

# EWAQ-G

Air cooled multiscroll  
chillers

# Installation, maintenance & operation manual

SS (Standard Efficiency - Standard Noise)

SR (Standard Efficiency - Reduced Noise)

XS (High Efficiency - Standard Noise)

XR (High Efficiency - Reduced Noise)

Refrigerant: R410A

D-EIMAC01208-16EN

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Thank you for purchasing this chiller

**This manual is an important support document for qualified personnel but it is not intended to replace such personnel.**



READ THIS MANUAL CAREFULLY BEFORE INSTALLING AND STARTING UP THE UNIT.

IMPROPER INSTALLATION COULD RESULT IN ELECTRIC SHOCK, SHORT-CIRCUIT, COOLANT LEAKS, FIRE OR OTHER DAMAGE TO EQUIPMENT OR INJURY.

THE UNIT MUST BE INSTALLED BY A PROFESSIONAL OPERATOR/TECHNICIAN.

UNIT STARTUP MUST BE PERFORMED BY AUTHORISED, TRAINED PERSONNEL.

ALL ACTIVITIES MUST BE CARRIED OUT IN ACCORDANCE WITH LOCAL LAWS AND REGULATIONS.

**IF THE INSTRUCTIONS IN THIS MANUAL ARE NOT ABSOLUTELY CLEAR, DO NOT INSTALL AND/OR OR START UP THE UNIT.**

IF CASE OF DOUBT CONTACT THE MANUFACTURER'S REPRESENTATIVE FOR ADVICE AND INFORMATION.

### Description

The unit purchased is a Water Chiller that is designed to cool water (or a water-glycol mixture) within certain limits which will be listed below. The unit operates based on the compression, condensation and evaporation of vapour as per the Carnot cycle and consists mainly of the following components:

- One or more scroll compressors which increase the pressure of the refrigerant gas from evaporation pressure to condensation pressure.
- A condenser where the refrigerant gas condenses under high pressure and transfers heat to the water.
- An expansion valve which allows the pressure of condensed liquid refrigerant to be reduced from condensation pressure to evaporation pressure.
- An evaporator, where the low pressure liquid refrigerant evaporates and chills the water.

### General Information



All the units are delivered with **wiring diagrams, certified drawings, ID plate and DoC (Declaration of Conformity)**. These documents list all the technical data of the unit acquired and **CONSTITUTE AN INTEGRAL AND ESSENTIAL PART OF THIS MANUAL**.

In the event of any discrepancy between this manual and the appliance documents, please refer to the documents that come supplied with the unit. In case of doubt, contact the manufacturer's representative.

The aim of this manual is to make sure that the installer and the qualified operator can properly commission, operate and maintain the unit without creating any risk to people, animals or things.

### Receiving the unit

The unit must be inspected for any possible damage immediately upon reaching final place of installation. All components described in the delivery note must be inspected and checked.

Should there be evidence of damage, do not remove the damaged components and immediately report the extent and type of damage both to the transportation company, asking them to inspect it, and the manufacturer's representative, sending if possible photos which may be useful in identifying those responsible.

Damage must not be repaired before the inspection of the transportation company representative and the manufacturer's representative.

Before installing the unit, check that the model and power supply voltage shown on the nameplate are correct. The manufacturer will not accept responsibility for any damage following acceptance of the unit.

### Storage

The unit must be protected from dust, rain, constant exposure to the sun and possible corrosive agents and rodents when being stored outside before installation.

Even though it is covered by a heat-shrinking plastic sheet, this is not intended for long-term storage and must be removed as soon as the unit is unloaded. The unit must be protected by tarpaulins or suchlike which are more suitable for the long term.

Storage conditions must be within the following limits:

Minimum ambient temperature: -20 °C

Maximum ambient temperature: +42 °C

Maximum relative humidity: 95% without condensation.

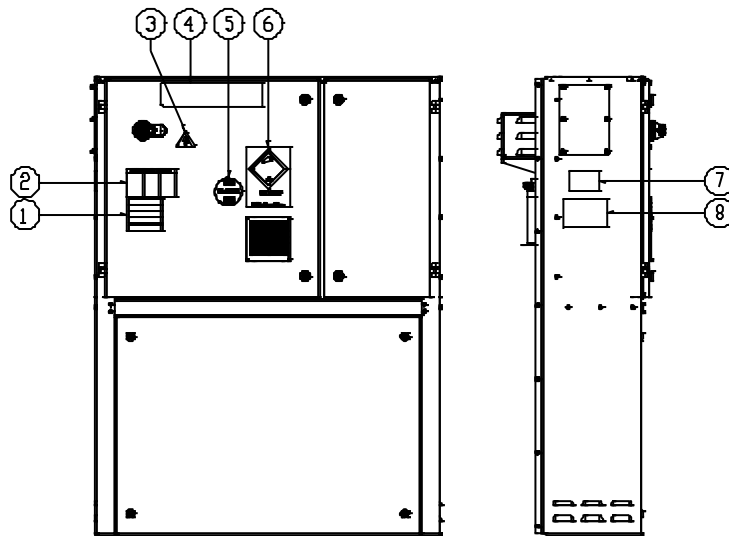
If the unit is stored at a temperature below the minimum ambient temperature, the components may be damaged, while at a temperature above the maximum ambient temperature, the safety valves could open and discharge the refrigerant into the atmosphere.

### Operation

Operation outside any of the above-mentioned limits may damage the unit.

In case of doubt, contact manufacturer's representative.

Figure 1 - Description of the labels applied to the electrics panel



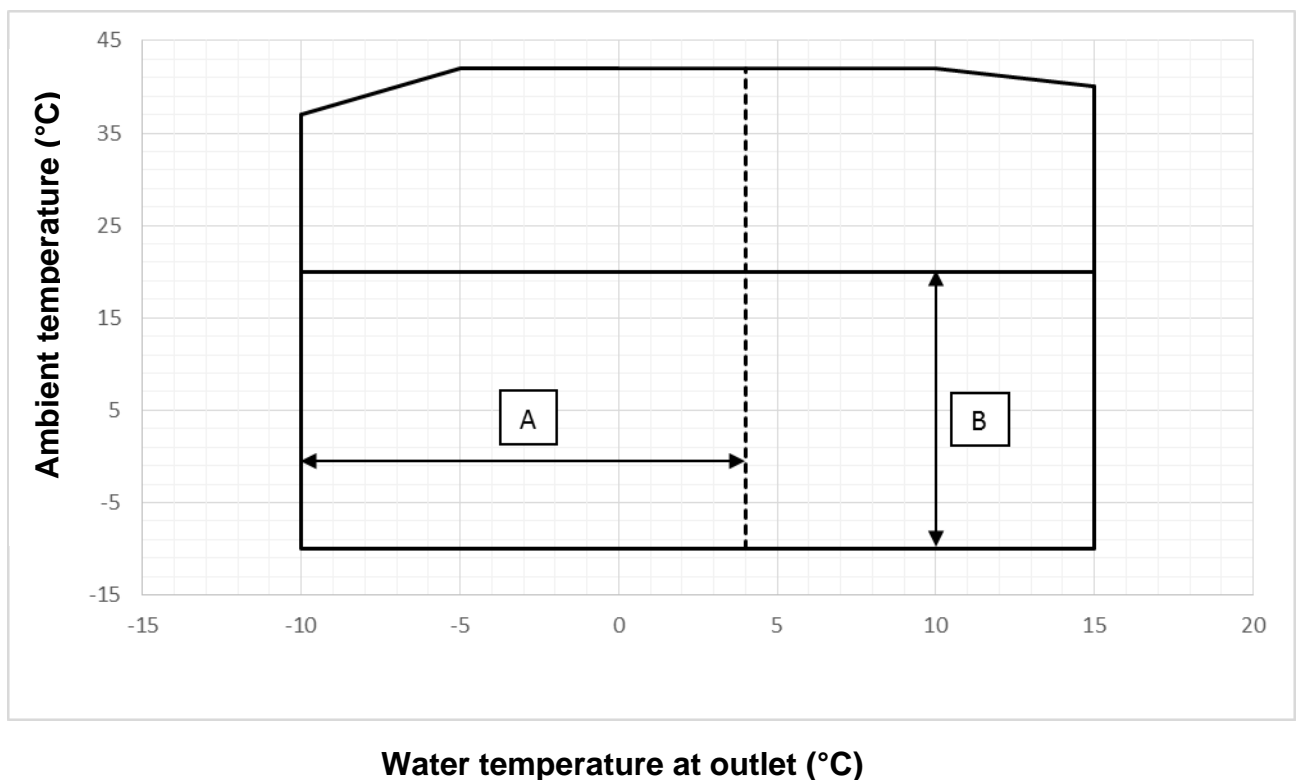
Identification of labels

1 – Slack electrical cable warning	5 – Type of gas
2 – Hazardous voltage warning	6 – Non flammable gas symbol
3 – Electrical hazard symbol	7 – Unit ID plate information
4 – Manufacturer's logo	8 – Lifting instructions

