



30GK 085-245

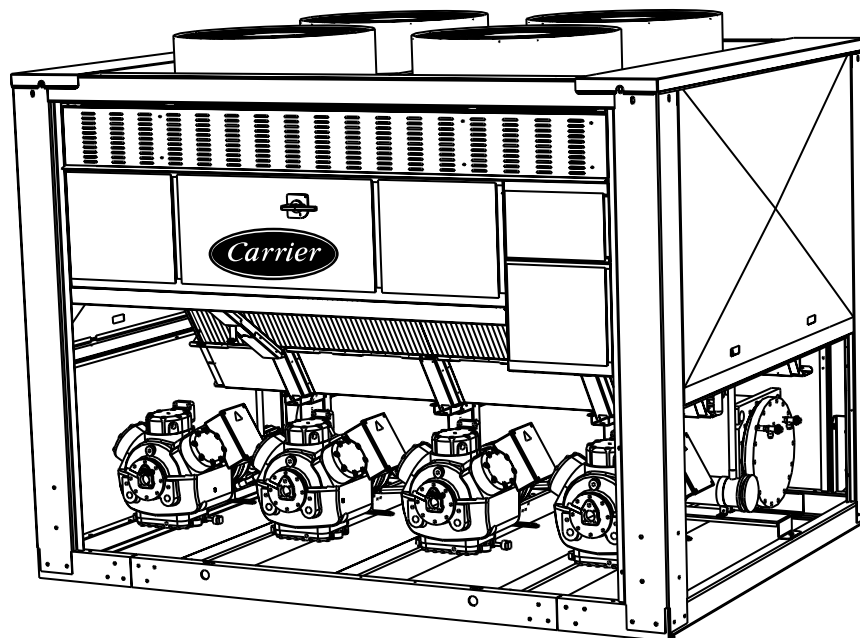
Standard options 50A and 50B

**Air-Cooled Liquid Chillers with Heat
Reclaim Option**

Nominal cooling capacity: 243 - 740 kW

50 Hz

PRO-DIALOG ^{PLUS}



Installation, operation and maintenance instructions



Quality Management System Approval



The cover graphic is for illustrative purposes only and is not part of any offer for sale or contract.

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1 - INTRODUCTION

This document describes an option that offers the possibility to reclaim part of the heat that is normally rejected on 30GK liquid chillers. This system is easy to install and easy to use. It is an economical alternative to separate heating and cooling systems. This document completes the current installation and selection manuals for 30GK units.

There are two options, 50 A or 50B (see “Unit performances”).

2 - OPERATION

2.1 - General

We must not confuse the heat reclaim option with a heat pump.

- Heat reclaim does not include a reversal of the cooling cycle. It requires constant refrigeration.
- In a heat pump the cooling cycle is reversed (and a four-way valve is used).

In heat reclaim systems cooling is given priority and the control is based on the chilled water circuit. Condenser heat can be reclaimed, if required. Units equipped with this system have a water-cooled condenser (used to reclaim the system heat), plus an air-cooled condenser.

2.2 - Operating principle

In these units heat reclaim is achieved with a heat reclaim condenser (with two refrigerant circuits and one water-circuit, designed as a so-called flooded heat exchanger), installed in series with the air-cooled condensers (see typical circuit diagram below). The heat reclaim condenser size is sufficient to permit 50% reclaim of total heat rejection capacity at full load and at Eurovent conditions (12/7°C and 35°C).

The condenser leaving water temperature is obtained by maintaining the saturated condensing temperature, controlled by the different fan stages + the speed variator on the first fan of each circuit.

3 - INSTALLATION

Please refer to the 30GK installation instructions.

3.1 - Heat reclaim condenser

The heat reclaim condenser is factory-installed and ready for connection to the water circuit. Depending on the size it is located on the special chassis, on one side of the unit or in the middle part. For more details please refer to the dimensional drawings.

3.2 - Temperature sensors

Temperature sensors are supplied by the factory and must be installed on the water connection at the heat reclaim condenser inlet and outlet (see wiring diagram).

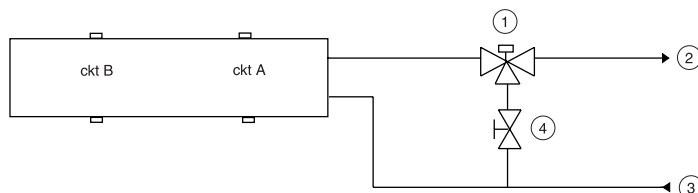
3.3 - The three-way valve

A three-way valve, factory-supplied with the unit, must be installed on-site (see typical circuit diagram). It is controlled by a 0-10 V signal delivered by the chiller and permits bypassing the heat reclaim condenser for correct operation at low return water temperature. Water and electrical connections, as well as thermal insulation must be made at the time of installation on-site.

The best position is close to the heat reclaim condenser (to achieve a small water circuit).

Note: The space required by this valve does not permit installation in the factory.

