redge

CLEANAIR LX

Air Handling Units



Installation, Operation and Maintenance Manual

INDEX

GENERAL DATA
INTRODUCTION **5**
TECHNICAL DATA **5**
SOUND LEVELS **5**
DIMENSIONIONS **5**
FUNCTIONAL LIMITS **6**
USE **6**
SAFETY PRICIPLES **6**
STANDARDS AND CERTIFICATIONS **6**
PRODUCT STANDARDS
UNI EN ISO 9001 CERTIFICATION
CE MARKING
LATENT RISKS **7**
SAFETY INSTRUCTIONS 7
DANGEROUS ZONES 8

INSTALLATION

RECEPTION/POSITIONING **9**
IDENTIFICATION OF UNIT 9
RECEPTION PROCEDURE 9
POSITIONING 10
STORAGE 10
UNPACKING 10
WEIGHT DISTRIBUTION AND CENTRE OF GRAVITY 10
POSITIONING AND ACCESS SPACE 11
JOINING SECTIONS 12
ASSEMBLY OF HEAT RECLAIM SECTIONS 12
INSTALLATION OF WEATHERING ROOF 13
EQUALISERS 13
DUCTING, WATER AND ELECTRICAL CONNECTIONS **14**
DUCTING CONNECTIONS 14
WATER CONNECTIONS 14
ELECTRICAL CONNECTIONS 14
WATER COIL CONNECTIONS 14
STEAM COIL CONNECTIONS 15
DIRECT EXPANSION COIL CONNECTIONS 15
RUN AROUND COILS 15
CONNECTIONS OF ELECTRIC COILS 16
EVAPORATIVE PACK AND WASTE WATER HUMIDIFIERS 16
EVAPORATIVE PACK AND RICIRCULATED WATER HUMIDIFIERS 16
ATOMIZED WATER HUMIDIFIERS 16
STEAM HUMIDIFIERS 17
IMMERSED ELECTRODE STEAM HUMIDIFIERS 17
AIR WASHERS 17
NOTES ON CONDENSATE DRAINS 17
CONNECTION OF ELECTRICAL MOTORS 18
ROLL FILTERS 18
HEAT WHEELS 18

USE

PRECUTIONS DURING START-UP **22**
CONTROL CHECKS BEFORE AND DURING START UP **22**
ELECTRICAL PANEL (SUPPLIED BY OTHERS) 22
AIR DUCTING DISTRIBUTION (BY OTHERS) 22
DAMPERS 22
PRE-FILTERS 22
ROLL FILTERS 22
SOFT BAG FILTERS 22
RIGID BAG FILTERS 23
ABSOLUTE FILTERS 23
ACTIVE CARBON FILTERS 23
DIRTY FILTER DETECTION DEVICES 23
FANS 23

MAINTENANCE

ROUTINE MAINTENANCE **24**
INTRODUCTION **24**
DAMPERS 24
PRE-FILTERS 24
ROLL FILTERS 24
BAG FILTERS 25
RIGID BAG FILTERS 25
ABSOLUTE FILTERS 26
ACTIVE CARBON FILTERS 26
WATER COILS 26
PLATE HEAT EXCHANGERS 26
HEAT WHEELS 26
EVAPORATIVE PACK AND WASTE WATER HUMIDIFIERS 26
EVAPORATIVE PACK AND RECIRCULATED WATER HUMIDIFIERS 27
STEAM HUMIDIFIERS 27
IMMERSED ELECTRODE STEAM HUMIDIFIERS 27
ATOMIZED WATER HUMIDIFIERS 27
AIR WASHERS 27
FANS 27
TROUBLESHOOTING **30**
INTRODUCTION 30
AT START-UP 30
IN USE 30

