

Reversible heat pump water cooled horizontal indoor installation ductable

## INSTALLATION AND MAINTENANCE MANUAL



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*Dear Customer,*

*We congratulate you on choosing an ELFOSystem product, the air conditioning system at annual cycle that offers the possibility in a sole system of meeting all the heating, conditioning and domestic hot water needs.*

*Clivet is being working for years to offer systems able to assure the maximum comfort for long time with high reliability, efficiency , quality and safety. The target of the company is to offer advanced systems, that assure the best comfort, reduce the energy consumption, the installation and maintenance costs for all the life-cycle of the system.*

*With this manual, we want to give you information that are useful in all the phases: from the reception, to the installation and use until the disposal so that a system so advanced offers the best procedure of installation and use.*

*Best regards and have a nice reading !*

*CLIVET Spa*

The data contained in this manual is not binding and may be changed by the manufacturer without prior notice.  
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# 1 - GENERAL

## 1.1 MANUAL

The manual provides correct unit installation, use and maintenance.

Fare particolare attenzione ad :

-  WARNING indicate particularly important operations or information.
-  PROHIBITED indicate operations that must not be carried out, that compromise the operating of the equipment or may cause damage to persons or things.
  - It is advisable to read it carefully so you will save time during operations.
-  Follow the written indications so you will not cause damages to things and injuries people. The preliminary information must be read prior to carrying out any of the following operations.

## 1.2 GENERAL INSTRUCTIONS

### Preliminaries

-  The positioning, hydraulic system, refrigerating, electrics and the channelization of the air must be determined by the system designer in accordance with the local regulations. Only qualified personnel can operate on the unit, as required by the regulation in force.

Using the unit in case of breakdown or malfunction

- voids the warranty
- may compromise the safety of the machine
- may increase time and repair costs.

Follow local safety regulations.

Keep packing material out of children's reach it may be dangerous.

Recycle and dispose of packing material in conformity with local regulations.

### Risk situations

-  The unit has been designed and created to prevent injuries to people.

During designing it is not possible to plane and operate on all risk situation.

Read carefully "Residual risk" section where all situation which may cause damages to things and injuries to people are reported.

Installation, starting, maintenance and repair required specific knowledge; if they are carried out by inexperienced personnel, they may cause damages to things and injuries people.

### Intended use

Use the unit for the:

- **air treatment.**

Follow the limits defined in the technical bulletin and on this manual.

-  Not treat air containing :

- high concentration of dust;
- aggressive substances ;
- residual of industrial processes.

-  Any use other than intended does not involve the manufacturer in any commitment or obligation.

### Installation

-  Verify that the electrical line characteristics are in compliance with data quotes on the unit serial number label.

### Maintenance

-  Plan periodic inspection and maintenance in order to avoid or reduce repairing costs.
- Turn the machine off before any operation.

### Modification

-  All unit modifications will end the warranty coverage and the manufacturer responsibility.

### Breakdown/Malfunction

Disable the unit immediately in case of breakdown or malfunction.

Contact a constructor certified assistance service

Use original spares parts only. .

### User training

-  The installer has to train the user on :

- start-up / shutdown;
- set points change;
- standby mode;
- Maintenance;
- what to do / what not to do in case of breakdown.

### Data update

Continual product improvements may imply manual data changes

Visit manufacturer web site for updated data.

## 1.3 INDICATIONS FOR THE USER

-  Keep this manual with the wiring diagram in an accessible place for the operator.

Note the unit label data so you can provide them at the assistance centre in case of intervention (see "Unit identification" section)

Provide a machine notebook that allows any interventions carried out on the machine to be noted and tracked making it easier to suitably note the various interventions and aids the search for any breakdowns.

- In case of breakdown or malfunction:
- immediately deactivate the unit.
- Contact a constructor certified assistance service.
- Use original spares parts only.

Ask the installer to format on:

- 
  - start-up / shutdown
  - set points change
  - standby mode
  - maintenance
  - what to do / what not to do in case of breakdown

## 1.4 UNIT IDENTIFICATION

### Serial number label

The serial number label is positioned on the unit and allows to identify all the unit features.



It has not to be removed for any reason.

It reports the regulations indications such as:

- Machine type series → **EVH-SPACE**
- Size → **21 ....101**
- Serial number xxxxxxxxxxxx
- Year of manufacture
- Wiring diagram number
- Electrical data
- Manufacturer logo and address

### Serial number

It identifies uniquely each machine.

It identifies specific spare parts for the machine

### Assistance requests

Note data from the serial number label and write them in the chart on side, so you will find them easily when needed.

In case of intervention you have to provide data

Serie
Size
Serial number
Year of manufacture
Wiring diagram

## 2 - RECEPTION

### 2.1 INFORMAZIONI PRELIMINARI

#### Generali



Operare rispettando le normative di sicurezza in vigore.

Per le informazioni di dettaglio (dimensioni, pesi, caratteristiche tecniche, etc) far riferimento al capitolo INFORMAZIONI TECNICHE.

Per effettuare le operazioni usare dispositivi di protezione: guanti , occhiali ecc.

#### Stoccaggio

Rispettare le indicazioni riportate sull'esterno dell'imballo.

#### Movimentazione

Verificare peso dell'unità e capacità del mezzo di sollevamento.

Individuare i punti critici nel percorso di movimentazione : percorsi sconnessi, rampe, scalini, porte.

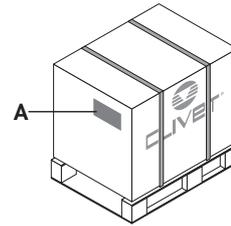
Considerare che il baricentro potrebbe essere spostato rispetto al centro dell'unità .

Assicurarsi che l'unità sia in equilibrio stabile.

#### Rimozione imballo

Fare attenzione a non danneggiare l'unità.

Riciclare e smaltire il materiale di imballaggio secondo le norme locali.



### 2.2 CONTROLLO ALL'ARRIVO



Prima di accettare la consegna controllare:

- Che l'unità non abbia subito danni nel trasporto
- Che il materiale consegnato corrisponda a quanto indicato sul documento di trasporto confrontando i dati con l'etichetta matricolare 'A' posizionata sull'imballo.

In caso di danni o anomalie :

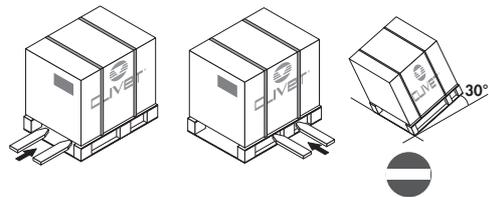
- annotare immediatamente sul documento di trasporto il danno riscontrato e riportare la dicitura: "Ritiro con riserva per evidenti ammanchi/danni da trasporto".
- contestare via fax e con raccomandata A.R. al vettore e al fornitore.

Le contestazioni devono essere effettuate entro 8 giorni dal ricevimento, le segnalazioni oltre tale termine non sono valide.

### 2.3 MOVIMENTAZIONE CON IMBALLO

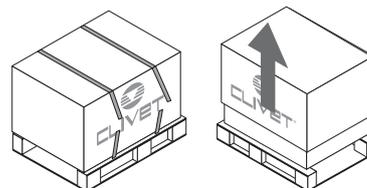
Sollevamento con forche:

- Inserire le forche come indicato in figura.
- È vietato sollevare più colli contemporaneamente lasciandoli sciolti.
- In caso di sollevamento di più unità contemporaneamente deve essere utilizzato un contenitore idoneo.



### 2.4 RIMOZIONE IMBALLO

- Tagliare le reggette di fissaggio.
- Rimuovere l'imballo sollevandolo verso l'alto.
- Rimuovere il nylon di protezione.



## 3 - POSITIONING

### 3.1 PRELIMINARY INFORMATION

Operate in compliance with safety regulations in force .

For detailed information (dimensions, weight, technical characteristics etc.) please refer to the "Technical information" section.



Use single protection devices : gloves, glasses ecc. .

During positioning consider these elements :

- technical spaces required for the machine and system
- place where the machine will be installed
- electrical connections
- water connections
- air / aeraulic ducts



Do not considerer these elements could decrease performances and operational life of the unit.

The functional clearances have to :

- guarantee the unit good operating
- allow the maintenance operations
- safeguard the authorized operators and the exposed person.
- position the unit taking into consideration the clearances indicated in the figure.

### 3.2 POSITIONING

Unit has been designed to be installed:

- **inside**
- **in fixed positions**

Limit vibration transmission:

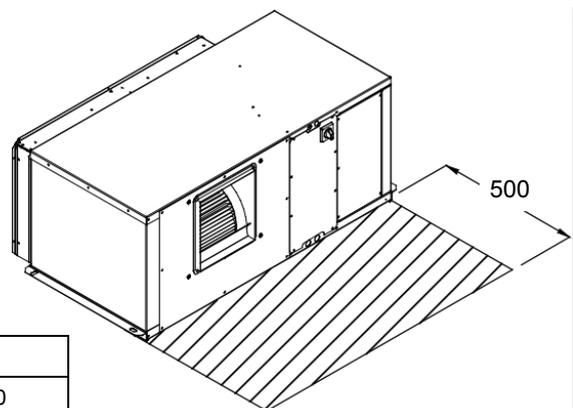
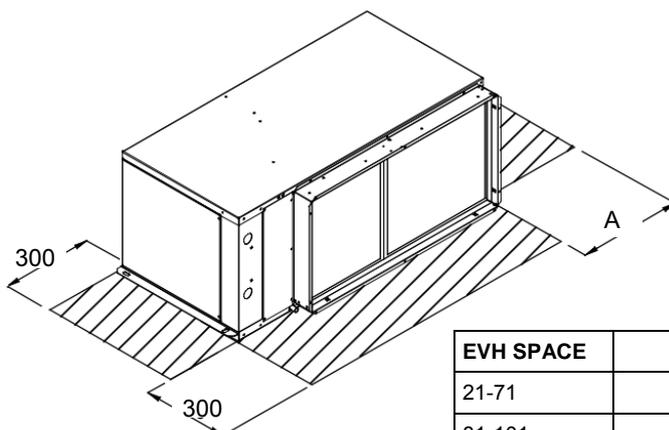
- use antivibration devices on unit bearing/supporting points;
- install flexible joints on the hydraulic/ aeraulic/cooling connections.



