



United Technologies

## PRO-DIALOG

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS



Unit with optional hydronic module



Standard unit

Water-Cooled/Condenserless  
Liquid Chillers/Water-Sourced Heat Pumps  
with or without Integrated Hydronic Module

61WG/30WG/30GA 020-090

Nominal cooling capacity 25-95 kW  
Nominal heating capacity 29-117 kW

**AQUASNAP. AQUASNAP.**  
Heating

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**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/30WGA 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/30WGA 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.

They are designed for an operating life of 15 years by assuming a 75% utilisation factor; that is approximately 100,000 operating hours.

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.**

***30WGA are supplied without safety valve on the high-pressure refrigerant circuit and are equipped with automatically reset pressure switches in accordance with EN378.***

***For unit installation and connection to the remote condenser it is necessary to:***

- ***Check the applicable air conditioning regulations and safety standards (e.g. PED and EN378 for the European Union)***
- ***Determine which accessories (safety valves, fuses etc.) are required so that these circuits comply with the applicable regulations and standards.***

***If shut-off valves are used on the circuit, ensure that these valves do not shut off the safety valve for the different containers that they protect.***

***The protection devices include the 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
<b>Refrigerant side</b>		
High-pressure switch	x	
External relief valve***		x
Rupture disk		x
Fuse plug		x
<b>Heat transfer fluid side</b>		
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.

These units are intended to be stored and operated in an environment where the ambient temperature must be not less than the lowest allowable temperature indicated on the nameplate.

**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

Carrier recommends the following drafting for a logbook (the table below should not be considered as reference and does not involve Carrier responsibility):

Intervention		Name of the commissioning engineer	Applicable national regulations	Verification Organism
Date	Nature <sup>(1)</sup>			

(1) Maintenance, repairs, regular verifications (EN 378), leakage, etc.

Engineers working on the electric or refrigeration components must be authorised, trained and fully qualified to do so (e.g. electricians trained and qualified in accordance with IEC 60364 classification BA4).

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.**

**Never use the compressor as a vacuum pump.**

**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.**

***If any intervention is required on the air-cooled condenser in 30WGA units please refer to the safety instructions supplied by the condenser manufacturer.***

***It is recommended to install an indicating device to show if part of the refrigerant has leaked from the valve. The presence of oil at the outlet orifice is a useful indicator that refrigerant has leaked. Keep this orifice clean to ensure that any leaks are obvious. The calibration of a valve that has leaked is generally lower than its original calibration. The new calibration may affect the operating range. To avoid nuisance tripping or leaks, replace or re-calibrate the valve.***

#### **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***

#### **ATTENTION:**

- ***Attach the label supplied that shows the refrigerant used to the side used for topping up and/or recovery.***
- ***On the label clearly indicate the topped up refrigerant quantity in indelible ink.***
- ***Prevent the release of fluorinated gas from the unit. Ensure that fluorinated gas is never released to the atmosphere during installation, maintenance or disposal. If a leak of fluorinated gas is detected, stop the leak and repair it as quickly as possible.***
- ***Only a qualified service technician is allowed to access this product and to correct the fault.***
- ***Any handling of fluorinated gas contained in this product (e.g. moving the product or topping up the gas) must comply with EC regulation no. 842/2006 about certain fluorinated greenhouse gases and any other applicable local legislation.***
- ***Contact your local dealer if you have any questions.***
- ***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 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.***

The company or organisation that conducts a pressure switch test shall establish and implement a detailed procedure to fix:

- Safety measures
- Measuring equipment calibration
- Validating operation of protective devices
- Test protocols
- Recommissioning of the equipment.

Consult Carrier Service for this type of test. Carrier mentions here only the principle of a test without removing the pressure switch:

- Verify and record the set-points of pressure switches and relief devices (valves and possible rupture discs)
- Be ready to switch-off the main disconnect switch of the power supply if the pressure switch does not trigger (avoid over-pressure or excess gas in case of valves on the high-pressure side with the recovery condensers)
- Connect a calibrated pressure gauge (the values displayed on the user interface may be inaccurate in an instant reading because of the scanning delay applied in the control)
- Complete an HP Test as provided by the software (refer to the Control IOM for details).

***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.***

***Before any intervention on the refrigerant circuit the complete refrigerant charge needs to be recovered.***

***For 30WGA units with remote condenser the installer must be clearly note the total refrigerant charge used in the system (in kg) on the label attached to the 30WGA.***

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

***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.***

***The accidental releases of the refrigerant, due to small leaks or significant discharges following the rupture of a pipe or an unexpected release from a safety valve, can cause frostbites and burns to personnel exposed. Do not ignore such injuries. Installers, owners and especially service engineers for these units must:***

- ***Seek medical attention before treating such injuries.***
- ***Have access to a first-aid kit, especially for treating eye injuries.***

***We recommend to apply standard EN 378-3 Annex 3.***

***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 walk-way, 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.***

## 1.5 - Measures, provisions, procedures against emergencies

When the machine is subjected to heat or fire, a device prevents explosion by releasing the refrigerant (via the relief valve). This fluid can be decomposed into toxic waste when subjected to flame:

- Stay away from the unit.
- Set up warnings and recommendations for personnel in charge to stop the fire.
- Fire extinguishers appropriate to the system and the refrigerant type must be easily accessible.

## 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/30WGA 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, repair or replace the damaged parts (see chapter 15 “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 placing the unit

#### 2.2.1 - Moving

See chapter 1.1 - “Installation safety considerations”

#### 2.2.2 - Placing 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 strengthening measures have been taken.
- the unit support points are located at the four lower corners.
- the positioning at these four points must be horizontal (level tolerance 1.5 mm/m in both axes)
- if the support structure is sensitive to vibration and/or noise transmission it is advisable to insert anti-vibration mounts (elastomeric mounts or springs) between the unit and the structure. Selection of these devices is based on the system characteristics and the comfort level required and should be made by technical specialists.
- 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/30WGA 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 (option 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 as follows:

External visual installation checks:

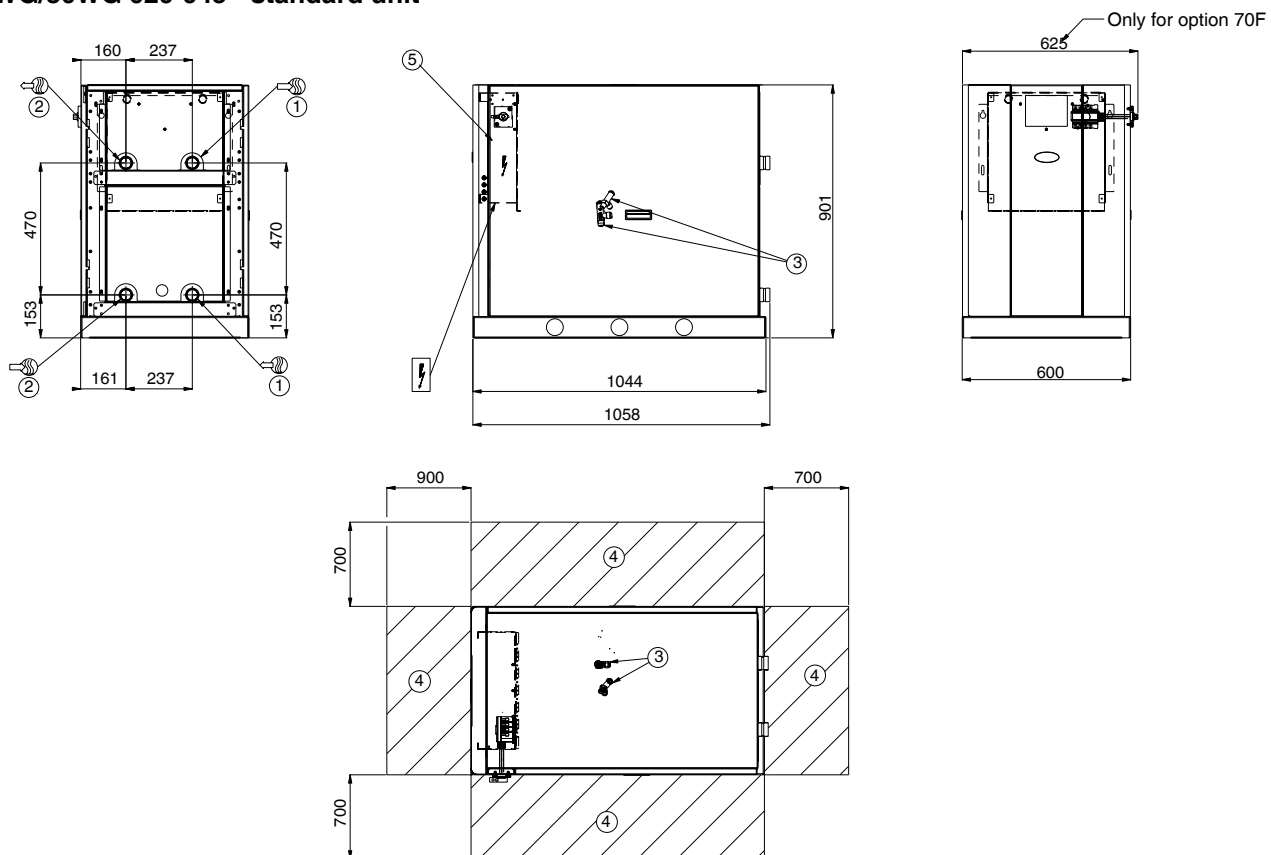
- Ensure that the machine is charged with refrigerant, Verify on the unit nameplate that the 'fluid transported' is R410A and is not nitrogen.
- Compare the complete installation with the refrigeration system and power circuit diagrams.
- Check that all components comply with the design specifications.
- 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.

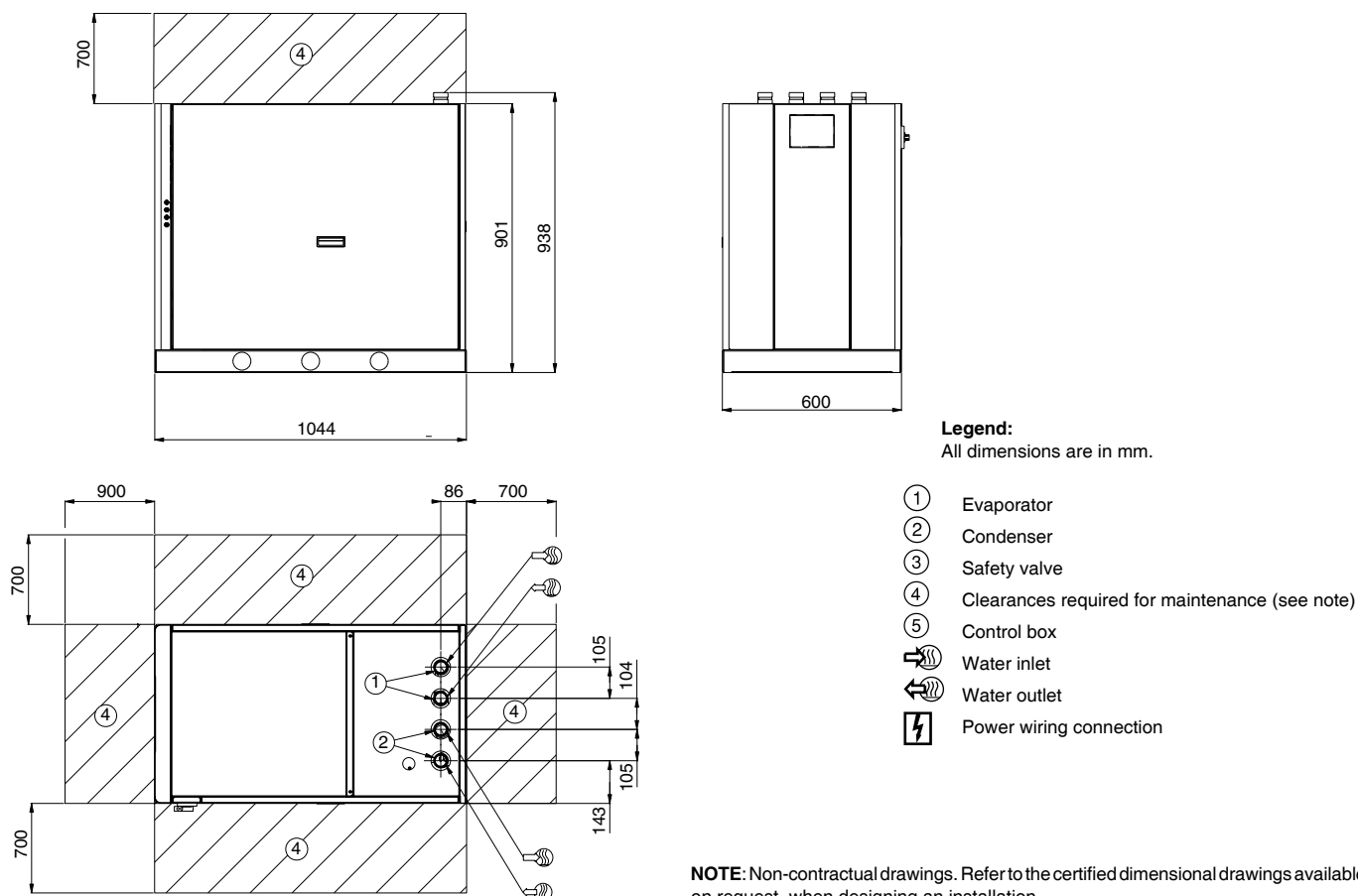
- Verify that all documents for pressure containers, certificates, name plates, files, instruction manuals provided by the manufacturer to comply with the regulations are present.
- Verify the free passage of access and safety routes.
- Check that ventilation in the plant room is adequate.
- Check that 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 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

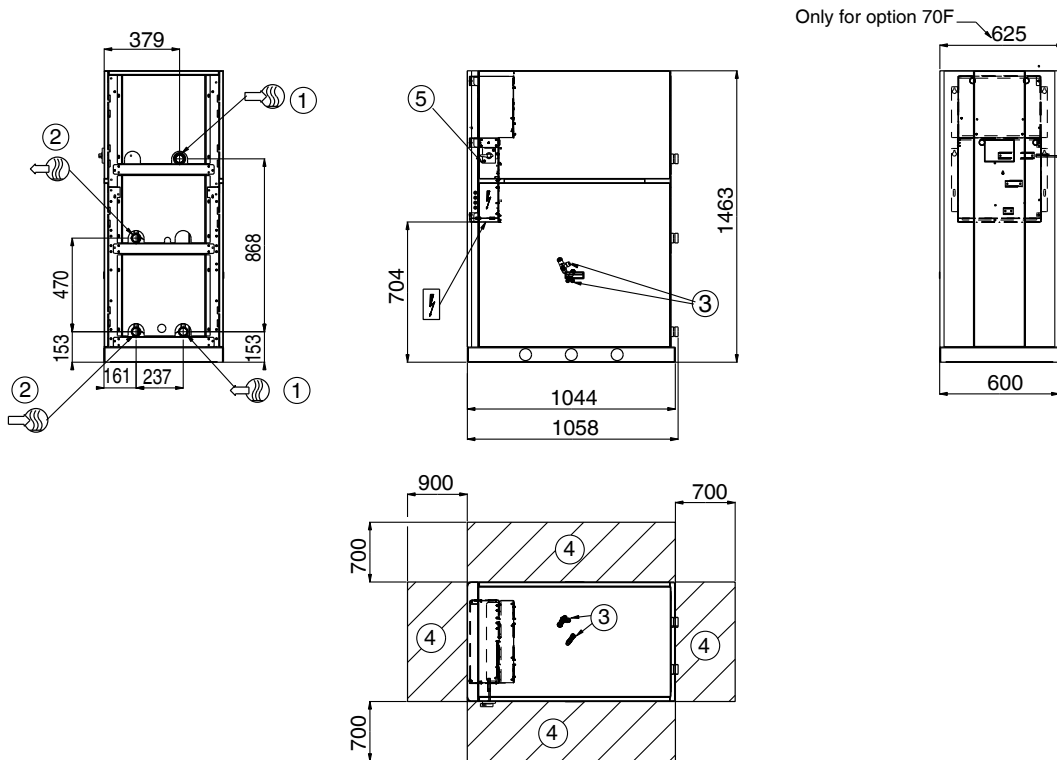
#### 3.1 - 61WG/30WG 020-045 - standard unit



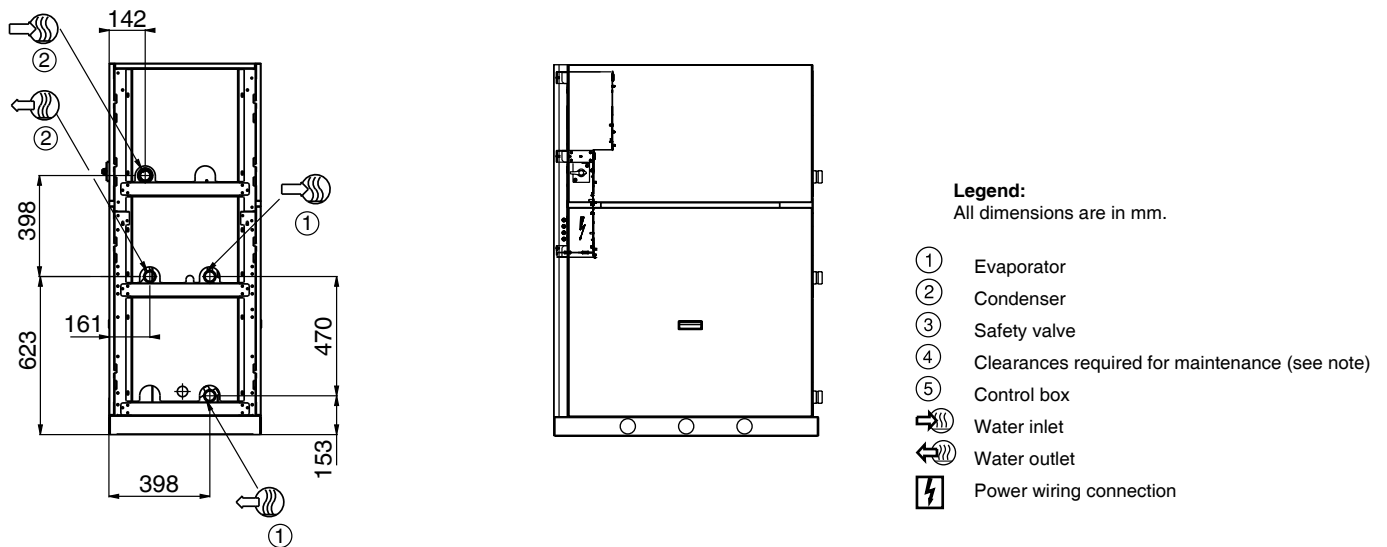
#### 3.2 - 61WG/30WG 020-045 - unit with top connections (option 274)



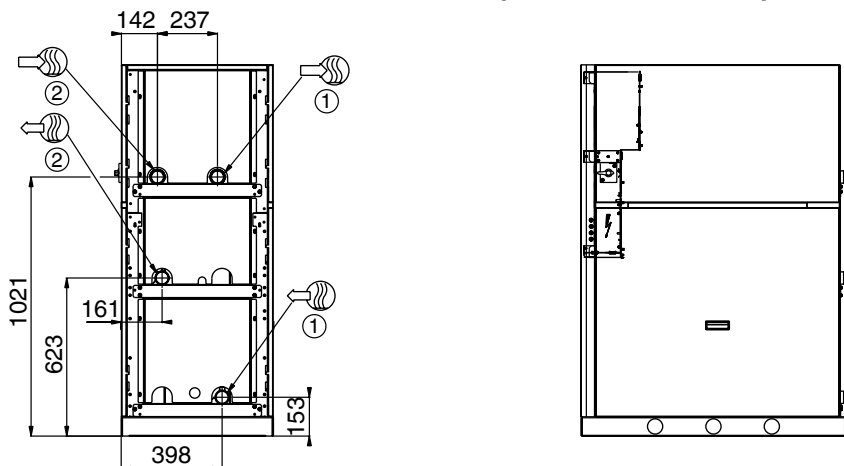
### 3.3 - 61WG/30WG 020-045 - unit with evaporator hydronic module (option 116)



