Liebert HPC-S

017-032

Air Cooled Chillers with Scroll compressor/s

USER MANUAL

English, cod. 273911, rev. 26.06.2017

Caution

It is recommended that:

- the manual is retained for the entire service life of the machine;
- the user reads the manual carefully before carrying out any operations on the machine;
- the machine is used exclusively for the purpose for which it is intended; incorrect use of the machine shall release the manufacturer from any liability.

This manual has been prepared to enable the end - user to carry out only those operations that can done with the panels closed. Any operations that require the opening of doors or equipment panels must be carried out only by qualified personnel.
Each machine is equipped with an electric isolating device which allows the operator to work in conditions of safety. This device must always be used to eliminate risks during maintenance (electric shocks, scalds, automatic restarting, moving parts and remote control). The panel key supplied with the unit must be kept by the person responsible for maintenance.

For identification of the unit (model and serial no.) in case of the necessity for assistance or spare parts, read the identification labels affixed to the outside and inside of the unit.

IMPORTANT: This manual may be subject to modification; for complete and up - to - date information the user should always consult the manual supplied with the machine.

Index

1 - Introduction

1.1 - Foreword

The handbook and all the documents supplied with the system are aimed at enabling both the installer and the operator to carry out correctly installation, control and maintenance operations on the chiller unit, without damaging it or harming the relevant staff. The handbook and the supplied documents are thus an aid for the skilled staff to arrange the special outfit so as to install, operate and maintain the machine correctly according to the local norms in force.
The handbooks, wiring diagrams and documents enclosed to the machine must be read and kept for the whole system life.

The **Liebert HPC- S 017- 032** water chillers can be identified as follows:

FG0 017

Cooling Capacity:
Cooling Capacity (x 10 = kW)

Refrigerant:
0 R410A

Versions:
G
B = Base version

Execution:
C Air cooled Chiller
F Freecooling Chiller

1.2 - Responsibility

Vertiv accepts no present or future responsibility for damage to persons, things or to the machine itself due to operators' negligence, failing to comply with the installation, operation and maintenance instructions of this handbook, failed application of the safety norms in force for the system and the qualified staff charged with the operation and maintenance.

1.3 - General description

Liebert HPC- S 017- 032 units with air cooled condensers have been designed and manufactured for producing chilled water.
They are also available in versions with a built- in freecooling module, with a pump assembly installed on the machine and/or inertial buffer tank inside the machine; the chilling units can be equipped with several options indicated in the price list.
The **Liebert HPC- S 017- 032** product line has been designed considering the state- of- the- art techniques available nowadays in the industry, and includes all the components necessary for automatic and efficient operation.

Each unit is completely factory assembled; after evacuation, the necessary quantity of refrigerant is added to the refrigerant circuit(s) and the unit is tested.
All the units are equipped with two independent refrigerating circuits, each one composed of: an air cooled condenser, a hermetic Scroll compressors and a braze- welded plate evaporator. The components of the liquid line are the charging valves, filters dryers, shut- off valve, moisture indicator and electronic expansion valve.
The hydraulic circuit - with max. working pressure 6 bar - is made up of carbon steel pipes connected with grooved- end (Victaulic) fittings and couplings and include also a flow switch and, in the freecooling versions, chilled water coils and a three- way valve.

The hermetic scroll compressors are complete with the following protection/safety devices: oil heater, electronic protection monitoring the temperature of the motor windings and the direction of rotation (the latter may be enclosed in the electronics of the compressor or external, depending on the model). The **Liebert HPC- S 017- 032** water chillers are controlled by the "iCOM" microprocessor, managing all the unit operating conditions. The user can change and/or modify the operating parameters through the display keyboard installed on the electrical panel.
The electrical control board is equipped with all the safety and operating devices required for reliable operation. The compressor motors are equipped with protection on all three phases and are started by three- pole contactors.

2 - Preliminary Operations

2.1 - Packing removal

Remove the polythene package caring not to damage the unit. Dispose of the package materials delivering them to specialized collection or recycling centers (comply with the local norms in force).

2.2 - Inspection

All the units are assembled and wired in the producing factory. Before shipment they are charged with the necessary quantities of refrigerant and oil and then tested under the operating conditions required by the customer. The freecooling coils are supplied dry to avoid possible problems due to the frost in the storage period. Immediately inspect the machine carefully on delivery to check for damage during transportation or missing components; possible claims must be made immediately to the carrier and the factory or its representative.

2.3 - Operating range

Refer to the table "Tab. 3 - Operating range" showing the limits for each model; contact your dealer for different values.

2.3.1 - Outer air temperature

The units are designed to operate at:

- Min. temperatures:
  - 25° C for Freecooling;
  - 10° C for Chiller;
- Max. temperatures:
  depending on the model as indicated in the table "Tab. 3 - Operating range".
  All working limits refer to steady state operation mode.

Note:
Avoid positioning in areas with strong dominant winds that may impair the operation and effect the indicated limits.

Such limits are considered for new machines or machines that have been correctly installed and maintained.

The units are designed to be stored at:

- Temperatures: - 10 / +45° C;
- Humidity: 80% R.H., not condensing.

2.3.2 - Water circuit

- Maximum water flow allowed: depending on the pressure drop corresponding to the required thermal difference (usually not lower than 3.5° C - 4° C);
- Minimum allowed water flow: compatible with a sufficient evaporation temperature, to avoid the intervention of the safety devices (to be evaluated for a thermal difference not higher than 8° C);

- Temperature range of the water exiting the evaporator: 4° C - 15° C;
- Maximum temperature of the water entering the unit: 20° C; higher temperatures are allowed only at the system start- up and not during normal operation;
- The “G” version with EC fans 900mm (digit 11 = 3) allow maximum outlet water temperature of 20° C and maximum water return temperature of 26° C.
- Maximum glycol concentration: 50% (35% with the optional pump assembly installed on the machine);
- Minimum allowed glycol concentration: depending on the minimum temperature of the ambient air expected at the installation site (see Tab. a);
- Maximum pressure of the hydraulic circuit: 6 bar; take care that this limit is independent of presence / absence of pumps fitted on the unit, so it’s necessary to check the max pump static head (indicated on pump’s nameplate) and pressurized the water circuit never more than 6 barg – max. pump static head.

2.3.3 - Power supply

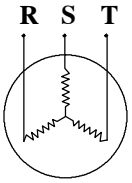
Electrical panel designed according to CEI EN 60204- 1 “Safety of machinery - Electrical equipment of machines”.

- Voltage: in standard operating conditions, from 0.9 to 1.1 times the rated voltage.
- Frequency: from 0.99 to 1.01 times the rated frequency continuously.
- Voltage unbalance: must be lower than 2%.

The Fig. a shows a calculation example of the voltage unbalance.

Fig. a - Example of calculating phase to phase variability

1) The 400 V supply has the following variability:
   RS = 388 V
   ST = 401 V
   RT = 402 V



2) The average voltage is:

$$\frac{388 + 401 + 402}{3} = 397$$

3) The maximum deviation from the average is:
   402 - 397 = 5 V

4) The phase to phase variability is:

$$\frac{5}{397} \times 100 = 1.26 \text{ (acceptable)}$$

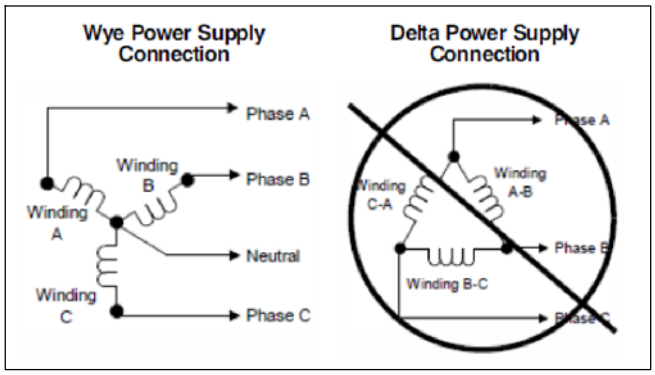
NOTE:

Three-phase electric power

Requirements:

The **Liebert HPC- S 017- 032** units are equipped with electrical devices (EC motors, power supplies module, inverter pumps, control devices, etc.) that are designed to operate properly with Star-connected power (Wye) with earthed neutral (TN or TT system).
Three-phase distribution Delta-connected (Δ) or Star-connected power (Wye) without ground or floating ground (IT) contact Vertiv

Wye (Y) vs. Delta (Δ) power supply connection diagram.



Acceptable power supply (TT, TN-S, TN-C, TN-C-S systems):

- 400V Wye with solidly grounded neutral (230V line to ground).

Unacceptable power supply:

- 400V Wye without ground connection or with high-resistance (or impedance) ground (IT).
- 400V Δ without ground or with high-resistance (or impedance) ground (IT).
- 400V Δ with corner ground or with grounded center-tapped.

2.4 - Sound pressure levels

The Tab. 5 shows the noise data for the units in standard configuration (without pumps), operating continuously and measured according to the ISO 3744 norm, in free field conditions.
The highest noise levels are detected on the condenser coil side.

Note:
Avoid positioning in areas with possible reverberation of the sound waves, which can adversely effect the noise levels.

2.5 - Transport

- If the unit is shiped with a container, for extracting, follow the instructions placed on the front panel;
- Handle the unit by lifting it with a crane from above;
- The lifting holes are positioned in the frame’s base (when lifting, use spreader bars to protect the sides, see Fig. 3).

Note:
Place the lifting tubes in the holes in the base indicated by ”LIFT HERE”. Lock the ends of the tubes in position with the ring nut, as shown in Fig. 3, using 60 mm span.
The capacity of the lifting gear must be adequate to lift the load in question. Check the weight of the units, the capacity of the lifting gear and ropes and the condition and suitability of the aforementioned equipment.

2.6 - Foundations

- The unit must be placed on a level surface which will support its weight.
- If necessary, position the unit on suitable anti- vibration supports that can be supplied as an option (in rubber or spring- type).
- **Attention**
  Position the anti- vibration supports on the ground, lower the chiller on them and at the end fix the anti- vibration supports to the chiller itself.
- Refer to the manual ”Installation of the spring anti- vibration supports” for their correct positioning.
- When positioned, level the unit.

Note:
For weight distribution see Fig. 5.

Note:
The weights and their distribution refer to standard units with/without tank but without options; if the pump assembly, or other options are installed on the machine, add the weights of the installed accessories to those of the standard units (see Tab. 7 - Application consideration).

2.7 - Service area

- In order to allow free air flow and maintenance of the unit, a minimum area must be left free of obstructions around the unit (see Fig. 1).
- The hot air expelled by the fans must be allowed to rise unimpeded by obstacles for a minimum height of 2.5 m.
- Avoid recirculation of hot air between the suction and discharge, otherwise the unit performance may be impaired or the standard operation can be interrupted.

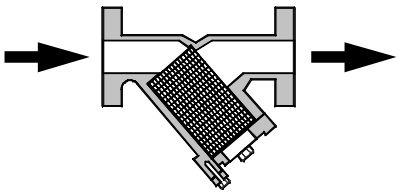
3 - Installation

3.1 - Hydraulic connections

3.1.1 - Hydraulic circuit construction (Fig. b)

The piping must be connected to the chiller. Construct a chilled water circuit as described below, see Fig. b:

1) Place shut- off valves within the circuit to allow servicing;
2) Install a pump system suitable for the flow rate required at a pressure head equal to the sum of all the pressure drops (see project data).
   Liebert HPC- S 017- 032 chillers can be equipped, upon request, with pumps having performance as indicated in Tab. 4;
3) Install manometers at the chiller inlet/outlet;
4) Install thermometers at the chiller inlet/outlet;
5) Connect the pipes to the chiller by flexible joints to avoid transmitting vibrations and to balance the thermal expansion; proceed in the same way even if the pump set is outside the chiller;
6) It is useful to include a water pressure switch to give an early warning of low water pressure;



7) Place a mesh filter at the inlets of the pump and water chiller (Can be supplied as an optional accessory - not fitted).
   If the fluid contains particles larger than1 mm (0,04 inch), we recommend that a strainer with a size of 14- 20 mesh (number of openings per inch) is installed before the exchanger. The particles could otherwise block the channels, causing bad performance, increased pressure drop and risk of freezing;
8) Install at the highest points in the circuit, apparatus which allows the bleeding of air and possibly the filling of glycol;
9) Place a drain valve at the lowest point in the circuit and immediately at the outlet of the water chiller;
10) Install a water filling set including the following:
    a) filling water meter;
    b) manometer;
    c) non- return valve;
    d) air separator;
    e) removable supply tube, **which must be disconnected after each charge/top- up;**
11) For maximum protection ensure that all tubing exposed to low outdoor temperatures is fitted with anti- freeze heaters and insulated using closed cell synthetic rubber (elastomer);
12) The circuit must include an expansion vessel (with safety valve) of suitable capacity;
13) Connect the lines avoiding stresses on the machine inner parts.

Note:
If the water chiller is complete with an expansion vessel (supplied as an option), check if the capacity is enough, and install a second vessel in the circuit, if required (see par. 8.3). Follow the indications in Fig. d for the correct sizing.

Note:
The whole circuit must contain a water volume suitable for the capacity of the installed chiller. Check if the inertial capacity given by the sum of the hydraulic volume inside the machine (including the volume of the optional interna tank, if fitted) and the system volume is sufficient, or possibly install a tank in the circuit. Follow the indications in Fig. c for the correct sizing.

Note:
The hydraulic circuit must ensure a constant water supply to the evaporator in every operating condition. Otherwise, the compressors may be damaged by repeated returns of liquid refrigerant on their suction.

Note:
If multiple chiller are installed in parallel on hydraulic circuit, it's recommend to install a water check valve (optional kit) on the water delivery of each chiller before the connection to the main hydraulic header.

Note:
In the chiller with pumps and in all freecooling units, water quality has to be in accordance with VDI 2035.

3.1.2 - Additional of water and ethylene glycol

Very important:

Add water and ethylene glycol to the circuit with a % depending on the minimum temperature of the outside air expected at the installation site. Do not exceed the nominal operating pressure of the circuit's components.

Notes:

- To avoid stratification run the circulation pump for at least 30 minutes after adding any glycol.
  If the pumps are fitted on the chiller, they have to be run all together.
- Water glycol fluid mixture has to be circulated inside the chiller hydraulic parts including freecooling coils and by- pass pipes; in order to do it move the 3- way valve on both positions for the time necessary.
- After adding water to the hydraulic circuit **always disconnect the water supply coming from the sanitary supply;** this avoids the danger of glycol entering the sanitary water system.
- After any topping- up of the water check the concentration and add glycol if necessary.

3.1.3 - Water- glycol mixture

Water- glycol mixtures are used as the thermal carrier fluid in very cold climates or with temperatures below zero degrees centigrade. Determine the ethylene glycol % which must be added to the water, with the assistance of Tab. a.

Tab. a - Ethylene glycol to be added to water (% in weight of total mixture)

Ethylene glycol (% in weight)	0	10	20	30	40	50
Freezing temperature, °C (*)	0	- 4.4	- 9.9	- 16.6	- 25.2	- 37.2
Mixture density at 20°C (*), kg/l	-	1.017	1.033	1.048	1.064	1.080

(*) Values are for Clariant Antifrogen N. For different brands, check manufacturer's data.

For the chiller internal water volume refer to Tab. 1. If the optional buffer tank is installed on the machine, add the tank hydraulic volume.

ALWAYS CHARGE THE HYDRAULIC CIRCUIT WITH THE REQUIRED GLYCOL % NECESSARY FOR THE MINIMUM AMBIENT TEMPERATURE AT THE INSTALLATION SITE. FAILING TO COMPLY WITH THIS INSTRUCTION SHALL INVALIDATE THE UNIT WARRANTY.

3.1.4 - Protection and cleaning of the evaporator and components of hydraulic circuit

It is the user's responsibility to establish the quality of the water and make sure that this is compatible with the materials used in the hydraulic components and exchangers. The quality of water may significantly affect the operation and the life of the exchangers. The first step in the planning the treatment of the water is chemical analysis, which must be performed by qualified personnel from specialist organizations. Exchangers cleaning may be performed only with chemical method, using commercially - available products with a dual action, that is, the removal of the scale and the prevention of corrosion.
In the chiller with pumps and in all freecooling units, water quality has to be in accordance with VDI 2035.

The oxygen dissolved in water increases the rate of corrosion. The main factors causing corrosion are sulphur and carbon dioxide acids (see the Langelier and Ryznar indices). A combined effect of fouling due to dust and organic material provides a support for bacteria, fungi and algae; the growth of organisms may produce an oxygen gradient and this results in rather severe pitting of the metallic surface. The phenomenon of corrosion is obviously related to the material used on the liquid side of the heat exchanger. The following table shows the reference values for corrosion on copper, these values must be considered as guidelines to avoid corrosion.

In winter, if the system is stopped, the water inside the exchangers can freeze damaging the system irreparably; thus, it is recommended to use glycol mixtures (see following paragraphs: please consider the different outputs and absorption by the chiller, the pump sizing and the performance of the system terminals/conditioners) or drain the system completely, using the suitable cocks arranged in the exchangers and in the circuit, trying to drain the water residues blowing air in the lines.

Tab. b - Water component for corrosion limit on Copper

pH	-	7.5 ÷ 9.0
SO_4	ppm	< 100
HCO_3 / SO_4	-	> 10
Total hardness	dH	4.5 ÷ 8.5
CJ-	ppm	< 50
PO_4^{3-}	ppm	< 2.0
NH3	ppm	< 0.5
Free Chlorine	ppm	< 0.5
Fe^{3+}	ppm	< 0.5
Mn^{++}	ppm	< 0.05
CO_2	ppm	< 50
H_2S	ppb	< 50
Temperature	°C	< 65
Oxygen content	ppm	< 0.1

3.2 - Connection of the safety valve discharge

Safety valves are installed on the high pressure side of the refrigeration circuit: the discharge of these valves must be conveyed outside through a suitable pipe, having a diameter of at least that of the valve outlet, without burdening the valve body. Convey the discharge to areas where the jet cannot harm people and the surrounding environment.

Fig. b - Ideal chilled water circuit

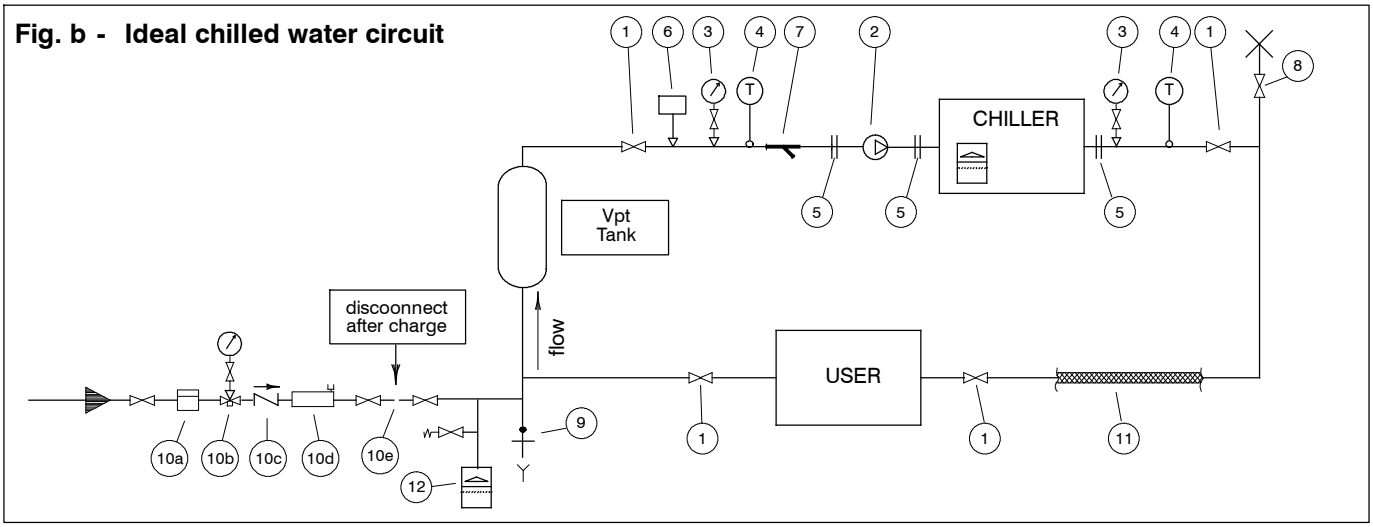


Fig. c - Inertial tank sizing

The total optimal hydraulic value of the system where the **Liebert HPC- S 017- 032** chiller is installed can be calculated by the following ratio:

$$V = \frac{43 \times Rt}{Xd}$$

where:

- V=min. required total water volume expressed in liters
- Rt=refrigerating capacity expressed in kW
- Xd=differential band set on the control and expressed in degrees centigrade

Please note that the min. required total water volume (V) must be at least equal to the sum of the hydraulic volume of the **Liebert HPC- S 017- 032** chiller (Vm) plus the volume of the hydraulic circuit connected to it (Vpc); if this condition is not complied with, it is necessary to install an inertial tank (Vpt, as indicated in the Fig. b *ideal chilled water circuit*) with a volume at least equal to the following value: Vpt=V- Vm- Vpc

Fig. d - Sizing of the expansion tank

The total volume of the expansion tank is calculated with the following ratio:

$$V = \frac{C \times e}{1 - \frac{Pi}{Pf}}$$

where:

- C=quantity of water inside the system expressed in liters
- e=water expansion coefficient, with water at 10 °C as a reference
- Pi=absolute pressure of initial charging, equivalent to the tank pre- charge pressure (typical value 2.5 bara)
- Pf=absolute final tolerated pressure, lower than the operating pressure or than the safety valve calibration pressure (typical value 4.0 bara).

