

AQL/AQH 20 ÷ 130



English



20
↓
131 kW



23
↓
141 kW



Air cooled water chillers and air-to-water reverse cycle heat pumps

IOM AQLH-N.2GB

Date : **November 2005**

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1 MANUFACTURER INFORMATION

1.1 Preface

The Itelco-Clima AQL/AQH units are manufactured according to the most stringent design and construction standards to ensure the highest performance, reliability and adaptability level to all types of air conditioning installations. These units are intended to cool water or glycol/water (and to heat water in the case of heat pump models). They are not suitable for purposes other than those specified in this manual.

If the Hydro Kit option (hydronic module) is mounted on the field, these units can be converted into a complete and compact cooling and heating system for production and distribution.

If these units are used improperly or for purposes other than those for which they have been designed without Itelco-Clima prior consent, they might prove to be dangerous.

This manual contains all the information required for the correct installation and start-up of the unit as well as all operation and maintenance instructions. This manual should be carefully read before attempting to operate or service the unit.

With the exception of the operations specifically detailed in this manual, all installation, commissioning and maintenance tasks may be only performed by duly trained and qualified personnel from a Service Centre.

The manufacturer is not liable for any damage which may be caused to things or people as a result of incorrect installation, commissioning and/or operation of the unit and/or failure to follow the procedures and instructions contained in this manual.

1.2 Warranty

This unit is supplied finished, tested and ready to work.

Any warranty will be automatically made null and void if the device has been modified without the manufacturer's prior written consent.

The warranty will be only valid if the following requirements are met:

- The initial start-up shall be carried out by the personnel from an Authorised Service Centre.
- Maintenance may be only carried out by duly trained personnel.
- Only original spare parts have been used.
- All the scheduled maintenance operations detailed in this manual have been performed.



If no water filter is installed in the external circuit, this will automatically make the warranty null and void. The Hydro Kit option which shall be mounted on the field already includes such a filter.

The failure to comply with any of the conditions above will automatically make the warranty of the unit null and void.

1.3 Safety

The installation of these units shall be carried out according to the Machinery Safety Directive (98/37/EC), the 72/23 EEC Low Voltage Directive the 89/336/EEC Electromagnetic Interference Directive as well as in compliance with other rules in force in the country where the installation is carried out. Do not operate the unit if what above has not been observed.



The unit shall be earthed. Installation and/or maintenance operations may be only performed after having powered off the electrical panel of the unit.

The non-observance of the safety measures above may result in electrocution and fire risks in case of a short-circuit.



This unit contains liquid and gaseous refrigerant under pressure inside heat exchangers, compressors and refrigerating lines. The release of this refrigerant may be dangerous and cause injury.



Fan protections shall always be fitted and not removed unless the device has been powered off.



It is the user's responsibility to ensure that the unit is suitable for its conditions of use and that the installation and maintenance are carried out only by the personnel who have the experience required to act as instructed by this manual.



The unit shall be supported by a bedplate which shall have the features specified by this manual. Failure to provide proper support may put the personnel at risk of serious injury.



The unit has not been designed to support any load and/or stress which might derive from adjacent units, pipelines and/or structures. Any external load or stress may cause the structure of the unit to break or collapse as well as represent a serious danger for people. In these cases, any form of warranty will automatically become null and void.



The packaging material shall be neither discarded nor burnt in the environment.

1.4. Emergency Stop

The switch outside the unit is set to 0 (Off) to cause the unit to stop.

After having acted on this switch, the unit shall be restarted in accordance with the procedure detailed in this manual.

1.5. Information about this Manual

The instructions contained in this manual shall be strictly followed for safety reasons. Otherwise, any damage will not be covered by the manufacturer's warranty.

The following conventional symbols are used by this manual in case of potential dangers:



The Danger symbol is used to alert you to procedures or practices which, if not correctly followed, might cause serious personal injury.



The Attention symbol will appear before procedures which, if not observed, might result in damage to the unit.



The Note symbol will draw the user's attention to comments which are particularly important with respect to the rest of the text.

The content of this manual and of any other document supplied with the unit is the exclusive property of the manufacturer who reserves any property right. Its reproduction is forbidden without the prior written consent by the manufacturer or its legal representative.

1.6 Safety Labels

The following labels are fitted to each unit in their proper locations:

Refrigerant Identification Label (Outside the panel door)



Unit Identification Label (Inside the door of the external panel)

MODELLO MODEL				<input type="text"/>
MATICOLA SERIAL NUMBER				<input type="text"/>
CARICA REFR. REFRIGERANT CHARGE		X CIRCUITO X CIRCUIT	KG	<input type="text"/>
CARATTERISTICHE ELETTRICHE ELECTRICAL DATA				
	V	PH	HZ	
AL. IM. POTENZA MAIN SUPPLY	400	3	50	
AL. IM. AUSIL. IAR IA AUXILIARY SUPPLY	230	1	50	
CORRENTE DI SPUNTO I _{RA}	A			
CORRENTE A PIENO CARICO I _{FLA}	I _{MAXI} A			
POTENZA ASSORBITA POWER INPUT	I _{MAXI} KW			
PRESS. ESERC. ACQUA WATER OPERATION PRESSURE	I _{MAXI} BAR			
MASSA MASS	KG.			
MADE IN ITALY		COD.		

Compressor Oil Heater Warning Label (Outside the door of the electrical panel)

ATTENZIONE
INSERIRE LE RESISTENZE DI RISCALDAMENTO OLIO ALMENO 12 ORE PRIMA DI OGNI AVVIAMENTO.

PRIMA DELLA MESSA IN TENSIONE ASSICURARSI CHE LE VITI DEI CIRCUITI ELETTRICI SIANO SERRATE COMPLETAMENTE.

WARNING
ENERGIZE THE CRANCKCASE HEATER FOR AT LEAST 12 HOURS BEFORE EACH STARTING.

BEFORE TIGHTENING-UP, TO TIGHTEN ALL TERMINAL SCREWS ESPECIALLY THOSE IN MAIN CIRCUIT.

Test Certificate (Inside the door of the external panel)

CERTIFICATO DI COLLAUDO PRODUZIONE ITELCO-CLIMA
ITELCO-CLIMA PRODUCTION TEST CERTIFICATE
UNITA': ARIA-ARIA/ARIA-ACQUA - SEMICENTRALI - CHILLER AIR/AIR AIR/WATER

PROG. COLL. NUMBER CHECK	DESCRIZIONE DEI TEST DESCRIPTION OF QUALITY CHECK	TIMBRO OPERAT. INSP. CODE
01	VERIFICA ASSEMBLAGGIO VERIFY ASSEMBLY COMPLETE	
02	VERIFICA VISIVA CABLAGGIO COLLEG. ELETTRICI E CONNESSIONE VERIFY WIRING CONNECTIONS	
03	VUOTO E CARICA REF. VACUUM AND CHARGE TEST	
04	VERIFICA CON CERCAFUGHE TENUTA CIRCUITO FRIGORIFERO REFRIGERANT LEAK TEST	
05	PROVE FUNZIONALI CON RILIEVI TEMPERATURA/PRESSIONI-RUMORE FUNCTION AND RUN TEST NOISE TEST	
06	VERIFICA INTERVENTI SICUREZZE PRESSIONE E TEMPERATURA CHECK OPERATION AND SAFETY DEVICES	
07	VERIFICA TENUTA CIRCUITO IDR. E FUNZIONAMENTO POMPA (SU PACK) HYDRAULIC CIRCUIT TEST (PUMP CHECK ONLY FOR PACK UNIT)	
08	VERIFICA MONTAGGIO ACCESSORI (SE PREVISTI) E DOCUMENTAZIONE CHECK ACCESSORIES/DOCUMENTATION	
09	CONTROLLO ESTETICO FINALE E PULIZIA INTERNA VISUAL CHECK FOR DIRT AND DAMAGE	

Electrical Warning Label (Adjacent to the main switch)

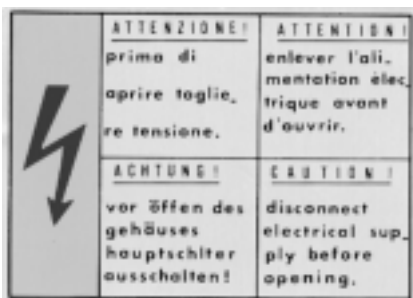
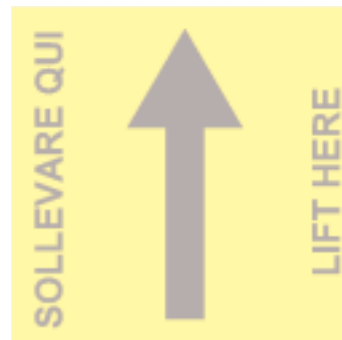


Plate showing the lifting point

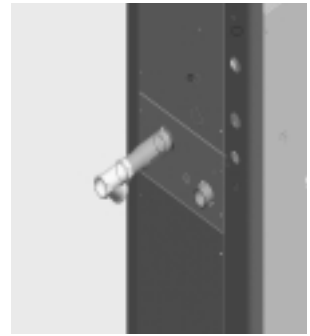
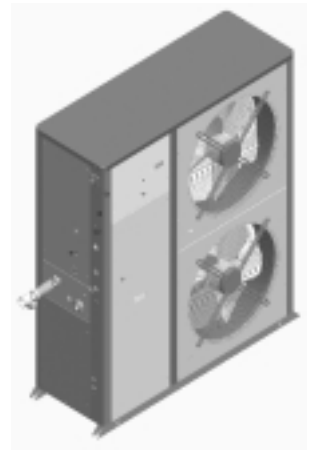
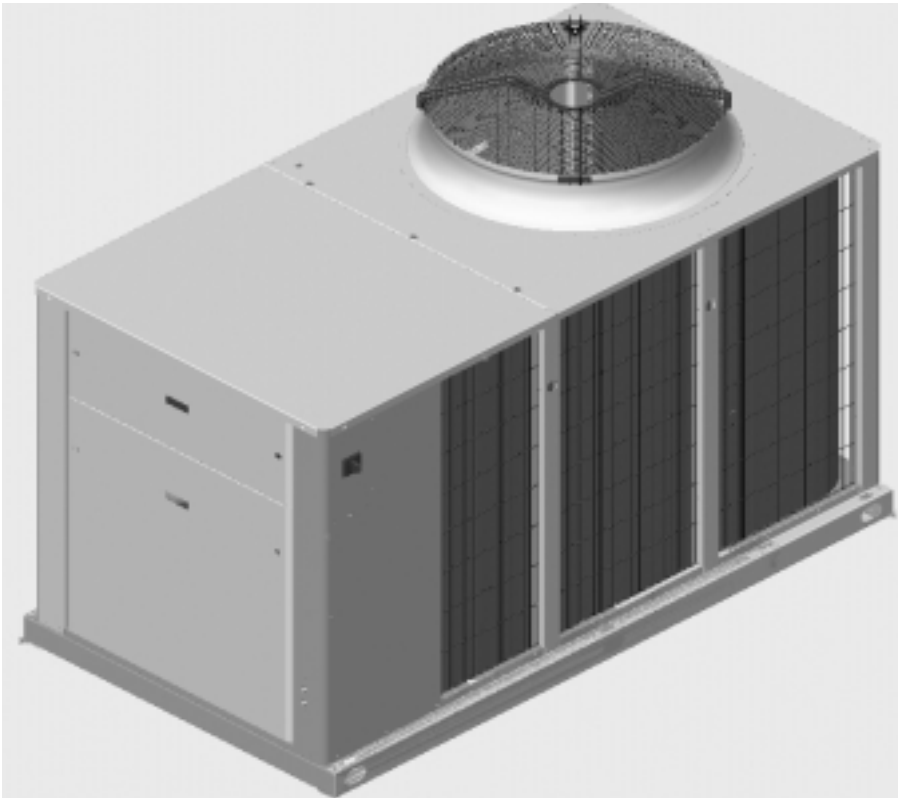


1.7. Material Safety Data

Refrigerant Data	
Safety Data	R407C
Toxicity	Low
In contact with skin	Liquid splashes or sprays may cause freeze burns. Unlikely to be hazardous by skin absorption. However, R407C may be slightly irritant and, if liquid, it has a strong degreasing effect. Flush contaminated skin areas with running water. If it comes into contact with wet fabrics, the liquid refrigerant will cause them to freeze and adhere to the skin. Carefully remove the contaminated clothing since it might adhere to the skin and cause freeze burns. Apply to a doctor if the affected skin areas should be reddened or irritated.
In contact with eyes	Vapours have no effect. Liquid splashes or sprays may cause freeze burns. In these cases rinse your eyes with running water or with a solution for eye lavages for at least 10 minutes. Immediately apply to a doctor.
Ingestion	Very unlikely to occur. If this should be the case, it may cause freeze burns. Never induce vomiting. Keep the patient awake. Make it rinse its mouth with running water and make it drink about 1/4 of a litre. Immediately apply to a doctor.
Inhalation	R407C: High concentration levels of its vapours in the air can produce an anaesthetic effect, including the loss of consciousness. Particularly severe exposures may cause heart arrhythmia and sometimes prove to be also fatal. At high concentrations there is a danger of asphyxia due to a reduced oxygen content in the atmosphere. In these cases take the patient to the open air, in a cool place and keep it at rest. Administer oxygen, if required. Apply artificial respiration if breathing has ceased or if it has become irregular. In case of heart failure immediately apply cardiac massage. Immediately apply to a doctor.
Further Medical Advice	A symptomatic and supportive therapy is generally suitable. A heart sensitisation has been observed in some cases, as a result of exposures to particularly high concentrations. In the presence of catecholamines (such as for example adrenaline) in the blood flow, it has increased the irregularity of the cardiac rhythm and then caused the heart failure.
Long-term exposure	R407C: A lifetime study which has been conducted on the effects inhalation may have on rats at 50,000 ppm has shown the onset of benign tumours of the testicle. These remarks suggest that there is no danger for human beings if they are exposed to concentrations below the occupational limits or equal to them.
Occupational exposure limits	R407C: Recommended limits: 1,000 ppm v/v – 8 hours TWA.
Stability	R407C: Not specified.
Conditions to avoid	Use in the presence of exposed flames, red heat surfaces and high humidity levels.
Hazardous reactions	Possibility of violent reactions with sodium, potassium, barium and other alkaline substances. Incompatible materials: magnesium and all the alloys containing over 2% of magnesium.
Hazardous decomposition products	R407 C: Halogen acids deriving from thermal decomposition and hydrolysis.
General precautions	Avoid the inhalation of high concentrations of vapours. The concentration in the atmosphere shall be kept at the minimum value and anyway below the occupational limits. Since vapours are heavier than air and they tend to stagnate and to build up in closed areas, any opening for ventilation shall be made at the lowest level.

Breathing protection	In case of doubt about the actual concentration, wear breathing apparatus. It should be self-contained and approved by the bodies for safety protection.
Storage Preservation	Refrigerant containers shall be stored in a cool place, away from fire risk, direct sunlight and all heat sources, such as radiators. The maximum temperature shall never exceed 45°C in the storage place.
Protection clothes	Wear boots, safety gloves and glasses or masks for facial protection.
Behaviour in case of leaks or escapes	Never forget to wear protection clothes and breathing apparatus. Isolate the source of the leakage, provided that this operation may be performed in safety conditions. Any small quantity of refrigerant which may have escaped in its liquid state may evaporate provided that the room is well ventilated. In case of a large leakage, ventilate the room immediately. Stop the leakage with sand, earth or any suitable absorbing material. Prevent the liquid refrigerant from flowing into drains, sewers, foundations or absorbing wells since its vapours may create an asphyxiating atmosphere.
Disposal	The best procedure involves recovery and recycle. If this is not possible, the refrigerant shall be given to a plant which is well equipped to destroy and neutralise any acid and toxic by-product which may derive from its disposal.
Combustibility features	R407C: Non flammable in the atmosphere.
Containers	If they are exposed to the fire, they shall be constantly cooled down by water sprays. Containers may explode if they are overheated.
Behaviour in case of fire	In case of fire wear protection clothes and self-contained breathing apparatus.

Lubricating Oil Data	
Safety Data	Oil R407C: ICI EMKARATE RL32CF MOBIL EAL ARTIC 22CC
Classification	Not dangerous.
In contact with skin	Very little irritating. No first aid is required. It is enough to provide for a reasonable personal hygiene, i.e. washing the exposed skin areas with water and soap several times a day. Wash dirty work clothes at least once a week.
In contact with eyes	Flush your eyes with an eyewash solution for at least 15 minutes and apply to a doctor.
Ingestion	Immediately apply to a doctor.
Inhalation	Immediately apply to a doctor.
Conditions to avoid	Contact with strongly oxidising agents, alkaline or acid solutions as well as overheating. It may degrade some types of paint and rubber.
Breathing protection	It may only be used in well ventilated areas.
Protection clothes	Always wear glasses or a mask for facial protection. Even if it is not strictly necessary, it is recommended to wear gloves in case of a long-term exposure.
Behaviour in case of leaks or escapes	Wear protection clothes and gloves. Stop the leakage. Absorb oil by using suitable substances, such as sand, sawdust and any other material available on the market.
Disposal	Oil and whatever may be contaminated by it shall be incinerated in a plant in compliance with the local standards about the destruction of exhausted oils.
Behaviour in case of fire	Use dry chemical compounds, carbon dioxide or extinguishing foams to put out the fire. The use of water on hot oil which has been set on fire may cause splashing.
	If oil has not caught fire yet, spray some water to disperse the vapours and protect the personnel who are attempting to stop the leakage.
Containers	If they are exposed to the fire, they shall be constantly cooled down by water sprays.
Behaviour in case of fire	In case of fire wear self-contained breathing apparatus.



2 PRODUCT DESCRIPTION

2.1 General Information

AQL/AQH units are of an enbloc type with one single refrigerating circuit. They are intended to cool down the water required for any air-conditioning application as well as any other fluid, such as for example glycol water.

These units are completely assembled at works. They are equipped with all the refrigerating connections and the internal electrical wiring required for a rapid installation on the field.

An operation test is performed after assembly, with water flowing through the refrigerant/water exchanger in order to make sure that every refrigerating circuit is properly working. The refrigerating circuits of every unit are pressure tested before inspection, drained and charged with R407C.

A low noise level is the result of a careful study. It is achieved on chillers by using technologically advanced components: SCROLL compressors with soundproof cases and fans with streamline nozzles. All this without negatively affecting the operation performances and limits of the units.

AQL models can cool down chilled water at a temperature between + 18 and + 5°C.

AQH heat pump models can warm up water at a temperature between 25°C and 50°C.

Body and Frame

The base and frame of these units are made with very thick galvanized steel elements, assembled with stainless steel screws. All panels can be disassembled to ensure easy access to internal components. All galvanized steel parts are protected by epoxy powder paint.

Compressors

The models are equipped with two SCROLL airtight tandem compressors with an internal motor protection and a separate soundproof coverage.

The compressors of all models are assembled on rubber shock absorbers. Their motors can be directly started. They are cooled down by the aspirated refrigerant gas and equipped with internal thermistor protections against overloads.

Overload protections are automatically reset after having tripped. The compressor terminal box has an IP54 protection degree (AQL/AQH 40-130).

Compressors are powered on and off by the micro-processor of the unit control system which is intended to control the delivery of the thermal refrigerating capacity.

Evaporators

Evaporators are made up of stainless steel plates. They are thermally insulated by means of a thick flexible insulating mattress with closed cells. The maxi-

imum operating pressures correspond to 10 bar for the water side and to 30 bar for the refrigerant side. Antifreeze protection for the water in the exchangers is ensured by electrical heaters and differential pressure switches for 30 units and by flow switches for the other units. The water side of these exchangers is connected by manifolds which will provide for the connection to the plant by means of one single gas threaded attachment.

Condensing batteries

The batteries forming the condenser are made up of copper tubes arranged in staggered rows and mechanically expanded inside an aluminium finned pack. The maximum operating pressure on the refrigerant side of the condensing batteries will correspond to 28 bar.

Condenser Fans

The condenser fans are of a helical type. They are directly coupled and have an impeller with wing contoured aluminium blades. Each fan is equipped with a galvanised steel accident-prevention protection which is painted after manufacture. The fans motors are completely closed. They have an IP54 protection degree and a protection thermostat embedded in the windings.

Fans Control

All models have a step speed controller as a standard. It will act according to the condensing pressure and allow the operation up to an external operation of $-5/10^{\circ}\text{C}$

Refrigerating Circuits

Each unit is equipped with a single refrigerating circuit of external service valves intended to measure the refrigerant pressure and charge, a sight glass with a humidity indicator, a dryer filter and a thermal expansion valve. Refrigerating circuits are also complete with a high pressure switch as well as a high and low transducer.

Control Supply Panel

All components of the control system and those necessary to start the motors are shop connected and tested. In 40-130 models, the components of the control system and of the supply system are accessible through separate doors, while in 20-25-30-35 models the board is protected by a door which can be removed with a screwdriver. The control compartment contains an electronic card and a control board with keyboard and display, to show the operational functions, as well as the intervention of the alarms and the working blocks.

2.2 Accessories

Water Filter

In 20-35 units, the 1-1/2" filter is included in the supplied equipment; in 40-130 units (in the model equipped with a pump) the filter is positioned in the hydraulic circuit, while in the models without pump it is supplied as an optional.

Anti-Vibration Kit

For 20-35 units, the anti-vibration kit made of special rubber is provided together with the unit. As for 40-130 models, the kit includes 4 spring shock-absorbers, to be mounted during the installation of the unit by the customer.

Electrical flow switch or Water Differential Pressure Switch

Models 20-35: differential pressure switch.
Models 40-130: electrical flow switch.

Corrosion proofing protection for condensing batteries

Two-level optional treatment

- I) Simple treatment for a non extreme application
- II) Treatment for an extreme blygold application.

Intrusion proofing protection for condensing batteries

A galvanised and painted steel wire net protection is assembled outside the unit.

Water Gauge

It is assembled on the unit as a standard.

Pump

Double pump kit (Mod. 40-130)
Standard pump with head $>10\text{m H}_2\text{O}$

High Pressure Fans (high head)

For 40-130 units, channeled fans with static pressure 80 Pa (models 40-60) and 100 Pa (models 70-130).

3-Wire Supply Kit

For 40-80 units, 3-phase supply without neutral wire (for 90-130 units, supply without standard neutral wire).

Low temperature kit -18 °C (40-130)

Phase Monitor Kit (40-130)

Kit for shipping by plane

Complete wooden package with a unit without refrigerant and with a nitrogen precharge. No CE declaration is supplied by the manufacturer in this case (the unit is entirely tested at works).

Hydro Module

The hydro module is available for the units with a pump. It is installed beneath the unit through the pipe fittings which are supplied with the unit.

The module is entirely enclosed in a RAL 9001 galvanised and painted steel body. The tank is completely insulated with 30 Kg/m³ closed cell polyethylene in a silver colour.

Antifreeze resistances or a heating booster kit are installed in the tank (upon request).

On/Off Remote Kit

It enables the operator to power on the unit when it is in standby mode, to display alarms and to switch over cooling – heat pump. The kit will include a 3 metre long cable for installation on the wall.

Sequencer kit - 4 units

Kit of external pressure gauge

Cooling mode

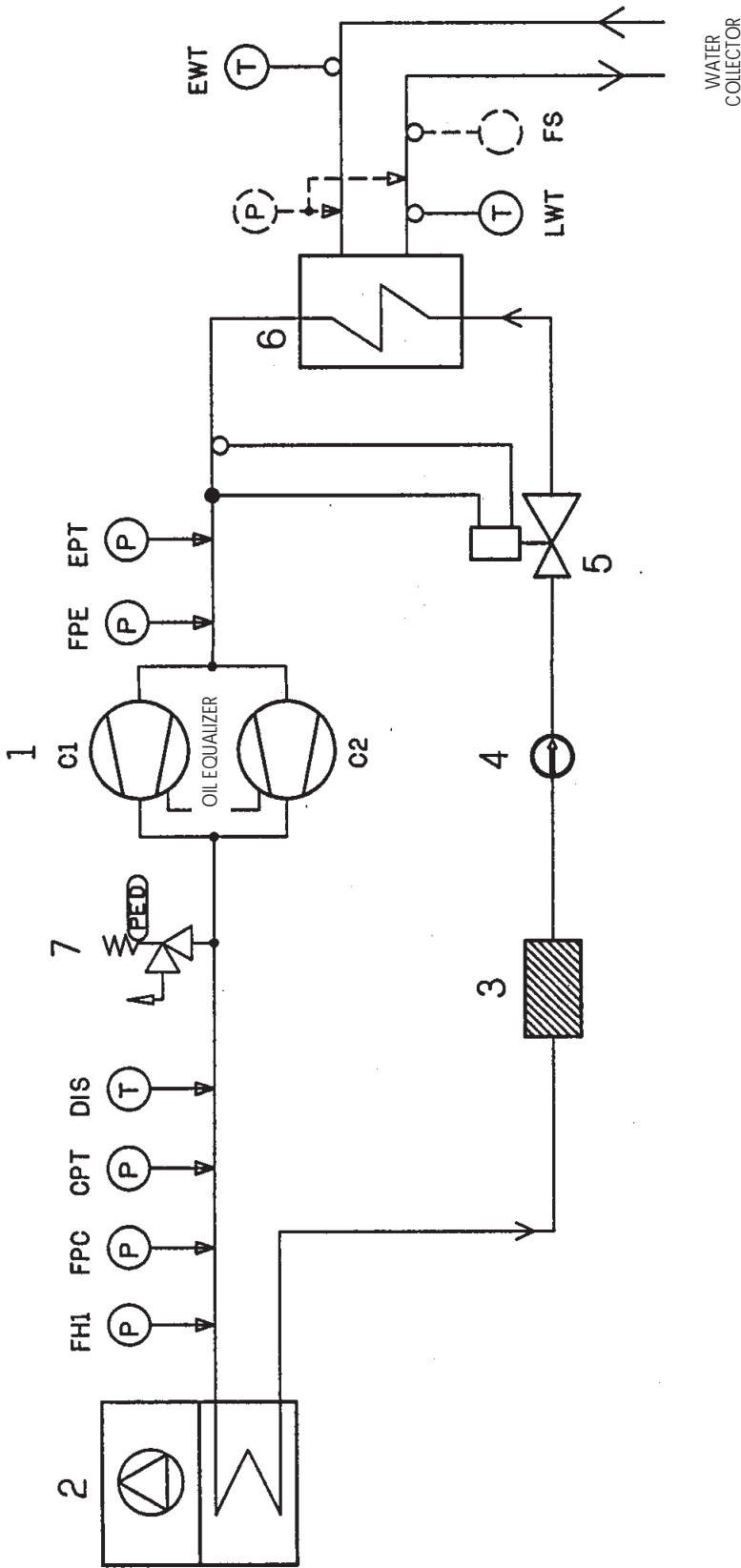
The low pressure liquid refrigerant will flow into the evaporator where it is evaporated and overheated by the heat absorbed from the chilled water flowing through the plates.