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

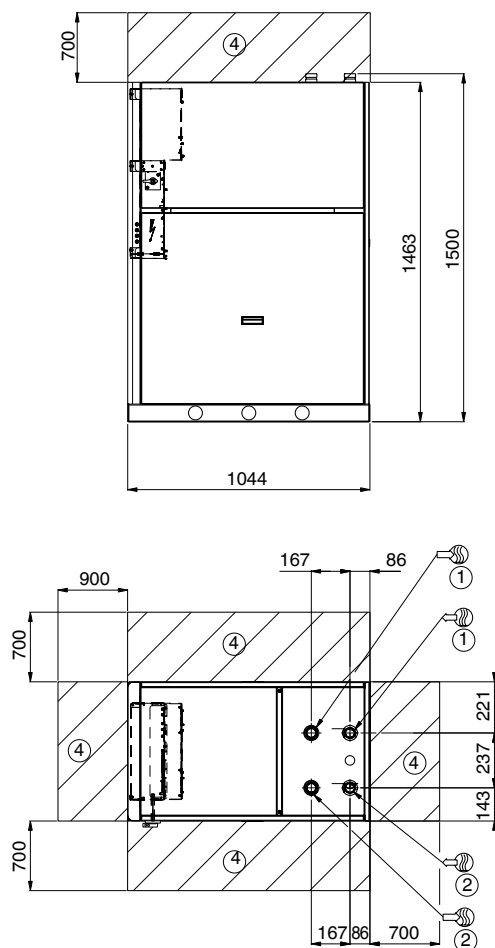


### 3.5 - 61WG/30WG 020-045 - unit with evaporator/condenser hydronic modules (options 116 + 270)



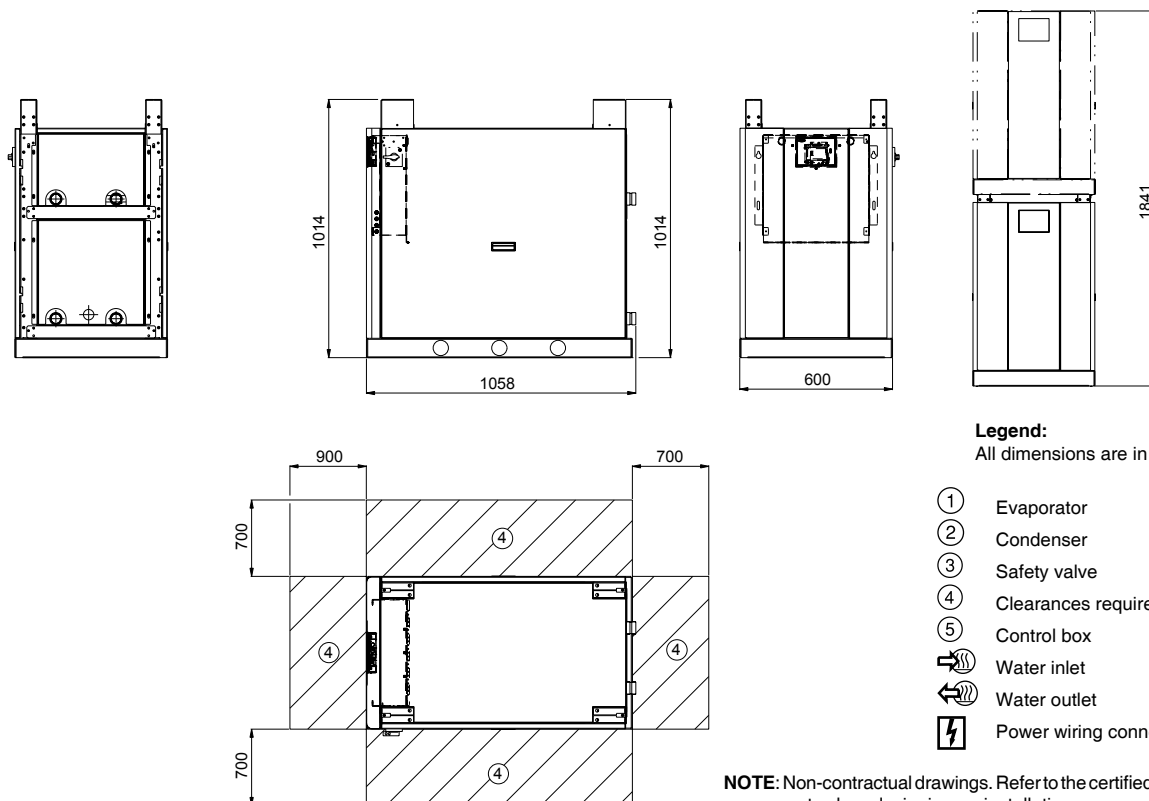
**NOTE:** Non-contractual drawings. Refer to the certified dimensional drawings available on request, when designing an installation.

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

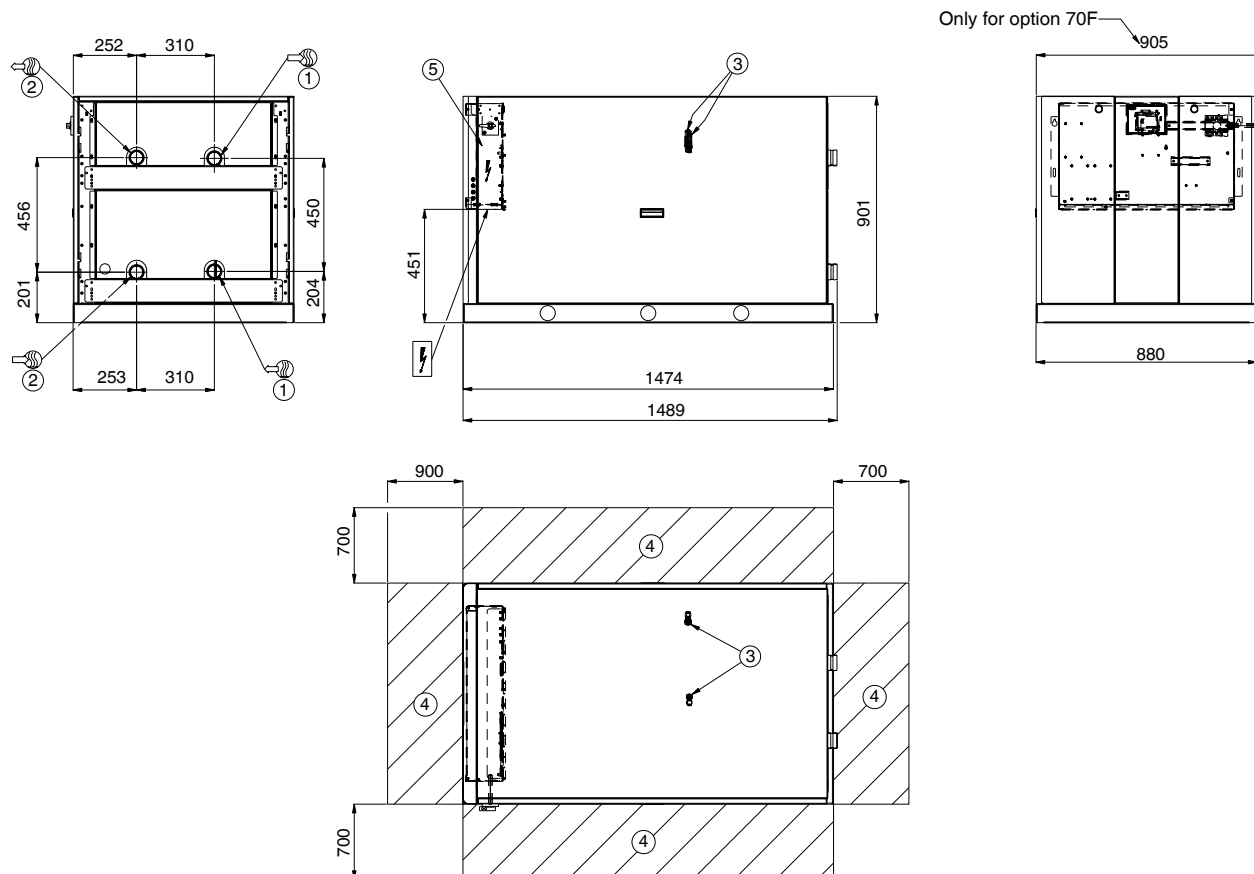


### 3.7 - 61WG/30WG 020-045 - stackable unit (option 273)

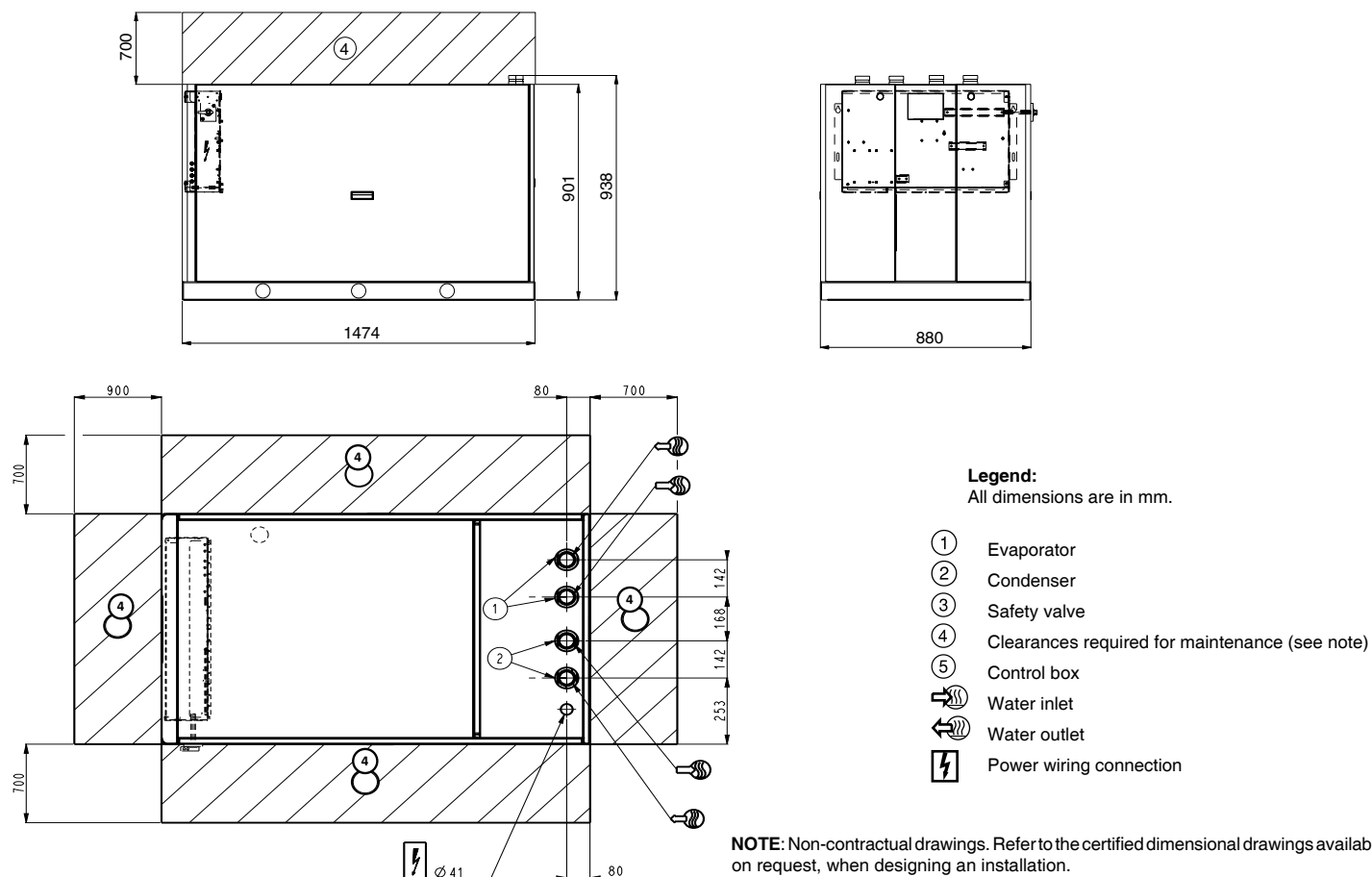
**NOTE:** The water and electrical connections are identical to those of the standard unit.



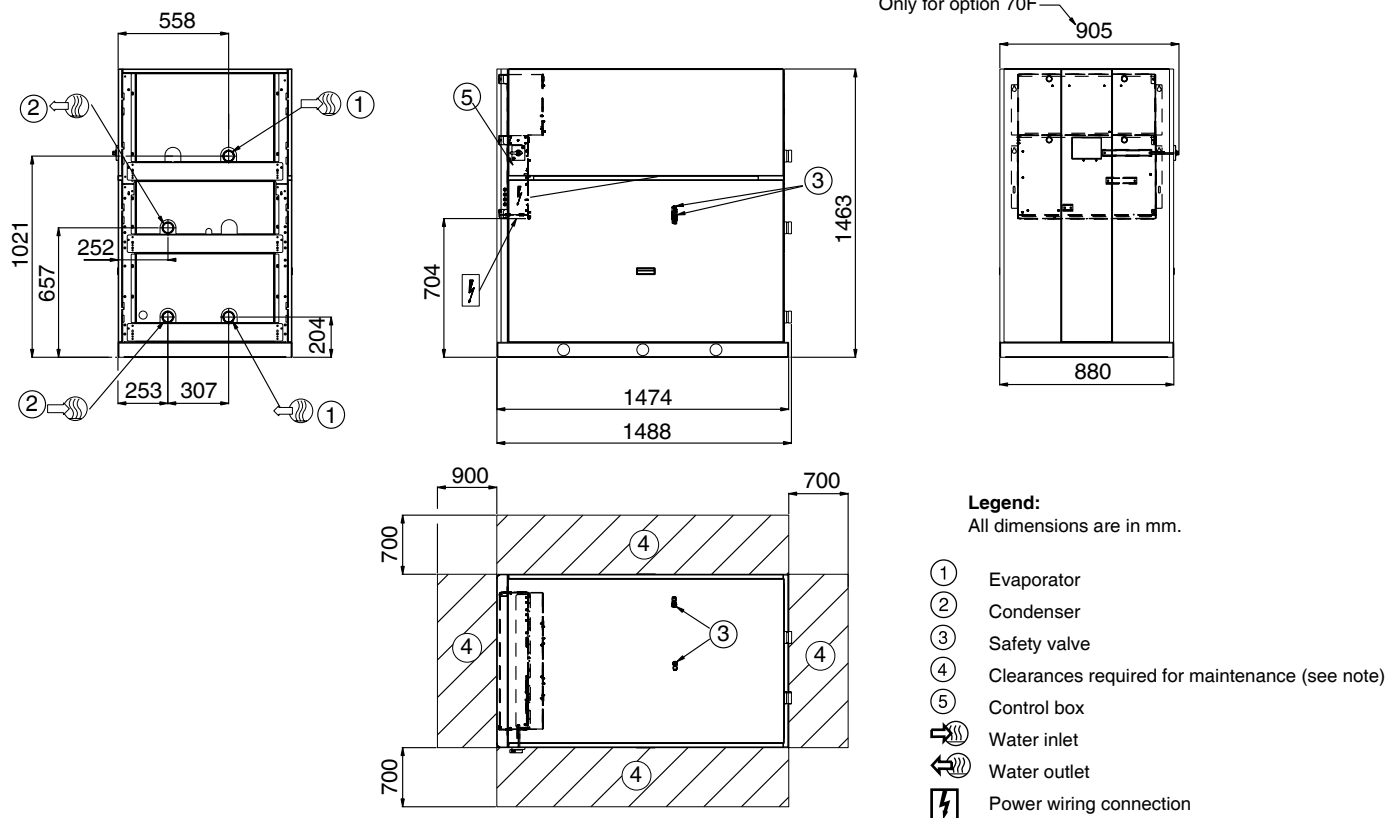
### 3.8 - 61WG/30WG 050-090 - standard unit



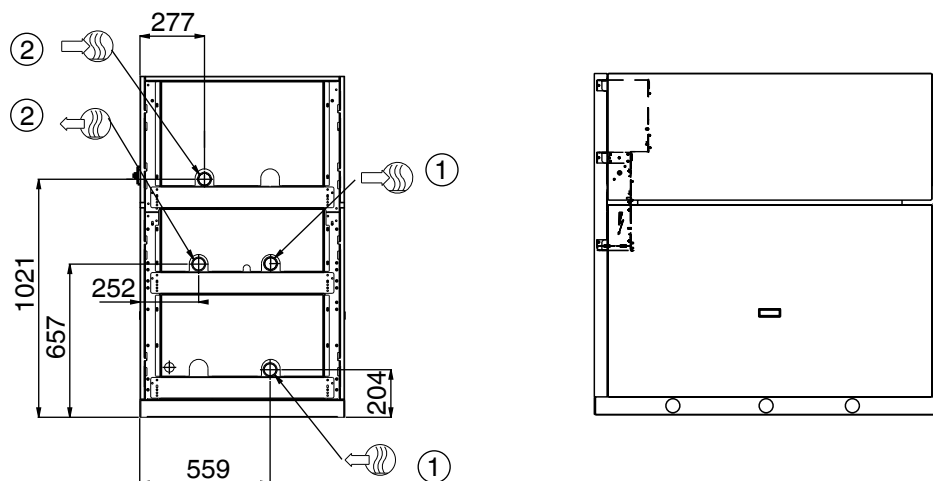
### 3.9 - 61WG/30WG 050-090 - unit with top connections (option 274)



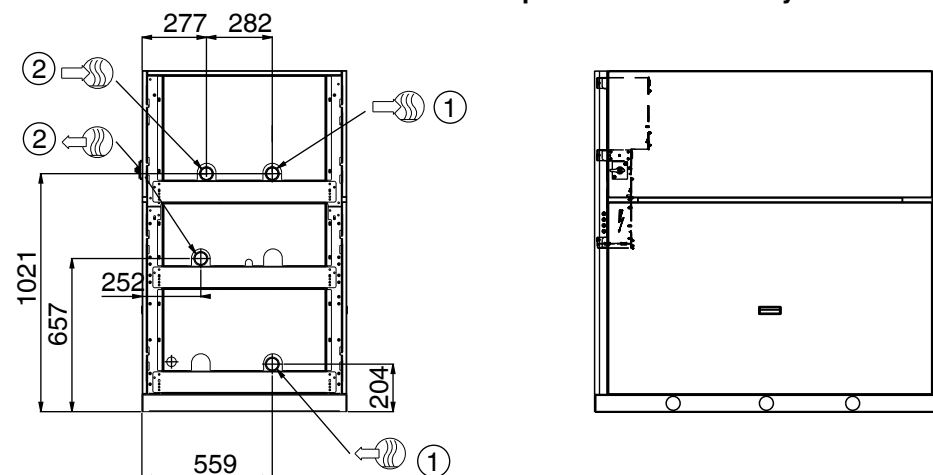
### 3.10 - 61WG/30WG 050-090 - unit with evaporator hydronic module (option 116)



