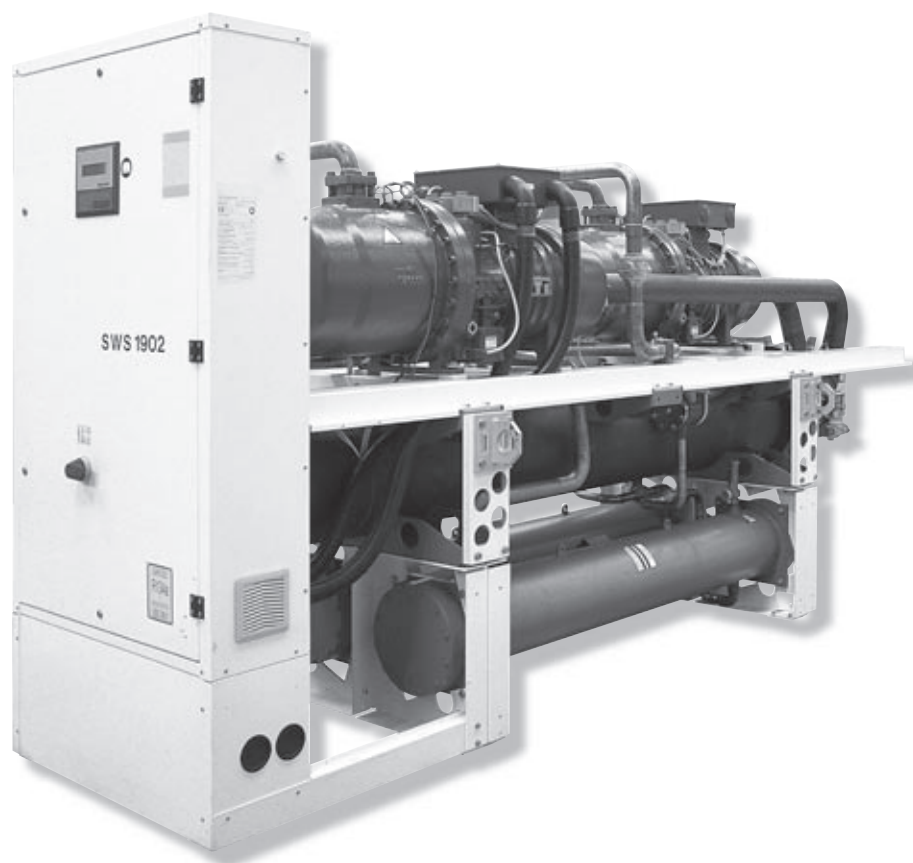


SWS / SWR



English



272
↓
1148 kW

Water cooled water chillers with screw compressors



IOM SWS-N.2GB

Date : July 2007

Supersedes : IOM SWS-N.1GB



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1 FOREWORD

1.1 Introduction

Itelco-Industry units, manufactured to state-of-the-art design and implementation standards, ensure top performance, reliability and fitness to any type of air-conditioning systems.

These units are designed for cooling water or glycoled water (and for water heating in heat pump models) and are unfit for any purposes other than those specified in this manual.

This manual includes all the information required for a proper installation of the units, as well as the relevant operating and maintenance instructions.

It is therefore recommended to read this manual carefully before installation or any operation on the machine. The chiller installation and maintenance must be carried out by skilled personnel only (where possible, by one of Itelco-Industry 's Authorised Service Centers).

The manufacturer may not be held liable for any damage to people or property caused by improper installation, start-up and/or improper use of the unit and/or failure to implement the procedures and instructions included in this manual.

1.2 Warranty

These units are delivered complete, tested and ready for being operated. Any form of warranty will become null and void in the event that the appliance is modified without Itelco-Industry 's preliminary written authorisation.

This warranty shall apply providing that the installation instructions have been complied with (either issued by Itelco-Industry , or deriving from the current practice), and the Form 1 ("Start-up") has been filled-in and mailed to Itelco-Industry (attn. After-Sales Service).

In order for this warranty to be valid, the following conditions shall be met:

- The machine must be operated only by skilled personnel from Itelco-Industry 's Authorised After-Sales Service.
- Maintenance must be performed only by skilled personnel - from one of Itelco-Industry 's Authorised After-Sales Centers.
- Use only original Itelco-Industry spare parts.

- Carry out all the planned maintenance provided for by this manual in a timely and proper way.

Failure to comply with any of these conditions will automatically void the warranty.

1.3 Emergency stop / Normal stop

The emergency stop of the unit can be enabled using the master switch on the control panel (move down the lever).

For a normal stop, press the relevant push-buttons.

To restart the appliance, follow the procedure detailed in this manual.

1.4 An introduction to the manual

For safety reasons, it is imperative to follow the instructions given in this manual. In case of any damage caused by non-compliance with these instructions, the warranty will immediately become null and void.

Conventions used throughout the manual:



The Danger sign recalls your attention to a certain procedure or practice which, if not followed, may result in serious damage to people and property.



The Warning sign precedes those procedures that, if not followed, may result in serious damage to the appliance.



The Notes contain important observations.



The Useful Tips provide valuable information that optimises the efficiency of the appliance.

This manual and its contents, as well as the documentation which accompanies the unit, are and remain the property of Itelco-Industry , which reserves any and all rights thereon. This manual may not be copied, in whole or in part, without Itelco-Industry 's written authorization.

2 SAFETY

2.1 Foreword

These units must be installed in conformity with the provisions of Machinery Directive 98/37/EC, Low Voltage Directive 73/23/EC, Pressure Vessels Directive 97/23/EC, Electromagnetic Interference Directive 89/336/EC, as well as with other regulations applicable in the country of installation. If these provisions are not complied with, the unit must not be operated.



The unit must be grounded, and no installation and/or maintenance operations may be carried out before deenergising the electrical panel of the unit.

Failure to respect the safety measures mentioned above may result in electrocution hazard and fire in the presence of any short-circuits.



Inside the heat exchangers, the compressors and the refrigeration lines, this unit contains liquid and gaseous refrigerant under pressure. The release of this refrigerant may be dangerous and cause injuries.



The units are not designed to be operated with natural refrigerants, such as hydrocarbons. Itelco-Industry may not be held liable for any problems deriving from the replacement of original refrigerant or the introduction of hydrocarbons.

Itelco-Industry units are designed and manufactured according to the requirements of European Standard PED 97/23/EC (pressure vessels).

- The used refrigerants are included in group II (non-hazardous fluids).
- The maximum working pressure values are mentioned on the unit's data plate.
- Suitable safety devices (pressure switches and safety valves) have been provided, to prevent any anomalous overpressure inside the plant.
- The vents of the safety valves are positioned and oriented in such a way as to reduce the risk of contact with the operator, in the event that the valve is operated. Anyway, the installer will convey the discharge of the valves far from the unit.
- Dedicated guards (removable panels with tools) and danger signs indicate the presence of hot pipes or components (high surface temperature).



The guards of the fans (only for units provided with air heat exchangers) must be always mounted and must never be removed before de-energising the appliance.



It is the User's responsibility to ensure that the unit is fit for the conditions of intended use and that both installation and maintenance are carried out by experienced personnel, capable of respecting all the recommendations provided by this manual. It is important that the unit is adequately supported, as detailed in this manual. Non-compliance with these recommendations may create hazardous situations for the personnel.



The unit must rest on a base which meets the characteristics specified in this manual; a base with inadequate characteristics is likely to become a source of serious injury to the personnel.



The unit has not been design to withstand loads and/or stress that may be transmitted by adjacent units, piping and/or structures. Each external load or stress transmitted to the unit may break or cause breakdowns in the unit's structure, as well as serious dangers to people. In these cases, any form of warranty will automatically become null and void.



The packaging material must not be disposed of in the surrounding environment or burnt.

2.2 Definitions

OWNER: means the legal representative of the company, body or individual who owns the plant where Itelco-Industry unit has been installed; he/she has the responsibility of making sure that all the safety regulations specified in this manual are complied with, along with the national laws in force.

INSTALLER: means the legal representative of the company who has been given by the owner the job of positioning and performing the hydraulic, electric and other connections of Itelco-Industry unit to the plant: he/she is responsible for handling and properly installing the appliance, as specified in this manual and according to the national regulations in force.

Safety

OPERATOR: means a person authorised by the owner to do on Itelco-Industry unit all the regulation and control operations expressly described in this manual, that must be strictly complied with, without exceeding the scope of the tasks entrusted to him.

ENGINEER: means a person authorised directly by Itelco-Industry or, in all EC countries, excluding Italy, under his full responsibility, by the distributor of Itelco-Industry product, to perform any routine and extraordinary maintenance operations, as well as any regulation, control, servicing operations and the replacement of pieces, as may be necessary during the life of the unit.

2.3 Access to the unit

The unit must be placed in an area which can be accessed also by OPERATORS and ENGINEERS; otherwise the unit must be surrounded by a fence at not less than 2 meters from the external surface of the machine.

OPERATORS and ENGINEERS must enter the fenced area only after wearing suitable clothing (safety shoes, gloves, helmet etc.). The INSTALLER personnel or any other visitor must always be accompanied by an OPERATOR.

For no reason shall any unauthorised personnel be left alone in contact with the unit.

2.4 General precautions

The OPERATOR must simply use the controls of the unit; he must not open any panel, other than the one providing access to the control module.

The INSTALLER must simply work on the connections between plant and machine; he must not open any panels of the machine and he must not enable any control.

When you approach or work on the unit, follow the precautions listed below:

- do not wear loose clothing or jewellery or any other accessory that may be caught in moving parts
- wear suitable personal protective equipment (gloves, goggles etc.) when you have to work in the presence of free flames (welding operations) or with compressed air
- if the unit is placed in a closed room, wear ear protection devices
- cut off connecting pipes, drain them in order to balance the pressure to the atmospheric value before disconnecting them, disassemble connections, filters, joints or other line items
- do not use your hands to check for any pressure drops

- use tools in a good state of repair; be sure to have understood the instructions before using them
- be sure to have removed all tools, electrical cables and any other objects before closing and starting the unit again

2.5 Precautions against residual risks

Prevention of residual risks caused by the control system

- be sure to have perfectly understood the operating instructions before carrying out any operation on the control panel
- when you have to work on the control panel, keep always the operating instructions within reach
- start the unit only after you have checked its perfect connection to the plant
- promptly inform the ENGINEER about any alarm involving the unit
- do not reset manual restoration alarms unless you have identified and removed their cause

Prevention of residual mechanical risks

- install the unit according to the instructions provided in this manual
- carry out all the periodical maintenance operations prescribed by this manual
- wear a protective helmet before accessing the interior of the unit
- before opening any panelling of the machine, make sure that it is secured to it by hinges
- do not touch air condensation coils without wearing protective gloves
- do not remove the guards from moving elements while the unit is running
- check the correct position of the moving elements' guards before restarting the unit

Prevention of residual electrical risks

- connect the unit to the mains according to the instructions provided in this manual
- periodically carry out all the maintenance operations specified by this manual
- disconnect the unit from the mains by the external disconnecting switch before opening the electrical board
- check the proper grounding of the unit before start-up
- check all the electrical connections, the connecting cables, and in particular the insulation; replace worn or damaged cables

- periodically check the board's internal wiring
- do not use cables having an inadequate section or flying connections, even for limited periods of time or in an emergency

Prevention of other residual risks

- make sure that the connections to the unit conform to the instructions provided in this manual and on the unit's panelling
- if you have to disassemble a piece, make sure that it has been properly mounted again before restarting the unit
- do not touch the delivery pipes from the compressor, the compressor and any other piping or component inside the machine before wearing protective gloves
- keep a fire extinguisher for electrical appliances near the machine
- on the units installed indoor, connect the safety valve of the refrigeration circuit to a piping network that can channel any overflowing refrigerant outside
- remove and leak of fluid inside and outside the unit
- collect the waste liquids and dry any oil spillage
- periodically clean the compressor compartment, to remove any fouling
- do not store flammable liquids near the unit
- do not disperse the refrigerant and the lubricating oil into the environment
- weld only empty pipes; do not approach flames or other sources of heat to refrigerant pipes
- do not bend/hit pipes containing fluids under pressure

2.6 Precautions during maintenance operations

Maintenance operations can be carried out by authorised technicians only.

Before performing any maintenance operations:

- disconnect the unit from the mains with the external disconnecting switch
- place a warning sign "do not turn on - maintenance in progress" on the external disconnecting switch
- make sure that on-off remote controls are inhibited
- wear suitable personal protective equipment (helmet, safety gloves, goggles and shoes etc.)

To carry out any measurements or checks which require the activation of the machine:

- work with the electrical board open only for the necessary time
- close the electrical board as soon as the measurement or check has been completed
- for outdoor units, do not carry out any operations in the presence of dangerous climatic conditions (rain, snow, mist etc.)

The following precautions must be always adopted:

- do not scatter the fluids of the refrigeration circuit in the surrounding environment
- when replacing an eprom or electronic cards, use always suitable devices (extractor, antistatic bracelet, etc.)
- to replace a compressor, the evaporator, the condensing coils or any other weighty element, make sure that the lifting equipment is consistent with the weight to be lifted
- in air units with independent compressor compartment, do not access the fan compartment unless you have disconnected the machine by the disconnecting switch on the board and you have placed a warning sign "do not turn on - maintenance in progress"
- contact Itelco-Industry for any modifications to the refrigeration, hydraulic or wiring diagram of the unit, as well as to its control logics
- contact Itelco-Industry if it is necessary to perform very difficult disassembly and assembly operations
- use only original spare parts purchased directly from Itelco-Industry or the official retailers of the companies on the recommended spare parts list
- contact Itelco-Industry if it is necessary to handle the unit one year after its positioning on site or if you wish to dismantle it.

2.7 Safety labels

The labels below will be affixed to each unit in the indicated point:



Identification of the refrigerant - External door

COD.PRODOTTO NEUTRO
 PRODUCT CODE



MODELLO
 MODEL

OdL 

MATRICOLA
 SERIAL NUMBER



ANNO DI COSTRUZIONE

CARICA REFR. CIRCUITO 1 2 3 4
 REFRIGERANT CHARGE Kg

ALTA PRESSIONE (max) bar
 HIGH PRESSURE

BASSA PRESSIONE (max) bar
 LOW PRESSURE

ALIM. POTENZA V/PH/Hz
 MAIN SUPPLY

CORRENTE DI SPUNTO (max) A
 LRA

CORRENTE A PIENO CARICO (max) A

POTENZA ASSORBITA (max) Kw
 POWER INPUT

PRESS. ESERC.ACQUA (max) bar
 WATER OPERATION PRESSURE

MASSA (max) Kg
 MASS

ITELCO-INDUSTRY S.r.l. Via XXV Aprile 29 20030 BARLASSINA MI (ITALIA)
 MADE IN ITALY


Identification of the unit - Outside, on the right-hand front column

**TENERE SU QUESTA LINEA
 GANCIO DI SOLLEVAMENTO**



**KEEP LIFT HOOK
 ON THIS LINE**

Gravity centre - Base

| | | |
|---|---|--|
|  | ATTENZIONE! prima di aprire togliere tensione. | ATTENTION! enlever l'alimentation électrique avant d'ouvrir. |
| | ACHTUNG! vor öffnen des gehäuses hauptschalter ausschalten! | CAUTION! disconnect electrical supply before opening. |

Electrical warning Adjacent to the master switch

ATTENZIONE

INSERIRE LE RESISTENZE DI RISCALDAMENTO OLIO ALMENO 12 ORE PRIMA DI OGNI AVVIAMENTO (SE PREVISTE).

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

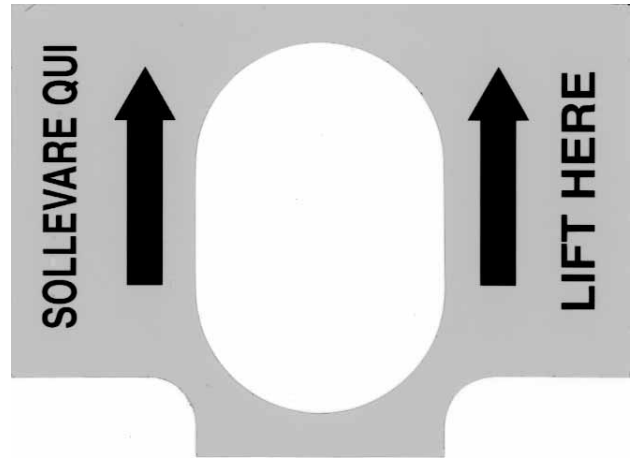
WARNING

ENERGIZE THE CRANCKCASE HEATER FOR AT LEAST 12 HOURS BEFORE EACH STARTING (IF FITTED).

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

881000215/01

Start-up warning - Outside the door of the electrical board



Lifting point - Base

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

| PROGR. COLL. NUMBER CHECK | DESCRIZIONE DEI TEST DESCRIPTION OF QUALITY CHECK | TIMERO 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 TEMPERATURE/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 | |

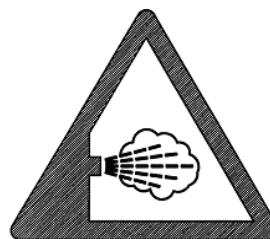
Final Test Certificate - Inside the external door

EIN - INLET
ENTRÉE - ENTRATA
AUS - OUTLET
SORTIE - USCITA

Fitting identification - Adjacent to fittings



Grounding connection - On the electrical board, adjacent to the connection



Warning - safety valves' vents



Warning - high-temperature zones Adjacent to hot pipes or components

2.8 Safety regulations

| Refrigerant data | Safety data: R407C, R134a, R22 |
|----------------------------------|--|
| Toxicity | Low |
| Contact with skin | If sprayed, the refrigerant is likely to cause frost burns. If absorbed by the skin, the danger is very limited; it may cause a slight irritation, and the liquid is degreasing. Unfreeze the affected skin with water. Remove the contaminated clothes with great care - in the presence of frost burns, the clothes may stick to the skin. Wash with plenty of warm water the affected skin. In the presence of symptoms such as irritation or blisters, obtain medical attention. |
| Contact with eyes | Vapours do not cause harmful effects. The spraying of refrigerant may cause frost burns. Wash immediately with a proper solution or with tap water for at least 10 minutes, and then obtain medical attention. |
| Ingestion | Very unlikely - should something happen, it will cause frost burns. Do not induce vomiting. Only if the patient is conscious, wash out mouth with water and give some 250 ml of water to drink. Then, obtain medical attention. |
| Inhalation | R407C, R134a, R22: remarkable concentrations in the air may have an anaesthetic effect, up to fainting. The exposure to considerable amounts may cause irregular heartbeat, up to the sudden death of the patient. Very high concentrations may result in the risk of asphyxia, due to the reduction in the oxygen percentage in the atmosphere. Remove the patient to fresh air and keep warm and at rest. If necessary, give oxygen. In case of breathing difficulties or arrest, proceed with artificial respiration. In case of cardiac arrest, proceed with cardiac massage. Then, obtain medical attention. |
| Recommendations | Semiotics or support therapy is recommended. Cardiac sensitisation has been observed that, in the presence of circulating catecholamines such as adrenalin, may cause cardiac arrhythmia and accordingly, in case of exposure to high concentrations, cardiac arrest. |
| Prolonged exposure | R407C, R134a, R22: a study on the effects of exposure to 50,000 ppm during the whole life of rats has identified the development of benign testicle tumour. This situation should therefore be negligible for personnel exposed to concentrations equal to or lower than professional levels. |
| Professional levels | R407C, R134a, R22: Recommended threshold: 1000 ppm v/v - 8 hours TWA. |
| Stability | R407C, R134a, R22: Not specified |
| Conditions to avoid | Do not use in the presence of flames, burning surfaces and excess humidity. |
| Hazardous reactions | May react with sodium, potassium, barium and other alkaline metals. Incompatible substances: magnesium and alloys with magnesium concentrations > 2%. |
| Hazardous decomposition products | R407C, R134a, R22: Halogen acids produced by thermal decomposition and hydrolysis. |

| | |
|------------------------------------|--|
| General precautions | Do not inhale concentrated vapours. Their concentration in the atmosphere should not exceed the minimum preset values and should be maintained below the professional threshold. Being more weighty than the air, the vapour concentrates on the bottom, in narrow areas. Therefore, the exhaust system must work at low level. |
| Respiratory system protection | If you are in doubt about the concentration in the atmosphere, it is recommended to wear a respirator approved by an accident-prevention Authority, of the independent or oxygen type. |
| Storage | Cylinders must be stored in a dry and fresh place, free from any fire hazard, far from direct sunlight or other sources of heat, radiators etc. Keep a temperature below 45°C. |
| Protective clothing | Wear overalls, protective gloves and goggles or a mask. |
| Accidental release measures | It is important to wear protective clothing and a respirator. Stop the source of the leak, if you can do this without danger. Negligible leaks can be left evaporating under the sun, providing that the room is well ventilated. Considerable leaks: ventilate the room. Reduce the leak with sand, earth or other absorbing substances. Make sure that the liquid does not channelled into gutters, sewers or pits where the vapours are likely to create a stuffy atmosphere. |
| Disposal | The best method is recovery and recycling. If this method is not practicable, dispose according to an approved procedure, that shall ensure the absorption and neutralization of acids and toxic agents. |
| Fire fighting information | R407C, R134a, R22: Not flammable in the atmosphere. |
| Cylinders | The cylinders, if exposed to fire, shall be cooled by water jets; otherwise, if heated, they may explode. |
| Protective fire fighting equipment | In case of fire, wear an independent respirator and protective clothing. |

| Lubricant oil data | Safety data: Polyester oil (POE) |
|--------------------------------------|---|
| Classification | Not harmful |
| Contact with skin | May cause slight irritation. Does not require first aid measures. It is recommended to follow usual personal hygiene measures, including washing the exposed skin with soap and water several times a day. It is also recommended to wash your overalls at least once a week. |
| Contact with eyes | Wash thoroughly with a suitable solution or tap water. |
| Ingestion | Seek medical advice immediately. |
| Inhalation | Seek medical advice immediately. |
| Conditions to avoid | Strong oxidising substances, caustic or acid solutions, excess heat. May corrode some types of paint or rubber. |
| Protection of the respiratory system | Use in well ventilated rooms. |
| Protective clothing | Always wear protective goggles or a mask. Wearing protective gloves is not mandatory, but is recommended in case of prolonged exposure to refrigerant oil. |
| Accidental release measures | It is important to wear protective clothing and, especially, goggles. Stop the source of the leak. Reduce the leak with absorbing substances (sand, sawdust or any other absorbing material available on the market). |
| Disposal | The refrigerant oil and its waste will be disposed of in an approved incinerator, in conformity with the provisions and the local regulations applicable to oil waste. |
| Fire fighting information | In the presence of hot liquid or flames, use dry powder, carbon dioxide or foam. If the leak is not burning, use a water jet to remove any vapours and to protect the personnel responsible for stopping the leak. |
| Cylinders | The cylinders exposed to a fire will be cooled with water jets in case of fire. |
| Fire fighting protective equipment | In case of fire, wear an independent respirator. |

3 TRANSPORT, LIFTING AND POSITIONING

Refrigerators are supplied assembled (apart from standard antivibrating rubber supports, that will be installed on site). The equipment are full of refrigerant and oil, in the quantity required for a proper operation.

3.1 Inspection

When the unit is delivered, it is recommended to check it carefully and to identify any damage occurred during transportation. The goods are shipped ex-factory, at the buyer's risk. Check that the delivery includes all the components listed in the order.

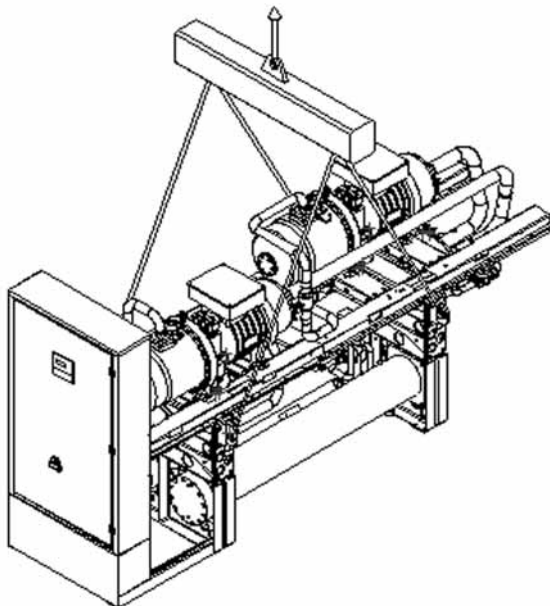
In case of damage, note it down on the carrier's delivery note and issue a claim according to the instructions provided in the delivery note.

In the presence of any serious damage, that does not affect the surface only, it is recommended to inform Itelco-Industry immediately.

Please note that Itelco-Industry may not be held liable for any damage to the equipment during transportation, even though the carrier has been appointed by the factory.

3.2 Lifting

The unit must be lifted by using the hooks inserted into the relevant eyebolts (see the figure).



It is recommended to use a spacer to prevent cables from damaging the unit.

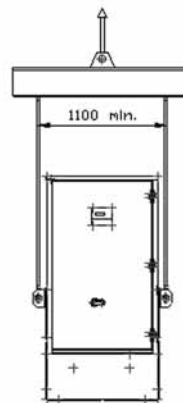


Figure a

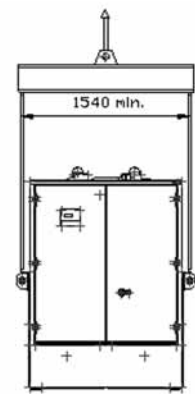


Figure b

For the minimum size of the spacer, please refer to *Figure a* for sizes from 1002 to 1902 (R407C) and from 1602 to 1902 (R134a), to *Figure b* for sizes from 2202 to 4402 (R407C) and from 2202 to 4802 (R134a).

Before positioning the unit, make sure that the place of installation is appropriate and sturdy enough to hold the weight and to withstand the stress caused by the operation of the whole assembly.



Do not displace the unit on rollers, and do not lift it with a lift truck.

To lift and displace the unit:

- Insert and secure eyebolts into the holes marked on the frame.
- Connect cables to eyebolts.
- Hook near the barycentre of the unit.
- The cables must be long enough to form, if tensioned, an angle of at least 45° with respect to the horizontal plane.

Transport, Lifting and Positioning



For lifting operations, use only tools and material fit for this purpose, in accordance with accident-prevention regulations.



It is recommended not to remove the protective plastic envelope, that should prevent scraps from penetrating into the appliance and any damage to the surfaces, until the unit is ready for operation.



The lifting eyebolts protrude from the base of the unit; it is therefore recommended to remove them once the unit has been lifted and positioned, if in your opinion they are likely to become a source of hazard and injury.

The eyebolts must be mounted on the unit whenever it shall be displaced and then lifted again.

3.3 Anchoring

It is not essential to secure the unit to the foundations, unless in areas where there is a serious risk of earthquake, or if the appliance is installed on the top of a steel frame.

3.4 Storage

When the unit is to be stored before installation, adopt a few precautions to prevent any damage or risk of corrosion or wear:

- plug or seal every single opening, such as water fittings
- do not store the appliance in a room where the temperature exceeds 50°C for the units using R407C and, if possible, do not expose to direct sunlight
- it is recommended to store the unit in a roof where traffic is minimized, to prevent the risk of accidental damage
- the unit must not be washed with a steam jet
- take away and leave to the site manager all the keys providing access to the control board

Finally, it is recommended to carry out visual inspections at regular intervals.

4 INSTALLATION

4.1 Positioning the unit



Before installing the unit, make sure that the structure of the building and/or the supporting surface can withstand the weight of the appliance. The weights of the units are listed in Chapter 8 of this manual.

These units have been designed for outdoor installation on a solid surface. Standard accessories include antivibrating rubber supports, that must be positioned under the base.

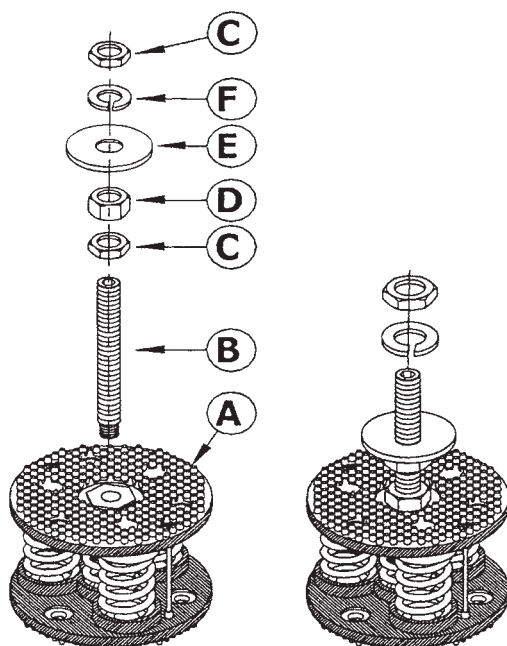
When the unit is to be installed on the ground, it is necessary to provide a concrete base, to ensure a uniform distribution of the weights.

As a general rule, no special sub-bases are required. However, if the unit is to be installed on the top of inhabited rooms, it is advisable to rest it on spring shock absorbers (optional), that will minimise the transmission of any vibration to the structures.

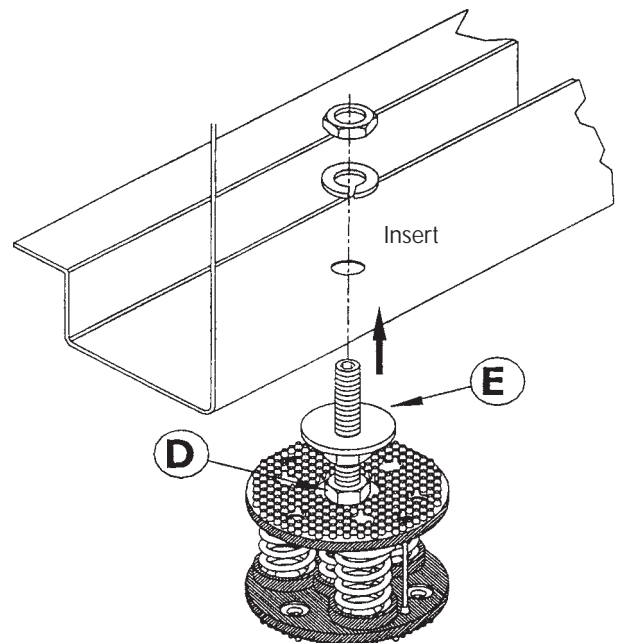
To choose the place of installation of the unit, bear in mind that the place of installation must have all the necessary spaces for air circulation and maintenance operations (see Chapter 9).

