redge

eCOMFORT2
20 - 190 kW

Air Cooled Liquid Chiller / Heat Pump



Installation, Operating and Maintenance Manual

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AIR COOLED UNITS

INSTALLATION, OPERATION, MAINTENANCE MANUAL

Ref.: MIL160E-0720 09-2024

The present manual applies to the following chiller versions:
eComfort range: GAC-GAH 020-185

INSPECTIONS AND REQUALIFICATION ACCORDING PRESSURE EQUIPMENT DIRECTIVE MUST FOLLOW THE LOCAL REGULATIONS WHERE THE UNIT IS INSTALLED.

Our company is a member of the Eurovent Certification Program, all Redge chillers are tested and rated in accordance with Eurovent certification program.	EUROVENT CERTIFIED PERFORMANCE
Our products comply with the European standards.	CE

Original version is the English one. Other versions are translations.

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INTRODUCTION

We remind you that these instructions must be followed for operation, maintenance, repair and decommissioning of the product. Failure to follow these instructions will result in the offender assuming the manufacturer's responsibilities.

You must read and be familiar with this operating manual prior to commission the chiller.
Please closely follow the instructions.
We would like to stress the importance of training with respect to the correct handling of the chiller.
Please consult Redge on the options available in this field.
It is important that this manual is stored in a permanent location in the vicinity of the chiller.



IMPORTANT GENERAL INSTRUCTIONS

This manual contains important instructions regarding the commissioning of the chiller. It also includes important instructions to prevent personal injury and damage to the machine during operation. Furthermore, in order to promote fault-free operation of the chiller, maintenance information has been included.
Please do not hesitate to contact one of our employees should you require further information on specific chiller subjects. Order related documentation will be forwarded under separate cover.
This documentation consists of:

- ***EU declaration.***
- ***Operating manual for control system.***
- ***Installation operating manual.***
- ***Wiring diagram.***
- ***Refrigerant flow diagram.***
- ***Units detail are given on unit nameplate.***

The data published in this manual is based on the most recent information available. It is supplied conditional to later modifications.
We reserve the right to modify the construction and/or design of our chillers, at any time, without prior notification or obligation to adapt previous supplies accordingly..



Any work on the Chiller should be carried out by trained and licensed competent technician. The following risks are present on the unit:

- ***Risk of electrical shock.***
- ***Risk of injury from rotating parts.***
- ***Risk of injury from sharp edges and heavy weight.***
- ***Risk of injury from high pressure gas.***
- ***Risk of injury from slightly flammable refrigerant.***
- ***Risk of injury from high and low temperatures components.***

It is expected that all works on equipment be carried out in accordance with all local standards and norms. It is expected that all works are carried out with good working practices.

Inspections and requalification according to Pressure Equipment Directive (PED) must follow the local regulations where the unit is installed.

The refrigerating system is designed for a working life of at least 12 years if the safety and maintenance instructions are strictly respected.
The equipment can be renewed in its lifespan of the periodic requalification certificate is validated by the expert (Authorized body or according to current local regulations).

COMPLIANCE WITH REGULATIONS AND DIRECTIVES

The units comply with the directives and regulations which apply at the time of their placing on the market.
For more information, please see the product's Declaration of Conformity.

The unit is designed for outdoor installation only. The unit must be installed in accordance with local safety codes and regulations and can only be used in well ventilated area.

Inspections and requalification according to the pressure equipment directive must comply with the regulations of the place where the unit is installed. In some countries there may be mandatory requirements for commissioning, operational monitoring, periodic inspection and requalification. Please refer to them when installing the equipment. In France, the ministerial decree of 20/11/2017 (or formerly the decree of March 15, 2000) relating to the in-service monitoring of pressure equipment and simple pressure vessels applies. By respecting the CTP of the USNEF entitled: "Professional technical book for the monitoring in service of pressurized refrigeration systems" your refrigeration system will be in conformity with the ministerial decree.

We would like to stress the importance of training with respect to the correct handling of the unit.
Please consult Redge on the options available in this field.
It is important that this manual is stored in a permanent location in the vicinity of the unit.

SAFETY DEVICES:
This equipment is protected with calibrated safety pressure switches.

PRESSURE RELIEF VALVES:
This equipment contains pressure relief valves to limit damage in the event of an external fire. Make sure that people are not exposed to refrigerant discharge.

EMC DIRECTIVE COMPLIANCE
WARNING:
This equipment is compliant with the essential requirements of the EMC2014/30/EU directive for industrial environments and light industry. In an industrial environment, this equipment may create radio noise. In this case, the owner can be asked to take appropriated actions.

The units meet the following hardest environments standards, according to the product's Declaration of Conformity:
- EN 61000-6-2 : Immunity for industrial environments.
- EN 61000-6-4 : Emissions for industrial environments.
- EN 61000-6-8 : Emissions for commercial and light industrial environments.

In conclusion, in view of the results obtained on the unit tested, the entire range defined complies with the essential requirements of the EMC Directive 2014/30/EU, for commercial, light industrial and industrial environments in accordance with the above standards.

This applies to all installed machines which have a rated current I<75A:
- The short-circuit ratio Rsce=33 is defined in standard EN61000-3-12 in relation to the harmonic values on the network. Equipment complying with the harmonic current limits equivalent to Rsce=33 may be connected to any connection point on the main power supply system.
- The maximal allowable impedance of the main supply system Zmax=0.47Ω is defined by EN 61000-3-11 standard relative to the voltage variation, fluctuation and flicker readings. The connection to the supply is a conditional connection submitted to the preliminary agreement of the power supply local provider.

The differences between the various machines are only related to the power of the compressors and equipment that are associated. For conducted and radiated emission and immunity, these differences do not alter the results.

CAUTION:
In the event of fire, refrigerating circuits can cause an explosion and spray coolant gas and oil.

F-GAS REGULATION:
PLEASE READ THE SAFETY DATA SHEET OF THE REFRIGERANT BEFORE ANY INTERVENTION OR INSTALLATION OF THE UNIT.
Operators of refrigeration equipment's must comply with the obligations defined in:
- **Regulation on Fluorinated greenhouse gases (F Gas).**
- **Regulation on substances that deplete the ozone layer.**

<table>
<tr><td rowspan="2"></td><td>Non compliance with these requirements is an offence and liable of financial penalties.</td></tr>
<tr><td>Moreover, in case of problem it is mandatory to prove to the insurance company that the equipment complies with the F gas Regulation, as well as that all measures have been taken to safeguard people, environment and property.</td></tr>
</table>

MAIN SAFETY RECOMMENDATIONS

IMPORTANT NOTICE:
All work on the unit must be carried out by a qualified and authorized personnel.
Non-compliance with the following instructions may result in injury or serious accidents.

Protection: Safety accessory / Damage limitation accessory:
In the chillers, the HP pressure switch is a PED safety accessory (see 2.11 Dir.2014/68/EU) and the valves are accessories to limit damage in the event of an external fire (see 2.12).

	PED safety accessory (see 2.11)	Damage limitation accessory in the event of an external fire (see 2.12)
HP pressure switch	YES	N/A
Valve(s)	N/A	YES

Safety pressure switch chain test:
Test to check correct operation of the safety pressure switch chain, to be carried out every year by Redge technical personnel.
- Before starting the test, install an HP pressure gauge to check overall operation of the safety pressure switch. Perform a visual check and a preliminary leak test.
- Start the Climatic's "Circ1 HP or Circ2 HP" mode to build up pressure in the refrigerant circuit (compressors running, ventilation off, program HP envelope safety deactivated, pressure switch contactor status taken into account).
- When the pressure switch is switched on, the contactor is deactivated, shutting down the compressors and activating alarm 091.
- Check on the Climatic display that the pressure trip value is less than PS.

Works on the unit:
The risk analyses of our machines are carried out considering operation in a standard environment with unpolluted air. For other applications, which do not meet this criterion (Kitchen, industry, ...) please contact your local sales representative.
- The unit shall be isolated from the electrical supply by disconnecting and locking out the main isolating switch.
- Workers shall wear the appropriate personal protective equipment (helmet, gloves, glasses, etc.).

Works on the electrical system:
- Work on electric components shall be performed with the power off by employees having valid electrical qualification and authorization.

Work on the refrigerant circuit(s):
- Monitoring of the pressures, draining and filling of the system under pressure shall be carried out using equipment designed for this purpose and suitable for the refrigerant contained.
- To prevent the risk of explosion due to spraying of coolant and oil, the relevant circuit shall be drained and at zero pressure before any disassembly or unbracing of the refrigerating parts takes place.
- There is a residual risk of pressure build-up by degassing the oil or by heating the exchangers after the circuit has been drained. Zero pressure shall be maintained by venting the drain connection to the atmosphere on the low-pressure side.
- The brazing shall be carried out by a qualified brazier. The brazing shall comply with standard EN1044 (minimum 30% silver).

Replacing components, equipment and piping:
- Replacement shall be carried out using spare parts, or using parts approved by Redge.
- Only the refrigerant shown on the manufacturer's nameplate shall be used, excluding the rest of the products (mixture of refrigerants, hydrocarbons, etc.).

Parametering and control:
- For any intervention related to component parameterization, controls and unit operation management, refer to "eClimatic" user manual.

MAIN SAFETY RECOMMENDATIONS

Recommend refrigerant speeds:
- Liquid: Max. pressure loss: 1 - 1,5°C. Max. speed: 1 - 1,5m/s.
- Suction: Max. pressure loss: 1,5 - 2°C. Vmax: 15m/s, Vmin horizontal: 3,5m/s, Vmin vertical: 8m/s.
- Delivery: Max. pressure loss: 1°C. Vmax: 15m/s, Vmin horizontal: 3,5m/s, Vmin vertical: 8m/s

Transport - Handling:
- Never lift the unit without forklift protections.
- Remove the forklift protection before installation.
- If access to the installation is difficult, provide guard rail. This recommendation is valid for installations in general. It's also valid to reach other parts of the unit: refrigerant circuit, etc.
- Installation of the unit and accessibility must be compliant with the local regulations. Ensure that all access equipment allow maintenance operation in safety (electrical cabinet, main switch, panels, refrigerant circuit, etc).
- It is strictly forbidden to walk or store equipment or material on top of the unit.
- Equipment designed to withstand transport and handling according to the established protocol (for the handling protocol, please refer to the installation instructions for the relevant product range).
- All unloading operations must be carried out with suitable equipment (crane, forklift truck, etc.).
- When using a forklift truck, you must respect the positions and the direction of handling indicated on the products.
- The equipment must be handled with care to avoid damage to the bodywork, pipework, condenser, etc.

Unit installation in heavy wind locations:
- The units are designed to withstand winds up to 80km/h. Above this limit, it's recommended to take appropriate actions to secure the installation.

Commissioning:
- It must only be carried out by trained refrigeration engineers.
- Don't forget to open the insulation valve on the liquid line before starting the unit.

WARNING:
- **The units are not designed to resist to a fire. The installation site must comply with the standards relating to fire protection.**
- **In case of installation of the units in an area recognized as being potentially at risk for natural phenomena (tornado, earthquake, tidal wave, lightning...), please follow the standards and regulations, and provide the necessary devices to prevent from these risks.**
- **In the event of fire, refrigerating circuits are liable to rise in pressure above the maximum working pressure and release refrigerant and oil. Please take this into account in your risk analyses.**

Delivery checks:
On receipt of a new equipment please check the following points. It is the customer's responsibility to ensure that the products are in good working order:
- The exterior has not been damaged in any way.
- The lifting and handling equipment are suitable for the equipment and comply with the specifications of the handling instructions enclosed here-in.
- Accessories ordered for on-site installation have been delivered and are in good working order.
- The equipment supplied corresponds to the order and matches the delivery note.

If the product is damaged, exact details must be confirmed in writing by registered post to the shipping company within 48 hours of delivery (working days). A copy of the letter must be addressed to Redge and the supplier or distributor for information purposes. Failure to comply will invalidate any claim against the shipping company.

Storage:
When units are delivered on site they are not always required immediately and are sometimes put into storage. In the event of medium to long-term storage, we recommend the following procedures:
- Ensure that there is no water in the hydraulic systems.
- Keep protective plastic film in position.
- Ensure the electrical panels are closed.
- Keep all items and options supplied in a dry and clean place for future assembly before using the equipment.
- Store the unit on an appropriate place (flat surface).
- Storage temperature must be respected according to the information given on the rating plate.

It is strongly recommended to store units is a dry, sheltered place (in particular for units that will be installed indoor).

WARRANTY

The warranty of the unit is subject to the warranty definitions as agreed upon in the order.
It is expected that the design and installation of the unit utilises good working practices.
The warranty will be legally null and void if:

- ***Service and maintenance have not been executed in accordance with the regulations; repairs have not been carried out by Redge personnel or have been implemented without prior written permission by Redge.***
- ***Modifications have been made to the equipment without prior written permission by Redge.***
- ***Settings and protections have been modified without prior written permission by Redge.***
- ***Non-original or other than the prescribed refrigerants or lubricants are used.***
- ***The equipment has not been installed and/or connected in accordance with the installation instructions.***
- ***The equipment is being used improperly, incorrectly, negligently or not in accordance with its nature and/or purpose.***
- ***A flow protection device is not fitted.***
- ***The unit maintenance booklet is not complete or not available.***

In these circumstances Redge is indemnified from any product liability claims from third parties.
In the event of a warranty claim the machine serial number and Redge order number must be quoted.

The technical information and specifications contained in this manual are for reference only. The manufacturer reserves the right to modify these without warning and without obligation to modify equipment already sold.



DO NOT CONFUSE THE WARRANTY WITH MAINTENANCE.

In the absence of any other written agreement (e.g. local regulations), the guarantee shall only apply to design faults which occur within the warranty period.

- The warranty will only apply if a maintenance contract has been signed, starting from the date of commissioning, and if the maintenance contract has actually been performed.
- The maintenance contract must be made with a specialist, competent company.
- The sole effect of any repair, modification or replacement of an item during the warranty period must be to extend the material's warranty period.
- Maintenance must be carried out in accordance with regulations.
- In addition to annual checks, safety accessories for non-toxic fluids must be requalified (calibrated or replaced) every 12 months, according to the current regulations.
- If a spare part is supplied after the expiry of the warranty period, it shall be guaranteed for a period equal to the initial warranty period and will be subject to the same conditions.
- We recommend for a contract four inspections per year (every three months), before the start of each season, in order to check the operation of the equipment in the various operating modes.

DISPOSAL OF THE EQUIPMENT:
The shutdown of the equipment, the recovery of fluids (oil, refrigerant, water and its mixtures with glycols) must be carried out by qualified personnel in accordance with the recommendations of EN 378-4:2016+A1:2019.

All components of the refrigeration system, such as refrigerants, oil, coolants, filters, dehydrators and insulating materials shall be recovered, reused and/or disposed of properly (see EN 378-4:2016+A1:2019). No material may be disposed of in the environment.

The waste recovery sectors (e.g. eco-organizations,...) are in charge of collecting, cleaning up and recovering WEEE on the whole European market.

WARRANTY

SAFETY:

The safety information contained in this manual is provided as a guide for the safe handling of this installation. Redge does not vouch for the completeness of this information and can therefore not accept liability for any possible omissions. Everyone involved in the product life cycle must perform a risk analysis. This applies to manufacturers, installers, maintainers and end-users. If risks are not eliminated or remain at unacceptable levels of occurrence or severity, they must be communicated to the next party (the customer in general) through the drafting of an installation, use, maintenance guide.

Notwithstanding that the chillers are equipped with extensive safety and protection features, the utmost care and attention is needed when carrying out operations on the machine. Furthermore, ear protection should be worn when working on or in the vicinity of the chillers. Operations on the cooling circuit or electrical equipment should be carried out by authorised personnel.

It is essential to follow non exhaustive recommendations hereunder:

- Never work on a unit that is still energized. Wait 15 minutes before working on the machine after a power outage (discharge of the capacitors).
- Any manipulation (opening or closing) of a shut-off valve must be carried out by a qualified and authorized engineer. These procedures must be carried out with the unit shut-down.
- Never work an electrical component until the general power supply to the unit has been cut. During any maintenance operations on the unit, lock the power supply circuit in the open position ahead of the machine. If the work is interrupted, check the lock before resuming the work.
- WARNING: Even if the unit has been switched off, the power circuit remains energized, unless the unit or circuit disconnect switch is open. Refer to the wiring diagram for further details.
- In case of maintenance operations on fans (grills replacement …) ensure that the power is shut off to avoid automatic restart.
- Before the opening of the refrigerant circuit, check the pressure with manometers or pressure sensors, and purge the circuit in accordance with current environmental directives.
- Never leave a unit stopped with valves closed on the liquid line, refrigerant could be trapped and the pressure would rise.
- All installation parts must be maintained by the personnel in charge, in order to avoid material deterioration and injuries to people. Faults and leaks must be repaired immediately. The authorized technician must have the responsibility to repair the fault immediately. Each time repairs have been carried out to the unit, the operation of the safety devices must be re-checked.
- Follow guidance and recommendations given in safety and machine standards such as EN378, ISO5149, etc. The use of the EN 378-2 standard provides you with the state of the art with regard to the essential safety requirements of the Machine Directives and DESP.
- Do not use oxygen to purge lines or to pressurize a machine for any purpose. Oxygen gas reacts violently with oil, grease, and other common substances.
- Never exceed the specified maximum operating pressures.
- Verify the allowable maximum high- and low-side test pressures by checking the instructions in this manual and the pressures given on the unit name plate.
- Do not use air for leak testing. Use only nidron or dry nitrogen.
- Do not unweld or flame cut the refrigerant lines or any refrigerant circuit component until all refrigerant (liquid and vapor) has been removed from roof top. Successive purges with a neutral gas (such as dry nitrogen) are recommended to remove all traces of refrigerant. Refrigerant in contact with an open flame produces toxic gases.
- Do not siphon refrigerant.
- Wearing PPE is mandatory (glasses, cuffs, gloves, masks). Avoid splashing refrigerant on the skin or in the eyes. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, immediately and abundantly flush the eyes with water and consult a doctor.

WARNING

Warning labels

The chiller may be marked with the following warning labels to alert to potential hazards (on or near the potentially hazardous part). The chiller may include the following labels.

			
High temperatures	Low temperatures	Rotating parts	Sharp parts
			
Electrical voltage	Flammable	Non-flammable liquefied gas (high pressure)	Flammble liquefied gas (high pressure)
			
Don’t walk on it	Wear of PPE (Personal protective equipment)	Warning Inflammable dusty filters	Don’t strap
			
Gravity center	Warning main switch supplied from bottom	EUROVENT certification	
			
Protection by water filter mandatory	Protection by strainer filter mandatory		
			
OK to send document	Information to read	Electrical connections can loosen during transport Please check them before start-up	
			
CMIM marking (Morocco)	CE marking	CA marking (UK)	EAC marking (Russia)

Regularly check that the warning labels are still in the correct positions on the machine and replace them if necessary.

WARNING

PED DIRECTIVE:
For units covered by the Pressure Equipment Directive (see EU Declaration of Conformity).



WARNING:

1. All work on the unit must be performed by competent and qualified personnel. Failure to comply with the following instructions could result in serious injury or accident.
2. **Warning:** High pressure safety switches are safety accessories that keep the system within its permissible operating limits.
3. In case of installation in an earthquake zone or in an area that may be affected by severe natural events such as storms, tornadoes, floods, tidal waves, etc., the installer and/or operator shall refer to the applicable standards and regulations to ensure that the required devices are available, as our units are not designed to operate under such conditions without prior precautions.
4. The pressure increase in case of external fire is not considered as an operating condition (EN 378-2:2016 § 6.2 .2.3). However, the designer may implement means to limit damage in case of fire: Our products, even when equipped with LFL sensors (for products loaded with A2L fluids) are not designed to withstand a fire. This fire risk must be taken into account by the integrator/installer in the risk analysis of the location where our products are installed. The installation site must implement all necessary fire protection measures and comply with applicable regulations. The installation of means as described in EN 378-3+A1:2020 for refrigeration systems in a separate room for refrigeration machines fulfills the requirement for damage limitation. A damage limitation accessory may be present if necessary.
5. In case of exposure to corrosive external atmospheres or corrosive products, the installer and/or operator shall take the necessary precautions to avoid damage to the equipment and shall ensure that the equipment supplied has the necessary and sufficient corrosion protection.
6. To respect a sufficient number of supports for the piping according to their size and weight under operating conditions and to design the piping to avoid a water hammer phenomenon.
7. For factory hermetically sealed refrigeration systems charged with refrigerant, a safety chain test is performed at the end of the test to ensure proper operation of the factory pressure switch. As hydrostatic tests cannot be carried out on all our units for prejudicial reasons, a visual examination, a pressure resistance test at 1.1 x PS and a tightness test are planned. (The whole circuit is checked with a leak detector).
8. If a valve is present, the refrigerant emissions from the safety valves must be directed to the outside, to a place free of ignition sources, fresh air intake and human presence. The valve shall be sized and connected in accordance with EN 13136 +A1: 2018.
9. When carrying out any work, comply with all applicable safety regulations and standards (e.g., EN 378-2:2016), and follow the recommendations on the labels or in the instructions accompanying the equipment. All necessary measures must be taken to prevent access to not competent persons.
10. It is essential that any piping or other components of the refrigeration circuit hazardous to people because of their surface temperature are insulated or identified.
11. Ensure that the installation zone (room or area) of the machine has restricted access and ensure the good condition of the covering.

DATA PAGE FOR UNIT COMMISSIONING

Unit:		Serial no. :	
Control panel identification code			
Installation address:			
Installer:		Installer tel. :	
Installer address:			
Date of commissioning:			
Checks:			
Supply voltage:		Rated voltage of the unit :	

	YES	NO
Unit on rubber antivibration mounts		
General power supply connection		
Control panel connection (option)		
Compressor oil level indicator		
Hydraulic connection		
Purged of the installation		

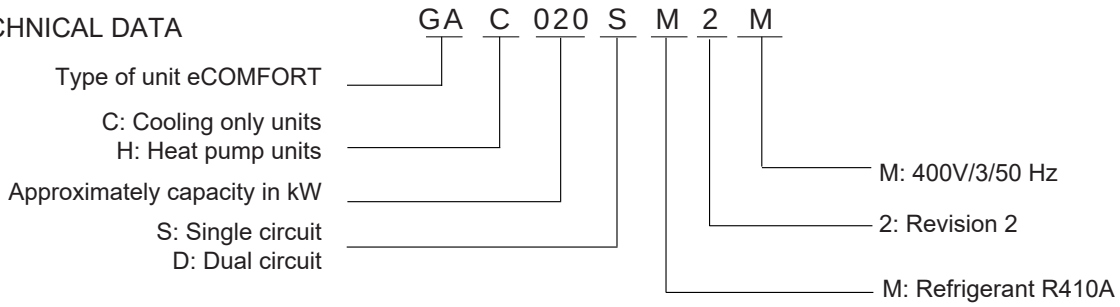
DATA INPUT		COOLING CYCLE	HEATING CYCLE
Air Input Temperature, Coil	°C		
Water Output Temperature	°C		
Water Input Temperature	°C		
High Pressure			
Low Pressure			

ELECTRIC POWER CONSUMPTION		COOLING CYCLE			HEATING CYCLE		
Compressor 1	A						
Fan 1	A						
Compressor 2	A						
Fan	A						
Compressor 3	A						
Fan 3	A						
Compressor 4	A						
Fan 4	A						

Options Installed:	
Comments:	

1.- GENERAL CHARACTERISTICS

1.1.- TECHNICAL DATA



OPTIONS	
LNCJ	Low noise : Accoustic compressor jacket
SEAS	Variable air flow control with standard EC fans
HIFP	Variable air flow control with high pressure EC fans
ACTR	LenGuard anti-corrosion condenser coil treatment
CPGR	Coils protection : metallic grille
LLWT	Low leaving water temperature down to -12°C
PHRF	Domestic hot water supply : desuperheater
RLKD	Refrigerant leak detection
SPLP	Hydraulic module with low-pressure single pump
DPLP	Hydraulic module with low-pressure twin pump
SPEL	Hydraulic module with eDrive low-pressure single pump
DPEL	Hydraulic module with eDrive low-pressure twin pump
SPHP	Hydraulic module with high-pressure single pump
DPHP	Hydraulic module with high-pressure twin pump
SPEH	Hydraulic module with eDrive high-pressure single pump
DPEH	Hydraulic module with eDrive high-pressure twin pump
BYVC	Bypass Valve for delta P control with eDrive pump (supplied loose)
WTNG	Water tank
WTHS	Water tank electrical heater Standard
WTHH	Water tank electrical heater High
EWFS	Electronic flow switch
WFIF	Water filter (supplied loose)
KGRL	Flange connection (supplied loose)
APEP	Antifreeze protection on exchangers and pipings down to -20°C
APPP	Antifreeze protection on exchangers, pump(s) piping down to -20°C
APPW	Antifreeze protection on exchangers, pump(s) piping and water tank down to -20°C
ECLO	LonWorks® interface FTT10
BNET	BACnet® interface MSTP
MBUS	ModBus interface RS485
MBIP	ModBus and BACnet® interface TCP/IP
DM60	Remote advanced display (supplied loose)
DS60	Service display (supplied loose)
DCBO	Remote control : customer drive contact input/output
ELME	Electric energy meter
PHCT	Phase reversal protection
POWF	Power factor correction
SOFT	Soft starter
EBFM1	Electrical box upgrade ventilation : 1 fan
EBFM2	Electrical box upgrade ventilation : 2 fans
ALWA	Aluminum wires adaptor (supplied loose)
AVUB	Rubber anti-vibration mounts type (supplied loose)
SLCR	Wooden crate for long distance

NOTE: When it is possible options supplied loose should be included in a carton box inside the unit.

1.- GENERAL CHARACTERISTICS

1.1.- TECHNICAL DATA

COOLING ONLY

GAC MODELS		020S	025S	030S	035S	040S	045S	055S	060S	070S	080S
Cooling capacity (*)	Kw	20,1	24,6	31,7	36,9	40,1	45,5	54,8	61,2	69,5	82,7
Number of compressors		2 / Scroll						2 / Scroll			
Hydraulic connections		1 1/2"						2"			
Nominal water rate	m^3/h	3,5	4,2	5,5	6,4	6,9	7,8	9,4	10,5	12,0	14,2
Net weight	Kg	312	319	342	366	371	386	602	627	657	706

GAC MODELS		090S	110S	125S	110D	125D	140D	160D	185D
Cooling capacity (*)	Kw	91,3	106,7	122,3	105,6	123,2	138,8	162	185
Number of compressors		3 / Scroll			2+2 / Scroll		2+2 / Scroll		3+2 / Scroll
Hydraulic connections		2 1/2"					3"		
Nominal water rate	m^3/h	15,7	18,4	21,0	18,2	21,2	23,9	27,9	31,8
Net weight	Kg	876	892	892	989	1000	1401	1508	1575

HEAT PUMP

GAH MODELS		020S	025S	030S	035S	040S	045S	055S	060S	070S	080S
Cooling capacity (*)	Kw	20,0	24,4	31,0	36,4	39,4	44,7	54,0	60,1	68,4	81,4
Heating capacity (**)	Kw	19,8	24,5	31,9	36,7	39,2	44,6	53,6	61,3	67,6	79,3
Number of compressors		2 / Scroll						2 / Scroll			
Hydraulic connections		1 1/2"						2"			
Nominal water rate	m^3/h	3,4	4,2	5,3	6,3	6,8	7,7	9,3	10,3	11,8	14,0
Net weight	Kg	335	341	370	394	400	421	645	683	715	773

GAH MODELS		090S	110S	125S	110D	125D	140D	160D	185D
Cooling capacity: (*)	Kw	90,5	105,6	120,4	104,7	121,0	136,5	159,3	181,4
Heating capacity: (**)	Kw	91,2	103,4	118,1	106,3	121,1	135,8	157,2	174,5
Number of compressors:		3 / Scroll			2+2 / Scroll		2+2 / Scroll		3+2 / Scroll
Hydraulic connections:		2 1/2"					3"		
Nominal water rate:	m3/h	15,6	18,2	20,7	18,0	20,8	23,5	27,4	31,2
Net weight:	Kg	927	995	995	1061	1073	1483	1592	1663

(*) Cooling capacity: Outside temperature: 35ºC / Inlet / Outlet water temperature: 12 / 7ºC.
(**) Heating capacity: Outside temperature: 7ºC DB / 6ºC WB / Inlet / Outlet water temperature: 40 / 45ºC.

WARNING:
To know the refrigerant charge, see the unit rating plate.

1.- GENERAL CHARACTERISTICS

1.1.- TECHNICAL DATA

HYDRAULIC CIRCUIT

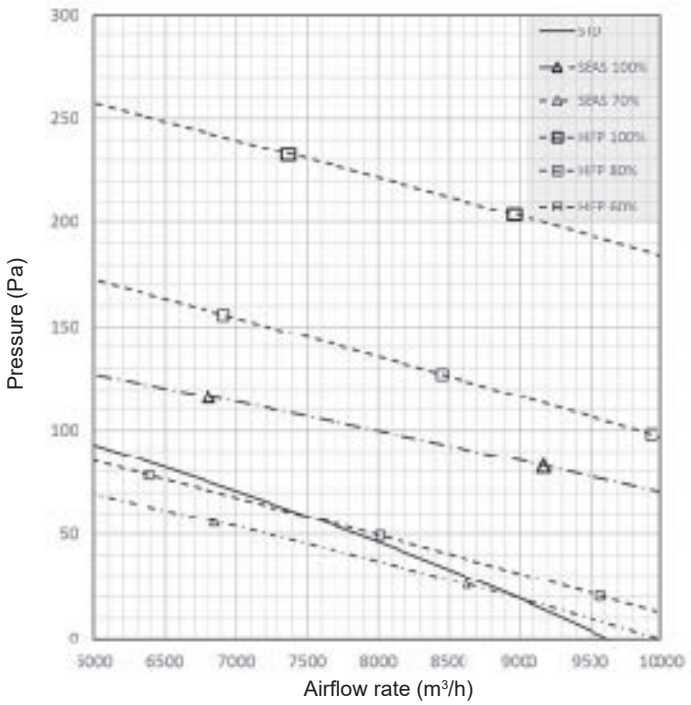
GAC/GAH		020S	025S	030S	035S	040S	045S	055S	060S	070S	080S
Low pressure pump	Type	Stainless steel threaded centrifugal pumps									
High pressure pump											
Expansion vessel	Type	Fixed membrane expansion vessel									
	Max. pressure (bar)	3.5						3.5			
	Volume (dm³)	18						35			
Buffer tank	Type	Isolated steel tank									
	Safety valve set (bar)	3.5						3.5			
	Volume (dm³)	100						175			

		090S	110S	125S	110D	125D	140D	160D	185D
Low pressure pump	Type	Stainless steel threaded centrifugal pumps							
High pressure pump									
Expansion vessel	Type	Fixed membrane expansion vessel							
	Max. pressure (bar)	3.5					3.5		
	Volume (dm³)	35					50		
Buffer tank	Type	Isolated steel tank							
	Safety valve set (bar)	3.5					3.5		
	Voume (dm³)	**GAC**: 175			250		400		
		GAH: 250							

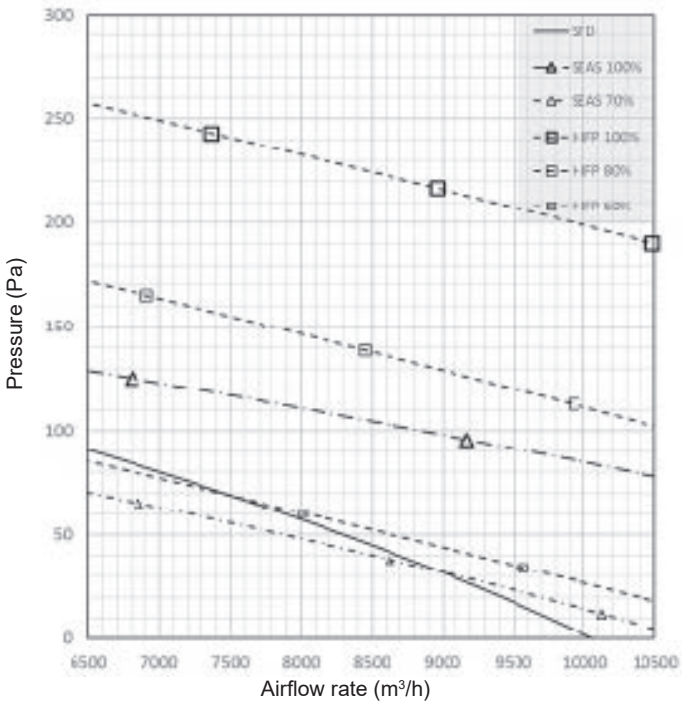
(***) Only in units with Hydronic module

