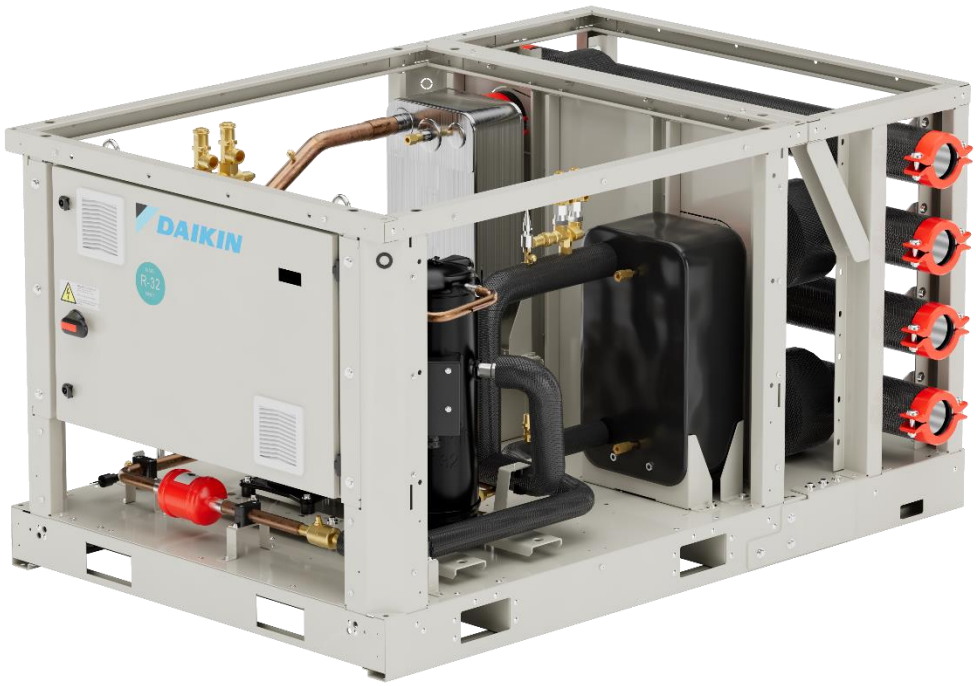
Public

REV	03
Date	02/2026
Supersedes	D-EIMHP01702-23_02EN

Installation, Operation and Maintenance Manual
D-EIMHP01702-23_03EN

Water Cooled Chiller & heat pump with Scroll Compressors

EWWT100-160Q Water-cooled scroll chiller
EWLT100-160Q Condenserless scroll chiller
EWHT100Q Water-cooled scroll Heat pump



Original instructions

Contents

LIST OF FIGURES

LIST OF TABLES

Fig. 1 – Typical refrigerant circuit for cooling only version (EWWT-Q)

The input and output of the water of the condenser and the evaporator are approximate. Consult the dimensional drawings of the unit for the exact hydraulic connections.

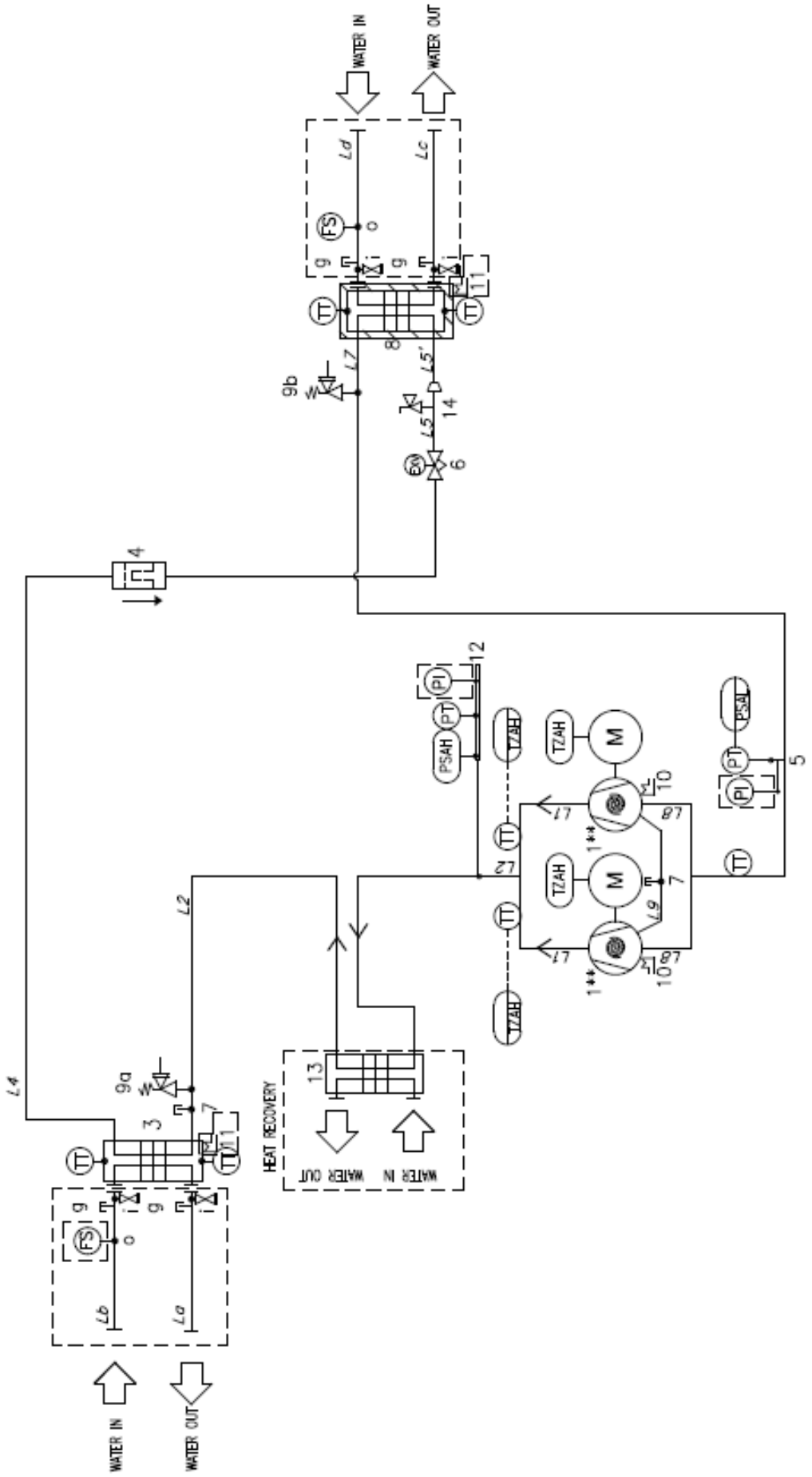


Fig. 2 Typical circuit for moto-evaporating version (EWLT-Q)

The input and output of the water of the evaporator are approximate. Consult the dimensional drawings of the unit for the exact hydraulic connections.

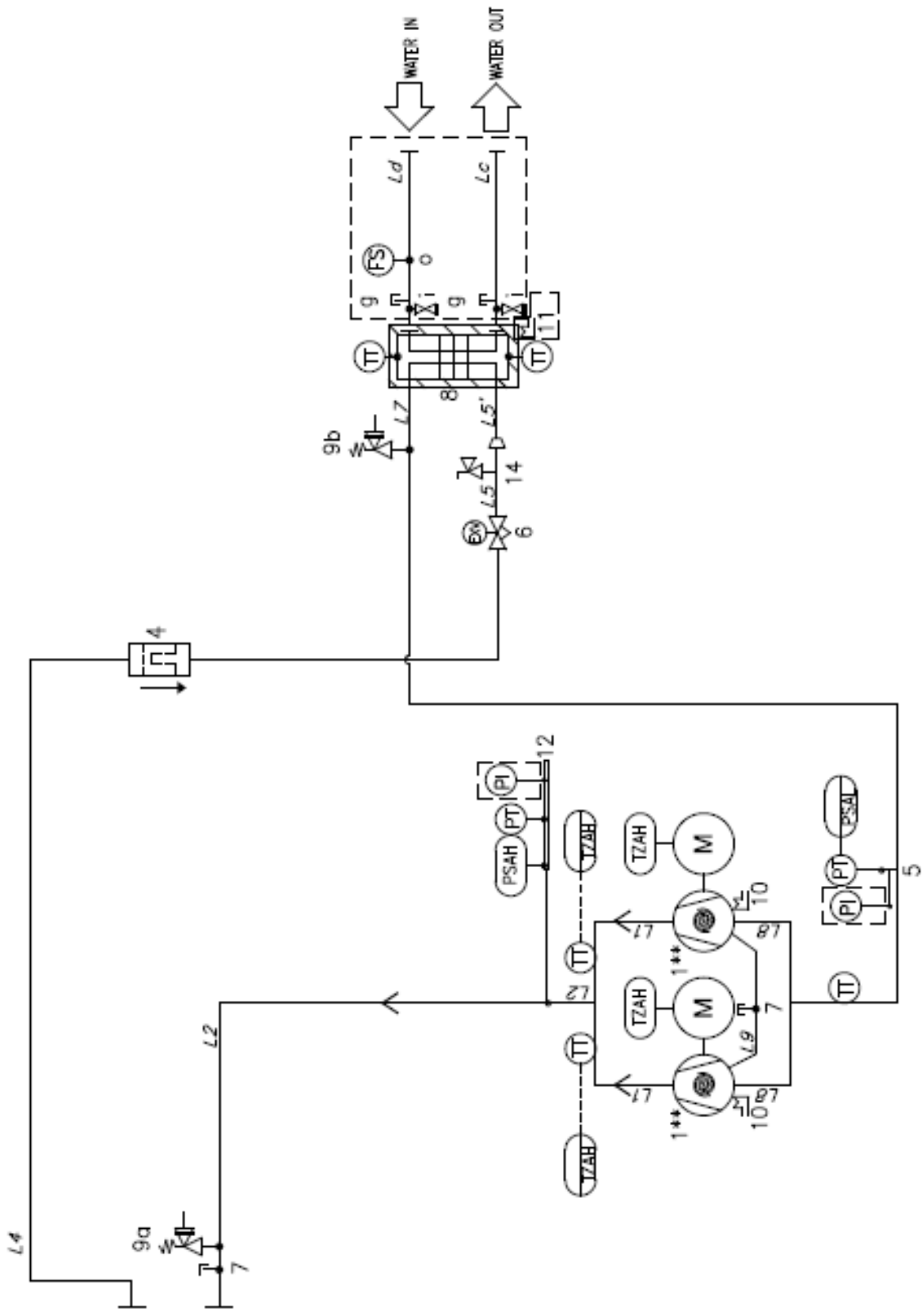


Fig. 3 Typical refrigerant circuit for heat pump version

The input and output of the water of the condenser and the evaporator are approximate. Consult the dimensional drawings of the unit for the exact hydraulic connections.

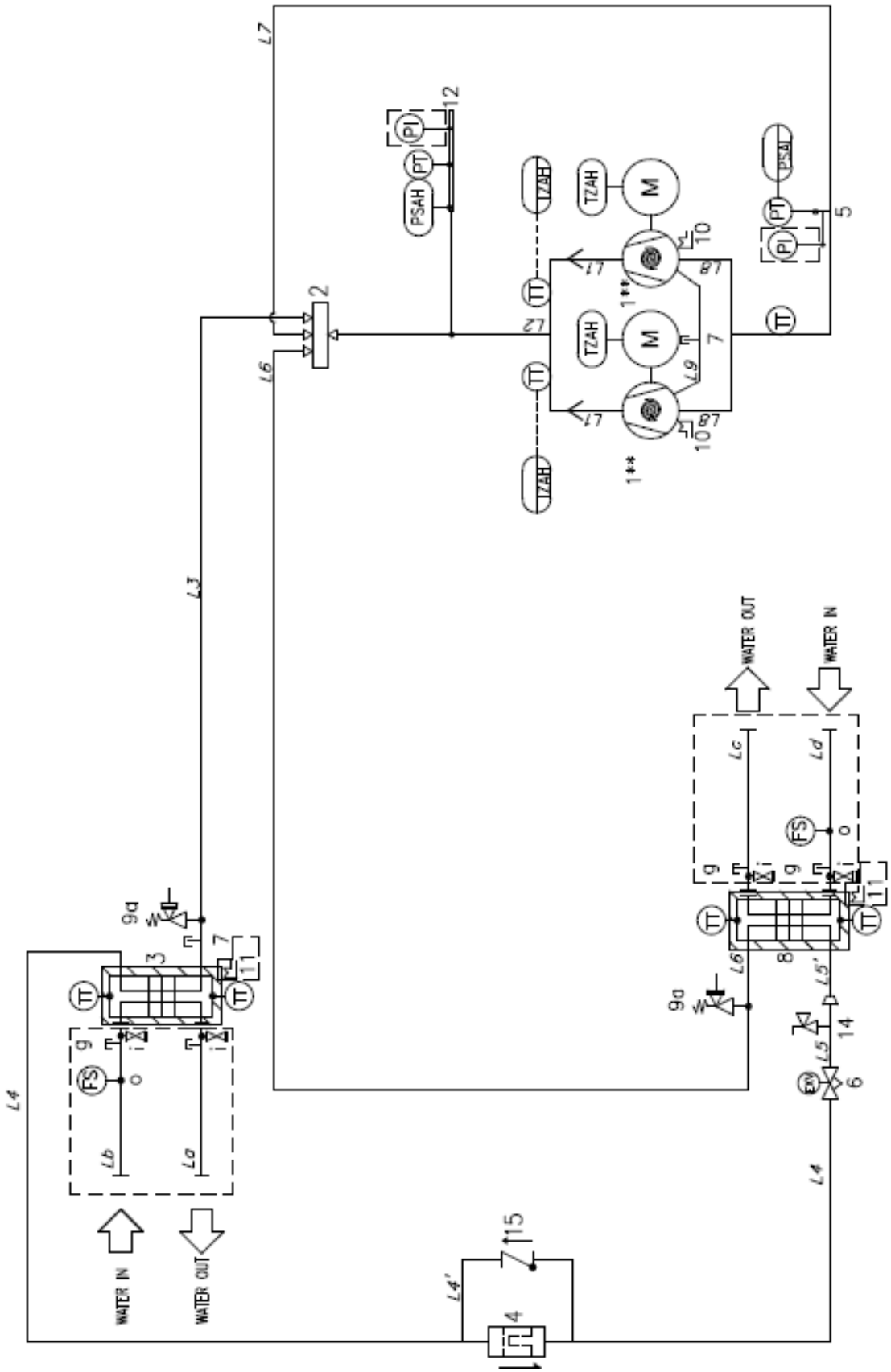
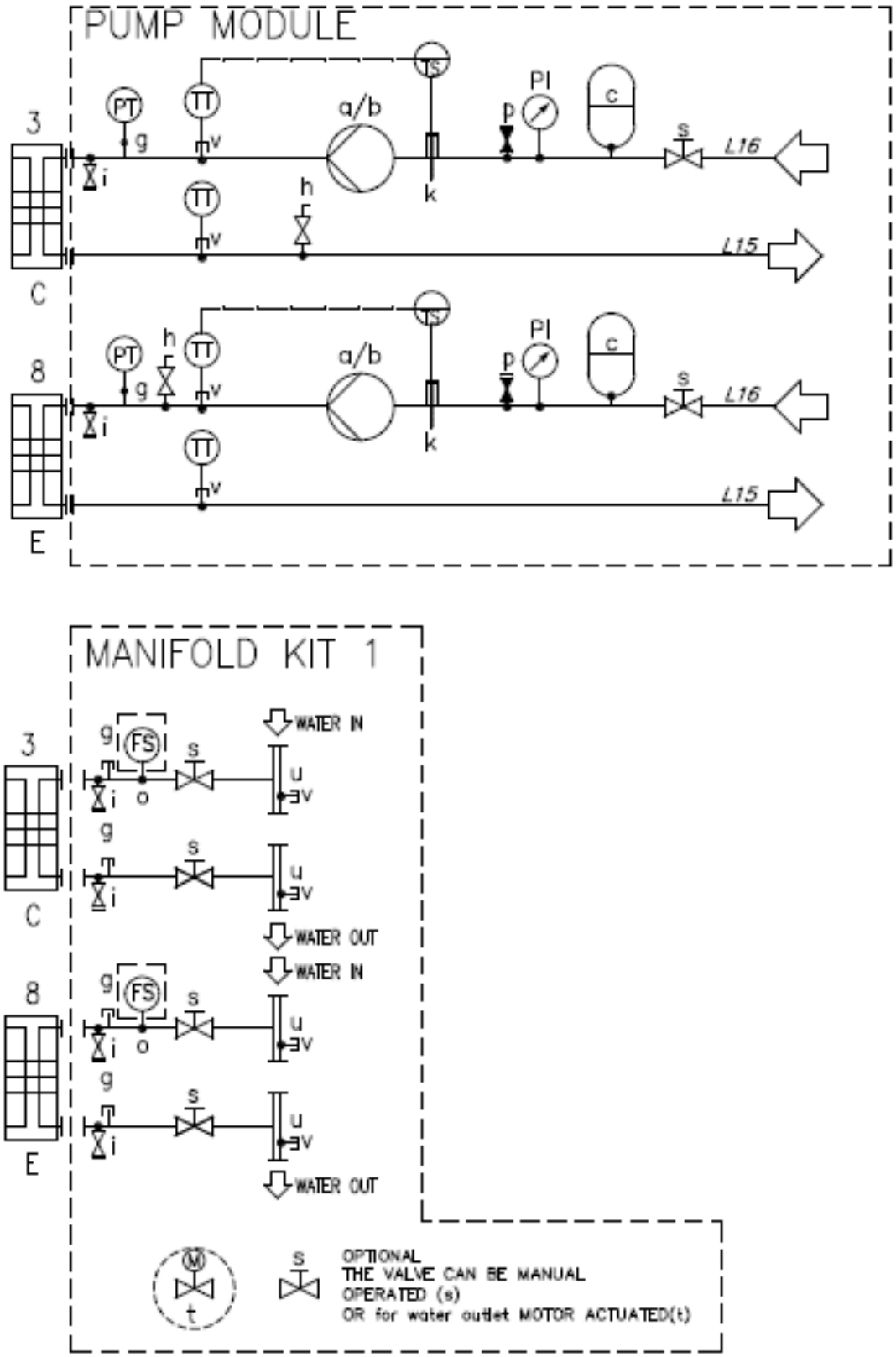
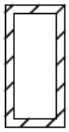
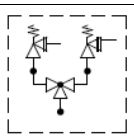


Fig. 4 Typical hydronic manifold and pump module circuit

The input and output of the water of the condenser and the evaporator are approximate. Consult the dimensional drawings of the unit for the exact hydraulic connections.



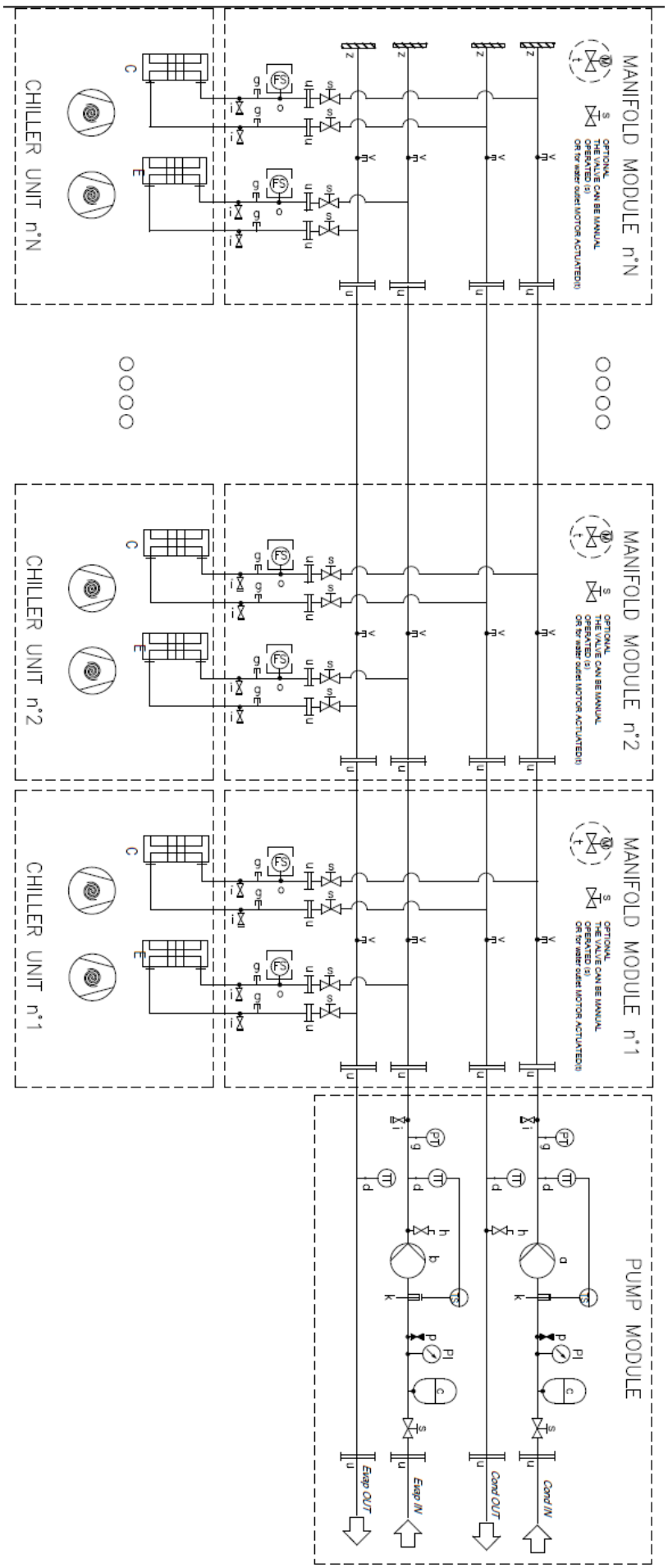
Legend	
1	Scroll compressor
2	4 way valve
3	Heat exchanger (BPHE)
4	Filter
5	Tee access fitting (¼" SAE flare)
6	Electronic expansion valve
7	Access fitting (¼" SAE flare)
8	Heat exchanger (BPHE)
9a	Pressure relief valve 49 bar ¾" NPT
9b	Pressure relief valve 25.5 bar 3/8" NPT
10	Compressor crankcase heater
11	Electrical heater (optional)
12	Manifold with access fitting
13	BPHE heat recovery (optional)
14	Tee access valve
15	Check valve
L1	Compressor discharge
L2	Discharge collector
L3	4 way valve - condenser
L4	Condenser - EXV
L5	EXV - Access fitting
L5'	Evaporator connection
L6	Evaporator – 4 way valve
L7	Suction collector
L8	Compressor suction
L9	Compressor oil equalizer line
La	Water out BPHE 3
Lb	Water in BPHE 3
Lc	Water out BPHE 8
Ld	Water in BPHE 8
PT	Pressure transducer
PSAH	High pressure switch 44.5 bar
TZAH	High temperature switch
PSAL	Low pressure limiter (controller function)
TT	Temperature transducer
PI	Pressure gauge (optional)

Legend	
	Thermal insulation 19mm
	Optional
	Located in control panel or control system function
	Located in field
	Safety valves can be provided with a changeover device as optional.

REFRIGERANT	PED/PER GROUP	LINE	PS [bar]	TS [°C]
R32	1	HIGH PRESSURE GAS	49	+20/+130
		HIGH PRESSURE LIQ	49	-30/+65
		LOW PRESSURE	25,5	-30/+25
WATER CIRCUITS	2	WATER IN/OUT	10	-15/+65

Fig. 5 Connection of more unit-manifold systems together and with pump module

The input and output of the water of the condenser and the evaporator are approximate. Consult the dimensional drawings of the unit for the exact hydraulic connections.



Legend	
a	Condenser pump
b	Evaporator pump
c	Expansion tank 18 L
d	Plugged fitting 1/2" NPT
g	Plugged fitting 1/4" NPT
h	Air vent 3/8" NPT (install in the highest point)
i	Drain 1/2"
k*	Electrical heater 3/4" G
p	Automatic filling valve fitting 1/2" G
q	Manifold with Victaulic connection
s	Manual actuated valve
t	Motor actuated valve
u	Victaulic connection
v	Probe holder
z	Victaulic cap
TS	Temperature switch
PI	Pressure gauge
FS	Flow switch
TT	Temperature transducer
PT	Pressure transducer

1 INTRODUCTION

This manual is an important supporting 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 the equipment or injure to people.

The unit must be installed by a professional operator/technician
Unit startup has to be performed by authorized and trained professional
All activities have to be performed according to local laws and regulation.

Unit installation and start up is abosolutely forbidden if all instruction contained in this manual are not clear.
If case of doubt contact the manufacturer representative for advice and information.

1.1 Precautions against residual risks

1- install the unit according to the instructions set out in this manual.
2- regularly carry out all the maintenance operations foreseen in this manual.
3- wear protective equipment (gloves, eye protection, hard hat, etc.) suited to the work in hand; do not wear clothes or accessories that can get caught or sucked in by flows of air; tie back long hair before entering the unit.
4- before opening the machine panelling make sure that it is firmly hinged to the machine.
5- the fins on heat exchangers and the edges of metal components and panels can cause cuts.
6- do not remove the guards from mobile components while the unit is operating.
7- make sure that mobile component guards are fitted correctly before restarting the unit.
8- fans, motors and belts drives might be running before entering, always wait for these to stop and take appropriate measures to prevent them from starting up.
9- the surfaces of the machine and pipes can get very hot or cold and cause the risk of burn.
10- never exceed the maximum pressure limit (PS) of the water circuit of the unit.
11- before removing parts on the pressurised water circuits, close the section of the piping concerned and drain the fluid gradually to stabilise the pressure at the atmospheric level.
12- do not use your hands to check possible refrigerant leaks.
13- disable the unit from the mains using the main switch before opening the control panel.
14- check that the unit has been grounded correctly before starting it.
15- install the machine in a suitable area; in particular, do not install it outdoors if it is intended for use indoors.
16- do not use cables with inadequate sections nor extension cord connections, even for very short periods or emergencies.
17- for units with power correction capacitors, wait 5 minutes after removing the electric power supply before accessing the inside of the switch board.
18- if the unit is equipped with compressors with integrated inverter, disconnect it from the mains and wait a minimum of 20 minutes before accessing it to carry out maintenance: residual energy in the components, which takes at least this length of time to dissipate, poses the risk of electrocution.
19- the unit contains pressurised refrigerant gas: the pressurised equipment must not be touched except during maintenance, which must be entrusted to qualified and authorised personnel.
20- connect the utilities to the unit following the indications set out in this manual and on the panelling of the unit itself.
21- to avoid an environmental risk, make sure that any leaking fluid is collected in suitable devices in accordance with local regulations.
22- if a part needs to be dismantled, make sure it is correctly re-assembled before starting the unit.
23- when the rules in force require the installation of fire-fighting systems near the machine, check that these are suitable for extinguishing fires on electrical equipment and on the lubricating oil of the compressor and the refrigerant, as specified on the safety data sheets of these fluids.
24- when the unit is equipped with devices for venting overpressure (safety valves): when these valves are triggered, the refrigerant gas is released at a high temperature and speed; prevent the release of gas from harming people or objects and, if necessary, discharge the gas according to the provisions of EN 378-3 and the local regulations in force.
25- keep all the safety devices in good working order and check them periodically according to the regulations in force.
26- keep all lubricants in suitably marked containers.
27- do not store inflammable liquids near the unit.
28- solder or braze only empty pipes after removing all traces of lubricant oil; do not use flames or other heat sources in the vicinity of pipes containing refrigerant fluid.
29- do not use naked flames near the unit.
30- the machinery must be installed in structures protected against atmospheric discharge according to the applicable laws and technical standards.
31- do not bend or hit pipes containing pressurised fluids.
32- it is not permitted to walk or rest other objects on the machines.
33- the user is responsible for overall evaluation of the risk of fire in the place of installation (for example, calculation of the fire load).
34- during transport, always secure the unit to the bed of the vehicle to prevent it from moving about and overturning.
35- the machine must be transported according to the regulations in force taking into account the characteristics of the fluids in the machine and the description of these on the safety data sheet.
36- inappropriate transport can cause damage to the machine and even leaking of the refrigerant fluid. Before start-up, the machine must be checked for leaks and repaired accordingly.

37- the accidental discharge of refrigerant in a closed area can cause a lack of oxygen and, therefore, the risk of asphyxiation: install the machinery in a well-ventilated environment according to EN 378-3 and the local regulations in force.
38- the installation must comply with the requirements of EN 378-3 and the local regulations in force; in the case of installations indoors, good ventilation must be guaranteed, and refrigerant detectors must be fitted when necessary.

