



Water-Cooled/Condenserless Liquid Chillers with Integrated Hydronic Module

AQUASNAP



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PRO-DIALOG



Quality and Environment
Management Systems
Approval

30RW/30RWA

Nominal cooling capacity 20-315 kW

- The 30RW/30RWA Aquasnap liquid chiller range features the latest technological innovations: scroll compressors, digital auto-adaptive Pro-Dialog control and ozone-friendly refrigerant HFC-407C. Aquasnap 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 the condenser water pump speed and the operation of the glycol cooler fans (30RW) or of the air-cooled condenser fans (30RWA) 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: Pro-Dialog 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 (30RW/RWA), or continuous speed variation (30RWA).
- Quick electrical connections: Aquasnap 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 (30RW) or the condenser (30RWA) fans to maintain the condensing pressure at its lowest possible value. The standard 30RW chiller can operate down to -20°C outside temperature.

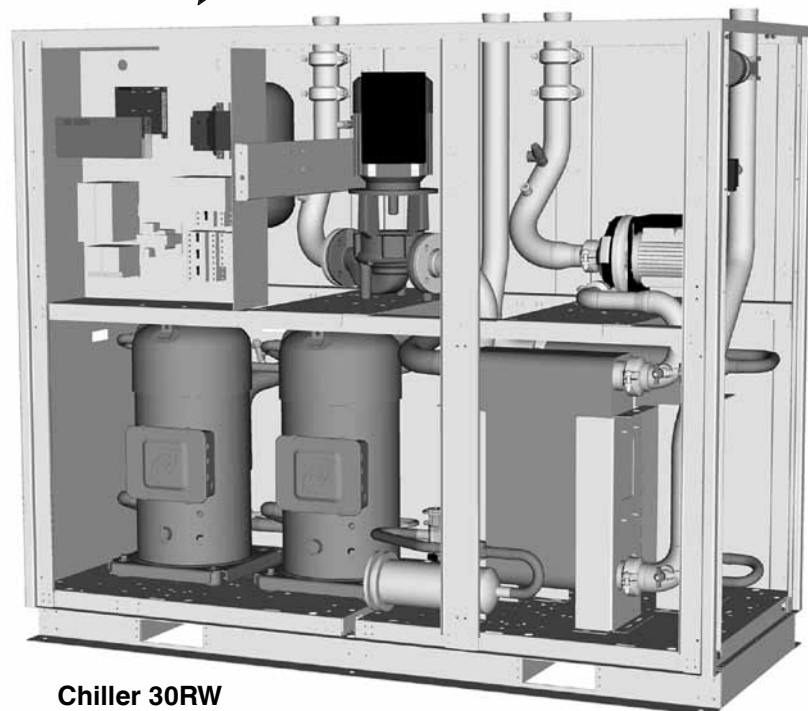
Options

Options	No.	Description	Advantages	Use
Very low temperature glycol solution	6	Production of low-temperature chilled water down to -10°C	Covers specific applications such as ice storage and industrial processes	30RW 110-300 30RWA 020-300
Electronic starter	25	Electronic compressor starter	Reduced compressor start-up current	30RW 110-300 30RWA 020-300
High-pressure single-pump evaporator hydronic module	116B	See chapter "Hydronic module"	Easy and fast installation	30RW 110-300 30RWA 020-300
High-pressure dual-pump evaporator hydronic module	116C	See chapter "Hydronic module"	Easy and fast installation, operating safety	30RW 110-300 30RWA 020-300
Field water connections at the unit top	116E	Field water connections at the unit top	Reduced foot print	30RWA 020-045
Heat pump	150A	Hot-water control	Allows use of the unit in hot-water production mode up to 52°C	30RW 110-300 30RWA 020-300
RS485 communications and "CCN Clock Board" time schedule board	155	Additional RS485 communications board	Allows time scheduling and communication with the Aquasmart ("the hydronic solution") system via the CCN protocol	30RW 110-300 30RWA 020-300
Condenser hydronic module with variable-speed single pump	270B	See chapter "Hydronic module"	Easy and fast installation, reduced water circulating pump power consumption	30RW 110-300
Condenser hydronic module with variable-speed dual pump	270C	See chapter "Hydronic module"	Easy and fast installation, operating safety, reduced water circulating pump power consumption	30RW 110-300

The drycoolers or air-cooled condensers of the Carrier 09 series are supplied ready for installation with a control box. A simple communication bus connects the liquid chiller to the heat rejection unit. As all control components are installed and tested in the factory, installation and start-up of the chiller and its associated glycol cooler are simplified.