Low heat reclaim condenser entering water temperature:
Below 20°C a small part of the water flow is directed to the condenser via the three-way valve permitting temperature increase in the hot water circuit. This should be very rare, as it is not part of the basic operating range of the heat reclaim condenser. The condenser full flow rate is reached at 40°C.



Legend

- 1 Three-way valve
- 2 Leaving water
- 3 Return water
- 4 Option 50B: control valve for low water flow rate in the condenser. Compensates for the low pressure drop in the heat exchanger.

3.4 - Frost protection of the condenser water circuit

The heat reclaim heat exchanger uses strip heaters to protect against frost. These are energised based on the saturated condensing temperature.

The condenser shell and the entering water box opposite are also protected by factory-installed heaters.

- To protect the gland of the three-way valve against frost, a factory-supplied heater is also available.
- If use of ethylene glycol and machine pumpdown are not envisaged, heaters must be installed on-site on the external piping and on the body of the three-way valve up to the entering/leaving condenser water box.

ATTENTION: The power supply to the unit must remain on if the unit is not in use: the body of the three-way valve and the condenser entering/leaving water boxes must be correctly insulated against the cold and heated.

4 - START-UP

Start-up is the same as for standard air-cooled chillers. Please refer to the 30GK installation and controls manuals.

4.1 - Heat reclaim mode

The heat reclaim mode is activated via a remote contact to be connected at the customer terminal block (refer to the manual for the control system).

Mode changes (cooling only to heat reclaim) must be limited to ensure that unit performance is not affected. In heat reclaim mode, the air-cooled condenser pumpdown cycle temporarily reduces the saturated evaporating temperature.

4.2 - Design parameters

The control default parameters can be refined as much as possible on-site. The percentage of heat reclaim, based on unit load, follows linear laws.

Parameters permit automatic adjustment of the condensing temperatures for each capacity stage (configuration carried out by Carrier Service). For more details please refer to the operating manual for the Pro-Dialog Plus control.

5 - OPERATING LIMITS

The operating limits have been imposed to maintain the right suction pressure for correct unit operation.

The refrigerant supply to the evaporator must always be sufficient to ensure the saturated suction temperature and the correct amount of superheat.

This means that the capacity of the air-cooled condenser must be sufficient to subcool the refrigerant and permit the expansion device to supply the evaporator correctly.

5.1 - Heat reclaim system

The heat reclaim capacity varies from 20% at minimum load up to 50% of the total heat rejection capacity (minimum load corresponds to an outside temperature of 15°C).

5.2 - Heat reclaim condenser

The maximum water leaving temperature is 55°C (this affects the COP* compared to a standard unit).

The minimum water entering temperature is 40°C. The temperature difference may be between 3 and 10 K (outside this range the water velocity limits in the heat exchanger are not maintained).

* Coefficient of performance - ratio between unit cooling capacity and power input.

5.3 - Evaporator side

The evaporator side operating limits are the same as for standard units.

5.4 - Outside air temperature

The maximum outside air temperature must be below 3°C compared to standard units - please refer to the 30GK installation manual.

If required the “low outside air temperature” option must be ordered separately.

For low outside air temperature and low unit load part of the heat is evacuated by natural convection and another part is reclaimed. This means that there is little or no heat reclaim.

6 - DESIGN

6.1 - Control

The control changes the condensing temperature setpoint based on unit capacity, or energises the three-way valve if the return water temperature is too low to ensure correct unit operation.

Unit control can regulate:

- condenser pump operation when the unit is switched to heat reclaim mode;
- the three-way valve (factory-supplied and installed on site).

Hot water control in a heat reclaim system:

- *The hot water temperature is not controlled, but is based on the unit cooling load, water entering temperature and condensing temperature.*
- *Therefore, in all cases where precise control of the hot water temperature is required, a water tank and additional heaters must be installed.*

6.2 - Compromise

Heat reclaim mode operation does not affect the unit COP* significantly, compared to standard air-cooled chillers. This must however be taken into consideration when the pay-back period for an installation is calculated.

For example:

- If the unit is designed to operate at 30°C ambient air, the saturated condensing temperature is approximately 50°C.
- If the heat reclaim temperature at the condenser outlet must be 52°C, the saturated condensing temperature must be controlled at 57°C. This means a cooling capacity reduction and an increase of the power input.

* Coefficient of performance - ratio between unit cooling capacity and power input.

