

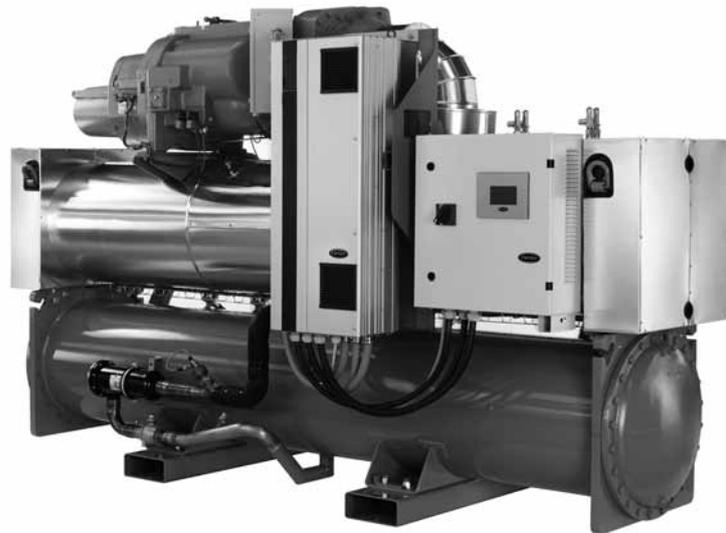


30XW-V/30XWHV

Variable-Speed Water-Cooled Liquid Chillers/Variable-Speed Water-to-Water Heat Pumps

Nominal cooling capacity: 587-858 kW
Nominal heating capacity: 648-968 kW

50 Hz



Installation, operation and maintenance instructions



Quality and Environment
Management Systems
Approval

CONTENTS

1 - INTRODUCTION	4
1.1 - Installation safety considerations	4
1.2 - Equipment and components under pressure	5
1.3 - Maintenance safety considerations	5
1.4 - Repair safety considerations	6
2 - PRELIMINARY CHECKS	7
2.1 - Check equipment received	7
2.2 - Moving and siting the unit	8
3 - DIMENSIONS, CLEARANCES	9
4 - PHYSICAL AND ELECTRICAL DATA	10
4.1 - Physical data	10
4.2 - Electrical data	10
4.3 - Short-circuit stability current for all units	11
4.4 - Compressor electrical data	11
4.5 - Compressor usage	11
5 - ELECTRICAL CONNECTION	12
5.1 - Power supply	12
5.2 - Voltage phase imbalance (%)	12
5.3 - Power connection/disconnect switch	12
5.4 - Recommended wire sections	12
5.5 - Power cable entry	12
5.6 - Field control wiring	13
5.7 - 24 and 230 V power reserve for the user	13
6 - APPLICATION DATA	13
6.1 - Operating limits	13
6.2 - Minimum chilled water flow	13
6.3 - Maximum chilled water flow	14
6.4 - Condenser water flow rate	14
6.5 - Number of passes	14
6.6 - Evaporator and condenser water flow rates	14
6.7 - Variable flow evaporator	14
6.8 - System minimum water volume	14
6.9 - Pressure drop curves	15
7 - WATER CONNECTIONS	16
7.1 - Operating precautions	16
7.2 - Water connections	17
7.3 - Flow control	17
7.4 - Evaporator and condenser water box bolt tightening	17
8 - HEAT PUMPS 30XWHV	17
8.1 - Physical data for heat pumps	17
8.2 - Electrical data for heat pumps	17
8.3 - Dimensions and clearances for heat pumps	17
8.4 - Operating range for heat pumps	17
8.5 - Operating modes for heat pumps	17

9 - MAJOR SYSTEM COMPONENTS AND OPERATION DATA	18
9.1 - Compressors.....	18
9.2 - Oil filter	18
9.3 - Refrigerant	18
9.4 - Lubricant	18
9.5 - Oil supply solenoid valve.....	18
9.6 - Pressure vessels.....	18
9.7 - High-pressure safety switch	19
9.8 - Electronic expansion valve (EXV)	19
9.9 - Moisture indicator	19
9.10 - Filter drier	19
9.11 - Sensors.....	19
9.12 - Frequency variator	19
10 - OPTIONS	20
11 - STANDARD MAINTENANCE.....	21
11.1 - Level 1 maintenance	21
11.2 - Level 2 maintenance	21
11.3 - Level 3 (or higher) maintenance	21
11.4 - Tightening of the electrical connections	21
11.5 - Tightening torques for the main bolts and screws	22
11.6 - Evaporator and condenser maintenance.....	22
11.7 - Compressor maintenance.....	22
11.8 - Frequency variator maintenance	23
12 - START-UP CHECKLIST FOR 30XW-V/30XWHV UNITS (USE FOR JOB FILE)	24

This manual applies to the following two variable-speed 30XW unit types:

- 30XW-V Liquid chillers
- 30XWHV Heat pumps

For the operation of the control please refer to the Touch Pilot control manual.

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

1 - INTRODUCTION

30XW-V/30XWHV units are designed to cool or heat water for the air conditioning and heating of buildings and industrial processes.

Prior to the initial start-up of the 30XW-V/30XWHV 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.

30XW-V/30XWHV units are designed for a very high level of safety during installation, start-up, operation and maintenance.

They will provide safe and long-lasting 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.

Always ensure that all required safety measures are followed, including those in this document, such as: wearing protective clothing (gloves, ear defenders, safety glasses and shoes) using appropriate tools, employing qualified and skilled technicians (electricians, refrigeration engineers) and following local regulations.

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

Access to the unit must be reserved to authorised personnel, qualified and trained in monitoring and maintenance. The access limitation device must be installed by the customer (e.g. cut-off, enclosure).

After the unit has been received and 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.

Carrier strongly recommends employing a specialised company to unload the machine.

It is compulsory to wear personal protection equipment.

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.

Use slings or lifting beams with the correct capacity, and always follow the lifting instructions on the certified drawings supplied with the unit. Do not tilt the unit more than 15°.

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 protection devices.

This applies to the safety valves (if used) in the refrigerant or heat transfer medium circuits, the fuse plugs and the pressure switches.

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

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.

All factory-installed relief valves are lead-sealed to prevent any calibration change.

The external safety valves and the fuses are designed and installed to ensure damage limitation in case of a fire.

In accordance with the regulations applied for the design, the European directive on equipment under pressure and in accordance with the national usage regulations:

- ***these safety valves and fuses are not safety accessories but damage limitation accessories in case of a fire,***
- ***the high pressure switches are the safety accessories.***

The relief valve must only be removed if the fire risk is fully controlled and after checking that this is allowed by local regulations and authorities. This is the responsibility of the operator.

The external safety valves must in principle be connected to discharge pipes for units installed in a room. Refer to the installation regulations, for example those of European standards EN 378 and EN 13136.

They include a sizing method and examples for configuration and calculation. Under certain conditions these standards permit connection of several valves to the same discharge pipe. Note: Like all other standards these EN standards are available from national standards organisations.

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.

It is recommended to install an indicating device to show if part of the refrigerant has leaked from the valve. The presence of oil at the outlet orifice is a useful indicator that refrigerant has leaked. Keep this orifice clean to ensure that any leaks are obvious.

The calibration of a valve that has leaked is generally lower than its original calibration. The new calibration may affect the operating range. To avoid a nuisance tripping or leaks, replace or re-calibrate the valve.

Periodic check of the relief valves: See paragraph 1.3 “Maintenance safety considerations”.

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

All refrigerant handling precautions must comply with local regulations.

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.

See section “9.6 - Pressure vessels”.

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.

The insulation must be removed and heat generation must be limited by using a wet cloth.

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.

ATTENTION: *The frequency variators used in the 30XW-V/30XWHV units are equipped with capacitor batteries with a discharge time of twenty (20) minutes after disconnecting the power. If the discharge circuit inside the capacitor fails, it is not possible to define the discharge time.*

After disconnecting the power to the control box, wait twenty minutes before opening the control box.

Before any intervention, verify that there is no voltage present at any accessible conducting parts of the power circuit.

