Carrier®

61WG/30WG 020-090

Water-Sourced Liquid Chillers/ Heat Pumps with or without Integrated Hydronic Modules

Nominal cooling capacity 24-95 kW
Nominal heating capacity 30-116 kW

PRO-DIALOG

AQUASNAP® Heating

Unit with optional hydronic module

Standard unit

AQUASNAP®

Installation, operation and maintenance instructions

LLOYD'S REGISTER QUALITY ASSURANCE
ISO9001·ISO14001

Quality and Environment Management Systems Approval

CONTENTS

The illustrations in this document are for illustrative purposes only and not part of any offer for sale or contract.

1 - INTRODUCTION

Prior to the initial start-up of the 61WG/30WG 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 61WG/30WG units 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.

DO NOT COVER ANY PROTECTION DEVICES.

This applies to fuse plugs and safety valves (if used) in the refrigerant or heat transfer medium circuits. Check if the original protection plugs are still present at the valve outlets. These plugs are generally made of plastic and should not be used. If they are still present, please remove them. Install devices at the valve outlets or drain piping that prevent the penetration of foreign bodies (dust, building debris, etc.) and atmospheric agents (water can form rust or ice). These devices, as well as the drain piping, must not impair operation and not lead to a pressure drop that is higher than 10% of the control pressure.

Classification and control
In accordance with the Pressure Equipment Directive and national usage monitoring regulations in the European Union the protection devices for these machines are classified as follows:

	Safety accessory*	Damage limitation accessory** in case of an external fire
Refrigerant side		
High-pressure switch	x	
External relief valve***		x
Rupture disk		x
Fuse plug		x
Heat transfer fluid side		
External relief valve****	x	x

* Classified for protection in normal service situations.
** Classified for protection in abnormal service situations.
*** The instantaneous over-pressure limited to 10% of the operating pressure does not apply to this abnormal service situation. The control pressure can be higher than the service pressure. In this case either the design temperature or the high-pressure switch ensures that the service pressure is not exceeded in normal service situations.
**** The classification of these safety valves must be made by the personnel that completes the whole hydronic installation.

Do not remove these valves and fuses, even if the fire risk is under control for a particular installation. There is no guarantee that the accessories are re-installed if the installation is changed or for transport with a gas charge.

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

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

These pipes must be installed in a way that ensures that people and property are not exposed to refrigerant leaks. As the fluids can be diffused in the air, ensure that the outlet is far away from any building air intake, or that they are discharged in a quantity that is appropriate for a suitably absorbing environment.

Periodic check of the safety valves: See paragraph 1.3 - "Maintenance safety considerations".

Provide a drain in the drain pipe, close to each safety valve, to avoid an accumulation of condensate or rain water.

All precautions concerning handling of refrigerant must be observed in accordance 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.

Do not introduce significant static or dynamic pressure with regard to the operating pressures used during operation or for tests in the refrigerant circuit or in the heat exchange circuits.

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.

Any intervention on the refrigerant circuit, including changing of drier blocks, is only permitted after the complete removal of the refrigerant charge. For these units transfer of the refrigerant charge from the high or low-pressure side is not possible, nor permitted.

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 energised.

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

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-410A
  Global Warming Potential (GWP): 1975

  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 EN378-2 can be used if no similar criteria exist in the 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.

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. After each repair of the unit, check the operation of the protection devices and create a report of the parameter operation at 100%.

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 polluted (e.g. by a short circuit in a motor or BPHE frost) 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-410A charge, as indicated on the unit name plate. Do not top up the refrigerant charge. Only charge liquid refrigerant R-410A 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-410A) will impair machine operation and can even destroy the compressors. The compressors operating with this refrigerant type are lubricated with a synthetic polyol-ester oil.

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.

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

If the recommendations above are not observed, this can have serious or even fatal consequences and damage the installation.

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 unweld or flamecut the refrigerant lines or any refrigerant circuit component until all refrigerant (liquid and vapour) as well as the oil have been removed from unit. Traces of vapour should be displaced with dry 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 and safety 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. 3/8" SAE connectors on the liquid, suction and discharge lines are available for 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 walkway, rack or support. 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.).

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.
- Compare the name plate data with the order. The name plate is attached in two places to the unit:
  - on one of the unit sides on the outside,
  - on the control box door on the inside.
- 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 pressure
  - Unit leak test pressure
  - Voltage, frequency, number of phases
  - Maximum current drawn
  - Maximum power input
  - Unit net weight
- Confirm that the options ordered for on-site installation have been supplied, are complete and undamaged.
- Do not keep the 61WG/30WG 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 chapter "Maintenance".

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

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.

In case of extra-high units the machine environment must permit easy access for maintenance operations.

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 strenghtening measures have been taken.
- the unit is installed level on an even surface (maximum tolerance is 1.5 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.
- No material or object that can be affected by condensate (even a small amount) must be left under the machine or in the water flow direction.

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.

ATTENTION: Stacked units must not be moved.

If 61WG/30WG units are hoisted with rigging, it is necessary to protect the unit frame (side and rear panels and front doors) against accidental crushing. Use struts or lifting beams to spread the slings above the unit. Do not tilt a unit more than 15°, or 5° for units with the stacking option (No. 273). Always follow the instructions on the handling notice attached to the unit.

If a unit includes a hydronic module (options 116 or 270), the hydronic module and pump piping must be installed in a way that does not submit it to any strain. The hydronic module pipes must be fitted so that the pump does not support the weight of the pipes.

Never push or lever on any of the enclosure panels (panels, uprights, front access doors) of the unit. Only the base of the unit frame is designed to withstand such stresses.

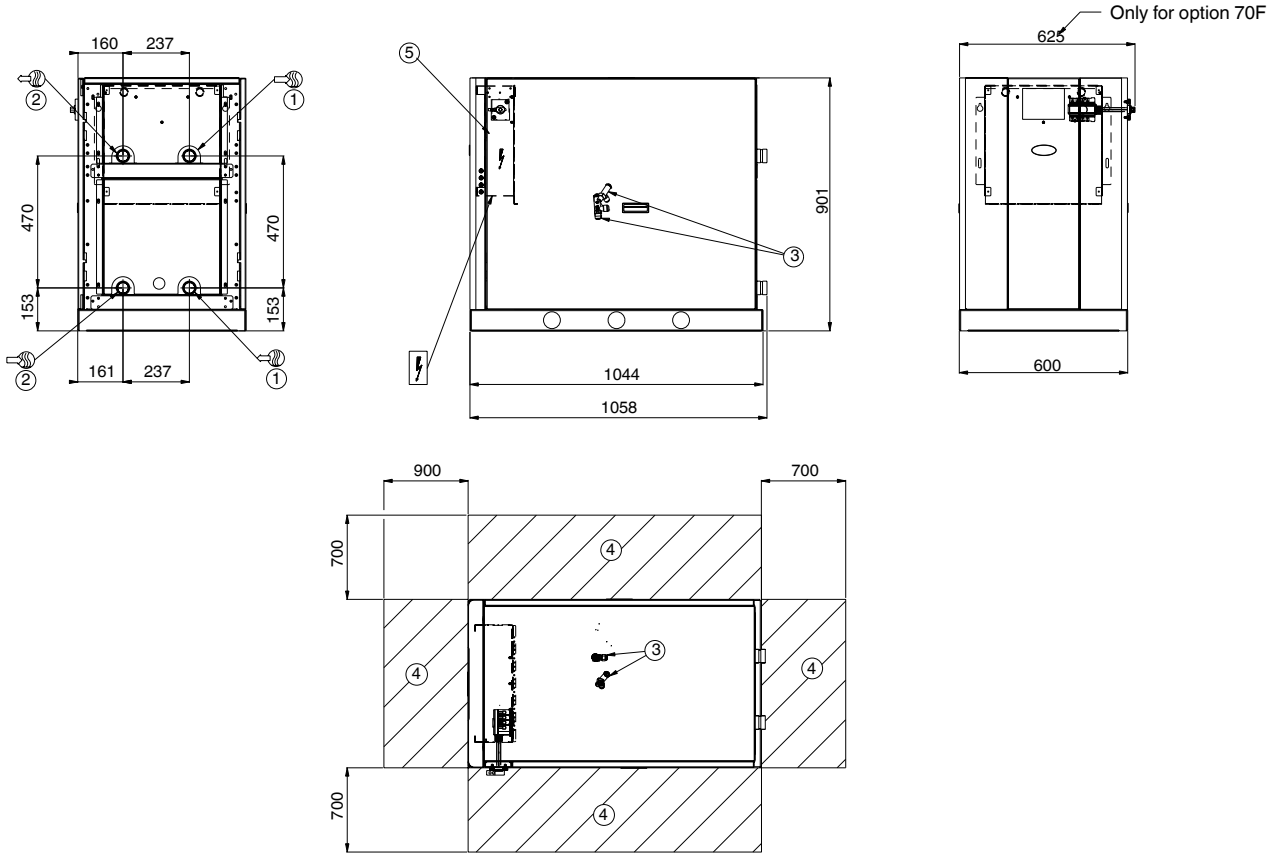
Checks before system start-up
Before the start-up of the refrigeration system, the complete installation, including the refrigeration system must be verified against the installation drawings, dimensional drawings, system piping and instrumentation diagrams and the wiring diagrams.

For these checks national regulations must be followed. If the national regulation does not specify any details, refer to standard EN 378-2 as follows:

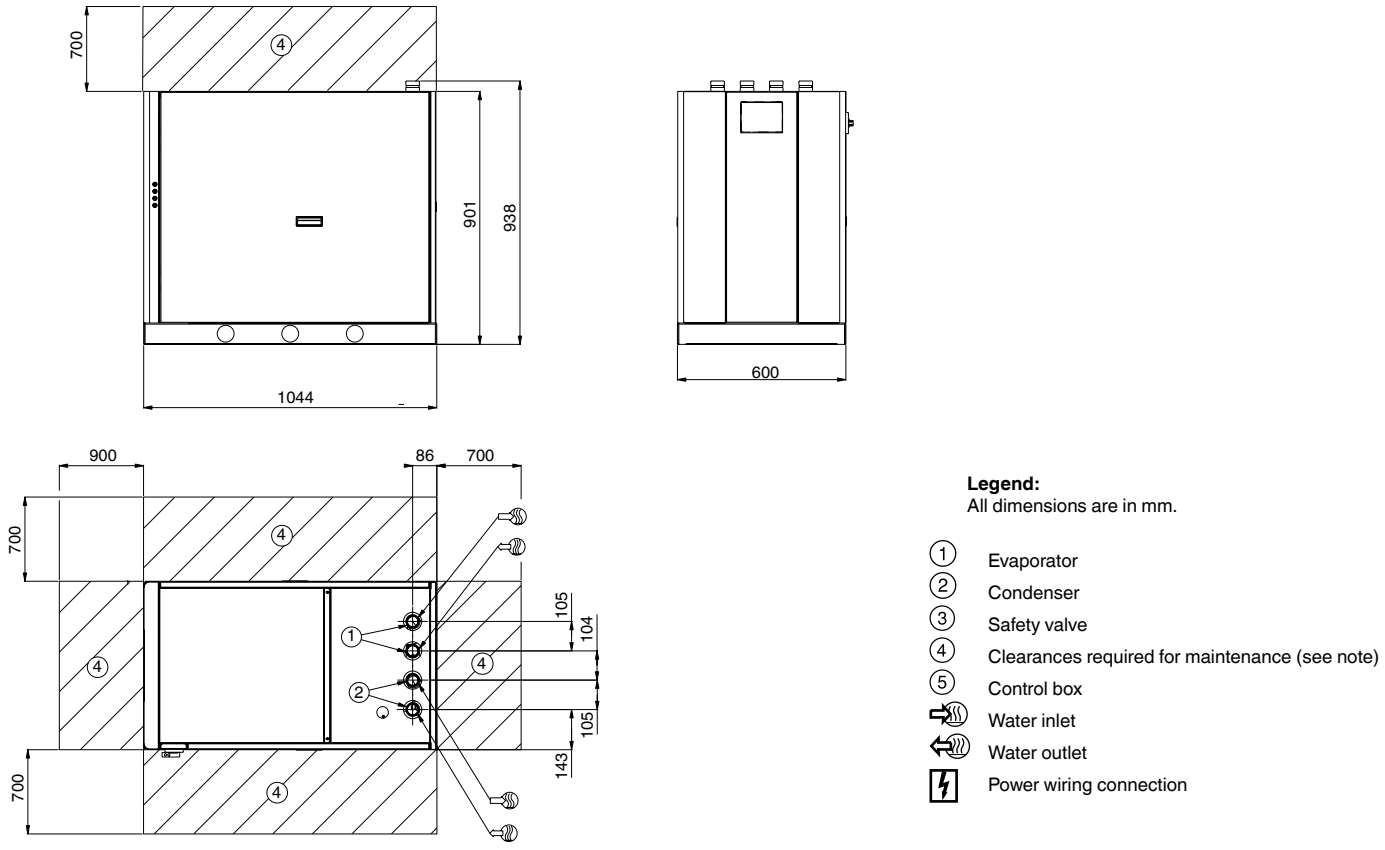
External visual installation checks:
- Compare the complete installation with the refrigeration system and power circuit diagrams.
- Check that all components comply with the design specifications.
- Check that all protection documents and equipment provided by the manufacturer (dimensional drawings, 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 documents 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.
- Ensure that the position of the condensate drain piping allows draining and that the connections are correct for the water used.
- Avoid common routing of the customer power wiring and other machine wiring, especially for longer runs (> 200 mm).

3 - DIMENSIONS, CLEARANCES

3.1 - 61WG/30WG 020-045 - standard unit



3.2 - 61WG/30WG 020-045 - unit with top connections (option 274)

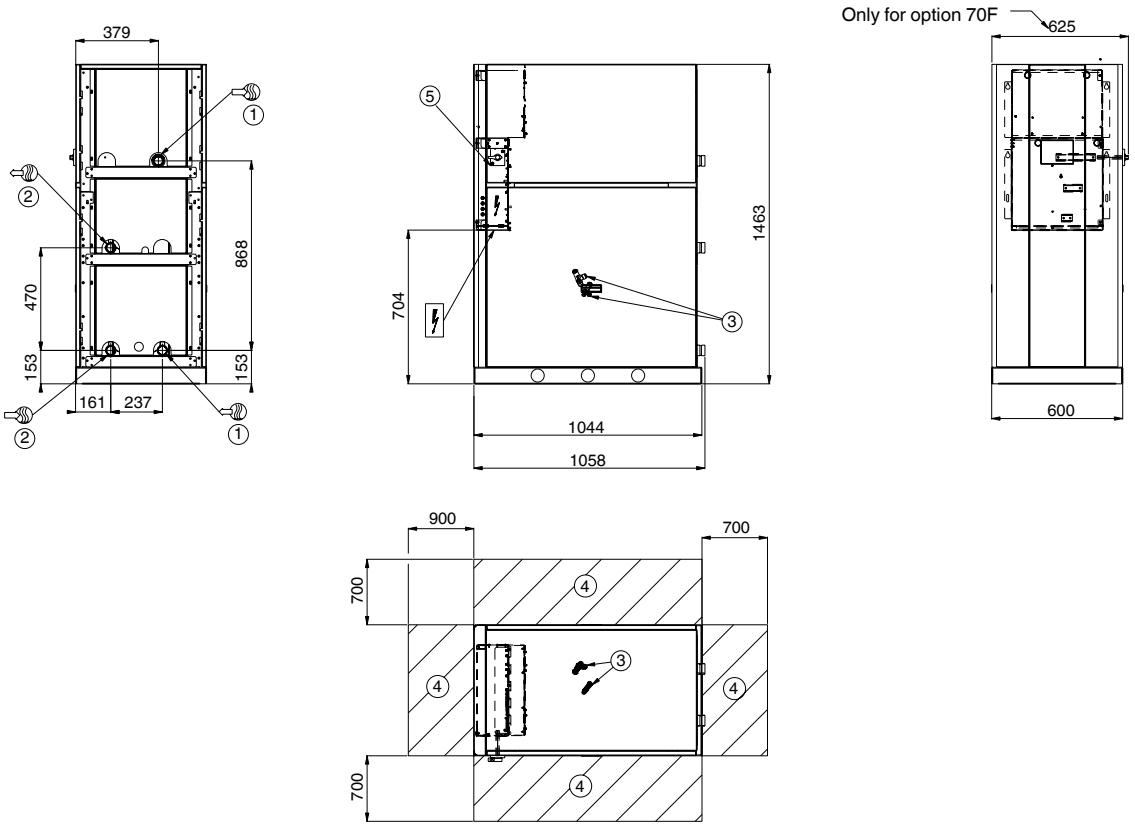


Legend:
All dimensions are in mm.

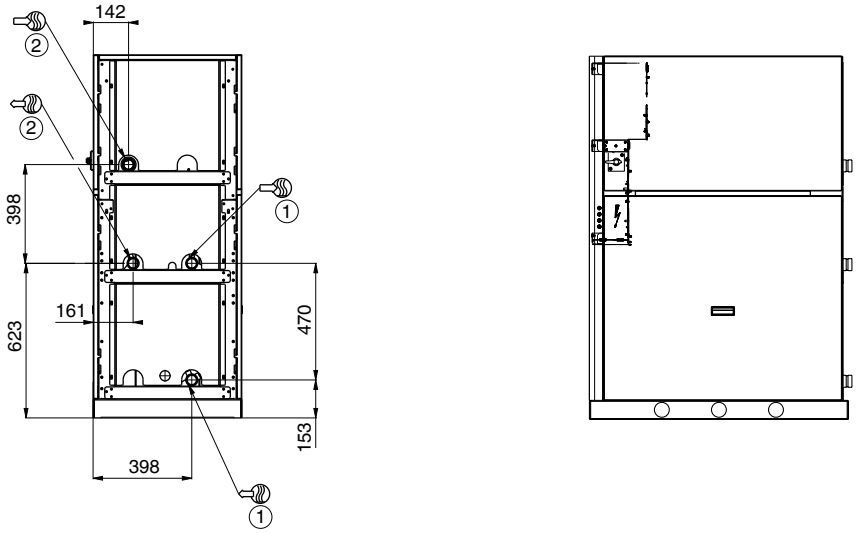
①	Evaporator
②	Condenser
③	Safety valve
④	Clearances required for maintenance (see note)
⑤	Control box
	Water inlet
	Water outlet
	Power wiring connection

NOTE: Non-contractual drawings. Refer to the certified dimensional drawings available on request, when designing an installation.

