Zeta Rev

40÷233 kW

General
Chillers and reversible units with hermetic scroll compressors and plate heat exchanger. Extended range, versatile applications.

Configurations
HE: high efficiency

SLN: super low noise

/HP: reversible heat pump

LE: with remote user-side heat exchanger

/LN: low noise

/DS: with desuperheater

/DC: with total recovery

Strengths
- Chiller with low refrigerant charge
- Intelligent management of defrost cycles: Anti-Ice Circuit
- Night Shift function for noise control (option)
- BlueThink advanced control with integrated web server. Multilogic function and Blueye® supervision system. (options)
- Flowzer: inverter driven pumps (options)

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WESTERN™ AIRCONDITIONING

Zeta Rev

Chillers and reversible units with hermetic scroll compressors and plate heat exchanger. Extended range, versatile applications.

STRUCTURE

The structure of the unit is made of galvanized sheet-iron coated with polyester powder in RAL 5017/7035 at 180°C, which makes it highly resistant to weather conditions.

The structure is a load-bearing frame, with removable panelling lined with sound absorbing expanded polyurethane matting.

All screws and bolts are stainless steel.

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. They are provided with thermal overload protection by internal Klixon® or external Kriwan© module (depending on the model) and with oil equalization line. All the compressors are fitted as standard with crankcase heater.

The compressors are enclosed in a dedicated technical compartment, which can be accessed by removing the panelling to allow maintenance operations to be carried out even with units running.

SOURCE-SIDE HEAT EXCHANGER

(excluding HP units)

For the cooling only units, the exchangers are made with microchannel aluminium coils.

The 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. The entire coil is also subjected to SilFLUX coating processes (or equivalent) or has zinc added to further increase its corrosion resistance.

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%.

E-coated microchannel coils are available as an option. This option is strongly recommended for applications in coastal or highly industrialized areas.

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, the use of Cu/Al coils with anti-corrosion treatment is strongly recommended.

The exchanger is protected by a metal mesh.

SOURCE-SIDE HEAT EXCHANGER

(only for HP units)

The exchangers are made with finned pack coils with copper tubes and aluminium fins.

At the base of each coil, there is an Anti-Ice Circuit: this helps to prevent ice formation in the lower part of the coil and therefore allows the unit to operate even with extremely harsh temperatures and with high humidity levels.

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 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.

For standard efficiency models from 3.2 to 10.2 and for HE and SLN version models from 3.2 to 7.2, the unit is fitted as standard with condensing control with fan speed adjuster. For the other models, condensing control by steps or condensing control with fan speed adjuster are available as alternative options.

USER-SIDE HEAT EXCHANGER

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

For dual circuit models, the unit uses two heat exchangers already manifolded inside the unit and therefore with a single hydraulic connection.

The exchanger is also equipped with thermostat-controlled anti-freeze heater to protect it from ice formation when the unit is not running.

REFRIGERANT CIRCUIT

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

- valve on the liquid line
- charging valves
- liquid sight glass
- replaceable solid cartridge dehydrator filter (except for sizes 3.2, 4.2 and 5.2 where the filter is a weld-on filter)
- thermostatic expansion valve with pressure equalization
- high and low pressure switches

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

As an accessory, all the units can be fitted with an electronic expansion valve that allows machine stability to be reached more quickly and better superheating control than the mechanical expansion valve, to maximize the use of the evaporator in all load conditions.

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
- fan contactors
- phase-cutting fan speed adjuster
- thermal magnetic circuit breakers for pumps (if present)
- phase monitor
- potential-free general alarm contacts
- single potential free operating contacts for compressors, fans and pumps (when present)
- digital input for general ON/OFF
- summer/winter selection by digital input (only for HP units)
- external air temperature probe
- microprocessor controller with display accessible from the outside

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

The power supply of the unit is 400V/3~+N/50Hz for the following models:

- Zeta Rev from size 3.2 up to size 10.2
- Zeta Rev HE from size 3.2 up to size 7.2
- Zeta Rev SLN from size 3.2 up to size 7.2

The power supply of the unit is 400V/3~/50Hz for the following models:

- Zeta Rev from size 12.2 up to size 24.4
- Zeta Rev HE from size 8.2 up to size 16.4
- Zeta Rev SLN from size 8.2 to 16.4 from size 8.2 up to size 16.4

CONTROL BLUETHINK

The unit is supplied as standard with parametric control. The advanced control can be requested as accessory.

Main controller functions parametric

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 alarm log
- RS485 serial port with Modbus protocol
- digital input for general ON/OFF
- digital input for Summer/Winter selection (only for HP units)

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

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 controller functions advanced

The control allows the following functions:

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

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

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

Main functions of the webserver (only for units with advanced control)

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

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

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

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.

Management of defrost cycles (only for HP units)

For defrost management, the control of the unit uses a sliding intervention threshold, depending on the pressures inside the unit and the external air temperature. By putting together all this information, the control can identify the presence of ice on the coil and activates the defrosting sequence only when necessary, so as to maximize the energy efficiency of the unit.

Sliding management of the defrost threshold ensures that, as the absolute humidity of outdoor air decreases, the frequency of the defrost cycles gradually decreases because they are carried out only when the ice formed on the coil actually penalizes performance.

The defrost cycle is fully automatic and is carried out using a patented defrost system (patent n° 1335232): during the initial stage, a defrost is carried out by cycle reversal with fans stopped. When the frost on the coil has melted sufficiently, reverse ventilation is activated, that is, with air flow in the opposite direction to that of normal operation, so as to facilitate the ejection of condensed water and detached ice. When the coil is clean, ventilation is reversed again and the unit resumes operation in heat pump mode.

In addition, the Anti-Ice Circuit helps to prevent ice formation in the lower part of the coil and so allows the unit to operate even with extremely harsh temperatures and with high humidity levels.

The combination of defrost cycle management with sliding intervention threshold, patented defrost system and Anti-Ice Circuit allows the number and duration of defrost cycles to be optimized and reduced to a minimum.

CONTROLS AND SAFETY DEVICES

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

- user-side water temperature probe
- antifreeze probe on the user side heat exchanger
- high pressure switch with manual reset
- low pressure safety device with automatic reset, for a limited number of occurrences, managed by the controller
- compressor overtemperature protection
- fan overtemperature protection
- mechanical paddle flow switch (supplied loose)

TESTING

All units are factory-tested and supplied complete with oil and refrigerant, except for the LE and LE/HP versions that are charged with nitrogen.

VERSIONS

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

HE: high efficiency unit

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 high efficiency levels: in chiller configuration, SEER up to 4.02; in heat pump configuration (HE/HP), SCOP up to 3.59.

SLN: super low noise unit

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 version.