7 - TYPICAL CIRCUIT DIAGRAM

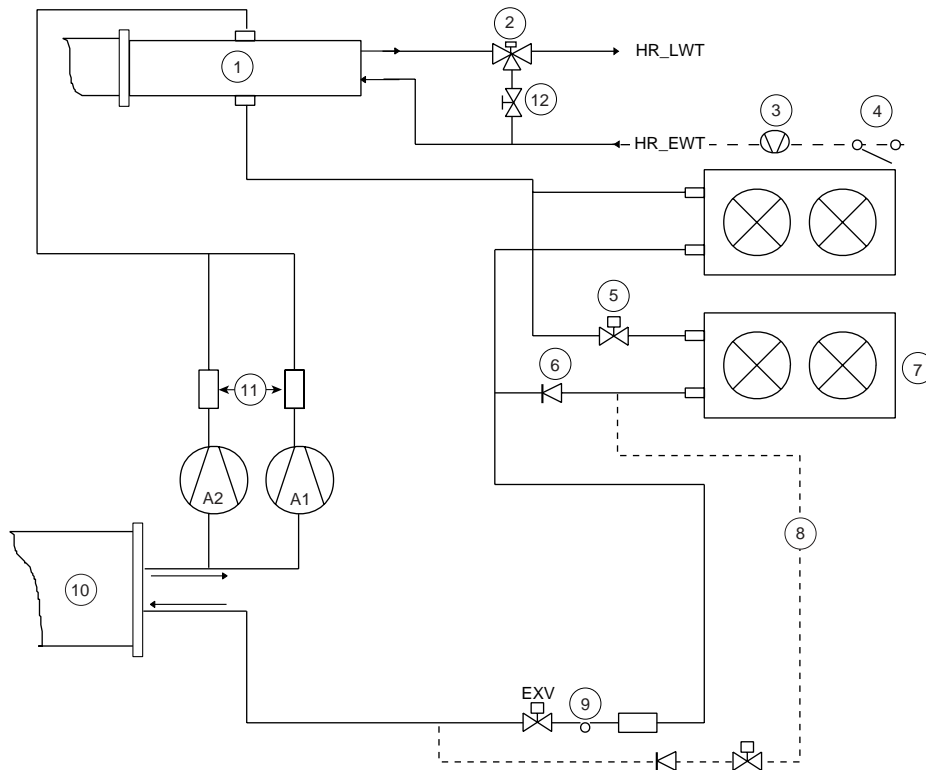
To maintain sufficient condensing pressure in heat reclaim mode and to ensure correct refrigerant supply for the evaporator during the change to heat reclaim mode, part of the air-cooled condensers is evacuated and then isolated.

Therefore (see diagram below), when changing to heat reclaim mode:

- The solenoid valve (5) is closed.
- The liquid line solenoid valve (8) is open.
- The coil (7) is evacuated (up to a pressure value read by a sensor on the discharge line).
- During operation in heat reclaim mode, the refrigerant can no longer circulate in the coil due to valves (6), solenoid valve (5) and liquid line valve (8).

This procedure is initialised each time the unit passes to the heat reclaim mode.

Typical unit circuit diagram



Legend

- | | | | |
|---|---|--------|---|
| 1 | Heat reclaim condenser circuit A | 9 | Liquid sight glass |
| 2 | Three-way valve | 10 | Evaporator circuit side |
| 3 | Condenser pump | 11 | Muffler |
| 4 | Disconnect switch - customer safety device on the water circuit | 12 | Option 50B (see diagram in chapter "Three-way valve") |
| 5 | Motorised condenser shutoff valve | HR_EWT | Heat reclaim condenser water inlet |
| 6 | Condenser check valve | HR_LWT | Heat reclaim condenser water outlet |
| 7 | Air-cooled condenser, not in the circuit during heat reclaim mode | A1,A2 | Compressors |
| 8 | ----- Pumpdown line (check valve and liquid line solenoid valve) | | |

8 - CHARACTERISTICS

8.1 - Physical and electrical data

These are identical to those of the standard unit. Please refer to the 30GK selection and installation manuals.

8.2 - Physical data for heat reclaim condensers

30GK		085	095	100	120	130	148	160	170	190	220	245
Number of water passes		2	2	2	2	2	2	2	2	2	2	2
Net water volume	l	24	24	24	32	32	39	39	39	62	62	62
Water connections		Welded flat flange + flat gaskets (factory-supplied)										
Inlet/outlet diameter	in	2-1/2	2-1/2	2-1/2	3	3	3	3	3	4	4	4
Water drain/air purge diameter	in	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Minimum flow rate, closed water loop*	l/s	1.3	1.3	1.3	1.6	1.6	2.1	2.1	2.1	3.7	3.7	3.7
Minimum flow rate, open water loop*	l/s	4.0	4.0	4.0	4.9	4.9	6.4	6.4	6.4	11.0	11.0	11.0
Maximum water-side operating pressure**	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

* Based on a water flow rate of 0.3 m/s for a closed loop and 0.9 m/s for an open loop.