1.2 General description

The unit purchased is a Water Chiller and/or a Heat Pump, that is a machine designed to cool/heat the 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 the coolant refrigerant, according to the Carnot cycle, and is composed mainly of the following parts depending on the Mode of Operation.

Chiller (cooling/heating mode):
- Two scroll compressors that increase the pressure of the refrigerant gas from evaporation to condensation pressure.
- A condenser where the refrigerant gas under high pressure condenses transferring the heat to the water.
- Expansion valve allowing to reduce the pressure of condensed liquid refrigerant from condensation pressure to evaporation pressure.
- Evaporator, where the low-pressure liquid refrigerant evaporates chilling the water.

Heat Pump:
- Two scroll compressors that increase the pressure of the refrigerant gas from evaporation to condensation pressure.
- A 4-way valve which enables the inversion of the refrigeration cycle.
- A heat exchanger in which the refrigerant condenses heating the water.
- Expansion valve allowing to reduce the pressure of condensed liquid from condensation pressure to evaporation pressure.
- A heat exchanger where the low-pressure refrigerant evaporates removing the heat from the water.
- The operation of the heat exchangers can be inverted using the 4-way valve, with which the use of the heating/cooling unit can be seasonally inverted.

The Daikin EWWT-Q/ EWLT-Q / EWHT-Q modular water-cooled water chillers and heat pump can be used for cooling and heating applications. XS version is designed for indoor installation while XR version is suitable also for outdoor installation. EWWT-Q and EWLT-Q units are available in 3 standard sizes and for their nominal cooling capacities see Databook tables. The EWHT-Q is available in one standard size and for their nominal cooling capacities see Databook tables.
The present installation manual describes the procedures for unpacking, installing, and connecting the EWWT-Q/ EWLT-Q / EWHT-Q units.

All the units are delivered, together with wiring diagrams, certified drawings, nameplate 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 case of any discrepancy between this manual and the equipment's documents please refer to on board documents. In case of any doubt contact the manufacturer representative.
The purpose of this manual is to allow the installer and the qualified operator to ensure proper, commissioning, operation and maintenance, without any risk to people, animals or things.

1.3 Information about the refrigerant used

This product contains R32 refrigerant that has a minimal environmental impact, thanks to its low value of Global Warming Potential (GWP). According to ISO 817, R32 refrigerant is classified as A2L, which is slightly flammable, since the flame propagation rate is low, and non-toxic.
R32 refrigerant can burn slowly when all the following conditions are present:

- The concentration is between the lower and upper limit (LFL & UFL).
- T Wind velocity<propagation of flame velocity
- Energy of the ignition source>Minimum ignition energy

But pose no risk under the normal usage conditions for air-conditioning equipment and work environment.

1.4 Installation requirements

Before machine installation and commissioning, the people involved in this activity must have acquired the information necessary to carry out these tasks, applying all the information collected in this book all the procedures reported in the norms and the provided requirements by the local law.
Do not allow unauthorized and/or unskilled personnel to access the unit.

1.1. Information about installation of systems with R32

Physical characteristics of R32 refrigerant

Safety class (ISO 817)	A2L
PED Group	1
Practical limit (kg/m^3)	0.061
ATEL/ ODL (kg/m^3)	0.30
LFL (kg/m^3) @ 60°C	0.307
Vapour density @25°C, 101.3 kPa (kg/m^3)	2.13
Molecular mass	52.0
Boiling point (° C)	-52
GWP (100 yr ITH)	675
GWP (ARS 100 yr ITH)	677
Autoignition temperature (° C)	648

The chiller has to be installed in open air or machinery room (location classification III).
To ensure location classification III a mechanical vent on the secondary circuit(s) has to be installed.
Local building codes and safety standards shall be followed; in absence of local codes and standards refer to EN 378-3:2016 as a guide.
In paragraph “Additional guidelines for safe use of R32” there are provided additional information that should be added to the requirements of safety standards and building codes.
Additional guidelines for safe use of R32 for equipment located in the open air.
Refrigerating systems sited in the open air shall be positioned to avoid leaked refrigerant flowing into a building or otherwise endangering people and property.
The refrigerant shall not be able to flow into any ventilation fresh air opening, doorway, trap door or similar opening in the event of a leak. Where a shelter is provided for refrigerating equipment sited in the open air it shall have natural or forced ventilation.
For refrigeration systems installed outside in a location where a release of refrigerant can stagnate e.g., below ground, then the installation shall comply with the requirements for gas detection and ventilation of machinery rooms.
Additional guidelines for safe use of R32 for equipment located in a machinery room.
When a machinery room is chosen for the location of the refrigerating equipment it shall be in accordance with local and national regulations. The following requirements (according to EN 378-3:2016) can be used for the assessment.

- A risk analysis based on the safety principle for a refrigeration system (as determined by the manufacturer and including the charge and safety classification of the used refrigerant) should be conducted to determine if it is necessary to install the chiller in a separate refrigeration machinery room.
- Machinery rooms should not be used as occupied spaces. The building owner or user shall ensure that access is permitted only by qualified and trained personnel doing the necessary maintenance to the machinery room or general plant.
- Machinery rooms shall not be used for storage except for tools, spare parts, and compressor oil for the installed equipment. Any refrigerants, or flammable or toxic materials shall be stored as required by national regulations.
- Open (naked) flames shall not be permitted in machinery rooms, except for welding, brazing or similar activity and then only provided the refrigerant concentration is monitored and adequate ventilation is ensured. Such open flames shall not be left unattended.
- A remote switching (emergency type) for stopping the refrigerating system shall be provided outside the room (near the door). A similar acting switch shall be located at a suitable location inside the room.
- All piping and ducting passing through floors, ceiling and walls of machinery room shall be sealed.
- Hot surfaces shall not exceed a temperature of 80 % of the auto-ignition temperature (in °C) or 100 K less than the auto-ignition temperature of the refrigerant, whichever is lower.

Refrigerant	Self-ignition temperature	Maximum surface temperature
R32	648 °C	548°C

- Machinery rooms shall have doors opening outward and sufficient in number to ensure freedom for persons to escape in an emergency; the doors shall be tight fitting, self-closing and so designed that they can be opened from inside (antipanic system).
- Special machinery rooms where the refrigerant charge is above the practical limit for the volume of the room shall have a door that either opens directly to the outside air or through a dedicated vestibule equipped with self-closing, tight-fitting doors.
- The ventilation of machinery rooms shall be sufficient both for normal operating conditions and emergencies.
- Ventilation for normal operating conditions shall be in accordance with national regulations.
- The emergency mechanical ventilation system shall be activated by a detector(s), located in the machinery room.
    - This ventilation system must be:
        - independent of any other ventilation system on the site.
        - provided with two independent emergency controls one located outside the machinery room, and the other inside.
    - The emergency exhaust ventilation fan shall:

- Be either in the air flow with the motor outside the airflow or rated for hazardous areas (according to the assessment).
- Be located to avoid pressurization of the exhaust ductwork in the machinery room.
- not cause sparks to occur if it contacts the duct material.

o Airflow of the emergency mechanical ventilation shall be at least:

$$V = 0{,}014 \times m2/3$$

Where:

V	is the air flow rate in m3/s
M	is the mass of refrigerant charge, in kg, in the refrigerating system with the largest charge, any part of which is in the machinery room
0.014	It is a conversion factor

o Mechanical ventilation shall be operated continuously or shall be switched on by the detector.

- Detector shall automatically activate an alarm, start mechanical ventilation, and stop the system when it triggers.
- The location of detectors shall be chosen in relation to the refrigerant, and they shall be located where the refrigerant from the leak will concentrate.
- The positioning of the detector shall be done with due consideration of local airflow patterns, accounting for location sources of ventilation and louvers. Consideration shall also be given to the possibility of mechanical damage or contamination.
- At least one detector shall be installed in each machinery room, or the occupied space being considered and/or at the lowest underground room for refrigerants heavier than air and at the highest point for refrigerants lighter than air.
- Detectors shall be continuously monitored for functioning. In the case of a detector failure, the emergency sequence should be activated as if refrigerant had been detected.
- The pre-set value for the refrigerant detector at 30 °C or 0 °C, whichever is more critical, shall be set to 25 % of the LFL. The detector shall continue to activate at higher concentrations.

Refrigerant	LFL	Threshold level	
R32	0.307 kg/m3	0.7675 kg/m3	36000 ppm

- All electrical equipment (not only the refrigerating system) shall be selected to be suitable for use in the zones identified in the risk assessment. Electrical equipment shall be deemed to comply with the requirements if the electrical supply is isolated when the refrigerant concentration reaches 25 % of the lower flammable limit or less.
- Machinery rooms or special machinery rooms shall be clearly marked as such on the entrances to the room, together with warning notices indicating that unauthorized persons shall not enter, and that smoking, naked light or flames are prohibited. The notices shall also state that, in the event of an emergency, only authorized persons conversant with emergency procedures shall decide whether to enter the machinery room. Additionally, warning notices shall be displayed prohibiting unauthorized operation of the system.
- The owner / operator shall keep an updated logbook of the refrigerating system.

The optional leak detector supplied by dae with the chiller should be used exclusively to check refrigerant leakage from the chiller itself

2 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 the responsibilities.
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. Responsibility for any damage after acceptance cannot be attributed to the manufacturer.

3 OPERATING LIMITS

3.1 Storage

The unit, in XS version, must be installed and stored indoor.
The unit, in XR version, must be protected from dust, rain, constant exposure to the sun and possible corrosive agent when being stored outside before installation (both Indoor and Outdoor installation).
Even though it is covered by a heat-shrinking plastic sheet, it is not intended for long-term storage and must be removed as soon as the unit is unloaded. It must in fact be protected by tarpaulins and the like which are more suitable for the long term.
Environmental conditions must be within the following limits:
Minimum ambient temperature: -20°C
Maximum ambient temperature: +45°C
Maximum relative humidity: 95% without condensation. If the unit is stored at a temperature under the minimum ambient temperature, the components could be damaged, while at a temperature above the maximum ambient temperature, the safety valves could open and discharge the refrigerant into the atmosphere.
Lastly, storage in places with condensation of humidity can damage the electric components.

3.2 Operating limits

Operation out of the mentioned limits may damage the unit.
In case of doubts contact manufacturer representative.

Fig. 6 – EW(W/H)T-Q Operating limits

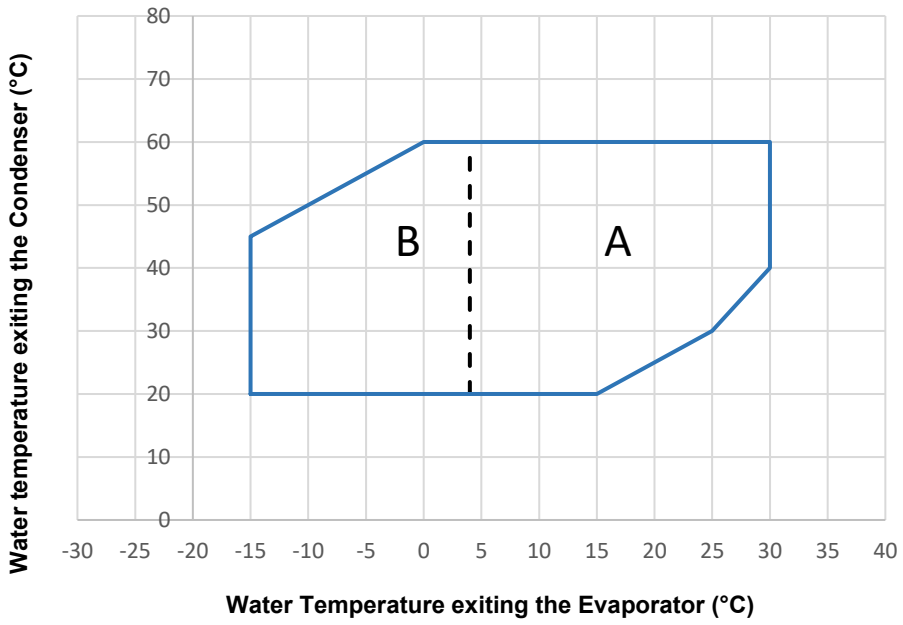
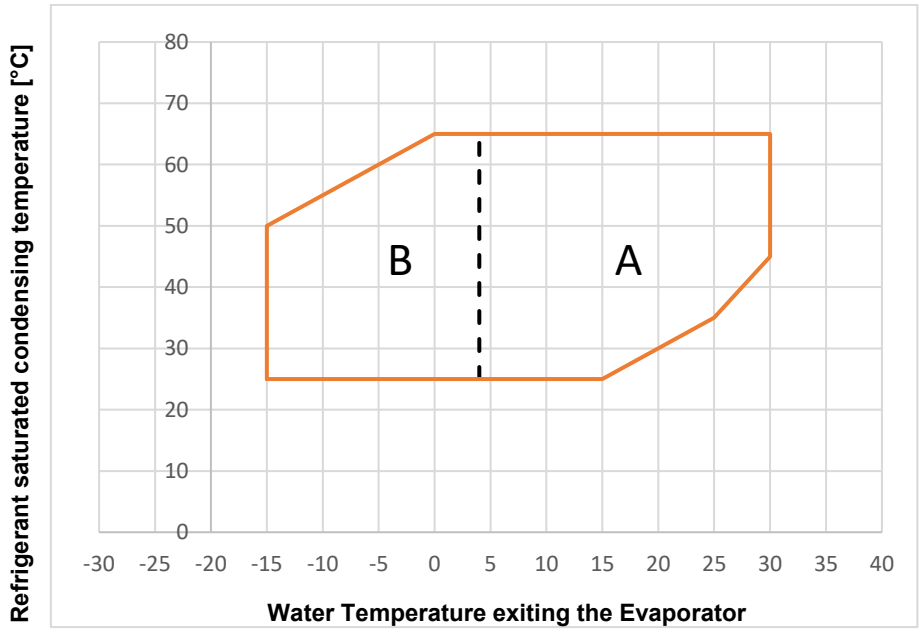


Fig. 7 – EWLT-Q Operating limits



A	Operation with Water
B	Operation with Glycol + Water Solution

The evaporator water inlet must never exceed the temperature of 40°c.

The charts shown above constitute a guideline on operating limits in the range.
Refer to the CSS selection software for the actual operating limits in the working conditions for each model.

Table 1 –Minimum percentage of glycol for the low water temperature

Type	Concentration (wt%) (1)	0	10	20	30	40
Ethylene glycol	**Freezing point (°C)**	0	-4	-9	-16	-23
	Minimum LWE (2)	5	2	0	-5	-11
Propylene glycol	**Freezing point (°C)**	0	-3	-7	-13	-22
	Minimum LWE (2)	5	3	-2	-4	-10

Legend:
(1) Minimum percentage of glycol to prevent freezing of the water circuit at the indicated ambient air temperature
(2) Ambient air temperature that exceeds the operating limits of the unit.
Protection of the water circuit is necessary in the winter season, even with the unit not in operation.

4 MECHANICAL INSTALLATION

4.1 Safety

All EWWT-Q/ EWLT-Q / EWHT-Q machines are built in compliance with the main European Directives (Machinery Directive, Low Voltage Directive, Electromagnetic Compatibility Directive, PED Pressure Equipment Directive); be sure to receive, together with the documentation, also the Declaration of Conformity (DoC) of the product to the directives.
Before installation and commissioning of the machinery, the people involved in this activity must have acquired the information necessary to perform these tasks, applying all the information gathered in this manual.
The unit must be firmly secured to the soil.
It is essential to observe the following instructions:

- It is forbidden to access the electrical components without having opened the main switch and switched off the power supply.
- It is forbidden to access the electrical components without using an insulating platform. Do not access the electrical components if water and/or moisture are present.
- The sharp edges can cause injuries. Avoid direct contact and use adequate protection device.
- Do not insert solid object in the water pipes.
- A mechanical filter must be installed on the water pipe connected to the heat exchanger inlet.
- The unit is supplied with high pressure switches and/or safety valves, that are installed both on the high-pressure and on the low-pressure sides of the refrigerant circuit: **be careful.**

It is absolutely forbidden to remove the protections of moving parts.

In case of a sudden stop. follow the instructions listed in the **Control Panel Instruction Manual** which is part of the on-board documentation.

It is strongly recommended that the installation and maintenance operations not be performed alone but with other people.
In case of accidental injury or unease, it is necessary to:

- keep calm.
- Press the alarm button, if present at the installation site, or open the main switch
- move the injured person in a warm place far from the unit and in rest position.
- contact immediately emergency rescue personnel of the building or the Health Emergency Service
- wait without leaving the injured person alone until the rescue operators come.
- Give all necessary information to the rescue operators.

4.2 Handling and lifting

The unit must be lifted with the utmost care and attention, following the lifting instructions shows on the label applied to the unit. Lift the unit very slowly, keeping it perfectly levelled.
Avoid bumping and/or shaking the unit during the 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 damages. Do not allow any part of the unit to fall during loading/unloading.
All units have holes in the base frame. Only these points may be used for lifting the unit, as shown in the following figure. The unit can be handled and lifted with a pallet truck if wooden spacers are present.
The handling and lifting with a forklift are the only rigging methods using the base frame's holes.

The forklift, the pallet truck 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

Fig. 8 – ***Handling of the single circuit unit***

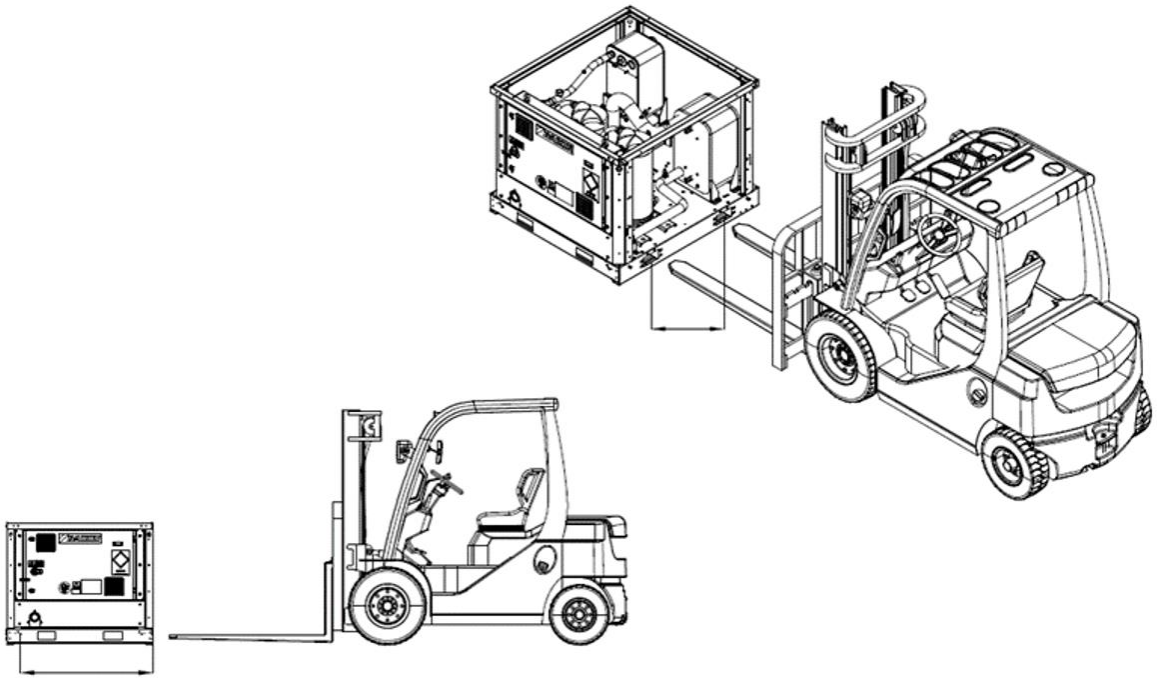


Fig. 9 – Alternative handling method with forklift

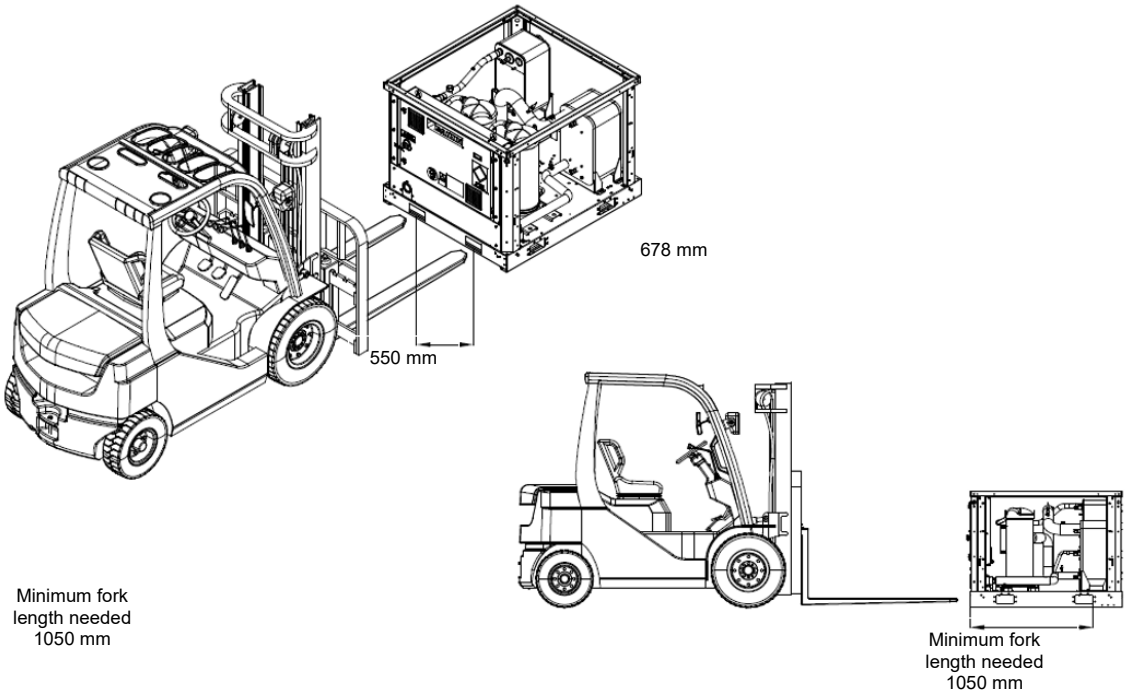
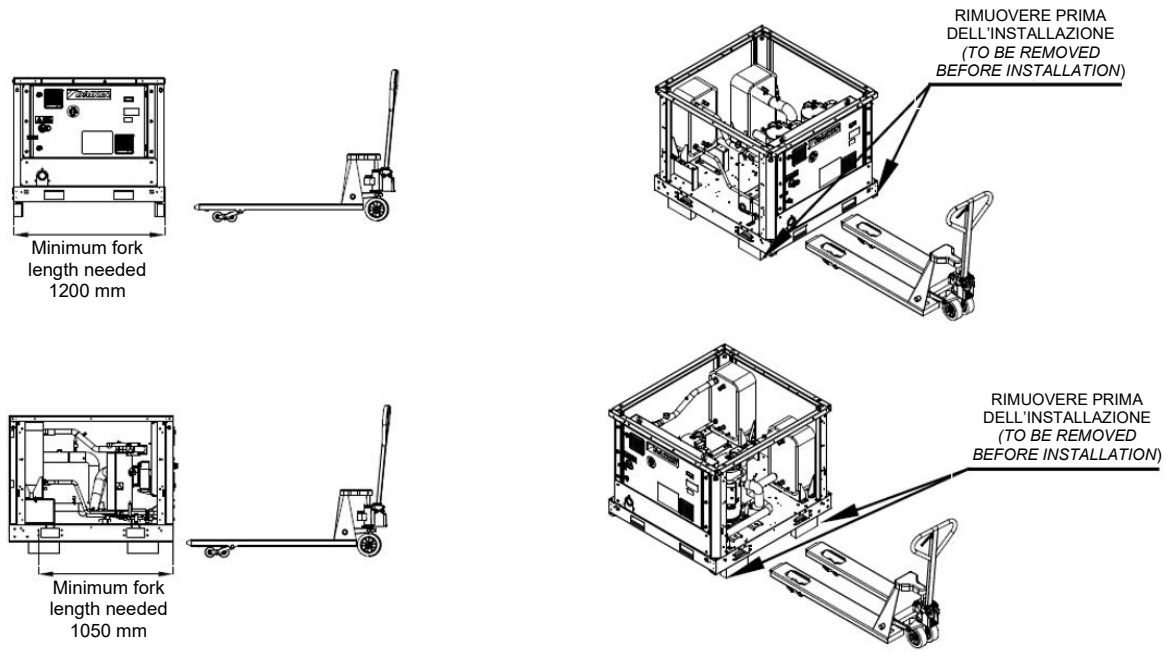


Fig. 10 – Alternative handling method with pallet truck



Consult the dimensional drawing for the hydraulic and electrical connection of the units.
The overall dimensions of the machine, as well as the weights described in this manual, are purely indicative.
The contractual dimensional drawing and the related electrical scheme are delivered to the customer when ordering.

4.3 Positioning and assembly

The unit must be installed on a sturdy and perfectly level foundation. For installation on the ground, a resistant concrete base must be created with a width greater than that of the unit. This base must be able to support its weight.
Anti-vibration supports must be installed between the frame of the unit and the concrete base of the steel beams; for their installation follow the dimensional drawing provided 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 elements.
Before the first start-up, it is mandatory that the installation be verified as being level and horizontal using a laser level or another suitable instrument.
The error in the levelness and the 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 be assemble all around to prevent free access. To guarantee the best performance in the place of installation, the following precautions and instructions must be respected:
- Make sure to provide a strong and solid foundation to reduce noise and vibrations.
- Avoid installing the unit in areas that could be dangerous during maintenance operations, such as platforms without parapets, railings or areas not complying with the requirements to leave a clearance space all the way around it.

Respect the minimum access distances around the unit 1000 mm all around the unit

For further solutions, please consult manufacturer representative.

4.4 Noise and sound protection

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 the noise emission level do not require any special protection device to operate continuously close to the unit without any risk.
In case of installation with special noise requirements it could be necessary to install additional sound attenuation devices.
When sound levels require special control, great care must be exercised to isolate the unit from its base by appropriately applying anti-vibrating elements, provided as optional. Flexible joints must be installed on the water connections, as well.

4.5 Water circuit for the connection of the unit

4.5.1 Water piping

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. To protect the unit, the BPHE must be protected against freezing by continuous monitoring of the water flow in the BPHE by a flow switch provided with unit. Be sure to install the flow switch according to the instructions present in this manual (See paragraph WATER PIPING INSTALLATION PROCEDURE).
4. Manual or automatic air venting device at the system's highest point.; drain device at the system's lowest point.
5. Neither the evaporator nor the heat recovery device must be positioned at the system's highest point.
6. A suitable device that can maintain the water system under pressure.
7. Water temperature and pressure indicators to assist the operator during service and maintenance.
8. A water filter or a device that can remove particles from the liquid and is mandatory at the entry of the evaporator/condenser.
9. A filter or device that can remove particles from the fluid. The use of a filter extends the life of the BPHE and pump and helps to keep the water system in a better condition. **The water filter must be installed as close as possible to the unit**. If the water filter is installed in another part of the water system, the Installer must guarantee the cleaning of the water pipes between the water filter and the BPHE.