FAN DATA

GAH
020S / 025S



GAH
030S

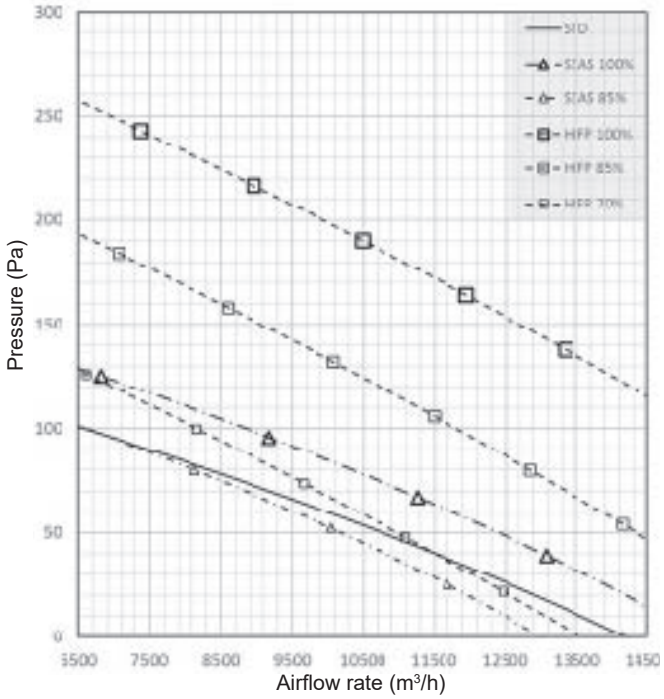


1.- GENERAL CHARACTERISTICS

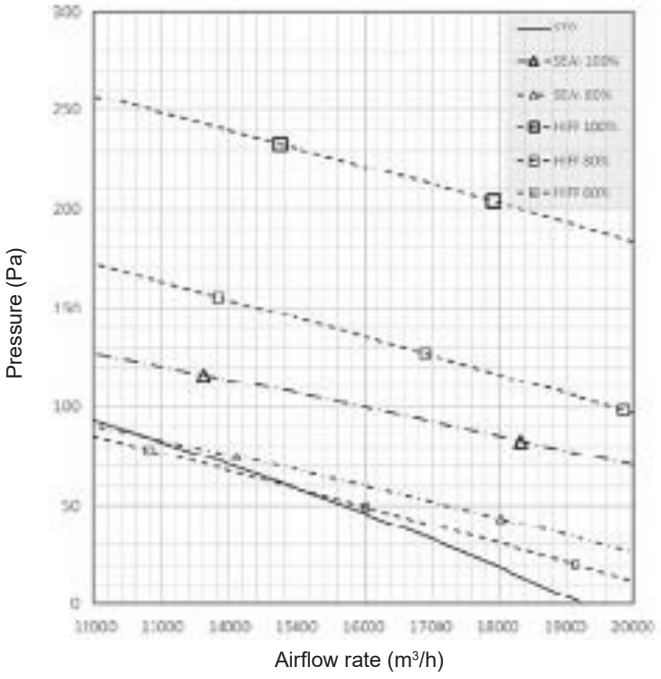
1.1.- TECHNICAL DATA

FAN DATA

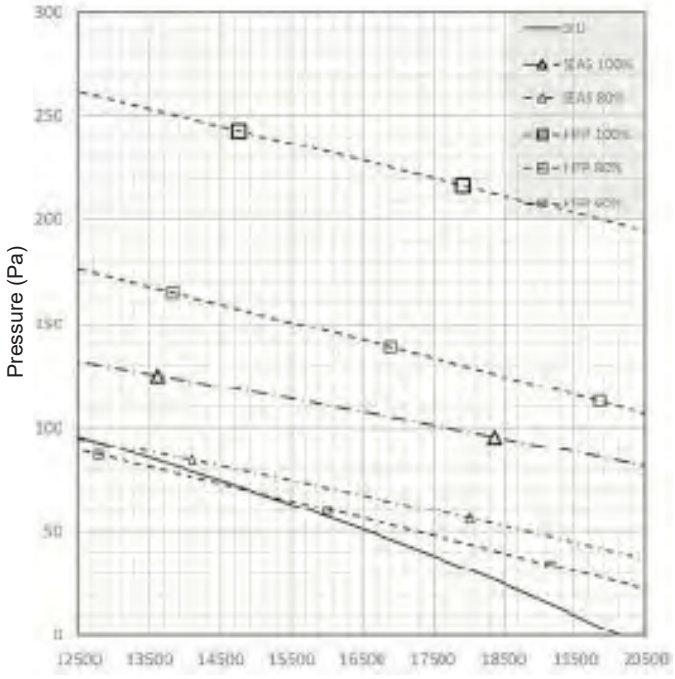
GAH
035S / 040S / 045S



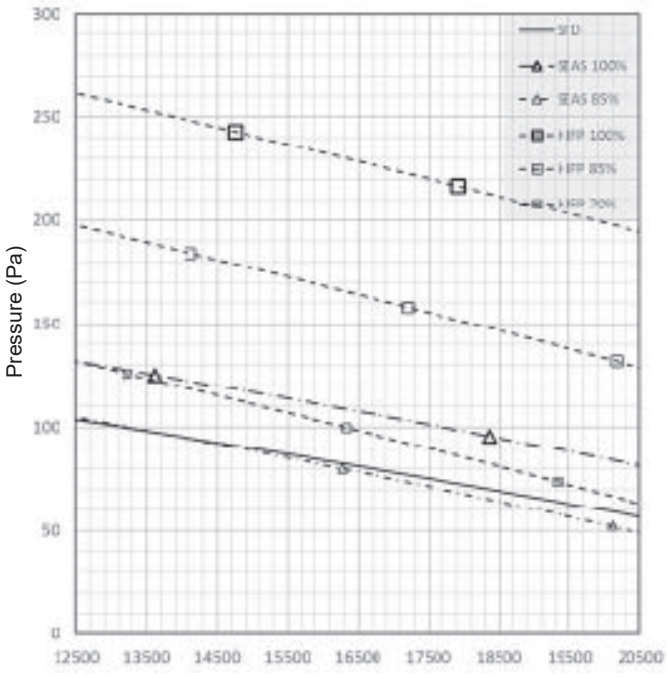
GAH
055S



GAH
060S / 070S



GAH
080S

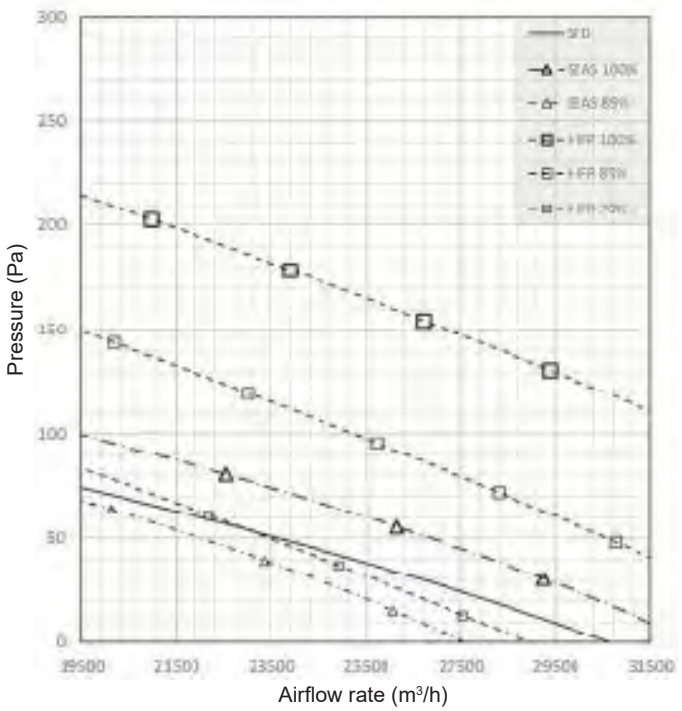


1.- GENERAL CHARACTERISTICS

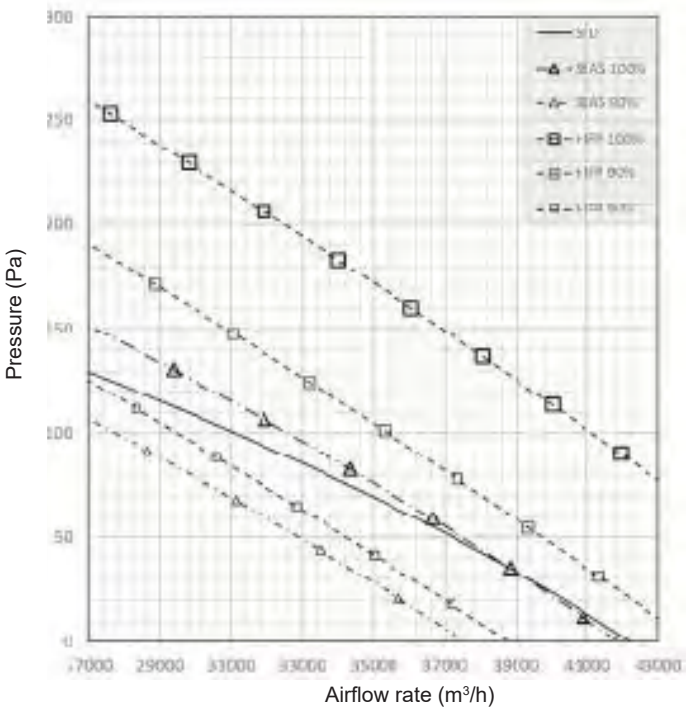
1.1.- TECHNICAL DATA

FAN DATA

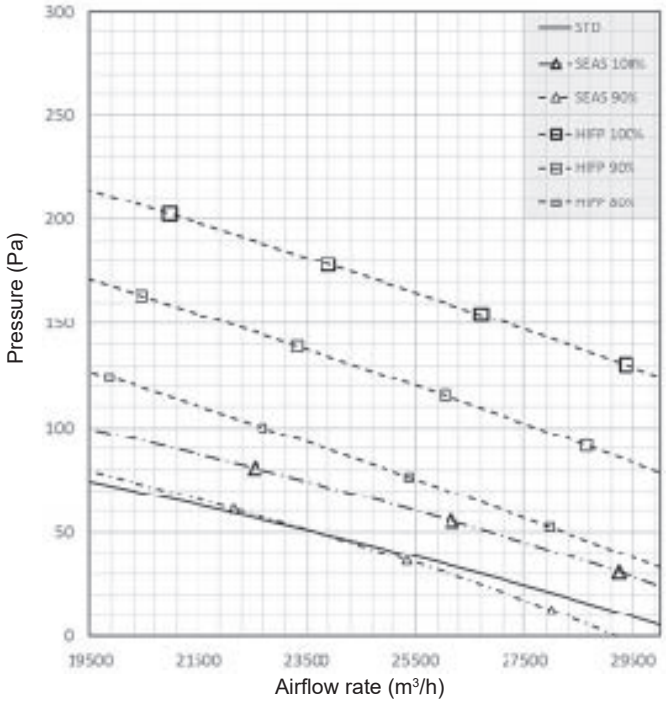
GAH
090S



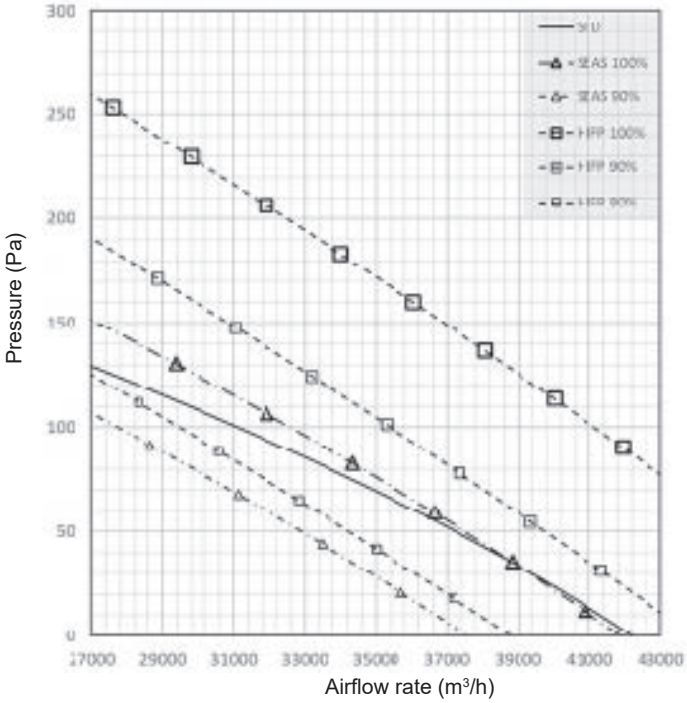
GAH
110S / 125S



GAH
110D



GAH
125D

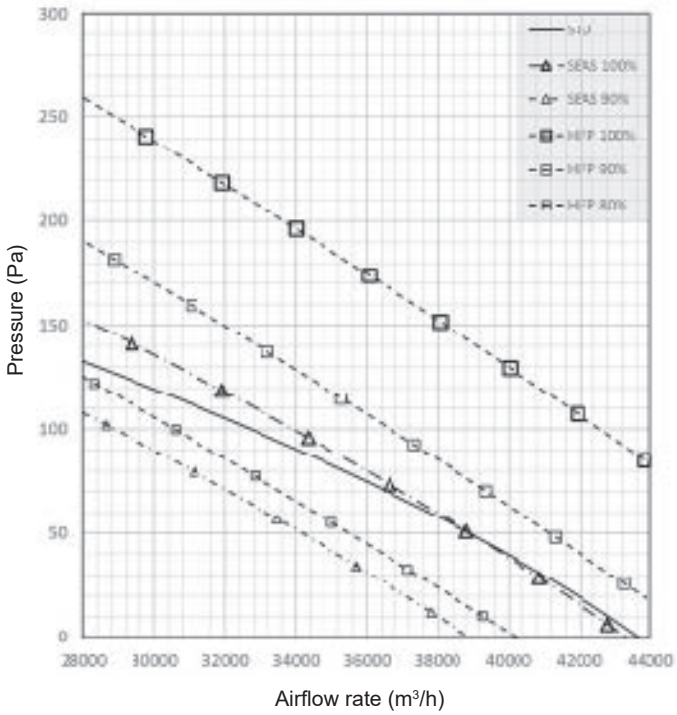


1.- GENERAL CHARACTERISTICS

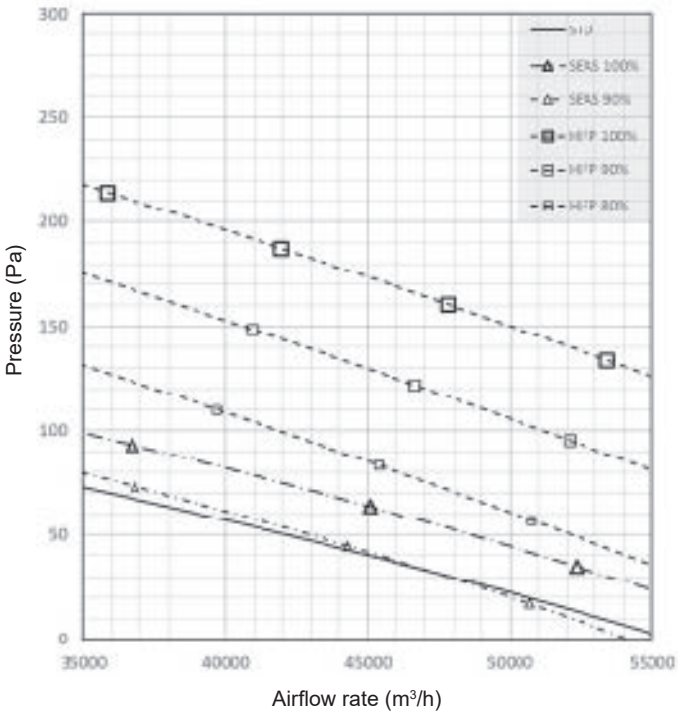
1.1.- TECHNICAL DATA

FAN DATA

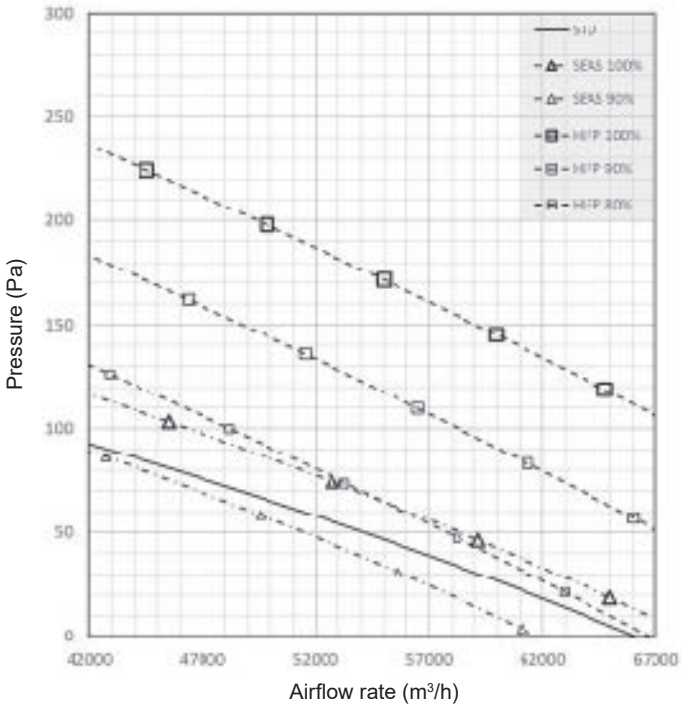
GAH
140D



GAH
160D



GAH
185D



NOTE: For GAC units consider 3% more of airflow

1.- GENERAL CHARACTERISTICS

1.2.- ELECTRICAL DATA

GAC/GAH		020S	025S	030S	035S	040S	045S	055S	060S	070S	080S
Maximun power	kW	9,94	12,22	15,32	17,63	18,21	20,99	25,1	28,00	30,90	35,78
Maximun current	A	16,57	18,8	25,79	31,25	30,47	37,05	42,22	47,03	51,84	68,14
LRC											
Starting current	A	52,11	61,74	88,72	117,96	117,57	147,86	140,56	162,56	167,37	210,54
Starting current with SoftStarter	A	34,91	41,14	58,72	77,56	77,17	96,66	93,36	106,56	111,37	140,94
SEAS FAN											
Additional power	kW	0,24	0,24	0,24	-0,05	-0,05	-0,05	0,48	0,48	0,48	-0,1
Additional current	A	0,2	0,2	0,2	-0,82	-0,82	-0,82	0,4	0,4	0,4	-1,64
HIPF FAN											
Additional power	kW	1,1	1,1	1,1	0,81	0,81	0,81	2,2	2,2	2,2	1,62
Additional current	A	1,5	1,5	1,5	0,48	0,48	0,48	3	3	3	0,96
LOW PRESSURE WATER PUMP											
Additional power	kW	0,57	0,57	0,81	0,81	1,35	1,35	1,35	1,35	1,35	1,35
Additional current	A	1,37	1,37	1,59	1,59	2,45	2,45	2,45	2,45	2,45	2,45
HIGH PRESSURE WATER PUMP											
Additional power	kW	1,35	1,35	1,73	1,73	1,73	1,73	1,73	1,73	1,73	1,73
Additional current	A	2,45	2,45	3,15	3,15	3,15	3,15	3,15	3,15	3,15	3,15
ANTIFREEZE ELECTRICAL HEAT											
Additional power	kW	2,25	2,25	2,25	2,25	2,25	2,25	6	6	6	6
Additional current	A	3,25	3,25	3,25	3,25	3,25	3,25	8,66	8,66	8,66	8,66
STANDARD ELECTRICAL HEATER (GAH only)											
Additional power	kW	9	9	9	9	9	9	18	18	18	18
Additional current	A	12,99	12,99	12,99	12,99	12,99	12,99	25,98	25,98	25,98	25,98
HIGH ELECTRICAL HEATER (GAH only)											
Additional power	kW	12	12	12	12	12	12	24	24	24	24
Additional current	A	17,32	17,32	17,32	17,32	17,32	17,32	34,64	34,64	34,64	34,64

GAC/GAH		090S	110S	125S	110D	125D	140D	160D	185D
Maximun power	kW	41,08	48,43	54,88	49,48	57,38	63,2	71,48	84,11
Maximun current	A	69,75	81,96	103,35	83,83	96,81	106,48	136,08	149,85
LRC(A)									
Starting current	A	166,23	197,49	245,75	182,17	212,34	222,01	278,48	292,25
Starting current with SoftStarter	A	119,03	141,49	176,15	134,97	156,34	166,01	208,88	222,65
SEAS FAN									
Additional Power	kW	-0,1	-0,48	-0,48	-0,1	-0,48	-0,48	-0,2	-0,58
Additional Current	A	-1,64	-2,4	-2,4	-1,64	-2,4	-2,4	-3,28	-4,04
HIPF FAN									
Additional Power	kW	1,62	2,08	2,08	1,62	2,08	2,08	3,24	3,7
Additional Current	A	0,96	1,2	1,2	0,96	1,2	1,2	1,92	2,16
LOW PRESSURE WATER PUMP									
Additional Power	kW	1,95	1,95	1,95	1,95	1,95	3,28	3,28	3,28
Additional Current	A	3,43	3,43	3,43	3,43	3,43	6,24	6,24	6,24
HIGH PRESSURE WATER PUMP									
Additional Power	kW	3,28	3,28	3,28	3,28	3,28	4,5	4,5	4,5
Additional Current	A	6,24	6,24	6,24	6,24	6,24	7,62	7,62	7,62
ANTIFREEZE ELECTRICAL HEAT (GAC)									
Additional Power	kW	6	6	6	9	9	12	12	12
Additional Current	A	8,66	8,66	8,66	12,99	12,99	17,32	17,32	17,32
ANTIFREEZE ELECTRICAL HEAT (GAH)									
Additional Power	kW	9	9	9	9	9	12	12	12
Additional Current	A	12,99	12,99	12,99	12,99	12,99	17,32	17,32	17,32
STANDARD ELECTRICAL HEATER (only GAH)									
Additional Power	kW	27	27	27	27	27	36	36	36
Additional Current	A	38,97	38,97	38,97	38,97	38,97	51,96	51,96	51,96
HIGH ELECTRICAL HEATER (only GAH)									
Additional Power	kW	36	36	36	36	36	48	48	48
Additional Current	A	51,96	51,96	51,96	51,96	51,96	69,28	69,28	69,28

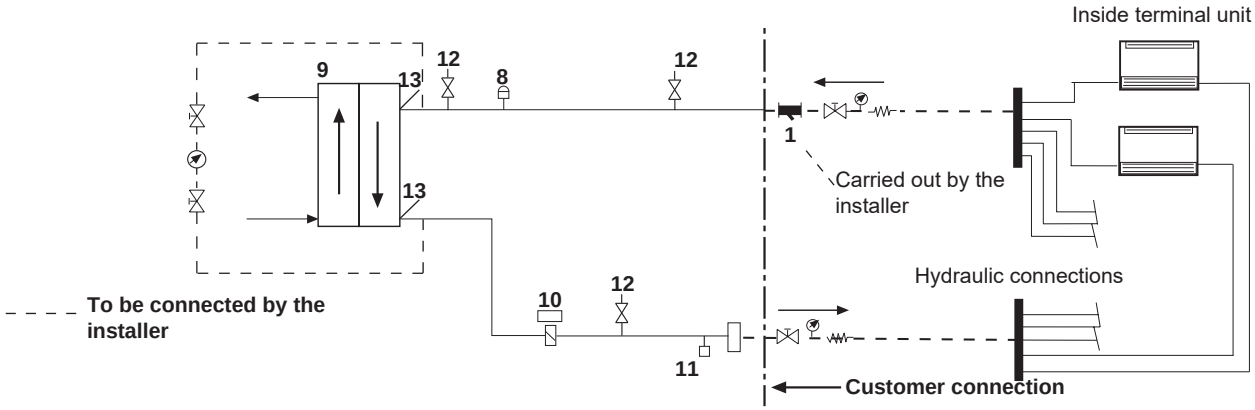
SEAS	Variable airflow control with standard EC fans
HIFP	Variable airflow control with high pressure EC fans

1.- GENERAL CHARACTERISTICS

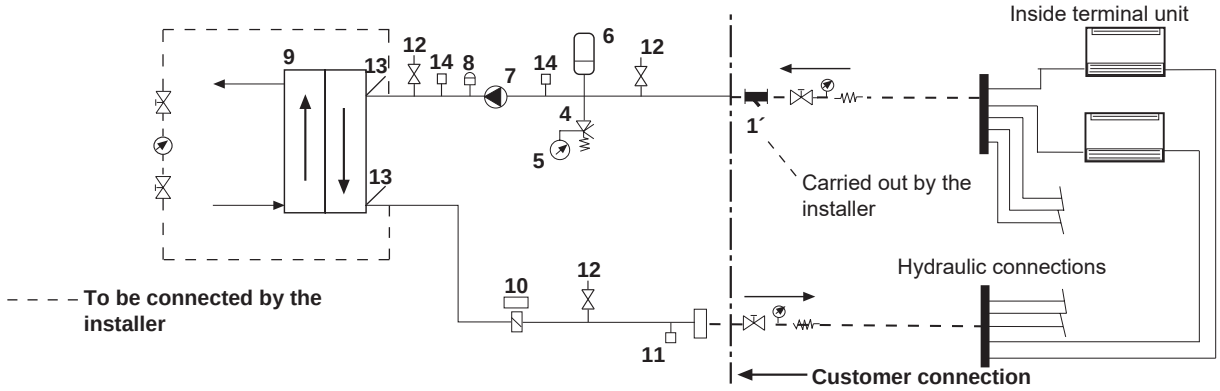
1.3.- COMPONENTS

The eComfort system comprises a water cooler or air/water pump combined with a series of hydraulic accessories.

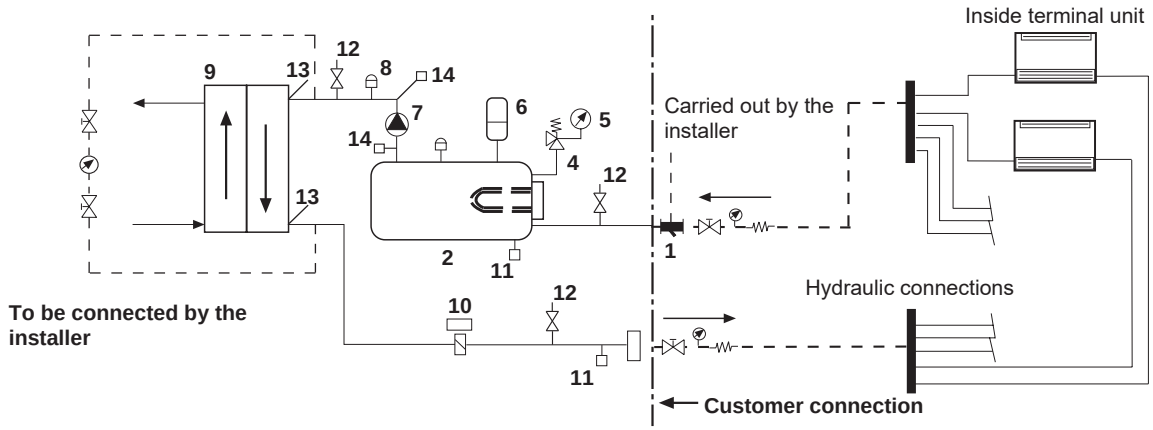
STANDARD UNIT



UNIT WITH WATER PUMP OPTION



UNIT WITH WATER TANK OPTION



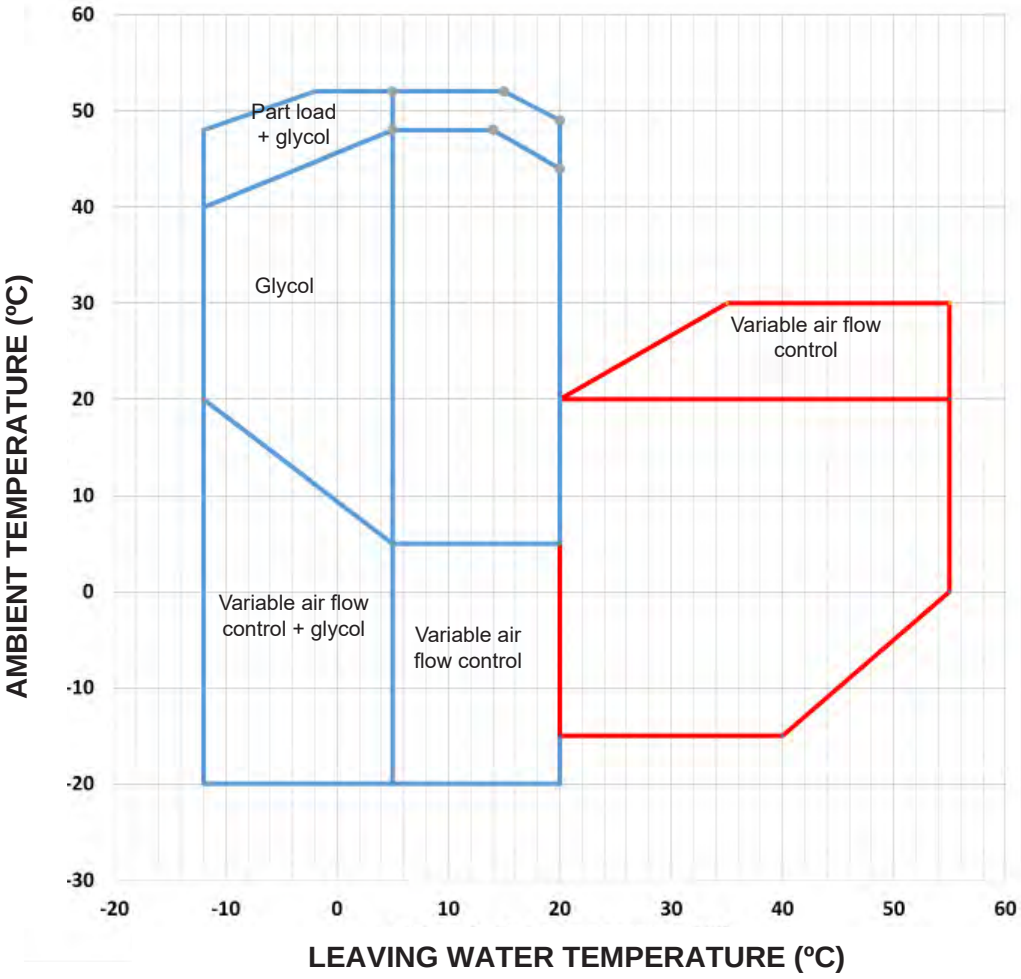
COMPONENTS:

STANDARD VERSION	UNIT WITH WATER PUMP OPTION	UNIT WITH WATER TANK OPTION
8, 9, 10, 11, 12, 13	4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12, 13, 14

1	Water filter (additional option, supplied loose)	**6**	Expansion vessel	**11**	Drain valve
2	Water tank	**7**	Water pump	**12**	Pressure tap
3	Water tank heater	**8**	Air purge valve	**13**	Water temperature sensor
4	Safety valve	**9**	Plate exchanger	**14**	Pressure transducer (when variable water flow option is selected)
5	Pressure gauge	**10**	Flow switch		

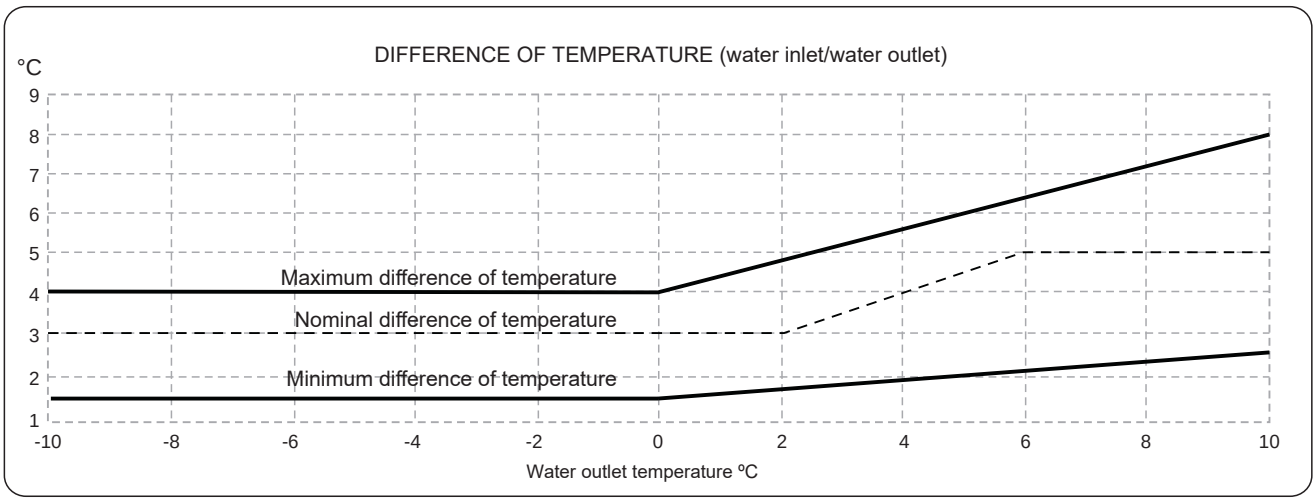
The use of a water filter in the water circuit upstream of the heat exchanger is mandatory. These filters must remove all particles with a diameter greater than 1 mm, and must be positioned within 1 meter of the inlet of the exchanger. They may be supplied as an option by the manufacturer.

1.4.- OPERATING LIMITS



Operating ranges are guidelines only. Verify the operating range with our selection tool.
Water type heat exchanger: ΔT 5K.

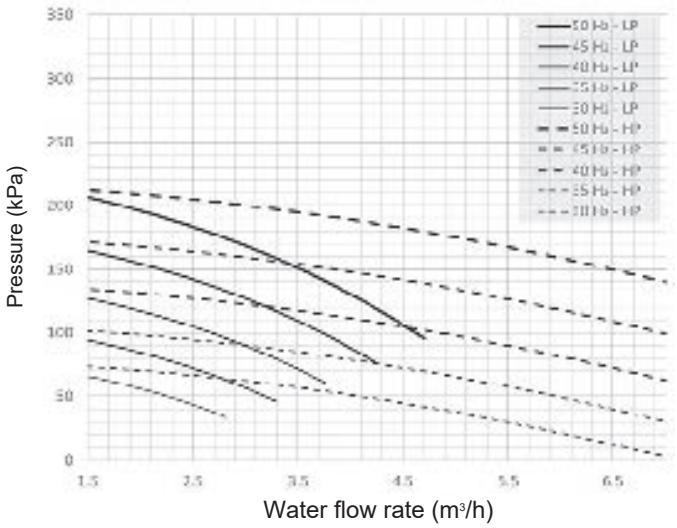
UNITS WITH LOW WATER TEMPERATURE KIT (OPTION)



