



30GX 082-358

30HXC 080-375

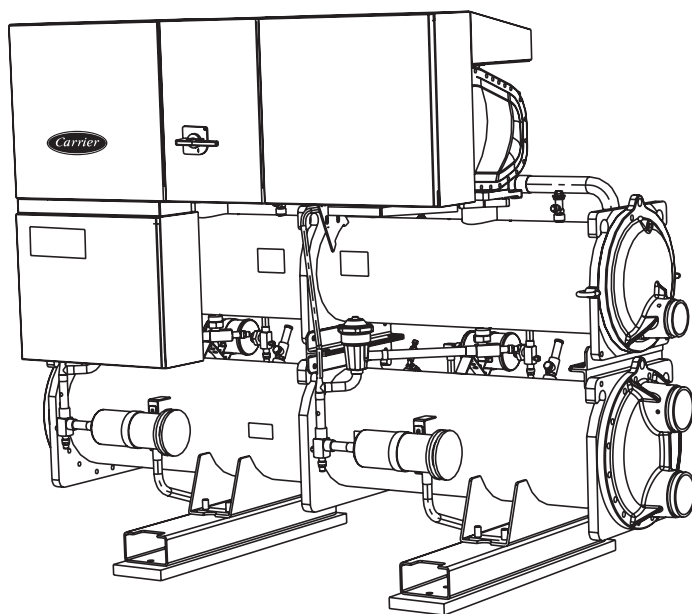
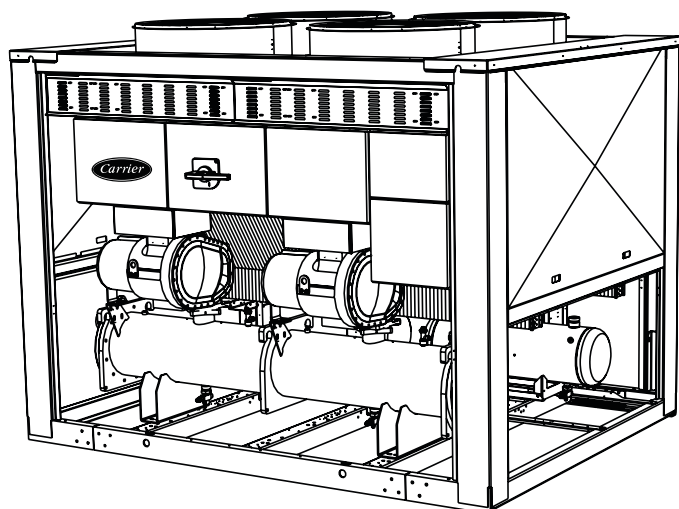
Screw Compressor Water-Cooled Liquid Chillers and Air-Cooled Liquid Chillers

Nominal cooling capacity 30HXC: 286-1300 kW

Nominal cooling capacity 30GX: 282-1203 kW

50 Hz

GLOBAL CHILLER



Installation, operation and maintenance instructions



Quality Management System Approval



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1 - INTRODUCTION

Prior to the initial start-up of the 30HXC/GX units, the people involved in the on-site installation, start-up, operation and maintenance of this unit should be thoroughly familiar with these instructions and the specific project data for the installation site.

The 30HXC/GX liquid chillers are designed to provide a very high level of safety during installation, start-up, operation and maintenance. They will provide safe and reliable service when operated within their application range.

This manual provides the necessary information to familiarize yourself with the control system before performing start-up procedures. The procedures in this manual are arranged in the sequence required for machine installation, start-up, operation and maintenance.

Be sure you understand and follow the procedures and safety precautions contained in the instructions supplied with the machine, as well as those listed in this guide.

To find out, if these products comply with European directives (machine safety, low voltage, electromagnetic compatibility, equipment under pressure etc.) check the declarations of conformity for these products.

1.1 - Installation safety considerations

After the unit has been received, when it is ready to be installed or reinstalled, and before it is started up, it must be inspected for damage. Check that the refrigerant circuit(s) is (are) intact, especially that no components or pipes have shifted (e.g. following a shock). If in doubt, carry out a leak tightness check and verify with the manufacturer that the circuit integrity has not been impaired. If damage is detected upon receipt, immediately file a claim with the shipping company.

Do not remove the skid or the packaging until the unit is in its final position. These units can be moved with a fork lift truck, as long as the forks are positioned in the right place and direction on the unit.

The units can also be lifted with slings, using only the designated lifting points marked on the unit.

These units are not designed to be lifted from above. Use slings with the correct capacity, and always follow the lifting instructions on the certified drawings supplied with the unit.

Safety is only guaranteed, if these instructions are carefully followed. If this is not the case, there is a risk of material deterioration and injuries to personnel.

Never cover any safety devices.

This applies to the relief valve in the water circuit and the relief valve(s) in the refrigerant circuit(s).

Ensure that the valves are correctly installed, before operating the unit.

In certain cases the relief valves are installed on isolating valves. These valves are factory-supplied lead-sealed in the open position. This system permits isolation and removal of the relief valves for checking and replacing. The relief valves are designed and installed to ensure protection against overpressure caused by fire.

All factory-installed relief valves are lead-sealed to prevent any calibration change. If the relief valves are installed on a change-over manifold, this is equipped with a relief valve on each of the two outlets. Only one of the two relief valves is in operation, the other one is isolated. Never leave the change-over valve in the intermediate position, i.e. with both ways open (locate the control element in the stop position). If a relief valve is removed for checking or replacement please ensure that there is always an active relief valve on each of the change-over valves installed in the unit.

The safety valves must be connected to discharge pipes. These pipes must be installed in a way that ensures that people and property are not exposed to refrigerant leaks. These fluids may be diffused in the air, but far away from any building air intake, or they must be discharged in a quantity that is appropriate for a suitably absorbing environment.

Periodic check of the relief valves: See paragraph 'Maintenance safety considerations'.

Provide a drain in the discharge circuit, close to each relief valve, to avoid an accumulation of condensate or rain water.

Ensure good ventilation, as accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation or explosions.

Inhalation of high concentrations of vapour is harmful and may cause heart irregularities, unconsciousness, or death. Vapour is heavier than air and reduces the amount of oxygen available for breathing. These products cause eye and skin irritation. Decomposition products are hazardous.

1.2 - Equipment and components under pressure

These products incorporate equipment or components under pressure, manufactured by Carrier or other manufacturers. We recommend that you consult your appropriate national trade association or the owner of the equipment or components under pressure (declaration, re-qualification, retesting, etc.). The characteristics of this equipment/these components are given on the nameplate or in the required documentation, supplied with the products.

1.3 - Maintenance safety considerations

Engineers working on the electric or refrigeration components must be authorized, trained and fully qualified to do so.

All refrigerant circuit repairs must be carried out by a trained person, fully qualified to work on these units. He must have been trained and be familiar with the equipment and the installation. All welding operations must be carried out by qualified specialists.

Any manipulation (opening or closing) of a shut-off valve must be carried out by a qualified and authorised engineer. These procedures must be carried out with the unit shut-down.

NOTE: The unit must never be left shut down with the liquid line valve closed, as liquid refrigerant can be trapped between this valve and the expansion device. (This valve is situated on the liquid line before the filter drier box.)

During any handling, maintenance and service operations the engineers working on the unit must be equipped with safety gloves, glasses, shoes and protective clothing.

Never work on a unit that is still energized.

Never work on any of the electrical components, until the general power supply to the unit has been cut using the disconnect switch(es) in the control box(es).

If any maintenance operations are carried out on the unit, lock the power supply circuit in the open position ahead of the machine.

If the work is interrupted, always ensure that all circuits are still deenergized before resuming the work.

ATTENTION: Even if the compressor motors have been switched off, the power circuit remains energized, unless the unit or circuit disconnect switch is open. Refer to the wiring diagram for further details. Attach appropriate safety labels.

Operating checks:

IMPORTANT INFORMATION REGARDING THE REFRIGERANT USED:

- *This product contains fluorinated greenhouse gas covered by the Kyoto protocol.
Refrigerant type: R-134a
Global Warming Potential (GWP): 1300*

Periodic inspections for refrigerant leaks may be required depending on European or local legislation. Please contact your local dealer for more information.

- *During the life-time of the system, inspection and tests must be carried out in accordance with national regulations.*

The information on operating inspections given in annex C of standard EN278-2 can be used if no similar criteria exist in the national regulations.

Safety device checks (annex C6 – EN 378-2):

- *The safety devices must be checked on site once a year for safety devices (high-pressure switches), and every five years for external overpressure devices (safety valves).*
- *Check manual “30GX/30HXC Pro-Dialog Plus control” for a detailed explanation of the high-pressure switch test method.*

If the machine operates in a corrosive environment, inspect the protection devices more frequently.

Regularly carry out leak tests and immediately repair any leaks.

1.4 - Repair safety considerations

All installation parts must be maintained by the personnel in charge, in order to avoid material deterioration and injuries to people. Faults and leaks must be repaired immediately. The authorized technician must have the responsibility to repair the fault immediately. Each time repairs have been carried out to the unit, the operation of the safety devices must be re-checked.

If a leak occurs or if the refrigerant becomes contaminated (e.g. by a short circuit in a motor) remove the complete charge using a recovery unit and store the refrigerant in mobile containers.

Repair the leak detected and recharge the circuit with the total R-134a charge, as indicated on the unit name plate. Certain parts of the circuit can be isolated. If leaks occur in these sections it is possible to top up the refrigerant charge. Refer to chapter 11.2 ‘Refrigerant charging - adding charge’. Only charge liquid refrigerant R-134a at the liquid line.

Ensure that you are using the correct refrigerant type before recharging the unit.

Charging any refrigerant other than the original charge type (R-134a) will impair machine operation and can even lead to a destruction of the compressors. The compressors operating with this refrigerant type are lubricated with a synthetic polyolester oil.

Do not use oxygen to purge lines or to pressurize a machine for any purpose. Oxygen gas reacts violently with oil, grease, and other common substances.

Never exceed the specified maximum operating pressures. Verify the allowable maximum high- and low-side test pressures by checking the instructions in this manual and the pressures given on the unit name plate.

Do not use air for leak testing. Use only refrigerant or dry nitrogen.

Do not unweld or flamecut the refrigerant lines or any refrigerant circuit component until all refrigerant (liquid and vapour) has been removed from chiller. Traces of vapour should be displaced with dry air nitrogen. Refrigerant in contact with an open flame produces toxic gases.

The necessary protection equipment must be available, and appropriate fire extinguishers for the system and the refrigerant type used must be within easy reach.

Do not siphon refrigerant.

Avoid spilling liquid refrigerant on skin or splashing it into the eyes. Use safety goggles. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, immediately and abundantly flush the eyes with water and consult a doctor.

Never apply an open flame or live steam to a refrigerant container. Dangerous overpressure can result. If it is necessary to heat refrigerant, use only warm water.

During refrigerant removal and storage operations follow applicable regulations. These regulations, permitting conditioning and recovery of halogenated hydrocarbons under optimum quality conditions for the products and optimum safety conditions for people, property and the environment are described in standard NFE 29795.

Any refrigerant transfer and recovery operations must be carried out using a transfer unit. A 3/8" SAE connector on the manual liquid line valve is supplied with all units for connection to the transfer station. The units must never be modified to add refrigerant and oil charging, removal and purging devices. All these devices are provided with the units. Please refer to the certified dimensional drawings for the units.

Do not re-use disposable (non-returnable) cylinders or attempt to refill them. It is dangerous and illegal. When cylinders are empty, evacuate the remaining gas pressure, and move the cylinders to a place designated for their recovery. Do not incinerate.

Do not attempt to remove refrigerant circuit components or fittings, while the machine is under pressure or while it is running. Be sure pressure is at 0 kPa before removing components or opening a circuit.

Do not attempt to repair or recondition any safety devices when corrosion or build-up of foreign material (rust, dirt, scale, etc.) is found within the valve body or mechanism. If necessary, replace the device. Do not install safety valves in series or backwards.

ATTENTION: No part of the unit must be used as a walk-way, rack or support. Periodically check and repair or if necessary replace any component or piping that shows signs of damage.

The refrigerant lines can break under the weight and release refrigerant, causing personal injury.

Do not climb on a machine. Use a platform, or staging to work at higher levels.

Use mechanical lifting equipment (crane, hoist, winch, etc.) to lift or move heavy components. For lighter components, use lifting equipment when there is a risk of slipping or losing your balance.

Use only original replacement parts for any repair or component replacement.

Consult the list of replacement parts that corresponds to the specification of the original equipment.

Do not drain water circuits containing industrial brines, without informing the technical service department at the installation site or a competent body first.

Close the entering and leaving water shutoff valves and purge the unit water circuit, before working on the components installed on the circuit (screen filter, pump, water flow switch, etc.).

Do not loosen the water box bolts until the water boxes have been completely drained.

Periodically inspect all valves, fittings and pipes of the refrigerant and hydronic circuits to ensure that they do not show any corrosion or any signs of leaks.

2 - PRELIMINARY CHECKS

2.1 - Check equipment received

- Inspect the unit for damage or missing parts. If damage is detected, or if shipment is incomplete, immediately file a claim with the shipping company.
- Confirm that the unit received is the one ordered. Compare the name plate data with the order.
- The unit name plate must include the following information:
 - Version number
 - Model number
 - CE marking
 - Serial number
 - Year of manufacture and test date
 - Refrigerant used and refrigerant class
 - Refrigerant charge per circuit
 - Containment fluid to be used
 - PS: Min./max. allowable pressure (high and low pressure side)
 - TS: Min./max. allowable temperature (high and low pressure side)
 - Relief valve set pressure
 - Pressure switch cut-out pressure
 - Unit leak test pressure
 - Voltage, frequency, number of phases
 - Maximum current drawn
 - Maximum power input
 - Unit net weight
- Confirm that all accessories ordered for on-site installation have been delivered, and are complete and undamaged.
- Do not keep the 30HXC units outside where they are exposed to the weather, as the sensitive control mechanism and the electronic modules may be damaged.

The unit must be checked periodically during its whole operating life to ensure that no shocks (handling accessories, tools etc.) have damaged it. If necessary, the damaged parts must be repaired or replaced. See also chapter "Maintenance".

2.2 - Moving and siting the unit

2.2.1 - Moving

See chapter 1.1 “Installation safety considerations”.

2.2.2 - Siting the unit

Always refer to the chapter “Dimensions and clearances” to confirm that there is adequate space for all connections and service operations. For the centre of gravity coordinates, the position of the unit mounting holes, and the weight distribution points, refer to the certified dimensional drawing supplied with the unit.

Typical applications of these units are in refrigeration systems, and they do not require earthquake resistance. Earthquake resistance has not been verified.

CAUTION: *Only use slings at the designated lifting points which are marked on the unit.*

Before siting the unit check that:

- the permitted loading at the site is adequate or that appropriate strengthening measures have been taken.
- the unit is installed level on an even surface (maximum tolerance is 5 mm in both axes).
- there is adequate space above the unit for air flow and to ensure access to the components.
- the number of support points is adequate and that they are in the right places.
- the location is not subject to flooding.
- for outdoor installations, where heavy snowfall is likely and long periods of sub-zero temperatures are normal, provision has to be made to prevent snow accumulating by raising the unit above the height of drifts normally experienced. Baffles may be necessary to deflect strong winds. They must not restrict air flow into the unit.

CAUTION: *Before lifting the unit, check that all casing panels are securely fixed in place. Lift and set down the unit with great care. Tilting and jarring can damage the unit and impair unit operation.*

If 30GX units are hoisted with rigging, it is advisable to protect coils against crushing while a unit is being moved. Use struts or spreader bars to spread the slings above the unit. Do not tilt a unit more than 15°.

WARNING: *Never push or lever on any of the enclosure panels of the unit. Only the base of the unit frame is designed to withstand such stresses.*

Checks before system start-up

Before the start-up of the refrigeration system, the complete installation, including the refrigeration system must be verified against the installation drawings, dimensional drawings, system piping and instrumentation diagrams and the wiring diagrams.

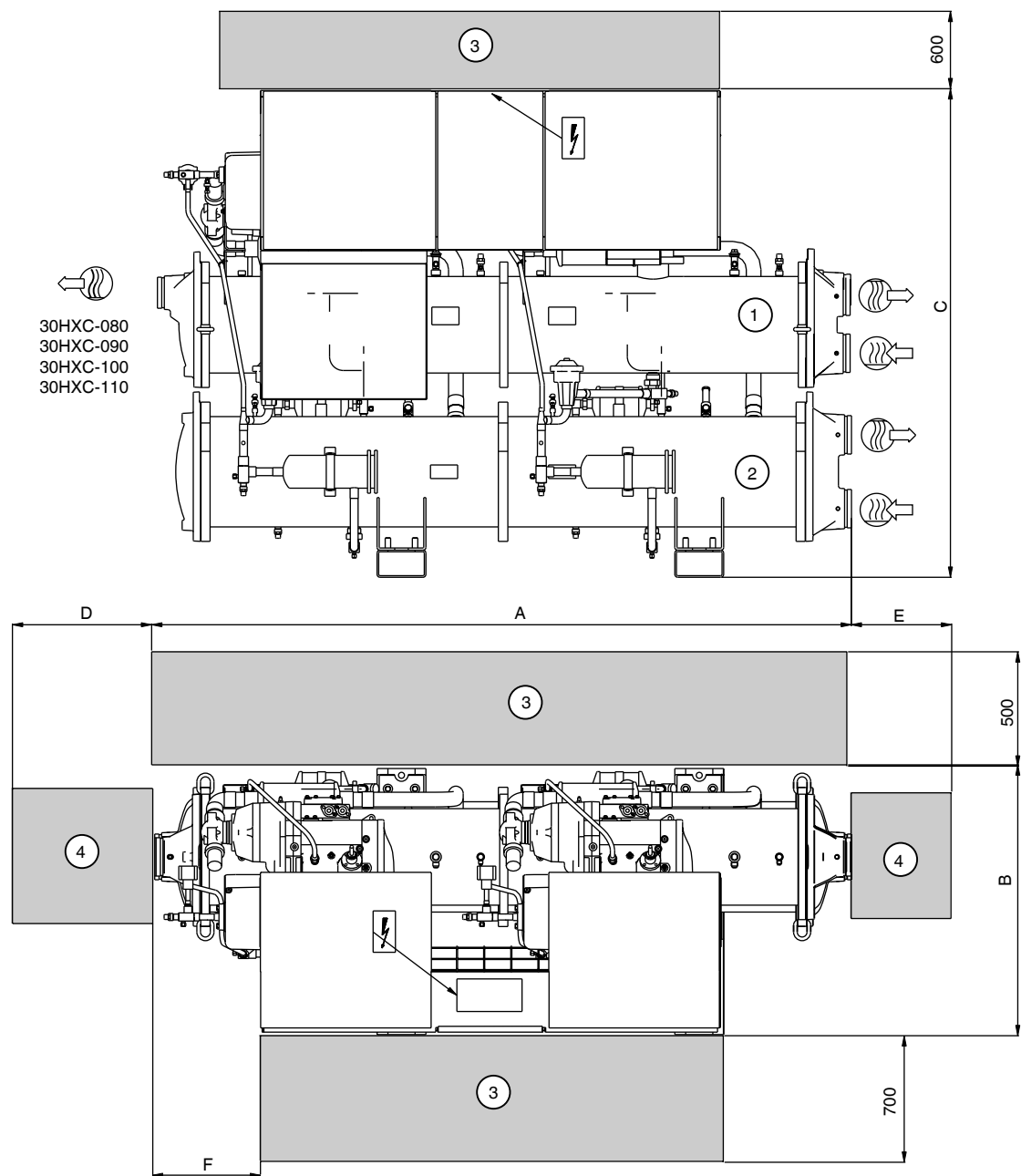
During the installation test national regulations must be followed. If no national regulation exists, paragraph 9-5 of standard EN 378-2 can be used as a guide.

External visual installation checks:

- Compare the complete installation with the refrigeration system and power circuit diagrams.
- Check that all components comply with the design specifications.
- Check that all safety documents and equipments that are required by current European standards are present.
- Verify that all safety and environmental protection devices and arrangements are in place and comply with the current European standard.
- Verify that all relevant documents for pressure vessels (certificates, name plates, files, instruction manuals etc.) required by the current European standards are present.
- Verify the free passage of access and safety routes.
- Check that ventilation in the plant room is adequate.
- Check that refrigerant detectors are present.
- Verify the instructions and directives to prevent the deliberate removal of refrigerant gases that are harmful to the environment.
- Verify the installation of connections.
- Verify the supports and fixing elements (materials, routing and connection).
- Verify the quality of welds and other joints.
- Check the protection against mechanical damage.
- Check the protection against heat.
- Check the protection of moving parts.
- Verify the accessibility for maintenance or repair and to check the piping.
- Verify the status of the valves.
- Verify the quality of the thermal insulation and of the vapour barriers.