- plan in the false ceiling the openings indicated in the functional clearances to allow the access to the unit for the maintenance operations
- Ceiling positioning : let free the projection to the ground of the unit and of the functional clearances to allow the access with ladders or other means

Installation standards:

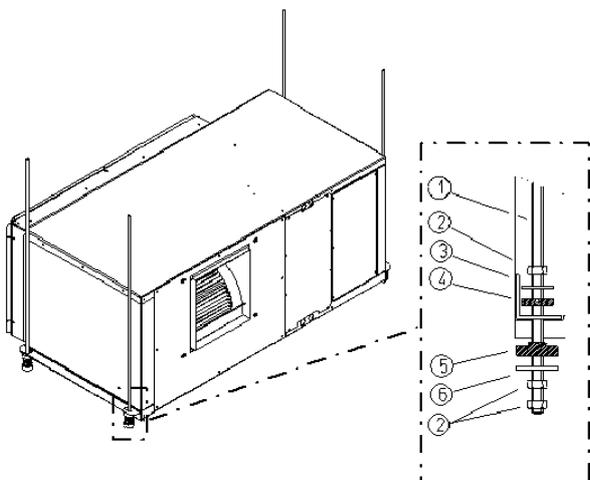
- Safe accessible position;
- avoid flood-prone places;
- verify unit weight and bearing point capacity;



EVH SPACE	A
21-71	550
81-101	620

## 3 - POSITIONING

### Hanging



- (1) Tapped bar M10 (M12 for sizes 81-91-101)
- (2) galvanized steel nuts
- (3) galvanized steel plain washer Ø external 30mm
- (4) rubber plain washer Ø external 30mm thickness 6mm
- (5) Anti-vibration rubber or spring
- (6) galvanized steel plain washer Ø external 40mm

### 3.3 THERMOSTAT POSITIONING (OPTIONAL)



The choice of the installation point is important for the comfort of the served area and the energy consumptions.

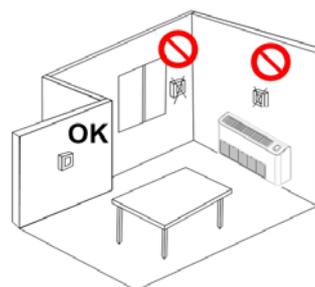
The thermostat must be positioned:

- in a room with medium temperature and humidity conditions, representative of the other rooms;
- at a height of 150 cm;
- preferably on an inner wall;

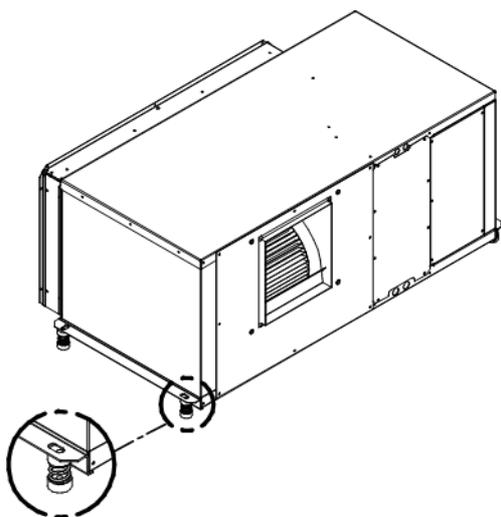


Positions to avoid:

- near heat sources;
- exposed to direct solar radiation;
- in a position with exhaust air from outlets or diffusers;
- behind curtains or pieces of furniture;
- - near doors and windows to the outside;
- - on walls crossed by heating chimneys or pipes;
- - on external walls.



### in support



## 4 - WATER CONNECTIONS

### 4.1 PRELIMINARY INFORMATION



Selection and installation of system components must be carried out by installer.

Following a series of instructions that must be integrated with what required by local regulations and by the code of practise.

### 4.2 COMPONENTS

#### INTERCEPTING VALVES

- Installed on the input and output, they allow to carry out all the maintenance operations and possible without emptying the installation.

#### THERMOMETERS AND PRESSURE GAUGES:

- Installed on the input and output of the main parts facilitate the controls and the maintenance.

#### BLEED VALVES :

- Installed in all the highest points of the system, they allow the venting from the circuit.

#### BLEEDING COCKS :

- Installed at the lowest points of the circuit, so as to allow emptying .

#### EXPANSION TANK :

- It allows the system correct pressure to be maintained at the water temperature changing. It has to be sized according to the system water content.

#### WATER FILTER :



- If it is not built-in, it has to be immediately installed at the unit water inlet, in a position easily accessible for cleaning.



- The filter should never be removed, the operation will void the warranty.

#### SUPPORTS :

- for the weight of the water piping that must not rest on the unit fittings.

#### FLOW SWITCH

- as a component of the system must always be provided.

### 4.3 OPERATION SEQUENCE

Before connecting the unit, carefully wash the system by filling it and emptying it several times with clean water.

Ignoring this operation will lead to several filter cleaning interventions and at worst cases can cause damages to the exchangers and the other parts.

Execute leakage test before isolate the pipes.

To avoid heat dispersions and formation of condensate isolate all the pipes.

Leave various point of service free (wells, vent-holes etc )

### 4.4 CONDENSE DRAIN

The condense must be disposed of in order to avoid damaging things and persons.

- Unit drain coupling: the connection must not transmit mechanical stresses and must be carried out paying attention not to damage the unit drain coupling.
- Foresee a siphon that, by eliminating the depression caused by the fan, prevents suction of air from the drain piping.
- The piping must have adequate slope to allow out flow.
- Anchor the piping with an adequate number of supports.
- On the contrary, cracking in the piping and air pockets obstructing the outflow, are generated.
- Isolate piping and siphon to avoid condense dripping.
- Connect the condense drain to a rain drain network.
- DO NOT use white waters or sewage drains to avoid possible inhaling of odours in case of evaporation of the water contained in the si phon.
- At work end, check the regular outflow of the condense by pouring water in the bowl.

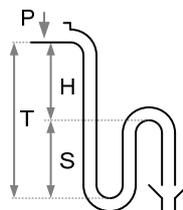


Siphon height calculation

$$T = 2P$$

$$S = T/2$$

P is the pressure determined by the fan in correspondence of the condense collection bowl (approx. 1 mm = 9.81 Pa)



Example :

$$P = 300 \text{ Pa} = 30 \text{ mm}$$

$$T = 2P = 60 \text{ mm}$$

$$S = T/2 = 30 \text{ mm}$$

### 4.5 RISK OF FREEZING

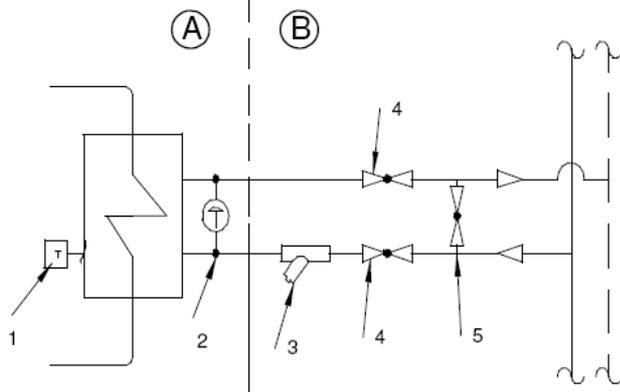


Adopt measures to prevent risk of freezing if the unit or relative hydraulic connections can be subject to temperatures near 0°C.

- isolate the piping
- protect the piping with heating cables laid underneath the insulation

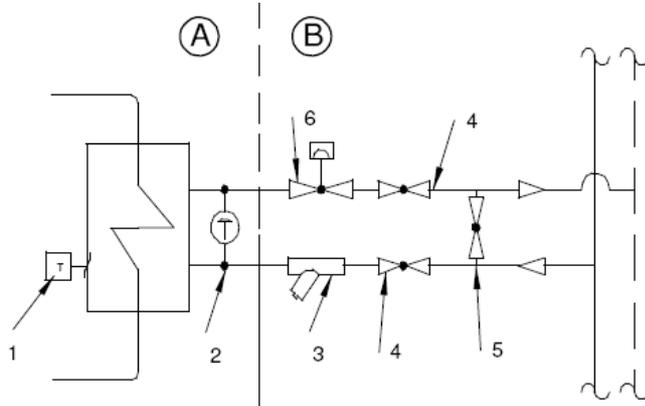
## 4 - WATER CONNECTIONS

### WATER LOOP WITH CONSTANT WATER FLOW



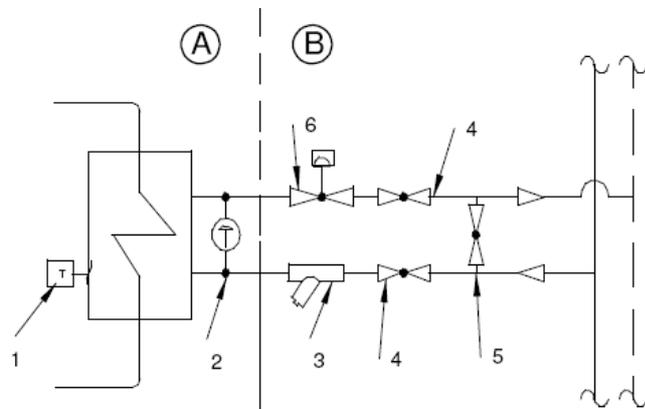
- (1) antifreeze protection
  - (2) differential pressure switch, water side
  - (3) Steel mesh filter on the water side (optional)
  - (4) shut-off valve on the system water connections (optional)
  - (5) by-pass cleaning valve (optional)
- The dotted line indicates the supply limit of the standard unit (field A)

### WATER LOOP WITH VARIABLE WATER FLOW



- (1) antifreeze protection
  - (2) differential pressure switch, water side
  - (3) Steel mesh filter on the water side (optional)
  - (4) shut-off valve on the system water connections (optional)
  - (5) by-pass cleaning valve (optional)
  - (6) ON/OFF solenoid valve water side (optional)
- The dotted line indicates the supply limit of the standard unit (field A)

### WATER SOURCE



- (1) antifreeze protection
  - (2) differential pressure switch, water side
  - (3) Steel mesh filter on the water side (optional)
  - (4) shut-off valve on the system water connections (optional)
  - (5) by-pass cleaning valve (optional)
  - (6) Water side modulating valve (optional)
- The dotted line indicates the supply limit of the standard unit (field A)

## 5 - AEREAULIC CONNECTIONS

### 5.1 GENERAL

Proper execution and sizing of air connections are essential for ensuring correct operation of the unit and an acceptable level of silence in the room.

When designing and creating ducts, consider PRESSURE DROPS, FLOW RATE and AIR SPEED which need to be compatible with the characteristics of the unit.



Special consideration needs to be made for pressure drops that are greater than the unit's static pressure, which would lead to a reduction in flow rate resulting in unit shutdown.