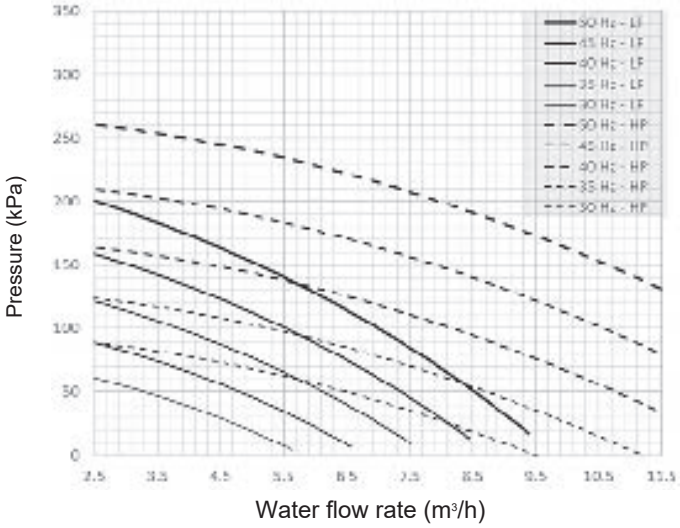
1.5.- HYDRAULIC SYSTEM DATA

WATER FLOW AND AVAILABLE STATIC PRESSURE OF WATER PUMP

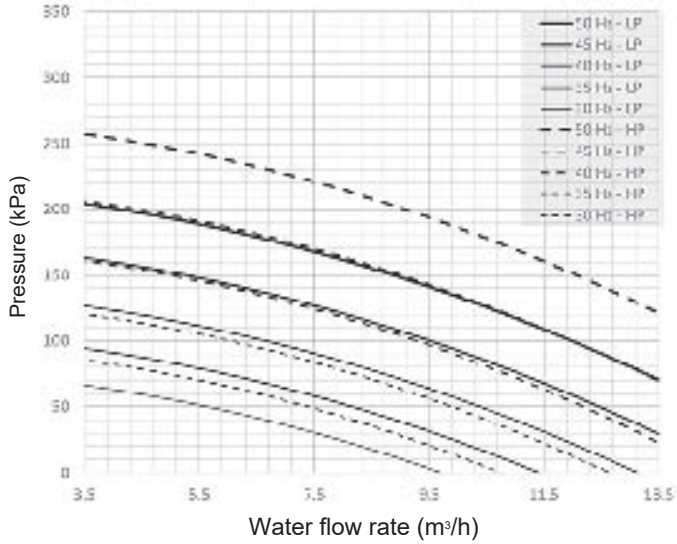
GAC/H
020S - 025S



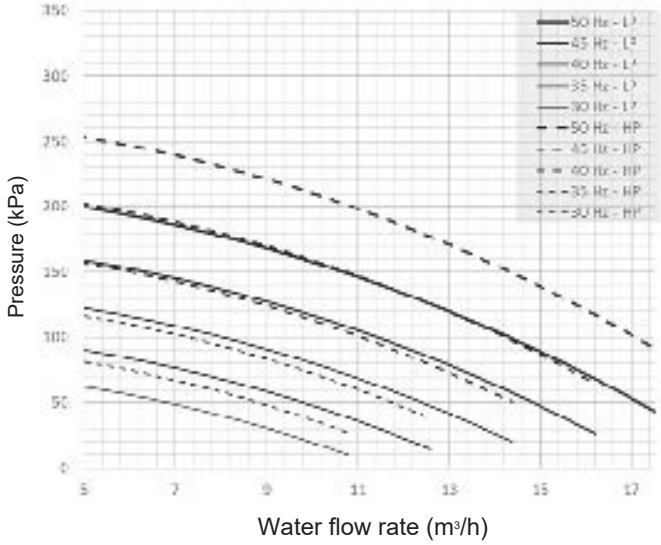
GAC/H
030S - 035S



GAC/H
040S - 045S



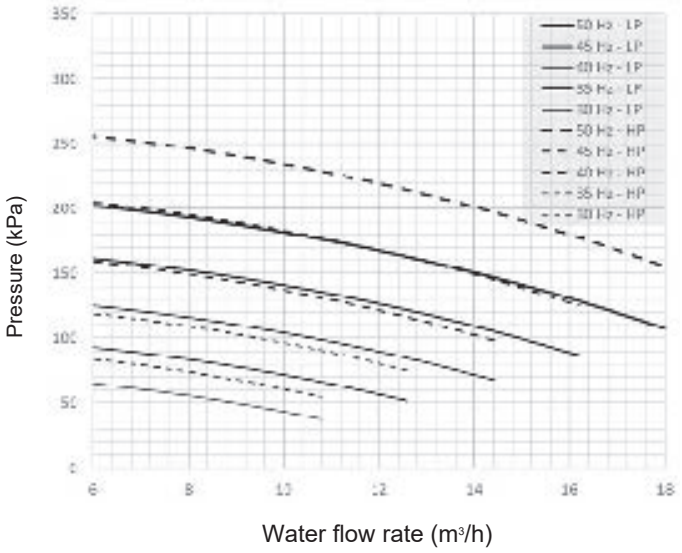
GAC/H
055S - 060S



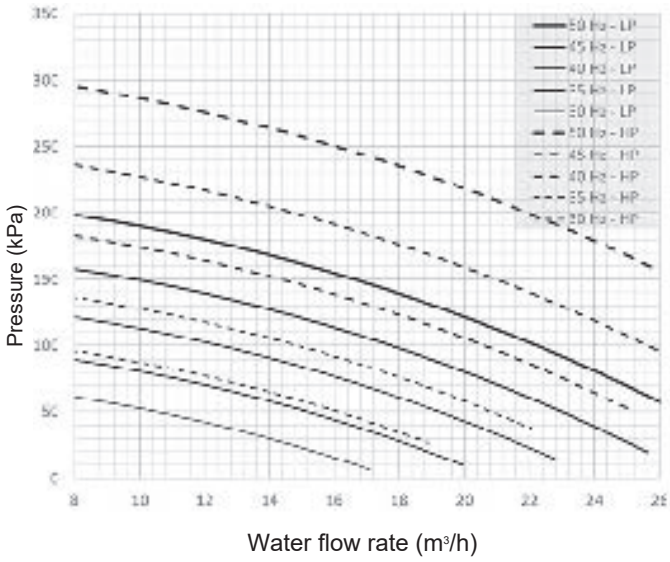
1.5.- HYDRAULIC SYSTEM DATA

WATER FLOW AND AVAILABLE STATIC PRESSURE OF WATER PUMP

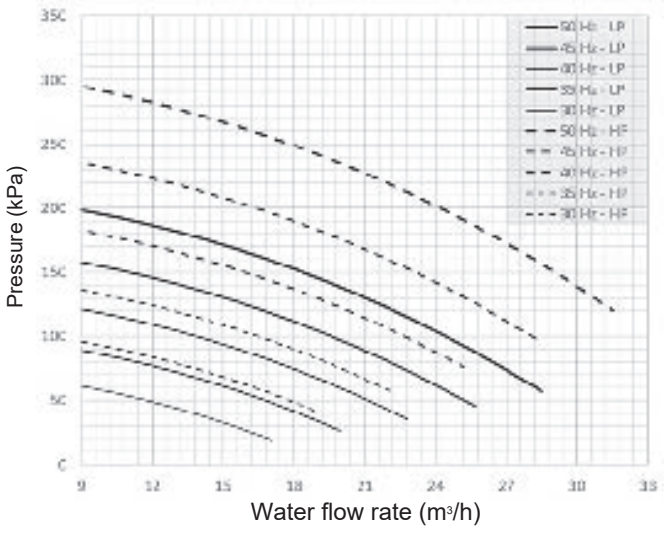
GAC/H
070S / 080S



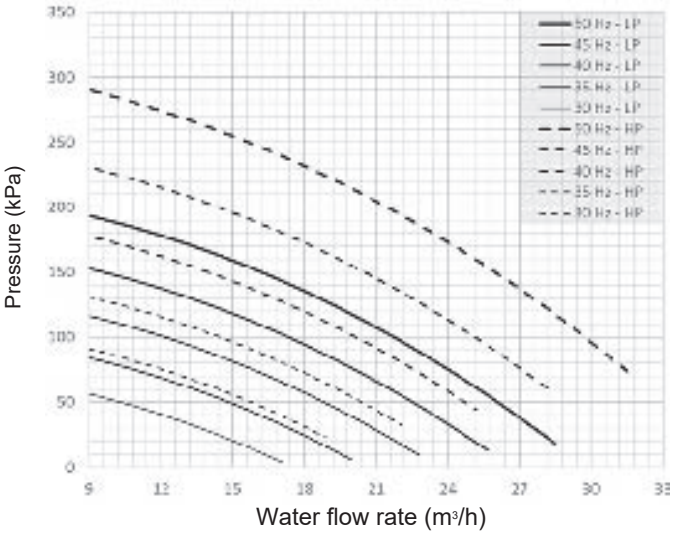
GAC/H
090S



GAC/H
110S / 125S



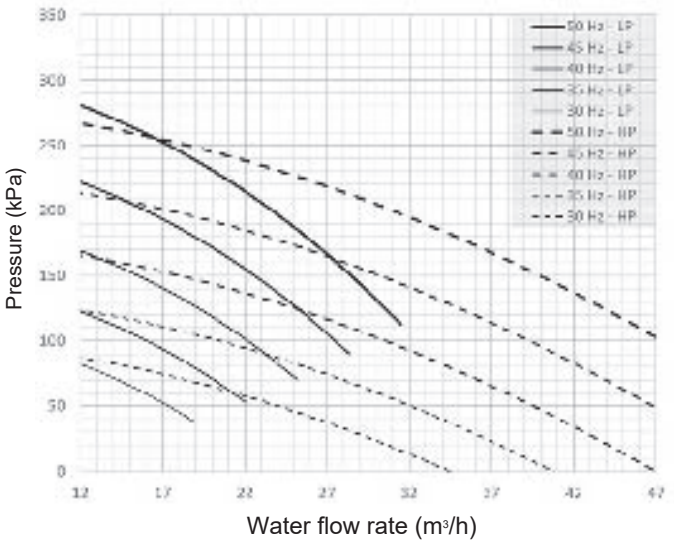
GAC/H
110D / 125D



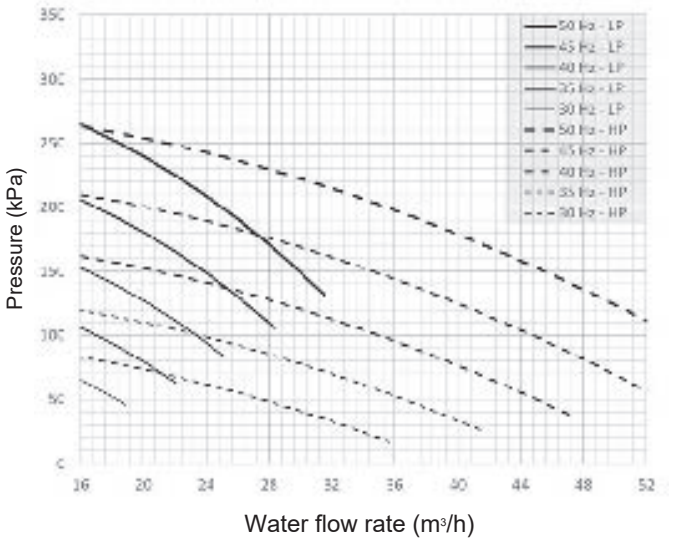
1.5.- HYDRAULIC SYSTEM DATA

WATER FLOW AND AVAILABLE STATIC PRESSURE OF WATER PUMP

GAC/H
140D / 160D

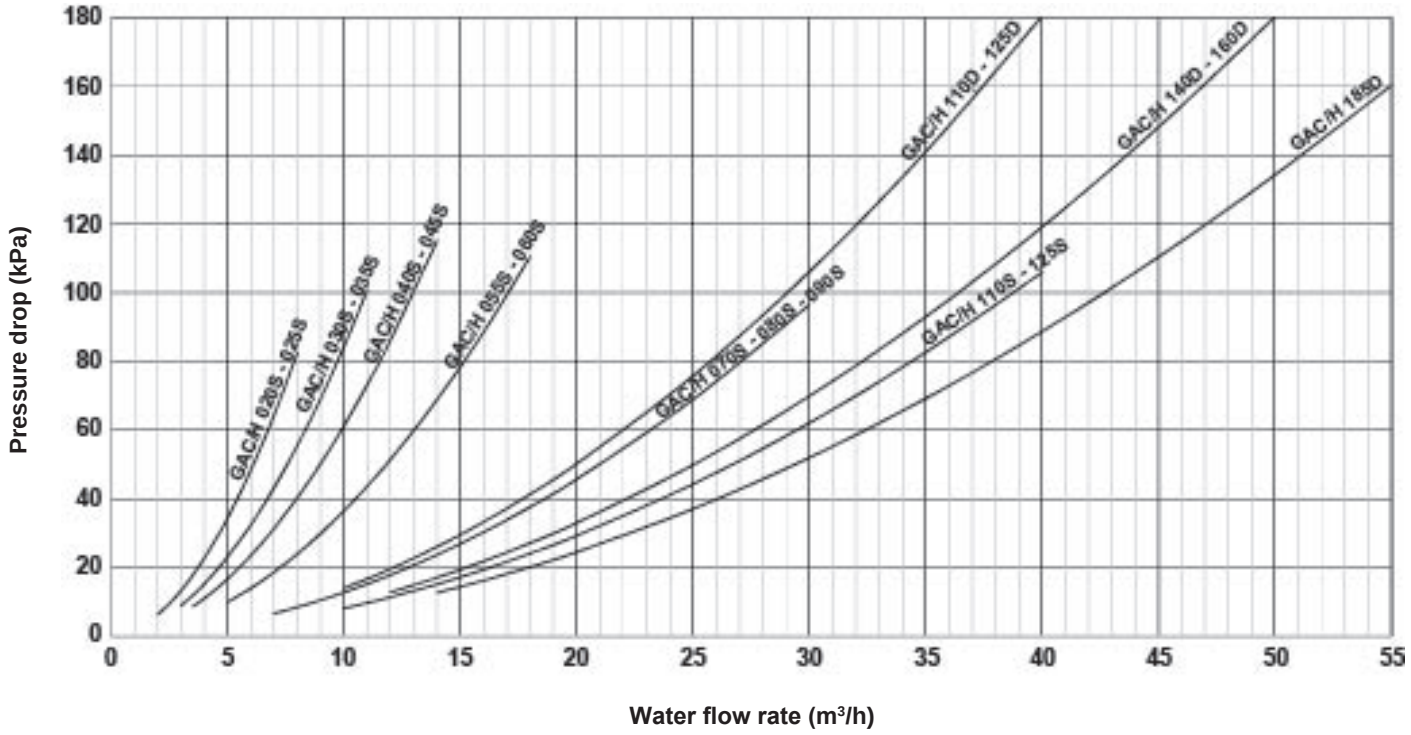


GAC/H
185D

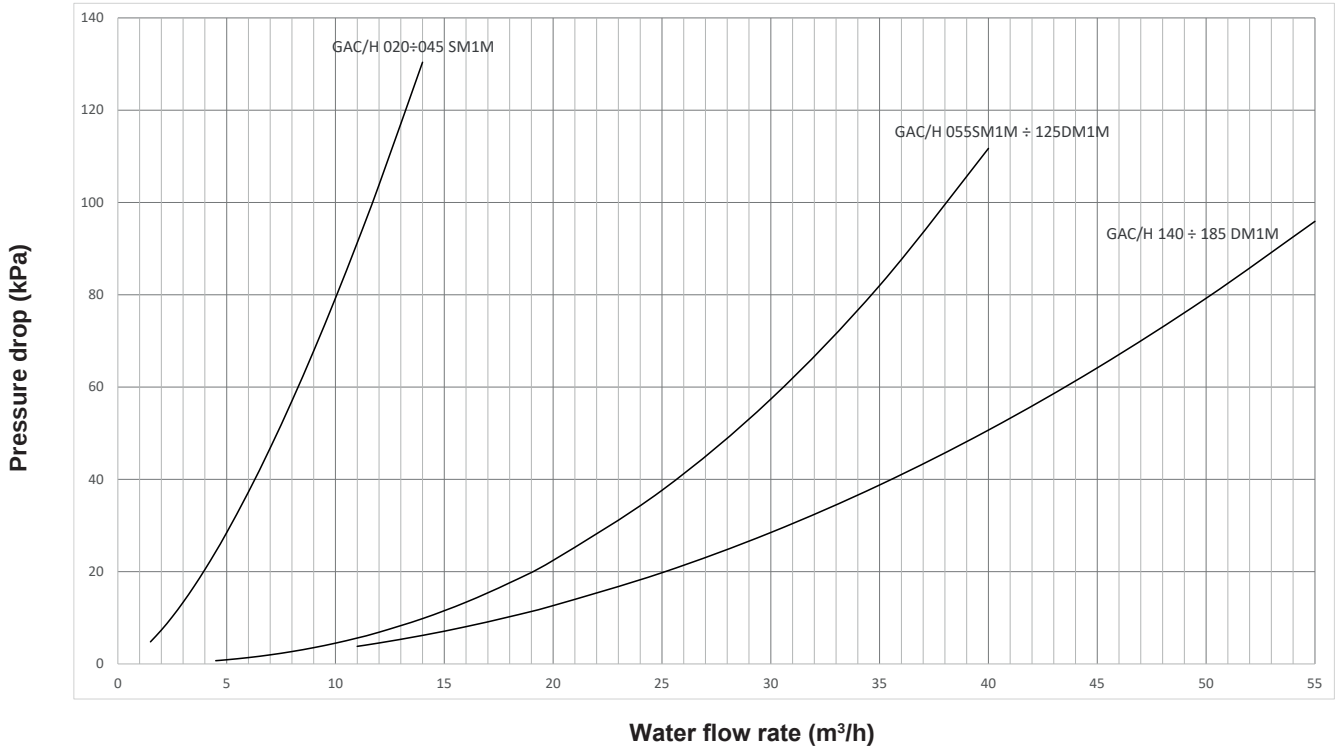


1.6.- PRESSURE DROP IN THE WATER SYSTEM

Pressure drop of the unit without water filter



Pressure drop for option water filter



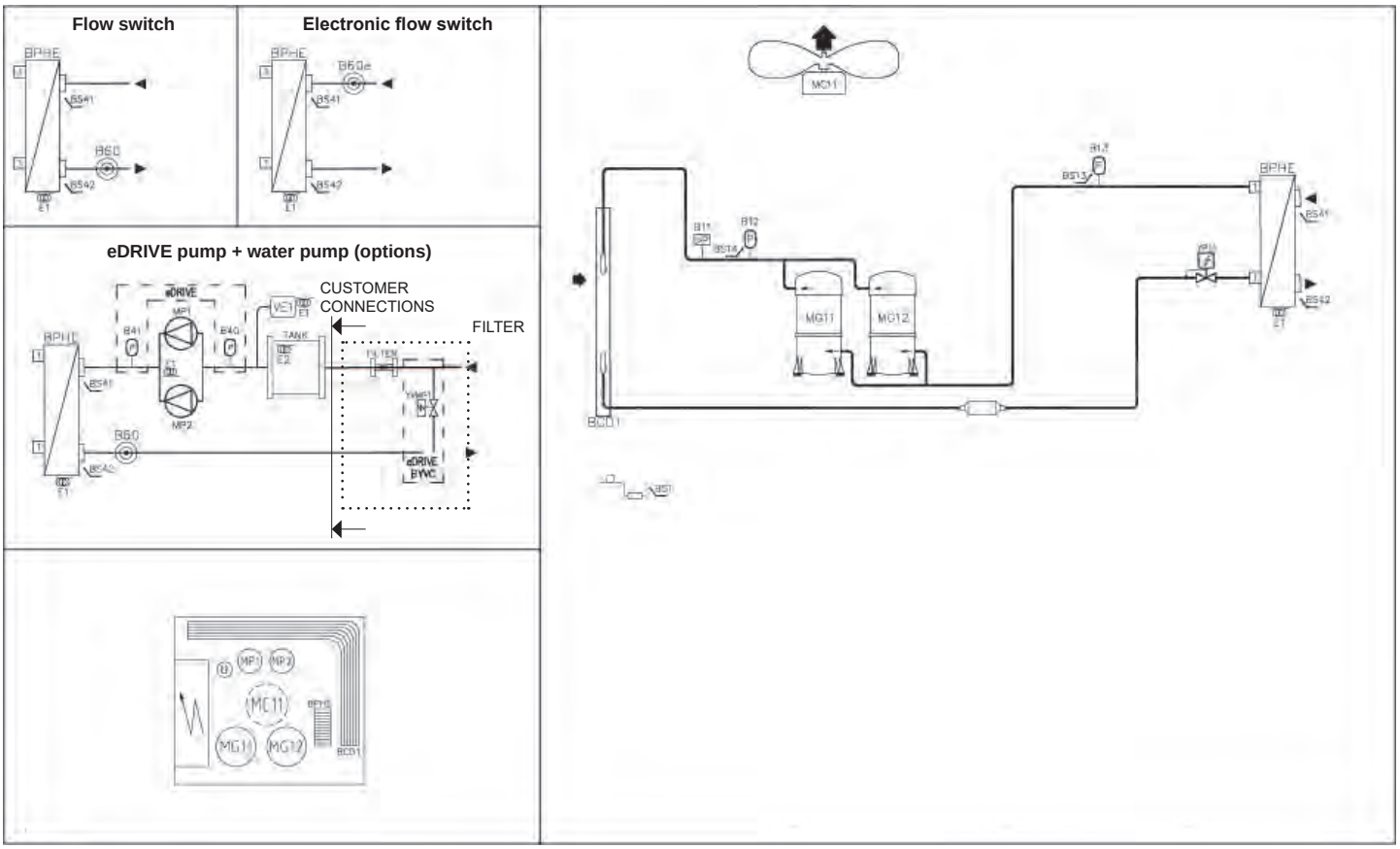
1.- GENERAL CHARACTERISTICS

1.7.- WATER FLOW

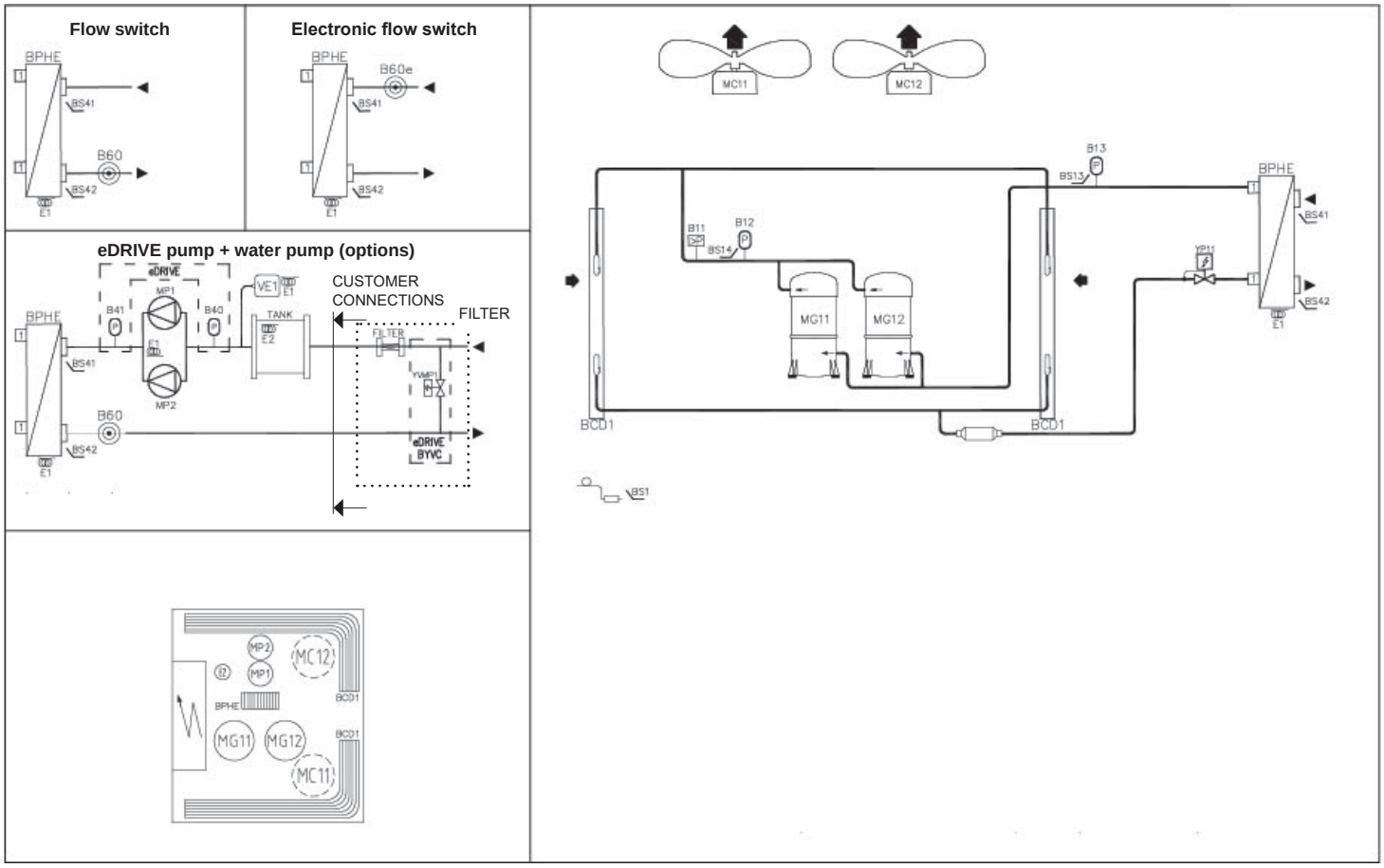
UNIT MODEL	WATER FLOW RATE (m^3/h)			WATER CONTENT (dm^3)	
	MINIMUM	NOMINAL	MAXIMUM	Unit without buffer tank	Buffer tank
GAC 020S	1.7	3.5	5.8	4.0	100
GAC 025S	2.1	4.2	7.0	4.0	100
GAC 030S	2.7	5.5	9.1	4.6	100
GAC 035S	3.2	6.4	10.6	4.6	100
GAC 040S	3.5	6.9	11.5	5.2	100
GAC 045S	3.9	7.8	13.0	5.2	100
GAC 055S	4.7	9.4	15.7	6.0	175
GAC 060S	5.3	10.5	17.5	6.0	175
GAC 070S	6.0	12.0	19.9	10.2	175
GAC 080S	7.1	14.2	23.7	10.2	175
GAC 090S	7.9	15.7	26.1	11.3	175
GAC 110S	9.2	18.4	30.6	14.1	175
GAC 125S	10.5	21.0	35.0	14.1	175
GAC 110D	9.1	18.2	30.2	13.0	250
GAC 125D	10.6	21.2	35.3	13.0	250
GAC 140D	11.9	23.9	39.7	24.3	400
GAC 160D	13.9	27.9	46.4	24.3	400
GAC 185D	15.9	31.8	53.0	27.1	400
GAH 020S	1.7	3.4	5.7	4.0	100
GAH 025S	2.1	4.2	7.0	4.0	100
GAH 030S	2.7	5.3	8.9	4.6	100
GAH 035S	3.1	6.3	10.4	4.6	100
GAH 040S	3.4	6.8	11.3	5.2	100
GAH 045S	3.9	7.7	12.8	5.2	100
GAH 055S	4.7	9.3	15.5	6.0	175
GAH 060S	5.2	10.3	17.2	6.0	175
GAH 070S	5.9	11.8	19.6	10.2	175
GAH 080S	7.0	14.0	23.3	10.2	175
GAH 090S	7.8	15.6	25.9	11.3	250
GAH 110S	9.1	18.2	30.2	14.1	250
GAH 125S	10.4	20.7	34.5	14.1	250
GAH 110D	9.0	18.0	30.0	13.0	250
GAH 125D	10.4	20.8	34.7	13.0	250
GAH 140D	11.7	23.5	39.1	24.3	400
GAH 160D	13.7	27.4	45.6	24.3	400
GAH 185D	15.6	31.2	52.0	27.1	400

1.8.- PIPING DRAWINGS
COOLING ONLY UNITS

GAC 020S-025S-030S-035S-040S-045S

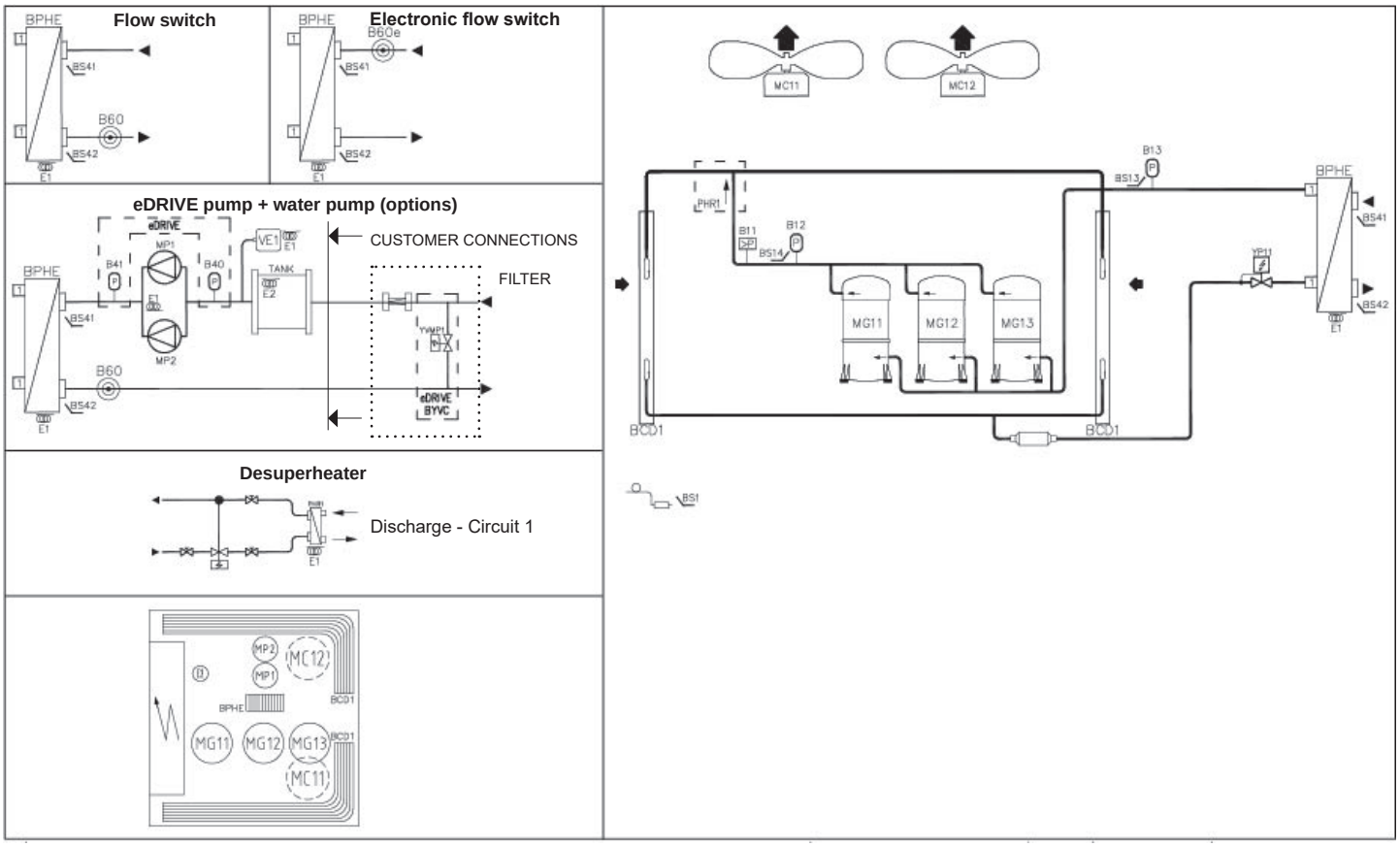


GAC 055S-060S-070S-080S

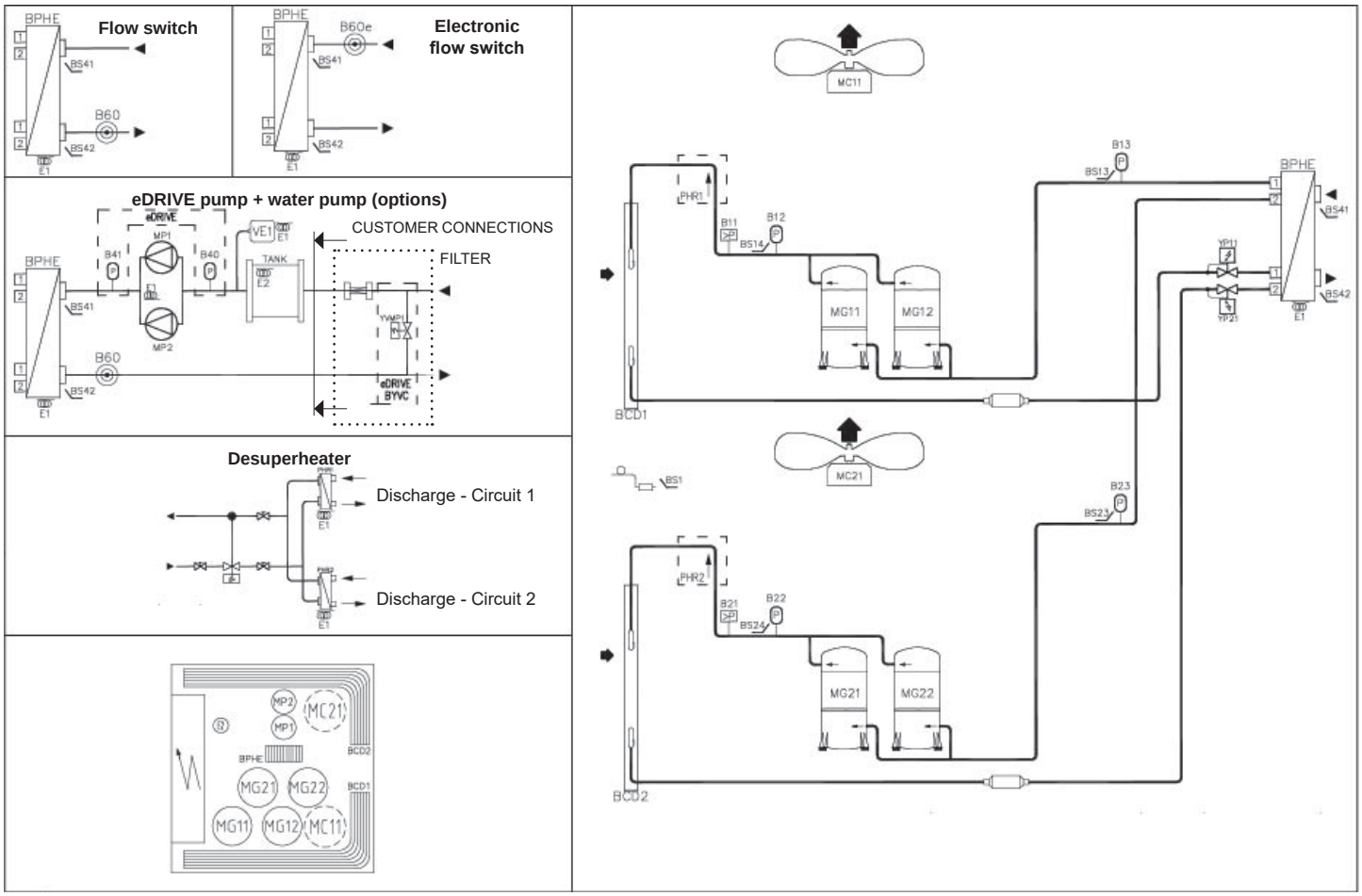


1.8.- PIPING DRAWINGS
COOLING ONLY UNITS

GAC 090S-110S-125S

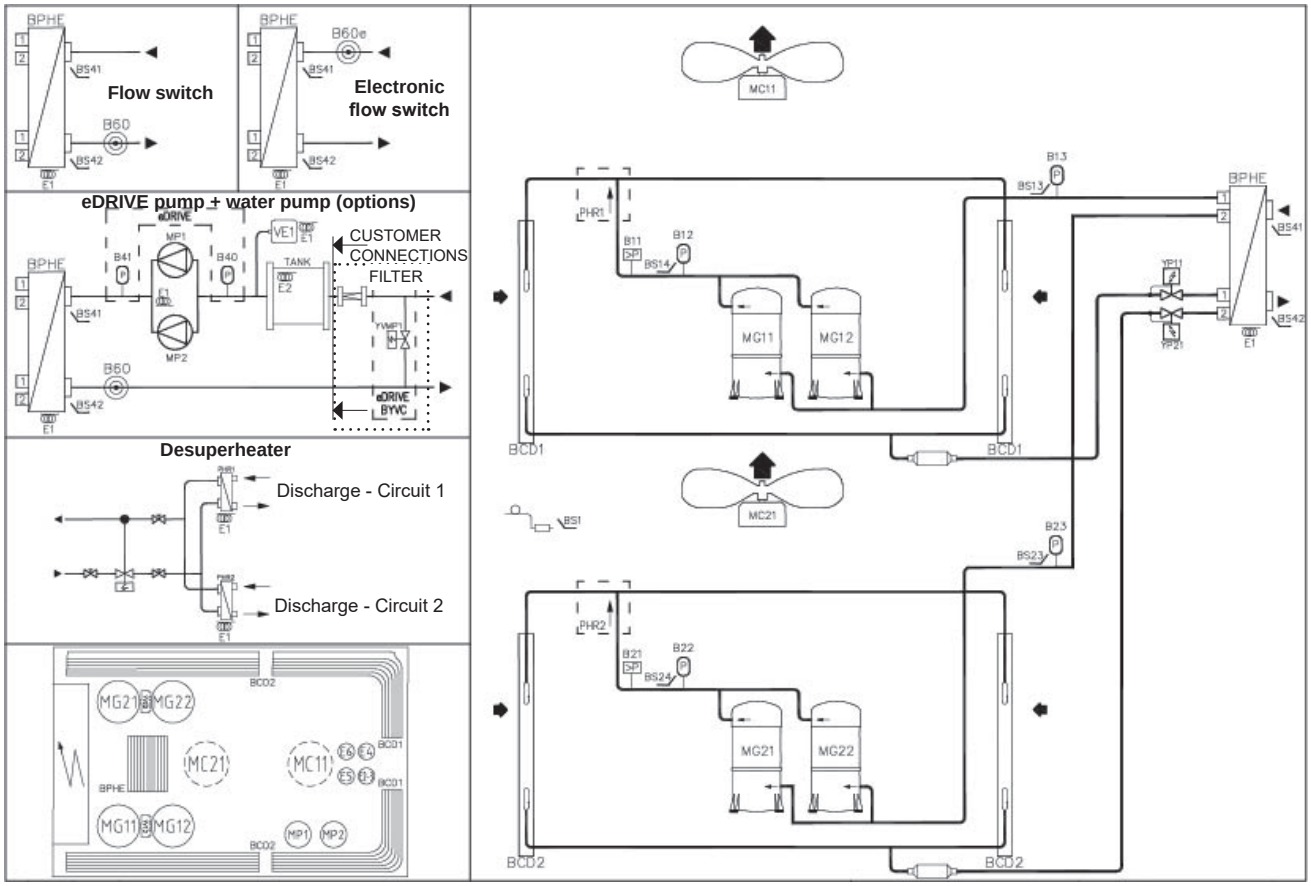


GAC 110D-125D

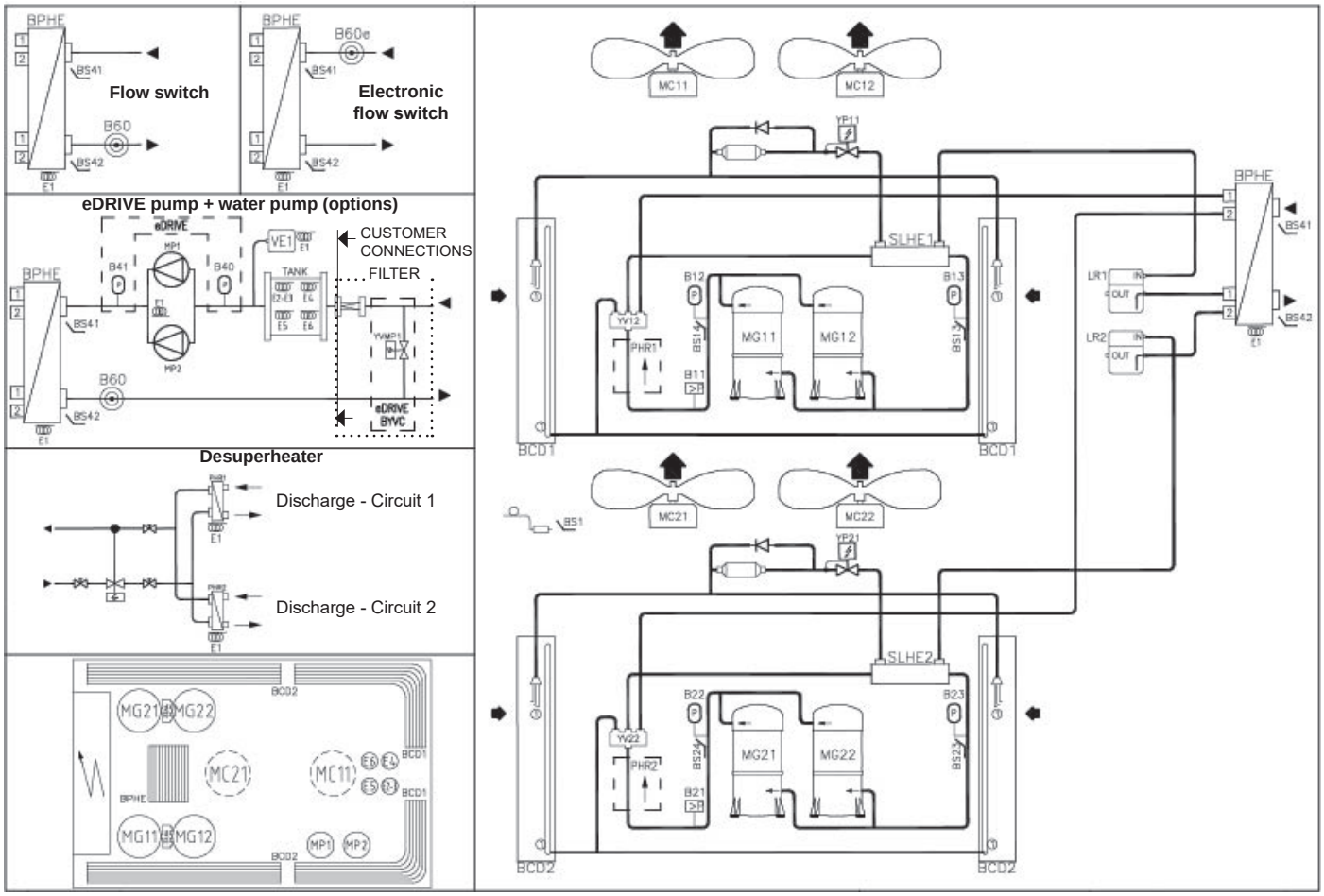


1.8.- PIPING DRAWINGS
COOLING ONLY UNITS

GAC 140D

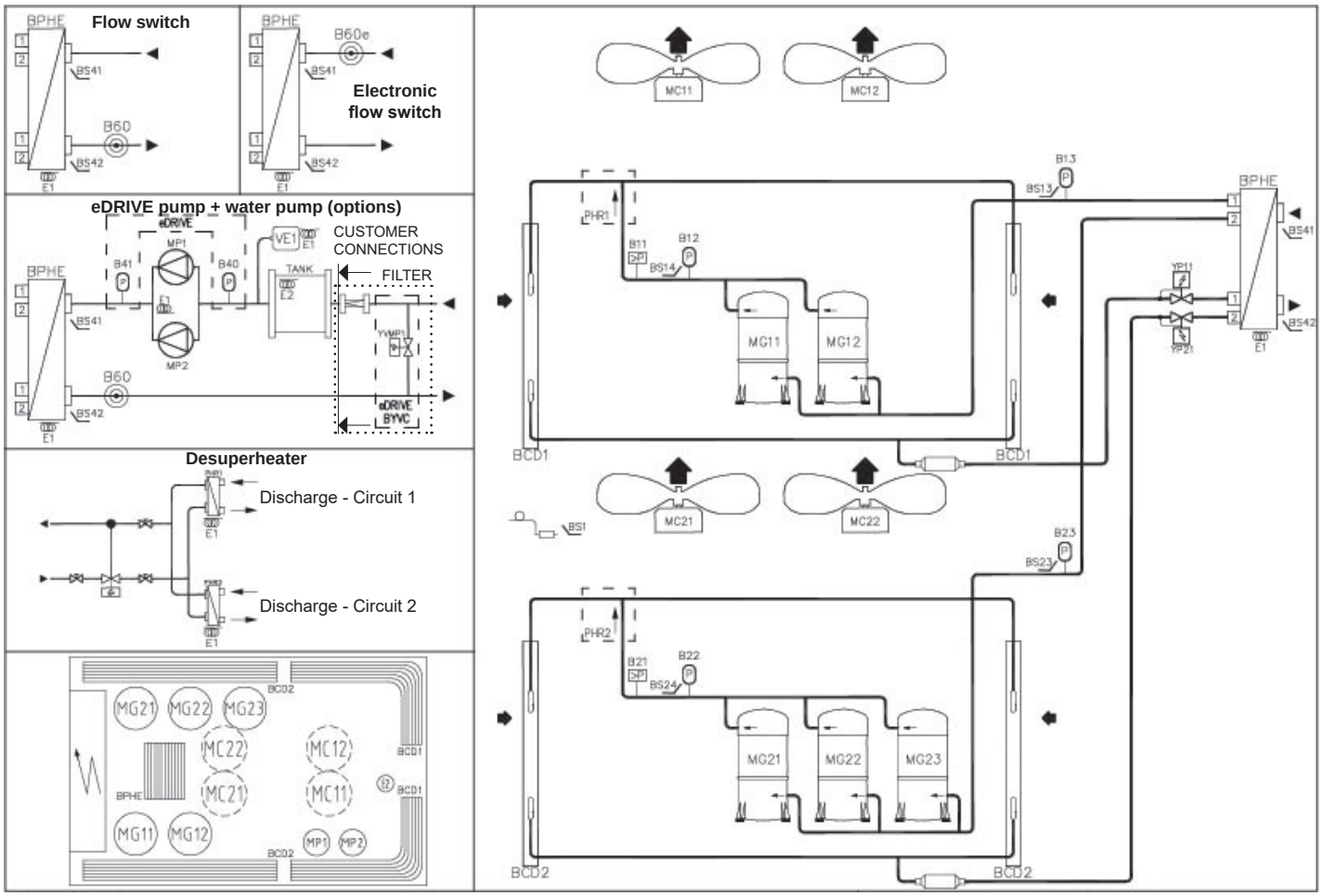


GAC 160D



1.8.- PIPING DRAWINGS
COOLING ONLY UNITS

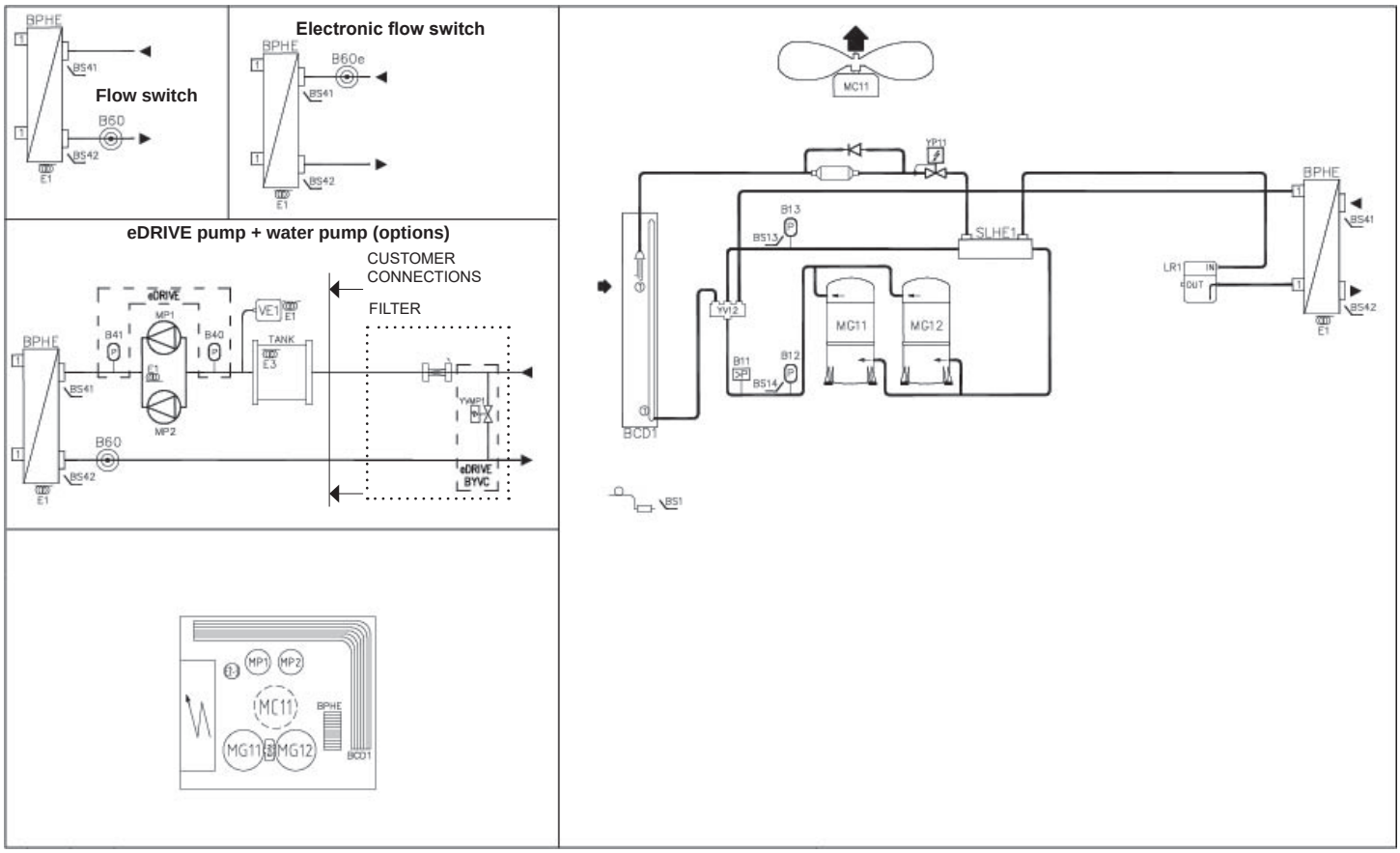
GAC 185D



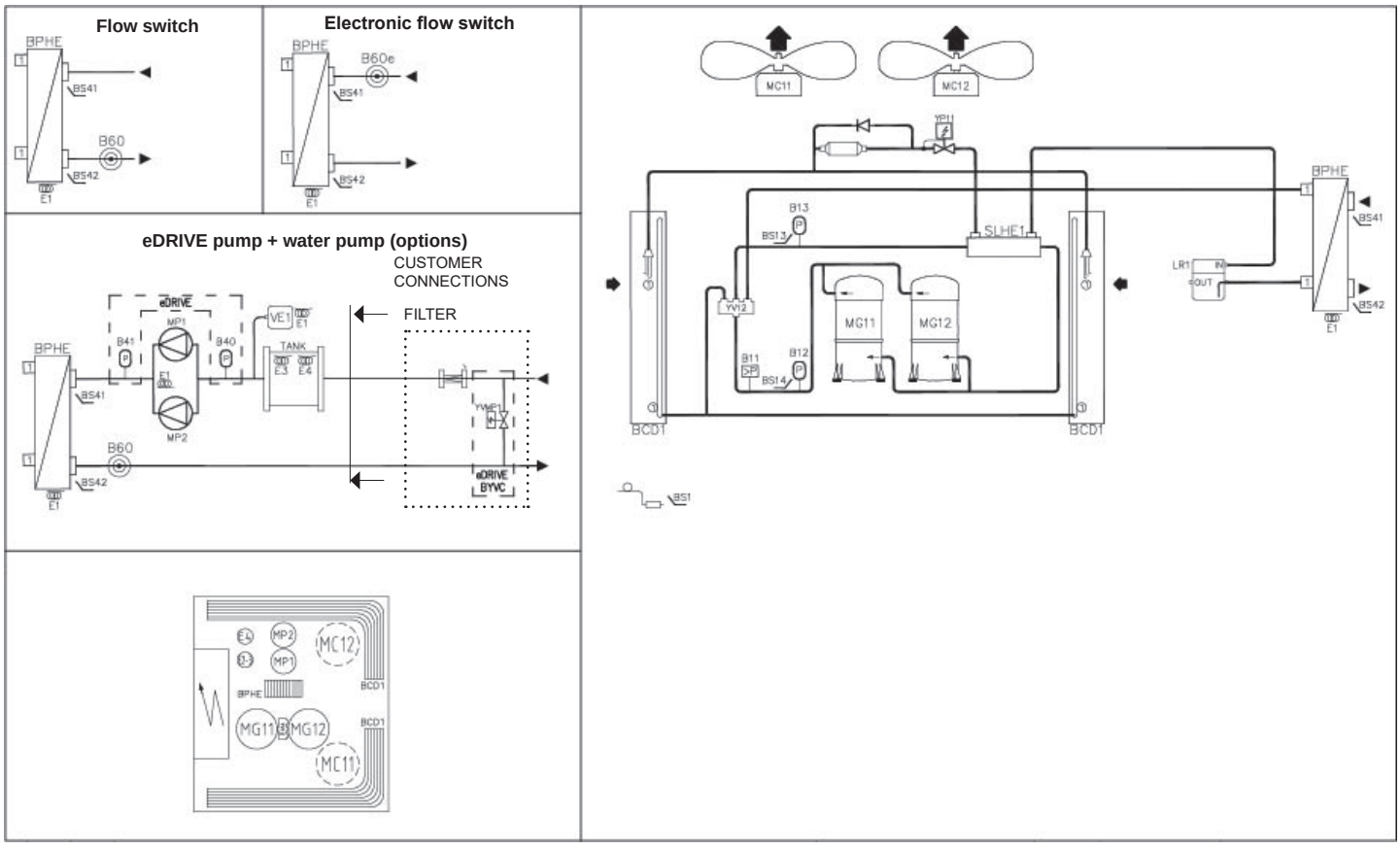
	LEGEND		LEGEND
B11	High pressure pressostat 1	**BS41**	Inlet water temperature
B12	High pressure transducer 1	**BS42**	Outlet water temperature
B13	Low pressure transducer 1	**E1**	Evaporator antifreeze heater
B21	High pressure pressostat 2	**E2**	Antifreeze heater
B22	High pressure transducer 2	**E3-4-5-6**	Electrical heater
B23	Low pressure transducer 2	**LR**	Liquid receiver
B40	Inlet water pressure	**MC**	Fan
B41	Outlet water pressure	**MG**	Scroll compressor
B60	Water flow switch	**MP**	Water Pump
B60e	Electronic water flow switch	**PHR 1-2**	Partial Heat Recovery
BCD	Condenser	**SLHE**	Suction liquid heat exchanger
BPHE	Evaporator (plate heat exchanger)	**VE1**	Expansion vessel
BS1	Outdoor temperature	**YP11**	Electronic expansion valve - Circuit 1
BS13	Suction temperature 1	**YP21**	Electronic expansion valve - Circuit 2
BS14	Discharge temperature 1	**YV12-22**	4 way reversing valve
BS23	Suction temperature 2	**YVMP1**	By-pass valve
BS24	Discharge temperature 2		