Recommended maximum opening for strainer mesh is:

- 0.87 mm (DX S&T)
- 1.0 mm (BPHE)
- 1.2 mm (Flooded)

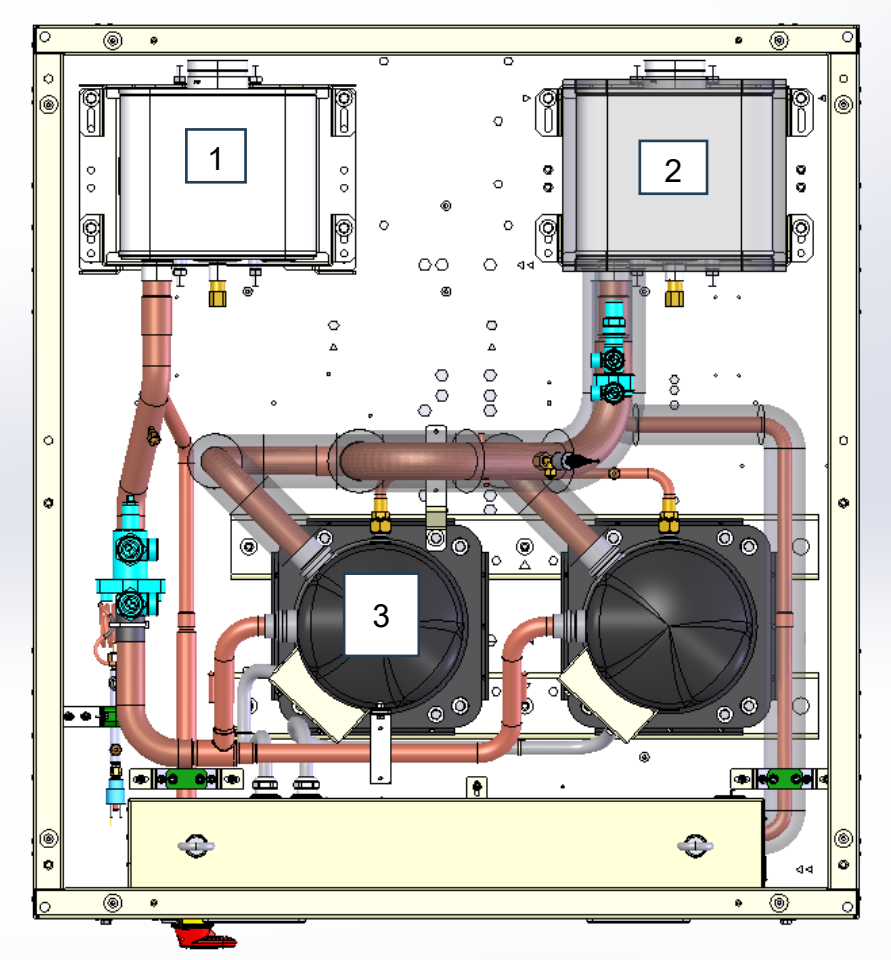
10. BPHE can be equipped with an optional electrical resistance with a thermostat that ensures protection against water freezing at ambient temperatures as low as -20°C.
11. When the manifold module is equipped, the water filter shall be mounted upstream the manifold module.
12. At ambient temperatures below 0°C, it is mandatory to equip the unit with optional electrical resistance.
13. All the other water piping/devices outside the unit must therefore be protected against freezing.
14. The heat recovery device must be emptied of water during the winter season, unless an ethylene glycol mixture in appropriate percentage is added to the water circuit.
15. If glycol is added to the water system as anti-freeze protection, pay attention to the fact that suction pressure will be lower, the unit performance will be lower and water pressure drops will be greater. All unit-protection systems, such as anti-freeze, and low-pressure protection will have to be readjusted.
16. The filter can be installed at the entrance of the pump when it is placed on the input pipe of the water of the evaporator, only if the cleanliness of the water installation between the pump and the evaporator is guaranteed. Any slag in the evaporator causes the warranty of the unit to be forfeited.
17. If the unit is being replaced, empty and clean the entire water system before installing a new one and prior to starting it conduct adequate tests and chemical treatments of the water.
18. Before insulating water piping, check that there are no leaks.
19. 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.
20. Install a suitable expansion.

To avoid damages, install a filter that can be inspected on the water pipes at the entry to the heat exchangers.

4.5.2 Water piping installation procedure

The unit is equipped with two heat exchangers: evaporator and condenser. For EWHT-Q units, the unit evaporator shall be connected to the plant circuit and the unit condenser to the wastewater circuit.

Fig. 11 – Reference drawing for evaporator and condenser identification



1	Condenser
2	Evaporator
3	Compressor

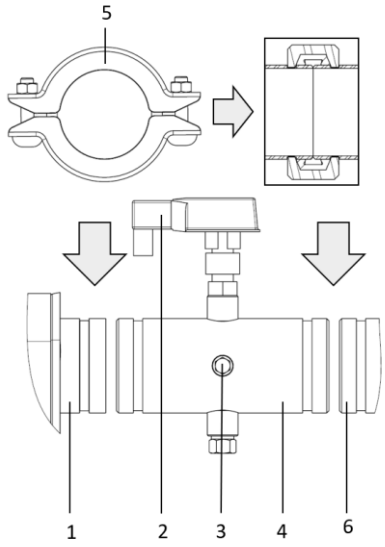
The units have a water input and output for the connection of the chiller to water circuit of the system. This circuit must be connected to the unit by an authorised technician and must comply with all the current national and local regulations on the subject.

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 the 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.

4.5.2.1 Preparing the unit for connection to the water circuit.

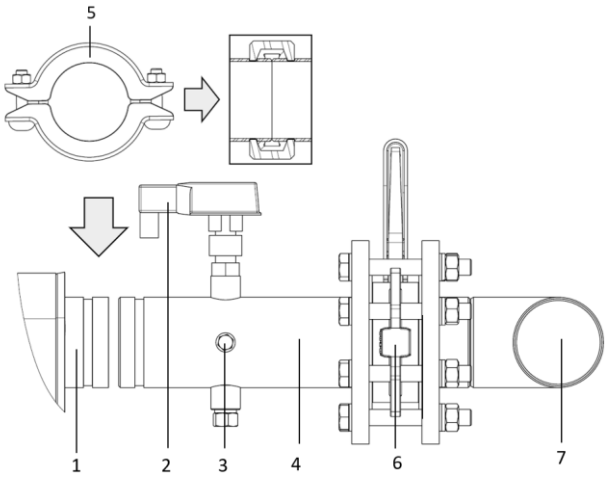
A box containing Victaulic® couplings is delivered with the unit.

Water IN/OUT accessory kit for standalone units



1	Evaporator water entry
2	Flow Switch
3	Water entry sensor
4	Water entry pipe with flow switch and temperature sensor of the incoming water
5	Joint
6	In situ water pipe circuit

Manifold accessory for modular installation



1	Evaporator water entry
2	Flow Switch
3	Water entry sensor
4	Water entry pipe with flow switch and temperature sensor of the incoming water
5	Joint
6	Butterfly valve
7	Manifold pipe

As not to damage the parts of the units during transport, the water inlet pipe with the flow switch and the water inlet temperature sensor and the water outlet pipe with the outlet water temperature sensor, are not factory mounted.

4.5.2.2 Connecting the water inlet pipe containing the flow switch.

The water inlet pipe containing the flow switch is mounted on the side of the water inlet of the evaporator (condenser in case of EWHT-Q series) and is pre-insulated. Cut the tie wraps and fix the pipe with the supplied Victaulic® couplings to the evaporator/condenser inlet.

4.5.2.3 Electrical connection of flow switch

The cables routing of evaporator and condenser flow switch is showed in the figures below.

Fig. 12 – Evaporator and condenser flow switch positions

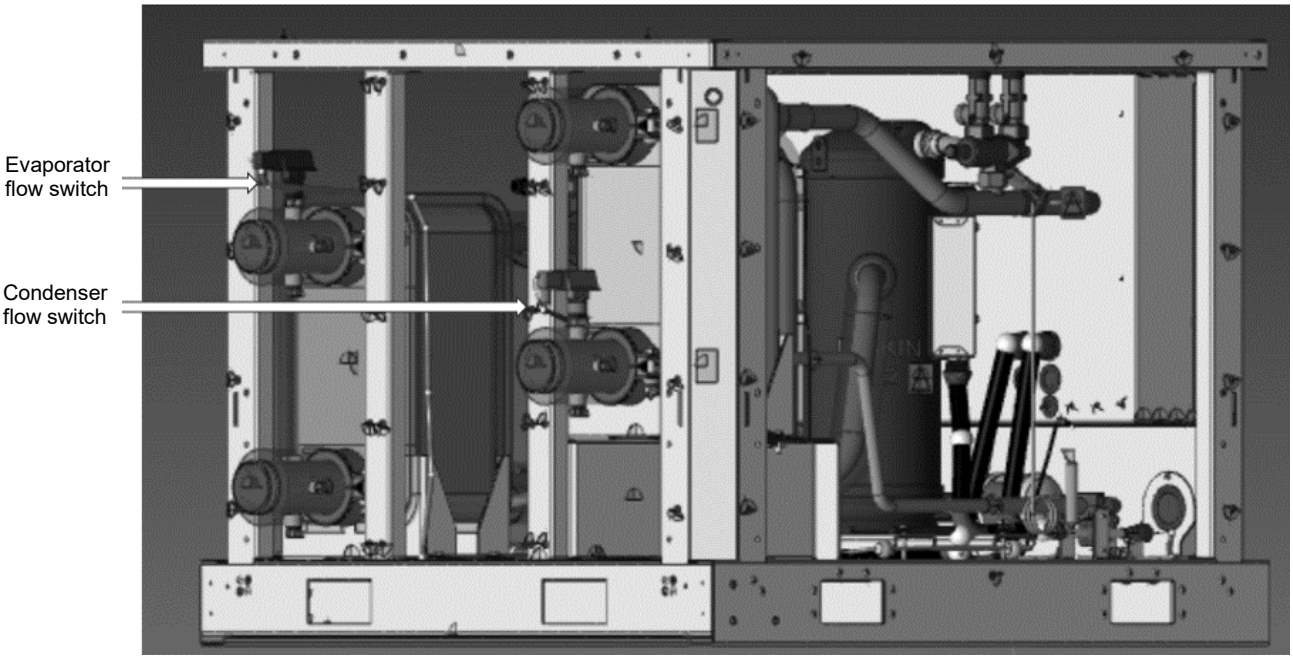


Fig. 13 – Cables routing of evaporator flow switch

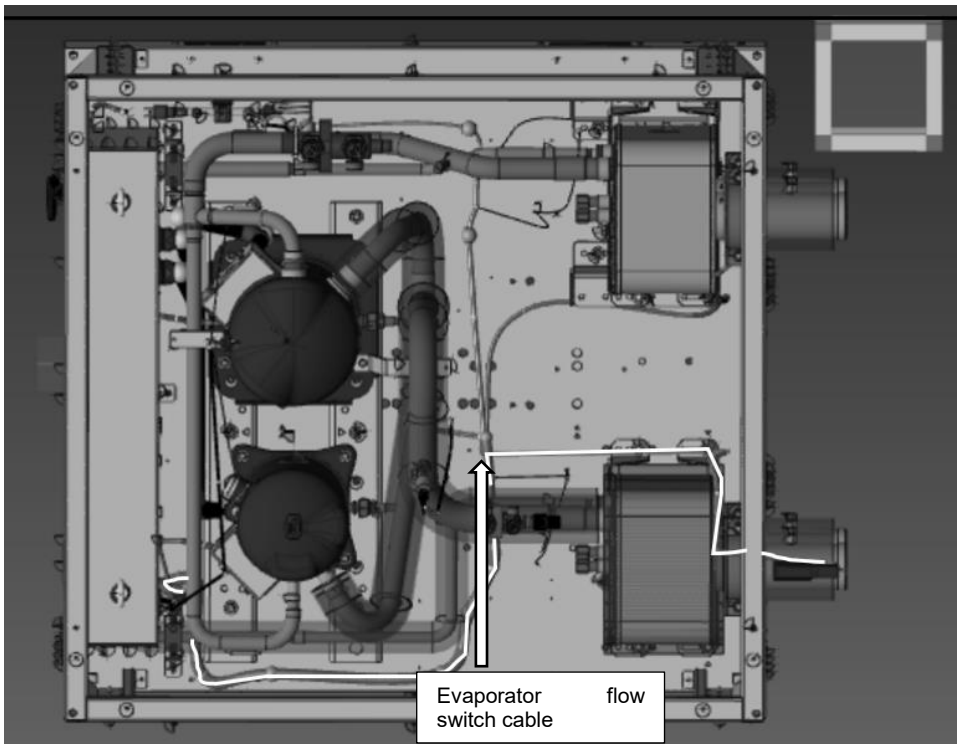
- 

Fig. 14 – Cables routing of evaporator flow switch

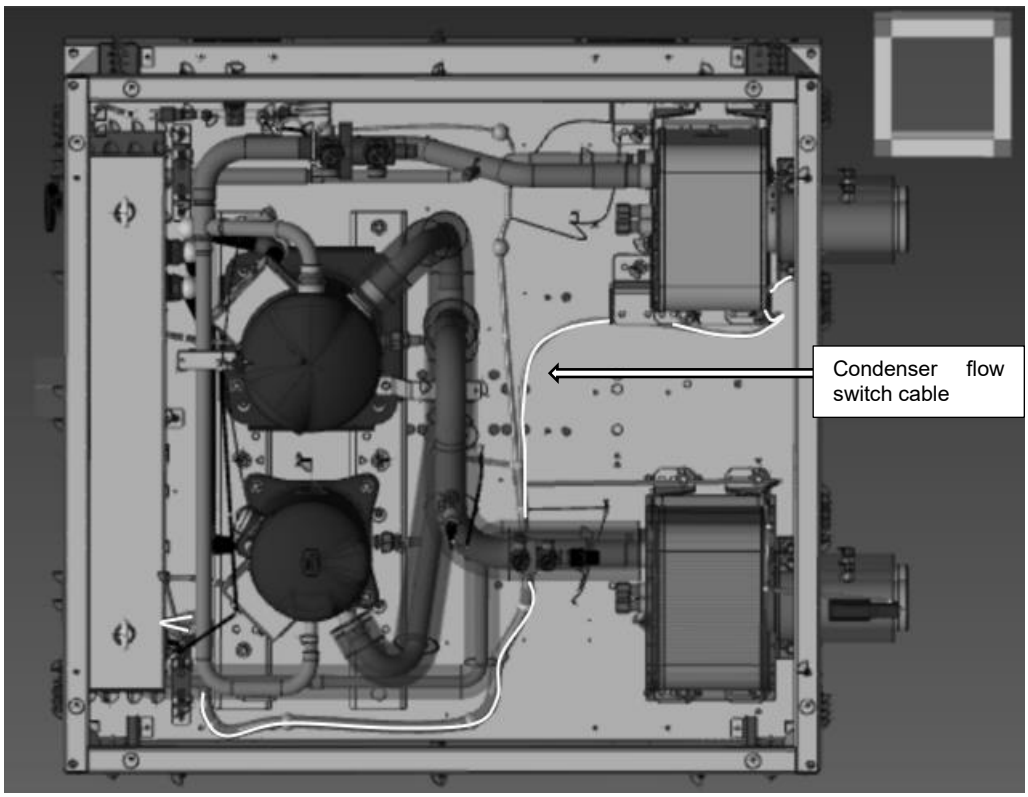
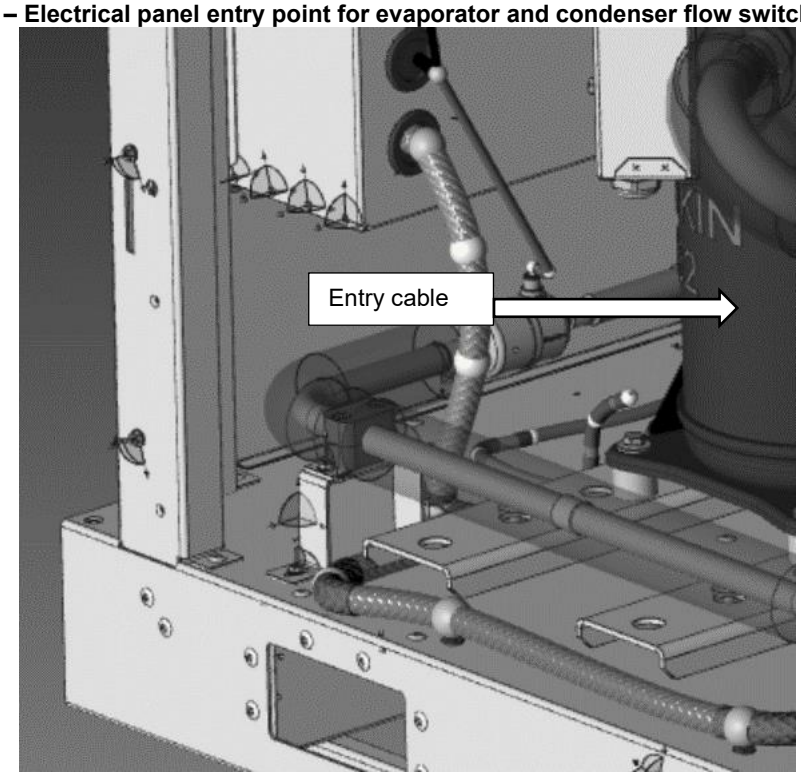


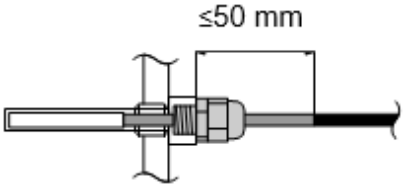
Fig. 15 – Electrical panel entry point for evaporator and condenser flow switch cables



4.5.2.4 Connecting the water outlet pipe.

The water outlet pipe is mounted on the side of the water outlet of the evaporator/condenser and is pre-insulated. Cut the tie wraps and fix the pipe(s) with the supplied Victaulic® couplings to the evaporator/condenser outlet(s).
In case of modular application with manifold modules, after installation of the water inlet and outlet pipes, it is recommended to check the insertion depth of the water temperature sensors into the connection pipes prior the operation (see figure).

Fig. 16 – Water temperature probe



4.5.2.5 Connecting the counter pipes

1. Weld the supplied counter pipes to the ends of the water circuit and connect to the unit with the provided Victaulic® couplings.

2. Drain taps must be provided at all low points of the system to permit complete drainage of the circuit during maintenance or in case of shut down. The drain plug is provided to drain the condenser. When doing this, also remove the air plugs (refer to the outlook diagram).
3. Air vent must be provided at all high points of the system. The vents should be located at points which are easily accessible for servicing.
4. Shut-off valves should be provided at the unit so that normal servicing can be accomplished without draining the system.
5. Vibration eliminators in all water piping connected to the chiller are recommended to avoid straining the piping and transmitting vibration and noise.

4.5.3 Piping insulation

The complete water circuit, including all the pipes, must be insulated to avoid condensate from forming and reducing the cooling capacity.
Protect the water pipes from freezing during the winter (using for example a glycol solution or a heating cable).

4.6 Water treatment

Table 2 - DAE Water quality requirements

DAE Water quality requirements	Shell&tube + Flooded	BPHE
pH (25°C)	6.8 – 8.4	7.5-9.0
Electrical conductivity (25°C)	< 2000 µS/cm	<500 µS/cm
Chloride ion	< 150 mg Cl^-/l	
Chlorine molecular	< 5 mg Cl2/l	<1.0mg Cl2/l
Sulphate ion (SO_4^{--}/l)	< 100 mg SO_4^{--}/l	<100 mg SO_4^{--}/l
Alkalinity	< 200 mg $CaCO_3$/l	<100 mg $CaCO_3$/l
Total Hardness	130-300 mg $CaCO_3$/l	80-150 mg $CaCO_3$/l
Iron	< 5.0 mg Fe/l	
Copper	< 1.0 mg Cu/l	
Ammonium ion (NH3)	< 1.0 mg NH_4^+/l	<0.5mg NH_4^+/l
Silica	50 mg SiO_2/l	
Dissolved Oxygen	< 8 mg/l	
Total dissolved solids	< 1500 mg/l	
Hydrogen carbonate (HCO---)		60-200 mg HCO3/l
(HCO---)/(SO4--)		>0.5
(Ca+Mg)/(HCO---)		>1.6

The water in the system must be particularly clean and all traces of oil and rust must be removed. Install a mechanical filter at the entry of every heat exchanger. The failure to install a mechanical filter allows 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 maintained responsible for any damage to the exchangers if the mechanical filters are not installed.

Before putting the unit into operation, clean the water circuit. Dirt, scales, debris, and other material can accumulate inside the heat exchanger and reduce both its heat exchanging capacity and the flow of the water.
An adequate treatment of the water can reduce the risk of corrosion, erosion, scale formation, etc. The must 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 damages or malfunctions of the equipment.
The quality of the water must comply with the specifications listed in the following table.

The pressure of the water must not exceed the maximum operating pressure (PN 10)

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

4.7 Operating stability and minimum water content in the system

The water content of the systems should have a minimum water amount to avoid excessive stress (start and stops) on the compressors.
Design considerations for water volume are the minimum cooling load, the water temperature setpoint differential and the cycle time for the compressors.
As a general indication, the system water content should not be less than the values deriving from the following formula:

$$\boldsymbol{Single\ circuit\ Unit} = \mathbf{5} * \frac{\boldsymbol{lt}}{\boldsymbol{kWnominal}}$$

$$\boldsymbol{Dual\ circuit\ unit} = \mathbf{3,5} * \frac{\boldsymbol{lt}}{\boldsymbol{kWnominal}}$$

kWnominal = Cooling capacity at 12/7°C OAT=35°C

The above rule of thumb derives from the following formula, as the relative volume of water capable of maintaining the water temperature setpoint differential during the minimum load transient avoiding excessive starts and stops of the compressor itself (which depends on the compressor technology):

$$\boldsymbol{Water\ Volume} = \frac{\boldsymbol{CC\ [W]\ x\ Min\ load\ \%\ x\ DNCS[s]}}{\boldsymbol{FD}\ \left[\frac{\boldsymbol{g}}{\boldsymbol{L}}\right] * \boldsymbol{SH}\left[\frac{\boldsymbol{J}}{\boldsymbol{g°C}}\right] * (\boldsymbol{DT})[°\boldsymbol{C}]}$$

CC = Cooling Capacity
DNCS = Delay to next Compressor Start
FD = Fluid Density
SH = Specific Heat
DT = Water Temperature Setpoint Differential

A properly designed storage tank should be added if the system components do not provide sufficient water volume.
By default, the unit is set to have a water temperature setpoint differential in line with Comfort application which allows to operate with the minimum volume mentioned in the previous formula.
However, if a smaller temperature differential is set, as in the case of Process applications where temperature fluctuations must be avoided, a larger minimum water volume will be required.
To ensure proper operation of the unit when changing the value of setting, the minimum water volume must be corrected.

In case of more than one installed unit, the overall capacity of the installation must be considered in the calculation so summing the water content of each unit.

4.8 Anti-freeze protection for evaporator and recovery exchangers

When the entire system of the cooling or heating 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 the flow of water inside the exchangers
2- Additional heat insulation and heating of exposed piping
3- Emptying and cleaning of the heat exchanger during the winter and its maintenance with antioxidant atmosphere (nitrogen).

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

The installer and/or the local personnel assigned to 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 unit damage. Damage caused by freezing is not covered by the warranty.

Damage caused by freezing is excluded from the warranty, therefore daikin applied europe s.p.a declines all responsibility

5 GUIDELINES FOR REMOTE CONDENSER APPLICATION (EWLT-Q VERSION)

Design of remote condenser application, and sizing of piping and piping path, is a responsibility of plant designer.
This paragraph is only focused to give suggestion to plant designer, different solutions can be considered with references to application peculiarities.
For remote condenser application, such as air-cooled or evaporative condensers, the chillers are shipped with holding nitrogen charge. It is important that the unit be kept tightly closed until the remote condenser is installed and piped to the unit.
Chillers are supplied with filter drier, moisture indicator and expansion valve factory mounted as standard.
It is the contractor responsibility to install the interconnection piping, leak test it and the entire system, evacuate the system and supply the refrigerant charge.
All piping must be compliant to the applicable local and state codes.
Use refrigerant grade copper tubing only and isolate the refrigeration lines from building structures to prevent transfer of vibration.
It is important that the discharge lines be looped at the condenser and trapped at the compressor to prevent refrigerant. and oil from draining into the compressors; looping the discharge line also provide greater flexibility.
Do not use a saw to remove end caps. This might allow copper chips to contaminate the system. Use a tube cutter or heat to remove caps. When sweating copper joints, it is important to flow dry nitrogen through the system prior to charging with refrigerant. This prevents scale formation and the possible formation of an explosive mixture of refrigerant. and air. This will also prevent the formation of toxic phosgene gas, which occurs when the refrigerant is exposed to open. flame.
Soft solders are not to be used. For copper-to-copper joints use a phosphorous-copper solder with 6% to 8% silver content. A high silver content brazing rod must be used for copper-to-brass or copper-to-steel joints. Only use oxyacetylene brazing.
After the equipment is correctly installed, leak tested and evacuated, it can be charged with refrigerant and started under the supervision of Daikin authorized technician.
Total refrigerant charge will depend on the used remote condenser and volume of refrigerant piping.

5.1 Selection of piping material

1- Foreign materials inside pipes (including oils for fabrication) must be 30 mg/10 m or less.
2- Use the following material specification for refrigerant piping:

- construction material: Phosphoric acid deoxidized seamless copper for refrigerant.
- size: Determine the proper size referring to "Technical specifications".
- the pipe thickness of the refrigerant piping must comply with relevant local and national regulations.

For R32 the design pressure is 49 bar.

3- In case the required pipe sizes (inch sizes) are not available, it is also allowed to use other diameters (mm sizes), taken the following into account:

- select the pipe size nearest to the required size.
- use the suitable adapters for the change-over from inch to mm pipes (field supply).

5.2 Installation information for condenserless units

This product is factory charged with N2 (holding charge)

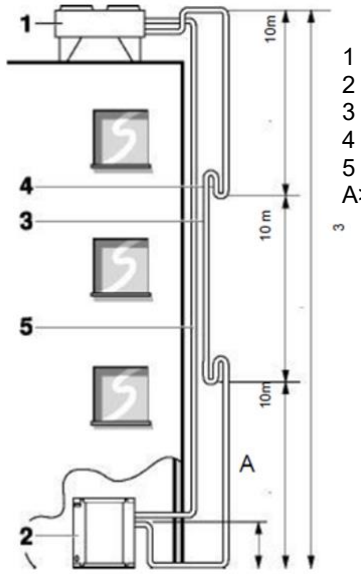
The units are equipped with a refrigerant inlet (discharge side) and a refrigerant outlet (liquid side) for the connection to a remote condenser. This circuit must be provided by a licensed technician and must comply with all relevant national and local regulations.

5.3 Connecting the refrigerant circuit

When a condenser-less unit is installed below the condensing unit, the following can occur:
- When the unit stops, oil will return to the discharge side of the compressor.
- When starting the unit, this can cause liquid (oil) hammer.
- The oil circulation will decrease

To solve these phenomena, provide oil traps in the discharge pipe every 10m if the level difference is more than 10m.

Fig. 17 – *Connecting the refrigerant circuit (1)*



1 Remote condenser
2 Indoor water chillers
3 Discharge
4 Oil trap
5 Liquid
A>0 m

piping length: equivalent = 50 m maximum height = 30 m

- It is highly recommended, prior to the installation of the units, to perform a vacuum within the piping system using a 2-stage vacuum pump with a non-return valve that can evacuate to a gauge pressure of −100.7 kPa (−1.007 bar) (5 Torr absolute). Then, once the vacuum is completed, let the system in vacuum for at least 2 hours. After that, pressurise the system with nitrogen gas to a maximum gauge pressure of 4.0 MPa (40 bar). Never set the gauge pressure higher than the maximum operation pressure of the unit, i.e., 4.0 MPa (40 bar).

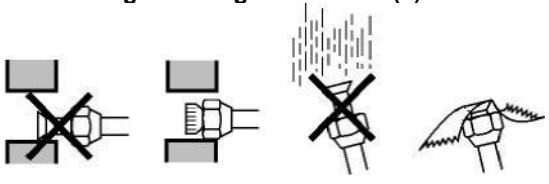
Once the connecting operations begins, is it possible to depressurize the system letting the nitrogen inside flow out of the piping system.

- Connect the refrigerant piping securely before running the compressor. If the refrigerant piping is NOT connected when the compressor is run, air will be sucked in. This will cause abnormal pressure in the refrigeration cycle, which may result in equipment damage and even injury.

- There should be no blockage (stop valve, solenoid valve) between the remote condenser and the provided liquid injection of the compressor.

When inserting the refrigerant piping though a wall, take care not to let dust or moisture come into the piping. Protect the pipes with a cap or seal the pipe end completely with tape. Use caution when passing copper tubes through walls.

Fig. 18 – Connecting the refrigerant circuit (4)



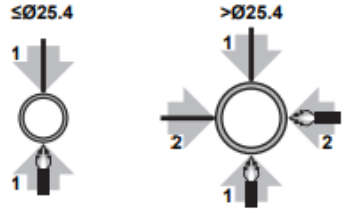
The discharge and liquid line are to relate to flare connections to the remote condenser piping. For use of the correct pipe diameter see "Technical specifications".

Be sure that the field installed piping does not touch other pipes, the bottom panel or side panel. Especially for the bottom and side connection, be sure to protect the piping with suitable insulation, to prevent it from coming into contact with the casing.

Do not clean out the air with the refrigerants. Use a vacuum pump to eliminate the air from the system.

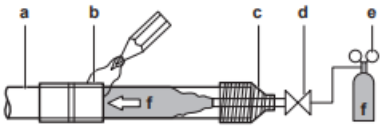
5.3.1 To braze the pipe end

Precautions when connecting field piping. Add brazing material as shown in the figure below:



▪ When brazing, blow through with nitrogen to prevent creation of large quantities of oxidised film on the inside of the piping. This film adversely affects valves and compressors in the refrigerating system and prevents proper operation.
▪ Set the nitrogen pressure to 20 kPa (0.2 bar) (just enough so it can be felt on the skin) with a pressure-reducing valve.

