CLIVET®

R-407C

WSAT-SC

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

AIR-COOLED WATER CHILLERS RATED FROM 190 TO 450 KW

M01W45H6-06

Installation and Use Manual

- CONTENT -

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 SAFET 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 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 anti-condensate heat insulation. Two independent alternating water / freon refrigerant circuits, with cross flow to optimize heat exchange; complete with safety differential pressure switch on the water side and antifreeze heater to protect against the risk of freezing.

FAN
Helical fans with sickle-shaped blades with "Winglets" at the end, coupled directly to a three phase electric external rotor motor with thermal protection incorporated in version IP 54. Housed in aerodynamically shaped nozzles to increase efficiency and minimize noise levels. They are fitted with protective safety guard grilles.

REFRIGERANT CIRCUIT
The units are made with two independent refrigerant circuits, each with:
- electronic expansion valve (see details further on)
- high pressure switch
- low pressure switch
- high pressure safety valve
- low pressure safety valve
- replaceable anti-acid solid cartridge dehydrator filter
- compressor discharge shut-off valve
- liquid line shut-off valve
- sight glass with moisture indicator

Sizes 75C and 90C are realized only with a single refrigerant circuit.

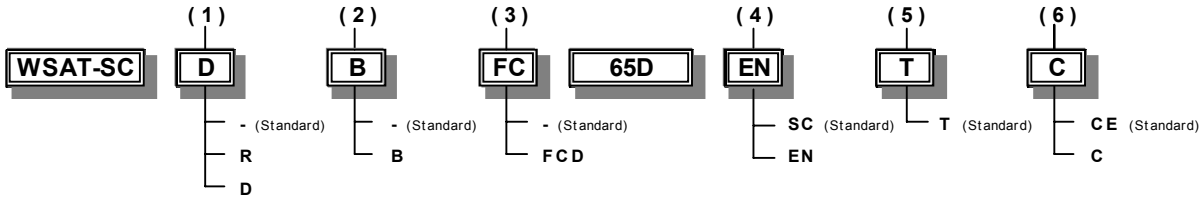
ELECTRICAL PANEL
the Power Section includes:
- main door lock isolator switch
- isolating transformer for auxiliary circuit power supply
- compressor circuit breaker
- fan overload circuit breakers
- compressor control contactor
- fan control contactors
- phase-cutting fan speed control

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
- input for demand limit (absorbed power limit according to an external signal 0÷10V or 4÷20mA) - except sizes 75C and 90C.
- 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
- possibility of communication with ZONE MASTER system (optional)

ACCESSORIES
- copper / aluminium condenser coils with acrylic lining
- copper / aluminium condenser coils with Fin Guard (Silver) treatment
- steel mesh strainer to be mounted at the exchanger inlet. (The manufacturer declines all liability with invalidation of the guarantee if it is not installed inside the system).
- condenser coil and compressor compartment protection grill.
- Anti-hail protection grilles
- compressor suction shut-off valve
- R-22
- Hydro Pack
- Anti-ice electric heaters utility side for hydronic group
- phase monitor
- power factor correction capacitors (cosfi > 0.9)
- Free contacts for compressor state
- Master-Slave function
- ECOBreeze
- set point compensation with outside temperature probe
- set point compensation with 4-20 mA signal
- set point compensation according to the outside enthalpy
- high and low pressure gauges
- remote microprocessor control unit
- data logger (device for the acquisition of status and regulation values, as well as for recording the operation conditions in the surrounding of alarm events)
- spring antivibration mounts
- CAN/LON WORKS serial converter kit
- CAN/MODBUS serial converter kit

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

CONFIGURATION CODE



(1) ENERGY RECOVERY
Total Recovery (R)
size 75C-90C NOT AVAILABLE
performed using braze-welded plate exchangers suitable for recovering 100% of the condensing heat for the production of hot water In addition, exchangers are complete with safety differential pressure switch on the water side, antifreeze heater to protect against the risk of ice.
Partial Recovery (D)
size 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. In addition, exchangers are complete with antifreeze heater to protect against the risk of ice.
Not required (-)
(2) LOW TEMPERATURE
Low water temperature (B)
this version allows unit operation in the range of water and glycol mix tempera-tures between +5°C and -8°C.
Two versions are available
- Unit for low temperatures only
- Unit with double working set point
(For special conditions contact our sales office)

(3) ENERGY SAVINGS
Direct free-cooling (FCD)
Version that allows to recovery free-cooling from ambient when tha ambient air temperature is lower than the system outlet water temperature.
size 75C-90C NOT AVAILABLE
(4) ACOUSTIC CONFIGURATION
compressors soundproofing (SC)
this configuration is obtained by inserting the compressors in a soundproof enclosure.
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.
(5) ENERGY EFFICIENCY
Temperate Climate (T)
standard
(6) HEAT EXCHANGERS APPROVALS
C = CLIVET (Internal testing)
CE = PED (European testing)

- 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 partecipating 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.

- RESIDUAL RISKS -

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
- External danger zone, identified by a precise area around the unit (2 metres from the external diameter) 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.

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.
- 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.

- RESIDUAL RISKS -

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: • 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	**Precautionary measures to be taken**: Ensure a sufficient exchange of air and/or suction in workplaces. **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.
09	Physical and chemical properties	**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
10	Stability and reactivity	**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
11	Toxicological information	**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)
12	Ecological information	**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
13	Notes concerning disposal	**Disposal of product**: recycle or incenerate.
14	Information on shipping	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
15	Information on regulation	**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
16	Other information	**Recommended uses**: low-temperature coolant **Bibliographical references**: Encyclopedie des gas (Air Liquide-ed.1976- ELSEVIER AMSTERDAM)

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: SC (STANDARD)

SIZES			65D	70D	75C	75D	80D	90C	90D	100D	110D	120D	135F	150F	165F	180F
Cooling																
Cooling capacity	1	kW	177.4	188.7	193.4	202.3	213	237.5	233.4	256	306.4	328.2	356.4	394	427	463.6
Compressor power input		kW	54	58.2	67.8	64.2	69.8	86.1	77.2	89.6	94.5	106	114	131	145	160
Total power input		kW	62.1	66.3	73.8	72.3	77.9	94	85.3	97.7	106	118	128	147	162	176
EER			2.86	2.85	2.62	2.8	2.73	2.53	2.74	2.62	2.88	2.79	2.78	2.67	2.63	2.63
ESEER			4.09	4.07	3.97	4	3.91	3.91	3.91	3.75	4.12	3.99	4.16	4.06	4	4.02
Compressor																
Type of compressors			SCROLL													
No. of Compressors		Nr	4	4	3	4	4	3	4	4	4	4	6	6	6	6
Rated power (C1)		HP	30	35	75	35	40	90	45	50	55	60	60	75	75	90
Nominal Power (C2)		HP	35	35	-	40	40	-	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	12	14	18	14	16	18	16	16	19	24	24	24	24	24
Oil charge (C2)		l	14	14	-	16	16	-	16	16	24	24	24	24	24	24
Refrigerant charge (C1)		kg	27	30.5	25	30.5	34	25	36	38	40.5	51	51	57	57	57
Refrigerant charge (C2)		kg	30.5	30.5	-	34	34	-	36	38	51	51	57	57	57	57
Refrigerant circuits		Nr	2	2	1	2	2	1	2	2	2	2	2	2	2	2
Internal exchanger																
Type of internal exchanger	2		PHE													
No. of internal exchangers		Nr	1													
Water flow rate		l/s	8.5	9	9.2	9.7	10.2	11.4	11.2	12.2	14.6	15.7	17	18.8	20.4	22.1
Pressure drop		kPa	31	35	27	31	34	30	35	35	36	41	32	40	39	45
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	7	11.9	11.9	8.3	11.9	11.9	17.3	17.3	17.3	17.3	17.3	17.3
External section fans																
Type of fans	3		AX													
Number of fans		Nr	2 + 2	2 + 2	3	2 + 2	2 + 2	4	2 + 2	2 + 2	3 + 3	3 + 3	3 + 4	4 + 4	4 + 4	4 + 4
Standard air flow		l/s	24400	23900	18100	23900	23900	21400	23900	23900	36700	35750	39700	43600	46000	44800
Connections																
Water fittings			3"													
Dimensions																
Length		mm	2950	2950	3250	2950	2950	3650	2950	2950	4250	4250	4250	4250	4250	4250
Depth		mm	2195	2195	1095	2195	2195	1095	2195	2195	2195	2195	2195	2195	2195	2195
Height		mm	2250	2250	2030	2250	2250	2030	2250	2250	2250	2250	2250	2250	2250	2250
Standard unit weights																
Shipping weight		kg	2172	2240	1771	2305	2374	2117	2385	2398	3030	3104	3250	3273	3683	3895
Operating weight		kg	2187	2257	1791	2323	2393	2138	2406	2422	3055	3133	3283	3310	3720	3932

(1) data referred to the following conditions :
internal exchanger water = 12/7°C
room temperature = 35°C

(2) PHE = plates
(3) AX = axial-flow fan

OPERATING LIMITS

SIZES			75C	90C	65D	70D	75D	80D	90D	100D	110D	120D	135F	150F	165F	180F
External exchanger																
Max air intake temperature	1	°C	47	47	43	47	47	43	45	43	46	46	45	45	45	45
Max air intake temperature	2	°C	50	50	45	50	50	45	48	46	49	49	48	48	48	48
Min. air intake temperature	3	°C	-10													
Min. air intake temperature	4	°C	-7													
Min. air intake temperature	5	°C	3													
Min. air intake temperature	6	°C	12													
Internal exchanger																
Max water inlet temperature		°C	22													
Min. water outlet temperature	7	°C	6													
Min. water outlet temperature	8	°C	-8													

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: the Standard unit shall never be exposed, at temperatures below -10°C while
supplied. On request it's possible to take countermeasures for the operation also in more
critical environmental conditions. For special conditions contact our Sales Office.
ATTENTION: IN CASE OF PREDOMINANT WINDS, WINDBREAK BARRIERS ARE NECESSARY.

(1) 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 unit
(8) B = Low Temperature.

