Kappa Rev FC

377÷1291 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
HE: high efficiency version

SLN: super low noise version

/LN: low-noise unit

/DS: execution featuring a desuperheater

/DC: execution with recovery condenser

Configurable free-cooling section: Basic, Custom, Extra

Strengths
- 3 free-cooling configurations available
- Chiller with low refrigerant charge
- Operating in a wide range of external ambient conditions
- Night Shift function for noise control (option)
- Dual power supply with automatic switching and Fast restart function (options)
- BlueThink advanced control with integrated web server. Multilogic function and Blueye® supervision system. (options)
- Flowzer: inverter driven pumps (options)

BlueBox by Swegon

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.

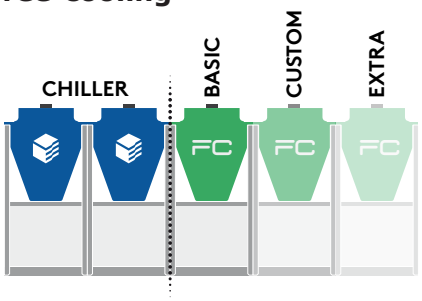
A strong point of our free cooling units is certainly the control system that allows maximum use to be made of the free resource, consisting of outside air, so minimizing the energy used by the compressors. The controller of the unit activates the chiller section and the free cooling section, also in 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 integrated into Kappa Rev 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 there are two separate fan sections, the unit controller 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

Compared to other free cooling systems, such as for example the system with facing coils, the one used by Kappa Rev 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

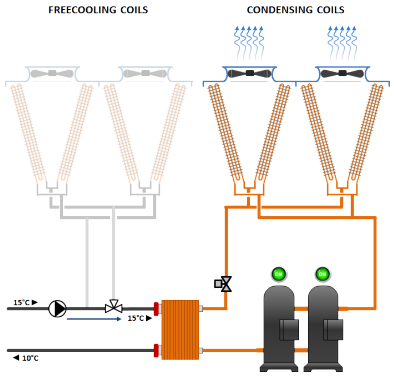
Finally, it should be remembered that the modularity of Kappa Rev FC does not regard only the size of the free cooling section; it also regards the possibility of choosing from various combinations of efficiency and noiselessness of the chiller section.

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.

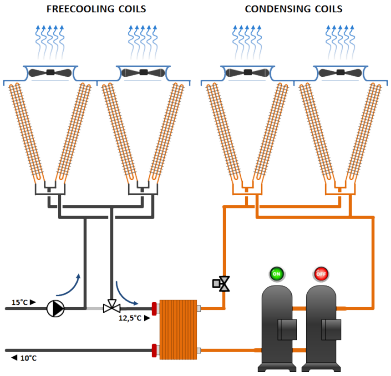


The total cooling capacity is generated by the compressors of the chiller section, and the free cooling coil and relevant fans remain inactive. The operation of the unit is that of a classic chiller.

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

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

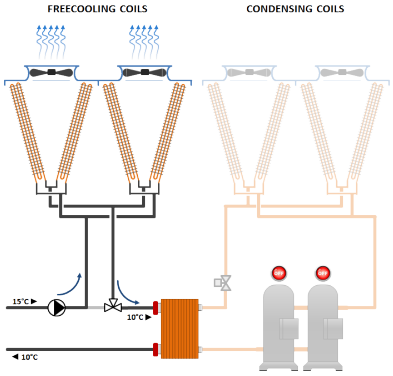


The control switches over the 3-way valve to put the free cooling coil in series with the evaporator and with the free cooling section fans.

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.

Free cooling only mode

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

Kappa Rev 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

STRUCTURE

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.

Depending on version and customization the units with cooling capacity above 800 kW can present the chiller section separated from the free-cooling section. For more information refer to "Technical specifications" section.

REFRIGERANT

Refrigerant R513A (GWP=573*) standard.

The refrigerant consists in a blend of R134a (44%) and R1234yf (56%), with temperature glide equal to 0.

R513A is classified as a non hazardous fluid (Group 2 fluid under PED).

COMPRESSORS

Versione HE FC e SLN FC

For the HE FC and SLN FC version units, the compressors are semi-hermetic screw compressors with continuous capacity reduction of output capacity from 25 to 100%, which allows the energy efficiency of the unit to be maximized in all operating conditions.

The capacity reduction of the entire unit is always continuous, from the minimum capacity reduction step, based on the number of compressors, up to 100%. Lubrication of the compressors is ensured by the pressure difference between delivery and suction.

All the compressors are fitted with check valve on delivery side, metal mesh filter on suction side and electronic protection with temperature sensors directly inserted in the windings and on the delivery pipe.

The machine is started and switched off with a forced 25% capacity reduction of each compressor and starting is of the "star-delta" type.

All the compressors are fitted as standard with crankcase heater and discharge valve.

SOURCE-SIDE HEAT EXCHANGER

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.

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%.

USER-SIDE HEAT EXCHANGER

The exchanger is a dry-expansion shell-and-tube exchanger.

It is sized to maximize the efficiency of the unit, by keeping the overall dimensions and the refrigerant charge down to a minimum.

The exchanger consists of a steel shell insulated with a shell made of closed-cell foam material, while the tube bundle is made with copper tubes.

On the hydraulic connections of the exchanger, there are also pipe taps for the differential pressure switch and wells for the temperature probes.

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.

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

Compared to the mechanical expansion valve, the electronic expansion valve allows machine stability to be reached more quickly and better superheating control to maximize the use of the evaporator in all load conditions. This also acts as shut-off valve on the liquid line, as it closes during compressor stops, so preventing dangerous refrigerant migration.

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
- fuses to protect the compressors, fans and auxiliary circuits
- compressor contactors
- fan contactors
- phase monitor
- potential-free general alarm contacts
- single potential free operating contacts
- external air temperature probe
- microprocessor controller with display accessible from the outside
- Capacitive backup battery for electronic expansion valve

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.

Where separated from the chiller module, the free-cooling section is provided with its own electrical panel.

CONTROLLO BLUETHINK

Main controller functions

The microprocessor control allows the following functions:

- water temperature control, with control of the water leaving the user-side 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
- digital input for general ON/OFF
- digital input for Summer/Winter selection (only for HP units)
- RS485 serial port with Modbus protocol
- Ethernet serial port with Modbus protocol and integrated web server preloaded web page

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 (only for units with advanced control)

As standard, the Bluethink controller integrates a webserver 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, fans, pumps, electronic 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
- remote summer winter mode selection

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

Kappa Rev HE FC

The HE FC version unit uses oversize coils, 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.

Kappa Rev SLN FC

The SLN FC version unit uses a soundproofed compressor compartment (see description of the /LN option), 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 speed adjuster allows rotation of the fans at maximum speed when external air temperature conditions are particularly critical so as to guarantee the same operating limits as the HE FC version.

OPTIONS

/DC: unit with total recovery condenser

In addition to the set-up of a chiller only unit, /DC units comprise:

- a heat recovery condenser for recovering 100% of the condensation heat on each refrigerant circuit. The exchanger is a brazed plate heat exchanger; for multi-circuit units, the heat exchangers are to be manifolded outside the unit (by the customer)
- temperature probe at the inlet of each recovery exchanger
- liquid receiver for each refrigerant circuit with system for emptying the refrigerant from the condensing coil
- potential free contact in the electrical control panel for activation of recovery.

When required by the system, through the closing of a contact, the control automatically manages activation of recovery. Recovery management is carried out through a control on the temperature of the return water. The control also automatically manages safety deactivation of recovery if the condensing pressure becomes too high, and changes to using the condensing coils.

/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. The unit does not control external pumps and/or sensors on the desuperheater circuit. 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.

Two illustrative graphs are shown below in which, as the ambient temperature changes, (Tair) and as the temperature of the water leaving the heat recovery heat exchanger changes, (Tw,out DS), the percentage of recovered heat is shown as an indication (Recovery ratio).

The percentage of recovered heat is calculated as the ratio between recovered thermal power to the desuperheater and the thermal power released by the condenser under nominal conditions, that is, evaporator inlet/outlet water temperature 12/7°C.

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.

/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.

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
- modules /1PG, /2PG, /1PGS and /2PGS that have pumps suitable for operating with glycol up to 50%

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.

For units that are made in two separate sections, the hydraulic module is intended as a single section. The water inlet and outlet of each section are to be manifolded in parallel outside the units (by the customer).

DESCRIPTION OF ACCESSORIES

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

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.

Applies to units with advanced controller.

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.

LWTK **Low water temperature kit**

This accessory is compulsory if a water temperature set point lower than or equal to -5°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 an oversized evaporator and increased insulation, 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 the options: "BK_Brine Kit" and one of the condensation controls, with speed regulator 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.

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.

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.

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

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.

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

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.

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.

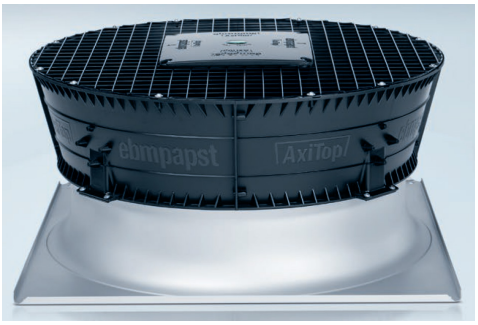
The pressure recuperator is a passive element situated on the ejection duct of each individual fan designed to allow better conversion of kinetic energy into static pressure, which manifests itself as a higher pressure generated by the fan.

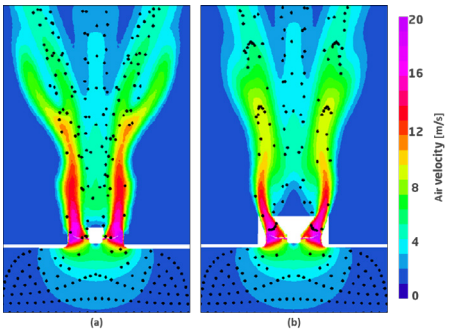
This higher pressure can have at least two possible applications:

- 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.

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

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.

IVPO **Soundproofed pump compartment**

With this accessory, the motor and the impeller of the pumps are enclosed in a compartment that is fully soundproofed with sound absorbing material and soundproofing material.

RA **Antifreeze heater**

These electric heaters are fitted on the pumps and in the tank (depending on the configuration of the machine) to prevent damage to the hydraulic components due to ice formation during periods when the machine is inactive.

Based on normal operating conditions and the percentage of glycol in the system, an appropriate "antifreeze alarm" temperature is set in the control. When a temperature that is 1K higher than the antifreeze alarm threshold is detected at the outlet from the exchanger, the pump (if present) and the antifreeze heaters are switched on. If the temperature of the outgoing water reaches the antifreeze alarm threshold, the compressors are stopped, keeping the heaters and the pumps active, and the general alarm contact of the machine is activated.

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.

FLUS **Flow switch (instead of the water differential pressure switch)**

As an alternative to the differential pressure switch (standard flow sensor), it is possible to request the paddle flow switch as accessory. This detects when there is no water flow to the user-side exchanger and sends a signal to the control of the unit that will stop the compressors to prevent damage to the exchangers.

Application of this accessory is compulsory for units that use non-glycol water and work with a yearly cycle where external air temperatures are zero or below.

The flow switch is supplied loose (installation by the customer) and replaces the water differential pressure switch (standard).

Electrical accessories

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

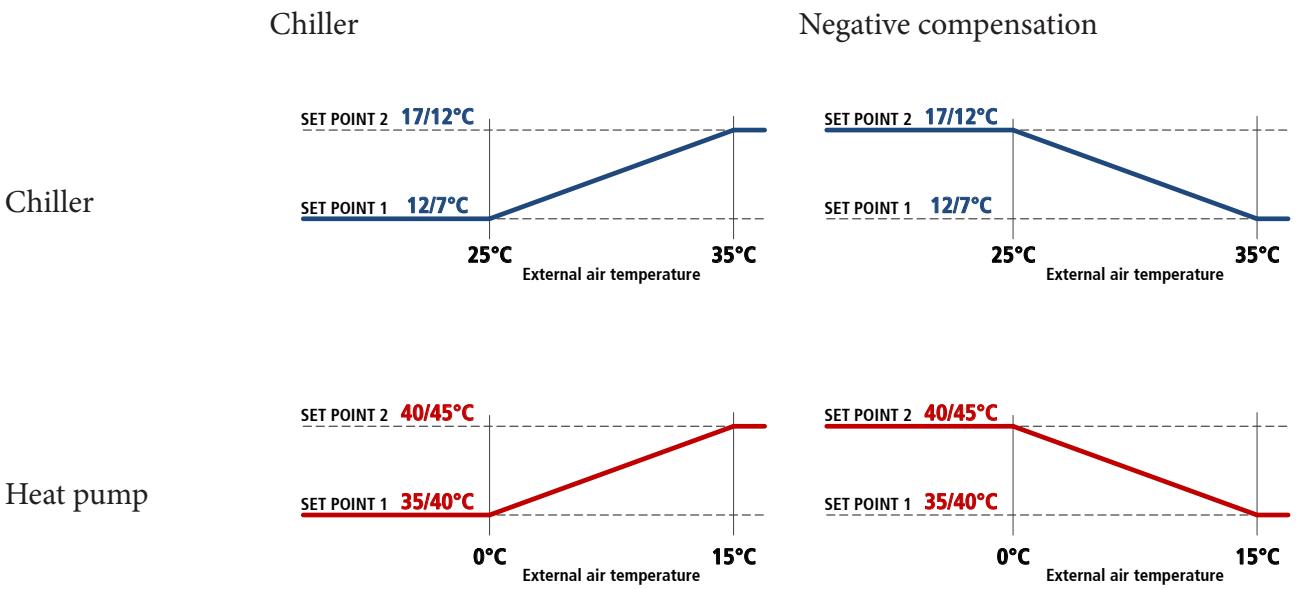
COTW **Outgoing water temperature control (S)**

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.

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.

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.

The two pumps are controlled by two separate relays.

RIF Power factor correction to cosφ ≥ 0.95

With this accessory, an electrical control panel (IP54 protection rating), containing power factor correction capacitors to make the cosφ 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

LIRA Absorbed current limitation with measurement of absorption

For the unit equipped with this accessory, it is possible to set, directly in the control, a maximum current that can be absorbed by the machine. The control instantly checks the absorptions, through an amperometric transformer, and, in case of need, applies a dynamic forced capacity reduction able to always keep the absorbed current below the set threshold.

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 lowest set point.

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

- set point 1 at 7°C
- set point 2 at 12°C

For operating conditions other than standard, unless otherwise specified in the order for the second set point, the controller will be set at the factory:

- by adding 5°C to the main set point

If necessary this value will however be limited to remain within the operating limits of the unit.

If the difference between the minimum set point and the maximum set point is greater than 5K, it is compulsory to ask for the accessory "Electronic expansion valve".

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 lowest set point.

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

- 0V will correspond to a set point of 7°C
- 10V will correspond to a set point of 12°C

For operating conditions other than standard, unless otherwise specified in the order for the variable set point, the controller will be set at the factory:

- by adding 5°C (10V) to the main set point (0V)

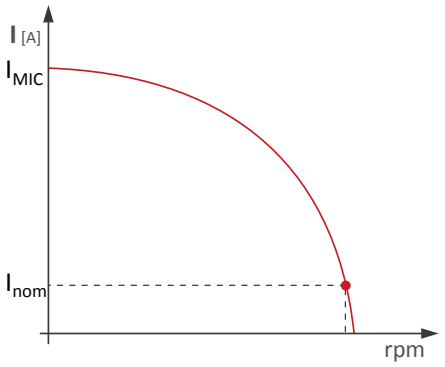
If necessary this value will however be limited to remain within the operating limits of the unit.

If the difference between the minimum set point and the maximum set point is greater than 5K, it is compulsory to ask for the accessory "Electronic expansion valve".

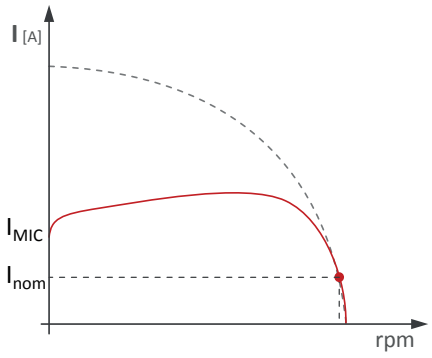
SOFT **Electronic soft-starter**

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 cosφ ≥ 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.