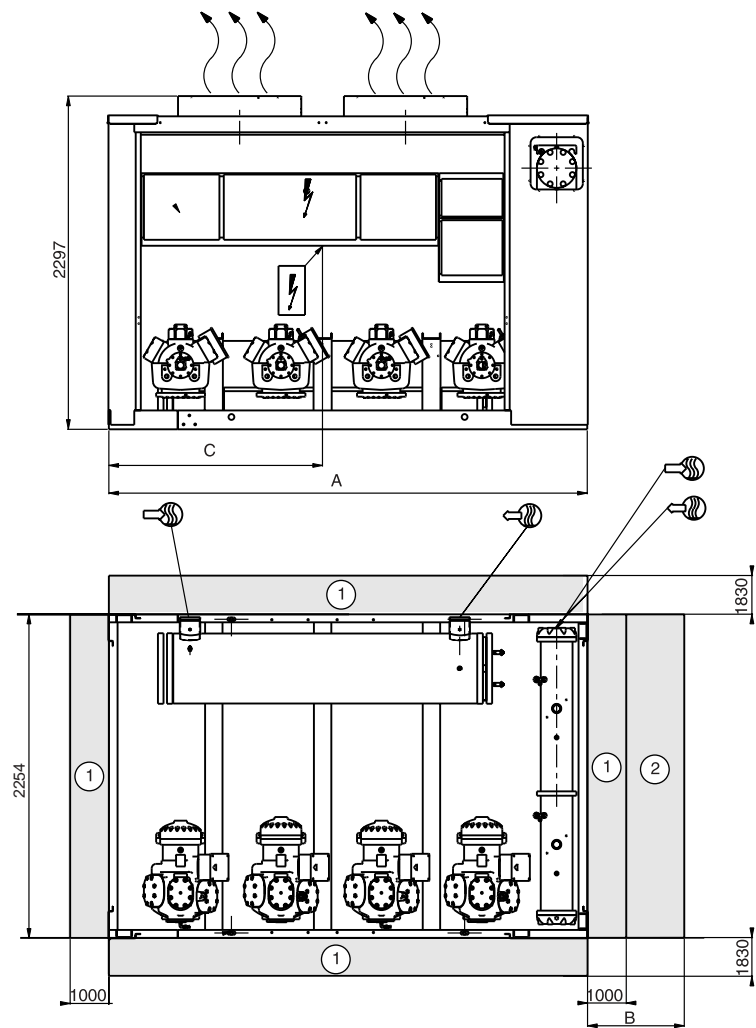
** If the condenser water flow rate is likely to exceed the limit of 1000 kPa, a pressure control safety valve must be installed on the circuit.

Note:





The maximum refrigerant-side operating pressure (France) is:
1000 kPa.

9 - DIMENSIONAL DRAWINGS

9.1 - 30GK 085 - 130



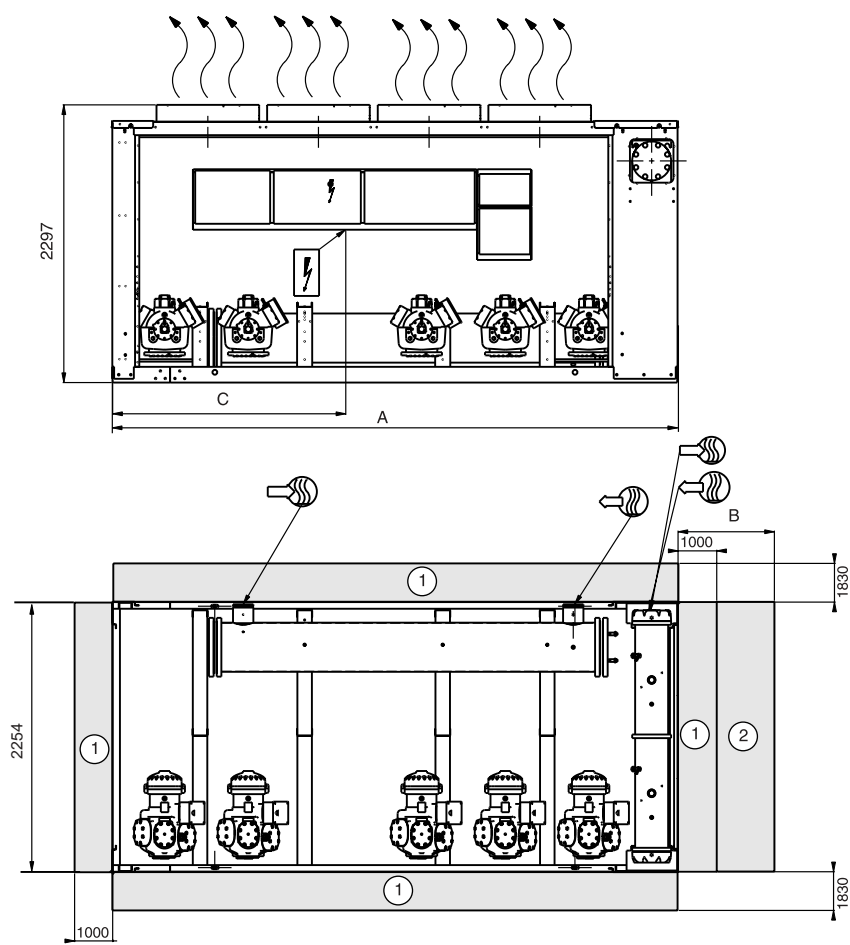
Legend:
All dimensions are in mm

- ① Required space for maintenance
- ② Recommended space for tube removal (can be either on the left or on the right-hand side of the unit)
-  Water inlet
-  Water outlet
-  Power supply
-  Air outlet: do not obstruct