3.3 - 61WG/30WG 020-045 - unit with evaporator hydronic module (option 116)



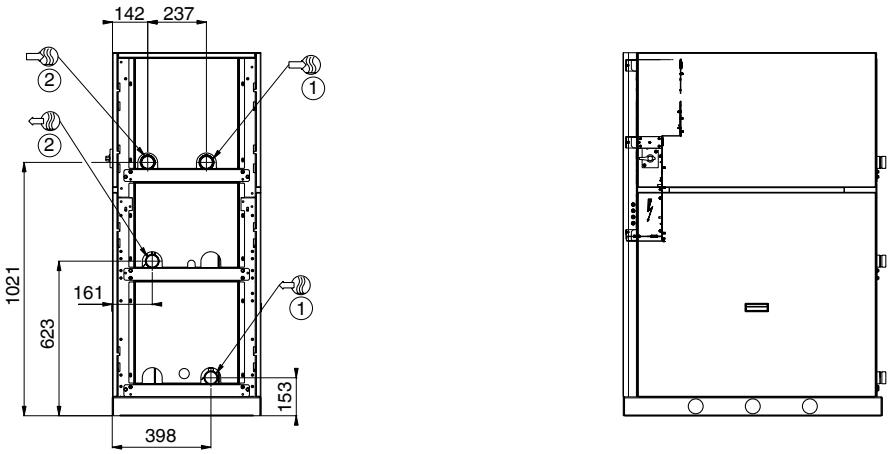
3.4 - 61WG/30WG 020-045 - unit with condenser hydronic module (option 270)



Legend:
All dimensions are in mm.

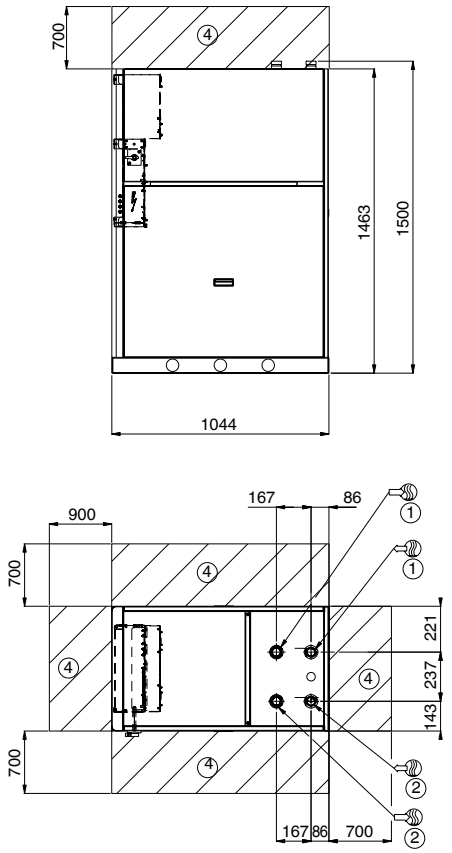
1. Evaporator
2. Condenser
3. Safety valve
4. Clearances required for maintenance (see note)
5. Control box
- Water inlet
- Water outlet
- Power wiring connection

3.5 - 61WG/30WG 020-045 - unit with evaporator/condenser hydronic modules (options 116 + 270)



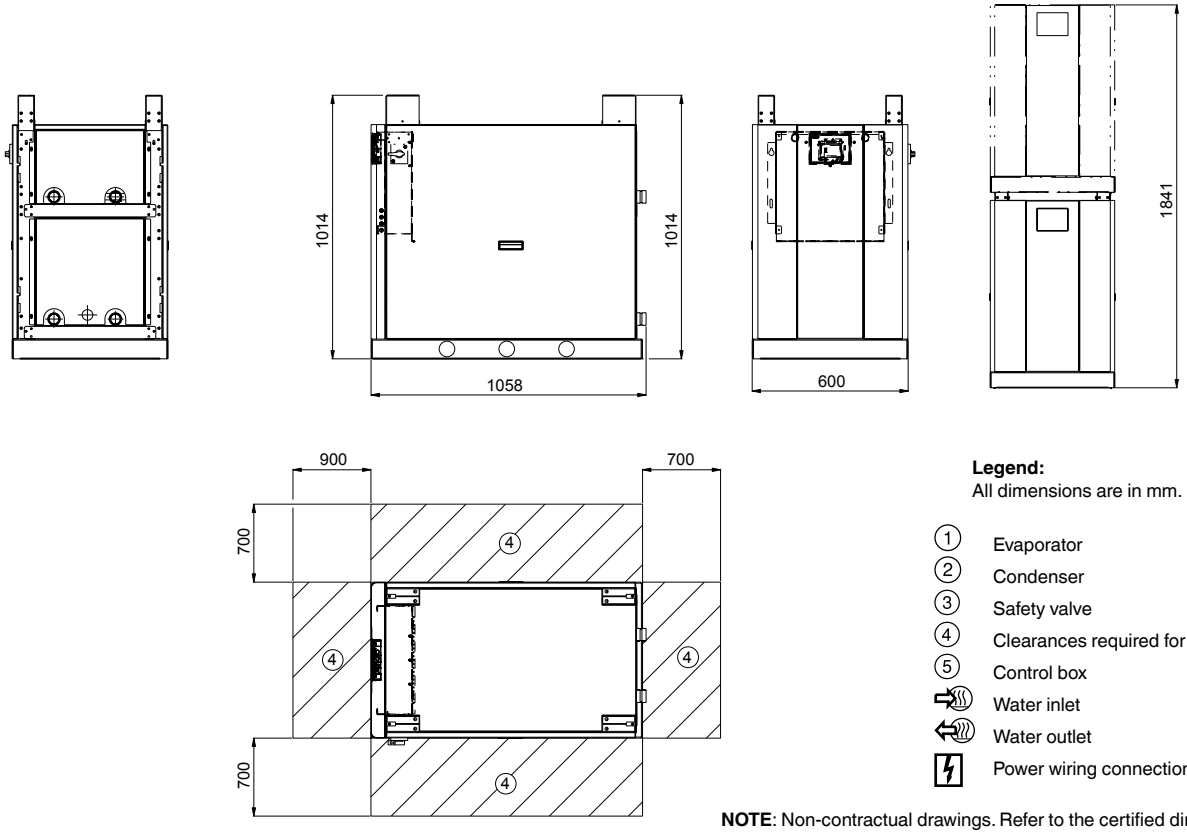
NOTE: Non-contractual drawings. Refer to the certified dimensional drawings available on request, when designing an installation.

3.6 - 61WG/30WG 020-045 - unit with hydronic module and top connections (options 116 + 274 - 270 + 274 - 116 + 270 + 274)



3.7 - 61WG/30WG 020-045 - stackable unit (option 273)

NOTE: The water and electrical connections are identical to those of the standard unit.

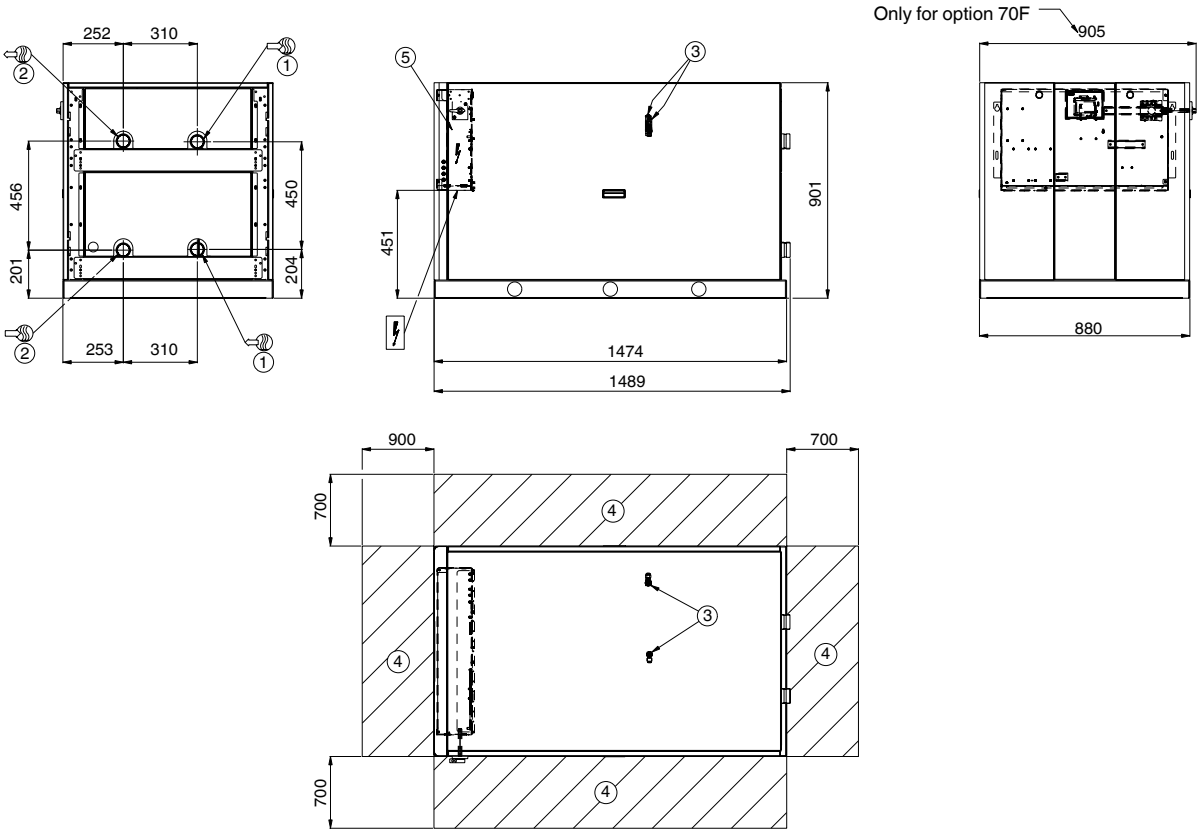


Legend:
All dimensions are in mm.

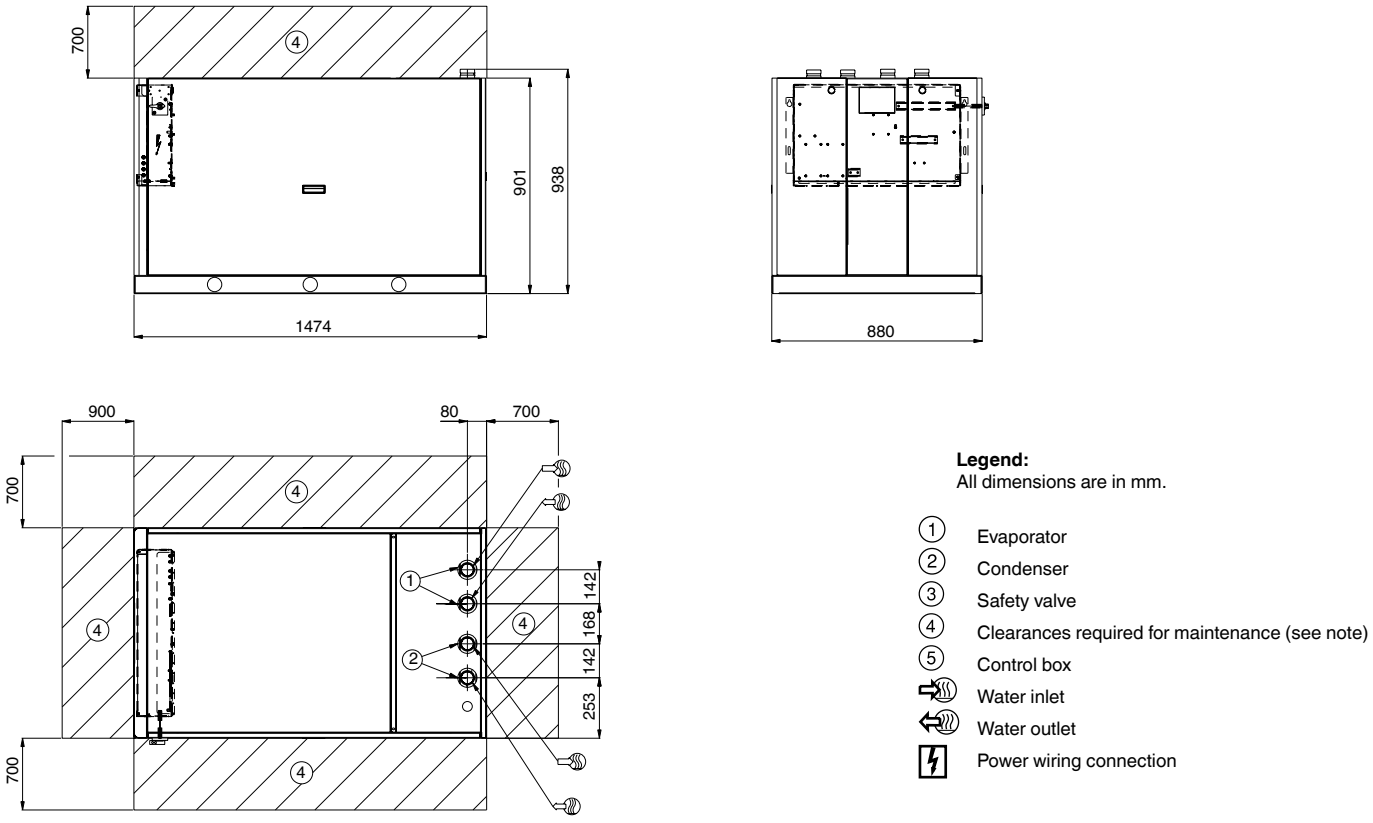
1. Evaporator
2. Condenser
3. Safety valve
4. Clearances required for maintenance (see note)
5. Control box
- Water inlet
- Water outlet
- Power wiring connection

NOTE: Non-contractual drawings. Refer to the certified dimensional drawings available on request, when designing an installation.

3.8 - 61WG/30WG 050-090 - standard unit



3.9 - 61WG/30WG 050-090 - unit with top connections (option 274)

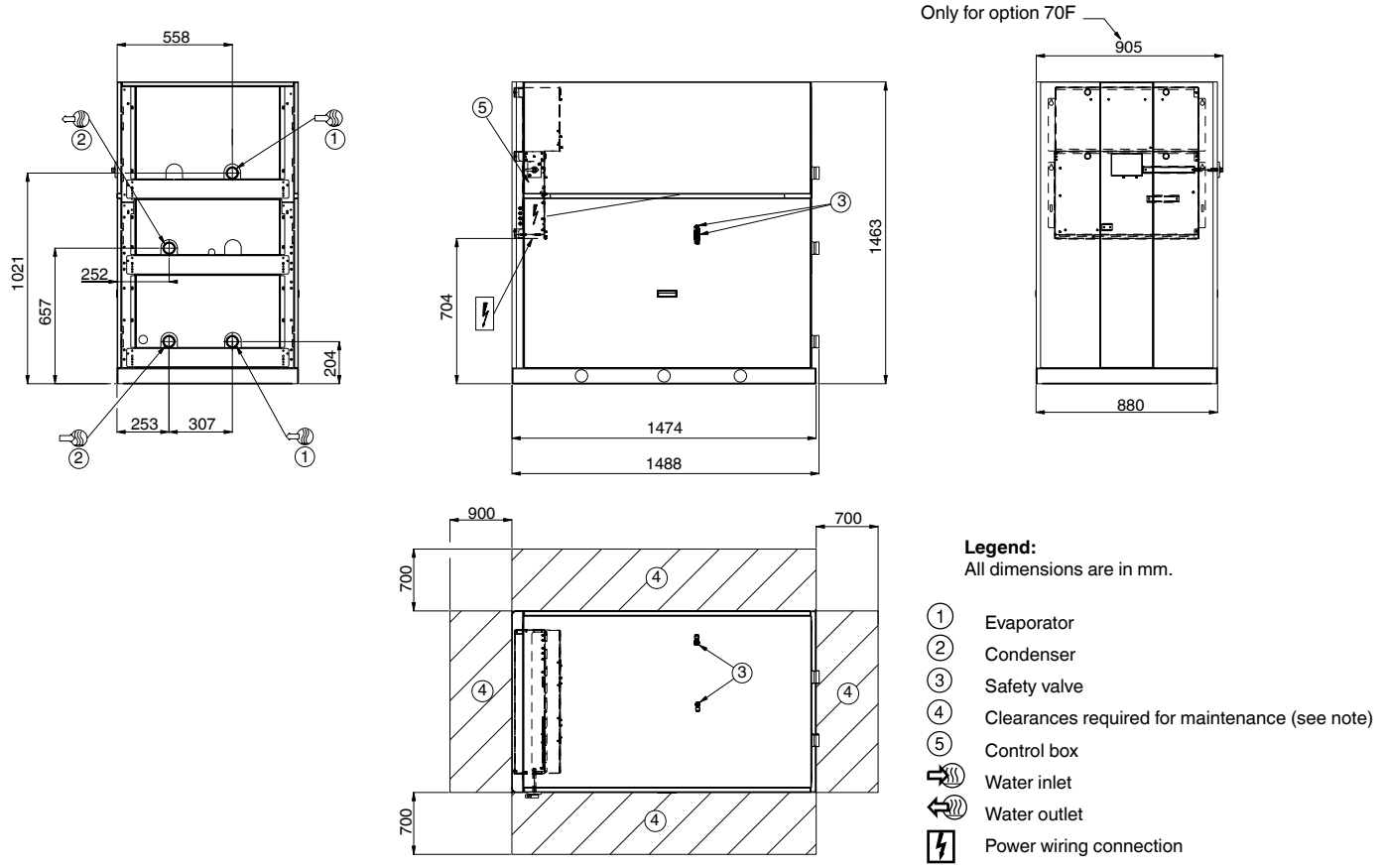


Legend:
All dimensions are in mm.

1. Evaporator
2. Condenser
3. Safety valve
4. Clearances required for maintenance (see note)
5. Control box
- Water inlet
- Water outlet
- Power wiring connection

NOTE: Non-contractual drawings. Refer to the certified dimensional drawings available on request, when designing an installation.