SHUTDOWN **32**
DISCONNECTION OF UNIT **32**
DISASSEMBLY AND DISPOSAL **32**

INTRODUCTION

This manual has been prepared to allow correct installation, set-up and maintenance of the unit; it is therefore of fundamental importance that:
- the following instructions are read with due attention;
- the unit is installed, tested and serviced by qualified personnel (law n.46 of 03/05/1990) in possession of the legal requirements.
- All liability of the manufacturer is declined, with the warranty forfeiting in the event of electrical and/or mechanical modifications.
- In general, tampering not expressly authorized and which does not comply with what is indicated in this manual will invalidate the guarantee.
- Observe the local safety regulations in force at the time of installation.
- Check that the characteristics of the electrical network comply with the data shown on the serial number plate of the unit on site on the delivery fan section door.
- This manual and any electrical diagram of the unit must be kept with care and made available to the operator for any further consultation.
- The packing material (plastic film, expanded polystyrene, nails, etc.) as a potential source of danger must be kept out of the reach of children and properly recycled according to local regulations in force.
- The unit must only be used for the use for which it was expressly designed, indicated in the paragraph GENERAL TECHNICAL DATA.
- Any use other than that specified does not imply a commitment or constraint of any kind for the manufacturer.
- Deactivate the equipment in the event of a breakdown or malfunction.
- For any repairs, contact only a technical assistance center authorized by the manufacturer and request the use of original spare parts.
- Failure to comply with the above can compromise the safety of the equipment.
- The manufacturer declines all responsibility for any damage that may directly or indirectly arise to persons or things as a result of failure to observe these instructions.

TECHNICAL DATA

Refer to the technical sheet attached to the unit

SOUND LEVELS

Refer to the technical sheet attached to the unit

DIMENSIONS

Refer to the assembly drawing attached to the unit

OPERATING LIMITS

Component	Size	UM	Limit	Note
wrapper	Max. pressure	Pa	2000	
	Max. depression	Pa	2000	
Water heat exchange coils	Max. working pressure	kPa	2000	
	Max. tube side temperature	°C	120	Higher values on request; in this case, see the technical data sheet attached to the machine
	Min. pipe side temperature °C without glycol	°C	5	
	Max front speed without droplet separator	m/s	2.5	Cooling coils with probable formation of condensate
Plate recuperators	Max. differential pressure	Pa	800	
Humidifiers	Max speed front. without droplet separator	Pa	2.6	
Fans	Max. rotation speed	kW	As supplied	Consult headquarters before modifying the transmission
	Max. power consumption	kW	As supplied	See installed power on the technical sheet. Consult factory before replacing motor

INTENDED USE

The unit is intended for air treatment in the functions indicated on the technical sheet attached to the machine (in the more general case it may include air movement, mixing of two flows, filtration at different efficiencies, heating, cooling, humidification, de-dehumidification, soundproofing).

PRINCIPLES OF SECURITY INTEGRATION

The machine is designed and built in such a way as not to expose people's health and safety to risk.
For this purpose, project solutions have been adopted aimed at eliminating the possible causes of risk where possible or at significantly reducing the probability of the risk event. Where it was not possible to intervene in the design phase to prevent and/or eliminate the risk, refer to the behavioral requirements set out in the "RESIDUAL RISKS" section.

STANDARDS AND CERTIFICATIONS

PRODUCT STANDARDS

The air handling units are manufactured following the specific product standards: EN1886:1998

EN13053:2001

UNI EN ISO 9001
With the aim of satisfying its customers, it has chosen the ISO 9001 Quality System to organize and control its activities. With a view to the continuous improvement of the quality and reliability of its products and services, it has had its Quality System certified.

CE MARKING
The products are provided with the CE mark in compliance with the provisions of the following Community directives, including the latest amendments, and with the relative national implementing legislation. The declaration of conformity is supplied in copy together with the product. The original is kept with the relative technical file.

RESIDUAL RISKS

Residual risk identifies all the dangers that cannot be totally reduced through design and protection techniques, or potential danger that is not evident.

SAFETY INSTRUCTIONS

ATTENTION !
IN THIS FILE, EVERY OPERATION WHICH MAY GIVE RISK IS NOTICED IN ADDITION TO THE PRECAUTIONS TO BE OBSERVED CASE BY CASE

All UNITS are equipped with pictograms with danger warnings.

The units are safe machines, provided that the safety guards are not tampered with or removed.

Technical preparation, observance of the procedures illustrated in this manual and the signs affixed to the critical points of the unit allow you to operate safely.

During the installation, commissioning, use and maintenance of the air handling units, the following safety standards must be observed:

BANS !
- Do not operate the control unit without it and its electrical components having been connected to the building's earth system.
- Do not operate the unit without the fan mouth having been connected to a duct or protected with an accident prevention net.
- Do not use the control unit as a support for other machinery
- Do not use the control unit as a walkway or scaffolding
- Do not use the control unit as a shelter for equipment, spare parts, etc.
- Do not open the inspection doors while the fan is running, especially in the pressurized sections of the unit.
- Do not leave the doors partially closed; make sure that all the handles or knobs are perfectly closed.
- Do not expose yourself to the light of the ultraviolet lamps used in the sections with germicidal lamps.

