B COOL MANUFACTURERS OF AIR-CONDITIONING EQUIPMENT LTD

Large Series
BAWC/H - L

PACKAGED AIR TO WATER CHILLERS / HEAT PUMPS
COOLING / HEATING APPLICATIONS
OUTDOOR INSTALLATION

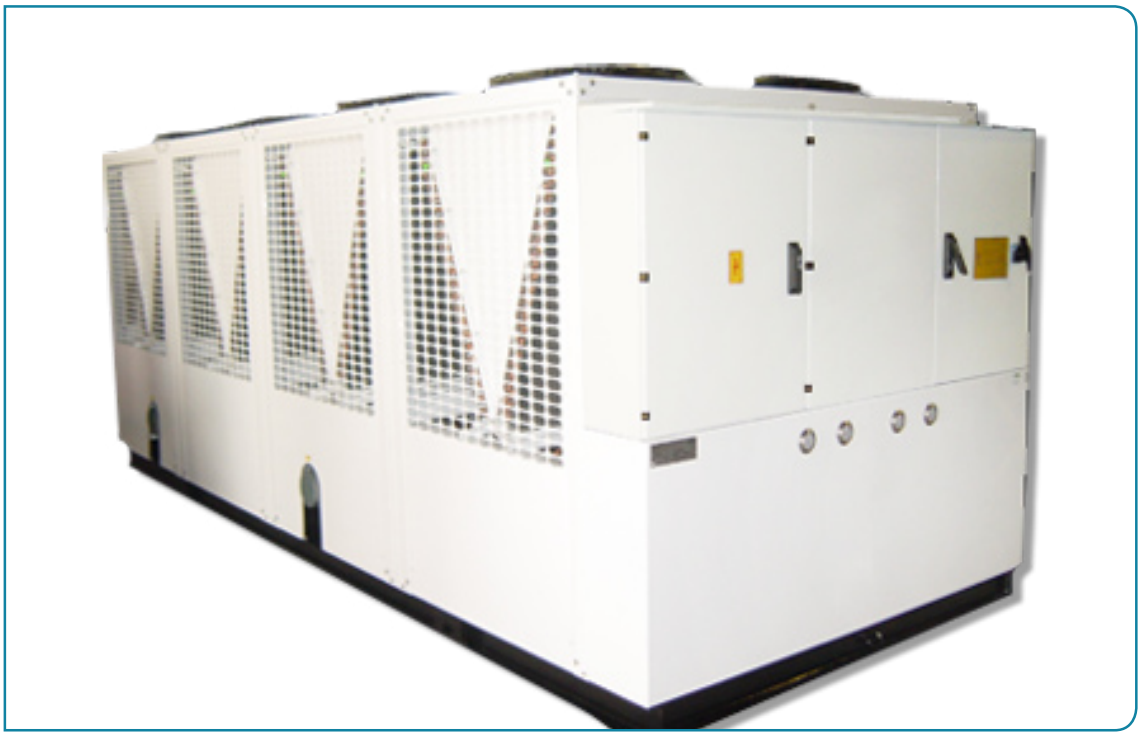
CE

ISO 9001
BUREAU VERITAS
Certification

Ver. 3.02 01_18

COOLING CAPACITY
217,1 kW - 679,1 kW (R410a)

HEATING CAPACITY
241,5 kW - 757,7 kW (R410a)



Engineering Data

The **BCOOL BAWC/H** large capacity series includes packaged air cooled water chillers and heat pumps for cooling and heating applications and outdoor installation. They are available in several types and models, with nominal capacities ranging from 217,1 to 679,1 kW in cooling and 241,5 to 757,7 kW in heating.

The **BCOOL BAWC/H - L series** is ideal, in combination with water terminal units or air-handling units, for air-conditioning of office-buildings, business centers, shopping centers, hotels, hospitals, banks, entertainment centers, etc., or for supplying cold or hot water in industrial applications.

Optimized design for R410a refrigerant

Casing: Galvanized Steel plate with polyesteric coating
Assembly: Fully bolted/welding free
Compressor: Hermetically sealed scroll type
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
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 and low pressure manometers
Step function fan control or linear fan speed regulation control, according to coil temperatures
Various optional capabilities

Nomenclature

B - A W - X - X X X - X - X - X

1 2 3 4 5 6 7

1 **BCOOL**

2 **A**ir Cooled **W**ater Chiller or Heat Pump

3 **C**-Cooling only, **H**-Heat Pump

4 **Capacity (RT)**

5 **Series**

L-large

6 **Optional**

HD-Hydronic

PK-Pump Kit

7 **Refrigerant Liquid**

R410a

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Generally

The BCOOL BAWC/H large series, including air cooled water chillers and heat pumps, consists of 10 basic models covering capacities from 217,1 up to 679,1 kW in cooling and 241,5 up to 757,7 kW in heating. 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/heat pump 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 R410a refrigerant, that is chlorine-free and has zero ozone depletion potential. BAWC/H - L 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 use low-noise, maintenance free, Hermetic Scroll compressors with low vibration levels, especially optimized for use with R410a refrigerant, provided from world class suppliers. They are equipped with a crankcase electrical heater for the oil and are internally protected against potential overloading or electrical spikes.
The compressors are mounted on special anti-vibration rubber mounts, to absorb and eliminate any vibrations 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.

Water heat exchanger

All units are equipped with a Shell and Tube, water–direct expansion type evaporator, which has up to four separate cooling circuits. 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.

Air heat exchanger fans

All units' fans are of the axial type, three phase, 6 poles, internally protected against potential overheating, silent and suitable for outdoor installation. Due to the sophisticated 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 of the external rotor type, aerodynamically shaped so as not to interfere with the airflow and have permanently lubricated bearings that to do not require service. Step function fan control (standard) or continuous linear fan speed regulation control (optional) is achieved according to coil temperatures, resulting in fan silent mode operation. This optional feature for BCOOL BAWC/H units saves energy and reduces sound levels dramatically, optimizing capacity.

Microprocessor controller

All units are equipped with a sophisticated controller that combines intelligence with operating simplicity. The controller constantly monitors all machine parameters and precisely manages among others:

- Automatic compressor control function through return water temperature.
- Step function fan control, based on coil heat exchanger temperatures.
- Defrost control.
- Hydraulic circuit pump control.
- Compressor starting order control, to reduce starting current.
- Compressor operation control, based on running time.
- Compressor start-up time delay function.
- Compressor running time records.
- Over 150 programmable parameters.
- Fan motor overload protection.
- Auto diagnostic stop function due to low water circulation, high/low operating pressure and compressor/pump thermal overload.
- Auto diagnostic stop function and digital display of approximately 30 possible error codes, including thermistor faults.
- Digital displays of inlet/outlet water, as well as coil temperature of each circuit.
- Remote cool/heat selector switch.
- Remote on/off switch.
- Phase sequence - phase failure - reverse phase and voltage monitoring .
- Many optional control capabilities (listed in optional accessories).

Refrigerant circuits

The units have, depending on the size, one, two, three or four separate refrigerant circuits. Each circuit has, as expansion device, an electronic expansion valve. Other components fitted are: suction accumulator, liquid receiver, 4-way reversing valve, check valve, solenoid valve, large capacity filter dryer with a replaceable core, sight glass and high/low pressure manometers. Unit protection is provided by a high/low pressure switch with auto reset.

Other unit accessories / options

- Reciprocating, scroll or tandem scroll compressors availability, based on specifications.
- R407C or other refrigerant liquid.
- Continuous linear fan speed regulation control, based on coil heat exchanger temperatures.
- Condenser fins made of copper or prepainted aluminum and Blygold treatment for anti-corrosion protection.
- Glycol application for chilled water low temperature down to -5^{0}C.
- Pressure relief valve on compressor discharge.
- A-meter, V-meter.
- Hydraulic module without buffer tank (PK series).
- Water heat exchanger anti-freezing electrical heater.
- Compressor noise reduction jacket.
- Hydronic module with buffer tank (HD series).
- Two pumps (one stand by).
- Axial fans with EC motors, for energy saving.
- Heat recovery exchanger.