- the weight of the ducts must not be supported by the connection flanges
- place anti-vibration joints between the ducts and the unit
- the connection to the flanges and between the various sections of the ducts must ensure an airtight seal, preventing leakage in delivery and return which would compromise overall system efficiency.
- limit pressure drops by optimizing the path, the type and number of curves and the branches
- use curves with a wide radius. Consider whether it might be useful to equip them with deflectors (especially if the air speed is high or if curves are tight )

### 5.2 FEATURES FOR DUCTS FOR TREATED AIR

- The inner surface of the duct must be smooth and washable. It must not contaminate the air.
- Thermally insulate the ducts and the flanges so as to prevent loss of energy and condensation build-up.

#### GRILLES OUTLETS DIFFUSERS

Proper distribution of air in the room is essential for ensuring comfort levels.

In the selection and positioning of grilles, outlets and diffusers, the following are to be avoided:

- excessive air speed
- formation of stagnant zones and layering
- entry of cold air into the room
- formation of localized currents (due to uneven air distribution)
- excessive variations in ambient temperature in the vertical and horizontal planes
- short circuiting of delivery air towards return air

For purposes of comfort, the following things need to be considered:

- air diffusers must be selected by checking the sound power generated at nominal flow rate conditions
- the disconnections to the diffusers are to be made using flexible elements
- the return grilles must be amply sized

#### APPLICATIONS AT HIGH DEGREE OF SILENCE

For applications that require a high degree of silence in the system:

- In delivery and return, provide septum silencers, preferably inserted in sections of ducts located outside the building.
- Equip all curves with deflectors.

## 6 - ELECTRICAL CONNECTIONS

### 6.1 PRELIMINARY INFORMATION

#### General

- The characteristics of the electrical lines must be determined by specialized personnel able to design electrical installations; moreover, the lines must be in conformity with regulations in force.
- Please refer to the "Information" section for the detailed characteristics of the apparatus (dimensioning, performance, etc) .
- Operate in compliance with safety regulations in force .
- Use single protection devices : gloves, glasses ecc....
- The protection devices of the unit power line must be able to stop the presumed short circuit current, whose value must be determined in function of system features
- The power cables and the protection cable section must be defined in accordance with the characteristics of the protections adopted.
- The electrical data indicated in the technical bulletin and in the manual refer to the standard unit, accessories excluded.  
The serial number label reports the unit specific electrical data, included any electrical accessories.  
Refer therefore to the electrical data indicated on the serial number label.

- 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 aren't disturbances .
- Guarantee the continuity of the screen for the entire extension of the cable.
- Respect impedance, capacity and attenuation indications.

### 6.2 POWER SUPPLY INPUT



Fix the cables: if vacated may be subject to tearing.



The cable don't have to touch the compressor and the refrigerant piping ( they reach high temperatures ).

#### Connections



- All electrical operations should be performed by trained personnel having the necessary requirements by the regulations in force and being informed about the risks relevant to these activities.
- Refer to the unit electrical diagram (the number of the diagram is shown on the serial number label).
- Verify that the network has characteristics conforming to the data shown on the serial number label .
- Shelter the cables using adequate measure fairleads.
- Before starting work, verify that the sectioning device at the start of the unit power line is open, blocked and equipped with sign warning.
- First create the earthing connection.
- Prior to powering the unit ensure that all the protections that were removed during the electrical connection work have been restored.

#### Signal lines/data-lay

- 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.

## 6 - ELECTRICAL CONNECTIONS

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### WITH A PERMISSIBLE TOLERANCE

Make sure that the sectioning device at the beginning of the unit's power line is opened, locked and equipped with a signal.

Open the general line disconnecting switch (if present)

Verify that the net is in conformity with the data shown in the registration plate placed on the electrical board.

Check the dimensional drawing for the input of the electrical lines

Take away the closing plate placed on the electric board (ONLY IF PRESENT) and drill a hole through it to pass the cables through.

Protect the cables, using the fairlead of an adequate size.

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

Connect the cables to the relevant terminal boards

Before supplying power to the unit, make sure that all the safety devices that were removed during electrical connections are positioned again.

### FUNCTIONAL CONNECTIONS

FOR ALL CONNECTIONS REFER TO THE WIRING DIAGRAM ENCLOSED WITH THE UNIT

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 centers (in order to avoid unauthorized modifications).

### ON / OFF FROM REMOTE CONTROL

Generally the unit is delivered with bridged terminals; if the control is not used, the bridge should not be removed.

### CHANGING FROM SUMMER TO WINTER USING THE REMOTE CONTROL

Only if the hot water coil or electric heaters are present.

This function is activated with the RemMode = 1 parameter.

Selection switch open – unit in heating mode, selection switch closed – unit in cooling mode, this way the keyboard or supervisor unit selection is deactivated.

### SET ECO USING THE REMOTE CONTROL

This function is activated with the RemMode = 1 parameter.

In this way the keyboard or supervisor unit selection is deactivated.

### VENTILATION ONLY USING THE REMOTE CONTROL

This function is activated with the RemMode = 1 parameter.

In this way the keyboard or supervisor unit selection is deactivated.

### FIRE ALARM INLET

Generally the unit is delivered with bridged terminals; if the control is not used, the bridge should not be removed.

### SIGNALIZATION OF MALFUNCTIONING/ UNIT FUNCTIONING

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

Maximum voltage at the terminal ends is 24v ac and maximum power is 5A (AC1).

### REMOTE KEYPAD

Signal conductor signal:	2 + SHIELD
Min. section:	0.34 MM <sup>2</sup>
Max. length:	100 METRES
voltage:	230/1/50

### HID-P1 ROOM THERMOSTAT

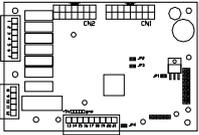
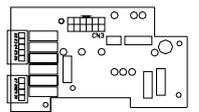
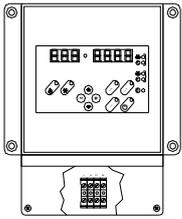
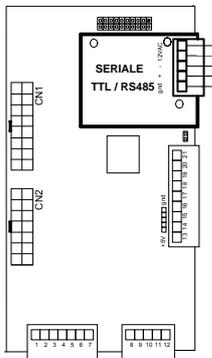
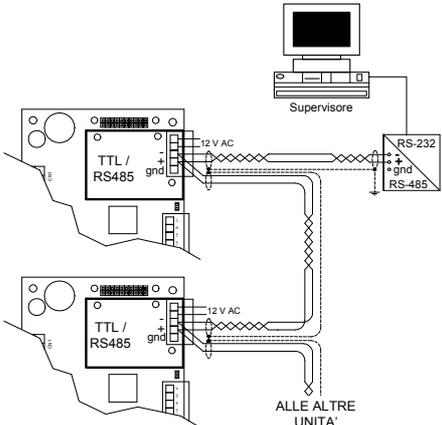
Conductor number:	3 + SHIELD
Min. section:	0.34 MM <sup>2</sup>
Max. length:	100 METRES

## 6 - ELECTRICAL CONNECTIONS

The complete system is made of the following modules.

Some are optional so they could not be present.

Some are supplied in packages separated by the unit: verify the shipping documents.

	<p><b>MAIN ADJUSTMENT MODULE</b>  <b>STANDARD ON THE UNIT - code C5110760</b>          It controls unit (inlets, outlets, configuration parameters)</p>
	<p><b>EXPANSION PLUG-IN MODULE</b>          code C5110767 - OPTIONAL          Plugged-in on the main module.          It controls some inputs and outputs.</p>
	<p><b>STANDARD ON THE UNIT</b>          It enables the thermo-adjustment according to the temperature detected by the probe on the room thermostat, instead of according to the temperature detected by the probe on the unit intake..</p>
	<p><b>REMOTE KEYPAD</b>          OPTIONAL - Code PE6B0017          It remotely repeats all functions available on the machine keyboard.</p>
	<p><b>SERIAL CONVERTER TTL/RS485</b>          The supervision services are available, with standard modbus protocol. Plugged-in in the main module on the electric board (see lay in the wiring diagram). It is possible to connect up to 127 units with a single supervision system.          The connection with a PC must use a RS485/232 converter; the serial line RS232 can be max. 10-m long.  <b>CONNECTIONS:</b>          refer to the wiring diagram and to the SERIAL LINES/DATA paragraph  <b>SPECIFICS FOR THE RS485 CONNECTION</b>          cable with 2 twisted wires + screen          the serial line RS-485 can be max. 1000-m long.</p>
 <p>The diagram illustrates the electrical connections for the supervision system. A 'Supervisore' (Supervisor) PC is connected to an 'RS-232' converter. The RS-232 converter is connected to a common 'RS-485' network. Two 'TTL / RS485' modules are shown, each receiving '12 V AC' and 'gnd' power. The RS-485 network is connected to 'ALLE ALTRE UNITA'' (all other units). The RS-232 converter also shows connections for 'gnd' and 'RS-485'.</p>	

## 7- START-UP

### Preliminary checks

#### Checks with machine in OFF, before start-up .

For details refer to the various chapters in the manual.

√ Unit OFF power supply
● safe access
● functional spaces
● integrity of structure
● unit on anti-vibration devices
● air filters present and clean
● completed idraulic system
● cooling circuit visual control
● earth connection
● unit powered by fixed network or by electrogen group
● electric connections by customer

### Start-up sequence

#### Machine start-up operations.

For details refer to the various chapters in the manual.

√ unit ON power supply
● Powered unit
● compressor carter heaters ON from at least 8 hours
● phases sequence control
● vacuum voltage measurement
● unit ON
● load voltage measurement and absorptions
● treated air flow rate measurement
● supply, return and outdoor air temperature measurement
● subcooling and overheating measurement
● no anomalous vibrations check
● set-point customisation
● available machine documentation

## 7- START-UP

### 7.1 PRELIMINARY INFORMATION

The indicated operations must be carried out by qualified technicians and specifically trained on the product.

Upon request, the after-sales assistance centres execute start-up.

The electric, hydraulic connections and the other work of the system are the responsibility of the installer.

Agree the start-up date with the after-sales assistance centre with sufficient advance

### 7.2 PRELIMINARY CHECKS

Before starting any check, verify that :

- the unit is perfectly installed and in compliance with that reported in this manual
- the electric power supply line of the unit is isolated at start-up
- the isolation device of the line is open, blocked and equipped with relative signal.