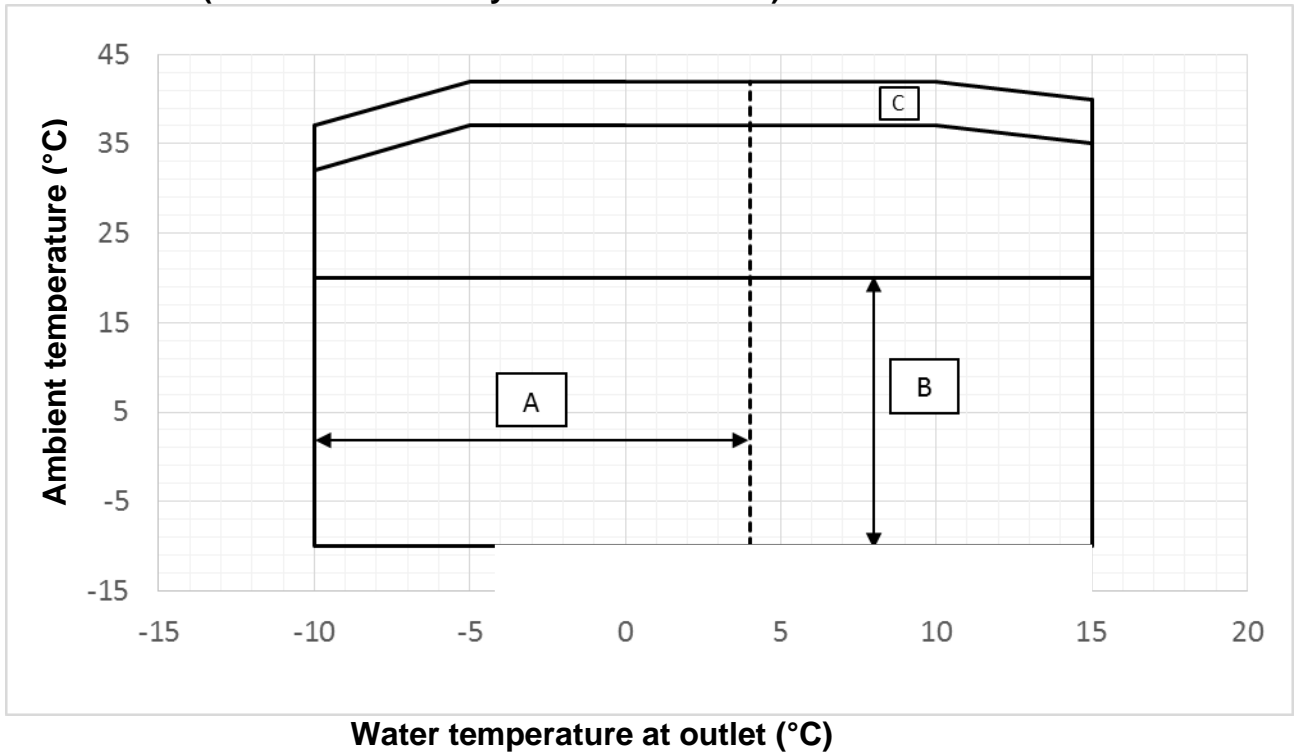
\*With the exception of the unit ID plate, which is always in the same position, the other plates may be in different positions depending on the model and options on the unit.

Figure 2 - Operating limits

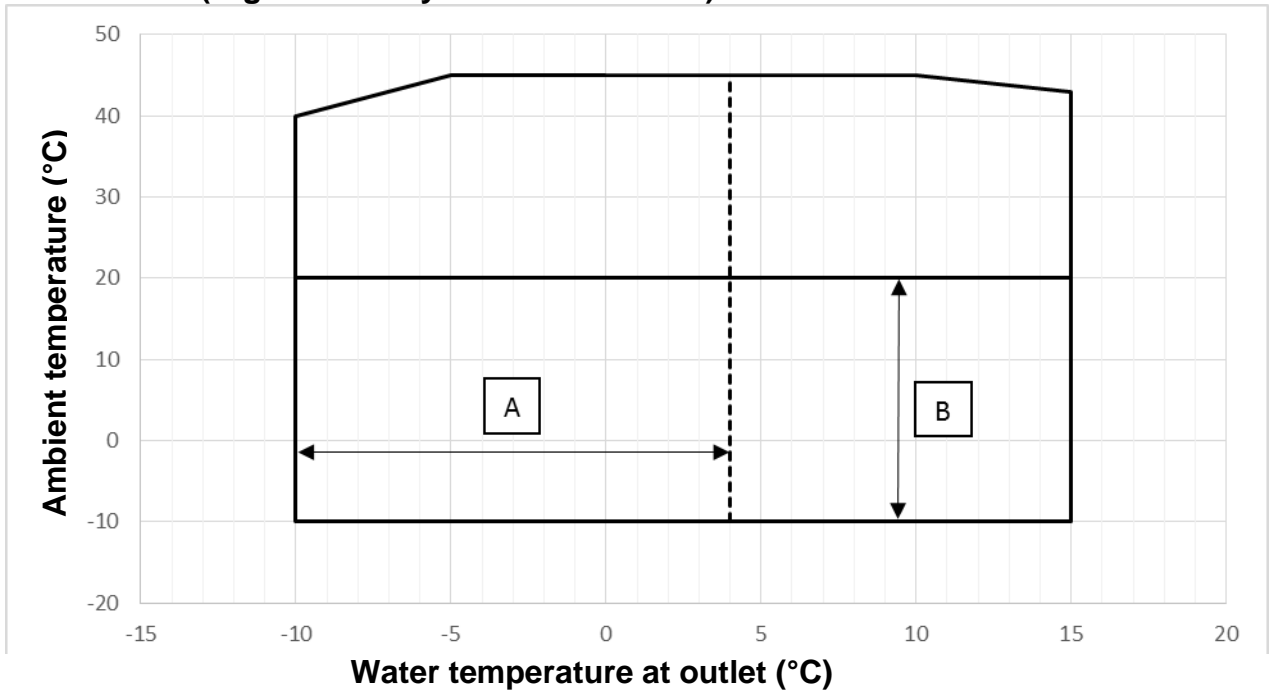
EWAQ G SS (Standard efficiency– Standard noise)



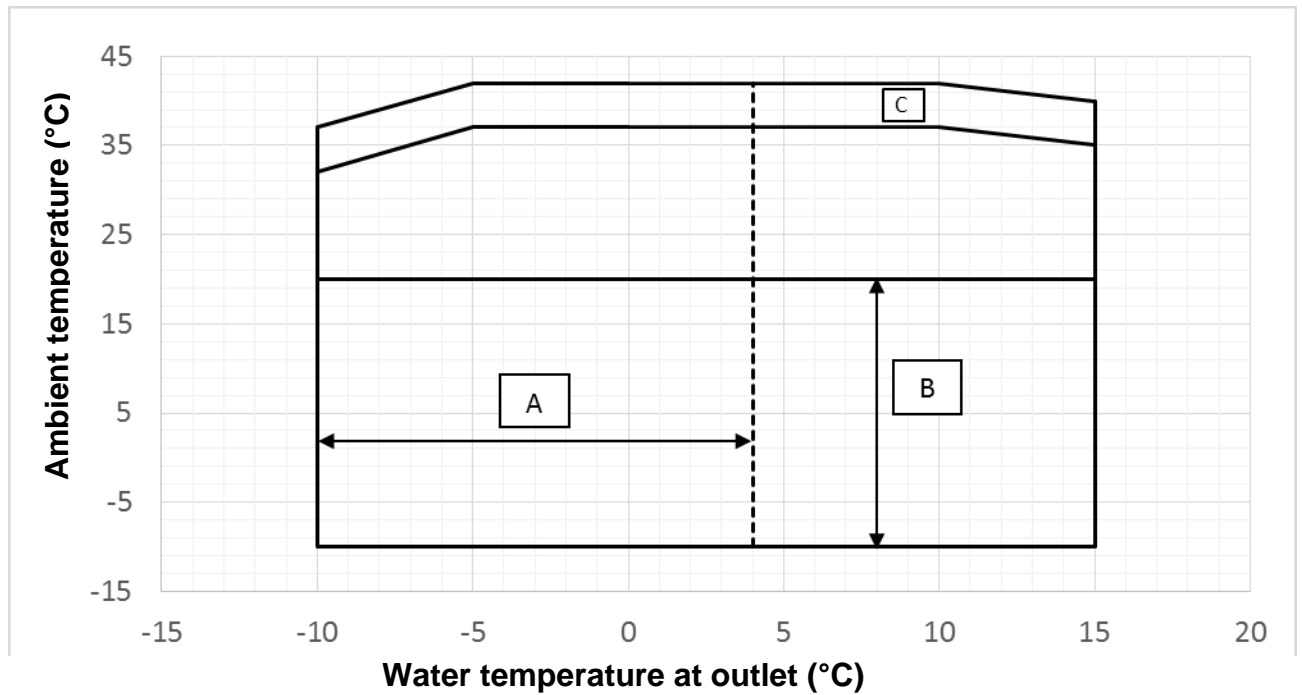
**EWAQ G SR (Standard efficiency – Reduced noise)**



