RAH Ka

AIR COOLED WATER CHILLERS WITH SCREW COMPRESSORS AND AXIAL FANS

COOLING CAPACITY FROM 387 TO 1207 kW 1 AND 2 COOLING CIRCUITS

RAH 602 Ka + CF + GP

Above picture is only indicative and is not binding.

The mono-bloc air cooled chillers of **RAH Ka series** are extremely compact units so to reduce the installation spaces and weight. They are designed for outdoor installation and are particularly suitable both for air conditioning systems and for industrial applications where it is necessary to ensure excellent seasonal performance and low environmental impact. Depending on the cooling capacity, they are available from 1 to 2 cooling circuits. Thanks to the several options available, these units are particularly flexible and can be easily adapted to all installation sites. These units are completely assembled and tested in the factory and supplied with refrigerant and non-freezing oil charge. Therefore, once on site, the units only need to be positioned and electrically and hydraulically connected.

The available versions, with refrigerant R134a (Ka), are the following:

- **ST/Ka - STANDARD Version:** coil sized to work till 45°C external air temperature and without cabinet on compressors.
- **S/Ka - SILENCED Version:** oversized coil, reduced air flow obtained by changement of axial fans power supply's connection, by a cabinet on compressors suitably soundproofed by a high thickness and class "0" fire self-extinguishing polyester sound absorbing mat according to BS476 norms.

Operation Limits:
Standard unit:
AIR: from 15 to 45°C - WATER (out from evaporator): From 5 to 15°C
Silenced unit:
AIR: from 15 to 40°C - WATER (out from evaporator): From 5 to 15°C

MAIN COMPONENTS

Structure realized with frame made of hot dip galvanized sheet and RAL 7035 painted, suitably treated to resist to external agents. The compressors and main components are easily accessible and suitably placed in the technical partition.

Screw compressors, semi-hermetic type, equipped with capacity steps, motor thermal protection, oil crankcase heater and phase monitor. The compressors lubrication is of forced type, with no pump and in order to prevent many oil migrations to the cooling circuit, the compressors are provided with an oil separator, in-built to the discharge side. The electrical motor is foreseen for lower inrush current and, in this case, the unit is equipped with an automatic partial load inrush device and mechanical interlock of the inrush control switches, to prevent accidental short circuits (Options DS and PW).

Shell & tube evaporator dry expansion type with shell and tubes plate made in carbon steel and pure electrolytic copper tubes, insulated by close-cell polyurethane foam material, and external UV ray-proof scratch jacket. Some plastic and corrosion-proof baffles are suitably placed inside the shell, allowing a correct water distribution and making the tube bundle particularly strong and vibration-free, also in case of very high water flows. Exchanger design pressure water side: 10 bar.

Heat-exchange external coil with micro finned copper tubes and "Turbofin" aluminum fins with special corrugation for a better efficiency. It is suitably sized with a wide exchange surface, so to allow the unit operation also at very high external air temperatures. Their peculiar positioning allows an increasing of overall efficiency; so that the units are very compact. On request, in case of installation in aggressive environments, several coil protection treatments are available.

Axial fans with low RPM, directly coupled type, with 6 pole electrical motor complete with in-built overload protection, electronic balance, low sound level blades with wing profile and safety protection grid. On request, it is available the modulating fans speed regulation.

Cooling circuit composed of electronic thermostatic expansion valve, sight glass, high pressure safety device, antifreeze thermostat, high and low pressure switches, high and low pressure gauges, non-return valve on discharge side directly built-in in compressor, dehydrating filter with replaceable cartridges, shut-off valve on liquid line.

Electric board in compliance with CE norms, contained in a suitable partition protected by the internal safety panel, provided with a lock-door main switch. Inside, it is complete with all control and protection switches, the terminal board and auxiliaries. The electrical board also includes the control device for power supply phases, to prevent the compressor to turn in the wrong sense. The microprocessor, complete with display, is also placed inside the electrical board.