Optional accessories

Microprocessor controller options:

- Remote keyboard.
- Dynamic set point program.
- BMS module interface kit for Modbus connection.
- Parallel chiller operation with optional controller.
- Microprocessor parameter reprogramming card.

MODEL		50 Hz	BAWC/H 060_1C	BAWC/H 060_2C	BAWC/H 075	BAWC/H 085	BAWC/H 100
Nominal Cooling capacity[1]		**kW**	**217,1**	**217,1**	**262,2**	**300,9**	**340,0**
		RT	61,8	61,8	74,6	85,6	96,8
		Btu/h	741.367	741.367	895.528	1.027.593	1.161.093
Nominal Heating capacity[2]		**kW**	**241,5**	**241,5**	**293,6**	**336,2**	**378,8**
		Kcal/h	207.837	207.837	252.658	289.346	326.033
Construction		Material/ Color	Galvanized steel / Light grey-beige (RAL 9002)				
Compressor			SCROLL				
Quantity			2 (1 TANDEM)		4 (2 TANDEM)		
Capacity steps			2 STEPS		4 STEPS		
Absorbed power	**cooling**	kW	64,40	64,40	79,80	90,90	102,00
	heating		**67,60**	**67,60**	**84,40**	**96,40**	**108,40**
Nominal operating current	**cooling**	A	109,70	109,70	138,28	156,76	175,24
	heating		**114,24**	**114,24**	**144,28**	**164,30**	**184,32**
Maximum operating current		A	165,2	165,2	194,0	227,8	261,6
Air heat exchanger			High capacity cross finned coil with internally grooved tubes and louvered fins				
Water heat exchanger			Shell and tube				
Quantity			1				
Water content		Lit.	50,0	50,0	55,0	93,0	93,0
Max. operating pressure		Water side Bar	10				
		Refrigerant side Bar	45				
Connections		mm	114,3	114,3	114,3	141,3	141,3
Nominal water flow		Lit/h	37.331	37.331	45.094	51.744	58.466
Water pressure drop		kPa	47,00	47,00	53,00	31,00	40,00
Minimum content of water system		Lit.	778	778	470	539	609
Fan			Axial (6 poles)				
Quantity			4	4	4	4	4
Speed		RPM	900				
Total air flow		m^3/h	76.000	76.000	76.000	76.000	108.000
Absorbed power		kW	7,8	7,8	7,8	7,8	13,2
Nominal operating current		A	15,4	15,4	15,4	15,4	24,4
Compressor starting current		A	408,0	408,0	272,0	310,0	310,0
Electrical characteristics			Electric network 400 V / 3 Ph / 50 Hz				
Total absorbed power	**cooling**	kW	72,16	72,16	87,56	98,66	115,20
	heating		**75,36**	**75,36**	**92,16**	**104,16**	**121,60**
Total operating current	**cooling**	A	125,10	125,10	153,68	172,16	199,64
	heating		**129,64**	**129,64**	**159,68**	**179,70**	**208,72**
Compressor carter resistance power		W	2 X150		4 X 150		
Voltage operating limits		V	360-440				
Refrigerant circuit							
Number of circuits			1	2			
Expansion device			**Electronic expansion valve**				
Refrigerant type			R410a				
Noise level @ 5m		db(A)	80	80	80	80	82
Dimensions	**BAWC/H - L**	Width mm	2.200	2.200	2.200	2.200	2.200
		Length mm	3.300	3.300	3.300	3.300	3.300
		Height mm	2.380	2.380	2.380	2.400	2.400
Shipping weight		kg	1.850	1.850	2.150	2.350	2.450

NOTES

Nominal conditions are as following:

1 Entering / leaving chilled water temperature 12 / 7°C, ambient 35°C (cooling).

2 Entering / leaving heated water temperature 40 / 45°C, ambient 7°C DB / 6°C WB (heating).

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	BAWC/H 115	BAWC/H 130	BAWC/H 150	BAWC/H 170	BAWC/H 190
Nominal Cooling capacity[1]		**kW**	**393,3**	**451,4**	**509,3**	**601,6**	**679,1**
		RT	111,9	128,5	145,0	171,2	193,3
		Btu/h	1.343.327	1.541.748	1.739.453	2.054.435	2.319.248
Nominal Heating capacity[2]		**kW**	**440,4**	**504,3**	**568,3**	**672,4**	**757,7**
		Kcal/h	378.987	434.019	489.050	578.691	652.067
Construction		Material/ Color	Galvanized steel / Light grey-beige (RAL 9002)				
Compressor			SCROLL				
Quantity			6 (3 TANDEM)			8 (4 TANDEM)	
Capacity steps			6 STEPS			8 STEPS	
Absorbed power	**cooling**	kW	119,70	136,35	153,00	181,80	204,00
	heating		**126,60**	**144,60**	**162,60**	**192,80**	**216,80**
Nominal operating current	**cooling**	A	207,42	235,14	262,86	313,52	350,48
	heating		**216,42**	**246,45**	**276,48**	**328,60**	**368,64**
Maximum operating current		A	291,0	341,7	392,4	455,6	523,2
Air heat exchanger		High capacity cross finned coil with internally grooved tubes and louvered fins					
Water heat exchanger		Shell and tube					
Quantity		1					
Water content		Lit.	88,0	80,0	133,4	125,0	114,0
Max. operating pressure		Water side Bar	10				
		Refrigerant side Bar	45				
Connections		mm	141,3	141,3	168,3	168,3	168,3
Nominal water flow		Lit/h	67.642	77.634	87.589	103.450	116.784
Water pressure drop		kPa	49,00	67,00	42,00	57,00	97,00
Minimum content of water system		Lit.	470	539	608	539	608
Fan			Axial (6 poles)				
Quantity			6	6	6	8	8
Speed		RPM	900				
Total air flow		m^3/h	114.000	114.000	162.000	152.000	216.000
Absorbed power		kW	11,7	11,7	19,8	15,6	26,4
Nominal operating current		A	23,1	23,1	36,6	30,8	48,8
Compressor starting current		A	272,0	310,0	310,0	272,0	310,0
Electrical characteristics			Electric network 400 V / 3 Ph / 50 Hz				
Total absorbed power	**cooling**	kW	131,40	148,05	172,80	197,40	230,40
	heating		**138,30**	**156,30**	**182,40**	**208,40**	**243,20**
Total operating current	**cooling**	A	230,52	258,24	299,46	344,32	399,28
	heating		**239,52**	**269,55**	**313,08**	**359,40**	**417,44**
Compressor carter resistance power		W	6 X150			8 X 150	
Voltage operating limits		V	360-440				
Refrigerant circuit							
Number of circuits			3			4	
Expansion device			**Electronic expansion valve**				
Refrigerant type			R410a				
Noise level @ 5m		db(A)	82	82	84	84	86
Dimensions	**BAWC/H - L**	Width mm	2.200	2.200	2.200	2.200	2.200
		Length mm	4.200	4.200	4.200	5.500	5.500
		Height mm	2.380	2.380	2.380	2.400	2.400
Shipping weight		kg	3.170	3.290	3.390	4.300	4.450

NOTES

Nominal conditions are as following:

1 Entering / leaving chilled water temperature 12 / 7°C, ambient 35°C (cooling).

2 Entering / leaving heated water temperature 40 / 45°C, ambient 7°C DB / 6°C WB (heating).

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.