Also, for SLN/HP version units working in heat pump mode, the fans always operate at 100% speed and therefore guarantee the same performance levels as the high efficiency versions.

LE: unit with remote user-side heat exchanger

The LE version units are without user-side heat exchanger and thermostatic expansion valve (to be positioned on the remote heat exchanger).

The units are supplied with:

- standard solenoid valve on the liquid line
- without refrigerant charge and charged with nitrogen
- weld-on refrigerant connections closed with copper plugs

OPTIONS

/HP: reversible heat pump

The /HP units comprise (for each refrigerant circuit):

- 4-way reversing valve
- fluid accumulator
- second electronic expansion valve.
- Anti-Ice Circuit at the base of each coil

The Anti-Ice Circuit helps to prevent ice formation in the lower part of the coil and therefore allows the unit to operate even with extremely harsh temperatures and with high humidity levels.

For defrost management, the control of the unit uses a sliding intervention threshold, depending on the pressures inside the unit and the external air temperature. By putting together all this information, the control can identify the presence of ice on the coil and activates the defrosting sequence only when necessary, so as to maximize the energy efficiency of the unit.

Sliding management of the defrost threshold ensures that, as the absolute humidity of outdoor air decreases, the frequency of the defrost cycles gradually decreases because they are carried out only when the ice formed on the coil actually penalizes performance.

The defrost cycle is fully automatic and is carried out using a patented defrost system: during the initial stage, a defrost is carried out by cycle reversal with fans stopped. When the frost on the coil has melted sufficiently, reverse ventilation is activated, that is, with air flow in the opposite direction to that of normal operation, so as to facilitate the ejection of condensation water and detached ice. When the coil is clean, ventilation is reversed again and the unit resumes operation in heat pump mode.

The combination of defrost cycle management with sliding intervention threshold, patented defrost system and Anti-Ice Circuit allows the number and duration of defrost cycles to be optimized and reduced to a minimum.

Summer/winter switching can be done from the control keypad, digital input or BMS (requires write enabling).

/DC: unit with recovery condenser

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

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

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

This option is not available for /HP units

/DS: unit with desuperheater

In addition to the set-up of a chiller only unit, /DS units include a heat exchanger for condensation heat recovery.

The brazed plate heat recovery heat exchanger is placed in series with the condensing coil. One of these is required for each refrigerant circuit of the unit; for dual circuit units, the heat exchangers are to be manifolded outside the unit (by the customer).

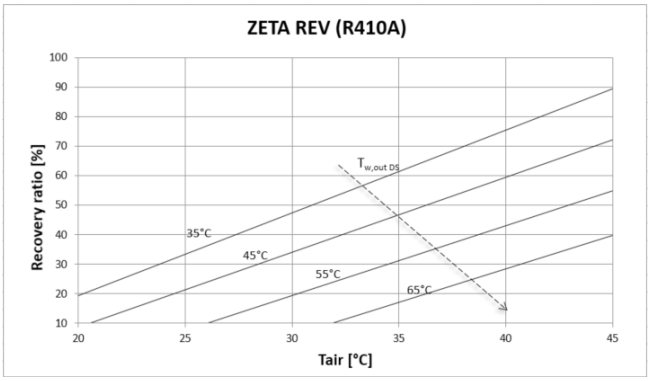
Condensation heat recovery is a function of size, version and operating conditions.

An illustrative graph is shown below in which, as the ambient temperature changes, (T_{air}) and as the temperature of the water leaving the heat recovery heat exchanger changes, ($T_{w,out\ DS}$), the percentage of recovered heat is shown as an indication (Recovery ratio).

Condensation heat recovery is a function of size, version and operating conditions.

The percentage of recovered heat is calculated as the ratio between recovered heat flow to the desuperheater and the heat flow to the condenser under nominal conditions, therefore evaporator inlet-outlet water temperature 12-7°C.

In the following graph, a constant temperature delta of 5°C between water inlet and outlet at the heat recovery heat exchanger has been considered.



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, provision must be made for shutting off the heat recovery water circuit during operation in heat pump mode to avoid taking power from the user-side heat exchanger.

/LN: low noise unit

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

HYDRAULIC MODULES

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

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

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

The following are also available:

- modules /1PM, /2PM, /1PMS and /2PMS that have pumps with increased available discharge head
- modules /1PG, /2PG, /1PGS and /2PGS that have pumps suitable for operating with glycol up to 50%

Hydraulic modules with one pump have:

- one pump
- an expansion vessel

Hydraulic modules with two pumps have:

- two pumps
- a check valve on the delivery side of each pump
- 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.

All the hydraulic circuit components are fully insulated, except for:

- drain valves
- venting valves
- tank plugs
- safety valves
- expansion vessel
- probe pockets

