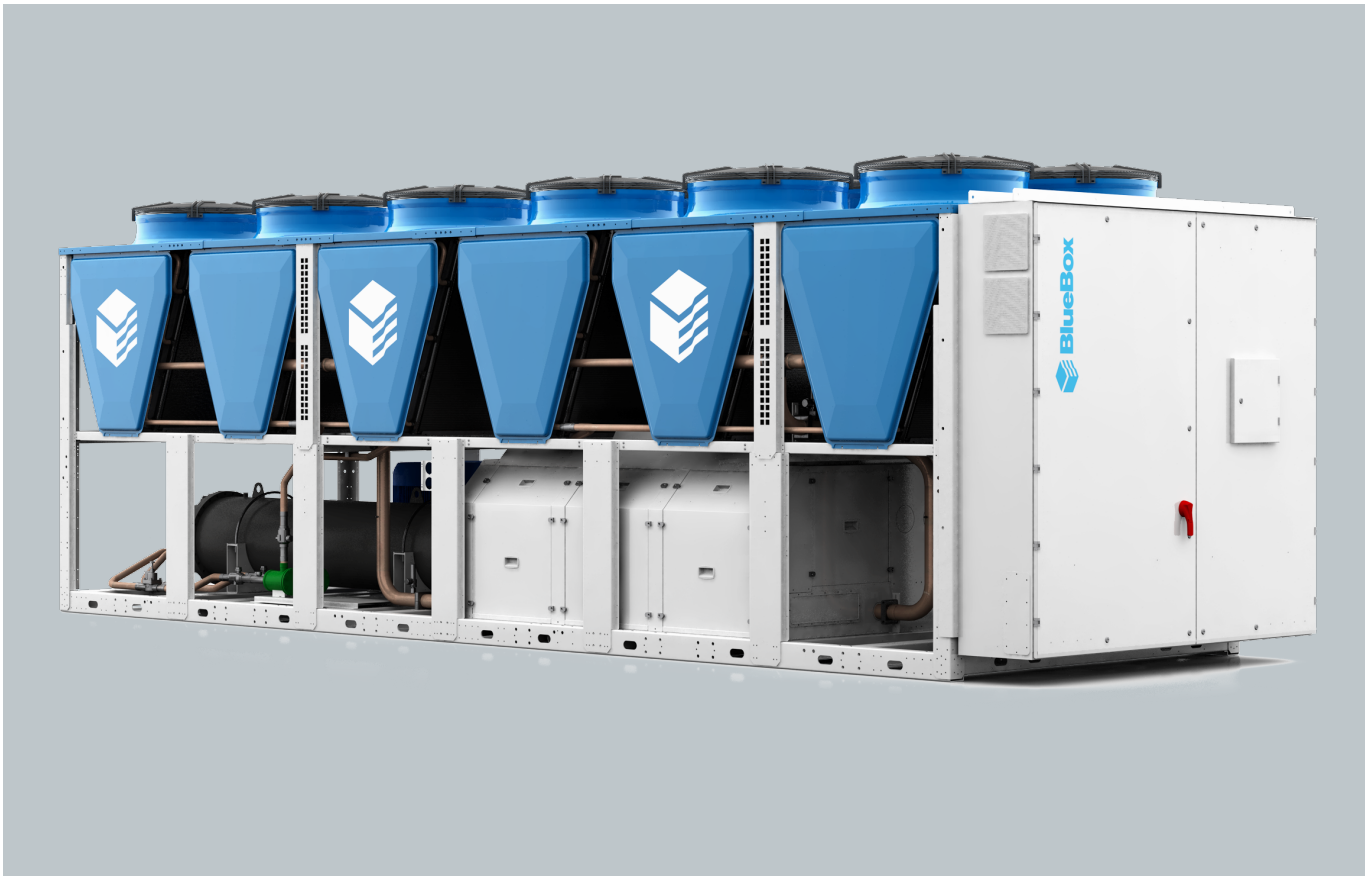
Kappa SKY LGW

230÷1060 kW



General
High efficiency, single and double circuit chillers featuring screw compressors with variable compression ratio and an inverter for capacity modulation

Configurations
Xi: high efficiency, unit with full inverter compressors

/LN: low noise version

SLN: super low noise version

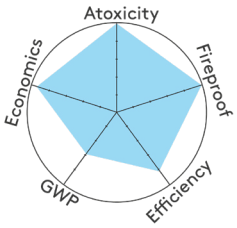
/HAT: for high external air temperature

Strengths
- High efficiency and compact dimensions
- Refrigerant R1234ze with GWP<1
- Versatile application: water temperature up to 23°C. Operation in a wide range of environmental conditions.
- Reduced noise levels, low noise and super low noise versions
- BlueThink advanced control with integrated web server. Multilogic function and Blueye® supervision system. (options)
- Flowzer: energy optimization on water side (options)
- Conforming with **Ecodesign Reg. 2281 tier 2**

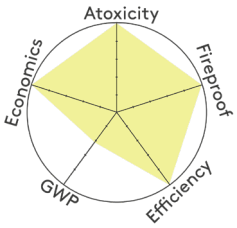
BlueBox by Swegon

Kappa SKY LGW

THE FUTURE OF REFRIGERANTS THAT REDUCE GREENHOUSE EFFECT

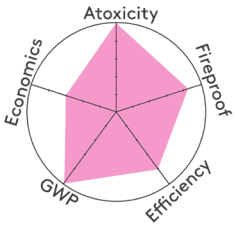


R134a



R410A

R1234ze



R1234yf

Propane (R290)

To reduce the emission into the atmosphere of gases that contribute to increasing the greenhouse effect, the European Union has set itself the target of reducing the use of F-gases by two-thirds of the 2014 level by 2030. Although these fluids have allowed a drastic reduction in the use of high ODP (Ozone Depletion Potential) refrigerants, their high GWP value and their longevity in the atmosphere (if released, they remain there for hundreds of years) contribute to the increase in global warming up to 8,000 times more than carbon dioxide.

The application of these regulations will lead to a progressive reduction in the use of refrigerants such as R134a and R410A and therefore substitute refrigerant fluids will gradually take hold.

There already exist various alternatives to F-Gases but, for each of them, the safety, investment and sustainability implications need to be carefully considered.

F-gases such as R410A or R134a have the indisputable advantage of being non-toxic and absolutely non-flammable. Paradoxically, the chemical properties that make these refrigerants safe are the same ones that cause such a prolonged resistance of the molecule in the atmosphere and therefore a high GWP.

If, in searching for an alternative, we look at natural refrigerants, such as carbon dioxide (R744), ammonia (R717) or hydrocarbons such as propane (R290), we actually have very low or zero GWP, but their toxicity and/or extreme flammability will have to be accepted. This will turn into higher costs of the machine and of the system in order to guarantee their safety.

In fact, the technological costs arising from the use of the various refrigerants must also be considered:

- units that use carbon dioxide as refrigerant need to work with such high pressure values (even higher than 100bar) that they are potentially explosive. This involves extremely onerous construction choices that justify their use only in the refrigeration field
- units that use ammonia must obligatorily be made completely of steel and use specific compressors and components. To this are added the setting up costs that, in view of the extreme toxicity of the fluid, will have to prevent contamination and poisoning hazards. All this limits the use of this fluid to only extremely high capacity systems, normally above a MW
- for units that use propane, all the necessary countermeasures must be taken to prevent the risk of explosion due to its very high flammability, and this turns into the obligation to use ATEX components, which are extremely costly

WHY R1234ZE

LGW stands for Low Global Warming Potential and identifies the units using the HFO refrigerant R1234ze.

LGW aims at offering an environmentally and economically sustainable alternative to conventional models based on R134a refrigerant.

R1234ze is a pure compound (Hydrofluoroolefin) with GWP<1, which is equivalent to natural refrigerant fluids.

R1234ze is rated as non dangerous (PED group 2 fluid).

It is also classified as A2L according to ASHRAE standard 34:

- Non toxic.
- Lower flammability fluid (or mildly flammable).

LWG units are the best alternative to R134a, especially in countries where:

- legislative restrictions or prohibitions are applied on units using high GWP gas;
- incentive policies are in place relating to the design of plants featuring units with low GWP refrigerants;
- Impose specific taxation on high GWP refrigerants - or are likely to do it in the future.

Moreover, its minimum GWP value is decisive for projects:

- credits can be obtained for building certification in connection with the implementation of the best solutions with low environmental impact.
- min. targets are adopted for the containment of the environmental footprint;

This also goes to the benefit of unit installation, commissioning and maintenance as it reduces the overall management costs.

Specific measures have been implemented in LGW models so that they are easier to use in projects with highly stringent requirements and their safety is enhanced.

Kappa SKY LGW

PRODUCT DESCRIPTION

Kappa SKY LGW is a range of inverter-controlled screw compressor chillers for the generation of refrigerated water from 5°C up to 23°C with external temperatures ranging between -20°C and 50°C.

The Kappa SKY range is available with 3 noise emission levels (base version, LN and SLN). All the refrigerant circuits are fitted with an inverter-controlled screw compressor that is designed to modulate the demand for cold.

REFRIGERANT

Refrigerant R1234ze (GWP<1*)

(*) GWP (AR5), pursuant to IPCC V, evaluated over a span of 100 years.

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.

All the units are monobloc type.

COMPRESSORS

Units fit innovative screw compressors with a variable compression ratio, which ensure optimised operation under all operating conditions.

The new position of the slide valve contributes to changing the compressor internal geometry, thus optimising the purge pressure in function of the ambient conditions. The BlueThink controller constantly monitors the evaporating and condensing temperatures of the unit and changes the compression ratio of the compressors to obtain the maximum achievable efficiency.

The compressors in use are designed according to an exclusive BlueBox specification in order to achieve maximum efficiency both under partial and full load conditions.

Xi version (full inverter)

Units in LWG Xi version are available in single and double circuit configuration. Each circuit fits a semi-hermetic screw compressor with variable compression ratio. Each circuit also features an AC inverter for continuous capacity reduction of the refrigeration demand from each compressor from 25 up to 100%, thus achieving a min. control step of 12.5% in double circuit units. The capacity reduction of the entire unit is always continuous, from the minimum capacity reduction step, based on the number of compressors, up to 100%. The variation of the compression ratio caused by the sliding of the internal slide valve, in combination with capacity reduction of the refrigeration demand by the inverter, allows for the maximisation of the energy efficiency of the unit in all operating conditions.

In addition to managing capacity modulation, BlueThink also controls all safety devices so that the compressor can operate within its operating limits at all times and simultaneously safeguard its operation and reliability. Compressor lubrication is ensured by the pressure difference between the delivery and the suction lines, thanks to the regulation action performed by BlueThink.

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

Startup in compressors featuring an inverter is of the "Direct On Line" type with an inverter-controlled acceleration ramp that minimises inrush currents.

In addition to the obvious energy savings arising from greater efficiency, the use of a full inverter unit also brings advantages in terms of installation:

- For these units, the cosφ (power factor) is always greater than 0.95, therefore making external power factor correction systems unnecessary.
- The maximum inrush current of the unit is always lower than its maximum absorbed current (calculated in the worst operating condition), therefore making the power cables and line protection devices less onerous.

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

The base version does not feature a R1234ze refrigerant detector as there are no areas where the refrigerant may potentially build up in the event of leaks.

The refrigerant detector is installed as standard in LN and SLN versions.

SOURCE-SIDE HEAT EXCHANGER

The exchangers are made with microchannel aluminium coils.

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.

The use of microchannel coils, as opposed to conventional copper/aluminium coils, reduces the total weight of the unit and reduces the refrigerant charge.

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.

Options are available for installation in environments with a particularly aggressive atmosphere or in coastal or highly industrialized areas. See section: "Description of accessories".

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 control manages the speed of the fans through a phase cutting speed adjuster, in order to optimize the operating conditions and efficiency of the unit.

The fan speed regulator is supplied standardly.

This control also has the effect of reducing the noise level of the unit: in fact, the typical conditions under which the control will be modulating the speed of the fans are those of the night, spring and autumn.

For units equipped with EC fans (option), the same function is carried out using the electronically commutated motor of the fans.

USER-SIDE HEAT EXCHANGER

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

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

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

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

The evaporator is standardly supplied with an antifreeze heater, which is wrapped around the shell, and it is heat insulated.

REFRIGERANT CIRCUIT

Each refrigerant circuit of the basic unit comprises:

- discharge valve for each compressor
- shut-off valve in the liquid line
- 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 and safety valves.

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

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 with forced ventilation and IP54 protection rating. The electrical control panel of the basic unit comprises:

- main disconnect switch
- fuses to protect the compressors, fans and auxiliary circuits
- compressor contactors
- fan contactors
- phase monitor
- potential-free general alarm contacts
- single potential free operating contacts
- external air temperature probe
- a regulation controller with a display;
- Capacitive backup battery for electronic expansion valve
- an AC inverter for each refrigerant circuit (full inverter unit), one single AC inverter (hybrid units).

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.

CONTROL BLUETHINK

Main controller functions

The regulation controller is designed for the following functions:

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

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

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

Main functions of the webserver

The BlueThink controller is standardly supplied with a web server, access to which is gained with an authentication password.

The web page is designed to carry out the following functions (some of these are available only for users with an advanced access level):

- 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, outside air temperature, evaporating and condensing pressures, suction and discharge temperatures
- display of the status of compressors, fans, pumps, electronic expansion valves
- display in real time of the graphs of the main quantities
- display of the graphs of logged quantities
- display of alarm log
- management of users on several levels
- remote ON/OFF
- remote set point change
- remote time band change
- to view instant data relating to current absorption, power and out-of-sync events as well as electricity consumption (where the Energy Meter accessory is fitted).