**EWAQ G XS (High efficiency – Standard noise)**



## EWAQ G XR (High efficiency - Reduced noise)



### Notes

The diagram shows the guide lines for the range of operating limits. Refer to the Chiller Selection Software (CSS) for the true operating limits under working conditions for each model.

### Legend

**Ambient temperature (°C)** = Air temperature at condenser inlet (°C)

**Water temperature at outlet (°C)** = Water temperature at evaporator outlet (°C)

A = Operating with glycol

B = Operating with fan speed mode selected

C = Operating at maximum fan speed

**Table 1 - Evaporator – Difference in temperature  $\Delta t$  at Minimum and Maximum**

<b>A - <math>\Delta t</math></b>	<b>°C</b>	<b>8</b>
<b>B - <math>\Delta t</math></b>	<b>°C</b>	<b>4</b>

### Legend

A =  $\Delta t$  Maximum difference in evaporator water temperature

B =  $\Delta t$  Minimum difference in evaporator water temperature

**Table 2 – Evaporator – Scaling factor**

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
0.0176	1.000	1.000	1.000
0.0440	0.978	0.986	0.992
0.0880	0.957	0.974	0.983
0.1320	0.938	0.962	0.975

### Legend

A = Scaling factor ( $\text{m}^2 \text{ } ^\circ\text{C} / \text{kW}$ )

B = Refrigeration capacity correction factor

C = Power consumption correction factor

D = EER correction factor

**Table 3 - Air heat exchanger - Correction factor at altitude**

A	0	300	600	900	1200	1500	1800
B	1013	977	942	908	875	843	812
C	1.000	0.993	0.986	0.979	0.973	0.967	0.960
D	1.000	1.005	1.009	1.015	1.021	1.026	1.031

**Legend**

A = Altitude above sea level (m)

B = Atmospheric pressure (mbar)

C = Refrigeration capacity correction factor

D = Power consumption correction factor

- The maximum operating altitude is 2000 metres above sea level

- If the unit is to be installed at an altitude of between 1000 and 2000 metres above sea level, contact manufacturer.

**Table 4 – Minimum percentage of glycol for low air ambient temperature**

	AAT (2)	-3	-8	-15	-20
A (1)		10%	20%	30%	40%
	AAT (2)	-3	-7	-12	-20
B (1)		10%	20%	30%	40%

**Legend**

AAT = Ambient Air Temperature (°C) (2)

A = Ethylene glycol (%) (1)

B = Propylene glycol (%) (1)

(1) Minimum percentage of glycol to prevent the water circuit from freezing at the indicated ambient air temperature.

(2) Ambient air temperature which exceeds unit operating limits.

Water circuits must also be protected in winter even if the unit is not being used.

**Legend**

A = External Static Pressure (Pa)

B = Refrigeration capacity correction factor (kW)

C = Power consumption correction factor (kW)

D = Reduction of maximum temperature of the air which passes through the condenser

**Safety**

The unit must be firmly secured to the ground.

The following instructions must be followed:

- Never access electrical components without having first closed the main switch and switched off the power supply.
- Never access electrical components without some form of insulation. Never access electrical components if water and/or moisture are present.
- Always disconnect the power supply by closing the main switch before carrying out any work on the cooling fans and/or compressors. Failure to do so may result in serious injury.
- Sharp edges can cause injuries. Avoid direct contact with components and wear suitable PPE.
- Do not introduce solid objects into water pipes.
- A mechanical filter must be fitted to the water pipe connected to the heat exchanger inlet.
- The unit is supplied with high pressure switches and/or safety valves, that are installed on both the high-pressure and low-pressure sides of the refrigerant circuit: **pay attention.**

**It is absolutely forbidden to remove any protection system covering moving parts.**

In the event of a sudden stop, follow the instructions in the **Control Panel Instruction Manual** which is part of the documentation supplied with the unit.

We strongly recommend that installation and maintenance operations are performed alone but with other people present.

In the event of an accident or problem:

- Keep calm
- Press the alarm button, if present or close the main switch
- Move the injured person to a warm place far from the unit and in place him or her in the recovery position
- Immediately contact any emergency personnel in the building or the call the Emergency Services
- Wait until emergency personnel arrive and do not leave the injured person alone
- Give all necessary information to the emergency personnel.

### Positioning and assembly

The unit must be installed on a solid, perfectly level base. For earthing purposes, a solid cement base, that is wider than the unit, must be made. This base must be able to support the weight of the unit.

Anti-vibration supports must be installed between the frame of the unit and the cement base of the steel beams; for such installation follow the dimensional drawing supplied with the unit.

The frame of the unit must be perfectly levelled during installation, if necessary using shims to be inserted under the anti-vibration supports.

Before first start-up, the installation must be confirmed as being level and horizontal using a laser level or another suitable instrument.

Any error in the level and horizontal position must not be greater than 5 mm per unit up to 7 metres and 10mm per unit over 7 metres.

If the unit is installed in places that are easily accessible to people and animals, we recommend that protection grates are fitted all round to prevent access. To ensure optimal performance in installation site, the following precautions and instructions must be respected:

- Make sure that there is a strong, solid foundation to reduce noise and vibrations.
- Avoid installing the unit in areas that could be dangerous during maintenance operations, such as platforms without handrails, guide rails or in areas that fail to comply with requirements as regards free space around the unit.

The installer is responsible for calculating the best position for the unit.

It is vital that all minimum distances for all units are complied with to ensure there is adequate ventilation for the condenser racks.

When deciding where to position the unit and to ensure proper airflow, the following factors must be taken into consideration:

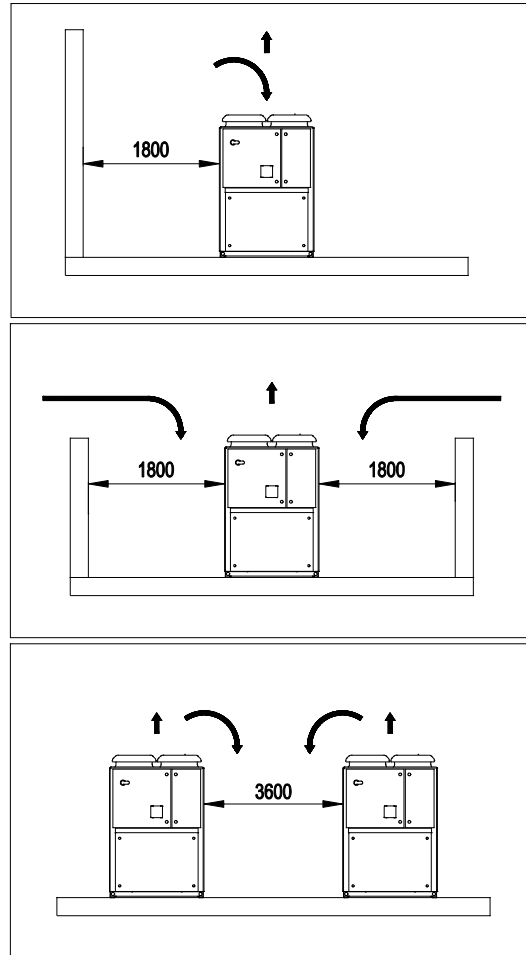
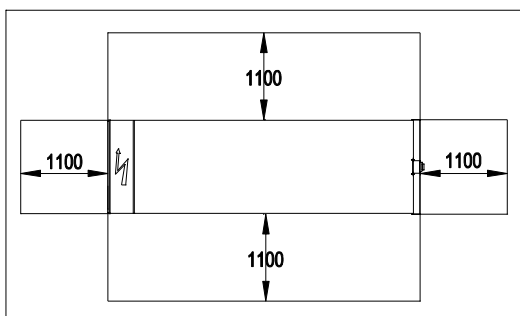
- avoid the recirculation of hot air
- avoid insufficient air supply for the air cooling condenser.