3 - DIMENSIONS, CLEARANCES, WEIGHT DISTRIBUTION

3.1 - 30HXC 080-190



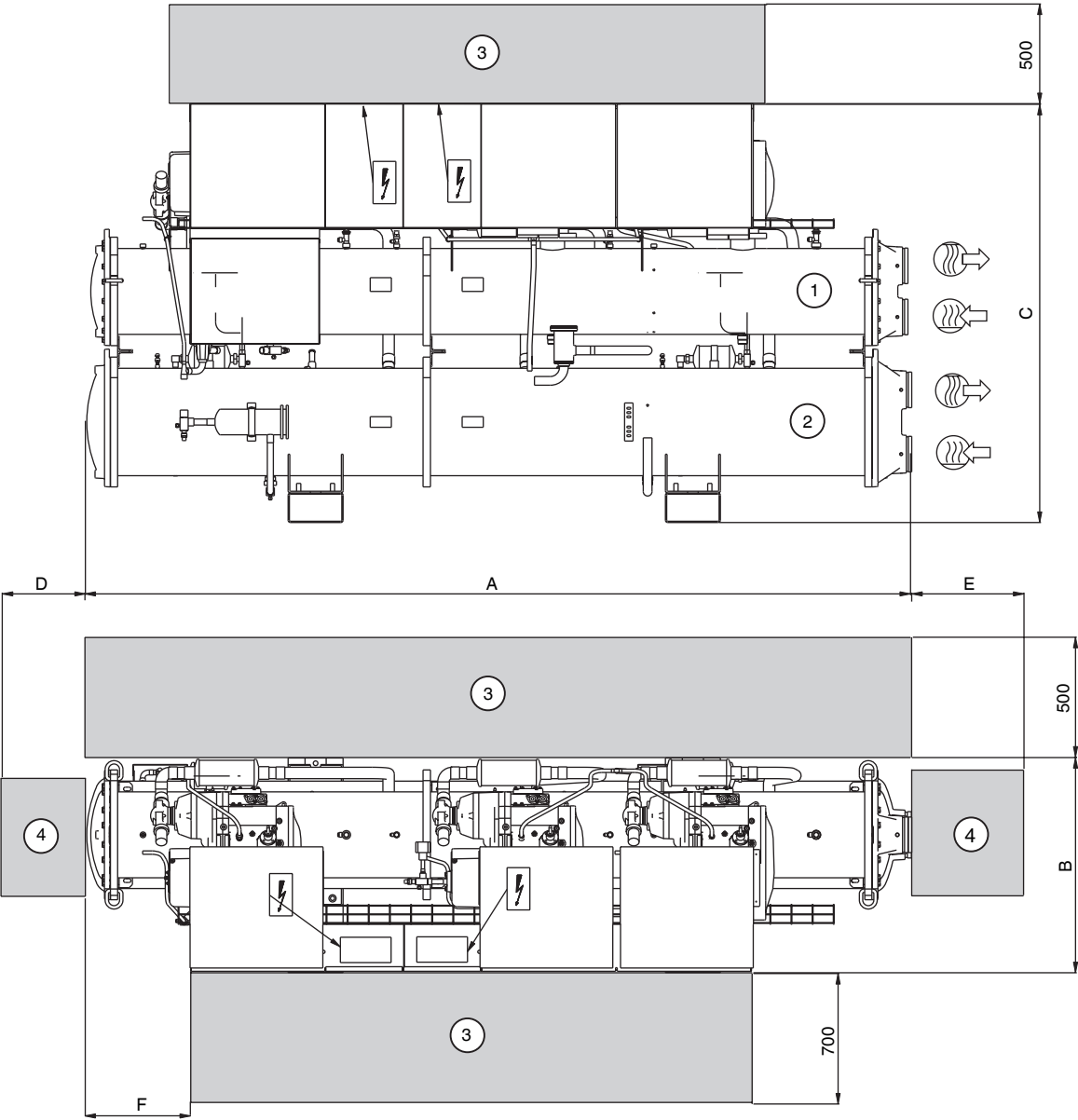
Legend
All dimensions are in mm.

① Evaporator
② Condenser
③ Clearances required for operation and maintenance
④ Clearances required for heat exchanger tube removal. Clearances D and E can be either on the left or on the right hand side.

- Water inlet
Water outlet
Power supply




30HXC	A	B	C	D	E	F
080-090-100	2558	980	1800	2200	1000	385
110	2565	980	1850	2200	1000	385
120-130-140-155	3275	980	1816	2990	1000	689
175-190	3275	980	1940	2990	1000	689

NOTE: Refer to the certified dimensional drawings supplied with the unit, when designing an installation.



Legend

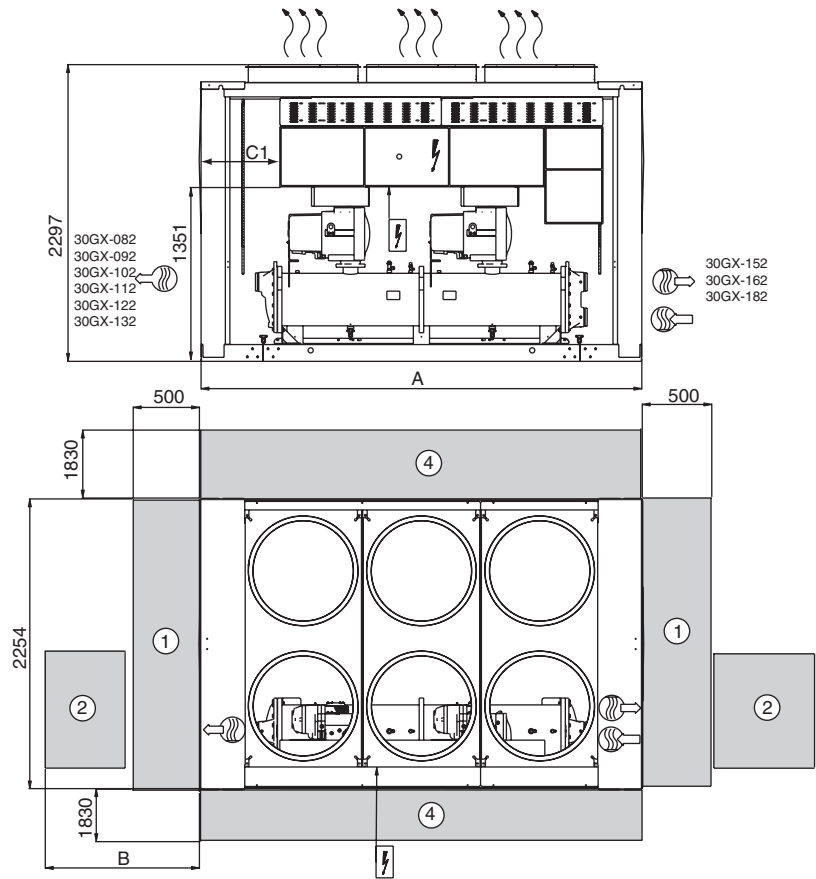
All dimensions are in mm.

- ① Evaporator
- ② Condenser
- ③ Clearances required for operation and maintenance
- ④ Clearances required for heat exchanger tube removal. Clearances D and E can be either on the left or on the right hand side.
-  Water inlet
-  Water outlet
-  Power supply

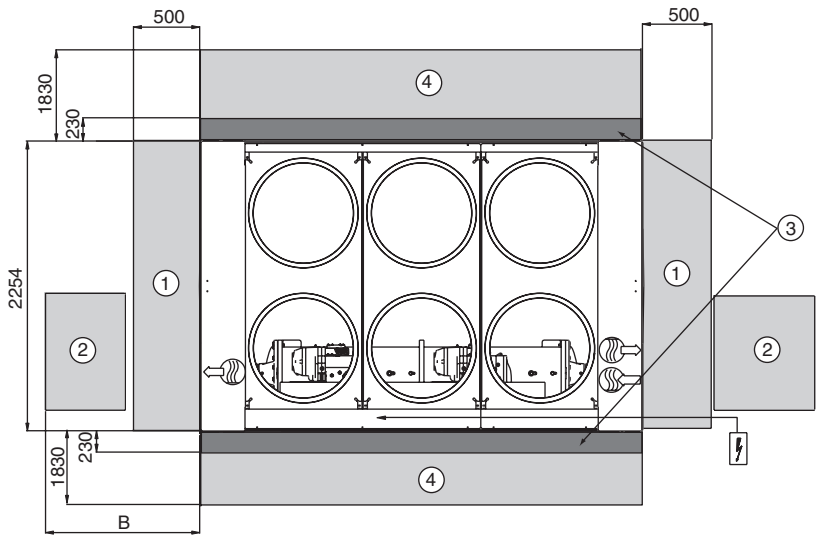
30HXC	A	B	C	D	E	F
200	3903	1015	1980	3600	1000	489
230-260-285	3924	1015	2060	3600	1000	489
310-345-375	4533	1015	2112	4200	1000	503

NOTE: Refer to the certified dimensional drawings supplied with the unit, when designing an installation.

Standard units



Units with low and very low noise levels



Legend

All dimensions are in mm.

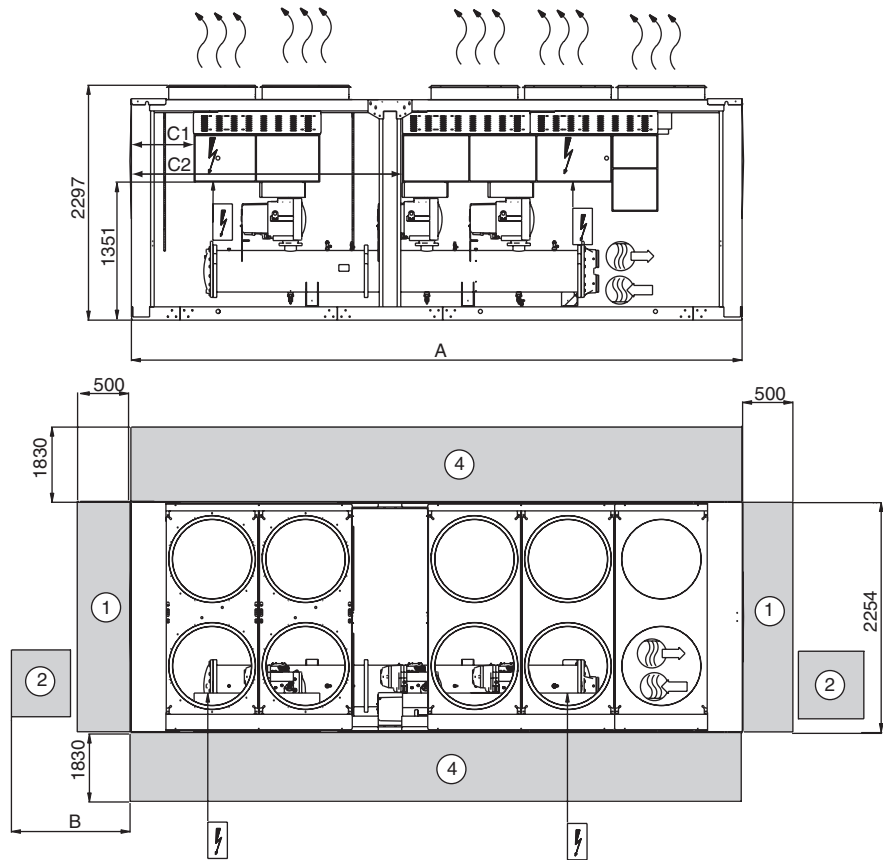
- ① Clearances required for operation and maintenance
- ② Clearances required for tube removal
- ③ Thickness of sound absorption kit
- ④ Clearances required for maintenance and air flow
- Water inlet
- Water outlet
- Power supply
- Air outlet - do not obstruct

30GX	A	B	C1
082-092-102	2967	1900	414
112-122-132	3425	1700	617
152-162	4340	2400	1151
182	5994	1850	2226

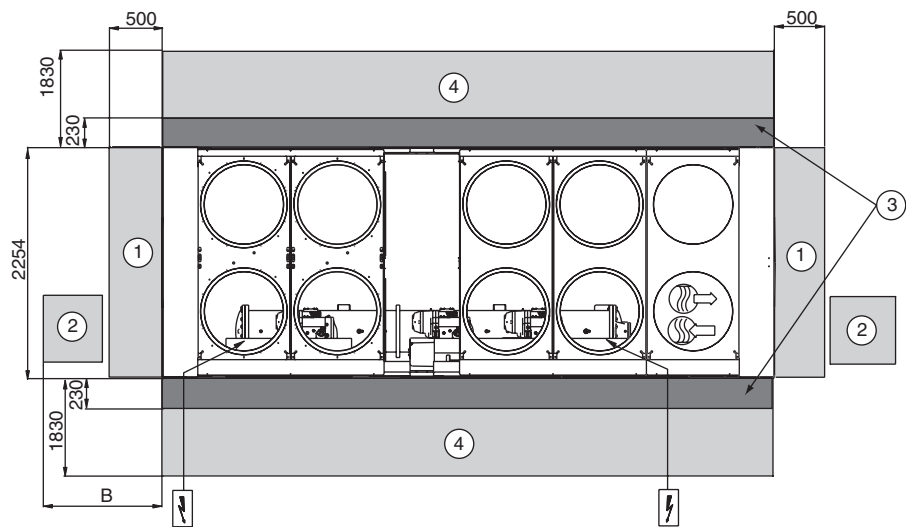
NOTE: Refer to the certified dimensional drawings supplied with the unit, when designing an installation.

3.4 - 30GX 207-358

Standard units



Units with low and very low noise levels



Legend

All dimensions are in mm.

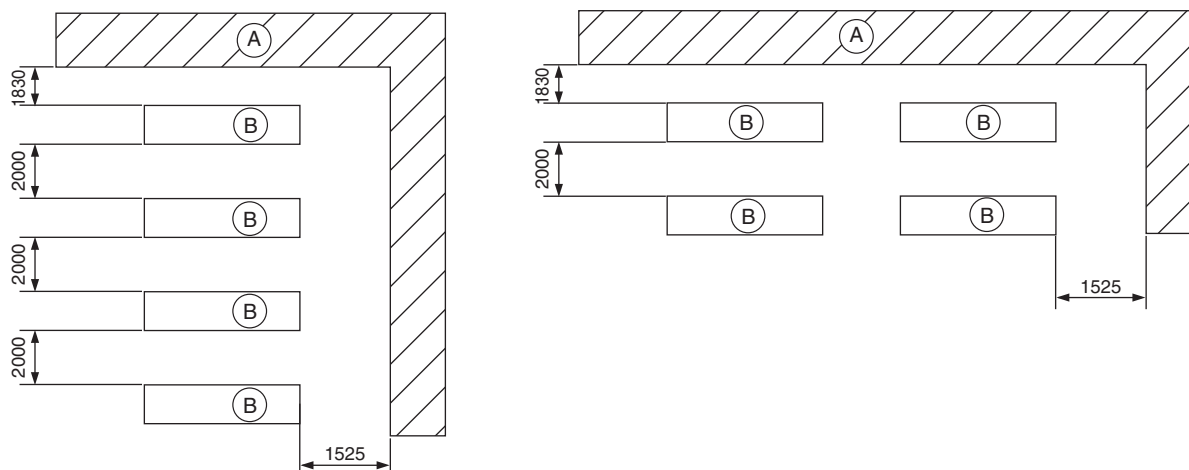
- ① Clearances required for operation and maintenance
- ② Clearances required for tube removal
- ③ Thickness of sound absorption kit
- ④ Clearances required for maintenance and air flow
- Water inlet
- Water outlet
- Power supply
- Air outlet - do not obstruct

30GX	A	B	C1	C2
207-227	5994	2850	621	2662
247-267	6909	2850	621	2662
298	7824	2050	1036	3578
328-358	8739	1150	1951	4493

NOTE: Refer to the certified dimensional drawings supplied with the unit, when designing an installation.

3.5 - Multiple chiller installation

NOTE: If the walls are higher than 2 m, contact the factory.



Legend

A Wall
B Units

Notes

Unit must have clearances for air flow as follows:

Top: do not restrict in any way

In case of multiple chillers (up to four units), the respective clearance between them should be increased from 1830 to 2000 mm for the side space requirement.

If necessary, add the required clearances for evaporator tube removal.

4 - PHYSICAL AND ELECTRICAL DATA FOR 30HXC UNITS

4.1 - Physical data 30HXC

30HXC		080	090	100	110	120	130	140	155	175	190	200	230	260	285	310	345	375
Cooling capacity*	kW	286	312	348	374	412	449	509	541	598	651	699	812	897	985	1106	1204	1300
Operating weight	kg	2274	2279	2302	2343	2615	2617	2702	2712	3083	3179	3873	4602	4656	4776	5477	5553	5721
Refrigerant charge**	kg	HFC-134a																
Circuit A**		33	33	32	31	49	51	48	51	54	56	92	115	117	117	109	104	119
Circuit B**		34	34	30	35	52	47	48	50	50	59	54	63	75	75	106	102	137
Oil***		Polyolester oil CARRIER SPEC. PP 47-32																
Circuit A/B	l	17/17	17/17	17/17	17/17	17/17	17/17	17/17	17/17	17/17	17/17	30/17	30/17	30/17	30/17	34/34	34/34	34/34
Compressors†		Semi-hermetic, twin-screw																
Size - Circuit A†		39	46	46	56	56	66	80	80	80	80+	66/56	80/56	80/80	80+/80+	80/66	80/80	80+/80+
Size - Circuit B†		39	39	46	46	56	56	56	66	80	80+	66	80	80	80+	80/66	80/80	80+/80+
Capacity control		PRO-DIALOG Plus control																
No. of control steps		6	6	6	6	6	6	6	6	6	6	8	8	8	8	10	10	10
Minimum step capacity	%	19	19	21	19	21	19	17	19	21	21	14	14	14	14	10	10	10
Evaporator		Shell and tube with internally finned copper tubes																
Net water volume	l	50	50	58	69	65	65	75	75	88	88	126	155	170	170	191	208	208
Water connections		Victaulic connections																
Inlet/outlet	in	4	4	4	5	5	5	5	5	5	5	6	6	6	6	8	8	8
Drain and vent (NPT)	in	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Max. water side operating pressure	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Condenser		Shell and tube with internally finned copper tubes																
Net water volume	l	48	48	48	48	78	78	90	90	108	108	141	190	190	190	255	255	255
Water connections		Victaulic connections																
Inlet/outlet	in	5	5	5	5	5	5	5	5	6	6	6	8	8	8	8	8	8
Drain and vent (NPT)	in	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Max. water side operating pressure	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

* Standard Eurovent conditions: Evaporator entering/leaving water temperature 12°C and 7°C. Condenser entering/leaving water temperature 30°C/35°C. Evaporator and condenser fouling factor = 0.000044 m² K/W.

** The weights shown are guidelines only. For the unit refrigerant charge please refer to the unit nameplate.

*** For options 150 and 150A the units are supplied with an additional charge of 3 litres per compressor.

† Nominal size per compressor. The compressor size is the same as its nominal cooling capacity in tons of refrigeration (1 ton = 3.517 kW).