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

ATTENTION: *Even if the unit has 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.*

Protection device checks:

- *If no national regulations exist, check the protection devices on site in accordance with standard EN378: once a year for the high-pressure switches, every five years for external safety valves.*
- *The detailed description of the high-pressure switch test method is given in the service manual for the unit.*

At least once a year thoroughly inspect the protection devices (valves, pressure switches). If the machine operates in a corrosive environment, inspect the protection devices more frequently.

Regularly carry out leak tests and immediately repair any leaks.

Ensure regularly that the vibration levels remain acceptable and close to those at the initial unit start-up.

Before opening a refrigerant circuit, purge and consult the pressure gauges.

Change the refrigerant when there are equipment failures, following a procedure as the one described in NF E29-795 or carry out a refrigerant analysis in a specialist laboratory.

If the refrigerant circuit remains open for longer than a day after an intervention (such as a component replacement), the openings must be plugged and the circuit must be charged with nitrogen (inertia principle). The objective is to prevent penetration of atmospheric humidity and the resulting corrosion on the internal walls and on non-protected steel surfaces.

1.4 - Repair safety considerations

It is compulsory to wear personal protection equipment.

The insulation must be removed and warming up must be limited by using a wet cloth.

Before opening the unit always ensure that the circuit has been purged.

If work on the evaporator is required, ensure that the piping from the compressor is no longer pressurised (as the valve is not leaktight in the compressor direction.)

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 protection devices must be re-checked.

Comply with the regulations and recommendations in unit and HVAC installation safety standards, such as: EN 378, ISO 5149, etc.

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. 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.

RISK OF EXPLOSION: *Never use air or a gas containing oxygen during leak tests to purge lines or to pressurise a machine. Pressurised air mixtures or gases containing oxygen can be the cause of an explosion. Oxygen reacts violently with oil and grease.*

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.

Only use dry nitrogen for leak tests, possibly with an appropriate tracer gas.

Do not unweld or flamecut the refrigerant lines or any refrigerant circuit component until all refrigerant (liquid and vapour) has been removed from unit. 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 contact with liquid refrigerant on the skin or splashing it into the eyes. Use safety goggles and gloves. 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 NF E29-795.

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 and that the unit has been shut down and de-energised before removing components or opening a circuit. If the refrigerant circuit is open to carry out a repair, all circuit openings must be plugged, if the repair takes longer than 30 minutes. This prevents humidity from contaminating the circuit, especially the oil. If the work is expected to take longer, charge the circuit with nitrogen.

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.

It is recommended to wear ear defenders, when working near the unit and the unit is in operation.

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. The name plate is attached to the outside right-hand side of the control box.
- 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)
 - Pressure switch cut-out pressures
 - 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.

The unit must be checked periodically during its whole operating life - if necessary by removing any thermal or sound insulation - 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 11 "Standard maintenance".

The machine must be installed in a place that is not accessible to the public or protected against access by non-authorized persons.

2.2 - Moving and siting the unit

2.2.1 - Moving

See chapter 1.1 “Installation safety considerations”.

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

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.

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.

CAUTION: Lift and set down the unit with great care. Tilting and jarring can damage the unit and impair unit operation.

2.2.3 - 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 the national regulation does not specify any details, refer to standard EN 378-2 as follows:

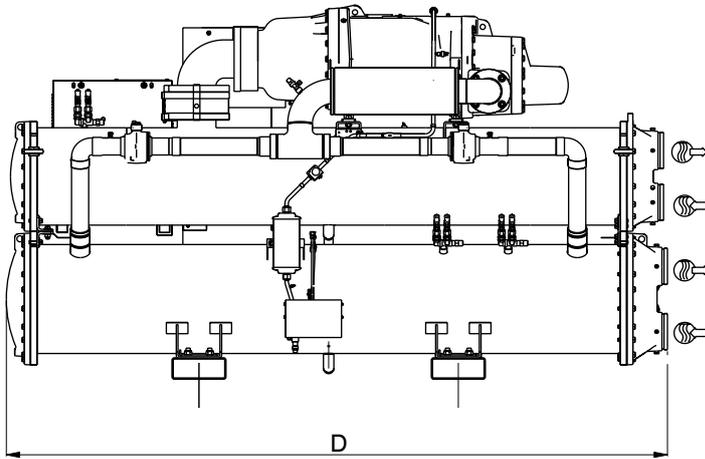
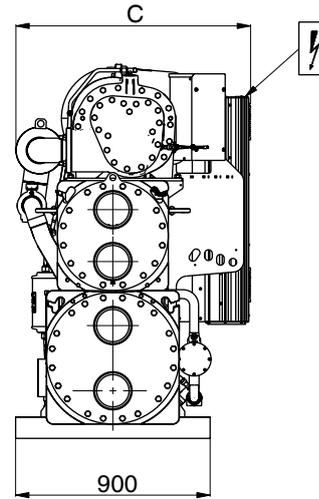
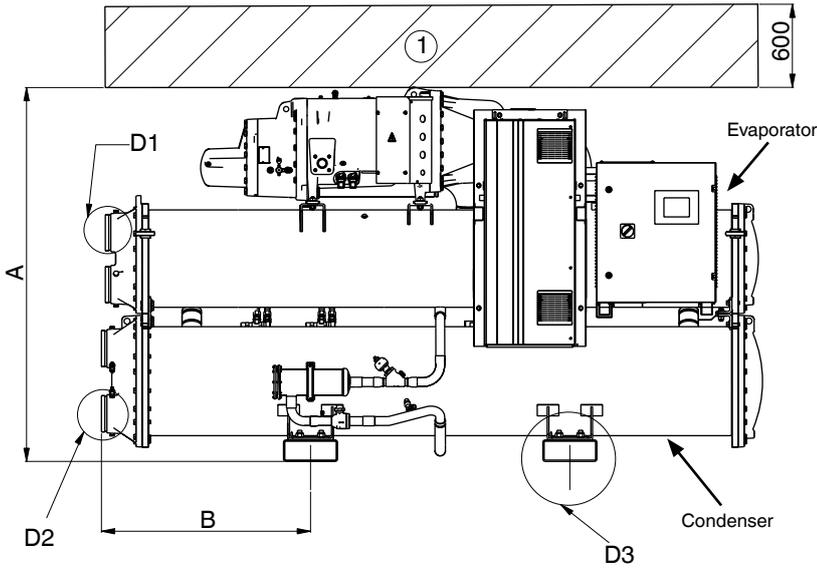
External visual installation checks:

- Compare the complete installation with the refrigeration system and power circuit diagrams.
- Check that all components comply with the design specifications.
- Check that all protection documents and equipment provided by the manufacturer (dimensional drawings, P&ID, declarations etc.) to comply with the regulations are present.
- Verify that the environmental safety and protection and devices and arrangements provided by the manufacturer to comply with the regulations are in place.
- Verify that all document for pressure containers, certificates, name plates, files, instruction manuals provided by the manufacturer to comply with the regulations 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.
- Check the condition of the insulation of the 400 V cables.

3 - DIMENSIONS, CLEARANCES

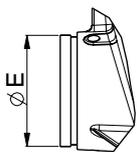
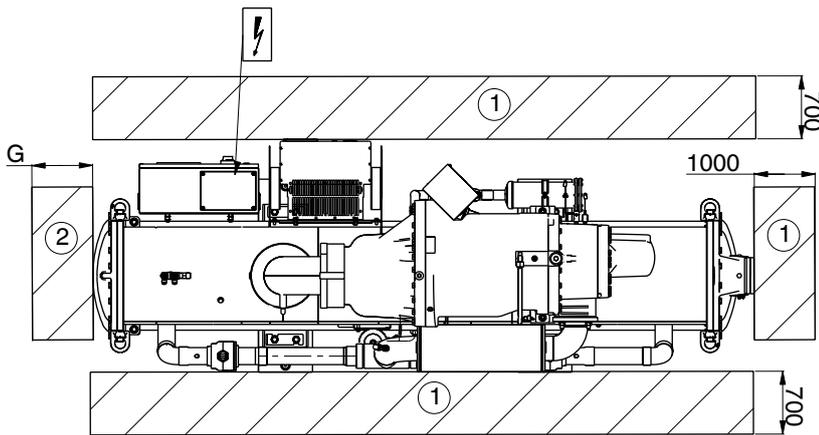
30XW-V/30XWHV 580-880



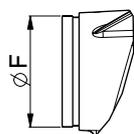
Dimensions in mm							
	A	B	C	D	E	F	G
30XW-V/30XWHV							
580	1743	968	1087	3059	168.3	168.3	2900
630	1743	968	1087	3059	168.3	168.3	2900
810	1950	1083	1237	3290	219.1	219.1	3100
880	1950	1083	1237	3290	219.1	219.1	3100

Legend:
All dimensions are given in mm.

