CE

TECHNICAL MANUAL FOR CHILLERS AND INVERTER AIR/WATER HEAT PUMPS WITH AXIAL FANS

TECHNICAL MANUAL

INDEX

The CHA/IK/WP manual contains all the necessary information for the better use of the equipment under safety conditions for the operator thus meeting the requirements listed in the 2006/42/CE Equipment Directive and following amendments.

1 AIM AND CONTENTS OF THIS MANUAL

This manual provides basic information as for the installation, the operation and the maintenance of the CHA/IK/WP units. It is addressed to machine operators and it enables them to use the equipment efficiently, even if they do not have any previous specific knowledge of it.
This manual describes the characteristics of the equipment at the time it is being put on the market; therefore, it may not capture later technological improvements introduced by G.I.INDUSTRIAL HOLDING S.P.A. as part of its constant endeavour to enhance the performance, ergonomics, safety and functionality of its products.

1.1 HOW TO KEEP THIS MANUAL

The manual has to be always kept with the unit it refers to. It has to be stored in a safe place, away from the dust and moisture. It has to be accessible to all users who shall consult it any time they are in doubt on how to operate the equipment.
G.I.INDUSTRIAL HOLDING S.P.A. reserves the right to modify its products and related manuals without necessarily updating previous versions of the reference material. The customer shall store any updated copy of the manual or parts of it delivered by the manufacturer as an attachment to this manual.
G.I.INDUSTRIAL HOLDING S.P.A. is available to give any detailed information about this manual and to give information regarding the use and the maintenance of its own units.

1.2 GRAPHIC SYMBOLS

	***Indicates operations that can be dangerous for people and/or disrupts the correct operation of the equipment.***
	***Indicates prohibited operations.***
	Indicates important information that the operator has to follow in order to guarantee the correct operation of the equipment in complete safety.

2 SAFETY LAWS

G.I.INDUSTRIAL HOLDING S.P.A.'s equipments and their component parts have been designed in compliance with the harmonised EC norms in force and with other European and national norms as required by the Council Directive (2006/42/CE and later amendments).
The equipments meet also the following requirements:
- UNI EN ISO 121100
- UNI EN ISO 13857
- UNI EN 378-1, 378-2, 378-3 e 378-4 Rules
- UNI EN 12735-1 Rule
- CEI EN 60204-1 Rule
- CEI EN 61000-6-1 Rule
- CEI EN 61000-6-3 Rule
- 97/23/CE, 2006/95/CE, 2006/95/CE, 2006/95/CE, 2006/96/CE Community Directives

3 GENERAL SAFETY GUIDELINES

Before beginning to operate on CHA/IK/WP units every user has to be perfectly knowledgeable about the functions of the equipment and its controls and has to have read and understood the information listed in this manual.

	***It's strictly forbidden to remove and/or tamper with any safety device.***
	***Any routine or not-routine maintenance operation shall be carried out when the equipment has been shut down, disconnected from electric and pneumatic power sources and after its pneumatic system has been discharged.***
	***Do not put your neither hands nor insert screwdrivers, spanners or other tools into moving parts of the equipment.***
	***The equipment supervisor and the maintenance man has to receive suitable training for the performance of their tasks in safety.***
	***Operators have to know how to use personal protective devices and have to know the accident-prevention guidelines contained in national and international laws and norms.***

3.1 WORKERS' HEALTH AND SAFETY

The European Community has adopted a number of directives on workplace's health and safety, which include **89/391/CEE**, **89/686/CEE, 89/655/CEE, 86/188/CEE** and **77/576/CEE** directives. Every employer shall implement such provisions and ensure that workers respect them:

	***Do not tamper with or replace parts of the equipment without the specific consent of the manufacturer. The manufacturer shall have no responsibility whatsoever in case of unauthorised operations.***
	***Using components, expendable materials or spare parts that do not correspond to those recommended by the manufacturer and/or listed in this manual may be dangerous for the operators and/or damage the equipment***
	***The operator's workplace has to be kept clean, tidy and free from objects that may prevent free movements. Appropriate lighting of the work place shall be provided so as to allow the operator to carry out the required operations safely. Poor or too strong lighting can cause risks.***
	***Ensure that work places are always adequately ventilated and that aspirators are working, in good condition and in compliance with the requirements of the laws in force.***

3.2 PERSONAL SAFETY EQUIPMENTS

When operating and maintaining the CHA/IK/WP units, use the following personal protective equipments.

		***Protective clothing: Maintenance men and operators has to wear protective clothing that complies with the basic safety requirements currently in force. In case of slippery floors, users have to wear safety shoes with non-slip soles.***
		***Gloves: During maintenance or cleaning operation protection gloves have to be used***
		***Mask and goggles: Respiratory protection (mask) and eye protection (goggles) should be used during cleaning and maintenance operations.***

3.3 SAFETY SYMBOLS

The equipment features the following safety signs, which has to be complied with:

	***General hazards***
	**Electric *shock* hazard**

3.4 REFRIGERANT SAFETY DATA SHEET

Name:	R410A (50% Difluoromethane (R32); 50% Pentafluoroethane (R125).
	RISKS IN DICATIONS
Major risks:	Asphyxia
Specific risks:	The rapid evaporation may cause freezing.
	FIRST AID
General informations:	Never give anything by mouth to an unconscious person.
Inhalation:	Outdoors opens transport. Oxygen or artificial respiration if necessary. Do not administer adrenaline or similar drugs.
Eyes contact:	Rinse carefully with water for at least 15 minutes and consult a doctor.
Contact with skin:	Wash immediately with plenty of water. Take off immediately the contaminated clothing.
	FIRE PREVENTION
Extinguishing Media:	Whatever.
Specifc risks:	Increase in pressure.
Specifics methods:	Use **water spray** to **cool containers**
	MISURE IN CASO DI FUORIUSCITA ACCIDENTALE
Personal precautions:	Evacuate personnel to safe areas. Provide adequate ventilation. Use personal protective equipment.
Environmental precautions:	Evaporate.
Cleaning method:	Evaporate.
	MANIPOLAZIONE E STOCCAGGIO
Manipulation Action/technical precautions:	Provide sufficient air exchange and/or exhaust in work rooms.
Recommendations for safe use:	Do not breathe vapors or spray mist.
Storage:	Close tightly and store in a cool, dry and well ventilated place. Store in original container. Incompatible products: explosive, flammable materials, Organic peroxide
	EXPOSURE CONTROL / PERSONAL PROTECTION
Control parameters:	AEL (8-h e 12-h TWA) = 1000 ml/m³ for each of the two components.
Respiratory protection:	For rescue and maintenance operation in storage tanks use self-contained respirator apparatus. The vapors are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Eyes protection:	Safety glasses.
Protection of hands:	Rubber gloves.
Hygiene measures:	Do not smoke.
	PHYSICAL AND CHEMICAL PROPERTIES
Colour:	Colourless.
Odor:	Light.
Boiling point:	-52.8°C at atmospheric pressure.
Lighting point:	do not ignite.
Relative density:	1.08 kg/l at 25°C.
Solubility in water:	Negligible.
	STABILITY AND REACTIVITY
Stability:	No reactivity when used with the appropriate instructions.
Materials to avoid:	Highly oxidizing materials. Incompatible with magnesium, zinc, sodium, potassium and aluminum. The incompatibility is more serious if the metal is present in powerder form or if the surfaces were, recently, unprotected.
Decomposition products Risks:	These products are halogenated compounds, hydrogen fluoride, carbon oxides (CO, CO2), carbonyl halides.
	TOXICOLOGICAL INFORMATION
Acute toxicity:	(R32) LC50/ inhalation /4 hours/on rat >760 ml/l (R125) LC50/ inhalation /4 hours/on rat >3480 mg/l
Local effects:	Concentrations substantially above the TLV may cause narcotic effects. Inhalation of decomposed products of high concentrations may cause respiratory failure (pulmonary edema).
Long term toxicity:	**Did not show carcinogenic**, **teratogenic** or **mutagenic effects** in **animal experiments**.
	ECOLOGICAL INFORMATION
Global warming potential GWP (R11=1):	1730
Potential depletion Ozone ODP (R11=1):	0
Disposal considerations:	usable with reconditioning.

4 TECHNICAL CHARACTERISTICS

The CHA/IK/WP heat pumps series are designed for applications in residential and commercial areas, These units are extremely versatile and can operate in heat pump mode with the ability of producing hot water at a temperature of 55°C for environmental heating and sanitary applications. The INVERTER compressor with brushless DC motor technology, matched with electronic expansion valve, pump and variable speed blower are generally used for optimizing the power consumption and efficient operation of the refrigerating components.

4.1 Frame

All CHA/IK/WP units are made up of hot-galvanised thick sheet metal, painted with polyurethane powder enamels at 180°C to ensure the best resistance against atmospheric agents. The frame is self-supporting with removable panels. All screws and rivets for outdoor installations are in stainless steel.

4.2 Refrigerant circuit

The refrigerant gas used in these units is R410A. The refrigerant circuit has been manufactured by means of international primary brands components and according to the UNI EN 13134 Rule concerning welding procedures. The refrigerant circuit includes: 4 way reverse cycle valve, electronic expansion valve, liquid separator, liquid receiver, valves for maintenance and control, pressure safety device according to PED regulation, pressure transducers to accurately adjust the evaporating and condensing pressures, filters for throttling valve to avoid its clogging.

4.3 Compressors

The used DC inverter compressors are a rotary hermetic single-phase type (only for CHA/IK/WP 15 and CHA/IK/WP 25 model types) and twin rotary single-phase (for CHA/IK/WP 41 model), scroll 3-phases (for CHA/IK/WP 61 model) designed to be used with R410 refrigerant. The compressors are all supplied with crankcase heater and thermal overload protection. They are mounted on a rubber material acting as a shock absorbers.
The compressors are mounted in a separate chamber in order to be separated from the air stream to reduce the noise. The crankcase heater is always powered when the compressor is in stand-by. The inspection is possible through the frontal panel of the unit that allow the maintenance of the compressors even if the unit is working.

4.4 Air side exchangers

The air side exchangers are made up of copper pipes and aluminium fins. The tubes are mechanically expanded into the aluminium fins to improve the heat exchange factor. The geometry of these condensers guarantee a low air side pressure drop and, then, the use of low rotation (and low noise emission) fans. The source heat exchangers can be protected by a metallic filter to be installed upon request.