4.2 - Electrical data 30HXC

30HXC		080	090	100	110	120	130	140	155	175	190	200	230	260	285	310	345	375
Power circuit																		
Nominal power supply (Un)*	V-ph-Hz	400-3-50																
Voltage range	V	360-440																
Control circuit supply		The control circuit is supplied via the factory-installed transformer																
Nominal power input*	kW	53	62	67	76	80	89	102	112	121	129	140	164	192	195	221	250	263
Nominal current drawn*	A	101	115	127	143	149	168	190	207	226	234	255	294	337	354	399	448	477
Max. power input**	kW	87	97	108	119	131	144	161	175	192	212	223	257	288	318	350	384	424
Circuit A	kW	-	-	-	-	-	-	-	-	-	-	144	161	192	212	175	192	212
Circuit B	kW	-	-	-	-	-	-	-	-	-	-	79	96	96	106	175	192	212
Cosine phi, unit at full load		0.88	0.88	0.88	0.88	0.89	0.88	0.88	0.89	0.89	0.89	0.88	0.89	0.89	0.89	0.89	0.89	0.89
Max. current drawn (Un - 10%)***	A	158	176	195	215	235	259	289	314	344	379	401	461	517	568	628	688	758
Circuit A***	A	-	-	-	-	-	-	-	-	-	-	259	289	344	379	314	344	379
Circuit B***	A	-	-	-	-	-	-	-	-	-	-	142	172	172	189	314	344	379
Maximum current drawn (Un)***	A	143	160	177	195	213	236	263	285	312	344	365	419	468	516	570	624	688
Circuit A***	A	-	-	-	-	-	-	-	-	-	-	236	263	312	344	285	312	344
Circuit B***	A	-	-	-	-	-	-	-	-	-	-	129	156	156	172	285	312	344
Maximum starting current, standard unit (Un)****	A	181	206	223	249	267	298	333	355	382	442	841	978	1027	1200	1129	1184	1373
Circuit A***	A	-	-	-	-	-	-	-	-	-	-	712	822	871	1028	844	871	1028
Circuit B***	A	-	-	-	-	-	-	-	-	-	-	605	715	715	856	844	871	1028
Max. starting current/max. current draw ratio, unit		1.26	1.28	1.26	1.27	1.25	1.26	1.27	1.24	1.22	1.28	2.31	2.33	2.19	2.32	1.98	1.89	1.99
Max. starting current/max. current draw ratio, circuit A		-	-	-	-	-	-	-	-	-	-	3.02	3.13	2.79	2.99	2.96	2.79	2.99
Max. starting current/max. current draw ratio, circuit B		-	-	-	-	-	-	-	-	-	-	4.70	4.58	4.58	4.97	2.96	2.79	2.99
Max. starting current - reduced current start (Un) ****	A	std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	636	683	732	824	834	889	997
Circuit A	A	std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	507	527	576	652	549	576	652
Circuit B	A	std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	330	370	370	385	549	576	652
Max. starting current - red. current start/max. current draw ratio, unit		std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	1.74	1.63	1.56	1.60	1.46	1.42	1.45
Circuit A		std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	2.15	2.00	1.84	1.89	1.93	1.84	1.98
Circuit B		std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	2.56	2.37	2.37	2.24	1.93	1.84	1.89
Three-phase short circuit holding current	kA	25	25	25	25	25	25	25	25	25	25	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Circuit A	kA	-	-	-	-	-	-	-	-	-	-	25	25	25	25	25	25	25
Circuit B	kA	-	-	-	-	-	-	-	-	-	-	15	15	15	15	25	25	25
Customer standby capacity, unit or circuit B, for evaporator water pump connections†	kW	8	8	8	11	11	11	15	15	15	15	15	18	18	30	30	30	30

* Standard Eurovent conditions: Evaporator entering/leaving water temperature 12°C and 7°C. Condenser entering/leaving water temperature 30°C/35°C.

** Power input, compressor, at unit operating limits (evaporator water entering/leaving temperature = 15°C/10°C, condenser entering/leaving water temperature = 45°C/50°C) and a nominal voltage of 400 V (data given on the unit name plate).

*** Maximum unit operating current at maximum unit power input.

**** Maximum instantaneous starting current (maximum operating current of the smallest compressor(s) + locked rotor current or reduced starting current of the largest compressor)

† Current and power inputs not included in the values above.

N/A Not applicable.

4.3 - Electrical data, 30HXC compressors

Reference	Size	I nom.	MHA	LRA	LRA (Y)	LRA (S) 1 cp	LRA (S) 2 cp
06NW2146S7N	39	50	79	344	109	NA	NA
06NW2174S7N	46	60	97	423	134	NA	NA
06NW2209S7N	56	71	117	506	160	260	350
06NW2250S7N	66	86	142	605	191	330	400
06NW2300S5N	80	105	172	715	226	370	420
06NW2300S5E	80+	114	189	856	270	385	480

Legend

- 06NW - Compressor for water-cooled units
- N - Non-economized compressor
- E - Economized compressor
- I nom. - Average current draw of the compressor at Eurovent conditions (A)
- MHA - Must hold amperes (maximum operating current) at 360 V (A)
- LRA - Locked rotor current with across-the-line start (A)
- LRA (Y) - Locked rotor current at reduced current (star/delta start-up mode) (A)
- LRA (S) 1 cp. - Start-up with reduced current (A) with electronic starter (start-up duration 3 seconds max.) for one compressor per circuit
- LRA (S) 2 cp. - Start-up with reduced current (A) with electronic starter (start-up duration 3 seconds max.) for two compressors per circuit

4.4 - Electrical data for 30HXC units with high condensing temperatures (option 150/150A)

30HXC		080	090	100	110	120	130	140	155	175	190	200	230	260	285	310	345	375
Power circuit																		
Nominal power supply (Un)*	V-ph-Hz	400-3-50																
Voltage range	V	360-440																
Control circuit supply		The control circuit is supplied via the factory-installed transformer																
Max. power input*	kW	108	122	136	149	163	180	196	213	229	287	278	310	343	431	426	458	574
Circuit A	kW	-	-	-	-	-	-	-	-	-	-	180	196	229	287	213	229	287
Circuit B	kW	-	-	-	-	-	-	-	-	-	-	98	114	114	144	213	229	287
Max. current drawn (Un - 10%)**	A	198	223	247	271	295	325	355	385	415	516	502	562	622	774	770	830	1032
Circuit A	A	-	-	-	-	-	-	-	-	-	-	325	355	415	516	385	415	516
Circuit B	A	-	-	-	-	-	-	-	-	-	-	177	207	207	258	385	415	516
Maximum current drawn (Un)**	A	180	203	225	246	268	295	323	350	377	469	456	512	566	704	700	754	938
Circuit A	A	-	-	-	-	-	-	-	-	-	-	295	323	377	469	350	377	469
Circuit B	A	-	-	-	-	-	-	-	-	-	-	161	189	189	235	350	377	469
Maximum starting current, standard unit (Un)***	A	281	316	338	382	404	437	521	548	576	635	1255	1549	1603	1734	1737	1792	1969
Circuit A***	A	-	-	-	-	-	-	-	-	-	-	1094	1360	1415	1500	1387	1415	1500
Circuit B***	A	-	-	-	-	-	-	-	-	-	-	960	1226	1226	1265	1387	1415	1500
Max. starting current/max. current draw ratio, unit		1.56	1.56	1.51	1.55	1.51	1.48	1.62	1.57	1.53	1.35	2.75	3.03	2.83	2.46	2.48	2.38	2.10
Max. starting current/max. current draw ratio, circuit A		-	-	-	-	-	-	-	-	-	-	3.71	4.22	3.75	3.19	3.97	3.75	3.19
Max. starting current/max. current draw ratio, circuit B		-	-	-	-	-	-	-	-	-	-	5.96	6.50	6.50	5.39	3.97	3.75	3.19
Max. starting current - reduced current start (Un)***	A	std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	870	933	987	1129	1121	1176	1364
Circuit A	A	std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	709	744	799	895	771	799	895
Circuit B	A	std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	435	490	490	510	771	799	895
Max. starting current - red. current start/max. current draw ratio, unit		std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	1.91	1.82	1.75	1.60	1.60	1.56	1.45
Circuit A		std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	2.40	2.31	2.12	1.91	2.21	2.12	1.91
Circuit B		std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	2.70	2.60	2.60	2.17	2.21	2.12	1.91
Three-phase short circuit holding current	kA	25	25	25	25	25	25	25	25	25	25	25	N/A	N/A	N/A	N/A	N/A	N/A
N/A																		
Circuit A	kA	-	-	-	-	-	-	-	-	-	-	25	25	25	25	25	25	25
Circuit B	kA	-	-	-	-	-	-	-	-	-	-	15	15	15	15	25	25	25
Customer standby capacity, unit or circuit B, for evaporator water pump connections†	kW	8	8	8	11	11	11	15	15	15	15	15	18	18	30	30	30	30

* Power input, compressor, at unit operating limits (evaporator water entering/leaving temperature = 15°C/10°C, condensing temperature = 68°C) and a nominal voltage of 400 V (data given on the unit name plate).

** Maximum unit operating current at maximum unit power input.

*** Maximum instantaneous starting current (maximum operating current of the smallest compressor(s) + locked rotor current or reduced starting current of the largest compressor)

† Current and power inputs not included in the values above

N/A Not applicable

The 30HXC 080-375 units for high condensing temperatures are directly derived from the standard models. Their application range is the same as that of the standard units, but permits operation at condenser leaving water temperatures up to 63°C. The PRO-DIALOG control offers all the advantages of the standard units, plus control of the condenser leaving water temperature.

The main modifications are:

- Use of 30GX compressors (example: 06NA2300S5N instead of 06NW 2300S5N).
- Modification of electrical components to operate with compressors for high condensing temperatures.
- Modification of heat exchangers to meet pressure code requirements (if necessary).

Option 150

These units are designed for traditional applications for water-cooled units, but for higher condenser leaving water temperatures than 50°C.

Like the standard units they are equipped with condenser entering and leaving water sensors.

It is possible to control the machine at the condenser water outlet, requiring a factory configuration change and the use of a heating/cooling inlet reversing device.

Option 150A

These units are designed for water-to-water heat pumps.

They are factory configured as heat pumps (heating/cooling control as a function of the remote reversing device). The condenser incorporates thermal insulation that is identical to that of the evaporator.

Technical information

All information is identical to that of the standard 30HXC units, except for the following paragraphs.

Selection

There are no nominal conditions for this unit type. The selection is made using the current electronic catalogue.

Dimensions

These are identical to those of the standard 30HXC units. The only difference is in the diameter of the incoming field wiring connection, described in the chapter "Recommended selection". Refer to the dimensional drawings for these units, before proceeding with the wiring.

Compressor

See table in chapter 5.3.

Options and accessories

All options available for the standard 30HXC units are compatible, except low-temperature option 5 for the evaporator available in the special unit.

ATTENTION: *If units have two different operating modes - one with high condensing temperature and the other with low condensing temperature - and the transition is made with the unit in operation, the temperature must not vary by more than 3 K per minute. In cases where this is not possible, it is recommended to go through a unit start/stop switch (remote start/stop available for standard units).*

4.5 - Unit characteristics for 30HXC units with very low temperature option (option 6)

The 30HXC units with the very low temperature option are directly derived from the 30HXC models equipped with the high condensing temperature option (option 150). Unit sizes available with the very low temperature option are the following: 30HXC 090, 110, 130, 155, 175, 200, 230, 260, 310, 345.

Their application range allows the production of glycol/water solution down to -10°C with ethylene glycol at 35% (by weight) or down to -7°C with propylene glycol at 30% (by weight). The precision of these amounts is critical for correct unit operation.

In addition to the ones already listed for the high condensing temperature option (see chapter 4.4) the main modifications are:

- the evaporator is equipped with reinforced thermal 38 mm insulation,
- the electronic expansion valves are changed,
- the use of a wide-band oil differential sensor.

All technical data is the same as for the 30HXC units with option 150 except for the following chapters:

4.5.1 - Options and accessories

The options available for the 30HXC units equipped with the very low temperature option are as follows: 20, 22, 60, 61, 84, 84D, 84R, 92, 104A, 107, 107A, 152, 193, 194, 197, 199.

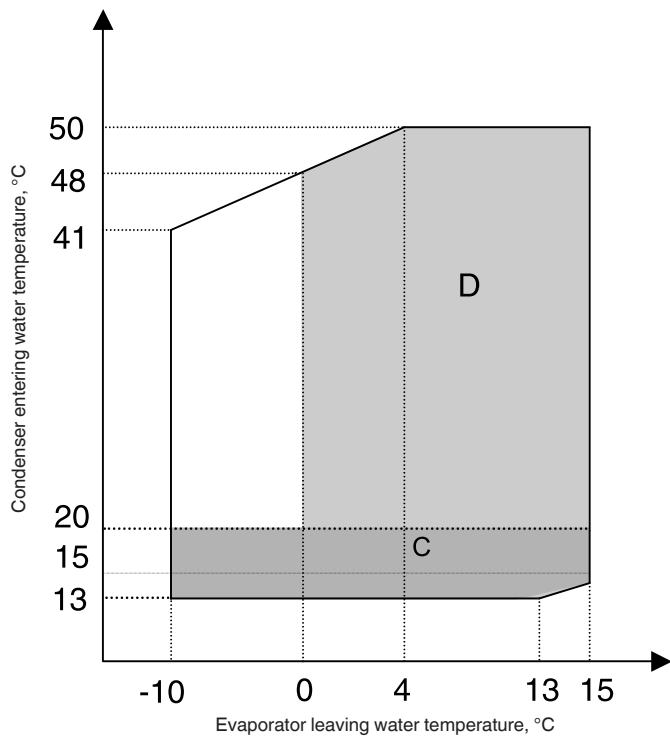
4.5.2 - Operating range, 30HXC units with very low temperature option

30HXC evaporator with 35% ethylene glycol	°C	Minimum	Maximum
Evaporator entering water temperature	-7.2	21	
Evaporator leaving water temperature	-10	15	
30HXC evaporator with 30% polypropylene glycol			
Evaporator entering water temperature	-4.2	21	
Evaporator leaving water temperature	-7	15	
30HXC condenser			
Condenser entering water temperature	20	50	
Condenser leaving water temperature	25	55	
Outdoor air temperature	6	40	

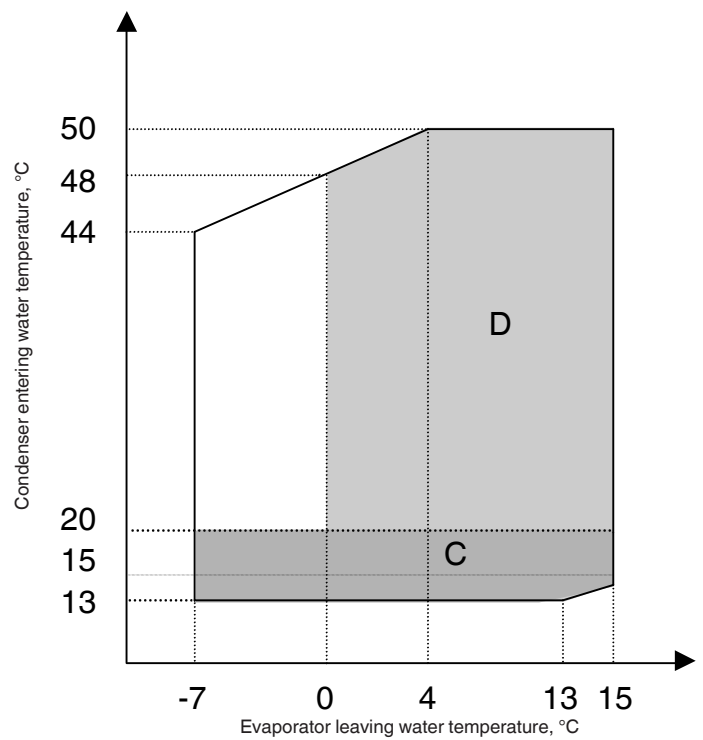
For very low temperature applications the anti-freeze solution is critical for correct unit operation. The following amounts (by weight) are required:

Evaporator leaving water, °C	Ethylene glycol, %	Propylene glycol, %
-6	25	27
-7	28	30
-8	30	NA
-9	33	NA
-10	35	NA

Operating range 35% ethylene glycol



Operating range 30% propylene glycol



- Notes**
1. Evaporator $\Delta T = 4 \text{ K}$ max. - condenser $\Delta T = 5 \text{ K}$
 2. Operating range applicable for full and reduced load
 3. At full load with a condenser entering water temperature below 20°C , a three-way valve must be used to maintain the correct condensing temperature.

- Legend**
- C Unit operating with a condensing pressure control with an analogue water control valve.
For transient operating modes (start-up and part load), the unit can operate down to a condenser water temperature of 13°C .
- D Operation permitted, but performances is not optimized

4.5.3 - Evaporator water flow (l/s) for 35% ethylene glycol

30HXC	Min.* (closed loop)	Max.**
090	8.0	15.7
110	10.6	21.3
130	12.4	25.1
155	14.5	28.1
175	15.6	33.0
200	20.5	38.0
230	21.0	39.7
260	24.1	48.3
310	29.6	62.0
345	30.2	63.0

* Based on a Reynolds number of 4000

** Based on a water velocity of 3.6 m/s

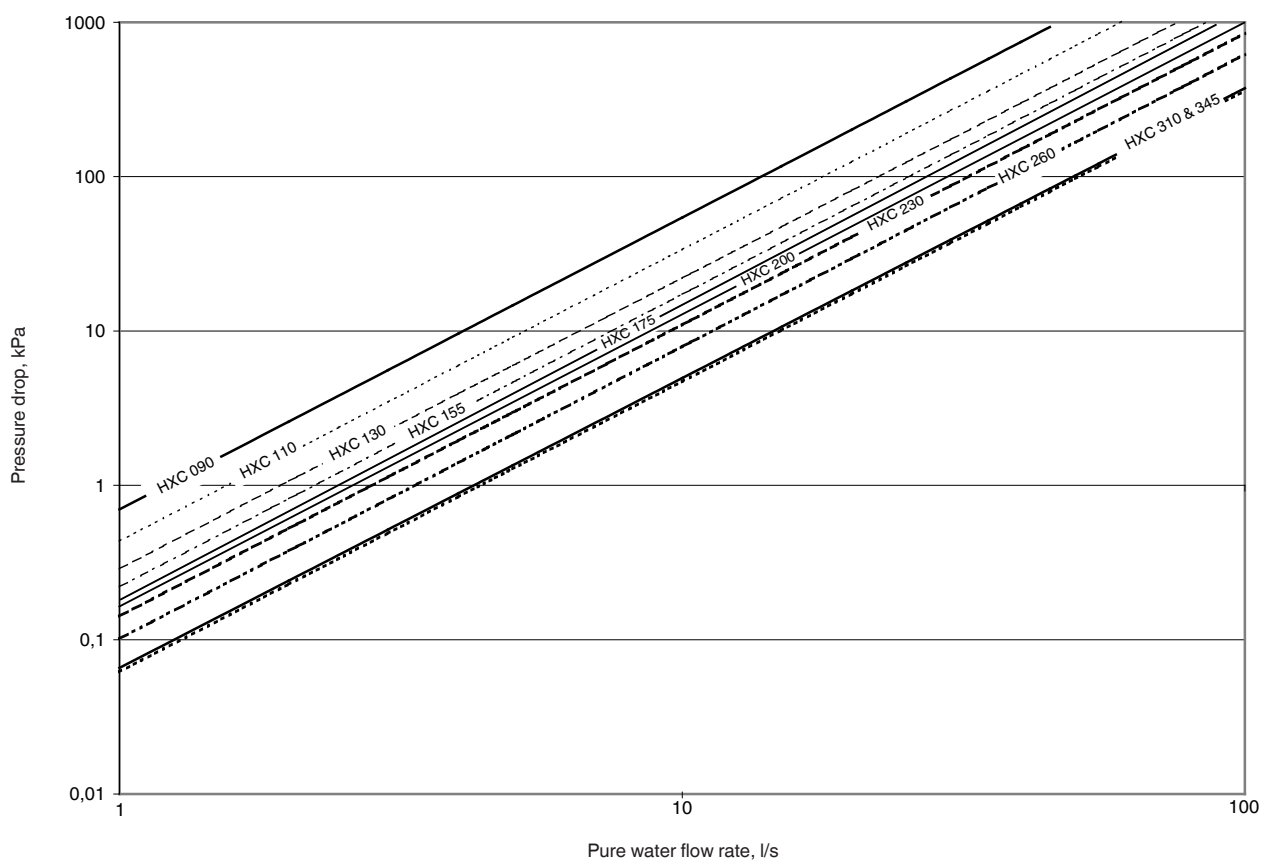
Evaporator water flow (l/s) for 30% propylene glycol

30HXC	Min.* (closed loop)	Max.**
090	11.1	15.7
110	14.2	21.3
130	16.7	25.1
155	19.1	28.1
175	21.1	33.0
200	25.1	38.0
230	27.4	39.7
260	32.3	48.3
310	40.0	62.0
345	40.6	63.0

4.5.4 - Evaporator pressure drop curve, units for very low temperature

The evaporator is equipped with heat insulation of 38 mm thick polyurethane foam.

