

TECHNICAL SELECTION

Software version: ELCA World v. 1.6.1.0

User: Tim Cheng

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 HEATING COOLING

TECHNICAL SELECTION

FOCS-N /LN-CA 2622

Reversible unit, air source for outdoor installation

 R HFC R-134a SCREW

Code	FOCS-N /LN-CA 2622	
Version	LN-CA	
Size	2622	
Power supply	V/ph/Hz	400/3/50

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1.1 Standard unit composition

Reversible unit, air source for outdoor installation

Outdoor heat pump unit for the production of chilled/hot water with semi-hermetic screw compressors optimized for R134a, axial-flow fans, external coil with copper tubes and aluminium fins, shell and tubes heat exchanger designed by Mitsubishi Electric Hydronics & IT Cooling Systems S.p.A. and electronic expansion valve.

Base and supporting structure and panels are made of galvanized epoxy powder coated steel with increased thickness.

These units are designed for two-pipes systems and are able to produce hot or cold water according to the selected operation mode; the precise thermoregulation guarantees an optimal response to load variations, in every operating conditions.

Structure

Base and frame in galvanized steel. The supporting frame are polyester-painted for the highest resistance to external factors: surfaces' hue and brightness are preserved. In silenced versions, pipes and compressors' box are covered with an acoustic layer to reduce global noise emissions.

UNIT DESCRIPTION

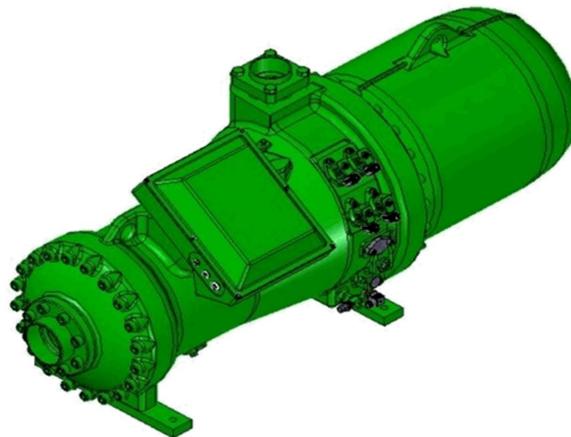
Data Book

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Compressor

New semi-hermetic screw compressors designed for high efficiency both at full and partial load.

Semi-hermetic screw compressors with 2 five- and six-lobe rotors: the five-lobe rotor is splined directly onto the motor (nominal speed 2950 rpm) without the use of interposed gears. The bearings provided along the rotor axis in a separate chamber isolated from the compression chamber are made in carbon steel. Each compressor is provided with an inlet for refrigerant injection (for the extension of operating limits) and the use of the economizer (for the output capacity and efficiency's increase). Optimized lubrication guarantees oil's distribution between mechanical parts, without using an oil pump; the built-in oil separator has 3 stages of separation, and a 10 mm stainless steel mesh filter ensures the constant presence of oil inside. Cooling power is partialized by a slide valve, which depending on the position assumed, permits a stepless compression chamber reduction; each compressor can therefore smoothly partialize from 25% to 100% of its capacity. The two pole motors are fitted as standard with electric devices to limit the absorbed current during compressor start-up, and with empty start-up. Each compressor is fitted with manual-reset motor thermal protection, delivery gas temperature and oil level controls and an electric resistance for the carter's heating while the compressor is stopped. A check valve fitted on the refrigerant delivery line prevents the rotors from reversing after stopping. On-off cocks on the delivery line of each compressor to isolate the refrigerant charge in the heat exchanger when required.



Plant side heat exchanger

Shell and tube heat exchanger; it acts as an evaporator or as a condenser depending to the unit's commutation; refrigerant flows inside the pipes and water flow on the shell side. The tubes have asymmetrical flows that maintain the correct speed of the refrigerant in the tubes during phase transition. The water flows on the shell side is fitted with baffles to increase turbulence and therefore the efficiency of exchange. The steel shell has external foamed closed-cell elastomer insulating lining 10 mm thick and thermal conductivity of 0.033 W/mK at 0°C. The tube nest is manufactured using copper tubes with internal grooves for favouring heat exchange and mechanically expanded onto the tube plates. The heat exchanger is fitted with a differential pressure switch which controls the flow of water when the unit is working, in this way preventing anomalies and overheating. The heat exchanger is made in compliance with PED standard work pressure requisites.

