SIGMA SKY R7

30÷200 kW

General
Chillers and non-reversible heat pumps with low GWP refrigerant with scroll compressors and plate heat exchangers. Also available in inverter version for a specific capacity range. Extended range, versatile applications.

Configurations
Chiller: chiller with ON / OFF compressors

Hi: chiller with inverter compressor

OH: non-reversible heat pump

Hi OH: Non-reversible heat pump with inverter compressor

/XLN: Super low-noise unit

/DS: execution featuring a desuperheater

/DC: execution with recovery condenser

Strengths
- Conforming with Ecodesign Reg. 2281, tier 2
- High efficiency inverter version available
- Low GWP refrigerant: unit filled with R32
- New design: compact footprint for options with built-in hydraulic module
- Buffer tank (option)
- BlueThink advanced control with integrated web server. Multilogic function and Blueye® supervision system. (options)
- Flowzer: inverter driven pumps (options)

BlueBox by Swegon

SIGMA SKY R7

Sigma Sky R7 is a wide range of high efficiency reversible chillers and non reversible heat pumps, with hermetic scroll compressors and water source, suitable for both comfort and process applications.

In order to meet any and all requirements and to achieve the most challenging efficiency levels, Sigma Sky was designed to also include an inverter compressor and to come in a dedicated unit set-up for heating only and cooling only.

If compared to its predecessor Tetris W Rev, the furnishing elements of the Sigma Sky configuration are designed to be more compact and to maximise the reduction of the machine footprint, especially in configurations including the built-in hydraulic module.

REFRIGERANT

The models from the Sigma Sky series are available with refrigerant R32.

Acronym "R7" indicates the need to use refrigerant R32 and it shows that the refrigerant has a GWP level below 700.

Refrigerant R32 (GWP=677*)

The refrigerant consists in pure gas.

R32 is classified as a Group 1 fluid under PED.

It is also classified as A2L under the ASHRAE Standard 34, i.e.

- non-toxic;
- mildly flammable.

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

BODY

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

All screws and bolts are stainless steel.

Although they intended for installation in machinery rooms, the units from the Sigma Sky series are always enclosed within dedicated panels, which prevent access to the elements around the unit in all circumstances and contribute to correct reading by the refrigerant leak detection sensor (installed on the machine as standard) during unit operation. The panels serve as covering and protective elements and they are fully made with sheet metal coated with epoxy-polyester powder, colour RAL 7035. RAL 7035 .

COMPRESSORS

Sigma SKY R7 - Sigma SKY R7 OH R7 - Sigma SKY HPW R7

The compressors are hermetic, orbiting spiral scroll compressors connected in tandem, with either one or two circuits (coming soon). 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.

Sigma SKY Hi R7 - Sigma SKY Hi OH R7

Depending on the model, there are the following compressor configurations:

models with just one compressor (x.1) use a single modulating compressor

models with two compressors (x.2) use one modulating compressor connected in tandem with one ON/OFF compressor

The modulating compressors are hermetic scroll compressors with permanent-magnet brushless motor and are fitted with oil level sight glass.

The speed of the modulating compressor is varied, depending on the total heat load, roughly between 30 and 105 rps. 30rps and 105rps of its nominal capacity, which is referred to a speed of approx. 95 rps..

The speed of rotation of the compressor is variable in the range 1.800÷6.300 rpm.

The modulating compressors are controlled through DC inverter. This also has the following functions:

- management of acceleration and deceleration ramps
- management of the operating envelope of the modulating compressor
- management of the alarms and safety devices of the modulating compressor

The use of a modulating compressor allows the total inrush current to be reduced because it is always started with an acceleration ramp. In models with two compressors the ON/OFF compressors always get started with the modulating compressor operating at low speed so as to minimise the inrush current of the unit.

The ON/OFF compressors are hermetic orbiting spiral scroll compressors and are fitted with oil level sight glass.

For units with two compressors, there is also an oil equalization line.

USER-SIDE HEAT EXCHANGER

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

Models with 2 refrigerant circuits (coming soon) are fitted with a dual circuit heat exchanger and therefore with a single pair of hydraulic connections. This has allowed us to:

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

The heat exchanger is fitted with a temperature probe for protection against frost and a differential pressure switch for water flow control. .

A paddle flow switch is available as option for water flow control (supplied together with the unit).

SOURCE-SIDE HEAT EXCHANGER

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

Models with 2 refrigerant circuits are fitted with dual circuit heat exchanger and therefore with a single pair of hydraulic connections. (coming soon)

REFRIGERANT CIRCUIT

Sigma SKY R7 - Sigma SKY R7 OH R7 - Sigma SKY HPW R7

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

- valve on the liquid line
- charging valves
- liquid sight glass
- Weld-on filter drier
- electronically-controlled thermostatic expansion valve
- pressure transducers for reading the high and low pressure values and relevant evaporating and condensing temperatures
- User-side differential pressure switch
- pressostato di alta pressione

The units are fitted with an electronic expansion valve which helps the machine achieve stability more quickly and provides for better superheating control if compared to a mechanical expansion valve, thus maximising the use of the evaporator in all load conditions.

The evaporator and the compressor suction pipes are always isolated with an extruded closed-cell expanded elastomer. In OH and HPW versions the elastomer isolation above is also applied to the delivery pipes in the compressor and to the condenser.

Sigma SKY Hi R7 - Sigma SKY Hi OH R7

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- liquid sight glass
- Weld-on filter drier
- electronically-controlled thermostatic expansion valve
- pressure transducers for reading the high and low pressure values and relevant evaporating and condensing temperatures
- User-side differential pressure switch
- pressostato di alta pressione

The evaporator and the compressor suction pipes are always isolated with an extruded closed-cell expanded elastomer. In OH version the elastomer isolation above is also applied to the delivery pipes in the compressor and to the condenser.

