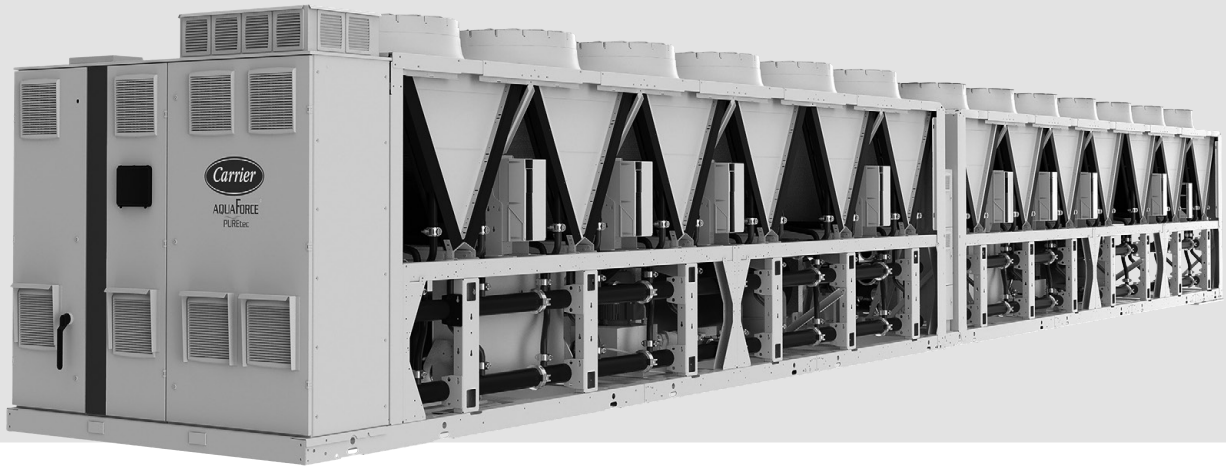
Carrier

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS



Liquid chiller with variable speed screw compressor and greenspeed™ smart technology

30XF-Z 0400 - 2100(1)

Rated cooling capacity: 0400 kW - 2100 kW - 50 Hz

(1) Unit size 400, 550, 600, 1100, 1250, 1400 & 1500 available in Q3 2024.

Original document

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1 - SYSTEM SAFETY CONSIDERATIONS

The units are designed to provide a very high level of safety and reliability, making installation, start-up, operation, and maintenance easier and safer.

The procedures in this manual are arranged in the sequence required for installation, start-up, operation, and maintenance of the units.

Ensure that you follow them and that you take the required safety precautions, including those listed in this guide, which include:

- Wearing personal protective equipment (gloves, safety glasses, safety shoes),
- Having the appropriate tools,
- Employing qualified, skilled technicians (electricians, refrigeration system specialists).

Prior to the initial start-up of the units, everyone involved in the works should be thoroughly familiar with these instructions and with the characteristics of the installation site and ensure these are respected.

1.1 - Electrical safety considerations

ELECTRICAL RISK: 

Never work on a unit that is still energized.

Never work on any of the electrical components until the general power supply to the unit have been isolated and locked out using the disconnect switch(es) on the power box.

WARNING: Even if the unit is stopped, the power circuit remains energized, unless the unit or circuit disconnect switch is open. Refer to the wiring diagram for further details. Follow the appropriate safety guidelines.

When working close to the condenser fans, particularly when removing the grilles, ensure that the power supply to the fans is switched off to ensure they cannot run.

WARNING: The variable frequency drives (VFD) fitted to the units have circuit capacitors which take twenty (20) minutes to discharge after the power supply is disconnected. If the discharge circuit inside the capacitor fails, it is not possible to define the discharge time.

After disconnecting the power supply to the electrical box, wait around twenty minutes before accessing the electrical box or VFD. This value is a guide and may differ from one VFD to another: Refer to the information given on the VFD to find out the precise value.

Before any intervention, verify that there is no voltage present at any accessible conducting parts of the power circuit. If the work is interrupted, always ensure that all circuits are still de-energized before resuming the work.

An internal fault with the compressor variable frequency drive can cause serious injury if the variable frequency drive has not been closed correctly: It is essential to ensure that all covers are in place and correctly secured before switching on the power supply to the unit.

Duplex units : Accessible live terminations

WARNING: For units with two modules, live cable terminations intended for hazardous voltage are accessible when units are delivered from factory.

Cables for electrical connections between modules A and B are installed inside module A but are not factory-fitted on electrical terminals.

Electrical connections on both sides are required once the modules have been handled and positioned.

Refer to the electrical wiring diagram for identification of all the connections.

For all connections with hazardous voltage there is a risk of injury or death if the power is applied while the conductors are not connected inside module B.

To avoid that:

- **Perform connections on module B corresponding terminals BEFORE module A CORRESPONDING terminals.**
- **Before applying power, always check that all connections are done inside module B.**
- **Cross check with electrical WIRING diagram that all connections have been done.**

Option 85A / 85B:

WARNING: When option 85Aor 85B is present, PRESENCE OF TWO POWER SUPPLIES.

To switch off the machine, both power supplies must be switched off and logged. Refer to the detailed electrical diagram.

WARNING: ALWAYS DISCONNECT THE TWO DEVICES ON THE UNIT BEFORE SERVICING THE EQUIPMENT.

The unit is not designed to allow intervention on the electrical equipment if the two power supplies are not disconnected.

Measures to reduce the risk of a partial shutdown include labelling, visibility of the two disconnecting devices simultaneously and their proximity.

If the machine is locked out at the customer's facility, the effectiveness of these measures is reduced: It is necessary to provide measures at the facility and the personnel involved to remind the presence of both power supplies.

Option 295+:

WARNING: When option 295+ for Ultra Fast Capacity recovery is present, energy is stored inside the equipment and 24Vdc voltage is present even if the main disconnect switch was switched off. Refer to section describing option 295+ in this document for more explanations.

Option 329:

WARNING: Strong magnetic field inside the compressor casing. Do not open the compressor.

The compressor motor cannot be removed and therefore is not field serviceable.

WARNING: Voltage potential and an electrical current may be generated on the compressor terminals and on the connected power leads which are connected when filling/emptying the refrigerant.

Ensure that the terminal box is securely fixed in place before filling the machine with refrigerant, draining the refrigerant, or rotating the motor shaft.

Option 336:

WARNING: When option 336 for active anti-harmonic filter is present, the filters have circuit capacitors in which energy is stored even if the main disconnect switch was switched off.

Therefore, hazardous voltage can still be present.

Current measuring toroids are used by the active filter for measuring the current of the unit.

WARNING: The current measuring toroids circuit must never be opened when current is present in the measured circuit. Failure to comply with this recommendation can cause over-voltage, electric arcs and destruction of the toroids. If it is necessary to disconnect the current toroids, they must be short-circuited.

1.2 - Refrigerant safety considerations

Use safety goggles and safety gloves.

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

Unit's refrigerant charge removal

If a leak occurs or if the refrigerant becomes contaminated (e.g. by a short circuit in a motor), and before any intervention, remove the complete charge using a recovery unit and store the refrigerant in mobile containers. The compressors cannot transfer the whole refrigerant charge and can be damaged if used to pump-down. The refrigerant charge should not be transferred to the high-pressure side.

Detect and repair the leak, check the type of refrigerant in the machine and then recharge the machine/circuit with the total charge, as indicated on the unit nameplate. Certain parts of the circuit can be isolated. Do not top up the refrigerant charge. Only charge the liquid refrigerant at the liquid line.

Charging any refrigerant other than the original type will impair machine operation and can even cause irreparable damage to the compressors. The compressors operating with this refrigerant type are lubricated with a synthetic polyol ester oil, which are completely incompatible with mineral oils.

Do not siphon refrigerant. Traces of vapor should be displaced with dry nitrogen.

Refrigerant in contact with an open flame produces toxic gases. Do not unweld the refrigerant pipework or any refrigerant circuit component or cut these with a torch until all refrigerant (liquid and vapor) as well as the oil have been removed from the unit.

Refrigerant exposure impact on health

Do not use your hands to check possible refrigerant leaks.

Vapor is heavier than air and reduces the amount of oxygen available for breathing. Ensure good ventilation, as accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation or explosions.

These products cause eye and skin irritation. Decomposition products are hazardous. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death.

Avoid contact with liquid refrigerant. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, immediately and abundantly flush the eyes with water and consult a doctor.

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

- Create a procedure to ensure medical attention is sought beforetreating any symptoms;
- Seek medical attention before treating such injuries.
- Have access to a first-aid kit, especially for treating eye and skin injuries.

We recommend that standard EN 378-3 Annex 3 is applied.

Ensure there is sufficient ventilation if the unit is installed in an enclosed area. In gas form, refrigerant is heavier than air and, if allowed to accumulate in a confined area, it can reduce the quantity of oxygen in the air, causing respiratory issues and a risk of explosions.

The refrigerant used in the units in this range is R1234ze(E).

Special equipment must be used when working on the refrigerant circuit (pressure gauge, charge transfer equipment, etc.).

Do not clean the unit with hot water or steam. This may cause the refrigerant pressure to rise.

NOTE: If a liquid line valve is present, never leave refrigerant in liquid form between this closed valve and the expansion valve as the change in temperature may cause the liquid to expand, rupturing this section of the circuit. This valve is situated on the liquid line before the filter drier.

Never apply an open flame or pressurized steam to a refrigerant container. Dangerous overpressure can result. If it is necessary to heat the refrigerant, only use liquid hot water (<70°C).

During refrigerant removal and storage operations follow applicable regulation. The standard NF E29-795 describes the regulations permitting conditioning and recovery of halogenated hydrocarbons under optimum quality conditions for the products and optimum safety conditions for people, property, and the environment.

If any damage is caused to the equipment, the refrigerant must be changed in accordance with this standard, or an analysis of the fluid must be performed by a specialized laboratory.

Any refrigerant transfer and recovery operations must be carried out using a transfer unit.

Service valves are positioned on the liquid, suction and discharge lines and are available on all units for connection to the transfer unit.

The units must never be modified to add refrigerant and oil charging, removal and purging devices. These units have the required openings. Refer to the certified dimensional drawings.

It is dangerous and illegal to re-use disposable (non-returnable) cylinders or attempt to refill them. When the cylinders are empty, evacuate the remaining gas pressure, fill out the relevant paperwork and hand them over to an approved recovery agency. **Do not incinerate.**

OPERATING CHECKS:

- Important: This product contains R1234ze(E) which is an HFO gas.
- Type of fluid: Refer to the nameplate.
- Global Warming Potential (GWP): Refer to the table below.

WARNING:

1. ***Ensure that the refrigerant is never released to the atmosphere during installation, maintenance, or equipment disposal.***
2. ***Deliberate refrigerant release into the atmosphere is not allowed.***
3. ***If a refrigerant leak is detected, ensure that the leak is repaired quickly.***
4. ***Only certified, qualified personnel are permitted to install, service and perform leak tightness tests on the refrigerant, decommission the equipment and recover the refrigerant.***
5. ***The operator must ensure that any refrigerant recovered is recycled, regenerated, or destroyed.***
6. ***The operator is bound by the obligation to perform leak tightness tests, or have these performed, at regular intervals. Regulations within the European Union have set the following intervals:***

Refrigerant charge/ circuit (kg)	R134a (GWP = 1430)	Charge < 3,5 kg	3,5 ≤ charge < 34,9 kg	34,9 ≤ charge < 349,7 kg	Charge > 349,7 kg
	R407C (GWP = 1774)	Charge < 2,8 kg	2,8 ≤ charge < 28,2 kg	28,2 ≤ charge < 281,9 kg	Charge > 281,9 kg
	R410A (GWP = 2088)	Charge < 2,4 kg	2,4 ≤ charge < 23,9 kg	23,9 ≤ charge < 239,5 kg	Charge > 239,5 kg
	R1234ze(E) (GWP = 1)	No requirement			
CO_2 equivalent charge of the refrigerant charge / circuit		< 5 tons	5 ≤ charge < 50 tons	50 ≤ charge < 500 tons	Charge > 500 tons(1)
System WITHOUT leakage detection		No check	12 months	6 months	3 months
System WITH leakage detection			24 months	12 months	6 months

(1) From 01/01/2017, units must be equipped with a leakage detection system.

7. ***For all equipment subject to regular leak tightness tests, the operator must keep a log used to record the following:***

- ***The quantities and types of fluids contained in the system (added and recovered),***
- ***The quantity of fluid recycled, regenerated, or destroyed,***
- ***The date and results of the leak tightness tests,***
- ***The details of the technician and of the company performing the work, etc.***

8. ***Contact your local dealer or installer if you have any questions.***

Information on operating inspections given in EN 378 standard can be used when similar criteria do not exist in the national regulation.

Check regularly for leaks and repair immediately.

Case of external fire

When the unit is subjected to fire, a safety device prevents rupture due to over-pressure by releasing the refrigerant.

The fluid may then break down into toxic residues when in contact with flames:

- Stay away from the unit,
- Ensure the personnel in charge of extinguishing the fire are duly warned and issued with recommendations,
- Fire extinguishers appropriate to the system and the refrigerant type must be easily accessible.
- Do not clean refrigerant combustion by-products with water, the mixture is highly corrosive.
- Do not restart the unit after it has been submitted to a fire. Material may have been seriously damaged by the heat.
- Restart may only be possible after detailed verification by a competent personnel in order to insure that the unit has not suffered any damage.

Flammable refrigerant safety considerations:

IMPORTANT INFORMATION REGARDING THE REFRIGERANT USED:

R1234ze(E) refrigerant is classed in group 2 "non-hazardous" according to the criteria of the European Pressure Equipment Directive (PED) 2014/68/EC.

In line with the standard ISO-819, R1234ze(E) refrigerant is classed in safety group A2L: Low flammability.

One of the characteristics of this refrigerant is that no flammable mixture is created with air below a room temperature of 21°C and under controlled humidity conditions.

Nevertheless, when the humidity or temperature increases, this refrigerant may become flammable and present a potential hazard if the flammability risks are not correctly mitigated within the installation's machine room.

As R1234ze(E) refrigerant is mildly flammable, an ATEX perimeter of 0.5 m must be put in place around the unit (see § - Dimensions, Clearances).

No source of ignition must be present within this zone (see standard EN 378-2, Appendix K). If an ignition source is identified in the hazard area, additional ventilation can be implemented according to your risk analysis.

The local safety regulations and standards relating to the buildings must be respected.

In the absence of local regulations and standards, refer to the standard EN-378 (2012) (Safety requirements for substances classed A2) or ISO-5149 (2014) (for substances classed A2L).

The customer must obtain the approval of the local authorities governing the building. Carrier may also provide guidelines on the safe use of R1234ze(E) refrigerant to complement the safety standards and regulations relating to the buildings with a view to ensuring risks are reduced to acceptable levels.

Only employ qualified technicians well-trained in the use and the risks associated with flammable refrigerants and the respect of local regulations (see standard EN 378-4 in appendix E - repair guidelines for equipment using flammable refrigerants).

Use a gas detector during any intervention on the unit.

For more details on the physical properties, the flammability and toxicity characteristics, the identification of risks, the safety requirements for the installation, etc., refer to standards such as the following:

- ASHRAE 34, EN-378, ISO-817 and ISO-5149,
- Safety Data Sheets (SDS) provided by the refrigerant manufacturer,
- The European Union REACH database (registration, evaluation, authorization, and restriction of chemicals)

1.3 - Pressure equipment safety considerations

These products include pressure equipment or components manufactured by the unit manufacturer or by other manufacturers. They comply with the European Pressure Equipment Directive.

The characteristics of this equipment/these components are given on the nameplate or in the required documentation, supplied with the products.

We recommend that you contact your professional body to find out which regulations affect you as the operator or owner of pressure equipment or components (declaration, re-qualification, re-testing).

The units are intended to be stored and operated in an environment where the ambient temperature does not drop below the minimum allowable temperature indicated on the nameplate.

Do not introduce significant static or dynamic pressure regarding the operating pressures for tests in the refrigerant circuits or in the heat exchange circuits.

Pressure Vessels

NOTE: Monitoring during operation, re-qualification, re-testing, exemption from retesting:

- Follow the regulations on monitoring pressure equipment.
- The user or operator is usually required to create and maintain a monitoring and maintenance log.
- In the absence of any regulations, or in addition to the regulations, follow the guidance in EN 378.
- Follow the local professional recommendations, whenever they exist.
- Regularly inspect the condition of the coating (paint) on the surface of the components to detect blistering resulting from corrosion. To do this check an uninsulated part of the pressure vessel or for rust drips at a joint in the insulation.
- Regularly check for the presence of any impurities (e.g. sand, grit) in the heat transfer fluids. These impurities can cause wear and/or pitting corrosion.
- Filter the heat-transfer fluid and carry out internal inspections as described in EN 378-2 Appendix C.
- In case of re-testing please refer to the maximum operating pressure given on the unit nameplate
- The reports of the periodical checks by the user or the operator must be included in the monitoring and maintenance log.

Corrosion build-up:

Below thickness values are applicable on evaporator shell-and tube heat exchanger and on oil separator:

Gas side: 0 mm

Heat-transfer medium side: 1 mm for tube sheets in lightly alloyed steels, 0 mm for stainless steel plates or plates with copper-nickel or stainless-steel protection.

Water-box: 1 mm

Parts painted: 0 mm

If any part of the piece (with 0mm of acceptable corrosion) shows corrosion, change the piece.

Classification and control:

In accordance with the European Pressure Equipment Directive (PED) and national usage monitoring regulations in the European Union relating to design, the protective devices fitted to these machines are classified as follows:

	Safety device(1)	Over pressure protection in case of an external fire(2)
Refrigerant side		
High pressure switch	X	
External relief valve(3)		X
Rupture disk		
Fuse plug		X
Heat transfert fluid side		
External relief valve	(4)	(4)

(1) Classified for protection in normal service situations.
(2) Classified for protection in abnormal service situations. These accessories are sized for fires with a thermal flow of 10kW/m². No combustible matter should be placed within 6.5m of the unit.
(3) The instantaneous overpressure limitation of 10% of the operating pressure does not apply to this abnormal service situation.
The control pressure can be higher than the service pressure. In this case, either the design temperature or the high pressure switch ensures that the service pressure is not exceeded in normal service situations.
(4) The selection of these relief valves must be made by the personnel responsible for completing the hydraulic installation.

WARNING:

- ***The refrigerant side external relief valves are not safety devices but accessories which limit damage in the event of a fire.***
- ***The safety device on the refrigerant side is the high-pressure safety loop described in section 7.1.2.7.***

Overpressure Protective Devices

NEVER COVER ANY PROTECTIVE DEVICE.

This applies to any relief valves (if used) in the refrigerant or heat transfer medium circuits and the pressure switches.

DO NOT OBSTRUCT ANY PROTECTIVE DEVICE.

This applies to any rupture disks and valves fitted on the refrigerant or heat transfer medium circuits.

Check that the protective devices are well installed and not covered before operating the unit.

Check whether the original protection plugs are still present at the valve outlets. These plugs are generally made of plastic and should not be used. If there are still present, please remove them.

Relief valves - Installation

Refer to the installation regulations, for example those of standard EN 378-3 and EN 13136.

The external relief valves must always be vented to outside if the units are installed in a closed space.

Provide a drainpipe for each relief valve if the unit is installed in a closed room.

Provide a drain in the drainpipe, close to each relief valve, to avoid an accumulation of condensate or rainwater.

These pipes must be installed in a way that ensures that people and property are not exposed to refrigerant leaks.

As the fluids can be diffused in the air, ensure that refrigerant is discharged away from building air intakes or that it is discharged into enough suitable absorbent material.

Fit devices at the valve or discharge piping outlets to prevent the penetration of foreign bodies (dust, building debris, etc.) and atmospheric agents (water can form rust or ice).

These devices, as well as the discharge piping, must not impair operation or lead to a pressure drop that is higher than 10% of the set pressure.

Relief valves - Maintenance

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

The valves must be checked periodically.

It is recommended to install an indicating device to check whether any refrigerant has leaked from the relief valve.

The presence of oil at the outlet orifice is a useful indicator that refrigerant has leaked. Keep this orifice clean to ensure that any leaks are obvious.

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

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

Dual relief valves on a change-over valve

If the relief valves are installed on a change-over valve, this is equipped with a relief valve on each of the two outlets. Only one of the two relief valves is in operation, the other one is isolated.

Never leave the change-over valve in the intermediate position, i.e. with both ways open. Bring the actuator in abutment, front or back according to the outlet to isolate.

If a relief valve is removed for checking or replacement, ensure that there is always an active relief valve on each of the change-over valves installed in the unit.

CHECKING THE PROTECTIVE DEVICE:

- **External overpressure devices (external relief valves) must be replaced or checked to ensure that their settings and operation are correct at least every five years or in accordance with national regulations, at the earliest opportunity.**
- **The high pressure (SRMCR) safety loop must be tested at least once a year to check it is operating correctly; this must include the compressor shutdown and its activation and deactivation values.**

The company or organization that conducts a pressure switch test must establish and implement detailed procedures for:

- Safety measures,
- Measuring equipment,
- Values and tolerances for cut-off and discharge devices,
- Test stages,
- Recommissioning of the equipment.

The manufacturer recommends contacting Carrier Service for this type of test. An example of the test procedure without removing the pressure switch is given in section “SYSTEM STANDARD MAINTENANCE” of this manual.

WARNING: If the test results in the replacement of the pressure switch, it is necessary to recover the refrigerant charge. These pressure switches are not installed on Schraeder type automatic valves.

If the machine operates in a corrosive environment, inspect the protection devices more frequently.

Do not attempt to repair or recondition a valve if there has been any corrosion or build-up of foreign material (rust, dirt, scale, etc.) on the valve body or mechanism. In this case, it must be replaced.

Do not install relief valves in series or backwards.

RISK OF EXPLOSION: 

Never use air or gases containing oxygen during leak tests, to purge pipework or to pressurize a unit. Only use dry nitrogen for leak tests, with an appropriate tracer gas if necessary.

Pressurized air mixtures or gases containing oxygen can cause an explosion. Oxygen reacts violently with oils and greases.

Failure to observe the above recommendations can have serious or even fatal consequences and damage installations.

Never exceed the specified maximum operating pressures.

Verify the maximum allowable high and low side test pressures by checking the instructions in this manual and the pressures given on the unit nameplate.

The manual valves must only be manipulated when the machine is off. Do not forget to refit protective caps to prevent leaks.

Make sure the circuit pressure is zero and that the unit has been shut down and de-energized and purged before removing components or opening a circuit.

Do not attempt to remove refrigerant circuit components or fittings, while the machine is under pressure or while it is running.

Before opening a refrigerant circuit, drain and consult the pressure indicators.

If the refrigerant circuit remains open after an intervention (such as a component replacement, etc.):

- Seal the openings if the duration is less than a day,
- Beyond this time, charge the circuit with a dry, inert gas (nitrogen).

The objective is to prevent penetration of atmospheric humidity and the resulting corrosion of the unprotected internal steel walls.

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

Each time repairs have been carried out to the unit, the operation of the protection devices must be re- checked.

1.4 - Maintenance & Repair safety guidelines

Healthy requirements

To prevent any accident due to electromagnetic interference, it is recommended that personnel holding a pace maker do not service the equipment while it is in operation.

Qualifications requirements

Any person authorized to access the unit must be aware of the general and special safety precautions for the establishment and must also be qualified and trained in surveillance and maintenance.

Any technician carrying out work on the electrical or refrigerating components must be authorized, with the relevant qualifications and certifications, including for brazing operations and for manipulation (opening or closing) of a shut-off valve. He/she must have been specifically trained on this equipment and system.

Personal Protective Equipment

It is compulsory to wear ear protection when working near the unit and the unit is in operation. Technicians or engineers working on the units must be equipped as follows :

Personal protective equipment (PPE)(1)	Operations		
	Handling	Maintenance, service	Welding or brazing(2)
Protective gloves, eye protection, safety shoe, protective clothing.	X	X	X
Ear protection.		X	X
Filtering respirator.			X

(1) We recommend compliance with the instructions in the EN 378-3 standard.
(2) Performed in the presence of A1 refrigerant according to EN 378-1.

The necessary protective equipment must be available, and appropriate fire extinguishers for the system and the refrigerant type used must be within easy reach.

Access to the unit components

WARNING: No part of the unit must be used as a walkway, rack, or support. Periodically check and repair or, if necessary, replace any component or piping that shows signs of damage.

The refrigerant lines can break under the weight and release refrigerant, causing personal injury.

Do not climb on a machine. Use a platform or staging and a harness to work at higher level.

Use mechanical lifting equipment (crane, hoist, winch, etc.) to lift or move heavy components. For lighter components, use lifting equipment if there is any risk of slipping or losing your balance.

Hot / Cold surfaces

Some pipes (discharge and liquid lines) as well as the compressors discharge side can reach temperatures higher than 65°C. Do not touch those pipes without gloves. Risk of human injury by hot burn.

Some pipes (liquid and diphasic lines) as well as the compressors suction side can reach temperatures under 0°C. Do not touch those pipes without gloves. Risk of human injury by cold burn.

Repair:

To prevent any damage or accidents, trained personnel must resolve any malfunctions or leaks immediately.

Repairs must comply with the regulations and recommendations given in the current country safety standards for refrigerant systems and machines, such as: EN 378, ISO 5149, etc.

Use only original replacement parts for any repair or component replacement. Consult the list of replacement parts that corresponds to the original equipment.

Any repair or modification, including replacement of removable parts:

- Must comply with local regulations and must be performed by qualified operators in accordance with qualified processes, including changing a wiring harness conductor,
- Must be approved by the original manufacturer. Repairs and modifications which involve a permanent assembly (welding, soldering, expansion of tubes, etc.) must be performed by qualified operators following operating procedures,
- All modifications and repairs must be listed in the monitoring and maintenance log,
- Never attempt to repair or modify a plate heat exchanger.

All welding operations and manipulation (opening or closing) of a shut-off valve must be carried out with the unit shutdown.

The manufacturer recommends the following template for the maintenance log (the table below is only given as a guide and does not engage the manufacturer's liability):

Intervention		Name of the commissionning engineer	Applicable national regulations	Verification organism
Date	Nature(1)			

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

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

If any maintenance operations are carried out on the unit, lock the power supply circuit in the open position ahead of the machine.

Hydraulic circuit interventions

Do not drain the heat transfer medium circuits without informing the site technical / service department or other competent body first.

Close the shut-off valves on the water inlet and outlet and drain the unit's hydraulic circuit before working on the components installed on the hydraulic circuit (screen filter, pump, water flow sensor, etc.).

Periodically inspect all valves, fittings and pipes on the refrigerant and hydraulic circuits to ensure that they do not show any signs of corrosion or leaks.

Do not loosen the water box bolts until the water boxes have been completely drained.

2.1 - 30XF-Z family range

30XF-Z family consists of 15 units sizes.

6 units consist of one single piece (single units):

- 30XF-Z_0400
- 30XF-Z_0550
- 30XF-Z_0600
- 30XF-Z_0750
- 30XF-Z_0900
- 30XF-Z_1000

9 units consist of two pieces (duplex units):

- 30XF-Z_1100
- 30XF-Z_1250
- 30XF-Z_1400
- 30XF-Z_1500
- 30XF-Z_1700
- 30XF-Z_1800
- 30XF-Z_1900
- 30XF-Z_2000
- 30XF-Z_2100

For each unit consisting of two pieces, one piece is called “module A” and the other piece is called “module B”.

Please refer to section 3.4 to identify the module A and B for each duplex unit.

2.2 - Units utilization

Application Range

The units are intended to cool water for building air conditioning or for industrial processes. This unit is optimized for Data Center cooling and computer center cooling.

They will provide safe and reliable service if used within their application ranges.

To find out if these products comply with European directives (machine safety, low voltage, electromagnetic compatibility, pressure equipment, etc.) check the declarations of conformity for these products.

Lifetime

The units are designed for a theoretical operating life of 15 years, based on load profiles defined within the applicable EcoDesign regulations.

Beyond this period, the manufacturer recommends proceeding to a periodical qualification of the refrigerating circuit following national applicable regulations. It must be conducted by an operator qualified for the control of pressure equipment.

It is recommended to repeat this check every 5 years. This control does not replace the requirements of applicable national regulations.

2.3 - Units receipt

See Environment, Health & Safety Instructions for Chillers And Heat Pumps.

3 - SYSTEM STRUCTURAL & ACOUSTICAL DATA

3.1 - System Installation

3.1.1 - Handling

It is strongly recommended that a specialized company is employed to unload the machine.

Do not remove the skid or the packaging until the unit is in its final position.

These units can be safely moved by trained personnel with a forklift truck with the correct capacity for the dimensions and weight of the unit, as long as the forks are positioned in the location and direction shown on the unit.

The units can also be lifted with slings, using only the designated lifting points marked on the unit (labels on the chassis and label with the unit handling instructions, attached to the unit).

Use slings or lifting beams with the correct capacity and follow the lifting instructions on the certified dimensional drawings supplied for the unit.

WARNING: Only attach slings to the designated lifting points which are marked on the unit.

It is advisable to protect coils against crushing while a unit is being moved. Use struts or a lifting beam to spread the slings above the unit. Do not tilt a unit more than 15°.

Safety can only be guaranteed if these instructions are carefully followed. Failure to do so may result in damage to the equipment and physical injury.

See the slinging plan for each machine in section **Erreur ! Source du renvoi introuvable**. and in appendix 4.

CAUTION: Before lifting the unit, check that all casing panels and grilles are securely fixed in place. Lift and set down the unit with great care. Tilting and jarring can damage the unit.

WARNING: Never apply pressure or leverage to any of the unit's panels or uprights; only the base of the unit frame is designed to withstand such stresses. No force or effort must be applied to pressurized parts, especially via pipes connected to the water-cooled heat exchanger

If the unit consists of two modules, they will be handled separately but will operate together. Before any handling of each module, hydraulic connections between module A and B as well as electrical connections have to be disconnected.

Hydraulic connections consist of:

- One pipe from module B to module A evaporator feeder tank,
- One pipe from module A evaporator to module B evaporator.

Electrical connections consist of:

- 4 cables (3 phases + earth) to supply the module B compressor VFD,
- 1 large cable containing 4 cables (3 phases + earth) to supply the module B control box.

3.1.2 - Positioning

The units are classified as "indirect heat exchange systems" (class C in accordance with ISO-5149 and EN-378). No charge limitation applies to class "C" occupancy level for R-1234ze(E). Refer to these standards for further details. This level must be confirmed by the customer.

The units are designed to be installed in a special location which must not be accessible to the public or must be protected against access by unauthorized persons. The customer is responsible for installing the access restriction device (e.g. cut-off, enclosure).

An extinguisher must be accessible and visible close to the machine installation area.

Appropriate fire extinguishers for the system must be accessible and visible close to the machine installation area.

This machine is not intended to operate in an ATEX area.

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

For the center of gravity coordinates, the position of the unit mounting holes, and the weight distribution points, refer to the certified dimensional drawings. Ensure the free space shown in the dimensional drawings is respected to facilitate maintenance and connection.

The unit must be located at least 6 m from the nearest entrance to the building.

The typical applications of these units are cooling and heating, which do not require earthquake resistance. Earthquake resistance has not been verified.

Before refitting the unit, check that:

- The chosen location can support the weight of the unit, or that appropriate reinforcement measures have been taken,
- The unit is installed level on an even surface (maximum tolerance is 5 mm along both axes),
- The number of support points is adequate and that they are in the right places,
- There is adequate space above and around the unit for air to circulate and for access to the components (see dimensional drawings),
- The location is not subject to flooding,
- For outdoor applications, avoid installing the unit in a location where snow is likely to accumulate (in areas subject to long periods of sub-zero temperatures, the unit should be raised),
- Baffles may be necessary to deflect strong winds. However, they must not restrict air flow into the unit.
- If the support structure is sensitive to vibration and/or noise transmission it is advisable to insert anti-vibration mounts (elastomer mounts or metal springs) between the unit and the structure. Selection of these devices is based on the system characteristics and the comfort level required and should be made by technical specialists,
- If the optional anti-vibration mounts are present, their number and position must comply with the indications given on the certified dimensional drawing.

3.1.2.1 - Underneath a roof

The unit must be preferably installed outdoors (open space). If the unit is installed indoor, it must be in a room where air is able to circulate freely.

The volume of air supplied to the condenser coils must not be restricted to ensure the operation of the unit is not adversely affected.

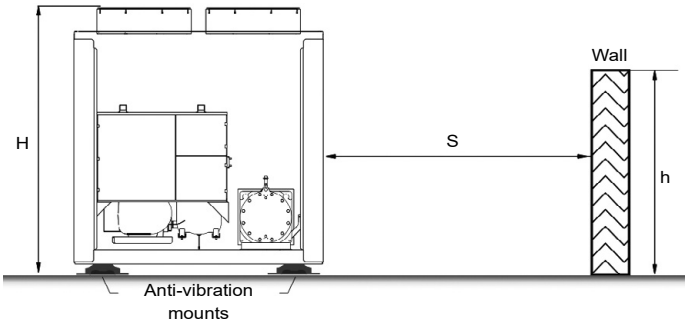
The upper part of the machine (on top of the fans) must not be covered.

If the floor space requires the machine to be partially covered, please contact Carrier Service to assess the various installation options.

3.1.2.2 - Proximity to walls

To guarantee correct operation in most cases:

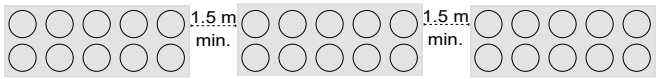
- If h < H (2.3 m), minimum S = 3 m.
- If h > H or S < 3 m, contact your Carrier distributor to assess the various installation options. An accessory (available for sale as a spare part) can be added to the unit in certain situations.



3.1.2.3 - Installation of multiple chillers

It is recommended that multiple chillers are installed in a single row, arranged as shown in the example below, to avoid warm air being recycled from one unit to another.

If the floor space does not allow this arrangement, contact your Carrier distributor to assess the various installation options.



3.1.2.4 - Potentially flammable zone around the unit

The full unit, including all options and accessories that are delivered by the manufacturer, has been qualified for the use with A2L refrigerant.

For that purpose, the manufacturer complies with EN378-2 §6.2.14. and defined a potentially flammable zone using EN60079-10-1 in order to identify where ignition sources must not be present.

Then the manufacturer designed the machine so that, if the unit is used the way it was designed for, there is no internal ignition source in the internal potentially flammable zone.

Thus, the only residual risk is to have an ignition source introduced in the potentially flammable zone by the user.

For that purpose, the manufacturer decided to represent the external potentially flammable zone (see below scheme) where the user must not introduce ignition source.

This indication is only here to help our customer to identify the limits of the flammability risk.

But there is no risk of explosion linked to the use of A2L refrigerant due to the machine itself.

In case an additional equipment is necessary (motorized valve, pump, etc...), it must be:

- Installed out of defined potentially flammable zone,
- Qualified as a non ignition source for the fluid used.

NOTE:

(The following information is provided by the manufacturer exclusively for informational purposes. The application of the following directives relies exclusively upon the user.)

- **According to directives 2009/104/EC and 1999/92/EC, these zones might be qualified by the user as ATEX Zone based on the user's own risk analysis for which the user remains solely responsible.**
- **According to the definition of Annex I of directive 1999/92/EC, this zone might be classified Zone 2 as it might be a place in which an explosive atmosphere consisting of a mixture of air with flammable substance in the form of gas is not likely to occur in normal operation but, if it does occur, will persist for a short period only.**

3.2 - Structural & Acoustical System

3.2.1 - Units Physical Data

30XF-Z Single Units		0750	0900	1000
Dimensions				
Length	mm	6785	7979	9173
Width	mm	2261	2261	2261
Height	mm	2324	2324	2324
Weights				
Operating weight(1)	kg	6070	6370	6709
Sound levels				
Sound Power(2)	dB(A)	102,5	101,0	102,5
Sound Pressure at 10 m(3)	dB(A)	79,0	77,0	78,5
Chassis Paint Color		Color code RAL 7035		

30XF-Z Duplex Units		1700	1800	1900	2000	2100
Dimensions						
Length - Module A	mm	6785	7979	7979	7979	9173
Length - Module B	mm	6319	6319	7513	8707	8707
Length	mm	13135	14335	15529	16723	17919
Width	mm	2258	2258	2258	2258	2258
Height	mm	2325	2325	2325	2325	2325
Weights						
Operating weight(1)	kg	11863	12131	12459	12870	13325
Sound levels						
Sound Power(2)	dB(A)	103,0	103,5	104,0	105,0	105,5
Sound Pressure at 10 m(3)	dB(A)	78,0	78,5	78,5	79,5	80,0
Chassis Paint Color		Color code RAL 7035				

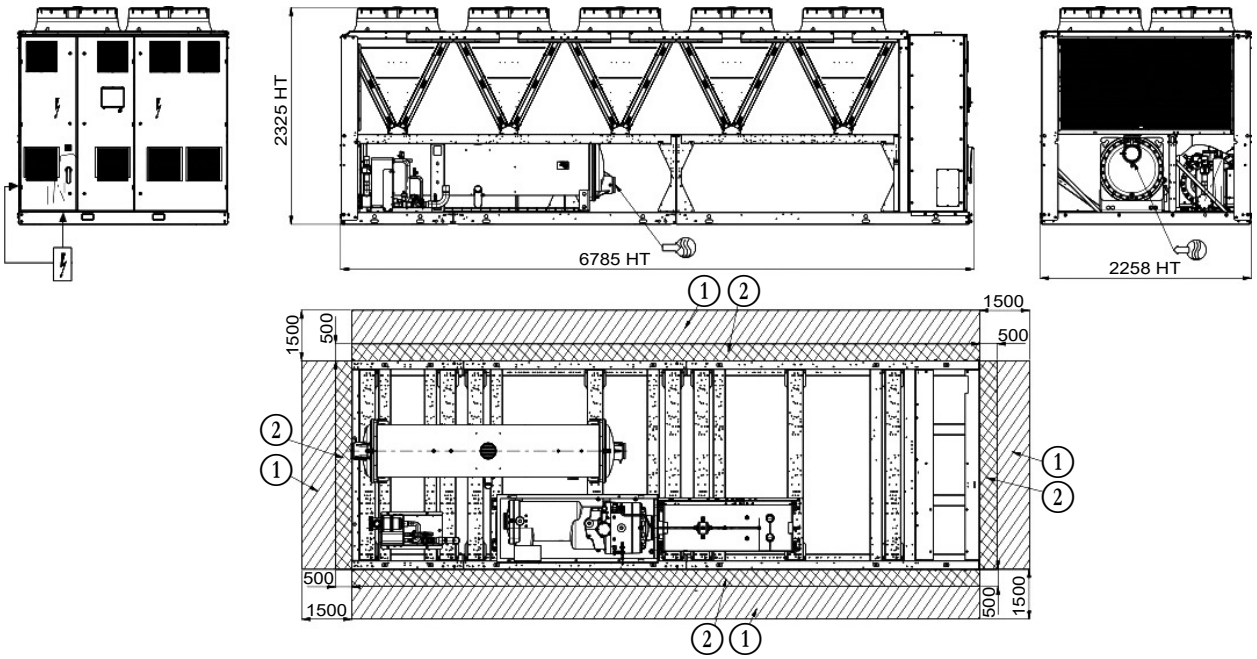
(1) Values are guidelines only. Refer to the unit name plate.
(2) In dB ref =10^{-12} W, 'A' weighted. Declared noise emission value dissociated in accordance with ISO 4871 with an uncertainty of +/-3 dB(A). Measurement following ISO 9614-1 and certified by Eurovent.
(3) In dB ref =20 µPa, 'A' weighted. Declared noise emission value in accordance with ISO 4871 with an uncertainty of +/-3 dB(A). For information, calculated from the sound power Lw(A).