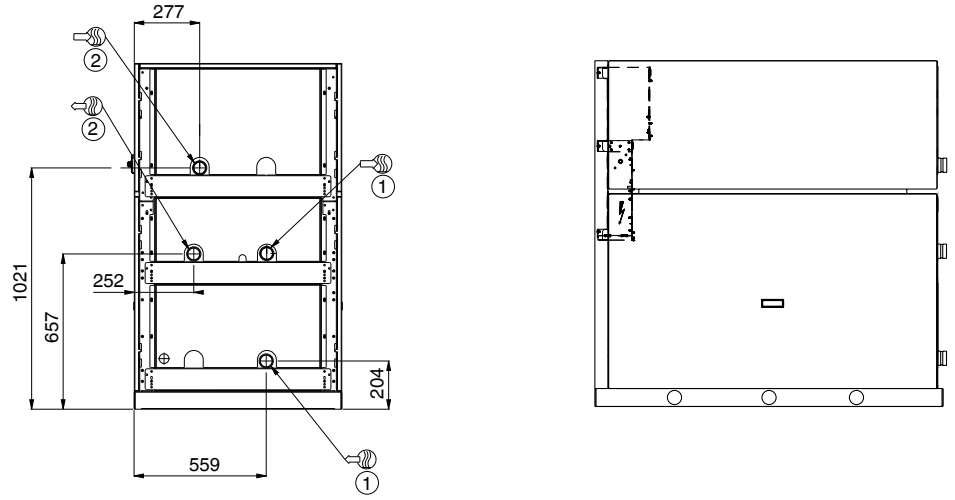
3.10 - 61WG/30WG 050-090 - unit with evaporator hydronic module (option 116)



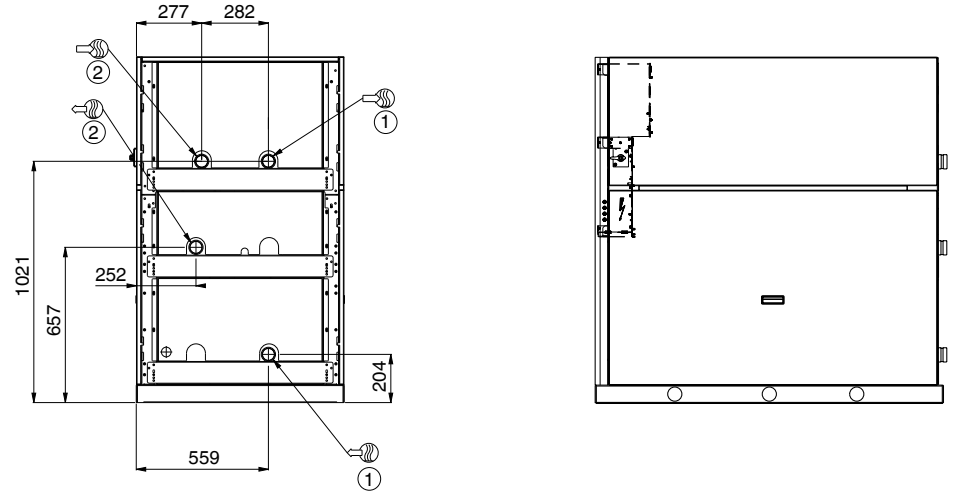
Legend:
All dimensions are in mm.

1. Evaporator
2. Condenser
3. Safety valve
4. Clearances required for maintenance (see note)
5. Control box
- Water inlet
- Water outlet
- Power wiring connection

3.11 - 61WG/30WG 050-090 - unit with condenser hydronic module (option 270)

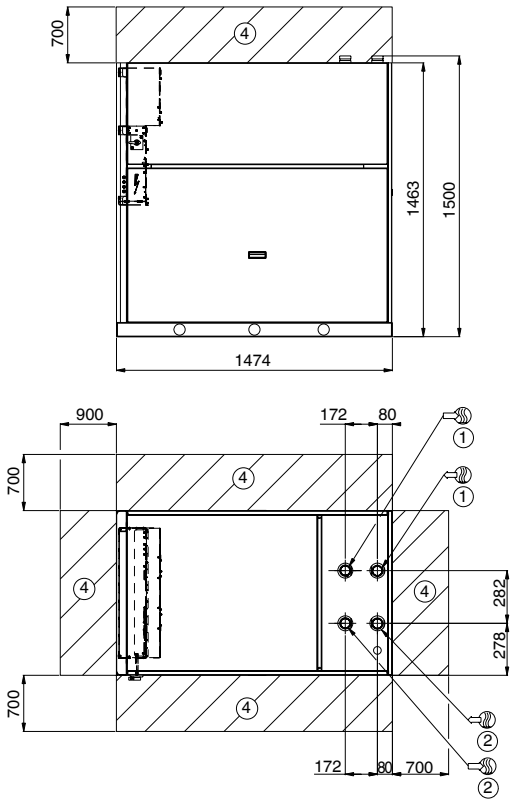


3.12 - 61WG/30WG 050-090 - unit with evaporator/condenser hydronic modules (options 116 + 270)



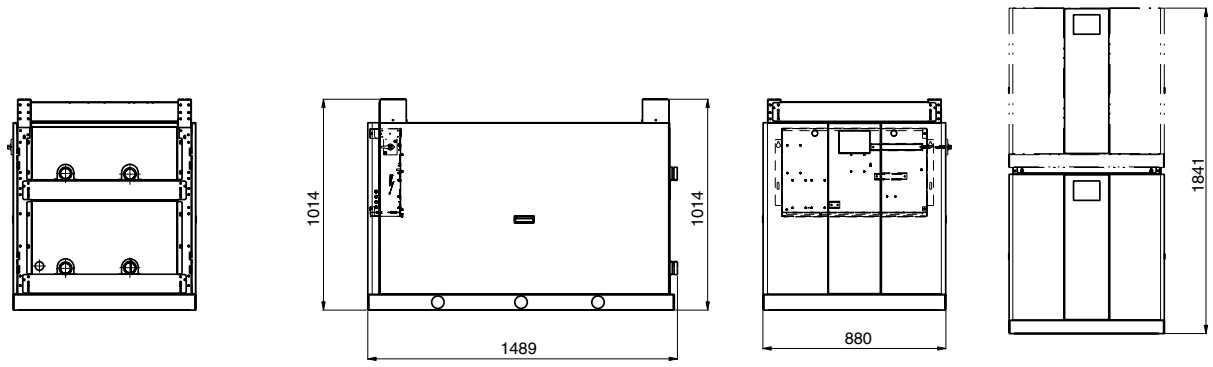
NOTE: Non-contractual drawings. Refer to the certified dimensional drawings available on request, when designing an installation.

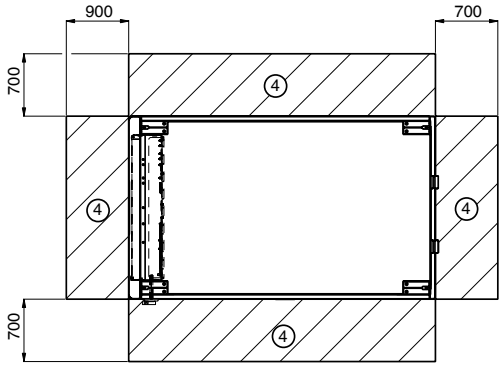
3.13 - 61WG/30WG 050-090 - unit with hydronic module and top connections (options 116 + 274 - 270 + 274 - 116 + 270 + 274)



3.14 - 61WG/30WG 050-090 - stackable unit (option 273)

NOTE: The water and electrical connections are identical to those of the standard unit.





Legend:
All dimensions are in mm.

1. Evaporator
2. Condenser
3. Safety valve
4. Clearances required for maintenance (see note)
5. Control box
- Water inlet
- Water outlet
- Power wiring connection

NOTE: Non-contractual drawings. Refer to the certified dimensional drawings available on request, when designing an installation.

4 - PHYSICAL AND ELECTRICAL DATA 61WG/30WG

4.1 - Physical data 61WG

61WG		020	025	030	035	040	045	050	060	070	080	090
Sound levels*												
Sound power level 10^{-12} W, standard unit	dB(A)	67.0	68.5	69.0	69.3	70.0	70.1	71.5	72.0	72.0	73.0	73.4
Operating weight	kg	191	200	200	207	212	220	386	392	403	413	441
Compressors		Hermetic scroll 48.3 r/s										
Quantity		1	1	1	1	1	1	2	2	2	2	2
Number of capacity steps		1	1	1	1	1	1	2	2	2	2	2
Minimum capacity	%	100	100	100	100	100	100	50	50	50	50	50
Refrigerant**		R-410A										
Charge, standard unit	kg	3.5	3.5	3.6	3.7	4.0	4.6	7.6	7.8	7.9	8.7	11.5
Charge, unit with option 272	kg	2.7	2.9	2.9	3.0	3.2	3.9	7.2	7.3	7.4	7.6	10.5
Oil		160SZ										
Charge per compressor	l	3	3.3	3.3	3.3	3.3	3.6	3.3	3.3	3.3	3.3	3.6
Control		Pro-Dialog+										
Evaporator		Direct-expansion plate heat exchanger										
Water volume	l	3.3	3.6	3.6	4.2	4.6	5.0	8.4	9.2	9.6	10.4	12.5
Water connections		Victaulic										
Inlet/outlet	in	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2
Max. water-side operating pressure without hydronic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Condenser		Plate heat exchanger										
Net water volume	l	3.3	3.6	3.6	4.2	4.6	5.0	8.4	9.2	9.6	10.4	12.5
Water connections		Victaulic										
Inlet/outlet	in	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2
Max. water-side operating pressure without hydronic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

* In accordance with ISO 9614-1, measured in a free field. The sound levels only apply to units without options.
** Weight shown is a guideline only. To find out the unit refrigerant charge, please refer to the unit nameplate

4.2 - Physical data 30WG

30WG		020	025	030	035	040	045	050	060	070	080	090
Sound levels*												
Sound power level 10^{-12} W	dB(A)	67.0	68.5	69.0	69.3	70.0	70.1	71.5	72.0	72.0	73.0	73.4
Operating weight	kg	191	200	200	207	212	220	386	392	403	413	441
Compressors		Hermetic scroll 48.3 r/s										
Quantity		1	1	1	1	1	1	2	2	2	2	2
Number of capacity steps		1	1	1	1	1	1	2	2	2	2	2
Minimum capacity	%	100	100	100	100	100	100	50	50	50	50	50
Refrigerant**		R-410A										
Charge	kg	3.5	3.5	3.6	3.7	4.0	4.6	7.6	7.8	7.9	8.7	11.5
Oil		160SZ										
Charge per compressor	l	3	3.3	3.3	3.3	3.3	3.6	3.3	3.3	3.3	3.3	3.6
Control		Pro-Dialog+										
Evaporator		Direct-expansion plate heat exchanger										
Water volume	l	3.3	3.6	3.6	4.2	4.6	5.0	8.4	9.2	9.6	10.4	12.5
Water connections		Victaulic										
Inlet/outlet	in	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2
Max. water-side operating pressure without hydronic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Condenser		Plate heat exchanger										
Net water volume	l	3.3	3.6	3.6	4.2	4.6	5.0	8.4	9.2	9.6	10.4	12.5
Water connections		Victaulic										
Inlet/outlet	in	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2
Max. water-side operating pressure without hydronic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

* In accordance with ISO 9614-1, measured in a free field. The sound levels only apply to units without options.
** Weight shown is a guideline only. To find out the unit refrigerant charge, please refer to the unit nameplate.

4.3 - Physical data 61WG/30WG units with hydronic module

61WG/30WG (option 116J/270J)		020	025	030	035	040	045	050	060	070	080	090
Operating weight*	kg	305	313	313	321	327	334	513	521	533	544	574
Height**	mm	1463	1463	1463	1463	1463	1463	1463	1463	1463	1463	1463
Hydronic module												
Maximum operating pressure	kPa	300	300	300	300	300	300	300	300	300	300	300
Water filter (max. removed particle diameter)	mm	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Expansion tank capacity***	l	8	8	8	8	8	8	12	12	12	12	12
Water connections	in	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2

* Weight shown is a guideline only. .

** The length and width dimensions are the same as for the standard unit.

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

4.4 - Electrical data 61WG/30WG

61WG		020	025	030	035	040	045	050	060	070	080	090
Power circuit												
Nominal voltage	V-ph-Hz	400-3-50										
Voltage range	V	360-440										
Control circuit supply		24 V, via internal transformer										
Maximum start-up current draw (Un)*												
Standard unit	A	98	142	142	147	158	197	164	166	175	189	233
Unit with electronic starter option	A	53.9	78.1	78.1	80.9	86.9	108.4	100.1	102.1	108.9	117.9	144.4
Unit power factor at maximum capacity**		0.83	0.82	0.84	0.83	0.82	0.84	0.82	0.82	0.83	0.82	0.84
Maximum operating power input**	kW	9.7	11.4	12.7	14.6	16.5	18.6	22.8	25.4	29.2	33	37.2
Nominal unit operating current draw***	A	10.5	13.2	13.8	15.6	16.2	20.2	26.4	27.6	31.2	32.4	40.4
Maximum operating current draw (Un)****	A	16.1	19.6	21.1	24.4	26.7	30.9	39.2	42.2	48.8	53.4	61.8
Maximum operating current draw (Un-10%) †	A	19	22	24	28	31	36	44	48	56	62	72
Customer-side unit power reserve		Customer reserve at the 24 V control power circuit										
Short-circuit stability and protection		See table below "Short-circuit stability current"										

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

** Power input, compressors and fans, at the unit operating limits (saturated suction temperature 10°C, saturated condensing temperature 65°C) and nominal voltage of 400 V (data given on the unit nameplate).

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

**** Maximum unit operating current at maximum unit power input and 400 V (values given on the unit nameplate).

† Maximum unit operating current at maximum unit power input and 360 V.

30WG		020	025	030	035	040	045	050	060	070	080	090
Power circuit												
Nominal voltage	V-ph-Hz	400-3-50										
Voltage range	V	360-440										
Control circuit supply		24 V, via internal transformer										
Maximum start-up current draw (Un)*												
Standard unit	A	98	142	142	147	158	197	163	165	174	188	233
Unit with electronic starter option	A	53.9	78.1	78.1	80.9	86.9	108.4	100.1	102.1	108.9	117.9	144.4
Unit power factor at maximum capacity**		0.83	0.82	0.84	0.83	0.82	0.84	0.82	0.82	0.83	0.82	0.84
Maximum operating power input**	kW	9.1	10.7	11.7	13.6	15	17	21.4	23.4	27.2	30	34
Nominal unit operating current draw***	A	10.6	12.9	13.3	15.2	16.5	19.7	25.8	26.6	30.4	33	39.4
Maximum operating current draw (Un)****	A	15.6	18.7	19.8	23.2	25.4	29	37.4	39.6	46.4	50.8	58
Maximum operating current draw (Un-10%) †	**A**	18	21	23	27	30	36	42	46	54	60	72
Customer-side unit power reserve		Customer reserve at the 24 V control power circuit										
Short-circuit stability and protection		See table below "Short-circuit stability current"										

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

** Power input, compressors and fans, at the unit operating limits (saturated suction temperature 10°C, saturated condensing temperature 65°C) and nominal voltage of 400 V (data given on the unit nameplate).

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

**** Maximum unit operating current at maximum unit power input and 400 V (values given on the unit nameplate).

† Maximum unit operating current at maximum unit power input and 360 V.

4.5 - Short-circuit stability current (TN system*) - standard unit (with main disconnect switch)

61WG/30WG	020	025	030	035	040	045	050	060	070	080	090
Value without upstream protection											
Short-term current at 1 s - Icw - kA rms	3	3	3	3	3	3	3	3	3	3	3
Admissible peak current - Ipk - kA pk	6	6	6	6	6	6	6	6	6	6	6
Value with upstream protection (circuit breaker)											
Conditional short-circuit current Icc - kA rms	40	40	40	40	40	40	40	40	40	40	40
Schneider circuit breaker - Compact series	NSX 100N										
Reference number**	LV429795										

* Earthing system type

** If another current limitation protection system is used, its time-current and thermal constraint (I^2t) trip characteristics must be at least equivalent to those of the recommended Schneider circuit breaker. Contact your nearest Carrier office.
The short-circuit stability current values above are in accordance with the TN system.

4.6 - Electrical data, optional hydronic module

The pumps that are factory-installed in these units have motors with efficiency class IE2. The additional electrical data required* is as follows:

Motors of fixed-speed hydronic module pumps, 61WG/30WG (options 116F and 270F)

No.**	Description***		61WG/30WG - options 116F and 270F (low-pressure pumps)									
			20	**25**	**30**	**35**	**40**	**45**	**50**	**60**	**70**	**80**	**90**
1	Nominal efficiency at full load and nominal voltage	%	80	80	80	80	80	80	80	80	80	80	82
1	Nominal efficiency at 75% rated load and nominal voltage	%	78	78	78	78	78	78	78	78	78	78	82
1	Nominal efficiency at 50% rated load and nominal voltage	%	75	75	75	75	75	75	75	75	75	75	80
2	Efficiency level		IE2										
3	Year of manufacture		This information varies depending on the manufacturer and model at the time of incorporation. Please refer to the motor name plates.										
4	Manufacturer's name and trademark, commercial registration number and place of manufacturer												
5	Product's model number												
6	Number of motor poles		2	2	2	2	2	2	2	2	2	2	2
7-1	Rated shaft power output at full load and nominal voltage (400 V)	kW	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.87	0.87	0.87	1.26
7-2	Maximum power input (400 V)****	kW	0.83	0.83	0.83	0.83	0.83	0.83	0.83	1.2	1.2	1.2	1.5
8	Rated input frequency	Hz	50										
9-1	Rated voltage	V	3 x 400										
9-2	Maximum current drawn (400 V)†	A	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3	2.3	2.3	3.1
10	Rated speed	r/s	48.2	48.2	48.2	48.2	48.2	48.2	48.2	47.3	47.3	47.3	48.2
		rpm	2890	2890	2890	2890	2890	2890	2890	2838	2838	2838	2892
11	Product disassembly, recycling or disposal at end of life		Disassembly using standard tools. Disposal and recycling using an appropriate company.										
12	Operating conditions for which the motor is specifically designed												
	I - Altitudes above sea level	m	< 1000††										
	II - Ambient air temperature	°C	< 40										
	IV - Maximum air temperature		Please refer to the operating conditions given in this manual or in the specific conditions in the Carrier selection programs.										
	V - Potentially explosive atmospheres		Non-ATEX environment										

Motors of variable-speed hydronic module pumps, 61WG/30WG (options 116J and 270J)

No.**	Description***		61WG/30WG - options 116J and 270J (high-pressure pumps)									
			20	**25**	**30**	**35**	**40**	**45**	**50**	**60**	**70**	**80**	**90**
1	Nominal efficiency at full load and nominal voltage	%	82	82	82	82	82	82	82	82	82	82	82
1	Nominal efficiency at 75% rated load and nominal voltage	%	82	82	82	82	82	82	82	82	82	82	82
1	Nominal efficiency at 50% rated load and nominal voltage	%	80	80	80	80	80	80	79	79	79	79	79
2	Efficiency level		IE2										
3	Year of manufacture		This information varies depending on the manufacturer and model at the time of incorporation. Please refer to the motor name plates.										
4	Manufacturer's name and trademark, commercial registration number and place of manufacturer												
5	Product's model number												
6	Number of motor poles		2	2	2	2	2	2	2	2	2	2	2
7-1	Rated shaft power output at full load and nominal voltage (400 V)	kW	1.26	1.26	1.26	1.26	1.26	1.26	1.90	1.90	1.90	1.90	1.90
7-2	Maximum power input (400 V)****	kW	1.50	1.50	1.50	1.50	1.50	1.50	2.30	2.30	2.30	2.30	2.30
8	Rated input frequency	Hz	50										
9-1	Rated voltage	V	3 x 400										
9-2	Maximum current drawn (400 V)†	A	3.1	3.1	3.1	3.1	3.1	3.1	4.3	4.3	4.3	4.3	4.3
10	Rated speed	r/s	48.2	48.2	48.2	48.2	48.2	48.2	47.7	47.7	47.7	47.7	47.7
		rpm	2892	2892	2892	2892	2892	2892	2863	2862	2862	2862	2862
11	Product disassembly, recycling or disposal at end of life		Disassembly using standard tools. Disposal and recycling using an appropriate company.										
12	Operating conditions for which the motor is specifically designed												
	I - Altitudes above sea level	m	< 1000††										
	II - Ambient air temperature	°C	< 40										
	IV - Maximum air temperature		Please refer to the operating conditions given in this manual or in the specific conditions in the Carrier selection programs.										
	V - Potentially explosive atmospheres		Non-ATEX environment										

* Required by regulation 640/2009 with regard to the application of directive 2005/32/EC on the eco-design requirements for electric motors

** Item number imposed by regulation 640/2009, annex I2b.

*** Description given by regulation 640/2009, annex I2b.

**** To obtain the maximum power input for a unit with hydronic module add the maximum unit power input from the electrical data table to the pump power input.