Fig. 19 – ***Pipe Brazing***



a) Refrigerant piping
b) Part to be brazed
c) Taping
d) Manual value
e) Pressure-reducing valve
f) Nitrogen

Do NOT use antioxidants when brazing pipe joints. Residue can clog pipes and break equipment.
▪ Do NOT use flux when brazing copper-to-copper refrigerant piping. Use phosphor copper brazing filler alloy (BCuP), which does not require any flux. Flux has an extremely harmful influence on refrigerant piping systems. For instance, if chlorine-based flux is used, it will cause pipe corrosion or, in particular, if the flux contains fluorine, it will deteriorate the refrigerant oil.

Make sure that the pipes are flushed with nitrogen during the brazing, to protect them from soot.

5.4 Leak test and vacuum drying

The condenser-less units have already been checked at the factory guaranteeing that there are no leaks.
Once the pipes have been connected, a leak test must be performed once again.
Before any vacuum procedure begins, it is necessary to make sure that the expansion valve of the unit is FULLY OPEN. Otherwise, it will not be possible to perform a complete vacuum process. Follow the procedure stated in the operation manual to open the expansion valve.
The air in the refrigerant circuit must be evacuated at a value of 4 mbar absolute, using the vacuum pumps.

5.5 Charging the unit

Carefully perform all required procedures like explained in chapters from which is referred to in chapter “BEFORE STARTING”, but do not start the unit. It is also necessary to read the operation manual delivered with the unit. This will contribute to understand the operation of the unit and its electronic controller.

While charging the refrigerating gas, make sure to follow one of the procedures stated below:

• **PLATE HEAT EXCHANGER FILLED WITH WATER:** Turn on the water pump during the charging process to let the water circulate. This is to avoid that the expansion that happens while the refrigerating gas fills the heat exchanger leads to an excessive cooling of the water which may then freeze. The continuous circulation of the water will prevent the water itself from freezing. To manually turn on the water pump, see further details on the Operating Manual.

• **PLATE HEAT EXCHANGER EMPTY (NO WATER INSIDE)**: It is possible to charge the refrigerant without turning on the water pump.

Only use R32 as refrigerant. Other substances may cause explosions and accidents.

R32 contains fluorinated greenhouse gases. Its global warming potential (GWP) value is 675. Do not vent these gases into the atmosphere.
when charging refrigerant, always use protective gloves and safety glasses.

If the system does not contain any refrigerant (e.g., after refrigerant reclaim operation), the unit must be charged with its original amount of refrigerant (refer to the nameplate on the unit).
Only use R32 when adding refrigerant.

5.5.1 Fine-tuning of refrigerant charge while unit is operating

Use the 1/4” SAE Flare valve on the suction for fine-tuning of the refrigerant charge and make sure to charge the refrigerant in its liquid state.

a. For fine-tuning of the refrigerant charge, the compressor must operate at full load (100%).
b. Verify the superheat and subcooling:
    - superheat must be between 3 and 8 K
    - subcooling must be between 3 and 8 K

Liquid temperature probe is not provided with the standard unit. To measure subcooling value, use an external measurement of liquid temperature.

c. Verify the oil sight glass. Level must be within the sight glass.
d. As long as superheat and subcooling do not reach the indicated values in point (b), add refrigerant in steps of 500 g and wait until the unit runs in stable conditions. Repeat the complete procedure step (e) until the subcooling and superheat values are reached. ,
    The unit must have the time to stabilize which means that this charging has to be done in a smooth way.
e. Note down the superheat and subcooling for future reference.
f. Fill out the total refrigerant charge on the unit nameplate and on the refrigerant charge label supplied with the product.

Take care for contamination of the remote condenser in order to avoid blocking of the system. It is impossible for Daikin to control the contamination of the "foreign" condenser of the installer. The Daikin unit has a strict contamination level.

5.5.2 Oil charge

The compressor of the EWLT version units is shipped with their proper charge of oil. The refrigerant circuits must not remain open to the air for more than 15 minutes. If this happens you need to replace the oil charge as described in “MAINTENANCE” chapter of this manual

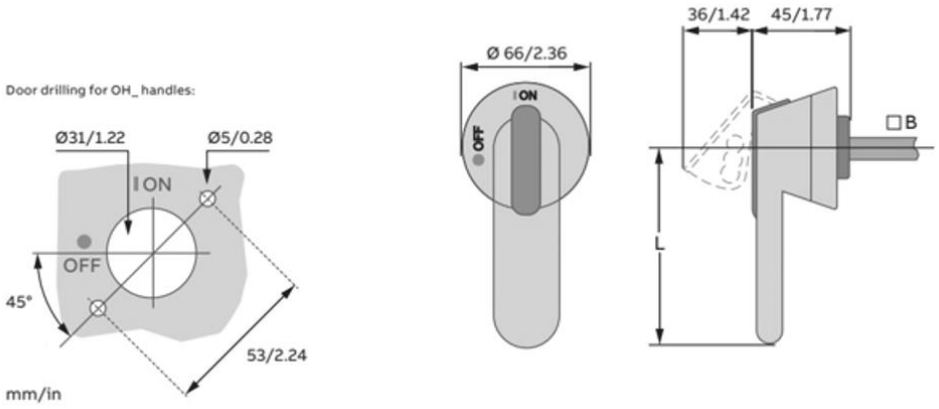
6 ELECTRICAL INSTALLATION

6.1 To install the main switch handle and shaft

The main switch is provided shipped loose with the unit, it must be installed before any electrical operation.

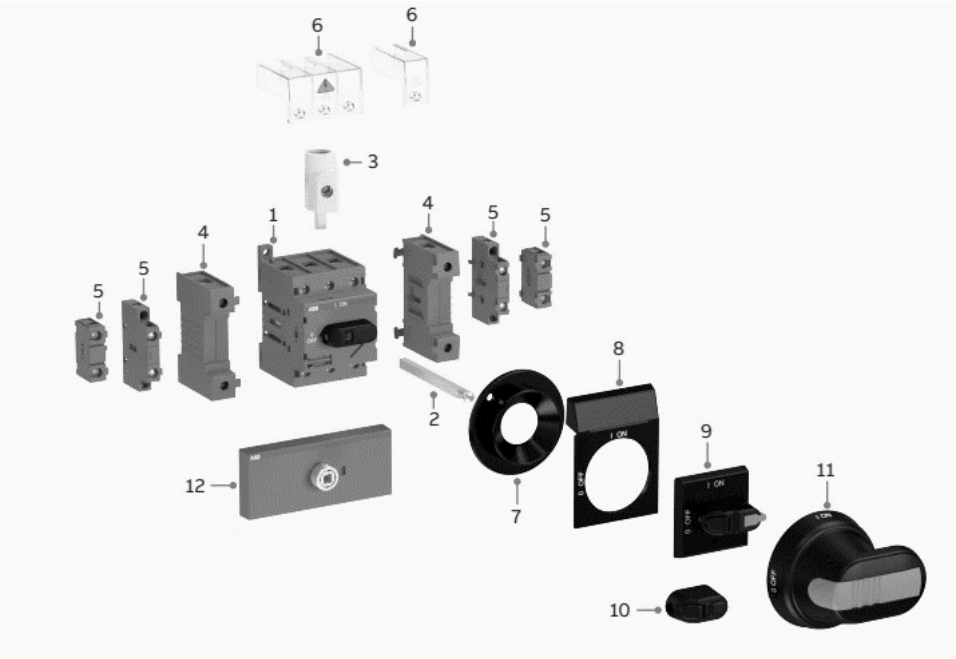
Open the door of the electrical panel and mount the main switch handle and shaft parts. The handle of the main switch is mounted on the electrical panel door.
In Fig. *20* – Handle assembly instructions are shown the handle assembly instructions and in are shown the geometric details of the pistol handle.

Fig. 21 – Details of the pistol handle



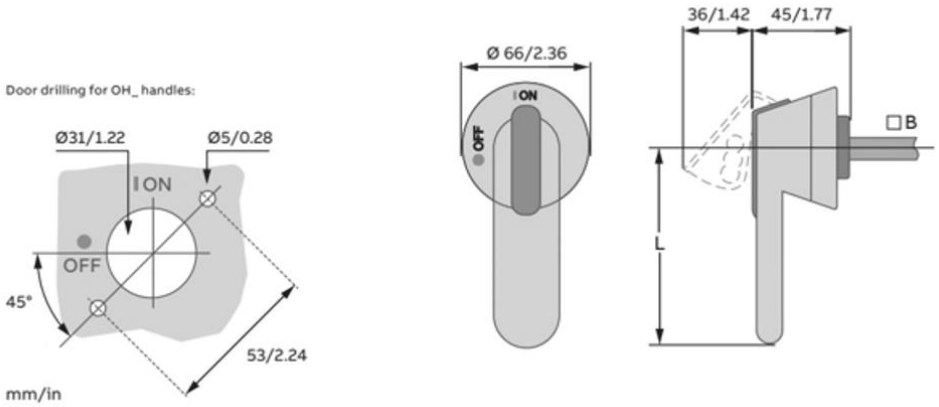
Handle type	Shaft diameter B	Length L
OH_45J6	6/0.24	45/1.77

Fig. 20 – ***Handle assembly instructions***



1	Switch disconnector	**7**	Shaft alignment
2	Extended shaft	**8**	Legend plate
3	Terminal clamp	**9**	Selector handle
4	Fourth pole, N, PE-terminals	**10**	Handle knob
5	Auxiliary contact	**11**	Pistol handle
6	Terminal shroud	**12**	Conversion kit

Fig. 21 – ***Details of the pistol handle***



Handle type	Shaft diameter B	Length L
OH_45J6	6/0.24	45/1.77

6.2 General specifications

Refer to the specific wiring diagram for the unit you have bought. If the wiring diagram is not provided with the unit or if it has been lost, please contact your manufacturer representative, who will send you a copy.
In case of discrepancy between wiring diagram and electrical panel/cables, please contact the manufacturer representative.

This unit includes non-linear loads such as inverters, which have a natural current leakage to earth. If an Earth Leakage Detector is installed upstream the unit, a type B device with a minimum threshold of 300 mA must be used.

Before any installation and connection works, the unit must be switched off and secured. Since this unit includes inverters, the intermediate circuit of the capacitors remains charged with high voltage for a short period of time after being switched off.
Do not operate to the unit before 20 minutes after the unit has been switched off.

Electrical equipment can operate correctly in the intended ambient air temperature. For very hot environments and for cold environments, additional measures are recommended (contact the manufacturer representative).
The electrical equipment can operate correctly when the relative humidity does not exceed 50 % at a maximum temperature of +40 °C. Higher relative humidities are permitted at lower temperatures (for example 90% at 20 °C).
Harmful effects of occasional condensation shall be avoided by design of the equipment or, where necessary, by additional measures (contact the manufacturer representative).

This product complies with EMC standards for industrial environments. Therefore, it is not intended for use in residential areas, e.g. installations where the product is connected to a low voltage public distribution system. Should this product need to be connected to a low voltage public distribution system, specific additional measures will have to be taken to avoid interference with other sensitive equipment.

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 directive and regulations in force.

All installation, management 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 representative who will send you a copy.
In case of discrepancy between the wiring diagram and the 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 ones, using several raceways for this purpose.
Before performing service operations on the unit, open the general disconnection switch located on the main power supply.

If the unit is off but the disconnection switch is in the closed position, the circuits not being used will still be active.

Never open the terminal board of the compressors without having disconnected the main switch of the machine.
Simultaneous mono and three-phase loads and imbalance between the phases can cause leakage towards earth up to 150mA during the normal operation of the unit.
The protections for the power supply system must be designed based on the values mentioned above.

6.2.1 About electrical compliance (only for EWWT100)

Only EWWT100 shall comply to the following Standards, because its I<75 A.

The equipment complies with:

- EN/IEC 61000-3-11 = European/International Technical Standard setting the limits for voltage changes, voltage xxxx with input current >16 A and ≤75 A per phase.
- EN/IEC 61000 3 12 = European/International Technical Standard setting the limits for harmonic currents produced by equipment connected to public low-voltage systems with input current >16 A and ≤75 A per phase.

The equipment complies with EN/IEC 61000-3-11 provided that the system impedance is less than or equal to at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network $\mathbf{z_{sys}}$ if necessary, that the equipment is connected only to a supply with a system impedance less than or $\mathbf{z_{max}}$ equal to $\mathbf{z_{max}}$.

	Z_{max} (Ω)
EWWT100	0.017

6.3 Electrical supply

The electrical equipment can operate correctly with the conditions specified below:

Voltage	Steady state voltage: 0,9 to 1,1 of nominal voltage
Frequency	0,99 to 1,01 of nominal frequency continuously 0,98 to 1,02 short time
Armonics	Harmonic distortion not exceeding 10 % of the total r.m.s. voltage between live conductors for the sum of the 2nd through to the 5th harmonic. An additional 2 % of the total r.m.s. voltage between live conductors for the sum of the 6th through to the 30th harmonic is permissible.
Voltage unbalance	Neither the voltage of the negative sequence component nor the voltage of the zero sequence component in three-phase supplies exceeding 3 % of the positive sequence component
Voltage interruption	Supply interrupted or at zero voltage for not more than 3 ms at any random time in the supply cycle with more than 1 s between successive interruptions.
Voltage dips	Voltage dips not exceeding 20% of the peak voltage of the supply for more than one cycle with more than 1 s between successive dips.

6.4 Electric connections

Provide an electrical circuit to connect the unit. It must be connected to the copper cables with an adequate section relative to the plate absorption values and according to the current electrical standards.
Daikin Applied Europe S.p.A. declines all responsibility for an inadequate electrical connection.

The connections to the terminals must be made with copper terminals and cables, otherwise overheating or corrosion may occur at the connection points with the risk of damaging the unit. The electrical connection must be carried out by qualified personnel, in compliance with the laws in force. There is a risk of electric shock.

The power supply to the unit must be set up in such a way that it can be switched on or off independently from that of other system components and other equipment in general, by means of a general switch.
The electrical connection of the panel must be carried out maintaining the correct sequence of the phases. Refer to the specific wiring diagram for the unit you have bought. Should the wiring diagram not be on the unit, or should it have been lost, please contact your manufacturer representative, who will send you a copy. In case of discrepancy between wiring diagram and electrical panel/cables, please contact the manufacturer representative.

Do not apply torque, tension or weight to the main switch terminals. Power line cables must be supported by appropriate systems.

To avoid interference, all control wires must be connected separately from the power cables. To do this, use several electrical passage ducts.
Simultaneous single and three-phase loads and phase unbalance can cause ground losses of up to 150 mA during normal unit operation. If the unit includes devices that generate higher harmonics, such as an inverter or phase cut, ground losses can increase to much higher values, about 2 A.
The protections for the power supply system must be designed according to the values mentioned above. A fuse must be present on each phase and, where provided for by the national laws of the country of installation, a leak detector to earth.
This product complies with EMC (Electromagnetic Compatibility) standards for industrial environments. Therefore, it is not intended for use in residential areas, e.g. installations where the product is connected to a low voltage public distribution system. Should this

product need to be connected to a low voltage public distribution system, specific additional measures will have to be taken to avoid interference with other sensitive equipment.

Before any electrical connection work to the compressor motor and / or the fans, make sure that the system is switched off and the main switch of the unit is open. Failure to observe this rule could result in serious personal injury.

6.5 Cable requirements

The cables connected to the circuit breaker must respect the insulation distance in the air and the surface isolation distance between the active conductors and the earth, according to IEC 61439-1 table 1 and 2, and to the local national laws. The cables connected to the main switch must be tightened using a pair of keys and respecting the unified clamping values, relative to the quality of the screws of the washers and nuts used.
Connect the earth conductor (yellow / green) to the PE ground terminal.
The equipotential protection conductor (earth conductor) must have a section according to table 1 of EN 60204-1 Point 5.2, shown below.

Table 3 – Table 1 of EN60204-1 Point 5.2

Section of the copper phase conductors feeding the equipment *S* [mm^2]	**Minimum cross-section of the external copper protection conductor** *Sp* [mm^2]
$S \leq 16$	S
$16 < S \leq 35$	16
$S > 35$	$S/2$

In any case, the equipotential protection conductor (earth conductor) must have a cross section of at least 10 mm^2, in accordance with point 8.2.8 of the same standard.

6.6 Phase unbalance

In a three-phase system, the excessive imbalance between the phases is the cause of the engine overheating. The maximum permitted voltage unbalance is 3%, calculated as follows:

$$Sbilanciamento\ \% = \frac{(Vx - Vm) * 100}{Vm}$$

where:
Vx = phase with greater unbalance
Vm = average of the tensions
Example: the three phases measure 383, 386 and 392 V respectively. The average is:

$$\frac{383 + 386 + 392}{3} = 387\ V$$

The unbalance percentage is:

$$\frac{(392 - 387) * 100}{387} = \mathbf{1.29}\ \%$$

less than the maximum allowed (3%).

6.7 Connection of the power supply of the unit

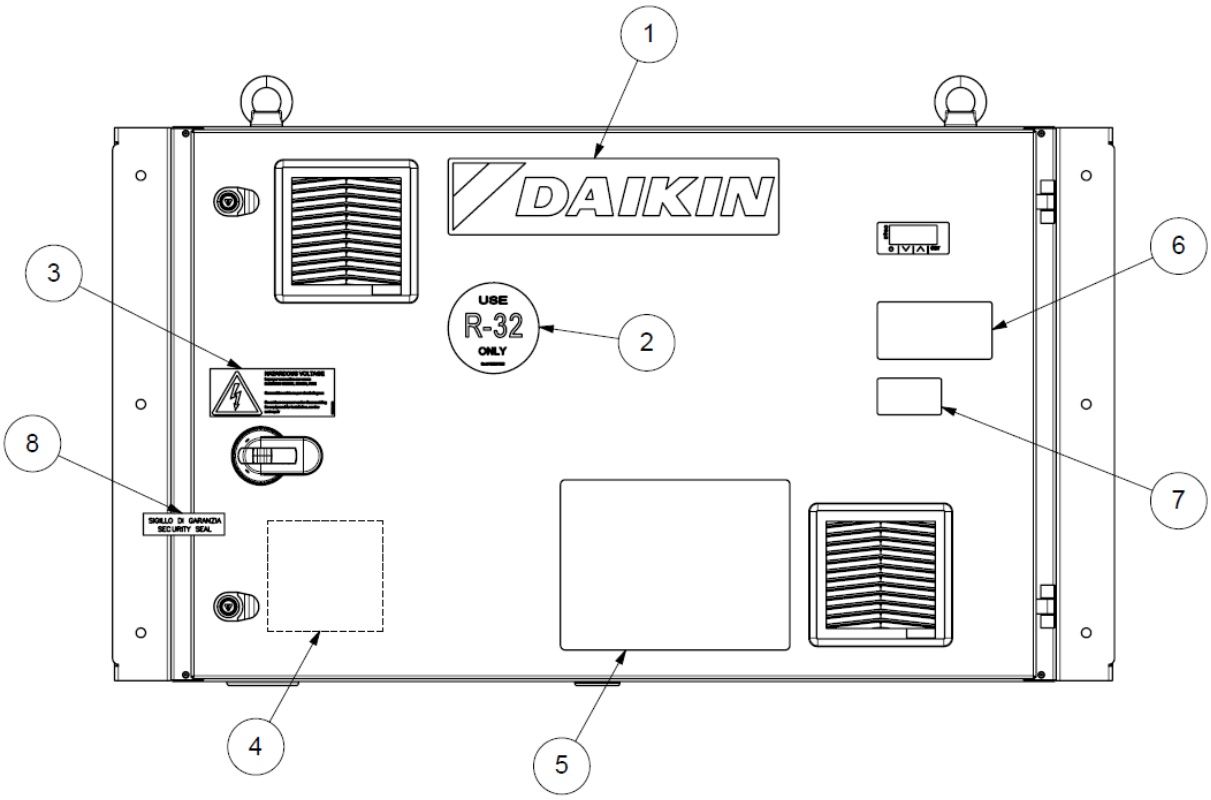
Using the suitable wire, connect the power circuit to the terminals L1, L2 and L3 of the electric panel.

Never twist, pull or apply weight to the terminals of the main switch. The wires of the power supply line must be supported by adequate systems.

The wires connected to the switch must respect the elevated insulation distance and the distance of surface insulation between the active conductors and the mass, in accordance with IEC 61439-1, Table 1 and 2 and local national laws.The wires connected to the main switch must be tightening using a wrench torque and complying with the unified tightening values relative to the quality of the screws of the washers and the nuts used.

6.8 Electrical panel label description

Fig. 22 – ***Identification of the labels applied to the electric panel (Standard*)***



Identification of the labels

1 – Manufacturer's logo	**5** – Instructions for handling / lifting
2 – Type of coolant in the circuit/s	**6** – Identification data of the unit
3 – Hazardous voltage warning	**7 – Flammable** gas EN ISO 7010-W021
4 – Tighten electrical cables warning (inside the panel)	**8** – Warranty seal

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

7 ADDITIONAL GUIDELINES FOR MODULAR APPLICATIONS

This chapter is as an integration of the manual for modular applications. All the indications reported outside this chapter, for single unit installation, must be considered still valid.

The three models EWWT100-125-160Q may connect together in a system using standard Daikin master/slave (MUSE) serial connection.

The system is equipped with:

- Two or more chiller modules, up to 4 modules connected together.
- Power supply bars system (external accessory, not standard)
- Water manifold module (external accessory, not standard)
- Pump module (external accessory, not standard)

The possible combinations of the modules are reported in Table 4.

Table 4 – Modular combinations*

	ID	kW
1 module	A	100
	B	125
	C	160
2 modules	A+A	200
	A+B	225
	B+B	250
	B+C	285
	C+C	320
3 modules	A+A+B	325
	A+B+B	350
	B+B+B	375
	B+B+C	410
	B+C+C	445
	C+C+C	480
4 modules	B+B+B+B	500
	B+B+B+C	535
	B+B+C+C	570
	B+C+C+C	605
	C+C+C+C	640

*This is a reference table at nominal water conditions. For the specific capacity rating, refer to Daikin software selection. For the field installation the order of modules is not mandatory, it can vary from the dispositions showed in the table.

7.1 Water manifold module installation

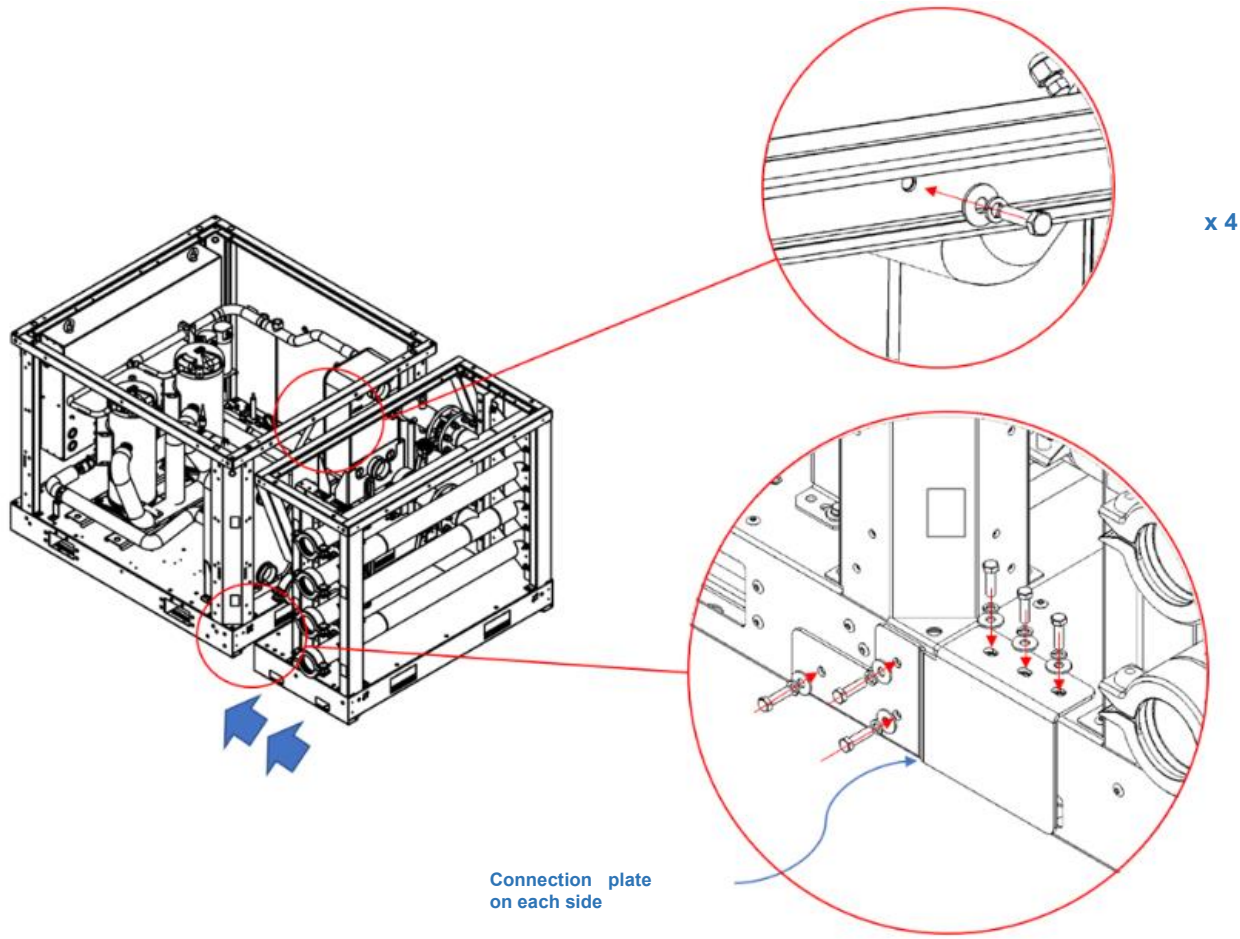
7.1.1 Connection between manifold module and chiller unit

In case of modular application, the units shall be connected on the water side through manifold modules. The manifold allows the connection between the unit heat exchangers and the customer plant.
The manifold modules can be:

- Supplied by Daikin for each specific installation.
- Designed by the customer.

When the manifold modules are designed by the customer, the guidelines in this chapter shall be followed for a proper design.

Fig. 23 – Connection instructions between chiller and manifold modules



After installation of manifold module and before connection to the chiller module, it is important to clean and remove welding oxides and other contamination products deriving during production of the water piping.
The cleaning steps are the following:

1. Flush the pipes with a solution of hot water and a mild detergent.
2. Flush with a dilute solution of phosphoric acid
3. Stop the cleaning when no more debris are visible.
4. After the cleaning, flush the pipes for one hour with cold water to remove any residue.

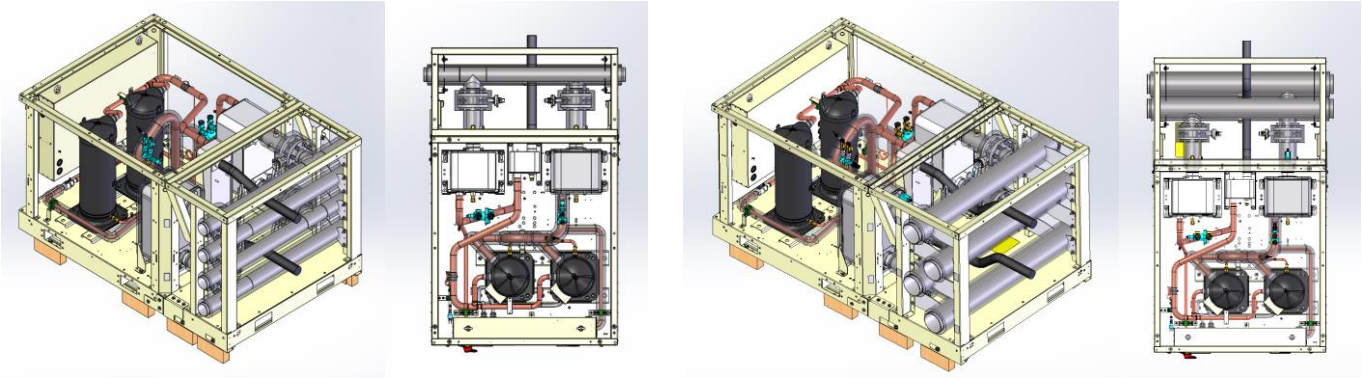
All the cleaning liquids, acids, and detergents must be compatible with stainless steel, copper, and carbon steel. Consult a professional water treatment specialist when in doubt.

The manifold module is equipped with a butterfly valve in each pipe.