4.2 Spring Isolator Installation

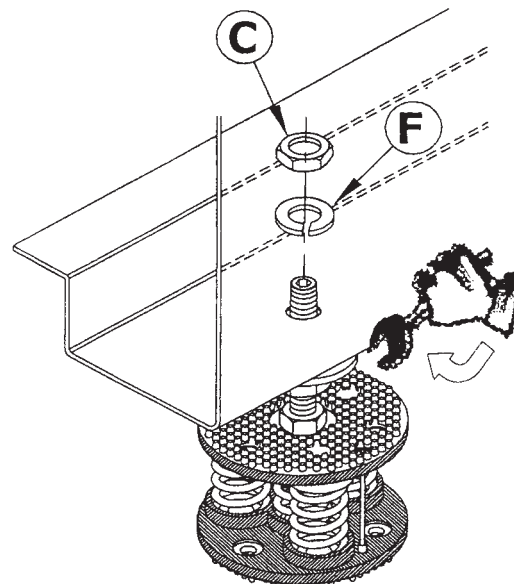
- Prepare the base, that must be flat and plane.
- Lift the appliance and insert shock absorbers as follows:



- 1) proceed with the assembly of the jack components



- 2) insert the jack into the threaded seat provided on the upper plate of the shock absorber. Then insert the jack mounted on the shock absorber, in the hole provided on the base of the machine.



- 3) make sure that the base of the machine is resting on the flat washer (E) of the jack. To offset any difference in height, work on high nut (D), using a 24 wrench. Clamp in the obtain position with the grover washer (F) and the relevant low nut (C).

At the end of this operation, check that the machine is elastic on its axes, and preset for the installation of antivibrating joints in the water connections.

Installation

4.3 External hydraulic circuit



The external hydraulic circuit must ensure the water flow to the evaporator under any working conditions and with any adjustment.

The external hydraulic circuit should consist of the following elements:

- A circulation pump which delivers a sufficient water flow and discharge head.
- The capacity of the primary hydraulic circuit should not be less than 7,5 litres/KW of cooling capacity, in order to prevent the repeated start-up of the compressor and any damage to it. If the water capacity in the primary piping of the circuit and in the evaporator is lower than this value, an insulated storage tank shall be installed.
- A membrane expansion vessel provided with safety valve with vent, that must be visible.



The capacity of the expansion vessel must allow for an expansion of at least 2% of the volume of the fluid in the circuit (evaporator, piping, user circuit and standby tank, if any). The expansion vessel needs not be isolated, because no water can circulate inside it.

- A flow meter, to disable the appliance when the water is not circulating.



The external hydraulic circuit must ensure the water flow to the evaporator under any working or adjustment conditions.

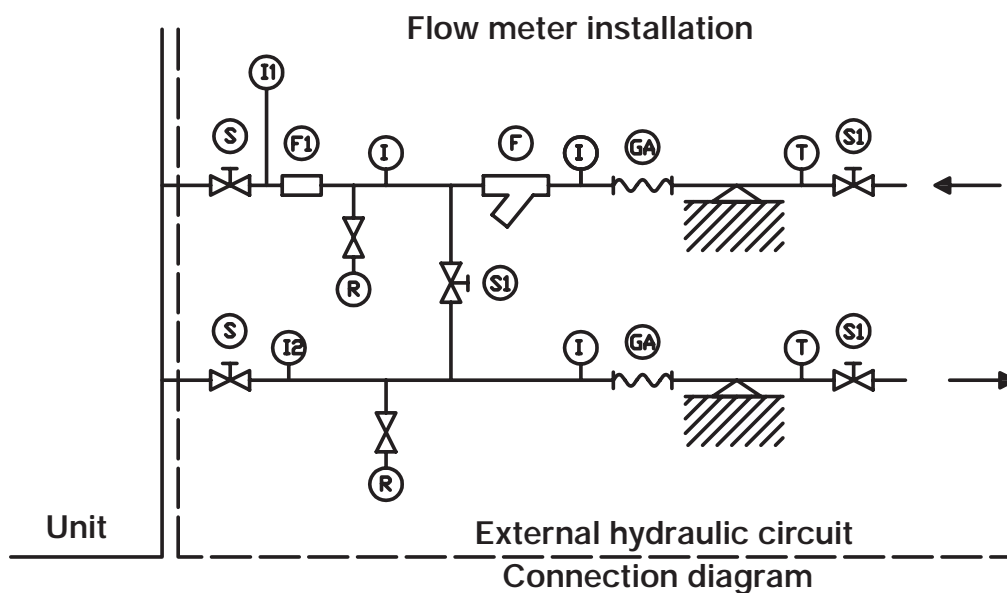
To install the flow meter, conform to the manufacturer's instructions.

As a general rule, the flow meter must be mounted on a horizontal pipe, and its distance from the curves must be 10 times the diameter of the pipe, far from valves or other components that may hinder the water flow upstream of or downstream from the flow meter.

- The air exhaust valves must be mounted in the highest point of the piping.
- The stop valves must be mounted on the water inlet/outlet piping of the evaporator and the heat recovery condenser.
- The drain points (provided with plugs, cocks etc.) must be positioned in the lowest point of the piping.

Furthermore:

- Provide the evaporator with a by-pass circuit equipped with valve, to wash the plant.
- Insulate the piping, to prevent the risk of heat loss.
- Install a filter on the suction side of the evaporator or the heat recovery condenser.



Legends:

I: Pressure gauge connection
 S: Gate valve
 F1: Flow meter
 GA: Flexible hoses

R: Drain cock
 T: Thermometer
 F: Filter
 I1/I2: Pressure gauge connection to measure pressure drop or head pressure



Before filling the circuit, it is important to check that it is free from any foreign matter, sand, gravels, rust, welding deposits, waste and other materials that may damage the evaporator.

When cleaning the lines, it is recommended to create a circuit by-pass. It is important to mount a filtering medium (30 mesh) upstream of the chiller.



If necessary, the water required to fill the circuit must be treated to obtain the requested PH.

4.4 Hydraulic connection of the condenser



The external hydraulic circuit must ensure the water flow to the condenser under any working or adjustment conditions.

The cooling of the units is generally ensured by connecting the condenser to a cooling tower, though the units can be cooled also with well water.

In the presence of a water-cooled condenser, it is necessary to check the flow rate and/or the temperature of the cooling fluid that flows through the condenser, so as to maintain the refrigerant pressure at values that can ensure a satisfactory operation.

When a cooling tower is used, the simplest regulation methods consist of checking the operation or the speed of the fan or the air volume, by means of a damper, once the pilot thermostat has been installed in the basin of the tower.

Alternatively, or if no water from a cooling tower is used, you can adopt a recirculation system provided with a 3-way valve.

This circuit shall consist of:

- A circulation pump that can ensure the necessary capacity and discharge head.
- A flow meter to turn off the appliance when no water is circulating.



The flow meter must be connected in series, as shown in the wiring diagram of the control panel.

To install the flow meter, follow the manufacturer's instructions.

As a general rule, the flow meter shall be mounted on a horizontal pipe, at a distance from the curves equal to 10 times the diameter of the pipe and far from valves or other components that are likely to hinder the water flow upstream of or downstream from the flow meter.

- The bleed valves must be mounted on the highest point of the piping.
- The stop valves must be mounted on the piping of the water entering/leaving the condenser.
- The discharge points (provided with plugs, cocks etc.) must be arranged in the lowest point of the piping.

Furthermore:

- Provide the condenser with a by-pass circuit, equipped with a shutoff valve
- Insulate piping, to prevent the risk of heat loss.
- Install a filter on the suction side of the condenser.
- A three-way valve should be installed on-site. It permits to bypass the condenser for correct operation at low return water temperature. The best position is close to the condenser.

To install the flow meter, follow the diagram illustrated in paragraph 4.3.

4.5 Hydraulic connection

The water inlet/outlet fittings shall conform to the instructions provided by the plates affixed near the connection points.

4.6 Power supply



Before carrying out any operations on the electrical system, make sure that the unit is deenergised.



It is important that the appliance is grounded.



The company in charge of the installation shall conform to the standards applicable to outdoor electrical connections.

Installation

Itelco-Industry may not be held liable for any damage and/or injury caused by failure to comply with these precautions.

The unit conforms to EN 60204-1.

The following connections shall be provided:

- A 3-phase and grounding connection for the power supply circuit.
- The electrical distribution system shall meet the power absorbed by the appliance.
- The disconnecting and magnetothermal switches must be sized to control the starting current of the unit.
- The power supply lines and the insulation devices must be designed in such a way that every line independent.
- It is recommended to install differential switches, to prevent any damage caused by phase drops.
- The fans and compressors are supplied through contactors controlled from the control panel.
- Each motor is provided with an internal safety thermal device and external fuses.
- The power supply cables must be inserted into dedicated openings on the front of the unit, and they will enter the electrical board through holes drilled on the bottom of the board.

4.7 Electrical connections

The unit must be installed on site according to the Machinery Directive (98/37/EC), the Low Voltage Directive (73/23/EC), the Electromagnetic Interference Directive (89/336/EC) and the usual procedures and standards applicable in the place of installation. The unit must not be operated if its installation has not been carried out according to the instructions provided in this manual.

The power supply lines must consist of insulated copper conductors, dimensioned for the maximum absorbed current.

Connection to terminals must be performed according to the diagram of connections provided in this manual and according to the wiring diagram which accompanies the unit.



Before connecting the power supply lines, check that the available voltage value does not exceed the range specified in the Electric Data (Chapter 8).

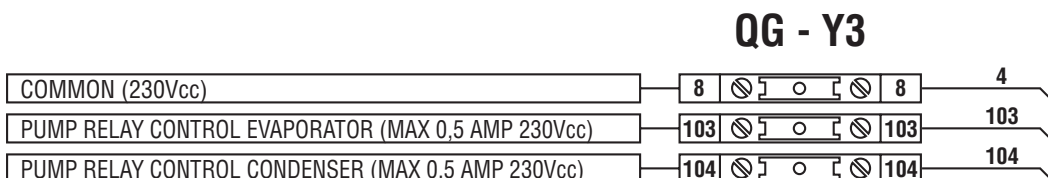
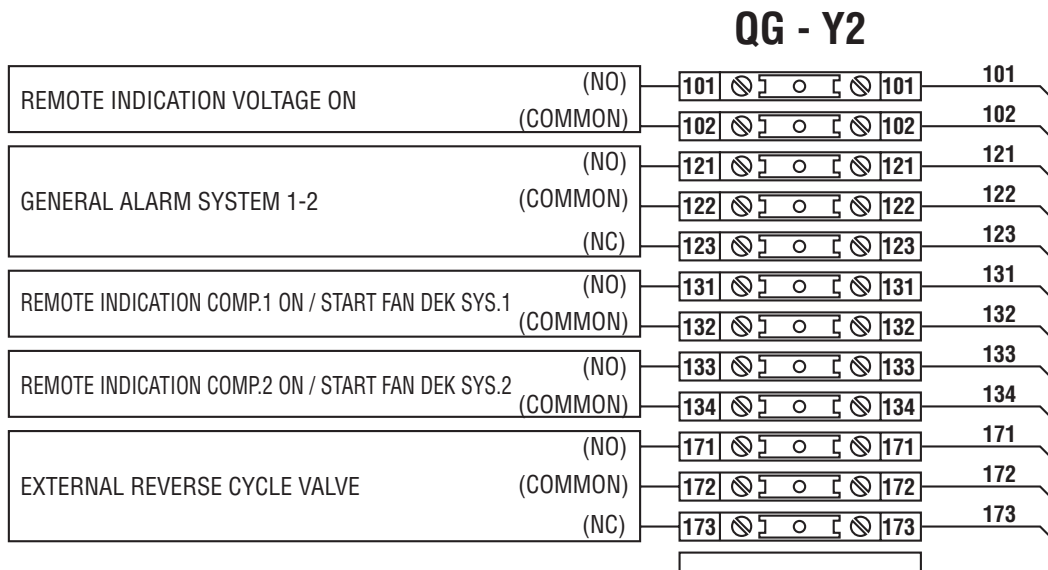
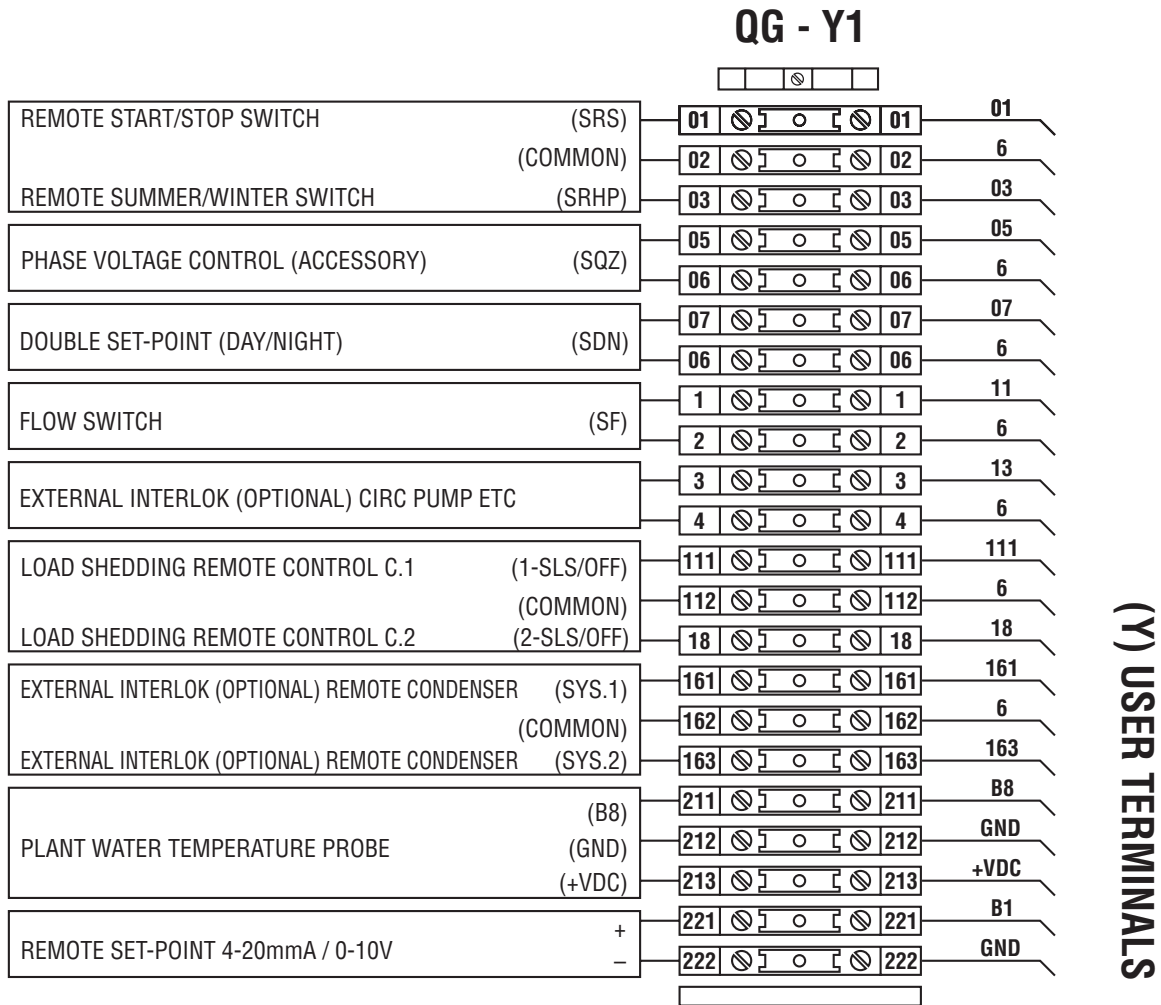
For 3-phase systems, check also that the unbalance between the phases does not exceed 2%. To perform this check, measure the differences between the voltage of each phase couple and their mean value during operation. The maximum % value of these differences (unbalance) must not exceed 2% of the mean voltage.

If the unbalance is unacceptable, contact the Energy Distributor to solve this problem.



Supplying the unit through a line whose unbalance exceeds the permissible value will automatically void the warranty.

Terminal box



5 START-UP



The unit must be started for the first time by personnel suitably trained by one of Itelco-Industry 's Authorised Service Centre. Failure to meet this requirement will immediately void the warranty.



The operations carried out by Itelco-Industry personnel are limited to the start-up of the unit, and do not include any other operation on the plant, such as, for example, electrical and hydraulic connections etc. All the other operations before start-up, including oil pre-heating for at least 12 hours, must be performed by the Installer.

5.1 Preliminary check

The checks listed below shall be performed before starting the unit and before the arrival of the personnel authorised by Itelco-Industry .

- Check the section of power supply and grounding cables; make sure that terminals are tightened and check the correct operation of contactors, with the master switch open.
- Check that any voltage and phase variation in the power supply does not exceed the prefixed thresholds.
- Connect the contacts of the flow meter and the thermal relay of the pump and of the other devices (if any), to terminals 1-2 and 3-4, respectively.
- Check that the components of the external water circuit (pump, user equipment, filters, power supply tank and reservoir, if any) have been installed properly, and according to the manufacturer's instructions.
- Check the filling of the hydraulic circuits, and make sure that the fluid circulation is correct, without any trace of leaks and air bubbles. If you use ethylene glycol as antifreeze, check that its percentage is correct.
- Check that the direction of rotation of the pumps is correct, and that fluids have been circulating for at least 12 hours for both pumps. Then, clean the filters on the suction side of the pumps.
- Adjust the liquid distribution network in such a way that the flow rate is within the specified range.
- Check that the water quality is up to the specifications.
- Check that oil heaters, if any, have been turned on at least 12 hours before.

5.2 Start-up

Start-up sequence:

- Turn on the master switch (at least 12 hours before).
- Check that the oil in the compressor has reached the requested temperature (the minimum temperature outside the pan must be approx. 40°C) and that the auxiliary control circuit is energised.
- Check the operation of all the external equipment, and make sure that the control devices of the plant are properly calibrated.
- Start the pump and check that the water flow is correct.
- Set the desired fluid temperature on the control board.
- Start the appliance (see Chapter 6).
- After about 15 minutes of operation check that there are no bubbles, through the sight glass on the liquid line.



The presence of bubbles may indicate that a part of the refrigerant charge has been released in one or more points. It is important to remove these leaks before proceeding.

- Repeat the start-up procedure after removing the leaks.
- Check the oil level in the compressor's sight glass.

5.3 Checking the operation

Check the following:

- The temperature of the water entering the evaporator.
- The temperature of the water leaving the evaporator.
- The level of the water flow rate in the evaporator, if possible.
- The current absorption upon the start of the compressor and in case of stabilised operation.

Check that the condensing and evaporation temperatures, during operation at high and low pressure detected by the pressure gauges of the refrigerant, are within the following range:

(On the units not provided with HP/LP pressure gauges for the refrigerant, connect a pressure gauge to the Schreder valves on the refrigeration circuit).

| | |
|----------------|---|
| HP side | Approx 7 to 11°C above the inlet water temperature of condenser, for R407C units; approx 2 to 5°C above the inlet water temperature of condenser, for R134a units. |
| LP side | Approx 3.5 to 5°C below the temperature of the leaving chilled water, for R407C; approx 3.5 to 6°C below the temperature of the leaving chilled water, for R134a units. |

5.4 Delivery to the customer

- Train the user according to the instructions provided in Section 6.

6 OPERATION

These chillers are equipped with a microprocessor control logic and regulation management system.

The system consists of a unit logic board and a liquid crystal control panel which manages the control, starting, shutdown and display functions.

6.1 General Information

■ Introduction

The information and the operating instructions of the electronic control system mounted on the unit are listed here below.

■ Main characteristics

- Microprocessor control
- User friendly easy reachable keyboard
- Proportional – Integral control of return water temperature (RWVT)
- Hysteresis type control of leaving chilled water temperature (LWT)
- Access code to Service Level
- Acoustic and LED alarm indication
- Backlighted liquid crystals display
- Closed loop condensing pressure control
- Start and stop pump down logic
- Cooling capacity steps rotation
- Oil recovery function
- Night (or Double set point) function management
- Compressor and pump working hours meter
- Discharge and suction pressure display
- Memorized alarms history
- 4 set point time programs

Possibility to connect:

- Serial Communication Card RS485 Card to connect the **Chiller Control** to a BMS net (MODBUS, LONWORK, BACNET)
- Remote Display Terminal
- Remote control
- Phase monitoring kit
- Killer Data Logger
- GSM Modem

■ “Chiller Control” system two screw compressors unit

These cooling only water chillers are provided with a microprocessor board having a default program for the management of two refrigeration circuits each one equipped with one twin screws compressor, one low pressure transducer and one high pressure transducer. The control system consists of:

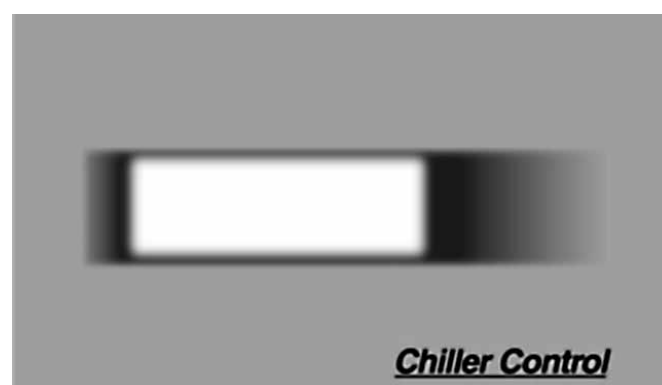
- INTERNAL ELECTRONIC PCB
- TERMINAL UNIT WITH DISPLAY AND KEYBOARD
- CHILLED FLUID TEMPERATURE SENSORS
- AMBIENT AIR TEMPERATURE SENSORS
- COIL TEMPERATURE SENSOR
- HIGH PRESSURE TRANSDUCER
- LOW PRESSURE TRANSDUCER

6.2 Keyboard – Display Terminal Unit

■ General Information

The figure which follows shows the terminal unit with open access door.

On the figure it is possible to see the microprocessor managed 4 lines – 20 columns LCD display, the keyboard and the LEDs which allow to program all the control parameters as setpoints, differential band, alarm thresholds and to perform the main functions.

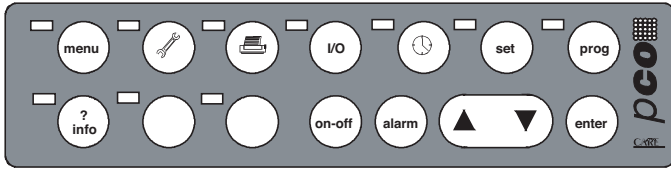












■ Keyboard

The terminal unit allows the operator to perform the following operations:

- initial configuration of the unit
- modification of the main working parameters
- displaying of the alarms and their notification by “buzzer”
- displaying of all the measured parameters

The connection between the terminal unit and the board is realized by a 6 ways phone cable. The connection between the terminal unit and the main board is not strictly necessary to the normal operation of the controller.



-  Access to the displaying mask of the main parameters and unit status mask.
-  Access to devices maintenance parameters (elapsed working hour of the device and reset of the hours meter, alarm history) (Service Level)
-  Not Available
-  Access to the displaying masks of digital and Analog inputs and outputs status and of the software release.
-  Access to clock programming mask
-  Access to the displaying / programming masks of the control setpoint (User Level - Setpoint)
-  Access to "Service level" masks
-  +  Pushing this key together it is possible to access to the "Manufacturer Level"
-  Used only for unit with four compressors or back to back configuration with master slave. Switch the displaying master unit control / slave unit control

The LEDs of each keys light up when the function related to the key is active.



Figure 1

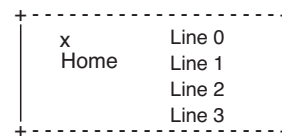
1. **On/Off** key: it allows to switch on and off the unit. Unit status is indicated by the lighting of the green LED.
2. **Alarm** key: it is used to display the alarms, to manually reset the alarms and to arrest the buzzer. If the key is lighted in red it means that at least one alarm was detected. Pushing one time this key the buzzer is arrested and the mask related the active alarm is displayed. Pushing it a second time the alarm is reset.
3. **Upward** arrow key: it allows to program the control parameters and to move between the masks (not backlighted).
4. **Downward** arrow key: it allows to program the control parameters and to move between the masks (not backlighted).
5. **Enter** key: it allows to move the cursor inside the masks and to save the programmed parameters. This key is continuously backlighted (in yellow) to show that the unit is under power.



■ Display

The unit is equipped with a 4 lines – 20 columns LCD display.

The parameters and the operation information are shown in pages called "masks".

The navigation inside each mask is possible using as follows the terminal unit keys.



When cursor position corresponds to the left corner of the upper part of the display (Home) pushing the  arrow keys it is possible to access to the masks which are associated to the selected field. If a mask contains parameters programming fields, pushing the key ENTER the cursor will move to those fields. When it reaches one of the programming fields, using the  arrow keys it is possible to modify the relevant value within its programming range. The modified value must be confirmed pushing the ENTER key.

6.3 Functions / Keys / Configuration

■ Alarms Table

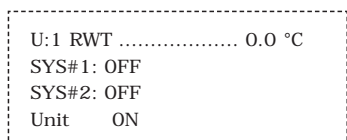
| Code | Alarm Description | Comp. #1 Status | Comp. #2 Status | Pump Evap. Status | Pump Cond. Status |
|------|--|-----------------|-----------------|-------------------|-------------------|
| AL01 | Wrong power | Off | Off | Off | Off |
| AL02 | Antifreeze alarm | Off | Off | On | Off |
| AL03 | Interlock | Off | Off | Off | Off |
| AL04 | Flow switch alarm | Off | Off | Off | Off |
| AL05 | System #1 low suction pressure | Off | On | On | On |
| AL06 | System #2 low suction pressure | On | Off | On | On |
| AL07 | System #1 high discharge pressure | Off | On | On | On |
| AL08 | System #2 high discharge pressure | On | Off | On | On |
| AL09 | Compressor #1 thermal protection | Off | On | On | On |
| AL10 | Compressor #2 thermal protection | On | Off | On | On |
| AL14 | Remote interlock n°1 | Off | On | On | On |
| AL15 | Remote interlock n°2 | On | Off | On | On |
| AL18 | Clock board failure | On | On | On | On |
| AL21 | B1 wrong signal | Off | Off | On | Off |
| AL22 | B2-LP1 sensor failure | Off | On | On | On |
| AL23 | B3-DP1 sensor failure | On | On | On | On |
| AL24 | B4-TEin sensor failure | On | On | On | On |
| AL25 | B5-TEout sensor failure | Off | Off | On | On |
| AL26 | B6-LP2 sensor failure | On | Off | On | On |
| AL27 | B7-DP2 sensor failure | On | On | On | On |
| AL28 | B8-Tplan sensor failure | Off | Off | On | On |
| AL29 | B9-TCin sensor failure | On | On | On | On |
| AL30 | B10-TCout sensor failure | On | On | On | On |
| AL31 | SYS #1 compressor Maintenance | On | On | On | On |
| AL32 | SYS #2 compressor Maintenance | On | On | On | On |
| AL33 | Pump maintenance | On | On | On | On |
| AL37 | System #1 compressor differential pressure | Off | On | On | On |
| AL38 | System #2 compressor differential pressure | On | Off | On | On |

Notes:

1 = Check power phases rotation and/or minimum voltage. It works only in case the Phases Monitor (accessory) is installed.

■ “Menu” key

Pushing the “Menu” key the main mask is displayed:



In this mask the following items are displayed:

- unit serial number and control temperature
- system #1 status
- system #2 status
- unit status.

■ I/O (input / output) Status

Pushing the "I/O" key it is possible to access to all the masks showing the values read by all the sensors installed on the unit.

| Sensor | Use |
|--------|--|
| Tin | Entering chilled fluid temperature |
| Tout | Leaving chilled fluid temperature |
| TpLAN | Installation control sensor (in case of "Chiller Network") |
| SP #1 | System #1 suction pressure transducer |
| DP #1 | System #1 discharge pressure transducer |
| SP #2 | System #2 suction pressure transducer |
| DP #2 | Sys 2 : trasduttore pressione mandata |
| TC #1 | Heat recovery heat exchanger entering water temp. |
| TC #2 | Heat recovery heat exchanger leaving water temp. |

The following items are also displayed:

1. Chiller Control digital inputs and outputs status
2. Analog outputs driving the fan speed controllers
3. Code and release of the "Chiller Control" software.

■ Maintenance

Pushing the "Maintenance" key it is possible to access to the following information masks:

1. ALARM HISTORY

```

N°0000
AL000 00:00 00/00/00
Setpoint ..... 00.0 °C
TemperaturE ..... 00.0 °C
    
```

Pushing the "Enter" the cursor enter in the list of the memorized alarms. At this point the arrow keys allow to scroll the masks of all the memorized alarms which show the date, time, code and the controlled water temperature (entering or leaving) at the moment in which the alarm itself was detected.

2. PUMP WORKING HOURS

```

U:1
Pump..... 00000 h
    
```

3. COMPRESSORS WORKING HOURS

```

U:1 SYS #1
Compressor      00000 h
U:1 SYS #2
Compressor      00000 h
    
```

4. PASSWORD (*)

```

U:1
DIGIT password
      0000
    
```

Nota (*): Contact Itelco Clima Service Department to access to the following masks.