3.3 - Dimensions & Clearances Drawings

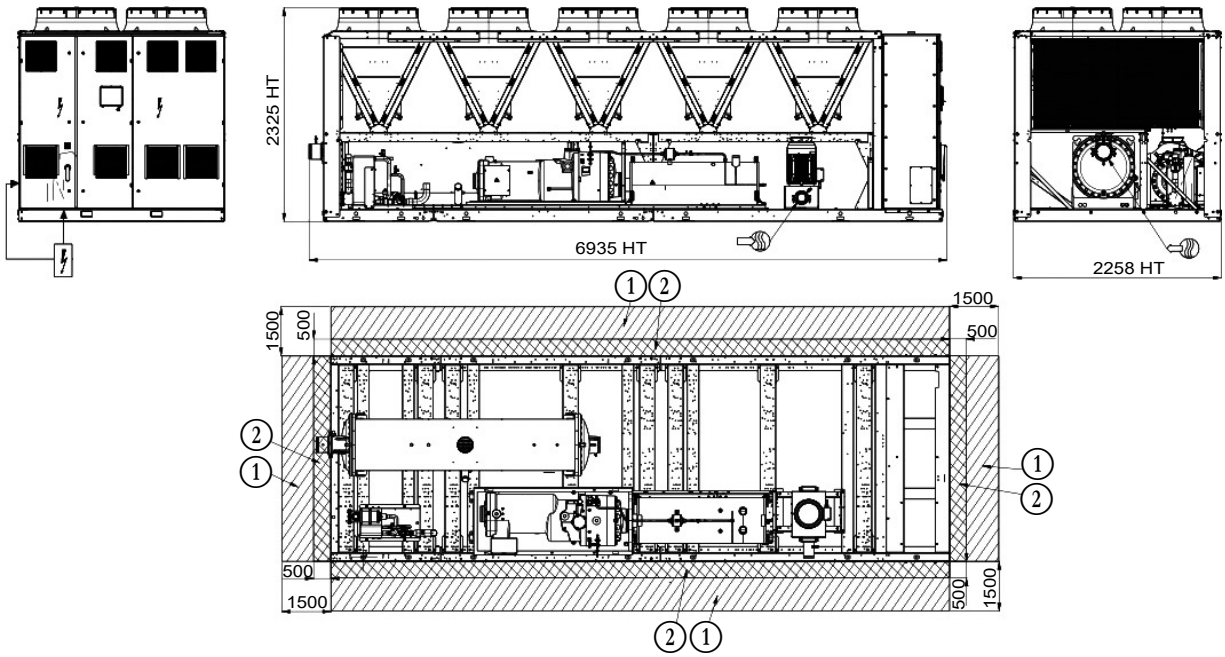
3.3.1 - Single Module Units

3.3.1.1 - 30XF-Z_0750

Standard unit



Option 116V



Legend

All dimensions are given in mm,

① Required clearances for maintenance (see note)

② Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

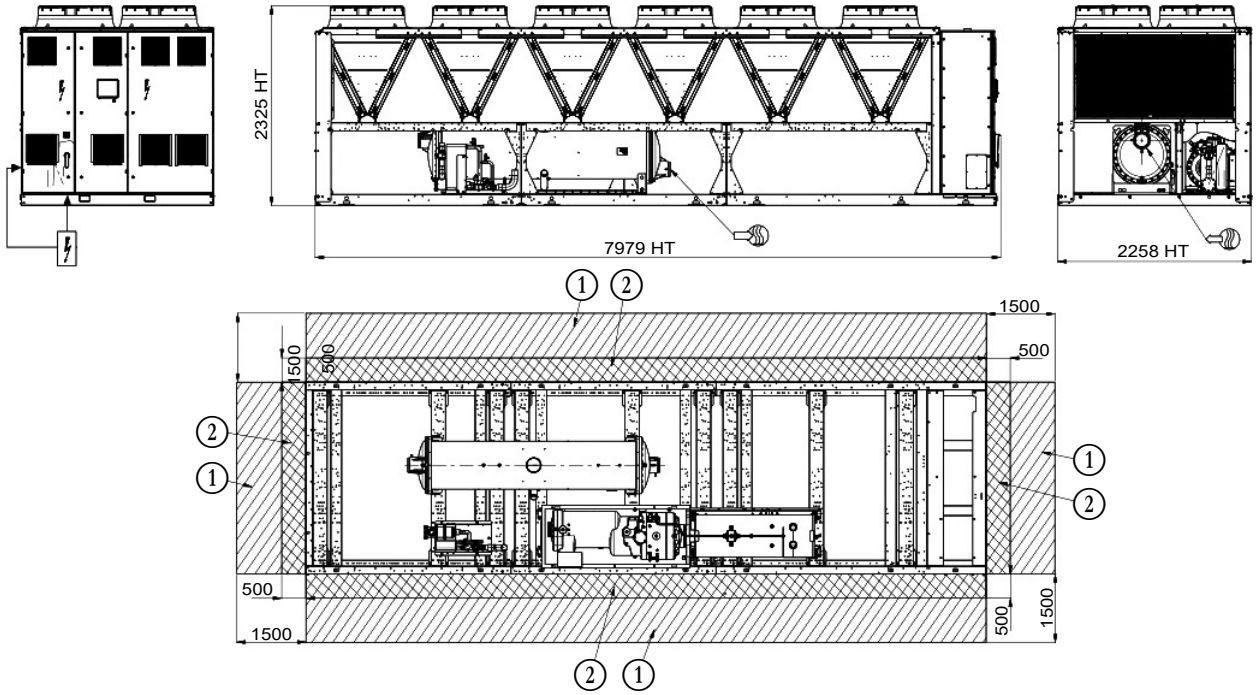
Before designing an installation, consult the certified dimensional drawings, available on request,

For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

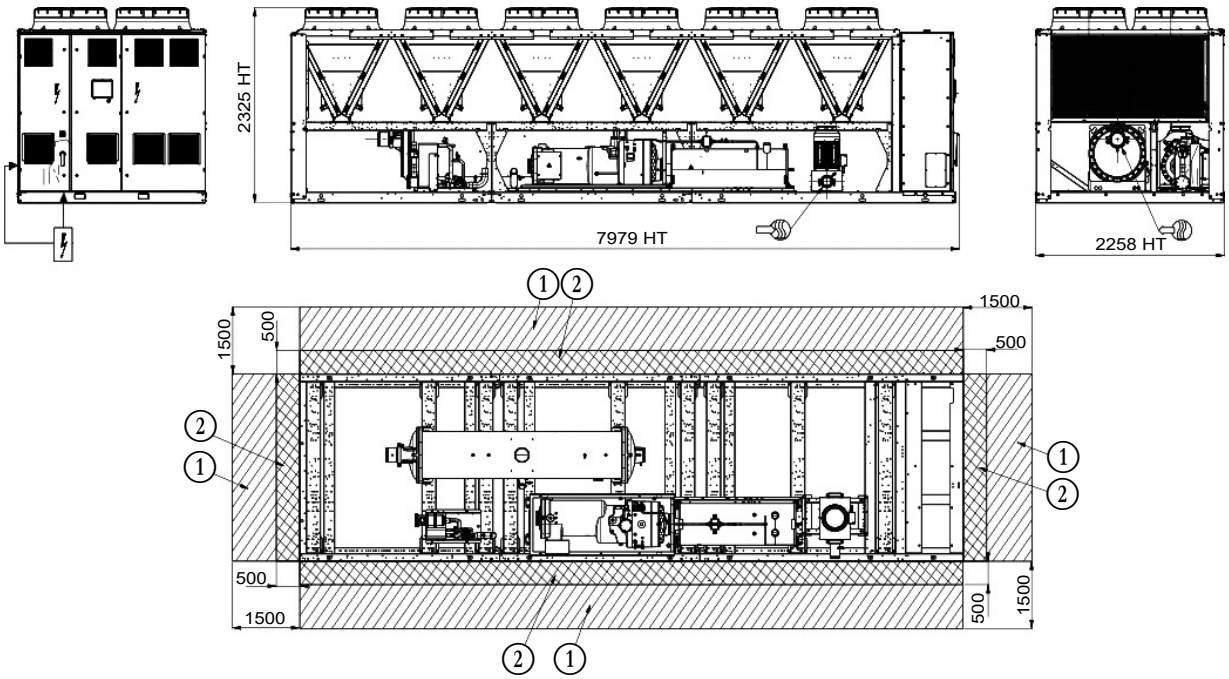
If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

3.3.1.2 - 30XF-Z_0900

Standard unit



Option 116V



Legend

All dimensions are given in mm,

① Required clearances for maintenance (see note)

② Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

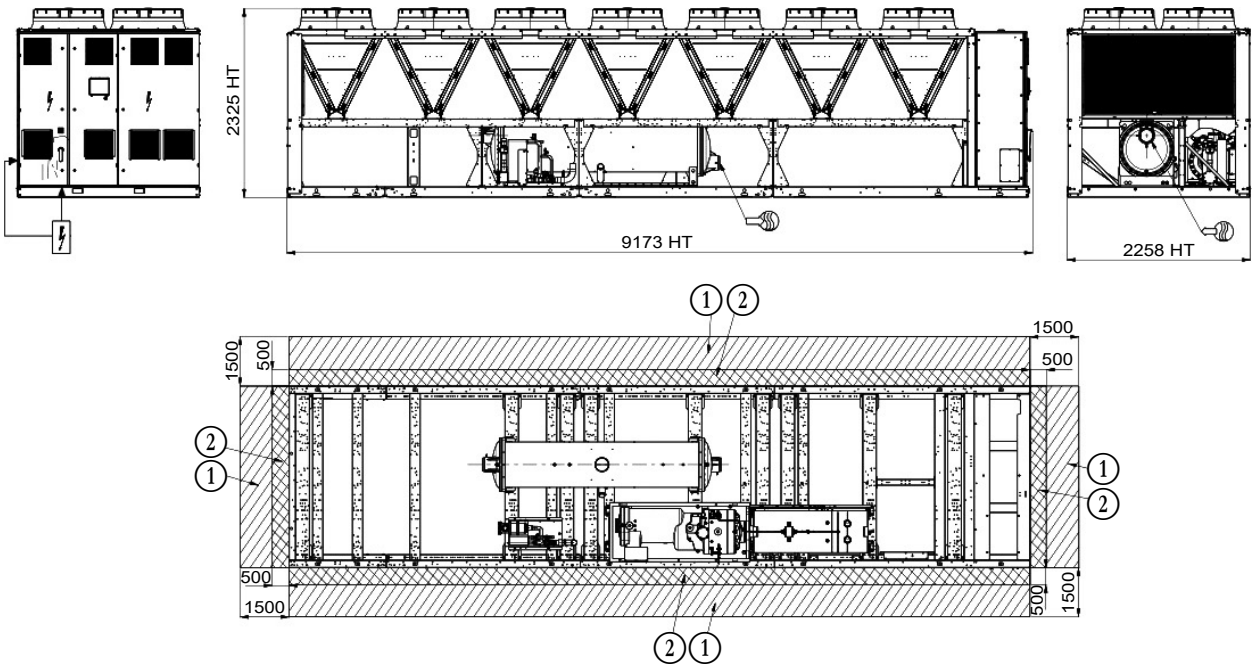
Before designing an installation, consult the certified dimensional drawings, available on request,

For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

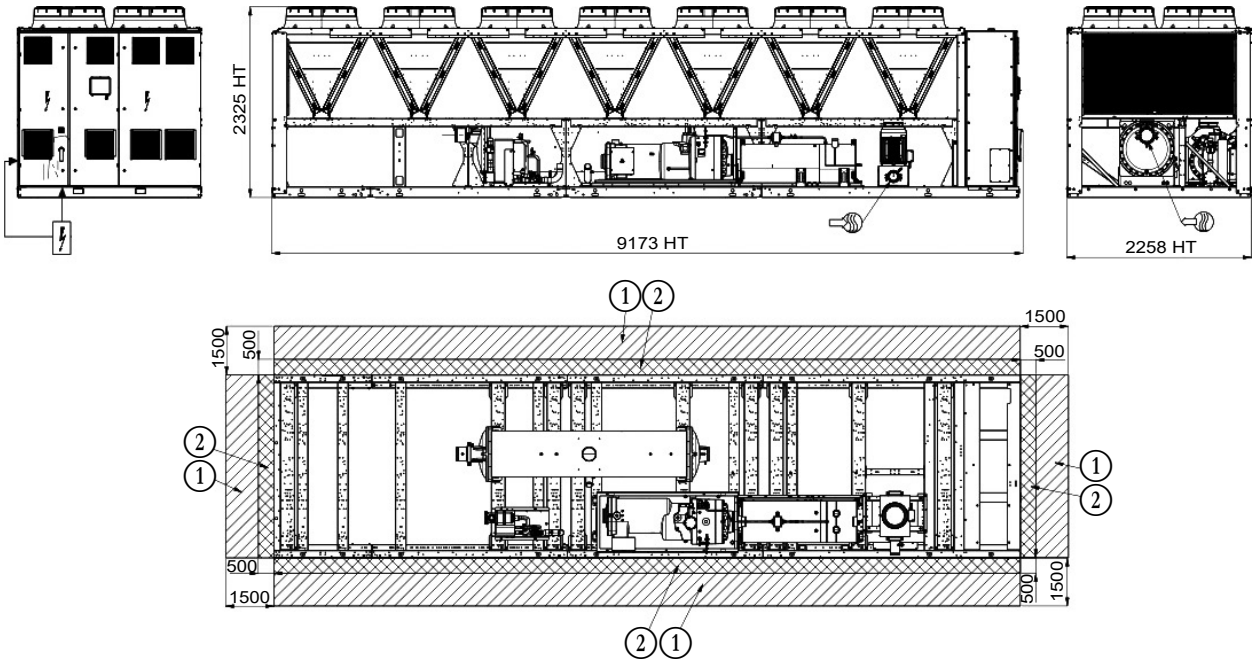
If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

3.3.1.3 - 30XF-Z_1000

Standard unit



Option 116V



Legend

All dimensions are given in mm,

① Required clearances for maintenance (see note)

② Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

Before designing an installation, consult the certified dimensional drawings, available on request,

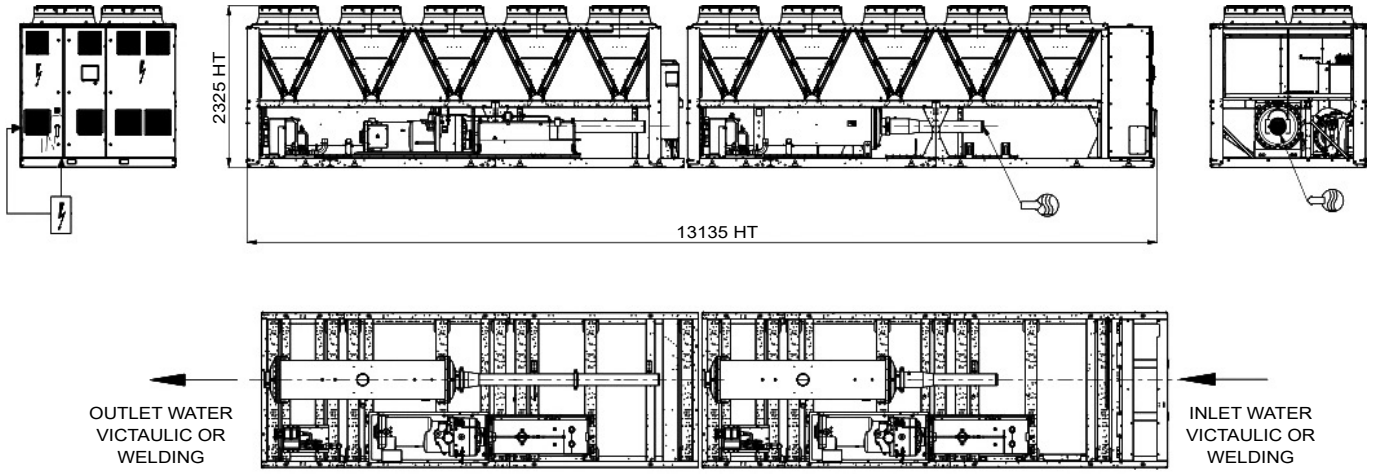
For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

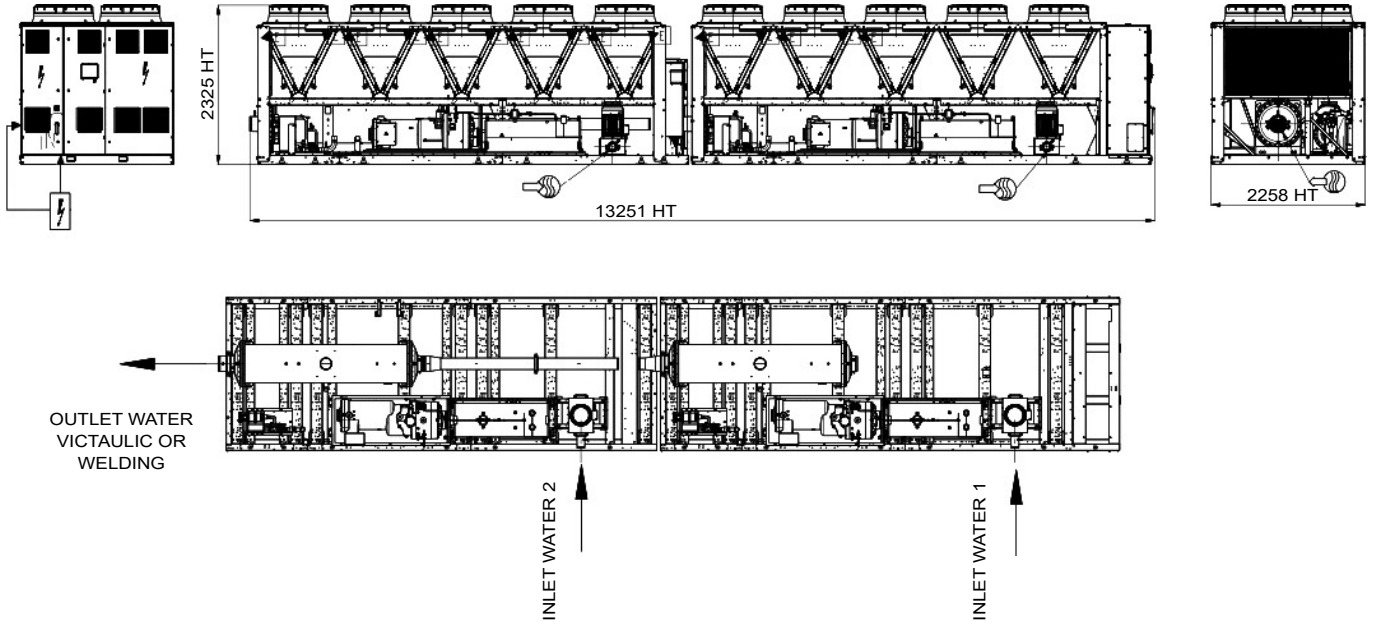
3.3.2 - Dual Module Units – Full Units

3.3.2.1 - 30XF-Z_1700

Standard unit



Option 116V



Legend

All dimensions are given in mm,

① Required clearances for maintenance (see note)

② Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

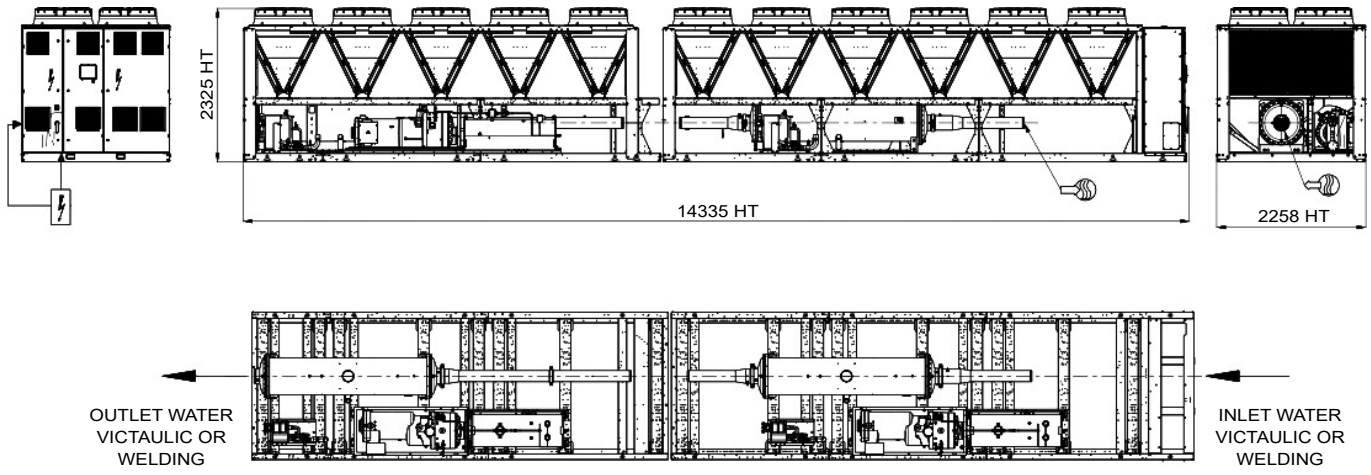
Before designing an installation, consult the certified dimensional drawings, available on request,

For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

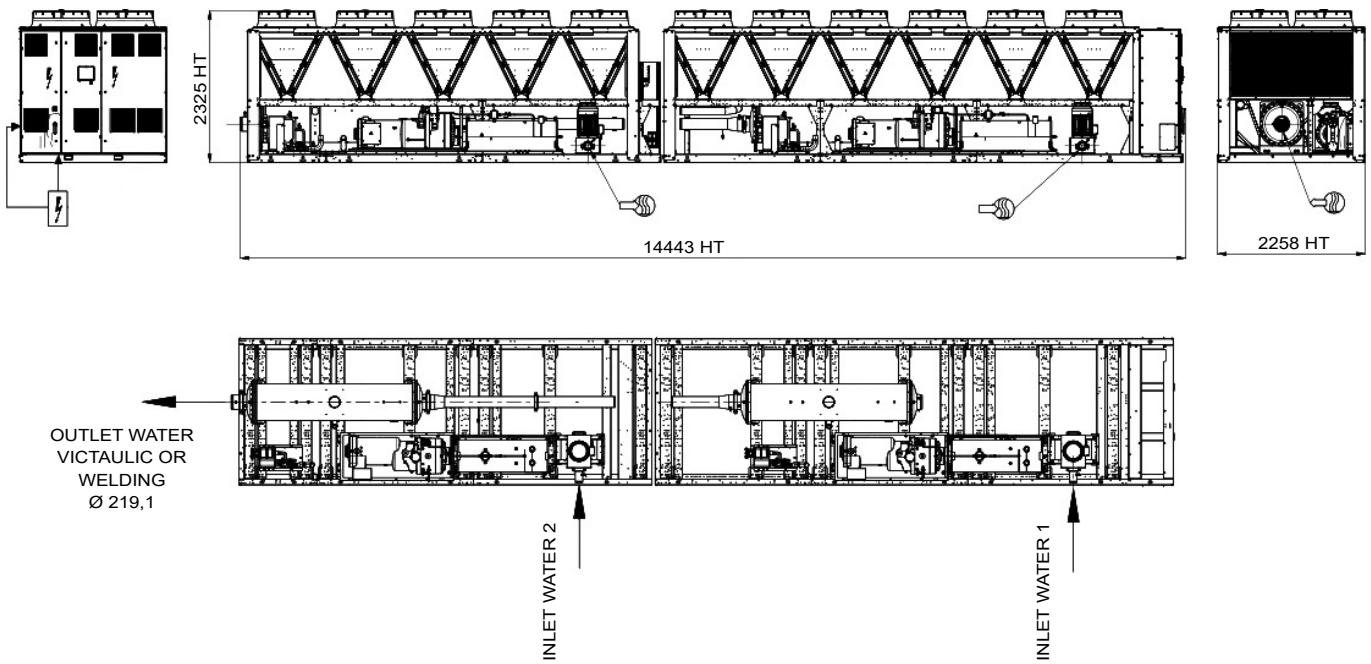
If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

3.3.2.2 - 30XF-Z_1800

Standard unit



Option 116V



Legend

All dimensions are given in mm,

① Required clearances for maintenance (see note)

② Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

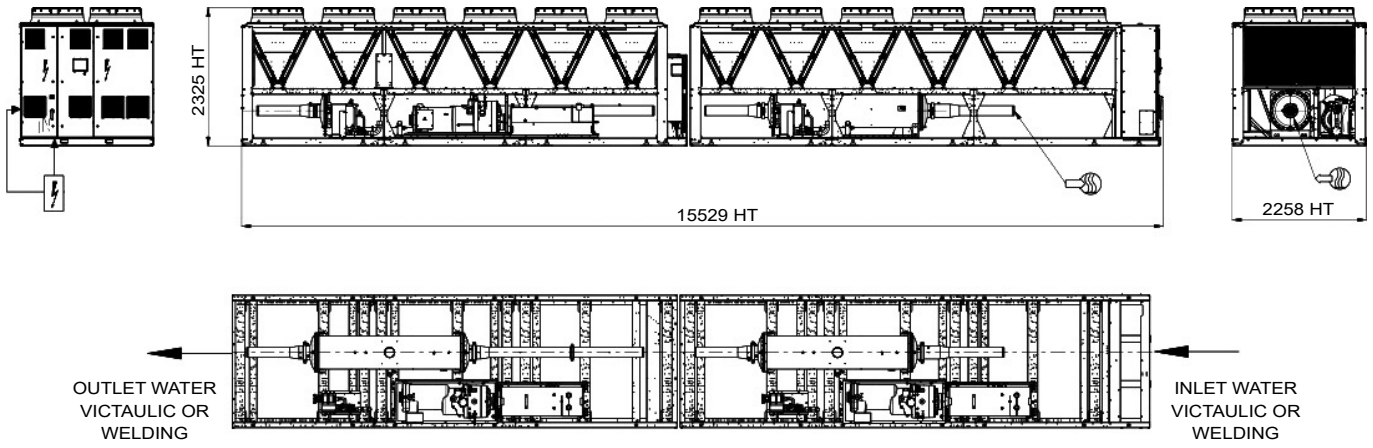
Before designing an installation, consult the certified dimensional drawings, available on request,

For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

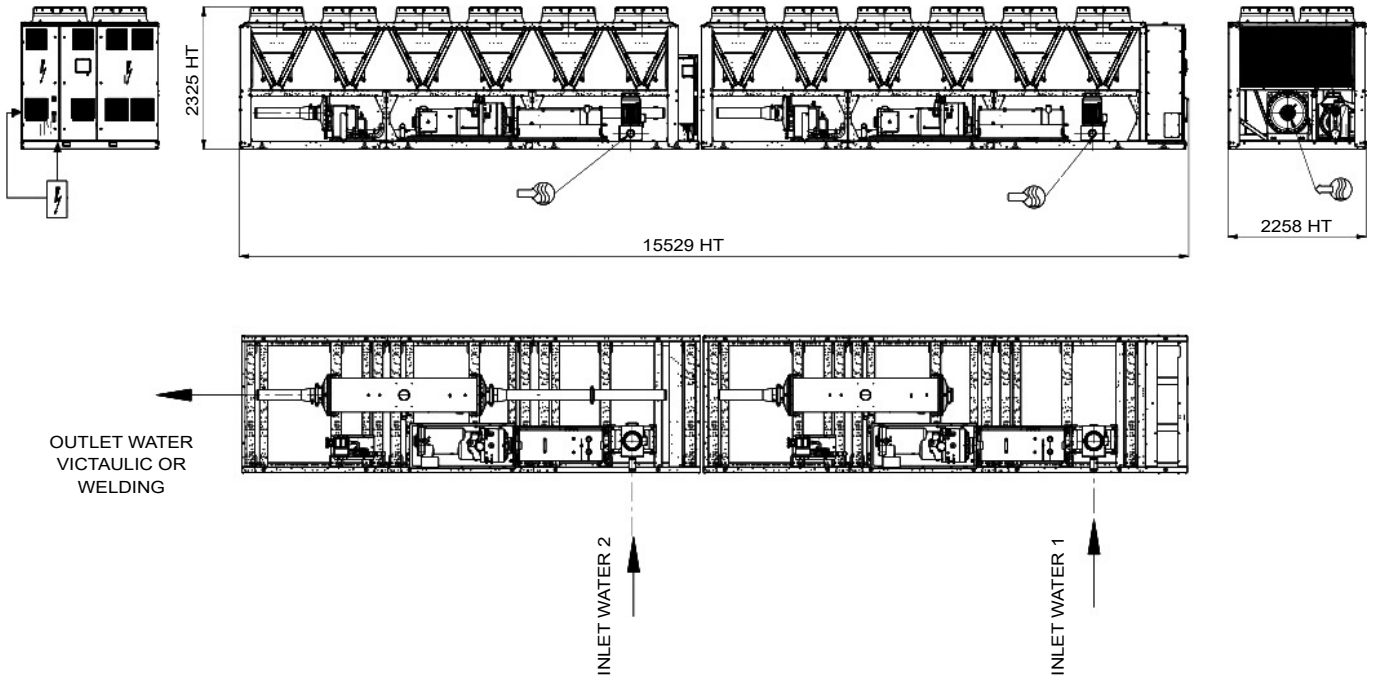
If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

3.3.2.3 - 30XF-Z_1900

Standard unit



Option 116V



Legend

All dimensions are given in mm,

① Required clearances for maintenance (see note)

② Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

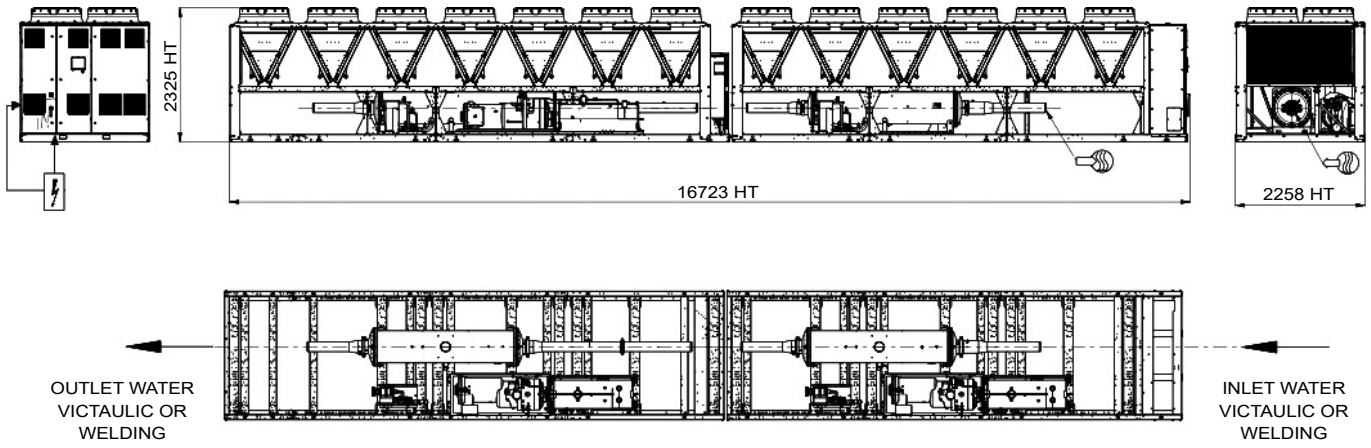
Before designing an installation, consult the certified dimensional drawings, available on request,

For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

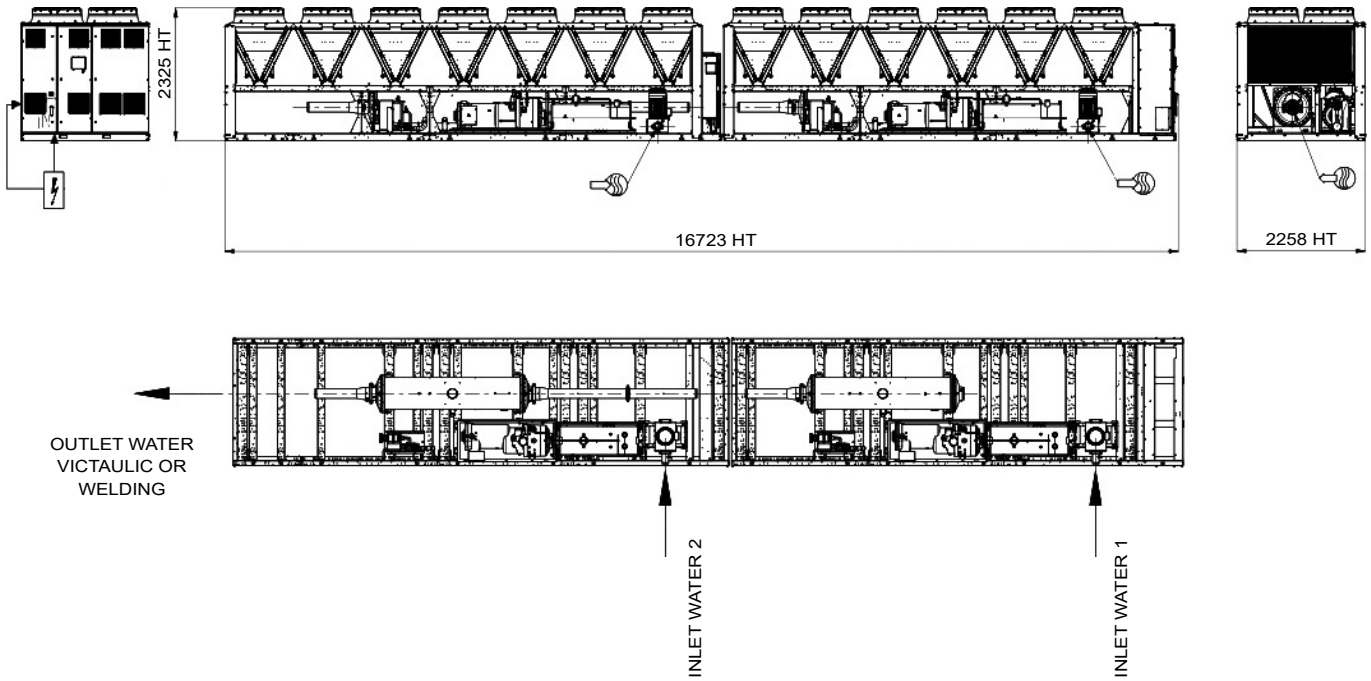
If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

3.3.2.4 - 30XF-Z_2000

Standard unit



Option 116V



Legend

All dimensions are given in mm,

① Required clearances for maintenance (see note)

② Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

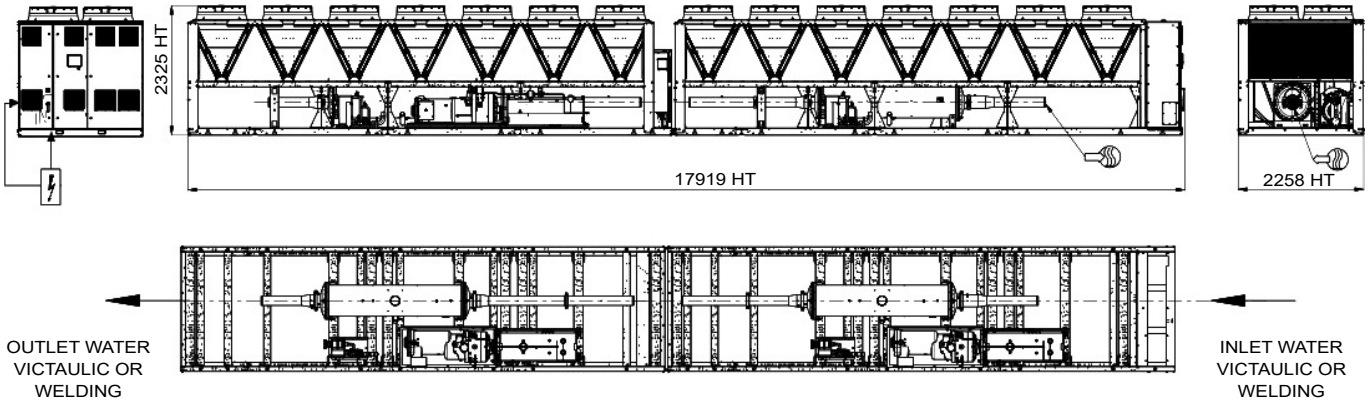
Before designing an installation, consult the certified dimensional drawings, available on request,

For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

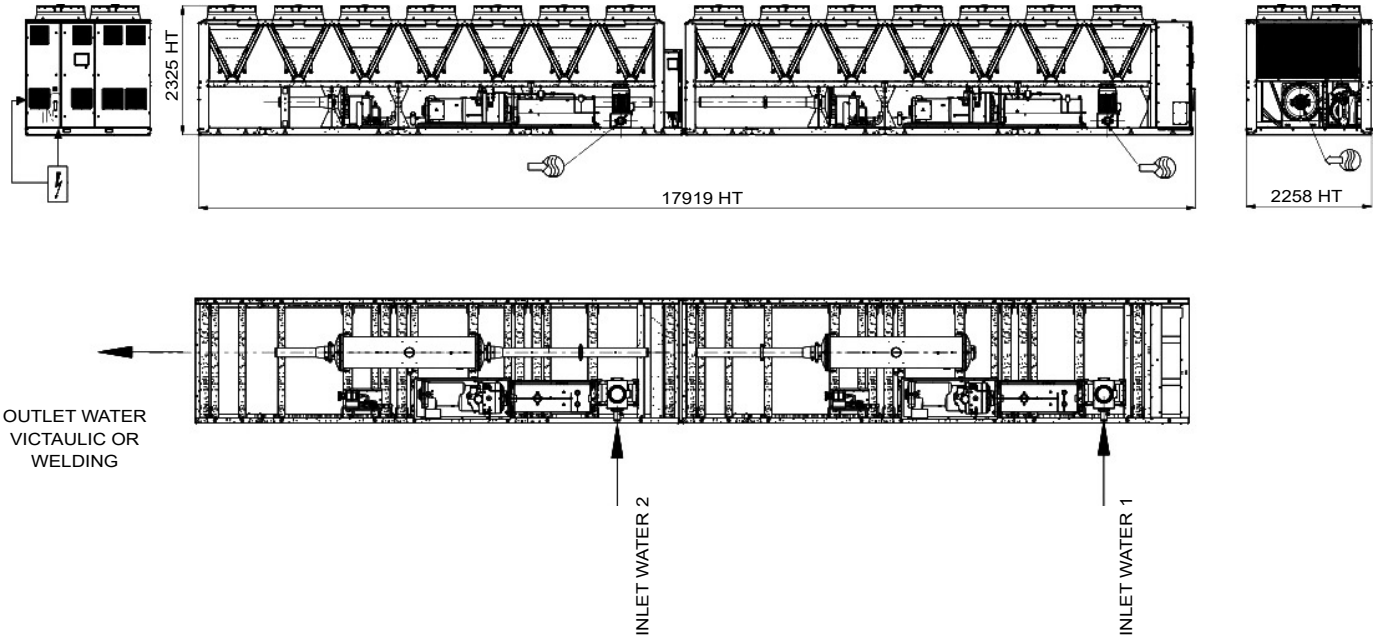
If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

3.3.2.5 - 30XF-Z_2100

Standard unit



Option 116V



Legend

All dimensions are given in mm,

① Required clearances for maintenance (see note)

② Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

Before designing an installation, consult the certified dimensional drawings, available on request,

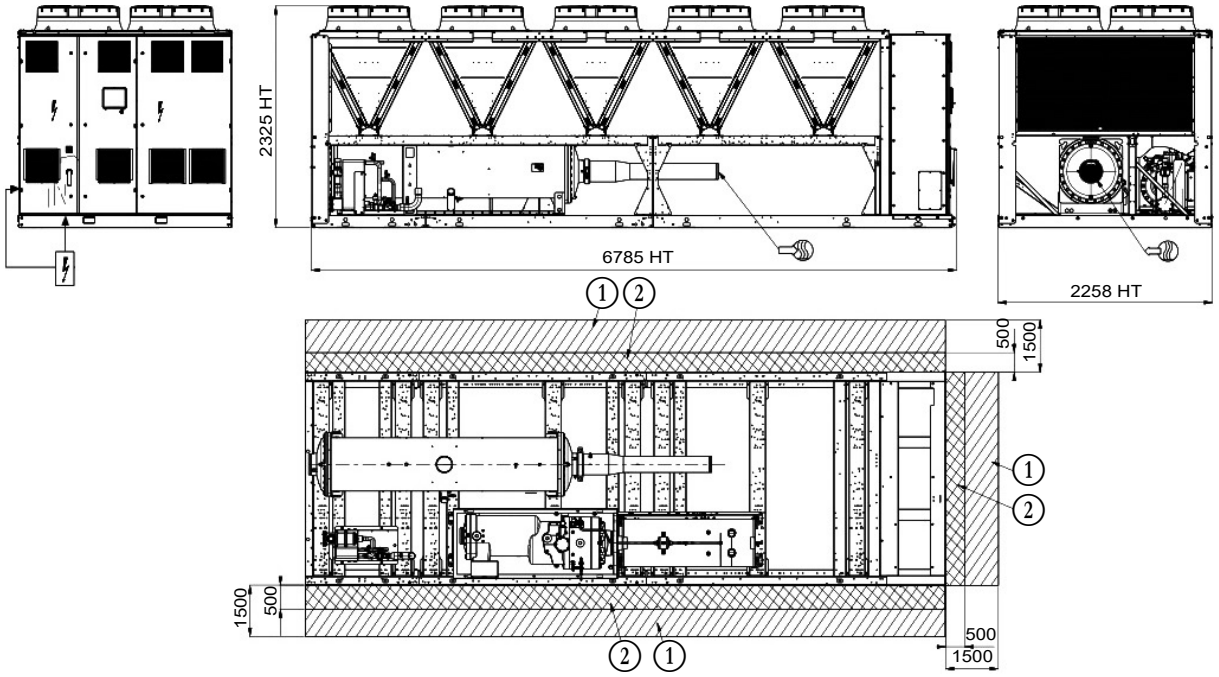
For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