- ELECTRICAL DATA -

ACOUSTIC CONFIGURATION: (EN)

SIZES			65D	70D	75C	75D	80D	90C	90D	100D	110D	120D	135F	150F	165F	180F
COOLING																
Cooling capacity	1	kW	173	185	187	196	206	233	225	253	296	319	354	385	416	440
Compressor power input		kW	55.7	60.8	71.9	67.7	73.8	88.7	81.9	92	98	111	122	135	153	171
Total power input		kW	61	66.1	75.8	73	79.1	93.8	87.2	97.3	106	118	131	146	164	182
EER			2.84	2.8	2.47	2.68	2.6	2.49	2.58	2.6	2.8	2.69	2.7	2.64	2.54	2.41
ESEER			4.26	4.2	3.83	4.02	3.9	3.86	3.87	3.89	4.2	4.04	4.2	4.1	3.95	3.75
COMPRESSOR																
Type of compressors			SCROLL													
No. of Compressors		Nr	4	4	3	4	4	3	4	4	4	4	6	6	6	6
Rated power (C1)		HP	30	35	75	35	40	90	45	50	55	60	60	75	75	90
Nominal Power (C2)		HP	35	35	-	40	40	-	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	12	14	18	14	16	18	16	16	19	24	24	24	24	24
Oil charge (C2)		l	14	14	-	16	16	-	16	16	24	24	24	24	24	24
Refrigerant charge (C1)		kg	27	30.5	25	30.5	34	25	36	38	40.5	51	51	57	57	57
Refrigerant charge (C2)		kg	30.5	30.5	-	34	34	-	36	38	51	51	57	57	57	57
Refrigerant circuits		Nr	2	2	1	2	2	1	2	2	2	2	2	2	2	2
INTERNAL EXCHANGER																
Type of internal exchanger	2		PHE													
No. of internal exchangers		Nr	1													
Water flow rate		l/s	8.3	8.8	8.9	9.4	9.8	11.1	10.7	12.1	14.2	15.2	16.9	18.4	19.9	21
Pressure drop		kPa	30	34	26	30	33	29	34	34	35	40	31	39	37	41
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	7	11.9	11.9	8.3	11.9	11.9	17.3	17.3	17.3	17.3	17.3	17.3
EXTERNAL SECTION FANS																
Type of fans	3		AX													
Number of fans		Nr	4	4	3	4	4	4	4	4	6	6	7	8	8	8
Standard air flow		l/s	18200	17800	13900	17800	17800	15500	17800	16900	26550	26550	32500	35000	34200	33350
CONNECTIONS																
Water fittings			3"													
DIMENSIONS																
Length		mm	2950	2950	3250	2950	2950	3650	2950	2950	4250	4250	4250	4250	4250	4250
Depth		mm	2195	2195	1095	2195	2195	1095	2195	2195	2195	2195	2195	2195	2195	2195
Height		mm	2250	2250	2030	2250	2250	2030	2250	2250	2250	2250	2250	2250	2250	2250
STANDARD UNIT WEIGHTS																
Shipping weight		kg	2181	2260	1791	2325	2394	2137	2405	2418	2980	3129	3340	3453	3773	3875
Operating weight		kg	2197	2277	1811	2343	2413	2158	2426	2442	3005	3158	3373	3490	3810	3912

(1) data referred to the following conditions :
internal exchanger water = 12/7°C
room temperature = 35°C

(2) PHE = plates
(3) AX = axial-flow fan

OPERATING LIMITS

SIZES			75C	90C	65D	70D	75D	80D	90D	100D	110D	120D	135F	150F	165F	180F
EXTERNAL EXCHANGER																
Max air intake temperature	1	°C	46	46	40	44	44	40	43	43	44	43	43	43	43	43
Max air intake temperature	2	°C	49	49	43	47	47	43	46	46	47	46	46	46	46	46
Min. air intake temperature	3	°C	-10													
Min. air intake temperature	4	°C	-7													
Min. air intake temperature	5	°C	3													
Min. air intake temperature	6	°C	12													
INTERNAL EXCHANGER																
Max water inlet temperature		°C	22													
Min. water outlet temperature	7	°C	6													
Min. water outlet temperature	8	°C	-8													

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: the Standard unit shall never be exposed, at temperatures below -10°C while
supplied. On request it's possible to take countermeasures for the operation also in more
critical environmental conditions. For special conditions contact our Sales Office.
ATTENTION: IN CASE OF PREDOMINANT WINDS, WINDBREAK BARRIERS ARE NECESSARY.

(1) unit at full load
(2) Max inlet air temperature - capacity-controlled unit with standard limit device
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(6) Min inlet air temperature - unit at partial load and air speed of 1 m/s.
(7) standard unit
(8) B = Low Temperature.

- ELECTRICAL DATA -

SETTING THE CUT-OUT DEVICES AND CONTROLS

		Open	Closed	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	
High pressure 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

FOULING CORRECTION FACTORS

	INTERNAL EXCHANGER	
m² °C/W	Cooling capacity correction factors	m² °C/W Cooling capacity correction factors Compressor
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.

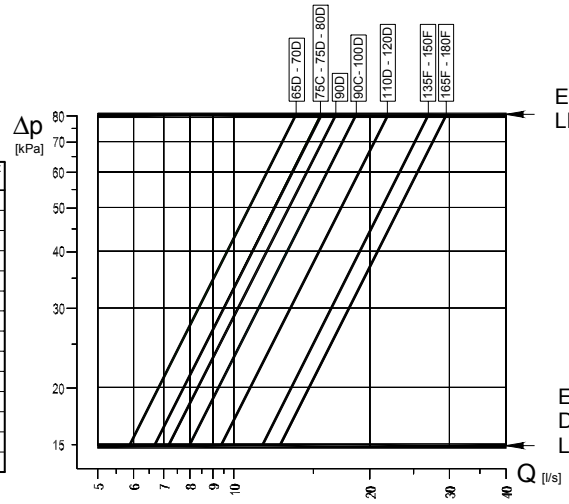
EXCHANGER OPERATING LIMIT (SC-EN)

	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

INTERNAL EXCHANGER PRESSURE DROPS: SC - EN

	Qmin [l/s]	Qmax [l/s]
75C	6.7	15.6
90C	8.0	18.6
65D	5.9	13.7
70D	5.9	13.7
75D	6.7	15.5
80D	6.7	15.5
90D	7.2	16.8
100D	8.0	18.6
110D	9.4	21.9
120D	9.4	21.9
135F	11.6	26.9
150F	11.6	26.9
165F	12.7	29.5
180F	12.7	29.5



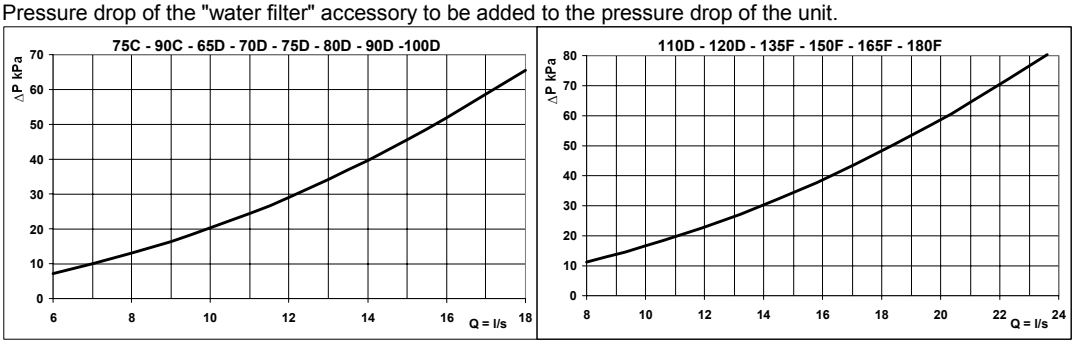
EVAPORATOR PRESSURE DROP LIMIT. CAUTION: DO NOT USE OVER THIS LIMIT

EVAPORATOR PRESSURE DROP LIMIT. CAUTION: DO NOT USE UNDER THIS LIMIT

ACCESSORIES

WATER FILTER

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



Q = water flow dP = pressure drop

SOUND LEVELS

SC (STANDARD) **EN**

Power supplied 33% - Ambient temperature 28°C

Size	Sound Power Level (dB) Octave band (Hz) 63	125	250	500	1000	2000	4000	8000	Sound pressure level dB(A)	Sound power level dB(A)
75C	85	84	80	78	72	66	63	55	60	78
90C	78	83	79	77	71	66	62	55	60	78
135F	85	87	83	81	75	69	66	59	62	82
150F	85	88	84	81	76	70	66	59	63	82
165F	85	88	84	82	76	70	67	60	63	83
180F	85	88	84	82	76	70	67	60	63	83

Size	Sound Power Level (dB) Octave band (Hz) 63	125	250	500	1000	2000	4000	8000	Sound pressure level dB(A)	Sound power level dB(A)
75C	82	83	79	76	71	67	62	56	59	78
90C	82	82	78	76	71	67	63	56	59	77
135F	86	87	82	77	75	70	64	60	61	80
150F	87	87	83	79	75	70	65	61	61	81
165F	86	87	83	80	75	71	66	60	62	82
180F	86	87	83	80	75	71	66	60	62	81

Power supplied 50% - Ambient temperature 30°C

Size.	Sound Power Level (dB) Octave band (Hz) 63	125	250	500	1000	2000	4000	8000	Sound pressure level dB(A)	Sound power level dB(A)
65D	96	92	93	89	85	81	74	68	72	91
70D	96	92	92	89	85	81	74	67	72	91
75D	96	92	92	89	85	81	74	67	72	91
80D	96	92	92	89	85	81	74	67	72	91
90D	96	92	92	89	85	81	74	67	72	91
100D	96	92	93	89	85	81	74	67	72	91
110D	98	94	95	91	87	83	76	70	74	93
120D	97	95	95	92	88	83	77	70	74	94

Size	Sound Power Level (dB) Octave band (Hz) 63	125	250	500	1000	2000	4000	8000	Sound pressure level dB(A)	Sound power level dB(A)
65D	85	88	84	80	77	72	66	59	63	82
70D	85	88	84	80	77	72	66	59	64	83
75D	85	88	84	81	77	72	66	59	64	83
80D	85	88	84	82	77	72	66	59	64	83
90D	85	88	84	81	77	72	67	59	64	83
100D	84	87	84	82	77	72	67	58	64	83
110D	87	90	86	83	79	74	68	61	66	85
120D	87	90	86	84	79	74	68	61	66	85