RST_HOUR METERS

```

Reset hours U:1
pump ..... N
compressors
SYS #1 N SYS #2 N
    
```

MSK_FILTERS

```

Enabling software
filters ..... S
Threshold ..... 00.5 °C
Interval ..... 020 sec
    
```

M_DISABLE

```

Enabling
compressors
SYS #1=Y SYS #2=Y
    
```

M_OFFSET1

```

Sensor calibration
Tin ..... 0.0 °C
SP #1 ..... 0.0 bar
DP #1 ..... 0.0 bar
    
```

M_OFFSET2

```

Tair ..... 0.0 °C
Tout ..... 0.0 °C
SP #2 ..... 0.0 bar
DP #2 ..... 0.0 bar
    
```

M_OFFSET3

```

Sensor calibration
TpLAN ..... 0.0 °C
    
```

HOUR_THRES

```

Maintenance alarm
threshold
      003X1000h
    
```

Operation

■ Setpoint

Pushing the "Set" key it is possible to access to user's Setpoint level. The following table contains the de-

tails of the parameters which is possible to set with the relevant limitations and default values:

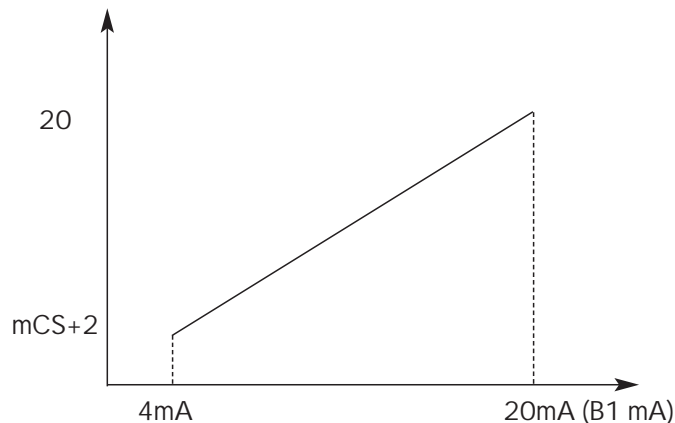
| User's Setpoints | Control of | Low Limit | High Limit | Default | | | |
|--------------------|------------|-----------|------------|---------|-----|-----|---------|
| System #1 ON/OFF | - | OFF | ON | OFF | | | |
| System #2 ON/OFF | - | OFF | ON | OFF | | | |
| Cooling Setpoint | Inlet | 8 | 20 | 10 | | | |
| | Outlet | 6 | 20 | 8 | | | |
| Heating Setpoint | Inlet | 20 | 48 | 43 | | | |
| | Outlet | 20 | 50 | 45 | | | |
| Glycol Setpoint | Inlet | -15 | 20 | 10 | | | |
| | Outlet | -15 | 20 | 8 | | | |
| Dead band | Inlet | 1 | 10 | 5 | | | |
| | Outlet | 1 | 6 | 2 | | | |
| Language Selection | — | ITA | ENG | GER | FRA | SPA | Italian |

■ Remote setpoint - Input B1

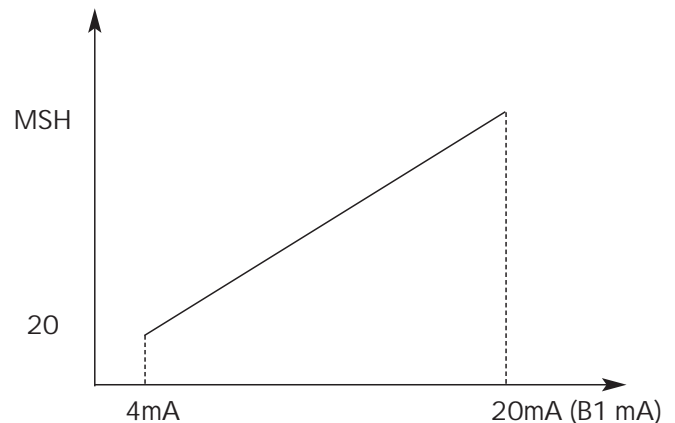
When the B1 input is enabled, the remote setpoint is activated. The active set of the machine, in cold or heat mode, is no longer the set selected on the key-

board, but is a value which corresponds to the B1 analog input in the 4-20mA scale, according to the following curve:

REM. COLD SET (°C)



REM. HOT SET (°C)



■ Clock Key

To have access to the following mask:

DATE AND TIME

| | | |
|------|-------|----------|
| U:1 | Clock | |
| Hour | | 00:00 |
| Day | | |
| Date | | 00/00/00 |

SETPOINTS TIMING

| | |
|---------|---------------|
| Setp1 = | 00.0 - 00:00h |
| Setp2 = | 00.0 - 00:00h |
| Setp3 = | 00.0 - 00:00h |
| Setp4 = | 00.0 - 23:59h |

TIMING PERIODS ENABLING

| | |
|---|---|
| Day timing periods with setpoint variations | N |
|---|---|

7 GENERAL DESCRIPTION

7.1 Introduction

The water chillers with two refrigeration circuits of the SWS series have been designed for indoor installation.

For heat dissipation purposes, the SWS units must be coupled to a cooling tower, or use well water.

The series includes the following versions:

| Version | Description |
|---|--|
| SWS standard version (STD) SWS low noise version (LN) SWS extra low noise version (ELN) | Chillers with water condensation, working with R407C and R134a refrigerants (with R22 refrigerant on request for extra-european countries) |

For each version, the corresponding moto-evaporating version is available: SWR

Available options:

| Options | Description |
|---------|---|
| SWS/D | The thermal recovery is ensured by a de-superheater mounted on the compressor's delivery line |

7.2 General specifications

The SWS/SWR chillers are supplied complete and fitted with refrigerant connection pipes and internal wiring.

The refrigeration circuit of each SWS unit is subjected to a pressure test, drained, vacuumised, dehydrated and filled with refrigerant, and includes the necessary oil. On completion of the assembly, each unit is subjected to final testing and checking of the proper operation of all refrigeration circuits.

The base and the frame of every single unit are made of sturdy galvanised steel and fastened by stainless steel screws and bolts. Both the compressor and the components of the refrigerant circuit are lodged in a compartment coated with soundproofing material (ELN versions), whose sides can be easily removed to provide access.

The galvanised steel sections are oven-painted with white enamel (RAL 9001).

7.3 Compressors

The SWS/SWR units feature semi-hermetic screw compressors. The control of the compressor's capacity is managed by solenoid capacity control valves, that are controlled by the microprocessor of the appliance; every compressor has 3 working steps: 25% (start only), 50%, 75%, 100%.

The compressors' motors are cooled by the refrigerant gas and are provided, in each phase, by a built-in temperature-sensitive solid state device for overload protection.

The motor's terminals are weatherproof, according to standard IP-54.

| COMPRESSOR START-UP | |
|---------------------------|---------------------------|
| PART - WINDING | STAR - TRIANGLE |
| SWS/SWR 1002 - 1902 R407C | SWS/SWR 2202 - 4402 R407C |
| SWS/SWR 1602 - 2202 R134a | SWS/SWR 2212 - 4802 R134a |

General Description

7.4 Refrigerant circuits

Every single SWS unit has two complete refrigerant circuits, one per compressor. Each refrigerant circuit includes: a service valve for refrigerant filling, shutoff valves for suction lines (on request), as well as for the delivery and liquid lines, a thermostatic expansion valve with external equalizer, a solenoid valve to start/stop the compressor, a dehydrating cartridge filter, a sight glass with humidity indicator, a differential oil pressure switch. The moto-evaporating SWR units, which derive from the SWS versions, are provided with shutoff cocks on the delivery and liquid lines, so as to allow the connection of remote condensers.

Each circuit is also provided with safety devices, in accordance with PED 97/23/EC: HP pressure switches, pressure transducers, safety valves providing protection in case of fire or in the case of a malfunction of compressors.

7.5 Evaporator

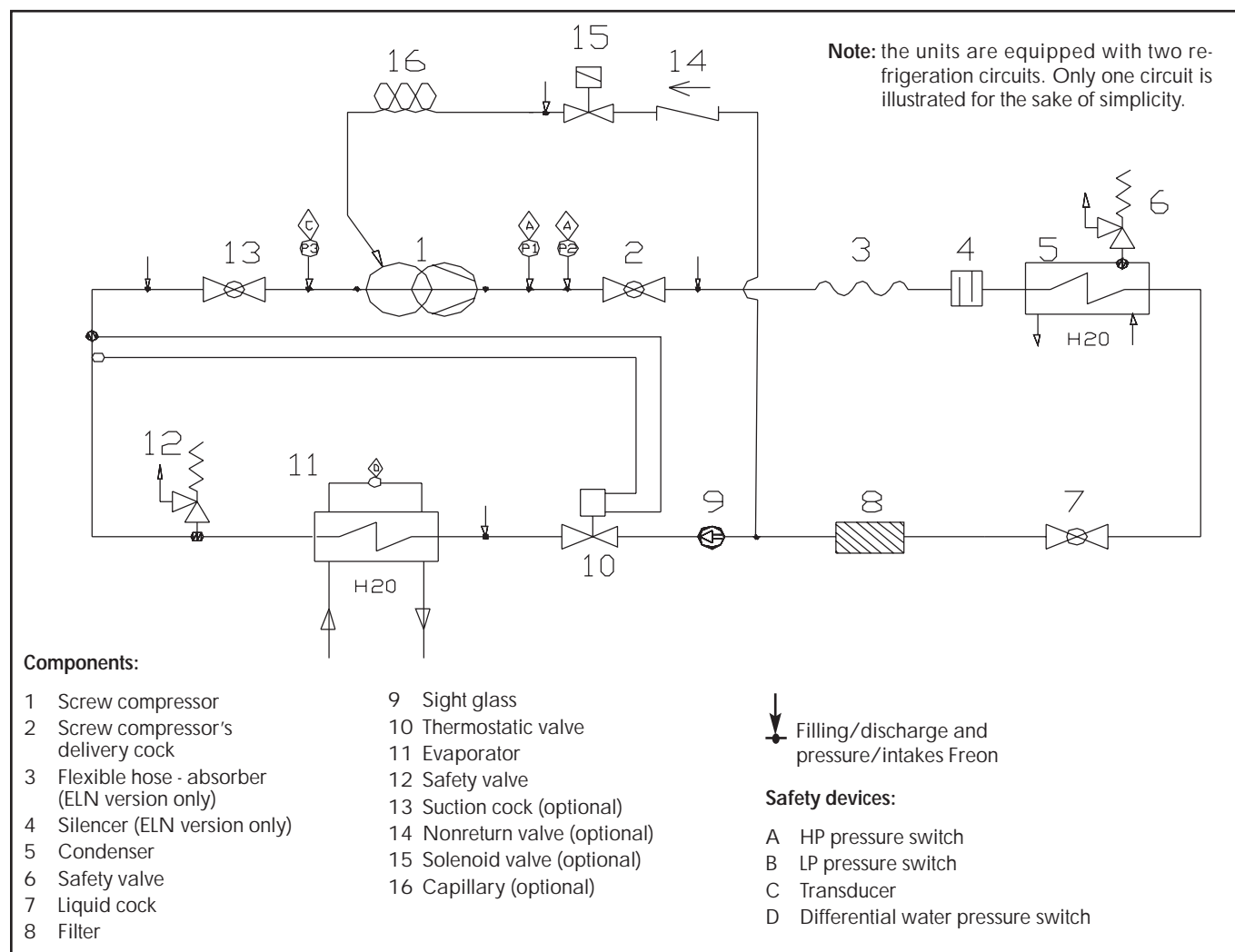
All units are equipped with a single direct-expansion refrigerant/water exchanger of shell and tube type, with several refrigeration circuits. The tube bundle can be removed for any inspections or maintenance.

The heat exchangers are insulated with 19mm-thick anti-condensate closed-cell polyethylene material. The insulating material is not UV-ray-proof.

7.6 Condenser

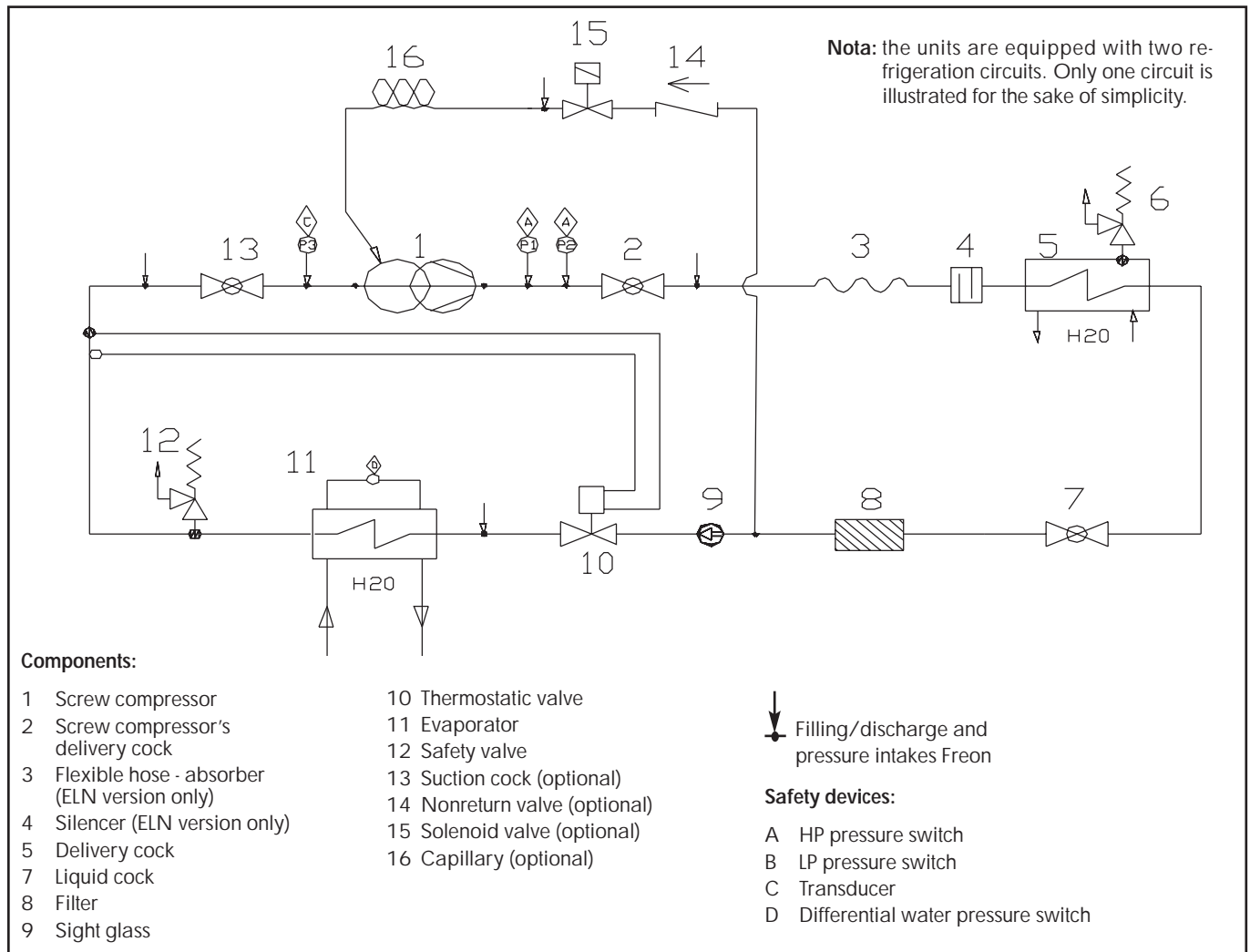
All units are provided with two condensers (one per circuit). The heat exchanger is of shell and tube type, with square plates, preset for opening for inspection, cleaning and maintenance purposes.

SWS refrigeration diagram



General Description

SWR refrigeration diagram



7.7 Power supply and control system

All units are provided with a microprocessor and a "Chiller Control" system.

The electrical connection of the controls and the start-up units for the motor are carried out and tested in the factory.

A door stop disconnecting switch is always available, and is mounted on the door of the appliance. IP 54 protection degree.

The power supply/control compartment includes:

- Master switch
- Network isolator, contactors, compressor fuses
- A transformer for auxiliaries, fuses, relay and electronic card
- The keyboard and the display of the "Chiller-Control" microcomputer, mounted on the door of the control section.

7.8 "Chiller Control"

The "Chiller Control" unit consists of an expandable interface card and a controller.

The function of the expandable interface card is to monitor the inputs and control the outputs:

- Digital inputs, such as alarm and control signals.
- Analog inputs, such as temperature/pressure measuring signals.
- Digital outputs for the excitation of control relays and remote-control switches.

The microprocessor will execute the logic that controls:

- The LED and the display of the alarm signals and the operation of the appliance.
- The compressor's start-up logic (excitation of the winding and stop), potential regulation (3+3 steps).

General Description

- The display of the compressor's working hours and the temperature of the water to the evaporator.
- The anti-cycling and delay timing upon start-up.
- The automatic advance/delay sequence for the compressor start-up.

Reference and parameter control:

- User level: the operator can modify any data with the 'ENTER', '+' and '-' keys.
- Service level: password protected access by the authorised personnel.

7.9 Accessories

List of the available accessories, supplied separately, to be mounted on-site by the installer:

Water flow meter

Prevents the operation of the unit if the circulating chilled fluid is insufficient. It is recommended to install a flow meter to ensure the correct operation of the unit.

Antivibrating supports (AVM)

solating spring supports, provided with bolts for fastening onto the base. They are supplied separate from the unit, and shall be mounted on site at the customer's expense.

Remote wall terminal (200 m)

Makes it possible to control the unit through the remote terminal, up to a maximum distance of 200 meters.

Chiller data logger

Records continuously the essential thermodynamic operating parameters, during the 10 minutes that precede the last alarm.

GSM Modem

Makes it possible to check the working mode or the switching on/off of the unit via SMS. In case of any alarms, the unit sends an SMS to the user.

RS-485 serial card

A communication interface allows you to control and manage the unit from a local station, with RS485 connection, up to a distance of 1000 m.

It is therefore possible to obtain remote control and management by integrating these functions into the building's control system.

8 TECHNICAL DATA

8.1 Pressure drops

Evaporator

| SWS R407C | | 1002 | 1202 | 1402 | 1602 | 1902 | 2202 |
|----------------------|--|-------|-------|------|-------|-------|-------|
| K | $10^4 \text{ kPa}/(\text{m}^3/\text{s})^2$ | 23.5 | 23.5 | 11.3 | 11.3 | 7.8 | 4.6 |
| Min. water flow rate | l/s | 9.9 | 10.7 | 11.8 | 13.4 | 16.7 | 20.5 |
| Max. water flow rate | l/s | 23.1 | 24.9 | 27.6 | 31.4 | 39.0 | 47.7 |
| Min. pressure drops | kPa | 23.1 | 26.8 | 15.8 | 20.4 | 21.8 | 19.1 |
| Max. pressure drops | kPa | 126.0 | 145.9 | 86.3 | 111.2 | 118.5 | 104.1 |

| SWS R407C | | 2602 | 3002 | 3402 | 3802 | 4202 | 4402 |
|----------------------|--|-------|-------|-------|-------|-------|-------|
| K | $10^4 \text{ kPa}/(\text{m}^3/\text{s})^2$ | 4.6 | 3.7 | 3.5 | 3.6 | 3.6 | 3.6 |
| Min. water flow rate | l/s | 23.9 | 27.0 | 30.4 | 35.1 | 36.8 | 39.2 |
| Max. water flow rate | l/s | 55.8 | 62.9 | 70.8 | 81.9 | 85.9 | 91.4 |
| Min. pressure drops | kPa | 26.1 | 27.1 | 32.4 | 44.1 | 48.5 | 55.0 |
| Max. pressure drops | kPa | 142.4 | 147.3 | 176.1 | 240.2 | 264.2 | 299.2 |

| SWS R134a | | 1602 | 1902 | 2202 | 2212 | 2352 |
|----------------------|--|-------|-------|-------|-------|-------|
| K | $10^4 \text{ kPa}/(\text{m}^3/\text{s})^2$ | 26.3 | 18.1 | 12.1 | 6.6 | 5.6 |
| Min. water flow rate | l/s | 9.3 | 12.4 | 15.0 | 18.1 | 19.3 |
| Max. water flow rate | l/s | 21.6 | 28.9 | 35.0 | 42.1 | 45.0 |
| Min. pressure drops | kPa | 22.7 | 27.8 | 27.4 | 21.5 | 20.6 |
| Max. pressure drops | kPa | 123.4 | 151.1 | 149.2 | 117.1 | 112.4 |

| SWS R134a | | 2502 | 2652 | 2802 | 3012 | 3202 |
|----------------------|--|-------|-------|-------|-------|-------|
| K | $10^4 \text{ kPa}/(\text{m}^3/\text{s})^2$ | 5.6 | 6.0 | 6.0 | 6.0 | 3.8 |
| Min. water flow rate | l/s | 20.5 | 21.8 | 23.2 | 24.4 | 26.8 |
| Max. water flow rate | l/s | 47.8 | 50.9 | 54.0 | 57.0 | 62.5 |
| Min. pressure drops | kPa | 23.3 | 28.7 | 32.3 | 36.0 | 26.9 |
| Max. pressure drops | kPa | 126.9 | 156.4 | 176.1 | 196.2 | 146.7 |

| SWS R134a | | 3412 | 3602 | 4212 | 4602 | 4802 |
|----------------------|--|-------|-------|-------|-------|-------|
| K | $10^4 \text{ kPa}/(\text{m}^3/\text{s})^2$ | 3.8 | 3.6 | 3.6 | 3.6 | 3.6 |
| Min. water flow rate | l/s | 28.7 | 30.7 | 32.8 | 35.5 | 38.2 |
| Max. water flow rate | l/s | 67.0 | 71.6 | 76.6 | 82.8 | 89.0 |
| Min. pressure drops | kPa | 31.0 | 33.5 | 38.4 | 44.9 | 51.9 |
| Max. pressure drops | kPa | 168.9 | 182.5 | 209.1 | 244.4 | 282.4 |

Condenser

| SWS R407C | | 1002 | 1202 | 1402 | 1602 | 1902 | 2202 |
|----------------------|--|-------|-------|-------|-------|-------|-------|
| K | $10^4 \text{ kPa}/(\text{m}^3/\text{s})^2$ | 55.7 | 55.7 | 53.0 | 43.1 | 32.4 | 16.5 |
| Min. water flow rate | l/s | 6.3 | 6.8 | 7.6 | 8.6 | 10.7 | 13.0 |
| Max. water flow rate | l/s | 14.8 | 15.9 | 17.7 | 20.1 | 24.9 | 30.3 |
| Min. pressure drops | kPa | 22.4 | 26.0 | 30.5 | 32.1 | 36.8 | 27.8 |
| Max. pressure drops | kPa | 122.1 | 141.3 | 166.0 | 174.6 | 200.6 | 151.3 |

| SWS R407C | | 2602 | 3002 | 3402 | 3802 | 4202 | 4402 |
|----------------------|--|-------|-------|-------|-------|-------|-------|
| K | $10^4 \text{ kPa}/(\text{m}^3/\text{s})^2$ | 11.8 | 11.8 | 11.2 | 6.7 | 6.4 | 6.4 |
| Min. water flow rate | l/s | 15.1 | 17.1 | 19.2 | 22.2 | 23.4 | 25.1 |
| Max. water flow rate | l/s | 35.3 | 39.8 | 44.8 | 51.8 | 54.6 | 58.5 |
| Min. pressure drops | kPa | 27.1 | 34.4 | 41.3 | 33.1 | 34.9 | 40.0 |
| Max. pressure drops | kPa | 147.6 | 187.2 | 224.8 | 180.3 | 189.8 | 218.0 |

| SWS R134a | | 1602 | 1902 | 2202 | 2212 | 2352 |
|----------------------|--|------|-------|-------|-------|-------|
| K | $10^4 \text{ kPa}/(\text{m}^3/\text{s})^2$ | 44.8 | 35.3 | 25.3 | 17.1 | 17.1 |
| Min. water flow rate | l/s | 5.7 | 7.5 | 9.1 | 11.1 | 11.7 |
| Max. water flow rate | l/s | 13.3 | 17.5 | 21.2 | 25.6 | 27.3 |
| Min. pressure drops | kPa | 14.6 | 19.8 | 20.9 | 20.5 | 23.3 |
| Max. pressure drops | kPa | 79.7 | 107.6 | 113.9 | 111.4 | 126.8 |

| SWS R134a | | 2502 | 2652 | 2802 | 3012 | 3202 |
|----------------------|--|-------|-------|-------|-------|-------|
| K | $10^4 \text{ kPa}/(\text{m}^3/\text{s})^2$ | 13.7 | 13.7 | 13.7 | 12.3 | 12.3 |
| Min. water flow rate | l/s | 12.4 | 13.2 | 14.0 | 14.9 | 16.3 |
| Max. water flow rate | l/s | 29.0 | 30.8 | 32.7 | 34.7 | 38.0 |
| Min. pressure drops | kPa | 21.2 | 24.0 | 27.0 | 27.1 | 32.5 |
| Max. pressure drops | kPa | 115.4 | 130.6 | 146.8 | 147.7 | 176.8 |

| SWS R134a | | 3412 | 3602 | 4212 | 4602 | 4802 |
|----------------------|--|------|------|-------|-------|-------|
| K | $10^4 \text{ kPa}/(\text{m}^3/\text{s})^2$ | 4.9 | 4.9 | 4.9 | 4.9 | 4.5 |
| Min. water flow rate | l/s | 17.4 | 18.6 | 20.1 | 21.7 | 23.2 |
| Max. water flow rate | l/s | 40.7 | 43.4 | 47.0 | 50.6 | 54.2 |
| Min. pressure drops | kPa | 14.8 | 16.8 | 19.7 | 22.9 | 24.4 |
| Max. pressure drops | kPa | 80.5 | 91.6 | 107.5 | 124.5 | 132.9 |

8.2 Technical data

SWS 1002-2202 R407C

| SWS R407C | | 1002 | 1202 | 1402 | 1602 | 1902 | 2202 |
|--------------------|---------|--------------------|------|------|------|------|------|
| Nominal voltage | V/ph/Hz | 400/3/50 | | | | | |
| Number of circuits | | 2 | 2 | 2 | 2 | 2 | 2 |
| Number of steps | | 6 | | | | | |
| Capacity steps | % | 25/50/63/75/87/100 | | | | | |

Refrigerant

| | | | | | | | |
|------------|----|-------|----|----|----|----|-----|
| Type | | R407C | | | | | |
| Charge (1) | kg | 59 | 63 | 70 | 80 | 99 | 122 |

Compressors

| | | | | | | | |
|---------------|--|--------------|---|---|---|---|-----|
| Type | | Screw | | | | | |
| Number | | 2 | 2 | 2 | 2 | 2 | 2 |
| Start-up type | | Part-Winding | | | | | Y/Δ |

Evaporator

| | | | | | | | |
|-----------------|-----|--------------|------|------|------|-------|-------|
| Type | | Shell & Tube | | | | | |
| Number | | 1 | 1 | 1 | 1 | 1 | 1 |
| Water flow rate | l/s | 13.9 | 14.9 | 16.6 | 18.8 | 23.4 | 28.6 |
| Pressure drop | kPa | 45.4 | 52.5 | 31.1 | 40.0 | 42.7 | 37.5 |
| Water content | l | 93.3 | 93.3 | 80.2 | 80.2 | 124.7 | 221.7 |

Condenser

| | | | | | | | |
|-----------------|-----|--------------|------|------|------|------|------|
| Type | | Shell & Tube | | | | | |
| Number | | 2 | 2 | 2 | 2 | 2 | 2 |
| Water flow rate | l/s | 8.9 | 9.6 | 10.6 | 12.1 | 14.9 | 18.2 |
| Pressure drop | kPa | 44.0 | 50.9 | 59.8 | 62.8 | 72.2 | 54.5 |
| Water content | l | 28.4 | 28.4 | 28.4 | 30.8 | 49.4 | 62.4 |

Hydraulic connections Evaporator

| | | | | | | | |
|-----------------|------|-----------|----|----|----|----|----|
| Type | | Victaulic | | | | | |
| Inlet diameter | inch | 5" | 5" | 5" | 5" | 6" | 8" |
| Outlet diameter | inch | 5" | 5" | 5" | 5" | 6" | 8" |

Hydraulic connections Condenser

| | | | | | | | |
|-----------------|------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|----|----|
| Type | | Gas threaded female | | | | | |
| Inlet diameter | inch | 2 ¹ / ₂ | 2 ¹ / ₂ | 2 ¹ / ₂ | 2 ¹ / ₂ | 3" | 3" |
| Outlet diameter | inch | 2 ¹ / ₂ | 2 ¹ / ₂ | 2 ¹ / ₂ | 2 ¹ / ₂ | 3" | 3" |

Weights

| | | | | | | | |
|-----------|----|------|------|------|------|------|------|
| Shipping | kg | 1645 | 1659 | 2041 | 2067 | 2554 | 3005 |
| Operating | kg | 1768 | 1780 | 2148 | 2176 | 2728 | 3288 |

Dimensions

| | | | | | | | |
|--------|----|------|------|------|------|------|------|
| Length | mm | 3795 | 3795 | 3795 | 3795 | 3795 | 4210 |
| Width | mm | 950 | 950 | 950 | 950 | 950 | 1400 |
| Height | mm | 1910 | 1910 | 1910 | 1910 | 1910 | 2050 |

(1) Indicative value. Always refer to the value specified on the unit's label.

SWS 2602-4402 R407C

| SWS R407C | | 2602 | 3002 | 3402 | 3802 | 4202 | 4402 |
|--------------------|---------|--------------------|------|------|------|------|------|
| Nominal voltage | V/ph/Hz | 400/3/50 | | | | | |
| Number of circuits | | 2 | 2 | 2 | 2 | 2 | 2 |
| Number of steps | | 6 | | | | | |
| Capacity steps | % | 25/50/63/75/87/100 | | | | | |

Refrigerant

| | | | | | | | |
|------------|----|-------|-----|-----|-----|-----|-----|
| Type | | R407C | | | | | |
| Charge (1) | kg | 142 | 160 | 181 | 209 | 219 | 233 |

Compressors

| | | | | | | | |
|---------------|--|-------|---|---|---|---|---|
| Type | | Screw | | | | | |
| Number | | 2 | 2 | 2 | 2 | 2 | 2 |
| Start-up type | | Y/Δ | | | | | |

Evaporator

| | | | | | | | |
|-----------------|-----|--------------|-------|-------|-------|-------|-------|
| Type | | Shell & Tube | | | | | |
| Number | | 1 | 1 | 1 | 1 | 1 | 1 |
| Water flow rate | l/s | 33.5 | 37.7 | 42.5 | 49.1 | 51.5 | 54.8 |
| Pressure drop | kPa | 51.3 | 53.0 | 63.4 | 86.5 | 95.1 | 107.7 |
| Water content | l | 221.7 | 206.5 | 184.4 | 222.2 | 222.2 | 222.2 |

Condenser

| | | | | | | | |
|-----------------|-----|--------------|------|------|------|------|------|
| Type | | Shell & Tube | | | | | |
| Number | | 2 | 2 | 2 | 2 | 2 | 2 |
| Water flow rate | l/s | 21.2 | 23.9 | 26.9 | 31.1 | 32.7 | 35.1 |
| Pressure drop | kPa | 53.1 | 67.4 | 80.9 | 64.9 | 68.3 | 78.5 |
| Water content | l | 71.4 | 71.4 | 71.4 | 95.0 | 95.0 | 95.0 |

Hydraulic connections Evaporator

| | | | | | | | |
|-----------------|------|-----------|----|----|----|----|----|
| Type | | Victaulic | | | | | |
| Inlet diameter | inch | 8" | 8" | 8" | 8" | 8" | 8" |
| Outlet diameter | inch | 8" | 8" | 8" | 8" | 8" | 8" |

Hydraulic connections Condenser

| | | | | | | | |
|-----------------|------|---------------------|---|---|----|----|----|
| Type | | Gas threaded female | | | | | |
| Inlet diameter | inch | 3 | 3 | 3 | 4" | 4" | 4" |
| Outlet diameter | inch | 3 | 3 | 3 | 4" | 4" | 4" |

Weights

| | | | | | | | |
|-----------|----|------|------|------|------|------|------|
| Shipping | kg | 3259 | 3326 | 3460 | 4330 | 4380 | 4254 |
| Operating | kg | 3552 | 3604 | 3716 | 4648 | 4696 | 4572 |

Dimensionss

| | | | | | | | |
|--------|----|------|------|------|------|------|------|
| Length | mm | 4210 | 4210 | 4210 | 4210 | 4210 | 4210 |
| Width | mm | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 |
| Height | mm | 2050 | 2050 | 2050 | 2050 | 2050 | 2050 |

(1) Indicative value. Always refer to the value specified on the unit's label.