TECHNICAL SPECIFICATIONS

ZETA REV

			3.2	4.2	5.2	6.2	7.2	8.2	9.2	10.2	12.2
ZETA REV											
Cooling											
Refrigeration capacity	(1)	kW	40,4	45,3	52,9	59,6	66,7	80,9	92,8	101,9	116,2
Total absorbed power	(1)	kW	13,9	16,7	20,2	20,7	24,4	26,5	31,1	36,1	41,6
EER	(1)		2,91	2,71	2,62	2,88	2,73	3,06	2,98	2,82	2,79
Eurovent efficiency class	(1)		B	C	D	C	C	B	B	C	C
ESEER			4,15	4,11	4,07	4,19	4,09	4,20	4,25	4,12	4,03
ZETA REV /HP											
Cooling											
Refrigeration capacity	(1)	kW	39,8	44,7	52,3	58,6	65,8	80,1	90,3	98,0	113,9
Total absorbed power	(1)	kW	14,2	17,0	19,9	21,2	24,8	27,2	32,2	38,0	42,7
EER	(1)		2,81	2,63	2,63	2,77	2,66	2,95	2,80	2,58	2,67
Eurovent efficiency class	(1)		C	D	D	C	D	B	C	D	D
ESEER			4,08	4,07	4,08	4,11	4,05	4,13	4,16	4,05	3,96
Heating											
Heating capacity	(2)	kW	42,1	47,1	55,4	63,2	70,1	83,7	94,7	104,2	121,7
Total absorbed power	(2)	kW	13,6	15,7	18,1	20,0	22,0	26,3	29,8	33,4	39,2
COP	(2)		3,08	3,00	3,06	3,16	3,18	3,19	3,18	3,12	3,10
Eurovent efficiency class	(2)		B	C	B	B	B	B	B	B	B
Compressors											
Compressors/Circuits		n°/n°	2/1	2/1	2/1	2/1	2/1	2/1	2/1	2/1	2/1
Minimum capacity reduction step	(7)	%	50%	50%	50%	50%	50%	50%	43%	50%	44%
Refrigerant charge CH (MCHX)	(3)	kg	4,0	4,2	4,4	5,5	5,7	8,9	9,2	9,2	9,6
Refrigerant charge HP	(3)	kg	11,4	11,7	12,5	17,5	17,6	23,5	26,3	26,3	26,5
Fans											
Quantity		n°	2	2	2	2	2	3	3	3	2
Total air flow rate CH (MCHX)		m³/h	18.000	18.000	17.000	19.000	19.000	28.000	28.000	28.000	39.000
Total air flow rate HP		m³/h	16.000	16.000	15.000	18.000	18.000	26.000	26.000	26.000	36.000
User-side heat exchanger											
Quantity		n°	1	1	1	1	1	1	1	1	1
Water flow rate CH	(1)	m³/h	7,0	7,8	9,2	10,3	11,5	14,0	16,0	17,6	20,1
Pressure drop CH	(1)	kPa	37,6	32,6	32,6	42,3	21,8	32,9	28,3	33,7	34,1
Water flow rate HP	(1)	m³/h	6,9	7,7	9,0	10,1	11,4	13,8	15,6	16,9	19,7
Pressure drop HP	(1)	kPa	35,5	30,9	32,4	39,7	20,6	30,7	26,0	30,3	31,8
Noise levels											
Sound power level cooling	(4)	dB(A)	78	79	79	80	81	82	83	84	86
Sound power level heating	(5)	dB(A)	78	79	79	80	81	82	83	84	86
Sound pressure level cooling	(6)	dB(A)	46	48	48	48	49	50	51	52	54
Sound power level of vers. LN cooling	(4)	dB(A)	76	77	77	78	79	80	81	82	84
Sound power level of vers. LN heating	(5)	dB(A)	76	77	77	78	79	80	81	82	84
Sound pressure level of vers. LN cooling	(6)	dB(A)	44	46	46	46	47	48	49	50	52
Dimensions and weights**											
Length		mm	1.750	1.750	1.750	2.200	2.200	3.200	3.200	3.200	3.200
Depth		mm	1.000	1.000	1.000	1.000	1.000	1.100	1.100	1.100	1.100
Height		mm	1.400	1.400	1.400	1.740	1.740	1.740	1.740	1.740	1.880
Operating weight		kg	416	428	430	560	586	802	814	826	968

CH: chiller unit; HP: heat pump unit; MCHX: unit with microchannel coils

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

(2) Outside air temperature 7°C DB, 6°C WB; condenser inlet/outlet water temperature 40/45°C. Values in accordance with EN 14511.

(3) Theoretical values referred to the basic unit. The amount of gas actually charged in the unit may differ.

(4) Unit operating at nominal operating capacity, without any accessories, with external air temperature of 35°C and user-side heat exchanger water inlet-outlet temperature of 12-7°C. Binding values. Values obtained from measures taken according to standard ISO 3744 and to the Eurovent certification programme where applicable.

(5) Unit operating at nominal operating capacity, without any accessories, with external air temperature of 7°C (6°C wb) and user-side heat exchanger water inlet-outlet temperature of 40-45°C. Values obtained from measures taken according to standard ISO 3744.

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

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

** Basic CH unit without included accessories

ECODESIGN

INTRODUCTION

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

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

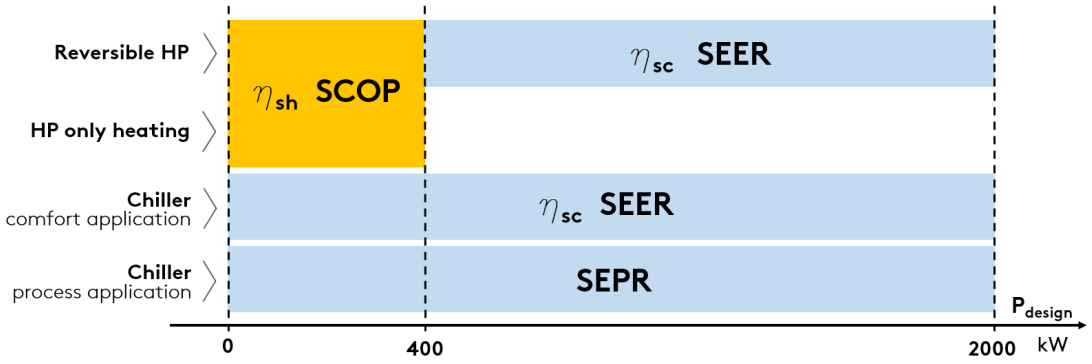
- Regulation 2013/813, for small heat pumps (Pdesign ≤ 400 kW)
- Regulation 2016/2281, for chillers and heat pumps with Pdesign > 400 kW
- Regulation 2013/811, for heat pumps with Pdesign ≤ 70 kW.

The last-mentioned regulation (2013/811) regards the labelling (Ecolabel certification) of small heat pumps.
The other two regulations (2013/813 and 2016/2281) set seasonal efficiency targets that the products must comply with to be sold and installed in the European Union (essential requirement for CE marking).
These efficiency limits are defined through ratios, which are respectively:

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

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

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



Some notes and clarifications:

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

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

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

Regulation 2013/813 distinguishes two different types: at low temperature and at medium temperature.
The following refer to the application at low temperature: (low temperature application) all heat pumps whose maximum delivery temperature for heating purposes is lower than 52°C with source at temperature of -7°C and -8°C wet bulb (air-water unit) or inlet 10°C (water-water unit), at the reference design conditions for an average climate.For these, the efficiency ratio is "low temperature application" (outlet water temperature 35°C).
For all the other heat pumps, the efficiency ratio is related to "medium temperature application" (outlet water temperature 55°C).
The ratios must be calculated according to the reference European heating season in average climatic conditions.

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

REGULATION 2016/2281, comfort application

TYPE OF UNIT		MINIMUM REQUIREMENT			
		Tier 1		Tier 2 (2021)	
SOURCE	**Pdesign**	**ηsc [%]**	**SEER**	**ηsc [%]**	**SEER**
air	< 400kW	149	3,8	161	4,1
air	≥ 400kW	161	4,1	179	4,55
water	< 400kW	196	5,1	200	5,2
water	≥ 400kW and < 1500kW	227	5,875	252	6,5
water	≥ 1500kW	245	6,325	272	7

REGULATION 2016/2281, process application

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

REGULATION 2013/813

SOURCE	APPLICATION	MINIMUM REQUIREMENT	
		ηsh [%]	**SCOP**
air	low temperature application	125	3,2
air	low temperature application	125	3,325
water	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	2016/2283
	≥ 18°C	SEER/ηsc medium temperature application	2016/2283
Heat pumps (reversible and only heating) Pdesign≤400kW		SCOP/ηsh	2013/815
Reversible heat pumps Pdesign>400kW	< 18°C	SEER/ηsc low temperature application	2016/2283
	≥ 18°C	SEER/ηsc medium temperature application	2016/2283
Heat pumps only heating Pdesign>400kW		-	-

- = exemption from Ecodesign

PROCESS APPLICATION

PRODUCT	OUTLET WATER TEMPERATURE	COMPLIANCE INDEX	REGULATION
Chiller	≥ +2°C , ≤ 12°C	SEPR	2016/2283
	> 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.