ELECTRICAL CONTROL PANEL

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

The electrical control panel of the basic unit comprises:

- main disconnect switch
- automatic circuit breakers for compressors with fixed calibration
- fuses to protect the auxiliary circuits
- thermal magnetic circuit breakers for the pumps (if present)
- contactors for compressors and pumps (if present)
- phase monitor
- potential-free general alarm contacts
- single potential free operating contacts for compressors and pumps (if present)
- microprocessor controller with display accessible from the outside
- Warning lights used to warn about voltage being supplied to the leak test circuit, a malfunction of the refrigerant leak sensor, and a refrigerant leak alarm.

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

All cables are supplied with PG elements (cable glands) to increase the safety of the unit and at the same time to reduce the possibility of refrigerant spilling into the electrical panel should refrigerant leak.

The power supply of the unit is 400V/3~/50Hz or 400V/3~+N/50Hz depending on the model and the version

CONTROL BLUETHINK

The unit is supplied as standard with an advanced controller (applies to all versions).

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

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

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

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

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

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

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

Human-Machine Interface

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

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

CONTROLS AND SAFETY DEVICES

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

- high pressure switch with manual reset
- high pressure safety device with automatic reset, for a limited number of occurrences, managed by the controller
- high pressure safety valve conveyed outside the unit
- antifreeze probe at outlet of each evaporator
- compressor overtemperature protection
- mechanical paddle flow switch (supplied loose)
- Refrigerant leak detector calibrated for R32

TESTING

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

PACKAGING

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

The unit is wrapped in transparent polyethylene stretch film.

SAFETY DEVICE CHAIN

The unit is conceived and designed for installations inside machinery rooms, as classified in standard EN 378-1. The machinery room shall comply with the requirements laid down in standard EN 378-3. The unit is finally manufactured in compliance with standard EN 378-2, sect. 6.2.14, which specifies and safeguards every element for design compliance.

More specifically, in compliance with the requirements laid down in standard EN 378-2, sect. 6.2.14, the units of the Sigma Sky R7 range shall include the following:

- detailed study to prevent the occurrence of flammability conditions in the technical room;where possible, use of weld-on components to prevent potential leakage;isolation of the electrical panel aboard from the technical room in order to prevent all migration of refrigerant coming from the refrigerant circuit, which is a potential cause of flame ignition;safety valves routed to the outside of the unit;additional draining holes on the base of the frame in order to prevent the refrigerant concentration from achieving the LFL value (Low Flammability Limit) in the event of leakage;a refrigerant leak detector installed as standard, specifically calibrated for R32 refrigerant, and designed to continue to read in the event of leakage, provided that the leak is confined inside the panelled machine. It gets activated when 10% of the LFL value is achieved.

The two scenarios below may occur in the event of a refrigerant leak.

Scenario 1 - Refrigerant leak inside the unit

- The alarm relay in the sensor opens and, in so doing, it cuts off power to the unit, excepting the leak detector which continues to operate and to read the leakage status in the room.A (red) LED light goes on outside the electrical panel to warn about the leak. NOTE: provision is made for a potential-free contact to trigger the alarm.

Scenario 2 – Refrigerant leak outside the unit and inside the machinery room (or another indoor place where the unit is installed) Please note that:

- the installer is the sole person responsible for assessing the risk of flammability and for classifying the danger zone in the place of installation, as required by standard EN 378-3 and/or national and local regulations.The installer is the sole person responsible for establishing the safety measures required in the machinery room, including the installation of fans, refrigerant leak detectors, etc.The installer is the sole person responsible for switching the unit off using the potential-free contact before the leak reaches the unit and its electrical panel.

If the refrigerant leak detector is malfunctioning, the following situations may occur:

- the malfunction relay in the sensor opens and, in so doing, it cuts off power to the unit, excepting the leak detector which continues to operate and to read the leakage status in the room;a (yellow) LED light goes on outside the electrical panel to warn about the leak. NOTE: provision is made for a potential-free contact to trigger the alarm.

Where a black-out occurs, none of the elements in the unit are powered.

For the purpose of this document, a black-out is to be considered as a temporary and short-lasting condition. When power is restored, the sequence for the activation of all the elements, including the safety elements, gets restarted. The sensor performs its restart cycle (approx. 120 seconds), during which the circuit breaker is prevented from closing. At the end of this cycle, an additional min. span of time elapses (set in the timer) before the sensor can read correctly. If no leak or malfunction is identified at the end of this extra time, the circuit breaker closes and the unit can get restarted, according to the time set in the controller. Conditions of power missing for a long time (e.g. for extraordinary maintenance at the place of unit installation), which may last for several days also, are not be considered as a temporary black-out and they have to be treated as black-out conditions. In this case, when the unit is restarted, it is good practice to carry out a preventive inspection of the unit and a check for leaks.

VERSIONS

In the basic version, the unit is a high efficiency liquid chiller, but includes various types of set-up as an option to meet the requirements of all types of application.

R7: chiller

The standard Sigma Sky R7 unit is a non-reversible chiller for cooling only

OH R7: heat pump (heating only)

The OH unit is a non-reversible heat pump.

HPW R7: heat pump with hydronic-side reversal

The HPW unit is a heat pump that includes cycle reversal on the hydronic side of the system via special 3-way or 4-way reversing valves outside the unit (not supplied).

In addition to what is present in the basic version, the HPW set-up includes an OK signal in the terminal board for controlling the group of external reversing valves (not supplied).

Hi R7: inverter chiller

Unit with inverted-modulated compressor (cooling only)

Hi OH R7: inverter non-reversible heat pump

Unit with inverted-modulated compressor (heating only)

OPTIONS

/DC: unit with total recovery condenser

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

- a heat recovery condenser for recovering 100% of the condensation heat; The exchanger is a brazed plate heat exchanger
- temperature probe at the inlet of the heat recovery heat exchanger
- a liquid receiver for each refrigerant circuit

This set-up is not available for OH, HPW and HP units.