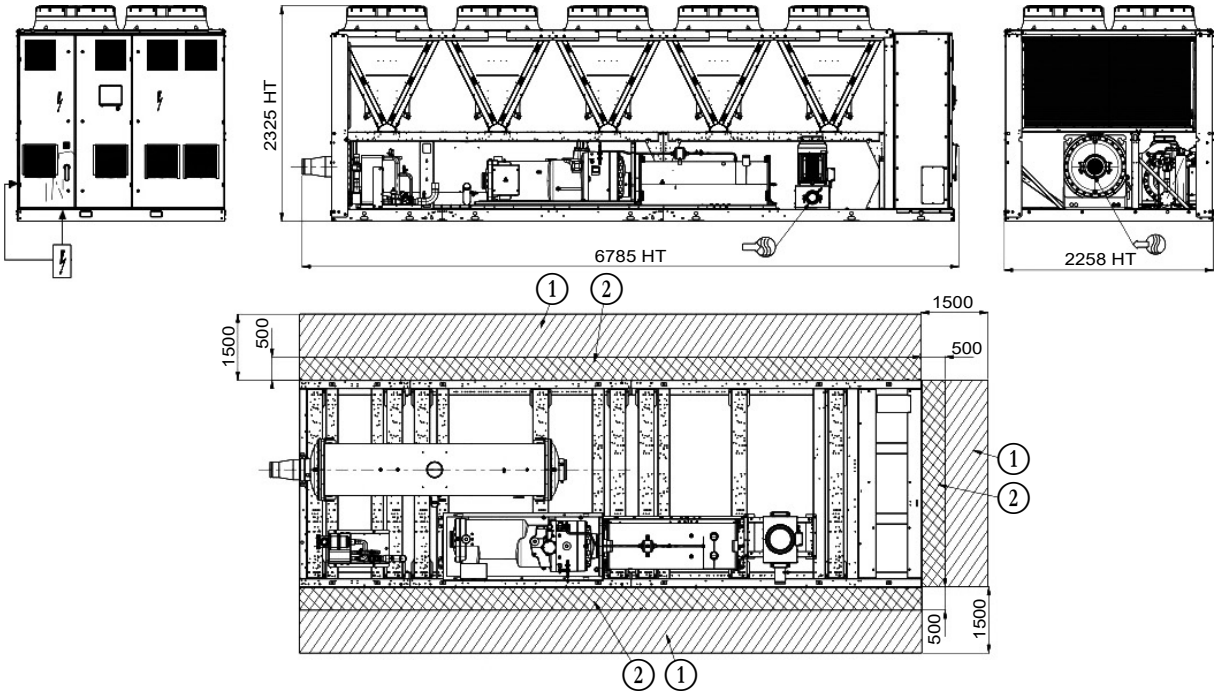
3.3.3 - Dual Module Units – A Modules

3.3.3.1 - 30XF-Z_1400 / 30XF-Z_1500 / 30XF-Z_1700 – Module_A

Standard unit



Option 116V



Legend

All dimensions are given in mm,

(1) Required clearances for maintenance (see note)

(2) Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

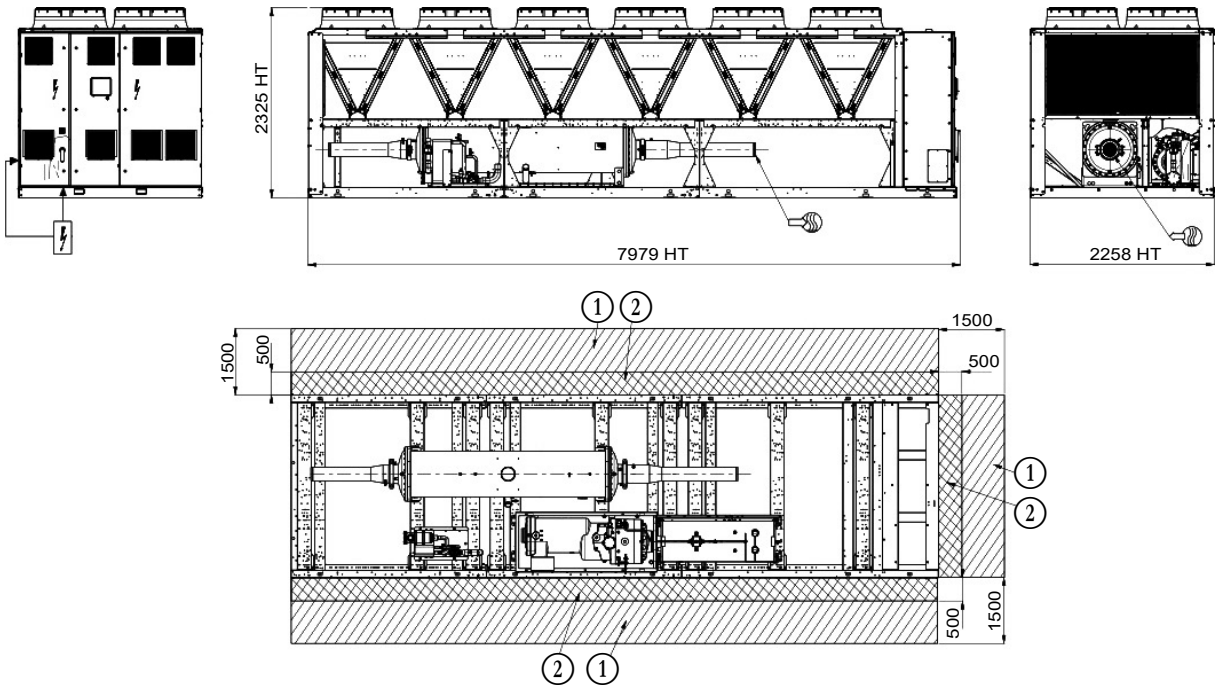
Before designing an installation, consult the certified dimensional drawings, available on request,

For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

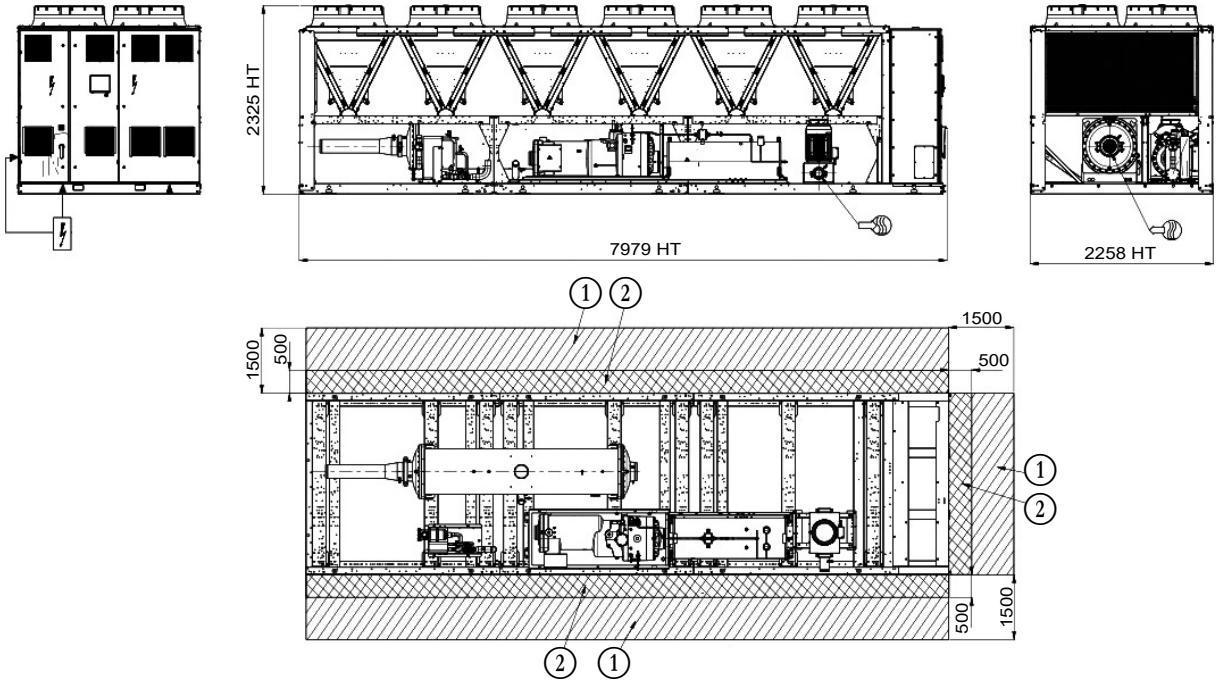
If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

3.3.3.2 - 30XF-Z_1800 / 30XF-Z_1900 / 30XF-Z_2000 – Module_A

Standard unit



Option 116V



Legend

All dimensions are given in mm,

1. Required clearances for maintenance (see note)
2. Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

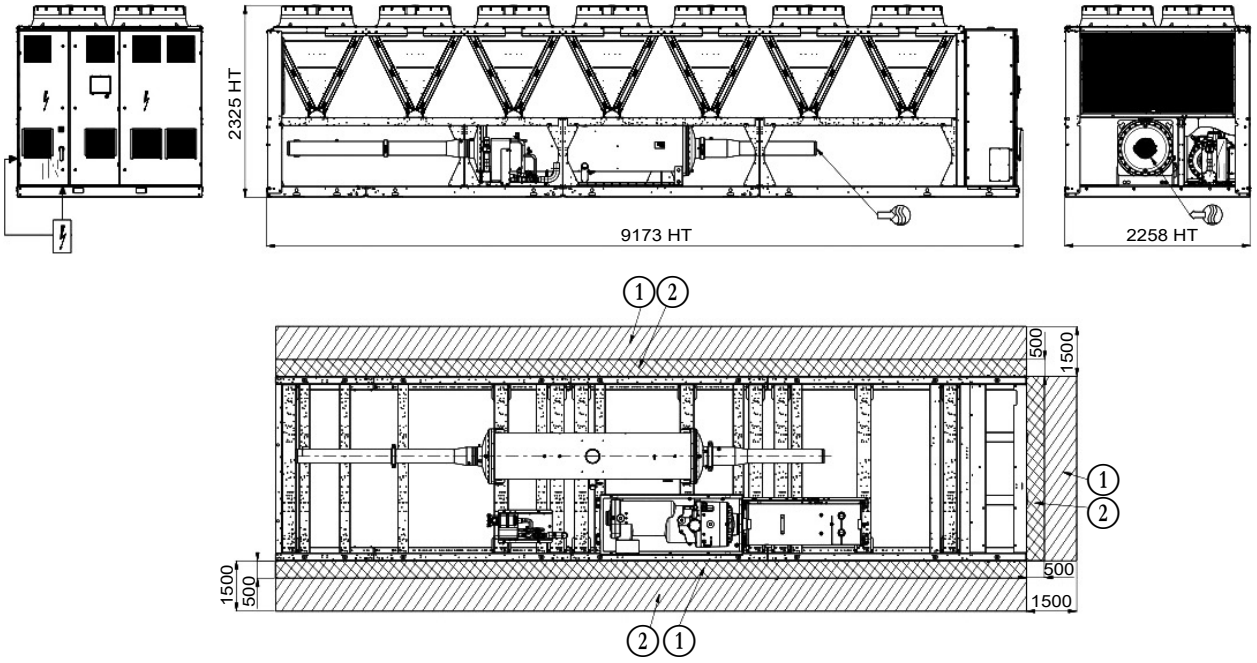
Before designing an installation, consult the certified dimensional drawings, available on request,

For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

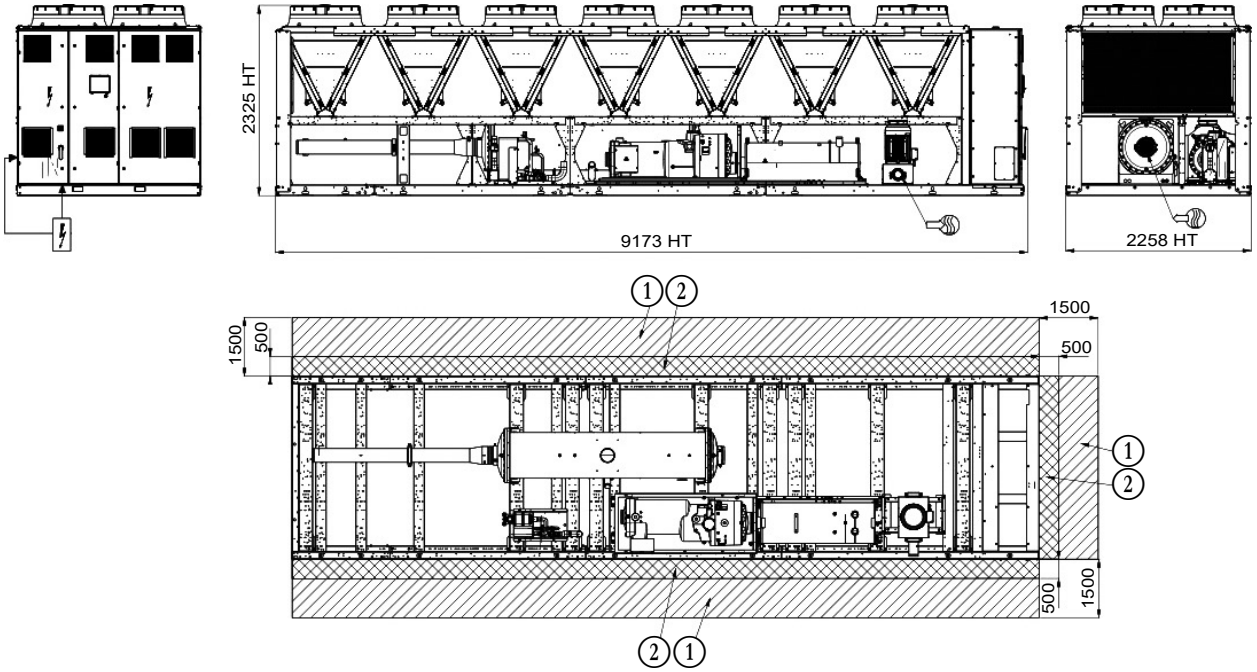
If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

3.3.3.3 - 30XF-Z_2100 – Module_A

Standard unit



Option 116V



Legend

All dimensions are given in mm,

1. Required clearances for maintenance (see note)
2. Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

Before designing an installation, consult the certified dimensional drawings, available on request,

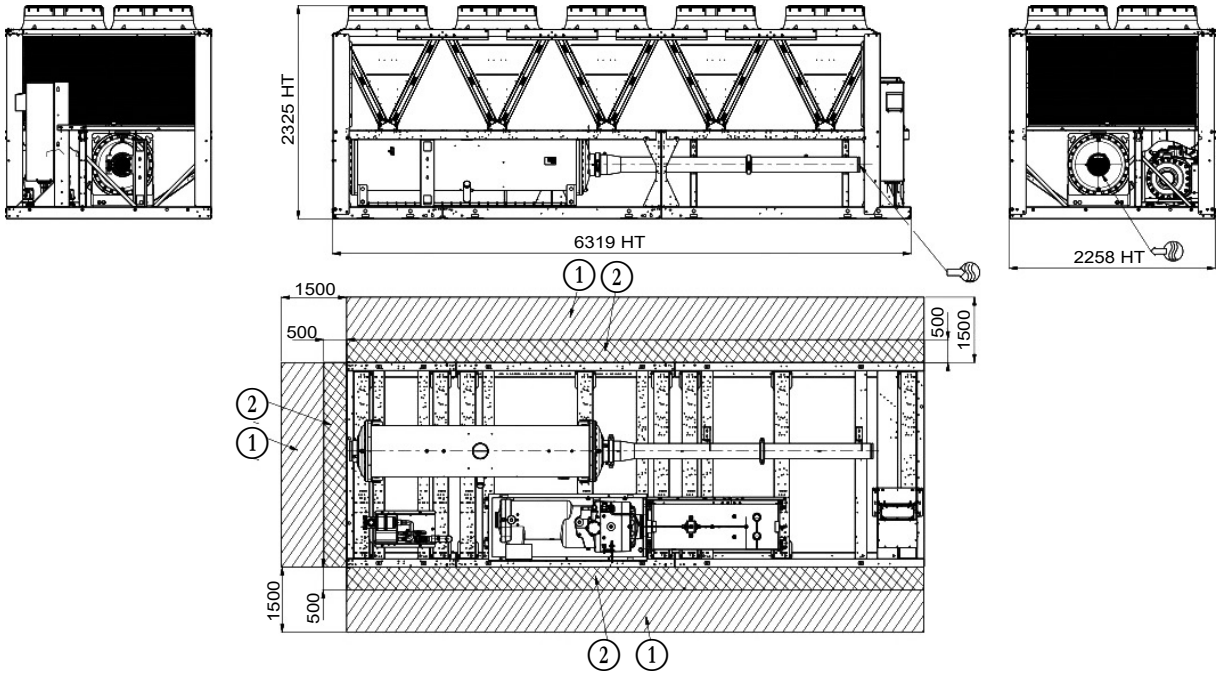
For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

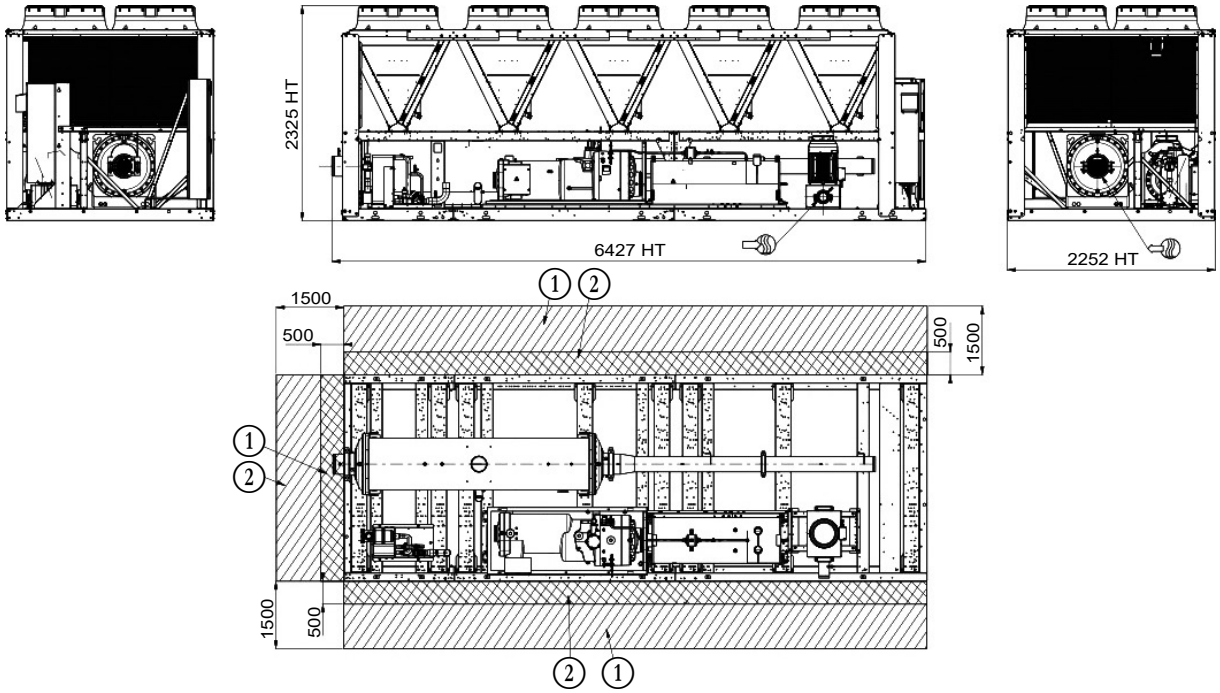
3.3.4 - Dual Module Units – B Modules

3.3.4.1 - 30XF-Z_1700 / 30XF-Z_1800 – Module_B

Standard unit



Option 116V



Legend

All dimensions are given in mm,

① Required clearances for maintenance (see note)

② Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

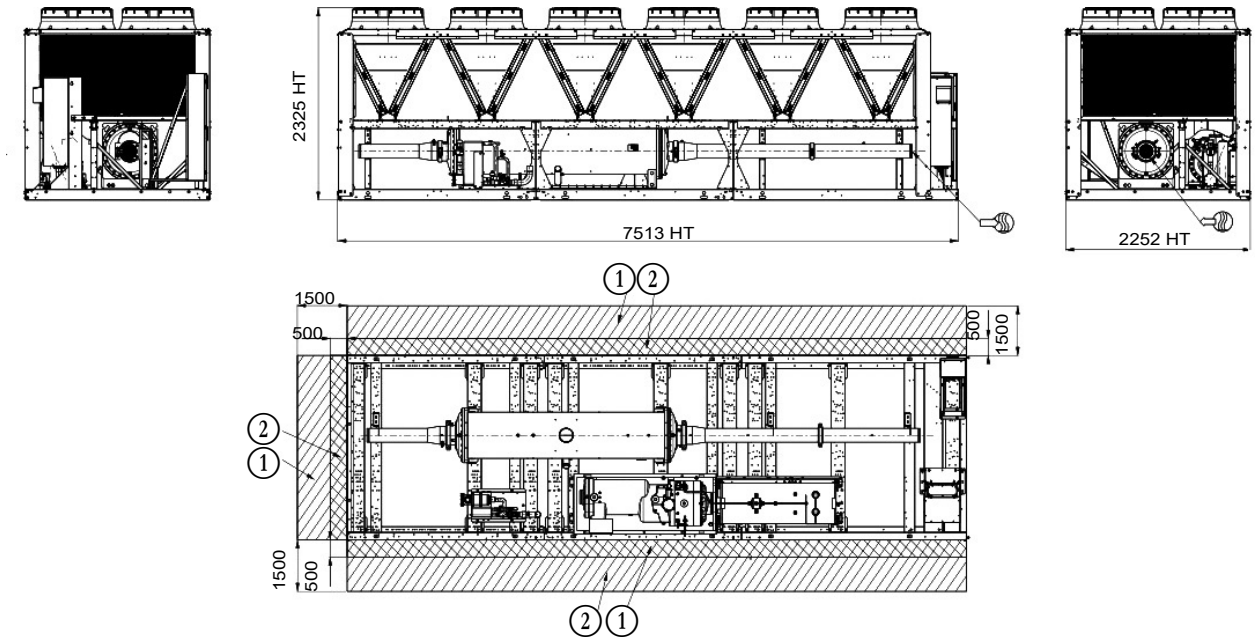
Before designing an installation, consult the certified dimensional drawings, available on request,

For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

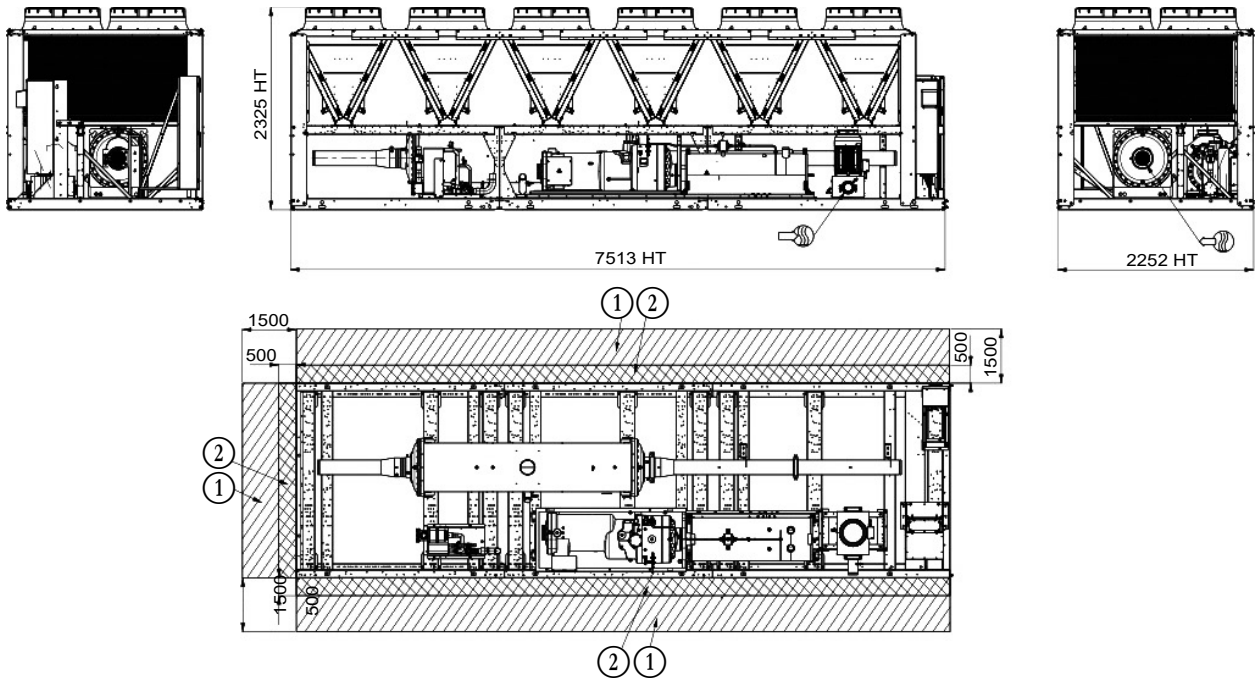
If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

3.3.4.2 - 30XF-Z_1900 – Module_B

Standard unit



Option 116V



Legend

All dimensions are given in mm,

① Required clearances for maintenance (see note)

② Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

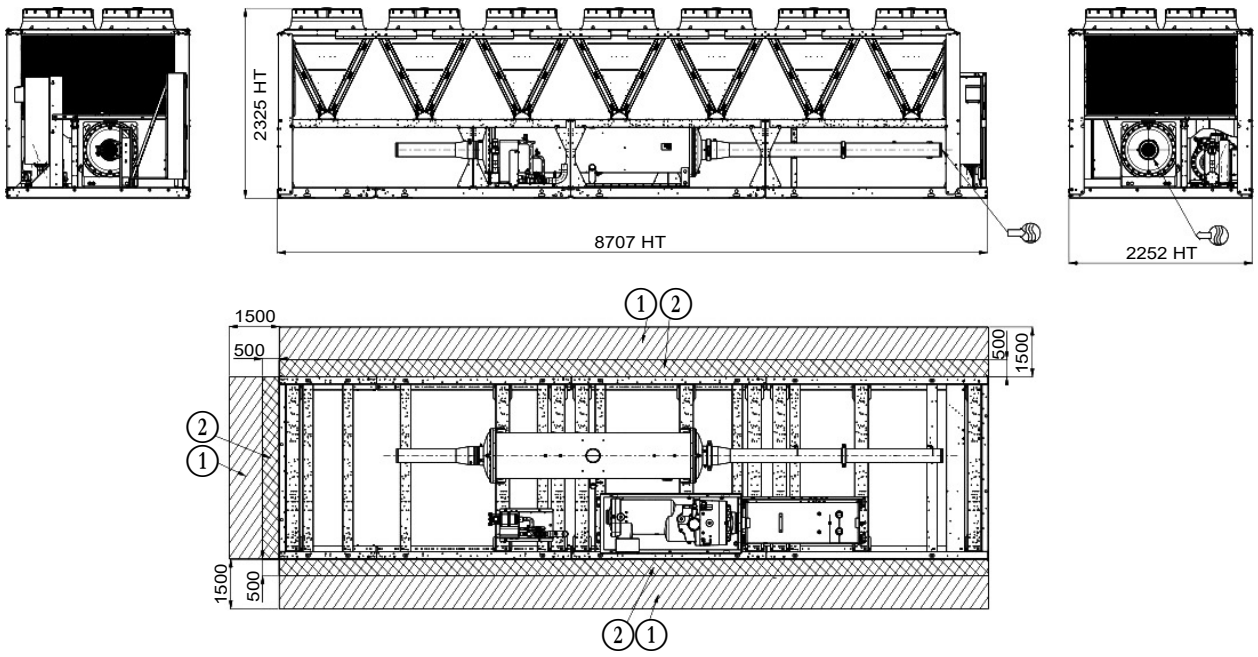
Before designing an installation, consult the certified dimensional drawings, available on request,

For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

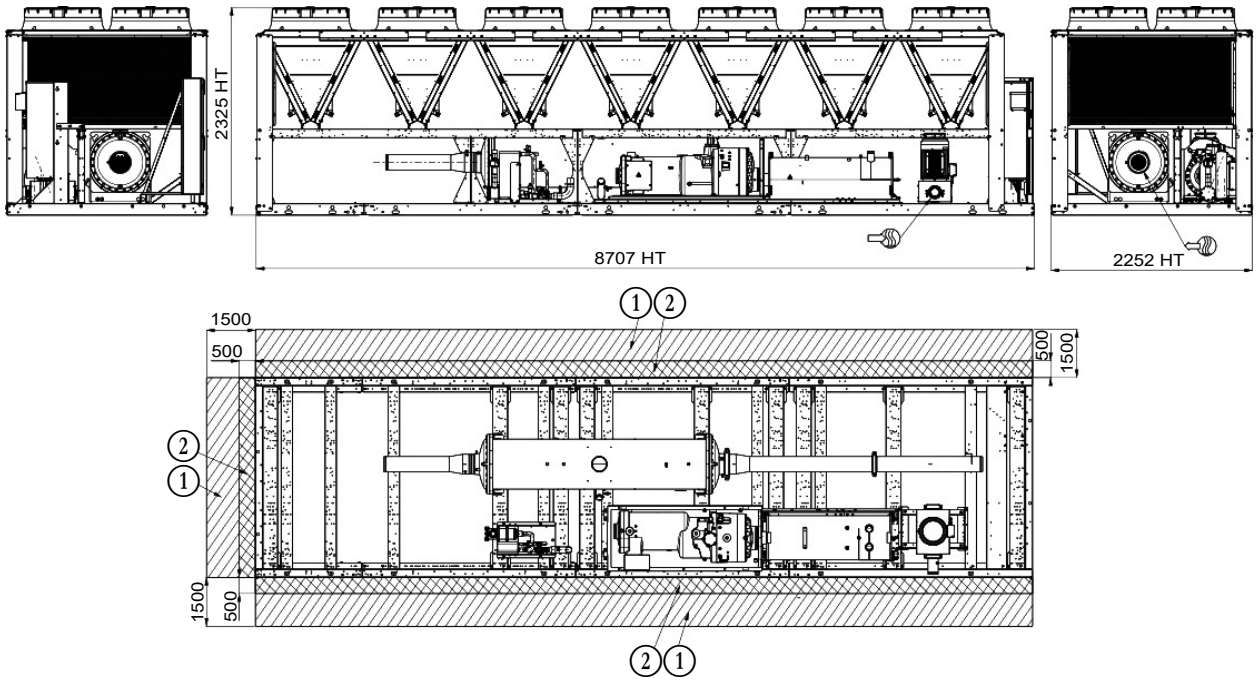
If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

3.3.4.3 - 30XF-Z_2000 / 30XF-Z_2100 – Module_B

Standard unit



Option 116V



Legend

All dimensions are given in mm,

1. Required clearances for maintenance (see note)
2. Potentially flammable zone around the machine

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding,

Before designing an installation, consult the certified dimensional drawings, available on request,

For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings,

If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required,

4.1 - Electrical Connections

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

The power supply must conform to the specification on the chiller nameplate.

The supply voltage must be within the range specified in the electrical data table.

WARNING: Operating the chiller with an incorrect supply voltage or excessive phase imbalance constitutes misuse which will invalidate the Carrier warranty.

4.1.1 - Electrical connections for duplex units

For the unit that have two modules, electrical connections between the modules are required once the modules have been handled and positioned.

Cables go through the unit from module A electrical cabinet to module B in order to be connected to module B terminals.

Refer to wiring diagram for identification of all the connections.

Cables using Protective Extra Low Voltage are factory-fitted on module A electrical cabinet terminals: They need to be connected only on module B corresponding terminals.

Cables with hazardous voltage are not factory-fitted on module A electrical cabinet terminals: They need to be connected on both module A electrical cabinet terminals and module B corresponding terminals.

Warning: For all connections with hazardous voltage there is a risk of injury or death if the power is applied while the conductors are not connected inside module B.

To avoid that: Perform connections on module B corresponding terminals BEFORE module A electrical cabinet terminals.

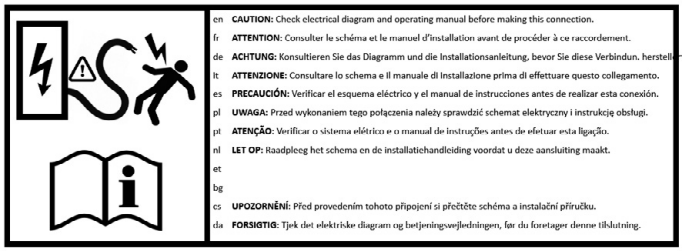
Moreover, the unit is delivered with sets of fuses inside the module A electrical cabinet. They are not factory-fitted in order to enable operators protection from hazards generated by modular power supply.

Those fuses are required to be fitted in the corresponding terminals to enable effective power supply from module A to module B.

Warning:

- ***Insert fuses into the dedicated terminals AFTER cables are connected on module B corresponding terminals and hazardous voltage cables are connected on module A corresponding terminals.***
- ***Before applying power, always check that all connections are done inside module B. Cross check with wiring diagram that all connections have been done.***

Prevention of the case where a unit is disconnected for handling before possible new connection after first installation: yellow stickers related to duplex units connections must be stored in the electrical cabinet. After disconnection, they must be installed again inside the cabinet of module A, on all connections of circuits to module B.



4.1.2 - Power cables access routing

The power cable access routing into the electrical cabinet is from the side or from the underneath of the unit: Refer to the plans for the unit.

The choice depends on the installation configuration of the machine and the specifications of the cables to be connected:

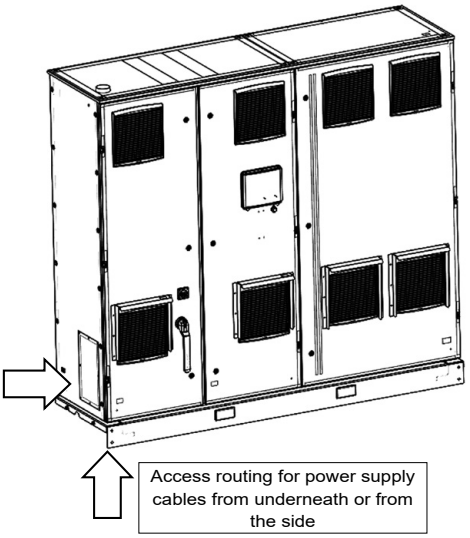
Cable access routing from the side of the unit: This configuration allows a larger number of cables to be connected and/or for larger curve radii.

Cable access routing from the underneath of the unit: This configuration requires the unit to be raised in relation to the cable routing level (for example: Fitting on rails and supports). The quantity of conductors which can be connected and the bending radius needed are also restricted.

The installer is responsible for ensuring the electrical cabinet is sealed around the power cable access routing. Holes must be drilled in the plate provided, and the latter must be assembled.

Important: Check the bending radius for the cable access routing underneath the unit. Refer to the certified dimensional drawing for the unit.

Location of the openings for inserting external connections



4.1.3 - Recommended cables sections

Wire sizing is the responsibility of the installer and depends on the characteristics and regulations applicable to each installation site.

The cable selections given in this document are therefore only given as a guide, and do not in any way incur Carrier's liability. After wire sizing has been completed, using the certified dimensional drawing, the installer must verify the appropriate means of connection and define any modifications necessary on site.

The connections provided as standard for the customer-supplied power supply cables, on the main disconnect switch, are designed for the number and type of cross sections given in the second column of the table below.

The calculations have been performed using the maximum possible current on the machine (see electrical data notes table).

The calculations of favorable and unfavorable cases have been performed using the maximum current for each unit (see electrical data notes table). The study includes the standardized installation cases according to IEC 60364: Cable with PVC (70°C) or XLPE (90°C) insulation with copper core; fitted in accordance with table 52c of the standard. The maximum ambient temperature taken into consideration for this study is 46°C. The given maximum length is calculated to limit the voltage drop to 5%.

IMPORTANT: Before connecting the main power cables (L1 - L2 - L3), always check the correct order (clockwise) of the 3 phases before connecting to the main disconnect/isolator switch.

Minimum and maximum cable section selection table for connection to 30XF-Z units:

30XF-Z Units	Max. connectable section(1)		Calculation of favourable case: - Suspended overhead line (standardized routing n°. 17) - Cable insulated to 90°C - Copper conductor (Cu)			Calculation of unfavourable case: - Conductors in ducts or multi-conductor cables in closed conduits (standardized routing n°. 41) - Cable insulated to 70°C when possible - Copper conductor (Cu)		
	Side connection	Bottom connection	Section(2)	Max. length for a voltage drop <5%	Cable type(3)	Section(2)	Max length for a voltage drop <5%	Cable type(3)
	qty x mm² (per phase)	qty x mm² (per phase)	qty x mm² (per phase)	m	-	qty x mm² (per phase)	m	-
0750	4 x 240	3 x 240	1 x 185	263	90°C	2 x 185	453	70°C
0900	4 x 240	3 x 240	2 x 95	227	90°C	2 x 240	458	70°C
1000	4 x 240	3 x 240	2 x 120	240	90°C	4 x 150	462	70°C
1700	3 x 300	3 x 240	2 x 240	258	90°C	4 x 150	297	90°C
1800	3 x 300	3 x 240	2 x 240	242	90°C	4 x 185	317	90°C
1900	3 x 300	3 x 240	4 x 120	217	90°C	4 x 240	326	90°C
2000	3 x 300	3 x 240	4 x 150	237	90°C	4 x 240	309	90°C
2100	3 x 300	3 x 240	4 x 150	235	90°C	4 x 240	306	90°C

(1) Connection capacities actually available for each unit. These are defined according to the connection terminal size, the electrical box access opening dimensions, and the available space inside the electrical box.
(2) Selection simulation result considering the hypotheses indicated.
(3) If the maximum calculated selection is for a 90°C cable type, this means that a selection based on a 70°C cable type can exceed the connection capacity actually available. Special attention must be given to the selection.

NOTE: The currents considered are given for a machine without options.

4.1.4 - Field-installed control wiring

IMPORTANT: Connecting the interface circuits on-site creates certain safety risks; any modification to the electrical box must ensure the equipment remains compliant with local regulations. In particular, precautions must be taken to prevent accidental electrical contact between the circuits supplied by different sources:

- ***The choice of routing and/or insulation characteristics of the conductors ensures double electrical insulation.***
- ***The conductors should be fixed together inside the electrical box to prevent contact between the end of the conductor and a live part in case of accidental disconnection.***

Refer to the 30XF-Z SmartVu™ control manual and the certified wiring diagram supplied with the unit for the field control wiring for the following features:

- Remote on/off switch,
- Capacity limit external switch,
- Remote dual setpoint,
- Operating and alarm feedback,
- Evaporator pump control,
- Setpoint offset,
- Various interlocks on the Energy Management Module (EMM) board option,
- Control of the variable speed evaporator pump,
- Refrigerant leakage detection signal (option).

Connections to the customer communication bus

The CCN bus is connected using the connectors specifically provided inside the electrical box. Two connectors are provided to allow both permanent and service connections.

The permanent Ethernet bus and USB service socket are connected using the connector integrated into the touchscreen interface.

A shielding clamp for the cable from the system is provided near the permanent bus connectors.

After all possible options have been connected, the CT transformer ensures the availability of a 1 A power reserve at 24 Vac for the on-site control cabling.