ZETA REV RANGE

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

Zeta Rev:
- chiller version: regulation 2016/2281
- /HP version: regulation 2016/2281 (since they are all units with Pdesign ≤ 400 kW).

Zeta Rev HE and Zeta Rev SLN:
- chiller version: regulation 2016/2281
- /HP version: regulation 2013/813 (since they are all units with Pdesign ≤ 400 kW).

Zeta Rev LE:
Since these are partly completed machines, conformity with Ecodesign depends on combination with the remote heat exchanger.
All LE units are CE marked.

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

ZETA REV

			3.2	4.2	5.2	6.2	7.2	8.2	9.2	10.2	12.2
REGULATION 2016/2281											
Pdesign	(1)	kW	40,4	45,3	52,9	59,6	66,7	80,9	92,8	101,9	116,2
Compliance 12/7											
Compliance	(1)		N	N	N	Y	Y	Y	Y	Y	Y
ηsc	(1)	%	N	N	N	152,2	151,0	149,3	150,1	149,9	149,0
SEER	(1)		N	N	N	3,88	3,85	3,81	3,83	3,82	3,80
Compliance Tier 2 (2021)	(1)		N	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	Y
ηsc	(1)	%	149,1	149,1	149,0	155,1	152,9	155,5	157,7	154,9	151,2
SEER	(1)		3,80	3,80	3,80	3,95	3,90	3,96	4,02	3,95	3,85
Compliance Tier 2 (2021)	(1)		N	N	N	N	N	N	N	N	N
Compliance 23/18											
Compliance	(2)		Y	Y	Y	Y	Y	Y	Y	Y	Y
ηsc	(2)	%	170,3	163,3	165,9	-	-	-	-	-	-
SEER	(2)		4,33	4,16	4,22	-	-	-	-	-	-
Compliance SEPR											
Compliance	(3)		Y	Y	Y	Y	Y	Y	Y	Y	Y
SEPR	(3)		5,66	5,38	5,3	5,53	5,24	5,53	5,54	5,33	5,09

			13.2	14.4	15.2	16.2	16.4	18.4	20.4	24.4
REGULATION 2016/2281										
Pdesign	(1)	kW	125,1	136,8	146,2	159,1	153,4	189,3	207,7	233,3
Compliance 12/7										
Compliance	(1)		N	Y	Y	N	Y	Y	Y	Y
ηsc	(1)	%	N	149,4	151,6	N	149,1	154,1	150,8	149,1
SEER	(1)		N	3,81	3,87	N	3,80	3,93	3,84	3,80
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)	%	149,1	158,8	155,0	149,1	151,1	163,6	158,0	160,0
SEER	(1)		3,80	4,05	3,95	3,80	3,85	4,17	4,03	4,07
Compliance Tier 2 (2021)	(1)		N	N	N	N	N	Y	N	N
Compliance 23/18										
Compliance	(2)		Y	Y	Y	Y	Y	Y	Y	Y
ηsc	(2)	%	163,0	-	-	167,0	-	-	-	-
SEER	(2)		4,15	-	-	4,25	-	-	-	-
Compliance SEPR										
Compliance	(3)		Y	Y	Y	Y	Y	Y	Y	Y
SEPR	(3)		5,17	5,23	5,2	5,1	5,03	5,42	5,22	5,05

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

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

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

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

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

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

ELECTRICAL SPECIFICATIONS

ZETA REV - ZETA REV LE

			3.2	4.2	5.2	6.2	7.2	8.2	9.2	10.2	12.2
General electrical specifications											
Max. absorbed power (FLI)	(1)	kW	18,3	21,4	24,5	27,2	30,5	35,7	41,4	47,0	54,2
Max. absorbed current (FLA)	(1)	A	37,6	47,2	49,2	55,2	67,2	75,9	81,9	87,9	97,1
Rated current (Inom)	(2)	A	32	36	41	44	49	62	66	71	76
cosφ standard unit	(2)		0,8	0,8	0,8	0,82	0,81	0,78	0,81	0,83	0,84
Nominal current with power factor correction (Inom)	(2)	A	28	30	34	37	42	52	56	61	67
cosφ unit with power factor correction	(2)		0,96	0,96	0,96	0,95	0,95	0,95	0,95	0,96	0,95
Max. inrush current (MIC)	(3)	A	122	137	145	148	176	216	267	273	321
Maximum inrush current with soft-starter (MIC)	(4)	A	82	93	98	101	120	146	177	183	212
Power supply		V/ph/Hz	400/3~+N/50								
Power supply for auxiliary circuits		V/ph/Hz	230-24/1~/52								
Suggested line section	(5)	mm²	5G10 mm2 FG16OR16	5G16 mm2 FG16OR16	5G16 mm2 FG16OR16	5G16 mm2 FG16OR16	5G16 mm2 FG16OR16	5G25 mm2 FG16OR16	5G25 mm2 FG16OR16	5G35 mm2 FG16OR16	4G50 mm2 FG16OR16
Suggested line protection	(6)		NH00gG 50A	NH00gG 63A	NH00gG 63A	NH00gG 80A	NH00gG 80A	NH00gG 100A	NH00gG 100A	NH00gG 125A	NH00gG 160A
Electrical specifications for fans											
Rated power of fan standard		n° x kW	2 x 0,6	2 x 0,6	2 x 0,6	2 x 0,6	2 x 0,6	3 x 0,6	3 x 0,6	3 x 0,6	2 x 2,0
Rated current of fan standard		n° x A	2 x 2,6	2 x 2,6	2 x 2,6	2 x 2,6	2 x 2,6	3 x 2,6	3 x 2,6	3 x 2,6	2 x 4,3
Rated power of fan EC		n° x kW	2 x 0,8	2 x 0,8	2 x 0,8	2 x 0,8	2 x 0,8	3 x 0,8	3 x 0,8	3 x 0,8	2 x 1,9
Rated current of fan EC		n° x A	2 x 1,4	2 x 1,4	2 x 1,4	2 x 1,4	2 x 1,4	3 x 1,4	3 x 1,4	3 x 1,4	2 x 2,9
Rated power of fan oversize EC		n° x kW	2 x 1,0	2 x 1,0	2 x 1,0	2 x 1,0	2 x 1,0	3 x 1,0	3 x 1,0	3 x 1,0	2 x 3,0
Rated current of fan oversize EC		n° x A	2 x 1,6	2 x 1,6	2 x 1,6	2 x 1,6	2 x 1,6	3 x 1,6	3 x 1,6	3 x 1,6	2 x 4,5