4.5 Fans

The fans are axial type with aluminium aerofoil blades. They are statically and dynamically balanced and supplied complete of the safety fan guard according to the EN 60335 Rule (safety for electrical apparatus of domestic and similar use). They are mounted on the unit frame by interposition of rubber vibration dampers. The electric motors are all at 6 poles (about 800/900 rpm). The motors are directly driven with an integrated thermal overload protection. The protection class of the motors is IP 54.

4.6 User heat exchangers

The user heat exchangers are made up of AISI 316 stainless steel braze-welded plates type. The use of these kind of heat exchangers allows a massive reduction of the refrigerant charge of the unit compared to the traditional shell-in-tube evaporators and also a reduction of the overall dimensions of the unit. Each heat exchanger is provided with a temperature sensor working as antifreeze protection.

4.7 Electric box

The electric box is manufactured according to according current European Union laws. The accessibility to the board is possible after removing the front panel of the unit. The protection degree is IP55. The terminal board is supplied with voltage free contacts for remote ON-OFF, winter/summer change over and general alarm, sanitary water temperature sensor and free contacts for remote control and for the management of the dual setpoint of operation

4.8 Microprocessors

All CHA/IK/WP units are standard supplied with a microprocessor adopting an overheating control logic program through the electronic expansion valve which is driven by the pressure transducers signals. The microprocessor is also capable of controlling the following functions: water temperature regulation, antifreeze protection, compressors' time setting, compressor automatic starting sequence, alarm reset, alarm management and operating LED. Upon request, the microprocessor can be connected to a BMS remote control system and to the simpler HNS system with our terminal units. The control system together with the INVERTER technology and the on board sensors continuously monitor and adapt the performance of the inverter compressor, of the pump and of the fan (2 fans as for the CHA/IK/WP 41 and 61 models) according to the value of cooling power at any working conditions requested by the user.

The CHA/IK/WP INVERTER system firm reduces the plant's water content to the minimum, that is from the usual value of cooling 12-15 l/kW to 10 liters (as for the 15 and 25 model types) or to 16 liters (as for the 41 model type) or to 20 liters (as for the 61 model type), IN ABSOLUTE, as for the CHA/IK/WP units. Because of the reduced water content, the CHA/IK/WP units can be installed in plants without water tank with advantages in terms of the appliance's reduced size, the installation space, heat loss and installation costs.

4.9 Protezione Monitoring and Protection devices

All units are standard supplied with the following monitoring and protection devices: return water temperature sensor installed at the return water pipe line from the plant, operating and antifreeze sensor installed at the outlet pipe of the water to the plant, high pressure transducer, low pressure transducer, compressor's inlet and outlet temperature sensors, compressors thermal protection device, fans thermal protection device, water side installed water flow switch to protect the evaporator, high pressure flow switch.

CAUTION: Having a fixed ΔT(°C), the INVERTER control system is able to manage in the plant the minimum water contents up to a value of 10 liters (as for the 05 and 07 model types), or of 16 liters (as for the 10 model type), and of 20 liters (as for the 15 model type). This value makes reference to the liters absolute value and not to any kW of installed power.

4.10 Hydraulic circuit

The CHA/IK/WP chillers units are supplied with an integrated hydraulic circuit including the circulating pump, suitable for chilled water utilization and directly run by the microprocessor that controls the related start up and proper running. The hydraulic circuit also includes: expansion vessel, safety valve (6 bar) and the automatic air release valve.

4.11 Fan speed control

This type of control is managed by the microprocessor and is necessary when the unit is running in cooling mode at outside air temperature below than 20°C, thus reducing the air flow rate of the condensor and adapting the evaporating pressure in order to allow proper running of the unit. Such control can also be used to reduce the noise level of the unit when the outside air temperature decreases (e.g. during night operation period).

5 INSTALLATION

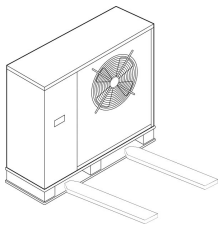
WARNING: All the operation described in next chapters MUST BE DONE BY TRAINED PEOPLE ONLY. Before any operation on the unit, be sure that the electric supply is disconnected.

5.1 GENERALITY

When installing or servicing the unit, it is necessary to strictly follow the rules listed in this manual, to conform to all the specifications of the labels on the unit, and to take any possible precautions. Not observing the rules reported on this manual can create dangerous situations. After receiving the unit, immediately check its integrity. The unit left the factory in perfect condition; any eventual damage has to be questioned to the carrier and recorded on the Delivery Note before signing it. G.I.INDUSTRIAL HOLDING S.P.A. has to be informed, within 8 days, of the extent of the damage. The Customer should prepare a written statement of any severe damage.

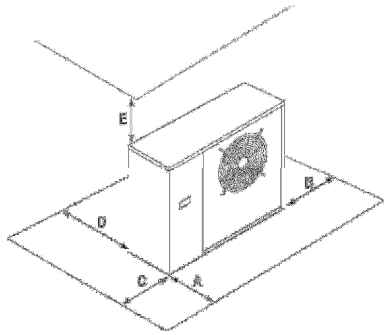
5.2 LIFTING AND HANDLING

When unloading and installing the unit, it is highly recommended to avoid any sudden move in order to protect the inner components. Units can be lifted by means of a forklift or, in alternative, of belts, being sure not to damage the lateral panels and the cover. It is important to keep the unit horizontal during these operations.



