Tetris W Rev FC/NG

40÷640 kW

General
Free-cooling chillers for indoor installations.
Extended range, versatile applications.
No Glycol.

Configurations
HE: Version with oversize free-cooling heat exchanger

/LN: silenced unit

Strengths

- 2 free-cooling configurations available
- Tier 2 compliance: sizes up to 400 kW
- No glycol on user side
- Hybrid free-cooling: mixed free-cooling/chiller mode in spring and autumn
- Integrated management of chiller, free-cooling and external dry-cooler
- Easy handling: depth ≤ 880 mm
- BlueThink advanced control with integrated web server. Multilogic function and Blueye® supervision system. (options)
- Flowzer: inverter driven pumps (options)

WESTERN™ AIRCONDITIONING WARMTEPOMPEN

BlueBox by Swegon

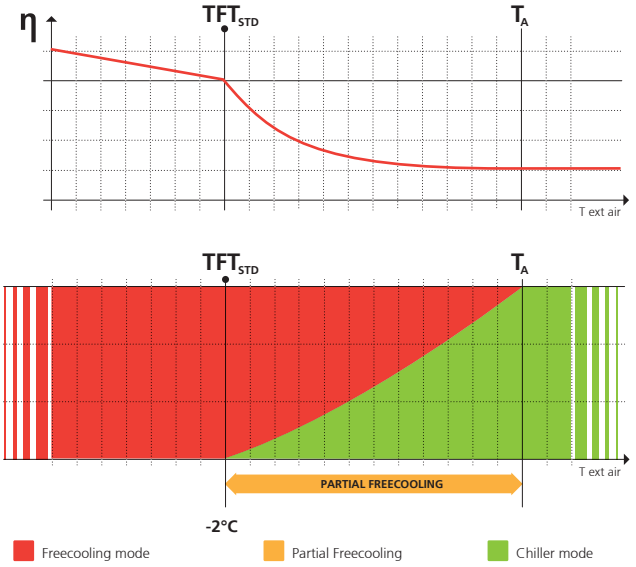
THE PACKAGED FREE COOLING SYSTEM

Free cooling is carried out when the outside air temperature is lower than the temperature of the water returning from the system. In these conditions, a suitably configured system allows chilled water to be obtained without the need for operation of the compressors and therefore almost cost free.

A cooling system that allows free cooling conditions to be exploited is made by placing an air liquid cooler (normally a dry-cooler) alongside a conventional chiller. The apparent simplicity of a system formed in this way hides a non-negligible pitfall: management.

In fact, a system of this kind is normally controlled by a "manager" outside the chiller that, in order to limit the degree of complexity, usually manages everything with an ON/OFF free-cooling logic, that is, either only chiller or only free cooling.

Actually, there are numerous situations in which free cooling can be used even when the conditions for obtaining the total cooling capacity required by the system are not present; it can make an important contribution to reducing the total consumption of the chiller section that will only have to add the missing amount of capacity.



An outside air temperature TA can be defined, below which the free-cooling section is activated even though it can provide only a small portion of the required cooling capacity. From this moment on, it is necessary to introduce the concept of machine efficiency η, which no longer coincides with the known EER because the cooling capacity that the unit can deliver no longer totally depends on the power consumed by the compressors as it also benefits from the component coming from free cooling.

In the same way, we define the Total Free-cooling Temperature (TFT) as the outside air temperature at which the capacity that can be obtained from free cooling is the same as that delivered by the refrigerant circuit under nominal conditions.

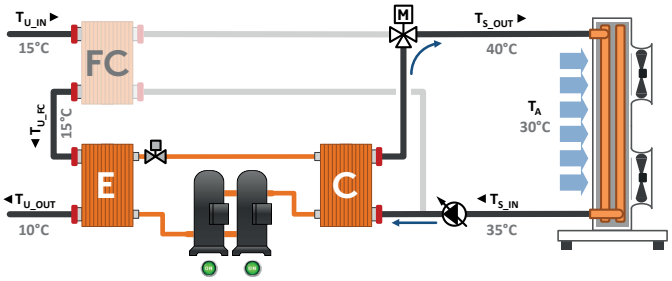
When the TFT is reached, the efficiency value η is extremely high because the power consumed by the system in this condition is the power consumed by just the pumps and the fans. So therefore the efficiency of the unit can easily reach values even higher than 15.

In its standard configuration, **Tetris W Rev FC/NG** includes an inverter-controlled source-side pump, a 3-way modulating valve installed in the machine for management of the water flow rate to the free cooling heat exchanger and management of the external dry-cooler. This level of integration allows the control of the unit to have full management of the system and therefore gives it the ability to work in "partial free cooling" mode, thereby obtaining very high efficiency levels.

If we consider the case of a typical industrial installation in which chilled water production at a temperature of 10°C at the user side is required, then the TA will be a few degrees lower. It follows that, in situations of this kind, even for latitudes corresponding to those of Frankfurt, the partial free cooling mode is used for over half of the yearly hours of operation with enormous benefits in terms of reduction of the total energy consumed over the year. In particular, the saving will be highest for applications that envisage continuous operation without seasonal stops.

Depending on the outside air temperature, the unit can work in three different operating modes.

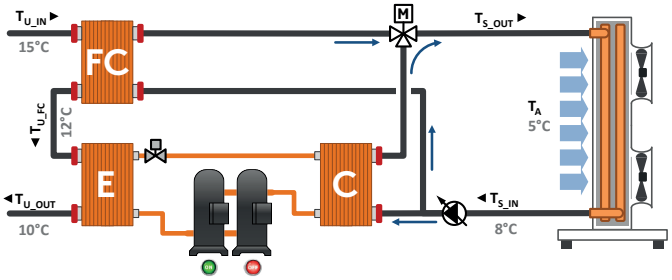
Pure chiller mode



The free cooling heat exchanger is completely excluded by the 3-way valve, and the cooling capacity is provided entirely by the refrigerant circuit through operation of the compressors.

The external dry-cooler should be sized to discharge the capacity to be condensed in these conditions, and therefore on a par with a system having a unit that does not allow free cooling.

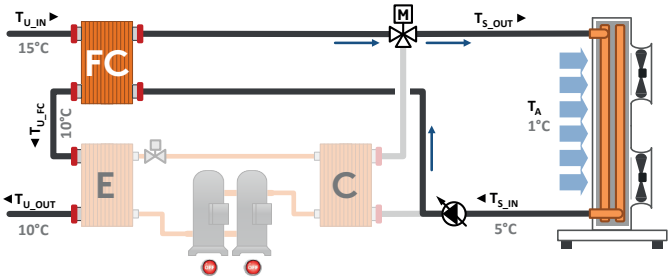
Mixed mode



The outside air temperature is not low enough to allow all the capacity required by the system to be obtained through free cooling, but is in any case able to guarantee coverage of a part of it. The 3-way valve modulates the opening so as to have source fluid passing through the free cooling heat exchanger and also through the condenser.

This condition, called "partial free cooling", occurs much more often than the total free cooling condition and guarantees an energy saving compared to the pure chiller mode because a capacity reduction of the compressors will be obtained with consequent energy saving.

Pure free cooling mode



When the outside air temperature is low enough (that is, less than or equal to the TFT), all the capacity needed to cover the immediate requirements of the system is totally produced by making use of free cooling and keeping the compressors of the chiller section switched off.

Two efficiency levels to choose from

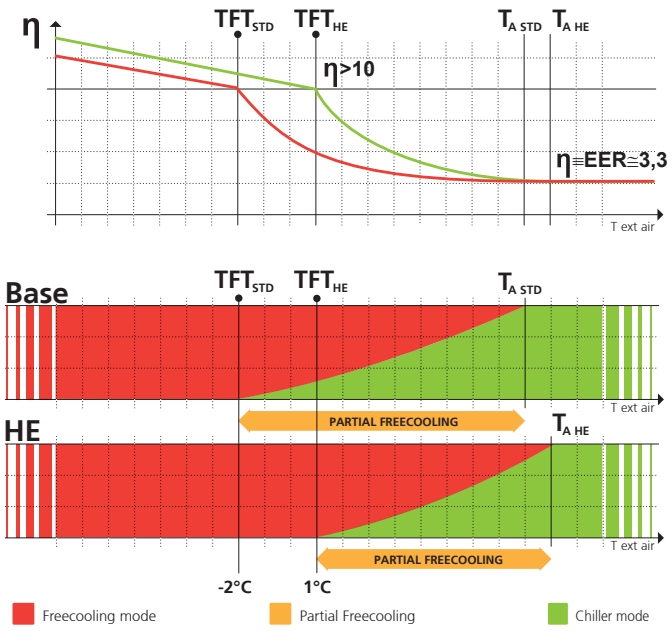
It is clear how, for the same external dry cooler performance, the TFT (Total Freecooling Temperature) depends on the sizing of the plate heat exchanger dedicated to free cooling inside the unit. By using a more generous sizing of this heat exchanger, it is therefore possible to raise the value of the TFT and so increase the total number of hours per year during which the unit works in partial and total free cooling conditions.

By working on the size of the heat exchange parts, we have chosen to make two set-ups available on the entire range. These in turn lead to obtaining two TFT values:

- Basic: allows the TFT at -2°C
- HE: allows the TFT at 1°C

These temperature levels refer to the unit working under nominal conditions (E.G.30% 35/40°C; W 15/10°C) combined with an ideal dry-cooler that, at an outside air temperature of 30°C, is able to exactly discharge the capacity to be condensed.

The following diagram shows a comparison of the efficiency and of the capacity obtained by free cooling for the two different set-ups.

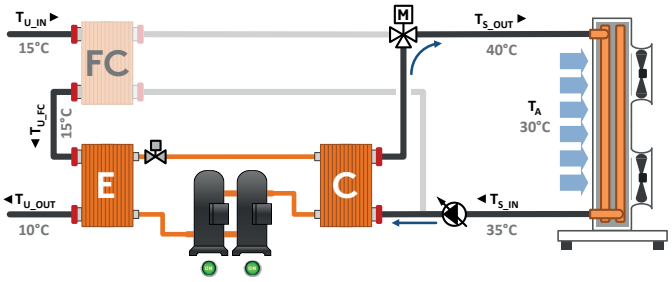


OPERATING MODE

The outside air temperature is an essential parameter for establishing which operating mode of the unit, not just in terms of whether or not free cooling is activated, but also in terms of the condensation control procedure and of the capacity generated by the machine.

Five operating scenarios, which are made for various outside air temperatures TA, are described in detail below.

Scenario 1

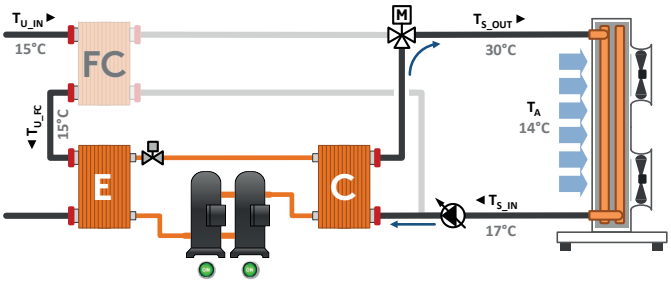


Chiller mode

Conditions surrounding the system: TA > TU_IN

- Freecooling: **OFF**
- Compressors: **ON**
- Source-side pump: **100%**
- 3-way valve: fully closed
- Dry-cooler: speed of the fans set to carry out the condensation control of the chiller (high set point)

Scenario 2

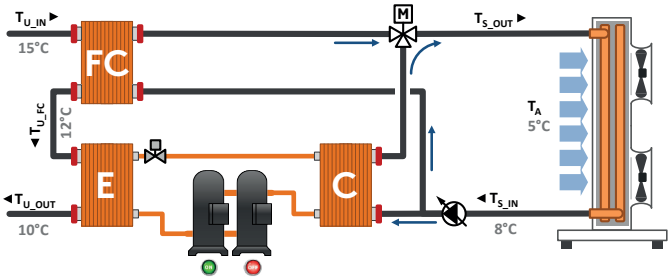


Chiller mode

Conditions surrounding the system: TA < TU_IN, TS_IN > TU_IN

- Freecooling: **OFF**
- Compressors: **ON**
- Source-side pump: works in modulating mode to control condensation
- 3-way valve: fully closed
- Dry-cooler: speed of the fans set to obtain the maximum performance (low set point)

Scenario 3

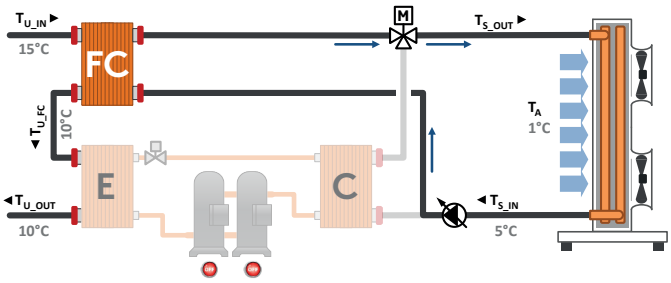


Partial free cooling mode

Conditions surrounding the system: (TS_IN + δ) < TU_IN

- Freecooling: **ON**
- Compressors: **ON (at reduced capacity)**
- Source-side pump: **100%**
- 3-way valve: partially open. Modules to guarantee condensation control and feeding of the free cooling heat exchanger
- Dry-cooler: speed of the fans set to obtain the maximum performance (low set point)

Scenario 4

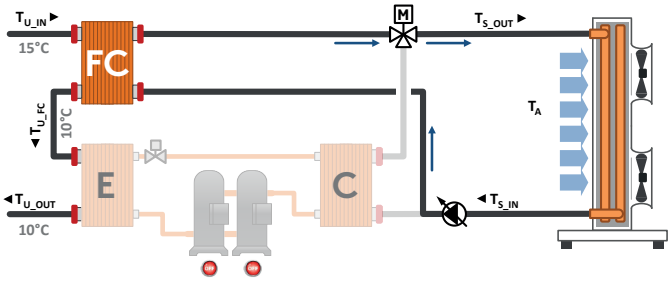


Free cooling mode (TFT)

Conditions surrounding the system: TU_FC = 10°C = TU_OUT

- Freecooling: **ON**
- Compressors: **OFF**
- Source-side pump: **100%**
- 3-way valve: fully open
- Dry-cooler: speed of the fans set to control TS_IN and therefore the output capacity at the free cooling heat exchanger

Scenario 5



Free cooling mode

Conditions surrounding the system: TA << 0°C

- Freecooling: **ON**
- Compressors: **OFF**
- Source-side pump: modulates its speed to guarantee control of cooling capacity at the free cooling heat exchanger
- 3-way valve: fully open
- Dry-cooler: **OFF**

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REFRIGERANT

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

BODY

The structure consists of a load-bearing frame made of epoxy polyester powder coated steel sheet, coloured with RAL 7035.