Drycooler 09



Chiller 30RW



Physical data

	30RWA									30RW/RWA											
	020	025	030	040	045	060	070	080	090	110	120	135	150	160	185	210	245	275	300		
Air conditioning application as per EN14511-3:2011* - 30RW																					
Nominal cooling capacity	kW									110	125	142	152	165	186	219	251	288	315		
EER	kW/kW									4.06	3.92	4.01	3.93	4.51	4.24	4.38	4.25	4.36	4.32		
Eurovent class cooling	-									D	D	D	D	C	D	C	C	C	C		
ESEER	kW/kW									4.79	4.56	4.74	4.66	5.36	5.06	5.17	5.01	5.27	5.15		
Air conditioning application** - 30RW																					
Nominal cooling capacity	kW									110	125	142	152	165	187	220	252	289	316		
EER	kW/kW									4.23	4.07	4.16	4.06	4.67	4.42	4.48	4.42	4.45	4.45		
ESEER	kW/kW									5.41	4.89	5.32	5.20	6.00	5.44	5.63	5.67	5.72	5.63		
Air conditioning application as per EN14511-3:2011* - 30RWA																					
Nominal cooling capacity	kW									20	26	30	40	47	58	72	81	93			
EER	kW/kW									3.87	4.03	4.03	4.10	4.12	4.17	4.16	4.11	4.10			
Air conditioning application** - 30RWA																					
Nominal cooling capacity	kW									21	26	30	41	47	58	72	82	93			
EER	kW/kW									4.03	4.13	4.15	4.21	4.21	4.23	4.24	4.25	4.17			
Operating weight***																					
30RW unit without pump	kg									-	-	-	-	-	-	-	-	-	-	-	
30RWA unit without pump	kg									308	322	322	342	356	624	645	679	700			
Extra weight																					
30RW: single evaporator pump (option 116B)	kg									-	-	-	-	-	-	-	-	-	-	-	
30RWA: single evaporator pump (option 116B)	kg									25	25	25	27	27	14	14	14	14			
30RW/RWA: dual evaporator pump (option 116C)	kg									35	35	35	37	37	20	20	20	20			
30RW: single condenser pump (option 270B)	kg									-	-	-	-	-	-	-	-	-	-		
30RW: dual condenser pump (option 270C)	kg									-	-	-	-	-	-	-	-	-	-		
Sound power level - 30RW****																					
Sound power level at 10 m - 30RW†	dB(A)									-	-	-	-	-	-	-	-	-	-	-	
Sound power level - 30RWA****	dB(A)									63	69	69	73	73	75	75	75	78			
Sound power level at 10 m - 30RWA†	dB(A)									38	40	40	40	42	44	44	44	47			
Dimensions (length x depth x height)																					
Standard unit with or without hydronic module	mm									1204 x 695 x 1698			2004 x 895 x 1750			2300 x 922 x 1963					
Unit with hydronic module (options 116B, 116C, 270B, 270C)	mm									1204 x 695 x 1750										2950 x 922 x 1993	
Refrigerant																					
										R-407C											
Circuit A	kg									3.2	3.3	3.3	4.2	6.2	7.5	9.6	11	12.4			
Circuit B	kg									-	-	-	-	-	-	-	-	-	-		
Compressors																					
										Hermetic scroll, 48.3 r/s											
Circuit A	r/s									1	1	1	1	1	2	2	2	2			
Circuit B	r/s									-	-	-	-	-	-	-	-	-	-		
Capacity steps	r/s									1	1	1	1	1	2	2	2	2			
Minimum capacity	%									100	100	100	100	100	46	43	50	50			
Control																					
										Pro-Dialog Plus											
Condensers (30RW only)																					
Water volume	l									-	-	-	-	-	-	-	-	-	-	-	
Max. water-side operating pressure with/without hydronic module	kPa									400/1000											
Condenser hydronic module (30RW only)																					
Pump																					
Quantity										Frequency-variator controlled variable-speed composite single or dual centrifugal pump depending on option used, (48.3 r/s at 50 Hz)											
Capacity	kW									-	-	-	-	-	-	-	-	-	-	-	
Expansion tank volume	l									-	-	-	-	-	-	-	-	-	-		
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			
Max. water-side operating pressure with/without hydronic module	kPa									400/1000											
Evaporator hydronic module, 30RW/RWA																					
Pump (centrifugal composite)										Single or dual pump depending on option used, 48.3 r/s											
Expansion tank volume	l									8	8	8	8	8	12	12	12	25			
Water connection diameter ††																					
										Victaulic											
Standard field connection	in									2	2	2	2	2	2	2	2	2			
Welded field connection	mm									60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3			
Refrigerant pipe field outside connection diameter, 30RWA																					
Discharge pipe																					
Circuit A	in									7/8	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8			
Circuit B	in									-	-	-	-	-	-	-	-	-	-		
Liquid refrigerant return pipe																					
Circuit A	in									7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8			
Circuit B	in									-	-	-	-	-	-	-	-	-	-		

* Eurovent-certified performances in accordance with standard EN14511-3:2011.

Cooling mode conditions 30RW: evaporator water entering/leaving temperature 12°C/7°C, condenser water entering/leaving temperature 30°C/35°C, evaporator fouling factor 0 m² K/W.

Cooling mode conditions 30RWA: evaporator water entering/leaving temperature 12°C/7°C, saturated bubble point condensing temperature 45°C, subcooling 5 K, evaporator fouling factor 0 m² K/W.

** Gross performances, not in accordance with EN14511-3:2011. These performances do not take into account the correction for the proportional heating capacity and power input generated by the water pump to overcome the internal pressure drop in the heat exchanger.

Cooling mode conditions 30RW: evaporator water entering/leaving temperature 12°C/7°C, condenser water entering/leaving temperature 30°C/35°C, evaporator fouling factor 0 m² K/W.

Cooling mode conditions 30RWA: evaporator water entering/leaving temperature 12°C/7°C, saturated bubble point condensing temperature 45°C, subcooling 5 K, evaporator fouling factor 0 m² K/W.

*** Weight shown is a guideline only.

**** In accordance with ISO 9614-1 and certified by Eurovent.

† For information, calculated from the sound power level Lw(A).

†† 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

Units without hydronic module	30RWA										30RW/RWA										
	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										400-3-50									
Voltage range	V	360-440										360-440									
Control circuit supply	The control circuit is supplied via the unit-mounted transformer																				
Max. power input* - 30RW/RWA	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 current drawn																					
30RW**	A	-	-	-	-	-	-	-	-	-	48.1	54.0	61.0	68.0	71.7	84.2	96.1	108.0	122.0	136.0	
30RWA***	A	10.4	13.3	15.5	19.1	22.4	28.8	34.5	38.1	44.8	51.4	58.0	64.7	71.4	76.3	89.6	102.8	116.0	129.4	142.8	
Max. current drawn - 30RW/RWA****	A	13.7	17.6	20.5	25.9	30.2	38.0	46.3	51.8	60.5	69.2	78.0	87	96.0	104	120.9	138.5	156.0	174.0	192.0	
Max. start-up current, standard units without soft starter - 30RW/ RWA†	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	
Max. start-up current, units with optional soft starter - 30RW/ RWA††	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 - 30RW/RWA	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).

Electrical data, units with hydronic modules

The pumps that are factory-installed in these units have motors with efficiency class IE2. The additional electrical data required by regulation 640/2009 is given in the installation, operation and maintenance manual.

This regulation concerns the application of directive 2005/32/EC on the eco-design requirements for electric motors.

Electrical data notes and operating conditions:

- 30RW and 30RWA 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 Carrier 30RW and 30RWA 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 30RW and 30RWA chillers 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 (for hydronic kit see chapter 4.4 of the installation manual)

- 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 simplified connection on TN(s) networks (IEC 60364). For IT networks provide a local earth and consult competent local organisations to complete the electrical installation.
 7. Derived currents: If protection by monitoring of derived currents is necessary to ensure the safety of the installation, the control of the cut-out value must take the presence of leak currents into consideration that result from the use of optional frequency converters in the unit. A value of at least 150 mA is recommended to control differential protection devices.

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 Carrier representative.

* The protection level of the control boxes required to conform to this class is IP21B (according to reference document IEC 60529). All 30RW and 30RWA units with correctly installed casing panels fulfil this protection condition.

Part load performances

With the rapid increase in energy costs and the care about environmental impacts of electricity production, the power consumption of air conditioning equipment has become an important topic. The energy efficiency of a liquid chiller at full load is rarely representative of the actual performance of the units, as on average a chiller works less than 5% of the time at full load.

The heat load of a building depends on many factors, such as the outside air temperature, the exposure to the sun and the building occupancy.

Consequently it is preferable to use the average energy efficiency, calculated at several operating points that are representative for the unit utilisation.

ESEER (in accordance with EUROVENT)

The ESEER (European seasonal energy efficiency ratio) permits evaluation of the average energy efficiency at part load, based on four operating conditions defined by Eurovent. The ESEER is the average value of energy efficiency ratios (EER) at different operating conditions, weighted by the operating time.

ESEER (European seasonal energy efficiency ratio)

Load %	Air temperature °C	Energy efficiency	Operating time %
100	35	EER1	3
75	30	EER2	33
50	25	EER3	41
25	20	EER4	23

ESEER = EER1 x 3% + EER2 x 33% + EER3 x 41% + EER4 x 23%

Part load performances

30RW		110	120	135	150	160	185	210	245	275	300
ESEER	kW/kW	4.79	4.56	4.74	4.66	5.36	5.06	5.17	5.01	5.27	5.15

ESEER Calculations according to standard performances (in accordance with EN14511-3:2011) and certified by Eurovent.

