



WSAN-SC

65D-70D-75C-75D-80D-90C-
90D-100D-110D-120D-135F-
150F-165F-180F

AIR TO WATER HEAT PUMP FOR OUTDOOR INSTALLATION

M02W43G6-04.doc



Installation and Use Manual

- GENERAL -	4
GENERAL WARNINGS	4
INTENDED USE	4
TECHNICAL CHARACTERISTICS OF STANDARD UNITS.....	5
- REGULATIONS AND CERTIFICATIONS -	7
UNI EN ISO 9001 CERTIFICATION	7
CE MARK.....	7
EUROVENT CERTIFICATION.....	7
- RESIDUAL RISKS -	8
REFRIGERANT SAFETY CHARTS	9
- ELECTRICAL DATA -	11
GENERAL SPECIFICATIONS	11
- RECEPTION -	16
INSPECTION UPON RECEPTION	16
STORAGE	16
HANDLING	16
REMOVING THE PACKING	17
- POSITIONING -	18
DIMENSIONS	19
- WATER CONNECTIONS -	24
- ELECTRICAL CONNECTIONS -	27
GENERAL.....	27
LINE OF UNIT POWER SUPPLY	27
SIGNALS / DATA LINES.....	27
- START-UP -	34
- CONTROL -	36
- ROUTINE MAINTENANCE -	45
- TROUBLESHOOTING -	49
- DECOMMISSIONING OF THE UNIT -	51
DISCONNECTING THE UNIT	51
DISMANTLING AND DISPOSAL	51

GENERAL WARNINGS**MANUAL PURPOSE**

This manual has been designed to enable the unit to be installed, started up and maintained correctly.

MANUAL INSTRUCTIONS

It is essential to observe these instructions.

The manufacturer declines all liability for any damage that may be caused whether directly or indirectly to persons or things if these instructions are not heeded.

MANUAL STORE

This manual and the unit's wiring diagram should be carefully stored so that they are readily available to the operator when required.

EXPERT PERSONAL

The unit must be installed, tested and maintained by expert personal who meet the relevant legal requirements (Italian law No. 46 of 5/3/1990).

LOCAL SAFETY REGULATION INSTALLATION

The installation must be performed observing the local safety regulations.

POWER SUPPLY

Make sure the power supply conforms to the data on the unit's rating plate, located inside the door of the main electrical panel.

PACKAGING

The packaging material (plastic bags, polystyrene foam, nails, etc.) is potentially dangerous and should therefore be kept away from children and recycled in compliance with the local regulations in force.

MAINTENANCE

Before performing any service operations, cut off the power. Perform the operations in conformity with the local regulations in force.

PERIODICAL INSPECTIONS

Perform periodical inspections to locate possible loosened or broken parts. If the repairs are not performed, there will be a higher risk for things and peoples to become damaged and injured.

FAULT – POOR OPERATION

Switch off the unit in the event of faults or poor operation.

REPAIR

Only have repairs carried out by a service centre authorised by the manufacturer, and insist on the use of original spare parts only.

Failure to comply with the above may compromise the safety of the unit.

MODIFICATIONS

The manufacturer will not accept any responsibility, and the warranty will lapse, in the event of electric and/or mechanical modifications. Any modification which is not formally authorized, and which does not respect the instructions given in this manual, will cause the warranty to lapse.

INTENDED USE

The unit must only be used for the specific purpose it was designed, as described in the paragraph GENERAL TECHNICAL SPECIFICATIONS. Any use other than that specified does not imply any commitment or constraint by the manufacturer in any way whatsoever.

ADDITIONAL SAFETY PRECAUTIONS

This unit has been especially designed and manufactured so to prevent any risk to persons and health hazard.

For this reason, design solutions fit to eliminate (where possible) any cause of risk and sensibly reduce the probability of danger have been adopted.

Please refer to the "**Residual Risks**" section of this manual and strictly observe the behaviour prescriptions listed there in order to prevent any possible risk that hasn't been possible to avoid in the design stage.

DATA UPDATING

The manufacturer may be able to modify the data without prior notice as a consequence of constant improvements.

INTENDED USE

The unit is designed to cool/heat water or a water and glycol mix for air-conditioning, within the limits defined in the technical bulletin and this manual.

- GENERAL -**TECHNICAL CHARACTERISTICS OF STANDARD UNITS****COMPRESSOR**

Scroll compressor complete with: overload thermal protection, high refrigerant discharge temperature, rubber antivibration mounts, oil charge, acoustic and weather proof cabinet. A oil heater is automatically switched on at the compressor shut-down to prevent oil dilution by the refrigerant.

STRUCTURE

hot-galvanized and painted plate structure with pre-painted aluminium external panelling to ensure maximum weatherability. The uniform distribution of the weight of the unit is guaranteed by the base structure, made up of galvanized and painted plate section bars, and featuring holes to simplify the lifting and earthing of the unit.

AIR EXCHANGER

Heat exchange coil with aluminium fins and copper tubes in staggered rows. The coils are complete with integral subcooling circuit which assures the correct refrigerant feeding of the expansion valve. Available in different options as per optional list.

WATER EXCHANGER

Direct expansion heat exchanger, with 316 stainless steel braze-welded plates and large exchange surface, complete with external anticondensate heat insula-tion. Two independent alternating water / freon refrigerant circuits, with cross flow to optimise heat exchange; complete with safety differential pressure switch on the water side and antifreeze heater to protect against the risk of freezing.

The differential pressure switch on the water side is supplied as standard.

FAN

helical fans with die-cast aluminium blades, directly coupled to a three-phase electric motor with external rotor, with built-in thermal overload protection, IP 54 index of protection. Housed inside an aerodynamically shaped nozzles to in-crease efficiency and minimise noise levels; fitted with safety grills.

REFRIGERANT CIRCUIT

The units are made with two independent refrigerant circuits, each with:

- high pressure safety valve
- low pressure safety valve
- solenoid valves
- thermostatic expansion valve with equalizer
- pressure probes
- high pressure switch
- low pressure switch
- replaceable anti-acid solid cartridge dehydrator filter
- compressor suction shut-off valve
- compressor discharge shut-off valve
- liquid line shut-off valve
- liquid flow and moisture indicator
- liquid receiver
- non-return valve
- 4-way reverse cycle valve
- liquid separator

ELECTRICAL PANEL

the Power Section includes:

- main door lock isolator switch
- isolating transformer for auxiliary circuit power supply
- compressor circuit breaker
- fan overload circuit breakers
- compressor control contactor
- fan control contactors
- phase-cutting fan speed control

the control section includes:

- proportional + integral water temperature control
- antifreeze protection
- compressor overload protection and timer
- self-diagnosis system with immediate display of the error code
- compressor operating hour display

- remote ON/OFF control
- automatic compressor start rotation control
- relay for remote cumulative fault signal
- H2o antifreeze and high refrigerant gas pressure pre-alarm function that reduces cooling capacity to avoid unit shut-down
- display of the set values, the error codes and the parameter index
- ON/OFF and alarm reset buttons
- UP and DOWN buttons to increase and decrease the values
- interface terminal with graphic display
- input for demand limit (absorbed power limit according to an external signal 0÷10V or 4÷20mA)

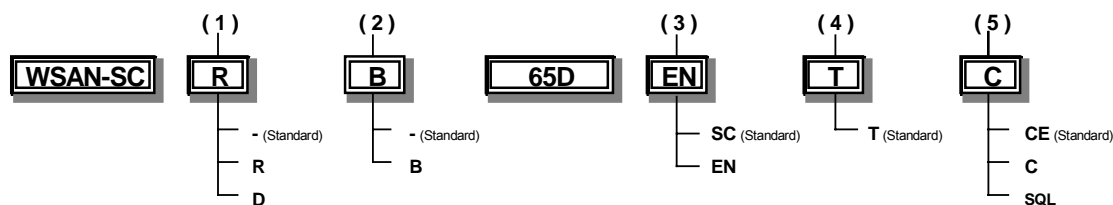
ACCESSORIES

- copper / aluminium condenser coils with acrylic lining
- copper / copper condenser coils
- copper / tinned copper condenser coils
- copper / aluminium condenser coils with Fin Guard (Silver) treatment
- steel mesh strainer to be mounted at the exchanger inlet. Suitable for filtering water and trapping the impurities present in the water circuit.
- condenser coil and compressor compartment protection grill.
- R-22
- Hydro Pack
- Anti-ice electric heaters utility side for hydronic group
- Free contacts for compressor state
- phase monitor
- power factor correction capacitors (cosfi > 0.9)
- set point compensation with outside temperature probe
- set point compensation with 4-20 mA signal
- set point compensation according to the outside enthalpy
- data logger
- high and low pressure gauges
- remote microprocessor control unit
- spring antivibration mounts
- rubber antivibration mounts
- ECOBreeze
- Master-Slave function

TEST

All the units are tested in factory in specific steps, before shipping them. After the approval, the humidity volume present in all circuits are analyzed, in order to ensure the respect of the limits set by the manufacturers of the different components.

CONFIGURAZIONE COSTRUTTIVA



(1) ENERGY RECOVERY

Not required (-)

Partial Recovery (D)

sizes 75C - 90C NOT AVAILABLE

Performed using braze-welded plate exchangers suitable for recovering the desuperheating heat, up to a maximum of 20% of the total heat of the unit.

Total Recovery (R)

sizes 75C - 90C NOT AVAILABLE

performed using braze-welded plate exchangers suitable for recovering 100% of the condensing heat for the production of hot water.

(2) LOW TEMPERATURE

Low water temperature (B)

range of application of this version is between +5°C down to -8°C using glycol solution.

(3) ACOUSTIC CONFIGURATION compressors soundproofing (SC)

this configuration is obtained by inserting the compressors in a soundproofed chamber.

Extremely low noise (EN)

this configuration is achieved by further soundproofing the compressor compartment and reducing the speed of the fans, with a larger condensing section.

(4) ENERGY EFFICIENCY

Temperate Climate (T)

standard

(5) HEAT EXCHANGERS APPROVALS

CE = PED (European testing)

C = CLIVET (Internal testing)

SQL

- REGULATIONS AND CERTIFICATIONS -**UNI EN ISO 9001 CERTIFICATION**

CERTIFIED QUALITY SYSTEM
UNI EN ISO 9001:2000

Clivet S.p.A., in order to guarantee customer satisfaction, has chosen the ISO 9001 Quality System as the reference for all its business activities. This is demonstrated by the company's commitment to ongoing improvements in the quality and reliability of its products; its sales, design, purchasing, production and after-sales service activities are the means used to reach such purpose.

CE MARK

Clivet products bear the CE mark, in compliance with the requirements of the following EC directives, including the latest amendments, and with the corresponding national approximated legislation:

- 98/37/CE
- 89/336/CEE as modified by the directives 92/31/CEE and 93/68/CEE
- 73/23/CEE as modified by the directive 93/68/CEE
- 97/23/CE

EUROVENT CERTIFICATION

Clivet is participating in the EUROVENT Certification Programme "Liquid Chilling Packages". Products are listed in the EUROVENT Directory of Certified Products and in the site www.eurovent-certification.com. Eurovent Chillers Certification Programme covers air cooled packaged chillers up to 600 kW and water cooled packaged chillers up to 1500 kW.

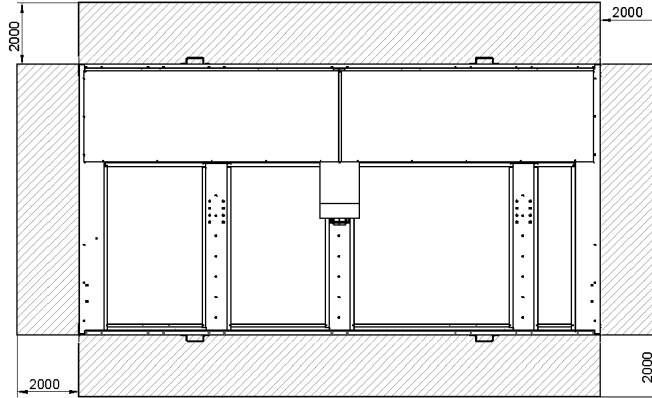
GENERAL

This section lists some of the more common situations which, being beyond the control of the manufacturer, could be a source of risk to persons or property.

DEFINITION OF DANGER AREA

The figure below highlights the area in which only authorised personnel may operate.

- External danger zone, identified by a precise area around the unit and its vertical projection on the ground in the case of hanging unit.
- Internal danger zone, identified by the area that can be entered only after having intentionally removed the protecting panels or parts of these.



Note: Measures are in mm.

HANDLING

If handling operations are undertaken without adopting all the necessary safety procedures and exercising due care, the unit can fall or topple, causing damage — possibly extremely serious — to persons and/or property, and to the unit itself. Ensure the unit is handled and manoeuvred as directed on the packing and in the present manual, and in accordance with local regulations. In the event of refrigerant gas escaping, refer to the “Safety datasheet” for the particular refrigerant.

INSTALLATION

- Incorrect installation of the unit can result in water leaks, accumulation of condensate, escape of refrigerant, electric shocks, fire, as well as irregular operation or damage to the unit itself. Make certain that only a qualified technician carries out the installation, also that the directions contained in this manual are followed and local statutory regulations observed.
- In the event of the unit being installed in a site where there is even the slightest risk of inflammable gas escapes and consequently the possibility of such gases accumulating in area around the unit, the risk of explosion and fire cannot be discounted. Take every care and precaution when selecting the installation site.
- Installation on a structure not able to bear the weight and/or afford a secure anchorage of the equipment may cause the unit to fall and/or topple, resulting in damage to persons or property, or to the unit itself. Make certain that every care and precaution is taken when positioning and securing the unit.
- If the unit is easily accessible to children, unauthorized persons or animals, this is a situation that can give rise accidents and injuries, perhaps serious. Install the unit in a place where access is allowed only to authorized persons, or install barriers or guards preventing unauthorized entry.

GENERAL RISKS

- A smell of burning, smoke or other indications of serious irregularity could signal the onset of situations liable to cause damage to persons or property or to the unit itself. Isolate the unit from the electrical power supply (red-and-yellow switch), and contact an authorized service centre so that the source of the problem can be identified and remedied.
- Accidental contact with heat exchange coils, compressors, pressure pipelines or other components can result in wounding or burns, or both. Always wear suitable clothing, including protective gloves, when working in the danger area.
- Maintenance or repairs carried out by unskilled operatives can result in harm or damage to persons and property, or to the unit itself. Always contact an authorized service centre.
- Failure to close the panels of the unit, or to check that all the fixing screws of the panels are properly tightened, can result in harm or damage to persons or property, or to the unit itself. Verify periodically that all panels are closed and made properly secure.
- In the event of fire, the temperature of the refrigerant can rise to the point that pressure will exceed safety levels and perhaps cause fluid to be projected. It may also happen that parts of the circuit isolated by closed valves will explode. Do not stand near safety valves, and never leave the valves of the refrigerant circuit closed.

ELECTRICAL SYSTEM

- If the power line connecting the unit to the a.c. supply is incomplete, or if the connection is made with cables of incorrect cross section and/or with insufficiently rated protective devices, this can result in electric shock, toxicity hazard, damage to the unit or fire. All work on the electrical system should be carried out referring to the wiring diagram and to the directions given in this manual, and the system itself must be dedicated.

- RESIDUAL RISKS -

- Failure to secure the cover enclosing electrical components can lead to the infiltration of dust and water, ultimately causing electric shocks, damage to the unit, or fire. Always fasten the cover securely to the unit.
- If live metal parts of the unit are not connected properly to the earth system, they can cause electric shock or even death by electrocution. Make absolutely certain that the connection to the earth system is made in accordance with correct practice.
- Contact with live parts rendered accessible internally of the unit when the guards are removed can result in electric shock, burns or death by electrocution. Before exposing these parts, make certain the isolating switch on the power line to the unit is set to the OFF position and padlocked, and post a warning sign.
- Contact with parts that could become live when the unit is started up can result in electric shock, burns or death by electrocution. When there is no need for circuits to be powered up, set the isolating switch on the power line to the OFF position, padlock it and post a warning sign.

MOVING PARTS

- Contact with the fan rotors can cause injury. Before removing the protective grilles or the fans themselves, make certain the isolating switch on the power line to the unit is set to the OFF position and padlocked, and post a warning sign.
- Contact with the fan rotors can cause injury. Before removing the protective grilles or the fans themselves, make certain the isolating switch on the power line to the unit is set to the OFF position and padlocked, and post a warning sign.

REFRIGERANTS

- In the event of safety valves coming into operation and releasing refrigerant gas, persons in the vicinity can be injured or suffer toxic effects. Always wear suitable clothing and protective goggles when working in potential hazard areas. In the event of refrigerant gas escaping, refer to the "Safety datasheet" for the particular refrigerant.
- If an open flame or heat source is brought into contact with the refrigerant, or the pressurized gas circuit should overheat (e.g. during welding operations), this can cause explosion or fire. Do not position any heat source within the hazard area. Maintenance or repair operations involving welding must be carried out with the system emptied of refrigerant.

WATER SYSTEM

- Defects affecting pipelines, connections or valves and other control components can result in water being leaked or sprayed from the system, occasioning damage to property or causing short circuits in the unit. Make certain all hydraulic connections are securely made, following the directions given in the present manual.

REFRIGERANT SAFETY CHARTS

		R-407C
01	Identifying elements for the substance	Product name: forane 407C N°SDS 01965/1 Supplier: ELF ATOCHEM ITALIA Via G.Murat 17, 20159 Milano tel. 02/668111
02	Information concerning composition of components	Chemical nature of the compound Mixture based on: <ul style="list-style-type: none"> • Forane 32(difluoromethane) (N° CAS: 75-10-5) • Forane 125 (pentafluoroethane) (N° CAS: 354-33-6) • Forane 134a (1.1.1.2 tetrafluoroethane) (N° CAS: 811-97-2)
03	Identification of risk	Greatest physical and chemical dangers: Thermal decomposition in toxic and corrosive products
04	First-aid measures	General information: Inhalation: Carry the victim into the open air. Resort to oxygen or artificial respiration if necessary. Contact with skin: Frostbite must be treated in the same way as burns. Contact with the eyes: Immediate rinsing in abundant water. If irritation should continue, consult an ophthalmologist. Medical instructions: Do not administer catecholamines (due to the cardiac sensitisation caused by the product)
05	Fire prevention measures	Specific dangers: Thermal decomposition into toxic and corrosive products. Hydrofluoric acid. Carbon monoxides. Specific means of intervention: Cool containers/cisterns with jets of water. Prevent any sparks or flames. Do NOT smoke. Special protection systems for fire-fighting squads: Carry breathing apparatus and wear protective clothing.
06	Measures to take in case of accidental spillage	Individual precautions: Avoid contact with the skin, eyes and inhalation of vapours. Use personal protection devices. In an enclosed space: ventilate or use breathing apparatus (risk of suffocation). NO SMOKING ALLOWED Precautions for environmental protection: Minimise the amount of waste deposited in the environment.
07	Manipulation and storage	Technical measures/precautions. Form of storage and manipulation applicable to the products: PRESSURIZED GAS. Ensure adequate ventilation and evacuation for the level of equipment. Advice for use: Prevent sparks and contact with hot surfaces. DO NOT SMOKE. Technical measures/Storage procedures: Store at room temperature in the original container. Keep away from flames, hot surfaces and sparks. Store in a cool, well-ventilated place. Protect full containers from sources of heat to avoid excessive pressures. Recommended: Ordinary steel. Avoid: Alloy containing more than 2% magnesium. Plastics.

