

AIR-COOLED LIQUID CHILLERS, REVERSIBLE AIR-TO-WATER HEAT PUMPS



Commercial and industrial
applications

Compact design

Quiet operation

Variable water flow

Partial heat reclaim

30RBS 039-160 C 30RQS 039-160 B

AQUASNAP[®]

Nominal cooling capacity 30RBS: 40-156 kW
Nominal cooling capacity 30RQS: 38-148 kW
Nominal heating capacity 30RQS: 42-150 kW

The Aquasnap range of liquid chillers/air-to-water heat pumps was designed for commercial (air conditioning of offices, hotels etc.) or industrial (low-temperature process units etc.) applications.

The Aquasnap integrates the latest technological innovations:

- Ozone-friendly refrigerant R410A
- All-aluminium microchannel heat exchangers for the cooling only units (30RBS)
- Scroll compressors
- Low-noise fans made of a composite material
- Auto-adaptive microprocessor control
- Electronic expansion valve
- Variable-speed pump (option)

The Aquasnap can be equipped with a hydraulic module integrated into the unit chassis, limiting the installation to straightforward operations like connection of the power supply and the chilled water supply and return piping.



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FEATURES

Quiet operation

- Compressors
 - Low-noise scroll compressors with low vibration level
 - The compressor assembly is installed on an independent chassis and supported by anti-vibration mountings
 - Dynamic suction and discharge piping support, minimising vibration transmission (Carrier patent).
- Condenser (30RBS)/air evaporator/condenser (30RQS) section
 - Vertical condenser coils
 - Anti-vibration mountings and optional grilles to protect the heat exchanger against possible shocks.
 - Low-noise latest-generation Flying Bird IV fans, made of a composite material (Carrier patent) are now even quieter and do not generate intrusive low-frequency noise
 - Rigid fan installation for reduced start-up noise (Carrier patent).

Easy and fast installation

- Integrated hydraulic module (option)
 - Centrifugal low or high-pressure water pump (as required), based on the pressure loss of the hydraulic installation

Hydraulic module



- Single or dual water pump (as required) with operating time balancing and automatic changeover to the back-up pump if a fault develops
- Water filter protects the pump against circulating debris
- Pressure measurement, using two pressure transducers and allowing indication of water flow rate, water pressure and lack of water.
- High-capacity membrane expansion tank ensures pressurisation of the water circuit
- Overpressure valve, set to 4 bar
- Speed variator on the pumps (option) to ensure the correct flow rate, based on the system requirements
- Thermal insulation and frost protection down to -20°C, using an electric resistance heater (see table of options)
- Physical features
 - The unit has a small footprint and a low height (1330 mm) allowing it to blend in with any architectural styles.
 - The unit is enclosed by easily removable panels, covering all components (except air heat exchangers and fans).
- Simplified electrical connections
 - A single power supply point without neutral
 - Main disconnect switch (option 70) with high trip capacity
 - Transformer for safe 24 V control circuit supply included

- Fast commissioning
 - Systematic factory operation test before shipment
 - Quick-test function for step-by-step verification of the instruments, electrical components and motors.

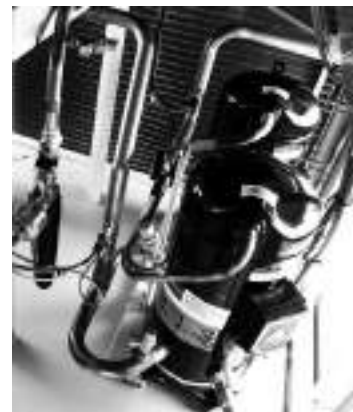
Economical operation

- Optional variable-speed pump for economical operation
- The control algorithm adjusts the water flow rate based on the actual system requirements and obsoletes the need for the control valve at the unit outlet.
- Increased energy efficiency at part load
 - The refrigerant circuit includes several compressors connected in parallel. At part load, around 99% of the operating time, only the compressors that are absolutely necessary operate. At these conditions the compressors operating are more energy efficient, as they use the total condenser and evaporator capacity.
 - The electronic expansion device (EXV) allows operation at a lower condensing pressure (SEER and SCOP Seasonal performances optimisation).
 - Dynamic superheat management for better utilisation of the water heat exchanger surface.
 - Defrost cycle optimisation (30RQS).
- Reduced maintenance costs
 - Maintenance-free scroll compressors
 - Fast diagnosis of possible incidents and their history via the Touch Pilot Junior control
 - R410A refrigerant is easier to use than other refrigerant blends.

Environmental care

- Ozone-friendly R410A refrigerant
 - Chlorine-free refrigerant of the HFC group with zero ozone depletion potential
 - Very efficient - gives an increased energy efficiency ratio
 - 50% reduction in the refrigerant charge through the use of micro-channel heat exchangers for the cooling only units (30RBS)
- Leak-tight refrigerant circuit
 - Brazed refrigerant connections for increased leak-tightness
 - Reduction of leaks due to reduced vibration levels and elimination of capillary tubes (TXVs)
 - Verification of pressure transducers and temperature sensors without transferring refrigerant charge.

Partial view of the hydraulic circuit



FEATURES

Superior reliability

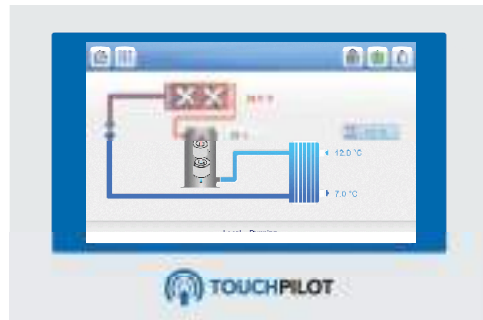
- State-of-the-art concept
 - Cooperation with specialist laboratories and use of limit simulation tools (finite element calculations) for the design of the critical components, e.g. motor supports, suction/discharge piping etc.
 - All aluminium micro-channel heat exchanger (MCHE) on cooling only units (30RBS), offers increased corrosion resistance compared to traditional coils. The all-aluminium design eliminates the formation of galvanic currents between aluminium and copper that cause coil corrosion.
- Auto-adaptive control
 - Control algorithm prevents excessive compressor cycling and permits reduction of the water quantity in the hydraulic circuit (Carrier patent)
 - Hydraulic module with integrated pressure transducers allowing measurement of the water pressure at two points, as well as measurement of the water flow rate and detection of lack of water and pressure. This considerably reduces the risk of problems such as frost accumulation on the water heat exchanger.
 - Automatic compressor unloading in case of abnormally high condensing pressure. If an anomaly occurs (e.g. fouled air heat exchanger coil, fan failure) Aquasnap continues to operate, but at reduced capacity.
 - On Heat pump version 30RQS specific Free Defrost algorithm to optimise performance and comfort even during defrost period.
- Exceptional endurance tests
 - Corrosion resistance tests in salt mist in the laboratory
 - Accelerated ageing test on components that are submitted to continuous operation: compressor piping, fan supports
 - Transport simulation test in the laboratory on a vibrating table.

Touch Pilot Junior control

The Touch Pilot Junior features a control with advanced communication technology over Ethernet (IP), user-friendly and intuitive user interface with 4.3" colour touch screen.

- Energy management
 - Internal time schedule clock: Controls heat pump on/off times and operation at a second set-point
 - Set-point offset based on the outside air temperature
 - Master/slave control of two heat pumps operating in parallel with operating time equalisation and automatic change-over in case of a unit fault.
- Integrated advanced communication features
 - Night mode: Capacity and fan speed limitation for reduced noise level
 - With hydraulic module: Water pressure display and water flow rate calculation
 - Easy and high-speed communication technology over Ethernet (IP) to a building management system
 - Access to multiple unit parameters.
 - Without hydraulic module: 0-10V output is available for external variable speed pump control

- 4.3" Touch Pilot Junior user interface



- Intuitive and user-friendly 4.3 inch touch screen interface
- Concise and clear information is available in local languages
- Complete menu, customised for different users (end user, service personnel or Carrier engineers).

Remote management (standard)

Units with Touch Pilot Junior control can be easily accessed from the internet, using a PC with an Ethernet connection. This makes remote control quick and easy and offers significant advantages for service operations.

The Aquasnap is equipped with an RS485 serial port that offers multiple remote control, monitoring and diagnostic possibilities. Carrier offers a vast choice of control products, specially designed to control, manage and supervise the operation of an air conditioning system. Please consult your Carrier representative for more information.

The Aquasnap also communicates with other building management systems via optional communication gateways.

A connection terminal allows remote control of the Aquasnap by wired cable:

- Start/stop: Opening of this contact will shut down the unit
- Dual set-point: Closing of this contact activates a second set-point (example: unoccupied mode).
- Demand limit: Closing of this contact limits the maximum heat pump capacity to a predefined value.
- Operation indication: This volt-free contact indicates that the heat pump is operating (cooling load).
- Alarm indication: This volt-free contact indicates the presence of a major fault that has led to the shut-down of one or several refrigerant circuits.

Flying Bird IV fan



FEATURES

All-aluminium micro-channel heat exchanger (MCHE)



Already utilised in the automobile and aeronautical industries for many years, the MCHE micro-channel heat exchanger is entirely made of aluminium. This one-piece concept significantly increases its corrosion resistance by eliminating the galvanic currents that are created when two different metals (copper and aluminium) come into contact in traditional heat exchangers.

As an option, the Enviro-Shield and Super Enviro-Shield anti-corrosion protections have been developed to increase the application range of the MCHE coil from medium to very corrosive environments. With Enviro-Shield protection, corrosion resistance of the MCHE coil is doubled without any impact on heat exchange.

With Super Enviro-Shield protection corrosion resistance of the MCHE coil is multiplied by four, and allows use in very corrosive industrial or marine environments

The MCHE heat exchanger allows a reduction in chiller refrigerant charge by up to 50%.

The low thickness of the MCHE reduces air pressure losses by 50% and makes it less susceptible to fouling (e.g. by sand) than a traditional coil. Cleaning of the MCHE heat exchanger is very fast using a dry air jet or a high-pressure washer, while observing the usage precautions.

PARTIAL HEAT RECLAIM USING DESUPERHEATERS (OPTION 49)

This option permits the production of free hot water using heat reclaim by desuperheating the compressor discharge gases. The option is available for the whole 30RBS/RQS range.

A plate heat exchanger is installed in series with the air condenser coils on the compressor discharge line of each circuit.

Physical data, 30RBS units with partial heat reclaim using desuperheaters (option 49)

30RBS partial heat reclaim mode		039	045	050	060	070	080	090	100	120	140	160
Operating weight 30RBS units with MCHE coils⁽¹⁾												
Standard unit without hydraulic module	kg	437	444	448	468	467	492	784	793	830	929	964
Standard unit with hydraulic module option												
Single high-pressure pump	kg	467	474	478	498	497	515	854	815	831	968	1003
Dual high-pressure pump	kg	493	500	504	524	522	541	861	870	914	1005	1040
Refrigerant charge, units with MCHE coils												
R-410A												
Circuit A	kg	4,7	5,3	5,9	6,7	6,2	7,3	10,7	10,8	11,4	6,5	7,4
Circuit B	kg	-	-	-	-	-	-	-	-	-	6,5	7,4
Condensers												
All aluminium microchannel heat exchanger (MCHE)												
Desuperheaters on circuits A and B												
Plate heat exchangers												
Water volume, circuit A	l	0.549	0.549	0.549	0.549	0.732	0.732	0.976	0.976	0.976	0.732	0.732
Water volume, circuit B	l	-	-	-	-	-	-	-	-	-	0.732	0.732
Max. water-side operating pressure without hydraulic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Water connections												
Cylindrical, male gas thread												
Connections	in	1	1	1	1	1	1	1	1	1	1	1
Outside diameter	mm	42	42	42	42	42	42	42	42	42	42	42

(1) Weights shown are a guideline only.

Physical data, 30RQS units with partial heat reclaim using desuperheaters (option 49)

30RQS partial heat reclaim mode		039	045	050	060	070	078	080	090	100	120	140	160
Operating weight units with RTPF coils⁽¹⁾													
Standard unit without hydraulic module	kg	507	514	542	555	556	563	749	896	904	962	1073	1091
Standard unit with hydraulic module option													
Single high-pressure pump	kg	563	544	572	585	585	593	779	928	936	998	1112	1130
Dual high-pressure pump	kg	562	570	597	611	611	619	805	973	981	1046	1149	1167
Refrigerant charge, units with RTPF coils													
R-410A													
Circuit A	kg	12.5	13.5	16.5	17.5	18.0	16.5	21.5	27.5	28.5	33.0	19.0	18.5
Circuit B	kg	-	-	-	-	-	-	-	-	-	-	19.0	18.5
Condensers													
Grooved copper tubes. aluminium fins													
Desuperheaters on circuits A and B													
Plate heat exchangers													
Water volume, circuit A	l	0.549	0.549	0.549	0.732	0.732	0.732	0.732	0.976	0.976	0.976	0.732	0.732
Water volume, circuit B	l	-	-	-	-	-	-	-	-	-	-	0.732	0.732
Max. water-side operating pressure without hydraulic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Water connections													
Cylindrical, male gas thread													
Connections	in	1	1	1	1	1	1	1	1	1	1	1	1
Outside diameter	mm	42	42	42	42	42	42	42	42	42	42	42	34

(1) Weights shown are a guideline only.

Operating limits

Desuperheater		Minimum	Maximum
Entering water temperature at start-up	°C	25 ⁽¹⁾	60
Leaving water temperature during operation	°C	30	65
Air condenser		Minimum	Maximum
Outside air temperature	°C	-10	46

(1) The entering water temperature at start-up must not be lower than 25°C. For installations with a lower temperature a three-way valve is necessary.

PHYSICAL DATA, 30RBS

30RBS		039	045	050	060	070	080	090	100	120	140	160		
Cooling														
Standard unit Full load performances*	CA1	Nominal capacity	kW	40	44	51	58	67	79	87	97	114	135	156
		EER	kW/kW	2,87	2,76	2,67	2,66	2,72	2,70	2,73	2,73	2,67	2,70	2,65
	Eurovent class			C	C	D	D	C	C	C	C	D	C	D
	CA2	Nominal capacity	kW	53	59	69	81	85	98	114	126	151	171	194
EER		kW/kW	3,44	3,32	3,12	3,31	2,97	3,06	3,18	3,09	3,10	2,99	3,01	
Standard unit Seasonal energy efficiency**	SEER_{12/7°C} Comfort low temp.		kWh/kWh	3,86	3,97	4,03	3,92	3,79	3,85	4,16	4,16	4,07	3,93	4,17
	η_s cool_{12/7°C}		%	152	156	158	154	149	151	164	163	160	154	164
	SEPR_{12/7°C} Process high temp.		kWh/kWh	5,27	5,31	5,26	5,09	4,92	5,16	4,95	5,12	5,51	4,90	5,32
Unit with option 6B Seasonal energy efficiency**	SEPR_{-2/-8°C} Process medium temp.		kWh/kWh	2,88	3,21	2,91	3,09	3,04	2,75	2,97	3,12	3,10	3,07	3,02
Integrated Part Load Value	IPLV.SI	kW/kW	4,540	4,710	4,810	4,580	4,260	4,390	4,550	4,530	4,550	4,290	4,640	
Sound levels														
Standard unit														
Sound power level ⁽¹⁾		dB(A)	80	81	81	81	87	87	84	84	84	84	90	90
Sound pressure level at 10 m ⁽²⁾		dB(A)	49	49	49	49	55	55	52	52	52	58	58	
Unit with option 15LS														
Sound power level ⁽¹⁾		dB(A)	79	80	80	80	80	80	83	83	83	83	83	83
Sound pressure level at 10 m ⁽²⁾		dB(A)	48	48	48	48	48	48	51	51	51	51	51	
Dimensions														
Length	mm	1061	1061	1061	1061	1061	1061	2258	2258	2258	2258	2258	2258	
Width	mm	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	
Height	mm	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	
Operating weight with MCHE coil⁽³⁾														
Standard unit without hydraulic module		kg	429	436	442	454	454	471	766	776	789	896	928	
Standard unit with hydraulic module														
Single high-pressure pump		kg	459	466	472	484	484	501	798	808	825	935	967	
Dual high-pressure pump		kg	484	492	497	510	510	527	843	853	873	972	1004	
Compressors														
Hermetic scroll compressors, 48.3 r/s														
Circuit A			2	2	2	2	2	2	3	3	3	2	2	
Circuit B			-	-	-	-	-	-	-	-	-	2	2	
No of control stages			2	2	2	2	2	2	3	3	3	4	4	
Refrigerant charge with MCHE coil⁽³⁾														
R-410A														
Circuit A		kg	4.7	5.3	5.9	6.7	6.2	7.3	10.7	10.8	11.4	6.5	7.4	
		teqCO ₂	9.8	11.1	12.3	14.0	12.9	15.2	22.3	22.6	23.8	13.6	15.5	
Circuit B		kg	-	-	-	-	-	-	-	-	-	6.5	7.4	
		teqCO ₂	-	-	-	-	-	-	-	-	-	13.6	15.5	

- * In accordance with standard EN14511-3:2013
** In accordance with standard EN14825:2016, average climate
CA1 Cooling mode conditions: Evaporator water entering/leaving temperature 12°C/7°C, outside air temperature 35°C, evaporator fooling factor 0 m².K/W
CA2 Cooling mode conditions: Evaporator water entering/leaving temperature 23°C/18°C, outside air temperature 35°C, evaporator fooling factor 0 m².K/W
η_s cool_{12/7°C} & SEER_{12/7°C} **Bold values compliant to Ecodesign regulation: (EU) No 2016/2281 for Comfort application**
SEPR_{12/7°C} **Bold values compliant to Ecodesign regulation: (EU) No 2016/2281 for Process application**
SEPR_{-2/-8°C} **Bold values compliant to Ecodesign regulation: (EU) No 2015/1095 for Process application**
IPLV.SI Calculations according to standard performances AHRI 551-591 (SI).
(1) In dB ref=10⁻¹² W, (A) weighting. Declared dualnumber noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3dB(A)). Measured in accordance with ISO 9614-1 and certified by Eurovent.
(2) In dB ref 20μPa, (A) weighting. Declared dualnumber noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3dB(A)). For information, calculated from the sound power level Lw(A).
(3) Values shown are a guideline only. Please refer to the unit nameplate



Eurovent certified values

PHYSICAL DATA, 30RBS

30RBS	039	045	050	060	070	080	090	100	120	140	160	
Capacity control	Touch Pilot Junior											
Minimum capacity	%	50	50	50	50	50	50	33	33	33	25	25
Condensers	All-aluminium microchannel heat exchanger (MCHE)											
Fans	Axial Flying Bird IV with rotating shroud											
Quantity		1	1	1	1	1	1	2	2	2	2	2
Maximum total air flow	l/s	3885	3883	3687	3908	5013	5278	6940	6936	7370	10026	10556
Maximum rotation speed	r/s	12	12	12	12	16	16	12	12	12	16	16
Evaporator	Direct expansion, plate heat exchanger											
Water volume	l	2.6	3.0	3.3	4.0	4.8	5.6	8.7	9.9	11.3	12.4	14.7
Without hydraulic module (option)												
Max. water-side operating pressure	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
With hydraulic module (option)												
Single or dual pump (as selected)	Pump, Victaulic screen filter, relief valve, expansion tank, purge valves (water + air), pressure sensors											
Expansion tank volume	l	12	12	12	12	12	12	35	35	35	35	35
Expansion tank pressure ⁽⁴⁾	bar	1	1	1	1	1	1	1.5	1.5	1.5	1.5	1.5
Max. water-side operating pressure	kPa	400	400	400	400	400	400	400	400	400	400	400
Water connections with/without hydraulic module	Victaulic											
Diameter	in	2	2	2	2	2	2	2	2	2	2	2
Outside tube diameter	mm	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3
Chassis paint colour	Colour code: RAL7035											

- (4) When delivered, the standard pre-inflation of the tank is not necessarily the optimal value for the system. To permit changing the water volume, change the inflation pressure to a pressure that is close to the static head of the system. Fill the system with water (purging the air) to a pressure value that is 10 to 20 kPa higher than the pressure in the tank.

ELECTRICAL DATA, 30RBS

30RBS without hydraulic module		039	045	050	060	070	080	090	100	120	140	160
Power circuit												
Nominal power supply	V-ph-Hz	400-3-50										
Voltage range	V	360-440										
Control circuit supply												
24 V via internal transformer												
Maximum start-up current (Un)⁽¹⁾												
Standard unit	A	114	135	143	146	176	213	174	208	248	243	286
Unit with electronic starter option	A	75	87	94	96	114	140	125	150	176	186	215
Unit power factor at maximum capacity⁽²⁾		0.83	0.81	0.81	0.83	0.81	0.78	0.83	0.81	0.79	0.81	0.78
Maximum operating power input⁽²⁾	kW	20	22	25	28	31	36	42	46	53	62	72
Nominal unit operating current draw⁽³⁾	A	26	29	33	36	42	53	55	62	77	85	106
Maximum operating current draw (Un)⁽⁴⁾	A	35	45	47	53	67	73	81	99	108	134	146
Maximum operating current draw (Un-10%)[†]	A	38	49	51	58	75	80	89	110	118	150	159
Customer-side unit power reserve	Customer reserve at the 24 V control power circuit											
Short-circuit stability and protection	See table 9.1											

(1) Maximum instantaneous start-up current at operating limit value (maximum operating current of the smallest compressor(s) + fan current + locked rotor current of the largest compressor).

(2) Power input, at the unit permanent maximum operating conditions (data given on the unit nameplate)

(3) Standardised Eurovent conditions: evaporator entering/leaving water temperature 12°C/7°C, outside air temperature 35°C.

(4) Maximum unit current at 400 V, non permanent operating conditions (values given on the unit nameplate).

† Maximum unit operating current at 360 V, non permanent operating conditions.

Short-circuit stability current (TN system⁽¹⁾)

30RBS		039	045	050	060	070	080
Value without upstream protection							
Short-term current at 1s - I _{cw} - kA rms		3.36	3.36	3.36	3.36	3.36	3.36
Admissible peak current - I _{pk} - kA pk		20	20	20	20	20	15
Value with upstream protection by circuit breaker							
Conditional short-circuit current I _{cc} - kA rms		40	40	40	40	40	40
Schneider circuit breaker - Compact series		NS100H	NS100H	NS100H	NS100H	NS100H	NS100H
Reference No. ⁽²⁾		29670	29670	29670	29670	29670	29670

30RBS		090	100	120	140	160
Value without upstream protection						
Short-term current at 1s - I _{cw} - kA rms		5.62	5.62	5.62	5.62	5.62
Admissible peak current - I _{pk} - kA pk		20	20	15	20	15
Value with upstream protection by circuit breaker						
Conditional short-circuit current I _{cc} - kA rms		40	40	40	30	30
Schneider circuit breaker - Compact series		NS100H	NS160H	NS160H	NS250H	NS250H
Reference No. ⁽²⁾		29670	30670	30670	31671	31671

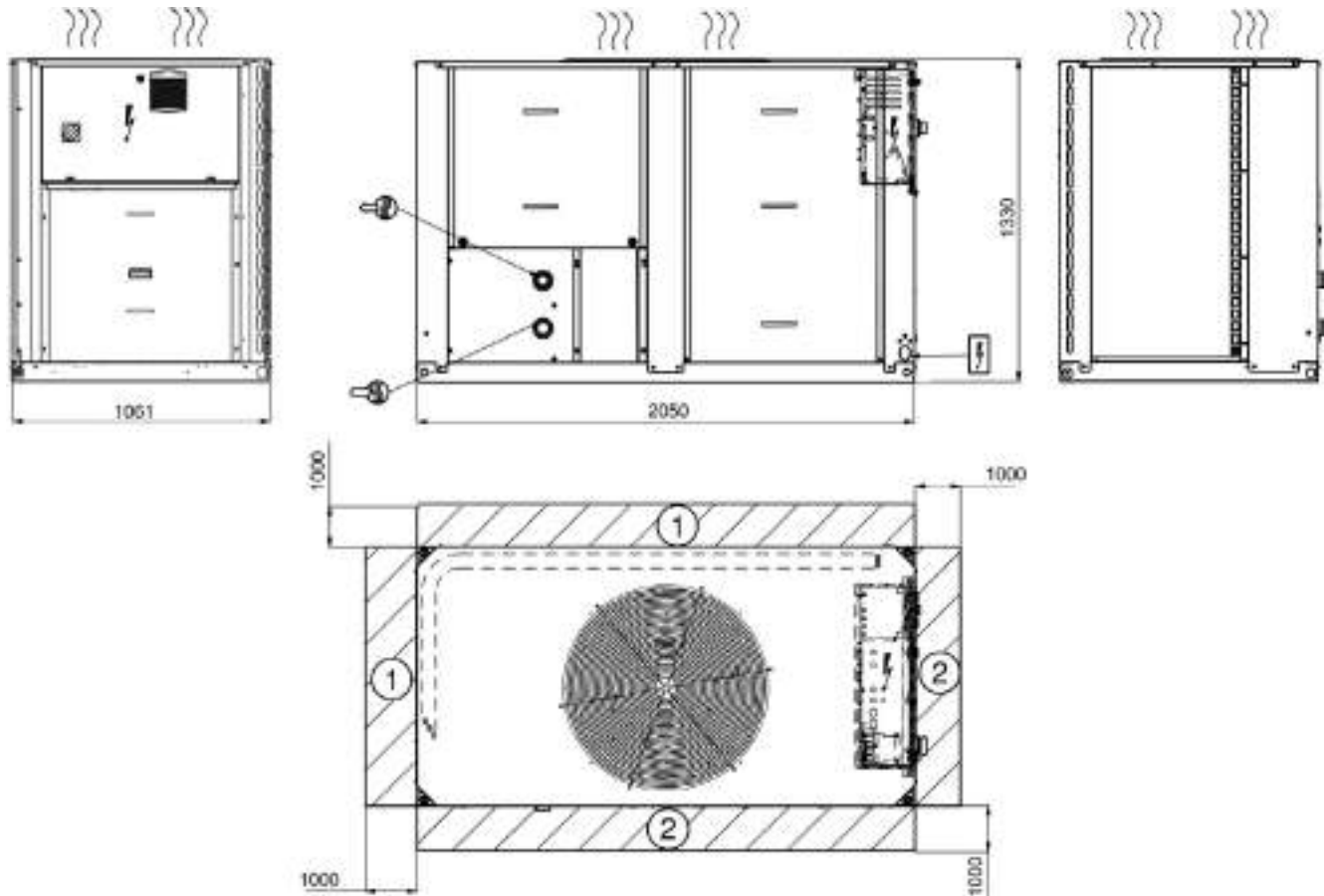
(1) Earthing system type

(2) If another current limitation protection system is used, its time-current and thermal constraint (I²t) trip characteristics must be at least equivalent to those of the recommended Schneider circuit breaker.

The short-circuit stability current values above are suitable with the TN system.






DIMENSIONS/CLEARANCES, 30RBS

30RBS 039-080, units with and without hydraulic module



Legend:

All dimensions are given in mm

-  Control box
-  Water inlet
-  Water outlet
- ① Required clearances for air entry
- ② Recommended space for maintenance
-  Air outlet, do not obstruct
-  Power supply inlet

NOTES:

- A Non-certified drawings.**
Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation.
For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.
- B In multiple-chiller installations (maximum four units),** the side clearance between the units should be increased from 1000 to 2000 mm.
- C The height of the solid surface must not exceed 2 m.**