Cooler pressure drop, 30HXC low-brine version



5 - PHYSICAL AND ELECTRICAL DATA FOR UNITS 30GX

5.1 - Physical data 30GX

30GX		082	092	102	112	122	132	152	162	182	207	227	247	267	298	328	358
Net nominal cooling capacity*	kW	282	305	329	384	412	443	500	549	599	705	751	809	916	990	1116	1203
Net nominal cooling capacity*																	
Option 15LN*	kW	277	299	322	377	404	434	490	518	588	677	744	801	907	980	1083	1191
Operating weight	kg	3066	3097	3106	3350	3364	3378	3767	3783	4725	5520	5535	6121	6293	7339	7779	7950
Operating weight - option 15LN	kg	3566	3597	3606	3922	3936	3950	4443	4459	5653	6462	6477	7191	7363	8521	9011	9268
Refrigerant charge**	kg	HFC-134a															
Circuit A**		52	55	51	51	56	54	71	71	86	124	124	154	169	163	156	169
Circuit B**		53	48	51	50	54	52	66	72	90	81	81	88	104	148	157	167
Oil		Polyolester oil CARRIER SPEC. PP 47-32															
Circuit A	l	20	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40
Circuit B	l	20	20	20	20	20	20	20	20	20	20	20	20	20	40	40	40
Compressors		Semi-hermetic, twin-screw															
Circ. A - nom. size per compressor**		46	46	56	56	66	66	80	80	80+	66/56	80/66	80/80	80+/80+	80/80	80/80	80+/80+
Circ. B. nom. size per compressor**		39	46	46	56	56	66	80	80	80+	80	80	80	80+	66/66	80/80	80+/80+
Capacity control		PRO-DIALOG Plus control															
No. of control steps		6	6	6	6	6	6	6	6	6	8	8	8	8	10	10	10
Minimum step capacity	%	19	21	19	21	19	21	19	21	21	16	14	14	14	9	10	10
Evaporator		Shell and tube with internally finned copper tubes															
Net water volume	l	50	58	58	69	69	73	65	65	88	126	126	155	170	191	208	208
Water connections		Victaulic connections															
Inlet/outlet	in	4	4	4	5	5	5	5	5	5	6	6	6	6	8	8	8
Drain and vent (NPT)	in	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Max. water side operating pressure	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Condensers		Copper tubes, aluminium fins															
Condenser fans		Axial FLYING BIRD 2 fan with a rotating shroud															
Quantity		4	4	4	6	6	6	8	8	8	10	10	12	12	14	16	16
Fan speed	r/s	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8
Total air flow	l/s	21380	21380	21380	32070	32070	32070	42760	42760	42760	53450	53450	64140	64140	74830	85520	85520

* Standard Eurovent conditions: Evaporator entering/leaving water temperature 12°C and 7°C. Outdoor air temperature 35°C, evaporator fouling factor of 0.000044 m² K/W.
Net cooling capacity = gross cooling capacity minus the capacity corresponding to the evaporator pressure drop (flow x drop/0.3).

** The weights shown are guidelines only. For the unit refrigerant charge please refer to the unit nameplate.

5.2 - Electrical data 30GX

30GX		082	092	102	112	122	132	152	162	182	207	227	247	267	298	328	358
Power circuit																	
Nominal power supply	V-ph-Hz	400-3-50															
Voltage range	V	360-440															
Control circuit supply		The control circuit is supplied via the factory-installed transformer															
Nominal operating power input*	kW	98	108	120	128	149	166	182	198	217	242	285	297	332	370	395	435
Nominal operating power input - option 15LN*	kW	99	110	123	130	151	172	185	201	220	248	287	299	329	373	406	447
Nominal operating current drawn *	A	170	188	206	220	256	290	313	340	373	413	478	498	547	621	675	744
Maximum power input**	kW	132	145	159	177	194	211	232	248	306	318	351	372	459	459	496	612
Circuit A	kW	-	-	-	-	-	-	-	-	-	194	227	248	306	248	248	306
Circuit B	kW	-	-	-	-	-	-	-	-	-	124	124	124	153	211	248	306
Cosine phi, unit at full load		0.85	0.85	0.86	0.85	0.85	0.86	0.85	0.85	0.86	0.85	0.85	0.85	0.86	0.85	0.85	0.86
Maximum current drawn (Un - 10%)***	A	248	272	295	331	361	391	433	463	564	593	653	695	847	854	926	1129
Circuit A	A	-	-	-	-	-	-	-	-	-	361	421	463	564	463	463	564
Circuit B	A	-	-	-	-	-	-	-	-	-	232	232	232	283	391	463	564
Maximum current drawn (Un)***	A	225	247	268	301	328	355	394	421	513	539	594	632	770	776	842	1026
Circuit A	A	-	-	-	-	-	-	-	-	-	328	383	421	513	421	421	513
Circuit B	A	-	-	-	-	-	-	-	-	-	211	211	211	257	355	421	513
Maximum starting current, standard unit**** (Un)	A	338	360	404	437	470	497	592	620	679	1338	1631	1669	1800	1814	1880	2057
Circuit A****	A	-	-	-	-	-	-	-	-	-	1127	1420	1459	1544	1459	1459	1544
Circuit B****	A	-	-	-	-	-	-	-	-	-	1248	1248	1248	1287	1154	1459	1544
Max. starting current/max. current draw ratio, unit		1.51	1.46	1.51	1.45	1.43	1.40	1.50	1.47	1.32	2.48	2.75	2.64	2.34	2.34	2.23	2.00
Max. starting current/max. current draw ratio, circuit A		-	-	-	-	-	-	-	-	-	3.43	3.71	3.46	3.01	3.46	3.46	3.01
Max. starting current/max. current draw ratio, circuit B		-	-	-	-	-	-	-	-	-	5.93	5.93	5.93	5.01	3.25	3.46	3.01
Max. starting current - reduced current start**** (Un)	A	std.	std.	std.	std.	std.	std.	std.	std.	std.	953	1015	1053	1195	1198	1264	1452
Circuit A	A	std.	std.	std.	std.	std.	std.	std.	std.	std.	742	804	843	939	843	843	939
Circuit B	A	std.	std.	std.	std.	std.	std.	std.	std.	std.	512	512	512	532	769	843	939
Max.starting current - red. current start/max. current draw ratio, unit		std.	std.	std.	std.	std.	std.	std.	std.	std.	1.77	1.71	1.67	1.55	1.54	1.50	1.41
Circuit A	std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	2.26	2.10	2.00	1.83	2.00	2.00	1.83
Circuit B	std.	std.	std.	std.	std.	std.	std.	std.	std.	std.	2.43	2.43	2.43	2.07	2.16	2.00	1.83
Three-phase short-circuit holding current	kA	25	25	25	25	25	25	25	25	25	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Circuit A	kA	-	-	-	-	-	-	-	-	-	25	25	25	25	25	25	25
Circuit B	kA	-	-	-	-	-	-	-	-	-	25	25	25	25	25	25	25
Standby capacity, unit or circuit A†																	
for evaporator water pump connections	kW	4	4	4	5.5	5.5	5.5	7.5	7.5	7.5	7.5	9	9	9	15	15	15
and for heat reclaim condenser pump	kW	3	3	4	4	4	5.5	5.5	5.5	5.5	N/A	5.5	7.5	7.5	N/A	9	N/A

* Standard Eurovent conditions: Evaporator entering/leaving water temperature 12°C and 7°C. Outdoor air temperature 35°C.

** Power input, compressor and fan, at unit operating limits (evaporator water entering/leaving temperature = 15°C/10°C, outdoor air temperature = 46°C) and a nominal voltage of 400 V (data given on the unit name plate).

*** Maximum unit operating current at maximum unit power input.

**** Maximum instantaneous starting current (maximum operating current of the smallest compressor(s) + fan current + locked rotor current or reduced starting current of the largest compressor).

Fan electrical data = power input 2.4 kW and current draw 5.5 A per fan.

† Current and power inputs not included in the values above

N/A Not applicable

5.3 - Electrical data, 30GX and 30HXC compressors, option 150 + 150A

Reference	Size	I nom.	MHA	LRA	LRA (Y)	LRA (S) 1 cp.	LRA (S) 2 cp.
06NA2146S7N	39	72	99	605	191	NA	NA
06NA2174S7N	46	87	124	715	226	NA	NA
06NA2209S7N	56	103	148	856	270	330	480
06NA2250S7N	66	124	177	960	303	435	575
06NA2300S5N	80	149	207	1226	387	490	610
06NA2300S5E	80+	174	258	1265	400	510	660

Legend

06NA	- Compressor for air-cooled units
N	- Non-economized compressor
E	- Economized compressor
I nom.	- Average current draw of the compressor at Eurovent conditions (A)
MHA	- Must hold amperes (maximum operating current) at 360 V (A)
LRA	- Locked rotor current with across-the-line start (A)
LRA (Y)	- Locked rotor current at reduced current (star/delta start-up mode) (A)
LRA (S) 1 cp.	- Start-up with reduced current (A) with electronic starter (start-up duration 3 seconds max.) for one compressor per circuit
LRA (S) 2 cp.	- Start-up with reduced current (A) with electronic starter (start-up duration 3 seconds max.) for two compressors per circuit

6 - APPLICATION DATA

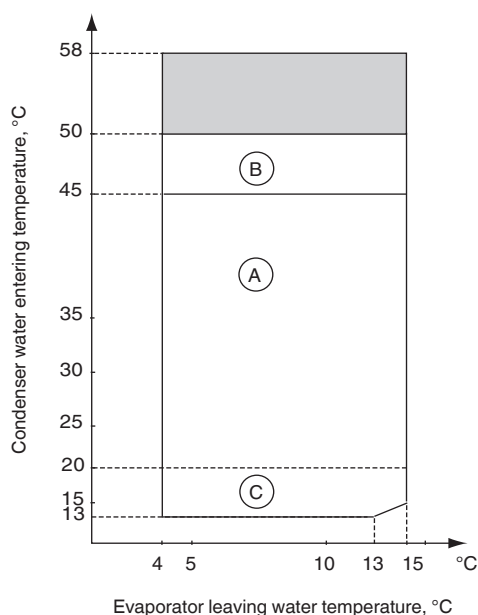
6.1 - Unit operating range

Evaporator 30HXC - 30GX		Minimum	Maximum
Evaporator entering water temperature	°C	6.8*	21
Evaporator leaving water temperature	°C	4**	15
Condenser (water-cooled) 30HXC		Minimum	Maximum
Condenser entering water temperature	°C	20***	45
Condenser leaving water temperature	°C	25	50
Outside ambient operating temperature 30HXC	°C	6	40
Condenser (air-cooled) 30GX		Minimum	Maximum
Outdoor ambient operating temperature	°C	0†	46
Available static pressure	kPa		0

Notes

- * For application requiring operation at less than 6.8°C, contact Carrier for unit selection using the Carrier electronic catalog.
- ** For application requiring operation at less than 4°C, the units require the use of antifreeze.
- *** Water-cooled units (30HXC) operating at full load and below 20°C condenser entering water temperature require the use of a head pressure control with analogue water control valves (see paragraph on head pressure control). Maximum ambient temperature: For transport and storage of the 30GX and 30HXC units the minimum and maximum allowable temperatures are -20°C and +70°C. It is recommended that these temperatures are also applied for transport by container.
- † For operation in ambient temperatures down to -18°C the unit must be equipped with option 28.

6.1.1 - Operating range 30HXC



Notes

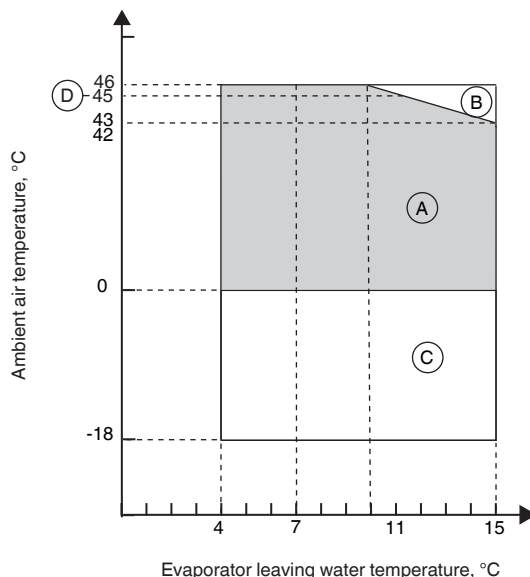
- 1. Evaporator and condenser $\Delta T = 5$ K
- 2. For start-up at full load with a condenser water entering temperature below 20°C, a three-way valve must be used to maintain the correct condensing temperature
- 3. Maximum condenser water leaving temperature 50°C (at full load)
- 4. For low evaporator leaving temperatures $< +4^\circ\text{C}$ and $> -6^\circ\text{C}$ order option 5

Legend

- A Standard unit operating at full load.
- B Standard unit operating at reduced load.
- C Units operating with head pressure control with **analogue water control valve**. For transient operating modes (start-up and part load) the unit can operate down to a condenser water temperature of 13°C.

Additional operating range for high condensing temperature units and non-reversible heat pumps.

6.1.2 - Operating range 30GX



Notes

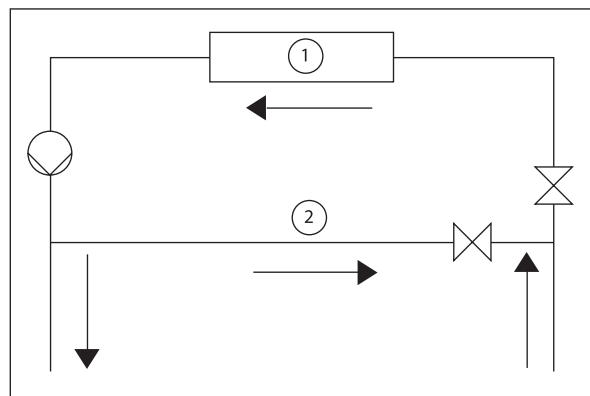
- 1. Evaporator $\Delta T = 5$ K
- 2. If the ambient temperature can be below freezing, the evaporator must be protected against frost.
- 3. Available static pressure zero.
- 4. For low evaporator leaving temperatures $< +4^\circ\text{C}$ and $> -6^\circ\text{C}$ order option 5

Legend

- A Standard unit operating at full load.
- B Standard unit operating at reduced load.
- C With year-round operation option.
- D Operating limit, units 30GX 267 and 358 at full load.

6.2 - Minimum chilled water flow

The minimum chilled water flow is shown in the table on the next page. If the flow is less than this, the evaporator flow can be recirculated, as shown in the diagram. The temperature of the mixture leaving the evaporator must never be less than 2.8 K lower than the chilled water entering temperature.



Legend

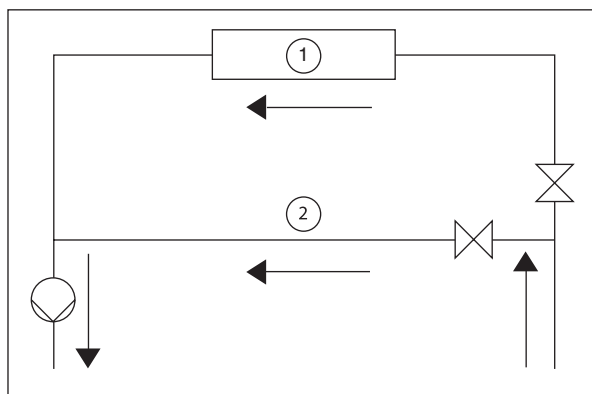
- 1 Evaporator
- 2 Recirculation

6.3 - Maximum chilled water flow

The maximum chilled water flow is limited by the maximum permitted pressure drop in the evaporator. It is provided in the table on the next page. If the flow exceeds the maximum value, two solutions are possible:

- Select a non-standard evaporator with one water pass less which will allow a higher maximum water flow rate.
- Bypass the evaporator as shown in the diagram to obtain a higher temperature difference with a lower evaporator flow rate.

For maximum chilled water flow rate



Legend

- 1 Evaporator
2 Bypass

6.4 - Variable flow evaporator

Variable evaporator flow can be used in standard 30HXC and 30GX chillers. The chillers maintain a constant leaving water temperature under all flow conditions. For this to happen, the minimum flow rate must be higher than the minimum flow given in the table of permissible flow rates and must not vary by more than 10% per minute.

If the flow rate changes more rapidly, the system should contain a minimum of 6.5 litres of water per kW instead of 3.25 l/kW.

6.5 - System minimum water volume

Whichever the system, the water loop minimum capacity is given by the formula:

$$\text{Capacity} = \text{Cap (kW)} \times \text{N litres}$$

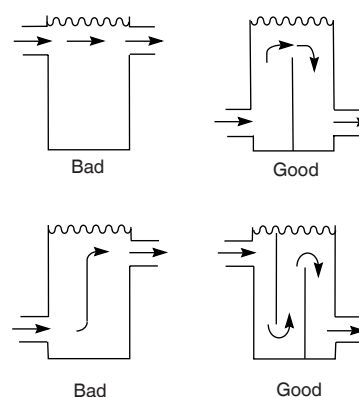
Application	N
Normal air conditioning	3.25
Process type cooling	6.5

Where Cap is the nominal system cooling capacity (kW) at the nominal operating conditions of the installation.

This volume is necessary for stable operation and accurate temperature control.

It is often necessary to add a buffer water tank to the circuit in order to achieve the required volume. The tank must itself be internally baffled in order to ensure proper mixing of the liquid (water or brine). Refer to the examples below.

NOTE: The compressor must not restart more than 6 times in an hour.



6.6 - Cooler flow rate (l/s)

30HXC	Min.* (closed loop)	Max.**
080-090	5.2	20.8
100	6.5	25.9
110	7.4	29.6
120-130	8.3	33.4
140-155	9.4	37.8
175-190	11.5	45.9
200	14.1	56.3
230	16.3	65.2
260-285	18.3	73.4
310	20.9	83.7
345-375	23.0	91.9
30GX	Min.* (closed loop)	Max.**
082	5.2	20.8
092-102	6.5	25.9
112-132	7.4	29.6
152-162	9.4	37.8
182	11.5	45.9
207-227	14.1	56.3
247	16.3	65.2
267	18.3	73.4
298	20.9	83.7
328-358	23.0	91.9

* Based on a water velocity of 0.9 m/s.