1.8.- PIPING DRAWINGS
HEAT PUMP UNITS

GAH 020S-025S-030S-035S-040S-045S

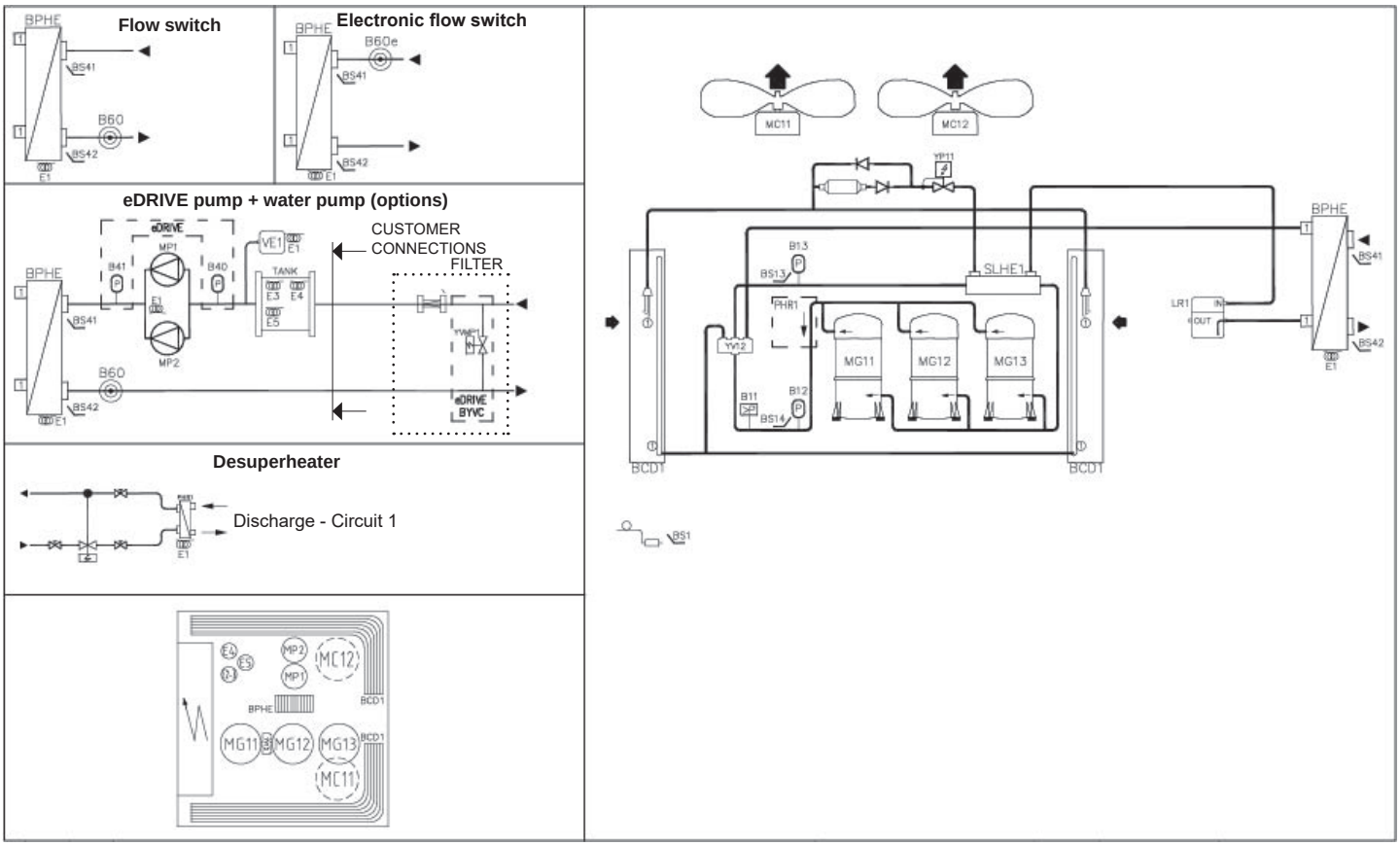


GAH 055S-060S-070S-080S

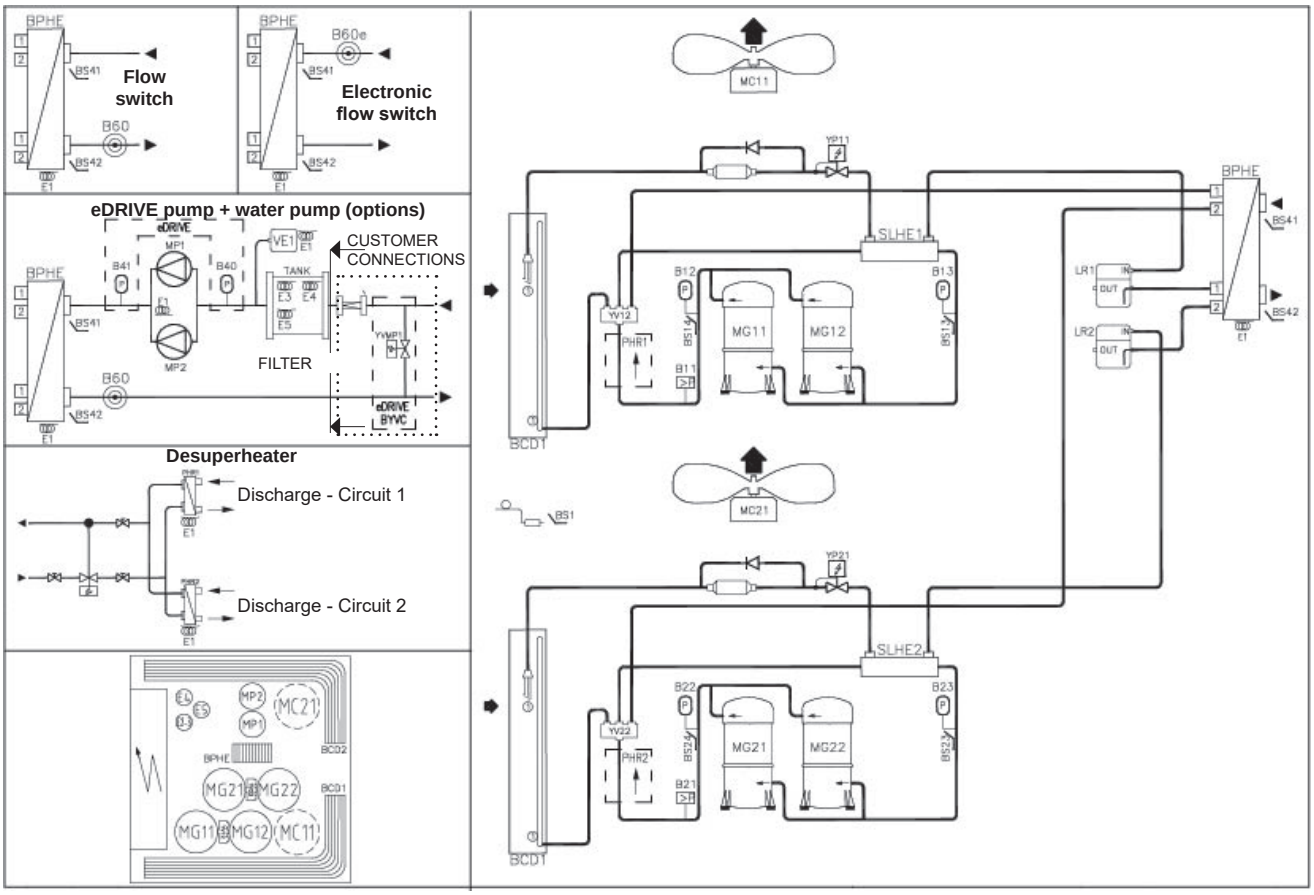


1.8.- PIPING DRAWINGS
HEAT PUMP UNITS

GAH 090S-110S-125S



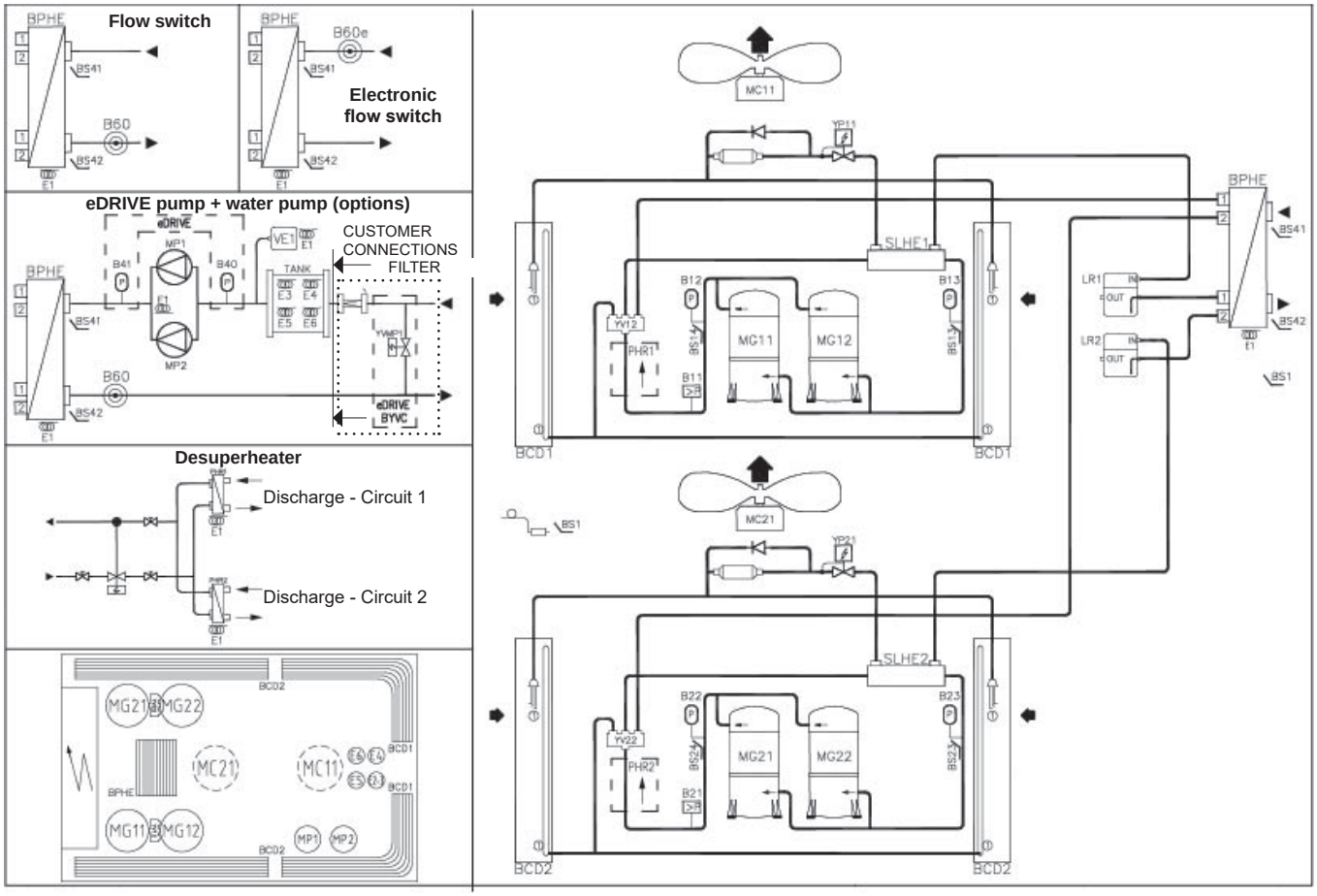
GAH 110D-125D



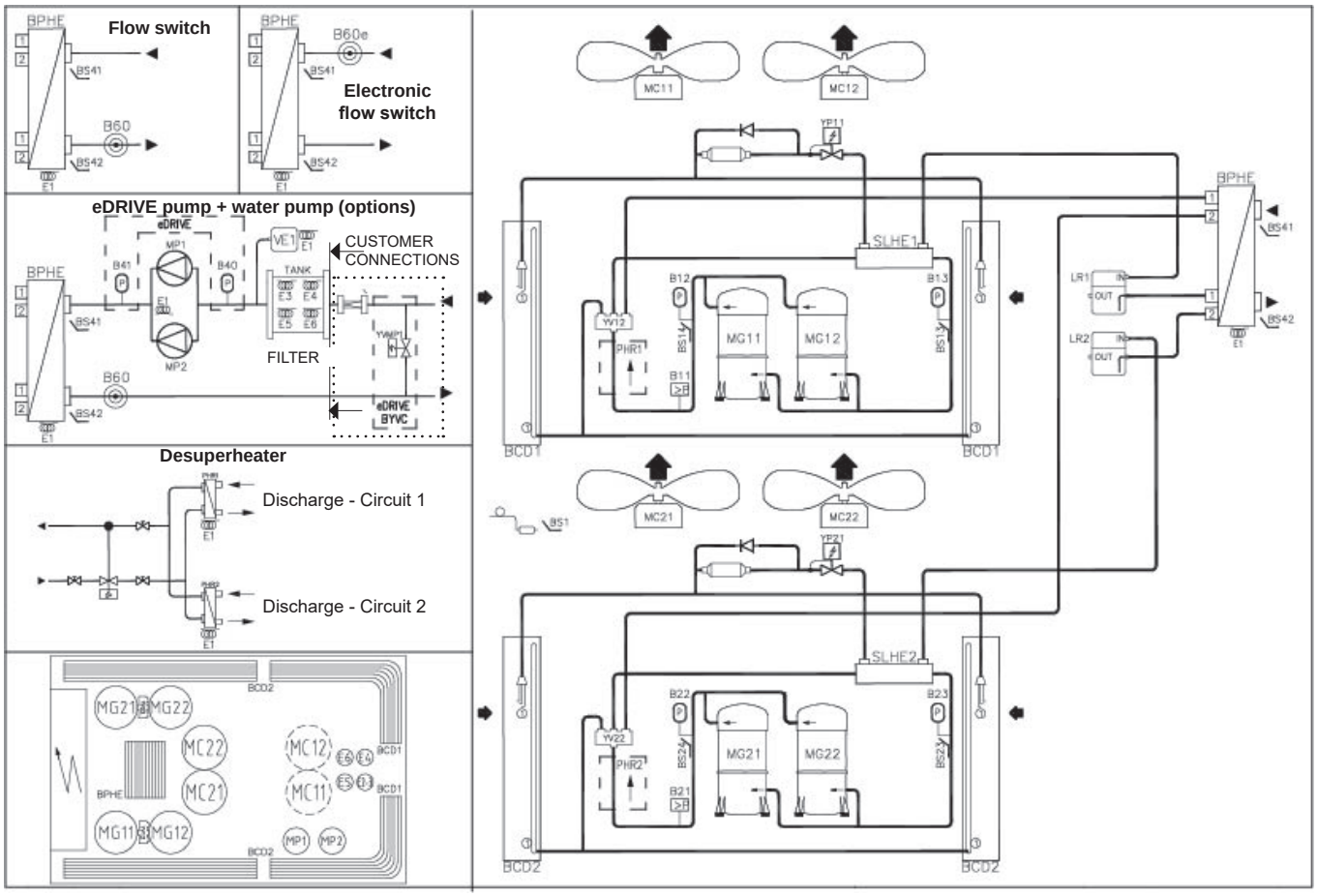
1.8.- PIPING DRAWINGS

HEAT PUMP UNITS

GAH 140D



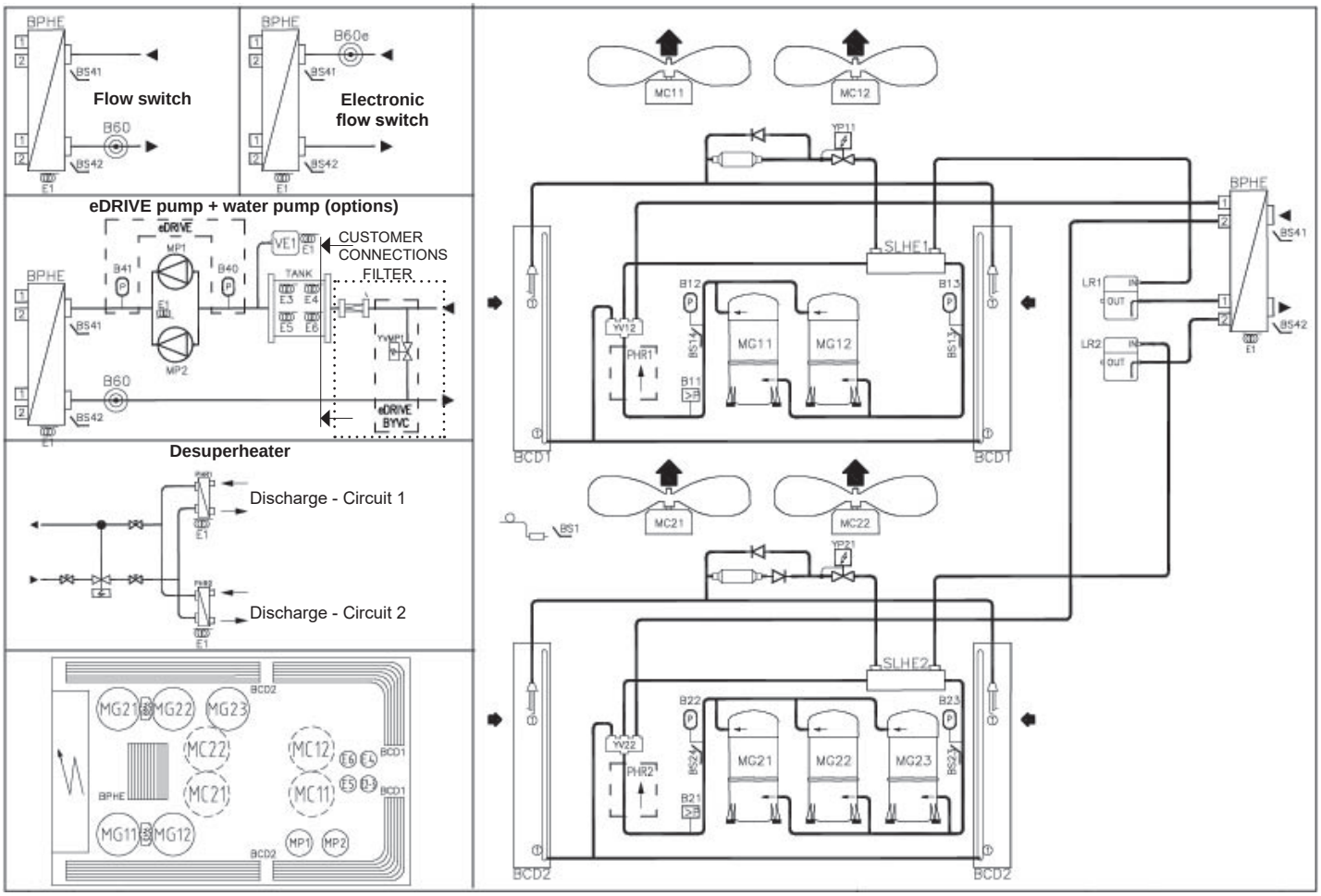
GAH 160D



1.8.- PIPING DRAWINGS

HEAT PUMP UNITS

GAH 185D



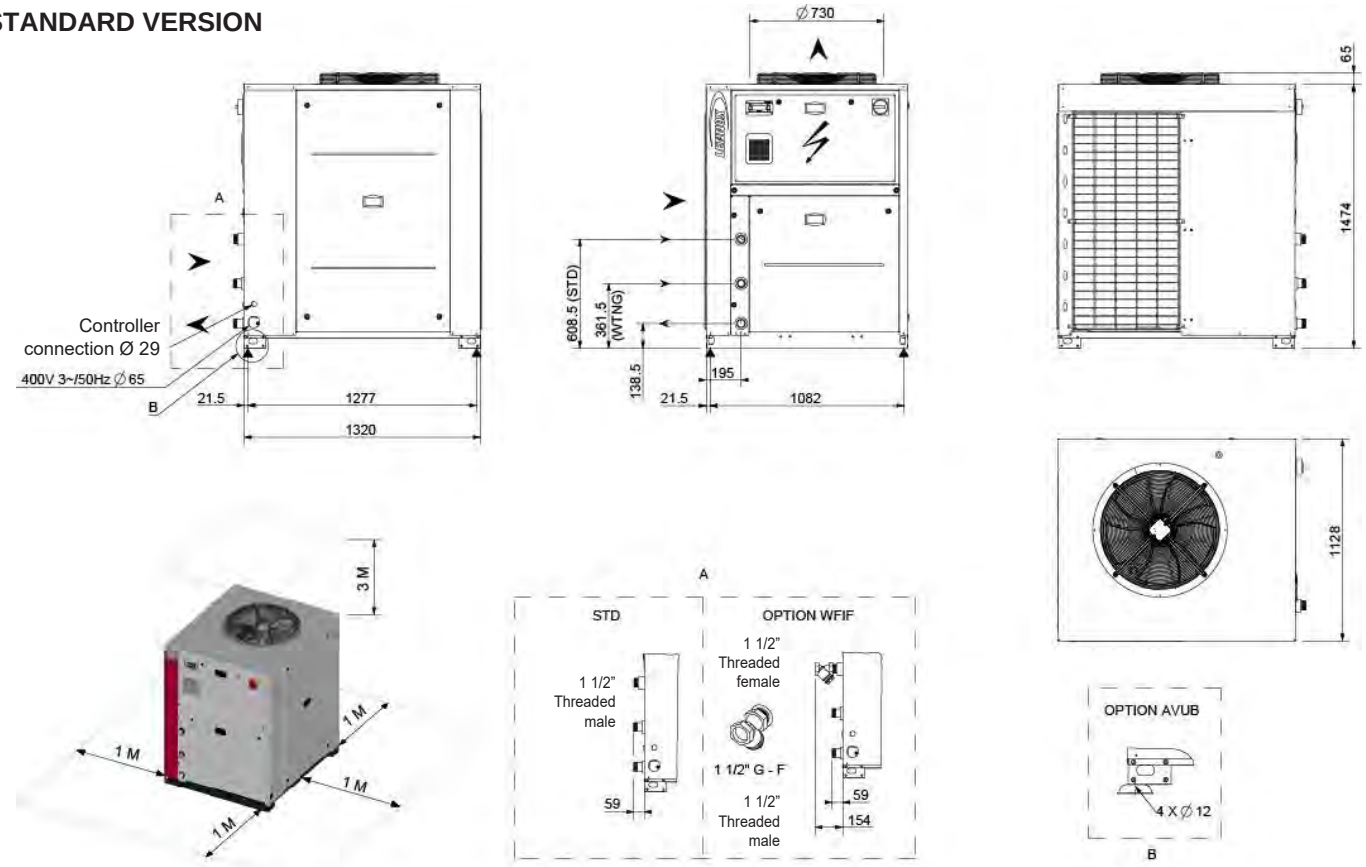
	LEGEND		LEGEND
B11	High pressure pressostat 1	**BS41**	Inlet water temperature
B12	High pressure transducer 1	**BS42**	Outlet water temperature
B13	Low pressure transducer 1	**E1**	Evaporator antifreeze heater
B21	High pressure pressostat 2	**E2**	Antifreeze heater
B22	High pressure transducer 2	**E3-4-5-6**	Electrical heater
B23	Low pressure transducer 2	**LR**	Liquid receiver
B40	Inlet water pressure	**MC**	Fan
B41	Outlet water pressure	**MG**	Scroll compressor
B60	Water flow switch	**MP**	Water Pump
B60e	Electronic water flow switch	**PHR 1-2**	Partial Heat Recovery
BCD	Condenser	**SLHE**	Suction liquid heat exchanger
BPHE	Evaporator (plate heat exchanger)	**VE1**	Expansion vessel
BS1	Outdoor temperature	**YP11**	Electronic expansion valve - Circuit 1
BS13	Suction temperature 1	**YP21**	Electronic expansion valve - Circuit 2
BS14	Discharge temperature 1	**YV12-22**	4 way reversing valve
BS23	Suction temperature 2	**YVMP1**	By-pass valve
BS24	Discharge temperature 2		

1.- GENERAL CHARACTERISTICS

1.9.- DIMENSIONS

GAC/H 020S-025S

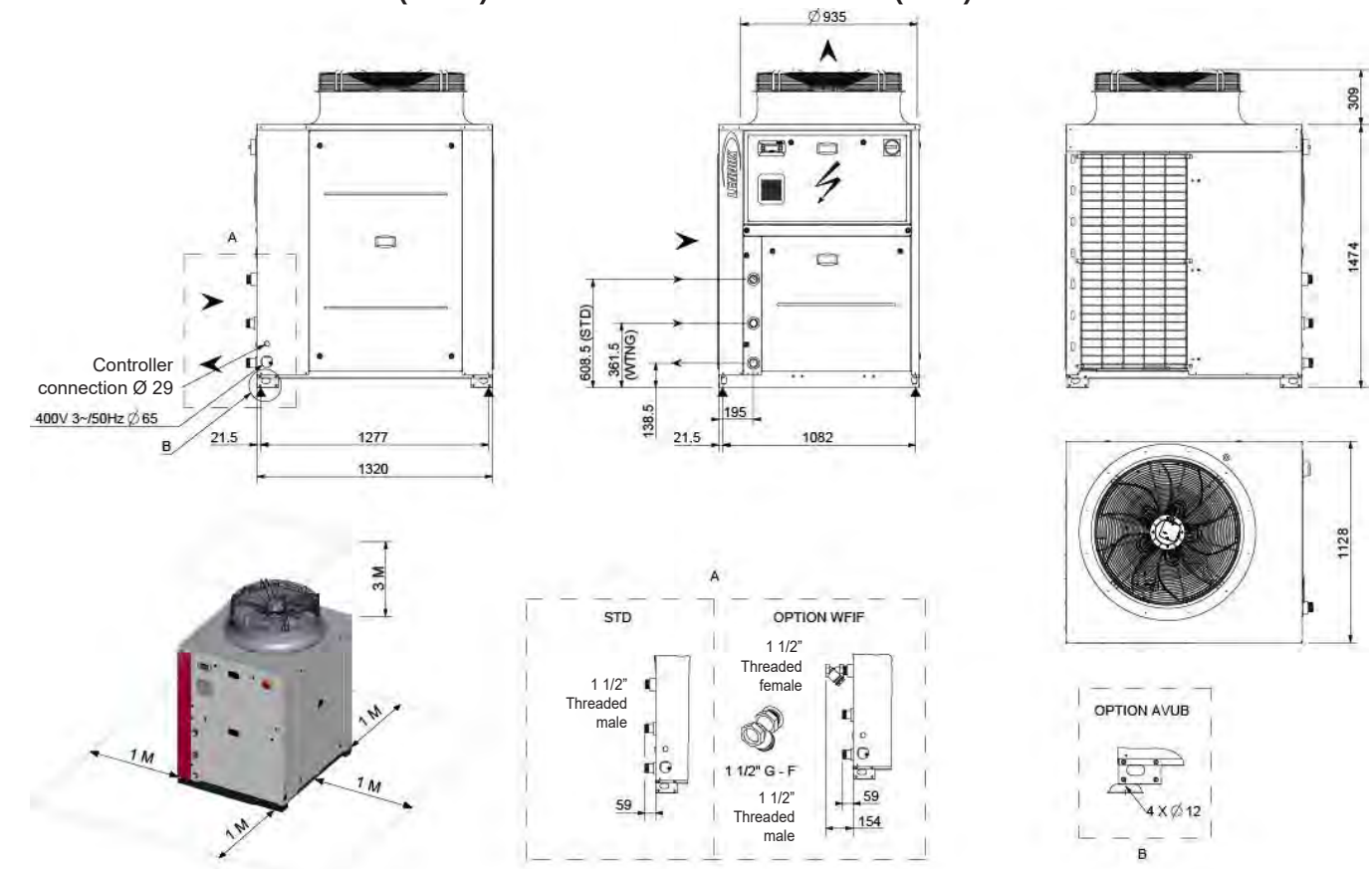
STANDARD VERSION



GAC-H_020S_025S_Z

All dimensions in mm

UNIT WITH STANDARD EC FANS (SEAS) OR HIGH PRESSURE EC FANS (HIPF)



GAC-H_020S_025S_S_H_Z

All dimensions in mm

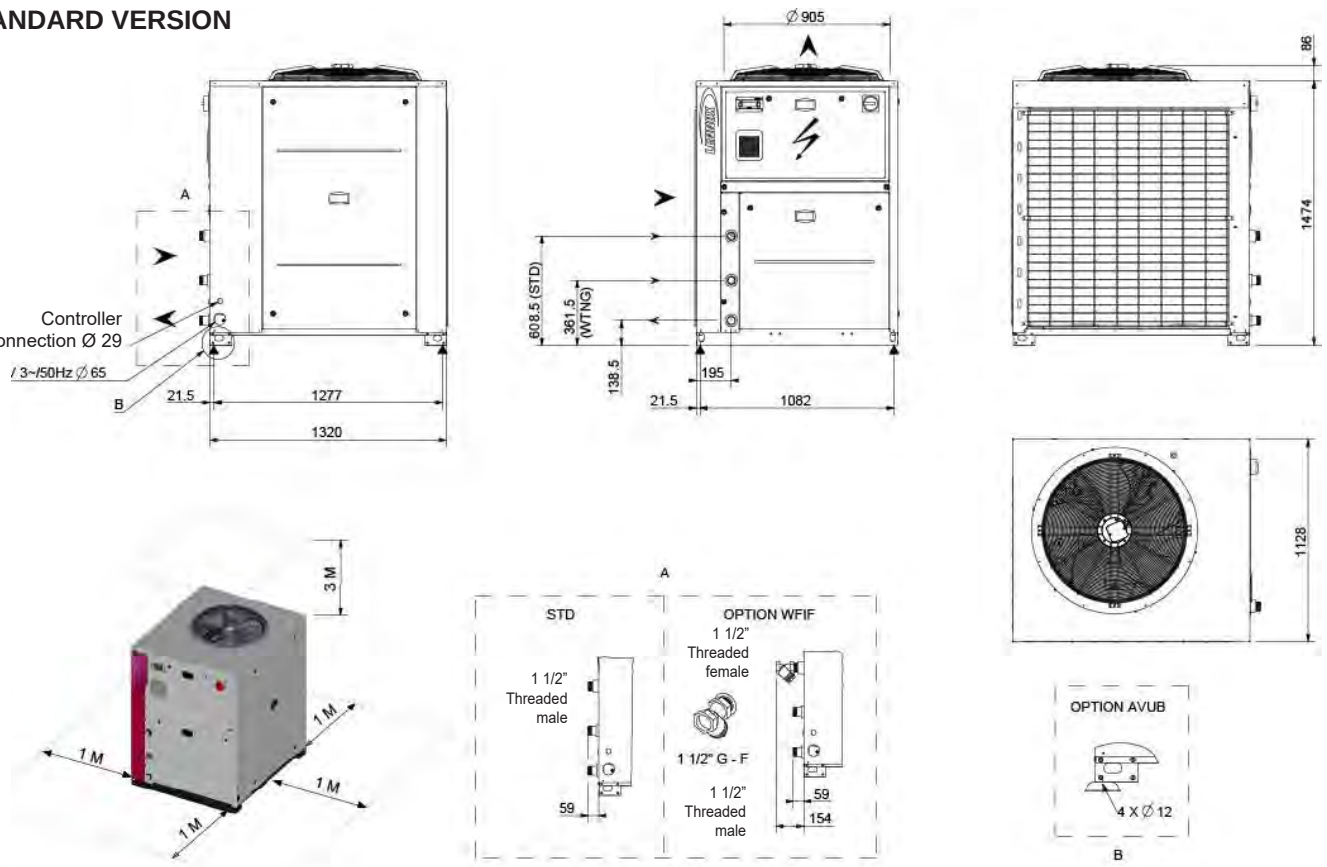
SPXX	Hydraulic module with single pump	**WTNG**	Water tank
DPXX	Hydraulic module with twin pum	**WFIF**	Water filter (supplied loose)
AVUB	Rubber anti-vibration mounts		

1.- GENERAL CHARACTERISTICS

1.9.- DIMENSIONS

GAC/H 030S-035S-040S-045S

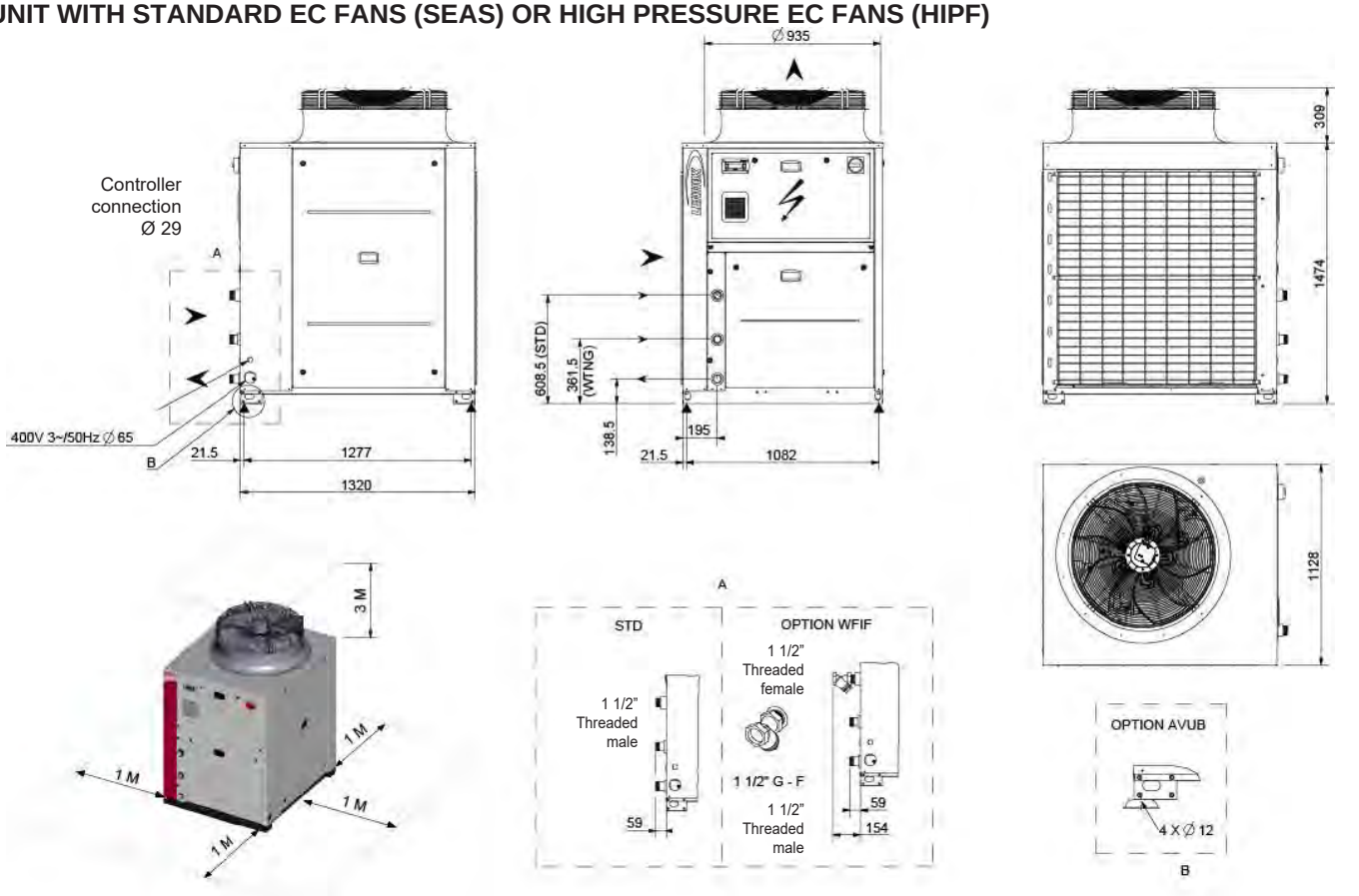
STANDARD VERSION



GAC-H_035S_045S_Z

All dimensions in mm

UNIT WITH STANDARD EC FANS (SEAS) OR HIGH PRESSURE EC FANS (HIPF)