30GK	A mm	B mm	C mm	Weight kg
085	3318	2500	1352	3130
095	3318	2500	1352	3160
100	3318	2500	1352	3675
120	3776	2500	1810	4010
130	3776	2500	1524	4390

- NOTES:**
- **Non-contractual diagrams.**
For a specific installation, please consult the certified dimensional drawings, available on request.
For the position of the fixing points, weight distribution and centre of gravity coordinates please refer to the certified dimensional drawings.
 - For multiple-chiller installations (maximum four), the clearance between the units must be increased from 1000 to 2000 mm to ensure sufficient side clearance.
 - If the unit is surrounded by a solid surface (example: wall) this must not exceed 2 metres in height.

9.2 - 30GK 148-170



Legend:

All dimensions are in mm

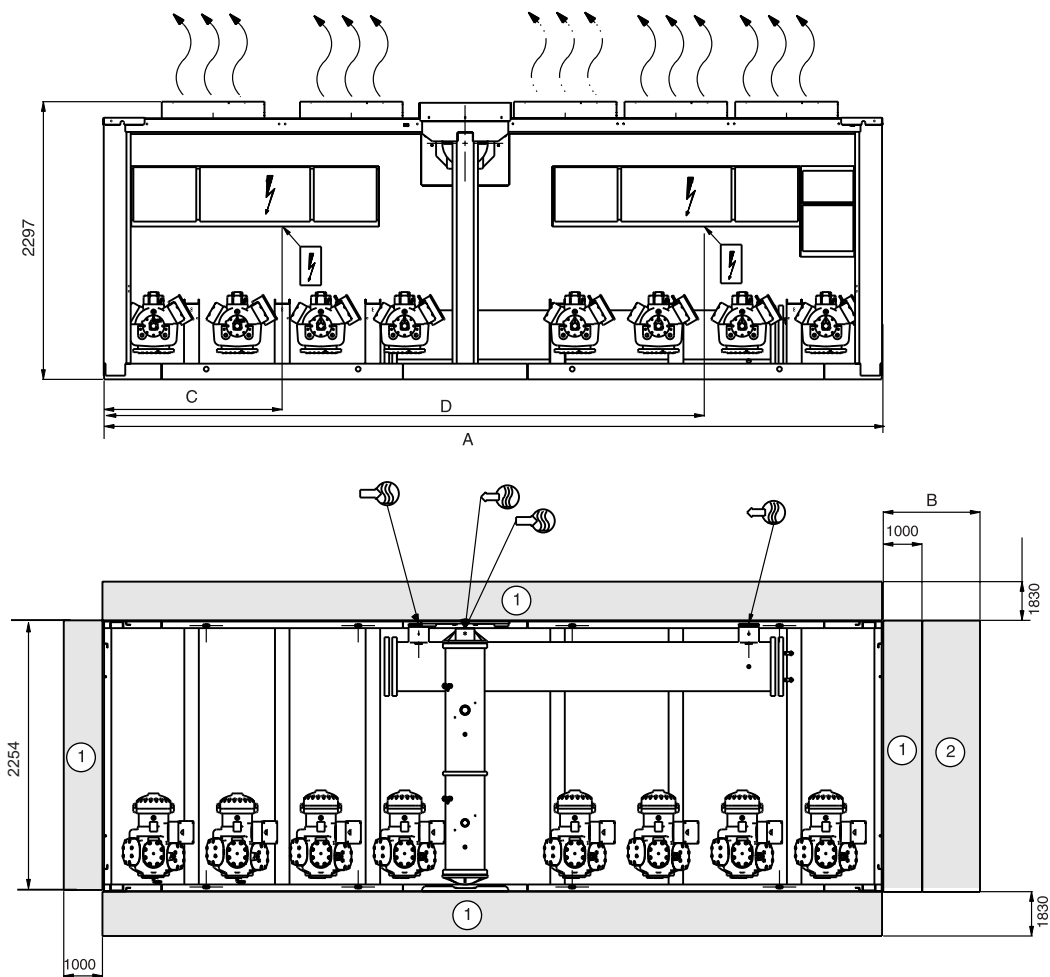
- ① Required space for maintenance
- ② Recommended space for tube removal (can be either on the left or on the right-hand side of the unit)
- Water inlet
- Water outlet
- Power supply
- Air outlet: do not obstruct

30GK	A mm	B mm	C mm	Weight kg
148	4690	3000	1824	4830
160	4690	3000	1824	4945
170	4690	3000	1803	5195

NOTES:





- Non-contractual diagrams.
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For the position of the fixing points, weight distribution and centre of gravity coordinates please refer to the certified dimensional drawings.
- For multiple-chiller installations (maximum four), the clearance between the units must be increased from 1000 to 2000 mm to ensure sufficient side clearance.
- If the unit is surrounded by a solid surface (example: wall) this must not exceed 2 metres in height.