### 7.3 COOLING CIRCUIT

1. Visually check the cooling circuit: any oil stains can be symptom of leaks (caused by, for example, transport, handling or other).
2. Check the cooling circuit is pressurised: use the machine pressure gauges, if present, or service pressure gauges.
3. Check all service sockets are closed with relative plugs; their absence may determine coolant leaks

### 7.4 HYDRAULIC CIRCUIT

1. Find out if, before connecting the unit, the hydraulic system has been washed and the washing water drained.
2. Check the hydraulic circuit has been loaded and pressurised.
3. Check the shut-off valves on the circuit are in "OPEN" position.
4. Check there is no air inside the circuit, eventually bleed it through the vent valves in the high points of the system.
5. In case of using solutions to be cooled, check the percentage is suitable for the type of use.

Glycol in weight (%)	10	20	30	40
Freezing temperature (°C)	-3.9	-8.9	-15.6	-23.4
Safety temperature (°C)	-1	-4	-10	-19

### 7.5 ELECTRIC CIRCUIT



Check the unit is connected to the earth system. Check fastening of the conductors: the vibrations caused by handling and transport may cause loosening.

Power the unit by closing the isolation device but leave in OFF.

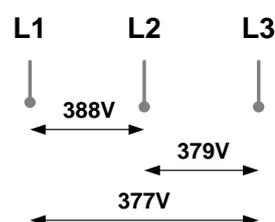
Check the network frequency and voltage values, that are within the limits:

$$400/3/50 \text{ +/- } 10\%$$

Check the unbalancing of the phases:

**must be below 2% .**

Example :



$$1) \frac{388 + 379 + 377}{3} = 381 \text{ (A)}$$

$$2) \text{ MAX} - \text{A} = 388 - 381 = 7$$

$$3) \text{ S} = \frac{7}{\text{A}} \times 100 = 1,83 \text{ OK}$$



Operation outside the limits can entail irreversible damages.

### 7.6 COMPRESSOR CARTER RESISTORS

Power the compressor oil heating resistors for at least 8 hours before starting the compressor itself:

- upon unit commissioning
- after every prolonged stop period with unit not powered

Power the resistors by closing the unit isolator.

Check electric absorption of the resistors to be sure they are working.

Execute start only if the temperature of the compressor casing on the lower side is at least 10°C higher than the outdoor temperature.



Do not start the compressor with carter oil not in temperature.

## 7- START-UP

### 7.7 VOLTAGES

Check the air and water temperatures are within the operational limits.

Start the unit; refer to the "Adjustment" section for indications on the control system.

With the unit running, meaning in stable conditions and near the work ones, check:

- power supply voltage
- unit overall absorption
- absorption of the individual electric loads.

### 7.8 ROOM PRESSURE CALIBRATION

The Scroll compressors have only one rotation direction.

In the event it is reversed, the compressor is not immediately damaged, but increases its noise and jeopardises pumping. After a few minutes, the compressor blocks due to intervention of the thermal protection. In this case, disconnect power supply and invert 2 phases on the machine power supply.

Avoid the compressor working for a long time with contrary rotation: more than 2-3 of these anomalous start-ups can damage it.

To ensure the rotation direction is correct, measure the condensation and suction pressure. The pressures must significantly differ: upon start-up, the suction pressure decreases whereas the condensation one, increases.

The phase monitor optional, controlling the phases sequence, can also eventually be installed subsequently.

### 7.9 REMOTE CONSENTS

Check the remote controls (ON-OFF, etc.) are connected and, if necessary, enabled with relative parameters (ELECTRIC CONNECTIONS sections and following pages)

Check the probes or optional components are connected and enabled with the relative parameters.

### 7.10 START-UP REPORT

To detect the objective operational conditions is useful to control the unit over time.

With the unit running, meaning in stable conditions and near the work ones, detect the following data:

- Overall absorptions and voltages with unit in full load
- Absorptions of the various electric loads (compressors, fans, pumps etc)
- Temperatures and flow rates of the various fluids (water, air) at input and output of the unit
- Temperatures and pressures in the feature points of the cooling circuit (compressor, liquid, suction drain/unload)



The detections must be kept and made available during maintenance interventions.

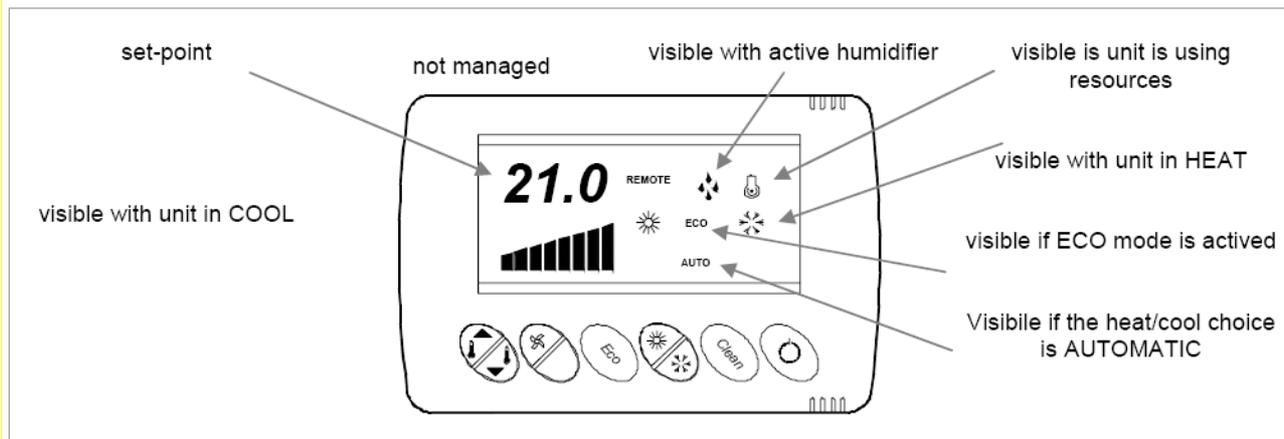
### 7.11 EC DIRECTIVE 97/23 PED

From Directive 97/23 EC PED derive the prescriptions for the installers, the users and the maintenance operators of the unit also.

Refer to the local implemented standards; in synthesis and for merely indicative purposes:

- Compulsory check of first system: only for units assembled on site by the installer (e.g. condensing + direct expansion unit)
- Declaration of start-up: for all units
- Periodical checks: to be carried out as frequently as defined by the Manufacturer (see MAINTENANCE section) .

## 8 - CONTROL



### OPERATING MODES

#### MANUAL

The choice between the HEATING or the COOLING mode is carried out **manually** by the keypad, the room thermostat or the remote selector (see the chapter ELECTRICAL CONNECTIONS).

#### AUTOMATIC

The choice between the HEATING or the COOLING mode is carried out **automatically** by the electronic module, according to the room temperature detected by the probe placed on the unit inlet (or on the room thermostat, if present). When temperatures are higher than the cool set, the unit cools the room; when temperatures are lower than the heat set, it heats the room.

The choice between the automatic and manual change is definite by the parameter num. 1 OnModeMan:

MANUAL = 1 AUTOMATIC = 0

#### ECO

In this operating mode, lower consumption is preferred to comfort:

The ECO-COOL set is higher than the COOLING set

The ECO-HEAT set is lower than the HEATING set

In this mode, the fan is activated periodically to verify the room temperature and therefore decide to activate or not the available resources to satisfy the set.

It can be activated by the keypad.

#### CLEAN

The CLEAN mode differs from the VENTILATION ONLY because it can be timed; after the set time, the mode deactivates.

It can be activated by the keypad.

#### VENTILATION

In VENTILATION ONLY, the unit behaves like a fan: the OUTLET fans are activated and no setting on the room temperature is performed.

It can be activated by the remote selector.

#### SET-POINT

##### MANUAL SET POINT

The ambient set point can be MANUALLY modified by the thermostat at P01 parameter

##### HID-P1 ROOM THERMOSTAT

The unit is designed for the connection with a remote HID-P1 thermostat to be placed in the room.

It is possible to perform the thermoregulation according to the temperature detected by the probe of the room thermostat: it is necessary to take away the probe placed on the unit inlet and to modify the machine configuration (this operation should be performed by an authorized service centre).

The thermostat displays the set-point on the display.

## 8 - CONTROL

<b>ON-OFF</b> Key hold pressed	
<b>SET THE WORKING SETPOINT :</b>	
<b>DISPLAY THE ROOM TEMPERATURE :</b> keys hold pressed	
<b>SUMMER/WINTER MODE CHANGE</b> Key hold pressed The key is not operative if the unit is set for the automatic operating mode: under such conditions, the AUTO indication is displayed.	
<b>ECO operation</b>	
<b>CLEAN - WASHING</b>	
<b>ALARMS</b> Each time the unit is in alarm, the code of the current alarm is displayed instead of the setpoint. The code alternates with intervals of about 3 seconds with the displaying of the room temperature. In case of multiple alarms, the one occurring first is displayed.	
<b>LIST OF THE ALARMS IN PROGRESS</b> Press the Dw ventilation key: the alarm list is scrolled by a code at a time. After 5 seconds from the last pressing of the key Dw the display returns to the standard appearance.	
<b>ALARM RESET</b> The current alarms are reset holding the buttons ECO and Clean pressed.	 
<b>KEY LOCK</b> All button functions can be locked by holding the buttons Clean and On-Off pressed. The lock is signalled by the characters "---" whenever any key is pressed.	 

### PARAMETERS

IT IS NOT NECESSARY TO ACCESS THE PARAMETERS FOR THE STANDARD USE.

THE OPERATIONS INDICATED HERE BELOW ARE NEEDED EXCLUSIVELY FOR CALIBRATIONS AND CONFIGURATIONS; THEY ARE THEREFORE ADDRESSED EXCLUSIVELY TO AUTHORIZED SERVICE CENTERS, OR ANYWAY TO QUALIFIED TECHNICIANS.

The parameter from 01 to 08 are present in the main module on the machine: the modification can be realized either by the thermostat or by the keypad.

The parameters from 09 to 12 are on the thermostat.

To access the parameters:

- switch the machine off and on again by the key ON-OFF.
- Wait for the display to show the setpoint.
- Press both setpoint adjustment keys for a few seconds, till the code P01 is displayed.
- Then press the ECO key to display the value associated with the parameter P01.
- The parameter value can be changed while it is displayed using the setpoint adjustment keys.
- The new value is stored pressing again the ECO key.

- To move to another parameter use the keys arrow "UP" or arrow "DOWN" for adjusting the setpoint.
- To exit the programming mode press again and simultaneously the setpoint adjustment keys in the parameter list menu. If the keys are not pressed for at least 10 seconds the module anyway exits the programming mode.