GAC-H_030S_045S_S_H_Z

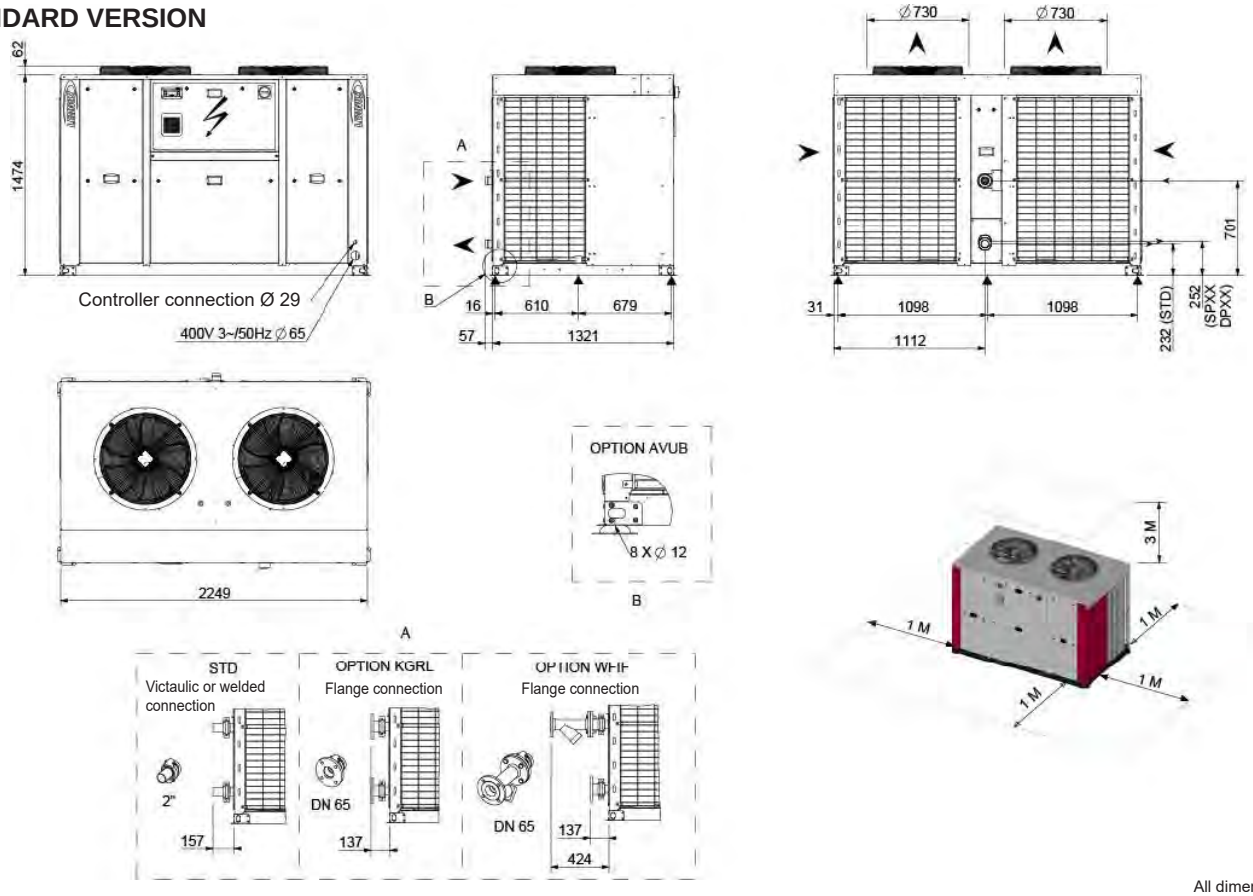
All dimensions in mm

SPXX	Hydraulic module with single pump	**WTNG**	Water tank
DPXX	Hydraulic module with twin pum	**WFIF**	Water filter (supplied loose)
AVUB	Rubber anti-vibration mounts		

1.9.- DIMENSIONS

GAC/H 055S

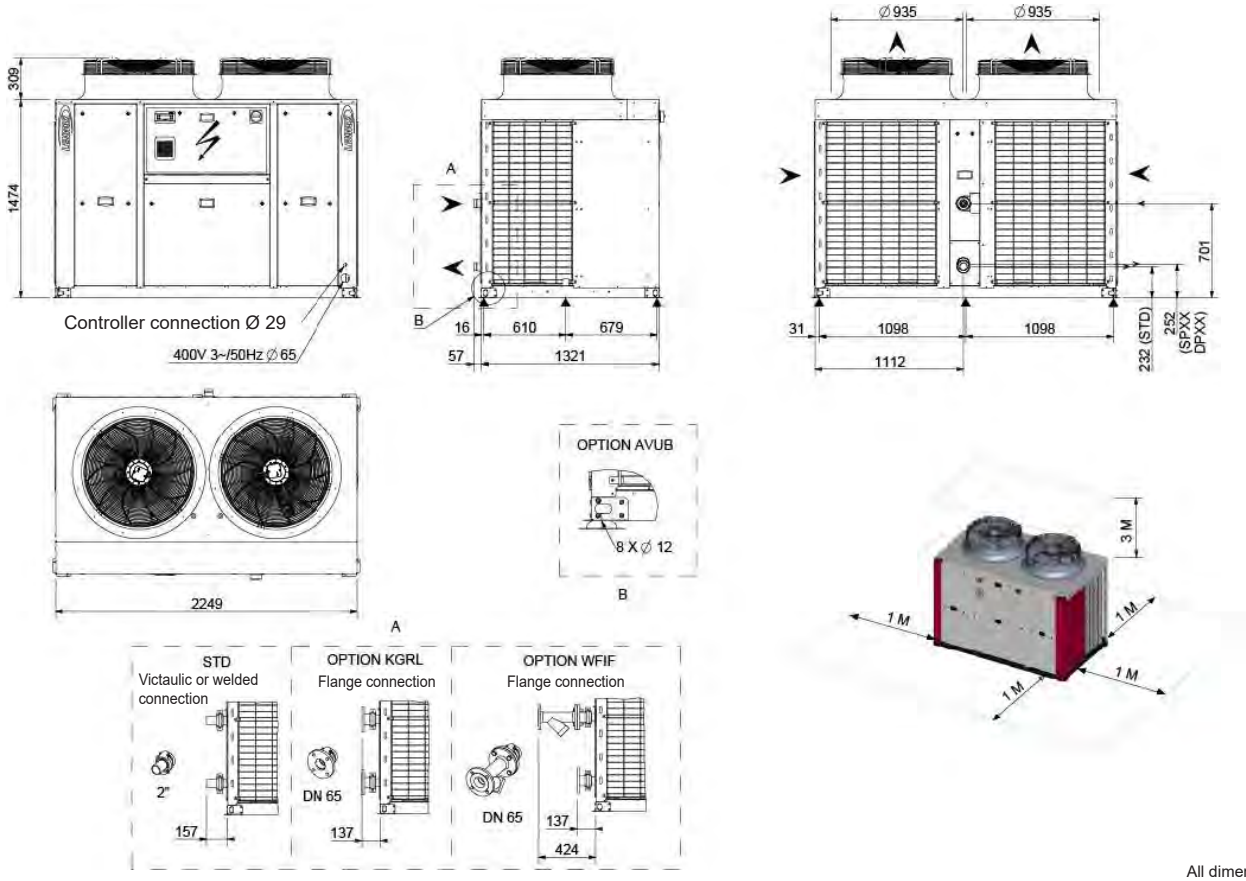
STANDARD VERSION



GAC-H_055S_Z

All dimensions in mm

UNIT WITH STANDARD EC FANS (SEAS) OR HIGH PRESSURE EC FANS (HIPF)



GAC-H_055S_S_H_Z

All dimensions in mm

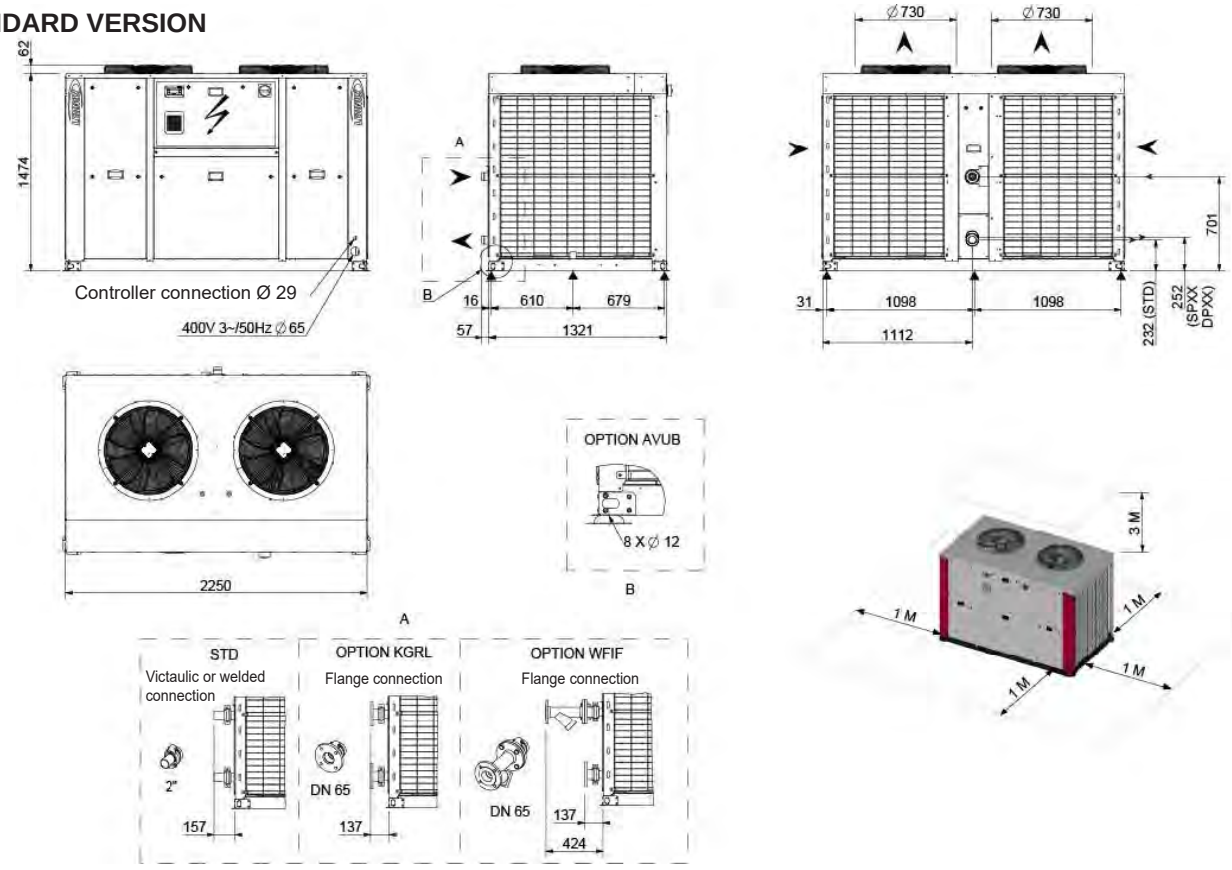
SPXX	Hydraulic module with single pump	**KGRL**	Flange connection
DPXX	Hydraulic module with twin pum	**WFIF**	Water filter (supplied loose)
AVUB	Rubber anti-vibration mounts		

1.- GENERAL CHARACTERISTICS

1.9.- DIMENSIONS

GAC/H 060S-070S-080S

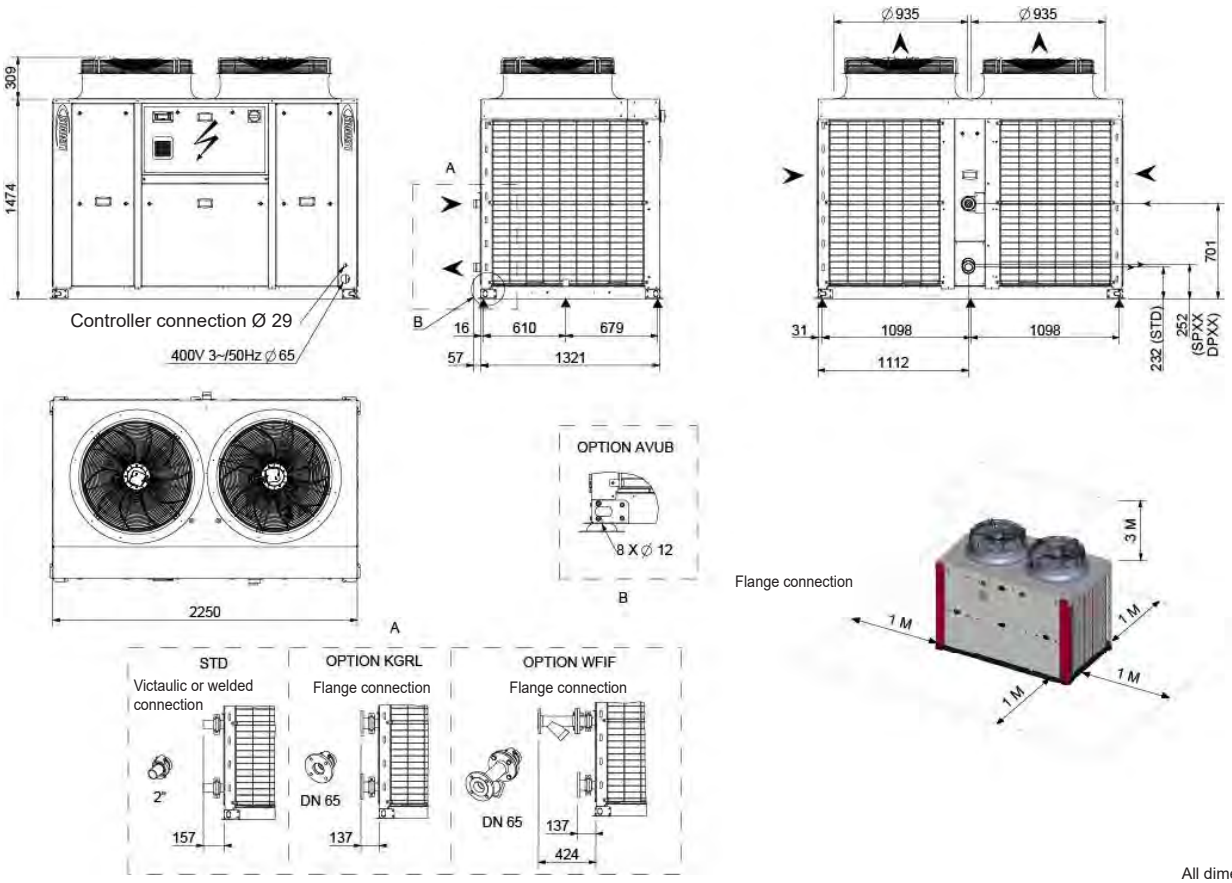
STANDARD VERSION



GAC-H_060S_070S_Z

All dimensions in mm

UNIT WITH STANDARD EC FANS (SEAS) OR HIGH PRESSURE EC FANS (HIPF)



GAC-H_060S-080S_S_H_Z

All dimensions in mm

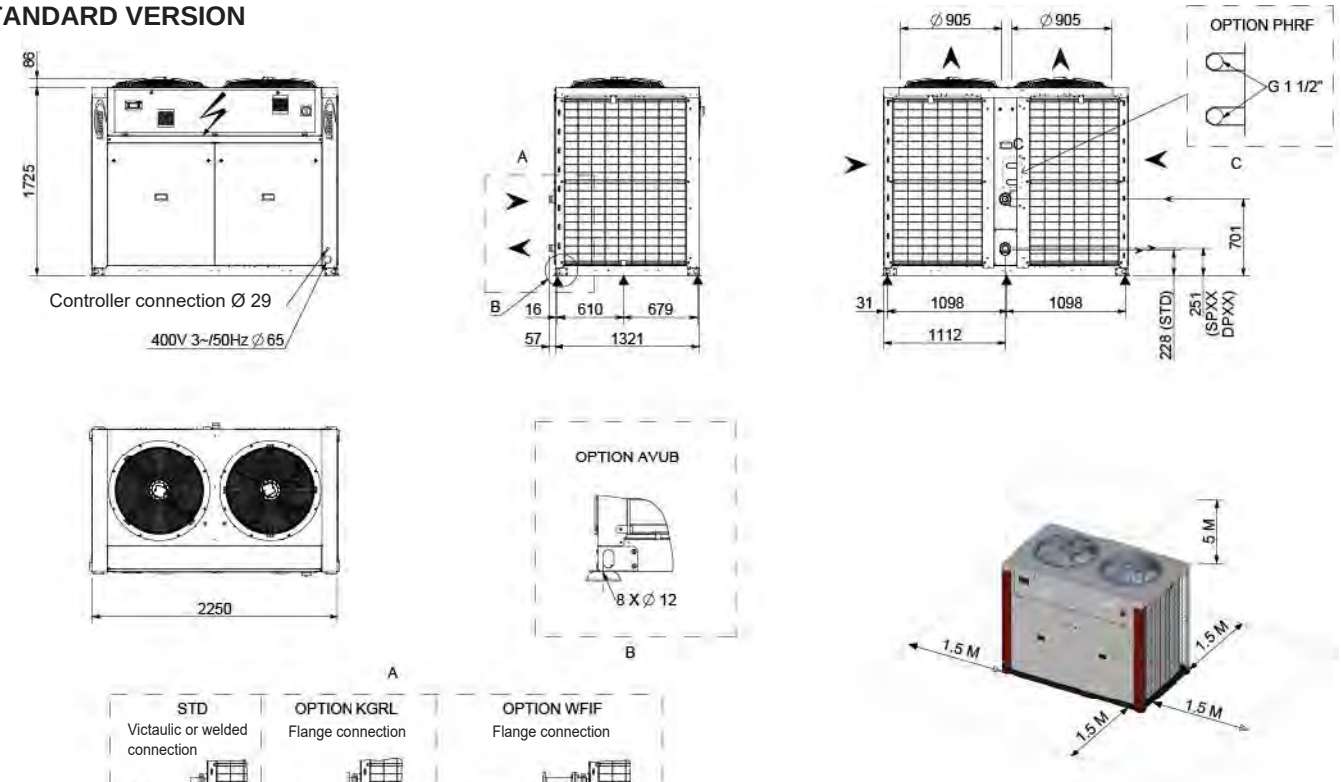
SPXX	Hydraulic module with single pump	**KGRL**	Flange connection
DPXX	Hydraulic module with twin pum	**WFIF**	Water filter (supplied loose)
AVUB	Rubber anti-vibration mounts		

1.- GENERAL CHARACTERISTICS

1.9.- DIMENSIONS

GAC 090S-110S-125S

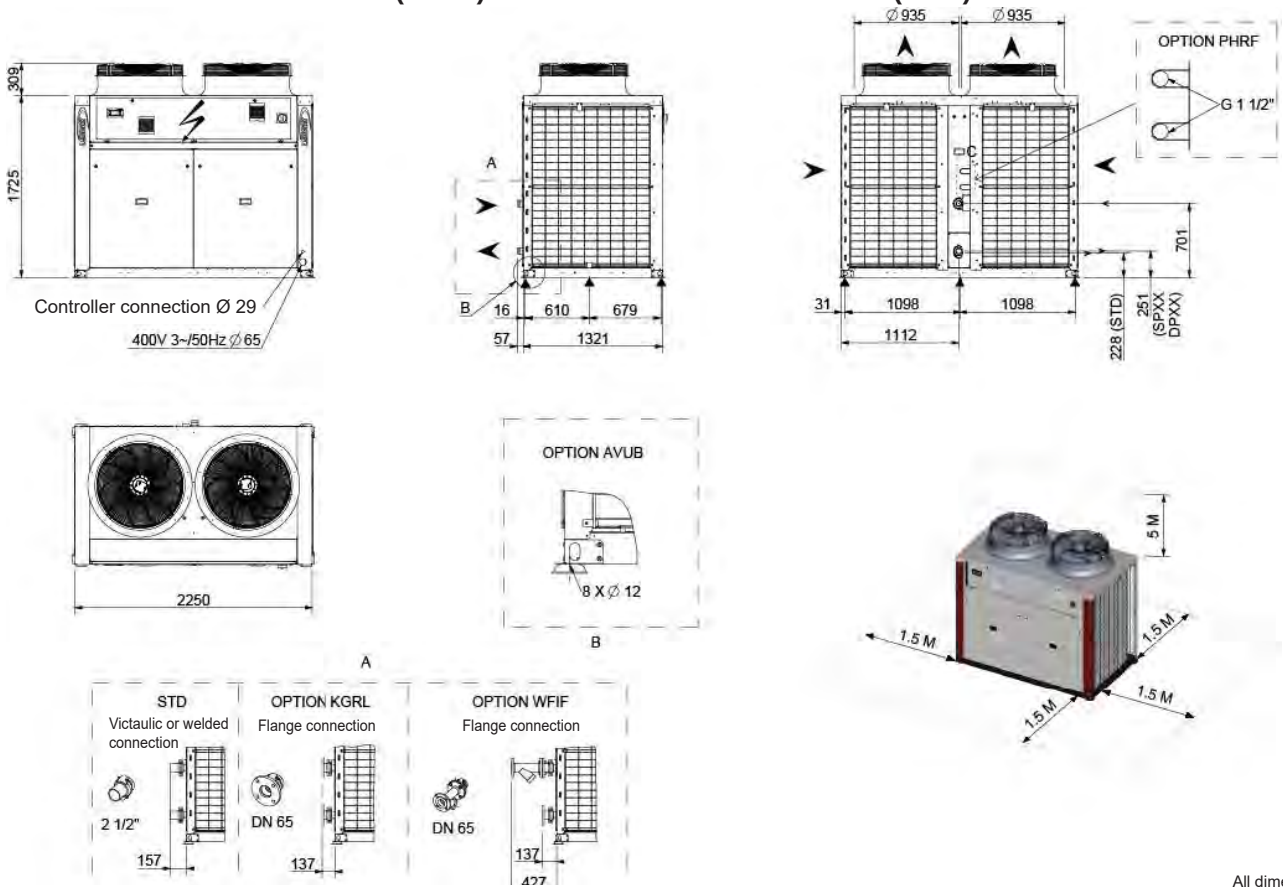
STANDARD VERSION



GAC-H_090S_125S_Z

All dimensions in mm

UNIT WITH STANDARD EC FANS (SEAS) OR HIGH PRESSURE EC FANS (HIPF)



GAC_090S-125S_S_H_Z

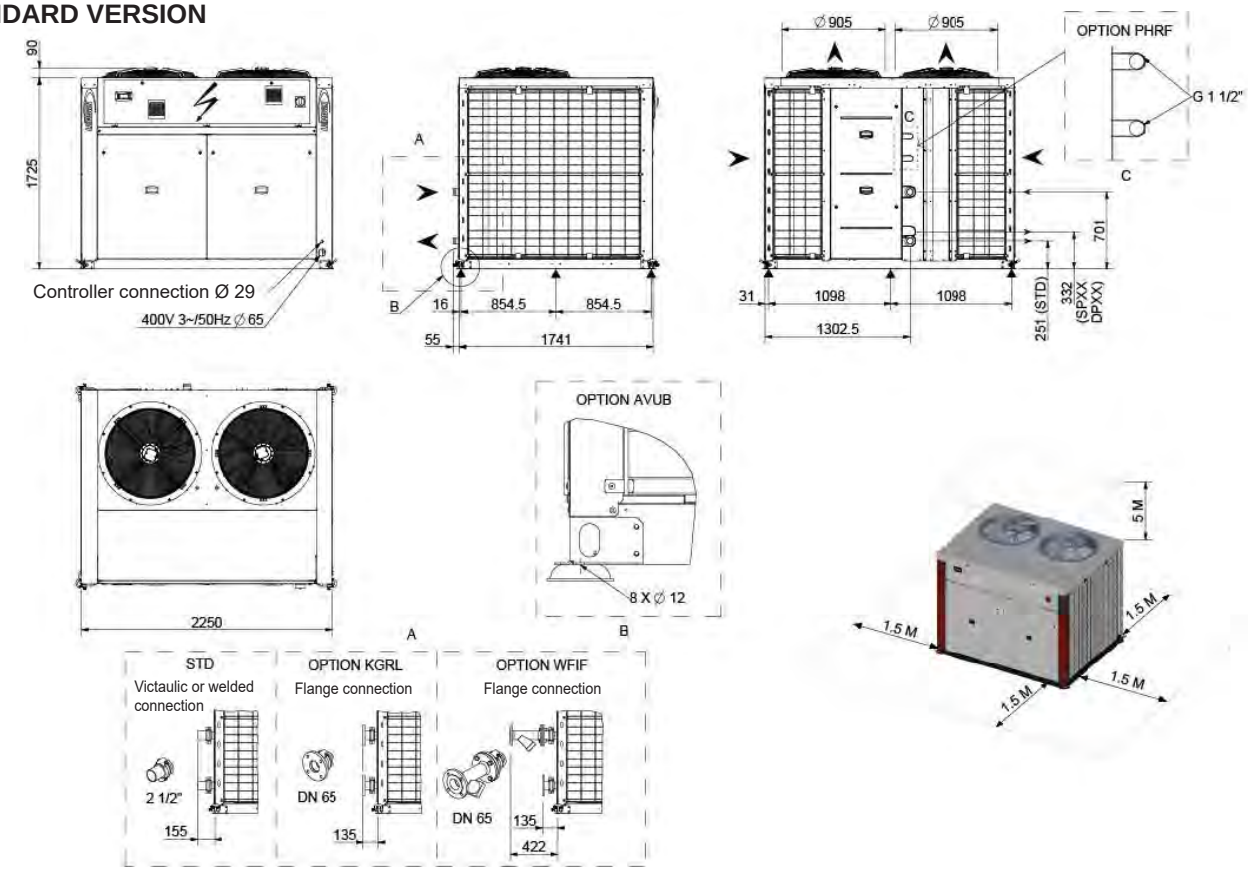
All dimensions in mm

SPXX	Hydraulic module with single pump	**KGRL**	Flange connection
DPXX	Hydraulic module with twin pum	**WFIF**	Water filter (supplied loose)
AVUB	Rubber anti-vibration mounts	**PHRF**	Domestic hot water supply : desuperheater

1.9.- DIMENSIONS

GAC 110D-125D

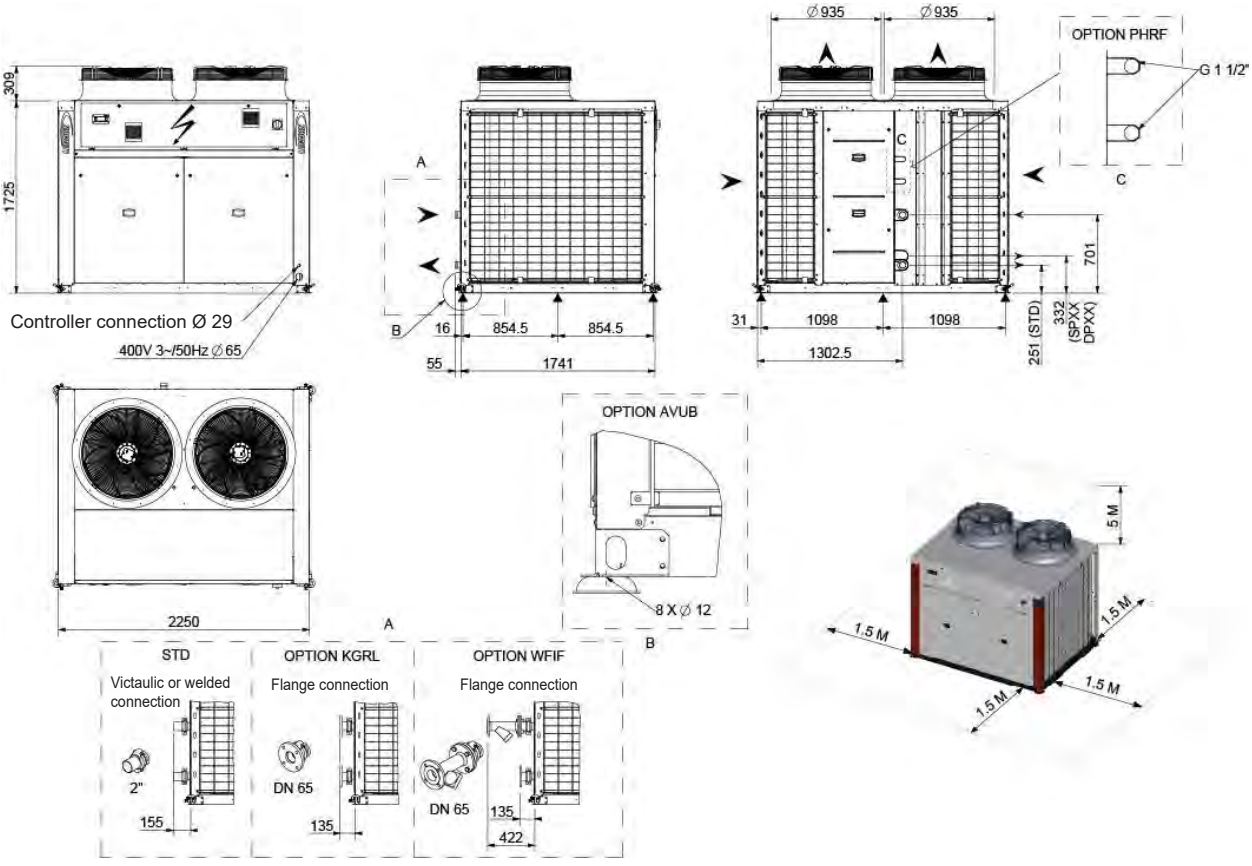
STANDARD VERSION



GAC_110D_125D_Z

All dimensions in mm

UNIT WITH STANDARD EC FANS (SEAS) OR HIGH PRESSURE EC FANS (HIPF)



GAC_110D_125D_S_H_Z

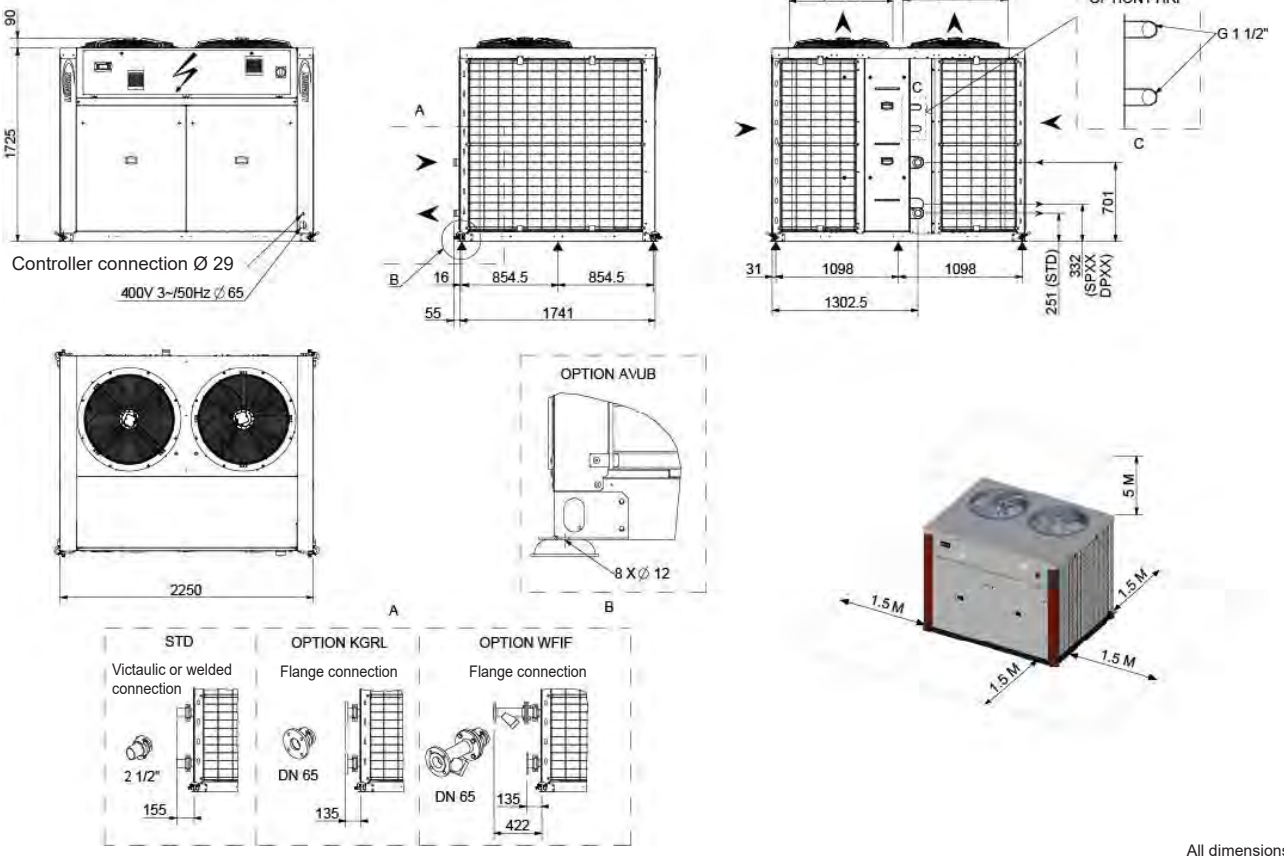
All dimensions in mm

SPXX	Hydraulic module with single pump	**KGRL**	Flange connection
DPXX	Hydraulic module with twin pum	**WFIF**	Water filter (supplied loose)
AVUB	Rubber anti-vibration mounts	**PHRF**	Domestic hot water supply : desuperheater

1.9.- DIMENSIONS

GAH 090S-110S-125S-125D

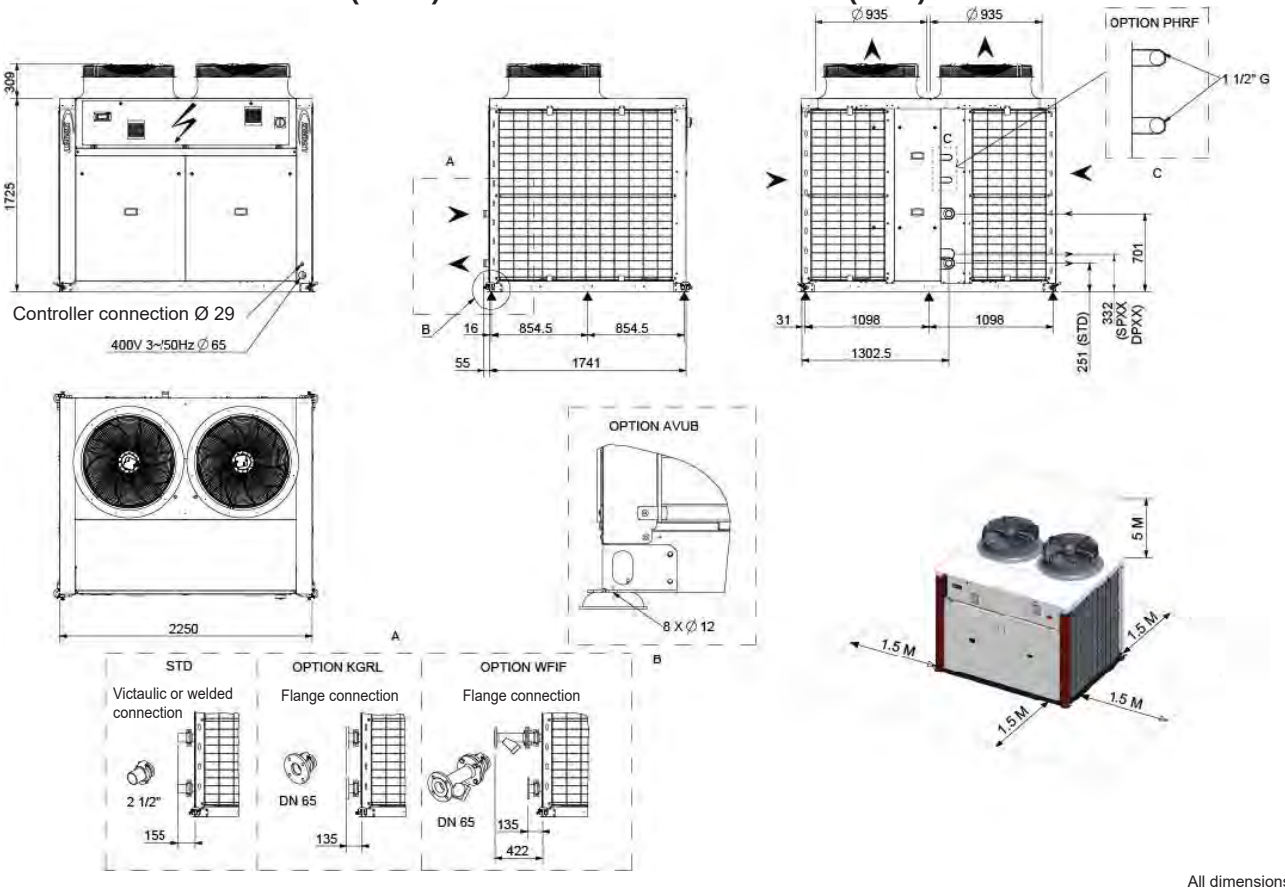
STANDARD VERSION



GAH_090S_125S_110D_125D_Z

All dimensions in mm

UNIT WITH STANDARD EC FANS (SEAS) OR HIGH PRESSURE EC FANS (HIPF)



GAH_090S_125S_110D_125D_S_H_Z

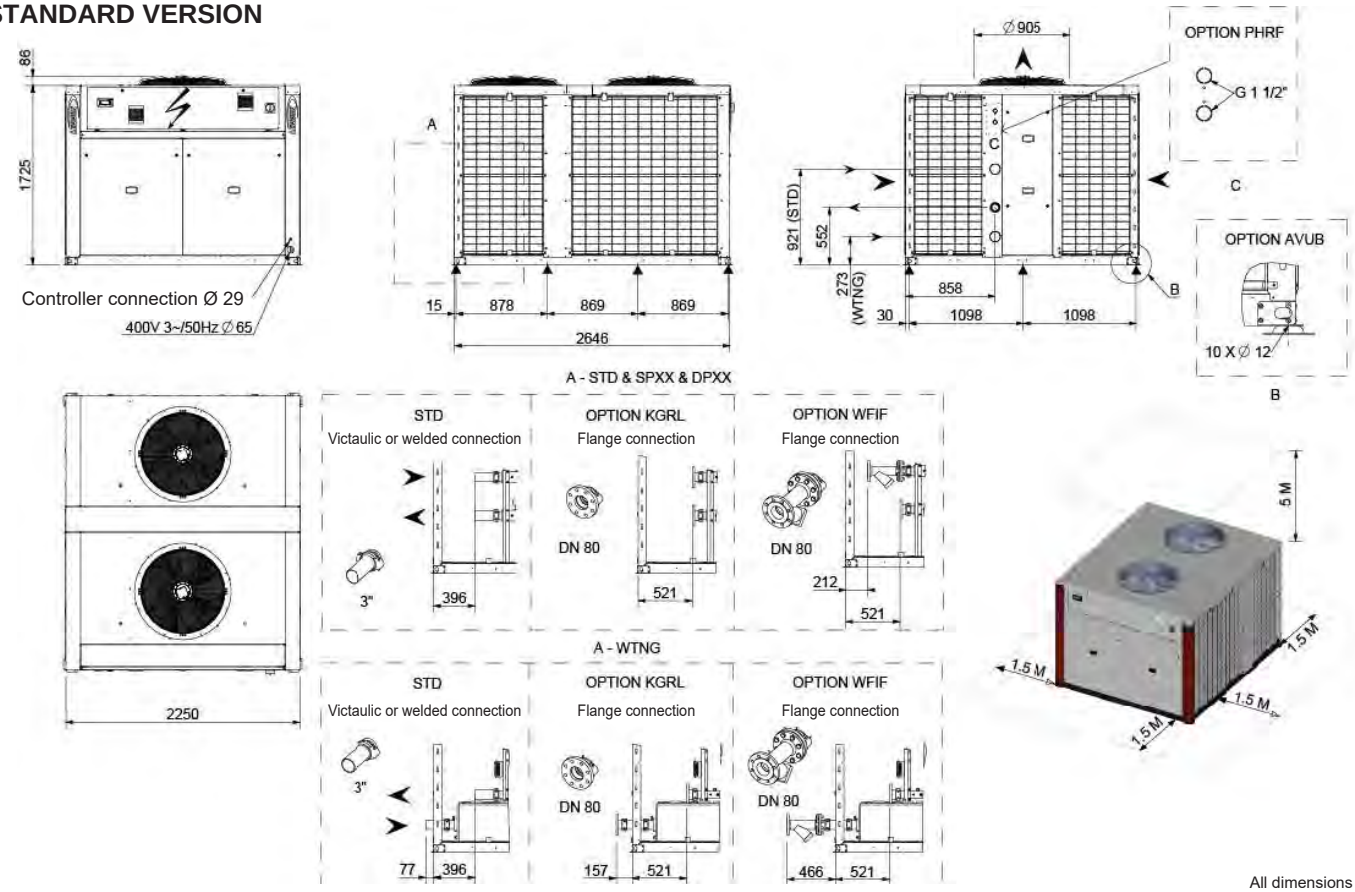
All dimensions in mm

SPXX	Hydraulic module with single pump	**KGRL**	Flange connection
DPXX	Hydraulic module with twin pum	**WFIF**	Water filter (supplied loose)
AVUB	Rubber anti-vibration mounts	**PHRF**	Domestic hot water supply : desuperheater