Cooling capacity table for BAWC/H - L R410a

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
BAWC/H 060_1C	**5**	**235,3**	**52,2**	**84,7**	**218,6**	**57,4**	**93,3**	**200,2**	**63,1**	**102,5**	**188,9**	**68,3**	**110,9**	**178,0**	**73,5**	**119,4**
	7	**254,0**	**53,0**	**86,1**	**236,4**	**58,0**	**94,2**	**217,1**	**64,4**	**109,7**	**204,1**	**69,6**	**113,0**	**191,0**	**75,3**	**122,4**
	10	**284,0**	**54,5**	**88,5**	**264,9**	**59,9**	**97,3**	**241,0**	**67,0**	**113,5**	**221,4**	**70,8**	**115,1**	**206,2**	**76,6**	**124,5**
BAWC/H 060_2C	**5**	**235,3**	**52,2**	**84,7**	**218,6**	**57,4**	**93,3**	**200,2**	**63,1**	**102,5**	**188,9**	**68,3**	**110,9**	**178,0**	**73,5**	**119,4**
	7	**254,0**	**53,0**	**86,1**	**236,4**	**58,0**	**94,2**	**217,1**	**64,4**	**109,7**	**204,1**	**69,6**	**113,0**	**191,0**	**75,3**	**122,4**
	10	**284,0**	**54,5**	**88,5**	**264,9**	**59,9**	**97,3**	**241,0**	**67,0**	**113,5**	**221,4**	**70,8**	**115,1**	**206,2**	**76,6**	**124,5**
BAWC/H 075	**5**	**284,2**	**64,6**	**105,0**	**264,0**	**71,2**	**115,6**	**241,7**	**78,2**	**127,0**	**228,1**	**84,6**	**137,4**	**215,0**	**91,1**	**147,9**
	7	**306,8**	**65,7**	**106,7**	**285,5**	**71,8**	**116,7**	**262,2**	**79,8**	**138,3**	**246,5**	**86,2**	**140,0**	**230,7**	**93,4**	**151,7**
	10	**343,0**	**67,5**	**109,7**	**319,9**	**74,2**	**120,6**	**291,0**	**83,0**	**140,7**	**267,4**	**87,8**	**142,6**	**249,1**	**95,0**	**154,3**
BAWC/H 085	**5**	**326,2**	**73,6**	**119,6**	**303,0**	**81,1**	**131,7**	**277,4**	**89,1**	**144,7**	**261,8**	**96,4**	**156,5**	**246,7**	**103,7**	**168,5**
	7	**352,1**	**74,8**	**121,5**	**327,7**	**81,8**	**132,9**	**300,9**	**90,9**	**156,8**	**282,8**	**98,2**	**159,5**	**264,8**	**106,4**	**172,8**
	10	**393,6**	**76,9**	**124,9**	**367,1**	**84,5**	**137,3**	**334,0**	**94,5**	**160,2**	**306,9**	**100,0**	**162,4**	**285,9**	**108,2**	**175,7**
BAWC/H 100	**5**	**368,6**	**82,6**	**134,2**	**342,4**	**91,0**	**147,8**	**313,5**	**100,0**	**162,4**	**295,8**	**108,1**	**175,6**	**278,8**	**116,4**	**189,1**
	7	**397,8**	**83,9**	**136,4**	**370,3**	**91,8**	**149,1**	**340,0**	**102,0**	**175,2**	**319,6**	**110,2**	**178,9**	**299,2**	**119,3**	**193,9**
	10	**444,7**	**86,3**	**140,2**	**414,8**	**94,9**	**154,1**	**377,4**	**106,1**	**179,8**	**346,8**	**112,2**	**182,3**	**323,0**	**121,4**	**197,2**
BAWC/H 115	**5**	**426,3**	**97,0**	**157,5**	**396,1**	**106,8**	**173,4**	**362,6**	**117,3**	**190,6**	**342,2**	**126,9**	**206,1**	**322,5**	**136,6**	**221,9**
	7	**460,2**	**98,5**	**160,0**	**428,3**	**107,7**	**175,0**	**393,3**	**119,7**	**207,4**	**369,7**	**129,3**	**210,0**	**346,1**	**140,0**	**227,5**
	10	**514,4**	**101,3**	**164,5**	**479,8**	**111,3**	**180,8**	**436,6**	**124,5**	**211,0**	**401,2**	**131,7**	**213,9**	**373,6**	**142,4**	**231,4**
BAWC/H 130	**5**	**489,3**	**110,4**	**179,4**	**454,6**	**121,6**	**197,6**	**416,2**	**133,6**	**217,1**	**392,7**	**144,5**	**234,8**	**370,1**	**155,6**	**252,7**
	7	**528,1**	**112,2**	**182,3**	**491,6**	**122,7**	**199,3**	**451,4**	**136,4**	**235,1**	**424,3**	**147,3**	**239,2**	**397,2**	**159,5**	**259,1**
	10	**590,4**	**115,4**	**187,4**	**550,7**	**126,8**	**206,0**	**501,1**	**141,8**	**240,3**	**460,4**	**150,0**	**243,6**	**428,8**	**162,3**	**263,6**
BAWC/H 150	**5**	**552,1**	**123,9**	**201,3**	**512,9**	**136,5**	**221,7**	**469,6**	**149,9**	**243,6**	**443,1**	**162,2**	**263,5**	**417,6**	**174,6**	**283,6**
	7	**595,9**	**125,9**	**204,5**	**554,6**	**137,7**	**223,7**	**509,3**	**153,0**	**262,9**	**478,7**	**165,2**	**268,4**	**448,2**	**179,0**	**290,8**
	10	**666,2**	**129,4**	**210,3**	**621,3**	**142,3**	**231,1**	**565,3**	**159,1**	**269,7**	**519,5**	**168,3**	**273,4**	**483,8**	**182,1**	**295,8**
BAWC/H 170	**5**	**652,1**	**147,3**	**239,2**	**605,8**	**162,2**	**263,4**	**554,7**	**178,2**	**289,4**	**523,4**	**192,7**	**313,0**	**493,3**	**207,4**	**337,0**
	7	**703,9**	**149,6**	**243,0**	**655,1**	**163,6**	**265,8**	**601,6**	**181,8**	**313,5**	**565,5**	**196,3**	**318,9**	**529,4**	**212,7**	**345,5**
	10	**786,9**	**153,8**	**249,8**	**734,0**	**169,1**	**274,6**	**667,8**	**189,1**	**320,5**	**613,6**	**200,0**	**324,9**	**571,5**	**216,3**	**351,4**
BAWC/H 190	**5**	**736,1**	**165,2**	**268,4**	**683,9**	**182,0**	**295,6**	**626,1**	**199,9**	**324,8**	**590,8**	**216,2**	**351,3**	**556,9**	**232,8**	**378,1**
	7	**794,5**	**167,9**	**272,7**	**739,5**	**183,6**	**298,2**	**679,1**	**204,0**	**350,5**	**638,4**	**220,3**	**357,9**	**597,6**	**238,7**	**387,7**
	10	**888,3**	**172,6**	**280,4**	**828,5**	**189,7**	**308,2**	**753,8**	**212,2**	**359,6**	**692,7**	**224,4**	**364,5**	**645,1**	**242,8**	**394,3**

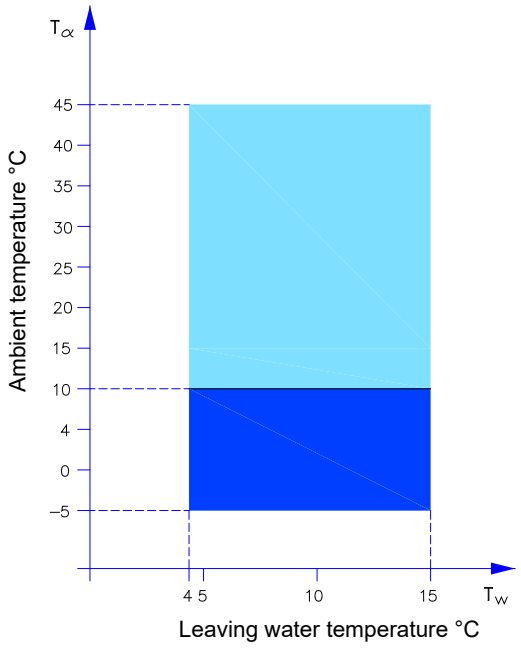
NOTES
- Bold values show nominal cooling capacities.
- Absorbed power and current refer to the compressor.
- Above figures are valid for water dt=5°C.