P01 Manual SetPoint ( ManSet )

P02 economic set in cooling ( SetCoolECO )

P03 economic set in heating ( SetHeatECO )

P04 manual or auto setpoint enabling ( ONSetMan )

P05 manual or automatic mode change enabling ( ONModeMan )

P06 humidity setpoint in the Cool mode ( SetURCool )

P07 humidity setpoint in the Heat mode ( SetURHeat )

P08 SetCO<sub>2</sub> (SetCO<sub>2</sub>). The displayed value is in "ppm / 10"

P09 setpoint positive/negative max. variation range by the user

P10 thermostat temperature probe offset

P11 thermostat humidity probe offset

P12 Clivet Bus thermostat address

By P09 the range within which the user can modify the machine set-point is defined.

## 8 - CONTROL

### ALARM LIST

The ALARMS indicate a potentially hazardous situation for the machine integrity.

Before resetting the alarm, identify and remove the reason of the lock: a repeated reset can cause irreversible damage. That's why the reset is MANUAL, namely through keyboard (provided that the cause no longer exists).

PRE-ALARMS and SIGNALS indicate a close risk situation. Their occurrence can be accepted if occasional and/or in temporary situations (for example at the system start-up).

The reset is AUTOMATIC, that is there is a self-reset as soon as the cause ceases without any keyboard intervention.

FAILURES signal the malfunctioning of probes and transducers; they are AUTOMATICALLY reset, so that anyway the unit can operate, even if possibly with reduced functions.

In case of doubt contact an authorized service center.

The presence of one or more alarms is signalled by the ALARM CODE blinking and by the machine time it/they occurred.

The cumulative lock relay activates simultaneously with the alarm code displaying.

Some alarms, typically PRE-ALARMS, do not activate the relay.

The table shows all the variables which can be managed by the electronic system.

According to the machine configuration and the accessories, some alarms can be not relevant.

Code	Alarms	reset	I/O on 1 compr. board	I/O on 2 compr. board
E00	Communication time out between thermostat and unit	Automatic		
E01	Inlet temp. Probe fault	Automatic	2.1	2.1
E02	Outlet temp. Probe fault	Automatic	2.2	2.2
E03	Externe temperature probe fault	Automatic	2.3	2.3
E04	Ambient UR% probe fault	Automatic	2.9	3.7
E05	Externe UR% probe fault	Automatic	3.8	3.8
E06	Air qualità probe fault	Automatic	3.11	3.11
E07	Fire alarm	Manual	1.3	1.3
E08	Outlet fan protection intervention	Manual	1.7	1.7
C9	Clogged filter signal	Automatic	1.8	1.14
E10	Aux. heater overtemperature alarm	Manual	1.10	
E11	Antifreeze alarm	Manual	1.9	1.15
C12	Outlet high temp. signaling	Automatic	1.10	
C13	Outlet low temp. signaling	Automatic		
E14	Cond. pressure probe fault - 1"	Automatic		
E15	Cond/evap. pressure probe fault - 1	Automatic	2.8	2.8
E16	High pressure alarm - 1	Manual	1.5	1.5
C17 - E17	Low pressure alarm - 1	Automatic	1.4	1.4
E18	Compressor / fan safety device intervention -1	Manual	1.6	1.6
E19	Condenser / evap. water-flow alarm -1	Automatic		
C20	High pressure -1 prealarm 1	Automatic		
C21 - E21	High pressure -1 prealarm 2	Automatic		
C22 - E22	Low pressure prealarm - 1	Automatic		
C23	Defrosting forcing intervention - 1	Automatic		
E24	Condensation temperature probe fault - 2	Automatic		
E25	Cond./evap. pressure probe fault - 2	Automatic		2.9
E26	High pressure alarm - 2	Manual		1.10
C27 - E27	Low pressure alarm - 2	Automatic		1.8
E28	Compressor/fan safety intervention-2	Manual		1.9
E29	Condenser/evap. Water-flow alarm - 2	Automatic		
C30	High pressure -2 prealarm 1	Automatic		
C31 - E31	High pressure -2 prealarm 2	Automatic		
C32 - E32	Low pressure prealarm - 2	Automatic		
C33	Defrosting forcing intervention - 2	Automatic		
E34	Internal handling coil temperature probe fault	Automatic		
E35	Unit configuration error	Automatic		
E36	Condenser temperature probe fault	Automatic		
E37	Condenser / water evap. antifreeze alarm	Automatic		
E38	Overhetaing external water coil	Automatic		

## 9 - MAINTENANCE

### 9.1 GENERALITY

Maintenance must be carried out authorised after-sales assistance centres or by specialised personnel.

Maintenance allows:

- maintaining the unit efficient
- reduce deterioration speed to which each equipment is subject in time
- collect information and data to understand the efficiency state of the unit and prevent possible faults



### 9.2 FREQUENCY OF INTERVENTIONS

Frequency of the inspections must be at least six-monthly. However, frequency depends on the type of use.

- heavy (continuous or highly intermittent, near to operation limits, etc.)
- critical (essential service).



### 9.3 MACHINE SCHEDULE

Foresee a machine schedule to keep trace of the interventions made on the unit.

In this way, it will be easier to adequately schedule the various interventions and facilitate any troubleshooting.

On the schedule note:

- date
- type of intervention made
- description of intervention
- measurements taken, etc. .

### 9.4 STAND-BY

If foreseen a long period of inactivity:

- disconnect voltage to avoid electric risks or damages following lightning
- prevent the risk of freezing (empty or glycol the sections of the system exposed to negative temperatures, keep any antifreeze heaters powered)

It is advised that start-up after a period of inactivity be carried out by a qualified technician, in particular after seasonal stops or for seasonal switch-over.

Upon start-up, follow that indicated in the START-UP section.

Plan in advance the technician intervention to prevent misunderstandings and be able to use the system when required



### 9.5 WATER EXCHANGER

It is very important for the exchanger to be able to provide the maximum thermal exchange. Therefore, it is essential for the inner surfaces to be clean of dirt and incrustations.

Periodically check the difference between the temperature of the supply water and the condensation temperature. If the difference is greater than 8 °C – 10 °C it is advisable to clean the exchanger.

The clearing must be effected :

- With circulation opposite to the usual one
- With a speed at least 1,5 times higher than the nominal one
- With an appropriate product moderately acid (95% water + 5% phosphoric acid)
- After the cleaning rinse with water to inhibit the detergent rests.

### 9.6 INTERNAL AIR COIL

Accidental contact with the fins of the exchanger may cause small cuts. When performing the following steps, use protective gloves.

The finned surfaces of the cooling coils and especially the condensation collection trays are the places where microorganisms and moulds most easily flourish. It is therefore very important to clean regularly with suitable detergents and disinfect with appropriate products as necessary.



### 9.7 CONDENSATE DISCHARGE

Dust and deposits could cause obstructions .

In the tank can also proliferate microorganisms and mold. Very important to provide for a periodic cleaning with appropriate detergents and in case to a disinfection with sanitizing products.

Clean the tank, pour some water into the tank and check water flows normally.

## 9 - MAINTENANCE

### 9.8 AIR FILTERS

It is really important that the coil for the air treatment can offer the maximum thermal exchange: so the unit must always operate with installed, clean filters.

The cleaning and the replacement of the filters are very important operations from a hygiene-health point of view.

Operating with a clogged filter causes the reduction of the air rate and, as a consequence, malfunctions, blocks and possible failure of the unit.

The frequency of the filter check depends on the quality of the external air, the operation hours of the unit, the dust and number of people in the rooms.

In general, the ideal frequency can vary from EVERY WEEK to EVERY MONTH. It is recommended to start with frequent controls and reduce them according to the level of dirt.

### FANS WITH BELT DRIVE

#### BELT

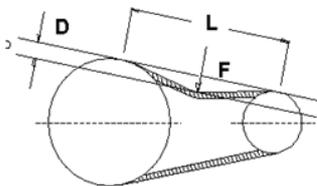
The tension of the belt can be adjusted by the worm screw on the slide connected to the electric motor, using a socket wrench or spanner.

The belt is tensioned correctly when the tolerances defined in the enclosed sketch are respected.

The tension of the belt should be checked after around 10 hours of operation.

Avoid the following situations:

1. Not sufficient tension, which causes slipping and overheating and, as a consequence, the reduction of service life.
2. Too much high tension, which subjects the belt to high stresses and, as a consequence, the reduction of unit life and an excessive stress on bearings and supports.
3. Belt lifted from the groove
4. Belt that reaches the bottom of the groove.
5. Belts of different length (only in the case of coupled belts).



**L** = distance between pulleys

**F** = belt profile force SPA 2,8..3,6 Kg

**D** = elastic deviation =  $L \times 0,0015$

#### PULLEYS

Avoid the following situations:

1. Pulleys not aligned.
2. Pulleys not parallel.
3. dirty pulleys; dust, grease, dirt deposited between the surfaces of the belt and of the pulleys can make the system operate in anomalous conditions.
4. Pulleys not straight.
5. Pulleys too small.
6. Pulleys broken.
7. Pulleys off-centre or unstable.
8. Pulleys worn.

#### ELECTRIC MOTOR

The cooling air slits must be always free to let the air pass.

#### ANTIVIBRATION RUBBERS

Periodically check the condition to avoid situations of anomalous vibrations / noise.

## 9 - MAINTENANCE

### 9.9 RECOMMENDED PERIODICAL CHECKS SHEET

Checks carried out on.....by.....company.....

√	intervention frequency (months)	1	6	12
<input type="checkbox"/>	presence corrosion			●
<input type="checkbox"/>	panel fixing			●
<input type="checkbox"/>	coil cleaning		●	
<input type="checkbox"/>	bowl cleaning + sanitisation		●	
<input type="checkbox"/>	outflow test		●	
<input type="checkbox"/>	air filters cleaning/inspection	●		
<input type="checkbox"/>	air flow rate measurement			●
<input type="checkbox"/>	channelling: anti-vibration devices and fastenings check			●
<input type="checkbox"/>	power supply cable isolation and fastening check			●
<input type="checkbox"/>	earth cable check			●
<input type="checkbox"/>	electric control board cleaning			●
<input type="checkbox"/>	power remote controls state			●
<input type="checkbox"/>	clamps closure, cables isolation integrity			●
<input type="checkbox"/>	phases unbalancing and power supply voltage (vacuum and loaded)		●	
<input type="checkbox"/>	absorption of the individual electric loads		●	
<input type="checkbox"/>	compressors carter heaters test		●	
<input type="checkbox"/>	leaks control *			●
<input type="checkbox"/>	cooling circuit work parameters detection		●	
<input type="checkbox"/>	four-way valve exchange check		●	
<input type="checkbox"/>	protective equipment test: safety valves, pressure switches, thermostats, flow meters, etc.		●	
<input type="checkbox"/>	protective equipment test: setpoint, climatic compensations, power slicing, air flow rate variations		●	
<input type="checkbox"/>	control devices test: alarms signal, thermometers, probes, pressure gauges, etc.		●	
<input type="checkbox"/>	electrical heaters check - option			●
<input type="checkbox"/>	water coil check - option			●

Notes/interventions recommended to Owner

\*European regulation 303/2008:

Refer to the local implemented standards; in synthesis and for merely indicative purposes, the regulation prescribes the following.