4.2 - Electrical Components

4.2.1 - Main Electrical Cabinet

The main electrical cabinet(s) contains:

- A power supply disconnecting component for each power supply: Disconnect switch,
- Part of the equipment protecting the circuits inside the machine from short circuits,
- Variable frequency drives to manage and protect against overload the compressors, fans, and pumps motors,
- The active anti-harmonic filter if option 336 was chosen,
- The switching equipment for the heaters and fans for the electrical equipment,
- The control devices.

4.2.2 - Variable Frequency Drives

The units are equipped with variable frequency drives for the compressors and the fans motors.

The variable frequency drives enable the speed of the motors to be selected by adjusting the voltage and frequency by modulating the pulse width (PWM).

The frequency setpoint on the operating range and the status feedback for the variable frequency drives is transmitted by communication via the internal RS485 Bus using the LEN Protocol by the "Carrier controller".

For the compressors, the variable frequency drives provide the unit shutdown function via the pressure switches cabled to the regulator's digital inputs.

4.2.3 - Fans Motors

The fan motors are equipped with a rotating shroud and made of composite recyclable material. Each motor is fixed with transverse supports.

All the fans in the same refrigerating circuit run together at the same rotation speed. The fan speed is controlled by an algorithm that continuously optimizes the condensing temperature to obtain the best energy efficiency (EER) for the units, whatever the operating conditions.

Standard units are equipped with AC asynchronous induction motors, controlled by variable frequency drives. Several motors can be associated to each fan variable frequency drive.

Refer to wiring diagram for more detailed information about distribution of ventilation.

The motors are three-phase, with lifetime lubricated bearings and class F insulation (IP55 level).

In case of a locked rotor or an overload, the motors are electrically protected by the variable frequency drives (VFD). Each VFD follows an overcurrent curve, which varies according to the frequency from 5 to 50 Hz and the number of fans controlled.

If a fan fails to operate (in open circuit), the lack of current is detected, generating an alert on the user interface. Refer to the control manual for the description of alarms

According to regulation No. 640/2009 and amendment 4/2014 implementing directive 2009/125/EC regarding eco-design requirements for electric motors:

30XF-Z Standard Units		
Motor Type		Asynchronous
Number of poles	p	6
Nominal Voltage	V	400
Number of phases	Ph	3
Nominal Input Frequency	Hz	50
Maximum Input Power (400V)	kW	1,96
Nominal Shaft Power Output	kW	1,4
Motor manufacturer		Leroy Somer
Motor P/N		00PPG000558700A
Speed regulator		YES
Motor included in the application domain of the regulation 640/2009 & amendement 4/2014		NO
Sales leaflet for exemption		Article 2.1
Ambient air temperature for which the motor is specifically designed	°C	70

4.3 - Electrical System

4.3.1 - Units short circuit current withstand capability

30XF-Z		**0750**	**0900**	**1000**	**1700**	**1800**	**1900**	**2000**	**2100**
Rated short-circuit currents									
Rated short time (1s) current - Icw	kA rms	20	20	20	40	40	40	40	40
Rated peak current - Ipk	kA pk	80	80	80	110	110	110	110	110
Value with upstream electrical protection(1)									
Rated conditional short circuit current Icc	kA rms	50	50	50	50	50	50	50	50
Associated protection - Type		Fuses (gG/ gL)							
Associated protection - Maximum rating	A	630	630	630	1250	1250	1250	1250	1250

(1) If another current limitation protection device is used, its time-current and thermal constraint (I^2t) trip characteristics must be at least equivalent to those of the recommended protection.

NOTE: The short-circuit stability current values above are suitable with the TN system.

4.3.2 - Units Electrical Data

30XF-Z Units		0750	0900	1000	1700	1800	1900	2000	2100
Power circuit supply									
Nominal voltage	V-ph-Hz	400-3-50							
Voltage range	V	360-440							
Input power(1)									
Maximum operating input power(2)	kW	229	271	311	482	512	571	604	609
Operating current draw(1)									
Maximum Current (Un)(2)	A	355	421	482	748	795	887	938	945
Maximum Current (Un-10%)	A	387	459	513	816	867	954	997	1004
Power factor at maximum input power(1)		0,91-0,93							
Displacement Power Factor (Cos. Phi)(3)		>0,98							
Total current harmonic distortion rate (THDi)(4)	%	35-45%							
Start-up current(1)									
Maximum Current (Un)(5)	A	80	80	80	455	502	547	554	554

(1) Values obtained at operation with maximum operating input power.
(2) Values given on the unit nameplate.
(3) Values decrease when load lowers.
(4) May vary according to the installation's short circuit ratio. The exact values depend on the short-circuit ratio (Rsce).
THDi increases when load lowers. It's necessary to consider a degradation of the values when the input power drops.
The highest impact on the installation occurs when the current is maximum.
Therefore compliance of the installation regarding voltage harmonic distortion at PCC (per IEC61000-2-4 or other standard) shall be usually checked at max load in order to cover all load conditions.
(5) Starting current of the smallest compressor + Operating current of the biggest compressor + Fan current.

4.4 - Compliance of Electrical Installation

Electrical installation and all the connections to the network must be carried out in compliance with all standards applicable to the installation location.

Generally, the recommendations of the International Electrotechnical Commission document (IEC60364) are accepted as compliance with the requirements of the installation guidelines.

The units are designed and built to ensure compliance with these guidelines.

The European standard EN 60204-1 (corresponds to IEC 60204-1 - Machine safety - Electrical equipment of machines - part 1: General requirements) was specifically taken into account when the electrical equipment was designed.

Note : The standard EN60204-1 also enables to meet the requirements of the Machinery Directive.

Annex B of EN 60204-1 is intended to define the electrical characteristics used for the operation of the units.

Those described below apply alongside the other information provided in this document.

Note: If aspects of an installation require different specifications from those listed below (or which are not listed), always contact your Carrier representative.

Overcurrent Protections

Overcurrent protection of the power supply conductors is not provided with the unit.

WARNING: A part of the short circuit protection and must be carried out on the customer installation in compliance with the instructions given in this document.

Leakage Currents Protections

If protection by monitoring the leakage currents is necessary to ensure the safety of the installation, the presence of DC voltage component as well as additional derived currents introduced using variable frequency drives in the unit must be considered. It is especially recommended that the differential protection devices are:

- Suitable for protection of DC and AC circuitry
- Of reinforced immunity protection types and/or set at a threshold value not lower than 150 mA.

Unit's Power Connection Point

The units with one or two modules are equipped with:

- One electrical power connection point as standard,
- Two electrical power connection points if option 85A (dual power supply 400V/400V) or 85B (dual power supply 400V/230V) is present.

The power connection point(s) is/are located immediately upstream of their dedicated main disconnect switch:

- 400Vac 3~ for first/single power supply.
- 400Vac 3~ for second power supply with option 85A.
- 230Vac 2~ for second power supply with option 85B.

Neutral Regime

The units are designed for connection to TN networks (IEC 60364).

The neutral wire (N) must not be connected directly to the unit.

Note :

In IT networks, the use of filters integrated into the variable frequency drives is not suitable.

In addition, the equipment 's short circuit holding current characteristics are modified.

Unit's Disconnect Switch

It is of a type suitable for power interruption in compliance with EN 60947-3 (equivalent to IEC 60947-3).

Environment Classification following IEC60364

Environment Criteria	Environment Class
Ambient atmosphere	Outdoor(1)
Altitude	Up to 1000 m (2000 m)(2)
Ambient temperature range	From -20°C to +48°C (55°C)(3)
Presence of solid foreign bodies	Class AE3 (no significant dust present)(1)
Presence of water	Class AD4 (projection in all directions without pressure)(1)
Presence of corrosive and polluting substances:	Class AF1 (negligible)
Competence of personnel:	BA4 (trained personnel).

(1) The required protection level for this class is IP43BW minimum (according to the reference standard IEC 60529). All units are classified as IP44CW and fulfil this protection condition.
(2) Above 1000m, the maximum temperature must be reduced by 0.5K for every additional 100m up to 2000m,
(3) The value in brackets corresponds to operation with degraded thermal performances.

Electromagnetic (High frequency) conducted disturbances

Compatibility levels for electromagnetic (high frequency) conducted disturbances following EN 61800-3:

Disturbance Criteria	Disturbance Level
Immunity to external interference	Defined by the second environment(1)
Interference emissions	Defined in category C3(2)

(1) Examples of installations included in the first / second electromagnetic environments:

First Environment	Second Environment
§ commercial buildings	§ Industrial zones
§ residential buildings	§ Technical premises powered from a dedicated transformer.

(2) Category C3 is suitable for use in an industrial environment and is not designed for use in a public low-voltage system that supplies residential or commercial locations. As an option, conformity with category C2 permits this type of installation.

Warning: In a residential or commercial environment, this product may cause radio interference in which case additional mitigation measures could be required.

Note : EN 61800-3 is equivalent to IEC 61800-3.

Low frequency conducted disturbances

Compatibility levels for low frequency conducted disturbances as per the class 2 levels from IEC 61000-2-4:

Disturbance Criteria	Disturbance Level
Power supply frequency variation	±1Hz
Voltage Phase imbalance	2%
Current Phase imbalance	10%
Voltage Total Harmonic Distortion (THDu)	8%
Rated impulse voltage Uw (IEC60664-1)	2,5 kV

The units integrate variable frequency drives which have harmonic currents which are a source of interference.

An analysis may be required to verify if this interference exceeds the compatibility limits of the other devices connected to the same power supply network.

Note : The compatibility levels inside an electrical installation, that must be met at the in-plant coupling point (IPC) to which other loads are connected, are described in standard IEC 61000-2-4.

WARNING: If the phase imbalance exceeds the limits specified above, contact your local electricity supplier and ensure that the chiller is not switched on until corrective measures have been taken.

Voltage Phase Imbalance Calculation [%]

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

Example:

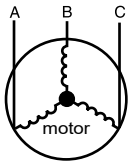
On a 400 V - 3 ph - 50 Hz supply, the individual phase voltages were measured with the following values:

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

Average voltage = (406 + 399 + 394)/3 = 1199/3
= 399.7 (rounded up to 400 V)

Calculate the maximum deviation from the 400 V average:

(AB) = 406 - 400 = 6
(BC) = 400 - 399 = 1
(CA) = 400 - 394 = 6



The maximum deviation from the average is 6 V. The greatest percentage deviation is:

100 x 6/400 = 1.5%

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

5 - SYSTEM HYDRAULIC DATA

5.1 - Hydraulic Connections

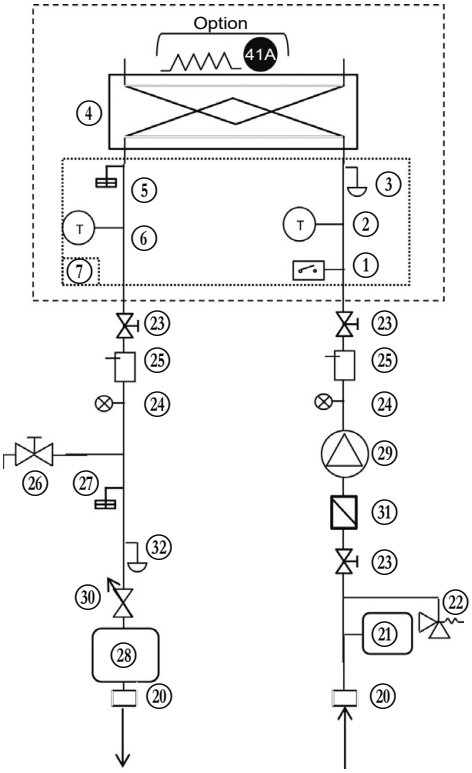
When connecting units to the water distribution pipe work, refer to the certified dimensional drawings supplied with the unit for the dimensions and position of the water inlet and outlet connections.

WARNING:

- ***All welding operations (connection to the hydraulic network) must be performed by qualified welders. The Victaulic® connection or the counter-flange must be removed before welding as a matter of course.***

5.1.1 - Units Hydraulic Circuit Diagram

1 Module



Legend

Unit Hydraulic Components

1. Flow rate sensor
2. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger inlet (see Control Manual)
3. Water purge on water box
4. Water heat exchanger
5. Air bleed on water box
6. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger outlet (see Control Manual)
7. Water box

Customer Loop Minimum Additional Components

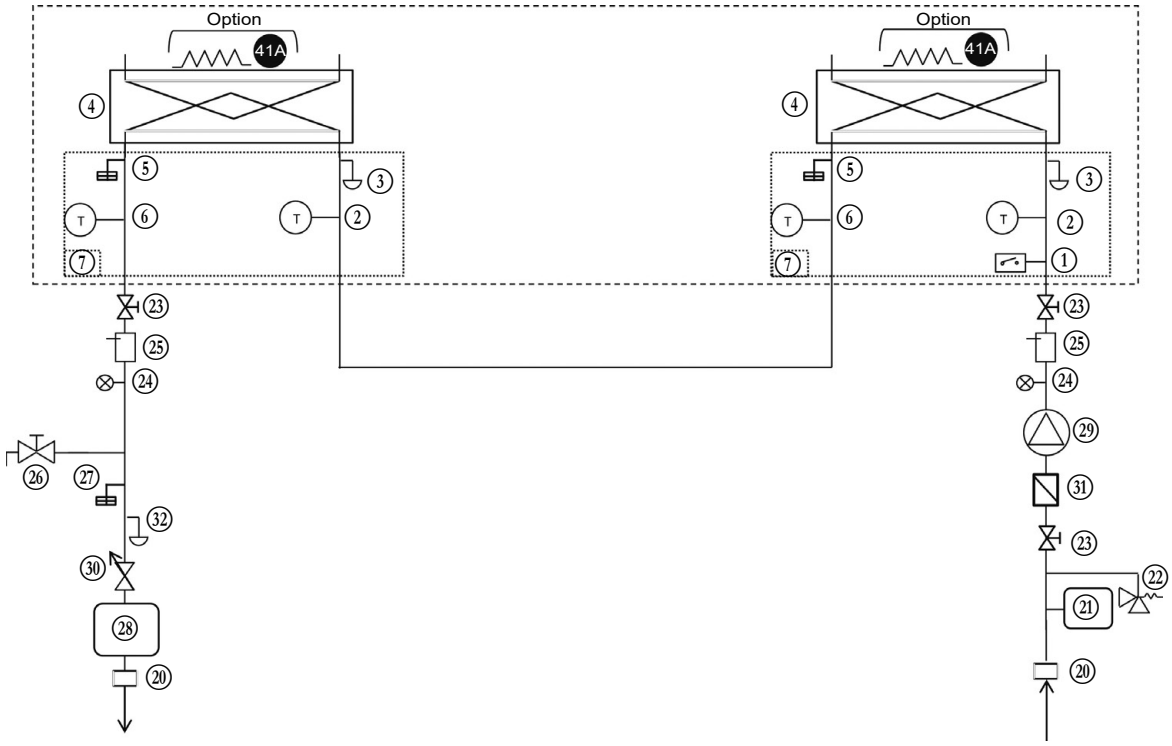
20. Flexible Connection
21. Expansion Vessel
22. Relief Valve
23. Shut-off valve
24. Pressure gauge
25. Well
26. Charge valve
27. Air bleed
28. Buffer tank (if whole hydraulic loop volume under minimum required water volume enabling reaching full unit refrigerating capacity)
29. Pump
30. Water flow control valve (if fixed speed pump)
31. Screen filter (particle size of 1.2mm)
32. Water drain tap

- - - - - Unit Hydraulic Components

NOTES:

- **The installation must be protected against frost**
- **The water heat exchanger may be protected against freeze using electrical heaters and heat trace cables. (factory-fitted option n°41A.**

2 Modules



Legend

Unit Hydraulic Components

1. Flow rate sensor
2. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger inlet (see Control Manual)
3. Water purge on water box
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5. Air bleed on water box
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   NOTE: Provides temperature measurement at the water exchanger outlet (see Control Manual)
7. Water box

Customer Loop Minimum Additional Components

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- - - - - Unit Hydraulic Components

NOTES:

- **The installation must be protected against frost**
- **The water heat exchanger may be protected against freeze using electrical heaters and heat trace cables. (factory-fitted option n°41A.**

5.1.2 - Piping Diameters & Connections Type

Hydraulic Connections are all Victaulic clamping clips type.

30XF-Z Single Units		0750	0900	1000
Inlet Connection Diameter	mm	168,3	168,3	168,3
Outlet Connection Diameter	mm	168,3	168,3	168,3

30XF-Z Duplex Units		1700	1800	1900	2000	2100
Inlet Connection Diameter	mm	168,3	168,3	168,3	168,3	168,3
Connection Diameter for the flow from A to B - Leaving A	mm	219,1	168,3	168,3	168,3	168,3
Connection Diameter for the flow from A to B - Entering B	mm	168,3	168,3	168,3	168,3	168,3
Outlet Connection Diameter	mm	219,1	219,1	168,3	168,3	168,3

5.1.3 - Installation Nominal Flow Rate Adjustment

Once the heat transfer medium is present within the installation and before the unit start-up, purge the air from the loop.

Then, follow the hydraulic circuit cleaning procedure in 10.5.1– Hydraulic Circuit Cleaning.

If the customer heat transfer medium pump is fixed speed, the flow rate can be adjusted following the next procedure, using a variable flow control valve.

If the customer heat transfer medium pump is variable speed, the flow rate adjustment depends on the pump regulation strategy chosen by the customer.

If the unit is equipped with option 116V, please follow dedicated Installation Nominal Flow Rate Adjustment procedure in 12.10.1.1.3– Installation Nominal Flow Rate Adjustment.

Nominal Flow Rate:

The temperature difference required between the unit inlet and outlet determines the nominal flow rate of the installation.

Use the specification provided when selecting the unit to know the heat transfer medium flow rate and pressure drop between unit inlet and outlet at your operating conditions.

If this information is not available when commissioning the unit, contact the design office responsible for the installation.

Control Valve:

As the exact total installation pressure drop is not known prior to commissioning, it is necessary to adjust the heat transfer medium flow rate with the control valve to set the required flow rate.

Indeed, due to the pressure drop it generates on the hydraulic network, this flow control valve is used to set the network pressure drop curve to the heat transfer medium pump pressure curve, to obtain the flow rate at the desired operation point.

This will be checked reading the pressures on the pressure gauges at the unit terminals to calculate the unit pressure drop.

Adjustment Procedure:

Before proceeding, it is advisable to remove any possible contamination from the hydraulic circuit. Please follow the procedure described in 10.5.1– Hydraulic Circuit Cleaning.

The pressure drop read using the pressure gauge placed on the unit inlet and outlet is the reference to be used to check and adjust the nominal flow rate of the system.

Compare the pressure drop value measured with the design value on the unit specification.

If the pressure drop reading is below the specified value, this indicates that the flow rate is too high. In this case, close the control valve and read the new pressure difference.

If the pressure drop reading is above the specified value, this indicates that the flow rate is too low. In this case, open the control valve and read the new pressure difference.

Repeat as necessary, closing or opening the control valve until the specific pressure drop corresponding to the operating conditions flow rate is achieved.

NOTE:

Opening the valve is possible only if the valve was too much closed precedingly. If the initial pressure drop is above the specified value, the network has an excessive pressure drop in relation to the available static pressure delivered by the pump.

The nominal water flow cannot be obtained (lower resulting flow) and the difference in temperature between the water inlet and outlet of the evaporator will be increased.

5.2 - Hydraulic Components

5.2.1 - Customer Hydraulic Loop Components

Following components are required to be within the customer hydraulic loop (some of them can be added within the unit as options):

Component	Location in the circuit(s)	Use
Piping	Between other components.	Heat transfer medium channelling.
Pump	After an hydraulic filter and before an isolation valve.	Enable heat transfer medium circulation.
Filter(s)	Before a pump and after an isolation valve.	See "Fouling"
Expansion vessel	Before the pump.	Allow water extra volume absorption because of high temperatures.
Relief valve	At the pump outlet.	Allow water evacuation to avoid loop components explosion in case of high pressure.
Pressure reducing valves	Along the circuit.	Maintain the pressure of the circuit(s) when the unit is in operation.
Shut-off valves	Close to the water inlet and outlet connections.	Isolate the unit hydraulic loop from the customer hydraulic loop.
Manual or Automatic Vents	All high points in the circuit(s). Automatic vents installed only outside of buildings (ATEX zone 2 possible at the air vent discharge).	Allowing the circuit(s) to be purged from air which: - Decreases thermal performances and - Damages heat transfer fluid Pump body.
Drain connections	All low points in the circuit(s).	Allowing the whole circuit(s) to be drained in case of maintenance
Pressure gauges	Both the water inlet and outlet pipes.	Unit pressure drop measurement.
Thermometers	Both the water inlet and outlet pipes.	Water temperature measurement.
Flow control valve	Along the circuit.	Nominal flow rate adjustment.
Charging valve	Along the circuit.	Heat Transfer Medium charge within the loop.
Insulation	On the cold-water pipework, after testing	Prevent heat transmission and condensation.
Vapor barrier	Covering the above mentionned insulation	Prevent heat transmission and condensation.
Buffer tank(s)	At the unit outlet.	See "Total Water Loop Minimum Volume" and "Buffer Tank".

Heat Transfer Medium Pump

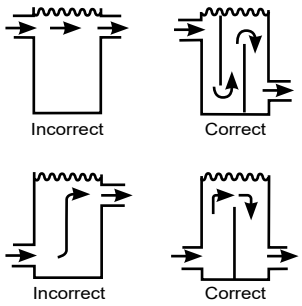
The heat-transfer medium pump must be controlled by the chiller if the unit is not equipped with the 152P option, whether the unit is equipped with the hydraulic module option (116V) or not.

Dedicated terminals are provided for connection to the pump control (wiring from chiller to pump control panel by others).

Buffer Tank

It may be necessary to add a buffer tank to the circuit in order to achieve the required volume (see “Total Water Loop Minimum Volume”). The tank must itself be internally baffled to ensure proper mixing of the liquid (water or brine). Please refer to the examples below.

Connection to a buffer tank



Material Compatibility:

- The use of different metals in the hydraulic system may create galvanic couples and lead to corrosion. Verify the need to install sacrificial anodes.
- Products used for the thermal insulation of components during hydraulic connection must have a chemically neutral effect on the surfaces to which they are applied. All original materials supplied by Carrier comply with this requirement.

WARNING:

- ***If additional equipment is added to the system, the installer must comply with the basic recommendations, especially the minimum and maximum flow rates.***

5.2.2 - Heat Exchanger for heat transfer fluid chilling, hydraulic side

See 7.1.5– Evaporation Components for a global description of the component.

Number of passes on hydraulic sideof the heat exchanger:

- Single Units: 3 passes,
- Duplex Units: 1 pass in the evaporator of each module.

A shell and tube heat exchanger has always two water boxes that help distributing the flow entering the tubes or mixing the flow leaving the tubes.

The heat exchanger is equipped with a drain plug located on each water box and an air vent.

WARNING: Before carrying out any hydraulic connections, install the water box bleed plugs (one plug on each water box, supplied in the electrical cabinet).

The evaporator has been tested and stamped in accordance with the applicable pressure code. The maximum standard operating pressure is 1000 kPa relative for the waterside. That pressure may differ according to the regulation and the code applied.

5.3 - Hydraulic System

5.3.1 - Customer Hydraulic Loop Requirements

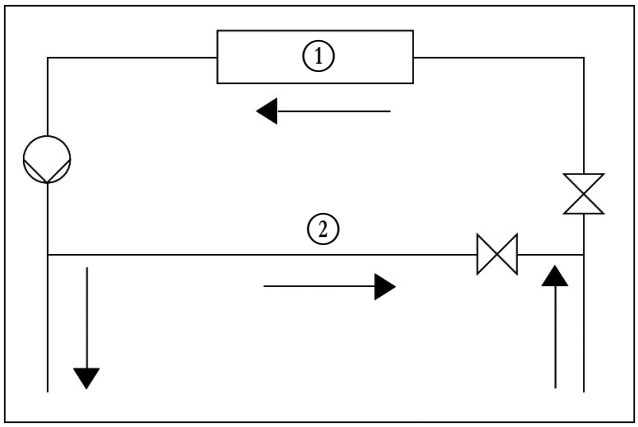
Customer Hydraulic Loop Design

Below the main points to be checked:

- The hydraulic circuit should be designed to have the least number of elbows and horizontal pipe runs at different levels.
- Use flexible connections to reduce the transmission of vibrations. The piping must not transmit any axial or radial force to the exchangers, or any vibrations.
- If the installation flow rate is not between the unit allowed flow range, following instructions are required to be considered:

Hydraulic Flow Rate Recirculation

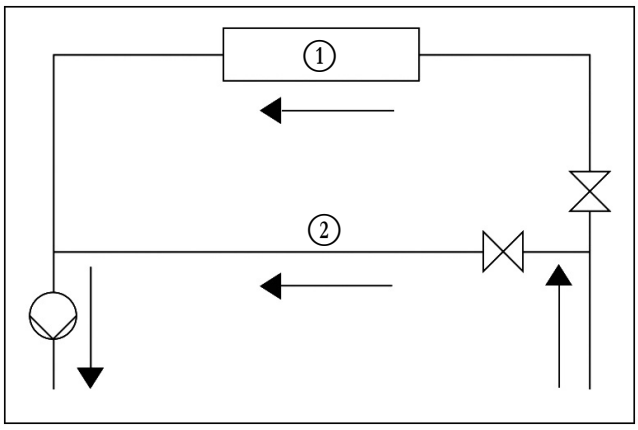
If the installation flow rate is less than the minimum allowed unit flow rate, the flow can be recirculated, as shown in the diagram below:



Legend:
1. Evaporator
2. Recirculation

Hydraulic Bypass

If the installation flow rate exceeds the maximum allowed unit flow rate, it can be bypassed as shown in the diagram below:



Legend:
1. Evaporator
2. Bypass

Installation Pressure Drop minimization:

- Reduce the pressure drops of individual components (elbows, level changes, options, etc.) as much as possible,
- Use the correct pipe diameter,
- Do not extend the hydraulic systems.

Total Water Loop Minimum Volume

Regardless of the system, the water minimum volume in the loop is given by the formula:

Capacity = Cap [kW] x N

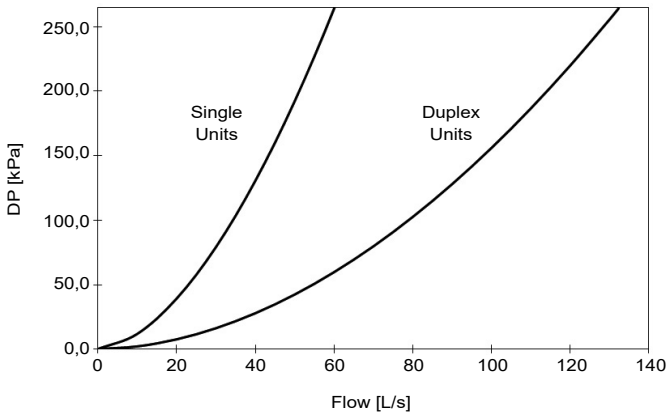
Application	N[L/kW]
Normal air conditioning	3,25
Process type cooling	6,5

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

This volume is necessary for stable operation.

5.3.2 - Units Pressure Drop Curves

Standard Units Pressure Drop



5.3.3 - Units Hydraulic Data

You can find here under maximum operating pressures on hydraulic side, minimum and maximum hydraulic flow rates and volume of the hydraulic loop in the unit(1):

30XF-Z Single Units		0750	0900	1000
Volume in the unit	L	206	206	206
Max. operating pressure - hydraulic side	kPa	1000	1000	1000
Min. hydraulic flow rate	L/s	7	9	10
Max. hydraulic flow rate	L/s	49	57	63

30XF-Z Duplex Units		1700	1800	1900	2000	2100
Volume in the unit	L	506	526	549	549	562
Max. operating pressure - hydraulic side	kPa	1000	1000	1000	1000	1000
Min. hydraulic flow rate	L/s	15	16	17	18	20
Max. hydraulic flow rate	L/s	106	111	117	122	127

(1) The indicated volume of the hydraulic loop in the unit includes:
- Heat exchanger(s)
- Water boxes
- Valves
- Piping factory fitted inside each single unit and each module of a duplex unit.

5.3.4 - Units Hydraulic Notes

Piping linking modules of a duplex unit is the property of the customer. Therefore, it is not taken account in the volume of the hydraulic loop in the unit as well as for the unit pressure drop calculation.

Unit Operation:

- Do not introduce any excessive static or dynamic pressure into the heat exchange circuit (regarding the design operating pressures).

5.4 - Heat Transfer Medium

5.4.1 - Material Compatibility

- If additives or fluids other than those recommended by Carrier are used, ensure that these are not considered gases, and that they are class 2, as defined in directive 2014/68/EU.
- Before any start-up, verify that the heat-transfer medium is compatible with the materials and the hydraulic circuit coatings.
- The water must be analyzed. Depending on its composition, the circuit created must include the elements needed for water treatment: Filters, additives, intermediate exchangers, bleed devices, vents, isolation valves, etc., to prevent corrosion, fouling, and deterioration of the pump fittings.

Carrier recommendations:

1. **No NH^{4+} ammonium ions in the water, as these cause significant damage to copper. This is one of the most important factors governing the service life of copper piping. A content of several tenths of mg/l will badly corrode the copper over time.**
2. **Cl^- chloride ions also cause damage to copper with a risk of perforating corrosion. If possible, keep below 125 mg/l.**
3. **SO_4^{2-} sulphate ions can cause perforating corrosion if their content is above 30 mg/l.**
4. **No fluoride ions (<0.1 mg/l).**
5. **No Fe^{2+} and Fe^{3+} ions if non negligible levels of dissolved oxygen are present. Dissolved iron < 5 mg/l with dissolved oxygen < 5 mg/l.**
6. **Dissolved silicon: Silicon is an acid element of water and can also lead to a risk of corrosion. Content < 1 mg/l.**
7. **Water hardness: >0.5 mmol/l. Values between 1 and 2.5 mmol/l can be recommended. This will facilitate scale deposit that can limit corrosion of copper. Values that are too high can cause piping blockage over time. A total alkalimetric titre (TAC) below 100 mg/l is desirable.**
8. **Dissolved oxygen: Any sudden change in water oxygenation conditions must be avoided. It is as detrimental to deoxygenate the water by mixing it with inert gas as it is to over-oxygenate it by mixing it with pure oxygen. The disturbance of the oxygenation conditions encourages destabilisation of copper hydroxides and shedding of particles.**
9. **Electric conductivity 10-600µS/cm.**
10. **pH: Ideal case pH neutral at 20-25°C (7.5 < pH < 9).**

Corrosion

- To prevent any risk of corrosion by differential aeration, if the hydraulic circuit is drained for a period of more than one month, blanket the entire circuit with dry and inert gas (nitrogen for example) at 0.5bar maximum.
- After a period during which the unit was not operating and drained, at the beginning of the next period of unit operation, fill the system with water treated with appropriate corrosion inhibitors.

5.4.2 - Frost Protection

WARNING: Any damage caused by frost is not covered by the warranty.

The hydraulic components (heat exchanger, piping, pumps…) can be damaged by frost. They will be protected by following the recommendations below. Protection against frost of the installation is the responsibility of the customer.

If the installation is in an area where the ambient temperature is liable to fall below 0°C, it is recommended that antifreeze solution is added to protect it to a temperature of 10K below the lowest temperature likely to be reached at the installation site.

WARNING:

- ***Anti-freeze solutions concentration must be maximum of 45%.***
- ***Only use antifreeze solutions approved for use with heat exchangers.***

If antifreeze solution is not added to the circuit, and the unit is not intended to be operated during freezing conditions, the installation must be drained.

WARNING:

- ***Check that there are no retention points.***

  IMPORTANT: Depending on the atmospheric conditions in your region, you need to:
- ***Add ethylene glycol in a suitable concentration to protect the installation.***
- ***Where applicable, if a long period without use is expected, drain and, as a safety measure, add ethylene glycol to the exchanger via the drain valve located on the water inlet (a drain is available on the water boxes on both sides of the exchanger if the machine is not perfectly levelled).***
- ***In case of prolonged non-usage, the hydraulic circuits must be protected by circulating a passivating solution. (Consult a specialist).***
- ***If it is not to be used in freezing conditions, or during a prolonged period without power (whether this is scheduled or not), the hydraulic components (evaporator, outside pipes, optional hydraulic module…) must be drained without delay***

In case where it is not possible to apply these recommendations, the units can be equipped with heaters to protect the hydraulic components against frost (option 41A).

The antifreeze solution and the heaters can be combined.

5.4.3 - Fouling

- If there are particles in the fluid which are liable to foul the exchanger, a screen filter must be installed upstream of the pump (customer side or option 116V). The mesh size of this filter must be 1.2 mm (see Typical hydraulic installation diagram).
- The brine loop must be clean. To ensure the exchangers are able to operate correctly, it is recommended that a sludge container, settling container, or another filtration system is also installed upstream of the unit, if necessary.
- Before starting the unit, it is recommended to circulate the heat-transfer medium for 10 minutes and then clean the screen filter.

6 - SYSTEM AERAULIC DATA

6.1 - Aeraulic Components

6.1.1 - Fan

Fans are axial Flying Bird™ 6 VI impeller. They are trained with motors coupled to variable frequency drives in order to enable them to have a variable speed. Each fan is associated to one motor. Refer to 4.2.4 - Fans Motors for more information about fan motors.

According to the Regulation No. 327/2011 implementing Directive 2009/125/EC regarding eco-design requirements for fans driven by motors with an electric input power between 125 W and 500 kW.

30XF-Z Standard Units		
Measurement category		A
Efficiency category		Static
Target efficiency level ERP2015		N(2015) 40
Overall Efficiency	%	40,1
Efficiency level at the optimum efficiency point		44,6
Air Flow Rate	m³/s	4,22
Pressure at optimum energy efficiency	Pa	174,2
Nominal Speed	tr/min	948
Specific ratio		1,002
Fan Manufacturer		Simonin
Fan P/N		00PSG002630700A
Year of manufacture		See label on the unit
Relevant information to facilitate the disassembly, recycling or removal of the product at the end of life		See the Maintenance Manual
Relevant information to minimize the impact on the environment		See the Maintenance Manual

6.1.2 - Heat Exchanger for heat rejection, air side

See 7.1.4– Condensation Components for a global description of the component.

6.2 - Aeraulic System

6.2.1 - Units Aeraulic Data

30XF-Z Single Units		**0750**	**0900**	**1000**
Fans Quantity		10	12	14
Maximum Total Air Flow Rate	m³/s	52	62	72
Maximum Rotation Speed	rpm	950	950	950

30XF-Z Duplex Units		**1700**	**1800**	**1900**	**2000**	**2100**
Fans Quantity		20	22	24	26	28
Fans Quantity - Module A		10	12	12	12	14
Fans Quantity - Module B		10	10	12	14	14
Maximum Total Air Flow Rate	m³/s	103	114	124	134	145
Maximum Rotation Speed	rpm	950	950	950	950	950

7.1 - Thermodynamic Components

Components	Features on 30XF-Z
Compressor	Twin Screw Variable Speed with induction motor (06Z)
Expansion Valve	Electronic Expansion Valve (EXV)
Air Heat Exchanger	Novation™ Micro Channel Heat Exchanger (MCHE)
Heat Transfer Medium Heat Exchanger	Flooded Shell & Tube Heat Exchanger (FLHE)
Economizer	Electronic Expansion Valve (EXV Eco) ; Brazed Plates Heat Exchanger (BPHE Eco)

7.1.1 - Refrigerant

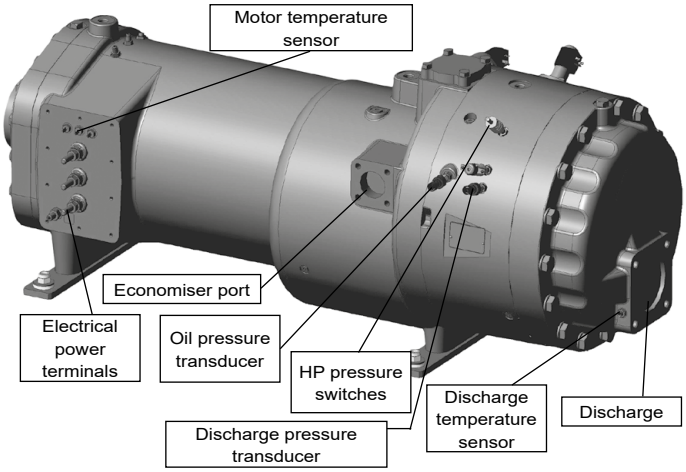
This document concerns units which operate using R1234ze(E) only.

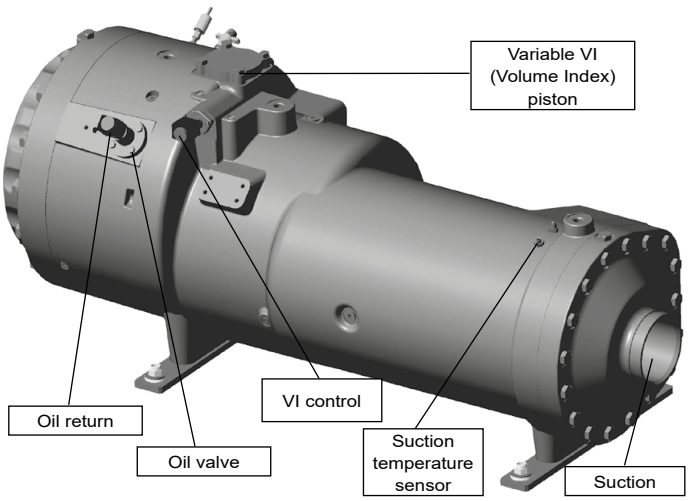
R1234ze (E) refrigerant is classed within A2L fluids, which means it has a low risk of flammability.

7.1.2 - Compression Components

7.1.2.1 - Compressors

The units use twin-screw compressors fitted with an asynchronous induction motor fitted on a variable frequency drive to enable screw rotation speed variability.





7.1.2.2 - Economizer and suction port filters

To improve the reliability of the compressor, filters are fitted on the compressor suction connection and economizer port, as standard.

7.1.2.3 - Lubricant oil

The 06Z screw compressor is approved for use with the following lubricants with R1234ze(E):

Hatcol 4496 (Carrier material specification PP 47-38).

Contact Carrier ERCD to purchase oil top-up.

CAUTION: Too much oil in the circuit can cause the unit to malfunction.

NOTE: Never use oils that have been exposed to air.

7.1.2.4 - Oil supply solenoid valve

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

7.1.2.5 - Oil filter

The 06Z screw compressor has an independent oil filter mounted on to the oil separator. This filter is field replaceable.

7.1.2.6 - Oil separator

On these units, the oil separator is a pressure vessel which is mounted underneath the condenser coils, at the compressor discharge. The gas discharged at the compressor outlet is directed to the oil separator and most of the oil is separated from the gas by a process of rapid deceleration and gravity. The gas is then directed to a mesh filter where the remaining oil is separated by coalescence, and flows to the bottom of the vessel. The oil-free gas exits via the top of the vessel towards the condenser.

The oil separator is equipped with a heater cable managed by the control system. The oil separator also has a built-in silencer.

7.1.2.7 - High Pressure SRMCR safety loop

General description

The unit is equipped with a high-pressure safety loop, known as the SRMCR (Safety-Related Measurement Control and Regulation) loop, comprising:

- 2 high pressure switches (HPS) that require resetting with a tool at the outlet of each compressor called PZHH.
- The speed regulator which supplies the compressor and is equipped with the Safe Torque Off (STO) function.

Refer to the wiring diagram and the nomenclature for the machine (references).

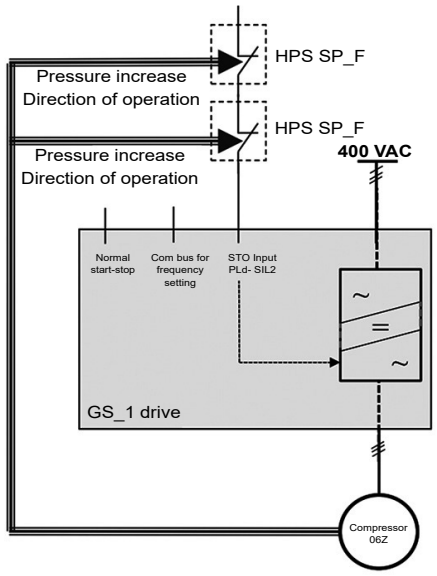
This SRMCR device is designed in accordance with standard EN 61508 for SIL (safety integrity level): 2.

Demand mode: Low and high. The mission time is 20 years.