Sound spectrum

Standard 30RW units

	Octave bands, Hz							Sound power levels
		125	250	500	1k	2k	4k	
110	dB	80	72	77	75	72	68	dB(A) 80
120	dB	82	72	78	77	72	69	dB(A) 81
135	dB	82	74	80	77	71	69	dB(A) 81
150	dB	69	70	79	74	71	68	dB(A) 79
160	dB	72	69	75	70	67	61	dB(A) 76
185	dB	81	74	79	74	71	65	dB(A) 80
210	dB	78	73	81	76	73	69	dB(A) 81
245	dB	76	71	82	77	75	72	dB(A) 83
275	dB	76	76	82	76	74	71	dB(A) 82
300	dB	75	79	82	75	73	70	dB(A) 82

Standard 30RWA units

	Octave bands, Hz							Sound power levels
		125	250	500	1k	2k	4k	
020	dB	58	56	56	58	56	55	dB(A) 63
025	dB	65	64	66	63	63	58	dB(A) 69
030	dB	65	64	66	63	63	58	dB(A) 69
040	dB	64	63	67	64	62	61	dB(A) 73
045	dB	71	69	69	69	65	65	dB(A) 73
060	dB	70	74	72	69	69	61	dB(A) 75
070	dB	69	73	72	69	68	63	dB(A) 75
080	dB	69	72	73	70	68	64	dB(A) 75
090	dB	69	72	75	74	72	67	dB(A) 78
110	dB	80	72	77	75	72	68	dB(A) 80
120	dB	82	72	78	77	72	69	dB(A) 81
135	dB	82	74	80	77	71	69	dB(A) 81
150	dB	69	70	79	74	71	68	dB(A) 79
160	dB	72	69	75	70	67	61	dB(A) 76
185	dB	81	74	79	74	71	65	dB(A) 80
210	dB	78	73	81	76	73	69	dB(A) 81
245	dB	76	71	82	77	75	72	dB(A) 83
275	dB	76	76	82	76	74	71	dB(A) 82
300	dB	75	79	82	75	73	70	dB(A) 82

Operating limits

Operating limits 30RW/RWA

30RW/30RWA	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

30RW - 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	

Drycooler

Entering air temperature	-20	(note 4)
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30RW - 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	

Drycooler

Entering air temperature	(note 5)	(note 4)
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30RWA - with variable-speed fan

	At start-up and during operation	
Air-cooled condenser	Minimum	Maximum
Entering air temperature	-10	(note 6)

30RWA - with fixed-speed fan

	At start-up and during operation	
Air-cooled condenser	Minimum	Maximum
Entering air temperature	0	(note 6)

Notes:

- 30RW/30RWA 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.
- 30RW 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 PRO-DIALOG control.
- 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).
- The maximum entering air temperature is based on the remote condenser selection.

IMPORTANT: Maximum ambient temperatures. For storage and transport of 30RW 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

	Minimum flow rate, l/s	Maximum flow rate*, l/s		Maximum flow rate**, l/s
		Single pump	Dual pump	
30RWA				
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
090	1.5	6.6	6.3	8.4
30RW/RWA				
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	13.7	14.3
160	2.7	14.2	14.2	15.9
185	3.1	14.5	14.5	17
210	3.8	17.4	22	24
245	4.4	17.4	22	24
275	5	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

	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
30RWA			
020	0.5	1.2	1.4
025	0.7	1.5	1.8
030	0.8	1.7	2
040	1	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
30RW/RWA			
110	2.8	6.4	7.4
120	3.3	7.3	8.5
135	3.6	8.3	9.5
150	4	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	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.

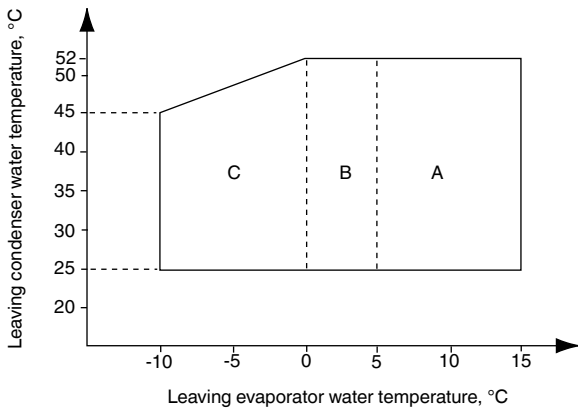
** The maximum flow rate given is for units without hydronic module that have a fixed condenser flow rate.

Units with a hydronic module have a variable flow rate.

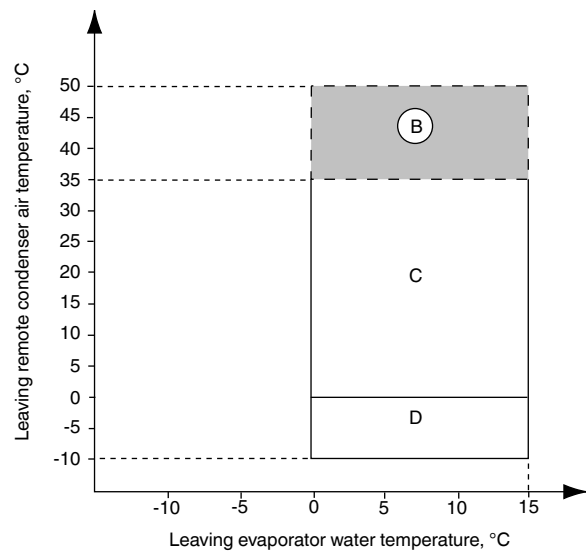
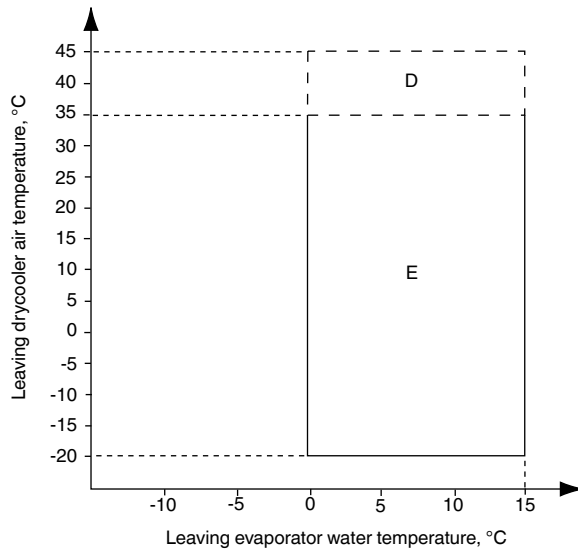
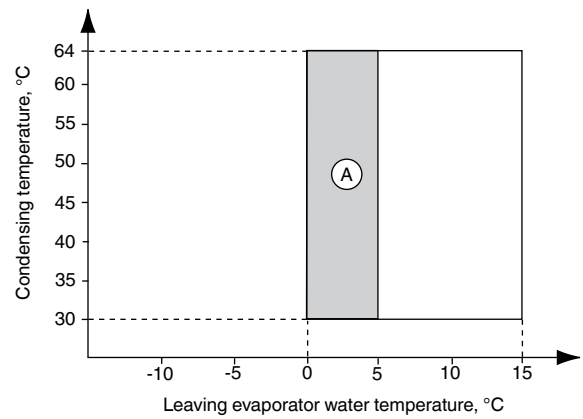
The maximum flow rate is optimised by unit control at all operating conditions, based on pump capacity, system pressure losses and outdoor temperature.