5.3 LOCATION AND MINIMUM TECHNICAL CLEARANCES

The all CHA/IK/WP units are designed for outdoor installation: any cover over the unit and location near trees (even if they partially cover the unit) has to be avoided in order to prevent air recirculation. It is advisable to create a proper basement, with a size similar to unit foot-print. Unit vibration level is very low: it is advisable however, to fit a rigid rubber band between basement and unit base-frame. It is also possible to install anti-vibration supports (springs or rubbers) to keep vibrations at a very low level. Absolute care has to be taken to ensure adequate air volume to the condenser. Re-circulation of discharge air has to be avoided; failure to observe this point will result in poor performance or activation of safety controls. For these reasons it is necessary to observe the following clearances:



MOD.	A	B*	C	D	E**
CHA/IK/WP 15	1500	500	400	400	500
CHA/IK/WP 25	1500	500	400	400	500
CHA/IK/WP 41	1500	500	400	400	500
CHA/IK/WP 61	1500	500	400	400	500

* The recommended minimum distance for installation and maintenance.
** The recommended minimum distance for assistance and maintenance

5.4 HYDRAULIC CONNECTIONS

The hydraulic connections have to be installed in accordance with national and local regulations; pipes can be made up of steel, galvanized steel or PVC. Pipes have to be designed depending on the nominal water flow and on the hydraulic pressure drops of the system. All pipes have to be insulated with closed-cell material of adequate thickness. Chillers have to be connected to piping by means of flexible joints. Piping should include:

- Hole thermometers to monitor the system's temperature.
- Manual shut-off valves to separate the chiller from the hydraulic circuit.
- Y-shaped metallic filter (to be mounted on the inlet pipe) with a mesh not larger than 1 mm.
- Charging group and discharge valve, where necessary.

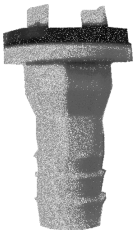
WARNING: Unit water inlet pipe have to be in correspondence with the connection labelled: "WATER INLET", otherwise the evaporator may freeze.

WARNING: It is compulsory to install on the WATER INLET connection a metallic filter with a mesh not larger than 1 mm. Should the water flow switch be altered or should the filter not be installed, the warranty will no longer be valid. The filter have to be kept clean, so make sure it is clean after the unit has been installed, and then check it

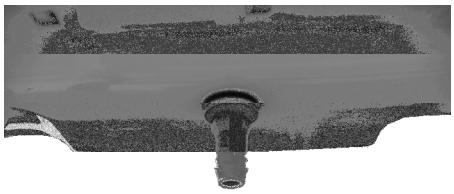
	periodically.
	All units are standard supplied with the water flow switch (factory installed). Should the water flow switch be altered, removed, or should the water filter not be installed on the unit, the warranty will be invalidated. Please refer to the wiring diagram for the water flow switch electric connections.

5.4.1 DRAINAGE CONNECTION

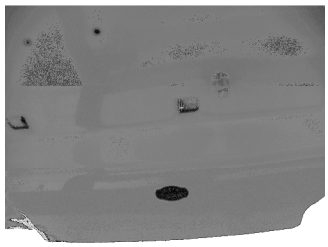
All CHA/IK/WP units have been designed to use their own base as a drain pan; a plastic pipe fitting is standard provided to be installed onto the lower part of the unit in the special housing enabling the connection of a drainage pipe.



Drainage pipe fitting



Drainage pipe fitting housing



Drainage pipe fitting connected to the unit

	WARNING: The unit should be installed so that adequate clearance is available for maintenance and repairation. The warranty does not cover costs related to platforms or handling equipment necessary for any maintenance.
	All maintenance and testing operations should be carried out only by QUALIFIED PERSONNEL.
	Before any operation on the unit, make sure the power supply is disconnected.
	WARNING: Inside the unit, there are some moving parts. Be especially careful when working near them, even if the unit is off.
	The temperatures of heads and exhaust piping of the compressor are usually high. Therefore be careful when working near condensing coils.
	The aluminum fins are very sharp and can cause serious injuries.
	After the maintenance operations, close the panels tightly with the fastening screws.

5.5 ELECTRICAL CONNECTIONS

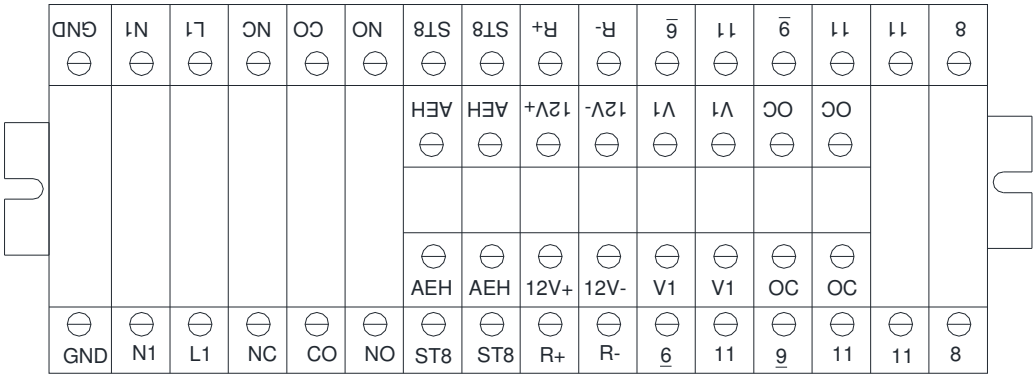
Check out that the power supply meets the unit's electric nominal data (tension, phases, frequency) reported on the label in the unit's front panel. Power connections have to be made in accordance to the wiring diagram enclosed with the unit and in conformity with the national and international norms in force. Power cables and line fuses have to be sized according to the specifications listed in the wiring diagram enclosed with the unit.