† To obtain the maximum unit operating current draw for a unit with hydronic module add the maximum unit current draw from the electrical data table to the pump current draw.

†† Above 1000 m, a degradation of 3% for each 500 m should be taken into consideration.

4.7 - Compressor usage and electrical data table

Compressor	Reference	I Nom	I Max (Un)	I Max (Un - 10%)	LRA*	LRA**	Circ.	61WG 020	025	030	040	045	060	070	080	090	110	120
SH090	00PSG001549100	10.5	16.1	19	98	53.9	A	1										
SH105	00PSG001549200	13.2	19.6	22	142	78.1	A		1					2				
SH120	00PSG001549300	13.8	21.1	24	142	78.1	A			1					2			
SH140	00PSG001549400	15.6	24.4	28	147	80.9	A				1					2		
SH161	00PSG001549500	16.2	26.7	31	158	86.9	A					1					2	
SH184	00PSG001549600	20.2	30.9	36	197	108.4	A						1					2

Compressor	Reference	I Nom	I Max (Un)	I Max (Un - 10%)	LRA*	LRA**	Circ.	30WG 020	025	030	040	045	060	070	080	090	110	120
WSH090	00PSG001482000	10.6	15.6	18	98	53.9	A	1										
WSH105	00PSG001482100	12.9	18.7	21	142	78.1	A		1					2				
WSH120	00PSG001482200	13.3	19.8	23	142	78.1	A			1					2			
WSH140	00PSG001482300	15.2	23.2	27	147	80.9	A				1					2		
WSH161	00PSG001482400	16.5	25.4	30	158	86.9	A					1					2	
WSH184	00PSG001482500	19.7	29	36	197	108.4	A						1					2

Legend
I Nom Nominal current draw (A) at standard Eurovent conditions see definition of conditions under nominal unit current draw)
I Max Maximum operating current, A
LRA* Locked rotor current at nominal voltage, A
LRA** Locked rotor current with electronic starter at nominal voltage, A

Electrical data notes and operating conditions:
- 61WG and 30WG units have a single power connection point, located immediately upstream of the main disconnect switch.
- The control box includes the following standard features:
  - a main disconnect switch,
  - the starter and motor protection devices for each compressor and the pumps
  - the control devices
- Field connections:
  All connections to the system and the electrical installations must be in full accordance with all applicable local codes.
- The Carrier 61WG and 30WG units are designed and built to ensure conformance with these codes. The recommendations of European standard EN 60204-1 (machine safety - electrical machine components - part 1: general regulations - corresponds to IEC 60204-1) are specifically taken into account, when designing the electrical unit equipment.

NOTES:
- Generally the recommendations of IEC 60364 are accepted as compliance with the requirements of the installation directives. Conformance with EN 60204-1 is the best means of ensuring compliance with the Machines Directive § 1.5.1.
- Annex B of EN 60204-1 describes the electrical characteristics used for the operation of the machines.

1. The operating conditions for the units are specified below:
   Environment* - Environment as classified in IEC 60364 § 3:
   - ambient temperature range: +5°C to +40°C, class AA4
   - humidity range (non-condensing)*:
     - 50% relative humidity at 40°C
     - 90% relative humidity at 20°C
   - altitude: ≤ 2000 m (see note for table 4.6 - Electrical data, hydronic module)
   - indoor installation*
   - 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)
   - vibration and shock, class AG2, AH2
   - competence of personnel, class BA4* (trained personnel - IEC 60364)
2. Power supply frequency variation: ± 2 Hz.
3. The neutral (N) conductor must not be connected directly to the unit (if necessary use a transformer).
4. Over-current protection of the power supply conductors is not provided with the unit.
5. The factory-installed disconnect switch(es)/circuit breaker(s) is (are) of a type suitable for power interruption in accordance with EN 60947.
6. The units are designed for simplified connection on TN(s) networks (IEC 60364). For IT networks provide a local earth and consult competent local organisations to complete the electrical installation.
7. Derived currents: If protection by monitoring of derived currents is necessary to ensure the safety of the installation, the control of the cut-out value must take the presence of leak currents into consideration that result from the use of frequency converters in the unit. A value of at least 150 mA is recommended to control differential protection devices.

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

* The protection level of the control boxes required to conform to this class is IPX1B (according to reference document IEC 60529). All 61WG and 30WG units fulfil this protection condition.
Units equipped with front casing panel meet class IP23. If the casing panel has been removed, access to energised components is protected to level IPXXB.

5 - APPLICATION DATA

5.1 - Operating limits

61WG		Minimum	Maximum
Evaporator			
Entering water temperature at start-up	°C	7.5*	27
Leaving water temperature during operation	°C	5**	20
Entering/leaving water temperature difference	K	2.5	7
Condenser			
Entering water temperature at start-up	°C	15***	60****
Leaving water temperature during operation	°C	20	65
Entering/leaving water temperature difference	K	2.5	18

* For entering water temperatures below 7.5°C at start-up, contact Carrier.
** If the leaving water temperature is below 5°C, a frost protection solution must be used. Please refer to option 6 for evaporator leaving water low-temperature applications (< 5°C).
*** For applications with a condenser entering temperature below 15°C the use of a three-way valve is recommended. This three-way valve can be controlled by the 0-10 V analogue output of the Pro-Dialog+ control.
**** For a water flow rate that corresponds to a maximum water-side temperature difference of 5 K.

61WG + option 272 (geothermal application)		Minimum	Maximum
Evaporator			
Entering water temperature at start-up	°C	-2.5*	25
Leaving water temperature during operation	°C	-5*	20
Entering/leaving water temperature difference	K	2.5	5
Condenser			
Entering water temperature at start-up	°C	15**	60***
Leaving water temperature during operation	°C	20	65
Entering/leaving water temperature difference	K	2.5	18

* A frost protection solution must be used.
** For applications with a condenser entering temperature below 15°C the use of a three-way valve is recommended. This three-way valve can be controlled by the 0-10 V analogue output of the Pro-Dialog+ control.
*** For a water flow rate that corresponds to a maximum water-side temperature difference of 5 K.

30WG		Minimum	Maximum
Evaporator			
Entering water temperature at start-up	°C	7.5*	27
Leaving water temperature during operation	°C	5**	20
Entering/leaving water temperature difference	K	2.5	7
Condenser			
Entering water temperature at start-up	°C	15***	55****
Leaving water temperature during operation	°C	20	60
Entering/leaving water temperature difference	K	2.5	18

* For entering water temperatures below 7.5°C at start-up, contact Carrier.
** If the leaving water temperature is below 5°C, a frost protection solution must be used. Please refer to option 6 for evaporator leaving water low-temperature applications (< 5°C).
*** For applications with a condenser entering temperature below 15°C the use of a three-way valve is recommended. This three-way valve can be controlled by the 0-10 V analogue output of the Pro-Dialog+ control.
**** For a water flow rate that corresponds to a maximum water-side temperature difference of 5 K.

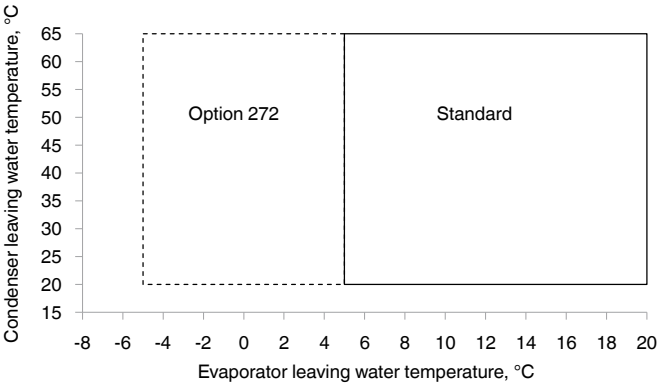
30WG + option 6		Minimum	Maximum
Evaporator			
Entering water temperature at start-up	°C	-9.5*	27
Leaving water temperature during operation	°C	-12*	20
Entering/leaving water temperature difference	K	2.5	3
Condenser			
Entering water temperature at start-up	°C	15**	55***
Leaving water temperature during operation	°C	20	60
Entering/leaving water temperature difference	K	2.5	18

Note: Do not exceed the maximum operating temperature.
* A frost protection solution must be used.
** For applications with a condenser entering temperature below 15°C the use of a three-way valve is recommended. This three-way valve can be controlled by the 0-10 V analogue output of the Pro-Dialog+ control.
*** For a water flow rate that corresponds to a maximum water-side temperature difference of 5 K.

30WG + drycooler		Minimum	Maximum
Evaporator			
Entering water temperature at start-up	°C	7.5*	27
Leaving water temperature during operation	°C	5**	20
Entering/leaving water temperature difference	K	2.5	7
Condenser without hydronic kit			
Entering air temperature at start-up + during operation	°C	10-15***	40-45****
Condenser with option 270J (kit with variable-speed pump)			
Entering air temperature at start-up+ during operation	°C	-10†	40-45****

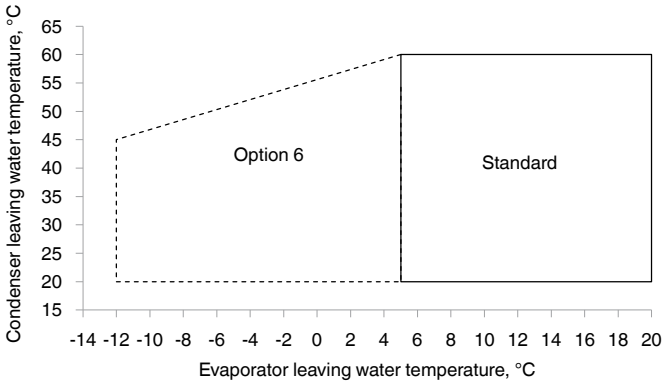
* For entering water temperatures below 7.5°C at start-up, contact Carrier.
** If the leaving water temperature is below 5°C, a frost protection solution must be used. Please refer to option 6 for evaporator leaving water low-temperature applications (< 5°C).
*** The minimum entering air temperature is based on the drycooler selection.
**** The maximum entering air temperature is based on the drycooler selection.
† For applications with a low condenser entering air temperature the use of a three-way valve is recommended. This thre-way valve can be controlled by the 0-10 V analogue output of the Pro-Dialog+ control.

5.2 - Operating range 61WG



61WG standard unit
61WG unit with option 272 (brine to water)

5.3 - Operating range 30WG



30WG standard unit
30WG unit with option 6 (brine)

5.4 - Minimum chilled water flow

If the system water flow rate is lower than the minimum water flow rate, recirculation of the evaporator flow may occur. The temperature of the mixture leaving the evaporator must never be less than 2.5 K lower than the chilled water entering temperature.

5.5 - 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 tables in chapter 5.7. If the flow exceeds the maximum value, two solutions are possible:

- Modify the flow rate with a control valve.
- Bypass the evaporator to obtain a highter temperature difference with a lower evaporator flow rate.

5.6 - Variable flow

A pump with variable flow can be used in these units. The units 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 the values below.

5.7 - Water flow rate

5.7.1 - Standard 61WG

61WG	Evaporator water flow rate, l/s					
	Minimum*		Minimum**	Maximum***		Maximum****
	Low pressure	High pressure		Low pressure	High pressure	
020	1.1	0.9	0.5	3.1	3.6	3.8
025	1.0	1.0	0.5	3.3	3.8	4.1
030	1.0	1.0	0.5	3.3	3.8	4.1
035	1.1	1.1	0.6	3.6	4.2	4.7
040	1.1	1.1	0.6	3.8	4.4	5.0
045	1.2	1.1	0.8	4.0	4.6	5.4
050	1.6	1.4	0.8	5.4	7.8	9.2
060	1.5	1.5	1.0	6.1	8.0	9.9
070	1.6	1.5	1.1	6.2	8.1	10.3
080	1.6	1.5	1.3	6.3	8.3	10.9
090	2.0	1.6	1.5	7.8	8.7	12.5

* Flow rate for a temperature difference at the minimum leaving water temperature (unit with hydronic module)
** Minimum flow rate for a water temperature difference of 7 K (unit without hydronic module)
*** Maximum flow rate for an available pressure of 20 kPa (unit with low-pressure hydronic module) or 50 kPa (unit with high-pressure hydronic module)
**** Maximum flow rate for a pressure drop of 100 kPa in the plate heat exchanger (unit without hydronic module)

61WG	Condenser water flow rate, l/s			
	Minimum*	Maximum**		Maximum***
	Low pressure	Low pressure	High pressure	
020	0.3	3.1	3.5	3.8
025	0.3	3.3	3.8	4.1
030	0.3	3.3	3.8	4.1
035	0.4	3.5	4.1	4.7
040	0.4	3.7	4.3	5.0
045	0.4	3.9	4.5	5.4
050	0.4	4.8	6.8	7.0
060	0.5	5.5	7.0	7.5
070	0.5	5.6	7.2	7.8
080	0.6	5.8	7.4	8.2
090	0.6	7.2	7.9	9.3

* Minimum flow rate for a water temperature difference of 18 K (unit with or without hydronic module)
** Maximum flow rate for an available pressure of 20 kPa (unit with low-pressure hydronic module) or 50 kPa (unit with high-pressure hydronic module)
*** Maximum flow rate for a pressure drop of 100 kPa in the plate heat exchanger (unit without hydronic module)

5.7.2 - 61WG with option 272

61WG	Minimum evaporator water flow rate - option 272*, l/s		
	Minimum**		Minimum***
	Low pressure	High pressure	
020	0.3	0.3	0.3
025	0.3	0.3	0.3
030	0.3	0.3	0.3
035	0.4	0.4	0.4
040	0.4	0.4	0.4
045	0.5	0.5	0.5
050	0.8	0.9	0.5
060	1.0	1.0	0.5
070	1.0	1.1	0.6
080	1.1	1.2	0.7
090	1.1	1.4	0.7

* Option 272: Condenser side high-temperature water production, with glycol solution, evaporator side
** Minimum flow rate for a maximum permitted temperature difference at the minimum leaving water temperature (unit with hydronic module)
*** Minimum flow rate for a maximum permitted temperature difference at the minimum leaving water temperature (unit without hydronic module)

5.7.3 - Standard 30WG

30WG	Evaporator water flow rate, l/s					
	Minimum*		Minimum**	Maximum***		Maximum****
	Low pressure	High pressure		Low pressure	High pressure	
020	1.0	0.9	0.5	3.1	3.6	3.8
025	1.0	1.0	0.5	3.3	3.8	4.1
030	1.0	1.0	0.5	3.3	3.8	4.1
035	1.1	1.1	0.6	3.6	4.2	4.7
040	1.2	1.1	0.6	3.8	4.4	5
045	1.2	1.1	0.8	4.0	4.6	5.4
050	1.6	1.4	0.8	5.4	7.8	9.2
060	1.5	1.5	1.0	6.1	8.0	9.9
070	1.6	1.5	1.1	6.2	8.1	10.3
080	1.6	1.5	1.3	6.3	8.3	10.9
090	2.0	1.6	1.5	7.8	8.7	12.5

* Flow rate for a temperature difference at the minimum leaving water temperature (unit with hydronic module)
** Minimum flow rate for a water temperature difference of 7 K (unit without hydronic module)
*** Maximum flow rate for an available pressure of 20 kPa (unit with low-pressure hydronic module) or 50 kPa (unit with high-pressure hydronic module)
**** Maximum flow rate for a pressure drop of 100 kPa in the plate heat exchanger (unit without hydronic module)

30WG	Condenser water flow rate, l/s			
	Minimum*	Maximum**		Maximum***
	Low pressure	Low pressure	High pressure	
020	0.3	3.1	3.5	3.8
025	0.3	3.3	3.8	4.1
030	0.3	3.3	3.8	4.1
035	0.4	3.5	4.1	4.7
040	0.4	3.7	4.3	5.0
045	0.4	3.9	4.5	5.4
050	0.4	4.8	6.8	7.0
060	0.5	5.5	7.0	7.5
070	0.5	5.6	7.2	7.8
080	0.6	5.8	7.4	8.2
090	0.6	7.2	7.9	9.3

* Minimum flow rate for a water temperature difference of 18 K (unit with or without hydronic module)
** Maximum flow rate for an available pressure of 20 kPa (unit with low-pressure hydronic module) or 50 kPa (unit with high-pressure hydronic module)
*** Maximum flow rate for a pressure drop of 100 kPa in the plate heat exchanger (unit without hydronic module)

5.7.4 - 30WG with option 6

30WG	Minimum evaporator water flow rate - option 6*, l/s		
	Minimum**		Minimum***
	Low pressure	High pressure	
020	0.7	0.6	0.5
025	0.8	0.7	0.5
030	0.8	0.7	0.5
035	0.9	0.7	0.6
040	1.0	0.7	0.6
045	1.0	0.8	0.8
050	1.4	1.1	0.8
060	1.0	1.1	1.0
070	1.0	1.2	1.1
080	1.1	1.2	1.3
090	1.2	1.2	1.5

* Option 6: glycol solution, very low temperature
** Minimum flow rate for a maximum permitted temperature difference at the minimum leaving water temperature (unit with hydronic module)
*** Minimum flow rate for a maximum permitted temperature difference at the minimum leaving water temperature (unit without hydronic module)

5.8 - Minimum water volume

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

Capacity = Cap (kW) x N Liters

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

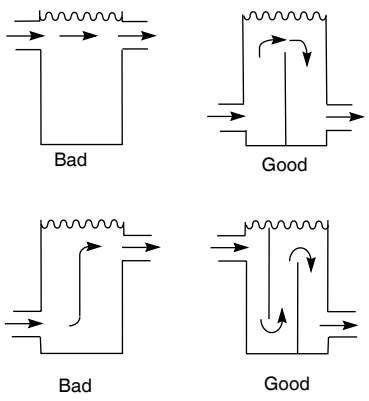
This volume is necessary for stable operation and accurate temperature control.

