



BW05

Nominal cooling capacity 20-310 kW

- The new generation of BW05 liquid chillers features the latest technological innovations: scroll compressors, digital auto-adaptive control and ozone-friendly refrigerant HFC-407C. BW05 can be supplied with hydronic evaporator and condenser modules as standard, limiting the installation to simple operations such as the entering and leaving water piping connection. An auto-adaptive control algorithm intelligently controls condenser water pump speed and the operation of the glycol cooler fans to ensure reliable and economical operation under any climate conditions.

"Plug and Play" installation

- Integrated hydronic modules: they minimise site installation complexity and reduce the required space for the chiller installation.

Evaporator hydronic module

This consists of a removable screen filter, single or twin-head water pump, expansion tank, water flow switch, safety valve, pressure gauge, and purge valve. A control valve permits adjustment of the flow rate to the water system characteristics. All components are isolated to prevent condensation.

Condenser hydronic module

This consists of a removable screen filter, single or twin-head (from size 060 upwards) variable-speed water pump, expansion tank, safety valve, pressure gauge, and purge valve. The variable-speed pump controls the chiller condensing pressure and makes the installation of a three-way mixing valve on the condenser water circuit unnecessary.

- Fan control: The control system also controls the fans of the glycol cooler or remote air-cooled condenser. There are two methods: up to 8 stages maximum with balancing of fan operation times.
- Quick electrical connections: BW05 is equipped with a general disconnect switch and a 24 V control circuit supply transformer as standard. A single power supply entry (three-phase without neutral) supplies the chiller.

Economical operation

- The condensing pressure is optimised by a patented auto-adaptive algorithm. At part load or moderate outside temperature an algorithm intelligently controls the condenser water pump speed and the operation of the glycol cooler fans to maintain the condensing pressure at its lowest possible value. The standard BW05 can operate down to -20°C outside temperature.

- The variable-speed condenser water pump automatically adjusts the water flow rate to maintain the ideal condensing conditions. At part load the power consumption of the pump is significantly reduced. A further advantage: as the three-way valve on the condenser circuit is not required, the hydronic circuit pressure drops are lower and the condenser water pump uses less energy.
- High-performance welded evaporator and condenser plate heat exchangers. With their counter-flow technology the heat exchangers maximise the thermodynamic properties of refrigerant HFC-407C. They are sized for very low water pressure drops. From size BW05 160 upwards the evaporator and the condenser have two interlaced refrigerant circuits.

Finds space anywhere

- BW05 saves space, as it does not require additional space for the water pumps - everything is built into the unit. A further advantage: as routine unit maintenance operations are carried out via the front or side panels, the chiller can be installed against a wall.
- No plant room required. With its aesthetically pleasing casing design and the water connections at the top (BW05 020-150) it can be installed in a place that is open to the public (garage, basement etc.), if local regulations permit.
- Low-noise operation. BW05 is equipped with quiet, vibration-free scroll compressors. These are well known for their durability and reliability, and they require no maintenance.

Reliability

- Refrigerant HFC-407C has no effect on the ozone layer, and is the replacement for R-22 in air conditioning applications with small and medium capacities. It has been extensively tested for several years and offers the same reliability and even slightly superior performances to those of R-22.
- The refrigerant circuit is designed to be completely leak-proof. All pipes and the refrigeration components are welded, the capillaries, a source of leaks in the past, have been replaced. Pressure sensors, mounted directly on the pipes, take the place of the pressure switches. From size BW05 160 upwards, two independent refrigerant circuits ensure partial cooling capacity in all circumstances.

Control system

- BW05 has an advanced numeric control system that combines intelligence with great operating simplicity. It controls the operation of compressors, evaporator and condenser water pumps and fans.

Energy demand optimisation

- A patented auto-adaptive control algorithm optimises the condensing pressure at part load to reduce the compressor load, ensuring a perfect supply of the evaporator with liquid refrigerant. The algorithm controls the operation of the variable-speed condenser water pump and of the fans.
- The control system automatically resets the chilled-water temperature set point based on the outside air temperature or the return water temperature. The control can also operate on a second set point (example: unoccupied mode).

Total chiller protection

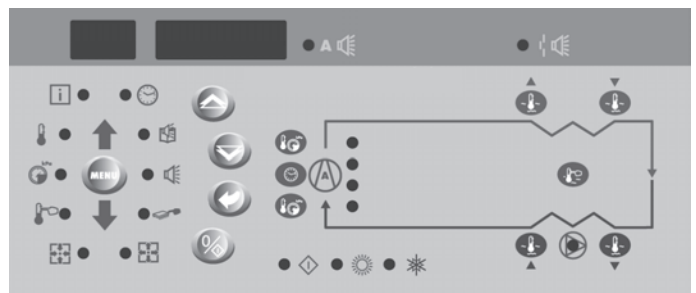
- A patented auto-adaptive algorithm controls the compressor operation and permanently adapts to the system characteristics (water loop inertia). Dangerous compressor cycling is prevented. The chiller can operate safely with a low water volume, and this frequently makes a buffer tank unnecessary (see minimum water volume later in this document).
- The control system permanently analyses the compressor suction and discharge pressures and temperatures. When an abnormal situation is detected, the control reacts e.g. by unloading one refrigerant circuit. As a result the compressors always operate in their ideal temperature range and many chiller fault shut-downs can be prevented.

Easy-to-use system

- The operator interface is clear and user-friendly: LEDs and two numeric displays offer an immediate check of all unit operating data.
- By pushing the buttons conveniently positioned on a synoptic chiller diagram you have an immediate display of the following parameters: temperatures, pressures, set point, compressor run times etc.
- 10 menus offer direct access to all machine data, including a history of possible faults, for rapid and complete chiller fault diagnosis.

Easy remote control

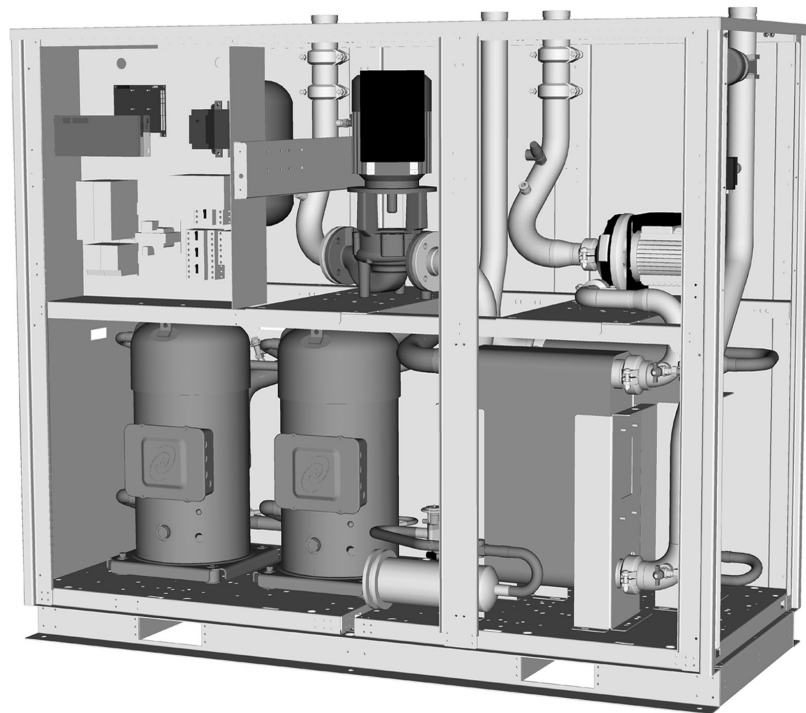
- Remote control and monitoring of the chiller is achieved through a wired connection: start/stop, cooling/heat reclaim mode selection, power demand limit or dual set point and customer safety lock. The system permits remote signalling of any possible anomaly for each refrigerant circuit.
- The optional "CCN Clock Board" offers other control possibilities. Three independent time schedules permit definition of:
 - chiller start/stop
 - operation at the second chilled-water set-point (e.g. unoccupied mode)
 - operation with a reduced number of fans (e.g. during the night).
 This option also permits parallel operation of two units and remote control via communication bus (RS 485 serial port).