Use the values of the water expansion coefficient indicated in the table below:

T [°C]	Density [kg/m³]	Expansion coefficient "e" H2O	"e" 10% glycol	"e" 20% glycol	"e" 30% glycol	"e" 40% glycol	"e" 50% glycol
10	999.6	0.001	0.003	0.005	0.007	0.013	0.015
20	997.9	0.002	0.005	0.008	0.010	0.015	0.018
30	995.6	0.004	0.007	0.011	0.013	0.017	0.020
40	992.2	0.008	0.011	0.014	0.016	0.021	0.024
50	988.1	0.012	0.015	0.018	0.021	0.025	0.028

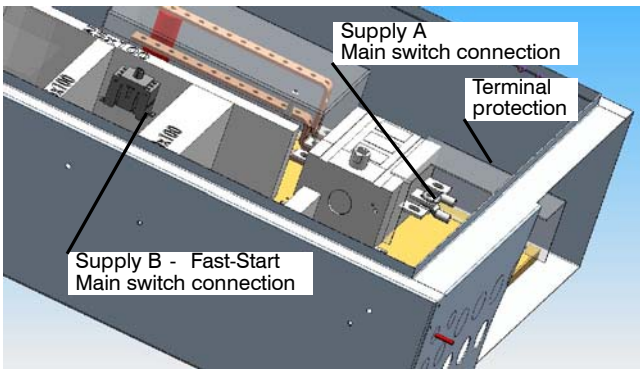
3.3 - Electrical connections

1) Before wiring, check that:

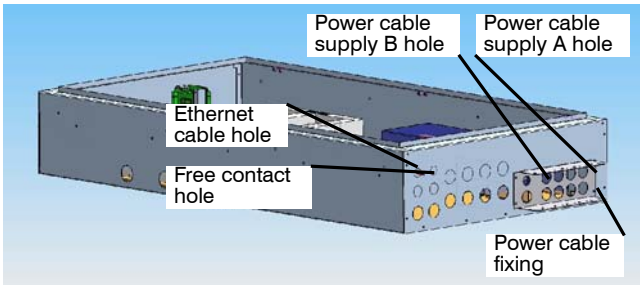
- the electrical components are in good conditions;
- all terminal screws are well tightened;
- the supply voltage and frequency comply with those indicated on the unit and within the tolerances indicated in the paragraph "Operating limits";
- the max. unbalance between the phases does not exceed the value indicated in the paragraph "Operating limits".

2) Connection of the supply cable:
The units are equipped with electrical panel with one main switch for the power section and one switch (option) for the control section.

- Choose a supply cable (three- pole type with ground) for the power section and a supply cable (two- pole type with ground) for the control section (option):
  - the local norms;
  - the system absorption (FLA unit);
  - the system voltage;
  - installation type;
  - cable length;
  - upstream protection.
- After opening the passage in the structural works (pre-cut), for the supply line inlet, restore the original protection degree with suitable accessories for the wiring and junction boxes.
- Install the cable avoiding carefully to touch the hot parts.
- Connect the cable to the inlet terminal board (disconnecting switch terminals for phases, ground bar for PE conductor). After having connected the cable, restore the protections against direct contacts.



Example of connection with the disconnecting switch with 2 cable terminals.



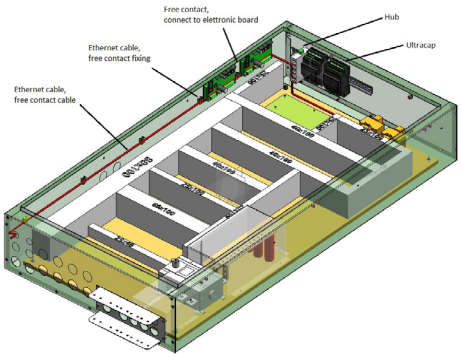
3) The system/line cable protection is to be arranged by the customer.

Use a protection with differential switch. If the system is equipped with EC type fans and/or pumps with inverters, use a B type switch.

4) Ethernet cable connection.

The control can be connected with a remote display (ColdFire) through an Ethernet network cable (see HW user handbook).

- Fasten the cable to the clamp- holding plates and make it pass through the first free hole on the panel bottom (arrange a cable clamp).
- After opening the passage in the structural works (pre- cut), opposite the supply line inlet, restore the original protection degree with suitable accessories for the wiring and junction boxes.
- The cable must be protected by a sheath.



5) Connection of the clean contacts for the unit status signals. The clean contacts can be used only with PELV type sources, as described by the norm CEI EN 60204- 1 “Safety of machinery - Electrical equipment of machines”. The table below shows the available terminals and their meaning (refer to the wiring diagrams for further information). Use wires 1mm^2. The cable passage must be arranged as described in the previous point 4).

Free contacts available

-XU	400 401 402	General Alarm - Unit off	→ 400-401 NC
-XU	300 301 302	Warning - Unit off	→ 300-301 NC
-XU	450 451	Compressor 1 ON	→ 450-451 NC
-XU	452 453	Compressor 2 ON	→ 452-453 NC
-XU	454 455	Compressor 3 ON	→ 454-455 NC
-XU	456 457	Compressor 4 ON	→ 456-457 NC
-XU	462 463	Configure output	→ 462-461 NC
-XU	476 477	Tank draining	→ 458-459 NC
-K71	8 7	Compressor 1-2 alarm	→ K71:OUT5 NO Alarm - Unit OFF
-K71	6 5	Alarm high water temp.	→ K71:OUT6 NO Alarm - Unit OFF
-K71	2 1	Water flow alarm	→ K71:OUT8 NO Alarm - Unit OFF
-K72	8 7	Compressor 3-4 alarm	→ K72:OUT5 NO Alarm - Unit OFF
-K72	6 5	Compr. Contactor melted	→ K72:OUT6 NC Alarm
-K72	2 1	Condensaer fan failure	→ K72:OUT8 NO Alarm - Unit OFF

Input contact

-XU	470 471	Remote on-off	Supply voltage 24V AC

Dry contact K72: OUT6 NC during alarm state opposite logic to the others) signals compressor’s contactor melted: It has to be managed by the customer switching OFF unit power supply. Before switching ON the unit, check the compressor and their contactor conditions.

Note:
The power supply should never be disconnected, except when performing maintenance.
Operate (open) the main switch before carrying out any maintenance work on electrical components.

Note:
It is forbidden to work on the electrical components without using insulating platforms, and in the presence of water or fog or mist.

Note:
The supply to the external pump assembly must be made before starting the chiller and must be kept on as long as the chiller is in use. Incorrect operation will cause the unit to lock- out because of the internal protections (flow switch intervention).

Note:
The compressors are equipped with an electronic protection device blocking their start if the phase sequence is not correct, or stopping their operation if a thermal relay intervenes. This device is essential for the integrity of the mechanical and electrical components of the compressors. Reset the standard functions by isolating this device and removing the causes of the lock- out.

Note:
The chillers are equipped with their own microprocessor control adjustment. The use of the remote ON- OFF input (located in the electric panel terminal board) as a system temperature control element is forbidden.

4 - Start- Up and Operation

4.1 - Initial check

Caution:
The operation has to be done by a qualified technician with an experience and know- how on chiller units, iCOM control board and software.

Before the checks below make sure the unit power supply line is disconnected at the start. Make sure the disconnection device is locked and the suitable warning plate for no operation is applied on the start handle. Before operating on the electrical connections, make sure there is no voltage through a voltmeter or a phase detector.

Some components (electronic pumps, EC fans, compressor's capacitors, soft- start, inverter) may remain high voltage for a short period after power supply removal. Wait at least 5 minutes to remove their electrical box panels and access to their parts under tension.

1) Check all the cable connections particularly the main power connections on the power fuses, contactors and MCB.
2) Check that all thermal protections are calibrated according the electrical data tables reported on wiring diagram.
3) Check all water connections.
4) Open the shut- off valve on the liquid line.
5) Ensure that the low pressure is higher than 7.0 bar for R410A: if this is not the case, prolong pre- heating of the compressor (see Fig. 9 - Refrigerant circuits) and check that the refrigerant EEV (shut- off valve) is properly sealed.
6) Open all isolating valves and/or water ball valve
7) In case of climates with temperatures below zero degrees C, make sure the chilled water circuit is filled with the correct concentration of water/glycol.
8) Bleed all air out of the chilled water circuit.
9) Verify the water flow rate and its direction.
10) Ensure that the thermal load is sufficient for start- up.
11) Record the functional data on the Start- Up certificate.

Caution:
The outer air temperature probe must be positioned in the shade and protected against the weather.

Caution:
Now set the handle of the door- lock general knife switch to the position "1"; it is now possible to supply the unit electrically closing the disconnection device upstream the power supply line.

4.2 - First start- up

(or after a long stop)

Caution:
Before the following operations, make sure all protections on the units have been reset; set the handle of the door- lock general knife switch to the position "1", check the display LED is switched on and check again by a voltmeter or tester if the voltage and phase difference fall within the indicated limits.

Operate as follows:

1) **At least 8 hours before the start- up, power the crank-case heaters by setting the main isolator switch ON. Make sure the auxiliary circuit has been powered and check the operation (a fault due to an incorrect proced-ure will invalidate the compressor guarantee).**
2) Open the valves of the refrigeration circuit that had been closed before the initial check.
3) Check the machinery supplying the thermal load connec-ted with the unit and start the system pump(s).
4) MAKE SURE THE COMPRESSOR OIL HAS BEEN HEATED FOR AT LEAST 8 HOURS; start the unit only then.
5) Make sure the fans rotate in the correct direction (anticlock-wise): check the electrical connections, if necessary.
6) Make sure the pumps rotate in the correct direction.
7) **During the unit start- up an inlet water temperature higher than 20° C is allowed. Under standard operating conditions check that the limits indicated in paragraph 2.3 are not exceeded.**
8) Check the correct operation of the control and safety devices.
9) Check the outlet temperature of the chilled water (check if the set- point set on the controller is reached).
10) Check the oil level when both compressors are running.
11) With the compressors at full load, check there are no bubbles visible in the frefrigerant sight glass. If there are any, charge the unit according to par. 5.

4.3 - Starting and stopping

ALWAYS ENSURE THAT THE COMPRESSOR OIL HAS BEEN PREHEATED.
FOR BRIEF STOPPAGES MAINTAIN THE SUPPLY TO THE CRANKCASE HEATER.

- Start the unit setting the Microprocessor switch **ON.**
- Stop the unit setting the Microprocessor switch **OFF**.
- In case of long stops, turn the machine off using the Microprocessor switch OFF.
  In this case the compressor crankcase heaters remain powered.
- For seasonal shutdown of the unit operate the main switch located on the main electrical power supply. This will disconnect the compressor crankcase heaters. Machine restart must be managed as in § 4.2 "Initial startup (or following a long interruption)".
- The unit can tolerate short periods without power due to a blackout without the fast start function (up to four hours), with automatic restart without the need to repeat the procedure described in § 4.2 "Initial startup (or following a long interruption)".
- The unit can tolerate short periods without power due to a blackout with the fast start function (up to one hour), with automatic restart without the need to repeat the procedure described in § 4.2 "Initial startup (or following a long interruption)".

4.4 - Chillers serving special plants

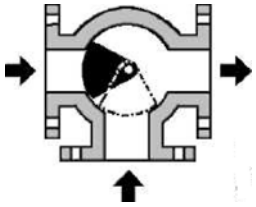
The units are capable of cooling a water- glycol mixture to temperatures close to 0° C without the need for significant modifications. In the case of modification, the set values of the safety and control components must also be changed. This can be carried out in the factory (at the time of testing) or at the time of installation, only by qualified and authorised personnel.

4.5 - Freecooling

The "freecooling" is a system of pre- cooling and/or cooling the water/glycol mixture using ambient air when the latter is at a temperature below the return mixture temperature. If the outside temperature is sufficiently low to dissipate the entire heat load, the refrigeration compressors automatically switch off, and the mixture's temperature is controlled by the fan speed adjustment.
If the mixture temperature is too high for freecooling, the compressors will operate as long as necessary to ensure the correct water/glycol mixture temperature.

4.5.1 - Freecooling versions: Three- way valve

Water quality has to be in accordance with VDI 2035 in order to assure valve functionality; max. working pressure is 6 Bar.
Shutter valve position is shown by cutting reference on the valve end of the valve shaft (when the servo is disassembled) and by pin indicator mounted on the motor body.



Actuator running time (90° angle rotation) is 90 seconds.
In the following pictures it is shown manual unlocking instruction (it is necessary to follow this instruction when the hydraulic circuit is filled with glycol).

UNLOCK

To unlock the actuator open the top cover and push the activation button.

4.6 - Microprocessor control

Consult the "iCOM" Service Manual.

5 - Refrigerant and Oil Charge

All work on pipes or components of the refrigerating circuit under pressure must be exclusively carried out by qualified staff, competent in such works.

5.1 - Refrigerant charge

WHILST REPAIRING THE REFRIGERATING CIRCUIT RECOVER ALL THE REFRIGERANT IN A CONTAINER: DO NOT ALLOW IT TO ESCAPE. NEVER USE THE COMPRESSOR FOR THE SYSTEM VACUUM (THIS INVALIDATES THE WARRANTY).

- The unit is delivered charged according to the Tab. 2.

Warning for the refrigerant charge:

- Ensure there are no refrigerant leaks.
- Check the refrigerant type in the refrigeration circuit: a unit originally charged by the manufacturer with R410A cannot be charged with other gas and vice versa; possibly apply to the Technical Support Department.
- Charge with the compressor in operation, connecting the cylinder with the charge connector after the thermostatic expansion valve.
  Drain the connection pipe between the cylinder and the charging point; tighten the seal joint and then start charging the unit. It is imperative that the cylinder is weighed both before and after the operation.
- Charge the unit until the bubbles in the sight glass have disappeared and the working conditions of the entire refrigeration circuit have returned to normal (sub- cooling and superheating within the limits indicated below).
- Measure the superheating as follows:
  1) Detect the temperature on the suction line, close to the temperature sensosor of the electronic expansion valve, using a contact thermometer.
  2) Connect a pressure gauge (by max. a 30- cm pipe) with the Schraeder connection and read the corresponding saturated evaporating temperature.
  3) The superheating is the difference between the two readings.
- Verify that the superheating is 5° C - 8° C.
- Measure the sub- cooling as follows:
  1) Detect the temperature on the liquid line using a contact thermometer.
  2) Connect a pressure gauge (by max. a 30- cm pipe) with the Schraeder connection on the liquid line and read the corresponding saturated condensing temperature.
  3) The sub- cooling is the difference between the two readings.
- Verify that at the condenser outlet, sub- cooling is 3° C - 5° C.

IT IS IMPORTANT TO CARRY OUT CHARGING CORRECTLY. An excess of refrigerant causes an increase in sub- cooling and consequent operating difficulties in the hot season; a shortage of charge generates an increase in superheating and possible compressor stoppages. Whenever work is carried out on the unit, ensure afterwards that the working conditions are correct, checking sub- cooling and superheating.
Check the oil level (3/4 of max) in sight glass (fitted on oil and gas equalization tube of each tandem compressor) after a short operating time of both compressors (installed in the same refrigerant circuit).
Note: Check the oil level moving in sight glass (fitted on oil and gas equalization tube of each tandem compressor) from the stopped compressor to the running one.
Note: if only one compressor is running it's possible that the oil level in sight glass (fitted on oil and gas equalization tube of each tandem compressor) reach the min level or lower: it's a normal operating mode and it doesn't affect the reliability of the unit.

5.2 - Oil charge

Contact the Technical Support Department for the specifications of the oil to be used for topping up; the oil changes according to the type of used refrigerant.

NEVER MIX DIFFERENT OILS TOGETHER. CLEAN THE PIPING COMPLETELY BEFORE CHANGING THE TYPE OF OIL USED.

TOP- UPS OF UP TO 20- 30% OF THE TOTAL AMOUNT OF OIL CONTAINED IN THE COMPRESSOR CRANKCASE ARE PERMITTED; FOR LARGER PERCENTAGES CONTACT THE TECHNICAL SUPPORT DEPARTMENT.

5.2.1 - Procedure for oil topping- up

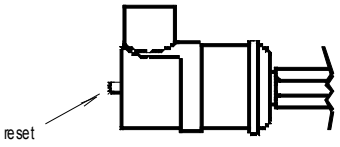
If there has been any loss of oil then this must be topped up as follows:

1) Take a clean, dry, transparent container (with volume calibrations) and fill it with at least twice the amount of oil required.

2) Isolate the compressor by closing the cock on the liquid line.
3) Connect to the fittings on the compressor body (Schraeder valves) and empty it of refrigerant until atmospheric pressure (1 bar) is reached.
4) Using a pipe, connect the oil container to the oil service fitting on the lower part of the compressor.
5) Open the oil service cock, lifting the container, so that the oil flows by gravity.
6) Charge the required quantity of oil (make sure the tube always remains below the oil level in the container).
7) Stop the oil flow by closing the oil service fitting, open the shut- off cock on the refrigerating circuit and restore the drained refrigerant charge.

6 - Safety Devices Settings

The water chiller has been already tested and calibrated by the manufacturer. The following setting values are suggested in the field.

COMPONENT	SETTING	NOTES
Low pressure switch (LP) (managed by electronic control iCOM)	Operation with R410A (standard factory setting): START : 5.5 bar DIFF. : 0.5 bar STOP : 5.0 bar	
High pressure switch (HP)	Operation with R410A (standard factory setting): STOP : 42.0 bar START : 33.0 bar DIFF. : 9.0 bar (fixed)	

The settings for the safety valves installed on the machine are indicated below:

MODELS	SETTING	SAFETY VALVE
CB0 / CG0 017- 020- 023- 025- 028- 030- 032 **FB0 / FG0 017- 020- 023- 025- 028- 030- 032**	45.0 bar	High pressure side

6.1 - Electronic expansion valve

The electronic expansion valve used in the **Liebert HPC S 017- 032** range enables accurate and min. possible control of the overheating of the gas sucked by the compressor under all load conditions, together with the operation at low condensation and high compressor choking. Under such application conditions a mechanical expansion valve can never reach the performance ensured by an electronic expansion valve (with energy benefits) nor the functional stability, above all during the transients of the load variations (with benefits as for reliability). The final result of the application of the electronic expansion valve on **Liebert HPC S 017- 032** is therefore an improved energy operating costs and a higher reliability, thanks to its special adjustment features above all on partial loads, conditions under which every chiller operates for most of the time. The operating parameters and their programming in the microprocessor dedicated to the EEV control are described in the suitable iCOM manual available on the machine
The valve has already been factory- set and superheat should be reset only when it's not between 5 and 8° C or it's present oil foam (visible on compressor's oil sight glass),

THIS OPERATION MUST BE PERFORMED BY AN EXPERIENCED REFRIGERATION TECHNICIAN.
Before beginning this calibration be sure that the refrigerant charge is correct: this is obtained through the sub- cooling (4- 8°C, as specified in para. 5.1).

Compressor's suction pressure, temperature and superheat could be read on iCOM control display as described in the suitable iCOM manual available on the machine.

PLEASE CHANGE SUPERHEAT SETPOINT ONLY WHEN RELEVANT COMPRESSOR IS OFF; IT'S NOT ALLOWED TO CHANGE EEV SUPERHEAT SETPOINT WHEN THE RELEVANT COMPRESSOR IS RUNNING.

If the superheat is too low, there is a risk of poor lubrication and consequent breakage of the compressor as a result of pressure shock.
If the superheat is too high the output of the system is limited and the compressor overheats.

6.2 - Environment protection

A misuse or an incorrect calibration of the unit leads to increased energy consumption, resulting in an economic and environmental damage. Use the freecooling function, if available.

7 - Maintenance

The Maintenance Programme below must be carried out by a qualified technician, preferably working under a maintenance contract.

Caution:
Before the checks below make sure the unit power supply line is disconnected at the start. Make sure the disconnection device is locked and the suitable warning plate for no operation is applied on the start handle.

Before operating on the electrical connections, make sure there is no voltage through a voltmeter or a phase detector.

Some components (electronic pumps, EC fans, compressor's capacitors, soft- start, inverter) may remain high voltage for a

short period after power supply removal. Wait at least 5 minutes to remove their electrical box panels and access to their parts under tension.

Before any intervention on the unit or accessing the inner components, always ensure the machine is turned off. The front part of the compressor and the delivery pipe are very hot: be careful when operating nearby. Be very careful when operating close to the finned coils, as the fins are very sharp. Do not remove the fan protection grille before having shut the whole machine off; do not insert foreign objects through the fan protection grille. After the maintenance interventions, always close the unit by refitting the relevant panels, fastened by the fixing screws.

If the front upper panels are removed (coil compartment) wait for the fan(s) to come to a complete stop before accessing the compartment; if the front lower panels are removed, pay special attention when working near the compressor upper part and the discharge line: they are very hot; possibly wait for them to cool.

7.1 - Coil cleaning procedures

The obstructions provided by powder, pollution etc. accumulated between the coils fins can be removed by means of a pressure washer.
This operation shall be periodically executed.