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

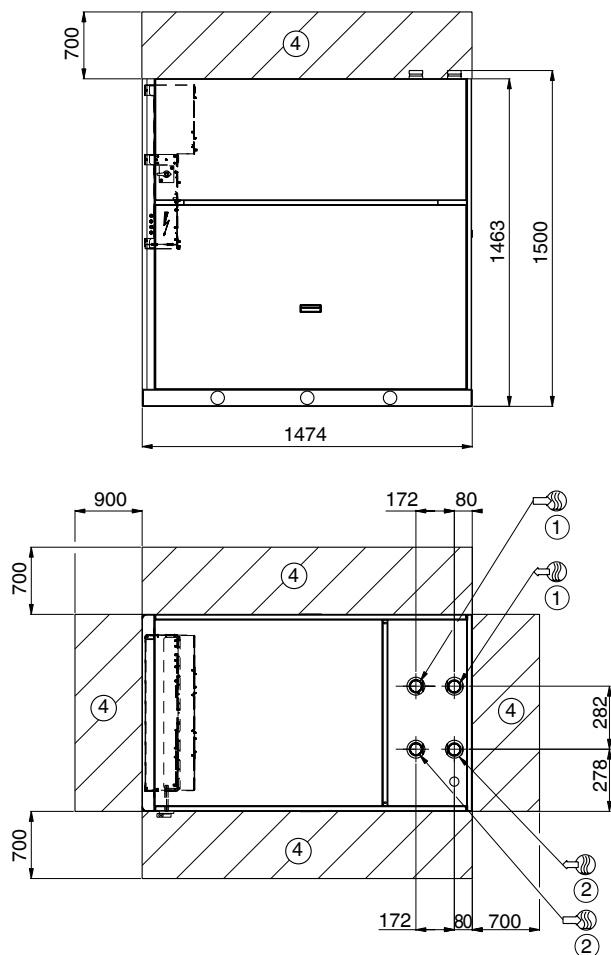


### 3.12 - 61WG/30WG 050-090 - unit with evaporator/condenser hydronic modules (options 116 + 270)



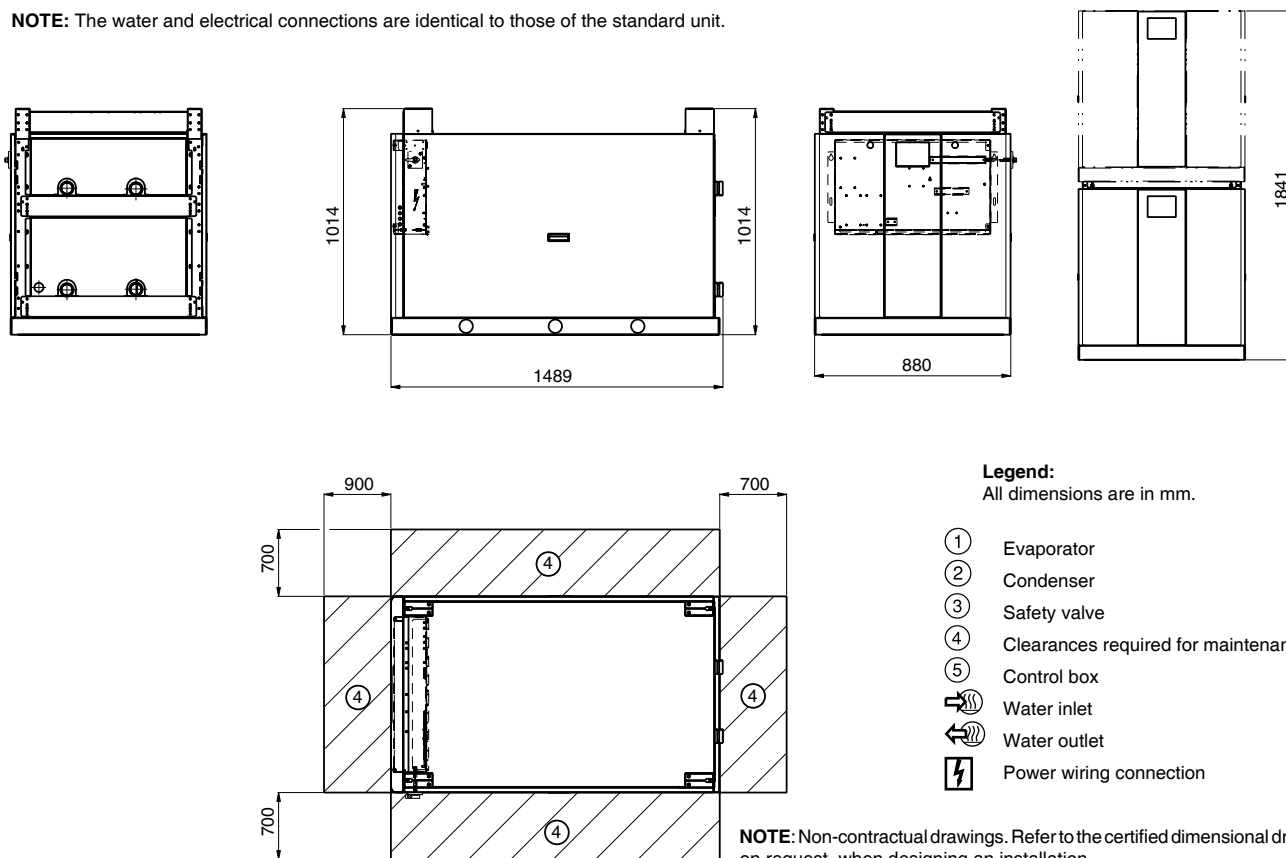
**NOTE:** Non-contractual drawings. Refer to the certified dimensional drawings available on request, when designing an installation.

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



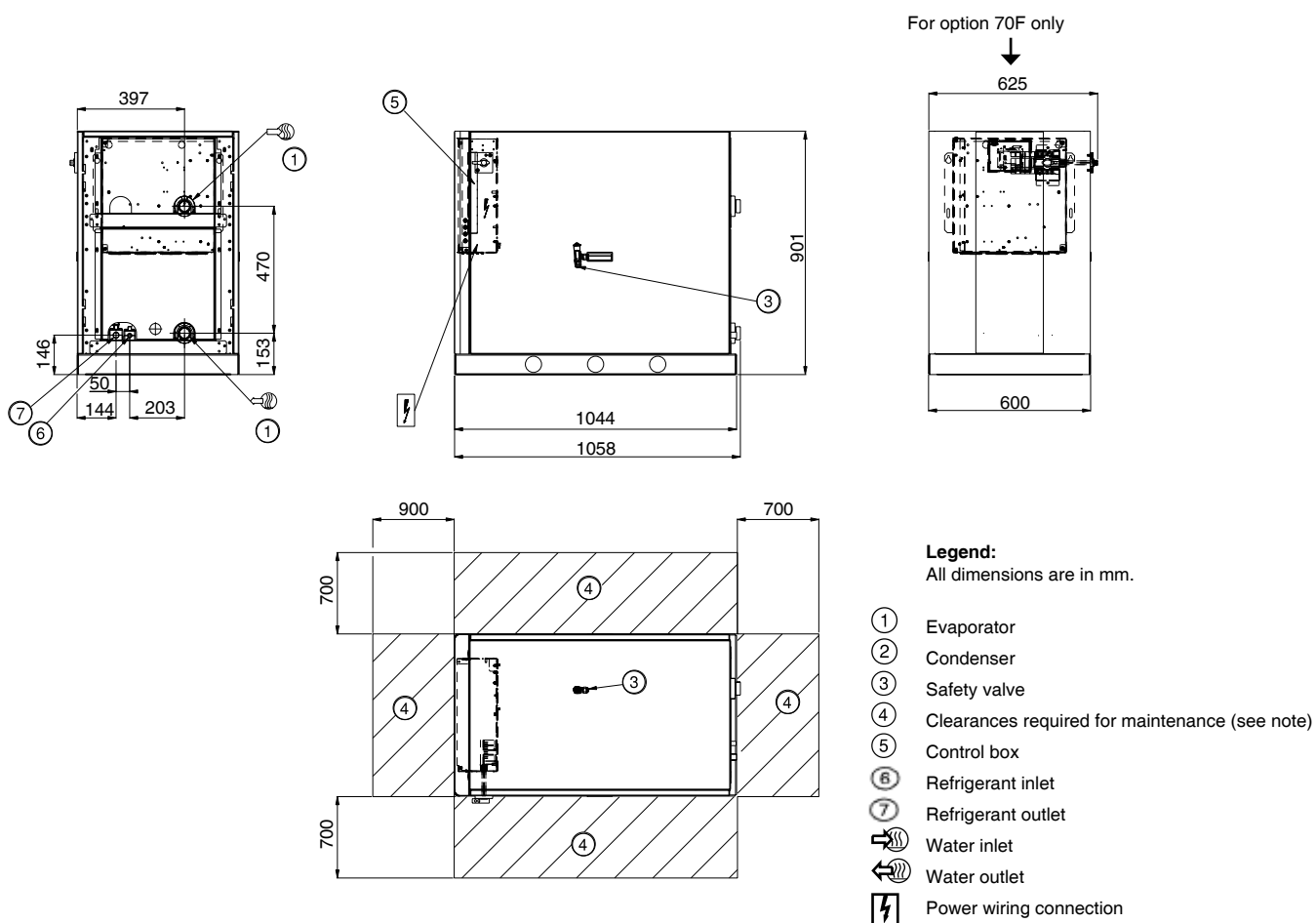
### 3.14 - 61WG/30WG 050-090 - stackable unit (option 273)

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

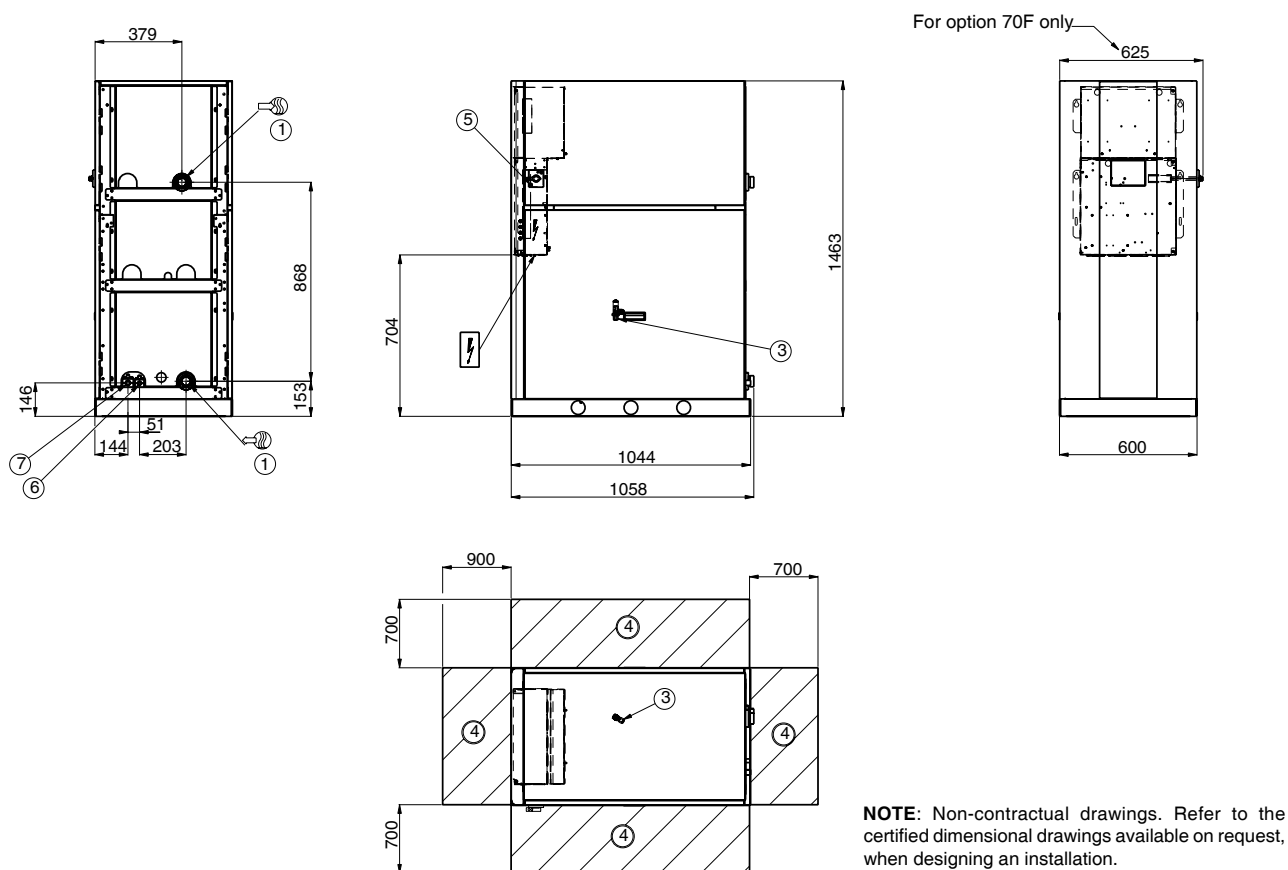


**NOTE:** Non-contractual drawings. Refer to the certified dimensional drawings available on request, when designing an installation.

### 3.15 - 30WGA 020-045 - standard unit

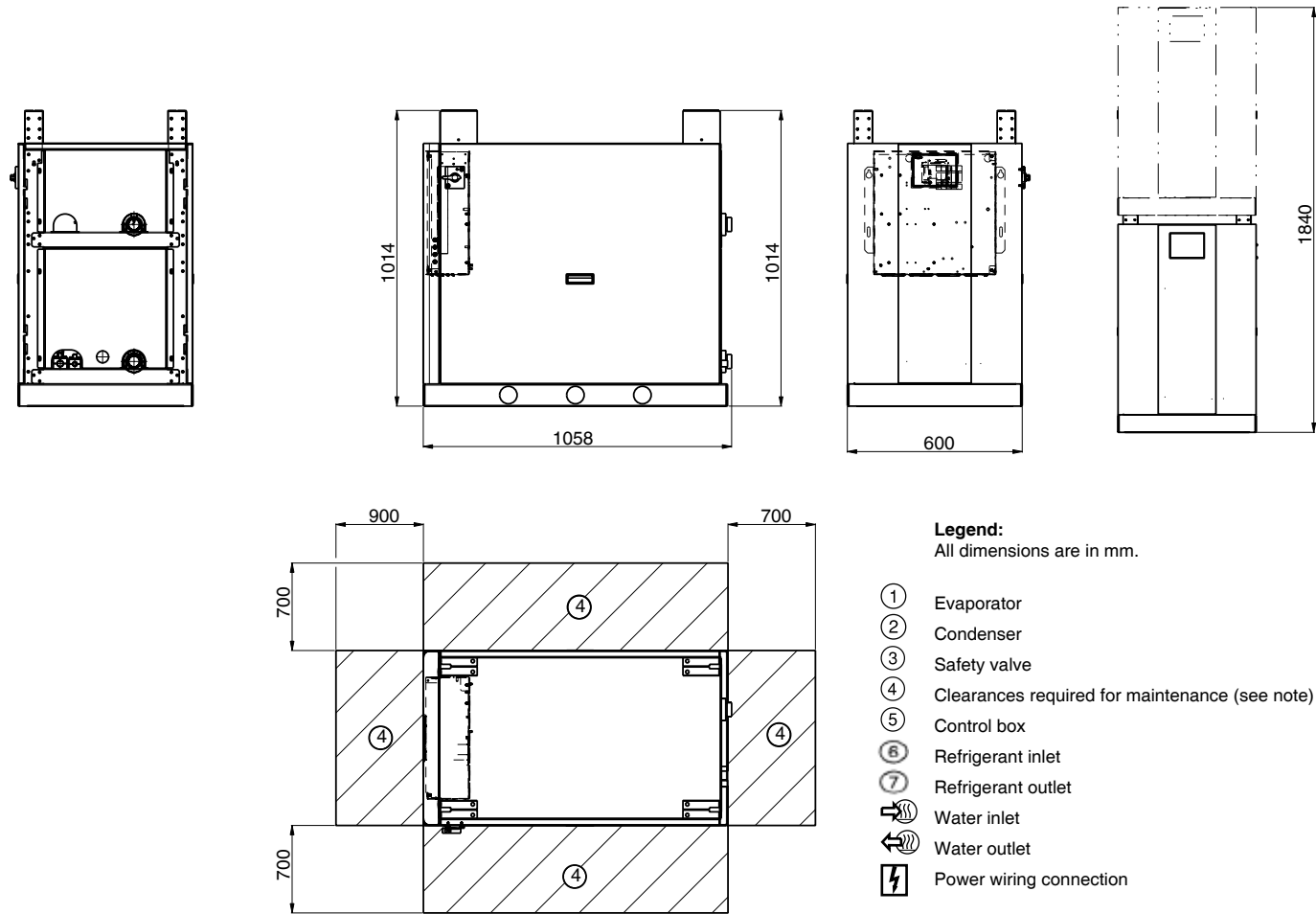


### 3.16 - 30WGA 020-045 - unit with evaporator hydronic module (option 116)

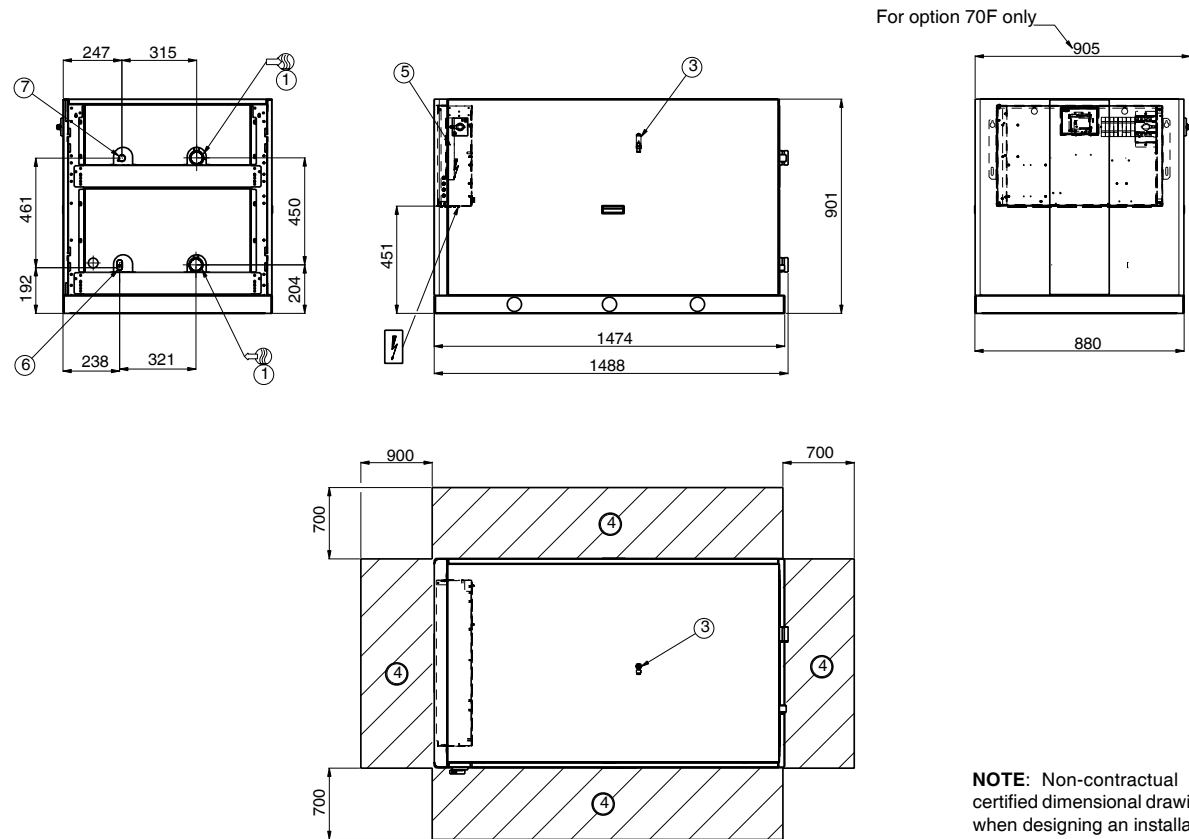


3.17 - 30WGA 020-045 - stackable unit (option 273)

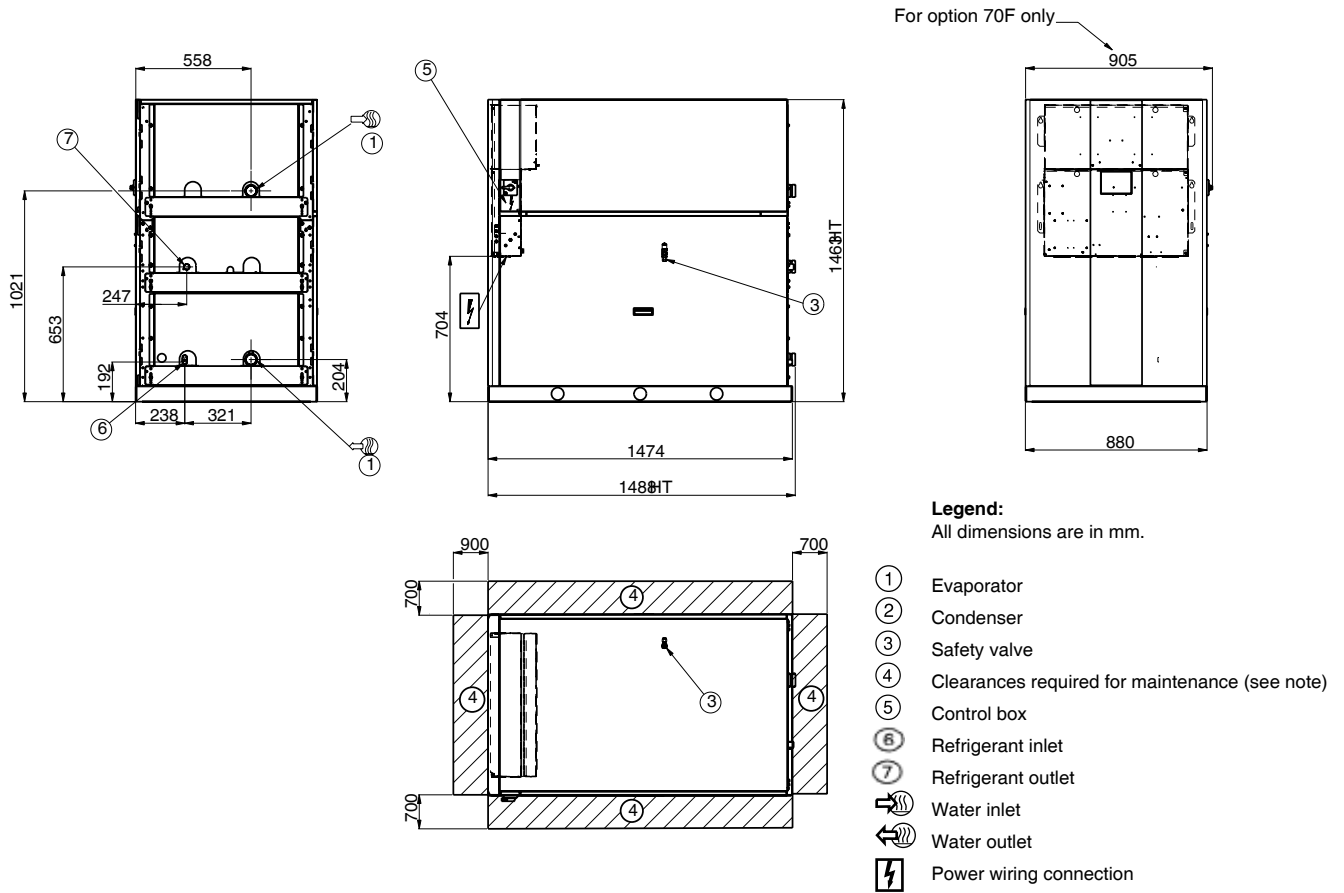
NOTE: The water and electrical connections are identical to those of the standard unit.