Heating capacity table for BAWH - L R410a

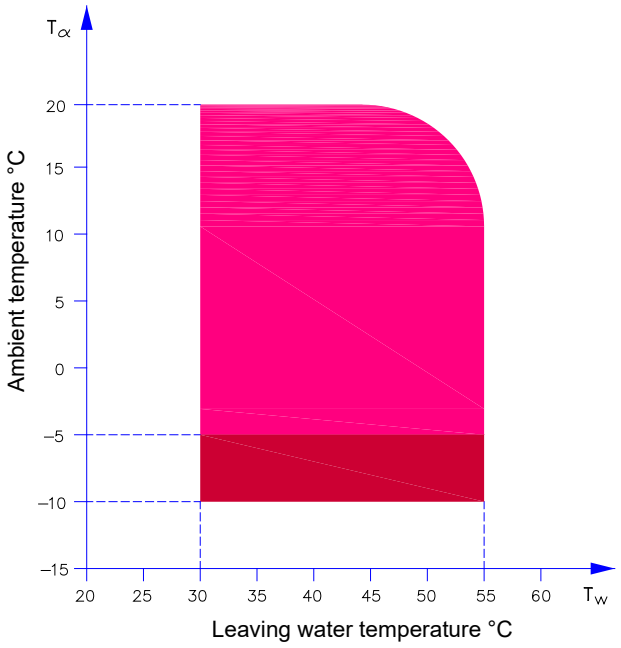
Ambient °C		-5			0			2			7			10		
MODEL	Water outlet °C	Heating capacity kW	Absorbed power kW	Current A	Heating capacity kW	Absorbed power kW	Current A	Heating capacity kW	Absorbed power kW	Current A	Heating capacity kW	Absorbed power kW	Current A	Heating capacity kW	Absorbed power kW	Current A
BAWH 060_1C	**35**	**191,8**	**50,4**	**90,2**	**215,9**	**51,2**	**91,2**	**229,9**	**51,6**	**91,7**	**251,0**	**52,2**	**92,5**	**283,0**	**56,4**	**98,5**
	40	**186,4**	**55,8**	**97,6**	**210,8**	**56,6**	**98,6**	**223,9**	**57,0**	**99,2**	**243,9**	**57,6**	**100,0**	**273,9**	**62,2**	**106,5**
	45	**184,3**	**62,0**	**106,1**	**202,9**	**65,2**	**110,9**	**217,8**	**63,0**	**107,7**	**241,5**	**67,6**	**114,2**	**266,1**	**68,5**	**115,7**
BAWH 060_2C	**35**	**191,8**	**50,4**	**90,2**	**215,9**	**51,2**	**91,2**	**229,9**	**51,6**	**91,7**	**251,0**	**52,2**	**92,5**	**283,0**	**56,4**	**98,5**
	40	**186,4**	**55,8**	**97,6**	**210,8**	**56,6**	**98,6**	**223,9**	**57,0**	**99,2**	**243,9**	**57,6**	**100,0**	**273,9**	**62,2**	**106,5**
	45	**184,3**	**62,0**	**106,1**	**202,9**	**65,2**	**110,9**	**217,8**	**63,0**	**107,7**	**241,5**	**67,6**	**114,2**	**266,1**	**68,5**	**115,7**
BAWH 075	**35**	**233,1**	**62,9**	**114,0**	**262,5**	**63,9**	**115,2**	**279,5**	**64,4**	**115,9**	**305,1**	**65,2**	**116,9**	**344,1**	**70,4**	**124,4**
	40	**226,7**	**69,6**	**123,2**	**256,3**	**70,6**	**124,5**	**272,2**	**71,1**	**125,2**	**296,5**	**71,9**	**126,3**	**332,9**	**77,6**	**134,5**
	45	**224,0**	**77,4**	**134,0**	**246,6**	**81,4**	**140,1**	**264,8**	**78,7**	**136,1**	**293,6**	**84,4**	**144,3**	**323,5**	**85,6**	**146,2**
BAWH 085	**35**	**266,9**	**71,9**	**129,8**	**300,6**	**73,0**	**131,2**	**320,1**	**73,6**	**131,9**	**349,4**	**74,4**	**133,1**	**394,0**	**80,4**	**141,6**
	40	**259,5**	**79,5**	**140,3**	**293,5**	**80,7**	**141,8**	**311,7**	**81,3**	**142,6**	**339,6**	**82,1**	**143,9**	**381,3**	**88,7**	**153,1**
	45	**256,5**	**88,4**	**152,6**	**282,4**	**92,9**	**159,5**	**303,3**	**89,8**	**154,9**	**336,2**	**96,4**	**164,3**	**370,5**	**97,7**	**166,4**
BAWH 100	**35**	**300,8**	**80,8**	**145,6**	**338,6**	**82,1**	**147,2**	**360,6**	**82,7**	**148,0**	**393,7**	**83,7**	**149,3**	**444,0**	**90,4**	**158,9**
	40	**292,4**	**89,4**	**157,4**	**330,7**	**90,7**	**159,1**	**351,1**	**91,4**	**160,0**	**382,6**	**92,4**	**161,4**	**429,6**	**99,7**	**171,8**
	45	**289,0**	**99,4**	**171,2**	**318,2**	**104,5**	**179,0**	**341,7**	**101,0**	**173,8**	**378,8**	**108,4**	**184,3**	**417,4**	**109,9**	**186,7**
BAWH 115	**35**	**349,7**	**94,4**	**171,0**	**393,7**	**95,8**	**172,8**	**419,3**	**96,6**	**173,8**	**457,7**	**97,7**	**175,3**	**516,1**	**105,6**	**186,6**
	40	**340,0**	**104,4**	**184,8**	**384,5**	**106,0**	**186,8**	**408,3**	**106,7**	**187,9**	**444,8**	**107,9**	**189,5**	**499,4**	**116,5**	**201,7**
	45	**336,0**	**116,1**	**201,1**	**369,9**	**122,0**	**210,1**	**397,2**	**118,0**	**204,1**	**440,4**	**126,6**	**216,4**	**485,3**	**128,4**	**219,2**
BAWH 130	**35**	**400,4**	**107,8**	**194,7**	**450,8**	**109,5**	**196,8**	**480,1**	**110,3**	**197,9**	**524,1**	**111,6**	**199,6**	**591,0**	**120,6**	**212,4**
	40	**389,3**	**119,3**	**210,5**	**440,3**	**121,0**	**212,7**	**467,5**	**121,9**	**213,9**	**509,3**	**123,2**	**215,8**	**571,9**	**133,0**	**229,7**
	45	**384,8**	**132,6**	**229,0**	**423,6**	**139,4**	**239,3**	**454,9**	**134,8**	**232,4**	**504,3**	**144,6**	**246,5**	**555,7**	**146,6**	**249,7**
BAWH 150	**35**	**451,2**	**121,2**	**218,4**	**508,1**	**123,1**	**220,8**	**541,0**	**124,1**	**222,0**	**590,6**	**125,5**	**223,9**	**666,0**	**135,6**	**238,3**
	40	**438,7**	**134,1**	**236,1**	**496,1**	**136,1**	**238,6**	**526,8**	**137,1**	**240,0**	**574,0**	**138,5**	**242,1**	**644,5**	**149,6**	**257,7**
	45	**433,6**	**149,1**	**256,8**	**477,4**	**156,7**	**268,5**	**512,6**	**151,5**	**260,7**	**568,3**	**162,6**	**276,5**	**626,3**	**164,9**	**280,1**
BAWH 170	**35**	**533,9**	**143,7**	**259,6**	**601,1**	**145,9**	**262,4**	**640,1**	**147,1**	**263,9**	**698,8**	**148,8**	**266,2**	**788,1**	**160,8**	**283,3**
	40	**519,1**	**159,1**	**280,6**	**587,0**	**161,4**	**283,6**	**623,3**	**162,5**	**285,2**	**679,1**	**164,3**	**287,7**	**762,5**	**177,4**	**306,3**
	45	**513,0**	**176,8**	**305,3**	**564,8**	**185,9**	**319,1**	**606,5**	**179,7**	**309,9**	**672,4**	**192,8**	**328,6**	**741,0**	**195,5**	**332,9**
BAWH 190	**35**	**601,6**	**161,6**	**291,2**	**677,4**	**164,1**	**294,4**	**721,3**	**165,4**	**296,0**	**787,5**	**167,4**	**298,6**	**888,0**	**180,8**	**317,8**
	40	**584,9**	**178,9**	**314,8**	**661,5**	**181,5**	**318,1**	**702,4**	**182,8**	**320,0**	**765,3**	**184,7**	**322,8**	**859,2**	**199,5**	**343,6**
	45	**578,1**	**198,8**	**342,5**	**636,5**	**209,0**	**357,9**	**683,4**	**202,1**	**347,6**	**757,7**	**216,8**	**368,6**	**835,0**	**219,8**	**373,4**