			13.2	15.2	16.2	14.4	16.4	18.4	20.4	24.4
General electrical specifications										
Max. absorbed power (FLI)	(1)	kW	59,2	67,7	76,2	62,6	71,8	85,1	96,4	108,4
Max. absorbed current (FLA)	(1)	A	105,6	122,5	139,4	132,6	144,6	160,9	172,9	194,2
Rated current (Inom)	(2)	A	83	94	104	93	111	124	134	152
cosφ standard unit	(2)		0,85	0,85	0,85	0,76	0,85	0,85	0,85	0,85
Nominal current with power factor correction (Inom)	(2)	A	74	84	95	75	89	104	115	132
cosφ unit with power factor correction	(2)		0,95	0,95	0,95	0,97	0,95	0,96	0,96	0,96
Max. inrush current (MIC)	(3)	A	329	367	384	242	285	346	358	418
Maximum inrush current with soft-starter (MIC)	(4)	A	220	243	260	186	215	256	268	309
Power supply		V/ph/Hz	400/3~+N/50							
Power supply for auxiliary circuits		V/ph/Hz	230-24/1~/52							
Suggested line section	(5)	mm²	4G50 mm2 FG16OR16	4G50 mm2 FG16OR16	4G70 mm2 FG16OR16	4G50 mm2 FG16OR16	4G70 mm2 FG16OR16	4G70 mm2 FG16OR16	4G95 mm2 FG16OR16	4G95 mm2 FG16OR16
Suggested line protection	(6)		NH00gG 160A	NH00gG 160A	NH1gG 200A	NH00gG 160A	NH1gG 200A	NH1gG 200A	NH1gG 250A	NH1gG 250A
Electrical specifications for fans										
Rated power of fan standard		n° x kW	2 x 2,0	2 x 2,0	2 x 2,0	2 x 2,0	2 x 2,0	3 x 2,0	3 x 2,0	4 x 2,0
Rated current of fan standard		n° x A	2 x 4,3	2 x 4,3	2 x 4,3	2 x 4,3	2 x 4,3	3 x 4,3	3 x 4,3	4 x 4,3
Rated power of fan EC		n° x kW	2 x 1,9	2 x 1,9	2 x 1,9	2 x 1,9	2 x 1,9	3 x 1,9	3 x 1,9	4 x 1,9
Rated current of fan EC		n° x A	2 x 2,9	2 x 2,9	2 x 2,9	2 x 2,9	2 x 2,9	3 x 2,9	3 x 2,9	4 x 2,9
Rated power of fan oversize EC		n° x kW	2 x 3,0	2 x 3,0	2 x 3,0	2 x 3,0	2 x 3,0	3 x 3,0	3 x 3,0	4 x 3,0
Rated current of fan oversize EC		n° x A	2 x 4,5	2 x 4,5	2 x 4,5	2 x 4,5	2 x 4,5	3 x 4,5	3 x 4,5	4 x 4,5

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

(2) Datum related to the unit without accessories working in standard conditions (A35°C; W12/7°C)

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

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

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

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

HYDRAULIC MODULES

ZETA REV

			3.2	4.2	5.2	6.2	7.2	8.2	9.2	10.2	12.2
Volume of the expansion vessel		l	5	5	5	18	18	18	18	18	18
Volume of the buffer tank		l	165	165	165	200	200	450	450	450	450
Standard pumps											
Pump model 1P, 2P			P2	P2	P3	P4	P4	P5	P7	P7	P9
Available head 1P	(1)	kPa	145	135	162	133	148	168	177	165	172
Available head 2P	(1)	kPa	137	125	149	117	128	136	162	147	149
Oversize pumps											
Pump model 1PM, 2PM			P6	P6	P6	P6	P6	P8	P8	P8	P11
Available head 1PM	(1)	kPa	255	237	233	218	232	322	320	298	295
Available head 2PM	(1)	kPa	247	227	221	202	212	291	305	280	271
Pumps for glycol											
Pump model 1PG, 2PG			P15	P15	P16	P16	P16	P17	P17	P18	P18
Available head 1PG	(1)	kPa	120	124	168	150	174	153	153	158	146
Available head 2PG	(1)	kPa	105	105	143	138	158	146	143	146	132

			13.2	14.4	15.2	16.2	16.4	18.4	20.4	24.4
Volume of the expansion vessel		l	18	18	18	18	18	18	18	18
Volume of the buffer tank		l	450	390	390	390	390	700	700	700
Standard pumps										
Pump model 1P, 2P			P9	P9	P10	P9	P10	P10	P10	P13
Available head 1P	(1)	kPa	160	157	184	170	194	176	153	218
Available head 2P	(1)	kPa	133	120	140	138	153	156	129	188
Oversize pumps										
Pump model 1PM, 2PM			P11	P11	P11	P11	P12	P12	P12	P14
Available head 1PM	(1)	kPa	283	279	334	292	344	324	300	281
Available head 2PM	(1)	kPa	256	242	290	260	303	304	276	250
Pumps for glycol										
Pump model 1PG, 2PG			P19	P19	P19	P18	P19	P19	P20	P20
Available head 1PG	(1)	kPa	175	169	148	142	159	126	192	171
Available head 2PG	(1)	kPa	157	157	133	131	145	118	182	159

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

HYDRAULIC MODULES

	Rated power	Rated current	Min. flow rate	Max. flow rate
	kW	A	m^3/h	m^3/h
P1	1,1	2,7	3,0	9,0
P2	0,9	2,1	3,6	9,6
P3	0,9	2,4	3,6	9,6
P4	1,1	2,5	7,0	18,0
P5	1,5	3,2	7,0	18,0
P6	1,9	4,2	7,0	18,0
P7	1,9	4,5	12,0	31,2
P8	3,0	6,1	6,0	20,0
P9	2,2	4,5	12,0	42,0
P10	3,0	6,1	12,0	42,0
P11	4,0	8,7	12,0	42,0
P12	5,5	10,4	12,0	42,0
P13	5,5	10,4	24,0	72,0
P14	7,5	13,7	24,0	72,0
P15	1,5	3,2	7,0	18,0
P16	1,9	4,2	7,0	18,0
P17	2,2	4,6	12,0	31,2
P18	3,0	6,1	12,0	42,0
P19	4,0	8,7	12,0	42,0
P20	7,5	13,7	24,0	72,0

USER-SIDE EXCHANGER FLOW RATE FIELDS

The units are sized and optimized for the following nominal conditions: external air 35°C, inlet/outlet of the user-side heat exchanger 12/7°C.