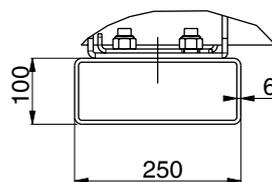
- ① Required clearances for maintenance
- ② Recommended space for tube removal
- Water inlet
- Water outlet
- Power supply connection



D1



D2



D3

NOTES:

- **Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings supplied with the unit or available on request.**
- **For the positioning of the fixing points, weight distribution and centre of gravity coordinates refer to the dimensional drawings.**

4 - PHYSICAL AND ELECTRICAL DATA

4.1 - Physical data

30XW-V/30XWHV		580	630	810	880
Operating weight*	kg	3152	3190	4157	4161
Sound levels, standard units					
Sound power level**	dB(A)	105	105	105	105
Sound pressure level at 1 m***	dB(A)	87	87	87	87
Sound levels, units with option 257					
Sound power level**	dB(A)	102	102	102	102
Sound pressure level at 1 m***	dB(A)	84	84	84	84
Compressor					
Semi-hermetic 06T screw compressor, 60 r/s					
Circuit A	-	1	1	1	1
Refrigerant charge*					
R-134a					
Circuit A	kg	130	125	180	175
Oil charge					
SW220 or RL220H					
Circuit A	l	32	32	36	36
Capacity control					
Touch Pilot, electronic expansion valve (EXV)					
Minimum capacity	%	20	20	20	20
Evaporator					
Multi-tube type flooded					
Net water volume	l	106	106	154	154
Water connections		Victaulic			
Inlet/outlet****	in	6	6	8	8
Drain and purge (NPT)	in	3/8	3/8	3/8	3/8
Maximum water-side operating pressure	kPa	1000	1000	1000	1000
Condenser					
Multi-tube type					
Net water volume	l	112	112	165	165
Water connections		Victaulic			
Inlet/outlet****	in	6	6	8	8
Drain and purge (NPT)	in	3/8	3/8	3/8	3/8
Maximum water-side operating pressure	kPa	1000	1000	1000	1000

* Weights are guidelines only. The refrigerant charge is given on the unit nameplate..

** 10⁻¹² W in accordance with ISO 9614-1

*** In a free field at full load (ref. 2 x 10⁻⁵ Pa)

**** For options 100C (single-pass evaporator) and 102C (single-pass condenser), please refer to chapter 7.2 - "Water connections"

4.2 - Electrical data

30XW-V/30XWHV		580	630	810	880
Power circuit					
Nominal power supply	V-ph-Hz	400-3-50			
Voltage range	V	360-440			
Control circuit					
24 V via the built-in transformer					
Start-up current*	A	Negligible (lower than maximum current drawn)			
Power factor					
-					
At nominal capacity**		0.89	0.90	0.89	0.90
At maximum capacity***		0.92	0.92	0.92	0.92
Cosine phi					
> 0.98					
Total harmonic distortion****	%	40	40	40	40
Maximum power input†	kW	155	193	222	246
Eurovent current draw**	A	175	200	240	265
Maximum current draw (Un)†	A	245	300	346	383
Maximum current draw (Un -10%)***	A	270	330	380	421
Maximum power input with option 150B†	kW	141	173	199	221
Maximum current draw (Un) with option 150B†	A	222	272	314	348
Dissipated power***	W	3000	4200	4700	5300

* Instantaneous start-up current.

** Eurovent unit operating conditions: evaporator entering/leaving water temperature = 12°C/7°C, condenser entering/leaving water temperature = 30°C/35°C.

*** Values obtained at operation with maximum unit power input.

**** The THDI may vary, based on the short-circuit current/max. current draw ratio of the system transformer. In most cases the THDI of the application will be between 35 and 48%.

† Values obtained at operation with maximum unit power input. Values given on the unit name plate.

4.3 - Short-circuit stability current for all units

Short-circuit stability current for all units using the TN system (earthing system type): 50 kA (conditional system short-circuit current I_{cc}/I_{cf} at the unit connection point as rms value).

All units are equipped with a main disconnect switch located in the control box immediately downstream of the unit power connection point.

4.4 - Compressor electrical data

Compressor	I Nom (A)*	I Max (A)**	MHA (A)	LRDA (A)	Cosine phi nom.*	Cosine phi max.**
06TUX483	178	250	279	1537	0.88	0.92
06TUX554	205	315	340	1537	0.89	0.92
06TVX680	245	362	390	2179	0.89	0.92
06TVX753	260	400	430	2179	0.89	0.92

* Value at standard Eurovent conditions: evaporator entering/leaving water temperature = 12°C/7°C, condenser entering/leaving water temperature = 30°C/35°C.

** Value at maximum capacity and nominal voltage (400 V)

Legend

MHA - Maximum compressor operating current, limited by the unit (current given for maximum capacity at 360 V)

LRDA - Locked rotor current for delta connection

4.5 - Compressor usage

30XW-V/30XWHV	580	630	810	880
06TUX483	A	-	-	-
06TUX554	-	A	-	-
06TVX680	-	-	A	-
06TVX753	-	-	-	A

Notes, electrical data and operating conditions - 30XW-V/30XWHV units

- The control box includes the following standard features:
 - One main disconnect switch per circuit
 - Anti-short cycle protection devices
 - Control devices
- **Field connections:**
All connections to the system and the electrical installations must be in full accordance with all applicable codes.
- The Carrier 30XW-V/30XWHV 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*.
- Annex B of EN 60204 1 describes the electrical characteristics used for the operation of the machines. The ones described below apply to 30XW-V/30XWHV units and complement other information in this document:
 1. Physical environment**: Environment as classified in EN 60721 (corresponds to IEC 60721):
 - indoor installation
 - ambient temperature range: minimum temperature +5°C to +42°C, class AA4
 - altitude: lower than or equal to 2000 m
 - presence of water: class AD2 (possibility of water droplets)
 - presence of hard solids, class 4S2 (no significant dust present)
 - presence of corrosive and polluting substances, class 4C2 (negligible)
 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 60947-3 (corresponds to IEC 60947-3).
 6. The units are designed for connection to TN networks (IEC 60364). In IT networks the use of noise filters integrated into the frequency variator(s) make machine use unsuitable. In addition, the short-circuit holding current characteristics have been modified. Provide a local earth, consult competent local organisations to complete the electrical installation.
 7. Electromagnetic environment: classification of the electromagnetic environment is described in standard EN 61800-3 (corresponds to IEC 61800-3):
 - Immunity to external interference defined by the second environment***
 - Interference emission as defined in category C3†
- Due to the harmonic currents the integrated frequency variator in the 30XW-V/30XWHV units is a source of interference. An analysis may be required to verify if these interferences exceed the compatibility limits of the other devices connected to the same power supply network. The compatibility levels inside an electrical installation, that must be met at the in-plant coupling point (IPC) to which other loads are connected are described in standard 61000-2-4. Two characteristics are required for this analysis:
 - The short-circuit ratio (Rsce) of the installation calculated at the in-plant coupling point (IPC).
 - The total harmonic current distortion rate (THDI), calculated for the machine at maximum capacity.
Note: The evaluation of the compatibility level of harmonic interference on the public low-voltage power distribution system can be done using technical report IEC61000-3-4. In this document the THDI rate of the 30XW-V/30XWHV units permits a stage 2 connection procedure for any Rsce value above 300: the connection is based on the system data and the material.
- Derived currents: If protection by monitoring the leakage currents is necessary to ensure the safety of the installation, the presence of derived currents introduced by the use of frequency variators in the unit must be considered. In particular the choice the detection type and a control value not lower than 150 mA are recommended to control differential protection devices.
NOTE: If particular aspects of an actual installation do not conform to the conditions described above, or if there are other conditions which should be considered, always contact your local Carrier representative.
- * 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 Machinery Directive.
- ** The required protection level for this class is IP21B or IPX1B (according to reference document IEC 60529). All 30XW-V/30XWHV have IP23 units fulfil this protection condition.
- *** Example of installations of the second environment: industrial zones, technical locations supplied from a dedicated transformer.
- † Category C3 is suitable for use in an industrial environment and is not designed for use in a public low-voltage system that supplies residential locations. As an option, conformity with category C2 permits this type of installation.