7.1.2 Partial Heat Recovery with manifold module

In case the unit with optional Partial Heat Recovery (PHR) is installed with the manifold module, to connect the PHR exchanger pipes the following precautions can be followed: when the system is made up of multiple modules, it is recommended to have the PHR pipes come out between the manifold pipes, like the black pipes in the following pictures.

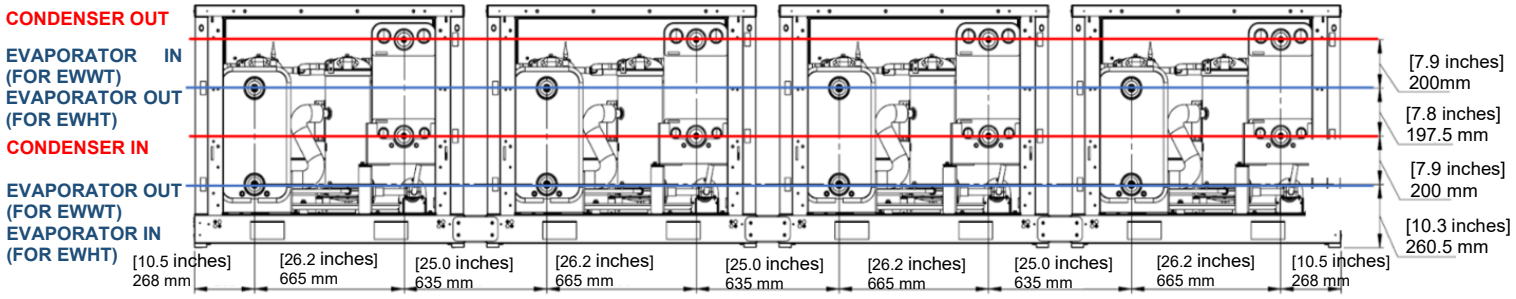
Fig. 24 – PHR pipes with manifold module (at left for 3inch – at right for 5inch manifold pipes)



7.1.3 Reference drawing in case of custom water piping

In case the manifold module is not provided by Daikin, it is possible to refer to the following indication for customer piping connection.

Fig. 25 – Water piping configuration



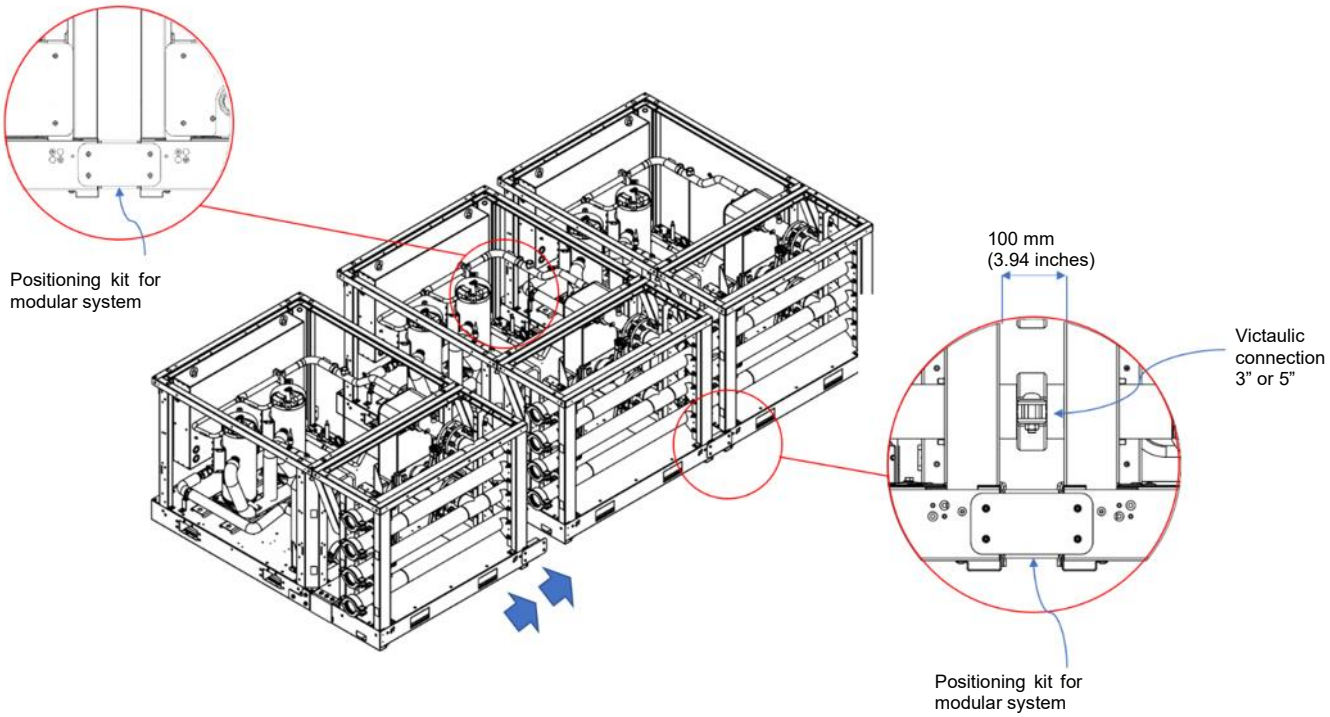
When pump module is not equipped, the customer can connect the plant water piping indifferently to the left or right side of the manifold modules system. When pump module is supplied, the water connection can only be done to the pump suction pipe.

7.2 Connection of modular system

7.2.1 Mechanical connection

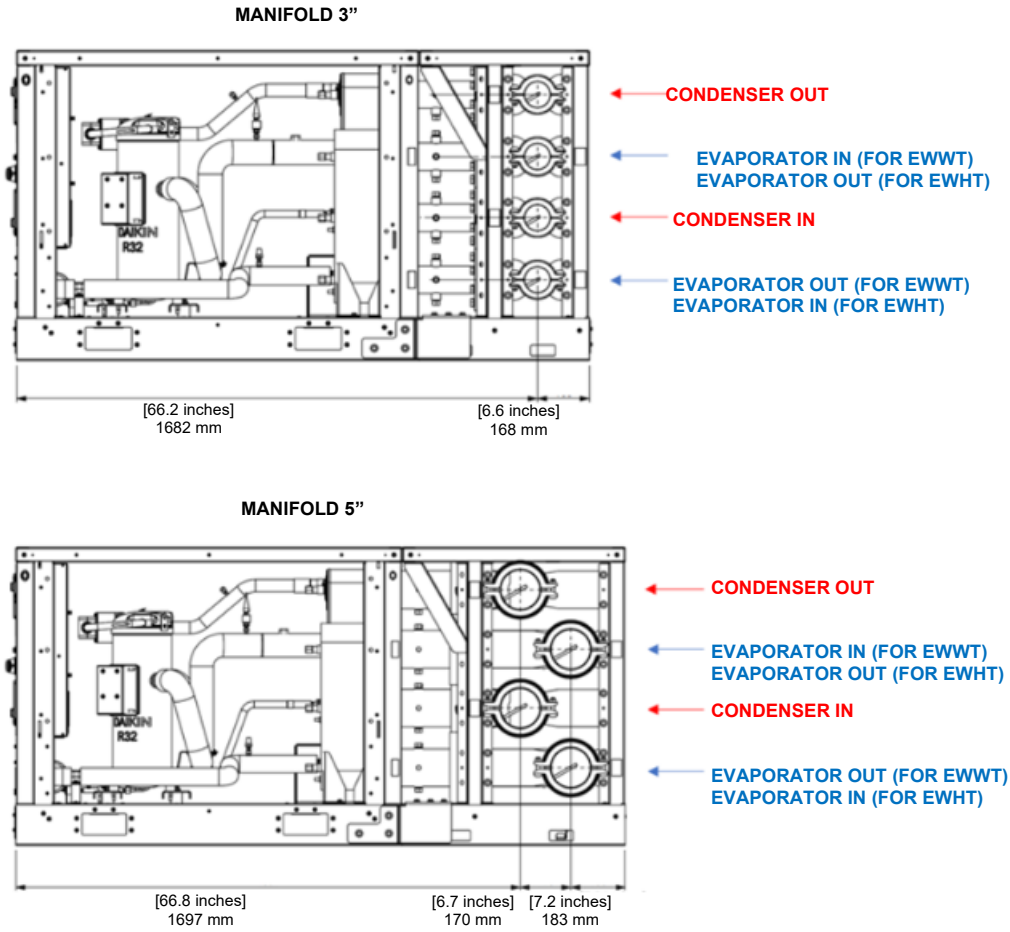
The mechanical connection of more modular systems together is possible thanks to a positioning kit.
The positioning kit allows to align perfectly the two systems for a proper connection.

Fig. 26 – Modular systems connection



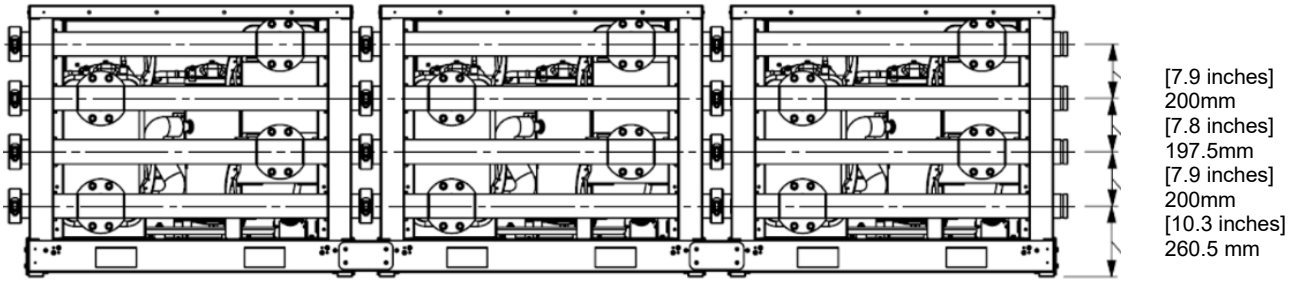
7.2.2 Water manifold connection

Fig. 27 – Water manifold sizes



EWWT-Q and EWLT-Q series are equipped with heat exchangers that need to work all counter-current. In these cases, the water inlet for evaporator is on the top pipe and the water inlet for condenser is on the bottom pipe.
The EWHT-Q series works with co-current evaporator and counter-current condenser. Thus, for EWHT-Q series, the water inlets for evaporator and condenser are both on the bottom pipes.

Fig. 28 – Water connection to modules



As reported in the previous picture, the water connection can be done from each side, there are no indication about constrain on right / left side. Also, the two connections related to same water loop (cold loop or hot loop) can be done on the same side or opposite side.
The only constrain to be respected in the water connection is the pipe where the water need to enter / leave the system (as in case of pump module).

7.3 Motor for Plate Heat Exchanger Shut-Off Valve

The manifold module is equipped with a butterfly valve in each pipe.
These shut-off valves are manual in case of standard unit, but it can be provided an actuator kit as unit accessory.
While with the manual shut-off valves the water flow rate for each exchanger is constrained on the base of the pressure drop, the motorized valves allow to manage each plate heat exchanger’s flow rate and pressure drop.

The usage of the electric actuator allows to avoid water circulation in the plate heat exchanger of unit currently not currently operating.

7.3.1 Motor mechanical installation

In this chapter are reported the instructions to install the electric actuator on the shut-off valve.
The motor kit consists of two main components:

1. Motor
2. Limit switches related to valve full opening/closing position indication.

Fig. 29 – Mounting instructions for valve actuator

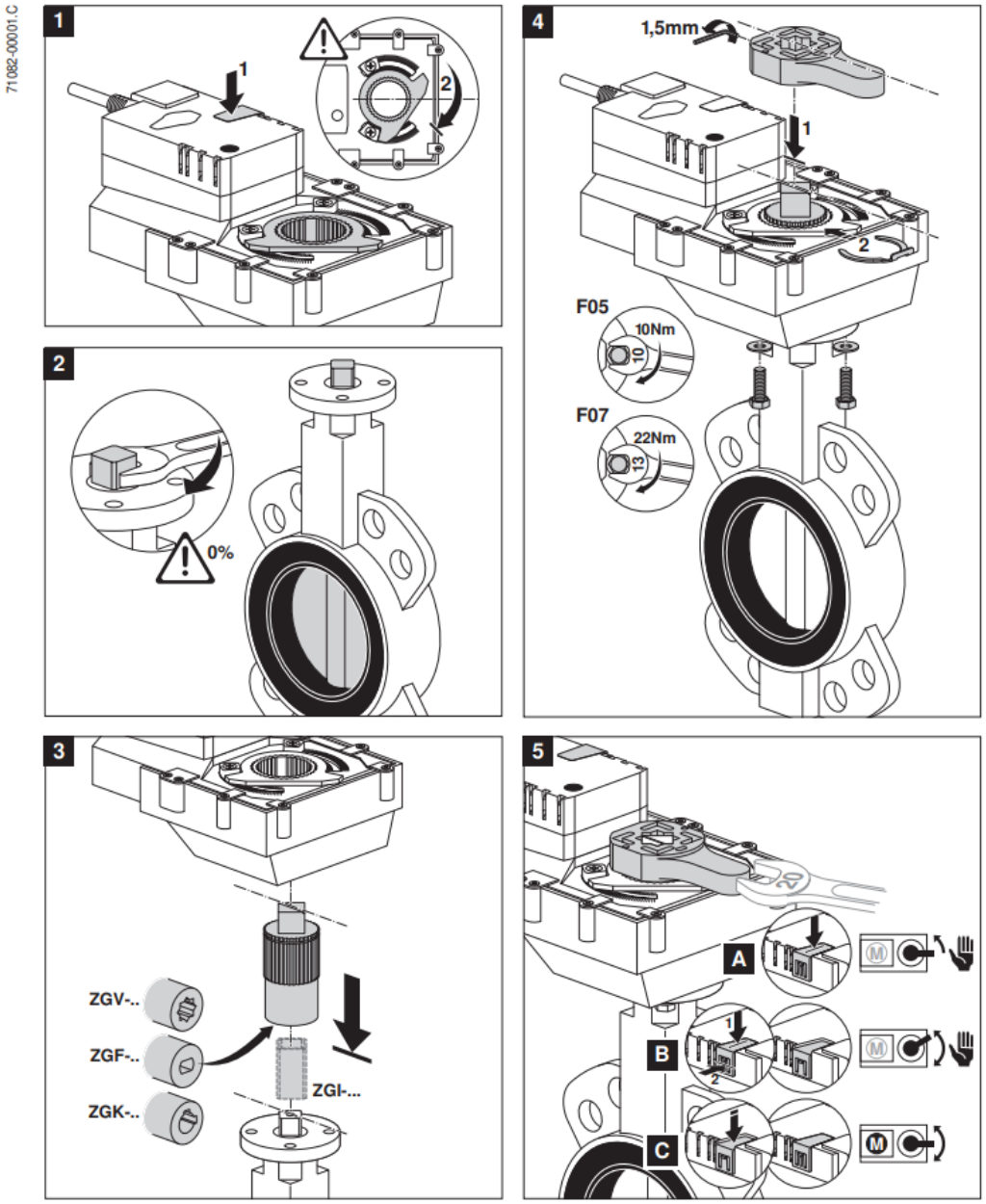
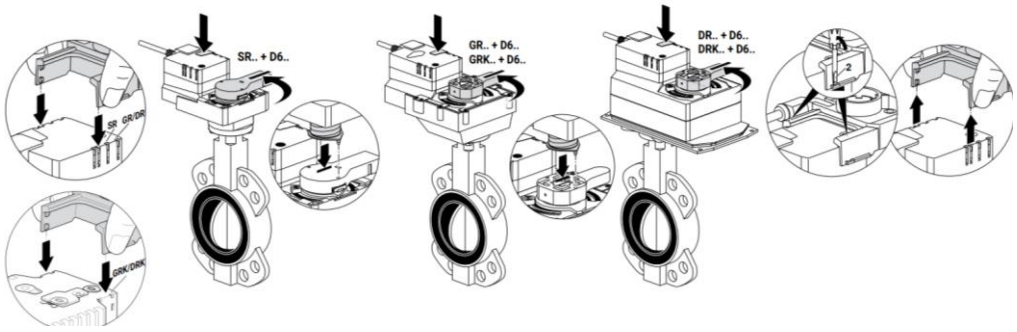
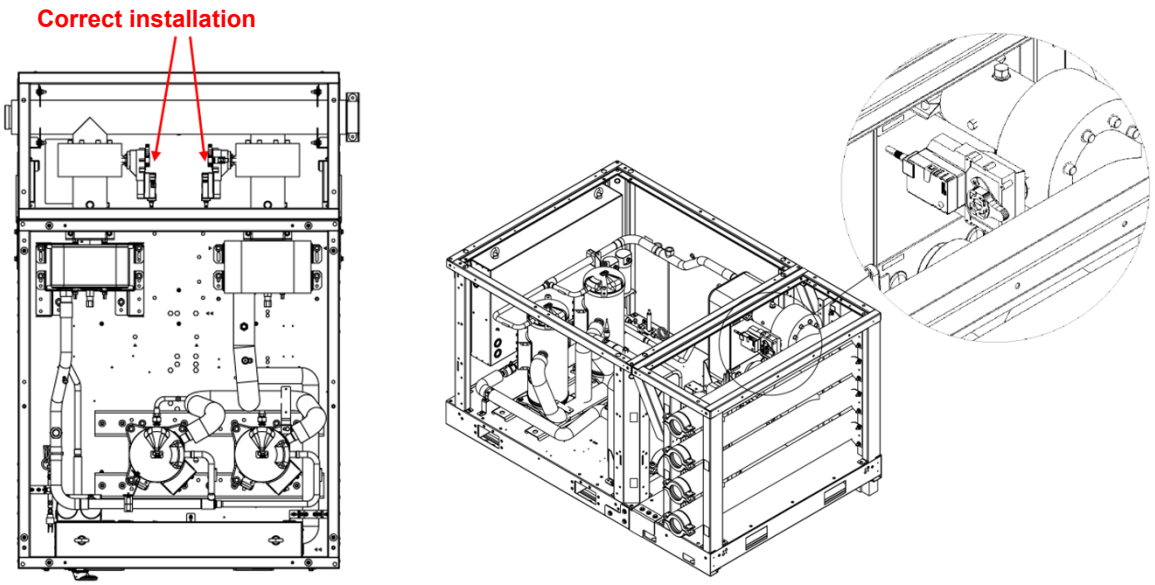


Fig. 30 – Mounting instructions for actuator limit switches



The valve shall be mounted on the unit following the indications in figure below.

Fig. 31 – Mounting indications for valve actuator



7.3.2 Valve actuator and Limit Switch electrical installation

The installation of an expansion module in the electrical panel is mandatory for the electrical connection of the valve actuator.

Fig. 32 – Wiring diagram for motor (left figure) and limit switches (right figure)

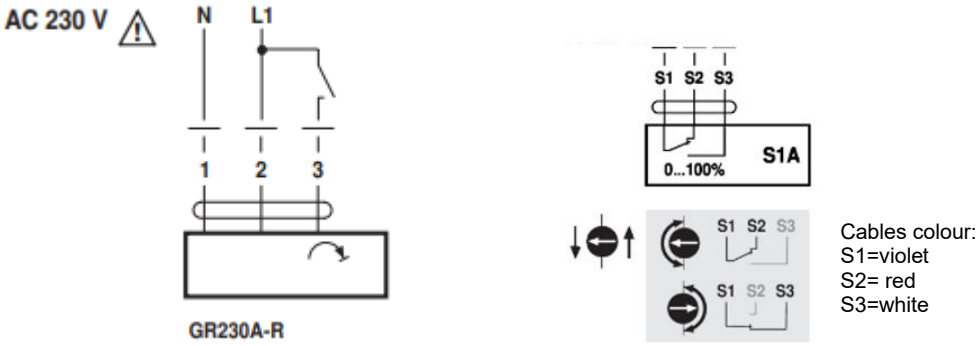


Fig. 33 – Cable adapters for evaporator shut off valve actuator and limit switches

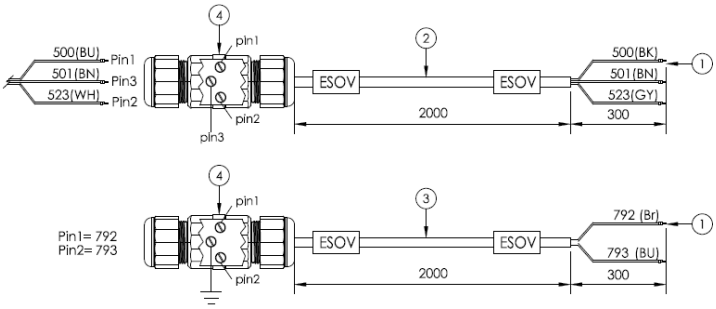


Fig. 34 – Cable adapters for condenser shut off valve actuator and limit switches

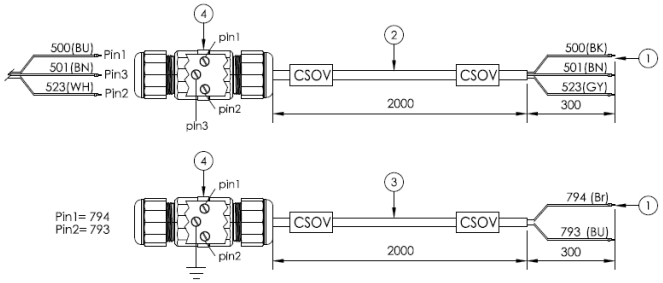
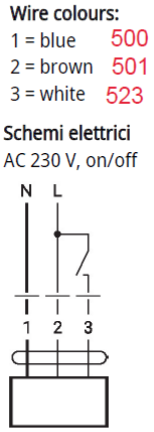


Fig. 35 – Shut off valve actuator wiring diagram



The electrical connection between the shut-off valve components and the junction cables is set out in table below.

Cable from Motor	Junction Cable	Cable from electrical cabinet
(Pin1) blue	500	(Pin1) black
(Pin2) brown	501	(Pin2) brown
(Pin3) white	523	(Pin3) grey

Cable from Limit Switches	Junction Cable	Cable from electrical cabinet
S1 (Violet)	(Pin1) 792	(Pin1) brown
S3 (White)	(Pin2) 793	(Pin2) blue

In figures below is shown the cables routing of valve actuator.

Fig. 36 – Evaporator shut off valve actuator cable routing

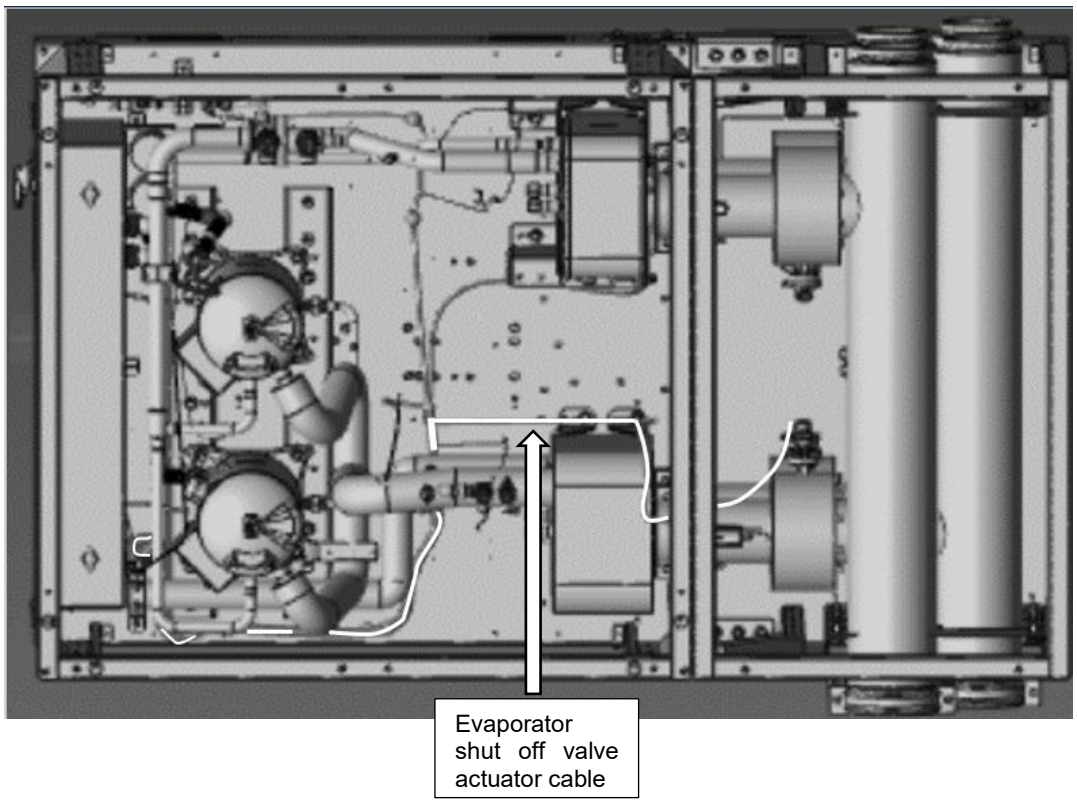


Fig. 37 – Condenser shut off valve actuator cable routing

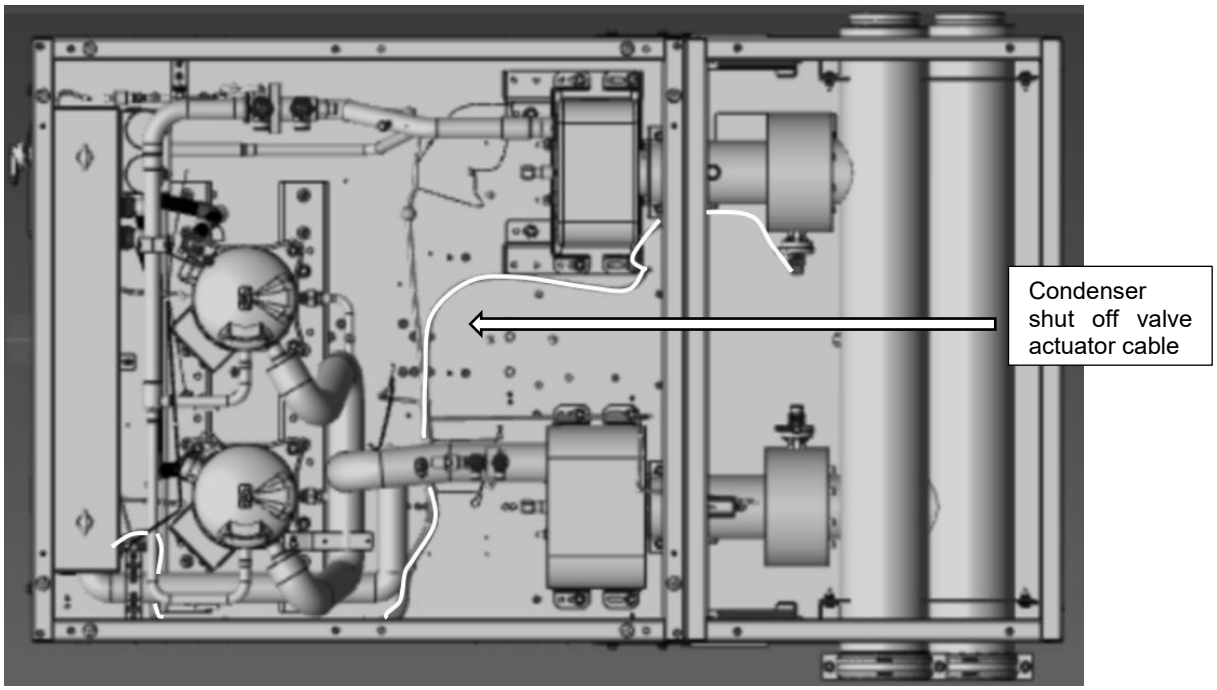
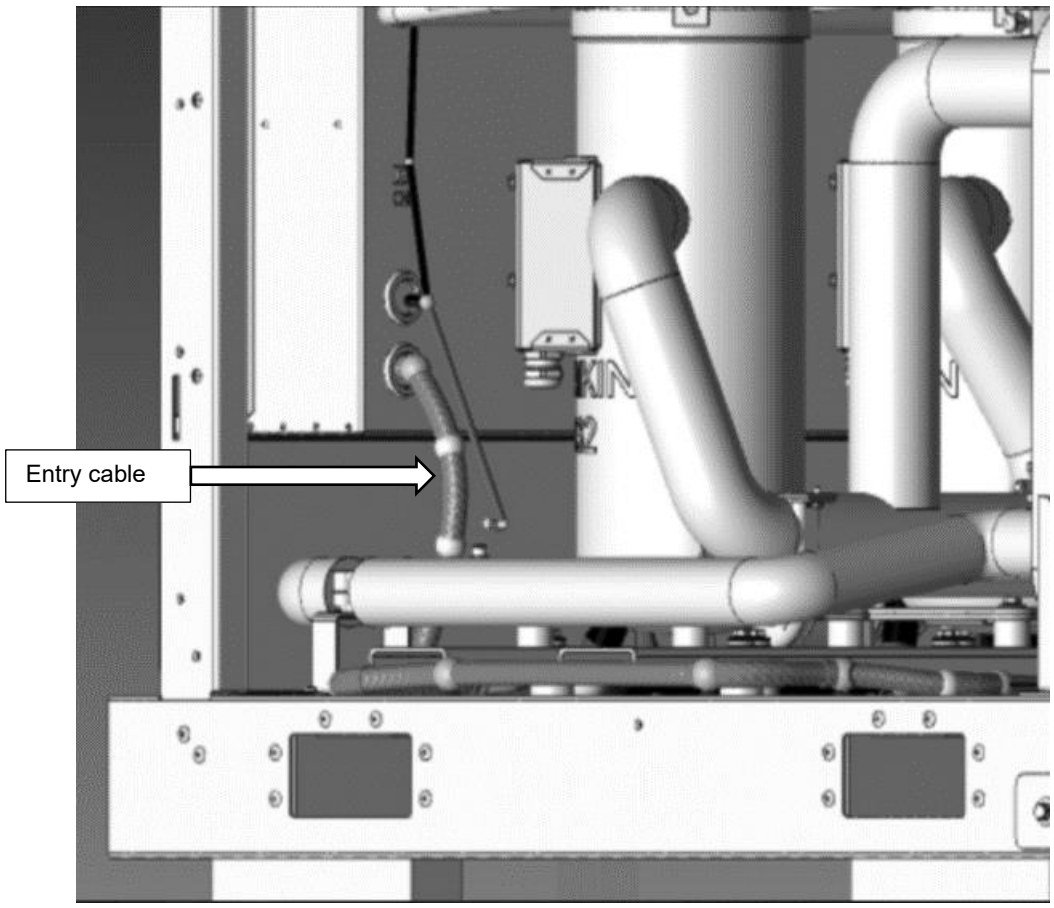


Fig. 38 – Electrical panel entry for evaporator and condenser shut off valve actuator cables

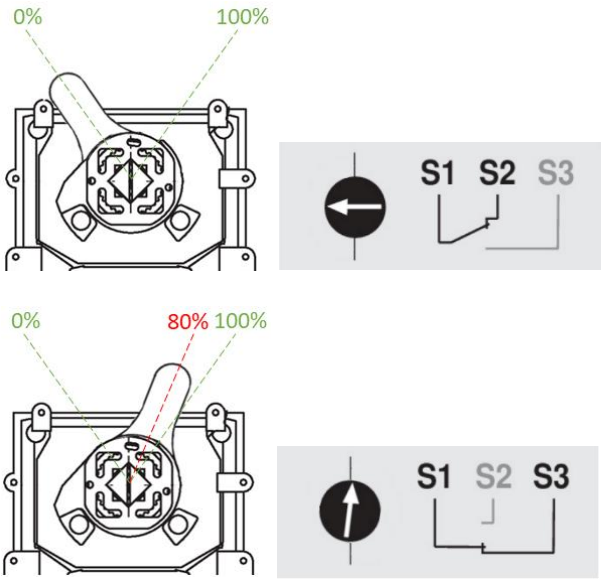


7.3.3 Setting of Limit Switches trigger

The procedure to set the trigger of the feedback switches of the valve is detailed below:

- Set the **Unit Mode = Test.**
- In **Unit Manual Control** drive the valve in the closed position 0%, wait for the closed feedback state.
    - While opening the valve handle rotates from 0% to 100%, in the meanwhile the arrow opening indicator also rotates.
    - When the valve handle is around the 80% position, the arrow indicator must be rotated with a screwdriver in the closed switch position as showed below.