1.9.- DIMENSIONS

GAC/H 140D

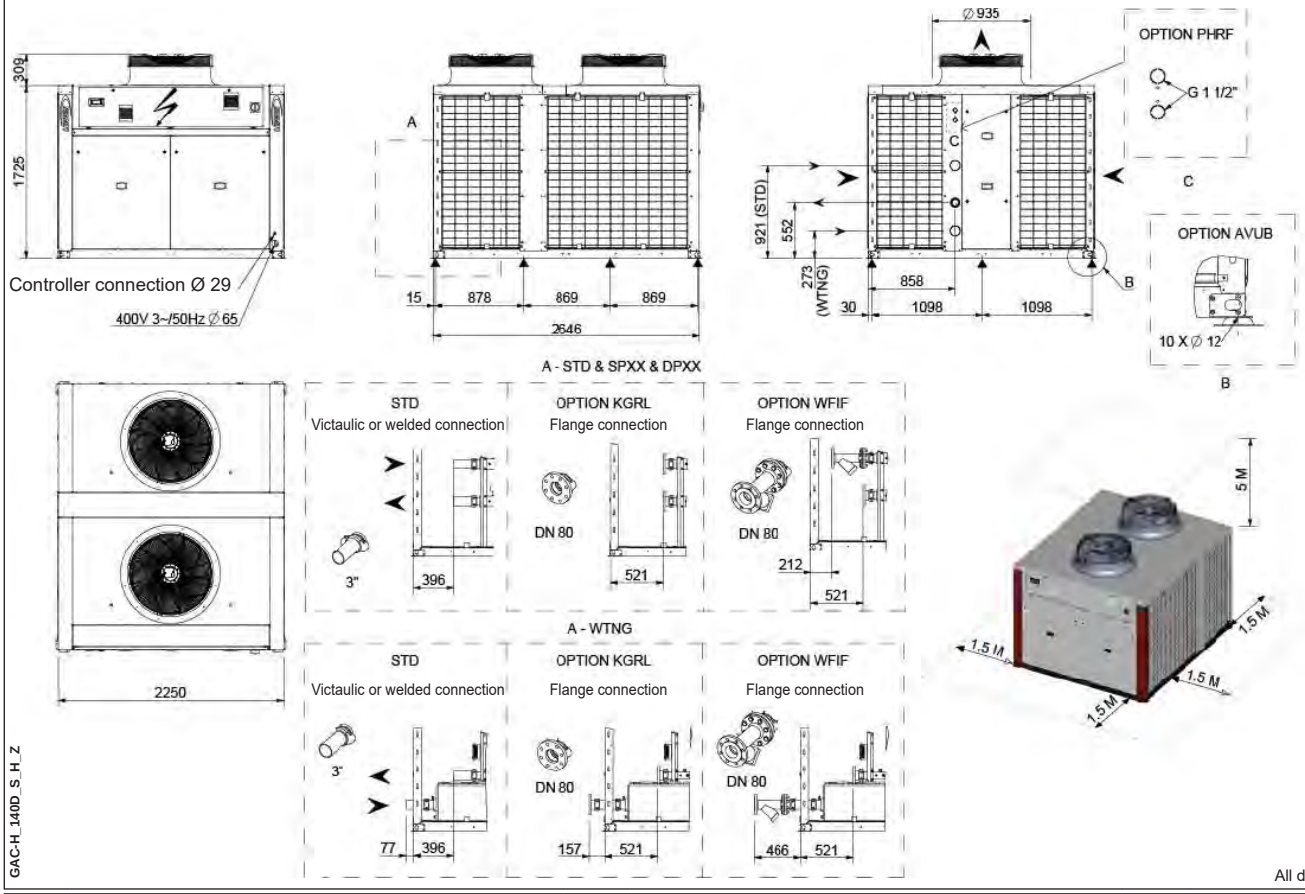
STANDARD VERSION



GAC-H_140D_Z

All dimensions in mm

UNIT WITH STANDARD EC FANS (SEAS) OR HIGH PRESSURE EC FANS (HIPF)



GAC-H_140D_S_H_Z

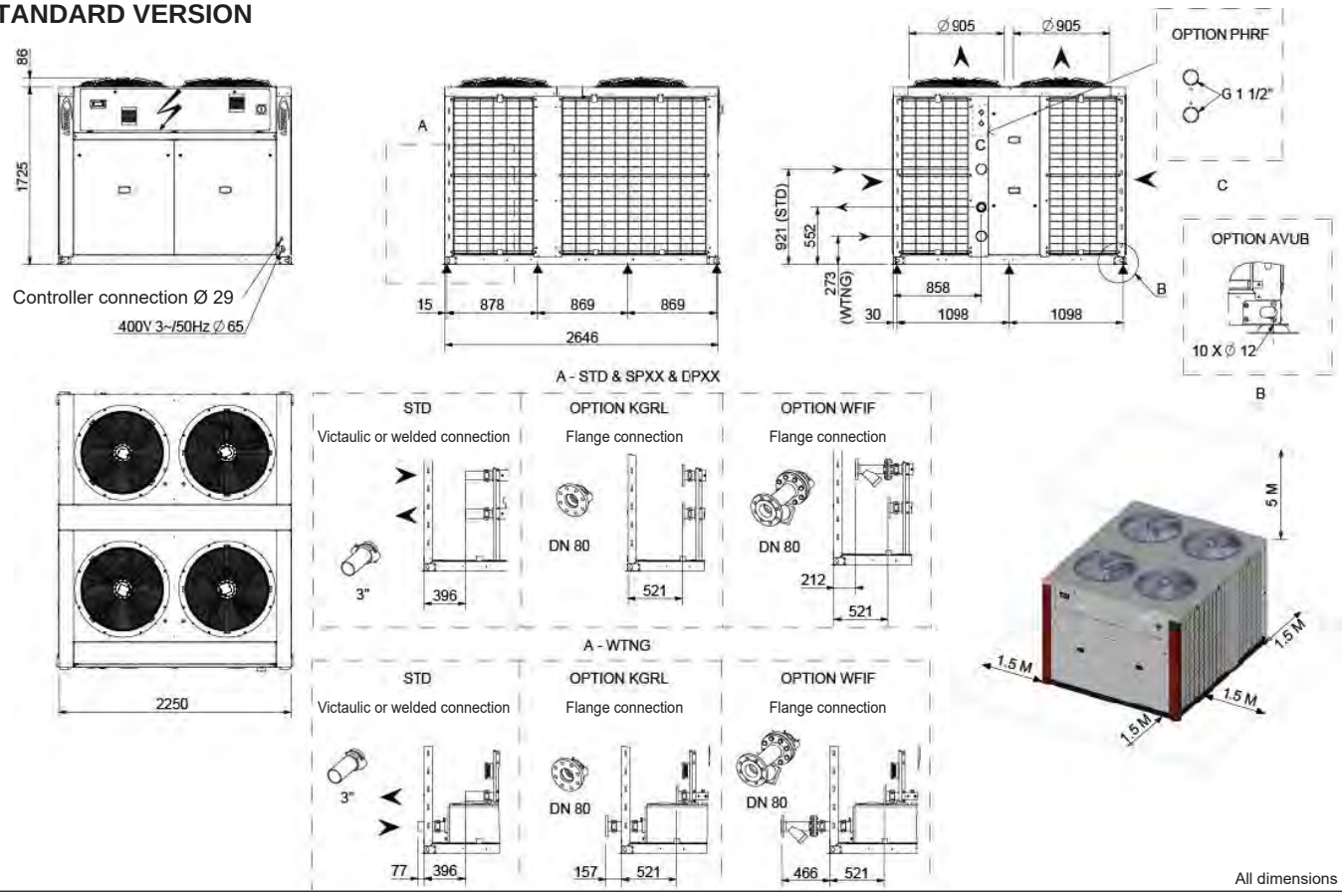
All dimensions in mm

SPXX	Hydraulic module with single pump	**KGRL**	Flange connection	**WTNG**	Water tank
DPXX	Hydraulic module with twin pum	**WFIF**	Water filter (supplied loose)		
AVUB	Rubber anti-vibration mounts	**PHRF**	Domestic hot water supply : desuperheater		

1.9.- DIMENSIONS

GAC/H 160D - 185D

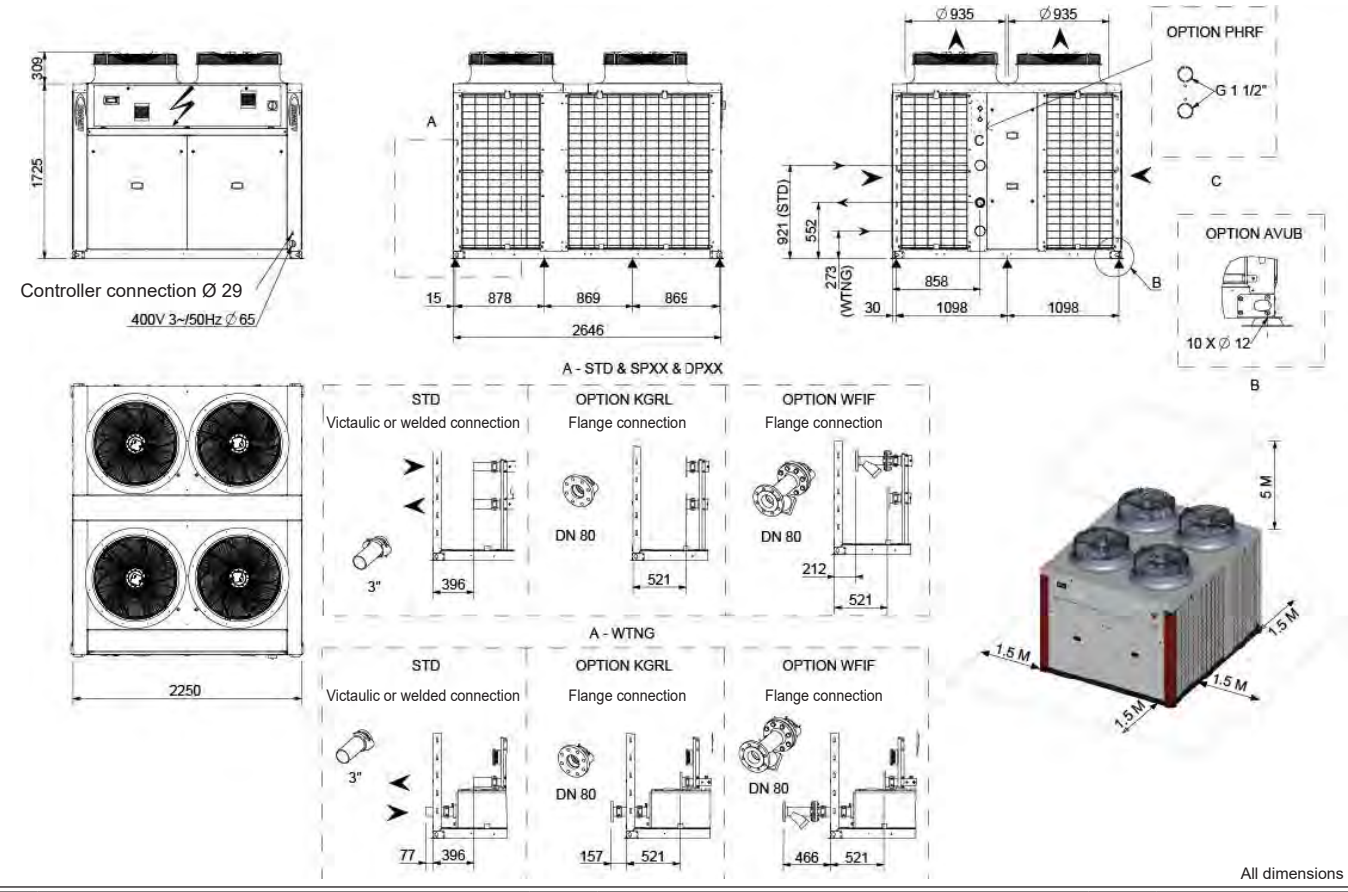
STANDARD VERSION



All dimensions in mm

GAC-H_160D_185D_Z

UNIT WITH STANDARD EC FANS (SEAS) OR HIGH PRESSURE EC FANS (HIPF)



All dimensions in mm

GAC-H_160D_185D_S_H_Z

SPXX	Hydraulic module with single pump	**KGRL**	Flange connection	**WTNG**	Water tank
DPXX	Hydraulic module with twin pum	**WFIF**	Water filter (supplied loose)		
AVUB	Rubber anti-vibration mounts	**PHRF**	Domestic hot water supply : desuperheater		

2.- INSTALLATION

2.1.- TRANSPORT - HANDLING

Equipment designed to withstand transport and handling according to the established protocol (for the handling protocol, please refer to the installation instructions for the relevant product range).
All unloading operations must be carried out with suitable equipment (crane, forklift truck, etc.).
Optional removable handling rings are available for certain products.
When using a forklift truck, you must respect the positions and the direction of handling indicated on the products.
The equipment must be handled with care to avoid damage to the bodywork, piping, condenser, etc.

Controls and delivery checks
After the unit has been received, when it is ready to be installed or reinstalled, and before it is started up, it must be inspected for damage. On receipt of anew equipment please check the following points. It is the customer's responsibility to ensure that the products are in good working order:

- The exterior has not been damaged in any way.
- The lifting and handling equipment are suitable for the equipment and comply with the specifications of the handling instructions enclosed here-in.
- Accessories ordered for on site installation have been delivered and are in good working order.
- If the unit is delivered with its operating charge of refrigerant, that there has been no leakage (use an electronic detector).
- The equipment supplied corresponds to the order and matches the delivery note.

If the product is damaged, exact details must be confirmed in writing by registered post to the shipping company within 48 hours of delivery (working days).

A copy of the letter must be addressed to Redge and the supplier or distributor for information purposes. Failure to comply will invalidate any claim against the shipping company.
Please be reminded that Redge is not responsible for off-loading and positioning.

Unit rating plate

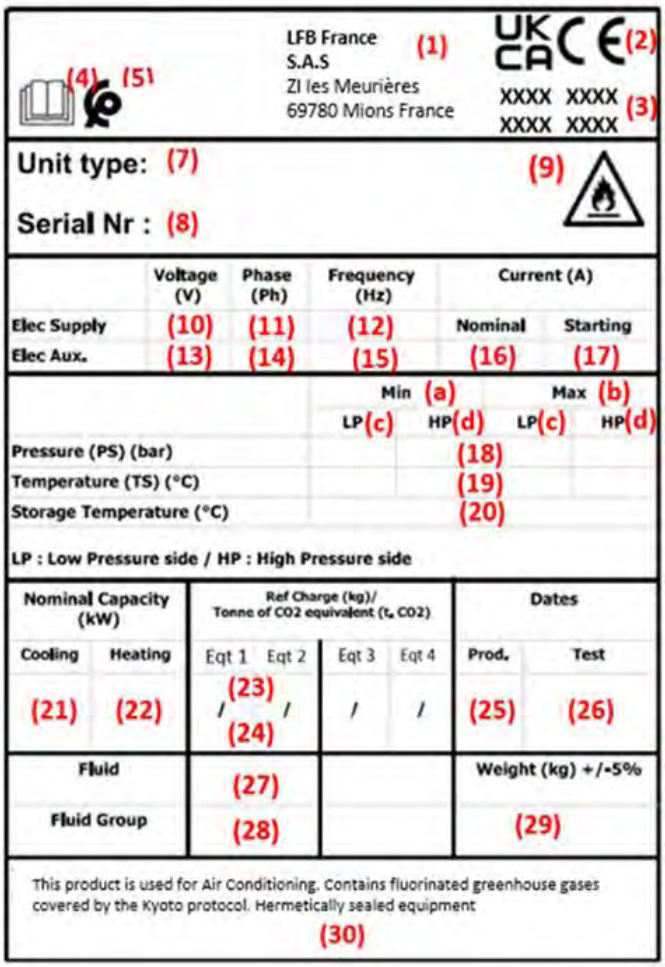
The rating plate provides a complete reference for the model and ensures that the unit corresponds to the model ordered. It states the electrical power consumption of the unit on start-up, its rated power and its supply voltage.

The supply voltage must not deviate beyond +5/-5%.

The start-up power is the maximum value likely to be achieved for the specified operational voltage. The customer must have a suitable electrical supply. It is therefore important to check whether the supply voltage stated on the unit's rating plate is compatible with that of the mains electrical supply.

When positioning the unit, be sure that the Rating plate will always be visible since this data will be necessary to assure proper maintenance.

2.- INSTALLATION



The rating plate indicates:

(1) Address.
(2) Regulatory marking.
(3) Identification number of the notified body only if the product is subject to the Pressure Equipment Directive (2014/68/EU - PESR 2016 - Gas appliance: 2016/426/EU - GAR 2016/426).
(4) «To be read» pictogram.
(5) Regulatory marking.
(6) QR code, unit documentation link.
(7) Unit type.
(8) Serial number.
(9) Flammable fluid type pictogram.
(10) Power part voltage.
(11) Power part phase.
(12) Power part phase frequency.
(13) Control part voltage.
(14) Control part phase.
(15) Control part frequency.
(16) Nominal current.
(17) Start-up current.
(18) Minimum (a) / maximum (b) operating pressure low (c) / high (d) pressure side.
(19) Minimum (a) / maximum (b) operating temperature low (c) / high (d) pressure side.
(20) Minimum (a) / maximum (b) storage temperature low (c) / high (d) pressure side.
(21) Nominal capacity in cooling mode.
(22) Nominal capacity in heating mode.
(23) Refrigerant charge per circuit.
(24) Equivalent ton of CO_2 refrigerant per circuit.
(25) Year of production.
(26) Date of end of line test of the unit.
(27) Type of refrigerant and global warming potential (GWP).
(28) Refrigerant group.
(29) Unit weight.
(30) Message: “This product is used for Air Conditioning. Contains fluorinated greenhouse gases covered by the Kyoto Protocol. Hermetically sealed equipment”.

2.- INSTALLATION

When unpacking the machine, have a correct segregation of non-hazardous waste coming from packaging: Plastic film or other plastic elements, metal strips, wood and pallets, through authorized dealers, or segregate
them in the containers destined for this purpose
Follow the installation instructions established in this manual to avoid disturbing noise caused by movement or shocks due to deficient installation of the unit.

2.2.- SITE AND SHIPPING GUIDANCE

All INSTALATION, SERVICE, and MAINTENANCE operations must be carried out by QUALIFIED PERSONNEL

The unit must be transported in a HORIZONTAL POSITION on its metal bedplate profiles. Any other position may cause serious damage to the machine.
When the unit is received, it should be checked to assure that there are no bumps or other damage, following the instructions on the packaging. If there is damage, the unit may be rejected by notifying the Redge Distribution Deparent and reporting why the machine is unacceptable on the transport agent's delivery notice. Any later complaint or claim made to the Redge Distribution Deparent, for this type of anomaly, cannot be considered under the Guarantee.
Sufficient space must be allowed to facilitate placement of the unit. The unit may be mounted outdoors. There should be adequate drainage around the unit.
In heat pump units during defrost cycle, the units produce a great amount of water melting the ice off coils.
If you wish to drain the water, adequate drainage should be installed behind the unit to collect and carry out the water where desired.

When positioning the unit, be sure that the Rating Plate will always be visible since this data will be necessary to assure proper maintenance.

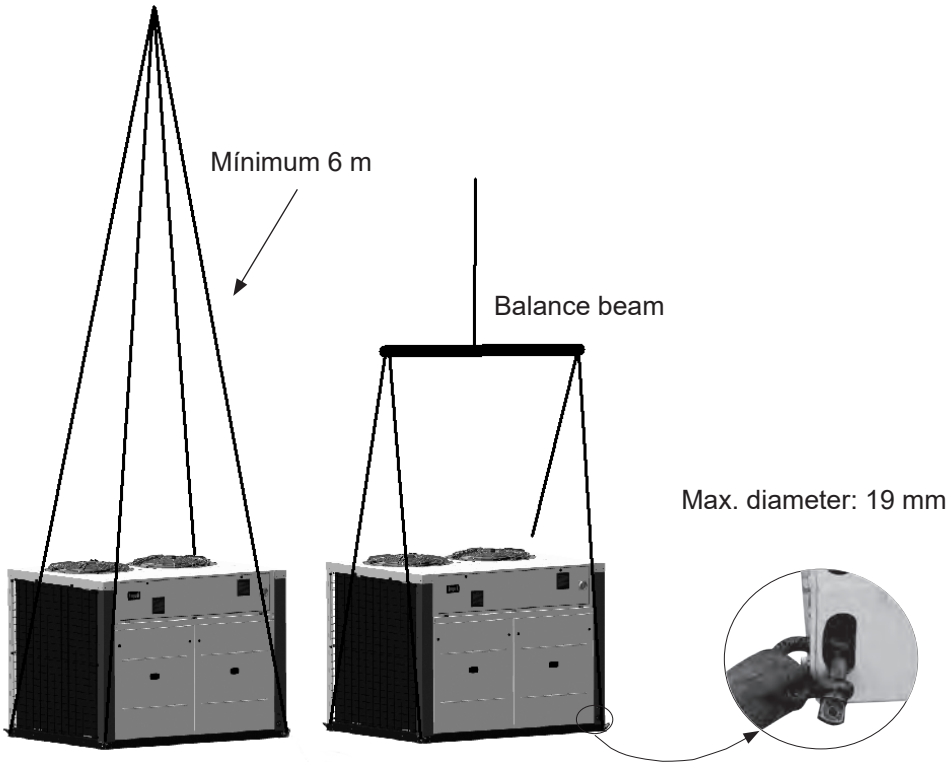
It is advisable to unpack the unit at the place where the unit is going to be installed, to avoid damages during manage.

2.3.- UNIT LIFTING

How to hoist the unit

If unloading and placement requires the use of a crane, then secure the suspension cables as shown in the figure.
The unit can only be lifted and moved by its base.

WITH HOOK OR
WITH BALANCE BEAM

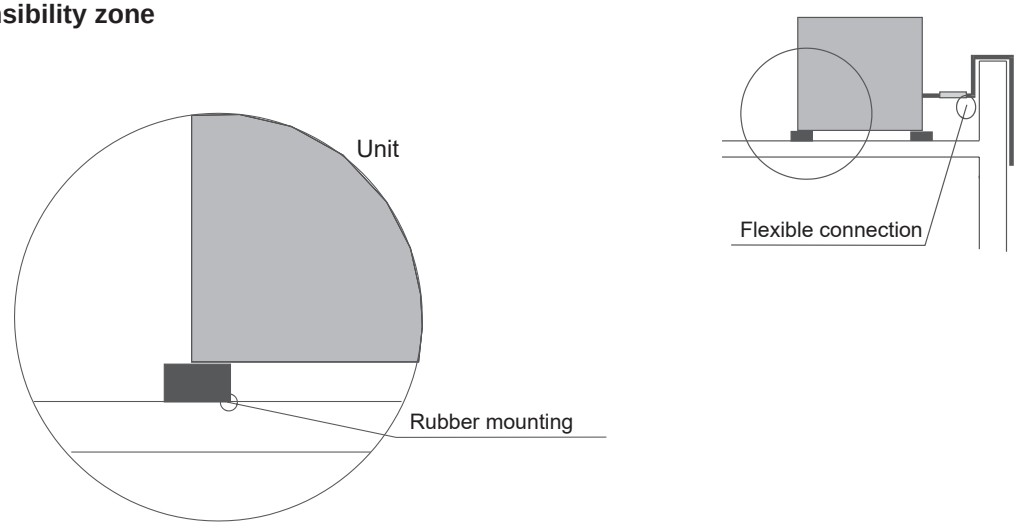


NOTE: Use slingers of 6m with the hook in order to prevent pressure on the top of the unit because it can be damaged. Whenever it is possible, use balance beam.

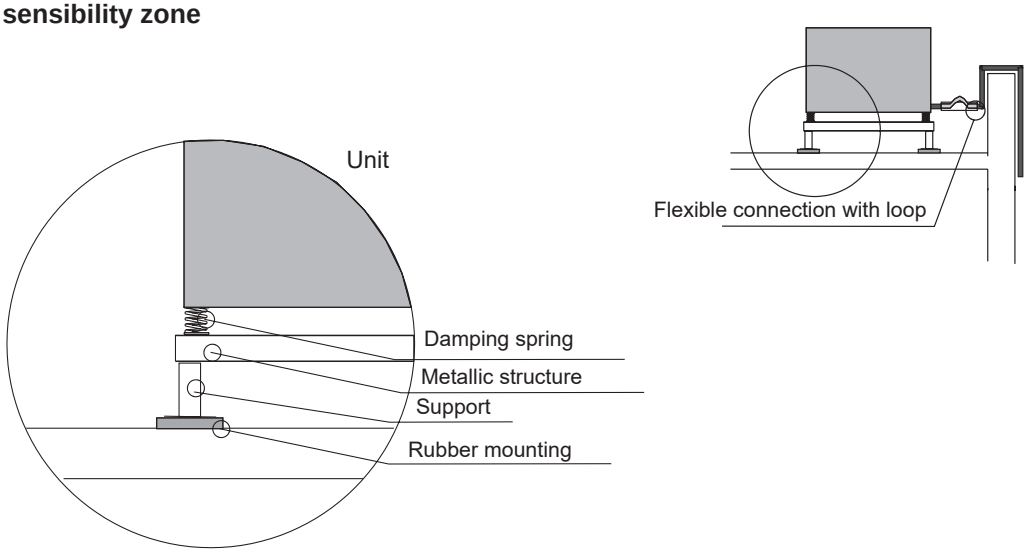
2.- INSTALLATION

2.4.- ANTIVIBRATION MOUNTING

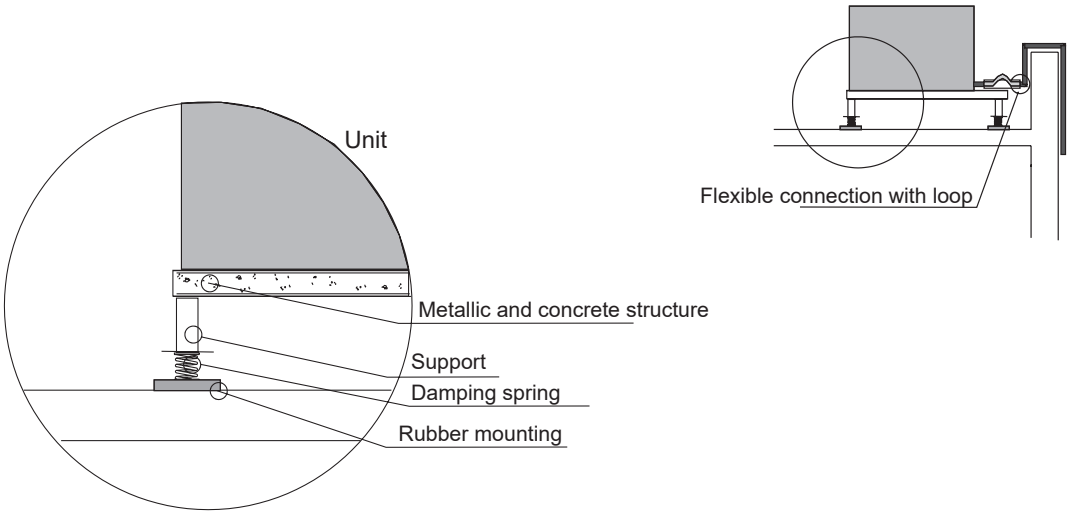
1. Mounting on a low sensibility zone



2. Mounting on a medium sensibility zone

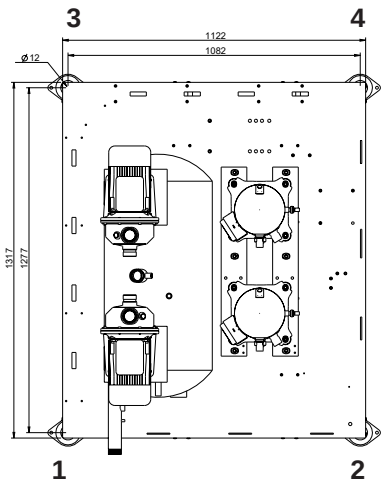


3. Mounting on a high sensibility zone (Check floor load)

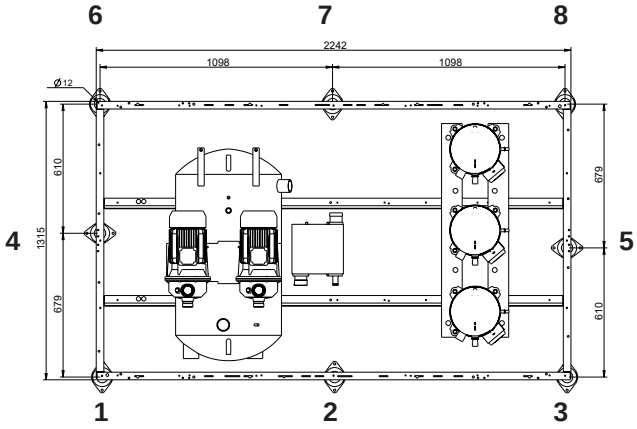


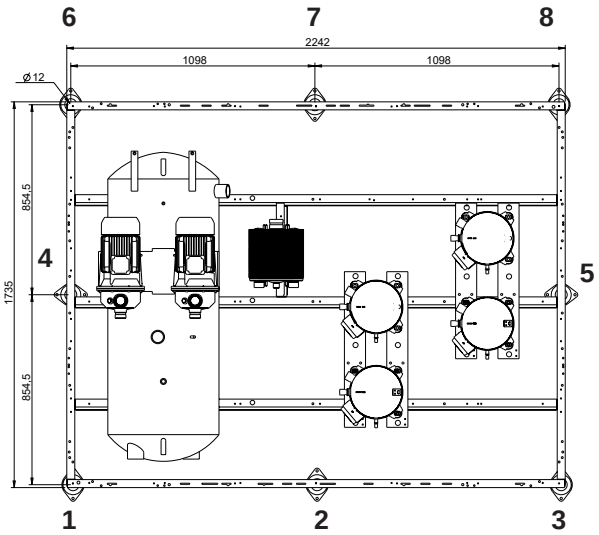
2.- INSTALLATION

2.5.- WEIGHT DISTRIBUTION (kg) - Units with water tank



Nr. Position	STD Unit					With Dual Pump					With Dual Pump & Water tank				
	1	2	3	4	Total (Kg)	1	2	3	4	Total (Kg)	1	2	3	4	Total (Kg)
GAC020SM2M	81	74	78	79	312	92	88	93	84	357	135	124	135	107	502
GAC025SM2M	83	75	80	81	319	94	90	95	85	364	137	126	137	108	509
GAC030SM2M	89	81	86	87	342	101	97	101	91	390	144	133	144	114	535
GAC035SM2M	95	86	92	93	366	107	103	108	97	414	151	139	151	119	559
GAC040SM2M	96	88	93	95	371	108	104	109	98	419	152	140	152	120	564
GAC045SM2M	100	91	97	98	386	112	108	113	102	434	156	143	156	123	579
GAH020SM2M	87	79	84	85	335	98	94	99	89	380	142	130	142	111	525
GAH025SM2M	88	80	85	87	341	100	96	100	90	386	143	132	143	113	531
GAH030SM2M	96	87	93	94	370	108	104	109	98	418	152	139	152	119	563
GAH035SM2M	102	93	99	100	394	114	110	115	103	442	158	145	158	125	587
GAH040SM2M	104	94	100	102	400	116	111	116	105	448	160	147	160	126	593
GAH045SM2M	109	99	105	107	421	121	116	122	110	469	166	152	166	130	614





Nr. Position	STD Unit									With Dual Pump									With Dual Pump & Water tank								
	1	2	3	4	5	6	7	8	Total (Kg)	1	2	3	4	5	6	7	8	Total (Kg)	1	2	3	4	5	6	7	8	Total (Kg)
GAC055SM2M	79	72	68	72	69	77	74	90	602	90	79	75	89	77	86	79	85	660	133	115	98	134	105	124	115	132	955
GAC060SM2M	83	75	71	75	72	80	77	93	627	94	82	77	92	79	89	82	88	685	137	118	101	137	108	127	118	135	980
GAC070SM2M	87	79	74	79	76	84	81	98	657	98	86	81	96	83	93	86	92	715	141	121	104	141	111	131	121	139	1010
GAC080SM2M	93	85	80	85	81	90	87	105	706	105	92	86	103	89	99	92	99	764	148	127	109	148	116	138	127	146	1059
GAH055SM2M	85	77	73	77	74	83	79	96	645	96	84	79	95	82	91	84	91	703	139	120	103	140	110	130	120	137	998
GAH060SM2M	90	82	77	82	79	87	84	102	683	101	89	84	100	86	96	89	96	741	144	124	106	145	114	135	124	143	1036
GAH070SM2M	94	86	81	86	82	92	88	107	715	106	93	87	104	90	100	93	100	773	149	128	110	149	117	139	128	147	1068
GAH080SM2M	102	93	87	93	89	99	95	115	773	114	100	94	112	96	108	100	107	831	157	135	116	158	124	146	135	155	1126
GAC090SM2M	103	114	116	103	110	103	114	113	876	118	120	121	122	113	118	113	117	941	169	163	169	169	156	163	156	156	1301
GAC110SM2M	105	116	118	105	112	105	116	115	892	120	122	123	124	115	120	115	119	957	171	165	171	171	158	165	158	158	1317
GAC125SM2M	105	116	118	105	112	105	116	115	892	120	122	123	124	115	120	115	119	957	171	165	171	171	158	165	158	158	1317
GAC110DM2M	117	129	131	117	124	117	129	128	989	132	134	136	137	127	132	127	131	1054	180	178	177	179	170	178	177	176	1414
GAC125DM2M	118	130	132	118	125	118	130	129	1000	133	135	137	138	128	133	128	132	1065	181	180	178	180	171	180	178	177	1425
GAH090SM2M	109	121	122	109	116	109	121	120	927	124	126	128	129	119	124	119	123	992	172	170	169	171	162	170	169	168	1352
GAH110SM2M	117	129	131	117	124	117	129	128	995	133	135	137	138	127	133	127	131	1060	180	179	178	180	170	179	178	177	1420
GAH125SM2M	117	129	131	117	124	117	129	128	995	133	135	137	138	127	133	127	131	1060	180	179	178	180	170	179	178	177	1420
GAH110DM2M	125	138	140	125	133	125	138	137	1061	141	143	145	146	135	141	135	140	1126	189	187	186	188	178	187	186	185	1486
GAH125DM2M	127	139	142	127	134	127	139	138	1073	142	145	147	148	137	142	137	141	1138	190	189	187	190	180	189	187	187	1498

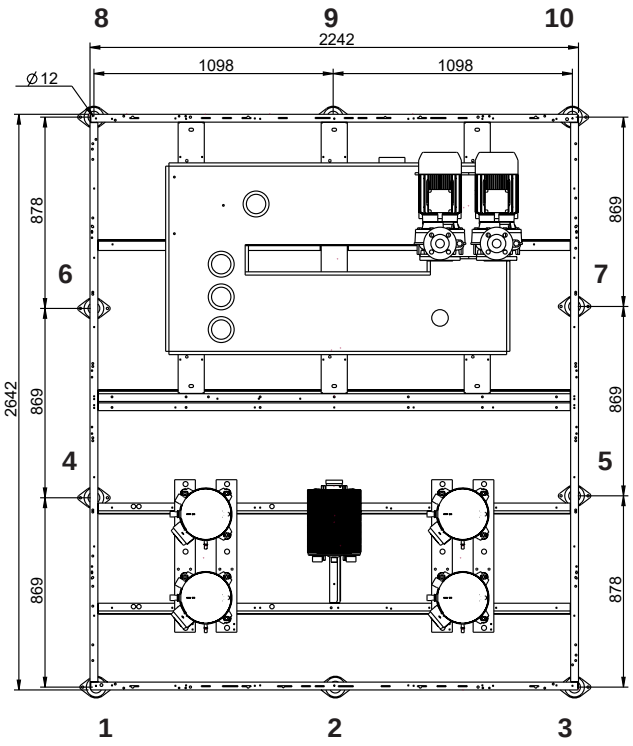
2.- INSTALLATION

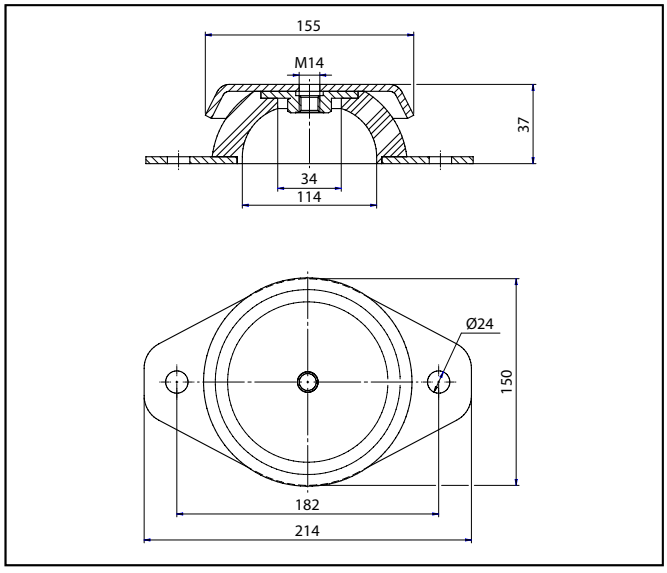
2.5.- WEIGHT DISTRIBUTION (kg) - Units with water tank

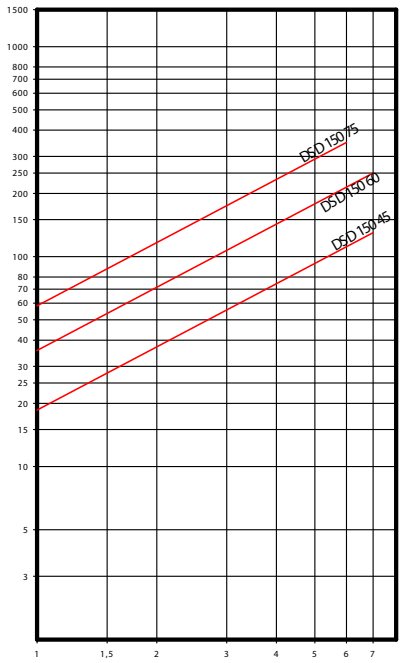
Nr. Position	STD Unit										
	1	2	3	4	5	6	7	8	9	10	Total (Kg)
GAC140DM2M	151	150	153	149	147	143	142	123	122	122	1401
GAC160DM2M	163	161	164	160	158	154	152	133	131	131	1508
GAC185DM2M	170	169	172	167	165	161	159	139	137	137	1575
GAH140DM2M	160	159	162	157	156	151	150	131	129	129	1483
GAH160DM2M	172	170	174	169	167	162	161	140	139	139	1592
GAH185DM2M	180	178	181	176	175	170	168	146	145	145	1663

Nr. Position	With Dual Pump										
	1	2	3	4	5	6	7	8	9	10	Total (Kg)
GAC140DM2M	162	165	161	156	155	150	149	137	137	146	1518
GAC160DM2M	174	177	172	167	166	161	159	146	146	156	1625
GAC185DM2M	181	184	179	174	173	168	166	152	152	162	1692
GAH140DM2M	171	174	170	165	163	158	157	144	144	154	1600
GAH160DM2M	183	186	181	176	174	169	168	154	154	164	1709
GAH185DM2M	190	194	189	183	182	176	174	160	160	171	1780

Nr. Position	With Dual Pump & Water tank										
	1	2	3	4	5	6	7	8	9	10	Total (Kg)
GAC140DM2M	191	187	189	191	193	191	195	243	248	271	2098
GAC160DM2M	201	196	198	201	203	201	205	256	260	284	2205
GAC185DM2M	207	202	205	207	209	207	211	264	268	293	2272
GAH140DM2M	198	194	196	198	201	198	203	253	257	281	2180
GAH160DM2M	208	204	206	208	211	208	213	266	270	295	2289
GAH185DM2M	215	210	212	215	217	215	220	274	279	304	2360







2.- INSTALLATION

2.6.- INSTALLATION CLEARANCES

Clearance around the unit, for any unit version. Keep this space free around the unit for installation.
Failure to install the units as shown will impact performance and reliability.

	STANDARD VERSION	UNIT WITH STANDARD EC FANS (SEAS) OR HIGH PRESSURE EC FANS (HIPF)
GAC/H 020S-025S-030S-035S-040S-045S		
GAC/H 055S		
GAC/H 060S-070S-080S		
GAC 090S-110S-125S		

2.6.- INSTALLATION CLEARANCES

Clearance around the unit, for any unit version. Keep this space free around the unit for installation.
Failure to install the units as shown will impact performance and reliability.