Operating range

30RW



30RWA



Notes 30RW

1. Evaporator and condenser $\Delta T = 5\text{ K}$
 2. For 30RW 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 30RW 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.

Notes 30RWA

1. Evaporator $\Delta T = 5\text{ K}$
 2. Unit operation is limited by the maximum compressor condensing temperature of 64°C .
- A Standard unit operation with the anti-freeze solution required and special control configuration.
 B Operation at high air temperature is based on the condenser selected.
 C Operating range down to 0°C , if the air-cooled condenser is not equipped with a variable-speed head fan.
 D Extended operating range with variable-speed fan.

Water loop volume

Evaporator

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*
30RWA 020-045	3.5
30RWA 060-300	2.5
30RW 110-300	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.

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.

30RW/30RWA	30RWA			30RW/RWA		
	020-045	060-080	090	110-150	160-210	245-300
Pure water	673	1000	1000	2080	2900	4162
10% ethylene glycol	487	730	1525	1525	2135	3053
20% ethylene glycol	358	540	1120	1120	1570	2236
35% ethylene glycol	290	430	910	910	1260	1800

Condenser

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.

Maximum volume

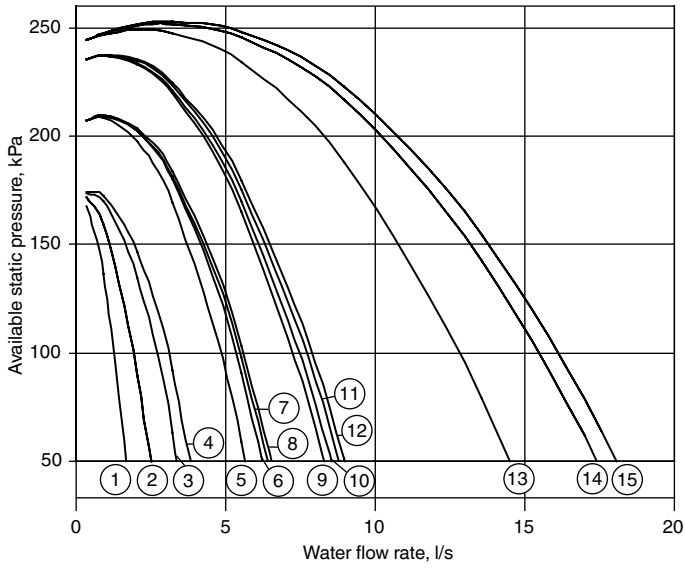
Units with hydronic module incorporate an expansion tank sized for the maximum water loop volume.

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

30RW	110-150	160-210	245-300
Pure water	2080	2900	4162
10% ethylene glycol	1525	2135	3053
20% ethylene glycol	1120	1570	2236
35% ethylene glycol	910	1260	1800

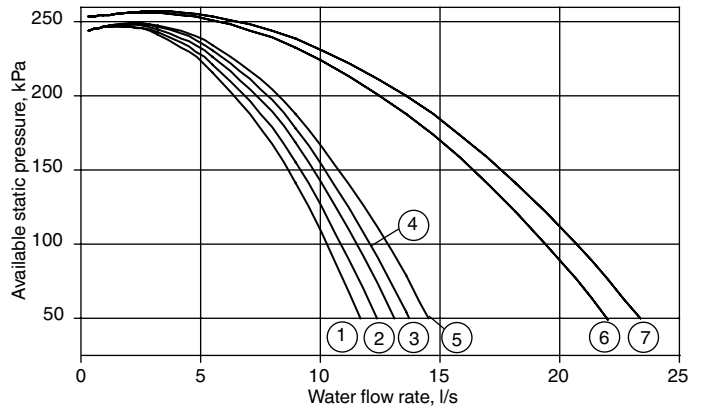
Available static pressure, evaporator side 30RW/30RWA

Single pump



- Legend**
- | | |
|---------------|---------------------|
| 1 RWA 020 | 9 30RW/RWA 110 |
| 2 RWA 025-030 | 10 30RW/RWA 120 |
| 3 RWA 040 | 11 30RW/RWA 135 |
| 4 RWA 045 | 12 30RW/RWA 150 |
| 5 RWA 060 | 13 30RW/RWA 160-185 |
| 6 RWA 070 | 14 30RW/RWA 210-245 |
| 7 RWA 080 | 15 30RW/RWA 275-300 |
| 8 RWA 090 | |

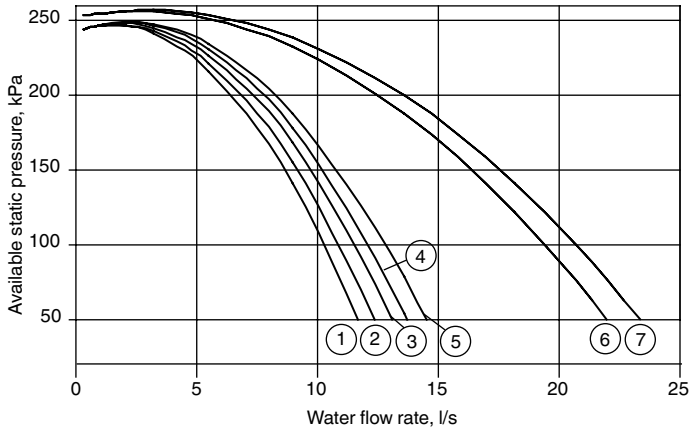
Dual pump



- Legend**
- | | |
|----------------|---------------------|
| 1 RWA 060 | 7 30RW/RWA 135 |
| 2 RWA 070 | 8 30RW/RWA 150 |
| 3 RWA 080 | 9 30RW/RWA 160-185 |
| 4 RWA 090 | 10 30RW/RWA 210-245 |
| 5 30RW/RWA 110 | 11 30RW/RWA 275-300 |
| 6 30RW/RWA 120 | |