Operator interface

Options and accessories

	Option	Accessory
Heat pump (hot or cold water control)	X	
Low leaving water temperature down to -10°C	X	
Electronic starter for reduced start-up current	X	
CCN Clock Board RS485 communications and time schedule board	X	X
Communications board for the "hydraulic solution" system	X	
Evaporator hydronic module with single pump	X	
Evaporator hydronic module with twin-head pump (sizes 060-300)	X	
Condenser hydronic module with single pump	X	
Condenser hydronic module with twin-head pump (sizes 060-300)	X	



Brine water heat pump BW05

Physical data

BW05		020	025	030	040	045	060	070	080	090	110	120	135	150	160	185	210	245	275	300	
Nominal cooling capacity*		kW	20.2	25.9	29.9	39.7	45.3	56	70	80	91	108	123	139	149	162	183	216	247	284	310
Operating weight																					
BW05 without hydronic module		kg	316	335	338	367	387	683	713	755	781	864	937	956	977	1079	1144	1357	1471	1421	1491
Extra weight																					
Evaporator with single-pump hydronic kit		kg	25	25	25	27	27	14	14	14	14	15	15	15	75	75	75	75	60	63	
Condenser with single-pump hydronic kit		kg	35	35	35	37	37	20	20	20	20	80	80	80	80	80	80	95	95	97	101
Evaporator with twin-head pump hydronic kit		kg	-	-	-	-	-	104	104	104	104	130	130	130	130	130	130	188	188	-	-
Condenser with twin-head pump hydronic kit		kg	-	-	-	-	-	114	114	114	140	140	140	140	140	140	140	198	198	-	-
Casing, if hydronic option is used		kg	-	-	-	-	-	-	-	-	-	-	-	-	-	170	170	170	170	-	-
Refrigerant			R-407C																		
Circuit A		kg	3.2	3.3	3.3	4.2	6.2	7.5	9.6	11	12.4	14	16.4	18.5	19.3	15	17	19	19	24	24
Circuit B		kg	-	-	-	-	-	-	-	-	-	-	-	-	-	15	17	19	19	24	24
Compressors			Hermetic scroll, 48.3 r/s																		
Circuit A			1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Circuit B			-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2	2	2	2
Number of capacity steps			1	1	1	1	1	2	2	2	2	2	2	2	4	4	4	4	4	4	4
Minimum capacity		%	100	100	100	100	100	46	43	50	50	42	50	46	50	25	25	21	25	23	25
Control																					
Condensers			Welded plate heat exchangers																		
Water volume		l	2	2.91	2.91	3.8	4.8	6.1	7.8	9	9.7	12.2	13.7	15.8	17.9	26.5	26.5	34.9	34.9	46.6	46.6
Max. water-side operating pressure, without hydronic module		kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Max. water-side operating pressure, with hydronic module		kPa	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Condenser hydronic module			Single or twin-head composite centrifugal pump, as per option used, variable speed by frequency converter (48.3 r/s)																		
Condenser pump																					
Expansion tank volume, condenser loop		l	8	8	8	8	8	12	12	12	25	25	25	25	25	35	35	35	50	50	50
Evaporator			Welded direct-expansion plate heat exchanger																		
Water volume		l	2	2.91	2.91	3.8	4.8	6.1	7.8	9	9.7	12.2	13.7	15.8	17.9	26.5	26.5	34.9	34.9	46.6	46.6
Max. water-side operating pressure, without hydronic module		kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Max. water-side operating pressure, with hydronic module		kPa	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Evaporator hydronic module			Single or twin-head composite centrifugal pump, as per option used (48.3 r/s)																		
Evaporator pump																					
Expansion tank volume, evaporator loop		l	8	8	8	8	8	12	12	12	25	25	25	25	25	35	35	35	50	50	50
Water connections			Victaulic† (BW05 020-045 without hydronic module: threaded gas connections)																		
Standard field connection diameter, Victaulic		inch	2	2	2	2	2	2	2	2	2	3 OD	3 OD	3 OD	3 OD	3	3	3	3	3	3
Welded field connection diameter		mm	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	76.1	76.1	76.1	76.1	88.9	88.9	88.9	88.9	88.9	88.9

* Standard EUROVENT conditions: evaporator entering/leaving water temperature = 12°C/7°C, condenser entering/leaving water temperature = 30°C/35°C.

** Standard EUROVENT conditions: evaporator entering/leaving water temperature = 12°C/7°C, saturated bubble point condensing temperature = 45°C, subcooling = 5 K.

† With tubular sleeve, supplied with the unit, consisting of a Victaulic connection at one end and a plain section at the other end.

Electrical data

BW05 (without hydronic module)		020	025	030	040	045	060	070	080	090	110	120	135	150	160	185	210	245	275	300	
Power circuit																					
Nominal power supply	V-ph-Hz	400-3-50																			
Voltage range	V	360-440																			
Control circuit supply																					
The control circuit is supplied via the unit-mounted transformer																					
Maximum unit power input*	kW	8.1	10.3	12.0	15.8	18.0	22.3	27.8	31.6	36.1	42.4	48.8	54.0	59.1	63.2	72.2	84.9	97.6	107.9	118.2	
Nominal unit current draw**	A	9.9	12.6	14.6	17.9	21.1	27.2	32.5	35.8	42.1	48.1	54.0	61.0	68.0	71.7	84.2	96.1	108.0	122.0	136.0	
Maximum unit current draw†	A	13.7	17.6	20.5	25.9	30.2	38.0	46.3	51.8	60.5	69.2	78.0	99.9	96.0	120.1	120.9	138.5	156.0	174.0	192.0	
Maximum start-up current (standard unit without electronic starter)††																					
	A	86.0	130.0	130.0	135.0	155.0	147.6	155.5	160.9	185.2	245.2	254.0	309.0	318.0	212.6	245.7	314.5	332.0	396.0	414.0	
Maximum start-up current (electronic-starter option)‡																					
	A	51.6	78.0	78.0	81.0	93.0	95.6	101.5	106.9	123.2	159.2	168.0	201.0	210.0	158.6	183.7	228.5	246.0	288.0	306.0	
Three-phase short-circuit holding current																					
	kA	7.5	7.5	7.5	7.5	7.5	10	10	10	10	10	10	10	10	18	18	18	18	18	18	

- * Power input of the compressor(s) at maximum unit operating conditions: entering/leaving evaporator water temperature = 15°C/10°C, maximum condensing temperature of 65°C, and 400 V nominal voltage.
- ** Nominal unit current draw at standard conditions: evaporator entering/leaving water temperature 12°C/7°C, condenser entering/leaving water temperature 30°C/35°C. The current values are given at 400 V nominal voltage.
- *** Nominal unit current draw at standard conditions: evaporator entering/leaving water temperature 12°C/7°C, saturated condensing temperature (dew point) 45°C, subcooling 5 K. The current values are given at 400 V nominal voltage.
- † Maximum unit operating current at maximum unit power input and 400 V.
- †† Maximum instantaneous starting current at 400 V nominal voltage and with compressor in across-the-line start (maximum operating current of the smallest compressor(s) + locked rotor current of the largest compressor).
- ‡ Maximum instantaneous starting current at 400 V nominal voltage and with compressor with electronic starter (maximum operating current of the smallest compressor(s) + reduced start-up current of the largest compressor).