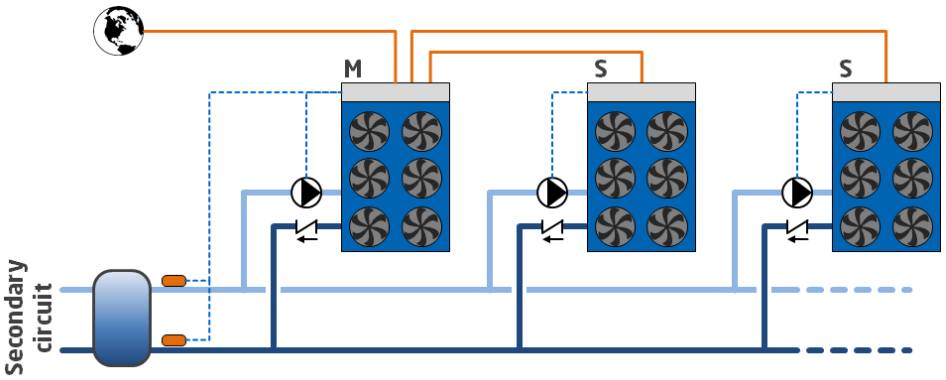
If the operating temperatures of the unit can extend below -25°C, specific measures must be adopted to guarantee correct operation of the unit and the reliability of critical components.

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.

Multilogic systems only operate with the "Ipro" advanced controller and if the connected units have the same software version. A Multilogic network cannot operate with different software versions/releases.



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. Reading / writing access is activable on field with a service level.

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. Reading / writing access is activable on field with a service level.

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.

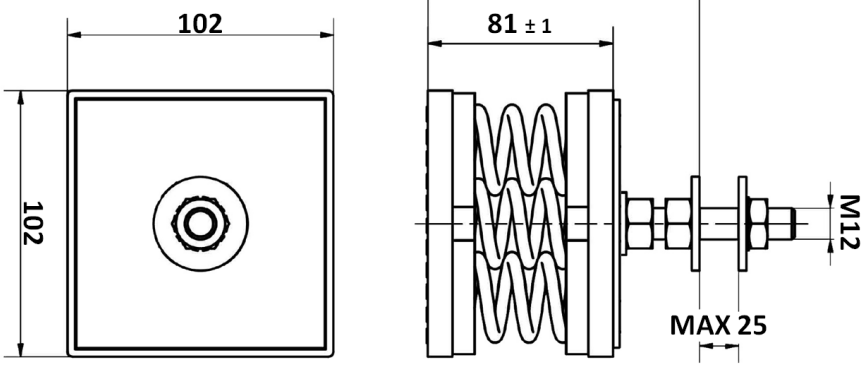
Other accessories

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 to the finned pack coils with copper pipes and aluminum fins and consists in the passivation of the aluminum with a polyurethane base through a procedure of immersion and then of a spray application of the coating that guarantees a double protection of the finning all over the exposure to the most aggressive environmental conditions even for more particular (or niche) process applications.

Specifically, the immersion process guarantees complete coverage of galvanic corrosion while the application of the spray protects the ends of the fins which represent the critical point for the initiation of the corrosion phenomenon.

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.

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

- there are obvious signs of corrosion on the exposed metal surfaces in the installation area
- the installation is located close to the sea coast
- the prevailing winds come from the sea and travel in the direction of the unit
- the environment is industrial with a significant concentration of pollutants
- it is an urban environment with a high population density
- it is a rural environment 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".

BFAN Free cooling coil treated with anti-corrosion paints

Specific option for free-cooling coils.

The treatment is applied to the finned pack coils with copper pipes and aluminum fins and consists in the passivation of the aluminum with a polyurethane base through a procedure of immersion and then of a spray application of the coating that guarantees a double protection of the finning all over the exposure to the most aggressive environmental conditions even for more particular (or niche) process applications.

Specifically, the immersion process guarantees complete coverage of galvanic corrosion while the application of the spray protects the ends of the fins which represent the critical point for the initiation of the corrosion phenomenon.

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

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".

FW Water filter

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.

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

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.

Flowzer options

Our range of Flowzer options offers flexible and scalable solutions to set the speed of pumps in the system with a view to optimising and reducing energy consumption.Different types of control modes are offered based on the system and application type:

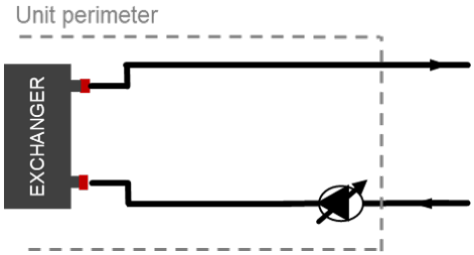
- FLOWZER VP - Inverter for manual pump adjustment
- FLOWZER VD - control of available pump discharge head for variable flow systems without monitoring the flow rate limits;
- FLOWZER VDE - flow rate control to keep the flow rate constant as the external working conditions of the system change;
- FLOWZER VDT - flow rate control with constant TD (difference between input and output temperature in the heat exchanger on the user side) in variable flow pumps, without monitoring the flow rate limits;
- FLOWZER VFPP - automatic management of variable flow rate in systems with one single primary circuit and a bypass valve;
- FLOWZER VPS - automatic management of variable flow rate, including balancing of flow rates between primary and secondary circuits;
- flowzer vps with TD-based control - automatic management of variable flow rate, including control with constant TD (difference between input and output temperature in the heat exchanger on the user side) in systems featuring both the primary and secondary circuits.

The tables below summarise the main system diagrams and show the application type and advantages/disadvantages offered by each solution. Each individual option is illustrated and explained individually in the next pages.

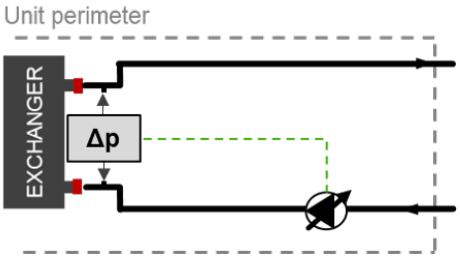
The hydraulic diagrams in this document are for exemplification purposes only and their main function is to help the reader understand the type of machines and devices the controller can manage.For a more technical evaluation of the system, please refer to the dedicated manual.

Constant flow system			
	Application	Advantages	Disadvantages
Flowzer VP	Ideal for constant flow systems The option is given to set two different speeds: one for heating and one for cooling mode or one for chiller and one for FC mode. This solution replaces the 2-way regulating valve.	- Increased efficiency: increased “REAL” EER of the unit installed, considering the power consumption of the pumps in real installation conditions and in real operating conditions. - Reduced installation times and costs: quick setup of water flow using the display.	This solution doesn't allow to save energy in the pump under part load conditions, due to the possibility to only set two frequency values in the inverter.
Flowzer VDE	Ideal for constant flow systems to keep the water flow to the heat exchanger constant under all conditions	- Plug&Play: provides for easy and flexible implementation as it is not supplied with options to be fitted therefore allows for quick commissioning.	This solution is less efficient as losses in the heat exchanger are kept constant under all conditions (including in cases when they may be reduced).

FLOWZER VP

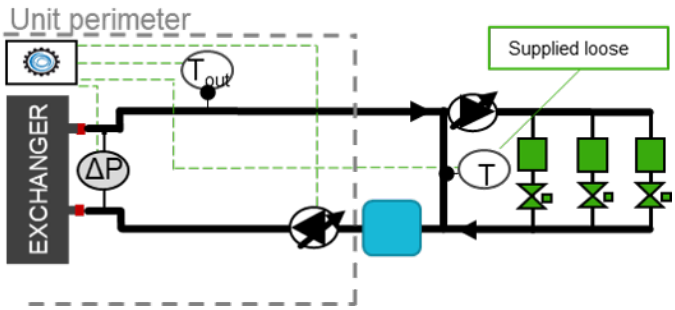


FLOWZER VDE

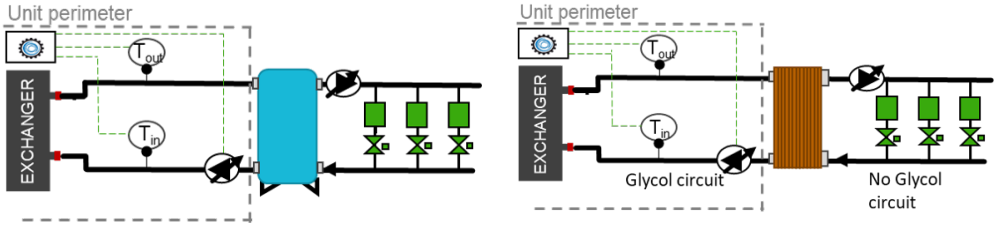


Variable flow system featuring primary and secondary circuits			
	Application	Advantages	Disadvantages
Flowzer VPS	Ideal for all systems featuring a primary and a secondary circuit divided by a hydraulic bypass branch	- Energy saving: the energy consumption during pumping operations can be cut down to 55% if compared with a traditional system - Enhanced comfort: correct balancing between primary and secondary loop	Only recommended in systems featuring a primary and a secondary circuit divided by a bypass pipe; not flexible for other applications
Flowzer VDT	Ideal for systems featuring similar users or users with similar operating conditions It is recommended in structured systems in which the client has third-party systems to control the min. and max. flow rate.	- Plug&Play: provides for easy and flexible implementation as it is not supplied with options to be fitted and for quick commissioning.	Risk of over- or underflow for some of the users in the secondary circuit if they have different operating conditions (same temperature difference) A control is required by third-party equipment to ensure compliance with the unit flow limits.
FLOWZER VPS with TD-based control	Ideal for systems featuring similar users or users with similar operating conditions Ideal for systems featuring a primary and a secondary circuits physically divided from the heat exchanger or a tank with multiple connections.	- Plug&Play: provides for easy and flexible implementation as it is not supplied with options to be fitted and for quick commissioning.	Risk of over- or underflow for some of the users in the secondary circuit if their temperature difference is not the same due to the existing operating conditions

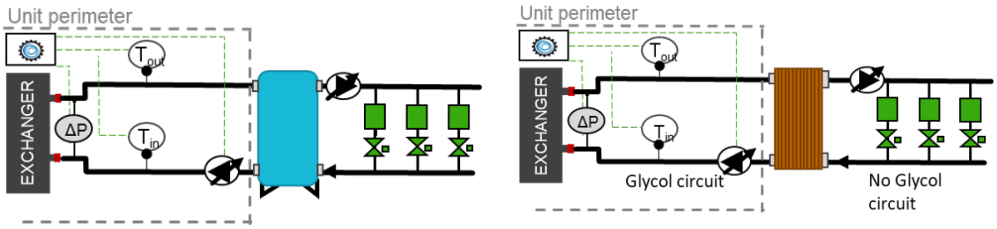
FLOWZER VPS



FLOWZER VDT

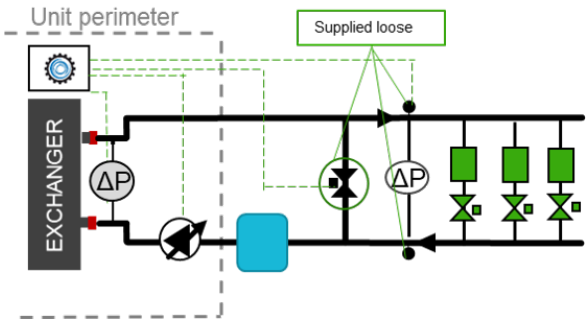


FLOWZER VPS with DT-based control

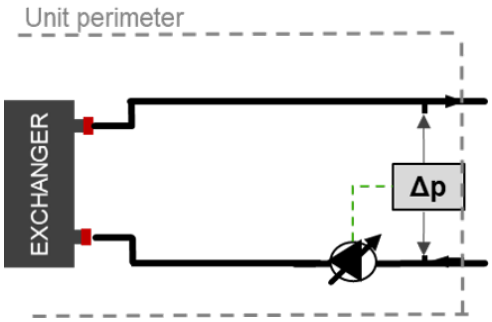


Variable flow system featuring primary circuit only			
	Application	Advantages	Disadvantages
Flowzer VFPP	Ideal for new systems intended to reduce installation costs	- Energy saving: the energy consumption during pumping operations can be cut down to 50% if compared with a traditional system Lower CAPEX thanks to reduced installation costs and smaller number of components (one pump less)	Requires some testing to correctly set the pressure available in the system and to correctly position the two transducers, based on the system layout and devices.
Flowzer VD	Ideal for systems fitted with changing users according to the season. Ideal for industrial processes, such as injection moulding, in order for each terminal to operate with the correct discharge head. It is recommended in structured systems in which the client has third-party systems to control the min. and max. flow rate.	- Plug&Play: provides for easy and flexible implementation as it is not supplied with options to be fitted therefore allows for quick commissioning.	A control is required by third-party equipment to ensure compliance with the unit flow limits.

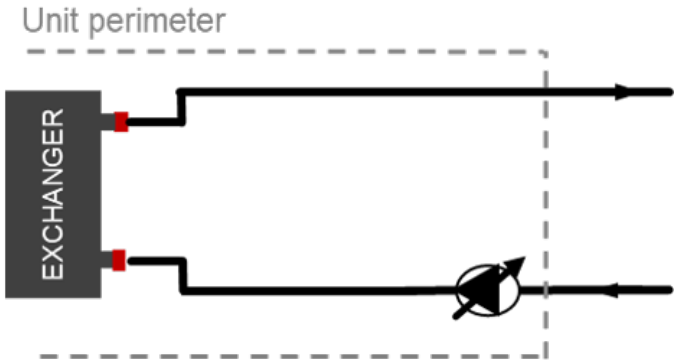
Flowzer VFPP



Flowzer VD



FVP FLOWZER VP - Inverter for manual pump adjustment



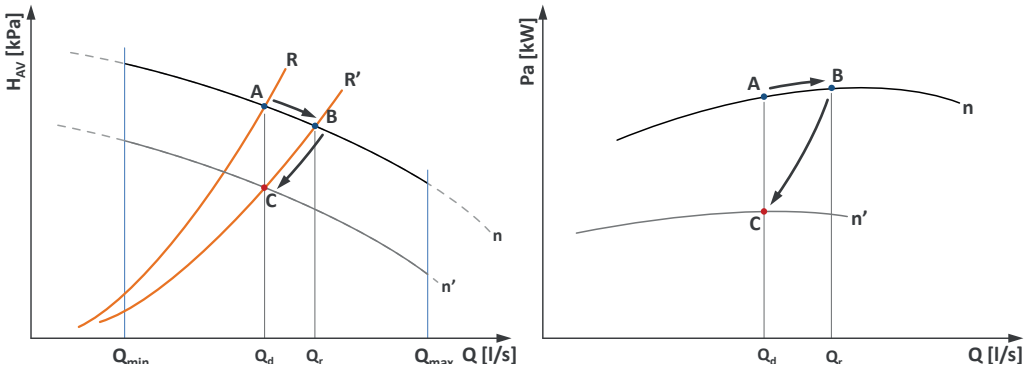
The accessory consists of inserting an inverter in the machine to manually adjust the speed of the pump (or pumps) in order to calibrate the pump flow rate on the head losses of the system.

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 Qd.

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 Qr higher than Qd.

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.

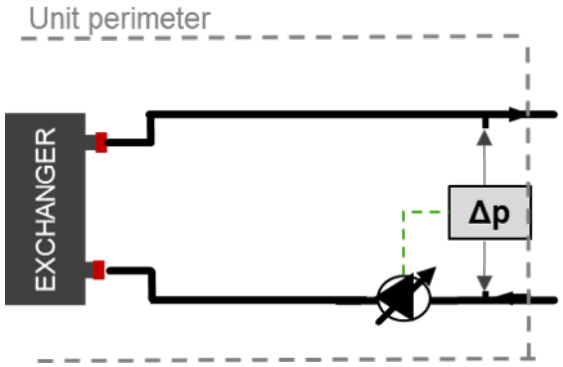


The use of the Flowzer allows the pump speed to be set manually (e.g. at speed n' instead of n) to obtain the design water flow rate and thermal gradient (point C). Once the adjustment procedure has been carried out, the pump will always work at a fixed flow rate.