	STANDARD VERSION	UNIT WITH STANDARD EC FANS (SEAS) OR HIGH PRESSURE EC FANS (HIPF)
GAC 110D-125D GAH 090S-110S-125S		
GAC/H 140D		
GAC/H 160D-185D		

2.- INSTALLATION

2.7.- UNIT INSTALLATION

1. The eComfort units could be installed outside or inside.
2. See the minimum clearance diagrams for access - air supply to the batteries in the heating section of the unit.
3. Assemble the unit on a solid and resistant base, preferably concrete. To prevent vibrations, the concrete base should not come into contact with the building's foundations.
4. It is advisable to assemble the unit on shock absorbers (antivibration mountings).
5. During heating mode (heating pump coolers) ice forms in the coils. The defrost process is activated during heating mode in heat pump units, when the outside temperature is low and the outdoor coil could become frozen. To melt the ice, the defrost function will switch the unit to cooling operation for a short period. When the evaporation temperature starts to drop, a defrost period sets in to provide sufficient heat transfer. During defrosting, the ice melts from the batteries. As a result, the ice contains water which must be removed.

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WARNING
If the unit is exposed for long periods to installation conditions below 0ºC the water from defrost can freeze in the base of the unit. This prevents drainage. Ice build up can occur preventing correct operation. For these conditions contact customer service team.

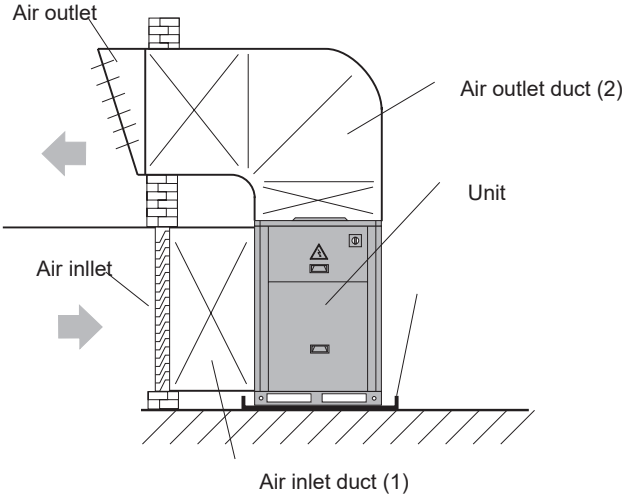
6. The heat exchanger water flow during cooling must be the same as during heating.
7. The use of a water filter in the water circuit upstream of the heat exchanger is mandatory. These filters must remove all particles with a diameter greater than 1 mm, and must be positioned within 1 meter of the inlet of the exchanger. They may be supplied as an option by the manufacturer.

LACK OF FILTER AT THE INLET OF A PLATE HEAT EXCHANGER WILL MAKE WARRANTY VOID.

It is important to follow non exhaustive recommendations hereunder:

- The water pipes must not transmit any radial or axial force to the heat exchangers nor any vibration (Use flexible connections to reduce the transmission of vibrations).
- Manual or automatic air bleeders must be installed at all high points in the circuit(s).
- Drain connections must be installed at all low points to allow the whole circuit to be drained.
- An expansion device must be installed to maintain pressure in the circuit(s) as well as a safety device
- Comply with the water inlet and outlet connections shown on the unit.
- Install thermometers in both the entering and leaving water connections.
- Install stop valves, close to the entering and leaving water connections.
- After testing for leaks, insulate all pipe work, to reduce thermal leaks and to prevent condensation.
- If the external water pipes are in an area, where the ambient temperature is likely to fall below 0°C, insulate the piping and add an electric heater. As an option, the internal unit piping is protected.
- Ensure full earthling continuity
- Connection pipes must under no circumstances generate strain on the piping system of our units. To do this, appropriate means of support and fastening must be used.
- Respect a sufficient number of supports for the piping according to their size and weight under operating conditions and to design the piping to avoid a water hammer phenomenon.

8. Use water treating if necessary.
9. Location inside:





2.- INSTALLATION

For location inside, keep in mind following advice:

- In heat pump units during defrost cycle, the units produce a great amount of water melting the ice off coils. If you wish to drain the water, adequate drainage should be installed below the unit to collect and carry out the water where desired.
- Air duct installation:

If the air duct has been installed, the operating limits get reduced.

10. For cooling or heat pump units the hydraulic system must contain the following components pump, buffer tank, expansion device, safety valve, water filter, flow switch.
11. To obtain the total water system pressure drop add the unit pressure drop + water pipework + fittings and terminal unit pressure drops the water pump can be selected to provide the correct water flow across the heat exchanger.
12. A water balancing valve is advised to ensure correct water flow.
13. Pressure safety controls must be guaranteed and ensured:

- The applicable regulations and standards (for example: EN 378-2) will be followed, to apply the appropriate control and guarantee that the pressure never exceeds the maximum limit.
- High pressure protection is required to stop compressor operation outside allowable pressure limits. The high pressure control must be installed correctly, which means that no service valve is allowed between the compressor and the pressure protection.
- The high pressure cut-out setting will be determined according to the applicable standard, the type of system, the refrigerant and the maximum allowable pressure PS.
- Ensure that the pressure never drops below atmospheric pressure. If so, immediately disconnect the power supply to the compressor and check the cause of the low pressure before restarting the compressor.



CAUTION:
Operation outside the field of application: Compressor failure. A low pressure protection is installed on the suction line to stop the compressor when operating outside the limits of the enclosure.

14. A crankcase heater is used to prevent coolant from migrating into the housing during periods of non-use. Installation of a crankcase heater is required when the system load exceeds the load limits stated by the supplier. This requirement is independent of the type and configuration of the system.

Initial field start-up is a very critical period for any compressor because all loading surfaces are new and require a short break-in period to withstand high loads in harsh conditions. The crankcase heater must be turned on a minimum of 8 hours before the compressor is started. This will prevent oil dilution and bearing stress on initial start-up. The crankcase heater must remain energized during compressor off cycles and must be properly grounded.



WARNING:
The crankcase heater is not an ignition source during normal operation, but could become one if not installed correctly in accordance with the installation instructions. Ensure correct electrical and mechanical installation.

15. It is recommended to operate fixed speed scroll compressors with soft-starters. The versions and sizes of the soft-starters must be selected according to the manufacturer's recommendations, taking into account the amps of the compressor. Due to the design of the compressors, the internal compression components start unloaded, even if the system pressures are not balanced. Since the internal pressures of the compressor are balanced at startup, low voltage starting characteristics are excellent and starting components are not normally required.

16. Good system control should prevent the system from operating outside the published operating range and acceptable superheat range, regardless of weather conditions and capacity demand. However, under some extreme operating conditions, such as loss of load or improper control operation, the internal discharge gas temperature reached may damage the compressor. To ensure positive compressor protection, discharge gas temperature protection is required for any application with these compressors.



CAUTION:
Inadequate lubrication: Damage to the scroll assembly. All compressors are equipped with external discharge gas temperature protection.

17. Oil circulation through the system must be ensured at all times (compressor oil return, oil balance, refrigerant reflux and oil dilution). The pipes of the refrigeration system have been designed to guarantee a sufficient velocity of the refrigerant gas, so that the oil returns to the compressor at all times and in all conditions. The calculation of the diameter of the individual pipes depends on the properties of the refrigerant, the pressure level, the mass flow rate and the density.

CAUTION:
Inadequate lubrication: Destruction of bearings and moving parts. Ensure that oil return from the system to the compressor is adequate at all times. There is no return of liquid refrigerant to the compressor. Liquid refrigerant dilutes oil, could wash oil from bearings and moving parts, and could cause overheating and compressor failure.

IMPORTANT

If the outside temperature in the area where the eComfort unit is to be installed is likely to drop below 5°C, it is very important to take the following precautions to avoid that water in the circuit freezing, that may produce damage to the components.

- If unit has to work under low outside temperatures:

* Do not disconnect power supply in order that water pump starts when detects water temperatures below +5 ºC (only Hydraulic and Hydronic models).

* If the outside temperature where the system is to be installed or the water outlet temperature is likely to drop below 5ºC, it is very important to use glycol anti-freeze.
The amount of anti-freeze required will vary depending on the minimum ambient temperature or the water outlet temperature.
When the percentage of glycol increases the standard pump flow decreases, the pressure drop increases and the cooling and thermal capacities drop. As a result the minimum flow must be multiplied by the coefficient shown in the table:

Minimum ambient temperature or water outlet temperature	Ethylene Glycol %	Pressure drop	Water flow	Power input	Capacities	
					Cooling mode	Heating mode
From +5ºc to 0ºc	10%	1,05	1,02	0,997	0,995	0,994
From 0ºc to -5ºc	20%	1,10	1,05	0,996	0,985	0,993
From -5ºc to -10ºc	30%	1,15	1,08	0,995	0,975	0,99
From -10ºc to -15ºc	35%	1,18	1,10	0,994	0,965	0,987

Also is advisable to use the option “evaporator anti freeze protection”

Failure to follow this advice, may result in damage to the installation.

Optionally, an immersion heater can be supplied complete with safety thermostat and pressure switch fitted in the buffer tank of the cooling only chiller. A similar option is available for heat pump versions with the added advantage of a supplementary heating source (Hydronic version units).

Legislation does not allow refrigerant gas emissions to the atmosphere, so the refrigerants have to be recycled to avoid being released to the atmosphere.

Those recycled refrigerants shall be processed afterwards by an authorized waste manager.
Those components derived from the recycling of the unit have to be managed by authorized waste manager or be left in local waste facilities according the local normative in each country.

2.- INSTALLATION

2.8.- ELECTRICAL CONNECTIONS

For safety reasons, Redge recommends that the electrical installation be carried out in accordance with EN 60204-1 and/or other applicable Standards and Regulations.

- BEFORE MAKING ANY ELECTRICAL CONNECTIONS, BE SURE THAT ALL CIRCUIT BREAKERS ARE OPEN AND SUPPLY IS OFF.
- IN ORDER TO CARRY OUT THE ELECTRICAL CONNECTIONS, FOLLOW THE ELECTRICAL DIAGRAM SUPPLIED WITH THE UNIT.
- TAKE INTO ACCOUNT THE CURRENT STANDARD FOR THE INSTALLATION OF THE UNIT, WHETHER LOCAL, REGIONAL OR NATIONAL STANDARDS.
- **USE SUPERINMUNIZED DIFFERENTIAL SWITCHES.**

WARNING:
Electrical connections are not an ignition source during normal operation, but could become one if not installed correctly according to installation instructions. Ensure correct mechanical and electrical installation.

Before connecting the electric power cables (L1 - L2 - L3), it is imperative to check the correct order of the 3 phases before connecting to the main disconnect switch.
Use proper wire terminal material that is compatible to the type of wire (Copper or Aluminum) being used.
Use proper procedures and coatings when using aluminum wires to avoid galvanic corrosion which may lead to a short circuit event.

WARNING:
Electrostatic discharge (ESD): Damage to the communication module. When connecting the wires to the terminal box, be sure to use an antistatic device (for example: antistatic wrist straps) or apply sufficient ESD protection (for example: electrical grounding), as electrostatic discharge can damage electronic components, communication module.

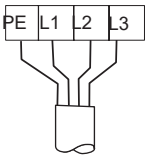
Recommended cable selection

The sizing of the power cables is the responsibility of the installer. it must be done in accordance with the electrical values of each unit (noted at the time of ordering, the firm plate and on the electric diagram) and according to the **regulations of each country**.
The table below is given as an indication and does not engage the responsibility of Redge.
Once the selection is made, the installer must make the adaptations if necessary.
The connections on the main switch of the unit are to be realized with lugs or bars. In case of use of aluminum wires, the customer must use bi-metal terminals.

- WTHH: Water tank electrical heater.
- The cable sections have been calculated based on.
    - A distance of 50m and variation of -10V.
    - XLPE insulation cupper cable over perforated cable tray.
    - Max. Tª: 50ºC.
    - Type of cable in Cu RV-K.
- Do not start the unit if the drop is greater than this.
- Ground wires must be properly connected and have a greater length than the phase wires.

2.- INSTALLATION

2.8.- ELECTRICAL CONNECTIONS

POWER SUPPLY	UNIT MODEL	NUMBER OF WIRE x SECTION			
		COBRE / CUPPER CU		ALUMINIO / ALUMINIUN AL	
		WITHOUT WTHH	WITH WTHH	WITHOUT WTHH	WITH WTHH
 3 ~ 400V-50Hz + PE	**20SM2M**	4G x 6 mm²	4G x 6 mm²	4G x 6 mm²	4G x 10 mm²
	25SM2M	4G x 6 mm²	4G x 10 mm²	4G x 6 mm²	4G x 10 mm²
	30SM2M	4G x 6 mm²	4G x 10 mm²	4G x 10 mm²	4G x 16 mm²
	35SM2M	4G x 6 mm²	4G x 10 mm²	4G x 10 mm²	4G x 16 mm²
	40SM2M	4G x 6 mm²	4G x 16 mm²	4G x 10 mm²	4G x 16 mm²
	45SM2M	4G x 10 mm²	4G x 16 mm²	4G x 10 mm²	4G x 25 mm²
	55SM2M	4G x 10 mm²	3 x 25 mm² 1 x 16 mm²	4G x 16 mm²	3 x 35 mm² 1 x 16 mm²
	60SM2M	4G x 16 mm²	3 x 35 mm² 1 x 16 mm²	4G x 25 mm²	3 x 50 mm² 1 x 25 mm²
	70SM2M	4G x 16 mm²	3 x 35 mm² 1 x 16 mm²	3 x 35 mm² 1 x 16 mm²	3 x 50 mm² 1 x 25 mm²
	80SM2M	4G x 25 mm²	3 x 35 mm² 1 x 16 mm²	3 x 35 mm² 1 x 16 mm²	3 x 70 mm² 1 x 25 mm²
	90SM2M	3 x 25 mm² 1 x 16 mm²	3 x 50 mm² 1 x 25 mm²	3 x 50 mm² 1 x 16 mm²	3 x 95 mm² 1 x 35 mm²
	110SM2M	3 x 35 mm² 1 x 16 mm²	3 x 70 mm² 1 x 35 mm²	3 x 70 mm² 1 x 25 mm²	3 x 95 mm² 1 x 50 mm²
	125SM2M	3 x 50 mm² 1 x 16 mm²	3 x 70 mm² 1 x 35 mm²	3 x 70 mm² 1 x 35 mm²	3 x 120 mm² 1 x 50 mm²
	110DM2M	3 x 35 mm² 1 x 16 mm²	3 x 70 mm² 1 x 35 mm²	3 x 50 mm² 1 x 25 mm²	3 x 95 mm² 1 x 50 mm²
	125DM2M	3 x 50 mm² 1 x 25 mm²	3 x 70 mm² 1 x 35 mm²	3 x 70 mm² 1 x 35 mm²	3 x 120 mm² 1 x 70 mm²
	140DM2M	3 x 70 mm² 1 x 25 mm²	3 x 95 mm² 1 x 50 mm²	3 x 95 mm² 1 x 35 mm²	3 x 150 mm² 1 x 95 mm²
	160DM2M	3 x 70 mm² 1 x 35 mm²	3 x 120 mm² 1 x 50 mm²	3 x 95 mm² 1 x 50 mm²	3 x 150 mm² 1 x 95 mm²
	185DM2M	3 x 95 mm² 1 x 35 mm²	3 x 120 mm² 1 x 70 mm²	3 x 120 mm² 1 x 70 mm²	3 x 185 mm² 1 x 95 mm²

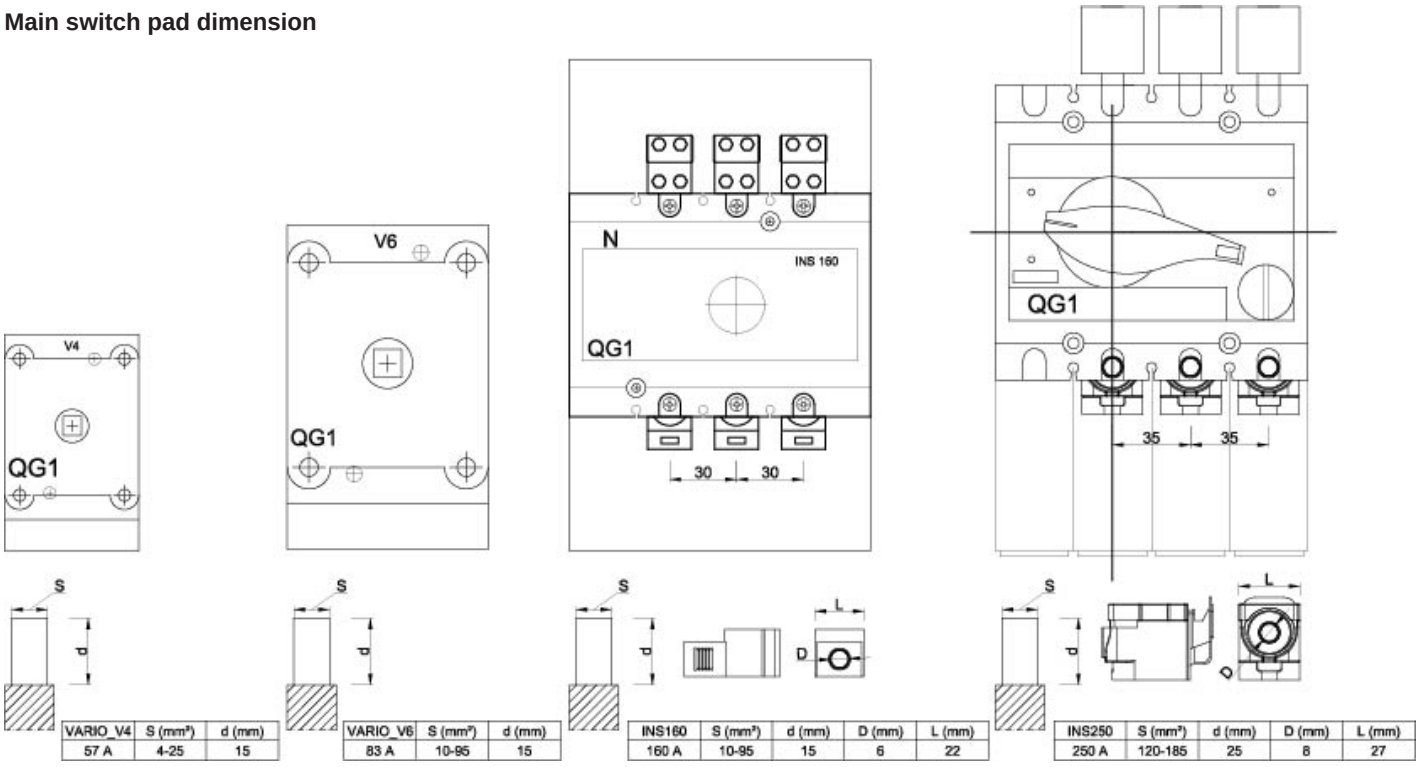
2.- INSTALLATION

2.8.- ELECTRICAL CONNECTIONS

VOLTAGE OPERATION LIMITS

MODELS	VOLTAGE	LIMITS
GAC/GAH 020-185	3~400V-50Hz ±5%	3~360-440V-50Hz

Main switch pad dimension



VARIO_V4	S (mm²)	d (mm)
57 A	4-25	15

VARIO_V6	S (mm²)	d (mm)
83 A	10-95	15

INS160	S (mm²)	d (mm)	D (mm)	L (mm)
160 A	10-95	15	6	22

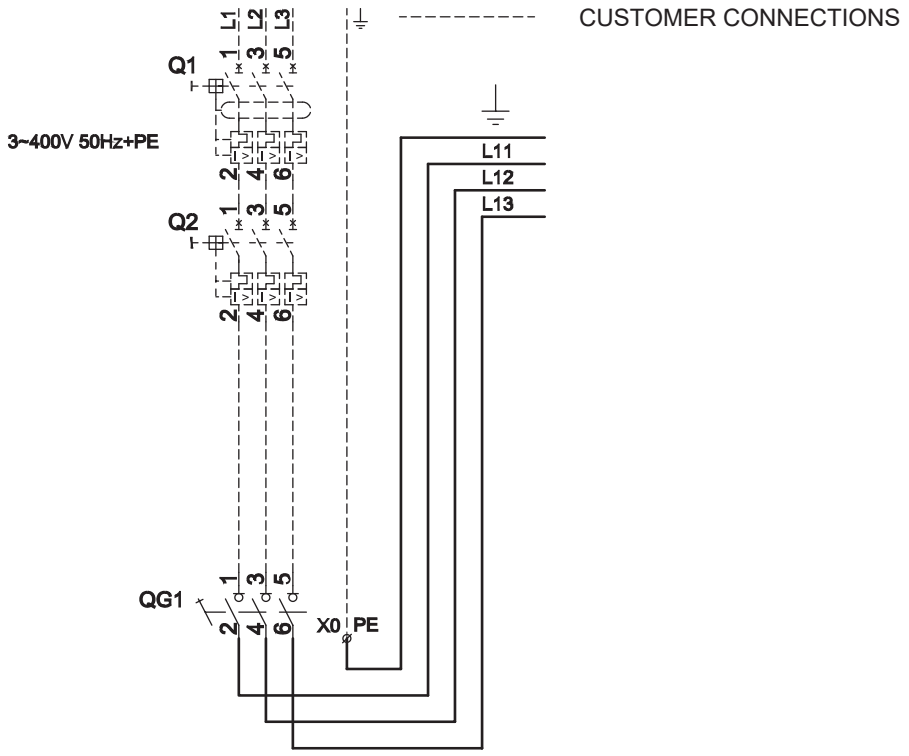
INS250	S (mm²)	d (mm)	D (mm)	L (mm)
250 A	120-185	25	8	27

2.- INSTALLATION

2.8.- ELECTRICAL CONNECTIONS

Customer protection information

In order to protect our unit, Redge recommends the implementation of this type of protection upstream. There are two options available, either circuit breaker protection or fuse protection.
The customer must provide the necessary equipment in his installation to protect the power line that feeds our unit.
A differential of 300mA is recommended.
If the unit is equipped with variable condenser fans or variable speed pumps or compressor, a type B differential is recommended.



Wiring of remote elements

- Avoid electromagnetic interference around the cables of remote elements.
- Do not run power or lighting cables and control cables in the same cable tray (minimum 50cm separation).
- Keep cables apart when they cross.
- The lengths given below are indicative and depend on the environment in which it is located:

REFERENCE	LENGTH MAX.	CONNECTION TYPE	CABLE TYPE
AD0	50m	Phone cable (RJ12)	Flat phone cable 0,25mm² (Shielded)
AD2	500m		Li-2YCY 1x2x0,5 ou Li-2YCY 1x2x0,34 (Shielded, twisted)
AD3	50m	Phone cable (RJ12)	Flat phone cable 0,25mm² (Shielded)
pLan, Bus	500m		Li-2YCY 1x2x0,5 ou Li-2YCY 1x2x0,34 (Shielded, twisted)
BS0 ,BH10 , BH15	200m		Li-YCY 2x0,75 ou Li-YCY 2x1 (Shielded)

2.9.- PARTIAL HEAT RECOVERY OPTION

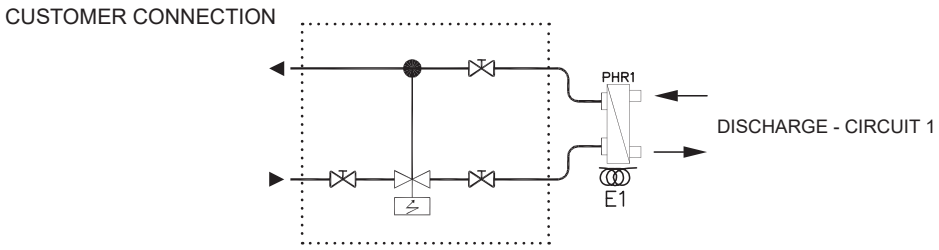
The aim of the Partial Heat Recovery (PHRF) is to recover temperature heat from the compressor discharge gases by means of a condensing water heat exchanger.

The heat recovery capacity depends on the operating conditions (the compressor discharge temperature comes from the HP/LP ratio), on the number of compressor running, on the water flow and on the water inlet temperature.

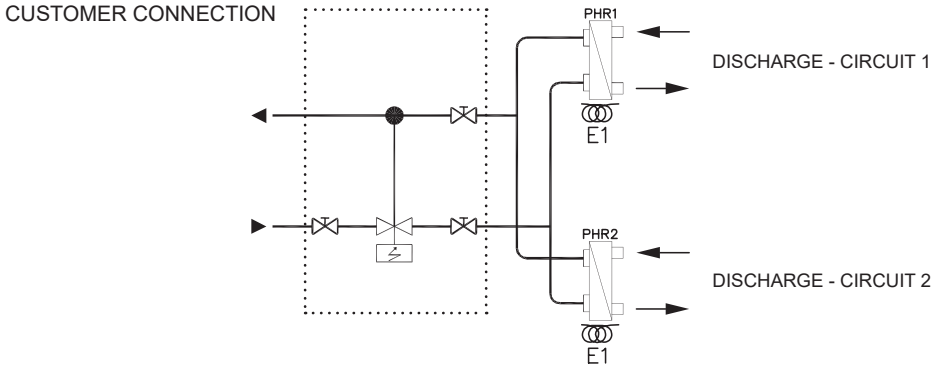
The unit will always be driven by the air conditioning load. In any case, if there is no load on the cooling side, the unit will not be able to generate heat. The heat capacity will always be in accordance with the cooling capacity and the absorbed power of the unit.

The simplest regulation we recommend: a 3-way valve with a regulation on the water temperature.
All regulation should be managed by the customer.

GAC-H 090S-110S-125S



GAC-H 110D-125D-140D-160D-185D



3.- COMMISSIONING AND OPERATION

Redge REFAC, S.A. Designs and develops its machines always looking for the greater comfort and well-being of its customers and users, at the same time as the greater energy efficiency of the elements that constitute the units. This effort would be fruitless if it was not united to a responsible use of these equipment. For this reason, we invite you to use these machines in a responsible way with the environment, combining the adequate comfort, with a responsible consumption of the energy resources.

WARNING: Diesel Effect: System explosion. The mixture of air and oil at high temperature can lead to an explosion. Avoid operating with air.

IMPORTANT: Oil dilution: bearing malfunction. It is important to ensure that new compressors are not subject to fluid abuse. It is mandatory to have a crankcase heater installed if the refrigerant charge exceeds the charge limits indicated in the supplier's tables. It is recommended to turn on the crankcase heater 12 hours before starting the compressor.

3.1.- STEPS TO FOLLOW FOR COMMISSIONING THE UNITS

PRELIMINARY CHECKING

Before starting up the unit, the following points should be checked:
1.- Check that the voltage coincides with that indicated on the characteristics plate.
2.- Check that the wired remote control is connected according to the electrical diagram (if it is included).
3.- Make sure that the water connections to the unit (inlet and outlet) are correct and have not been changed, since the flow switch will not work if the connections are exchanged. Check that the water circuits are connected to the heat exchangers (eg no reversal between evaporator and condenser or between water inlets and outlets). The water circulation pump will preferably be installed upstream so that the evaporator / condenser is subjected to positive pressure. Input and output connections are indicated on the certified drawing shipped with the unit or shown in the catalogue. The use of a filter in the water circuit located upstream of the heat exchanger is mandatory. These filters must remove all particles with a diameter greater than 1 mm and must be placed a maximum of 1 meter from the exchanger inlet.
4.- Check that the main switch is “ON”.
5.- The compressor must not be started before the crankcase heater has acted for at least 8 hours.
- It incorporates an electrical resistance, to ensure the separation between the refrigerant fluid and the oil in the crankcase, which works when the compressor stops and stops working when the compressor starts.
- About eight hours before starting up or after a prolonged stoppage of the unit, you must power up the unit and turn the switch ON for said resistance to act.
- The compressor starts some time after the water pump has been started.
6.- Check the direction of rotation of the water pump.
7.- Check if there is air in the water circuit. Purge if necessary.
8.- Check that the fan rotates freely.
9.- Ensure the tightness in the refrigeration circuit.

WARNING: High pressure: Personal injury. Consider personal safety requirements and check test pressures prior to testing.
Use only dry inert gases (for example: nitrogen) for leak testing. Do not use other industrial gases and never add refrigerant to the test gas (as a leak indicator).

10.- Specify the details of the installation with the installer, verifying:
- Absence of explosive atmosphere or flammable gas in the environment.
- Adequate ventilation according to the volume of the room and the refrigerant charge.
- Visual control of electricity (wiring, fuses,...).
- Cable glands in good condition, all electrical connections well connected and terminal box closed to guarantee the corresponding IP protection.
- Visual inspection of the unit in search of leaks, components and loose cables in the electrical installation,...
- Functional test of high and low pressure switches and any pressure actuated valves.
- Setting and operation of all safety functions and protection devices.
- Valves in the correct operating position.
- Pressure gauges and compounds installed.
- Correct charge with refrigerant.
- Location and position of the electrical auxiliary switch of the compressor.

3.- COMMISSIONING AND OPERATION

3.1.- STEPS TO FOLLOW FOR COMMISSIONING THE UNITS

11.- In case it is necessary to charge the unit with refrigerant, the following recommendations must be followed:
- Before charging or recharging, the system must be leak tested and pressure tested with the appropriate purge gas.
- Make sure that the refrigerant circuit is grounded before loading it with refrigerant.
- The system will be charged with liquid through the liquid receiver shutoff valve or through a valve in the liquid line. The use of a filter drier in the charging line is strongly recommended. Since scroll compressors have discharge check valves, the systems will be charged with liquid on the high and low sides simultaneously to ensure there is positive refrigerant pressure in the compressor before it runs.
- Extreme care must be taken not to overfill the system with refrigerant. The manufacturer/installer of the system must respect he load limitations according to current standards, such as EN 378-2.

12.- In the event that it is necessary to empty the refrigerant unit, the recommendations described above must be followed.

CAUTION: Vacuum operation: Damage to the compressor. Compressor operation outside the operating range is not allowed.

Always check before starting the unit that the three-phase compressor rotates correctly by means of a phase detector. Scroll type compressors only compress in one direction of rotation. It is essential that the connection of phases in three-phase compressors, SCROLL type, is carried out properly (it is verified that the direction of rotation is correct when the suction pressure decreases and the discharge pressure increases when the compressor is activated. If the connection is incorrect , rotation will be reversed, causing a high noise level and reduced current consumption, and if this occurs, the internal protection of the compressor will be activated, stopping it; this is solved by disconnecting and reconnecting, exchanging the connection of two of the three phases).

REMEMBER THAT THE COMPRESSOR IS A SCROLL TYPE COMPRESSOR

COMMISSIONING

Once the above points have been verified, the unit can be started up taking into account the following points:
1.- Adjust the control for the desired operating mode of the unit.
2.- Check the perfect operation of the compressor.
- These compressors will only compress in one direction of rotation. Observing that the suction pressure drops and the discharge pressure rises when the compressor is energized allows verification of the proper direction of rotation.
- Occasionally, during starts and stops, a characteristic metallic noise is produced when the compressor spirals come into contact.
- When shutdown occurs, scroll compressors incorporate a device that minimizes reverse rotation. Residual momentary reversal of the rolls at power off could cause a clicking sound. It is completely normal and has no effect on your durability.
3.- Check the oil level in the compressor, if it includes a sight glass, (when the compressor stops, the level must be between 1/4 and 3/4 of the sight glass, while during operation, the level must be between 3/4 and full viewfinder). If you have to add oil, remember that it must be compatible with the one included in the compressor.
- It is recommended that the oil level should be kept at the midpoint of the sight glass.
4.- Check that the operating pressure values are normal.
5.- Measure the electrical consumption of the unit.
6.- Check the electrical consumption of the compressor and the fans as specified in this manual.
7.- If the unit is a Heat Pump, change the cycle, checking that the 4-way valve makes the change correctly. It is recommended to check pressures in the new cycle.

3.- COMMISSIONING AND OPERATION

3.2.- UNIT OPERATION: REFRIGERATION CIRCUIT

OIL CHARGE:

All units are delivered with a complete oil charge, and there is no need to add any oil before start up or afterwards. When a compressor is replaced, it may be necessary to add a certain amount of oil. Oil level must be between one third and two third of the sight glass of compressor when unit is idle for 30 min. Overcharging with oil can cause serious problems on an installation, particularly for the compressors.

3.3.- UNIT OPERATION: ELECTRICAL AND CONTROL FEATURES

See the specific manual for the «CLIMATIC» control.

1.- Fan over current protection:
Circuit breaker designed to stop the fan motors in the event of phase over current in relation to the permitted value.

2.- Compressor motor over current protection:
Circuit breaker designed to protect each motor winding against accidental over current.

3.- Chilled liquid pump interlock:
This interlock is made only if the the pump is supplied with the liquid chiller. As soon as the unit is powered up and the remote on/off for the unit is validated, the pump starts running. Prior operation of the pumps is mandatory for compressor operation.
Note: on units with CLIMATIC control, control of 1 or 2 water pumps is catered for by the control program.

4.- Flow switch for the chilled liquid:
This control device initiates unconditional unit stoppage as soon as the flow of chilled liquid (water, brine, etc...) ensured by the pump becomes insufficient, since this could cause rapid evaporator freeze up. When the contact opens due to a lack of flow the unit must stop immediately.
If the purchaser installs a flow switch himself, electrical connections should be made to the two remote interlock terminals (dry contact).

5.- Antifreeze protection (standard):
This feature is provided as standard by the climatic controller: and can be adjusted for brine or glycol/water chilling for which the freezing temperature depends on the concentration of the solution.
The antifreeze protection causes an immediate shut down of the unit.
The controller monitors the chilled water outlet temperature. It then triggers the fault if the temperature goes below the set point value (+3°C for water).

6.- Loss of power supply:
There are no problems restarting the machine after a loss of power supply of short duration (up to about one hour). If loss of power supply lasts longer than this, when power supply is resumed set the unit to «OFF» with the compressor crankcase heaters activated for as long as it takes to bring sump oil back up to temperature, then restart the unit.

3.4.- CLIMATIC CONTROL

See the specific manual for the «CLIMATIC» control.

3.- COMMISSIONING AND OPERATION

3.5.- CHECKING THE WATER FLOW RATE

It is very important that the unit operates at the correct water flow rate. It is dangerous to leave the unit operating at a low flow rate as this could result in serious damage to components as well as the water exchanger. If the unit operates at too high a flow rate, this will also hinder optimum performance. The best way of determining the operating flow rate is to measure the temperature difference between the inlet and water outlet.

Checking the water flow rate (it is vital to measure the thermal peak) (Standard unit)
For nominal and minimum water flow the difference between the inlet and water outlet temperature should be 5ºC (cooling and heating pump units in cooling cycle only) for an inlet temperature of 12°C, an outlet temperature of 7°C and an outside temperature of 35°C. If these conditions change, the unit capacity will also change and as a result for nominal flow the difference between the inlet and water outlet temperature will vary slightly from 5ºC as can be seen in the following table, based on nominal flow rate.

	ΔT (Water inlet temperature - Water outlet temperature)						
	Outside temperature (ºC)						
Water outlet ºC	**15**	**20**	**25**	**30**	**35**	**40**	**45**
7	6,1	5,8	5,5	5,3	5,0	4,7	4,4
9	6,5	6,2	5,9	5,6	5,3	5,0	4,7
11	7,0	6,7	6,4	6,0	5,7	5,4	5,0

If the unit must be started in the heating cycle and if you wish to operate at nominal cooling rate, the following shows the approximate differences between the inlet and water outlet temperatures for the various conditions.

	ΔT (Water inlet temperature - Water outlet temperature)				
	Outside Temperature (ºC BH)				
Water outlet ºC	**-6**	**0**	**6**	**12**	**18**
35	4,5	5,5	6,5	7,5	8,5
50	4	5	6	7	8

NOTES:

- The unit control system displays the inlet and water outlet temperature to be displayed. See the Control Description section.
- Check that the correct water pump has been selected, taking into account the loss of pressure in the hydraulic system. It is dangerous to let the unit run at a low rate and any faults which may result will not be covered under warranty.
- Do not start up the air conditioning units or the fan coils until the water temperature reaches the set temperature or use an automatic control device which cancels the air conditioning unit operation if the installation is not properly set.
- When everything is operating normally, take a reading of all the data and **fill out the Commissioning Sheet.**

3.6.- WATER ANALYSIS

The water must be analyzed. According to the results of the analysis, the installed hydraulic network must include all the necessary elements for the water treatment: filters, additives, intermediate exchangers, purge valves, vents, isolation valves, etc,...

We do not advise operation of the units with open loops which can cause problems with oxygenation, or operation with untreated ground water.

The use of untreated, or improperly treated, water can lead to scale, algae and sludge build-up, or corrosion. It is advisable to consult a qualified water treatment specialist to determine the type of treatment required. The manufacturer cannot be held responsible for damage caused by the use of untreated or improperly treated water, salt water or seawater.

Here are our non exhaustive recommendations given as an indication:

- No NH4+ ammonium ions in the water, they are very detrimental for copper <10mg/l.
- Cl- Chloride ions are detrimental for copper with a risk of perforations by corrosion by puncture. < 10 mg/l.
- SO42- sulphate ions can cause perforating corrosion.< 30 mg/l.
- No fluoride ions (<0.1 mg/l).
- No Fe2+ and Fe3+ ions with dissolved oxygen. Dissolved iron < 5 mg/l with dissolved oxygen < 5 mg/l. Over those values, it means a corrosion of steel which may generate a corrosion of copper parts under deposite of Fe – this is mainly the case with shell and tube heat exchangers.
- Dissolved silicon: silicon is an acid element of water and can also lead to corrosion risks. Content < 1mg/l.
- Water hardness: TH > 2.8 K. Values between 10 and 25 can be recommended. This will facilitate scale deposit that can limit corrosion of copper. TH values that are too high can cause piping blockage over time.
- TAC < 100.
- Dissolved oxygen: Any sudden change in water oxygenation conditions must be avoided. It is as detrimental to deoxygenate the water by mixing it with inert gas as it is to over-oxygenate it by mixing it with pure oxygen. The disturbance of the oxygenation conditions encourages destabilisation of copper hydroxides and enlargement of particles.
- Specific resistance - Electric conductivity: The higher the specific resistance, the slower the corrosion tendency. Values above 3000 Ohm/cm are desirable. A neutral environment favours maximum specific resistance values. For electric conductivity values in the order of 200-6000 S/cm can be recommended.
- pH (hydrogen potential): neutral pH at 20°C, according to the values in the glycol safety data sheet.

4.- MAINTENANCE

When carrying out maintenance works on these units, please make a correct segregation of the non-hazardous waste generated: insulation, air filters, plastic or metallic elements, packaging, etc., as well as waste considered hazardous: oils, filters and rags Impregnated with oils, welding elements such as filler material, strippers, electrical and electronic waste, batteries, lamps, etc., these must be managed by an authorized dealer.
The refrigerant gas can be reused, or collected in a bottle and managed as hazardous waste by an authorized dealer.

WARNING: Conductor cables: Electrical shock. Follow lockout / tagout procedure and national regulations before performing any maintenance or service work on the system.
Screwed electrical connections must be used in all applications. Refer to original equipment wiring diagrams.
Electrical connections must be made by qualified electrical personnel.

IMPORTANT:

- Only qualified and trained personnel can repair or carry out work on units that use flammable refrigerant. Personnel working on maintenance, repair and decommissioning must be properly trained. Any work procedure that affects safety (for example; breaking into the refrigeration circuit, opening sealed components, opening ventilated enclosures,...) must only be carried out by qualified and trained personnel in accordance with national certification systems or others equivalents.

- It is recommended that, to carry out an intervention, the staff have a work procedure:
  * If any work is to be conducted on the refrigeration systems, appropriate fire-fighting equipment (dry powder extinguishers, CO_2 extinguishers,...) shall be provided and be confirmed that it is available near the work area .
  * Before starting work on these systems with flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised.
  * Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapour being present while the work is being performed.

- It is recommended that the service technician perform a risk analysis to assess all possible risks prior to any repair work.