** Based on a water velocity of 3.6 m/s.

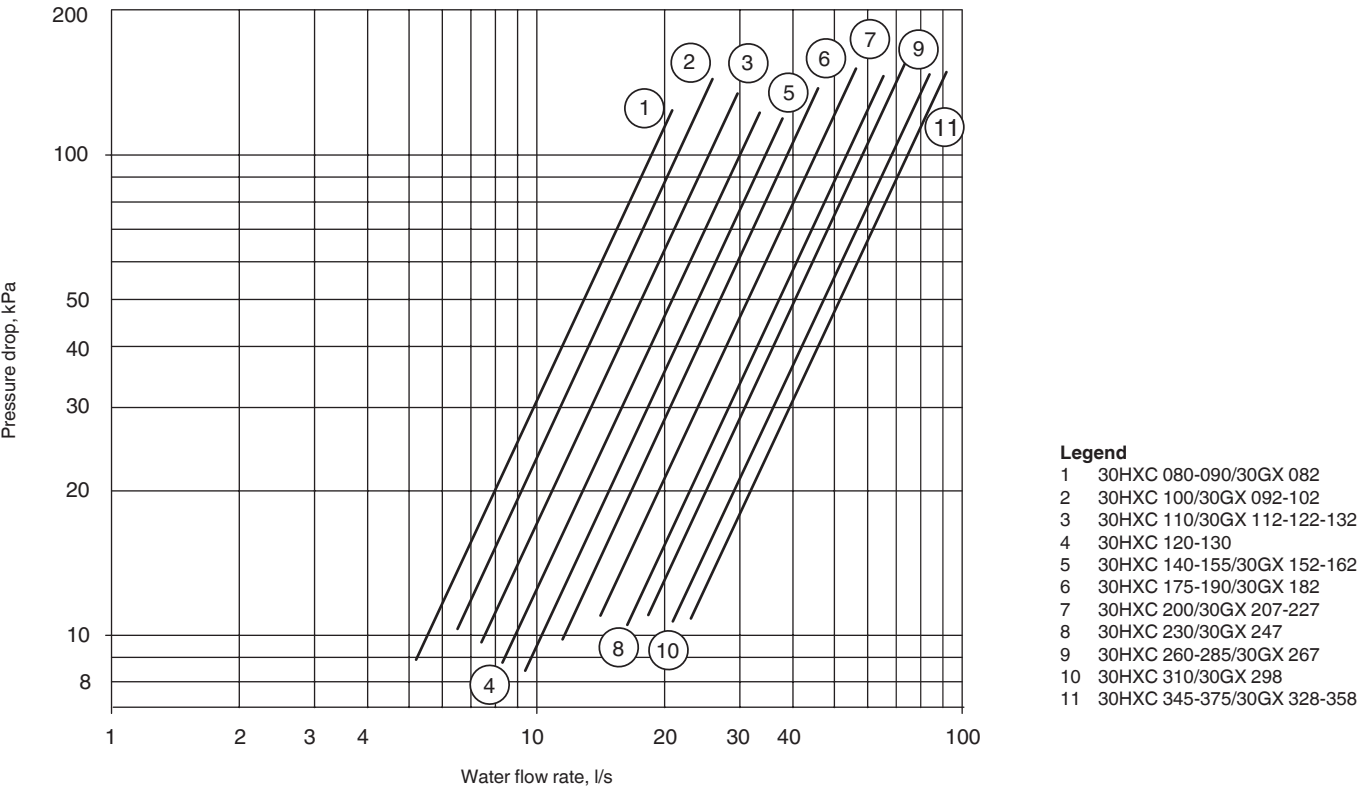
6.7 - Condenser flow rate (l/s)

30HXC	Min.*		Max.**
	Closed loop	Open loop	
080-110	2.3	7.0	28.2
120-130	3.1	9.3	37.1
140-155	3.7	11.1	44.5
175-190	4.3	13.0	51.9
200	4.9	14.8	59.2
230-285	6.7	20.1	80.4
310-375	8.0	24.0	95.9

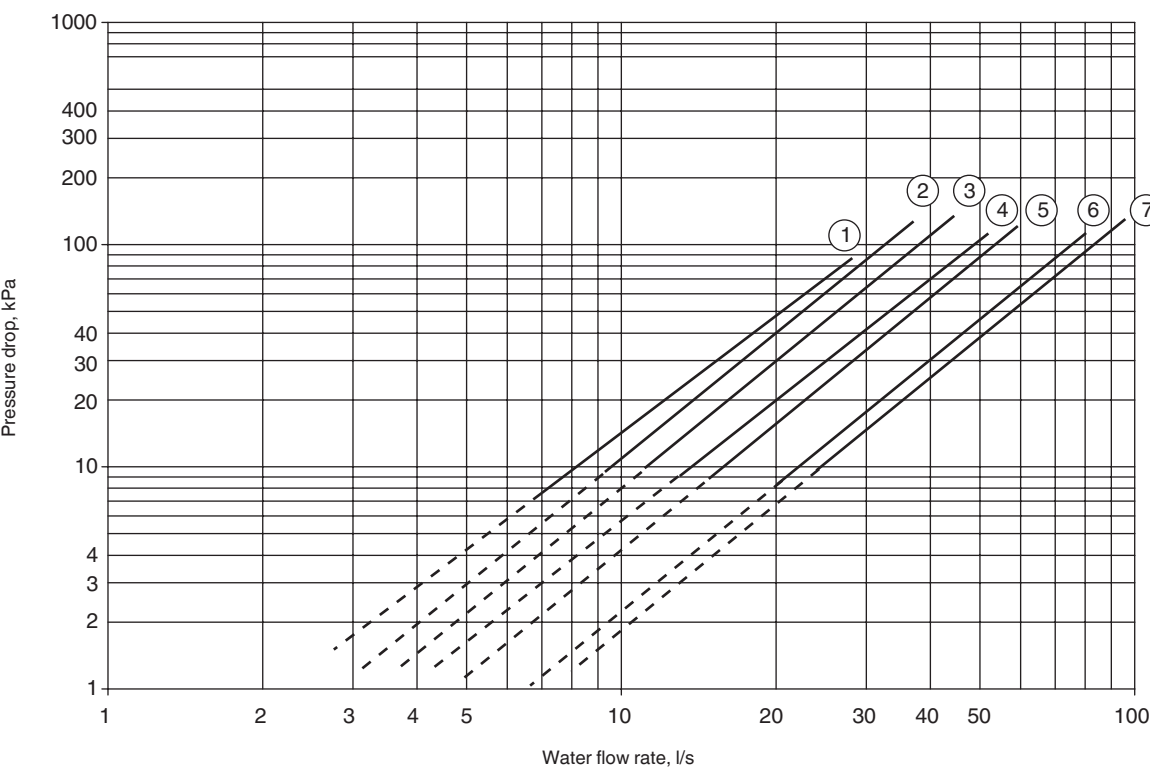
* Based on a water velocity of 0.3 m/s in a closed loop and 0.9 m/s in an open loop.

** Based on a water velocity of 3.6 m/s.

6.8 - Evaporator pressure drop curve



6.9 - Condenser pressure drop curve



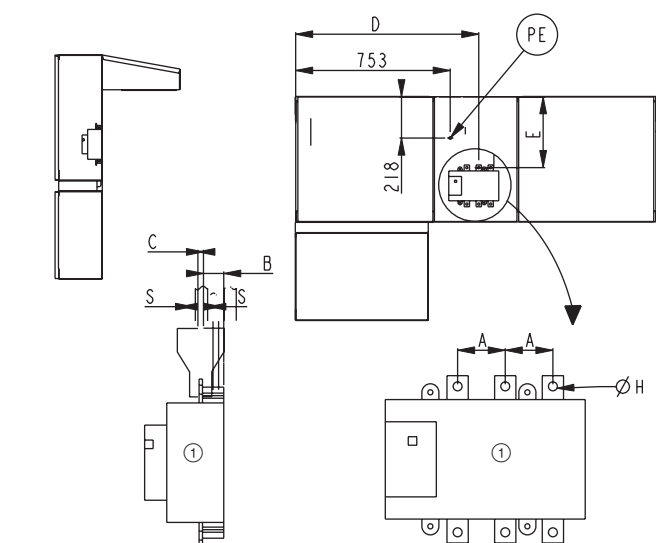
- Legend**
- 1 30HXC 080-090-100-110
 - 2 30HXC 120-130
 - 3 30HXC 140-155
 - 4 30HXC 175-190
 - 5 30HXC 200
 - 6 30HXC 230-260-285
 - 7 30HXC 310-345-375

Note:
The dotted part of the curves corresponds to the flow values only permitted for closed circuits.

7 - ELECTRICAL CONNECTION

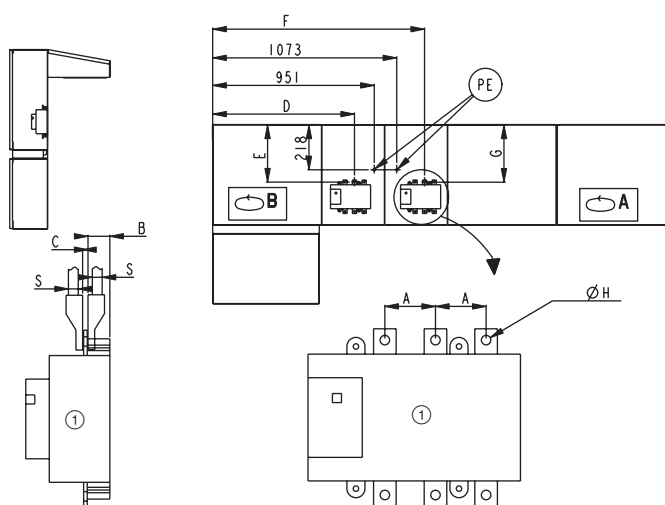
7.1 - Electrical connections 30HXC units

7.1.1 - 30HXC 080-190 control box



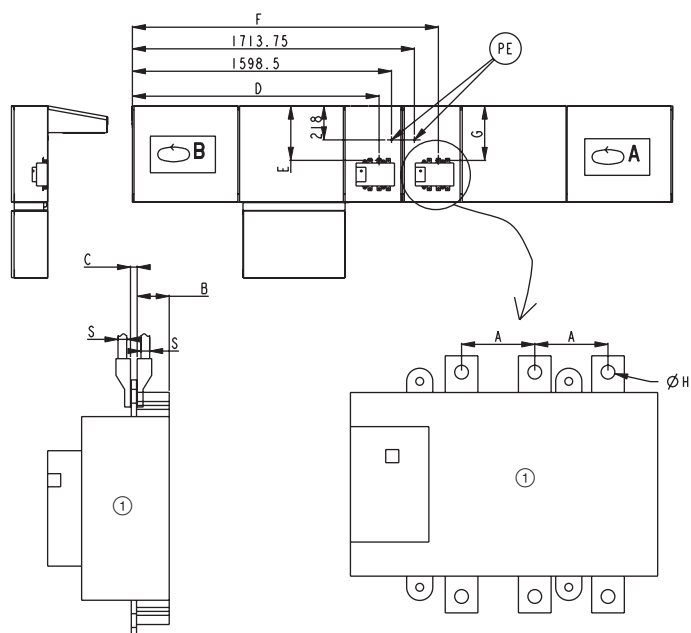
30HXC	A	B	C	D	E	Ø H
Standard						
080-190 (315/400A)	56	25	4	863	314	10.5
Option 150/150A						
080-140 (315/400A)	56	25	4	863	314	10.5
155-190 (630A)	68	32	6	880	307.5	12.5

7.1.2 - 30HXC 200-285 control box



30HXC	A	B	C	D	E	F	G	Ø H
Standard								
Circuit A								
200-285 (400A)	56	25	4	841	314	1183	314	10.5
Circuit B								
200-285 (250A)	39	23.5	4	811.5	324	-	-	8.5
Option 150/150A								
Circuit A								
200-230 (400A)	56	25	4	841	314	1183	314	10.5
260-285 (630A)	68	32	6	-	-	1200	307.5	12.5
Circuit B								
200-260 (250A)	39	23.5	4	811.5	324	-	-	8.5
285 (400A)	56	25	4	841	314	1183	314	10.5

7.1.3 - 30HXC 310-375 control box



Legend

- ① Main disconnect switch
- PE Earth connection
- S Power supply cable section (see table "Recommended wire sections").

30HXC	A	B	C	D	E	F	G	Ø H
Standard								
Circuit A								
310-375 (400A)	56	25	4	1492.6	314	1824	314	10.5
Circuit B								
310-345 (400A)	56	25	4	1492.6	314	1824	314	10.5
375 (630A)	68	32	6	1510	307.5	1841	307.5	12.5
Option 150/150A								
Circuit A								
310 (400A)	56	25	4	1492.6	314	1824	314	10.5
345-375 (630A)	68	32	6	1510	307.5	1841	307.5	12.5
Circuit B								
310-375 (630A)	68	32	6	1510	307.5	1841	307.5	12.5

NOTES:

The 30HXC 080-190 and 30GX 082-182 units have only one power connection point located at the main disconnect switch.

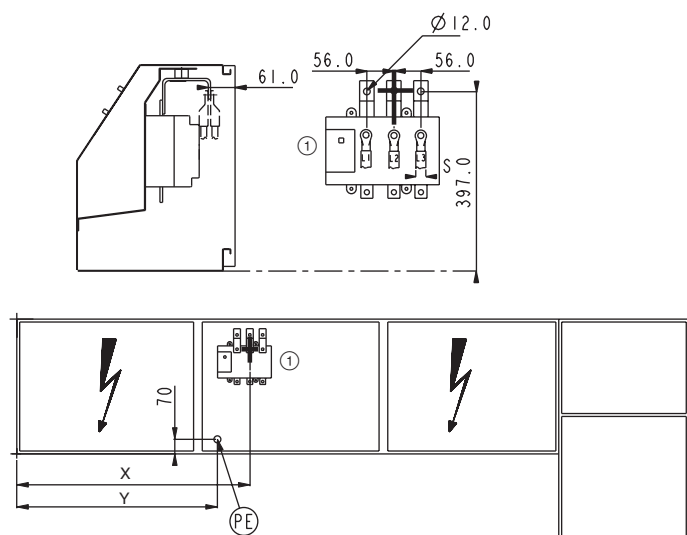
Before connecting electric power cables, it is imperative to check the correct order of the 3 phases (L1 - L2 - L3).

Non-certified drawings.

Refer to the certified drawings supplied with the unit or available on request.

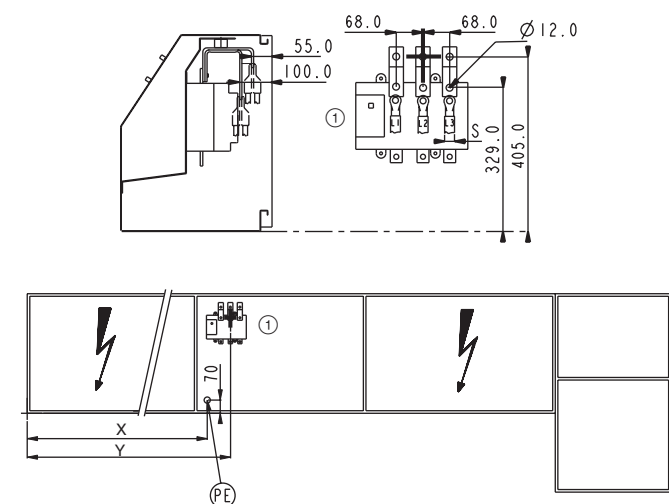
7.2 - Electrical connections 30GX units

7.2.1 - 30GX 082-132 control box



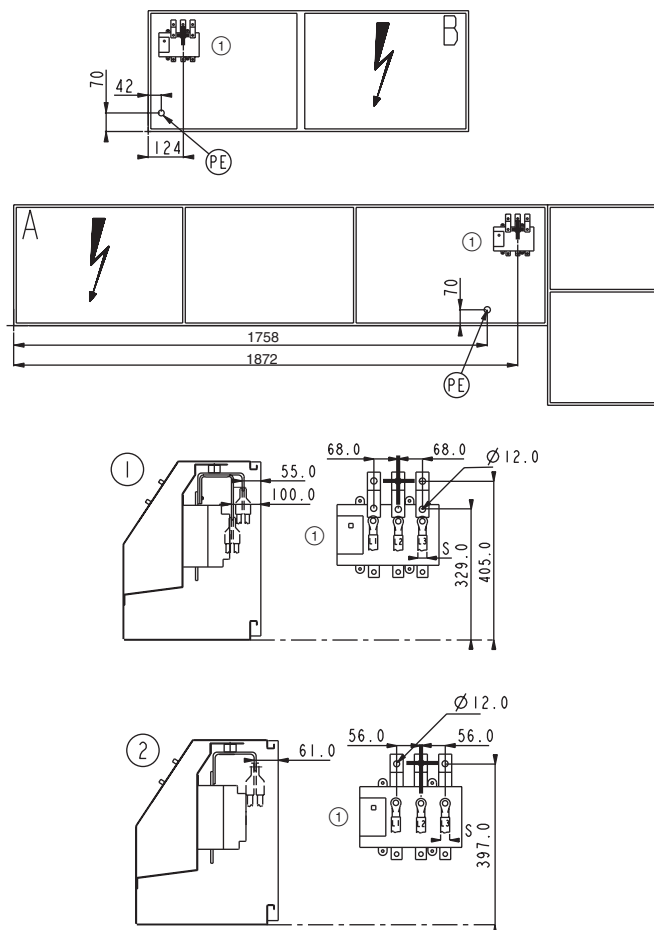
30GX	X	Y
082-102	764	680
112-132	862	924

7.2.2 - 30GX 152-182 control box



30GX	X	Y
152-162	682	798
182	912	1028

7.2.3 - 30GX 207-267 control box



Legend

- ① Main disconnect switch
- PE Earth connection
- S Power supply cable section (see table "Recommended wire sections").
- X Disconnect switch position referred to the unit side
- Y Control box position referred to the unit base

NOTES:

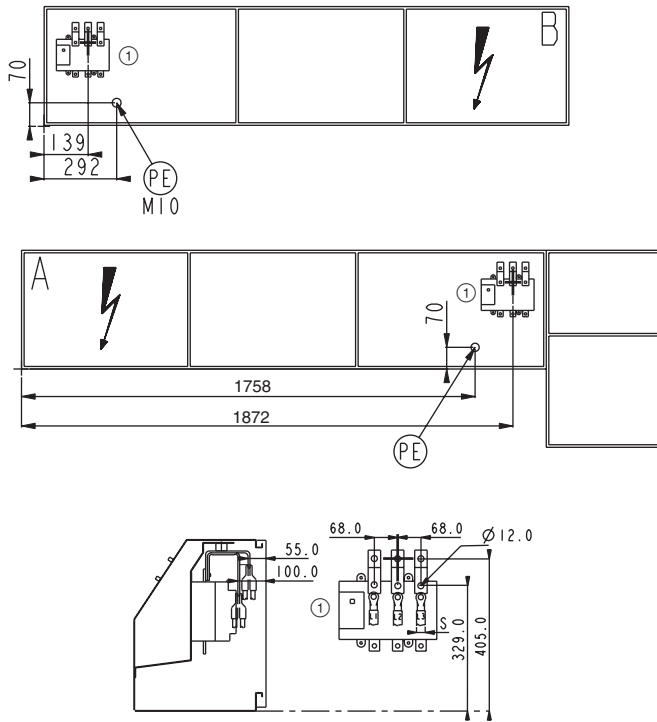
The 30HXC 080-190 and 30GX 082-182 units have only one power connection point located at the main disconnect switch.

Before connecting electric power cables, it is imperative to check the correct order of the 3 phases (L1 - L2 - L3).

Non-certified drawings.

Refer to the certified drawings supplied with the unit or available on request.

7.2.4 - 30GX 298-358 control box



Legend

- ① Main disconnect switch
- PE Earth connection
- S Power supply cable section (see table "Recommended wire sections").

NOTES:

The 30HXC 080-190 and 30GX 082-182 units have only one power connection point located at the main disconnect switch.

Before connecting electric power cables, it is imperative to check the correct order of the 3 phases (L1 - L2 - L3).

Non-certified drawings.

Refer to the certified drawings supplied with the unit or available on request.

7.3 - Power supply

The power supply must conform to the specification on the chiller nameplate. The supply voltage must be within the range specified in the electrical data table. For connections refer to the wiring diagrams.

WARNING: Operation of the chiller with an improper supply voltage or excessive phase imbalance constitutes abuse which will invalidate the Carrier warranty. If the phase imbalance exceeds 2% for voltage, or 10% for current, contact your local electricity supply at once and ensure that the chiller is not switched on until corrective measures have been taken.

7.4 - Voltage phase imbalance (%)

$$\frac{100 \times \text{max. deviation from average voltage}}{\text{Average voltage}}$$

Example:

On a 400 V - 3 ph - 50 Hz supply, the individual phase voltages were measured to be:

AB = 406 V; BC = 399 V; AC = 394 V

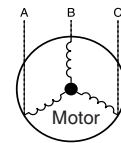
$$\begin{aligned} \text{Average voltage} &= (406 + 399 + 394)/3 = 1199/3 \\ &= 399.7 \text{ say } 400 \text{ V} \end{aligned}$$

Calculate the maximum deviation from the 400 V average:

$$(AB) = 406 - 400 = 6$$

$$(BC) = 400 - 399 = 1$$

$$(CA) = 400 - 394 = 6$$



The maximum deviation from the average is 6 V. The greatest percentage deviation is:

$$100 \times 6/400 = 1.5\%$$

This is less than the permissible 2% and is therefore acceptable.

Electrical data notes for 30HXC units:

- 30HXC 080-190 units have a single power connection point; 30HXC 200-375 units have two connection points.
- The control box includes the following standard features:
 - Starter and motor protection devices for each compressor
 - Control devices
- **Field connections:**
All connections to the system and the electrical installations must be in full accordance with all applicable codes.
- The Carrier 30HXC units are designed and built to ensure conformance with local codes. The recommendations of European standard EN 60204-1 (corresponds to IEC 60204-1) (machine safety - electrical machine components - part 1: general regulations) are specifically taken into account, when designing the electrical equipment.
- **Electrical reserves:**
Circuit B has disconnect switches and branch sections, designed to supply the evaporator and condenser pump power input.

IMPORTANT:

- 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 and § 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 30HXC units is specified below:
 - a. Environment* - Environment as classified in IEC 60364 § 3:
 - ambient temperature range: +5°C to +40°C, class AA4

- humidity range (non-condensing)*:
 - 50% relative humidity at 40°C
 - 90% relative humidity at 20°C
- altitude: ≤ 2000 m
- indoor installation*
- presence of water: class AD2* (possibility of water droplets)
- presence of hard solids, class AE2* (no significant dust present)
- presence of corrosive and polluting substances, class AF1 (negligible)
- vibration and shock, class AG2, AH2

b. Competence of personnel, class BA4* (trained personnel - IEC 60364)

2. Power supply frequency variation: ± 2 Hz.
3. The neutral (N) line must not be connected directly to the unit (if necessary use a transformer).
4. Overcurrent 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 (corresponds to IEC 60947) .
6. The units are designed for connection to TN networks (IEC 60364). For IT networks the earth connection must not be at the network earth. Provide a local earth, consult competent local organisations to complete the electrical installation.

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

- * The protection level required to conform to this class is IP21B (according to reference document IEC 60529). All 30HXC units are protected to IP23C and fulfil this protection condition.

Electrical data notes for 30GX units:

- 30GX 082-182 units have a single power connection point; 30GX 207-358 units have two connection points.
- The control box includes the following standard features:
 - Starter and motor protection devices for each compressor and the fan(s)
 - 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 30GX units are designed and built to ensure conformance with these codes. The recommendations of European standard EN 60 204-1 (corresponds to IEC 60204-1) (machine safety - electrical machine components - part 1: general regulations) are specifically taken into account, when designing the electrical equipment.
- **Electrical reserves:**
Circuit A has disconnect switches and branch sections, designed to supply the evaporator pump power input.

IMPORTANT:

- Generally the recommendations of IEC 60364 are accepted as compliance with the requirements of the installation directives. Conformance with EN 60 204 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 30GX units is specified below:
 - a. Environment* - Environment as classified in EN 60 721 (corresponds to IEC 60721):

- outdoor installation*
- ambient temperature range: -18°C to +46°C, class 4K3*
- altitude: ≤ 2000 m
- presence of hard solids, class 4S2* (no significant dust present)
- presence of corrosive and polluting substances, class 4C2 (negligible)
- vibration and shock, class 4M2

b. Competence of personnel, class BA4* (trained personnel - IEC 60364)

2. Power supply frequency variation: ± 2 Hz.
3. The neutral (N) line must not be connected directly to the unit (if necessary use a transformer).
4. Overcurrent 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 (corresponds to IEC 60947) .
6. The units are designed for connection to TN networks (IEC 60364). For IT networks the earth connection must not be at the network earth. Provide a local earth, consult competent local organisations to complete the electrical installation.

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

- * The required protection level for this class is IP43BW (according to reference document IEC 60529). All 30GX units are protected to IP44CW and fulfil this protection condition.

7.5 - Recommended wire sections

Wire sizing is the responsibility of the installer, and depends on the characteristics and regulations applicable to each installation site. The following is only to be used as a guide-line, and does not make Carrier in any way liable. After wire sizing has been completed, using the certified dimensional drawing, the installer must ensure easy connection and define any modifications necessary on site.

The connections provided as standard for the field-supplied power entry cables to the general disconnect/isolator switch are designed for the number and type of wires, listed in the table below.

The calculations are based on the maximum machine current (see electrical data tables).

For the design the following standardised installation methods are used, in accordance with IEC 60364, table 52C:

- For 30HXC units installed inside the building: No.13: perforated horizontal cable conduit, and No. 41: closed conduit.
- For 30GX units installed outside the building: No.17: suspended aerial lines, and No. 61: buried conduit with a derating coefficient of 20.

The calculation is based on PVC or XLPE insulated cables with copper or aluminium core. The maximum temperature is 40°C for 30HXC units and 46°C for 30GX units.

The given wire length limits the voltage drop to < 5%.

IMPORTANT: Before connection of the main power cables (L1 - L2 - L3) on the terminal block, it is imperative to check the correct order of the 3 phases before proceeding to the connection on then terminal block or the main disconnect/isolator switch.

7.5.1 - Field control wiring

Refer to the 30GX/HXC Pro-Dialog Plus Controls IOM and the certified wiring diagram supplied with the unit for the field control wiring of the following features:

- Evaporator pump interlock (mandatory)
- Remote on/off switch
- Condenser flow switch (field-supplied, 30HXC only)
- Remote heat/cool switch
- Demand limit external switch 1
- Remote dual set point
- Alarm report by circuit
- Evaporator pump control
- Condenser pump control (30HXC only)
- Remote set point reset or outside air temperature sensor reset (0-10 V)

7.5.2 - Selection table of minimum and maximum wire sections for connection to 30HXC units

400 V-3 ph-50 Hz

30HXC	Minimum wire section (mm²)*	Wire type	L (m)	Maximum wire section (mm²)*	Wire type	L (m)
080	1 x 50	XLPE Cu	160	1 x 120	XLPE Al	205
090	1 x 50	XLPE Cu	160	1 x 120	XLPE Al	205
100	1 x 70	XLPE Cu	170	1 x 150	XLPE Al	210
110	1 x 70	XLPE Cu	170	1 x 185	XLPE Al	220
120	1 x 95	XLPE Cu	180	1 x 185	XLPE Al	220
130	1 x 95	XLPE Cu	180	1 x 240	XLPE Al	225
140	1 x 120	XLPE Cu	185	2 x 95	XLPE Al	195
155	1 x 120	XLPE Cu	185	2 x 120	XLPE Al	205
175	1 x 150	XLPE Cu	190	2 x 120	XLPE Al	205
190	1 x 185	XLPE Cu	190	2 x 150	XLPE Al	210
200 Circuit A	1 x 95	XLPE Cu	180	1 x 185	XLPE Al	220
				1 x 120	XLPE Cu	225
230 Circuit A	1 x 95	XLPE Cu	180	1 x 240	XLPE Al	225
				1 x 150	XLPE Cu	230
260 Circuit A	1 x 120	XLPE Cu	185	2 x 150	XLPE Al	265
				1 x 240	XLPE Cu	235
285 Circuit A	1 x 150	XLPE Cu	190	2 x 185	XLPE Al	270
				2 x 120	XLPE Cu	280
310 Circuit A	1 x 120	XLPE Cu	185	2 x 120	XLPE Al	255
				2 x 95	XLPE Cu	270
345 Circuit A	1 x 120	XLPE Cu	185	2 x 150	XLPE Al	265
				2 x 95	XLPE Cu	270
375 Circuit A	1 x 150	XLPE Cu	190	2 x 185	XLPE Al	270
				2 x 120	XLPE Cu	280
200 Circuit B	1 x 50	XLPE Cu	160	1 x 120	XLPE Al	205
				1 x 70	XLPE Cu	205
230 Circuit B	1 x 70	XLPE Cu	170	1 x 150	XLPE Al	210
				1 x 95	XLPE Cu	215
260 Circuit B	1 x 95	XLPE Cu	180	1 x 150	XLPE Al	210
				1 x 95	XLPE Cu	215
285 Circuit B	1 x 95	XLPE Cu	180	1 x 185	XLPE Al	220
				1 x 120	XLPE Cu	225
310 Circuit B	1 x 185	XLPE Cu	190	2 x 185	XLPE Al	270
				1 x 240	XLPE Cu	235
345 Circuit B	1 x 185	XLPE Cu	190	2 x 185	XLPE Al	270
				2 x 120	XLPE Cu	280
375 Circuit B	1 x 240	XLPE Cu	190	2 x 240	XLPE Al	280
				2 x 150	XLPE Cu	290

* Power supply wire section (see diagrams/legend S in chapter 'Electrical connection'). The disconnect switches are indicated by a Ⓢ.

7.5.3 - Selection table of minimum and maximum wire sections for connection to 30HXC units with high condensing temperatures (option 150 + 150A)

400 V-3 ph-50 Hz

30HXC	Minimum wire section (mm ²)*	Wire type	L (m)	Maximum wire section (mm ²)*	Wire type	L (m)
080 Opt. 150	1 x 70	XLPE Cu	170	1 x 150	XLPE Al	210
090 Opt. 150	1 x 70	XLPE Cu	170	1 x 185	XLPE Al	220
100 Opt. 150	1 x 95	XLPE Cu	180	1 x 240	XLPE Al	225
110 Opt. 150	1 x 95	XLPE Cu	180	1 x 240	XLPE Al	225
120 Opt. 150	1 x 120	XLPE Cu	185	2 x 95	XLPE Al	195
130 Opt. 150	1 x 120	XLPE Cu	185	2 x 120	XLPE Al	205
140 Opt. 150	1 x 150	XLPE Cu	190	2 x 120	XLPE Al	205
155 Opt. 150	1 x 185	XLPE Cu	190	2 x 150	XLPE Al	210
175 Opt. 150	1 x 185	XLPE Cu	190	2 x 150	XLPE Al	210
190 Opt. 150	2 x 95	XLPE Cu	170	2 x 240	XLPE Al	225
200 Opt. 150 Circuit A	1 x 120	XLPE Cu	185	2 x 150	XLPE Al	265
				1 x 185	XLPE Cu	235
230 Opt. 150 Circuit A	1 x 150	XLPE Cu	190	2 x 150	XLPE Al	265
				1 x 240	XLPE Cu	235
260 Opt. 150 Circuit A	1 x 185	XLPE Cu	190	2 x 240	XLPE Al	280
				2 x 150	XLPE Cu	290
285 Opt. 150 Circuit A	1 x 240	XLPE Cu	190	2 x 240	XLPE Cu	295
310 Opt. 150 Circuit A	1 x 150	XLPE Cu	190	2 x 185	XLPE Al	270
				2 x 120	XLPE Cu	280
345 Opt. 150 Circuit A	1 x 185	XLPE Cu	190	2 x 240	XLPE Al	280
				2 x 150	XLPE Cu	290
375 Opt. 150 Circuit A	1 x 240	XLPE Cu	190	2 x 240	XLPE Cu	295
200 Opt. 150 Circuit B	1 x 70	XLPE Cu	170	1 x 150	XLPE Al	210
				1 x 95	XLPE Cu	215
230 Opt. 150 Circuit B	1 x 70	XLPE Cu	170	1 x 185	XLPE Al	220
				1 x 120	XLPE Cu	225
260 Opt. 150 Circuit B	1 x 70	XLPE Cu	170	1 x 185	XLPE Al	220
				1 x 120	XLPE Cu	225
285 Opt. 150 Circuit B	1 x 120	XLPE Cu	185	2 x 150	XLPE Al	265
				1 x 185	XLPE Cu	235
310 Opt. 150 Circuit B	1 x 185	XLPE Cu	190	2 x 240	XLPE Al	280
				2 x 150	XLPE Cu	290
345 Opt. 150 Circuit B	1 x 240	XLPE Cu	190	2 x 240	XLPE Al	280
				2 x 150	XLPE Cu	290
375 Opt. 150 Circuit B	2 x 95	XLPE Cu	170	2 x 240	XLPE Cu	295

* Power supply wire section (see diagrams/legend S in chapter 'Electrical connection'). The disconnect switches are indicated by a ①.

7.5.4 - Selection table of minimum and maximum wire sections for connection to 30GX units

400 V-3 ph-50 Hz

30GX	Minimum wire section (mm ²)*	Wire type	L (m)	Maximum wire section (mm ²)*	Wire type	L (m)
082	1 x 95	XLPE Cu	190	2 x 240	PVC Al	450
092	1 x 120	XLPE Cu	195	2 x 240	PVC Al	450
102	1 x 120	XLPE Cu	195	2 x 185	PVC Cu	470
112	1 x 150	XLPE Cu	200	2 x 240	PVC Cu	480
122	1 x 185	XLPE Cu	205	2 x 240	PVC Cu	480
132	1 x 185	XLPE Cu	205	3 x 240	XLPE Cu	355
152	1 x 240	XLPE Cu	205	3 x 240	PVC Cu	600
162	1 x 240	XLPE Cu	205	3 x 185	XLPE Cu	430
182	2 x 120	XLPE Cu	200	3 x 240	XLPE Cu	440
207 (Circuit A)	1 x 185	XLPE Cu	205	3 x 240	PVC Cu	685
227 (Circuit A)	1 x 240	XLPE Cu	205	3 x 185	XLPE Cu	490
247 (Circuit A)	1 x 240	XLPE Cu	205	3 x 240	XLPE Cu	505
267 (Circuit A)	2 x 120	XLPE Cu	200	3 x 240	XLPE Cu	505
298 (Circuit A)	2 x 95	XLPE Cu	190	3 x 240	XLPE Cu	505
328 (Circuit A)	2 x 95	XLPE Cu	190	3 x 240	XLPE Cu	505
358 (Circuit A)	2 x 120	XLPE Cu	200	3 x 240	XLPE Cu	505
207/227/247 (Circuit B)	1 x 95	XLPE Cu	190	2 x 240	PVC Al	560
				2 x 95	XLPE Cu	380
267 (Circuit B)	1 x 120	XLPE Cu	195	2 x 240	XLPE Al	410
				2 x 150	XLPE Cu	415
298 (Circuit B)	1 x 185	XLPE Cu	205	3 x 240	PVC Cu	685
328 (Circuit B)	1 x 240	XLPE Cu	205	3 x 185	XLPE Cu	490
358 (Circuit B)	2 x 120	XLPE Cu	200	3 x 240	XLPE Cu	505

* Power supply wire section (see diagrams/legend S in chapter 'Electrical connection'). The disconnect switches are indicated by a ①.

8 - WATER CONNECTIONS

ATTENTION: Before carrying out any water connections install the water box purge plugs (one plug per water box in the lower section - supplied in the control box).

For size and position of the heat exchanger water inlet and outlet connections refer to the certified dimensional drawings supplied with the unit.

The water pipes must not transmit any radial or axial force to the heat exchangers nor any vibration.

The water supply must be analysed and appropriate filtering, treatment, control devices, isolation and bleed valves and circuits built in, to prevent corrosion, fouling and deterioration of the pump fittings. Consult either a water treatment specialist or appropriate literature on the subject.

8.1 - Operating precautions

The water circuit should be designed to have the least number of elbows and horizontal pipe runs at different levels. Below the main points to be checked for the connection:

- Comply with the water inlet and outlet connections shown on the unit.
- Install manual or automatic air purge valves at all high points in the circuit(s).
- Use an expansion device to maintain pressure in the circuit(s) and install a safety valve as well as an expansion tank.
- Install thermometers in both the entering and leaving water connections.
- Install drain connections at all low points to allow the whole circuit to be drained.
- Install stop valves, close to the entering and leaving water connections.
- Use flexible connections to reduce the transmission of vibrations.
- Insulate all pipework, after testing for leaks, both to reduce heat gains and to prevent condensation.
- Cover the insulation with a vapour barrier.
- Where there are particles in the fluid that could foul the heat exchanger, a screen filter should be installed ahead of the pump. The mesh size of the filter must be 1.2 mm (see 'Typical water circuit' diagram).

Before the system start-up verify that the water circuits are connected to the appropriate heat exchangers (e.g. no reversal between evaporator and condenser).

Do not introduce any significant static or dynamic pressure into the heat exchange circuit (with regard to the design operating pressures).

Before any start-up verify that the heat exchange fluid is compatible with the materials and the water circuit coating.

In case additives or other fluids than those recommended by Carrier are used, ensure that the fluids are not considered as a gas, and that they belong to class 2, as defined in directive 97/23/EC.

Carrier recommendations on heat exchange fluids:

1. No NH_4^+ ammonium ions in the water, they are very detrimental for copper. This is one of the most important factors for the operating life of copper piping. A content of several tenths of mg/l will badly corrode the copper over time.
2. Cl^- Chloride ions are detrimental for copper with a risk of perforations by corrosion by puncture. If possible keep below 10 mg/l.
3. SO_4^{2-} sulphate ions can cause perforating corrosion, if their content is above 30 mg/l.
4. No fluoride ions (<0.1 mg/l).
5. No Fe^{2+} and Fe^{3+} ions with non negligible levels of dissolved oxygen must be present. Dissolved iron < 5 mg/l with dissolved oxygen < 5 mg/l.
6. Dissolved silicon: silicon is an acid element of water and can also lead to corrosion risks. Content < 1 mg/l.
7. Water hardness: > 0.5 mmol/l. Values between 1 and 2.5 can be recommended. This will facilitate scale deposit that can limit corrosion of copper. Values that are too high can cause piping blockage over time. A total alkalimetric titre (TAC) below 100 is desirable.
8. Dissolved oxygen: Any sudden change in water oxygenation conditions must be avoided. It is as detrimental to deoxygenate the water by mixing it with inert gas as it is to over-oxygenate it by mixing it with pure oxygen. The disturbance of the oxygenation conditions encourages destabilisation of copper hydroxides and enlargement of particles.
9. Specific resistance – electric conductivity: the higher the specific resistance, the slower the corrosion tendency. Values above 30 Ohm·m are desirable. A neutral environment favours maximum specific resistance values. For electric conductivity values in the order of 20-60 mS/m can be recommended.
10. pH: Ideal case pH neutral at 20-25°C
 $7 < \text{pH} < 8$

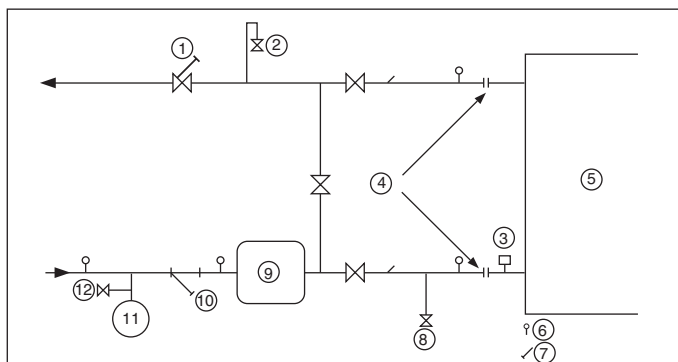
If the water circuit must be emptied for longer than one month, the complete circuit must be placed under nitrogen charge to avoid any risk of corrosion by differential aeration.

Charging and removing heat exchange fluids should be done with devices that must be included on the water circuit by the installer. Never use the unit heat exchangers to add heat exchange fluid.

8.2 - Water connections

This diagram shows a typical water installation.

Typical water circuit diagram



Legend

- 1 Control valve
- 2 Air vent
- 3 Flow switch for the evaporator
- 4 Flexible connection
- 5 Heat exchanger
- 6 Pressure tap
- 7 Thermostat sleeve
- 8 Drain
- 9 Buffer tank
- 10 Filter (mesh size: 1.2 mm = 20 mesh)
- 11 Expansion tank
- 12 Fill valve

8.3 - Flow control

8.3.1 - Evaporator flow switch and chilled water pump interlock

IMPORTANT: On 30GX and 30HXC units, the unit water flow switch must be energised, and the chilled water pump interlock must be connected. Failure to follow this instruction will void the Carrier guarantee.

The flow switch is supplied, installed on the evaporator entering water pipe and preset at the factory to cut out when there is insufficient water flow. If adjustment is necessary:

1. Switch on the unit. Set it to constant flow (preset value).

The yellow LED is illuminated, and the output is switched for approximately 20 seconds (power-on delay time).

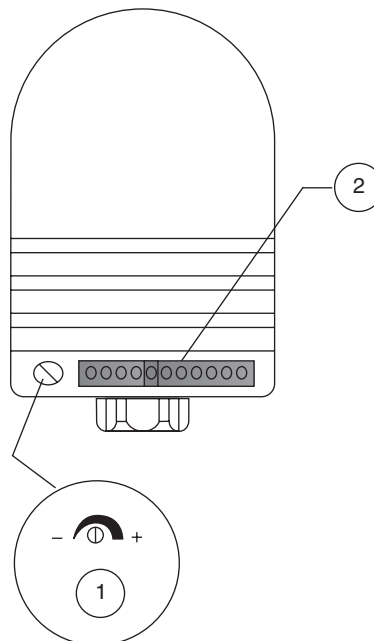
2. Turn the potentiometer until one green LED is illuminated.

The further the green LED is from the yellow LED, the safer the adjustment (standby capacity in case of flow or temperature fluctuations).

3. After the adjustment attach the label supplied to the potentiometer, in order to protect it against unauthorised tampering.

Terminals 34 and 35 are provided for field installation of the chilled water pump interlock (auxiliary contact for pump operation to be wired on site).

Potentiometer adjustment



Legend

- 1 Setting potentiometer sensitivity
- 2 Chain of LEDs
 - red LED lights: the unit is not adjusted
 - yellow LED lights: the output is switched
 - green LED lights: the unit is adjusted

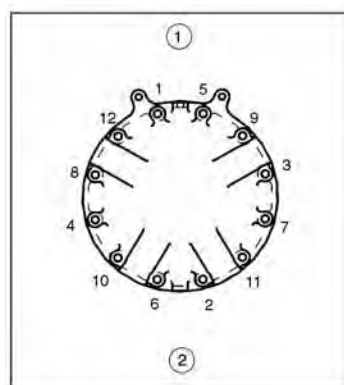
8.3.2 - Condenser water flow switch (30HXC)

The use of a condenser water flow switch is recommended. The flow switch is not supplied, and must be installed on site and connected in accordance with the wiring diagrams.

8.4 - Evaporator (and condenser for the 30HXC) water box bolt tightening

The evaporator (and condenser) are of the shell and tube type with removable water boxes to facilitate cleaning. Re-tightening or tightening must be done in accordance with the illustration below.

Water box tightening sequence



Legend

- 1 Sequence 1: 1 2 3 4
Sequence 2: 5 6 7 8
Sequence 3: 9 10 11 12
- 2 Tightening torque
Bolt size M16 - 171 - 210 Nm

NOTE: Before this operation we recommend draining the circuit and disconnecting the pipes to be sure that the bolts are correctly and uniformly tightened.