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

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

ZETA REV

	Qmin	Qmax
	m³/h	m³/h
3.2	3,5	10,5
4.2	3,9	11,7
5.2	4,6	13,7
6.2	5,2	15,5
7.2	5,8	17,3
8.2	7,0	21,0
9.2	8,0	24,0
10.2	8,8	26,4
12.2	10,0	30,1
13.2	10,8	32,4
15.2	12,6	37,9
16.2	13,7	41,2
14.4	11,8	35,4
16.4	13,2	39,7
18.4	16,3	49,0
20.4	17,9	53,8
24.4	20,1	60,4

ZETA REV HE

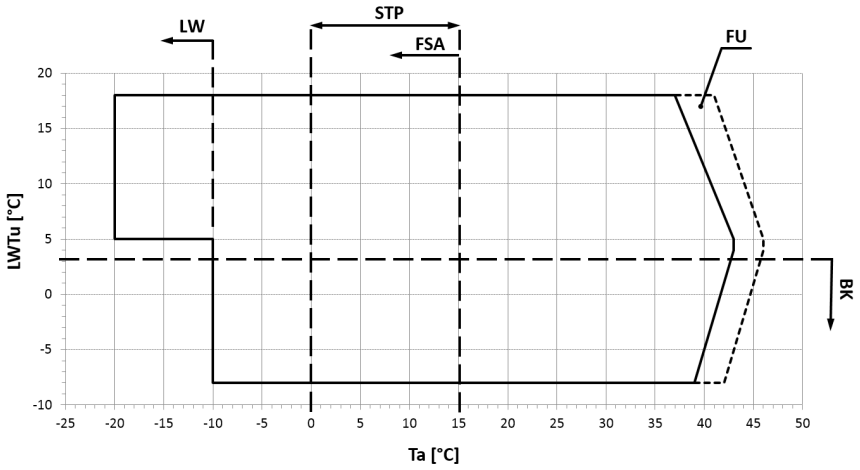
	Qmin	Qmax
	m³/h	m³/h
3.2	3,7	11,0
4.2	4,2	12,7
5.2	5,0	15,1
6.2	5,5	16,4
7.2	6,2	18,7
8.2	7,5	22,6
9.2	8,7	26,1
10.2	9,6	28,8
12.2	11,0	33,1
13.2	12,0	36,0
15.2	13,7	41,1
16.2	15,5	46,5
14.4	12,5	37,4
16.4	14,8	44,4

ZETA REV SLN

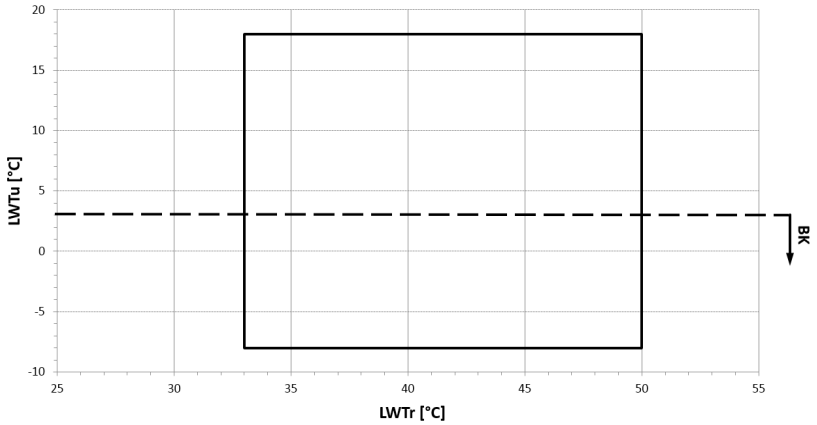
	Qmin	Qmax
	m³/h	m³/h
3.2	3,5	10,6
4.2	4,0	11,9
5.2	4,5	13,6
6.2	5,4	16,1
7.2	6,1	18,3
8.2	7,3	21,8
9.2	8,2	24,7
10.2	9,2	27,6
12.2	10,1	30,4
13.2	11,8	35,4
15.2	13,3	39,8
16.2	14,7	44,0
14.4	12,2	36,7
16.4	14,0	42,0

OPERATING LIMITS
ZETA REV

COOLING



TOTAL RECOVERY



Ta: external air temperature

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

LWTr: water outlet temperature from the recovery exchanger

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

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

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

STP: for external air temperatures of between +15°C and 0°C, the unit can work only if equipped with the ”Condensing control by steps” accessory. For temperatures below 0°C, the unit can work only if fitted with the accessories indicated in the FSA note.

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

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

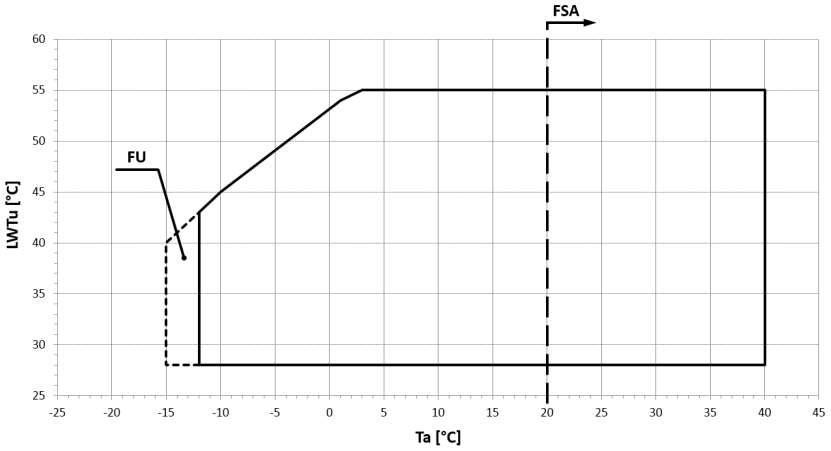
The inlet and outlet temperatures of the user-side exchanger must be given on ordering to allow correct setting of the alarm parameters and verification of the sizing of the expansion valve.

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

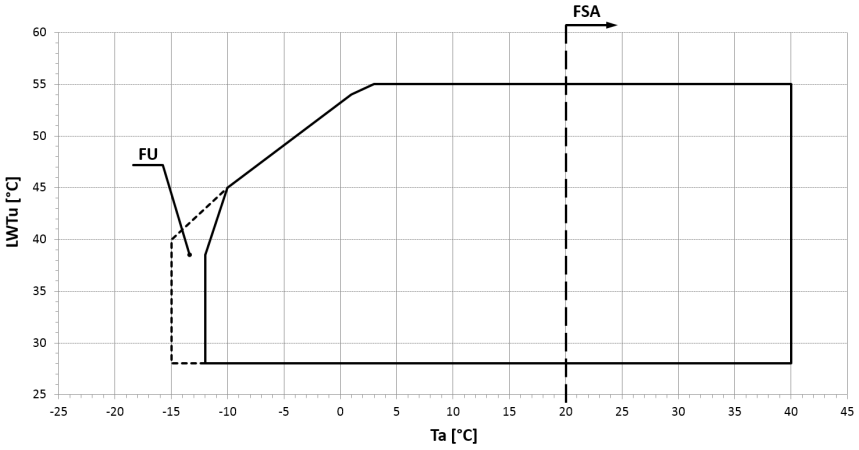
The unit will be optimized to work at the set point temperatures given on ordering. For different set points, the cooling capacity provided and the level of efficiency of the machine could decrease and move away from these conditions.