/DS: unit with partial heat recovery

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

The desuperheater can be used during operation in cooling mode. However, it can also be used in heating mode on condition that the following measures are taken:

- a valve (either 2- or 3-way) must be installed on the desuperheater water circuit;
- the valve must be monitored using a temperature control system;
- the valve must be operated to regulate the temperature of the input water into the desuperheater = IWTds.

First, enter the unit heating setpoint, which corresponds to the temperature of water delivered to the heating unit=LWTu_Heating. Then set the condition below:

- IWTds > LWTu_Heating + 10 [K]

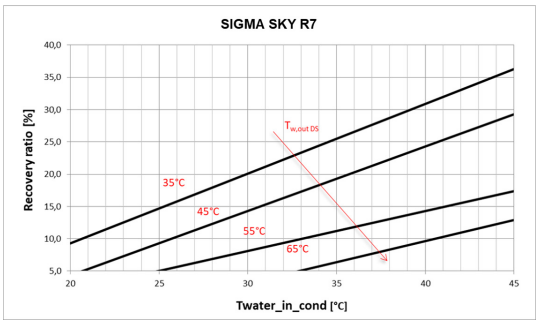
The valve, the control systems and their installation, setup operations, etc. are the responsibility of the client. If heat recovery is not required during operation in heat pump mode, or where the above requirements are not met, the water circuit of the desuperheater must be shut off. Desuperheater operation in heat pump mode reduces the heating capacity transferred from the unit to the user's hydronic circuit.

Below is an example graph where, as the condenser inlet temperature changes (Twater_in_cond) and as the temperature of the water leaving the heat recovery heat exchanger changes, (Tw,out DS), the percentage of recovered heat is shown as an indication (Recovery ratio).

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.



/XLN: super low noise unit

Units in XLN set-up are fully panelled with sheet metal panels coated with epoxy-polyester powder, colour RAL 7035. RAL 7035 and lined with matting made of sound absorbing and soundproofing material.

Compressors are provided with a cover jacket consisting of: 13 mm noise-absorbing material made with self-extinguishing polyester fibre on the compressor side - density 30 Kg/m³ -, soundproof rubber sheet - density 6 kg/m³ -, placed in-between the polyester layers, and an additional 5 mm layer of noise-absorbing material made with self-extinguishing polyester fibre on the sheath side - density 30 kg/m³. Max. total thickness: 20 mm

HYDRAULIC MODULES

All the units can be equipped with hydraulic module in various combinations on the user side, on the source side and in combination with the total heat recovery heat exchanger.

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
- 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

Hydraulic module combinations

The hydraulic circuit inside the unit is completely insulated with closed cell insulation material.

The technical choices made for the Sigma Sky range are such that:

- the selection of one pump (pump on source side) is not allowed;
- the number of pumps on the user side and on the source side is the same.

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

The hydraulic module on the user side can have the following configurations:

- /1P: hydraulic module with one pump
- /1PS: hydraulic module with one pump and buffer tank
- /2P: hydraulic module with two pumps
- /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, /1PMS, /2PM and /2PMS that have pumps with increased available discharge head

modules /1Pr, 1Prs/, /2Pr, and /2PrS with suitable pumps, having a reduced available head.

The pumps above can be combined with the following options on the source side:

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

The source side pumps are normally switched off and they are switched on a few seconds before the start of first compressor.

When reaching the set point, a few seconds after switching off the last compressor, the source side pumps are switched off again.

For the various set-ups refer to the table showing the versions that are not available.

TECHNICAL SPECIFICATIONS

SIGMA SKY R7

			4.2	5.2	6.2	7.2	8.2	9.2	11.2
Cooling									
Refrigeration capacity	(1)	kW	44,1	54,6	63,3	72,8	81,8	95,7	108,7
Total absorbed power	(1)	kW	9,1	11,1	12,9	15	16,9	19,7	22,2
EER	(1)		4,85	4,92	4,9	4,86	4,85	4,85	4,89
Compressors									
Compressors/Circuits		n°/n°	2/1	2/1	2/1	2/1	2/1	2/1	2/1
Minimum capacity reduction step	(2)	%	50	50	50	50	50	50	32
Refrigerant charge	(3)	kg	3,6	4,1	4,7	5,3	6,1	6,9	7,8
User-side heat exchanger									
Quantity		n°	1	1	1	1	1	1	1
Water flow rate	(1)	m³/h	7,6	9,4	10,9	12,5	14,1	16,5	18,7
Head loss	(1)	kPa	20,2	17	17	18	20	21	23
Source-side heat exchanger									
Quantity		n°	1	1	1	1	1	1	1
Water flow rate	(1)	m³/h	9,1	11,3	13,1	15	16,9	19,8	22,4
Head loss	(1)	kPa	17,6	20	21	23	24	26	27
Noise levels									
Sound power lev.	(4)	dB(A)	71	72	73	75	76	77	79
Sound pressure lev.	(5)	dB(A)	56	56	57	59	60	61	63
Sound power level XLN vers.	(4)	dB(A)	67	68	69	71	72	73	75
Sound pressure level XLN vers.	(5)	dB(A)	52	52	53	55	56	57	59
Dimensions and weights**									
Length		mm	1443	1490	1490	1490	1490	1490	1490
Depth		mm	795	795	795	795	795	795	795
Height		mm	1029	1900	1900	1900	1900	1900	1900
Operating weight		kg	362	513	529	559	573	590	635