8.5 - Frost protection

8.5.1 - Standard machine

If the chiller or the water piping is in an area where the ambient temperature can fall below 0°C it is recommended to add an antifreeze solution to protect the unit and the water piping to a temperature of 10 K below the lowest temperature likely to be reached at the installation site. Use only antifreeze solutions, approved for heat exchanger duty. If the system is not protected by an antifreeze solution and will not be used during the freezing weather conditions, draining of the cooler and outdoor piping is mandatory. Damage due to freezing is not covered by the warranty.

IMPORTANT: Depending on the climatic conditions in your area you must:

- Add ethylene glycol with an adequate concentration to protect the installation up to a temperature of 10 K below the lowest temperature likely to occur at the installation site.
- If the unit is not used for an extended period, it is recommended to drain it, and as a safety precaution add ethylene glycol to the heat exchanger, using the water entering purge valve connection (a purge connection is available somewhere on the heat exchanger water box in case the machine is not perfectly level).

At the start of the next season, refill the unit with water and add an inhibitor.

- For the installation of auxiliary equipment, the installer must comply with basic regulations, especially for minimum and maximum flow rates, which must be between the values listed in the operating limit table (application data).

8.5.2 - Optional evaporator frost protection (30GX)

In cases where it is not possible to apply the recommendations in paragraph 8.5.1, the units can be equipped with heaters to protect the evaporator against frost (option 41A). See chapter 10.4 “Evaporator frost protection (30GX)”.

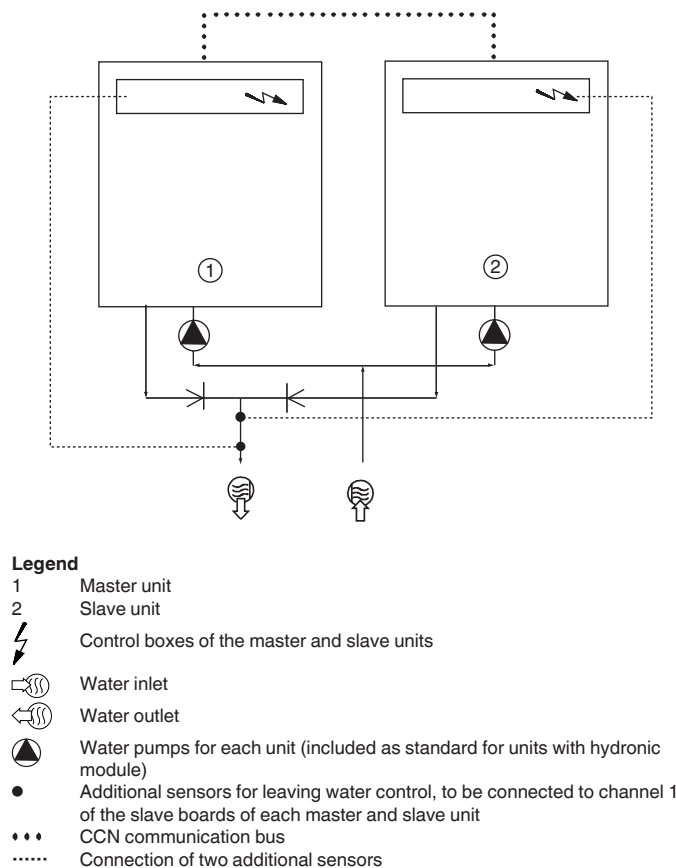
8.6 - Operation of two units in master/slave mode

The control of a master/slave assembly is in the entering water and does not require any additional sensors (standard configuration). It can also be located in the leaving water. In this case two additional sensors must be added on the common piping.

All parameters, required for the master/slave function must be configured using the Service Configuration menu. All remote controls of the master/slave assembly (start/stop, set point, load shedding etc.) are controlled by the unit configured as master and must only be applied to the master unit.

Each unit controls its own water pump. If there is only one common pump, in cases with variable flow, isolation valves must be installed on each unit. They will be activated at the opening and closing by the control of each heat pump (in this case the valves are controlled using the dedicated water pump outputs). See the 30GX/HXC Pro-Dialog Plus Control IOM for a more detailed explanation.

30HXC/GX with configuration: leaving water control



9 - MAJOR SYSTEM COMPONENTS AND OPERATION DATA

9.1 - Geared twin screw compressor

- 30HXC and 30GX units use 06N geared twin screw compressors
- 06NA are used on 30GX (air-cooled condensing application)
- 06NW are used on 30HXC (water-cooled condensing application)
- Nominal capacities range from 137 to 281 kW (39 to 80 tons). Economized or non economized models are used depending on the 30HXC and 30GX unit size.

9.1.1 - Oil filter

The 06N screw compressor has an oil filter integral in the compressor housing. This filter is field replaceable.

9.1.2. - Refrigerant

The 06N screw compressor is specially designed to be used in R-134a system only.

9.1.3 - Lubricant

The 06N screw compressor is approved for use with the following lubricant: Carrier material spec PP 47-32.

9.1.4 - Oil supply solenoid valve

An oil supply solenoid valve is standard on the compressor to isolate the compressor from oil flow when the compressor is not operating.

The oil solenoid is field replaceable.

9.1.5 - Suction and economizer screens

To increase the reliability of the compressor, a screen has been incorporated as a standard feature into suction and economizer inlets of the compressor.

9.1.6 - Unloading system

The 06N screw compressor has an unloading system that is standard on all compressors. This unloading system consists of two steps of unloading that decrease the compressor capacity by rerouting partially compressed gas back to suction.

9.2 - Pressure vessels

9.2.1 - Evaporator

30HXC and 30GX chillers use a flooded evaporator. The water circulates in the tubes and the refrigerant is on the outside in the shell. One vessel is used to serve both refrigerant circuits. There is a center tube sheet which separates the two refrigerant circuits. The tubes are 3/4" diameter copper with an enhanced surface inside and out. There is just one water circuit, and depending on the size of the chiller, there may be two or three water passes.

At the top of the cooler are the two suction pipes, one in each circuit. Each has a flange welded to it, and the compressor mounts on the flange.

The evaporator shell has a thermal insulation of 19 mm thick polyurethane foam and a water drain and purge. With the very low temperature option this insulation is 38 mm thick.

9.2.2 - Condenser and oil separator (30HXC)

30HXC chiller use a vessel that is a combination condenser and oil separator. It is mounted below the cooler. Discharge gas leaves the compressor and flows through an external muffler to the oil separator, which is the upper portion of the vessel. It enters the top of the separator where oil is removed, and then flows to the bottom portion of the vessel, where gas is condensed and subcooled. One vessel is used to serve both refrigerant circuits. There is a center tube sheet which separates the two refrigerant circuits. The tubes are 3/4" or 1" diameter copper with enhanced surface inside and out. There is just one water circuit with two water passes.

The condenser shell can have a thermal insulation of 19 mm thick polyurethane foam and a water drain and purge.

9.2.3 - Oil separator (30GX)

In the air-cooled units, the oil separator is a pressure vessel that is mounted under the outside vertical condenser coils. Discharge gas enters at the top of the separator where much of the oil separates and drains to the bottom. The gas then flows through a wire mesh screen where the remaining oil is separated and drains to the bottom.

The oil separator vessel shell has a thermal insulation of 19 mm thick polyurethane foam.

The oil separator is equipped with a trace heater regulated by the control. This heater is equipped with an internal thermostat that disconnects the power supply when the temperature reaches 85°C and automatically resets when the temperature again falls to a normal value.

The products that may be added for thermal insulation of the vessels during the water piping connection procedure must be chemically neutral in relation to the materials and coatings to which they are applied. This is also the case for the products originally supplied by Carrier.

NOTES: Monitoring during operation, re-qualification, re-testing and re-testing dispensation:

- *Follow the regulations on monitoring pressurised equipment.*
- *It is normally required that the user or operator sets up and maintains a monitoring and maintenance file.*
- *Follow the control programmes of EN 378-2, annexes A, B, C and D.*
- *If they exist follow local professional recommendations.*
- *Regularly inspect the condition of the coating (paint) to detect blistering resulting from corrosion. To do this, check a non-insulated section of the container or the rust formation at the insulation joints.*
- *Regularly check for possible presence of impurities (e.g. silicon grains) in the heat exchange fluids. These impurities may be the cause of the wear or corrosion by puncture.*
- *Filter the heat exchange fluid check and carry out internal inspections as described in EN 378-2, annex C.*
- *In case of re-testing take the maximum pressure difference into consideration. Never exceed the maximum or minimum operating pressures given on the unit nameplate.*
- *The reports of periodical checks by the user or operator must be included in the supervision and maintenance file.*

Repair

Any repair or modification, including the replacement of moving parts:

- must follow local regulations and be made by qualified operators and in accordance with qualified procedures, including changing the heat exchanger tubes,
- must be made in accordance with the instructions of the original manufacturer. Repair and modification that necessitate permanent assembly (soldering, welding, expanding etc.) must be made using the correct procedures and by qualified operators,

An indication of any modification or repair must be shown in the monitoring and maintenance file.

Recycling

The unit is wholly or partly recyclable. After use it contains refrigerant vapours and oil residue. It is coated by paint.

Operating life

This unit is designed for:

- prolonged storage of 15 years under nitrogen charge with a temperature difference of 20 K per day,
- 452000 cycles (start-ups) with a maximum difference of 6 K between two neighbouring points in the vessel, based on 6 start-ups per hour over 15 years at a usage rate of 57%.

Corrosion allowances

- Gas side: 0 mm
- Heat exchange fluid side: 1 mm for tubular plates in lightly alloyed steels, 0 mm for stainless steel plates or plates with copper-nickel or stainless steel protection.

9.3 - Electronic expansion device (EXV)

The microprocessor controls the EXV through the EXV control module. Inside this EXV is a linear actuator stepper motor. High-pressure liquid refrigerant enters the valve through the bottom. A series of calibrated slots are located inside the orifice assembly. As refrigerant passes through the orifice, the pressure drops and the refrigerant changes to a 2-phase condition (liquid and vapour). To control refrigerant flow for different operating conditions, the sleeve moves up and down over the orifice, thereby changing effective flow area of expansion device. The sleeve is moved by a linear stepper motor. The stepper motor moves in increments and is controlled directly by the processor module. As the stepper motor rotates, motion is transferred into linear movement by the lead screw. Through the stepper motor and lead screws, 1500 discrete steps of motion are obtained. The large number of steps and long stroke result in very accurate control of refrigerant flow.

At initial start-up, the EXV position is at zero. After that, the microprocessor keeps accurate track of the valve position in order to use this information as input for the other control functions. It does this by initializing the EXV's at startup. The processor sends out enough closing pulses to the valve to move it from fully open to fully closed, then resets the position counter to zero. From this point on, until the initialization, the processor counts the total number of open and closed steps it has sent to each valve.

9.4 - Economizer

Economizers are installed on 30HXC 190, 285 and 375 and 30GX 182, 267 and 358.

The economizer improves both the chiller capacity and efficiency as well as providing motor cooling. The economizers used are direct-expansion plate heat exchangers.

The flow of the direct-expansion plate heat exchanger circuit is adjusted by the motor cooling valves. The circuit permits sub-cooling of the liquid circuit.

9.5 - Oil pumps

The 30GX/HXC screw chillers use one externally mounted pre-lubricating oil pump per circuit. This pump is operated as part of the start-up sequence.

ATTENTION: The operating temperature of the coil may reach 80°C. In certain temporary conditions (especially during start-up at low outside temperature or low condenser loop temperature) the oil pump can be reactivated.

On 30GX units, the pumps are mounted to the base rails on the oil separator side of the unit. The pumps are mounted to a bracket on the condensers of 30HXC units. When a circuit is required to start, the controls will energize the oil pump first so that the compressor starts with correct lubrication. If the pump has built up sufficient oil pressure, the compressor will be allowed to start. Once the compressor has started, the oil pump will be turned off. If the pump was not able to build up enough oil pressure, the control will generate an alarm.

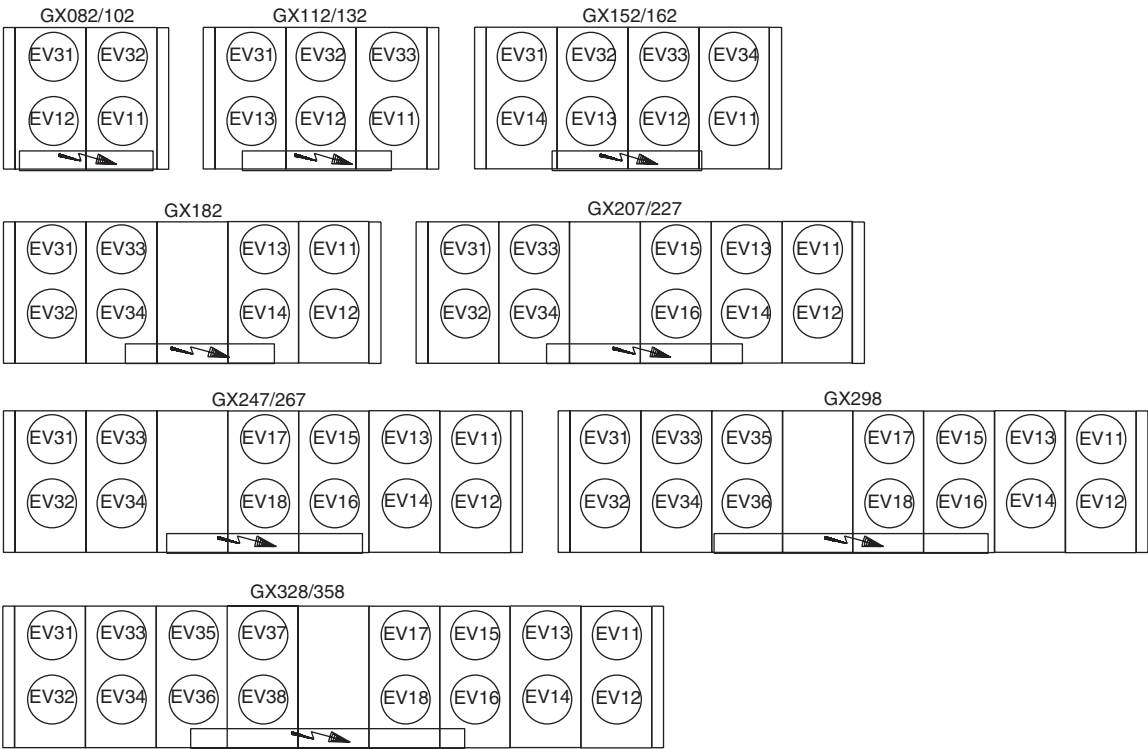
9.6 - Motor cooling valves

Compressor motor winding temperatures are controlled to the optimum setpoint. The control accomplishes this by cycling the motor cooling solenoid valve to allow liquid refrigerant to flow across the motor windings as needed. On units equipped with economizers, a single valve per circuit controls the refrigerant flow required for the economizer effect and for motor cooling. This is a valve with progressive control. The adjustment of the opening is determined by Pro-Dialog, based on the compressor motor temperature.

9.7 - Sensors

The units use thermistors to measure the temperature, and pressure transducers to control and regulate system operation (see 30GX/HXC - Pro-Dialog Plus Control IOM for a more detailed explanation).

30GX fan arrangement



10 - MAIN OPTIONS AND ACCESSORIES

Depending on the applications for which the units are selected, they can be equipped with options. This chapter describes the main components that require special information for correct start-up and maintenance of these units, except where this is contained in a separate document.

10.1 - Compressor suction valves (option 92)

These valves are designed to isolate the compressor from the rest of the circuit. Discharge valves, oil valves and cooling valves are installed in the standard unit. A label attached to the evaporator near each valve shows the open or closed position of the valve. It is important to remove the cap in order to manoeuvre the valve shaft and to replace it after this operation to ensure leak-tightness.

10.2 - Compressor and evaporator noise insulation (30GX - option 14A)

The evaporator and the compressor body are wrapped in a noise-absorbing cover, consisting of a leak-tight enclosure, protecting a flexible acoustic material. It is fixed with self-adhesive tape to the components. During maintenance operations certain parts must be removed, and later replaced. Take care to avoid damage the leak-tight enclosure of the acoustic material and the electrical connections.

10.3 - Low-noise 30GX units equipped with acoustic panels (option 15)

The modifications compared with the standard units are:

- Factory-installation of an acoustic board.
- Factory-installation of side panels.
- Field-installation of a fixing system for the acoustic panels.
- Field-installation of removable acoustic panels.

These units have a special dimensional drawing. The mounting instructions are supplied with the panel fixing system. Following these instructions will:

- facilitate installation
- identify the position of each panel
- identify the panel(s) behind which the control box is located
- permit connection of a service tool linked to CCN without removing the panels.

10.4 - Evaporator frost protection (30GX - option 41A)

The modifications compared with the standard units are:

- additional solenoid valves at the condenser entering piping
- additional liquid solenoid valves at the evaporator entering refrigerant piping
- additional heaters on the shell and the evaporator water heads (under the insulation).

These elements can be shown on the unit and on the wiring diagram.

When the unit stops, the closure of the solenoid valves prevents migration of the refrigerant contained in the evaporator to the condenser, if this is the cold point of the circuit. The heaters are activated, when the outdoor temperature is low and permit maintaining a saturated pressure in the evaporator (see 30GX/HXC Pro-Dialog Plus Control IOM for a more detailed explanation).

Heater capacities 30GX units

30GX	Capacity in kW
082-132	4.3
152-162	4.8
182	5.3
207-227	5.8
247-358	6.9

IMPORTANT: To ensure that the protection works the heaters and the control must be energised. The correct operation of the heaters must be verified at start-up and must form part of the annual operation checks of these units.

Never switch off the heaters. The main disconnect switch (QS 101) and the auxiliary heater disconnect switch must always remain energised (see wiring diagram for location of QS and QF 101).

10.5 - Year-round operation of 30GX units (option 28)

The modifications compared with the standard units consist of placing insulated trace heaters on:

- the oil piping
- the oil filter box body

These elements can be shown on the unit and on the wiring diagram.

The heaters are activated, based on the outdoor temperature (see 30GX/HXC Pro-Dialog Plus Control IOM for a more detailed explanation).

The heaters are equipped with an internal thermostat that disconnects the power supply when the temperature reaches 85°C and automatically resets when the temperature again falls to a normal value.

10.6 - Soft Start for 3- and 4-compressor 30HXC and 30GX units (option 25)

These units are equipped with an electronic compressor starter. This permits optimising the start-up current, and reducing nuisance cut-outs due to current surges in the electrical system at start-up. The starter parameters are factory-set.

For more detailed information refer to the specific document supplied with this option.

IMPORTANT: If any work is carried out on the electrical components, normal safety measures must be observed. Factory settings must not be modified. If these instructions are not followed, the Carrier guarantee will become invalid.

10.7 - Electric protection level of the 30HXC control boxes to IP44C (option 20)

The control boxes are leak-tight and equipped with a ventilation system to ensure cooling of the electrical components. The control box fan is controlled by a thermostat (setpoint 55°C, differential 20°C). A safety thermostat switches the unit off, if the control box temperature exceeds 60°C.

These elements can be shown on the unit and on the wiring diagram.

10.8 - Tropicalised control box for 30HXC and 30GX units (option 22)

The control boxes are leak-tight and equipped with heaters. The standard components are already treated for “all-weather” operation. Heating the air will reduce the moisture level in the control box and prevent condensation.

10.9 - Brine units for low-temperature evaporator leaving applications (option 5)

These units are verified for compatibility between unit and specific application.

They have control configuration parameters that are matched to the application (see 30GX/HXC Pro-Dialog Plus Control IOM for a more detailed explanation).

10.10 - Disassembled 30HXC units (option 51)

These units are equipped with flange connections on the refrigerant piping to permit disassembly of the units without unwelding. The dimensional drawing for this option gives the weight of the different parts. The units are fully factory-assembled, charged with oil and refrigerant and run-tested at the end of the assembly line. The refrigerant charge is then removed and replaced by a nitrogen holding charge.

IMPORTANT: *The oil charge remains in the unit and must not be exposed to moisture during disassembly and reassembly. The refrigerant charge is not supplied and must be provided on site. Please refer to the unit nameplate.*

10.11 - Available fan pressure of 150 Pa for 30GX units (option 12)

The electrical section and the fan disconnect switches are matched to the application. The relevant certified dimensional drawing shows the new elements (unit weights and dimensions, duct connection diameters and location).