Evaporator hydronic module

BW05		020	025	030	040	045	060	070	080	090	110	120	135	150	160	185	210	245	275	300	
Single pump																					
Shaft power rating	kW	0.75	0.75	0.75	0.75	0.75	1.5	1.5	1.5	1.5	1.85	1.85	1.85	1.85	4	4	4	4	4	4	
Power input*	kW	1.0	1.0	1.0	1.0	1.0	2.1	2.1	2.1	2.1	2.5	2.5	2.5	2.5	5	5	5	5	5	5	
Maximum current draw**	A	1.9	1.9	1.9	1.9	1.9	3.9	3.9	3.9	3.9	4.6	4.6	4.6	4.6	8.3	8.3	8.3	8.3	8.3	8.3	
Dual pump																					
Shaft power rating	kW	-	-	-	-	-	2.2	2.2	2.2	2.2	4	4	4	4	4	4	5.5	5.5	5.5	5.5	
Power input	kW	-	-	-	-	-	2.8	2.8	2.8	2.8	5.3	5.3	5.3	5.3	5.3	5.3	6.8	6.8	6.8	6.8	
Maximum current draw	A	-	-	-	-	-	4.7	4.7	4.7	4.7	8.7	8.7	8.7	8.7	8.7	8.7	11.6	11.6	11.6	11.6	

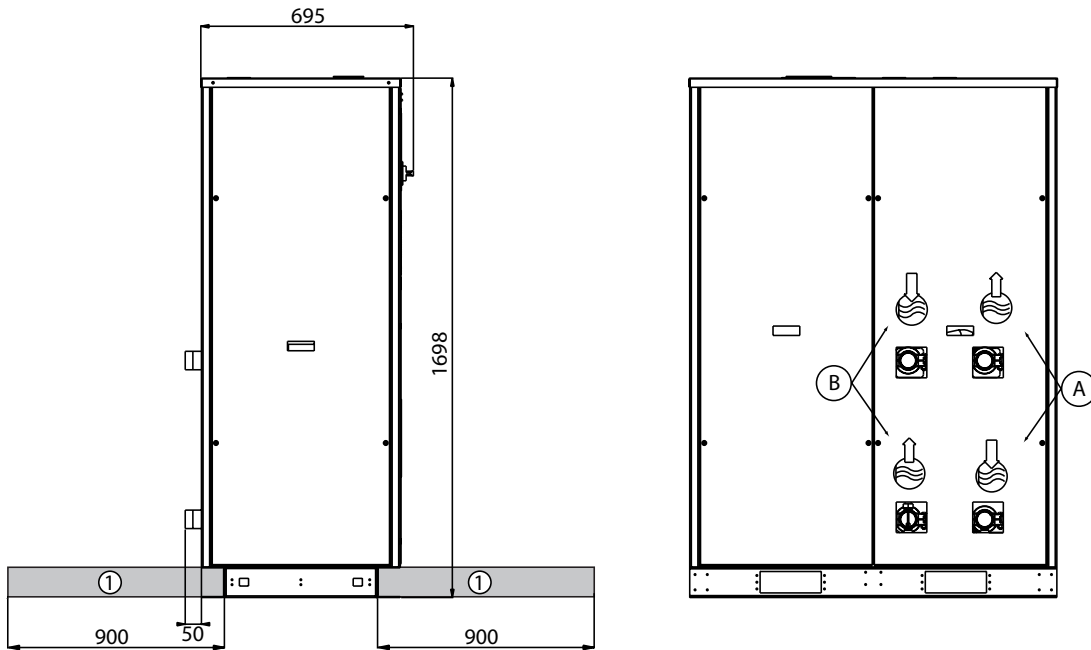
Condenser hydronic module

BW05		020	025	030	040	045	060	070	080	090	110	120	135	150	160	185	210	245	275	300	
Variable-speed single pump																					
Shaft power rating	kW	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	4	4	4	4	4	4	5.5	5.5	5.5	5.5	
Power input***	kW	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	5	5	5	5	5	5	6.7	6.7	6.7	6.7	
Maximum current draw†	A	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	8.3	8.3	8.3	8.3	8.3	8.3	11.5	11.5	11.5	11.5	
Pompe double à vitesse variable																					
Shaft power rating	kW	-	-	-	-	-	2.2	2.2	2.2	2.2	4	4	4	4	4	4	5.5	5.5	5.5	5.5	
Power input	kW	-	-	-	-	-	2.8	2.8	2.8	2.8	5.3	5.3	5.3	5.3	5.3	5.3	6.8	6.8	6.8	6.8	
Maximum current draw	A	-	-	-	-	-	4.7	4.7	4.7	4.7	8.7	8.7	8.7	8.7	8.7	8.7	11.6	11.6	11.6	11.6	

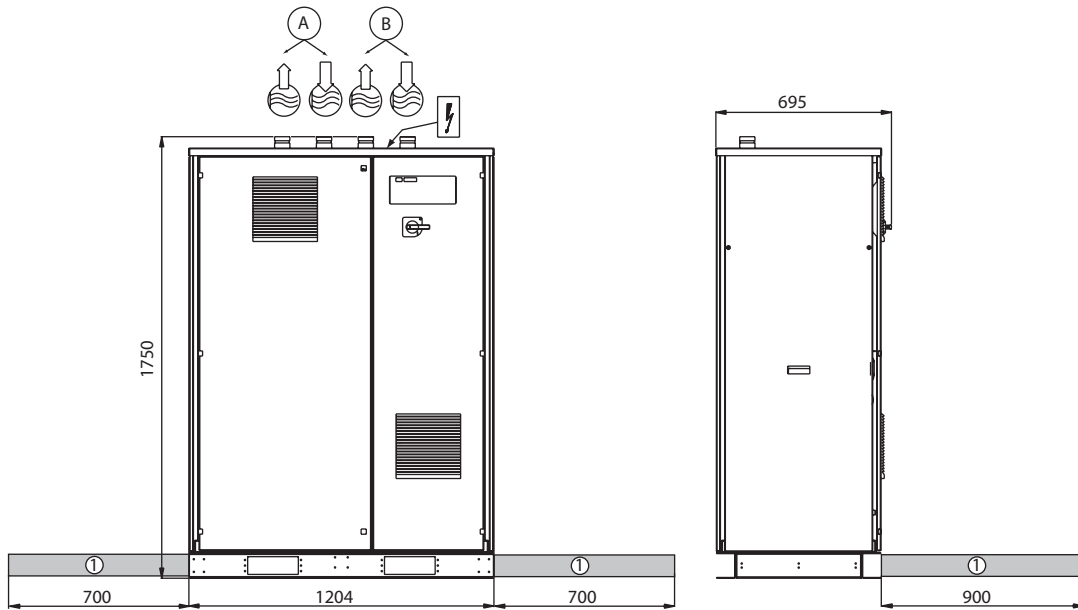
- Notes:**
- The water pump power input values given are for guidance only.
 - BW05 units have an evaporator and a condenser pump.
 - To obtain the maximum unit power input for a unit with hydronic kit add the evaporator (*) and condenser pump (***) power input to the maximum power input of the unit without hydronic module, given in the top table.
 - To obtain the maximum unit current draw for a unit with hydronic kit add the evaporator (**) and condenser pump current (†) draw to the maximum current draw of the unit without hydronic module, given in the top table.