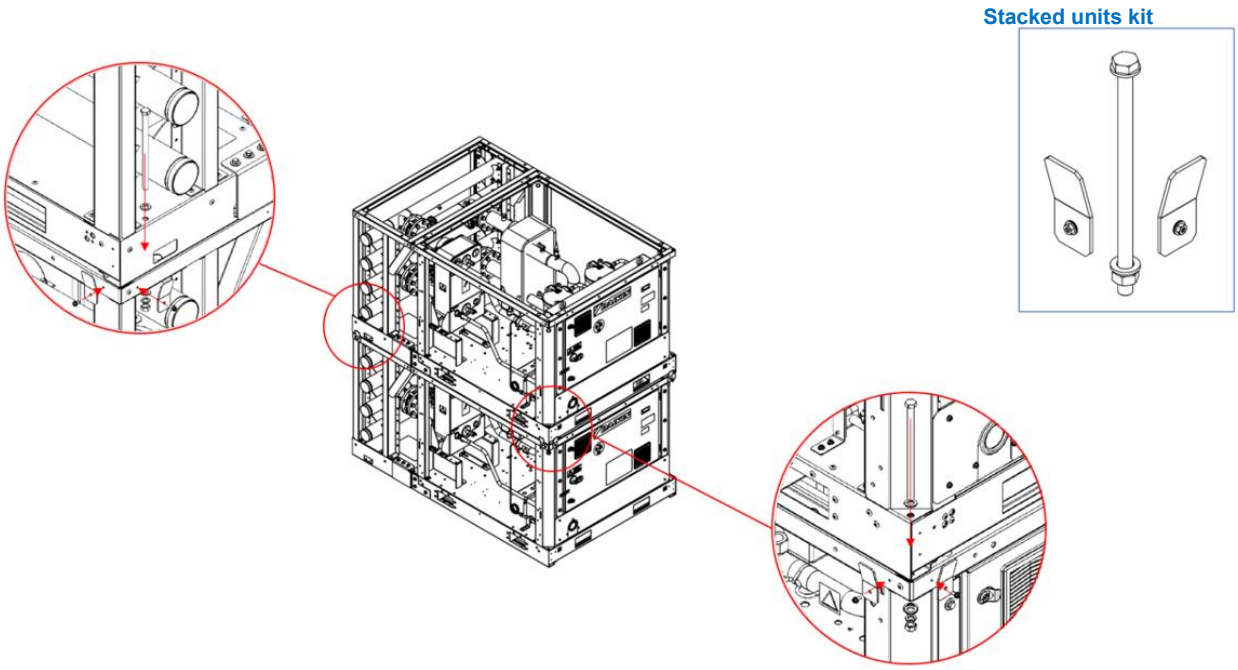
Fig. 39 – Setting of limit switches trigger



7.4 Connection of stacked units

The connection of stacked units is possible thanks to “Stacked unit kit” accessory (see figure below). This accessory is mandatory for this modules configuration.

Fig. 40 – Mounting instructions for stacked units



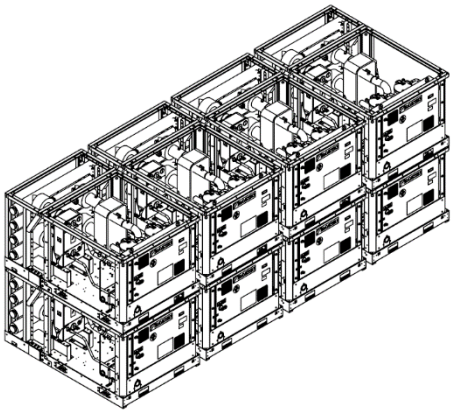
7.5 Connection of more unit-manifold systems together

For the installation of more unit-manifold systems together, are possible two configurations:

- From two to four unit-manifold systems in line
- Installation of two stacked unit-manifold systems

For the second type of installation, the control manages the units of the same level. Thus, there is a control system for each level. No hydraulic piping is present to connect the two levels.

Fig. 41 – Mounting instructions for more unit-manifold systems together



7.6 Pump module installation

If pump module is installed, it is advisable to install the master module near to the pump module.

Fig. 42 – Pump module installation

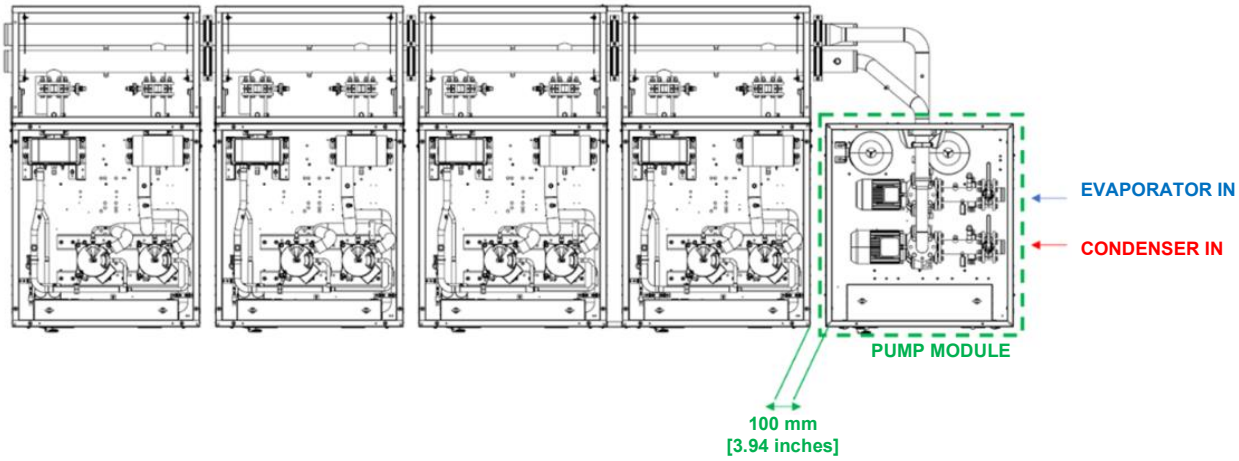
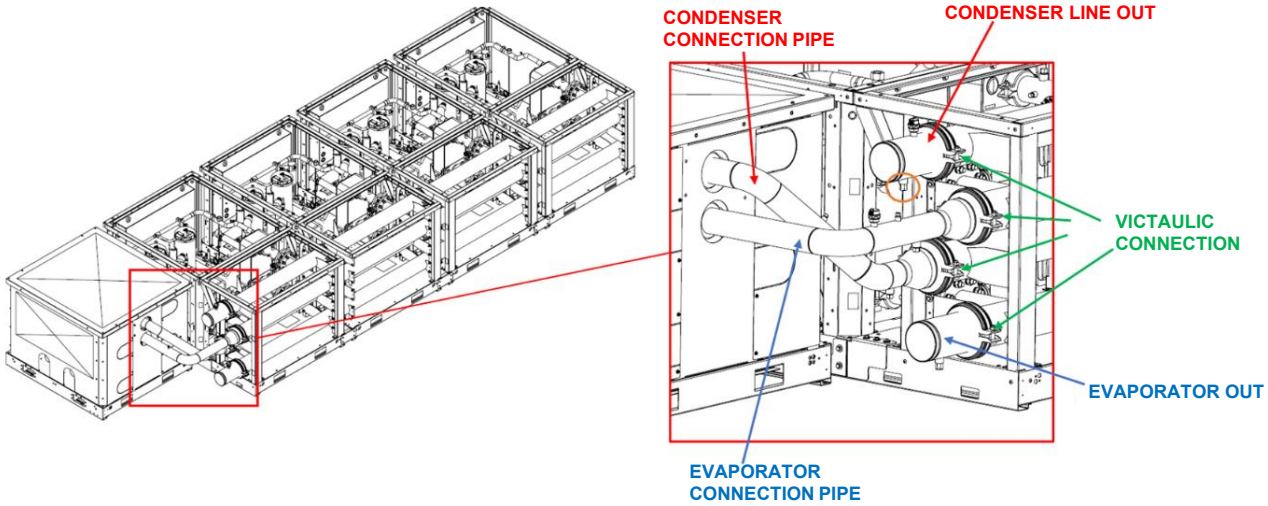


Fig. 43 – Pump module installation – piping details



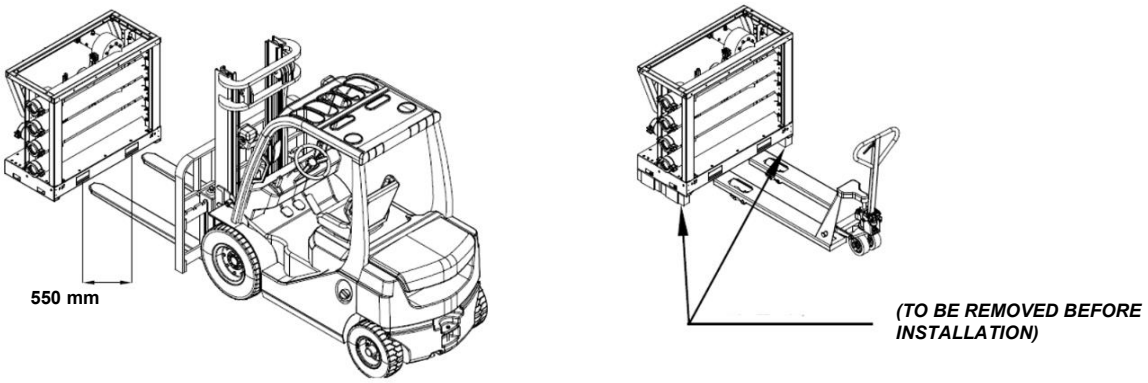
The pump module can be installed only on one side of the unit- manifold system.
The water inlet installation is constrained to the pump suction.

7.7 Handling of the Modules

The packaging from the factory permits lifting with a suitable crane. Ensure straps are in good working condition and that they are rated for the weight of the machines. Spreader bars may be required for effective rigging and to avoid damage to the chiller modules. The system arrives fully charged with refrigerant.

The manifold can be handled by forklift using the holes in the base frame, or by pallet truck if wooden spacers are present.

Fig. 44 – Handling of manifold module



The module consists of the unit and the manifold connected; it can be lifted by forklift. Only the base frame holes must be used to lift the module.

Fig. 45 – Handling of unit and manifold modules

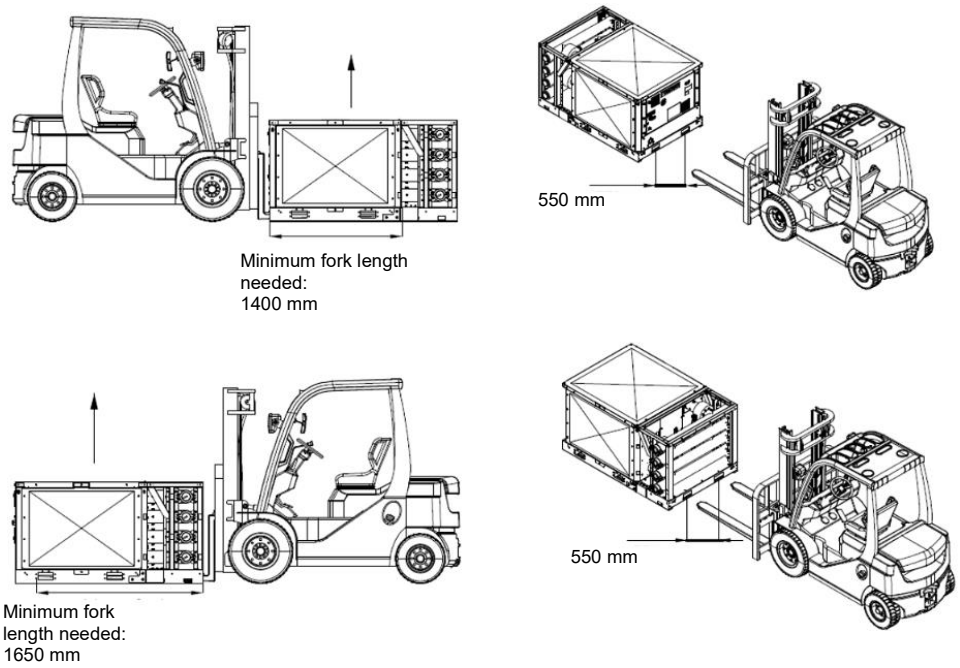


Fig. 46 – Indications for stacked units installation

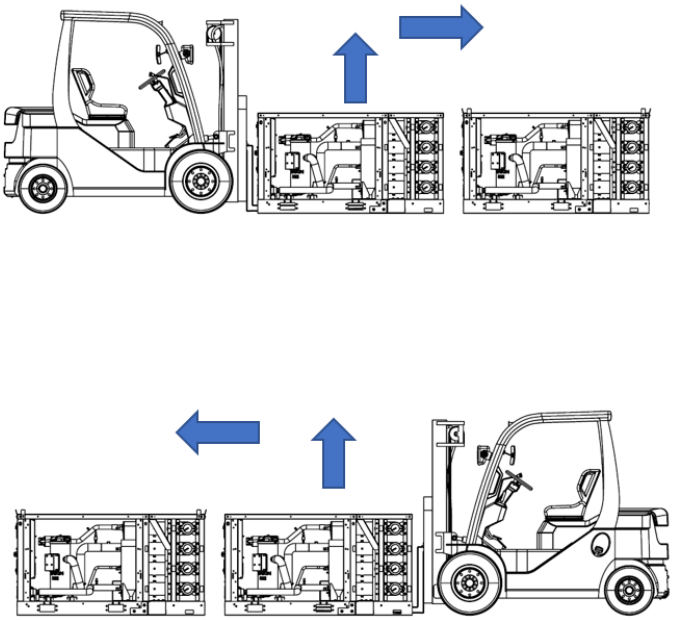


Fig. 47 – Handling of pump module using forklift

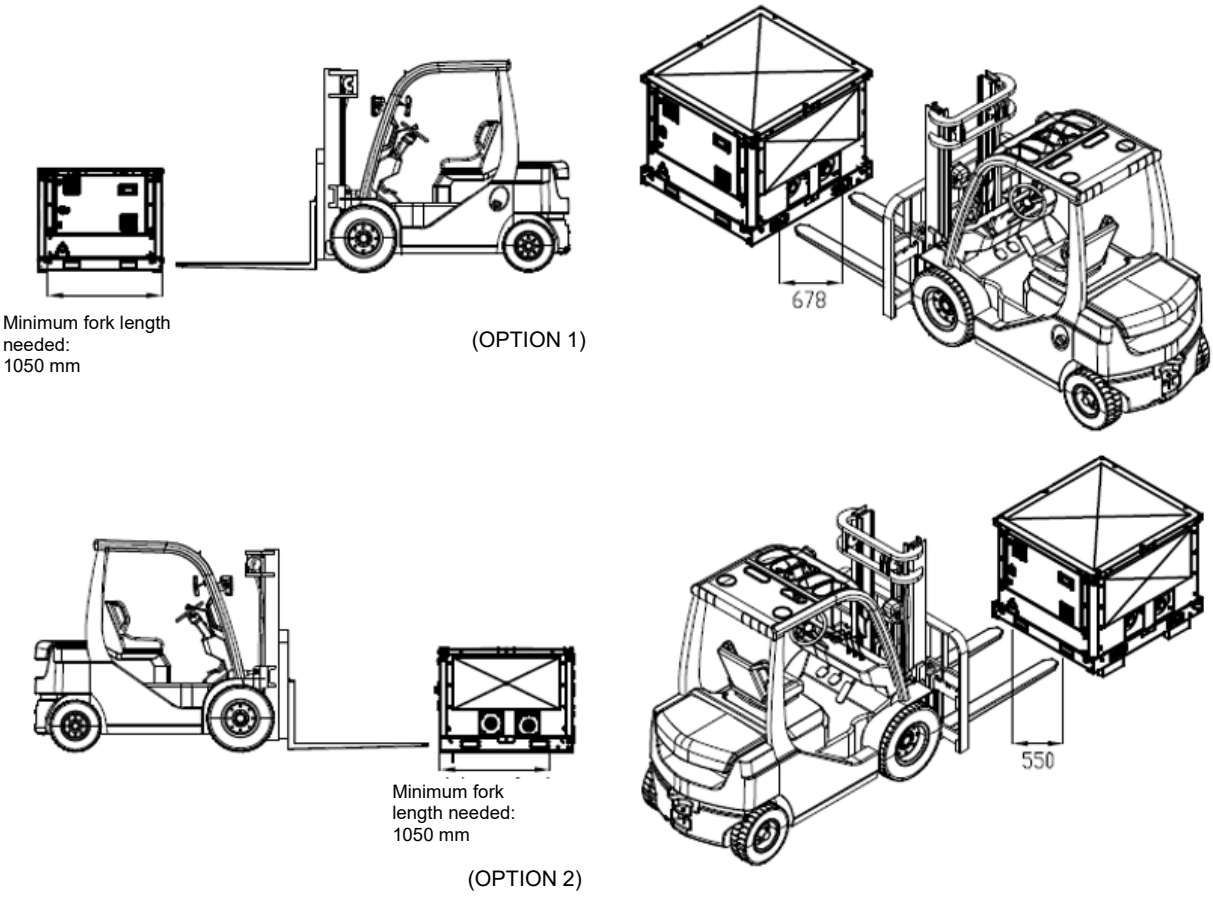
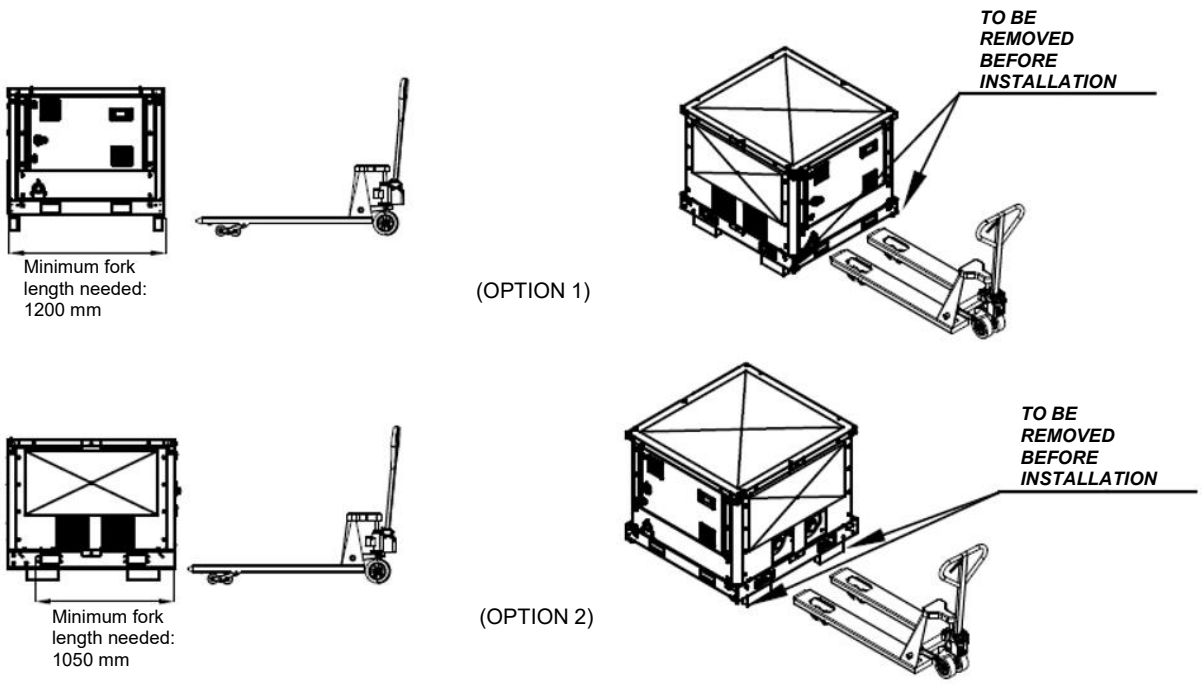


Fig. 48 – Handling of pump module using for pallet truck



7.8 Electrical installation of modules

Unit modules can be electrically connected together through a power bar system. Each unit module is equipped with a power bar module with fuses inside and the power bar modules are connected together with connection modules.
A box is present on both sides of the power bar system in order to permit the cables routing.

Fig. 49 – Power bar system

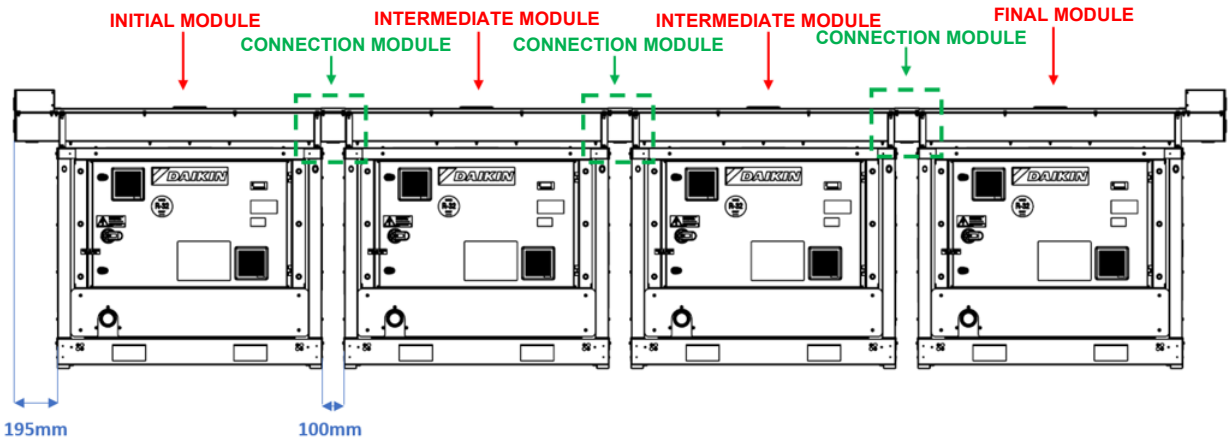


Fig. 50 – Cables routing between bar system and unit

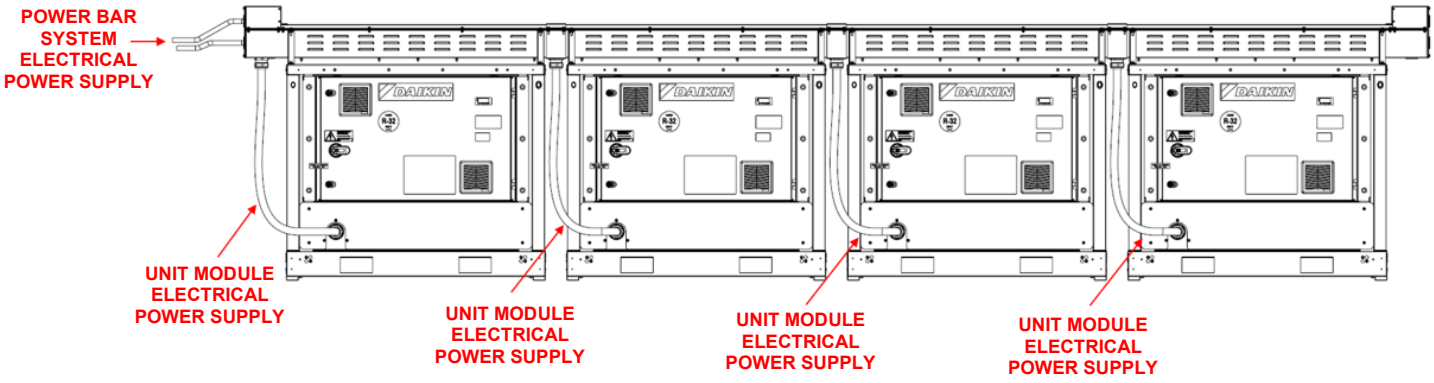
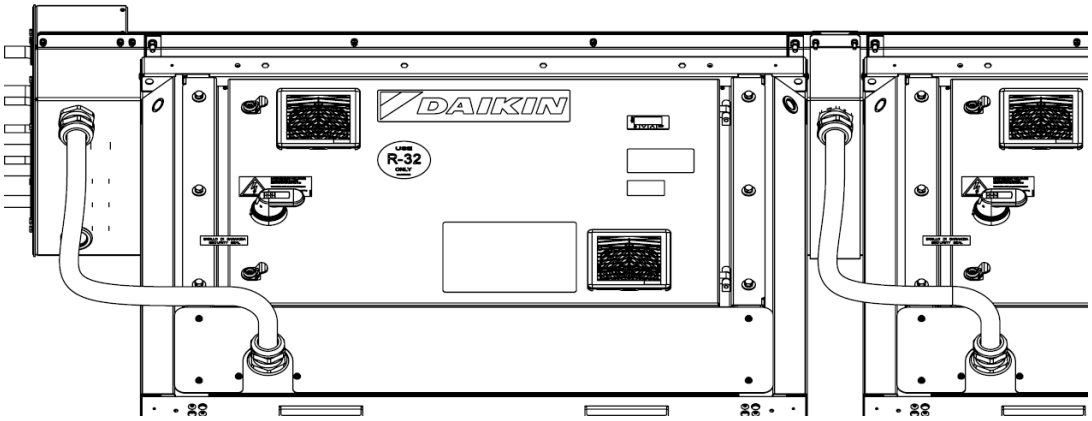