	WARNING: The supply voltage's fluctuations can not exceed ±10% of the nominal value. Should this tolerance not be respected, please contact our technical department.
	WARNING: The power supply have to respect the listed limits: failing this, warranty will terminate immediately. Before any operation on the unit, be sure that the power supply is disconnected. ***WARNING: The water flow switch (B component in the previous hydraulic circuit and factory installed) have ALWAYS to be connected following the indications listed in the wiring diagram. Never bridge the water flow switch connections in the terminal board. Should the water flow switch connections altered or not properly made, the guarantee will be invalidated.***
	WARNING: The remote control panel is connected to the water chiller by means of no.4 wires having a 1,5 mm^2 section. The power supply cables have to be separated from the remote control wires. The maximum distance is 50 m.
	WARNING: The remote control panel can not be installed in areas with strong vibrations, corrosive gases, and excess of dirtiness or high humidity levels. Leave free the area near the cooling openings.

5.5.1 WIRING TERMINAL BLOCK

	Electrical wiring have to be done only by qualified personnel.

The electrical connections have to be realized by qualified personnel. The terminal block is located under the plastic cover on the side of the hydraulic connections (for the models 41 and 61, it is necessary to remove the protective carter). The wiring to the terminal block has to be realized in accordance to the below notes.



GND: grounding;
N1: power supply neutral wire;
L1: power supply phase wire;
NC: generic alarm output (closed when the alarm is activated);
CO: generic alarm output common terminal;
NO: generic alarm output (closed when the alarm is not activated);
ST8: connect the humidistat for the double set-point regulation
ST8: connect the humidistat for the double set-point regulation (optional)
AEH: sanitary water supplementary heater output (220V, 50Hz, 5A);
AEH: sanitary water supplementary heater output (220V, 50Hz, 5A);
R+: modbus + signal connection to remote keyboard;
R-: modbus - signal connection to remote keyboard;
12V+: power output for remote keyboard (12V, 50Hz, 500mA);
12V-: power output for remote keyboard (12V, 50Hz, 500mA);
6: sanitary water boiler sensor input;
11: sanitary water boiler sensor input;
V1: sanitary water boiler 3-way on-off valve control output (free contact);
V1: sanitary water boiler 3-way on-off valve control output (free contact);
9: summer/winter switching mode input via remote control (closed = summer/open = winter);
11: summer/winter switching mode input via remote control (closed = su
OC: connect the coil of the relay for the double set-point regulation (optional)
OC: connect the coil of the relay for the double set-point regulation (optional)
11: remote on-off input (closed = unit ON/open = unit OFF).
8: remote on-off input (closed = unit ON/open = unit OFF);

6 START UP

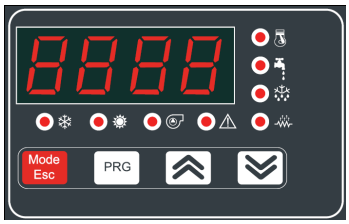
Before start-up:

- Check out the availability of the supplied wiring diagrams and manuals of installed apparatus.
- Check out the availability of the electrical and hydraulic diagrams of the plant in which the unit is installed.
- Check that the shut-off valves of the hydraulic circuits are open.
- Verify that the hydraulic circuit has been charged by air pressure and vented.
- Check out that all water connections are properly installed and all indications on unit labels are observed.
- Ensure that arrangements have been provided for to drain the condensate.
- Check out that all power cables are properly connected and all terminals are hardly fixed.
- Check that electrical connections are carried out according to the norms in fore including grounding.
- Check out that the voltage is the one shown in the unit labels.
- Make sure the voltage is within the limits (± 10%) of tolerance range.
- Check out that crankcase heaters are powered correctly.
- Check out that there is no refrigerant leakage.

- Check out that all the cover panels are installed in the proper position and locked with fastening screws before start up.

	***WARNING: The crankcase heaters have to be powered at least 12 hours before start up by switching off the main switch (the heaters are automatically powered when the main switch is switched off). The crankcase heaters are working properly if, after some minutes, the temperature of crankcase's compressor is about 10°C ÷ 15°C higher than ambient temperature.***
	WARNING: Never switch off the unit (for a temporary stop) by switching off the main switch: this component should be used to disconnect the unit from the power supply only for lengthy stoppages (e.g. seasonal stoppages). Besides, failing the power supply, the crankcase's resistances are not supplied thus resulting in a possible breakdown of the compressors once the unit is switched on.
	WARNING: Do not modify the internal wiring of the unit otherwise the warranty will terminate immediately. ***WARNING: As for the heat pump models, the summer/winter operating mode have to be selected at the beginning of the related season. Frequent changes of this seasonal operating mode have to be avoided in order to prevent severe damages to compressors.***

7 MICROPROCESSOR USER INTERFACE



It is used to select the operating mode, and to reset the manual resetting alarms. The operating mode changes as per the sequence below each time you press the Mode button:

off → cool → heat → off

During the parameters' setting, this button can be used to revert BACK to the previous level.