- RESIDUAL RISKS -

		R-407C
08	Control of individual exposure/protection	<p>Precautionary measures to be taken: Ensure a sufficient exchange of air and/or suction in workplaces.</p> <p>Control parameters. Exposure limits: There is no F-USA limit value Forane 134a Elf recommended limit value: VME=1000ppm Forane 32 Elf recommended limit value: VME=1000ppm Forane 125 Elf recommended limit value: VME=1000ppm Respiratory protection: In case of insufficient ventilation, carry suitable breathing apparatus. Protection for the hands: Gloves Protection for the eyes: Protective eyewear.</p>
09	Physical and chemical properties	<p>Physical state (20°C): liquid gas Colour: colourless Smell: Slightly similar to ether; pH: not applicable. Boiling point/interval: -42,4 °C Melting point/interval: Not inflammable in test conditions Vapour pressure: (25°C): 1.13 Mpa (11,3 bar) a (50°C): 2.11 Mpa (21,1 bar) a (70°C): 3.26 Mpa (32,6 bar) Vapour density: At boiling point 4,54 kg/m3 Density: (25°C) 1133 kg/m3 a (50°C) 1004 kg/m3 a (70°C) 861 kg/m3</p>
10	Stability and reactivity	<p>Conditions to avoid: Avoid contact with flames and red-hot metal surfaces. Dangerous decomposition products: Thermal decomposition into toxic and corrosive products: Toxic fluorinates Hydrogen fluoride (hydrofluoric acid) Further information: Product stable in normal storage and handling conditions</p>
11	Toxicological information	<p>Inhalation: Practically non-toxic in experiments conducted on animals Forane 134a, 32, 125. No rat mortality at 500000 ppm/4h. As with other volatile aliphatic halogenated compounds, with the accumulation of vapours and/or the inhalation of large quantities, the product can cause: loss of consciousness and heart problems aggravated by stress and lack of oxygen; risk of death. Contact with skin: Frostbite possible from splashes of liquefied gas. Chronic toxicity: Studies on extended inhalation in animals have not highlighted any sub-chronic toxic effect (rat/3 months/Inhalation:50000ppm) Specific effects: Genotoxicity, according to experimental data available Forane 134a, 32, 125 NOT Genotoxic Carcinogenic effect: Forane 134a experiments on animals have not demonstrated a clear cancerogenous effect (rat /oral inhalation) Toxicity for reproduction: Foetal development Forane 134a, 32, 125 according to available data there are no toxic effects for foetal development. Fertility, according to available data for animals: Forane 134a no effect on fertility (mice/inhalation)</p>
12	Ecological information	<p>Forane 32 Durability/degradability: Not easily biodegradable in water: 5% after 28d Bioaccumulation: Practically non-absorbable by biological organisms log pow 0,21 Forane 125 Mobility: Rapid evaporation t ½ life 3,2 h (estimated) Durability/degradability: Not easily biodegradable in water: 5% after 28 days. In the atmosphere degradation at rate of 1/2 life in 28,3 y (estimated). Potential for destruction of ozone ODP (R-11 = 1)=0. Potential greenhouse effect (GWP): (HGWP) = 0,58. Low absorption in ground and sediments log Koc= 1,3-1,7 Bioaccumulation: Practically non-absorbable by biological organisms log pow 1,48 Forane 134a Mobility: Rapid evaporation t ½ life 3 h (estimated) Durability/degradability: Not easily biodegradable in water: 3% after 28 days. In the atmosphere degradation at rate of 3% after 28 days (estimated). Potential for destruction of ozone ODP (R-11 = 1)=0. Potential greenhouse effect (GWP): (HGWP) = 0,26. Bioaccumulation: Practically non-absorbable by biological organisms log pow 1,06</p>
13	Notes concerning disposal	Disposal of product: recycle or incenerate.
14	Information on shipping	<p>Consult the ELF ATOCHEM safety service for supplementary information and updates ONU number 3163. RID/ADR class 2 figure (and letter) 4° a Regulations: No. danger/No. material 20/3163 label 2 IMDG class 2.2 ONU (IMDG) 3163 Regulations: 2.2 /2 label IATA class 2.2 ONU (IATA) or No.ID 3163 Regulations: 2.2 /2 label</p>
15	Information on regulation	<p>EEC directives Security reports: D.91/155/CEE modified by D.93/112/CEE: Dangerous substances Classification/CE mark Dangerous manufactured compounds: Not classified as dangerous Inventory: EINECS compliant</p>
16	Other information	<p>Recommended uses: low-temperature coolant Bibliographical references: Encyclopedie des gas (Air Liquide-ed.1976- ELSEVIER AMSTERDAM)</p>

This document refers to the product as is and which conforms to the specifications supplied by ELF ATOCHEM.

If combinations or mixtures are made, check that there are no new dangers resulting from this action. The information provided in this report has been provided in good faith and is based on our latest knowledge of the product in question as of the date of publication of the same. The attention of users is drawn to the potential risks of employing the product for any use other than that for which it is intended. This report must be used and reproduced solely for purposes of prevention and safety. The list of legislative, regulatory or administrative texts must not be considered exhaustive. The product user is under obligation to refer to all the official texts concerning the use, conservation and manipulation of the product for which he is sole responsible. The product user must also provide all those who might come into contact with the product with the information necessary for their safety at work and the protection of their health and that of the environment, giving them a copy of this safety information report.

- ELECTRICAL DATA -

GENERAL SPECIFICATIONS

Acoustic configuration: compressors soundproofing (SC)

SIZES		65D	70D	75C	75D	80D	90C	90D	100D	110D	120D	135F	150F	165F	180F
COOLING															
Cooling capacity	1 kW	172	177	186	189	199	231	224	251	294	323	348	393	423	454
Compressor power input	kW	58.1	61.3	72.1	64.4	68.1	87.8	76.2	84.1	97.7	107	115	129	148	169
Total power input	2 kW	66.2	69.4	78	74.4	80	95.6	88.1	96	110	119	130	145	165	185
EER	Nr	2.6	2.55	2.38	2.54	2.49	2.42	2.54	2.61	2.67	2.71	2.68	2.71	2.56	2.45
HEATING															
Heat output	3 kW	176	188	196	195	200	243	236	266	298	334	349	396	427	470
Compressor power input	kW	56.7	59.9	61.8	62.3	65.5	80.2	73.7	80.4	91.6	104.1	113.7	128.2	139.7	156.2
Total power input	2 kW	64.8	68.1	67.7	72.2	77.2	88.5	85.5	92.1	104	116	129	145	156	173
COP	Nr	2.72	2.76	2.9	2.7	2.59	2.75	2.76	2.89	2.87	2.88	2.71	2.73	2.74	2.72
COMPRESSOR															
Type of compressors		SCROLL													
No. of Compressors	Nr	4	4	3	4	4	3	4	4	4	4	6	6	6	6
Nominal power (C1)	HP	30	35	75	35	40	90	45	50	55	60	60	75	75	90
Nominal power (C2)	HP	35	35	0	40	40	0	45	50	55	60	75	75	90	90
Std Capacity control steps	Nr	4	4	3	4	4	3	4	4	4	4	6	6	6	6
Oil charge (C1)	l	8.2	8.8	18.9	8.8	9.4	17.7	11	12.6	12.2	11.8	14.1	18.9	18.9	17.7
Oil charge (C2)	l	8.8	8.8	0	9.4	9.4	0	11	12.6	12.2	11.8	18.9	18.9	17.7	17.7
Refrigerant charge (C1)	kg	28	28	25	28	40	25	40	40	40	60	60	60	60	80
Refrigerant charge (C2)	kg	28	28	0	40	40	0	40	40	60	60	60	60	60	80
Refrigerant circuits	Nr	2	2	1	2	2	1	2	2	2	2	2	2	2	2
INTERNAL EXCHANGER															
Type of internal exchanger	4	PHE													
No. of internal exchangers	Nr	1													
Water flow rate	l/s	8.2	8.5	8.9	9	9.5	11	10.7	12	14	15.4	16.6	18.8	20.2	21.7
Pressure drop	kPa	33.2	36.5	26.8	26.7	29.1	35.1	33.2	35.7	32.6	38.8	30.7	38.1	37.7	43.5
Water content	l	17.2	17.2	19.7	19.7	19.7	21.4	21.4	23.9	29	29	37.4	37.4	42.5	42.5
EXTERNAL EXCHANGER															
Front surface	m ²	11.9	11.9	9.5	11.9	11.9	9.5	11.9	11.9	17.3	17.3	17.3	17.3	17.3	17.3
EXTERNAL SECTION FANS															
Type of fans	5	AX													
Number of fans	Nr	4	4	3	5	6	4	6	6	6	6	7	8	8	8
Standard air flow	l/s	24711	24524	17212	29259	33994	22378	32869	32869	36677	36677	45614	50156	50156	50156
CONNECTIONS															
Liquid fitting		3"													
STANDARD UNIT WEIGHTS															
Shipping weight	kg	2228	2351	1863	2422	2495	2178	2531	2562	3008	3255	3510	3605	3903	4123
Operating weight	kg	2244	2367	1882	2441	2514	2198	2551	2585	3036	3283	3546	3641	3943	4163

According to EUROVENT the Total Power Input does not consider the pump share, re-quired to overcome the pressure drop for the solution circulation inside the exchangers.

Weight referred to standard unit; according to the considered accessories unit weight can noticeably change.

(1) data referred to the following conditions :

internal exchanger water = 12/7°C

outside air temperature 35°C

(2) data referred to the following conditions:

internal exchanger water = 40/45°C

outside air temperature = 6.1°C W.B.

(3) PHE = plates

(4) AX = axial-flow fan

SETTING THE CUT-OUT DEVICES AND CONTROLS

		Open	Closet	Value
High pressure switch	kPa	2700	1940	--
Low pressure switch	kPa	230	360	--
Low pressure switch (Brine)	bar	110	240	
Antifreeze protection	°C	4	6,5	
Safety valve	kPa	--	--	3000
Low pressure safety valve	kPa	--	--	1900
Max no. of compressor starts per hour	Nr	--	--	10
High compressor discharge temperature safety thermostat	°C	--	--	120

Acoustic configuration: Extremely low noise (EN)

SIZES		65D	70D	75C	75D	80D	90D	100D	110D	120D	135F	150F
COOLING												
Cooling capacity	1 kW	163	171	189	183	192	221	246	292	314	331	374
Compressor power input	kW	61.3	64.8	70.5	68.1	71.1	79.9	91.5	99.1	113	121	136
Total power input	2 kW	66.6	70.1	75.6	74.6	78.8	87.6	99.3	107	121	131	147
EER	Nr	2.45	2.44	2.5	2.45	2.44	2.52	2.48	2.73	2.6	2.53	2.54
HEATING												
Heat output	3 kW	175	184	197	191	201	238	261	297	328	345	391
Compressor power input	kW	56.7	59.8	61.7	62.1	65.3	74.5	85.4	92.8	104	115	128
Total power input	2 kW	62	65.3	67	68.8	73.1	82.4	92.3	100	112	124	139
COP	Nr	2.82	2.82	2.94	2.78	2.75	2.89	2.83	2.97	2.93	2.78	2.81
COMPRESSOR												
Type of compressors		SCROLL										
No. of Compressors	Nr	4	4	3	4	4	4	4	4	4	6	6
Nominal power (C1)	HP	30	35	75	35	40	45	50	55	60	60	75
Nominal power (C2)	HP	35	35	0	40	40	45	50	55	60	75	75
Std Capacity control steps	Nr	4	4	3	4	4	4	4	4	4	6	6
Oil charge (C1)	l	8.2	8.8	19	8.8	9.4	11	12.6	12.2	11.8	14.1	18.9
Oil charge (C2)	l	8.8	8.8	0	9.4	9.4	11	12.6	12.2	11.8	18.9	18.9
Refrigerant charge (C1)	kg	28	28	25	28	40	40	40	40	60	60	60
Refrigerant charge (C2)	kg	28	28	0	40	40	40	40	60	60	60	60
Refrigerant circuits	Nr	2	2	1	2	2	2	2	2	2	2	2
INTERNAL EXCHANGER												
Type of internal exchanger	4	PHE										
No. of internal exchangers	Nr	1										
Water flow rate	l/s	7.8	8.2	9	8.7	9.2	10.6	11.8	14	15	15.8	17.9
Pressure drop	kPa	31.8	34.9	27.5	25.5	27.9	32.8	34.2	32.3	37.5	29.5	36.7
Water content	l	17.2	17.2	19.7	19.7	19.7	21.4	23.9	29	29	37.4	37.4
EXTERNAL EXCHANGER												
Front surface	m ²	11.9	11.9	9.5	11.9	11.9	11.9	11.9	17.3	17.3	17.3	17.3
EXTERNAL SECTION FANS												
Type of fans	5	AX										
Number of fans	Nr	4	4	4	5	6	6	6	6	6	7	8
Standard air flow	l/s	18695	18521	16467	21792	25064	24088	24088	27685	27685	34282	37170
CONNECTIONS												
Liquid fitting		3"										
STANDARD UNIT WEIGHTS												
Shipping weight	kg	2248	2371	2107	2442	2515	2551	2582	3028	3275	3530	3625
Operating weight	kg	2264	2387	2126	2461	2534	2571	2605	3056	3303	3566	3661

According to EUROVENT the Total Power Input does not consider the pump share, re-quired to overcome the pressure drop for the solution circulation inside the exchangers.

Weight referred to standard unit; according to the considered accessories unit weight can noticeably change.

(1) data referred to the following conditions :

internal exchanger water = 12/7°C

outside air temperature 35°C

(2) data referred to the following conditions:

internal exchanger water = 40/45°C

outside air temperature = 6.1°C W.B.

(3) PHE = plates

(4) AX = axial-flow fan

EXCHANGER OPERATING LIMIT (SC-EN)

	INTERNAL EXCHANGER		
	Maximum operating pressure on refrigerant side (kPa)		Maximum operating pressure on water side (kPa)
	Standard	Basse temperature - B	
CLIVET (C)	3200	3200	2500
PED (CE)	3200	3200	2500

for different approvals contact our sales office

- ELECTRICAL DATA -

Acoustic configuration: compressors soundproofing (SC)

OPERATING LIMITS (COOLING)

SIZES		65D	70D	75C	75D	80D	90C	90D	100D	110D	120D	135F	150F	165F	180F
EXTERNAL EXCHANGER															
Max air intake temperature	1 °C	45	45	43	45	45	43	45	45	45	45	45	45	43	43
Max air intake temperature	2 °C	47	47	45	47	47	45	47	47	47	47	47	47	45	45
Min. air intake temperature	3 °C	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
Min. air intake temperature	4 °C	-5	-5	-6	-5	-5	-8	-5	-5	-5	-5	-5	-5	-6	-6
Min. air intake temperature	5 °C	5	5	4	5	5	3	5	5	5	5	5	5	4	4
Min. air intake temperature	6 °C	15	15	13	15	15	12	15	15	15	15	15	15	13	13
INTERNAL EXCHANGER															
Max water inlet temperature	°C								22						
Min. water outlet temperature	7 °C								6						
Min. water outlet temperature	8 °C								-8						

OPERATING LIMITS (HEATING)

SIZES		65D	70D	75C	75D	80D	90C	90D	100D	110D	120D	135F	150F	165F	180F
EXTERNAL EXCHANGER															
Max air temperature inlet (WB)	9 °C								23						
Min air inlet temperature (W.B.)	°C								-5						
INTERNAL EXCHANGER															
Min. water outlet temperature	°C								30						
Max water outlet temperature	°C	53	53	53	53	53	52	53	52	51	52	51	51	51	51

Acoustic configuration: Extremely low noise (EN)

OPERATING LIMITS (COOLING)

SIZES		65D	70D	75C	75D	80D	90D	100D	110D	120D	135F	150F
EXTERNAL EXCHANGER												
Max air intake temperature	1 °C	43	43	43	43	43	44	42	44	43	43	43
Max air intake temperature	2 °C	45	45	45	45	45	46	44	46	45	45	45
Min. air intake temperature	3 °C	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
Min. air intake temperature	4 °C	-6	-6	-7	-6	-6	-5	-6	-6	-6	-6	-6
Min. air intake temperature	5 °C	4	4	3	4	4	5	3	5	4	4	4
Min. air intake temperature	6 °C	13	13	12	13	13	14	12	14	13	13	13
INTERNAL EXCHANGER												
Max water inlet temperature	°C								22			
Min. water outlet temperature	7 °C								6			
Min. water outlet temperature	8 °C								-8			

OPERATING LIMITS (HEATING)

SIZES		65D	70D	75C	75D	80D	90D	100D	110D	120D	135F	150F
EXTERNAL EXCHANGER												
Max air temperature inlet (WB)	9 °C								23			
Min air inlet temperature (W.B.)	°C								-5			
INTERNAL EXCHANGER												
Min. water outlet temperature	°C								30			
Max water outlet temperature	°C	53	53	53	53	53	53	53	51	53	52	52

internal exchanger water = 12/7°C

difference between inlet / outlet water temperature = 5°C

Warning: the still air condition is meant as absence of air flow to the unit. Any wind condition can let air pass through the condenser coil thus worsening the operating limits of the unit (see limits with air speed at 0,5 m/s & 1 m/s). Note: In any case, the unit should never be exposed to or operated, transported and/or stored at temperatures below -10°C.

ATTENTION: IN CASE OF PREDOMINANT WINDS, WINDBREAK BARRIERS ARE NE-CESSARY.

- (1) Max inlet temperature - unit at full load
- (2) Max inlet air temperature - capacity-controlled unit with standard limit device
- (3) Min inlet air temperature - unit at full load and motionless ambient air
- (4) Min inlet air temperature - unit at partial load and motionless ambient air
- (5) Min inlet air temperature - unit at partial load and air speed of 0.5 m/s.
- (6) Min inlet air temperature - unit at partial load and air speed of 1 m/s.
- (7) Standard Version

external exchanger air intake 35°C

(8) Low temperature version

external exchanger air intake 35°C

Fluid with ethylene glycol of 40%

(9) unit at full load

internal exchanger water = 40/45°C

FOULING CORRECTION FACTORS

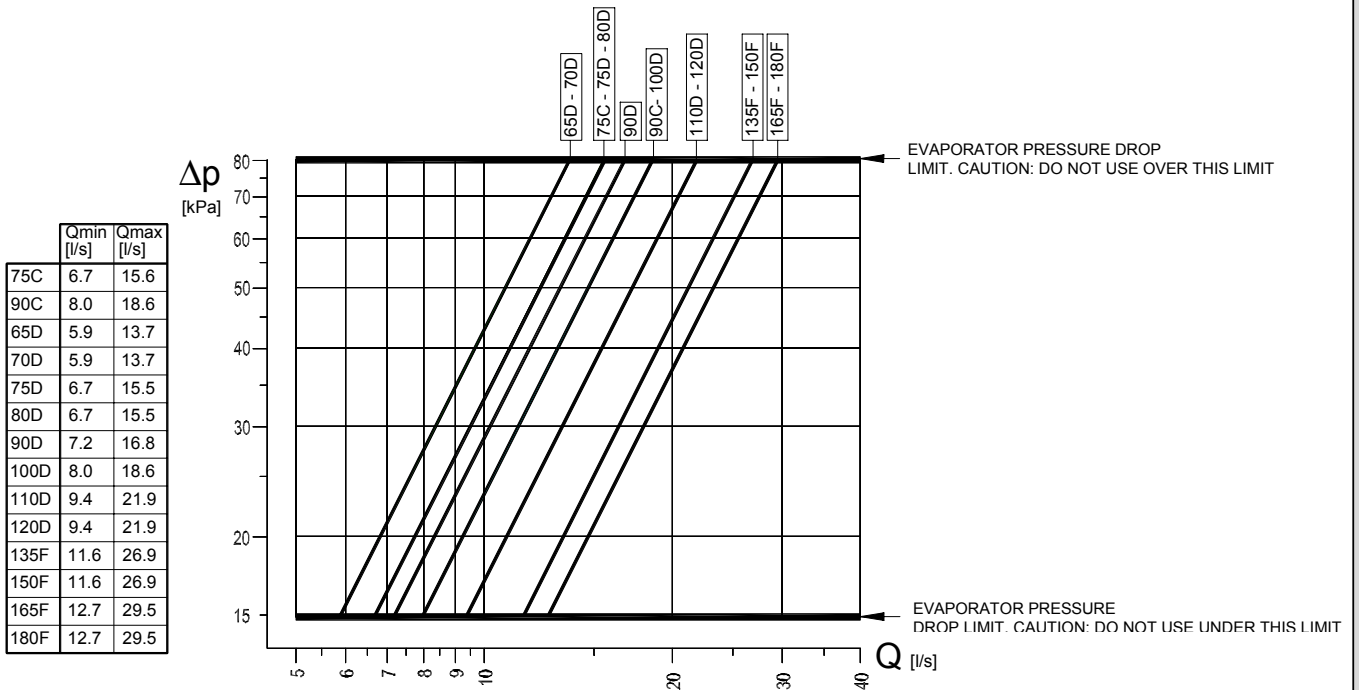
m ² °C/W	INTERNAL EXCHANGER	
	Cooling capacity correction factors	Cooling capacity correction factors
0.44 x 10 ⁻⁴	1.00	1.00
0.88 x 10 ⁻⁴	0.97	0.99
1.76 x 10 ⁻⁴	0.94	0.98

CORRECTION FACTORS FOR GLYCOL USE

% ethylene glycol by weight		5%	10%	15%	20%	25%	30%	35%	40%
Freezing temperature	°C	-2.0	-3.9	-6.5	-8.9	-11.8	-15.6	-19.0	-23.4
Safety temperature	°C	3.0	1.0	-1.0	-4.0	-6.0	-10.0	-14.0	-19.0
Cooling Capacity Factor	Nr	0.995	0.990	0.985	0.981	0.977	0.974	0.971	0.968
Compressor input Factor	Nr	0.997	0.993	0.990	0.988	0.986	0.984	0.982	0.981
Internal exchanger Glycol solution flow Factor	Nr	1.003	1.010	1.020	1.033	1.050	1.072	1.095	1.124
Pressure drop Factor	Nr	1.029	1.060	1.090	1.118	1.149	1.182	1.211	1.243

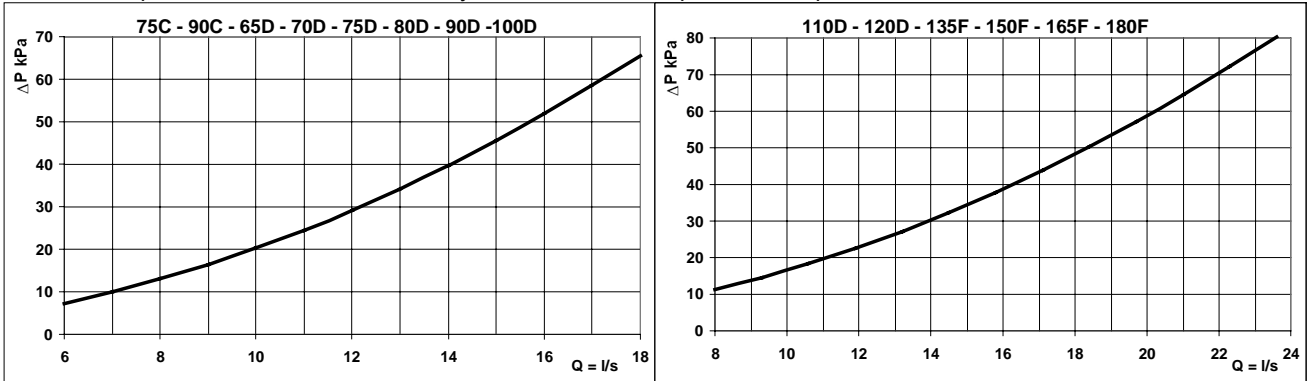
The correction factors shown refer to water and glycol ethylene mixes used to prevent the formation of frost on the exchangers in the water circuit during inactivity in winter.