Dimensions/clearances

BW05 020-045 - unit without hydronic module (standard)






BW05 020-045 - unit with hydronic module (option) and/or unit with option 116E (Victaulic water connection at the top)



	BW05 020-030	BW05 040-045
A	1-1/4" gas	2" gas
B	1-1/4" gas	2" gas

Legend

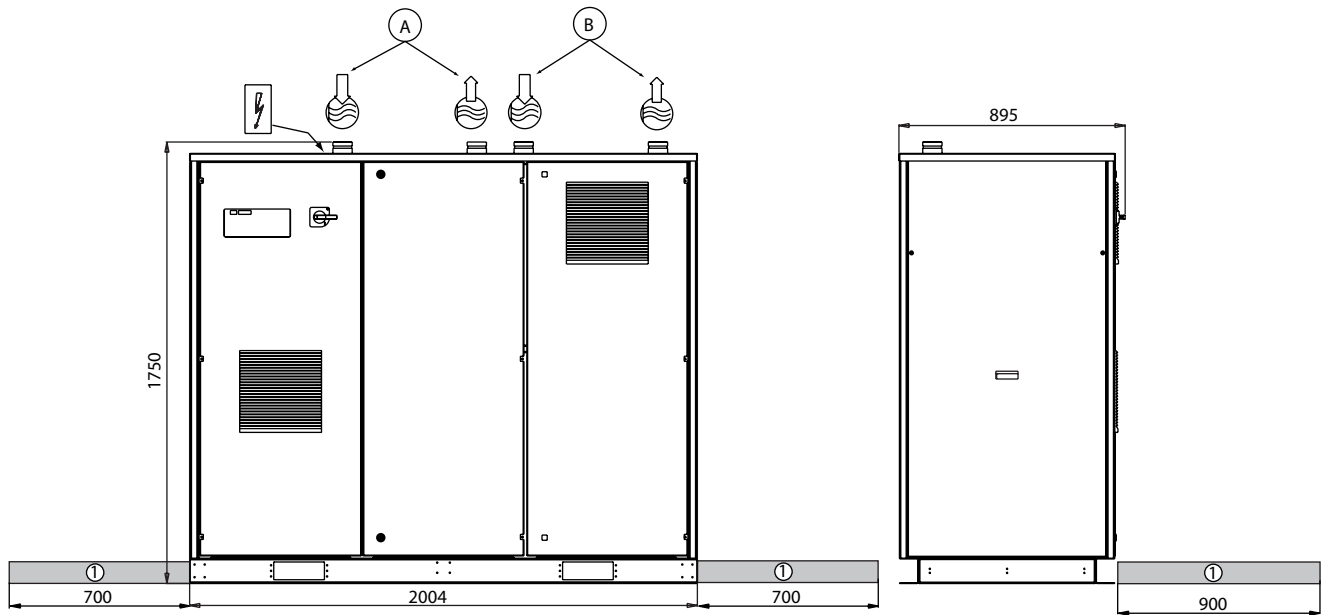
All dimensions are given in mm.

-  Water inlet
-  Water outlet
- A Condenser (water inlet/outlet for BW05 unit)
- B Evaporator
- ① Required clearances for maintenance
-  Power supply

NOTE: Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings, available on request.





Dimensions/clearances

BW05 060-150 - unit with or without hydronic module



Legend

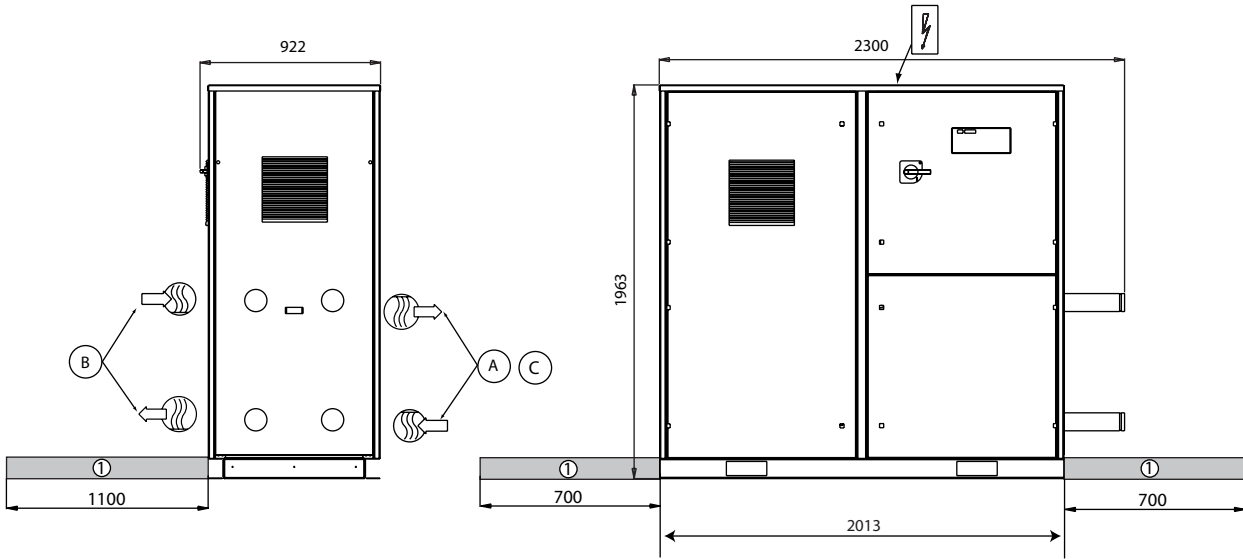
All dimensions are given in mm.

-  Water inlet
-  Water outlet
- A Condenser (water inlet/outlet for BW05 unit)
- B Evaporator
-  Required clearances for maintenance
-  Power supply

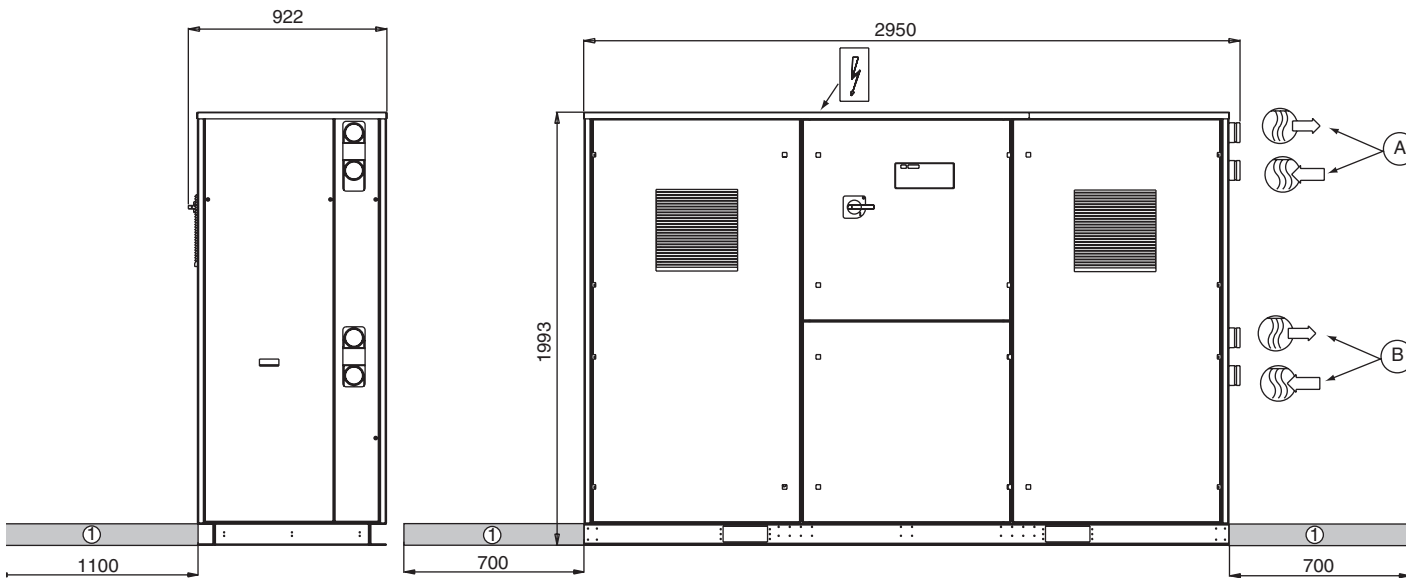
NOTE: Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings, available on request.