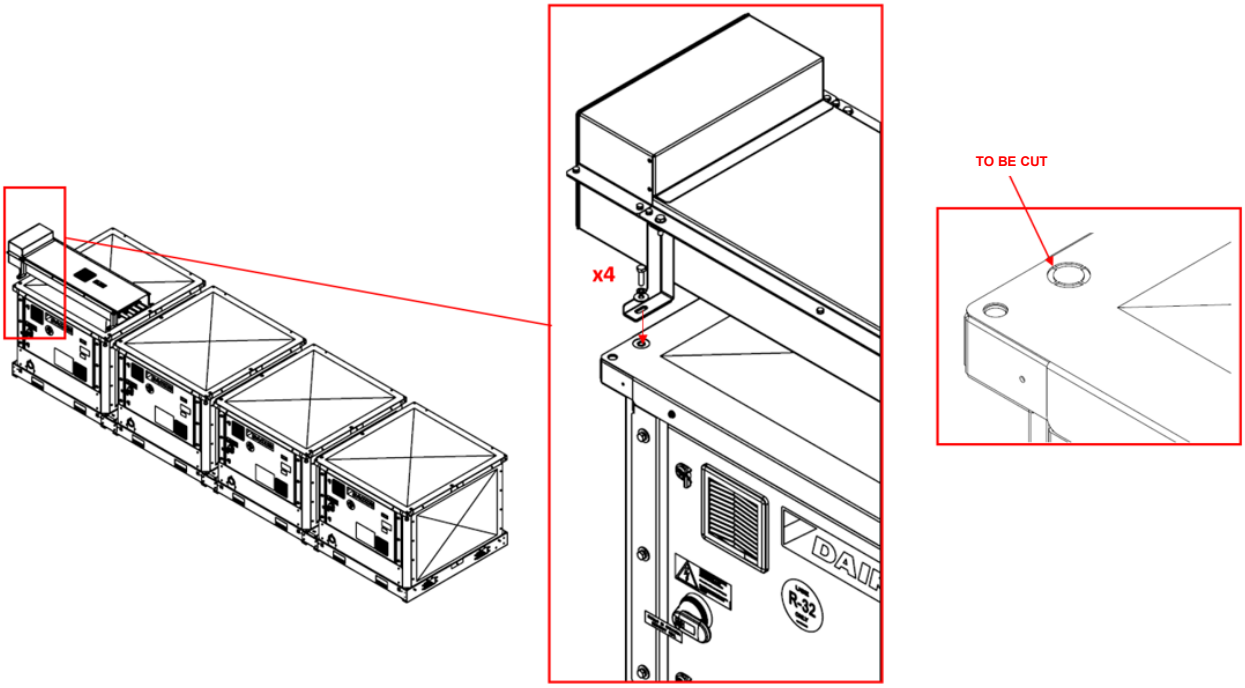
Fig. 51 – Details of cables routing



7.8.1 Power bar system mechanical installation

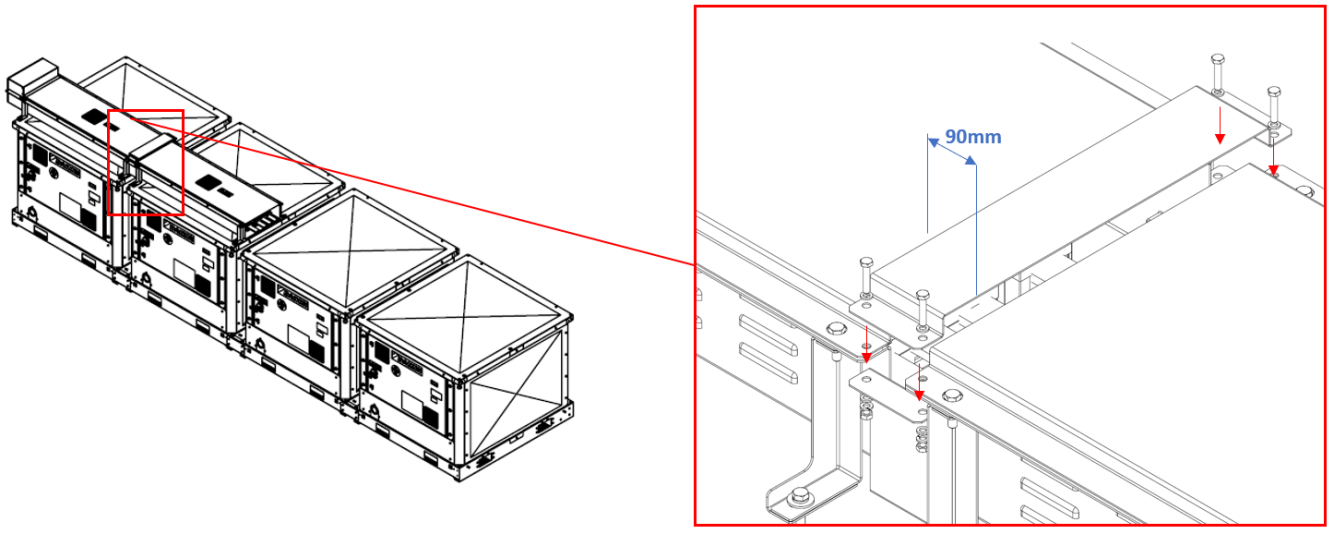
For a correct mechanical installation each power bar module has to be put on top of the proper unit module and fixed with 4 screws using the hexsert mounted on the lateral crossbeams (2 on each side). When the top panel of the cabinet is present (XR unit version), a part of the sheet needs to be cut to allow the fastening of the screws.
The first and the last unit module have a proper power bar module with a box that allow the installation of the power cables, the other units have a specific power bar module without the box.

Fig. 52 – Fixing of the power bar system to the unit



Two consecutive modules have to be connected by a connection module. This module includes 4 busbar connecting terminal in order to guarantee the electric continuity through the power bar modules.

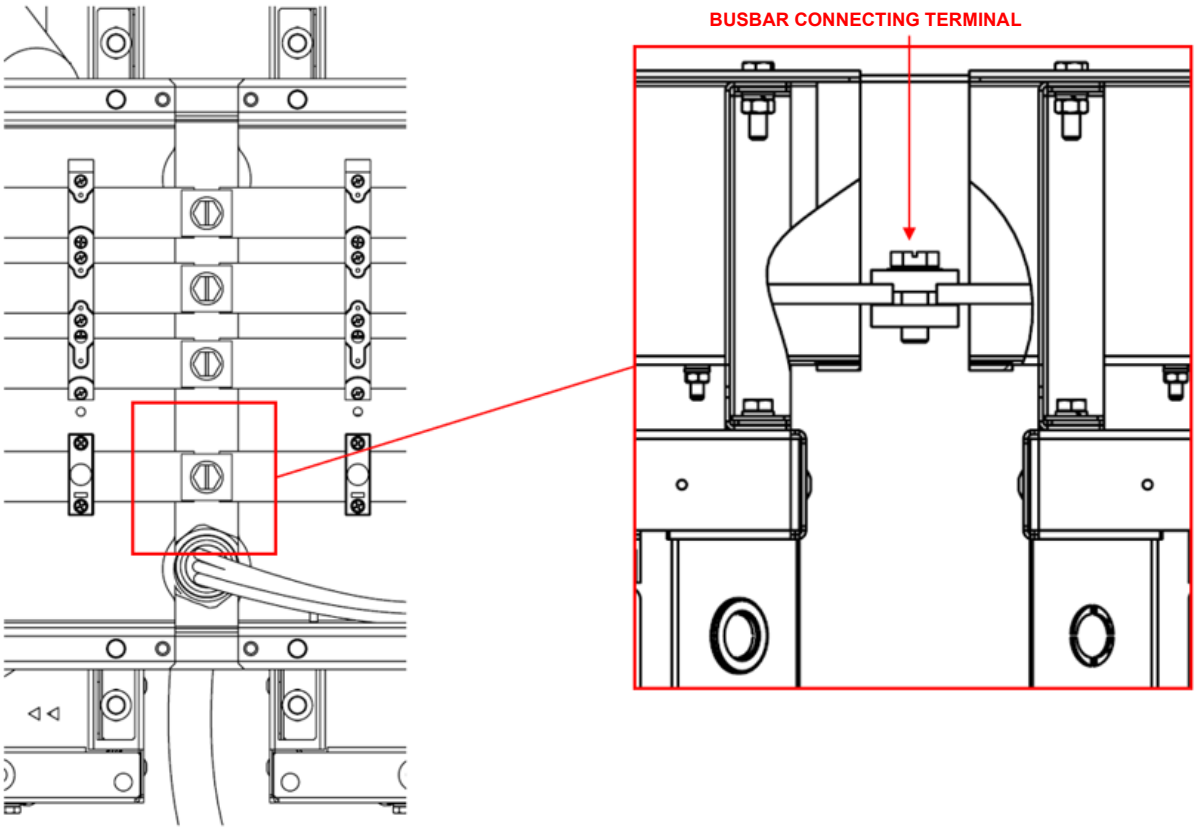
Fig. 53 – Connection of the power bar modules together



7.8.2 Power bar system electrical connection

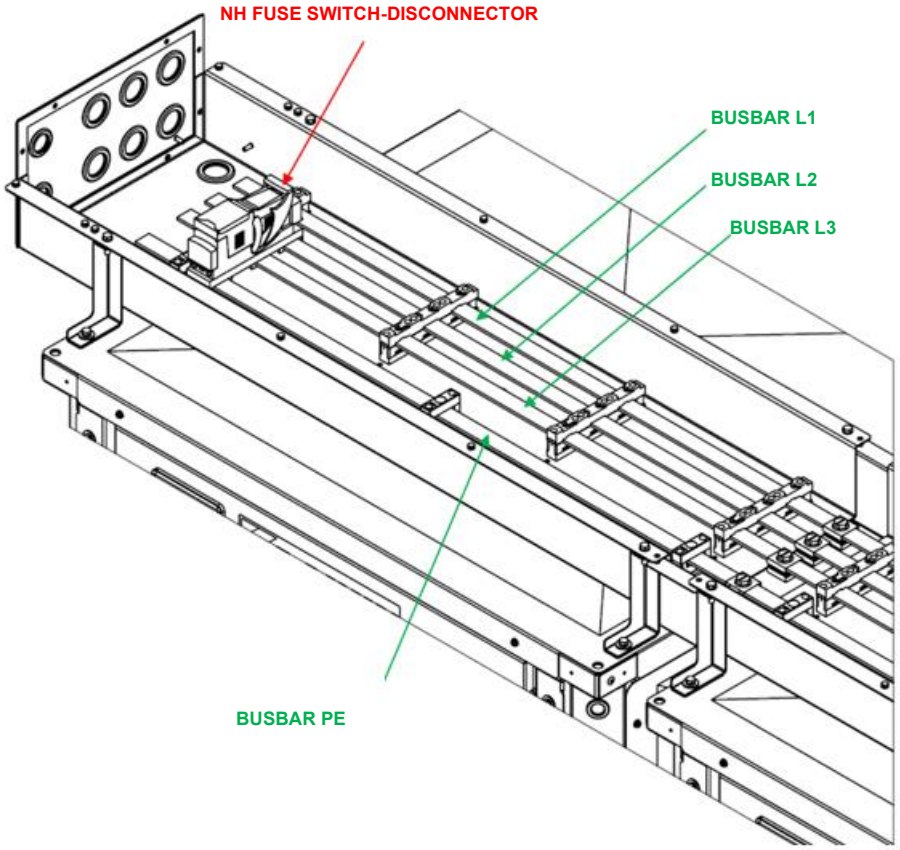
The electrical connection of more modules of the power bar system is possible thanks to specific connection clamps. These clamps allow the connection of the bars of each module.

Fig. 54 – Details of connection of the power bar modules together



Top view of the open power bar module

Fig. 55 – Detail of the fuses and of the box for cables routing of the power bar module



The electrical connection of the units to the power bar system is done through a multipolar cable, 3 phases with ground. The three phases shall be connected to the fuse holder, equipped with each module, and the ground (PE) shall be connected to the ground bar (Busbar PE).

Fig. 56 – Detail of electrical connection for the initial unit module

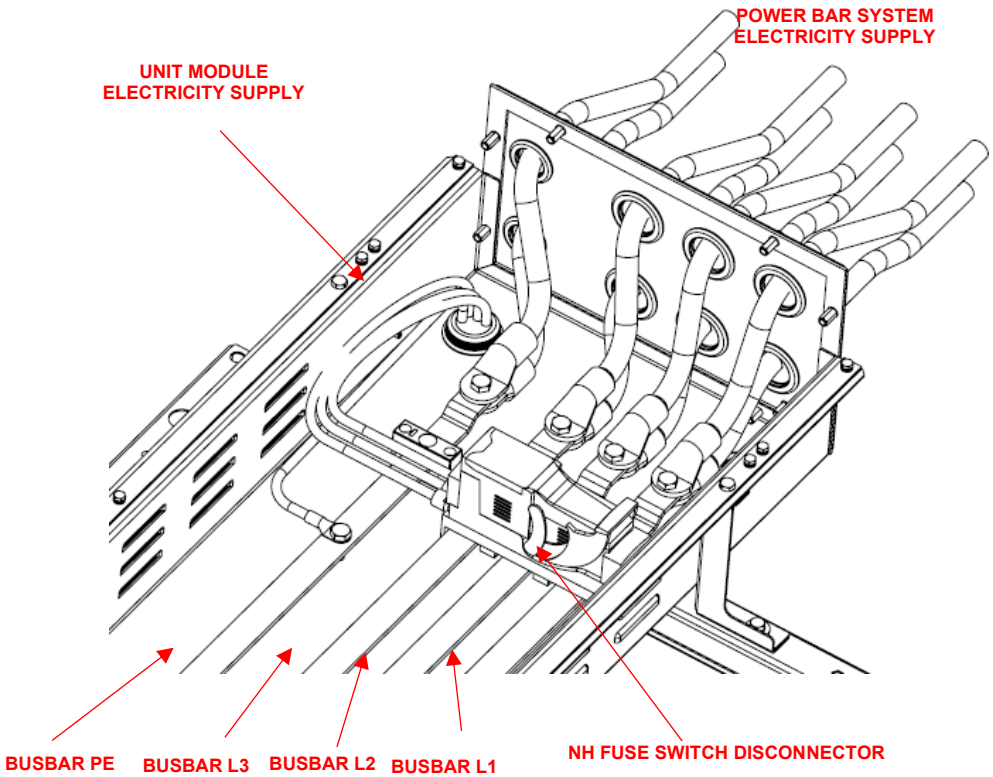
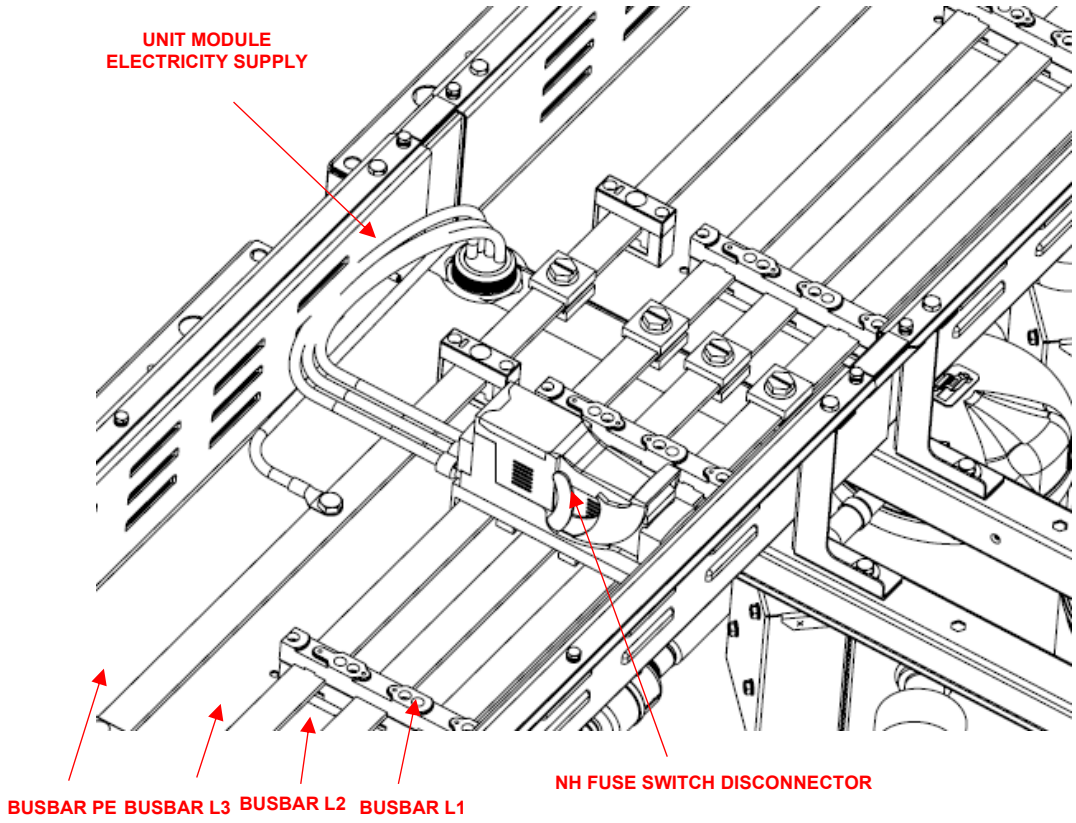


Fig. 57 – Detail of electrical connection for any other unit module



Refer to the specific wiring diagram for the unit purchased. The wiring diagram may not be on the unit or it could be lost, in that case please contact your manufacturer representative, who will send you a copy.
In case of discrepancy between wiring diagram and electrical panel/cables, please contact the manufacturer representative.

This unit includes non-linear loads such as inverters, which have a natural current leakage to earth. If an Earth Leakage Detector is installed upstream the unit, a type B device with a minimum threshold of 300 mA must be used.

Electrical equipment can operate correctly in the intended ambient air temperature. For very hot environments and for cold environments, additional measures are recommended (contact the manufacturer representative).
The electrical equipment can operate correctly when the relative humidity does not exceed 50 % at a maximum temperature of +40 °C. Higher relative humidities are permitted at lower temperatures (for example 90% at 20 °C).
Harmful effects of occasional condensation shall be avoided by design of the equipment or, where necessary, by additional measures (contact the manufacturer representative).

This product complies with EMC standards for industrial environments. Therefore, it is not intended for use in residential areas, e.g. installations where the product is connected to a low voltage public distribution system. This product needs to be connected to a low voltage public distribution system, specific additional measures will have to be taken to avoid interference with other sensitive equipment.

The units must be connected to a TN power supply system.
If the units need to 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 directive and regulations in force.
The connections to the terminals must be made with copper terminals and cables, otherwise overheating or corrosion may occur at the connection points with the risk of damaging the unit. The electrical connection must be carried out by qualified personnel, in compliance with the laws in force. There is a risk of electric shock.

Failure to disconnect power before servicing could result in death or serious injury.
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

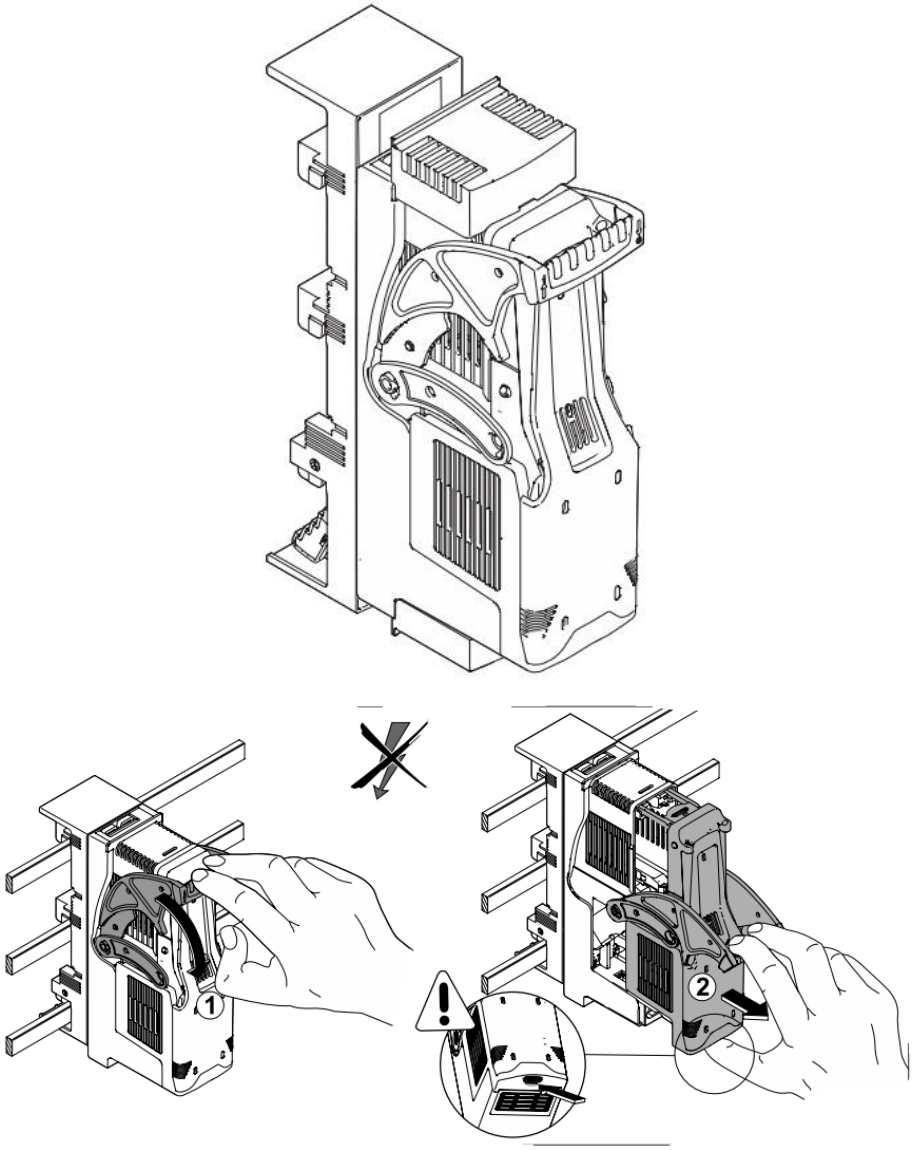
Before any installation and connection works, the unit must be switched off and secured. Since this unit includes inverters, the intermediate circuit of the capacitors remains charged with high voltage for a short period of time after being switched off.
Do not operate to the unit before 20 minutes after the unit has been switched off.

7.9 Fuses replacement for power bar system

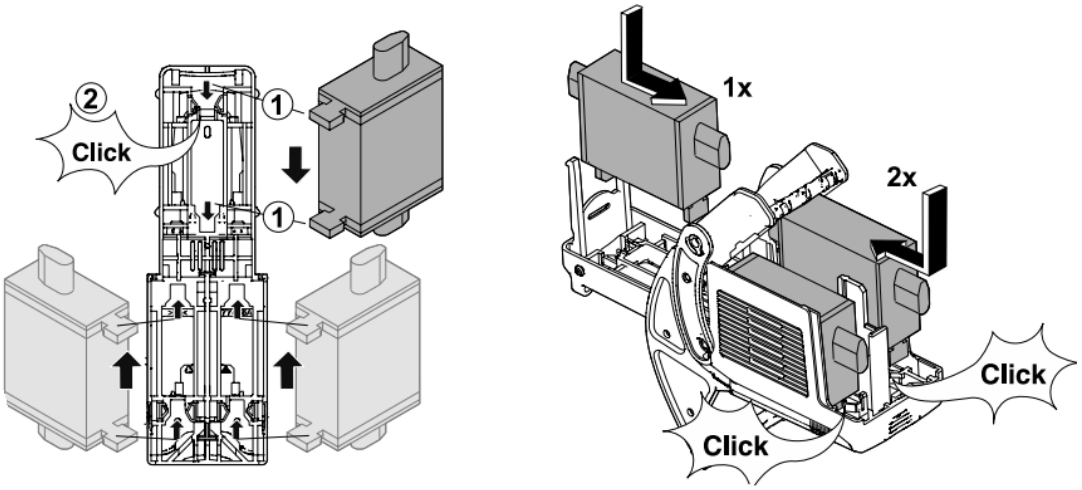
Before replacing the fuse, make sure you have cut off the power supply to the duct.

The fuses shown in figure 46 electrically protect, by blowing, the single unit in case of overcurrent. When this event occur, the replacement of the fuses is needed.
This chapter has the aim to give the instructions for the fuses replacement.

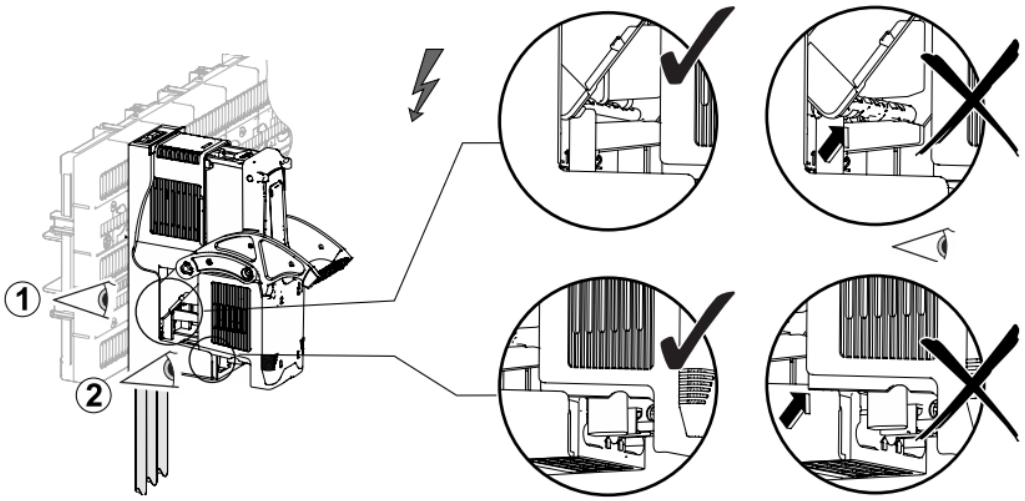
Fig. 58 – NH fuse switch disconnector



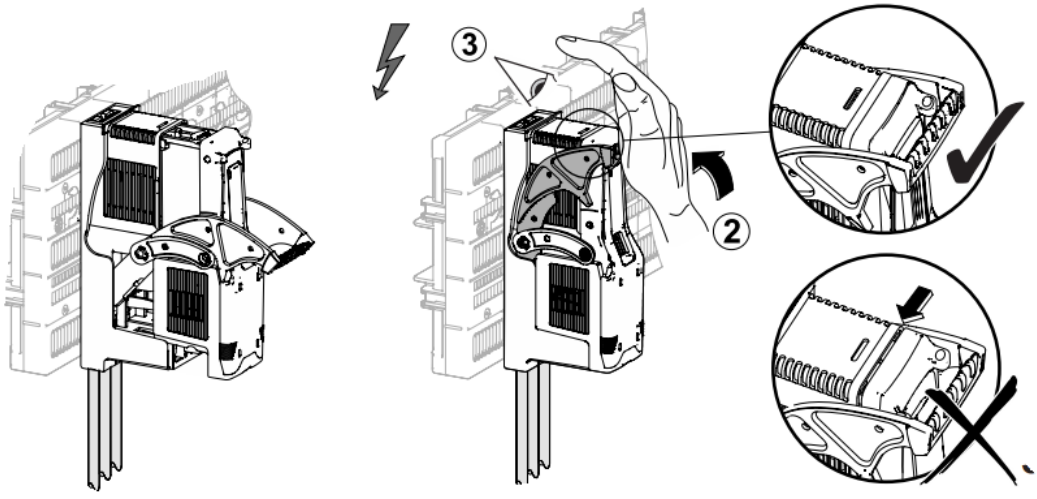
1)Pull the lever of the fuse holder downwards, exerting little pressure to avoid damaging it.
2)Gently extract the body where the fuses are contained.



3)Insert the fuses into the body exerting a slight pressure downwards for the single fuse, and a slight pressure upwards for the pair of fuses: in this way the fuses are hooked.
To extract the fuses: press the single fuse slightly upwards and the pair of fuses slightly downwards.



4)Insert the mobile part of the fuse holder in to the fixed one, being careful not to damage the part.