Source side heat exchanger

Air-refrigerant heat exchanger, working as a condenser or an evaporator depending to the specific operating mode. Made with copper tubes and aluminium fins. The aluminium fins are spaced to guarantee the best heat exchange efficiency. The lower part of the exchanger works as a subcooling circuit increasing the cooling capacity, when it is working as a condenser.

UNIT DESCRIPTION

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Fan section source side

From size 2022 to 2622 (all versions): axial electric fans, system of protection IP54 and "F" insulation class, with external rotor, profiled blades, housed in aerodynamic hoods complete with guard grille. 6-poles electric motor with built-in thermal protection. Variable Speed low-temperature Device (DVV) to control condensation adjusting the rotational speed with voltage steps (auto-transformer) is standard for all versions.

From size 2722 to 4822 (all versions): electronically commutated fans (EC fans). The brushless motor, governed by a special controller, continuously adjust fans' speed to minimize energy consumption, electromagnetic noises and current's absorption even during start-up phase.

Refrigerant circuit

The unit has two completely independent cooling circuits in order to ensure continuous operation, limited pollution, and easy maintenance.

Each cooling circuit is fitted as standard with:

- economizers
- Electronic expansion valve
- reversing cycle valve
- high and low pressure safety valve
- high and low pressure transducers
- check valve on the compressor delivery line
- on-off cock on the compressor's suction and delivery line and on the refrigerant line
- Liquid line solenoid valve
- drier filter with replaceable cartridge
- refrigerant line sight glass with humidity indicator
- High pressure switches
- Liquid receivers
- Liquid separators

Electrical and control panel

Electrical and control panel built in accordance with EN60204-1 standard, complete with:

The unit is supplied fully refrigerant charged and factory tested. On site installation only requires power and hydraulic connection.

- control circuit transformer
- general door lock isolator
- power circuit with electric bus bar distribution system
- fuses and contactors for compressors and fans
- terminals for cumulative alarm block
- remote ON/OFF terminals
- spring-type control circuit terminal board
- phases sequence and minimum/maximum voltage control
- electrical heaters on external coils (only on CA, LN-CA, SL-CA versions)

Power supply 400V/3ph/50Hz with star/delta start

Certification and applicable directives

The unit complies with the following directives and relative amendments:

- EUROVENT Certification program
- CE - Declaration of conformity certificate for the European Union
- EAC - Product quality certificate for Russian Federation
- SAFETY QUALITY LICENCE - Product quality certificate for Popular Republic of China

UNIT DESCRIPTION

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- M&I - Product quality certificate for Australia and New Zealand
- Machine directive 2006/42/EC
- PED directive 2014/68/EU
- Low Voltage directive 2006/95/EC
- ElectroMagnetic compatibility directive 2004/108/EC
- ISO 9001 - Company Quality Management System certification
- ISO 14001 - Company Environmental Management System certification

Tests

Tests performed throughout the production process, as indicated in ISO9001.

Performance or noise tests can be performed by highly qualified staff in the presence of customers.

Performance tests comprise the measurement of:

- electrical data
- water flow rates
- working temperatures
- power input
- power output
- pressure drops on the water-side exchanger both at full load (at the conditions of selection and at the most critical conditions for the condenser) and at part load conditions.

During performance testing it is also possible to simulate the main alarm states.

Noise tests are performed to check noise emissions according to ISO9614.

1.2 Versions

/B – Basic version

Standard unit

/CA - Class A of efficiency

Class A of efficiency as per Eurovent (in heating mode).

/LN-CA - Low Noise, Class A of efficiency

Class A low-noise, in accordance with Eurovent.

This configuration features special soundproofing for the compressor chamber and pumps (if present) and a reduced fan speed.

/SL-CA - Super Low noise, Class A of efficiency

Super low-noise version, Class A of efficiency as per Eurovent.

Acoustic insulation on the compressors box, on pipes and a low fans' rotational speed gives the minimization of sound emission.

1.3 Configurations

- , standard unit

Reversible standard unit for production of chilled/hot water according to the selected operation mode.