Dimensions/clearances

BW05 160-300 - unit without hydronic module (standard)



BW05 160-300 - unit with hydronic module (option)



Legend

All dimensions are given in mm.



Water inlet



Water outlet

A

Condenser (water inlet/outlet for BW05 unit)

B

Evaporator

①

Required clearances for maintenance



Power supply

NOTE: Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings, available on request.

Cooling capacities BW05 (cont.)

LMT	Condenser leaving water temperature °C																				
	30			35			40			45											
	CAP kW	COMP kW	COOL kPa	COND I/s	COND kPa	COND PRES kPa	CAP kW	COMP kW	COOL kPa	COND I/s	COND kPa	COND PRES kPa	CAP kW	COMP kW	COOL kPa	COND I/s	COND kPa	COND PRES kPa			
BW05	8	20.9	5.01	1	41	129	1.24	58	177	177	181	55	181	18.3	6.28	0.87	32	139	1.17	53	184
020	26.9	6.26	1.28	21	143	1.58	30	198	253	7.04	1.21	19	147	1.12	17	151	1.49	27	203		
025	30.9	7.25	1.48	27	132	1.82	39	183	29.1	8.17	1.39	24	138	1.77	37	186	1.72	36	190		
030	41.1	9.73	1.96	29	139	2.41	43	195	38.7	10.9	1.85	26	144	2.36	41	198	2.39	39	200		
040	46.8	11.4	2.24	23	140	2.77	36	199	44	12.8	2.1	21	145	2.69	34	202	2.62	32	204		
045	58	14	2.76	23	183	3.41	34	191	54	15.7	2.59	20	187	3.32	32	194	3.22	30	197		
060	73	17.1	3.47	23	173	4.26	34	173	68	19.3	3.26	20	179	4.15	33	178	4.04	31	182		
070	83	19.5	3.94	27	161	4.84	39	154	78	21.9	3.72	24	168	4.72	37	159	4.61	36	163		
080	94	22.8	4.48	30	146	5.52	45	128	88	25.6	4.2	27	156	5.37	43	135	5.22	41	141		
090	102	26.4	5.33	29	171	6.54	42	199	105	29.4	5.02	26	160	6.37	40	202	5.87	38	205		
110	117	31.1	6.07	31	152	7.49	45	188	120	34.6	5.72	27	164	7.3	43	192	7.11	41	196		
120	144	34.5	6.89	30	131	8.47	45	179	136	38.5	6.51	27	145	8.27	43	183	8.06	41	188		
135	154	37.9	7.37	28	119	9.1	42	175	146	42.4	6.98	25	134	8.91	40	179	8.72	39	183		
150	168	35.8	8.02	28	200	9.64	40	171	159	40.2	7.15	23	124	9.2	37	180	9.2	37	180		
160	189	42.9	9.04	32	187	11	45	147	178	48.1	8.53	28	195	10.7	43	153	10.4	41	159		
185	223	49.8	10.7	22	194	12.9	32	196	211	56	10.1	20	202	12.6	30	200	12.3	29	203		
210	255	58	12.2	29	169	14.8	41	172	241	64	11.5	26	180	14.5	39	177	14.1	37	182		
245	293	66	14	24	146	17	35	158	278	73	13.3	22	160	16.6	34	163	16.2	32	169		
275	321	72	15.3	29	118	18.6	42	135	305	81	14.6	26	135	18.2	40	140	17.8	39	146		
300	10	22.4	5.01	1.07	46	123	1.31	64	170	21.1	5.62	1.01	41	128	1.27	61	174	1.23	58	178	
020	28.8	6.26	1.37	24	139	1.67	34	193	27.1	7.04	1.29	21	143	1.62	32	196	1.58	30	198		
025	33.1	7.24	1.58	31	126	1.92	43	176	31.2	8.17	1.49	28	132	1.87	41	180	1.82	39	183		
030	43.9	9.76	2.1	33	133	2.55	48	189	41.4	11	1.98	29	138	2.49	46	192	2.43	44	195		
040	50	11.4	2.39	27	134	2.92	40	193	47.1	12.9	2.25	24	140	2.84	37	196	2.76	35	199		
045	62	14	2.96	26	177	3.6	38	183	58	15.7	2.78	23	182	3.5	36	187	3.4	34	191		
060	78	17.1	3.71	26	166	4.5	38	164	73	19.3	3.5	23	172	4.38	36	168	4.26	34	173		
080	88	19.6	4.22	30	152	5.12	44	141	83	22	3.98	27	160	4.99	42	147	4.86	40	153		
090	100	22.9	4.79	35	135	5.84	50	112	94	25.7	4.5	31	145	5.67	47	120	5.5	45	129		
110	119	26.5	5.71	33	159	6.92	47	191	113	29.6	5.38	29	169	6.73	45	195	6.55	42	199		
120	136	31.3	6.51	35	137	7.93	51	179	128	34.8	6.13	31	150	7.72	48	184	7.51	46	188		
135	154	34.8	7.37	35	113	8.96	50	169	146	38.8	6.97	31	128	8.74	48	174	8.51	46	178		
150	165	38.2	7.88	32	99	9.63	47	164	156	42.7	7.47	29	115	9.41	45	169	9.18	43	174		
160	180	35.9	8.58	32	191	10.2	44	159	170	40.3	8.13	29	199	9.96	42	164	10.45	41	169		
185	202	43	9.67	36	175	11.6	50	132	191	48.3	9.13	32	185	11.3	48	139	11	45	147		
210	239	50	11.4	25	182	13.7	35	187	226	56	10.8	23	192	13.3	34	191	12.6	32	195		
245	274	58	13.1	32	152	15.7	46	160	298	65	12.4	29	166	15.3	43	166	15.6	41	171		
275	314	66	15	28	125	18	39	144	343	73	14.2	25	142	17.6	38	150	17.1	36	156		
300	343	73	16.4	33	94	19.7	47	117	326	81	15.6	30	112	19.3	45	124	18.8	43	131		

Legend:
 LMT Leaving water temperature °C
 CAP kW Cooling capacity
 COMP kW Compressor power input
 COOL I/s Evaporator water flow rate
 COOL kPa Evaporator water pressure drop
 COND PRES kPa Available pressure at the unit evaporator outlet (unit with hydronic module)
 COND I/s Condenser water flow rate
 COND kPa Condenser water pressure drop
 COND PRES kPa Available pressure at the unit condenser outlet (unit with hydronic module)

Note: For the water pump power input (BW05 with hydronic module) please refer to the electrical data table.

Application data:
 Standard I/s
 Refrigerant: R-407C
 Condenser and evaporator entering/leaving water temperature difference: 5 K
 Evaporator fluid: Chilled water
 Fouling factor: 0.44 x 10⁻⁴ (m²K)/W

Operating limits

Operating limits BW05

BW05	At start-up		At shut-down
Evaporator	Minimum, °C	Maximum, °C	Maximum, °C
Entering water temperature	7.5	30	50
During operation			
	Minimum, °C	Maximum, °C	Maximum, °C
Leaving water temperature	5 (note 1)	15	50
BW05 - With hydronic module and variable-speed pump			
	At start-up and during operation		During operation
Condenser	Minimum	Maximum	
Entering water temperature	-15	47 (note 3)	
Leaving water temperature	-	52	
Dry-cooler			
Entering air temperature	-20	(note 4)	
BW05 - Without hydronic module			
	At start-up and during operation		During operation
Condenser	Minimum	Maximum	
Entering water temperature	20 (note 2)	47 (note 3)	
Leaving water temperature	25	52	
Dry-cooler			
Entering air temperature	(note 5)	(note 4)	

Notes:

- BW05 units can operate from 4°C to 0°C without modification. In all cases the units must be configured for low leaving-water temperature, and use of antifreeze is required.
- BW05 units without hydronic module operating below 20°C entering condenser water temperature require the use of a three-way valve controlled from the 0-10 V analogue output of the control system.
- For a flow rate corresponding to a condenser Δt of 5 K.
- The maximum entering air temperature is based on the drycooler selection.
- The minimum entering air temperature range is between 15 and 20°C (without the use of three-way valves)
Operation at -15°C ambient temperature is possible with the use of a three-way valve to maintain the required minimum condensing temperature (see note 2).