Periodic testing: The test must be performed at least once a year during the normal periodic pressure test. Refer to the description in section 10.8.4– Periodic test of the high-pressure safety loop.

Description of operation and resetting

The image below is intended to illustrate the operating description: Refer to the detailed machine drawing for the precise wiring diagram.



HPS: High pressure switch SP1F (A) / SP2F (A)
GS_1: Power drive for compressor GSA1 / GSB1

During normal operation, the speed regulator supplies and controls the compressor once the control signal is received via the digital on-off input (normal on-off) and the communication bus (setting the frequency).

When one of the HPS sensors opens, the STO (Safe Torque Off) digital input opens, which instantly suppresses the control command for the thyristors which manage the supply for the compressor, independently of the on-off commands and frequencies: The compressor is no longer supplied and stops immediately.

Restarting after high pressure detection

After overpressure is detected, it is necessary to manually reset the switched HPS. A blunt tool with a diameter of less than 6 mm must be used for this.

Verification in case of a safety device failure

If the unit operating pressure appears to have been exceeded at some point (for example, after the relief valves have been opened), the unit must be stopped immediately.

The safety loop unit must pass all the periodic verifications before any restart is possible.

If the test reveals malfunctions likely to have caused overpressure within the machine, a complete check of all the pressure equipment must be performed to check their mechanical integrity.

7.1.3 - Expansion Components

The expansion module includes a liquid valve, a filter drier, an electronic expansion valve (EXV) and protection devices (fusible plug or valve).

7.1.3.1 - Electronic expansion valve (EXV)

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

The EXV is also equipped with a sight glass used to check the mechanism movement and the presence of the liquid gasket.

7.1.3.2 - Moisture indicator

Located on the EXV, this enables the unit charge to be controlled and indicates moisture in the circuit.

The presence of bubbles in the sight-glass indicates an insufficient charge or non-condensable gases in the system.

The presence of moisture changes the color of the indicator paper in the sight-glass.

7.1.3.3 - Filter drier

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

7.1.4 - Condensation Components

The condensers in the units are micro-channel coils made entirely of aluminum.

Depending on applications, silicone cover caps are required to be put on condenser coils block fittings. Please contact Carrier Service for more information.

7.1.5 - Evaporation Components

The heat exchanger enabling chilling of the heat transfer fluid is called the evaporator. The units use a flooded shell-and-tube heat exchanger as evaporator: The heat-transfer medium (water or glycoled water) circulates in the tubes and the refrigerant is inside the shell.

The tubes are copper, and 3/4” in diameter, with a finned surface inside and out.

The evaporator has been tested and stamped in accordance with the applicable pressure code. The maximum standard operating pressure is 2100 kPa relative for the refrigerant side. That pressure may differ according to the regulation and the code applied.

The evaporator has thermal insulation formed of 19 mm thick polyurethane foam. An aluminum cladding is available as an option.

7.1.6 - Economizer Module Components

The economizer module includes an additional electronic expansion valve (EXV Eco) and a brazed plate heat exchanger (BPHE Eco).

At the condenser outlet, a small fraction of the liquid is expanded via the secondary EXV in one of the BPHE circuits and then is returned as a gas to the compressor via the economizer port.

This expansion provides an increase in the liquid subcooling of the other fraction of the refrigerant entering the evaporator via the main EXV. This enables the system's cooling capacity and efficiency to be improved.

7.2 - Thermodynamic System

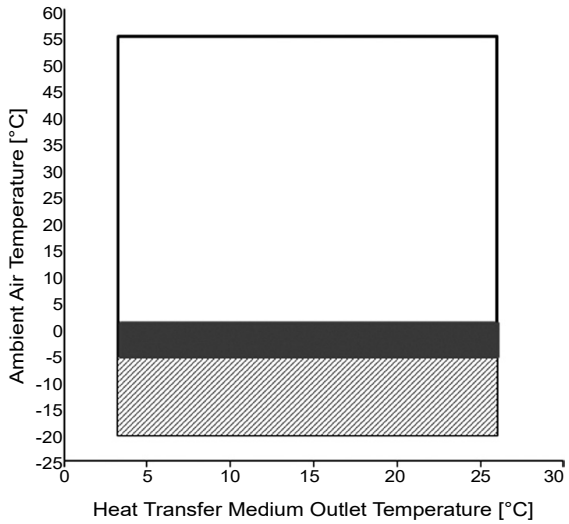
7.2.1 - Units Operating Range

Heat Transfer Medium Heat Exchanger		Minimum	Maximun
Heat Transfer Medium Inlet Temperature at start-up	°C	-	45(1)
Heat Transfer Medium Inlet Temperature during operation	°C	6,8	36
Heat Transfer Medium Outlet Temperature during operation	°C	3,3(2)	26
Air Heat Exchanger		**Minimum**	**Maximun**
Ambient Air Temperature during storage	°C	-20	68
Ambient Air Temperature during operation	°C	-20(3)	55

(1) Operating at partial load,
(2) According to the type of installation and air temperature,
(3) Options 41A/41B mandatory for start-ups below -5°C

NOTE:
- **The use of brine or antifreeze protection option is required if pure water is to be used and to be cooled below 4°C,**
- **If the air temperature is to fall below 0°C, a glycol/water solution or the freeze protection option must be used,**

Units Operating Range



NOTE:
- **These ranges are given for indicative purpose. Check the operating range from Carrier electronic catalogue.**

Legend:
- Operating range, standard units
- Below 0°C air temperature the unit must either be equipped with the evaporator frost protection option 41A/41B, or the water loop must be protected against frost by using a frost protection solution (by the installer).
- For start-ups with air temperature below -5°C, the machine must be equipped with options 41A/41B.

7.2.2 - Units Thermodynamic Data

30XF-Z Single Units		0750	0900	1000
Refrigerant Charge(1)		R1234ze A2L (GWP = 1 following AR 5 ; ODP=0)		
Module A	kg	130,00	132,00	134,00
	$teqCO_2$	0,91	0,92	0,94
Oil Charge(1)		POE oil for R1234ze, Contact Carrier ERCD for supplying,		
Module A	L	26,0	26,0	26,0
Unit Minimum Part Load(2)	%	24	20	18
PED Category		IV	IV	IV

30XF-Z Duplex Units		1700	1800	1900	2000	2100
Refrigerant Charge(1)		R1234ze A2L (GWP = 1 following AR 5 ; ODP=0)				
Module A	kg	128	130	130	130	132
	$teqCO_2$	0,90	0,91	0,91	0,91	0,92
Module B	kg	130	130	132	134	134
	$teqCO_2$	0,91	0,91	0,92	0,94	0,94
Oil Charge(1)		POE oil for R1234ze, Contact Carrier ERCD for supplying,				
Module A	L	26,0	26,0	26,0	26,0	26,0
Module B	L	26,0	26,0	26,0	26,0	26,0
Unit Minimum Part Load(2)	%	11	11	10	9	9
PED Category		IV	IV	IV	IV	IV

(1) Values are guidelines only, Refer to the unit name plate,
(2) For standard conditions, Depending on operating conditions, units might have a different minimum part load or cycle,

8 - SYSTEM CONTROL DATA

8.1 - Control Components

8.1.1 - Pressure & Temperature Sensors

The unit uses thermistors to measure temperature, and pressure transducers to monitor and control the operation of the system. Refer to the 30XF-Z SmartVu™ control manual for more detailed explanations.

8.1.2 - Flow switch for low flow rate detection

All the units are equipped as standard with a flow switch set in the factory (according to the size of the unit and the application). If adjustment is necessary, it must be performed by qualified personnel, approved by Carrier Service.

IMPORTANT: The water flow switch for the machine must be operational. The Carrier warranty will be voided if this instruction is not adhered to.

8.1.3 - Oil level switch for low oil level detection

All the units are equipped as standard with an oil level switch set in the factory.

8.2 - System Controller

Controller Features	
Human Machine Interface	SmartVu™ with 7" coloured touch screen interface
Languages	10 languages (DE, EN, ES, FR, IT, NL, PT, TR, TU + one on customer choice)

Refer to the 30XF-Z SmartVu™ control manual for more detailed explanations.

9.1 - Checks before & after system initial start-up

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

9.1.1 - Documentation

- Check that all documents provided by the manufacturer to comply with the regulations are present (unit nameplate, declarations of compliance, etc.).

IMPORTANT: If any documentation is missing, order a replacement.

- Check that the declaration of conformity for the pressurized ensemble mentions all the circuit equipment.
- Compare the complete system against:
  - Dimensional drawing,
  - Piping and instrumentation diagram (PID),
  - Wiring diagram.

9.1.2 - Installation Checks

- Verify the installation of electrical and hydraulic connections.
- Verify the supports and fixing elements (materials, routing, and connection).
- Verify that access and safety routes are unobstructed.
- Verify the accessibility for maintenance or repair and to check the piping.
- Verify the status of all valves on refrigerant and hydraulic loops.
- Verify that the environmental protection and safety devices and arrangements provided by the manufacturer to comply with the regulations are in place and compliant.
- Check the protection against heat.

9.1.3 - Refrigerant & Oil Checks

All measures must be taken to ensure that the pressure and temperature limits, specifically those listed on the unit nameplates, are not exceeded during operation, maintenance, and recycling.

Heat exchange fluid temperatures above the maximum recommended can lead to an increase in the refrigerant pressure and can cause a loss of refrigerant due to the relief valve discharge.

- Verify on the unit nameplate that the 'fluid transported' is that recommended for operation and is not nitrogen.
- Verify the instructions and directives to prevent the deliberate removal of refrigerant gases.
- Ensure that the machine is charged with refrigerant.

Each unit is shipped with an exact charge of refrigerant and oil. Check that there are no visible refrigerant or oil leaks:

- No apparent damage on the refrigerant circuit pipes (no trauma, cracks, deformation) ;
- No traces of grease on the connections and refrigerant circuit sensors.

In case of doubt, use a refrigerant leak detection device suited to the fluid in the unit.

9.1.4 - Mechanical Checks

- Verify the quality of welds and other joints.
- Check the protection against mechanical damage.
- Check the protection of moving parts.
- Check that all clamps securing the pipes are correctly tightened.
- ***IMPORTANT:***

If the compressors are equipped with anti-vibration mounts, check whether these mounts have clamping mechanisms.

If they do, the clamping mechanisms must be removed before system start-up.

Clamping mechanisms are identified by red collars and by a label affixed to the compressor sub-assembly.

9.1.5 - Electrical Checks

- Check the power supply at the main connection point and the order of phases.
- Check the operation of the oil heaters (present on the oil separator) 24 hours before starting up the system.
- Check the condition of 400 V cable insulation.
- Check cable gland at main electrical cabinet outlet:

9.1.6 - Hydraulic Checks

- Verify the quality of the thermal insulation.
- Ensure the inlet and outlet water pipes are connected in the direction shown on the unit.

9.2 - Commissioning Operation Checks

Always ensure you have read and fully understood the operating instructions for the units before starting up the unit, and ensure the following precautions have been taken:

- Refer to these instructions.
- All setpoint adjustments and control tests must be carried out before the unit is started up.
- The system must have a heat load and water flowing in the exchangers when it is started up and tested.
- Check the heat transfer fluid circulation pumps, the air handling equipment, and any other equipment connected to the system.

IMPORTANT: Commissioning and start-up must be supervised by a qualified engineer.

NOTE: If the manufacturer's recommendations (system, hydraulic and electrical connections) are not observed, no claims made under the warranty will be accepted.

9.2.1 - Compressors Checks

Ensure that each compressor is rotating in the correct direction, by checking that the discharge temperature rises quickly, the HP increases, and the LP drops.

If it is rotating in the wrong direction, the electric power supply is incorrectly wired (reversed phases). To ensure rotation in the correct direction, swap two power supply phases.

- Check the compressor discharge temperature with a contact sensor.
- Ensure that all safety devices are operational, checking specifically that the high-pressure switches are activated and that any alarms have been cleared.

9.2.2 - Electrical Checks

- Check the input current.
- Check that the air flow from the electrical cabinet cooling fans are directed from the outside of the cabinets to the inside (ensuring fresh air is drawn towards the inside of the cabinets).

9.2.3 - Hydraulic Checks

As the exact total system pressure drop is not known at commissioning, adjust the flow of water with the control valve until the desired nominal rate is obtained.

Follow the procedure described in 5.1.3– Installation Nominal Flow Rate Adjustment.

9.3 - Unit initial start-up checklist

Preliminary information

Job name: .....
Location: .....
Installing contractor: .....
Distributor: .....

Equipment

Model #: .....

Compressors

Module A
Model no. .....
Serial number .....
Motor # .....

Module B
Model no. .....
Serial number .....
Motor # .....

Compressors variable frequency drives

Module A
Model no. .....
Serial number .....

Module B
Model no. .....
Serial number .....

Fans variable frequency drives

Module A
Model no.: .....
Serial number: .....
Model no.: .....
Serial number: .....
Model no.: .....
Serial number: .....
Model no.: .....
Serial number: .....

Module B
Model no.: .....
Serial number: .....
Model no.: .....
Serial number: .....
Model no.: .....
Serial number: .....
Model no.: .....
Serial number: .....

Evaporators

Module A
Model no.: .....
Serial number: .....

Module B
Model no.: .....
Serial number: .....

Condensers

Model #: .....

Unit options and additional accessories

....
....

9 - SYSTEM INITIAL START-UP

Is there any shipping damage? .....
If so, where? .....
Will this damage prevent unit start-up? .....

☐ The unit is installed level
☐ The power supply corresponds to the unit nameplate
☐ The electrical circuit wiring has been sized and installed correctly
☐ The electrical circuit protection has been sized and installed correctly
☐ The unit earth cable has been connected
☐ All the customer connection terminals (power) are tightened
☐ All the chilled water valves are open
☐ The chilled water pipes are correctly connected
☐ The air present in the chilled water circuit has been purged

Hydraulic Loop

Water loop volume =..... L
Calculated volume =..... L
→3.25 L/nominal kW capacity for air conditioning
→6.5 L/nominal kW capacity for cooling in industrial processes
☐ Correct loop volume established
☐ Proper loop corrosion inhibitor included ..... L of .....
☐ Correct loop frost protection included (if required) ..... L of .....
☐ The installation pipework is equipped with heater cables, if exposed to temperatures below 0°C.

Additional Items for units with option 116V

☐ The chilled water pump is operating with the correct rotation. Check the phase sequence of the electrical connection. In the case of a unit equipped with the hydraulic module, use the pump test function (refer to the manual control for a more detailed explanation).The machine is deenergized once the pump test is complete.
☐ Circulate chilled water in the hydraulic circuit for at least 2 hours, then remove, clean, and refit the screen filter. The machine is deenergized once the pump test is complete.
☐ The water inlet pipe at the evaporator comprises a filter.

Pump pressure difference check

Module A		**Module B**	
Pump inlet	kPa	Pump inlet	kPa
Pump outlet	kPa	Pump outlet	kPa
Outlet - inlet	kPa	Outlet - inlet	kPa

WARNING: Calculate the pump pressure difference and use it with the performance tables (in the product documentation) to determine the flow rate in liters per second. Check the unit's minimum flow rate.

☐ Total = ... l/s
☐ Nominal kW = ... l/s
☐ The total is greater than unit’s minimum flow rate
☐ The total corresponds to the specifications of ..... l/s

9 - SYSTEM INITIAL START-UP

Before unit start-up

☐ a. The oil heaters have been energized for at least 24 hours
☐ b. All the discharge and liquid valves are open
☐ c. All suction valves are open, if fitted
☐ d. All the oil line valves and economizer valves (if fitted) are open
☐ e. Any leaks have been located. The unit has been checked for leaks (including couplings):
  ☐ f1. on the whole unit
  ☐ f2. on the couplings
  Locate and report any refrigerant leaks
  .....
  .....
☐ g. Check voltage imbalance: AB ..... AC ..... BC .....
  Average voltage = ...V
  Maximum deviation = ...V
  Voltage imbalance = ...%

☐ h. Voltage imbalance less than 2%

WARNING: Operating the chiller with an incorrect supply voltage or excessive phase imbalance constitutes misuse which will invalidate the Carrier warranty. If the phase imbalance exceeds 2% for voltage, or 10% for current, contact your local electricity supplier immediately and ensure that the chiller is not switched on until corrective measures have been taken.

During unit start-up

WARNING: Be sure that all service valves are open, and that the pump is on before attempting to start this machine. Once all checks are complete, start up the unit.

☐ The unit starts and operates correctly .....

WARNING: Once the unit is energized, check for alarms (refer to the control manual to check the alarm menu).

☐ Report all alarms: .....
☐ Special notes: .....

Temperatures and pressures

WARNING: Once the unit has been operating for a while and the pressures are stabilized, record the following:

Evaporator water inlet .....
Evaporator water outlet .....
Room temperature .....

Module A suction pressure .....
Module B suction pressure .....
Module A discharge pressure .....
Module B discharge pressure .....

Module A suction temperature .....
Module B suction temperature .....
Module A discharge temperature .....
Module B discharge temperature .....

Refrigerant liquid pressure and temperature, Module A .....
Refrigerant liquid pressure and temperature, Module B .....
Subcooling value, Module A .....
Subcooling value, Module B .....

10 - SYSTEM MAINTENANCE & REPAIR

To ensure optimal efficiency and reliability of the units, we recommend establishing a maintenance contract with the local Carrier Service organization. This contract will include regular inspections by the manufacturer's Carrier Service specialists so that any malfunction is detected and corrected quickly, ensuring that no serious damage can occur.

A Carrier Service maintenance contract is the best way to ensure the maximum operating life for your equipment and, through the expertise of Carrier technicians, provides the ideal way to manage your system cost effectively.

Refrigeration equipment must be maintained by professional technicians, whilst routine checks can be carried out locally by specialist technicians (refer to the standard EN378-4).

All refrigerant charging, removal and draining operations must be carried out by a qualified technician and with the correct equipment for the unit. Any inappropriate handling can lead to uncontrolled fluid or pressure leaks.

IMPORTANT: Before performing any work on the machine, ensure it is deenergized. If a refrigerant circuit is opened, it must be evacuated, recharged, and tested for leaks. Before any operation on the refrigeration circuit, it is necessary to remove the complete refrigerant charge from the unit with a refrigerant charge transfer unit.

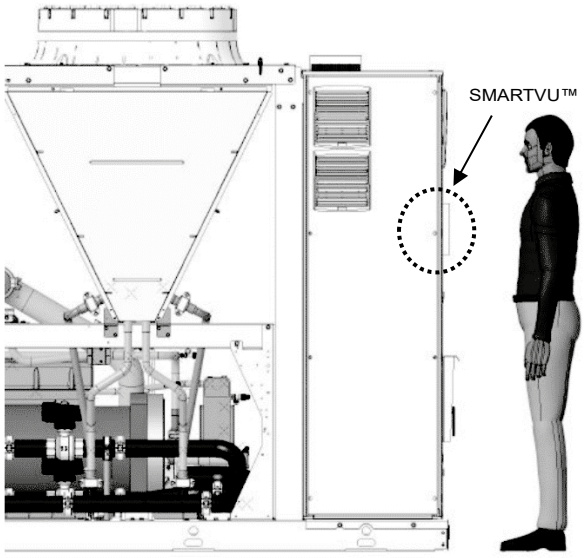
Simple preventive maintenance will allow you to get the best performance from your HVAC unit:

- Improved refrigerating performance,
- Reduced electricity consumption,
- Prevention of accidental component failure,
- Prevention of major time-consuming and costly work,
- Protection of the environment.

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

NOTE: Any deviation from or failure to observe these maintenance criteria will render the guarantee conditions for the refrigeration unit null and void, and will release the manufacturer, Carrier, from its liability.

Position of the operator workstation:



10.1 - Level 1 maintenance

See Note above.

These simple procedures can be carried out by the user:

Standard unit:

- Check for any general visible signs of deterioration.
- Visual inspection for oil traces (sign of a refrigerant leak).
- Check for detached protective devices, and improperly closed doors / covers.
- Check if there is water on the surface of the evaporator, which would be a sign of a defect in its isolation.
- Clean the air-cooled exchangers (see the dedicated chapter).

Refrigerant circuit:

- Verify the refrigerant charge in the liquid line sight glass.
- Verify that the temperature difference at the heat exchanger inlet and outlet is correct.
- If the unit does not operate, check its alarm report (see the report in the SmartVu™ control manual).

Electrical:

- Check the filter fouling level at the air vents in the electrical box.
- Check the correct operation on electrical box fans.
- Check the fouling level at the exhaust air openings on the top of the power cabinet (fouling, snow, sand, etc.).

Unit + Option 262/263:

- Perform procedures as per the Standard unit
- Visual inspection of the anti-corrosion coatings.

10.2 - Level 2 maintenance

See Note above.

This level requires specific expertise in electrical, hydraulic and mechanical systems. it is possible that this expertise may be available locally; there may be a maintenance service, industrial site or specialist subcontractor in the area.

In these cases, the following maintenance operations are recommended:

Carry out all level 1 operations, then:

Hydraulic circuit:

- When working on the hydraulic circuit, take care not to damage the adjacent air heat exchanger,
- Check the hydraulic connections,
- Analyze the heat-transfer medium composition,
- Check the concentration of the anti-freeze protection solution (ethylene glycol or propylene glycol),
- Check the heat transfer medium flow rate via the heat exchanger pressure difference,
- Check the operation of the flow switch,
- Check the condition of pipe thermal insulation,
- Check for corrosion of the steel pipe work
- Check the condition of the expansion tank (customer side) and replace it if required:
  - Presence of corrosion,
  - Loss of gas pressure.
- Clean the hydraulic filter (customer side or already present following options selected).

Electrical:

- At least once a year, tighten the electrical connections for the power supply circuits (see tightening torques table below).
- Check and tighten all control connections, as required.
- Check that the differential circuit breakers are operating correctly every 6 months (if present).
- Remove the dust and clean the inside of the electrical boxes, as necessary.
- Check that the protective devices against access to live parts are present and in good condition.
- Replace the fuses every 3 years or every 15000 hours (ageing).
- Replace the electrical box cooling fans every 5 years.
- Check that the electrical boxes air inlet and outlet are not obstructed. If yes, clean them (sand, dust, leaves…).
- Check good operation of heaters that are present in the units, including heater of Module B compressor frequency drive when present: Measure the current on the terminals inside the electrical box (activate quick test mode to control the heaters if necessary).

Refrigerant circuit:

- Keep an up-to-date service booklet specific to the refrigeration unit in question.
- The unit is subject to F-gas tight regulatory checks. Please refer to the table in the introduction.
- Check the unit operating parameters and compare them with the previous values and note any changes,
- Check the operation of the high-pressure switches. Replace them if there is a fault.
- Check the fouling of the filter drier. Replace it if necessary.

Mechanical:

- Check that the mounting bolts for the ventilation sub-assemblies, fans, compressors, and electrical boxes are securely tightened.
- Check the height of the anti-vibration mounts (located between the feet of the oil separator and the support rails) after 5 years of use, and each year thereafter. Once the total minimum height of the mount is less than 25 mm, the mounts will need replacing.

IMPORTANT: Ensure all adequate safety measures are taken for all these operations: Use appropriate PPE (personal protective equipment), comply with all applicable industry and local regulations, and use common sense.

10.3 - Level 3 (or higher) maintenance

Maintenance at this level requires specific skills/qualifications/ tools and expertise that only the manufacturer, or one of its approved representatives is able to ensure. This maintenance work relates to the following:

- Replacement of a major component (compressor, evaporator).
- Operations on the refrigerating circuit (handling refrigerant).
- Modification of factory-set parameters (change of application).
- Movement or disassembly of the refrigeration unit.
- Any operation due to proven lack of maintenance.
- Any operation covered by the warranty.

To reduce waste, the refrigerant and the oil must be transferred in accordance with applicable regulations, using methods that limit refrigerant leaks and with materials that are suitable for the products.

Any leak detected must be repaired immediately.

The compressor oil that is recovered during maintenance contains refrigerant and must be treated accordingly.

Pressurized refrigerant must not be vented to the open air.

If the refrigerant circuit is opened for a period of up to one day, cap all openings. If open for longer, blanket the circuit with nitrogen.

10.4 - Tightening Torques

10.4.1 - Tightening Torques for the Main Fastenings

Screw type	Use	Value [N.m]
Tapping screws D = 4,8	Condenser modules, housing, panels	4,2
Tapping screws D = 6,3	Fan plastic impeller	4,2
M6 Taptite screw	Pipes mouting, condenser modules	7
M10 Taptite screw	Chassis, frame, structure, condenser modules, economizer assembly, electrical panels, compressor and oil separator fixing	30
M6 H screw	Piping collar clamps	10
M8 H screw	Condenser modules, fan plastic impeller	18
M8 H screw	MCHE coil	14
M8 H screw	Filter drier cover	35
M8 H screw	Compressor oil flange line	25
M10 H screw	Oil separator fixing	30
M12 H screw	Economiser port flange	40
M16 H screw	Heat exchanger water boxes	190
M16 H screw	Cooler on frame	130
M16 H stud	Compressor fixing	30
M16 H stud and nut	Oil separator flange	130
M8 H nut	Oil separator fixing	14
M10 H nut	Victaulic collar clamps 3" on liquid line	65
M10 H nut	Victaulic collar clamps 3" on water piping	45
M12 H nut	Victaulic collar clamps 4" on suction line	65
M12 H nut	Victaulic collar clamps 4" on water piping	45
M16 H nut	Victaulic collar clamps 5" and 6" on suction line	65
M20 H nut	Victaulic collar clamps 5", 6" and 8" on water piping	45
M16 H Nylstop nut	Compressor fixing	23
5/8 ORFS nut	Oil line	65
1"3/4-12-UN Rotalock	Liquid line	100
2"1/4-12-UN Rotalock	Liquid line	145
M6 T30 torx screw	Control cabinet casing panel	4,5

10.4.2 - Tightening Torques for the Main Electrical Connections

Tightening Torques for the Main Electrical Connections of Standard Units

Component	Designation in the unit	Value [N,m]
Customer connections		
M10 screw-nut on phases	L1/L2/L3	49
M10 screw-nut on earth strip	PE	49
Main disconnect switch (without option 70D)		
Circuit breaker - all calibers	QS100-*	50 -75
Earth strip connections		
M8		24
M10		49
Compressor variable frequency drive		
M10 nuts on phases	GS*	29,5
M10 or M8 nut on earth	R/S/T U/V/W	29,5
M8 nuts on internal connections (fuses and busbars)	GND	14,5
Compressor connections		
M12 nuts on phases	EC*	23
M12 screws on ground	1/2/3	25
Variable frequency drives for the fans and hydraulic pumps (opt 116V & 305C)		
Screws on phases and earth, VFD up to 4kW	GS*	2,5
Screws on phases and earth, VFD up to 7,5kW	GS*	2,5
Screws on phases and earth, VFD up to 11kW	GS*	2,5
Screws on phases and earth, VFD up to 15kW	GS*	4,5
Switch cage terminal screws		
ABB 243920	KM /KEH*	Spring Terminals
ABB 311581	KEH*	1,2-2,5
FIN391100240060	K118*/K119*	0,5
ABB 273079433	K400	0,6 - 0,8
Circuit breaker and differential block cage terminal screws		
ABB 450040	QF284	2,8
ABB type S803S	QF*	3,5
ABB type MS116 =< 16A	QM100 / QMGS-* / QM* / QFEH1	0,8-1,2
ABB type MS116 >= 20A	QMGS-*	2
ABB type MS132	QMGS-* / QF100-2 / QM*	2
ABB type MS165	QF 100-*	4
Potential transformer	TC*	0,5 - 2,5
Control cabinet distributor		13

Tightening Torques for the Main Electrical Connections of Units + Option 70D

Component	Designation in the unit	Value [N.m]
Main disconnect switch with option 70D		
Circuit breaker - caliber 630/800A	QF100	9
Circuit breaker - caliber 1000A	QF100	18

WARNING: The tightening of the connections at the compressor terminals requires special precautions. Refer to the section below.

10.5 - Hydraulic Maintenance & Repair

WARNING: Filling, topping up, or emptying of the water circuit must be carried out by qualified personnel using the air bleed devices and tools and equipment suitable for the products.

- The heat-transfer medium should be filled and drained using devices fitted to the water circuit by the installer. Never use the unit heat exchangers to add heat exchange fluid.

Check that:

- The insulating foam is neither detached nor torn during works,
- The heaters and probes are operating and correctly positioned in their supports,
- The water-side connections are clean and show no sign of leakage.

10.5.1 - Hydraulic Circuit Cleaning

- Open all control valves completely.
- Start up the heat transfer medium pump.
- Read the unit pressure drop as the difference between the pressure gauges connected to the unit inlet and outlet.
- Let the pump run for 2 hours continuously to flush the system's hydraulic circuit (presence of contaminating solids).
- Perform another reading.
- Compare this value to the initial value.

An increasing pressure difference value indicates that fouling is present inside the hydraulic circuit and must be removed. The hydraulic filters on the installation must be removed and cleaned.

In this case:

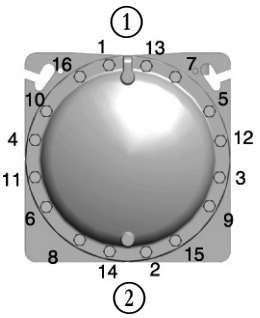
- Drain the installation,
- Remove the filters and clean them,
- Refill and purge the air from the circuit.

Repeat until all fouling is removed.

10.5.2 - Water boxes screws tightening

The evaporator is of the shell and tube type with removable water boxes to facilitate cleaning. Before the unit is first filled with water, or after cleaning, tighten or re-tighten the boxes as per the diagram below.

Water box tightening sequence



Key

① Sequence 1: 1 2 3 4
Sequence 2: 5 6 7 8
Sequence 3: 9 10 11 12
Sequence 4: 13 14 15 16

② Tightening torque
Bolt rating
M16 - 171 - 210 Nm

NOTE: During this procedure, we recommend that the circuit is drained, and the pipes are disconnected to ensure that the bolts are tightened correctly and uniformly.

10.6 - Aeraulic Maintenance & Repair

10.6.1 - Coils (Air heat exchanger) Cleaning

We recommend that coils are inspected regularly to check the degree of cleanliness. This depends on the environment where the unit is installed, in particular urban and industrial sites, and for units installed near trees that shed their leaves.

Recommendations for maintenance and cleaning of MCHE coils:

- Regularly cleaning the coil surface is essential for correct unit operation.
- Eliminating contamination and removal of harmful residue will increase the operating life of the coils and the unit.
- The maintenance and cleaning procedures below are part of the regular maintenance to increase the operating life of coils.
- Specific recommendation in case of snow: For long term storage, regularly check that no snow has accumulated on the coil.
- Clean the surface of the coil by spraying the coil regularly and uniformly from bottom to top, orienting the water jet at right angles to the surface. Do not exceed a water pressure of 6200 kPa (62 bar) or an angle of 45° to the coil. The nozzle must be at least 300 mm away from the coil surface.
- Cleaning could be made on the coil visible part, but also from the top, by removing the fan volute.
- Clean and scrub the entire coil connections with a soft Nylon, PolyPro® or Tynex® brush and low pressure tap water.

Level 1 cleaning:

- Remove all foreign objects or fragments/debris attached to the coil surface or wedged between the chassis and the supports.
- Use a low-pressure dry air jet to remove all traces of dust from the coil.

Level 2 cleaning:

- Carry out the level 1 cleaning operations.
- Clean the coil using suitable products.

Use appropriate PPE including safety glasses and/or mask, waterproof clothes and safety gloves. It is recommended to wear clothing that covers the whole body.

Specific products approved by the manufacturer for cleaning coils are available from the manufacturer's spare parts network. The use of any other product is strictly prohibited. After the cleaning product is applied, rinsing with water is mandatory (see manufacturer's standard RW01-25).

IMPORTANT: Never use a pressure water spray without a large diffuser.

Concentrated and/or rotating water jets are strictly forbidden.

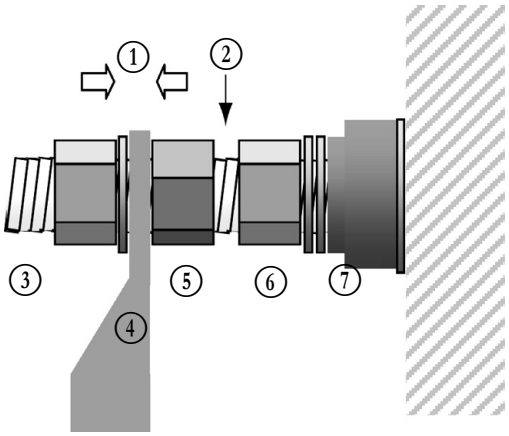
Never use a fluid with a temperature above 45°C to clean the air heat exchangers.

Correct and frequent cleaning (approximately every three months) will prevent 2/3 of the corrosion problems. Protect the electrical cabinets, the motorized ball valve and the VFDs during cleaning operations. Don't forget to remove protections after cleaning operations.

10.7 - Electrical Maintenance & Repair

10.7.1 - Compressor Motor power terminals connection

These precautions need to be applied whenever an operation requires removal of the power conductors connected to the compressor power supply terminals.



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

The tightening nut on the terminal (6) supporting the isolator (7) must never be loosened, as it keeps the terminal secure and stops the compressor leaking.

The phase lug (4) must be tightened applying the torque between the counter nut (5) and the tightening nut (3): During this operation a counter-torque must be applied at counter nut (5).

The lock nut (5) must not be in contact with the terminal securing nut (6).

10.7.2 - Variable frequency drive Maintenance

WARNING: Before any work on the variable frequency drive, ensure that the circuit breaker/disconnect switch is open and there is no voltage present

The capacitors take approximately 20 minutes to discharge. This value is a guide and may differ from one VFD to another: Refer to the information given on the VFD to find out the precise value.

Only appropriately qualified personnel are authorized to replace or make modifications to components inside the variable frequency drive.

During periodic inspections, check the condition of the ventilation grilles on the variable frequency drive door; ensure that they are not pierced, damaged or obstructed.

Replace the fan if a "fan replacement" alert/warning is displayed in the list of alarms.

For any other alarm or problem relating to the variable frequency drive, contact Carrier Service.

In general, a fault with the variable frequency drive can be corrected by repairing or replacing an internal component. If the complete variable frequency drive needs to be replaced, its removal will require prior removal of the ventilation ducts and the top of the cabinet: Please contact Carrier Service. Similarly, precautions must be taken for handling, as the variable frequency drives are very heavy (between 65kg and 120kg, depending on their size).

The variable frequency drives fitted on the units do not require a dielectric test, even if being replaced: They are systematically checked before delivery. Moreover, the filtering components installed in the variable frequency drive can falsify the measurement and may even be damaged.

If the insulation of a component (compressor, cables, etc.) requires testing, the variable frequency drive must be disconnected from the power circuit.

10.8 - Compression Components Maintenance & Repair

10.8.1 - Checking the compressor rotation

Ensuring the compressor screw rotation is correct is one of the most critical considerations.

Reverse screw rotation, even for a short period, will have a considerable adverse effect on the compressor's reliability, and may even cause irreparable damage. The reverse rotation protection process must be capable of determining the direction of rotation and stopping the compressor within one second.

Reverse rotation is most likely to occur whenever the wiring at the compressor terminals have been modified.

To minimize any risk of reverse rotation, the following procedure must be applied.

Rewire the electrical wires to the compressor terminals as originally wired. Keep a counter torque on the lower nut on the power supply cable terminal lug when the latter is installed.

When a compressor is replaced, a low-pressure switch must be installed temporarily as a safety measure on the high-pressure part of the compressor. The purpose of this pressure switch is to protect the compressor against any wiring errors at the compressor terminals.

The electrical contact of the switch would be wired in series with the high-pressure switch.

The pressure switch must remain in place until the compressor has been started and direction of rotation has been verified; at this point, the pressure switch can be removed.

The switch that has been selected for detecting reverse rotation is Carrier part number HK01CB001. This pressure switch opens the contacts when the pressure falls below 7 kPa. The pressure switch has a manual reset, which can be reset when the pressure exceeds 70 kPa once more. The pressure switch must be a manual reset type to prevent any risk of the compressor short cycling in the reverse direction.

10.8.2 - Oil separator

Check that the heaters are operating correctly and that they are firmly attached to the oil separator.

10.8.3 - Oil filter change schedule

As keeping the system clean is critical to ensure its reliable operation, there is a filter in the oil pipe at the oil separator outlet.

The oil filter is specified to provide a high level of filtration (5 µ), necessary for ensuring the compressor has a long service life.

The filter should be checked after the first 500 hours of operation, and every subsequent 2000 hours. The filter must be replaced as soon as the pressure differential on the filter exceeds 200 kPa (2 bar).

The pressure drop on the filter is determined by measuring the pressure at the discharge (dp) and the oil pressure (op).

The difference in these two pressures will be the pressure drop on the filter, check valve, and solenoid valve.

The pressure drop on the check valve and solenoid valve is approximately 40 kPa (0.4 bar), which should be subtracted from the two oil pressure measurements to give the oil filter pressure drop.

10.8.4 - Periodic test of the high-pressure safety loop

The aim of this periodic test is to check the settings of the high-pressure safety loop on one of the unit's refrigerant circuits and check it is operating correctly. This procedure must be repeated for each circuit.

1. Fit a calibrated pressure gauge on the high-pressure part of the circuit (compressor discharge).
2. Reset all the active alarms.
3. Activate the HP test mode for the corresponding circuit via the control interface.

   The high-pressure test maybe defined in the fan addressing menu (FAN DRV2).

   To activate the high-pressure test for a specific circuit, access the Maintenance menu.

   Select Fan addressing (section 5.5.10).

   Set the high-pressure test A or high-pressure test B to "yes".
4. Save the fault trip value.
5. Check that the two HPS have tripped.

   If the two HPS have tripped, move on to step 9. If just one of the HPS has tripped.
6. Replace the tripped HPS with another system which has a greater value.

   Alternatively, an emergency stop button can be installed.
7. Repeat steps 2 to 5.
8. Check whether the trip values are correct.

   The trip values must be between +0/-1.4 bars of the rated value indicated on the unit.
9. Reset all the alarms.
10. Reset both the HPS.
11. Deactivate the HP test mode for the circuit.

NOTE: For step 6, electrical disconnection of the tripped HPS and its substitution must be performed within the compressor terminal box. All the procedures for accessing an environment containing hazardous live parts must be respected.

The connector type must be WAGO 231-302 or equivalent.

11 - SYSTEM FINAL SHUTDOWN

The unit is fully or partially recyclable. After use, it may contain refrigerant vapors and oil residues. Some parts are painted.

11.1 - Shutting down

Separate the units from their energy sources, allow them to cool then drain them completely.

11.2 - Recommendations for disassembly

Use the original lifting equipment.

Sort the components according to their material for recycling or disposal, in accordance with regulations in force.

Check whether any part of the unit can be recycled for another purpose.

IMPORTANT: Follow the disassembly procedure indicated in the disassembly instructions.

11.3 - Fluids to be recovered for treatment

- Refrigerant.
- Heat-transfer fluid: Depending on the installation, water, brine solution, etc.
- Compressor oil.

11.4 - Materials to be recovered for recycling

- Steel.
- Copper.
- Aluminum.
- Plastics.
- Polyurethane foam (insulation).

11.5 - Waste Electrical and Electronic Equipment (WEEE)

At the end of its life, this equipment must be disassembled, and contaminated fluids removed by professionals and processed via approved channels for Waste Electrical and Electronic Equipment (WEEE).

12 - OPTIONS

Option	N°	Description	Advantage	Use 30XF-Z
High speed fans at 1140RPM	12B	Fans speed can be increased up to 1140RPM	Enhances the unit performances at high ambient temperature, Higher static pressure available (max 200Pa)	0400-2100
Low Noise	15	Aesthetic and sound absorbing compressor enclosure	Noise level reduction	0400-2100
Very Low Noise	15LS	Sound absorbing & aesthetic compressor enclosure and oil separator, evaporator and suction line acoustic treatment, combined with low-speed fans	Noise level reduction in sensitive environments	0400-2100
Enclosure panels	23A	Side enclosure panels	Improves aesthetics and piping protection against impacts,	0400-2100
Grilles and enclosure panels	23	Metallic protection grilles and side enclosure panels	Improves aesthetics, protection against intrusion to the unit interior, coil and piping protection against impacts,	Available in Q3 2024
Water exchanger frost protection	41A	Electric resistance heater on the water exchanger and discharge valve	Water exchanger frost protection down to -20°C outside temperature	0400-2100
Evaporator & hydraulic module frost protection	41B	Electric resistance heater on water exchanger, discharge valve and hydraulic module	Water exchanger and hydraulic module frost protection down to -20°C outside temperature	0400-2100
Lead/Lag operation (sensor kit)	58	Unit equipped with supplementary water outlet temperature sensor kit (to be field installed) allowing Lead/Lag operation of two units connected in parallel	Optimised operation of two units connected in parrallel operation with operating time equalisation	Available in Q3 2024
Main disconnect switch with short-circuit protection	70D	Disconnector circuit breaker equipped with an external disconnect switch handle	Ensure protection of main disconnect switch and associated cables against short-circuits when building devices are not compliant	0400-2100
Dual Power Supply 400V/400V	85A	Power supply separated in two 400V feeds: Supply 1 (400V): Compressors & Fans / Supply 2 (400V): Control, Main pumps & Heaters	Chiller can be connected on 2 separated power suppliesControl, main pumps & heaters can be connected to external UPS 400V which allow ultra fast capacity recovery and maintain water flow in case of power supply 1 failure	0400-2100
Dual Power Supply 400V/230V	85B	Power supply separated in two feeds: Supply 1 (400V): Compressors, Fans, pumps & heaters / Supply 2 (230V): Control only	Chiller control can be connected to external UPS 230V which allow ultra-fast capacity with the chiller	0400-2100
Service set valve	92	Liquid line valve, evaporator suction line valve and compressor discharge line valve	Allow isolation of various refrigerant circuit components for simplified service and maintenance	0400-2100
HP VSD single-pump (variable speed)	116V	Single high-pressure water pump with variable speed drive (VSD), electronic water flow control, pressure transducers, Multiple possibilities of water flow control, (expansion tank not included)	Easy and fast installation (plug & play), significant pumping energy cost savings (up totwo-thirds), tighter water flow control, improved sytem reliability	0400-2100
Bacnet over IP	149	Bi-directional high-speed communication using BACnet protocol over Ethernet network (IP)	Easy and high-speed connection by ethernet line to a building management system, Allows access to multiple unit parameters	0400-2100
Modbus over IP and RS485	149B	Bi-directional high-speed communication using Modbus protocol over Ethernet network (IP)	Easy and high-speed connection by ethernet line to a building management system, Allows access to multiple unit parameters	0400-2100
Remote pump control	152P	Additionnal hardwired control outputs/inputs for internal pumps management	Pumps control can be directly managed by customer BMS via hardwired connections, Pumps control by Modbus is also possible	0400-2100
Energy Management Module Plus	156+	Extra control board card for additionnal control outputs/inputs, See Energy Management Module option chapter	Extended remote control capabilities (Set-point reset, freeze protection, demande limit, capacity limitation, input contact for refrigerant leak detection)	0400-2100
Dual relief valves on 3-way valve	194	Three-way valve upstream of dual relief valves on the shell and tubes evaporator	Valve replacement and inspection facilitated without refrigerant loss, Comforms to European standard EN378/BGVD4	0400-2100
Compliance with Swiss regulations	197	Additional tests on the water heat exchangers: Supply (additional of PED documents) supplementary certificates and test certifications	Conformance with Swiss regulations	Available in Q3 2024
Compliance with Australian regulations	200	Unit approved to Australian code	Conformance with Australian regulations	Available in Q3 2024
Capacity booster	232	Compression load increase	Cooling capacity increase	0400-2100
Insulation of the evap, in/out refrigerant lines	256	Thermal insulation of the evaporator entering/ leaving refrigerant lines with flexible, UV resistant insulation	Prevents condensation on the evaporator entering/leaving refrigerant lines	0400-2100
Anti-corrosion protection on Total FreeCooling coils	262AC	Same anti-corrosion traitment as for condenser MCHE coils	Improved corrosion resistance, recommended for use in moderately corrosive environments	0400-2100
Enviro-Shield anti-corrosion protection	262	Coating by conversion process which modifies the surface of the aluminum producing a coating that is integral to the coil, Complete immersion in a bath to ensure 100% coverage, Minimal heat transfer variation, tested 4000 hours salt spray per ASTM B117	Improved corrosion resistance, recommended for use in moderately corrosive environments	0400-2100

12 - OPTIONS

Option	N°	Description	Advantage	Use 30XF-Z
Super Enviro-Shield anti-corrosion protection	263	Extremely durable and flexible epoxy polymer coating applied on micro channel heat exchangers by electro coating process, final UV protective topcoat, Minimal heat transfer variation, tested 6000 hours constant neutral salt spray per ASTM B117, superior impact resistance per ASTM D2794	Improved corrosion resistance, recommended for use in extremely corrosive environments	0400-2100
Super Enviro-Shield on Total Free Cooling coils	263AC	Same anti-corrosion traitment as for condenser MCHE coils	Improved corrosion resistance, recommended for use in extremely corrosive environments	0400-2100
Welded evaporator connection (kit)	266	Victaulic piping connections with welded joints	Easy installation	0400-2100
Evaporator with aluminum jacket	281	Evaporator covered with an aluminum sheet for thermal insulation protection	Improved resistance to aggressive climate conditions	Available in Q3 2024
EMC class, C2, as per EN 61800-3	282	Additional RFI filters on the unit power line	Reduces electromagnetic interferences for compliance with emission level category C2 in order to allow the units to operate in the first environment (so called, residential environment)	Available in Q3 2024
230V electrical plug	284	230V AC power supply source provided with plug socket and transformer (180 VA, 0,8 Amps)	Permits connection of a laptop or an electrical device during unit commissioning or servicing	0400-2100
Electric energy meter	294	Electricity meter , Display of energy consumption, instantaneous (U, V, I) and cumulated (kWh) on the unit user interface datas available on communication bus	Permits the acquisition, (remote) monitoring of energy used	0400-2100
Ultra Fast Capacity Recovery	295+	Electrical capacity module to enable quick restart and fast loading preserving unit reliability	Ultra Fast full capacity recovery after power failure, Matches requirements of typical critical missions applications, (process, data centers)	0400-2100
Mexico screw compressor	297	Screw compressor made in Mexico	Mexico screw compressor	0400-2100
Total hydraulic Free-Cooling	305A	Hydronic free-cooling coils on both refrigerant circuits,	Energy savings for applications with cooling demand throughout the entire year (e,g, Industrial process, Data-center,,,,)	0400-2100
Total hydraulic Free-Cooling Glycol Free	305C	Hydronic free-cooling coils on both refrigerant circuits and decouppling exchanger,	Energy savings for applications with cooling demand throughout the entire year (e,g, Industrial process, Data-center,,,,) Operation without glycol	0400-2100
Compliance with UAE regulation	318	Additional label on the unit with rated power input, rated current and EER following AHRI 550/590	Compliance with ESMA standard UAE,S 5010-5:2019	Available in Q3 2024
Compliance with Qatar regulation	319	Specific nameplate on the unit with power supply 415 V+/-6%	Compliance with KAHRAMAA regulation in Qatar,	Available in Q3 2024
Compliance with Morocco regulation	327	Specifics documents according Morroco regulation	Conformance with Morocco regulations	Available in Q3 2024
Compressor with permanent magnet	329	Screw compressor equipped with permanent magnet motor	Permanent magnet motor improves significantly compressor efficiency	Available in Q3 2024
Delivery with plastic tarp cover	331	Plastic sheeting covering the units, with strapping securing it on the wooden pallet,	Allow unit to avoid dust and dirt from the outside environment during stocking and shipping,	0400-2100
400-3-60Hz power supply	335	400-3-60Hz power supply	Permits unit connection to 400-3-60Hz power supply	0400-2100
Active Harmonic Filters	336	Use of active electronic filters placed into electrical cabinet (THDI 5% at full load)	No energy lost in the distribution system and higher Power Usage Effectiveness of data center to maintain low and safe level of harmonics to ensure reliability	0400-2100
Surge arrester	337	Surge arrester Class I/II according to IEC 61643-11	To protect electrical devices from high voltage spikes, Can be recommanded in area with high flashes / km^2 / year,	0400-2100
Hydraulic Free-cooling removal	338	Hydraulic free-cooling features will not be included in the unit	Cost reduction when Free cooling features can't be valorized	0400-2100

12.1 - Option 12B: High Speed Fans at 1140 RPM (60Hz)

12.1.1 - System Electrical Data

12.1.1.1 - Electrical Components

Fan Motors

According to regulation No. 640/2009 and amendment 4/2014 implementing directive 2009/125/EC regarding eco-design requirements for electric motors.

30XF-Z Units + Option 12B		
Measurement category		A
Efficiency category		Static
Target efficiency level ERP2015		N(2015) 40
Overall Efficiency	%	40,1
Efficiency level at the optimum efficiency point		43,1
Air Flow Rate	m³/s	5,31
Pressure at optimum energy efficiency	Pa	216
Nominal Speed	tr/min	1125
Specific ratio		1,002
Fan Manufacturer		Simonin
Fan P/N		00PSG002630700A
Year of manufacture		See label on the unit
Relevant information to facilitate the disassembly, recycling or removal of the product at the end of life		See the Maintenance Manual
Relevant information to minimize the impact on the environment		See the Maintenance Manual

12.1.1.2 - Electrical System

Units Electrical Data

30XF-Z Units + Option 12B		0750	0900	1000	1700	1800	1900	2000	2100
Input power(1)									
Maximum operating input power(2)	kW	242	286	329	508	540	601	637	644
Operating current draw(1)									
Maximum Current (Un)(2)	A	374	444	510	787	838	933	988	999
Maximum Current (Un-10%)	A	406	482	540	855	910	1001	1048	1058
Start-up current(1)									
Maximum Current (Un)(5)	A	80	80	80	475	526	571	582	582

(1) Values obtained at operation with maximum operating input power.
(2) Values given on the unit nameplate.
(5) Starting current of the smallest compressor + Operating current of the biggest compressor + Fan current.

12.1.2 - System Aeraulic Data

12.1.2.1 - Aeraulic Components

Fans

According to the Regulation No. 327/2011 implementing Directive 2009/125/EC regarding eco-design requirements for fans driven by motors with an electric input power between 125 W and 500 kW.

30XF-Z Units + Option 12B		
Measurement category		A
Efficiency category		Static
Target efficiency level ERP2015		N(2015) 40
Overall Efficiency	%	40,1
Efficiency level at the optimum efficiency point		43,1
Air Flow Rate	m³/s	5,31
Pressure at optimum energy efficiency	Pa	216
Nominal Speed	tr/min	1125
Specific ratio		1,002
Fan Manufacturer		Simonin
Fan P/N		00PSG002630700A
Year of manufacture		See label on the unit
Relevant information to facilitate the disassembly, recycling or removal of the product at the end of life		See the Maintenance Manual
Relevant information to minimize the impact on the environment		See the Maintenance Manual

12.1.2.2 - Aeraulic System

Units Aeraulic Data

30XF-Z Duplex Units		1700	1800	1900	2000	2100
Fans Quantity		20	22	24	26	28
Fans Quantity - Module A		10	12	12	12	14
Fans Quantity - Module B		10	10	12	14	14
Maximum Total Air Flow Rate	m³/s	103	114	124	134	145
Maximum Rotation Speed	rpm	950	950	950	950	950

12.2 - Option 15: Low Noise

12.2.1 - System Structural & Acoustical Data

12.2.1.1 - Structural & Acoustical System

Structural & Acoustical Data

30XF-Z Single Units + Option 15		0750	0900	1000
Sound levels				
Sound Power(1)	dB(A)	98,0	97,5	99,5
Sound Pressure at 10 m(2)	dB(A)	75,0	73,5	75,5

30XF-Z Duplex Units + Option 15		1700	1800	1900	2000	2100
Sound levels						
Sound Power(1)	dB(A)	100,0	100,5	100,5	101,5	102,5
Sound Pressure at 10 m(2)	dB(A)	75,0	75,5	75,0	75,5	76,5

(1) In dB ref =10^{-12} W, 'A' weighted, Declared noise emission value dissociated in accordance with ISO 4871 with an uncertainty of +/-3 dB(A), Measurement following ISO 9614-1 and certified by Eurovent,
(2) In dB ref =20 µPa, 'A' weighted, Declared noise emission value in accordance with ISO 4871 with an uncertainty of +/-3 dB(A), For information, calculated from the sound power Lw(A),

12.3 - Option 15LS: Very Low Noise

12.3.1 - System Structural & Acoustical Data

12.3.1.1 - Structural & Acoustical System

Structural & Acoustical Data

30XF-Z Single Units + Option 15LS		0750	0900	1000
Sound levels				
Sound Power(1)	dB(A)	96,5	96,0	97,0
Sound Pressure at 10 m(2)	dB(A)	73,5	72,5	73,0

30XF-Z Duplex Units + Option 15LS		1700	1800	1900	2000	2100
Sound levels						
Sound Power(1)	dB(A)	99,0	99,0	99,5	100,0	100,0
Sound Pressure at 10 m(2)	dB(A)	74,0	74,0	74,0	74,5	74,0

(1) In dB ref =10^{-12} W, 'A' weighted, Declared noise emission value dissociated in accordance with ISO 4871 with an uncertainty of +/-3 dB(A), Measurement following ISO 9614-1 and certified by Eurovent,
(2) In dB ref =20 µPa, 'A' weighted, Declared noise emission value in accordance with ISO 4871 with an uncertainty of +/-3 dB(A), For information, calculated from the sound power Lw(A).

12.4 - Options 41A / 41B: Frost protection heaters

12.4.1 - System Hydraulic Data

12.4.1.1 - Heat Transfer Medium

Frost Protection

In case option 41B is selected on duplex units, heaters are pending at the outlet of the module A to be applied on the surface of the piping linking both modules once the customer has supplied and connected it.

WARNING:

- ***If frost protection is dependent on electric heaters, never de-energize the unit when frost protection is required.***
- ***To enable this, the unit's main disconnect switch and the auxiliary circuit breakers protecting the heaters must be left closed (see the wiring diagram for the location of these components).***
- ***If piping trace heaters are used, ensure the external heaters do not affect the measurements provided by the water chilling heat exchanger inlet and outlet temperature sensors.***

To check if the heater circuit is "operational":

- Inside the electrical box, check presence of voltage and current on the connection terminals for the evaporator heaters (activate quick test mode to control the heaters).

12.5 - Option 58: Operation of two units as a Lead/Lag pair

12.5.1 - System Controls Data

12.5.1.1 - System Controller

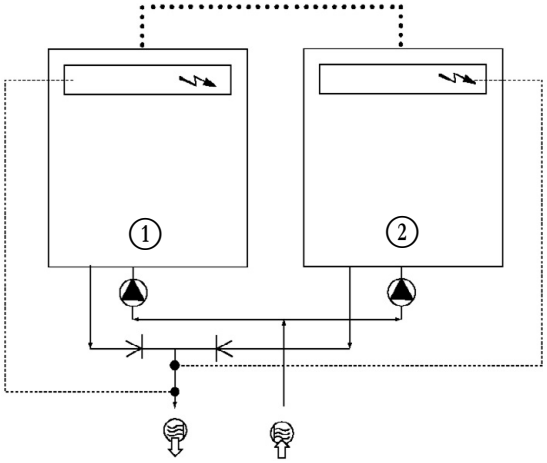
The Lead-Lag pair is controlled on the water inlet without any additional sensors being added (standard configuration). It is also possible to control on the water outlet by adding two additional sensors in the common supply pipe work.

All the parameters required for the Lead/Lag function must be configured using the MST_SLV configuration menu. All remote controls of the Lead/Lag pair (start/stop, setpoint, load shedding, etc.) are managed by the unit configured as the Lead and must only be applied to the Lead unit.

Each unit controls its own water pump. If there is only one common pump, in cases with a variable flow, isolation valves must be installed on each unit. These should be controlled (opened and closed) using the controls for the relevant unit (in this case, valves will be controlled using the dedicated water pump outputs). Refer to the SmartVu™ control manual for a more detailed explanation.

WARNING: To permit Lead/Lag operation both units must be equipped with option 58.

Configuration: Control on the water outlet



Key

1 Lead unit
2 Lag unit
Control panels for Lead and Lag units
Water inlet
Water outlet
Water pumps for each unit
Additional sensors for the control of the leaving water temperature to be connected on channel 1 of the Lag boards of both Lead and Lag unit
Communication bus CCN
Connection of two additional sensors

12.6 - Option 70D: Main disconnect switch with short-circuit protection

12.6.1.1 - Additional Electrical Components

Main Electrical Cabinet

The electrical cabinet(s) contains a power supply disconnecting component for each power supply: Circuit breaker if option 70D was chosen.

12.6.1.2 - Electrical System

Electrical Notes

Customer Building Electrical Connections

For machines equipped with option 70D, the short circuit protection is already provided.

Short-Circuit Current

30XF-Z Units + Option 70D		0750	0900	1000	1700	1800	1900	2000	2100
Rated conditional short circuit current Icc	kA rms	50	50	50	50	50	50	50	50

NOTE: The short-circuit stability current values above are suitable with a TN system.

12.7 - Option 85A: Dual Power Supply 400V / 400V

The second power supply is a secured backup for elements whose power supply is required to ensure minimum water circulation in the event of loss of first power supply and immediate restart of the unit when it is returned.

12.7.1 - System Electrical Data

12.7.1.1 - Electrical Connections

Cables sections for 400V Main power supply are the same as cables sections for single power connection point for standard units (Option 338).

Allowable cable section for the second power connection point : 1mm² to 6 mm².

12.7.1.2 - Electrical System

Units short circuit current withstand capability

30XF-Z Units + Option 85A - Supply 400V_2		0750	0900	1000	1700	1800	1900	2000	2100
Rated short-circuit currents									
Rated conditional short circuit current Icc	kA rms	30	30	30	30	30	30	30	30

NOTE: The short-circuit stability current values above are suitable with the TN system.

Units Electrical Data

30XF-Z Units + Option 85A - Supply 400V_2		0750	0900	1000	1700	1800	1900	2000	2100
Power circuit supply									
Nominal voltage	V-ph-Hz	400-3-50							
Voltage range	V	360-440							
Operating current draw									
Maximum Current (Un)(2)	A	0,3	0,3	0,3	0,5	0,5	0,5	0,5	0,5

(2) Values given on the unit nameplate.

Notes :

- **Control circuit is supplied with 24V via internal transformer from 400V second power supply.**
- **Electrical data concerning 400V Main power supply is the same as electrical data concerning single power connection point for standard units (Option 338).**

12.8 - Option 85B: Dual Power Supply 400V / 230V

The second power supply is a secured backup for elements whose power supply is required to ensure minimum water circulation in the event of loss of first power supply and immediate restart of the unit when it is returned.

12.8.1 - System Electrical Data

12.8.1.1 - Electrical Connections

Recommended cables sections

Cables sections for 400V Main power supply are the same as cables sections for single power connection point for standard units (Option 338).

Allowable cable section for the second power connection point : 1mm² to 6 mm².

12.8.1.2 - Electrical System

Units short circuit current withstand capability

30XF-Z Units + Option 85B - Supply 230V		0750	0900	1000	1700	1800	1900	2000	2100
Rated short-circuit currents									
Rated conditional short circuit current Icc	kA rms	20	20	20	20	20	20	20	20

Note : The short-circuit stability current values above are suitable with the TN system.

Unit Electrical Data

30XF-Z Units + Option 85B - Supply 230V		0750	0900	1000	1700	1800	1900	2000	2100
Power circuit supply									
Nominal voltage	V-ph-Hz	230-3-50							
Voltage range	V	207-253							
Operating current draw									
Maximum Current (Un)(2)	A	1,1	1,1	1,1	2,1	2,1	2,1	2,1	2,1

(2) Values given on the unit nameplate.

Notes :

- **Control circuit is supplied with 24V via internal transformer from 230V power supply.**
- **Electrical data concerning 400V power supply is the same as electrical data concerning single power connection point for standard units (Option 338).**
- **In the case of dual module units, the backup supply voltage of module A is 230V while module B backup supply voltage is 24V.**

12.9 - Option 116V: Hydraulic module

12.9.1 - System Structural & Acoustical Data

12.9.1.1 - Structural & Acoustical System

Units Physical Data

30XF-Z Single Units + Option 116V		0750	0900	1000
Dimensions				
Length	mm	6935	7979	9173
Weights				
Operating weight(1)	kg	6262	6562	6901

30XF-Z Duplex Units + Option 116V		1700	1800	1900	2000	2100
Dimensions						
Length - Module A	mm	6785	7979	7979	7979	9173
Length - Module B	mm	6427	6427	7513	8707	8707
Length	mm	13251	14443	15529	16723	17919
Weights						
Operating weight(1)	kg	12247	12515	12843	13254	13709

(1) Values are guidelines only. Refer to the unit name plate.

12.9.2 - System Electrical Data

12.9.2.1 - Additional Electrical Components

Pump motors

The pumps that are factory-installed in these units comply with the European Ecodesign directive ErP. The additional electrical data required (1) is as follows:

No.(2)	Description(3)		LNE 65-160-75 SPC	LNEE 80-160-110	LNEE 80-160-150
1	Nominal efficiency at full load and nominal voltage	%	90,8	91,6	93,1
	Nominal efficiency at 75% of full load and nominal voltage	%	90,8	92,2	93,3
	Nominal efficiency at 50% of full load and nominal voltage	%	89,6	91,7	92,7
2	Efficiency level	-	IE3		
3	Year of manufacture	-	This information varies depending on the manufacturer and model at the time of incorporation. Please refer to the motor nameplate.		
4	Manufacturer's name and trademark, commercial registration number and place of manufacturer	-	Same as above		
5	Product's model number	-	Same as above		
6	Number of motor poles	-	2		
7-1	Nominal Shaft Power Output at full load and nominal voltage (400V)	kW	7,5	11	15
7-2	Maximum Input Power (400V)(4)	kW	8,26	12,01	16,11
8	Nominal Input Frequency	Hz	50		
9-1	Nominal Voltage	V	3Ph x 400		
9-2	Maximum Current Drawn (400V)(5)	A	14,10	20,20	26,60
10	Nominal Speed	rps - rpm	48 - 2900		
11	Product disassembly, recycling or disposal at end of life	-	Disassembly using standard tools. Disposal and recycling by an appropriate company.		
12	Operating conditions for which the motor is specifically designed				
	I - Altitudes above sea level	m	< 1000(6)		
	II - Ambient air temperature	°C	< 40		
	III - Maximum operating temperature	°C	Please refer to the operating conditions given in this manual or in the specific conditions in the Carrier selection programs.		
	IV - Potentially flammable atmospheres	-	Non-ATEX Environnement		

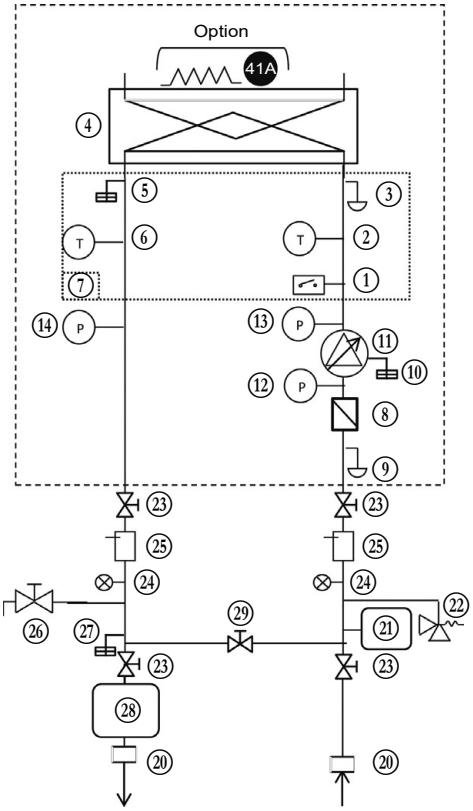
(1) Required by regulation No. 640/2009 concerning the application of directive 2009/125/EC on the eco-design requirements for electric motors.
(2) Item number imposed by regulation No. 640/2009, appendix I2b.
(3) Description given by regulation No. 640/2009, appendix I2b.
(4) To obtain the maximum unit input power for a unit with hydraulic module, add the ""maximum unit operating input power"" (see Electrical Data table) to the pump power.
(5) To obtain the maximum unit operating current draw for a unit with hydraulic module add the "maximum unit operating current draw" (Electrical Data table) to the pump current draw.
(6) Above 1000 m, a degradation of 3% for each 500 m should be taken into consideration.

12.9.3 - System Hydraulic Data

12.9.3.1 - Hydraulic Connections

Units Hydraulic Circuit Diagram

1 Module



Legend

Unit Hydraulic Components

1. Flow rate sensor
2. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger inlet (see Control Manual)
3. Water purge on water box
4. Water heat exchanger
5. Air bleed on water box
6. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger outlet (see Control Manual)
7. Water box
8. Screen filter (particle size of 1.2mm)
9. Water drain tap
10. Air bleed on the pump body
11. Variable speed pump
12. Pressure sensor
    NOTE: Provides pressure measurement at the pump suction (see Control Manual)
13. Pressure sensor
    NOTE: Provides pressure measurement at the pump discharge (see Control Manual)
14. Pressure sensor
    NOTE: Provides pressure measurement at the unit outlet (see Control Manual)

Customer Loop Minimum Additional Components

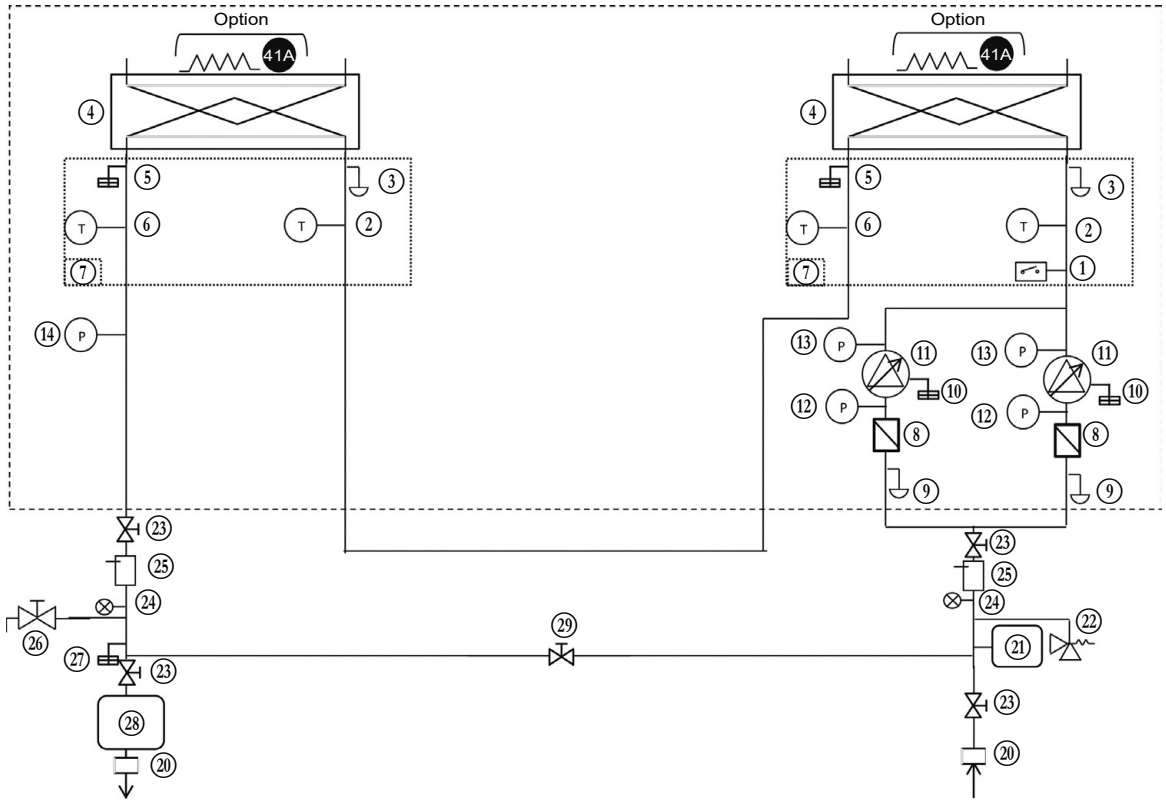
20. Flexible Connection
21. Expansion Vessel
22. Relief Valve
23. Shut-off valve
24. Pressure gauge
25. Well
26. Charge valve
27. Air bleed
28. Buffer tank (if whole hydraulic loop volume under minimum required water volume enabling reaching full unit refrigerating capacity)
29. Shut-off valve to enable water circulation to protect against freeze if shut-off valves (item 23) are closed.

- - - - - Unit Hydraulic Components

NOTES:

- **The installation must be protected against frost**
- **The water heat exchanger may be protected against freeze using electrical heaters and heat trace cables. (factory-fitted option n°41A).**
- **The unit hydraulic loop may be protected against freeze using electrical heaters and heat trace cables. (factory-fitted option n°41B).**
- **The pressure sensors are assembled on connections without Schaeder ports. Depressurize and drain the system before any work.**

2 Modules



Legend

Unit Hydraulic Components

1. Flow rate sensor
2. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger inlet (see Control Manual)
3. Water purge on water box
4. Water heat exchanger
5. Air bleed on water box
6. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger outlet (see Control Manual)
7. Water box
8. Screen filter (particle size of 1.2mm)
9. Water drain tap
10. Air bleed on the pump body
11. Variable speed pump
12. Pressure sensor
    NOTE: Provides pressure measurement at the pump suction (see Control Manual)
13. Pressure sensor
    NOTE: Provides pressure measurement at the pump discharge (see Control Manual)
14. Pressure sensor
    NOTE: Provides pressure measurement at the unit outlet (see Control Manual)

Customer Loop Minimum Additional Components

20. Flexible Connection
21. Expansion Vessel
22. Relief Valve
23. Shut-off valve
24. Pressure gauge
25. Well
26. Charge valve
27. Air bleed
28. Buffer tank (if whole hydraulic loop volume under minimum required water volume enabling reaching full unit refrigerating capacity)
29. Shut-off valve to enable water circulation to protect against freeze if shut-off valves (item 23) are closed.

- - - - - Unit Hydraulic Components

NOTES:

- **The installation must be protected against frost**
- **The water heat exchanger may be protected against freeze using electrical heaters and heat trace cables. (factory-fitted option n°41A).**
- **The unit hydraulic loop may be protected against freeze using electrical heaters and heat trace cables. (factory-fitted option n°41B).**
- **The pressure sensors are assembled on connections without Schaeder ports. Depressurize and drain the system before any work.**

Piping Diameters & Connections Type

30XF-Z Single Units + Option 116V		0750	0900	1000
Inlet Connection Diameter	mm	114,3	114,3	114,3
Outlet Connection Diameter	mm	168,3	168,3	168,3

30XF-Z Duplex Units + Option 116V		1700	1800	1900	2000	2100
Inlet Connection Diameter - Module A	mm	114,3	114,3	114,3	114,3	114,3
Inlet Connection Diameter - Module B	mm	114,3	114,3	114,3	114,3	114,3
Connection Diameter for the flow from B to A - Leaving B	mm	114,3	114,3	114,3	114,3	114,3
Connection Diameter for the flow from B to A - Entering A	mm	114,3	114,3	114,3	114,3	114,3
Connection Diameter for the flow from A to B - Leaving A	mm	168,3(1)	168,3	168,3	168,3	168,3
Connection Diameter for the flow from A to B - Entering B	mm	168,3	168,3	168,3	168,3	168,3
Outlet Connection Diameter	mm	219,1	219,1	168,3	168,3	168,3

(1) From A to B - Leaving A: Evaporator water box outlet diameter is 219.1mm (8"). Then a reduction pipe from 219.1mm (8") to 168.3mm (6") is delivered with the unit but not factory fitted.

Installation Nominal Flow Rate Adjustment

Refer to the schematic diagram in the "Water connections" paragraph for all item references in this chapter.

The water circulation pumps have been sized to allow the hydraulic modules to operate in all likely system operating conditions, i.e., at a range of temperature differences between the water inlet and outlet at full load from 5 to 15 K.

As pumps motors are linked to variable frequency drives, the pump frequencies are variable.

If the option 116V was selected for the unit, the pump is variable speed and the installation nominal flow rate adjustment is a matter of pump frequency regulation.

Nominal Data:

Use the specification provided when selecting the unit to know the data necessary for setting the installation flow rate, depending on the pump regulation mode selected:

Pump Regulation Mode	Data to collect
Fixed Flow rate control	Nominal Flow Rate
Temperature difference control	Nominal Temperature difference between unit inlet and outlet
Constant outlet pressure control	Nominal Pressure at the unit outlet
Pressure difference control	Nominal Pressure difference between unit inlet and outlet

If this information is not available when activating the system, contact the design office responsible for the installation to obtain it.

Contact the manufacturer's service department to implement the procedures described below.

Variable-speed pump - Setting a fixed flow rate

The flow will be set to a nominal value. This value shall remain constant and will not be dependent on variations in the installation's load.

Adjustment procedure

Once the circuit has been cleaned, set the required heat transfer medium flow rate by adjusting the pump frequency on the user interface.

Stop the forced operation of the pump and proceed to the configuration of the unit for the required control mode.

Modify the control parameters:

- Heat transfer medium flow rate control method (fixed speed),
- Constant frequency value.

Variable-speed pump - Temperature differential control

The system flow rate has not been set to a nominal value.

The flow rate will be adjusted, by varying the pump speed, to maintain an evaporator Delta T value defined by the user.

This is checked by the temperature sensors at the evaporator inlet and outlet.

The system reads the measured temperature values, calculates the corresponding Delta T, compares it with the setpoint value set by the user and then modulates the pump speed.

- This results in an increase in the flow rate if the Delta T° exceeds the setpoint.
- This results in a decrease in the flow rate if the Delta T° is less than the setpoint.

This modulation is limited only by the maximum and minimum flow rates for the unit and by the maximum and minimum allowable pump speeds.

The resulting Delta T° may, in certain cases, differ from the setpoint value:

- If the setpoint value is too high (corresponding to a flow rate lower than the minimum value or a frequency less than the minimum value), the system will be limited to the minimum flow rate or minimum frequency, which will result in a Delta T below the setpoint,
- If the setpoint value is too low (corresponding to a flow rate higher than the maximum value or a frequency greater than the maximum value), the system will be limited to the maximum flow rate or maximum frequency, which will result in a Delta T above the setpoint.

Adjustment procedure

Once the circuit is cleaned, stop the forced start of the pump and proceed to the configuration of the unit for the required control mode.

Modify the control parameters:

- Heat transfer medium flow rate control method (Delta T).
- Required Delta T value.
- If necessary, the control PID parameters can also be adjusted (refer to the control manual).

Variable-speed pump - Pressure differential control

The system flow rate has not been set to a nominal value.

This will be adjusted by the system, by varying the pump speed, to maintain a constant Delta P value defined by the user.

This is checked by the pressure sensors at the hydraulic module inlet and outlet.

The system calculates the value for the measured pressure difference, compares it with the setpoint value set by the user and then modulates the pump speed module accordingly.

- This results in an increase in the flow rate if the measurement is below the setpoint,
- This results in a decrease in the flow rate if the measurement exceeds the setpoint.

This modulation is limited only by the maximum and minimum flow rates for the unit and by the maximum and minimum allowable pump speeds.

The maintained Delta P may, in certain cases, differ from the setpoint value:

- If the setpoint value is too high (corresponding to a flow rate higher than the maximum value or a frequency greater than the maximum value), the system will be limited to the maximum flow rate or maximum frequency, which will result in a Delta P below the setpoint.
- If the setpoint value is too low (corresponding to a flow rate lower than the minimum value or a frequency less than the minimum value), the system will be limited to the minimum flow rate or minimum frequency, which will result in a Delta P above the setpoint,

Contact the manufacturer's service department to implement the procedures described below.

Adjustment procedure

Once the circuit is cleaned, place the hydraulic circuit in the configuration for which the unit selection was performed (generally all valves open and all cooling coils active).

Read the value of the flow on the user interface and compare it with the theoretical value of the range:

- If the flow rate read is greater than the specified value, reduce the Delta P setpoint on the user interface to decrease the flow rate value.
- If the flow rate read is less than the specified value, increase the Delta P setpoint on the user interface to increase the flow rate value.

Repeat until the unit's nominal flow rate at the required operation point is achieved.

Stop the forced operation of the pump and proceed to the configuration of the unit for the required control mode.

Modify the control parameters:

- Water flow rate control method (Delta P).
- Required Delta P set point.
- If necessary, the control PID parameters can also be adjusted (refer to the control manual).

NOTE: If, during adjustment, the low or high frequency limits are reached before reaching the specified flow rate, keep the pressure differential value at its lower or higher limit as the control set point.

If the user knows in advance the pressure differential value at the unit outlet, this value can be entered directly. You should not, however, avoid the sequence of cleaning the hydraulic circuit.

Variable- speed pump - Constant unit leaving pressure

The system flow rate has not been set to a nominal value.

This will be adjusted by the system, by varying the pump speed, to maintain a constant pressure value at the unit outlet, defined by the user.

This is checked by the pressure sensor at the unit outlet.

The system measures the pressure, compares it with the setpoint value set by the user and then modulates the pump speed module accordingly:

- This results in an increase in the flow rate if the measurement is below the setpoint,
- This results in a decrease in the flow rate if the measurement exceeds the setpoint.

This modulation is limited only by the maximum and minimum flow rates for the unit and by the maximum and minimum allowable pump speeds.

The maintained LWP (Leaving Water Pressure) value may, in certain cases, differ from the setpoint value:

- If the setpoint value is too high (corresponding to a flow rate higher than the maximum value or a frequency greater than the maximum value), the system will be limited to the maximum flow rate or maximum frequency, which will result in a leaving water pressure below the setpoint,
- If the setpoint value is too low (corresponding to a flow rate lower than the minimum value or a frequency less than the minimum value), the system will be limited to the minimum flow rate or minimum frequency, which will result in a leaving water pressure greater than the setpoint.

Contact the manufacturer's service department to implement the procedures described below.

Adjustment procedure

Once the circuit is cleaned, place the hydraulic circuit in the configuration for which the unit selection was performed (generally all valves open and all cooling coils active).

Read the value of the flow on the user interface and compare it with the theoretical value of the range:

- If the flow rate read is greater than the specified value, reduce the leaving water pressure setpoint on the user interface to reduce the flow rate value;
- If the value of the flow is lower than the specified value, increase the leaving water pressure setpoint on the user interface to increase the value of the flow.

Repeat until the unit's nominal flow rate at the required operation point is achieved.

Stop the forced operation of the pump and proceed to the configuration of the unit for the required control mode.

Modify the control parameters:

- Water flow rate control method (fixed pressure),
- Required LWP value,
- If necessary, the control PID parameters can also be adjusted (refer to the control manual).

NOTE: If, during adjustment, the low or high frequency limits are reached before reaching the specified flow rate, keep the outlet pressure value at its lower or higher limit as the control set point.

12.9.3.2 - Additional Hydraulic Components

Heat Transfer Medium Pump

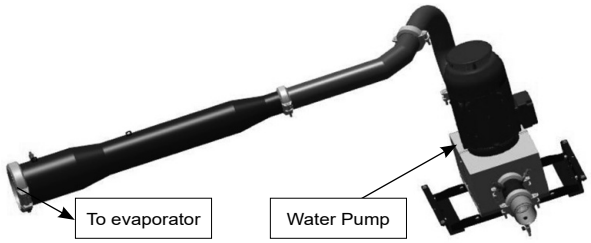
The units with option 116V are equipped with a single variable speed pump. The pump has an air vent. The pump maximum frequency is 50Hz.

Pump	Module	0750	0900	1000
LNE 65-160-75 SPC	A	-	-	-
LNEE 80-160-110	A	-	-	-
LNEE 80-160-150	A	1	1	1

Pump	Module	1700	1800	1900	2000	2100
LNE 65-160-75 SPC	A	-	-	-	-	-
	B	-	-	-	-	-
LNEE 80-160-110	A	-	-	-	-	-
	B	-	-	-	-	-
LNEE 80-160-150	A	1	1	1	1	1
	B	1	1	1	1	1

Steel Piping

The units with option 116V are equipped with piping to channel water from the pump outlet to the heat exchanger chilling the heat transfer medium.



Moreover, for duplex units, each module is equipped with steel piping integrated within the units to allow water flow:

- From the module B pump outlet to the module A shell-and-tube evaporator inlet,
- From the module A shell and tube evaporator outlet to the module B shell and tube evaporator inlet.