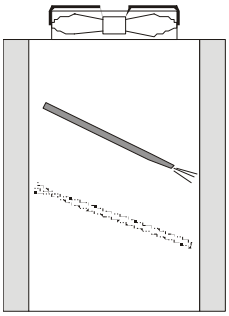
Before operating:

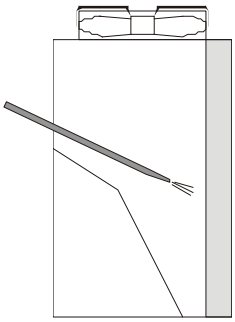
1) disconnect the unit from the electrical power supply;
2) remove the air filters;
3) wait until the fans are completely stopped;
4) ensure that the fans impellers cannot move for any reason (e.g.: wind). Block them mechanically to avoid accidental contacts with the rotating blades.

The high pressure water flow shall be the contrary of the air flow direction and parallel to the coil fins.

In order to achieve this result, introduce the water nozzle in the internal space of the unit, following these possible strategies:

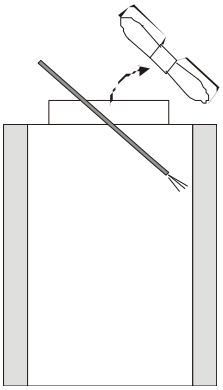
Remove the back panel(s) and insert the nozzle inside the internal space.





Remove the side panels (in case of single coil units) and insert the nozzle inside the internal space.

Remove one or more fans.
Insert the water nozzle through the fan opening / nozzle.



In case of greasy obstructions, a specific neutral degreasing product can be used to ease the process.
After the cleaning operation, re-assemble the parts previously removed and unblock the blocked fans before reconnecting to the electrical power supply.

7.2 - Lubrication - pump

The bearings of motors up to 11 kW are greased for life and require no lubrication.
The bearings of motors of 11 kW and up must be greased in accordance with the indications on the motor nameplate.
The motor should be lubricated with a lithium- based grease meeting the following specifications:

- NLGI grade 2 or 3.
- Viscosity of basic oil: 70 to 150 cSt at 40° C (aprox. +104° F).
- Temperature range: - 30° C (aprox. - 22° F) to 140° C (aprox. +284° F) during continuous operation.

7.3 - Spare parts

The use of original spare parts is recommended.
When placing an order refer to "Component List" enclosed with the machine and quote the unit model no. and serial no.

NOTE: if one or more compressors must be replaced, you must contact **"Vertiv"** Service.

7.4 - Dismantling the unit

The machine has been designed and built to ensure continuous operation. The working life of some of the main components, such as the fans and the compressors, depends on the maintenance that they receive.

The unit contains substances and components hazardous for the environment (electronic components, lead battery, refrigerating gases and oils). At the end of the useful life, when the unit is dismantled, the operation must be carried out by specialized technicians. The unit must be delivered to suitable centers specialized for the collection and disposal of equipment containing hazardous substances. Lead battery, refrigerating fluid and the lubricating oil inside the circuit must be recovered according to the laws in force in the relevant country.

7.5 Regulation (EU) no. 517/2014 (F- gas)

7.5.1 Introduction

Stationary air conditioners placed into the European Community market and operating with fluorinated greenhouse gases (F-gas, such as R407C, R134a, R410A), have to comply with the F- gas Regulation (EU) No. 517/2014.

This Regulation is in force since Jan 1, 2015 an it replaces the Re. (EU) no. 342/2006.

This document summarizes the obligations for the operators that are responsible for the equipment during all its operative life until its disposal.

7.5.2 Normative References

F-gas	517/2014	Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006
Certified personnel and Companies	2015/2067	Commission Implementing Regulation (EU) 2015/2067 of 17 November 2015 establishing, pursuant to Regulation (EU) No 517/2014 of the European Parliament and of the Council, minimum requirements and the conditions for mutual recognition for the certification of natural persons as regards stationary refrigeration, air conditioning and heat pump equipment, and refrigeration units of refrigerated trucks and trailers, containing fluorinated greenhouse gases and for the certification of companies as regards stationary refrigeration, air conditioning and heat pump equipment, containing fluorinated greenhouse gases
Leak check air conditioning	1516/2007	Commission Regulation No 1516/2007 of 19 December 2007 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, standard leakage checking requirements for stationary refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases
Leak check fire protection systems	1497/2007	Commission Regulation No 1497/2007 of 18 December 2007 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, standard leakage checking requirements for stationary fire protection systems containing certain fluorinated greenhouse gases From 01/01/2017 to be replaced by: Commission Implementing Regulation (EU) 2015/2068 of 17 November 2015 establishing, pursuant to Regulation (EU) No 517/2014 of the European Parliament and of the Council, the format of labels for products and equipment containing fluorinated greenhouse gases

7.5.3 Fluorinated Greenhouse Gases

Following notes have to be considered when operating with the above mentioned equipments:

- Fluorinated greenhouse gases are covered by the Kyoto Protocol.
- The fluorinated greenhouse gases in this equipment should not be vented to the atmosphere.
- Referring to the value noted in Annex I and Annex IV of Regulation (EU) No 517/2014 here below the global warming potential (GWP) of some major F- gases or mixtures:
  - R-134a GWP 1430
  - R-407C GWP 1774
  - R-410A GWP 2088

NOTE: *the refrigerants as R22 are not F-gas and their relevant regulation is Reg. (EU) no. 1005/2009.*

7.5.4 Operators

7.5.4.1 Definitions

- Operator, according to Regulation 517/2014 Article 2, point 8, means the natural or legal person exercising actual power over the technical functioning of products and equipment covered by this Regulation.
- The State may, in defined, specific situations, designate the owner as being responsible for the operator's obligations.
- Where large installations are involved, service companies are contracted to carry out maintenance or servicing. In these cases the determination of the operator depends on the contractual and practical arrangements between the parties.

7.5.4.2 Obligations

Operators of stationary air conditioners, which contain fluorinated greenhouse gases, shall, using all measures which are technically feasible and do not entail disproportionate cost:

a Prevent leakage of these gases and as soon as possible repair any detected leakage.

b Ensure that they are checked for leakage by certified personnel.

c Ensure for putting in place arrangements for the proper recovery by certified personnel.

d According to Regulation 517/2014 the operators shall ensure that the equipment is checked for leaks as following:

Case 1 - Non-sealed equipment contains less than 5 tonnes of CO 2 equivalent of fluorinated greenhouse gases.

► Leakage test not required

Case 2 - Hermetically sealed equipment contains less than 10 tonnes of CO 2 equivalent of fluorinated greenhouse gases.

► Leakage test not required

Case 3

► **Leakage test required:** check the equipment for leaks with the minimum frequency given in the following table:

X = Tonnes of CO2 Equivalent	Y = equivalent amount of refrigerant [kg]			Minimum frequency for leak check	
	R134a	R410A	R407C	with leakage detection	without leakage detection
5 ≤ X < 50	3,5 ≤ Y < 35	2,4 ≤ Y < 24	2,8 ≤ Y < 28	12 Months	24 Months
50 ≤ X < 500	35 ≤ Y < 350	24 ≤ Y < 240	28 ≤ Y < 282	6 Months	12 Months
X ≥ 500	Y ≥ 350	Y ≥ 240	Y ≥ 282	3 Months	12 Months

e Recovery for the purpose of recycling, reclamation or destruction of the fluorinated greenhouse gases, pursuant to Art. 8 of the Regulation 517/2014 shall take place before the final disposal of that equipment and, when appropriate, during its servicing and maintenance.

7.5.5 Leakage Detection

The manufacturer approves the following leakage check methods according to Reg. 1516/2007 and Reg. 1497/2007:

	Method	Specifications
a	Check of circuits and components representing a risk of leakage with gas detection devices adapted to the refrigerant in the system	Gas detection devices shall be checked every 12 months to ensure their proper functioning. The sensitivity of portable gas detection devices shall be at least five grams per year.
b	Application of ultraviolet (UV) detection fluid or suitable dye in the circuit	The method shall only be undertaken by personnel certified to undertake activities which entail breaking into the refrigeration circuit containing fluorinated greenhouse gases.
c	Proprietary bubble solutions/soapsuds	---

7.5.6 Labelling

The label applied on the unit (see *Onboard Label*) is designed to fill-in the relevant amounts of refrigerant according to Regulation 1494/2007 (2015/2068):

a Where fluorinated greenhouse gas is foreseen to be added to the equipment outside of the manufacturing site at the point of installation, a dedicated label accommodates notation of both the quantity (kg) pre-charged in the manufacturing plant and of the quantity charged at the installation site as well as the resulting total quantity of F-gas as a combination of the above mentioned quantities, in a manner which conforms to the legibility and indelibility.

Our split units are usually not pre-charged on factory, in this case the total quantity of refrigerant charged in the unit has to be written in the relevant label, during the commissioning operation at the installation site.

All of the quantities of must be given both as mass of refrigerant [kg] and as Tonnes of CO2 Equivalent.

Use the following rule for computation:

$$\text{Tonnes of CO2} = \frac{\text{kg of refrigerant x GWP of refrigerant}}{1000}$$

where:

Refrigerant	GWP
R-134a	1430
R-407C	1774
R-410A	2088

b Our packaged units (not split) operating with f - gas are usually full charged on factory and the total amount of refrigerant charge is already reported on the label. In this case, the label has no need of further written information.

c In general, the above mentioned information has been located in the main nameplate of relevant unit.

d For equipment with double refrigeration circuits, in regards to differentiates requirements on the basis of the quantity of F-gas contained, the required information about refrigerant charge quantities has to be listed separately for each individual circuit

e For equipments with separate indoor and outdoor sections connected by refrigerant piping, the label information will be on that part of the equipment which is initially charged with the refrigerant. In case of a split system (separate indoor and outdoor sections) without a factory pre-charge of refrigerant, the mandatory label information will be on that part of the product or equipment which contains the most suitable service points for charging or recovering the fluorinated greenhouse gas(es).

NOTE: *Safety data sheets of F-gases used in the products are available on demand.*

7.5.7 Record Keeping

Operators of equipment which is required to be checked for leaks (see *7.5.5 Leakage Detection*), shall establish and maintain records for each piece of such equipment specifying the following information:

a the quantity and type of fluorinated greenhouse gases installed

b the quantities of fluorinated greenhouse gases added during installation, maintenance or servicing or due to leakage

c whether the quantities of installed fluorinated greenhouse gases have been recycled or reclaimed, including the name and address of the recycling or reclamation facility and, where applicable, the certificate number

d the quantity of fluorinated greenhouse gases recovered

e the identity of the undertaking which installed, serviced, maintained and where applicable repaired or decommissioned the equipment, including, where applicable, the number of its certificate

f the dates and results of the leak checks carried out (see *7.5.5 Leakage Detection*)

g if the equipment was decommissioned, the measures taken to recover and dispose of the fluorinated greenhouse gases

Unless the records are stored in a database set up by the competent authorities of the Member States the following rules apply:

a the operators shall keep the records for at least five years

b undertakings carrying out activities for operators shall keep copies of the records for at least five years

Maintenance programme - Monthly check

FANS	• Check that the fan motor rotates freely without any abnormal noise, and ensure that the bearings are not running hot. • Also check the current absorption.
CONDENSER AND AIR FILTER	• Check the conditions of the filters (if they are supplied); if necessary clean them (including the electrical panel ventilation filter). • Check the condenser coils and clean if necessary (see coil cleaning procedures).
CONTROL	• Check that the control equipment, LEDs and display are operating correctly. • Check the supply voltage. • Check the operation of the compressor's oil heaters. • Check the conditions of the remote control switch contacts. • Check the operation of the evaporator resistance (if present). • Check the operation of the electrical panel fan and heaters (if present).
ELECTRICAL CIRCUIT	• Check the electrical supply on all phases. • Ensure that all electrical connections are tight.
REFRIGERATION CIRCUIT	• Check the condensing and the evaporating pressures (to be done by a refrigeration technician). • Check the compressor's current absorption, the delivery temperature and possible unusual noises. • Check the refrigerant charge by means of the sight glass. • Check that the safety devices operate correctly. • Check the correct operation of the EEV (superheating between 5°C - 8°C). • Check that the oil level is approx 3/4 indicated by the sight glass (fitted on oil and gas equalization tube of each tandem compressor) after a short operating time of both compressors.
CHILLED WATER CIRCUIT	• Ensure that there are no water leaks. • Bleed any air out of the hydraulic circuit using the bleed valves. • Verify that the water flow rate is correct. • Check the inlet - outlet liquid temperature and pressure. • Check the correct operation of the three- way valve (Versions with freecooling only). • Check if the system is charged with the specified glycol percentage and that no ice has formed in the hydraulic circuit. • Check the evaporator cleanliness. • Check the motor pump current. • Check the motor pump noise. • Ensure the motor pump is periodically lubricated.

8 - Options and Accessories

8.1 - Pump set

It is possible to select the pump type (low or high head) on each unit, both in the standard version and in the one with inverter and integrated electronic adjustment. The centrifugal pump units are direct driven, with close- coupled motors and a single shaft; the induction motor has 2 poles with IP 55 protection and class F insulation.
Pumps are primarily fitted with motors that meet the legislative requirements of the EuP IE3 grade.
The pumps are of the top- pull- out design, i.e. the power head (motor, pump head and impeller) can be removed for maintenance or service while the pump housingremains in the pipework.
The electronic pump adjustment algorithm enables to modulate the pump speed to keep the delivery steady through the evaporator even if the hydraulic load changes; in this way, a significant energy saving is achieved and varies depending on the applications. In particular, in the Freecooling units this benefit is obtained above all in summer, when the Freecooling coil is short- circuited. The programming of the adjustment set of the electronic pump can be made in factory or in the installation site thanks to a simple user panel interface CU351 fitted on chiller electrical panel; in case of doubt, contact your dealer.

Pump casings and impellers are in cast iron EN- GJL 200, shafts are in stainless steel, the shaft seal is a unbalanced, mechanical shaft seal with dimensions according to DIN 24 960 and assembly length according to EN 12 756, brass neck ring permits ideal conditions for the use of water mixtures containing ethylene glycol. The BQQE mechanical shaft seal is a rubber bellow seal with silicon carbide/silicon carbide seal faces and secondary seals of EPDM. The pump housing, the motor stool and the motor stator housing are electrocoated.

The pump units have been chosen and sized to operate within specific limits, namely:

- Water / ethylene glycol mixtures up to 65% / 35% by weight;
- Temperatures of the standard pumped fluid not lower than 4°C.

The motor stool forms connection between the pump housing and the motor, and is equipped with a manual air vent screw for venting of the pump housing and the shaft seal chamber. It is very important to carry out this operation as the circulation of liquid through the duct of the air vent screw ensures lubrication and cooling of the shaft seal.
Between the outlets of the two chambers and the discharge flange, twin- head pumps have a non- return flap valve in EPDM rubber. The flap is opened by the flow of the pumped liquid and cuts off the port of the idle pump chamber.
In the electrical panel there are automatic circuit breakers for each pump; the microprocessor control manages the operating rotation between the two pumps and start- up of the stand- by pump if the primary pump fails.

In case of electronic inverter pump replacement it's necessary to set all deep parameters (user panel is not feasible for this operation); this operation mustbe performedby anexperienced **Vertiv** technician.

For the technical features of the pumps and the hydraulic schematic see Tab. 4, Fig. 11 and Fig. 12.

8.2 - Water chiller with partial heat recovery (20%) - Special option

This option enables the recovery of up to 20% of the heat normally rejected by the condensers. The system does not require any adjustment and is made up of plate heat exchangers installed on each circuit before the condenser. The exchangers are protected by a suitable anti- frost heater that operates when the system is stopped. It is recommended to install a safety valve in the hydraulic circuit to avoid hazards due to overpressures, if there is no water flow in the recuperator.
The water temperature at the recuperator inlet (in stable operating conditions) must be in the range of 25 to 45 °C, with a differential of between 3.5 and 8 °C.

WARNING: you must exclude the use of heat recovery for the direct heating of sanitary hot water.

8.3 - Hydraulic circuit accessories

Made up of an expansion vessel (pre- charged at 1.5 bar, max. operating pressure 10 bar) and a safety valve, set at 6 bar. Their position in the hydraulic circuit is illustrated in Fig. 11, Fig. 12.

- Expansion vessel volume: 12 litres for all units.

It is recommended that the total required expansion vessel capacity is always checked, depending on the unit's internal hydraulic volume (with the volume of the buffer tank, if installed), the user circuit volume, the glycol percentage in the mixture, and the expected maximum temperature variation of the mixture.

The water flow switch is a compulsory device protecting the unit. It is installed, as standard, on units with the optional on- board pump set, and is available as a option for units without pumps on board: in the latter case the flow switch, if not installed on the machine, must be installed on the hydraulic circuit by the installer and wired to the electric panel terminal board, as indicated on the wiring diagram.

8.4 - Water chiller with inertial tank

The machine can be supplied complete with a buffer tank; it performs the inertial stabilizer function, for a better compressor operation, summed up in the following two points:

- it reduces the frequency of the compressor start up and consequent high current peaks, which is higher when the system thermal inertia is lower, improving their performance.
- it naturally eliminates the operation troubles caused by sudden load variations (shown by variations of the chilled water temperature).

The buffer tank is supplied complete with manometer and temperature sensor well, air purge valve, discharge valve and sinking connection for electric heaters (to be installed as option, managed by the iCOM control); max operating pressure: 6 bar. Built in carbon steel and coated with anti- condensate insulation with PVC film proper for outdoor installation. It is installed inside a cabinet which can be supplied either already connected to the unit (mechanically and hydraulically jointed to it) or loose (completely separate from the unit).

Technical data:

- Internal volume: 1000 litres
- Net weight: 400 kg
- Working weight: 1400 kg

9 - Electrical Panel and Chiller Control

The electrical panel is designed, constructed and tested in compliance with IEC standards (EN60204- 1).

It is installed on the compressor compartment side and can be accessed through the unit right side panel; it has a degree of protection equivalent to IP54. It is possible to access the “iCOM” control display without switching the unit off, so as to aid maintenance operations.

The cooling of the electrical panel is achieved through forced ventilation controlled by the microprocessors board. For low ambient temperatures (below - 5° C) it is possible to have an electric heater fitted inside (optional) and controlled as well by the microprocessor board.

Main features:

- Power supply: 400V±10% / 3Ph + PE / 50Hz.
- Auxiliary power supply circuit: 230V / 1Ph / 50Hz and 24V / 1Ph / 50Hz.
- Main switch.
- Main switch for auxiliary circuit and fast start feature (optional).
- Protection MCBs for compressors, fans and pumps.
- Contactors for compressors and pumps.
- Relay for checking phase sequence, minimum voltage, loss one or more phase.
- Manual operation through “iCOM” controller.
- PFC(Power Factor Correction) for compressors (option).
- Compressors electronic soft start (option).
- Volt-free contacts for remote indication of:
  - compressors in operation;
  - pump(s) in operation;
  - general alarm;
  - warning alarm;
  - tandem compressor alarm 1/2;
  - high temperature inlet/outlet water alarm;
  - water flow alarm;
  - condenser fan failure:
  - configurable free contact;
  - external input for remote ON/OFF.

Tab. 1 - Internal hydraulic volume

MODEL		UNIT VOLUME (l)	MODEL		UNIT VOLUME (l)
CB0	017	11	FB0	017	107
	020	11		020	107
	023	13		023	109
	025	13		025	126
	028	17		028	130
	030	17		030	147
	032	22		032	151
CG0	017	11	FG0	017	107
	020	11		020	107
	023	13		023	126
	025	13		025	126
	028	17		028	147
	030	17		030	147

Note:
Add the tank's volume for the units with optional buffer tank.

Tab. 2 - Refrigerant and oil charge

CB0 / **FB0**

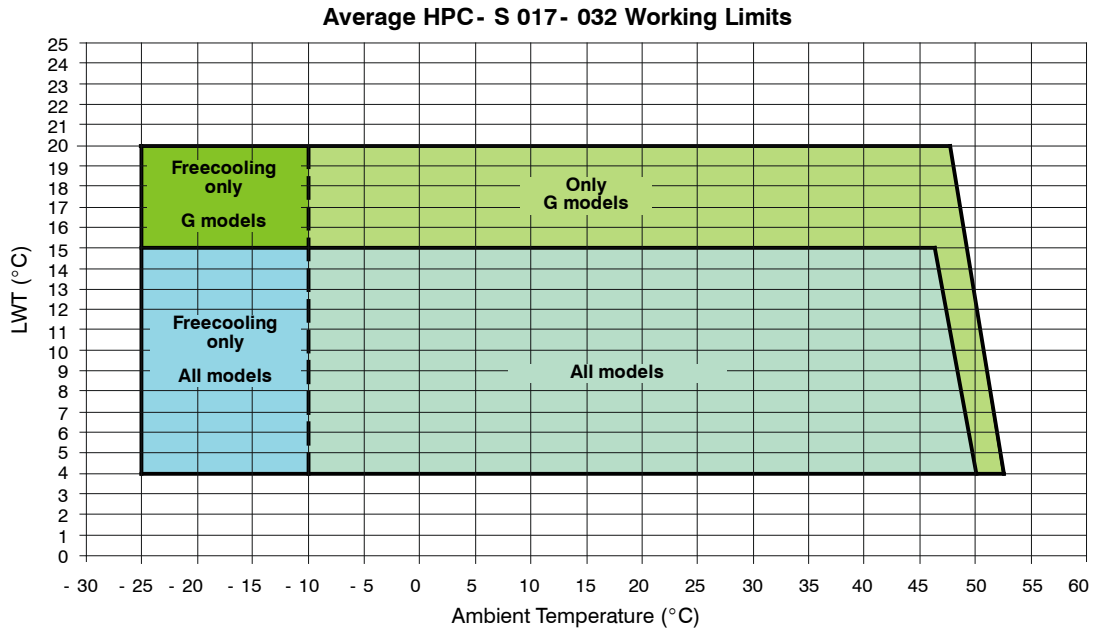
MODEL		017	020	023	025	028	030	032
Refrigerant charge (each circuit)	[kg]	15	16	17	21	23	26	26
Oil charge (each circuit)	[lt]	3,4+3,4	3,4+4,7	3,4+6,8	4,7+6,8	6,8+6,8	6,8+6,3	6,3+6,3

CG0 / **FG0**

MODEL		017	020	023	025	028	030
Refrigerant charge (each circuit)	[kg]	15	16	20	21	25	26
Oil charge (each circuit)	[lt]	3,4+3,4	3,4+4,7	3,4+6,8	4,7+6,8	6,8+6,8	6,8+6,3

Note:
Refrigerant type: R410A; Oil type: ICI Emkarate RL 32 3MAF.