5 - ELECTRICAL CONNECTION

Please refer to the certified dimensional drawings, supplied with the unit.

5.1 - Power supply

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

WARNING: Operation of the unit 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 supplier at once and ensure that the unit is not switched on until corrective measures have been taken.

5.2 - 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

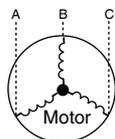
$$\begin{aligned} \text{Average voltage} &= (406 + 399 + 394)/3 = 1199/3 \\ &= 399.7 \text{ say } 400 \text{ V} \end{aligned}$$

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.

5.3 - Power connection/disconnect switch

All units have one connection point per unit.

5.4 - 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 guideline, and does not make 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 second column of the table below.

The calculations for favourable and unfavourable cases are based on the maximum current for each unit (see electrical data tables). For the design the standardised installation methods in accordance with IEC 60364 are used: multiconductor PVC (70°C) or XLPE (90°C) insulated cables with copper core; arrangement to comply with table 52c of the above standard. The maximum temperature is 42°C. The given maximum length is calculated to limit the voltage drop to 5%.

5.5 - Power cable entry

The power cables can enter the control box from above the unit. A removable aluminium plate on the upper part of the control box face allows introduction of the cables. Refer to the certified dimensional drawing for the unit.

Minimum and maximum connectable wire sections

30XW-V/30XWHV	Max. connectable wire section*	Calculation favourable case: Perforated horizontal conduit (standardised routing No. 13) XLPE insulated cable			Calculation unfavourable case: Closed conduit (standardised routing No. 41) PVC insulated cable, if possible		
		Section**, mm ² (per phase)	Max. length, m	Cable type	Section**, mm ² (per phase)	Max. length, m	Cable type***
580	2 x 240	1 x 120	237	XLPE	1 x 240	420	PVC
630	2 x 240	1 x 150	235	XLPE	2 x 185	480	PVC
810	2 x 240	1 x 185	245	XLPE	2 x 240	505	PVC
880	2 x 240	1 x 240	275	XLPE	2 x 240	450	PVC

* Connection capacities actually available for each machine, defined according to the connection terminal size, the control box access opening size and the available space inside the control box.

** Selection simulation result considering the hypothesis indicated.

*** If the maximum calculated section is for an XLPE cable type, this means that a selection based on a PVC cable type can exceed the connection capacity actually available. Special attention must be given to the selection.

Note: The currents considered are given for a machine equipped with a hydronic kit operating at maximum current.

5.6 - Field control wiring

IMPORTANT: Field connection of interface circuits may lead to safety risks: any control box modification must maintain equipment conformity with local regulations. Precautions must be taken to prevent accidental electrical contact between circuits supplied by different sources:

- **The routing selection and/or conductor insulation characteristics must ensure dual electric insulation.**
- **Conductor fixing between different conductors and/or inside the control box must prevent accidental disconnection and uncontrolled conductor displacement, where ends could touch an active energised part.**

Refer to the Touch Pilot control manual and the certified wiring diagram supplied with the unit for the field control wiring of the following features.

Available as standard:

- Customer interlock
- Remote on/off switch
- Demand limit external switch
- Remote dual set point
- Alarm and operation report
- Evaporator pump control
- Condenser pump control
- Heating/cooling change-over

Available as an option:

- Water valve control
- Various interlocks and reports on the Energy Management Module (EMM) board
- Refrigerant leak detection

CCN bus connection

- The permanent connection to the system CCN bus is made at the terminal provided for this purpose inside the control box.
- The connection of the CCN service tool is possible at a socket under the control box, accessible from outside.

5.7 - 24 and 230 V power reserve for the user

Control circuit reserve:

After all required options have been connected, the TC transformer includes a power reserve of 1 A at 24 V a.c. that can be used for the field control wiring.

A second TCA transformer supplies the 230 V, 50 Hz circuit to charge a battery for a portable computer at 0.63 A maximum at 230 V. The connection is via an EEC 7/16 type socket (2 poles without earth) located on the inside front of the control box and accessible from outside.

Only devices with class II double insulation can be connected at this socket.

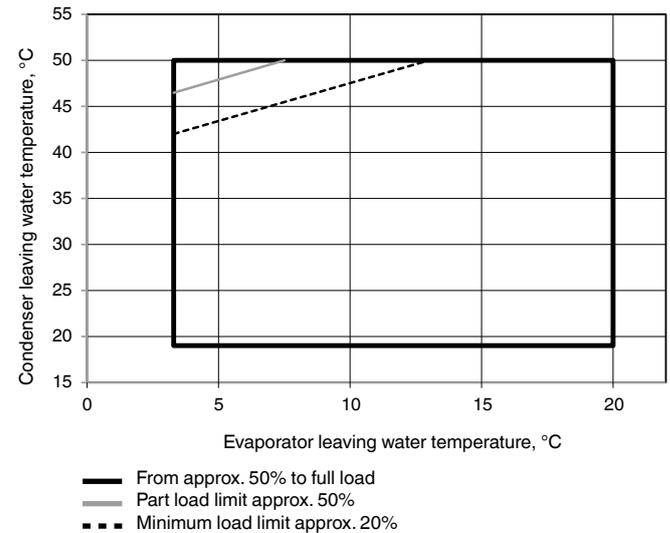
6 - APPLICATION DATA

6.1 - Operating limits

30XW-V/30XWHY	Minimum	Maximum
Evaporator		
Entering temperature at start-up	-	35.0°C
Leaving temperature during operation	3.3°C	20.0°C
Entering/leaving temperature difference at full load	2.8 K	11.1 K
Condenser		
Entering temperature at start-up	13.0°C*	-
Leaving temperature during operation	19.0°C*	50.0°C
Entering/leaving temperature difference at full load	2.8 K	11.1 K

* For lower condenser temperatures a water flow control valve must be used at the condenser (two or three-way valve). Please refer to option 152 to ensure the correct condensing temperature.

Note: Ambient temperatures: During storage and transport of the 30XW-V/30XWHV units (including by container) the minimum and maximum permissible temperatures are -20°C and 72°C (and 65°C for option 200).



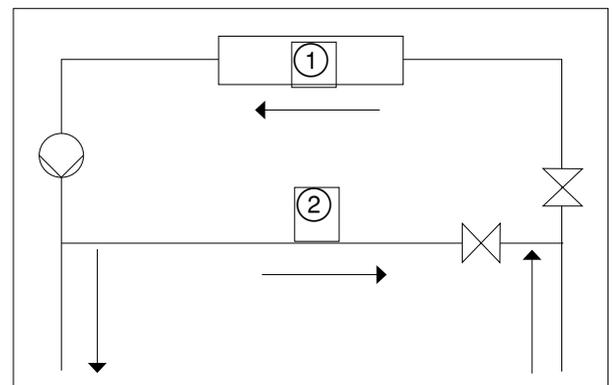
For more precise details please refer to the unit selection program.

6.2 - Minimum chilled water flow

The minimum chilled water flow is shown in the table in chapter 6.6.