INTERNAL EXCHANGER PRESSURE DROPS



WATER FILTER

Pressure drop of the "water filter" accessory to be added to the pressure drop of the unit.



- ELECTRICAL DATA -

SOUND LEVELS

ACOUSTIC CONFIGURATION

SC (STANDARD)

EN

Power supplied 33% - Ambient temperature 28°C

SIZES	Sound Power Level (dB)								Sound pressure level	Sound power level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
75C	86	85	81	79	73	67	64	56	61	79
90C	79	84	80	78	72	67	63	56	61	79
135F	86	88	84	82	76	70	67	60	63	83
150F	86	89	85	82	77	71	67	60	64	83
165F	86	89	85	83	77	71	68	61	64	84
180F	86	89	85	83	77	71	68	61	64	84

SIZES	Sound Power Level (dB)								Sound pressure level	Sound power level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
75C	83	84	80	77	72	68	63	57	60	79
135F	87	88	83	78	76	71	65	61	62	81
150F	88	88	84	80	76	71	66	62	62	82

Power supplied 50% - Ambient temperature 30°C

SIZES	Sound Power Level (dB)								Sound pressure level	Sound power level
	Octave band (Hz)									
	63	63	125	125	250	250	500	500	dB(A)	dB(A)
65D	97	93	94	90	86	82	75	69	73	92
70D	97	93	93	90	86	82	75	68	73	92
75D	97	93	93	90	86	82	75	68	73	92
80D	98	94	94	91	87	83	76	69	74	93
90D	97	93	93	90	86	82	75	68	73	92
100D	97	93	94	90	86	82	75	68	73	92
110D	99	95	96	92	88	84	77	71	75	94
120D	98	96	96	93	89	84	78	71	75	95

SIZES	Sound Power Level (dB)								Sound pressure level	Sound power level
	Octave band (Hz)									
	63	63	125	125	250	250	500	500	dB(A)	dB(A)
65D	86	89	85	81	78	73	67	60	64	83
70D	86	89	85	81	78	73	67	60	65	84
75D	86	89	85	82	78	73	67	60	65	84
80D	86	89	85	83	78	73	67	60	65	84
90D	86	89	85	82	78	73	68	60	65	84
100D	85	88	85	83	78	73	68	59	65	84
110D	88	91	87	84	80	75	69	62	67	86
120D	88	91	87	85	80	75	69	62	67	86

Power supplied 66% - Ambient temperature 30°C

SIZES	Sound Power Level (dB)								Sound pressure level	Sound power level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
75C	90	92	92	89	85	81	74	67	72	91
90C	93	92	93	90	85	81	75	67	73	91
135F	100	97	98	94	90	86	79	73	76	96
150F	101	97	98	95	91	86	80	73	76	96
165F	101	98	99	95	91	87	80	74	77	97
180F	101	98	98	95	91	87	80	73	77	97

SIZES	Sound Power Level (dB)								Sound pressure level	Sound power level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
75C	84	87	83	80	76	71	65	57	63	82
135F	91	94	90	86	83	77	71	65	69	88
150F	92	95	91	87	83	78	71	66	69	89

Power supplied 100% - Ambient temperature 35°C

SIZES	Sound Power Level (dB)								Sound pressure level	Sound power level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
65D	102	98	99	95	91	87	80	74	78	97
70D	102	98	98	95	91	87	80	73	78	97
75C	95	97	97	94	90	86	79	72	77	96
75D	102	98	98	95	91	87	80	73	78	97
80D	104	100	100	97	93	89	82	75	80	99
90C	98	97	98	95	90	86	80	72	78	96
90D	102	98	98	95	91	87	80	73	78	97
100D	102	98	99	95	91	87	80	73	78	97
110D	104	100	101	97	93	89	82	76	80	99
120D	103	101	101	98	94	89	83	76	80	100
135F	104	101	102	98	94	90	83	77	80	100
150F	105	101	102	99	95	90	84	77	80	100
165F	105	102	103	99	95	91	84	78	81	101
180F	105	102	102	99	95	91	84	77	81	101

SIZES	Sound Power Level (dB)								Sound pressure level	Sound power level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
65D	91	94	90	86	83	78	72	65	69	88
70D	91	94	90	86	83	78	72	65	70	89
75C	89	92	88	85	81	76	70	62	68	87
75D	91	94	90	87	83	78	72	65	70	89
80D	91	94	90	88	83	78	72	65	70	89
90D	91	94	90	87	83	78	73	65	70	89
100D	90	93	90	88	83	78	73	64	70	89
110D	93	96	92	89	85	80	74	67	72	91
120D	93	96	92	90	85	80	74	67	72	91
135F	95	98	94	90	87	81	75	69	73	92
150F	96	99	95	91	87	82	75	70	73	93

Measures according to ISO 3744 regulations, with respect to the EUROVENT 8/1 certification.
The sound pressure level refers to a distance of 1m from the external surface of the units operating in an open field..
data referred to the following conditions : internal exchanger water = 12/7°C.

INSPECTION UPON RECEPTION

Check on arrival that the unit has not suffered damage during transit and that it is complete in every part as specified in the order. In the event of visible damage/deficiencies being discovered, make a note immediately on the delivery document with the comment: "CONDITIONAL ACCEPTANCE — CLEAR EVIDENCE OF DEFICIENCIES/DAMAGE DURING TRANSIT", then inform both the supplier and the carrier of the details by fax and by registered mail with advice of receipt not later than 8 days after taking consignment. Notifications sent after 8 days have elapsed will be ignored.

STORAGE

Shelter from: direct sunlight, rain, sand and wind

Temperature: maximum 60°C minimum -10°C

Maximum humidity: 90%

The respect of the instructions on the exterior side of the packaging assures the physical and functional integrity of the unit for the final user's advantage.

It is recommended to:

- Handle carefully
- Keep in a dry place
- Avoid putting other objects on top of the unit (respect the limits of levels of superimposition shown in the package)
- Avoid placing the unit with thermoretractable protection under the sun since the pressure of the circuits can assume values which activate the safety valves.

HANDLING

The operation of handling the unit must be carried out respecting the instructions of the safety norms in force (Legislative Decree 626/94 and following modifications)

Before starting the handling operations:

- Value the critical points during handling (stairs, flights, disconnected routes, doors etc)
- Verify that the lifting capacity of the means used is adequate to the unit weight
- Consider that the barycentre could be moved with respect to the centre of the unit
- Before starting to lift, verify that the unit is at a stable balance

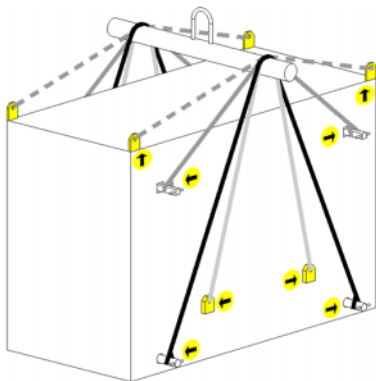
The following examples are indications; the choice of the means and of the handling modes will depend on factors, such as:

- The unit weight
- Type and overall dimensions of the unit
- Place and route for the handling (dirt yard, asphalted square, etc.)
- Condition of the place of destination (roof, square, etc.)
- Handling route characteristics (distances, flights, steps, doors).

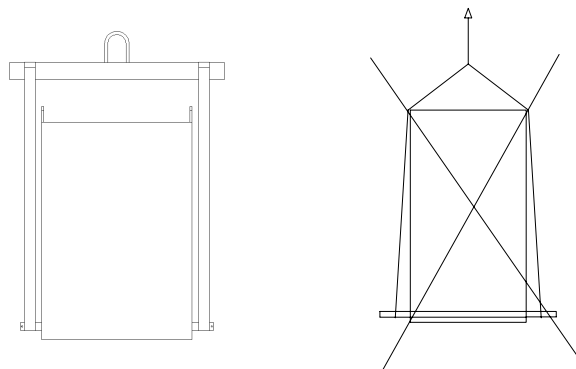
labels / yellow brackets show the lifting points

2 lifting points - use 2-arm uprights

(2 slopes/chains/slings per each side of the unit)
according to the unit type, the holes and/or lifting brackets are placed at different points

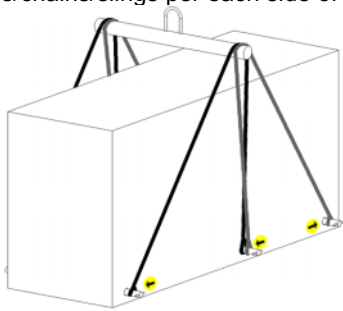


use a spacer bar to avoid damaging the unit

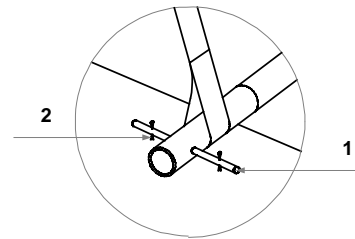


- RECEPTION -

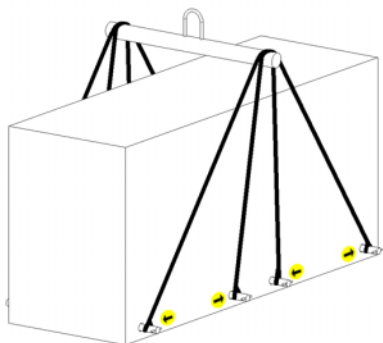
3 lifting points - use 3-arm uprights
(3 slopes/chains/slings per each side of the unit)



**Insert safety pins (1)
and split pins (2)**

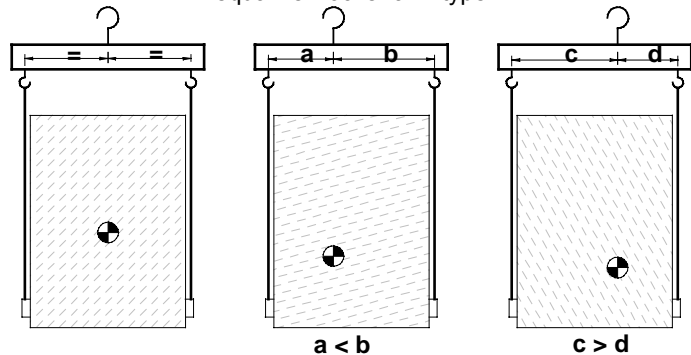


4 lifting points - use 4-arm uprights
(4 slopes/chains/slings per each side of the unit)



How to balance the charge

Move the upper hook or the lower hooks, according to the spring equalizer rocker arm type



● **Baricentro unità
unit barycentre**

REMOVING THE PACKING

For removing the packaging, use specific personal protection for the operator (gloves, glasses, etc.).

Remove the polystyrene packaging making sure not to damage the unit.

Check for any visible damage.

Dispose of the packaging by taking it to specialist collection or recycling centres, in accordance with local regulations.

GENERAL

For installing air-conditioning systems, it is necessary to consider the following:

- the technical spaces necessary for the machine and system
- the place where the machine will be installed
- the transport of thermal carrier fluids and relevant connections to the unit:
 - water
 - air
 - refrigerant (unit in more sections)
- electrical connections

If these aspects are not evaluated carefully, they can affect the performances and the working life of the unit.

FUNCTIONAL CLEARANCES

When placing the unit, please respect the functional clearances indicated in DIMENSIONS section.

The functional spaces need to be observed because of the following:

- guarantee good operation of the unit
- to allow the performance of all maintenance operations
- protect the authorized operators and exposed people

If more units are placed close to one another, the functional spaces must be doubled.

POSITIONING

The units are designed for the installation:

- outdoor installations must be performed in fixed positions and in areas accessible only to qualified and authorized personnel.
- 1. SAFETY VALVE (only if present on the unit): the installer is responsible for evaluating the opportunity of installing drain tubes, in conformity with the local regulations in force (EN 378)
- 2. Install the unit raised from the ground
- 3. Avoid installations in places subject to flooding
- 4. Consider the maximum level which can be reached by snow
- 5. Verify that the fixing/supporting points are level and suitable to support the weight of the unit (see the weight and the weights distribution).
- 6. Put a rubber layer between the supporting plan and the unit to avoid noise and vibrations. It is recommended to put the unit on specific anti-vibration devices (in this case, flexible joints are necessary on all the hydraulic/ aerualic connections – the joints are not supplied by Clivet).
- 7. Anchor the unit to the ground; foresee windbreak barriers in case of places where there are strong prevalent winds
- 8. Install in the false ceiling the opening indicated in the functional clearances to allow the access to the unit for the maintenance operations. Leave both the unit's ground projection the functional spaces free so that there is access to the stairs or other units.
- 9. In winter operating is produced a considerable quantity of condensate that has to be disposed by the unit. Verify that the condensation drain tube does not cause any problems to people or things (for example, dropping from terraces, walking places, etc.).

In case of long periods of working in the heat pump with external temperature lower than 0°C the condensation could freeze and create ice accumulation; evaluate the opportunity of installing anti-freeze resistances

For units equipped with the condensation drain tube connection, it is possible to see it in the dimensional drawing.

The choice of where to position the unit is of fundamental importance for its use and working; therefore, there are things to avoid:

- Obstacles to the air flow
- Difficulties of air circulation
- Leaves or other objects which can obstruct the exchange coils.
- Winds which contrast or favour too much air flow
- Phenomena's of stratification or of air circulation
- Sources of heat in the nearby vicinity
- Positioning under the round level or near very high walls (evaluate with attention)

The previous situations cause working anomalies or stop the machine and cause:

- During SUMMER operation, increase of the condensation pressure with the decay of performances and possible stops due to high pressure.
- During WINTER operation, decrease of the evaporation pressure with increase to the amount of defrosting and consequent decay of the performances and possible stops due to high pressure.

INSTALLATION OF ANTIVIBRATION MOUNTS

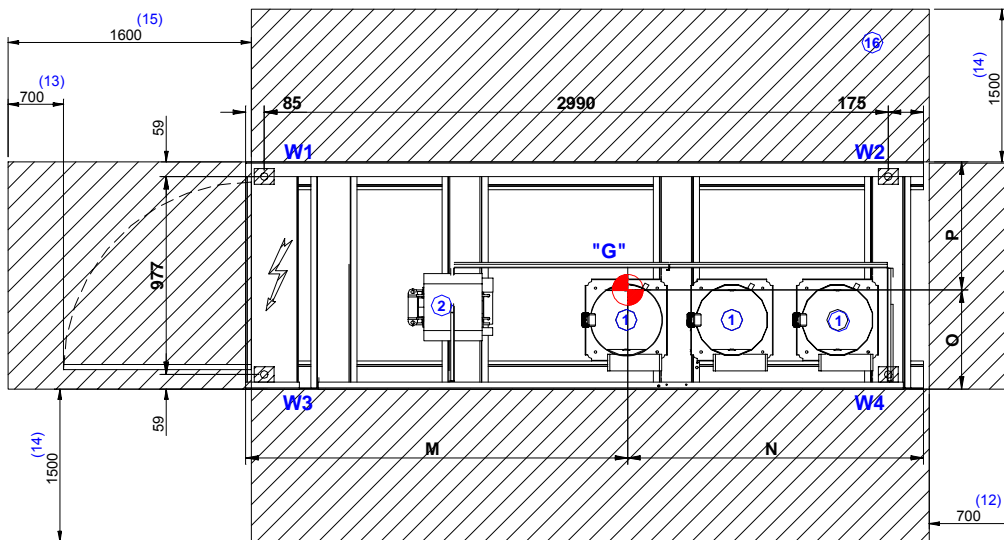
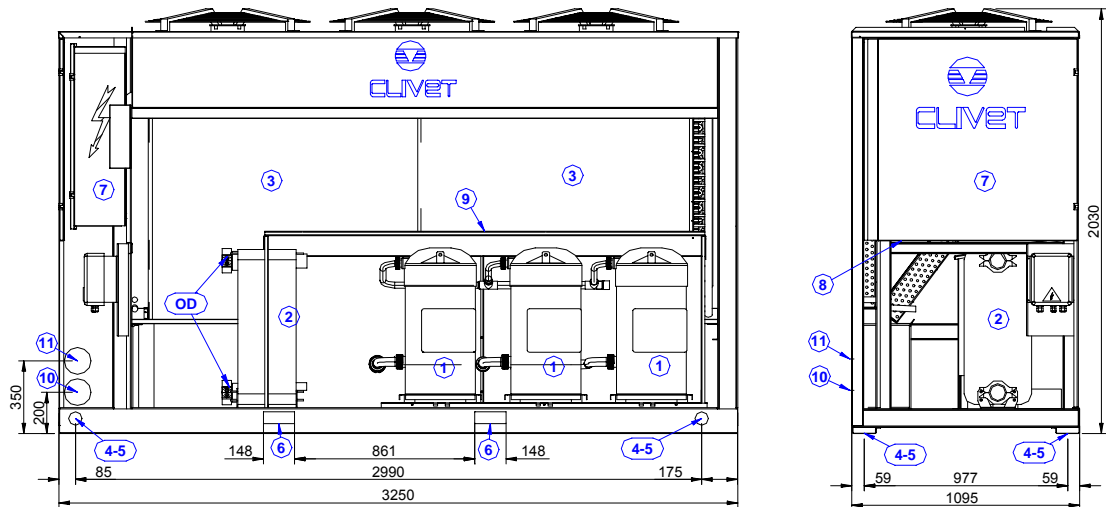
With a jack for leveling the unit	With a supported chassis
<p>Each supporting point of the unit supports a different weight, so each anti-vibration device is dimensioned for a specific supporting point and only on this point can it be positioned.</p> <p>The anti-vibration devices must be placed in accordance of the tables and the dimensional drawings where the supporting points are shown by W1, W2, W3 etc. On each anti-vibration point, the relative identification code is printed , for ex. C6100100</p>	

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- POSITIONING -

DIMENSIONS

Sizes 75C



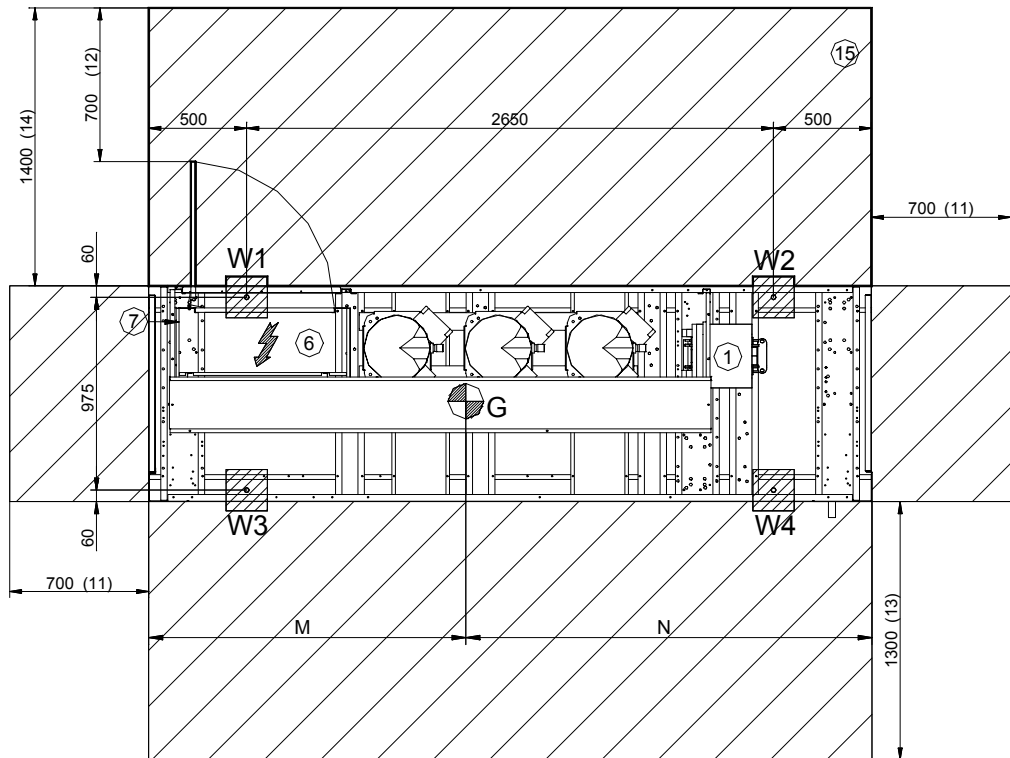
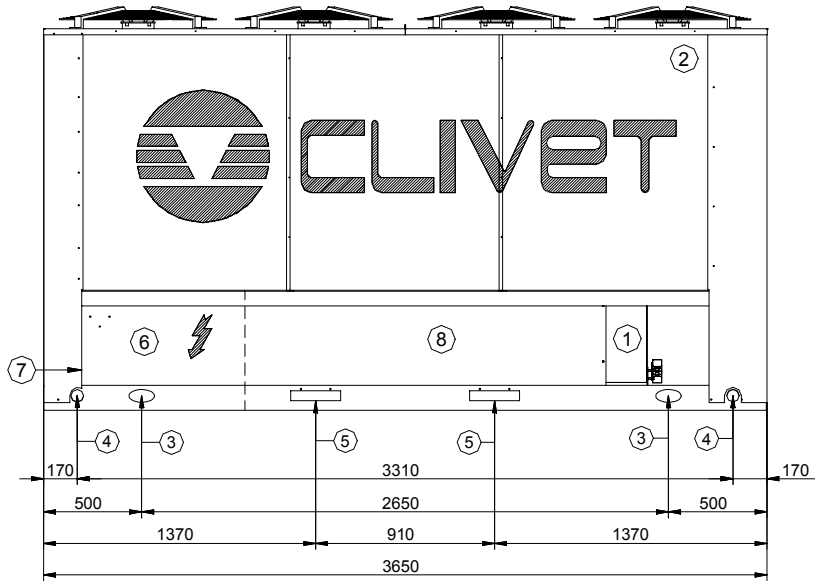
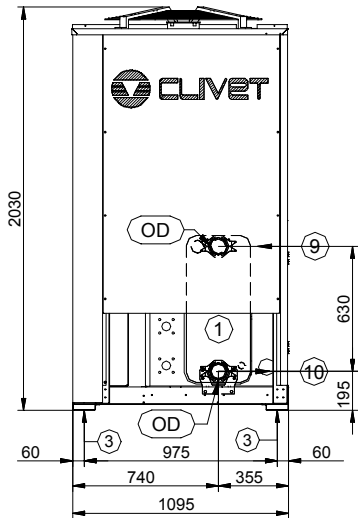
- (1) COMPRESSOR
- (2) INTERNAL EXCHANGER
- (3) EXTERNAL EXCHANGER
- (4) HOLE TO HANG UNIT
- (5) LIFTING HOLES
- (6) LIFTING LUGS
- (7) ELECTRICAL PANEL
- (8) POWER INPUT
- (9) SOUNDPROOFED CABIN
- (10) INTERNAL EXCHANGER WATER OUTLET
- (11) INTERNAL EXCHANGER WATER INLET
- (12) MINIMUM DIMENSION FOR A SAFE PASSAGE.
- (13) MINIMUM DIMENSION FOR A SAFE PASSAGE WHEN THE DOOR OF THE ELECTRICAL SWITCHBOARD IS OPEN.
- (14) MINIMUM DIMENSION FOR A PROPER AIR FLOW TO THE CONDENSER COIL.
- (15) MINIMUM DIMENSION ON THE ELECTRICAL SWITCHBOARD SIDE.
- (16) CLEARANCE ACCESS RECOMMENDED
- (G) BARYCENTRE

	Size	SC
M	mm	1757
N	mm	1493
O	mm	570
P	mm	525
OD	mm	89
W1	kg	397
W2	kg	502
W3	kg	433
W4	kg	550
Operating weight	kg	1882
Shipping weight	kg	1863

NOTE: Weight referred to standard unit; according to the considered accessories unit weight can noticeably change.