3.18 - 30WGA 050-090 - standard unit

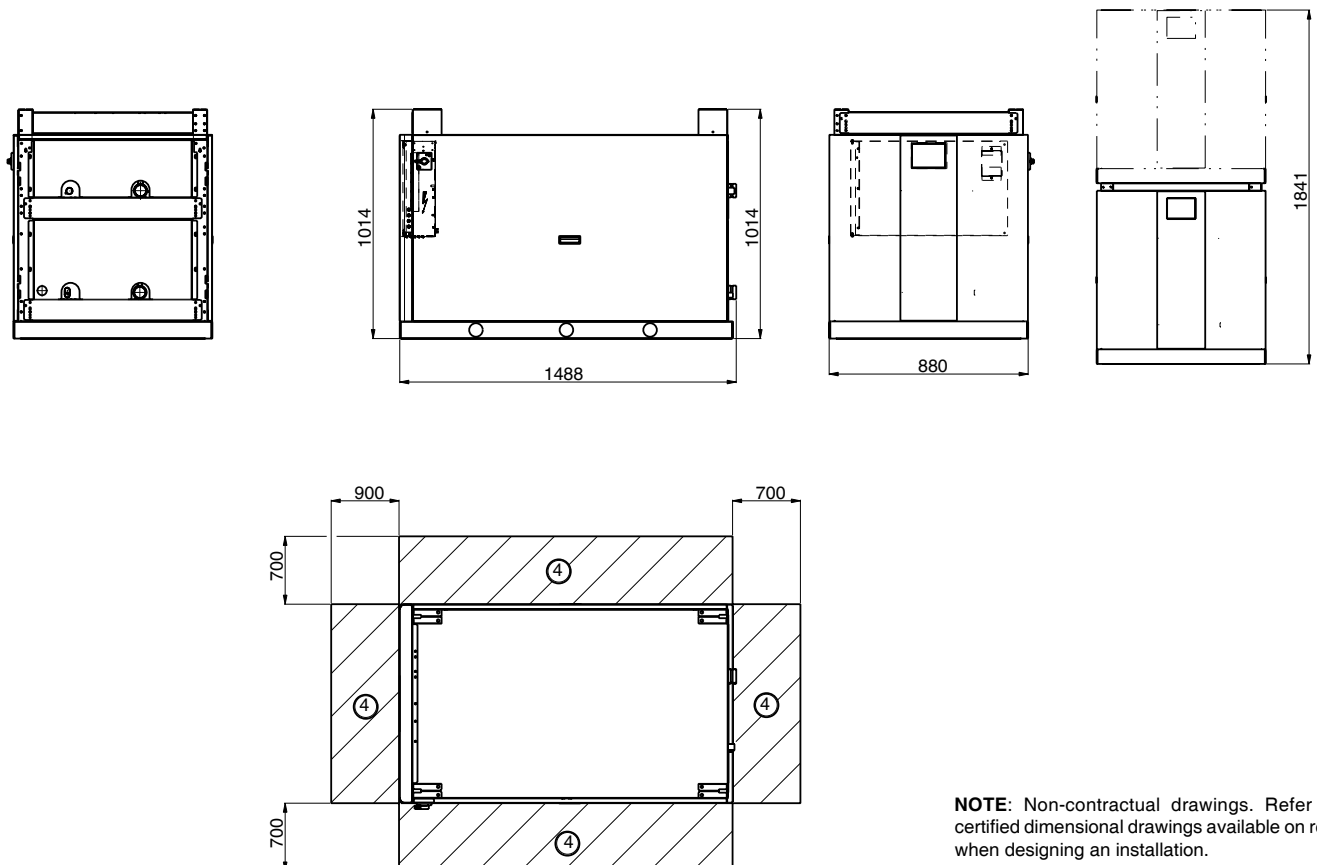


### 3.19 - 30WGA 050-090 - unit with evaporator hydronic module (option 116)



### 3.20 - 30WGA 050-090 - stackable unit (option 273)

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



## 4 - PHYSICAL AND ELECTRICAL DATA 61WG/30WG

### 4.1 - Physical data 61WG

61WG		020	025	030	035	040	045	050	060	070	080	090
<b>Operating weight*</b>	kg	191	200	200	207	212	220	386	392	403	413	441
<b>Sound levels**</b>												
Sound power level 10 <sup>-12</sup> 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
<b>Compressors</b>		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
<b>Refrigerant*</b>		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
<b>Oil</b>		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
<b>Control</b>		Pro-Dialog+										
<b>Evaporator</b>		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
<b>Condenser</b>		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

\* Weight shown is a guideline only. To find out the unit refrigerant charge, please refer to the unit nameplate

\*\* In accordance with ISO 9614-1, measured in a free field. The sound levels only apply to units without options. Declared dualnumber noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3dB(A)).

### 4.2 - Physical data 30WG

30WG		020	025	030	035	040	045	050	060	070	080	090
<b>Operating weight*</b>	kg	191	200	200	207	212	220	386	392	403	413	441
<b>Sound levels**</b>												
Sound power level 10 <sup>-12</sup> 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
<b>Compressors</b>		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
<b>Refrigerant*</b>		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
<b>Oil</b>		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
<b>Control</b>		Pro-Dialog+										
<b>Evaporator</b>		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
<b>Condenser</b>		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

\* Weight shown is a guideline only. To find out the unit refrigerant charge, please refer to the unit nameplate

\*\* In accordance with ISO 9614-1, measured in a free field. The sound levels only apply to units without options. Declared dualnumber noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3dB(A)).

### 4.3 - Physical data 30WGA

30WGA		020	025	030	035	040	045	050	060	070	080	090
<b>Operating weight*</b>	kg	164	171	171	177	180	185	321	324	332	339	354
<b>Sound levels**</b>												
Sound power level 10 <sup>-12</sup> 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
<b>Compressors</b>		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
<b>Refrigerant</b>		R-410A										
<b>Oil</b>		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
<b>Control</b>		Pro-Dialog+										
<b>Evaporator</b>		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
<b>Refrigerant connections</b>												
Discharge line diameter	in	7/8	7/8	7/8	7/8	7/8	7/8	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8
Liquid line diameter	in	5/8	5/8	5/8	5/8	5/8	5/8	7/8	7/8	7/8	7/8	7/8

\* Weight shown is a guideline only. To find out the unit refrigerant charge, please refer to the unit nameplate

\*\* In accordance with ISO 9614-1, measured in a free field. The sound levels only apply to units without options. Declared dualnumber noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3dB(A)).

### 4.4 - Physical data 61WG/30WG/30WGA units with hydronic module

61WG/30WG/30WGA		020	025	030	035	040	045	050	060	070	080	090
<b>Operating weight 30WG/61WG (option 116V + 270V)*</b>	kg	305	313	313	321	327	334	513	521	533	544	574
<b>Weight 30WGA (option 116V)*</b>	kg	250	258	258	263	266	271	431	435	442	449	465
<b>Height**</b>	mm	1463	1463	1463	1463	1463	1463	1463	1463	1463	1463	1463
<b>Hydronic module with option 293 or 293A</b>												
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
<b>Water connections</b>	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.

#### 4.5 - Electrical data 61WG/30WG/30WGA

61WG without hydronic module		020	025	030	035	040	045	050	060	070	080	090
<b>Power circuit</b>												
Nominal voltage	V-ph-Hz	400-3-50										
Voltage range	V	360-440										
<b>Control circuit supply</b>		24 V, via internal transformer										
<b>Maximum start-up current draw (Un)*</b>												
Standard unit	A	98	142	142	147	158	197	161	163	172	185	226
Unit with electronic starter option	A	53.9	78.1	78.1	80.9	86.9	108.4	98	99	105	114	139
<b>Unit power factor at maximum capacity**</b>		0.83	0.82	0.84	0.83	0.82	0.84	0.82	0.82	0.83	0.82	0.84
<b>Maximum operating power input**</b>		kW	9.7	11.4	12.8	14.7	16.6	18.7	22.8	25.6	29.4	37.4
<b>Nominal unit operating current draw***</b>		A	12.9	15.8	16.8	19.2	20.7	24.6	31.6	33.6	38.4	49.2
<b>Maximum operating current draw (Un)****</b>		A	16.1	19.6	21.1	24.4	26.7	30.9	39.2	42.2	48.8	61.8
<b>Maximum operating current draw (Un-10%)†</b>		A	17.8	21.6	23.2	26.9	29.4	34.0	43.2	46.4	53.8	68.0
<b>Customer-side unit power reserve</b>		Customer reserve at the 24 V control power circuit										
<b>Short-circuit stability and protection</b>		See table below "Short-circuit stability current"										

\* Maximum instantaneous start-up current at operating limit values (maximum operating current of the smallest compressor(s) + locked rotor current or limited start-up current of the largest compressor).  
\*\* Maximum power input at the unit operating limits.  
\*\*\* Values obtained at standardised Eurovent conditions: evaporator entering/leaving water temperature 10 °C/7 °C, condenser entering/leaving water temperature 30 °C/35 °C.  
\*\*\*\* Maximum unit operating current at maximum unit power input and 400 V.  
† Maximum unit operating current at maximum unit power input and 360 V.

30WG without hydronic module		020	025	030	035	040	045	050	060	070	080	090
<b>Power circuit</b>												
Nominal voltage	V-ph-Hz	400-3-50										
Voltage range	V	360-440										
<b>Control circuit supply</b>		24 V, via internal transformer										
<b>Maximum start-up current draw (Un)*</b>												
Standard unit	A	98	142	142	147	158	197	161	163	172	185	227
Unit with electronic starter option	A	53.9	78.1	78.1	80.9	86.9	108.4	96.8	97.9	104.1	112.3	137.4
<b>Unit power factor at maximum capacity**</b>		0.83	0.82	0.84	0.83	0.82	0.84	0.82	0.82	0.83	0.82	0.84
<b>Maximum operating power input**</b>		kW	9.7	11.4	12.8	14.7	16.6	18.7	22.8	24.6	29.4	37.4
<b>Nominal unit operating current draw***</b>		A	12.9	18.8	16.8	19.2	20.7	24.6	31.6	33.6	38.4	49.2
<b>Maximum operating current draw (Un)****</b>		A	15.6	18.7	19.8	23.2	25.4	29.0	37.5	39.6	46.4	58.0
<b>Maximum operating current draw (Un-10%)†</b>		A	17.2	20.6	21.8	25.6	28.0	31.9	41.2	43.6	51.2	63.8
<b>Customer-side unit power reserve</b>		Customer reserve at the 24 V control power circuit										
<b>Short-circuit stability and protection</b>		See table below "Short-circuit stability current"										

\* Maximum instantaneous start-up current at operating limit values (maximum operating current of the smallest compressor(s) + locked rotor current or limited start-up current of the largest compressor).  
\*\* Maximum power input at the unit operating limits.  
\*\*\* Values obtained at standardised Eurovent conditions: evaporator entering/leaving water temperature 12 °C/7 °C, condenser entering/leaving water temperature 30 °C/ 35 °C.  
\*\*\*\* Maximum unit operating current at maximum unit power input and 400 V.  
† Maximum unit operating current at maximum unit power input and 360 V.

30WGA without hydronic module		020	025	030	035	040	045	050	060	070	080	090
<b>Power circuit</b>												
Nominal voltage	V-ph-Hz	400-3-50										
Voltage range	V	360-440										
<b>Control circuit supply</b>		24 V, via internal transformer										
<b>Maximum start-up current draw (Un)*</b>												
Standard unit	A	98	142	142	147	158	197	161	163	172	185	228
Unit with electronic starter option	A	53.9	78.1	78.1	80.9	86.9	108.4	96.8	97.9	104.1	112.3	137.4
<b>Unit power factor at maximum capacity**</b>		0.83	0.82	0.84	0.83	0.82	0.84	0.82	0.82	0.83	0.82	0.84
<b>Maximum operating power input**</b>		kW	9.7	11.4	12.8	14.7	16.6	18.7	22.8	25.6	29.4	37.4
<b>Nominal unit operating current draw***</b>		A	11.4	13.8	14.7	16.5	18.1	21.2	27.6	29.4	33.0	42.4
<b>Maximum operating current draw (Un)****</b>		A	14.7	17.7	19.3	21.7	24.1	27.5	35.4	38.7	43.5	55.0
<b>Maximum operating current draw (Un-10%)†</b>		A	16.2	19.5	21.3	23.9	26.5	30.3	39.0	42.6	47.8	60.6
<b>Customer-side unit power reserve</b>		Customer reserve at the 24 V control power circuit										
<b>Short-circuit stability and protection</b>		See table below "Short-circuit stability current"										

\* Maximum instantaneous start-up current at operating limit values (maximum operating current of the smallest compressor(s) + locked rotor current or limited start-up current of the largest compressor).  
\*\* Maximum power input at the unit operating limits.  
\*\*\* Values obtained at the following conditions: evaporator entering/leaving water temperature 12 °C/7 °C, condenser entering/leaving water temperature 45 °C.  
\*\*\*\* Maximum unit operating current at maximum unit power input and 400 V.  
† Maximum unit operating current at maximum unit power input and 360 V.

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

61WG/30WG/30WGA	020	025	030	035	040	045	050	060	070	080	090
<b>Value with non-specified upstream protection</b>											
Short-term current at 1 s - I <sub>cw</sub> - kA rms	3	3	3	3	3	3	3	3	3	3	3
Admissible peak current - I <sub>pk</sub> - kA pk	6	6	6	6	6	6	6	6	6	6	6
<b>Maximum value with upstream protection (by circuit breaker)</b>											
Conditional short-circuit current I <sub>cc</sub> - 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<sup>2</sup>t) 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.

## 4.7 - Electrical data, optional hydronic module

*The pumps that are factory-installed in these units comply with the European Ecodesign directive ErP. The additional electrical data required\* is as follows:*

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

No.**	Description***		61WG/30WG/30WGA - options 116T and 270T (low-pressure pumps)										
			20	25	30	35	40	45	50	60	70	80	90
1	Nominal efficiency at full load and nominal voltage	%	81,1	81,1	81,1	81,1	81,1	81,1	81,1	81,1	81,1	81,1	83,4
1	Nominal efficiency at 75% rated load and nominal voltage	%	80,8	80,8	80,8	80,8	80,8	80,8	80,8	80,8	80,8	80,8	81,2
1	Nominal efficiency at 50% rated load and nominal voltage	%	77,5	77,5	77,5	77,5	77,5	77,5	77,5	77,5	77,5	77,5	78,3
2	Efficiency level		IE3										
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	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	1,3
7-2	Maximum power input (400 V)****	kW	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,6
8	Rated input frequency	Hz	50	50	50	50	50	50	50	50	50	50	50
9-1	Rated voltage	V	3 x 400										
9-2	Maximum current drawn (400 V)†	A	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,9
10	Rated speed	rpm	2850	2850	2850	2850	2850	2850	2850	2850	2850	2850	2890
		r/s	47	47	47	47	47	47	47	47	47	47	48
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/30WGA (options 116V and 270V)

No.**	Description***		61WG/30WG/30WGA - options 116V and 270V (high-pressure pumps)										
			20	25	30	35	40	45	50	60	70	80	90
1	Nominal efficiency at full load and nominal voltage	%	83,4	83,4	83,4	83,4	83,4	83,4	84,8	84,8	84,8	84,8	84,8
1	Nominal efficiency at 75% rated load and nominal voltage	%	81,2	81,2	81,2	81,2	81,2	81,2	82,2	82,2	82,2	82,2	82,2
1	Nominal efficiency at 50% rated load and nominal voltage	%	78,3	78,3	78,3	78,3	78,3	78,3	79	79	79	79	79
2	Efficiency level		IE3										
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	1,3	1,3	1,3	1,3	1,3	1,3	1,7	1,7	1,7	1,7	1,7
7-2	Maximum power input (400 V)****	kW	1,6	1,6	1,6	1,6	1,6	1,6	2,4	2,4	2,4	2,4	2,4
8	Rated input frequency	Hz	50	50	50	50	50	50	50	50	50	50	50
9-1	Rated voltage	V	3 x 400	3 x 400	3 x 400	3 x 400	3 x 400	3 x 400	3 x 400	3 x 400	3 x 400	3 x 400	3 x 400
9-2	Maximum current drawn (400 V)†	A	2,9	2,9	2,9	2,9	2,9	2,9	4,2	4,2	4,2	4,2	4,2
10	Rated speed	rpm	2890	2890	2890	2890	2890	2890	2870	2870	2870	2870	2870
		r/s	48	48	48	48	48	48	48	48	48	48	48
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 2009/125/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.

## 4.8 - Compressor usage and electrical data table

Compressor	Reference	I Nom	I Max (Un)	I Max (Un - 10%)	LRA*	LRA**	61WG										
							020	025	030	035	040	045	050	060	070	080	090
SH090	00PSG001482000	10.5	16.1	17.8	98	53.9	1										
SH105	00PSG001482100	13.2	19.6	21.6	142	78.1		1					2				
SH120	00PSG001482200	13.8	21.1	23.2	142	78.1			1					2			
SH140	00PSG001482300	15.6	24.4	26.9	147	80.9				1					2		
SH161	00PSG001482400	16.2	26.7	29.4	158	86.9					1					2	
SH184	00PSG001482500	20.2	30.9	34.0	197	108.4						1					2

Compressor	Reference	I Nom	I Max (Un)	I Max (Un - 10%)	LRA*	LRA**	30WG										
							020	025	030	035	040	045	050	060	070	080	090
WSH090	00PSG001549100	10.6	15.6	17.2	98	53.9	1										
WSH105	00PSG001549200	12.9	18.7	20.6	142	78.1		1					2				
WSH120	00PSG001549300	13.3	19.8	21.8	142	78.1			1					2			
WSH140	00PSG001549400	15.2	23.2	25.6	147	80.9				1					2		
WSH161	00PSG001549500	16.5	25.4	28.0	158	86.9					1					2	
WSH184	00PSG001549600	19.7	29	31.9	197	108.4						1					2

Compressor	Reference	I Nom	I Max (Un)	I Max (Un - 10%)	LRA*	LRA**	30WGA										
							020	025	030	035	040	045	050	060	070	080	090
WSH090	00PSG001549100	11.4	14.7	16.2	98	53.9	1										
WSH105	00PSG001549200	13.8	17.7	19.5	142	78.1		1					2				
WSH120	00PSG001549300	14.7	19.3	21.3	142	78.1			1					2			
WSH140	00PSG001549400	16.5	21.7	23.8	147	80.9				1					2		
WSH161	00PSG001549500	18.1	24.1	26.5	158	86.9					1					2	
WSH184	00PSG001549600	21.2	27.5	30.3	197	108.4						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/30WG/30WGA 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/30WG/30WGA 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.
- 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)
  - Power supply frequency variation:  $\pm 2$  Hz.
  - The neutral (N) conductor must not be connected directly to the unit (if necessary use a transformer).
  - Over-current protection of the power supply conductors is not provided with the unit.
  - The factory-installed disconnect switch(es)/circuit breaker(s) is (are) of a type suitable for power interruption in accordance with EN 60947.
  - 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. Units delivered with speed drive (option116T/116V and 270T/270V) are not compatible with IT network.
  - 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.