It allows you to enter into the setting menu parameters and to select the cool/summer, heat/winter and sanitary water set point value.

UP button: In the setting mode, this button allows you to move up to a higher menu or to increase the value of a parameter when you are in the "edit" mode.

DOWN button: In the setting mode, this button allows you to shift to a lower menu or to decrease the value of a parameter when you are in the "edit" mode.

7.1 Setpoint adjustable by the user

Setpoint type	Setpoint (summer/winter)	Summer default (range)	Winter default (range)
First setpoint	Coo/Hea	7 (5÷18)	45 (35÷55)
Second setpoint	Co2/He2	18 (7÷23)	35 (25÷45)
Sanitary Setpoint	San	50 (25÷55)	

The functionality of the second setpoint can be used only when you purchase the related optional kit.

7.2 Display

In Normal view displays the outlet water temperature reported to tenths of degrees, or the alarm code if at least an alarm is active. In case of multiple alarms activation, it will display the first alarm, while the second appears when the first is reset. Into the menu mode, the display depends on the current position where you are.

7.3 Led


Compressor LED

- ON if the compressor is running
- OFF if the compressor is off
- FLASHING if timings are in progress waiting for compressor's start up


Sanitary water LED

- ON if sanitary water valve is in open position
- OFF if the sanitary water valve is in closed position


Defrosting LED

- ON in defrost operating mode
- OFF if defrosting mode is disabled or completed
- FLASHING if defrosting cycle interval's time is in progress

 LED is ON if the water pump is running.

 LED is ON if the water pump is running.

 LED is ON if an alarm is activated.

 LED is ON if the unit is in the heating mode operation.

 LED is ON if the unit is in the cooling mode operation.

7.4 Dynamic set-point adjusting

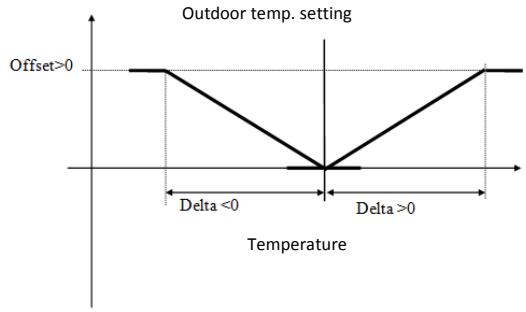
The controller can change the set-point by adding a value depending on the outdoor air temperature sensor. In this case, you need to set the parameter H18 =29 (which is already set from the factory), and if necessary to change the values of the parameters from P14 to P19 following the indications below (settings to be done by the installer):

Par-> PUP-> controller parameters:

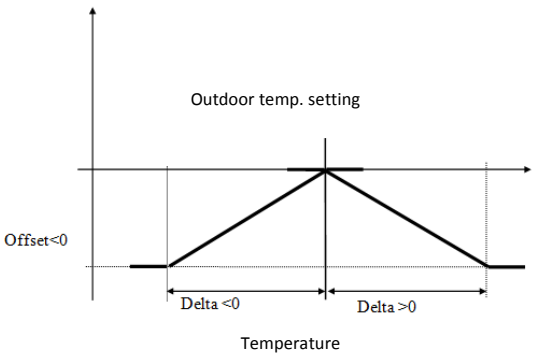
• P13 = dynamic set-point, enabled = 1/ unabled = 0 (in caso di utilizzo della compensazione climatica da tastiera remota CRH opzionale, deve essere disabilitato).
• P14 = offset in cooling mode operation.
• P15 = offset in heating mode operation.
• P16 = Outdoor temperature setting in cooling mode.
• P17 = Outside temperature setting in heating mode.
• P18 = Temperature difference in cooling mode operation.
• P19 = Temperature difference in heating mode operation.

Curve of the set-point variation as a function of the outside temperature:

Cooling mode



Heating mode



7.5 On/off remote control and Summer/Winter modes

The terminal has two digital inputs to control the unit via an external consent.
9-11: Summer/winter switching mode input via remote control. To enable this feature, set the parameter H55 = 1. The parameter is protected by maintainer password (could be changed by the installer).
8-11: Remote on-off input. The feature is already enabled by default. Remove the jumper in the terminal to put the unit in stand-by mode. If the sanitary operating mode is activated, the on-off remote function will switch off the machine provided the sanitary set had not yet been reached.