Human Machine Interface (Display)

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.
- to view instant data relating to current absorption, power and out-of-sync events as well as electricity consumption (where the Energy Meter accessory is fitted).

TESTING

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

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
- water differential pressure switch installed at the factory
- overtemperature protection for compressors and fans

CERTIFICATIONS AND REFERENCE STANDARDS

The manufacturer has implemented and keeps the Management Systems listed below and it is certified against them:

- Quality Management System according to standard UNI EN ISO 9000;
- Environmental Management System according to standard UNI EN ISO 14000;
- Health and Safety Management System according to standard BS OHSAS 18000 (as converted into UNI EN ISO 45000).

These management systems ensure that the company puts in place any and all actions and initiatives to define and monitor the standards defined by its Management, which are stated in its Quality, Environmental and Safety policies.

To meet the safety requirements, the unit was designed and manufactured in compliance with the directives and product regulations below:

- PED Directive: safety criteria to be followed when designing pressure equipment;
- Machinery Directive: safety criteria to be followed when designing machinery;
- Low Voltage Directive: safety criteria to be followed when designing electrical machine parts;
- Electromagnetic Compatibility Directive: electromagnetic compatibility criteria to be followed when designing electrical machine parts;
- WEEE Directive: criteria for product management at the end of its life cycle as waste with a view to environmental protection.

The units are manufactured, tested and checked with reference to the European standards specified in the Declaration of CE Conformity, in accordance with the requirements and procedures of our Quality System.

The installation, use and storage of units featuring mildly flammable refrigerants (A2L pursuant to standard ASHRAE 34), such as R1234ze, must meet the European standards and regulations and the local laws, where applicable.

For further details, please refer to the "Instruction manual for operation and maintenance".

Responsibilities and obligations exclusive to the installer:

- to carry out a specific risk assessment according to the European regulations/standards above and/or the local laws in order to define the necessary measures for conformity;
- to comply with the requirements and to take the measures resulting from the outcomes of the risk assessment, pursuant to the relevant regulations and standards.

VERSIONS

The Kappa SKY LGW family includes different versions, which are characterised by different noise levels. Each model is designed to be fitted with EC fans, as an option.

Xi

The Xi models (full inverter) achieve maximum efficiency at partial loads (SEER) thanks to the use of AC inverters on both circuits and the use of compressors with a variable compression ratio (Vi).

Xi SLN

The Kappa SKY Xi units (full inverter) are also available in super low noise version (SLN).

Sound-proof compressor compartments (see description of /LN option) and fans featuring a speed regulator and reduced air flow rate are used, and the units are sized properly. 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.

OPTIONS

/LN: silenced unit

In the unit with the /LN option, all the compressors are enclosed in fully soundproofed compartments with sound absorbing panels and soundproofing material placed in-between them.

The compressor compartment is supplied with a R1234ze refrigerant detector and a pushing fan designed to take the air from outside the compartment and push it inside the compartment until it comes out of the outlet grille specifically installed on the compartment side opposite the fan.

If the gas detector senses leaking refrigerant, the machine electronic controller causes all the fitted and operating compressors to instantly stop and an alarm message to appear on the display.

/HAT: unit for high external air temperatures

The unit fitted with this accessory adopts an electrical control panel made using specific components to withstand high temperatures, special cables and oversize protection parts.

This accessory extends the operating limits of the unit in terms of max. external air temperature.

This accessory guarantees operation with external air temperature up to 46°C.

The /HAT accessory is not compatible with SLN versions.

For higher temperatures, a set-up with air conditioning of the electrical control panel is necessary; the unit works in capacity reduction mode. The feasibility of this set-up must be assessed: please contact our sales department.

HYDRAULIC MODULES

The units may be equipped with a pre-installed hydraulic module featuring single propeller centrifugal pumps with intake and delivery flanges on the line.

The pumps fit a high efficiency motor type IE3.

An inverter may be connected to the pumps in order to achieve accurate thermodynamic regulation and to minimise energy consumption (refer to the Flowzer accessories).

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

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

All the above-mentioned modules are fitted with pumps that have a head value between 100 and 150 kPa.

The following are also available:

- Modules /1PM, /2PM, are fitted with pumps that have a boosted head value (between 200 and 250 kPa).

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 showing the configuration compatibility to check whether specific set-ups are available.