Power supplied 66% - Ambient temperature 30°C

Size	Sound Power Level (dB) Octave band (Hz) 63	125	250	500	1000	2000	4000	8000	Sound pressure level dB(A)	Sound power level dB(A)
75C	89	91	91	88	84	80	73	66	71	90
90C	92	91	92	89	84	80	74	66	72	90
135F	99	96	97	93	89	85	78	72	75	95
150F	100	96	97	94	90	85	79	72	75	95
165F	100	97	98	94	90	86	79	73	76	96
180F	100	97	97	94	90	86	79	72	76	96

Size	Sound Power Level (dB) Octave band (Hz) 63	125	250	500	1000	2000	4000	8000	Sound pressure level dB(A)	Sound power level dB(A)
75C	83	86	82	79	75	70	64	56	62	81
90C	83	86	82	80	75	70	65	57	63	81
135F	90	93	89	85	82	76	70	64	68	87
150F	91	94	90	86	82	77	70	65	68	88
165F	90	93	90	87	83	78	72	64	69	89
180F	90	93	90	88	82	78	72	64	69	89

Power supplied 100% - Ambient temperature 35°C

Size	Sound Power Level (dB) Octave band (Hz) 63	125	250	500	1000	2000	4000	8000	Sound pressure level dB(A)	Sound power level dB(A)
65D	99	95	96	92	88	84	77	71	75	94
70D	99	95	95	92	88	84	77	70	75	94
75C	92	94	94	91	87	83	76	69	74	93
75D	99	95	95	92	88	84	77	70	75	94
80D	99	95	95	92	88	84	77	70	75	94
90C	95	94	95	92	87	83	77	69	75	93
90D	99	95	95	92	88	84	77	70	75	94
100D	99	95	96	92	88	84	77	70	75	94
110D	101	97	98	94	90	86	79	73	77	96
120D	100	98	98	95	91	86	80	73	77	97
135F	101	98	99	95	91	87	80	74	77	97
150F	102	98	99	96	92	87	81	74	77	97
165F	102	99	100	96	92	88	81	75	78	98
180F	102	99	99	96	92	88	81	74	78	98

Size	Sound Power Level (dB) Octave band (Hz) 63	125	250	500	1000	2000	4000	8000	Sound pressure level dB(A)	Sound power level dB(A)
65D	88	91	87	83	80	75	69	62	66	85
70D	88	91	87	83	80	75	69	62	67	86
75C	86	89	85	82	78	73	67	59	65	84
75D	88	91	87	84	80	75	69	62	67	86
80D	88	91	87	85	80	75	69	62	67	86
90C	86	89	85	83	78	73	68	60	66	84
90D	88	91	87	84	80	75	70	62	67	86
100D	87	90	87	85	80	75	70	61	67	86
110D	90	93	89	86	82	77	71	64	69	88
120D	90	93	89	87	82	77	71	64	69	88
135F	92	95	91	87	84	78	72	66	70	89
150F	93	96	92	88	84	79	72	67	70	90
165F	92	95	92	89	85	80	74	66	71	91
180F	92	95	92	90	84	80	74	66	71	91

Measures according to ISO 3744 regulations, with respect to the EUROVENT 8/1 certification.
The sound pressure level is measured 1 metre the external surface of the unit operating in an open field. Data refer to the following conditions: internal exchanger water = 12/7°C.

- RECEPTION -

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

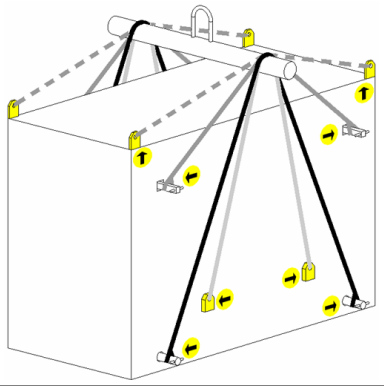
The following examples are indications; the choice of the means and of the handling modes will depend on factors, such as:

- 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).

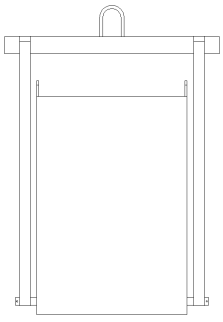
labels / yellow brackets show the lifting points

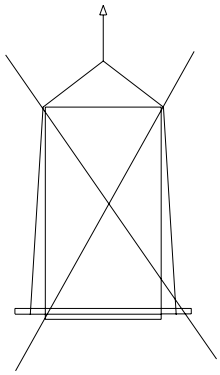
2 lifting points - use 2-arm uprights

(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

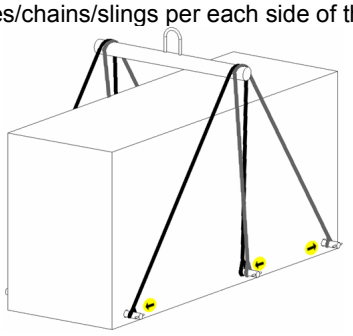




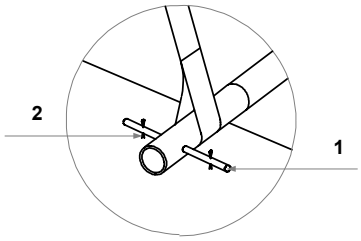
- RECEPTION -

3 lifting points - use 3-arm uprights

(3 slopes/chains/slings per each side of the unit)

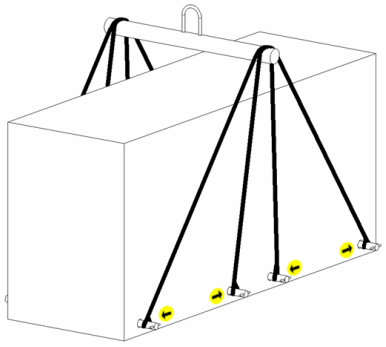


Insert safety pins (1)
and split pins (2)



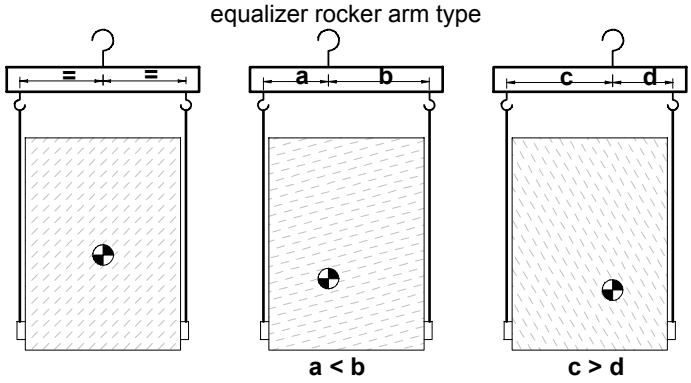
4 lifting points - use 4-arm uprights

(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.

- POSITIONING -

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. Install the unit raised from the ground
2. avoid installations in places subject to flooding
3. Consider the maximum level which can be reached by snow
4. Verify that the fixing/supporting points are level and suitable to support the weight of the unit (see the weight and the weights distribution).
5. 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/ aeraulic connections – the joints are not supplied by Clivet).
6. Anchor the unit to the ground; foresee windbreak barriers in case of places where there are strong prevalent winds

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

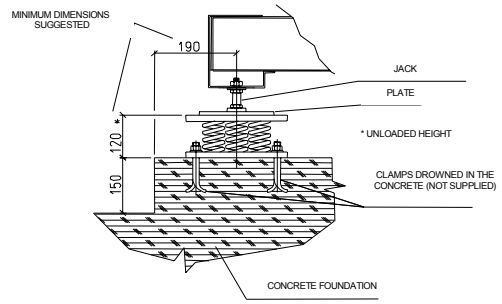
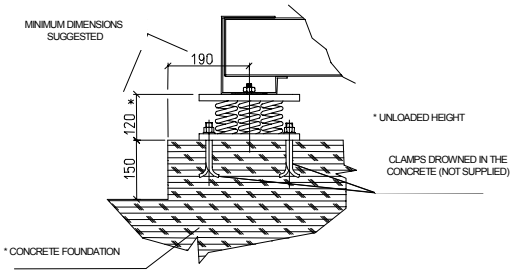
- Obstacles to the air flow
- Difficulties of air circulation
- Leaves or other objects which can obstruct the exchange coils.
- Winds which contrast or favour too much air flow
- Phenomena's of stratification or of air circulation
- Sources of heat in the nearby vicinity
- Positioning under the round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

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

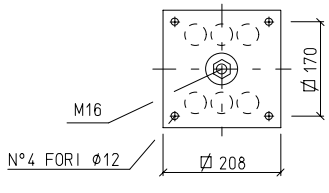
- During SUMMER operation, increase of the condensation pressure with the decay of performances and possible stops due to high pressure.

INSTALLATION OF ANTIVIBRATION MOUNTS

Use of an anti-vibration device requires the installation of flexible joints on the hydraulic / aeraulic / cooling connections.

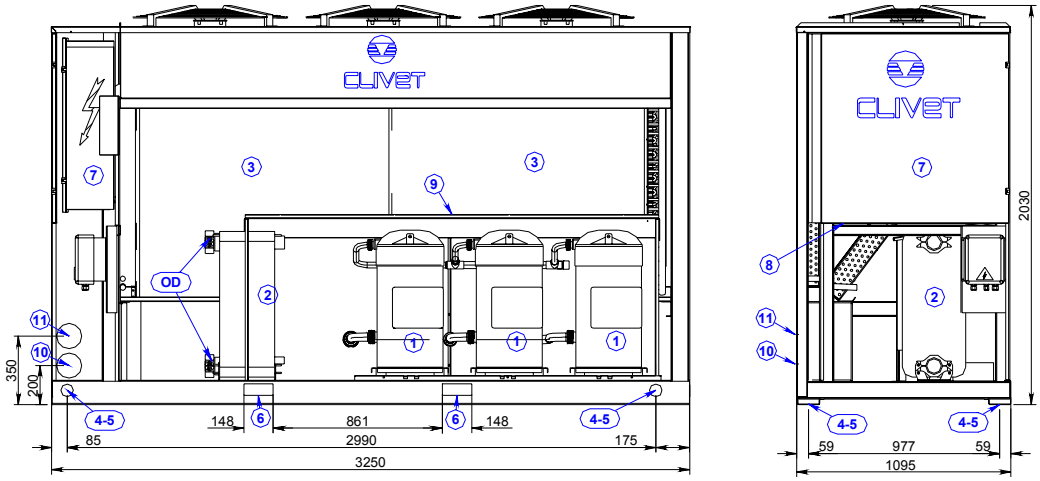
With a jack for leveling the unit	With a supported chassis
	