Tab. 3 - Operating range



Operating range - Chiller with AC fans 900mm

Models: CB0 017- 032		017	020	023	025	028	030	032
Operating range								
Max. outdoor temperature (1)	°C	50.0	48.0	47.5	49.0	48.5	48.0	48.0
Safety devices settings								
High pressure switch (1)	barg				42			
High pressure safety valve	barg				45			
High pressure safety valves (each circuit)	Nr.				1			
High pressure safety valve connection	in				3/4" G			
Low pressure switch	barg				5.0			

(1) - With nominal air flow; water outlet temperature 7° C; full load; R410A refrigerant.

Operating range - Chiller with AC fans 800mm

Models: CB0 017- 032		017	020	023	025	028	030	032
Operating range								
Max. outdoor temperature (1)	°C	48.0	46.5	46.0	47.0	47.0	47.0	46.5
Safety devices settings								
High pressure switch (1)	barg				42			
High pressure safety valve	barg				45			
High pressure safety valves (each circuit)	Nr.				1			
High pressure safety valve connection	in				3/4" G			
Low pressure switch	barg				5.0			

(1) - With nominal air flow; water outlet temperature 7° C; full load; R410A refrigerant.

Operating range - Chiller with EC fans 900mm

Models: CG0 017- 030		017	020	023	025	028	030
Operating range							
Max. outdoor temperature (1)	°C	51.0	51.0	51.0	51.5	51.0	51.0
Safety devices settings							
High pressure switch (1)	barg				42		
High pressure safety valve	barg				45		
High pressure safety valves (each circuit)	Nr.				1		
High pressure safety valve connection	in				3/4" G		
Low pressure switch	barg				5.0		

(1) - With nominal air flow; water outlet temperature 7° C; full load; R410A refrigerant.

Operating range - Chiller with EC fans 800mm

Models: CG0 017- 030		017	020	023	025	028	030
Operating range							
Max. outdoor temperature (1)	°C	45.5	45.0	46.0	46.0	46.0	45.0
Safety devices settings							
High pressure switch (1)	barg			42			
High pressure safety valve	barg			45			
High pressure safety valves (each circuit)	Nr.			1			
High pressure safety valve connection	in			3/4" G			
Low pressure switch	barg			5.0			

(1) - With nominal air flow; water outlet temperature 7° C; full load; R410A refrigerant.

Operating range - Freecooling with AC fans 900mm

Models: FB0 017- 032		017	020	023	025	028	030	032
Operating range								
Max. outdoor temperature (1)	°C	48.0	46.0	45.0	47.0	46.0	46.0	45.5
Safety devices settings								
High pressure switch (1)	barg				42			
High pressure safety valve	barg				45			
High pressure safety valves (each circuit)	Nr.				1			
High pressure safety valve connection	in				3/4" G			
Low pressure switch	barg				5.0			

(1) - With nominal air flow; mixture outlet temperature 10° C; full load; R410A refrigerant.

Operating range - Freecooling with AC fans 800mm

Models: FB0 017- 032		017	020	023	025	028	030	032
Operating range								
Max. outdoor temperature (1)	°C	46.5	44.5	43.5	45.5	44.5	45.0	44.0
Safety devices settings								
High pressure switch (1)	barg				42			
High pressure safety valve	barg				45			
High pressure safety valves (each circuit)	Nr.				1			
High pressure safety valve connection	in				3/4" G			
Low pressure switch	barg				5.0			

(1) - With nominal air flow; mixture outlet temperature 10° C; full load; R410A refrigerant.

Operating range - Freecooling with EC fans 900mm

Models: FG0 017- 030		017	020	023	025	028	030
Operating range							
Max. outdoor temperature (1)	°C	49.0	48.0	49.5	49.0	49.5	48.5
Safety devices settings							
High pressure switch (1)	barg			42			
High pressure safety valve	barg			45			
High pressure safety valves (each circuit)	Nr.			1			
High pressure safety valve connection	in			3/4" G			
Low pressure switch	barg			5.0			

(1) - With nominal air flow; mixture outlet temperature 10° C; full load; R410A refrigerant.

Operating range - Freecooling with EC fans 800mm

Models: FG0 017- 030		017	020	023	025	028	030
Operating range							
Max. outdoor temperature (1)	°C	43.0	42.5	42.0	43.0	43.5	43.0
Safety devices settings							
High pressure switch (1)	barg			42			
High pressure safety valve	barg			45			
High pressure safety valves (each circuit)	Nr.			1			
High pressure safety valve connection	in			3/4" G			
Low pressure switch	barg			5.0			

(1) - With nominal air flow; mixture outlet temperature 10° C; full load; R410A refrigerant.

Tab. 4 - Pump group characteristics

2 Pole, standard head pressure (data referred to each pump)

Models			017	020	023	025	028	030	032
CB0	Water Flow	m^3/h	28.07	30.68	35.43	39.36	44.94	50.67	57.39
	Available Pressure Head	kPa	106	91	125	101	131	88	38
CG0	Water Flow	m^3/h	28.48	31.85	37.20	40.76	46.53	52.58	-
	Available Pressure Head	kPa	105	83	115	92	120	71	-
Pump/s number		Nr.	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Pump Rotor Model		-	65-190/2	65-190/2	65-230/2	65-230/2	65-260/2	65-260/2	65-260/2
Nominal Motor Power		kW	2.2	2.2	3.0	3.0	4.0	4.0	4.0
Noise Level *(*)*		dB(A)	60	60	59	59	63	63	63

(*) - According to ISO 3744

2 Pole, high head pressure (data referred to each pump)

Models			017	020	023	025	028	030	032
CB0	Water Flow	m^3/h	28.07	30.68	35.43	39.36	44.94	50.67	57.39
	Available Pressure Head	kPa	186	171	170	149	216	181	142
CG0	Water Flow	m^3/h	28.48	31.85	37.20	40.76	46.53	52.58	-
	Available Pressure Head	kPa	184	165	161	140	208	167	-
Pump/s number		Nr.	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Pump Rotor Model		-	65-260/2	65-260/2	65-260/2	65-260/2	65-340/2	65-340/2	65-340/2
Nominal Motor Power		kW	4.0	4.0	4.0	4.0	5.5	5.5	5.5
Noise Level *(*)*		dB(A)	63	63	63	63	63	63	63

(*) - According to ISO 3744

2 Pole, standard head pressure (data referred to each pump)

Models			017	020	023	025	028	030	032
FB0	30% glycol/water Mixture Flow	m^3/h	31.73	34.62	39.60	44.43	50.53	57.23	64.34
	Available Pressure Head	kPa	96	69	130	125	97	100	37
FG0	30% glycol/water Mixture Flow	m^3/h	32.33	35.66	42.22	45.68	52.97	58.93	-
	Available Pressure Head	kPa	91	59	145	115	51	80	-
Pump/s number		Nr.	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Pump Rotor Model		-	65-260/2	65-260/2	65-340/2	65-340/2	65-340/2	65-410/2	65-410/2
Nominal Motor Power		kW	4.0	4.0	5.5	5.5	5.5	7.5	7.5
Noise Level *(*)*		dB(A)	63	63	63	63	63	60	60

(*) - According to ISO 3744

2 Pole, high head pressure (data referred to each pump)

Models			017	020	023	025	028	030	032
FB0	30% glycol/water Mixture Flow	m^3/h	31.73	34.62	39.60	44.43	50.53	57.23	64.34
	Available Pressure Head	kPa	172	146	219	216	191	170	117
FG0	30% glycol/water Mixture Flow	m^3/h	32.33	35.66	42.22	45.68	52.97	58.93	-
	Available Pressure Head	kPa	168	137	235	206	148	152	-
Pump/s number		Nr.	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Pump Rotor Model		-	65-340/2	65-340/2	65-410/2	65-410/2	65-410/2	65-460/2	65-460/2
Nominal Motor Power		kW	5.5	5.0	7.5	7.5	7.5	11.0	11.0
Noise Level *(*)*		dB(A)	63	63	60	60	60	60	60

(*) - According to ISO 3744

Tab. 5 - Sound pressure/power level

The following table indicates the overall sound pressure level at full load conditions, measured 1m from the unit, according to ISO 3774, with an outdoor temperature of 35° C and referred to free field conditions.

SPL CB0 - FB0 AC 900

Models	Octave band frequency [Hz]								Total [dB(A)]
	63	125	250	500	1000	2000	4000	8000	
	"SPL" Sound pressure levels [dB]								
CB0 017 - FB0 017	84	80	76	73	72	68	60	52	76,0
CB0 020 - FB0 020	84	80	76	73	72	68	60	52	76,0
CB0 023 - FB0 023	84	80	76	73	72	68	60	52	76,0
CB0 025 - FB0 025	85	80	76	73	72	68	60	53	76,5
CB0 028 - FB0 028	85	80	76	73	72	68	60	53	76,5
CB0 030 - FB0 030	85	81	77	74	73	69	61	53	77,0
CB0 032 - FB0 032	85	81	77	74	73	69	61	53	77,0

PWL CB0 - FB0 AC 900

Models	Octave band frequency [Hz]								Total [dB(A)]
	63	125	250	500	1000	2000	4000	8000	
	"PWL" Sound power levels [dB]								
CB0 017 - FB0 017	103	99	95	92	91	87	79	71	95,0
CB0 020 - FB0 020	103	99	95	92	91	87	79	71	95,0
CB0 023 - FB0 023	103	99	95	92	91	87	79	71	95,0
CB0 025 - FB0 025	104	100	96	93	92	88	80	72	96,0
CB0 028 - FB0 028	104	100	96	93	92	88	80	72	96,0
CB0 030 - FB0 030	105	101	97	94	93	89	81	73	97,0
CB0 032 - FB0 032	105	101	97	94	93	89	81	73	97,0

Note:
Sound power levels tolerance for each octave band: - 0/+2 dB

SPL CB0 - FB0 AC 800

Models	Octave band frequency [Hz]								Total [dB(A)]
	63	125	250	500	1000	2000	4000	8000	
	"SPL" Sound pressure levels [dB]								
CB0 017 - FB0 017	79	74	71	70	66	60	52	45	70,5
CB0 020 - FB0 020	79	74	71	70	66	60	52	45	70,5
CB0 023 - FB0 023	79	74	71	70	66	60	52	45	70,5
CB0 025 - FB0 025	79	74	72	70	66	60	52	45	71,0
CB0 028 - FB0 028	79	74	72	70	66	60	52	45	71,0
CB0 030 - FB0 030	80	75	72	71	67	61	53	46	71,5
CB0 032 - FB0 032	80	75	72	71	67	61	53	46	71,5

PWL CB0 - FB0 AC 800

Models	Octave band frequency [Hz]								Total [dB(A)]
	63	125	250	500	1000	2000	4000	8000	
	"PWL" Sound power levels [dB]								
CB0 017 - FB0 017	98	93	90	89	85	79	71	64	89,5
CB0 020 - FB0 020	98	93	90	89	85	79	71	64	89,5
CB0 023 - FB0 023	98	93	90	89	85	79	71	64	89,5
CB0 025 - FB0 025	99	94	91	90	86	80	72	65	90,5
CB0 028 - FB0 028	99	94	91	90	86	80	72	65	90,5
CB0 030 - FB0 030	100	95	92	91	87	81	73	66	91,5
CB0 032 - FB0 032	100	95	92	91	87	81	73	66	91,5

Note:
Sound power levels tolerance for each octave band: - 0/+2 dB

SPL CG0 - FG0 EC 900

Models	Octave band frequency [Hz]								Total [dB(A)]
	63	125	250	500	1000	2000	4000	8000	
	"SPL" Sound pressure levels [dB]								
CG0 017 - FG0 017	87	82	78	75	74	70	62	55	78,5
CG0 020 - FG0 020	87	82	78	75	74	70	62	55	78,5
CG0 023 - FG0 023	87	83	79	76	75	71	63	55	79,0
CG0 025 - FG0 025	87	83	79	76	75	71	63	55	79,0
CG0 028 - FG0 028	88	83	79	76	75	71	63	56	79,5
CG0 030 - FG0 030	88	83	79	76	75	71	63	56	79,5

PWL CG0 - FG0 EC 900

Models	Octave band frequency [Hz]								Total [dB(A)]
	63	125	250	500	1000	2000	4000	8000	
	"PWL" Sound power levels [dB]								
CG0 017 - FG0 017	106	101	97	94	93	89	81	74	97,5
CG0 020 - FG0 020	106	101	97	94	93	89	81	74	97,5
CG0 023 - FG0 023	107	102	98	95	94	90	82	75	98,5
CG0 025 - FG0 025	107	102	98	95	94	90	82	75	98,5
CG0 028 - FG0 028	108	103	99	96	95	91	83	76	99,5
CG0 030 - FG0 030	108	103	99	96	95	91	83	76	99,5

Note:
Sound power levels tolerance for each octave band: - 0/+2 dB

SPL CG0 - FG0 EC 800

Models	Octave band frequency [Hz]								Total [dB(A)]
	63	125	250	500	1000	2000	4000	8000	
	"SPL" Sound pressure levels [dB]								
CG0 017 - FG0 017	73	68	66	64	60	54	46	39	65,0
CG0 020 - FG0 020	73	68	66	64	60	54	46	39	65,0
CG0 023 - FG0 023	74	69	66	65	61	55	47	40	65,5
CG0 025 - FG0 025	74	69	66	65	61	55	47	40	65,5
CG0 028 - FG0 028	74	69	67	65	61	55	47	40	66,0
CG0 030 - FG0 030	74	69	67	65	61	55	47	40	66,0

PWL CG0 - FG0 EC 800

Models	Octave band frequency [Hz]								Total [dB(A)]
	63	125	250	500	1000	2000	4000	8000	
	"PWL" Sound power levels [dB]								
CG0 017 - FG0 017	92	87	85	83	79	73	65	58	84,0
CG0 020 - FG0 020	92	87	85	83	79	73	65	58	84,0
CG0 023 - FG0 023	93	88	86	84	80	74	66	59	85,0
CG0 025 - FG0 025	93	88	86	84	80	74	66	59	85,0
CG0 028 - FG0 028	94	89	87	85	81	75	67	60	86,0
CG0 030 - FG0 030	94	89	87	85	81	75	67	60	86,0

Note:
Sound power levels tolerance for each octave band: - 0/+2 dB

In the "G" version chiller, the characteristics of the "EC" fans can achieve significant noise reductions according to their speed (RPM).

Tab. 6 - Electrical characteristics

Electrical data - CB0 017 - 032

Models CB0		**017**	**020**	**023**	**025**	**028**	**030**	**032**
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz						
Total power input (1)	kW	57	66	76	83	92	107	119
OA (1) (without PFC)	A	111	121	135	146	164	188	210
cosφ (1) (without PFC)	-	0.74	0.79	0.81	0.82	0.81	0.82	
OA (1) (with PFC)	A	94	109	123	138	155	175	194
cosφ (1) (with PFC)	-	0.87	0.88	0.89	0.88	0.86	0.88	
Max. power input	kW	82	94	105	120	131	152	171
FLA (without PFC)	A	151	163	181	199	217	254	286
cosφ (without PFC)	-	0.78	0.83	0.84	0.87			0.86
FLA (with PFC)	A	136	152	170	191	209	244	273
cosφ (with PFC)	-	0.87	0.89		0.90			
LRA (without compressor soft- start)	A	291	348	404	422	440	499	531
LRA (with compressor soft- start)	A	213	247	282	299	317	359	391
Min. cable section	mm^2	70	70	95	95	120	150	185
Max. fuse (gG/aM)	A	315/315			500/450			
Ring terminals with hole	mm	8			10			
Line screw fixing	Nm	15- 22			30- 44			
Control power supply (only for opt. fast- start)	V/Ph/Hz	230V (400V) / 2Ph + PE / 50Hz						
$P_{max.}$	kW	0.35						
$I_{max.}$	A	1,5 (0,88)						
Cable section min./max.	mm^2	1,5 / 10						
Max. fuse (gG/aM)	A	40						
Line screw fixing	Nm	2						
Compressor - Power input (1)	kW	50	59	68	74	83	95	107
Compressor - Nominal current (1)	A	96	106	120	126	144	162	184
Single compressor 1/3 - Max. current	A	34	40	49			65	
Single compressor 1/3 - LRA	A	174	225	272			310	
Single compressor 1/3 - LRA (soft- start)	A	96	124	150			171	
Single compressor 2/4 - Max. current	A	34			40	49		65
Single compressor 2/4 - LRA	A	174			225	272		310
Single compressor 2/4 - LRA (soft- start)	A	96			124	150		171
Fans number	Nr.	3			4		5	
AC fans 900 - Power input	kW	2.4						
AC fans 900 - Nominal current	A	5.1						
AC fans 900 - Max. current	A	5.15						
AC fans 800 - Power input (option)	kW	1.7						
AC fans 800 - Nominal current (option)	A	3.7						
AC fans 800 - Max. current (option)	A	3.9						
Std. head pressure pump model (option)	-	65- 190/2		65- 230/2		65- 260/2		
Std. head pressure pump - Nominal power	kW	2,2		3		4		
Std. head pressure pump - Motor power	kW	2.7		3.6		4.7		
Std. head pressure pump - Max. current	A	4.5		6.3		8.0		
Std. head pressure pump - LRA	A	42		58		98		
High head pressure pump model (option)	-	65- 260/2				65- 340/2		
High head pressure pump - Nominal power	kW	4				5,5		
High head pressure pump - Motor power	kW	4.7				6.5		
High head pressure pump - Max. current	A	8.0				11.2		
High head pressure pump - LRA	A	98				131		

(1) - Outdoor temperature 35° C; water inlet/outlet temperature 12/7° C; R410A refrigerant.

The cable have to be sized compliance with local standards and according to the type and characteristics of installation. Suggested cables section are reffered to PVC insulation with max. working temperature at 70° C and ambient temperature at 30° C.

OA, FLA and LRA are calculated for unit without pumps and with fans as standard configuration.

If the unit with EC - FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the followingsymbols (This circuit breaker is type B.):

Electrical data - CG0 017- 030

Models CG0		**017**	**020**	**023**	**025**	**028**	**030**
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz					
Total power input (1)	kW	57	64	74	80	92	103
OA (1) (without PFC)	A	107	115	132	139	158	176
cosφ (1) (without PFC)	-	0.77	0.80	0.81	0.83	0.84	0.85
OA (1) (with PFC)	A	91	102	120	130	149	164
cosφ (1) (with PFC)	-	0.90			0.89		0.90
Max. power input	kW	83	95	109	121	136	154
FLA (without PFC)	A	149	161	184	196	218	250
cosφ (without PFC)	-	0.80	0.85	0.86	0.90		0.89
FLA (with PFC)	A	134	150	172	188	211	240
cosφ (with PFC)	-	0.90	0.92		0.93		
LRA (without compressor soft- start)	A	289	346	407	419	441	495
LRA (with compressor soft- start)	A	211	245	284	296	319	356
Min. electrical cable section	mm^2	70		95		120	150
Max. fuse (gG/aM)	A	315/315			500/450		
Ring terminals with hole	mm	8			10		
Line screw fixing	Nm	15- 22			30- 44		
Control power supply (only for opt. fast- start)	V/Ph/Hz	230V (400V) / 2Ph + PE / 50Hz					
$P_{max.}$	kW	0.35					
$I_{max.}$	A	1,5 (0,88)					
Max. fuse (gG/aM)	A	40					
Line screw fixing	Nm	2					
Compressor - Power input (1)	kW	49	56	63	70	78	89
Compressor - Nominal current (1)	A	96	100	114	122	136	154
Single compressor 1/3 - Max. current	A	34	40	49			65
Single compressor 1/3 - LRA	A	174	225	272			310
Single compressor 1/3 - LRA (soft- start)	A	96	124	150			171
Single compressor 2/4 - Max. current	A	34			40	49	
Single compressor 2/4 - LRA	A	174			225	272	
Single compressor 2/4 - LRA (soft- start)	A	96			124	150	
Fans number	Nr.	3		4		5	
EC fans 900 - Power input	kW	2.7					
EC fans 900 - Nominal current	A	4.2					
EC fans 900 - Max. current	A	4.4					
EC fans 800 - Power input (option)	kW	0.7					
EC fans 800 - Nominal current (option)	A	1.3					
EC fans 800 - Max. current (option)	A	1.4					
Std. head pressure pump model (option)	-	65- 190/2		65- 230/2		65- 260/2	
Std. head pressure pump - Nominal power	kW	2,2		3		4	
Std. head pressure pump - Motor power	kW	2.7		3.6		4.7	4.7
Std. head pressure pump - Max. current	A	4.5		6.3		8.0	8.0
Std. head pressure pump - LRA	A	42		58		98	
High head pressure pump model (option)	-	65- 260/2				65- 340/2	
High head pressure pump - Nominal power	kW	4				5,5	
High head pressure pump - Motor power	kW	4.7				6.5	
High head pressure pump - Max. current	A	8.0				11.2	
High head pressure pump - LRA	A	98				131	

(1) - Outdoor temperature 35° C; water inlet/outlet temperature 12/7° C; R410A refrigerant.