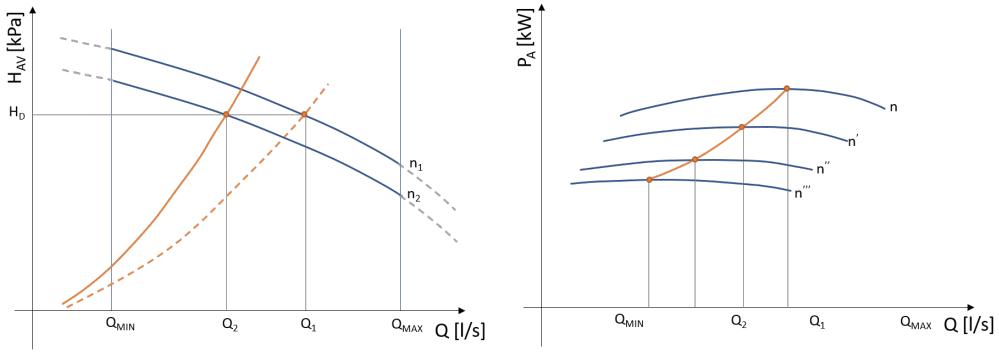
The adoption of the VP Flowzer allows to considerably reduce the electrical power consumption of the pump with a consequent energy saving. By way of example, a reduction in the flow rate of 10% leads to a reduction in power consumption of around 27%.

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 - control of available pump discharge head for variable flow systems without monitoring the flow rate limits;**



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.



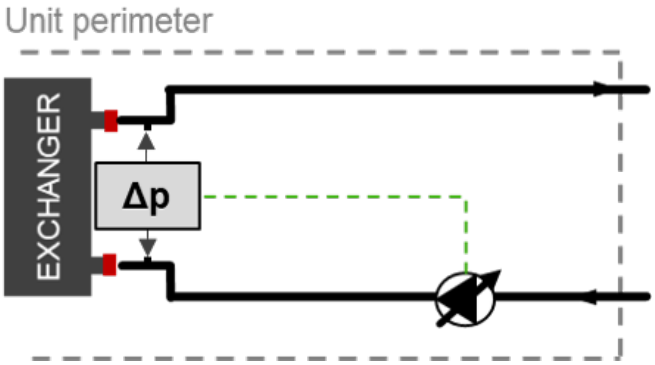
With the Flowzer VD, the customer can set, directly on the display, the available discharge head value (Hd) that the unit must maintain. As can be seen from the graph as the user request decreases, the resistant curve of the plant moves to the left, consequently the inverter reduces the speed of the 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).

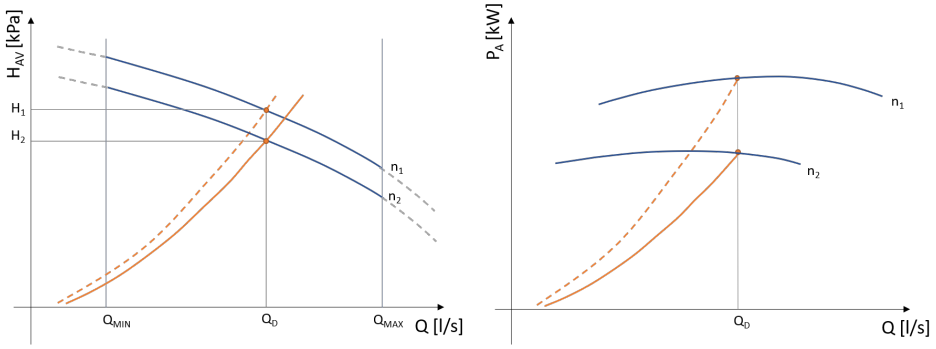
The use of this accessory also allows the pump speed to be adapted to possible fouling of the filter on the hydraulic circuit.

The option is not compatible with the Multilogic version. Please refer to the HYZER solutions for the compatibility between variable flow systems and multi-machine systems.

FVDE **FLOWZER VDE - flow rate control to keep the flow rate constant as the external working conditions of the system change;**

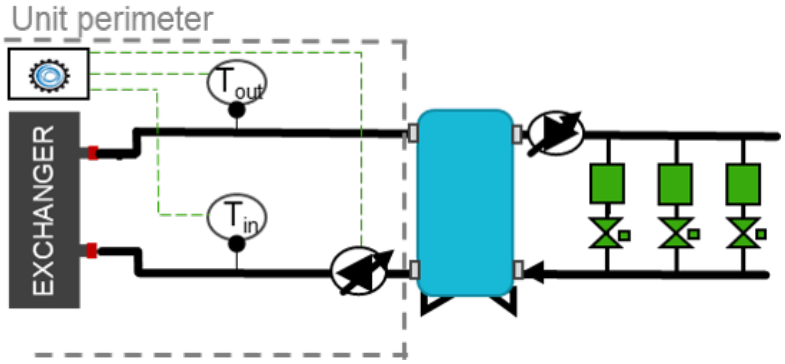


Flowzer VDE requires a differential pressure transducer to be installed in the machine. Through this transducer, the inverter can gauge the actual pressure at the ends of the heat exchanger installed in the machine and it can automatically adapt the pump speed for a constant flow value under all conditions. Flowzer VDE must be combined with Flowzer VP.



Flowzer VDE is used to automatically adjust the pump speed. As the graph shows, the inverter trips and increases the pump speed if a different condition occurs which would cause an undesired drop in the flow rate (e.g. operation of an external dry cooler). This is a more accurate solution than the VP option alone as it always provides for the water flow (Qd) required by the design conditions.

FVDT **FLOWZER VDT - flow rate control with constant TD (difference between input and output temperature in the heat exchanger on the user side) in variable flow pumps, without monitoring the flow rate limits;**



Flowzer VDT uses the temperature sensors installed at the inlet and outlet of the heat exchanger to automatically adjust the pump speed, thus keeping the T delta difference setpoint constant.

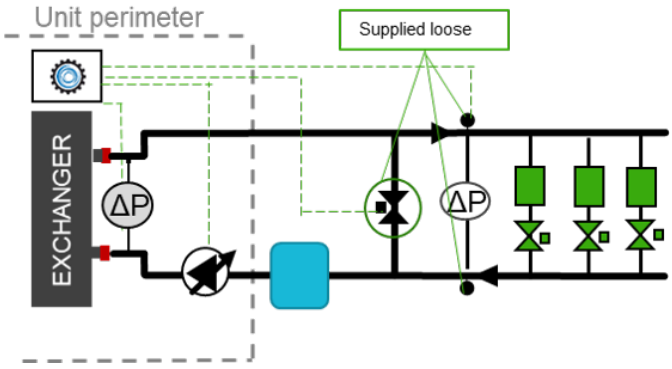
The option is not compatible with the Multilogic version. Please refer to the HYZER solutions for the compatibility between variable flow systems and multi-machine systems.

The unit must include the advanced Bluethink controller and just one heat exchanger on the user side.

With the Flowzer VDT, the customer can set, directly on the display, the available delta T value that the unit must maintain. 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 option is specifically designed for systems in which the system users have similar operating conditions (same temperature difference).

FVF **FLOWZER VFPP - automatic management of variable flow rate in systems with one single primary circuit and a bypass valve;**



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 (Δpe)
- 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 (Δpp) 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.
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:

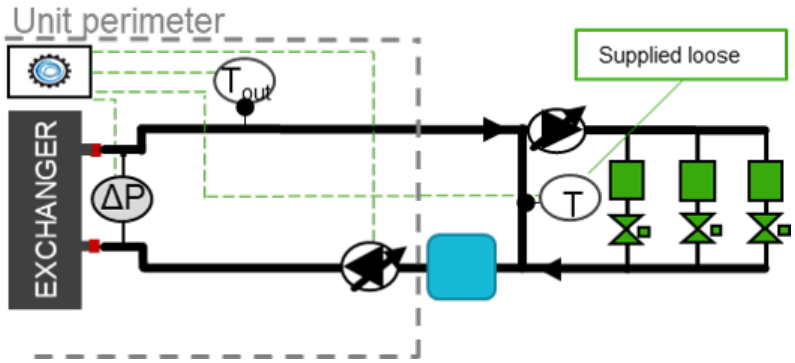
- single inverter + pumping module, integrated in the unit
- small internal footprint, due to the simplified layout

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 Δpp
- 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 Δpe
- When the minimum allowed flow rate threshold is exceeded, the control system will open the bypass valve Vbp 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 (Vmin) must be ensured by the relevant tank to be installed between the unit and the separator or the bypass pipe.
The bypass valve Vbp 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 Δpp 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.

FVPS **FLOWZER VPS - automatic management of variable flow rate, including balancing of flow rates between primary and secondary circuits;**



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

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 and just one heat exchanger on the user side.

The option offers a complete default package to guarantee simple selection, purchasing and commissioning.

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:

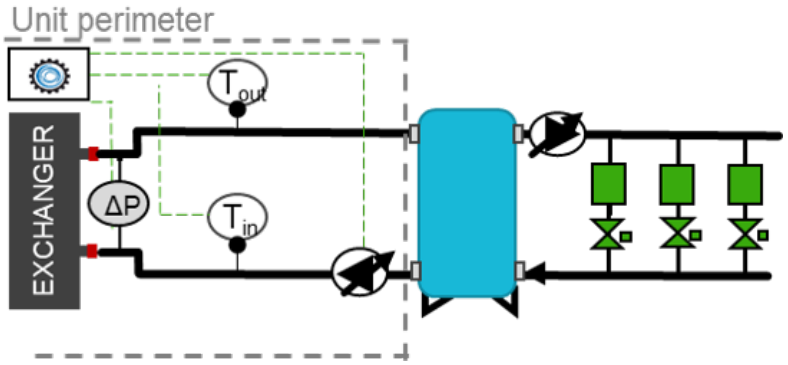
- Flowzer VPS performs a smart check of the flow rate in the primary circuit and balances it with the flow rate in the secondary circuit.
- the system controller modulates the pump speed according to the condition detected by the system sensors T
- if the system terminals are switched off, the flow rate 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 Δpe

In the required minimum load condition (that is, with all system terminals switched off) the necessary minimum volume (Vmin) 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.

FVPD **FLOWZER VPS with TD-based control - automatic management of the variable flow rate, including control with constant temperature difference (TD) in the heat exchanger on the user side in systems featuring both the primary and secondary circuits.**



Bluethink solution for variable flow systems - ideal for systems featuring a primary and a secondary circuit physically divided by a heat exchanger or a tank with multiple connections.

flowzer vps with TD-based control includes:

- a differential pressure transducer, installed at the factory at the ends of the user-side heat exchanger of the unit (Δpe)

The option must be necessarily combined with the Flowzer VP (inverter) and with one of the hydraulic modules that can be selected for the unit. The option is not compatible with the Multilogic version. Please refer to the HYZER solutions for the compatibility between variable flow systems and multi-machine systems.

The unit must include the advanced Bluethink controller and just one heat exchanger on the user side.

The option offers a complete default package to guarantee simple selection, purchasing and commissioning.

flowzer vps with TD-based control offers the following advantages:

- a full package that is easy to install as all the regulating devices are pre-assembled and pre-wired in the unit;
- achieving a complete variable flow system, with maximum energy saving
- the ideal solution to refurbish existing systems where the T different must be kept constant in the system, especially in comfort applications;

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.

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 with TD-based control performs smart monitoring of the flow rate in the primary circuit, keeping the T difference constant in the heat exchanger;
- the system controller modulates the pump speed according to the condition detected by the temperature sensors (T) in the system, which are installed at the inlet and outlet of the heat exchanger on the user side;
- the difference in the water temperature (T) and flow rate are inversely proportional, which is why if the T difference is reduced at the same performance level, the water flow exceeds the flow required by the system and the pump speed is reduced in order to save energy;

on the other hand, when the load increases, the T difference increases in the system and the pump speed is increased accordingly.

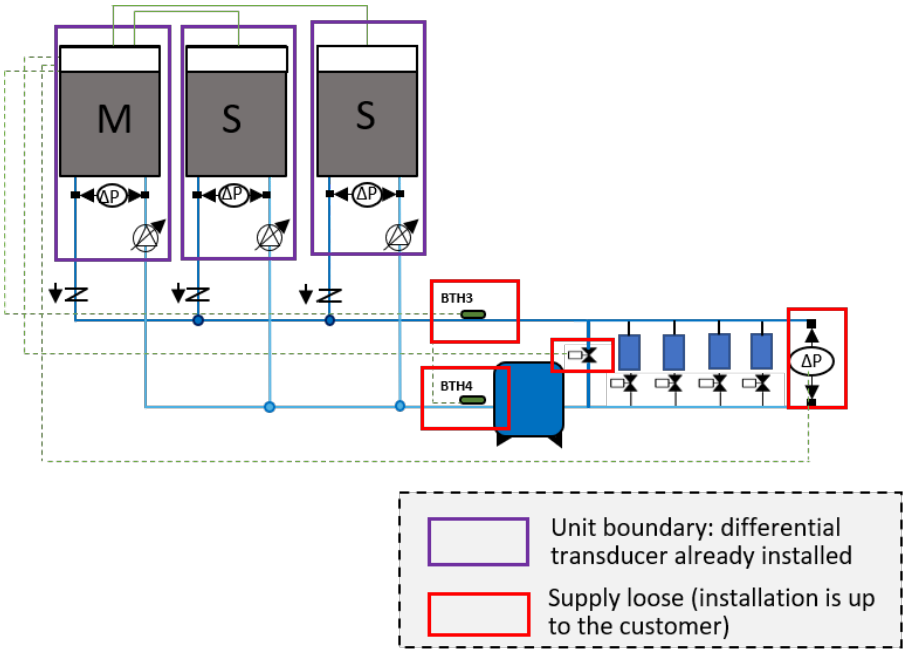
- The check contributes to reducing/increasing the speed of the pump in the primary circuit until the min./max. flow threshold admitted in the heat exchanger of the unit is exceeded.
- this flow rate is indirectly monitored through the losses detected by the differential pressure transducer Δpe

The temperature sensors of the system output a 4-20 mA signal.

Further details can be found in the relevant manual.

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.

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.

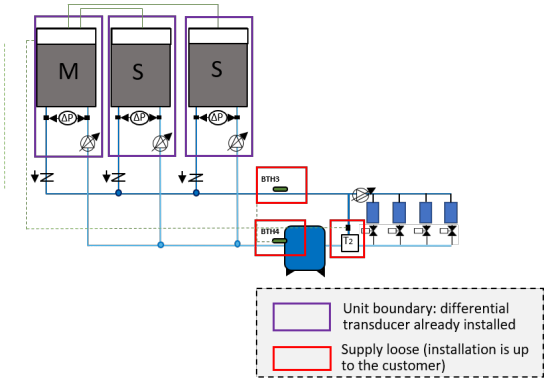
This option must be selected with either the "HYZER E VFPP function for Master unit to manage up to 2 Slave units" or "HYZER E VFPP function for Master unit to manage up to 6 Slave units".

	System capacity range**	Quantity	Diameter	Qmax**
	kW	-	in	m³/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 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

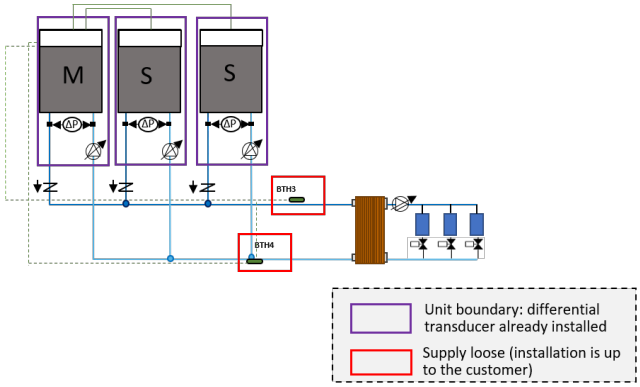
For the master units, the accessory requires:

- 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 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.

HDx HYZER E VPS with DT-based control function



The HYZER E VPS with TD-based control function combines the Multilogic function, which is used to manage multi-machine systems, with the FLOWZER VPS with DT-based control 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 with DT-based control 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 with TD-based control logic, please refer to the dedicated FVPS with DT-based control 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:

- **HD0:** HYZER E VPS with TD-based control function for Slave units;
- **HD2:** HYZER E VPS with TD-based control function for the Master unit in order to manage up to 2 Slave units;
- **HD6:** HYZER E VPS with TD-based control 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 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).