IMPORTANT: Maximum ambient temperatures. For storage and transport of BW05 units, the minimum and maximum temperatures must not go beyond -20°C and 50°C. It is recommended that these temperatures are used for transport by container.

Evaporator water flow rate

BW05	Minimum flow rate, l/s	Maximum flow rate*, l/s		Maximum flow rate**, l/s
		Single pump	Dual pump	
020	0.3	1.7	-	1.7
025	0.4	2.5	-	3.1
030	0.5	2.5	-	3.1
040	0.7	3.4	-	3.7
045	0.8	3.8	-	4.7
060	0.9	5.7	5.6	5.9
070	1.2	6.2	6.1	7.3
080	1.4	6.4	6.2	8.0
090	1.5	6.6	6.3	8.4
110	1.8	8.3	11.7	10.3
120	2.2	8.5	12.4	11.4
135	2.4	8.8	13.1	12.8
150	2.7	9.0	13.7	14.3
160	2.7	14.2	14.2	15.9
185	3.1	14.5	14.5	17.0
210	3.8	17.4	22.0	24.0
245	4.4	17.4	22.0	24.0
275	5.0	18.1	23.3	29.1
300	5.5	18.1	23.3	29.1

* Maximum flow rate for an available pressure of 50 kPa (unit with hydronic module)

** Maximum flow rate for a pressure drop of 100 kPa in the plate heat exchanger (unit without hydronic module)

Condenser water flow rate

BW05	Minimum flow rate* (l/s) at min. condenser capacity, $\Delta t = 10$ K	Nominal condenser flow rate at Eurovent conditions, l/s	Maximum flow rate** (l/s) at max. condenser capacity, $\Delta t = 5$ K
020	0.5	1.2	1.4
025	0.7	1.5	1.8
030	0.8	1.7	2
040	1.0	2.3	2.7
045	1.2	2.7	3.1
060	1.4	3.3	3.8
070	1.8	4.1	4.8
080	2.1	4.7	5.5
090	2.3	5.4	6.2
110	2.8	6.4	7.4
120	3.3	7.3	8.5
135	3.6	8.3	9.5
150	4.0	9.1	10.3
160	4.2	9.4	10.9
185	4.7	10.8	12.5
210	5.7	12.7	14.6
245	6.5	14.5	16.8
275	7.3	16.6	19
300	8.0	18.2	20.5

* The minimum flow rate given is for units without hydronic module that have a fixed condenser flow rate.

Units with a hydronic module have a variable flow rate and no minimum fixed flow rate. The minimum flow rate is optimised by unit control in parallel with the drycooler fan stages for all operating conditions, especially at low outdoor temperature and low load conditions.

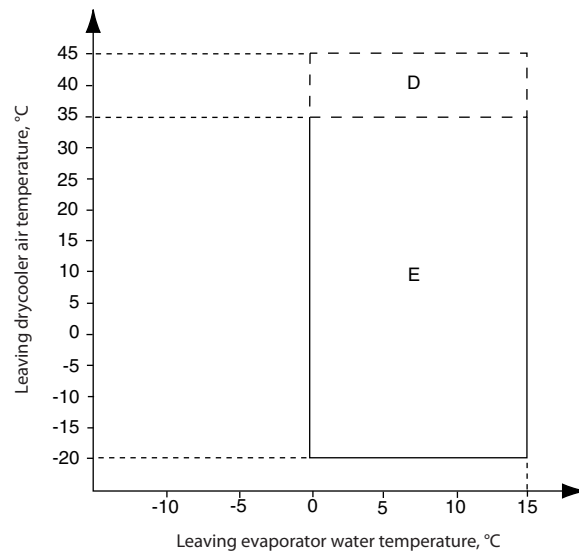
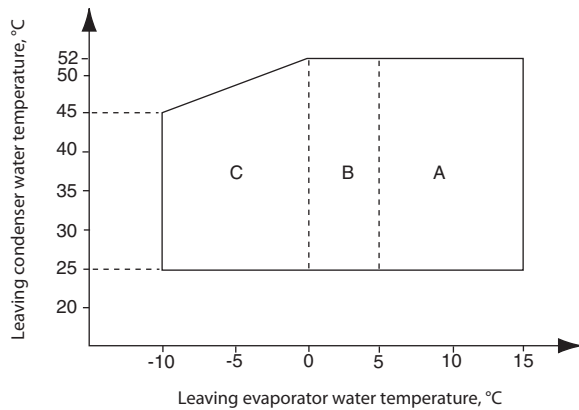
** The maximum flow rate given is for units without hydronic module that have a fixed condenser flow rate.

Units with a hydronic module have a variable flow rate.

The maximum flow rate is optimised by unit control at all operating conditions, based on pump capacity, system pressure losses and outdoor temperature.

Operating range

BW05



Notes BW05

1. Evaporator and condenser $\Delta T = 5\text{ K}$
2. For BW05 units without hydronic module with an entering condenser water temperature below 20°C a three-way valve is required to allow operation, while maintaining the correct condensing temperature.
3. For BW05 units equipped with a hydronic module the minimum entering water temperature is -15°C .
4. Maximum leaving condenser water temperature is 52°C (at full load)
- A Standard unit with without antifreeze solution
- B Standard unit operation with the anti-freeze solution required and control configuration for a leaving water temperature down to 0°C .
- C Standard unit operation with the anti-freeze solution required and control configuration for a leaving water temperature down to -10°C .
- D Operation at high air temperature is based on the drycooler selected.
- E Operation at low air temperature is possible down to -20°C with a drycooler.

Water loop volume

Evaporator

1. Minimum volume

A minimum water volume is required for correct chiller operation. The minimum water loop volume can be calculated in accordance with the following formula:

Volume = CAP(kW) x N* = litres, where CAP is the cooling capacity at nominal operating conditions.

Air conditioning application	N*
BW05 020-045	3.5
BW05 060-300	2.5

Industrial process cooling

Certain industrial process applications may require high stability of the leaving water temperature levels. In this case the values above must be increased.

2. Maximum volume

Units with hydronic module incorporate an expansion tank sized for the maximum water loop volume.

The table below gives the maximum water loop volume (in litres) for pure water or ethylene glycol with various concentrations.

BW05	020-045	060-080	090-150	160-210	245-300
Pure water	673	1000	2080	2900	4162
10% ethylene glycol	487	730	1525	2135	3053
20% ethylene glycol	358	540	1120	1570	2236
35% ethylene glycol	290	430	910	1260	1800

Condenser

1. Minimum volume

The condenser water loop volume has no impact on the chiller operation.

Note: For heat pump operation (unit control based on the hot-water temperature) the minimum condenser water loop volume must be calculated in accordance with the method used for the evaporator loop, replacing the cooling capacity with the heating capacity.