7.6 Sanitary valve adjustment

To activate the hot sanitary water function, be sure to install a temperature sensor inside the tank and to connect it to the 6 and 11 terminals. Once the temperature sensor is installed and connected, it is necessary to set the parameter H10 **= 1**, and to set the parameter H20 **= 6**. To set the parameters, please enter the maintainer password and then enter the PRG->Pss->Par->Cnf->H10/ H20 parameters (the configuration could be done by the installer).
If the hot sanitary water temperature is below the set point value (set at 48°C by default) which can be adjusted by entering the PRG-> Set-> SAN menu, the unit activates the sanitary valve and the frequency of the compressor will be reduced to the minimum value for 2 minutes, in such a way that the valve can divert the water flow towards the sanitary tank. After the water flow is diverted, the compressor changes the frequency to the maximum value till the temperature reaches the set point of sanitary water. Once reached the set point value, the valve switches to the stand-by mode and the compressor works normally.
The 3-way water flow deviation valve (with spring return) has to be connected to the V1-V1 terminals.
Closed contact means that the valve is activated and diverts the water flow to the sanitary water tank.
Open contact means that the valve is switched off and diverts the water flow to users.
While shifting from domestic water to sanitary water, the operating sensor changes from "outlet water sensor" to "sanitary tank sensor". While shifting from the winter operating mode to the sanitary operating mode, the compressor does not switch off, and reaches the highest frequency; on the other hand, while shifting from the summer operating mode to the sanitary operating mode, the compressor is switched off to wait for the safety timing.
NOTE: turning off the unit by means of a remote device (8-11 terminals), or of the on board keyboard, or of a remote keyboard does not affect the sanitary operating mode. Once the H10 parameter is set to 1, the unit switches to health priority as soon as electrified. The on board display shows the temperature measured by the sensor placed inside the sanitary water tank. Once the sanitary cycle is completed, the display returns to show the outlet water sensor temperature.
Defrosting during winter operation mode is always performed on the user side, never on the sanitary water tank.

7.7 ALARMS

7.7.1 Water flow switch

The water side flow switch is already installed inside the unit and DOES NOT HAVE to be tampered with or by-passed in any way. The flow switch is by-passed for 10 seconds after the unit's start up. The alarm will automatically reset itself for the first time and it will be reset when the alarm remains ON for at least 5 seconds. If the alarm happens more than one time per hour, it cannot automatically reset itself and so you should manually reset it.

7.7.2 High temperature

The alarm will be activated when the outlet water temperature sensor becomes higher than 65°C for at least 5 seconds. It turns off when the water outlet temperature decreases below 45°C.

7.7.3 Anti-freezing

The alarm will be activated when the outlet water temperature sensor is less than 4°C. It turns off when the temperature becomes higher than +7°C.

7.7.4 Sensors alarm

The alarm will be activated in the case of a short or open circuit of any connected and enabled sensor.
The alarm will be activated also when the temperature becomes higher than the sensors' upper limit of 100°C or less than the lower limit of -50°C.

7.7.5 Timeout inverter

Supposing the controller does not communicate with the driver board of the compressor, the time out alarm will be activated in order to prevent a system's control loss.

7.7.6 ON/OFF remote

In case the unit is remote controlled by a remote digital input.

7.7.7 High pressure

If the on board pressure transductor detects a pressure higher than 40 bar, the alarm will be activated.
In this case the compressor will stop immediately. The alarm will reset when the pressure decreases under 36 bar.

7.7.8 High pressure flow switch (in series with the compressor outlet probe)

If the pressure switch on the machine detects a pressure higher than 42 bar the alarm will be active.
In this case, the compressor will be immediately stopped. The alarm resets when the pressure drops below 32 bar.

7.7.9 Low pressure

If the on board pressure transductor detects a pressure lower than 2 bars, the alarm will be activated.
In this case the compressor will stop immediately. The alarm will reset when the pressure goes over 6 bar.

7.8 Power failure

After power supply reset:
1. The system comes back to the previous state before the power failure.
2. If the system is defrosting, this mode will be cancelled after power supply reset.
3. All the running timings will be cleared and reset again.

7.9 USER BLOCK ALLARMS TABLE

Error description	Code	Compressor	Pump	Resistances	Fan
Off remote control	E00	OFF	OFF	OFF	OFF
Inverter hardware malfunctioning	E75	OFF			OFF
Compressor's tension too high	E76	OFF			OFF
Power supply tension out of bounds	E78	OFF			OFF
Compressor not power supplied	E79	OFF			OFF
Inverter time out malfunctioning	E80	OFF			OFF
Inlet water sensor	E61	OFF	OFF	OFF	OFF
Outlet water sensor	E62	OFF	OFF	OFF	OFF
Compressor inlet sensor	E63	OFF	OFF	OFF	OFF
Compressor exhaust temp. sensor + HP flow switch	E64	OFF	OFF	OFF	OFF
High pressure transductor	E65	OFF	OFF	OFF	OFF
Low pressure transductor	E66	OFF	OFF	OFF	OFF
Outdoor battery sensor for climate adjust	E67	OFF	OFF	OFF	OFF
Sanitary water boiler sensor (opt.)	E69	OFF	OFF	OFF	OFF
Water flow switch	E06	OFF	OFF	OFF	OFF
High temperature	E18	OFF		OFF	
High pressure	E01	OFF	OFF		
Low pressure	E02	OFF			OFF
Anti-freezing alarm	E05	OFF	OFF	OFF	OFF

8 SHUTDOWNS FOR LONG PERIODS

- Turn off the unit by placing the switch of each unit to "OFF" position.
- Close the water valves.
- Place the general differential circuit breaker to OFF position.

