Tetris 2 FC

122÷518 kW

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

Configurations
A and A+: high efficiency

SLN: super low noise

/LN: low noise

/DS: with desuperheater

Configurable free-cooling section: Basic, Custom, Extra

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

BlueBox by Swegon

IT PAYS TO USE FREE-COOLING UNITS!

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

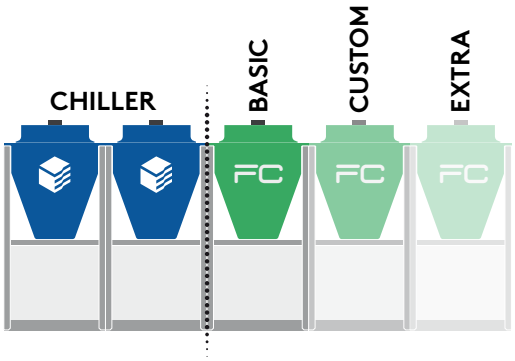
A strong point of our free cooling units is certainly the control system that allows maximum use to be made of the free resource, consisting of outside air, so minimizing the energy used by the compressors. The controller of the unit activates the chiller section and the free cooling section, also in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

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

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

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

Modular free-cooling



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

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

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

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

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

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

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

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

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

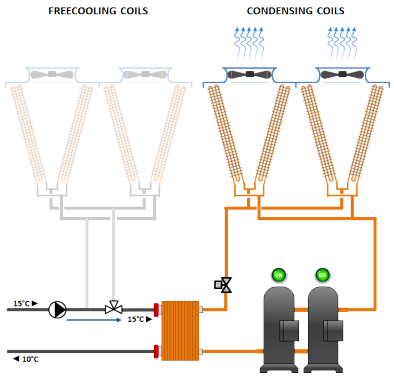
Finally, it should be remembered that the modularity of Tetris 2 FC does not regard only the size of the free cooling section; it also regards the possibility of choosing from different combinations of efficiency and noiselessness of the chiller section.

PRINCIPLE OF OPERATION

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

Chiller only mode

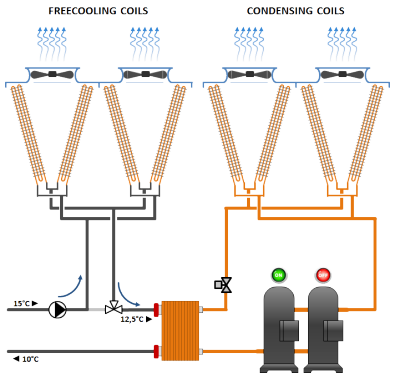
When the ambient temperature is higher than the temperature of the water returning from the system, all the required cooling capacity must be produced by the compressors.



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

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

Mixed mode

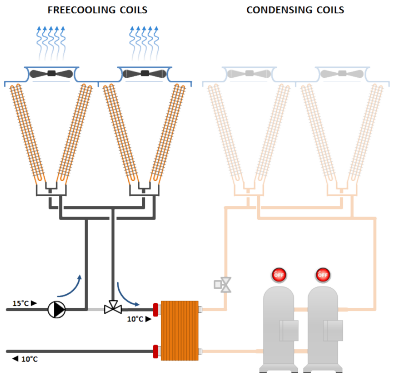


The control switches over the 3-way valve to put the free cooling coil in series with the evaporator and with the free cooling section fans.

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

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

Free cooling only mode



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

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

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

Tetris 2 FC

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

PRODUCT DESCRIPTION

BODY

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

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

REFRIGERANT

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

COMPRESSORS

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

SOURCE-SIDE HEAT EXCHANGER

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

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

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

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

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

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

FANS

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

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

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

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

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

USER-SIDE HEAT EXCHANGER

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

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

The heat exchanger is equipped with:

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

FREE COOLING CIRCUIT

The free cooling circuit consists of:

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

REFRIGERANT CIRCUIT

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

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

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

ELECTRICAL CONTROL PANEL

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

The electrical control panel of the basic unit comprises:

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

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

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

CONTROL BLUETHINK

Main controller functions

The control allows the following functions:

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

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

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

Main functions of the webserver

As standard, the Bluethink controller integrates a 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
- Mechanical paddle flow switch factory-mounted, except for single-circuit units. For these units, flow switch is supplied as kit; mounting support (1" female fitting) and installation are care of customer
- overtemperature protection for compressors and fans

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

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

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

SLN and A/SLN

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

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

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

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

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

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

HYDRAULIC MODULES
All units can be fitted with hydraulic module in various configurations:
- /1P: hydraulic module with one pump
- /2P: hydraulic module with two pumps
- /1PS: hydraulic module with one pump and buffer tank
- /2PS: hydraulic module with two pumps and buffer tank

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

The following are also available:
- modules /1PM, /2PM, /1PMS and /2PMS that have pumps with increased available discharge head

Hydraulic modules with one pump have:
- one pump
- a gate valve on the delivery side of the pump
- an expansion vessel

Hydraulic modules with two pumps have:
- two pumps
- a check valve on the delivery side of each pump
- a gate valve on the outlet of the delivery manifold
- an expansion vessel

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

Hydraulic modules with tank also have:
- a gate valve at the inlet of the pump or the suction manifold
- a tank with drain valve and air valve

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

TECHNICAL SPECIFICATIONS

TETRIS 2 FC

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

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

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

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

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

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

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

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

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

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

TETRIS 2 FC

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

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

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

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

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

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

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

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

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

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

TETRIS 2 FC

			10.2	12.2	13.2	15.2	16.2	20.3	24.3	27.4
Dimensions and weights**										
Length FC BASIC		mm	2.304	2.304	2.304	2.304	2.304	4.601	4.601	4.601
Length FC CUSTOM		mm	2.304	2.304	2.304	2.304	2.304	4.601	4.601	4.601
Length FC EXTRA		mm	3.452	3.452	3.452	3.452	3.452	5.750	5.750	5.750
Depth		mm	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260
Height		mm	2.440	2.440	2.440	2.440	2.440	2.440	2.440	2.440

			29.4	32.4	33.4	37.4	41.4	43.6	47.6
Dimensions and weights**									
Length FC BASIC		mm	4.601	4.601	6.153	6.153	6.153	6.153	6.153
Length FC CUSTOM		mm	4.601	4.601	7.287	7.287	7.287	7.287	7.287
Length FC EXTRA		mm	5.750	5.750	8.450	8.450	8.450	8.450	8.450
Depth		mm	2.260	2.260	2.260	2.260	2.260	2.260	2.260
Height		mm	2.440	2.440	2.440	2.440	2.440	2.440	2.440

** Basic CH unit without included accessories

TETRIS 2 A FC

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

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

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

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

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

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

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

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

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

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

TETRIS 2 A FC

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

** Basic CH unit without included accessories

TETRIS 2 SLN FC

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

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

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

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

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

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

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

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

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

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

TETRIS 2 SLN FC

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

** Basic CH unit without included accessories

TETRIS 2 A+ FC

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

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

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

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

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

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

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

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

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

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

TETRIS 2 A+ FC

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

** Basic CH unit without included accessories

TETRIS 2 A SLN FC

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

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

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

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

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

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

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

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

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

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

TETRIS 2 A SLN FC

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

** Basic CH unit without included accessories

ECODESIGN

INTRODUCTION

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

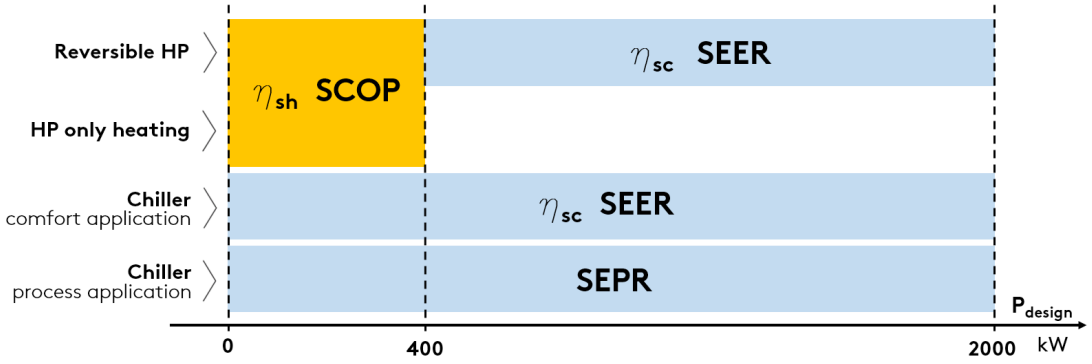
The Directive contains various regulations; as regards chiller products and heat pumps, the regulations of interest are the following:

- Regulation 2013/813, for small heat pumps (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		-	-

- = exemption from Ecodesign

PROCESS APPLICATION

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

- = exemption from Ecodesign

Some specifications and notes follow.

Partly completed machinery

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

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

EC fans:

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

A unit equipped with EC fans has a higher SEER (ηsc) than the configuration with standard fans.

TETRIS 2 FC RANGE

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

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

- chiller version: regulation 2016/2281.

The tables below give information on the conformity of the units and the seasonal energy performance ratios with regard to the reference regulation.
For each size, the possible set-ups (BASIC, CUSTOM, EXTRA) are included for conformity assessments.