/D, unit with partial heat recovery

Unit for the production of water for the primary circuit and for sanitary purposes.

This version features an additional water/coolant heat exchanger on the gas delivery line, fitted in series with the traditional cooling circuit condenser. This allows to recover the de-superheating heat for the production of medium-to-high temperature water (secondary or recovery circuit). Hot water can be produced in the recovery circuit for domestic hot water and the like both in summer and winter. The heating capacity of this circuit is approximately equal to the power input of the compressor.

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2.1 PERFORMANCE AT DESIGN CONDITIONS

RUNNING CONDITIONS

COOLING

HEAT EXCHANGER USER SIDE

Fluid type		WATER
Glycol	%	0
Fouling factor	m ² K/kW	0.000
Fluid inlet temperature (cooling mode)	°C	12.00
Fluid outlet temperature (cooling mode)	°C	7.00
Water flow	l/s	26.97
Pressure drop at the heat exchanger	kPa	24.5
Available unit head	kPa	0.00

OUTDOOR CONDITION

Air temperature (cooling mode)	°C	35.0
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HEATING

HEAT EXCHANGER USER SIDE

Fluid type		WATER
Glycol	%	0
Fouling factor	m ² K/kW	0.000
Fluid inlet temperature (heating mode)	°C	50.00
Fluid outlet temperature (heating mode)	°C	55.00
Water flow	l/s	21.53
Pressure drop at the heat exchanger	kPa	15.6
Available unit head	kPa	0.00

OUTDOOR CONDITION

Air temperature (heating mode)	°C	-5.0
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COOLING (EN 14511)

Cooling capacity	kW	562.8
Compressor power input	kW	191.0
Fans power input (cooling mode)	kW	14.40
Total power input	kW	206.9
EER	kW/kW	2.720
ESEER EN 14511	kW/kW	3.850

HEATING (EN14511)

Total heating capacity	kW	398.7
Compressors power input (heating mode)	kW	187.2
Fan power input (heating mode)	kW	14.40
Total power input	kW	198.4
COP	kW/kW	2.010

SCOP

The performance shown are obtained from theoretical calculations and tolerances will apply. Rpt.version: 1.0.6.0

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SCOP Official (Reg. 813/2013 EU)

LOW TEMPERATURE

Type climate		Average
Temperature application	°C	35
Type flow		Fixed
Type Temperature		Variable
Bivalent temperature	°C	-9.0
PDesign	kW	387
Qhe	kWh	223040
SCOP		3.58
Performance η_s	%	140
Seasonal efficiency class		-

SCOP Editable (EN 14825)

MEDIUM TEMPERATURE

Type climate		Colder	Average	Warmer
Temperature application	°C	0.00	0.00	55.00
Type flow		-	-	Fixed
Type Temperature		-	-	Variable
Bivalent temperature	°C	0.0	0.0	2.0
PDesign	kW	0.00	0.00	471
Qhe	kWh	0	0	181574
SCOP		0.00	0.00	3.46
Performance η_s	%	0	0	136
Seasonal efficiency class		-	-	-

Note

Any SCOP values different from what is reported in commercial documentations are due to the different configuration of the unit and/or different calculation parameters input by the user.

2.2 EFFICIENCIES

ESEER (EN 14511 VALUE)

Load	%	100	75	50	25
Outdoor air temperature	°C	35.0	30.0	25.0	20.0
Temp. evaporator inlet	°C	12.00	10.75	9.50	8.51
Temp. evaporator outlet	°C	7.00	7.00	7.00	7.00
Evaporator water flow	l/s	26.97	26.97	26.97	26.97
Cooling capacity	kW	562.8	422.1	281.4	140.7
Total power input	kW	206.6	118.0	70.90	33.80
EER	kW/kW	2.720	3.580	3.970	4.170
ESEER EN14511 CALCULATED	kW/kW			3.850	
ESEER	kW/kW			3.850	

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2.3 EXCHANGERS

HEAT EXCHANGER USER SIDE

Typology		SHELL&TUBE
Quantity	N°	1
Type of connections		FLEXIBLE JOINT
Diameter of connections		8"
Min flow	l/s	18.86
Max flow	l/s	51.72
Heat exchanger water content	l	268
Minimum water content admitted in the plant	l	2100