9.3 - 30GK 190-220



Legend:

All dimensions are in mm

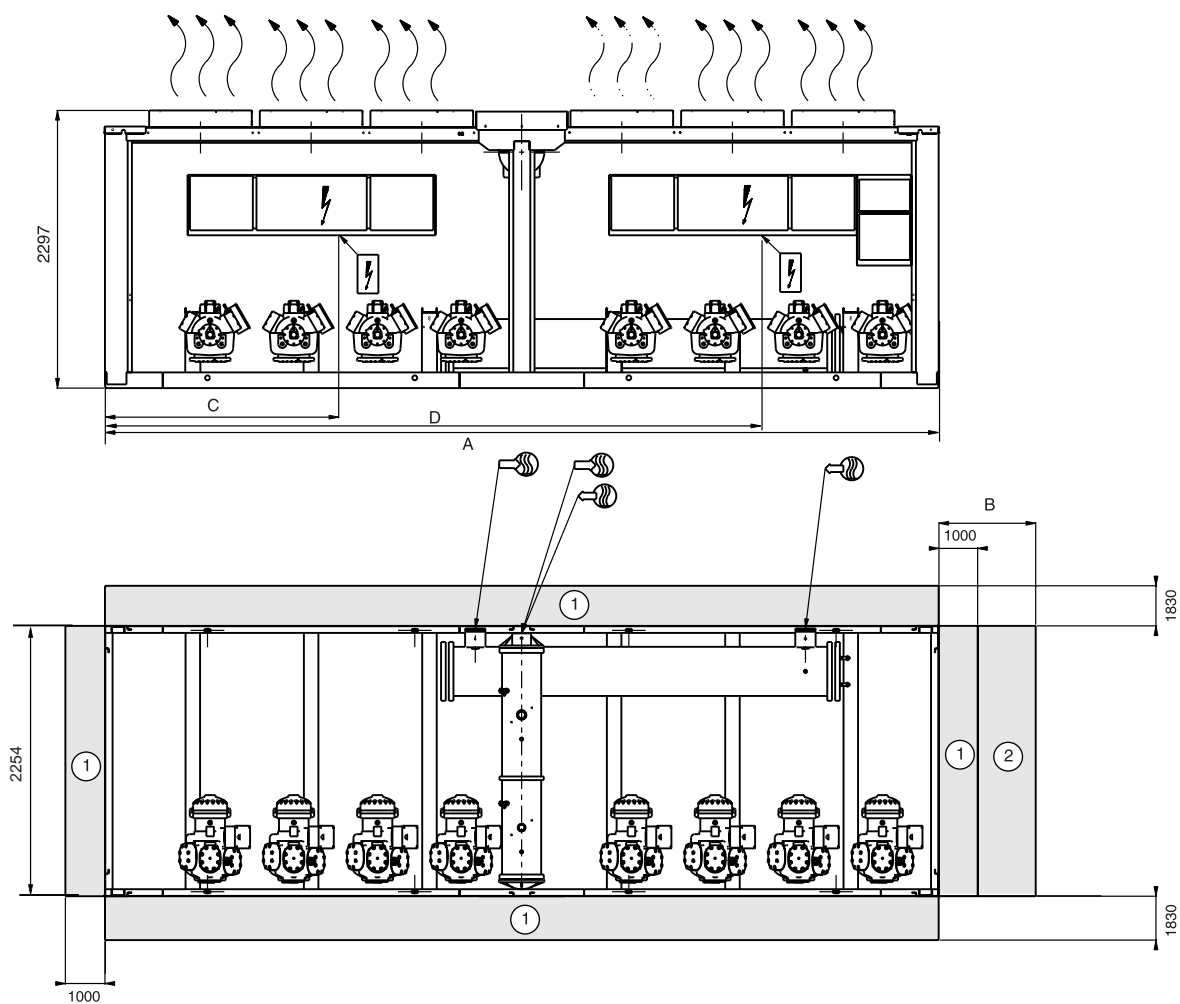
- ① Required space for maintenance
- ② Recommended space for tube removal (can be either on the left or on the right-hand side of the unit)
-  Water inlet
-  Water outlet
-  Power supply
-  Air outlet: do not obstruct

30GK	A mm	B mm	C mm	D mm	Weight kg
190	5536	2500	1352	3921	6050
220	6451	2500	1352	4836	6680

NOTES:





- Non-contractual diagrams.
- For a specific installation, please consult the certified dimensional drawings, available on request.
- For the position of the fixing points, weight distribution and centre of gravity coordinates please refer to the certified dimensional drawings.
- For multiple-chiller installations (maximum four), the clearance between the units must be increased from 1000 to 2000 mm to ensure sufficient side clearance.
- If the unit is surrounded by a solid surface (example: wall) this must not exceed 2 metres in height.