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

COOLING



HEATING



NOTES

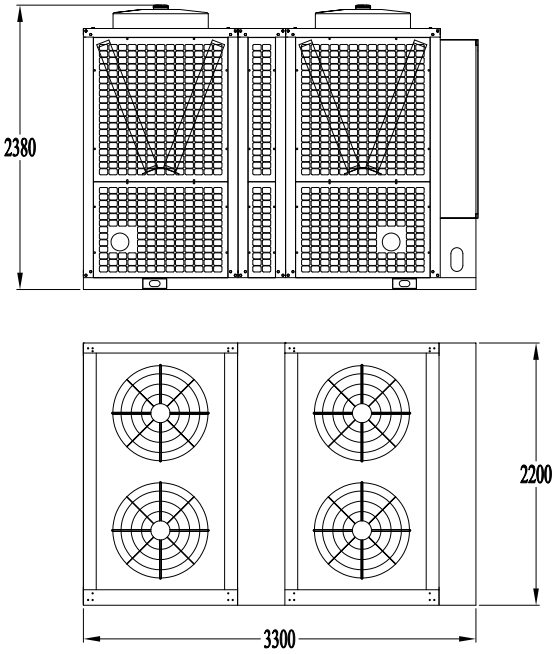
Protect the water circuit against freezing when it is necessary.
The above operating limits are for general guidance only.
It may be possible for certain units to operate outside the confines of the graph. Please contact BCOOL if further clarification is required.

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.

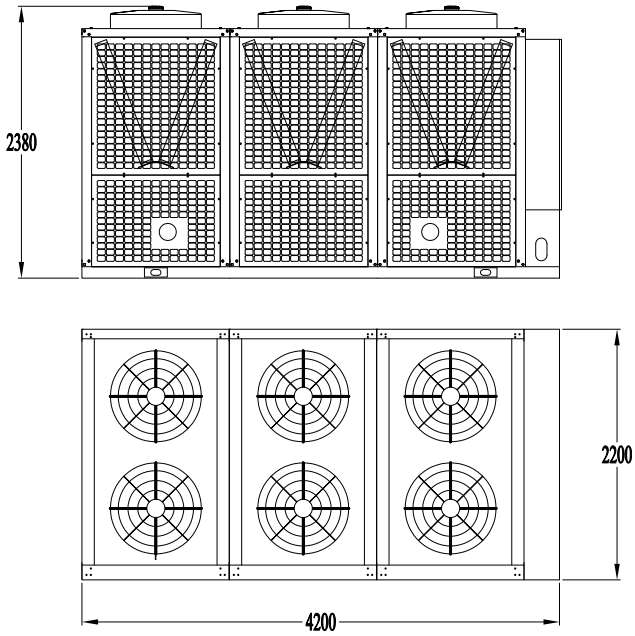
2.5 Sound data BAWC/H - L

MODEL		db(A)	63	125	250	500	1000	2000	4000	8000
BAWC/H 060_1C	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
BAWC/H 060_2C	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
BAWC/H 075	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
BAWC/H 085	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
BAWC/H 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
BAWC/H 115	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
BAWC/H 130	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
BAWC/H 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
BAWC/H 170	Power	93	87	85	85	88	87	86	82	74
	Pressure @1 m	82	76	74	74	77	76	75	71	63
	Pressure @10 m	62	56	54	54	57	56	55	51	43
BAWC/H 190	Power	93	87	85	85	88	87	86	82	74
	Pressure @1 m	82	76	74	74	77	76	75	71	63
	Pressure @10 m	62	56	54	54	57	56	55	51	43

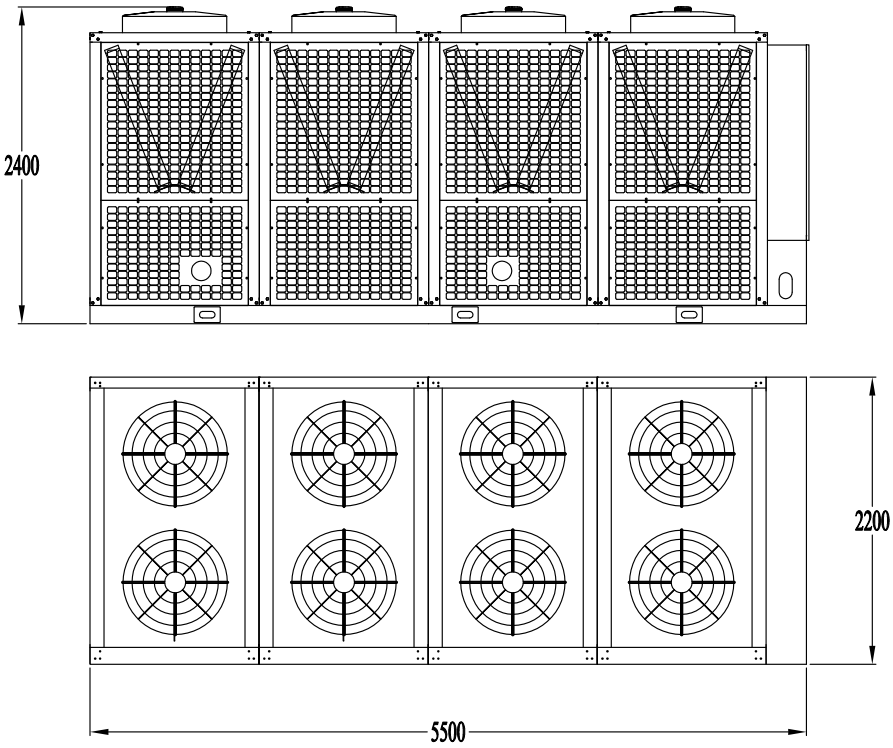
BAWC/H 060-100



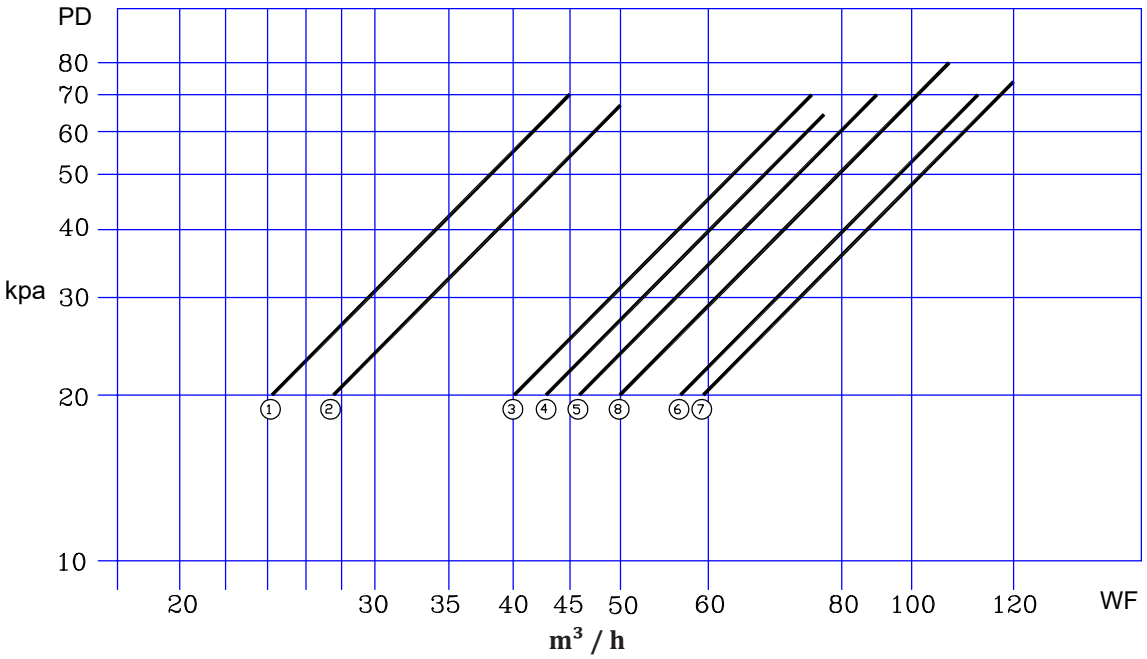
BAWC/H 115-150



BAWC/H 170-190



4.1 Water pressure drop curves



PD: pressure drop **WF:** water flow

1. **BAWC/H 060**
2. **BAWC/H 075**
3. **BAWC/H 085-110**
4. **BAWC/H 115**
5. **BAWC/H 130**
6. **BAWC/H 150**
7. **BAWC/H 170**
8. **BAWC/H 190**