OBLIGATIONS!
- Wear personal protective equipment before working on the unit
- Before accessing the control unit, make sure that all electrical utilities have been cut off. In particular, before opening the inspection doors, make sure that the fan is off and that it cannot be switched on again without the knowledge of whoever is working on the control unit itself.
- Always refit the protective casing of the fan section before restarting the fan.

ATTENTION !
- Be careful when lifting the control unit whose center of gravity can also be greatly offset.
- Be careful when blocking the lifting ropes/hooks.
- Pay attention to the sheet metal edges inside the control unit.
- Pay attention to the corners of the roof in outdoor central units.
- Pay attention to possible burns deriving from heating coils.
- Pay attention to possible burns deriving from steam humidification systems.
- Pay attention to the servo-controlled shutters which could close suddenly.

RESPECT ZONE

The figure below highlights the area in which only an authorized operator can operate.

- External buffer zone is identified by a precise surface around the machine and by its vertical projection on the ground in the case of a suspended machine.
- Internal buffer zone is the area accessible only by deliberate removal of the fairings or parts of them.



RECEPTION / PLACEMENT

UNIT IDENTIFICATION

The units are identified by the serial number label reproduced below.
The label shows the type of appliance (series and size), the serial number, the main operating data and the year of construction.
The label is affixed to the external paneling of the delivery fan section, inspection side.

For no reason should the label be removed.

redge

MODELLO / MODEL		
N° MATRICOLA / SERIAL NO.		
	MANDATA SUPPLY	RIPRESA RETURN
PORTATA / FLOWRATE m^3/h		
PSU / EXT		
POTENZA/POWER INPUT kW		
CORRENTE / CURRENT A		
VOLT / PH / Hz		
MASSA / WEIGHT kg		

DATA / DATE 21/02/2023 MADE IN ITALY UK CA CE

CHECK UPON RECEPTION

The units are normally shipped without packaging, except for the wooden feet at the corners of each section that makes up the air handling unit. Upon request, they are shipped on pallets, in cages or crates and/or with nylon protection on the openings.
Upon arrival, check that the unit has not been damaged during transport and that it is complete in its parts as per order. In the event of visible damage, immediately note the damage found on the transport document, reporting the wording: "WITHDRAWAL WITH RESERVE FOR EVIDENT DAMAGE TO PACKAGING" as returns carriage free and free with charge involve compensation for damages to be paid by the insurance company according to the provisions of law No. 450 of 22.08.85 "compensation limit".

IMPORTANT

ALL THE OPERATIONS MENTIONED BELOW MUST BE CARRIED OUT IN COMPLIANCE WITH THE SAFETY REGULATIONS IN FORCE, BOTH AS RELATED TO THE EQUIPMENT USED AND AS RELATED TO THE OPERATING MODES.

ATTENTION

BEFORE CARRYING OUT HANDLING OPERATIONS MAKE SURE THAT:
- THE CAPACITY OF THE LIFTING EQUIPMENT IS SUITABLE FOR THE WEIGHT OF THE UNIT IN QUESTION
- THE WEIGHT DISTRIBUTION AND THE POSITION OF THE CENTER OF GRAVITY ARE TAKEN IN THE MAXIMUM CONSIDERATION
- THE WEIGHT CAN BE DETERMINED FROM THE DRAWING SUPPLIED WITH THE MACHINE.

WARNINGS

- HANDLE WITH CARE
- KEEP DRY
- ABSOLUTELY AVOID OVERLAPING OTHER OBJECTS ON THE UNIT

HANDLING

Particular attention must be paid during loading, unloading and transport operations. The units equipped with support feet allow easy lifting using the forks of a forklift or with special ropes or belts.
The main sections are equipped with a metal profile base on which holes are made for the introduction of 2” thicker pipes which facilitate lifting with ropes.
Special eyebolts are applied to units without base.

! Do not leave the load hanging in the air.

! When moving, proceed at low speed, paying attention to the permitted gradients.

! Pay attention in handling the units during the phases of unloading from the means of transport, during the positioning and assembly of the sections, in order to avoid any damage to the casing and to the more delicate components

! The various sections must be loaded and unloaded paying attention to the protruding parts: hinges, handles, water connections, etc., which must never be used as gripping or support points in movements, even if minimal, for housing.

STORAGE

If the units are not installed promptly, they must be stored in dry rooms, protected from atmospheric agents.