IMPORTANT: *The units (supplied for operation with discharge ducts) are shipped without fan discharge protection grilles. For safety reasons, the unit must not be started until the ducts have been connected.*

11 - MAINTENANCE

11.1 - Maintenance instructions

During the unit operating life the service checks and tests must be carried out in accordance with applicable national regulations.

If there are no similar criteria in local regulations, the information on checks during operation in annex C of standard EN 378-2 can be used.

External visual checks: annex D of standard EN 378-2. These controls must be carried out:

- After an intervention that is likely to affect the resistance or a change in use or change of high-pressure refrigerant, or after a shut down of more than two years. Components that do not comply, must be changed. Test pressures above the respective component design pressure must not be applied (annex B and D).
- After repair or significant modifications or significant system or component extension (annex B).
- After re-installation at another site (annexes A, B and D).
- After repair following a refrigerant leak (annex D). The frequency of refrigerant leak detection can vary from once per year for systems with less than 1% leak rate per year to once a day for systems with a leak rate of 35% per year or more. The frequency is in proportion with the leak rate.

NOTE: *High leak rates are not acceptable. The necessary steps must be taken to eliminate any leak detected.*

NOTE 2: *Fixed refrigerant detectors are not leak detectors, as they cannot locate the leak.*

11.2 - Soldering and welding

Component, piping and connection soldering and welding operations must be carried out using the correct procedures and by qualified operators. Pressurised containers must not be subjected to shocks, nor to large temperature variations during maintenance and repair operations.

11.3 - Refrigerant charging - adding charge

IMPORTANT: *These units are designed for use with R-134a only. DO NOT USE ANY OTHER refrigerant in these units.*

CAUTION: *When adding or removing charge, circulate water through the condenser (HX) and cooler at all times to prevent freezing. Freezing damage is considered abuse and may void the Carrier warranty.*

All refrigerant removal and draining operations must be carried out by a qualified technician and with the correct material for the unit. Any inappropriate handling can lead to uncontrolled fluid or pressure leaks.

CAUTION: *DO NOT OVERCHARGE system. Overcharging results in higher discharge pressure with higher cooling fluid consumption, possible compressor damage and higher power consumption.*

11.4 - Indication of low charge on a 30HXC system

NOTE : *To check for low refrigerant charge on a 30HXC, several factors must be considered. A flashing liquid-line sightglass is not necessarily an indication of inadequate charge. There are many system conditions where a flashing sightglass occurs under normal operation. The 30HXC metering device is designed to work properly under these conditions.*

1. Make sure that the circuit is running at a full-load condition. To check whether circuit A is fully loaded, follow the procedure described in the Controls manual.
2. It may be necessary to use the Manual Control feature to force the circuit into a full-load condition. If this is the case, see the instructions for using the Manual Control feature in the Controls manual.
3. With the circuit running at full-load, verify that the cooler leaving fluid temperature is in the range of $6^{\circ}\text{C} \pm 1.5\text{ K}$.
4. At this condition, observe the refrigerant in the liquid line sightglass. If there is a clear sightglass, and no signs of flashing, then the circuit is adequately charged. Skip the remaining steps.
5. If the refrigerant appears to be flashing, the circuit is probably low on charge. Verify this by checking the EXV position (see 30GX/HXC Pro-Dialog Plus Controls IOM).
6. If the opening position of the EXD is greater than 60%, and if the liquid-line sightglass is flashing, then the circuit is low on charge. Follow the procedure for adding charge.

11.4.1 - To add charge to the 30HXC systems

1. Make sure that the unit is running at full-load, and that the cooler leaving fluid temperature is in the range of 5.6 to 7.8°C .
2. At these operating conditions, check the liquid-line sightglass. If there is a clear sightglass, then the unit has sufficient charge. If the sightglass is flashing, then check the EXD Percent Open. If this is greater than 60%, then begin adding charge.

NOTE: *A flashing liquid-line sightglass at operating conditions other than those mentioned above is not necessarily an indication of low refrigerant charge.*

3. Add 2.5 kg of liquid charge into the evaporator using the charging valve located on the top of the evaporator.
4. Observe the EXD Percent Open value. The EXD should begin closing as charge is being added. Allow the unit to stabilize. If the EXD Percent Open remains above 60%, and there are still bubbles in the sightglass, add an additional 2.5 kg of liquid charge.
5. Allow the unit to stabilize, and again check the EXD Percent Open. Continue adding 2.5 kg of liquid refrigerant charge at a time, and allow the unit to stabilize before checking the EXD position.
6. When the EXD Percent Open is in the range of 40-60%, check the liquid line sightglass. Slowly add enough additional liquid charge to ensure a clear sightglass. This should be done slowly to avoid overcharging the unit.

7. Verify adequate charge by continuing to run at full-load with $6^{\circ}\text{C} \pm 1.5\text{ K}$ evaporator leaving fluid temperature. Check that the refrigerant is not flashing in the liquid-line sightglass. The EXD Percent Open should be between 40 and 60%. The cooler level indicator should be in the range of 1.5 - 2.5.

11.4.2 - Indication of low charge on 30GX systems

1. Make sure that the circuit is running at a full-load condition and that the condensing temperature is $50^{\circ}\text{C} \pm 1.5\text{ K}$. To check whether circuit A is fully-loaded, follow the procedure in the 30GX/HXC Pro-Dialog Plus Controls IOM.
2. It may be necessary to use the Manual Control feature to force the circuit into a full-load condition. If this is the case, see the instructions for using the Manual Control function (procedure in the 30GX/HXC Pro-Dialog Plus Controls IOM).
3. With the circuit running at full-load, verify that the cooler leaving fluid temperature is in the range of $6^{\circ}\text{C} \pm 1.5\text{ K}$.
4. Measure the air temperature entering the condenser coils. Measure the liquid temperature after the tee where the two coil liquid lines join. The liquid temperature should be 8.3 K above the air temperature entering the coils. If the difference is more than this and the sightglass is flashing, the circuit is uncharged. Proceed to step 5.
5. Add 2.5 kg of liquid charge into the cooler using charging valve located in the top of the cooler.
6. Allow the system to stabilize and then recheck the liquid temperature. Repeat step 5 as needed allowing the system to stabilize between each charge addition. Slowly add charge as the sightglass begins to clear to avoid over-charging.

11.4.3 - Space temperature, outdoor air temperature (optional)

These temperatures are used to measure the temperature of the space or the outside air temperature respectively for reset control based on Outside Air or Space Temperature reset options.

11.5 - Electrical maintenance

When working on the unit comply with all safety precautions described in section "Maintenance safety considerations".

- It is strongly recommended to change the fuses in the units every 15000 operating hours or every 3 years.
- It is recommended to verify that all electrical connections are tight:
 - after the unit has been received at the moment of installation and before the first start-up,
 - one month after the first start-up, when the electrical components have reached their nominal operating temperatures,
 - then regularly once a year.

11.6 - Pressure transducers

11.6.1 - Discharge pressure (circuits A and B)

This input is used to measure the high side pressure of each circuit of the unit.

It is used to provide the pressure to replace the discharge pressure gauge and to control the head pressure.

11.6.2 - Suction pressure (circuits A and B)

This input is used to measure the pressure of the low side of the unit. It is used to provide the pressure to replace the suction pressure gauge.

11.6.3 - Oil pressure (each compressor)

This input is used to measure the oil pressure of each unit compressor. It is located on the oil pressure port of each compressor.

11.6.4 - Economizer pressure (circuits A and B)

This input is used to monitor the oil pressure differential supplied to the compressor.

11.7 - Oil charging - low oil recharging

11.7.1 - Addition of oil charge to 30HXC/GX systems

1. If the 30HXC/GX unit shuts-off repeatedly on Low oil Level, this may be an indication of inadequate oil charge. It could also mean simply that oil is in the process of being reclaimed from the low-side of the system.
2. Begin by running the unit at full-load for an hour and a half.
3. After running for 1-1/2 hours allow the unit to re-start and run normally. If the Low Oil Level alarms persist, the unit has a low oil charge. Add oil to the oil separator, using the oil charging valve at the bottom of the condenser (30HXC) or at the bottom of the oil separator (30GX).

CAUTION: Do NOT add oil at any other location as improper unit operation may result.

4. Make sure that the unit is not running when adding oil, as this will make the oil charging process easier. Because the system is under pressure even when the unit is not running, it will be necessary to use a suitable pump (hand or electric pump) to add oil to the system.
5. Using a suitable pump, add 2 litres of Polyolester oil to the system (CARRIER SPEC: PP47-32). Make sure that the oil level safety switch is NOT jumpered, and allow the unit to re-start and run normally.
6. If low oil level problems persist, add another 1 or 2 litres of oil. If it is necessary to add more than 4 litres of oil to the system, then contact your Carrier distributor service department.

CAUTION: When transferring the refrigerant charge to a storage unit, oil may be carried along when the unit is not operating. Reuse first of all the amount of refrigerant transferred. After draining the oil, only recharge the amount drained (an excess oil charge may impair correct unit operation).

If an oil draining or recovery operation becomes necessary, the fluid transfer must be made using mobile containers.

11.8 - Integral oil filter change

An integral oil filter in the 06N screw compressor is specified to provide a high level of filtration (3 µ) required for long bearing life. As system cleanliness is critical to reliable system operation, there is also a prefilter (7 µ) in the oil line at the oil separator outlet.

The replacement integral oil filter element part number is:

Carrier part number (including filter and O-ring): 06NA 660016S.

11.9 - Filter change-out schedule

The filter should be checked after the first 1000 hours of operation, and every subsequent 4000 hours. The filter should be replaced at any time when the pressure differential across the filter exceeds 2.1 bar.

The pressure drop across the filter can be determined by measuring the pressure at the filter service port and the oil pressure port. The difference in these two pressures will be the pressure drop across the filter, check valve, and solenoid valve. The pressure drop across the check valve and solenoid valve is approximately 0.4 bar, which should be subtracted from the two oil pressure measurements to give the oil filter pressure drop. The oil filter pressure drop should be checked after any occasion that the compressor is shut down on a low oil pressure safety.

11.10 - Filter change-out procedure

The following steps outline the proper method of changing the integral oil filter.

1. Shutdown and lockout the compressor.
2. Manually force the operation of the oil solenoid valve, in order to press the internal valve shutter onto its seat.
3. Close the oil filter service valve. Bleed pressure from the filter cavity through the filter service port.
4. Remove the oil filter plug. Remove the old oil filter.
5. Prior to installing the new oil filter, "grease" the o-ring with oil. Install the filter and replace the plug.

Before closing up the lube oil system, take the opportunity to replace the prefilter, as well.

6. When complete, evacuate the filter cavity through the filter service port. Open the filter service valve. Remove any compressor lockout devices, the compressor is ready to return to operation.

11.11 - Compressor replacement

11.11.1 - Compressor rotation control

Correct compressor rotation is one of the most critical application considerations. Reverse rotation, even for a very short duration, damages the compressor.

The reverse rotation protection scheme must be capable of determining the direction of rotation and stopping the compressor within 300 milliseconds. Reverse rotation is most likely to occur whenever the wiring to the compressor terminals is disturbed.

To minimize the opportunity for reverse rotation, the following procedure must be applied. Rewire the power cables to the compressor terminal pin as originally wired.

For replacement of the compressor, a low pressure switch is included with the compressor. This low pressure switch should be temporarily installed as a hard safety on the high pressure part of the compressor. The purpose of this switch is to protect the compressor against any wiring errors at the compressor terminal pin. The electrical contact of the switch would be wired in series with the high pressure switch. The switch will remain in place until the compressor has been started and direction of rotation has been verified; at this point, the switch will be removed.

The switch that has been selected for detecting reverse rotation is Carrier part number HK01CB001. It is available as part of the “Compressor installation package” (part No. 06NA 660 013). This switch opens the contacts when the pressure falls below 6,8 kPa absolute. The switch is a manual reset type that can be reset after the pressure has once again risen above 69 kPa relative. It is critical that the switch be a manual reset type to preclude the compressor from short cycling in the reverse direction.

11.11.2 - EXD troubleshooting procedure

Follow steps below to diagnose and correct EXD problems.

Check EXD motor operation first (see procedure in the 30GX/HXC Pro-Dialog Plus Controls IOM). You should be able to feel the actuator moving by placing your hand on the EXD. You should feel a hard knocking come from the actuator when it reaches the top of its stroke (can be heard if surroundings are relatively quiet). The actuator should knock when it reaches the bottom of its stroke. If it is believed that the valve is not working properly, contact your Carrier service department for further checks on:

- output signals on EXD module
- wire connections (continuity and tight connection at all pin terminals)
- resistance of the EXD motor windings.

11.12 - Corrosion control

All metallic parts of the unit (chassis, casing panels, control boxes, heat exchangers etc.) are protected against corrosion by a coating of powder or liquid paint. To prevent the risk of blistering corrosion that can appear when moisture penetrates under the protective coatings, it is necessary to carry out periodic checks of the coating (paint) condition.

11.13 - Condenser coil

We recommend, that finned coils are inspected regularly to check the degree of fouling. This depends on the environment where the unit is installed, and will be worse in urban and industrial installations and near trees that shed their leaves.

For coil cleaning proceed as follows:

- Remove fibres and dust collected on the condenser face with a soft brush (or vacuum cleaner).
- Clean the coil with the appropriate cleaning agents.

We recommend TOTALINE products for coil cleaning:
Part No. P902 DT 05EE: traditional cleaning method
Part No. P902 CL 05EE: cleaning and degreasing.

These products have a neutral pH value, do not contain phosphates, are not harmful to the human body, and can be disposed of through the public drainage system.

Depending on the degree of fouling both products can be used diluted or undiluted.

For normal maintenance routines we recommend using 1 kg of the concentrated product, diluted to 10%, to treat a coil surface of 2 m². This process can either be carried out using a high-pressure spray gun in the low-pressure position. With pressurised cleaning methods care should be taken not to damage the coil fins. The spraying of the coil must be done:

- in the direction of the fins
- in the opposite direction of the air flow direction
- with a large diffuser (25-30°)
- at a minimum distance of 300 mm from the coil.

The two cleaning products can be used for any of the following coil finishes: Cu/Cu, Cu/Al, Cu/Al with Italcoat or Polual protection.

It is not necessary to rinse the coil, as the products used are pH neutral. To ensure that the coil is perfectly clean, we recommend rinsing with a low water flow rate. The pH value of the water used should be between 7 and 8.

WARNING:

Never use pressurized water without a large diffuser. Concentrated and/or rotating water jets are strictly forbidden.

Correct and frequent cleaning (approximately every three months) will prevent 2/3 of the corrosion problems.

Protect the control box during cleaning operations.

Never use a fluid with a temperature above 45°C to clean the air heat exchangers.

12 - START-UP CKECKLIST FOR 30HXC/GX LIQUID CHILLERS (USE FOR JOB FILE)

Preliminary information

Job name:
Location:
Installing contractor:
Distributor:
Start-up preformed by:

Equipment

Model: Serial number

Compressors

Circuit A

1. Model number
Serial number
Motor number

2. Model number
Serial number
Motor number

Circuit B

1. Model number
Serial number
Motor number

2. Model number
Serial number
Motor number

Cooler

Model number Manufactured by
Serial number Date

Condenser (30HXC)

Model number Manufactured by
Serial number Date

Air handling equipment

Manufacturer
Model number Serial number

Additional air handling units and accessories
.....

Preliminary equipment check

Is there any shipping damage? If so, where?
.....
Will this damage prevent unit start-up?

- ☐ Unit is level in its installation
- ☐ Power supply agrees with the unit nameplate
- ☐ Electrical circuit wiring has been sized and installed properly
- ☐ Unit ground wire has been connected
- ☐ Electrical circuit protection has been sized and installed properly
- ☐ All terminals are tight
- ☐ All cables and thermistors have been inspected for crossed wires
- ☐ All plug assemblies are tight

Check air handling systems

- ☐ All air handlers are operating
- ☐ All chilled water valves are open
- ☐ All fluid piping is connected properly
- ☐ All air has been vented from the system
- ☐ Chilled water pump (CWP) is operating with the correct rotation. CWP amperage: Rated: Actual:

Check condenser system (30HXC)

- ☐ All condenser water valves are open
- ☐ All condenser piping is connected properly
- ☐ All air has been vented from the system
- ☐ Condenser water pump (CWP) is operating with the correct rotation.
Condenser water pump amperage: Rated: Actual:

Unit start-up

- ☐ CWP starter has been properly interlocked with the chiller
- ☐ Oil heaters have been energized for at least 24 hours (30GX)
- ☐ Oil level is correct
- ☐ All discharge and liquid valves are open
- ☐ All suction valves are open, if equipped
- ☐ All oil line valves and economizer discharge bubbler valves (30HXC only if equipped) are open
- ☐ Unit has been leak checked (including fittings)
Locate, repair, and report any refrigerant leaks

.....
.....
.....

Check voltage imbalance: AB AC..... BC.....
Average voltage = (see installation instructions)
Maximum deviation = (see installation instructions)
Voltage imbalance = (see installation instructions)

- ☐ Voltage imbalance is less than 2%

WARNING: Do not start chiller if voltage imbalance is greater than 2%. Contact local power company for assistance.

- ☐ All incoming power voltage is within rated voltage range

Check cooler water loop

Water loop volume = (litres)
Calculated volume = (litres)
3.25 litres/nominal kW capacity for air conditioning
6.5 litres/nominal kW capacity for process cooling

- ☐ Proper loop volume established
- ☐ Proper loop corrosion inhibitor included.....litres of
- ☐ Proper loop freeze protection included (if required) litres of.....
- ☐ Piping includes electric heater tape, if exposed to the outside
- ☐ Inlet piping to cooler includes a 20 mesh strainer with a mesh size of 1.2 mm

Check pressure drop across the cooler

Entering cooler = (kPa)
Leaving cooler = (kPa)
(Leaving - entering) = (kPa)

WARNING: Plot cooler pressure drop on performance data chart (in product data literature) to determine total litres per second (l/s) and find unit's minimum flow rate.

Total l/s =
l/s / nominal kW =

- ☐ Total l/s is greater than unit's minimum flow rate
- ☐ Total l/s meets job specified requirement of..... (l/s)

Check condenser water loop

- ☐ Proper loop corrosion inhibitor included.....litres of
- ☐ Inlet piping to condenser includes a 20 mesh strainer with a mesh size of 1.2 mm

Check pressure drop across the condenser (30HXC only)

Entering condenser = (kPa)

Leaving condenser = (kPa)

(Leaving - entering) = (kPa)

WARNING: Plot condenser pressure drop on performance data chart (in product data literature) to determine total litres per second (l/s) and find unit's minimum flow rate.

Total l/s =

l/s / nominal kW =

☐ Total l/s is greater than unit's minimum flow rate☐ Total l/s meets job specified requirement of..... (l/s)**Perform TEST function (indicate positive result):****WARNING:** Once power is supplied to the unit, check the display for any alarms, such as phase reversal. Follow the TEST function instructions in the Controls and Troubleshooting literature (follow the procedure in the Controls IOM).

Cooler fluid select	External reset sensor
Minimum load select	Cooler pump interlock
Loading sequence select	Cooler pump control
Lead/lag sequence select	Condenser pump control*
Head pressure control	Condenser flow switch*
Motormaster select*	Condenser water sensors*
Water valve type*	*If installed

To start the chiller**WARNING:** Be sure that all service valves are open, and all pumps are on before attempting to start this machine. Once all checks have been made, move the switch to "LOCAL" or "REMOTE" from "OFF".☐ Unit starts and operates properly**Temperatures and pressures****WARNING:** Once the machine has been operating for a while and the temperatures and pressures have stabilized, record the following:

Cooler EWT	Ambient temperature (GX)
Cooler LWT	Condenser EWT
	Condenser LWT
Circuit A oil pressure	Circuit B oil pressure
Circuit A suction pressure	Circuit B suction pressure
Circuit A discharge temperature	Circuit B suction temperature
Circuit A suction temperature	Circuit B discharge pressure
Circuit A discharge pressure	Circuit B discharge temperature
Circuit A liquid line temperature	Circuit B liquid line temperature

NOTE FOR OPTION 51:**The pouch supplied with the unit contains the label indicating the refrigerant used and describing the procedure required under the Kyoto Protocol F-Gas Regulation:**

- Attach this label to the machine.
- Follow and observe the procedure described.



Carrier is participating in the Eurovent Certification Programme. Products are as listed in the Eurovent Directory of Certified Products.

This programme covers air-cooled chillers up to 600 kW and water-cooled chillers up to 1500 kW.



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Manufacturer reserves the right to change any product specifications without notice.



Environmental Management System Approval

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