Microprocessor for unit management installed on the internal safety panel of the electrical board, controlling the chilled water temperature regulation, the working parameters, auto-detection failure system, remote management and supervision, complete with compressors hour counter.

ACCESSORIES

A **Amperometer:** Electrical device to measure the electrical current absorbed by the unit.

AE **Electrical power supply different than standard:** Particularly 230 V three-phase, 460 V three-phase. Frequency 50/60 Hz.

BT **Low temperature operation** (down to -8°C): Electronic device for the continuous modulating voltage control of the condensing pressure through the variation of the fan rotation speed (Alternative to BF and EC).

BF **Low ambient temperature operation** (down to -20°C): Electronic device, frequency converter type, for the continuous modulating control of the condensing pressure through the variation of the fan rotation speed (Alternative to BT and EC).

CF **Soundproofed compressors cabinet with standard material:** Insulation of compressors by a cabinet with profile and panels made of hot dip galvanized sheet and powder painted, coated with soundproofing material ashlar type and vibration dampers under compressors. Access panels are easy to open thanks to a triangular wrench. (Available only for STANDARD version).

CFU **Soundproofed compressors cabinet with polyester material:** Insulation of compressors by a cabinet with profile and panels made of hot dip galvanized sheet and powder painted, coated with high thickness soundproofing polyester mat and vibration dampers under compressors. Access panels are easy to open thanks to a triangular wrench. (Already included in SILENCED version).

CS **Compressors inrush counter:** Electromechanical device positioned inside the electrical board, recording the total inrush starts of compressors.

DS **Star/Delta:** Electric device of close transition type to reduce the inrush current, complete with short circuit safety by mechanical interlock.

EC **Axial fans with electronic commutated motor:** Made of high-performance composite material, with external rotor directly coupled to a three-phase electronically commutated motor (EC), they have the possibility of a continuous regulation of the speed by means of a 0-10V signal, completely managed by the microprocessor. Thanks to a more accurate adjustment of air flow, they allow operation of the unit with external temperature down to -20°C. (Alternative to BT and BF).

GP **Condensing coil protection grid:** Metal grid to protect against accidental impacts. Four-mesh wire 50x50 mm.

GP1 **Anti-intrusion grid:** Metal grid to protect the compressors section against accidental impact in the absence of soundproofed compressor cabinet.

GP2 **Anti-intrusion grid with compressor cabinet:** Metal grid to protect the compressors section against accidental impact in the presence of soundproofed compressor cabinet.

IG **Watch card:** Electronic card to program the switch-over and rotation between to units, after a pre-set time.

IH **RS 485 Serial interface:** Electronic card to be connected to the microprocessor to allow connection of the units to CAREL supervision systems for a remote control and monitoring of the unit. To connect the units to a different supervision system, it is available the protocol of parameters set.

IM **Sea-wood packing:** Fumigated sea wood case and protection bag with hygroscopic salts, suitable for long sea transports.

LI **Liquid injection:** Mechanical device allowing a better cooling of compressors at very high compression level.

M6-M25 **Modulating capacity control:** By means of some valves installed on compressors, depending on their quantity, the capacity is modulated from 6 to 100%.

MV **Buffer tank:** Of suitable capacity complete with expansion vessel, safety valve, water gauge, water charge and discharge valves, air purging valves.

OS **Oil flow safety switch:** In-built in the compressor oil separator, it indicates the eventual decrease of the oil level.

P1 **Pump group:** Chilled water pump group made of a single pump, expansion vessel, safety valve water gauge, water charge and discharge valves, air purging valves, electric control of the pump. The pump is of mono-bloc 2-pole type for standard version, 4-pole for S version.

P1H **Higher available pressure pump group:** Chilled water pump group made of a single pump, expansion vessel, safety valve water gauge, water charge and discharge valves, air purging valves, electric control of the pump. The pump is of mono-bloc 2-pole type for standard version, 4-pole for S version.

P2 **Double pump group** (only one working): Chilled water pump group

made by two pumps in parallel, expansion vessel, safety valve, water gauge, water charge and discharge valves, air purging valves, water shut-off valve on suction and check valve on discharge for each single pump, electric control of the pump. The pumps are of mono-bloc 2-pole type for standard version, 4-pole for S version.

P2H **Higher available pressure double pump group** (only one working): Chilled water pump group made by two higher available pressure pumps in parallel, expansion vessel, safety valve, water gauge, water charge and discharge valves, air purging valves, water shut-off valve on suction and check valve on discharge for each single pump, electric control of the pump. The pumps are of mono-bloc 2-pole type for standard versions, 4-pole for S version.

PT **In-line twin pump group** (only one working): Chilled water pump group made by a twin pump group with a single impeller body and two separate electric motors. The hydraulic kit is made by an expansion vessel, safety valve, water gauge, water charge and discharge valves, air purging valves, electric control of the pump. The pumps are of mono-bloc 2-pole type for standard version, 4-pole for S version.

PF **Safety water flow switch:** Installed on evaporator, it switches off the unit in case of lack of water flow rate through the evaporator.

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 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 signaling and the display of the present alarms.

PW **Part-Winding:** Equipment for step compressors starting, reducing of about 35% the inrush current of each compressor.

RA **Anti-freeze heater on evaporator:** Electrical heater installed on the evaporator, in order to prevent freezing and provided with thermostat.

RD **Shut-off valve on discharge side:** They are use to isolate compressors during service operations.

RF **Power factor correction system cosfi ≥ 0,9:** Electrical device made of suitable condensers for compressors rephasing, ensuring a cosfi value ≥0,9, so to reduce the reactive power absorption from the electrical network.

RH **Shut-off valve on suction side:** They are use to isolate compressors during service operations.

RL **Compressors overload relays:** Electromechanical protection devices against compressor's overload with displayed alarm.

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

RP **Partial heat recovery:** (about 20%) of condensing heat through a refrigerant/water plate exchanger (desuperheater) always in series to the compressors. It is used when you want to partially recover condensing heat capacity for production of sanitary water.

RR **Copper/copper condensing coils:** Special execution of the condensing coils with copper pipe and fins.

RT **Total heat recovery:** (100%) of condensing heat by refrigerant/water shell & tube heat exchanger in alternative and in parallel to the condensing air section. It is used when you want to completely recover condensing heat capacity for production of sanitary water or for heating applications.

V **Voltmeter:** Electrical device measuring the electrical voltage of the unit power supply.

VB **Brine Version:** Unit suitable for working with evaporator outlet water temperatures lower than 0°C. A 20 mm evaporator insulation will be provided.

VS **Solenoid valve:** Electromagnetic solenoid valve on each cooling circuit to cut off the liquid line at compressors switch-off, avoiding a possible consequent flooding of the same.