Nevertheless, piping linking modules outside the modules of a duplex unit remains the property of the customer and therefor is not taken account in the volume of the hydraulic loop in the unit as well as for the unit pressure drop calculation.

Other Hydraulic Components

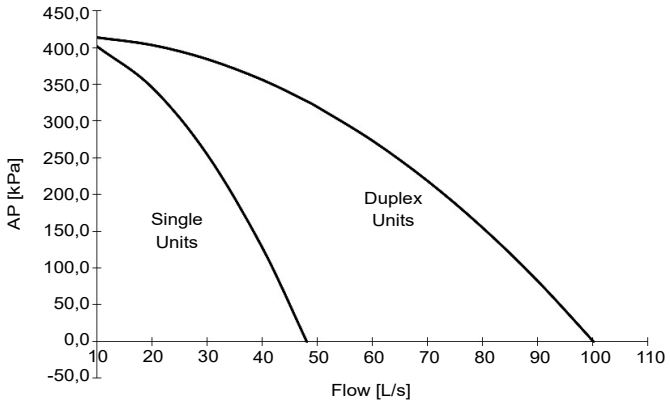
The units are equipped with the following additional components integrated in the unit hydraulic circuit:

- One screen filter 1.2mm mesh,
- One relief valve,
- One water drain tap,
- 2 pressure sensors: One upstream and one downstream of the pump.

12.9.3.3 - Hydraulic System

Units Available Pressure Curves

Units + Option 116V - Available Pressure



Units Hydraulic Data

30XF-Z Single Units + Option 116V		0750	0900	1000
Volume in the unit	L	270	270	270

30XF-Z Duplex Units + Option 116V		1700	1800	1900	2000	2100
Volume in the unit	L	615	640	657	657	676

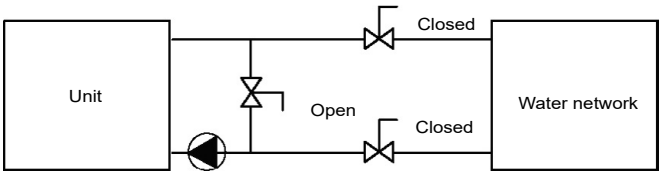
Additional Units Hydraulic Notes

When filling with heat-transfer medium, remember to vent the air contained in the pump body. Otherwise, there is a risk that the pump will deteriorate prematurely.

12.9.3.4 - Heat Transfer Medium

Frost protection

Protecting units with option 116V against frost requires water circulation in the hydraulic circuit. The unit pump will start up automatically at regular intervals. If the system is isolated by a valve, it is imperative to install a bypass as indicated below:



If the unit is equipped with the option 116V, do not use an antifreeze solution concentrated higher than 40%.

In case where it is not possible to put an antifreeze solution or to drain the hydraulic installation, the units can be equipped with heaters to protect the hydraulic components against frost (option 41B if option 116V is present).

Pump cavitation protection

To ensure the durability of pumps fitted within the integrated hydraulic modules, the control algorithm for units includes protection against cavitation.

It is therefore necessary to ensure a minimum pressure at the pump inlet both when shut down and during operation.

A pressure below the predefined threshold will prevent unit start-up or will cause an alarm and shutdown.

Before complete shutdown following an alarm, the user interface will give an advance warning that this threshold has been exceeded.

To obtain an adequate pressure, it is recommended:

- That the hydraulic circuit is pressurized between 100 kPa (1 bar) and 400 kPa (4 bar) maximum at the pump inlet,
- That the hydraulic circuit is cleaned when filled with water or when modified,
- That the screen filter is cleaned regularly.

12.9.4 - System Control Data

12.9.4.1 - Additional Control Components

Additional Flow switches for Dual Module Units

For dual module units, a flow switch is added at the outlet of the pump of each module.

12.9.4.2 - System Controller

Water Flow Rate Calculation

Units equipped with the hydraulic module allow direct monitoring of the flow rate via the unit's user interface (see control manual).

The fluid pressure is measured by pressure sensors installed at the pump inlet and at the unit outlet. The system calculates the flow rate corresponding to the measured differential pressure.

These values are given as an indication to the user and may vary depending on the fouling of the hydraulic circuit and the correct operation of the pump. The manufacturer is not responsible for the accuracy of this information.

12.9.5 - Additional System Maintenance & Repair

12.9.5.1 - Hydraulic Maintenance & Repair

Level 2 maintenance

Replace the packing around the pump body after 20,000 hours of operation and the bearings after 20,000 hours.

Hydraulic Circuit Cleaning

- Start-up the system pump by using the forced start command.
- Control the frequency to the maximum value to generate the highest possible flow.
- If there is a ‘‘Maximum flow exceeded’’ alarm, reduce the frequency until an acceptable value is reached.
- Read the value of the flow on the user interface.
- Follow the standard procedure for the hydraulic circuit cleaning.

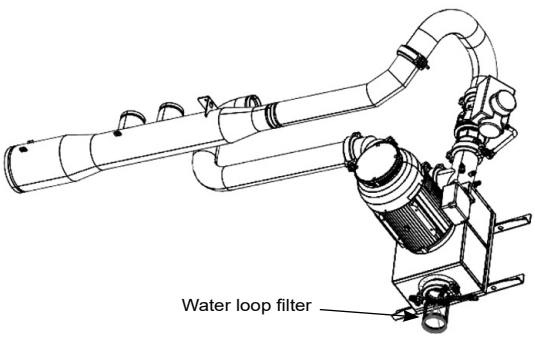
Hydraulic Filter Maintenance

A filter with a mesh size of 1.2mm is factory fitted at the pump inlet to protect the circuit from any contamination. During system start-up, after a few hours of operation, it is recommended that the cleanliness of the filter is checked to ensure no debris was caught in the mesh.

The filters do not have any operating requirements. However, the mesh must be cleaned or changed as necessary.

Filter replacement procedure:

1. Purge the water loop,
2. Unscrew the clamp (4) and remove the clamp (3),
3. Swivel the piping so that the filter can be accessed,
4. Clean the filter with water or replace it if needed,
5. The cleaning frequency for the filter depends on the degree of soiling in the network,
6. Refit the clamps and tighten. For the tightening torques of the screws, nuts and bolts, refer to table 10.4– Tightening Torques,
7. Check that the clamps are correctly sealed,



12.10 - Option 152P: Remote Pump Control

The installation nominal heat transfer medium flow rate adjustment will be performed following procedures described in 12.10.1.1.3– Installation Nominal Flow Rate Adjustment is the pump is variable speed.

12.11 - Option 232: Capacity Booster

12.11.1 - System Electrical Data

12.11.1.1 - Electrical System

Unit Electrical Data

30XF-Z Units + Option 232		0750	0900	1000	1700	1800	1900	2000	2100
Input power(1)									
Maximum operating input power(2)	kW	330	335	339	647	651	655	659	663
Operating current draw(1)									
Maximum Current (Un)(2)	A	526	533	540	1031	1038	1045	1051	1058
Maximum Current (Un-10%)	A	526	533	540	1031	1038	1045	1051	1058
Start-up current(1)									
Maximum Current (Un)(5)	%	80	80	80	597	604	604	611	611

(1) Values obtained at operation with maximum operating input power.
(2) Values given on the unit nameplate.
(5) Starting current of the smallest compressor + Operating current of the biggest compressor + Fan current.

12.11.2 - System Thermodynamic Data

12.11.2.1 - Thermodynamic System

30XF-Z Single Units		0750	0900	1000
Unit Minimum Part Load(1)	%	18	18	18

30XF-Z Duplex Units		1700	1800	1900	2000	2100
Unit Minimum Part Load(1)	%	9	9	9	9	9

(2) For standard conditions. Depending on operating conditions, units might have a different minimum part load or cycle.

12.12 - Options 262 / 263: Coils Coating

12.12.1 - System Aeraulic Data

12.12.1.1 - Aeraulic Components

Coils air side

Corrosion

E-coat and TCP treatments (options 262 and 263) protect against aluminum corrosion in aggressive environment.

NOTE: The ageing of the coils depends on external conditions.

12.13 - Option 284: 230V Electrical plug

12.13.1 - System Electrical Data

12.13.1.1 - Electrical Connections

Field installed control wiring

As an option, a second CT transformer also supplies the 230V 50 Hz circuit provided to charge a laptop battery, maximum of 0.80 A. This is connected using a CEE 7/17 standard, type E socket. An earth leakage switch provides this circuit with additional protection. Its cut-off setting is 10 mA.

12.14 - Option 295+: Ultra fast capacity Recovery

When option Ultra-fast recovery is present, the Touch Pilot is supplied at 24Vdc by a capacity module that keeps the supply after input voltage is switched OFF during 10 minutes. This will avoid resetting delay of the Touch Pilot when power supply is back and therefore allow the unit to be back at its original operating state within 3 minutes.

When the capacity module is fully unloaded, 15 minutes delay maximum shall be considered after unit power supply is switched ON to have the module fully loaded. **The duration of 10 minutes for buffer supply is guaranteed only after the capacity module is fully loaded.**

When the capacity module is fully loaded, a duration of up to 4 hours shall be considered before it is fully unloaded if no power consuming device is present.

CAUTION: In case of access to the cabinet that encloses the capacity module, consider the occurrence of stored energy as well as 24 Vdc even if power supply has been switched OFF. Energy is present in the capacitor that are fitted inside the capacity module and voltage is present inside as well as outside on 24 Vdc circuit between the capacity module and the Touch Pilot.

Occurrence of stored energy as well as 24 Vdc voltage creates some hazards in case of careless handling?. Particularly: Arcing, burst, electric shock in wet environment.

Module state can be checked through LED that are present on front side of the device.

Status LED			Description
Uin OK (green)	READY (green)	ALARM (red)	
○	○	○	Device off
●	●	●	Initialization, LED test (~3s)
●	●	○	Main operations, buffer is ready. The SOC(1) of the capacitors is below READY threshold.
-	● 50%	○	Main operations, charging process. The SOC(1) of the capacitors is below READY threshold.
-	● 50%	●	Main operations, ALARM. The SOC(1) of the capacitors is below READY threshold.
-	●	●	Main operations, ALARM. The SOC(1) of the capacitors is below READY threshold.
○	●	○	Buffer mode.
-	●	●	Buffer mode, ALARM due to over temperature >70°C
-	○	●	Buffer mode, ALARM
-	○	●	Start-up, ALARM
● 90%	●	○	Main operations, REMOTE contact shorted to SGnd, buffer is READY
-	● 50%	○	Main operations, REMOTE contact shorted to SGnd, charging in process
● 10%	● 50%	○	Main operations, REMOTE contact shorted to SGnd or output delay on enable, charging process OR CAP is fully charged(2)
-	● 50%	●	Main operations, REMOTE contact shorted to SGnd or output delay on enable, charging process OR READY, ALARM
○	○	● 50%	The device is locked due to over temperature less or higher than 80°C. No input, the device output is OFF.
●	○	● 50%	The device is locked. The temperature is less than 80°C. The device output in ON.
● 10%	○	● 50%	The device is locked. The temperature is less or higher than 80°C, or BYPASS function is disabled. The device output is OFF.

(1) SOC: State of charge
(2) Delay for the flashing READY LED max 10 sec.

12.15 - Option 298A: BluEdge Digital (Connectivity embedded)

Description:

The connectivity system is composed of a modem and an antenna with GPS localization that transmit the machine's operating data in real time via a 4G LTEM.

Modem precautions:

Do not:

Operate the Sierra Wireless product in areas where blasting is in progress, near medical equipment, near life support equipment, or any equipment which may be susceptible to any form of radio interference. In such areas, the Sierra Wireless product MUST BE POWERED OFF. The Sierra Wireless product can transmit signals that could interfere with this equipment.

For information:

The connectivity can start the machine only if it is in **network** mode. If there is a technician on site who prefers to start or stop the machine by pressing the "ON/OFF" button of the PIC 6 display, the control is no longer in **network** mode but in **local** mode. When the operator is in local mode the option is no longer capable to start the machine remotely. (While the machine is in local mode, the option is in monitoring mode.)

Antenna precautions:

Do not:

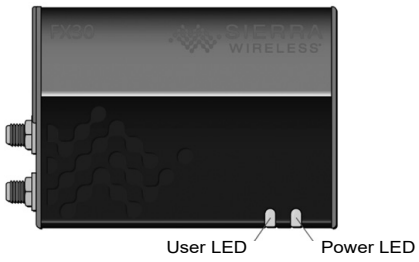
- Operate the transmitter when someone is within 20 cm of the antenna.
- Operate the equipment in an explosive atmosphere.
- Attempt to install the antennas without the proper safe equipment to access the install location.
- Install the antenna near overhead power lines.
- Chew parts or put them in mouth, keep away from unsupervised children.
- Cover the antenna in order to have a good signal.
- Place objects next to the antenna in order to have a good signal.

Activation of the connectivity:

Contact your Connectivity Service to ask the commissioning of the connectivity system included in your chiller. If the activation has not been done, the system will not send any data from the machine.

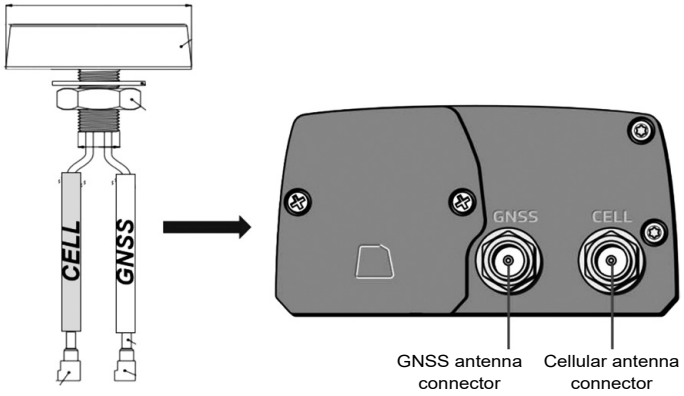
Modem LEDs to check the GSM signal:

LED Behavior



LED	Color/Pattern	Description
Power LED	Off	No power or input voltage ≥ 32 VDC or ≤ 4,75 VDC
	Solid Red	Gateway is powered on, not attached to cellular network.
	Solid Amber	Attached to cellular network.
User LED	Green	Good network signal
	Amber	Correct/Poor network signal
	RED	No signal

Technicals specifications:



Modem (FX30S LTE-M)	
POWER VOLTAGE	DC 4,75V to 32V
POWER CONSUMPTION	
Ignition Off	400 µW
Ultra-Low Power Mode	2 mW
Idle mode	0,4W
4G LTE max	3,2 W, burst 7,5W (USB at 110Mbps and Serial continuous)
Radio Module	WP7702
WEIGHT	158g
ENVIRONEMENTAL	
Operational Temperature (Class B)	30°C to +75°C
Humidity	95% relative humidity over a temperature range of +20°C to +60°C

Antenna (LGP-7-38-03RSP & LGP-7-38-1-2SP)	
Operating temperature	-40° / +85°C (-40° / 185°F)
Material	ASA

12.16 - Option 305A: Free Cooling

12.16.1 - System Structural & Acoustical Data

12.16.1.1 - Structural & Acoustical System

Units Physical Data

30XF-Z Single Units + Option 305A		0750	0900	1000
Weights				
Operating weight(1)	kg	7489	7988	8513

30XF-Z Duplex Units + Options 305A		1700	1800	1900	2000	2100
Weights						
Operating weight(1)	kg	14704	15288	15833	16527	17198

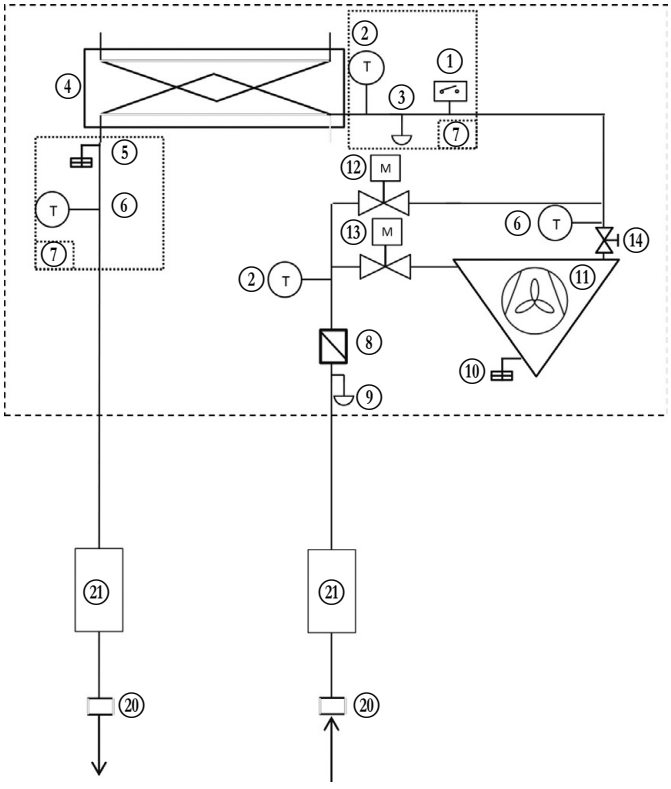
(1) Values are guidelines only. Refer to the unit name plate.

12.16.2 - System Hydraulic Data

12.16.2.1 - Hydraulic Connections

Units Hydraulic Circuit Diagram

1 Module



Legend

Unit Hydraulic Components

1. Flow rate sensor
2. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger inlet (see Control Manual)
3. Water purge on water box
4. Water heat exchanger
5. Air bleed on water box
6. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger outlet (see Control Manual)
7. Water box
8. Screen filter (particle size of 0.7mm)
9. Water drain tap
10. Air bleeds on each Free Cooling coil
11. Free Cooling coils
12. Motorized valve to by-pass Free Cooling coils.
13. Motorized valve to allow water flow within Free Coling coils.
14. Shut-off valve to isolate Free Cooling coils.

Customer Loop Minimum Additional Components

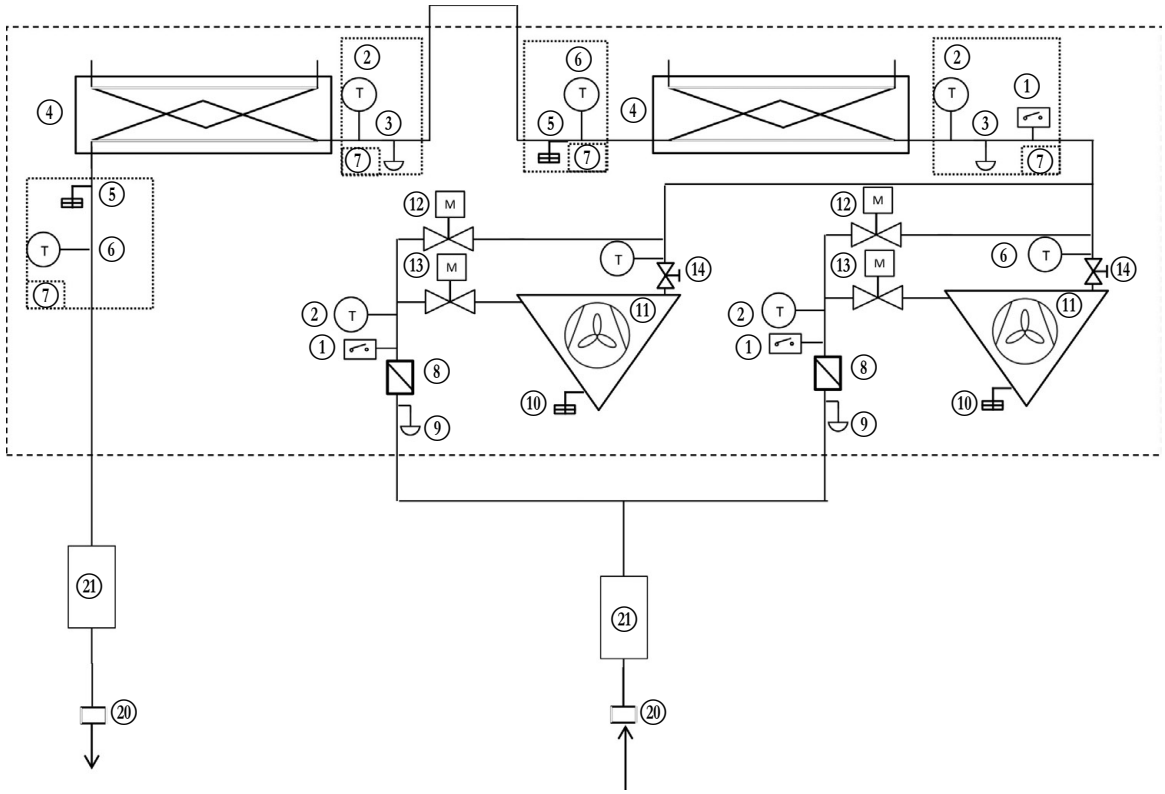
20. Flexible Connection
21. See Standard Units Hydraulic PID

- - - - - Unit Hydraulic Components

NOTES:

- **A glycol based solution must be used as heat transfer medium. Glycol type and percentage must be adapted to the lowest predictible temperature on the installation site.**

2 Modules



Legend

Unit Hydraulic Components

1. Flow rate sensor
2. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger inlet (see Control Manual)
3. Water purge on water box
4. Water heat exchanger
5. Air bleed on water box
6. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger outlet (see Control Manual)
7. Water box
8. Screen filter (particle size of 0.7mm)
9. Water drain tap
10. Air bleeds on each Free Cooling coil
11. Free Cooling coils
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14. Shut-off valve to isolate Free Cooling coils.

Customer Loop Minimum Additional Components

20. Flexible Connection
21. See Standard Units Hydraulic PID

- - - - - Unit Hydraulic Components

NOTES:

- **A glycol based solution must be used as heat transfer medium. Glycol type and percentage must be adapted to the lowest predictible temperature on the installation site.**

Piping Diameters & Connections Type

See section 12.10.1.1.2– Piping Diameters & Connections Type.

Installation Nominal Flow Rate Adjustment

As glycol may create more foam than pure water, purging operations might be required to be repeated many times.

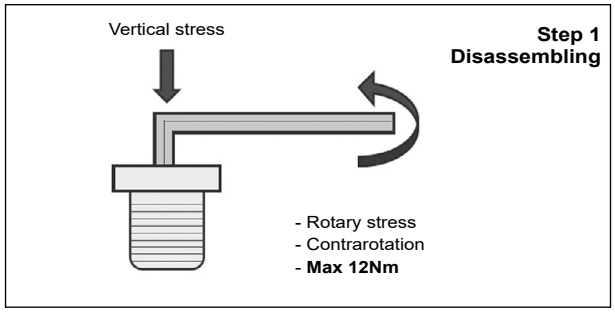
12.16.2.2 - Additional Hydraulic Components

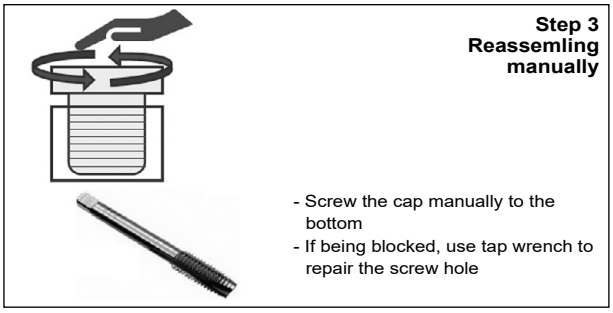
Free Cooling Coils

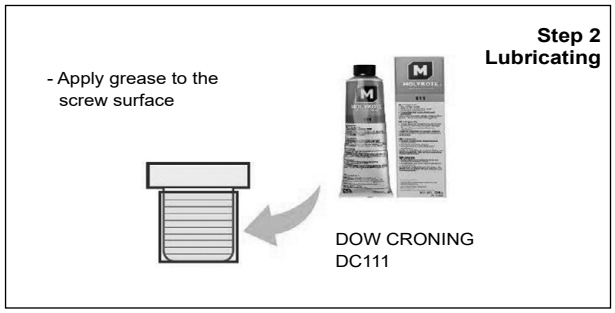
Procedure for Venting Air via Bleed Caps on Free Cooling Coils.

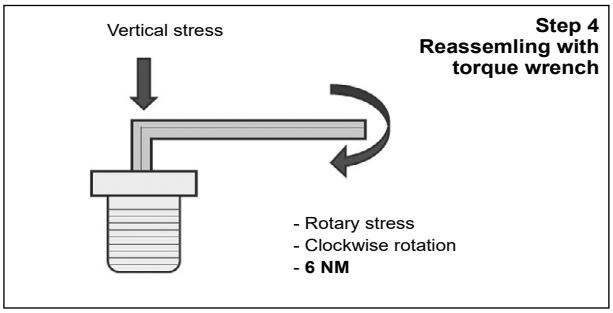
IMPORTANT: Free cooling coils bleed caps:

- ***Use a 6 mm torque wrench to open free cooling coils purge caps and not any other tool.***
- ***Do not strain too much free cooling coils purge caps. It is not required to open all of them to make an air purge on the glycol loop.***
- ***To open free cooling coils purge caps, follow the next steps:***









Motorized Valves

Each module is equipped with two 24VAC motorized valves allowing switching between the three cooling modes of the machine: Free cooling, mixed free cooling or mechanical cooling.

Manual Valves

Each module is equipped with a manual valve. It is possible to isolate free cooling coils closing the relevant motorized valve.

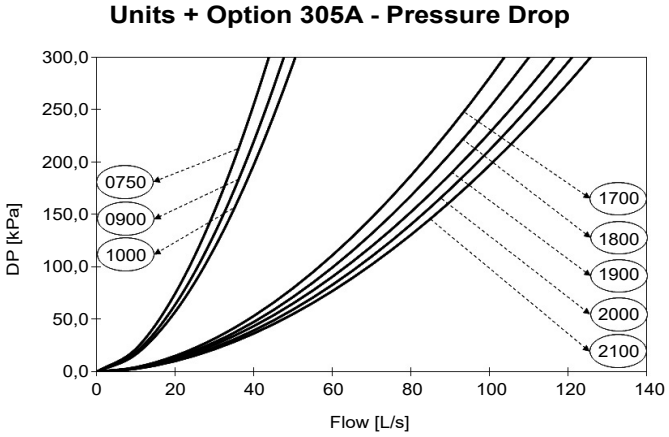
Other Hydraulic Components

The units are equipped with the following additional components integrated in the unit hydraulic circuit:

- One screen filter 0.7mm mesh,
- One water drain tap.

12.16.2.3 - Hydraulic System

Units Pressure Drop Curves



Units Hydraulic Data

30XF-Z Single Units + Option 305A		0750	0900	1000
Volume in the unit	L	556	603	649
Free Cooling Coils Quantity		10	12	14

30XF-Z Duplex Units + Option 305A		1700	1800	1900	2000	2100
Volume in the unit	L	1199	1271	1335	1381	1447
Free Cooling Coils Quantity		20	22	24	26	28

Additional Units Hydraulic Notes

When filling with heat-transfer medium, remember to vent the air. Otherwise, there is a risk that performances won't be reached and equipment will deterioarate prematurely.

12.16.2.4 - Heat Transfer Medium

Free Cooling Coils Corrosion Protection

With the hydraulic free cooling option, a glycol-based solution (EG or PG) must be used to exchange heat with air through MCHE coils made of aluminum. Those solutions contain corrosion inhibitors to protect the aluminum from being corroded.

It is strongly recommended that the loop is analyzed each year to ensure there are still enough inhibitors. Please see 12.19.4.1.1– Free Cooling Coils Corrosion Protection for periodicity of inhibitors refill.

WARNING:

- ***Carrier does not recommend making glycol-based solution diluting glycol within pure water. Indeed, that would dilute inhibitors which would decrease their concentration and quantity within the brine loop.***
- ***Carrier recommends directly buying glycol-based solution at the right glycol concentration which will contain the right concentration of inhibitors and help keeping the required quantity of inhibitors in the brine loop.***

Free Cooling Coils Frost Protection

To prevent the risks of freezing the coils when operating in low temperature environments, the units equipped with the free cooling option must be protected with a glycol-based antifreeze solution as for the heat transfer medium.

The unit is delivered without the heat transfer medium. When filling with it, ensure that the two motorized valves are open, along with the manual valve, to guarantee that it is correctly distributed within the unit.

If the customer loop requires testing or flushing with water, ensure that the free cooling coils are isolated (the motorized valve and the manual valve are closed) to prevent water from returning to the free cooling micro-channel coils.

WARNING:

- ***Never fill free cooling coils with pure water. Always fill the glycol loop directly with a glycol-based solution. In case of cold temperatures, water could freeze, and the free cooling coils explode from inside.***
- ***The circuit of the free cooling water coils does not allow the coil to be completely drained. Thus, when storing the machine or shutting down for a long period without power, it is necessary to fill the batteries with an antifreeze solution.***

If water is introduced, drain the unit using the bleed caps and the drain valves at the low point in the free cooling manifolds. Then add a glycol-based antifreeze solution to protect the unit from freezing.

The glycol freeze point depends on its concentration. The glycol concentration must be chosen in order to avoid glycoled water freeze in the hydraulic loop.

NOTE: If the manufacturer's recommendations are not respected, there is a risk of damage to the equipment.

Free Cooling Coils Fouling

To avoid risks of free cooling coils fouling, a screen filter is supplied at 0.7mm mesh and not 1.2mm mesh when option 305A is present.

12.16.3 - System Thermodynamic Data

12.16.3.1 - Thermodynamic System

Free Cooling Operation Principle

The unit SmartVu™ control maximises the use of the free cooling based on the needs of the application and the climate conditions. Once the chilled water/ambient air temperature differential exceeds the threshold value by 2K, the SmartVu™ control activates free cooling and adjusts the air flow rate to optimize the unit's energy performance. If the operating conditions enables the free cooling to operate on its own to meet the requirements, the compressors are stopped. A motorized valve directs the chilled water to the free cooling coils.

There are three operating modes:

Warm weather season: Mechanical cooling mode

The liquid chiller meets the needs traditionally using the refrigerant circuit. The fluid bypasses the free cooling coils and is cooled in the evaporator.

Mid-season: Combination mode

It is possible to operate with free cooling and mechanical cooling modes combined. This helps to optimize free cooling operations while covering the system's cooling requirements. The fluid is pre-cooled by the free cooling coils positioned in series with the refrigerant circuit evaporator which finalizes cooling the fluid.

Cold weather season: Free cooling mode

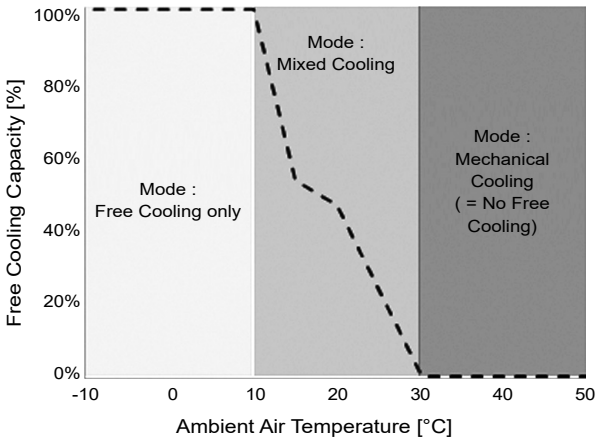
Depending on the capacity requested and the setpoint, all the requirements may be fulfilled by the free cooling in this operating mode with the fans running, thereby ensuring optimum energy efficiency.

Operating principle:

The unit includes a hydraulic free cooling system. Depending on the conditions, the unit adjusts its operating mode to ensure the best efficiency.

The following example shows the three operating modes depending on the ambient temperature for a water inlet at 30°C.

Free Cooling Operation Modes



Free cooling only mode: Cooling capacity is adjusted with fan speed regulation only. This mode activates to have the best efficiency for the unit and when compressor activation is no longer needed.

Mixed mode: Cooling capacity is managed by compressor speed while maximizing the use of ambient air to cool part of the need.

No free cooling mode: Cooling capacity is managed by compressor speed only. There is no free cooling possible because ambient air temperature is higher than water loop conditions.

The switch between modes is managed by the control of the unit.

12.16.4 - System Control Data

12.16.4.1 - Additional Control Components

Additional Flow switches for Dual Module Units

See 12.10.3.1.1– Additional Flow switches for Dual Module Units.

12.16.5 - Additional System Maintenance & Repair

12.16.5.1 - Hydraulic Maintenance & Repair

Free Cooling Coils Corrosion Protection

The table below gives the maximum period after which it is necessary to top up the glycol-based solution to refill inhibitors (based on a percentage of inhibitors of 6% within glycol):

Maximum number of year between two corrosion inhibitors top-ups:

30XF-Z Units + Option 305A		Free Cooling Coils Quantity connected to the hydraulic loop													
		2	4	6	8	10	12	14	16	18	20	22	24	26	28
Total volume in the hydraulic loop (Unit + Customer) [L]		Glycol 20%(1)													
	500	3	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
	1000	6	3	2	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
	2500	>15	8	5	4	3	3	2	2	2	(2)	(2)	(2)	(2)	(2)
	5000	>15	>15	11	8	6	5	5	4	4	3	3	3	2	2
	10000	>15	>15	>15	>15	13	11	9	8	7	6	6	5	5	5
	15000	>15	>15	>15	>15	>15	>15	14	12	11	10	9	8	7	7
		Glycol 30%(1)													
	500	5	2	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
	1000	10	5	3	2	2	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
	2500	>15	12	8	6	5	4	3	3	3	2	2	2	2	(2)
	5000	>15	>15	>15	12	10	8	7	6	5	5	4	4	4	3
	10000	>15	>15	>15	>15	>15	>15	14	12	11	10	9	8	7	7
	15000	>15	>15	>15	>15	>15	>15	>15	>15	>15	14	13	12	11	10
		Glycol 45%(1)													
	500	7	4	2	2	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
	1000	14	7	5	4	3	2	2	2	(2)	(2)	(2)	(2)	(2)	(2)
	2500	>15	>15	12	9	7	6	5	4	4	4	3	3	3	3
	5000	>15	>15	>15	>15	14	12	10	9	8	7	6	6	5	5
	10000	>15	>15	>15	>15	>15	>15	>15	>15	>15	14	13	12	11	10
	15000	>15	>15	>15	>15	>15	>15	>15	>15	>15	>15	>15	>15	>15	>15

(1) Renewed EG or PG.
(2) Volume too low.

30XF-Z Units + Option 305A		Volume of inhibitor to add after x(2) years, as a proportion to the total volume in the loop:
Glycol [%](1)	20	0,8%
	30	1,2%
	45	1,8%

(1) Renewed EG or PG.
(2) See previous table.

Example:

If the loop contains 2500L, comprising EG30%, for a unit with 6 free cooling coils, then it is necessary to add 30L (2500(1)1.2%) of corrosion inhibitor every 8 years.

The corrosion inhibitors to be used are dipotassium hydrogen phosphate type inhibitors. Only use products compatible with aluminum. It is not recommended that the glycol is diluted to obtain the desired concentration, so as to not reduce the original quantity of corrosion inhibitors.

Open loops are prohibited.

Formula equivalent to table 1: X = (V(1)P) / (1578(1)N)

X: Number of years between two corrosion top-ups

V: Total volume in the loop [L]

P: Glycol concentration [%]

N: Total number of free cooling coils connected to the water loop

Formula equivalent to table 2: I = (V(1)P) / (2500(1)N)

I: Volume of inhibitor to be added after X years [L]

V: Total volume in the loop [L]

P: Glycol concentration [%]

12.16.5.2 - Aeraulic Maintenance & Repair

Free Cooling Coils Inspection & Cleaning

See 10.6.1– Coils (Air heat exchanger) Cleaning.

In case option 305A is present, free cooling coils are placed in front of condensing coils. The process described in 10.6.1 could be applied to the free cooling coil external surface and the condensing coil internal surface.

Space between free cooling and condensing coils should also be cleaned.

12.17 - Option 305C: Free Cooling Glycol Free

The aim of that option is to avoid use of glycol in the full customer loop. To do so, water does not flow into FC coils but in a BPHE. An internal loop is filled with glycoled water which flows through the FC coils and the GF BPHE. It enables heat transfer from water to glycol in the GF BPHE and from glycol to air in the FC coils.

12.17.1 - System Structural & Acoustical Data

12.17.1.1 - Structural & Acoustical System

Units Physical Data

30XF-Z Single Units + Option 305C		0750	0900	1000
Weights				
Operating weight(1)	kg	8064	8564	9092

30XF-Z Duplex Units + Options 305C		1700	1800	1900	2000	2100
Weights						
Operating weight(1)	kg	15859	16437	16980	17571	18236

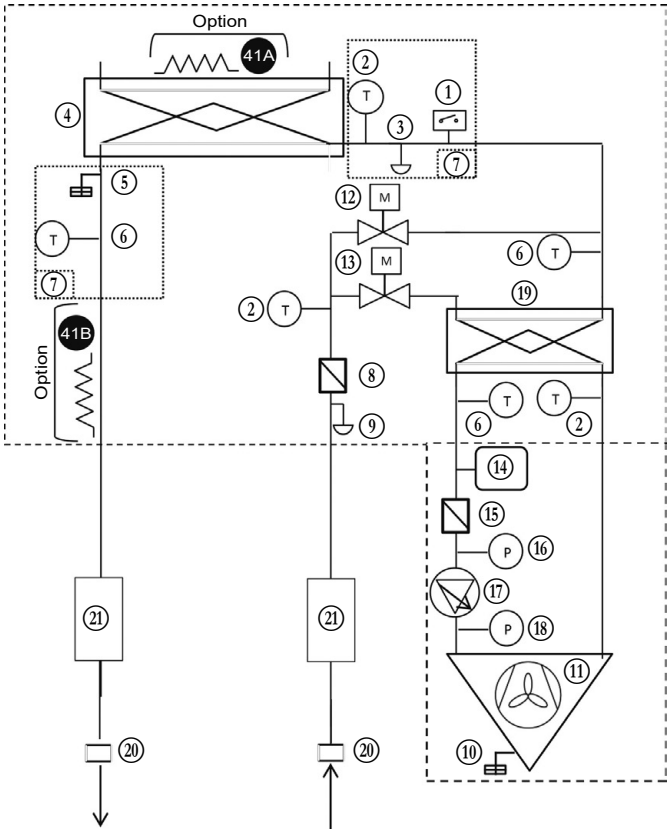
(1) Values are guidelines only. Refer to the unit name plate.