All screws and bolts are stainless steel.

Models from 3.2 to 34.4 and models 37.4, 38.4, 39.4, 40.4, 47.4, 48.4, 53.4, 54.4, 55.6, 56.6 and 59.6 are all made in a monoblock structure that houses all the components of the chiller section, free cooling section and hydraulic section.

Otherwise, to guarantee easier handling on site, for models 38.4, 40.4, 48.4, 54.4, 56.6 and 60.6, the structure is divided into two parts: one module consists of the chiller (compressors and refrigerant circuit) while the other module is made to contain the free cooling section and the hydraulic circuit with the pumps.

The two modules can be placed in any reciprocal position considering that, once they are positioned on site, they will have to be hydraulically and electrically connected (by the customer).

COMPRESSORS

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

USER-SIDE HEAT EXCHANGER

The exchanger is a braze-welded stainless steel plate heat exchanger, insulated with a shroud of closed-cell insulating material. Models with 2 refrigerant circuits are fitted with dual circuit heat exchanger.

The use of plate heat exchangers allows us to:

- maximize the EER and COP levels
- reduce the amount of refrigerant used in the unit
- make the unit lighter and more compact
- make its maintenance easier.

The heat exchanger is provided with a temperature probe for freeze protection and a differential pressure switch.

SOURCE-SIDE HEAT EXCHANGER

The exchanger is a braze-welded stainless steel plate heat exchanger, insulated with a shroud of closed-cell insulating material. Models with 2 refrigerant circuits are fitted with dual circuit heat exchanger.

FREE-COOLING CIRCUIT

The free cooling circuit consists of:

- a water-water heat exchanger: this is a brazed AISI stainless steel plate heat exchanger with anti-condensation insulation made of closed-cell insulating material. The heat exchanger makes the separation between the source side (glycol) and the user side (non-glycol) and allows transfer of cooling capacity from one side to the other during operation in free cooling mode.
- a 3-way modulating valve: the valve, complete with servo control, allows the free cooling circuit to be fed and the condensation control to be carried out when the unit is working in mixed chiller-free cooling mode.
- an inverter-controlled source-side pump: all the units are completed as standard with an inverter-controlled source-side pump (1SV). The inverter allows the water flow rate to be modulated on the source side in order to carry out condensation control or control of output capacity at the free cooling heat exchanger.

For models 38.4, 40.4, 48.4, 54.4, 56.6 and 60.6, all these components are gathered in a separate section from the chiller section so as to make on-site handling operations easier. The two sections are to be hydraulically and electrically connected on site (by the customer).

REFRIGERANT CIRCUIT

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

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

The pipes of the circuit and the exchanger are insulated with extruded closed-cell expanded elastomer.

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.

ELECTRICAL CONTROL PANEL

The electrical control panel is made in a painted galvanized sheet-iron box.

The electrical control panel of the basic unit comprises:

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

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

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

For models 38.4, 40.4, 48.4, 54.4, 56.6 and 60.6, the free cooling module is separate from the chiller module and is equipped with a secondary electrical control panel having a main disconnect switch and into which are transferred components for management of the pumps, remote air heat exchanger (dry-cooler) and 3-way valve. The power supply to the secondary electrical control panel is taken from the main electrical control panel.

CONTROL BLUETHINK

Main controller functions advanced

The control allows the following functions:

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

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, pumps, expansion valves
- display in real time of the graphs of the main quantities
- display of the graphs of logged quantities
- display of alarm log
- management of users on several levels
- remote ON/OFF
- remote set point change
- remote time band change

Human-Machine Interface

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

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

CONTROLS AND SAFETY DEVICES

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

- high pressure switch with manual reset
- high pressure safety device with automatic reset, for a limited number of occurrences, managed by the controller
- low pressure safety device with automatic reset and limited tripping managed by the controller
- high pressure safety valve
- antifreeze probe at outlet of each evaporator
- compressor overtemperature protection
- mechanical paddle flow switch (supplied loose)

TESTING

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

PACKAGING

The unit is made and shipped on a wooden pallet that allows the unit to be handled using a forklift truck.

The unit is wrapped in transparent polyethylene stretch film.

VERSIONS

In the basic version, the unit has a high efficiency chiller section and includes a free cooling heat exchanger that, under nominal conditions and with a suitably sized remote air heat exchanger, allows a TFT (Total Freecooling Temperature) of about -2°C.

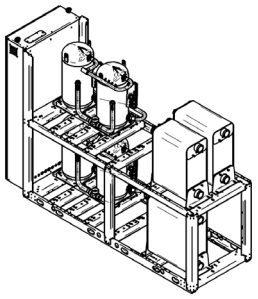
HE: high efficiency free cooling section

The HE unit includes an oversize free cooling heat exchanger that allows a rise in the TFT to about +1°C.

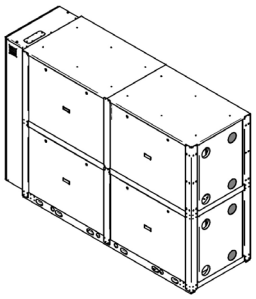
OPTIONS

/LN: silenced unit

Units in LN set-up are fully panelled with epoxy polyester powder coated steel sheet panels coloured with RAL 7035 and lined with matting made of sound absorbing and soundproofing material.



Example of non /LN unit



Example of /LN unit

HYDRAULIC MODULES

All the units can be equipped with hydraulic module in various combinations on the user side and on the source side. Refer to the table of configurations that are not possible to check for availability of specific set-ups.

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.

User-side hydraulic modules

The hydraulic circuit inside the unit is fully insulated with closed-cell insulating material..

The module can have the following configurations:

- /1P: hydraulic module with one pump
- /2P: hydraulic module with two pumps

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

The following are also available:

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

Source-side hydraulic modules

The source-side pumps are always inverter-controlled to modulate the water flow rate to the source side and free cooling heat exchangers. Modulation of the inverter is done directly by the control depending on the condensing temperature and the free cooling heat exchanger outlet temperature (user side).

As standard supply, all the units are in /1SV set-up that includes one inverter-controlled pump.

The module can have the following configurations:

- /2SV: hydraulic module with two inverter-controlled pumps

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

The following are also available:

modules /1SVM and /2SVM that have pumps with increased available discharge head

modules /1SVG and /2SVG that have pumps suitable for operating with glycol up to 50%

DESCRIPTION OF ACCESSORIES

Refrigerant

R410 R410A

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

Refrigerant circuit accessories

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

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.

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.

RPP Refrigerant leak detector with automatic pump down

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

The accessory includes the capacitive backup battery.

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

RPR Refrigerant leak detector

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

RUB Compressor suction and delivery valves

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

Hydraulic circuit accessories

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

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.

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

VSS **Source-side safety valve**

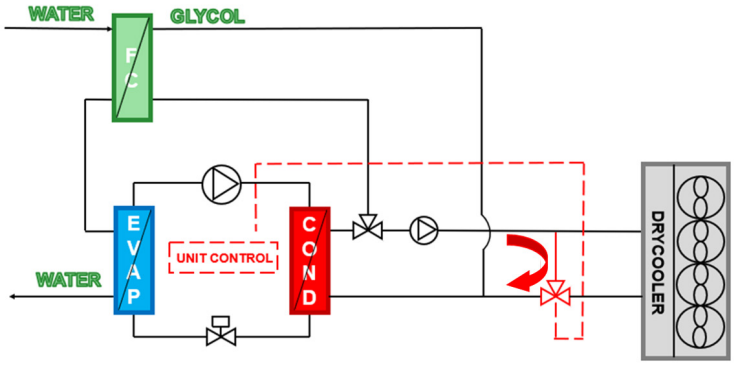
With this accessory, a safety valve is inserted in the hydraulic circuit of the unit: when the calibration pressure is reached, the valve opens and, by discharging (to be routed by the customer), prevents the system pressure from reaching limits that are dangerous for the components present in the system.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

VSWU **User-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.

KGBT **Drycooler Management kit for low temperatures**

The accessory consists in the supply of a 3-way valve that allows to by-pass the dry-cooler when the temperature of the glycol water leaving it is below the minimum temperature set. As shown in the following diagram, the valve operates by managing a by-pass of the dry-cooler avoiding an overcooling of the mixture. The operation is carried out also when the fans are not running in conjunction with particularly unfavorable external temperatures (low external temperatures associated with the presence of wind).



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.

IA 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.

R1PU Relay for management of 1 external user-side pump
This accessory can be requested for units without user-side pumps and allows a pump outside the machine to be controlled.

R2PU Relay for management of 2 external user-side pumps
This accessory can be requested for units without user-side pumps and allows two pumps outside the machine to be controlled with a running/stand-by logic by implementing a rotation on the hours of operation.
Dwie pompy są sterowane przez dwa osobne przekaźniki.

RIF Power factor correction to 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

SETD Double set point from digital input
The accessory allows you to preset two different operating set points and manage the change from one to the other through a digital signal.
The set point temperatures must be specified when ordering. For optimization of the unit, reference will be made to the lower set point in chiller mode and the higher set point in heat pump mode.
Unless otherwise specified in the order, the controller will be set at the factory with the following temperatures:

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

PDx **Provision for remote dry-cooler ...**

This accessory is compulsory when the unit is coupled to the dry-cooler combined as per catalogue and supplied from the factory.

When this accessory is present, the protective devices, contactors and speed adjuster of the dry-cooler are arranged in the electrical control panel of the internal unit.

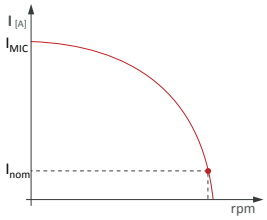
The dry-cooler obligatorily takes its power directly from the internal unit.

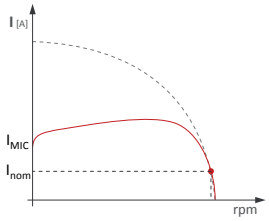
This accessory can be combined only with the dry-coolers supplied from the factory, which comply with the combination suggested in the catalogue and are ordered at the same time as the unit. For combinations other than the factory combinations, their feasibility must be checked with our sales department.

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.

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.

SETV **Variable set point with remote signal**

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

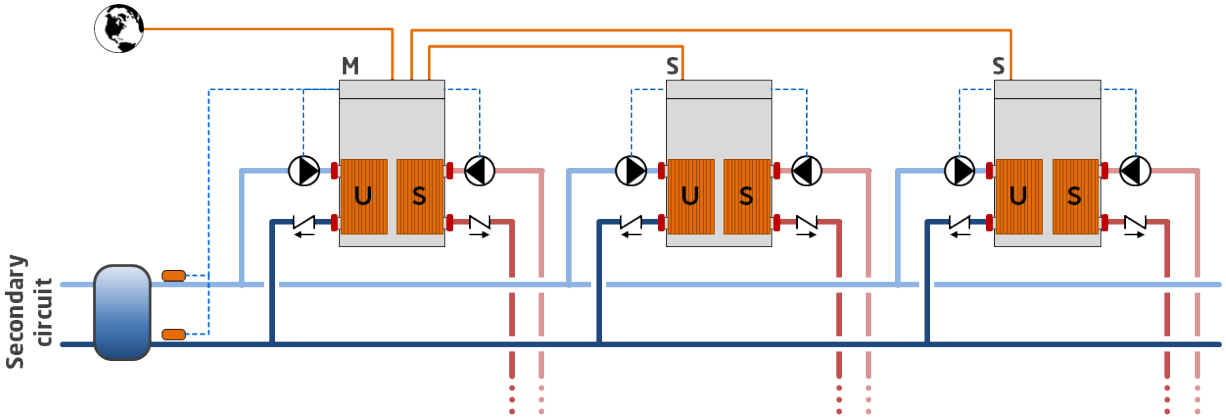
The set point temperatures and the type of signal to use for the adjustment must be specified when ordering. For optimization of the unit, reference will be made to the lower set point in chiller mode and the higher set point in heat pump mode.

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

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

FMx Multilogic Function

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



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

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

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

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

The Multilogic function that can be requested with the unit can be:

- **FM0:** Multilogic function for Slave unit
- **FM2:** Multilogic function for Master unit for managing up to 2 Slaves
- **FM6:** Multilogic function for Master unit for managing up to 6 Slaves

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 of the system (supplied separately with it, 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.

GLO **Modbus Lonworks Gateway**

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

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

PBA **BACnet protocol over IP (Ethernet)**

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

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

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.