KAPPA REV HE FC (R513A)

			33.2	35.2	37.2	40.2	43.2	51.2	54.2	58.2
Cooling (A30°C; W10°C; e.g.30%)										
Refrigeration capacity	(1)	kW	382	438	461	526	582	591	655	765
Total absorbed power	(1)	kW	106	122	127	146	163	167	185	218
EER	(1)		3,7	3,72	3,73	3,71	3,69	3,62	3,66	3,61
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	73	84	88	101	112	113	126	147
FC BASIC (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	1 ½	2	2	2	2	2 ½	3	3
Refrigeration capacity only FC	(2)	kW	161	221	228	236	244	287	338	356
Absorbed power only FC	(2)	kW	5	7	7	7	7	9	11	11
TFT	(3)	°C	-7,4	-3,6	-4,1	-6,2	-8	-4,9	-3,6	-5,9
Total head losses	(7)	kPa	147	196	172	198	225	200	214	249
Total internal volume	(4)	l	145	140	140	170	170	305	225	330
FC CUSTOM (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	2	3	3	3	3	3	4	4
Refrigeration capacity only FC	(2)	kW	210	286	296	307	318	327	388	411
Absorbed power only FC	(2)	kW	7	11	11	11	11	11	14	14
TFT	(3)	°C	-2,2	0,7	0,4	-0,9	-2,1	-2,3	-1	-2,8
Total head losses	(7)	kPa	165	158	128	148	168	175	184	210
Total internal volume	(4)	l	145	200	200	230	230	225	305	410
FC EXTRA (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	3	4	4	4	4	4	5	5
Refrigeration capacity only FC	(2)	kW	279	336	347	361	374	385	488	517
Absorbed power only FC	(2)	kW	11	14	14	14	14	14	18	18
TFT	(3)	°C	1,9	2,6	2,4	1,4	0,4	0,3	2	0,7
Total head losses	(7)	kPa	134	146	112	129	147	150	171	193
Total internal volume	(4)	l	210	280	280	315	315	305	305	410
Fans										
Chiller fans		n°	6	7	8	8	8	9	11	12
Fans FC BASIC		n°	3	4	4	4	4	5	6	6
Fans FC CUSTOM		n°	4	6	6	6	6	6	8	8
Fans FC EXTRA		n°	6	8	8	8	8	8	10	10
Compressors										
Compressors/Circuits		n°/n°	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2
Minimum capacity reduction step	(8)	%	12%	12%	13%	12%	13%	12%	12%	12%
Refrigerant charge (MCHX)		kg	46	52	52	56	56	68	77	83
Refrigerant charge (Cu/Al)		kg	64	73	76	80	80	95	110	119
Noise levels										
Chiller: Sound power level	(5)	dB(A)	94	95	95	96	96	97	98	98
Chiller: Sound power level of LN version	(5)	dB(A)	89	90	90	91	91	92	93	93
Chiller: Sound pressure level	(6)	dB(A)	62	62	62	63	63	65	66	66
Chiller: Sound pressure level of LN version	(6)	dB(A)	57	58	58	59	59	59	61	60
FC BASIC: Sound power level	(5)	dB(A)	76	77	77	77	77	78	79	79
FC CUSTOM: Sound power level	(5)	dB(A)	77	79	79	79	79	79	80	80
FC EXTRA: Sound power level	(5)	dB(A)	79	80	80	80	80	80	81	81
FC BASIC: Sound pressure level	(6)	dB(A)	44	45	45	45	45	46	47	47
FC CUSTOM: Sound pressure level	(6)	dB(A)	45	47	47	47	47	47	48	48
FC EXTRA: Sound pressure level	(6)	dB(A)	47	48	48	48	48	48	49	49

(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 rated engine speed, without any accessory, with external air temperature 30 ° C and inlet / outlet water temperature for user exchanger 15/10 ° C. Binding values. Values obtained from measurements carried out according to ISO 3744. evaporator 15/10 ° C.

(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.

** Basic CH unit without included accessories

KAPPA REV HE FC (R513A)

			67.2	73.2	80.2	85.2	90.2	95.2	100.2	105.2
Cooling (A30°C; W10°C; e.g.30%)										
Refrigeration capacity	(1)	kW	833	876	921	1003	1079	1142	1209	1291
Total absorbed power	(1)	kW	236	247	261	285	309	329	348	365
EER	(1)		3,61	3,64	3,63	3,65	3,63	3,61	3,62	3,66
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	160	168	177	193	207	220	233	248
FC BASIC (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	4	4	4	4	5	5	6	6
Refrigeration capacity only FC	(2)	kW	413	427	440	451	558	572	654	665
Absorbed power only FC	(2)	kW	14	14	14	14	18	18	21	21
TFT	(3)	°C	-4,3	-4,7	-5,3	-6,6	-3,6	-4,4	-2,9	-3,7
Total head losses	(7)	kPa	174	197	217	253	263	285	289	279
Total internal volume	(4)	l	410	410	410	400	385	430	430	545
FC CUSTOM (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	5	5	5	5	6	6	7	7
Refrigeration capacity only FC	(2)	kW	506	524	540	555	634	651	731	743
Absorbed power only FC	(2)	kW	18	18	18	18	21	21	25	25
TFT	(3)	°C	-0,8	-1,1	-1,4	-2,4	-1,3	-1,9	-1	-1,6
Total head losses	(7)	kPa	153	173	193	221	244	263	275	266
Total internal volume	(4)	l	410	410	410	400	385	430	430	545
FC EXTRA (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	6	6	7	7	8	8	9	9
Refrigeration capacity only FC	(2)	kW	590	611	689	709	786	807	887	902
Absorbed power only FC	(2)	kW	21	21	25	25	28	28	32	32
TFT	(3)	°C	1,3	1,1	1,9	1,3	1,7	1,1	1,6	1,2
Total head losses	(7)	kPa	141	154	168	196	226	242	262	253
Total internal volume	(4)	l	410	410	410	400	385	430	430	545
Fans										
Chiller fans		n°	12	13	14	15	16	17	18	19
Fans FC BASIC		n°	8	8	8	8	10	10	12	12
Fans FC CUSTOM		n°	10	10	10	10	12	12	14	14
Fans FC EXTRA		n°	12	12	14	14	16	16	18	18
Compressors										
Compressors/Circuits		n°/n°	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2
Minimum capacity reduction step	(8)	%	13%	12%	13%	12%	13%	12%	13%	12%
Refrigerant charge (MCHX)		kg	83	92	92	105	111	128	128	141
Refrigerant charge (Cu/Al)		kg	119	131	134	150	159	179	182	198
Noise levels										
Chiller: Sound power level	(5)	dB(A)	99	100	100	100	100	101	101	102
Chiller: Sound power level of LN version	(5)	dB(A)	94	95	95	95	95	96	96	97
Chiller: Sound pressure level	(6)	dB(A)	67	67	67	67	67	68	68	69
Chiller: Sound pressure level of LN version	(6)	dB(A)	62	62	62	62	62	63	63	64
FC BASIC: Sound power level	(5)	dB(A)	80	80	80	80	81	81	82	82
FC CUSTOM: Sound power level	(5)	dB(A)	81	81	81	81	82	82	82	82
FC EXTRA: Sound power level	(5)	dB(A)	82	82	82	82	83	83	84	84
FC BASIC: Sound pressure level	(6)	dB(A)	48	48	48	48	49	49	50	50
FC CUSTOM: Sound pressure level	(6)	dB(A)	49	49	49	49	50	50	50	50
FC EXTRA: Sound pressure level	(6)	dB(A)	50	50	50	50	51	51	52	52

(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 rated engine speed, without any accessory, with external air temperature 30 ° C and inlet / outlet water temperature for user exchanger 15/10 ° C. Binding values. Values obtained from measurements carried out according to ISO 3744. evaporator 15/10 ° C.

(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.

** Basic CH unit without included accessories

KAPPA REV HE FC (R513A)

			33.2	35.2	37.2	40.2	43.2	51.2	54.2	58.2
Dimensions and weights**										
FC BASIC										
Modules		n°	1	1	1	1	1	1	1	1
Length		mm	6162	7312	7312	7312	7312	9605	10750	10750
Length chiller module		mm	-	-	-	-	-	-	-	-
Length free-coling module		mm	-	-	-	-	-	-	-	-
FC CUSTOM										
Modules		n°	1	1	1	1	1	1	1	1
Length		mm	6162	8460	8460	8460	8460	9605	11898	11898
Length chiller module		mm	-	-	-	-	-	-	-	-
Length free-coling module		mm	-	-	-	-	-	-	-	-
FC EXTRA										
Modules		n°	1	1	1	1	1	1	1	1
Length		mm	7310	9608	9608	9608	9608	10753	13047	13047
Length chiller module		mm	-	-	-	-	-	-	-	-
Length free-coling module		mm	-	-	-	-	-	-	-	-
Depth		mm	2260	2260	2260	2260	2260	2260	2260	2260
Height		mm	2440	2440	2440	2440	2440	2440	2440	2440

			67.2	73.2	80.2	85.2	90.2	95.2	100.2	105.2
Dimensions and weights**										
FC BASIC										
Modules		n°	1	1	1	2	2	2	2	2
Length		mm	11898	13053	13053	14198	15347	16492	17640	18850
Length chiller module		mm	-	-	-	9610	9610	10755	10755	11965
Length free-coling module		mm	-	-	-	4588	5737	5737	6885	6885
FC CUSTOM										
Modules		n°	1	2	2	2	2	2	2	2
Length		mm	13047	14202	14202	15347	16495	17640	18789	19999
Length chiller module		mm	-	8465	8465	9610	9610	10755	10755	11965
Length free-coling module		mm	-	5737	5737	5737	6885	6885	8034	8034
FC EXTRA										
Modules		n°	2	2	2	2	2	2	2	2
Length		mm	14195	15350	16499	17644	18793	19938	21085	22295
Length chiller module		mm	7310	8465	8465	9610	9610	10755	10755	11965
Length free-coling module		mm	6885	6885	8034	8034	9183	9183	10330	10330
Depth		mm	2260	2260	2260	2260	2260	2260	2260	2260
Height		mm	2440	2440	2440	2440	2440	2440	2440	2440

KAPPA REV SLN FC (R513A)

			33.2	35.2	37.2	40.2	43.2	51.2	54.2	58.2
Cooling (A30°C; W10°C; e.g.30%)										
Refrigeration capacity	(1)	kW	377	423	451	519	569	587	644	761
Total absorbed power	(1)	kW	108	121	127	146	162	166	183	217
EER	(1)		3,60	3,57	3,64	3,65	3,62	3,63	3,63	3,61
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	72	81	86	100	109	112	124	146
FC BASIC (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	1 ½	2	2	2	2	2	2 ½	3
Refrigeration capacity only FC	(2)	kW	161	218	225	233	240	247	298	351
Absorbed power only FC	(2)	kW	5	7	7	7	7	7	9	11
TFT	(3)	°C	-7	-3,1	-3,8	-5,9	-7,5	-8,1	-5,8	-5,7
Total head losses	(7)	kPa	150	214	189	210	240	123	230	248
Total internal volume	(4)	l	145	140	140	170	170	160	305	330
FC CUSTOM (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	2	3	3	3	3	3	3	4
Refrigeration capacity only FC	(2)	kW	210	282	292	302	313	322	340	405
Absorbed power only FC	(2)	kW	7	11	11	11	11	11	11	14
TFT	(3)	°C	-1,8	0,9	0,6	-0,8	-1,9	-2,1	-3	-2,6
Total head losses	(7)	kPa	168	176	145	160	183	98	200	210
Total internal volume	(4)	l	145	200	200	230	230	225	225	410
FC EXTRA (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	3	4	4	4	4	4	4	5
Refrigeration capacity only FC	(2)	kW	278	331	342	355	368	379	401	509
Absorbed power only FC	(2)	kW	11	14	14	14	14	14	14	18
TFT	(3)	°C	2,2	2,8	2,6	1,5	0,7	0,5	-0,2	0,9
Total head losses	(7)	kPa	137	164	129	141	162	73	186	192
Total internal volume	(4)	l	210	280	280	315	315	305	305	410
Fans										
Chiller fans		n°	6	7	8	8	8	9	11	12
Fans FC BASIC		n°	3	4	4	4	4	4	5	6
Fans FC CUSTOM		n°	4	6	6	6	6	6	6	8
Fans FC EXTRA		n°	6	8	8	8	8	8	8	10
Compressors										
Compressors/Circuits		n°/n°	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2
Minimum capacity reduction step	(8)	%	12%	12%	12,5%	11%	12,5%	12%	12%	12%
Refrigerant charge (MCHX)		kg	46	52	52	56	56	68	77	83
Refrigerant charge (Cu/Al)		kg	64	73	76	80	80	95	110	119
Noise levels										
Chiller: Sound power lev. SLN vers.	(5)	dB(A)	86	87	87	88	88	89	90	90
Chiller: Sound pressure lev. SLN vers.	(5)	dB(A)	54	55	54	56	56	57	58	58
FC BASIC: Sound power lev.	(5)	dB(A)	76	77	77	77	77	77	78	79
FC CUSTOM: Sound power lev.	(5)	dB(A)	77	79	79	79	79	79	79	80
FC EXTRA: Sound power lev.	(5)	dB(A)	79	80	80	80	80	80	80	81
FC BASIC: Sound pressure lev.	(6)	dB(A)	44	45	45	45	45	45	46	47
FC CUSTOM: Sound pressure lev.	(6)	dB(A)	45	47	47	47	47	47	47	48
FC EXTRA: Sound pressure lev.	(6)	dB(A)	47	48	48	48	48	48	48	49

(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 rated engine speed, without any accessory, with external air temperature 30 ° C and inlet / outlet water temperature for user exchanger 15/10 ° C. Binding values. Values obtained from measurements carried out according to ISO 3744. evaporator 15/10 ° C.

(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.

** Basic CH unit without included accessories

KAPPA REV SLN FC (R513A)

			67.2	73.2	80.2	85.2	90.2	95.2	100.2	105.2
Cooling (A30°C; W10°C; e.g.30%)										
Refrigeration capacity	(1)	kW	833	862	908	993	1076	1148	1222	1268
Total absorbed power	(1)	kW	239	247	262	290	311	334	355	368
EER	(1)		3,60	3,59	3,56	3,54	3,59	3,58	3,60	3,56
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	160	165	174	191	207	221	235	244
FC BASIC (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	3	4	4	4	5	5	6	6
Refrigeration capacity only FC	(2)	kW	360	421	434	445	549	564	644	655
Absorbed power only FC	(2)	kW	11	14	14	14	18	18	21	21
TFT	(3)	°C	-7,2	-4,4	-5	-6,4	-3,4	-4,3	-2,9	-3,3
Total head losses	(7)	kPa	126	208	231	267	282	305	313	302
Total internal volume	(4)	l	330	410	410	400	385	430	430	545
FC CUSTOM (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	4	5	5	5	6	6	7	7
Refrigeration capacity only FC	(2)	kW	415	515	532	546	624	641	720	732
Absorbed power only FC	(2)	kW	14	18	18	18	21	21	25	25
TFT	(3)	°C	-3,7	-0,8	-1,2	-2,2	-1,1	-1,8	-0,9	-1,4
Total head losses	(7)	kPa	105	184	207	235	262	283	299	288
Total internal volume	(4)	l	410	410	410	400	385	430	430	545
FC EXTRA (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	5	6	6	7	8	8	9	9
Refrigeration capacity only FC	(2)	kW	522	600	620	697	773	795	873	888
Absorbed power only FC	(2)	kW	18	21	21	25	28	28	32	32
TFT	(3)	°C	0	1,3	1	1,4	1,8	1,3	1,7	1,3
Total head losses	(7)	kPa	93	165	182	210	244	262	286	275
Total internal volume	(4)	l	410	410	410	400	385	430	430	545
Fans										
Chiller fans		n°	12	13	14	15	16	17	18	19
Fans FC BASIC		n°	6	8	8	8	10	10	12	12
Fans FC CUSTOM		n°	8	10	10	10	12	12	14	14
Fans FC EXTRA		n°	10	12	12	14	16	16	18	18
Compressors										
Compressors/Circuits		n°/n°	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2
Minimum capacity reduction step	(8)	%	13%	12%	13%	12%	13%	12%	13%	12%
Refrigerant charge (MCHX)		kg	83	92	92	105	111	128	128	141
Refrigerant charge (Cu/Al)		kg	119	131	134	150	159	179	182	198
Noise levels										
Chiller: Sound power lev. SLN vers.	(5)	dB(A)	91	92	92	92	92	93	93	94
Chiller: Sound pressure lev. SLN vers.	(5)	dB(A)	59	59	59	59	59	60	60	61
FC BASIC: Sound power lev.	(5)	dB(A)	79	80	80	80	81	81	82	82
FC CUSTOM: Sound power lev.	(5)	dB(A)	80	81	81	81	82	82	82	82
FC EXTRA: Sound power lev.	(5)	dB(A)	81	82	82	82	83	83	84	84
FC BASIC: Sound pressure lev.	(6)	dB(A)	47	48	48	48	49	49	50	50
FC CUSTOM: Sound pressure lev.	(6)	dB(A)	48	49	49	49	50	50	50	50
FC EXTRA: Sound pressure lev.	(6)	dB(A)	49	50	50	50	51	51	52	52

(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 rated engine speed, without any accessory, with external air temperature 30 ° C and inlet / outlet water temperature for user exchanger 15/10 ° C. Binding values. Values obtained from measurements carried out according to ISO 3744. evaporator 15/10 ° C.