### 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.
- The operating conditions for the units are specified below:
 

Environment\* - Environment as classified in EN 60721 (equivalent to CEI60721):

  - Indoor installation
  - ambient temperature range: +5 °C for the temperature minimum to +40 °C, class 4K4H
  - humidity range (non-condensing)\*:
    - 50% relative humidity at 40 °C
    - 90% relative humidity at 20 °C
  - altitude:  $\leq 2000$  m (see note for table 4.7 - Electrical data, hydronic module)
  - indoor installation\*

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

\* The protection level of the control boxes required to conform to this class is IPX1B (according to reference document IEC 60529). All 61WG/30WG/30WGA 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

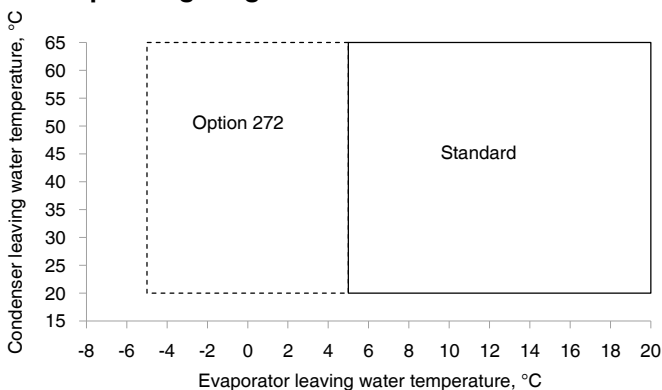
61WG		Minimum	Maximum
<b>Evaporator</b>			
Entering water temperature at start-up	°C	7.5*	27
Leaving water temperature during operation	°C	5**	20
Entering/leaving water temperature difference	K	2.5	7
<b>Condenser</b>			
Entering water temperature at start-up	°C	15***	60****
Leaving water temperature 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 272 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
<b>Evaporator</b>			
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
<b>Condenser</b>			
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.

### 5.2 - Operating range 61WG



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

### 5.3 - Operating limits 30WG

30WG		Minimum	Maximum
<b>Evaporator</b>			
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
<b>Condenser</b>			
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
<b>Evaporator</b>			
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
<b>Condenser</b>			
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

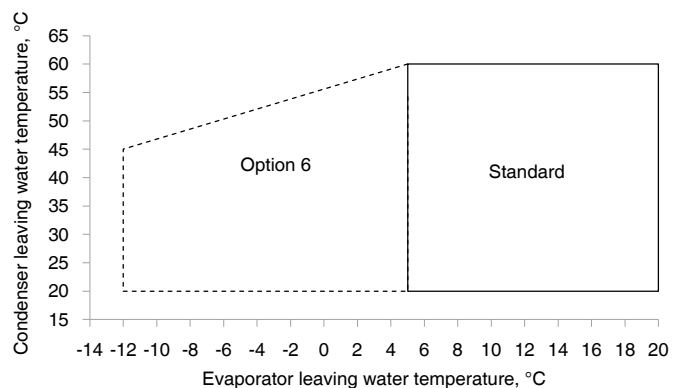
**Note:** Do not exceed the maximum operating temperature.

- \* 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
<b>Evaporator</b>			
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
<b>Condenser without hydronic kit</b>			
Entering air temperature at start-up + during operation	°C	10-15***	40-45****
<b>Condenser with option 270V (kit with variable-speed pump)</b>			
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 three-way valve can be controlled by the 0-10 V analogue output of the Pro-Dialog+ control.

### 5.4 - Operating range 30WG



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

## 5.5 - Operating limits 30WGA

30WG	Minimum	Maximum
<b>Evaporator</b>		
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
<b>Air entering temperature (at start-up and during operation)**</b>		
Air entering temperature (fixed-speed fan)	°C 0***	35 to 48†
Air entering temperature (variable-speed fan)	°C -10 to -20‡	35 to 48‡

\* For entering water temperatures below 7.5 °C at start-up, contact Carrier.

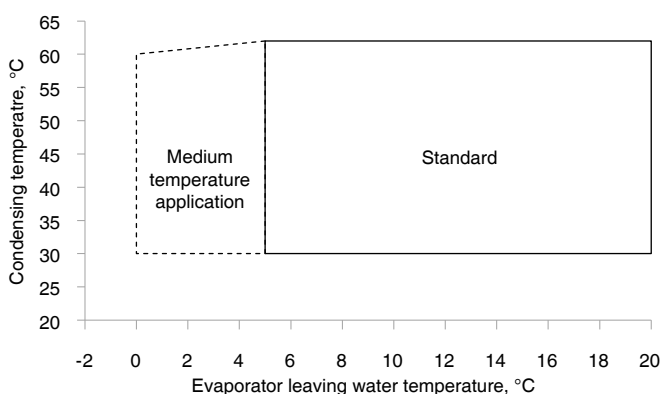
\*\* 30WGA unit can operate down to 0 °C if the configuration of the fluid type used is modified. If the leaving water temperature is below 5 °C, a frost protection solution must be used.

\*\*\* The minimum temperature range is based on the condenser selected. If the condenser only has a few fan stages, the use of variable-speed fans is recommended from 10 °C.

† The minimum temperature range is based on the condenser selected.

‡ The maximum temperature range is based on the condenser selected.

## 5.6 - Operating range 30WGA



— 30WGA standard unit

--- 30WGA unit for medium temperature application (% glycol < 25%)

## 5.7 - 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.

## 5.8 - 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 higher temperature difference with a lower evaporator flow rate.

## 5.9 - 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.

## 5.10 - Water flow rates

### 5.10.1 - Standard 61WG

61WG	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	5.0
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	1.6	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

\* Units with hydronic module

Flow rate for a maximum permitted temperature difference at the minimum leaving water temperature

\*\* Units without hydronic module

Flow rate for a maximum permitted temperature difference at the minimum leaving water temperature

\*\*\* Units with 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)

\*\*\*\* Units without hydronic module

Maximum flow rate for a pressure drop of 100 kPa in the plate heat exchanger.

61WG	Condenser water flow rate, l/s			
	Minimum*	Maximum**		Maximum***
		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

\* Units with or without hydronic module

Minimum flow rate for a water temperature difference of 18 K-

Note: Operation permitted up to a value of 20 K.

\*\* Units with 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)

\*\*\* Units without hydronic module

Maximum flow rate for a pressure drop of 100 kPa in the plate heat exchanger

### 5.10.2 - 61WG with option 272

61WG	Minimum evaporator glycol solution flow rate - option 272*, l/s		
	Minimum**	Minimum***	
		Low pressure	High pressure
020	0.5	0.5	0.5
025	0.5	0.5	0.5
030	0.5	0.5	0.5
035	0.6	0.6	0.6
040	0.6	0.6	0.6
045	0.8	0.8	0.8
050	2.0	1.9	0.8
060	1.9	1.9	1.0
070	1.9	1.9	1.1
080	1.9	2.0	1.3
090	2.2	2.0	1.5

\* Option 272: Condenser side high-temperature water production, evaporator side with glycol solution,

\*\* Units with hydronic module

Minimum flow rate for a maximum permitted temperature difference at the minimum leaving water temperature

\*\*\* Units without hydronic module

Minimum flow rate for a maximum permitted temperature difference at the minimum leaving water temperature

### 5.10.3 - Standard 30WG/30WGA

30WG 30WGA	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	1.1	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	1.6	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

- \* Units with hydronic module  
Flow rate for a maximum permitted temperature difference at the minimum leaving water temperature
- \*\* Units without hydronic module  
Flow rate for a maximum permitted temperature difference at the minimum leaving water temperature
- \*\*\* Units with 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)
- \*\*\*\* Units without hydronic module  
Maximum flow rate for a pressure drop of 100 kPa in the plate heat exchanger.

30WG	Condenser water flow rate, l/s			
	Minimum*		Maximum**	Maximum***
	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

- \* Units with or without hydronic module  
Minimum flow rate for a water temperature difference of 18 K-  
Note: Operation permitted up to a value of 20 K.
- \*\* Units with 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)
- \*\*\* Units without hydronic module  
Maximum flow rate for a pressure drop of 100 kPa in the plate heat exchanger

### 5.10.4 - 30WG with option 6

30WG	Minimum evaporator glycol solution flow rate - option 6*, l/s		
	Minimum**		Minimum***
	Low pressure	High pressure	
020	1.4	1.3	0.5
025	1.5	1.3	0.5
030	1.5	1.3	0.5
035	1.6	1.5	0.6
040	1.7	1.5	0.6
045	1.8	1.5	0.8
050	2.5	2.2	0.8
060	2.2	2.3	1.0
070	2.2	2.4	1.1
080	2.3	2.4	1.3
090	2.5	2.5	1.5

- \* Option 6: Glycol solution production, very low temperature
- \*\* Units with hydronic module  
Minimum flow rate for a maximum permitted temperature difference at the minimum leaving water temperature
- \*\*\* Units without hydronic module  
Minimum flow rate for a maximum permitted temperature difference at the minimum leaving water temperature

### 5.11 - Minimum water volume

Whichever the system, the water loop minimum capacity is given by the formula: Capacity = Cap (kW) x N Liters

Cap is the nominal system cooling capacity (kW) at the nominal system operating conditions. This volume is necessary for stable operation and accurate temperature control.

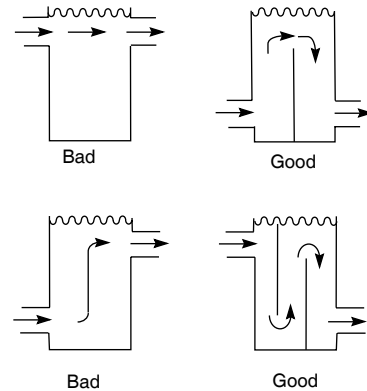
Application	N
61WG/30WG/30WGA	2.5

**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.



### 5.12 - 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/30WGA		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

### 5.13 - Expansion tank

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

## 5.14 - Protection against cavitation (option 116)

To ensure the durability of the pumps in the integrated hydronic modules, the control algorithm of the 61WG/30WG/30WGA 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.

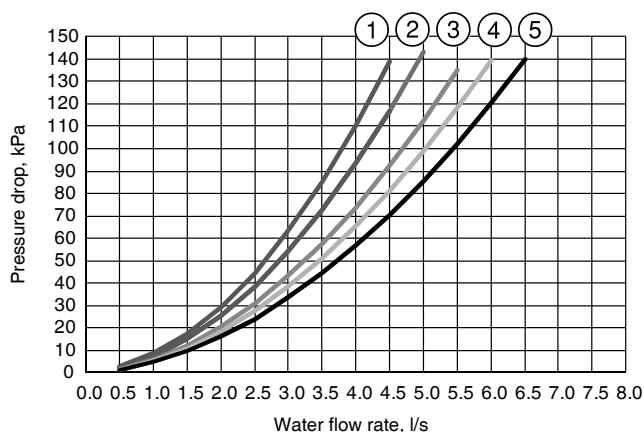
In order to obtain sufficient pressure, it is recommended:

- 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.

## 5.15 - Plate heat exchanger pressure drop (includes internal piping)

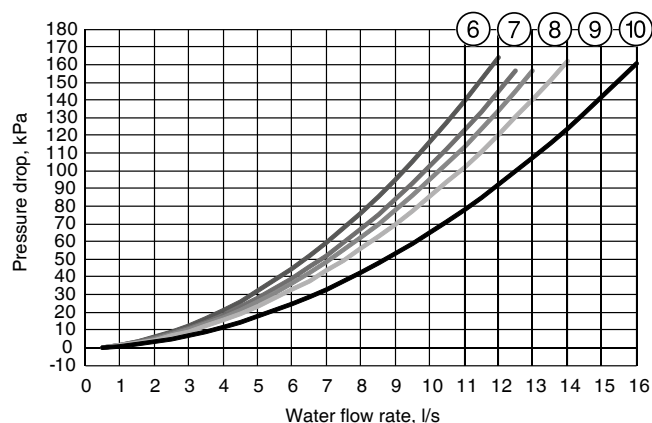
Evaporator - standard unit without hydronic module - Water only

### 61WG/30WG/30WGA 020-045



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

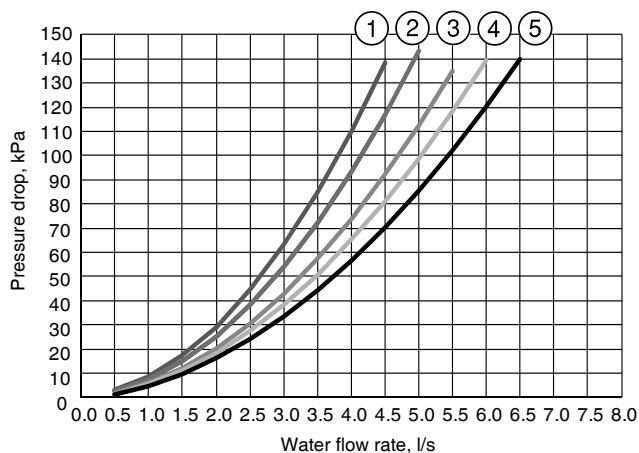
### 61WG/30WG/30WGA 050-090



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

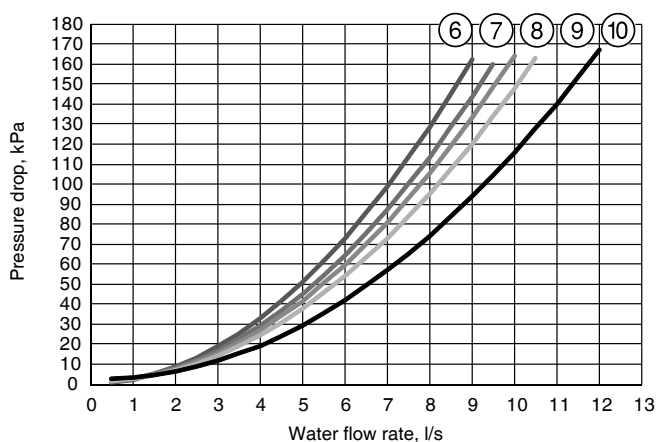
Condenser - standard unit without hydronic module - Water only

### 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

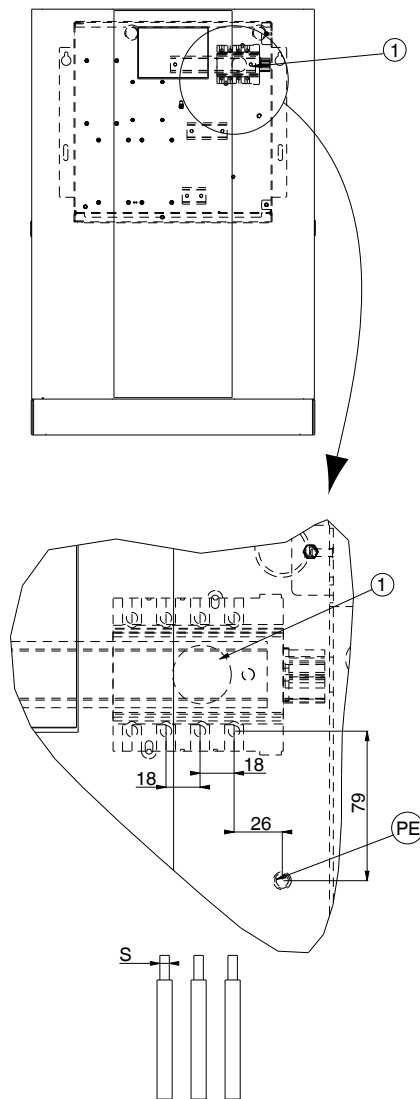
### 61WG/30WG 050-090



- 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/30WGA



#### Legend

1 Main disconnect switch

PE Earth connection

S Power supply cable section (see table "Recommended wire sections").

#### NOTES:

**The 61WG/30WG/30WGA 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.

In 30WGA units the power supply must not be disconnected after the unit has been commissioned, except for quick maintenance interventions (one day). For longer maintenance tasks or if the unit is put into storage (for example during the winter, when the unit is not used for cooling), the unit power supply must be ensured to guarantee supply to the compressor heaters on the crankcase.

**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

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

Calculate the maximum deviation from the 400 V average:

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

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

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



The maximum deviation from the average is 6 V. The greatest percentage deviation is:  $100 \times 6/400 = 1.5 \%$

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

### 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 on the next page.

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.**

#### 6.4.2 - 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***
	mm <sup>2</sup> (per phase)	mm <sup>2</sup> (per phase)	m		mm <sup>2</sup> (per phase)	m	
020	1 x 35	1 x 2,5	60	PVC Cu	1 x 4	100	PVC Cu
025	1 x 35	1 x 2,5	60	PVC Cu	1 x 4	100	PVC Cu
030	1 x 35	1 x 4	80	PVC Cu	1 x 6	120	PVC Cu
035	1 x 35	1 x 4	80	PVC Cu	1 x 6	120	PVC Cu
040	1 x 35	1 x 6	100	PVC Cu	1 x 10	150	PVC Cu
045	1 x 35	1 x 6	100	PVC Cu	1 x 10	150	PVC Cu
050	1 x 35	1 x 10	120	PVC Cu	1 x 16	180	PVC Cu
060	1 x 35	1 x 10	120	PVC Cu	1 x 16	180	PVC Cu
070	1 x 35	1 x 16	140	PVC Cu	1 x 25	205	PVC Cu
080	1 x 35	1 x 16	140	PVC Cu	1 x 25	205	PVC Cu
090	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/30WGA units

30WG 30WGA	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***
	mm <sup>2</sup> (per phase)	mm <sup>2</sup> (per phase)	m		mm <sup>2</sup> (par phase)	m	
020	1 x 35	1 x 2,5	60	PVC Cu	1 x 4	100	PVC Cu
025	1 x 35	1 x 2,5	60	PVC Cu	1 x 4	100	PVC Cu
030	1 x 35	1 x 4	80	PVC Cu	1 x 6	120	PVC Cu
035	1 x 35	1 x 4	80	PVC Cu	1 x 6	120	PVC Cu
040	1 x 35	1 x 4	80	PVC Cu	1 x 6	120	PVC Cu
045	1 x 35	1 x 6	100	PVC Cu	1 x 10	150	PVC Cu
050	1 x 35	1 x 10	120	PVC Cu	1 x 16	180	PVC Cu
060	1 x 35	1 x 10	120	PVC Cu	1 x 16	180	PVC Cu
070	1 x 35	1 x 16	140	PVC Cu	1 x 16	180	PVC Cu
080	1 x 35	1 x 16	140	PVC Cu	1 x 25	205	PVC Cu
090	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 simulation result considering the hypothesis indicated.

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

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

#### 6.4.1 - Field control wiring

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

- The routing selection and/or conductor insulation characteristics must ensure dual electric insulation.
- In case of accidental disconnection, conductor fixing between different conductors and/or in the control box prevents any contact between the conductor ends and an active energised part.

Refer to the 61WG/30WG/30WGA 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 - see description of options 153 and 154 in the 61WG/30WG/30WGA Pro-Dialog+ controls manual

## 6.5 - 24 V user power reserve

After all possible options have been connected, the transformer ensures the availability of a usable 24 VA or 1 A power reserve for the control circuit on site.