Technical data

SWS 1602-2352 R134a

| SWS R134a | | 1602 | 1902 | 2202 | 2212 | 2352 |
|--------------------|---------|--------------------|------|------|------|------|
| Nominal voltage | V/ph/Hz | 400/3/50 | | | | |
| Number of circuits | | 2 | 2 | 2 | 2 | 2 |
| Number of steps | | 6 | | | | |
| Capacity steps | % | 25/50/63/75/87/100 | | | | |

Refrigerant

| | | | | | | |
|------------|----|-------|----|----|----|----|
| Type | | R134a | | | | |
| Charge (1) | kg | 46 | 61 | 74 | 52 | 55 |

Compressors

| | | | | | | |
|----------------|--|-------|---|---|-----|---|
| Type | | Screw | | | | |
| Number | | 2 | 2 | 2 | 2 | 2 |
| TStart-up type | | P/W | | | Y/Δ | |

Evaporator

| | | | | | | |
|-----------------|-----|--------------|-------|-------|-------|-------|
| Type | | Shell & Tube | | | | |
| Number | | 1 | 1 | 1 | 1 | 1 |
| Water flow rate | l/s | 13.0 | 17.3 | 21.0 | 25.3 | 27.0 |
| Pressure drop | kPa | 44.4 | 54.4 | 53.7 | 42.2 | 40.5 |
| Water content | l | 80.2 | 124.7 | 221.7 | 162.0 | 184.0 |

Condenser

| | | | | | | |
|-----------------|-----|--------------|------|------|------|------|
| Type | | Shell & Tube | | | | |
| Number | | 2 | 2 | 2 | 2 | 2 |
| Water flow rate | l/s | 8.0 | 10.5 | 12.7 | 15.3 | 16.4 |
| Pressure drop | kPa | 28.7 | 38.7 | 41.0 | 40.1 | 45.7 |
| Water content | l | 30.8 | 49.4 | 55.4 | 62.0 | 62.0 |

Hydraulic connections Evaporator

| | | | | | | |
|-----------------|------|-----------|----|----|----|----|
| Type | | Victaulic | | | | |
| Inlet diameter | inch | 5" | 6" | 8" | 6" | 6" |
| Outlet diameter | inch | 5" | 6" | 8" | 6" | 6" |

Hydraulic connections Condenser

| | | | | | | |
|-----------------|------|---------------------------------|----|----|----|----|
| Type | | Gas threaded female | | | | |
| Inlet diameter | inch | 2 ¹ / ₂ " | 3" | 3" | 3" | 3" |
| Outlet diameter | inch | 2 ¹ / ₂ " | 3" | 3" | 3" | 3" |

Weights

| | | | | | | |
|-----------|----|------|------|------|------|------|
| Shipping | kg | 2067 | 2554 | 3005 | 3377 | 3470 |
| Operating | kg | 2144 | 2688 | 3212 | 3601 | 3717 |

Dimensions

| | | | | | | |
|--------|----|------|------|------|------|------|
| Length | mm | 3795 | 3795 | 4210 | 4210 | 4210 |
| Width | mm | 950 | 950 | 1400 | 1400 | 1400 |
| Height | mm | 1910 | 1910 | 2050 | 2050 | 2050 |

(1) Indicative value. Always refer to the value specified on the unit's label.

SWS 2502-3202 R134a

| SWS R134a | | 2502 | 2652 | 2802 | 3012 | 3202 |
|--------------------|---------|--------------------|------|------|------|------|
| Nominal voltage | V/ph/Hz | 400/3/50 | | | | |
| Number of circuits | | 2 | 2 | 2 | 2 | 2 |
| Number of steps | | 6 | | | | |
| Capacity steps | % | 25/50/63/75/87/100 | | | | |

Refrigerant

| | | | | | | |
|------------|----|-------|----|----|----|----|
| Type | | R134a | | | | |
| Charge (1) | kg | 59 | 63 | 66 | 70 | 77 |

Compressors

| | | | | | | |
|---------------|--|-------|---|---|---|---|
| Type | | Screw | | | | |
| Number | | 2 | 2 | 2 | 2 | 2 |
| Start-up type | | Y/Δ | | | | |

Evaporator

| | | | | | | |
|-----------------|-----|--------------|-------|-------|-------|-------|
| Type | | Shell & Tube | | | | |
| Number | | 1 | 1 | 1 | 1 | 1 |
| Water flow rate | l/s | 28.7 | 30.5 | 32.4 | 34.2 | 37.5 |
| Pressure drop | kPa | 45.7 | 56.3 | 63.4 | 70.6 | 52.8 |
| Water content | l | 184.0 | 222.0 | 222.0 | 222.0 | 359.0 |

Condenser

| | | | | | | |
|-----------------|-----|--------------|------|------|------|------|
| Type | | Shell & Tube | | | | |
| Number | | 2 | 2 | 2 | 2 | 2 |
| Water flow rate | l/s | 17.4 | 18.5 | 19.6 | 20.8 | 22.8 |
| Pressure drop | kPa | 41.6 | 47.0 | 50.2 | 50.5 | 60.5 |
| Water content | l | 68.0 | 68.0 | 68.0 | 71.0 | 71.0 |

Hydraulic connections Evaporator

| | | | | | | |
|-----------------|------|-----------|----|----|----|----|
| Type | | Victaulic | | | | |
| Inlet diameter | inch | 6" | 6" | 6" | 6" | 8" |
| Outlet diameter | inch | 6" | 6" | 6" | 6" | 8" |

Hydraulic connections Condenser

| | | | | | | |
|-----------------|------|---------------------|----|----|----|----|
| Type | | Gas threaded female | | | | |
| Inlet diameter | inch | 3" | 3" | 3" | 3" | 3" |
| Outlet diameter | inch | 3" | 3" | 3" | 3" | 3" |

Weights

| | | | | | | |
|-----------|----|------|------|------|------|------|
| Shipping | kg | 3498 | 3592 | 3605 | 4029 | 4952 |
| Operating | kg | 3750 | 3882 | 3895 | 4323 | 5382 |

Dimensions

| | | | | | | |
|--------|----|------|------|------|------|------|
| Length | mm | 4210 | 4210 | 4210 | 4210 | 4670 |
| Width | mm | 1400 | 1400 | 1400 | 1400 | 1400 |
| Height | mm | 2050 | 2050 | 2050 | 2050 | 2050 |

(1) Indicative value. Always refer to the value specified on the unit's label.

Technical data

SWS 3412-4802 R134a

| SWS R134a | | 3412 | 3602 | 4212 | 4602 | 4802 |
|--------------------|---------|--------------------|------|------|------|------|
| Nominal voltage | V/ph/Hz | 400/3/50 | | | | |
| Number of circuits | | 2 | 2 | 2 | 2 | 2 |
| Number of steps | | 6 | | | | |
| Capacity steps | % | 25/50/63/75/87/100 | | | | |

Refrigerant

| Type | | R134a | | | | |
|------------|----|-------|----|----|-----|-----|
| Charge (1) | kg | 82 | 88 | 94 | 102 | 110 |

Compressors

| Type | | Screw | | | | |
|---------------|--|-------|---|---|---|---|
| Number | | 2 | 2 | 2 | 2 | 2 |
| Start-up type | | Y/Δ | | | | |

Evaporator

| Type | | Shell & Tube | | | | |
|-----------------|-----|--------------|-------|-------|-------|-------|
| Number | | 1 | 1 | 1 | 1 | 1 |
| Water flow rate | l/s | 40.2 | 42.9 | 46.0 | 49.7 | 53.4 |
| Pressure drop | kPa | 60.8 | 65.7 | 75.3 | 88.0 | 101.7 |
| Water content | l | 359.0 | 359.0 | 359.0 | 399.0 | 399.0 |

Condenser

| Type | | Shell & Tube | | | | |
|-----------------|-----|--------------|-------|-------|-------|-------|
| Number | | 2 | 2 | 2 | 2 | 2 |
| Water flow rate | l/s | 24.4 | 26.0 | 28.2 | 30.4 | 32.5 |
| Pressure drop | kPa | 29.0 | 33.0 | 38.7 | 41.7 | 47.9 |
| Water content | l | 126.0 | 126.0 | 126.0 | 133.0 | 133.0 |

Hydraulic connections Evaporator

| Type | | Victaulic | | | | |
|-----------------|------|-----------|----|----|----|----|
| Inlet diameter | inch | 8" | 8" | 8" | 8" | 8" |
| Outlet diameter | inch | 8" | 8" | 8" | 8" | 8" |

Hydraulic Connections Condenser

| Type | | Victaulic | | | | |
|-----------------|------|-----------|----|----|----|----|
| Inlet diameter | inch | 4" | 4" | 4" | 4" | 4" |
| Outlet diameter | inch | 4" | 4" | 4" | 4" | 4" |

Weights

| | | | | | | |
|-----------|----|------|------|------|------|------|
| Shipping | kg | 4970 | 4986 | 5112 | 5165 | 5342 |
| Operating | kg | 5455 | 5471 | 5597 | 5698 | 5875 |

Dimensions

| | | | | | | |
|--------|----|------|------|------|------|------|
| Length | mm | 4670 | 4670 | 4670 | 4670 | 4670 |
| Width | mm | 1400 | 1400 | 1400 | 1400 | 1400 |
| Height | mm | 2050 | 2050 | 2050 | 2110 | 2110 |

(1) Indicative value. Always refer to the value specified on the unit's label.

SWR 1002-2202 R407C

| SWR R407C | | 1002 | 1202 | 1402 | 1602 | 1902 | 2202 |
|--------------------|---------|--------------------|------|------|------|------|------|
| Nominal voltage | V/ph/Hz | 400/3/50 | | | | | |
| Number of circuits | | 2 | 2 | 2 | 2 | 2 | 2 |
| Number of steps | | 6 | | | | | |
| Capacity steps | % | 25/50/63/75/87/100 | | | | | |

Refrigerant

| | | | | | | | |
|------|--|-------|--|--|--|--|--|
| Type | | R407C | | | | | |
|------|--|-------|--|--|--|--|--|

Compressors

| | | | | | | | |
|---------------|--|--------------|---|---|---|---|-----|
| Type | | Screw | | | | | |
| Number | | 2 | 2 | 2 | 2 | 2 | 2 |
| Start-up type | | Part-Winding | | | | | Y/Δ |

Evaporator

| | | | | | | | |
|-----------------|-----|--------------|------|------|------|-------|-------|
| Type | | Shell & Tube | | | | | |
| Number | | 1 | 1 | 1 | 1 | 1 | 1 |
| Water flow rate | L/s | 13.9 | 14.9 | 16.6 | 18.8 | 23.4 | 28.6 |
| Pressure drop | kPa | 45.4 | 52.5 | 31.1 | 40.0 | 42.7 | 37.5 |
| Water content | l | 93.3 | 93.3 | 80.2 | 80.2 | 124.7 | 221.7 |

Hydraulic connections Evaporator

| | | | | | | | |
|-----------------|------|-----------|----|----|----|----|----|
| Type | | Victaulic | | | | | |
| Inlet diameter | inch | 5" | 5" | 5" | 5" | 6" | 8" |
| Outlet diameter | inch | 5" | 5" | 5" | 5" | 6" | 8" |

Refrigerant connections

| | | | | | | | |
|--------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Type | | To be welded | | | | | |
| Discharge diameter | inch | 1" ⁵ / ₈ | 1" ⁵ / ₈ | 1" ⁵ / ₈ | 1" ⁵ / ₈ | 2" ¹ / ₈ | 2" ¹ / ₈ |
| Liquid diameter | inch | 1" ³ / ₈ | 1" ³ / ₈ | 1" ³ / ₈ | 1" ³ / ₈ | 1" ³ / ₈ | 1" ³ / ₈ |

Weights

| | | | | | | | |
|-----------|----|------|------|------|------|------|------|
| Shipping | kg | 1370 | 1380 | 1755 | 1765 | 2065 | 2453 |
| Operating | kg | 1463 | 1473 | 1835 | 1845 | 2190 | 2675 |

Dimensions

| | | | | | | | |
|--------|----|------|------|------|------|------|------|
| Length | mm | 3795 | 3795 | 3795 | 3795 | 3795 | 4210 |
| Width | mm | 950 | 950 | 950 | 950 | 950 | 1400 |
| Height | mm | 1910 | 1910 | 1910 | 1910 | 1910 | 2050 |

Technical data

SWR 2602-4402 R407C

| SWR R407C | | 2602 | 3002 | 3402 | 3802 | 4202 | 4402 |
|--------------------|---------|--------------------|------|------|------|------|------|
| Nominal voltage | V/ph/Hz | 400/3/50 | | | | | |
| Number of circuits | | 2 | 2 | 2 | 2 | 2 | 2 |
| Number of steps | | 6 | | | | | |
| Capacity steps | % | 25/50/63/75/87/100 | | | | | |

Refrigerant

| | | | | | | | |
|------|--|-------|--|--|--|--|--|
| Type | | R407C | | | | | |
|------|--|-------|--|--|--|--|--|

Compressors

| | | | | | | | |
|---------------|--|-------|---|---|---|---|---|
| Type | | Screw | | | | | |
| Number | | 2 | 2 | 2 | 2 | 2 | 2 |
| Start-up type | | Y/Δ | | | | | |

Evaporator

| | | | | | | | |
|-----------------|-----|--------------|-------|-------|-------|-------|-------|
| Type | | Shell & Tube | | | | | |
| Number | | 1 | 1 | 1 | 1 | 1 | 1 |
| Water flow rate | l/s | 33.5 | 37.7 | 42.5 | 49.1 | 51.5 | 54.8 |
| Pressure drop | kPa | 51.3 | 53.0 | 63.4 | 86.5 | 95.1 | 107.7 |
| Water content | l | 221.7 | 206.5 | 184.4 | 222.2 | 222.2 | 222.2 |

Hydraulic connections Evaporator

| | | | | | | | |
|-----------------|------|-----------|----|----|----|----|----|
| Type | | Victaulic | | | | | |
| Inlet diameter | inch | 8" | 8" | 8" | 8" | 8" | 8" |
| Outlet diameter | inch | 8" | 8" | 8" | 8" | 8" | 8" |

Refrigerant connections

| | | | | | | | |
|--------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Type | | To be welded | | | | | |
| Discharge diameter | inch | 2" ⁵ / ₈ | 2" ⁵ / ₈ | 2" ⁵ / ₈ | 3" ¹ / ₈ | 3" ¹ / ₈ | 3" ¹ / ₈ |
| Liquid diameter | inch | 1" ³ / ₈ | 1" ³ / ₈ | 1" ³ / ₈ | 1" ³ / ₈ | 1" ³ / ₈ | 1" ³ / ₈ |

Weights

| | | | | | | | |
|-----------|----|------|------|------|------|------|------|
| Shipping | kg | 2663 | 2712 | 2825 | 3495 | 3535 | 3395 |
| Operating | kg | 2885 | 2919 | 3009 | 3717 | 3757 | 3617 |

Dimensions

| | | | | | | | |
|--------|----|------|------|------|------|------|------|
| Length | mm | 4210 | 4210 | 4210 | 4210 | 4210 | 4210 |
| Width | mm | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 |
| Height | mm | 2050 | 2050 | 2050 | 2050 | 2050 | 2050 |

SWR 1602-2352 R134a

| SWR R134a | | 1602 | 1902 | 2202 | 2212 | 2352 |
|--------------------|---------|--------------------|------|------|------|------|
| Nominal voltage | V/ph/Hz | 400/3/50 | | | | |
| Number of circuits | | 2 | 2 | 2 | 2 | 2 |
| Number of steps | | 6 | | | | |
| Capacity steps | % | 25/50/63/75/87/100 | | | | |

Refrigerant

| | | | | | | |
|------|--|-------|--|--|--|--|
| Type | | R134a | | | | |
|------|--|-------|--|--|--|--|

Compressors

| | | | | | | |
|---------------|--|-------|---|---|-----|---|
| Type | | Screw | | | | |
| Number | | 2 | 2 | 2 | 2 | 2 |
| Start-up type | | P/W | | | Y/Δ | |

Evaporator

| | | | | | | |
|-----------------|-----|--------------|-------|-------|-------|-------|
| Type | | Shell & Tube | | | | |
| Number | | 1 | 1 | 1 | 1 | 1 |
| Water flow rate | l/s | 13.0 | 17.3 | 21.0 | 25.3 | 27.0 |
| Pressure drop | kPa | 44.4 | 54.4 | 53.7 | 42.2 | 40.5 |
| Water content | l | 80.2 | 124.7 | 221.7 | 162.0 | 184.0 |

Hydraulic connections Evaporator

| | | | | | | |
|-----------------|------|-----------|----|----|----|----|
| Type | | Victaulic | | | | |
| Inlet diameter | inch | 5" | 6" | 8" | 6" | 6" |
| Outlet diameter | inch | 5" | 6" | 8" | 6" | 6" |

Weights

| | | | | | | |
|-----------|----|------|------|------|------|------|
| Shipping | kg | 1765 | 2065 | 2453 | 2895 | 2985 |
| Operating | kg | 1845 | 2190 | 2675 | 3057 | 3169 |

Dimensions

| | | | | | | |
|--------|----|------|------|------|------|------|
| Length | mm | 3795 | 3795 | 4210 | 4210 | 4210 |
| Width | mm | 950 | 950 | 1400 | 1400 | 1400 |
| Height | mm | 1910 | 1910 | 2050 | 2050 | 2050 |

Technical data

SWR 2502-3202 R134a

| SWR R134a | | 2502 | 2652 | 2802 | 3012 | 3202 |
|--------------------|---------|--------------------|------|------|------|------|
| Nominal voltage | V/ph/Hz | 400/3/50 | | | | |
| Number of circuits | | 2 | 2 | 2 | 2 | 2 |
| Number of steps | | 6 | | | | |
| Capacity steps | % | 25/50/63/75/87/100 | | | | |

Refrigerant

| | | | | | | |
|------|--|-------|--|--|--|--|
| Type | | R134a | | | | |
|------|--|-------|--|--|--|--|

Compressors

| | | | | | | |
|---------------|--|-------|---|---|---|---|
| Type | | Screw | | | | |
| Number | | 2 | 2 | 2 | 2 | 2 |
| Start-up type | | Y/Δ | | | | |

Evaporator

| | | | | | | |
|-----------------|-----|--------------|-------|-------|-------|-------|
| Type | | Shell & Tube | | | | |
| Number | | 1 | 1 | 1 | 1 | 1 |
| Water flow rate | l/s | 28.7 | 30.5 | 32.4 | 34.2 | 37.5 |
| Pressure drop | kPa | 45.7 | 56.3 | 63.4 | 70.6 | 52.8 |
| Water content | l | 184.0 | 222.0 | 222.0 | 222.0 | 359.0 |

Hydraulic connections Evaporator

| | | | | | | |
|-----------------|------|-----------|----|----|----|----|
| Type | | Victaulic | | | | |
| Inlet diameter | inch | 6" | 6" | 6" | 6" | 8" |
| Outlet diameter | inch | 6" | 6" | 6" | 6" | 8" |

Weights

| | | | | | | |
|-----------|----|------|------|------|------|------|
| Shipping | kg | 2995 | 3085 | 3095 | 3505 | 4421 |
| Operating | kg | 3179 | 3307 | 3317 | 3727 | 4780 |

Dimensions

| | | | | | | |
|--------|----|------|------|------|------|------|
| Length | mm | 4210 | 4210 | 4210 | 4210 | 4670 |
| Width | mm | 1400 | 1400 | 1400 | 1400 | 1400 |
| Height | mm | 2050 | 2050 | 2050 | 2050 | 2050 |

SWR 3412-4802 R134a

| SWR R134a | | 3412 | 3602 | 4212 | 4602 | 4802 |
|--------------------|---------|--------------------|------|------|------|------|
| Nominal voltage | V/ph/Hz | 400/3/50 | | | | |
| Number of circuits | | 2 | 2 | 2 | 2 | 2 |
| Number of steps | | 6 | | | | |
| Capacity steps | % | 25/50/63/75/87/100 | | | | |

Refrigerant

| | | | | | | |
|------|--|-------|--|--|--|--|
| Type | | R134a | | | | |
|------|--|-------|--|--|--|--|

Compressors

| | | | | | | |
|---------------|--|-------|---|---|---|---|
| Type | | Screw | | | | |
| Number | | 2 | 2 | 2 | 2 | 2 |
| Start-up type | | Y/Δ | | | | |

Evaporator

| | | | | | | |
|-----------------|-----|--------------|-------|-------|-------|-------|
| Type | | Shell & Tube | | | | |
| Number | | 1 | 1 | 1 | 1 | 1 |
| Water flow rate | l/s | 40.2 | 42.9 | 46.0 | 49.7 | 53.4 |
| Pressure drop | kPa | 60.8 | 65.7 | 75.3 | 88.0 | 101.7 |
| Water content | l | 359.0 | 359.0 | 359.0 | 399.0 | 399.0 |

Hydraulic connections Evaporator

| | | | | | | |
|-----------------|------|-----------|----|----|----|----|
| Type | | Victaulic | | | | |
| Inlet diameter | inch | 8" | 8" | 8" | 8" | 8" |
| Outlet diameter | inch | 8" | 8" | 8" | 8" | 8" |

Weights

| | | | | | | |
|-----------|----|------|------|------|------|------|
| Shipping | kg | 4431 | 4441 | 4561 | 4581 | 4753 |
| Operating | kg | 4790 | 4800 | 4920 | 4980 | 5153 |

Dimensions

| | | | | | | |
|--------|----|------|------|------|------|------|
| Length | mm | 4670 | 4670 | 4670 | 4670 | 4670 |
| Width | mm | 1400 | 1400 | 1400 | 1400 | 1400 |
| Height | mm | 2050 | 2050 | 2050 | 2010 | 2010 |

8.3 Electrical data

| SWS/SWR R407C | | 1002 | 1202 | 1402 | 1602 | 1902 | 2202 |
|-----------------------------|-----------------|-------------------|------|------|------|-------|-------|
| Nominal voltage | V(%)·ph-Hz | 400 ±10% / 3 / 50 | | | | | |
| Nominal power input | kW | 92 | 98 | 114 | 130 | 157 | 189 |
| Max power input | kW | 111 | 117 | 135 | 155 | 187 | 225 |
| Nominal current | A | 157 | 175 | 203 | 232 | 280 | 338 |
| Max. current (FLA) | A | 164 | 192 | 248 | 280 | 336 | 392 |
| Max. start-up current (LRA) | A | 360 | 440 | 367 | 449 | 613 | 455 |
| External fuses | (A) | 200 | 250 | 315 | 315 | 400 | 500 |
| Wire cross area (1) | mm ² | 120 | 120 | 185 | 185 | 2x150 | 2x150 |

Compressors

| | | | | | | | |
|-----------------------------|----|-------|-------|-------|-------|-------|-------|
| Number | n° | 2 | 2 | 2 | 2 | 2 | 2 |
| Nominal power input | kW | 2x46 | 2x49 | 2x57 | 2x65 | 2x79 | 2x95 |
| Max. power input | kW | 2x55 | 2x58 | 2x68 | 2x77 | 2x94 | 2x113 |
| Rated current | A | 2x79 | 2x87 | 2x102 | 2x116 | 2x140 | 2x169 |
| Max. current (FLA) | A | 2x82 | 2x96 | 2x124 | 2x140 | 2x168 | 2x196 |
| Max. start-up current (LRA) | A | 2x303 | 2x373 | 2x280 | 2x351 | 2x495 | 2x318 |
| Oil treater power input | W | 200 | 200 | 200 | 200 | 200 | 200 |

| SWS/SWR R407C | | 2602 | 3002 | 3402 | 3802 | 4202 | 4402 |
|-----------------------------|-----------------|-------------------|-------|-------|-------|-------|-------|
| Nominal voltage | V(%)·ph-Hz | 400 ±10% / 3 / 50 | | | | | |
| Nominal power input | kW | 223 | 246 | 269 | 296 | 316 | 393 |
| Max power input | kW | 265 | 293 | 317 | 349 | 373 | 460 |
| Nominal current | A | 397 | 440 | 480 | 529 | 564 | 701 |
| Max. current (FLA) | A | 450 | 490 | 540 | 600 | 668 | 800 |
| Max. start-up current (LRA) | A | 512 | 546 | 642 | 753 | 829 | 875 |
| External fuses | (A) | 500 | 630 | 630 | 630 | 800 | 1000 |
| Wire cross area (1) | mm ² | 2x185 | 2x185 | 2x185 | 2x240 | 2x240 | 2x300 |

Compressors

| | | | | | | | |
|-----------------------------|----|-------|-------|-------|-------|-------|-------|
| Number | n° | 2 | 2 | 2 | 2 | 2 | 2 |
| Nominal power input | kW | 2x111 | 2x123 | 2x135 | 2x158 | 2x158 | 2x197 |
| Max. power input | kW | 2x132 | 2x147 | 2x158 | 2x175 | 2x186 | 2x230 |
| Nominal current | A | 2x199 | 2x220 | 2x240 | 2x264 | 2x282 | 2x351 |
| Max. current (FLA) | A | 2x225 | 2x245 | 2x270 | 2x300 | 2x334 | 2x400 |
| Max. start-up current (LRA) | A | 2x354 | 2x374 | 2x453 | 2x543 | 2x595 | 2x595 |
| Oil treater power input | W | 275 | 275 | 275 | 275 | 275 | 275 |

(1) The dimensioning of the unit's power cables is the responsibility of the installer, who shall consider: the rating, the maximum working temperature in the room, the type of insulation and the cable laying, the maximum length of the power supply line.

| SWS/SWR R134a | | 1602 | 1902 | 2202 | 2212 | 2352 |
|-----------------------------|-----------------|-------------------|-------|-------|-------|-------|
| Nominal voltage | V(%)·ph-Hz | 400 ±10% / 3 / 50 | | | | |
| Nominal power input | kW | 78.8 | 95 | 114.4 | 158 | 166 |
| Max power input | kW | 109.6 | 132.4 | 159.4 | 220 | 230 |
| Nominal current | A | 141 | 169 | 204 | 266 | 279 |
| Max. current (FLA) | A | 192 | 210 | 260 | 360 | 395 |
| Max. start-up current (LRA) | A | 347.2 | 424.5 | 586 | 393 | 417.5 |
| External fuses | (A) | 250 | 250 | 315 | 400 | 400 |
| Wire cross area (1) | mm ² | 120 | 120 | 185 | 2x150 | 2x150 |

Compressors

| | | | | | | |
|-----------------------------|----|--------|--------|--------|-------|---------|
| Number | n° | 2 | 2 | 2 | 2 | 2 |
| Nominal power input | kW | 2x39.4 | 2x47.5 | 2x57.2 | 2x79 | 79+87 |
| Max power input | kW | 2x54.8 | 2x66.2 | 2x79.7 | 2x110 | 110+120 |
| Nominal current | A | 2x70 | 2x85 | 2x102 | 2x133 | 133+146 |
| Max. current (FLA) | A | 2x96 | 2x105 | 2x130 | 2x180 | 180+215 |
| Max. start-up current (LRA) | A | 2x280 | 2x351 | 2x495 | 2x267 | 267+314 |
| Oil treater power input | W | 200 | 200 | 200 | 300 | 300 |

| SWS/SWR R134a | | 2502 | 2652 | 2802 | 3012 | 3202 |
|-----------------------------|-----------------|-------------------|-------|-------|-------|-------|
| Nominal voltage | V(%)·ph-Hz | 400 ±10% / 3 / 50 | | | | |
| Nominal power input | kW | 174 | 184 | 194 | 211 | 228 |
| Max power input | kW | 240 | 251 | 262 | 286 | 310 |
| Nominal current | A | 292 | 310 | 328 | 351 | 374 |
| Max. current (FLA) | A | 430 | 446 | 462 | 511 | 560 |
| Max. start-up current (LRA) | A | 464.5 | 491.5 | 502.7 | 597.7 | 632 |
| External fuses | (A) | 500 | 500 | 500 | 630 | 630 |
| Wire cross area (1) | mm ² | 2x150 | 2x185 | 2x150 | 2x185 | 2x185 |

Compressors

| | | | | | | |
|-----------------------------|----|-------|---------|-------|---------|-------|
| Number | n° | 2 | 2 | 2 | 2 | 2 |
| Nominal power input | kW | 2x87 | 87+97 | 2x97 | 97+114 | 2x114 |
| Max power input | kW | 2x120 | 120+131 | 2x131 | 131+155 | 2x155 |
| Nominal current | A | 2x146 | 146+164 | 2x164 | 164+187 | 2x187 |
| Max. current (FLA) | A | 2x215 | 215+231 | 2x231 | 231+280 | 2x280 |
| Max. start-up current (LRA) | A | 2x280 | 314+341 | 2x341 | 341+436 | 2x436 |
| Oil treater power input | W | 300 | 300 | 300 | 300 | 300 |

(1) The dimensioning of the unit's power cables is the responsibility of the installer, who shall consider: the rating, the maximum working temperature in the room, the type of insulation and the cable laying, the maximum length of the power supply line.

Technical data

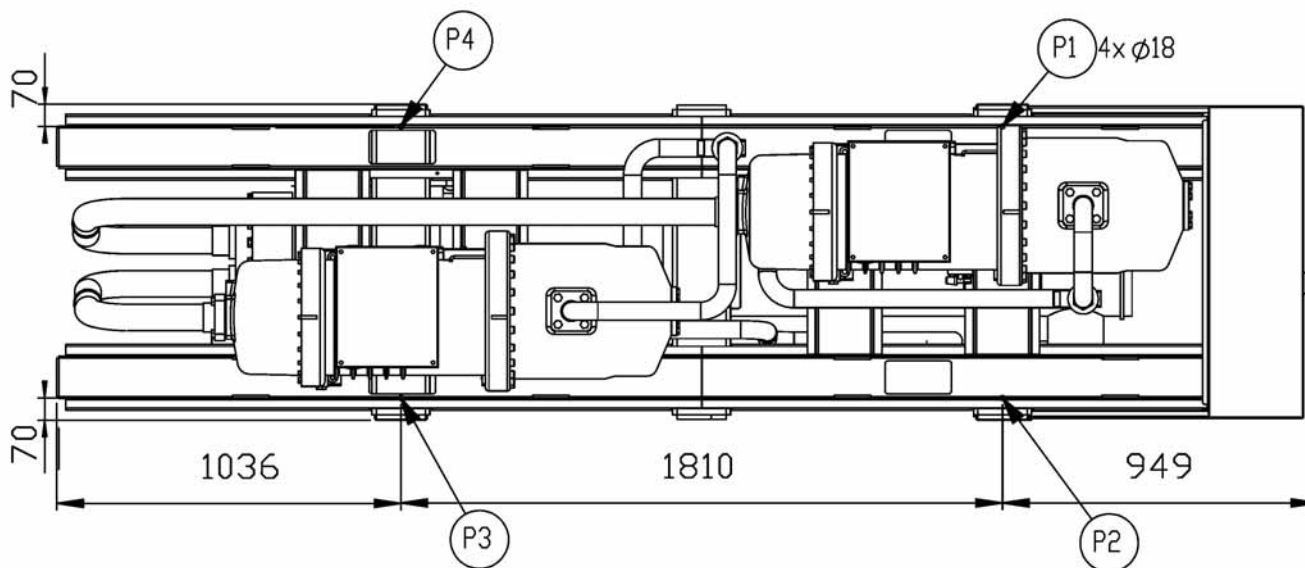
| SWS/SWR R134a | | 3412 | 3602 | 4212 | 4602 | 4802 |
|-----------------------------|-----------------|-------------------|-------------|-------------|-------------|-------------|
| Nominal voltage | V(%)·ph-Hz | 400 ±10% / 3 / 50 | | | | |
| Nominal power input | kW | 249 | 270 | 298 | 315 | 322 |
| Max power input | kW | 359 | 408 | 408 | 426 | 444 |
| Nominal current | A | 404 | 434 | 492 | 519 | 546 |
| Max. current (FLA) | A | 590 | 620 | 620 | 670 | 720 |
| Max. start-up current (LRA) | A | 661 | 682 | 803 | 867 | 902 |
| External fuses | (A) | 630 | 630 | 630 | 800 | 800 |
| Wire cross area (1) | mm ² | 2x185 | 2x185 | 2x185 | 2x240 | 2x240 |

Compressors

| | | | | | | |
|-----------------------------|----|---------|-------|-------|---------|-------|
| Number | n° | 2 | 2 | 2 | 2 | 2 |
| Nominal power input | kW | 114+135 | 2x135 | 2x149 | 149+166 | 2x166 |
| Max power input | kW | 155+204 | 2x204 | 2x204 | 204+222 | 2x222 |
| Nominal current | A | 187+217 | 2x217 | 2x246 | 246+273 | 2x273 |
| Max. current (FLA) | A | 280+310 | 2x310 | 2x310 | 310+360 | 2x360 |
| Max. start-up current (LRA) | A | 436+465 | 2x465 | 2x586 | 586+650 | 2x650 |
| Oil treater power input | W | 300 | 300 | 300 | 300 | 300 |

(1) The dimensioning of the unit's power cables is the responsibility of the installer, who shall consider: the rating, the maximum working temperature in the room, the type of insulation and the cable laying, the maximum length of the power supply line.

8.4 Position of antivibration mounting springs and weight distribution on supports

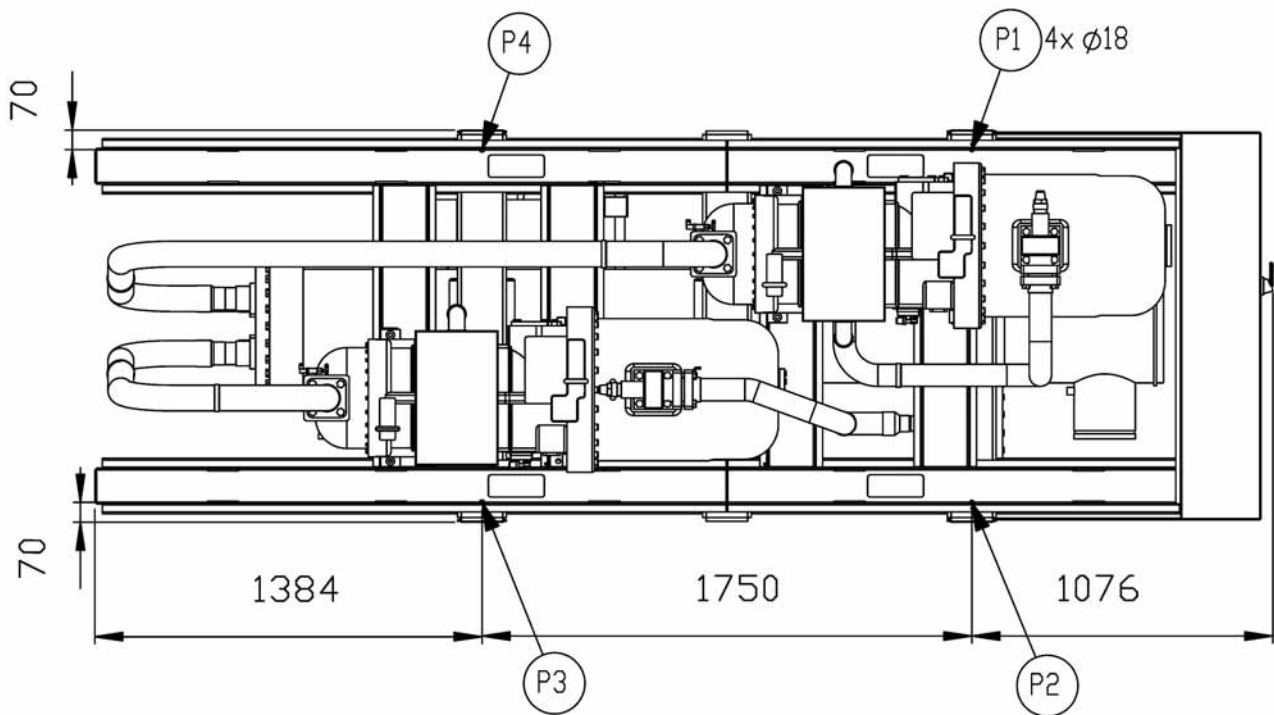


Weight distribution SWS 1002-1902 R407C STD

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 1002 | 1768 | 442 | 442 | 442 | 442 |
| 1202 | 1780 | 445 | 445 | 445 | 445 |
| 1402 | 2148 | 537 | 537 | 537 | 537 |
| 1602 | 2176 | 544 | 544 | 544 | 544 |
| 1902 | 2728 | 682 | 682 | 682 | 682 |

Weight distribution SWS 1602-1902 R134a STD

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 1602 | 2144 | 536 | 536 | 536 | 536 |
| 1902 | 2688 | 672 | 672 | 672 | 672 |

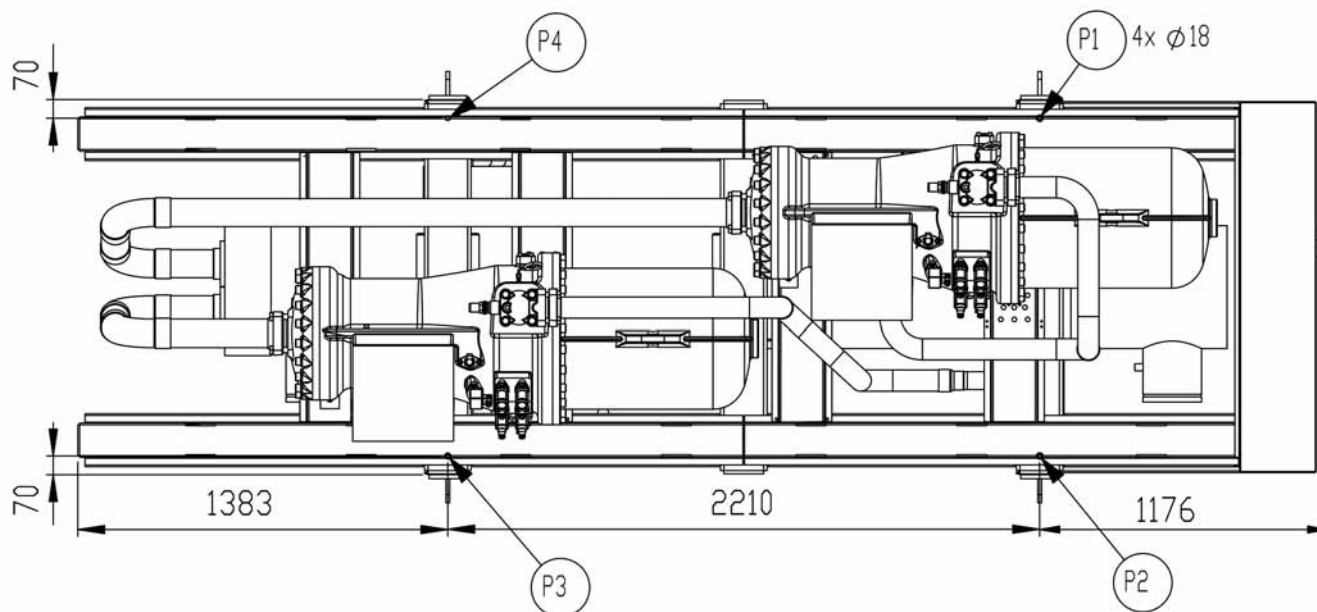


Weight distribution SWS 2202-4402 R407C STD

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 2202 | 3288 | 822 | 822 | 822 | 822 |
| 2602 | 3552 | 888 | 888 | 888 | 888 |
| 3002 | 3604 | 901 | 901 | 901 | 901 |
| 3402 | 3716 | 929 | 929 | 929 | 929 |
| 3802 | 4648 | 1162 | 1162 | 1162 | 1162 |
| 4202 | 4696 | 1174 | 1174 | 1174 | 1174 |
| 4402 | 4572 | 1143 | 1143 | 1143 | 1143 |

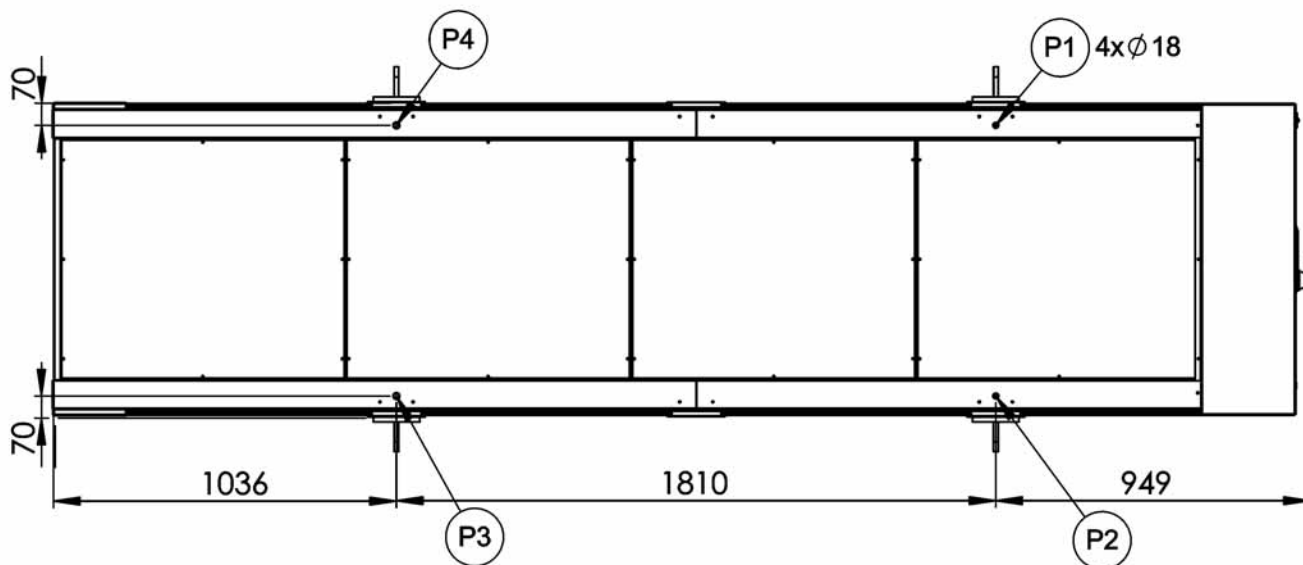
Weight distribution SWS 2202-3012 R134a STD

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 2202 | 3211 | 803 | 803 | 803 | 803 |
| 2212 | 3601 | 900 | 900 | 900 | 900 |
| 2352 | 3717 | 929 | 929 | 929 | 929 |
| 2502 | 3750 | 937 | 937 | 937 | 937 |
| 2652 | 3882 | 970 | 970 | 970 | 970 |
| 2802 | 3895 | 974 | 974 | 974 | 974 |
| 3012 | 4323 | 1081 | 1081 | 1081 | 1081 |



Weight distribution SWS 3202-4802 R134a STD

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 3202 | 5382 | 1346 | 1346 | 1346 | 1346 |
| 3412 | 5455 | 1364 | 1364 | 1364 | 1364 |
| 3602 | 5471 | 1368 | 1368 | 1368 | 1368 |
| 4212 | 5597 | 1399 | 1399 | 1399 | 1399 |
| 4602 | 5698 | 1424 | 1424 | 1424 | 1424 |
| 4802 | 5875 | 1469 | 1469 | 1469 | 1469 |

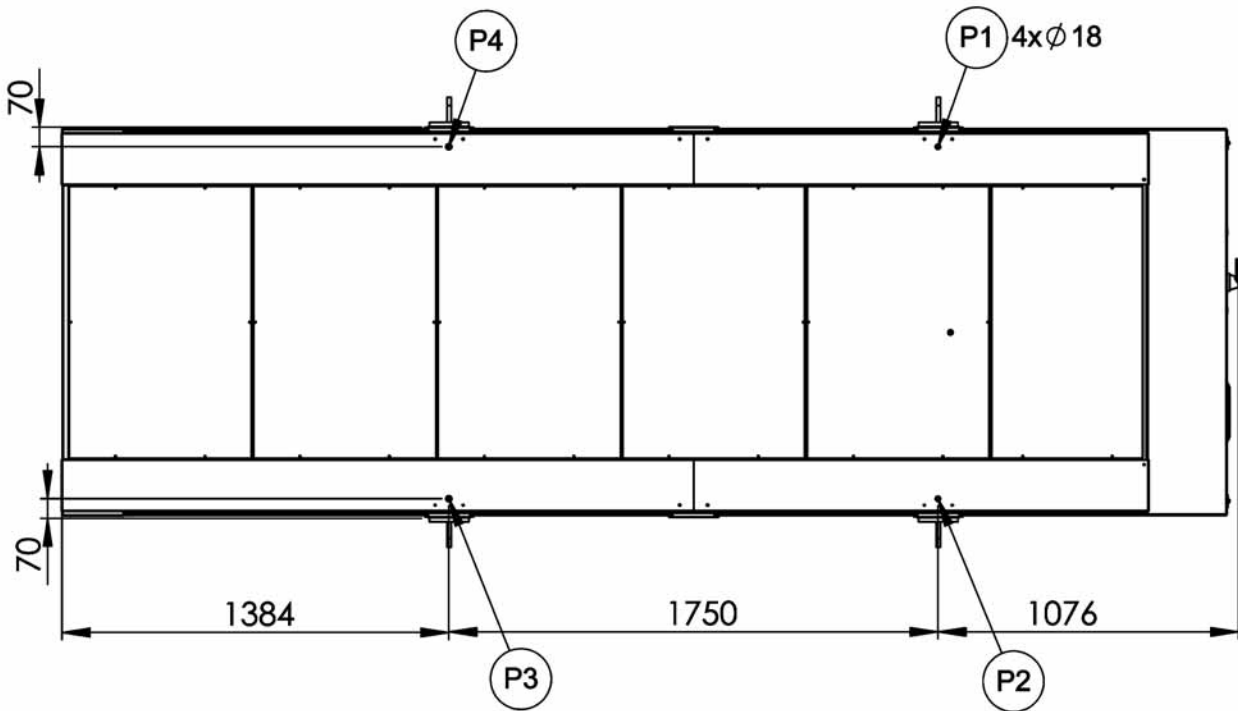


Weight distribution SWS 1002-1902 R407C LN

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 1002 | 2077 | 519 | 519 | 519 | 519 |
| 1202 | 2091 | 523 | 523 | 523 | 523 |
| 1402 | 2460 | 615 | 615 | 615 | 615 |
| 1602 | 2488 | 622 | 622 | 622 | 622 |
| 1902 | 3038 | 759 | 759 | 759 | 759 |

Weight distribution SWS 1602-1902 R134a LN

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 1602 | 2454 | 613 | 613 | 613 | 613 |
| 1902 | 3000 | 750 | 750 | 750 | 750 |

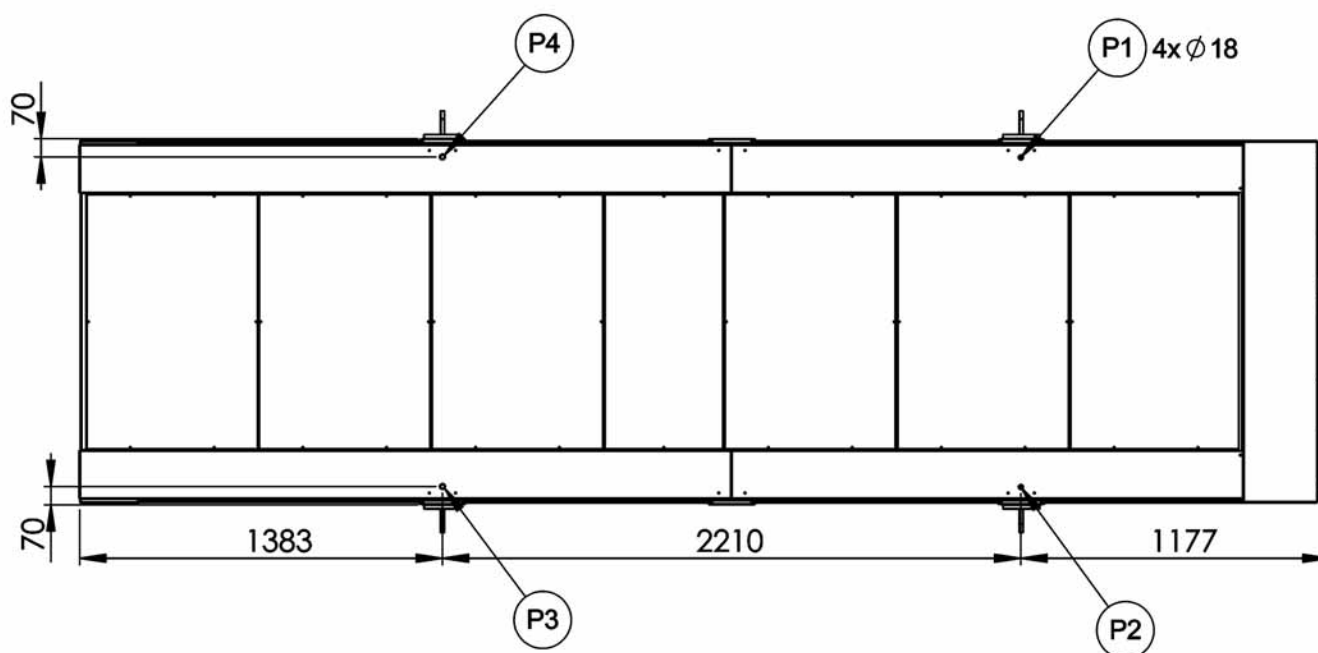


Weight distribution SWS 2202-4402 R407C LN

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 2202 | 3689 | 922 | 922 | 922 | 922 |
| 2602 | 3952 | 988 | 988 | 988 | 988 |
| 3002 | 4004 | 1001 | 1001 | 1001 | 1001 |
| 3402 | 4115 | 1029 | 1029 | 1029 | 1029 |
| 3802 | 5047 | 1262 | 1262 | 1262 | 1262 |
| 4202 | 5097 | 1274 | 1274 | 1274 | 1274 |
| 4402 | 4971 | 1243 | 1243 | 1243 | 1243 |

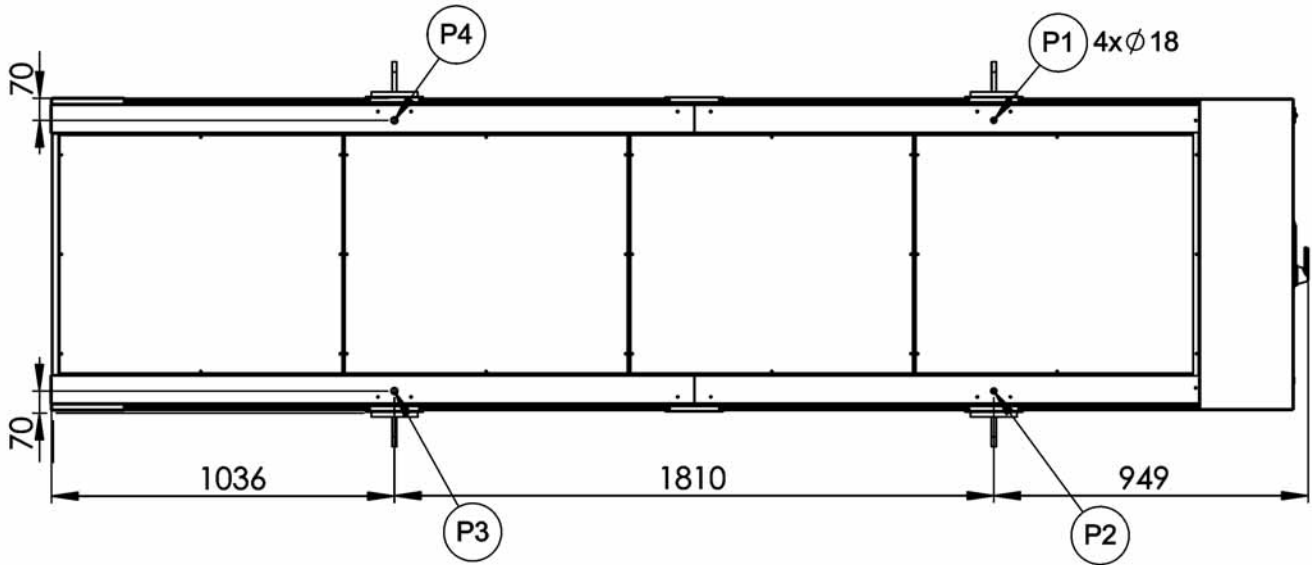
Weight distribution SWS 2202-3012 R134a LN

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 2202 | 3611 | 903 | 903 | 903 | 903 |
| 2212 | 4001 | 1000 | 1000 | 1000 | 1000 |
| 2352 | 4117 | 1029 | 1029 | 1029 | 1029 |
| 2502 | 4150 | 1037 | 1037 | 1037 | 1037 |
| 2652 | 4282 | 1070 | 1070 | 1070 | 1070 |
| 2802 | 4295 | 1074 | 1074 | 1074 | 1074 |
| 3012 | 4723 | 1181 | 1181 | 1181 | 1181 |



Weight distribution SWS 3202-4802 R134a LN

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 3202 | 5882 | 1471 | 1471 | 1471 | 1471 |
| 3412 | 5955 | 1489 | 1489 | 1489 | 1489 |
| 3602 | 5971 | 1493 | 1493 | 1493 | 1493 |
| 4212 | 6097 | 1524 | 1524 | 1524 | 1524 |
| 4602 | 6198 | 1549 | 1549 | 1549 | 1549 |
| 4802 | 6375 | 1594 | 1594 | 1594 | 1594 |

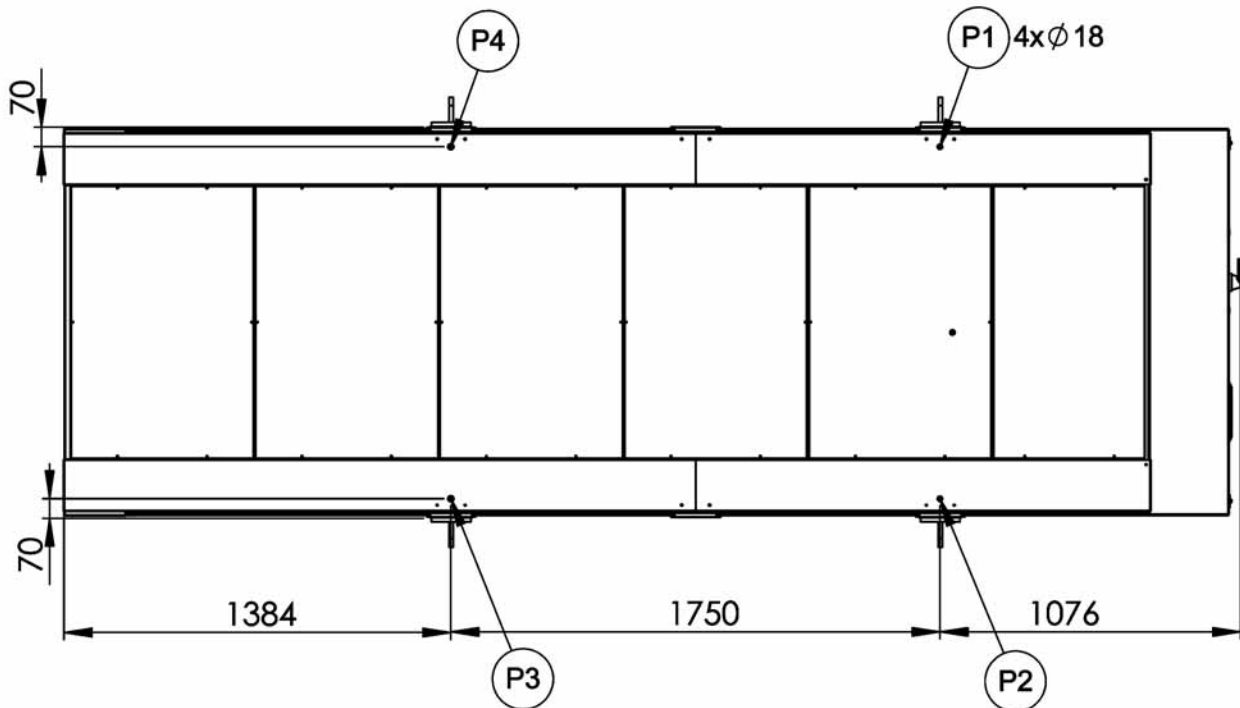


Weight distribution SWS 1002-1902 R407C ELN

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 1002 | 2167 | 542 | 542 | 542 | 542 |
| 1202 | 2181 | 545 | 545 | 545 | 545 |
| 1402 | 2550 | 637 | 637 | 637 | 637 |
| 1602 | 2578 | 644 | 644 | 644 | 644 |
| 1902 | 3128 | 782 | 782 | 782 | 782 |

Weight distribution SWS 1602-1902 R134a ELN

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 1602 | 2544 | 636 | 636 | 636 | 613 |
| 1902 | 3090 | 772 | 750 | 750 | 750 |

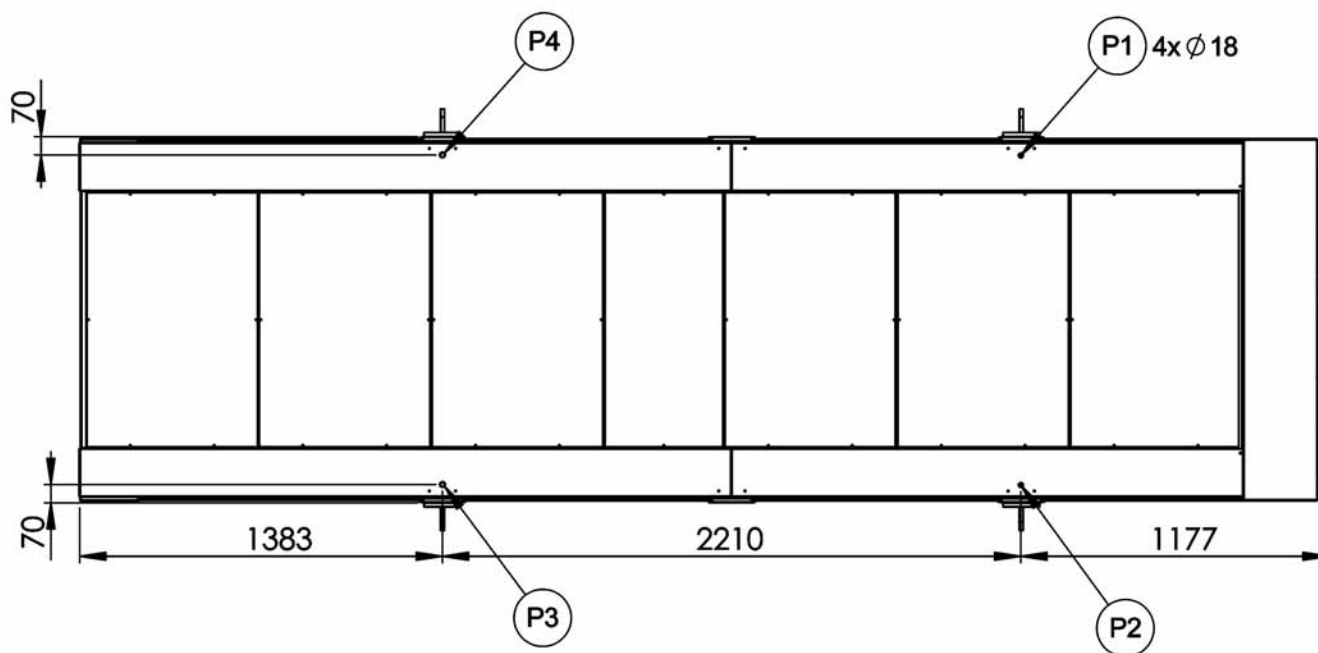


Weight distribution SWS 2202-4402 R407C ELN

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 2202 | 3809 | 952 | 952 | 952 | 952 |
| 2602 | 4072 | 1018 | 1018 | 1018 | 1018 |
| 3002 | 4124 | 1031 | 1031 | 1031 | 1031 |
| 3402 | 4235 | 1059 | 1059 | 1059 | 1059 |
| 3802 | 5167 | 1292 | 1292 | 1292 | 1292 |
| 4202 | 5217 | 1304 | 1304 | 1304 | 1304 |
| 4402 | 5091 | 1273 | 1273 | 1273 | 1273 |

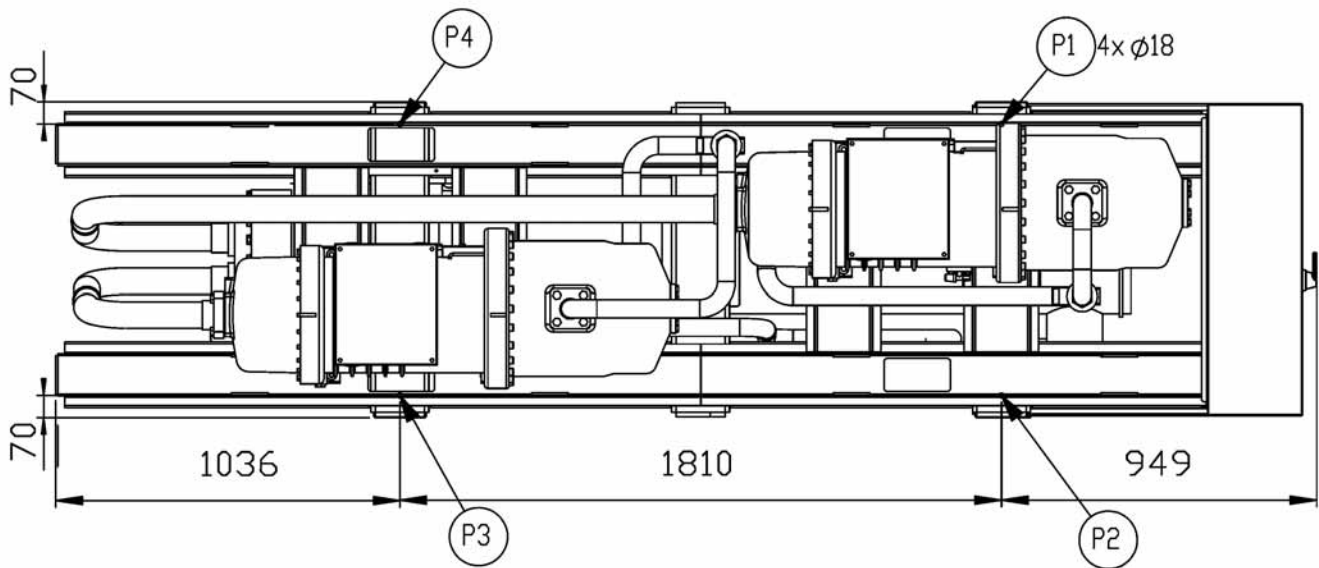
Weight distribution SWS 2202-3012 R134a ELN

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 2202 | 3731 | 933 | 933 | 933 | 933 |
| 2212 | 4151 | 1038 | 1038 | 1038 | 1038 |
| 2352 | 4267 | 1067 | 1067 | 1067 | 1067 |
| 2502 | 4300 | 1075 | 1075 | 1075 | 1075 |
| 2652 | 4432 | 1108 | 1108 | 1108 | 1108 |
| 2802 | 4445 | 1111 | 1111 | 1111 | 1111 |
| 3012 | 4873 | 1218 | 1218 | 1218 | 1218 |



Weight distribution SWS 3202-4802 R134a ELN

| SWS | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 3202 | 6052 | 1513 | 1513 | 1513 | 1513 |
| 3412 | 6125 | 1531 | 1531 | 1531 | 1531 |
| 3602 | 6141 | 1535 | 1535 | 1535 | 1535 |
| 4212 | 6267 | 1567 | 1567 | 1567 | 1567 |
| 4602 | 6368 | 1592 | 1592 | 1592 | 1592 |
| 4802 | 6545 | 1636 | 1636 | 1636 | 1636 |

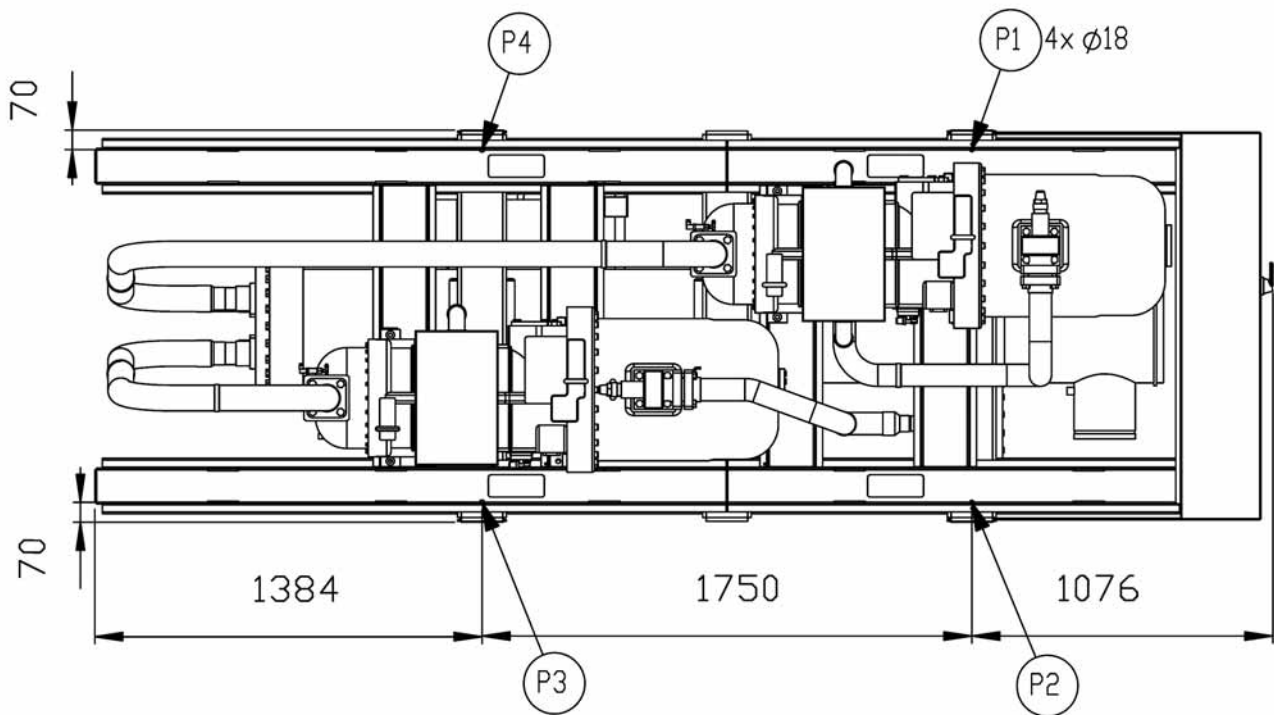


Weight distribution SWR 1002-1902 R407C STD

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 1002 | 1464 | 366 | 366 | 366 | 366 |
| 1202 | 1472 | 368 | 368 | 368 | 368 |
| 1402 | 1836 | 459 | 459 | 459 | 459 |
| 1602 | 1844 | 461 | 461 | 461 | 461 |
| 1902 | 2188 | 547 | 547 | 547 | 547 |

Weight distribution SWR 1602-1902 R134a STD

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 1602 | 1844 | 461 | 461 | 461 | 461 |
| 1902 | 2188 | 547 | 547 | 547 | 547 |

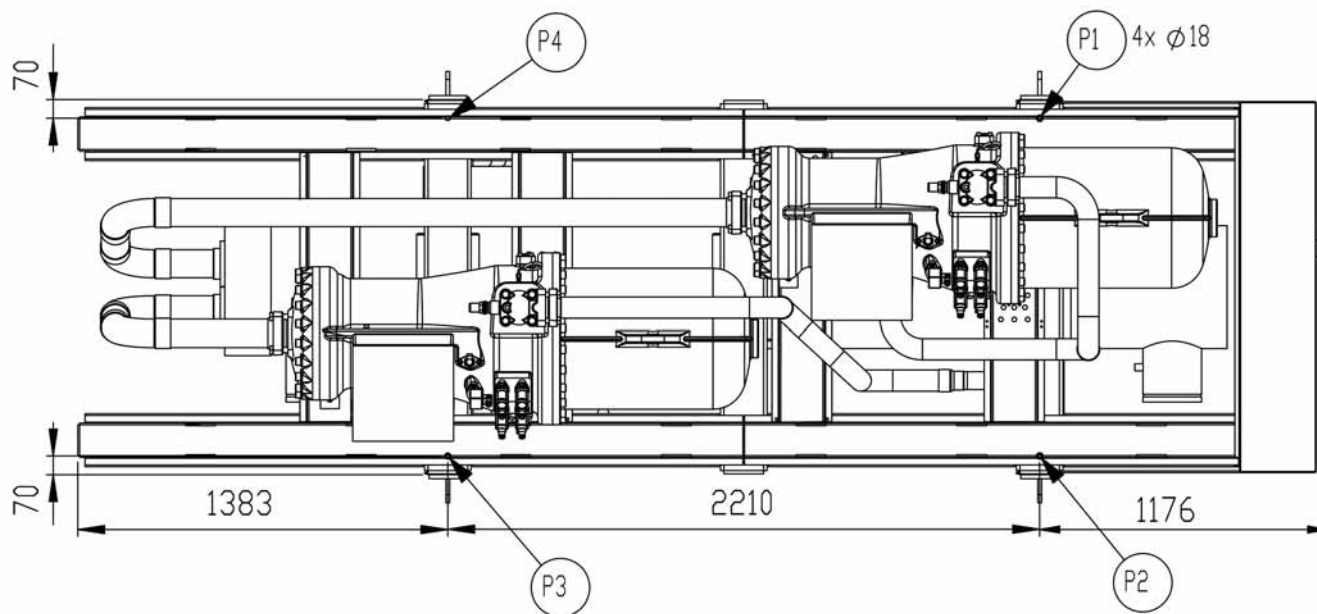


Weight distribution SWR 2202-4402 R407C STD

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 2202 | 2676 | 669 | 669 | 669 | 669 |
| 2602 | 2884 | 721 | 721 | 721 | 721 |
| 3002 | 2920 | 730 | 730 | 730 | 730 |
| 3402 | 3008 | 752 | 752 | 752 | 752 |
| 3802 | 3716 | 929 | 929 | 929 | 929 |
| 4202 | 3756 | 939 | 939 | 939 | 939 |
| 4402 | 3616 | 904 | 904 | 904 | 904 |

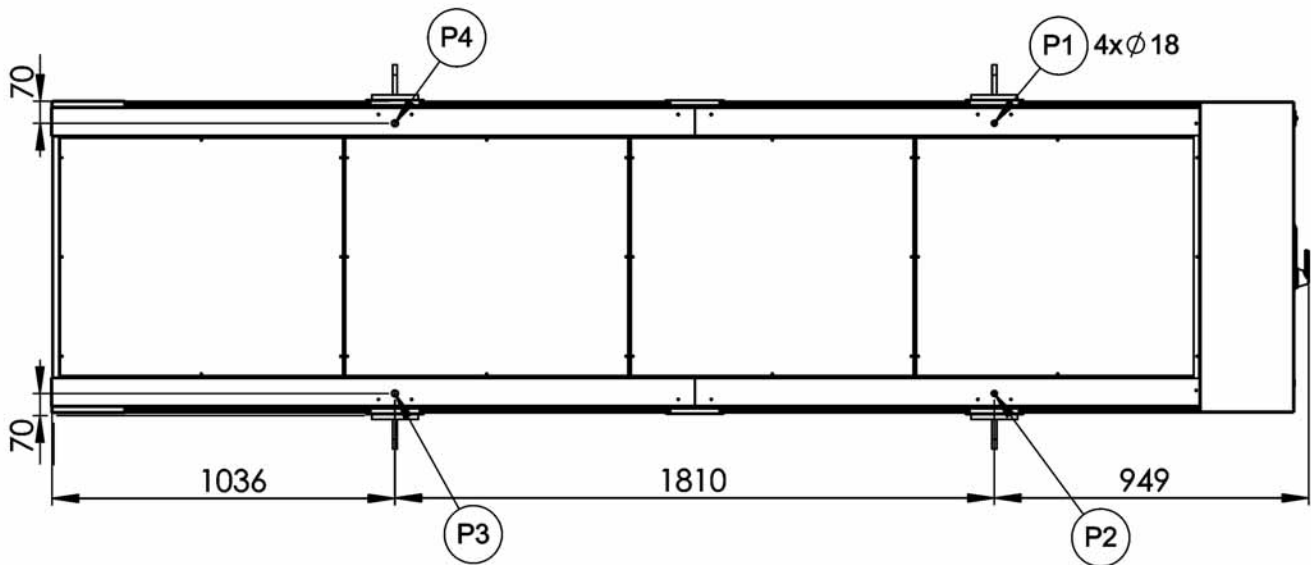
Weight distribution SWR 2202-3012 R134a STD

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 2202 | 2676 | 669 | 669 | 669 | 669 |
| 2212 | 3057 | 764 | 764 | 764 | 764 |
| 2352 | 3169 | 792 | 792 | 792 | 792 |
| 2502 | 3179 | 795 | 795 | 795 | 795 |
| 2652 | 3307 | 827 | 827 | 827 | 827 |
| 2802 | 3317 | 829 | 829 | 829 | 829 |
| 3012 | 3727 | 932 | 932 | 932 | 932 |



Weight distribution SWR 3202-4802 R134a STD

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 3202 | 4780 | 1195 | 1195 | 1195 | 1195 |
| 3412 | 4790 | 1198 | 1198 | 1198 | 1198 |
| 3602 | 4800 | 1200 | 1200 | 1200 | 1200 |
| 4212 | 4920 | 1230 | 1230 | 1230 | 1230 |
| 4602 | 4980 | 1245 | 1245 | 1245 | 1245 |
| 4802 | 5153 | 1288 | 1288 | 1288 | 1288 |

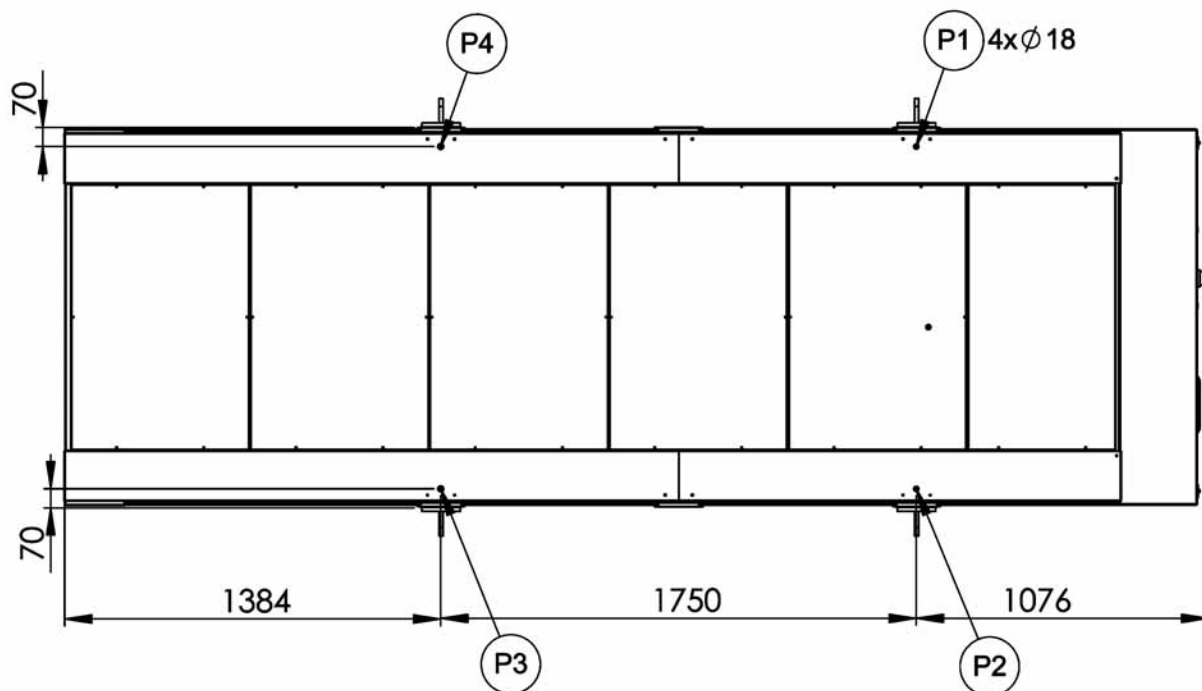


Weight distribution SWR 1002-1902 R407C LN

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 1002 | 1773 | 443 | 443 | 443 | 443 |
| 1202 | 1783 | 446 | 446 | 446 | 446 |
| 1402 | 2145 | 536 | 536 | 536 | 536 |
| 1602 | 2155 | 539 | 539 | 539 | 539 |
| 1902 | 2500 | 625 | 625 | 625 | 625 |

Weight distribution SWR 1602-1902 R134a LN

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 1602 | 2155 | 539 | 539 | 539 | 539 |
| 1902 | 2500 | 625 | 625 | 625 | 625 |

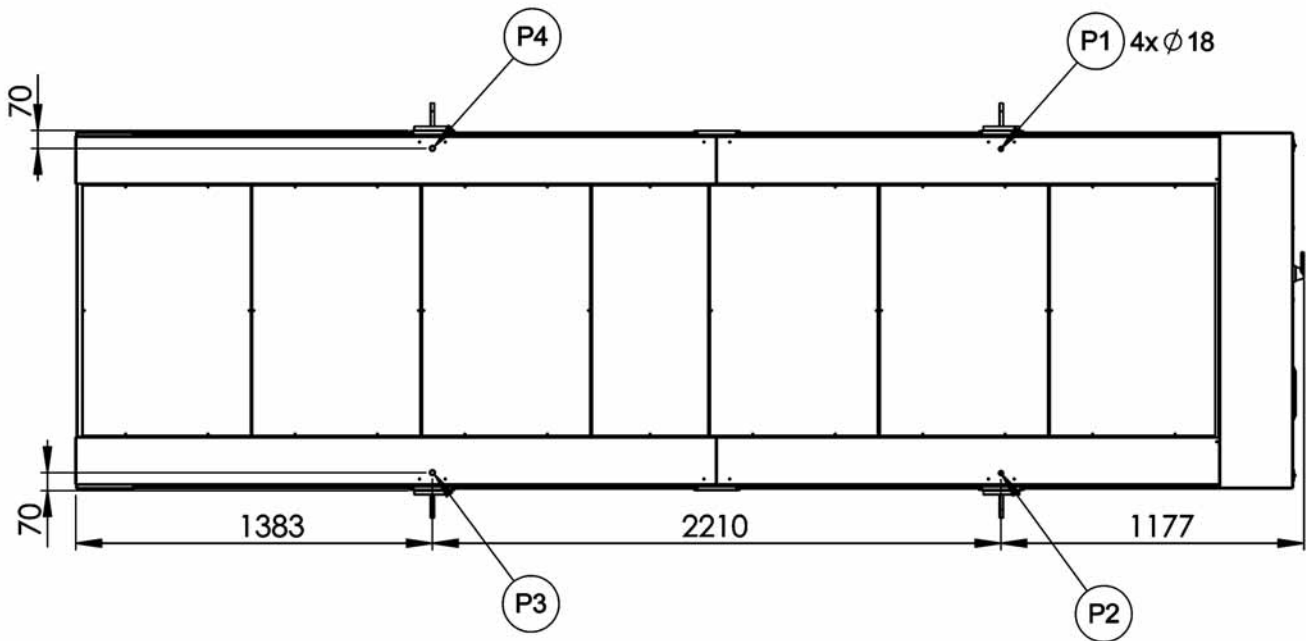


Weight distribution SWR 2202-4402 R407C LN

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 2202 | 3075 | 769 | 769 | 769 | 769 |
| 2602 | 3285 | 821 | 821 | 821 | 821 |
| 3002 | 3319 | 830 | 830 | 830 | 830 |
| 3402 | 3409 | 852 | 852 | 852 | 852 |
| 3802 | 4117 | 1029 | 1029 | 1029 | 1029 |
| 4202 | 4157 | 1039 | 1039 | 1039 | 1039 |
| 4402 | 4017 | 1004 | 1004 | 1004 | 1004 |

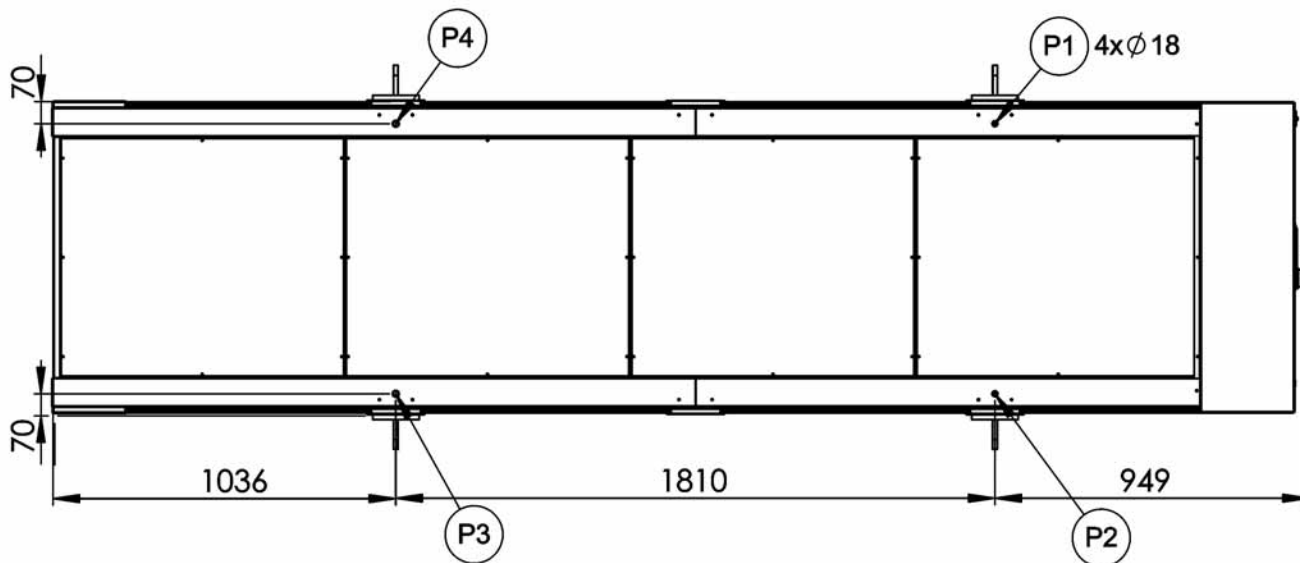
Weight distribution SWR 2202-3012 R134a LN

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 2202 | 3075 | 769 | 769 | 769 | 769 |
| 2212 | 3457 | 864 | 864 | 864 | 864 |
| 2352 | 3569 | 892 | 892 | 892 | 892 |
| 2502 | 3579 | 895 | 895 | 895 | 895 |
| 2652 | 3707 | 927 | 927 | 927 | 927 |
| 2802 | 3717 | 929 | 929 | 929 | 929 |
| 3012 | 4127 | 1032 | 1032 | 1032 | 1032 |



Weight distribution SWR 3202-4802 R134a LN

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 3202 | 5280 | 1320 | 1320 | 1320 | 1320 |
| 3412 | 5290 | 1323 | 1323 | 1323 | 1323 |
| 3602 | 5300 | 1325 | 1325 | 1325 | 1325 |
| 4212 | 5420 | 1355 | 1355 | 1355 | 1355 |
| 4602 | 5480 | 1370 | 1370 | 1370 | 1370 |
| 4802 | 5653 | 1413 | 1413 | 1413 | 1413 |

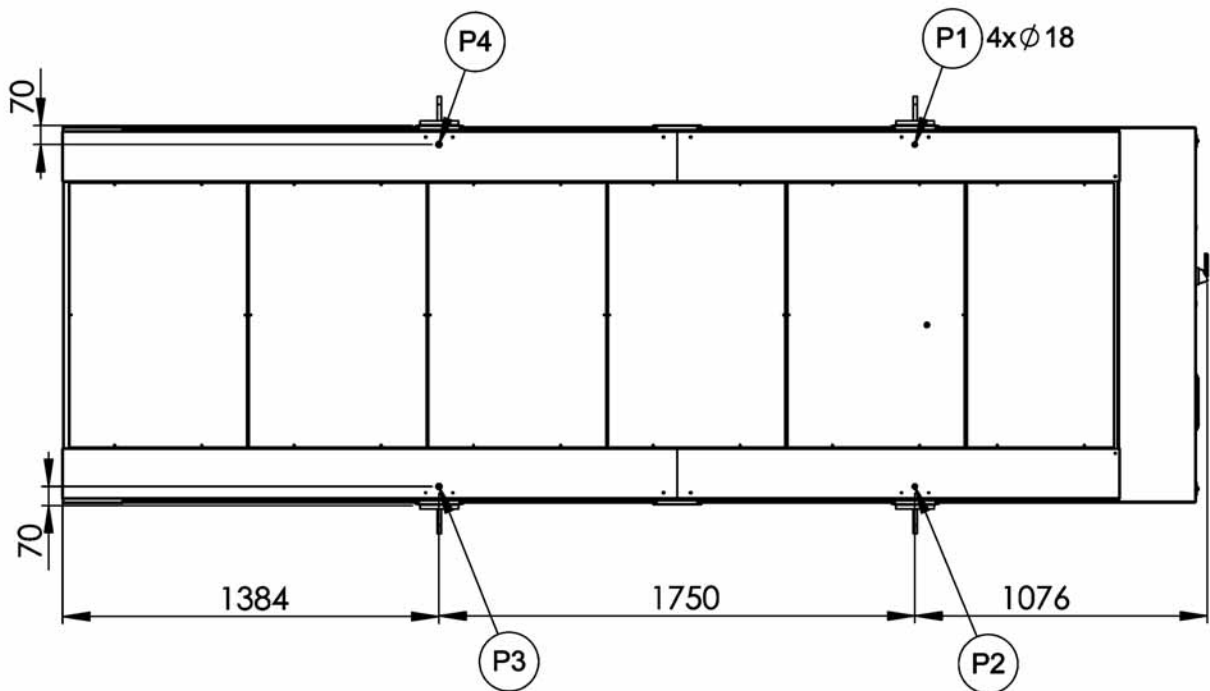


Weight distribution SWR 1002-1902 R407C ELN

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 1002 | 1863 | 466 | 466 | 466 | 466 |
| 1202 | 1873 | 468 | 468 | 468 | 468 |
| 1402 | 2235 | 559 | 559 | 559 | 559 |
| 1602 | 2245 | 561 | 561 | 561 | 561 |
| 1902 | 2590 | 647 | 647 | 647 | 647 |

Weight distribution SWR 1602-1902 R134a ELN

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 1602 | 2245 | 561 | 561 | 561 | 561 |
| 1902 | 2590 | 647 | 647 | 647 | 647 |

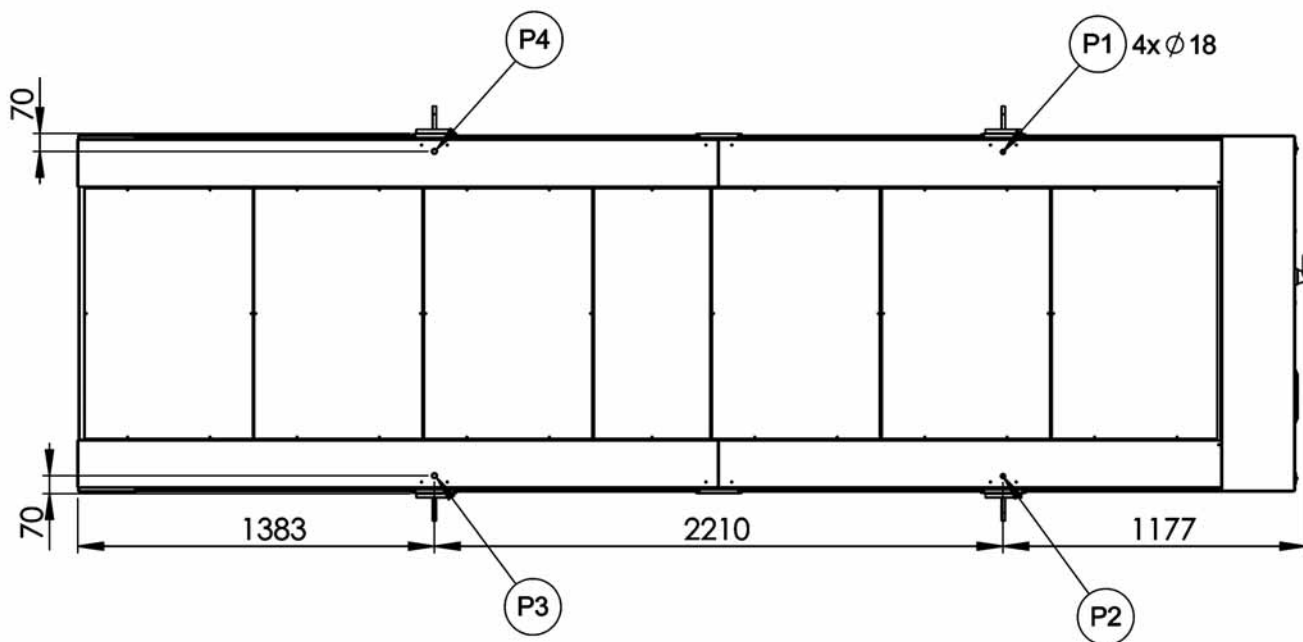


Weight distribution SWR 2202-4402 R407C ELN

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 2202 | 3195 | 799 | 799 | 799 | 799 |
| 2602 | 3405 | 851 | 851 | 851 | 851 |
| 3002 | 3439 | 860 | 860 | 860 | 860 |
| 3402 | 3529 | 882 | 882 | 882 | 882 |
| 3802 | 4237 | 1059 | 1059 | 1059 | 1059 |
| 4202 | 4277 | 1069 | 1069 | 1069 | 1069 |
| 4402 | 4137 | 1034 | 1034 | 1034 | 1034 |

Weight distribution SWR 2202-3012 R134a ELN

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 2202 | 3591 | 799 | 799 | 799 | 799 |
| 2212 | 3607 | 902 | 902 | 902 | 902 |
| 2352 | 3719 | 930 | 930 | 930 | 930 |
| 2502 | 3729 | 932 | 932 | 932 | 932 |
| 2652 | 3857 | 964 | 964 | 964 | 964 |
| 2802 | 3867 | 967 | 967 | 967 | 967 |
| 3012 | 4277 | 1069 | 1069 | 1069 | 1069 |



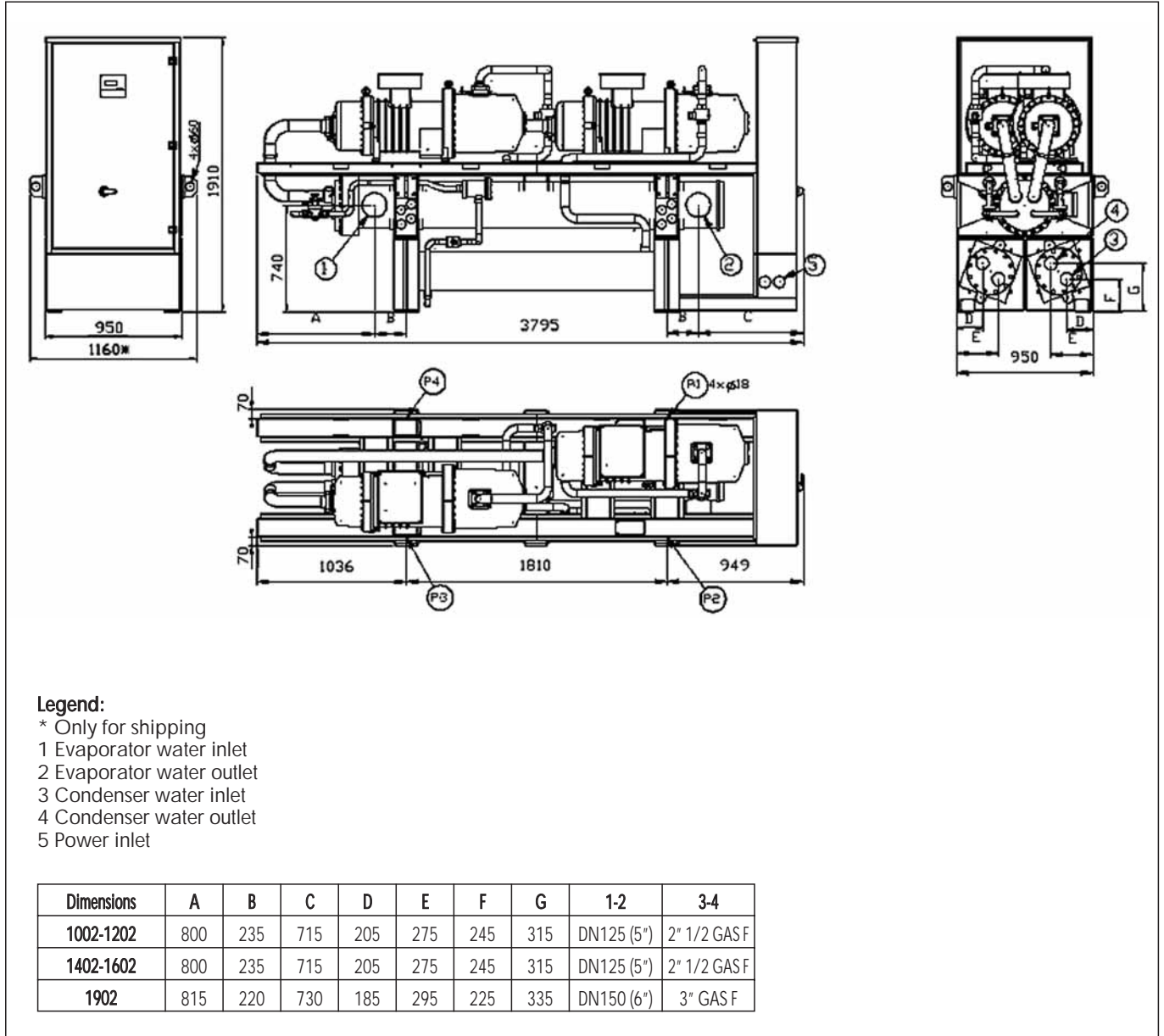
Weight distribution SWR 3202-4802 R134a ELN

| SWR | Operating weight (kg) | P1 (kg) | P2 (kg) | P3 (kg) | P4 (kg) |
|------|-----------------------|---------|---------|---------|---------|
| 3202 | 5450 | 1363 | 1363 | 1363 | 1363 |
| 3412 | 5460 | 1365 | 1365 | 1365 | 1365 |
| 3602 | 5470 | 1368 | 1368 | 1368 | 1368 |
| 4212 | 5590 | 1398 | 1398 | 1398 | 1398 |
| 4602 | 5650 | 1413 | 1413 | 1413 | 1413 |
| 4802 | 5823 | 1456 | 1456 | 1456 | 1456 |

8.5 Overall dimensions and maintenance space

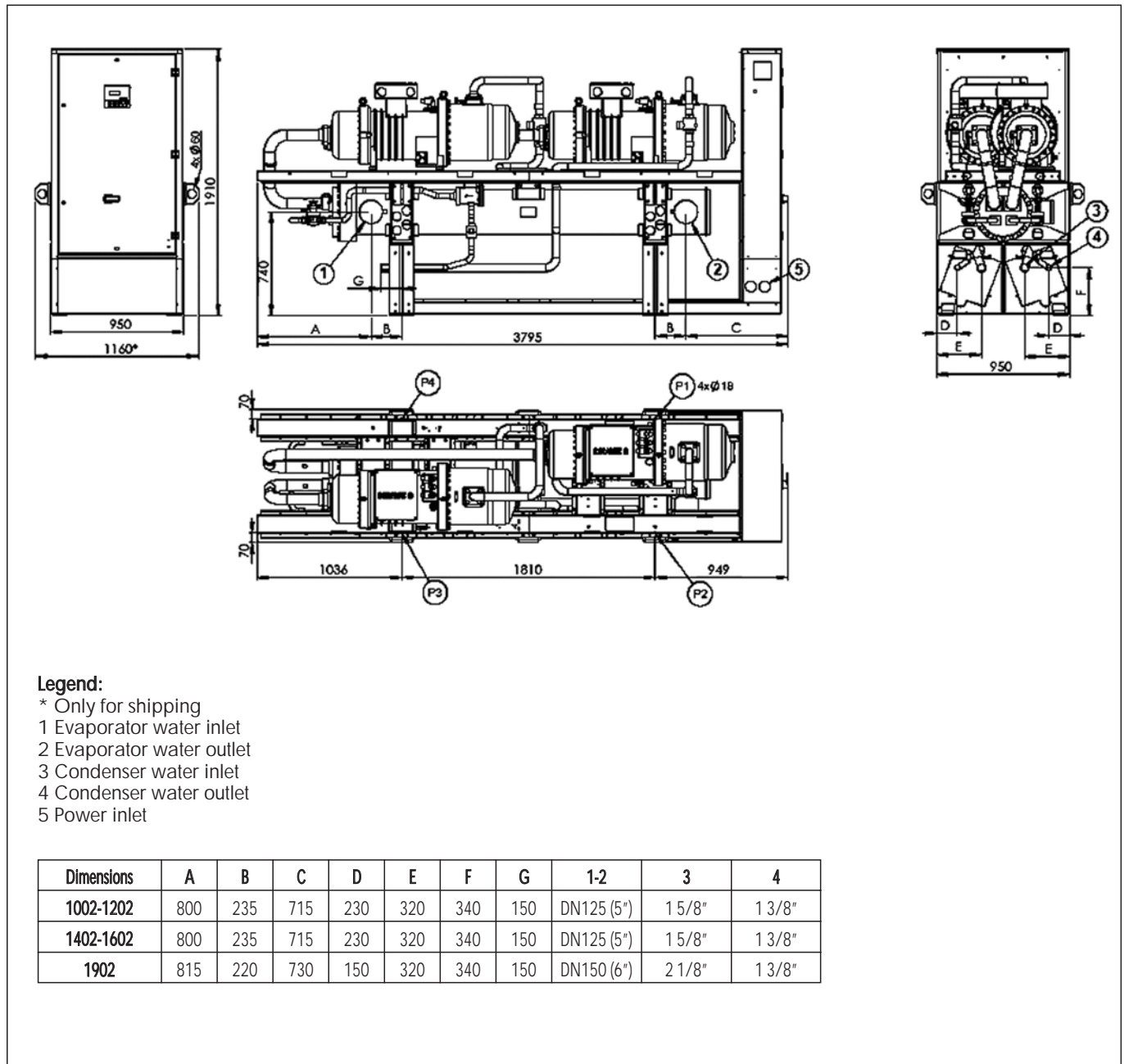
Overall dimensions

SWS 1002 - 1902 STD R407C and SWS 1602 - 1902 STD R134a



Overall dimensions

SWR 1002 - 1902 STD R407C and SWR 1602 - 1902 STD R134a

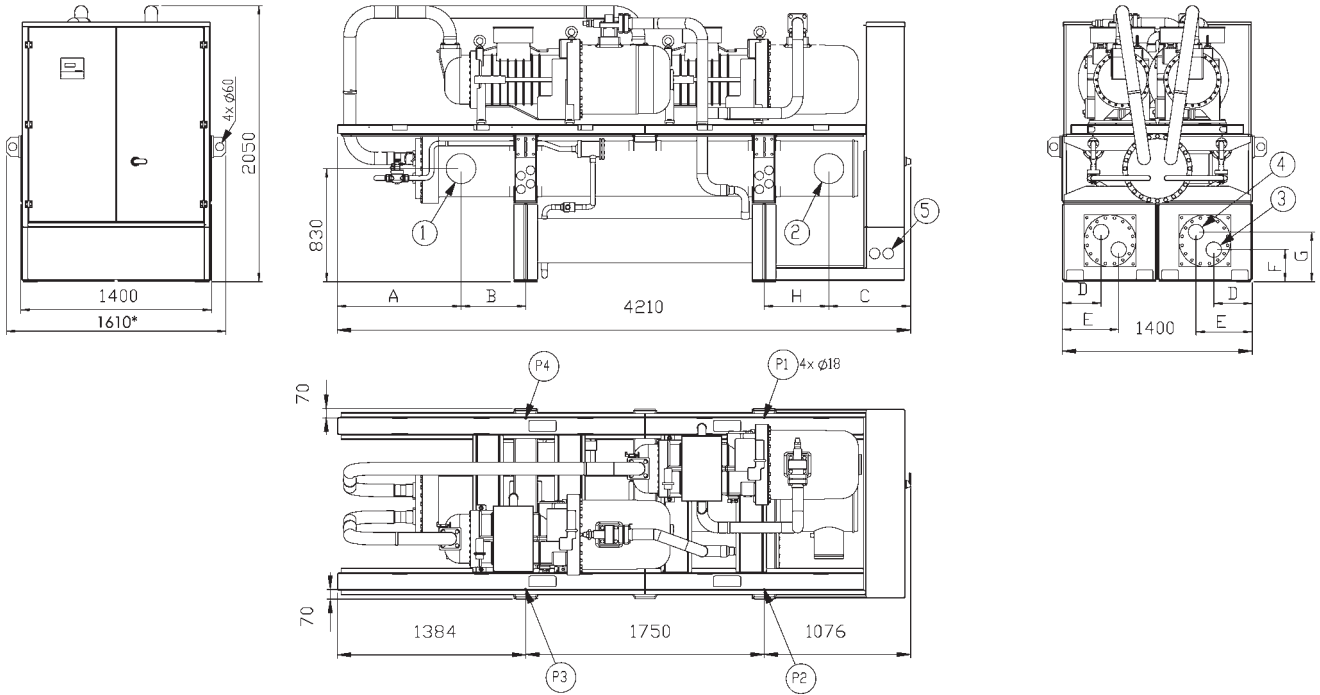


Legend:

- * Only for shipping
- 1 Evaporator water inlet
- 2 Evaporator water outlet
- 3 Condenser water inlet
- 4 Condenser water outlet
- 5 Power inlet

| Dimensions | A | B | C | D | E | F | G | 1-2 | 3 | 4 |
|------------------|-----|-----|-----|-----|-----|-----|-----|------------|--------|--------|
| 1002-1202 | 800 | 235 | 715 | 230 | 320 | 340 | 150 | DN125 (5") | 1 5/8" | 1 3/8" |
| 1402-1602 | 800 | 235 | 715 | 230 | 320 | 340 | 150 | DN125 (5") | 1 5/8" | 1 3/8" |
| 1902 | 815 | 220 | 730 | 150 | 320 | 340 | 150 | DN150 (6") | 2 1/8" | 1 3/8" |

Overall dimensions
SWS 2202 - 4402 STD R407C and SWS 2212 - 3012 STD R134a

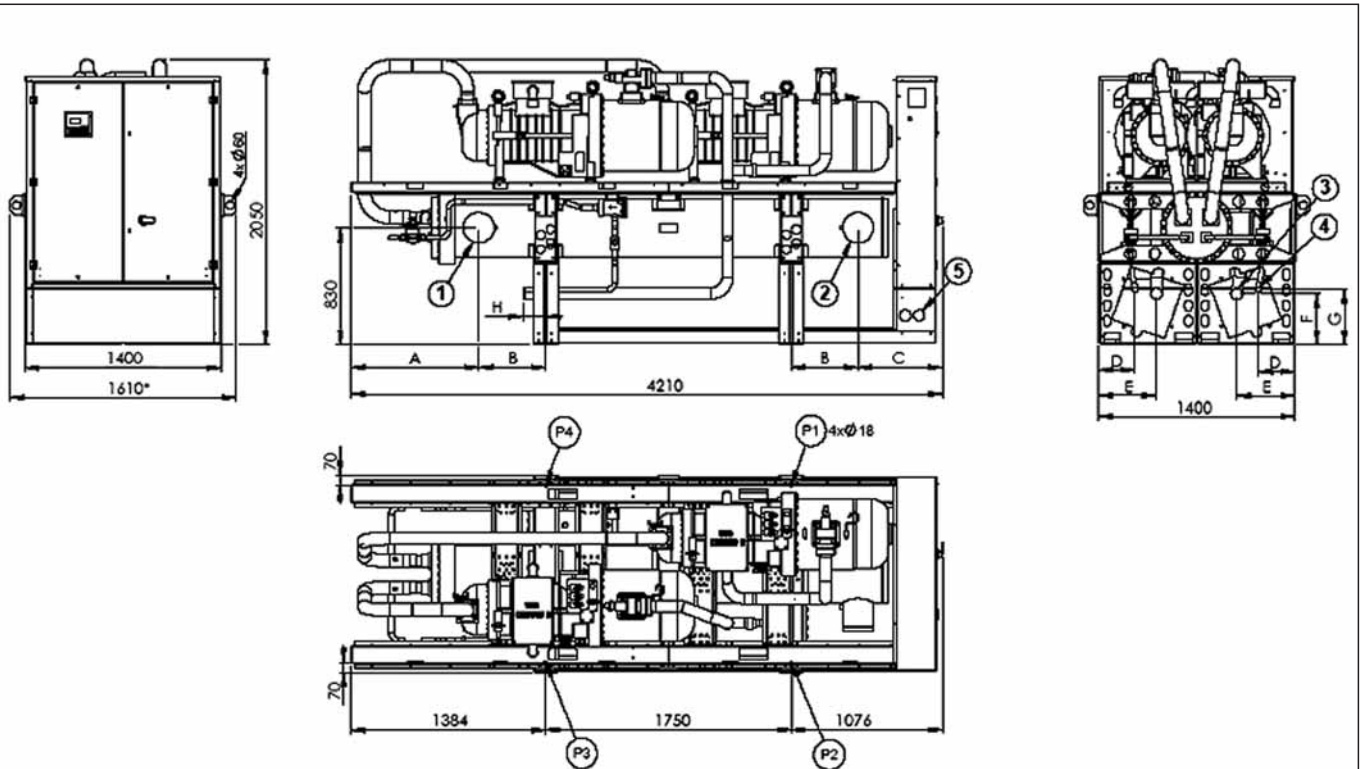


egend:

- * Only for shipping
- 1 Evaporator water inlet
- 2 Evaporator water outlet
- 3 Condenser water inlet
- 4 Condenser water outlet
- 5 Power inlet

| Dimensions | A | B | C | D | E | F | G | H | 1-2 | 3-4 |
|-----------------------|------|-----|-----|-----|-----|-----|-----|-----|------------|----------|
| 2202 | 1160 | 225 | 850 | 295 | 400 | 245 | 355 | 255 | DN200 (8") | 3" GAS F |
| 2602-3002-3402 | 1160 | 225 | 850 | 295 | 400 | 245 | 355 | 255 | DN200 (8") | 3" GAS F |
| 3802-4202-4402 | 910 | 475 | 600 | 285 | 415 | 235 | 365 | 475 | DN200 (8") | 4" GAS F |
| 2212-2352-2502 | 1176 | 208 | 835 | 295 | 405 | 245 | 355 | 208 | DN150 (6") | 3" GAS F |
| 2652-2802-3012 | 923 | 460 | 587 | 295 | 405 | 245 | 355 | 490 | DN150 (6") | 3" GAS F |

Overall dimensions SWR 2202 - 4402 STD R407C

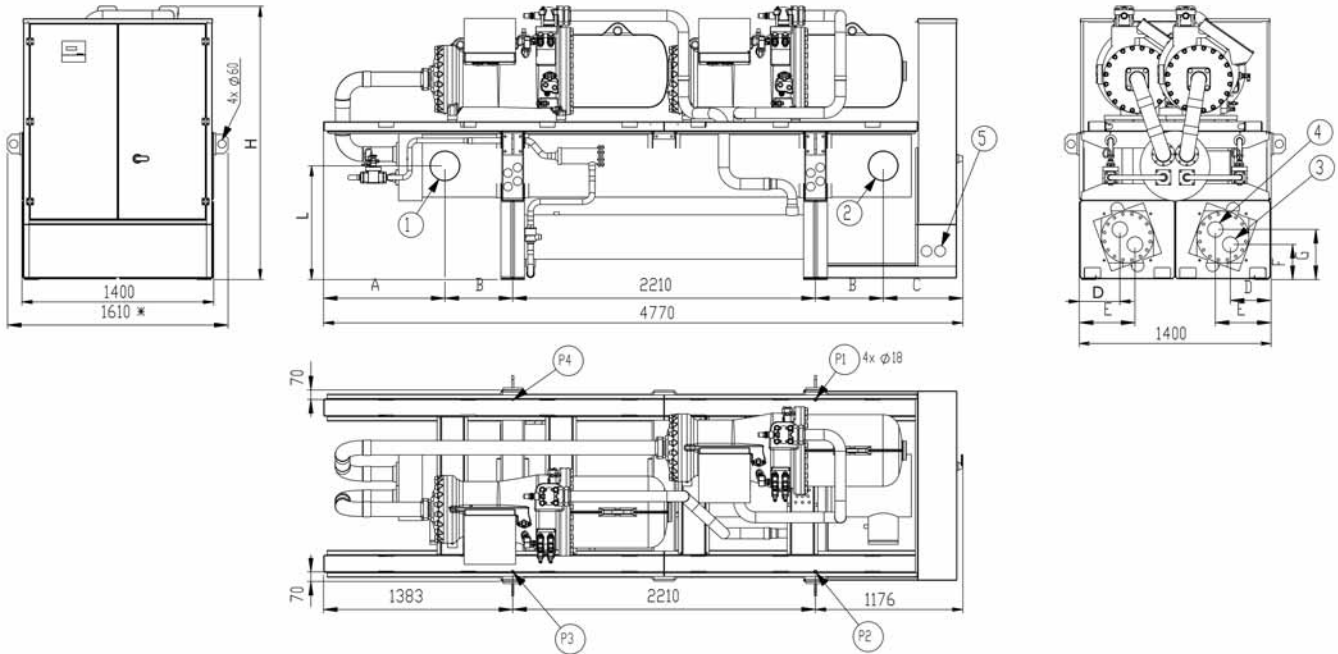


egend:

- * Only for shipping
- 1 Evaporator water inlet
- 2 Evaporator water outlet
- 3 Condenser water inlet
- 4 Condenser water outlet
- 5 Power inlet

| Dimensions | A | B | C | D | E | F | G | H | 1-2 | 3 | 4 |
|-----------------------|------|-----|-----|-----|-----|-----|-----|-----|------------|--------|--------|
| 2202 | 1160 | 225 | 850 | 260 | 430 | 360 | 390 | 160 | DN200 (8") | 2 1/8" | 1 3/8" |
| 2602-3002-3402 | 1160 | 225 | 850 | 260 | 395 | 360 | 390 | 160 | DN200 (8") | 2 5/8" | 1 3/8" |
| 3802-4202-4402 | 910 | 475 | 600 | 260 | 410 | 360 | 390 | 160 | DN200 (8") | 3 1/8" | 1 3/8" |

Overall dimensions
SWS 3202 - 4802 STD R134a



Legend:

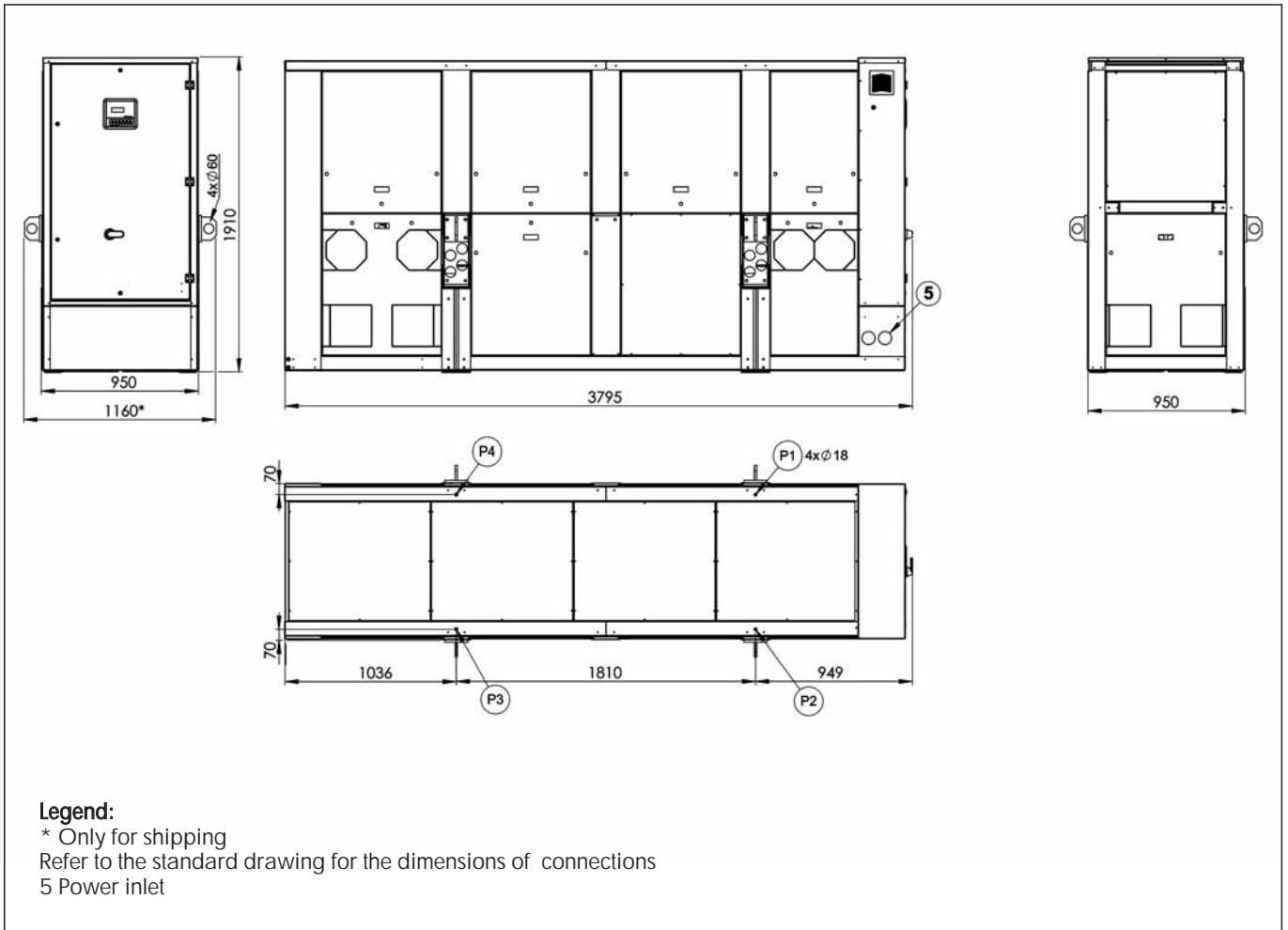
- * Only for shipping
- 1 Evaporator water inlet
- 2 Evaporator water outlet
- 3 Condenser water inlet
- 4 Condenser water outlet
- 5 Power inlet

| Dimensions | A | B | C | D | E | F | G | H | L | 1-2 | 3-4 |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|------|-----|------------|------------|
| 3202 | 888 | 495 | 682 | 297 | 407 | 256 | 366 | 2050 | 830 | DN200 (8") | 3" GAS F |
| 3412-3602-4212 | 888 | 495 | 682 | 297 | 400 | 256 | 366 | 2050 | 830 | DN200 (8") | DN100 (4") |
| 4602-4802 | 888 | 495 | 682 | 297 | 400 | 256 | 366 | 2110 | 860 | DN200 (8") | DN100 (4") |

Overall dimensions

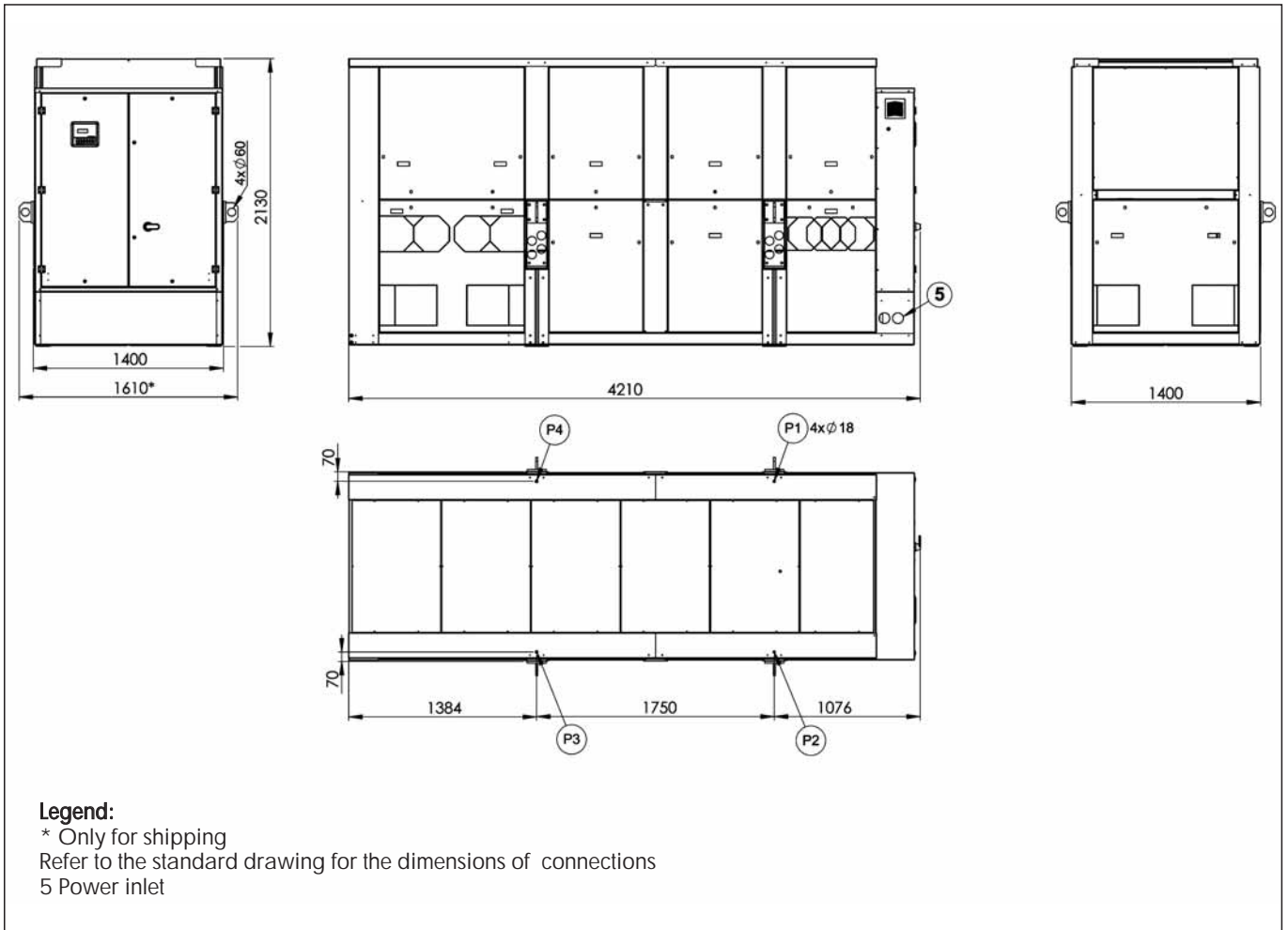
SWS 1002 - 1902 LN/ELN R407C and SWS 1602 - 1902 LN/ELN R134a

SWR 1002 - 1902 LN/ELN ad R407C and SWR 1602 - 1902 LN/ELN R134a

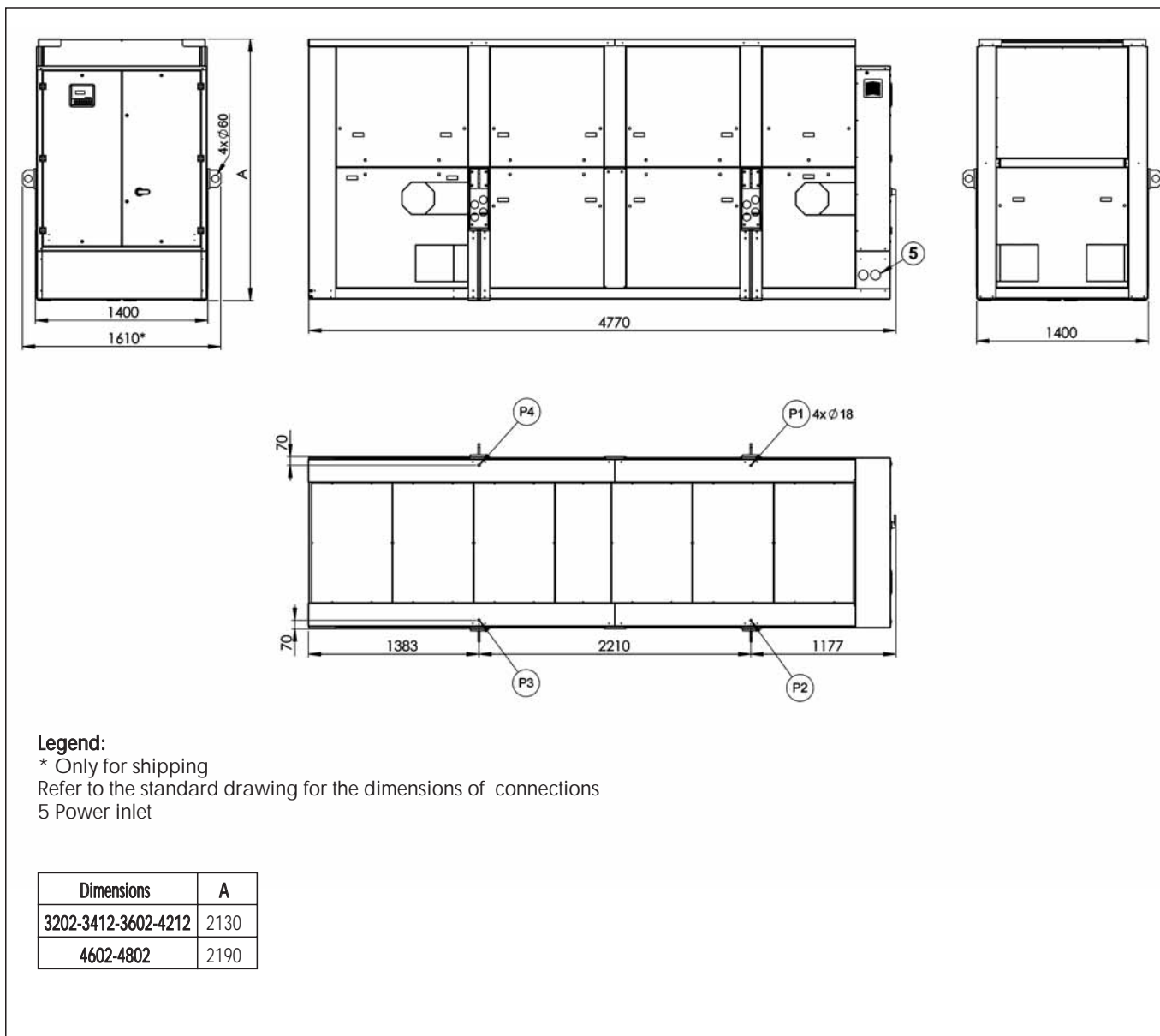


Overall dimensions

SWS 2202 - 4402 LN/ELN R407C and SWS 2202 - 3012 LN/ELN R134a
SWR 2202 - 4402 LN/ELN R407C and SWR 2202 - 3012 LN/ELN R134a



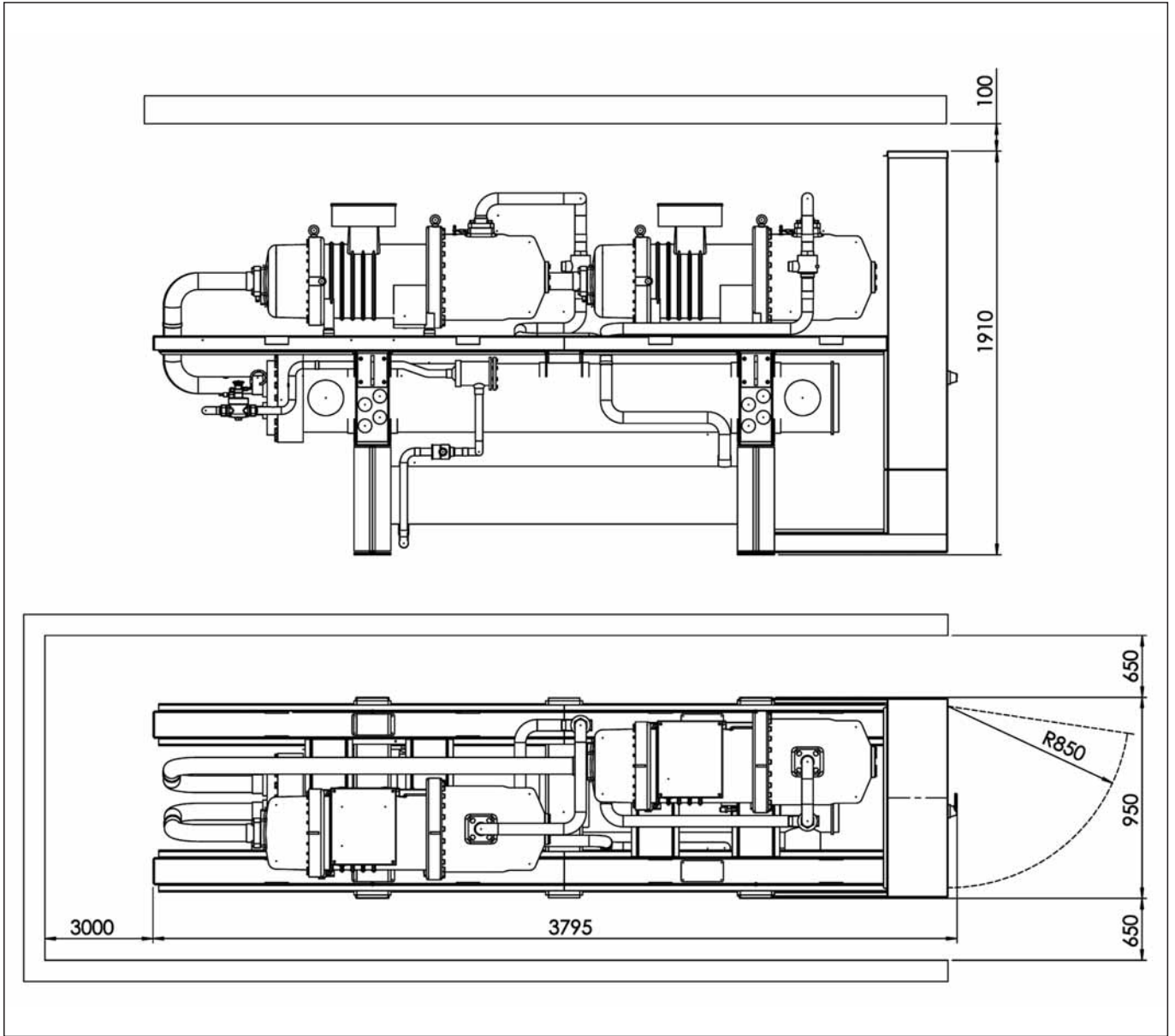
Overall dimensions SWS 3202 - 4802 LN/ELN R134a SWR 3202 - 4802 LN/ELN R134a



Maintenance space

SWS 1002 - 1902 R407C and SWS 1602 - 1902 R134a

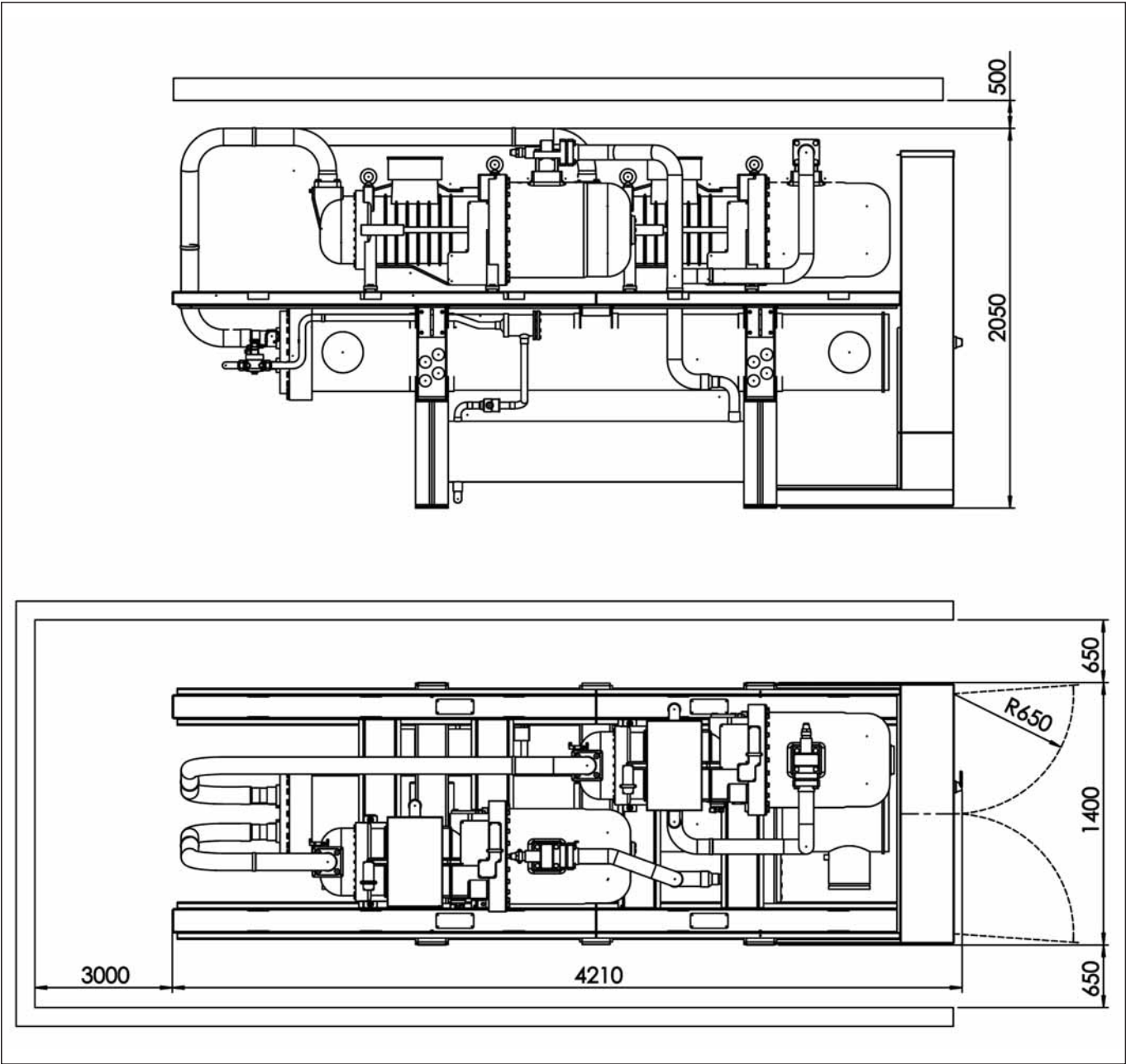
SWR 1002 - 1902 R407C and SWR 1602 - 1902 R134a



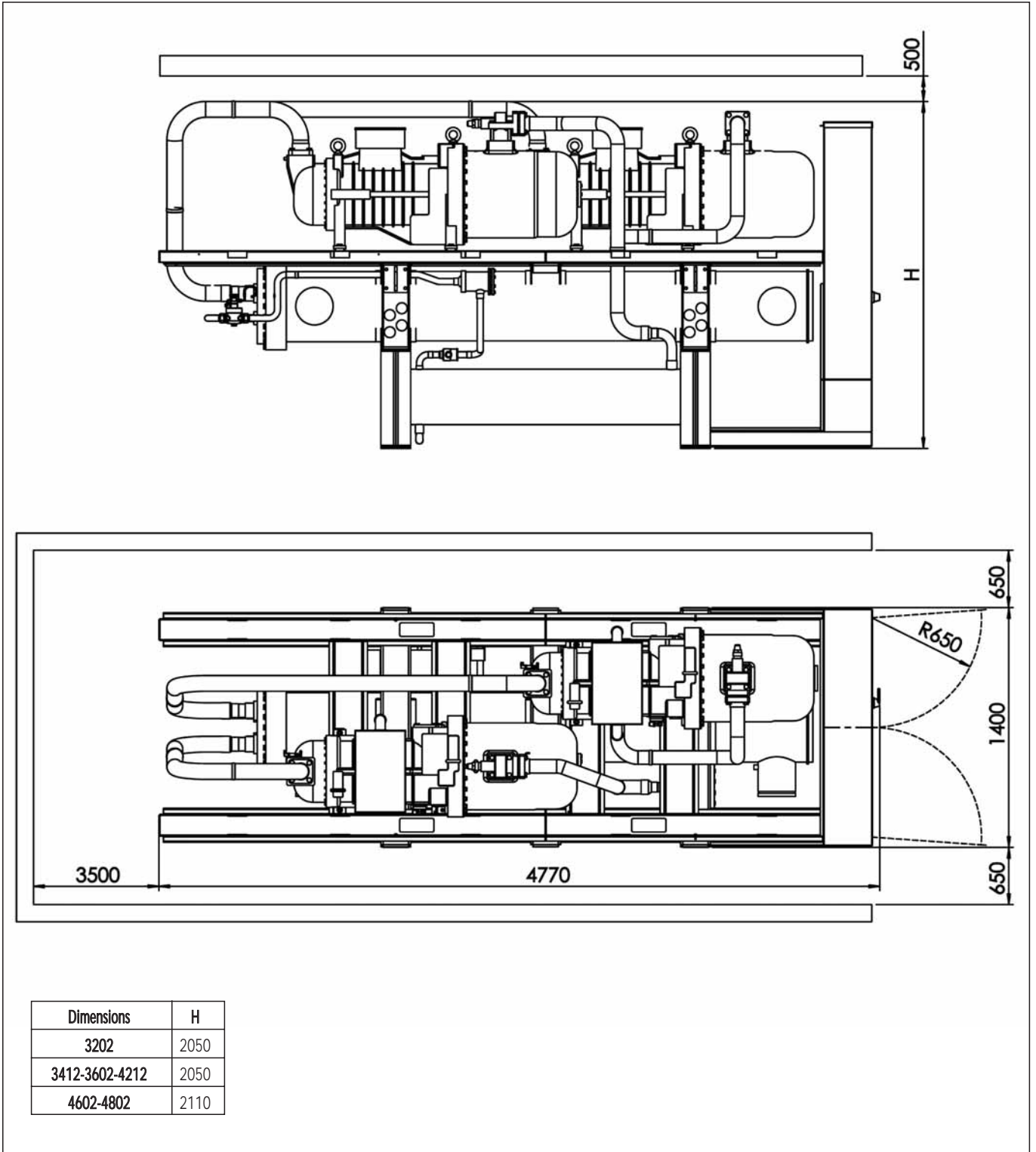
Maintenance space

SWS 2202 - 4402 R407C and SWS 2202 - 3012 R134a

SWR 2202 - 4402 R407C and SWR 2202 - 3012 R134a



Maintenance space
 SWS 3202 - 4802 R134a
 SWR 3202 - 4802 R134a



9 MAINTENANCE

Carefully read the "Safety" section of this manual before carrying out any maintenance operations.



Do not discharge the refrigerant into the atmosphere while the refrigeration circuits are being drained. Use appropriate recovery equipment.

When the recovered refrigerant cannot be re-used, return it to the manufacturer.



Do not throw away the waste oil of the compressor, because it contains refrigerant in solution.

The waste oil must be returned to the manufacturer.

Unless otherwise specified, the operations described below may be carried out only by a trained maintenance operator.

9.1 General requirements

Itelco-Industry units have been designed for continuous operation, providing that they are subjected to regular maintenance, within the limits specified in this manual. Each unit must be serviced according to the programme by the User/Customer, and must be inspected at regular intervals by the personnel of one of Itelco-Industry 's authorised Service Centers.

It is the responsibility of the User to meet these maintenance requirements and/or to enter into an agreement with one of Itelco-Industry 's Service Centers, so as to properly safeguard the operation of the appliance.

During the warranty period, in case of damage or failures caused by improper maintenance, Itelco-Industry will not refund the costs incurred to repair the appliance in its original state.

The provisions of this section apply only to standard units; according to the order requirements, other documentation may be added, concerning any modifications or supplementary accessories.

9.2 Planned maintenance

Maintenance inspections must be carried out according to the program below, by a qualified person. As a general rule, units cannot be repaired directly by the user, who shall not try to service or repair any failures or anomalies identified during daily inspections. If you are in doubt, please contact Itelco-Industry Service Centre.

Scheduled Maintenance

| Operations | Daily | Weekly | Monthly | Beginning of season | End of season |
|---|-------|--------|---------|---------------------|---------------|
| Check the temperature of the leaving fluid | • | | | | |
| Check the pressure drops in the heat exchanger | | • | | | |
| Check for electric absorption | | • | | | |
| Check suction pressure and temperature | | • | | | |
| Check delivery pressure and temperature | | • | | | |
| Check the oil level in the compressor | | • | | | |
| Check that there are no gas bubbles in the liquid line | | • | | | |
| Check that the fins of the external coil are clean (if any) | | | • | | |
| Check the operation of the oil heaters | | | • | | |
| Check the remote control switches | | | • | | |
| Check the operation of the LP pressure switch | | | | • | |
| Check the operation of the HP pressure switch | | | | • | |
| Check the insulation of the heat exchanger | | | | • | |
| Check that terminals are tightened | | | | • | |
| Check that the terminals screws are tightened | | | | • | |
| Clean the exterior of the unit with water and soap | | | | • | |
| Check the density of the antifreeze (if any) | | | | • | • |
| Check the operation of the flow switches | | | | • | |
| Check the operation of the solenoid valve | | | | • | • |

9.3 Refrigerant charge



Do not inject refrigerant liquid into the LP side of the circuit. Be very careful, and charge the circuit properly. If the charge is insufficient, the efficiency of the unit will be lower than expected. In the worst of cases the LP pressure switch may be activated, resulting in the halting of the unit.

In the presence of an excess charge, the condensing pressure will rise (in the worst of cases, the HP pressure switch may be activated, resulting in the stop of the equipment), and the consumption will increase as well.



It is strictly forbidden to use the compressor as a vacuum pump to drain the plant.

Fill the refrigeration circuit after it has been drained for maintenance purposes (leaks, replacement of the compressor etc.). The amount of the charge is indicated on the plate affixed to the unit.

Before refilling, it is important to drain and de-hydrate the circuit, thus obtaining a minimum abs. pressure value of 50 Pa.

Inject the refrigerant fluid before removing the vacuum, then fill the circuit up to 90% of the total gas requirement (in liquid form). The appliance must be filled through the filling valve on the liquid line, on the outlet side of the condenser.

It is recommended to connect the refrigerant cylinder to the filling valve on the liquid line, and to arrange it in such a way as to inject only liquid refrigerant.

Then start the compressor and let the gas flow from the cylinder, up until the liquid flow, which can be observed through the sight glass, is limpid.

9.4 Compressors

The frequency of the checks to be made on compressors depends on a variety of factors, first of all the working conditions. Anyway, it is advisable to adopt the following tips:

- After 300 hours of work, check the conditions of the oil: a certain amount of impurities from the system may accumulate in the oil of the compressors.
- Check the acidity of the oil every year.

- After 8000 hours of work, carry out a visual inspection on the suction/discharge valves for wear. If necessary, replace these components. If compressors are started/stopped frequently or in particularly demanding working conditions, it is advisable to reduce this period to 5000 hours. Anyway, this time is indicative only.
- After 24000 hours of work, carry out a general overhaul of the compressor. If the compressors work for a period shorter than 40% of a year, the overhaul can be performed every about 5 years. This period depends on the type of application, the working conditions, the duration of start/stop cycles.



If it is necessary to replace the compressor (in case of burning of the winding or mechanical failure), contact one of Itelco-Industry's Service Centres.

Compressors use polyester oil, for both the versions manufactured for R134a and R407C. During maintenance operations on the compressor, or if you have to open the refrigerant circuit in any point, remember that this type of oil is highly hygroscopic, and accordingly it is important that it is not left exposed to the weather for prolonged periods, as this would require the replacement of the oil.

9.5 Condenser

Check the condenser water side for cleanliness at regular intervals. This may be accomplished by checking water side pressure drop (refer to Section 9).

Soiling of the condenser results in increased condensing pressure, which reduces efficiency and increases current consumption and may cause the high pressure switch to activate.

It is advisable to supply the condensers with antialgae and anti-line treated water.

If soiled, the heat exchanger must be chemically cleaned by Authorised service personnel.

For other types of service (special maintenance, heat exchanger replacement, etc.), contact an Authorised Service Centre).

9.6 Dehydrating filter

The refrigeration circuits are provided with dehydrating filters.

The filter clogging is marked by the presence of air bubbles in the sight glass, or by the difference between the temperatures measured downstream from and upstream of the drying filter. If, once the cartridge has been cleaned, there are still some air bubbles, the appliance has lost a part of the refrigerant charge in one or more points, that must be identified and serviced.

9.7 Sight glass

The sight glass is used for inspecting the refrigerant flow and the humidity % of the refrigerant. The presence of bubbles indicates that the dehydrating filter is clogged or the charge insufficient.

A colour indicator is positioned inside the sight glass.

If you compare the colour of the indicator to the scale on the ring of the sight glass, you can calculate the percentage of humidity of the refrigerant. If it is excessive, replace the filter's cartridge, operate the appliance for 1 day and then check the humidity % again. When the humidity % is within the pre-determined range, no other operations are required. If the humidity % is still too high, replace the dehydrating filter again, start the unit and operate it for another day.

9.8 Thermostatic expansion valve

The circuit of the unit is equipped with a thermostatic expansion valve, with external equalizer.

The valve is shop-calibrated for an overheating of 5°C.

Procedure to check for overheating:

- Measure the suction pressure with the pressure gauges on the board of the unit or using a pressure gauge connected to the service valve on the suction side.
- From the pressure gauge's temperature scale, measure the saturated suction temperature (T_{sa}) which corresponds to the pressure value.
- Using a contact pressure gauge affixed to the outlet fitting of the gas of the evaporator, measure the actual temperature (T_{se}).

Overheating calculation (S):

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

Overheating is regulated through the thermostatic expansion valve.

Make the adjusting screw follow a complete turn, and operate the appliance for five minutes. Check again and, if necessary, repeat the regulation.

If the expansion valve cannot be regulated, it is probably broken, and shall be replaced. The replacement must be carried out by a Service Centre.

9.9 Evaporator

Check at regular intervals that the water side of the heat exchanger is perfectly clean. To do this, measure the pressure drop, water side (see Section 8) or measure the temperature of the liquid leaving and entering the heat exchanger, and compare it to the evaporation temperature.

To obtain an effective heat exchange, the difference between the temperature of the leaving water and the saturated evaporating temperature must be in the 3.5-6°C to R134a and 3.5-5°C to R407C. A greater difference would indicate a low efficiency of the heat exchanger (i.e. the heat exchanger is dirty).

In this case, the heat exchanger must be subjected to chemical cleaning, an operation that shall be carried out by authorised engineers.

For other maintenance operations (extraordinary overhauling, replacement of the heat exchanger etc.), contact an authorised Service Centre.

10 TROUBLESHOOTING

The table below lists the anomalies of operation of the unit, the relevant causes and the corrective measures. For anomalies of any other type or not listed, contact one of Itelco-Industry 's Service Centre for technical assistance.

| Anomaly | Cause | Operation |
|--|---|--|
| The unit continues to work, but without cooling. | Insufficient charge of refrigerant. | Refill. |
| | The dehydrating filter is clogged. | Replace. |
| Ice on the suction line. | Wrong calibration of overheating. | Increase overheating. |
| | | Check the charge. |
| Excessive noise. | Vibration of lines. | Check the clamping brackets, if any. |
| | Whistler emitted by the thermostatic expansion valve. | Refill. |
| | | Check the dehydrating filter. |
| Noisy compressor. | | Seized bearings; replace the compressor. |
| | | Check that the compressor's locknuts are tightened. |
| Low oil level in the compressor. | One or more gas or oil leaks in the circuit. | Identify and remove leaks. |
| | Mechanical failure of the compressor. | Request the intervention of a Service Centre. |
| | Anomaly of the oil heater of the compressor's base. | Check the electric circuit and the resistor of the heater of the motor base, and replace defective components. |

Troubleshooting

| Anomaly | Cause | Operation |
|---|--|--|
| One or both compressors are not working. | Breaking of the electric circuit. | Check the electric circuit and detect any ground dispersions and short circuits. Check fuses. |
| | Intervention of the HP pressure switch. | Reset the pressure switch and the control panel and restart the appliance. Identify and remove the cause that enabled the pressure switch. |
| | The fuse of the control circuit is broken. | Check for ground dispersions and short circuits. Replace fuses. |
| | Loosened terminals. | Check and tighten. |
| | Halt caused by thermal overload of the electric circuit. | Check the operation of check and safety devices. Identify and remove the cause. |
| | Wrong wiring. | Check wiring of check and safety devices. |
| | The line voltage is too low. | Check voltage. If problems regard the system, solve them. If they are caused by the distribution network, inform the Energy Distributor. |
| | Short-circuit of the compressor's motor. | Check the continuity of the winding. |
| | Seized compressor. | Replace the compressor. |
| Activation of the LP alarm, stop of the unit. | Gas leak. | Identify and remove the leak. |
| | Insufficient charge | Refill. |
| | Failure of the pressure switch. | Replace the pressure switch. |
| Activation of the HP alarm, stop of the unit. | Failure of the pressure switch. | Check the operation of the pressure switch, replace it if defective. |
| | The delivery valve is partially closed. | Open the valve and replace it, if faulty. |
| | Substances with condensable gases in the circuit. | Drain the circuit. |
| The liquid line is too hot. | Insufficient charge. | Identify and remove the cause of the loss of charge and refill. |
| Frosting of the liquid line. | The valve of the liquid line is partially closed. | Check that valves are open. |
| | The liquid filter is clogged. | Replace the cartridge or the filter. |

11 SPARE PARTS

11.1 Spare part list

The table below shows the list of spare parts recommended during the first two years of operation.

| Component | Number |
|------------------------------|--------|
| HP pressure switch | 1 |
| Gas filter | 2 |
| Thermostatic valve | 2 |
| Auxiliary relays | 2 |
| Compressor's fuses | 6 |
| Auxiliary fuses | 6 |
| Set of compressor contactors | 1 |
| Water sensor | 1 |
| High Pressure Transducer | 1 |
| Low Pressure Transducer | 1 |
| Electronic card | 1 |
| Keyboard | 1 |
| Compressor oil resistor | 1 |

11.2 Oil for compressors

The compressors are lubricated with:

| Compressor | Refrigerant | Lubricant oil |
|------------|--------------|------------------|
| REFCOMP | R134a, R407C | DEA SE 170 |
| | R22 | CPI CP- 4214-320 |
| BITZER | R134a, R407C | BITZER BSE 170 |
| | R22 | BITZER B320SH |

11.3 Wiring diagrams

The wiring diagrams are installed inside the doors of the electrical panels of the unit.

Any request for wiring diagrams shall be forwarded to Itelco-Industry Service Centre.

12 DISMANTLING, DEMOLITION AND SCRAPPING



During the draining of the refrigeration circuits, do not let the refrigerant overflow in the surrounding atmosphere. The circuit must be drained using suitable recovery equipment.



Do not disperse the waste oil of the compressors in the environment, since it contains some dissolved refrigerant.

For the disposal, contact the competent authority for information.

Unless otherwise specified, the maintenance operations listed below may be carried out by any trained maintenance operator.

12.1 Generalities

Open each line that supplies the unit, including the ones of control circuits. Make sure that all disconnecting switches are secured in the off position. The power cables can be disconnected and disassembled. Refer to Chapter 4 for the position of connection points.

Remove all the refrigerant from the refrigeration circuits of the unit and store it in suitable containers, using a recovery unit. If its characteristics have remained the same, the refrigerant can be used again. Contact the competent authority to obtain information about disposal. In **NO** event shall the refrigerant be discharged into the atmosphere. The oil in each refrigeration circuit must be drained and collected into a suitable container; then it shall be disposed of in conformity with local regulations that apply to the disposal of waste lubricants. Any oil spillage must be recovered and disposed of in like manner.

Isolate the unit's heat exchangers from the external hydraulic circuits and drain the heat exchange sections of the plant. If no isolation valves are installed on the cooler it might be necessary to drain the complete hydronic system.



If no shutoff valves have been provided, it may be necessary to drain the whole plant. If a glycoled solution or a similar fluid has been used in the hydraulic circuits, or if chemical additives have been added to the circulating water, the circulating fluid **MUST** be drained in a proper way. For **NO** reason shall a circuit containing glycoled water or a similar solution be discharged directly into the drains or surface waters.

After draining operations, the piping of the hydraulic networks can be disconnected and disassembled.

Once they have been disconnected as specified, the packaged units can be disassembled in a single piece. First of all, disassemble the anchoring screws and then lift the unit from the position of installation, and hook it to the lifting points provided, using suitable lifting equipment.

To this end, refer to Chapter 4 for the installation of these appliances, to Chapter 8 for their weights and Chapter 3 for handling.

The units that, once disconnected, cannot be removed in a single piece, must be dismantled on site; in this case, be very careful with the weight and handling of every single component.

It is always advisable to dismantle the units following the installation steps, but in reverse.



Some residues of oil, glycoled water or similar solutions may remain in certain parts of the unit. These residues must be recovered and disposed of according to the procedures specified above.

It is very important to ensure that, while a component of the unit is being removed, all the others are properly supported.



Use only lifting means of adequate capacity.

Once disassembled, the components of the unit can be disposed of in conformity with current regulations.

As part of our ongoing product improvement programme, our products are subject to change without prior notice. Non contractual photos.

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