Companies and technicians carrying out installation, maintenance/repair interventions, leaks check and recovery must be CERTIFIED as foreseen by the local standards.

The leaks check must be carried out on a yearly basis

## 10 - RESIDUAL RISKS

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### Generality

The most common situations, as they cannot be controlled by the manufacturer, that may give rise to risk situations for things or persons are found in this section.

### Dangerous area

It is the area in which only an authorised operator can act. The dangerous area is the area inside the unit, accessible only via removal of the cowlings or parts of it.

### Handling

The handling operations, if carried out without all the necessary safety devices and without the due caution, can cause the falling or overturning of the unit with consequent damages, even serious, to things, persons and the unit itself.

Handle the unit following the instructions on the packaging, in this manual and according to the local standards in force.

In case of coolant gas leak, refer to the coolant "Safety sheet".

### Installation

An incorrect installation of the unit can cause water leaks, condensate storage coolant leaks, electric shocks, fires, malfunctioning or damages to the unit itself.

Check installation is carried out only by qualified technical personnel and that the instructions in this manual and the local standards in force are complied with.

The unit installation in a place where, even occasionally, the flammable gas leaks and consequent storage of these gases in the area around the unit itself, can cause explosions and fires.

Installation of the unit in an unsuitable place to support the weight and/or guarantee an adequate anchoring, can cause the falling and/or overturning, with consequent damages to things, persons or the unit itself.

Carefully check positioning and anchoring of the unit.

The easy access to the unit by children, unauthorised persons or animals, may give rise to accidents and injuries, even serious.

Install the unit in places accessible only by authorised personnel and/or foresee protections against intrusions in the dangerous area.

### General risks

Burnt odour, smoke or other signs of serious anomalies may show the arising of situations that can cause damages to things, persons or the unit itself.

Electrically isolate the unit (yellow-red isolator).

Contact the after-sales authorised assistance centre to identify and resolve the problem at origin of the anomaly.

The accidental contact with exchange coils, compressors, supply piping or other components can cause injuries and/or burns.

Always wear adequate clothing that includes protective gloves for operations inside the dangerous area.

Maintenance and repair operations carried out by unqualified personnel can cause damages to things, persons or the unit itself.

Always contact a qualified after-sales assistance centre.

The lack in closing the unit panels, or lack in checking the correct fastening of all fastening screws of the panelling, can cause damages to things, persons or the unit itself.

Periodically check closing of all panels and their correct fastening.

In the event of fire, the coolant temperature can reach values such to bring the pressure over the safety value, with consequent possible projection of coolant or explosions of the circuit that remain isolated from closure of the cocks.

Do not stand near the safety valve and never leave the cooling system cocks closed.

### Electrical part

An incomplete connection line to the electric mains and/or with incorrectly dimensioned cables, and/or with inadequate protective equipment, can cause electric shocks, intoxication, damages to the unit or fires.

Carry out all work on the electric system with reference to the wiring diagram and this manual, assuring use of a dedicated system.

An incorrect fastening of the lid of the electric components can favour entry of dust, water, etc. inside and consequently cause electric shocks, damages to the unit or fires.

Always securely fasten the lid to the unit.

The metal masses of the unit, when powered and not correctly connected to the earth system, can cause electric shocks or death for electrocution.

Carefully execute connection to the earth system.

Contact with the accessible powered parts inside the unit after the removal of guards can cause electric shocks, burns or death for electrocution.

Open and padlock the main isolator before removing the guards and signal the works in progress with relative sign.

Contact with parts that may power due to unit start-up, can cause electric shocks, burns or death for electrocution.

When not necessary.

### Moving parts

Contact with the transmissions or suction of the fans can cause injuries.

Before accessing inside the unit, open the isolator on the unit connection line, padlock it and expose appropriate sign.

Contact with the fans can cause injuries.

Before removing the protective grilles or fans, open the isolator on the unit connection line, padlock it and expose relative sign.

### Coolant

The intervention of the safety valves and the consequent coolant gas expulsion can cause injuries and intoxication. Always wear adequate clothing and protective goggles for operations inside the dangerous area.

In case of coolant gas leak, refer to the coolant "Safety sheet".

Contact between naked flames or sources of heat with coolant, or the heating of the pressurised gas circuit (e.g. during welding), can cause explosions or fires.

Do not place any source of heat inside the dangerous area.

The maintenance or repair interventions requiring welding must be done with system drained.

### Hydraulic part

Defects in the piping, in the connections or in the shut-off parts, can cause water leaks or projections, with consequent damages to things or short circuits of the unit.

# 11 - DISPOSAL

## 11.1 DISCONNECTION

The disconnection operations must be carried out by qualified technicians.

- Avoid pouring or leaking in room.
- Before disconnecting the unit recover, if present: :
  - the coolant gas
  - solutions to be cooled present inside the hydraulic circuits
- While awaiting dismantling and disposal, the unit can be stored, even outdoor, as bad weather and temperature changes do not cause damaging effects for the environment, as long as the unit has the electric, cooling and hydraulic circuits intact and closed.

## 11.2 DISMANTLING

FOR DISMANTLING AND DISPOSING THE UNIT MUST ALWAYS BE DELIVERED TO AUTHORISED CENTRES.

During dismantling, the fan, the motor and the coil, if working, may be recovered by the specialised centres for an eventual reuse.

All materials must be recovered or disposed of in compliance with the relative national standards in force.

For further information on the dismissal of the unit, contact the manufacturing company.

## 11.3 EC WEEE DIRECTIVE

The units falling within the standard in question are marked with the symbol at the side.

With a view of respecting the environment, our units are manufactured in accordance with EC Directive on waste electric and electronic equipment (WEEE).

The potential effects on the environment and on personal health, due to the presence of dangerous substances, are reported inside the use and maintenance manual, in the residue risks section.

If necessary, additional information to that listed below can be requested from the manufacturer/distributor/importer, as responsible for the collection/treatment of waste deriving from equipment contemplated by EC - WEEE, and the dealer from where the equipment was purchased or the local services in charge of waste collection.

The EC-WEEE Directive foresees that the disposal and recycling of electric and electronic equipment, indicated therein, are compulsorily managed through appropriate collection, in adequate centres, separate to that used for the disposal of mixed urban waste.

The user must not dispose of the equipment at the end of its life-span, as urban waste, but convey it to appropriate collection centres, as foreseen by the current standards or indicated by the distributor.



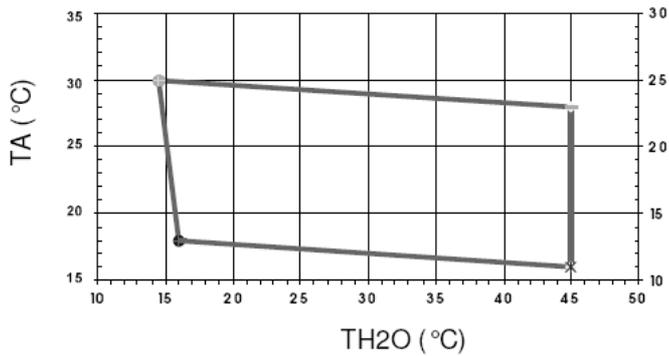
## GENERAL TECHNICAL SPECIFICATIONS

Size		21	25	31	41	51	61	71	81	91	101	
<b>COOLING</b>												
Cooling capacity	1	kW	8.04	8.49	9.31	13.3	17.2	19.5	21.6	23.5	27.8	31.5
Sensible capacity	1	kW	6.36	7.22	7.76	10.1	13.8	14.1	17.4	17.9	22.9	23.7
Compressor power input	1	kW	1.59	2.13	2.4	2.68	3.42	4.1	4.59	5.32	6.81	7.32
EER	1		5.06	3.99	3.88	4.96	5.03	4.76	4.71	4.42	4.08	4.3
<b>HEATING</b>												
Heat output	2	kW	8.17	10.1	11.9	14.3	17	20	22.9	25.3	31.9	37.3
Compressor power input	2	kW	1.8	2.29	2.72	3.15	3.57	4.37	4.99	5.6	7.53	8.48
COP	2		4.54	4.41	4.38	4.54	4.76	4.58	4.59	4.52	4.24	4.4
<b>COMPRESSOR</b>												
Type of compressors			SCROLL	SCROLL	SCROLL	SCROLL						
No. of Compressors		Nr	1	1	1	1	1	1	1	1	1	1
Std Capacity control steps		Nr	1	1	1	1	1	1	1	1	1	1
Refrigerant circuits		Nr	1	1	1	1	1	1	1	1	1	1
<b>INTERNAL EXCHANGER</b>												
Front surface		m2	0.3	0.3	0.3	0.3	0.6	0.6	0.6	0.8	0.8	0.8
Number of rows		Nr	3	3	3	3	4	4	4	4	4	4
Fin spacing		mm	1.8	1.8	1.8	1.8	1.8	1.8	1.8	2.1	2.1	2.1
<b>AIR HANDLING SECTION FANS (OUTLET)</b>												
Type of fans	3		ELV	ELV	ELV	ELV						
Number of fans		Nr	1	1	1	1	1	1	1	1	1	1
Standard air flow		l/s	555	666	750	777	1166	1222	1286	1527	1722	1861
Installed unit power		kW	0.373	0.373	0.373	0.373	0.736	0.736	0.736	1.1	1.1	1.1
Max outside static pressure	4	Pa	120	120	100	100	140	140	140	100	100	100
<b>EXTERNAL EXCHANGER</b>												
type of external exchanger	5		PHE	PHE	PHE	PHE						
Water flow rate (Exetrnal Exchanger)		l/s	0.4	0.5	0.5	0.7	0.8	0.9	1	1.2	1.4	1.6
external exchanger pressure drop		kPa	26	32	42	35	50	43	52	48	43	53
<b>CONNECTIONS</b>												
Water fittings			1"	1"	1"	1"	1"	1"	1"	1"	1"	1"
Condensate discharge			20	20	20	20	20	20	20	20	20	20
<b>POWER SUPPLY</b>												
Standard power supply		V	400/3/50+N	400/3/50	400/3/50	400/3/50						
<b>DIMENSIONS</b>												
Length		mm	1100	1100	1100	1100	1375	1375	1375	1730	1730	1730
Depth		mm	710	710	710	710	750	750	750	810	810	810
Height		mm	500	500	500	500	600	600	600	700	700	700
<b>STANDARD UNIT WEIGHTS</b>												
Shipping weight		kg	140	150	165	180	223	230	238	308	315	325
Operating weight		kg	130	140	155	170	210	217	225	295	302	310