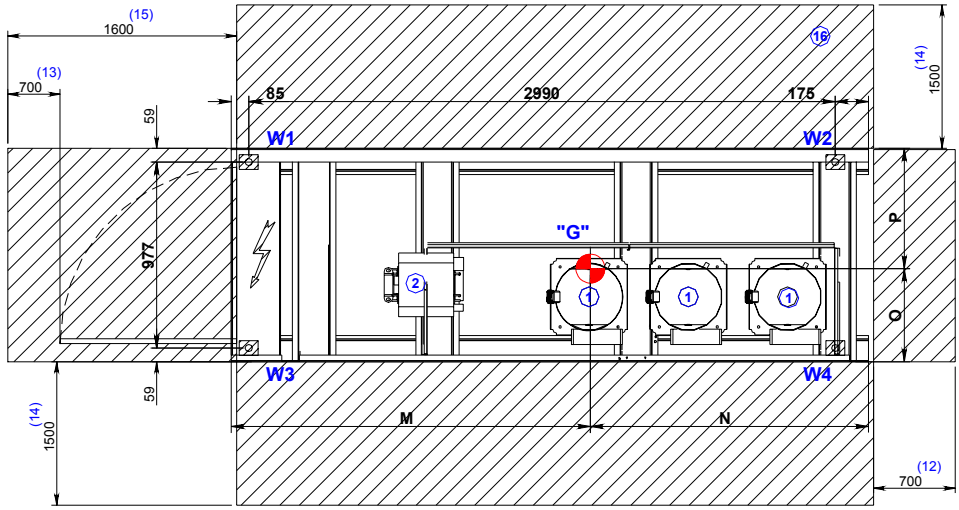
Each supporting point of the unit supports a different weight, so each anti-vibration device is dimensioned for a specific supporting point and only on this point can it be positioned.
The anti-vibration devices must be placed in accordance of the tables and the dimensional drawings where the supporting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



DIMENSIONS

Sizes 75C





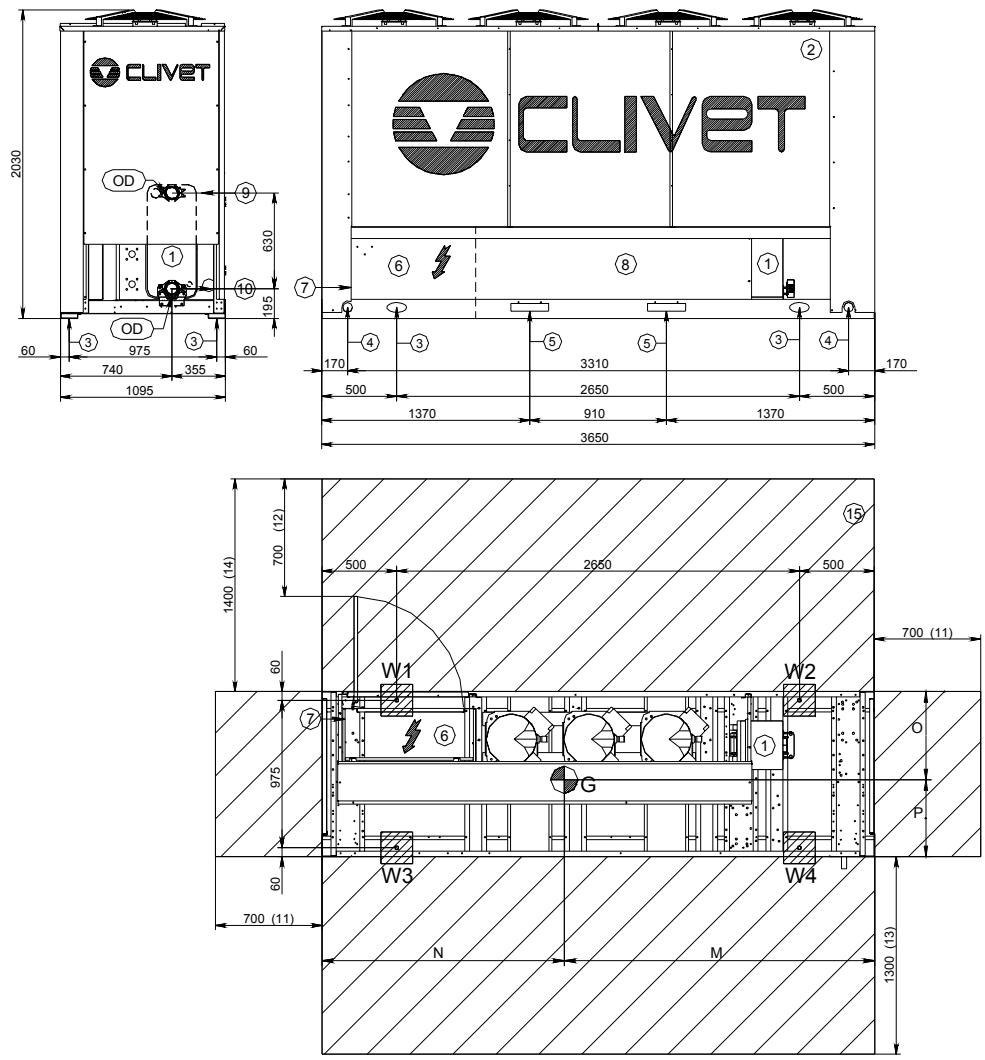
(1) COMPRESSOR
(2) INTERNAL EXCHANGER
(3) EXTERNAL EXCHANGER
(4) HOLE TO HANG UNIT
(5) LIFTING HOLES
(6) LIFTING LUGS
(7) ELECTRICAL PANEL
(8) POWER INPUT
(9) SOUNDPROOFED CABIN
(10) INTERNAL EXCHANGER WATER OUTLET
(11) INTERNAL EXCHANGER WATER INLET
(12) MINIMUM DIMENSION FOR A SAFE PASSAGE.
(13) MINIMUM 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

		SC	EN
SIZES		**75C**	**75C**
M	mm	1754	1757
N	mm	1496	1493
O	mm	568	570
P	mm	527	525
OD	mm	89	89
W1	kg	379	381
W2	kg	479	483
W3	kg	412	418
W4	kg	521	530

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

- POSITIONING -

Sizes 90C



(1) INTERNAL EXCHANGER
(2) EXTERNAL EXCHANGER
(3) HOLE TO HANG UNIT
(4) LIFTING HOLES
(5) LIFTING LUGS
(6) ELECTRICAL PANEL
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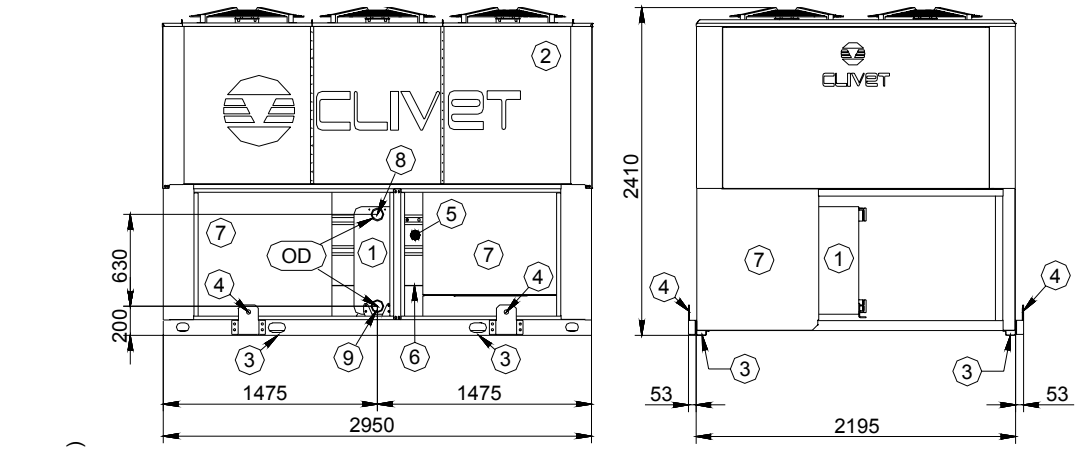
(13) MINIMUM DIMENSION FOR A PROPER AIR FLOW TO THE CONDENSER COIL.
(14) MINIMUM DIMENSION ON THE ELECTRICAL SWITCHBOARD SIDE.
(15) CLEARANCE ACCESS RECOMMENDED

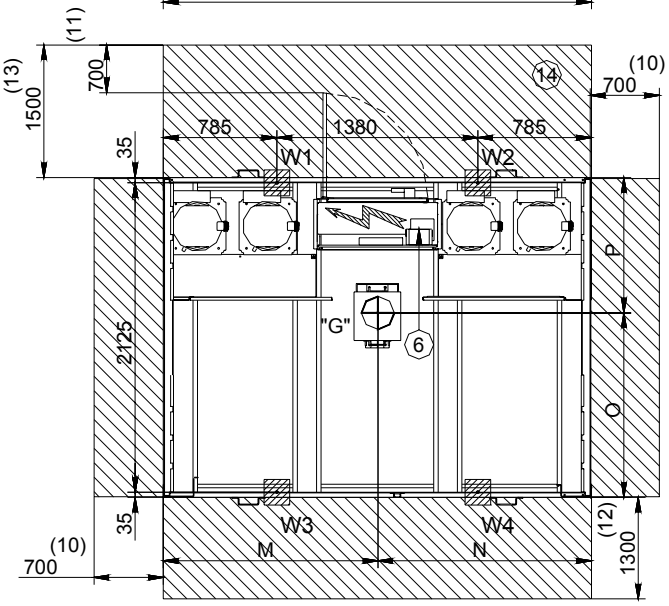
		SC	EN
SIZES		**90C**	**90C**
M	mm	1879	1869
N	mm	1771	1781
O	mm	522	504
P	mm	573	591
OD	mm	89	89
W1	kg	581	607
W2	kg	544	568
W3	kg	523	508
W4	kg	490	475