Other accessories

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

AG **Rubber anti-vibration mounts**

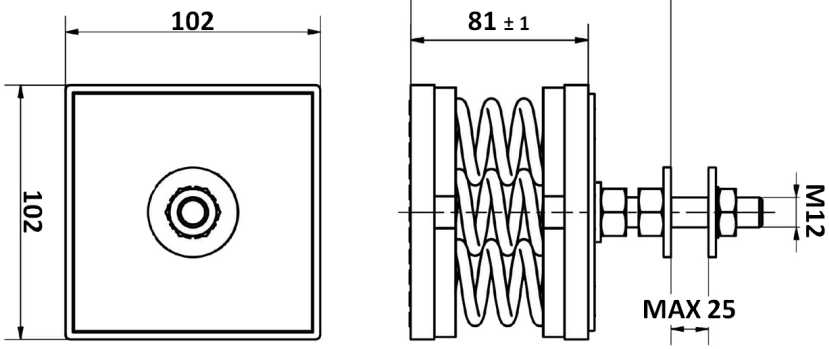
These allow you to reduce the vibrations transmitted from the unit to the surface it is standing on.

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.



GABB **Packaging in wooden crate**

The unit is protected by a custom-made wooden cage, including a wooden sled designed for loading into containers and a fixing system. The accessory can be used for container shipping. Loading on containers must be carried out at the factory. The accessory is incompatible with "Skid for shipping in containers".

KFW **Water filter kit**

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.

The kit involves the supply of a filter for each exchanger present in the machine.

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

Accessory supplied loose.

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

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:

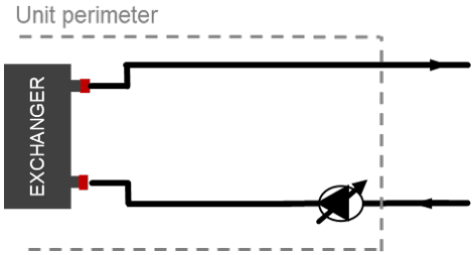
- FLOWZER VP - Inverter for manual pump adjustment
- FLOWZER VD - control of available pump discharge head for variable flow systems without monitoring the flow rate limits;
- FLOWZER VDE - flow rate control to keep the flow rate constant as the external working conditions of the system change;
- FLOWZER 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.

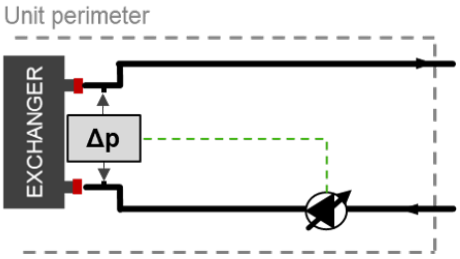
The hydraulic diagrams in this document are for exemplification purposes only and their main function is to help the reader understand the type of machines and devices the controller can manage.For a more technical evaluation of the system, please refer to the dedicated manual.

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

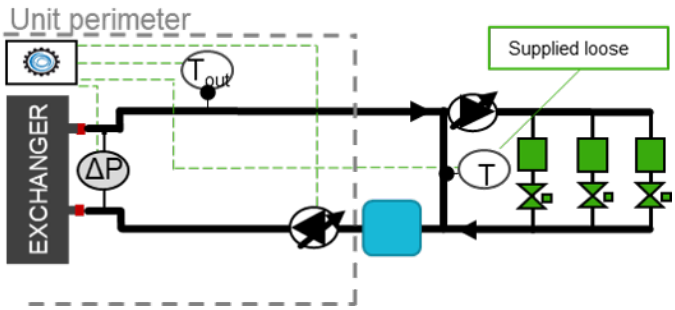


FLOWZER VDE

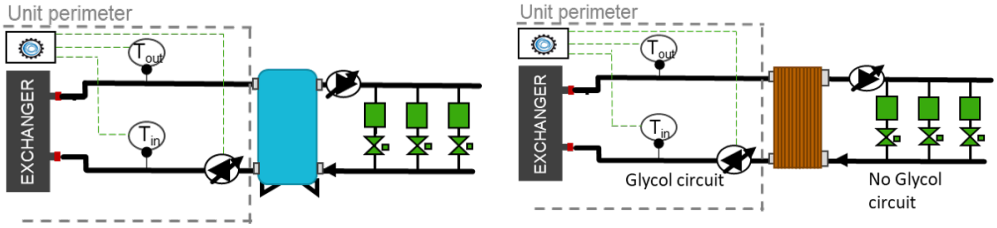


Variable flow system featuring primary and secondary circuits			
	Application	Advantages	Disadvantages
Flowzer VPS	Ideal for all systems featuring a primary and a secondary circuit divided by a hydraulic bypass branch	- Energy saving: the energy consumption during pumping operations can be cut down to 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

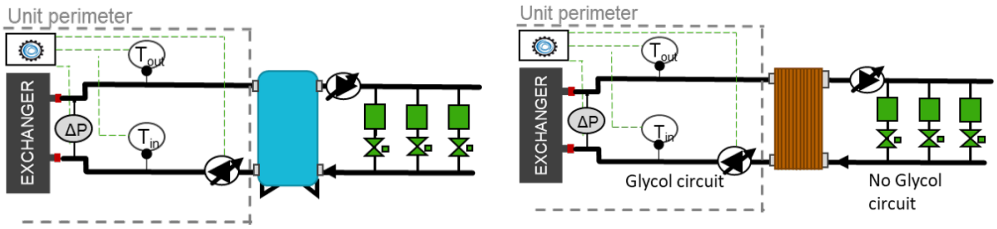
FLOWZER VPS



FLOWZER VDT

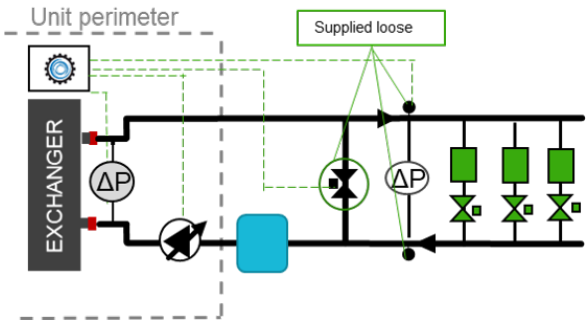


FLOWZER VPS with DT-based control

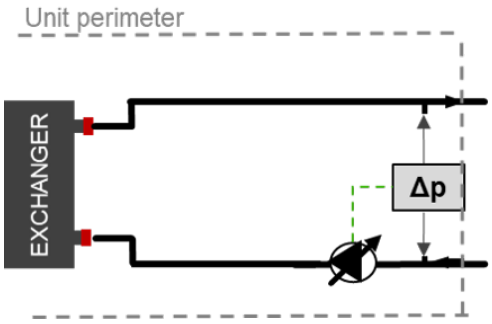


Variable flow system featuring primary circuit only			
	Application	Advantages	Disadvantages
Flowzer VFPP	Ideal for new systems intended to reduce installation costs	- Energy saving: the energy consumption during pumping operations can be cut down to 50% if compared with a traditional system Lower CAPEX 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.

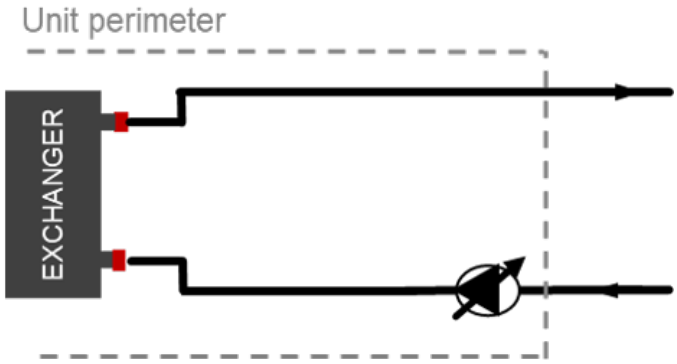
Flowzer VFPP



Flowzer VD



FVP FLOWZER VP - Inverter for manual pump adjustment



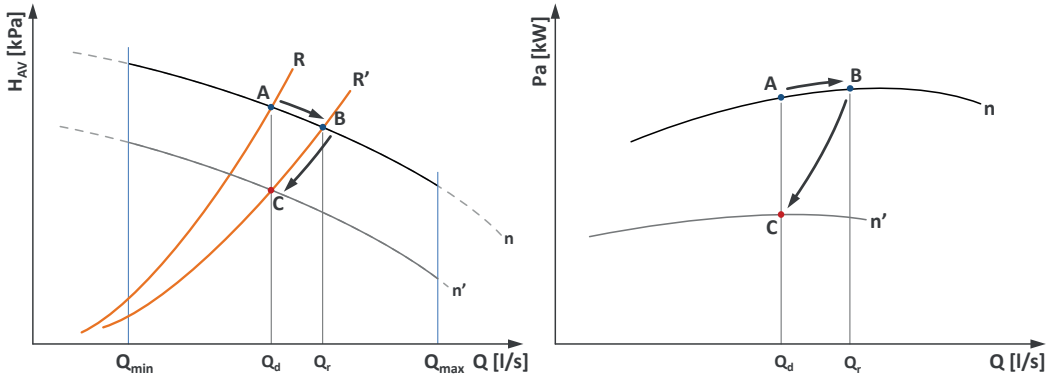
The accessory consists of inserting an inverter in the machine to manually adjust the speed of the pump (or pumps) in order to calibrate the pump flow rate on the head losses of the system.

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.

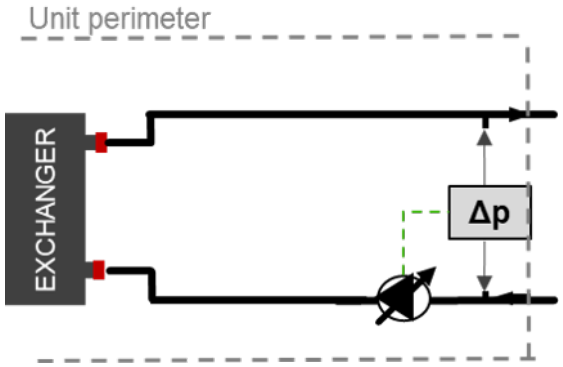


The use of the Flowzer allows the pump speed to be set manually (e.g. at speed n' instead of n) to obtain the design water flow rate and thermal gradient (point C). Once the adjustment procedure has been carried out, the pump will always work at a fixed flow rate.

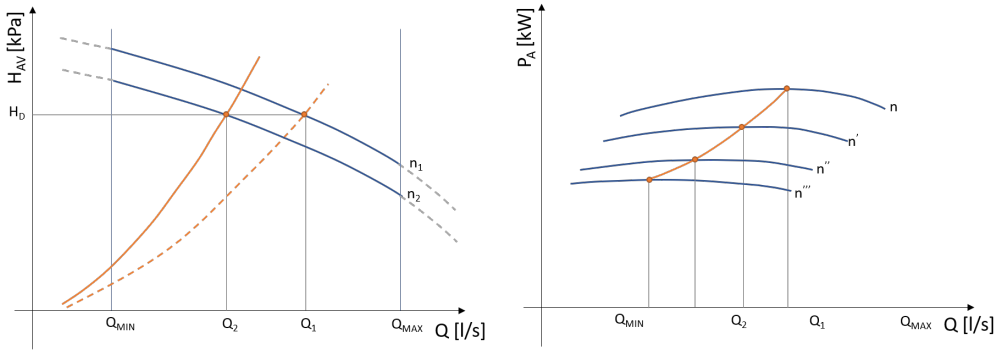
The adoption of the VP Flowzer allows to considerably reduce the electrical power consumption of the pump with a consequent energy saving. By way of example, a reduction in the flow rate of 10% leads to a reduction in power consumption of around 27%.

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.

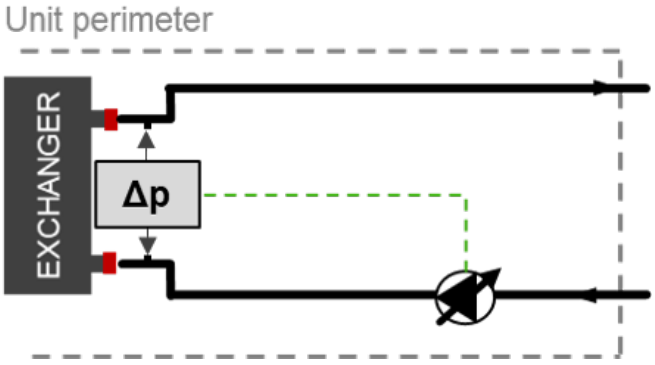


With the Flowzer VD, the customer can set, directly on the display, the available discharge head value (Hd) that the unit must maintain. As can be seen from the graph as the user request decreases, the resistant curve of the plant moves to the left, consequently the inverter reduces the speed of the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

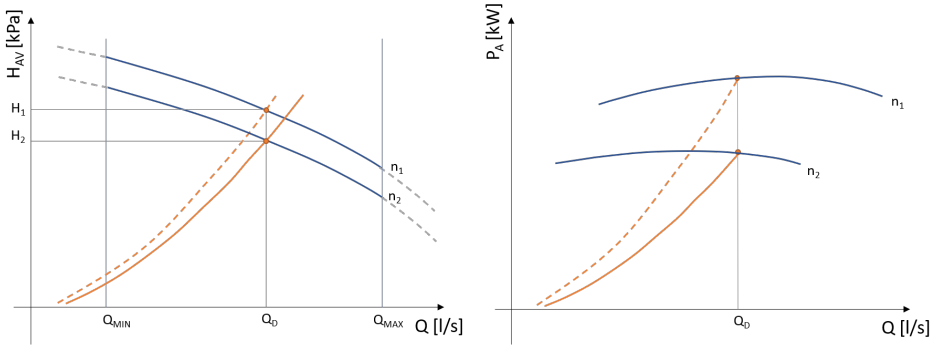
This accessory is useful when the total head losses of the circuit are slightly variable or when they change depending on the seasons (for example, some user points are active only during summer operation and not during winter operation).