2. Maximum volume

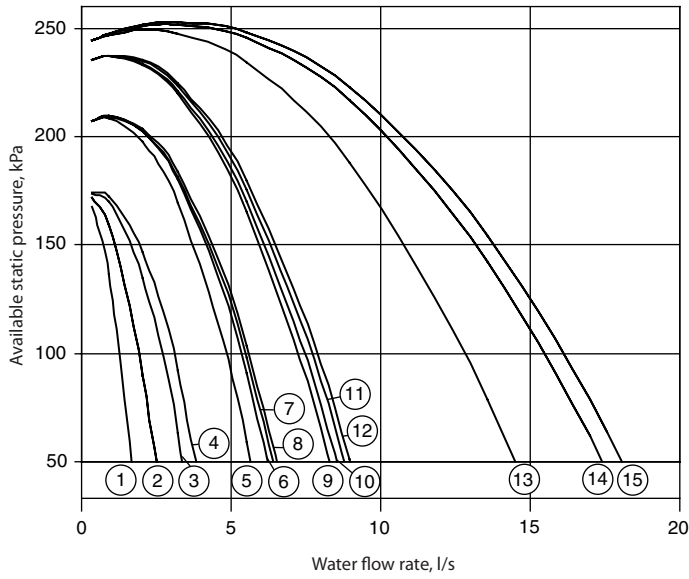
Units with hydronic module incorporate an expansion tank sized for the maximum water loop volume.

The table below gives the maximum water loop volume (in litres) for pure water or ethylene glycol with various concentrations.

BW05	020-045	060-080	090-150	160-210	245-300
Pure water	673	1000	2080	2900	4162
10% ethylene glycol	487	730	1525	2135	3053
20% ethylene glycol	358	540	1120	1570	2236
35% ethylene glycol	290	430	910	1260	1800

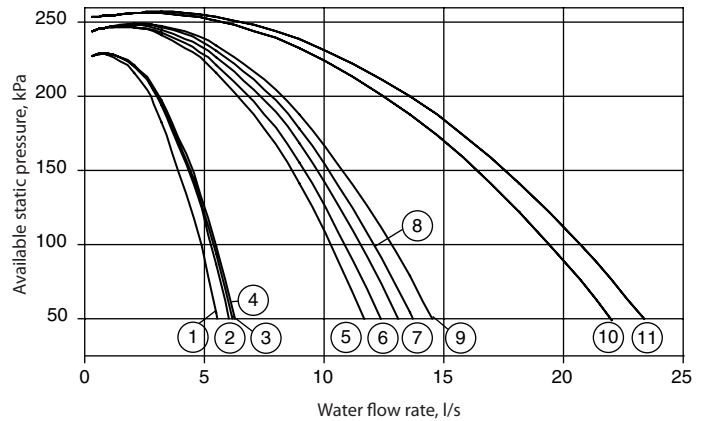
Available static pressure, evaporator side BW05

Single pump



- Legend**
- | | |
|----------------|-----------------|
| 1 BW05 020 | 9 BW05 110 |
| 2 BW05 025-030 | 10 BW05 120 |
| 3 BW05 040 | 11 BW05 135 |
| 4 BW05 045 | 12 BW05 150 |
| 5 BW05 060 | 13 BW05 160-185 |
| 6 BW05 070 | 14 BW05 210-245 |
| 7 BW05 080 | 15 BW05 275-300 |
| 8 BW05 090 | |

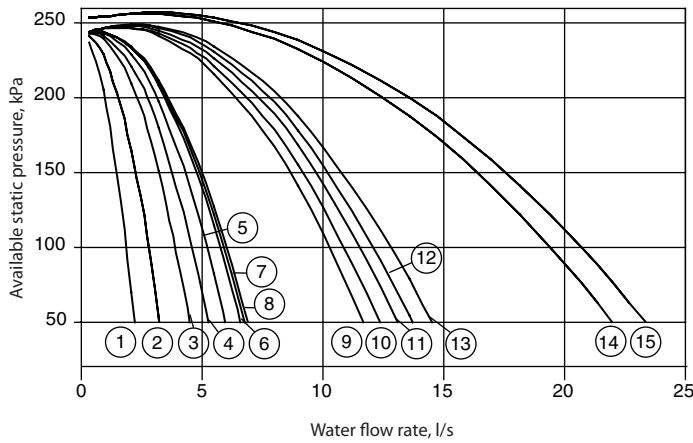
Dual pump



- Legend**
- | | |
|------------|-----------------|
| 1 BW05 060 | 7 BW05 135 |
| 2 BW05 070 | 8 BW05 150 |
| 3 BW05 080 | 9 BW05 160-185 |
| 4 BW05 090 | 10 BW05 210-245 |
| 5 BW05 110 | 11 BW05 275-300 |
| 6 BW05 20 | |

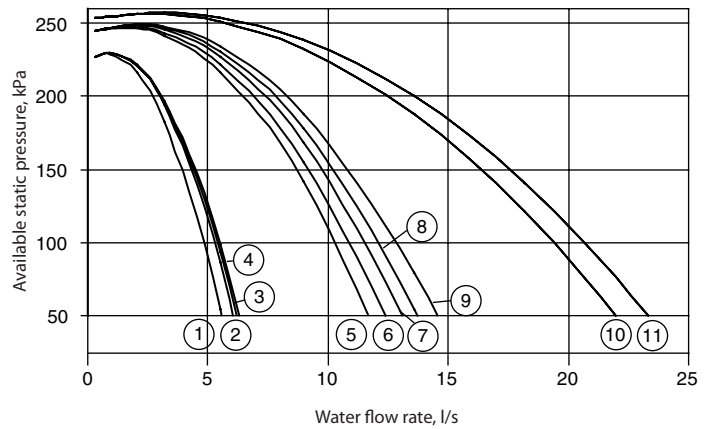
Available static pressure, condenser side BW05

Single pump



- Legend**
- | | |
|----------------|-----------------|
| 1 BW05 020 | 9 BW05 110 |
| 2 BW05 025-030 | 10 BW05 120 |
| 3 BW05 040 | 11 BW05 135 |
| 4 BW05 045 | 12 BW05 150 |
| 5 BW05 060 | 13 BW05 160-185 |
| 6 BW05 070 | 14 BW05 210-245 |
| 7 BW05 080 | 15 BW05 275-300 |
| 8 BW05 090 | |

Dual pump



- Legend**
- | | |
|------------|-----------------|
| 1 BW05 060 | 7 BW05 135 |
| 2 BW05 070 | 8 BW05 150 |
| 3 BW05 080 | 9 BW05 160-185 |
| 4 BW05 090 | 10 BW05 210-245 |
| 5 BW05 110 | 11 BW05 275-300 |
| 6 BW05 120 | |

Technical description

Guide specifications

Brine water heat pump
Nominal cooling capacity range: 20 to 310 kW
Model:
BW05

Part 1 - General

System description

- Brine water heat pump for indoor installation, equipped with scroll compressors, auto-adaptive microprocessor control and operating with HFC-407C refrigerant which has no effect on the ozone layer.

Quality assurance

- BW05 units comply with requirements of European directives:
 - machinery directive 98/37/CE, modified,
 - low voltage directive 73/23/EEC, modified,
 - electromagnetic compatibility directive 89/336/EEC, modified and with the applicable recommendations of European standards:
 - machine safety, electrical equipment in machines, general regulations: EN 60204-1,
 - radiated electromagnetic emissions: EN 50081-1,
 - conducted electromagnetic emissions: EN 50081-2,
 - electromagnetic immunity EN 50082-2. BW05 units have been designed and tested in a facility with a quality assurance system certified ISO 9001.
 - The BW05 unit have been assembled in a facility with an environment management system certified ISO 14001. All units undergo a run test before shipment.

Part 2 - Product equipment

Compressors

- Hermetic scroll compressor with only three moving parts, 2-pole electric motor, cooled by suction gas. Overload protection through an internal thermostat. Polyolester synthetic oil charge, and oil level sight glass.