If the system flow is less than the minimum unit flow rate, the evaporator flow can be recirculated, as shown in the diagram.

For minimum chilled water flow rate



Legend

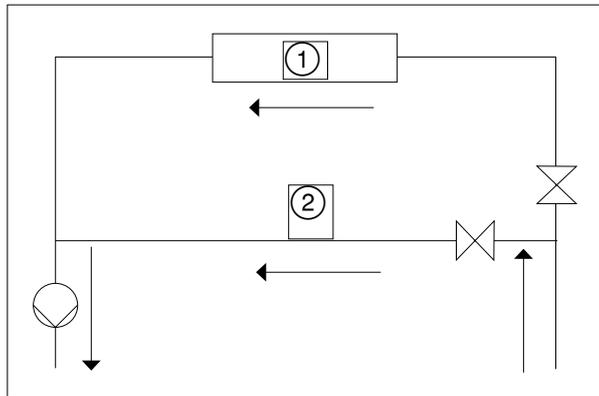
- 1 Evaporator
- 2 Recirculation

6.3 - Maximum chilled water flow

The maximum chilled water flow is limited by the permitted pressure drop in the evaporator. It is provided in the table in chapter 6.6.

- Select the option with one water pass less that will allow a higher maximum water flow rate (see option 100C in the table in chapter 6.5).
- Bypass the evaporator as shown in the diagram to obtain a lower evaporator flow rate.

For maximum chilled water flow rate



Legend
 1 Evaporator
 2 Bypass

6.4 - Condenser water flow rate

The minimum and maximum condenser water flow rates are shown in the table in chapter 6.6.

If the system flow is higher than the maximum unit flow rate, select the option with one pass less that will allow a higher maximum water flow rate. Please refer to option 102C in the table in chapter 6.5.

6.5 - Number of passes

30XW-V/30XWHV	580	630	810	880
Evaporator				
Standard	2	2	2	2
Option 100C	1	1	1	1
Condenser				
Standard	2	2	2	2
Option 102C	1	1	1	1

6.6 - Evaporator and condenser water flow rates

30XW-V/30XWHV	580	630	810	880
Evaporator water flow rate, l/s				
Minimum	10	10	13	13
Maximum	54	54	76	76
Condenser water flow rate, l/s				
Minimum	6	6	8	8
Maximum	52	52	74	74

Notes

- Minimum evaporator flow rate based on a water velocity of 0,5 m/s.
- Minimum condenser flow rate based on a water velocity of 0,3 m/s.
- Maximum flow rate based on a pressure drop of 120 kPa (units with two evaporator passes and two condenser passes).

6.7 - Variable flow evaporator

Variable evaporator flow can be used. The controlled 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.

6.8 - System minimum water volume

Whichever the system, the water loop minimum volume is given by the formula: $Volume = Cap (kW) \times N \text{ litres}$

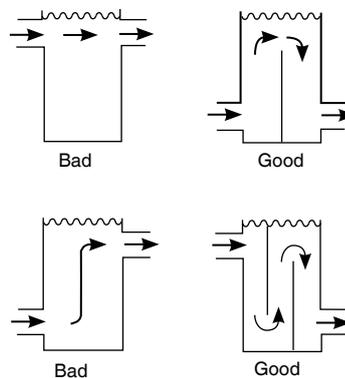
Application	N
Normal air conditioning	3.25
Process type cooling	6.5

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

This volume is necessary for stable operation.

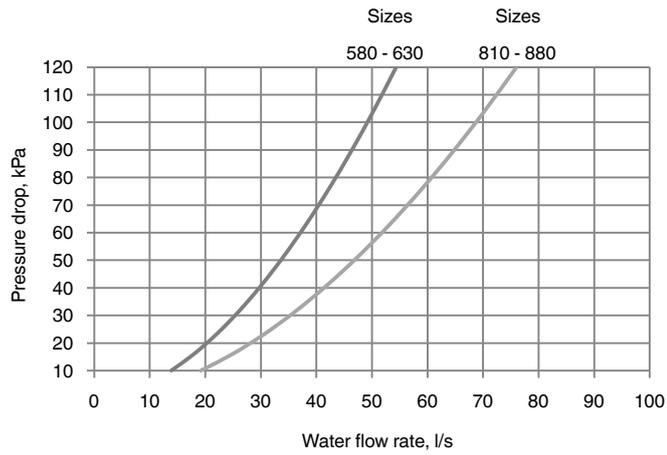
It is often necessary to add a buffer water tank to the circuit in order to achieve the required volume. The tank must itself be internally baffled in order to ensure proper mixing of the liquid (water or brine). Refer to the examples below.

Connection to a buffer tank

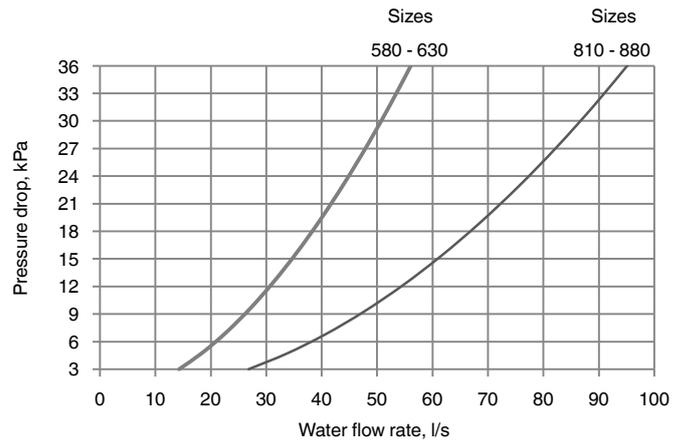


6.9 - Pressure drop curves

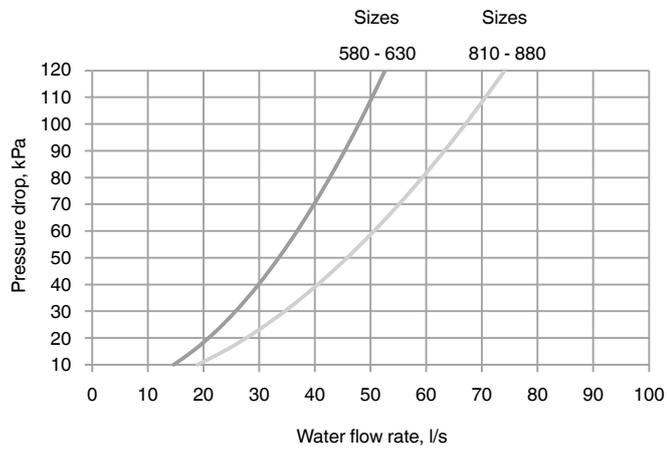
Units with two evaporator passes (standard)



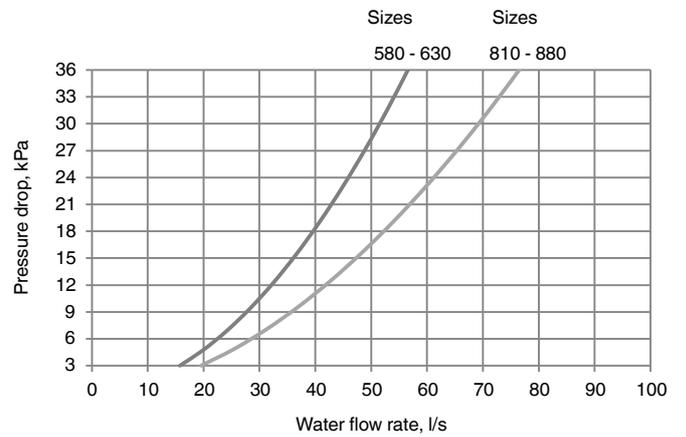
Units with one evaporator pass (option 100C)



Units with two condenser passes (standard)



Units with one condenser pass (option 102C)



7 - 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.