Application	N
61WG/30WG	2.5

ATTENTION: Minimum water volume required between the unit and possible customer-supplied valves to the outside of the unit.

Industrial process applications
Certain industrial processes may require high leaving water stability. In these cases the values above must be increased.

It may be 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.



5.9 - Maximum water loop volume (evaporator and condenser side)

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

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

61WG/30WG		020-045			060-090		
Static pressure	kPa	100	200	300	100	200	300
	bar	1	2	3	1	2	3
Pure water	l	220	450	75	340	225	115
10% ethylene glycol	l	165	110	53	255	170	85
20% ethylene glycol	l	100	70	35	150	100	50
35% ethylene glycol	l	85	55	30	130	85	45

5.10 - Expansion tank

The expansion tank is supplied with a pressure of 1 bar relative (±20%). The maximum operating pressure for the tank is 3 bar.

5.11 - Protection against cavitation (option 116)

To ensure the durability of the pumps in the integrated hydronic modules, the control algorithm of the 61WG/30WG units incorporates anti-cavitation protection.

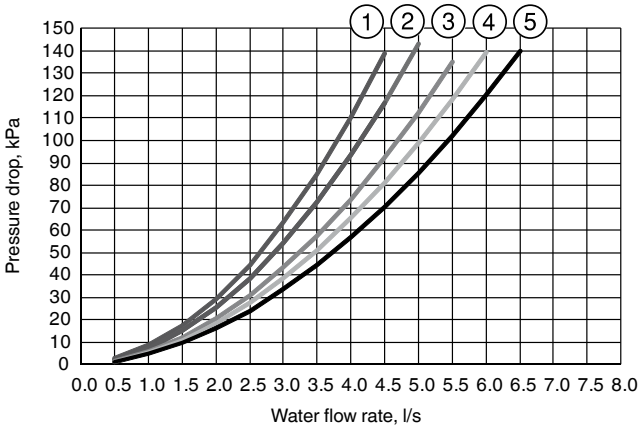
It is therefore necessary to ensure a minimum pump entering pressure of 60 kPa (0.6 bar) during operation and at shut-down. A pressure below 60 kPa will prohibit unit start-up or cause an alarm with the unit shutting down.

In order to obtain sufficient pressure, it is recommended:
- to pressurise the hydronic circuit between 100 kPa and 300 kPa (1 and 3 bar) maximum on the suction side of the pump,
- to clean the hydronic circuit before charging water,
- to regularly clean the screen filter.

5.12 - Plate heat exchanger pressure drop (includes internal piping)

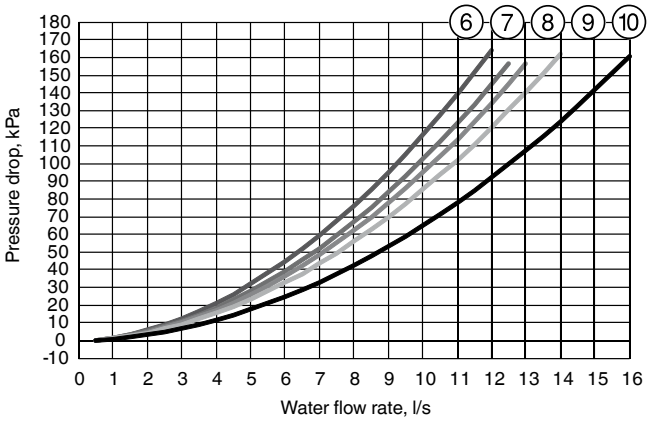
Evaporator - standard unit without hydronic module

61WG/30WG 020-045



1 61WG-30WG 020
2 61WG-30WG 025 to 61WG-30WG 030
3 61WG-30WG 035
4 61WG-30WG 040
5 61WG-30WG 045

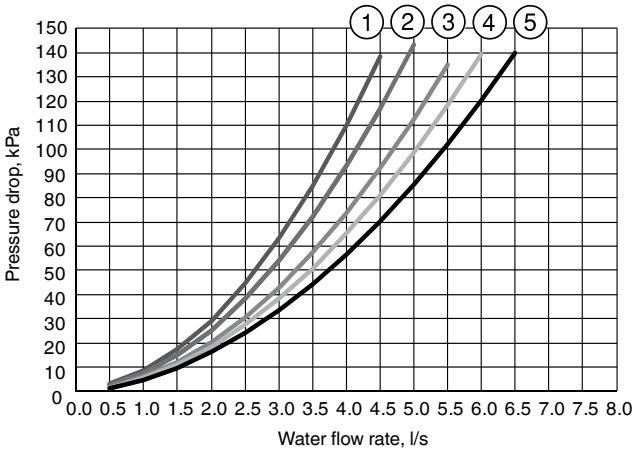
61WG/30WG 050-090



6 61WG-30WG 050
7 61WG-30WG 060
8 61WG-30WG 070
9 61WG-30WG 080
10 61WG-30WG 090

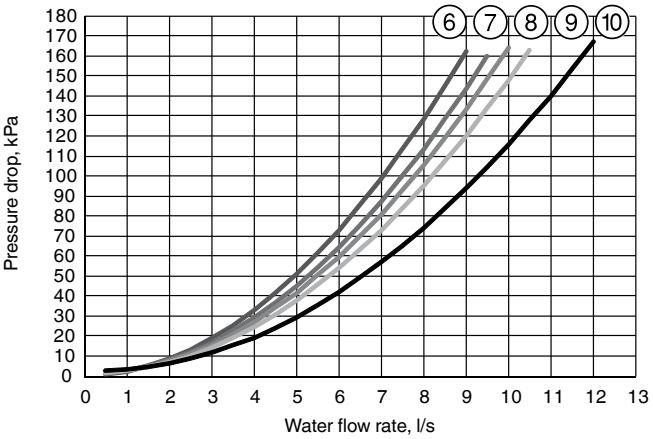
Condenser - standard unit without hydronic module

61WG/30WG 020-045



1 61WG-30WG 020
2 61WG-30WG 025 to 61WG-30WG 030
3 61WG-30WG 035
4 61WG-30WG 040
5 61WG-30WG 045

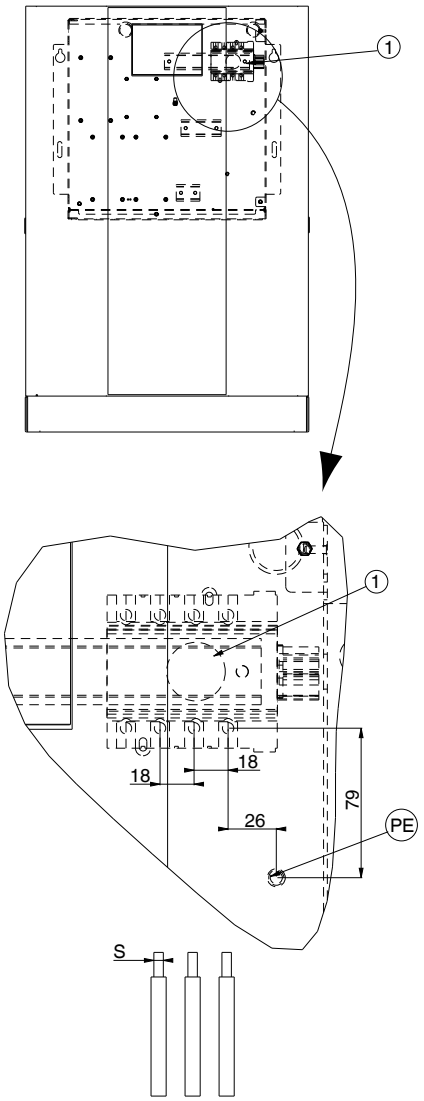
61WG/30WG 050-090



6 61WG-30WG 050
7 61WG-30WG 060
8 61WG-30WG 070
9 61WG-30WG 080
10 61WG-30WG 090

6 - ELECTRICAL CONNECTION

6.1 - Electrical connections, control box 61WG/30WG



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

NOTES:
The 61WG/30WG 020-090 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 dimensional drawings.

Before connecting the unit check that the phase order in the customer control box is the same as shown in the customer wiring diagrams.

6.2 - 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 connections refer to the wiring diagrams.

WARNING: Operation of the unit with an incorrect 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 unit is not switched on until corrective measures have been taken.

6.3 - Voltage phase imbalance (%)

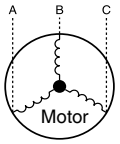
$$\frac{100 \times \text{max. deviation from average voltage}}{\text{Average voltage}}$$

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

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

Average voltage = (406 + 399 + 394)/3 = 1199/3
= 399.7 say 400 V

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 x 6/400 = 1.5 %

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

6.4 - 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 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 units installed inside the building:
  No.13: perforated horizontal cable conduit, and No. 41: closed conduit.

The calculation is based on PVC or XLPE insulated cables with copper or aluminium core. A maximum ambient temperature of 40°C has been taken into account. 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.

6.4.1 - Field control wiring

Refer to the 61WG/30WG Pro-Dialog+ Controls IOM and the certified wiring diagram supplied with the unit for the field control wiring of the following features:

- Remote on/off switch
- Remote heat/cool switch
- Demand limit external switch 1
- Remote dual set point
- Alarm report
- Pump control - unit without hydronic module.
- Relief boiler or electric heater
- Valve control (refer to the description of options 153 and 154 in the 61WG/30WG Pro-Dialog+ Controls manual)

6.4.2 - On-site control wiring

Selection of minimum and maximum wire sections for connection to 61WG units

61WG	Max. connectable section*	Calculation favourable case: Suspended aerial lines (standardised routing No. 17) PVC insulated cable			Calculation unfavourable case: Conductors in conduits or multi-conductor cables in closed conduit (standardised routing No. 41) PVC insulated cable, if possible		
	Section	Section**	Max. length for voltage drop <5%	Cable type	Section**	Max. length for voltage drop <5%	Cable type***
	mm² (per phase)	mm² (per phase)	m		mm² (per phase)	m	
20	1 x 35	1 x 2.5	60	PVC Cu	1 x 4	100	PVC Cu
25	1 x 35	1 x 2.5	60	PVC Cu	1 x 4	100	PVC Cu
30	1 x 35	1 x 4	80	PVC Cu	1 x 6	120	PVC Cu
35	1 x 35	1 x 4	80	PVC Cu	1 x 6	120	PVC Cu
40	1 x 35	1 x 6	100	PVC Cu	1 x 10	150	PVC Cu
45	1 x 35	1 x 6	100	PVC Cu	1 x 10	150	PVC Cu
50	1 x 35	1 x 10	120	PVC Cu	1 x 16	180	PVC Cu
60	1 x 35	1 x 10	120	PVC Cu	1 x 16	180	PVC Cu
70	1 x 35	1 x 16	140	PVC Cu	1 x 25	205	PVC Cu
80	1 x 35	1 x 16	140	PVC Cu	1 x 25	205	PVC Cu
90	1 x 35	1 x 25	170	PVC Cu	1 x 35	225	PVC Cu

Selection of minimum and maximum wire sections for connection to 30WG units

30WG	Max. connectable section*	Calculation favourable case: Suspended aerial lines (standardised routing No. 17) PVC insulated cable			Calculation unfavourable case: Conductors in conduits or multi-conductor cables in closed conduit (standardised routing No. 41) PVC insulated cable, if possible		
	Section	Section**	Max. length for voltage drop <5%	Cable type	Section**	Max. length for voltage drop <5%	Cable typee***
	mm² (per phase)	mm² (per phase)	m		mm² (par phase)	m	
20	1 x 35	1 x 2,5	60	PVC Cu	1 x 4	100	PVC Cu
25	1 x 35	1 x 2,5	60	PVC Cu	1 x 4	100	PVC Cu
30	1 x 35	1 x 4	80	PVC Cu	1 x 6	120	PVC Cu
35	1 x 35	1 x 4	80	PVC Cu	1 x 6	120	PVC Cu
40	1 x 35	1 x 4	80	PVC Cu	1 x 6	120	PVC Cu
45	1 x 35	1 x 6	100	PVC Cu	1 x 10	150	PVC Cu
50	1 x 35	1 x 10	120	PVC Cu	1 x 16	180	PVC Cu
60	1 x 35	1 x 10	120	PVC Cu	1 x 16	180	PVC Cu
70	1 x 35	1 x 16	140	PVC Cu	1 x 16	180	PVC Cu
80	1 x 35	1 x 16	140	PVC Cu	1 x 25	205	PVC Cu
90	1 x 35	1 x 16	140	PVC Cu	1 x 25	225	PVC Cu

* 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 simultation 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.

7 - WATER CONNECTIONS

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. Units with hydronic module include the safety valve and expansion tank.
- 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.
- If the insulation provided is not sufficient, insulate the cold-water piping, after testing for leaks, both to reduce heat loss and to prevent condensation.
- Cover the insulation with a vapour barrier. If the external water piping to the unit is in an area where the ambient temperature can fall below 0°C, it should be insulated and an electric heater should be installed on the piping.

NOTE: For units without hydronic module a screen filter must be installed as close as possible to the heat exchanger and in a position that is easily accessible for removal and cleaning. Units with a hydronic module are equipped with this filter.

The mesh size of the filter must be 1.2 mm. If this filter is not installed, the plate heat exchanger can quickly become contaminated at the first start-up, as it takes on the filter function, and correct unit operation is affected (reduced water flow due to increased pressure drop).

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 con-tent of several tenths of mg/l will badly corrode the copper over time (the plate heat exchangers used for these units have brazed copper joints).
- 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 dis-solved 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 < 1mg/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 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
  $7 < pH < 8$

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 diagrams on the following page illustrate a typical hydronic installation. When the hydronic circuit is filled, use the air vents to evacuate any residual air pockets.

7.3 - Frost protection

The units are designed to be installed under cover at outside temperatures between +5°C and +40°C. Therefore they do not include anti-freeze protection, as standard.

If the water piping is in an area where the ambient temperature can fall below 0°C it is recommended to install a trace heater on the piping and 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 heat exchanger water entering purge valve connection.***
- ***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).***
- ***To avoid corrosion by differential aeration, the complete heat exchange circuit must be charged with nitrogen, if it is drained for longer than one month. If the heat exchange fluid does not comply with Carrier recommendations, the circuit must immediately be filled with nitrogen.***

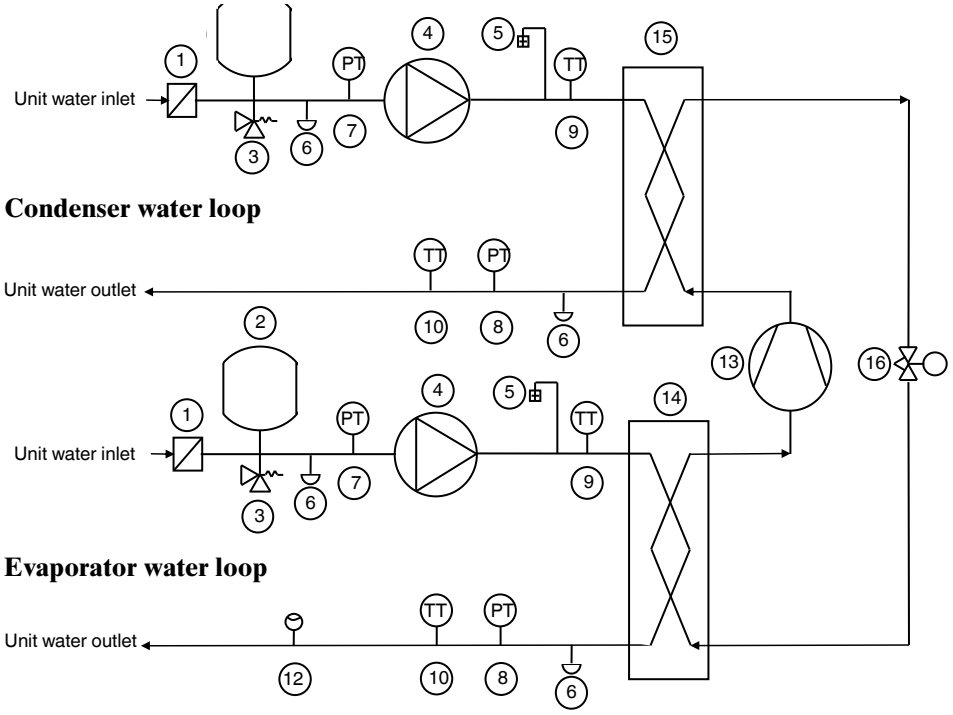
7.4 - Flow switch (units without hydronic module)

IMPORTANT: On 61WG and 30WG 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 leaving water pipe and preset at the factory to cut out when there is insufficient water flow.

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).

Typical water piping diagram, 61WG/30WG units with hydronic modules



Components of unit and hydronic module

1	Victaulic screen filter
2	Expansion tank
3	Safety valve
4	Water pump
5	Air vent
6	Water drain valve
7/8	Entering/leaving pressure sensor
9/10	Entering/leaving temperature probe
12	Flow switch 61WG option 272 (sizes 020-045 only)
13	Compressor
14	Evaporator
15	Condenser
16	Expansion device

NOTE: Units without hydronic module include a flow switch.

8 - NOMINAL WATER FLOW CONTROL WITH FIXED-SPEED PUMP

8.1 - General

The water circulation pumps of the 61WG/30WG units have been sized to allow the hydronic modules to cover all possible configurations based on the specific installation conditions, i.e. for various temperature differences between the entering and the leaving water (ΔT) at full load, which can vary between 2.5 and 7 K for evaporators and 3 and 18 K for condensers.

This required difference between the entering and leaving water temperature determines the nominal system flow rate. It is above all absolutely necessary to know the nominal system flow rate to allow its control via a manual valve.

Manual control valves for the unit are not supplied and must be installed upstream and downstream of the evaporator and condenser water loops to ensure correct flow control.

With the pressure loss generated by the control valve in the hydronic system, the valve is able to impose the system pressure/flow curve on the pump pressure/flow curve, to obtain the desired operating point (see example).

The pressure drop reading in the plate heat exchanger is used to control and adjust the nominal system flow rate. The pressure drop is measured with the pressure sensors connected to the heat exchanger water inlet and outlet.

Use this specification for the unit selection to know the system operating conditions and to deduce the nominal air flow as well as the plate heat exchanger pressure drop at the specified conditions. If this information is not available at the system start-up, contact the technical service department responsible for the installation to get it.