HEATING

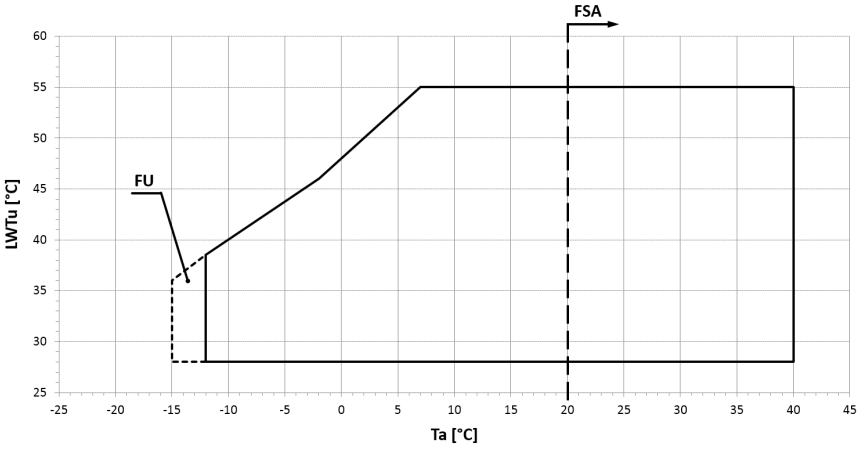
For models Zeta Rev 3.2, 4.2, 5.2, 6.2, 7.2, 8.2, 14.4, 16.4



For models Zeta Rev 9.2, 10.2, 16.2, 18.4, 20.4



For models Zeta Rev 12.2, 13.2, 15.2, 24.4



NOISE LEVELS

ZETA REV

Octave bands [dB]																	Total [dB(A)]	
	63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz			
	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw_ tot	Lp_ tot
3.2	79	48	78	47	70	38	73	41	72	41	71	39	69	38	64	32	**78**	**46**
4.2	79	48	78	47	70	39	74	42	73	42	74	42	70	39	65	34	**79**	**48**
5.2	79	48	78	47	70	38	74	43	74	43	73	41	70	38	65	33	**79**	**48**
6.2	79	48	78	47	69	38	72	41	75	43	75	43	71	39	67	36	**80**	**48**
7.2	79	48	78	47	70	38	75	43	75	44	75	44	72	40	67	35	**81**	**49**
8.2	81	49	80	48	71	39	75	43	76	44	77	45	73	41	68	36	**82**	**50**
9.2	79	47	78	46	74	42	75	43	76	44	79	47	72	40	65	33	**83**	**51**
10.2	80	48	78	46	76	44	77	45	77	45	81	49	73	41	64	32	**84**	**52**
12.2	84	52	74	42	77	45	78	46	80	48	82	50	75	43	69	37	**86**	**54**
13.2	84	52	74	42	77	45	78	46	81	49	83	51	76	44	71	39	**87**	**55**
15.2	84	52	74	42	77	45	79	47	82	50	82	50	76	44	70	38	**87**	**55**
16.2	84	52	74	42	77	45	79	47	82	50	82	50	76	44	69	37	**87**	**55**
14.4	87	55	76	44	75	43	79	47	79	47	79	47	75	43	70	38	**84**	**52**
16.4	87	55	76	44	75	43	79	47	80	48	80	48	76	44	71	39	**85**	**53**
18.4	87	55	77	45	79	47	81	49	80	48	83	51	76	44	70	38	**87**	**55**
20.4	88	56	78	46	81	49	82	50	81	49	85	53	77	45	69	37	**89**	**57**
24.4	89	57	79	47	81	49	82	50	84	52	86	54	79	47	73	41	**90**	**58**

ZETA REV /LN

Octave bands [dB]																	Total [dB(A)]	
	63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz			
	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw_ tot	Lp_ tot
3.2	77	45	76	45	68	36	71	39	70	39	69	37	67	36	62	31	**76**	**44**
4.2	77	45	76	45	68	37	72	40	71	40	71	40	68	37	63	32	**77**	**46**
5.2	77	45	76	45	68	36	72	41	72	41	71	39	68	36	63	32	**77**	**46**
6.2	77	46	76	45	68	36	70	39	73	41	73	41	69	37	66	34	**78**	**46**
7.2	77	46	76	45	68	36	73	41	73	42	73	42	70	38	65	34	**79**	**47**
8.2	79	47	78	46	70	38	73	41	74	42	75	43	71	39	66	34	**80**	**48**
9.2	77	45	76	44	72	40	73	41	74	42	77	45	70	38	64	32	**81**	**49**
10.2	78	46	76	44	75	43	75	43	75	43	79	47	71	39	62	30	**82**	**50**
12.2	82	50	72	40	75	43	76	44	78	46	80	48	73	41	67	35	**84**	**52**
13.2	82	50	72	40	75	43	76	44	79	47	81	49	75	43	69	37	**85**	**53**
15.2	82	50	72	40	75	43	77	45	80	48	80	48	74	42	68	36	**85**	**53**
16.2	82	50	72	40	75	43	77	45	80	48	80	48	74	42	67	35	**85**	**53**
14.4	84	52	74	42	73	41	77	45	77	45	77	45	73	41	68	36	**82**	**50**
16.4	84	52	74	42	73	41	77	45	78	46	78	46	74	42	69	37	**83**	**51**
18.4	85	53	76	44	77	45	79	47	79	47	81	49	74	42	68	36	**85**	**53**
20.4	86	54	76	44	79	47	80	48	79	47	83	51	75	43	67	35	**87**	**55**
24.4	87	55	77	45	80	48	80	48	82	50	84	52	78	46	71	39	**88**	**56**

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

Reference conditions: external air temperature 35°C; evaporator inlet/outlet water temperature 12/7°C; unit without accessories operating at nominal regime.

Lw: sound power levels. Lw Total is the only binding value. Tolerance in accordance with regulation 2016/2281.

Lp: sound pressure levels calculated from sound power levels, related to distance of 10 metres; source installed on a reflective surface in ideal free field conditions with directivity factor Q=2. Non-binding value; data (including Lp Total) are provided for illustrative purposes only and can not be used for forecasting purposes or for verification of mandatory limits.