7.1 - 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 a pressure reducer 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.
- 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:

- 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.
- Cl Chloride ions are detrimental for copper with a risk of perforations by corrosion by puncture. If possible keep below 10 mg/l.
- SO_4^{2-} sulphate ions can cause perforating corrosion, if their content is above 30 mg/l.
- No fluoride ions (<0.1 mg/l).
- 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.
- Dissolved silicon: silicon is an acid element of water and can also lead to corrosion risks. Content < 1 mg/l.
- 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 mg/l is desirable.
- 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.
- 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.
- 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.

ATTENTION: Filling, completing and draining the water circuit charge must be done by qualified personnel, using the air purges and materials that are suitable for the products.

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.

7.2 - Water connections

The water connections are Victaulic type connections. The inlet and outlet connection diameters are identical.

Inlet/outlet diameters

Evaporator 30XW-V/30XWHV		580	630	810	880
Units without option 100C					
Connection	in	6	6	8	8
Outside diameter	mm	168.3	168.3	219.1	219.1
Units with option 100C					
Connection	in	6	6	8	8
Outside diameter	mm	168.3	168.3	219.1	219.1
Condenser 30XW-V/30XWHV		580	630	810	880
Units without option 102C					
Connection	in	6	6	8	8
Outside diameter	mm	168.3	168.3	219.1	219.1
Units with option 102C					
Connection	in	8	8	8	8
Outside diameter	mm	219.1	219.1	219.1	219.1

7.3 - Flow control

Evaporator flow switch and chilled water pump interlock

IMPORTANT: On 30XW-V/30XWHV 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.

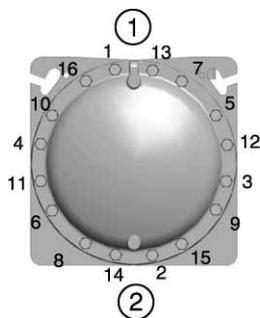
The water flow switch is installed on the evaporator water inlet and adjusted by the control, based on unit size and application. If adjustment is necessary, it must be carried out by qualified personnel trained by Carrier Service.

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

7.4 - Evaporator and condenser 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 in the example below.

Water box tightening sequence



Legend

- | | | | |
|---|-------------------------|---|------------------------------|
| 1 | Sequence 1: 1 2 3 4 | 2 | Tightening torque |
| | Sequence 2: 5 6 7 8 | | Bolt size M16 - 171 - 210 Nm |
| | Sequence 3: 9 10 11 12 | | |
| | Sequence 4: 13 14 15 16 | | |

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 - HEAT PUMPS 30XWHV

8.1 - Physical data for heat pumps

The physical data for 30XWHV for heat pumps are the same as for the 30XW-V units. Please refer to chapter 4.1.

8.2 - Electrical data for heat pumps

The electrical data for 30XWHV for heat pumps are the same as for the 30XW-V units. Please refer to chapter 4.2.

8.3 - Dimensions and clearances for heat pumps

The dimensions and clearances are the same as for the 30XW-V units. Please refer to chapter 3.

8.4 - Operating range for heat pumps

The operating limits are the same as for the 30XW-V units. Please refer to chapter 6.1.

8.5 - Operating modes for heat pumps

8.5.1 - Cooling mode

This operating mode is the same as that for 30XW-V units. The unit controls on the cooling setpoint.

8.5.2 - Heating mode

Unlike in the cooling mode, the unit uses the heating setpoint in this configuration. The evaporator leaving water control (lowest setpoint taken into consideration) is still maintained to prevent operation at very low temperatures.

9 - MAJOR SYSTEM COMPONENTS AND OPERATION DATA

9.1 - Compressors

- 30XW-V/30XWHV units use 06T geared twin-screw compressors equipped with a variable capacity slide valve and controlled by a speed variator.
- Compressor capacity control is ensured by successive use of speed variation (using a frequency variator) and swept volume variation at the screws (ensured by the slide valve).
- The combination of these two control modes permits fine control of the unit capacity between 20% and 100%.
- The 06T compressor models used are: 06TUX483, 06TUX554, 06TVX680, 06TVX753

9.2 - Oil filter

The 06T screw compressor has an independent oil filter.

9.3 - Refrigerant

30XW-V/30XWHV units only use refrigerant R-134a.

9.4 - Lubricant

The 06T screw compressor is approved for use with lubricants:

- Castrol Icematic SW220 (Carrier specification PP47-32)
- Lubrizol Emkarate RL220H (Carrier specification PP47-13)

9.5 - Oil supply solenoid valve

An oil supply solenoid valve is installed on the oil return line as standard to isolate the compressor from oil flow when the compressor is not operating. The oil solenoid valve is field replaceable.

9.6 - Pressure vessels

9.6.1 - General

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.
- If no regulations exist or to complement regulations, follow the control programmes of EN 378.
- 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 maybe 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, annexe C.
- In case of re-testing please refer to the maximum operating pressure given on the unit nameplate.
- The reports of periodical checks by the user or operator must be included in the supervision and maintenance file.

9.6.2 - 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.

9.6.3 - Recycling

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

9.6.4 - Operating life

The evaporator and oil separator are 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%.

9.6.5 - 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.

9.6.6 - Evaporator

30XW-V/30XWHV units use a flooded multi-tube evaporator. The water circulates in the tubes and the refrigerant is on the outside in the shell. The tubes are 3/4" diameter copper with an enhanced surface inside and out. There is just one water circuit with two water passes (one pass with option 100C, please refer to chapter 6.5).

The evaporator shell has a polyurethane foam thermal insulation and a water drain and purge.

It has been tested and stamped in accordance with the applicable pressure codes. The maximum standard relative operating pressure is 2100 kPa for the refrigerant-side and 1000 kPa for the water-side. These pressures can be different depending on the code applied. The water connection of the heat exchanger is a Victaulic connection.

The products that may be added for thermal insulation of the containers 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.

9.6.7 - Condenser and oil separator

30XW-V/30XWHV units use a heat exchanger that is a combination condenser and oil separator. It is mounted below the evaporator. Discharge gas leaves the compressor and flows through an external muffler to the oil separator, which is the upper portion of the heat exchanger. 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. The tubes are 3/4" or 1" diameter internally and externally finned copper tubes.

There is just one water circuit with two water passes (one pass with option 102C, please refer to chapter 6.5). For the heat pumps the condenser shell can have a polyurethane foam thermal insulation (option 86) and a water drain and purge.

It has been tested and stamped in accordance with applicable pressure codes. The maximum standard relative operating pressure is 2100 kPa for the refrigerant-side and 1000 kPa for the water-side. These pressures can be different depending on the code applied. The water connection of the heat exchanger is a Victaulic connection.

9.7 - High-pressure safety switch

30XW-V/30XWHV units are equipped with high-pressure safety switches.

In accordance with the applicable code the high-pressure switches with manual reset, called PZH (former DBK), are backed up by high-pressure switches that require resetting with a tool. The high-pressure switches that require resetting with a tool are called PZHH (former SDBK). If a PZHH cuts out, the corresponding PZH in the same compressor is faulty and must be replaced. The PZHH must be reset with a blunt tool with a diameter of less than 6 mm. Insert this tool into the opening on the pressure switch and push the reset button in this location.

These pressure switches are located at the discharge of each compressor. The pressure switch tap does not include a Schrader valve.

9.8 - Electronic expansion valve (EXV)

The EXV is equipped with a stepper motor (2785 to 3690 steps, depending on the model) that is controlled via the EXV board.

The EXV is also equipped with a sightglass that permits verification of the mechanism movement and the presence of the liquid gasket.

9.9 - Moisture indicator

Located on the EXV, permits control of the unit charge and indicates moisture in the circuit. The presence of bubbles in the sight-glass can indicate an insufficient charge or non-con-densables in the system. The presence of moisture changes the colour of the indicator paper in the sight-glass.

9.10 - Filter drier

The role of the filter drier is to keep the circuit clean and moisture-free. The moisture indicator shows, when it is necessary to change the element. A difference in temperature between the filter inlet and outlet shows that the element is dirty.

9.11 - Sensors

The units use thermistors to measure the temperature, and pressure transducers to control and regulate system operation (see Touch Pilot control manual for a more detailed explanation).