(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.

** Basic CH unit without included accessories

KAPPA REV SLN FC (R513A)

			33.2	35.2	37.2	40.2	43.2	51.2	54.2	58.2
Dimensions and weights**										
FC BASIC										
Modules		n°	1	1	1	1	1	1	1	1
Length		mm	6162	7312	7312	7312	7312	8457	10750	10750
Length chiller module		mm	-	-	-	-	-	-	-	-
Length free-coling module		mm	-	-	-	-	-	-	-	-
FC CUSTOM										
Modules		n°	1	1	1	1	1	1	1	1
Length		mm	6162	8460	8460	8460	8460	9605	10750	11898
Length chiller module		mm	-	-	-	-	-	-	-	-
Length free-coling module		mm	-	-	-	-	-	-	-	-
FC EXTRA										
Modules		n°	1	1	1	1	1	1	1	1
Length		mm	7310	9608	9608	9608	9608	10753	11898	13047
Length chiller module		mm	-	-	-	-	-	-	-	-
Length free-coling module		mm	-	-	-	-	-	-	-	-
Depth		mm	2260	2260	2260	2260	2260	2260	2260	2260
Height		mm	2440	2440	2440	2440	2440	2440	2440	2440

			67.2	73.2	80.2	85.2	90.2	95.2	100.2	105.2
Dimensions and weights**										
FC BASIC										
Modules		n°	1	1	1	2	2	2	2	2
Length		mm	10750	13053	13053	14198	15347	16492	17640	18850
Length chiller module		mm	-	-	-	9610	9610	10755	10755	11965
Length free-coling module		mm	-	-	-	4588	5737	5737	6885	6885
FC CUSTOM										
Modules		n°	1	2	2	2	2	2	2	2
Length		mm	11898	14202	14202	15347	16495	17640	18789	19999
Length chiller module		mm	-	8465	8465	9610	9610	10755	10755	11965
Length free-coling module		mm	-	5737	5737	5737	6885	6885	8034	8034
FC EXTRA										
Modules		n°	1	2	2	2	2	2	2	2
Length		mm	13047	15350	15350	17644	18793	19938	21085	22295
Length chiller module		mm	-	8465	8465	9610	9610	10755	10755	11965
Length free-coling module		mm	-	6885	6885	8034	9183	9183	10330	10330
Depth		mm	2260	2260	2260	2260	2260	2260	2260	2260
Height		mm	2440	2440	2440	2440	2440	2440	2440	2440

ECODESIGN

INTRODUCTION

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

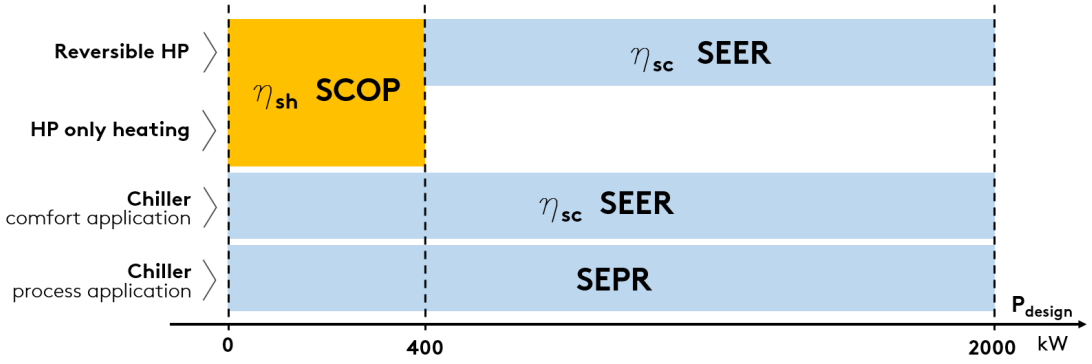
The Directive contains various regulations; as regards chiller products and heat pumps, the regulations of interest are the following:

- Regulation 2013/813, for small heat pumps (Pdesign ≤ 400 kW)
- Regulation 2016/2281, for chillers and heat pumps with Pdesign > 400 kW
- Regulation 2013/811, for heat pumps with Pdesign ≤ 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:

- ηsh (SCOP), with reference to regulation 2013/813
- ηsc (SEER) for comfort applications and SEPR for process applications, with reference to regulation 2016/2281.

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 ηsc (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	
SOURCE	**Pdesign**	**ηsc [%]**	**SEER**
air	< 400 kW	161	4,1
air	≥ 400 kW	179	4,55
water	< 400 kW	200	5,075
water	≥ 400 kW and < 1500 kW	252	6,375
water	≥ 1500 kW	272	6,875

REGULATION 2016/2281, process application

TYPE OF UNIT		MINIMUM REQUIREMENT
SOURCE	**Pdesign**	**SEPR**
air	< 400 kW	5
air	≥ 400 kW	5,5
water	< 400 kW	7
water	≥ 400 kW and < 1500 kW	8
water	≥ 1500 kW	8,5

REGULATION 2013/813

SOURCE	APPLICATION	MINIMUM REQUIREMENT	
		ηsh [%]	**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/ηsc low temperature application	2016/2281
	≥ 18°C	SEER/ηsc medium temperature application	2016/2281
Heat pumps (reversible and only heating) Pdesign≤400kW		SCOP/ηsh	2013/813
Reversible heat pumps Pdesign>400kW	< 18°C	SEER/ηsc low temperature application	2016/2281
	≥ 18°C	SEER/ηsc medium temperature application	2016/2281
Heat pumps only heating Pdesign>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 (ηsc) than the configuration with standard fans.

KAPPA REV FC RANGE

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

Kappa Rev HE FC /SLN 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.

KAPPA REV FC RANGE

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

Kappa Rev HE FC /SLN 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.

KAPPA REV HE FC (R513A)

			33.2	35.2	37.2	40.2	43.2	51.2	54.2	58.2
REGULATION 2016/2281										
Pdesign	(1)	kW	336	385	405	462	511	522	581	676
Compliance 12/7										
Compliance	(1)		Y	Y	Y	Y	Y	Y	Y	Y
ηsc	(1)	%	152	156	161	161	161	162	162	161
SEER	(1)		3,9	4	4,1	4,1	4,1	4,1	4,1	4,1
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)	%	-	-	-	-	-	-	-	-
SEER	(1)		-	-	-	-	-	-	-	-
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)		5,4	5,7	5,7	5,6	5,5	5,5	5,5	5,6

			67.2	73.2	80.2	85.2	90.2	95.2	100.2	105.2
REGULATION 2016/2281										
Pdesign	(1)	kW	732	773	815	889	960	1014	1076	1148
Compliance 12/7										
Compliance	(1)		Y	Y	Y	Y	Y	Y	Y	Y
ηsc	(1)	%	162	161	161	162	162	161	162	163
SEER	(1)		4,1	4,1	4,1	4,1	4,1	4,1	4,1	4,1
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)	%	-	-	-	-	-	-	-	-
SEER	(1)		-	-	-	-	-	-	-	-
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)		5,6	5,5	5,4	5,5	5,5	5,5	5,5	5,7

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.

KAPPA REV SLN FC (R513A)

			33.2	35.2	37.2	40.2	43.2	51.2	54.2	58.2
REGULATION 2016/2281										
Pdesign	(1)	kW	329	372	395	456	498	513	566	669
Compliance 12/7										
Compliance	(1)		Y	Y	Y	Y	Y	Y	Y	Y
ηsc	(1)	%	165	156	153	161	161	162	162	161
SEER	(1)		3,9	4	3,9	4,1	4,1	4,1	4,1	4,1
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)	%	-	-	-	-	-	-	-	-
SEER	(1)		-	-	-	-	-	-	-	-
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)		5,6	5,8	5,6	5,8	5,7	5,7	5,7	5,8

			67.2	73.2	80.2	85.2	90.2	95.2	100.2	105.2
REGULATION 2016/2281										
Pdesign	(1)	kW	732	773	815	889	960	1014	1076	1148
Compliance 12/7										
Compliance	(1)		Y	Y	Y	Y	Y	Y	Y	Y
ηsc	(1)	%	162	161	161	162	162	161	162	163
SEER	(1)		4,1	4,1	4,1	4,1	4,1	4,1	4,1	4,1
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)	%	-	-	-	-	-	-	-	-
SEER	(1)		-	-	-	-	-	-	-	-
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)		5,6	5,5	5,4	5,5	5,5	5,5	5,5	5,7

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.

KAPPA REV HE FC (R513A)

			33.2	35.2	37.2	40.2	43.2	51.2	54.2	58.2
General electrical specifications chiller section										
Nominal current (Inom)	(2)	A	190	204	224	247	274	295	335	377
cosφ standard unit	(2)		0,83	0,83	0,86	0,85	0,84	0,83	0,83	0,85
Nominal current with power factor correction (Inom)	(2)	A	164	178	198	219	240	257	290	333
cosφ unit with power factor correction	(2)		0,96	0,95	0,97	0,96	0,96	0,95	0,96	0,96
General electrical specifications FC BASIC										
Max. absorbed current (FLA)	(1)	A	264	301	319	354	389	419	479	535
Max. inrush current (MIC)	(3)	A	343	404	423	429	464	526	580	744
General electrical specifications FC CUSTOM										
Max. absorbed current (FLA)	(1)	A	268	308	327	362	397	423	486	542
Max. inrush current (MIC)	(3)	A	347	411	430	436	471	529	588	752
General electrical specifications FC EXTRA										
Max. absorbed current (FLA)	(1)	A	275	316	334	369	404	430	494	549
Max. inrush current (MIC)	(3)	A	354	419	438	444	479	537	595	759
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	6 x 2,0	7 x 2,0	8 x 2,0	8 x 2,0	8 x 2,0	9 x 2,0	11 x 2,0	12 x 2,0
Rated current of standard fan		n° x A	6 x 4,3	7 x 4,3	8 x 4,3	8 x 4,3	8 x 4,3	9 x 4,3	11 x 4,3	12 x 4,3
Rated power of EC fan		n° x kW	6 x 1,9	7 x 1,9	8 x 1,9	8 x 1,9	8 x 1,9	9 x 1,9	11 x 1,9	12 x 1,9
Rated current of EC fan		n° x A	6 x 2,9	7 x 2,9	8 x 2,9	8 x 2,9	8 x 2,9	9 x 2,9	11 x 2,9	12 x 2,9
Rated power of oversize EC fans		n° x kW	6 x 3,0	7 x 3,0	8 x 3,0	8 x 3,0	8 x 3,0	9 x 3,0	11 x 3,0	12 x 3,0
Rated current of oversize EC fans		n° x A	6 x 4,5	7 x 4,5	8 x 4,5	8 x 4,5	8 x 4,5	9 x 4,5	11 x 4,5	12 x 4,5
Electrical specifications for fans FC BASIC										
Rated power of standard fan		n° x kW	3 x 2,0	4 x 2,0	4 x 2,0	4 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	3 x 4,3	4 x 4,3	4 x 4,3	4 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	3 x 1,9	4 x 1,9	4 x 1,9	4 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	3 x 2,9	4 x 2,9	4 x 2,9	4 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	3 x 3,0	4 x 3,0	4 x 3,0	4 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	3 x 4,5	4 x 4,5	4 x 4,5	4 x 4,5	4 x 4,5	5 x 4,5	6 x 4,5	6 x 4,5
Electrical specifications for fans FC CUSTOM										
Rated power of fan		n° x kW	4 x 2,0	6 x 2,0	6 x 2,0	6 x 2,0	6 x 2,0	6 x 2,0	8 x 2,0	8 x 2,0
Rated current of fan		n° x A	4 x 4,3	6 x 4,3	6 x 4,3	6 x 4,3	6 x 4,3	6 x 4,3	8 x 4,3	8 x 4,3
Rated power of EC fan		n° x kW	4 x 1,9	6 x 1,9	6 x 1,9	6 x 1,9	6 x 1,9	6 x 1,9	8 x 1,9	8 x 1,9
Rated current of EC fan		n° x A	4 x 2,9	6 x 2,9	6 x 2,9	6 x 2,9	6 x 2,9	6 x 2,9	8 x 2,9	8 x 2,9
Rated power of oversize EC fans		n° x kW	4 x 3,0	6 x 3,0	6 x 3,0	6 x 3,0	6 x 3,0	6 x 3,0	8 x 3,0	8 x 3,0
Rated current of oversize EC fans		n° x A	4 x 4,5	6 x 4,5	6 x 4,5	6 x 4,5	6 x 4,5	6 x 4,5	8 x 4,5	8 x 4,5
Electrical specifications for fans FC EXTRA										
Rated power of fan		n° x kW	6 x 2,0	8 x 2,0	8 x 2,0	8 x 2,0	8 x 2,0	8 x 2,0	10 x 2,0	10 x 2,0
Rated current of fan		n° x A	6 x 4,3	8 x 4,3	8 x 4,3	8 x 4,3	8 x 4,3	8 x 4,3	10 x 4,3	10 x 4,3
Rated power of EC fan		n° x kW	6 x 1,9	8 x 1,9	8 x 1,9	8 x 1,9	8 x 1,9	8 x 1,9	10 x 1,9	10 x 1,9
Rated current of EC fan		n° x A	6 x 2,9	8 x 2,9	8 x 2,9	8 x 2,9	8 x 2,9	8 x 2,9	10 x 2,9	10 x 2,9
Rated power of oversize EC fans		n° x kW	6 x 3,0	8 x 3,0	8 x 3,0	8 x 3,0	8 x 3,0	8 x 3,0	10 x 3,0	10 x 3,0
Rated current of oversize EC fans		n° x A	6 x 4,5	8 x 4,5	8 x 4,5	8 x 4,5	8 x 4,5	8 x 4,5	10 x 4,5	10 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.

KAPPA REV HE FC (R513A)