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

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

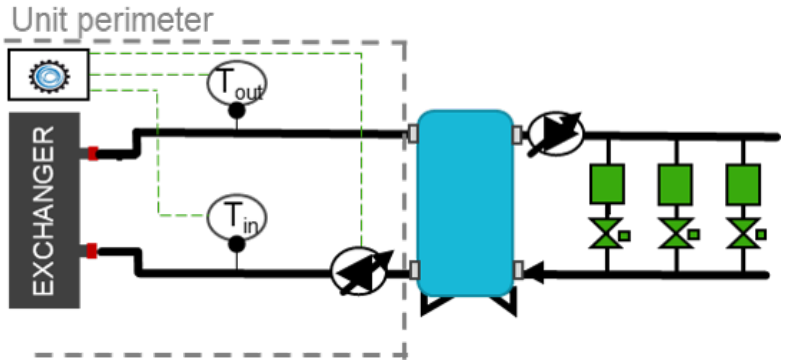


Flowzer VDE requires a differential pressure transducer to be installed in the machine. Through this transducer, the inverter can gauge the actual pressure at the ends of the heat exchanger installed in the machine and it can automatically adapt the pump speed for a constant flow value under all conditions.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

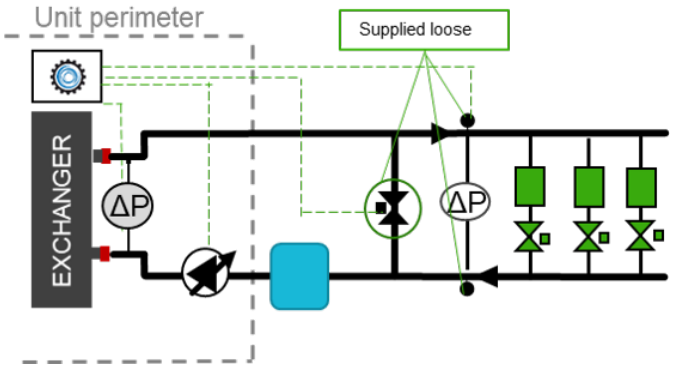
The option must be necessarily combined with the Flowzer VP (inverter) and with one of the hydraulic modules that can be selected for the unit. The option is not compatible with the Multilogic version. Please refer to the HYZER solutions for the compatibility between variable flow systems and multi-machine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

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

With the Flowzer VDT, the customer can set, directly on the display, the available discharge head 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:

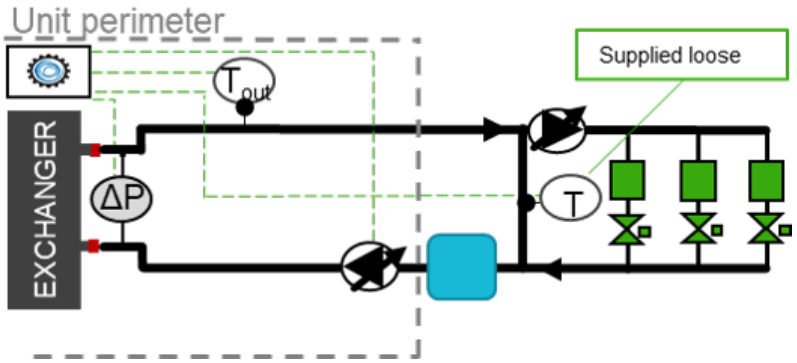
- single inverter + pumping module, integrated in the unit
- small internal footprint, due to the simplified layout

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:

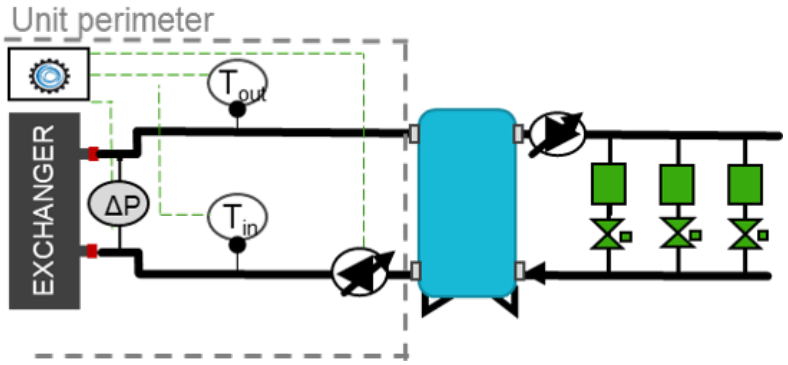
- being ideal for renovations of existing systems, especially for comfort applications
- achieving a complete variable flow system, with maximum energy saving
- implementing a flexible design, e.g. for scalable or multi-zone systems

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.

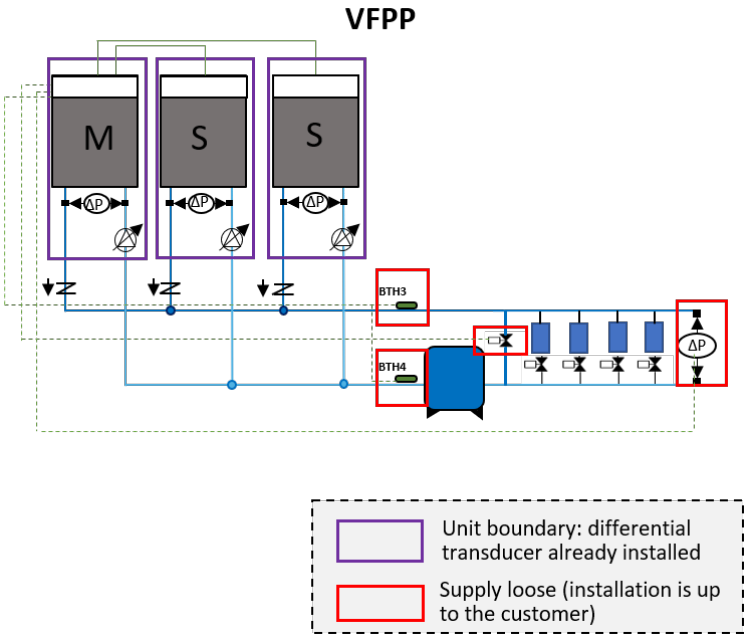
- The check contributes to reducing/increasing the speed of the pump in the primary circuit until the min./max. flow threshold admitted in the heat exchanger of the unit is exceeded.
- this flow rate is indirectly monitored through the losses detected by the differential pressure transducer Δpe

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.

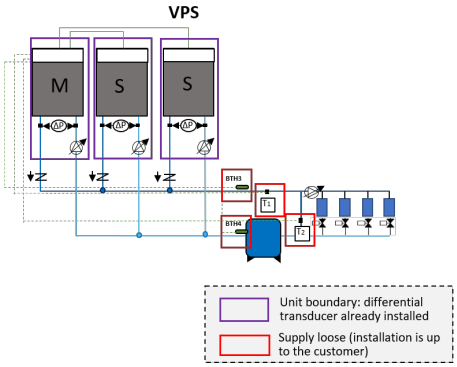
This option must be selected with either the "HYZER E VFPP function for Master unit to manage up to 2 Slave units" or "HYZER E VFPP function for Master unit to manage up to 6 Slave units".

	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

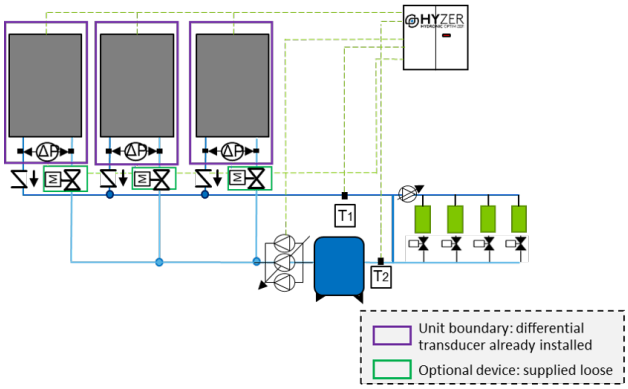
For the master units, the accessory requires:

- 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).

TECHNICAL SPECIFICATIONS

TETRIS W REV FC/NG

			3.2	4.2	5.2	6.2	7.2	8.2	9.2	10.2
Cooling (EG30% 35/40; W15/10)										
Refrigeration capacity	(1)	kW	39,5	45,0	51,5	57,0	65,8	74,0	84,7	102,9
Total absorbed power	(1)	kW	9,4	11,0	12,3	13,6	15,8	17,4	19,7	24,0
EER	(1)		4,18	4,10	4,18	4,19	4,16	4,26	4,29	4,28
Free-Cooling										
TFT of basic version	(3)	°C	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00
TFT of /HE version	(3)	°C	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Compressors										
Compressors/Circuits		n°/n°	2/1	2/1	2/1	2/1	2/1	2/1	2/1	2/1
Minimum capacity reduction step	(8)	%	50%	50%	50%	50%	50%	50%	50%	50%
Refrigerant charge		kg	3,8	4	4,5	7,5	7,7	7,8	8	8,5
User-side heat exchangers										
Water flow rate	(1)	m³/h	6,9	7,8	9,0	9,9	11,5	12,9	14,7	17,9
Total head losses	(1)	kPa	80	95	96	109	112	104	113	127
Total water content		l	10	10	12	13	17	21	24	25
Evaporator										
Quantity		n°	1	1	1	1	1	1	1	1
Basic version of free cooling heat exchanger										
Water content	(6)	l	4	4	5	5	8	9	12	14
Head loss	(1)	kPa	43	57	44	58	49	62	59	73
HE version of free cooling heat exchanger										
Water content	(6)	l	7	7	9	9	12	15	17	17
Head loss	(1)	kPa	43	57	44	58	56	59	65	88
Source-side heat exchanger										
Flow rate of water and 30% glycol	(1)	m³/h	9,4	10,7	12,3	13,6	15,7	17,6	20,1	24,4
Total head losses	(1)	kPa	88	111	112	122	128	85	97	108
Quantity		n°	1	1	1	1	1	1	1	1
Water content		l	3	3	4	4	5	7	8	9
Noise levels										
Sound power level of basic unit	(4)	dB(A)	73	75	75	77	77	78	79	80
Sound pressure level of basic unit	(5)	dB(A)	57	59	60	62	62	63	63	65
Sound power level of LN version	(4)	dB(A)	66	68	68	70	70	71	72	73
Sound pressure level of LN version	(5)	dB(A)	50	52	53	55	55	56	56	58
Dimensions and weights**										
Length		mm	1.633	1.633	1.633	1.633	1.633	1.633	1.633	1.633
Depth		mm	800	800	800	800	800	800	800	800
Height		mm	1.880	1.880	1.880	1.880	1.880	1.880	1.880	1.880
Operating weight		kg	330	340	380	400	400	440	460	470

(1) E.G. source fluid 30%; water temperature inlet-outlet source exchanger 35/40 ° C; water temperature inlet-outlet user exchanger 15/10 ° C. Values according to EN 14511 standard

(3) The indicated TFT is calculated considering the coupling with a drycooler sized to allow the unit to operate under nominal conditions with 30 ° C of outside air

(4) Unit operating at rated speed, without any accessory, with water temperature inlet-outlet source exchanger 35-40 ° C and water temperature inlet-outlet user exchanger 15-10 ° C.

(5) Values obtained from the sound power level (conditions: note 4), related to a distance of 1 m from the unit in free field with directivity factor Q=2. Non-binding values.

(6) This volume considers both the water content of the exchanger and an estimate of the volume of water contained in the pipes of the freecooling section

(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.

** Chiller version without accessories (chiller section + freecooling)

TETRIS W REV FC/NG

			12.2	13.2	15.2	17.2	19.2	20.2	24.2	27.2
Cooling (EG30% 35/40; W15/10)										
Refrigeration capacity	(1)	kW	116,9	134,7	149,6	165,6	188,3	205,8	228,9	258,3
Total absorbed power	(1)	kW	26,9	31,1	34,4	38,2	44,1	49,3	54,1	61,3
EER	(1)		4,34	4,33	4,35	4,33	4,26	4,17	4,23	4,21
Free-Cooling										
TFT of basic version	(3)	°C	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00
TFT of /HE version	(3)	°C	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Compressors										
Compressors/Circuits		n°/n°	2/1	2/1	2/1	2/1	2/1	2/1	2/1	2/1
Minimum capacity reduction step	(8)	%	43%	50%	44%	50%	45%	50%	50%	50%
Refrigerant charge		kg	10	11,5	12	14	15	15	21	21
User-side heat exchangers										
Water flow rate	(1)	m³/h	20,3	23,4	26,0	28,7	32,7	35,8	39,7	44,9
Total head losses	(1)	kPa	107	116	114	103	114	135	119	141
Total water content		l	31	33	36	48	49	50	92	96
Evaporator										
Quantity		n°	1	1	1	1	1	1	1	1
Basic version of free cooling heat exchanger										
Water content	(6)	l	12	12	16	16	20	20	26	29
Head loss	(1)	kPa	42	52	44	54	40	50	38	48
HE version of free cooling heat exchanger										
Water content	(6)	l	22	22	24	34	34	34	42	45
Head loss	(1)	kPa	36	46	57	33	44	55	47	59
Source-side heat exchanger										
Flow rate of water and 30% glycol	(1)	m³/h	27,8	32,0	35,5	39,3	44,7	49,1	54,6	61,6
Total head losses	(1)	kPa	92	100	111	120	147	142	110	130
Quantity		n°	1	1	1	1	1	1	1	1
Water content		l	10	12	13	15	16	18	30	32
Noise levels										
Sound power level of basic unit	(4)	dB(A)	83	84	85	85	86	87	87	88
Sound pressure level of basic unit	(5)	dB(A)	66	67	69	69	70	71	71	71
Sound power level of LN version	(4)	dB(A)	76	77	78	78	79	80	80	81
Sound pressure level of LN version	(5)	dB(A)	59	60	62	62	63	64	64	64
Dimensions and weights**										
Length		mm	3.300	3.300	3.300	3.300	3.300	3.300	3.300	3.300
Depth		mm	800	800	800	800	800	800	800	800
Height		mm	1.880	1.880	1.880	1.880	1.880	1.880	1.880	1.880
Operating weight		kg	580	670	700	740	770	800	860	880

(1) E.G. source fluid 30%; water temperature inlet-outlet source exchanger 35/40 ° C; water temperature inlet-outlet user exchanger 15/10 ° C. Values according to EN 14511 standard

(3) The indicated TFT is calculated considering the coupling with a drycooler sized to allow the unit to operate under nominal conditions with 30 ° C of outside air

(4) Unit operating at rated speed, without any accessory, with water temperature inlet-outlet source exchanger 35-40 ° C and water temperature inlet-outlet user exchanger 15-10 ° C.