Evaporator

- Stainless steel plate heat exchanger with welded copper connections. From size BW05 160 upwards the evaporator has two interlaced independent refrigerant circuits. Closed-cell thermal foam insulation.

Condenser (BW05 only)

- Stainless steel plate heat exchanger with welded copper connections. From size BW05 160 upwards the condenser has two interlaced independent refrigerant circuits.

Refrigerant circuit

- Each circuit includes: one or two compressors, liquid line valve, moisture sight glass, filter drier, thermostatic expansion device, high and low pressure transducers, manually reset high pressure switch, high and low-pressure safety valve (except sizes BW05 020-045) and HFC-407C refrigerant charge. The main components of the refrigerant circuit are welded.

Control and power circuit control box

- The control box is accessible via a hinged door. It includes a main disconnect switch, fuses and circuit breakers, compressor and evaporator water pump contactors, thermal relays, low-voltage control circuit transformer (24 V control circuit) and the control system. The whole unit is supplied via a single power connection point (three-phase supply without neutral).
- Extraction fans protecting the electrical components against overheating.

Chassis/cabinet

- Chassis and cabinet made of galvanised sheet steel. Painted in oven-baked polyester powder paint in light grey colour (RAL 7035). Removable side and rear panels. Front access via hinged doors.

Evaporator hydronic module

- Integrated hydronic module, including: removable screen filter, expansion tank, single monocoil centrifugal water pump (dual water pump optional from sizes BW05 060 up-wards) - three-phase motor with internal thermal protection, water flow switch, safety valve set to 4 bar, flow control valve, pressure gauge and purge valves. Internal piping made of galvanised steel. Thermal piping and water pump insulation to prevent condensation. Victaulic water connections at the top (BW05 020-150) or on the right-hand side (BW05 160-300) with welded connection sleeve.

Note: Units without hydronic module (option): water flow switch installed as standard and water piping protected against condensation. BW05 020-045 threaded gas water connections at the rear of the unit.

Condenser hydronic module

- Integrated hydronic module, including: removable screen filter, expansion tank, single monocoil centrifugal water pump (dual water pump optional from sizes BW05 060 upwards) - three-phase motor with integrated frequency converter, safety valve set to 4 bar, pressure gauge and purge valves. Internal piping made of galvanised steel with thermal insulation. Victaulic water connections at the top (BW05 020-150) or on the right-hand side (BW05 160-300) with welded connection sleeve.

Note: Units without hydronic module (standard). BW05 020-045 threaded gas water connections at the rear of the unit.

Control system

The control system ensures the following functions:

Control

- Entering or leaving chilled or hot water (heat pump option) temperature control by PID loop with compressor run time and start-up equalising. The system permanently adjusts the system inertia and ensures complete protection against excessive compressor cycling.
- Head pressure control by auto-adaptive algorithm:
 - Control of the frequency converter, integrated into the condenser water pump
 - Activating a maximum of 8 fan stages with operating time equalising or fan speed control (with glycol cooler or air-cooled condenser)
 - Fan rotation speed control (with air-cooled condenser)
- Evaporator and condenser water pump control (optional dual pump with automatic change-over in case of a fault from size BW05 060 upwards).
- Control at the second set point (example: unoccupied room).
- Leaving water temperature reset, based on the air temperature (with glycol cooler or air-cooled condenser) or the difference between entering/leaving water temperature.

Safety

- The system checks the evolution of the parameters (temperatures, pressures etc.), and responds to maintain the compressor within the operating range. If despite this one parameter exceeds its limit, an alert message is generated or the unit is shut down. The following faults cause the refrigerant circuit or the unit to be shut down:
 - Low suction pressure
 - High discharge pressure
 - Low suction temperature
 - Compressor, water pump overload
 - Reverse compressor rotation
 - Temperature sensor and pressure transducer fault
 - Board and loss of communication fault
 - Customer safety device tripping
 - Water heat exchanger anti-freeze protection
 - More than 50 alert or fault codes to facilitate fault detection.

Operator interface

Includes status or fault LEDs, two numerical displays, a refrigerant system synoptic diagram and a command keyboard.

- Immediate display of parameters: entering/leaving chilled water temperature, compressor suction/discharge pressures and temperatures, set point, run times and number of compressor start-ups.
- Diagnosis and complete parameter set by selection of one of the following ten menus: information, temperatures, pressures, set points, input values, test, configuration, alarms, alarm history and run times.

Remote chiller management

- Volt-free contact inputs permit:
 - Start/stop control
 - Selection of cooling or heat reclaim mode (override mode at high condensing temperature)
 - Integration of a customer safety device
 - Operation at the second set point* (example: room unoccupied)
 - Maximum demand limit* (three limit levels from size BW05 160 upwards)
- Outputs are available for:
 - Start-up of a boiler
 - Signalling of a general fault condition for each circuit.

Note: For units without hydronic module (option) a 0-10 V output is available to control a three-way valve or a variable-speed condenser water pump.

- The optional/accessory CCN Clock Board permits:
 - Control in primary/secondary configuration of two chillers operating in parallel
 - Programming of operating time schedules (up to 8 periods per week)
 - Programming of operating time schedules for the second set point (up to 8 periods per week)
 - Definition of an operating time period with a reduced number of fans (for example during the night)
 - Definition of an operating time period with demand limitation
 - Integration of the chiller into a building monitoring system (BMS): serial port RS 485.

Electrical data notes:

- BW05 020-300 units have a single power connection point.
- The control box includes the following standard features:
 - the starter and motor protection devices for each compressor and the pumps
 - the control devices
- Field connections:

All connections to the system and the electrical installations must be in full accordance with all applicable local codes.
- The BW05 units are designed and built to ensure conformance with these codes. The recommendations of European standard EN 60204-1 (machine safety - electrical machine components - part 1: general regulations - corresponds to IEC 60204-1) are specifically taken into account, when designing the electrical unit equipment.

NOTES:

- Generally the recommendations of IEC 60364 are accepted as compliance with the requirements of the installation directives. Conformance with EN 60204-1 is the best means of ensuring compliance with the Machines Directive § 1.5.1.
 - Annex B of EN 60204-1 describes the electrical characteristics used for the operation of the machines.
1. The operating environment for the BW05 brine water heat pump is specified below:
- Environment* - Environment as classified in IEC 60364 § 3:
 - ambient temperature range: +5°C to +40°C, class AA4
 - humidity range (non-condensing)*:
 - 50% relative humidity at 40°C
 - 90% relative humidity at 20°C

- altitude: ≥ 2000 m
 - indoor installation*
 - presence of water: class AD2* (possibility of water droplets)
 - presence of hard solids, class AE2* (no significant dust present)
 - presence of corrosive and polluting substances, class AF1 (negligible)
 - vibration and shock, class AG2, AH2
 - competence of personnel, class BA4* (trained personnel - IEC 60364)
2. Power supply frequency variation: ± 2 Hz.
 3. The neutral (N) conductor must not be connected directly to the unit (if necessary use a transformer).
 4. Over-current protection of the power supply conductors is not provided with the unit.
 5. The factory-installed disconnect switch(es)/circuit breaker(s) is (are) of a type suitable for power interruption in accordance with EN 60947.
 6. The units are designed for connection to TN networks (IEC 60364). For IT networks the earth connection must not be at the network earth. Provide a local earth, consult competent local organisations to complete the electrical installation.

NOTE: If particular aspects of an actual installation do not conform to the conditions described above, or if there are other conditions which should be considered, always contact your local representative.

- * The protection level of the control boxes required to conform to this class is IP21B (according to reference document IEC 60529). All BW05 units with correctly installed casing panels fulfil this protection condition.

VDBQD102