2.4 FANS

Fans type		AXIAL
Quantity	N°	12
Total fans power input	kW	14.40
F.L.I.	kW	12x2
F.L.A.	A	12x3.8

COOLING

Total fans power input	kW	14.40
Air flow	m³/s	46.03
Available static pressure	Pa	0

HEATING

Total fans power input	kW	14.40
Air flow	m³/s	46.03
Fan available static pressure	Pa	0

2.5 COMPRESSORS

COMPRESSORS

Compressor type		SCREW
Compressors nr.	N°	2
No. Circuits	N°	2
Number of capacity steps	N°	0
Min. capacity step	%	25
Regulation		STEPLESS
Oil charge	kg	44.0
F.L.I. - Max absorbed power	kW	2x113.6
F.L.A. - Max absorbed current	A	2x186.7
L.R.A. - Locked rotor amperes for single compressor	A	2x314

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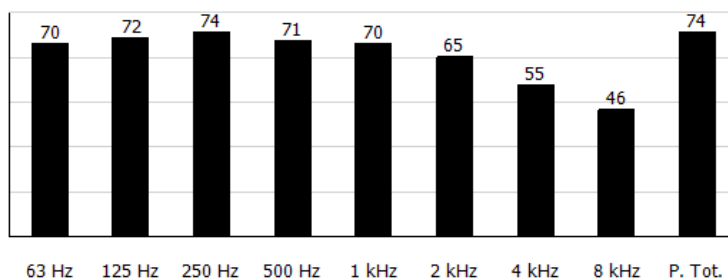
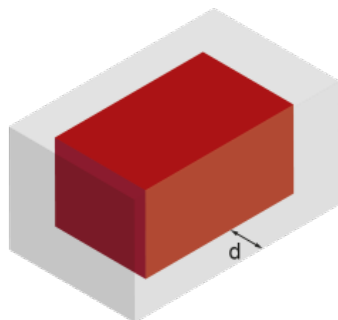
REFRIGERANT

Refrigerant		R134a
Theoretical refrigerant charge	kg	266
GWP100 value (from IPCC AR5)		1300
CO2 equivalent	t	346

2.6 NOISE DATA

SOUND DATA COLD

Frequencies	Hz	63	125	250	500	1000	2000	4000	8000
Sound power (spectrum)	dB	91	93	95	92	91	86	76	67
Total sound power level in cooling	dB(A)	95							
Sound pressure level (spectrum)	dB	70	72	74	71	70	65	55	46
Total sound Pressure	dB(A)	74							



SOUND DATA OUTDOOR HOT

Total sound power level in heating	dB(A)	96
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Note

Distance	m	1
Note	Average sound pressure level at 1 m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level. Sound power on the basis of measurements taken in compliance with ISO 9614.	

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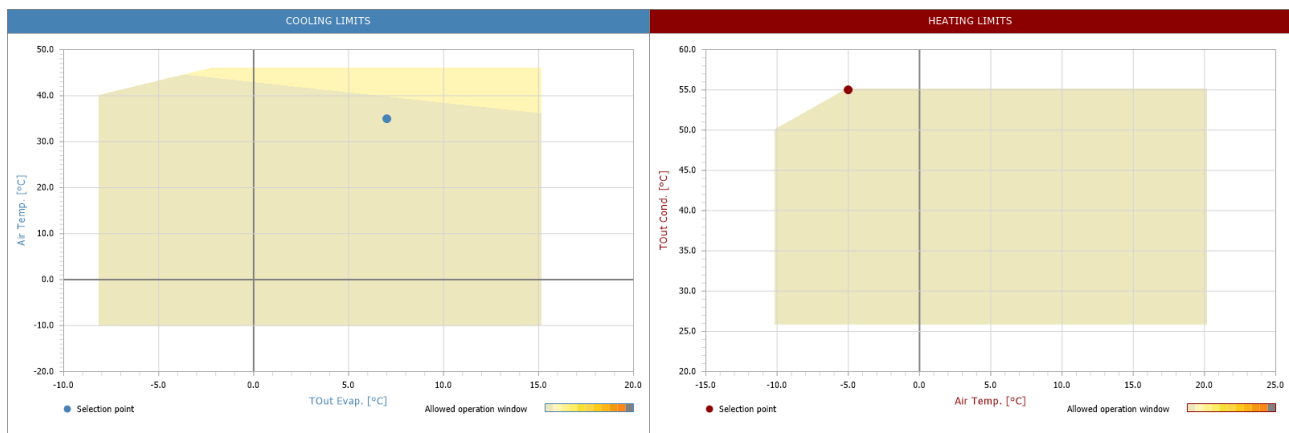
COOLING