(5) Values obtained from the sound power level (conditions: note 4), related to a distance of 1 m from the unit in free field with directivity factor Q=2. Non-binding values.

(6) This volume considers both the water content of the exchanger and an estimate of the volume of water contained in the pipes of the freecooling section

(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.

** Chiller version without accessories (chiller section + freecooling)

TETRIS W REV FC/NG

			30.3	34.3	40.3	18.4	20.4	24.4	26.4	30.4	34.4
Cooling (EG30% 35/40; W15/10)											
Refrigeration capacity	(1)	kW	328,0	370,2	413,9	168,8	204,4	232,9	262,6	297,5	331,0
Total absorbed power	(1)	kW	75,9	85,2	95,4	39,0	47,2	54,0	60,7	68,5	77,3
EER	(1)		4,32	4,34	4,34	4,33	4,33	4,31	4,32	4,34	4,28
Free-Cooling											
TFT of basic version	(3)	°C	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00
TFT of /HE version	(3)	°C	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Compressors											
Compressors/Circuits		n°/n°	3/1	3/1	3/1	4/2	4/2	4/2	4/2	4/2	4/2
Minimum capacity reduction step	(8)	%	33%	33%	33%	25%	25%	21%	25%	22%	25%
Refrigerant charge		kg	27	31	33	18	18	20,5	25	27	29
User-side heat exchangers											
Water flow rate	(1)	m³/h	56,9	64,3	71,9	29,2	35,4	40,4	45,6	51,6	57,4
Total head losses	(1)	kPa	125	145	142	82	97	113	117	112	123
Total water content		l	117	118	133	52	57	67	66	69	76
Evaporator											
Quantity		n°	1	1	1	1	1	1	1	1	1
Basic version of free cooling heat exchanger											
Water content	(6)	l	39	49	63	14	19	19	23	23	29
Head loss	(1)	kPa	47	50	47	34	47	59	46	41	49
HE version of free cooling heat exchanger											
Water content	(6)	l	65	65	79	24	27	37	37	37	45
Head loss	(1)	kPa	52	63	44	38	51	46	57	44	55
Source-side heat exchanger											
Flow rate of water and 30% glycol	(1)	m³/h	77,8	87,8	98,0	40,0	48,5	55,3	62,3	70,6	78,6
Total head losses	(1)	kPa	150	133	158	117	103	124	119	123	144
Quantity		n°	1	1	1	1	1	1	1	1	1
Water content		l	35	44	51	15	17	19	22	24	28
Noise levels											
Sound power level of basic unit	(4)	dB(A)	88	88	90	82	83	86	87	88	88
Sound pressure level of basic unit	(5)	dB(A)	71	71	73	65	66	69	69	71	71
Sound power level of LN version	(4)	dB(A)	81	81	83	75	76	79	80	81	81
Sound pressure level of LN version	(5)	dB(A)	64	64	66	58	59	62	62	64	64
Dimensions and weights**											
Length		mm	4.505	4.505	4.505	3.685	3.685	4.502	4.502	4.502	4.502
Depth		mm	880	880	880	880	880	880	880	880	880
Height		mm	1.880	1.880	1.880	1.880	1.880	1.880	1.880	1.880	1.880
Operating weight		kg	1220	1260	1340	770	800	1030	1210	1270	1350

(1) E.G. source fluid 30%; water temperature inlet-outlet source exchanger 35/40 ° C; water temperature inlet-outlet user exchanger 15/10 ° C. Values according to EN 14511 standard

(3) The indicated TFT is calculated considering the coupling with a drycooler sized to allow the unit to operate under nominal conditions with 30 ° C of outside air

(4) Unit operating at rated speed, without any accessory, with water temperature inlet-outlet source exchanger 35-40 ° C and water temperature inlet-outlet user exchanger 15-10 ° C.

(5) Values obtained from the sound power level (conditions: note 4), related to a distance of 1 m from the unit in free field with directivity factor Q=2. Non-binding values.

(6) This volume considers both the water content of the exchanger and an estimate of the volume of water contained in the pipes of the freecooling section

(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.

** Chiller version without accessories (chiller section + freecooling)

TETRIS W REV FC/NG

			37.4	39.4	47.4	53.4	55.6	59.6
Cooling (EG30% 35/40; W15/10)								
Refrigeration capacity	(1)	kW	377,3	423,1	467,6	526,7	563,1	633,9
Total absorbed power	(1)	kW	87,9	99,9	109,7	122,8	130,2	147,6
EER	(1)		4,29	4,23	4,26	4,29	4,33	4,30
Free-Cooling								
TFT of basic version	(3)	°C	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00
TFT of /HE version	(3)	°C	1,00	1,00	1,00	1,00	1,00	1,00
Compressors								
Compressors/Circuits		n°/n°	4/2	4/2	4/2	4/2	6/2	6/2
Minimum capacity reduction step	(8)	%	23%	25%	25%	25%	15%	17%
Refrigerant charge		kg	42	43	44	45	55,5	56
User-side heat exchangers								
Water flow rate	(1)	m³/h	65,4	73,4	81,0	91,3	97,5	109,9
Total head losses	(1)	kPa	96	131	102	118	100	118
Total water content		l	123	139	121	147	180	183
Evaporator								
Quantity		n°	1	1	1	1	1	1
Basic version of free cooling heat exchanger								
Water content	(6)	l	63	63	76	76	88	88
Head loss	(1)	kPa	42	53	41	51	42	53
HE version of free cooling heat exchanger								
Water content	(6)	l	79	93	93	118	118	118
Head loss	(1)	kPa	40	35	43	34	34	34
Source-side heat exchanger								
Flow rate of water and 30% glycol	(1)	m³/h	89,6	100,6	111,4	125,2	133,6	150,5
Total head losses	(1)	kPa	151	172	108	128	140	154
Quantity		n°	1	1	1	1	1	1
Water content		l	46	50	50	57	59	65
Noise levels								
Sound power level of basic unit	(4)	dB(A)	89	90	90	91	91	91
Sound pressure level of basic unit	(5)	dB(A)	72	72	73	73	73	73
Sound power level of LN version	(4)	dB(A)	82	83	83	84	84	84
Sound pressure level of LN version	(5)	dB(A)	65	65	66	66	66	66
Dimensions and weights**								
Length		mm	4.502	4.502	4.502	4.502	5.002	5.002
Depth		mm	872	872	872	872	872	872
Height		mm	1.880	1.880	1.880	1.880	1.880	1.880
Operating weight		kg	1500	1580	1630	1710	2030	2150

(1) E.G. source fluid 30%; water temperature inlet-outlet source exchanger 35/40 ° C; water temperature inlet-outlet user exchanger 15/10 ° C. Values according to EN 14511 standard

(3) The indicated TFT is calculated considering the coupling with a drycooler sized to allow the unit to operate under nominal conditions with 30 ° C of outside air

(4) Unit operating at rated speed, without any accessory, with water temperature inlet-outlet source exchanger 35-40 ° C and water temperature inlet-outlet user exchanger 15-10 ° C.

(5) Values obtained from the sound power level (conditions: note 4), related to a distance of 1 m from the unit in free field with directivity factor Q=2. Non-binding values.

(6) This volume considers both the water content of the exchanger and an estimate of the volume of water contained in the pipes of the freecooling section

(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.

** Chiller version without accessories (chiller section + freecooling)

TETRIS W REV FC/NG

			38.4	40.4	48.4	54.4	56.6	60.6
Cooling (EG30% 35/40; W15/10)								
Refrigeration capacity	(1)	kW	377,3	423,1	467,6	526,7	563,0	633,9
Total absorbed power	(1)	kW	87,9	99,9	109,7	122,7	130,2	147,6
EER	(1)		4,29	4,23	4,26	4,29	4,32	4,30
Free-Cooling								
TFT of basic version	(3)	°C	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00
TFT of /HE version	(3)	°C	1,00	1,00	1,00	1,00	1,00	1,00
Compressors								
Compressors/Circuits		n°/n°	4/2	4/2	4/2	4/2	6/2	6/2
Minimum capacity reduction step	(8)	%	23%	25%	25%	25%	15%	17%
Refrigerant charge		kg	42	43	44	45	55,5	56
User-side heat exchangers								
Water flow rate	(1)	m³/h	65,4	73,4	81,0	91,3	97,5	109,9
Total head losses	(1)	kPa	96	131	102	118	100	118
Total water content		l	123	139	121	147	180	183
Evaporator								
Quantity		n°	1	1	1	1	1	1
Basic version of free cooling heat exchanger								
Water content	(6)	l	63	63	76	76	88	88
Head loss	(1)	kPa	42	53	41	51	42	53
HE version of free cooling heat exchanger								
Water content	(6)	l	79	93	93	118	118	118
Head loss	(1)	kPa	40	35	43	34	34	34
Source-side heat exchanger								
Flow rate of water and 30% glycol	(1)	m³/h	89,6	100,6	111,4	125,2	133,6	150,5
Total head losses	(1)	kPa	151	172	108	128	140	154
Quantity		n°	1	1	1	1	1	1
Water content		l	46	50	50	57	59	65
Noise levels								
Sound power level of basic unit	(4)	dB(A)	89	90	90	91	91	91
Sound pressure level of basic unit	(5)	dB(A)	72	72	73	73	73	73
Sound power level of LN version	(4)	dB(A)	82	83	83	84	84	84
Sound pressure level of LN version	(5)	dB(A)	65	65	66	66	66	66
Dimensions and weights**								
Length		mm	2820	2820	2820	2820	3320	3320
Depth		mm	880	880	880	880	880	880
Height		mm	1880	1880	1880	1880	1880	1880
Weight in section chiller function		kg	1500	1580	1630	1710	2030	2150
Freecooling module dimensions and weights								
Length		mm	2930	2930	2930	2930	2930	2930
Depth		mm	880	880	880	880	880	880
Height		mm	1880	1880	1880	1880	1880	1880
Weight in freecooling section		kg	898	1096	1056	1602	1282	1162

(1) Source fluid E.G. 30%; source-side heat exchanger inlet-outlet water temperature 35/40°C; user-side heat exchanger inlet-outlet water temperature 15/10°C. Values compliant with standard EN 14511

(3) The indicated TFT is calculated considering coupling with a drycooler sized to allow the unit to work under nominal conditions with outside air at 30°C

(4) # tab # unit operating at rated speed, without any accessory, with water temperature inlet-outlet source exchanger 35-40 ° C and water temperature inlet-outlet user exchanger 15-10 ° C. Binding values. Values obtained from measurements performed according to ISO 3744.

(5) # tab # values obtained from the sound power level (in known condition 4), referred to a distance of 1 m from the unit in free field with directivity factor Q = 2. Non-binding values.

(6) This volume considers both the water content of the heat exchanger and an estimate of the volume of water contained in the pipes of the free cooling section

(6) This volume considers both the water content of the heat exchanger and an estimate of the volume of water contained in the pipes of the free cooling section

(6) This volume considers both the water content of the heat exchanger and an estimate of the volume of water contained in the pipes of the free cooling section

(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

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.

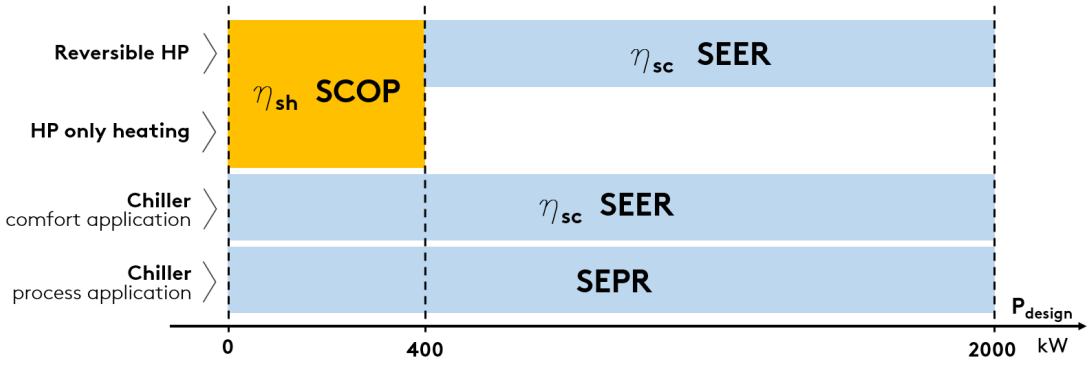
The other two regulations (2013/813 and 2016/2281) set seasonal efficiency targets that the products must comply with to be sold and installed in the European Union (essential requirement for CE marking).

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.