			67.2	73.2	80.2	85.2	90.2	95.2	100.2	105.2
General electrical specifications chiller section										
Nominal current (Inom)	(2)	A	397	432	465	493	521	553	583	623
cosφ standard unit	(2)		0,86	0,87	0,88	0,86	0,85	0,86	0,86	0,86
Nominal current with power factor correction (Inom)	(2)	A	352	387	422	437	461	495	528	564
cosφ unit with power factor correction	(2)		0,97	0,97	0,97	0,97	0,96	0,96	0,95	0,95
General electrical specifications FC BASIC										
Max. absorbed current (FLA)	(1)	A	568	597	626	681	742	787	839	888
Max. inrush current (MIC)	(3)	A	778	813	842	972	1034	1104	1156	1322
General electrical specifications FC CUSTOM										
Max. absorbed current (FLA)	(1)	A	575	605	634	688	750	795	847	896
Max. inrush current (MIC)	(3)	A	785	820	849	979	1041	1111	1164	1330
General electrical specifications FC EXTRA										
Max. absorbed current (FLA)	(1)	A	583	612	649	703	765	809	862	911
Max. inrush current (MIC)	(3)	A	792	827	864	994	1056	1126	1179	1345
Power supply		V/ph/Hz	400/3~/50							400/3~/51
Power supply for auxiliary circuits		V/ph/Hz	230-24/1~/50							230-24/1~/51
Electrical specifications for fans chiller section										
Rated power of standard fan		n° x kW	12 x 2,0	13 x 2,0	14 x 2,0	15 x 2,0	16 x 2,0	17 x 2,0	18 x 2,0	19 x 2,0
Rated current of standard fan		n° x A	12 x 4,3	13 x 4,3	14 x 4,3	15 x 4,3	16 x 4,3	17 x 4,3	18 x 4,3	19 x 4,3
Rated power of EC fan		n° x kW	12 x 1,9	13 x 1,9	14 x 1,9	15 x 1,9	16 x 1,9	17 x 1,9	18 x 1,9	19 x 1,9
Rated current of EC fan		n° x A	12 x 2,9	13 x 2,9	14 x 2,9	15 x 2,9	16 x 2,9	17 x 2,9	18 x 2,9	19 x 2,9
Rated power of oversize EC fans		n° x kW	12 x 3,0	13 x 3,0	14 x 3,0	15 x 3,0	16 x 3,0	17 x 3,0	18 x 3,0	19 x 3,0
Rated current of oversize EC fans		n° x A	12 x 4,5	13 x 4,5	14 x 4,5	15 x 4,5	16 x 4,5	17 x 4,5	18 x 4,5	19 x 4,5
Electrical specifications for fans FC BASIC										
Rated power of standard fan		n° x kW	8 x 2,0	8 x 2,0	8 x 2,0	8 x 2,0	10 x 2,0	10 x 2,0	12 x 2,0	12 x 2,0
Rated current of standard fan		n° x A	8 x 4,3	8 x 4,3	8 x 4,3	8 x 4,3	10 x 4,3	10 x 4,3	12 x 4,3	12 x 4,3
Rated power of EC fan		n° x kW	8 x 1,9	8 x 1,9	8 x 1,9	8 x 1,9	10 x 1,9	10 x 1,9	12 x 1,9	12 x 1,9
Rated current of EC fan		n° x A	8 x 2,9	8 x 2,9	8 x 2,9	8 x 2,9	10 x 2,9	10 x 2,9	12 x 2,9	12 x 2,9
Rated power of oversize EC fans		n° x kW	8 x 3,0	8 x 3,0	8 x 3,0	8 x 3,0	10 x 3,0	10 x 3,0	12 x 3,0	12 x 3,0
Rated current of oversize EC fans		n° x A	8 x 4,5	8 x 4,5	8 x 4,5	8 x 4,5	10 x 4,5	10 x 4,5	12 x 4,5	12 x 4,5
Electrical specifications for fans FC CUSTOM										
Rated power of fan		n° x kW	10 x 2,0	10 x 2,0	10 x 2,0	10 x 2,0	12 x 2,0	12 x 2,0	14 x 2,0	14 x 2,0
Rated current of fan		n° x A	10 x 4,3	10 x 4,3	10 x 4,3	10 x 4,3	12 x 4,3	12 x 4,3	14 x 4,3	14 x 4,3
Rated power of EC fan		n° x kW	10 x 1,9	10 x 1,9	10 x 1,9	10 x 1,9	12 x 1,9	12 x 1,9	14 x 1,9	14 x 1,9
Rated current of EC fan		n° x A	10 x 2,9	10 x 2,9	10 x 2,9	10 x 2,9	12 x 2,9	12 x 2,9	14 x 2,9	14 x 2,9
Rated power of oversize EC fans		n° x kW	10 x 3,0	10 x 3,0	10 x 3,0	10 x 3,0	12 x 3,0	12 x 3,0	14 x 3,0	14 x 3,0
Rated current of oversize EC fans		n° x A	10 x 4,5	10 x 4,5	10 x 4,5	10 x 4,5	12 x 4,5	12 x 4,5	14 x 4,5	14 x 4,5
Electrical specifications for fans FC EXTRA										
Rated power of fan		n° x kW	12 x 2,0	12 x 2,0	14 x 2,0	14 x 2,0	16 x 2,0	16 x 2,0	18 x 2,0	18 x 2,0
Rated current of fan		n° x A	12 x 4,3	12 x 4,3	14 x 4,3	14 x 4,3	16 x 4,3	16 x 4,3	18 x 4,3	18 x 4,3
Rated power of EC fan		n° x kW	12 x 1,9	12 x 1,9	14 x 1,9	14 x 1,9	16 x 1,9	16 x 1,9	18 x 1,9	18 x 1,9
Rated current of EC fan		n° x A	12 x 2,9	12 x 2,9	14 x 2,9	14 x 2,9	16 x 2,9	16 x 2,9	18 x 2,9	18 x 2,9
Rated power of oversize EC fans		n° x kW	12 x 3,0	12 x 3,0	14 x 3,0	14 x 3,0	16 x 3,0	16 x 3,0	18 x 3,0	18 x 3,0
Rated current of oversize EC fans		n° x A	12 x 4,5	12 x 4,5	14 x 4,5	14 x 4,5	16 x 4,5	16 x 4,5	18 x 4,5	18 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.

KAPPA REV SLN FC (R513A)

			33.2	35.2	37.2	40.2	43.2	51.2	54.2	58.2
General electrical specifications chiller section										
Nominal current (Inom)	(2)	A	190	204	224	247	274	295	335	377
cosφ standard unit	(2)		0,83	0,83	0,86	0,85	0,84	0,83	0,83	0,85
Nominal current with power factor correction (Inom)	(2)	A	164	178	198	219	240	257	290	333
cosφ unit with power factor correction	(2)		0,96	0,95	0,97	0,96	0,96	0,95	0,96	0,96
General electrical specifications FC BASIC										
Max. absorbed current (FLA)	(1)	A	264	301	319	354	389	416	475	535
Max. inrush current (MIC)	(3)	A	343	404	423	429	464	522	577	744
General electrical specifications FC CUSTOM										
Max. absorbed current (FLA)	(1)	A	268	308	327	362	397	423	479	542
Max. inrush current (MIC)	(3)	A	347	411	430	436	471	529	580	752
General electrical specifications FC EXTRA										
Max. absorbed current (FLA)	(1)	A	275	316	334	369	404	430	486	549
Max. inrush current (MIC)	(3)	A	354	419	438	444	479	537	588	759
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	6 x 2,0	7 x 2,0	8 x 2,0	8 x 2,0	8 x 2,0	9 x 2,0	11 x 2,0	12 x 2,0
Rated current of standard fan		n° x A	6 x 4,3	7 x 4,3	8 x 4,3	8 x 4,3	8 x 4,3	9 x 4,3	11 x 4,3	12 x 4,3
Rated power of EC fan		n° x kW	6 x 1,9	7 x 1,9	8 x 1,9	8 x 1,9	8 x 1,9	9 x 1,9	11 x 1,9	12 x 1,9
Rated current of EC fan		n° x A	6 x 2,9	7 x 2,9	8 x 2,9	8 x 2,9	8 x 2,9	9 x 2,9	11 x 2,9	12 x 2,9
Rated power of oversize EC fans		n° x kW	6 x 3,0	7 x 3,0	8 x 3,0	8 x 3,0	8 x 3,0	9 x 3,0	11 x 3,0	12 x 3,0
Rated current of oversize EC fans		n° x A	6 x 4,5	7 x 4,5	8 x 4,5	8 x 4,5	8 x 4,5	9 x 4,5	11 x 4,5	12 x 4,5
Electrical specifications for fans FC BASIC										
Rated power of standard fan		n° x kW	3 x 2,0	4 x 2,0	4 x 2,0	4 x 2,0	4 x 2,0	4 x 2,0	5 x 2,0	6 x 2,0
Rated current of standard fan		n° x A	3 x 4,3	4 x 4,3	4 x 4,3	4 x 4,3	4 x 4,3	4 x 4,3	5 x 4,3	6 x 4,3
Rated power of EC fan		n° x kW	3 x 1,9	4 x 1,9	4 x 1,9	4 x 1,9	4 x 1,9	4 x 1,9	5 x 1,9	6 x 1,9
Rated current of EC fan		n° x A	3 x 2,9	4 x 2,9	4 x 2,9	4 x 2,9	4 x 2,9	4 x 2,9	5 x 2,9	6 x 2,9
Rated power of oversize EC fans		n° x kW	3 x 3,0	4 x 3,0	4 x 3,0	4 x 3,0	4 x 3,0	4 x 3,0	5 x 3,0	6 x 3,0
Rated current of oversize EC fans		n° x A	3 x 4,5	4 x 4,5	4 x 4,5	4 x 4,5	4 x 4,5	4 x 4,5	5 x 4,5	6 x 4,5
Electrical specifications for fans FC CUSTOM										
Rated power of fan		n° x kW	4 x 2,0	6 x 2,0	6 x 2,0	6 x 2,0	6 x 2,0	6 x 2,0	6 x 2,0	8 x 2,0
Rated current of fan		n° x A	4 x 4,3	6 x 4,3	6 x 4,3	6 x 4,3	6 x 4,3	6 x 4,3	6 x 4,3	8 x 4,3
Rated power of EC fan		n° x kW	4 x 1,9	6 x 1,9	6 x 1,9	6 x 1,9	6 x 1,9	6 x 1,9	6 x 1,9	8 x 1,9
Rated current of EC fan		n° x A	4 x 2,9	6 x 2,9	6 x 2,9	6 x 2,9	6 x 2,9	6 x 2,9	6 x 2,9	8 x 2,9
Rated power of oversize EC fans		n° x kW	4 x 3,0	6 x 3,0	6 x 3,0	6 x 3,0	6 x 3,0	6 x 3,0	6 x 3,0	8 x 3,0
Rated current of oversize EC fans		n° x A	4 x 4,5	6 x 4,5	6 x 4,5	6 x 4,5	6 x 4,5	6 x 4,5	6 x 4,5	8 x 4,5
Electrical specifications for fans FC EXTRA										
Rated power of fan		n° x kW	6 x 2,0	8 x 2,0	8 x 2,0	8 x 2,0	8 x 2,0	8 x 2,0	8 x 2,0	10 x 2,0
Rated current of fan		n° x A	6 x 4,3	8 x 4,3	8 x 4,3	8 x 4,3	8 x 4,3	8 x 4,3	8 x 4,3	10 x 4,3
Rated power of EC fan		n° x kW	6 x 1,9	8 x 1,9	8 x 1,9	8 x 1,9	8 x 1,9	8 x 1,9	8 x 1,9	10 x 1,9
Rated current of EC fan		n° x A	6 x 2,9	8 x 2,9	8 x 2,9	8 x 2,9	8 x 2,9	8 x 2,9	8 x 2,9	10 x 2,9
Rated power of oversize EC fans		n° x kW	6 x 3,0	8 x 3,0	8 x 3,0	8 x 3,0	8 x 3,0	8 x 3,0	8 x 3,0	10 x 3,0
Rated current of oversize EC fans		n° x A	6 x 4,5	8 x 4,5	8 x 4,5	8 x 4,5	8 x 4,5	8 x 4,5	8 x 4,5	10 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.

KAPPA REV SLN FC (R513A)

			67.2	73.2	80.2	85.2	90.2	95.2	100.2	105.2
General electrical specifications chiller section										
Nominal current (Inom)	(2)	A	397	432	465	493	521	553	583	623
cosφ standard unit	(2)		0,86	0,87	0,88	0,86	0,85	0,86	0,86	0,86
Nominal current with power factor correction (Inom)	(2)	A	352	387	422	437	461	495	528	564
cosφ unit with power factor correction	(2)		0,97	0,97	0,97	0,97	0,96	0,96	0,95	0,95
General electrical specifications FC BASIC										
Max. absorbed current (FLA)	(1)	A	561	597	626	681	742	787	839	888
Max. inrush current (MIC)	(3)	A	770	813	842	972	1034	1104	1156	1322
General electrical specifications FC CUSTOM										
Max. absorbed current (FLA)	(1)	A	568	605	634	688	750	795	847	896
Max. inrush current (MIC)	(3)	A	778	820	849	979	1041	1111	1164	1330
General electrical specifications FC EXTRA										
Max. absorbed current (FLA)	(1)	A	575	612	641	703	765	809	862	911
Max. inrush current (MIC)	(3)	A	785	827	856	994	1056	1126	1179	1345
Power supply		V/ph/Hz	400/3~/50							400/3~/51
Power supply for auxiliary circuits		V/ph/Hz	230-24/1~/50							230-24/1~/51
Electrical specifications for fans chiller section										
Rated power of standard fan		n° x kW	12 x 2,0	13 x 2,0	14 x 2,0	15 x 2,0	16 x 2,0	17 x 2,0	18 x 2,0	19 x 2,0
Rated current of standard fan		n° x A	12 x 4,3	13 x 4,3	14 x 4,3	15 x 4,3	16 x 4,3	17 x 4,3	18 x 4,3	19 x 4,3
Rated power of EC fan		n° x kW	12 x 1,9	13 x 1,9	14 x 1,9	15 x 1,9	16 x 1,9	17 x 1,9	18 x 1,9	19 x 1,9
Rated current of EC fan		n° x A	12 x 2,9	13 x 2,9	14 x 2,9	15 x 2,9	16 x 2,9	17 x 2,9	18 x 2,9	19 x 2,9
Rated power of oversize EC fans		n° x kW	12 x 3,0	13 x 3,0	14 x 3,0	15 x 3,0	16 x 3,0	17 x 3,0	18 x 3,0	19 x 3,0
Rated current of oversize EC fans		n° x A	12 x 4,5	13 x 4,5	14 x 4,5	15 x 4,5	16 x 4,5	17 x 4,5	18 x 4,5	19 x 4,5
Electrical specifications for fans FC BASIC										
Rated power of standard fan		n° x kW	6 x 2,0	8 x 2,0	8 x 2,0	8 x 2,0	10 x 2,0	10 x 2,0	12 x 2,0	12 x 2,0
Rated current of standard fan		n° x A	6 x 4,3	8 x 4,3	8 x 4,3	8 x 4,3	10 x 4,3	10 x 4,3	12 x 4,3	12 x 4,3
Rated power of EC fan		n° x kW	6 x 1,9	8 x 1,9	8 x 1,9	8 x 1,9	10 x 1,9	10 x 1,9	12 x 1,9	12 x 1,9
Rated current of EC fan		n° x A	6 x 2,9	8 x 2,9	8 x 2,9	8 x 2,9	10 x 2,9	10 x 2,9	12 x 2,9	12 x 2,9
Rated power of oversize EC fans		n° x kW	6 x 3,0	8 x 3,0	8 x 3,0	8 x 3,0	10 x 3,0	10 x 3,0	12 x 3,0	12 x 3,0
Rated current of oversize EC fans		n° x A	6 x 4,5	8 x 4,5	8 x 4,5	8 x 4,5	10 x 4,5	10 x 4,5	12 x 4,5	12 x 4,5
Electrical specifications for fans FC CUSTOM										
Rated power of fan		n° x kW	8 x 2,0	10 x 2,0	10 x 2,0	10 x 2,0	12 x 2,0	12 x 2,0	14 x 2,0	14 x 2,0
Rated current of fan		n° x A	8 x 4,3	10 x 4,3	10 x 4,3	10 x 4,3	12 x 4,3	12 x 4,3	14 x 4,3	14 x 4,3
Rated power of EC fan		n° x kW	8 x 1,9	10 x 1,9	10 x 1,9	10 x 1,9	12 x 1,9	12 x 1,9	14 x 1,9	14 x 1,9
Rated current of EC fan		n° x A	8 x 2,9	10 x 2,9	10 x 2,9	10 x 2,9	12 x 2,9	12 x 2,9	14 x 2,9	14 x 2,9
Rated power of oversize EC fans		n° x kW	8 x 3,0	10 x 3,0	10 x 3,0	10 x 3,0	12 x 3,0	12 x 3,0	14 x 3,0	14 x 3,0
Rated current of oversize EC fans		n° x A	8 x 4,5	10 x 4,5	10 x 4,5	10 x 4,5	12 x 4,5	12 x 4,5	14 x 4,5	14 x 4,5
Electrical specifications for fans FC EXTRA										
Rated power of fan		n° x kW	10 x 2,0	12 x 2,0	12 x 2,0	14 x 2,0	16 x 2,0	16 x 2,0	18 x 2,0	18 x 2,0
Rated current of fan		n° x A	10 x 4,3	12 x 4,3	12 x 4,3	14 x 4,3	16 x 4,3	16 x 4,3	18 x 4,3	18 x 4,3
Rated power of EC fan		n° x kW	10 x 1,9	12 x 1,9	12 x 1,9	14 x 1,9	16 x 1,9	16 x 1,9	18 x 1,9	18 x 1,9
Rated current of EC fan		n° x A	10 x 2,9	12 x 2,9	12 x 2,9	14 x 2,9	16 x 2,9	16 x 2,9	18 x 2,9	18 x 2,9
Rated power of oversize EC fans		n° x kW	10 x 3,0	12 x 3,0	12 x 3,0	14 x 3,0	16 x 3,0	16 x 3,0	18 x 3,0	18 x 3,0
Rated current of oversize EC fans		n° x A	10 x 4,5	12 x 4,5	12 x 4,5	14 x 4,5	16 x 4,5	16 x 4,5	18 x 4,5	18 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.