4.- MAINTENANCE

4.1.- PREVENTIVE MAINTENANCE

PREVENTIVE MAINTENANCE PREVENTS COSTLY REPAIRS.
We recommend regular and thorough servicing of the Redge unit. It is therefore advisable to ask your dealer about maintenance contracts. Check maintenance of the following points indicated (depending on the operating conditions maintenance every 6 months may be necessary).
Local legislation always takes precedence.

During the life-time of the system, inspection and tests must be carried out in accordance with national regulations. The information on operating inspections given in annex C of standard EN378-2 can be used if no similar criteria exist in the national regulations.

- GENERAL CONDITION OF THE CARPENTRY:
Check the state of the casing, paint, deterioration due to bumps, rust spots, leveling and supporting, state of the antivibration mounts, if installed, screwed panels, etc.

- ELECTRICAL CONNECTIONS AND INTERCONNECTIONS:
Check the State of cables, tightening of screws, grounding, current draw of the compressor and fans and checking that the unit is receiving the correct voltage.

- REFRIGERANT CIRCUIT:
Check that pressure values are correct and that there are no leaks. Check that there is no damage to the pipe insulation, that the state of the batteries is correct and that there are no chips or clogs retained by the air flow, etc.

- COMPRESSOR:
Inspect the oil level.
Inspect the condition of the compressor mountings.

- FANS:
Check that fans turn freely and in the correct direction without excessive noises.

- CONTROL:
Check the Set Points and normal operation.

- WATER:
If the installation contains anti-freeze, regularly check the state of the anti-freeze as well as the cleanliness of the water.

- WATER FILTER:
Clean the water inlet filter if necessary.

- WATER PUMP:
When the installation is going to work with percentages of glycol up to 20% and water temperatures below -5ºC, even do we use a specific closing for the water pump, it is advisable to clean the water pump’s closing every year and a half, in order to avoid leaks by crystallization.

- PLATE EVAPORATOR:
Prove the general isolation state and tightness of the water connections.

- REFRIGERANT AND WATER LEAKS:
Check the general condition of the refrigerant circuit with a refrigerant leak detector.
Check the general condition of the refrigeration circuit. Due to the operation of the compressor, sounds and/or vibrations may be produced, which may cause cracks that may lead to refrigerant leakage. This situation must be avoided by the manufacturer - installer of the system. The most important objective is to guarantee minimum vibration in all directions to avoid transmitting vibrations to the structure to which the lines are attached.

4.- MAINTENANCE

4.2.- MAINTENANCE PLAN

N°	MAINTENANCE PLAN		Monthly	+ Quarterly	Half Yearly
	Task	**Operating mode**			
1	Inspection of the microchannel coils aluminum-copper connexions for corrosion.	Proper care to be given when cleaning the coils. If corrosion is detected, a preventive treatment needs to be done following our recommendations.			
2	Cleanning the coils (In accordance with local regulations).	It's mandatory to clean the external coils, according to the environment where the unit is located, the frequency of the cleaning varies from once in a month to minimum twice in a year. The performance and the sustainability of the machine is based on the perfect heat exchange.The use of a neutral pH cleaning product is mandatory. (WARNING: Fins and copper tubes are very fragile! Any damage WILL reduce the performances of the unit).			
3	Inspection of compressor's electrical current.	Check the electrical current of each compressor on the 3 phases of partial load and at 100% - with a certain frequency, according to the utilization of the machine. Example: **Monthly:** If the unit is used all over the year. **Half Year:** If seasonal use.			
4	Electrical cabinets air-filters cleanning.	It's mandatory to clean the filters at least once a month according to environment where the unit is located to avoid overheating the electrical components. Check the filter fouling rate, clean or replace it when needed by an original filter.	•	•	•
5	Inspection of the condensors fans.	Check the rotation of the fan (free rotation, detection of vibrations or bearing noises). Check for the Amps consumed on all three phases; compare it with the nominal value given in the electrical wiring diagram. Check the status of the fan blades and its protections.			
6	Visual inspection of the oil level and check the oil for traces of acidity in the refrigerant circuits.	Visually check the oil level through the sight glass on the side of the compressor casing. Test the oil every 3 years and/or after each intervention on the refrigerant circuit.			
7	Check the 4-way valve.	During cooling mode, reverse to Heat Pump mode. Reset the control.			
8	Check the position of the crankcase heaters (around the compressor) and it's proper functioning.	Ensure crankcase heaters is well fitted and secured.Verify the operation of the crankcase heaters.			
9	Verification of the defrost cycle with 4-way valve inversion.	Switch the unit to heat pump mode. Change the set point to obtain the standard defrost mode and reduce the cycle time to the min value. Check the operation of the defrost cycle.			
10	If possible, check for water pressure in the circuit.	Check the water pressure in the circuit and the efficiency of the expansion vessels.		•	
11	Check overall working of the flow controller.	Cut-off the compressors, stop the water circulation. Then start the unit and wait for the water flow fault signal in the controller.			
12	Check the circulation pumps.	Check the absorbed electrical power and the correct rotation of the pumps. Check if there is no leakage of water at pump seal and if needed follow the manufacturer maintenance plan.			

N°	MAINTENANCE PLAN		Monthly	+ Quarterly	Half Yearly
	Task	Operating mode			
13	Check water flow.	Measure the water flow rate and compare to the selected value from the technical datasheet.		I	
14	Inspection and cleanning the water filter.	ATTENTION: The water circuit can be under pressure. Follow the usual precautions when depressurizing the circuit before opening. Ignoring this rules can lead to accidents and cause injury to the personal.		I	
15	Check for water leakage in the unit and it's accessories.	Verify the gaskets, if cracked or ripped, repair them or replace them. Check for water leaks and repair if it's needed.			I
16	Check CLIMATIC™ control, set-points and variables.	Refer to the commissioning sheet; Check all set points are set according to this document.			I
17	Check refrigeration system for proper functioning (Thermal expansion valve).	Retrieve/Check the values for superheating and sub cooling. Resume the expansion valve settings when needed, verify the behavior in partial loads and at 100%. Resume settings to obtain superheat between 5K and 10K.			I
18	Check refrigeration system for proper functioning (Electronic expansion valve).	Retrieve/Check the values of the pressure and temperature sensors. Check also for the good behavior of the expansion valve (Open/closed) in full load and partial load conditions. The superheat must be between 5K an 8K.			I
19	Check the position and tightnessof refrigeration components.	Check systematically all connections and fixings on the refrigeration circuit. Check for oil traces, eventually a leak test should be conducted. Check operating pressures correspond to the ones indicated on the commissioning sheet.			I
20	SIGHT GLASS (when applicable).	The liquid refrigerant flow through the sight glass should be steady and without bubbles. Bubbles are a sign of a low charge, a possible leak, or of a restriction in the liquid line. Each sight glass is fitted with a humidity indicator. The color of the element changes according to the level of humidity in the refrigerant, but also according to temperature. It should indicate «dry refrigerant. If it shows «wet» or «CAUTION», contact a qualified refrigeration technician. **CAUTION:** when starting up the unit, run the compressor for at least 2 hours before taking a humidity reading. The humidity detector is also sensitive to temperature, and as a consequence, the system must be at normal operating temperature to give a meaningful reading.			I
21	Check antifreeze protection.	Test antifreeze function (leakage rate, frost protection thermostat)			I
22	Check refrigeration 3-way valve.	Check the proper functionning of the system.			I
23	Check tightness of all electrical connections.	Power down the unit and check and tighten all the screws, terminal and electric connections (including the terminal boxes)When turning on the unit, check for the deterioration of the electrical components with a thermal camera while the unit is working at 100% of it's power.			I
24	Check HP / LP safety switches.	Install a pressure gauge high / low pressure and check if the safety switches for its overall working.			I

N°	MAINTENANCE PLAN		Monthly	+ Quarterly	Half Yearly
	Task	Operating mode			
25	Check the position of all sensors.	Check the position and the fixation of all sensors.			•
26	Check anti-vibration mountings, for wear and tear.	Visually check anti-vibration mountings on compressors and centrifugal fan. Replace it, if damaged.			•
27	Check glycol concentration in the water circuit.	Check the glycol concentration in the pressurized water circuit. (a concentration of 30% gives a protection down to approx.. -15°C) check the circuit pressure.			▌
28	Check casing and equipment corrosion.	To treat and neutralize eventuals rust spots.			•
29	Check the water pump.	When the unit is operated with glycol up to 20% and the water temperature below -5°C, even if you use a specific thermal protection for the pump, it is advisable to clean the body of the pump every 18 months in order to avoid leaks by crystallization. (see supplier catalogue).			▌
30	Plate exchanger.	Verify the general insulation state, the tightness of the water connection and the freeze protection.			▌
31	Check the expansion vessel (if applicable).	Measure the pressure under the different water modes (from +7°C to +45°C).			▌
32	Check the software version.	Contact the manufacturer for updates.			▌

It is therefore advisable to ask your dealer about maintenance contracts. Local legislation must be respected.

When carrying out maintenance works on these units, please make a correct segregation of the non-hazardous waste generated - insulation, air filters, plastic or metallic elements, packaging, etc. - as well as waste considered hazardous: oil filters and rags impregnated with oils, welding elements such as filler material, strippers, electrical and electronic waste, batteries, lamps, etc. They must be managed by an authorized dealer.
The refrigerant gas can be reused, or collected in a bottle and managed as hazardous waste by an authorized dealer.

Symbols and legends:

• Operation which can be carried out by on-site maintenance technicians.

▌ Operation which must be carried out by qualified refrigeration personnel, trained to operate on this type of equipment.

4.- MAINTENANCE

4.3.- CLEANING THE CONDENSER

4.3.1.- Air cooled condensers

Clean the coils either with a vacuum cleaner, cold water, compressed air, or with a soft brush (non metallic). On units installed in a corrosive aosphere, coil cleaning should be part of the regular maintenance program. On this type of installation, all dust gathered on the coils should be quickly removed by regular cleaning.
Caution: Do not use high pressure cleaners that could cause permanent damage to the aluminium coil fins.

Specific maintenance of microchannels exchangers connection



For microchannel heat excahngers, the coil connexion to the circuit is made by means of a solder copper / aluminum. This connection is protected from galvanic corrosion by a special resin encapsulated in a heatshrinkable sheath.

This sleeve must be regularly visually inspected during unit cleaning operations to detect a possible premature deterioration.

Good shape





Bad shape

Indeed with slightly corrosive aospheres, a small copper etching can lead to a loss of adhesion of the resin thus allowing moisture to seep under the sleeve while triggering galvanic corrosion phenomena between the aluminum and the Copper.

If this attack is not detected in time, a leak may appear and then force change of the exchanger.



Galvanic corrosion under the plastic sleeve.

A LEAKAGE BY CORROSION DUE TO A LACK OF CONDENSER MAINTENANCE IS NOT COVERED BY UNIT WARRANTY

4.3.- CLEANING THE CONDENSER

In case of deterioration of the sleeve, it must be removed and replaced by polyurethane sealant - like Sikaflex 221 or equivalent.
In this case the recommended procedure is as follows :

Step 1
Remove the damaged sleeve by operating a longitudinal section as in the photo below :



Step 2
Clean the connection with a wire brush and a synthetic abrasive as one can find on the back of kitchen sponges :



Step 3
Clean and dry the connector with paper towels and acetone to remove any grease or surface pollution.

Step 4
Apply polyurethane sealant – like Sikaflex 221 - with a pistol and then spread it over the entire surface to be covered with a brush :







Feel free to add some polyurethane sealant to ensure complete coverage of the area.

4.3.2.- Plate heat exchanger condensers

Use a non corrosive solvent to remove scale deposits. The equipment to be used for external water circulation, the quantity of solvent and the safety measures to be taken must be approved by the company supplying the cleaning products or by the company conducting these operations.

4.- MAINTENANCE

4.4.- PROCESS FOR REPLACING A COMPRESSOR ON THE FIELD

When servicing these units, replacing the compressors is one of the most critical procedures. It should be done following this process:

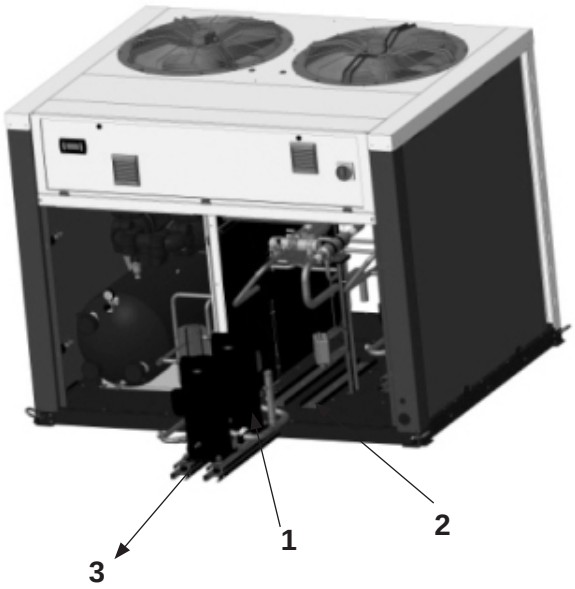
1.- Unweld the discharge and suction lines of the refrigeration circuit.
2.- Unscrew the screws of the compressor rails.
3.- Slide the rails of the compressors out of the unit.
4.- Replace the compressor.
5.- Slide again the rails inside the unit and fix the rails.

When replacing an A2L refrigerant compressor, the oil must be drained from the compressor and the compressor must be flushed with dry nitrogen. DO NOT close the ends with plugs.

CAUTION: Inadequate lubrication: Destruction of bearings. Change the accumulator after replacing a compressor with a burned out motor. The accumulator oil return hole or screen may be clogged with debris or may be clogged. This will result in a lack of oil to the new compressor and a second failure. Completely remove the refrigerant and oil from the replaced compressor.

During the execution of these compressor change tasks in the field, the following recommendations must be followed:

- Continuously check if the ambient atmosphere is flammable. If a flammable atmosphere is detected, ensure a adequate ventilation of the work space and immediately cut off the power supply.
- Resume work after the atmosphere is no longer dangerous.
- Recover the refrigerant from the refrigeration circuit using a suitable recovery unit. During this action, the compressor crankcase heater could be activated; deactivate immediately in case an atmosphere is detected flammable.
- Recover at an absolute pressure of 3 mbar or less. To obtain the best results and also recover the refrigerant dissolved in the oil, run the recovery unit two or three times as needed.
- Open the system with a cutting tool and flush the entire system with dry, oxygen-free nitrogen.
- Disassemble the compressor with a cutting tool. Properly drain and recover compressor oil. Flush the compressor again with dry nitrogen for a few minutes.
- If it is necessary to return a compressor to the manufacturer for analysis, it must be returned without oil and with the connections open. Do not close the connections with plugs.
- Collect and secure the oil properly. Provide information on the amount of oil drained from the compressor and its color.
- Dispose of the oil in accordance with local rules and regulations.



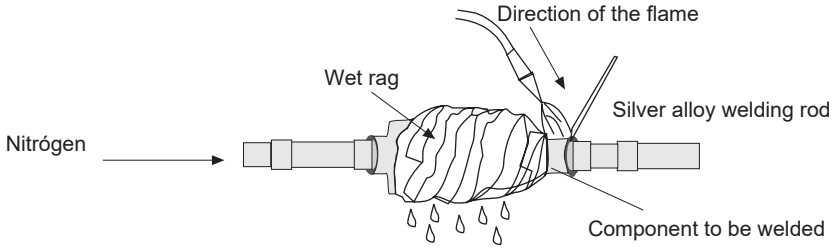
4.- MAINTENANCE

4.5.- CORRECTIVE MAINTENANCE

IMPORTANT MAKE SURE THAT THE UNIT IS COMPLETELY DISCONNECTED FROM THE POWER SUPPLY WHEN CARRYING OUT ANY TYPE OF WORK ON THE MACHINE.

If some component in the cooling circuit must be replaced, follow these recommendations:

- Always use original replacement parts.
- Regulation imposes the recovery of refrigerant fluids, as well as preventing their discharge into the atmosphere. The refrigerant must be recovered and evacuated from the refrigeration circuit using a recovery unit and a vacuum pump dedicated to A2L. It must be ensured that the outlet of the vacuum pump is not near any potential source of ignition and that ventilation is available.
- The system must be flushed with inert gas (dry nitrogen). Compressed air or oxygen must not be used to purge refrigerant systems.
- If cuts must be made in the pipe work, use pipe cutters. Do not use saws or any other tools that produce filings.
- All brazing must be carried out in a nitrogen aosphere to prevent corrosion from forming. Use silver alloy brazing rod.
- Take special care that the flame from the torch is aimed in the opposite direction from the component to be welded and is covered with a wet rag in order to avoid overheating.
- Disassemble the components with a cutting tool.
- Drain, recover and dispose of the compressor oil as appropriate.



- Take very special care if 4-way check valves are to be replaced since these have internal components that are very heat-sensitive (plastic, teflon etc...).
- If a compressor must be replaced, disconnect it electrically and un-braze the suction and discharge lines. Remove the securing screws and replace the old compressor with the new one. Check that the new compressor has the correct oil charge, screw it to the base and connect the lines and electrical connections.
- Carry out the vacuum above and below through the Schrader valves of the outdoor unit until -750 mm Hg is reached.
- Once this level of vacuum has been reached, keep the pump in operation for at least one hour. DO NOT USE THE COMPRESSOR AS A VACUUM PUMP. If the compressor runs in vacuum it will fail.
- Charge the unit with refrigerant according to the data on the Rating Plate for the unit and check that there are no leaks.

4.- MAINTENANCE

4.6.- REFRIGERANT EMISSION CONTROL

It is recommended to reduce refrigerant emissions to a minimum following the corresponding operation, maintenance and service procedures recommended by Redge:

- The refrigerant recycling procedure must be established before starting the intervention.
- The used refrigerant must always be recovered for its later reuse or recycling. The refrigerant should never be released into the atmosphere.
- Recycling equipment must be used which guarantees the lowest possible vacuum while the refrigerant is recovered and of this manner, minimizes its emissions.
- It is advisable to use cleaning methods for the refrigerant circuit using filters and dryers. Solvents which are not environmentally friendly should never be used. The materials used during these processes must be recycled correctly.
- Storage containers which comply with current legislation should always be used. Also, current regulations must be applied during the transportation of these refrigerant containers.
- All equipment used for these procedures (gauges, hoses, vacuum pumps,...) must be maintained in perfect condition, following the established calibration periods.
- To try to improve the performance of the equipment and reduce energy consumption, it must be considered to perform adequate preventive maintenance periodically.
- It is advisable to check the manufacturer's recommendations from time to time to reduce refrigerant emissions and increase the efficiency of the units. These improvements of the units could be through conversion refrigerants and/or compatible parts which must follow specific Redge guidelines.

4.7.- COMPRESSOR MAINTENANCE

Compressors replacement: Mechanical and/or electrical failures.

If in the unit happens a failure in the compressor, it is recommended to follow these procedures to replace it:

- To lift a compressor, you must always use the two lifting eyes which each compressor has. Redge recommends using lifting techniques approved in accordance with current applicable regulations to carry out this operation in complete safety.
- After a mechanical failure in a compressor, the oil must always be changed in all compressors corresponding to the set (TRIO /TANDEM) and it is recommended to replace the liquid line filter drier.
- After an electrical failure in a compressor, the oil must always be changed in all compressors corresponding to the set (TRIO / TANDEM), replace the liquid line filter drier and add a suction filter drier with clean-up cores.

A compressor should NEVER be lifted using a single lifting eye.
The refrigerant piping should NEVER be modified because this action could affect the lubrication of the compressor.

4.- MAINTENANCE

Refrigerant piping:

To facilitate welding and avoid possible leaks in the refrigerant piping, the connections and compressor suction and discharge piping are made of copper.

During maintenance and service works, the refrigerant piping can be reused. In cases where they cannot be reused, it is recommended that the customer request these replacement parts from Redge technical service to avoid altering the configuration of the refrigerant piping and possible incorrect operation of the unit.

If it is necessary to cut the tubes of the refrigerant installation should be done using a tubing cutter and it is recommended to clean these areas using a suitable suction system to prevent copper shavings from entering the system.

The compressor suction line configuration should NEVER be modified.
Change this configuration could cause a inadequate oil return to the compressors.

Refrigerant circuit opening time:

According to previously indicated in this manual, these units use POE oil, so it is recommended to minimize the exposure time of the refrigerant circuit, applying the following recommendations:

- The maximum opening time of the refrigerant circuit should never exceed one hour but depending on the environmental conditions this time could be reduced.
- It is recommended to evacuate the circuit to 500 microns or less.
- The compressor should always be re-sealed until it is installed again in the unit.
- Always keep POE oil containers closed to avoid exposure to the atmosphere.
- To minimize humidity absorption in the system, it is recommended to seal the refrigerant circuit and change the liquid line filter drier.

Compressor electrical connections:

For the rotation of the compressors used in these units to be correct, they must be perfectly wired, and their correct rotation must be verified using a rotation meter.
Although the reverse rotation of these compressors is not a terrible mistake for these models, it must be corrected as soon as possible because a negative impact on the bearings will be avoided.

The proper rotation of these compressors is following phases: L1 -L2 - L3. If these compressors are connected incorrectly, they carry out an excessive noise, do not pump and consume approximately half the normal current. If they stop operating for a long period of time, the compressors can become overheated.

When welding works are carried out on the connections of the refrigerant circuit piping with the compressors, it is recommended to protect their electrical boxes.

To verify the correct rotation of a compressor you should NEVER hit, because an incorrect rotation could cause failures in the compressor motor in a few seconds.

Compressor crankcase heaters:

- Due to it is necessary heat the oil refrigerant before starting the compressors, the crankcase heaters must be energized at least eight hours before starting the unit.
- Due to the crankcase heaters must always be energized before starting the compressors, the ambient temperature is not considered an important factor to consider.

4.- MAINTENANCE

Oil level:

To correctly verify the oil level, the compressors must be switch off and wait a few minutes before carrying out some reading operation. In TANDEM and/or TRIO compressor configurations, the oil level equalizes after switching off.

The oil level in the compressors should never be lower than the bottom of the sight glass or higher than the full sight glass. When these compressors are operating in a TANDEM and/or TRIO configuration, each compressor could have a different oil level. The oil level could be at the bottom of the sight glass but should always be visible.

Oil equalization line:

To facilitate the extraction of the oil equalization line, this piping is equipped with a Rotolock connector. Before separating the oil equalization line from the compressors, the oil must be drained to a level below the connector of this piping. This operation must be carried out in all compressors using the oil drain valve which each compressor has. Consider that if the oil drains below the level of the sight glass will be below the level of the oil equalization line. To drain the oil correctly, it is recommended to pressurize the low side of the compressor using nitrogen.

Oil filling, extraction and capacity:

To add or remove oil from compressors, it is recommended to use oil charging valves which have a dip tube that is extended to the bottom of each compressor.

To avoid that the humidity enters the refrigerant circuit when oil is added, this operation must be carried out following the manufacturer's guidelines, due to the POE oil used in these units easily absorbs and retains humidity. A vacuum pump can be used to remove the humidity from the oil, considering that is a difficult process. Also, it is recommended that once a POE oil container is opened, it must always be used.

In these units, only the oil specified by Redge in this manual should be used and under no circumstances should any other POE oil with similar characteristics be used.

WARNING: Oil should NEVER be reused once extracted from the compressors.

Suction restrictors for TANDEM and/or TRIO compressors:

Due to different size compressors are used in these units for TANDEM and/or TRIO configurations, these compressor combinations could require the use of a restrictor in the suction line of one or more compressors to avoid an imbalance in the oil level between the compressors when are in operation.

Oil tests:

If it is necessary, it is recommended to carry out an oil analysis in a laboratory specialized in oil analysis for these units. This analysis must provide a vision of the compressor and the refrigerant circuit conditions: presence of water, wear elements, viscosity, acidity, dielectric data,...

If once this analysis has been carried out, unacceptable wear conditions are shown, a change in the characteristics of the oil is evident, so its replacement is recommended to avoid further problems.

4.- MAINTENANCE

4.8.- DISPOSAL OF EQUIPMENT

Equipment shutdown and oil and refrigerant recovery should be performed by qualified personnel in accordance with NF EN 378. All parts of the refrigeration system, for example, refrigerant, oil, heat transfer fluid, filter, dehydrator, insulation materials must be recovered, reused and / or made available properly (see NF EN 378 part 4). No rejections will be made in the environment.

Legislation does not allow refrigerant gas emissions to the atmosphere, so the refrigerant have to be recycled to avoid being released to the atmosphere.

Those recycled refrigerants shall be processed afterwards by an authorized waste manager.
Those components derived from the recycling of the unit have to be managed by authorized waste manager or be left in local waste facilities according the local normative in each country.

4.9.- PRESSURE RELIEF VALVES

It is recommended to check pressure relief valves every 36 - 48 months according to the manufacturer's instructions. This operation is entrusted to qualified and trained personnel in compliance with the regulation in force in the country where the maintenance is performed.

5.- END OF THE MACHINE LIFE

The refrigerating system is designed for a working life of at least 12 years if the safety and maintenance instructions are strictly respected.

The equipment can be renewed in its lifespan of the periodic requalification certificate is validated by the expert (Authorized body or according to current local regulations).

At the end of the useful life of the units, please take into account the correct segregation of the waste generated. No Hazardous like: Painted metallic parts, plastic elements, copper pipes, batteries, exchangers, liquid receivers, water pumps, fans.. And Hazardous Materials such as batteries, electrical and electronic elements, compressors, dehydrating filters, valves or refrigerant gas, etc. to be managed with an authorized dealer.

6.- TROUBLESHOOTING - REPAIRS

6.1.- LIST OF THE MOST COMMON PROBLEMS

A.- THE COMPRESSOR DOES NOT START

PROBLEMS - SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
• Motor control circuits established, the compressor does not run	• No power supply	• Check main power supply and switch positions
	• Compressor motor burnt out	• Replace
• Low voltage reading on voltmeter	• Voltage too low	• Contact power company
• The system does not start	• Breaker tripped or fuses blown	• Determine the cause. If the system is in running order, close the disconnect
		• Check condition of fuses
	• No water flow in the evaporator or condenser	• Measure flow, check the water pump and water circuitry and filters
	• Flow switch contacts open	• Find the cause of the trip out
		• Check circulation of liquid in the evaporator, and the condition of the flow switch
	• Anti short cycle relay action	• Wait until the anti short cycle time delay has expired
	• Faulty control thermostat	• Check for proper operation, set points, contacts
	• Antifreeze thermostat tripped	• Check evaporating pressure and the condition of the antifreeze thermostat
	• Compressor thermal protection relay tripped	• Check for proper operation of the relay
	• High pressure safety switch tripped	• Check the condensing pressure, and the condition of the high pressure safety switch
• Normal operation with too frequent starts and stoppages due to low pressure alarm. • Or, normal compressor operation, but the low pressure alarm trips out and resets frequently	• Low refrigerant charge	• Check the charge through sub-cooling value, carry out a leak test, then top up the refrigerant charge
• Suction pressure too low, Filter drier frozen up	• Filter-drier obstructed	• Check the state of the drier and replace the filter
	• Expansion valve closed	• Check operation of the valve

B.- THE COMPRESSOR SHORT CYCLES ON HIGH PRESSURE SAFETY SWITCH TRIP OUT

PROBLEMS - SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
• The compressor short cycles on high pressure safety switch trip out	• High pressure safety switch trip out	• Check high pressure safety switch differential
	• Low air flow in condenser or dirty condenser coil (poor heat exchange)	• Check that fans are operating correctly or the state of cleanliness of the coils
	• Incondensable substances in the refrigeration circuit	• Bleed from circuit and top up the refrigerant charge. • Note : it is not permitted to discharge refrigerant to atmosphere

6.- TROUBLESHOOTING - REPAIRS

C.- THE COMPRESSOR RUNS IN LONG CYCLES OR RUNS CONTINOUSLY

PROBLEMS - SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
	• Faulty control thermostat	• Check operation
• Temperature too low in the conditioned space	• Chilled water thermostat set too low	• Adjust it
• No sub-cooling in the system at full load	• Low refrigerant charge	• Check the refrigerant charge in the sight glass and top up if necessary
	• Filter-drier partly obstructed	• Check the drier and replace as required, change the filter cartridge
	• Expansion valve partly closed	• Check expansion valve bulb and capillary, measure superheat
	• Liquid line valve not open far enough	• Open the valve completely
• Noisy compressor, or abnormally high suction pressure or low discharge pressure	• Leaky internal compressor valves/seals • Low oil level	• Contact Redge, compressor may have to be changed. • Add oil

D.- THE COMPRESSOR CUTS OUT BECAUSE OF OIL ISSUES

PROBLEMS - SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
• Oil level in sight glass is too low -	• Oil level is too low	• Check the oil level in the sight glass on the crankcase
• Visible oil leak / Oil level too low	• Low oil charge	• Check that there is no leakage and add oil
	• Leaky oil sump	• Repair and add oil
• Suction line unusually cold, compressor noisy	• Liquid refrigerant present in the compressor crankcase	• Check appearance of the oil in the sight glass. Measure superheat at the expansion valve
	• Poor heat exchange in the evaporator	• Check water flow. Check fouling by measuring the water pressure drop. Excessive oil migration in the circuit: measure evaporating pressure and superheat

E.- THE COMPRESSOR CUTS OUT ON ANTIFREEZE ALARMS

PROBLEMS - SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
	• Antifreeze alarm tripped	• Check that the low pressure side sensor is operating properly
	• Low water flow in the evaporator	• Check the water pump
	• Evaporator obstructed	• Determine the degree of fouling by measuring water pressure drop
	• Evaporator frozen up	• Measure pressure drop in water circuit, keep water circulating until evaporator has thawed completely
	• Low refrigerant charge	• Check the refrigerant charge and add refrigerant if necessary
	• Liquid refrigerant in the compressor crankcase	• Check appearance of the oil in the sight glass. Measure superheat at the expansion valve, check that the valve sensors are tightly attached
	• Poor heat exchange in the evaporator	• Check water flow. Check fouling by measuring the evaporator pressure drop. Excessive oil migration in the circuit : measure evaporating pressure and superheat

F.- THE COMPRESSOR CUTS OUT ON ITS MOTOR PROTECTION THERMAL RELAY

PROBLEMS - SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
	• Thermal protection tripped	• Check operation of thermal protection, change it if necessary
	• Motor windings are not being sufficiently cooled	• Measure superheat in the evaporator, adjust it if necessary
	• Compressor operating out of its application range	• Check operating conditions

G.- THE COMPRESSOR STARTS WITH DIFFICULTY

PROBLEMS - SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
	• Faulty windings	• Replace the compressor
	• Mechanical problem	• Replace the compressor

H.- THE COMPRESSOR IS NOISY

PROBLEMS - SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
• Compressor knocking	• Broken mechanical parts inside compressor	• Replace the compressor
• Suction line is unusually cold	• Liquid slugging	• Check superheat and that the expansion valve sensors are correctly installed
	• Expansion valve blocked in open position	• Repair or replace

6.- TROUBLESHOOTING - REPAIRS

I.- DISCHARGE PRESSURE TOO HIGH

PROBLEMS - SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
• Condenser abnormally hot	• Excessive refrigerant charge	• Recover excess refrigerant
• Chilled water leaving temperature too high	• Excessive cooling load	• Reduce load, reduce water flow if necessary

J.- DISCHARGE PRESSURE IS TOO LOW

PROBLEMS - SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
• No sub-cooling when operating at full load.	• Low refrigerant charge	• Repair the leak and add refrigerant

K.- SUCTION PRESSURE IS TOO HIGH

PROBLEMS - SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
• The compressor runs continuously	• Too much cooling demand on the evaporator	• Check the system
• Suction line unusually cold. Liquid refrigerant returns to compressor	• Expansion valve opened to far	• Adjust superheat and check that the expansion valve sensors are correctly fitted. Check parameters for electronic expansion valve.
	• Expansion valve blocked in open position	• Repair or replace

L.- SUCTION PRESSURE IS TOO LOW

PROBLEMS - SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
• No sub-cooling when operating at full load	• Low refrigerant charge	• Repair the leak and add refrigerant
• Excessive pressure drop across the filter-drier	• Filter-drier obstructed	• Replace the cartridge
• Loss of capacity	• Expansion valve obstructed	• Clean or replace
• Conditioned space too cold	• Control thermostat contacts stuck in closed position	• Repair or replace
• Compressor short-cycling	• Capacity modulation setting too low	• Adjust
• Low pressure drop in the evaporator	• Low water flow	• Check water flow. Check the condition of the filters, look for obstructions in the chilled water circuit piping

6.2.- CONTROL DEVICES

Operation

By reacting to compressor discharge pressure, the high pressure switch monitors efficiency of the condenser. Poor efficiency, the result of an excessive condensing pressure, is usually caused by:

- A dirty condenser.
- Low air flow.

The low pressure transducer monitors the pressure at which the refrigerant evaporates in the evaporator tubes. Low evaporating pressure is usually caused by:

- Low refrigerant charge.
- A faulty expansion valve.
- An obstructed liquid line filter-drier.

The control thermostat monitors chilled water temperature at the evaporator inlet. The most common causes of abnormal temperatures in this zone are:

- Low water flow.
- Thermostat setting too low.

A defective crankcase heater, causes condensation of refrigerant in the oil sump.

The above information does not represent a complete analysis of the refrigeration system. It is intended to familiarise the operator with unit operation and to provide him with the technical data required to enable him to recognise, correct or report a fault.

Only trained and qualified personnel is authorised to service and maintain this equipment.

6.3.- REGULAR CHECKS TO BE MADE: CHILLER UNIT ENVIRONMENT

CHILLED WATER CIRCUIT VALUE:

Inlet / Outlet pressure gauges for pressure drop ..... kPa

Evaporator inlet temperature ..... °C

Evaporator outlet temperature ..... °C

Glycol concentration (1) ..... %

Flow switch operational at .....flow %

Chilled water pump interlock ..... [ ]

Filter on water circuit ..... [ ]

CONDENSER WATER CIRCUIT:

Inlet / Outlet pressure gauges for pressure drop ..... kPa

Condenser inlet temperature ..... °C

Condenser outlet temperature ..... °C

Regulation on condenser water inlet ..... [ ]

Condenser pump interlock ..... [ ]

Filter on water circuit ..... [ ]

Unrestricted air flow on condenser coils (2) ..... [ ]

ELECTRICAL POWER SUPPLY:

Control circuit voltage V

Power circuit power supply voltage L1/L2 V

Power circuit power supply voltage L2/L3 V

Power circuit power supply voltage L3/L1 V

(1) Depending on the application.
(2) According to the type of unit.

6.- TROUBLESHOOTING - REPAIRS

6.4.- MANUFACTURER'S RECOMMENDED INSPECTIONS

6.4.1.- Liquid chillers with scroll compresor(s)

6.4.1.1.- Number of recommended preventive maintenance visits

NUMBER OF RECOMMENDED PREVENTIVE MAINTENANCE VISITS

Year visit	Start up Tube analysis	500 / 1000h visit	Major technical inspection	Inspection
1	1	1		2
2			1	3
3			1	3
4				3
5			1	3
6			1	3
7				3
8			1	3
9			1	3
10				3
+10			Every year	3 times a year

This table is published for units operating under normal conditions with an average annual runtime of 4000 hours. In hostile industrial environments, a specific maintenance visit schedule must be planned.

(1) Depending on the quality of the water.

6.4.1.2.- Description of inspection duties

START UP:
- Check unit installation
- Check water flow and water circuit auxilliaries
- Check safety devices
- Check leak tightness
- Configuration of the microprocessor based management system
- Verification of operating parameters and unit performance
- Transmission of the machine service log

500 h / 1000 h VISITS:
- Post wear in inspection
- Oil acidity test, leak test
- Replacement of the filter-drier cartridges depending on the results of the test above.
- Monitor unit performance and any eventual variations linked to use of the installation.

INSPECTION VISIT:
- **L**eak test.
- Operating test with record of measurements taken and functional analysis.

MAJOR TECHNICAL INSPECTION:
- Inspection visit.
- Acid test.
- Oil change if necessary.
- Replacement of filter-drier cartridges.
- Check up on the microprocessor based management system.
- Adjustment of safety devices.
- Verification of unit interlocks.
- Lubrication of bearings / dampers if necessary.
- Check Microchannel condenser connections.

In case of a positive acidity test result, we advice to replace the oil.
In a case of high acidity level a circuit clean up is recommended.

7.- CHECK LIST

Machine identifications:		**Affair number:**	
Year of manufacture:			
NORMAL CONDITIONS OF USE			
Leaving chilled water temperature:			**°C**
Outdoor air temperature:		**Max:** **ºC**	**Min:** **ºC**
Power supply voltage:			**V/Ph/Hz**
Refrigerant type:			
Date and time measurements were taken:			
Outdoor air temperature:			**°C**
Company responsible for measurements:			
Name of technician:			
Reamrks:			

		Circuit 1			**Circuit 2**			**Circuit 3**	**Circuit 4**
		Compr. 1	Compr. 2	Compr. 3	Compr. 1	Compr. 2	Compr. 3	Compr. 1	Compr. 1
Number of hours of operation									
Compressors in service per circuit									
Evaporating pressure	Bar								
Suction piping temperature	ºC								
Condensing pressure	Bar								
Discharge piping temperature	ºC								
Oil pump temperature	ºC								
Oil pressure	Bar								
Oil level									
Current on phase 1 per compressor	A								
Current on phase 2 per compressor	A								
Current on phase 3 per compressor	A								
Liquid line temperature	ºC								
Evaporator pressure drop	Bar								
Chilled water temperature	ºC								
Leaving chilled water temperature	ºC								
Condenser pressure drop	Bar								
Condenser lentering water temperature	ºC								
Condenser leaving water temperature	ºC								
H.P. pressure switch cut-out	Bar								
H.P. pressure switch cut-in	Bar								
Low pressure switch cut-in	Bar								
Oil pressure switch cut-out	Bar								
Antifreeze pressure switch cut-out	Bar								

Fan pressure switch 1: (cut-out / bar)	**Fan 2:**	**Fan 3:**	**Fan 4:**

7.- CHECK LIST

This check list should be filled in by the contractor to make sure that unit installation takes place according to appropriate industry practices.
WARNING: Disconnect the power supply before carrying out any inspections on the unit. If the unit must be left powered up, proceed with precaution to avoid risk of electrocution.

RECEPTION:
- Check absence of transport damage. If the product is damaged, exact details must be reported directly to Redge.
- Check for missing items.
- Availability of suitable lifting gear, slings and spacers.

UNIT INSTALLATION:
- Remove shipping crate.
- Confirm unit installation clearances.
- Mount vibration isolators.
- Set unit in permanent place.
- Level unit if necessary.

CHILLED WATER CIRCUIT:
- Check all piping for leakage.
- Install thermometers.
- Install water pressure regulator.
- Install balancing valves.
- Install flow switch.
- Clean, rinse, and fill water piping before connecting to the unit. Check presence of filter on unit inlet and state of cleanliness of the filter.
- Check operation of the pump and evaporator pressure drop.
- Check minimum volume of installation of hydraulic system.
- Expansion vessel is at correct pressure (before water is filled).
- If pump is external, flow rate is measured and within range.

ELECTRICAL EQUIPMENT:
- Check the main power supply matches the unit data plate.
- Check that the unit is correctly earthed.
- Check order of power supply phases for scroll compressor units.
- Check correct direction of rotation of fan motors and proper operation of the latter.
- Verify direction of rotation of pump correct.
- Ensure control cabinet wired up.
- Ensure power supply conforms with unit nameplate indications.
- Ensure pump starter and flow switch circuits complete and in working order.
- Install pipe heaters on all piping exposed to freezing temperatures.
- Tighten all connections with a torque wrench.

GENERAL:
- Ensure cooling load is available, (minimum 50 %).
- Coordination between different professions on site required for final commissioning.
- Power on carter heater 48 hour before commissioning date.

CUSTOMER ORDER NUMBER ..... Redge REFERENCE: .....
DESIGNATION .....
COMMENTS: .....
.....
NAME: ..... SIGNATURE: .....

NOTES

NOTES

CE

Debido al compromiso constante de REDGE con la calidad, las especificaciones, clasificaciones y dimensiones están sujetas a cambios sin previo aviso y sin que ello genere responsabilidad alguna
Una instalación, ajuste, modificación, servicio o mantenimiento inadecuados pueden causar daños materiales o lesiones personales.
La instalación y el servicio deben ser realizados por un instalador y una agencia de servicio calificados.