## 7 - 30WGA UNIT CONNECTIONS

### 7.1 - Recommendations for the installation of liquid chillers with remote condenser

The 30WGA units (split units for connection to air-cooled condensers) have been specially designed to optimise the operation of split system installations, using air-cooled condensers as the chiller heat rejection system.

The refrigerant circuit installation of an operational system is limited to the connection of the air-cooled condenser inlet and outlet to the 30WGA unit.

The components such as the check valve (in the discharge line), moisture sight glass and solenoid valves are installed and wired in the factory.

The filter-drier is supplied with the unit and must be installed upstream of the solenoid valve on the liquid line.

The Pro-Dialog+ control system of the 30WGA units incorporates the logic to permit control of the different fan versions (fixed or variable-speed).

To guarantee optimum and reliable performance of the units it is necessary to comply with the regulations described below, when these units are connected to remote condensers:

- Size the discharge and liquid line piping according to the recommendations in the following paragraphs (if necessary, install a double riser to ensure correct oil circulation in the refrigerant circuit).
- Select a condenser with an integrated subcooler to obtain a minimum of 3 K subcooling at the inlet to the expansion device.
- Install the filter drier supplied with the unit as close as possible to the liquid line filter drier.
- Install the outside air temperature sensor supplied near the air-cooled condenser. For units with remote condenser control (option 154), the sensor is supplied. The outside air temperature information is required for correct operation of the complete system.

#### Control of the remote air-cooled condenser using option 154

- Connect the fan stages electrically to the control board, using auxiliary electronic board AUX 1. To assign the fan stages refer to chapters 14 and 15 with the description of the analogue and digital inputs and outputs.
- Make the communication bus connection (twisted and shielded cable type for communication bus RS485) between the specific electronic AUX 1 board, that must be integrated in the condenser control box and using the NRCP master board of the 30WG unit.
- The Pro-Dialog+ control is used to configure the number of fan stages and the fan type based on the air-cooled condenser model used in the installation.

- A fan speed controller may be recommended for the first fan stage for operation at low ambient temperature at part load and for condensers with few fans.

**ATTENTION:** The air-cooled condenser must always be used with a subcooler. Normally 8 K subcooling at the condenser outlet is recommended.

### 7.2 - Piping installation and connection

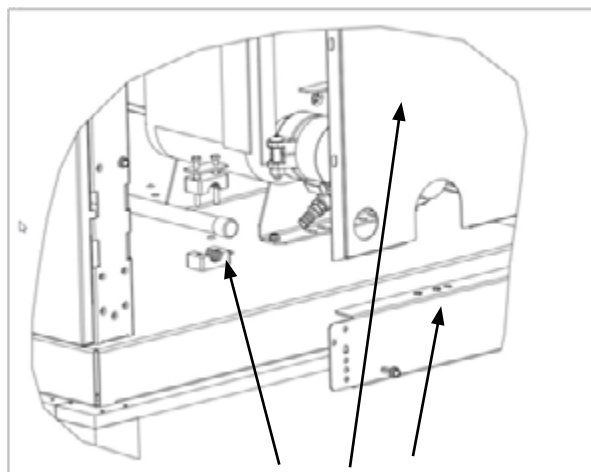
On all units release the holding charge pressure before opening the circuit.

Use the various valves and/or remove the safety cap from the conical Schrader valve supplied. Push in the valve tip to release the complete system holding charge (nitrogen).

Preparation before unsoldering the liquid and discharge line plugs:

- Remove all components that may be damaged during the unsoldering procedure
- Pipe soldering: remove the cores from the conical Schrader valves near the area, remove the pipe collars, remove the cladding panels and the metal crossbars.

All these components must be replaced before commissioning the system.



Components be removed before soldering

- Unsolder the plugs and prepare the pipes for connection.
- Connect the liquid line to the system, install the filter drier upstream of the unit.
- Make the high-pressure connections (discharge line) between the unit and the condenser.
- During these operations circulate and inert gas such as nitrogen in the pipes to prevent the formation of copper oxide.

**IMPORTANT:** The condenser circuit piping must be in accordance with good practices relating to the static support and the thermal expansion of copper pipes.

To ensure system vibration control, the collar positions on the piping in the unit must not be changed. At the outlet of the refrigerant section there are pipe flange collars. It is imperative to tighten these collars to prevent vibrations and possible breaks.

**The piping between the 30WGA and the condenser must be correctly supported in line with its size and the operating weight. Piping support is required to ensure that vibration levels at the piping are lower than the values at the compressor. If resonance occurs, reduce the width between the collar until the vibration levels are acceptable.**

## 8 - PIPE SIZING WITH REFRIGERANT FOR 30WGA UNITS

### 8.1 - General considerations and pipe size limits

Pipe size limits	
30WGA	Maximum
Linear length (discharge - liquid line)	30 m
Height difference	12 m

**The pipes must be as short as possible and have the least possible changes (bends etc.) to minimise pressure drops. If there is a risk of poor piping use, adequate measures must be taken (design, positioning, protection) to prevent incorrect use.**

**The following constraints must be taken into account when the refrigerant pipes are sized:**

- Oil return to the compressor is ensured by entrainment. A minimum refrigerant velocity is required to ensure entrainment. This velocity depends on the pipe diameter, the refrigerant and oil temperature (these are treated as being the same in most cases). A reduction of the pipe diameter permits an increase of the refrigerant velocity. The problem of a minimum entrainment velocity does not exist for the pipes that carry liquid refrigerant as the oil is fully miscible here.**
- The pressure drop at the compressor discharge (pipes linking the compressor outlet to the condenser inlet) must be limited to avoid system performance losses (increased compressor power input and decreased cooling capacity). Increasing the pipe diameter permits limiting the pressure drops.**

- The pressure drop in the liquid line (linking the condenser outlet to the expansion device) must not result in a change of phase. The estimate of these pressure drops must include those generated by possible accessories such as solenoid valves and filter driers.
- In applications with low outside temperature and with long pipes use of a check valve at the condenser outlet is recommended to overcome the poor supply of the expansion device during the start-up phase. Select a valve that is not pressure-tight to avoid significant pressure rises of the liquid refrigerant that may be trapped between the solenoid valve (tight) and the check valve.

### 8.2 - Pipe sizing

The following procedure can be used for pipe sizing:

- Measure the length (in metres) of the piping under consideration.
- Add 50% to take account of special characteristics.
- Read the pipe size from tables 1 and 2 below.
- Calculate the equivalent lengths for parts included in the piping under consideration (such as valves, filters, connections). The equivalent lengths are normally available from the component supplier. Add these lengths to the length calculated above.
- Repeat steps 3 and 4 if necessary.
- See tables “Discharge line piping” and “Liquid line piping” below.

### 8.3 - Discharge pipe sizing

The discharge piping must be sized to achieve reasonable pressure drops: a variation of 1.5 K of the saturated temperature is normally accepted (approx. 90 kPa variation for a condensing temperature of 45 °C).

**Table 1 - Discharge line piping\***

30WGA		020	025	030	035	040	045	050	060	070	080	090
Equivalent length												
0-10 m	in	3/4	3/4	7/8	7/8	7/8	7/8	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8
10-20 m	in	7/8	7/8	7/8	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-3/8	1-3/8	1-3/8
20-30 m	in	7/8	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8
30-40 m	in	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-3/8	1-3/8	1-3/8	1-3/8	1-5/8
40-50 m	in	1-1/8	1-1/8	1-1/8	1-1/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-5/8
50-60 m	in	1-1/8	1-1/8	1-1/8	1-1/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-5/8
60-70 m	in	1-1/8	1-1/8	1-1/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-5/8
70 m or more	in	1-1/8	1-1/8	1-1/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-5/8

\* Recommended diameters to ensure oil return in the application range.

**Table 2 - Liquid line piping\***

30WGA		020	025	030	035	040	045	050	060	070	080	090
Equivalent length												
0-10 m	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	5/8	5/8	5/8	5/8
10-20 m	in	1/2	1/2	1/2	1/2	5/8	5/8	5/8	5/8	5/8	3/4	3/4
20-30 m	in	1/2	1/2	1/2	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4
30-40 m	in	1/2	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	3/4	3/4
40-50 m	in	5/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	3/4	7/8
50-60 m	in	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	3/4	7/8	7/8
60 m or more	in	5/8	5/8	5/8	5/8	3/4	3/4	3/4	3/4	7/8	7/8	7/8

\* Recommended diameters to limit the impact of the 1.5 K pressure loss.

For most applications the refrigerant gas velocity is sufficient to entrain the liquid refrigerant/oil mixture. Nevertheless, table 3 shows the minimum required cooling capacities for different pipe diameters and different saturated discharge temperatures.

**Table 3 - Minimum capacity (kW) to ensure oil return for different pipe diameters**

30WGA	Outside pipe diameter, in						
Saturated condensing temperature, °C	3/4	7/8	1-1/8	1-3/8	1-5/8	2-1/8	2-5/8
30	3.8	5.6	11.5	19.7	31.0	48.9	86.5
35	3.8	5.7	11.7	19.9	31.5	49.5	87.7
40	3.9	5.8	11.8	20.2	31.9	50.2	88.9
45	3.9	5.9	12.0	20.5	32.3	50.9	90.1
50	4.0	5.9	12.1	20.8	32.7	51.5	91.2
55	4.0	6.0	12.3	21.0	33.1	52.2	92.4
60	4.1	6.1	12.4	21.3	33.5	52.8	93.6

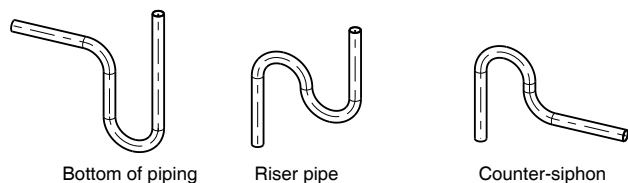
Correction factor, oil entrainment in the discharge lines						
Saturated evaporating temperature, °C	-7	-1	4	10	16	
Correction factor	0.94	0.97	1	1.03	1.06	

Table 1 "Discharge line piping" shows the different pipe diameters based on the unit size and the equivalent circuit length. These recommended diameters allow oil return within the application range.

**IMPORTANT: Siphon traps must be inserted in the vertical riser pipes:**

- *at the bottom of the piping*
- *every 3 m of vertical length*
- *at the top of the piping (counter-siphon).*

#### Examples



The siphon must be correctly sized to avoid trapping too much of the liquid oil/refrigerant mixture.

It is advisable to include a slight slope (10 to 20 mm/m) in the refrigerant flow direction in the horizontal piping between the 30WGA unit and the condenser.

## 8.4 - Liquid line sizing

The 30WGA compressors are supplied with an oil that is fully miscible with refrigerant R-410A in the liquid phase. Consequently low refrigerant velocities in the liquid lines are not a problem.

Table 2 "Liquid line piping" shows the different pipe diameters based on the unit size and the equivalent circuit length.

To determine the equivalent liquid line length the filter drier and the solenoid valve pressure drops must be taken into consideration. Table 4 below shows the equivalent length for each unit based on the diameter used.

**Table 4 - Equivalent length (m) for filter drier, solenoid valves, moisture sight-glass (standard supply)**

30WGA	020	025	030	035	040	045	050	060	070	080	090
1/2" diameter	4.2	4.2	4.2	4.2	4.2	4.2	2.2	-	-	-	-
5/8" diameter	12.3	12.3	12.3	12.3	12.3	12.3	5.4	5.4	5.4	5.4	5.4
3/4" diameter	-	-	-	-	29.9	29.9	12.4	12.4	12.4	12.4	12.4
7/8" diameter	-	-	-	-	-	-	-	-	25.1	25.1	25.1

The admissible pressure drops in the liquid lines depend mainly on the subcooling level of the liquid refrigerant at the condenser outlet. Pressure drops corresponding to 1.5 °C saturated temperature must not be exceeded.

If the liquid refrigerant head is very high, it may be necessary to increase the subcooling to prevent a phase change in the liquid line. A liquid-vapour heat exchanger or an additional coil can be used for this purpose.

It is advisable to include a slight slope (10 to 20 mm/m) in the refrigerant flow direction in the horizontal piping between the remote condenser and the 30WGA unit.

## 9 - 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.

### 9.1 - Operating precautions

Design the water circuit with the least number of elbows and horizontal pipe runs at different levels. The main points to be checked for the connection are:

- 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 and option 293 or 293A 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 vibration transmission.
- 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, insulate the piping and install an electric heater on the piping.

**NOTE: For units without option 293 or 293A, 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 include 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).**

**Damage due to absence of safety valve, expansion tank or screen filter (i.e. without option 293 or 293A) is not covered by the warranty.**

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.

If 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 2014/68/EU.

#### Carrier recommendations on heat exchange fluids:

- No  $\text{NH}_4^+$  ammonium ions in the water, they are very detrimental for copper. This is one of the most important factors for the operating life of copper piping. A content of several tenths of mg/l will badly corrode the copper over time (the plate heat exchangers used for these units have brazed copper joints).
- $\text{Cl}^-$  Chloride ions are detrimental for copper with a risk of perforations by corrosion by puncture. If possible keep below 125 mg/l.
- $\text{SO}_4^{2-}$  sulphate ions can cause perforating corrosion, if their content is above 30 mg/l.
- No fluoride ions (<0.1 mg/l).
- No  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$  ions with non negligible levels of

dissolved oxygen must be present. Dissolved iron < 5 mg/l with dissolved oxygen < 5 mg/l.

- Dissolved silicon: silicon is an acid element of water and can also lead to corrosion risks. Content < 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.
- Electric conductivity 10-600  $\mu\text{S}/\text{cm}$
- 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.

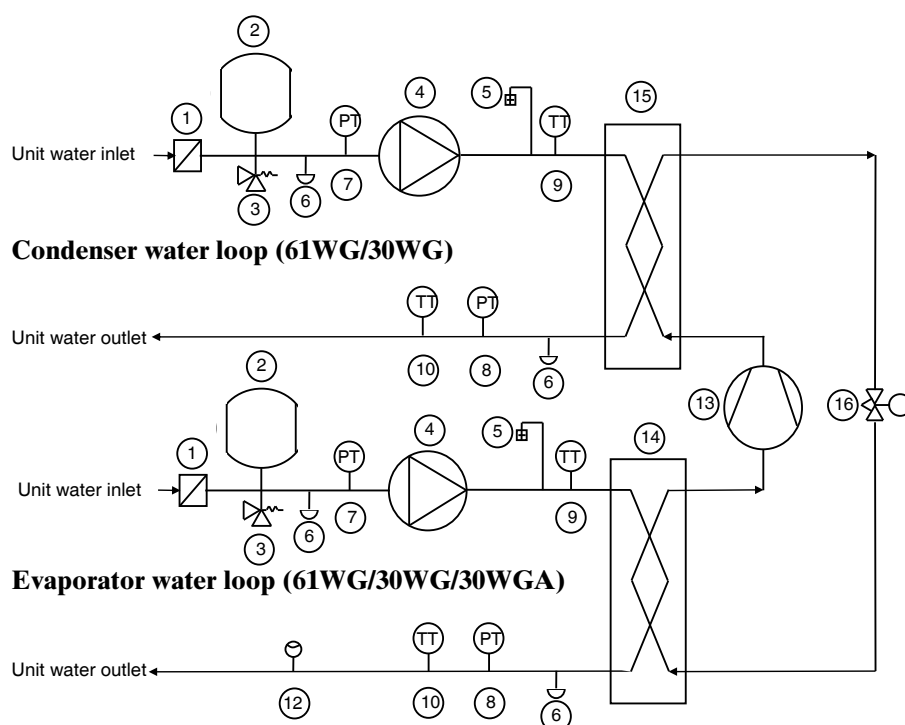
**ATTENTION: Filling, completing and draining the water circuit charge must be done by qualified personnel, using the air purges and materials that are suitable for the products.**

**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.**

## 9.2 - Water connections

The diagram below illustrates a typical hydronic installation. When the hydronic circuit is charged, use the air vents to evacuate any residual air pockets.

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



#### Components of unit and hydronic module

- 1 Victaulic screen filter (option 293 or 293A only)
- 2 Expansion tank (option 293 or 293A only)
- 3 Safety valve (option 293 or 293A only)
- 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.**

### 9.3 - 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 (chapter 5 - "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.**

### 9.4 - Flow switch (units without hydronic module)

**IMPORTANT: On 61WG/30WG/30WGA 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).

## 10 - NOMINAL WATER FLOW CONTROL WITH FIXED-SPEED PUMP

### 10.1 - 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 ( $\Delta T$ ) 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.

### 10.2 - 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.

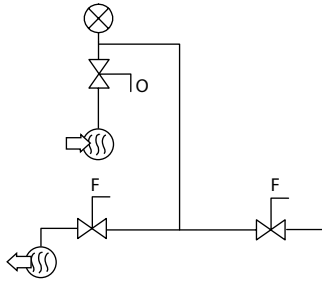
#### Proceed as follows:

Open the valve fully.

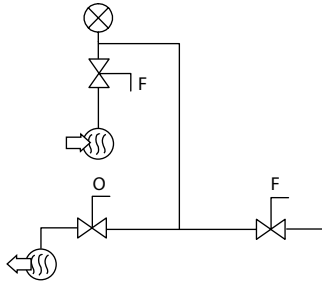
Start-up the pump using the forced start command (refer to the controls manual) and let the pump run for two consecutive hours to clean the hydronic circuit of the system (presence of solid contaminants).

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
- W Water inlet
- O Water outlet
- G 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, in units with option 293 or 293A, close the shutoff valves at the water inlet and outlet and remove the screen filter after emptying the hydronic section of the unit. In units without option 293 or 293A, clean the screen filter on hydronic circuit out 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.

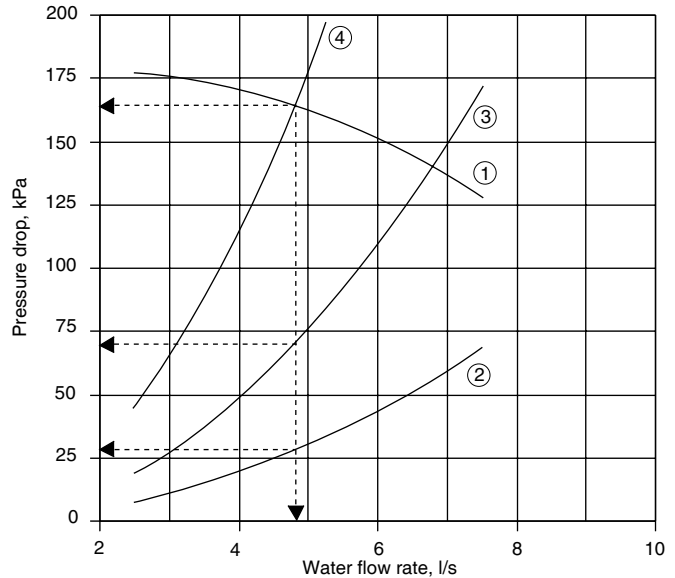
Proceed by successively closing the control valve until you obtain the specific pressure drop that corresponds to the nominal flow rate at the required unit operating point.

- 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 be 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

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

## 11 - NOMINAL WATER FLOW CONTROL WITH VARIABLE-SPEED PUMP

### 11.1 - Pump flow/pressure curve

61WG/30WG/30WGA 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/30WGA Pro-Dialog+ Control manual).

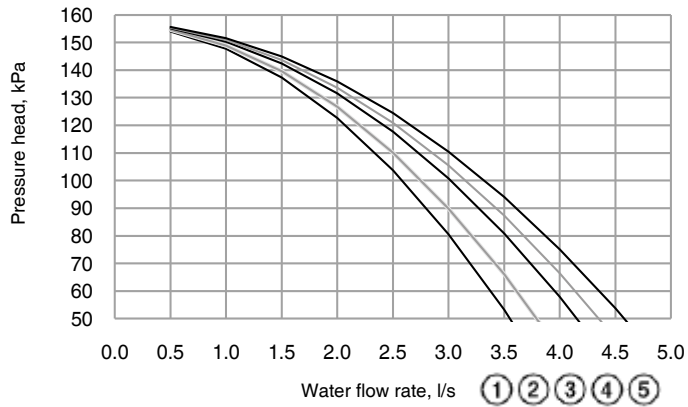
## 11.2 - Available external static pressure (variable-speed high-pressure pumps, units with hydronic module)

Data applicable for:

- Fresh water (without antifreeze) 20 °C
- In case of use of the glycol, the maximum water flow is reduced
- The curves represented below are in normal conditions: leaving water on the back side of the unit (without option 274).