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

- POSITIONING -

Sizes **65D-70D-75D-80D 90D-100D**





(1) INTERNAL EXCHANGER
(2) EXTERNAL EXCHANGER
(3) HOLE TO HANG UNIT
(4) LIFTING HOLES
(5) ELECTRICAL PANEL
(6) POWER INPUT
(7) SOUNDPROOFED CABIN
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(9) INTERNAL EXCHANGER WATER OUTLET
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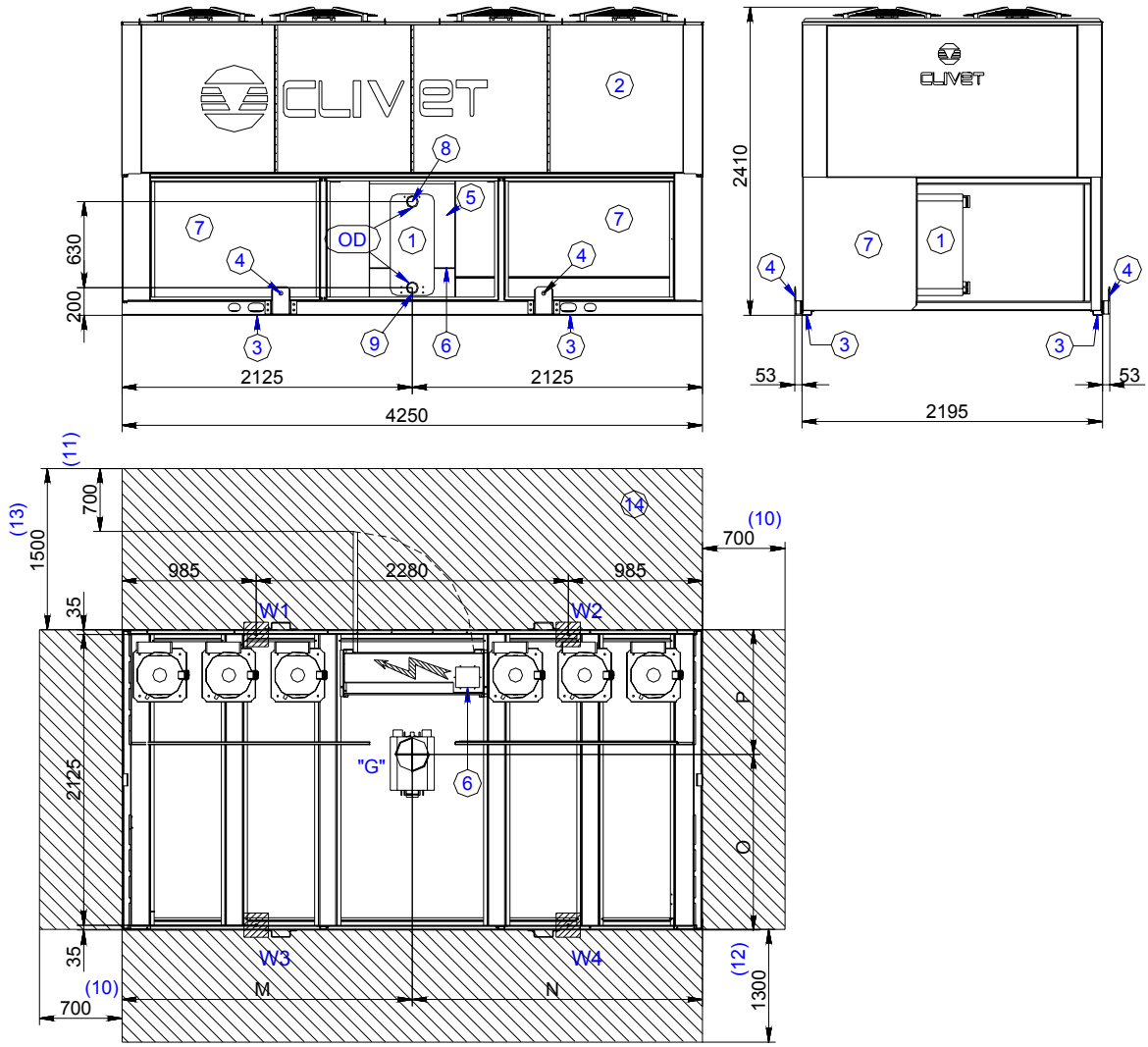
(13) MINIMUM DIMENSION ON THE ELECTRICAL SWITCHBOARD SIDE.
(14) CLEARANCE ACCESS RECOMMENDED
(G) BARYCENTRE

		SC						EN					
SIZES		**65D**	**70D**	**75D**	**80D**	**90D**	**100D**	**65D**	**70D**	**75D**	**80D**	**90D**	**100D**
M	mm	1437	1461	1437	1460	1460	1460	1458	1461	1438	1460	1460	1460
N	mm	1514	1490	1514	1491	1491	1491	1494	1490	1514	1491	1491	1491
O	mm	1350	1362	1374	1384	1383	1381	1360	1360	1371	1382	1381	1379
P	mm	845	833	821	811	812	814	835	835	824	813	814	816
OD	mm	89	89	89	89	89	89	89	89	89	89	89	89
W1	kg	715	720	773	777	781	785	703	725	777	782	786	790
W2	kg	639	690	691	742	746	750	667	695	696	747	751	755
W3	kg	440	433	454	447	450	454	424	438	459	452	455	459
W4	kg	393	415	406	427	430	434	403	420	411	432	435	439

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
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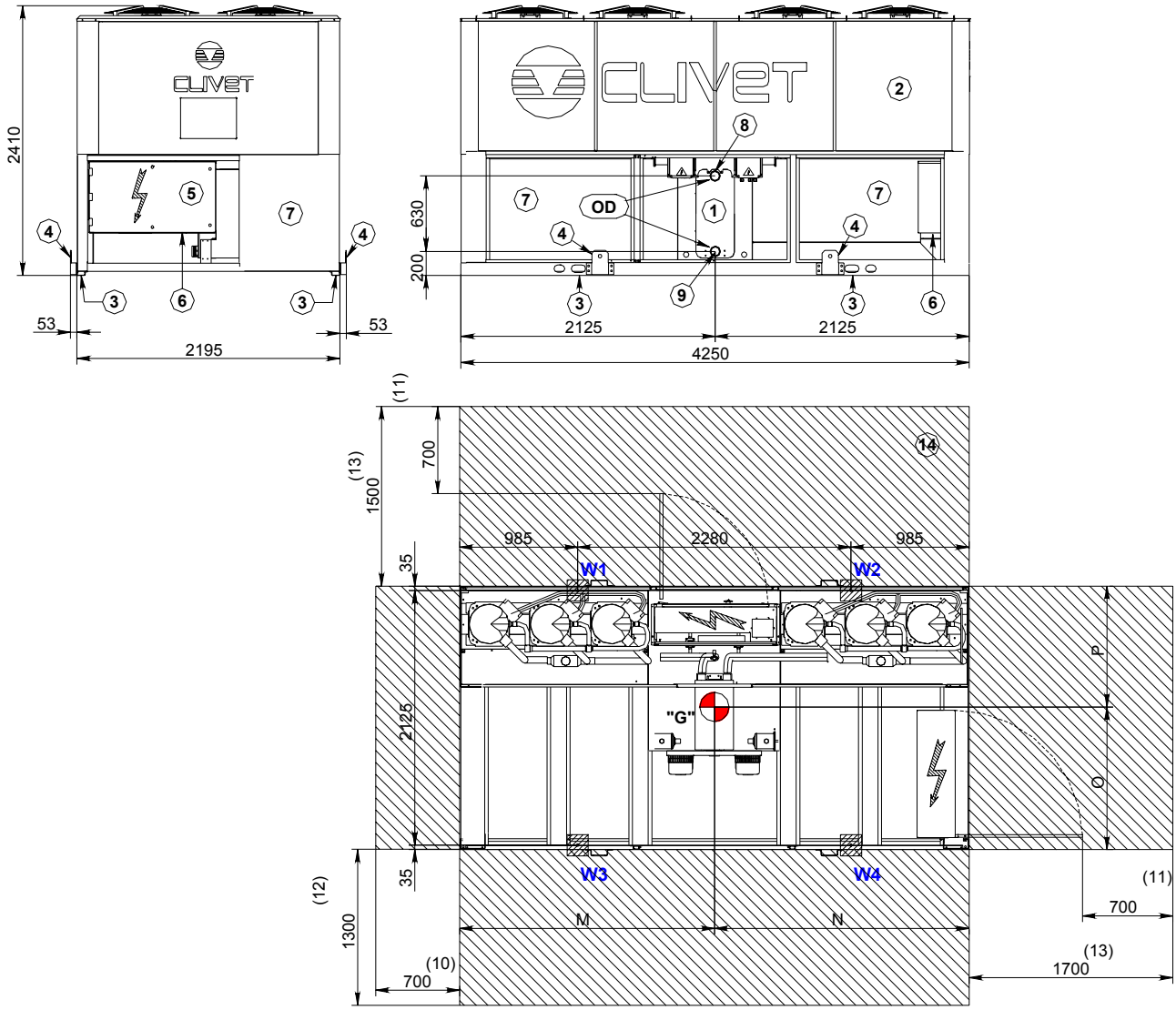
(14) CLEARANCE ACCESS RECOMMENDED
(G) BARYCENTRE

			SC				EN			
SIZES			**110D**	**120D**	**135F**	**150F**	**110D**	**120D**	**135F**	**150F**
M		mm	2117	2117	2112	2112	2092	2117	2112	2112
N		mm	2138	2139	2138	2138	2164	2139	2138	2138
O		mm	1382	1392	1405	1403	1379	1391	1376	1388
P		mm	815	805	789	791	818	806	818	806
OD		mm	89	89	89	89	89	89	89	89
W1		kg	976	1009	1071	1079	979	1016	1077	1124
W2		kg	958	990	1046	1054	919	997	1052	1099
W3		kg	565	572	589	596	571	578	629	641
W4		kg	555	561	576	582	536	567	615	627

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

- WATER CONNECTIONS -

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
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(13) MINIMUM DIMENSION ON THE ELECTRICAL SWITCHBOARD SIDE.
(14) CLEARANCE ACCESS RECOMMENDED
(G) BARYCENTRE

		SC		EN	
SIZES		**165F**	**180F**	**165F**	**180F**
M	mm	2131	2163	2131	2163
N	mm	2119	2087	2119	2087
O	mm	1391	1415	1403	1415
P	mm	803	779	791	779
OD	mm	89	89	89	89
W1	kg	1182	1234	1221	1228
W2	kg	1194	1320	1234	1314
W3	kg	669	666	674	662
W4	kg	676	712	681	708

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

- WATER CONNECTIONS -

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.

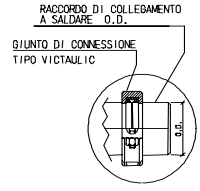
EVAPORATOR CONNECTION

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

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.