SIGMA SKY R7

			12.2	14.2	15.2	17.2	19.2	20.2
Cooling								
Refrigeration capacity	(1)	kW	122,1	136,9	152,1	174,1	194,6	201,7
Total absorbed power	(1)	kW	24,8	28	31,2	35,5	40,2	41,5
EER	(1)		4,92	4,89	4,88	4,9	4,84	4,86
Compressors								
Compressors/Circuits		n°/n°	2/1	2/1	2/1	2/1	2/1	2/1
Minimum capacity reduction step	(2)	%	50	44	50	45	50	38
Refrigerant charge	(3)	kg	8,7	8,6	9,5	10,9	11,7	12,7
User-side heat exchanger								
Quantity		n°	1	1	1	1	1	1
Water flow rate	(1)	m³/h	21	23,6	26,2	30	33,5	34,8
Head loss	(1)	kPa	25	39,6	40,9	40	40,3	40,6
Source-side heat exchanger								
Quantity		n°	1	1	1	1	1	1
Water flow rate	(1)	m³/h	25,2	28,2	31,4	35,9	40,2	41,6
Head loss	(1)	kPa	33	24,9	25,6	26,9	27,6	28,6
Noise levels								
Sound power lev.	(4)	dB(A)	81	82	82	83	85	86
Sound pressure lev.	(5)	dB(A)	65	66	66	66	68	69
Sound power level XLN vers.	(4)	dB(A)	77	78	78	79	81	82
Sound pressure level XLN vers.	(5)	dB(A)	61	62	62	62	64	65
Dimensions and weights**								
Length		mm	1490	1490	1490	1686	1686	1686
Depth		mm	795	795	795	795	795	795
Height		mm	1900	1900	1900	1900	1900	1900
Operating weight		kg	671	677	690	839	943	878

(1) Source side heat exchanger inlet/outlet water temperature 30/35°C; user side heat exchanger 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) The indicated refrigerant charge is calculated. The refrigerant charge can vary according to different versions/accessories and product updates.

(4) Unit operating at nominal operating capacity, without any accessories, with source-side heat exchanger inlet-outlet water temperature 30-35°C and user-side heat exchanger inlet-outlet water temperature 12-7°C.Binding values. Values obtained from measures taken according to standard ISO 3744 and to the Eurovent certification programme where applicable.

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

** Basic unit without included accessories

SIGMA SKY OH R7

			4.2	5.2	6.2	7.2	8.2	9.2	11.2
Reheating									
Heating capacity	(1)	kW	51	63	73	84	94,4	110,4	125,1
Total absorbed power	(1)	kW	11,4	14	16,2	18,8	21,2	24,8	27,8
COP	(1)		4,46	4,49	4,49	4,47	4,46	4,46	4,51
Compressors									
Compressors/Circuits		n°/n°	2/1	2/1	2/1	2/1	2/1	2/1	2/1
Minimum capacity reduction step	(2)	%	50	50	50	50	50	50	43
Refrigerant charge	(3)	kg	3,6	4,1	4,7	5,3	6,1	6,9	7,8
User-side heat exchanger									
Quantity		n°	1	1	1	1	1	1	1
Water flow rate	(1)	m³/h	9	11	13	14	16	19	21
Head loss	(1)	kPa	16	18	19	21	22	24	25
Source-side heat exchanger									
Quantity		n°	1	1	1	1	1	1	1
Water flow rate	(1)	m³/h	11	14	16	19	21	25	28
Head loss	(1)	kPa	46	38	38	41	46	48	52
Noise levels									
Sound power lev.	(4)	dB(A)	71	72	73	75	76	77	79
Sound pressure lev.	(5)	dB(A)	56	56	57	59	60	61	63
Sound power level XLN vers.	(4)	dB(A)	67	68	69	71	72	73	75
Sound pressure level XLN vers.	(5)	dB(A)	52	52	53	55	56	57	59
Dimensions and weights**									
Length		mm	1443	1490	1490	1490	1490	1490	1490
Depth		mm	795	795	795	795	795	795	795
Height		mm	1029	1900	1900	1900	1900	1900	1900
Operating weight		kg	362	513	529	559	573	590	635

SIGMA SKY OH R7

			12.2	14.2	15.2	17.2	19.2	20.2
Reheating								
Heating capacity	(1)	kW	140,2	157,3	174,8	199,9	224,3	232,2
Total absorbed power	(1)	kW	30,8	35	38,9	44,7	50,7	51,7
COP	(1)		4,55	4,49	4,49	4,47	4,42	4,49
Compressors								
Compressors/Circuits		n°/n°	2/1	2/1	2/1	2/1	2/1	2/1
Minimum capacity reduction step	(2)	%	50	44	50	45	50	38
Refrigerant charge	(3)	kg	8,7	8,6	9,5	10,9	11,7	12,7
User-side heat exchanger								
Quantity		n°	1	1	1	1	1	1
Water flow rate	(1)	m³/h	24	27	30	34	39	40
Head loss	(1)	kPa	30	23	23	25	28	26
Source-side heat exchanger								
Quantity		n°	1	1	1	1	1	1
Water flow rate	(1)	m³/h	32	36	39	45	50	52
Head loss	(1)	kPa	57	90	93	91	101	92
Noise levels								
Sound power lev.	(4)	dB(A)	81	82	82	83	85	86
Sound pressure lev.	(5)	dB(A)	65	66	66	66	68	69
Sound power level XLN vers.	(4)	dB(A)	77	78	78	79	81	82
Sound pressure level XLN vers.	(5)	dB(A)	61	62	62	62	64	65
Dimensions and weights**								
Length		mm	1490	1490	1490	1686	1686	1686
Depth		mm	795	795	795	795	795	795
Height		mm	1900	1900	1900	1900	1900	1900
Operating weight		kg	671	677	690	839	943	878

(1) Source exchanger inlet-outlet water temperature 10/7 ° C; user exchanger inlet-outlet water temperature 40/45 ° 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) The indicated refrigerant charge is calculated. The refrigerant charge can vary according to different versions/accessories and product updates.