The cable have to be sized compliance with local standards and according to the type and characteristics of installation. Suggested cables section are reffered to PVC insulation with max. working temperature at 70° C and ambient temperature at 30° C.

OA, FLA and LRA are calculated for unit without pumps and with fans as standard configuration.

If the unit with EC- FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the followingsymbols (This circuit breaker is type B.):

Note: EC fans electrical data are provided with max. operating current (fans at max. speed).
- *Nominal power supply: 400V / 3Ph + PE / 50Hz;*
- *Nominal power supply tollerance: 400V ±10%;*
- *Max. phase difference: 2%.*

Electrical data - FB0 017- 032

Models FB0		**017**	**020**	**023**	**025**	**028**	**030**	**032**
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz						
Total power input (1)	kW	60	69	80	87	97	111	126
OA (1) (without PFC)	A	116	126	143	153	169	194	218
cosφ (1) (without PFC)	-	0.75	0.79	0.81	0.82	0.83		
OA (1) (with PFC)	A	99	113	131	144	160	182	203
cosφ (1) (with PFC)	-	0.87	0.88		0.87	0.88		0.89
Max. power input	kW	82	94	105	120	131	152	171
FLA (without PFC)	A	151	163	181	199	217	254	286
cosφ (without PFC)	-	0.78	0.83	0.84	0.87			0.86
FLA (with PFC)	A	136	152	170	191	209	244	273
cosφ (with PFC)	-	0.87	0.89		0.90			
LRA (without compressor soft- start)	A	291	348	404	422	440	499	531
LRA (with compressor soft- start)	A	213	247	282	299	317	359	391
Min. electrical cable section	mm^2	70		95		120	150	185
Max. fuse (gG/aM)	A	315/315			500/450			
Ring terminals with hole	mm	8			10			
Line screw fixing	Nm	15- 22			30- 44			
Control power supply (only for opt. fast- start)	V/Ph/Hz	230V (400V) / 2Ph + PE / 50Hz						
$P_{max.}$	kW	0.35						
$I_{max.}$	A	1,5 (0,88)						
Cable section min./max.	mm^2	1,5 / 10						
Max. fuse (gG/aM)	A	40						
Line screw fixing	Nm	2						
Compressor - Power input (1)	kW	52	62	73	77	88	99	114
Compressor - Nominal current (1)	A	100	110	126	130	148	168	192
Single compressor 1/3 - Max. current	A	34	40	49			65	
Single compressor 1/3 - LRA	A	174	225	272			310	
Single compressor 1/3 - LRA (soft- start)	A	96	124	150			171	
Single compressor 2/4 - Max. current	A	34			40	49		65
Single compressor 2/4 - LRA	A	174			225	272		310
Single compressor 2/4 - LRA (soft- start)	A	96			124	150		171
Fans number	Nr.	3			4		5	
AC fans 900 - Power input	kW	2.4						
AC fans 900 - Nominal current	A	5.2						
AC fans 900 - Max. current	A	5.2						
AC fans 800 - Power input (option)	kW	1.8						
AC fans 800 - Nominal current (option)	A	3.8						
AC fans 800 - Max. current (option)	A	3.9						
Std. head pressure pump model (option)	-	65- 260/2			65- 340/2			65- 410/2
Std. head pressure pump - Nominal power	kW	4			5,5			7,5
Std. head pressure pump - Motor power	kW	4.7			6.5			8.4
Std. head pressure pump - Max. current	A	8.0			11.2			15.2
Std. head pressure pump - LRA	A	98			131			169
High head pressure pump model (option)	-	65- 340/2			65- 410/2			65- 460/2
High head pressure pump - Nominal power	kW	5,5			7,5			11
High head pressure pump - Motor power	kW	6.5			8.4			13.3
High head pressure pump - Max. current	A	11.2			15.2			21.4
High head pressure pump - LRA	A	131			169			171

(1) - Outdoor temperature 35° C; fluid inlet/outlet temperature 15/10° C; 70- 30% water- glycol mixture; R410A refrigerant.

The cable have to be sized compliance with local standards and according to the type and characteristics of installation. Suggested cables section are reffered to PVC insulation with max. working temperature at 70° C and ambient temperature at 30° C.

OA, FLA and LRA are calculated for unit without pumps and with fans as standard configuration.

If the unit with EC- FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the followingsymbols (This circuit breaker is type B.):

Electrical data - FG0 017- 030

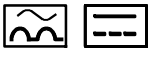
Models FG0		**017**	**020**	**023**	**025**	**028**	**030**
Power supply	V/Ph/Hz	400V / 3Ph + PE / 50Hz					
Total power input (1)	kW	59	68	77	85	95	108
OA (1) (without PFC)	A	110	120	135	145	162	184
cosφ (1) (without PFC)	-	0.78	0.82		0.85		
OA (1) (with PFC)	A	94	108	123	136	154	173
cosφ (1) (with PFC)	-	0.91	0.90				
Max. power input	kW	83	95	109	121	136	154
FLA (without PFC)	A	149	161	184	196	218	250
cosφ (without PFC)	-	0.80	0.85	0.86	0.90		0.89
FLA (with PFC)	A	134	150	172	188	211	240
cosφ (with PFC)	-	0.90	0.92		0.93		
LRA (without compressor soft- start)	A	289	346	407	419	441	495
LRA (with compressor soft- start)	A	211	245	284	296	319	356
Min. electrical cable section	mm^2	70		95		120	150
Max. fuse (gG/aM)	A	315/315			500/450		
Ring terminals with hole	mm	8			10		
Line screw fixing	Nm	15- 22			30- 44		
Control power supply (only for opt. fast- start)	V/Ph/Hz	230V (400V) / 2Ph + PE / 50Hz					
$P_{max.}$	kW	0.35					
$I_{max.}$	A	1,5 (0,88)					
Cable section min./max.	mm^2	1,5 / 10					
Max. fuse (gG/aM)	A	40					
Line screw fixing	Nm	2					
Compressor - Power input (1)	kW	51	59	66	74	81	95
Compressor - Nominal current (1)	A	96	106	118	126	140	162
Single compressor 1/3 - Max. current	A	34	40	49			65
Single compressor 1/3 - LRA	A	174	225	272			310
Single compressor 1/3 - LRA (soft- start)	A	96	124	150			171
Single compressor 2/4 - Max. current	A	34		40	49		
Single compressor 2/4 - LRA	A	174		225	272		
Single compressor 2/4 - LRA (soft- start)	A	96		124	150		
Fans number	Nr.	3		4		5	
EC fans 900 - Power input	kW	2.8					
EC fans 900 - Nominal current	A	4.3					
EC fans 900 - Max. current	A	4.4					
EC fans 800 - Power input (option)	kW	0.8					
EC fans 800 - Nominal current (option)	A	1.3					
EC fans 800 - Max. current (option)	A	1.4					
Std. head pressure pump model (option)	-	65- 260/2		65- 340/2			65- 410/2
Std. head pressure pump - Nominal power	kW	4		5,5			7,5
Std. head pressure pump - Motor power	kW	4.7		6.5			8.4
Std. head pressure pump - Max. current	A	8.0		11.2			15.2
Std. head pressure pump - LRA	A	98		131			169
High head pressure pump model (option)	-	65- 340/2		65- 410/2			65- 460/2
High head pressure pump - Nominal power	kW	5,5		7,5			11
High head pressure pump - Motor power	kW	6.5		8.4			13.3
High head pressure pump - Max. current	A	11.2		15.2			21.4
High head pressure pump - LRA	A	131		169			171

(1) - Outdoor temperature 35° C; fluid inlet/outlet temperature 15/10° C; 70- 30% water- glycol mixture; R410A refrigerant.

The cable have to be sized compliance with local standards and according to the type and characteristics of installation. Suggested cables section are reffered to PVC insulation with max. working temperature at 70° C and ambient temperature at 30° C.

OA, FLA and LRA are calculated for unit without pumps and with fans as standard configuration.

If the unit with EC- FAN or inverter pump is connected to an electric installation where an earthleakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the followingsymbols (This circuit breaker is type B.):



Note: EC fans electrical data are provided with max. operating current (fans at max. speed).

- *Nominal power supply: 400V / 3Ph + PE / 50Hz;*
- *Nominal power supply tollerance: 400V ±10%;*
- *Max. phase difference: 2%.*

Tab. 7 - Application consideration

Additional net weights for options (kg)

Options	Model CB0	Size 017	020	023	025	028	030	032
	Base unit	1608	1758	1813	2242	2305	2620	2678
Acoustic option	digit 7 = 1	35	35	35	35	35	35	35
Soft starter	digit 8 = 1	20	20	20	20	20	20	20
Buffer tank	digit 10 ≠ 0	440	440	440	440	440	440	440
Fan speed control	digit 11 = 2	- 39	- 39	- 39	- 52	- 52	- 65	- 65
	digit 11 = 3	- 23	- 23	- 23	- 19	- 19	- 15	- 15
	digit 11 = 4	- 65	- 65	- 65	- 75	- 75	- 85	- 85
Pumps group / Hydraulic kit	digit 12 = 1	10	10	10	10	10	10	10
	digit 12 = 2	160	160	170	170	175	175	175
	digit 12 = 3	175	175	175	175	190	190	190
	digit 12 = 4	220	220	240	240	250	250	250
	digit 12 = 5	250	250	250	250	280	280	280
	digit 12 = 6	180	180	180	180	195	195	195
Coil metal filter	digit 17 = 1	30	30	30	40	40	50	50

Options	Model FB0	Size 017	020	023	025	028	030	032
	Base unit	1867	2017	2072	2558	2621	2993	3051
Acoustic option	digit 7 = 1	35	35	35	35	35	35	35
Soft starter	digit 8 = 1	20	20	20	20	20	20	20
Buffer tank	digit 10 ≠ 0	440	440	440	440	440	440	440
Fan speed control	digit 11 = 2	- 39	- 39	- 39	- 52	- 52	- 65	- 65
	digit 11 = 3	- 23	- 23	- 23	- 19	- 19	- 15	- 15
	digit 11 = 4	- 65	- 65	- 65	- 75	- 75	- 85	- 85
Pumps group / Hydraulic kit	digit 12 = 1	10	10	10	10	10	10	10
	digit 12 = 2	95	95	110	110	110	112	112
	digit 12 = 3	110	110	112	112	112	170	170
	digit 12 = 4	170	170	200	200	200	204	204
	digit 12 = 5	200	200	204	204	204	327	327
	digit 12 = 6	114	114	125	125	125	203	203
Coil metal filter	digit 17 = 1	30	30	30	40	40	50	50

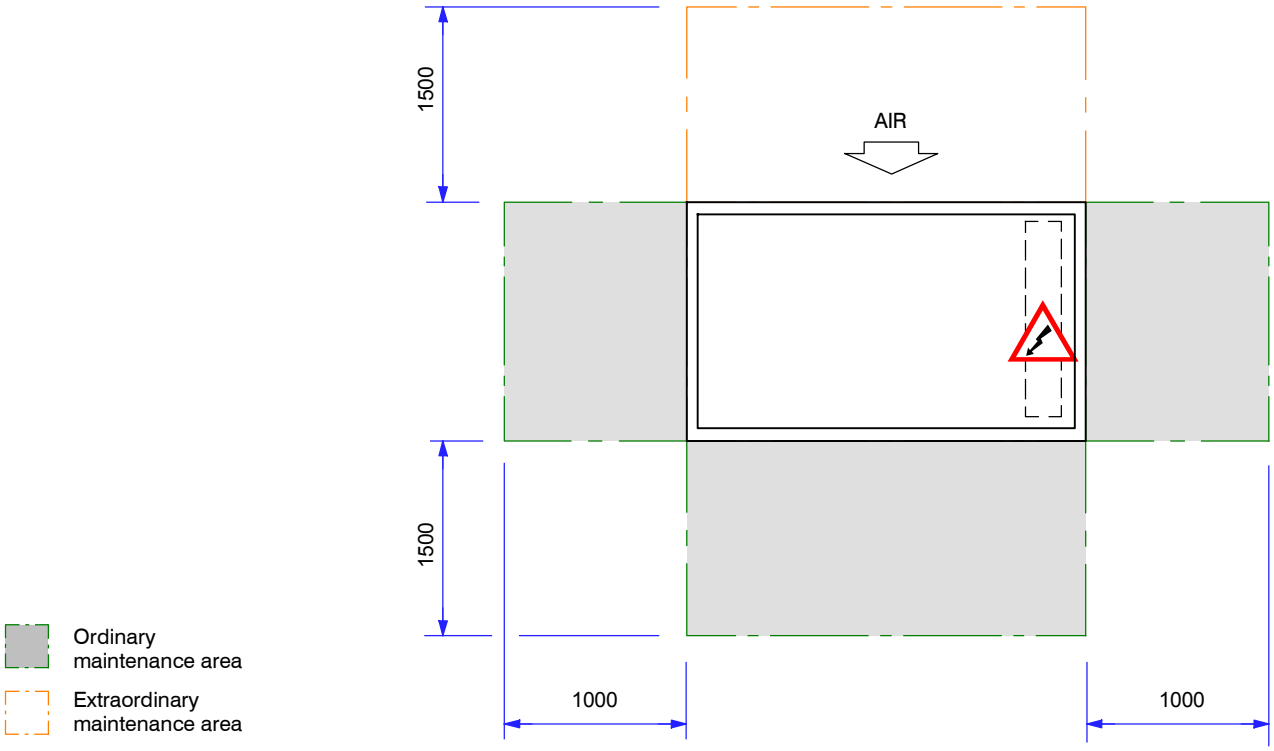
Options	Model CG0	Size 017	020	023	025	028	030
	Base unit	1610	1760	2098	2248	2592	2630
Acoustic option	digit 7 = 2	80	80	100	100	115	115
Soft starter	digit 8 = 1	30	30	30	30	30	30
Buffer tank	digit 10 ≠ 0	440	440	440	440	440	440
Fan speed control	digit 11 = 4	- 42	- 42	- 56	- 56	- 70	- 70
Pumps group / Hydraulic kit	digit 12 = 1	10	10	10	10	10	10
	digit 12 = 2	160	160	170	170	175	175
	digit 12 = 3	175	175	175	175	190	190
	digit 12 = 4	220	220	240	240	250	250
	digit 12 = 5	250	250	250	250	280	280
	digit 12 = 6	180	180	180	180	195	195
Coil metal filter	digit 17 = 1	30	30	40	40	50	50

Options	Model	Size					
	FG0	017	020	023	025	028	030
	Base unit	1869	2019	2414	2564	2965	3003
Acoustic option	digit 7 = 2	80	80	100	100	115	115
Soft starter	digit 8 = 1	30	30	30	30	30	30
Buffer tank	digit 10 ≠ 0	440	440	440	440	440	440
Fan speed control	digit 11 = 4	- 42	- 42	- 56	- 56	- 70	- 70
Pumps group / Hydraulic kit	digit 12 = 1	10	10	10	10	10	10
	digit 12 = 2	95	95	110	110	110	112
	digit 12 = 3	110	110	112	112	112	170
	digit 12 = 4	170	170	200	200	200	204
	digit 12 = 5	200	200	204	204	204	327
	digit 12 = 6	114	114	125	125	125	203
Coil metal filter	digit 17 = 1	30	30	40	40	50	50

N.B.: Special versions are not included in these tables.

N.B.: With copper- copper coil shipping, weight have big increase. It's mandatory to check all lifting devices.

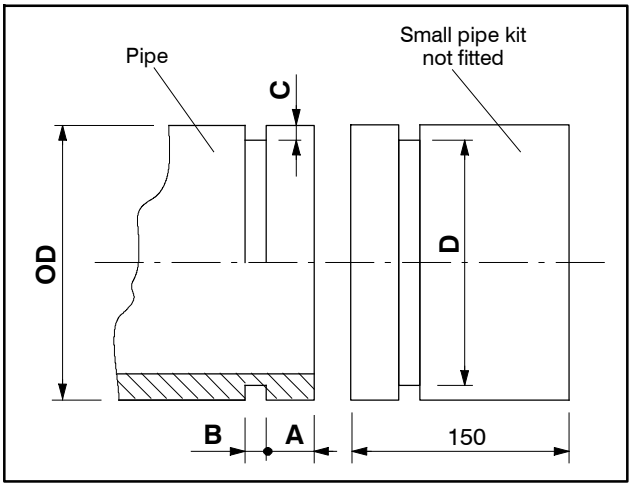
Fig. 1 - Service areas (top view)



Notes:
Minimum distance between 2 units from condensing coil side = 3 m
Do not obstruct the air exiting the fans for a minimum distance of 2.5 m

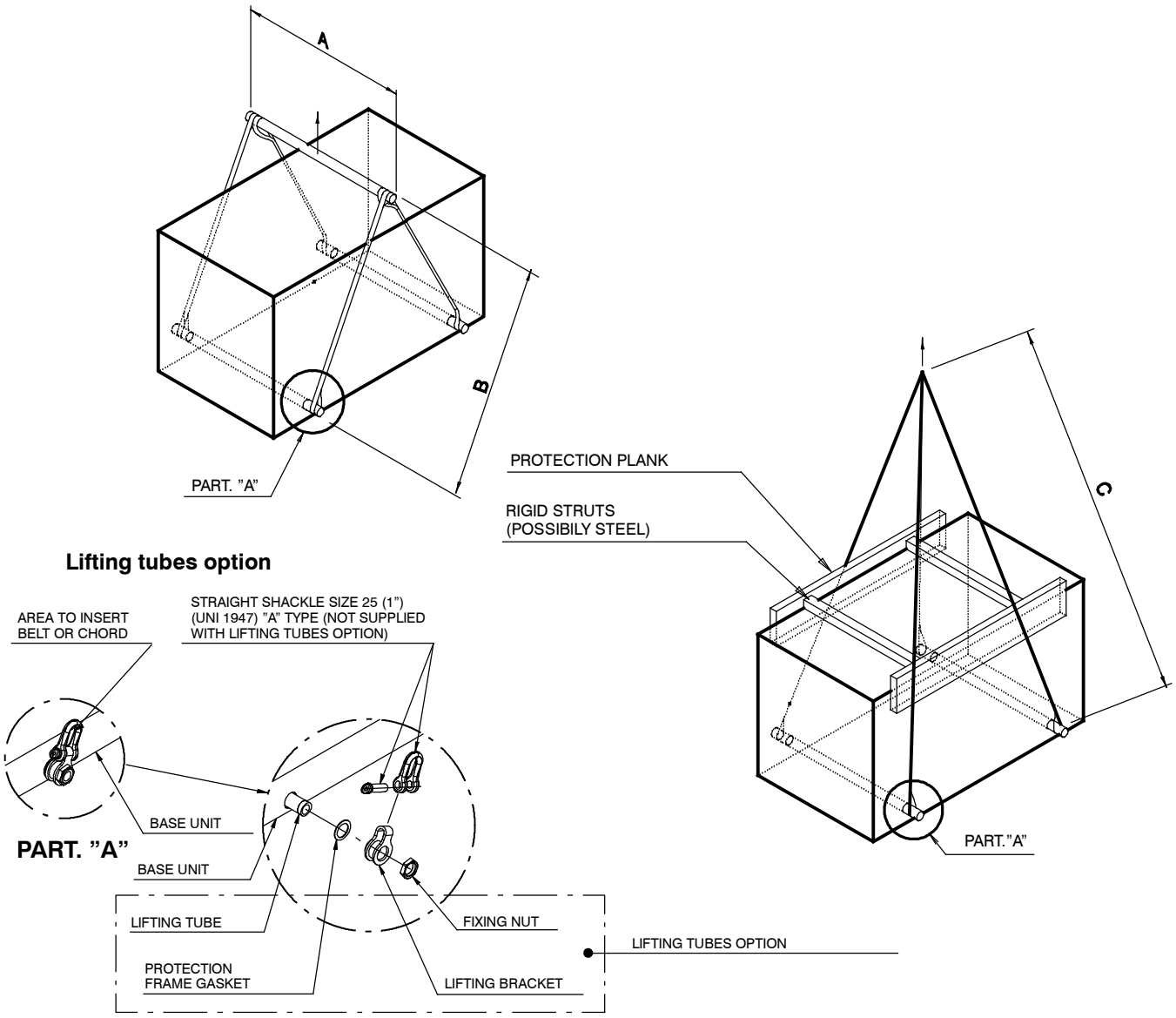
Fig. 2 - Victaulic connection system

DIMENSIONS						
OD	Ø inch DN Ø mm	3” 80 88,9	4” 100 114,3	5” 125 139,7	6” 150 168,3	8” 200 219,1
A **Tolerance**	mm mm	15,88 ±0,77	15,88 ±0,77	15,88 ±0,77	15,88 ±0,77	19,05 ±0,77
B **Tolerance**	mm mm	7,95 ±0,77	9,53 ±0,77	9,53 ±0,77	9,53 ±0,77	11,13 ±0,77
C	mm	1,98	2,11	2,13	2,16	2,34
D **Tolerance**	Ø mm mm mm	84,94 - 0,51 +0,00	110,08 - 0,51 +0,00	135,50 - 0,56 +0,00	163,96 - 0,56 +0,00	214,4 - 0,64 +0,00



For welded hydraulic connection use the ”line sections” supplied, otherwise directly connect grooved lines with the Victaulic- type joints of the unit, taking care to suitably grease the joint gaskets.