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

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



Some notes and clarifications:

For comfort applications, regulation 2016/2281 sets the 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			
		Tier 1		Tier 2 (2021)	
SOURCE	**Pdesign**	**ηsc [%]**	**SEER**	**ηsc [%]**	**SEER**
air	< 400kW	149	3,8	161	4,1
air	≥ 400kW	161	4,1	179	4,55
water	< 400kW	196	5,1	200	5,2
water	≥ 400kW and < 1500kW	227	5,875	252	6,5
water	≥ 1500kW	245	6,325	272	7

REGULATION 2016/2281, process application

TYPE OF UNIT		MINIMUM REQUIREMENT	
		Tier 1	Tier 2 (2021)
SOURCE	**Pdesign**	**SEPR**	**SEPR**
air	< 400kW	4,5	5
air	≥ 400kW	5	5,5
water	< 400kW	6,5	7
water	≥ 400kW and < 1500kW	7,5	8
water	≥ 1500kW	8	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		-	-

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.

TETRIS W REV FC / NG RANGE

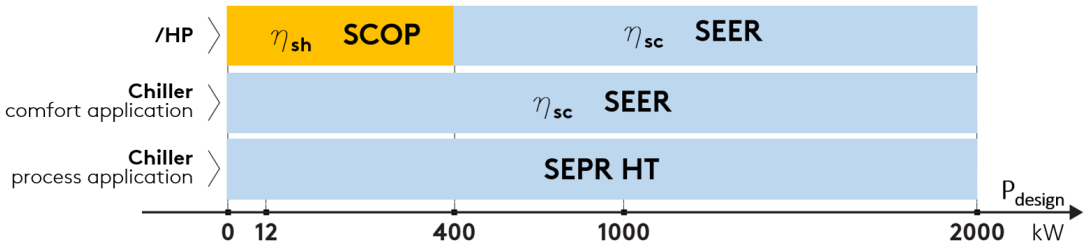
The Ecodesign/ErP Directive (2009/125/EC) lays down new standards for more efficient energy use.
Several regulations are part of the directive, and set mandatory seasonal efficiency targets for sale in the European Union.
The unit therefore, to be CE marked and sold in the EU market, must comply with the minimum requirements imposed by the regulations in question.
As for the Tetris W Rev FC / NG, in the different configurations, the regulations of interest are as follows:

- Regulation 2016/2281, for chillers with Pdesign> 400 kW

Minimum efficiency requirements are imposed through seasonal energy efficiency indices, respectively:

- ηsc (SEER) for comfort applications and SEPR for process applications, with reference to regulation 2016/2281

As regards the 2016/2281 regulation starting from 1 January 2021, the minimum required efficiency limit will be raised (Tier 2) compared to the current standard (Tier 1).



Tetris W Rev FC/NG:

- 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.

TETRIS W REV FC/NG

			3.2	4.2	5.2	6.2	7.2	8.2	9.2
REGULATION 2016/2281									
Pdesign	(1)	kW	38,2	43,4	49,8	55,2	64	71,9	82
COMFORT									
ηsc	(1)	%	201,2	201,3	200,8	202,6	201,7	205,6	200,9
SEER	(1)		5,23	5,23	5,22	5,27	5,24	5,34	5,22
Compliance Tier 1	(1)		Y	Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y	Y	Y
PROCESS									
SEPR	(2)		7,19	7,24	7,25	7,25	7,25	7,26	7,09
Compliance Tier 1	(2)		Y	Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(2)		Y	Y	Y	Y	Y	Y	Y

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.

(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 12/7°C, with reference to regulation 2016/2281 and norm EN 14825.

TETRIS W REV FC/NG

			3.2	4.2	5.2	6.2	7.2	8.2	9.2
REGULATION 2016/2281									
Pdesign	(1)	kW	38	44	50	55	64	72	82
COMFORT									
ηsc	(1)	%	206,2	206,2	205,8	207,8	206,6	210,6	205,8
SEER	(1)		5,23	5,23	5,22	5,27	5,24	5,34	5,22
Compliance Tier 1	(1)		Y	Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y	Y	Y
PROCESS									
SEPR	(2)		7,22	7,2	7,27	7,21	7,28	7,25	7,23
Compliance Tier 1	(2)		Y	Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(2)		Y	Y	Y	Y	Y	Y	Y

			10.2	12.2	13.2	15.2	17.2	19.2	20.2
REGULATION 2016/2281									
Pdesign	(1)	kW	100	113	131	145	161	182	200
COMFORT									
ηsc	(1)	%	205	211,4	206,6	206,2	205,4	220,6	211
SEER	(1)		5,2	5,36	5,24	5,23	5,21	5,59	5,35
Compliance Tier 1	(1)		Y	Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y	Y	Y
PROCESS									
SEPR	(2)		7,22	7,2	7,18	7,16	7,14	7,12	7,1
Compliance Tier 1	(2)		Y	Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(2)		Y	Y	Y	Y	Y	Y	Y

			24.2	27.2	30.3	34.3	40.3	18.4	20.4
REGULATION 2016/2281									
Pdesign	(1)	kW	222	251	310	346	385	163	197
COMFORT									
ηsc	(1)	%	205,8	227,4	220,6	223,4	225	217,8	220,2
SEER	(1)		5,22	5,76	5,59	5,66	5,7	5,52	5,58
Compliance Tier 1	(1)		Y	Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y	Y	Y
PROCESS									
SEPR	(2)		7,15	7,21	7,25	7,29	7,5	7,23	7,17
Compliance Tier 1	(2)		Y	Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(2)		Y	Y	Y	Y	Y	Y	Y

			24.4	26.4	30.4	34.4	37.4	38.4	39.4	40.4
REGULATION 2016/2281										
Pdesign	(1)	kW	225	254	287	320	361,8	377,3	423,1	408,4
COMFORT										
ηsc	(1)	%	221	226,2	215	217	221,8	221,8	233,4	233,4
SEER	(1)		5,6	5,73	5,45	5,5	5,62	5,62	5,91	5,91
Compliance Tier 1	(1)		Y	Y	Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y	Y	Y	Y
PROCESS										
SEPR	(2)		7,15	7,25	7,37	7,42	7,43	7,43	7,5	7,5
Compliance Tier 1	(2)		Y	Y	Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(2)		Y	Y	Y	Y	Y	Y	N	N

			47.4	48.4	53.4	54.4	55.6	56.6	59.6	60.6
REGULATION 2016/2281										
Pdesign	(1)	kW	467,6	453,8	526,7	521,9	563,1	544,8	633,9	615
COMFORT										
ηsc	(1)	%	255,8	255,8	253,2	253,2	254,6	254,6	254,6	254,6
SEER	(1)		6,47	6,47	6,41	6,41	6,44	6,44	6,44	6,44
Compliance Tier 1	(1)		Y	Y	Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y	Y	Y	Y
PROCESS										
SEPR	(2)		7,51	7,51	7,53	7,53	7,52	7,52	7,51	7,51
Compliance Tier 1	(2)		Y	Y	Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(2)		N	N	N	N	N	N	N	N

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.

(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 12/7°C, with reference to regulation 2016/2281 and norm EN 14825.

ELECTRICAL SPECIFICATIONS

TETRIS W REV FC/NG

			3.2	4.2	5.2	6.2	7.2	8.2	9.2	10.2
General electrical specifications										
Max. absorbed power (FLI)	(1)	kW	16	18	20	22	26	29	34	40
Max. absorbed current (FLA)	(1)	A	27	33	33	39	46	52	57	66
Nominal current (Inom)	(2)	A	25	38	36	43	44	48	57	57
cosφ standard unit	(2)		0,80	0,80	0,80	0,83	0,83	0,83	0,78	0,75
Nominal current with power factor correction (Inom)	(2)	A	21	32	31	37	39	42	47	45
cosφ unit with power factor correction	(2)		0,98	0,95	0,95	0,95	0,95	0,95	0,95	0,95
Maximum inrush current (MIC)	(3)	A	90	120	120	133	143	147	171	210
Maximum inrush current with soft-starter (MIC)	(4)	A	60	79	79	88	96	100	115	141
Power supply			400V / 3ph / 50Hz							
Power supply for auxiliary circuits			230V-24V / 1ph / 50 Hz							
Suggested line section	(5)	mm²	4G6 FG7OR	4G10 FG7OR	4G10 FG7OR	4G10 FG7OR	4G16 FG7OR	4G16 FG7OR	4G16 FG7OR	4G25 FG7OR
Suggested line protection	(6)		CH14gG 40A	NH00gG 50A	NH00gG 50A	NH00gG 50A	NH00gG 63A	NH00gG 63A	NH00gG 80A	NH00gG 100A

TETRIS W REV FC/NG

			12.2	13.2	15.2	17.2	19.2	20.2	24.2	27.2
General electrical specifications										
Max. absorbed power (FLI)	(1)	kW	46	54	60	67	74	82	92	102
Max. absorbed current (FLA)	(1)	A	73	82	90	100	114	129	153	167
Nominal current (Inom)	(2)	A	65	74	82	91	108	119	136	146
cosφ standard unit	(2)		0,80	0,84	0,85	0,86	0,86	0,86	0,87	0,87
Nominal current with power factor correction (Inom)	(2)	A	54	65	71	82	98	108	123	133
cosφ unit with power factor correction	(2)		0,95	0,95	0,97	0,96	0,95	0,95	0,96	0,96
Maximum inrush current (MIC)	(3)	A	261	270	317	327	365	380	349	388
Maximum inrush current with soft-starter (MIC)	(4)	A	171	180	208	218	241	256	242	269
Power supply			400V / 3ph / 50Hz							
Power supply for auxiliary circuits			230V-24V / 1ph / 50 Hz							
Suggested line section	(5)	mm²	4G25 FG7OR	4G25 FG7OR	3x35+1G25 FG7OR	3x35+1G25 FG7OR	3x50+1G25 FG7OR	3x70+1G35 FG7OR	3x95+1G50 FG7OR	3x95+1G50 FG7OR
Suggested line protection	(6)		NH00gG 100A	NH00gG 100A	NH00gG 125A	NH00gG 125A	NH00gG 160A	NH1gG 200A	NH1gG 250A	NH1gG 250A

(1) Data regarding the unit without accessories working in maximum power absorption conditions

(2) Datum related to the unit without accessories working under standard conditions (E.G. 30% 35/40°C; W15-10°C)

(3) Maximum effective RMS value of the current when the last compressor starts (FLA of the entire unit - FLA of the largest compressor + LRA of the largest compressor)

(4) Maximum effective RMS value of the current when the last compressor starts (FLA of the entire unit - FLA of the largest compressor + 0.6 x LRA of the largest compressor)

(5) These values are determined for cables with operating temperature of 40°C, EPR insulation and a line with a maximum length of 50m. The line section must be determined by a qualified technician based on the protection devices, the length of the line, the type of cable used and the type of installation.

(6) The correct line protection part must be determined by a qualified technician based on the length of the line, the type of cable used and the type of installation.

TETRIS W REV FC/NG

			30.3	34.3	40.3	18.4	20.4	24.4	26.4	30.4	34.4
General electrical specifications											
Max. absorbed power (FLI)	(1)	kW	122	140	150	67	79	92	107	119	132
Max. absorbed current (FLA)	(1)	A	192	231	247	112	132	144	160	176	196
Nominal current (Inom)	(2)	A	174	207	218	102	114	128	144	158	179
cosφ standard unit	(2)		0,86	0,87	0,88	0,78	0,75	0,80	0,84	0,85	0,86
Nominal current with power factor correction (Inom)	(2)	A	158	188	200	83	90	106	125	139	159
cosφ unit with power factor correction	(2)		0,95	0,96	0,96	0,95	0,95	0,97	0,97	0,97	0,97
Maximum inrush current (MIC)	(3)	A	442	427	469	227	275	333	348	403	423
Maximum inrush current with soft-starter (MIC)	(4)	A	318	320	349	171	206	243	258	295	314
Power supply			400V / 3ph / 50Hz								
Power supply for auxiliary circuits			230V-24V / 1ph / 50 Hz								
Suggested line section	(5)	mm²	3x95+1G50 FG70R	3x150+1G95 FG70R	3x150+1G95 FG70R	3x50+1G25 FG70R	3x70+1G35 FG70R	3x70+1G35 FG70R	3x95+1G50 FG70R	3x95+1G50 FG70R	3x150+1G95 FG70R
Suggested line protection	(6)		NH1gG 250A	NH2gG 315A	NH2gG 315A	NH00gG 160A	NH1gG 200A	NH1gG 200A	NH1gG 250A	NH1gG 250A	NH2gG 315A

TETRIS W REV FC/NG

			37.4	38.4	39.4	40.4	47.4	48.4
General electrical specifications								
Max. absorbed power (FLI)	(1)	kW	147	147	163	163	185	185
Max. absorbed current (FLA)	(1)	A	225	225	258	258	306	306
Nominal current (Inom)	(2)	A	200	200	234	234	270	270
cosφ standard unit	(2)		0,86	0,86	0,86	0,86	0,86	0,86
Nominal current with power factor correction (Inom)	(2)	A	177	177	210	210	245	245
cosφ unit with power factor correction	(2)		0,97	0,97	0,96	0,96	0,95	0,95
Maximum inrush current (MIC)	(3)	A	476	476	509	509	502	502
Maximum inrush current with soft-starter (MIC)	(4)	A	352	352	385	385	395	395
Power supply			400V / 3ph / 50Hz					
Power supply for auxiliary circuits			230V-24V / 1ph / 50 Hz					
Suggested line section	(5)	mm²	3x150+1G95 FG70R	3x150+1G95 FG70R	3x150+1G95 FG70R	3x150+1G95 FG70R	3x150+1G95 FG70R	3x150+1G95 FG70R
Suggested line protection	(6)		NH2gG 315A	NH2gG 315A	NH2gG 400A	NH2gG 400A	NH2gG 400A	NH2gG 400A

(1) Data regarding the unit without accessories working in maximum power absorption conditions

(2) Datum related to the unit without accessories working under standard conditions (E.G. 30% 35/40°C; W15-10°C)

(3) Maximum effective RMS value of the current when the last compressor starts (FLA of the entire unit - FLA of the largest compressor + LRA of the largest compressor)

(4) Maximum effective RMS value of the current when the last compressor starts (FLA of the entire unit - FLA of the largest compressor + 0.6 x LRA of the largest compressor)

(5) These values are determined for cables with operating temperature of 40°C, EPR insulation and a line with a maximum length of 50m. The line section must be determined by a qualified technician based on the protection devices, the length of the line, the type of cable used and the type of installation.