- POSITIONING -

Sizes 75C EN - 90C SC



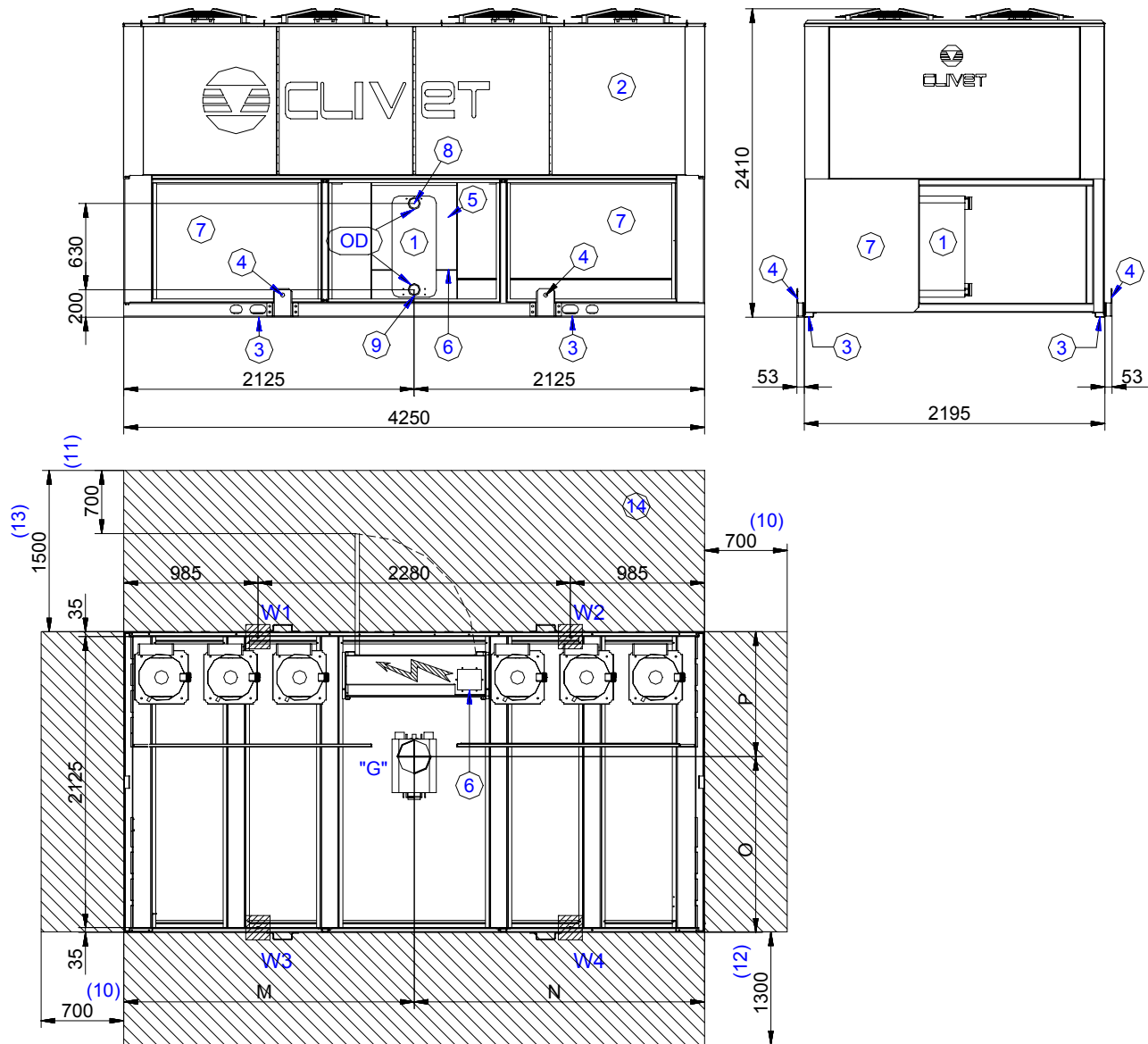
- (1) INTERNAL EXCHANGER
- (2) EXTERNAL EXCHANGER
- (3) HOLE TO HANG UNIT
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- (14) MINIMUM DIMENSION ON THE ELECTRICAL SWITCHBOARD SIDE.
- (15) CLEARANCE ACCESS RECOMMENDED
- (G) BARYCENTRE

		SC	EN
	Size	90C	75C
M	mm	1886	1873
N	mm	1764	1777
O	mm	571	566
P	mm	524	529
OD	mm	89	89
W1	kg	598	566
W2	kg	555	536
W3	kg	542	527
W4	kg	503	497
Operating weight	kg	2198	2126
Shipping weight	kg	2178	2107

NOTE: Weight referred to standard unit; according to the considered accessories unit weight can noticeably change.

- POSITIONING -

Sizes 110D-120D-135F-150F



- (1) INTERNAL EXCHANGER
- (2) EXTERNAL EXCHANGER
- (3) HOLE TO HANG UNIT
- (4) LIFTING HOLES
- (5) ELECTRICAL PANEL
- (6) POWER INPUT
- (7) SOUNDPROOFED CABIN
- (8) INTERNAL EXCHANGER WATER OUTLET
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- (12) MINIMUM DIMENSION FOR A PROPER AIR FLOW TO THE CONDENSER COIL.
- (13) MINIMUM DIMENSION ON THE ELECTRICAL SWITCHBOARD SIDE.
- (14) CLEARANCE ACCESS RECOMMENDED
- (G) BARYCENTRE

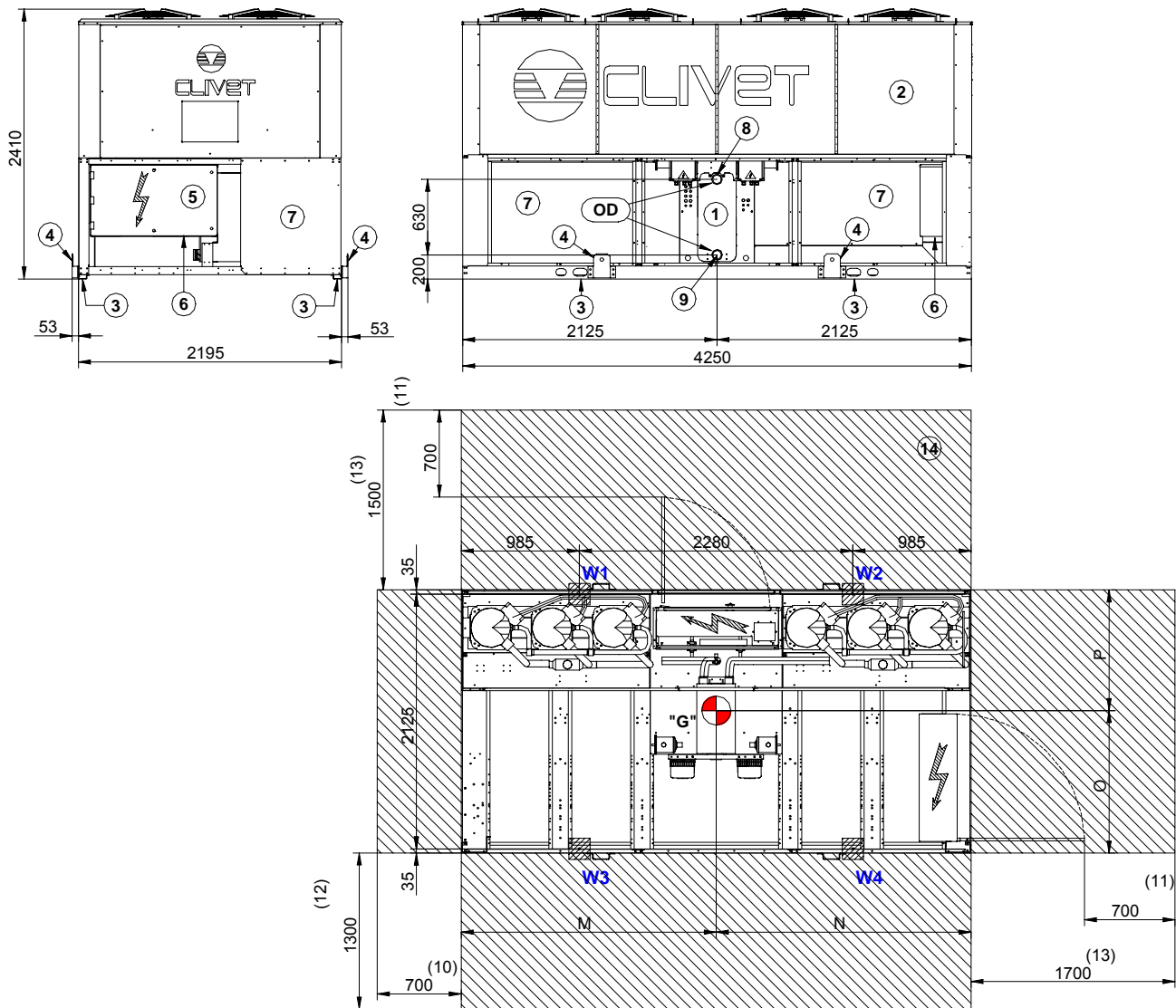
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SIZES		SC				EN			
		110D	120D	135F	150F	110D	120D	135F	150F
M	mm	1478	1479	2125	2125	2125	2125	2125	2125
N	mm	1472	1471	2125	2125	2125	2125	2125	2125
O	mm	1358	1358	1401	1403	1358	1358	1406	1405
P	mm	837	837	794	792	837	837	789	790
OD	mm	89	89	89	89	89	89	89	89
W1	kg	1006	1045	1120	1140	988	1045	1140	1145
W2	kg	877	1028	1115	1131	945	1042	1131	1138
W3	kg	612	609	658	690	590	609	650	692
W4	kg	541	601	653	680	533	607	645	686
Operating weight	kg	3036	3283	3546	3641	3056	3303	3566	3661
Shipping weight	kg	3008	3255	3510	3605	3028	3275	3530	3625

NOTE: Weight referred to standard unit; according to the considered accessories unit weight can noticeably change.

- POSITIONING -

Sizes 165F-180F



- (1) INTERNAL EXCHANGER
- (2) EXTERNAL EXCHANGER
- (3) HOLE TO HANG UNIT
- (4) LIFTING HOLES
- (5) ELECTRICAL PANEL
- (6) POWER INPUT
- (7) SOUNDPROOFED CABIN
- (8) INTERNAL EXCHANGER WATER OUTLET
- (9) INTERNAL EXCHANGER WATER INLET
- (10) MINIMUM DIMENSION FOR A SAFE PASSAGE
- (11) MINIMUM DIMENSION FOR A SAFE PASSAGE WHEN THE DOOR OF THE ELECTRICAL SWITCHBOARD IS OPEN.
- (12) MINIMUM DIMENSION FOR A PROPER AIR FLOW TO THE CONDENSER COIL.
- (13) MINIMUM DIMENSION ON THE ELECTRICAL SWITCHBOARD SIDE.
- (14) CLEARANCE ACCESS RECOMMENDED
- (G) BARYCENTRE

	Size	SC	EN
M	mm	2131	2163
N	mm	2119	2087
O	mm	1391	1415
P	mm	804	780
OD	mm	89	89
W1	kg	1255	1350
W2	kg	1267	1370
W3	kg	707	711
W4	kg	714	732
Operating weight	kg	3943	4163
Shipping weight	kg	3903	4123

NOTE: Weight referred to standard unit; according to the considered accessories unit weight can noticeably change.

GENERAL WARNINGS

Piping must be designed with the least possible number of bends and head variations. If the pressure chute of the installation is above the useful prevalence of the pump, the water delivery capacity is reduced as well as, as a consequence, the thermal exchange and the yield.

1. INTERCEPTING VALVES

Install on the input and output (of the user elements (exchangers, coils, humidifiers, etc) So that it will be possible to carry out all the service operations and possible substitutions without emptying the installation.

2. TEMPERATURE AND PRESSURE INDICATORS, DROPPING CAPS

Install on the input and output of the user elements (exchangers, coils, humidifiers, etc) So that it will be possible to carry out all the service operations and possible substitutions without emptying the installation.

3. AUTOMATIC OR MANUAL ESCAPE VALVES

Install the highest points of tubes in a way that the air can escape form the circuit.

4. LEAKAGE TESTS

Before performing the insulation of the tubes, carry out a leakage test.

5. TUBE INSULATION

All tubes of water must be insulated so that to avoid the formation of condensation and thermal dispersions along the tubes themselves. Verify that the insulation is the vapour coil type. The connections for the air escape and for the emptying must be out of the insulating thickness to assure the accessibility.

6. CONNECTIONS SUPPORTS

The weight of the hydraulic connections must be supported in the exterior of the unit. The exchanger connections must not be stressed.

7. ANTI-VIBRATION DEVICES

In case of units with anti-vibration devices, it is necessary to assemble elastic joints, even on water connections.

8. RISK OF FREEZE

If the unit and the relevant water connections are subject to temperatures near 0°C:

- mix the water of the system with glycol and/or
- protect the tubes with heating cables under the tubes insulation and / or
- empty the system by verifying that in the system or in the unit:
 - no taps are closed so they can not trap the water, even after emptying
 - there are no low points where the water can stagnate even after emptying; blow if necessary

9. INTALLATION EMPTYING

The refilling of the water present in the installation increase the oxidation phenomena and lime deposits: only empty or refill the installation if necessary.

10. EXPANSION TANK

The installation must be kept at the right pressure by both an expansion tank and a combined valve of pressure reduction and discharge; if the components are present on the unit, they must be installed on the installation. The expansion tank must be dimensioned in function of the water in the installation.

WINTER CONDENSATION

When a heat pump is running it produces a considerable amount of water due to the defrosting cycles of the external coil.

The condensation must be eliminated in a manner to avoid wetting pedestrian areas.

For units with condensation trays, refer to the dimensional diagrams to calculate the condensation discharge.

For units without condensation tray, evaluate the suitability of placing a tray beneath the unit base.

With extensive very cold outdoor temperatures, condensation could freeze and block the flow, causing a slow build-up of ice; therefore special attention must be paid to eliminating condensation, raising the unit off the ground and evaluating whether antifreeze elements should be installed.

EVAPORATOR CONNECTION**1. FILTER**

The filter, if not present on the unit, must be installed immediately upstream the unit, in a position accessible for the cleaning.

2. FLOW SWITCH

The flow switch must be foreseen, because is a system component. It has to be installed in a duct rectilinear part, not in proximity of curves that cause turbulences.

3. ANTIFREEZE SOLUTIONS

In case of unit use with water temperatures lower than + 4°C avoid the ice forming using antifreeze solutions (ex. Ethylene Glycol) in the required percentage. The use must be foreseen also in antifreeze function for ambient temperatures next to 0°C.

4. ANTIFREEZE HEATER

If the unit is equipped with antifreeze heater exchanger side (standard or optional according to the models) check that they are electrically supplied in the unit stop periods (nocturnal, weekend, long stops).

5. SYSTEM CLEANING

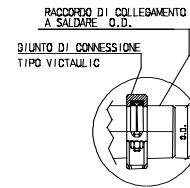
Perform careful system cleaning using clear water and discharging it before the unit connection.

- WATER CONNECTIONS -

VICTAULIC CONNECTIONS

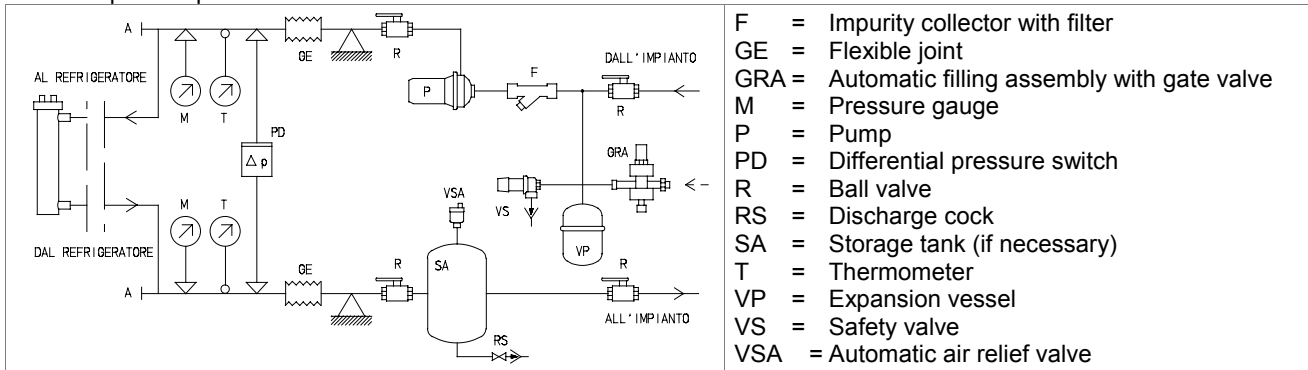
DO NOT WELD THE INSTALLATION PIPE (TOGETHER WITH THE CONNECTION UNION OF THE EVAPORATOR) WITH THE VICTAULIC CONNECTION JOINT ATTACHED. THE RUBBER GASKETS COULD BE IRREPARABLY DAMAGED.

1. Take away the supplied connection union by acting on the connection joint Victaulic.
2. Weld the union to the installation pipe.
3. Perform the connection between the installation pipe and the evaporator, using the joint.



SUGGESTED CONNECTION DIAGRAM

An example of a plan is as follows:



HYDROPACK

By equipping the refrigerating units with the Hydropack accessory, the necessary flow capacity/head are provided in different versions according to the plant's potential.

1) HYDROPACK with 2 pumps,

for the unit of lower power, the basic solution with 2 pumps can be selected. In case of blockage of a pump, the unit continues to operate normally up to about 60% of the load; this condition is in any case more reliable than the traditional solution with a single-pump of greater power.

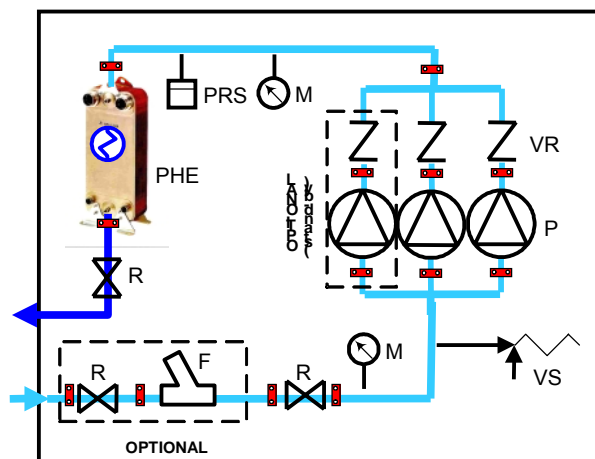
2) HYDROPACK with 2 pumps + 1 stand-by,

a third back-up pump can be envisaged for total reliability. In this way, the stated water flow capacity is assured. (Infact, in case of faults the third pump comes automatically into operation and the unit's control device signals the blocking of the out-of-order pump).

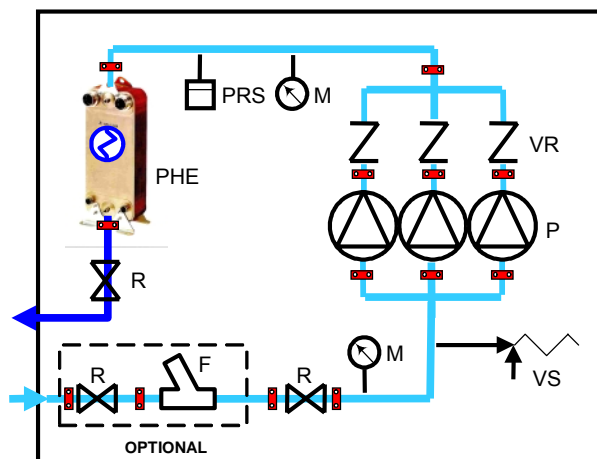
3) HYDROPACK with 3 pumps,

for units of greater power; with the 3 pumps for this solution always active; the possible blocking of one pump allows in any case the normal operation up to 80% of the load (always with blockage signalling). In this case, a back-up pump can be provided on request (not assembled); and the replacement can be carried out in a few minutes, thanks to the simplicity of the connections envisaged.

VERSION WITH 2 PUMPS



VERSION WITH 3 PUMPS

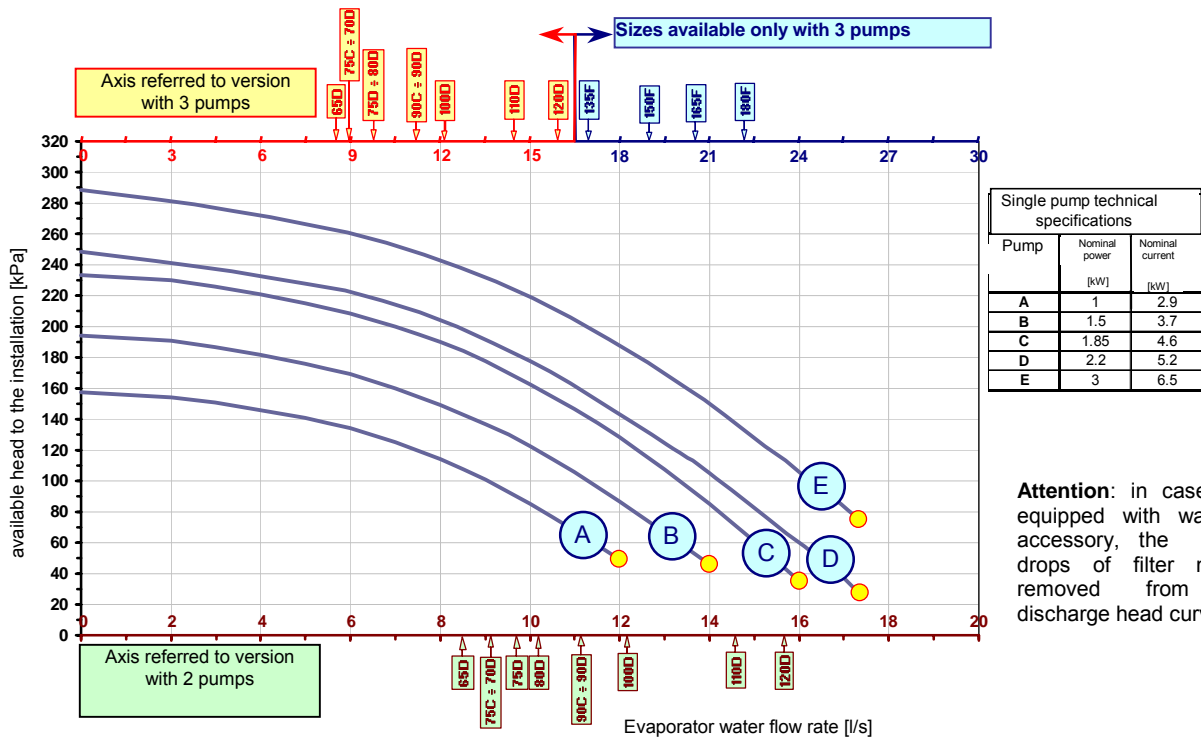


Multi pump hydronic group including:

- R = shut-off valves,
- F = steel mesh filter(optional),
- M = gauges,
- VS = safety valve(6 Bar),
- P = high efficiency single-structure and single-rotor electric pumps,
- VR = check valves,
- PRS = safety pressure switch (avoids pumps operation in case of water absence),
- PHE = evaporator -kit including two blind plugs needed in case of pump removal for maintenance operations..

- WATER CONNECTIONS -

PUMP PERFORMANCE RELATED TO THE EFFECTIVE PLANT HEAD (OPTIONAL)



RECOVERY EXCHANGER (OPTIONAL)

The unit can be equipped with exchangers to recover the condensation heat.

The recovery can be:

- TOTAL, with 100% recovery of the condensation heat
 - the thermoregulation is performed by CLIVET control system
- PARTIAL with 20% recovery
 - The customer is responsible for the management of the circulation pump, valves, thermostats, etc.

The recovery input water must not be below 25°C, in the event that, wrongful operations and breakages of the unit can occur.

Water connections must be performed carefully as for the evaporator (filter, circuit washing, etc).

Perform all necessary interventions to avoid the RISK OF FREEZING (tubes insulation, emptying of circuit, addition of glycol, anti-freeze resistances).

Water temperature can reach high temperatures (up to 100°C), therefore:

- avoid the RISK OF BURNS by adopting the necessary precautions (insulation of tubes, temperature detecting station on water if the sanitary use is foreseen, etc.)
- Install safety valves and specifically dimensioned expansion tanks in the hydraulic circuit.

- ELECTRICAL CONNECTIONS -

GENERAL

The characteristics of the electrical lines and relevant components must be determined by specialized personnel able to design electrical installations; moreover, the lines must be in conformity with professional procedures and the regulations in force.

All electrical operations should be performed by trained personnel having the necessary requisites under law and being informed about the risks relevant to these activities.

Before performing any operation on the electrical system, make sure that the unit supply line is **SELECTED AT START**.

For all electrical type operations, refer to the electrical diagram attached to the unit; the number of the diagram is shown on the registration plate positioned on the electrical board or next to it.

The electrical diagram should be carefully kept together with this manual and should be available for future intervention on the unit.

LINE OF UNIT POWER SUPPLY

The electrical data of the unit are shown in the technical chart of this manual and on the unit registration plate.

The presence of accessories can vary according to the unit; the electrical data shown in the technical chart refer to standard units. In the event of differences between the data of the registration plate and the data shown in this manual, as well as in the technical chart, please refer to the data shown in the registration plate.

The protection device of the unit power supply line should break off the short circuit power whose value should be determined according to the plant features.

The section of supply cables and protection cable must be seized according to the characteristics of the protections used.

SIGNALS / DATA LINES

Do not overpass the maximum power allowed, which varies, according to the type of signal.

Lay the cables far from power cables or cables having a different tension and that are able to emit electromagnetic disturbances. Do not lay the cable near devices which can generate electromagnetic interferences. Do not lay the cables parallel to other cables; cable crossings are possible, only if laid at 90°. Connect the screen to the ground, only if there are no disturbances. Assure the continuity of the screen during the entire extension of the cable. Observe, if any, the requirements about impendancy, capacity, attenuation.

ELECTRICAL DATA

Acoustic configuration: compressors soundproofing (SC) / Voltage: 400/3/50

Sizes		65D	70D	75C	75D	80D	90C	90D	100D	110D	120D	135F	150F	165F	180F
F.L.A. FULL LOAD CURRENT AT MAX ADMISSIBLE CONDITIONS															
F.L.A. - Total	A	142.6	151.9	154.1	165.2	178.5	203.7	195.9	213.3	243.7	274.1	292.6	323.7	369.3	414.9
L.R.A. LOCKED ROTOR AMPERES															
L.R.A. - Single External Fan	A	14	14	14	14	14	14	14	14	14	14	16	16	16	16
F.L.I. FULL LOAD POWER INPUT AT MAX ADMISSIBLE CONDITIONS															
F.L.I. - Total	kW	83.8	90.4	93.1	99	107.5	121.4	117.7	127.9	145.5	163.1	173.4	190.1	216.5	242.9
M.I.C. MAXIMUM INRUSH CURRENT															
M.I.C. - Value	A	339.1	348.4	376.9	366.7	385	461.3	448.7	466.1	531.3	561.7	543.4	578.5	658.9	704.5

voltage unbalance: max 2 %

power supply: 400/3/50 Hz +/-6%

Acoustic configuration: Supersilenziata (EN) / Voltage: 400/3/50

Sizes		65D	70D	75C	75D	80D	90D	100D	110D	120D	135F	150F
F.L.A. FULL LOAD CURRENT AT MAX ADMISSIBLE CONDITIONS												
F.L.A. - Total	A	135.8	145.1	151.3	156.7	168.3	185.7	203.1	233.5	263.9	278.6	307.7
L.R.A. LOCKED ROTOR AMPERES												
L.R.A. - Single External Fan	A	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	10	10
F.L.I. FULL LOAD POWER INPUT AT MAX ADMISSIBLE CONDITIONS												
F.L.I. - Total	kW	80.8	87.4	92	95.2	103	113.2	123.4	141	158.6	168.5	185.1
M.I.C. MAXIMUM INRUSH CURRENT												
M.I.C. - Value	A	317.1	326.4	374.1	339.2	352	415.7	433.1	498.3	528.7	525.9	558.5

CONNECTION TO THE MAINS

1. Make sure that the sectioning device at the beginning of the unit's power line is opened, locked and equipped with a signal
2. Open the general line disconnecting switch (if present).
3. Verify that the net is in conformity with the data shown in the registration plate placed on the electrical board.
4. Check the dimensional drawing for the input of the electrical lines.
5. Take away the closing plate placed on the electric board (ONLY IF PRESENT) and drill a hole through it to pass the cables through
6. Protect the leads with suitably sized cable clamps.
7. Using the layout of the electrical diagram, single out the connecting terminals of the electrical supply cables, of the neutral (if foreseen) and the PE protection cable.
8. Connect the cables to the relevant terminal boards.
9. Before supplying power to the unit, make sure that all the safety devices that were removed during electrical connections are positioned again.

FUNCTIONAL CONNECTIONS



Use voltage-free remote control devices that are suitable to commute very low loads (12V, 10mA).

Few inputs must be activated by configuration parameters whose access is reserved to authorized assistance centres (in order to avoid unauthorized modifications).

ON / OFF FROM REMOTE CONTROL

It allows the remote start and stop, not by keypad.

It can be used to disable the unit during the night, the weekend etc., so with ON or OFF periods relatively long (some hours).

It has not to be used with ON or OFF cycles too much short: they compromise the operating logic and they can cause malfunctions or faults. In summer operating, for example, ON –OFF cycles lower than one hour can compromise the thermoregulation logic, that implements an integral check.

If this function is not used, jump the respective terminals.

CHANGING FROM SUMMER TO WINTER USING THE REMOTE CONTROL

It allows the remote changing COOLING/HEATING, rather than by keypad.

Generally the unit is delivered with disabled input and the changing can be activated from keypad.

If this function is used, it is necessary to set the parameter 12 accessible only to the service centre; in this way the changing by keypad is no mere possible.

With selection switch open, the unit operates in heating, with selection switch closed it operates in cooling.

SIGNALIZATION OF MALFUNCTIONING / UNIT FUNCTIONING

Remote signalisation of the proper function (ex. green light) or signalisation of blocks of the machine (ex. red light).

Maximum voltage at the terminal ends is 24v ac and maximum power is 1A.

SECOND SET-POINT

It is possible to activate a secondary set-point with a remote contact (for example for the nighttime).

With CLOSED contact, the secondary set-point is enabled.

DEMAND LIMIT

It is possible to limit the absorbed electric power with an external signal of 10 Vcc or 4-20 mA. Higher is the signal, lower is the n°. of compressors that are available to satisfy the thermal need.

It is necessary the parameter configuration by the service centre.

MENU	NUM	Parameter name	meaning
Control-demandlimit	7	DmandLimitEn	Enables the function: <ul style="list-style-type: none"> • 0=disabled • 1=by signal • 2=by parameter
parameter-set-sensors	82	TypeDI	Signal type: 0=0-10V; 1=4-20mA

- ELECTRICAL CONNECTIONS -

EXTERNAL AIR TEMPERATURE PROBE - Optional

It allows the automatic correction of the set-point according to the external air temperature.

For example, in summer operating with low external temperatures, is possible to obtain the internal comfort also with set-point values higher than the standard value.

It is necessary the parameter configuration.

MENU	NUM	Parameter name	meaning
parameter control compext	1	EnCompExt	External compensation enabling 0 = no; 1 = COOL only; 2 = HEAT only; 3 = always
	4	MaxCExtC	Max. ext. compensation value of cooling
	5	MaxCExtH	Max. ext. compensation value of heating
	93	CextMaxH	Max. ext. temp. of heating compensation
	94	CextMinH	Min. ext. temp. of heating compensation
	106	CextMaxC	Max. ext. temp. of cooling compensation
	107	CextMinC	Min. ext. temp. of cooling compensation
parameter-set-sensors	9	ProbeText	It enables ext. temp. probe: 0=yes ; 1=non

SUMMER	WINTER

EXTERNAL AIR HUMIDITY PROBE - Optional

It allows the automatic correction of the set-point, according to external air enthalpy. The working process is similar to the above mentioned process.

In winter operating, the correction is only on the temperature.

The operating is analogous to the above described.

It is necessary the parameter configuration.

MENU	NUM	Parameter name	meaning
parameter control compext	4	MaxCExtC	Max. summer correction value
	110	HexMinC	Ext. enthalpy min. correction
	111	HexMaxC	Ext. enthalpy max. correction
parameter-set-sensors	23	ProbeURExt	It enables ext. humidity probe: 1=YES / 0=NO

- ELECTRICAL CONNECTIONS -

WATER RESET - Optional

It allows the automatic correction of the set-point, according to an external signal of 4-20 mA or 0-10 vcc.
The working process is similar to the above mentioned process. It is necessary the parameter configuration.

MENU	NUM	Parameter name	meaning
parameter control waterreset	11	MaxCWRC	WR Summer correction max. value
	24	MaxCWRH	WR Winter correction max. value
	75	WaterReset	Water Reset enabling: 0 = no; 1 = COOL only; 2 = HEAT only; 3 = always
	102	SWRMaxH	Winter MAX correction signal
	104	SWRMinH	Winter MIN correction signal
	105	SWRMaxC	Summer MAX correction signal
	108	SWRMinC	Summer MIN correction signal
parameter-set-sensors	83	TypeWR	Inlet signal type : 0=0-10V ; 1=4-20mA

SUMMER

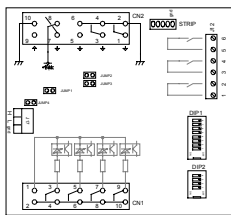
WINTER

CLIVET TALK MODULAR SYSTEM COMPOSITION

CLIVET TALK system is made up of different modules connected to each other with the CAN OPEN protocol.
The system configuration varies according to the typology of the unit and of the accessories: not always the represented electric modules are all presents on the unit.

	<p>INTERFACE code C5110606</p> <p>The interface module allows for the control of the operations of the whole machine, the programming of the different adjustment parameters and also to display the alarms and the unit status.</p>
	<p>CENTRAL MODULE code C5110694</p> <p>The central module manages the system configuration, the working mode, the set point, the thermal adjustment, remote inputs.</p>
	<p>COMPRESSOR MODULE - TANDEM / TRIO CODE C5110673 (TANDEM) – C5110672 (TRIO)</p> <p>It manages the cooling circuit (compressors, fans, valves) and relative safety devices.</p>

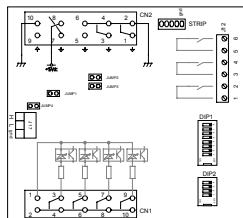
- ELECTRICAL CONNECTIONS -



EVAPORATOR MODULE

CODE C5110674

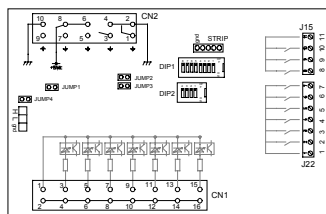
It manages components, safety devices, inputs and outputs relative to the water circuit (pumps, differential manostat, temperature probes)



PUMP MODULE

code C5110701

It manages controls and safety devices relative to the circulation pumps



RECOVERY MODULE

code C5110679

It manages the electrovalves and the pumps relative to the recovery circuit

REMOTE TERMINAL

cod PE1W0005

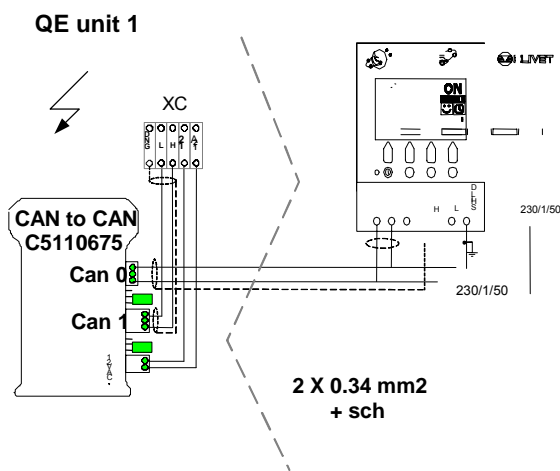
The remote keyboard has the same functions of the keyboard on board of the machine.

The connection of the remote keyboard to the system on board of the machine is carried out, using the "CAN to CAN" converter, which must be placed in the electric board of the machine

The REMOTE KEYBOARD must be configured with the software address = 27 (only an authorised service centre can perform this operation).

If the unit is managed by timetables, they must be activated only on one of the two keyboards of the machine, better if the remote keyboard.

CONNECTIONS: refer to the electric diagram and to the SIGNAL/DATA LINES paragraph.



MODBUS - CONVERTER CAN to MODBUS via RS 485

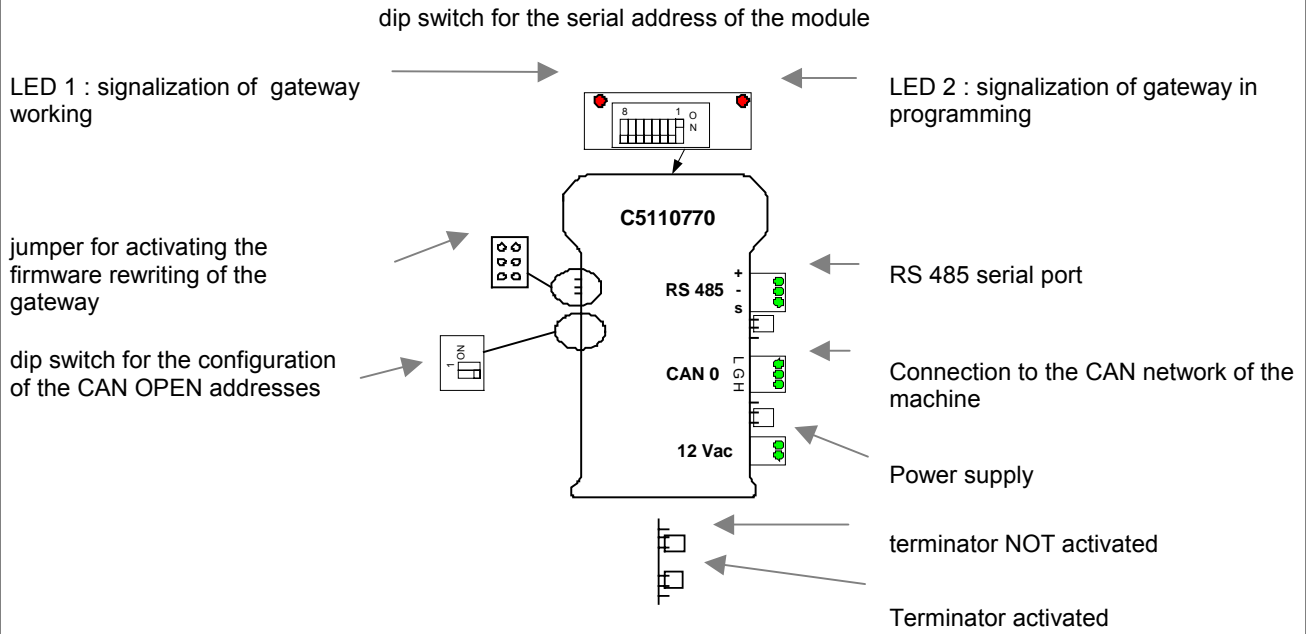
cod PE1W0003 / 6

Interfacing via RS 485 is performed using a converter for each unit.

The converter must be mounted on the electric board of the unit and connected, following the electric diagram attached to the unit.

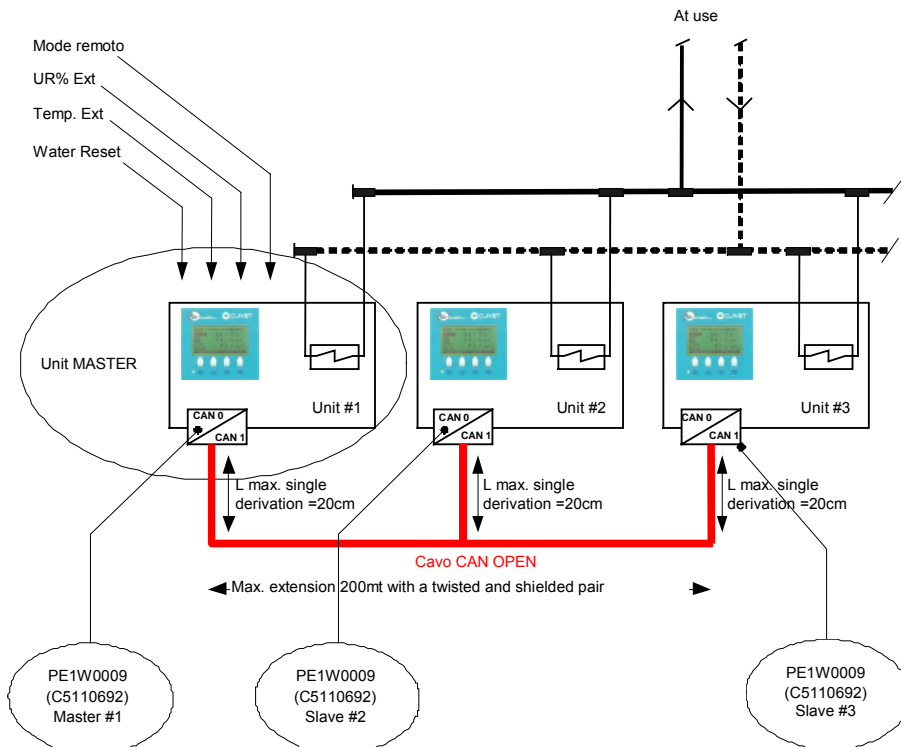
CONNECTIONS: refer to the electric diagram and to the SIGNAL/DATA LINES paragraph.

- ELECTRICAL CONNECTIONS -



UNIT NETWORK – MINI NETWORK – MASTER SLAVE

The *CLIVET TALK Local Network* system allows to connect up to 6 machines in a network which all serve the same installation.
To interact with the network which controls the working of the system, it is necessary to have a CAN to CAN converter code C5110692 for each machine.
Each single machine is equipped with the standard electronic devices: if necessary, it can function as an independent unit.



CONNECTION CABLE :

Section (nominal)	0.34mm ²
Heater	70mΩ/meter
Impedance	120mΩ/meter
Propagation delay	5nS/meter
Length MAX	200meters

DATALOGGER
cod PE1W0006

CONNECTIONS : make reference to the electrical panel and to SIGNALS/DATA LINES paragraph

- ELECTRICAL CONNECTIONS -

KIT LONWORKS
cod PE1W0014 / 25

Refer to the wiring diagram and to the LONWORKS MANUAL.
Information on cables for the Lonworks Network are available on www.echelon.com.

The LONWORKS technology is a complete platform to implement the net system control. These nets are intelligent control instruments or *nodes* that interact with their ambient and communicate each other using a common message based on the protocol (*LonTalk®*). A LONWORKS Network can have until 32.385 nodes divided in 255 subnets (127 nodes/subnets).

The Gateway switch is already set according to the Echelon classification for the destined unit type, with a number of managed variables that is subset of the ones managed by the unit, able to receive the standard Echelon profiles. The supply of this switch does not include configuration activities and LonWorks network conduction that, as usual, must be performed by the Supervision System supplier.

CAN TO MODBUS

GATEWAY LON-WORKS

gateway signalling led in programming

dip switch for module serial address setting

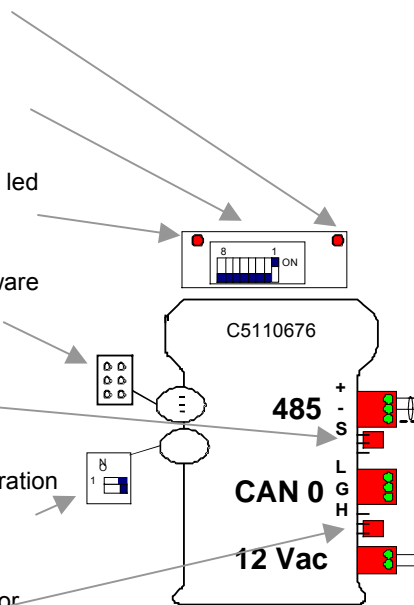
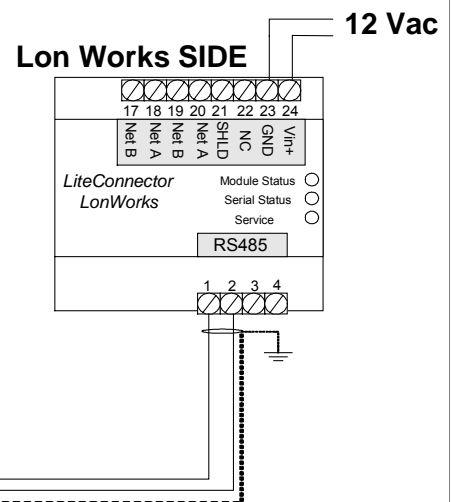
gateway operating signalling led

jumper for the gateway firmware rewriting enabling

CONNECTED terminator

CAN OPEN address configuration dip switch

NOT CONNECTED terminator



- START-UP -

ALL THE EQUIPMENT MUST BE COMMISSIONED BY AUTHORISED SERVICE CENTRES.
THIS SERVICE IS LIMITED TO START-UP OF THE UNIT ONLY AND NOT THE CONNECTIONS OR INSTALLATION
OF THE SYSTEM.

ONLY QUALIFIED TECHNICIANS MUST PERFORM THE FOLLOWING OPERATIONS.

PRELIMINARY CHECKS

Before checking, please verify the following:

- the unit should be installed properly and in conformity with this manual.
- the electrical power supply line should be sectioned at the beginning.
- the sectioning device is locked and the proper warning "not to operate" sign is placed on the handle.
- using a Voltmeter or a tension finder, make sure no tension is present
- the coils must be clean and free of obstacles
- the ventilators must be free of leaves, cardboard, fixed obstacles (beams, barriers, etc.), snow, etc.
- the external ventilators must not be blocked
- the external ventilators can be subject to a temporary block, especially if the inactivity period before the first start-up was quite long or if external temperature is very low. It is also possible to unblock them manually (ONLY WHEN THE UNIT IS UNPLUGGED – RISK OF INJURES) so that jams or electric overloads are avoided when the unit is restarted

AEREAULIC SYSTEM

Check that:

- the air filters are not removed from unit and are cleaned (possible ventilation checks and the operating starting period determinate a ducting "cleaning" with consequent filter precocious clogging, filters that must be cleaned and replaced)
- ducting are completed, connected and without obstructions
- possible dampers are opened (for ex. fire stop dampers) and calibrated (for ex. external air damper, control damper, ejection damper)

A correct air diffusion is important for the room comfort level; check that grilles, outlets and diffusers are without obstructions (furniture, shelves etc), opened and pre-calibrated.

REFRIGERANT SYSTEM

Carefully check the refrigerating circuit: the presence of oil stains can mean leakage caused by transportation, movements or other.

Using the unit manometers, if present, or service manometers, verify that the refrigerating circuit is in pressure.

Make sure that all the service outlets are closed with proper caps; if caps are not present, a leak of refrigerant can be possible.

WATER SYSTEM

Check that the water circuit has been filled and pressurised.

Make sure that there are no leaks.

Check that the shut-off valves in the circuit are in the "OPEN" position.

Check that there is no air in the circuit. If required, bleed it using the vent valves in the system.

When using antifreeze solutions, make sure the glycol percentage is suitable for the type of use envisaged.

% weight of ethylene glycol	10%	20%	30%	40%
Freezing point	- 4°C	- 9°C	- 15°C	- 23°C
Safety temperature	- 2°C	- 7°C	- 13°C	- 21°C

ELECTRICAL SYSTEM

Check the proper tightening of the screws that fix the conductors to the electrical components in the board (during handling and transportation, the vibrations could have loosened them).

Verify that the unit is connected to the ground plant.

Control that all panels and protection devices of the unit are repositioned and blocked.

Charge the unit by closing the sectioning device, but leave it on OFF.

Make sure that the tension and net frequency values are within the limit of

230 +/- 6% single phase unit and 400/3/50 +/- 6% three-phase unit

Control the unbalancing of the phases: it must be lower than 2%.

Example: L1 - L2 = 388V L2 - L3 = 379V L3 - L1 = 377V
 average of the measured values = (388 + 379 + 377) / 3 = 381
 maximum deviation from the average = 388-381= 7V
 Unbalancing = (7/381) x 100 = 1.83% = ACCEPTABLE

Operating out of the indicated limits causes the loss of the guarantee as well as very serious damages.

- START-UP -**IF THE CRANKCASE HEATERS ARE FITTED**

when the unit is started up for the first time and following all prolonged periods of inactivity is OBLIGATORY to connect the oil heaters on the compressor crankcase at least 8 hours before the compressor is to be started.

BEFORE POWERING THE RESISTANCES, OPEN THE COMPRESSORS COCKS, IF PRESENT.

To supply the heaters is necessary to switch off the isolator switch on the unit.

To make sure that the heaters are working, check the power input with amperometric pliers.

At start-up the compressor crankcase temperature on the lower side must be higher at least of 10°C than the external temperature.

DO NOT START THE COMPRESSOR WITH THE CRANKCASE OIL BELOW OPERATING TEMPERATURE.

VERIFY TENSIONS – ABSORPTIONS

Check that the temperatures of the fluids are included in the WORKING LIMITS.

If the controls of the previous paragraphs are positive, it is possible to restart the unit.

For information on the control panel, refer to the paragraph SETTING.

While the unit is working (ATTENTION ELECTRIC RISK: WORK SAFELY) check:

- Power supply tension
- Phase unbalance
- Total absorption of the unit
- Absorption of the single electric loads

UNIT EQUIPPED WITH SCROLL COMPRESSORS

The GENERAL TECHNICAL DATA table shows the type of compressor on the unit.

The Scroll compressors have only one direction of rotation.

In the event that the direction is reversed, the compressor will not be damaged, but its noisiness will increase and pumping will be negatively affected. After a few minutes, the compressor will stop because of the activation of the thermal protection. In this event, cut the power and reverse the 2 phases on the machine power.

Prevent the compressor from working with in reverse rotation: more than 2-3 anomalous starts up can damage it.

Make sure the direction of rotation is correct, measure the condensation and suction pressure. Pressure must clearly differ: at the start, the suction pressure decreases whilst the condensation pressure increases.

The phase optional monitor, which controls the phase sequence, can be installed later.

REMOTE INPUT CONFIGURATIONS

Check used remote inputs are activated (ON-OFF etc.) as given in the instructions in the ELECTRIC WIRING chapter.

SETTING THE SET-POINT

Check if it is necessary to modify the set-points shown in the SETTING chapter.

EVAPORATOR WATER-FLOW CHECK

Verify that the difference between the water at the input and at the output of the exchanger is related to the capacity according to the formula:

refrigerating capacity of the unit (kW) x 860 = Dt (°C) x flow rate (L/h).

The refrigerating capacity is shown in the GENERAL TECHNICAL FEATURE chart of this manual and it refers to specific water/air conditions or to the tables of COOLING PERFORMANCES on TECHNICAL CHART that refer to different use conditions.

Verify the loss of charge of the exchanger at the water side:

- determine the water capacity
- measure the difference of pressure between the input and output of the exchanger and compare it with the graph LOSS OF CHARGE OF THE EXCHANGER AT THE WATER SIDE

The pressure measurements will be easier if "M" gauges are installed as shown in the HYDRAULIC CONNECTION DIAGRAM.

REFRIGERANT CIRCUIT PARAMETER CHECK

Detecting the operational conditions is useful to control the unit along time: the performed records must be kept and be available during maintenance interventions.

When the unit works in stable conditions and according to the operating limits, take note of the following data:

1. compressor discharge temperature (WARNING – BURN DANGER)
2. condensing pressure
3. liquid temperature
4. dehydrator filter upstream and downstream temperature
5. inlet pressure
6. inlet temperature
7. exchanger inlet water temperature
8. exchanger outlet water temperature
9. external air temperature (battery input)
10. air temperature coming out from fans
- 11.

- CONTROL -

CONTROL INTERFACE

COOL cooling
HEAT heating

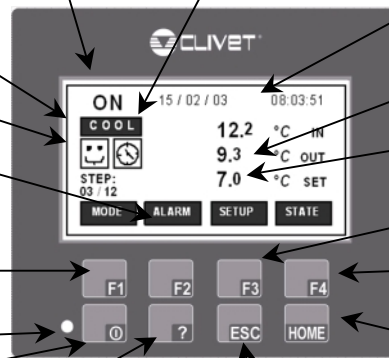
ON – ECO – OFF unit status enabled timing bands

INLET temperature

alarm ; OK 

Number of steps activated in comparison with the steps available

ALARM menu access



OUTLET temperature

Current set point

SET POINT, TIMING BANDS, CLOCK access

HEAT / COOL changement

off = unit OFF
on = unit ON

ON / OFF unit

HELP parameter descriptions

Back to previous shield

Stata MENU access

Back to main menu

UNIT START-UP

To turn the unit on or off, hold the ON/OFF switch down for a few seconds. When the unit is on, the "ON" message is displayed; when the unit is off, the "OFF" message is displayed.

It is also possible to access the different menus when the unit is in the "OFF" mode.

It is possible to check the ON/OFF condition at a distance, using a remote device (see the ELECTRICAL CONNECTIONS chapter).

CHARACTERISTICS

THERMOREGULATION

The thermoregulation is based on the OUTLET temperature.

The unit is dimensioned for a determined TOTAL HEAD between input and output water temperature.

Usually the project step is 5°C; if the value is different, it is necessary reset parameters 37 and 38 (accessible to the service centre).

In function of the total head, the installation determines the head quote that every resource (compressor, heating elements) is able to provide: the STEP HEAD.

The control logic insert gradually the resources when the outlet temperature is higher than the set point + the head step. The resources are activated one at a time and only at the SCAN TIME expiring.

The scan time is not fixed but it changes in function of the margin between the water outlet temperature and the Set point value. Higher is the margin value (both in positive and in negative) shorter will be the space among the scan points.

The scan time value is visualized at status 6; when the status 7 has reached the status 6 value, the compressor operating request is activated.

The scan time calculation starts at the same time of the activation of one compressor.

The compressor to activate is chosen to allow the circuit work in parallel and to minimize the wear of the complete refrigerant circuit and of the single compressor.

At the end of the calculation if the outlet temperature is higher than the step jump, it is inserted another compressor temp. $H2O > \text{set-point} + \text{step jump}$.

What above described is referred to the COOLING operating, in HEATING the logics is the same but overturned ($\text{compressor insertion for outlet temp.} < \text{set-point} - \text{step jump}$).

SET-POINT COMPENSATIONS

The compensations are evolved functions to protect the compressors and to adapt, as far as possible, the unit operating to the installation and use characteristics.

The compensations prolong the compressor operating time and limit the start number; to do this they delay the compressor insertion point adding an offset.

- The compensation on the DURATION is useful when the installation water content is limited.
- The compensation on the CHARGE is useful if the variable charge is present.

Optional components are necessary and for the enabling and configuration it is necessary the parameter modification with access reserved to the service centres. In industrial applications where is requested a temperature check is possible to disable the COMPENSATIONS. The STATUS menu displays the compensation value on ext. temp. (status 9) and WR (status 10).

- CONTROL -**SET-POINT CORRECTIONS**

The correction aim is to optimize the unit energetic efficiency.

To do this the corrections modify the set point in a dynamic way in function of determined variables: for example in summer operating with low external temperatures, so with a reduced charge, is possible to obtain the internal comfort also with set point higher than standard, obtaining an higher energetic efficiency.

The *static* set point can so be modified in a dynamic way by two CORRECTIONS based on as many unit external factors:

- correction based on the ext. temp. / enthalpy
- correction based on the Water reset (4-20 mA signal provided by the Client)

The correct set point, to whom have been summed or removed the corrections, is named ACTUAL set-point and it is visible at status n°2.

For further details see the ELECTRICAL CONNECTIONS section.

DEFROSTING

The defrosting maintains the external coil free from ice: to do that the unit is periodically commuted in "summer" operating for few minutes and the fans are stopped.

The defrosting phase is started when the evaporating pressure falls below the fixed value. Now starts a count and when it finishes, if the temperature on the coil is lower than the threshold, the real defrosting is performed.

The count can change according to the external temperature/humidity and (through some indirect variables) to the ice quantity on the coil.

MAINTENANCE SET POINT

It can be used to maintain the installation inside the working limits, even if the unit is deactivated.

The MAINTENANCE Set Point checks the water temperature when the unit is put on OFF or Stand-by.

To do this, it periodically activates the circulation pump, tests the water temperature and even activates one or more compressors.

Access reserved to the assistance centres.

MENU	NUM	Parameter name	meaning
PARAMETER CONTROL MAINTENANCE	25	MantCoolEn	It enables Summer Maintenance
	26	MantHeatEn	It enables Winter Maintenance
	114	SetMantCool	Summer maintenance set-point
	117	SetMantHeat	It enables Winter Maintenance

DEMAND LIMIT

The DEMAND LIMIT function allows to limit the capacity to be delivered to the system for the purpose of limiting the power input of the unit; all according to a signal outside the unit made available by the customer.

On STATUS menu, num 22, the DEMAND LIMIT external signal is displayed.

For other details see the ELECTRICAL CONNECTIONS section.

SECOND SET-POINT

The secondary set point is activated by remote authorization (see the ELECTRICAL CONNECTIONS chapter).

It is possible to limit the minimum power which can be delivered during the time in which the secondary set point is activated by configuring the 276 MinPot2Set parameter (access reserved to the assistance centres).

TIMETABLES

The system is factory equipped with a clock function, found on the board.

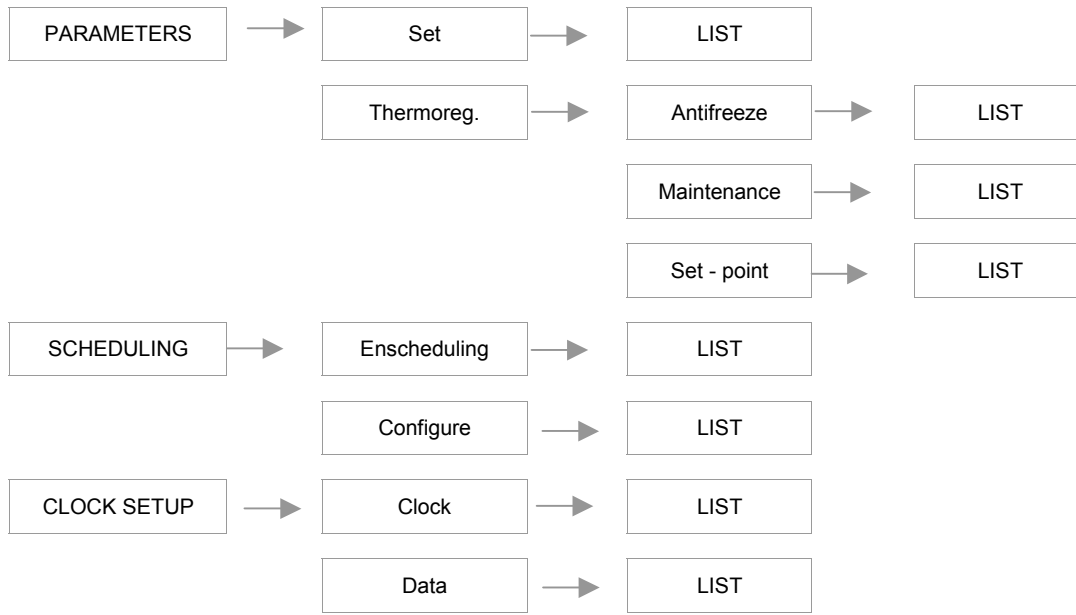
By activating the timetables, it is possible to set up to 6 events for each day of the week.

If there is also a remote keyboard, the operations relative to the time and the date must be repeated on both keyboards, so that the two clocks (which are different) are synchronized.

- CONTROL -

ACCESSIBLE PARAMETERS

PARAMETER MENU STRUCTURE









menu: PARAMETERS – THERMOREG. – SET POINT			DEFAULT values
90 / CEN	SecondSetC	Secondary cooling Set Point	12
91 / CEN	SecondSetH	Secondary heating Set Point	35
118 / CEN	SetCool	Cooling Set Point	6.5
119 / CEN	SetHeat	Heating Set Point	45
272 / CEN	SetRecovery	NOT USED	35
menu: PARAMETERS – THERMOREG. – MAINTENANCE			
114 / CEN	SetMantCool	Summer maintenance setpoint	15
117 / CEN	SetMantHeat	Winter maintenance setpoint	30
menu: PARAMETERS - THERMOREG.– ANTIFREEZE			
115 / CEN	AllFreeze	Antifreeze alarm set	4
121 / CEN	PreAF	Antifreeze pre-alarm set	4.5
261 / CEN	SetResist	Antifreeze heater set	4
menu: PARAMETERS – SET – UNIT - EVAPORATORS			
37 / EVAP	SetResist	Antifreeze heater set	4
39 / EVAP	ALLFreeze	Antifreeze alarm set	4
41 / EVAP	PreAF	Antifreeze pre-alarm set	4.5

KEYPAD USE

SET UP menu:

- PARAMETERS**
set point modification
- SCHEDULING**
enables/disables timing bands
- CLOCK SETUP**
Set the clock
- ID Tast-Cen**
(ATC ONLY)
- PASSWORD**
(ATC ONLY)

To enter in the SETUP menu		button F3 SETUP
To select the submenu		buttons ▲ ▼ F2 – F3
To access		button F1 ENTER
To scrolling voices		buttons ▲ ▼ F2 - F3
To go back a level of the menu		button ESC
To go back to the main menu		button HOME

- CONTROL -







SETUP – PARAMETERS:

THERMOREG.

Set the setpoint and the operating modes

SET

(ATC ONLY)

To enter in the SETUP menu		button F3 SETUP
To select the submenu		buttons ▲ ▼ F2 – F3
To access		button F1 ENTER
To access the desired parameter		buttons ▲ ▼ F1 – F2
To modify the parameter value		buttons + - F3 – F4
To go back to the main menu		button HOME














SETUP – SCHEDULING:

EnSCHEDULING

enables/disables timing bands

CONFIGURE

Set the timing bands

To enter in the SETUP menu		button F3 SETUP
To select the CONFIGURE submenu		buttons ▲ ▼ F2 – F3
To access		button F1 ENTER
To select DAY		buttons ▲ ▼ F1 – F2
To change week day		button F3
To select one of the 6 available daily events		button F4
To select TIME		buttons ▲ ▼ F1 – F2
To set the event hour and minutes		buttons + + F3 – F4
To select STATE		buttons ▲ ▼ F1 – F2
Select ON/OFF/ECO mode		button F4
To select Setpoint		buttons ▲ ▼ F1 – F2
Set the manual setpoint of the event		buttons + - F3 – F4
To go back to the main menu		button HOME

- CONTROL -







SETUP – CLOCK SETUP

CLOCK

Set the clock

DATA

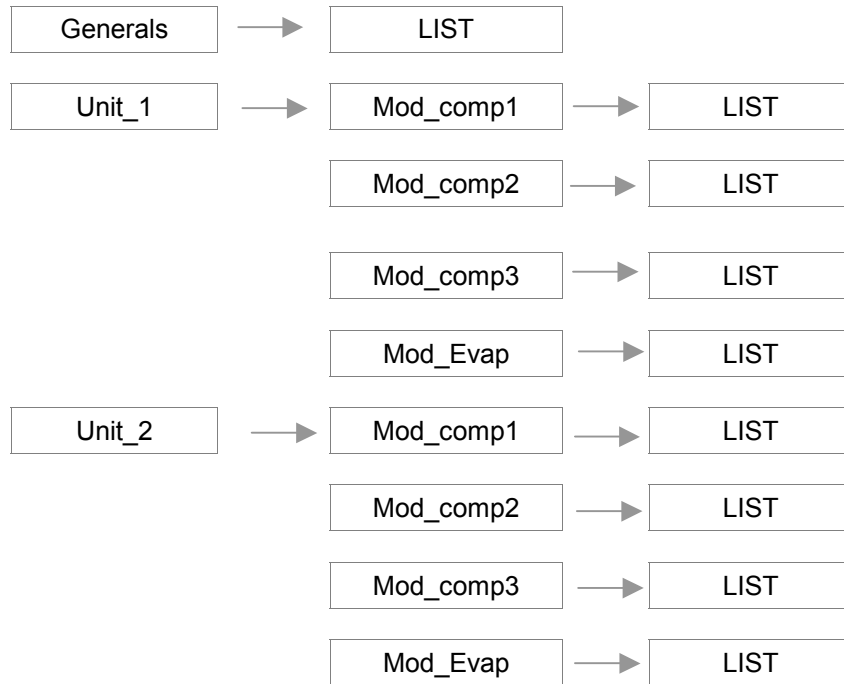
Set the dater

To enter in the SETUP menu		button F3 SETUP
To select the CLOCK SETUP submenu		buttons ▲ ▼ F2 – F3
To access to CLOCK		button F1 ENTER
To set HOURS MINUTES SECONDS		buttons F2 F3 F4
To confirm the single setting		button F1 ENTER
To go back to the main menu		button HOME

UNIT STATUS

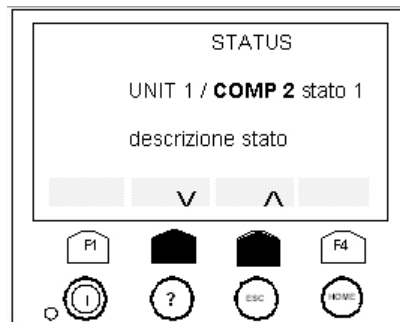
A sub-menu is associated with each electronic module of the unit. It displays the system status. According to the unit configuration, and then with electronic modules and options, some sub-menus and statuses can not be used.

STATA STRUCTURE



example

Visualized stata referring to
UNIT 1
COMP 2 MODULE



- CONTROL -

submenu:







GENERALS

UNIT 1

- mod_comp1
- mod_comp2
- mod_comp3
- mod_evap

UNIT 2

- mod_comp1
- mod_comp2
- mod_comp3
- mod_evap

To enter in the STATA menu		button F4 STATE
To select the module		buttons ▲ ▼ F2 – F3
To access		button F1 ENTER
To scroll the stata		buttons ▲ ▼ F2 - F3
To go back a level of the menu		button ESC
To go back to the main menu		button HOME

Index	GENERAL stata	UM
0	Machine status	1=ON / 0=OFF
1	Machine mode	0=Cool, 1= Heat
2	Actual set point	°C (tenths)
3	Inlet temperature	°C (tenths)
4	Outlet temperature	°C (tenths)
5	Number of steps activated	
6	Current step value (compensations)	°C (tenths)
7	Step activation timer	sec
8	Step activation dynamic TimeScan	sec
9	CompExt	°C (tenths)
10	CompWR	°C (tenths)
11	CompCar	°C (tenths)
12	CompSpunti	°C (tenths)
13	CompDuty	°C (tenths)
14	Ambient temperature	°C (tenths)
15	Ambient humidity	%
16	Free Cooling valve percentage	%
17	Free Cooling flow percentage	%
18	Free Cooling valve control	1=ON / 0=OFF
19	Pump 1 status	1=ON / 0=OFF
20	Pump 2 status	1=ON / 0=OFF
21	Water Reset	%
22	Demand Limit	%
60	Digital input	bit map of a byte
68	Water flow analogic out	
69	Pump module digital out	bit map of a byte
71	BitMap connected nodes MS	bit map of a byte
72	Hours pump 1 PMP	
73	Hours pump 2 PMP	
74	Hours pump 3 PMP	

Index	UNIT_1 – MOD COMP_1 Stata	UM
29	Compressor 1	1=ON / 0=OFF
30	Compressor 2	1=ON / 0=OFF
31	Compressor 3	1=ON / 0=OFF
32	Cp 1 timer status	1=ON / 0=OFF
33	Cp 2 timer status	1=ON / 0=OFF
34	Cp 3 timer status	1=ON / 0=OFF
35	Valve 1 c1 status	1=ON / 0=OFF
36	Valve 2 c1 status	1=ON / 0=OFF
37	Valve 3 c1 status	1=ON / 0=OFF
38	Valve 1 c2 status	1=ON / 0=OFF
39	Valve 2 c2 status	1=ON / 0=OFF
40	Valve 3 c2 status	1=ON / 0=OFF
41	Valve 1 c3 status	1=ON / 0=OFF

- CONTROL -

Index	UNIT_1 – MOD COMP_1 Stata	UM
42	Valve 2 c3 status	1=ON / 0=OFF
43	Valve 3 c3 status	1=ON / 0=OFF
44	Liquid Solenoid	1=ON / 0=OFF
45	Coil temperature	°C (tenths)
46	Recovery temperature	°C (tenths)
47	Condensation pressure	bar
48	Evaporation pressure	bar
49	Fan Status	bar
50	Defrost Status	1=ON / 0=OFF
51	Defrost count time	sec
52	Compressor 1 operating time	
53	Comp. 1 starts	
54	Compressor 2 operating time	
55	Comp. 2 starts	
56	Compressor 3 operating time	
57	Comp. 3 starts	
58	Recovery valve	1=ON / 0=OFF
59	Recovery PREHP delay	sec
61	Digital input	bit map of a byte

Index	UNIT_1 – MODEVAP_1 Stata	UM
23	Tout1	°C (tenths)
24	Tout2	°C (tenths)
25	Tinput	°C (tenths)
26	Pump 1 status	1=ON / 0=OFF
27	Pump 2 status	1=ON / 0=OFF
28	Heater status	1=ON / 0=OFF
62	Digital input	bit map of a byte

ALARMS

BEFORE RESETTING THE ALARM, IDENTIFY AND ELIMINATE THE CAUSE OF ITS ACTIVATION.
REPEATED RESETS CAN CAUSE IRREVERSIBLE DAMAGES.



The presence of an alarm is signaled by the icon flashing.

The cumulative block relay activates simultaneously, according to the type of alarm.

Alarms can be reset once the conditions that caused them to trip have been removed.

ALARMS and faults show a potentially dangerous situation for the machine integrity. An immediate analysis is necessary to detect the causes of the block. A repeated reset can provoke irreversible damage. That is why reset is MANUAL.

PRE-ALARMS AND SIGNALIZATIONS show a situation similar to that one described above. The occurrence of an alarm is acceptable if it is occasional and/or in transitory situations (for example, when the plant starts). In uncertain cases, please contact the authorized assistance center.

VIEW ALARM

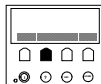
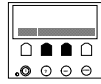
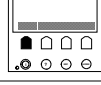
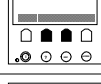


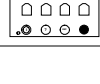
To visualize the alarm in progress

STORE ALARM

To visualize the historical alarm

DEL STORE

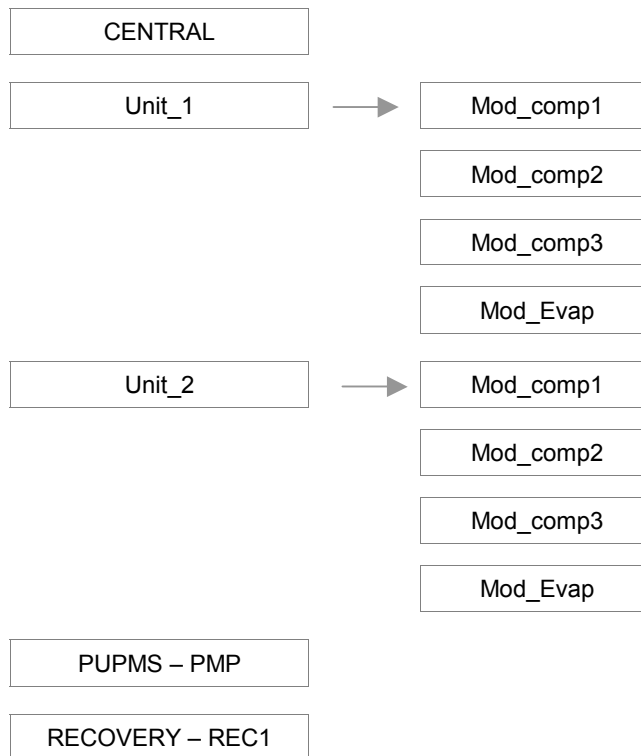
To delete the historical alarm

To enter in the ALARM menu		button F2 ALARM
To select VIEW ALARM		buttons ▲ ▼ F2 – F3
To access		button F1 ENTER
To scroll the active alarms		buttons ▲ ▼ F2 - F3
To reset the alarm in progress		button F1 ENTER
To go back a level of the menu		button ESC
To go back to the main menu		button HOME

- CONTROL -

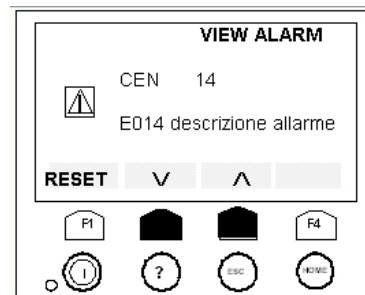
An alarm list is associated with the inputs of each electronic module of the unit.
According to the unit configuration, and then with electronic modules and options, some lists and/or ALARMS can not be used.

ALARM STRUCTURE



example

CEN : central module alarm
14 : alarm identificative string
E014 : alarm description



CENTRAL MODULE	
Str	Name
1	E001 H2O IN temp. probe fault on control module
2	E002 H2O OUT temp. probe fault on control module
3	E003 Outside air temp. probe fault
4	E004 Water Reset input fault
5	E005 Outside RH% probe fault
6	E006 Thermal cut-out alarm pump 1 on control module
7	E007 Thermal cut-out alarm pump 2 on control module
8	E008 Flow switch alarm on control module
9	E009 System pressure alarm
10	E010 Phase monitor alarm
11	E011 Antifreeze alarm on control module
12	E012 Antifreeze pre-alarm on control module
13	E013 Change CENTRAL pump
14	E014 Unit configuration alarm
15	E015 Demand Limit input fault
16	E016 Can net disconnectedness on control module

- CONTROL -

COMPRESSOR MODULE	
Str	Name
16	E101 Cond./ Evap. temp. probe fault
17	E102 Condensing pressure probe fault
18	E103 Evaporation pressure probe fault
19	E104 Recovery temp. probe fault
20	E105 High pressure alarm
21	E106 Low pressure alarm
22	E107 Fan/Pump thermal cut-out alarm
23	E111 Cond. / Evap. H2O flow alarm
24	E112 High pressure pre-alarm 1
25	E113 High pressure pre-alarm 2
26	E114 Low pressure pre-alarm
27	E115 Force defrost alarm
28	E116 Max Press. diff. alarm
29	E117 Recovery H2O flow alarm
30	E118 Heat recovery HP pre-alarm
31	E108 Compressor 1 thermal cut-out alarm
32	E109 Compressor 2 thermal cut-out alarm
33	E110 Compressor 3 thermal cut-out alarm
47	E213 Module not connected
49	E119 Oil differential pressure alarm
58	E120 Condenser frost alarm

PUMP MODULE	
Str Name	Name
53	E501 Water flow probe fault
54	E502 Thermal pump 1alarm Pump Module
55	E503 Thermal pump 2alarm Pump Module
56	E504 Thermal pump 3alarm Pump Module
57	E505 Max flow-rate signal Pump Module

RECOVERY EXPANSION MODULE	
	Name
50	E301 Out recovery probe alarm
51	E302 Gas temperature probe alarm

EVAPORATOR MODULE	
Str Name	Name
34	E201 Evaporator inlet probe fault
35	E202 Evaporator outlet probe 1 fault
36	E202 Evaporator outlet probe 2 probe fault
37	E203 Programmable evaporator input alarm
38	E204 Thermal cut-out alarm, evaporator pump 1
39	E205 Thermal cut-out alarm, evaporator pump 2
40	E206 Evaporator flow switch alarm
41	E207 Evaporator system fill alarm
42	E208 Change pumps on evaporator
43	E209 Antifreeze alarm on evaporator
44	E210 Tout 1, antifreeze pre-alarm on evaporator
45	E211 Tout 2, antifreeze pre-alarm on evaporator
46	E212 System pump lockout
48	E214 Module not connected

- ROUTINE MAINTENANCE -**PREVENTIVE MAINTENANCE**

All equipment is subjected to wear out.

The maintenance makes:

1. keeps their efficiency
2. limits breakdowns.
3. Gather information and data to understand the unit efficiency level and prevent possible faults

Therefore, it is fundamental to perform periodical checks: the SERVICES they are mainly cleaning activities, the INSPECTIONS forsee the unit status and operating check.

The machine should have a logbook used to keep track of the performed controls. This will make fixing up breakdowns easier. Take note of the date, type of control (autonomous maintenance, inspection or fixing up), description of the control, actions taken and so on.

BEFORE PERFORMING ANY MAINTENANCE OR CLEANING OPERATIONS, UNPLUG THE UNIT AND MAKE SURE NO PERSON CAN TURN THE POWER BACK ON.**SERVICES**

Parts subject to intervention:
BATTERIA ARIA ESTERNA
STRUTTURA
ELETTROVENTILATORI

EXTERNAL AIR COIL

ATTENTION: contact with the exchanger fins can cause cuts. Wear protective gloves to perform the above-described operations.

It is extremely important that the battery gives the maximum thermal exchange; therefore, its surface must be cleaned from dust and deposits. Remove all impurities from the surface.

Using an air pressure gun, clean the aluminium surface of the battery. Be careful to direct the air in the opposite direction of the fan air movement. Hold the gun parallel to the fins to avoid damages. As an alternative, an aspirator can be used to suck impurities from the air input side.

Verify that the aluminium fins are not bent or damaged. In the event of damages, contact the authorized assistance centre and get the battery "ironed out" in order to restore the initial condition for an optimal airflow.

STRUCTURE

Check the condition of the parts making up the structure.

Paint so as to eliminate or reduce oxidation at the points in the unit where this problem may occur. Check that the panelling is fastened correctly. Poor fastening may give rise to malfunctions and abnormal noise and vibrations. Check the condition of any gaskets.

ELECTRIC FANS

Make sure that the fans and the relative protection grids are well fixed.

Check, if possible, the unbalances of the electro-fan evident by noise and anomalous vibrations.

Verify that the terminal protection covers are closed and the cable holders are properly positioned

MAINTENANCE INSPECTIONS

Foresee inspection assistance carried out by authorized centres or by qualified personnel.

The inspections should be carried out at least:

- Every year for only the cooling units
- Every six months for the cooling and warming units

The frequency, however, depends on the use: in the event of frequent use (continuous or very intermittent use, near the operating limits, etc) or critical use (service necessary) it is recommended to plan inspections at close intervals.

The inspections to be performed are as follows:

- check the power supply tension when emptied or filled
- inspect the electrical board (status of solenoid starter contacts, terminal closings, the status of wiring and relevant insulations)
- inspect the absorption of the single electrical loads
- check the cleaning and the efficiency of the exchangers
- inspect the cleaning of the filters (air/water)
- check the leakage from the refrigerating circuit
- check the protection devices (safety valves, pressure switches, thermostats etc), the control systems, the control devices (alarm signalling, probe, gauges etc)
- check the operating parameters of the refrigerant circuit (see the following REFRIGERANT TABLES and the START-UP section)

SAFETY VALVES:

For units equipped with safety valves, follow the Manufacturer's instructions.

Verify periodically the cleaning of the safety valves and that oxidative / corrosive phenomena are not present, in particular for installations near the sea, in industrial areas or in rooms with a corrosive atmosphere.

- ROUTINE MAINTENANCE -

97/23 CE PED DIRECTIVE

97/23 CE PED DIRECTIVE gives instructions for installers, users and maintenance technicians as well. Refer to local actuation norms.

In Italy, refer to the Ministerial Decree of 1st December 2004 no. 329 (and following modifications), which defines the performances to be executed; the units of 1st category and those defined by the art. 3.3 97/23/EC are not included in this regulation (see the serial number plate on the unit).

Briefly and as an example, see the following:

1. COMPULSORY VERIFICATION OF THE FIRST INSTALLATION only for units assembled on the installer's building site (for ex. Condensing circuit + direct expansion unit)
2. CERTIFICATION OF SETTING IN SERVICE for all the units
3. PERIODICAL VERIFICATIONS to be executed with the frequency indicated by the Manufacturer (see the MAINTENANCE INSPECTIONS paragraph)

PUT AT REST

If a long period of inactivity is foreseen, for example the winter for the cooling unit, the following is recommended:

- to turn the power off in order to avoid electrical risks or damages by lightning strike
- to avoid the risk of frosts as shown in the HYDRAULIC CONNECTIONS section, and, in particular
 - to empty or add glycol in the plant sections subjected to temperatures below zero
 - to empty or add glycol in the water heating coils, also in summer
 - to power antifreeze resistances if present

If the period of inactivity is particularly long or in the event of extremely low temperatures, the external fans can be blocked temporarily; therefore, it is recommended to switch them on every month in order to avoid seizures or electrical overloads when the unit will be switched on. The restarting of the unit has to be carried out by qualified personnel, in particular, after the winter break for cooling units or when seasonal switching should be performed.

When restarting, refer to the START-UP section.

Schedule technical assistance in advance to avoid hitches and be able to use the installation when necessary.

REFRIGERANT TABLES

THIS SECTION IS DEVOTED ONLY TO QUALIFIED TECHNICIANS THAT KNOW THE FOLLOWING:

- THE OPERATIONAL PRINCIPLES OF THE REFRIGERATING CIRCUIT OPERATION
- THE MODES OF DETECTING TEMPERATURE AND PRESSURE
- THE RISKS RELEVANT TO THESE OPERATIONS

The data of the tables allow the testing of the refrigerating circuit operation by the detection of a few objective parameters:

- Condensing pressure
- Liquid temperature
- Inlet pressure
- Inlet temperature

The data are significant if they are detected simultaneously and while the refrigerating circuit is running.

OVERHEATING = inlet temperature – Saturation temperature			
	R-22	R-407C	R-410A
Inlet pressure	3.8 bar	3.8 bar	7.2 bar
Inlet temperature	7.3°C	7.3°C	7.3°C
Overheating	$7.3 - (-1.13) = 8.43^{\circ}\text{C}$	$7.3 - 1.18 = 6.12^{\circ}\text{C}$ for calculation consider the Td (dew point)	$7.3 - 0.8 = 6.5^{\circ}\text{C}$

SUBCOOLING = condensing temperature (pressure *) – liquid temperature			
	R-22	R-407C	R-410A
Condensing pressure	18.6 bar	18.6 bar	29.6 bar
Liquid temp.	42.9°C	42.9°C	45°C
subcooling	$50.39 - 42.9 = 7.49^{\circ}\text{C}$	$44.74 - 42.9 = 1.84^{\circ}\text{C}$ for calculation consider the Tb (bubble point)	$49.91 - 45 = 4.91^{\circ}\text{C}$

* It is important that the condensation pressure is detected as close as possible to the point where the liquid temperature is detected, in the event that the calculation will be effected by the losses of charge (and, therefore, of temperature) caused by the refrigerating circuit components placed between the two measurement points.

For R410A the glide was not considered, since it is close to 0.

The values in the tables refer to a specific refrigerant supplier; slight differences are possible with other suppliers.

Pg = P gauge = relevant pressure (read on the pressure gauge) **Td** = dew point temperature

Ts = saturation pressure

Tb = bubble point temperature

- ROUTINE MAINTENANCE -

Pg	R-22	R-134a	R-407C		R-410A
	Ts [°C]	Ts [°C]	Td [°C]	Tb [°C]	Ts [°C]
0.0	-41.09	-26.36	-36.90	-43.90	-51.66
0.2	-37.14	-22.31	-33.11	-40.05	-48.02
0.4	-33.67	-18.76	-29.80	-36.67	-44.83
0.6	-30.57	-15.59	-26.83	-33.65	-41.98
0.8	-27.76	-12.71	-24.15	-30.92	-39.40
1.0	-25.18	-10.08	-21.69	-28.41	-37.03
1.2	-22.79	-7.64	-19.41	-26.09	-34.84
1.4	-20.57	-5.37	-17.29	-23.93	-32.81
1.6	-18.48	-3.24	-15.31	-21.90	-30.90
1.8	-16.52	-1.23	-13.44	-19.99	-29.10
2.0	-14.65	0.67	-11.66	-18.19	-27.39
2.2	-12.89	2.48	-9.98	-16.47	-25.78
2.4	-11.20	4.20	-8.38	-14.83	-24.24
2.6	-9.59	5.84	-6.85	-13.27	-22.76
2.8	-8.04	7.42	-5.38	-11.77	-21.35
3.0	-6.56	8.93	-3.97	-10.33	-20.00
3.2	-5.13	10.39	-2.61	-8.94	-18.69
3.4	-3.75	11.79	-1.31	-7.61	-17.44
3.6	-2.41	13.15	-0.04	-6.31	-16.22
3.8	-1.13	14.46	1.18	-5.06	-15.05
4.0	0.12	15.74	2.36	-3.85	-13.91
4.2	1.34	16.97	3.51	-2.68	-12.81
4.4	2.51	18.17	4.62	-1.54	-11.74
4.6	3.66	19.33	5.71	-0.43	-10.69
4.8	4.77	20.47	6.76	0.65	-9.68
5.0	5.86	21.57	7.79	1.70	-8.69
5.2	6.92	22.65	8.79	2.73	-7.73
5.4	7.96	23.70	9.77	3.73	-6.79
5.6	8.97	24.73	10.72	4.71	-5.87
5.8	9.95	25.73	11.65	5.67	-4.97
6.0	10.92	26.71	12.56	6.60	-4.10
6.2	11.87	27.67	13.46	7.52	-3.24
6.4	12.79	28.62	14.33	8.41	-2.40
6.6	13.70	29.54	15.18	9.29	-1.57
6.8	14.59	30.44	16.02	10.15	-0.77
7.0	15.47	31.33	16.85	11.00	0.02
7.2	16.32	32.20	17.65	11.83	0.80
7.4	17.16	33.05	18.45	12.64	1.56
7.6	17.99	33.89	19.22	13.44	2.31
7.8	18.81	34.72	19.99	14.23	3.05
8.0	19.60	35.53	20.74	15.00	3.77
8.2	20.39	36.32	21.48	15.76	4.48
8.4	21.17	37.11	22.20	16.51	5.18
8.6	21.93	37.88	22.92	17.25	5.87
8.8	22.68	38.64	23.62	17.97	6.55
9.0	23.42	39.39	24.32	18.69	7.22
9.2	24.14	40.13	25.00	19.39	7.88
9.4	24.86	40.85	25.67	20.08	8.53
9.6	25.57	41.57	26.34	20.77	9.16
9.8	26.27	42.27	26.99	21.44	9.79
10.0	26.95	42.97	27.63	22.11	10.42
10.2	27.63	43.66	28.27	22.76	11.03
10.4	28.30	44.33	28.90	23.41	11.63
10.6	28.96	45.00	29.51	24.05	12.23
10.8	29.62	45.66	30.13	24.68	12.82

Pg	R-22	R-134a	R-407C		R-410A
	Ts [°C]	Ts [°C]	Td [°C]	Tb [°C]	Ts [°C]
11.0	30.26	46.32	30.73	25.30	13.40
11.2	30.90	46.96	31.32	25.92	13.97
11.4	31.53	47.59	31.91	26.52	14.54
11.6	32.15	48.22	32.49	27.12	15.10
11.8	32.76	48.84	33.07	27.72	15.66
12.0	33.37	49.46	33.63	28.30	16.20
12.2	33.97	50.06	34.19	28.88	16.74
12.4	34.57	50.66	34.75	29.46	17.28
12.6	35.15	51.26	35.30	30.03	17.81
12.8	35.73	51.84	35.84	30.59	18.33
13.0	36.31	52.42	36.37	31.14	18.85
13.2	36.88	53.00	36.90	31.69	19.36
13.4	37.44	53.56	37.43	32.23	19.87
13.6	38.00	54.13	37.95	32.77	20.37
13.8	38.55	54.68	38.46	33.31	20.86
14.0	39.10	55.23	38.97	33.83	21.36
14.2	39.64	55.78	39.47	34.35	21.84
14.4	40.17	56.32	39.97	34.87	22.32
14.6	40.70	56.85	40.46	35.38	22.80
14.8	41.23	57.38	40.95	35.89	23.27
15.0	41.75	57.91	41.43	36.39	23.74
15.2	42.26	58.43	41.91	36.89	24.20
15.4	42.78	58.94	42.39	37.39	24.66
15.6	43.28	59.45	42.86	37.87	25.12
15.8	43.78	59.96	43.32	38.36	25.57
16.0	44.28	60.46	43.78	38.84	26.01
16.2	44.77	60.95	44.24	39.32	26.46
16.4	45.26	61.44	44.69	39.79	26.90
16.6	45.75	61.93	45.14	40.26	27.33
16.8	46.23	62.42	45.59	40.72	27.76
17.0	46.71	62.90	46.03	41.18	28.19
17.2	47.18	63.37	46.47	41.64	28.62
17.4	47.65	63.84	46.90	42.09	29.04
17.6	48.11	64.31	47.33	42.54	29.45
17.8	48.58	64.77	47.76	42.99	29.87
18.0	49.03	65.23	48.18	43.43	30.28
18.2	49.49	65.69	48.60	43.87	30.69
18.4	49.94	66.14	49.02	44.30	31.09
18.6	50.39	66.59	49.43	44.74	31.49
18.8	50.83	67.04	49.84	45.16	31.89
19.0	51.27	67.48	50.25	45.59	32.28
19.2	51.71	67.92	50.65	46.01	32.68
19.4	52.15	68.36	51.05	46.43	33.07
19.6	52.58	68.79	51.45	46.85	33.45
19.8	53.01	69.22	51.85	47.26	33.84
20.0	53.43	69.64	52.24	47.67	34.22
20.2	53.85	70.07	52.63	48.08	34.59
20.4	54.27	70.49	53.01	48.49	34.97
20.6	54.69	70.90	53.39	48.89	35.34
20.8	55.10	71.32	53.77	49.29	35.71
21.0	55.51	71.73	54.15	49.69	36.08
21.2	55.92	72.14	54.53	50.08	36.44
21.4	56.33	72.54	54.90	50.47	36.81
21.6	56.73	72.95	55.27	50.86	37.17
21.8	57.13	73.35	55.64	51.25	37.52

- ROUTINE MAINTENANCE -

Pg	R-22	R-134a	R-407C		R-410A
	Ts [°C]	Ts [°C]	Td [°C]	Tb [°C]	Ts [°C]
22.0	57.53	73.74	56.00	51.63	37.88
22.2	57.92	74.14	56.36	52.01	38.23
22.4	58.31	74.53	56.72	52.39	38.58
22.6	58.70	74.92	57.08	52.77	38.93
22.8	59.09	75.31	57.43	53.14	39.28
23.0	59.48	75.69	57.79	53.51	39.62
23.2	59.86	76.07	58.14	53.88	39.96
23.4	60.24	76.45	58.48	54.25	40.30
23.6	60.62	76.83	58.83	54.62	40.64
23.8	60.99	77.21	59.17	54.98	40.98
24.0	61.36	77.58	59.51	55.34	41.31
24.2	61.74	77.95	59.85	55.70	41.64
24.4	62.10	78.32	60.19	56.05	41.97
24.6	62.47	78.68	60.53	56.41	42.30
24.8	62.84	79.04	60.86	56.76	42.62
25.0	63.20	79.41	61.19	57.11	42.95
25.2	63.56	79.76	61.52	57.46	43.27
25.4	63.92	80.12	61.84	57.81	43.59
25.6	64.27	80.48	62.17	58.15	43.90
25.8	64.63	80.83	62.49	58.49	44.22
26.0	64.98	81.18	62.81	58.83	44.53
26.2	65.33	81.53	63.13	59.17	44.85
26.4	65.68	81.87	63.45	59.51	45.16
26.6	66.03	82.22	63.76	59.85	45.47
26.8	66.37	82.56	64.07	60.18	45.77
27.0	66.71	82.90	64.38	60.51	46.08
27.2	67.05	83.24	64.69	60.84	46.38
27.4	67.39	83.58	65.00	61.17	46.69
27.6	67.73	83.91	65.31	61.50	46.99
27.8	68.07	84.24	65.61	61.82	47.28
28.0	68.40	84.58	65.91	62.14	47.58
28.2	68.73	84.90	66.21	62.46	47.88
28.4	69.06	85.23	66.51	62.78	48.17
28.6	69.39	85.56	66.81	63.10	48.46
28.8	69.72	85.88	67.10	63.42	48.76
29.0	70.04	86.20	67.40	63.73	49.05
29.2	70.37	86.52	67.69	64.05	49.33
29.4	70.69	86.84	67.98	64.36	49.62
29.6	71.01	87.16	68.27	64.67	49.91
29.8	71.33	87.47	68.56	64.98	50.19
30.0	71.64	87.79	68.84	65.29	50.47
30.2	71.96	88.10	69.13	65.59	50.75
30.4	72.27	88.41	69.41	65.90	51.03
30.6	72.59	88.72	69.69	66.20	51.31
30.8	72.90	89.03	69.97	66.50	51.59
31.0	73.21	89.33	70.25	66.80	51.86
31.2	73.52	89.64	70.52	67.10	52.14
31.4	73.82	89.94	70.80	67.40	52.41
31.6	74.13	90.24	71.07	67.69	52.68
31.8	74.43	90.54	71.34	67.99	52.95
32.0	74.73	90.83	71.61	68.28	53.22
32.2	75.03	91.13	71.88	68.57	53.49
32.4	75.33	91.43	72.15	68.87	53.75
32.6	75.63	91.72	72.42	69.15	54.02
32.8	75.93	92.01	72.68	69.44	54.28

Pg	R-22	R-134a	R-407C		R-410A
	Ts [°C]	Ts [°C]	Td [°C]	Tb [°C]	Ts [°C]
33.0	76.22	92.30	72.94	69.73	54.54
33.2	76.52	92.59	73.21	70.02	54.80
33.4	76.81	92.88	73.47	70.30	55.06
33.6	77.10	93.16	73.72	70.58	55.32
33.8	77.39	93.45	73.98	70.87	55.58
34.0	77.68	93.73	74.24	71.15	55.84
34.2	77.97	94.01	74.49	71.43	56.09
34.4	78.26	94.29	74.75	71.70	56.34
34.6	78.54	94.57	75.00	71.98	56.60
34.8	78.82	94.85	75.25	72.26	56.85
35.0	79.11	95.12	75.50	72.53	57.10
35.2	79.39	95.40	75.75	72.81	57.35
35.4	79.67	95.67	75.99	73.08	57.60
35.6	79.95	95.94	76.24	73.35	57.85
35.8	80.23	96.21	76.48	73.62	58.09
36.0	80.50	96.48	76.73	73.89	58.34
36.2	80.78	96.75	76.97	74.16	58.58
36.4	81.05	97.01	77.21	74.43	58.82
36.6	81.32	97.28	77.45	74.69	59.07
36.8	81.60	97.54	77.69	74.96	59.31
37.0	81.87	97.80	77.92	75.22	59.55
37.2	82.14	98.06	78.16	75.49	59.78
37.4	82.40	98.32	78.39	75.75	60.02
37.6	82.67	98.58	78.62	76.01	60.26
37.8	82.94	98.84	78.86	76.27	60.50
38.0	83.20	99.09	79.09	76.53	60.73
38.2	83.47	99.34	79.31	76.79	60.96
38.4	83.73	99.60	79.54	77.05	61.20
38.6	83.99	99.85	79.77	77.31	61.43
38.8	84.25	100.09	79.99	77.56	61.66
39.0	84.51	100.34	80.22	77.82	61.89
39.2	84.77	100.59	80.44	78.07	62.12
39.4	85.03	100.83	80.66	78.33	62.35
39.6	85.29	-	80.88	78.58	62.57
39.8	85.54	-	81.10	78.83	62.80
40.0	85.80	-	81.31	79.08	63.02
40.2	86.05	-	81.53	79.33	63.25
40.4	86.30	-	81.74	79.58	63.47
40.6	86.55	-	81.95	79.83	63.69
40.8	86.80	-	82.16	80.08	63.92
41.0	87.05	-	82.37	80.33	64.14
41.2	87.30	-	82.58	80.57	64.36
41.4	87.55	-	82.79	80.82	64.58
41.6	87.80	-	82.99	81.06	64.79
41.8	88.04	-	83.19	81.31	65.01
42.0	88.29	-	83.40	81.55	65.22
42.2	88.53	-	83.60	81.80	65.44
42.4	-	-	-	-	65.65
42.6	-	-	-	-	65.87
42.8	-	-	-	-	66.08
43.0	-	-	-	-	66.29
43.2	-	-	-	-	66.50
43.4	-	-	-	-	66.71
43.6	-	-	-	-	66.92
43.8	-	-	-	-	67.13

- TROUBLESHOOTING -

TECHNICAL QUALIFIED PERSONNEL HAVING THE REQUISITES UNDER LAW REQUISITES AND IN CONFORMITY WITH THE SAFETY REGULATIONS IN FORCE MUST CARRY OUT THE OPERATIONS.

THE INTERVENTIONS WITHIN THE WARRANTY PERIOD WILL BE CARRIED OUT BY AUTHORIZED SERVICE CENTERS.

BEFORE RESETTING AN ALARM, IDENTIFY AND ELIMINATE ITS CAUSE.
REPEATED RESETS MAY CAUSE SERIOUS DAMAGES.

Below is a list of the possible causes of alarms.

FAULTY PROBE

1. Identify the part on the wiring diagram.
2. Are the electric contacts/terminals loose? Are the leads broken or damaged?
3. Check the correct probe ohmic level using a tester.
4. Change the probe.
5. Check the electronic module configuration (only an authorised service centre can do this)
6. Change the electronic module

FAULTY PRESSURE TRANSDUCER

1. Identify the part on the wiring diagram
2. Are the electric contacts/terminals loose? Are the leads broken or damaged?
3. Check the pressure test points are in working order
4. Change the part
5. Check the electronic module configuration (only an authorised service centre can do this)
6. Change the electronic module

IN CERTAIN MACHINE CONFIGURATIONS, CERTAIN SAFETY DEVICES MAY BE IN SERIES AND REPORT TO A SINGLE INPUT ON THE ELECTRONIC MODULE.

CHECK THE WIRING DIAGRAM TO SEE IF THE DEVICE RELATIVE TO THE ALARM IS CONNECTED IN SERIES TO OTHER DEVICES OR SAFETY DEVICES.

IN COOLING**HIGH PRESSURE**

1. Is water temperature within the operating limits? (See paragraph: GENERAL - limits)
2. Is air temperature within the operating limits? (See paragraph: GENERAL - limits)
3. Is the coil clean?
4. Do the fans work?
5. Manostat/transducer: are the electric contacts/terminals loose? Are the wires broken or damaged?
6. Anti-condensation gas in the cooling circuit?
7. Too much refrigerant in the circuit?
8. Check the trigger point for the manostat and transducer.
9. Check the manostat or transducer pressure control point (deposits of oil, dirt, pin blocked mechanically)

LOW PRESSURE

1. Is air temperature within the operating limits (see paragraph: GENERAL - limits)
2. Is water temperature within the operating limits? (See paragraph: GENERAL - limits)
3. Check the water flow to the exchanger (and the thermal jump between intake and outlet)
4. Is flow CONSTANT or does it change in certain situations? (For example, if the pumps are turned off, certain areas of the plant are excluded or included, other uses are isolated, etc.).
5. Water filter clean / valves open /air bubbles in the plant.
6. Check the exchanger is clean.
7. Manostat / transducer: are the electric contacts / terminals loose? Are the wires broken or damaged?
8. Is the cooling circuit pressurised? Are there visible leaks of coolant? Is it correctly filled?
9. Blocked dehydrator filter?
10. Does the thermostat work correctly?
11. Check the trigger point for the manostat and transducer
12. Check the manostat or transducer pressure test point (build up of oil or dirt, pin blocked mechanically).

IN HEATING

HIGH PRESSURE

1. Is water temperature within the operating limits? (See paragraph: GENERAL - limits)
2. Is air temperature within the operating limits? (See paragraph: GENERAL - limits)
3. Check the water flow to the exchanger (and the thermal jump between intake and outlet)
4. Is flow CONSTANT or does it change in certain situations? (For example, if the pumps are turned off, certain areas of the plant are excluded or included, other uses are isolated, etc)
5. Water filter clean / valves open /air bubbles in the plant?
6. Check the exchanger is clean
7. Manostat / transducer: are the electric contacts / terminals loose? Are the wires broken or damaged?
8. Too much refrigerant in the circuit?
9. Check the trigger point for the manostat and transducer.
10. Check the manostat or transducer pressure control point (deposits of oil, dirt, pin blocked mechanically).

LOW PRESSURE

1. Is water temperature within the operating limits? (See paragraph: GENERAL - limits)
2. Is air temperature within the operating limits? (See paragraph: GENERAL - limits)
3. Is the coil clean?
4. Do the fans work?
5. Manostat / transducer: are the electric contacts / terminals loose? Are the wires broken or damaged?
6. Check the trigger point for the manostat and transducer
7. Is the cooling circuit pressurised? Are there visible leaks of coolant? Is it correctly filled?
8. Blocked dehydrator filter?
9. Does the thermostat work correctly?
10. Check the manostat or transducer pressure control point (deposits of oil, dirt, pin blocked mechanically).

COMPRESSOR PROTECTIONS

1. Identify the part on the wiring diagram
2. Are the electric contacts / terminals loose? Are the wires broken or damaged?
3. Check electric coil continuity using a tester.
4. Is vacuum power voltage below the limits?
5. Check the power contactors and relative contacts.
6. Is take-off power voltage lower than the limits?
7. Check electric input
8. Compressor discharge temperature higher than 120°C? Yes > check the thermostat and the coolant level.

FAN PROTECTIONS

1. Identify the part on the wiring diagram
2. Is the fan blocked manually? Check the bearings and drive belt (if fitted)
3. Are the electric contacts / terminals loose? Are the wires broken or damaged?
4. Check electric coil continuity using a tester
5. Is vacuum power voltage below the limits?
6. Check electric input

PUMP PROTECTION

1. Identify the part on the wiring diagram
2. Is the pump blocked manually? (If it is a circulation pump, it could happen after long periods without use)
3. Are the electric contacts / terminals loose? Are the wires broken or damaged?
4. Check electric coil continuity using a tester
5. Is vacuum power voltage below the limits?
6. Check electric input

- DECOMMISSIONING OF THE UNIT -

DISCONNECTING THE UNIT

Authorised personnel, who before proceeding must first read the Residual Risks section in this manual, must disconnect the units.

Before disconnecting the unit, the following must be recovered, if present:

- the refrigerant (if the circuits cannot be isolated): the refrigerant must be removed using suction devices operating in a closed circuit, so as to ensure that none of the compound is released into the atmosphere.
- the antifreeze in the circuits: when removing this fluid, make sure that it does not leak and that it is not released into the environment. The antifreeze fluid must be stored in special containers.

When recovering the substances present in the unit, all measures must be taken to avoid damaging persons and things and polluting the surrounding area.

Awaiting dismantling and disposal, the unit can also be stored outdoors, as bad weather and rapid changes in temperature will not cause damage to the environment.

DISMANTLING AND DISPOSAL

AFTER DISMANTLING, THE UNIT MUST BE DELIVERED TO AUTHORISED CENTRES FOR DISPOSAL.

On dismantling, the fan, motor and coil, if they work, should be delivered to specialised centres for recycling.

All materials involved with the unit must be disposed of in accordance with current national legislation.

For further information about disposing of the unit, please contact the manufacturer.

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