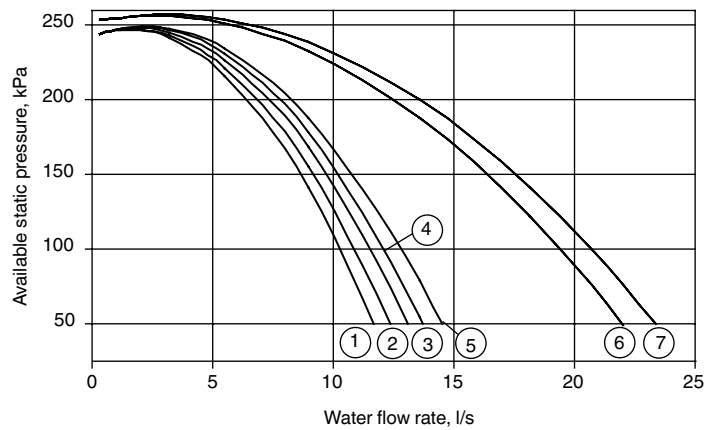
Available static pressure, condenser side 30RW

Single pump



- Legend**
- | |
|----------------|
| 1 30RW 110 |
| 2 30RW 120 |
| 3 30RW 135 |
| 4 30RW 150 |
| 5 30RW 160-185 |
| 6 30RW 210-245 |
| 7 30RW 275-300 |

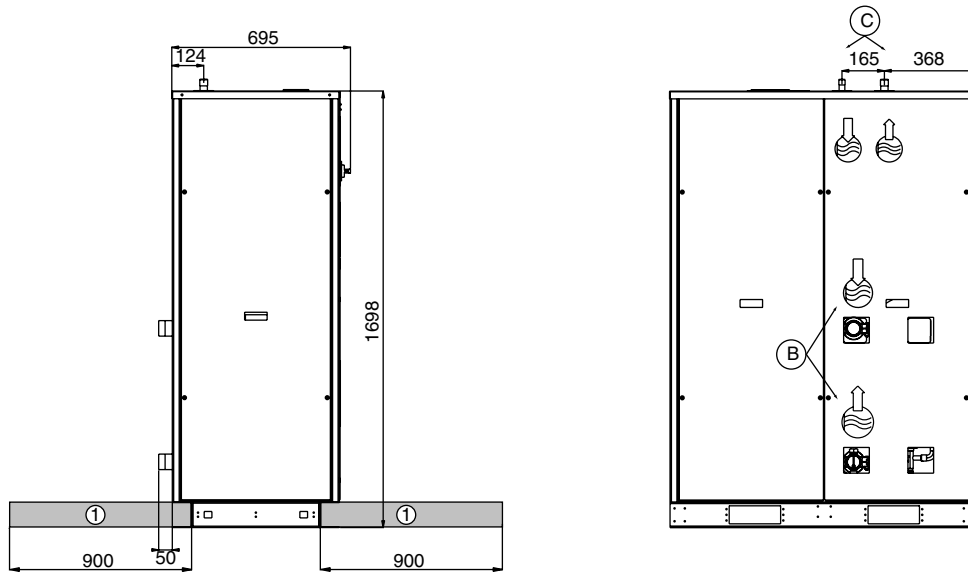
Dual pump



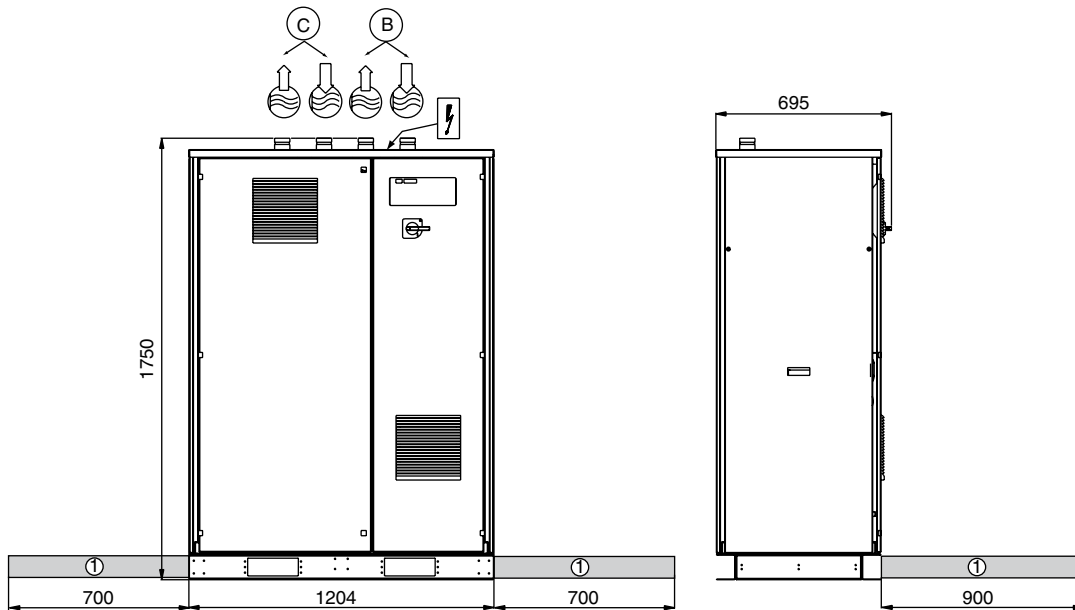
- Legend**
- | |
|----------------|
| 1 30RW 110 |
| 2 30RW 120 |
| 3 30RW 135 |
| 4 30RW 150 |
| 5 30RW 160-185 |
| 6 30RW 210-245 |
| 7 30RW 275-300 |

Dimensions/clearances

30RWA 020-045 - unit without hydronic module (standard)









30RWA 020-045 - unit with hydronic module (option) and/or unit with option 116E (Victaulic water connection at the top)



Legend

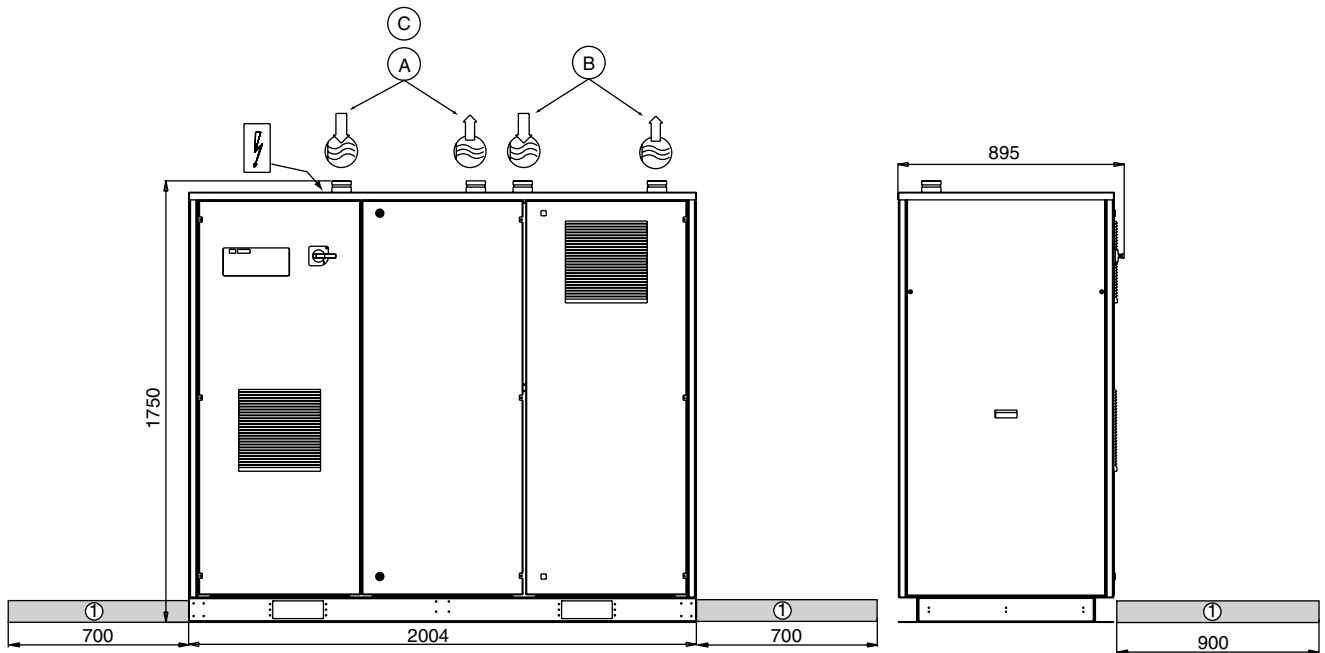
All dimensions are given in mm.