CONFIGURATIONS THAT ARE NOT POSSIBLE

ZETA REV

	CHILLER ONLY								HEAT PUMP			
	/DC / 1P	/DC / 2P	/DC /1PS	/DC /2PS	/DS / 1P	/DS / 2P	/DS /1PS	/DS /2PS	HP /DS /1P	HP /DS /2P	HP /DS /1PS	HP /DS /2PS
3.2				n.a.				n.a.				n.a.
4.2				n.a.				n.a.				n.a.
5.2				n.a.				n.a.				n.a.
6.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
7.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
8.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
9.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
10.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
12.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
13.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
15.2	n.a.	n.a.	n.a.	n.a.								
16.2	n.a.	n.a.	n.a.	n.a.								
14.4	n.a.	n.a.	n.a.	n.a.					n.a.	n.a.	n.a.	n.a.
16.4	n.a.	n.a.	n.a.	n.a.					n.a.	n.a.	n.a.	n.a.
18.4	n.a.	n.a.	n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
20.4	n.a.	n.a.	n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
24.4	n.a.	n.a.	n.a.	n.a.			n.a.	n.a.			n.a.	n.a.

ZETA REV HE - ZETA REV SLN

	CHILLER ONLY								HEAT PUMP			
	/DC / 1P	/DC / 2P	/DC / 1PS	/DC / 2PS	/DS / 1P	/DS / 2P	/DS / 1PS	/DS / 2PS	HP /DS /1P	HP /DS /2P	HP /DS /1PS	HP /DS /2PS
3.2			n.a.	n.a.			n.a.	n.a.				n.a.
4.2			n.a.	n.a.			n.a.	n.a.				n.a.
5.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
6.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
7.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
8.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
9.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
10.2	n.a.	n.a.	n.a.	n.a.								
12.2	n.a.	n.a.	n.a.	n.a.								
13.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
15.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
16.2			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
14.4			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.
16.4			n.a.	n.a.			n.a.	n.a.			n.a.	n.a.

n.a.: configuration not available

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 (HCO_3^-)	70 ÷ 300 ppm
Sulphates (SO_4^{2-})	< 50 ppm
Hydrogen carbonate / Sulphates (HCO_3^-/SO_4^{2-})	> 1
Chlorides (Cl^-)	< 50 ppm
Nitrates (NO_3^-)	< 50 ppm
Hydrogen sulphide (H_2S)	< 0,05 ppm
Ammonia (NH_3)	< 0,05 ppm
Sulphites (SO_3), free chlorine (Cl_2)	< 1 ppm
Carbon dioxide (CO_2)	< 5 ppm
Metal cations	< 0,2 ppm
Manganese ions (Mn^{++})	< 0,2 ppm
Iron ions (Fe^{2+} , Fe^{3+})	< 0,2 ppm
Iron + Manganese	< 0,4 ppm
Phosphates (PO_4^{3-})	< 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 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

V_{min} is the minimum water content of the system measured in l

P_{tot} is the total cooling capacity of the machine measured in kW

N is the number of capacity reduction steps

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

ρ is the density of the heat-carrying fluid. Unless otherwise specified, the density of water is considered and therefore 1000kg/m³

c_p is the specific heat of the heat-carrying fluid. Unless otherwise specified, the specific heat of water is considered and therefore 4.186kJ/(kgK)

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.

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 reversible units or 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.

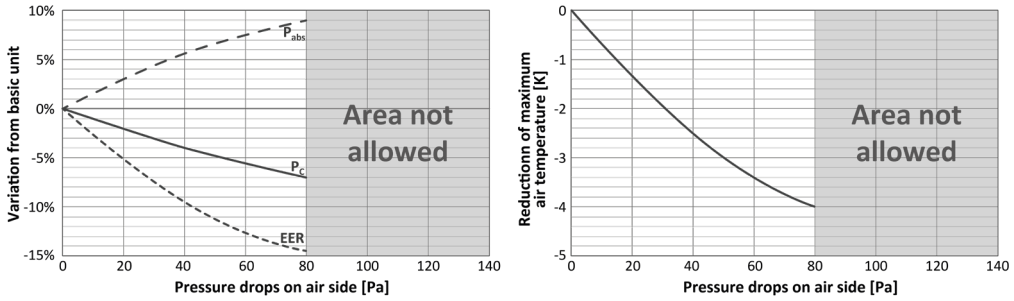
Aeraulic head losses and options available for the ventilating section

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.

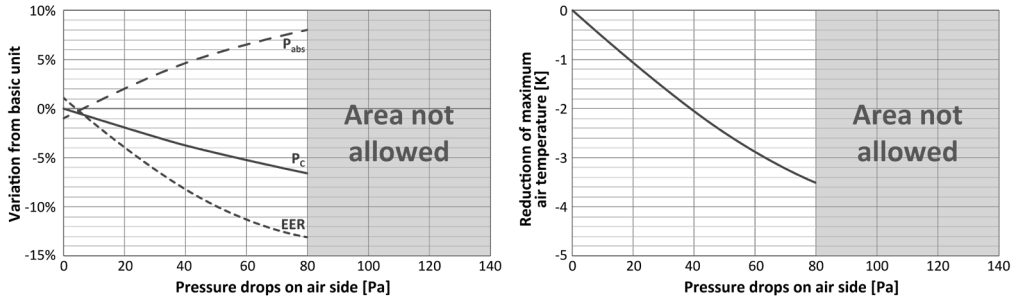
If there are obstacles to free air flow, you should consider the additional aeraulic head losses that will cause a reduction of the air flow rate and a consequent deterioration of performance.

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

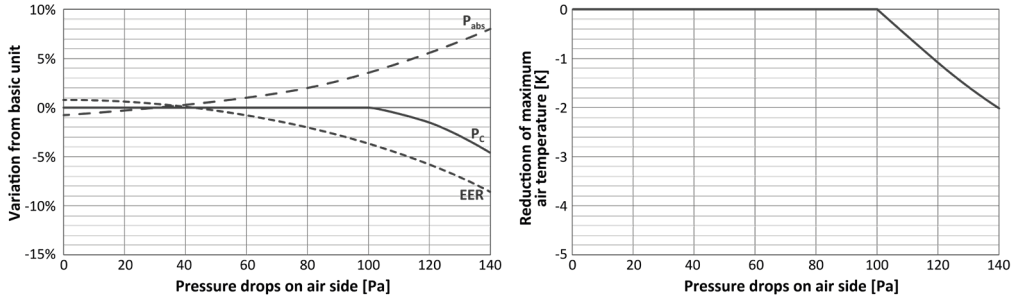
AC fans (Ø 800)



EC fans (Ø 800)



Oversize EC fans (Ø 800)



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

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

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