TETRIS 2 FC

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

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

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

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

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

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

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

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

TETRIS 2 SLN FC

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

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

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

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

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

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

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

TETRIS 2A + FC

			8.2	13.3	18.4	23.5	27.6
REGULATION 2016/2281							
Pdesign	(1)	kW	98,1	150	210	263	304
Compliance 12/7							
Compliance	(1)		Y	Y	Y	Y	Y
ηsc	(1)	%	152,4	160,9	162,5	164,1	166
SEER	(1)		3,89	4,1	4,14	4,18	4,22
Compliance Tier 2 (2021)	(1)		N	N	N	N	N
Compliance 12/7 unit with EC fans							
Compliance	(1)		Y	Y	Y	Y	Y
ηsc	(1)	%	164	178,2	174,6	182,1	183,1
SEER	(1)		4,18	4,53	4,44	4,63	4,65
Compliance Tier 2 (2021)	(1)		N	N	N	N	N
Compliance 23/18							
Compliance	(2)		Y	Y	Y	Y	Y
ηsc	(2)	%	-	-	-	-	-
SEER	(2)		-	-	-	-	-
Compliance SEPR							
Compliance	(3)		Y	Y	Y	Y	Y
SEPR	(3)		5,55	5,66	5,66	5,69	5,74

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

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

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

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

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

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

TETRIS 2 A FC

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

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

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

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

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

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

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

TETRIS 2A SLN FC

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

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

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

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

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

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

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

INSTALLATION ADVICE

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

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

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

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

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

Water characteristics

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

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

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

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

Glycol mixtures

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

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

The quantity of antifreeze should be considered as % on weight

Minimum water content in the system

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

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

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

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

where

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

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

N: number of capacity reduction steps

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

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

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

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

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

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

Installation site

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

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

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

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

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

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

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

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

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

Installations that require the use of treated coils

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

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

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

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

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

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

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

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

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

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

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

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

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

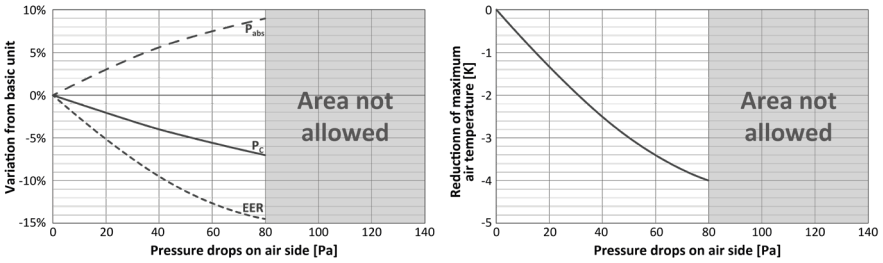
Aeraulic head losses and options available for the ventilating section

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

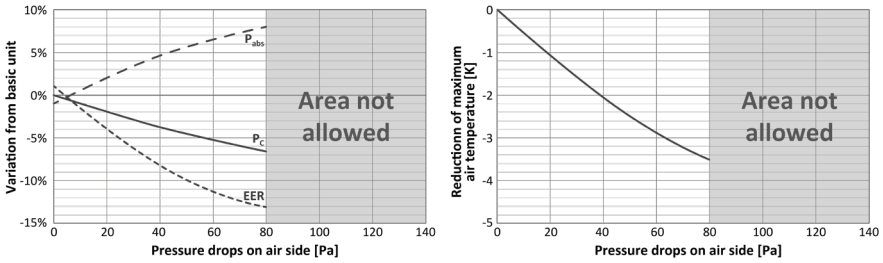
If there are obstacles to free air flow, you should consider the additional aeraulic head losses that will cause a reduction of the air flow rate and a consequent deterioration of performance.

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

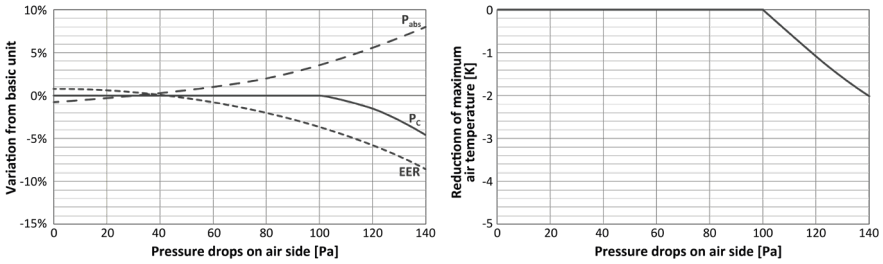
AC fans (Ø 800)



EC fans (Ø 800)



Oversize EC fans (Ø 800)



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

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

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

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

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