Both these conditions can cause an increase in condenser pressure which can lead to poor energy efficiency and refrigerating capacity.

If two or more units are positioned alongside each other, we recommend leaving a space of at least 3600 millimetres between condenser racks. Each side of the unit must be accessible for post-installation maintenance work.

It is therefore vital that the minimum access distances in front of the electrical panel are complied with: 1500 mm. The manufacturer cannot be expected to consider all these factors. In the unit design stage, we therefore recommend that you consult an authorised manufacturer representative for further solutions.

**Figure 3 - Distances to be complied with:**



### Noise

The noise generated by the unit is mainly due to the rotation of compressors.

The noise level for each model size is listed in sales documentation.

If the unit is correctly installed, operated and maintained, noise emission levels do not require any special protective devices to operate continuously close to the unit without any risk.

In case of installation with special noise requirements it may be necessary to install additional noise softening devices.

### Handling and lifting

The unit must be lifted with the utmost care and attention, following the lifting instructions shown on the label applied to the electric panel. Lift the unit very slowly, keeping it perfectly level.

Avoid bumping and/or shaking the unit during handling and loading/unloading operations from the transportation vehicle, push or pull the unit only using the base frame. Secure the unit inside the truck to prevent it from moving and causing damage. Do not allow any part of the unit to fall during loading/unloading.

All units have lifting points. Only these points may be used for lifting the unit, as shown in the following figure. Handling and lifting with a fork lift is the only alternative method.

- ⚠ Both the lifting ropes and the spacing bars must be strong enough to support the unit safely. Check the weight of the unit on its name plate, because



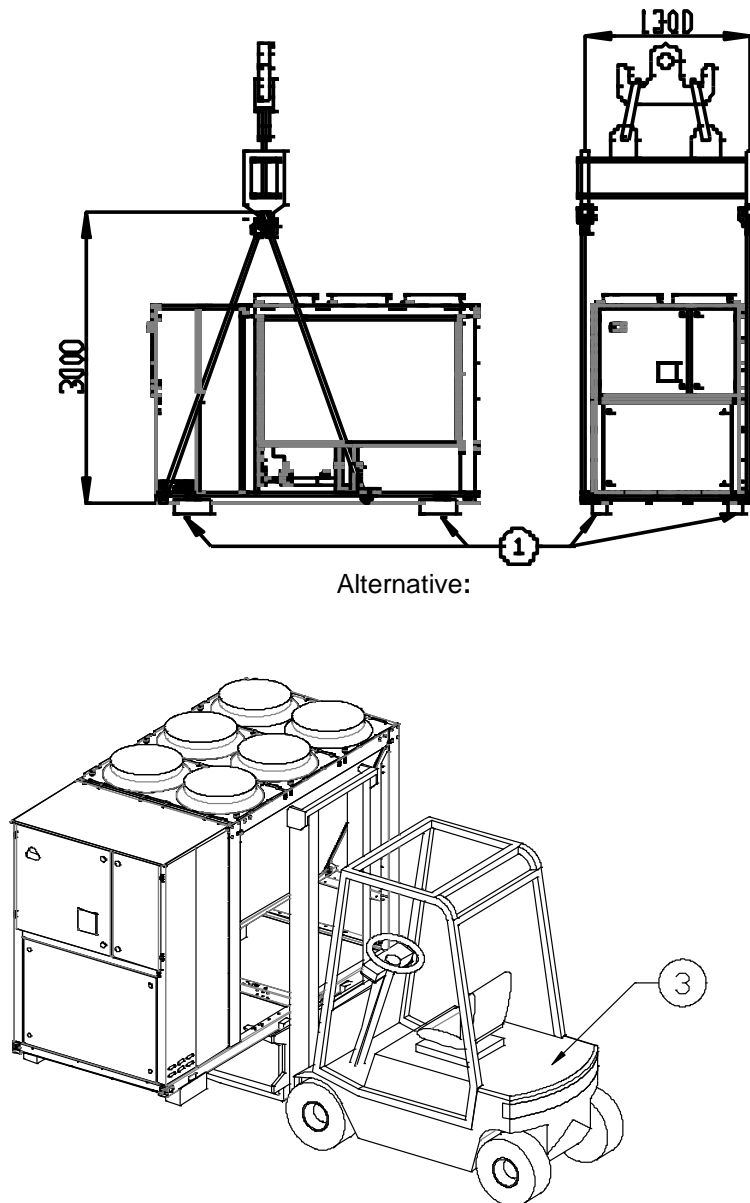
the weight of the units varies depending on the accessories requested.

#### Figure 4 – Lifting the unit

(The illustration only shows the version with 6 fans. The lifting method used for other versions with a different number of fans is identical)

N.B.: Follow the lifting instructions provided in the ID plate fastened to the electrical panel.

8: 8 – Lifting instructions



- 1 – Remove before installation
- 2 - Only use lifting hooks fitted with appropriate locking devices.  
The hooks must be safely fastened before performing the handling
- 3 – Fork lift truck

#### Sound protection

When sound levels require special control, great care must be taken to isolate the unit from its base by appropriately applying anti-vibrating elements. Flexible joints must also be installed on the water connections.

#### Hydraulic circuit for connection to the unit

The pipes must be designed with the lowest number of elbows and the lowest number of vertical changes of direction. In this way, installation costs are reduced considerably and system performance is improved.

The water system must have:

1. Anti-vibrating pipes which reduce the transmission of vibrations to the structures.
2. Isolating valves to isolate the unit from the water system of the installation during service operations.
3. Manual or automatic air venting device at the system's highest point.; drain device at the system's lowest point.
4. Neither the evaporator nor the heat recovery device must be positioned at the system's highest point.
5. A suitable device that can maintain the water system under pressure.
6. Water temperature and pressure indicators to assist the operator during service and maintenance.
7. A water filter or a device that can remove particles from the liquid and is mandatory at the entry of the evaporator.  
The filter can be installed at the pump inlet when it is placed on the evaporator water inlet pipe but only if the cleanliness of the water installation between the pump and the evaporator is guaranteed. Any waste in the evaporator will void the unit guarantee.
8. If the unit is being replaced, empty and clean the entire water system before installing a new one and prior to starting it, carry out adequate tests and chemical treatments of the water.
9. If glycol is added to the water system to provide anti-freeze protection, the performance of the unit will decrease. All unit-protection systems, such as anti-freeze, and low-pressure protection will need to be readjusted to offset the low pressure.
10. Before insulating water piping, check that there are no leaks.
11. Check that the pressure of the water does not exceed the design pressure of the water side heat exchangers and install a safety valve on the pipe of the water.
12. Install a suitable expansion tank.

#### **CAUTION**

**To avoid damage, install an inspectionable filter on the water pipes at the entry to the heat exchangers.**

#### **Pipe insulation**

The complete water circuit, including all pipes, must be insulated to avoid condensate from forming and reducing cooling capacity.

Protect water pipes from freezing during the winter (using for example a glycol solution or a heating cable).

#### **Installing the flow switch**

To guarantee sufficient water flow to the entire evaporator, it is vital that a flow switch be installed on the water circuit which can be positioned on the incoming or outgoing water pipes. The purpose of the flow switch is to stop the unit in the event of interrupted water flow, thus protecting the evaporator from freezing. The manufacturer may offer a flow switch specially selected for this purpose.

This paddle-type flow switch is suitable for heavy-duty applications and 2 1/2" pipe diameters.

It has a clean contact that is electrically connected to the terminals shown in the wiring diagram, and must be calibrated so that it intervenes when the flow of the water of the evaporator drops below 80% of the nominal flow and in any case within the limits listed in the following table.

#### **Preparing and checking the water circuit connection**

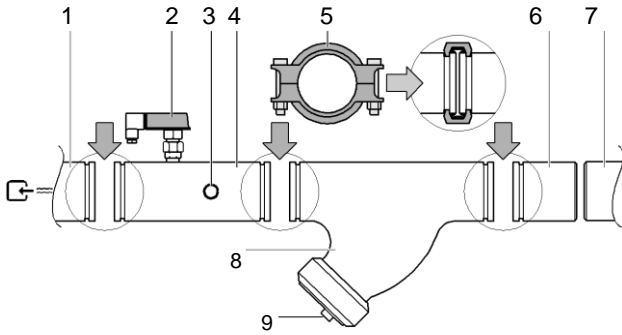
The units have a water input and output for the connection of the chiller to water circuit of the system. This circuit must be connected to the unit by an authorised technician and must comply with all the current national and European regulations on the subject.