9.12 - Frequency variator

9.12.1 - General

30XW-V/30XWHV units are equipped with a frequency variator that permits compressor capacity adjustment by varying the motor speed in the 30-60 Hz frequency range.

The compressor drive uses power supply waveform generation with variable frequency and voltage, generated by pulse width modulation (PWM).

Compressor start-up and stopping and the frequency setting for the operating range is only by RS485 communication in the LEN protocol via the Carrier controller.

One of the other frequency variator functions is to ensure the unit safety stop function using wired pressure switches at the digital drive inputs.

9.12.2 - Main sub-assemblies

Fuses

The fuses ensure fast frequency variator protection if a major internal fault occurs.

RFI filter

The RFI filter ensures filtering of EMC interference in accordance with standard IEC 61800-3. The standard filtration level of 30XW-V/30XWHV units is class C3 mostly used for operation in industrial environments. For more severe environments (residential), class C2 is available as an option.

Rectifier bridges and capacitors

These components permit converting a.c. voltage (at the input) to d.c. voltage. The module also controls capacitor load limitation during start-up. The direct voltage is then the basis for waveform generation at the outputs.

Self-balancing DC link smoothing choke (5%)

Choke with the main function of current smoothing (and thereby reducing the peak height and lengthening the diode conduction time). This results in a large reduction of the harmonic distortion rate (current) to a value between 35 and 40% for operation at maximum power input. This function is offered as standard for 30XW-V/30XWHV units.

IGBT bridge at speed variator output

From the internal d.c. voltage and using pulse width modulation (PWM), the frequency variator generates forms at variable voltage and frequency. This module also takes short-circuit protection and overload at the compressor outlet into consideration. The safety stop function of the pressure switches acts on this module and stops the output in accordance with standard EN ISO 13849-1, complying with the requirements of the pressure equipment directive (PED).

Auxiliary and communication control boards

Board and component assembly that ensures auxiliary functions: internal supplies, frequency variator fan control, communication in LEN protocol with the Carrier controller.

10 - OPTIONS

Options	No.	Description	Advantages
Condenser insulation	86	Thermal condenser insulation	Allows configuration with special installation criteria (hot parts insulated).
Service valve set	92	Valve set consisting of liquid line valve (evaporator inlet) and compressor suction line valve to isolate the various refrigerant circuit components.	Simplified service and maintenance
Evaporator with one pass	100C	Evaporator with one pass on the water-side. Evaporator inlet and outlet on opposite sides.	Quick and easy installation. Reduced evaporator pressure losses.
Condenser with one pass	102C	Condenser with one pass on the water-side. Condenser inlet and outlet on opposite sides.	Quick and easy installation. Reduced condenser pressure losses.
21 bar evaporator	104	Reinforced evaporator for extension of the maximum water-side service pressure to 21 bar	Covers applications with a high water column (high buildings)
21 bar condenser	104A	Reinforced condenser for extension of the maximum water-side service pressure to 21 bar	Covers applications with a high water column (high buildings)
Reversed evaporator water connections	107	Evaporator with reversed water inlet/outlet	Simplification of the water piping
Reversed condenser water connections	107A	Condenser with reversed water inlet/outlet	Simplification of the water piping
JBus gateway	148B	Two-directional communications board, complies with JBus protocol	Easy connection by communication bus to a building management system
BacNet gateway	148C	Two-directional communications board, complies with BacNet protocol	Easy connection by communication bus to a building management system
LON gateway	148D	Two-directional communications board, complies with LON protocol	Easy connection by communication bus to a building management system
Condensing temperature limitation	150B	Limitation of the maximum condenser leaving water temperature to 45°C. Modification on the unit name plate to reflect the reduced power input and current values.	Avoids oversizing of the protection elements and the power cables.
Control for low condensing temperature systems	152	Output signal (0-10 V) to control the condenser water inlet valve.	Used for applications with cold water at condenser inlet (well water). In this case the valve controls the water entering temp. to maintain an acceptable condensing pressure.
Energy Management Module EMM	156	Remote control module. Additional contacts for an extension of the unit control functions.	Easy connection by wired connection to a building management system
Leak detection	159	0-10 V signal to report any refrigerant leakage in the unit directly on the controller (the leak detector itself must be supplied by the customer)	Immediate customer notification of refrigerant losses to the atmosphere, allowing timely correction
Code compliance for Switzerland in addition to PED code	197	Additional tests on the water heat exchangers. Additional supply of PED documents, supplementary certificates and test certificates.	Conformance with Swiss regulations
Code compliance for Australia	200	Heat exchanger approved in accordance with the Australian code.	Conformance with Australian regulations
Low noise level (-3 dB(A) compared to standard unit)	257	Evaporator sound insulation	3 dB(A) quieter than a unit without this option
Welded evaporator water connection kit	266	Victaulic piping connections with welded joints.	Easy installation
Welded condenser water connection kit	267	Victaulic piping connections with welded joints.	Easy installation
Flanged evaporator water connection kit	268	Victaulic piping connections with flanged joints.	Easy installation
Flanged condenser water connection kit	269	Victaulic piping connections with flanged joints.	Easy installation
Thermal compressor insulation	271	Thermal compressor insulation	Prevents condensation forming on the compressor (due to the ambient air)
EMC classification according to IEC 61800-3 - class C2	282	Frequency variator with RFI filter class C2.	Reduces the risk of electromagnetic interference, if the unit is installed in a residential environment

11 - STANDARD MAINTENANCE

Air conditioning equipment must be maintained by professional technicians, whilst routine checks can be carried out locally by specialised technicians.

Simple preventive maintenance will allow you to get the best performance from your HVAC unit:

- improved cooling performance
- reduced power consumption
- prevention of accidental component failure
- prevention of major time-consuming and costly interventions
- protection of the environment

There are five maintenance levels for HVAC units, as defined by the AFNOR X60-010 standard.

11.1 - Level 1 maintenance

See note below.

Simple procedure can be carried out by the user:

- Visual inspection for oil traces (sign of a refrigerant leak)
- Air heat exchanger (condenser) cleaning - see chapter "Condenser coil - level 1"
- Check for removed protection devices, and badly closed doors/covers
- Check the unit alarm report when the unit does not work (see report in the Touch Pilot control manual).

General visual inspection for any signs of deterioration.

11.2 - Level 2 maintenance

See note opposite.

This level requires specific know-how in the electrical, hydronic and mechanical fields. It is possible that these skills are available locally: existence of a maintenance service, industrial site, specialised subcontractor.

In these cases, the following maintenance operations are recommended.

Carry out all level 1 operations, then:

- At least once a year tighten the power circuit electrical connections (see tightening torques table).
- Check and re-tighten all control/command connections, if required (see tightening torques table).
- Check the differential switches for correct operation every 6 months.
- Remove the dust and clean the interior of the control boxes, if required. Check the filter condition (if used).
- Check the presence and the condition of the electrical protection devices.
- Replace the fuses every 3 years or every 15000 hours (age-hardening).
- Replace the control box cooling fans (if used) every five years.
- Check the water connections.
- Purge the water circuit (see chapter 7 "Water connections").

- Clean the water filter (see chapter 7 "Water connections").
- Check the unit operating parameters and compare them with previous values.
- Keep and maintain a maintenance sheet, attached to each HVAC unit.

All these operations require strict observation of adequate safety measures: individual protection garments, compliance with all industry regulations, compliance with applicable local regulations and using common sense.

11.3 - Level 3 (or higher) maintenance

See note below.

The maintenance at this level requires specific skills/ approval/tools and know-how and only the manufacturer, his representative or authorised agent are permitted to carry out these operations. These maintenance operations concern for example:

- A major component replacement (compressor, evaporator)
- Any intervention on the refrigerant circuit (handling refrigerant)
- Changing of parameters set at the factory (application change)
- Removal or dismantling of the HVAC unit
- Any intervention due to a missed established maintenance operation
- Any intervention covered by the warranty.