12.17.2 - System Hydraulic Data

12.17.2.1 - Hydraulic Connections

Units Hydraulic Circuit Diagram

1 Module



Legend

Unit Hydraulic Components

1. Flow rate sensor
2. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger inlet (see Control Manual)
3. Water purge on water box
4. Water heat exchanger
5. Air bleed on water box
6. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger outlet (see Control Manual)
7. Water box
8. Screen filter (particle size of 1.2mm)
9. Water drain tap
10. Air bleeds on each Free Cooling coil
11. Free Cooling coils
12. Motorized valve to by-pass Free Cooling coils.
13. Motorized valve to allow water flow within Free Coling coils.
14. Expansion Vessel on glycol loop.
15. Screen filter (particle size of 0.7mm)
16. Temperature sensor
    NOTE: Provides pressure measurement at the pump suction (see Control Manual)
17. Variable speed pump
18. Pressure sensor
    NOTE: Provides pressure measurement at the pump discharge (see Control Manual)
19. Free Cooling Glycol Free BPHE

Customer Loop Minimum Additional Components

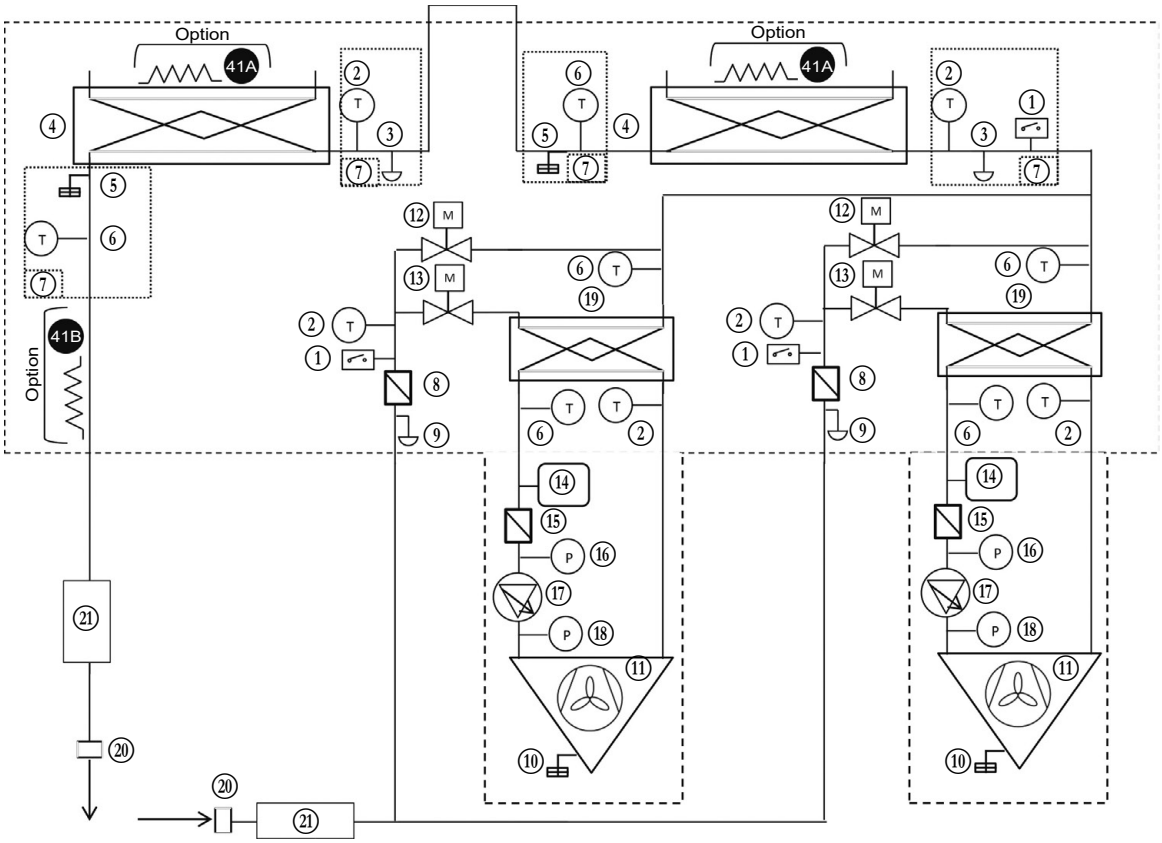
20. Flexible Connection
21. See Standard Units Hydraulic PID

- - - - - Unit Hydraulic Components

NOTES:

- **A glycol based solution must be used as heat transfer medium. Glycol type and percentage must be adapted to the lowest predictible temperature on the installation site.**

2 Modules



Legend

Unit Hydraulic Components

1. Flow rate sensor
2. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger inlet (see Control Manual)
3. Water purge on water box
4. Water heat exchanger
5. Air bleed on water box
6. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger outlet (see Control Manual)
7. Water box
8. Screen filter (particle size of 1.2mm)
9. Water drain tap
10. Air bleeds on each Free Cooling coil
11. Free Cooling coils
12. Motorized valve to by-pass Free Cooling coils.
13. Motorized valve to allow water flow within Free Coling coils.
14. Expansion Vessel on glycol loop.
15. Screen filter (particle size of 0.7mm)
16. Temperature sensor
    NOTE: Provides pressure measurement at the pump suction (see Control Manual)
17. Variable speed pump
18. Pressure sensor
    NOTE: Provides pressure measurement at the pump discharge (see Control Manual)
19. Free Cooling Glycol Free BPHE

Customer Loop Minimum Additional Components

20. Flexible Connection
21. See Standard Units Hydraulic PID

- - - - - Unit Hydraulic Components

NOTES:

- **A glycol based solution must be used as heat transfer medium. Glycol type and percentage must be adapted to the lowest predictible temperature on the installation site.**

Piping Diameters & Connections Type

See section 12.10.1.1.2– Piping Diameters & Connections Type

12.17.2.2 - Additional Hydraulic Components

When option 305C is selected, there are two hydraulic loops:

- A water loop that enables heat transfer with water as heat transfer medium for the customer loop,
- An internal glycol loop that enables Free Cooling without using glycoled water within customer loop directly.

A BPHE (called GF BPHE for Glycol Free Brazed Plates Heat Exchanger) enables heat transfer between water and glycol loop. Glycol exchanges heat with air within Free Cooling Coils, same as option 305A.

Water Loop

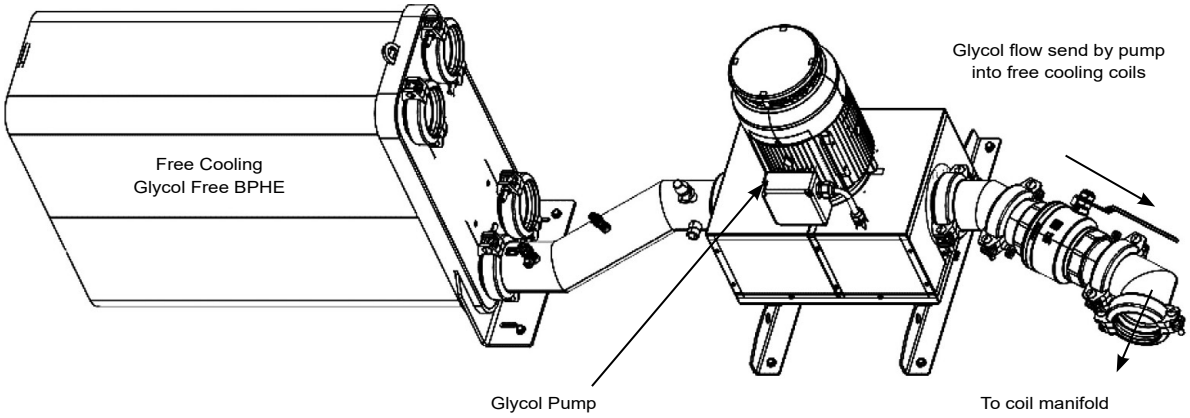
The water loop is composed of:

- A screen filter 1.2mm,
- A drain tap,
- Air bleeds,
- A BPHE,
- Steel piping.

Glycol Loop

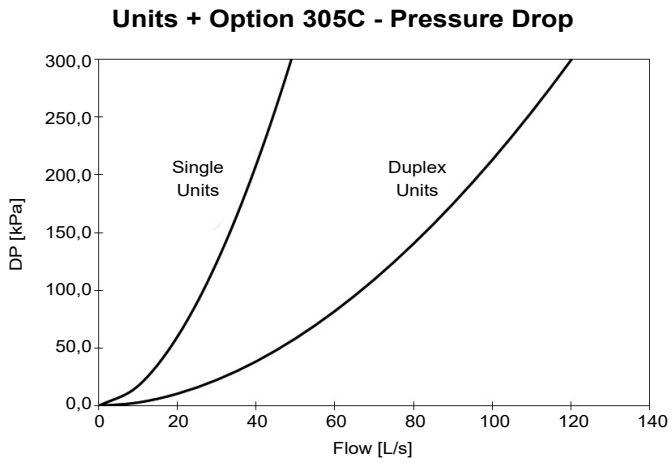
The glycol loop is composed of:

- A relief valve,
- An expansion vessel,
- A screen filter 0.7mm,
- A drain tap,
- Air bleeds,
- A variable speed pump,
- Pressure & Temperature sensors,
- A BPHE,
- Free Cooling Coils,
- Steel piping.



12.17.2.3 - Hydraulic System

Unit Water Loop Pressure Drop Curves



Unit Hydraulic Data

30XF-Z Single Units + Option 305C		0750	0900	1000
Volume in the unit - water side	L	375	375	375
Volume in the unit - glycol side	L	342	389	435
Max. operating pressure - glycol side	kPa	1000	1000	1000
Free Cooling Coils Quantity		10	12	14

30XF-Z Duplex Units + Options 305C		1700	1800	1900	2000	2100
Volume in the unit - water side	L	837	862	880	880	899
Volume in the unit - glycol side - Module A	L	342	389	389	389	435
Volume in the unit - glycol side - Module B	L	342	342	389	435	435
Max. operating pressure - glycol side - Module A	kPa	1000	1000	1000	1000	1000
Max. operating pressure - glycol side - Module B	kPa	1000	1000	1000	1000	1000
Free Cooling Coils Quantity - Module A		10	12	12	12	14
Free Cooling Coils Quantity - Module B		10	10	12	14	14

Additional Units Hydraulic Notes

After the unit was handled and positioned, it is required to be filled with glycol.

Please apply 12.10.1.3.3– Additional Units Hydraulic Notes to the pump on the glycol loop.

Once the glycol loop is filled, it is required to be purged from air. Indeed, glycol foams which decreases free cooling performances and reliability of the pump. To do that, use bleeds caps located on free cooling coils and on the pump body as well as purges located on free cooling manifolds and on the BPHE glycol side inlet.

12.17.2.4 - Heat Transfer Medium

Free Cooling Coils Fouling

To avoid risks of free cooling coils fouling, the screen filter on glycol loop should be 0.7mm.

Free Cooling Coils Frost Protection

See section 12.19.1.4.2– Free Cooling Coils Frost Protection.

WARNING: The internal glycol loop must never contain water but always glycoled water in order to avoid water freeze leading to coil burst. Carrier warranty may be voided if this rule is not respected.

Glycol Free BPHE Frost Protection

There is a heater on the glycol Free BPHE in order to avoid water freeze within it when the unit is not in operation.

The glycol freeze point depends on its concentration. The glycol concentration must be chosen to avoid freeze in the glycol loop depending on your local climate conditions.

Glycol-Side Pump Cavitation Protection

See 12.9.3.4 - Heat Transfer Medium, note about Pump cavitation protection.

Never actuate the glycol side pump before filling the internal loop with glycol.

12.17.3 - System Electrical Data

12.17.3.1 - Additional Electrical Components

Glycol-Side Pump motors

The pumps that are factory-installed in these units on the internal glycol loop comply with the European Ecodesign directive ErP. The additional electrical data required (1) is as follows:

No.(2)	Description(3)		LNE 65-125-22 SPC	LNE 80-125-40 SPC	LNE 80-160-55 SPC
1	Nominal efficiency at full load and nominal voltage	%	86,4	89,6	89,7
	Nominal efficiency at 75% of full load and nominal voltage	%	86,7	90,4	90
	Nominal efficiency at 50% of full load and nominal voltage	%	85	89,9	89
2	Efficiency level	-	IE3		
3	Year of manufacture	-	This information varies depending on the manufacturer and model at the time of incorporation. Please refer to the motor nameplate.		
4	Manufacturer's name and trademark, commercial registration number and place of manufacturer	-	Same as above		
5	Product's model number	-	Same as above		
6	Number of motor poles	-	2		
7-1	Nominal Shaft Power Output at full load and nominal voltage (400V)	kW	2,2	4	5,5
7-2	Maximum Input Power (400V)(4)	kW	2,55	4,46	6,13
8	Nominal Input Frequency	Hz	50		
9-1	Nominal Voltage	V	3Ph x 400		
9-2	Maximum Current Drawn (400V)(5)	A	4,54	7,62	10,50
10	Nominal Speed	rps - rpm	48 - 2900		
11	Product disassembly, recycling or disposal at end of life	-	Disassembly using standard tools. Disposal and recycling by an appropriate company.		
12	Operating conditions for which the motor is specifically designed				
	I - Altitudes above sea level	m	< 1000(6)		
	II - Ambient air temperature	°C	< 40		
	III - Maximum operating temperature	°C	Please refer to the operating conditions given in this manual or in the specific conditions in the Carrier selection programs.		
	IV - Potentially flammable atmospheres	-	Non-ATEX Environnement		

(1) Required by regulation No. 640/2009 concerning the application of directive 2009/125/EC on the eco-design requirements for electric motors.
(2) Item number imposed by regulation No. 640/2009, appendix I2b.
(3) Description given by regulation No. 640/2009, appendix I2b.
(4) To obtain the maximum unit input power for a unit with hydraulic module, add the ""maximum unit operating input power"" (see Electrical Data table) to the pump power.
(5) To obtain the maximum unit operating current draw for a unit with hydraulic module add the "maximum unit operating current draw" (Electrical Data table) to the pump current draw.
(6) Above 1000 m, a degradation of 3% for each 500 m should be taken into consideration.

12.17.4 - System Thermodynamic Data

12.17.4.1 - Thermodynamic System

Free Cooling Operation Principle

See 12.19.2.1.1– Free Cooling Operation Principle.

12.17.5 - System Control Data

12.17.5.1 - Additional Control Components

Additional Flow switches for Dual Module Units

See 12.10.3.1.1– Additional Flow switches for Dual Module Units.

12.17.6 - Additional System Maintenance & Repair

12.17.6.1 - Hydraulic Maintenance & Repair

Free Cooling Coils Corrosion Protection

See 12.19.4.1.1– Free Cooling Coils Corrosion Protection.

If the unit has the option 305C, follow the durations between inhibitors refill given in the table below:

Maximum number of year between two corrosion inhibitors top-ups, with glycol free option:

30XF-Z Single Units + Option 305C		0750	0900	1000
Glycol [%](1)	20	2	2	2
	30	3	3	3
	45	5	5	4

30XF-Z Duplex Units + Option 305C		1700	1800	1900	2000	2100
Module A						
Glycol [%](1)	20	2	2	2	2	2
	30	3	3	3	3	3
	45	5	5	5	5	4
Module B						
Glycol [%](1)	20	2	2	2	2	2
	30	3	3	3	3	3
	45	5	5	5	4	4

(1) Renewed EG or PG.

Procedure for Venting Air from Glycol Loop

Bleed on Free Cooling Coils

See 12.18.2.2.1– Free Cooling Coils.

Glycol-Side Filter maintenance

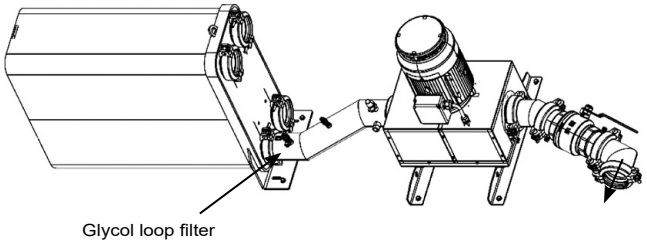
The brine loop must be clean. To ensure the exchangers are able to operate correctly, it is recommended that a sludge container, settling container, or another filtration system is also installed upstream of the unit, if necessary.

A filter with a mesh size of 0.7mm is factory fitted at the glycol free BPHE outlet to protect the micro-channel coils from any contamination. During system start-up, after a few hours of operation, it is recommended that the cleanliness of the filter is checked to ensure no debris was caught in the mesh.

The filters do not have any particular operating requirements. However, the mesh must be cleaned or changed as necessary.

Filter replacement procedure:

1 Purge the glycol loop via purges located on free cooling coils manifolds at the rear of the machine,
2 Unscrew the clamp (4) and remove the clamp (3),
3 Swivel the piping so that the filter can be accessed,
4 Clean the filter with water or replace it if needed,
5 The cleaning frequency for the filter depends on the degree of soiling in the network,
6 Refit the clamps and tighten. For the tightening torques of the screws, nuts and bolts, refer to table 13.5 – Tightening torques for the main fastenings,
7 Check that the clamps are correctly sealed,
8 If needed, top-up the glycol loop.



12.17.6.2 - Aeraulic Maintenance & Repair

Free Cooling Coils Inspection & Cleaning

See 12.19.4.2.1– Free Cooling Coils Inspection & Cleaning.

12.18 - Option 335: 400V-3Ph-60Hz power supply

12.18.1 - System Structural & Acoustical Data

12.18.1.1 - Structural & Acoustical System

Structural & Acoustical Data

30XF-Z Single Units		0750	0900	1000
Dimensions				
Length	in	267	314	361
Width	in	89	89	89
Height	in	91	91	91
Weights				
Operating weight(1)	lb	13382	14044	14792

30XF-Z Duplex Units		1700	1800	1900	2000	2100
Dimensions						
Length - Module A	in	267	314	314	314	361
Length - Module B	in	249	249	296	343	343
Length	in	516	563	610	657	704
Width	in	89	89	89	89	89
Height	in	91	91	91	91	91
Weights						
Operating weight(1)	lb	26154	26745	27467	28374	29378

(1) Values are guidelines only. Refer to the unit name plate.

12.18.2 - System Hydraulic Data

12.18.2.1 - Hydraulic Connections

Piping Diameter & Connections

30XF-Z Single Units + Option 335		0750	0900	1000
Inlet Connection Diameter	in	6"	6"	6"
Outlet Connection Diameter	in	6"	6"	6"

30XF-Z Duplex Units + Option 335		1700	1800	1900	2000	2100
Inlet Connection Diameter	in	6"	6"	6"	6"	6"
Connection Diameter for the flow from A to B - Leaving A	in	8"	6"	6"	6"	6"
Connection Diameter for the flow from A to B - Entering B	in	6"	6"	6"	6"	6"
Outlet Connection Diameter	in	8"	8"	6"	6"	6"

12.18.2.2 - Hydraulic System

Units Hydraulic Data

30XF-Z Single Units + Option 335		0750	0900	1000
Volume in the unit	gal	54	54	54
Max. operating pressure - hydraulic side	psi	145	145	145
Min. hydraulic flow rate	gpm	115	136	155
Max. hydraulic flow rate	gpm	781	901	1004

30XF-Z Duplex Units + Option 335		1700	1800	1900	2000	2100
Volume in the unit	gal	134	139	145	145	148
Max. operating pressure - hydraulic side	psi	145	145	145	145	145
Min. hydraulic flow rate	gpm	231	252	272	290	310
Max. hydraulic flow rate	gpm	1678	1765	1848	1933	2017

12.19 - Option 336: Active anti-harmonic filter

12.19.1 - System Electrical Data

12.19.1.1 - Additional Electrical Components

Active anti-harmonic filter

General description

This equipment is intended to reduce the rate of harmonic current distortion to a value close to 5% in the installation's power supply circuit.

It injects a current into the power supply circuit which is the opposite of the harmonic currents generated by the drives.

The filter communicates via Modbus with the control of the unit: Reports of alarms or internal alerts, advanced functionalities on the power consumption of the unit.

A configurable parameter allows the operation of the unit when the filter is inactive. In this case, the consumption of the unit is modified: Harmonic rate, current consumption. Refer to the electrical specification section of this document.

The filtering efficiency decreases above 42°C.

12.19.1.2 - Electrical System

Units Electrical Data

30XF-Z Units + Option 336		0750	0900	1000	1700	1800	1900	2000	2100
Power factor at maximum input power(6)		>0,98							
Displacement Power Factor (Cos. Phi)(3)		>0,98							
Total current harmonic distortion rate (THDi)(6)	%	5%							

(6) Values obtained when the anti-harmonic filter is operating normally. However:
- Filter efficiency decreases when unit current is under 60A.
- The impedance of the installation can modify this value: a tolerance of +/-2% may be considered on the announced value.
- The filtering capacity decreases when the temperature increases.
  When the ambient temperature exceeds 42 °C, Power Factor and THDi will get close to the values of the unit without hamonic filter.
- The machine can be configured to allow operation when the filter is inactive, in case of failure or when the ambient temperature exceeds 42 °C.

12.19.2 - Additional System Maintenance & Repair

12.19.2.1 - Electrical Maintenance & Repair

Active anti-harmonic filter

The inspection and maintenance below are to be carried out twice a year and require the removal of the three protective covers. They include:

Visual inspection for the following:

- Dust,
- Condensation,
- Abnormal odor, discoloration or deformation of components,
- Crack on plastic covers,
- Mark of overheating, damage or deformation of the AC and DC capacitors,
- Damage or discoloration of internal contactors,
- Wear of cable insulation,
- No traces of overheating on electrical connections.

Cleaning: Dust should be removed by avoiding any method that may generate electrostatic discharges such as vacuuming or wearing clothing.

Inspection of the fuses (F501): Inspect and change fuses if necessary.

Ventilation: Check for no suspect noise which may indicate unusual wear as well as the presence of an airflow over the filter.

The weight of the filter is about 150kg: Use a suitable handling system if the complete filter needs to be replaced.

13 - OPTIONS CUMULATION

13.1 - Options 85A + 116V

13.1.1 - System Electrical Data

13.1.1.1 - Electrical Connections

Cables sections for 400V Main power supply are the same as cables sections for single power connection point for standard units (Option 338).

Allowable cable section for the second power connection point : 1mm² to 25 mm².

13.1.1.2 - Electrical System

Units Electrical Data

30XF-Z Units + Options 85A + 116V - Supply 400V_2		0750	0900	1000	1700	1800	1900	2000	2100
Power circuit supply									
Nominal voltage	V-ph-Hz	400-3-50							
Voltage range	V	360-440							
Input power(1)									
Maximum operating input power(2)	kW	10,1	10,1	10,1	19,2	19,2	19,2	19,2	19,2
Operating current draw(1)									
Maximum Current (Un)(2)	A	25	25	25	49	49	49	49	49
Maximum Current (Un-10%)(2)	A	28	28	28	55	55	55	55	55

(1) Values obtained at operation with maximum operating power input (data given on the unit nameplate)
(2) Values given on the unit nameplate.

Notes :

- **Control circuit is supplied with 24V via internal transformer from 400V second power supply.**
- **Electrical data concerning 400V Main power supply is the same as electrical data concerning single power connection point for standard units (Option 338).**

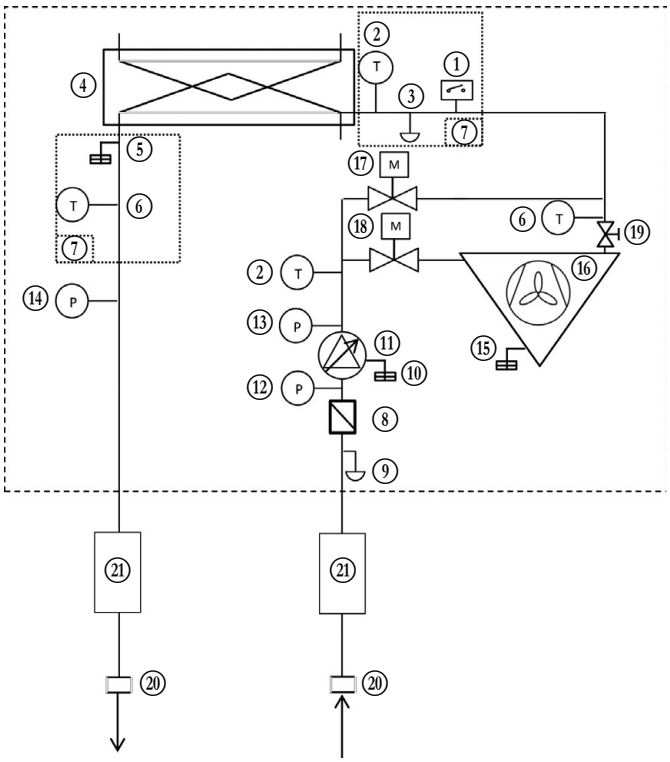
13.2 - Options 116V + 305A

13.2.1 - System Hydraulic Data

13.2.1.1 - Hydraulic Connections

Units Hydraulic Circuit Diagram

1 Module



Legend

Unit Hydraulic Components

1. Flow rate sensor
2. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger inlet (see Control Manual)
3. Water purge on water box
4. Water heat exchanger
5. Air bleed on water box
6. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger outlet (see Control Manual)
7. Water box
8. Screen filter (particle size of 0.7mm)
9. Water drain tap
10. Air bleeds on each Free Cooling coil
11. Free Cooling coils
12. Pressure sensor
    NOTE: Provides pressure measurement at the pump suction (see Control Manual)
13. Pressure sensor
    NOTE: Provides pressure measurement at the pump discharge (see Control Manual)
14. Pressure sensor
    NOTE: Provides pressure measurement at the unit outlet (see Control Manual)
15. Air bleeds on each Free Cooling coil
16. Free Cooling coils
17. Motorized valve to by-pass Free Cooling coils.
18. Motorized valve to allow water flow within Free Coling coils.
19. Shut-off valve to isolate Free Cooling coils.

Customer Loop Minimum Additional Components

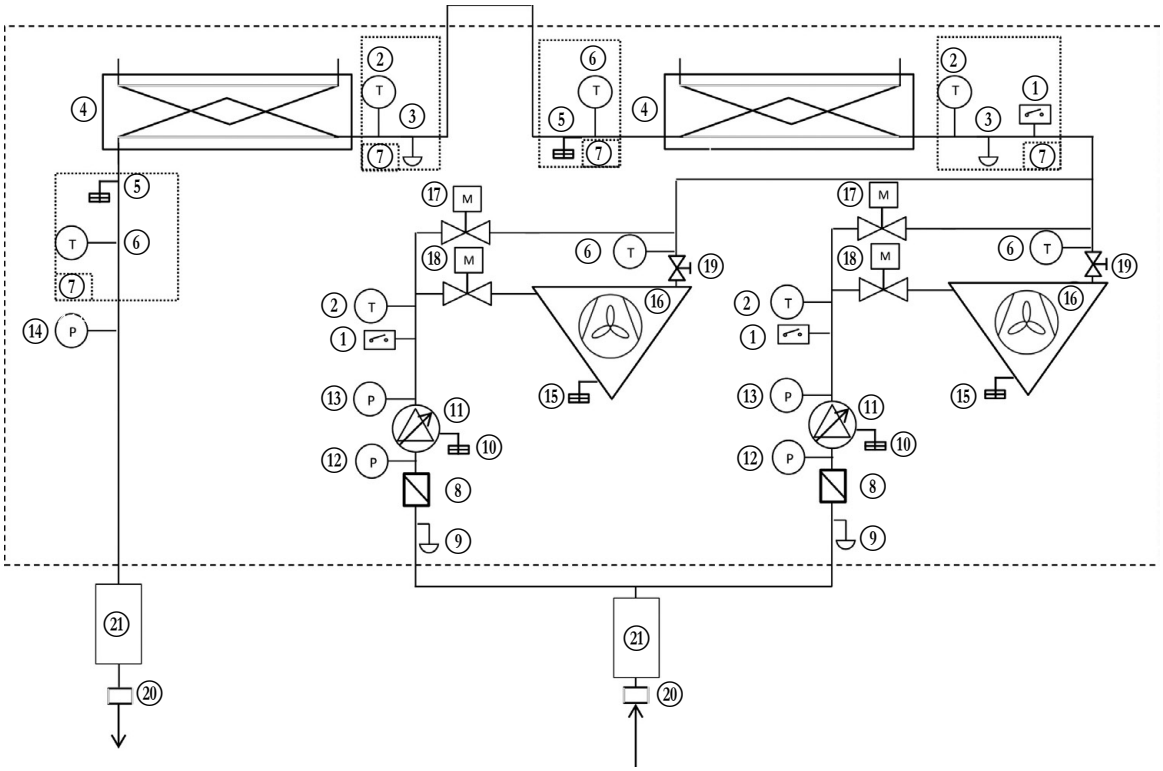
20. Flexible Connection
21. See Option 116V Hydraulic PID

- - - - - Unit Hydraulic Components

NOTES:

- **A glycol based solution must be used as heat transfer medium. Glycol type and percentage must be adapted to the lowest predictible temperature on the installation site.**

2 Modules



Legend

Unit Hydraulic Components

1. Flow rate sensor
2. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger inlet (see Control Manual)
3. Water purge on water box
4. Water heat exchanger
5. Air bleed on water box
6. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger outlet (see Control Manual)
7. Water box
8. Screen filter (particle size of 0.7mm)
9. Water drain tap
10. Air bleeds on each Free Cooling coil
11. Free Cooling coils
12. Pressure sensor
    NOTE: Provides pressure measurement at the pump suction (see Control Manual)
13. Pressure sensor
    NOTE: Provides pressure measurement at the pump discharge (see Control Manual)
14. Pressure sensor
    NOTE: Provides pressure measurement at the unit outlet (see Control Manual)
15. Air bleeds on each Free Cooling coil
16. Free Cooling coils
17. Motorized valve to by-pass Free Cooling coils.
18. Motorized valve to allow water flow within Free Coling coils.
19. Shut-off valve to isolate Free Cooling coils.

Customer Loop Minimum Additional Components

20. Flexible Connection
21. See Option 116V Hydraulic PID

- - - - - Unit Hydraulic Components

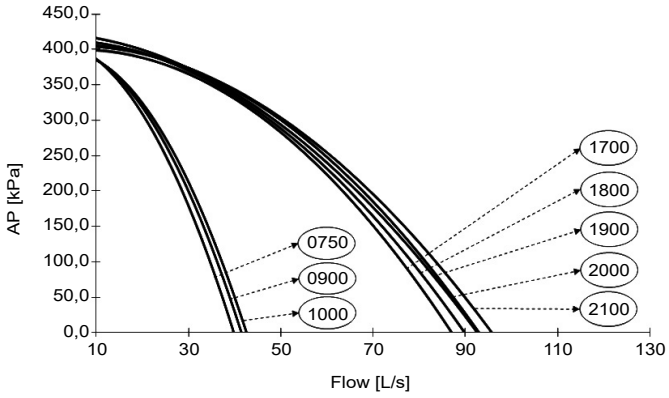
NOTES:

- **A glycol based solution must be used as heat transfer medium. Glycol type and percentage must be adapted to the lowest predictible temperature on the installation site.**

13.2.1.2 - Hydraulic System

Units Available Pressure Curves"

Units + Options 116V+305A - Available Pressure



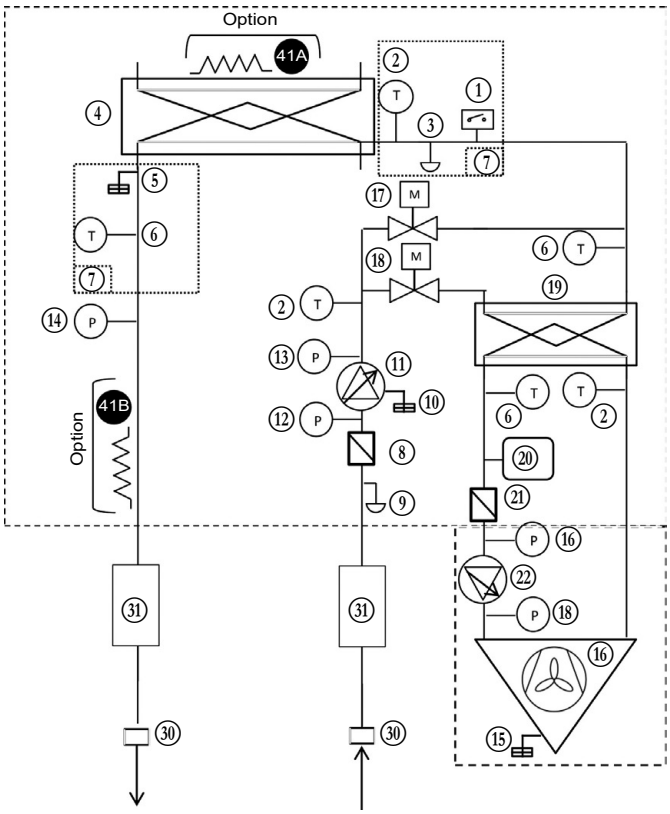
13.3 - Options 116V + 305C

13.3.1 - System Hydraulic Data

13.3.1.1 - Hydraulic Connections

Units Hydraulic Circuit Diagram

1 Module



Legend

Unit Hydraulic Components

1. Flow rate sensor
2. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger inlet (see Control Manual)
3. Water purge on water box
4. Water heat exchanger
5. Air bleed on water box
6. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger outlet (see Control Manual)
7. Water box
8. Screen filter (particle size of 1.2mm)
9. Water drain tap
10. Air bleeds on each Free Cooling coil
11. Variable speed pump
12. Pressure sensor
    NOTE: Provides pressure measurement at the pump suction (see Control Manual)
13. Pressure sensor
    NOTE: Provides pressure measurement at the pump discharge (see Control Manual)
14. Pressure sensor
    NOTE: Provides pressure measurement at the unit outlet (see Control Manual)
15. Air bleeds on each Free Cooling coil
16. Free Cooling coils
17. Motorized valve to by-pass Free Cooling coils.
18. Motorized valve to allow water flow within Free Coling coils.
19. Free Cooling Glycol Free BPHE
20. Expansion Vessel on glycol loop.
21. Screen filter (particle size of 0.7mm)
22. Variable speed pump

Customer Loop Minimum Additional Components

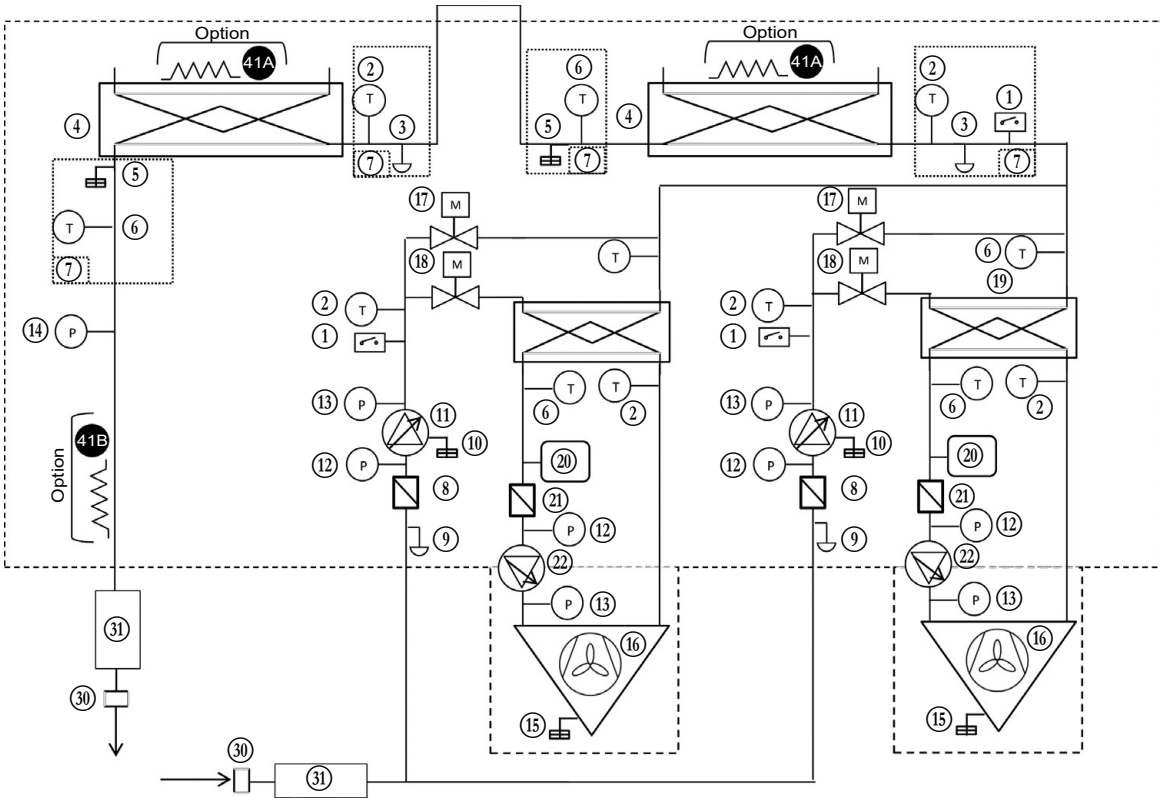
30. Flexible Connection
31. See Option 116V Hydraulic PID

- - - - - Unit Hydraulic Components

NOTES:

- **A glycol based solution must be used as heat transfer medium. Glycol type and percentage must be adapted to the lowest predictible temperature on the installation site.**

2 Modules



Legend

Unit Hydraulic Components

1. Flow rate sensor
2. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger inlet (see Control Manual)
3. Water purge on water box
4. Water heat exchanger
5. Air bleed on water box
6. Temperature sensor
   NOTE: Provides temperature measurement at the water exchanger outlet (see Control Manual)
7. Water box
8. Screen filter (particle size of 1.2mm)
9. Water drain tap
10. Air bleeds on each Free Cooling coil
11. Variable speed pump
12. Pressure sensor
    NOTE: Provides pressure measurement at the pump suction (see Control Manual)
13. Pressure sensor
    NOTE: Provides pressure measurement at the pump discharge (see Control Manual)
14. Pressure sensor
    NOTE: Provides pressure measurement at the unit outlet (see Control Manual)
15. Air bleeds on each Free Cooling coil
16. Free Cooling coils
17. Motorized valve to by-pass Free Cooling coils.
18. Motorized valve to allow water flow within Free Coling coils.
19. Free Cooling Glycol Free BPHE
20. Expansion Vessel on glycol loop.
21. Screen filter (particle size of 0.7mm)
22. Variable speed pump

Customer Loop Minimum Additional Components

30. Flexible Connection
31. See Option 116V Hydraulic PID

- - - - - Unit Hydraulic Components

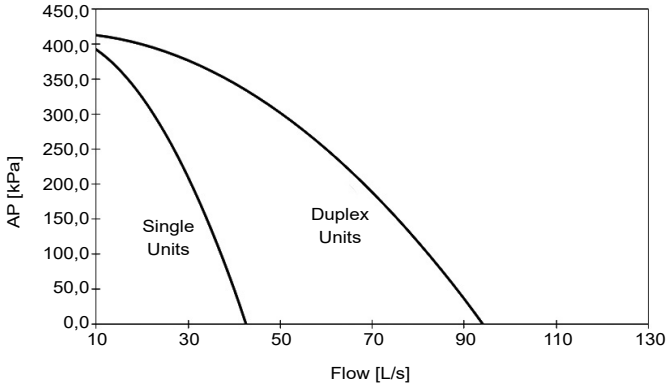
NOTES:

- **A glycol based solution must be used as heat transfer medium. Glycol type and percentage must be adapted to the lowest predictible temperature on the installation site.**

13.3.1.2 - Hydraulic System

Units Available Pressure Curves"

Units + Options 116V+305C - Available Pressure



13.4 - Options 335 + 116V

13.4.1 - System Structural & Acoustical Data

13.4.1.1 - Structural & Acoustical System

Structural & Acoustical Data

30XF-Z Single Units + Option 335 + 116V		0750	0900	1000
Weights				
Operating weight(1)	lb	13806	14467	15215

30XF-Z Duplex Units + Option 335 + 116V		1700	1800	1900	2000	2100
Weights						
Operating weight(1)	lb	27000	27592	28314	29221	30224

(1) Values are guidelines only. Refer to the unit name plate.

13.4.2 - System Hydraulic Data

13.4.2.1 - Hydraulic Connections

Piping Diameter & Connections

30XF-Z Single Units + Option 335+116V		0750	0900	1000
Inlet Connection Diameter	in	4"	4"	4"
Outlet Connection Diameter	in	6"	6"	6"

30XF-Z Duplex Units + Option 335+116V		1700	1800	1900	2000	2100
Inlet Connection Diameter - Module A	in	4"	4"	4"	4"	4"
Inlet Connection Diameter - Module B	in	4"	4"	4"	4"	4"
Connection Diameter for the flow from B to A - Leaving B	in	4"	4"	4"	4"	4"
Connection Diameter for the flow from B to A - Entering A	in	4"	4"	4"	4"	4"
Connection Diameter for the flow from A to B - Leaving A	in	6"(1)	6"	6"	6"	6"
Connection Diameter for the flow from A to B - Entering B	in	6"	6"	6"	6"	6"
Outlet Connection Diameter	in	8"	8"	6"	6"	6"

(1) From A to B - Leaving A : Evaporator water box outlet diameter is 219.1mm (8"). Then a reduction pipe from 219.1mm (8") to 168.3mm (6") is delivered with the unit but not factory fitted.

13.4.2.2 - Hydraulic System

Units Hydraulic Data

30XF-Z Single Units + Option 335+116V		0750	0900	1000
Volume in the unit	gal	71	71	71

30XF-Z Duplex Units + Option 335+116V		1700	1800	1900	2000	2100
Volume in the unit	gal	162	169	174	174	179

14 - APPENDICES

Appendices are provided in the document wallet with the instruction manual.

14.1 - Appendix 1: Declaration of conformity

14.2 - Appendix 2: Wiring diagram

14.3 - Appendix 3: Machine PID

14.4 - Appendix 4: Dimensional drawings

The quality management system of this product's assembly site has been certified in accordance with the requirements of the ISO 9001 standard (latest current version) after an assessment conducted by an authorized independent third party.
The environmental management system of this product's assembly site has been certified in accordance with the requirements of the ISO 14001 standard (latest current version) after an assessment conducted by an authorized independent third party.
The occupational health and safety management system of this product's assembly site has been certified in accordance with the requirements of the ISO 45001 standard (latest current version) after an assessment conducted by an authorized independent third party.
Please contact your sales representative for more information.

Order No.: 10809, 01.2024. Supersedes order No.: New.
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