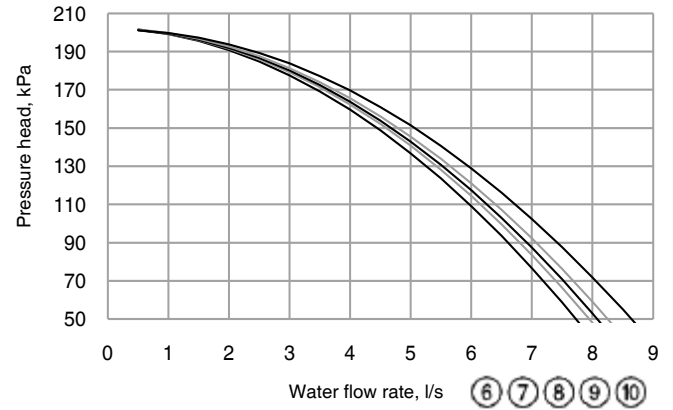
### Evaporator

#### 61WG/30WG/30WGA 020-045



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

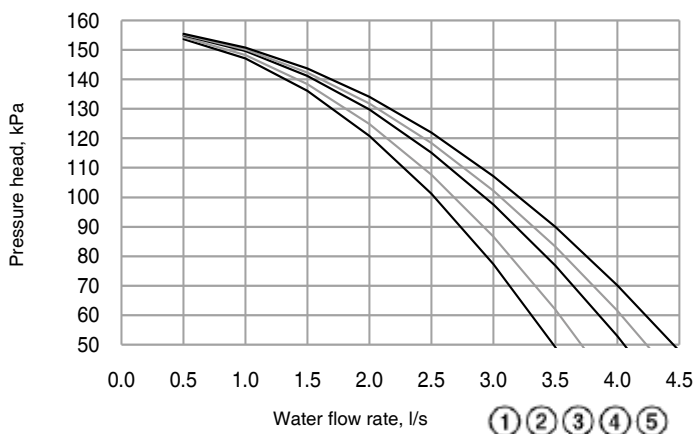
#### 61WG/30WG/30WGA 050-090



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

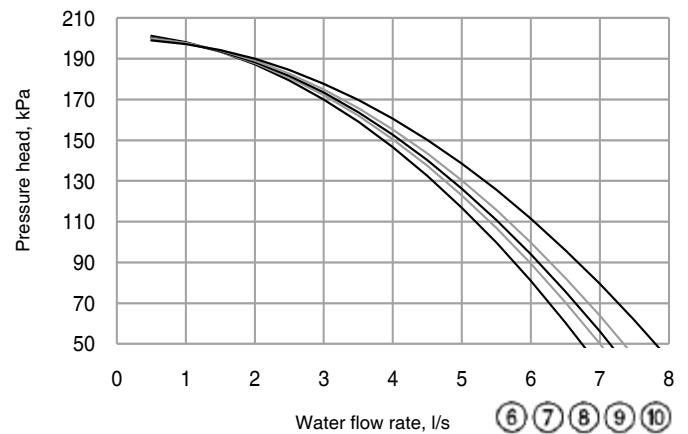
### Condenser

#### 61WG/30WG 020-045



- 1 61WG/30WG 020
- 2 61WG/30WG 025 to 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

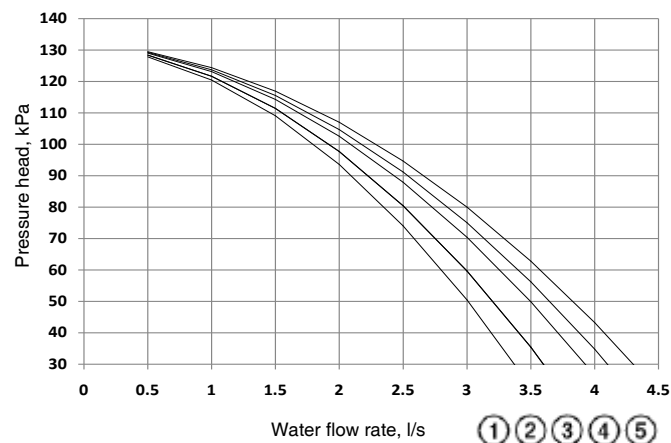
### 11.3 - Available external static pressure (fixed-speed low-pressure pumps, units with hydronic module)

Data applicable for:

- Fresh water 20 °C
- In case of use of the glycol, the maximum water flow is reduced
- The curves represented below are in normal conditions: leaving water on the back side of the unit (without option 274).

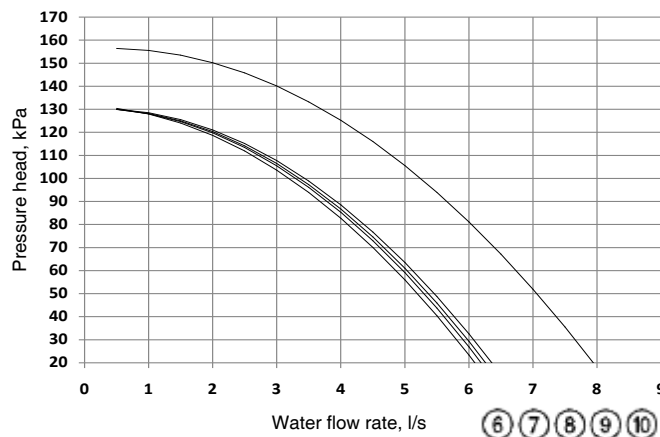
#### Evaporator

##### 61WG/30WG/30WGA 020-045



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

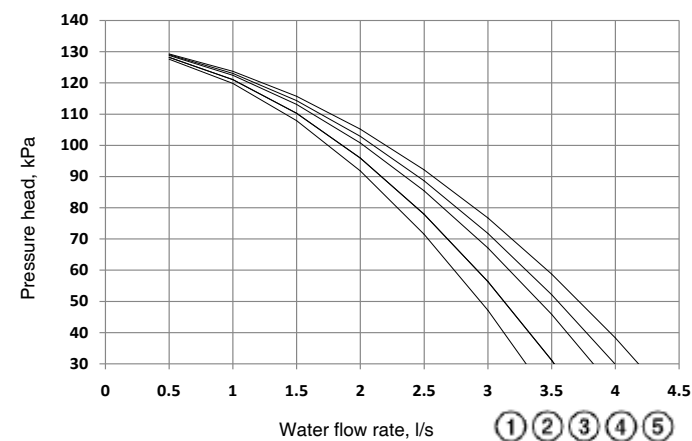
##### 61WG/30WG/30WGA 050-090



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

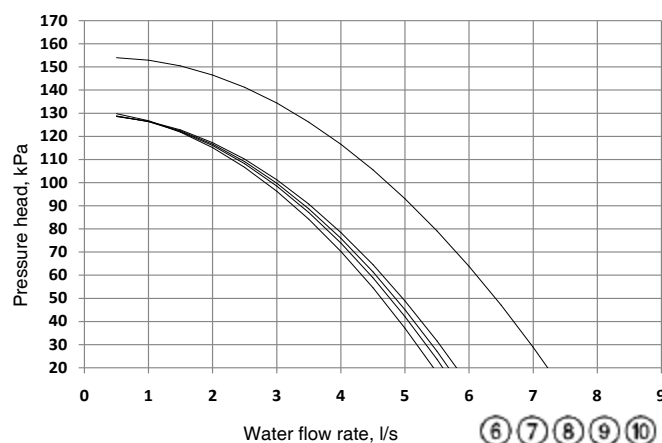
#### Condenser

##### 61WG/30WG 020-045



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

##### 61WG/30WG 050-090



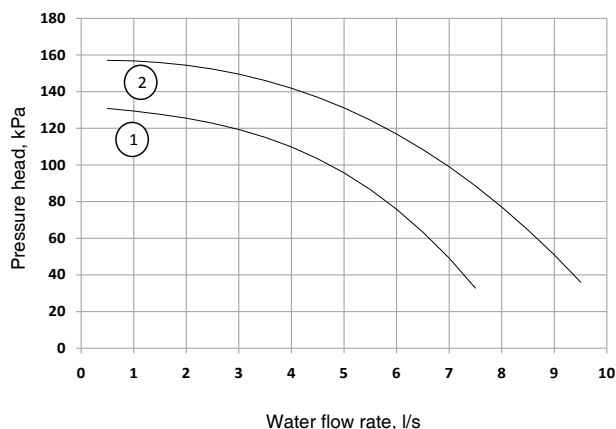
- 6 61WG/30WG 050
- 7 61WG/30WG 060
- 8 61WG/30WG 070
- 9 61WG/30WG 080
- 10 61WG/30WG 090

## 11.4 - Pump curve (units with hydronic modules)

Data applicable for:

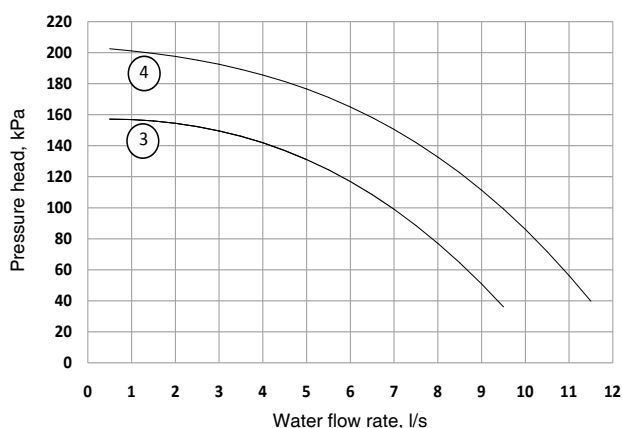
- Fresh water 20 °C
- In case of use of the glycol, the maximum water flow is reduced
- The curves represented below are in normal conditions: leaving water on the back side of the unit (without option 274).

### 11.4.1 - Low pressure pumps 61WG/30WG/30WGA (options 116T - 270T)



- 1 61WG/30WG/30WGA 020-080  
2 61WG/30WG/30WGA 090

### 11.4.2 - High pressure pumps 61WG/30WG/30WGA (options 116V - 270V)



- 3 61WG/30WG/30WGA 020-045  
4 61WG/30WG/30WGA 050-090

## 12 - OPERATION OF 61WG UNITS WITH SPECIFIC HEATING CONTROL (OPTION 153)

### 12.1 - Operating principle

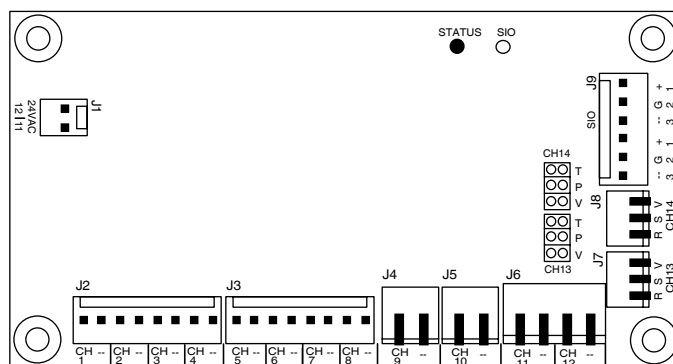
61WG units are specially designed to optimise the operation of heating installations that require hot-water production for a traditional heating system and domestic hot-water production.

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.

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



- Connector J2: Digital outputs CH 1 to 4 for fan stages 1 to 4.
- Connector J3: Digital output CH6 to control a directional on/off three-way valve
- Connector J6: Analogue input CH 11 for outside air temperature sensors
- Connector J6: Analogue input CH 12 for information on domestic hot water demand
- Connector J7: Analogue input CH 13 for information on domestic hot water demand
- Connector J8: Analogue input 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.

### 13 - OPERATION OF 61WG UNITS WITH THE HEATING SYSTEM MANAGER (HSM)

**HSM accessory: 00PPG000488000- or 00PPG000488100- or 00PPG000488200-**

The Heating System Manager (HSM) accessory allows improved integration of the 61WG heat pump to maximise energy efficiency performance.

With three system levels for nine typical configurations, most heating only applications are covered - from the simplest to the most complex, such as interfacing with a district heating system.

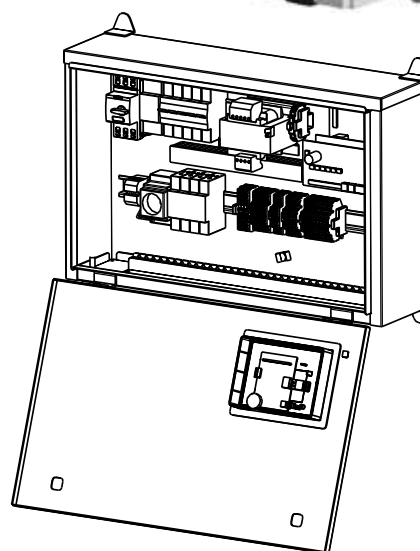
Each of these accessory configurations is described in detail in the user manual for these accessories. They offer:

- choice of additional control options (on/off volt-free contact or 0-10 V signal for increased performance)
- domestic hot water production temperature control and distribution.

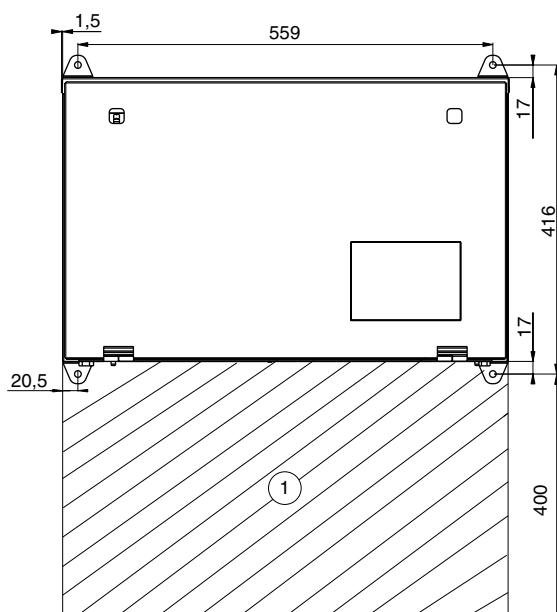
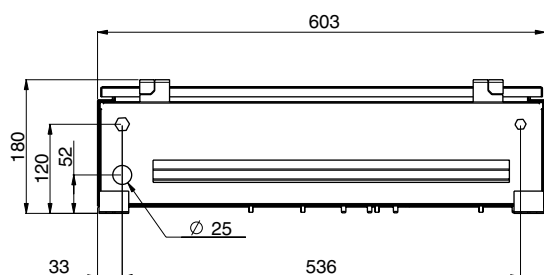
The control box can supply all auxiliary devices such as the circulating pumps or the mixing or switching valves.

The heat pump is controlled by a CCN bus and the control box includes an NRCP2-BASE board, a Pro-Dialog interface as well as all required sensors.

**HSM control box**

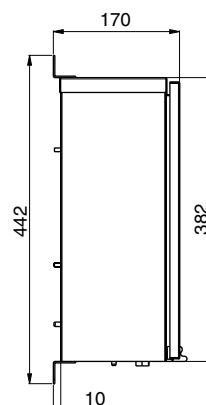


**HSM control box dimensions**



#### Installation safety notes

- The hydronic installation must be carried out by qualified personnel in accordance with applicable laws and following standard accepted practices.
- The hydronic installation must be regularly serviced.
- An incorrect hydronic installation that does not comply with the safety, electrical and thermal standards, as well as lacking/poor maintenance can lead to excessive pressures and cause piping breaks.



#### Legend:

All dimensions are in mm.

- 1 Clearance required to open the door and for customer connection

## 14 - 30WG UNIT OPERATION WITH A DRYCOOLER (OPTION 154)

### 14.1 - 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.

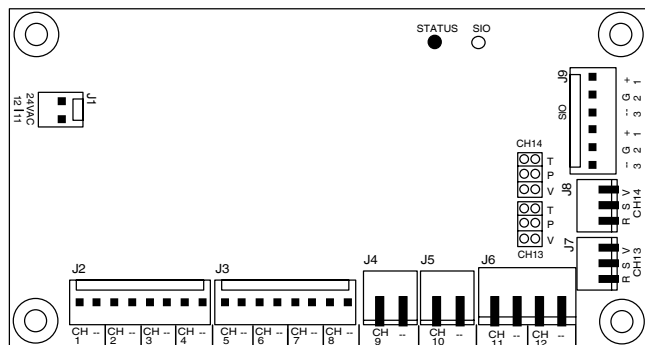
The installation of an operational system is limited on the condensing water loop side to connecting the drycooler entering and leaving water piping to the 30WG unit.

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.

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



- Connector J2: Digital outputs CH 1 to 4 for fan stages 1 to 4.
- Connector J3: Digital 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 dry-cooler leaving water and outside temperature sensors.
- 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 is 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 digital outputs permitting control of up to eight fan stages.

### 14.3 - Configuration of the number of fan stages and the automatic changeover of the fan stages

Please refer to the instructions in the 61WG/30WG/30WGA 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 digital outputs controlling the fans are activated by the control.

Pro-Dialog+ controls the automatic switching 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 a little or not at all and the shafts seizing up, especially during periods with a low cooling demand, when the outside temperature is low. Switching is often specified by the drycooler manufacturers to ensure a long operating life of fan motors that are only used a little or not at all in these particular operating conditions.

### 14.4 - Fan stage assignment

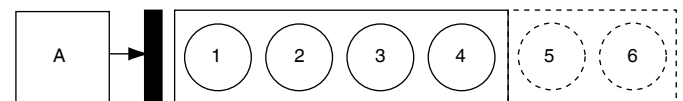
The minimum configuration of the number of fan stages is 2 for correct operation.

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.

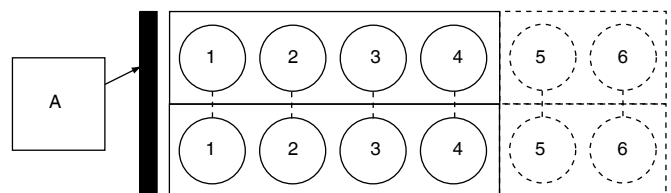
A drycooler with 4 or 6 fans installed in series for example along the length of the unit will result in a configuration of 4 or 6 fan stages.

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

## 14.5 - 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, described in chapter “Configuration of the number of fan stages and automatic changeover of the fan stages” is identical in this case.

## 14.6 - Drycooler installation on 30WG units

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.

## 15 - 30WGA UNIT OPERATION WITH A REMOTE AIR-COOLED CONDENSER (OPTION 154)

### 15.1 - Operating principle

30WGA units have been specially designed to optimise the operation of split installations, using air-cooled condensers as the chiller heat rejection system. The installation of an operational system is limited to the connection of the air-cooled condenser inlet and outlet piping to the 30WGA unit.

The Pro-Dialog+ control system of the 30WGA includes a logic to permit control the different fixed and variable-speed fan variants.

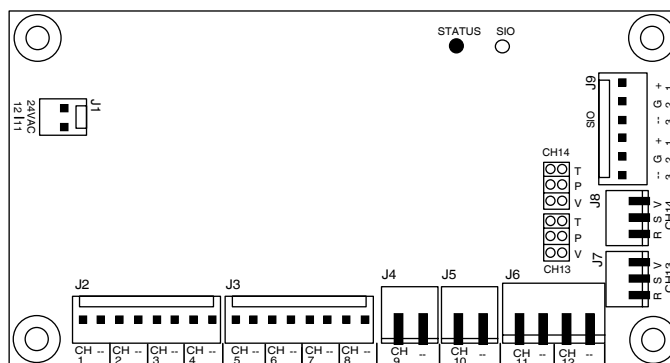
### 15.2 - Lead fan

The physical position of the air-cooled condenser with fixed or variable-speed fans depends on the position of the leaving liquid refrigerant manifold. In all cases there is always a so-called lead fan. This is the fixed or variable-speed fan that is physically the closest to the leaving liquid refrigerant manifold.

This ensures optimum subcooling on the condenser outlet side, especially at part load. This is the first fan to start in each circuit and the last fan to stop. A fan configuration with fixed-speed fans permits year-round system operation down to 0 °C outside temperature.

A fan configuration with a variable-speed lead fan permits year-round operation down to -10 °C outside temperature.