9.4 - 30GK 245



Legend:

All dimensions are in mm

- ① Required space for maintenance
- ② Recommended space for tube removal (can be either on the left or on the right-hand side of the unit)
-  Water inlet
-  Water outlet
-  Power supply
-  Air outlet: do not obstruct

30GK	A mm	B mm	C mm	D mm	Weight kg
245	6909	2500	1810	5294	7030

NOTES:

- Non-contractual diagrams.
For a specific installation, please consult the certified dimensional drawings, available on request.
For the position of the fixing points, weight distribution and centre of gravity coordinates please refer to the certified dimensional drawings.
- For multiple-chiller installations (maximum four), the clearance between the units must be increased from 1000 to 2000 mm to ensure sufficient side clearance.
- If the unit is surrounded by a solid surface (example: wall) this must not exceed 2 metres in height.

10 - UNIT PERFORMANCES

The performances of these units in cooling mode are subject to an additional refrigerant-side pressure drop due to the heat reclaim of the condenser. In this case cooling mode performances can be calculated with the 30GK selection software, increasing the air temperature by 2°C.

The 30GK performances in heat reclaim mode (see table below) are based on Eurovent conditions (outside air temperature: 35°C, cold water entering/ leaving temperature: 12°C/7°C, fouling factor: 0.04403 m² K/kW).

In all other cases the selection can be made by the technical support team in the factory.

10.3 - R407C units

Condenser leaving water temperature 45°C				Option 50B			
30GK unit	CAP	Unit*	HR CAP	Water flow	Cond. Δp	V.3-w	Total Δp
	kW	kW	kW	m ³ /h	kPa	kPa	kPa
30GK 085	261	88	170	29.0	26.2	58.8	85.0
30GK 095	303	108	200	34.2	35.7	69.4	105.1
30GK 100	358	127	236	40.3	48.5	81.9	130.4
30GK 120	402	149	268	45.7	36.9	58.3	95.2
30GK 130	429	156	284	48.5	41.2	61.9	103.1
30GK 148	483	175	319	54.5	34.2	69.5	103.7
30GK 160	521	186	343	58.6	39.3	74.8	114.1
30GK 170	552	200	366	62.4	44.1	79.6	123.7
30GK 190	641	229	423	72.3	22.3	58.0	80.3
30GK 220	701	266	470	80.2	26.9	64.3	91.2
30GK 245	750	286	502	85.7	30.4	68.8	99.2
Condenser leaving water temperature 50°C				Option 50A			
30GK unit	CAP	Unit*	HR CAP	Water flow	Cond. Δp	V.3-w	Total Δp
	kW	kW	kW	m ³ /h	kPa	kPa	kPa
30GK 085	241	93	162	13.8	6.6	44.4	51
30GK 095	282	115	192	16.4	9.1	52.8	61.9
30GK 100	337	133	228	19.5	12.6	62.6	75.2
30GK 120	383	157	262	22.3	9.8	71.7	81.5
30GK 130	409	164	278	23.7	11.0	76.2	87.2
30GK 148	459	184	311	26.6	13.6	54.0	67.6
30GK 160	494	196	335	28.6	10.3	58.0	68.3
30GK 170	527	211	358	30.6	11.7	62.1	73.8
30GK 190	607	242	413	35.3	6.1	71.6	77.7
30GK 220	659	279	455	38.9	7.3	78.9	86.2
30GK 245	716	301	492	42.0	8.4	85.4	93.8
Condenser leaving water temperature 55°C				Option 50A			
30GK unit	CAP	Unit*	HR CAP	Water flow	Cond. Δp	V.3-w	Total Δp
	kW	kW	kW	m ³ /h	kPa	kPa	kPa
30GK 085	221	98	154	13.2	6.0	42.3	48.3
30GK 095	259	120	184	15.7	8.4	50.4	58.8
30GK 100	311	139	219	18.7	11.6	59.9	71.5
30GK 120	363	165	255	21.8	9.4	70.0	79.4
30GK 130	385	171	269	23	10.4	73.9	84.3
30GK 148	430	193	301	25.7	12.8	52.2	65.0
30GK 160	463	206	324	27.6	9.7	56.1	65.8
30GK 170	494	222	347	29.6	11.0	60.1	71.1
30GK 190	572	254	401	34.2	5.8	69.5	75.3
30GK 220	600	303	437	37.3	6.7	75.7	82.4
30GK 245	675	315	479	40.9	8.0	83.0	91.0

10.1 - Option 50A

This option permits achieving a temperature difference of 10 K at the heat reclaim condenser.

10.2 - Option 50B

This option permits achieving a temperature difference of 5 K at the heat reclaim condenser.

The only difference between these two options is the three-way valve, sized in accordance with the flow rates, corresponding to a water temperature difference of 5 or 10 K at the heat reclaim condenser.