HYDRAULIC MODULES

KAPPA REV HE FC

			33.2	35.2	37.2	40.2	43.2	51.2	54.2	58.2
Volume of the expansion vessel		l	24	24	24	24	24	24	24	24
Volume of the buffer tank		l	300	300	300	300	300	740	740	740
FC BASIC standard pumps										
Pump model 1P,2P			P2	P4	P4	P4	P5	P7	P7	P8
Available head 1P	(1) (8)	kPa	188	232	258	235	268	240	209	262
Available head 2P	(1) (8)	kPa	179	222	247	222	251	236	203	254
Available head 1P	(1) (7)	kPa	138	149	167	130	150	146	125	153
Available head 2P	(1) (7)	kPa	129	139	156	117	133	141	119	146
FC BASIC oversize pumps										
Pump model 1PM, 2PM			P5	P5	P5	P5	P6	P8	P8	P9
Available head 1PM	(1) (8)	kPa	296	275	305	287	335	313	283	351
Available head 2PM	(1) (8)	kPa	287	263	292	272	332	309	278	344
Available head 1PM	(1) (7)	kPa	244	192	213	182	217	218	199	242
Available head 2PM	(1) (7)	kPa	235	180	200	167	214	213	193	235
FC CUSTOM standard pumps										
Pump model 1P,2P			P2	P3	P3	P4	P4	P7	P7	P8
Available head 1P	(1) (8)	kPa	187	182	209	233	208	240	206	258
Available head 2P	(1) (8)	kPa	179	170	196	221	194	235	201	251
Available head 1P	(1) (7)	kPa	120	140	162	180	149	171	155	192
Available head 2P	(1) (7)	kPa	112	128	149	168	135	166	149	185
FC CUSTOM oversized pumps										
Pump model 1PM, 2PM			P5	P5	P5	P5	P5	P8	P8	P9
Available head 1PM	(1) (8)	kPa	296	272	304	286	267	313	281	348
Available head 2PM	(1) (8)	kPa	286	261	291	271	250	308	275	341
Available head 1PM	(1) (7)	kPa	227	229	256	232	207	243	229	281
Available head 2PM	(1) (7)	kPa	218	218	243	217	190	238	223	273
FC EXTRA standard pumps										
Pump model 1P,2P			P1	P3	P3	P3	P4	P7	P7	P7
Available head 1P	(1) (8)	kPa	119	179	208	184	207	238	204	179
Available head 2P	(1) (8)	kPa	111	167	194	168	192	233	198	172
Available head 1P	(1) (7)	kPa	85	152	178	150	169	195	168	134
Available head 2P	(1) (7)	kPa	77	141	165	135	155	191	163	126
FC EXTRA oversized pumps										
Pump model 1PM, 2PM			P2	P5	P5	P5	P5	P8	P8	P10
Available head 1PM	(1) (8)	kPa	185	269	303	285	265	311	279	263
Available head 2PM	(1) (8)	kPa	177	258	290	270	248	306	273	258
Available head 1PM	(1) (7)	kPa	151	242	273	251	227	267	242	215
Available head 2PM	(1) (7)	kPa	142	230	259	236	210	263	237	211

(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

KAPPA REV HE FC

			67.2	73.2	80.2	85.2	90.2	95.2	100.2	105.2
Volume of the expansion vessel		l	24	24	24	24	24	24	24	24
Volume of the buffer tank		l	740	900	900	900	900	900	900	900
FC BASIC standard pumps										
Pump model 1P,2P			P8	P8	P10	P10	P10	P10	P10	P10
Available head 1P	(1) (8)	kPa	296	274	279	254	216	197	168	177
Available head 2P	(1) (8)	kPa	288	265	272	247	208	188	157	167
Available head 1P	(1) (7)	kPa	222	181	188	146	130	101	91	101
Available head 2P	(1) (7)	kPa	214	181	182	138	121	92	80	90
FC BASIC oversize pumps										
Pump model 1PM, 2PM			P11	P11	P12	P12	P12	P12	P12	P12
Available head 1PM	(1) (8)	kPa	333	316	383	356	315	293	260	268
Available head 2PM	(1) (8)	kPa	329	310	377	349	307	283	250	258
Available head 1PM	(1) (7)	kPa	258	231	292	247	228	196	183	193
Available head 2PM	(1) (7)	kPa	253	225	286	240	220	187	172	182
FC CUSTOM standard pumps										
Pump model 1P,2P			P8	P8	P8	P10	P10	P10	P10	P10
Available head 1P	(1) (8)	kPa	295	272	248	252	214	194	165	174
Available head 2P	(1) (8)	kPa	287	263	238	245	205	184	154	163
Available head 1P	(1) (7)	kPa	243	214	185	178	149	123	105	115
Available head 2P	(1) (7)	kPa	235	205	176	170	141	114	94	104
FC CUSTOM oversized pumps										
Pump model 1PM, 2PM			P11	P11	P11	P12	P12	P12	P12	P12
Available head 1PM	(1) (8)	kPa	332	314	296	354	313	289	257	264
Available head 2PM	(1) (8)	kPa	327	309	290	347	304	280	246	254
Available head 1PM	(1) (7)	kPa	279	255	231	279	248	219	197	206
Available head 2PM	(1) (7)	kPa	275	249	225	272	239	209	186	196
FC EXTRA standard pumps										
Pump model 1P,2P			P7	P7	P13	P13	P10	P10	P10	P10
Available head 1P	(1) (8)	kPa	218	195	180	153	208	188	157	167
Available head 2P	(1) (8)	kPa	210	186	175	146	200	178	147	156
Available head 1P	(1) (7)	kPa	179	145	145	109	159	144	118	128
Available head 2P	(1) (7)	kPa	171	145	139	102	159	134	107	117
FC EXTRA oversized pumps										
Pump model 1PM, 2PM			P10	P10	P10	P10	P12	P12	P12	P12
Available head 1PM	(1) (8)	kPa	306	291	273	247	307	283	250	257
Available head 2PM	(1) (8)	kPa	301	285	267	240	299	273	239	247
Available head 1PM	(1) (7)	kPa	266	248	236	202	266	239	210	219
Available head 2PM	(1) (7)	kPa	262	242	230	195	257	229	199	209

(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

KAPPA REV SLN FC

			33.2	35.2	37.2	40.2	43.2	51.2	54.2	58.2
Volume of the expansion vessel		l	24	24	24	24	24	24	24	24
Volume of the buffer tank		l	300	300	300	300	300	300	740	740
FC BASIC standard pumps										
Pump model 1P,2P			P2	P4	P4	P4	P5	P5	P7	P7
Available head 1P	(1) (8)	kPa	191	250	275	247	283	278	225	205
Available head 2P	(1) (8)	kPa	183	241	264	235	267	259	220	199
Available head 1P	(1) (7)	kPa	141	168	185	144	167	150	129	106
Available head 2P	(1) (7)	kPa	133	160	174	132	151	131	125	99
FC BASIC oversize pumps										
Pump model 1PM, 2PM			P5	P5	P5	P5	P6	P6	P8	P8
Available head 1PM	(1) (8)	kPa	299	293	322	299	351	341	299	281
Available head 2PM	(1) (8)	kPa	290	283	309	285	348	338	295	275
Available head 1PM	(1) (7)	kPa	248	211	231	196	234	213	203	181
Available head 2PM	(1) (7)	kPa	238	201	218	181	232	209	199	175
FC CUSTOM standard pumps										
Pump model 1P,2P			P2	P3	P3	P4	P4	P4	P7	P7
Available head 1P	(1) (8)	kPa	190	200	226	245	223	213	222	202
Available head 2P	(1) (8)	kPa	182	189	213	233	210	198	217	196
Available head 1P	(1) (7)	kPa	124	159	180	194	166	150	159	141
Available head 2P	(1) (7)	kPa	115	149	167	182	153	134	154	134
FC CUSTOM oversized pumps										
Pump model 1PM, 2PM			P5	P5	P5	P5	P5	P5	P8	P8
Available head 1PM	(1) (8)	kPa	299	290	321	298	282	276	297	278
Available head 2PM	(1) (8)	kPa	290	280	308	283	266	257	292	272
Available head 1PM	(1) (7)	kPa	230	248	275	246	224	211	233	216
Available head 2PM	(1) (7)	kPa	221	238	262	231	208	193	229	210
FC EXTRA standard pumps										
Pump model 1P,2P			P1	P3	P3	P3	P4	P4	P7	P7
Available head 1P	(1) (8)	kPa	123	197	225	195	222	212	220	200
Available head 2P	(1) (8)	kPa	114	187	212	181	208	196	215	193
Available head 1P	(1) (7)	kPa	88	172	196	164	186	171	173	157
Available head 2P	(1) (7)	kPa	80	161	184	149	173	156	168	150
FC EXTRA oversized pumps										
Pump model 1PM, 2PM			P2	P5	P5	P5	P5	P5	P8	P8
Available head 1PM	(1) (8)	kPa	188	287	320	296	280	274	294	275
Available head 2PM	(1) (8)	kPa	180	277	307	282	264	255	290	269
Available head 1PM	(1) (7)	kPa	154	261	291	264	244	233	247	232
Available head 2PM	(1) (7)	kPa	146	251	278	250	228	215	242	225

(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

KAPPA REV SLN FC

			67.2	73.2	80.2	85.2	90.2	95.2	100.2	105.2
Volume of the expansion vessel		l	24	24	24	24	24	24	24	24
Volume of the buffer tank		l	740	900	900	900	900	900	900	900
FC BASIC standard pumps										
Pump model 1P,2P			P8	P8	P8	P10	P10	P10	P10	P10
Available head 1P	(1) (8)	kPa	248	285	274	269	235	217	192	199
Available head 2P	(1) (8)	kPa	231	277	265	262	228	209	183	191
Available head 1P	(1) (7)	kPa	165	194	193	162	150	123	117	125
Available head 2P	(1) (7)	kPa	148	195	184	156	143	115	108	116
FC BASIC oversize pumps										
Pump model 1PM, 2PM			P9	P11	P11	P12	P12	P12	P12	P12
Available head 1PM	(1) (8)	kPa	285	326	315	370	334	313	285	290
Available head 2PM	(1) (8)	kPa	271	322	310	364	327	305	276	281
Available head 1PM	(1) (7)	kPa	201	244	233	264	249	218	209	217
Available head 2PM	(1) (7)	kPa	187	239	228	258	242	210	200	208
FC CUSTOM standard pumps										
Pump model 1P,2P			P8	P8	P8	P10	P10	P10	P10	P10
Available head 1P	(1) (8)	kPa	247	283	262	266	232	214	189	196
Available head 2P	(1) (8)	kPa	229	275	253	260	225	206	180	187
Available head 1P	(1) (7)	kPa	186	227	193	194	170	146	131	139
Available head 2P	(1) (7)	kPa	169	219	184	188	163	137	122	130
FC CUSTOM oversized pumps										
Pump model 1PM, 2PM			P9	P11	P11	P12	P12	P12	P12	P12
Available head 1PM	(1) (8)	kPa	284	325	310	368	331	309	281	287
Available head 2PM	(1) (8)	kPa	269	320	305	362	324	301	272	278
Available head 1PM	(1) (7)	kPa	223	268	238	296	268	241	223	231
Available head 2PM	(1) (7)	kPa	208	263	233	290	261	233	214	222
FC EXTRA standard pumps										
Pump model 1P,2P			P7	P7	P7	P13	P10	P10	P10	P10
Available head 1P	(1) (8)	kPa	170	206	195	168	227	208	182	189
Available head 2P	(1) (8)	kPa	152	198	186	162	220	199	173	180
Available head 1P	(1) (7)	kPa	122	158	154	126	179	166	144	152
Available head 2P	(1) (7)	kPa	105	159	145	120	181	158	135	143
FC EXTRA oversized pumps										
Pump model 1PM, 2PM			P10	P10	P10	P10	P12	P12	P12	P12
Available head 1PM	(1) (8)	kPa	258	301	287	261	326	303	274	279
Available head 2PM	(1) (8)	kPa	243	297	282	255	319	295	265	271
Available head 1PM	(1) (7)	kPa	210	261	243	219	286	261	236	244
Available head 2PM	(1) (7)	kPa	195	256	238	213	279	253	227	235

(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	5,5	10,4	24	87,12
P2	7,5	13,7	24	87,12
P3	9,2	17,2	42	132
P4	11	21,3	42	138
P5	15	26,6	35	168,4
P6	18,5	33	30	168,4
P7	18,5	33	70	270
P8	22	40,4	50	233
P9	30	53,5	55	266,1
P10	30	53,5	76	359
P11	30	53,5	76	324
P12	37	65,6	76	324
P13	22	40,4	76	324

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.

KAPPA REV HE FC

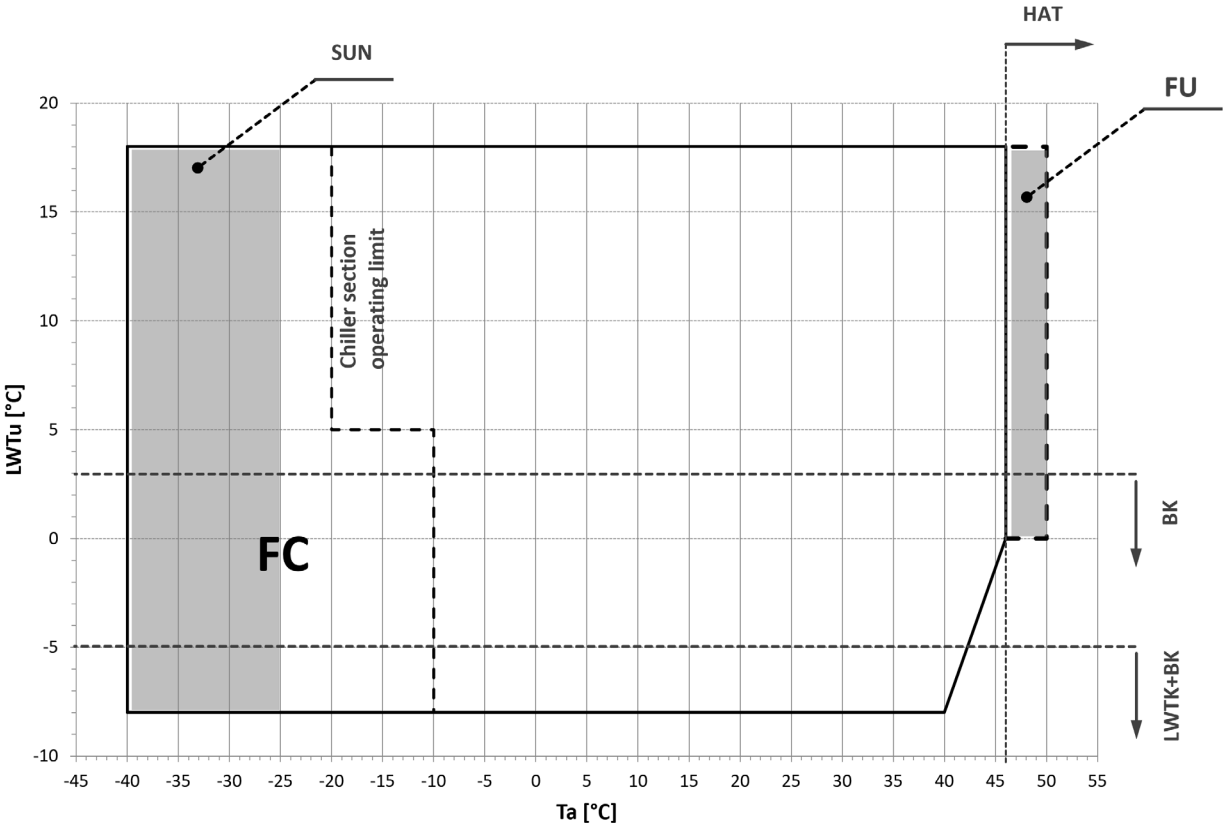
	Qmin	Qmax
	m³/h	m³/h
33.2	45	105
35.2	50	121
37.2	50	128
40.2	50	130
43.2	54	130
51.2	65	150
54.2	65	150
58.2	80	220
67.2	80	220
73.2	84	220
80.2	89	220
85.2	96	220
90.2	103	220
95.2	111	270
100.2	118	270
105.2	150	360

KAPPA REV SLN FC

	Qmin	Qmax
	m³/h	m³/h
33.2	45	104
35.2	50	117
37.2	50	124
40.2	50	130
43.2	52	130
51.2	65	150
54.2	65	150
58.2	80	213
67.2	80	220
73.2	81	220
80.2	86	220
85.2	93	220
90.2	103	220
95.2	107	270
100.2	113	270
105.2	150	359

OPERATING LIMITS

KAPPA REV FC
COOLING



Ta: external air temperature

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

LWTr: water outlet temperature from the recovery exchanger

FSA: to work in the area indicated by the arrow, it is mandatory to include the ”Fan speed adjuster” accessory or the ”EC fans” accessory

LW: in the indicated area, the unit can work only where there is no wind

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.