Fig. 3 - Lifting instructions with tubes

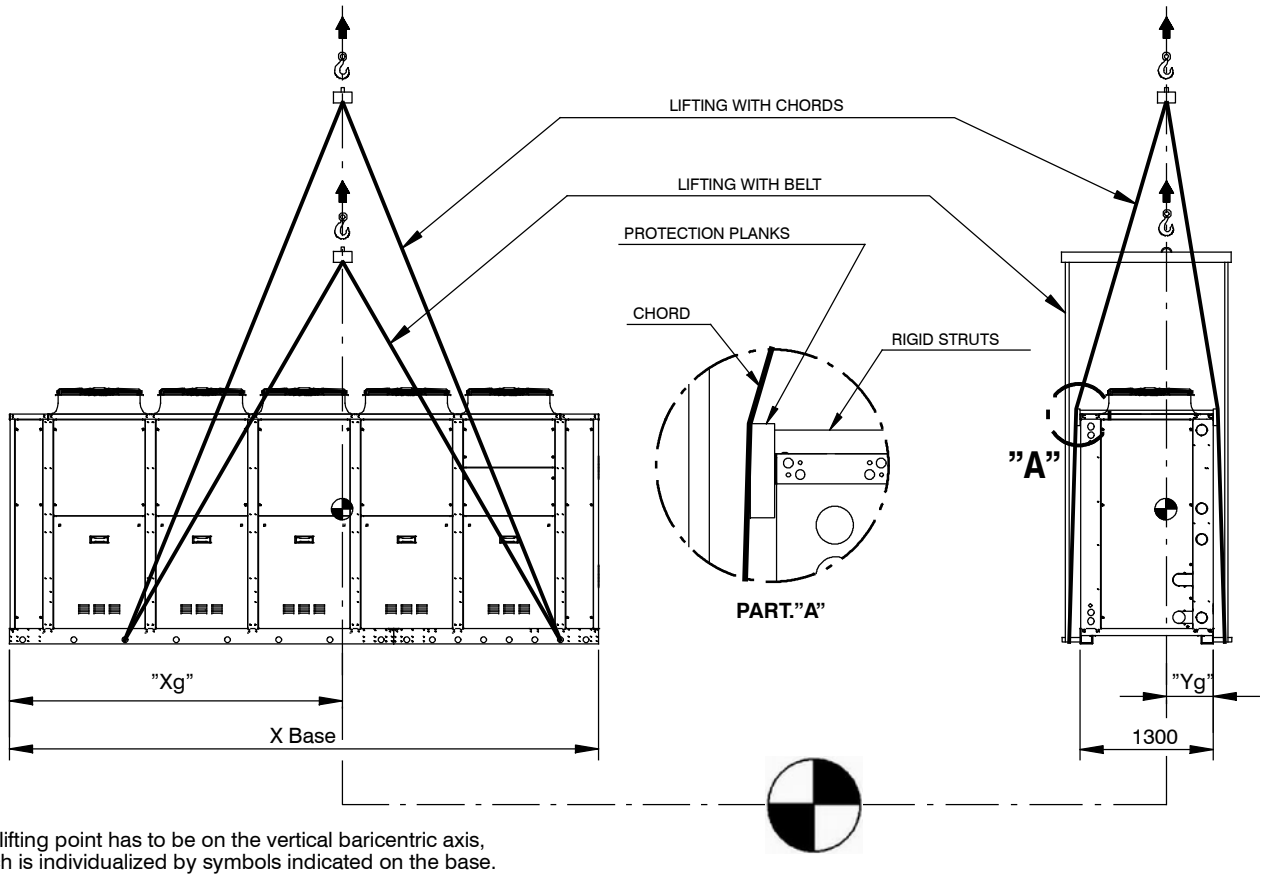


N.B: Place the lifting tubes in the holes in the base indicated by the word 'LIFT HERE'. Lock the ends of the tubes in position with the ring nut, as shown in part. "A", using 60 mm span.
The capacity of the lifting gear must be adequate to lift the load in question. Check the weight of the units, the capacity of the lifting gear and ropes and the condition and suitability of the aforementioned equipment.
Lift the unit with a speed suitable for the load to be moved, so as not to damage the **Liebert HPC- S 017- 032** structure.After lifting and positioning the unit, remove lifting accessories (ropes, slings, chains, hooks, brackets and tubes). Lifting tools as: hooks, lifting gear, ropes, chords, belts, rigid struts, protection plank are not provided with the unit.

Lifting

Models	A (mm)	B (mm)	C (mm)
CB0 / **FB0 017- 020- 023- 025- 028- 030- 032**	1.800	≈5.000	≈9.000
CG0 / **FG0 017- 020- 023- 025- 028- 030**			

Fig. 4 - Lifting baricentric axis



N.B:
The lifting point has to be on the vertical baricentric axis, which is individualized by symbols indicated on the base.

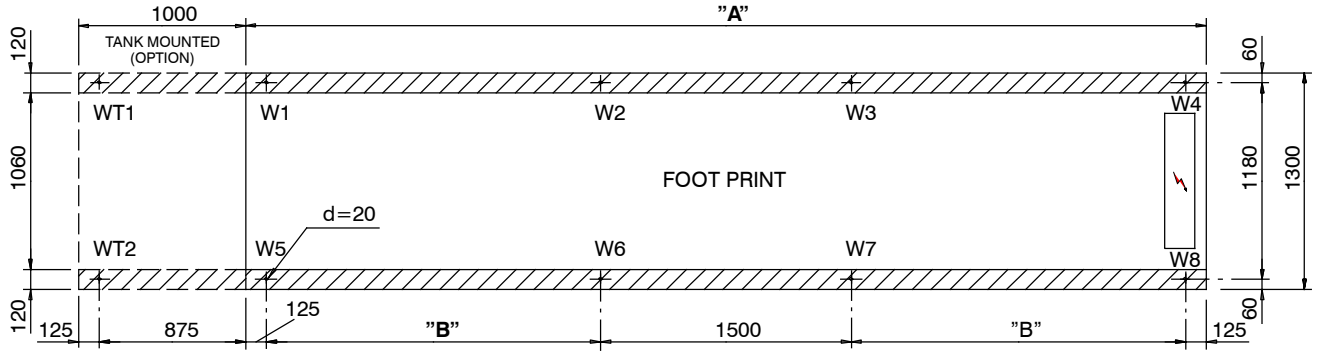
Shipping weight and unit baricentre position - Unit without tank

Models	Size	X Base (mm)	Unit without pumps		
			"Xg" (mm)	"Yg" (mm)	Shipping weight (kg)
CB0	017	3750	2025	610	1608
	020	3750	2075	580	1758
	023	3750	2075	570	1813
	025	4750	2695	580	2242
	028	4750	2685	580	2305
	030	5750	3295	590	2620
	032	5750	3295	590	2678
CG0	017	3750	2035	600	1610
	020	3750	2085	580	1760
	023	4750	2685	590	2098
	025	4750	2705	580	2248
	028	5750	3295	590	2592
	030	5750	3315	590	2630
FB0	017	3750	1935	660	1867
	020	3750	1995	630	2017
	023	3750	1995	620	2072
	025	4750	2595	640	2558
	028	4750	2595	630	2621
	030	5750	3185	640	2993
	032	5750	3185	640	3051
FG0	017	3750	1945	650	1869
	020	3750	2005	630	2019
	023	4750	2585	640	2414
	025	4750	2615	630	2564
	028	5750	3185	640	2965
	030	5750	3195	640	3003

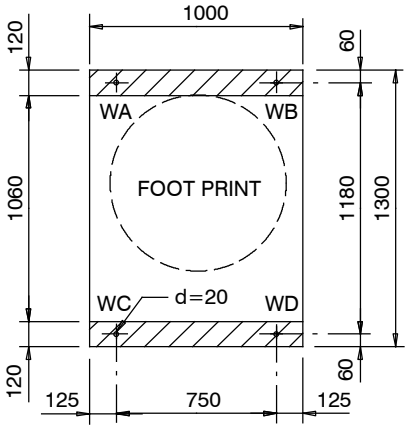
Shipping weight and unit baricentre position - Unit with tank

Models	Size	X Base (mm)	Unit without pumps		
			"Xg" (mm)	"Yg" (mm)	Shipping weight (kg)
CB0	017	4750	2475	620	2048
	020	4750	2555	600	2198
	023	4750	2565	590	2253
	025	5750	3165	600	2682
	028	5750	3175	590	2745
	030	6750	3745	600	3060
	032	6750	3755	600	3118
CG0	017	4750	2485	610	2050
	020	4750	2565	590	2200
	023	5750	3125	600	2538
	025	5750	3185	590	2688
	028	6750	3745	600	3032
	030	6750	3765	600	3070
FB0	017	4750	2475	660	2307
	020	4750	2545	640	2457
	023	4750	2555	630	2512
	025	5750	3145	640	2998
	028	5750	3145	630	3061
	030	6750	3715	650	3433
	032	6750	3715	640	3491
FG0	017	4750	2485	650	2309
	020	4750	2555	630	2459
	023	5750	3105	640	2854
	025	5750	3155	640	3004
	028	6750	3705	650	3405
	030	6750	3725	640	3443

Fig. 5 - Support positions and loads



Tank
(supply not mounted on unit)



WA = WB = 406 kg
WC = WD = 299 kg

Dimensions

Models	Size	Dimensions (mm)	
		"A"	"B"
CB0 / FB0	**017 - 020 - 023**	3750	1000
CG0 / FG0	**017 - 020**		
CB0 / FB0	**025 - 028**	4750	1500
CG0 / FG0	**023 - 025**		
CB0 / FB0	**030 - 032**	5750	2000
CG0 / FG0	**028 - 030**		

Operating weight distribution - Unit without tank

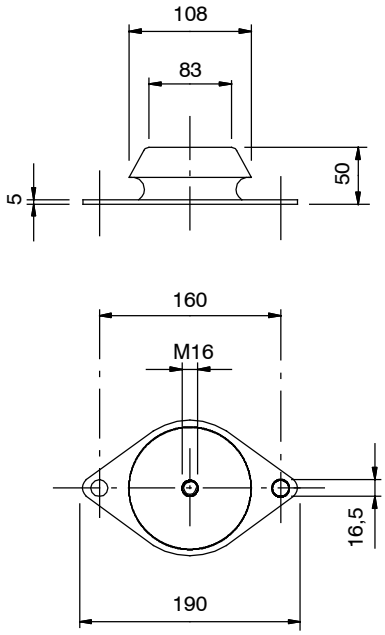
Models	Size	Weight distribution (kg)								Total (kg)
		W1	W2	W3	W4	W5	W6	W7	W8	
CB0	**017**	167	167	208	208	193	193	241	241	1618
	020	165	165	224	224	210	210	285	285	1768
	023	169	169	228	228	219	219	296	296	1824
	025	199	199	301	301	250	250	377	377	2254
	028	204	204	304	304	262	262	390	390	2320
	030	227	227	363	363	280	280	447	447	2634
	032	232	232	367	367	291	291	459	459	2698
CG0	**017**	164	164	207	207	193	193	245	245	1618
	020	162	162	224	224	210	210	289	289	1770
	023	189	189	282	282	235	235	349	349	2110
	025	196	196	302	302	249	249	384	384	2262
	028	224	224	360	360	276	276	444	444	2608
	030	224	224	365	365	278	278	455	455	2644
FB0	**017**	241	241	266	266	228	228	251	251	1972
	020	238	238	284	284	246	246	294	294	2124
	023	241	241	288	288	255	255	305	305	2178
	025	285	285	380	380	290	290	386	386	2682
	028	290	290	384	384	301	301	399	399	2748
	030	328	328	460	460	325	325	456	456	3138
	032	332	332	465	465	335	335	468	468	3200
FG0	**017**	238	238	266	266	228	228	255	255	1974
	020	234	234	284	284	246	246	298	298	2124
	023	276	276	360	360	275	275	359	359	2540
	025	281	281	381	381	290	290	392	392	2688
	028	324	324	456	456	322	322	453	453	3110
	030	324	324	463	463	324	324	464	464	3150

Operating weight distribution - Unit with tank

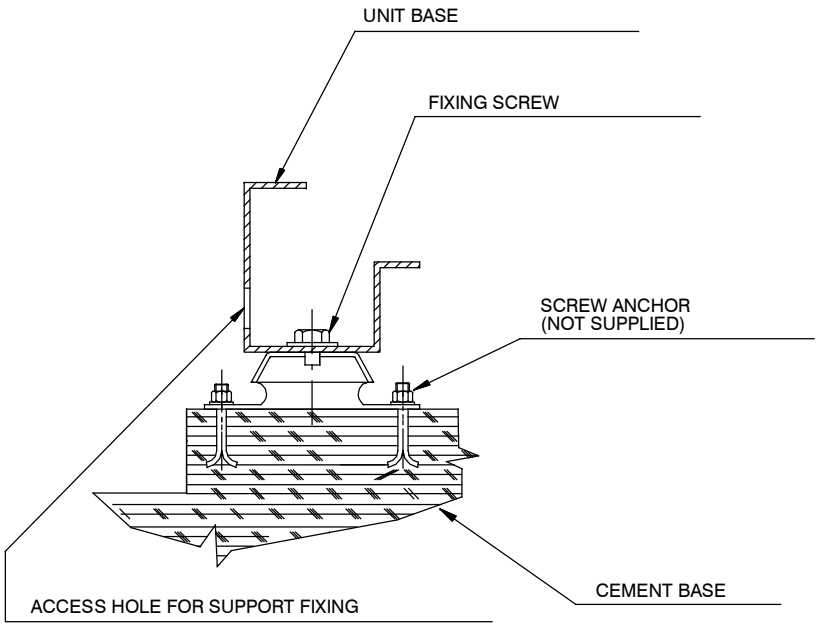
Models	Size	Weight distribution (kg)										Total (kg)
		WT1	W1	W2	W3	W4	WT2	W5	W6	W7	W8	
CB0	**017**	450	450	221	221	221	429	429	211	211	211	3054
	020	434	434	242	242	242	440	440	245	245	245	3209
	023	433	433	247	247	247	446	446	255	255	255	3264
	025	437	437	314	314	314	452	452	325	325	325	3695
	028	437	437	319	319	319	460	460	336	336	336	3759
	030	443	443	370	370	370	461	461	386	386	386	4076
	032	443	443	375	375	375	468	468	396	396	396	4135
CG0	**017**	446	446	222	222	222	430	430	214	214	214	3060
	020	431	431	242	242	242	441	441	247	247	247	3211
	023	437	437	294	294	294	446	446	300	300	300	3548
	025	433	433	315	315	315	452	452	329	329	329	3702
	028	441	441	366	366	366	460	460	382	382	382	4046
	030	438	438	372	372	372	460	460	391	391	391	4085
FB0	**017**	501	501	276	276	276	433	433	239	239	239	3413
	020	485	485	297	297	297	444	444	272	272	272	3565
	023	483	483	303	303	303	450	450	282	282	282	3621
	025	495	495	385	385	385	456	456	355	355	355	4122
	028	495	495	391	391	391	463	463	366	366	366	4187
	030	510	510	457	457	457	466	466	418	418	418	4577
	032	510	510	463	463	463	472	472	429	429	429	4640
FG0	**017**	497	497	276	276	276	434	434	241	241	241	3413
	020	481	481	297	297	297	445	445	274	274	274	3565
	023	496	496	365	365	365	450	450	331	331	331	3980
	025	491	491	386	386	386	456	456	359	359	359	4129
	028	508	508	453	453	453	465	465	414	414	414	4547
	030	505	505	459	459	459	466	466	423	423	423	4588

Fig. 6 - Rubber anti- vibration support + 1000 liters tank

Rubber support dimensions
(Single rubber support code: 270326)



Rubber support installation

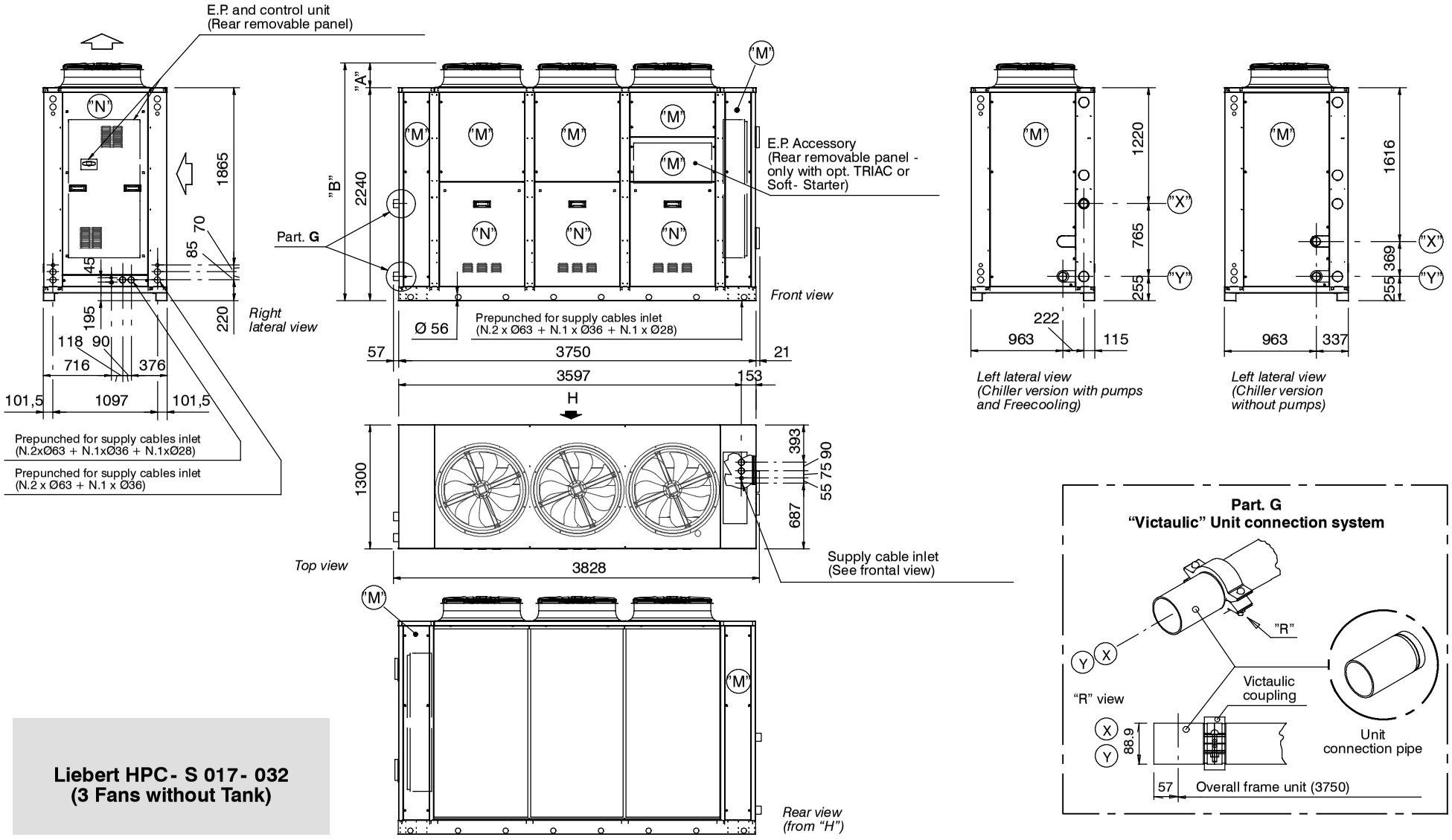


Rubber supports + 1000 liters tank

Unit	Configuration	Support kit code	Single support code	Kit support pieces
CB0 / FB0 017- 020- 023- 025- 028- 030- 032	Without tank	485625	270326	8
CG0 / FG0 017- 020- 023- 025- 028- 030				
CB0 / FB0 017- 020- 023- 025- 028- 030- 032	With tank	485626	270326	10
CG0 / FG0 017- 020- 023- 025- 028- 030				
1000 liters tank	Loose supplied	485649	270326	4

Each kit is complete with stainless steel fixing screws and plain washers for unit assembly.

