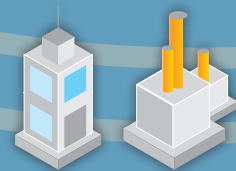


Air cooled chillers with brushless oil-free compressors

**RAC Ka Series - 1 or 2 cooling circuits
capacity from 300 to 1400 kW**



- External installation with very low sound level
- Cooling circuit with no lubricating oil entrainment
- High capacities and compact design
- Frequency controlled capacity regulation with a remarkable precision on the adjustment of the discharge temperature
- Slight inrush current
- Maximum efficiency with remarkable ESEER values



Air cooled chillers



brushless
oil-free
compressors



air cooled unit



only cooling
units



units available
in low noise
versions



units with
free-cooling



high efficiency
and energy
saving units

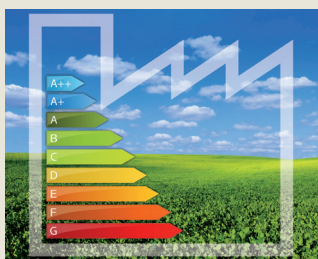


EMICON

AIR CONDITIONING AND INDUSTRIAL APPLICATION

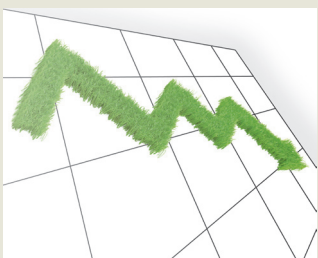
Air cooled chillers with brushless oil-free compressors

For all those applications requiring innovative plant proposals, the **RAC Ka series** represents the ideal solution in terms of:



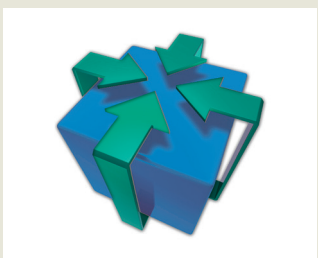
Energy saving

The reduction in investments and operating costs, together with the respect of the regulations in force about consumption cutback and environmental compatibility, correspond to more and more essential factors in the choice of technologically advanced units, with ESEER values higher than 5. Their use in continuous and yearly working application has confirmed a reduction on operating costs higher than 50%, allowing remarkable strategies of energy saving.



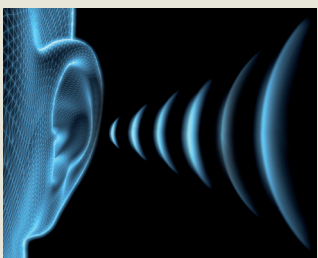
Low inrush current

Thanks to their technology and to the in-built soft-start system, the oil-free compressors have inrush current values very close to the nominal ones, with a consequent higher stability of the electrical power supply. Therefore, the use of these units also in buildings of non-recent construction allows their energy requalification in compliance with the regulations in force.



Compact design

The compact frame of this range, which is an essential element for handling and installation also in complicated architectonic facilities, represents the logistically ideal solution.



Low sound emissions

The compressors oil-free technology and the limited vibrations, together with the low speed fans, give this range very low sound levels, allowing the installation also in residential areas.

The units of **RAC Ka series** are particularly indicated for liquid cooling in the air conditioning and industrial process plants, where high efficiency at partial loads and maximum quietness must be granted. These groups have a compact design and a lower weight if compared to the traditional chillers of similar capacity. These units are completely assembled and tested in the factory and supplied with refrigerant charge. Therefore, once on site, the units only need to be positioned and electrically and hydraulically connected.

Available versions

- **Standard:** for condensing section, the use of 6-pole axial fans (990 rpm) with inverter regulation together with performing condensing coils allows to have a good energy efficiency (EER) and low sound levels.
- **High-efficiency:** thanks to the low condensing levels at the same external air temperature, it is possible to reach remarkable EER values. This range is provided with 4-pole axial fans (1450 rpm) with inverter regulation and it is suitable for installation also in those areas with higher air temperatures, assuring the cooling capacity without degrading.
- **Ultra silenced:** thanks to wide heat exchange surface, the condensing coils allow the unit operation at a reduced air flow, with a consequent reduction on the sound level of the external fan section.