TECHNICAL SPECIFICATIONS

KAPPA SKY LGW Xi

			24.1	31.1	40.1	45.2	52.2	60.2
Cooling (A35; W7)								
Refrigeration capacity	(1)	kW	234	305	391	446	515	586
Total absorbed power	(1)	kW	77	100	127	149	170	202
EER	(1)		3,03	3,05	3,07	2,99	3,02	2,9
EER energy class (Eurovent)	(1)		B	B	B	B	B	B
Compressors								
Compressors/Circuits		n°/n°	1/1	1/1	1/1	2/2	2/2	2/2
Minimum capacity reduction step	(2)	%	25	25	25	12,5	12,5	12,5
Refrigerant charge (MCHX)		kg	29	36	46	52	79	79
Refrigerant charge (CuAl)		kg	38	48	62	69	107	107
Fans								
Quantity		n°	5	6	8	8	10	10
Total air flow rate		m³/h	97000	116000	155000	155000	194000	194000
User-side heat exchanger								
Quantity		n°	1	1	1	1	1	1
Water flow rate (A35; W7)	(1)	m³/h	40	53	67	77	89	101
Head loss (A35; W7)	(1)	kPa	31	27	29	26	28	26
Noise levels								
Sound power lev.	(3)	dB(A)	96	99	100	100	101	102
Sound pressure lev.	(4)	dB(A)	64	67	68	68	69	70
Sound power lev. LN vers.	(3)	dB(A)	92	95	96	96	97	98
Sound pressure lev. LN vers.	(4)	dB(A)	60	63	64	64	65	66
Dimensions and weight								
Length	(5)	mm	3956	3956	5105	5105	6252	6252
Depth	(5)	mm	2260	2260	2260	2260	2260	2260
Height	(5)	mm	2440	2440	2440	2440	2440	2440
Operating weight (MCHX)	(5)	kg	2847	3070	3784	4505	4911	5002

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

(1) Outside air temperature 35°C; evaporator inlet-outlet water temperature 12/7°C. Values compliant with standard EN 14511

(2) 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.

(3) Unit operating at rated capacity, with no accessories of any kind - external air temperature 35°C and water input/output temperature from/to heat exchanger and user equal to 12/7°C. Values taken by measurements made in accordance with standard ISO 3744 and the Eurovent certification programme, where applicable. Binding values See NOISE LEVELS section.

(4) Values obtained from the sound power level (conditions: note 3), related to a distance of 10 m from the unit in free field with directivity factor Q=2. Non-binding values See NOISE LEVELS section.

(5) The data refers to standard unit with no accessories In particular, the introduction of some accessories such as copper / aluminum coils, hydraulic modules or recovery exchangers may result in an increase in weight that may exceed 10%. For more details, refer to the specific drawing of the selected configuration and to the "Dimensional Diagrams" section.

KAPPA SKY LGW Xi

			66.2	71.2	80.2	93.2	106.2
Cooling (A35; W7)							
Refrigeration capacity	(1)	kW	651	701	782	923	1063
Total absorbed power	(1)	kW	219	243	261	304	349
EER	(1)		2,97	2,88	2,99	3,03	3,04
EER energy class (Eurovent)	(1)		B	C	B	B	B
Compressors							
Compressors/Circuits		n°/n°	2/2	2/2	2/2	2/2	2/2
Minimum capacity reduction step	(2)	%	12,5	12,5	12,5	12,5	12,5
Refrigerant charge (MCHX)		kg	91	91	110	128	142
Refrigerant charge (CuAl)		kg	123	123	147	170	186
Fans							
Quantity		n°	12	12	14	16	18
Total air flow rate		m³/h	233000	233000	272000	310000	349000
User-side heat exchanger							
Quantity		n°	1	1	1	1	1
Water flow rate (A35; W7)	(1)	m³/h	112	121	135	159	183
Head loss (A35; W7)	(1)	kPa	27	32	29	26	29
Noise levels							
Sound power lev.	(3)	dB(A)	102	103	104	105	105
Sound pressure lev.	(4)	dB(A)	70	71	71	72	72
Sound power lev. LN vers.	(3)	dB(A)	98	99	100	101	101
Sound pressure lev. LN vers.	(4)	dB(A)	66	67	67	68	68
Dimensions and weight							
Length	(5)	mm	7401	7401	8549	9698	10846
Depth	(5)	mm	2260	2260	2260	2260	2260
Height	(5)	mm	2440	2440	2440	2440	2440
Operating weight (MCHX)	(5)	kg	5916	6028	7013	7656	8495

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

(1) Outside air temperature 35°C; evaporator inlet-outlet water temperature 12/7°C. Values compliant with standard EN 14511

(2) 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.

(3) Unit operating at rated capacity, with no accessories of any kind - external air temperature 35°C and water input/output temperature from/to heat exchanger and user equal to 12/7°C. Values taken by measurements made in accordance with standard ISO 3744 and the Eurovent certification programme, where applicable. Binding values See NOISE LEVELS section.