The low pressure steam produced as a result of this process will enter the compressor where it is over-pressurised and overheated. After having left the compressor, the high pressure steam will enter the condensing battery which will absorb its heat and release it to air circulating outside.

After having been properly liquefied and subcooled, the refrigerant will go through the expansion valve where its pressure and temperature are reduced before flowing into the evaporator where the cycle will start again.

2.3 Refrigeration Circuits

Units AQL 20-80



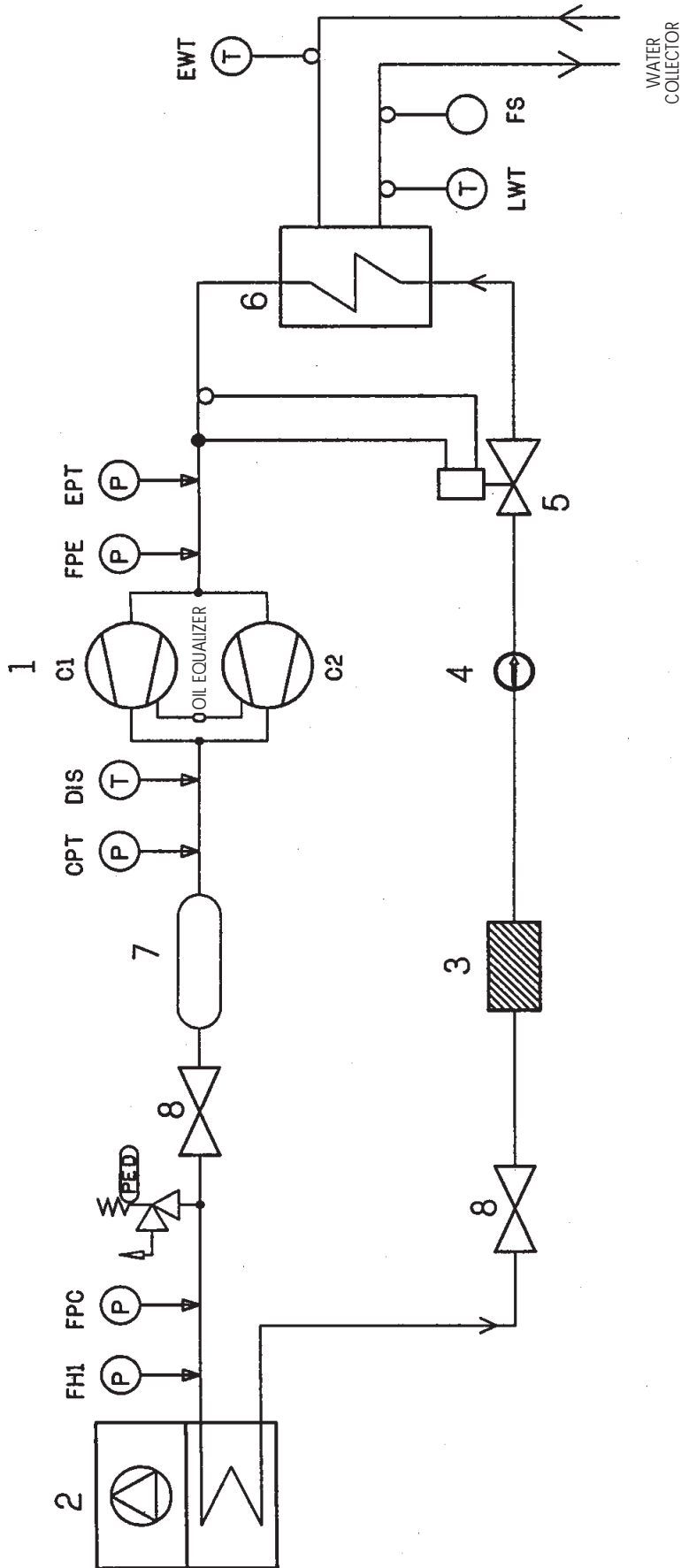
Safety & Control Devices:

- CPT High-pressure service outlet
- DIS Outlet temperature probe
- EPT Low-pressure service outlet
- EWT Entering water temperature probe
- FH1 Pressure switch
- FPC Condensing pressure transducer
- FPE Evaporation pressure transducer
- LWT Leaving water temperature probe
- P Differential pressure switch, water side (only for units 20-35)
- FS Electrical flow switch (optional, for units 20-35)

Components:

- 1 Compressors C1/C2
- 2 Condenser
- 3 Dehydrating filter
- 4 Liquid lamp
- 5 Expansion valve
- 6 Plate-type exchanger
- 7 Safety valve (only for units 40-80)

Units AQL 90-130



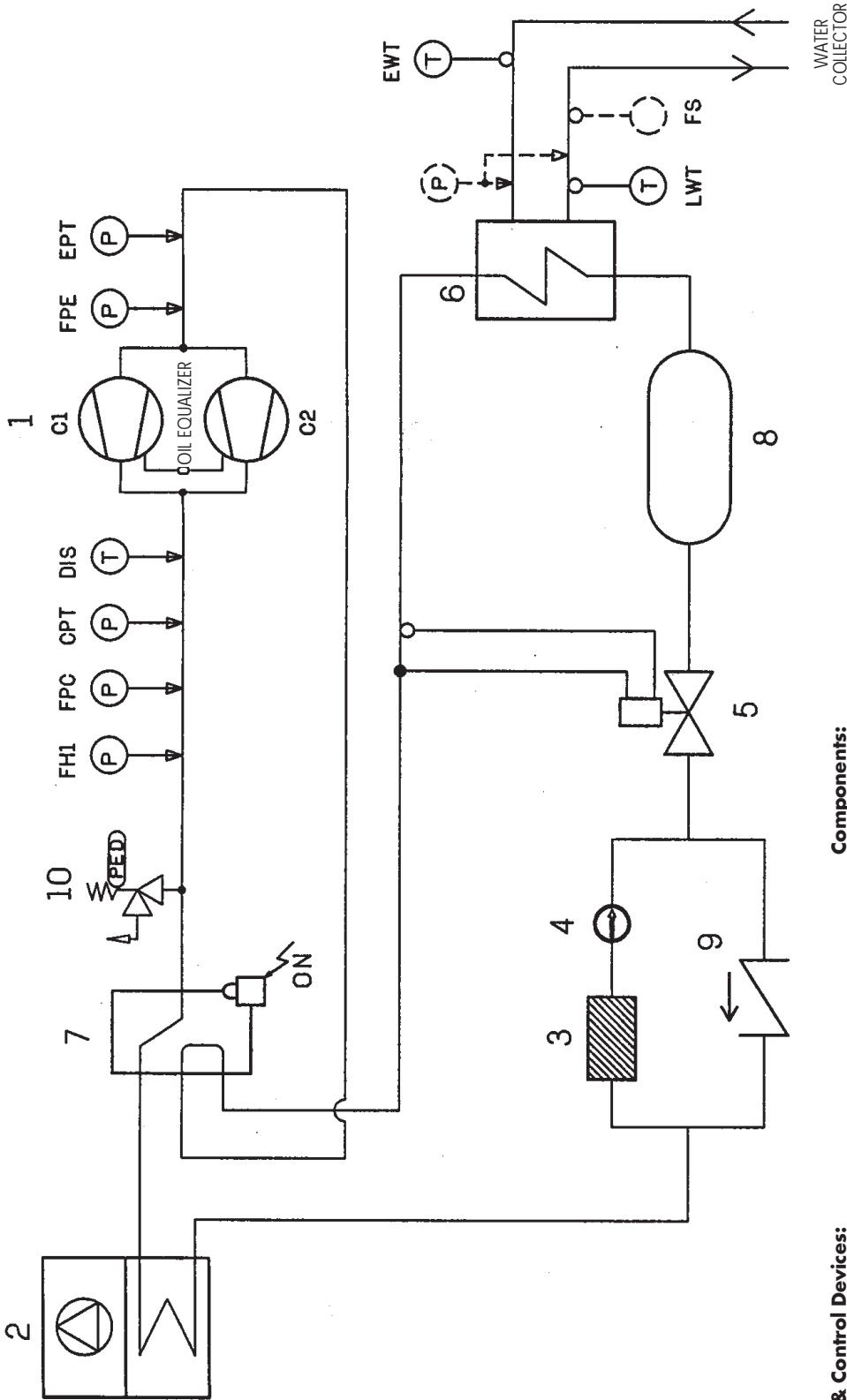
Safety & Control Devices:

- CPT High-pressure service outlet
- DIS Outlet temperature probe
- EPT Low-pressure service outlet
- EWT Entering water temperature probe
- FH Pressure switch
- FPC Condensing pressure transducer
- FPE Evaporation pressure transducer
- LWT Leaving water temperature probe
- FS Electrical flow switch

Components:

- 1 Compressors C1/C2
- 2 Condenser
- 3 Dehydrating filter
- 4 Liquid lamp
- 5 Expansion valve
- 6 Plate-type exchanger
- 7 Silencer
- 8 Ball cock

Units AQH 20-80



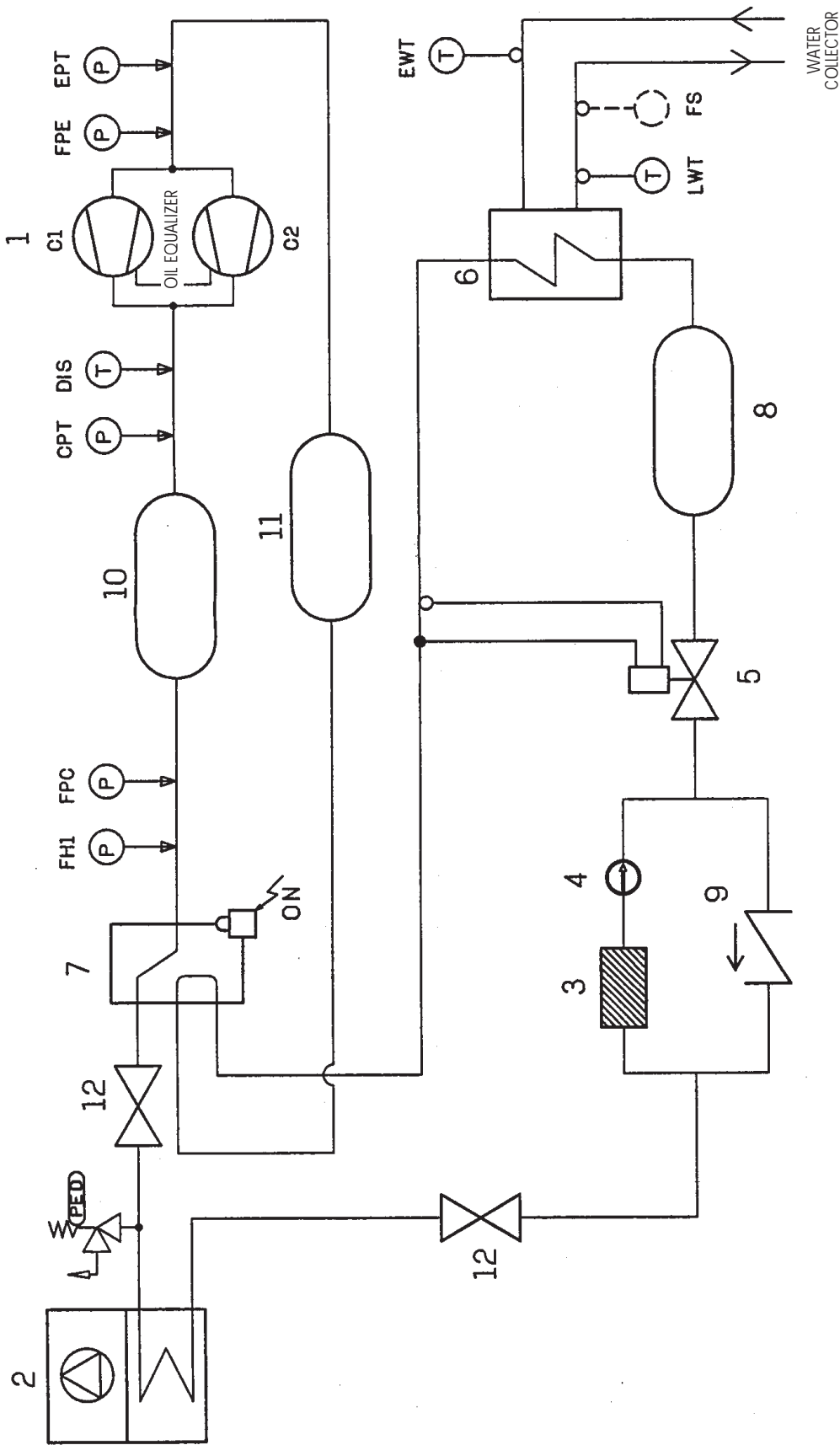
Safety & Control Devices:

- CPT High-pressure service outlet
- DIS Outlet temperature probe
- EPT Low-pressure service outlet
- EWT Entering water temperature probe
- FH1 Pressure switch
- FPC Condensing pressure transducer
- FPE Evaporation pressure transducer
- LWT Leaving water temperature probe
- P Differential pressure switch, water side (only for units 20-35)
- FS Electrical flow switch (optional, for unit 20-35)

Components:

- 1 Compressors C1/C2
- 2 Air exchanger
- 3 Dehydrating filter
- 4 Liquid lamp
- 5 Thermostatic expansion valve
- 6 Plate-type exchanger
- 7 4-way valve
- 8 Liquid receiver
- 9 Check valve
- 10 Safety valve (only for units 40-80)

Units AQH 90-130



Components:

- 1 Compressors C1/C2
- 2 Air exchanger
- 3 Dehydrating filter
- 4 Liquid lamp
- 5 Thermostatic expansion valve
- 6 Plate-type expansion valve
- 7 4-way valve
- 8 Liquid receiver
- 9 Check valve
- 10 Silencer
- 11 Liquid storage
- 12 Ball cock

Safety & Control Devices:

- CPT High-pressure service outlet
- DIS Outlet temperature probe
- EPT Low-pressure service outlet
- EWT Entering water temperature probe
- FHT Pressure switch
- FPC Condensing pressure transducer
- FPE Evaporation pressure transducer
- LWT Leaving water temperature probe
- FS Electrical flow switch

3 TRANSPORTATION, HANDLING AND STORAGE

The AQL/AQH units are supplied fully assembled and tested (except for the shock absorbers which are separately supplied). They are ready to be installed and started on the field.
R407C units are only charged with liquid refrigerant and with oil in the quantity required for operation.



The low pressure side of the refrigerating circuit on R407C units shall be charged by means of the service valve arranged on the thermal expansion valve before the device is operated.

3.1 Inspection

The unit shall be immediately inspected upon receipt to find out any damage since it has been delivered ex works and transported at the customer's risk. It is also necessary to make sure that all the parcels specified on the delivery note have been delivered.

Any damage you may find out shall be immediately reported in writing to the carrier. Even if the damage is only on the surface, please notify our local representative too.

The manufacturer disclaims all responsibility for the shipment even if it has provided for its organisation.

3.2 Handling

The AQL/AQH units are designed to be lifted from above, by means of cables and eyebolts. A spacer shall be arranged between the cables in order to prevent them from damaging the unit (see the figure aside).

Before handling the devices, make sure the site you have chosen for the installation can withstand its weight and support its mechanical impact.

Avoid touching sharp parts (such as the fins of batteries, for example) while handling the unit.

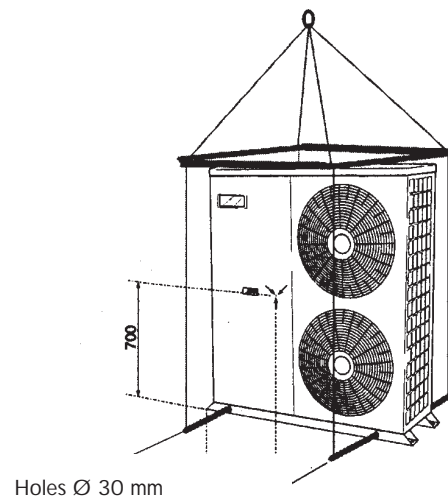
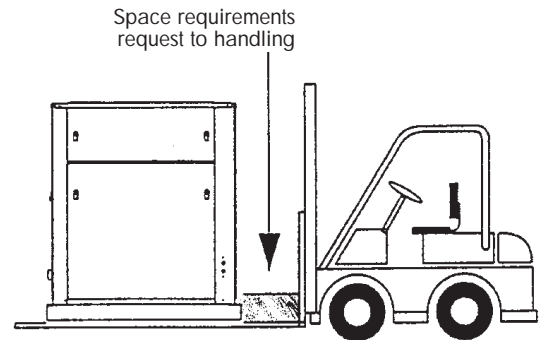
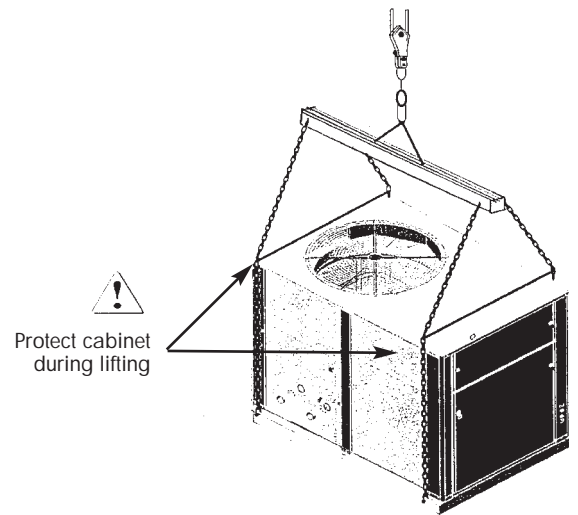


The unit shall never be placed on rollers.

Act as follows to lift and handle the unit:

- Insert and secure the eyebolts into the frame holes which have been marked on purpose.
- Connect the cables to the eyebolts.
- Insert the spacer between the cables.

- Provide for hooking at the centre of gravity of the device.
- Cables shall have such a length that the angle they form with the horizon when under tension is not less than 45°.





While lifting and handling the unit, pay attention. Otherwise, you might damage the finned pack of the batteries arranged on both sides of the unit. The sides of the unit shall be protected by cardboard or plywood sheets.



Until the unit is ready for operation, do not remove the plastic envelope and the battery protections which are intended to prevent dirt, dust and any foreign matter from penetrating into the unit through the inlets of fans or from damaging the external surfaces.

3.3 Storage

If the unit is to be stored before the installation for some time, take at least the following precautions to prevent damage, corrosion and/or deterioration:

- Make sure all openings, such as for example water connections, are well plugged and sealed.
- Never store the units in a room where temperature is above 42 °C (R407C units) or where the units are directly exposed to the sunlight.
- It is recommended to leave the finned batteries covered to protect them against any risk of corrosion, especially if building works are still in progress.
- Store the units in areas where minimum activity is likely to take place in order to avoid any risk of accidental damage.
- Never use steam to clean the unit.
- Remove all the keys required to have access to the control panel and give them to the person in charge of the field.

It is also recommended to provide for visual inspections at regular intervals.

4 INSTALLATION

4.1 Installation Site



Before installing the unit, make sure that the building structure and/or the supporting surface can withstand the weight of the device. The weights of the units are detailed by Chapter 9 of this manual.

These units have been designed to be installed on the floor, in the open air. As a standard, they are equipped with rubber vibration-damping supports which shall be arranged in the middle, beneath the supporting plates.

When the unit is to be installed on the ground, provide for a concrete bedplate which shall assure a uniform distribution of the weights.

No special subbase is generally required. However, if the unit is to be installed above inhabited rooms, it is recommended to place it on spring shock absorbers (40-130 units) which shall reduce to a minimum the transmission of vibrations to the structures.

When selecting the installation site, never forget to consider as follows:

- The longitudinal axis of the unit shall be parallel to the direction of the prevailing winds so as to assure a uniform air distribution on finned exchangers.
- The unit shall never be installed in the proximity of chimneys for the discharge of boiler flue gases.
- The unit shall never be installed downwind of sources of grease contaminated air, such as for example the outlets of large-kitchen extractors. Otherwise, grease might build up on the fins of refrigerant / air exchangers or condensers, act as a fixing agent for any sort of atmospheric impurity and rapidly cause the exchangers to clog.
- The unit shall never be installed in areas exposed to heavy snowfalls.
- The unit shall never be installed in areas exposed to flooding or beneath drip stones, etc.

■ The unit shall never be installed in narrow inner court yards or in any other restricted space where the noise may be reflected by the walls or where the air expelled by the fans may short-circuit on the refrigerant/air heat exchangers or condensers.

■ The installation site shall be characterised by the presence of the space required for air circulation and for the performance of maintenance operations (see chapter 9 for further details).

4.2 Defrost Water Drainage (only for AQH units)

When AQH units operate in the heat pump mode, they will discharge water from the bedplate during defrost cycles.

For this reason it is recommended to install these units with a minimum ground clearance of 200 mm to allow the defrost water to drain freely as well as to prevent it from freezing and forming any ice build-up.

AQH units shall be installed where defrost water may cause no damage.

4.3 Installation of Spring Shock Absorbers

- Prepare the bedplate which shall be smooth and flat.
- Lift the device and insert the shock absorbers. For this purpose follow the instructions here below.

Installation of the vibration-damping support by means of a jack:

- Fig. 1) Start assembling the components of the jack.
- Fig. 2) Insert the jack into the threaded seat arranged on the upper plate of the vibration-damping device. Insert the jack assembled on the vibration-damping device into the hole arranged on the bedplate of the machine.
- Fig. 3) Make sure that the bedplate of the machine is arranged on the flat washer (pos. E) of the jack. Use a wrench 13 and act on the high nut (pos. D) (Fig. 3) to balance any difference in height. Use a grower washer (pos. F) and act on the low nut (pos. C) to lock the position you have reached. At the end of the operation make sure the machine is elastic on the axes and ready for the installation of any vibration-damping balancing joint in the water connections.

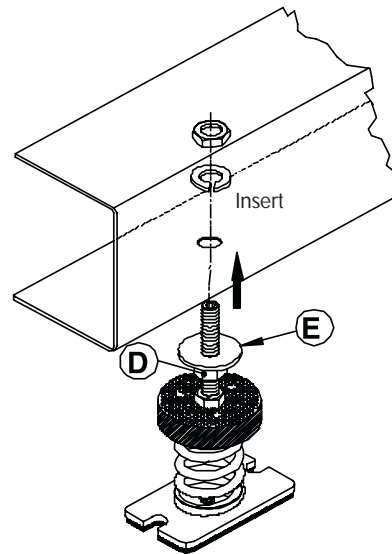


Fig. 2

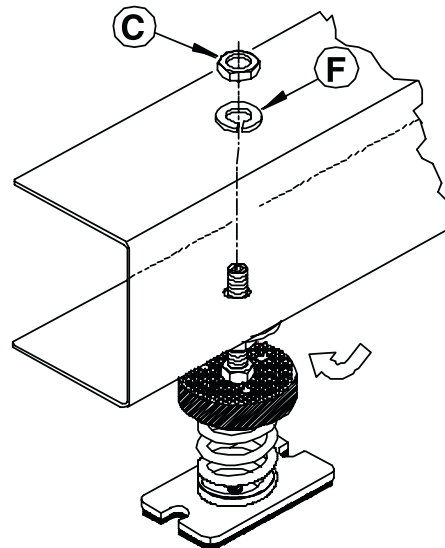


Fig. 3

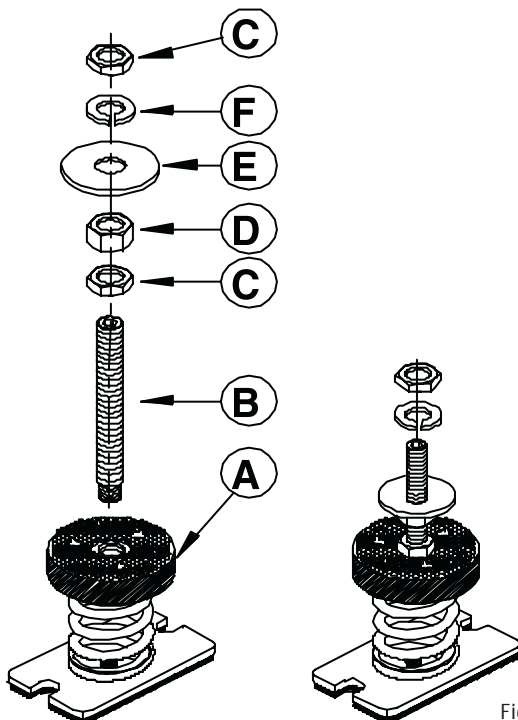


Fig. 1

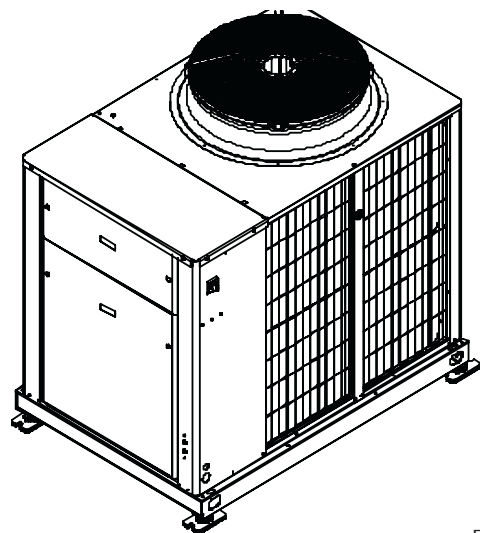


Fig. 4

4.4 External Water Circuit



The external water circuit shall guarantee a constant water flow rate through the circulating refrigerant/water heat exchanger (evaporator) under steady operating conditions and in case of a load variation.

The circuit shall be composed by the following elements:

- A circulation pump which can ensure the necessary flow rate and head.
- The total content of the primary water circuit shall never be lower than 2.5 lt/kW in terms of refrigerating capacity. If the total water volume in the primary circuit should be unable to reach such a value, an additional heat-insulated storage tank should be installed. This tank is intended to avoid any repetitive start of the compressor.
- A membrane expansion tank complete with a safety valve and a drain which shall be visible.



The expansion tank shall be dimensioned in such a way that it can absorb a 2% expansion of the total volume of the water in the plant (exchanger, pipelines, uses and storage tank, if available). The expansion tank shall never be insulated when the circulating fluid is not flowing through it.

A differential pressure switch is mounted on 20-35 units as a standard. It will stop the unit whenever it senses a load loss through the heat exchanger which may result in a flow rate problem. A flow switch is supplied for larger units as a standard.

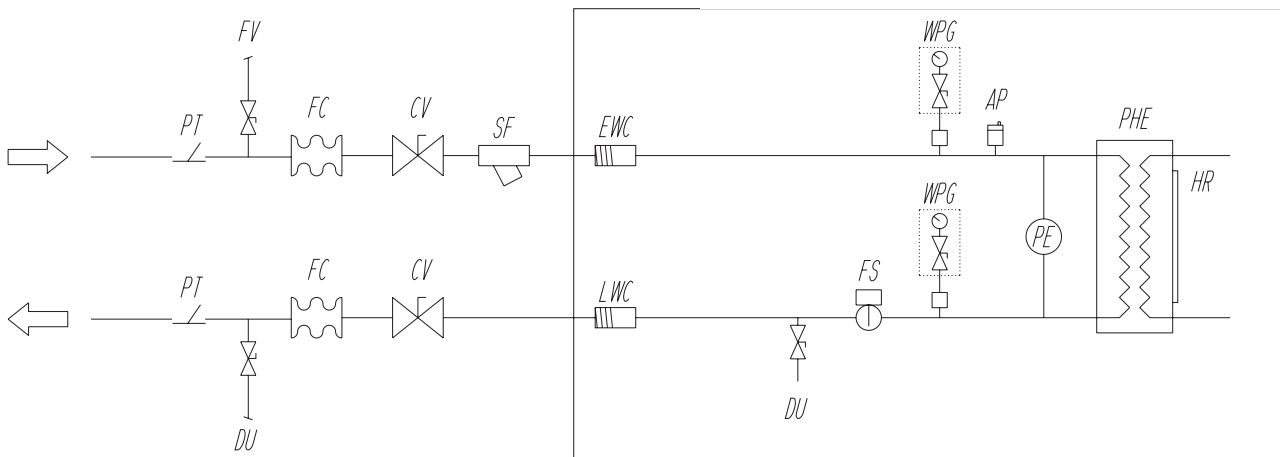
In addition:

- Install on/off valves on the lines at the inlet and outlet of the manifolds of the exchangers (evaporator).
- Arrange a by-pass complete with an on/off valve between the manifolds of the heat exchangers.
- Arrange air vent valves at the high points of the water lines.
- Arrange drain points complete with plugs, cocks, etc. in the proximity of the low points of the water lines.
- Insulate the water lines to prevent the heat from blowing back into the unit.

Version without a pump

PLANT COMPONENTS (NOT SUPPLIED)

HYDRO KIT COMPONENTS



Notes:

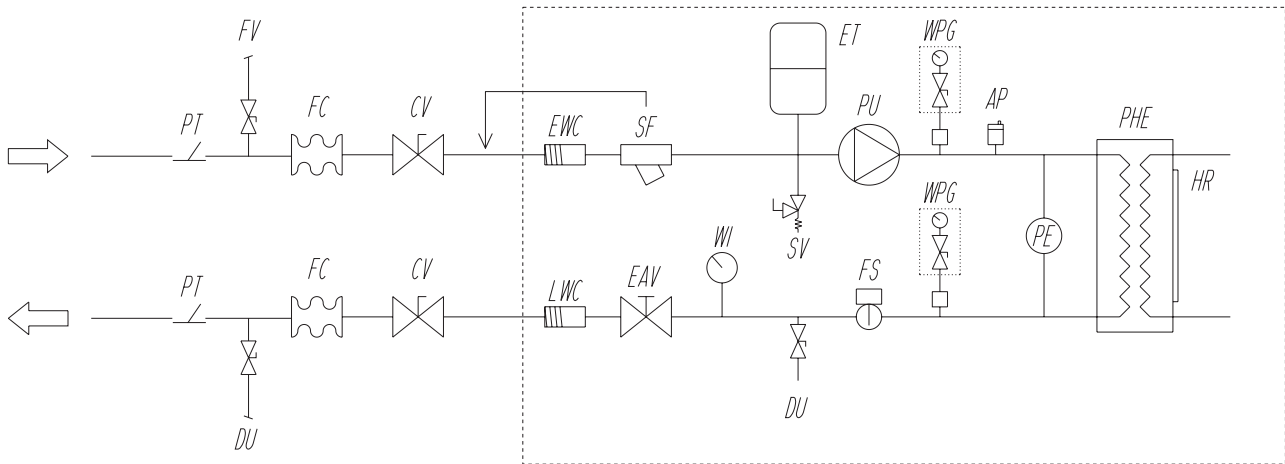
- SF Mesh filter (supplied)
- HR Antifreeze resistance of the plate-type exchanger
- WPG Attachments for manometers (only on 40/130)
- AP Vent valve
- FV Water filling valve
- PHE Plate-type exchanger
- DU Drain cock
- FC Flexible joints
- FS Flow switch (only on 40/130)
- PT Thermometric trap

- PE Differential water pressure switch (only on 20/35)
- EWC Attachment at the water inlet
- LWC Attachment at the water outlet
- CV On/Off valves

Version with a pump

PLANT COMPONENTS (NOT SUPPLIED)

HYDRO KIT COMPONENTS



Notes:

- SF Mesh filter (outside on 20/35)
- ET Expansion tank
- SV Safety valve
- AP Vent valve
- PHE Plate-type exchanger
- PU Circulation pump
- DU Drain cock
- EAV Flow rate calibration valve (only on 40/130)
- FS Flow switch (only on 40/130)

- PT Thermometric trap
- PE Differential water pressure switch (only on 20/35)
- HR Antifreeze resistance of the plate-type exchanger
- WPG Attachments for manometers (only on 40/130)
- EWC Attachment at the water inlet
- LWC Attachment at the water outlet
- WI Water gauge
- CV On/Off valves
- FC Flexible joints
- FV Water filling valve



Before filling the installation, remove any impurity, such as sand, crushed stones and welding scales, coating drops and any other material which might damage the evaporator.

4.5 Water connections



The attachments at the water inlet and outlet shall be connected in compliance with the instructions which can be found on the labels in the proximity of the attachments.

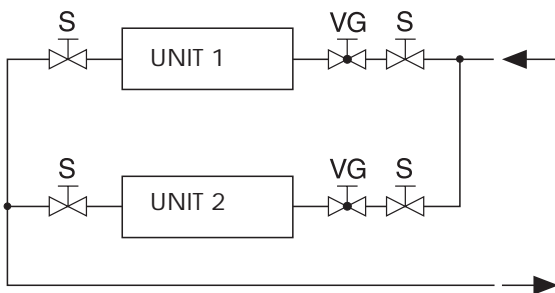
It is advisable to flush with disposable water by-passing the exchanger to avoid clogging.

Connect the water lines of the plants with the attachments of the unit whose diameters and positions are shown by Chapter 9.



The water used to fill the circuit shall be treated in such a way that the pH will have the correct value.

When two or several units are connected in parallel, to balance the load losses of the various circuits, it is recommended to execute a "reverse return" connection (see the diagram below).



Legend

- S On/Off valves
- VG Balancing valves

4.6 Accumulation Tank Kit

The accumulation tank which has been designed for mounting on AQL/AQH units is complete with all the hydraulic and electrical components required for the correct operation of the system.

These systems are carefully assembled and tested at works. They are ready for operation after having correctly realised all electrical and hydraulic connections.

4.6.1 Features

20/35 units have one single tank whereas the units starting from 40/50 have two tanks complete with a standard connection. The kit will include an antifreeze resistance, a drain cock, an automatic filling unit and an automatic air vent.

No pump is arranged on the kit since it is assumed that the kit is meant for the units with a hydro option where a pump and an expansion tank are already available.

A tank arranged for mounting a heating booster resistance kit may be optionally required (5 traps for the kits from 20 to 50 and 8 traps for the kits for larger sizes).

The tank is completely insulated with 30 Kg/m³ closed cell polyethylene in a silver colour and enclosed by a bearing structure made of passivated and painted plates. The box is equipped with bulkheads which can be easily opened for internal inspection.

The kit is installed beneath the chiller. It is an integral part of the unit without changing the support area.

Spring shock absorbers are also available for the units starting from 40.

4.6.2 Supplied Material

The kits will be supplied with pipelines ready for installation. An antifreeze resistance with wiring, an automatic water filling valve, a 3 bar safety valve, a drain cock and a vent valve have already been assembled.

Everything is placed on wooden pallets with wooden joists arranged on the kit for piling up and a film for protection against atmospheric agents.

4.6.3 Operating Limits

The unit will guarantee the operation at an air temperature of -10°C in a standard configuration with one single antifreeze resistance.

4.6.4 Shock Absorbers

Shock absorbers are supplied for 20-35 sizes as a standard. They shall be assembled by the customer for 40-130 sizes during the installation.

IMPORTANT

Select the shock absorbers for the units with a hydro kit.

4.6.5 Antifreeze Resistance

The antifreeze resistance of the tank (TEH) shall be wired with the panel as it is shown by the diagram attached to the unit.

4.6.6 Water Filter

The kit will use the water filter of the unit.

CAUTIONS

The unit + tank system shall be equipped with a filter for the 20-35 units. Use the filter + union as it is shown by Figure 3.

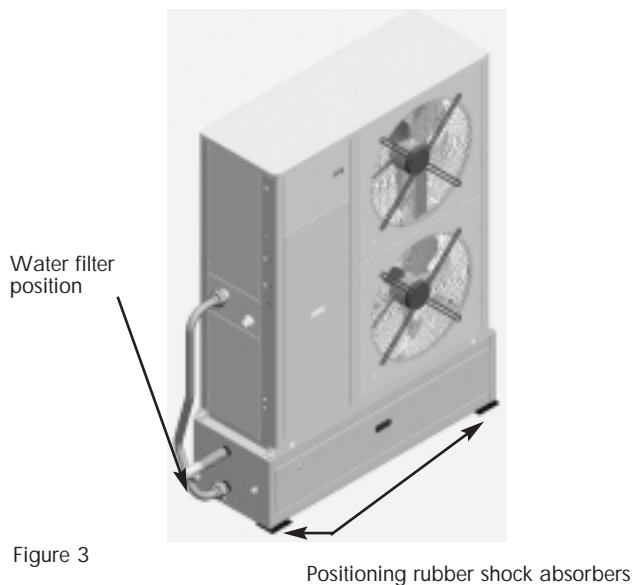


Figure 3

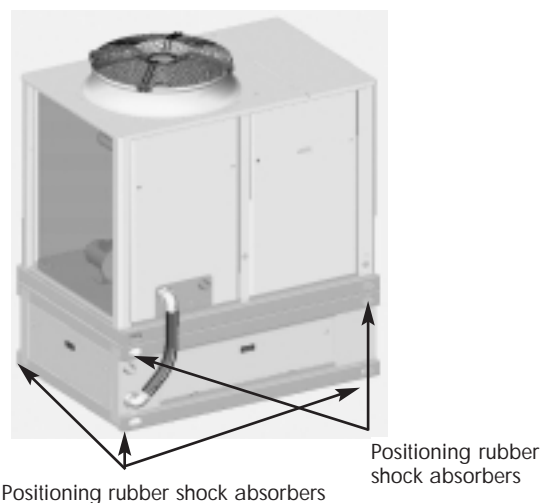


Figure 4

Machines from 40 to 130

4.6.7 Installation Procedure

The accumulation kits shall be arranged beneath the unit. They will not change its overall dimensions (Figure 3 and 4).

Arrange the rubber shock absorbers beneath the kit before providing for its connection.



The installation of the spring shock absorbers will replace the installation of the rubber shock absorbers supplied with the accumulation kit.

Arrange the rubber shock absorbers between the unit and the kit for the 40-130 units (Figure 4).

Tighten the screws into the holes arranged on the 4

corners in order to fasten the unit to the accumulation kit.

Provide for the hydraulic and electrical connections. In doing so, observe the diameters shown by the quoted drawings.

The wiring for the standard antifreeze resistance is arranged as it is shown by Figure 1 and 2 for the different types of accumulation. The resistance is connected with the main terminal box for the 20-25-30-35 models and with the pull box arranged in the fans department for larger sizes.

See the wiring diagram attached to the unit for the correct execution of the electrical connections.

Install the water filter as it is shown by Figure 3 for the machines of the 20-25-30-35 size.

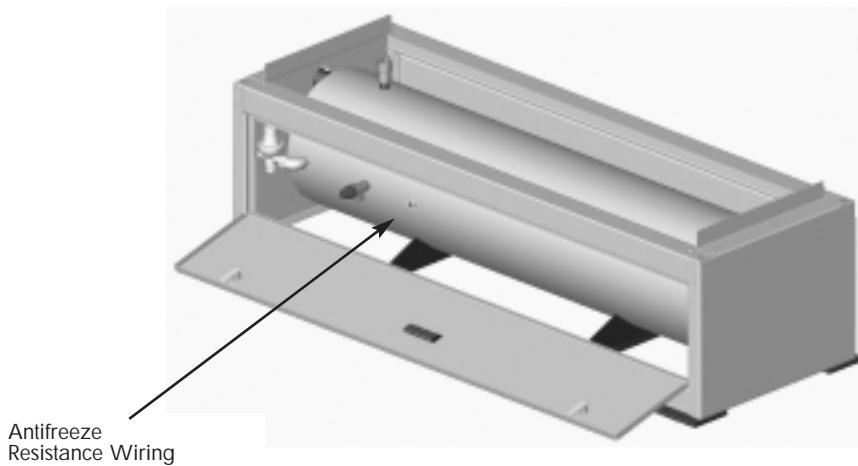


Figure 1

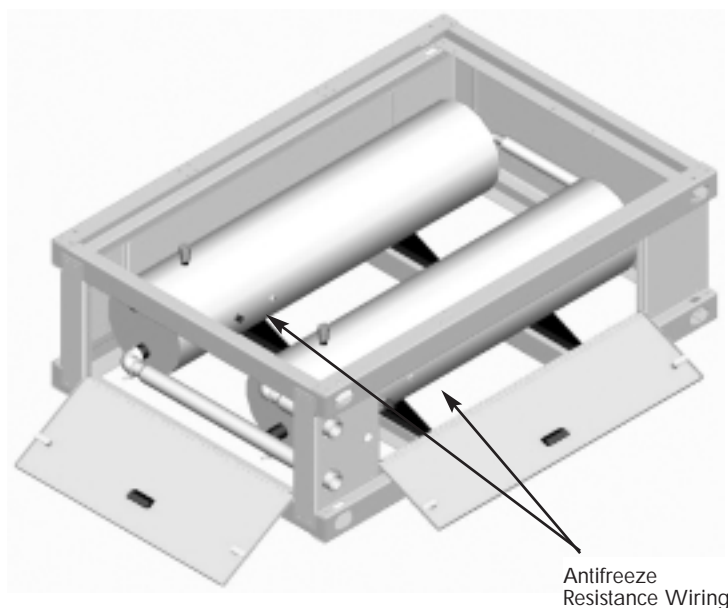
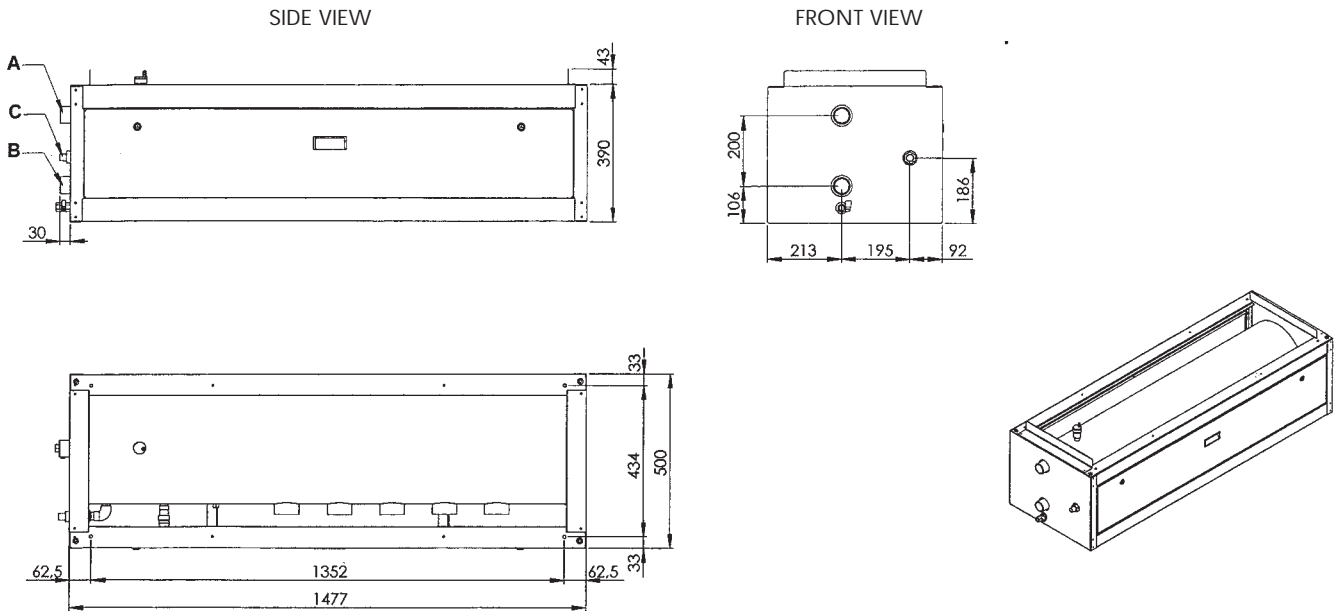


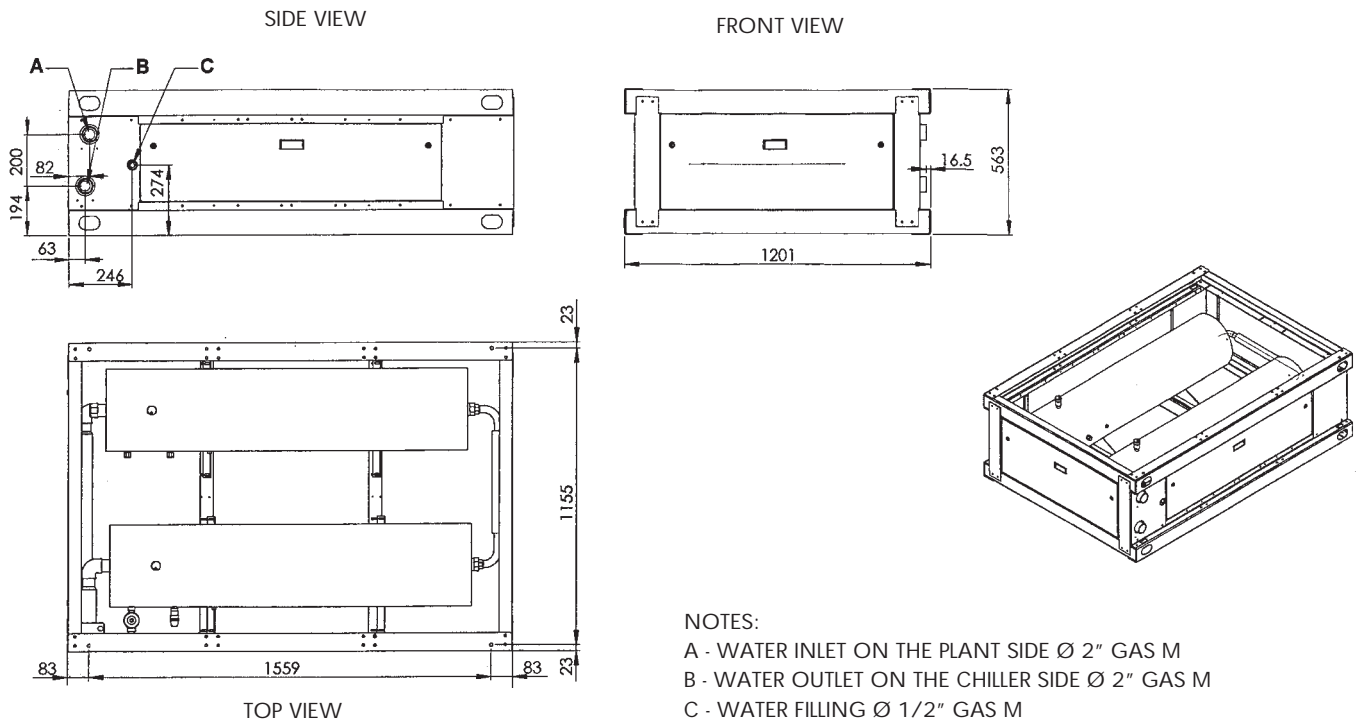
Figure 2

Storage Kit (112 I) for AQL/AQH 20-35 - Dimensional Data



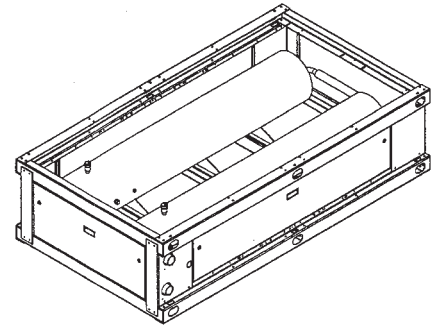
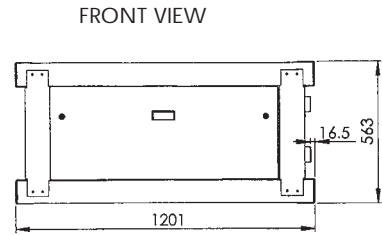
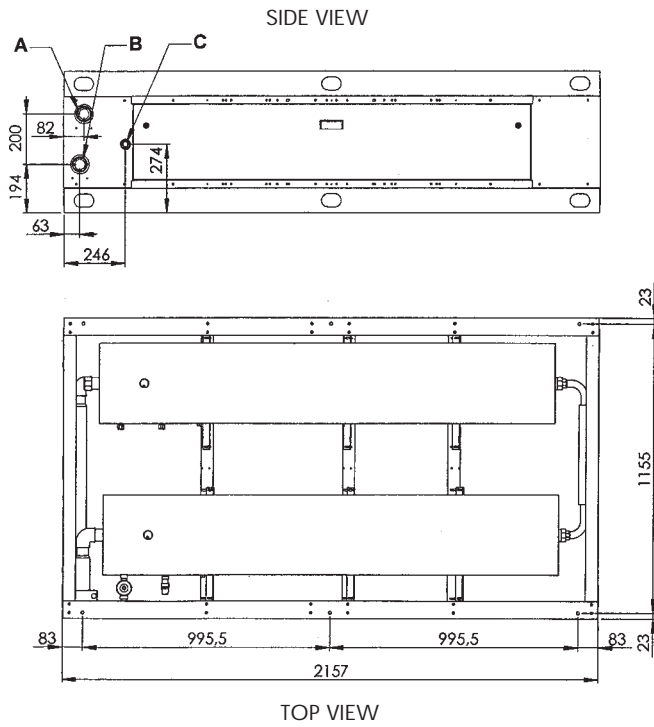
NOTES:
 A - WATER INLET ON THE PLANT SIDE Ø 1 1/2" GAS M
 B - WATER OUTLET ON THE CHILLER SIDE Ø 1 1/2" GAS M
 C - WATER FILLING Ø 1/2" GAS M

Storage Kit (224/112 I) for AQL 40-50 / AQH 40 - Dimensional Data



NOTES:
 A - WATER INLET ON THE PLANT SIDE Ø 2" GAS M
 B - WATER OUTLET ON THE CHILLER SIDE Ø 2" GAS M
 C - WATER FILLING Ø 1/2" GAS M

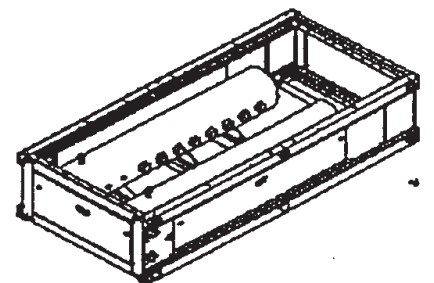
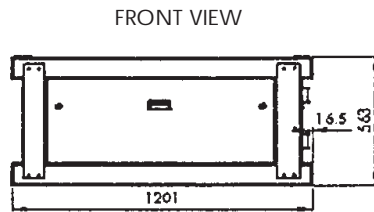
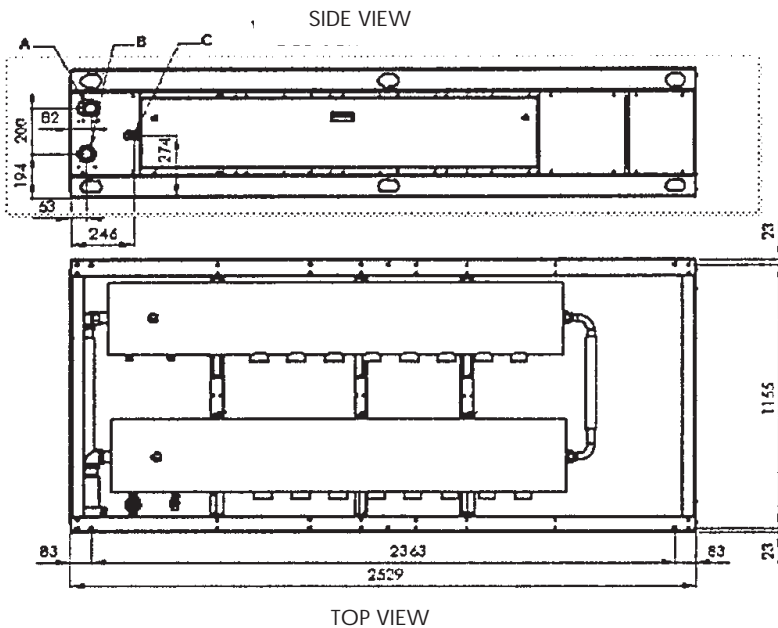
Storage Kit (294/147 I) for AQL 60-80 / AQH 50-80 - Dimensional Data



NOTES:

- A - WATER INLET ON THE PLANT SIDE Ø 2" GAS M
- B - WATER OUTLET ON THE CHILLER SIDE Ø 2" GAS M
- C - WATER FILLING Ø 1/2" GAS M

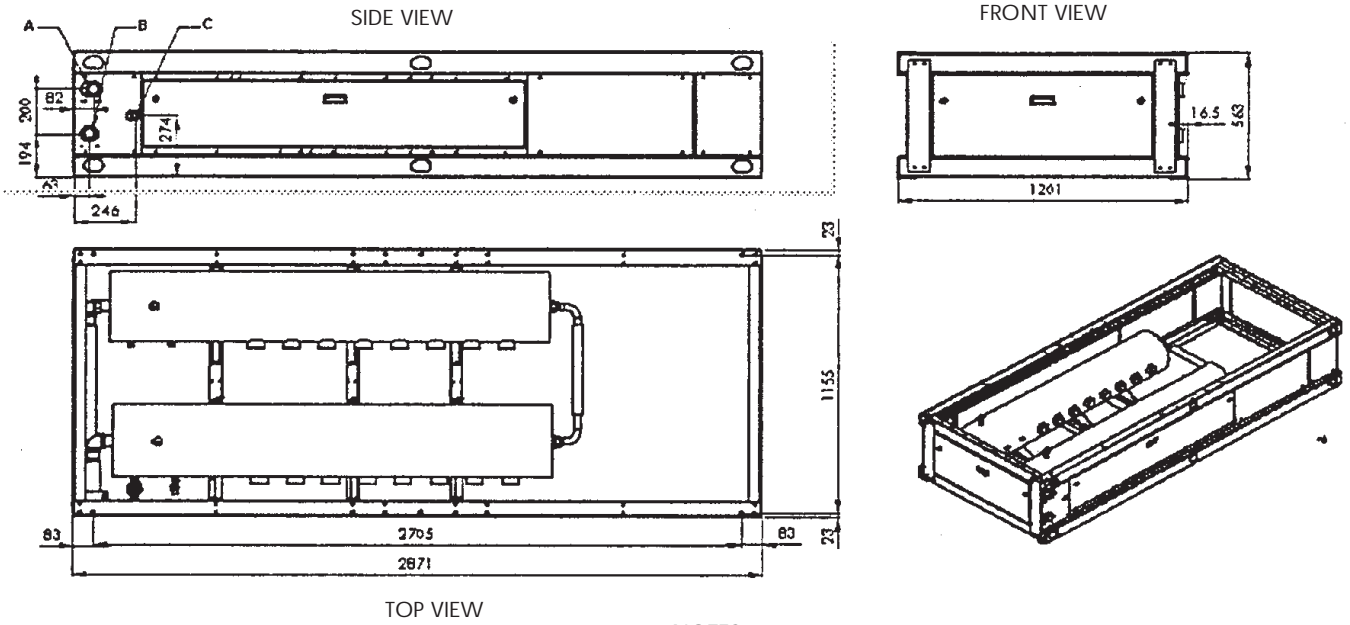
Storage kit (294-147 I) for AQL/AQH 90-100 / AQH 90 - Dimensional Data



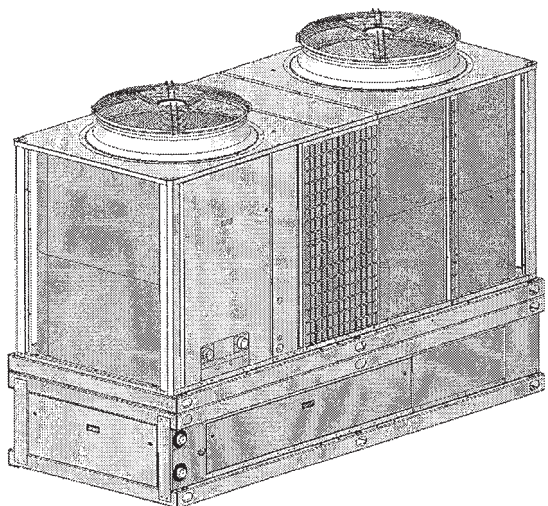
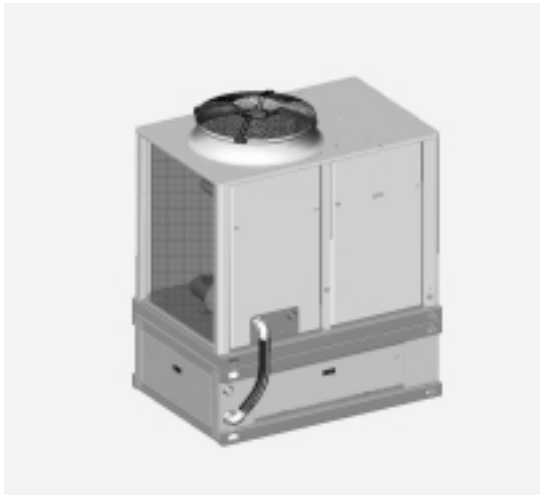
NOTES:

- A - WATER INLET ON THE PLANT SIDE Ø 2" GAS M
- B - WATER OUTLET ON THE CHILLER SIDE Ø 2" GAS M
- C - WATER FILLING Ø 1/2" GAS M

Storage Kit (294/147 l) for AQL/AQH 110-130 / AQH 100-130 - Dimensional Data



NOTES:
A - WATER INLET ON THE PLANT SIDE Ø 2" GAS M
B - WATER OUTLET ON THE CHILLER SIDE Ø 2" GAS M
C - WATER FILLING Ø 1/2" GAS M



4.7 Electrical Supply Features



Make sure the unit is not alive before acting on the electrical installation.



The unit shall be grounded.



The installer shall make sure that all the external connections of the unit have been realised in compliance with the safety rules in force.

The manufacturer is not responsible for any damage and/or accident which may result from the non observance of these precautions.

The unit complies with the EN 60204-1 standard.

The following connections are required:

- A pr=N three-phase line with earthing for the power supply or without N for the units not requiring it.

The electrical installation for distribution shall be able to supply the power absorbed from the device (see Chapter 9).

Disconnectors and magnetothermal switches shall be dimensioned in such a way that they can handle the pick-up current of the unit (see Chapter 9).

Power supply lines and insulation devices shall be designed in such a way that every line is completely independent.

It is recommended to install the differential switches which shall prevent any damage due to any phase loss.

Fans and compressors are supplied by contactors controlled by the control panel.

Each motor is complete with an internal safety thermal switch as well as with external fuses or magnetothermal switches.

Power supply cables shall be run through the entrance passage which can be found on the front side of the unit and then routed into the electrical panel through the holes at its bottom.

4.8 Electrical Connections

The installation of the unit on the field shall be carried out in compliance with the Machinery Safety Directive (EEC 98/37), the Low Voltage Directive (EEC 73/23), the Electromagnetic Compatibility Directive (EEC 89/336) as well as the usual procedures and standards in force. The unit shall never be operated if its installation is not carried out according to the instructions above. The power supply lines shall be composed by insulated copper wires dimensioned for the maximum current which may be absorbed.

Dimensioning shall be performed by considering the file length, the type of cable in use, the type of installation as well as the maximum operating room temperature.

Terminal connections shall be made according to the connection diagram attached to this manual and the wiring diagram supplied with the unit.



Before connecting the power supply lines, make sure that the voltage value lies within the limits shown by the Electrical Data in Chapter 9.

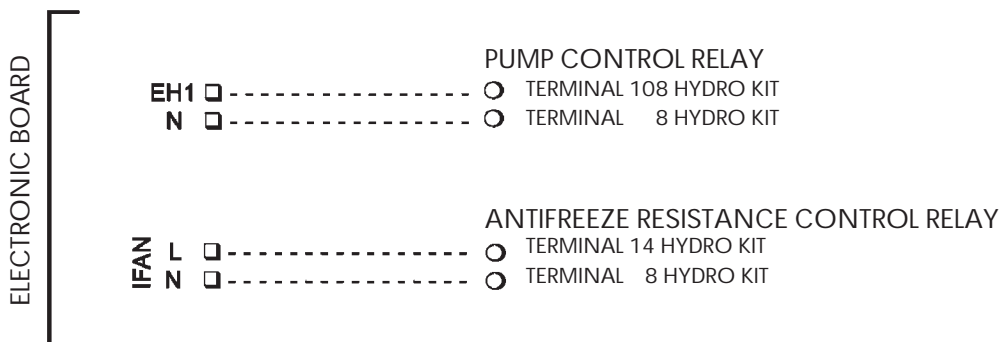
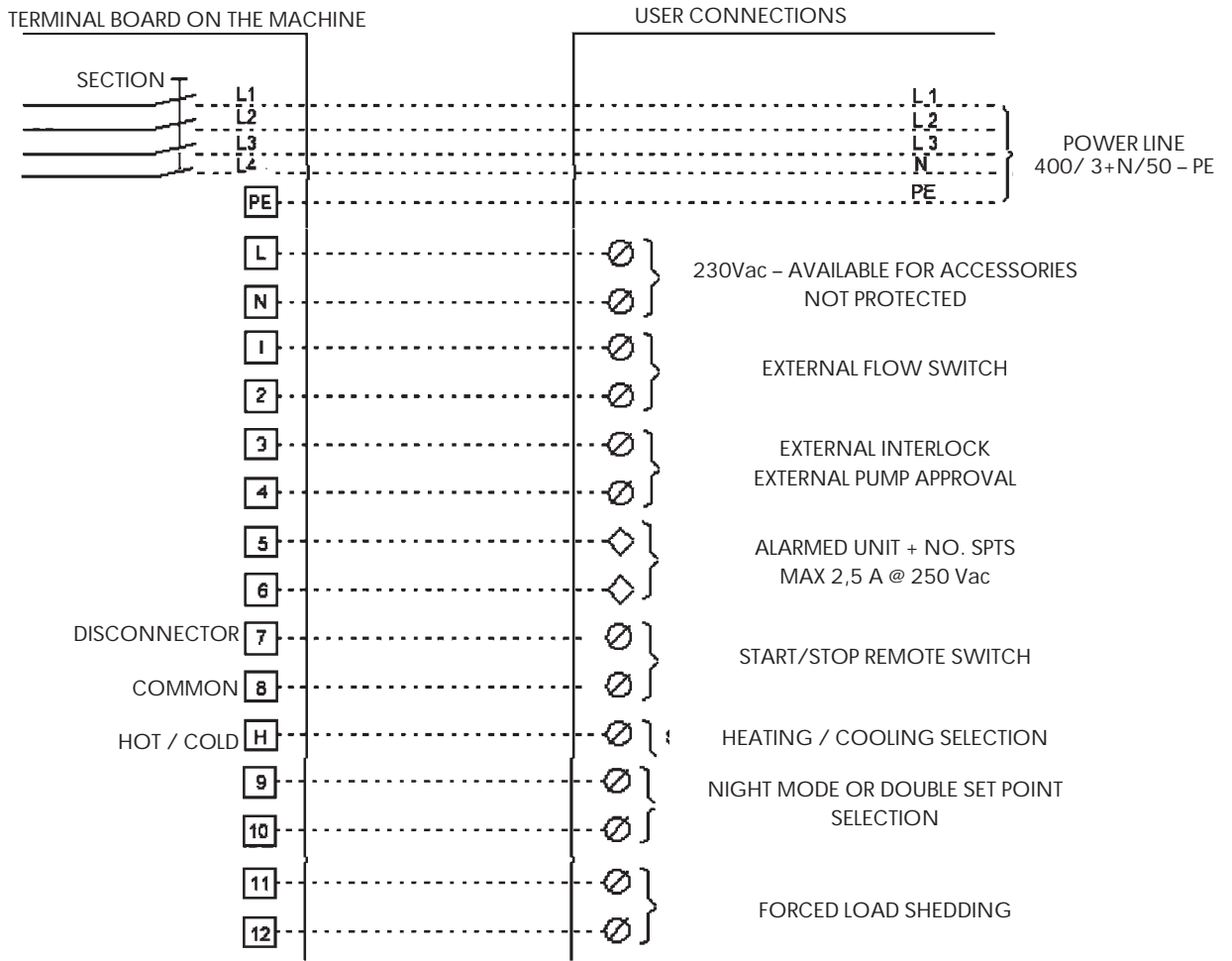
Make sure that the unbalance between the phases will not exceed 2% for three-phase systems. Check by measuring the differences between the voltage values of every single phase couple and their average value during the operation. The maximum percentage value of these differences (unbalance) shall never exceed 2% of the average voltage.

If the unbalance should be unacceptable, contact the Power Supply Company and require it to correct the fault.



If the unit is supplied by a line whose unbalance is higher than the admitted value, the warranty will automatically become null and void.

Electrical Connections of the AQL/AQH 20-35 units with Neutral

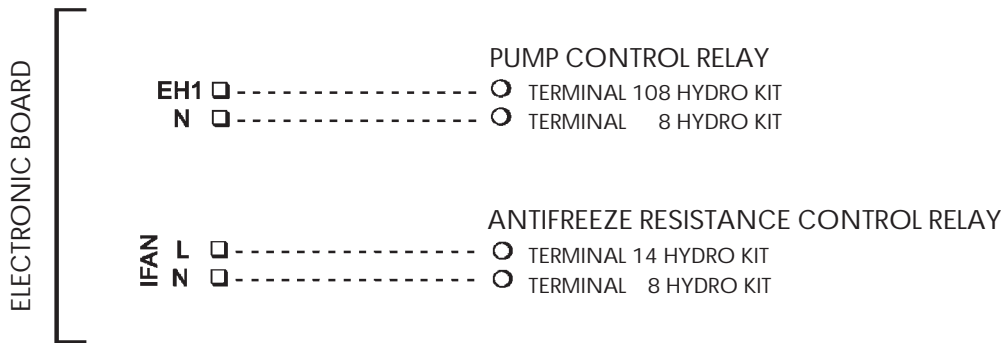
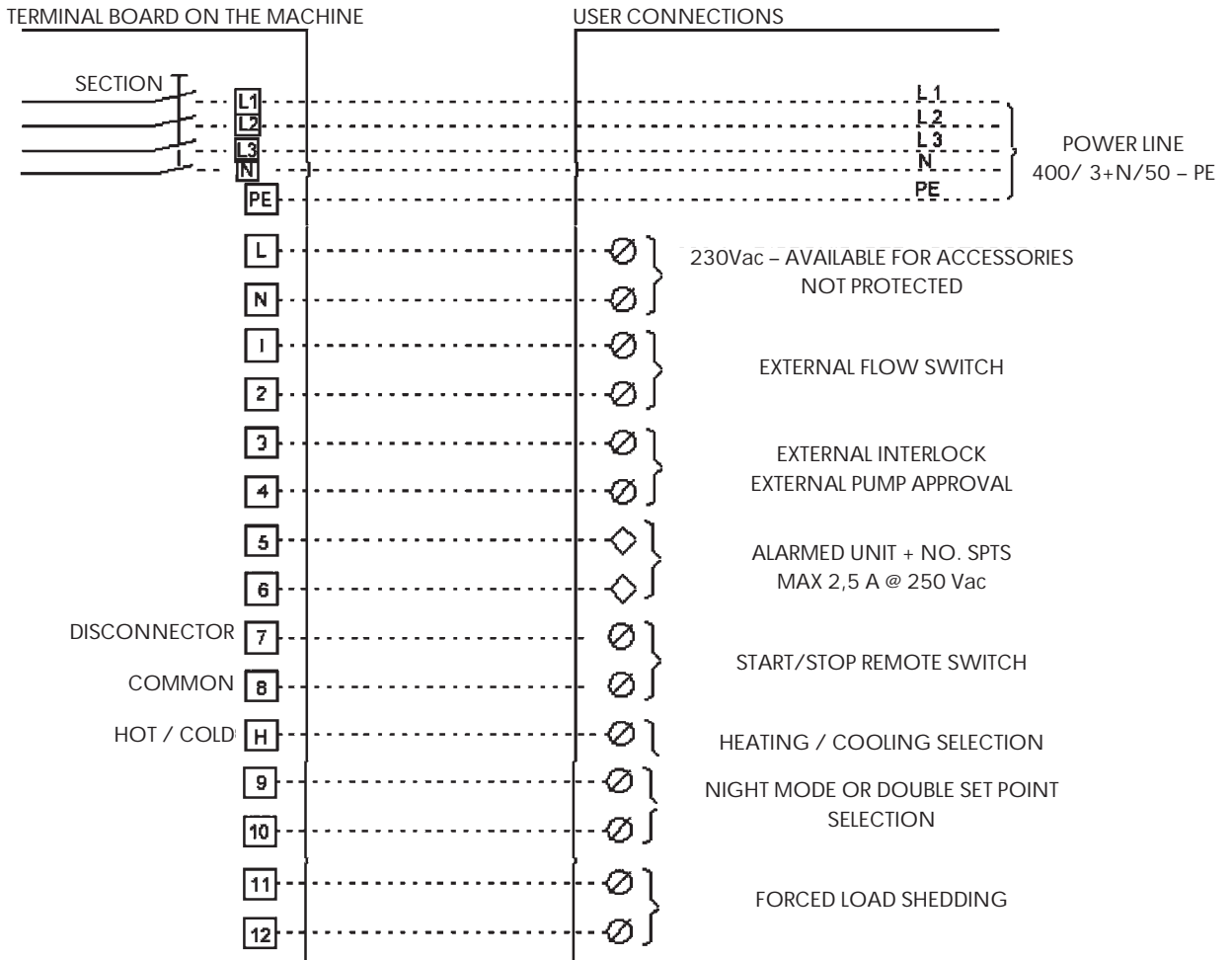


□ TERMINALS ON THE MACHINE

○ TERMINALS FOR EXTERNAL CONNECTIONS

◇ VOLTAGE FREE CONTACTS
NOTE: Always refer to the machine wiring diagram.

Electrical Connections of the AQL/AQH 40-80 units with Neutral

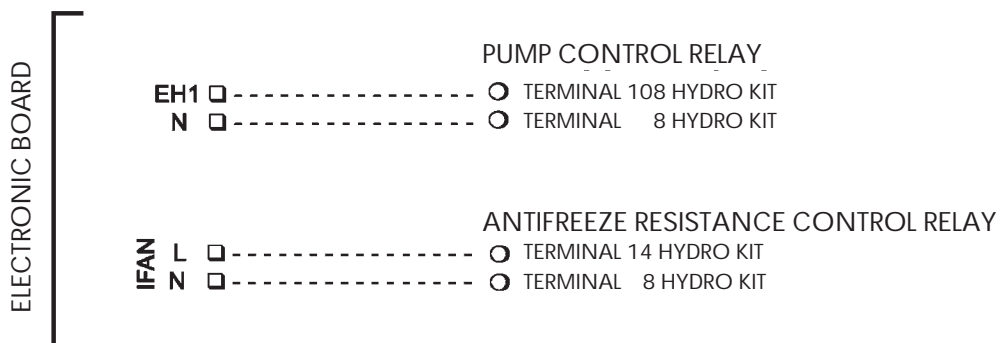
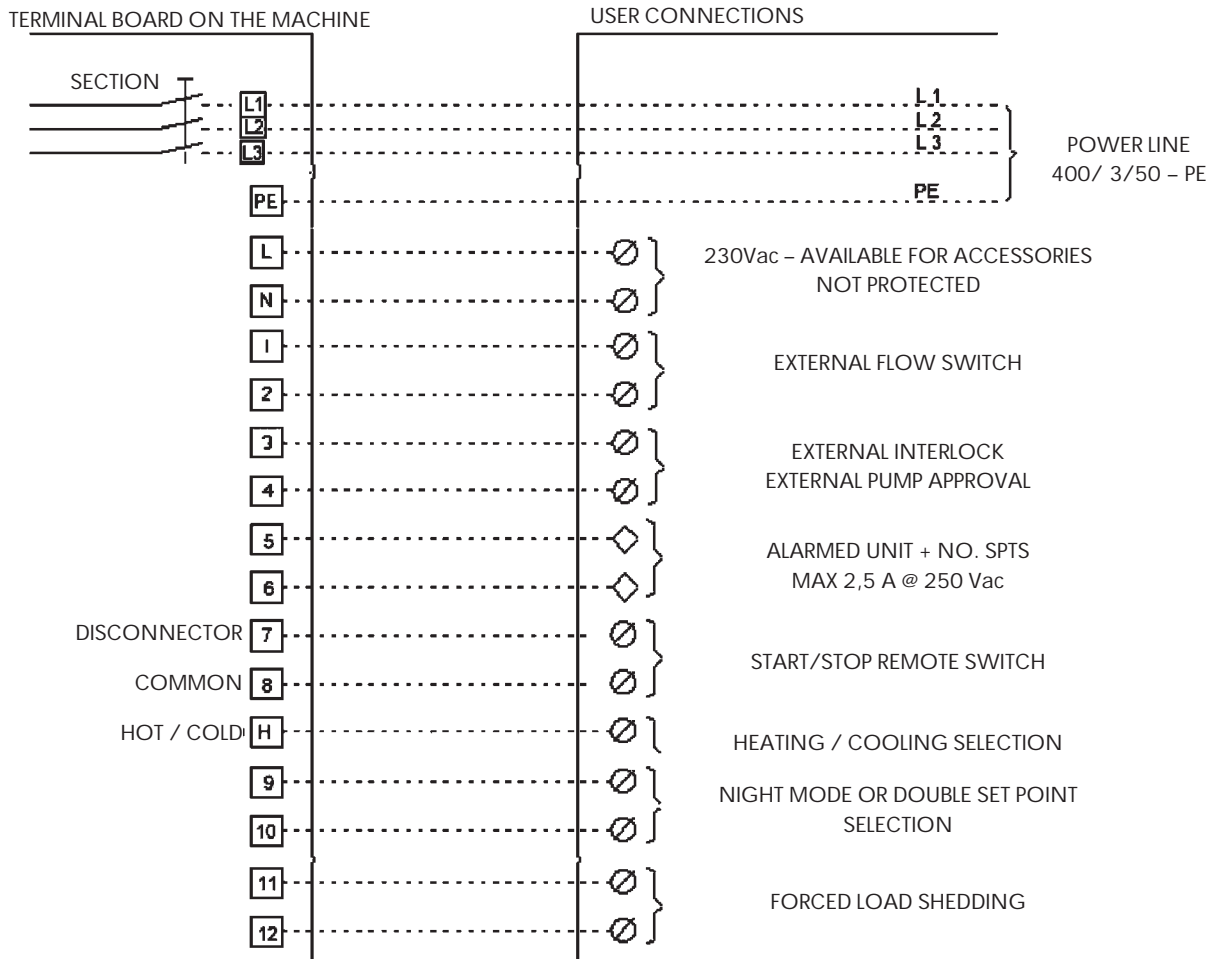


□ TERMINALS ON THE MACHINE

○ TERMINALS FOR EXTERNAL CONNECTIONS

◇ VOLTAGE FREE CONTACTS
NOTE: Always refer to the machine wiring diagram.

Electrical Connections of the AQL/AQH 40 - 80 units without Neutral



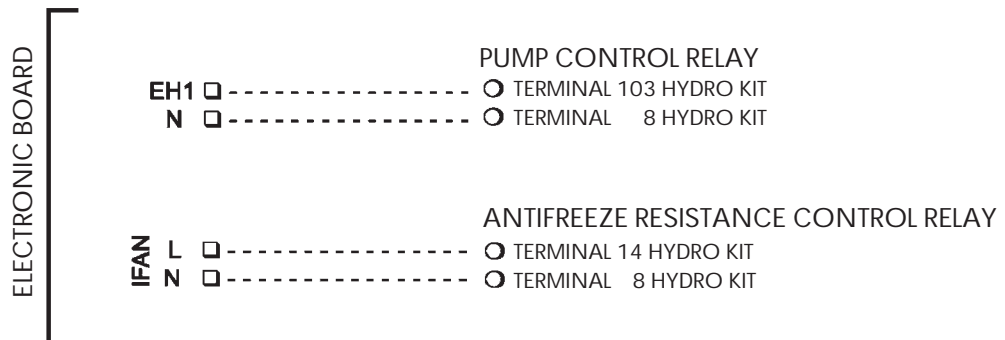
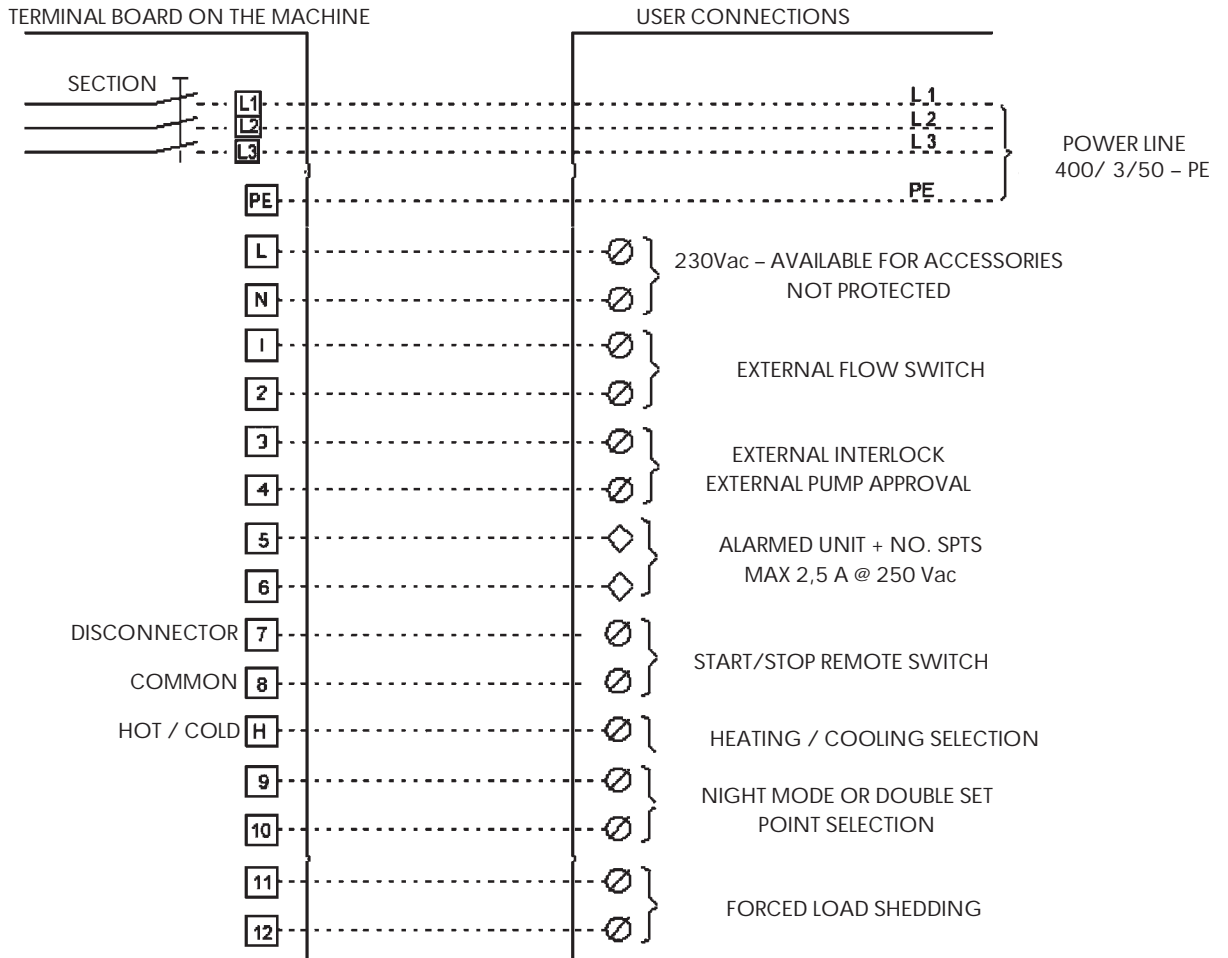
□ TERMINALS ON THE MACHINE

○ TERMINALS FOR EXTERNAL CONNECTIONS

◇ VOLTAGE FREE CONTACTS

NOTE: Always refer to the machine wiring diagram.

Electrical Connections of the AQL/AQH 90 - 130 units without Neutral



□ TERMINALS ON THE MACHINE

○ TERMINALS FOR EXTERNAL CONNECTIONS

◇ VOLTAGE FREE CONTACTS

NOTE: Always refer to the machine wiring diagram.

5 COMMISSIONING



The unit may only be started by the personnel trained by an authorised Itelco-Clima Service Centre. Otherwise, the warranty will be automatically made null and void.



The operations performed by the technical service personnel are limited to the start-up of the unit. They do not include any other work on the installation, such as for example the execution of electrical, hydraulic connections, etc. All the other operations preparatory to the start-up, including oil pre-heating for at least 12 hours, shall be carried out by the Installer.

5.1 Preliminary Checks

The following operations shall be performed before the arrival of the Itelco-Clima personnel on site in order to start up the unit.

- Check the sections of supply cables, the ground connection, the clamps of terminals and the good operation of contactors when the main disconnecter is open.
- Make sure the R.S.T. phase sequence is correct.
- Make sure the unbalance between the supply line phases is within the limits as per Chapter 4.
- Connect (without any supply) the flow switch contacts, the pump thermal overload cut-out or any other device to terminals 1-2 and 3-4.
- Make sure the components of the water circuit connected to the circulation refrigerant / fluid exchanger (pumps, sensors, uses, expansion tank and storage tank, if any) are correctly installed in compliance with the instructions of the manufacturers.
- Make sure that the water circuits have been filled and the circulation of the various fluids occurs correctly, without any sign of leakage or air bubbles. If ethylene glycol is used as an antifreeze, make sure its mixture percentage is correct.
- Make sure that the direction of rotation of the pumps is correct and the fluids have circulated for at least 12 hours for each pump. Clean the baskets of the filters on the aspirating side of the pumps.
- Calibrate the installation so that the fluid will have the specified flow rate.

- Make sure the quality of the circulating fluid complies with the specifications.

- Make sure oil electrical heaters have been energised for at least 12 hours.

5.2 Starting

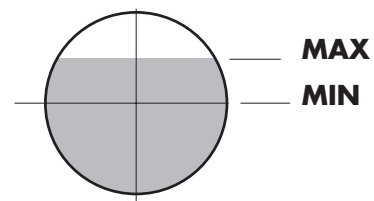
The starting sequence shall be performed as follows:

- Close the main disconnecter (at least 12 hours before).
- Make sure that the oil inside the compressors is hot enough (the external temperature of the oil pan shall be at least 40 °C) and the auxiliary circuit of controls is energised.
- Make sure that the whole external equipment is perfectly working and the control devices of the installation are properly calibrated.
- Start the pumps of the circulating fluids and make sure they can deliver the flow rate required.
- Set the fluid temperature you wish on the control panel (refer to Chapter 6).
- Start the unit you wish (refer to Chapter 6).
- Check the direction of rotation of scroll compressors.
- After about 15 minutes make sure no gas bubble is visible through the sight glass of the liquid line.



If air bubbles are visible through the sight glass, it means that the unit has lost part of its charge through one or several leakage points. The leaks shall be removed. Refer to Chapter 7.

- Repeat the starting procedure after having removed the leaks.
- Make sure the oil level is correct.



5.3 Performance Check

Check as follows:

- The inlet temperature of the fluid circulating in the manifold of the exchangers.
- The outlet temperature of the fluid circulating in the manifold of the exchangers.
- The flow rate of the fluid through the exchangers.
- The current absorbed by compressors and fans at the start-up and under steady operating conditions.

Check the saturated evaporation and condensation temperatures during the unit operation by connecting the manometers with the two Schraeder valves which can be found on the low and high pressure side of refrigerating circuits.

High pressure side	15-18°C above the air inlet temperature in the battery.
Low pressure side	5-7°C below the outlet temperature of the water circulating from the evaporator.

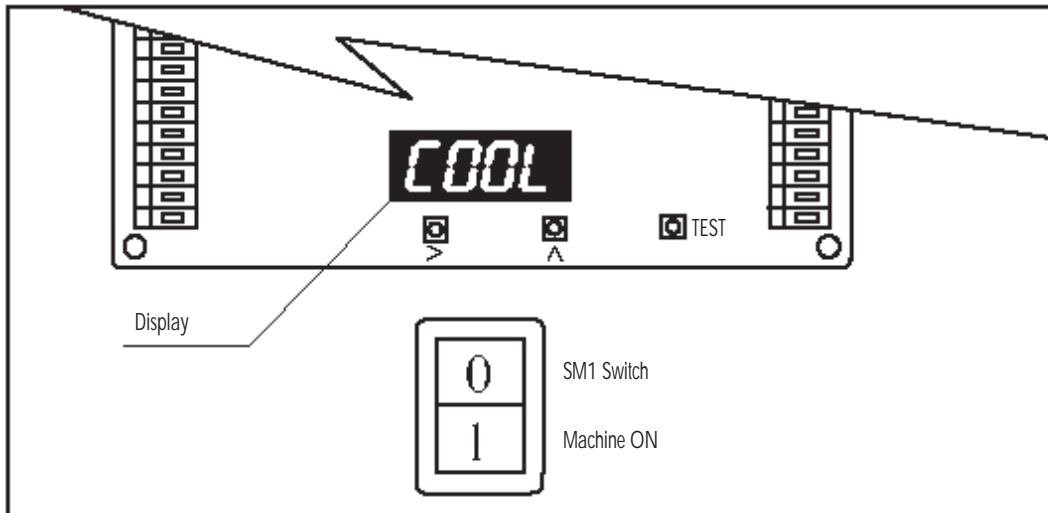
5.4 Delivery to the User

- Inform the user about the instructions for use which can be found in Chapter 6.

6 AQL/AQH CONTROL

6.1 Electronic Card Control

■ Keyboard



SM1 SWITCH:

- position **0**: machine OFF. The resistors may be enabled. Test available.
- position **1**: machine ON. Test available.

> SWITCH

makes it possible to horizontally scroll through the MENUS and to display the parameter values

^ SWITCH

makes it possible to vertically scroll through the MENUS and SUB-MENUS and to increase the numerical value of the parameters.

TEST SWITCH

Starts an automatic testing procedure for all the main functions of the unit. See TESTING PROCEDURE.

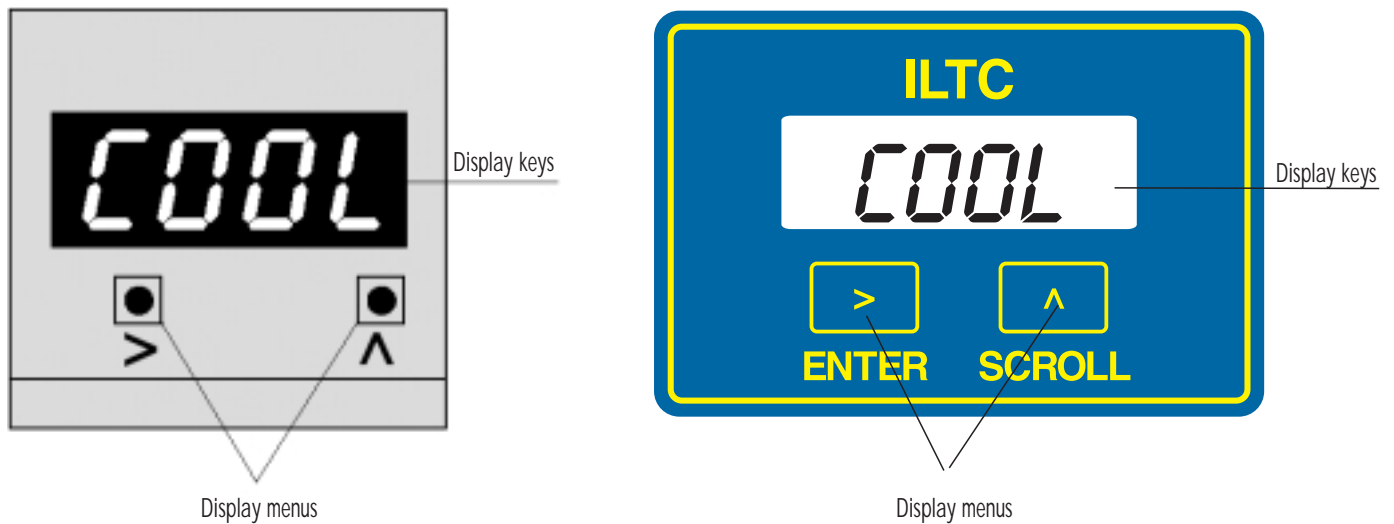
6.2 Dip Switches

The control is provided with 2 DIP switch blocks: DSW1 (12 dipo) and DSW2 (8 dipo).

FUNCTION OF DSW1 DIPS

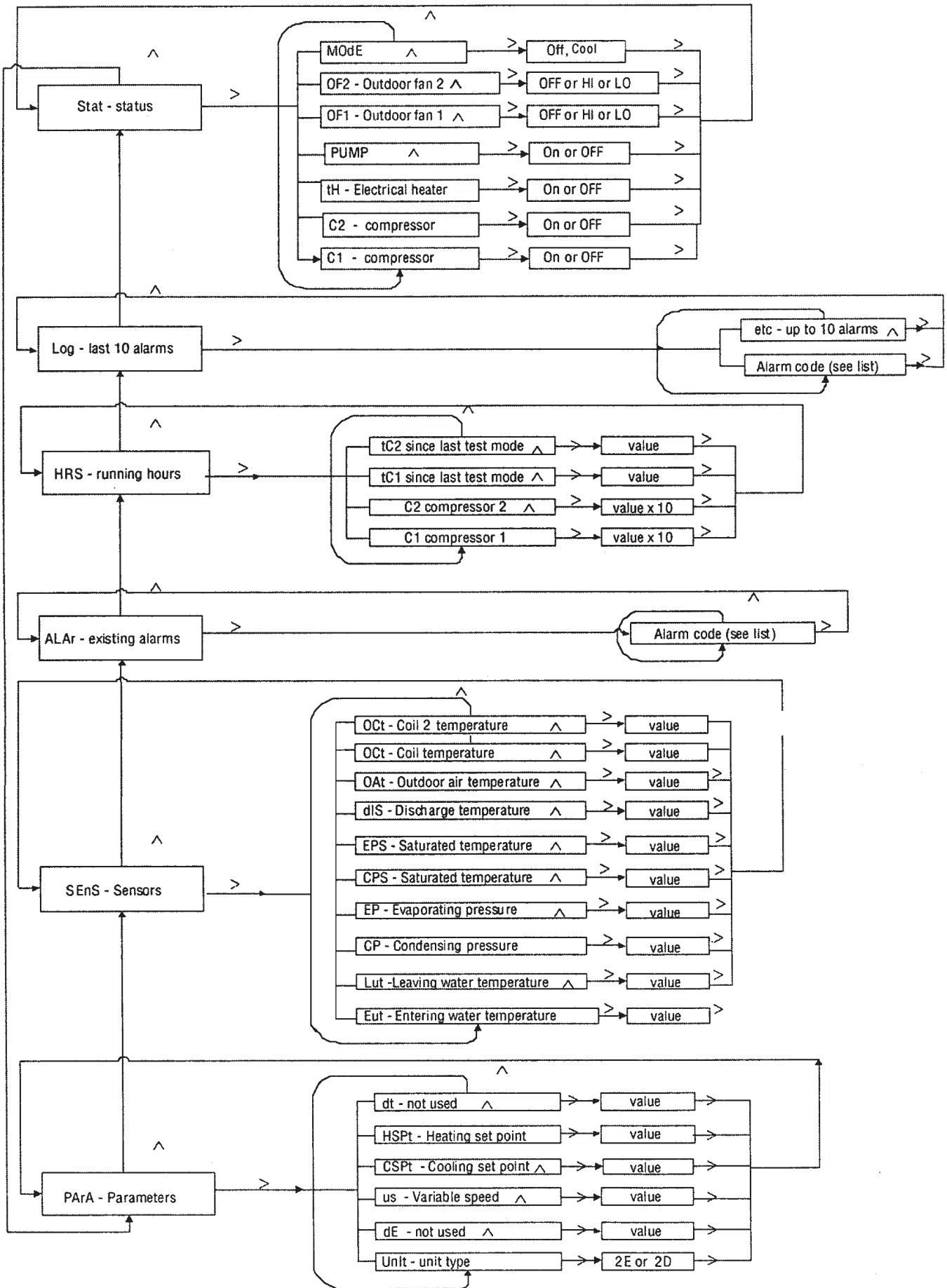
DIP	OFF	ON	STANDARD
1	Pump ON only if the unit is ON	Pump always ON	OFF
2	Step ventilation	Continuous ventilation	OFF
3	Pump Off in antifreeze protection	Pump On in antifreeze protection	ON
4	Discharge of comp. 1	Discharge of comp. 2	OFF
5	Normal	Slave	OFF
6	Room temperature compensation	No compensation	ON
7	Enable input 5 pump' thermal switch	Disable input 5	pack unit = OFF non pack = ON
8	Forced defrosting OFF	Forced defrosting ON	OFF
9	Serial address		OFF
10	Serial address		OFF
11	Serial address		OFF
12	Serial address		OFF

■ Display keys



All the information is displayed on 4 displays (7-segments).

Use the > and ^ keys to enter the display menus as follows:



6.3 ALAr and LOg Menus

The activated alarms of the unit are displayed in the ALAr menu. More alarms can be activated at the same time. The alarms are recorded in a permanent LOG memory.

The last 10 recorded alarms are displayed in the LOg menu. The following table shows the alarm codes and description:

Code	Alarm description	Auto	Manual	Notes
ADC	Microprocessor error		•	
CPF	failure of HP transducer, off scale	•		
EPF	failure of LP transducer, off scale	•		
REF	refrigerant leak - low pressure	•		
CPnc	failure of HP transducer, unchanged pressure	•		
EPnc	failure of LP transducer, unchanged pressure	•		
CFC1	failure of compressor 1		•	wrong rotation
CFC2	failure of compressor 2		•	wrong rotation
EWTH	failure of return water probe	•		short-circuit
EWTL	failure of return water probe	•		not connected
LWTC	no variation in the leaving water temperature	•		
LWTH	failure of leaving water probe	•		short-circuit
LWTL	failure of leaving water probe	•		not connected
LWLH	failure of compressor discharge temperature probe	•		short-circuit
DISL	failure of compressor discharge temperature probe	•		not connected
OATH	failure of air temperature probe	•		short-circuit
OATL	failure of air temperature probe	•		not connected
OC1L	failure of temperature probe - coil 1	•		not connected
OC2L	failure of temperature probe - coil 2	•		not connected
HPP	first high pressure protection	•		stop1 compressor
HP	high pressure protection from transducer			auto energized 3 times
HPC	high pressure protection - locked circuit		•	
LP	low pressure protection		•	
DIS	excessive discharge temperature of compressors		•	
LO	insufficient leaving water temperature	•		
HI	excessive entering water temperature	•		
FS	electrical flow switch or water differential pressure switch	•		
CF1	thermal protection, compressor 1		•	
CF2	thermal protection, compressor 2		•	
OF1	thermal protection, fans	•		
PF	thermal protection, pump		•	
LOu	low water volume	•		
EEP	microprocessor error		•	
JUMP	wrong DIP configuration		•	DIP check
ConF	wrong configuration		•	

6.4 SEnS Menu – Sensors reading

Displayed Code	Meaning
EWT	entering water temp
LWT	leaving water temp
CP	discharge pressure
EP	intake pressure
CPS	sat. temperature (discharge)
EPS	sat. temperature (intake)
Dis	compressor's discharge temp
OAT	room air temp
OCT 1	probe temperature in coil 1
OCT 2	probe temperature in coil 2

7 MAINTENANCE



While discharging the refrigerating circuits, never release the refrigerant into the atmosphere. Use proper recovery equipment for the discharge. If the recovered refrigerant can not be reused, it shall be returned to the producer.



Never dispose of the compressor oil in the atmosphere since it contains dissolved refrigerant. If used, the oil shall be returned to the producer.

The Safety Section of this manual shall be carefully read before performing any maintenance operation on the unit.

Unless otherwise specified, the maintenance operations here below can be performed by any maintenance technician who has been specifically trained.

7.1 General Information

Itelco-Clima AQL/AQH units have been designed for constant operation, provided that they are regularly serviced and operated within the limits specified by this manual. Every unit shall be serviced according to a User / Customer schedule and regularly inspected by the personnel from an authorised Itelco-Clima Service Centre.

It is the User's responsibility to fulfil these maintenance requirements and/or make an agreement with an Itelco-Clima Service Centre so as to protect the operation of the device.

If any damage or failure should occur as a result of improper maintenance during the warranty period, Itelco-Clima will not be liable for any cost required to restore the original state of the device.

This section is only applicable for basic AQL/AQH units. According to the circumstances, it might be supplemented with additional instructions as a result of any change which may be made to the unit or to the use of the ancillary equipment.

7.2 Daily Maintenance

Maintenance checks shall be performed by a competent person according to the schedule here below.

However, it shall be noted that AQL/AQH units can not be directly repaired by the User who shall refrain from attempting to repair any failure which may be discovered during daily maintenance. In case of doubt, contact the Itelco-Clima Service Centre.

Scheduled Maintenance

Operations	Daily	Weekly	Monthly	Season start	Season end
Check the temperature of the fluid leaving the exchanger	•				
Check any exchanger load loss		•			
Check the electrical absorption		•			
Check the suction temperature and pressure		•			
Check the delivery temperature and pressure		•			
Check the compressor oil level		•			
Make sure there is no gas bubble in the liquid line		•			
Make sure the finned pack of the external battery is clean			•		
Check the operation of the oil heater			•		
Check the operation of the Remote Control Unit			•		
Check the operation of the high pressure switch				•	
Check the insulation of the circulating refrigerant / fluid exchanger				•	
Make sure the screws of terminals are firmly tight				•	
Clean the external surfaces of the unit with soapy water				•	
Check the operation of the differential pressure switch				•	
Check the density of the antifreeze mixture (glycol water) if this mixture is used				•	•
Drain and clean the circulating refrigerant / fluid exchangers					•

7.3 Refrigerant Charge



AQL/AQH units operating with R407C shall be exclusively charged with refrigerant in the liquid state to prevent the refrigerant composition from altering. A service valve is arranged for charging the unit at low pressure.

If the charge is not enough, the unit will reduce its performance. In extreme cases, the low pressure switch might trip and cause the unit to stop.

If the charge is too large, the condensation pressure might increase to such an extent that it might cause the high pressure switch to trip and the unit to stop.



The compressors of the unit shall never be used as vacuum pumps to discharge the corresponding circuits.

The refrigerating circuit shall be recharged whenever it has been discharged for maintenance purposes (elimination of leaks, compressor repair, etc.). Charge quantities are specified by Chapter 9.

Before being charged, every circuit shall be dried and vacuum-purged so that the absolute pressure may not exceed 50 Pa inside it.

7.4 Compressors

Compressors are supplied with the oil quantity required for operation. This charge should last as long as the compressor under normal operating conditions. The lubricant shall not be topped up as long as the refrigerating circuit is operating correctly and until no repair has been carried out.

If a compressor is faulty and it is to be replaced, replacement may be only carried out by the personnel of an Authorised Service Centre.

7.5 Refrigerant/Air Exchangers

They are made up of copper tubes and aluminium fins. If the refrigerant should leak as a result of an accidental damage, repair operations may be only carried out by the personnel of an Authorised Service Centre.

To make service and maintenance operations easier, the external surfaces of these exchangers shall always be kept free of any impurity, such as leaves, fibres, insects, etc. If heat exchangers are dirty, the power absorbed may increase. This may also cause the unit to reach such a pressure threshold which might trigger an alarm and cause the unit to stop.



Avoid damaging the aluminium finned pack during cleaning.

The internal side of the finned pack of these exchangers can be cleaned by compressed air oriented parallel to the finned pack and in a direction opposite to that of the normal air circulation. The external side can be cleaned by a vacuum cleaner. The finned pack of these exchangers can be also cleaned by spraying a water and soap solution.

7.6 Fans of the Refrigerant/Air Exchangers

Each fan has got an impeller with wing contoured blades and a cylindrical conveyor. The bearings of the motors are life lubricated for life.

7.7 Dryer Filter

Refrigerating circuits are complete with dryer filters.

These filters can not be inspected and they are complete with a mechanical filter. When the dryer filter is clogged, this is shown by the presence of gas bubbles in the sight glass and by a temperature difference between the side upstream and downstream the filter.

If the presence of gas bubbles should persist after the filter cartridge has been replaced, it means that the unit has lost part of the refrigerant charge through one or more leaks which shall be identified and repaired.

7.8 Sight Glass

The sight glass is used to observe the liquid refrigerant flow and to find out if there is some humidity inside it. If there are some gas bubbles in the liquid flow, it means that the dryer filter is clogged or that the refrigerant charge has partially leaked out.

A coloured indicator is arranged inside the sight glass. If you compare its colour with the chromatic scale arranged on the external ring of the sight glass, you may find out if there is some humidity in the refrigerant. If the humidity content should be too high:

- Discharge the circuit and collect the refrigerant. The circuit shall be then vacuum-purged and recharged.

7.9 Thermal Expansion Valves

The refrigerating circuits of the AQL/AQH units are equipped with a thermal expansion valve complete with an external equaliser. This valve is calibrated at works to ensure 5 K overheating.

Act as follows to control overheating:

Read the suction pressure by using a manometer connected with the filling valve on the suction side.

Use the thermometric scale of the manometer to identify the T_{sa} saturated temperature corresponding to the pressure you have measured.

Measure the T_{se} effective suction temperature by using a contact thermometer arranged on the attachment at the outlet of the evaporator gas.

Overheating is calculated as follows:

$$S = T_{se} - T_{sa}$$

Or use the Menu function

Overheating can be changed by acting on the calibrating screw of the thermal expansion valve. Turn this screw clockwise to increase overheating. Turn it counterclockwise to decrease overheating.

The valve shall be calibrated again by turning the calibrating screw by one revolution at a time and then by operating the unit for 5 minutes. After this period of time has elapsed, check overheating and correct it again, if required.



The thermal expansion valves of the AQH models shall be calibrated with the utmost care since every circuit of these units has got one single thermal expansion valve which is used both in cooling and in heating mode.

If the thermal expansion valve can not react to the overheating calibration, it means that it is not operating correctly and that it shall be replaced. The thermal expansion valve may be only replaced by an Authorised Service Centre.

7.10 Refrigerant / Circulating Fluid Exchanger

The cleanness of these exchangers on the water side shall be checked at regular intervals. This can be accomplished by checking the load loss on the water side (see Chapter 9) or by checking the difference between the incoming and outgoing fluid temperature and by comparing these values with the evaporation temperature.

The difference between the outgoing fluid temperature and the evaporation temperature shall lie between 5 and 7 K to enable the heat exchange to occur optimally. A greater difference means that the exchanger is not working optimally since it is dirty.

In these cases, this exchanger shall be chemically cleaned by the personnel authorised by the manufacturer.

Contact an Authorised Service Centre for any other type of operation (extraordinary maintenance, replacement of the whole exchanger, etc.).

Contact an Authorised Service Centre for any other type of service (extraordinary maintenance, replacement of heat exchangers, etc.).

8 TROUBLE SHOOTING

The following table will give a detailed list of unit faults and remedies. Contact an Authorised Itelco-Clima Service Centre for any other problem which can not be clearly ascribed to one of the cases listed in the table and/or for any other need for technical assistance.

Fault	Probable Cause	Remedy
The unit operates continuously, but without cooling.	Low refrigerant charge.	Top up the refrigerant charge.
	The dryer filter is clogged.	Replace the dryer filter.
	Loss of efficiency in one or both circuits.	Check the compressor and replace it, if required.
Hoar-frost is building on the suction line.	The thermal expansion valve is out of calibration.	Increase overheating.
		Check the charge.
The noise level is too high.	Vibrating pipelines.	Secure the pipelines.
		Check the anchorage of the pipelines.
	The thermal expansion valve is whistling.	Top up the charge.
		Check the dryer filter and replace it, if required.
	Noisy compressor.	Check the state of the valves.
		The bearings have seized: replace the compressor.
Make sure that the nuts intended to anchor the compressor have been firmly tightened.		
The compressor oil level has decreased.	One or more than one oil or gas leaks from the circuit.	Identify and eliminate all leaks.
	The compressor is mechanically damaged.	Contact an Itelco-Clima Authorised Service Centre.
	Faulty oil heater.	Make sure the electrical circuit and the elements of the electrical heater are properly working. Replace any defective component.
One or two compressors are not working.	Power supply interruption.	Check the fuses of the supply circuit and make sure the circuit is neither grounded nor short-circuited.
	The high pressure switch has tripped.	Reset the pressure switch from the panel and restart the unit. Identify and eliminate what has caused the high pressure switch to trip.
	The control circuit fuse has tripped.	Check the fuses of the control circuit and make sure the circuit is neither grounded nor short-circuited. Replace the fuses, if required.
	Loose terminals.	Tighten the terminals.
	The thermal switches intended to protect the power supply have tripped.	Make sure the safety and control devices are properly working. Identify and eliminate what has caused the trip.
	Wrong electrical connections.	Check the electrical connections of the control and safety devices.
	The line voltage is too low.	Check the line voltage. Remove the problem if it is due to the plant. Contact the power supply company if it is due to the network.
	The compressor motor has short-circuited.	Check the continuity of the motor windings.
	The compressor has seized.	Replace the compressor.

Trouble Shooting

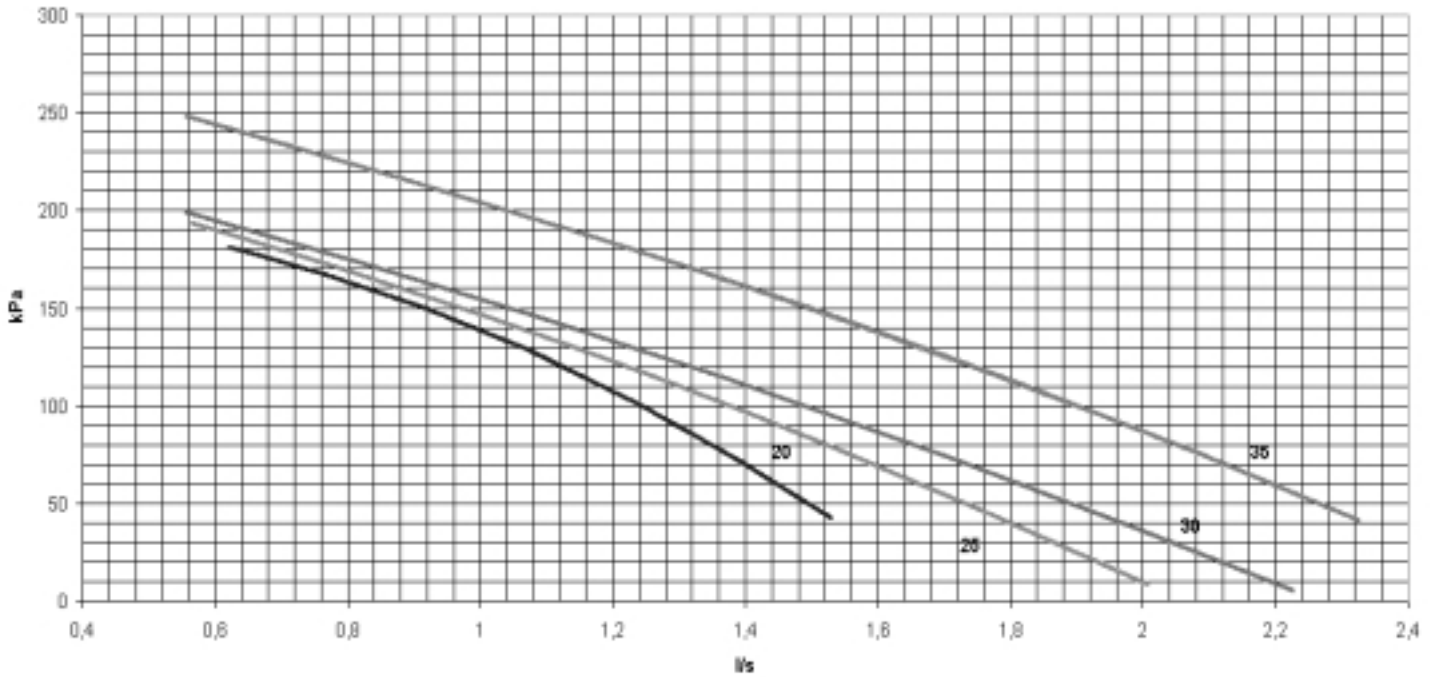
Fault	Probable Cause	Remedy
Low pressure alarm. The unit stops.	The refrigerant is leaking.	Identify and eliminate the leakage.
	Low charge.	Top up the charge.
	Faulty pressure switch.	Replace the pressure switch.
The high pressure switch has tripped. The unit stops.	The pressure switch is malfunctioning.	Check the pressure switch and replace it, if required.
	The delivery valve is partially closed.	Open the valve completely and replace it, if required.
	There are non condensables in the circuit.	Discharge the circuit.
	The fans of the refrigerant/air exchanger are not working.	Check the motors and the connections. Repair and/or replace, where required.
The liquid line is too high.	Low charge.	Identify and eliminate what has caused the charge to decrease.
The liquid line is covered with hoar-frost.	The valve of the liquid line is partially closed.	Check the opening of the valve.
	The dryer filter is clogged.	Replace the filter cartridge.
The fans can not rotate.	Problems in the electrical circuit.	Check all connections.
	The internal thermal switches have tripped.	Contact an Itelco-Clima Authorised Service Centre.
The thermal refrigerating power has decreased.	Faulty compressor.	Contact an Itelco-Clima Authorised Service Centre.
	The fluid side of the exchanger is dirty.	Clean the exchanger and the circuit chemically.
	The air/refrigerant exchanger is clogged.	Clean the batteries of the exchanger.
	Low charge.	Top up the charge.
The heater of the refrigerant / circulating fluid is not working.	The connection threshold is out of calibration.	Check the calibration on the control panel.
	The heater circuit has been interrupted.	Check the heater and replace it, if required.
The temperature of the circulating fluid is poorly checked or not checked at all.	The control thermostat is out of calibration.	Check the calibration on the control panel.
	The fluid thermal head is wrong.	Check the fluid flow rate and content.
	The electronic control system is malfunctioning.	Contact an Itelco-Clima Authorised Service Centre.
The fluid is only poorly circulating.	Air in the hydraulic circuit.	Use the vent valves to discharge air.
	Deposits or impurities in the refrigerant / circulating fluid exchanger	Backwash the exchanger.
The unit is not working and the low flow rate alarm has tripped.	No circulation	Check the pumps.
	The flow switch is not working.	Make sure the flow switch is properly working.
	The differential pressure switch is not working.	Make sure the differential pressure switch is properly working.

9 TECHNICAL DATA

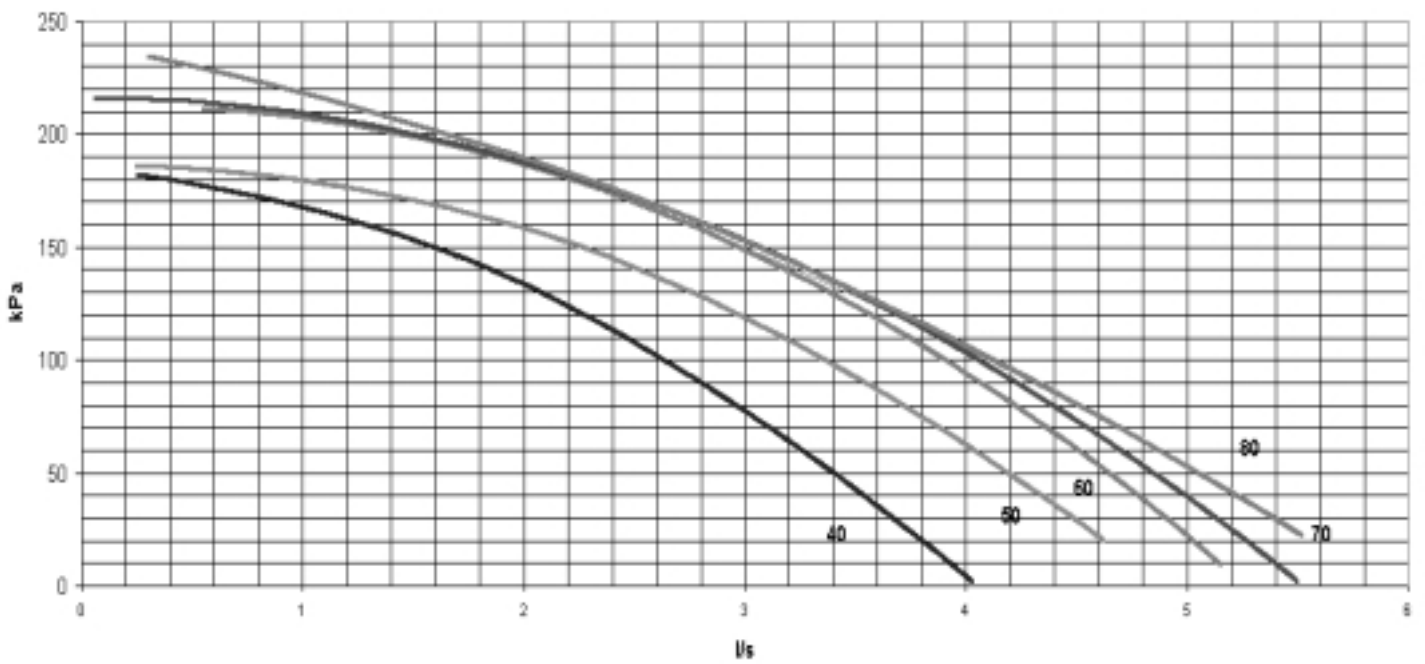
9.1 Hydraulic Features

AQL/AQH Unit

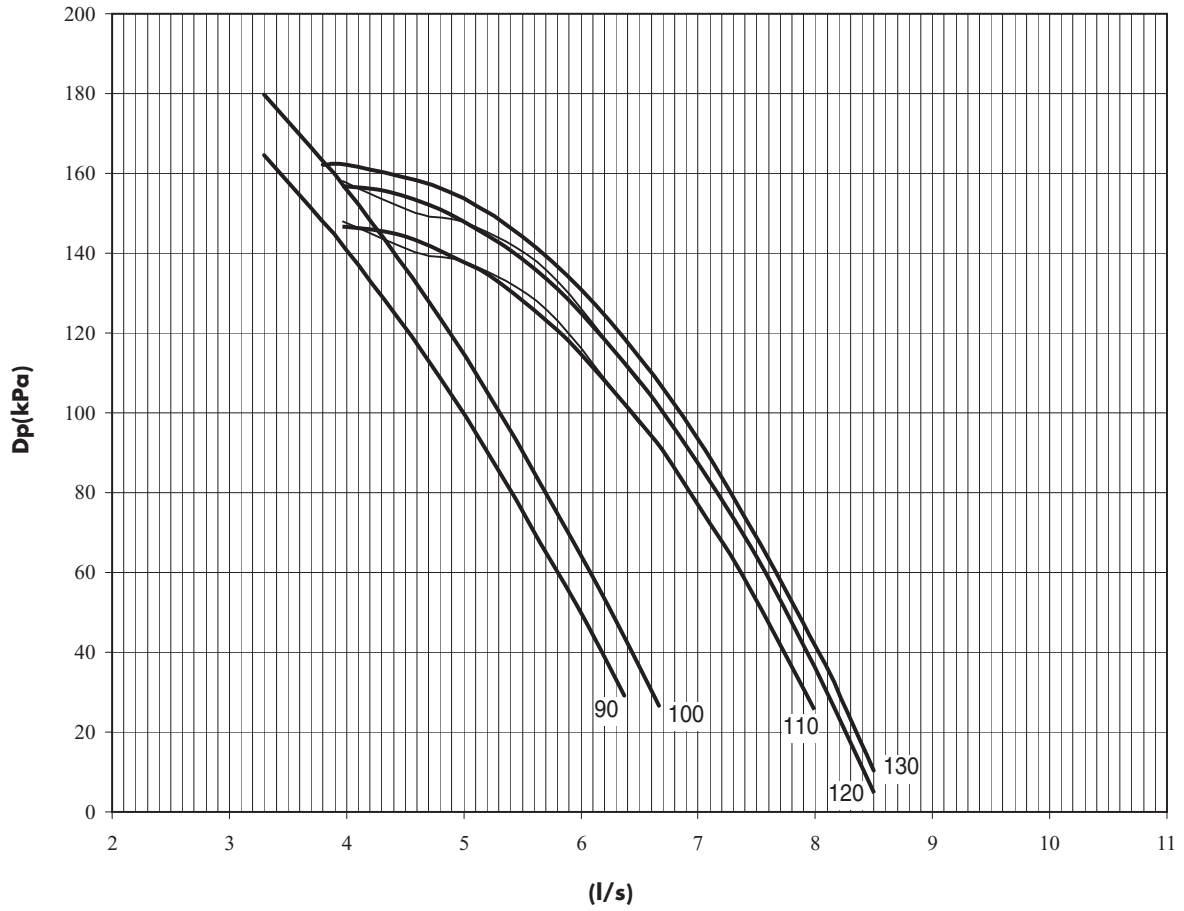
Useful head AQL/AQH 20-25-30-35



Useful head AQL/AQH 40-80

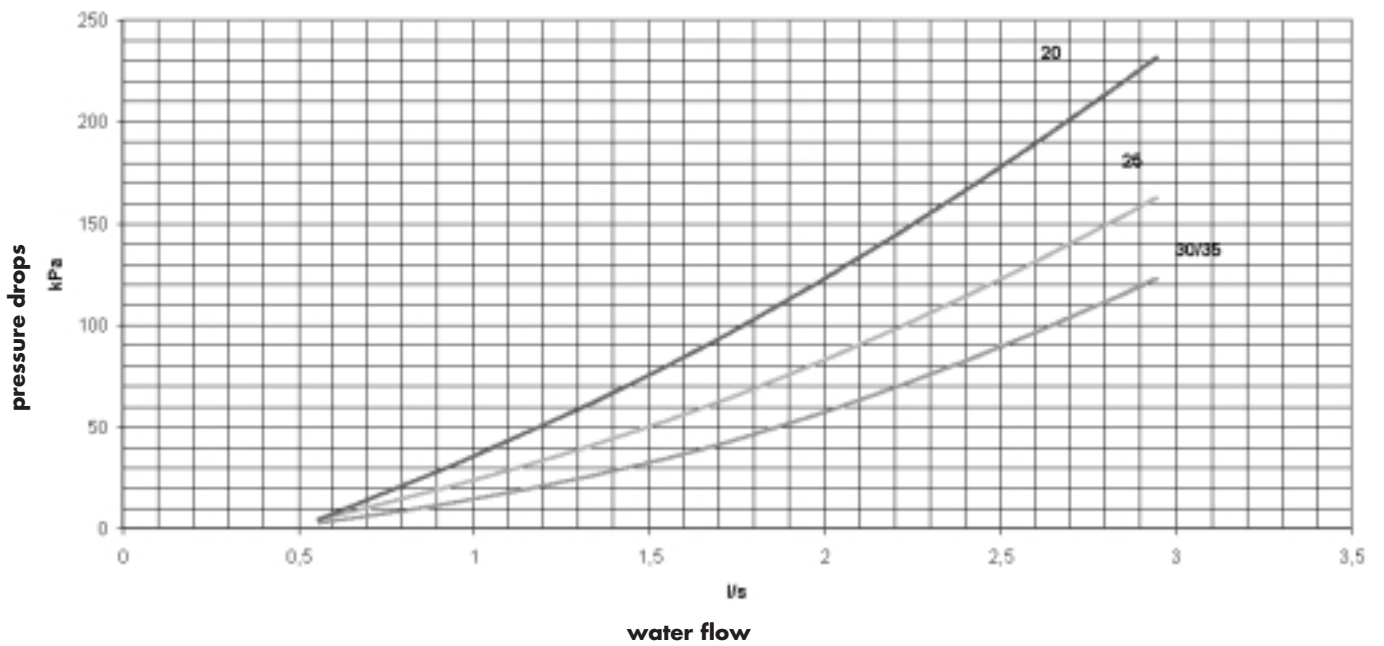


AQL / AQH 90-130 Standard Water Pump Available Head

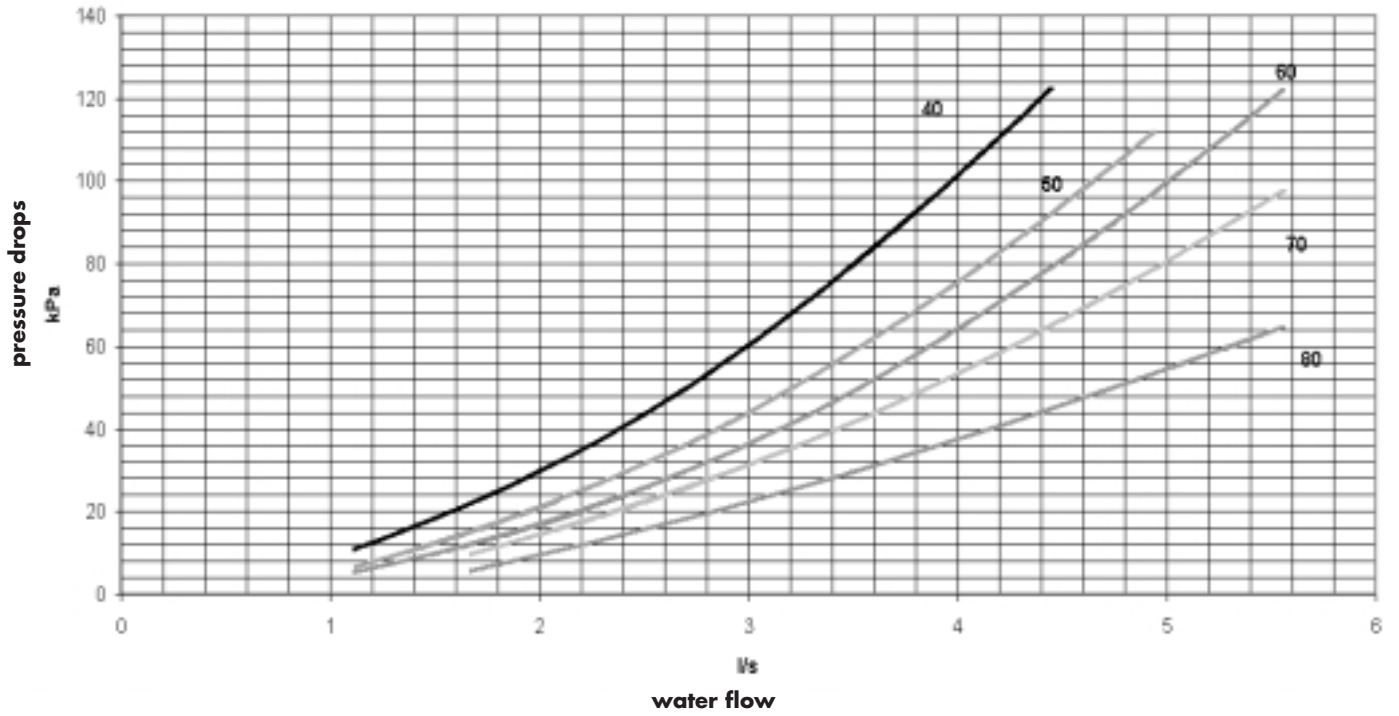


AQL / AQH 20-25-30-35 Refrigerant - Water Heat Exchangers Pressure Drops

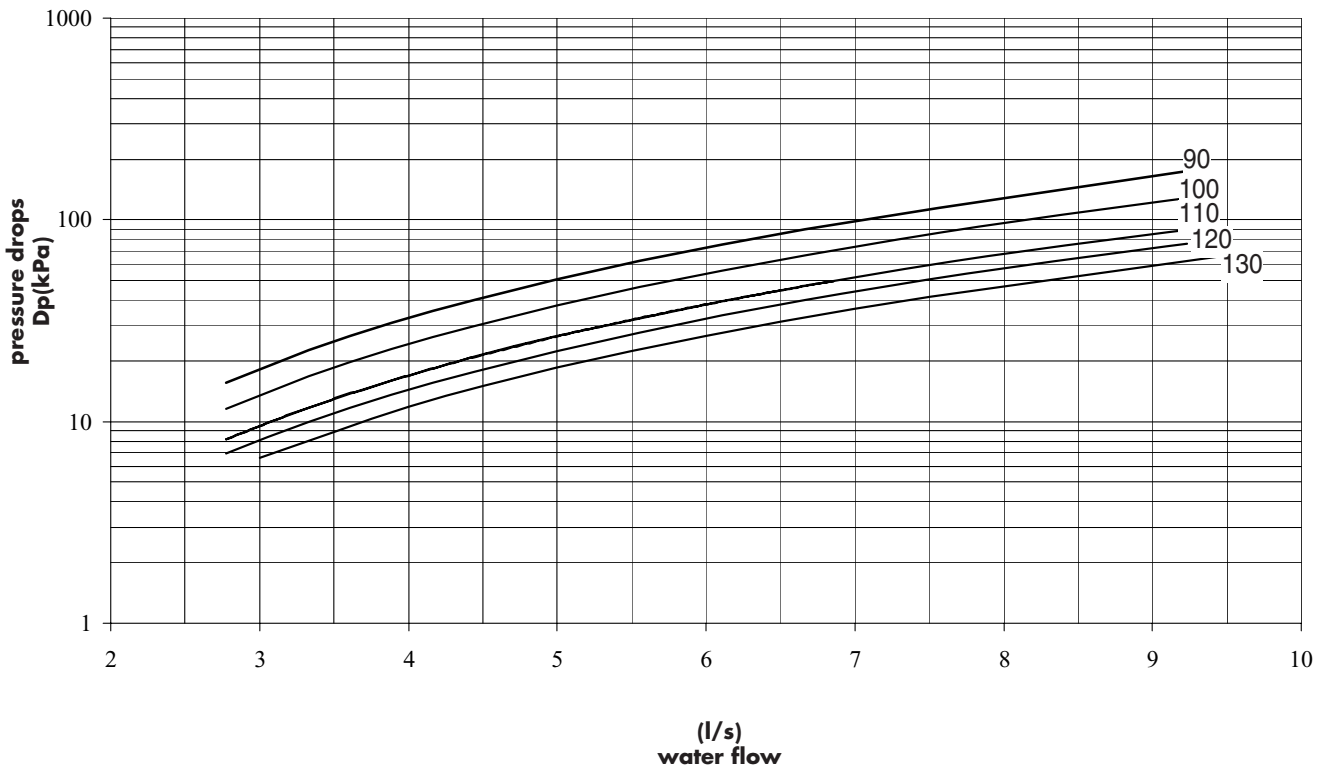
water side



AQL / AQH 40-80 Refrigerant - Water Heat Exchangers Pressure Drops



AQL / AQH 90-130 Refrigerant - Water Heat Exchangers Pressure Drops

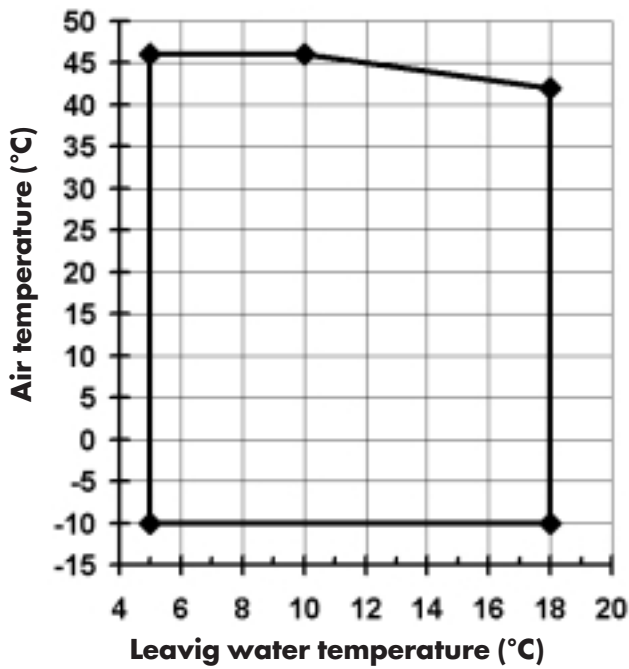


9.2 Working Range

Units AQL / AQH 20 -130 (R407C)

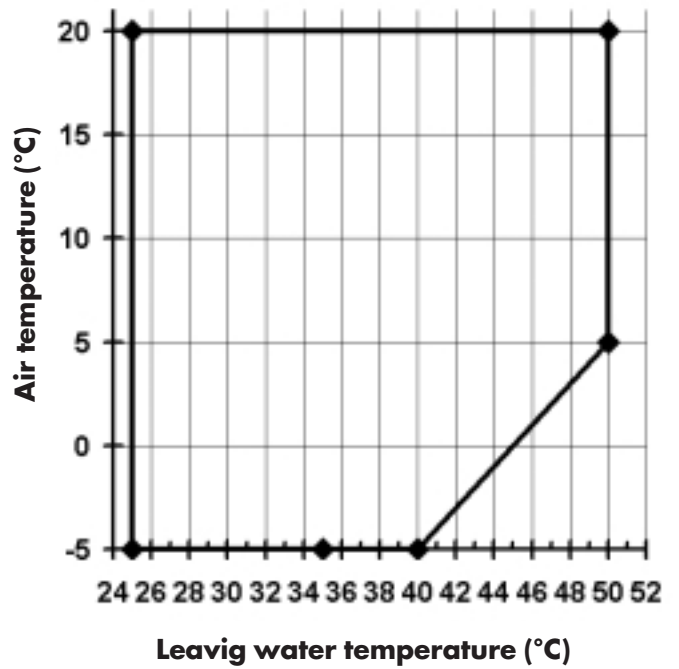
Working Range in cooling mode

Water temperature		Min.	Max
inlet on start-up	°C	10	30
inlet under nominal conditions	°C	8	23
outlet under nominal conditions	°C	5	18
delta T	°C	3	7
standard fans	Pa	0	
high discharge head fans	Pa	80 (mod. 40-60) 100 (mod. 70-130)	
minimum water content	L/kW	2,5	
Air temperature	°C	-10	46



Working Range in heating mode

Water temperature		Min.	Max
inlet on start-up	°C	18	-
inlet under nominal conditions	°C	20	45
outlet under nominal conditions	°C	23	50
delta T	°C	3	7
standard fans	Pa	0	
high discharge head fans	Pa	80 (mod. 40-60) 100 (mod. 70-130)	
minimum water content	L/kW	2,5	
Air temperature	°C	-5	20



9.3 Safety Devices

Models	20	25	30	35	40	50	60	70	80	90	100	110	120	130
Fans heat protection	yes													
Compressors heat protection	yes													
Magnetothermal switch auxiliary / fan	yes													
Compressors magnetothermal switch	yes													
Differential water pressure switch	yes													
Water flow switch	yes													
High pressure switch	yes													
Exchanger antifreeze resistance	yes													
High pressure transducer	yes													
Low pressure transducer	yes													

9.4 Noise Levels

Sound Power Levels - Lw(A) dB(A)

Model	Octave Band Central Frequency (Hz)								Sound Power Level dB(A)
	63	125	250	500	1000	2000	4000	8000	
AQL/AQH 20	55	63	67	73	64	62	60	57	75
AQL/AQH 25	56	64	68	74	65	63	61	58	76
AQL/AQH 30	56	64	68	74	65	63	61	58	76
AQL/AQH 35	57	65	69	75	66	64	62	59	77
AQL/AQH 40	62	70	74	80	74	70	67	64	82
AQL/AQH 50	62	70	74	80	74	70	67	64	82
AQL/AQH 60	63	71	75	82	75	71	68	65	84
AQL/AQH70	67	75	79	84	75	74	72	69	87
AQL/AQH80	67	80	84	84	75	79	77	74	87
AQL90/AQH90	80	79	73	79	80	76	71	61	86
AQL100	80	79	73	79	80	76	71	61	86
AQH100	81	81	74	80	80	78	73	61	87
AQL110/AQH110	81	81	74	80	80	78	73	61	87
AQL120/AQH120	81	81	74	80	80	78	73	61	87
AQL130/AQH130*	86	86	79	85	85	83	83	67	93

Sound Pressure Levels - Lp(A) dB(A)

Model	Octave Band Central Frequency (Hz)								Sound Power Level dB(A)
	63	125	250	500	1000	2000	4000	8000	
AQL/AQH 20	39	47	51	57	48	46	44	41	59
AQL/AQH 25	40	48	52	58	49	47	45	42	60
AQL/AQH 30	40	48	52	58	49	47	45	42	60
AQL/AQH 35	41	49	53	59	50	48	46	43	61
AQL/AQH 40	46	54	58	64	58	54	51	48	67
AQL/AQH 50	46	54	58	64	58	54	51	48	67
AQL/AQH 60	47	55	59	65	58	54	52	48	67
AQL/AQH70	51	59	63	68	59	58	56	53	70
AQL/AQH80	51	64	68	68	59	63	61	58	70
AQL90/AQH90	63	62	56	62	63	59	54	44	69
AQL100	63	62	56	62	63	59	54	44	69
AQH100	63	63	56	61	61	60	55	43	69
AQL110/AQH110	63	63	56	61	61	60	55	43	69
AQL120/AQH120	63	63	56	61	61	60	55	43	69
AQL130/AQH130	68	68	61	67	67	65	65	49	75

Sound pressure levels at 1 m distance, according to ISO 3744.

* Sound levels applicable to all high discharge head units (90-130).

9.5 General Characteristics

Units AQL/AQH 20-80

Models		20	25	30	35	40	50	60	70	80
Cooling Capacity* AQL	kW	21,5	26,0	29,9	34,2	39,5	47,9	55,9	67,0	75,0
Power absorbed by Compressors AQL (1)	kW	7	8,6	10	10,8	14,4	17,6	21,7	25,0	27,6
Cooling Capacity* AQH	kW	21,5	26,0	29,9	34,2	39,4	47,9	55,9	67,0	75,0
Power absorbed by Compressors AQH (1)	kW	7	8,6	10	10,8	14,4	17,6	21,7	25,0	27,6
Heating Capacity* AQH	kW	23,1	28	32,9	37,4	45,0	56,0	65,0	78,0	84,9
Power absorbed by Compr. in Heat Pump (1)	kW	7,2	8,6	10	10	14,5	17,6	22,0	25,5	28,5
Number of Refrigeration Circuits	No.	1	1	1	1	1	1	1	1	1
Capacity Steps	No.	2	2	2	2	2	2	2	2	2
Supply	Volt	400/3/50								
Refrigerant		R407C								
Refrigerant Charge	kg	6,4	6,4	6,4	7,6	9	11,5	13	14	16

Compressors

Type of Start-up		Direct								
Type		Scroll								
Quantity	No.	2	2	2	2	2	2	2	2	2

Evaporators

Type		Plate								
Number	No.	1	1	1	1	1	1	1	1	1
Water Flow rate	l/s	1,0	1,2	1,4	1,6	2	2,2	2,7	3,2	3,6
Pressure Drop, Water Side	kPa	37	36	29,5	38,5	30	25	30	26	31,5

Fans

Quantity	No.	2	2	2	2	1	1	1	1	1
Max. air flow rate (high)	m ³ /s	3,1	3,1	3,1	3,1	4,3	4,3	4,3	4,3	5,8
Absorbed power	kW	0,3	0,3	0,3	0,3	1,1	1,1	1,1	2	2

Pump

Number	No.	1	1	1	1	1	1	1	1	1
Absorbed power	kW	-	-	-	-	-	-	-	-	-

Hydraulic Connections

Type		gas thread								
Inlet diameter	inch	1"1/2	1"1/2	1"1/2	1"1/2	2"	2"	2"	2"	2"
Outlet diameter	inch	1"1/2	1"1/2	1"1/2	1"1/2	2"	2"	2"	2"	2"

Weights

Shipping weight without pump	kg	265	275	285	290	450	550	550	580	600
Working weight	kg	280	290	300	305	475	550	570	600	620

Dimensions

Length	mm	1477	1477	1477	1477	1719	1719	2150	2150	2150
Width	mm	516	516	516	516	1200	1200	1200	1200	1200
Height	mm	1607	1607	1607	1607	1634	1634	1634	1634	1634

Acoustical data

Sound Power Level	dB(A)	75	76	76	77	82	82	84	87	87
Sound Pressure Level (2)	dB(A)	59	60	60	61	67	67	67	71	71

- * Water 12°C / 7°C, room temperature 35°C (cooling)
Water 40°C / 45°C, room temperature 7°C BS-6°C BU (heating)

- (1) Maximum absorbed power calculated as the sum of the maximum power absorbed by compressors and the maximum power absorbed by fans.
(2) The pressure refers to 1 meter in free field, ISO Standard.

Units AQL/AQH 90-130

Models		90	100	110	120	130
Cooling Capacity* AQL	kW	86,4	98,0	112,0	122,2	131,0
Power absorbed by Compressors AQL (1)	kW	31,0	35,7	39,8	44,4	43
Cooling Capacity* AQH	kW	84,6	98,0	112,0	122,2	131,0
Power absorbed by Compressors AQH (1)	kW	31,0	35,7	39,8	44,4	43
Heating Capacity* AQH	kW	95,4	106,6	125,6	135,8	141,0
Power absorbed by Compr. in Heat Pump (1)	kW	31,0	36,5	38,8	42,5	42,3
Number of Refrigeration Circuits	No.	1	1	1	1	1
Capacity Steps	No.	2	2	2	2	2
Supply	Volt	400/3/50				
Refrigerant		R407C				
Refrigerant Charge	kg	24	28	30	34	34

Compressors

Type of Start-up		Direct				
Type		Scroll				
Quantity	No	2	2	2	2	2

Evaporators

Type		Plates				
Number	No.	1	1	1	1	1
Water Flow rate	l/s	4,1	4,7	5,4	5,8	6,3
Pressure Drop, Water Side	kPa	34	33	30	30	29

Fans

Quantity	No.	2	2	2	2	2
Max. air flow rate (high)	m ³ /s	8,3	8,3	8,3	8,3	11,1
Absorbed power	kW	2,2	2,2	2,2	2,2	4

Pump

Number	No.	1	1	1	1	1
Absorbed power	kW	1,5	1,5	1,85	1,85	1,85

Hydraulic Connections

Type		gas thread				
Inlet diameter	inch	2"	2"	2"	2"	2"
Outlet diameter	inch	2"	2"	2"	2"	2"

Weights

Shipping weight without pump	kg	1000	1050	1100	1100	1120
Working weight	kg					

Dimensions

Length	mm	2530	2870	2870	2870	2870
Width	mm	1200	1200	1200	1200	1200
Height	mm	1630	1630	1630	1630	1630

Acoustical data

Sound Power Level	dB(A)	86	87	87	87	93
Sound Pressure Level (2)	dB(A)	68,6	68,4	69,4	69,4	75

* Water 12°C / 7°C, room temperature 35°C (cooling)
Water 40°C / 45°C, room temperature 7°C BS-6°C BU (heating)

- (1) Maximum absorbed power calculated as the sum of the maximum power absorbed by compressors and the maximum power absorbed by fans.
(2) The pressure refers to 1 meter in free field, ISO Standard.

9.6 Electrical Characteristics

Units AQL/AQH 20-80

Units without Pump										
Models		20	25	30	35	40	50	60	70	80
Supply										
Rated voltage	V-ph-Hz	400/3 + N/50								
Permissible voltages	V	380 - 420								
Absorbed rated power	kW	7,6	9,2	10,6	12,8	15,4	18,7	22,8	27,0	29,6
Max. absorbed power	kW	9,2	13,3	15,4	15,9	19,4	24,5	28,9	35,0	37,8
Rated current	A	16,6	19,8	21,2	26,0	28,9	33,9	39,8	46,4	50,2
Max. current	A	19,6	27,6	29,6	31,6	36,4	44,4	50,4	60,0	64,0
Max. start-up current	A	64	82	91	120	142	186	218	228	232
External fuses	(A)	25	32	32	40	50	50	63	63	80
Cable section	mm ²	6	10	10	10	16	16	25	25	25

Hydro Units										
Models		20	25	30	35	40	50	60	70	80
Supply										
Rated voltage	V-ph-Hz	400/3 + N/50								
Permissible voltages	V	380- 420								
Absorbed rated power	kW	8,4	10,0	11,4	13,5	16,1	19,4	23,9	28,1	30,7
Max. absorbed power	kW	10,0	14,2	16,2	16,6	20,1	25,3	30,0	36,1	38,9
Rated current	A	18,3	21,5	22,9	27,7	31,0	36,0	42,9	49,5	53,3
Max. current	A	21,3	29,3	31,3	33,3	38,5	46,5	53,5	63,1	67,1
Max. start-up current	A	65	83	92	121	145	189	222	231	235
External fuses	(A)	25	32	32	40	50	50	63	63	80
Cable section	mm ²	6	10	10	10	16	16	25	25	25

Compressors										
Models		20	25	30	35	40	50	60	70	80
Absorbed rated power	kW	3,5+3,5	4,3+4,3	5,0+5,0	6,+6,1	7,9+6,4	11,2+6,4	13,8+7,9	13,8+11,2	13,8+13,8
Max. absorbed power	kW	4+4	6+6	7+7	8+8	10+8	15+8	18+10	18+15	18+18
Rated current	A	6,5+6,5	8,1+8,1	8,8+8,8	11,2+11,2	14,3+12,2	19,3+12,2	23,1+14,3	23,1+19,3	23,1+23,1
Max. current	A	8+8	12+12	13+13	14+14	18+16	26+16	30+18	30+26	30+30
Crankcase resistance	W	70+70								

Standard Fans											
Models		20	25	30	35	40	50	60	70	80	
Supply Voltage	V-ph-Hz	230/1/50				400/3/50					
Number		2				1					
Rated power	kW	0,3	0,3	0,3	0,3	1,1	1,1	1,1	2	2	
Absorbed rated current	A	1,8	1,8	1,8	1,8	2,4	2,4	2,4	4	4	

High Head Fans										
Models						40	50	60	70	80
Supply Voltage	V-ph-Hz	400/3/50								
Number		1								
Rated power	kW					2	2	2	4,7	4,7
Absorbed rated current	A					4	4	4	8,3	8,3

Standard Pumps										
Models		20	25	30	35	40	50	60	70	80
Supply Voltage	V-ph-Hz	400/3/50								
Rated power	kW	0,8	0,8	0,8	0,8	0,8	0,8	1,1	1,1	1,1
Absorbed rated current	A	1,7	1,7	1,7	1,7	2,1	2,1	3,1	3,1	3,1

Exchanger Resistance										
Models		20	25	30	35	40	50	60	70	80
Supply Voltage	V-ph-Hz	230/1/50								
Max absorbed power	W	35								

NOTE: the dimensioning of the unit's power supply cables is the responsibility of the installer, and shall be determined according to the rating, the max. working T in the room, the type of insulation and cable laying, and the max. length of the power supply line.

Units AQL/AQH 90-130

Units without Pump						
Models		90	100	110	120	130
Supply						
Rated voltage	V-ph-Hz	400/3 + N/50				
Permissible voltages	V	380 - 420				
Absorbed rated power	kW	33,2	37,9	42,0	46,6	47,0
Max. absorbed power	kW	43,2	48,4	54,9	60,1	62,0
Rated current	A	60,5	67,6	74,7	81,8	85,0
Max. current	A	72,5	81,2	90,5	99,2	102,4
Max. start-up current	A	249	304	313	322	325
External fuses	(A)	100	100	125	125	125
Cable section	mm ²	35	35	50	50	50

Hydro Units						
Models		90	100	110	120	130
Supply						
Rated voltage	V-ph-Hz	400/3 + N/50				
Permissible voltages	V	380 - 420				
Absorbed rated power	kW	34,7	39,4	43,8	48,4	48,8
Max. absorbed power	kW	44,7	49,9	56,7	61,9	63,8
Rated current	A	64,3	71,4	79,6	86,7	89,9
Max. current	A	76,3	85,0	95,4	104,1	107,3
Max. start-up current	A	253	308	318	327	330
External fuses	(A)	100	100	125	125	125
Cable section	mm ²	35	35	50	50	50

Compressors						
Models		90	100	110	120	130
Absorbed rated power	kW	17.6+13.4	22+13.7	23.9+15.9	22.2+22.2	21.5+21.5
Max. absorbed power	kW	24+17	29+17	29+24	29+29	29+29
Rated current	A	31,4+24,3	38,5+24,3	38,5+31,4	38,5+38,5	38,5+38,5
Max. current	A	38,5+29	47+29	47+38,5	47+47	47+47
Crankcase resistance	W	130+75	130+75	130+130	130+130	130+130

Standard Fans						
Models		90	100	110	120	130
Supply Voltage	V-ph-Hz	400/3/50				
Number		2				
Rated power	kW	1,1	1,1	1,1	1,1	2
Absorbed rated current	A	2,4	2,4	2,4	2,4	4

High Head Fans						
Models		90	100	110	120	130
Supply Voltage	V-ph-Hz	400/3/50				
Number		2				
Rated power	kW	2	2	2	2	2
Absorbed rated current	A	4	4	4	4	4

Standard Pumps						
Models		90	100	110	120	130
Supply Voltage	V-ph-Hz	400/3/50				
Rated power	kW	1,5	1,5	1,8	1,8	1,8
Absorbed rated current	A	3,8	3,8	4,9	4,9	4,9

Exchanger Resistance						
Models		90	100	110	120	130
Supply Voltage	V-ph-Hz	230/1/50				
Max absorbed power	W	35+35				

NOTE: the dimensioning of the unit's power supply cables is the responsibility of the installer, and shall be determined according to the rating, the max. working T in the room, the type of insulation and cable laying, and the max. length of the power supply line.

9.7 Dimensional Data

Units AQL/AQH 20-130

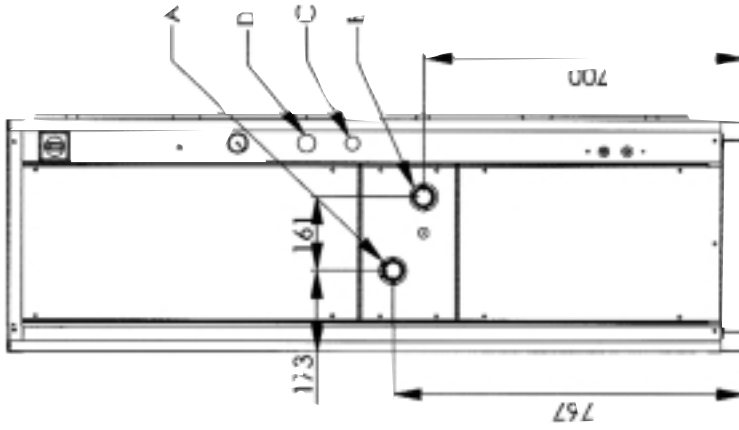
Weights																
Models		20	25	30	35	40	50	50*	60	70	80	90	100	110	120	130
With pump	kg	280	290	300	305	475	550	570	570	600	620	-	-	-	-	-
Without pump	kg	265	275	285	290	450	530	550	550	580	600	1000	1050	1100	1100	1120

Shipping Dimensions																	
Models		20	25	30	35	40	50	50*	60	70	80	90	100	100**	110	120	130
Length	mm	1530	1530	1530	1750	1750	1750	2170	2170	2170	2170	2530	2530	2870	2870	2870	2810
Depth	mm	600	600	600	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
Height	mm	1740	1740	1740	1730	1730	1730	1730	1730	1730	1730	1730	1730	1730	1730	1730	1730

* AQH 50
 ** AQH 100

Units AQL/AQH 20-25-30-35

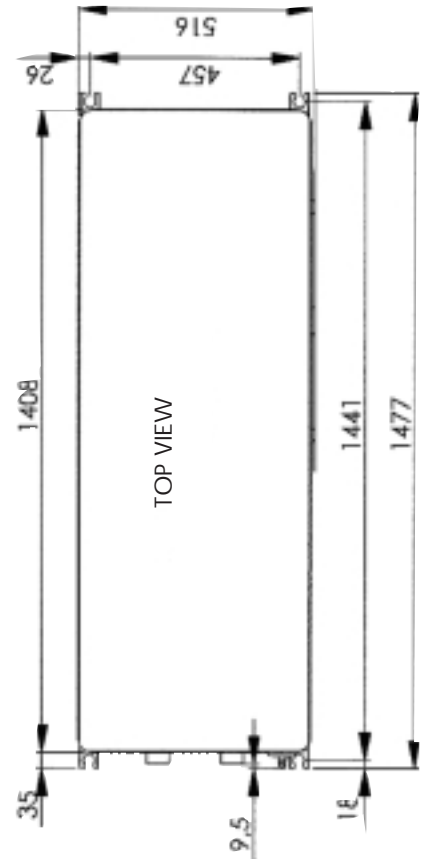
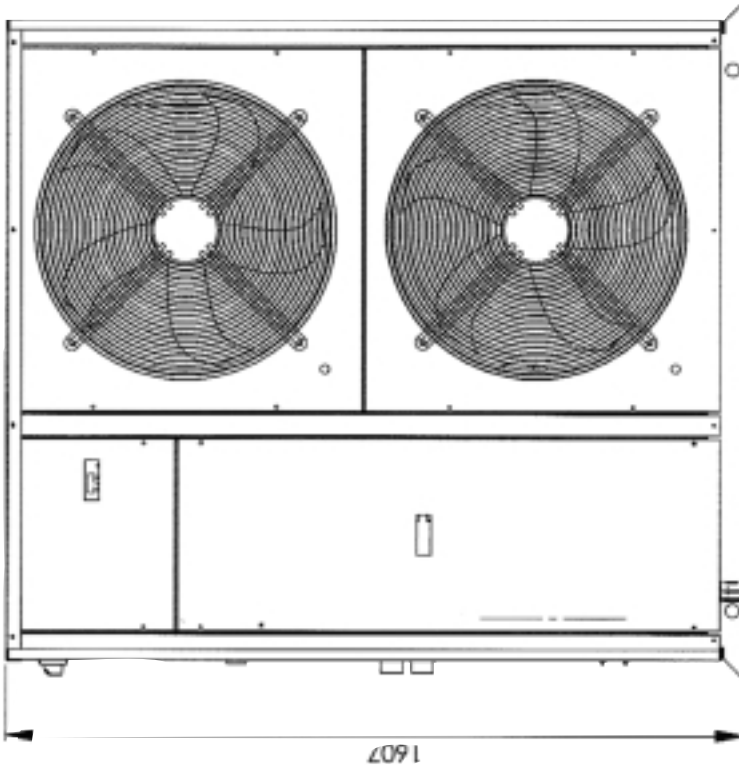
SIDE VIEW



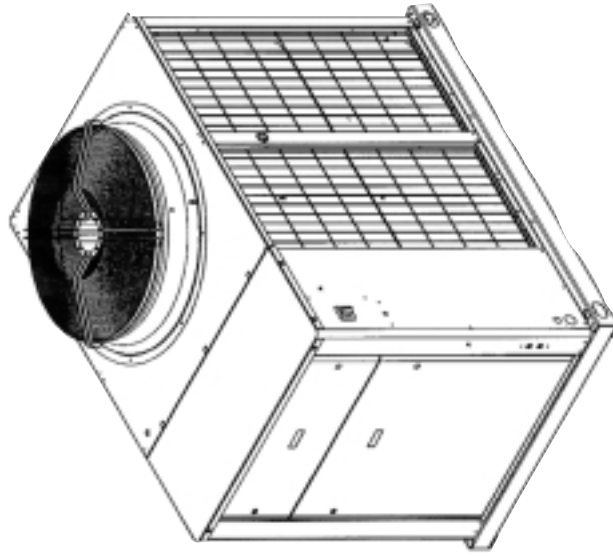
NOTES:

- A - WATER INLET Ø 1 1/2" GAS MIN.
- B - WATER OUTLET Ø 1 1/2" GAS MIN.
- C - RACEWAY FOR AUX. ELECTRICAL CONNECTIONS
- D - RACEWAY FOR ELECTRICAL CONNECTIONS

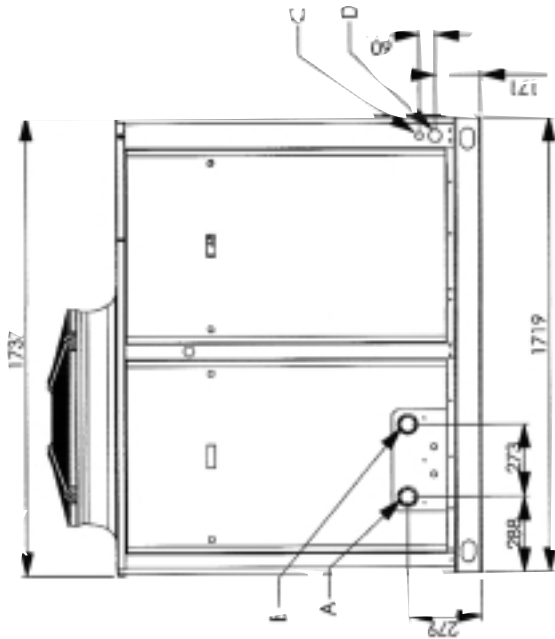
FRONT VIEW



Units AQL 40-50 and AQH 40



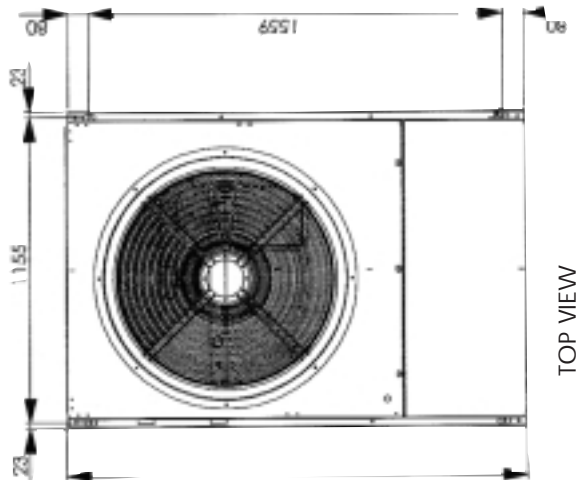
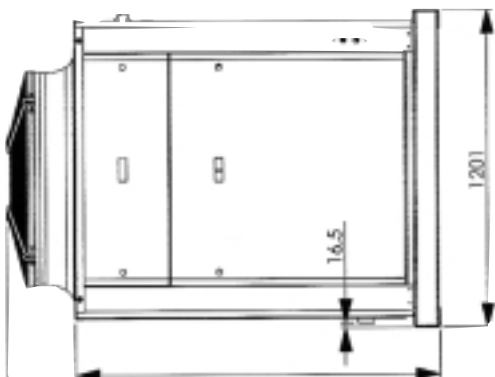
SIDE VIEW



NOTES:

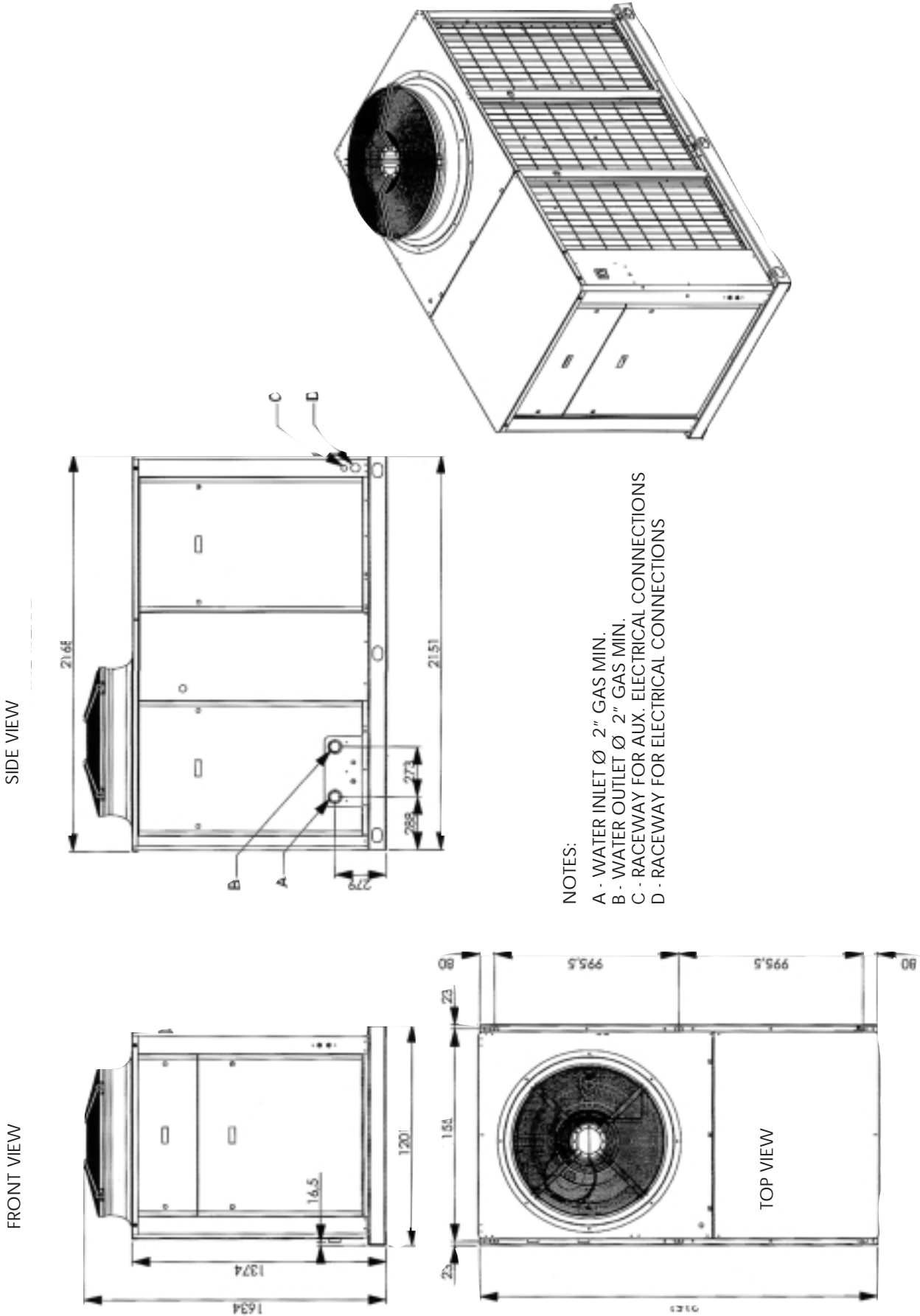
- A - WATER INLET Ø 2" GAS MIN.
- B - WATER OUTLET Ø 2" GAS MIN.
- C - RACEWAY FOR AUX. ELECTRICAL CONNECTIONS
- D - RACEWAY FOR ELECTRICAL CONNECTIONS

FRONT VIEW



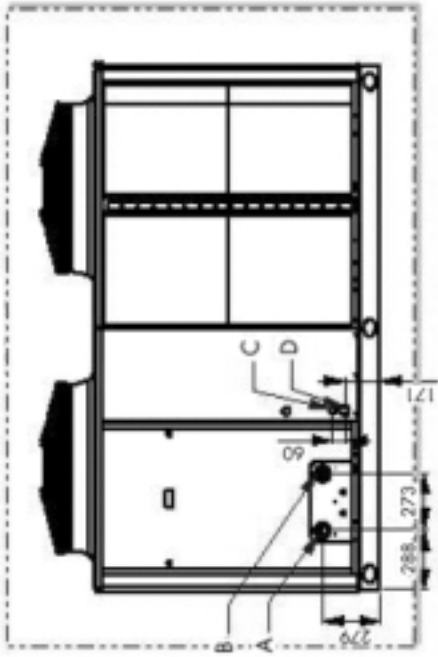
TOP VIEW

Units AQL 60-70-80 and AQH 50-60-70-80

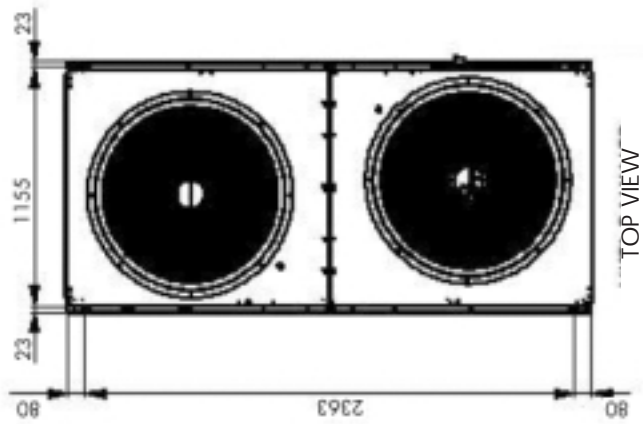
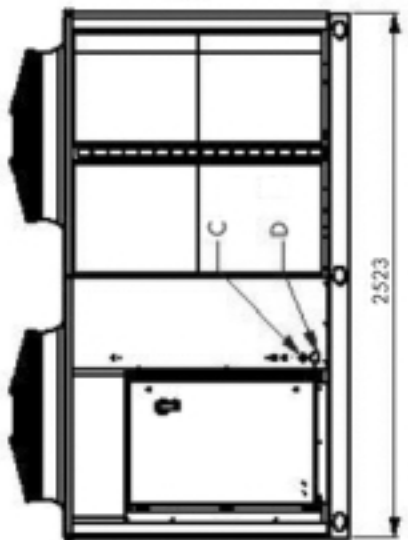
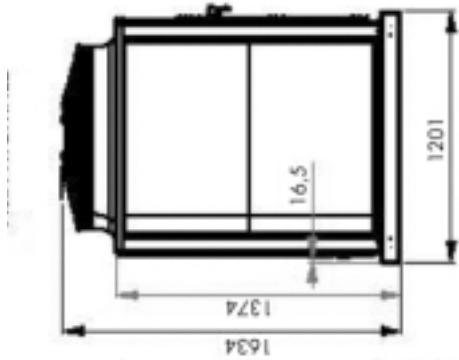


Units AQL/AQH 90-100

SIDE VIEW



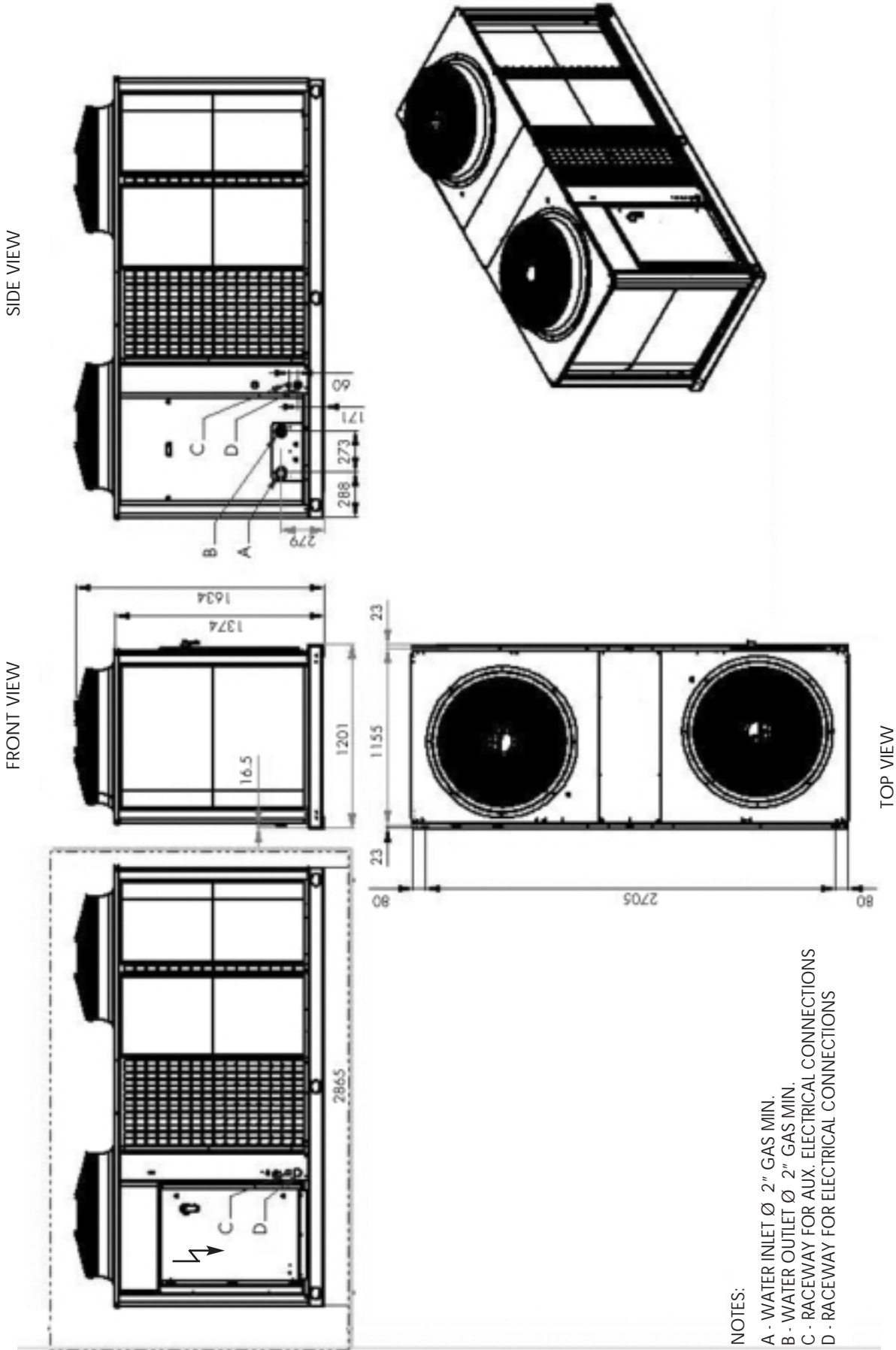
FRONT VIEW



TOP VIEW

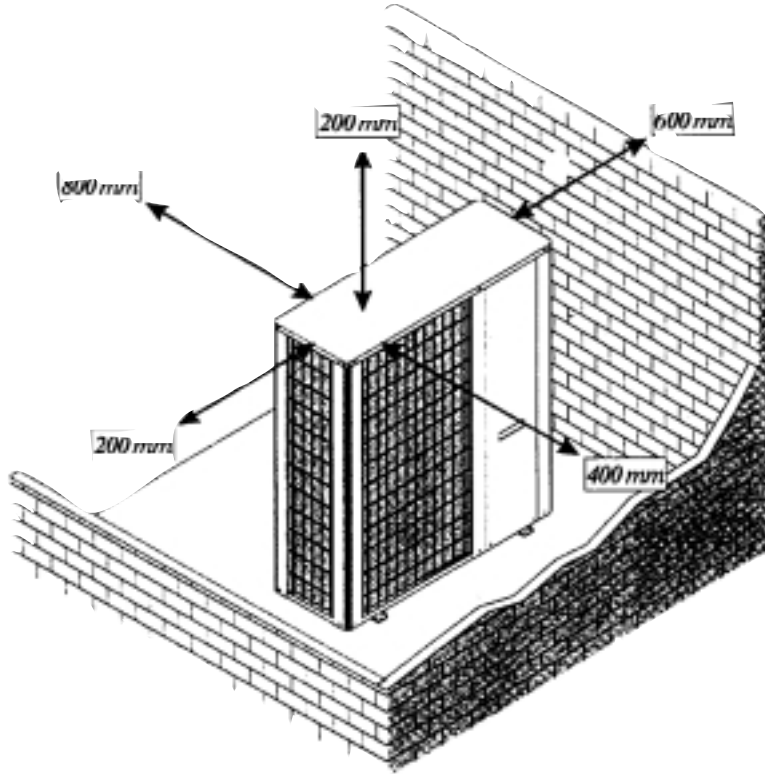
- NOTES:
- A - WATER INLET Ø 2" GAS MIN.
 - B - WATER OUTLET Ø 2" GAS MIN.
 - C - RACEWAY FOR AUX. ELECTRICAL CONNECTIONS
 - D - RACEWAY FOR ELECTRICAL CONNECTIONS

Units AQL/AQH 110-120-130

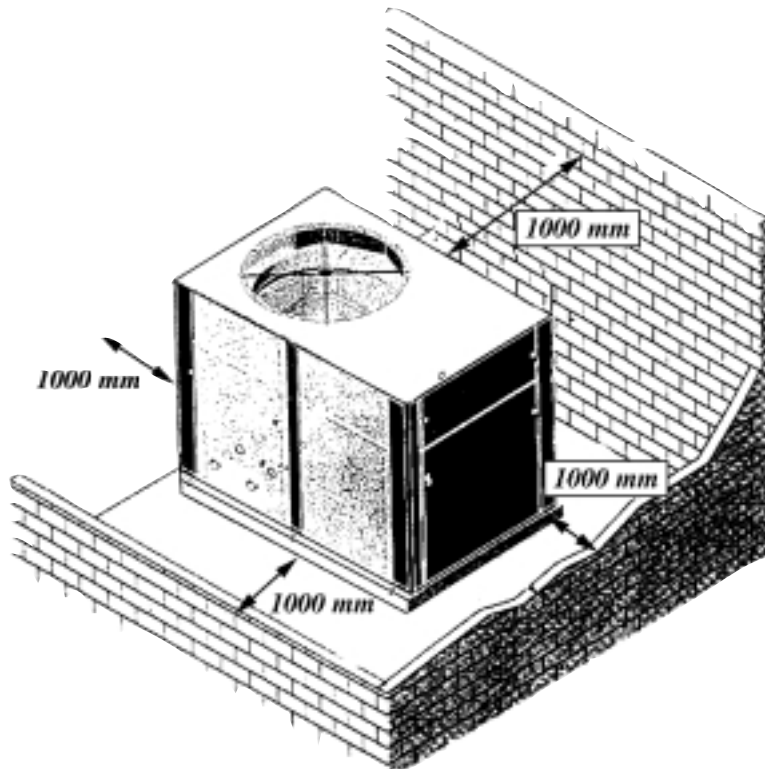


9.8 Space Requirements

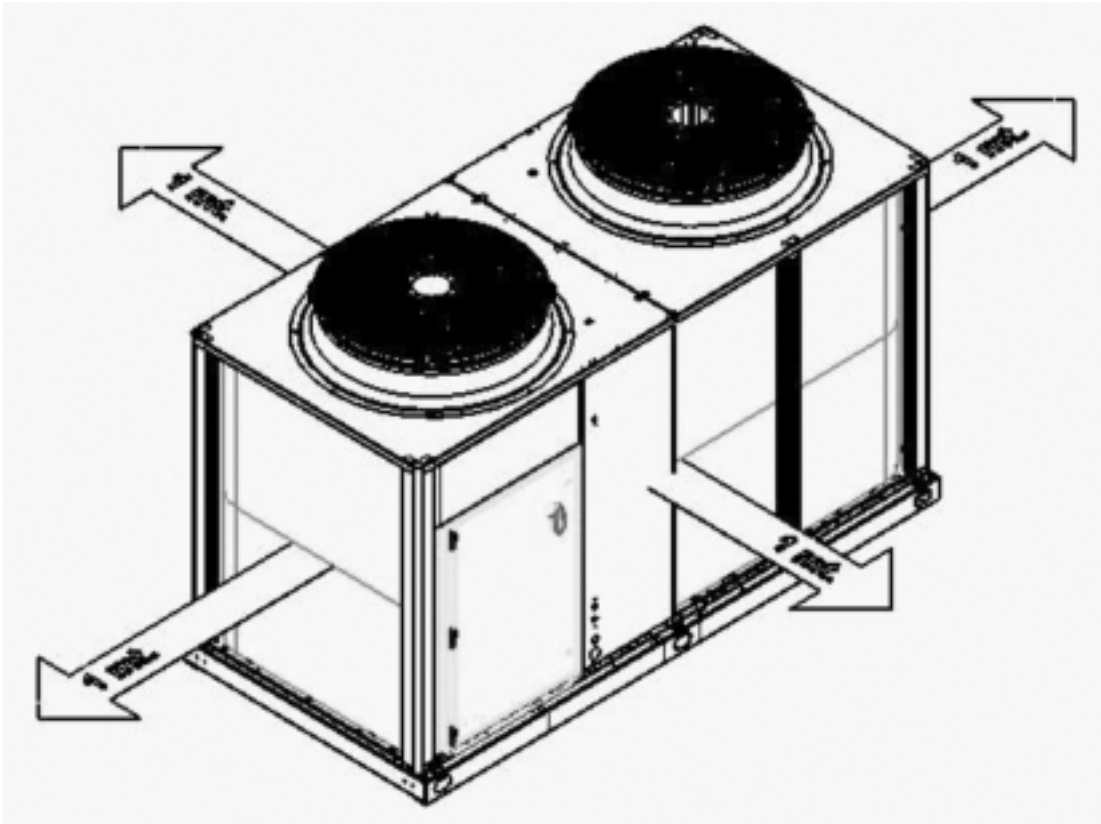
Units AQL/AQH 20-25-30-35



Units AQL/AQH 40-50-60-70-80



Units AQL/AQH 90-100-110-120-130



10 SPARE PARTS

10.1 Recommended Spare Parts

The table here below will list the spare parts which are recommended for each unit for two years.

Piece	No.
High pressure switch	1
Low pressure switch	1
Differential pressure switch	1
Dryer filter	2
Differential pressure switch	1
Thermal expansion valve	1
Auxiliary relays	2
Compressor fuses	6
Auxiliary fuses	6
Compressor contactor	1
Power contactor	1

10.2 Oils Recommended for Compressors

The table here below will list the oils recommended for each model.

Model	AQL/AQH
	Oil Tipe
20	Mobil EAL Artic 22CC Ici Emkrate RL32 CF
25	Mobil EAL Artic 22CC Ici Emkrate RL32 CF
30	Mobil EAL Artic 22CC Ici Emkrate RL32 CF
40	Mobil EAL Artic 22CC Ici Emkrate RL32 CF
50	Mobil EAL Artic 22CC Ici Emkrate RL32 CF
60	Mobil EAL Artic 22CC Ici Emkrate RL32 CF
70	Mobil EAL Artic 22CC Ici Emkrate RL32 CF
80	Mobil EAL Artic 22CC Ici Emkrate RL32 CF
90	ISO32-160SZ
100	ISO32-160SZ
110	ISO32-160SZ
120	ISO32-160SZ
130	ISO32-160SZ

10.3 Relevant Wiring Diagrams

The tables here below will list the wiring diagrams relevant for PACK and non PACK units with and without a neutral.

Model	Relevant wiring diagram
AQL/AQH 20	035B60251-010
AQL/AQH 25	035B60251-010
AQL/AQH 30	035B60251-010
AQL/AQH 35	035B60251-010

Model	Relevant wiring diagram
AQL/AQH 40	035B60254-010
AQL/AQH 50	035B60254-010
AQL/AQH 60	035B60254-010
AQL/AQH 70	035B60254-010
AQL/AQH 80	035B60254-010
AQL/AQH 90	035B60254-010
AQL/AQH 100	035B60254-010
AQL/AQH 110	035B60254-010
AQL/AQH 120	035B60254-010
AQL/AHQ 130	035B60254-010

NOTE: Always refer to the wiring diagram on the machine

Dismantling, Demolition and Scrapping

11 DISMANTLING, DEMOLITION AND SCRAPPING



While discharging the refrigerating circuits, never release the refrigerant into the atmosphere. Use proper recovery equipment for the discharge.



Never dispose of the compressor oil in the atmosphere since it contains dissolved refrigerant.

Contact the competent authority for any information about disposal.

Unless otherwise specified, the operations described here below can be performed by any maintenance technician who has been specifically trained.

11.1 General Information

Open any line which may supply the unit, including those of control circuits. Make sure that all disconnectors are secured in the OFF position. The supply cables can be also disconnected and disassembled. Refer to Chapter 4 for the position of connection points.

Remove all the refrigerant from the refrigerating circuits of the unit and store it in containers by making use of a recovery unit. If its features are intact, the refrigerant can be reused. Contact the competent authority for any information about disposal. The refrigerant may be discharged in the atmosphere under NO circumstance. The oil which may be found in any refrigerating circuit shall be drained to be collected in a container and disposed of in compliance with the local standards about the disposal of exhaust lubricants. Any oil leakage shall be recovered and disposed of in the same way.

Detach the unit exchanger(s) from the external water circuits and drain the heat exchanger section(s) of the plant. If no on/off valve has been installed, it might be necessary to drain the whole plant.



If a glycol solution or a similar fluid has been used in the water circuit(s) or if chemical additives have been added to the circulating water, the circulating fluid SHALL be properly disposed of. A circuit containing glycol water or a similar solution may be directly discharged in a sewer system or in surface water under NO circumstance.

After having provided for the drainage, disconnect and disassemble the pipelines of water networks.

Packaged units can generally be disassembled in one piece after having been disconnected as above. For this purpose disassemble the anchor screws and then lift the unit from its installation site by using the lifting devices and lifting points arranged.

Refer to Chapter 4 for the installation of these devices, to Chapter 9 for their weights and to Chapter 3 for their handling.

The units which can not be removed in one piece after having been disconnected shall be dismantled on site. Special care shall be paid to the weight of each component when handling. It is always recommended to dismantle the units in the reverse order of their installation.



Residual oil, glycol water or residues of similar solutions may remain in some parts of the unit. These residues shall be either recovered or disposed of as instructed above.

During the removal of a component it is very important to ensure that the remaining components of the unit are secured.



Only use the lifting equipment of adequate capacity.

The components of the unit can be disposed of according to the rules in force after having been disassembled.

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