ETHYLENE GLYCOL CORRECTION FACTORS

% ETHYLENE GLYCOL BY VOLUME	UNIT	10	20	30	40
Freezing point	^{0}C	-4	-9	-15	-23
Output duty	kW	0,99	0,98	0,97	0,96
Input power	kW	0,99	0,98	0,98	0,97
Equivalent Flow rate	L/H	1,02	1,04	1,08	1,13
Equivalent Pressure drop	kPa	1,06	1,12	1,18	1,25

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.
Water heat exchanger 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 inthe control circuit.
To protect the water heat exchanger 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 water heat exchanger.
Provide flexible connection pipes at the inlet and outlet of the water heat exchanger, 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 water heat exchanger 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.

4.2.2 Water charge, flow and quality

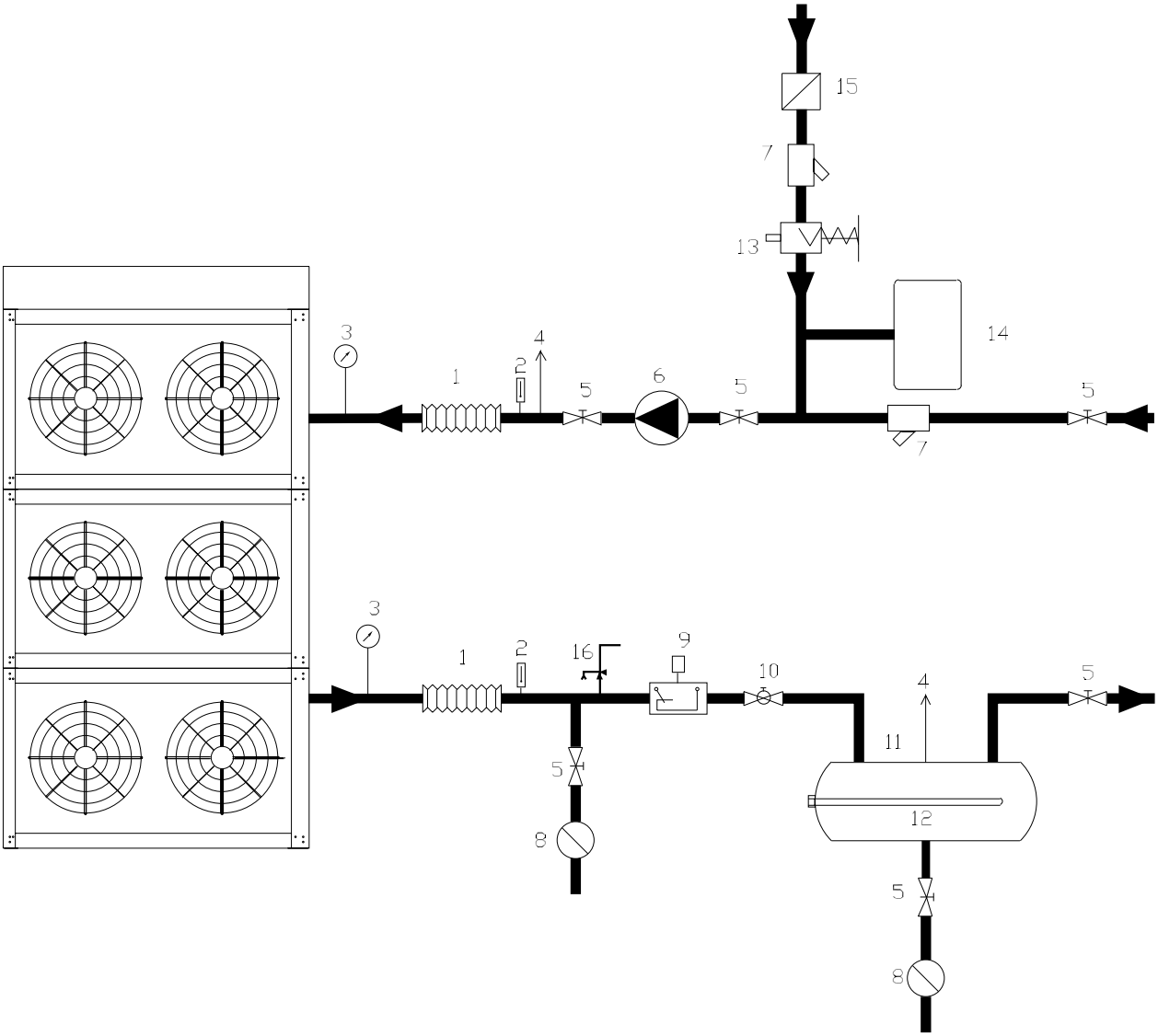
To ensure proper operation of the unit, a minimum water volume is required in the system and the water flow must be within the operational range, as specified in the tables.

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

MODEL	Minimum water volume (l)	Minimum water flow (l/h)	Nominal water flow (l/h)	Maximum water flow (l/h)
BAWC/H 060_1C	778	26132	37331	45544
BAWC/H 060_2C	778	26132	37331	45544
BAWC/H 075	470	31566	45094	55015
BAWC/H 085	539	36221	51744	63128
BAWC/H 100	609	40926	58466	71329
BAWC/H 115	470	47349	67642	82523
BAWC/H 130	539	54344	77634	94713
BAWC/H 150	608	61312	87589	106859
BAWC/H 170	539	72415	103450	126209
BAWC/H 190	608	81749	116784	142476