(4) Values obtained from the sound power level (conditions: note 3), related to a distance of 10 m from the unit in free field with directivity factor Q=2. Non-binding values See NOISE LEVELS section.

(5) The data refers to standard unit with no accessories In particular, the introduction of some accessories such as copper / aluminum coils, hydraulic modules or recovery exchangers may result in an increase in weight that may exceed 10%. For more details, refer to the specific drawing of the selected configuration and to the "Dimensional Diagrams" section.

KAPPA SKY LGW Xi SLN

			24.1	31.1	40.1	45.2	52.2	60.2
Cooling (A35; W7)								
Refrigeration capacity	(1)	kW	227	294	379	427	495	560
Total absorbed power	(1)	kW	79	103	130	154	176	212
EER	(1)		2,87	2,85	2,91	2,77	2,81	2,64
EER energy class (Eurovent)	(1)		C	C	B	C	C	D
Compressors								
Compressors/Circuits		n°/n°	1/1	1/1	1/1	2/2	2/2	2/2
Minimum capacity reduction step	(2)	%	25	25	25	12,5	12,5	12,5
Refrigerant charge (MCHX)		kg	29	36	46	52	79	79
Refrigerant charge (CuAl)		kg	38	48	62	69	107	107
Fans								
Quantity		n°	5	6	8	8	10	10
Total air flow rate		m³/h	75000	90000	120000	120000	150000	150000
User-side heat exchanger								
Quantity		n°	1	1	1	1	1	1
Water flow rate (A35; W7)	(1)	m³/h	39	51	65	74	85	96
Head loss (A35; W7)	(1)	kPa	29	25	28	24	26	24
Noise levels								
Sound power lev.	(3)	dB(A)	89	92	93	93	94	95
Sound pressure lev.	(4)	dB(A)	57	60	61	61	62	63
Dimensions and weight								
Length	(5)	mm	3956	3956	5105	5105	6252	6252
Depth	(5)	mm	2260	2260	2260	2260	2260	2260
Height	(5)	mm	2440	2440	2440	2440	2440	2440
Operating weight (MCHX)	(5)	kg	3017	3240	3984	4845	5251	5342

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

(1) Outside air temperature 35°C; evaporator inlet-outlet water temperature 12/7°C. Values compliant with standard EN 14511

(2) 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.

(3) Unit operating at rated capacity, with no accessories of any kind - external air temperature 35°C and water input/output temperature from/to heat exchanger and user equal to 12/7°C. Values taken by measurements made in accordance with standard ISO 3744 and the Eurovent certification programme, where applicable. Binding values See NOISE LEVELS section.

(4) Values obtained from the sound power level (conditions: note 3), related to a distance of 10 m from the unit in free field with directivity factor Q=2. Non-binding values See NOISE LEVELS section.

(5) The data refers to standard unit with no accessories In particular, the introduction of some accessories such as copper / aluminum coils, hydraulic modules or recovery exchangers may result in an increase in weight that may exceed 10%. For more details, refer to the specific drawing of the selected configuration and to the "Dimensional Diagrams" section.

KAPPA SKY LGW Xi SLN

			66.2	71.2	80.2	93.2	106.2
Cooling (A35; W7)							
Refrigeration capacity	(1)	kW	627	671	757	889	1009
Total absorbed power	(1)	kW	228	255	272	317	364
EER	(1)		2,75	2,63	2,78	2,8	2,77
EER energy class (Eurovent)	(1)		C	D	C	C	C
Compressors							
Compressors/Circuits		n°/n°	2/2	2/2	2/2	2/2	2/2
Minimum capacity reduction step	(2)	%	12,5	12,5	12,5	12,5	12,5
Refrigerant charge (MCHX)		kg	91	91	110	128	142
Refrigerant charge (CuAl)		kg	123	123	147	170	186
Fans							
Quantity		n°	12	12	14	16	18
Total air flow rate		m³/h	180000	180000	210000	240000	270000
User-side heat exchanger							
Quantity		n°	1	1	1	1	1
Water flow rate (A35; W7)	(1)	m³/h	108	116	130	153	174
Head loss (A35; W7)	(1)	kPa	26	29	27	24	26
Noise levels							
Sound power lev.	(3)	dB(A)	93	96	97	98	98
Sound pressure lev.	(4)	dB(A)	61	64	64	65	65
Dimensions and weight							
Length	(5)	mm	7401	7401	8549	9698	10846
Depth	(5)	mm	2260	2260	2260	2260	2260
Height	(5)	mm	2440	2440	2440	2440	2440
Operating weight (MCHX)	(5)	kg	6336	6448	7493	8136	9095

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

(1) Outside air temperature 35°C; evaporator inlet-outlet water temperature 12/7°C. Values compliant with standard EN 14511

(2) 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.