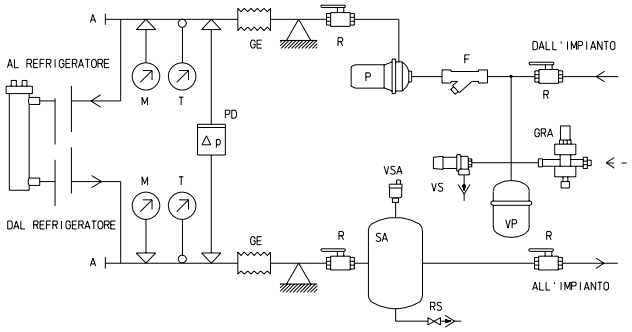
1. Take away the supplied connection union by acting on the connection joint Victaulic.
2. Weld the union to the installation pipe.
3. Perform the connection between the installation pipe and the evaporator, using the joint.



- ELECTRICAL CONNECTIONS -

SUGGESTED CONNECTION DIAGRAM

An example of a plan is as follows:

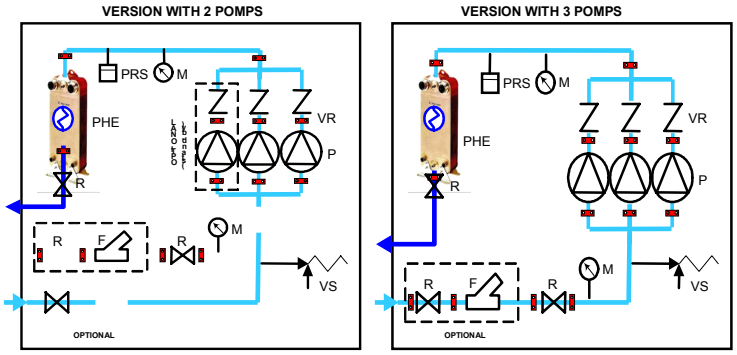


F	=	Impurity collector with filter
GE	=	Flexible joint
GRA	=	Automatic filling assembly with gate valve
M	=	Pressure gauge
P	=	Pump
PD	=	Differential pressure switch
R	=	Ball valve
RS	=	Discharge cock
SA	=	Storage tank (if necessary)
T	=	Thermometer
VP	=	Expansion vessel
VS	=	Safety valve
VSA	=	Automatic air relief valve

HYDROPACK

the modular pumping system allows the automatic reduction of the water capacity flow should the temperature rise above the operative limits. The device proves particularly useful during start-ups, in weekend pauses or after long periods of inactivity. When the temperature of the hydronic circuit's water is particularly high, unwanted blockages due to overloads are avoided together with the consequent interventions by specialised personnel for the guided re-starts.
Furthermore, Hydropack allows a variable water capacity flow in the systems where this would be called for.
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.

- 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.
- 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).
- 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.



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 opertaions.

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 impendency, capacity, attenuation.

ELECTRICAL DATA

Acoustic configuration: SC / Voltage: 400/3/50

SIZES			75C	90C	65D	70D	75D	80D	90D	100D	110D	120D	135F	150F	165F	180F
F.L.A. FULL LOAD CURRENT AT MAX ADMISSIBLE CONDITIONS																
F.L.A. - Total		A	154.1	203.7	142.6	151.9	161.2	170.5	187.9	205.3	243.7	274.1	285.6	315.7	363.2	406.9
L.R.A. LOCKED ROTOR AMPERES																
L.R.A. - Single External Fan		A	14	14	14	14	14	14	14	14	14	14	14	14	16	16
F.L.I. FULL LOAD POWER INPUT AT MAX ADMISSIBLE CONDITIONS																
F.L.I. - Total		kW	93.1	121.4	83.8	90.3	96.9	103.4	113.8	124.1	145.6	163.1	172.9	190.1	217.1	243.5
M.I.C. MAXIMUM INRUSH CURRENT																
M.I.C. - Value		A	376.9	461.3	339.1	348.4	357.7	367	430.7	448.1	531.3	561.7	543.4	578.5	667.9	713.5

voltage unbalance: max 2 %
power supply: 400/3/50 Hz +/-6%

Acoustic configuration: EN / Voltage: 400/3/50

SIZES			75C	90C	65D	70D	75D	80D	90D	100D	110D	120D	135F	150F	165F	180F
F.L.A. FULL LOAD CURRENT AT MAX ADMISSIBLE CONDITIONS																
F.L.A. - Total		A	149	196.9	135.8	145.1	154.4	163.7	181.1	198.5	233.5	263.9	273.7	301.6	347.2	392.8
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	4.7	4.7	10	10	10
F.L.I. FULL LOAD POWER INPUT AT MAX ADMISSIBLE CONDITIONS																
F.L.I. - Total		kW	90.9	118.4	80.8	87.3	93.9	100.4	110.8	121.1	141.1	158.6	167.6	185.1	211.5	237.9
M.I.C. MAXIMUM INRUSH CURRENT																
M.I.C. - Value		A	371.8	454.5	317.1	326.4	335.7	345	408.7	426.1	498.3	528.7	504.9	555.5	635.9	681.5

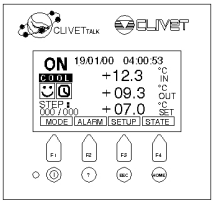
voltage unbalance: max 2 %
power supply: 400/3/50 Hz +/-6%

- ELECTRICAL CONNECTIONS -

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 commutate 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 longs (some hours).
It has not to be used with ON or OFF cycles too much shorts: 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.

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

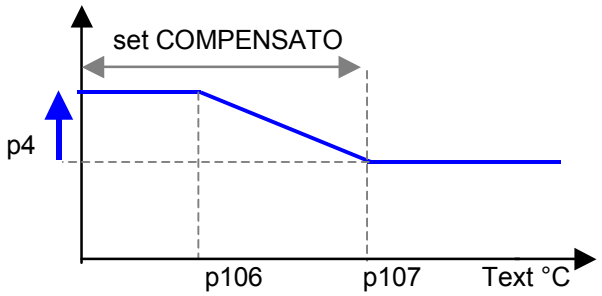
It is possible to activate a secondary set-point with a remote contact (for example for the nighttime).
With CLOSED contact, the secondary set-point is enabled.

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: • 0=disabled • 1=by signal • 2=by parameter
parameter-set-sensors	82	TypeDI	Signal type: 0=0-10V; 1=4-20mA

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 the cooling
	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			
			

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.

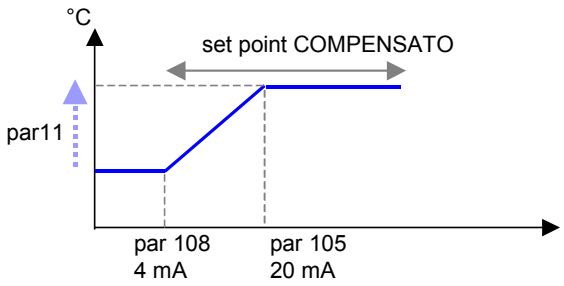
MENU	NUM	Parameter name	meaning
parameter control compext	4	MaxCExtC	Max. summer correction value
	110	HexMinC	Ext. enthalpy min. correction
	111	HexMaxC	Ext. enthalpy max. correction
parameter-set-sensors	23	ProbeURExt	It enables ext. humidity probe: 1=YES / 0=NO

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.

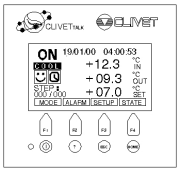
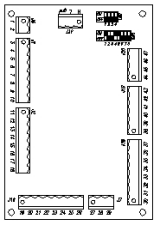
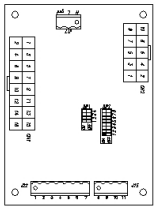
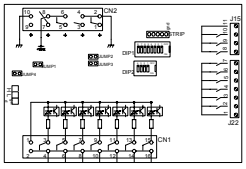
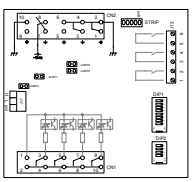
MENU	NUM	Parameter name	meaning
parameter control waterreset	11	MaxCWRC	WR Summer correction max. value
	75	WaterReset	Water Reset enabling: 0 = no; 1 = COOL only; 2 = HEAT only; 3 = always
	105	SWRMaxC	Summer MAX correction signal
	108	SWRMinC	Summer MIN correction signal
parameter-set-sensors	83	TypeWR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

SUMMER

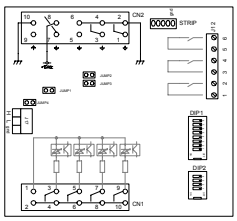


CLIVET TALK MODULAR SYSTEM COMPOSITION

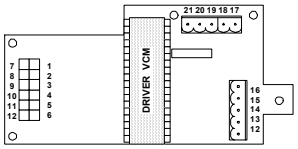
CLIVET TALK system is made up of different modules connected to each other with the CAN OPEN protocol.
The system configuration varies according to the typology of the unit and of the accessories: not always the represented electric modules are all presents on the unit.

	**INTERFACE** code C5110606 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.
	**CENTRAL MODULE** code C5110694 The central module manages the system configuration, the working mode, the set point, the thermal adjustment, remote inputs.
	**SCREW COMPRESSOR MODULE** code C5110705 It manages the cooling circuit (compressors, fans, valves) and relative safety devices.
	**COMPRESSOR MODULE - TANDEM / TRIO** **CODE C5110673 (TANDEM) – C5110672 (TRIO)** It manages the cooling circuit (compressors, fans, valves) and relative safety devices.
	**EVAPORATOR MODULE** **CODE C5110674** It manages components, safety devices, inputs and outputs relative to the water circuit (pumps, differential manostat, temperature probes)

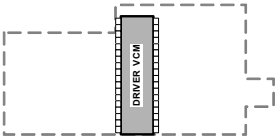
- ELECTRICAL CONNECTIONS -



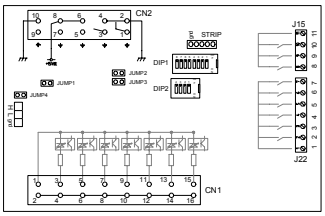
PUMP MODULE
code C5110701
It manages controls and safety devices relative to the circulation pumps



ELECTRONIC THERMOSTATIC VALVE EXPANSION MODULE
code C5110802
It manages the electronic thermostatic valve and the respective temperature/pressure check sensors.
It is fitted on the compressor module.