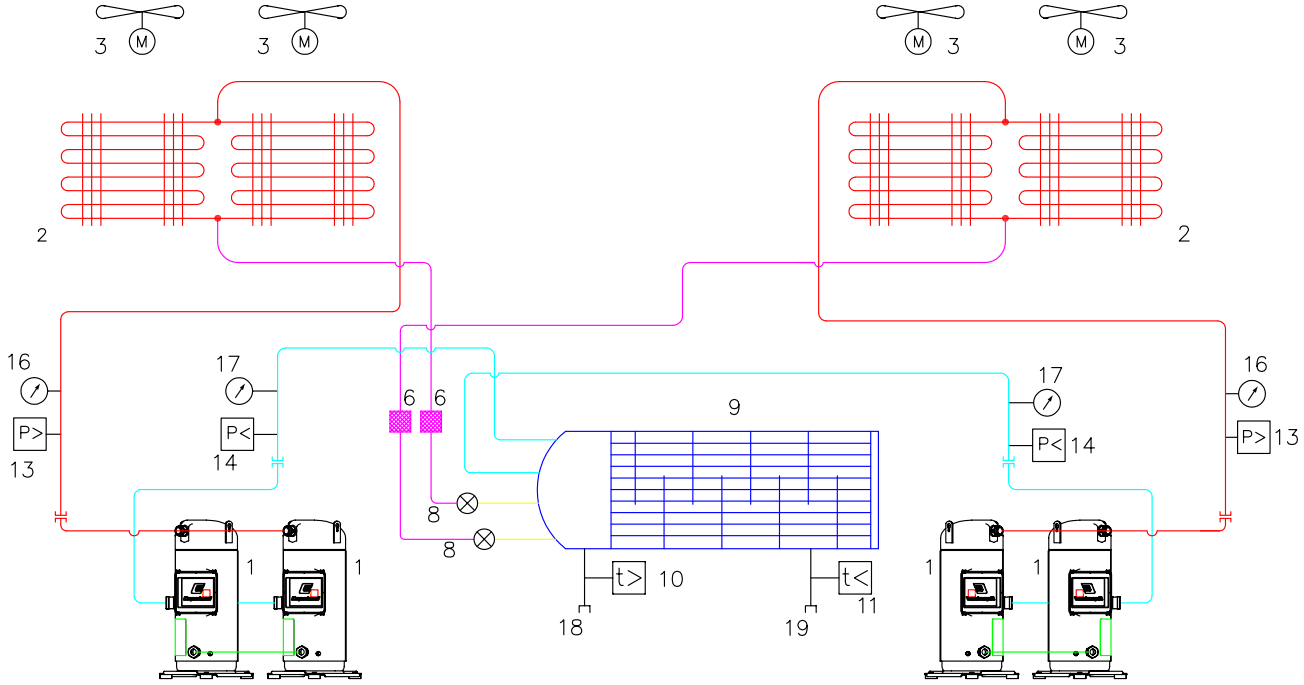
ITEMS	Evaporator water		Heated water		Tendency if out of criteria
	Circulating water 20°C	Supply water	Circulating water 20 - 60°C	Supply water	
Items to be controlled:					
PH AT 25°C	6.8 - 8.0	6.8 - 8.0	7.0 - 8.0	7.0 - 8.0	corrosion + scale
Electrical conduct (mS/m) at 25°C	below 30	below 30	below 30	below 30	corrosion + scale
Chloride ion (mg CI-/I)	below 50	below 200	below 30	below 30	corrosion
Sulfate ion (mg SO 2/4/I	below 50	below 50	below 30	below 30	corrosion
M-alkalinity (ph 4.8) (mg SO3/I)	below 50	below 50	below 50	below 50	scale
Total hardness (mg CaCO3/I)	below 70	below 70	below 70	below 70	scale
Calcium hardness (mg CaCO3/I)	below 50	below 50	below 50	below 50	scale
Silica ion (mg SiO2/I	below 30	below 30	below 30	below 30	scale
Items to be referred to:					
Iron (mg Fe/I)	below 1.0	below 0.3	below 1.0	below 0.3	corrosion + scale
Copper (mg Cu/I)	below 1.0	below 0.1	below 1.0	below 1.0	corrosion
Sulfide ion (mg S2-/I)	Not detectable	Not detectable	Not detectable	Not detectable	corrosion
Amonium ion (mg NH+4/I	below 0.3	below 0.1	below 0.1	below 0.1	corrosion
Remaining chloride (mg CI/I)	below 0.25	below 0.3	below 0.1	below 0.3	corrosion
Free carbide (mg SO2/I)	below 0.4	below 4.0	below 0.4	below 4.0	corrosion
Stability index	-	-	-	-	corrosion + scale

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

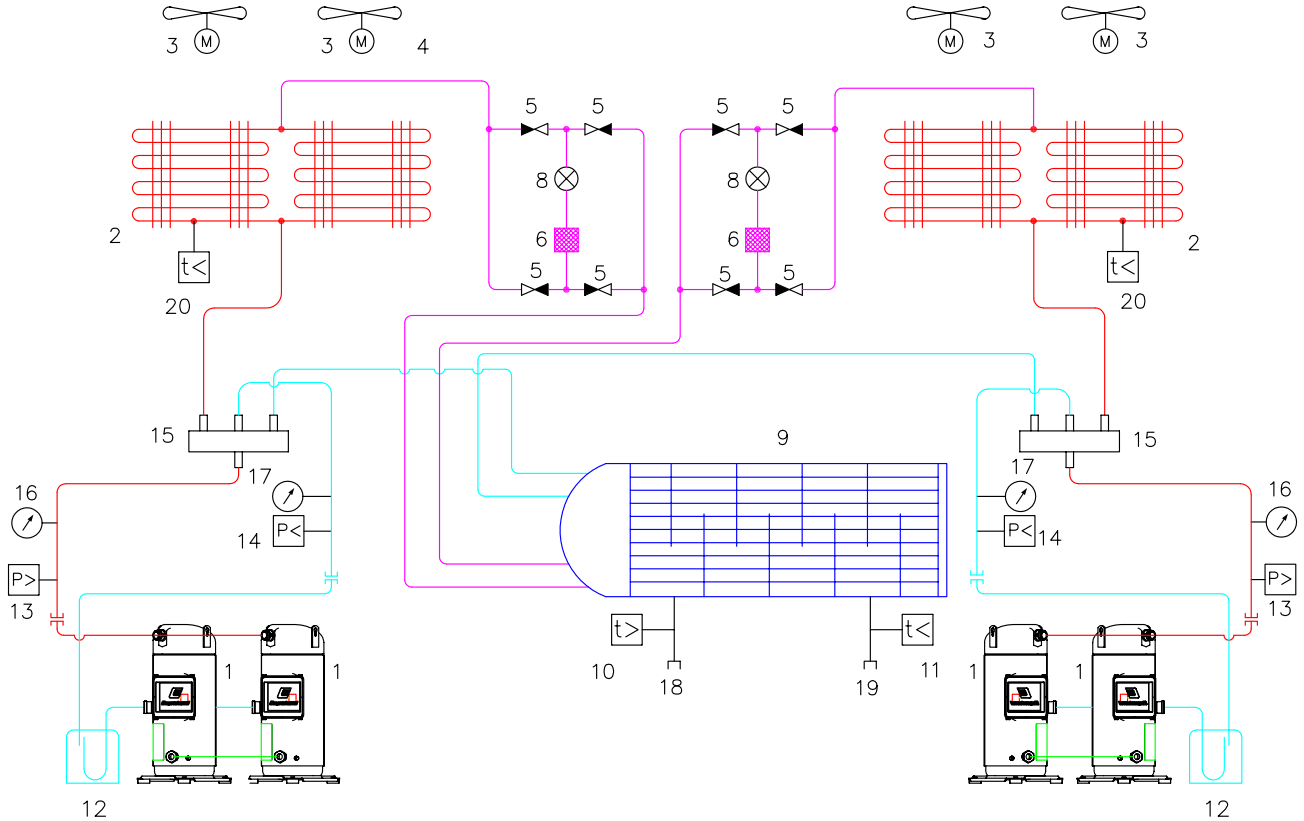


1. Flexible.
2. Thermometer.
3. Manometer.
4. Air vent.
5. Shut-off valve.
6. Pump (primary circuit).
7. Water filter.
8. Drainage.
9. Flow switch (optional).
10. Balancing valve.
11. Buffer Tank.
12. Electrical resistance (optional).
13. Automatic make up water valve.
14. Expansion tank.
15. Check valve.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

5.1 BAWC - L



5.2 BAWH - L



1.COMPRESSOR
2.CONDENSER
3.FAN
4.EXPANSION DEVICE (CAPILLARY)
5.CHECK VALVE
6.FILTER DRIER
8.EXPANSION VALVE

9.EVAPORATOR
10.TEMPERATURE PROBE (INLET)
11.TEMPERATURE PROBE (OUTLET)
12.ACCUMULATOR
13.HIGH PRESSURE SWITCH
14.LOW PRESSURE SWITCH
15.4_WAY VALVE