SCREW

HEATING

FOCS-N /LN-CA 2622

2.7 OPERATING LIMITS



2.8 ELECTRICAL DATA

Power supply	V/ph/Hz	400/3/50
F.L.I. - Max absorbed power	kW	251.0
F.L.A. - Max absorbed current	A	419
S.A. - Inrush current	A	481

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COOLING

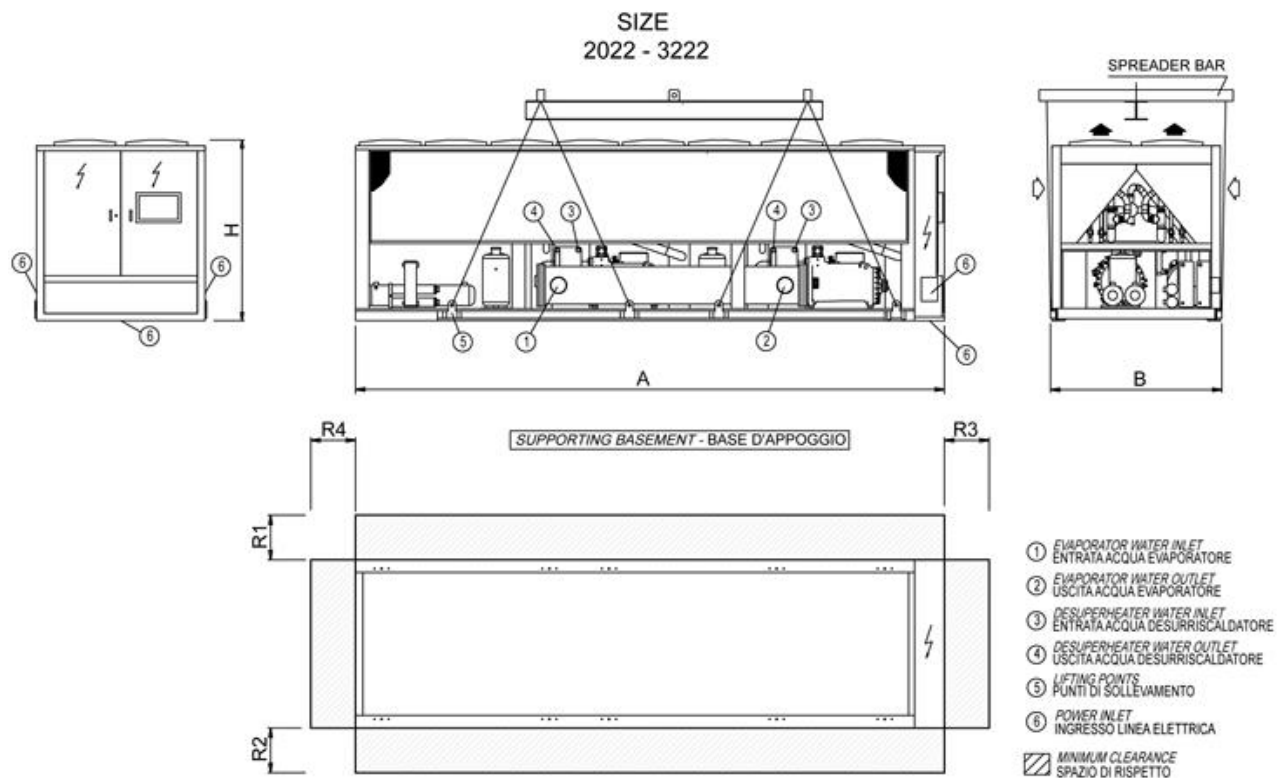
SCREW

HEATING

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2.9 WEIGHT & DIMENSIONS

A	mm	5800
B	mm	2260
H	mm	2430
Operating weight	kg	6930
R1	mm	2000
R2	mm	2000
R3	mm	1800
R4	mm	1500



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