FS Ka - silenced version with free-cooling coil

Operation limit with no capacity reduction – standard version:

- AIR: from -4°C to +40°C with fans regulated by inverter
- AIR: from -10°C to +40°C with EC brushless fans
- WATER (out from evaporator): from 5 to 20°C

Operation limit with no capacity reduction – high-efficiency version:

- AIR: from +1°C to +45°C with fans regulated by inverter
- AIR: from -8°C to +40°C with EC brushless fans
- WATER (out from evaporator): from 5 to 20°C

Operation limit with no capacity reduction – ultra silenced version:

- AIR: from -4°C to +38°C with fans regulated by inverter
- AIR: from -10°C to +40°C with EC brushless fans
- WATER (out from evaporator): from 5 to 20°C

Operation limit with no capacity reduction – free-cooling silenced version:

- AIR: from -4°C to +38°C with fans regulated by inverter
- AIR: from -10°C to +40°C with EC brushless fans
- WATER (out from evaporator): from 5 to 20°C

For free-cooling operation, the minimum external temperature is depending on the glycol percentage of the water circuit.

Main components

LAYOUT AND FRAME

The frame is made of hot galvanized steel plate structural, painted with epoxy powders colour RAL 7035. The compressors are installed in a suitable cabinet internally insulated with soundproofing and fire-retardant material. Cooling circuits with separate condensing sections and independent ventilation.

COMPRESSORS

The two-stage oil-free centrifugal compressor (with no mechanical bearings) is provided with in-built electronic control, pressure and temperature sensors, direct cooling system and inverter for capacity regulation. Each compressor is complete with rubber anti-vibration dampers, shut-off valves on discharge side with in-built non return valve, filter on suction side, two-stage hot gas by-pass for inrush phases, sight glass on liquid refrigerant line and shut-off valve for the controlled and direct cooling of compressor. Its peculiarity allows the continuous regulation of the cooling capacity, changing the speed of the two-stage compression device, with all the advantages of a direct current brushless motor, in which the electrical absorption reduces in a more proportional way than the loading decrease. The result is seasonal efficiency values (ESEER) remarkably high.

EVAPORATOR

Suitably designed evaporator so to guarantee high level of EER, ESEER and IPLV. The water refrigerant exchanger is of flooded type (pool boiling evaporation), with a single refrigerant passage (shell side) and water multi-passage internal piping, able to operate with a small difference between the evaporating temperature and the outlet fluid (outlet 1 or 2°C), with very low pressure drops and overheating of 1-2°C. The exchanger is completely insulated with close cell and fire-retardant material of 10 mm thickness, protected with anti-scratch coating. The evaporator is provided with level switch and sight glass for flooding control. An economizer system is in-built in the evaporator so to achieve a further increase on cooling capacity and ensure the non return of liquid to the compressor.

CONDENSING COILS

Finned pack exchanger with TURBOFIN aluminium fins (on request, versions in copper and pre-painted aluminium are available) and MICROFINNED pure electrolytic copper pipes. The frame is made of anodized aluminium of suitable thickness so to ensure the coil stiffness and, at the same time, resistance against external corrosion.

FREE-COOLING COIL (only for F.S Ka version)

Additional free-cooling water coil with copper tube and aluminium fins, for production of chilled water by means of the very low external air temperatures. This allows a remarkable reduction of the compressors working hours with a consequent energy saving, also considering that each circuit is completely independent. It is complete with 3-way mixing valve with 0-10V control.

AXIAL FANS

Low rpm axial fans, provided with protection grid, directly coupled to high efficiency motor with external rotor, in-built overload protection, statically and dynamically balanced, low sound level blades with wing profile and condensing control by inverter (IP 54 protection). In this way, the modulation of the air flow is continuous and within 0 to 100% of the nominal value of the unit without electrical resonance. If compared to the usual regulation on traditional chillers, the input power of fans is lower than 35% when the air flow is decreasing. For operation down to -10°C external air (option BT), EC brushless fans will be provided. In this case the advantage at partial loads is further increased, since the fans electrical absorption reduce of an additional 20%.