	***If the temperature drops below 0°C there is serious danger of frost: add a mixture of water and glycol in the system, otherwise drain the hydraulic circuits of the system and of the heat pump.***

9 MAINTENANCE AND PERIODICAL CONTROLS

	***WARNING: All the operations described in this chapter HAVE TO BE CARRIED OUT BY TRAINED STAFF ONLY. Before any operation or before entering the inner components of the unit, be sure that the power supply is disconnected. The compressor's heads and discharge piping are usually at high temperature levels. Be very careful when operating in their surroundings. Aluminium coil fins are very sharp and can cause serious wounds. Be very careful when operating in their surroundings. After maintenance operations, re-install the cover panels, and fix them by means of screws.***
	***The refrigerant circuits must not be filled with different gas other than that indicated on the nameplate. The use of a different refrigerant can cause severe damage to the compressor.***
	***It's forbidden to use oils other than those specified in this manual. The use of a different oil can cause serious damage to the compressor.***

It is a good rule to carry out periodic checks in order to verify the proper operation of the unit.

OPERATION	1 month	4 month	6 month
Filling the water circuit.	x		
Presence of bubbles in the water circuit.	x		
Check out that safety and control devices work correctly (indoor and outdoor units)	x		
Check out possible oil leakage from compressor (outdoor unit).	x		
Check out possible water leakages from the hydraulic circuit (outdoor unit).	x		
Check out the proper working of the flow switches (outdoor unit).	x		
Check out that the crankcase resistances are properly supplied and functioning (outdoor unit).	x		
Clean the metallic filters of the hydraulic circuit.	x		
Clean the finned coil by means of compressed air or water jet (outdoor unit).	x		
Check out that all the terminals on the electric board as well as on the terminals of the compressor are properly fixed. Clean from time to time the remote control switch's sliding and fixed contacts (indoor and outdoor units).		x	
Tightening of water connections.		x	
Check out the tightening and the balancing of the fan blades (outdoor unit).		x	
Correct voltage.			x
Correct absorption.			x
Check the refrigerant charge.			x
Check the operating pressure, and superheat and subcooling			x
Check of the efficiency of circulation pump.			x
Check the expansion tank.			x
If the unit should be out of service for a long period, discharge water from the piping and from heat exchanger. This operation is necessary if, during seasonal stoppages, ambient temperature is expected to go down below the freezing point of the employed fluid.			x

9.1 ENVIRONMENTAL PROTECTION

According to the norms dealing with the use of depleting stratospheric ozone substances, it is forbidden to release refrigerants fluids in the atmosphere. They have to be collected and delivered to the seller or to proper gathering points at the end of their operating life. Refrigerant R410A is mentioned among controlled substances and for this reason it has to be subjected to the mentioned norms. **A particular care is recommended during service operations in order to reduce as much as possible any refrigerant loss.**

10 WHEN THE UNIT GOES OUT OF SERVICE

Once the unit is arrived at the end of its life cycle and needs to be removed or replaced, the following operations are recommended:

- the refrigerant has to be recovered by trained people and sent to proper collecting centre;
- compressors' lubricating oil has to be collected and sent to proper collecting centre;
- the frame and the various components, if not serviceable any longer, have to be dismantled and divided according to their nature, particularly copper and aluminium, which are present in conspicuous quantity in the unit. These operations allow easy material recover and recycling process, thus reducing the environmental impact.

11 ELECTRIC DATA OF THE UNIT AND AUXILIARIES

Power supply of the unit	V/~/Hz	230/1/50*-400/3/50**	**Remote control circuit**	V/~/Hz	12/1/50
Control board circuit	V/~/Hz	12/1/50	**Fans power supply**	V/~/Hz	230/1/50

For the models15, 25,41* - Per la taglia 61**

Note: Electric data may change for updating. It is therefore necessary to refer always to the wiring diagram of this manual.

12 OPERATING LIMITS

12.1 Evaporator water flow rate

The nominal water flow rate is referred to a ΔT equal to 5°C, between the evaporator's inlet and outlet. The allowed maximum flow rate is the one having a ΔT equal to 3°C; higher values may cause too high pressure drops. The allowed minimum water flow rate is the one having a ΔT equal to 8°C. Insufficient values may cause too low evaporating temperatures with the intervention of safety devices which would stop the unit.

12.2 Cold water temperature (summer operation)

The allowed minimum temperature at the evaporator's outlet is 5°C; as for lower temperatures, the unit should undergo some structural modifications. In this case contact our company. The allowed maximum temperature at the evaporator's outlet is 25°C.

12.3 Hot water temperature (winter operation)

Once the system is working at the right temperature, the inlet hot water temperature have not to be lower than 25°C; lower values may cause compressor's incorrect working operation and its possible related breakdown. The maximum outlet water temperature have not to exceed 55°C (outlet water temperatures up to 55°C are recommended with outdoor air temperatures up to 2°C). On the other hand, failures may occur and even the intervention of safety devices.

12.4 Ambient air temperature

The units are designed and manufactured to operate, in summer operation, with the condensate control, with outdoor air temperatures ranging from -10°C to 46°C. While operating as a heat pump, the admitted outdoor air temperatures range from -15°C to 40°C: