B COOL MANUFACTURERS OF AIR-CONDITIONING EQUIPMENT LTD

BRAC Series

PACKAGED AIR TO WATER CHILLERS
COOLING APPLICATIONS
OUTDOOR INSTALLATION

Ver. 3.02 01_18

ISO 9001
BUREAU VERITAS
Certification

COOLING CAPACITY

164,0 kW - 1.342,9 kW **(R407C)**
152,1 kW - 1.198,2 kW **(R134a)**

Engineering Data

The **BCOOL BRAC** large capacity series includes packaged air cooled water chillers for cooling applications and outdoor installation. They are available in several types and models, with nominal capacities ranging from 152,06 to 1.342,87 kW.

The **BCOOL BRAC series** is ideal, in combination with water terminal units or air-handling units, for air-conditioning of large buildings, such as office-buildings, hotels, hospitals, shopping centers, entertainment centers, etc., or for supplying chilled water in industrial applications.

Optimized design for R407C and R134a refrigerant

Casing: Galvanized Steel plate with polyesteric coating.
Assembly: Fully bolted/welding free.
Compressor: Twin Screw Semi Hermetic.
Air heat exchanger: Cross finned coil, internally grooved copper tubes and louvered aluminium fins.
Direct drive propeller fan: Low rpm, quiet operation.
Water heat exchanger: Shell and tube type.
Free cooling coil: Cross finned coil, with copper tubes and aluminium fins.
Hydromodule.
Safety and functional devices:
High/low pressure switch.
Phase sequence - phase failure - reverse phase and voltage monitoring device.
Evaporator low temperature protection.
Electronic microprocessor control with digital display.
Differential water pressure switch.
High pressure relief valve on compressor discharge.
Constant compressor current monitoring control.
Liquid injection cooling system, to ensure the appropriate gas discharge temperature.
Electronic expansion valve, ensuring constant suction gas superheat at all operating conditions.
Stepless compressor control, continuously regulating output capacity from 25% to 100%, in accordance with load demand.
Various optional capabilities.

Nomenclature

B - R A - C - X X X - X - X
1 2 3 4 5 6

1 **BCOOL**

2 **R**-Twin Screw Compressors
A-Air Cooled Water Chiller

3 **C**ooling only

4 **Capacity (RT)**

5 **Optional**
HD-Hydronic
PK-Pump Kit

6 **Refrigerant Liquid**
R407C, R134a

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Generally

The BCOOL BRAC series, including air-cooled water chillers, consists of 16 basic models covering capacities from 152,1 up to 1.342,9 kW. It is the end result of a thorough study and accurate design by experienced BCOOL research and development teams, to develop a large size chiller series with compact shape, high performance and reliability of the highest quality standards. This series meets the highest levels of aesthetic and technical requirements, using the latest technological innovations, including environmentally friendly R407C or R134a refrigerant, that is chlorine-free and has zero ozone depletion potential. BRAC units are therefore ideal for installation in commercial and industrial applications, due to their robust construction, high-efficiency performance, reliability, selected materials and low operating sound levels.

Casing

All units use metal parts that are fabricated from heavy gauge galvanized steel sheets, formed to ensure maximum rigidity that guarantees and preserves the unit's operation during the years.
After fabrication these are degreased, phosphatised and electrostatically powder coated with an epoxy-polyester RAL 9002 coating of a thickness of 60-70 μm.
This fully automatic process ensures superior corrosion resistance against the most aggressive ambient conditions. This treatment can successfully withstand a salt spray test of 500 hours, according to ASTM B-117.
All components are assembled together using bolts, thus avoiding the need for welding which may harm the galvanization of the steel and ensuring that the whole assembly can fully withstand adverse weather conditions.
The compact footprint of the unit arises from detailed study and design by our engineering teams and results in a machine which fits easily in restricted areas, is simple and easy to install and maintain and has been designed with special fittings for easy transportation and lifting.
Removable side panels with special locks are used to permit access only to authorized personnel to internal components of the unit, for inspection and maintenance. Electrical and electronic equipment and components for proper unit's operation are located inside a weather proof (IP 55) electrical panel, with access via special key.

Compressors

All units are equipped with 2 semi-hermetic, accessible, screw type compressors and 2 independent refrigerant circuits. All screw compressors are designed for use with R407C or R134a refrigerant.
The compression of the refrigerant is succeeded via twin screw shafts. The first one is directly driven by the motor and the second one is driven by the first. As a result, the refrigerant flows through the screws and is compressed. The compressors consist of twin screws moving in opposite directions, especially made out of steel and are installed in a separate compartment from the electric motor. The original seating design of the twin screws in 11-B type ball bearings, constantly varying performance through an axial shaft, ensures not only long life but also high performance. Movement to the screws is transmitted by direct connection through the induction motor.

The 3 phase 2 pole induction motor is suitable for a 400V-50Hz network and does not require any heat dissipation, as it is cooled by the refrigerant medium itself. The windings design does not require any additional external cooling. A reduced starting current start-up configuration ensures minimum start-up current.
The compressors are equipped with continuous (stepless) capacity control system. In continuous (stepless) capacity control system, a normally open solenoid valve and a normally closed solenoid valve are equipped to the inlet and outlet of the piston cylinder respectively. These two solenoid valves are controlled by the chiller microprocessor, while refrigeration capacity control can be modulated at anywhere within 25%-100%.
The compressors are equipped with a special oil-separator, ensuring the minimum possible lubricant circulation in the refrigerant circuit. Fitting lubrication is accomplished with effusion created by the pressure differential during normal operation, without the use of an additional mechanical pump. Compressors are equipped with crankcase electrical heater for the oil, glass observation window for the oil level, oil filter with a designated cleaning/charging port, constant oil level control and are internally protected by special thermistors against potential overheating or electrical spikes.
Externally the compressors are equipped with a watertight IP-55 protected electrical panel, bearing all necessary connections for operation and control. Inside the electrical panel, an installed microprocessor controls all safety and operation features of the compressor.

In order to ensure correct operation, the compressor also features:

High temperature sensor for the refrigerant medium (PT-100).
High temperature sensor for induction motor windings (PT-100).
Low oil level safety switch.
Refrigerant gas suction filter, accessible.
Valves in both suction and discharge lines.
Check valve in discharge line.
Pressure safety setup, ensuring the highly pressurized refrigerant gas is within safety limits.
Additional cooling in the suction chamber via a thermoexpansion valve when necessary, through refrigerant liquid spray, ensuring temperatures are kept within designated limits.
Special rubber pads to absorb noise from the unit's operation.

Air heat exchanger

All units' air heat exchangers are manufactured from high quality seamless inner grooved copper tubes according to ASTM B-280, having an outside diameter of 9,52 mm (3/8"). The fins are manufactured from aluminium and form the secondary extended heat transfer surface. The fins are continuous across the heat exchanger and are fabricated in high precision dedicated press lines. The fin surface is waffle formed, so as to increase the fin rigidity and has special louvers that help to increase heat transfer. The combination of internally grooved copper-tubing and louvered fins has resulted in a heat transfer performance 30% superior to that of a conventional coil for this particular application. The assembly of the finned pack is achieved by mechanical expansion of the tubes in such a way, as to form a perfect mechanical bond with the fins. For this purpose, the fin holes have a peripheral extrusion (collar) of adjustable height. This extrusion serves to define the distance between the fins (and consequently the total heat transfer surface) and to ensure perfect contact of the fins to the tubes. Alternative fin materials are available upon request, such as epoxy – coated aluminium or copper for applications in especially aggressive environments.
The condensers are V-shaped paired, in order to exploit all available space. Upon completion of the manufacturing procedure, all coils are pressure tested at 30 bar for leaks.

Water heat exchanger

All units are equipped with a Shell and Tube, water–direct expansion type evaporator that has two separate cooling circuits, one for each independent refrigerant circuit. The casing is of steel and the internal tubes are of copper. There is an air vent valve, drain valve, differential water pressure switch, probes for water temperature sensors and the whole heat exchanger is wrapped in a heavy insulation material, appropriate for external installation.

Condenser fans

Condenser fans are of the axial type, directly transmitting motion to the blades, suitable for outdoor installation and pair mounted in-between the V-shaped condenser coils. The 3-phase motors are of closed type, low rpm, F insulation type and IP-55 protected. Axial seating is suitable for vertical operation, while internal thermal protection for the windings is also included. Due to the special aerodynamic design of the blades and inlet cones, as well as the perfect static and dynamic balancing, their operation is completely vibration-free. The fan motor assembly has a protective grid against accidental contact with moving parts, which is designed according to ISO regulations. Fan motors are aerodynamically shaped, so as not to interfere with the airflow and have permanently lubricated bearings that do not require service.
Upon request, it is also available an electrical set-up which controls the fan rpm through a microprocessor, depending on the condensation temperature or pressure. Through this set-up, the operational pressures of the device depend on the external conditions, thus increasing energy efficiency. Also this way of controlling of the fans ensures machine performance under extreme cooling conditions, maximum performance, minimum absorbed current and noise confinement of the machine.

Microprocessor controller

All units are equipped with an electronic programmable control system. This allows complete management of all functions of the unit and ensures protection of all vital parts. The controller has a full self-diagnostic function, as to prevent the stop of the machine by alarm. The diagnostic function permits easy and straightforward understanding of all possible failures and malfunctions of the unit. All functions and indicators appear on the LCD screen. Over 150 programmable parameters offer complete unit management.

Critical parameters that require control are:

Start-up / shut down time of compressor.
Time delay.
Protection against multiple start-up.
Water pump time delay in reference to unit's operation.
Inlet / outlet water temperature.
Evaporator and Condenser temperature.
Discharge temperature.
Suction temperature.
Continuous sophisticated compressor capacity control, using multiple parameters.
High discharge pressure.
Low suction pressure.
Water temperature adjustment in the inlet side, during summer operation.
Superheat temperature.

Controlled fault parameters:

Low suction pressure per refrigerant circuit.
High discharge pressure - temperature per refrigerant circuit.
Oil low level.
Compressor overload.
Fan motor overload.
Water pump overload.
Differential water pressure switch.
Error reading in water outlet low temperature.
Compressor operating hours reading.

In addition the control also includes:

Self diagnostic error of all electronic control sensors.
Connection to building management system (BMS) by means of a Modbus or Metasys Protocol, through RS485 serial gate.
Remote on / off switch.
Remote alarm indication capability.
History of operation points and fault codes.
Password access code.

Refrigerant circuits

All units have two separate refrigerant circuits. Each refrigerant circuit consists of the following:
Electronic expansion valve with constant step control, in order to maintain constantly the appropriate superheat of the refrigerant. The valve moves electromechanically and is controlled by the unit's microprocessor. The valve is supplied with low voltage current, which in addition is protected against sudden power shutdown. When the valve is in off position, it maintains a tight normally closed state not allowing refrigerant flow, thus not needing supplemental electromagnetic valve at the liquid line.
Filter dryer.
Shut-off valves to allow easy replacement of the filter core, without loss of refrigerant.
Liquid injection valve (R407C).
Shut-off valves to allow service of the compressors.
Solenoid valve in liquid injection line.
Sight glass for checking the liquid lines.
Pressure relief valve on compressor discharge.
High and low pressure gauge for each refrigerant circuit, easily viewed (optional).
Service valves.

Other unit accessories / options

R404a refrigerant, for special applications of low tempeature under 0^0C.
Condenser fins made of copper or prepainted aluminum and Blygold treatment for anti-corrosion protection.
Glycol application for chilled water temperature down to -15 ^{0}C
Continous linear fan speed regulation control.
A-meter, V-meter.
Anti-freezing electrical heater at the evaporator.
Electrical board ventilation fan.
Heat recovery exchanger.
Hydromodule with water pump, without buffer tank, PK series.
Hydromodule with water pump, with buffer tank, HD series.
Axial fans with EC motors, for energy saving.
Other custom built options upon request.

Optional accessories

Microprocessor controller options:
BMS module interface kit for Bacnet, Trend, Lonworks connection.
BMS interface kit for Modbus connection.
Connection via internet, using a device converting the Carel protocol to 10 Mb/s TCP / IP ethernet protocol.
Communication card through RS232 / RS485 serial ports.
Possibility to send and receive messages, using a GSM modem.
Extension memory card for up to five thousand messages.
Extension memory card 1 & 2 MB.
Microprocessor parameter reprogramming card.

BRAC R407C

MODEL	50 Hz	BRAC 050	BRAC 070	BRAC 085	BRAC 095	BRAC 105	BRAC 125	BRAC 150
Nominal cooling capacity[1]	**kW**	**163,94**	**219,46**	**273,02**	**317,95**	**373,9**	**422,71**	**500,69**
	RT	47	62	78	90	106	120	142
	Btu/h	558.886	748.159	930.750	1.083.920	1.274.659	1.441.057	1.706.898
Construction	Material/Color	Galvanized steel / Light grey-beige (RAL 9002)						
Compressor	Type	Twin Screw						
Quantity		2						
Capacity steps		Stepless down to 12,5 %						
Absorbed power	kW	57,0	74,8	91,2	104,6	126,4	138,8	154,6
Nominal operating current	A	93,4	122,6	149,6	171,6	207,4	227,6	253,4
Starting current	A	235,0	325,0	450,0	450,0	530,0	650,0	765,0
Air heat exchanger	Type	High capacity cross finned coil with internally grooved tubes and louvered fins						
Water heat exchanger	Type	Shell and tube						
Quantity		1						
Water content	Lit.	48,0	55,0	94,0	88,0	80,0	133,0	221,0
Max. operating pressure	Water side Bar	16						
	Refrigerant side Bar	29						
Connections		DN 100	DN 100	DN 125	DN 125	DN 125	DN 150	DN 150
Nominal water flow	m^3/h	28,198	37,747	46,959	54,687	64,311	72,706	86,119
Water pressure drop	kPa	27,0	37,0	26,0	29,0	23,0	29,0	40,0
Minimum water content of system	Lit.	590	790	983	1.145	1.346	1.522	1.802
Fan	Type	Axial						
Quantity		4	4	4	6	6	6	8
Speed	RPM	900						
Total air flow	m^3/h	79.000	78.240	75.000	117.360	115.000	112.500	156.480
Absorbed power	kW	6,0	6,0	6,0	9,0	9,0	9,0	12,0
Nominal operating current	A	12,0	12,0	12,0	18,0	18,0	18,0	24,0
Starting current	A	12,4	12,4	12,4	18,6	18,6	18,6	24,8
Electrical characteristics		Electric network 400 V / 3 Ph / 50 Hz						
Total absorbed power	kW	63,0	80,8	97,2	113,6	135,4	147,8	166,6
Total operating current	A	105,4	134,6	161,6	189,6	225,4	245,6	277,4
Compressor carter resistance power	W	300	300	300	300	300	300	300
Voltage operating limits	V	360-440						
Refrigerant circuit								
Number of circuits		2						
Expansion device		Electronic expansion valve						
Refrigerant type		R407C						
Noise level @ 5m	db(A)	66	67	68	69	69	69	70
Dimensions	Width mm	2.200	2.200	2.200	2.200	2.200	2.200	2.200
	Length mm	3.300	3.300	3.300	4.200	4.200	4.200	5.500
	Height mm	2.380	2.380	2.380	2.380	2.380	2.380	2.400
Shipping weight	Kg	1.750	2.120	2.570	3.380	3.850	3.900	4.500

NOTES

1 Nominal cooling capacity at following operational conditions: Entering / leaving chilled water temperature 12 / 7°C. Ambient air temperature 35°C.

Electrical installation specifications are purely indicative and non-binding.
All connections to the system and the electrical installation must be in full accordance with the applicable national and local codes.

MODEL	50 Hz	BRAC 170	BRAC 205	BRAC 230	BRAC 270	BRAC 300	BRAC 350	BRAC 385
Nominal cooling capacity[1]	**kW**	**593,78**	**712,37**	**807,41**	**943,06**	**1.038,1**	**1.223,32**	**1.342,87**
	RT	169	202	229	268	295	348	381
	Btu/h	2.024.250	2.428.534	2.752.534	3.214.977	3.538.977	4.170.409	4.577.966
Construction	Material/Color	Galvanized steel / Light grey-beige (RAL 9002)						
Compressor	Type	Twin Screw						
Quantity		2						
Capacity steps		Stepless down to 12,5 %						
Absorbed power	kW	169,8	224,4	250,4	294,0	324,2	378,0	415,2
Nominal operating current	A	278,4	365,0	410,6	482,2	532,0	620,2	681,0
Starting current	A	985,0	985,0	1285,0	1390,0	1580,0	2080,0	2330,0
Air heat exchanger	Type	High capacity cross finned coil with internally grooved tubes and louvered fins						
Water heat exchanger	Type	Shell and tube						
Quantity		1						
Water content	Lit.	221,0	207,0	185,0	222,0	320,0	313,0	348,0
Max. operating pressure	Water side Bar	16						
	Refrigerant side Bar	29						
Connections		DN 200	DN 200	DN 200	DN 200	DN 200	DN 200	DN 200
Nominal water flow	m^3/h	102,130	122,528	138,875	162,206	178,553	210,411	230,974
Water pressure drop	kPa	45,0	49,0	43,0	37,0	30,0	35,0	49,0
Minimum water content of system	Lit.	2.138	2.565	2.907	3.395	3.737	4.404	4.834
Fan	Type	Axial						
Quantity		10	10	12	14	14	16	16
Speed	RPM	900						
Total air flow	m^3/h	195.000	195.000	234.000	273.000	273.000	312.000	312.000
Absorbed power	kW	15,0	15,0	18,0	21,0	21,0	24,0	24,0
Nominal operating current	A	30,0	30,0	36,0	42,0	42,0	48,0	48,0
Starting current	A	31,0	31,0	37,2	43,4	43,4	49,6	49,6
Electrical characteristics		Electric network 400 V / 3 Ph / 50 Hz						
Total absorbed power	kW	184,8	239,4	268,4	315,0	345,2	402,0	439,2
Total operating current	A	308,4	395,0	446,6	524,2	574,0	668,2	729,0
Compressor carter resistance power	W	300	300	300	300	300	300	300
Voltage operating limits	V	360-440						
Refrigerant circuit								
Number of circuits		2						
Expansion device		Electronic expansion valve						
Refrigerant type		R407C						
Noise level @ 5m	db(A)	72	72	73	74	74	75	75
Dimensions	Width mm	2.200	2.200	2.200	2.200	2.200	2.200	2.200
	Length mm	6.800	6.800	8.100	9.400	9.400	10.700	10.700
	Height mm	2.400	2.400	2.420	2.420	2.420	2.420	2.420
Shipping weight	Kg	5.350	5.680	6.700	7.700	8.100	9.050	9.150

NOTES

1 Nominal cooling capacity at following operational conditions: Entering / leaving chilled water temperature 12 / 7^{0}C. Ambient air temperature 35^{0}C.

Electrical installation specifications are purely indicative and non-binding.
All connections to the system and the electrical installation must be in full accordance with the applicable national and local codes.

BRAC R134a

MODEL	50 Hz	BRAC 045	BRAC 060	BRAC 070	BRAC 080	BRAC 100	BRAC 115	BRAC 125	BRAC 140
Nominal cooling capacity[1]	**kW**	**152,06**	**200,66**	**217,5**	**273,24**	**350,78**	**401,54**	**436,75**	**480,82**
	RT	43	57	62	78	100	114	124	137
	Btu/h	518.386	684.068	742.801	931.500	1.195.841	1.368.886	1.488.920	1.639.159
Construction	Material/Color	Galvanized steel / Light grey-beige (RAL 9002)							
Compressor	Type	Twin Screw							
Quantity		2							
Capacity steps		Stepless down to 12,5 %							
Absorbed power	kW	46,4	58,4	67,6	78,2	98,4	112,6	121,4	136,4
Nominal operating current	A	76,0	95,8	109,8	128,2	161,4	184,6	199,2	223,8
Starting current	A	240,0	325,0	425,0	500,0	625,0	720,0	720,0	730,0
Air heat exchanger	Type	High capacity cross finned coil with internally grooved tubes and louvered fins							
Water heat exchanger	Type	Shell and tube							
Quantity		1							
Water content	Lit.	94,0	88,0	80,2	133,0	125,0	222,0	206,0	206,0
Max. operating pressure	Water side Bar	16							
	Refrigerant side Bar	29							
Connections		DN 125	DN 125	DN 125	DN 150	DN 150	DN 200	DN 200	DN 200
Nominal water flow	m^3/h	26,154	34,514	37,467	46,997	60,334	69,065	75,121	82,701
Water pressure drop	kPa	25,0	42,0	43,0	43,0	50,0	27,0	38,0	46,0
Minimum water content of system	Lit.	547	722	830	984	1.263	1.446	1.572	1.731
Fan	Type	Axial							
Quantity		4	4	4	4	6	6	6	8
Speed	RPM	900							
Total air flow	m^3/h	79.000	78.240	78.240	75.000	117.360	115.000	112.500	156.480
Absorbed power	kW	6,0	6,0	6,0	6,0	9,0	9,0	9,0	12,0
Nominal operating current	A	12,0	12,0	12,0	12,0	18,0	18,0	18,0	24,0
Starting current	A	12,4	12,4	12,4	12,4	18,6	18,6	18,6	24,8
Electrical characteristics		Electric network 400 V / 3 Ph / 50 Hz							
Total absorbed power	kW	52,4	64,4	73,6	84,2	107,4	121,6	130,4	148,4
Total operating current	A	88,0	107,8	121,8	140,2	179,4	202,6	217,2	247,8
Compressor carter resistance power	W	300	300	300	300	300	300	300	300
Voltage operating limits	V	360-440							
Refrigerant circuit									
Number of circuits		2							
Expansion device		Electronic expansion valve							
Refrigerant type		R134a							
Noise level @ 5m	db(A)	66	67	67	68	69	69	69	70
Dimensions	Width mm	2.200	2.200	2.200	2.200	2.200	2.200	2.200	2.200
	Length mm	3.300	3.300	3.300	3.300	4.200	4.200	4.200	5.500
	Height mm	2.380	2.380	2.380	2.380	2.380	2.380	2.380	2.400
Shipping weight	Kg	1.750	2.120	2.120	2.570	3.380	3.550	3.700	4.500

NOTES

1 Nominal cooling capacity at following operational conditions: Entering / leaving chilled water temperature 12 / 7^{0}C. Ambient air temperature 35^{0}C.

Electrical installation specifications are purely indicative and non-binding.
All connections to the system and the electrical installation must be in full accordance with the applicable national and local codes.

MODEL	50 Hz	BRAC 150	BRAC 170	BRAC 185	BRAC 210	BRAC 250	BRAC 285	BRAC 320	BRAC 340
Nominal cooling capacity[1]	**kW**	**531,4**	**577,37**	**652,75**	**740,23**	**857,95**	**992,3**	**1.115,64**	**1.198,15**
	RT	151	164	185	210	244	282	317	340
	Btu/h	1.814.826	1.968.307	2.225.284	2.523.511	2.924.830	3.382.841	3.803.318	4.084.602
Construction	Material/Color	Galvanized steel / Light grey-beige (RAL 9002)							
Compressor	Type	Twin Screw							
Quantity		2							
Capacity steps		Stepless down to 12,5 %							
Absorbed power	kW	154,4	168,2	181,4	201,2	231,2	268,2	298,8	321,6
Nominal operating current	A	248,4	275,8	297,6	330,2	380,4	440,0	490,2	518,6
Starting current	A	790,0	845,0	915,0	1285,0	1400,0	1495,0	2080,0	2380,0
Air heat exchanger	Type	High capacity cross finned coil with internally grooved tubes and louvered fins							
Water heat exchanger	Type	Shell and tube							
Quantity		1							
Water content	Lit.	185,0	185,0	225,0	310,0	378,0	348,0	337,0	435,0
Max. operating pressure	Water side Bar	16							
	Refrigerant side Bar	29							
Connections		DN 200	DN 200	DN 200	DN 200	DN 200	DN 200	DN 200	DN 200
Nominal water flow	m^3/h	91,541	99,308	112,273	127,320	147,567	170,676	191,890	206,082
Water pressure drop	kPa	45,0	46,0	43,0	37,0	37,0	41,0	49,0	52,0
Minimum water content of system	Lit.	1.850	2.079	2.350	2.665	3.089	3.572	4.016	4.13
Fan	Type	Axial							
Quantity		8	10	10	12	14	14	16	16
Speed	RPM	900							
Total air flow	m^3/h	156.000	195.000	195.000	234.000	273.000	273.000	312.000	312.000
Absorbed power	kW	12	15,0	15,0	18,0	21,0	21,0	24,0	24,0
Nominal operating current	A	24	30,0	30,0	36,0	42,0	42,0	48,0	48,0
Starting current	A	24,8	31,0	31,0	37,2	43,4	43,4	49,6	49,6
Electrical characteristics		Electric network 400 V / 3 Ph / 50 Hz							
Total absorbed power	kW	166,4	183,2	196,4	219,2	252,2	289,2	322,8	345,6
Total operating current	A	272,4	305,8	327,6	366,2	422,4	482,0	538,2	566,6
Compressor carter resistance power	W	300	300	300	300	300	300	300	300
Voltage operating limits	V	360-440							
Refrigerant circuit									
Number of circuits		2							
Expansion device		Electronic expansion valve							
Refrigerant type		R134a							
Noise level @ 5m	db(A)	70	72	72	73	74	74	75	75
Dimensions	Width mm	2.200	2.200	2.200	2.200	2.200	2.200	2.200	2.200
	Length mm	5.500	6.800	6.800	8.100	9.400	9.400	10.700	10.700
	Height mm	2.400	2.400	2.400	2.420	2.420	2.420	2.420	2.420
Shipping weight	Kg	4.850	5.350	5.680	6.700	7.700	8.100	9.050	9.150

NOTES

1 Nominal cooling capacity at following operational conditions: Entering / leaving chilled water temperature 12 / 7°C. Ambient air temperature 35°C.

Electrical installation specifications are purely indicative and non-binding.
All connections to the system and the electrical installation must be in full accordance with the applicable national and local codes.

2.3 Cooling capacity table
BRAC R407C

Ambient °C		25			30			35			40			45		
MODEL	Water outlet °C	Cooling capacity kW	Absorbed power kW	Current A	Cooling capacity kW	Absorbed power kW	Current A	Cooling capacity kW	Absorbed power kW	Current A	Cooling capacity kW	Absorbed power kW	Current A	Cooling capacity kW	Absorbed power kW	Current A
BRAC 050	5,0	177,7	46,2	75,0	165,1	50,8	82,6	151,2	56,1	91,2	136,1	61,8	100,5	119,8	67,9	110,3
	7,0	191,8	46,9	76,2	178,5	51,3	83,3	163,9	57,0	93,4	147,5	62,7	101,9	131,2	68,4	111,1
	10,0	214,4	48,2	78,3	200,0	53,0	86,1	184,4	58,1	94,4	167,7	64,0	104,0	149,7	70,1	113,9
BRAC 070	5,0	237,9	60,6	98,4	221,0	66,7	108,4	202,3	73,7	119,7	182,2	81,2	131,8	160,4	89,1	144,7
	7,0	256,8	61,6	100,0	239,0	67,3	109,4	219,5	74,8	122,6	197,5	82,3	133,7	175,6	89,8	145,8
	10,0	287,1	63,3	102,8	267,7	69,6	113,0	246,9	76,3	123,9	224,5	84,0	136,5	200,4	92,0	149,5
BRAC 085	5,0	296,0	73,9	120,0	274,9	81,4	132,1	251,7	89,8	145,9	226,6	99,0	160,7	199,6	108,6	176,4
	7,0	319,4	75,1	121,9	297,3	82,1	133,3	273,0	91,2	149,6	245,7	100,3	163,0	218,4	109,4	177,8
	10,0	357,1	77,2	125,3	333,1	84,8	137,8	307,1	93,0	151,1	279,3	102,4	166,4	249,3	112,2	182,2
BRAC 095	5,0	344,7	84,7	137,6	320,2	93,3	151,6	293,1	103,0	167,4	263,9	113,5	184,4	232,4	124,6	202,4
	7,0	372,0	86,1	139,8	346,2	94,1	152,9	318,0	104,6	171,6	286,2	115,1	186,9	254,4	125,5	203,9
	10,0	415,9	88,5	143,7	387,9	97,3	158,0	357,7	106,7	173,3	325,3	117,5	190,8	290,3	128,7	209,0
BRAC 105	5,0	405,3	102,4	166,3	376,5	112,7	183,2	344,7	124,5	202,2	310,3	137,1	222,8	273,3	150,5	244,5
	7,0	437,5	104,0	169,0	407,2	113,8	184,8	373,9	126,4	207,4	336,5	139,0	225,9	299,1	151,7	246,4
	10,0	489,1	106,9	173,7	456,2	117,6	191,0	420,6	128,9	209,4	382,5	141,9	230,6	341,4	155,5	252,6
BRAC 125	5,0	458,2	112,4	182,6	425,7	123,8	201,1	389,7	136,7	222,1	350,8	150,6	244,6	309,0	165,3	268,5
	7,0	494,6	114,2	185,6	460,3	124,9	202,9	422,7	138,8	227,6	380,4	152,7	248,0	338,2	166,6	270,6
	10,0	552,9	117,4	190,7	515,7	129,1	209,7	475,5	141,6	230,0	432,4	155,9	253,2	385,9	170,7	277,3
BRAC 150	5,0	542,7	125,2	203,4	504,2	137,9	224,0	461,6	152,3	247,4	415,6	167,7	272,5	366,0	184,1	299,1
	7,0	585,8	127,2	206,7	545,3	139,1	226,0	500,7	154,6	253,4	450,6	170,1	276,3	400,6	185,5	301,4
	10,0	654,9	130,8	212,5	610,8	143,8	233,6	563,3	157,7	256,2	512,2	173,6	282,0	457,1	190,2	308,9
BRAC 170	5,0	643,7	137,5	223,4	597,9	151,5	246,0	547,5	167,3	271,7	492,8	184,2	299,3	434,1	202,2	328,5
	7,0	694,7	139,7	227,0	646,6	152,8	248,2	593,8	169,8	278,4	534,4	186,8	303,4	475,0	203,8	331,0
	10,0	776,7	143,7	233,4	724,4	157,9	256,5	668,0	173,2	281,3	607,4	190,7	309,8	542,1	208,9	339,3
BRAC 205	5,0	772,2	181,8	295,3	717,4	200,2	325,2	656,8	221,0	359,1	591,3	243,5	395,5	520,7	267,3	434,1
	7,0	833,5	184,7	300,0	775,8	202,0	328,1	712,4	224,4	365,0	641,1	246,8	401,0	569,9	269,3	437,4
	10,0	931,8	189,8	308,4	869,1	208,7	339,0	801,4	228,9	371,8	728,8	252,0	409,4	650,4	276,0	448,4
BRAC 230	5,0	875,2	202,8	329,5	813,1	223,4	362,8	744,4	246,6	400,7	670,2	271,7	441,3	590,2	298,2	484,4
	7,0	944,7	206,1	334,8	879,3	225,4	366,1	807,4	250,4	410,6	726,7	275,4	447,4	645,9	300,5	488,1
	10,0	1056,1	211,8	344,1	985,0	232,9	378,3	908,3	255,4	414,9	826,0	281,2	456,8	737,2	308,0	500,3
BRAC 270	5,0	1022,3	238,1	386,8	949,7	262,2	426,0	869,5	289,6	470,4	782,7	319,0	518,2	689,4	350,2	568,8
	7,0	1103,4	242,0	393,1	1027,0	264,6	429,8	943,1	294,0	482,2	848,8	323,4	525,3	754,4	352,8	573,1
	10,0	1233,5	248,7	404,0	1150,5	273,4	444,2	1060,9	299,9	487,1	964,8	330,2	536,3	861,0	361,6	587,4
BRAC 300	5,0	1125,3	262,6	426,6	1045,4	289,2	469,8	957,1	319,3	518,7	861,6	351,8	571,4	758,9	386,1	627,2
	7,0	1214,6	266,8	433,4	1130,5	291,8	474,0	1038,1	324,2	532,0	934,3	356,6	579,3	830,5	389,0	632,0
	10,0	1357,8	274,3	445,5	1266,5	301,5	489,8	1167,9	330,7	537,2	1062,0	364,1	591,4	947,8	398,8	647,8
BRAC 350	5,0	1326,1	306,2	497,4	1231,9	337,2	547,7	1127,9	372,3	604,8	1015,4	410,1	666,2	894,2	450,2	731,3
	7,0	1431,3	311,1	505,4	1332,2	340,2	552,6	1223,3	378,0	620,2	1101,0	415,8	675,4	978,7	453,6	736,8
	10,0	1600,1	319,8	519,5	1492,5	351,5	571,1	1376,2	385,6	626,3	1251,5	424,5	689,6	1116,9	464,9	755,3
BRAC 385	5,0	1455,7	336,3	546,3	1352,3	370,4	601,6	1238,1	409,0	664,3	1114,6	450,5	731,8	981,6	494,5	803,3
	7,0	1571,2	341,7	555,1	1462,4	373,7	607,0	1342,9	415,2	681,0	1208,6	456,7	741,9	1074,3	498,2	809,4
	10,0	1756,5	351,3	570,6	1638,3	386,1	627,3	1510,7	423,5	688,0	1373,8	466,3	757,4	1226,0	510,7	829,6

NOTES
- Bold values show nominal cooling capacities.
- Absorbed power and current refer to the compressor.
- Above figures are valid for water dt=5°C.

BRAC R134a

Ambient °C		25			30			35			40		
MODEL	Water outlet °C	Cooling capacity kW	Absorbed power kW	Current A	Cooling capacity kW	Absorbed power kW	Current A	Cooling capacity kW	Absorbed power kW	Current A	Cooling capacity kW	Absorbed power kW	Current A
BRAC 045	5,0	164,8	37,6	61,1	153,1	41,4	67,2	140,2	45,7	74,2	126,2	50,3	81,8
	7,0	177,9	38,2	62,0	165,6	41,8	67,8	152,1	46,4	76	136,9	51,0	82,9
	10,0	198,9	39,3	63,8	185,5	43,2	70,1	171,1	47,3	76,9	155,6	52,1	84,6
BRAC 060	5,0	217,5	47,3	76,8	202,1	52,1	84,6	185	57,5	93,4	166,5	63,4	102,9
	7,0	234,8	48,1	78,1	218,5	52,6	85,4	200,7	58,4	95,8	180,6	64,2	104,4
	10,0	262,5	49,4	80,3	244,8	54,3	88,2	225,7	59,6	96,8	205,3	65,6	106,5
BRAC 070	5,0	234,9	54,8	88,2	218,8	60,3	97,1	200,5	66,5	107,2	180,1	73,3	118,2
	7,0	254,3	55,6	89,5	236,7	60,8	97,9	217,5	67,6	109,8	195,8	74,3	119,7
	10,0	282,8	57,2	92,1	265,1	43,2	101,2	244,7	68,9	111,1	222,5	75,9	122,2
BRAC 080	5,0	296,2	63,3	102,9	275,2	69,8	113,3	251,9	77	125,1	226,8	84,8	137,8
	7,0	319,7	64,4	104,5	297,6	70,4	114,3	273,2	78,2	128,2	245,9	86,0	139,7
	10,0	357,4	66,2	107,5	333,4	72,7	118,1	307,4	79,8	129,6	279,5	87,8	142,7
BRAC 100	5,0	380,2	79,7	129,5	353,2	87,8	142,6	323,4	96,9	157,4	291,1	106,8	173,4
	7,0	410,4	81,0	131,6	382,0	88,6	143,9	350,8	98,4	161,4	315,7	108,2	175,8
	10,0	458,8	83,2	135,2	428,0	91,5	148,7	394,6	100,4	163	358,8	110,5	179,5
BRAC 115	5,0	435,3	91,2	148,2	404,4	100,4	163,2	370,2	110,9	180,2	333,3	122,2	198,5
	7,0	469,8	92,7	150,5	437,3	101,3	164,6	401,5	112,6	184,6	361,4	123,9	201,2
	10,0	525,2	95,3	154,7	489,9	104,7	170,1	451,7	114,9	186,6	410,8	126,4	205,4
BRAC 125	5,0	473,4	98,3	159,7	439,8	108,3	175,9	402,7	119,6	194,2	362,5	131,7	214
	7,0	511,0	99,9	162,3	475,6	109,3	177,5	436,8	121,4	199,2	393,1	133,5	216,9
	10,0	571,3	102,7	166,8	532,8	112,9	183,4	491,3	123,8	201,2	446,8	136,3	221,5
BRAC 140	5,0	521,2	110,5	179,5	484,2	121,7	197,6	443,3	134,4	218,2	399,1	148,0	240,4
	7,0	562,6	112,3	182,4	523,6	122,8	199,4	480,8	136,4	223,8	432,7	150,0	243,7
	10,0	628,9	115,4	187,5	586,6	126,9	206,1	540,9	139,1	226,0	491,9	153,2	248,8
BRAC 150	5,0	573,9	125,1	199,5	534,5	137,8	219,6	489,8	151,9	242,4	440,0	167,4	267,4
	7,0	621,2	127,1	202,4	578,1	139,0	221,6	531,4	154,4	248,4	478,2	169,7	270,8
	10,0	690,8	130,6	208,4	647,7	98,7	229,0	597,8	157,3	251,3	543,6	173,4	276,5
BRAC 170	5,0	625,9	136,2	221,3	581,4	150,0	243,7	532,3	165,7	269,1	479,2	182,5	296,5
	7,0	675,5	138,4	224,9	628,8	151,4	245,9	577,4	168,2	275,8	519,6	185,0	300,6
	10,0	755,2	142,3	231,2	704,4	156,4	254,1	649,5	171,6	278,7	590,6	188,9	306,8
BRAC 185	5,0	707,6	146,9	238,7	657,3	161,8	262,8	601,8	178,7	290,3	541,8	196,8	319,7
	7,0	763,7	149,3	242,5	710,8	163,3	265,2	652,8	181,4	297,6	587,5	199,5	324,1
	10,0	853,8	153,5	249,3	796,4	168,7	274,0	734,3	185	300,6	667,8	203,7	330,9
BRAC 210	5,0	802,4	163	264,7	745,4	179,5	291,5	682,5	198,2	321,9	614,4	218,3	354,6
	7,0	866,1	165,6	269	806,1	181,1	294,2	740,2	201,2	330,2	666,2	221,3	359,5
	10,0	968,2	170,2	276,5	903,1	187,1	304,0	832,8	205,2	333,4	757,3	225,9	367
BRAC 250	5,0	930	187,3	304,2	864,0	206,2	335,0	791	227,7	369,9	712,1	250,9	407,5
	7,0	1003,8	190,3	309,1	934,3	208,1	338,0	858	231,2	380,4	772,2	254,3	413,1
	10,0	1122,2	195,6	317,7	1046,7	215	349,3	965,2	235,8	383,1	877,7	259,6	421,8
BRAC 285	5,0	1075,7	217,2	352,9	999,2	239,2	388,6	914,9	264,2	429,1	823,6	291,0	472,7
	7,0	1161	220,7	358,6	1080,6	241,4	392,1	992,3	268,2	440	893,1	295,0	479,2
	10,0	1297,9	226,9	368,6	1210,6	249,4	405,2	1116,3	273,6	444,4	1015,1	301,2	489,3
BRAC 320	5,0	1209,4	242	393,2	1123,4	266,5	433,0	1028,6	294,3	478,1	926,0	324,2	526,6
	7,0	1305,3	245,9	399,5	1214,9	268,9	436,8	1115,6	298,8	490,2	1004,1	328,7	533,9
	10,0	1459,3	252,8	410,6	1361,1	277,9	451,4	1255,1	304,8	495,1	1141,3	335,6	545,1
BRAC 340	5,0	1298,8	260,5	423,2	1206,5	286,9	466,0	1104,7	316,8	514,6	994,5	348,9	566,8
	7,0	1401,8	264,7	429,9	1304,8	289,4	470,2	1198,2	321,6	518,6	1078,3	353,8	574,7
	10,0	1567,2	272,1	442,0	1461,7	299,1	485,8	1347,9	328,0	532,9	1225,7	361,2	586,7

NOTES
- Bold values show nominal cooling capacities.
- Absorbed power and current refer to the compressor.
- Above figures are valid for water dt=5°C.

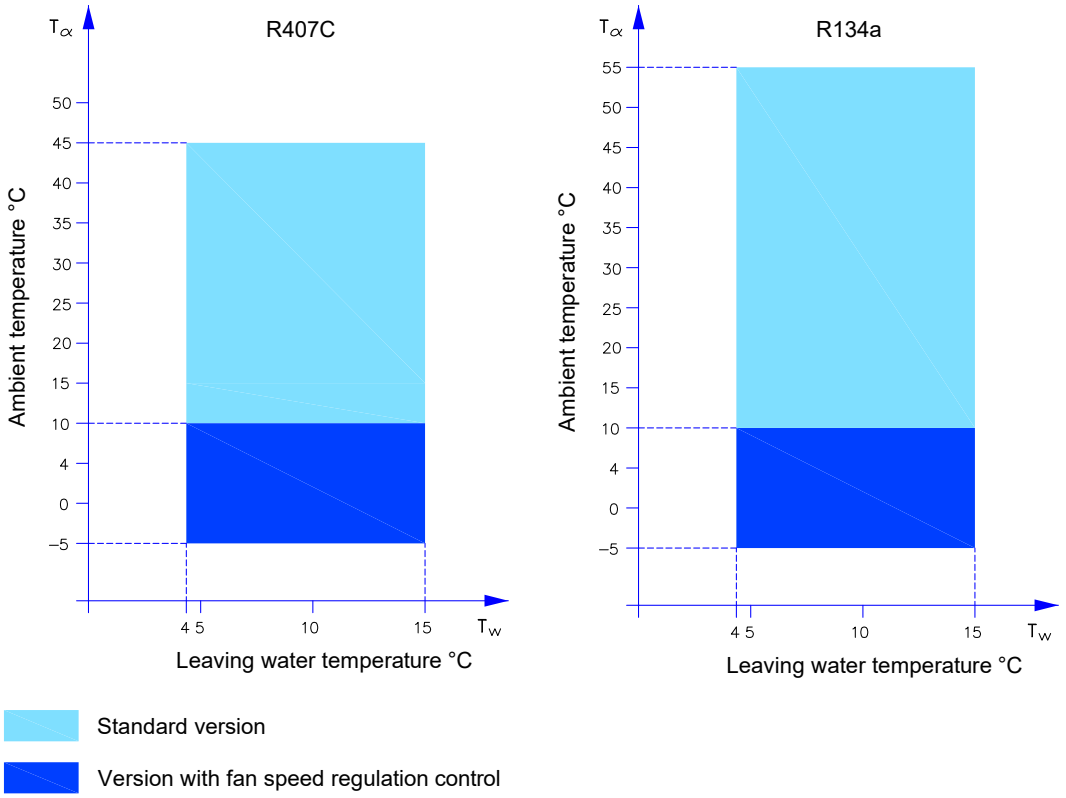
BRAC R134a

Ambient °C		45			50			55		
MODEL	Water outlet °C	Cooling capacity kW	Absorbed power kW	Current A	Cooling capacity kW	Absorbed power kW	Current A	Cooling capacity kW	Absorbed power kW	Current A
BRAC 045	5,0	111,2	55,3	89,8	104,9	56,6	92,0	99,8	64,0	104,9
	7,0	121,6	55,7	90,4	115,6	59,4	96,5	106,4	66,0	108,7
	10,0	138,8	57,1	92,7	121,6	60,3	98,0	111,0	70,8	115,7
BRAC 060	5,0	146,7	69,6	113	138,5	71,2	115,7	131,6	80,6	132,2
	7,0	160,5	70,1	113,8	152,5	74,8	121,4	140,5	83,0	137,0
	10,0	183,2	71,8	116,7	160,5	75,9	123,3	146,5	89,1	145,9
BRAC 070	5,0	159,0	80,6	129,7	149,9	82,5	132,9	142,7	93,3	151,5
	7,0	173,8	81,1	130,6	165,3	86,5	139,3	152,3	96,1	157,0
	10,0	198,4	83,1	133,8	173,8	87,9	141,5	158,8	103,1	167,2
BRAC 080	5,0	199,7	93,1	151,3	188,5	95,4	155,0	179,2	107,9	176,9
	7,0	218,6	93,8	152,4	207,7	100,1	162,6	191,3	111,2	183,3
	10,0	249,5	96,2	156,2	218,6	101,7	165,1	199,5	119,3	195,2
BRAC 100	5,0	256,4	117,2	190,4	242	120	195	230,1	135,8	222,7
	7,0	280,6	118,1	191,8	266,6	126,0	204,6	245,5	139,9	230,8
	10,0	320,3	121,0	196,6	280,6	127,9	207,8	256,1	150,1	245,8
BRAC 115	5,0	293,5	134,1	217,8	277,1	137,4	223,2	263,4	155,4	254,7
	7,0	321,2	135,1	219,5	305,2	144,1	234,1	281,1	160,1	264
	10,0	366,6	138,5	225	321,2	146,4	237,8	293,1	171,7	281,1
BRAC 125	5,0	319,3	144,6	234,9	301,4	148,1	240,6	286,5	167,5	274,9
	7,0	349,4	145,7	236,6	331,9	155,4	252,4	305,7	172,6	284,9
	10,0	398,8	149,3	242,6	349,4	157,8	256,4	318,8	185,1	303,4
BRAC 140	5,0	351,5	162,5	263,9	331,8	166,4	270,3	315,4	188,2	308,8
	7,0	384,7	163,7	265,9	365,4	174,6	283,6	336,6	194,0	320,0
	10,0	439,0	167,8	272,5	384,7	177,3	288,0	351,0	208,0	340,8
BRAC 150	5,0	388,4	184,0	293,5	366,1	188,3	300,6	348,6	213,1	342,8
	7,0	424,6	185,3	295,3	403,8	197,6	315,2	372,0	219,6	355,2
	10,0	484,6	189,9	302,8	424,6	200,7	320,2	387,9	235,5	378,3
BRAC 170	5,0	422,1	200,3	325,4	398,4	205,2	333,3	378,8	232,1	380,6
	7,0	461,9	201,8	327,9	438,8	215,3	349,7	404,2	239,2	394,4
	10,0	527,1	206,9	336,1	461,9	218,7	355,2	421,5	256,5	420,0
BRAC 185	5,0	477,2	216	351	450,4	221,3	359,5	428,2	250,3	410,7
	7,0	522,2	217,7	353,6	496,1	232,2	377,2	456,9	258	425,6
	10,0	596,0	223,1	362,4	522,2	235,8	383,1	476,5	276,6	453,2
BRAC 210	5,0	541,1	239,6	389,3	510,8	245,5	398,7	485,6	277,7	455,7
	7,0	592,2	241,4	392,2	562,6	257,5	418,3	518,2	286,1	472,2
	10,0	675,8	247,5	402	592,2	261,6	424,9	540,4	306,8	502,9
BRAC 250	5,0	627,2	275,4	447,3	592,0	282,1	458,2	562,8	319,1	525,0
	7,0	686,4	277,4	450,7	652,0	295,9	480,7	600,6	328,8	544,0
	10,0	783,3	284,4	461,9	686,4	300,6	488,2	626,3	352,6	579,3
BRAC 285	5,0	725,4	319,4	518,9	684,7	327,2	531,5	650,9	370,1	607,2
	7,0	793,8	321,8	522,8	754,1	343,3	557,7	694,6	381,4	629,2
	10,0	906,0	329,9	535,9	793,8	348,7	566,4	724,4	409	670,1
BRAC 320	5,0	815,5	355,9	578,1	769,8	364,5	592,2	731,9	412,3	676,5
	7,0	892,5	358,6	582,5	847,9	382,5	621,3	780,9	424,9	701,0
	10,0	1018,6	367,5	597	892,5	388,4	631	814,4	455,7	746,6
BRAC 340	5,0	875,8	383	622,2	826,7	392,4	637,3	786	443,8	715,7
	7,0	958,5	385,9	626,9	910,6	411,6	668,7	838,7	457,3	741,6
	10,0	1093,9	395,6	642,6	958,5	418,1	679,1	874,6	490,4	789,8

NOTES
- Bold values show nominal cooling capacities.
- Absorbed power and current refer to the compressor.
- Above figures are valid for water dt=5°C.

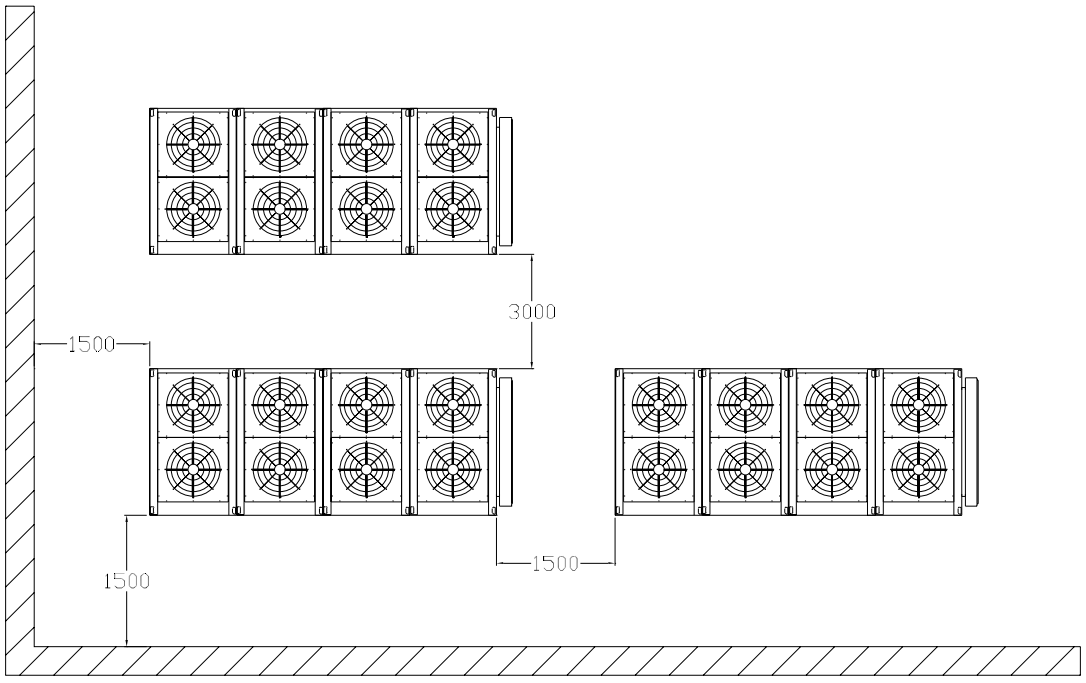
MODEL		db(A)	63	125	250	500	1000	2000	4000	8000
BRAC 050	Power	88	82	81	81	83	82	80	75	70
	Pressure @1 m	77	71	70	70	72	71	69	64	59
	Pressure @10 m	57	51	50	50	52	51	49	44	39
BRAC 070	Power	89	83	81	81	84	82	80	76	70
	Pressure @1 m	78	72	70	70	73	71	69	65	59
	Pressure @10 m	58	52	50	50	53	51	49	45	39
BRAC 085	Power	90	83	81	81	84	83	82	78	70
	Pressure @1 m	79	72	70	70	73	72	71	67	59
	Pressure @10 m	59	52	50	50	53	52	51	47	39
BRAC 095	Power	91	85	83	83	86	84	83	79	72
	Pressure @1 m	80	74	72	72	75	73	72	68	61
	Pressure @10 m	60	54	52	52	55	53	52	48	41
BRAC 105	Power	91	85	83	83	86	84	83	79	72
	Pressure @1 m	80	74	72	72	75	73	72	68	61
	Pressure @10 m	60	54	52	52	55	53	52	48	41
BRAC 125	Power	91	85	83	83	86	84	83	79	72
	Pressure @1 m	80	74	72	72	75	73	72	68	61
	Pressure @10 m	60	54	52	52	55	53	52	48	41
BRAC 150	Power	92	86	84	84	87	86	84	80	73
	Pressure @1 m	81	75	73	73	76	75	73	69	62
	Pressure @10 m	61	55	53	53	56	55	53	49	42
BRAC 170	Power	92	86	84	84	87	86	84	80	73
	Pressure @1 m	81	75	73	73	76	75	73	69	62
	Pressure @10 m	61	55	53	53	56	55	53	49	42
BRAC 205	Power	94	87	85	85	88	87	86	82	74
	Pressure @1 m	83	76	74	74	77	76	75	71	63
	Pressure @10 m	63	56	54	54	57	56	55	51	43
BRAC 230	Power	94	88	86	86	89	88	86	82	75
	Pressure @1 m	83	77	75	75	78	77	75	71	64
	Pressure @10 m	63	57	55	55	58	57	55	51	44
BRAC 270	Power	95	88	86	87	89	88	87	83	75
	Pressure @1 m	84	77	75	76	78	77	76	72	64
	Pressure @10 m	64	57	55	56	58	57	56	52	44
BRAC 300	Power	95	89	87	87	90	89	88	83	76
	Pressure @1 m	84	78	76	76	79	78	77	72	65
	Pressure @10 m	64	58	56	56	59	58	57	52	45
BRAC 350	Power	95	89	87	87	90	89	88	83	76
	Pressure @1 m	84	78	76	76	79	78	77	72	65
	Pressure @10 m	64	58	56	56	59	58	57	52	45
BRAC 385	Power	96	89	88	88	90	90	88	83	77
	Pressure @1 m	85	78	77	77	79	79	77	72	66
	Pressure @10 m	65	58	57	57	59	59	57	52	46

MODEL		db(A)	63	125	250	500	1000	2000	4000	8000
BRAC 045	Power	88	82	81	81	83	82	80	75	70
	Pressure @1 m	77	71	70	70	72	71	69	64	59
	Pressure @10 m	57	51	50	50	52	51	49	44	39
BRAC 060	Power	89	83	81	81	84	82	80	76	70
	Pressure @1 m	78	72	70	70	73	71	69	65	59
	Pressure @10 m	58	52	50	50	53	51	49	45	39
BRAC 070	Power	89	83	81	81	84	82	80	76	70
	Pressure @1 m	78	72	70	70	73	71	69	65	59
	Pressure @10 m	58	52	50	50	53	51	49	45	39
BRAC 080	Power	90	83	81	81	84	83	82	78	70
	Pressure @1 m	79	72	70	70	73	72	71	67	59
	Pressure @10 m	59	52	50	50	53	52	51	47	39
BRAC 100	Power	91	85	83	83	86	84	83	79	72
	Pressure @1 m	80	74	72	72	75	73	72	68	61
	Pressure @10 m	60	54	52	52	55	53	52	48	41
BRAC 115	Power	91	85	83	83	86	84	83	79	72
	Pressure @1 m	80	74	72	72	75	73	72	68	61
	Pressure @10 m	60	54	52	52	55	53	52	48	41
BRAC 125	Power	91	85	83	83	86	84	83	79	72
	Pressure @1 m	80	74	72	72	75	73	72	68	61
	Pressure @10 m	60	54	52	52	55	53	52	48	41
BRAC 140	Power	92	86	84	84	87	86	84	80	73
	Pressure @1 m	81	75	73	73	76	75	73	69	62
	Pressure @10 m	61	55	53	53	56	55	53	49	42
BRAC 150	Power	92	86	84	84	87	86	84	80	73
	Pressure @1 m	81	75	73	73	76	75	73	69	62
	Pressure @10 m	61	55	53	53	56	55	53	49	42
BRAC 170	Power	92	86	84	84	87	86	84	80	73
	Pressure @1 m	81	75	73	73	76	75	73	69	62
	Pressure @10 m	61	55	53	53	56	55	53	49	42
BRAC 185	Power	94	87	85	85	88	87	86	82	74
	Pressure @1 m	83	76	74	74	77	76	75	71	63
	Pressure @10 m	63	56	54	54	57	56	55	51	43
BRAC 210	Power	94	88	86	86	89	88	86	82	75
	Pressure @1 m	83	77	75	75	78	77	75	71	64
	Pressure @10 m	63	57	55	55	58	57	55	51	44
BRAC 250	Power	95	88	86	87	89	88	87	83	75
	Pressure @1 m	84	77	75	76	78	77	76	72	64
	Pressure @10 m	64	57	55	56	58	57	56	52	44
BRAC 285	Power	95	89	87	87	90	89	88	83	76
	Pressure @1 m	84	78	76	76	79	78	77	72	65
	Pressure @10 m	64	58	56	56	59	58	57	52	45
BRAC 320	Power	95	89	87	87	90	89	88	83	76
	Pressure @1 m	84	78	76	76	79	78	77	72	65
	Pressure @10 m	64	58	56	56	59	58	57	52	45
BRAC 340	Power	96	89	88	88	90	90	88	83	77
	Pressure @1 m	85	78	77	77	79	79	77	72	66
	Pressure @10 m	65	58	57	57	59	59	57	52	46



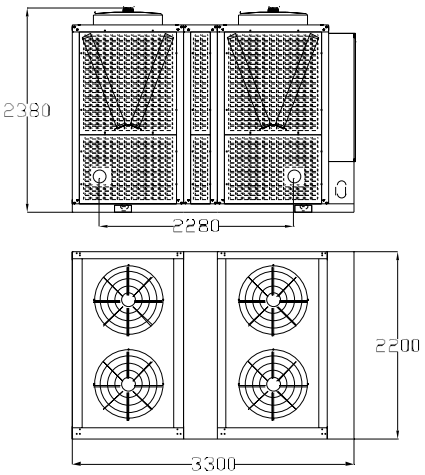
NOTES
Protect the water circuit against freezing when it is necessary.
The above operating limits are for general guidance only. It may be possible for certain units to operate outside the confines of the graph.
Please contact BCOOL if further clarification is required.
For operation with leaving water temperature below 6°C, it is obligatory to state this to BCOOL as soon as you order the chiller and also you need to add glycol in the water circuit.

2.8 Installation and service required space

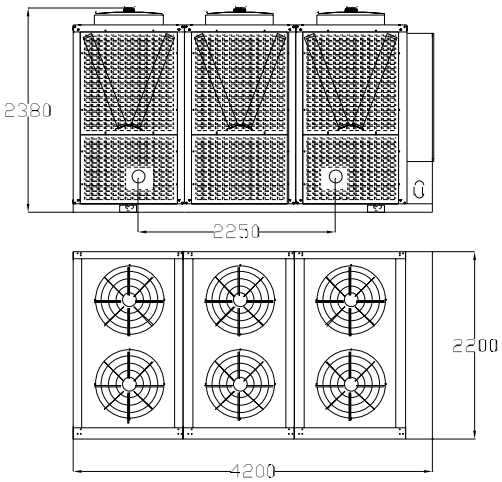


3.1 BRAC 050-205 R407C

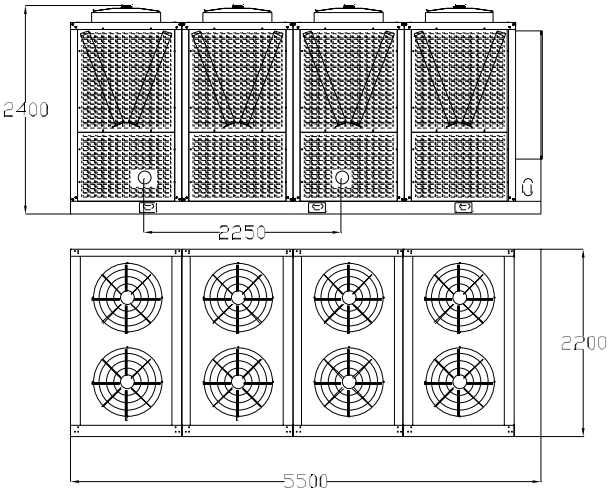
BRAC 50-85



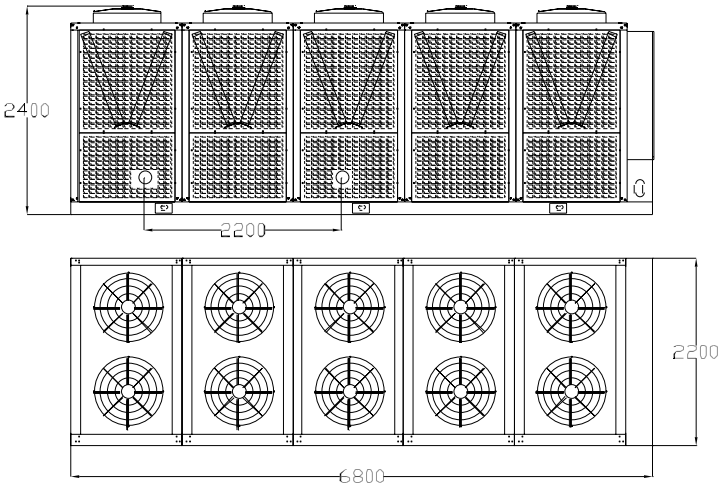
BRAC 95-125



BRAC 150

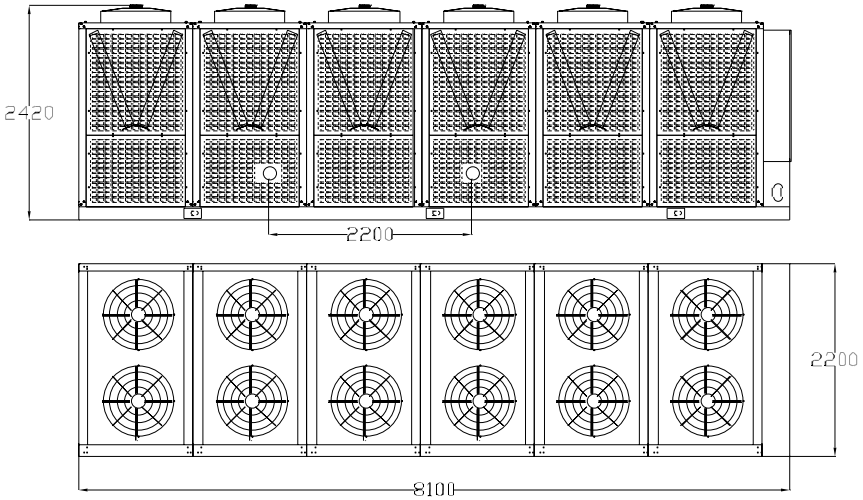


BRAC 170-205

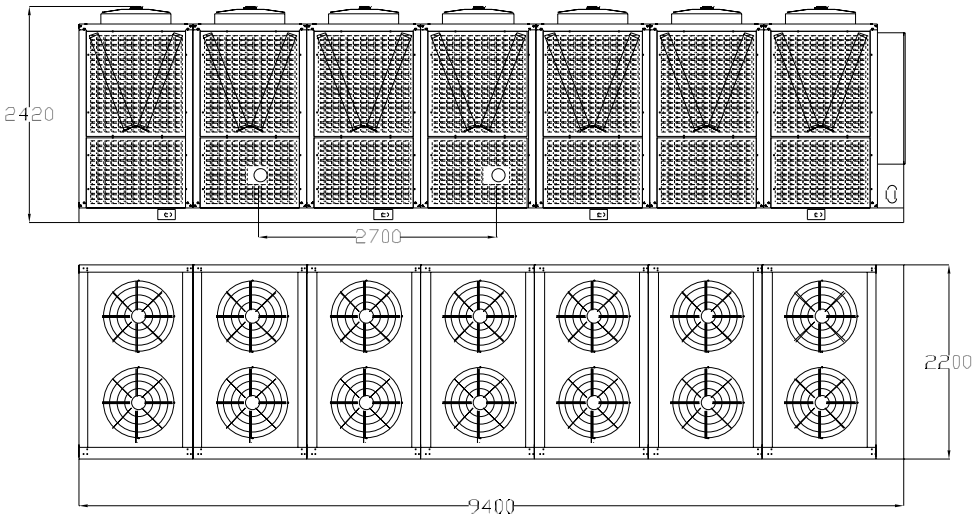


3.2 BRAC 230-385 R407C

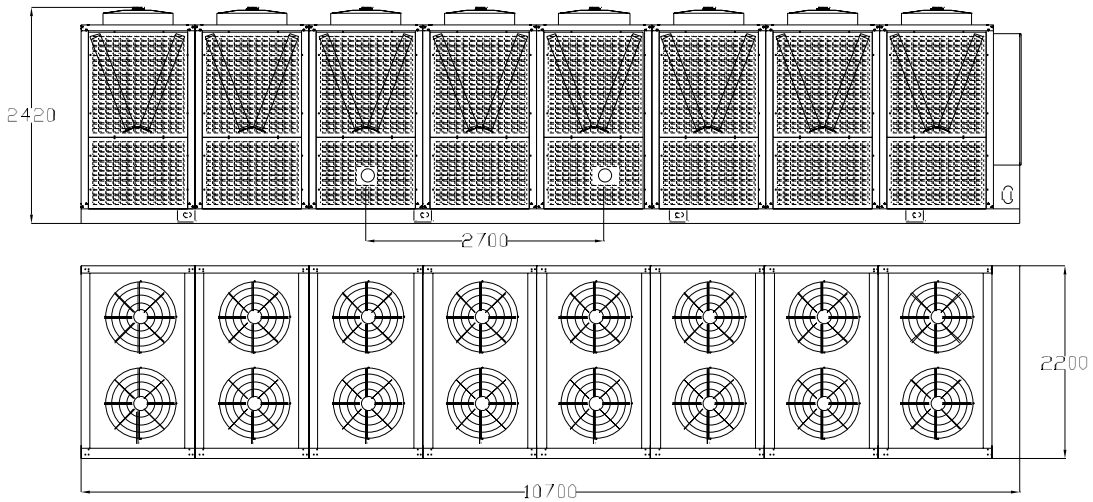
BRAC 230



BRAC 270-300

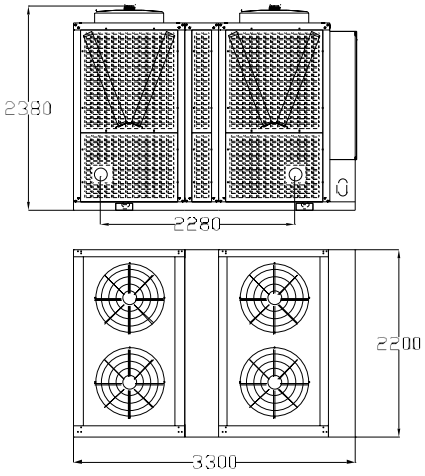


BRAC 350-385

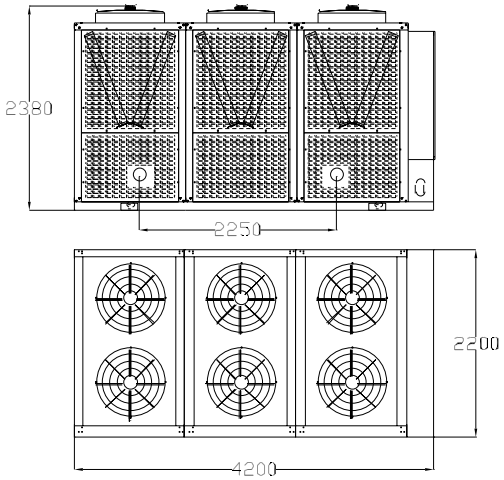


3.3 BRAC 045-185 R134a

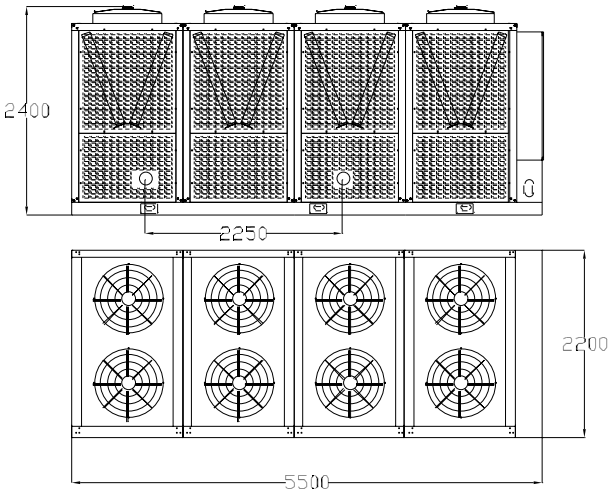
BRAC 45-80



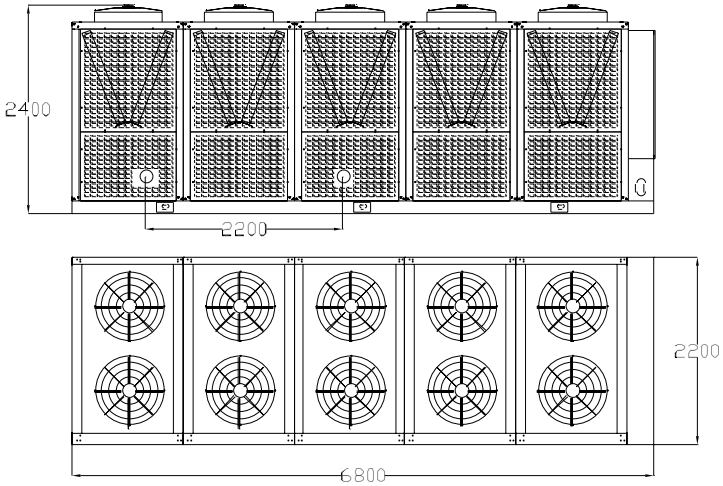
BRAC 100-125



BRAC 140-150

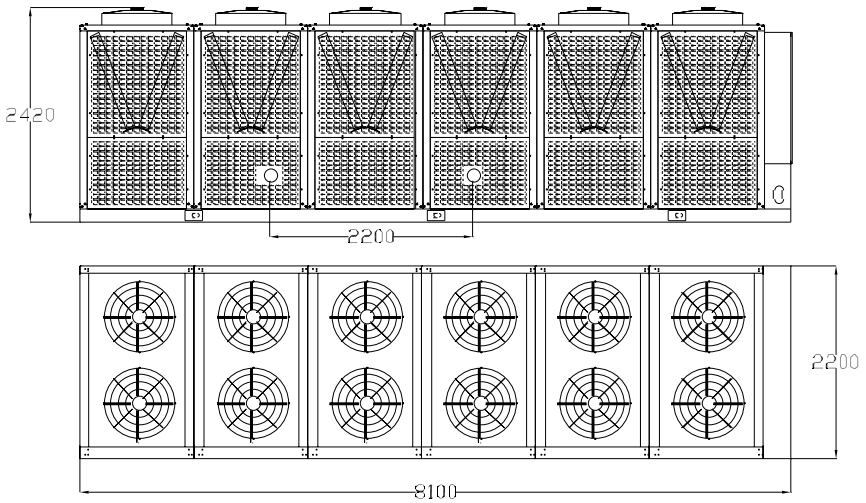


BRAC 170-185

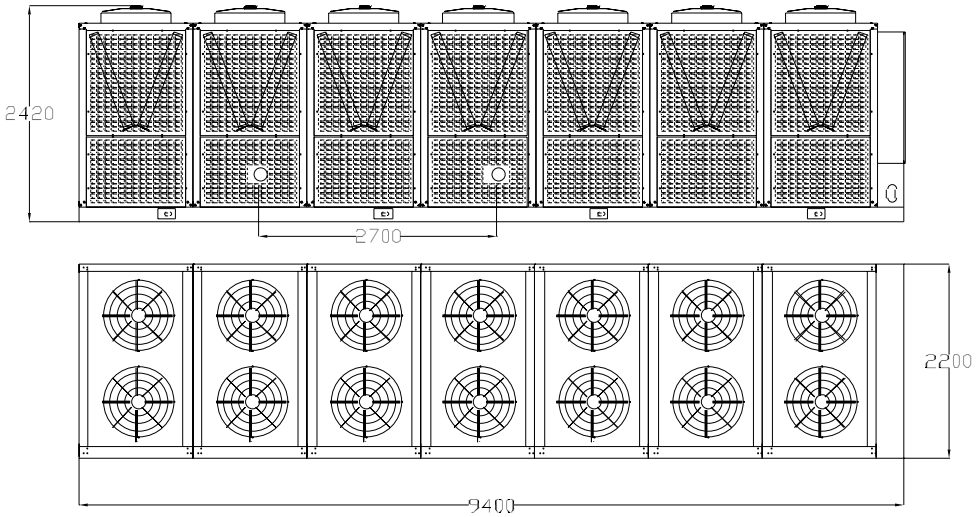


3.4 BRAC 210-340 R134a

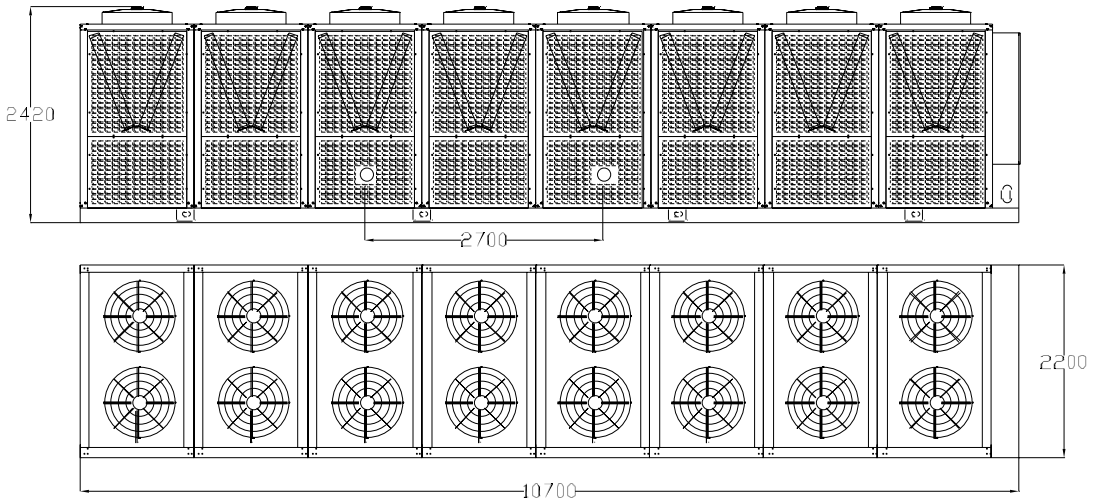
BRAC 210



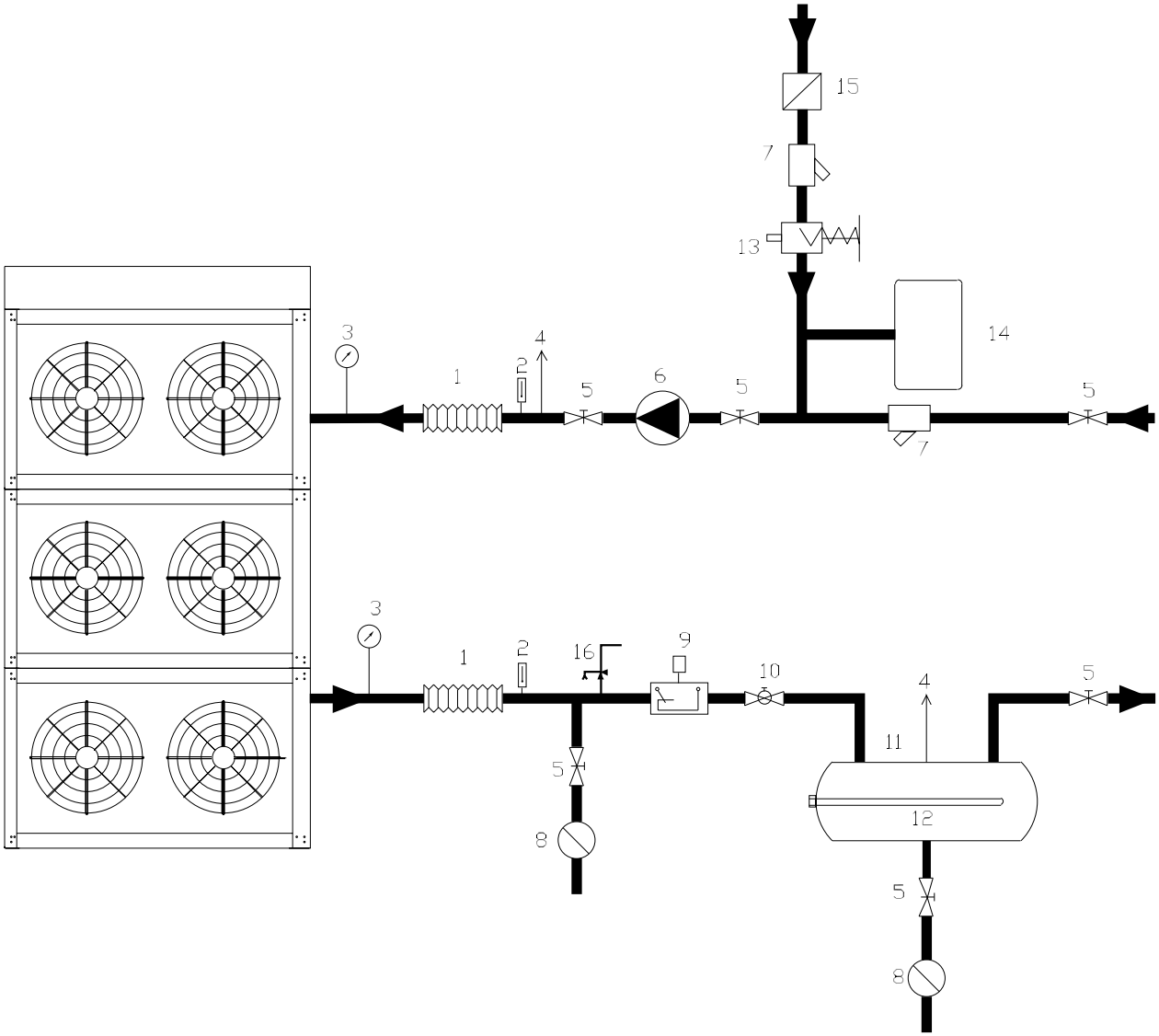
BRAC 250-285



BRAC 320-340



4.1 Recommended hydraulic circuit diagram



1. Flexible.
2. Thermometer.
3. Manometer.
4. Air vent.
5. Shut-off valve.
6. Pump (primary circuit).
7. Water filter.
8. Drainage.
9. Flow switch (optional).
10. Balancing valve.
11. Buffer Tank.
12. Electrical resistance (optional).
13. Automatic make up water valve.
14. Expansion tank.
15. Check valve.
16. Safety valve.

4.2.1 Recommendations concerning the hydraulic circuit

All field connections must be carried out by a licensed technician and must comply with the applicable local and national codes.

Evaporator water connections should be made in accordance with the unit outlook, respecting the water inlet/outlet.

Install a flow switch or water differential pressostat (standard component) in the water outlet piping, to prevent the unit from operating at a water flow which is too low. A terminal is provided in the switch box, for the electrical connection of the flow switch in the control circuit.

To protect the evaporator and avoid contamination and fragment, it is compulsory to install a filter in the water inlet pipe.
It is essential to install a thermometer in the water inlet/outlet pipe, to check temperatures.

Provide heat insulation with suitable vapor barrier around the chilled water piping, to prevent condensation and capacity loss. Provide drain connections at all low points of the system, to allow complete drainage for maintenance and / or shutdown.

Air vents should be provided at all high points of the system, located where they are easily accessible for service. The water pipes are specially designed to obtain a complete air purge of the evaporator.

Provide flexible connection pipes at the inlet and outlet of the evaporator, to prevent tubes vibration.

Install an expansion tank on the suction side of the water pump, so that the water pressure on the pump suction shall be positive.

The frequent evacuation of the water system should be avoided. To avoid frequent on/off operation of the compressor, a minimum water volume is required in the system (table 4.2.2).
To assure proper operation of the unit, the water flow through the evaporator must be within the specified limits (in table 4.2.2). The water quality should be in accordance with the specifications in table 4.2.2, to ensure the longest life span and optimum operation.

R407C	Minimum water volume (l)	Minimum water flow (l/h)	Nominal water flow (l/h)	Maximum water flow (l/h)
BRAC 050	590	19739	28198	34402
BRAC 070	790	26423	37747	46051
BRAC 085	983	32871	46959	57290
BRAC 095	1145	38281	54687	66718
BRAC 105	1346	45018	64311	78459
BRAC 125	1522	50894	72706	88701
BRAC 150	1802	60283	86119	105065
BRAC 170	2138	71491	102130	124599
BRAC 205	2565	85770	122528	149484
BRAC 230	2907	97213	138875	169428
BRAC 270	3395	113544	162206	197891
BRAC 300	3737	124987	178553	217835
BRAC 350	4404	147288	210411	256701
BRAC 385	4834	161682	230974	281788

R134a	Minimum water volume (l)	Minimum water flow (l/h)	Nominal water flow (l/h)	Maximum water flow (l/h)
BRAC 045	547	18308	26154	31908
BRAC 060	722	24160	34514	42107
BRAC 070	830	26227	37467	45710
BRAC 080	984	32898	46997	57336
BRAC 100	1263	42234	60334	73607
BRAC 115	1446	48346	69065	84259
BRAC 125	1572	52585	75121	91648
BRAC 140	1731	57891	82701	100895
BRAC 150	1850	64079	91541	111680
BRAC 170	2079	69516	99308	121156
BRAC 185	2350	78591	112273	136973
BRAC 210	2665	89124	127320	155330
BRAC 250	3089	103297	147567	180032
BRAC 285	3572	119473	170676	208225
BRAC 320	4016	134323	191890	234106
BRAC 340	4313	144257	206082	251420

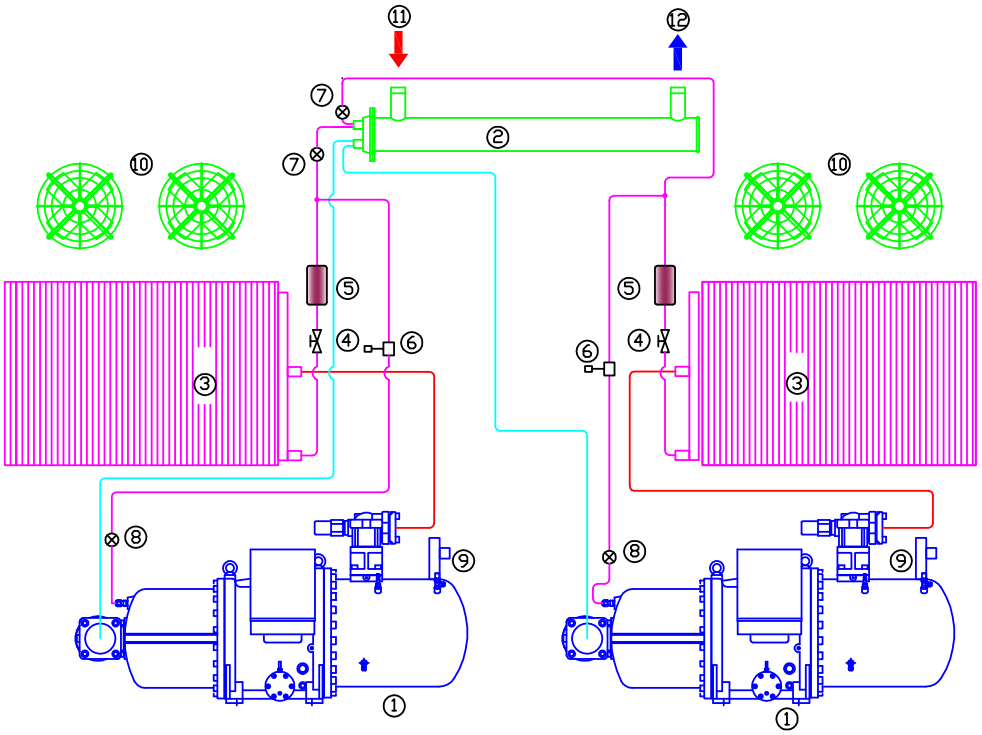
To ensure proper operation of the unit, a minimum water volume is required in the system and the water flow must be within the operational range, as specified in the tables.

Be sure the water quality is in accordance with the specifications below.

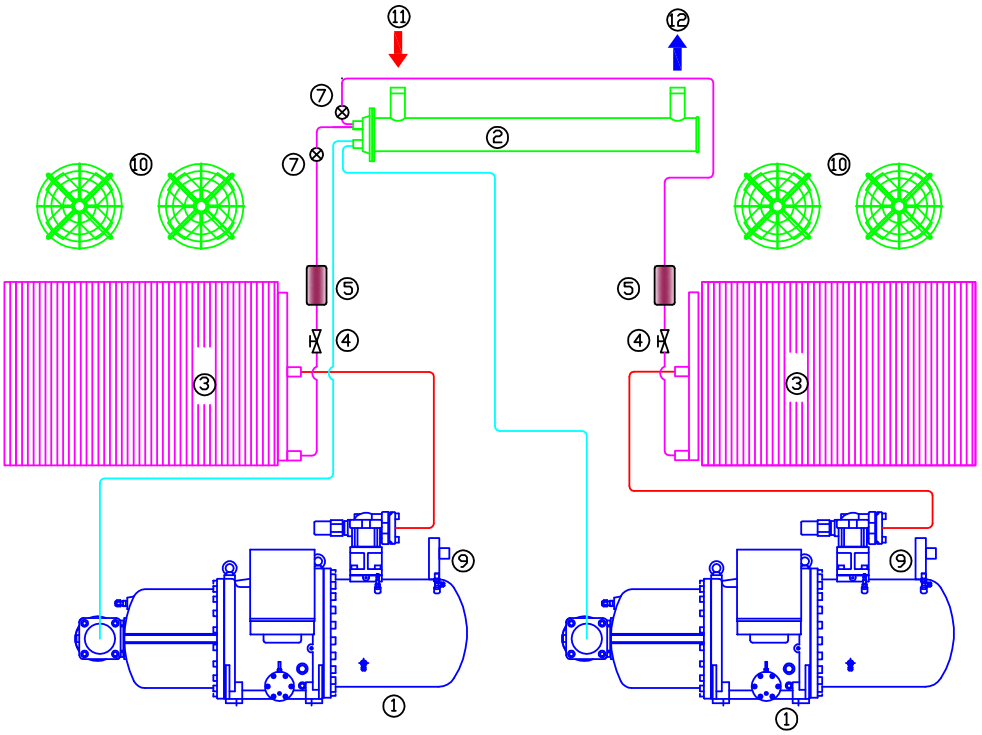
ITEMS	Evaporator water		
	Circulating water 20°C	Supply water	Tendency if out of criteria
Items to be controlled:			
PH AT 25°C	6.8 - 8.0	6.8 - 8.0	corrosion + scale
Electrical conduct (mS/m) at 25°C	below 30	below 30	corrosion + scale
Chloride ion (mg CI-/I)	below 50	below 200	corrosion
Sulfate ion (mg SO 2/4/I	below 50	below 50	corrosion
M-alkalinity (ph 4.8) (mg SO3/I)	below 50	below 50	scale
Total hardness (mg CaCO3/I)	below 70	below 70	scale
Calcium hardness (mg CaCO3/I)	below 50	below 50	scale
Silica ion (mg SiO2/I	below 30	below 30	scale
Items to be referred to:			
Iron (mg Fe/I)	below 1.0	below 0.3	corrosion + scale
Copper (mg Cu/I)	below 1.0	below 0.1	corrosion
Sulfide ion (mg S2-/I)	Not detectable	Not detectable	corrosion
Ammonium ion (mg NH+4/I	below 0.3	below 0.1	corrosion
Remaining chloride (mg CI/I)	below 0.25	below 0.3	corrosion
Free carbide (mg SO2/I)	below 0.4	below 4.0	corrosion
Stability index	-	-	corrosion + scale

NOTES
The above tables are purely indicative and non-binding.

5.1 BRAC R407C



5.2 BRAC R134a



1. Compressors.
2. Shell and tube heat exchanger.
3. Condenser coil.
4. Shut-off valve.
5. Filter dryer.
6. Electromagnetic valve.
7. Electronic expansion valve.
8. Thermal expansion valve.
9. Safety valve.
10. Fan
11. Water inlet
12. Water outlet

5.3 Operating pressure of the refrigerant circuit

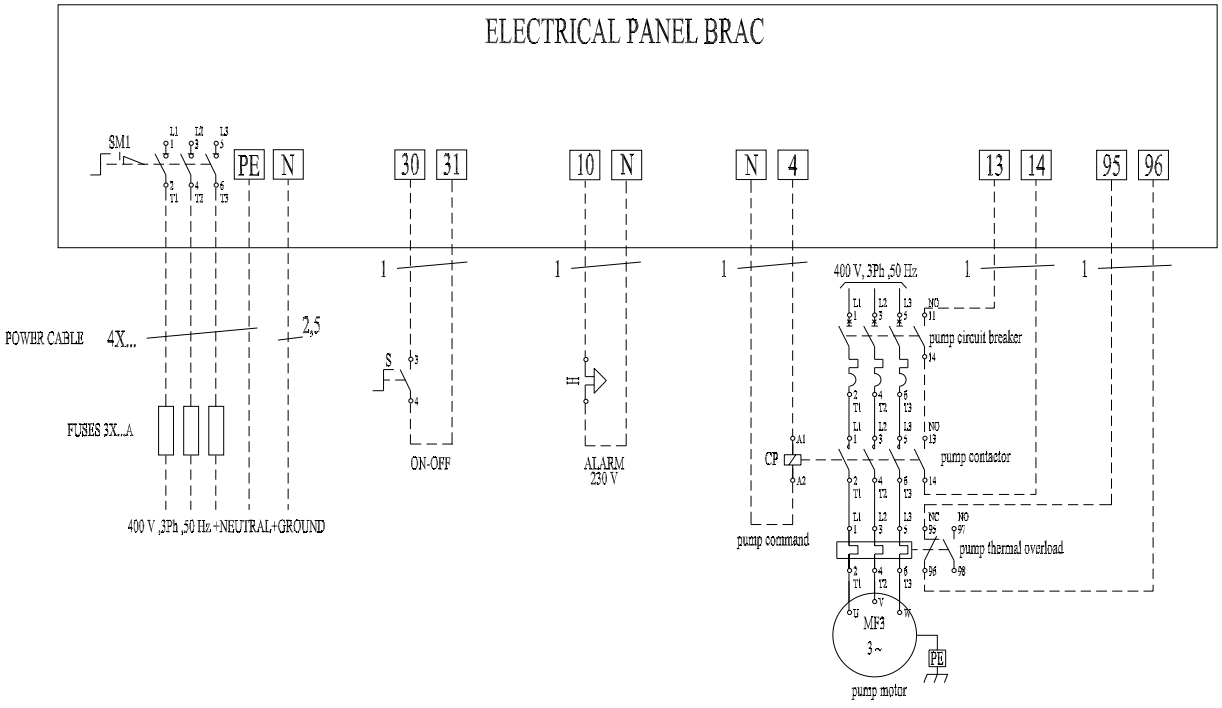
It is important to check the high and low pressure of the refrigerant circuit, to ensure the proper operation of the unit and to guarantee that the rated output shall be obtained.

Attention:
The pressures measured shall vary between a maximum and minimum value, depending on the water and ambient temperatures at the moment of measurement.

R407C	Cooling mode (region)	Minimum	Nomimal	Maximum
		(Ambient temp. 20°C) (leaving water temp. 6°C)	(Ambient temp. 35°C) (leaving water temp. 7°C)	(Ambient temp. 45°C) (leaving water temp. 15°C)
	low pressure	3,5 - 4,0 bar	4,0 - 5,0 bar	5,5 - 6,0 bar
	high pressure	17,0 - 19,0 bar	21,0 - 23,0 bar	24,0 - 26,0 bar

R134a	Cooling mode (region)	Minimum	Nomimal	Maximum
		(Ambient temp. 20°C) (leaving water temp. 6°C)	(Ambient temp. 35°C) (leaving water temp. 7°C)	(Ambient temp. 55°C) (leaving water temp. 15°C)
	low pressure	1,7 - 2,0 bar	2,0 - 2,3 bar	2,5 - 3,0 bar
	high pressure	8,0 - 10,0 bar	11,0 - 13,0 bar	16,0 - 19,0 bar

6.0 Wiring diagram



BRAC series

The supply, transport to jobsite, installation, commissioning and start-up of an air-cooled water chiller with the following technical characteristics:
The unit shall be factory assembled, charged with R407C or R134a refrigerant and factory tested.
The capacity of the unit shall be no less than:

Cooling capacity:	kW
Ambient air temperature	°C
Entering water temperature	°C
Leaving water temperature	°C

The unit shall operate unhindered within 6 to 15°C outlet water temperature, 3,5 to 7°C water temperature difference and -5 up to 45°C ambient air temperature. The structural requirements will be the following:

Unit Casing

All units use metal parts fabricated from heavy gauge galvanized steel sheets, formed to ensure maximum rigidity that guarantees and preserves the unit's operation during the years. After fabrication these are degreased, phosphatised, and electrostatically powder coated, with an epoxy-polyester RAL 9002 coating of a thickness of 60-70 μm.
This fully automatic process ensures superior corrosion resistance against the most aggressive ambient conditions. This treatment can successfully withstand a salt spray test of 500 hours, according to ASTM B-117. All components are assembled together using bolts, thus avoiding the need for welding which may harm the galvanization of the steel and ensuring that the whole assembly can fully withstand adverse weather conditions.
Removable side panels with special locks are used to permit access only to authorized personnel to internal components of the unit, for inspection and maintenance. Electrical and electronic equipment and components for proper unit's operation are located inside a weather proof (IP 55) electrical panel, with access via special key.

Compressors

All units are equipped with 2 semi-hermetic, accessible, screw type compressors and 2 independent refrigerant circuits.
All screw compressors are designed for use with R407C or R134a refrigerant. The compression of the refrigerant is succeeded via twin screw shafts. The first one is directly driven by the motor and the second one is driven by the first. As a result, the refrigerant flows through the screws and is compressed. The compressors consist of twin screws moving in opposite directions, especially made out of steel and are installed in a separate compartment from the electric motor.
The original seating design of the twin screws in 11-B type ball bearings, constantly varying performance through an axial shaft, ensures not only long life but also high performance. Movement to the screws is transmitted by direct connection through the induction motor.

The 3 phase 2 pole induction motor is suitable for a 400V-50Hz network and does not require any heat dissipation, as it is cooled by the refrigerant medium itself. The windings design does not require any additional external cooling. A reduced starting current start-up configuration ensures minimum start-up current. The compressors are equipped with continuous (stepless) capacity control system. In continuous (stepless) capacity control system, a normally open solenoid valve and a normally closed solenoid valve are equipped to the inlet and outlet of the piston cylinder respectively. These two solenoid valves are controlled by the chiller microprocessor, while refrigeration capacity control can be modulated at anywhere within 25%-100%. The compressors are equipped with a special oil-separator, ensuring the minimum possible lubricant circulation in the refrigerant circuit. Fitting lubrication is accomplished with effusion created by the pressure differential during normal operation, without the use of an additional mechanical pump. Compressors are equipped with crankcase electrical heater for the oil, glass observation window for the oil level, oil filter with a designated cleaning/charging port, constant oil level control and are internally protected by special thermistors against potential overheating or electrical spikes.
Externally the compressors are equipped with a watertight IP-55 protected electrical panel, bearing all necessary connections for operation and control. Inside the electrical panel, an installed microprocessor controls all safety and operation features of the compressor.

In order to ensure correct operation, the compressor also features:

High temperature sensor for the refrigerant medium (PT-100).
High temperature sensor for induction motor windings (PT-100).
Low oil level safety switch.
Refrigerant gas suction filter, accessible.
Valves in both suction and discharge lines.
Check valve in discharge line.
Pressure safety setup, ensuring that the highly pressurized refrigerant gas is within safety limits.
Additional cooling in the suction chamber via a thermoexpansion valve when necessary, through refrigerant liquid spray, ensuring temperatures are kept within designated limits.
Special rubber pads to absorb noise from the unit's operaton.

Air Heat Exchanger

All units' air heat exchangers are manufactured from high quality seamless inner grooved copper tubes according to ASTM B-280, having an outside diameter of 9,52 mm (3/8"). The fins are manufactured from aluminium and form the secondary extended heat transfer surface. The fins are continuous across the heat exchanger and are fabricated in high precision dedicated press lines. The fin surface is waffle formed, so as to increase the fin rigidity and has special louvers that help to increase heat transfer. The combination of internally grooved copper-tubing and louvered fins has resulted in a heat transfer performance 30% superior to that of a conventional coil for this particular application. The assembly of the finned pack is achieved by mechanical expansion of the tubes in such a way, as to form a perfect mechanical bond with the fins. For this purpose, the fin holes have a peripheral extrusion (collar) of adjustable height. This extrusion serves to define the distance between the fins (and consequently the total heat transfer surface) and to ensure perfect contact of the fins to the tubes. Alternative fin materials are available upon request, such as epoxy – coated aluminium or copper for applications in especially aggressive environments. The condensers are V-shaped paired, in order to exploit all available space. Upon completion of the manufacturing procedure, all coils are pressure tested at 30 bar for leaks.

Water Heat Exchanger

All units are equipped with a Shell and Tube, water–direct expansion type evaporator that has two separate cooling circuits, one for each independent refrigerant circuit. The casing is of steel and the internal tubes are of copper. There is an air vent valve, drain valve, differential water pressure switch, probes for water temperature sensors and the whole heat exchanger is wrapped in a heavy insulation material, appropriate for external installation.

Condenser Fans

Condenser fans are of the axial type, directly transmitting motion to the blades, suitable for outdoor installation and pair mounted in-between the V-shaped condenser coils. The 3-phase motors are of closed type, low rpm, F insulation type and IP-55 protected. Axial seating is suitable for vertical operation, while internal thermal protection for the windings is also included. Due to the special aerodynamic design of the blades and inlet cones, as well as the perfect static and dynamic balancing, their operation is completely vibration-free. The fan motor assembly has a protective grid against accidental contact with moving parts, which is designed according to ISO regulations. Fan motors are aerodynamically shaped, so as not to interfere with the airflow and have permanently lubricated bearings that do not require service. Upon request, it is also available an electrical set-up which controls the fan rpm through a microprocessor, depending on the condensation temperature or pressure. Through this set-up, the operational pressures of the device depend on the external conditions, thus increasing energy efficiency. Also this way of controlling of the fans ensures machine performance under extreme cooling conditions, maximum performance, minimum absorbed current and noise confinement of the machine.

Refrigerant circuits

All units have two separate refrigerant circuits.Each refrigerant circuit consists of the following:
Electronic expansion valve with constant step control, in order to maintain constantly the appropriate superheat of the refrigerant. The valve moves electromechanically and is controlled by the unit's microprocessor. The valve is supplied with low voltage current, which in addition is protected against sudden power shutdown. When the valve is in off position, it maintains a tight normally closed state not allowing refrigerant flow, thus not needing supplemental electromagnetic valve at the liquid line.
Filter dryer.
Shut-off valves to allow easy replacement of the filter core, without loss of refrigerant.
Liquid injection valve (R407C).
Shut-off valves to allow service of the compressors.
Solenoid valve in liquid injection line.
Sight glass for checking the liquid lines.
Pressure relief valve on compressor discharge.
High and low pressure gauge for each refrigerant circuit, easily viewed (optional).
Service valves.

Control System with Microprocessor controller

All units are equipped with an electronic programmable control system. This allows complete management of all functions of the unit and ensures protection of all vital parts. The controller has a full self-diagnostic function, as to prevent the stop of the machine by alarm. The diagnostic function permits easy and straightforward understanding of all possible failures and malfunctions of the unit. All functions and indicators appear on the LCD screen. Over 150 programmable parameters offer complete unit management.

Critical parameters that require control are:

Start-up / shut down time of compressor.
Time delay.
Protection against multiple start-up.
Water pump time delay in reference to unit's operation.
Inlet / outlet water temperature.
Evaporator and Condenser temperature.
Discharge temperature.
Suction temperature.
Continuous sophisticated compressor capacity control, using multiple parameters.
High discharge pressure.
Low suction pressure.
Water temperature adjustment in the inlet side, during summer operation.
Superheat temperature.

Controlled fault parameters:

Low suction pressure per refrigerant circuit.
High discharge pressure - temperature per refrigerant circuit.
Oil low level.
Compressor overload.
Fan motor overload.
Water pump overload.
Differential water pressure switch.
Error reading in water outlet low temperature.
Compressor operating hours reading.

In addition the control also includes:

Self diagnostic error of all electronic control sensors.
Connection to building management system (BMS) by means of a Modbus or Metasys Protocol, through RS485 serial gate.
Remote on / off switch.
Remote alarm indication capability.
History of operation points and fault codes.
Password access code

Other unit accessories / options

R404a refrigerant, for special applications of low temperature under 0°C.
Condenser fins made of copper or prepainted aluminium and Blygold treatment for anti-corrosion protection.
Glycol application for chilled water temperature down to -15°C.
Continuous linear fan speed regulation control.
A-meter, V-meter.
Anti-freezing electrical heater at the evaporator.
Electrical board ventilation fan.
Heat recovery exchanger.
Hydromodule with water pump, without buffer tank, PK series.
Hydromodule with water pump, with buffer tank, HD series.
Axial fans with EC motors, for energy saving.
Other custom built options upon request.

Optional accessories

Microprocessor controller options:
BMS module interface kit for Bacnet, Trend, Lonworks connection.
BMS interface kit for Modbus connection.
Connection via internet, using a device converting the Carel protocol to 10 Mb/s TCP / IP ethernet protocol.
Communication card through RS232 / RS485 serial ports.
Possibility to send and receive messages, using a GSM modem.
Extension memory card for up to five thousand messages.
Extension memory card 1 & 2 MB.
Microprocessor parameter reprogramming card.

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