Technical data sheet - RAH 431-1202 Ka

RAH		431 Ka	521 Ka	602 Ka	702 Ka	802 Ka	922 Ka	1032 Ka	1102 Ka	1202 Ka
Cooling capacity										
Cooling capacity 1)	kW	401,4	518,6	579,4	672,7	768,2	883,2	1015,6	1102,4	1187,0
Absorbed power	kW	117,8	156,6	181,2	217,4	247,2	289,2	321,8	359,2	395,6
EER Gross	kW/kW	3,41	3,31	3,20	3,09	3,11	3,05	3,16	3,07	3,00
EER Net	kW/kW	3,00	3,00	2,88	2,83	2,87	2,82	2,90	2,82	2,78
ESSER		3,66	3,89	3,44	3,78	4,01	3,95	3,97	3,76	3,82
Screw compressors										
Quantity	n	1	1	2	2	2	2	2	2	2
Standard steps capacity	n	3	3	6	6	6	6	6	6	6
Continuous control capacity (option)	%					0 - 12 ÷ 100				
Circuits	n	1	1	2	2	2	2	2	2	2
Nominal absorbed current	A	190,5	258,0	307,0	357,4	398,8	478,0	530,0	592,0	658,0
Maximum absorbed current	A	310,0	360,0	428,0	560,0	620,0	640,0	720,0	826,0	894,0
Inrush current	A	1.476,4	2.063,4	1.407,5	1.585,7	1.684,4	2.143,6	2.354,2	2.884,8	3.267,8
Inrush current with opt. PW/DS	A	500,0	685,0	600,0	657,7	707,0	877,0	975,0	1.170,0	1.315,0
Axial fans										
Quantity	n	8	8	10	10	10	12	14	16	16
Rotation speed	rpm	895	895	895	895	895	895	895	895	895
Motors power	kW	16,0	16,0	20,0	20,0	20,0	24,0	28,0	32,0	32,0
Total air flow	m^3/h	173.480	152.000	200.000	189.900	186.900	227.880	274.260	296.000	296.000
Total air flow	l/s	48.189	42.222	55.556	52.750	51.917	63.300	76.183	82.222	82.222
Nominal absorbed current	A	34,4	34,4	43,0	43,0	43,0	51,6	60,2	68,8	68,8
Shall and tube evaporator										
Quantity	n	1	1	1	1	1	1	1	1	1
Water flow rate	m^3/h	69,0	89,2	99,7	115,7	132,1	151,9	174,7	189,6	204,2
Water flow rate	l/s	19,2	24,8	27,7	32,1	36,7	42,2	48,5	52,7	56,7
Pressure drop	kPa	30	32	31	27	28	30	35	41	41
Pump Group P1										
Available pressure	kPa	136	110	134	129	143	131	114	99	130
Motor power	kW	5,5	5,5	7,5	7,5	11,0	11,0	11,0	11,0	15,0
Absorbed current	A	10,2	10,2	13,7	13,7	22,3	22,3	22,3	22,3	28,5
Weight	kg	84	84	93	93	158	158	158	158	165
Pump group P1H										
Available pressure	kPa	217	229	221	209	201	222	210	198	228
Motor power	kW	7,5	11,0	11,0	11,0	15,0	18,5	18,5	18,5	22,0
Absorbed current	A	13,7	22,3	22,3	22,3	28,5	34,2	34,2	34,2	40,7
Weight	kg	96	148	148	148	165	169	169	169	199
Pump Group P12										
Available pressure	kPa	136	110	134	129	143	131	114	99	130
Motor power	kW	5,5	5,5	7,5	7,5	11,0	11,0	11,0	11,0	15,0
Absorbed current	A	10,2	10,2	13,7	13,7	22,3	22,3	22,3	22,3	28,5
Weight	kg	168	168	186	186	316	316	316	316	330
Pump group P2H										
Available pressure	kPa	217	229	221	209	201	222	210	198	228
Motor power	kW	7,5	11,0	11,0	11,0	15,0	18,5	18,5	18,5	22,0
Absorbed current	A	13,7	22,3	22,3	22,3	28,5	34,2	34,2	34,2	40,7
Weight	kg	192	296	296	296	330	338	338	338	398
Pump group PT										
Available pressure	kPa	117	125	116	104	124	110	128	125	105
Motor power	kW	5,5	7,5	7,5	7,5	11,0	11,0	15,0	15,0	15,0
Absorbed current	A	10,2	13,7	13,7	13,7	22,3	22,3	28,5	28,5	28,5
Weight	Kg	176	200	200	200	345	345	359	359	359
Hydraulic kit										
Quantity	n					1				
Buffer tanks	l	800	800	800	800	1.000	1.000	1.000	1.200	1.200
Peso	Kg	145	145	145	145	220	220	220	260	260
Electrical data										
Total absorbed power	kW	133,8	172,6	201,2	237,4	267,2	313,2	349,8	391,2	427,6
Total nominal absorbed current	A	224,9	292,4	350,0	400,4	441,8	529,6	590,2	660,8	726,8
Maximum absorbed current	A	344,4	394,4	471,0	603,0	663,0	691,6	780,2	894,8	962,8
Total inrush current	A	1.476,4	2.063,4	1.407,5	1.585,7	1.684,4	2.143,6	2.354,2	2.884,8	3.267,8
Total inrush current with opt. PW/DS	A	500,0	685,0	600,0	657,7	707,0	877,0	975,0	1.170,0	1.315,0
Sound pressure level										
Sound pressure level 2)	dB(A)	84,9	84,1	84,1	85,9	87,3	88,1	87,1	87,3	89,4
Dimensions										
Lenght	mm	4.750	4.750	5.720	5.720	5.720	6.690	7.670	9.120	9.120
Width	mm	2.300	2.300	2.300	2.300	2.300	2.300	2.300	2.300	2.300
Height	mm	2.560	2.560	2.560	2.560	2.560	2.560	2.560	2.560	2.560
Transport weight 3)	kg	4.356	4.964	5.699	7.123	7.847	8.352	9.107	10.671	10.973
Weight in operation	kg	4.563	5.148	5.924	7.433	8.225	8.700	9.542	11.106	11.471
Refrigerant charge for each circuit	kg	91	180	190	231	234	272	362	294	385
Power supply										
Power supply	V / ph / Hz					400 V / 50 Hz / 3 Ph + T				
NOTES										