(3) Unit operating at rated capacity, with no accessories of any kind - external air temperature 35°C and water input/output temperature from/to heat exchanger and user equal to 12/7°C. Values taken by measurements made in accordance with standard ISO 3744 and the Eurovent certification programme, where applicable. Binding values See NOISE LEVELS section.

(4) Values obtained from the sound power level (conditions: note 3), related to a distance of 10 m from the unit in free field with directivity factor Q=2. Non-binding values See NOISE LEVELS section.

(5) The data refers to standard unit with no accessories In particular, the introduction of some accessories such as copper / aluminum coils, hydraulic modules or recovery exchangers may result in an increase in weight that may exceed 10%. For more details, refer to the specific drawing of the selected configuration and to the "Dimensional Diagrams" section.

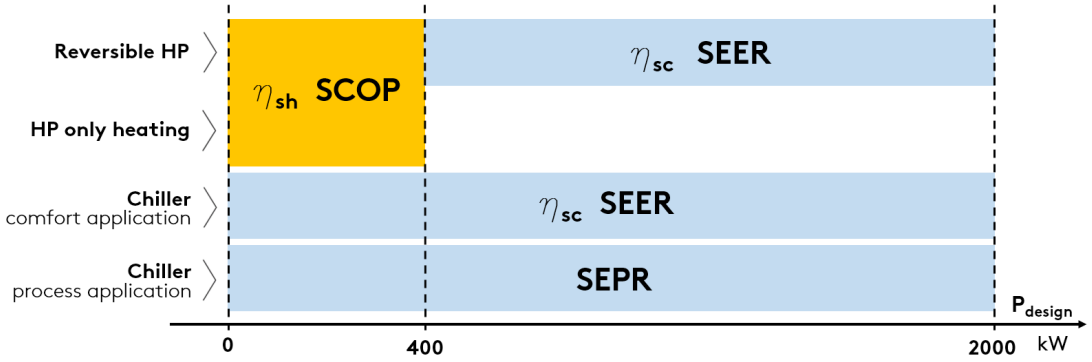
ECODESIGN

INTRODUCTION

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



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

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.

EC fans:

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

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

KAPPA SKY FAMILY

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.

For Kappa SKY family, in the different configurations, the reference regulation is as follows:

Regulation 2016/2281

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).

With reference to the Kappa SKY range, below is a list of concerned regulations relating to the different units in their various configurations.

KAPPA SKY LGW Xi

			24.1	31.1	40.1	45.2	52.2	60.2
REGULATION 2016/2281								
Pdesign	(1)	kW	234	305	391	446	515	586
COMFORT								
Standard units								
ηsc	(1)	%	176,2	178,2	182,2	181,8	181,4	181,8
SEER	(1)		4,48	4,53	4,63	4,62	4,61	4,62
Compliance Tier 1	(1)		Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y	Y
Units with EC fans (VEC)								
ηsc	(1)	%	199,8	202,6	211	200,2	201,4	197,8
SEER	(1)		5,07	5,14	5,35	5,08	5,11	5,02
Compliance Tier 1	(1)		Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y	Y
PROCESS								
SEPR	(2)		5,7	5,79	5,73	5,79	5,73	5,56
Compliance Tier 1	(2)		Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(2)		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.

KAPPA SKY LGW Xi

			66.2	71.2	80.2	93.2	106.2
REGULATION 2016/2281							
Pdesign	(1)	kW	651	701	782	923	1063
COMFORT							
Standard units							
ηsc	(1)	%	182,2	182,6	187,8	188,2	187,8
SEER	(1)		4,63	4,64	4,77	4,78	4,77
Compliance Tier 1	(1)		Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y
Units with EC fans (VEC)							
ηsc	(1)	%	201,4	198,2	206,2	207,8	208,2
SEER	(1)		5,11	5,03	5,23	5,27	5,28
Compliance Tier 1	(1)		Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y
PROCESS							
SEPR	(2)		5,56	5,52	5,74	5,9	5,85
Compliance Tier 1	(2)		Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(2)		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.

KAPPA SKY LGW Xi SLN

			24.1	31.1	40.1	45.2	52.2	60.2
REGULATION 2016/2281								
Pdesign	(1)	kW	227	294	379	427	495	560
COMFORT								
Standard units								
ηsc	(1)	%	173,4	174,6	179,4	179,8	179,4	179,8
SEER	(1)		4,41	4,44	4,56	4,57	4,56	4,57
Compliance Tier 1	(1)		Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y	Y
Units with EC fans (VEC)								
ηsc	(1)	%	194,6	195,4	202,2	192,6	195,8	189,4
SEER	(1)		4,94	4,96	5,13	4,89	4,97	4,81
Compliance Tier 1	(1)		Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y	Y
PROCESS								
SEPR	(2)		5,7	5,79	5,73	5,79	5,73	5,56
Compliance Tier 1	(2)		Y	Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(2)		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.

KAPPA SKY LGW Xi SLN

			66.2	71.2	80.2	93.2	106.2
REGULATION 2016/2281							
Pdesign	(1)	kW	627	671	757	889	1009
COMFORT							
Standard units							
ηsc	(1)	%	179,8	180,6	182,2	183	182,6
SEER	(1)		4,57	4,59	4,63	4,65	4,64
Compliance Tier 1	(1)		Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y
Units with EC fans (VEC)							
ηsc	(1)	%	193,4	193,4	199,8	199	199
SEER	(1)		4,91	4,91	5,07	5,05	5,05
Compliance Tier 1	(1)		Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y
PROCESS							
SEPR	(2)		5,56	5,52	5,74	5,9	5,85
Compliance Tier 1	(2)		Y	Y	Y	Y	Y
Compliance Tier 2 (2021)	(2)		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.

INSTALLATION ADVICE

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

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

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

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

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

Water characteristics

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

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

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

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

Glycol mixtures

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

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

The quantity of antifreeze should be considered as % on weight

Minimum water content in the system

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

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

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

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

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

where

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

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

N: number of capacity reduction steps

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

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

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

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

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

For the N values, consider the following convention:

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

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
- coils with anti-corrosion treatment (accessory available only for units with Cu/Al coil)

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 installations between 1 and 20 km from the coast of units with microchannel coil, we strongly recommend using the accessory "E-coated microchannel coils"
- for installations between 1 and 20 km from the coast of units with Cu/Al coils, we strongly recommend using the accessory "Coil treated with anti-corrosion paints"
- for distances within a kilometre of the coast, we strongly recommend using the accessory "Coil treated with anti-corrosion paints" for all units.

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.

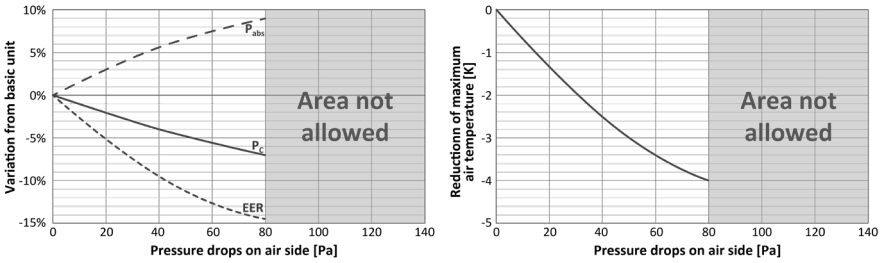
Aeraulic head losses and options available for the ventilating section

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.

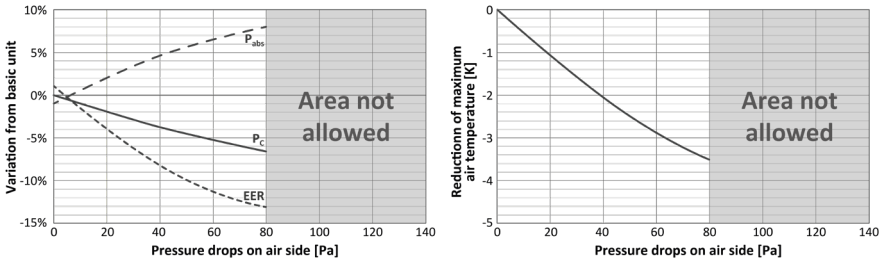
If there are obstacles to free air flow, you should consider the additional aeraulic head losses that will cause a reduction of the air flow rate and a consequent deterioration of performance.

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.

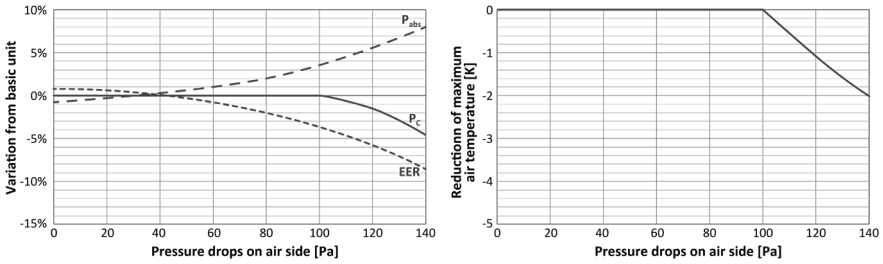
AC fans (Ø 800)



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.

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