5)Push the lever of the fuse holder upwards; the mobile part is hooked and slides inwards.
6)Apply power supply to the duct

7.9.1 M/S (MUSE) probes installation

In case of modular application with manifold modules, the system is managed by standard Daikin master/slave (M/S) serial connection called MUSE.
The MUSE can control the units' operation thanks to two temperature probes (included in manifold module):

- Common evaporator leaving temperature probe
- Common condenser leaving temperature probe
- Evaporator inlet temperature probe (only when pump module is supplied)
- Evaporator outlet temperature probe (only when pump module is supplied)
- Condenser inlet temperature probe (only when pump module is supplied)
- Condenser outlet temperature probe (only when pump module is supplied)

In the following figure are shown the positions of the manifold probes.

Fig. 59 – Positions of the temperature probes for 3" and 5" manifold

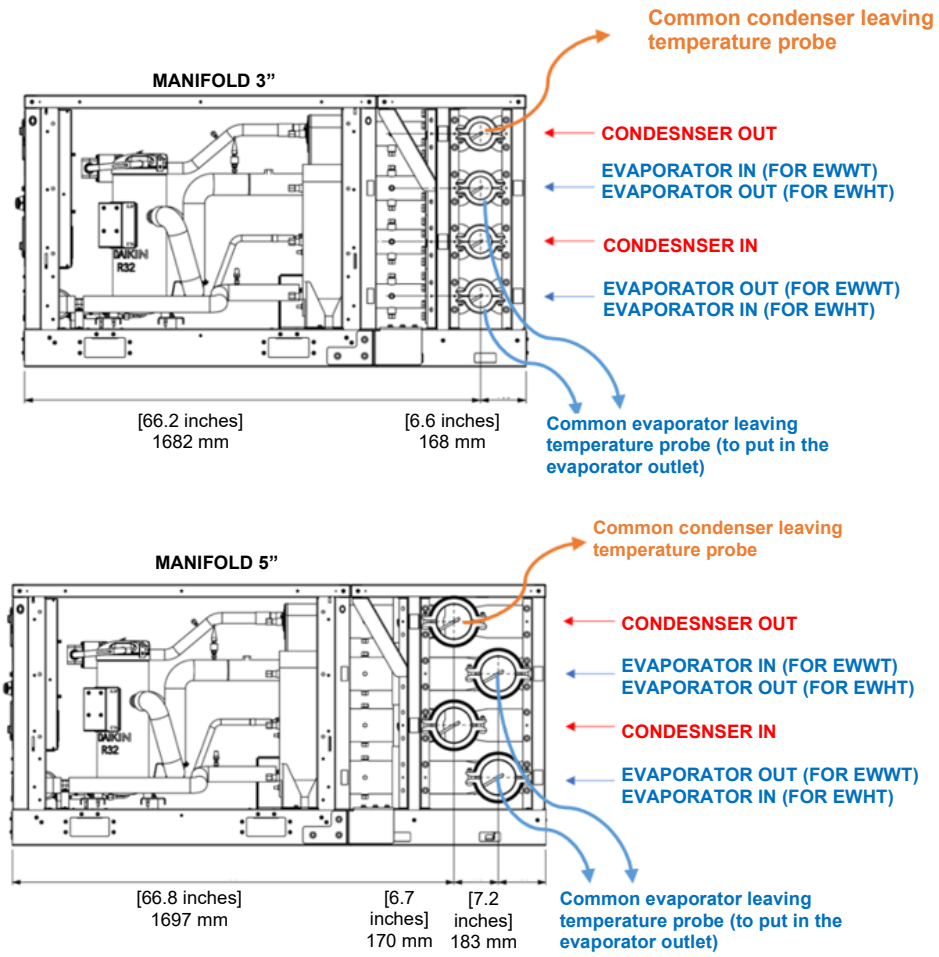
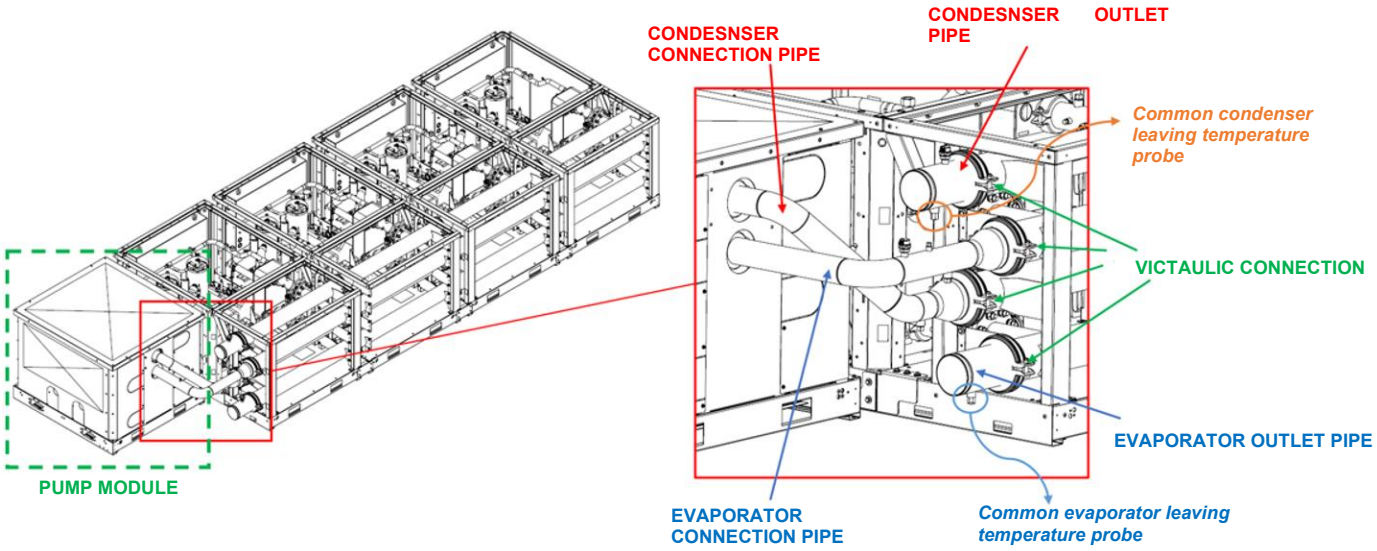


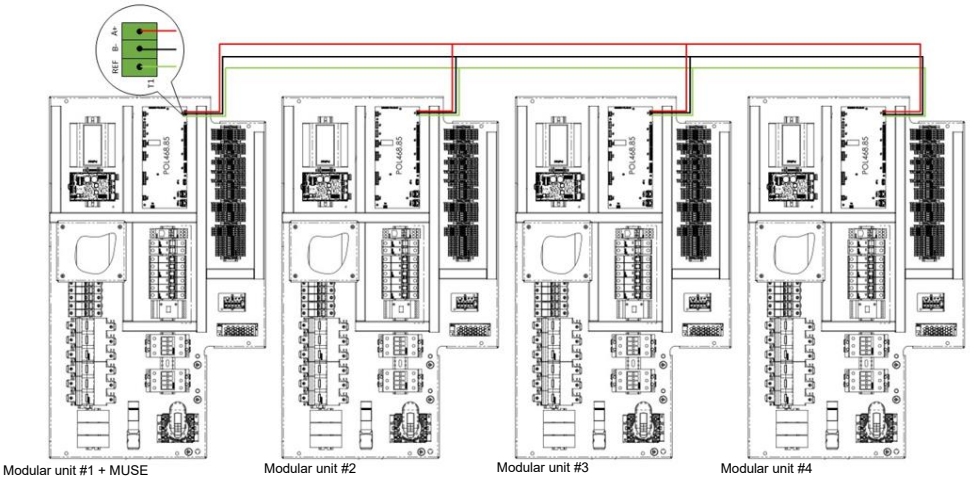
Fig. 60 – Details of probes positioning on the pipes



7.9.2 Unit modules M/S (MUSE) connection

The MUSE system uses the Modbus communication protocol to control and coordinate all the units. The system's units use the port T1 of the POL 468 for the Modbus communication.
In the following figure is showed how to connect the 4 PLCs on the same Modbus network.

Fig. 61 – Connection of 4 PLCs on the same Modbus network



7.10 Before starting

- Check that all hydraulic connections have been made correctly, that the information on the plates has been observed and that there is a filter upstream the entire modular system.
- Make sure that the circulation pump/s is operating and that the water flowrate is sufficient to close the contact of the flow switch, if installed.
- Check the water flow rate, measuring the pressure difference between inlet and outlet of the evaporator and calculate the flow rate using the evaporator pressure drop graphs present in this manual.
- Each manifold module is equipped with shut-off valves. Open or close the shut-off valves to reach the proper exchanger pressure drops, so the proper water flowrate.

Fig. 62 – Evaporator pressure drops

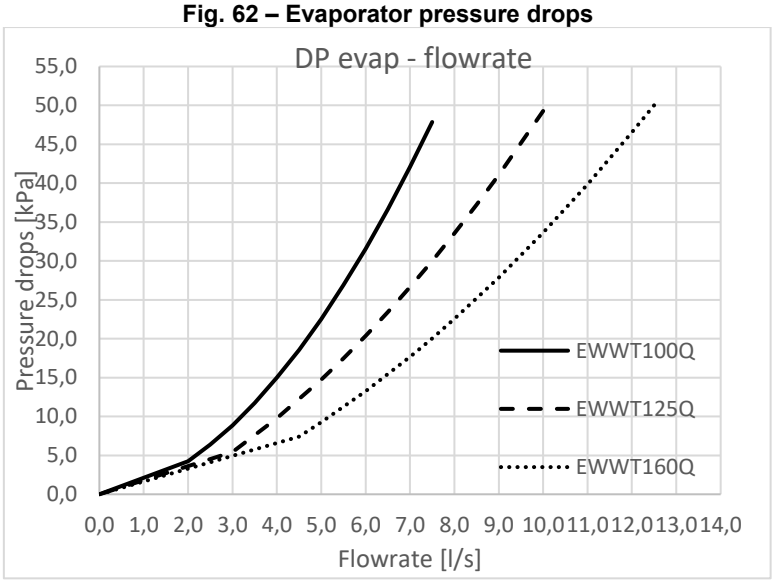
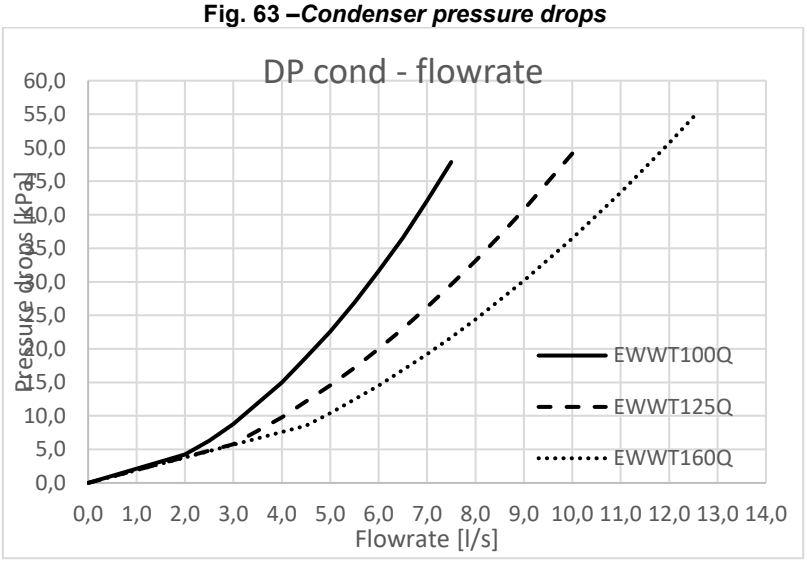


Fig. 63 –*Condenser pressure drops*



8 OPERATOR'S REPONSIBILITIES

It is essential that the user is appropriately 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 start-up sequence, operation, shutdown sequence and operation of all the safety devices.
The user must keep a log (system booklet) of the operating data of the unit installed and of all the periodic maintenance and service activities.
If the operator notes abnormal or unusual operating conditions, he is advised to consult the authorized technical service of the manufacturer.
This unit represents a substantial investment and deserves the attention and care to keep this equipment in good working order. However, during operation and maintenance it is essential to observe the following instructions:

- do not allow unauthorized and / or unqualified personnel to access the unit.
- it is forbidden to access the electrical components without having opened the unit main switch and switched off the power supply.
- it is forbidden to access the electrical components without using an insulating platform. Do not access the electrical components if water and/or moisture are present.
- verify that all operations on the refrigerant circuit and on the components under pressure are carried out exclusively by qualified personnel.
- the replacement of the compressors must be carried out exclusively by qualified personnel.
- sharp edges and the surface of the condenser section could cause injury. Avoid direct contact and use adequate protection device.
- do not introduce solid objects into the water pipes while the unit is connected to the system.
- it is absolutely forbidden to remove all protections of moving parts.

In case of sudden stop of the unit, follow the instructions on the Control Panel Operating Manual which is part of the on-board documentation delivered to the end user.
It is strongly recommended to perform installation and maintenance with other people.

Avoid installing the chiller in areas that could be dangerous during maintenance operations, such as platforms without parapets or railings or areas not complying with the clearance requirements around the chiller.

9 MAINTENANCE

This unit must be maintained by qualified technicians. Before beginning any work on the system the personnel shall assure that all security precautions have been taken.
Personnel working on the electrical or the refrigeration components must be authorized, trained and fully qualified.
Maintenance and repair requiring the assistance of other skilled personnel should be carried out under the supervision of the person competent in the use of flammable refrigerants. Any person conducting servicing or maintenance on a system or associated parts of the equipment should be competent according to EN 13313.
Persons working on refrigerating systems with flammable refrigerants should have competence in safety aspects of flammable refrigerant handling supported by evidence of appropriate training.
Always protect the operating personnel with personal protective equipment appropriate for the tasks to be performed. Common individual devices are: Helmet, goggles, gloves, caps, safety shoes. Additional individual and group protective equipment should be adopted after an adequate analysis of the specific risks in the area of relevance, according to the activities to be performed.

electrical components	Never work on any electrical components, until the general supply to the unit has been cut using the disconnect switch(es) in the control box. The frequency variators used are equipped with capacitor batteries with a discharge time of 20 minutes; after disconnecting power wait 20 minutes before opening the control box.
refrigerating system	The following precautions should be taken before working on the refrigerant circuit: - obtain permit for hot work (if required); - ensure that no flammable materials are stored in the work area and that no ignition sources are present anywhere in the work area; - ensure that suitable fire extinguishing equipment is available; - ensure that the work area is **properly ventilated** before working on the refrigerant circuit or before welding, brazing or soldering work; - ensure that the leak detection equipment being used is non-sparking, adequately sealed or intrinsically safe; - ensure that all maintenance staff have been instructed. The following procedure should be followed before working on the refrigerant circuit: 1. remove refrigerant (specify the residual pressure); 2. purge circuit with **inert gas** (e.g. nitrogen); 3. evacuate to a pressure of 0,3 (abs.) bar (or 0,03 MPa); 4. purge again with **inert gas** (e.g. nitrogen); 5. open the circuit. The area should be checked with an appropriate refrigerant detector prior to and during any hot work to make the technician aware of a potentially flammable atmosphere. If compressors or compressor oils are to be removed, it should be ensured that it has been evacuated to an acceptable level to ensure that there is no flammable refrigerant remaining within the lubricant. **Only refrigerant recovery equipment designed for use with flammable refrigerants should be employed.** If the national rules or regulations permit the refrigerant to be drained, this should be done safely, using a hose, for example, through which the refrigerant is discharged into the outside atmosphere in a safe area. It should be ensured that an inflammable explosive refrigerant concentration cannot occur in the vicinity of an ignition source or penetrate into a building under any circumstance. In the case of refrigerating systems with an indirect system, the heat-transfer fluid should be checked for the possible presence of refrigerant. After any repair work, the safety devices, for example refrigerant detectors and mechanical ventilation systems, should be checked and the results recorded. It should be ensured that any missing or illegible label on components of the refrigerant circuit is replaced. Sources of ignition should not be used when searching for a refrigerant leak.

9.1 Pressure / temperature table

Table 5 – Pressure / Temperature of the R32

°C	Bar	°C	Bar	°C	Bar	°C	Bar
-28	2.97	-2	7.62	24	16.45	50	31.41
-26	3.22	0	8.13	26	17.35	52	32.89
-24	3.48	2	8.67	28	18.30	54	34.42
-22	3.76	4	9.23	30	19.28	56	36.00
-20	4.06	6	9.81	32	20.29	58	37.64
-18	4.37	8	10.43	34	21.35	60	39.33
-16	4.71	10	11.07	36	22.45	62	41.09
-14	5.06	12	11.74	38	23.60	64	42.91
-12	5.43	14	12.45	40	24.78	66	44.79
-10	5.83	16	13.18	42	26.01	68	46.75
-8	6.24	18	13.95	44	27.29	70	48.77
-6	6.68	20	14.75	46	28.61	72	50.87
-4	7.14	22	15.58	48	29.99	74	53.05

9.2 Routine maintenance

This chiller must be maintained by qualified technicians. Before beginning any work on the system, the personnel shall assure that all security precautions have been taken.
Neglecting unit maintenance could degrade all parts of the units (coils, compressors, frames, pipes, etc.) with negative effect on performances and functionality.

9.2.1 Electrical maintenance

All electrical maintenance activities must be followed by qualified personnel. Make sure the system is switched off and the main switch of the unit open. Failure to observe this rule could result in serious personal injury. When the unit is turned off, but the disconnection switch is in the closed position, the unused circuits will still be active.

The maintenance of the electrical system consists of the application of some general rules as follows:
1. the current absorbed by the compressor must be compared to the rated value. Normally the value of the absorbed current is lower than the rated value that corresponds to the absorption of the full load compressor at the maximum operating conditions.
2. at least once every three months all the security checks must be made to verify their functionality. Each appliance, with aging, can change its point of operation and this must be monitored to adjust it or replace it. The pump interlocks and flow switches must be checked to make sure that they interrupt the control circuit if they intervene.

9.2.2 Service and limited warranty

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 ensuring years of failure-free operation.
However, it is important to ensure proper and periodical maintenance in accordance with all the procedures listed in this manual and with good practice of machines maintenance.
We strongly recommend stipulating a maintenance contract with a service authorized by the manufacturer. The experience and skill of the personnel, in fact, can ensure an 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 warranty.
Observe the following points in particular, in order to conform to warranty limits:
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-Par.4.3.2).
4. In case of electrical problems, the unit must remain
5. off until the problem has been solved.
6. Do not disable or cancel the safety devices,
7. whether mechanical, electrical or electronic.
8. 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.
9. Unless specifically agreed at the time of the 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 provided in this manual.

Table 6 - Standard Routine Maintenance Plan

Routine maintenance programme (Note 2)	**Weekly**	**Monthly** (Note 1)	**Half Yearly**	**Yearly** (Note 2)
General				
Reading of operating 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				**X**
Analysis of water (Note 6)				**X**
Electrical:				
Verification of control sequence				**X**
Verify contactor wear – Replace if necessary				**X**
Verify that all electrical terminals are tight – Tighten if necessary				**X**
Clean inside the electrical control board				**X**
Visual inspection of components for any signs of overheating		**X**		
Verify operation of compressor and electrical resistance		**X**		
Measure compressor motor insulation using the Megger				**X**
Refrigeration circuit:				
Check for any refrigerant leakage		**X**		
Verify filter dryer pressure drop		**X**		
Verify oil filter pressure drop (Note 4)		**X**		
Analyse compressor vibrations				**X**
Analyse compressor oil acidity (Note 7)				**X**
Check safety valves (Note 4)		**X**		
Check and application of an additional layer of protective paint (Note 8)			**X**	
Condenser section:				
Clean the exchangers (Note 5)				**X**
General				
Reading of operating data (Note 3)	**X**			

Notes:

1. Monthly activities include all the weekly ones.
2. The annual (or early season) activities include all weekly and monthly activities.
3. Daily reading of the operating values of the unit allows maintaining high observational standards.
4. Check for any dissolved metals.
5. Check that the cap and the seal have not been tampered with. Check that the drainage connection of the safety valves is not accidentally occluded by foreign objects, rust or ice. Check the manufacturing date on the safety valve and replace it, if necessary, in compliance with the national laws in force.
6. Clean water heat exchangers with appropriate chemicals. Particles and fibers could clog up the exchangers, especially for water exchangers pay attention if water rich in calcium carbonate is used. An increase in pressure drops or a decrease in thermal efficiency means that the heat exchangers are clogged. In environments with a high concentration of air-borne particles, it might be necessary to clean the condenser bank more often.
7. TAN (Total acid number): $\leq$ 0.10: No action
   Between 0.10 and 0.19: Replace anti-acid filters and re-check after 1000 running hours. Continue to replace the filters until the TAN is below 0.10.
   $>$ 0.19: replace oil, oil filter and oil filter dryer. Verify at regular intervals.
8. The protective paint layer must be applied on:all brazing and joints of copper refrigerant pipes; drier filter plate; Rotalock valves and flanges of refrigerant circuit; All BPHE not insulated; anti-chattering capillaries.

10 BEFORE START-UP

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

	Checks to be performed before starting the unit
□ **1**	Check for exterior damage
□ **2**	Open all the **closing valves**
□ **3**	Make sure that all the parts of the unit are pressurized with refrigerant (evaporator, condenser, compressors) before connecting it to the hydraulic circuit.
□ **4**	Install the **main fuses, earthing leakage detector and main switch**. Fuses recommended: aM compliant with the IEC 269-2 standard. *For the dimensions, check the wiring diagram.*
□ **5**	Connect the main voltage and check that it falls within the limits allowed of ±10% compared to the classification listed on the name plate. **The main power supply** 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. *Check the wiring diagram, terminals L1, L2 and L3.*
□ **6**	Install the **water filter kit/s** (also when not supplied) at the entrance of the exchangers.
□ **7**	Supply water to the exchangers and make sure that the **flow** falls within the limits shown in the table in the "Load, flow and quality of the water" paragraph.
□ **8**	The pipes must be completely **flushed out.** See the chapter "Preparation, check and connection of the water circuit".
□ **9**	Connect the **contact/s of the pump** 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.
□ 10	Check the **level of the oil** in the compressors.
□ 11	Check that all the **water sensors** are fastened correctly in the heat exchanger (see also sticker applied on the heat exchanger).

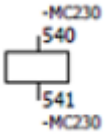
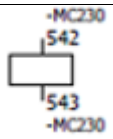
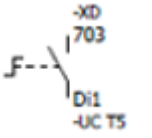
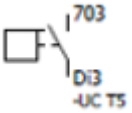
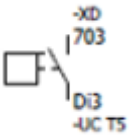
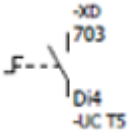
NOTE - Before starting the unit, read the operating manual provided with it. It will help you to better understand the operation of the equipment and the relative electronic controller and close the doors of the electric panel.

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.

Note

This list must be completed and sent to the local Daikin Service office at least two weeks before the start date.

Fig. 64 – ***Wiring for connecting the unit at the place of installation.***

Type signal description	Function	Page	Column	Symbol
Digital Output	EVAP. WATER PUMP 1 Max load 2A-230Vac External power supply	13	5	
Digital Output	EVAP. WATER PUMP 1 Max load 2A-230Vac External power supply	13	6	
Digital Output	COND. WATER PUMP 1 Max load 2A-230Vac External power supply	13	7	
Digital Output	UNIT ALARM Max load 2A-230Vac External power supply	13	9	
Digital Output	COND. WATER PUMP 2	16	1	
Digital Output	EVAP. WATER PUMP 2	16	2	
Digital Output	UNIT ON/OFF SWITCH	11	6	
Digital Output	EVAPORATOR FLOW SWITCH Obligatory	11	7	
Digital Output	EVAPORATOR FLOW SWITCH Obligatory	11	9	
Digital Output	COOL/HEAT SWITCH	11	8	

11 DISCHARGE OF THE REFRIGERANT FROM THE SAFETY VALVES

Avoid discharging refrigerant from the safety valves at the installation site. If necessary, it is possible to connect them to discharge pipes, the transversal section and length of which must comply with the national laws and the European directives.

12 PERIODIC OBLIGATORY CHECKS AND STARTING UP OFTHE GROUPS (UNITS)

These Groups (units) are included in category III of the classification established by the European Directive PED 2014/68/EU.
For Groups belonging to this category,some national laws require a periodic check by an authorized organization. Please verify and contact these organizations to also request authorization to start it up.

13 IMPORTANT INFORMATION ON THE REFRIGERANT USED

This product contains fluorinated greenhouse gases. Do not vent gases into the atmosphere.

Refrigerant type:	R32
GWP Value (global warming potential):	675

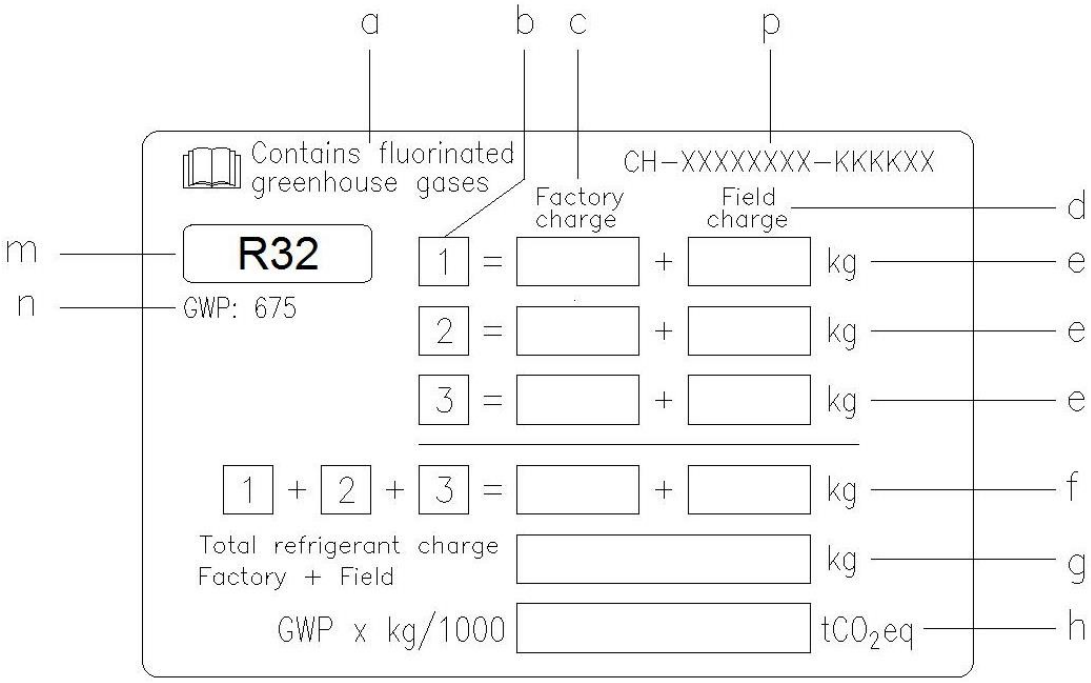
13.1 Factory and Field charged units instructions

The refrigerant system is charged with fluorinated greenhouse gases and the refrigerant charge is impressed on the plate, shown below, which is applied inside the electrical panel.

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) added during commissioning (on-site charging)
   - the total refrigerant charge (1 + 2 + 3)
   - calculate the greenhouse gas emission with the following formula:

$$GWP * total\ charge\ [kg]/1000$$

(Use the GWP value mentioned on the greenhouse gases label. This GWP value is based on the 4th IPCC Assessment Report.)



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
m Refrigerant type
n GWP = Global Warming Potential
p Unit serial number

In europe, the emission of greenhouse gases of the total refrigerant charge in the system (expressed in tonnes of equivalent co_2) is used to determine the frequency of maintenance interventions. 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)

14 PERIODIC CHECKS AND COMMISSIONING OF PRESSURE EQUIPMENT

The units are included in category III and IV of the classification established by the European Directive 2014/68/EU (PED). For chillers belonging to these categories, some local regulations require a periodic inspection by an authorized person. Please check with your local requirements.

15 DISMISSION AND DISPOSAL

The unit is made of metal, plastic, and electronic parts. All these components must be disposed of in accordance with local disposal laws and if in scope with the national laws implementing the Directive 2012/19/EU (RAEE).
Lead batteries must be collected and sent to specific waste collection centres.
Avoid the escape of refrigerant gases into the environment by using suitable pressure vessels and tools for transferring the fluids under pressure. This operation must be carried out by competent personnel in refrigeration systems and in compliance with the laws in force in the country of installation.

16 DURATION

After this period the manufacturer advises to carry out a total control of the whole and above all the integrity check of the pressurized refrigeration circuits, as required by the laws in force in some European Community countries.

DAIKIN APPLIED EUROPE S.p.A.
Via Piani di Santa Maria, 72 - 00072 Ariccia (Roma) - Italy
Tel: (+39) 06 93 73 11 - Fax: (+39) 06 93 74 014
http://www.daikinapplied.eu