(6) The correct line protection part must be determined by a qualified technician based on the length of the line, the type of cable used and the type of installation.

TETRIS W REV FC/NG

			53.4	54.4	55.6	56.6	59.6	60.6
General electrical specifications								
Max. absorbed power (FLI)	(1)	kW	199	199	221	221	243	243
Max. absorbed current (FLA)	(1)	A	327	327	338	338	382	382
Nominal current (Inom)	(2)	A	286	286	311	311	343	343
cosφ standard unit	(2)		0,88	0,88	0,86	0,86	0,88	0,88
Nominal current with power factor correction (Inom)	(2)	A	265	265	279	279	318	318
cosφ unit with power factor correction	(2)		0,95	0,95	0,96	0,96	0,95	0,95
Maximum inrush current (MIC)	(3)	A	548	548	589	589	633	633
Maximum inrush current with soft-starter (MIC)	(4)	A	429	429	465	465	509	509
Power supply			400V / 3ph / 50Hz					
Power supply for auxiliary circuits			230V-24V / 1ph / 50 Hz					
Suggested line section	(5)	mm²	2x(3x95+1G50) FG7OR	2x(3x95+1G50) FG7OR	2x(3x95+1G50) FG7OR	2x(3x95+1G50) FG7OR	2x(3x95+1G50) FG7OR	2x(3x95+1G50) FG7OR
Suggested line protection	(6)		NH3gG 500A	NH3gG 500A	NH3gG 500A	NH3gG 500A	NH3gG 500A	NH3gG 500A

(1) Data regarding the unit without accessories working in maximum power absorption conditions

(2) Datum related to the unit without accessories working under standard conditions (E.G. 30% 35/40°C; W15-10°C)

(3) Maximum effective RMS value of the current when the last compressor starts (FLA of the entire unit - FLA of the largest compressor + LRA of the largest compressor)

(4) Maximum effective RMS value of the current when the last compressor starts (FLA of the entire unit - FLA of the largest compressor + 0.6 x LRA of the largest compressor)

(5) These values are determined for cables with operating temperature of 40°C, EPR insulation and a line with a maximum length of 50m. The line section must be determined by a qualified technician based on the protection devices, the length of the line, the type of cable used and the type of installation.

(6) The correct line protection part must be determined by a qualified technician based on the length of the line, the type of cable used and the type of installation.

HYDRAULIC MODULES

All the units can be equipped with hydraulic module in various combinations on the user side and on the source side. Refer to the table of configurations that are not possible to check for availability of specific set-ups.

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.

User-side hydraulic modules

The hydraulic circuit inside the unit is fully insulated with closed-cell insulating material..

The module can have the following configurations:

- /1P: hydraulic module with one pump
- /2P: hydraulic module with two pumps

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

The following are also available:

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

Source-side hydraulic modules

The source-side pumps are always inverter-controlled to modulate the water flow rate to the source side and free cooling heat exchangers. Modulation of the inverter is done directly by the control depending on the condensing temperature and the free cooling heat exchanger outlet temperature (user side).

As standard supply, all the units are in /1SV set-up that includes one inverter-controlled pump.

The module can have the following configurations:

- /2SV: hydraulic module with two inverter-controlled pumps

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

The following are also available:

modules /1SVM and /2SVM that have pumps with increased available discharge head

modules /1SVG and /2SVG that have pumps suitable for operating with glycol up to 50%

The following are the characteristics of the pumps on the Tetris W Rev FC / NG units.

TETRIS W REV FC/NG

			3.2	4.2	5.2	6.2	7.2	8.2	9.2
User-side hydraulic modules									
Standard pump model			P2	P3	P5	P5	P5	P5	P8
Available head (1P)	(1)	kPa	121	117	143	126	117	119	111
Oversize pump model			P3	P6	P6	P6	P6	P6	P9
Available head (1PM)	(1)	kPa	153	186	183	166	156	158	159
Source-side hydraulic modules									
Standard pump model			P5	P6	P6	P6	P6	P9	P9
Available head (1SV)	(1)	kPa	149	161	156	138	127	177	157
Oversize pump model			P6	-	-	P9	P9	P12	P12
Available head (1SVM)	(1)	kPa	188	-	-	153	144	243	207
Pump model for high glycol			P6	P6	P6	P9	P9	P9	P9
Available head (1SVG)	(1)	kPa	139	148	141	131	127	164	140

			10.2	12.2	13.2	15.2	17.2	19.2	20.2
User-side hydraulic modules									
Standard pump model			P8	P9	P9	P16	P16	P18	P18
Available head (1P)	(1)	kPa	95	149	131	157	157	198	157
Oversize pump model			P9	P11	P11	P13	P18	P20	P20
Available head (1PM)	(1)	kPa	142	203	166	225	226	267	220
Source-side hydraulic modules									
Standard pump model			P9	P9	P17	P17	P19	P24	P24
Available head (1SV)	(1)	kPa	130	129	148	117	159	141	134
Oversize pump model			P14	P19	P19	P19	P21	P22	P26
Available head (1SVM)	(1)	kPa	244	239	218	188	218	251	217
Pump model for high glycol			P17	P19	P19	P19	P20	P25	P27
Available head (1SVG)	(1)	kPa	141	236	209	176	205	115	205

			24.2	27.2	30.3	34.3	40.3	18.4	20.4
User-side hydraulic modules									
Standard pump model			P24	P24	P24	P26	P26	P16	P16
Available head (1P)	(1)	kPa	176	145	141	191	171	171	132
Oversize pump model			P26	P26	P26	P28	P28	P18	P18
Available head (1PM)	(1)	kPa	257	226	225	250	220	241	203
Source-side hydraulic modules									
Standard pump model			P24	P26	P26	P32	P32	P19	P24
Available head (1SV)	(1)	kPa	152	198	137	151	113	149	177
Oversize pump model			P26	P28	P29	P34	P34	P21	P26
Available head (1SVM)	(1)	kPa	236	254	179	187	149	205	259
Pump model for high glycol			P27	P27	P33	P33	-	P20	P25
Available head (1SVG)	(1)	kPa	220	178	132	138	-	190	166

			24.4	26.4	30.4	34.4	37.4	38.4	39.4	40.4
User-side hydraulic modules										
Standard pump model			P18	P24	P24	P24	P24	P24	P26	P26
Available head (1P)	(1)	kPa	159	170	164	139	142	142	166	166
Oversize pump model			P20	P26	P26	P26	P26	P26	P28	P28
Available head (1PM)	(1)	kPa	217	252	247	223	229	229	211	211
Source-side hydraulic modules										
Standard pump model			P24	P25	P26	P27	P32	P32	P34	P34
Available head (1SV)	(1)	kPa	140	127	184	134	127	127	126	126
Oversize pump model			P26	-	P28	P29	P34	P34	P36	P36
Available head (1SVM)	(1)	kPa	224	-	232	174	163	163	197	197
Pump model for high glycol			P27	P27	P27	P33	P35	P35	P35	P35
Available head (1SVG)	(1)	kPa	209	193	181	135	148	148	178	178

(1) Source fluid E.G. 30%; source-side heat exchanger inlet-outlet water temperature 35/40°C; user-side heat exchanger inlet-outlet water temperature 15/10°C. Values compliant with standard EN 14511

TETRIS W REV FC/NG

			47.4	48.4	53.4	54.4	55.6	56.6	59.6	60.6
User-side hydraulic modules										
Standard pump model			P32	P32	P32	P32	P34	P34	P34	P34
Available head (1P)	(1)	kPa	185	185	158	158	168	168	166	166
Oversize pump model			P34	P34	P34	P34	P36	P36	P36	P36
Available head (1PM)	(1)	kPa	221	221	194	194	275	275	239	239
Source-side hydraulic modules										
Standard pump model			P34	P34	P37	P37	P38	P38	P38	P38
Available head (1SV)	(1)	kPa	172	172	114	114	153	153	121	121
Oversize pump model			P36	P36	P38	P38	P39	P39	P39	P39
Available head (1SVM)	(1)	kPa	245	245	173	173	205	205	173	173
Pump model for high glycol			P36	P36	P38	P38	P39	P39	P39	P39
Available head (1SVG)	(1)	kPa	245	245	170	170	201	201	167	167

(1) Source fluid E.G. 30%; source-side heat exchanger inlet-outlet water temperature 35/40°C; user-side heat exchanger inlet-outlet water temperature 15/10°C. Values compliant with standard EN 14511

PUMP DATA

The values of PNOM and INOM refer to the rated values of the pump. The actual power consumption of the pump depends on the working conditions and on the density of the processed fluid.
QMIN and QMAX are respectively the minimum and maximum flow rate values allowed by the pump. The flow rate range allowed by the pump may not cover the entire flow rate range allowed by the unit.
If the unit has to work with a flow rate that is not allowed by the pump, it will be necessary to contact our sales department that will check the possibility of selecting a pump that complies with the flow rate and discharge head parameters required by the specific installation.

	PNOM	INOM	QMIN	QMAX
	kW	A	m³/h	m³/h
P1	0,55	1,6	3,6	9,6
P2	0,9	2,1	3,6	9,6
P3	0,9	2,4	3,6	9,6
P4	1,1	2,5	7	18
P5	1,5	3,2	7	18
P6	1,85	4,2	7	18
P7	1,5	3,4	12	29
P8	1,85	4,5	12	31
P9	3,0	5,9	12	31
P10	2,2	4,5	6	20
P11	3,0	6,1	6	20
P12	4,0	8,7	6	20
P13	4,0	8,7	6	20
P14	5,5	10,4	6	20
P15	2,2	4,5	12	42
P16	3,0	6,1	12	42
P17	4,0	8,7	12	42
P18	4,0	8,7	12	42
P19	5,5	10,4	12	42
P20	5,5	10,4	12	42

	PNOM	INOM	QMIN	QMAX
	kW	A	m³/h	m³/h
P21	7,5	13,7	12	42
P22	9,2	17,2	12	42
P23	4,0	8,7	24	72
P24	5,5	10,4	24	72
P25	7,5	13,7	24	72
P26	7,5	13,7	24	72
P27	9,2	17,2	24	72
P28	9,2	17,2	30	72
P29	11,0	17,2	24	72
P30	5,5	10,4	42	126
P31	7,5	13,6	42	132
P32	9,2	17,2	42	132
P33	11,0	21,3	42	138
P34	11,0	21,3	42	138
P35	15,0	27,7	42	138
P36	15,0	26,6	35	157
P37	11,0	20,2	58	237
P38	15,0	26,6	65	255
P39	18,5	33,0	70	270

FLOW RATE RANGES OF HEAT EXCHANGERS

The units are sized and optimized for the following nominal conditions:

- inlet-outlet of the source-side heat exchanger 35/40°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:

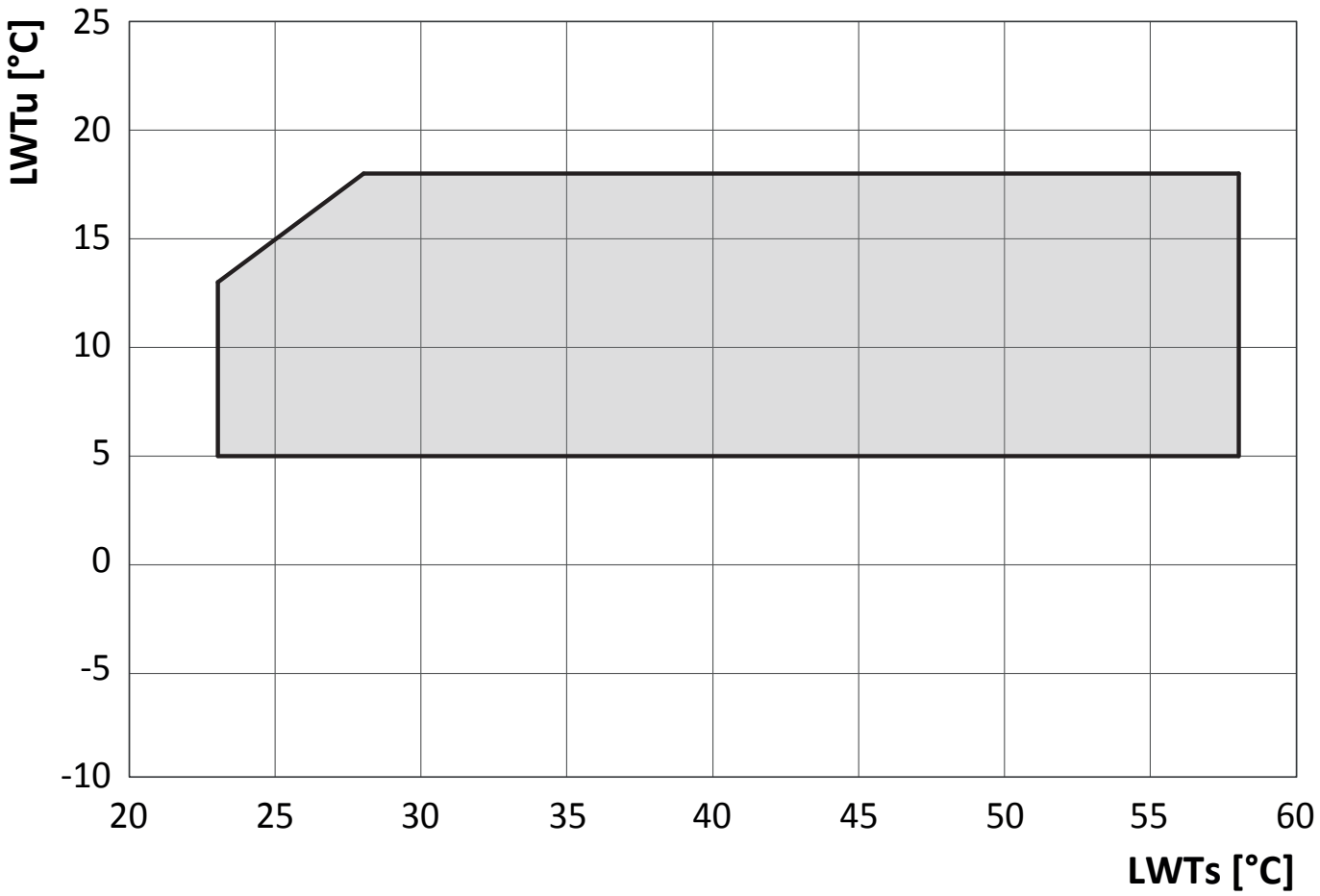
- the design condition falls within the operating limits specified below
- the flow rate at design conditions (that is, of the specific application) must always come within the allowed flow rate ranges specified below. If the design conditions require a water flow rate that does not come within the allowed operating range, you must contact our sales department that will identify the most suitable solution for the specific application.