(4) Unit operating at nominal operating capacity, without any accessories, with source-side heat exchanger inlet-outlet water temperature 30-35°C and user-side heat exchanger inlet-outlet water temperature 12-7°C.Binding values. Values obtained from measures taken according to standard ISO 3744 and to the Eurovent certification programme where applicable.

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

** Basic unit without included accessories

SIGMA SKY HPW R7

			4.2	5.2	6.2	7.2	8.2	9.2	11.2
Cooling									
Refrigeration capacity	(1)	kW	44,1	54,6	63,3	72,8	81,8	95,7	108,7
Total absorbed power	(1)	kW	9,1	11,1	12,9	15	16,9	19,7	22,2
EER	(1)		4,85	4,92	4,9	4,86	4,85	4,85	4,89
Reheating									
Heating capacity	(2)	kW	51	63	73	84	94,4	110,4	125,1
Total absorbed power	(2)	kW	11,4	14	16,2	18,8	21,2	24,8	27,8
COP	(2)		4,46	4,49	4,49	4,47	4,46	4,46	4,51
Compressors									
Compressors/Circuits		n°/n°	2/1	2/1	2/1	2/1	2/1	2/1	2/1
Minimum capacity reduction step	(2)	%	50	50	50	50	50	50	43
Refrigerant charge	(6)	kg	3,6	4,1	4,7	5,3	6,1	6,9	7,8
User-side heat exchanger									
Quantity		n°	1	1	1	1	1	1	1
Water flow rate	(1)	m³/h	8	9	11	13	14	16	19
Head loss	(1)	kPa	20	17	17	18	20	21	23
Water flow rate	(2)	m³/h	11	14	16	19	21	25	28
Head loss	(2)	kPa	46	38	38	41	46	48	52
Source-side heat exchanger									
Quantity		n°	1	1	1	1	1	1	1
Water flow rate	(1)	m³/h	9	11	13	15	17	20	22
Head loss	(1)	kPa	18	20	21	23	24	26	27
Water flow rate	(2)	m³/h	9	11	13	14	16	19	21
Head loss	(2)	kPa	16	18	19	21	22	24	25
Noise levels									
Sound power lev.	(4)	dB(A)	71	72	73	75	76	77	79
Sound pressure lev.	(5)	dB(A)	56	56	57	59	60	61	63
Sound power level XLN vers.	(4)	dB(A)	67	68	69	71	72	73	75
Sound pressure level XLN vers.	(5)	dB(A)	52	52	53	55	56	57	59
Dimensions and weights**									
Length		mm	1443	1490	1490	1490	1490	1490	1490
Depth		mm	795	795	795	795	795	795	795
Height		mm	1029	1900	1900	1900	1900	1900	1900
Operating weight		kg	362	513	529	559	573	590	635

(1) Source side heat exchanger inlet/outlet water temperature 30/35°C; user side heat exchanger inlet/outlet water temperature 12/7°C. Values compliant with standard EN 14511

(2) Source exchanger inlet-outlet water temperature 10/7 ° C; user exchanger inlet-outlet water temperature 40/45 ° C. Values compliant with standard EN 14511

(3) The indicated refrigerant charge is calculated. The refrigerant charge can vary according to different versions/accessories and product updates.

(4) Unit operating at nominal operating capacity, without any accessories, with source-side heat exchanger inlet-outlet water temperature 30-35°C and user-side heat exchanger inlet-outlet water temperature 12-7°C.Binding values. Values obtained from measures taken according to standard ISO 3744 and to the Eurovent certification programme where applicable.

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

(6) 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 unit without included accessories

SIGMA SKY HPW R7

			12.2	14.2	15.2	17.2	19.2	20.2
Cooling								
Refrigeration capacity	(1)	kW	122,1	136,9	152,1	174,1	194,6	201,7
Total absorbed power	(1)	kW	24,8	28	31,2	35,5	40,2	41,5
EER	(1)		4,92	4,89	4,88	4,9	4,84	4,86
Reheating								
Heating capacity	(2)	kW	140,2	157,3	174,8	199,9	224,3	232,2
Total absorbed power	(2)	kW	30,8	35	38,9	44,7	50,7	51,7
COP	(2)		4,55	4,49	4,49	4,47	4,42	4,49
Compressors								
Compressors/Circuits		n°/n°	2/1	2/1	2/1	2/1	2/1	2/1
Minimum capacity reduction step	(2)	%	50	44	50	45	50	38
Refrigerant charge	(6)	kg	8,7	8,6	9,5	10,9	11,7	12,7
User-side heat exchanger								
Quantity		n°	1	1	1	1	1	1
Water flow rate	(1)	m³/h	21	24	26	30	34	35
Head loss	(1)	kPa	25	40	41	40	40	41
Water flow rate	(2)	m³/h	32	36	39	45	50	52
Head loss	(2)	kPa	57	90	93	91	101	92
Source-side heat exchanger								
Quantity		n°	1	1	1	1	1	1
Water flow rate	(1)	m³/h	25	28	31	36	40	42
Head loss	(1)	kPa	33	25	26	27	28	29
Water flow rate	(2)	m³/h	24	27	30	34	39	40
Head loss	(2)	kPa	30	23	23	25	28	26
Noise levels								
Sound power lev.	(4)	dB(A)	81	82	82	83	85	86
Sound pressure lev.	(5)	dB(A)	65	66	66	66	68	69
Sound power level XLN vers.	(4)	dB(A)	77	78	78	79	81	82
Sound pressure level XLN vers.	(5)	dB(A)	61	62	62	62	64	65
Dimensions and weights**								
Length		mm	1490	1490	1490	1686	1686	1686
Depth		mm	795	795	795	795	795	795
Height		mm	1900	1900	1900	1900	1900	1900
Operating weight		kg	671	677	690	839	943	878

(1) Source side heat exchanger inlet/outlet water temperature 30/35°C; user side heat exchanger inlet/outlet water temperature 12/7°C. Values compliant with standard EN 14511

(2) Source exchanger inlet-outlet water temperature 10/7 ° C; user exchanger inlet-outlet water temperature 40/45 ° C. Values compliant with standard EN 14511

(3) The indicated refrigerant charge is calculated. The refrigerant charge can vary according to different versions/accessories and product updates.