16.HIGH PRESSURE MANOMETER
17.LOW PRESSURE MANOMETER
18.WATER INLET
19.WATER OUTLET
20.DEFROST PROBE

5.3 Operating pressure of the refrigerant circuit

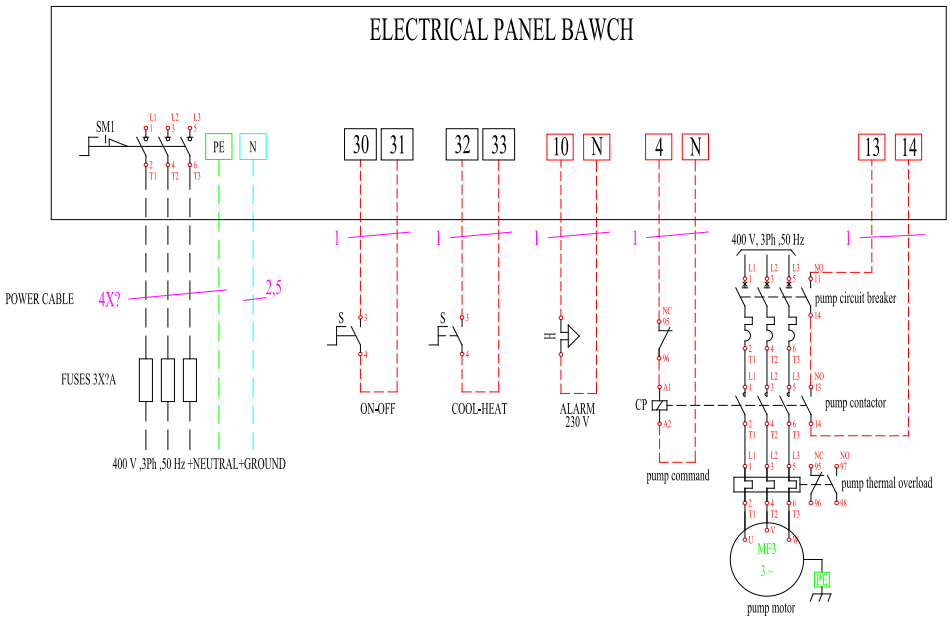
It is important to check the high and low pressure of the refrigerant circuit, to ensure the proper operation of the unit and to guarantee that the rated output shall be obtained.

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

R410a	**Cooling mode (region)**	Minimum	Nomimal	Maximum
		(Ambient temp. 20°C) (leaving water temp. 6°C)	(Ambient temp. 30°C) (leaving water temp. 7°C)	(Ambient temp. 40°C) (leaving water temp. 15°C)
	low pressure	7,0 - 7,2 bar	7,1 - 7,6 bar	9,4 - 10,0 bar
	high pressure	19,0 - 21,0 bar	24,0 - 28,0 bar	31,0 - 34,0 bar

R410a	**Heating mode (region)**	Minimum	Nomimal	Maximum
		(Ambient temp. 0°C) (leaving water temp. 50°C)	(Ambient temp. 7°C) (leaving water temp. 45°C)	(Ambient temp. 15°C) (leaving water temp. 45°C)
	low pressure	5,4 - 5,6 bar	6,9 - 7,2 bar	9,2 - 9,6 bar
	high pressure	34,0 - 36,0 bar	29,0 - 31,0 bar	30,0 - 33,0 bar

6.0 Wiring diagram



BAWC/H - L series

The supply, transport to jobsite, installation, commissioning and start-up of an air-cooled water chiller / heat pump with the following technical characteristics:
The unit shall be factory assembled, charged with R410a refrigerant and factory tested. The capacity of the unit shall be no less than:

Cooling capacity:	kW
In following conditions	
Ambient air temperature (DB)	°C
Entering water temperature	°C
Leaving water temperature	°C
Heating capacity:	kW
In following conditions	
Ambient air temperature (DB / WB)	°C
Entering water temperature	°C
Leaving water temperature	°C

The unit shall operate unhindered within 6 to 15°C/25°C to 50°C (cool/heat) water outlet 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

The unit casing shall be fabricated from heavy gauge galvanized steel sheets, formed to ensure maximum rigidity that shall guarantee and preserve the unit's operation during the years. All metal parts after fabrication shall be degreased, phosphatized and electrostatically powder coated with an epoxy-polyester RAL 9002 coating of a thickness of 60 70 μm. The corrosion resistance treatment must successfully withstand a salt spray test of 500 hours, according to ASTM B- 117. All components shall be assembled together exclusively using bolts, without welding. The unit shall have removable access panels, designed in such a manner as to permit easy access to internal compartments, only by authorized personnel. Electrical and electronic equipment and components for proper unit's operation shall be located inside a water proof (IP55) electrical panel, with access via special key.

Compressors

Shall be of the hermetic scroll type, with low noise and vibration levels, especially optimized for use with R410a refrigerant. They shall be equipped with a crankcase electrical heater, to separate refrigerant and oil when the unit is not operating. They shall also include internal protection against overloading or electrical spikes. The compressor shall be mounted on special anti-vibration rubber mounts, to absorb and eliminate any vibrations from the unit's operation.

Air Heat Exchanger

The air heat exchanger shall be manfactured from seamless copper tubes with an outside diameter of 9,52 mm (3/8'') of high quality, according to ASTM B-280. The tubes shall be internally grooved to achieve optimized heat transfer between refrigerant and tube. The fins shall be manufactured from aluminium. The fins shall be continuous across the heat exchanger and the fins surface shall be waffle formed and louvered, so as to increase the fin rigidity and heat transfer. The combination of internally grooved copper tubing and louvered fins must result in a heat transfer performance 30% superior to that of a conventional coil. The assembly of the finned pack shall be achieved by mechanical expansion, in such a way as to form a perfect mechanical bond with the fins. For his purpose, the fin holes shall have a peripheral extrusion (collar).

Water Heat Exchanger

All units shall be equipped with a Shell and Tube, water–direct expansion type evaporator, which has up to four separate cooling circuits. The casing shall be of steel and the internal tubes of copper. There shall be an air vent valve, drain valve, differential water pressure switch, probes for water temperature sensors and the whole heat exchanger shall be wrapped in a heavy insulation material, appropriate for external installation.

Air Heat Exchanger Fans

All units shall be equipped with axial type fans, three phase, 6 poles, internally protected against potential overheating, noiseless and suitable for outdoor installation. The design of the blades and inlet cones shall be aerodynamic and the fan motor assembly shall be perfectly statically and dynamically balanced, allowing a completely vibration-free operation. The fan motor assembly shall have a protective grid against accidental contact with moving parts, according to ISO regulations. The fan motor shall be of the external rotor type, with permanently lubricated bearings that do not require service. The motor shall be aerodynamically shaped, so as not to interfere with the airflow. The unit shall be equipped with a step function fan control (standard) or a continuouss linear fan speed regulation control (optional), according to coil temperatures.

Refrigerant circuits

The units shall have, depending on the size, one, two, three or four separate refrigerant circuits.
The circuit shall consist of a filter dryer with replaceable core, liquid receiver, suction accumulator, 4-way reversing valve, electronic expansion valve, sight glass, solenoid valve, check valve, high pressure switch, low pressure switch and high/low pressure manometers.

Control System with Microprocessor controller

The control system shall possess a sophisticated controller that shall constantly monitor all machine parameters and particularly manage among others:
Automatic compressor control function through return water temperature.
Step function fan control, based on coil heat exchanger temperatures.
Defrost control.
Hydraulic circuit pump control.
Compressor start-up time control function.
Compressor starting order control, to reduce starting current.
Compressor operation control, based on running time.
Compressor running time records.
Over 150 programmable parameters.
Fan motor overload protection.
Auto diagnostic stop function, due to low water circulation, high/low operating pressure and compressor/pump thermal overload.
Auto diagnostic function and digital display of approximately 30 possible error codes, including thermistor faults.
Digital displays of inlet/outlet water, as well as coil temperature of each circuit.
Remote cool/heat and on/off selection.
Phase sequence - phase failure - reverse phase and voltage monitoring.
Various other optional control capabilities (listed in options).

NOTE

The consultant may add, if required, the below mentioned optional accessories / functions:
Remote keyboard.
Dynamic set point program.
BMS module interface kit for Modbus connection.
Parallel chiller operation with more than 2 units, with optional controller.
Microprocessor parameters reprogramming card.
Continuous linear fan speed regulation control, based on coil heat exchanger temperatures.
Condenser fins made of prepainted aluminium or copper and Blygold treatment for additional anti-corrosion protection.
Water heat exchanger anti-freezing protection (elec. heater), controlled by microprocessor.
Glycol application for low chilled water temperatures.
Pressure relief valve on compressor discharge.
Hydraulic module without buffer tank, or Hydronic module with buffer tank.
Compressor noise reduction jacket.
Two pumps (one stand by).
A-meter, V-meter.
Axial Fans with EC motors, for energy saving.
Heat recovery exchanger.

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