**NOTE** - The components listed below are not included with the unit, but are supplied upon request, **also if their installation is compulsory.**



If dirt penetrates the water circuit, there could be problems. Therefore always remember the following when connecting the water circuit:

1. Only use pipes that are clean inside.
2. Keep the end of the pipe facing downward when removing any burrs.
3. Cover the end of the pipe when inserting it through a wall to avoid dust and dirt getting in.
4. Clean the pipes of the system located between the filter and the unit, with running water, before connecting it to the system.



- 1 Evaporator water inlet
- 2 Flow Switch
- 3 Water inlet sensor
- 4 Water inlet pipe with flow switch and water inlet temperature sensor
- 5 Joint
- 6 Counter-pipe
- 7 In situ water pipe circuit
- 8 Filter
- 9 Filter and cup

The water in the system must be particularly clean and all traces of oil and rust must be removed. Fit a mechanical filter at the entry of every heat exchanger. Failure to install a mechanical filter can allow solid particles and/or welding burrs to get inside the exchanger. We recommend installing a filter with a filtering mesh with holes not larger than 1.1mm in diameter.

The manufacturer cannot be held responsible for any damage to the exchangers if the mechanical filters are not installed.

### Water treatment

Before putting the unit into operation, clean the water circuit. Dirt, scale, debris and other material can accumulate inside the heat exchanger and reduce both its heat exchanging capacity and the flow of the water. Correct water treatment can reduce the risk of corrosion, erosion, scale formation, etc. The most suitable treatment must be selected depending on the place of installation, considering the water system and the characteristics of the water.

The manufacturer is not responsible for any damage or malfunctions of the equipment.

The quality of the water must comply with the specifications listed in the following table.

	Circulating water	Water supply	Possible problems
<b>Items to be checked</b>			
pH at 25°C	6.8~8.0	6.8~8.0	Corrosion + limescale
Electrical conductivity [mS/m] at 25°C	<40	<30	Corrosion + limescale
Chloride ions [mg Cl <sup>-</sup> /l]	<50	<50	Corrosion
Sulphate ions [mg SO <sub>4</sub> <sup>2-</sup> /l]	<50	<50	Corrosion
Alkalinity M (pH4.8) [mg CaCO <sub>3</sub> /l]	<50	<50	Limescale
Total hardness [mg CaCO <sub>3</sub> /l]	<70	<70	Limescale
Calcium hardness [mg CaCO <sub>3</sub> /l]	<50	<50	Limescale
Silicon ions [mg SiO <sub>2</sub> /l]	<30	<30	Limescale
<b>Elements of reference</b>			
Iron [mg Fe/l]	<1.0	<0.3	Corrosion + limescale
Copper [mg Cu/l]	<1.0	<0.1	Corrosion
Sulphur ions [mg S <sup>2-</sup> /l]	Not detectable	Not detectable	Corrosion
Ammonium ions [mg NH <sub>4</sub> <sup>+</sup> /l]	<1.0	<0.1	Corrosion
Remaining Chloride [mg Cl/l]	<0.3	<0.3	Corrosion
Free Carbide [mg CO <sub>2</sub> /l]	<4.0	<4.0	Corrosion
Index of stability	-	-	Corrosion + limescale



The water pressure must not exceed the maximum operating pressure for the unit.

**NOTE** - Include adequate protection systems in the water circuit to make sure that the pressure of the water never exceeds the maximum limit allowed.

### Water flow and volume

G EWAQ~G SS model	Minimum water flow l/s	Maximum water flow l/s
EWAQ075G-SS	2.16	4.32
EWAQ085G-SS	2.40	4.80
EWAQ100G-SS	2.76	5.52
EWAQ110G-SS	3.06	6.12
EWAQ120G-SS	3.36	6.72
EWAQ140G-SS	4.02	8.04
EWAQ155G-SS	4.44	8.88

G EWAQ-G SR model	Minimum water flow l/s	Maximum water flow l/s
EWAQ075G-SR	1.98	3.96
EWAQ085G-SR	2.28	4.56
EWAQ100G-SR	2.64	5.28
EWAQ110G-SR	2.88	5.76
EWAQ120G-SR	3.12	6.24
EWAQ140G-SR	3.72	7.44
EWAQ155G-SR	4.14	8.28
<b>EWAQ-G XS model</b>		
EWAQ080G-XS	2.28	4.56
EWAQ090G-XS	2.58	5.16
EWAQ105G-XS	3.00	6.00
EWAQ115G-XS	3.36	6.72
EWAQ130G-XS	3.78	7.56
EWAQ150G-XS	4.26	8.52
<b>EWAQ-G XR model</b>		
EWAQ080G-XR	2.16	4.32
EWAQ090G-XR	2.46	4.92
EWAQ105G-XR	2.88	5.76
EWAQ115G-XR	3.18	6.36
EWAQ130G-XR	3.60	7.20
EWAQ150G-XR	4.02	8.04

To ensure correct operation of the unit, the flow of water in the evaporator must fall within the operating sphere specified in the preceding table and there must be a minimum volume of water in the system.

The distribution circuits of the cold water should have a minimum content of water to avoid an excessive number of start-up and shut-downs of the compressor. Every time the compressor goes into operation, an excessive amount of oil from the compressor starts circulating in the refrigerant circuit and at the same time there is an increase of the temperature of the compressor stator, generated by the inrush current of the start-up. Therefore, to avoid damage to the compressors, the application of a device has been planned to limit frequent shut-downs and start-ups: in one hour, there will only be 6 start-ups of the compressor.

The system where the unit is installed must therefore ensure that the overall content of water allows the unit to operate continuously and therefore offers greater environmental comfort. The minimum water content per unit must be calculated approximately using the following formula:

$$M \text{ (litres)} = 5 \text{ (l/kW)} \times P \text{ (kW)}$$

Where:

M = minimum content of water per unit expressed in litres

P = refrigerating capacity of the unit expressed in kW

This formula is valid with the standard parameters of the microprocessor. To determine most accurately the quantity of water, we recommend contacting the designer of the system.

#### Anti-freeze protection for evaporators and recovery exchangers

When the entire system of the cooling installation is being designed, two or more of the following anti-freeze

protection methods should be considered at the same time:

1. Continuous circulation of water flow inside the exchangers
2. Additional heat insulation and heating of exposed piping
3. Emptying and cleaning the heat exchanger when it is not in use and its maintenance in an anti-oxidant atmosphere (nitrogen).

**As an alternative, it is possible to add an appropriate amount of glycol (antifreeze) to the water circuit.**

The installer and/or local personnel in charge of maintenance, must make sure that anti-freeze protection methods are in use and ensure that the appropriate maintenance operations of the antifreeze protection devices are always carried out. Failing to follow the instructions above could result in damage to the unit. Damage caused by freezing is not covered by the guarantee.

#### Electrical system General specifications

The units must be connected to a TN power supply system.

If the units must be connected to a different type of power system, for example the IT system, please contact the factory.



All the electrical connections to the unit must be carried out in compliance with national laws and European directives and regulations in force.

All installation, running and maintenance activities must be carried out by qualified personnel.

Refer to the specific wiring diagram for the unit purchased. Should the wiring diagram not be on the unit or should it have been lost, please contact the manufacturer's representative who will send you a copy.

In the event of any discrepancies between what is written on the wiring diagram and a visual check of the electric wires of the command and control panel, contact the manufacturer representative.

Use only copper conductors to avoid overheating or corrosion in the connection points, with resulting risk of damage to the unit.

To avoid interference, all the command and control cables must be connected separately from the power cables, using more than one cable duct for this purpose.

Before carrying out servicing work on the unit, close the general disconnection switch located on the main power supply.

**WARNING:** If the unit is off but the disconnection switch is in the open position, the circuits not being used are still live.

Never open the compressor terminal board without first having disconnected the unit main switch.

Simultaneous mono and three-phase loads and any imbalance between phases can cause leakage to earth of up to 150mA during the normal unit operations.

The protection systems for the power supply must be designed based on the values mentioned above.

## Wiring at the installation site



Wiring operations at the installation site and on other components must be performed by an authorised technician and must comply with current relevant national and European laws.