-  Water inlet
-  Water outlet
-  B Evaporator
-  C Refrigerant inlet/outlet (30RWA units only)
-  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

30RW 110-150/30RWA 060-150 - unit with or without hydronic module



Legend

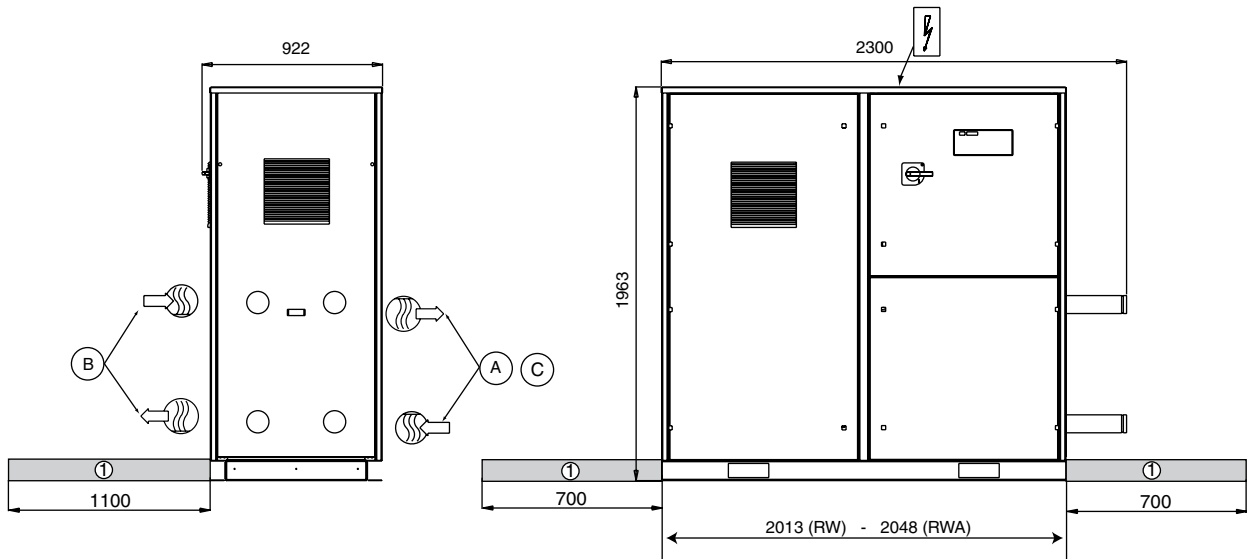
All dimensions are given in mm.

-  Water inlet
-  Water outlet
- A Condenser (water inlet/outlet for 30RW unit)
- B Evaporator
- C Refrigerant inlet/outlet (30RWA units only)
-  Required clearances for maintenance
-  Power supply

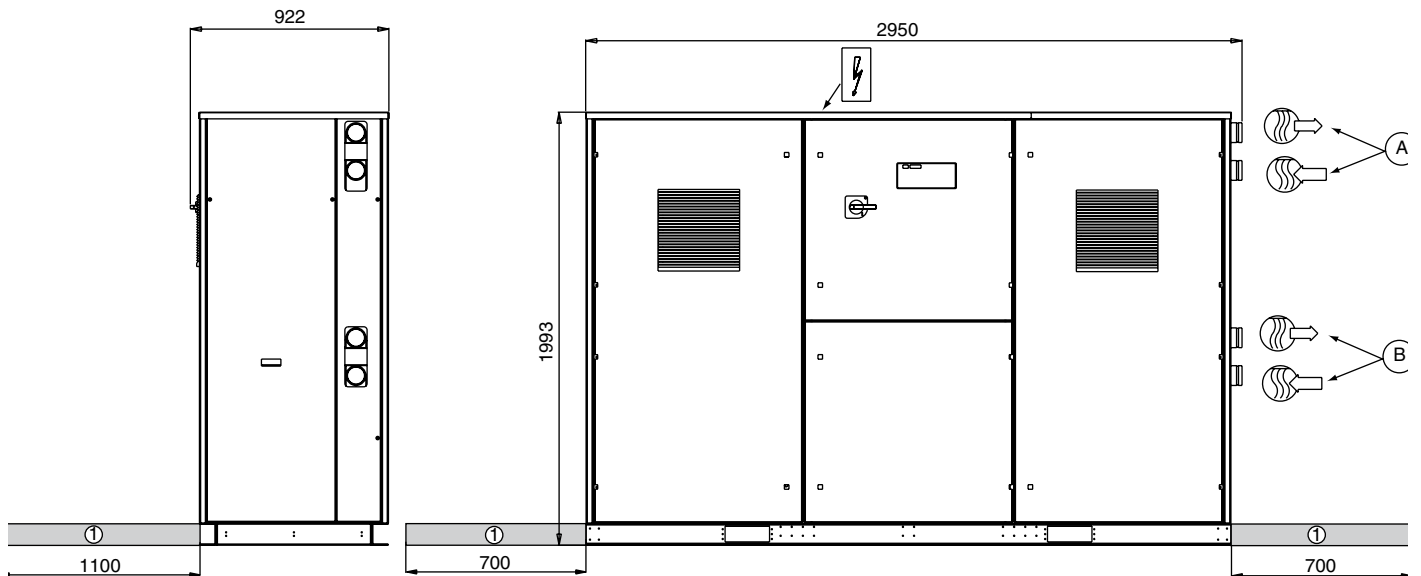
NOTE: Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings, available on request.

Dimensions/clearances

30RW/30RWA 160-300 - unit without hydronic module (standard)







30RW/30RWA 160-300 - unit with hydronic module (option)



Legend

All dimensions are given in mm.