These characteristics can be obtained from the technical literature using the unit performance tables or the Electronic Catalogue selection program for all conditions.

8.2 - Water flow control procedure

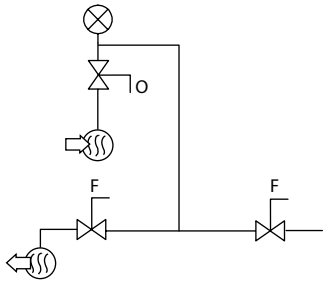
As the total system pressure drop is not known exactly at the start-up, the water flow rate must be adjusted with the control valve to obtain the specific flow rate for this application.

Proceed as follows:
Open the valve fully.

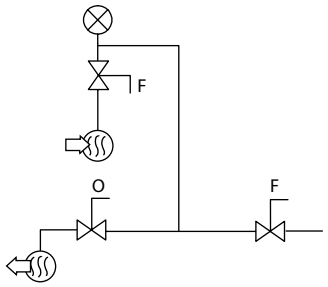
Start-up the pump using the forced start command (refer to the controls manual) and let the pump run for two consecutive hours to clean the hydronic circuit of the system (presence of solid contaminants).

Read the hydronic module pressure drop by taking the difference of the readings at the machine connected to the hydronic module inlet and outlet. Compare this value after two hours of operation.

Entering water pressure reading



Leaving water pressure reading



Legend

O	Open
F	Closed
	Water inlet
	Water outlet
	Pressure gauge

If the pressure drop has increased, this indicates that the screen filter must be removed and cleaned, as the hydronic circuit contains solid particles. In this case close the shutoff valves at the water inlet and outlet and remove the screen filter after emptying the hydronic section of the unit.

Renew, if necessary, to ensure that the filter is not contaminated.

When the circuit is cleaned, read the pressures at the unit (entering water pressure - leaving water pressure), expressed in kPa to find out the plate heat exchanger pressure drop.

Compare the value obtained with the theoretical selection value. If the pressure drop measured is higher than the value specified this means that the flow rate in the plate heat exchanger (and thus in the system) is too high. The pump supplies an excessive flow rate based on the global pressure drop of the application. In this case close the control valve one turn and read the new pressure difference.

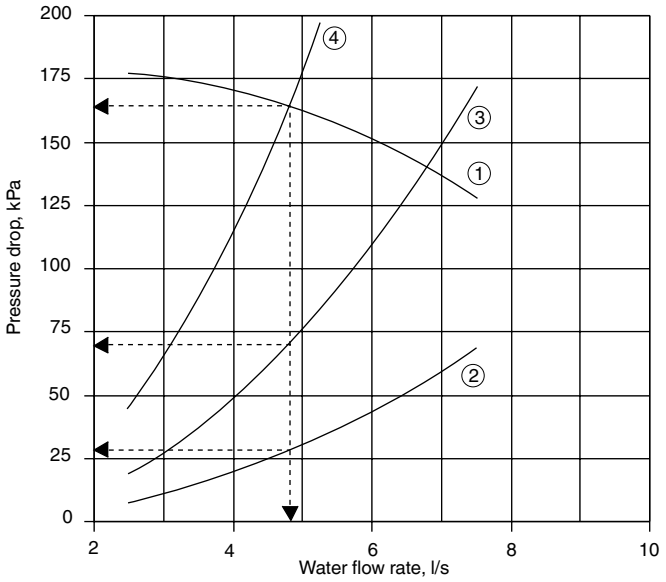
Proceed by successively closing the control valve until you obtain the specific pressure drop that corresponds to the nominal flow rate at the required unit operating point.

- If the system has an excessive pressure drop in relation to the available static pressure provided by the pump, the resulting water flow rate will de reduced and the difference between entering and leaving water temperature of the hydronic module will be increased.

To reduce the hydronic system pressure drops, it is necessary:

- to reduce the individual pressure drops as much as possible (bends, level changes, accessories, etc.)
- to use a correctly sized piping diameter.
- to avoid hydronic system extensions, wherever possible.

Example: Unit with a given nominal flow rate of 4.8 l/s



Legend

1 Unit pump curve
2 Plate heat exchanger pressure drop (to be measured with the pressure gauge installed at the water inlet and outlet)
3 Installation pressure drop with control valve wide open
4 Installation pressure drop after valve control to obtain the specified flow rate

9 - NOMINAL WATER FLOW CONTROL WITH VARIABLE-SPEED PUMP

9.1 - Pump flow/pressure curve

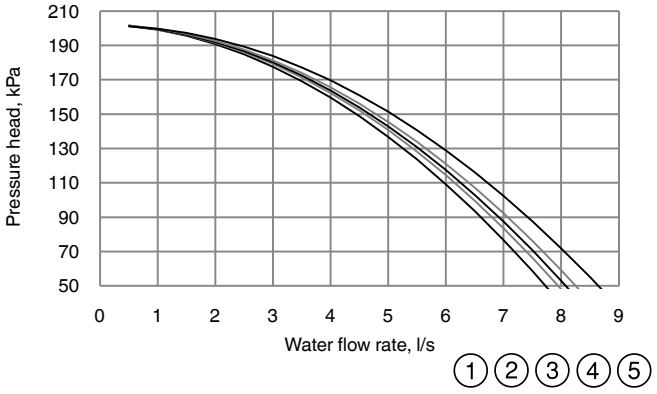
61WG/30WG units with variable-speed hydronic module include a water pump that automatically adjusts the flow to maintain a constant pressure or constant temperature difference.

No control is required at start-up, but the control mode must be selected at the unit interface (refer to the 61WG/30WG Pro-Dialog+ Control manual).

9.2 - Available static system pressure (fixed or variable-speed high-pressure pumps, units with hydronic module)

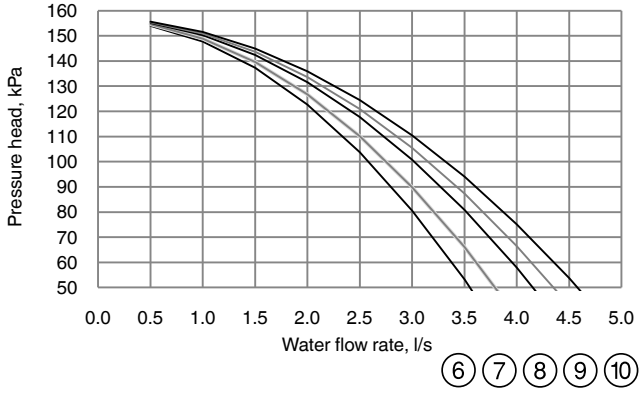
Evaporator

61WG/30WG 020-045



1 61WG-30WG 020
2 61WG-30WG 025 to 61WG-30WG 030
3 61WG-30WG 035
4 61WG-30WG 040
5 61WG-30WG 045

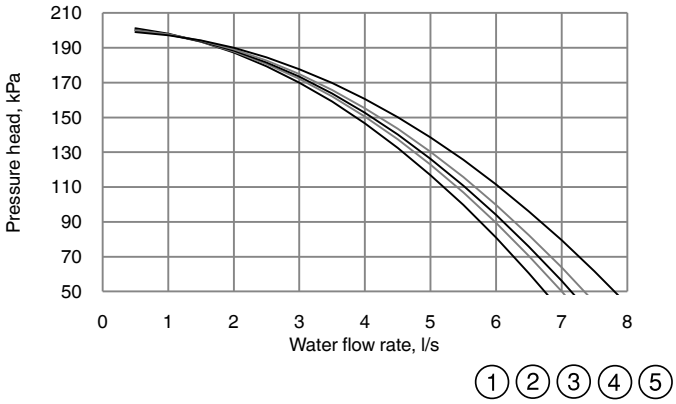
61WG/30WG 050-090



6 61WG-30WG 050
7 61WG-30WG 060
8 61WG-30WG 070
9 61WG-30WG 080
10 61WG-30WG 090

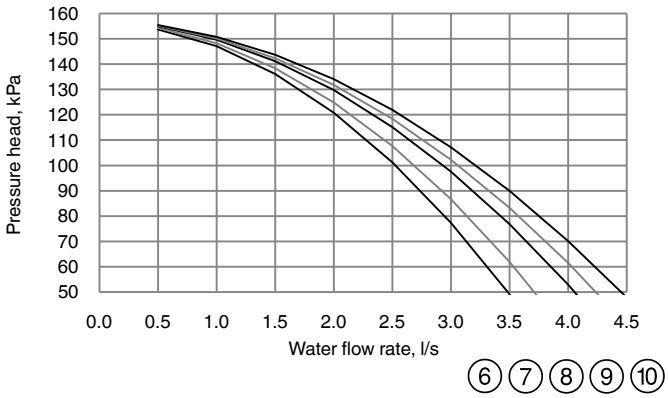
Condenser

61WG/30WG 020-045



1 61WG-30WG 020
2 61WG-30WG 025 to 61WG-30WG 030
3 61WG-30WG 035
4 61WG-30WG 040
5 61WG-30WG 045

61WG/30WG 050-090

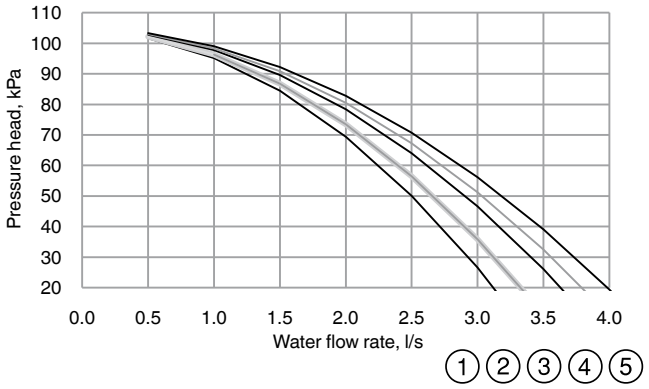


6 61WG-30WG 050
7 61WG-30WG 060
8 61WG-30WG 070
9 61WG-30WG 080
10 61WG-30WG 090

9.3 - Available static system pressure (fixed or variable-speed low-pressure pumps, units with hydronic module)

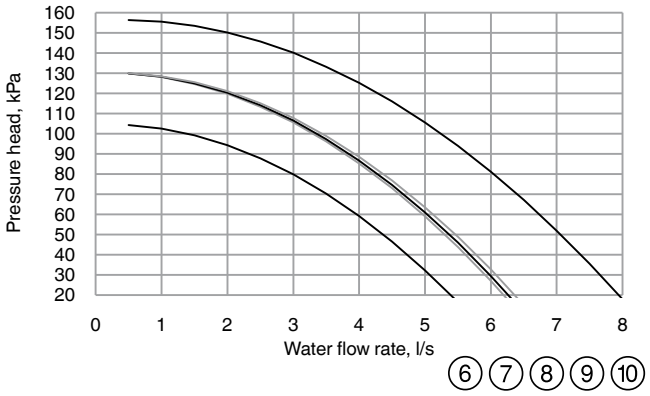
Evaporator

61WG/30WG 020-045



1 61WG-30WG 020
2 61WG-30WG 025 to 61WG-30WG 030
3 61WG-30WG 035
4 61WG-30WG 040
5 61WG-30WG 045

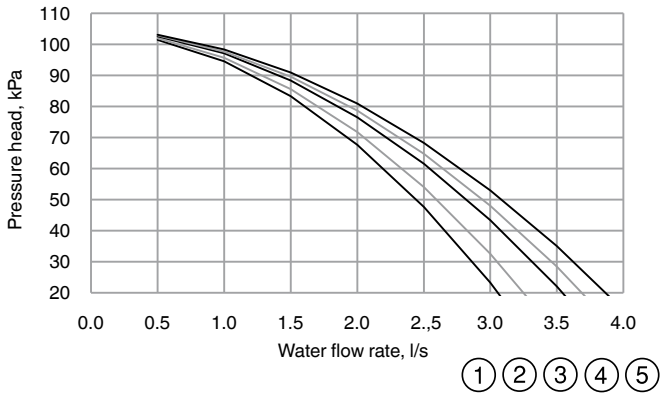
61WG/30WG 050-090



6 61WG-30WG 050
7 61WG-30WG 060
8 61WG-30WG 070
9 61WG-30WG 080
10 61WG-30WG 090

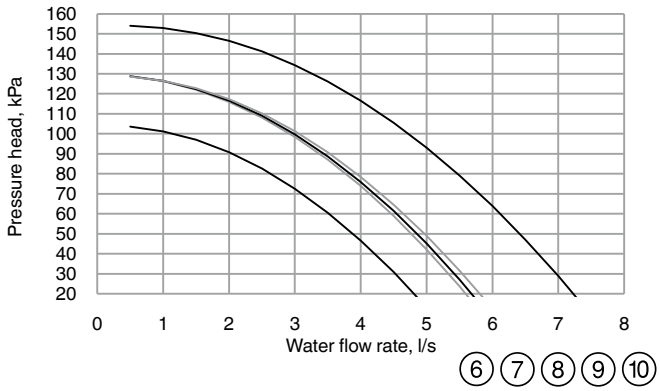
Condenser

61WG/30WG 020-045



1 61WG-30WG 020
2 61WG-30WG 025 to 61WG-30WG 030
3 61WG-30WG 035
4 61WG-30WG 040
5 61WG-30WG 045

61WG/30WG 050-090

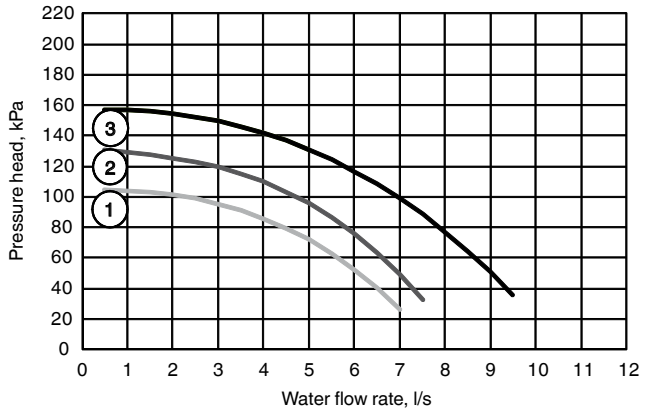


6 61WG-30WG 050
7 61WG-30WG 060
8 61WG-30WG 070
9 61WG-30WG 080
10 61WG-30WG 090

9.4 - Available static pressure for pumps only (units with hydronic modules)

9.4.1 - Fixed-speed pump

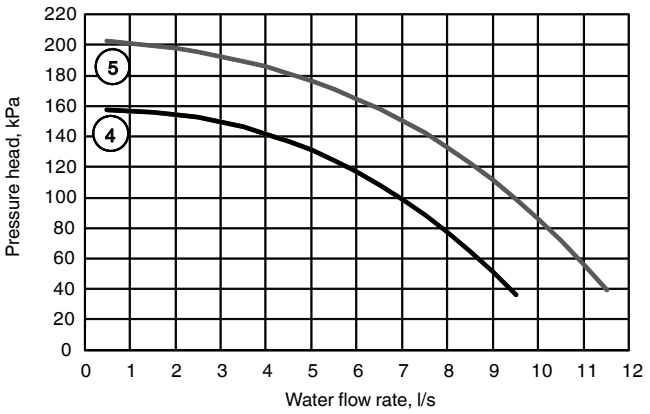
Low-pressure pumps 61WG - 30WG (options 116F - 270F)



1 61WG-30WG 020-050
2 61WG-30WG 060-080
3 61WG-30WG 090

9.4.2 - Variable-speed pump

High-pressure pumps 61WG - 30WG (options 116J - 270J)



4 61WG-30WG 020-045
5 61WG-30WG 050-090

10 - 30WG UNIT OPERATION WITH A DRYCOOLER

10.1 - Operating principle

30WG units have been specially designed to optimise the operation of systems, using drycoolers as heat rejection system.

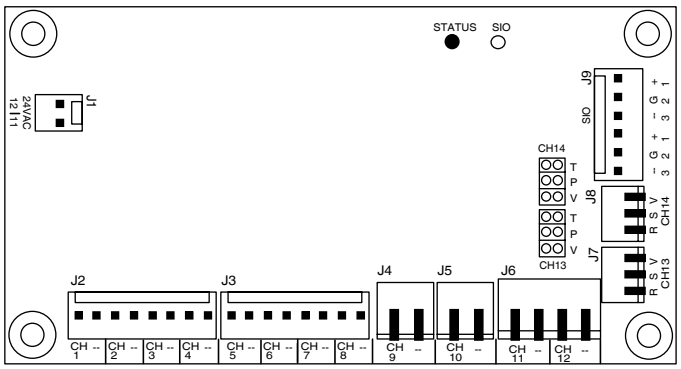
With a variable-speed condenser water pump integrated into the 30WG, the complexity of traditional systems, using a three-way valve has been reduced.

The installation of an operational system is limited on the condensing water loop side to connecting the drycooler entering and leaving water piping to the 30WG unit.

The Pro-Dialog+ control of the 30WG includes algorithms to permit constant automatic optimisation of:
- drycooler fan stage operation
- water flow rate variation in the loop between the condenser and the drycooler.

Parallel control of the fan stages (up to 8 stages maximum) and of the variable water flow rate of the loop permit year-round system operation down to -10°C outside temperature without any additional control.

10.2 - Auxiliary electronic board (AUX1) - analogue and digital inputs and outputs - to control the drycooler



- Connector J2: Discrete outputs CH 1 to 4 for fan stages 1 to 4.
- Connector J3: Discrete outputs CH 5 to 8 for fan stages 5 to 8.
- Connectors J4 and J5: Analogue outputs 0-10 V dc not used on the drycoolers (only used for fan speed variation of the air-cooled condensers).
- Connector J6: Analogue inputs CH 11 and 12 for ambient temperature and drycooler leaving water temperature.
- Connector J9: Communication bus with NRCP master board of the 30WG unit.

The electronic board specifically integrated in the control box of the drycooler and a communication bus connected to the microprocessor board of the 30WG are used for the overall system control.

The option supplied with the cooling unit must be installed in the drycooler control box. Connect the unit to board AUX1 in the drycooler, using a communication bus cable.

Pro-Dialog+ optimises system operation to obtain the best efficiency with variation of the water flow rate and the number of fans required for any thermal load and outside temperature conditions.

The electronic board (AUX1) integrated in the control box of the drycooler has analogue inputs for outside air temperature and drycooler leaving water temperature sensors, as well as eight discrete outputs permitting control of up to eight fan stages.

10.3 - Configuration of the number of fan stages and the automatic changeover of the fan stages

Please refer to the instructions in the 61WG/30WG Pro-Dialog+ IOM for the configuration of the number of fan stages to be controlled. It is enough to enter the number of fan stages of the drycooler in the Pro-Dialog+ service menu. The number of discrete outputs controlling the fans are activated by the control.