(4) Unit operating at nominal operating capacity, without any accessories, with source-side heat exchanger inlet-outlet water temperature 30-35°C and user-side heat exchanger inlet-outlet water temperature 12-7°C.Binding values. Values obtained from measures taken according to standard ISO 3744 and to the Eurovent certification programme where applicable.

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

(6) 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 unit without included accessories

SIGMA SKY Hi R7

			4.1	6.1	8.2	10.2	12.2
Cooling							
Refrigeration capacity	(1)	kW	39,6	58,9	80,4	103,2	123,4
Total absorbed power	(1)	kW	8,4	12,4	17	21,8	26
EER	(1)		4,72	4,76	4,72	4,74	4,75
Compressors							
Compressors/Circuits		n°/n°	1/1	1/1	2/1	2/1	2/1
Minimum capacity reduction step	(2)	%	14	17	7	10	9
Refrigerant charge	(3)	kg	3,6	5	6,1	7,7	8,2
User-side heat exchanger							
Quantity		n°	1	1	1	1	1
Water flow rate	(1)	m³/h	6,8	10,1	13,8	17,8	21,3
Head loss	(1)	kPa	20,2	23,3	20	24	25
Source-side heat exchanger							
Quantity		n°	1	1	1	1	1
Water flow rate	(1)	m³/h	8,2	12,2	16,7	21,4	25,6
Head loss	(1)	kPa	17,6	22,3	24	27	33
Noise levels							
Sound power lev.	(4)	dB(A)	84	85	85	86	87
Sound pressure lev.	(5)	dB(A)	69	70	69	70	71
Sound power level XLN vers.	(4)	dB(A)	80	81	81	82	83
Sound pressure level XLN vers.	(5)	dB(A)	65	66	65	66	67
Dimensions and weights**							
Length		mm	1443	1443	1490	1490	1490
Depth		mm	795	795	795	795	795
Height		mm	1029	1029	1900	1900	1900
Operating weight		kg	333	341	606	649	708

(1) Source side heat exchanger inlet/outlet water temperature 30/35°C; user side heat exchanger 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) The indicated refrigerant charge is calculated. The refrigerant charge can vary according to different versions/accessories and product updates.

(4) Unit operating at nominal operating capacity, without any accessories, with source-side heat exchanger inlet-outlet water temperature 30-35°C and user-side heat exchanger inlet-outlet water temperature 12-7°C.Binding values. Values obtained from measures taken according to standard ISO 3744 and to the Eurovent certification programme where applicable.

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

** Basic unit without included accessories

SIGMA SKY Hi OH R7

			4.1	6.1	8.2	10.2	12.2
Heating							
Heating capacity	(1)	kW	46	68,3	93,4	120	142,9
Total absorbed power	(1)	kW	10,3	15,2	20,9	26,8	31,6
COP	(1)		4,28	4,3	4,35	4,41	4,24
Compressors							
Compressors/Circuits		n°/n°	1/1	1/1	2/1	2/1	2/1
Minimum capacity reduction step	(2)	%	14	17	7	10	9
Refrigerant charge	(3)	kg	3,6	5	6,1	7,7	8,2
User-side heat exchanger							
Quantity		n°	1	1	1	1	1
Water flow rate	(1)	m³/h	4,1	6,1	8,3	10,7	12,8
Head loss	(1)	kPa	12,3	18,3	25	32,1	38,4
Source-side heat exchanger							
Quantity		n°	1	1	1	1	1
Water flow rate	(1)	m³/h	3,4	5,1	6,9	8,9	10,6
Head loss	(1)	kPa	10,9	16,2	22,1	28,5	34
Noise levels							
Sound power lev.	(4)	dB(A)	84	85	85	86	87
Sound pressure lev.	(5)	dB(A)	68,5	69,5	68,5	69,5	70,5
Sound power level XLN vers.	(4)	dB(A)	80	81	81	82	83
Sound pressure level XLN vers.	(5)	dB(A)	64,5	65,5	64,5	65,5	66,5
Dimensions and weights**							
Length		mm	1443	1443	1490	1490	1490
Depth		mm	795	795	795	795	795
Height		mm	1029	1029	1900	1900	1900
Operating weight		kg	333	341	606	649	708

(1) Source exchanger inlet-outlet water temperature 10/7 ° C; user exchanger inlet-outlet water temperature 40/45 ° 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) The indicated refrigerant charge is calculated. The refrigerant charge can vary according to different versions/accessories and product updates.

(4) Unit operating at nominal operating capacity, without any accessories, with source-side heat exchanger inlet-outlet water temperature 30-35°C and user-side heat exchanger inlet-outlet water temperature 12-7°C.Binding values. Values obtained from measures taken according to standard ISO 3744 and to the Eurovent certification programme where applicable.