## 15.3 - Auxiliary electronic board (AUX1) - analogue and digital inputs and outputs - to control the remote air-cooled condenser



- Connector J2: Digital outputs CH 1 to 4 for fan stages 1 to 4.
- Connector J3: Digital outputs CH 5 to 8 for fan stages 5 to 8.
- Connectors J4 and J5: Analogue outputs 0-10 V dc for fan speed variation of the air-cooled condensers.
- Connector J6: Analogue input CH 12 for outside temperature sensors.
- Connector J9: Communication bus with NRCP master board of the 30WGA unit.

The electronic board specifically integrated in the control box of the condenser and a communication bus connected to the microprocessor board of the 30WGA is used for the overall system control.

The option supplied with the cooling unit must be installed in the condenser control box. Connect the unit to board AUX1 in the condenser, using a twisted and shielded type RS485 communication bus cable.

Pro-Dialog+ continuously optimises system operation to obtain the best system efficiency by controlling the number of fans required for any thermal load and outside temperature conditions.

The outside air temperature sensor is required for correct system operation (EXV, fans, condensing temperature, setpoint). The position of the temperature sensor must be chosen with great care and must be representative of the outside temperature (limit any other source that could have a negative influence on the control: gusts of wind, other heat sources such as sun radiation and hot air recycling).

## 15.4 - Configuration of the number of fan stages and fan type based on the air-cooled condenser model used in the installation

Please refer to the instructions in the Pro-Dialog+ IOM for the 61WG/30WG/30WGA units to carry out the parameter setting of the air-cooled condenser used in the installation:

- Use of speed variation on the lead fan(s)
  - Number of fixed-speed fans
- Based on the parameter setting used, the arrangement of the digital and corresponding analogue outputs controlling the fans will be activated by the control.

Pro-Dialog+ controls the automatic switching 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 a little or not at all and the shafts seizing up, especially during periods with a low cooling demand, when the outside temperature is low. Switching is often specified by the condenser manufacturers to ensure a long operating life of the fan motors that are only used a little or not at all in these particular operating conditions.

## 16 - START-UP

### 16.1 - 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 (61WG/30WG).
- For units without hydronic module, the water pump overheat protection devices must be connected in series with the pump contactor power supply (61WG/30WG/30WGA).
- 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 pipings are not 100% insulated whatever the options. 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/30WGA 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  $\pm 2\%$ .
- 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).
- Check the operation of the fans in the air-cooled condensers.

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

## 16.2 - 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.*

*For 30WGA units operating with a remote air-cooled condenser the compressor oil level must be monitored during the system start-up phase. This is to ensure that the oil charge of the original compressors is sufficient for the system size and the piping configuration. Once the oil level has stabilised, it must not be lower than 1/4 of the oil sight glass level for the compressors that operate.*

### 16.3 - Refrigerant charge adjustment

**IMPORTANT:** *It is imperative to empty the nitrogen holding charge from the system and evacuate the system before beginning to charge refrigerant into the unit. Never charge refrigerant into the low-pressure side of the unit. While charging refrigerant ensure that all fans of the outdoor unit are operating.*

With all fans operating add refrigerant until the subcooling (upstream of the expansion device) is between 4 and 8 K.

To achieve this:

Measure the refrigerant pressure at the level of the service valve in the liquid line of the 30WGA unit, measure the liquid line temperature as close as possible to the service valve.

Add charge until the refrigerant passing through the sight glass is 'clear': the refrigerant is now only liquid. Then complete the charge until the actual subcooling required is between 4 et 8 K, based on the liquid line pressure drops (filter drier, solenoid valve, special components and possible liquid head).

The actual subcooling is equal to the saturated temperature at the bubble point, minus the liquid line temperature measured. If the actual subcooling value is higher than 8 K, (unit outlet) an excess charge is possible. This excess charge translates to an excessive condensing pressure and increases the compressor power input.

If adding charge does not result in a clear sight glass and the condensing pressure rises above the acceptable values, ensure that the filter drier is not blocked and that one of the solenoid valves is not partially closed.

## 16.4 - Oil charge adjustment

If a suction riser is used, the oil charge must be adjusted. Add the equivalent volume to half of the lower part of each siphon trap (see figure below), when the unit is empty.

Oil volume for a siphon trap



## 16.5 - 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.

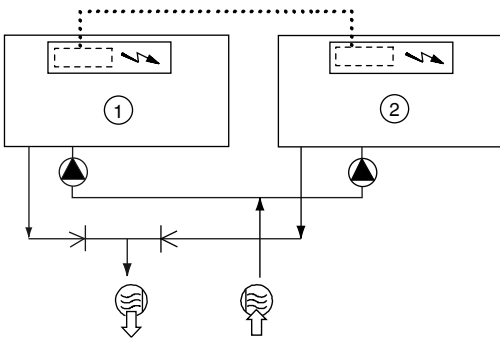
All remote controls of the master/slave assembly (start/stop, set point, load shedding etc.) are controlled by the unit configured as master and must only be applied to the master unit.

**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.

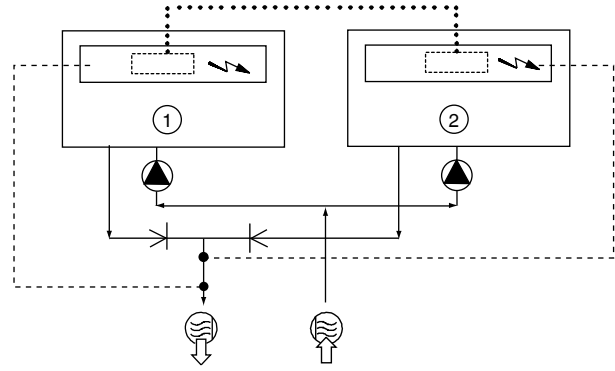
## 16.6 - Parallel or serial connection of two 61WG/30WG/30WGA units

### Entering water control for a hydronic kit



See legend in the next column.

## 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

## 17 - MAJOR SYSTEM COMPONENTS AND OPERATION DATA

### 17.1 - Compressors

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

30WGA split units operating with an air-cooled condenser, are supplied with the refrigerant circuit and consequently the compressor under nitrogen pressure of 100 kPa (1 bar).

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 (61WG/30WG/30WGA): 2820 kPa (28.2 bar)
- • Maximum operating pressure, high-pressure side (61WG/30WG): 4870 kPa (48.7 bar).
- • Maximum operating pressure, high-pressure side (30WGA): 4170 kPa (41,7 bars)
- 

These setpoint must be observed for 30WGA split units using an air-cooled condenser, when the installer checks the complete system leak tightness.

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.

## 17.2 - 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).

**NOTE: Only use oil approved for these compressors. Do not re-use oil that has been exposed to the air.**

**ATTENTION: R22 oils are not compatible with R410A oils and vice-versa.**

## 17.3 - Evaporators and water-cooled 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.

For 61WG/30WG units 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 may be the cause of the wear or corrosion by puncture.
- Filter the heat exchange fluid check and carry out internal inspections as described in EN 378, 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%.

## 17.4 - Electronic expansion valve (EXV)

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

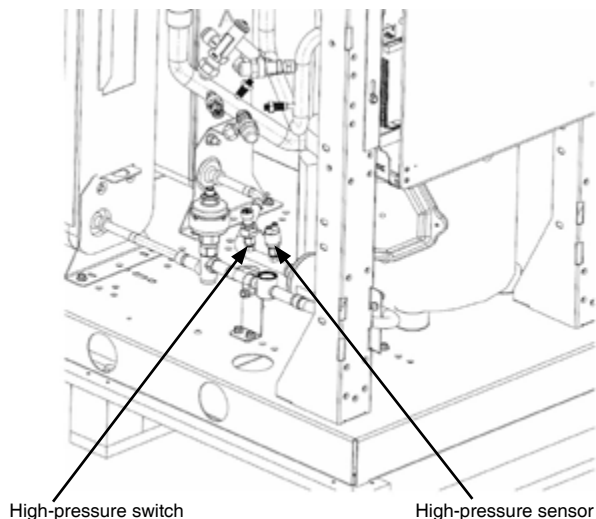
## 17.5 - Refrigerant

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

## 17.6 - High-pressure switch and high-pressure sensor

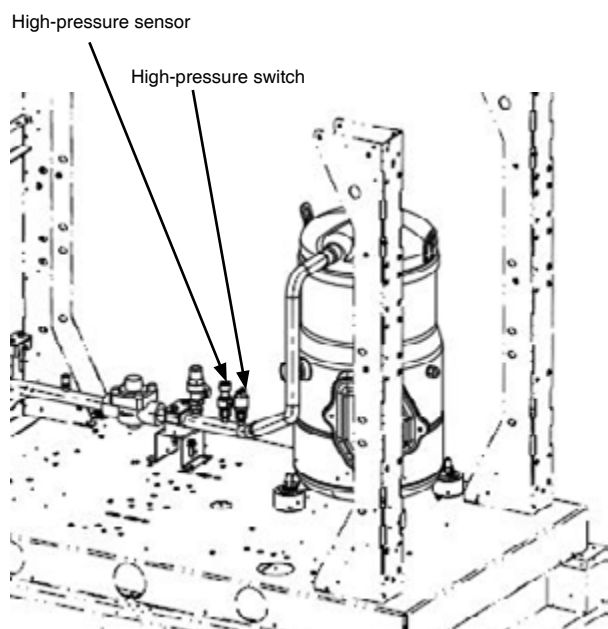
61WG/30WG units are equipped with an automatically reset safety pressure switch on the liquid line. Refer to the controls manual for the alarm acknowledgements.

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.

30WGA units are equipped with an automatically reset safety pressure switch on the discharge line. The pressure switch is specific for the 30WGA unit. Do not exchange it with other units including the 61WG/30WG units.



## 17.7 - 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.

Only 61WG/30WG units include high and low-pressure side safety valves. 30WGA units are only equipped with a low-pressure side safety valve. The installer must determine which accessories (safety valves, fuses etc.) are required to ensure that the completed high-pressure circuit complies with the applicable regulations and standards.

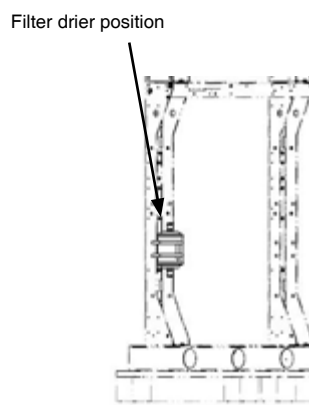
## 17.8 - Moisture indicator

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 insufficient charge or the presence of non-condensibles. Regarding 30WGA units, if the indicator paper in the sight glass is yellow during the delivery, it is not a non-conformity. It is necessary to verify if the indicator paper in the sight glass is yellow after the vacuum.

## 17.9 - 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.

30WGA are equipped as standard with a filter drier that needs to be soldered to the liquid line. It must be soldered as close as possible to the 30WGA unit, upstream of the solenoid valve and as soon as possible after the circuit has been exposed to the atmosphere while connecting the air-cooled condenser.



### 17.10 - Fixed-speed pump

This pump is factory-installed as standard to guarantee the nominal flow in the water loop. It is a fixed-speed pump with available system pressure. See the pump flow/pressure curves in chapters 10 and 11.

The nominal system flow rate must be adjusted with a manual control valve supplied by the customer (see chapters 10 and 11 on the control of the nominal water flow rate).

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.

**ATTENTION:** *Use of hydronic kit in an open loop is forbidden.*

### 17.11 - 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.

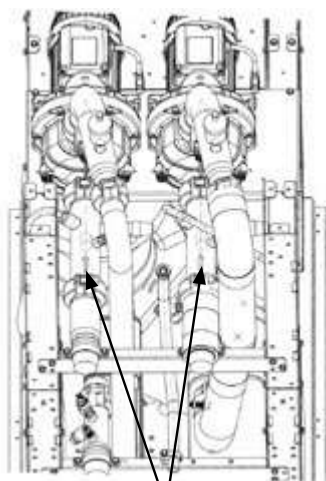
The maximum permitted concentration of the glycol additives is 35%.

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.

**ATTENTION:** *Use of hydronic kit in an open loop is forbidden.*

### 17.12 - Evaporator and condenser pump suction filter

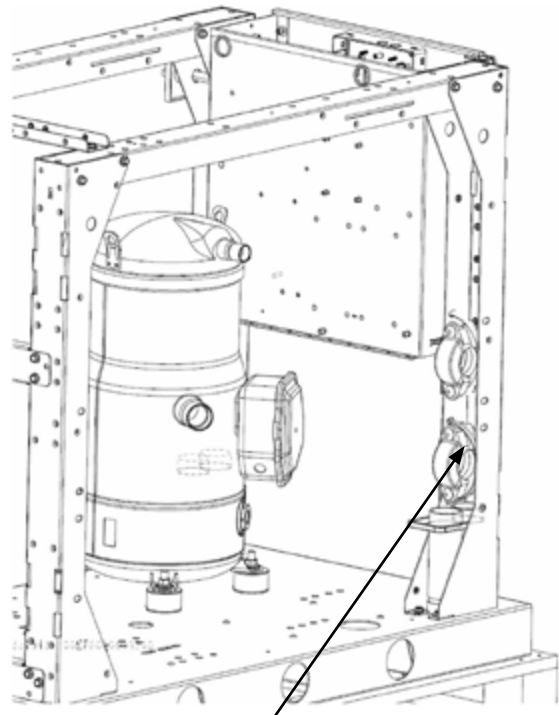


Filter positions in the unit

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.

### 17.13 - Connection sleeves



Position of the water connection sleeves in the unit

### 17.14 - 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.*

### 17.15 - Outside air temperature sensor

30WGA units require information about the outside air temperature. This is needed for correct system operation (EXV, fans, condensing temperature, setpoint).

In units without control of the remote condenser (standard), the sensor (25 m) is supplied with the control box of the 30WGA and must be installed near the air-cooled condenser.

In units with control of the remote condenser (option 154), the sensor is supplied with the option and must be installed near the air-cooled condenser.

The position of the temperature sensor must be chosen with great care and must be representative of the outside temperature (limit any other source that could have a negative influence on the control: gusts of wind, other heat sources such as sun radiation and hot air recycling).

## 18 - OPTIONS AND ACCESSORIES

Options	No.	Description	Advantages	Use
Low-temperature brine solution	6	Low temperature glycol solution production down to -12 °C with ethylene glycol	Covers specific applications such as ice storage and industrial processes	30WG 020-090
Soft starter	25	Electronic compressor starter	Reduced compressor start-up current	30WG 020-090 61WG 020-090 30WGA 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 30WGA 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 30WGA 020-090
Condenser insulation	86	Thermal condenser insulation	Optimisation for heating applications	30WG 020-090 61WG 020-090
LP single-pump, evap. side	116T	Evaporator hydronic module equipped with low pressure fixed-speed pump, drain valve, air vent and pressure sensors. Select option 293 for built-in safety hydraulic components.	Easy and fast installation	30WG 020-090 61WG 020-090 30WGA 020-090
HP variable-speed single-pump, evap. side	116V	Evaporator hydronic module equipped with high-pressure variable-speed pump, drain valve, air vent and pressure sensors. Select option 293 for built-in safety hydraulic components.	Easy and fast installation, reduced power consumption of the pump	30WG 020-090 61WG 020-090 30WGA 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 30WGA 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 30WGA 020-090
LON gateway	148D	Two-directional communications board, complies with Lon Talk protocol	Easy connection by communication bus to a building management system	30WG 020-090 61WG 020-090 30WGA 020-090
Built-in DHW and space heating control	153	Control board factory-installed on the unit, control using weather compensation, control of additional 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 or remote condenser for communication with the unit via a bus.	Permits the use of an energy-efficient plug-and-play system	30WG 020-090 30WGA 020-090
Low sound level	257	Compressor sound enclosure and sound insulation of main noise sources	Reduced sound emissions	30WG 020-090 61WG 020-090 30WGA 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 30WGA 020-090
Condenser screw connection sleeves	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 30WGA 020-090
Welded condenser connection sleeves	267	Welded condenser inlet/outlet connection sleeves	Allows welding of customer connections to the unit	30WG 020-090 61WG 020-090
LP single-pump, cond. side	270T	Condenser hydronic module equipped with low pressure fixed-speed pump, drain valve, air vent and pressure sensors. Select option 293A for built-in safety hydraulic components.	Easy and fast installation	30WG 020-090 61WG 020-090
HP variable-speed single-pump, cond. side	270V	Condenser hydronic module equipped with high-pressure variable-speed pump, drain valve, air vent and pressure sensors. Select option 293A for built-in safety hydraulic components.	Easy and fast installation, reduced power consumption of the 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 30WGA 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 30WGA 020-090
Filter drier with replaceable solid core	277	Filter the fine particles and eliminates humidity	Maintains the refrigerated circuit without humidity	30WGA 020-090
Safety hydraulic components, evap. side	293	Screen filter, expansion tank and safety valve integrated in the evaporator hydronic module	Easy and fast installation, operating safety	30WG 020-090 61WG 020-090 30WGA 020-090
Safety hydraulic components, cond. side	293A	Screen filter, expansion tank and safety valve integrated in the evaporator hydronic module	Easy and fast installation, operating safety	30WG 020-090 61WG 020-090
<b>Accessories</b>		<b>Advantages</b>	<b>Use</b>	
00PPG000488000- Heating System Manager type A: It controls one heat emitter type with an auxiliary electric heater or boiler.		Additional control box not supplied with the unit, to be installed remotely	Heating system control facilitated	61WG 020-090
00PPG000488100- Heating System Manager type B: It controls two heat emitter types (or independent zones) and domestic hot water production with an auxiliary electric heater or boiler.		Additional control box not supplied with the unit, to be installed remotely	Heating system control facilitated	61WG 020-090
00PPG000488200- Heating System Manager type C: It controls two heat emitter types (or independent zones) and domestic hot water production with a district heating network as auxiliary source.		Additional control box not supplied with the unit, to be installed remotely	Heating system control facilitated	61WG 020-090

## 19 - 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 can be used.

External visual checks: annex A and B of standard EN378.

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

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

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

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

### 19.1 - 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.**

## 19.2 - General system 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.
- Regularly check that the vibration levels remain acceptable and close to those at the start of using the unit.

### 19.3 - 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.**

### 19.4 - 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.

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

Change the refrigerant after an equipment failure, following a procedure such as the one described in NF E29-795 or carry out a refrigerant analysis in a specialist laboratory.

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

### 19.5 - 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  $P_s$  indicated on the compressor and unit name plates.
- If there is a leak, repair it and carry out the leak detection test again.

### 19.6 - 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. Never use the compressor as a vacuum pump.

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  $\mu$ m Hg).
2. Wait 30 minutes.
3. If the pressure increases rapidly, the system is not leak-tight. Localise and repair the leaks. Restart the evacuation procedure and repeat steps 1, 2, etc.
4. If the pressure increases 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  $\mu$ m 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.**

### 19.7 - 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.**

### 19.8 - Characteristics of R-410A

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

## 19.9 - 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.

### 19.10 - Tightening torques for the main electrical connections

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

### 19.11 - 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	100
Tapite screw M6	Panel fixing	7
H M6 screw	Stauff clamps	10

\* BPHE = Brazed plate heat exchanger

## 19.12 - 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 operations. 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.**

### 19.13 - 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.

### 19.14 - 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.

## 20 - 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.

### 20.1 - 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/30WGA 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.**

### 20.2 - 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/30WGA 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.

## 21 - START-UP CKECKLIST FOR 61WG/30WG/30WGA 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: Calculate the cooler pressure drop in performance data table (in the product data literature) to determine total litres per second (l/s) and find unit’s minimum flow rate.**

Total l/s = .....

l/s / nominal kW = .....

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

**Perform TEST function (indicate positive result):**

**WARNING: Once power is supplied to the unit, check the display for any alarms, such as phase reversal. Follow the TEST function instructions in the Controls and Troubleshooting literature (follow the procedure in the Controls IOM). 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, circuit A .....	Suction pressure, circuit B* .....
Discharge pressure, circuit A .....	Discharge pressure, circuit B* .....
Suction temperature, circuit A .....	Suction temperature, circuit B* .....
Discharge temperature, circuit A .....	Discharge temperature, circuit B* .....
Liquid line temperature, circuit A .....	Liquid line temperature, circuit B* .....
Compressor oil pressure A1** .....	Compressor oil pressure B1** .....
Compressor oil pressure A2** .....	Compressor oil pressure B2** .....

\* if available and installed  
\*\* if installed

**NOTES:**

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