(1) ambient air 26°C DB / 19.5°C WB  
 exchanger inlet water 29°C  
 exchanger water outlet 35°C  
 (2) ambient temperature 20°C  
 exchanger water outlet 10°C

(3) ELV=electric fan  
 (4) max available static pressure with standard electrofan at min speed and nominal air flow  
 According to the variability of the voltage also the value of capacity and head pressure  
 (5) PHE = plates

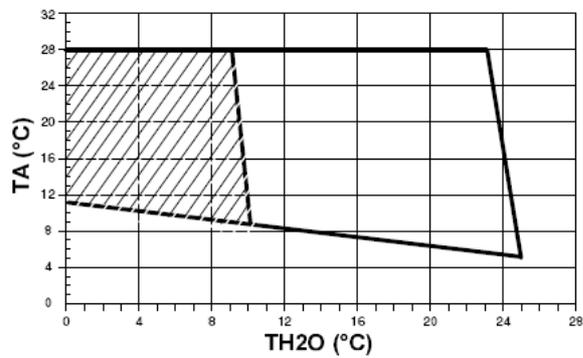
## OPERATING LIMITS (COOLING)



TH2O = WATER LOOP TEMPERATURE (°C)  
 TA = INTERNAL EXCHANGER INLET AIR TEMPERATURE W.B. (°C)  
 WB = WET BULB  
 MAXIMUM WATER LOOP TEMPERATURE WHEN NO UNIT WORKS = 60 °C  
 DATA REFERS TO UNITS OPERATING WITH NORMAL AIR AND WATER FLOW

ONCE-THROUGH WATER SYSTEM  
 IN COOLING OPERATION WITH MODULATING VALVE, INLET WATER TEMPERATURE  
 CAN REACH LOWER VALUES.  
 FOR FURTHER INFORMATION CONTACT OUR TECHNICAL DEPARTMENT

## OPERATING LIMITS (HEATING)

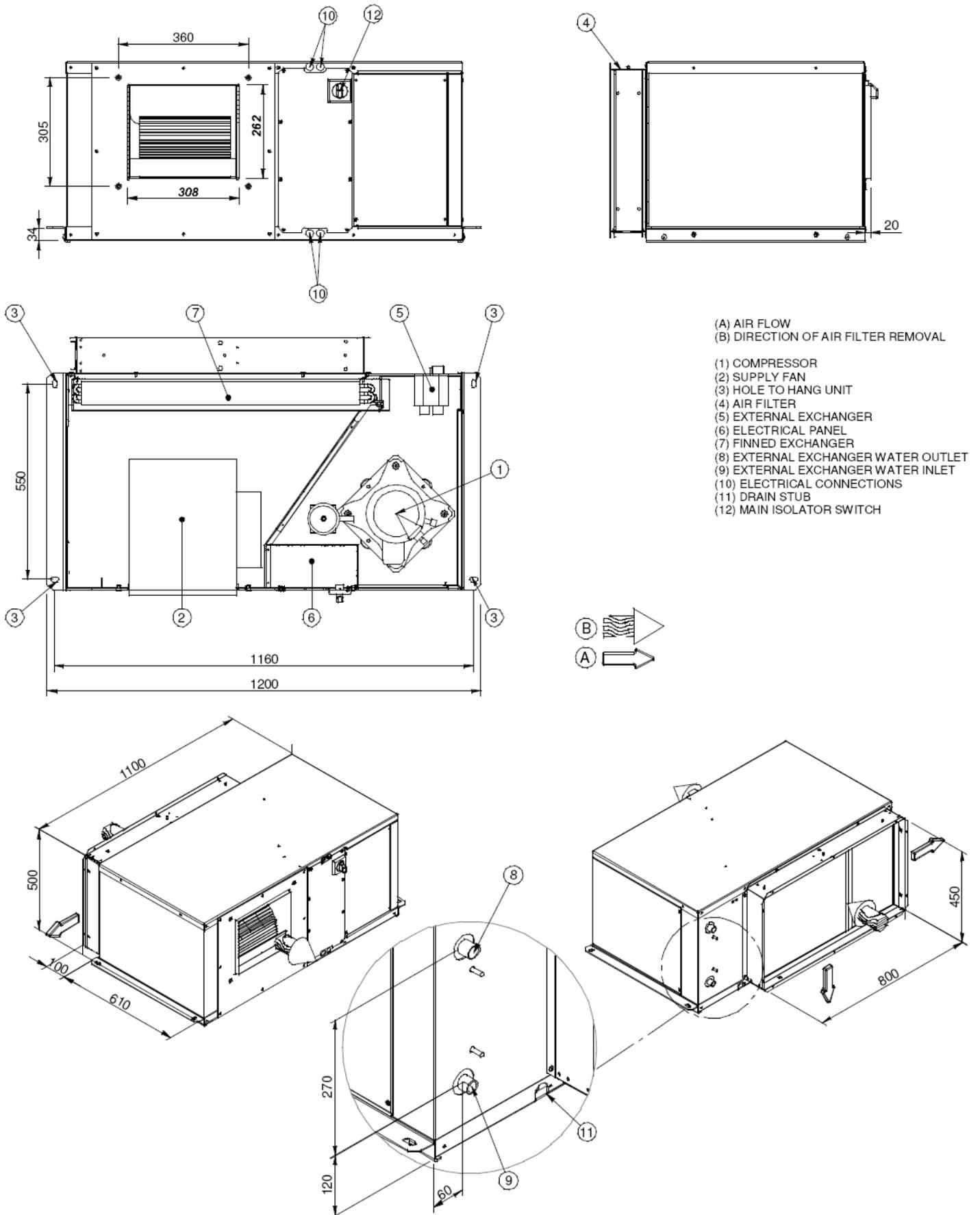


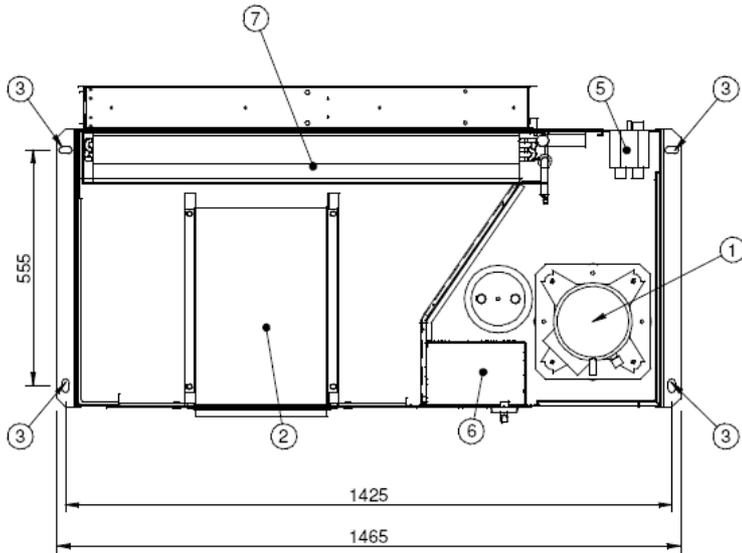
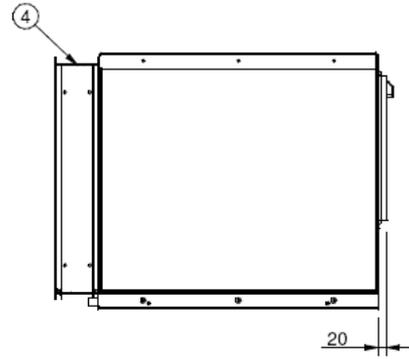
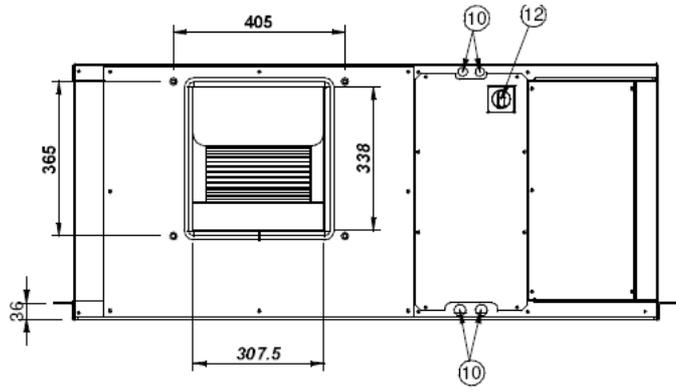
TH2O = WATER LOOP TEMPERATURE (°C)  
 TA = INTERNAL EXCHANGER INLET AIR TEMPERATURE W.B. (°C)  
 WB = WET BULB  
 MAXIMUM WATER LOOP TEMPERATURE WHEN NO UNIT WORKS = 60 °C  
 DATA REFERS TO UNITS OPERATING WITH NORMAL AIR AND WATER FLOW  
 HATCHED AREA = FIELD VALID ONLY WITH WATER AND GLYCOL MIX (TO AVOID THE  
 RISK OF FREEZING)

ONCE-THROUGH WATER SYSTEM  
 THE OPERATING RANGE IS VALID  
 FOR FURTHER INFORMATION CONTACT OUR TECHNICAL DEPARTMENT

Size		21	25	31	41	51	61	71	81	91	101
Dimensional dwg. no.		1	1	1	1	2	2	2	3	3	3
Length	mm	1100	1100	1100	1100	1375	1375	1375	1730	1730	1730
Depth	mm	710	710	710	710	750	750	750	810	810	810
Height	mm	500	500	500	500	600	600	600	700	700	700