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

** Basic 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.

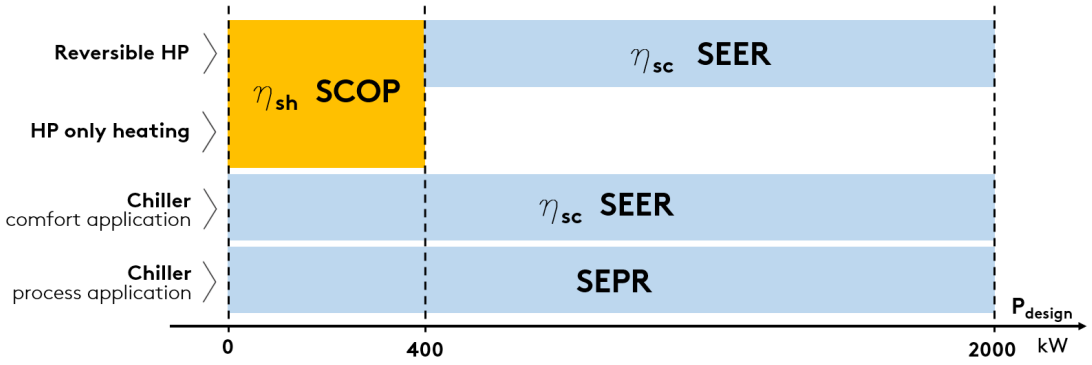
The other two regulations (2013/813 and 2016/2281) set seasonal efficiency targets that the products must comply with to be sold and installed in the European Union (essential requirement for CE marking).

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	4,975	200	5,075
water	≥ 400kW and < 1500kW	227	5,75	252	6,375
water	≥ 1500kW	245	6,2	272	6,875

REGULATION 2016/2281, process application

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

REGULATION 2013/813

SOURCE	APPLICATION	MINIMUM REQUIREMENT	
		ηsh [%]	**SCOP**
air	low temperature application	125	3,2
water	low temperature application	125	3,325
air	medium temperature application	110	2,825
water	medium temperature application	110	2,95

The conformity of the product must be checked according to the type of application, whether comfort or process, and at the required outlet water temperature.

The two schematic tables below, respectively for comfort application and for process application, indicate the reference of the required conformity according to the type of product and the set point temperature (reference to regulations 2016/2281 and 2013/813).

Important note: for mixed comfort and process applications, the reference application for conformity is the comfort application.

COMFORT APPLICATION

PRODUCT	OUTLET WATER TEMPERATURE	COMPLIANCE INDEX	REGULATION
Chiller	< 18°C	SEER/ηsc low temperature application	2016/2281
	≥ 18°C	SEER/ηsc medium temperature application	2016/2281
Heat pumps (reversible and only heating) Pdesign≤400kW		SCOP/ηsh	2013/813
Reversible heat pumps Pdesign>400kW	< 18°C	SEER/ηsc low temperature application	2016/2281
	≥ 18°C	SEER/ηsc medium temperature application	2016/2281
Heat pumps only heating Pdesign>400kW		-	-

PROCESS APPLICATION

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

- = exemption from Ecodesign

Some specifications and notes follow.

Partly completed machinery

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

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

SIGMA SKY RANGE

As regards, specifically, the Sigma Sky range, below the regulations of interest for the different units in the different configurations.

Sigma Sky R7 and Sigma Sky Hi R7:

- regulation 2016/2281

Sigma Sky HPW:

- regulation 2013/813 and 2013/811 for units from size 4.2 to 7.2
- regulation 2013/813 for the remaining units

Sigma Sky OH:

- regulation 2013/813 and 2013/811 for units from size 4.2 to 7.2
- regulation 2013/813 for the remaining units

Sigma Sky Hi OH R7 :

- regulation 2013/813 and 2013/811 for units from size 4.1 to 6.1
- regulation 2013/813 for the remaining units

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

SIGMA SKY R7

			4.2	5.2	6.2	7.2	8.2	9.2	11.2	12.2	14.2	15.2	17.2	19.2	20.2
REGULATION 2016/2281															
Pdesign	(1)	kW	44,1	54,6	63,3	72,8	81,8	95,7	108,7	122,1	136,9	152,1	174,1	194,6	201,7
COMFORT															
ηsc	(1)	%	213	212	213	223	224	225	227	221	223	221	224	227	226
SEER	(1)		5,4	5,37	5,39	5,64	5,66	5,7	5,76	5,6	5,65	5,59	5,68	5,75	5,72
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
PROCESS															
SEPR	(3)		(RFQ)	(RFQ)	(RFQ)	(RFQ)	(RFQ)	(RFQ)	(RFQ)	(RFQ)	(RFQ)	(RFQ)	(RFQ)	(RFQ)	(RFQ)
Compliance Tier 2 (2021)	(3)		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

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

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

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

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

SIGMA SKY OH R7

			4.2	5.2	6.2	7.2	8.2	9.2	11.2	12.2	14.2	15.2	17.2	19.2	20.2
REGULATION 2013/813															
Low Temperature Application															
Pdesign	(1)	kW	52,6	64,7	75	86,8	97,5	114,1	129,5	145,3	163,1	181,2	207,1	232,1	240,7
ηsh	(1)	%	220	221	223	222	220	221	222	222	221	219	219	219	218
SCOP	(1)		5,71	5,73	5,77	5,74	5,7	5,71	5,76	5,74	5,71	5,69	5,68	5,67	5,64
Compliance	(1)		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Medium Temperature Application															
Pdesign	(2)	kW	49,5	60,9	70,6	81,4	91,5	107,1	121,1	135,6	152,6	169,6	194,2	218,7	224,6
ηsh	(2)	%	176	179	180	176	175	175	179	180	182	181	179	177	181
SCOP	(2)		4,595	4,68	4,7025	4,5875	4,57	4,5625	4,6675	4,705	4,74	4,7225	4,6725	4,63	4,725
Compliance	(2)		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
REGULATION 2013/811															
Ecolabel LT	(3)		A+++	A+++	-	-	-	-	-	-	-	-	-	-	-
Ecolabel MT	(4)		A+++	A+++	-	-	-	-	-	-	-	-	-	-	-

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 30/35°C, Average climate profile, with reference to regulation 2013/813 and norm EN 14825.