Fig. 7 - Overall dimensions



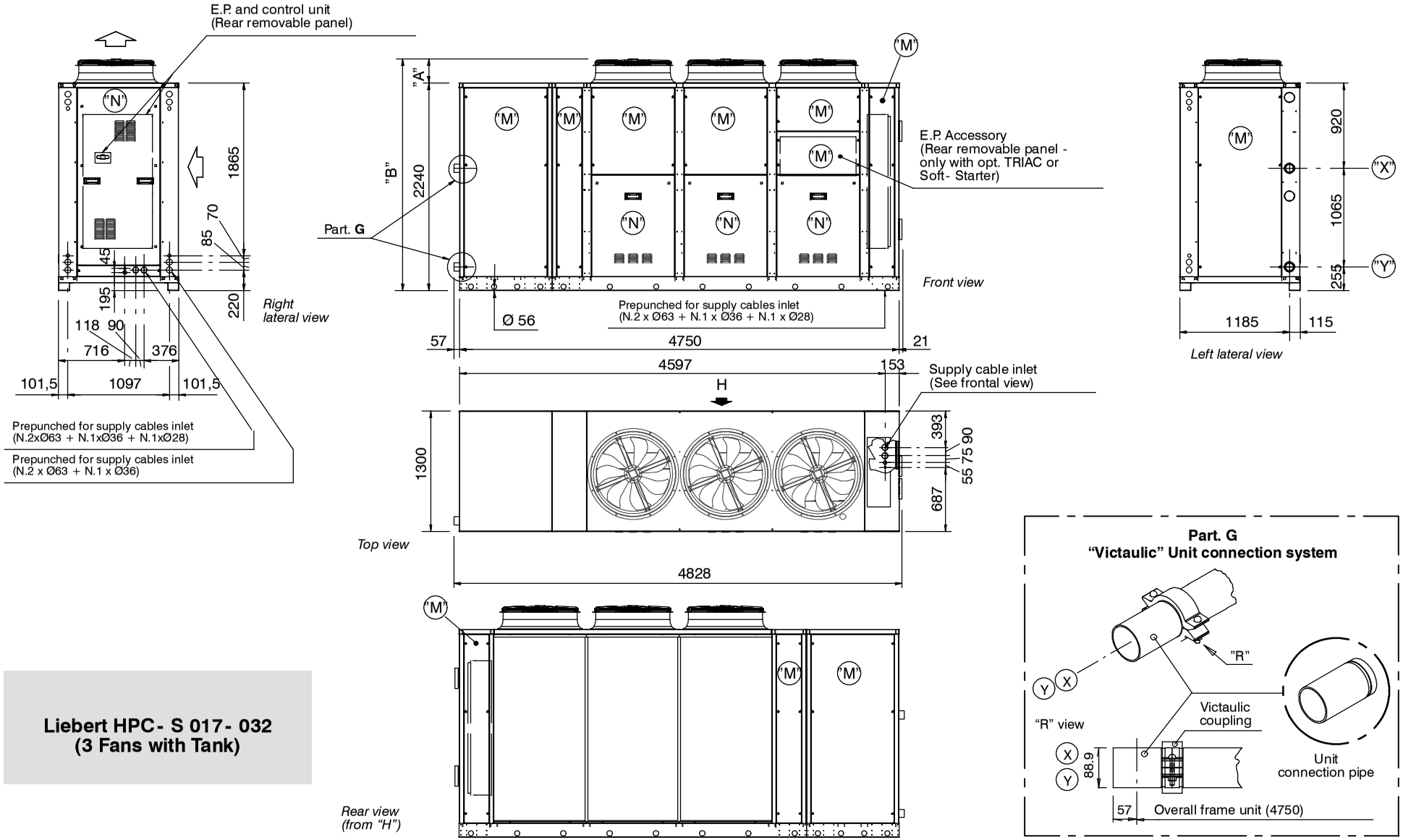
Liebert HPC- S 017- 032
(3 Fans without Tank)

Models	Fans N.	AC Fans				EC Fans				Chilled water connections	
		d = 800		d = 900		d = 800		d = 900		"X" Inlet	"Y" Outlet
		"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)		
C / FB0 017 - 020 - 023	3	260	2500	260	2500	289	2529	289	2529	VICTAULIC DN80- 3"- 88.9 mm	
C / FG0 017 - 020		-	-	-	-	232	2472	289	2529		

Air flow

(M) Removable panel fixed by screws

(N) Removable panel fixed by 1/4 turn locks



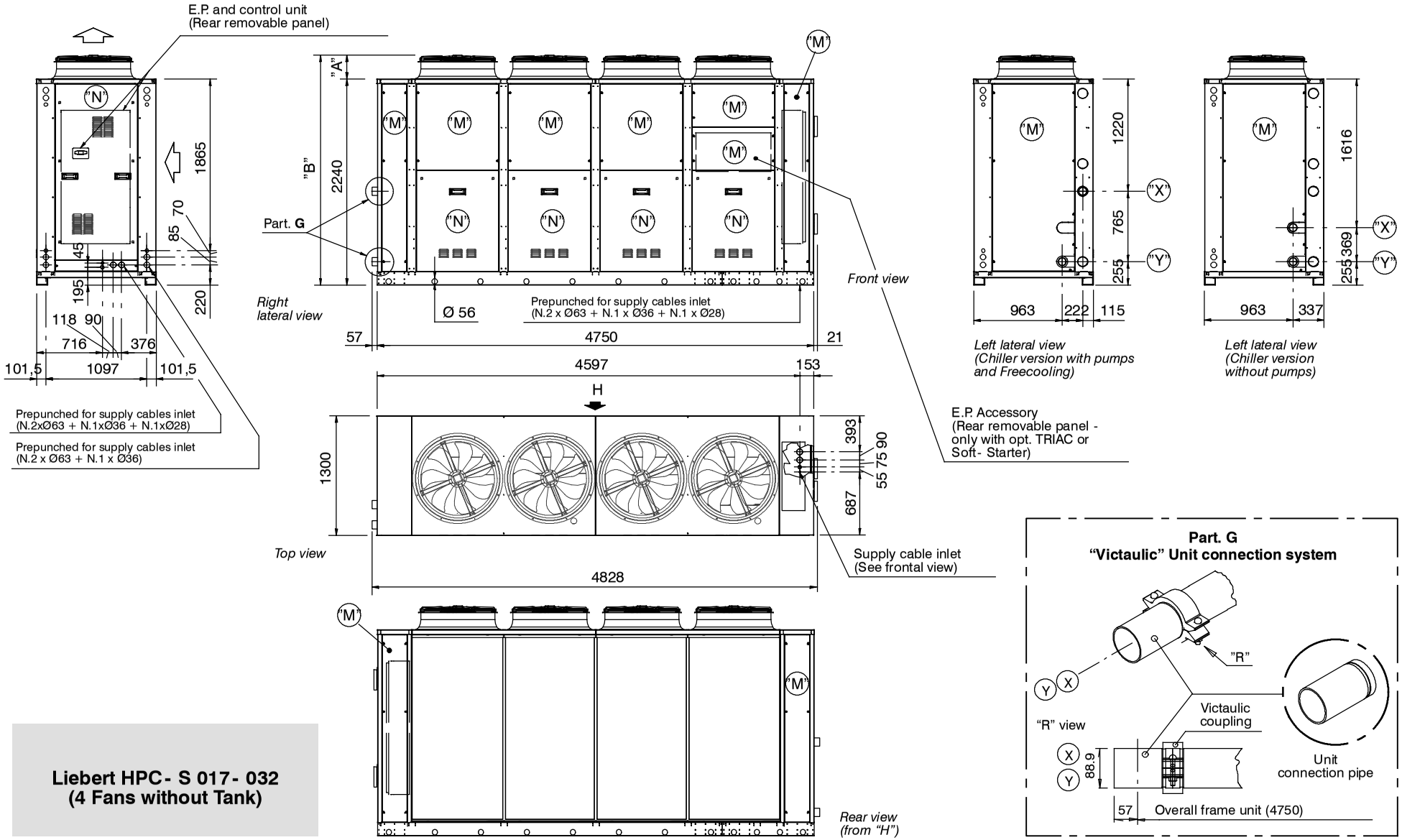
Liebert HPC- S 017- 032
(3 Fans with Tank)

Models	Fans N.	AC Fans				EC Fans				Chilled water connections	
		d = 800		d = 900		d = 800		d = 900		"X" Inlet	"Y" Outlet
		"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)		
C / FB0 017 - 020 - 023	3	260	2500	260	2500	289	2529	289	2529	VICTAULIC DN80- 3"- 88.9 mm	
C / FG0 017 - 020		-	-	-	-	232	2472	289	2529		

Air flow

(M) Removable panel fixed by screws

(N) Removable panel fixed by 1/4 turn locks



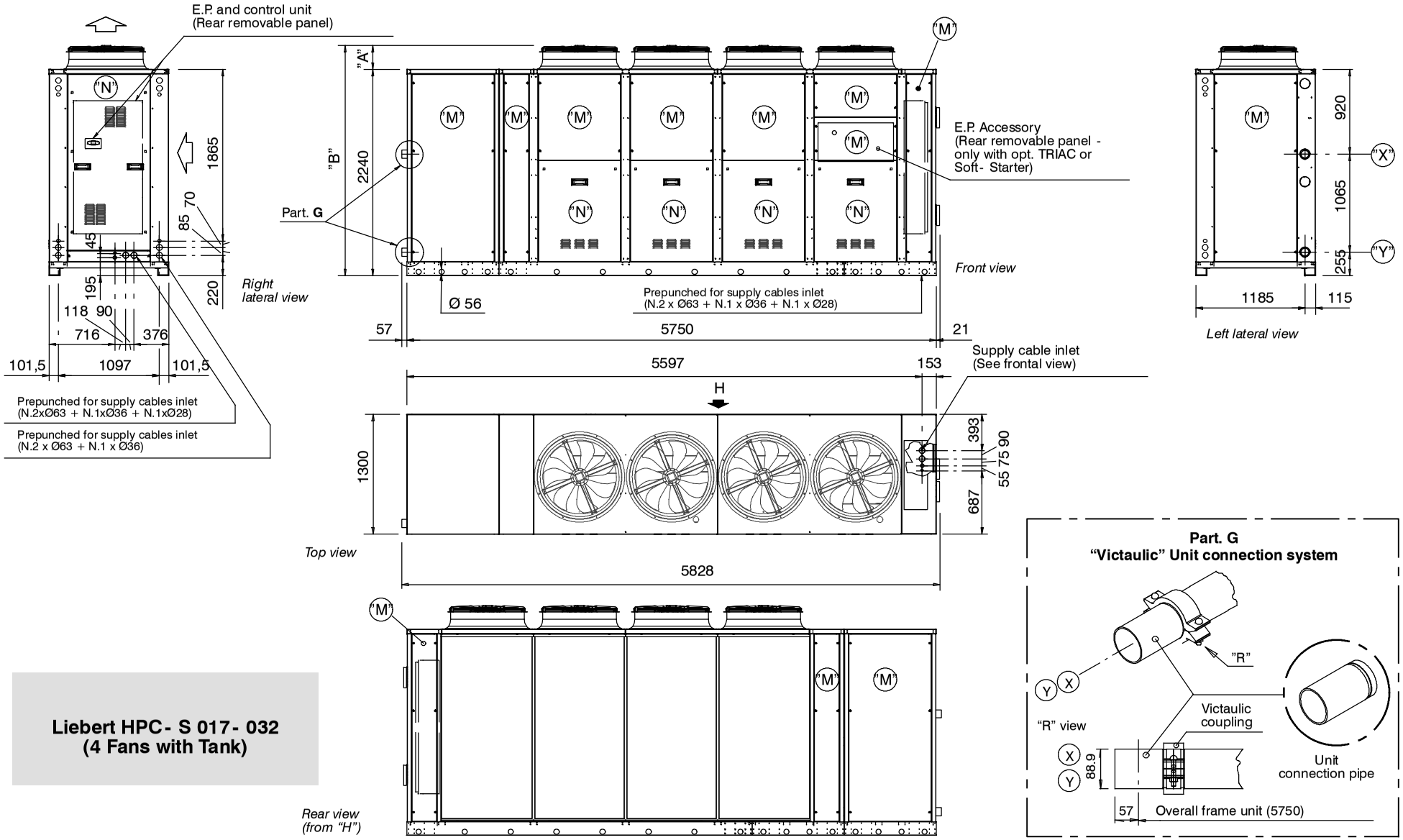
Liebert HPC- S 017- 032
(4 Fans without Tank)

Models	Fans N.	AC Fans				EC Fans				Chilled water connections	
		d = 800		d = 900		d = 800		d = 900			
		"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"X" Inlet	"Y" Outlet
C / FB0 025 - 028	4	260	2500	260	2500	289	2529	289	2529	VICTAULIC DN80- 3"- 88.9 mm	
C / FG0 023 - 025		-	-	-	-	232	2472	289	2529		

Air flow

(M) Removable panel fixed by screws

(N) Removable panel fixed by 1/4 turn locks



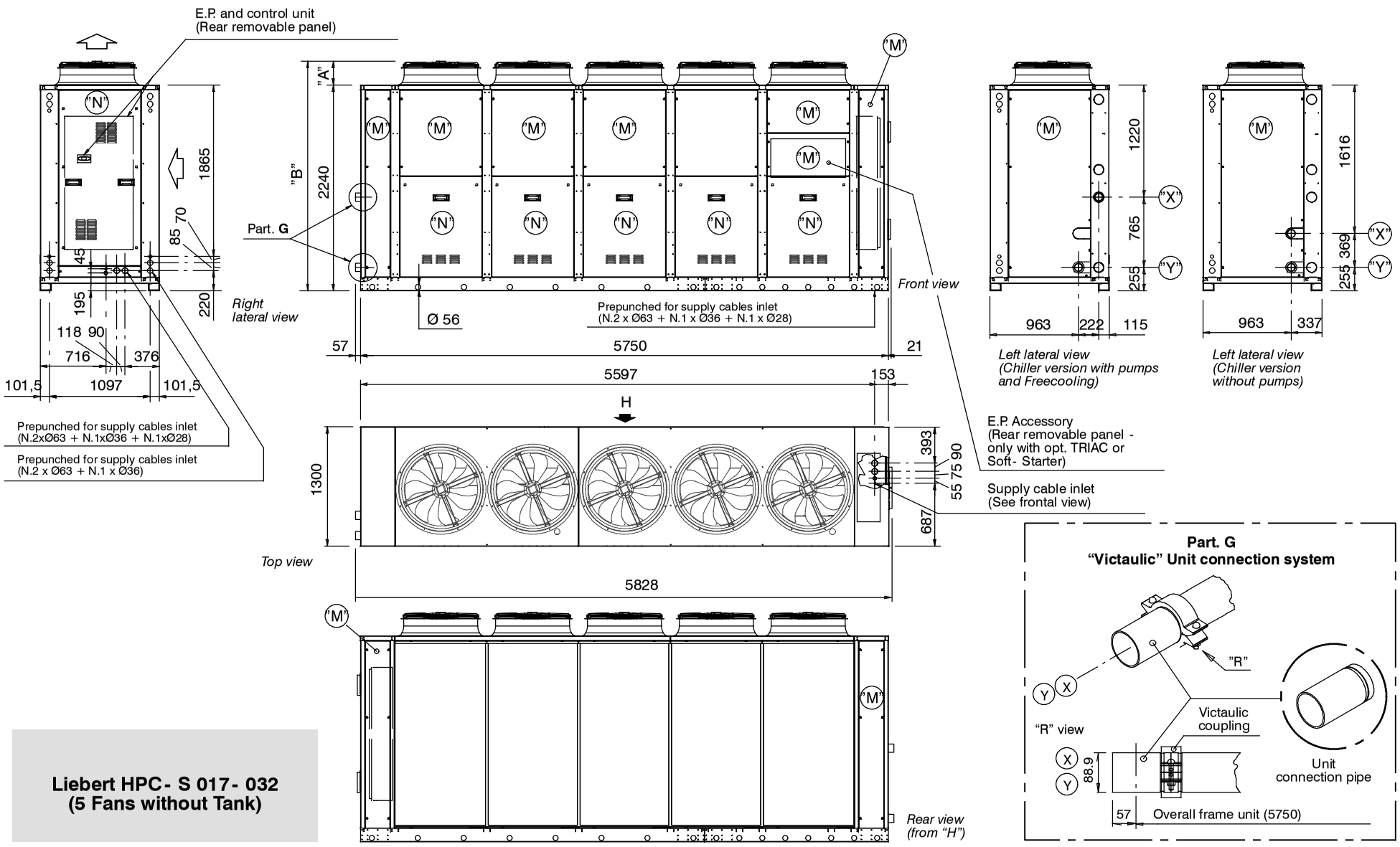
Liebert HPC- S 017- 032
(4 Fans with Tank)

Models	Fans N.	AC Fans				EC Fans				Chilled water connections	
		d = 800		d = 900		d = 800		d = 900		"X" Inlet	"Y" Outlet
		"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)		
C / FB0 025 - 028	4	260	2500	260	2500	289	2529	289	2529	VICTAULIC DN80- 3"- 88.9 mm	
C / FG0 023 - 025		-	-	-	-	232	2472	289	2529		

Air flow

(M) Removable panel fixed by screws

(N) Removable panel fixed by 1/4 turn locks



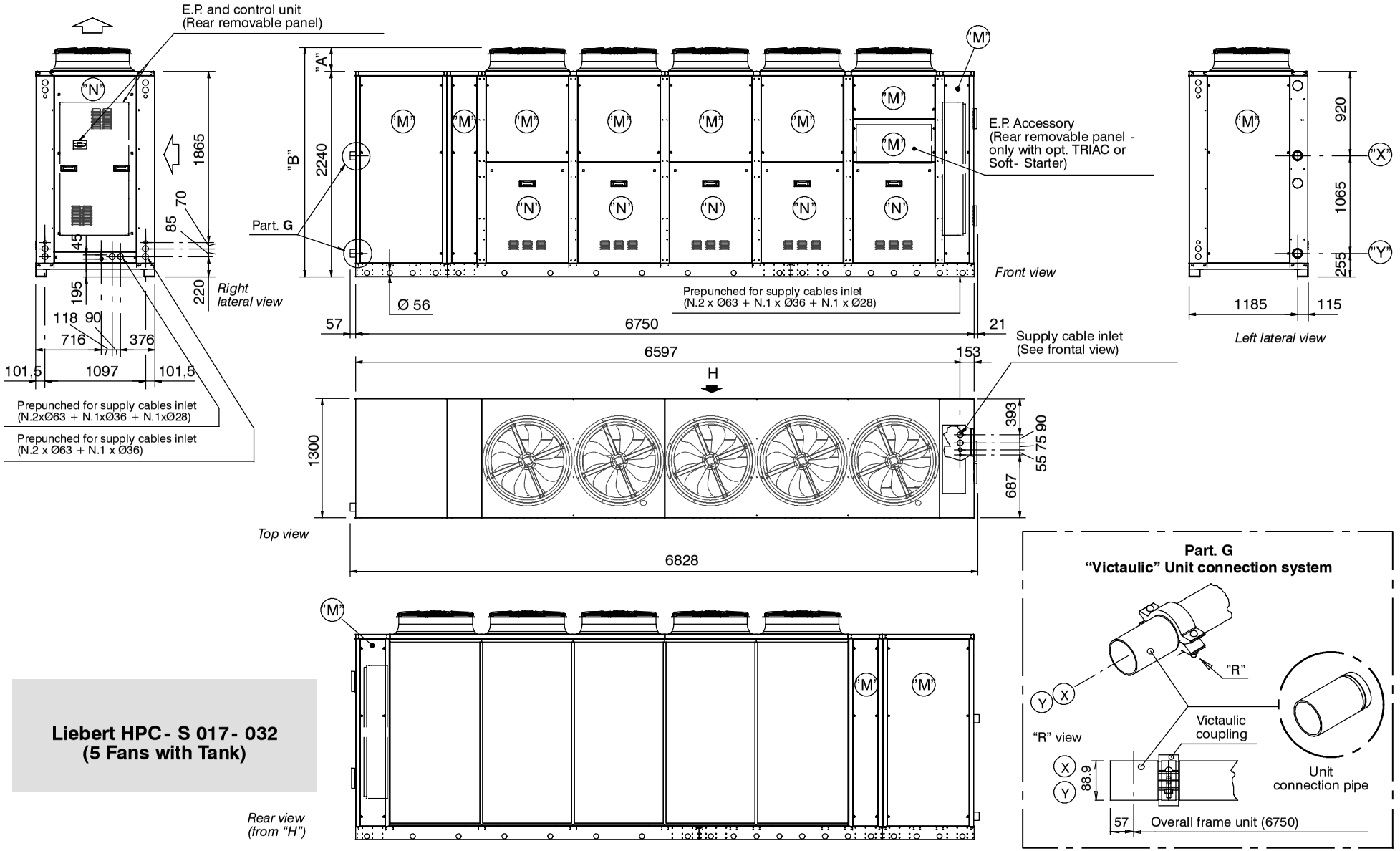
Liebert HPC- S 017- 032
(5 Fans without Tank)

Models	Fans N.	AC Fans				EC Fans				Chilled water connections	
		d = 800		d = 900		d = 800		d = 900			
		"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"X" Inlet	"Y" Outlet
C / FB0 030 - 032	5	260	2500	260	2500	289	2529	289	2529	VICTAULIC DN80- 3"- 88.9 mm	
C / FG0 028 - 030		-	-	-	-	232	2472	289	2529		

Air flow

(M) Removable panel fixed by screws

(N) Removable panel fixed by 1/4 turn locks



Liebert HPC- S 017- 032
(5 Fans with Tank)

Models	Fans N.	AC Fans				EC Fans				Chilled water connections	
		d = 800		d = 900		d = 800		d = 900			
		"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"A" (mm)	"B" (mm)	"X" Inlet	"Y" Outlet
C / FB0 030 - 032	5	260	2500	260	2500	289	2529	289	2529	VICTAULIC DN80- 3"- 88.9 mm	
C / FG0 028 - 030		-	-	-	-	232	2472	289	2529		