On-site wiring must be carried out in compliance with the wiring diagram supplied with the machine and the instructions listed below.

Use a dedicated electric circuit. Never use a power supply shared with other equipment.

**NOTE** - Check all the operations listed below on the wiring diagram in order to better understand how the equipment works.

Component table:

F1, 2	Main appliance fuses
L1, 2, 3	Main power supply terminals
PE	Main earth terminal
FS	Flow Switch
Q10	Main insulator switch
---	On-site wiring

## Electric circuit and wiring requirements

1. The power supply to the unit must be prepared so that it can be turned on and off independently from that of other system components or other appliances in general.
2. Create an electrical circuit for connecting the unit. This circuit must have protective and safety devices fitted i.e. a main switch and a fuse for each phase where required by legislative requirements in the country of installation as well as an earth leakage detector.



Turn off the main insulator switch before making any connections (turn off the switch, remove or disable the fuses).

## Connection of the unit power supply

Using suitable cable, connect the power circuit to terminals L1, L2 and L3 on the electric panel.

**WARNING: Never twist, pull or apply weight to the main switch terminals. The power supply cables must be supported by adequate systems.**

The wires connected to the switch must comply with the insulation distance and the distance of surface insulation between the active conductors and the earth, in accordance with IEC 61439-1, Table 1 and 2 and local national laws.

The cables connected to the main switch must be tightening using a torque wrench and complying with the unified tightening values relative to the quality of the screws of the washers and the nuts used.

Connect the earth wire (yellow/green) to the PE earth terminal.

The cross section of the protective equipotential conductor (earth conductor) must comply with Table 1 of EN 60204-1 below.

Cross-sectional area of copper phase conductors supplying the equipment	Minimum cross-sectional area of the external protective copper conductor
S mm <sup>2</sup>	Sp mm <sup>2</sup>
S ≤ 16	S
16 < S ≤ 35	16
S > 35	S/2

In any event, the protective equipotential conductor (earth conductor) must have a cross section of no less than 10 mm<sup>2</sup>, in compliance with Point 8.2.8 of the same standard.

## Interconnecting wires



The unit cannot operate without a flow of water thanks to the flow switch. However, for extra safety a water pump status contact must be fitted in series with the contact(s) of the flow switch(es) to prevent the unit operating without the pump.

If the unit is operated with no flow of water very severe damage can occur (evaporator freezing).

- Clean contacts  
The controller is fitted with various clean indicator contacts. These contacts can be wired as shown in the wiring diagram. The maximum current allowed is 2 A.
- Remote inputs  
In addition to the clean contacts, it is also possible to install remote inputs. For installation consult the wiring diagram.

## Before start-up



The unit must be started for the first time by DAIKIN authorised personnel ONLY.

The unit must absolutely not be started, even for a very short period of time, without having checked it in minute detail filling out the following list at the same time.

	<b>Checks to be performed before starting the unit</b>
<input type="checkbox"/> 1	Check for exterior damage
<input type="checkbox"/> 2	Open all the <b>closing valves</b>
<input type="checkbox"/> 3	Make sure that all the parts of the unit are pressurised with refrigerant (evaporator, air condenser, compressors) before connecting it to the hydraulic circuit.
<input type="checkbox"/> 4	Upstream of the unit, install a <b>main switch, main fuses</b> and, where required by legislative requirements in the country of installation, an earth leakage detector. <i>To select these components, consult the information on the unit ID plate and the relative technical catalogue.</i>
<input type="checkbox"/> 5	Connect the main voltage and check that it falls within the limits allowed of $\pm 10\%$ compared to the classification listed on the ID plate. The <b>main power supply</b> must be arranged so that it can be turned on or off independently from that of other parts of the system or other appliances in general. <i>Check the wiring diagram, terminals L1, L2, L3 and PE.</i>
<input type="checkbox"/> 6	Install the <b>water filter kit(s)</b> (also when not supplied) at the inputs to the exchangers.
<input type="checkbox"/> 7	Supply water to the exchangers and make sure that the <b>flow</b> falls within the limits shown in the table in the "Load, flow and quality of the water" section.
<input type="checkbox"/> 8	The pipes must be completely <b>flushed out</b> . See also the chapter "Preparing, checking and connecting the water circuit".
<input type="checkbox"/> 9	Connect the <b>pump contact(s)</b> in series with the contact of the flow meter(s) so that the unit can only be activated when the water pumps are operating and the flow of water is sufficient.
<input type="checkbox"/> 10	Check the <b>oil level</b> in the compressors.
<input type="checkbox"/> 11	Check that all the <b>water sensors</b> are fastened correctly to the heat exchanger (also see the label applied to the heat exchanger).

**NOTE** - Before starting the unit:

- read the operating manual which comes supplied with the unit. It will help you better understand how the appliance and electronic controller work;
- close the doors on the electrical panel.

**Open the isolation and/or shut off valves**

Before start-up, make sure that all the isolation and/or switch off valves are completely open.

**User responsibilities**

It is essential that the user is properly trained and becomes familiar with the system before operating the unit. In addition to reading this manual, the user must study the microprocessor operating manual and the wiring diagram in order to understand the start-up sequence, operation, shutdown sequence and operation of all the safety devices.

The user must keep a log (unit booklet) of the operating data of the unit installed and of all periodical maintenance and service activities.

If the operator notes abnormal or unusual operating conditions, he or she must consult the authorised manufacturer's technical service.

**Periodical maintenance**

The periodical maintenance activities (minimum), are listed in the specific table of this manual.

**Service and limited guarantee**

All the units are tested at the factory and guaranteed for a specific period of time.

These units have been developed and constructed according to high quality standards to provide years of problem-free operation. It is however important to ensure proper and periodical maintenance in accordance with all the procedures listed in this manual and with good practice of machine maintenance.

We strongly recommend taking a maintenance contract with a service authorised by the manufacturer. The experience and skill of the personnel can ensure efficient operation without problems over time.

**The unit must be covered by a suitable maintenance program from the time it is installed and not just from the start-up date.**

Keep in mind that operating the unit in an inappropriate manner, beyond its operating limits or not performing proper maintenance according to this manual will void the guarantee.

Observe the following points in particular, in order to comply with the guarantee:

1. The unit cannot function beyond the specified limits.
2. The electrical power supply must be within the voltage limits and without voltage harmonics or sudden changes.
3. The three-phase power supply voltage must not have an imbalance between the phases greater than 2% in accordance with EN 60204-1:2006 (Chapter 4-Paragraph 4.3.2).
4. In the event of electrical problems, the unit must remain off until the problem has been solved.
5. Do not disable or cancel the safety devices, whether mechanical, electrical or electronic.
6. The water used for filling the water circuit must be clean and suitably treated. A mechanical filter must be installed at the point closest to the evaporator inlet.

7. Unless specifically agreed at the time of order, the flow of water of the evaporator must never exceed 120% or be below 80% of the nominal capacity and in any case within the limits shown in this manual.

For Groups belonging to this category, various national laws call for a periodical control by an authorised organisation. We recommend you contact such an organisation to also request authorisation for start-up.

### Mandatory periodical checks and start-up of Groups (units)

These Groups (units) are included in category II and III of the classification established by European Directive PED 2014/68/EU.

**Table 5 - Periodic maintenance programme**

List of Activities	Weekly	Monthly (Note 1)	Annually / Seasonally (Note 2)
<b>General:</b>			
Collecting operational data (Note 3)	X		
Visual inspection of machine for any damage and/or loosening		X	
Verification of thermal insulation integrity			X
Clean and paint where necessary (Note 4)			X
Water analysis			X
Check flow switch operation		X	
<b>Electrics:</b>			
Check start-up sequence			X
Check wear on contacts – Replace if necessary			X
Check the that all electrical terminals are tight – Tighten if necessary			X
Clean the inside of the electrical panel (Note 4)		X	
Clean the ventilation filters on the electrical panel (Note 4)		X	
Visual inspection of components for any signs of overheating		X	
Check operation of compressor and electrical resistance		X	
Use a Megger to test the insulation of the compressor motor			X
<b>Refrigerant circuit:</b>			
Carry out a refrigerant leak test		X	
Check the refrigerant level through the inspection port – level full	X		
Check for a load loss in filter dryer (where present)		X	
Analyse the compressor vibrations			X
Check the safety valve (Note 5)		X	
<b>Heat exchangers:</b>			
Check that the heat exchangers are clean (Note 6)			X

#### Notes

- 1) Monthly activities include all weekly ones
- 2) Annual activities (or start of the season) include all weekly and monthly ones
- 3) The unit's operating values should be measured on a daily basis for more thorough monitoring
- 4) If a unit is installed in an "aggressive" environment, this activity should be carried out once a month.