COOLING CIRCUIT

Each circuit, realized with copper pipes, is mainly composed of: electronic thermostatic valve with in-built microprocessor and display for regulation of the refrigerant flow, also when the compressor is working at partial loads, and acting as solenoid valve when completely closed, shut-off valves on compressor's suction and discharge side, non return valve on discharge side, shut-off valve on liquid line, in-built economizer, dehydrating filter with replaceable cartridge, sight glass, hot gas by-pass line with tandem or trio compressors, liquid bleeding line for internal cooling of compressors, high and low pressure safety valve, high and low pressure gauges, high and low pressure transducers, high and low pressure switches.

ELECTRICAL BOARD

It is included in a cabinet suitable for outdoor installation (IP 55), on which the LCD display is positioned. The main switch is of lock-door type and the control, safety and protection devices, the terminal board and the 24V auxiliaries are internally installed. It is also complete of a phase monitor to prevent the compressor to turn in the wrong sense, so to avoid considerable damage. On request, a double electrical supply is available, separating the three-phase supply from the low tension single-phase supply of the control circuits. This option is useful in case of UPS emergency supply.

MICROPROCESSOR

It is made of a IN/OUT electrical board, a LCD display, key board and LED signals. This microprocessor allows the PID regulation of the evaporator outlet water temperature, the set of the operation parameters, the alarm management, the reading of the measured values (temperatures, working hours, etc) and the possibility to control them through a supervision system. It is also possible to read and to set inputs and outputs, all the operating parameters of the unit and to display all the existing alarms. The user terminal can be positioned up to 100 m far, simply removing it from the unit and using a 6-pole telephone cable, for an easier setting the unit.

RAC Ka - STANDARD VERSION

Model	RAC	351	411	451	512	562	602	642	682	752
Cooling capacity	kW	359	410	445	510	560	604	640	680	750
Compressors absorbed power	kW	92,3	113,0	121,0	135,8	151,0	159,2	161,4	173,4	195,0
EER NET		3,31	3,18	3,25	3,36	3,27	3,37	3,53	3,52	3,42
ESEER (ARI ST 555/590-98)		5,15	4,81	4,87	5,01	4,94	5,05	5,29	5,22	4,98
Cooling circuits	nr.	1								
Oil-free compressors	nr.	1			2					
Compressors input current	A	143	164	197	215	238	250	268	271	298
Shell & tube flooded evaporator	nr.	1								
Water flow	m ³ /h	61,6	70,4	76,4	87,6	96,1	103,7	109,9	116,7	128,8
Pressure drop	kPa	54	42	48	46	55	48	52	38	48
Axial fans	nr.	8			10				12	
Absorbed power	kW	16,0			20,0				24,0	
Sound power level	dB(A)	83,8	83,8	83,8	85,1	86,7	86,7	86,1	86,1	86,1
Sound pressure level	dB(A)	76,6	76,6	76,6	77,9	79,5	79,5	78,9	78,9	78,9
Dimensions										
Length	mm	4.750				5.720				6.690
Width	mm	2.380								
Height	mm	2.560								
Weight	kg	3.780	3.920	4.120	4.230	4.770	4.830	4.860	4.980	5.230
Power supply		400 V / 3 ph / 50 Hz + T								

Model	RAC	812	853	893	983	1083	1203	1283	1404	
Cooling capacity	kW	810	850	892	984	1.084	1.190	1.280	1.398	
Compressors absorbed power	kW	220,6	221	238	245	271,8	308,7	350,1	367,6	
EER NET		3,31	3,41	3,35	3,60	3,57	3,41	3,28	3,43	
ESEER (ARI ST 555/590-98)		4,75	5,27	5,14	5,35	5,33	5,14	4,89	4,91	
Cooling circuits	nr.	1								
Oil-free compressors	nr.	2	3			4				
Compressors input current	A	322	352	374	406	447	505	570	605	
Shell & tube flooded evaporator	nr.	1								
Water flow	m ³ /h	139,1	145,9	153,1	168,9	186,1	204,3	219,7	240,0	
Pressure drop	kPa	54	56	32	38	40	48	55	58	
Axial fans	nr.	12	14		16		20			
Absorbed power	kW	24,0	28,0		32,0			40,0		
Sound power level	dB(A)	86,1	87	87	87,1	87,6	88,7	88,7	89,3	
Sound pressure level	dB(A)	78,9	79,8	79,8	79,9	80,4	81,5	81,5	82,1	
Dimensions										
Length	mm	6.690	7.670			9.120		10.570		
Width	mm	2.380								
Height	mm	2.560								
Weight	kg	5.360	6.120	6.310	6.440	6.980	9.860	9.920	10.120	
Power supply		400 V / 3 ph / 50 Hz + T								

RAC HE Ka - HIGH EFFICIENCY VERSION

Model	RAC	321	381	431	522	582	642	722		
Cooling capacity	kW	325	388	429	524	584	645	724		
Compressors absorbed power	kW	69,8	83,7	98,2	119,6	135,0	140,4	157,6		
EER NET		3,64	3,76	3,64	3,76	3,66	4,04	3,87		
ESEER (ARI ST 555/590-98)		6,16	5,07	4,92	5,12	4,92	5,55	5,94		
Cooling circuits	nr.	1							2	
Oil-free compressors	nr.	1	1	1	2	2	2	2		
Compressors input current	A	122	162	98	120	135	140	262		
Shell & tube flooded evaporator	nr.	1							2	
Water flow	m ³ /h	55,8	66,6	73,6	90,0	100,3	110,7	124,3		
Pressure drop	kPa	48	45	48	50	48	38	48		
Axial fans	nr.	8			10					
Absorbed power	kW	19,6	19,6	19,6	19,6	24,5	24,5	29,4		
Sound power level	dB(A)	94	94	94	94	95,5	95,5	97		
Sound pressure level	dB(A)	88,5	88,5	88,5	88,5	90	90	91,5		
Dimensions										
Length	mm	4.750				5.720			6.690	
Width	mm	2.380								
Height	mm	2.560								
Weight	kg	3.780	3.920	4.120	4.230	4.790	4.860	5.195		
Power supply		400 V / 3 ph / 50 Hz + T								

Model	RAC	752	813	903	993	1133	1243	1364		
Cooling capacity	kW	754	808	896	990	1.132	1.236	1.365		
Compressors absorbed power	kW	164,8	183	197	214	247,2	279,3	302,8		
EER NET		3,88	3,71	3,87	3,90	3,82	3,76	3,88		
ESEER (ARI ST 555/590-98)		5,92	6,05	6,07	6,17	6,11	5,91	5,82		
Cooling circuits	nr.	1							2	
Oil-free compressors	nr.	2	3	3	3	3	3	4		
Compressors input current	A	273	292	333	360	412	460	506		
Shell & tube flooded evaporator	nr.	1							2	
Water flow	m ³ /h	129,4	138,7	153,8	170,0	194,3	212,2	234,3		
Pressure drop	kPa	54	52	34	42	48	53	56		
Axial fans	nr.	12	14		16		20			
Absorbed power	kW	29,4	34,3		39,2		49,0			
Sound power level	dB(A)	97	98		99,5					
Sound pressure level	dB(A)	91,5	92,5	93	94					
Dimensions										
Length	mm	6.690	7.670			9.120		10.570		
Width	mm	2.380								
Height	mm	2.560								
Weight	kg	5.150	6.120	6.310	6.895	9.890	10.020	10.160		
Power supply		400 V / 3 ph / 50 Hz + T								

RAC U Ka - ULTRA-SILENCED VERSION

Model	RAC	351	411	451	512	562	602	642	752	
Cooling capacity	kW	359	395	420	472	530	572	601	720	
Compressors absorbed power	kW	93,4	107,0	115,9	127,2	143,2	156,2	160,6	192,2	
EER NET		3,47	3,37	3,33	3,44	3,40	3,39	3,47	3,47	
ESEER (ARI ST 555/590-98)		5,08	4,88	4,79	5,05	5,03	4,98	4,82	4,83	
Cooling circuits	nr.	1								
Oil-free compressors	nr.	1			2					
Compressors input current	A	154	175	189	202	226	246	266	352	
Shell & tube flooded evaporator	nr.	1								
Water flow	m ³ /h	61,6	67,8	72,1	81,0	91,0	98,2	103,2	123,6	
Pressure drop	kPa	54	42	48	46	55	48	52	48	
Axial fans	nr.	8				10				
Absorbed power	kW	10,2				12,7				15,2
Sound power level	dB(A)	77,6	77,6	77,6	79,1	80,2	80,2	80,3	80,3	
Sound pressure level	dB(A)	70,1	70,1	70,1	71,6	72,7	72,7	72,8	72,8	
Dimensions										
Length	mm	4.750				5.720				6.690
Width	mm	2.380								
Height	mm	2.560								
Weight	kg	3.884	4.020	4.160	4.320	4.785	4.850	4.920	5.320	
Power supply		400 V / 3 ph / 50 Hz + T								

Model	RAC	853	893	983	1083	1203	1283	1404	
Cooling capacity	kW	810	865	925	980	1.130	1.210	1.360	
Compressors absorbed power	kW	224	242	258	265,8	317,7	360,3	356	
EER NET		3,36	3,34	3,35	3,43	3,29	3,14	3,57	
ESEER (ARI ST 555/590-98)		4,92	4,87	4,89	5,03	5,18	4,58	4,92	
Cooling circuits	nr.	1							2
Oil-free compressors	nr.	3							4
Compressors input current	A	352	380	427	438	519	586	586	
Shell & tube flooded evaporator	nr.	1							2
Water flow	m ³ /h	139,1	148,5	158,8	168,2	194,0	207,7	233,5	
Pressure drop	kPa	56	32	38	40	48	55	58	
Axial fans	nr.	14			16		20		
Absorbed power	kW	17,8			20,3		25,4		
Sound power level	dB(A)	80,6	80,6	81,8	81,8	82,3	82,3	83,3	
Sound pressure level	dB(A)	73,1	73,1	74,3	74,3	74,8	74,8	75,8	
Dimensions									
Length	mm	7.670				9.120		10.570	
Width	mm	2.380							
Height	mm	2.560							
Weight	kg	5.460	6.230	6.490	7.740	10.238	10.060	10.230	
Power supply		400 V / 3 ph / 50 Hz + T							

Nominal condition referred to: chilled water 12/7 °C - air 35 °C - max 38 °C.
Sound pressure level referred to 1 m in open field (ISO 3744).

RAC FS Ka - FREE-COOLING SILENCED VERSION

Model		321 FS Ka	381 FS Ka	401 FS Ka	522 FS Ka	602 FS Ka	672 FS Ka	732 FS Ka	
Cooling capacity	kW	322	376	409	457	549	605	668	
Compressors absorbed power	kW	79	93	102	124	135	151	176	
Free-cooling capacity	kW	141	165	177	193	238	265	291	
EER NET		3,30	3,37	3,39	3,21	3,47	3,48	3,36	
ESEER (ARI ST 555/590-98)		5,29	5,28	5,29	5,25	5,38	5,38	5,29	
Cooling circuits	nr.	1							
Oil-free compressors	nr.	1	2						
Compressors input current	A	134	158	173	211	230	257	299	
Shell & tube flooded evaporator									
Water flow	m ³ /h	59,0	69,1	75,2	83,9	100,8	111,2	122,8	
Pressure drop	kPa	68	72	69	69	71	64	68	
Axial fans	nr.	8						10	
Absorbed power	kW	18,5						23,1	
Sound pressure level	dB(A)	80			81		82		
Dimensions									
Length	mm	4.750				5.720			
Width	mm	2.380							
Height	mm	2.560							
Weight	kg	3.717	3.823	4.043	4.147	4.683	4.819	5.071	
Power supply		400 V / 3 ph / 50 Hz + T							

Model	RAC	822 FS Ka	894 FS Ka	964 FS Ka	1104 FS Ka	1304 FS Ka	1604 FS Ka
Cooling capacity	kW	759	803	882	978	1203	1396
Compressors absorbed power	kW	189	219	221	257	301	369
Free-cooling capacity	kW	334	340	383	429	517	581
EER NET		3,50	3,25	3,42	3,33	3,46	3,36
ESEER (ARI ST 555/590-98)		5,39	5,27	5,34	5,29	5,41	5,37
Cooling circuits	nr.	1					
Oil-free compressors	nr.	2					
Compressors input current	A	321	372	376	437	512	627
Shell & tube flooded evaporator							
Water flow	m ³ /h	139,3	147,6	162,0	179,6	221,0	256,3
Pressure drop	kPa	69	63	66	67	63	65
Axial fans	nr.	12		16		20	
Absorbed power	kW	27,7		37,0		46,2	
Sound pressure level	dB(A)	84		87		88	
Dimensions							
Length	mm	6.700			9.120		10.570
Width	mm	2.380					
Height	mm	2.560					
Weight	kg	5.491	6.040	6.596	6.753	10.618	10.868
Power supply		400 V / 3 ph / 50 Hz + T					

Nominal condition referred to: chilled water 12/7 °C - 30% glycol - air 35 °C - max 38 °C.
 Nominal condition for free-cooling referred to: chilled water 12/7 °C - 30% glycol - air 0 °C.
 Sound pressure level referred to 1 m in open field (ISO 3744).
 Above data are not binding and subject to variation without prior notice.



units with
free-cooling



high efficiency
and energy
saving units

Available options

A - Amperometer: Electrical device for measuring the intensity of electrical current absorbed by the unit.

BT - Low temperature operation (-10°C): Use of EC Brushless fans.

CE - UV protection on water insulation: particular coat of the evaporator and of water insulations with UV ray proof material.

DR - Refrigerant leakage detector: this device immediately detects eventual refrigerant leakages in the unit.

FA - Anti-pollen filters on condensing coils: interchangeable flat filters of metal mesh type, placed on the incoming air front surface of the coils.

GP - Condensing coil protection grid: metal protection grid against accidental impacts, made of 50x50 4-mesh wire.

GP1 - Protection grid for compressors section: metal protection grid against accidental impacts.

IH - RS 485 serial interface: electronic card to be connected to microprocessor, to allow communication between the units and a supervision system. It is possible to fully control the unit from remote. For connection to other supervision systems, the protocol of the controlled parameters is available on request.

IM - Seawood packing: fumigated seawood case and protection bag with hygroscopic salts, suitable for long sea transports.

PM - Spring-type vibration dampers: spring-type vibration dampers support, for insulating the unit (supplied in kit), mainly indicated for installation in difficult and aggressive environments. Made of two steel plates containing a suitable quantity of harmonic steel springs.

PQ - Remote display: remote terminal, allowing to display the temperature and humidity values detected by probes, the alarm digital inputs, the outputs and the remote ON/OFF of the unit, to change and program of the parameters, the sound signal and the display of the present alarms.

PV - Quick start after electrical black-out: this device allows the compressors re-start after 2 minutes from the return of power supply after electrical black-out.

RM - Condensing coil with pre-painted fins: superficial treatment of the condensing coils with epoxy coating.

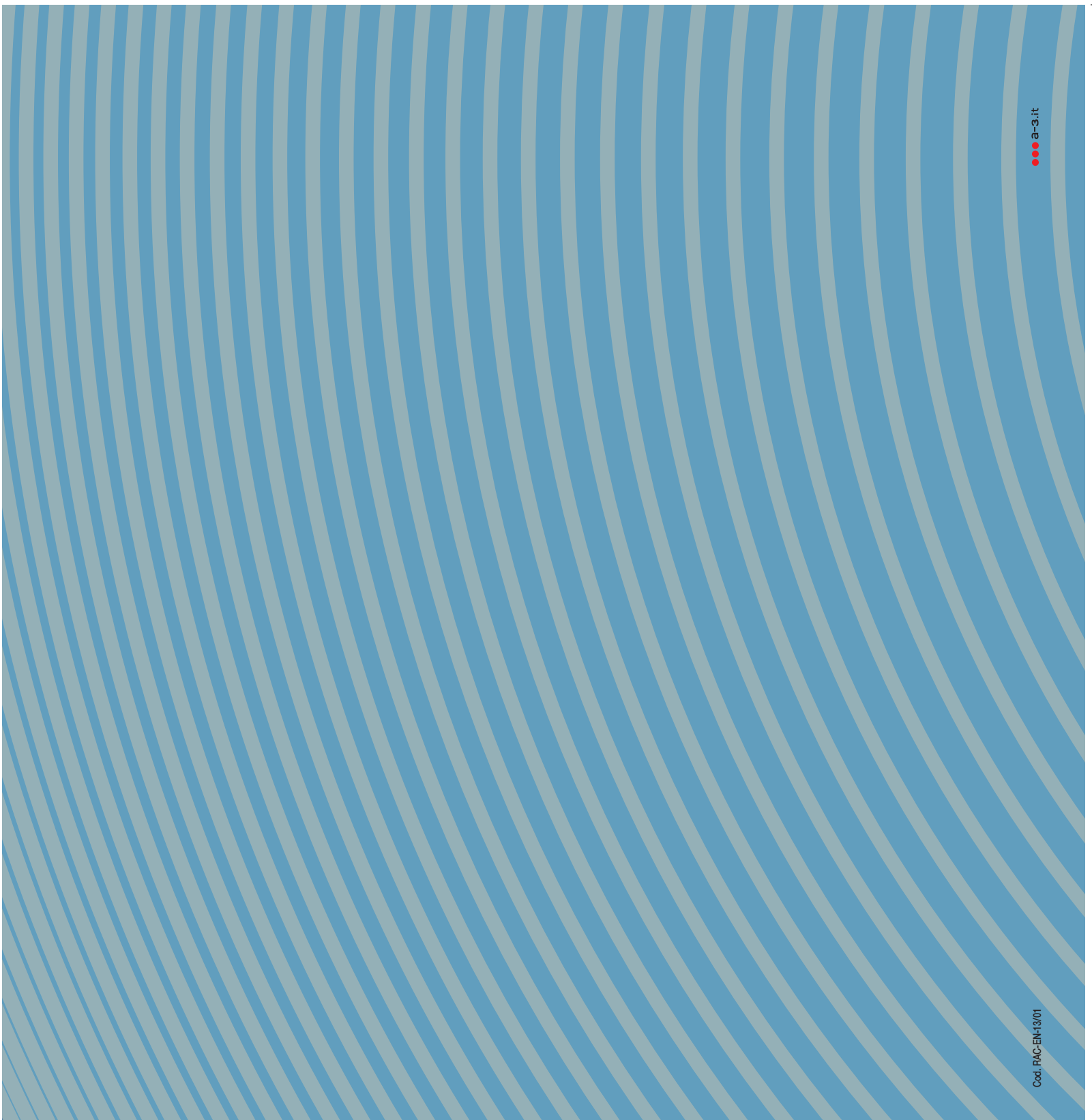
RP - Partial heat recovery (about 20%) of the condensing heat, by means of a refrigerant/water plate exchanger (desuperheater), always in series to the compressors. It is requested when you need to produce sanitary water, by recovering condensing heat capacity.

RR - Copper/copper condensing coils: special execution of the condensing coils with copper pipe and fins.

V - Voltmeter: Electrical device measuring the electrical tension in the power supply of the unit.

References

- Internet provider Iandex – Mosca (Russia)
- Energy Company Centrica PLC – Londra (U.K.)
- Telecom Italia – Centrale Milano Turro (Italia)
- Telecom Italia – Centrale Milano Malpaga (Italia)
- Telecom Italia – Centrale Verona (Italia)
- John Lewis Store – Londra (U.K.)



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Cod. RAC-EN13/01



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