Air flow

(M) Removable panel fixed by screws

(N) Removable panel fixed by 1/4 turn locks

Fig. 8 - Overall unit dimensions with lifting tubes option

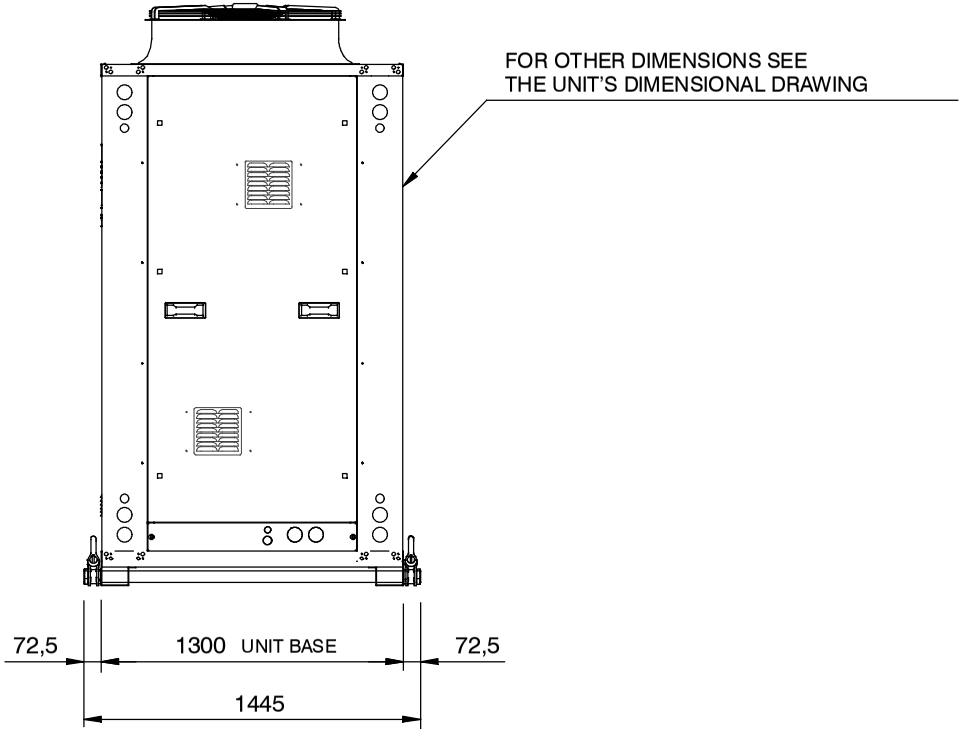
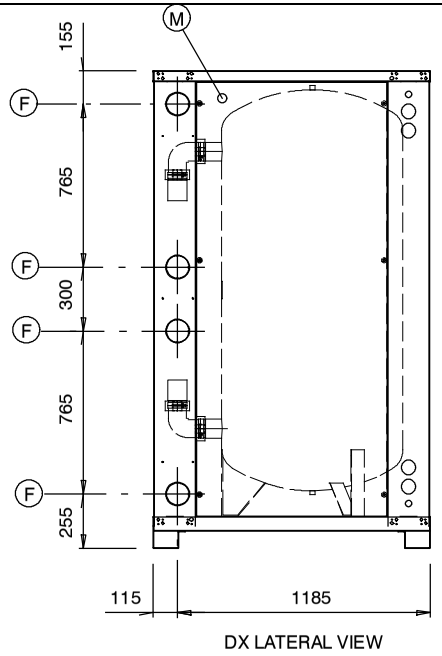
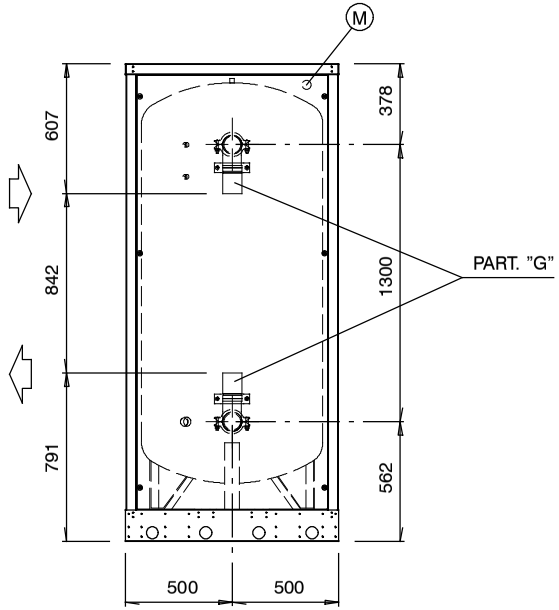


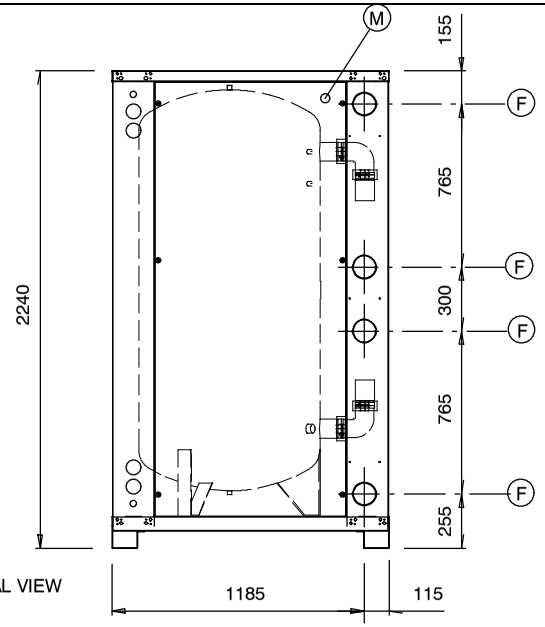
Fig. 9 - Tank overall dimensions (supply not mounted on unit)



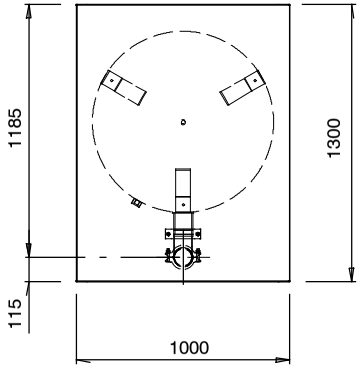
DX LATERAL VIEW



FRONT VIEW

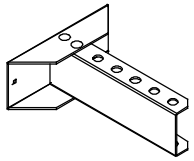


SX LATERAL VIEW



TOP VIEW

BRACKETS



N. 2 brackets for supported inlet/ outlet pipes. Fixed with M6 screws in (ø7) holes, near prepunched connections (ø110) chosen.

Ⓜ REMOVABLE PANEL

Ⓕ PREPUNCHED Ø110
(for inlet/outlet pipes connections)

PART. "G"
TANK CONNECTING SYSTEM

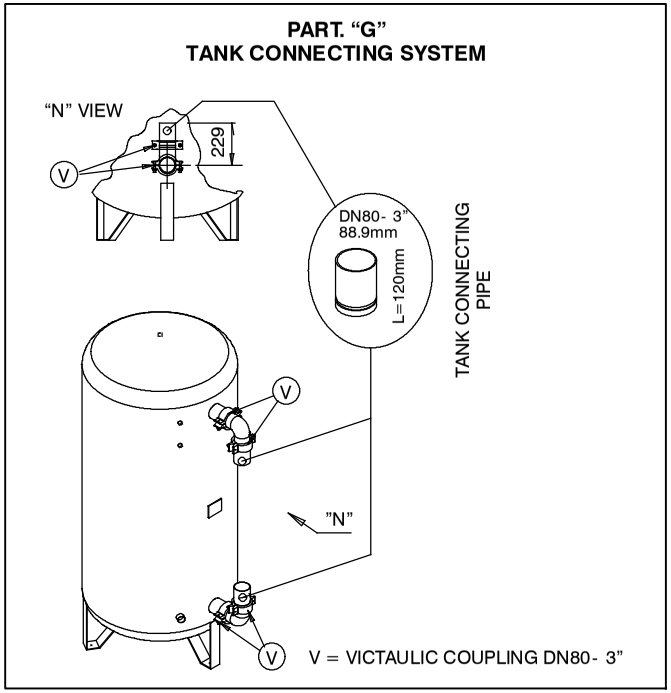
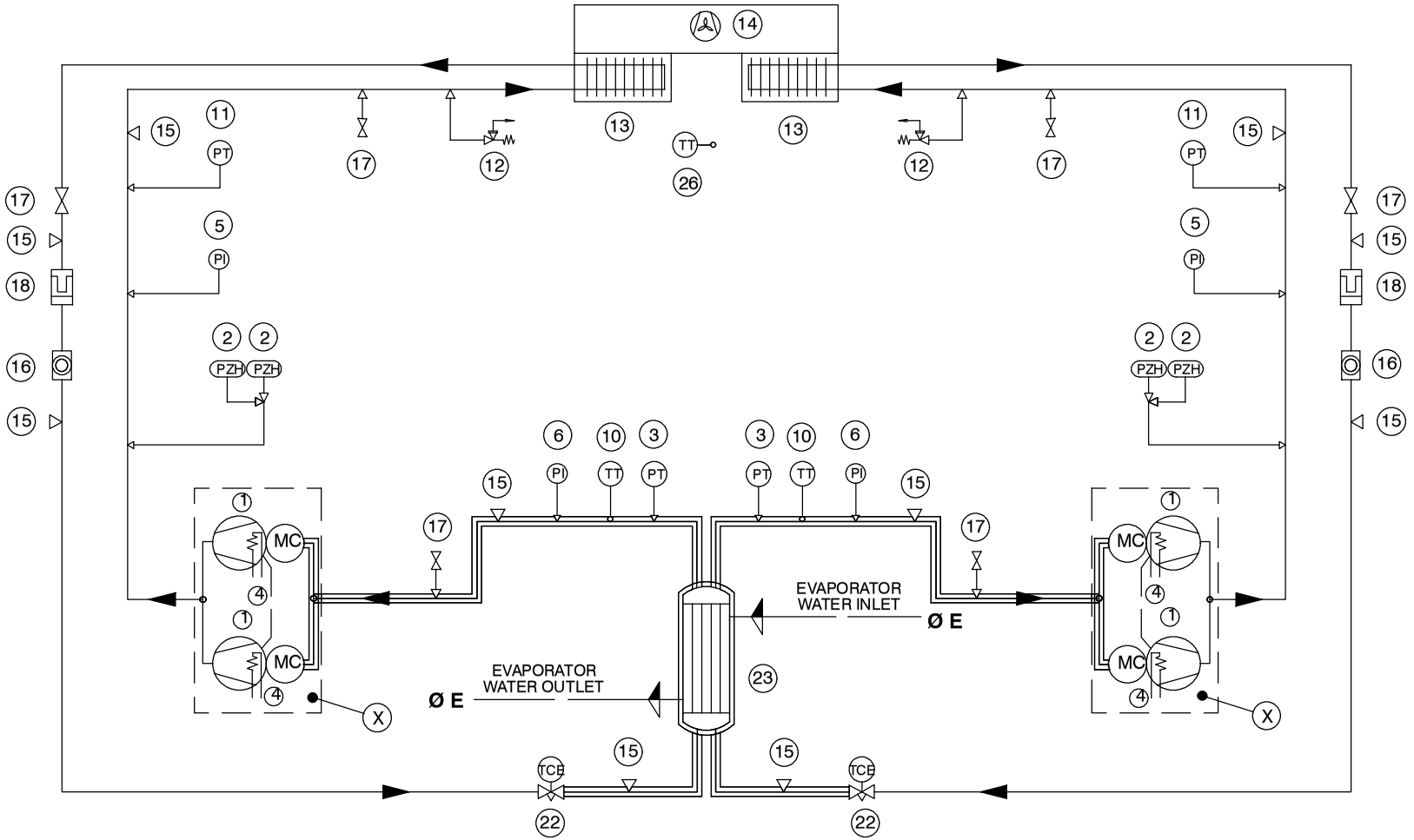


Fig. 10 - Refrigerant circuit



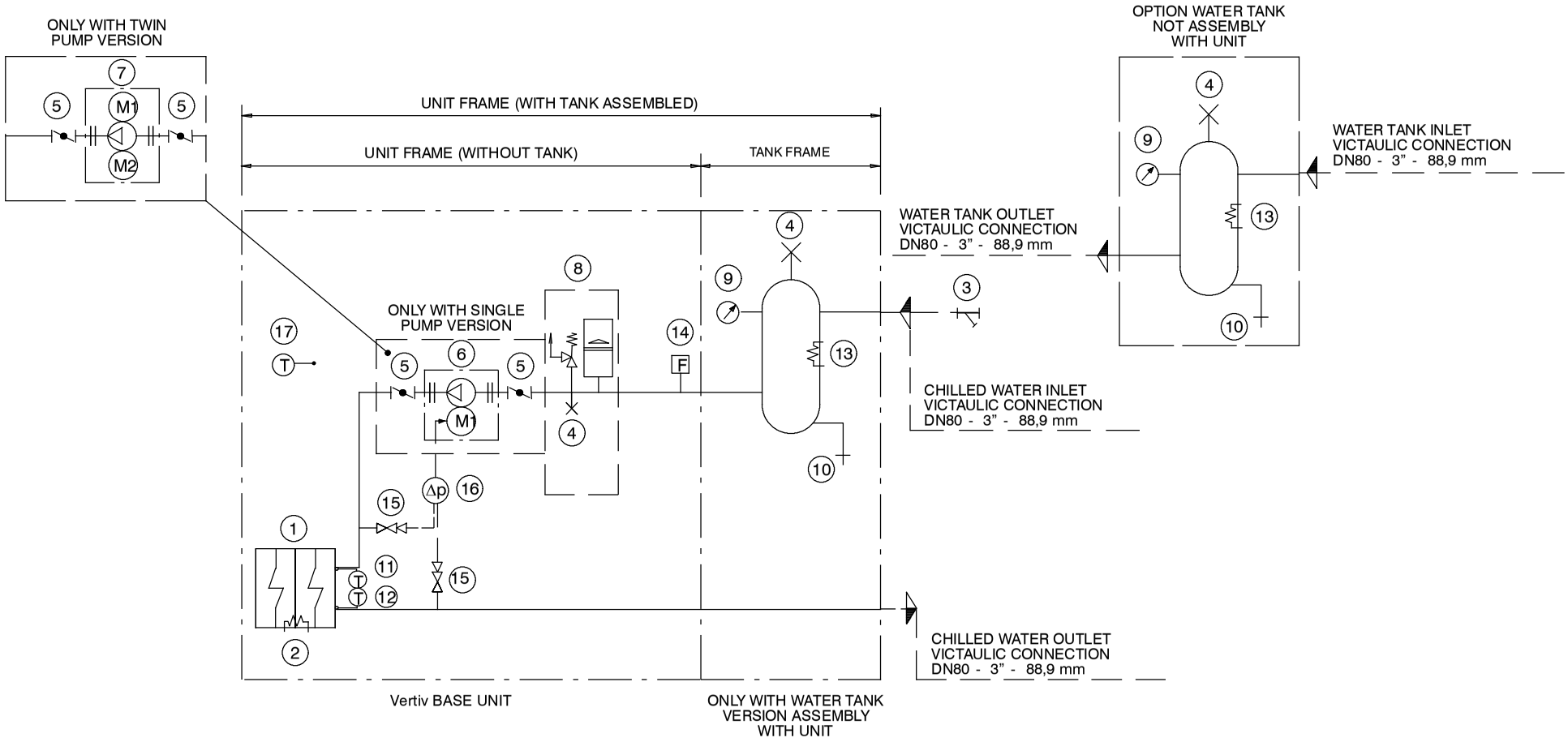
X

Make tandem compressor piping following the assembly instructions of supplier.

Ø E - VICTAULIC COUPLING DN80 - 3" - 88,9mm

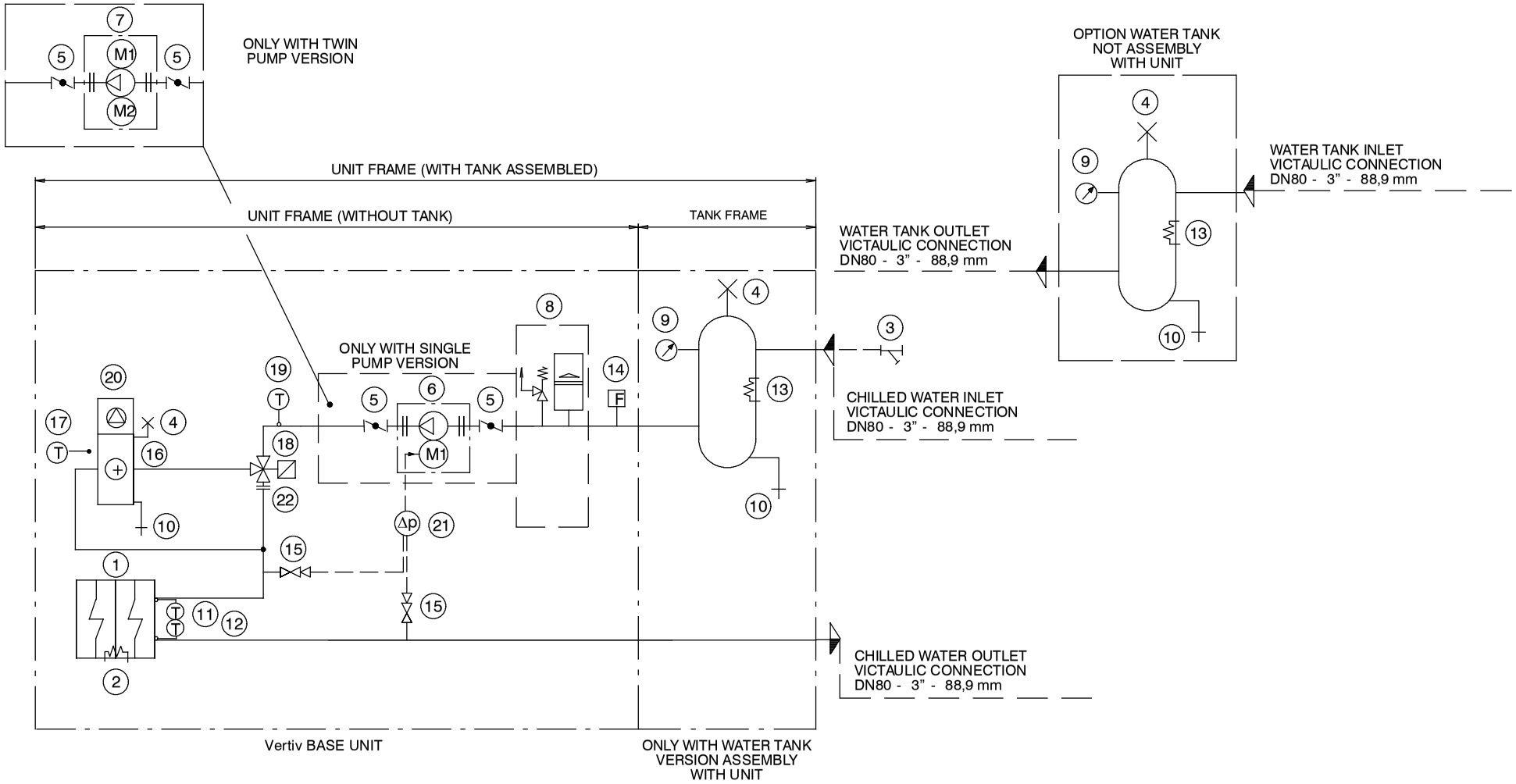
Pos.	Description	Pos.	Description	Pos.	Description
1	Compressor	10	Thermostatic temperature sensor	19	-
2	High pressure switch	11	Transducer pressure sensor *(High pressure control)*	20	-
3	Transducer pressure sensor *(Low pressure control)*	12	Safety valve	21	-
4	Crankcase heater	13	Condenser	22	Electronic expansion valve
5	High pressure manometer	14	Condenser fans	23	Evaporator
6	Low pressure manometer	15	Service connection	24	-
7	-	16	Sight glass	25	-
8	-	17	Shut - Off valve	26	External air temperature sensor
9	-	18	Filter dryer	27	-

Fig. 11 - Chiller hydraulic circuit



Pos.	Description	Pos.	Description
1	Evaporator	12	Water outlet evaporator probe
2	Evaporator antifreeze heater (optional)	13	Tank antifreeze heater (optional)
3	Water filter (optional)	14	Flow switch
4	Manual air valve	15	Service valve with cap
5	Butterfly valve	16	Differential transducer (only with electronic pumps)
6	Single pump	17	Air temperature sensor
7	Twin pump	18	-
8	Expansion tank + Safety valve (optional)	19	-
9	Manometer	20	-
10	Discharge valve	21	-
11	Water inlet evaporator probe	22	-

Fig. 12 - Freecooling hydraulic circuit



Pos.	Description	Pos.	Description
1	Evaporator	12	Water outlet evaporator probe
2	Evaporator antifreeze heater (optional)	13	Tank antifreeze heater (optional)
3	Water filter (option)	14	Flow switch
4	Manual air valve	15	Service valve with cap
5	Butterfly valve	16	Freecooling coil
6	Single pump	17	Air temperature sensor
7	Twin pump	18	3 way valve
8	Expansion tank + Safety valve (optional)	19	Control freecooling thermostat sensor
9	Manometer	20	Fans
10	Discharge valve	21	Differential transducer (only with electronic pumps)
11	Water inlet evaporator probe	22	Caslibrated bafle

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