The following are considered "aggressive" environments:

- Environments with a high concentrations of industrial waste gases in the atmosphere:
- Environments near the sea (salty air);
- Environments near the desert with the risk of sandstorms;
- Other aggressive environments.

#### 5) Safety valve

Check that the cap and seal have not been tampered with.

Check that the safety valve outlet has not been accidentally blocked by foreign objects rust or ice.

Check the date of manufacture on the safety valve and replace it as required by current national legislative requirements.

6) Clean the water heat exchangers. Particles and fibres can block heat exchangers. An increase in water flow or a drop in thermal efficiency indicates that the heat exchangers are blocked.

Clean the air heat exchanger cooling fins. If a unit is installed in an environment where there is a high concentration of particles in the air, the condenser may need to be cleaned often.

### Bleeding refrigerant gas from the safety valve

Do not bleed refrigerant gas from the safety valve at the installation site.

If necessary, the valve can be fitted with bleed hoses whose cross section and length comply with national legislative requirements and European Directives.

**Important information regarding the refrigerant used**

This product contains fluorinated greenhouse gases.  
Do not release the refrigerant gas into the atmosphere.

Refrigerant type: R410A

GWP value: 2087.5

(1) GWP = Global Warming Potential

The amount of refrigerant needed for standard operation is indicated on the unit ID plate.  
The actual quantity of refrigerant contained in the unit is listed on a silver plate inside the electrical panel.  
Depending on national or European legislative requirements periodical inspections may be required to check for potential refrigerant leaks. Please contact your local dealer for more information.

**Product lifespan**

Our products have a lifespan of 10 (ten) years.



## Factory and Field charged units instructions

(Important information regarding the refrigerant used)

The refrigerant system will be charged with fluorinated greenhouse gases.  
Do not vent gases into the atmosphere.

1 Fill in with indelible ink the refrigerant charge label supplied with the product as following instructions:

- the refrigerant charge for each circuit (1; 2; 3)
- the total refrigerant charge (1 + 2 + 3)
- **calculate the greenhouse gas emission with the following formula:**  
GWP value of the refrigerant x Total refrigerant charge (in kg) / 1000

	a		b	c		p	
	Contains fluorinated greenhouse gases					CH-XXXXXXXX-KKKKXX	
m	<b>R410A</b>	1	=	[ ]	+	[ ]	kg
n	GWP: 2087,5	2	=	[ ]	+	[ ]	kg
		3	=	[ ]	+	[ ]	kg
		1 + 2 + 3	=	[ ]	+	[ ]	kg
	Total refrigerant charge Factory + Field			[ ]			kg
	GWP x kg/1000			[ ]			tCO <sub>2</sub> eq

- a Contains fluorinated greenhouse gases
- b Circuit number
- c Factory charge
- d Field charge
- e Refrigerant charge for each circuit (according to the number of circuits)
- f Total refrigerant charge
- g Total refrigerant charge (Factory + Field)
- h **Greenhouse gas emission** of the total refrigerant charge expressed as tonnes of CO<sub>2</sub> equivalent
- m Refrigerant type
- n GWP = Global Warming Potential
- p Unit serial number

2 The filled out label must be adhered inside the electrical panel.

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



### NOTICE

In Europe, the **greenhouse gas emission** of the total refrigerant charge in the system (expressed as tonnes CO<sub>2</sub> equivalent) is used to determine the maintenance intervals. Follow the applicable legislation.

### Formula to calculate the greenhouse gas emission:

GWP value of the refrigerant x Total refrigerant charge (in kg) / 1000

Use the GWP value mentioned on the greenhouse gases label. This GWP value is based on the 4th IPCC Assessment Report. The GWP value mentioned in the manual might be outdated (i.e. based on the 3rd IPCC Assessment Report)

## Disposal

The unit is made of metal, plastic and electronic components. All these components must be disposed of in accordance with relevant current national and European legislative requirements.

Lead batteries must be collected and sent to specific waste collection centres.

Oil must be collected and sent to specific waste collection centres.

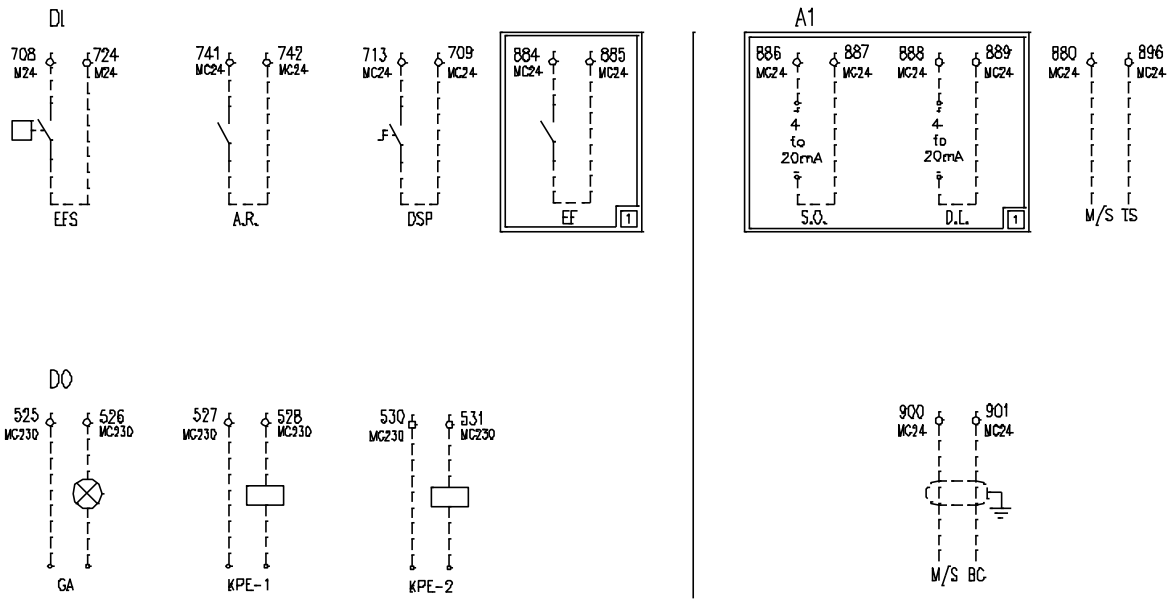


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The manufacturer will not accept any responsibility for direct or indirect damage, in the widest sense of the term, deriving from or associated with use and/or interpretation of this manual.

We reserve the right to make design and structural changes at any time without giving notice. As a result, the image on the cover of the manual is not binding.

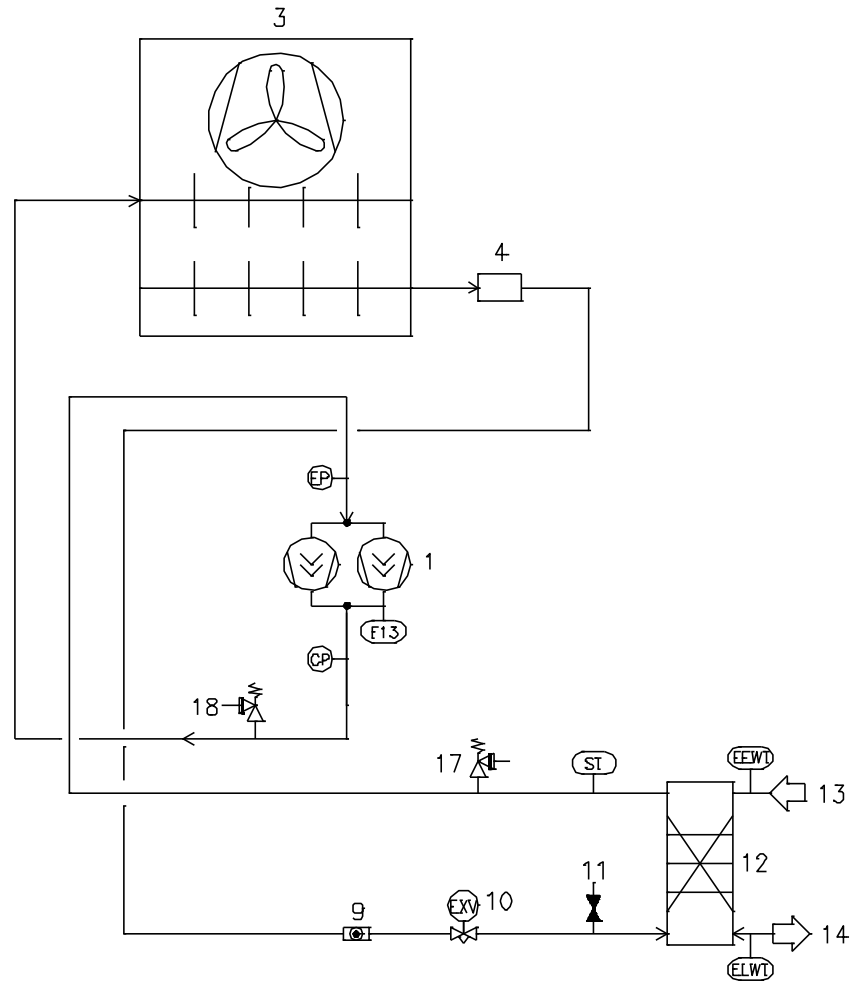
**Figure 5 – Unit wiring in installation site**