NOTE: Any deviation or non-observation of these maintenance criteria will render the guarantee conditions for the HVAC unit nul and void, and the manufacturer, Carrier France, will no longer be held responsible.

11.4 - Tightening of the electrical connections

11.4.1 - Tightening torques for the main electrical connections

Screw type	Designation in the unit	Torque value, N·m
Customer connection		
Screw-nut M12 at phase decks	L1/L2/L3	50
Nut on earth terminal	PE	81
Downstream power connections in the control box		
Screw M10 at downstream main disconnect deck (QS10)*	L1/L2/L3	50
Earth terminal M10		50
Power connections in the variator		
	GS-	
M10 nut on the phase pin		19
M10 nut on the earth pin		19
Compressor phase connection terminals		
M12	1/2/3/4/5/6 on EC-	23
M16	1/2/3/4/5/6 on EC-	30
Compressor earth connection		
	Gnd on EC-	25
Control disconnect connections		
Upstream and downstream screws at terminals	QF	2

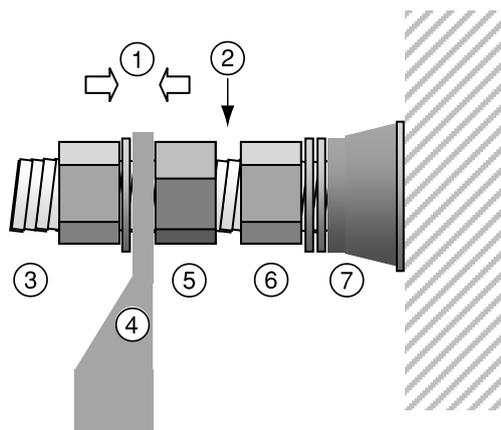
ATTENTION: The tightening of the connections at the compressor terminals requires special precautions. Please refer to the chapter below.

13.4.2 - Connection precautions for the compressor power terminals

These precautions must be applied during an intervention that requires the removal of the power conductors connected to the compressor supply terminals.

The tightening nut of terminal (6) supporting the isolator (7) must never be loosened, as it ensures terminal tightness and compressor leak tightness.

The tightening of phase lug (4) must apply the torque between counter nut (5) and tightening nut (3): during this operation a counter-torque must be applied at counter nut (5). Counter-nut (5) must not be in contact with the tightening nut of terminal (6).



1. Torque application to tighten the lug
2. Avoid contact between the two nuts
3. Lug tightening nut
4. Flat lug
5. Counter-nut
6. Terminal tightening nut
7. Isolator

11.5 - Tightening torques for the main bolts and screws

Screw type	Used for	Torque value, N·m
M20 nut	Chassis	190
M20 nut	Heat exchanger side-side connection	240
M16 nut	Compressor fixing	190
H M16 screw	Heat exchanger water boxes, structure	190
H M16 screw	Compressor suction flanges TT	190
H M20 screw	Compressor suction flanges TU & TV	240
M16 nut	Compressor discharge line TT & TU	190
M20 nut	Compressor discharge line TV	240
H M8 screw	Drier cover	35
1/8 NPT connection	Oil line	12
TE nut	Compressor oil line	24,5
7/8 ORFS nut	Oil line	130
5/8 ORFS nut	Oil line	65
3/8 ORFS nut	Oil line	26
H M6 screw	Stauff collar	10
Taptite screw M6	Oil line collar	7
Metric screw M6	Plate fixing, control box, terminal box	7
Taptite screw M10	Oil filter, control box fixing	30

ATTENTION: The tightening of the connections at the compressor terminals requires special precautions. Please refer to the chapter above.

11.6 - Evaporator and condenser maintenance

Check that:

- the insulating foam is intact and securely in place,
- the sensors and flow switch are correctly operating and correctly positioned in their support,
- the water-side connections are clean and show no sign of leakage.

11.7 - Compressor maintenance

11.7.1 - Oil filter change schedule

As system cleanliness is critical to reliable system operation, there is a filter in the oil line at the oil separator outlet. The oil filter is specified to provide a high level of filtration (5 µm) required for long compressor life.

The filter should be checked after the first 500 hours of operation, and every subsequent 2000 hours. The filter should be replaced at any time when the pressure differential across the filter exceeds 2 bar.

The pressure drop across the filter can be determined by measuring the pressure at the discharge port (at the oil separator) and the oil pressure port (at the compressor). 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.

11.7.2 - 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 and can even destroy it.

The reverse rotation protection scheme must be capable of determining the direction of rotation and stopping the compressor within one second. Reverse rotation is most likely to occur whenever the wiring at the compressor terminals has been modified.

To minimise the opportunity for reverse rotation, the following procedure must be applied. Rewire the power cables to the compressor terminals and/or the downstream variator connection decks 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. This switch opens the contacts when the pressure falls below 7 kPa. The switch is a manual reset type that can be reset after the pressure has once again risen above 70 kPa. It is critical that the switch be a manual reset type to preclude the compressor from short cycling in the reverse direction.

11.8 - Frequency variator maintenance

ATTENTION: Before any intervention at the frequency variator, ensure that the disconnect/isolator switch is open and that no voltage is present (reminder: the capacitor discharge time is approximately 20 minutes).

Only a well qualified person is allowed to replace or modify the components inside the frequency variator.

During periodic inspections, check the ventilation grilles at the frequency variator door; ensure that they are not pierced, damaged or obstructed.

Replace the fan, if a “replace fan” alert/warning is displayed in the alarm list.

For any other alarm or problem at the frequency variator, contact the Carrier service department.

The frequency variators in the 30XW-V/30XWHV units do not require a dielectric test, even if they are replaced parts: they are systematically checked before delivery. Otherwise the filtering components installed in the frequency variator can falsify the measurement and may even be damaged.

If it is necessary to test the insulation of a component (e.g. compressor, cables) the frequency variator must be disconnected at the power circuit.

12 - START-UP CHECKLIST FOR 30XW-V/30XWHV UNITS (USE FOR JOB FILE)

Preliminary information

Job name:
Location:
Installing contractor:
Distributor:

Unit

Model:

Compressors

Circuit A

Model number
Serial number
Motor number

Frequency variator

Model number
Serial number

Evaporator

Model number
Serial number

Condenser section

Model number
Serial number

Additional optional 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 chilled water valves are open
- All chilled water piping is connected properly
- All air has been vented from the chilled water circuit
- The unit is switched off again, after the pump test has been completed
- Chilled water pump (CWP) is operating with the correct rotation. Check the phase sequence of the electrical connection.
- Circulate chilled water in the water circuit for at least two hours, then remove, clean and replace the screen filter. The unit is switched off again, after the pump test has been completed.
- Inlet piping to cooler includes a 20 mesh strainer with a mesh size of 1.2 mm.
- Carry out a general visual inspection with particular attention to the ventilation grilles (that must not be pierced or obstructed) and ensure that the wiring is not damaged/cut.

Unit start-up

- Oil level is correct
- All discharge and liquid line valves are open
- Locate, repair and mark all refrigerant leaks
- All suction valves are open, if used
- All oil line valves and economizer valves (if used) are open
- Checks have been carried out for any possible leaks. Unit has been leak checked (including fittings)
 - on the whole unit
 - at all connections

Locate, repair, and report any refrigerant leaks.....

- Check voltage imbalance: AB..... AC..... BC.....
 Average voltage = V
 Maximum deviation = V
 Voltage imbalance = %
- Voltage imbalance is less than 2%

WARNING: Operation of the unit 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 supplier at once and ensure that the unit is not switched on until corrective measures have been taken.

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 temperatures below 0°C
- 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 table (in product data literature) to determine total litres per second (l/s) and find unit's minimum flow rate.

- Total = l/s
- Nominal kW = l/s
- Total l/s is greater than unit's minimum flow rate
- Total l/s meets job specified requirement of..... l/s

WARNING: Once power is supplied to the unit, check for any alarms (refer to the Touch Pilot control manual for the alarm menu).

Note all alarms:.....

NOTE:

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.**

Notes:

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



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