DRIVER MODULE
code C5110803
Inside there is the management firmware of the electronic thermostatic.
It is fitted on the expansion module.

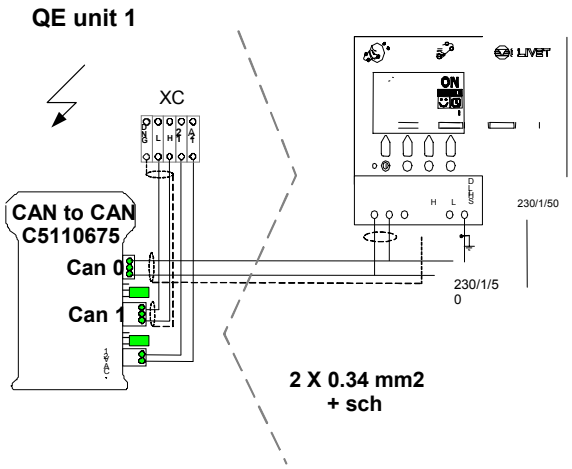


RECOVERY MODULE
code C5110679
It manages the electrovalves and the pumps relative to the recovery circuit

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.



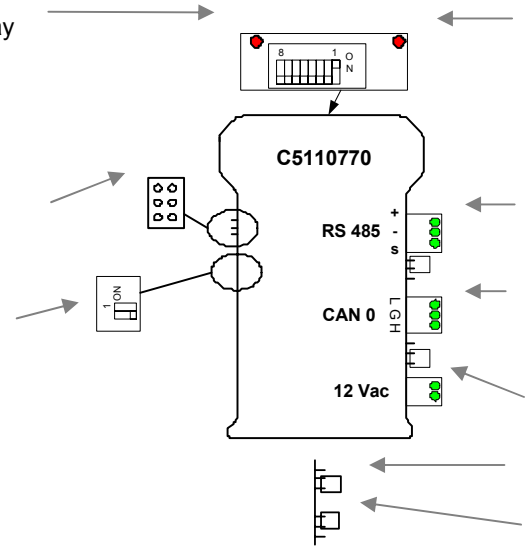
MODBUS - CONVERTER CAN to MODBUS via RS 485
cod PE1W0003 / 6
Interfacing via RS 485 is performed using a converter for each unit.
The converter must be mounted on the electric board of the unit and connected, following the electric diagram attached to the unit.
CONNECTIONS: refer to the electric diagram and to the SIGNAL/DATA LINES paragraph.

- ELECTRICAL CONNECTIONS -

dip switch for the serial address of the module

LED 1 : signalization of gateway working

LED 2 : signalization of gateway in programming



jumper for activating the firmware rewriting of the gateway

dip switch for the configuration of the CAN OPEN addresses

RS 485 serial port

Connection to the CAN network of the machine

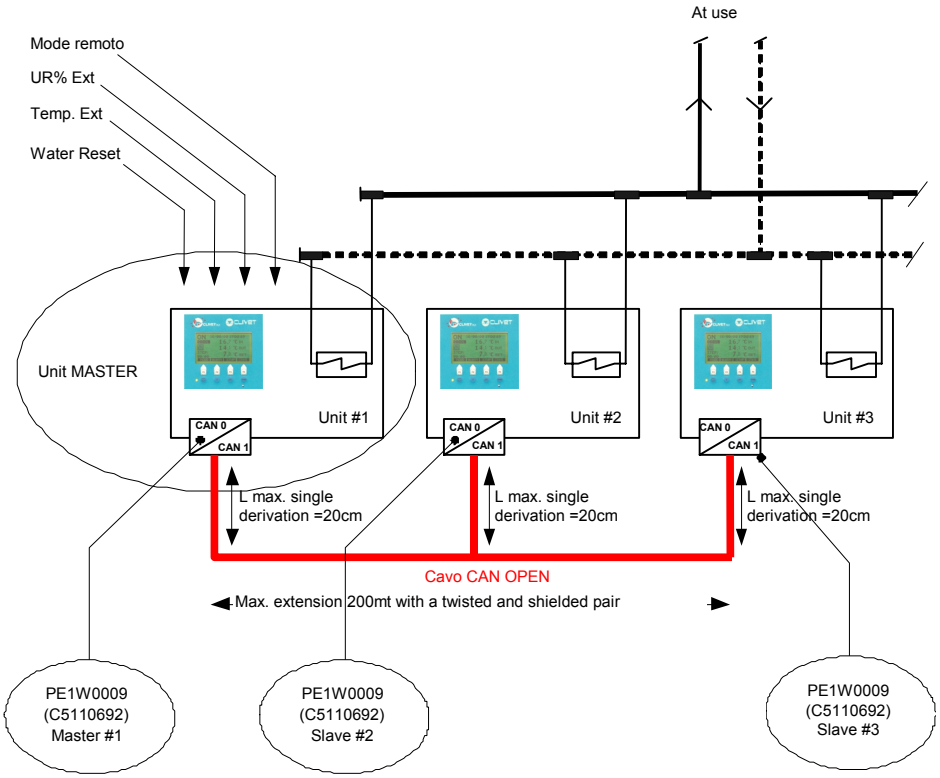
Power supply

terminator NOT activated

Terminator activated

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 :

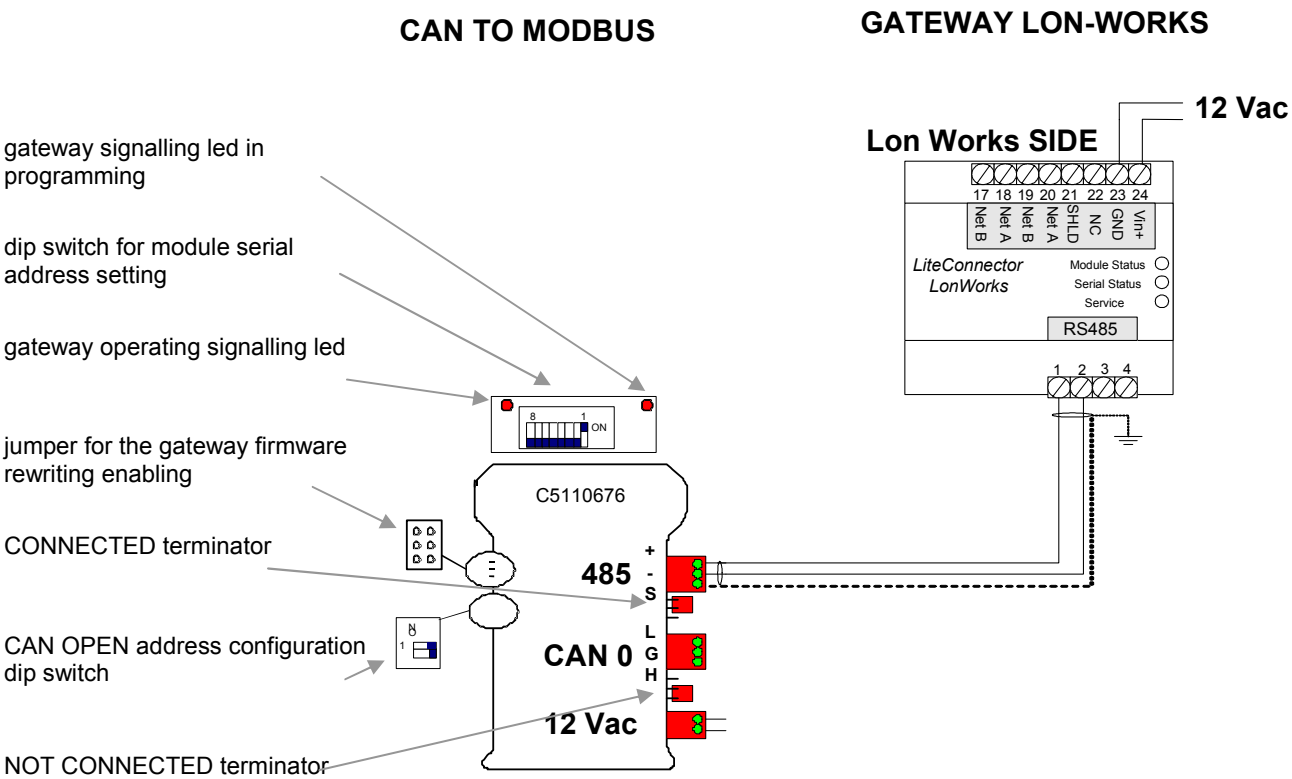
Section (nominal)	0.34mm2
Heater	70mΩ/meter
Impedance	120mΩ/meter
Propagation delay	5nS/metrer
Length MAX	200meters

DATALOGGER
cod PE1W0006
CONNECTIONS : make reference to the electrical panel and to SIGNALS/DATA LINES paragraph

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.



- 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

AERAULIC 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 conseguent filter precocius 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 presen,t 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.
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 starter.
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 hte heaters are working, check the power input with amperometic pliers.
At start-up the compressor cranckase 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 SAFETLY) 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

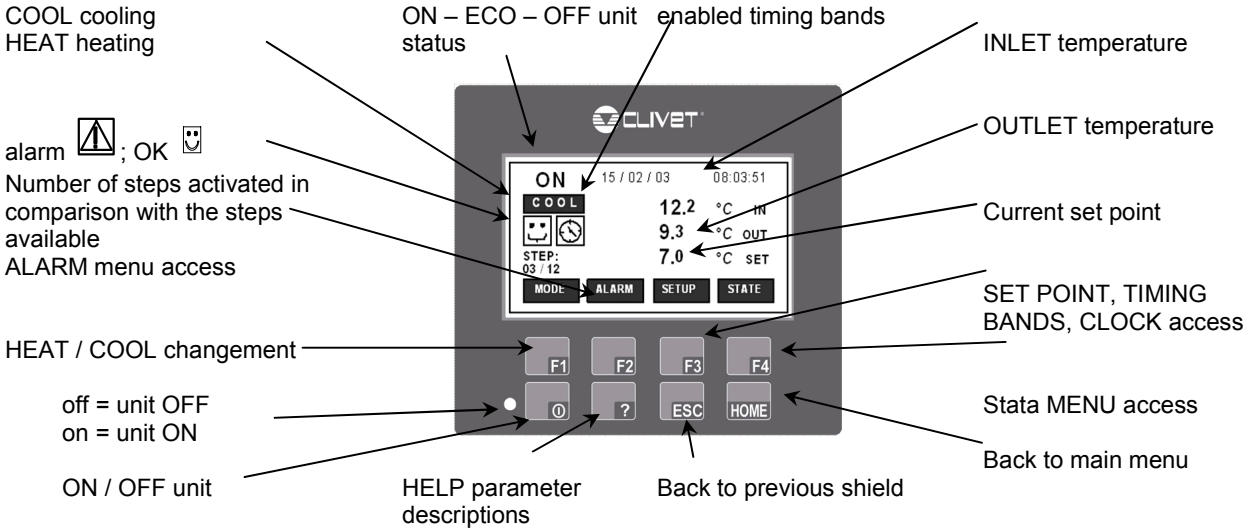
The pressure measurements will be easier if “M” gauges are installed as shown in the HYDRAULIC CONNECTION DIAGRAM.