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

LWTK: For LWTu lower or equal to -5°C, it is mandatory to fit the "LWTK" accessory

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

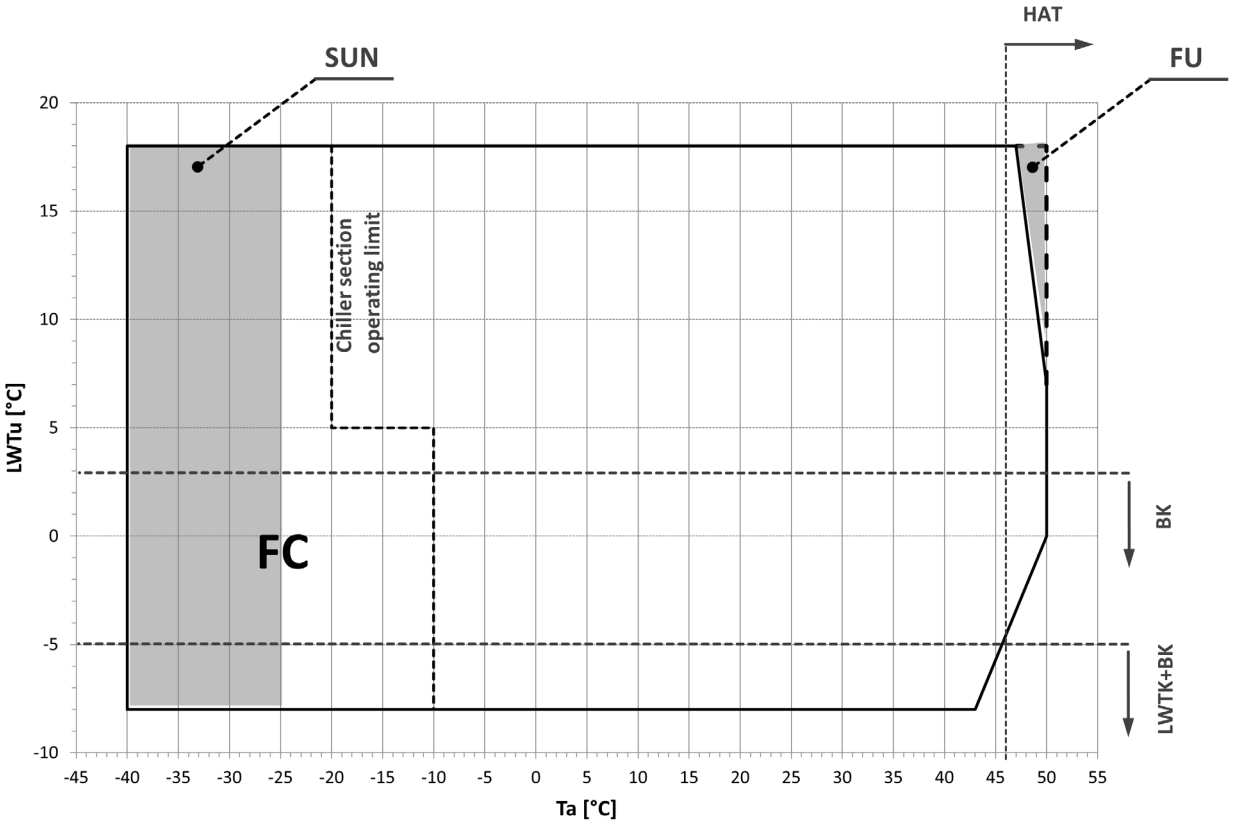
The inlet and outlet temperatures of the user-side exchanger must be given on ordering to allow correct setting of the alarm parameters and verification of the sizing of the expansion valve.

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

KAPPA REV HE FC - SLN FC
COOLING



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

LWTr: water outlet temperature from the recovery exchanger

FSA: to work in the area indicated by the arrow, it is mandatory to include the ”Fan speed adjuster” accessory or the ”EC fans” accessory

LW: in the indicated area, the unit can work only where there is no wind

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.

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

LWTK: For LWTu lower or equal to -5°C, it is mandatory to fit the "LWTK" 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

KAPPA REV HE 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	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw_tot	Lp_tot
33.2	71	39	74	42	89	57	90	58	91	59	86	54	79	47	71	39	**94**	**62**
35.2	73	40	82	49	90	57	91	59	92	60	87	55	79	47	72	39	**95**	**62**
37.2	73	41	84	52	90	57	91	58	92	59	88	55	79	46	71	39	**95**	**62**
40.2	70	37	79	47	88	55	95	62	93	60	86	53	76	44	69	36	**96**	**63**
43.2	67	34	68	35	86	54	95	63	93	60	85	52	74	42	67	35	**96**	**63**
51.2	68	36	71	39	87	54	95	63	94	62	88	55	76	43	69	36	**97**	**65**
54.2	76	44	77	45	87	55	95	62	95	63	90	58	77	45	71	38	**98**	**66**
58.2	77	45	87	55	94	61	94	62	95	63	89	56	81	48	72	39	**98**	**66**
67.2	77	44	90	58	97	64	94	62	97	64	88	56	83	51	73	41	**99**	**67**
73.2	77	44	90	57	99	66	96	63	97	64	90	57	83	50	74	41	**100**	**67**
80.2	76	43	88	55	100	67	97	64	97	64	90	57	82	49	74	41	**100**	**67**
85.2	76	43	87	54	101	68	97	64	96	63	91	58	80	47	73	40	**100**	**67**
90.2	76	43	86	53	102	69	97	64	95	62	91	58	78	45	72	39	**100**	**67**
95.2	76	43	87	54	102	69	98	65	97	64	92	59	81	48	73	40	**101**	**68**
100.2	75	42	87	54	101	68	97	64	98	65	91	58	82	49	74	41	**101**	**68**
105.2	81	48	87	54	101	68	97	64	100	67	91	58	82	49	75	42	**102**	**69**

KAPPA REV HE 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	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw_tot	Lp_tot
33.2	67	35	70	38	84	52	85	53	86	54	81	49	75	43	67	35	**89**	**57**
35.2	69	36	77	45	85	52	86	54	87	54	82	50	75	42	68	35	**90**	**58**
37.2	69	37	80	47	85	52	86	53	87	54	83	50	74	42	67	35	**90**	**58**
40.2	66	34	75	42	83	51	90	57	88	55	81	49	72	40	65	33	**91**	**59**
43.2	63	30	64	31	82	49	90	58	88	55	80	48	70	38	64	31	**91**	**59**
51.2	65	32	67	35	82	50	90	58	89	56	83	51	71	39	65	33	**92**	**59**
54.2	72	40	73	41	82	50	90	57	90	58	85	53	73	41	67	34	**93**	**61**
58.2	73	41	82	50	89	56	89	57	90	58	84	51	76	44	68	36	**93**	**60**
67.2	73	40	86	53	92	59	89	57	92	59	84	51	79	46	69	37	**94**	**62**
73.2	73	40	85	52	94	61	91	58	92	59	85	52	79	46	70	37	**95**	**62**
80.2	72	39	84	51	94	61	91	58	92	59	85	52	78	45	70	37	**95**	**62**
85.2	72	39	83	50	96	63	92	59	91	58	86	53	76	43	69	36	**95**	**62**
90.2	72	39	81	48	97	64	92	59	90	57	86	53	74	41	68	35	**95**	**62**
95.2	72	39	82	49	97	64	92	59	92	59	87	54	77	44	70	37	**96**	**63**
100.2	71	38	82	49	96	63	92	59	93	60	87	54	78	45	70	37	**96**	**63**
105.2	76	43	82	49	96	63	92	59	95	62	87	54	78	45	71	38	**97**	**64**

Unit operating at nominal operating capacity, with no options of any kind, with external air temperature of 30°C and user-side heat exchanger water inlet/outlet temperature of 15/10°C.

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 10 m from the unit in free field with directivity factor Q=2. Non-binding values.

The acoustic data are related to standard conditions in referable and reproducible operating conditions. All data with the exception of Lw_tot are provided for illustrative purposes only and can not be used for forecasting purposes or for the verification of binding limits.

With special reference to noise emissions, the Manufacturer takes liability for their conformity, limited to the declared Lw_tot value. Any and all other Manufacturer's liability for the impact of such emissions in relation to the location of the machine and other conditions related to machine installation is excluded. The environment and the installation conditions, as well as the operating modes, can alter the sound emissions. Any assessment concerning these conditions falls within the area of competence of the plant designer and/or the fitter.

KAPPA REV 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	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw_tot	Lp_tot
33.2	65	33	68	36	81	49	82	50	83	51	78	46	72	40	65	33	**86**	**54**
35.2	66	34	74	42	82	49	83	51	84	51	79	47	72	40	65	33	**87**	**55**
37.2	67	34	77	44	82	49	83	50	84	51	80	48	72	39	65	32	**87**	**54**
40.2	64	31	72	40	80	48	87	54	85	52	78	46	70	37	63	30	**88**	**56**
43.2	61	28	62	29	79	46	87	55	85	52	77	45	68	36	62	29	**88**	**56**
51.2	62	30	65	33	80	47	87	54	86	53	80	48	69	37	63	30	**89**	**57**
54.2	70	37	71	38	80	47	87	54	87	55	82	50	71	38	65	32	**90**	**58**
58.2	71	38	80	47	86	53	86	54	87	55	81	48	74	41	66	33	**90**	**58**
67.2	70	38	83	50	89	56	86	54	89	56	81	48	76	44	67	34	**91**	**59**
73.2	70	37	83	50	91	58	88	55	89	56	82	49	76	43	68	35	**92**	**59**
80.2	69	36	81	48	91	58	88	55	89	56	83	50	75	42	68	35	**92**	**59**
85.2	69	36	80	47	93	60	89	56	88	55	83	50	73	40	67	34	**92**	**59**
90.2	69	36	79	46	94	61	89	56	87	54	83	50	71	38	66	33	**92**	**59**
95.2	70	37	80	47	94	61	89	56	89	56	84	51	74	41	67	34	**93**	**60**
100.2	69	36	80	47	93	60	89	56	90	57	84	51	75	42	68	35	**93**	**60**
105.2	74	41	80	47	93	60	89	56	92	59	84	51	76	43	69	36	**94**	**61**

Unit operating at nominal operating capacity, with no options of any kind, with external air temperature of 30°C and user-side heat exchanger water inlet/outlet temperature of 15/10°C.

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 10 m from the unit in free field with directivity factor Q=2. Non-binding values.

The acoustic data are related to standard conditions in referable and reproducible operating conditions. All data with the exception of Lw_tot are provided for illustrative purposes only and can not be used for forecasting purposes or for the verification of binding limits.

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Delta wired free cooling module

FC modules	FC fans	Octave bands [dB]																Total [dB(A)]	
		63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz			
		Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw_tot	Lp_tot
1 ½	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**
2 ½	5	73	41	72	40	71	39	73	41	72	40	73	41	69	37	68	36	**78**	**46**
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**
5	10	76	44	75	43	74	42	76	44	75	43	76	44	72	40	71	39	**81**	**49**
6	12	77	45	76	44	75	43	77	45	76	44	77	45	73	41	72	40	**82**	**50**
7	14	77	45	76	44	75	43	77	45	76	44	77	45	73	41	72	40	**83**	**51**
8	16	78	46	77	45	76	44	78	46	77	45	78	46	74	42	73	41	**83**	**51**
9	18	79	47	78	46	77	45	79	47	78	46	79	47	75	43	74	42	**84**	**52**

Star wired free cooling module (SLN)

FC modules	FC fans	Octave bands [dB]																Total [dB(A)]	
		63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz			
		Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw_tot	Lp_tot
1	2	66	34	65	33	64	32	66	34	65	33	66	34	62	30	61	29	**71**	**39**
1 ½	3	68	36	67	35	66	34	68	36	67	35	68	36	64	32	63	31	**73**	**41**
2	4	69	37	68	36	67	35	69	37	68	36	69	37	65	33	64	32	**74**	**42**
2 ½	5	70	38	69	37	68	36	70	38	69	37	70	38	66	34	65	33	**75**	**43**
3	6	71	39	70	38	69	37	71	39	70	38	71	39	67	35	66	34	**76**	**44**
4	8	72	40	71	39	70	38	72	40	71	39	72	40	68	36	67	35	**77**	**45**
5	10	73	41	72	40	71	39	73	41	72	40	73	41	69	37	68	36	**78**	**46**
6	12	74	42	73	41	72	40	74	42	73	41	74	42	70	38	69	37	**79**	**47**
7	14	74	42	73	41	72	40	74	42	73	41	74	42	70	38	69	37	**80**	**48**
8	16	75	43	74	42	73	41	75	43	74	42	75	43	71	39	70	38	**80**	**48**
9	18	76	44	75	43	74	42	76	44	75	43	76	44	72	40	71	39	**81**	**49**

Unit operating at nominal operating capacity, with no options of any kind, with external air temperature of 30°C and user-side heat exchanger water inlet/outlet temperature of 15/10°C.

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 10 m from the unit in free field with directivity factor Q=2. Non-binding values.

The acoustic data are related to standard conditions in referable and reproducible operating conditions. All data with the exception of Lw_tot are provided for illustrative purposes only and can not be used for forecasting purposes or for the verification of binding limits.

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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.

It should also be pointed out that, for air-water units working in heat pump mode, the minimum amount of water must consider the need of the unit to carry out defrosting. Having an adequate buffering volume will allow prevention of too high drifts of the delivered water temperature at the end of the defrost cycle.

The following experimental formula allows to calculate the minimum water volume of the plant. The formula only refers to the operation of the unit in cooling mode.

$$V_{min} = \frac{P_{tot} \cdot 1.000}{N} \cdot \frac{300}{\Delta T \cdot \rho \cdot c_p} + P_{tot} \cdot 0{,}8$$

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:

$$V_{min} = \frac{P_{tot}}{N} \cdot 28{,}66 + P_{tot} \cdot 0{,}8$$

For the N values, consider the following convention:

- for units with 1 compressor N = 4
- for units with 2 compressors N = 8
- for units with 3 compressors N = 12
- for units with 4 compressors N = 16

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.

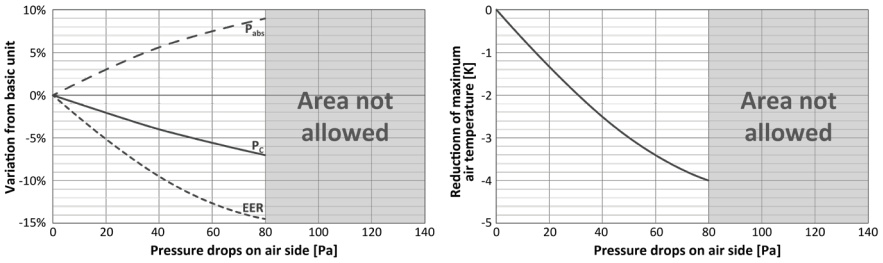
Aeraulic head losses and options available for the ventilating section

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.

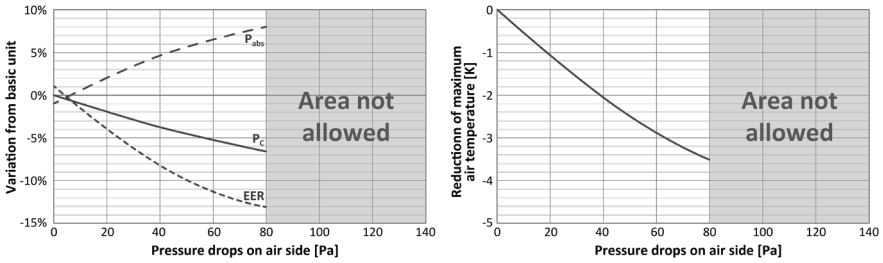
If there are obstacles to free air flow, you should consider the additional aeraulic head losses that will cause a reduction of the air flow rate and a consequent deterioration of performance.

The following diagrams show the trend of cooling capacity (PC), EER, total absorbed power (Pabs) 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.

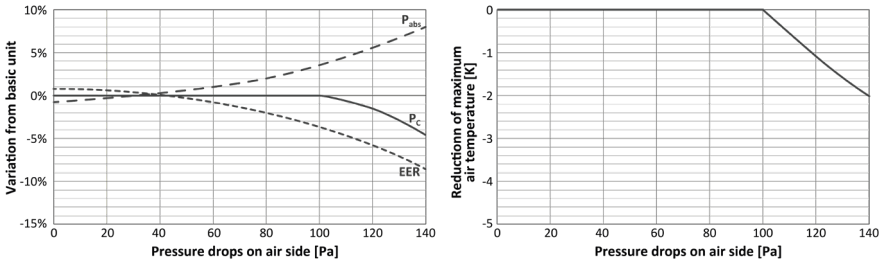
AC fans (Ø 800)



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.

TC-0000-KRFC-EN-Rev11-20250509

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