(2) User exchanger water inlet / outlet temperature 47/55 ° C (SCOP MT), Average climate profile, with reference to regulation 2013/813 and to EN 14825.

(3) Energy efficiency class with reference to regulation 2013/811, conditions of note (1) - (low temperature applications).

(4) Energy efficiency class in reference to regulation 2013/811, conditions of note (2) - (medium temperature applications).

SIGMA SKY HPW R7

			4.2	5.2	6.2	7.2	8.2	9.2	11.2	12.2	14.2	15.2	17.2	19.2	20.2
REGULATION 2013/813															
Low Temperature Application															
Pdesign	(1)	kW	52,6	64,7	75	86,8	97,5	114,1	129,5	145,3	163,1	181,2	207,1	232,1	240,7
ηsh	(1)	%	220	221	223	222	220	221	222	222	221	219	219	219	218
SCOP	(1)		5,71	5,73	5,77	5,74	5,7	5,71	5,76	5,74	5,71	5,69	5,68	5,67	5,64
Compliance	(1)		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Medium Temperature Application															
Pdesign	(2)	kW	49,5	60,9	70,6	81,4	91,5	107,1	121,1	135,6	152,6	169,6	194,2	218,7	224,6
ηsh	(2)	%	176	179	180	176	175	175	179	180	182	181	179	177	181
SCOP	(2)		4,595	4,68	4,7025	4,5875	4,57	4,5625	4,6675	4,705	4,74	4,7225	4,6725	4,63	4,725
Compliance	(2)		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
REGULATION 2013/811															
Ecolabel LT	(3)		A+++	A+++	-	-	-	-	-	-	-	-	-	-	-
Ecolabel MT	(4)		A+++	A+++	-	-	-	-	-	-	-	-	-	-	-

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 30/35°C, Average climate profile, with reference to regulation 2013/813 and norm EN 14825.

(2) User exchanger water inlet / outlet temperature 47/55 ° C (SCOP MT), Average climate profile, with reference to regulation 2013/813 and to EN 14825.

(3) Energy efficiency class with reference to regulation 2013/811, conditions of note (1) - (low temperature applications).

(4) Energy efficiency class in reference to regulation 2013/811, conditions of note (2) - (medium temperature applications).

SIGMA SKY Hi R7

			4.1	6.1	8.2	10.2	12.2
REGULATION 2016/2281							
Pdesign	(1)	kW	39,6	58,9	80,4	103,2	123,4
COMFORT							
ηsc	(1)	%	235	249	239	249	241
SEER	(1)		5,96	6,3	6,06	6,3	6,09
Compliance Tier 2 (2021)	(1)		Y	Y	Y	Y	Y
PROCESS							
SEPR	(3)		(RFQ)	(RFQ)	(RFQ)	(RFQ)	(RFQ)
Compliance Tier 2 (2021)	(3)		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.

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

SIGMA SKY Hi OH R7

			4.1	6.1	8.2	10.2	12.2
REGULATION 2013/813							
Low Temperature Application							
Pdesign	(1)	kW	46	68,3	93,4	120	142,9
ηsh	(1)	%	231	232	226	232	228
SCOP	(1)		5,98	6	5,85	5,99	5,89
Compliance	(1)		Y	Y	Y	Y	Y
Medium Temperature Application							
Pdesign	(2)	kW	45	66,7	90,9	116,7	138,6
ηsh	(2)	%	180	184	185	186	187
SCOP	(2)		4,71	4,79	4,83	4,86	4,86
Compliance	(2)		Y	Y	Y	Y	Y
REGULATION 2013/811							
Ecolabel LT	(3)		A+++	-	-	-	-
Ecolabel MT	(4)		A+++	A+++	-	-	-

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 30/35°C, Average climate profile, with reference to regulation 2013/813 and norm EN 14825.

(2) User exchanger water inlet / outlet temperature 47/55 ° C (SCOP MT), Average climate profile, with reference to regulation 2013/813 and to EN 14825.

(3) Energy efficiency class with reference to regulation 2013/811, conditions of note (1) - (low temperature applications).

(4) Energy efficiency class in reference to regulation 2013/811, conditions of note (2) - (medium temperature applications).

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
	1,2 ÷ 3,4 °d
Langelier index	- 0,4 ÷ 0,4
pH	7,5 ÷ 8,5
Electrical conductivity	10÷500 µS/cm
Organic elements	-
Hydrogen carbonate (HCO3-)	70 ÷ 300 ppm
Sulphates (SO42-)	< 50 ppm
Hydrogen carbonate / Sulphates (HCO3-/SO42-)	> 1
Chlorides (Cl-)	< 50 ppm
Nitrates (NO3-)	< 50 ppm
Hydrogen sulphide (H2S)	< 0,05 ppm
Ammonia (NH3)	< 0,05 ppm
Sulphites (SO3), free chlorine (Cl2)	< 1 ppm
Carbon dioxide (CO2)	< 5 ppm
Metal cations	< 0,2 ppm
Manganese ions (Mn++)	< 0,2 ppm
Iron ions (Fe2+ , Fe3+)	< 0,2 ppm
Iron + Manganese	< 0,4 ppm
Phosphates (PO43-)	< 2 ppm
Oxygen	< 0,1 ppm

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

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

Glycol mixtures

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

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

The quantity of antifreeze should be considered as % on weight

Minimum water content in the system

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

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

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

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

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

Installation site

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

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

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

- its dimensions must be proportionate to those of the unit: if possible, longer and wider than the unit by at least 30 cm and 15/20cm higher than the surrounding surface
- it must be able to bear at least 4 times the operating weight of the unit
- must allow the unit to be installed in a level position

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

TC_0000_SS_EN_Rev01_20220110

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