Pro-Dialog+ controls the automatic changeover of all fan stages, based on operating time and number of start-ups of the different stages. This function prevents fan motors from only running slightly or not at all and the shafts seizing up, especially during periods with a low cooling demand, when the outside temperature is low. This changeover is often specified by the drycooler manufacturers to ensure a long operating life of the fan motors that are only slightly or not at all used in these particular operating conditions.

10.4 - Fan stage assignment

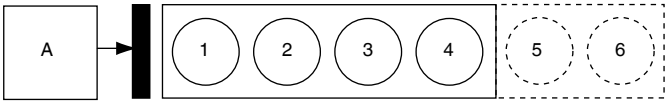
The minimum configuration of the number of fan stages is 2 for correct operation.

Depending on the drycooler capacity the number of fans can be between 2 and 8. They can be controlled by one fan or by linked pairs, if necessary.

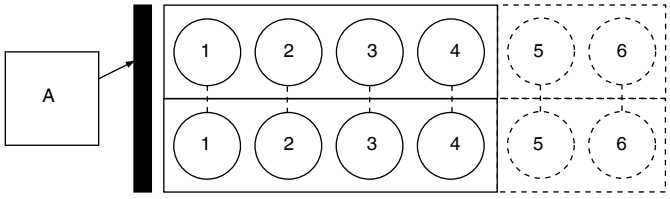
A drycooler with 4 or 6 fans installed in series for example along the length of the unit will result in a configuration of 4 or 6 fan stages.

Reciprocally a drycooler with 8 or 12 fans arranged in pairs along the length of the unit will also result in a configuration of 4 or 6 fan stages.

Configuration with 4 and 6 stages (min. 2 - max. 8)



Fans linked in pairs -
4 and 6-stage configuration (min. 2 - max. 8)



Legend
A Entering and leaving water manifold side
1 to 6 fans

10.5 - 30WG units without evaporator and condenser pump, three-way valve configuration for low outside temperature application

30WG units can be supplied from the factory without evaporator and condenser pump. If year-round low-temperature operation is planned, the unit will be installed with a three-way valve that is not supplied with the unit.

In this case Pro-Dialog+ should be configured for three-way valve system control from an analogue 0-10 volt output on the Carrier NRCP type master board. An adequate condensing temperature will be maintained with constant condenser flow rate. This configuration permits year-round system operation down to -20°C outside temperature.

Control and changeover of the fan stages are described in the paragraph “Configuration of the number of fan stages and automatic changeover of the fan stages” is identical in this case.

10.6 - Drycooler installation

For the drycooler installation follow professional guidelines.

- Water pipe sizing
- Maximum piping and shut-off valve pressure drops based on the available pressure of the 30WG pumps
- Maximum drycooler elevation in relation to the unit (safety valve at 3 bar on the 30WG water circuit).
- Fan stage control (see “Fan stage control”).
- Good positioning of the outside air temperature and drycooler leaving water temperature sensors.

11 - 61WG UNIT OPERATION WITH SPECIFIC HEATING CONTROL (OPTION 153)

11.1 - Operating principle

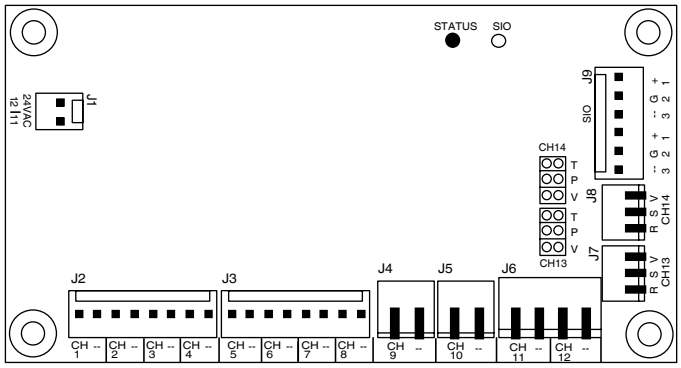
61WG units are specially designed to optimise the operation of heating installations that require hot-water production for a traditional heating system and domestic hot-water production.

The Pro-Dialog+ control system of the 61WG units includes algorithms that permit constant automatic optimisation of:

- control of a directional on/off three-way valve based on the heating or domestic hot water requirements,
- control of the electric heating stages allowing relief of the heating loop,
- hot-water setpoint reset (heating application) based on the air temperature,
- priority control between heating application and domestic hot-water application.

NOTE: The installer is responsible for ensuring that the installation complies with the applicable legislation in terms of electrical and thermal safety.

11.2 - Auxiliary electronic board (AUX1) - analogue and digital inputs and outputs



- Connector J2: Discrete outputs CH 1 to 4 for electric heating stages 1 to 4.
- Connector J3: Discrete output CH 6 for the control of a directional on/off three-way valve.
- Connector J6: Analogue inputs CH 11 for outside temperature sensors.
- Connector J6: Analogue inputs CH 12 for information on domestic hot-water requirements.
- Connector J7: Analogue inputs CH 13 for information on domestic hot-water requirements.
- Connector J8: Analogue inputs CH 14 for information on summer operation only (domestic hot-water only).

To apply the different configurations required, refer to the instructions in the Pro-Dialog+ Control IOM.

12 - START-UP

12.1 - Preliminary checks

- Never be tempted to start the unit without reading fully, and understanding, the operating instructions and without having carried out the following pre-start checks:
- Check the chilled water circulation pump operation with the Quick Test function.
- Check the air handling units and all other equipment connected to the evaporator. Refer to the manufacturer's instructions.
- Check the condensing loop water circulation pump operation with the Quick Test function.
- For units without hydronic module, the water pump overheat protection devices must be connected in series with the pump contactor power supply.
- Ensure that there are no refrigerant leaks.
- Confirm that all pipe securing bands are tight.
- Confirm the the electrical connections are secure.
- Avoid a long common power wiring connection run inside the unit close to the control or signal wiring.
- Observe the clearances on each unit side to facilitate maintenance.
- The unit wiring for all options offered is not insulated. The insulation only protects against running condensation.
- To ensure that no condensate can run under the unit, a condensate pan must be added under the unit that collects 100% of the condensate.
- If work is required in a control box or on the compressor wiring, the phase order must be verified with a quick test (refer to the 61WG/30WG Pro-Dialog+ Control manual. The compressors cannot support prolonged operation (>30 seconds) with reversed phases.
- Ensure that the last refrigerant charge made by the service team corresponds with the charge given on the name plate - otherwise the operating ranges and the unit efficiency will be impaired. The required tolerance for the charge is ±2%.
- Do not interchange material with another Carrier unit. The elements used for this unit are specific to this unit. Use the specific Carrier component list when ordering any parts.
- Before start-up ensure that the unit is level (1.5 mm/m).

ATTENTION: Use of units in an open loop is forbidden.

12.2 - Actual start-up

IMPORTANT

- ***Commissioning and start-up of the unit must be supervised by a qualified refrigeration engineer.***
- ***Start-up and operating tests must be carried out with a thermal load applied and water circulating in the evaporator and condenser.***
- ***All set-point adjustments and control tests must be carried out before the unit is started up.***

Ensure that all safety devices are operational, especially that the high pressure switches are switched on and that the alarms are acknowledged.

12.3 - Operation of two units in master/slave mode (option 58)

The control of a master/slave assembly is in the entering water piping (system return). All parameters, required for the master/slave function must be configured using the Service Configuration menu.

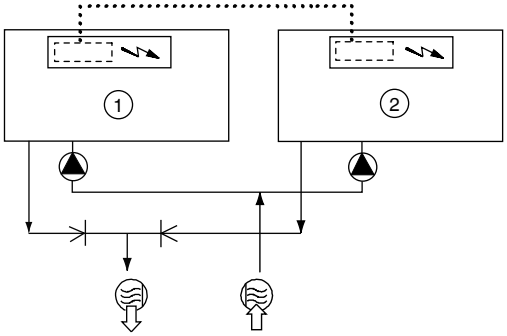
All remote controls of the master/slave assembly (start/stop, set point, load shedding etc.) are controlled by the unit configured as master and must only be applied to the master unit.

IMPORTANT: To permit master/slave operation both units must be equipped with option 58.

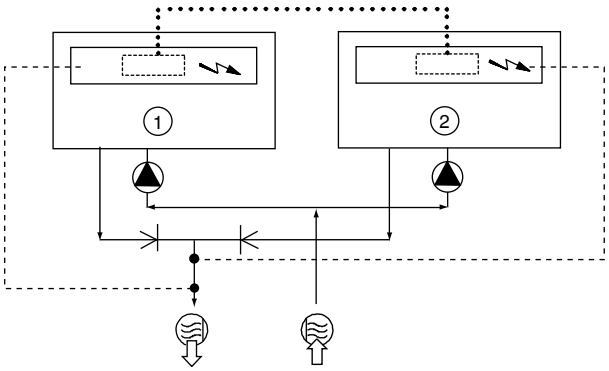
Depending on the installation and control type, each unit can control its own water pump.

12.4 - Parallel or serial connection of two 61WG/30WG units

Entering water control for a hydronic kit



Leaving water control



Legend

1 Master unit

2 Slave unit

Additional CCN board (one per unit, with connection via communication bus)

Control boxes of the master and slave units

Water inlet (for customers with both units)

Water outlet (for customers with both units)

Water pumps for each unit (included as standard for units with hydronic module)

Additional sensors for leaving water control, to be connected to channel 1 of the slave boards of each master and slave unit

•••• CCN communication bus

····· Connection of two additional sensors

13 - MAJOR SYSTEM COMPONENTS AND OPERATION DATA

13.1 - Compressors

61WG/30WG units use hermetic scroll compressors. The only refrigerant permitted for these compressors is R-410A.

The compressors are not certified for mobile applications or use in explosive environments.

For more information contact the Carrier service team for maintenance instructions.

IMPORTANT: All compressor and system pressure tests must be carried out by qualified personnel, taking the greatest care with potential dangers resulting from the pressures used, and respecting the maximum operating pressure limit on the high and low-pressure side, shown on the unit and compressor name plates.

- ***Maximum operating pressure, low-pressure side: 2820 kPa (28.2 bar)***
- ***Maximum operating pressure, high-pressure side: 4870 kPa (48.7 bar).***

Any modification or alteration such as soldering on the compressor shell may invalidate the right to use the equipment.

Units using these compressors are installed in areas where the temperature must be between 5°C minimum and 40°C maximum. The temperature around the compressors must not exceed 50°C during unit shutdown cycles.

Shock absorbers are installed under the compressor feet.

13.2 - Lubricant

The compressors have the following factory lubricant charge: polyolester oil (reference: POE 160SZ). Contact Carrier to order the oil. This lubricant must not be mixed with other lubricant types.

Before start-up and after normal unit operation check that the oil level is visible.

If an additional oil quantity is required to compensate the initial low level in the compressors, top up the charge, using only the permitted lubricant shown on the compressor name plate: polyolester oil (ref: POE 160SZ).

13.3 - Evaporators and condensers

The evaporators and condensers are single-circuit plate heat exchangers. They are tested and stamped for a maximum operating pressure of 4870 kPa, 2820 kPa on the refrigerant side and 1000 kPa on the water side.

The heat exchanger sizing for the whole range ensures a saturated evaporating temperature of 4.5°C and a condensing temperature of around 38°C with actual subcooling of around 4 K at the condenser leaving side, based on nominal Eurovent conditions.

The evaporators and condensers are single-circuit for all units.

The water connections between the heat exchangers and the piping of the hydronic modules have quick-connect Victaulic couplings to facilitate pump disassembly, if required.

A drain with a 1/4 turn valve is included in the leaving water of all heat exchangers.

The evaporators have 19 mm thick polyurethane foam thermal insulation. For option 86 (condenser insulation), the condensers also have 19 mm thick polyurethane foam thermal insulation.

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.

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.***
- ***If there are no regulations or to complement them 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 impurities 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, annex C.***
- ***In case of re-testing take the possible maximum pressure difference of 25 bar into consideration.***
- ***The reports of periodical checks by the user or operator must be included in the supervision and maintenance file.***

Repair
Any repair or modification of the plate heat exchangers is forbidden.

Only the replacement of the complete heat exchanger by an original heat exchanger supplied by the manufacturer is permitted. The replacement must be carried out by a qualified technician.

- The heat exchanger replacement must be shown on the monitoring and maintenance file.

Recycling
The plate heat exchanger is 100% recyclable. After use it contains refrigerant vapours and oil residue.

Operating life
This unit is designed for:

- prolonged storage of 15 years under nitrogen charge with a temperature difference of 20 K per day.
- 900000 cycles (start-ups) with a maximum difference of 6 K between two neighbouring points in the container, based on 12 start-ups per hour over 15 years at a usage rate of 57%.

13.4 - Electronic expansion valve (EXV)

The EXV is equipped with a stepper motor (2625 + 160 /- 0 steps) that is controlled via the EXV board.

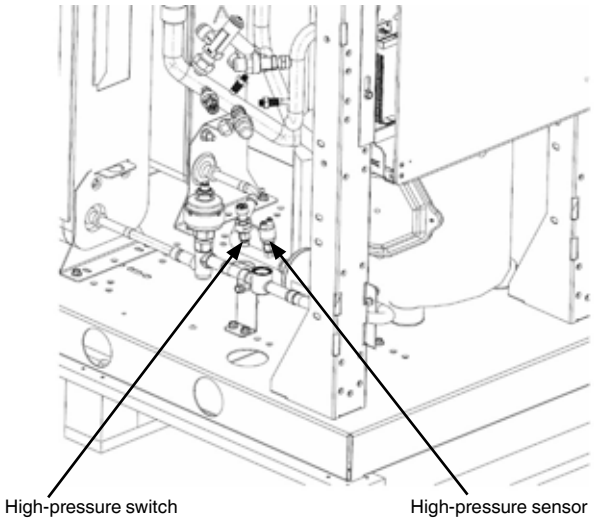
13.5 - Refrigerant

61WG/30WG units operate exclusively with R-410A.

13.6 - High-pressure switch and high-pressure sensor

61WG/30WG units are equipped with an automatically reset safety pressure switch on the liquid line. Refer to the controls manual for the alarm acknowledgements.

It is strictly forbidden to modify the unit refrigerant circuit. The pressure switch is specific to the 61WG/30WG units - do not interchange it with other units. The pressure switch tap does not include a Schrader valve.



The high-pressure sensor is however equipped with a Schrader valve. It is specific to these units and must not be replaced with one from other Carrier units.

13.7 - High and low-pressure side safety valves

The units are equipped with safety valves in accordance with the European directive 97/23/CE. These safety valves are calibrated and sized in accordance with the original high and low-pressure side equipment.

13.8 - Moisture indicator

Located in the liquid line, permits control of the unit charge, as well as the presence of moisture in the circuit. Bubbles in the sight glass indicate an insufficiant charge or the presence of non-condensibles. If moisture is present, the colour of the indicator paper in the sight glass changes.

13.9 - Filter drier in the refrigerant circuit

The filter keeps the circuit clean and moisture-free. The moisture indicator shows when it is necessary to change the filter cartridges. A temperature difference between the filter drier inlet and outlet indicates a contamination of the cartridges.

13.10 - Fixed-speed pump

This pump is factory-installed as standard to guarantee the nominal flow in the water loop.

This is a fixed-speed pump with available system pressure. See the pump flow/pressure curve.

The nominal system flow rate must be adjusted with a manual control valve supplied by the customer (see chapter on the control of the nominal system pressure).

The maximum permitted concentration of the glycol additives (ethylene glycol or propylene glycol) is 35%.

The maximum pump suction pressure is limited to 300 kPa (3 bar) due to the valve installed on the entering water piping.

The use of any other glycol type additives must be approved by Carrier.

13.11 - Variable-speed pump

This pump is factory-installed. It is a variable-speed pump with available system pressure. See the pump flow/pressure curve.

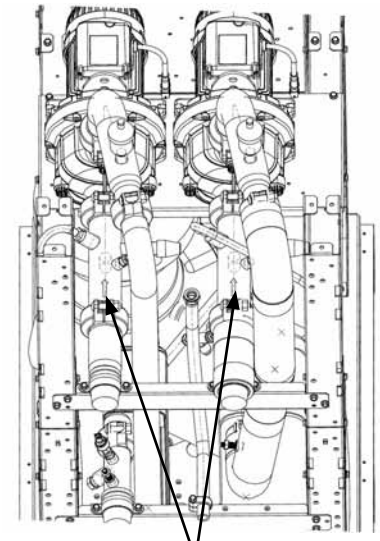
The system flow rate is automatically adjusted via the frequency converter built into the pump, based on the heat rejection load on the drycooler.

The maximum permitted concentration of the glycol additives is 35%.

The maximum pump suction pressure is limited to 300 kPa (3 bar) due to the valve installed on the entering water piping.

The use of any other glycol type additives must be approved by Carrier.

13.12 - Evaporator and condenser pump suction filter

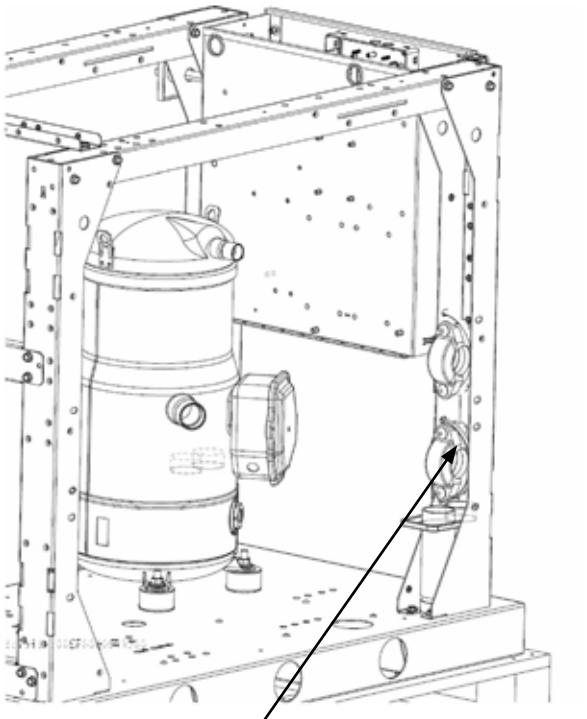


Filter positions in the unit

All pumps are protected by a suction filter. This is easily removable to recover solid particles. It protects the pump and the plate heat exchanger against solid particles with a size exceeding 1,2 mm. Before the unit start-up it is important to turn the evaporator and condenser pump to decontaminate the water loops of any solid pollution.

A specific pump start-up function in the Quick Test menu is available for this task.

13.13 - Connection sleeves



Position of the water connection sleeves in the unit

13.14 - Option 272: High-temperature water production with glycol solution

ATTENTION: The temperature sensor positioned in the discharge for option 272 is specific to this unit and must not be interchanged with another temperature sensor. For replacement please contact the Carrier service team.