-  Water inlet
-  Water outlet
- A Condenser (water inlet/outlet for 30RW unit)
- B Evaporator
- C Refrigerant inlet/outlet (30RWA units only)
-  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 in accordance with EN14511-3 : 2011



30RW units

	LWT °C	Condenser entering air temperature, °C																			
		30				35				40				45				50			
		Qc kW	EER kW/ kW	q l/s	Δp kPa	Qc kW	EER kW/ kW	q l/s	Δp kPa	Qc kW	EER kW/ kW	q l/s	Δp kPa	Qc kW	EER kW/ kW	q l/s	Δp kPa	Qc kW	EER kW/ kW	q l/s	Δp kPa
110	5	108	4.46	5.17	27	102	3.81	4.91	24	96	3.22	4.62	22	90	2.72	4.32	19	83	2.25	4.00	16
120		123	4.21	5.89	29	116	3.68	5.58	26	110	3.15	5.26	23	103	2.66	4.92	21	95	2.20	4.57	18
135		139	4.41	6.66	29	132	3.77	6.34	26	125	3.22	6.00	23	117	2.71	5.62	21	109	2.28	5.22	18
150		148	4.31	7.11	26	142	3.72	6.79	24	134	3.15	6.43	22	126	2.67	6.04	19	117	2.25	5.61	17
160		161	4.94	7.74	27	154	4.23	7.37	24	146	3.60	6.98	22	137	3.01	6.57	20	128	2.51	6.14	17
185		183	4.67	8.75	30	174	3.99	8.32	27	164	3.37	7.85	24	153	2.83	7.33	21	141	2.31	6.78	19
210		215	4.76	10.30	21	205	4.10	9.80	19	193	3.45	9.26	17	182	2.94	8.69	15	169	2.45	8.09	13
245		246	4.64	11.80	27	234	4.03	11.20	24	221	3.45	10.60	22	208	2.93	9.96	20	194	2.46	9.29	17
275		282	4.78	13.50	23	269	4.08	12.90	21	255	3.49	12.20	19	240	2.96	11.50	17	224	2.49	10.70	14
300		307	4.72	14.70	27	295	4.10	14.10	25	280	3.46	13.40	22	264	2.93	12.70	20	247	2.47	11.80	17
110	7	116	4.73	5.54	31	110	4.06	5.26	28	103	3.43	4.96	25	97	2.90	4.64	22	90	2.42	4.30	19
120		132	4.46	6.32	33	125	3.92	5.99	30	118	3.35	5.64	27	110	2.81	5.28	24	102	2.34	4.91	21
135		149	4.67	7.13	33	142	4.01	6.79	30	134	3.42	6.43	27	126	2.90	6.03	24	117	2.42	5.60	20
150		159	4.58	7.61	30	152	3.93	7.27	27	144	3.35	6.89	25	135	2.83	6.47	22	126	2.38	6.02	19
160		173	5.26	8.29	30	165	4.51	7.90	28	156	3.81	7.49	25	147	3.22	7.05	22	138	2.71	6.59	20
185		195	4.95	9.37	34	186	4.24	8.91	31	176	3.60	8.41	28	164	2.98	7.87	24	152	2.49	7.28	21
210		230	5.04	11.00	24	219	4.38	10.50	22	208	3.71	9.94	19	195	3.15	9.33	17	181	2.59	8.69	15
245		264	4.98	12.60	30	251	4.25	12.00	28	237	3.65	11.40	25	223	3.10	10.70	22	208	2.60	9.99	20
275		302	5.03	14.50	26	288	4.36	13.80	24	274	3.70	13.10	21	258	3.15	12.30	19	241	2.65	11.50	17
300		329	5.06	15.70	30	315	4.32	15.10	28	300	3.70	14.40	26	283	3.11	13.60	23	264	2.61	12.70	20
110	10	128	5.14	6.13	37	121	4.40	5.82	34	115	3.78	5.50	30	107	3.17	5.15	27	100	2.65	4.77	23
120		143	4.75	6.84	38	135	4.17	6.49	35	128	3.58	6.12	31	120	3.02	5.74	28	111	2.52	5.34	24
135		164	5.05	7.89	40	157	4.36	7.52	36	148	3.71	7.11	32	139	3.14	6.68	29	130	2.65	6.22	25
150		175	4.94	8.40	36	168	4.26	8.03	33	159	3.64	7.62	30	149	3.07	7.16	27	139	2.57	6.67	23
160		191	5.72	9.18	37	183	4.93	8.75	33	173	4.19	8.30	30	163	3.54	7.82	27	153	2.94	7.32	24
185		216	5.41	10.40	40	206	4.64	9.86	37	194	3.93	9.32	33	182	3.31	8.72	30	169	2.73	8.08	26
210		255	5.52	12.20	29	243	4.76	11.60	26	230	4.04	11.00	24	216	3.43	10.40	21	202	2.89	9.65	18
245		292	5.41	14.00	37	278	4.63	13.30	34	263	3.98	12.60	30	248	3.40	11.90	27	232	2.86	11.10	24
275		334	5.48	16.00	31	319	4.76	15.30	29	303	4.04	14.50	26	285	3.43	13.70	23	267	2.90	12.80	20
300		363	5.42	17.40	37	348	4.64	16.70	34	331	3.99	15.90	31	313	3.40	15.00	28	293	2.87	14.00	24

Legend

LWT Leaving water temperature, °C
 Qc Cooling capacity, kW
 EER Energy efficiency ratio, kW/kW
 q Evaporator water flow rate, l/s
 Δp Evaporator pressure drop, kPa

Application data

Standard units, refrigerant: R-407C
 Evaporator and condenser entering/leaving water temperature difference: 5 K
 Evaporator and condenser fluid: chilled water
 Fouling factor: 0.18×10^{-4} (m² K)/W

Performances in accordance with EN14511-3:2011.

Cooling capacities

30RW units

		Condenser entering air temperature, °C																			
		30				35				40				45				50			
		Qc kW	EER kW/ kW	q l/s	Δp kPa	Qc kW	EER kW/ kW	q l/s	Δp kPa	Qc kW	EER kW/ kW	q l/s	Δp kPa	Qc kW	EER kW/ kW	q l/s	Δp kPa	Qc kW	EER kW/ kW	q l/s	Δp kPa
110	5	108	4.66	5.17	27	103	3.98	4.91	24	97	3.36	4.62	22	90	2.79	4.32	19	84	2.32	4.00	16
120		123	4.38	5.89	29	117	3.85	5.58	26	110	3.24	5.26	23	103	2.72	4.92	21	96	2.27	4.57	18
135		139	4.59	6.66	29	133	3.93	6.34	26	125	3.32	6.00	23	118	2.80	5.62	21	109	2.32	5.22	18
150		149	4.52	7.11	26	142	3.83	6.79	24	135	3.26	6.43	22	126	2.73	6.04	19	117	2.29	5.61	17
160		162	5.16	7.74	27	154	4.38	7.37	24	146	3.70	6.98	22	138	3.10	6.57	20	129	2.58	6.14	17
185		183	4.85	8.75	30	174	4.12	8.32	27	164	3.47	7.85	24	153	2.89	7.33	21	142	2.37	6.78	19
210		215	4.90	10.30	21	205	4.19	9.80	19	194	3.59	9.26	17	182	2.98	8.69	15	169	2.49	8.09	13
245		247	4.84	11.80	27	235	4.12	11.20	24	222	3.52	10.60	22	208	2.97	9.96	20	194	2.49	9.29	17
275		283	4.96	13.50	23	270	4.22	12.90	21	256	3.56	12.20	19	241	3.01	11.50	17	225	2.53	10.70	14
300		308	4.89	14.70	27	295	4.21	14.10	25	281	3.56	13.40	22	265	3.01	12.70	20	247	2.52	11.80	17
110	7	116	4.96	5.54	31	110	4.23	5.26	28	104	3.57	4.96	25	97	2.98	4.64	22	90	2.47	4.30	19
120		132	4.66	6.32	33	125	4.07	5.99	30	118	3.46	5.64	27	111	2.91	5.28	24	103	2.42	4.91	21
135		149	4.89	7.13	33	142	4.16	6.79	30	134	3.53	6.43	27	126	2.97	6.03	24	117	2.47	5.60	20
150		159	4.77	7.61	30	152	4.06	7.27	27	144	3.44	6.89	25	135	2.90	6.47	22	126	2.42	6.02	19
160		174	5.52	8.29	30	165	4.67	7.90	28	157	3.96	7.49	25	148	3.32	7.05	22	138	2.76	6.59	20
185		196	5.19	9.37	34	187	4.42	8.91	31	176	3.71	8.41	28	165	3.11	7.87	24	152	2.53	7.28	21
210		231	5.24	11.00	24	220	4.48	10.50	22	208	3.78	9.94	19	195	3.20	9.33	17	182	2.64	8.69	15
245		264	5.18	12.60	30	252	4.42	12.00	28	238	3.78	11.40	25	224	3.15	10.70	22	209	2.65	9.99	20
275		303	5.22	14.50	26	289	4.45	13.80	24	274	3.81	13.10	21	258	3.23	12.30	19	241	2.68	11.50	17
300		329	5.22	15.70	30	316	4.45	15.10	28	301	3.81	14.40	26	284	3.19	13.60	23	265	2.68	12.70	20
110	10	128	5.45	6.13	37	122	4.66	5.82	34	115	3.92	5.50	30	108	3.29	5.15	27	100	2.72	4.77	23
120		143	5.00	6.84	38	136	4.39	6.49	35	128	3.71	6.12	31	120	3.12	5.74	28	112	2.60	5.34	24
135		165	5.36	7.89	40	157	4.55	7.52	36	149	3.87	7.11	32	140	3.26	6.68	29	130	2.72	6.22	25
150		176	5.22	8.40	36	168	4.44	8.03	33	159	3.76	7.62	30	150	3.18	7.16	27	140	2.64	6.67	23
160		192	6.06	9.18	37	183	5.15	8.75	33	174	4.37	8.30	30	164	3.67	7.82	27	153	3.06	7.32	24
185		217	5.73	10.40	40	206	4.85	9.86	37	195	4.09	9.32	33	183	3.39	8.72	30	169	2.82	8.08	26
210		256	5.77	12.20	29	244	4.93	11.60	26	231	4.20	11.00	24	217	3.50	10.40	21	202	2.93	9.65	18
245		293	5.63	14.00	37	279	4.81	13.30	34	264	4.13	12.60	30	249	3.51	11.90	27	232	2.90	11.10	24
275		334	5.76	16.00	31	320	4.92	15.30	29	304	4.16	14.50	26	286	3.53	13.70	23	267	2.93	12.80	20
300		364	5.69	17.40	37	349	4.85	16.70	34	332	4.15	15.90	31	314	3.49	15.00	28	293	2.93	14.00	24

Legend

LWT	Leaving water temperature, °C
Qc	Cooling capacity, kW
EER	Energy efficiency ratio, kW/kW
q	Evaporator water flow rate, l/s
Δp	Evaporator pressure drop, kPa

Application data

Standard units, refrigerant: R-407C
 Evaporator and condenser entering/leaving water temperature difference: 5 K
 Evaporator and condenser fluid: chilled water
 Fouling factor: 0.18×10^{-4} (m² K)/W

Gross performances, not in accordance with EN14511-3:2011. These performances do not take into account the correction for the proportional heating capacity and power input generated by the water pump to overcome the internal pressure drop in the heat exchanger.

Guide specifications

Liquid chillers
Nominal cooling capacity range: 20 to 315 kW
Carrier model:
30RW water-cooled
30RWA condenserless

Part 1 - General

System description

- Water-cooled (30RW) or condenserless (30RWA) liquid chiller for indoor installation, equipped with scroll compressors, auto-adaptive microprocessor control and operating with HFC-407C refrigerant that has no effect on the ozone layer.

Quality assurance

- 30RW 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. 30RW and 30RWA units have been designed and tested in a facility with a quality assurance system certified ISO 9001.
 - 30RW and 30RWA units have been assembled in a facility with an environment management system certified ISO 14001. All units undergo a run test before shipment (electrical test only for 30RWA units).

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 30RW 160 upwards the evaporator has two interlaced independent refrigerant circuits. Closed-cell thermal foam insulation.

Condenser (30RW only)

- Stainless steel plate heat exchanger with welded copper connections. From size 30RW 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 30RW 020-045) and HFC-407C refrigerant charge. The main components of the refrigerant circuit are welded.

Note: On 30RWA units the refrigerant circuit also includes a check valve on the discharge piping, a solenoid valve on the liquid piping, refrigerant piping and a nitrogen holding charge.

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 Pro-Dialog 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 monocell centrifugal water pump (dual water pump optional from sizes 30RW 110 upwards) - 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 (30RW 110-150) or on the right-hand side (30RW 160-300) with welded connection sleeve.

Note: Units without hydronic module (standard): water flow switch installed as standard and water piping protected against condensation.

Condenser hydronic module

- Integrated hydronic module, including: removable screen filter, expansion tank, single monocell centrifugal water pump (dual water pump optional from sizes 30RW 110 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 (30RW 110-150) or on the right-hand side (30RW 160-300) with welded connection sleeve.

Carrier Pro-Dialog Plus control system

Pro-Dialog Plus 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 Carrier glycol cooler or air-cooled condenser)
 - Fan rotation speed control (with Carrier air-cooled condenser)
- Evaporator and condenser water pump control (optional dual pump with automatic change-over in case of a fault from size 30RW 110 upwards).
- Control at the second setpoint (example: unoccupied room).
- Leaving water temperature reset, based on the air temperature (with Carrier 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, setpoint, 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, setpoints, 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 setpoint* (example: room unoccupied)
 - Maximum demand limit* (three limit levels from size 30RW 160 upwards)

* One or the other for 30RWA 110-160

- Outputs are available for:
 - Start-up of a boiler
 - Signalling of a general fault condition for each circuit.

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

- The optional CCN Clock Board permits:
 - Control in master/slave 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 setpoint (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.



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