1) Nominal condition referred to: air 35 °C - chilled water 12/7 °C.
2) Measured at 1 m in open field (ISO 3746).
3) Oil and refrigerant charge included.

Technical data sheet - RAH 431-1202 S Ka

RAH S		431 Ka	522 Ka	602 Ka	702 Ka	802 Ka	922 Ka	1032 Ka	1102 Ka	1202 Ka
Cooling capacity										
Cooling capacity 1)	kW	387,3	490,4	570,7	651,0	768,2	883,2	1.006,9	1.093,7	1.206,5
Absorbed power	kW	122,4	167,8	185,0	225,4	247,2	289,2	325,6	365,6	387,6
EER Gross	kW/kW	3,16	2,92	3,08	2,89	3,11	3,05	3,09	2,99	3,11
EER Net	kW/kW	2,92	2,76	2,89	2,73	2,93	2,88	2,91	2,80	2,92
ESSER		4,06	3,96	3,99	4,07	4,13	4,06	4,06	3,78	3,91
Screw compressors										
Quantity	n	1	2	2	2	2	2	2	2	2
Standard steps capacity	n	3	6	6	6	6	6	6	6	6
Continuous control capacity (option)	%					0-12÷100				
Circuits	n	1	2	2	2	2	2	2	2	2
Nominal absorbed current	A	197,6	284,4	312,6	369,6	398,8	478,0	536,0	614,0	646,0
Maximum absorbed current	A	310,0	392,0	428,0	560,0	620,0	640,0	720,0	826,0	894,0
Inrush current	A	1.442,0	1.222,2	1.367,3	1.548,8	1.641,4	2.092,0	2.297,0	2.827,0	3.193,0
Inrush current with opt. PW/DS	A	470,0	502,0	560,0	621,0	665,0	825,0	918,0	1.112,0	1.240,0
Axial fans										
Quantity	n	8	8	10	10	12	14	16	20	20
Rotation speed	rpm	685	685	685	685	685	685	685	685	685
Motors power	kW	10,2	10,2	12,7	12,7	15,2	17,8	20,3	25,4	25,4
Total air flow	m^3/h	139.360	116.000	155.000	150.000	174.000	217.000	232.800	326.000	320.000
Total air flow	l/s	38.711	32.222	43.056	41.667	48.333	60.278	64.667	90.556	88.889
Nominal absorbed current	A	20,0	20,0	25,0	25,0	30,0	35,0	40,0	50,0	50,0
Shall and tube evaporator										
Quantity	n					1				
Water flow rate	m^3/h	66,6	84,4	98,2	112,0	132,1	151,9	173,2	188,1	207,5
Water flow rate	l/s	18,5	23,4	27,3	31,1	36,7	42,2	48,1	52,3	57,6
Pressure drop	kPa	28	32	30	26	27	30	35	40	40
Pump Group P1										
Available pressure	kPa	103	127	115	103	132	120	107	103	101
Motor power	kW	5,5	7,5	7,5	7,5	11,0	11,0	11,0	15,0	15,0
Absorbed current	A	11,0	15,0	15,0	15,0	22,2	22,2	22,2	28,8	28,8
Weight	kg	119	141	141	141	205	205	205	250	250
Pump group P1H										
Available pressure	kPa	207	237	235	233	226	212	240	225	212
Motor power	kW	11,0	18,5	18,5	18,5	18,5	18,5	22,0	22,0	22,0
Absorbed current	A	22,2	35,0	35,0	35,0	35,0	35,0	41,5	41,5	41,5
Weight	kg	191	265	265	265	265	265	282	282	282
Pump Group P2										
Available pressure	kPa	103	127	115	103	132	120	107	103	101
Motor power	kW	5,5	7,5	7,5	7,5	11,0	11,0	11,0	15,0	15,0
Absorbed current	A	11,0	15,0	15,0	15,0	22,2	22,2	22,2	28,8	28,8
Weight	kg	238	282	282	282	410	410	410	500	500
Pump group P2H										
Available pressure	kPa	207	237	235	233	226	212	240	225	212
Motor power	kW	11,0	18,5	18,5	18,5	18,5	18,5	22,0	22,0	22,0
Absorbed current	A	22,2	35,0	35,0	35,0	35,0	35,0	41,5	41,5	41,5
Weight	kg	382	530	530	530	530	530	564	564	564
Pump group PT										
Available pressure	kPa	117	117	107	113	98	110	98	124	111
Motor power	kW	5,5	7,5	7,5	11,0	11,0	11,0	11,0	15,0	15,0
Absorbed current	A	11,0	15,0	15,0	22,2	22,2	22,2	22,2	28,5	28,5
Weight	Kg	262	314	314	415	415	461	461	471	471
Hydraulic kit										
Quantity	n					1				
Buffer tanks	l	800	800	800	800	1.000	1.000	1.200	1.200	1.200
Peso	Kg	145	145	145	145	220	220	260	260	260
Electrical data										
Total absorbed power	kW	132,6	178,0	197,7	238,1	262,4	307,0	345,9	391,0	413,0
Total nominal absorbed current	A	217,6	304,4	337,6	394,6	428,8	513,0	576,0	664,0	696,0
Maximum absorbed current	A	330,0	412,0	453,0	585,0	650,0	675,0	760,0	876,0	944,0
Total inrush current	A	1.462,0	1.242,2	1.392,3	1.573,8	1.671,4	2.127,0	2.337,0	2.877,0	3.243,0
Total inrush current with opt. PW/DS	A	490,0	522,0	585,0	646,0	695,0	860,0	958,0	1.162,0	1.290,0
Sound pressure level										
Sound pressure level 2)	dB(A)	79,2	80,1	78,8	80,7	82,2	83,0	81,9	82,0	84,3
Dimensions										
Lenght	mm	4.750	4.750	5.720	5.720	6.690	7.670	9.120	10.570	10.570
Width	mm	2.300	2.300	2.300	2.300	2.300	2.300	2.300	2.300	2.300
Height	mm	2.560	2.560	2.560	2.560	2.560	2.560	2.560	2.560	2.560
Transport weight 3)	kg	4522	5722	6152	7595	8114	8844	10527	10822	11664
Weight in operation	kg	4729	5906	6377	7905	8492	9192	10962	11257	12162
Refrigerant charge for each circuit	kg	91,7	180,5	190,8	231,8	235,0	272,7	362,9	295,2	385,4
Power supply										
Power supply	V / ph / Hz	400 V / 50 Hz / 3 Ph + T								
NOTES										

1) Nominal condition referred to: air 35 °C - chilled water 12/7 °C.
2) Measured at 1 m in open field (ISO 3746).
3) Oil and refrigerant charge included.