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 DANGERI)
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

CONTROL INTERFACE



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 > set-point + 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).

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.

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
	114	SetMantCool	Summer maintenance set-point

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

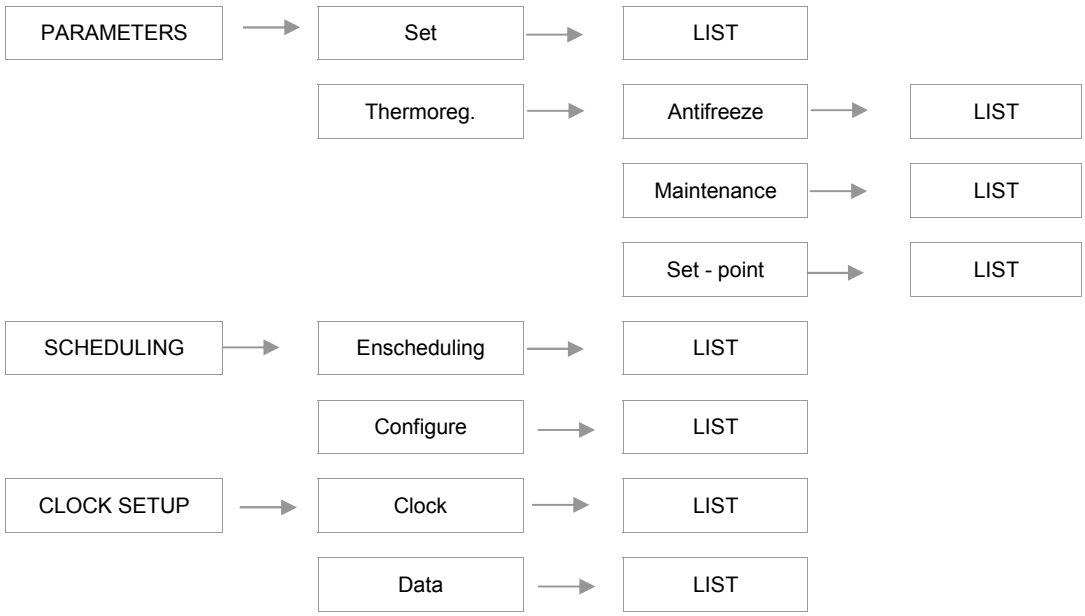
The secondary set point is activated by remote authorization (see the ELECTRICAL CONNECTIONS chapter).
It is possible to limit the minimum power which can be delivered during the time in which the secondary set point is activated by configuring the 276 MinPot2Set parameter (access reserved to the assistance 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.

ACCESSIBLE PARAMETERS

PARAMETER MENU STRUCTURE



menu: PARAMETERS – THERMOREG. – SET POINT			DEFAULT values
90 / CEN	SecondSetC	Secondary cooling Set Point	12
118 / CEN	SetCool	Cooling Set Point	6.5
272 / CEN	SetRecovery	NOT USED	35
menu: PARAMETERS – THERMOREG. – MAINTENANCE			
114 / CEN	SetMantCool	Summer maintenance setpoint	15
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

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

SETUP – CLOCK SETUP

CLOCK
Set the clock

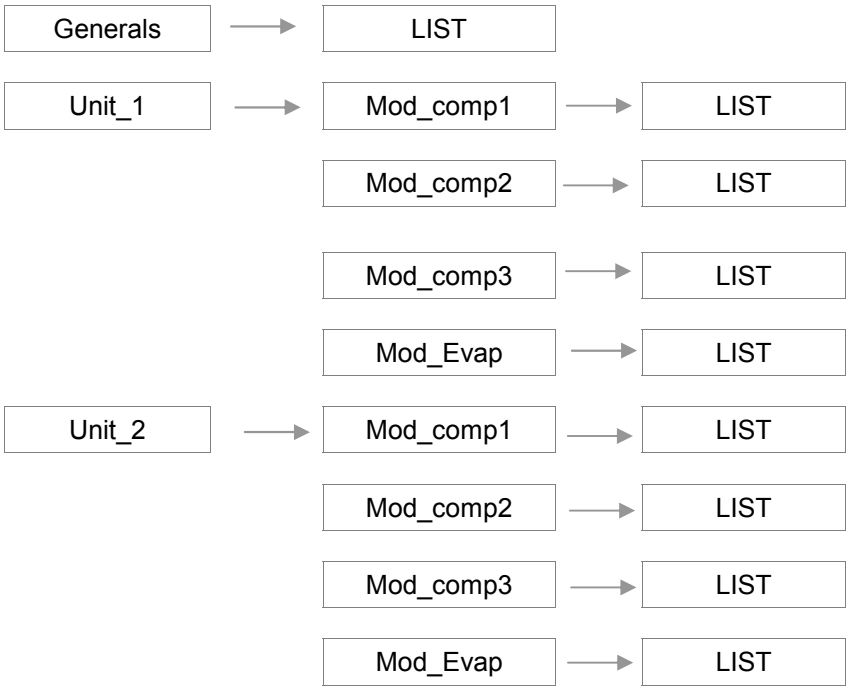
DATA
Set the dater

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

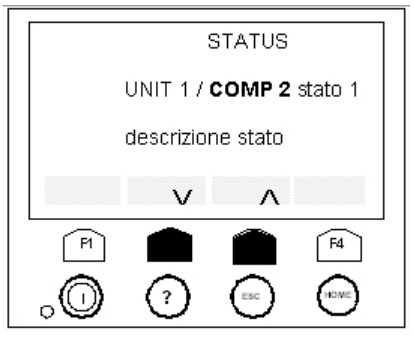


example

Visualized stata referring to

UNIT 1

COMP 2 MODULE



submenu:

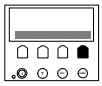
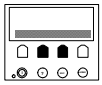
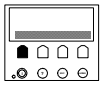
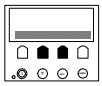
GENERALS

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

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.

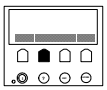
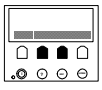
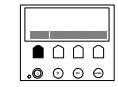
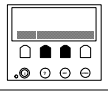
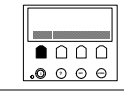
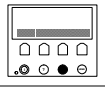
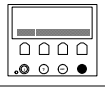
The presence of an alarm is signaled by the icon flashing  .
The cumulative block relay activates simultaneously, according to the type of alarm.
Alarms can be reset once the conditions that caused them to trip have been removed.
ALARMS and faults show a potentially dangerous situation for the machine 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

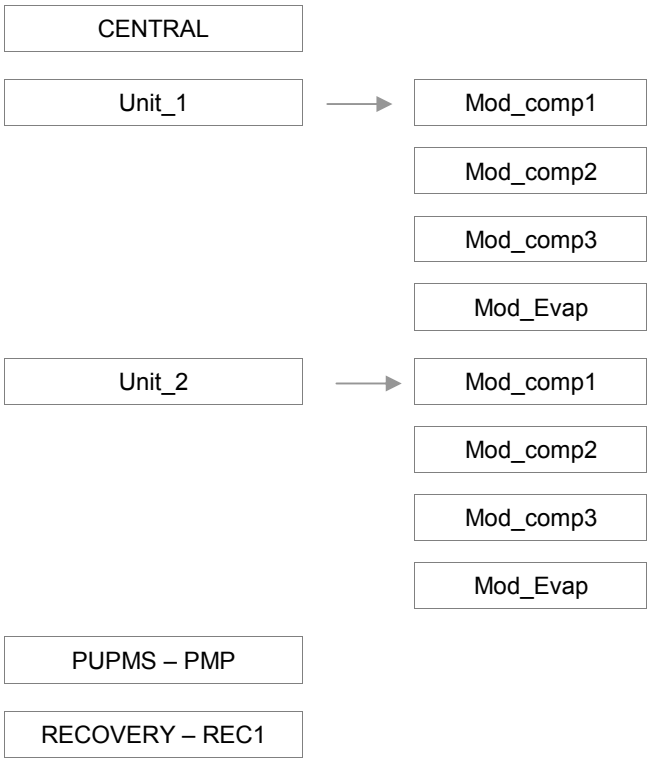
STORE ALARM
To visualize the historical alarm

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

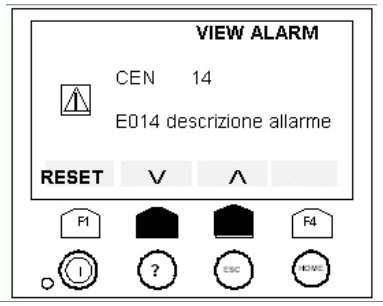
An alarm list is associated with the inputs of each electronic module of the unit.
According to the unit configuration, and then with electronic modules and options, some lists and/or ALARMS can not be used.

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

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
	E121 BP2 prealarm
	E123 TEE inlet temp. alarm
	E124 TEE discharge temp. alarm
	E125 MaxTS TEE prealarm
	E126 SPI Faulty alarm (TEE driver disconnection)
	E127 Power Fail alarm
	E128 Stepper Motor Error 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

-

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 forseen 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)

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.

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**°C	7.3 – 1.18 = **6.12**°C for calculation consider the Td (dew point)	7.3 – 0.8 = **6.5**°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**°C	44.74 – 42.9 = **1.84**°C for calculation consider the Tb (bubble point)	49.91 – 45 = **4.91**°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

Pg	R22	R134a	R407C		R410A
	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	R22	R134a	R407C		R410A
	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

Pg	R22	R134a	R407C		R410A
	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	R22	R134a	R407C		R410A
	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

TRASDUTTORE DI PRESSIONE GUASTO

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.

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).

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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