14 - OPTIONS

Options	No.	Description	Advantages	Use
Very low temperature glycol solution	6	Low temperature glycol solution production down to -12°C with ethylene glycol	Covers specific applications such as ice storage and industrial processe	30WG 020-090
Soft starter	25	Electronic compressor starter	Reduced compressor start-up current	30WG 020-090 61WG 020-090
Twinning	58	Unit equipped with an additional field-installed leaving water temperature sensor, allowing master/slave operation of two units connected in parallel.	Optimised operation of two units connected in parallel with operating time equalisation	30WG 020-090 61WG 020-090
External disconnect handle	70F	The handle of the electrical disconnect switch is on the outside of the unit	Quick access to the unit disconnect switch	30WG 020-090 61WG 020-090
Condenser insulation	86	Thermal condenser insulation	Optimisation for heating applications	61WG 020-090
Low-pressure single-pump hydronic module, evaporator side	116F	See hydronic module chapter	Easy and fast installation	30WG 020-090 61WG 020-090
High-pressure single-pump hydronic module, evaporator side	116J	See hydronic module chapter	Easy and fast installation, reduced power consumption of the water circulation pump.	30WG 020-090 61WG 020-090
JBus gateway	148B	Two-directional communications board, complies with JBus protocol	Easy connection by communication bus to a building management system	30WG 020-090 61WG 020-090
BacNet gateway	148C	Two-directional communications board, complies with BacNet protocol	Easy connection by communication bus to a building management system	30WG 020-090 61WG 020-090
LON gateway	148D	Two-directional communications board, complies with LON protocol	Easy connection by communication bus to a building management system	30WG 020-090 61WG 020-090
Specific single-source heating control	153	Control board factory-installed on the unit, control using weather compensation, control of supplementary electric heater (4 stages) or boiler, needle valve for domestic hot-water production with programmable time schedule.	Permits easy control of a basic heating system	61WG 020-090
Specific cooling control	154	Control box to be installed on the Carrier drycooler for communication with the unit via a bus.	Permits the use of an energy-efficient plug-and-play system	30WG 020-090
Control of multi-source heating system	157	Additional control box for remote installation to control the various heating system components	Allows control of pre-configured heating systems	61WG 020-090
Low sound level (-3 dB(A) compared to standard unit)	257	Compressor sound insulation		30WG 020-090 61WG 020-090
Evaporator screw connection sleeves	264	Evaporator inlet/outlet screw connection sleeves	Allows unit connection to a screw connector	30WG 020-090 61WG 020-090
Screw water connection between the customer condenser and the unit	265	Condenser inlet/outlet screw connection sleeves	Allows unit connection to a screw connector	30WG 020-090 61WG 020-090
Welded evaporator connection sleeves	266	Welded evaporator inlet/outlet connection sleeves	Allows welding of customer connections to the unit	30WG 020-090 61WG 020-090
Welded water connection between the customer condenser and the unit	267	Welded condenser inlet/outlet connection sleeves	Allows welding of customer connections to the unit	30WG 020-090 61WG 020-090
Low-pressure single-pump hydronic module, condenser side	270F	See hydronic module chapter	Easy and fast installation	30WG 020-090 61WG 020-090
High-pressure hydronic module with single variable-speed pump, condenser side	270J	See hydronic module chapter	Easy and fast installation, reduced power consumption of the water circulation pump.	30WG 020-090 61WG 020-090
High-temperature water production, condenser side, with glycol solution on the evaporator side	272	Condenser side water production up to 65°C, with glycol solution on the evaporator side to -5°C	Geothermal application and domestic hot-water production	61WG 020-090
Unit stackable for operation	273	Unit stackable for operation	Reduced footprint size	30WG 020-090 61WG 020-090
Customer water connection at the top of the unit	274	Customer water connection at the top of the unit	Reduced footprint size	30WG 020-090 61WG 020-090
Remote user interface	275	User interface for remote installation	Remote control of the unit and its operating parameters	30WG 020-090 61WG 020-090

15 - MAINTENANCE

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 A and B of standard EN378-2.

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

- After an intervention that is likely to affect the resis-tance 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.

15.1 - 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.

Any technician attending the machine for any purpose must be fully qualified to work on refrigerant and electrical circuits.

WARNING: Before doing any work on the machine ensure that the power is switched off. If a refrigerant circuit is opened, it must be evacuated, recharged and tested for leaks. Before any operation on a refrigerant circuit, it is necessary to remove the complete refrigerant charge from the unit with a refrigerant charge recovery unit.

All removal and refrigerant 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.

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

15.2 - General unit maintenance

- Keep the unit itself and the space around it clean and free of obstructions. Remove all rubbish such as packing materials, as soon as the installation is completed.
- Regularly clean the exposed pipework to remove all dust and dirt. This makes detection of water leaks easier, and they can be repaired before more serious faults develop.
- Confirm that all screwed and bolted connections and joints are secure.
- Secure connections prevent leaks and vibration from developing.
- Check that all foam insulation joints on the heat exchanger piping are in good condition.

15.3 - Refrigerant undercharge

If there is not enough refrigerant in the system, this is indicated by gas bubbles in the moisture sight glass.

If the undercharge is significant, large bubbles appear in the moisture sight glass, and the suction pressure drops. The compressor suction superheat is also high. The machine must be recharged after the leak has been repaired.

Find the leak and completely drain the system with a refrigerant recovery unit. Carry out the repair, leak test and then recharge the system.

IMPORTANT: After the leak has been repaired, the circuit must be tested, without exceeding the maximum low-side operating pressure shown on the unit name plate.

The refrigerant must always be recharged in the liquid phase into the liquid line. The refrigerant cylinder must always contain at least 10% of its initial charge. For the refrigerant quantity per circuit, refer to the data on the unit name plate.

During applications with option 272 (brine to water) and with positive evaporation, bubbles will appear in the sight-glass. This is normal, when the charge is optimised for improved efficiency in brine applications.

15.4 - Refrigerant guidelines

Refrigeration installations must be inspected and maintained regularly and rigorously by specialists. Their activities must be overseen and checked by properly trained people. To minimise discharge to the atmosphere, refrigerants and lubricating oil must be transferred using methods which reduce leaks and losses to a minimum.

- Leaks must be repaired immediately.
- If the residual pressure is too low to make the transfer alone, a purpose-built refrigerant recovery unit must be used.
- Compressor lubricating oil contains refrigerant. Any oil drained from a system during maintenance must therefore be handled and stored accordingly.
- Refrigerant under pressure must never be discharged to the atmosphere.

15.5 - Leak detection

Never use oxygen or dry air, as this would cause a risk of fire or explosion.

- Carry out a leak detection test on the whole system using the following methods: pressure test using dehydrated nitrogen or a mixture of nitrogen and refrigerant used for the system, helium leak test.
- Connect the compressor to the system by opening the valves.
- The duration of the test must be sufficient to guarantee the absence of very small leaks in the circuit.
- Use specific tools, designed for leak detection.
- The low-pressure side test pressure must not exceed pressure Ps indicated on the compressor and unit name plates.
- If there is a leak, repair it and carry out the leak detec-tion test again.

15.6 - Evacuation

To evacuate the system, observe the following recommendations:

Connect the vacuum pump to the high (HP) and low-pressure (LP) side for evacuation of the complete circuit.

All units are equipped with valves with 3/8" SAE connections on the suction, discharge and liquid lines, permitting the connection of large-diameter flexible pipes limiting the pressure drops for the evacuation.

1. The vacuum level achieved must be 0.67 mbar (500 µm Hg).
2. Wait 30 minutes.
3. If the pressure increases rapidly, the system ist not leak-tight. Localise and repair the leaks.
   Restart the evacuation procedure and repeat steps 1, 2 etc.
4. If the pressure increeases slowly, this indicates that moisture is present inside the system. Break the vacuum with nitrogen and restart the evacuation procedure (steps 1, 2 etc.).
5. Repeat the evacuation procedure (steps 1, 2); a vacuum level of 0.67 mbar (500 µm Hg) must be achieved and maintained for four hours.

   This vacuum level must be measured at one of the system connections and not at the vacuum pump pressure gauge.

ATTENTION: Do not use a megohmmeter and do not place any stress on the compressor motor when the system has been evacuated. There is a risk of internal short circuits between the motor windings.

Do not use additives for leak detection. Do not use CFCs/ HCFCs as tracer fluids for leak detection.

15.7 - Recharging liquid refrigerant

CAUTION: The units are charged with liquid R-410A refrigerant.

With high-pressure R-410A refrigerant the unit operating pressure is above 4000 kPa (40 bar), the pressure at 35°C air temperature is 50% higher than for R-22. Special equipment must be used when working on the refrigerant circuit (pressure gauge, charge transfer, etc.).

All checks must be pressure tests, and the appropriate pressure/temperature ratio table must be used to determine the corresponding saturated temperatures (saturated bubble point curve or saturated dew point curve).

Leak detection is especially important for units charged with refrigerant R-410A. Depending on whether the leak occurs in the liquid or in the vapour phase, the proportion of the different components in the remaining liquid is not the same.

NOTE: Regularly carry out leak checks and immediately repair any leak found.

15.8 - Characteristics of R-410A

Saturated temperatures (°C) based on the relative pressure (in kPa)			
Saturated temperature, °C	**Relative pressure, kPa**	**Saturated temperature, °C**	**Relative pressure, kPa**
-20	297	25	1552
-19	312	26	1596
-18	328	27	1641
-17	345	28	1687
-16	361	29	1734
-15	379	30	1781
-14	397	31	1830
-13	415	32	1880
-12	434	33	1930
-11	453	34	1981
-10	473	35	2034
-9	493	36	2087
-8	514	37	2142
-7	535	38	2197
-6	557	39	2253
-5	579	40	2311
-4	602	41	2369
-3	626	42	2429
-2	650	43	2490
-1	674	44	2551
0	700	45	2614
1	726	46	2678
2	752	47	2744
3	779	48	2810
4	807	49	2878
5	835	50	2947
6	864	51	3017
7	894	52	3088
8	924	53	3161
9	956	54	3234
10	987	55	3310
11	1020	56	3386
12	1053	57	3464
13	1087	58	3543
14	1121	59	3624
15	1156	60	3706
16	1192	61	3789
17	1229	62	3874
18	1267	63	3961
19	1305	64	4049
20	1344	65	4138
21	1384	66	4229
22	1425	67	4322
23	1467	68	4416
24	1509	69	4512
		70	4610

15.9 - Electrical maintenance

When working on the unit comply with all safety precautions described in section 1.3.

It is strongly recommended to change the unit fuses every 15000 operating hours or every three 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.

15.10 - Tightening torques for the main electrical connections

Component	Designation in the unit	Value (N·m)
Screw (PE) customer connection M8	PE	14.5
Screw on switch inlet zones		
Switch - MG 28904	QS_	8
Tunnel terminal screw, compressor contactor		
Contactor LC1D12B7	KM*	1.7
Contactor LC1D18B7	KM*	1.7
Contactor LC1D25B7	KM*	2.5
Tunnel terminal screw, compressor circuit breaker		
Circuit breaker 25507	QM*	3.6
Circuit breaker 25508	QM*	3.6
Circuit breaker 25509	QM*	3.6
Tunnel terminal screw, control power transformer		
Transformer - ABL6TS16B	TC	0.6
Compressor earth terminal in the power wiring control box		
M6	Gnd	5.5
Compressor earth connection		
M8	Gnd	2.83
Tunnel terminal screw, pump disconnect switch		
Disconnect switch GV2ME08	QM_	1.7
Disconnect switch GV2ME10	QM_	1.7
Tunnel terminal screw, pump contactor		
Contactor LC1K0610B7	KM	0.8 to 1.3
Contactor LC1K09004B7	KM	0.8 to 1.3
Contactor LC1K0910B7	KM	0.8 to 1.3
Contactor LC1K0901B7	KM	0.8 to 1.3
Variable-frequency switch ATV21	GS	1.3

15.11 - Tightening torques for the main bolts and screws

Screw type	Used for	Torque (N·m)
M8 nut	BPHE* fixing	15
M10 nut	Compressor mounting	30
Oil nut	Oil equalisation line	90
Taptite screw M6	Panel fixing	7
H M6 screw	Stauff clamps	10

* BPHE = Brazed plate heat exchanger

15.12 - Compressors

The compressors do not require any specific maintenance. Nevertheless the preventive system maintenance operations prevent specific compressor problems. The following periodic preventive maintenance checks are strongly recommended:
- Check the operating conditions (evaporating temperature, condensing temperature, discharge temperature, heat exchanger temperature difference, superheat, subcooling). These operating parameters must always be within the compressor operating range.
- Check that the safety devices are all operational and correctly controlled.
- Check oil level and quality. If there is a colour change in the sight glass, check the oil quality. This may include an acidity test, moisture control, a spectrometric analysis etc.
- Check the leak tightness of the refrigerant circuit.
- Check the compressor motor power input, as well as the voltage imbalance between phases.
- Check the tightening of all electrical connections.
- Ensure that the compressor is clean and runs correctly; verify that there is no rust on the compressor shell and no corrosion or oxydation at the electrical connections and the piping.

ATTENTION: The compressor and piping surface temperatures can in certain cases exceed 100°C and cause burns. Particular caution is required during maintenance opera-tions. At the same time, when the compressor is in operation, the surface temperatures can also be very cold (down to -15°C for units with a low leaving water temperature), and can cause frost burns.

15.13 - Evaporator and condenser maintenance

There is no particular maintenance necessary on the plate heat exchanger. Check:
- that the insulating foam has not become detached or damaged during work on the units,
- that the entering and leaving water temperature sensors are well connected
- the cleanliness on the water heat exchanger side (no signs of leaks).
- that the periodic inspections required by local regulations have been carried out.

15.14 - Corrosion check

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.

16 - AQUASNAP MAINTENANCE PROGRAM

All maintenance operations must be carried out by technicians who have been trained on Carrier products, observing all Carrier quality and safety standards.

16.1 - Maintenance schedule

Regular maintenance is indispensable to optimise equipment operating life and reliability. Maintenance operations must be carried out in accordance with the schedules below:

Service	Frequency
A	Weekly
B	Monthly
C	Annually
D	Special cases

If the equipment does not operate normally during maintenance operations, refer to the chapter on diagnostics and breakdowns of the 61WG/30WG Pro-Dialog+ Controls manual).

IMPORTANT: Before each equipment maintenance operation please ensure that:
- ***the unit is in the OFF position***
- ***it is impossible for the unit to restart automatically during maintenance.***

16.2 - Description of the maintenance operations

The equipment is supplied with polyolester oil (POE). Use only Carrier-approved oil. On request Carrier can carry out an oil analysis of your installation.

Service A
Full-load operating test
Verify the following values:
- compressor high-pressure side discharge pressure
- compressor low-pressure side suction pressure
- charge visible in the sight glass
- temperature difference between the heat exchanger water entering and leaving temperature.

Verify the alarm status

Service B
Carrier out the operations listed under Service A.

Refrigerant circuit
- Full-load operating test. In addition to the operations described under Service A, check the following values:
  - compressor discharge pressure
  - compressor oil level
  - actual liquid subcooling
  - overheating at the expansion device
- Verify the charge status by checking the colour indicator of the sight glass. If the colour has turned to yellow, change the charge and replace the filter drier cartridges after carrying out a leak test of the circuit.

Electrical checks
- Check the tightening of the electric connections, contactors, disconnect switch and transformer.
- Check the phase direction upstream of the unit and in the customer's electrical data table.
- Check the status of the contactors and fuses.
- Carry out a quick test (refer to the 61WG/30WG Pro-Dialog+ Controls manual).

Mechanical checks
- Verify the correct operation of the evaporator and condenser pumps with the Quick Test function.
- Verify the correct operation of cooling fans, speed converter and condensing pumps.

Water circuit checks
- Check the leak-tightness of the circuit.

Service C
Carry out the operations listed under Service B.

Refrigerant circuit
- Check the leak-tightness of the circuit and ensure that there is no piping damage.
- Carry out an oil contamination test. If acid, water or metallic particles are present, replace the oil in the circuit.
- Verify the tightening of the thermostatic mechanism of the expansion device.
- Full-load operating test. In addition to the checks carried out under Service B, validate the value between leaving water and the saturated evaporating temperature.
- Check the operation of the high-pressure switch(es). Replace them if there is a fault.
- Check the fouling of the filter drier (by checking the temperature difference in the copper piping). Replace it if necessary.

Electrical checks
- Check the status and insulation of the electrical cables.
- Check the phase/earth insulation of the compressors and pumps.
- Check the compressor and pump winding status.

Mechanical checks
- Check that no water has penetrated into the control box.
- Clean the filter of the air inlet grille and if necessary replace the filter.

Water circuit checks
- Clean the water filter.
- Purge the circuit with air.
- Verify the correct operation of the water flow switch.
- Check the status of the thermal piping insulation.
- Check the water flow by checking the heat exchanger pressure difference (using a pressure gauge).
- Check the concentration of the anti-freeze protection solution (ethylene glycol or polyethylene glycol).
- Check the heat transfer fluid status or the water quality.
- Check the steel pipe corrosion.

17 - START-UP CKECKLIST FOR 61WG/30WG UNITS (USE FOR JOB FILE)

Preliminary information

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

Equipment
Model: ..... Serial No. .....

Compressors
1. Model No. ..... 2. Model No. .....
Serial No. ..... Serial No. .....
Motor No. ..... Motor No. .....

Evaporator
Model No. ..... Manufactured by .....
Serial No. ..... Date .....

Condensers
Model No. ..... Manufactured by .....
Serial No. ..... Date .....

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 .....

Unit start-up
☐ CWP starter has been properly interlocked with the unit
☐ Oil level is correct
☐ All discharge and liquid valves 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 unit 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)

☐ 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 (unit without pump)

Check pressure drop across the evaporator
Entering evaporator = ... (kPa)
Leaving evaporator = ... (kPa)
(Leaving - entering) = ... (kPa)

WARNING: Plot cooler pressure drop on performance data chart (in product data literature) to determine total liters 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). Be sure that all service valves are open, before beginning the compressor test section.

To start the unit

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:

Evaporator EWT.....	Ambient temperature.....
Evaporator LWT.....	Condenser EWT .....
	Condenser LWT .....
Suction pressure.....	Discharge pressure.....
Suction temperature.....	Discharge temperature.....
Liquid line temperature.....	
Compressor oil pressure A1*.....	Compressor oil pressure A2* .....

* if installed

NOTES:
.....
.....

www.eurovent-certification.com
www.certiflash.com

Order No: 16122-76, 03.2012 - Supersedes order No: 16122-76, 02.2012.
Manufacturer reserves the right to change any product specifications without notice.

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