Legend	
AI	Analogue Inputs
A.R.	Remote ON / OFF
M/S TS	Main/Secondary Temperature Sensor
M/S BC	Main/Secondary Connection Box
D.L.	Request Limit
DI	Digital Inputs
DO	Digital Outputs
DSP	Double Setting Point
EF	External failure
EFS	Evaporator flow switch
GA	General Alarm
KPE-1	Pump 1 water evaporator
KPE-2	Pump 2 water evaporator
S.O.	Setting Off
1	Very Low Voltage Monitor (OP15A)

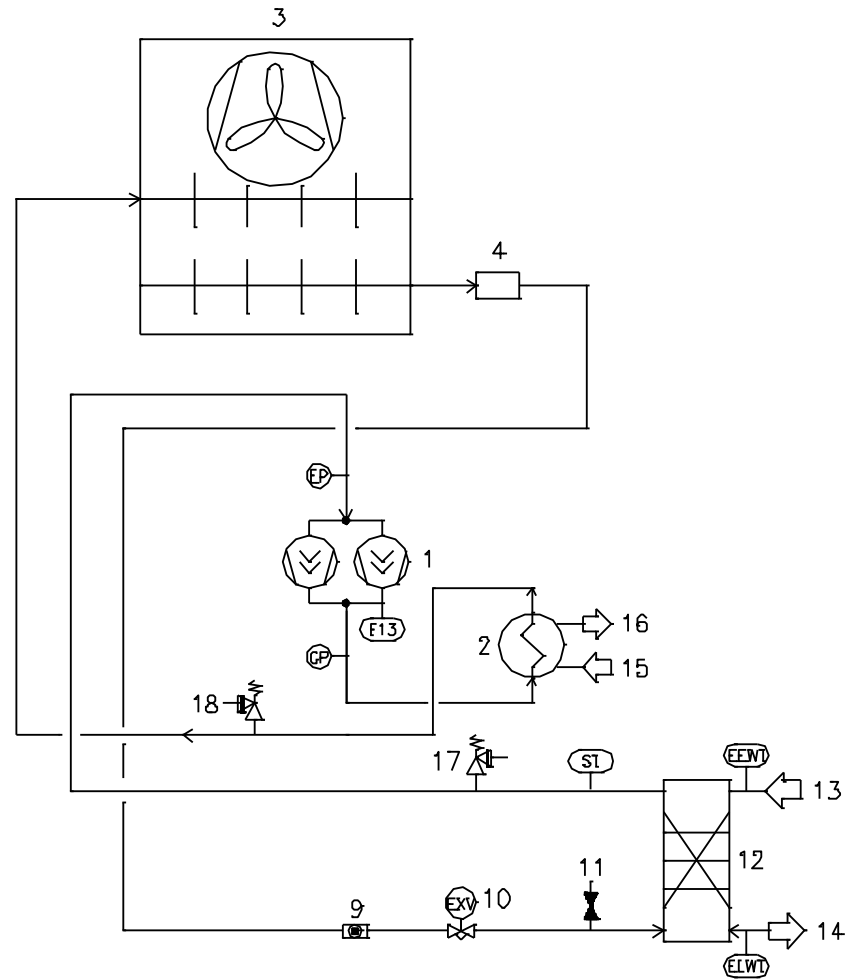
# A

**Typical refrigerant circuit** – The number of compressors and water inlet and outlet are indicative. Please refer to the machine dimensional diagrams for exact water connections.



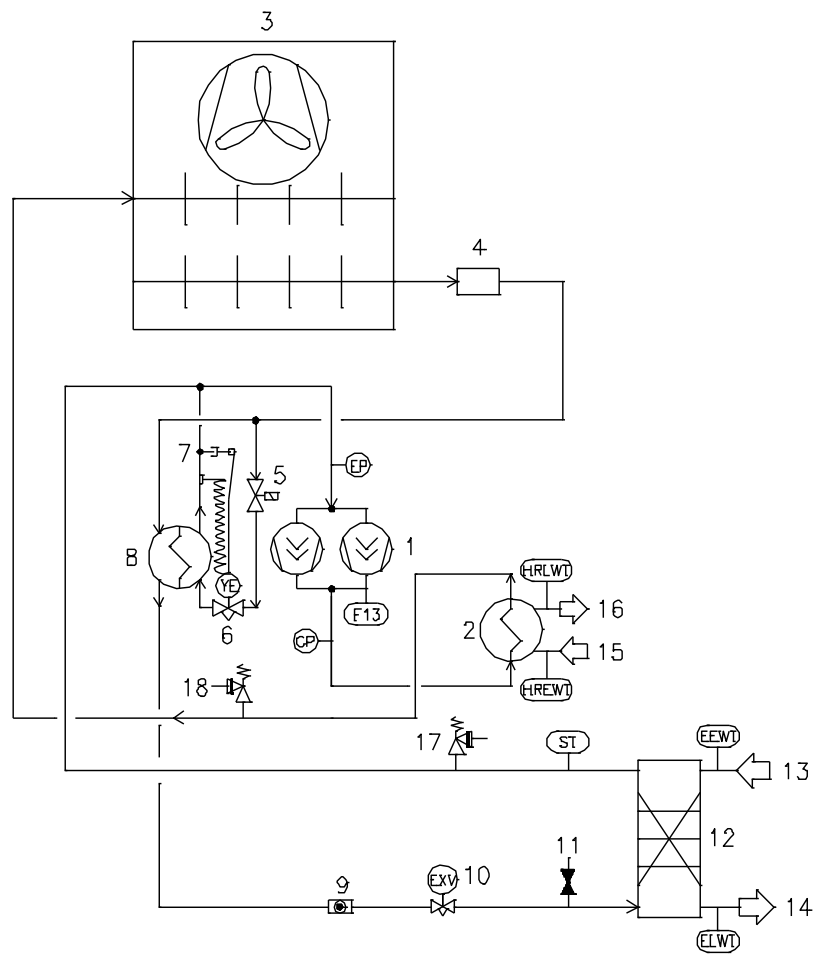
# B

**Typical refrigerant circuit with partial heat recovery** – The number of compressors and water inlet and outlet are indicative. Please refer to the machine dimensional diagrams for exact water connections.



# C

**Typical refrigerant circuit with total heat recovery** – The number of compressors and water inlet and outlet are indicative. Please refer to the machine dimensional diagrams for exact water connections.



Legend	
<b>1</b>	Compressor
<b>2</b>	Heat recovery
<b>3</b>	Condenser coil and Axial ventilator
<b>4</b>	Filter
<b>5</b>	Solenoid valve
<b>6</b>	Thermostatic valve
<b>7</b>	¼ SAE Flare Valve
<b>8</b>	Heat exchanger
<b>9</b>	Sight glass
<b>10</b>	Electronic expansion valve
<b>11</b>	Service port
<b>12</b>	Evaporator
<b>13</b>	Evaporator water inlet connection
<b>14</b>	Evaporator water outlet connection
<b>15</b>	Heat recovery water inlet connection
<b>16</b>	Heat recovery water outlet connection
<b>17</b>	Low pressure safety valve
<b>18</b>	High-pressure safety valve
<b>EP</b>	Low-pressure transducer
<b>CP</b>	High-pressure transducer
<b>ST</b>	Suction temperature sensor
<b>F13</b>	High pressure switch
<b>EEWT</b>	Evaporator Entering Water Temperature sensor
<b>ELWT</b>	Evaporator Leaving Water Temperature sensor
<b>HREWt</b>	Heat Recovery Entering Water Temperature sensor
<b>HRLWT</b>	Heat Recovery Leaving Water Temperature sensor

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