TETRIS W REV FC/NG

	User-side heat exchangers		Source-side heat exchanger	
	Qmin	Qmax	Qmin	Qmax
	m³/h	m³/h	m³/h	m³/h
3.2	3,4	10,3	4,7	14,1
4.2	3,9	11,7	5,4	16,1
5.2	4,5	13,4	6,1	18,4
6.2	5,0	14,9	6,8	20,4
7.2	5,7	17,2	7,8	23,5
8.2	6,4	19,3	8,8	26,4
9.2	7,4	22,1	10,1	30,2
10.2	8,9	26,8	12,2	36,7
12.2	10,1	30,4	13,9	41,6
13.2	11,7	35,1	16,0	48,0
15.2	13,0	39,0	17,7	53,2
17.2	14,4	43,1	19,6	58,9
19.2	16,3	49,0	22,4	67,1
20.2	17,9	53,7	24,6	73,7
24.2	19,9	59,6	27,3	81,9
27.2	22,4	67,3	30,8	92,4
30.3	28,5	85,4	38,9	116,6
34.3	32,2	96,5	43,9	131,7
40.3	35,9	107,8	49,0	147,0
18.4	14,6	43,9	20,0	60,1
20.4	17,7	53,1	24,3	72,8
24.4	20,2	60,6	27,6	82,9
26.4	22,8	68,4	31,2	93,5
30.4	25,8	77,4	35,3	105,8
34.4	28,7	86,2	39,3	117,9
37.4	32,7	98,0	44,8	134,3
38.4	32,7	98,0	44,8	134,3
39.4	36,7	110,2	50,3	150,9
40.4	36,7	110,2	50,3	150,9
47.4	40,5	121,5	55,7	167,2
48.4	40,5	121,5	55,7	167,2
53.4	45,7	137,0	62,6	187,9
54.4	45,7	137,0	62,6	187,9
55.6	48,8	146,3	66,8	200,4
56.6	48,8	146,3	66,8	200,4
59.6	55,0	164,9	75,3	225,8
60.6	55,0	164,9	75,3	225,8

OPERATING LIMITS

COOLING



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

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

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

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

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

NOISE LEVELS

TETRIS W REV FC/NG

	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
3.2	30	14	22	10	39	24	57	42	64	49	65	50	68	53	65	49	**73**	**57**
4.2	30	14	22	10	44	29	64	49	72	56	67	51	68	52	60	44	**75**	**59**
5.2	34	18	24	10	49	33	68	52	69	54	70	55	67	52	56	41	**75**	**60**
6.2	35	19	26	11	50	34	70	54	70	55	73	58	69	54	58	43	**77**	**62**
7.2	35	20	21	10	49	33	70	54	72	56	72	57	69	54	59	43	**77**	**62**
8.2	37	21	28	12	47	31	65	49	73	57	74	59	70	54	62	47	**78**	**63**
9.2	41	25	31	16	50	34	68	53	72	56	75	60	71	56	60	44	**79**	**63**
10.2	39	24	32	17	46	30	69	54	72	57	76	61	74	58	64	48	**80**	**65**
12.2	40	24	33	17	47	31	72	55	75	59	79	63	76	60	66	49	**83**	**66**
13.2	37	21	35	18	61	44	70	53	70	54	82	66	72	56	55	38	**84**	**67**
15.2	38	21	35	19	61	45	71	54	71	55	83	67	73	56	56	39	**85**	**69**
17.2	36	19	30	14	59	43	69	52	77	61	82	66	75	58	64	47	**85**	**69**
19.2	36	20	30	14	60	44	70	53	78	62	83	67	76	59	64	48	**86**	**70**
20.2	38	22	30	14	65	49	75	59	80	64	84	67	78	61	63	46	**87**	**71**
24.2	38	22	30	14	65	49	75	59	80	64	84	67	78	61	63	46	**87**	**71**
27.2	38	22	30	14	62	45	68	52	83	66	84	68	75	59	62	45	**88**	**71**
30.3	39	22	31	14	66	49	76	59	81	64	85	68	78	61	64	47	**88**	**71**
34.3	39	22	31	14	66	49	76	59	81	64	85	68	78	61	64	47	**88**	**71**
40.3	39	22	31	14	63	46	70	53	85	68	87	70	78	61	63	46	**90**	**73**
18.4	43	26	33	16	52	35	71	54	75	58	78	61	75	58	63	46	**82**	**65**
20.4	40	23	33	16	47	30	72	55	75	58	79	62	76	59	66	49	**83**	**66**
24.4	42	25	35	17	49	32	75	57	78	61	82	65	79	62	69	51	**86**	**69**
26.4	39	21	36	19	63	45	72	55	73	55	85	68	75	57	57	39	**87**	**69**
30.4	39	21	37	19	64	46	73	56	74	56	86	69	76	58	58	40	**88**	**71**
34.4	37	20	31	14	62	44	71	54	80	62	85	68	77	60	66	48	**88**	**71**
37.4	38	20	32	14	62	45	72	55	81	63	86	69	78	61	67	49	**89**	**72**
38.4	38	20	32	14	62	45	72	55	81	63	86	69	78	61	67	49	**89**	**72**
39.4	40	22	31	14	68	50	78	60	83	65	87	69	80	63	65	48	**90**	**72**
40.4	40	22	31	14	68	50	78	60	83	65	87	69	80	63	65	48	**90**	**72**
47.4	40	22	31	14	68	50	78	60	83	65	87	69	80	63	65	48	**90**	**73**
48.4	40	22	31	14	68	50	78	60	83	65	87	69	80	63	65	48	**90**	**73**
53.4	40	22	31	14	64	47	71	53	86	68	88	70	78	61	64	46	**91**	**73**
54.4	40	22	31	14	64	47	71	53	86	68	88	70	78	61	64	46	**91**	**73**
55.6	39	21	32	14	64	46	74	56	83	65	88	70	80	62	68	50	**91**	**73**
56.6	39	21	32	14	64	46	74	56	83	65	88	70	80	62	68	50	**91**	**73**
59.6	40	22	32	14	68	50	79	61	84	66	88	70	81	63	66	48	**91**	**73**
60.6	40	22	32	14	68	50	79	61	84	66	88	70	81	63	66	48	**91**	**73**

The acoustic data are related to standard conditions (source on a reflective surface in free field) in referable and reproducible operating conditions. The environment and the installation conditions, as well as the operating modes, can alter the sound emissions. 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.

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

Lw: sound power levels. The tot is the only binding value. Values obtained from measurements performed according to ISO 3744.

Lp: sound pressure levels calculated from sound power levels, related to distance of 1m from the unit in free field with directivity factor Q=2. Non-binding values.

TETRIS W REV FC/NG /LN

	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
3.2	27	11	20	10	36	20	52	36	58	42	59	43	62	46	58	43	**66**	**50**
4.2	27	12	19	10	40	25	58	43	65	49	60	45	61	46	54	38	**68**	**52**
5.2	30	15	22	10	44	28	61	45	62	47	63	48	60	45	50	35	**68**	**53**
6.2	31	16	23	10	44	29	63	47	63	48	66	50	62	47	52	37	**70**	**55**
7.2	32	16	18	10	44	28	63	47	64	49	65	49	62	47	53	37	**70**	**55**
8.2	33	18	25	10	42	26	58	43	65	50	67	51	62	47	56	41	**71**	**56**
9.2	37	21	28	13	45	30	62	46	65	49	68	52	65	49	54	39	**72**	**56**
10.2	35	20	29	14	41	26	63	47	65	50	69	53	66	51	57	42	**73**	**58**
12.2	37	20	30	14	43	27	65	49	68	52	72	55	69	53	60	43	**76**	**59**
13.2	34	17	32	15	55	39	64	47	64	48	75	58	66	49	50	34	**77**	**60**
15.2	34	18	32	16	56	40	64	48	65	49	76	60	67	50	51	34	**78**	**62**
17.2	33	16	27	11	54	38	63	46	70	54	75	59	68	52	58	42	**78**	**62**
19.2	33	17	28	11	55	38	64	47	71	55	76	60	69	53	59	42	**79**	**63**
20.2	35	18	28	11	60	43	69	52	73	57	77	60	71	54	57	41	**80**	**64**
24.2	35	18	28	11	60	43	69	52	73	57	77	60	71	54	57	41	**80**	**64**
27.2	35	19	28	11	57	40	63	46	76	59	78	61	69	53	57	40	**81**	**64**
30.3	35	18	28	11	60	43	70	53	74	57	78	61	72	55	58	41	**81**	**64**
34.3	35	18	28	11	60	43	70	53	74	57	78	61	72	55	58	41	**81**	**64**
40.3	36	19	28	11	58	41	64	47	78	61	80	63	71	54	58	41	**83**	**66**
18.4	39	22	30	13	47	30	65	48	68	51	71	54	68	51	57	40	**75**	**58**
20.4	37	20	30	13	43	26	65	48	68	51	72	55	69	52	60	43	**76**	**59**
24.4	38	21	32	14	45	28	68	51	71	54	75	57	72	55	62	45	**79**	**62**
26.4	35	18	33	16	58	40	66	49	67	49	78	61	68	51	52	35	**80**	**62**
30.4	36	18	34	16	58	41	67	50	68	50	79	62	69	52	53	35	**81**	**64**
34.4	34	17	29	11	56	39	65	48	73	56	78	61	71	53	60	43	**81**	**64**
37.4	35	17	29	11	57	40	66	49	74	57	79	62	72	54	61	44	**82**	**65**
38.4	35	17	29	11	57	40	66	49	74	57	79	62	72	54	61	44	**82**	**65**
39.4	36	19	29	11	62	45	71	54	76	59	80	62	74	56	60	42	**83**	**65**
40.4	36	19	29	11	62	45	71	54	76	59	80	62	74	56	60	42	**83**	**65**
47.4	36	19	29	11	62	45	71	54	76	59	80	62	74	56	60	42	**83**	**66**
48.4	36	19	29	11	62	45	71	54	76	59	80	62	74	56	60	42	**83**	**66**
53.4	37	19	29	11	59	41	65	48	79	61	81	63	72	55	59	41	**84**	**66**
54.4	37	19	29	11	59	41	65	48	79	61	81	63	72	55	59	41	**84**	**66**
55.6	35	17	30	12	59	41	68	50	76	58	81	63	74	56	63	45	**84**	**66**
56.6	35	17	30	12	59	41	68	50	76	58	81	63	74	56	63	45	**84**	**66**
59.6	37	19	29	11	63	45	72	54	77	59	81	63	75	57	60	42	**84**	**66**
60.6	37	19	29	11	63	45	72	54	77	59	81	63	75	57	60	42	**84**	**66**

The acoustic data are related to standard conditions (source on a reflective surface in free field) in referable and reproducible operating conditions. The environment and the installation conditions, as well as the operating modes, can alter the sound emissions. 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.

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

Lw: sound power levels. The tot is the only binding value. Values obtained from measurements performed according to ISO 3744.

Lp: sound pressure levels calculated from sound power levels, related to distance of 1m from the unit in free field with directivity factor Q=2. Non-binding values.

INSTALLATION ADVICE

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

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

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

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

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

Water characteristics

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

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

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

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

Glycol mixtures

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

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

The quantity of antifreeze should be considered as % on weight

Minimum water content in the system

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

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

where
Vmin is the minimum water content of the system [l]
Ptot is the total cooling capacity of the machine [kW]
N: number of capacity reduction steps
ΔT: differential allowed on the water temperature. Unless otherwise specified, this value is considered to be 2.5K
ρ: density of the heat-carrying fluid. Unless otherwise specified, the density of water is considered
cp: specific heat of the heat-carrying fluid. Unless otherwise specified, the specific heat of water is considered
Considering the use of water and grouping together some terms, the formula can be re-written as follows:

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

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

Installation site

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

- compliance with the clearance spaces indicated in the official dimensional drawing of the unit must be guaranteed so as to ensure accessibility for routine and non-routine maintenance operations
- you should consider the origin of the hydraulic pipes and their diameters because these affect the radiuses of curvature and therefore the spaces needed for installing them
- you should consider the position of the cable inlet on the electrical control panel of the unit as regards the origin of the power supply
- if the installation includes several units side by side, you should consider the position and dimensions of the manifolds of the heat exchangers

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
- must allow the unit to be installed in a level position

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 to the machine before positioning the unit on the ground.

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