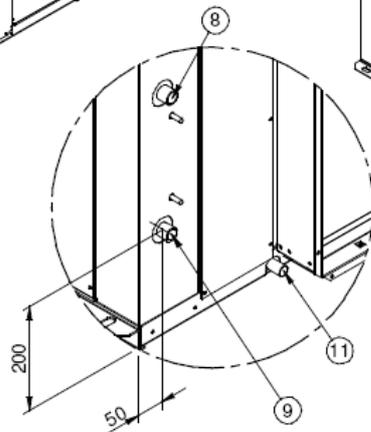
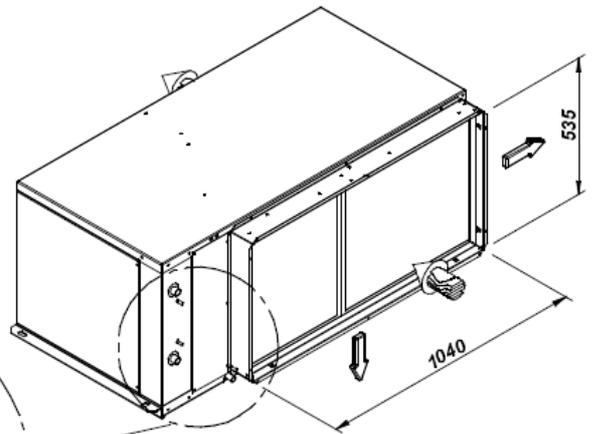
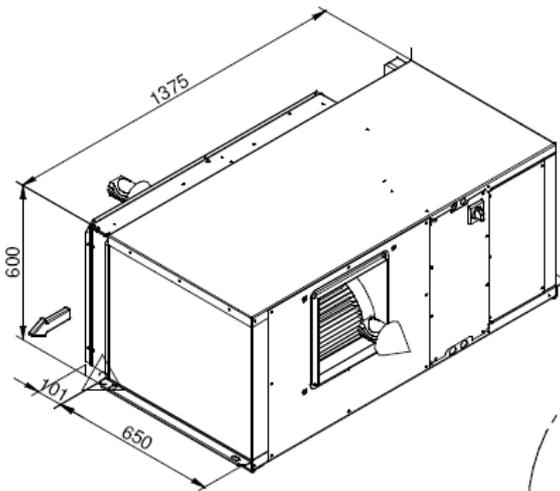
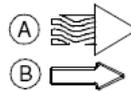
**DIMENSIONAL DRAWING(1)**



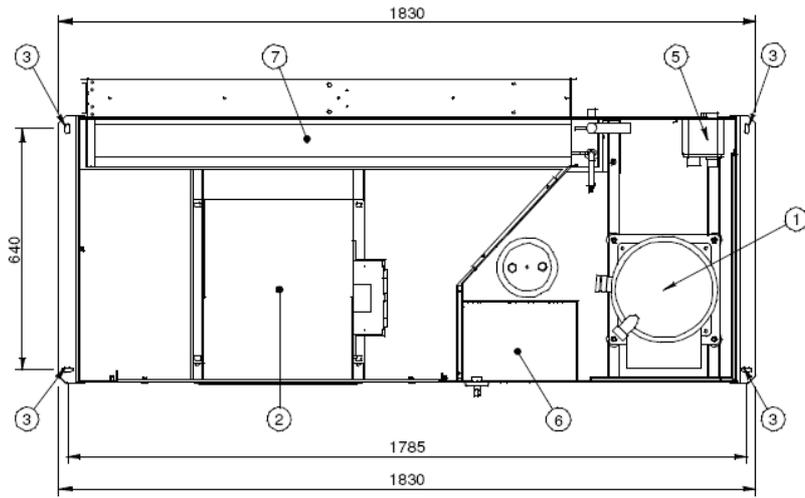
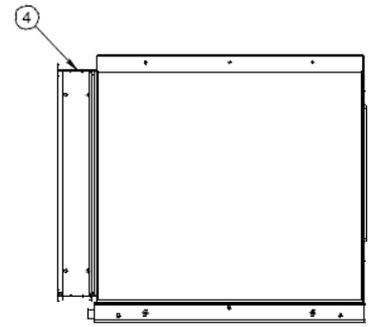
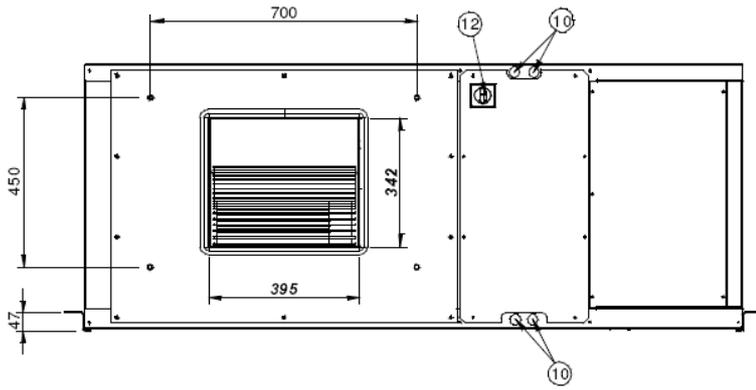


(A) AIR FLOW  
(B) DIRECTION OF AIR FILTER REMOVAL

- (1) COMPRESSOR
- (2) SUPPLY FAN
- (3) HOLE TO HANG UNIT
- (4) AIR FILTER
- (5) EXTERNAL EXCHANGER
- (6) ELECTRICAL PANEL
- (7) FINNED EXCHANGER
- (8) EXTERNAL EXCHANGER WATER OUTLET
- (9) EXTERNAL EXCHANGER WATER INLET
- (10) ELECTRICAL CONNECTIONS
- (11) DRAIN STUB
- (12) MAIN ISOLATOR SWITCH

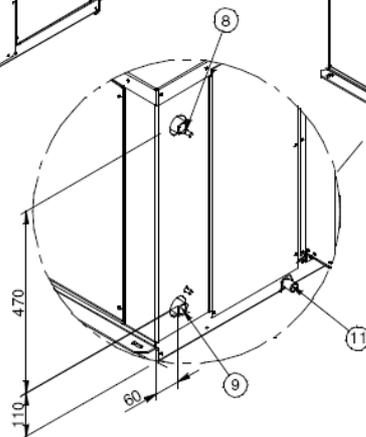
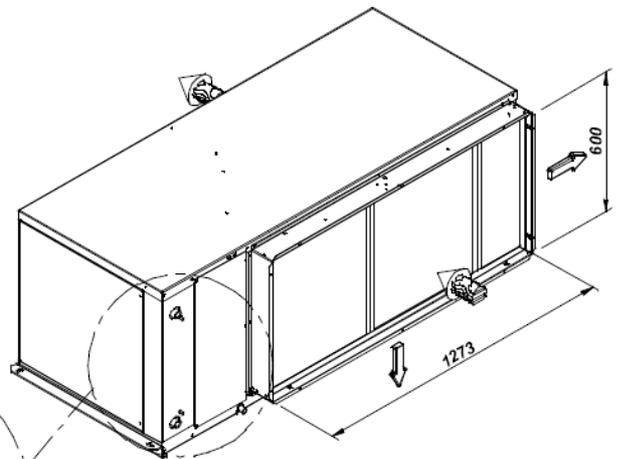
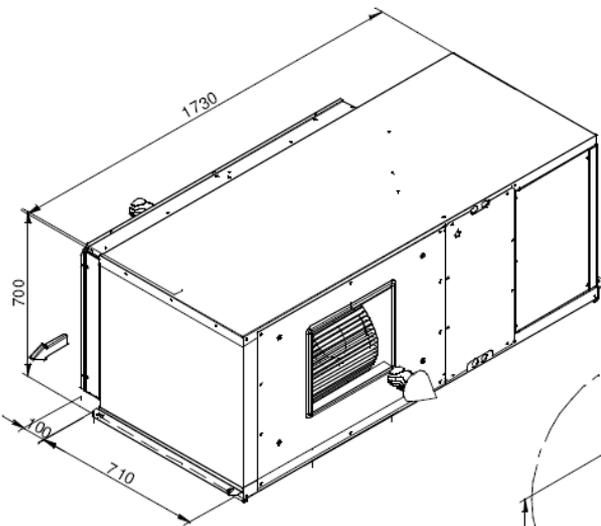
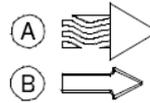


**DIMENSIONAL DRAWING(3)**



(A) AIR FLOW  
(B) DIRECTION OF AIR FILTER REMOVAL

- (1) COMPRESSOR
- (2) SUPPLY FAN
- (3) HOLE TO HANG UNIT
- (4) AIR FILTER
- (5) EXTERNAL EXCHANGER
- (6) ELECTRICAL PANEL
- (7) FINNED EXCHANGER
- (8) EXTERNAL EXCHANGER WATER OUTLET
- (9) EXTERNAL EXCHANGER WATER INLET
- (10) ELECTRICAL CONNECTIONS
- (11) DRAIN STUB
- (12) MAIN ISOLATOR SWITCH





**CLIVET SPA**

Via Camp Lonc 25, Z.I. Villapaiera - 32032 Feltre (BL) - Italy  
Tel. + 39 0439 3131 - Fax + 39 0439 313300 - info@clivet.it

**CLIVET ESPAÑA S.A.**

Calle Real de Burgos 12 - 28860, Paracuellos de Jarama, Madrid - España  
Tel. + 34 91 6658280 - Fax + 34 91 6657806 - info@clivet.es

**CLIVET UK LTD**

4 Kingdom Close, Segensworth East - Fareham, Hampshire - PO15 5TJ - United Kingdom  
Tel. + 44 (0) 1489 572238 - Fax + 44 (0) 1489 573033 - info@clivet-uk.co.uk

**CLIVET NEDERLAND B.V.**

Siliciumweg 20a, 3812 SX Amersfoort - Netherlands  
Tel. + 31 (0) 33 7503420 - Fax + 31 (0) 33 7503424 - info@clivet.nl

**CLIVET GmbH**

Hummelsbütteler Steindamm 84, 22851 Norderstedt - Germany  
Tel. + 49 (0) 40 32 59 57-0 - Fax + 49 (0) 40 32 59 57-194 - info.de@clivet.com

**CLIVET RUSSIA**

Elektrozavodskaya st. 24, office 509 - 107023, Moscow, Russia  
Tel. + 74956462009 - Fax + 74956462009 - info.ru@clivet.com

**CLIVET MIDEAST FZCO**

Dubai Silicon Oasis (DSO), High Bay Complex, Ind Unit No. 3 - PO Box 28178 - DUBAI, UAE  
Tel. + 97 14 3208499 - Fax + 97 14 3208216 - info@clivet.ae

**CLIVET AIRCONDITIONING SYSTEMS (P) LTD**

3C3, Gundecha Onclave,  
Kherani Road, Saki Naka, Andheri (East), Mumbai 400 072 (INDIA)  
Tel. + 91 - 22 - 6193 7000 - Fax + 91 - 22 - 6193 7001 - sales.india@clivet.com