10.4 - R22 units

Condenser leaving water temperature 45°C				Option 50B			
30GK unit	CAP	Unit*	HR CAP	Water flow	Cond. Δp	V.3-w	Total Δp
				40/45°C			
	kW	kW	kW	m³/h	kPa	kPa	kPa
30GK 085	274	88	176	30.0	28.0	61.0	89.0
30GK 095	324	109	211	36.0	39.3	73.1	112.4
30GK 100	359	122	234	40.0	47.8	81.2	129.0
30GK 120	418	144	273	46.6	38.3	59.5	97.8
30GK 130	462	155	301	51.3	45.8	65.5	111.3
30GK 148	507	171	329	56.2	36.3	71.7	108.0
30GK 160	533	179	346	59.1	39.8	75.3	115.1
30GK 170	587	196	381	65.0	47.7	83.0	130.7
30GK 190	684	223	442	75.5	24.1	60.6	84.7
30GK 220	761	266	500	85.3	30.1	68.5	98.6
30GK 245	800	276	523	89.3	32.7	71.6	104.3

Condenser leaving water temperature 50°C				Option 50A				Option 50B			
30GK unit	CAP	Unit*	HR CAP	Water flow	Cond. Δp	V.3-w	Total Δp	Water flow	Cond. Δp	V.3-w	Total Δp
				40/50°C				45/50°C			
	kW	kW	kW	m³/h	kPa	kPa	kPa	m³/h	kPa	kPa	kPa
30GK 085	255	93	169	14.4	7.2	46.3	53.5	28.9	26.0	58.6	84.
30GK 095	306	115	205	17.5	10.2	56.1	66.3	35.0	37.2	71.0	108.2
30GK 100	338	128	227	19.4	12.4	62.1	74.5	38.7	45.0	78.6	123.6
30GK 120	393	152	264	22.6	10.0	72.4	82.4	45.1	36.1	57.6	93.7
30GK 130	434	164	290	24.8	11.9	79.6	91.5	49.6	43.0	63.3	106.3
30GK 148	477	180	318	27.2	14.1	55.2	69.3	54.4	34.1	69.3	103.4
30GK 160	502	189	335	28.6	10.3	58.1	68.4	57.3	37.6	73.0	110.6
30GK 170	550	207	368	31.4	12.3	63.7	76.0	62.8	44.6	80.1	124.7
30GK 190	643	236	428	36.5	6.5	74.2	80.7	73.1	22.8	58.6	81.4
30GK 220	716	281	484	41.3	8.1	83.9	92.0	82.7	28.4	66.3	94.7
30GK 245	751	292	506	43.2	8.8	87.6	96.4	86.3	30.7	69.3	100.0

Condenser leaving water temperature 55°C				Option 50A				Option 50B			
30GK unit	CAP	Unit*	HR CAP	Water flow	Cond. Δp	V.3-w	Total Δp	Water flow	Cond. Δp	V.3-w	Total Δp
				45/55°C				50/55°C			
	kW	kW	kW	m³/h	kPa	kPa	kPa	m³/h	kPa	kPa	kPa
30GK 085	237	98	162	13.9	6.6	44.5	51.1	27.7	24.1	56.3	80.4
30GK 095	287	120	198	16.9	9.6	54.2	63.8	33.8	34.9	68.6	103.5
30GK 100	317	134	219	18.7	11.6	60.1	71.7	37.4	42.2	76.0	118.2
30GK 120	367	159	255	21.8	9.4	69.9	79.3	43.5	33.8	55.5	89.3
30GK 130	404	172	279	23.9	11.1	76.6	87.7	47.7	40.0	60.9	100.9
30GK 148	445	189	307	26.2	13.2	53.2	66.4	52.4	31.8	66.8	98.6
30GK 160	469	199	323	27.6	9.7	56.1	65.8	55.2	35.1	70.4	105.5
30GK 170	508	215	350	29.9	11.2	60.1	71.3	59.8	40.8	76.3	117.1
30GK 190	602	249	413	35.3	6.1	71.7	77.8	70.6	21.4	56.6	78.0
30GK 220	667	295	467	39.8	7.6	80.9	88.5	79.7	26.6	63.9	90.5
30GK 245	702	308	489	41.7	8.3	84.7	93.0	83.4	28.9	67.0	95.9

Legend

CAP, kW	Gross cooling capacity
Unit, kW	Unit power input
HR CAP, kW	Heat reclaim capacity
Cond Δp, kPa	Condenser pressure drop
V.3-w, kPa	Pressure drop of the three-way valve
Total Δp, kPa	Total unit pressure drop

* Only half of the fan power input has been taken into account (2.4 kW per fan).
For higher outside air temperatures the second half of the fan power input must be taken into account.



Order No: R3065-76, 03.2003 - Supersedes order No: 13065-76, 10.2001
Manufacturer reserves the right to change any product specifications without notice.



Environmental Management System Approval

Manufacturer: Carrier s.a., Montluel, France.
Printed in the Netherlands on chlorine-free paper.