Keep away from: sunlight, rain, sand and wind
Temperatures: maximum 60°C minimum -10°C
Maximum humidity: 90%

In these conditions, protection from oxidation phenomena is guaranteed.
Unless specifically requested by the customer, the manufacturer does not supply machines with protection against rain, dust or the like on the air inlet or outlet. Any protection must be removed when positioning the unit.

! Important: the panels are externally protected by a plastic material film (excluding the galvanized/galvanised panels). The protective film must be removed within two weeks of its exposure to atmospheric agents: subsequently this operation could prove impossible.

PACKING REMOVAL

During the removal of any packaging, for the safety of the operator, it is recommended to use suitable personal protective equipment (gloves, goggles, etc.)
Check for visible damage.
Dispose of the packaging products by sending them to specialized collection or recycling centers (follow the local regulations in force).

Remove the PVC and polystyrene packaging with the relative fixings, being careful not to damage the unit.

WEIGHT DISTRIBUTION AND CENTER OF GRAVITY

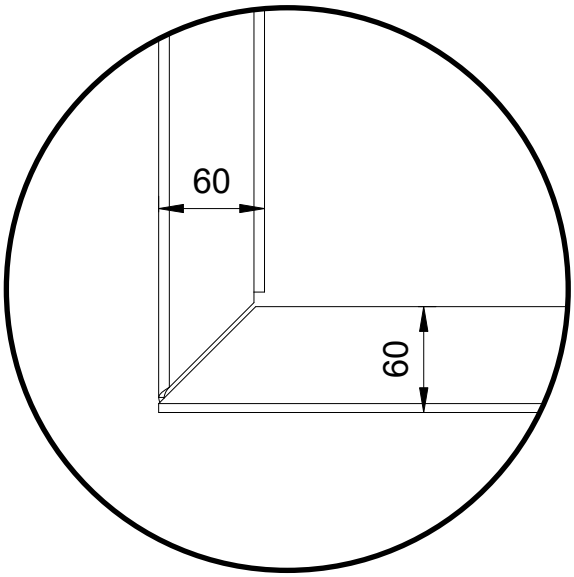
The weights can be seen on the drawing attached to the machine.
Check the position of the center of gravity by gradually lifting the machine, before lifting it for unloading or for positioning.

POSITIONING AND FUNCTIONAL SPACES

Given that the capacity of the floor on which the unit rests must have been checked in advance, the following warnings are given.

- The support surface of the units must be flat to avoid harmful tensions on the panels and on the frame during
- the coupling of the sections.
- It is essential to position the unit with a spirit level, shimming the supports if necessary, to allow easy opening of the inspection doors.
- The unit can be installed directly on a floor capable of supporting the weight.
- However, it is advisable to build a concrete or metal section base from scratch.
- Normally it is not necessary to place shock absorbers between the base of the unit and the floor as the internal moving parts are dynamically isolated from the structure. If for particular needs you want to use anti-vibration supports between the unit and the floor, contact the manufacturer.
- The wall-hung units must be suspended from the ceiling using special tie rods with a capacity suitable for the overall weight of the unit.

The base is formed by an inverted “C” in galvanized or stainless steel according to the needs. The base rests on the ground along the entire perimeter. Depending on the size, there are internal reinforcements which perform the function of supporting the internal components of the section.
On all sides of the base there are holes for lifting the section itself using 2” thick pipes.



The installer must ensure that the position of the unit allows all maintenance and replacement of components. In particular:

- A corridor with a width equal to the length of the finned coils (approximately equal to the width of the machine) must be guaranteed on at least one of the sides of the unit for the possible extraction of the coils.
- On the sides that have inspection doors, leave a corridor such that the doors can be opened completely, in any case not less than 600 mm
- Before positioning the unit, remember to prepare the siphon head and calculate the slope of the drain pipe.
- Particular attention should be paid to the sealing gaskets.
- The assembly of any flashing applied to the base must be carried out so that there is no water infiltration, therefore pay attention to the gasket and silicone sealing. The base step for supporting the units must have an adequate height in order to prevent any stagnation of water or snow from facilitating and causing infiltrations.

To limit the risk of damage you must:

- Apply protection to the casing when using ropes to unload the unit or any spacer bars between the lifting rods.
- Do not cause the units to fall but place carefully to avoid cutting the rivets, screws, etc.
- If the unit has the cover already mounted and fixed to the roof of the casing, check for any breakage or loosening of the screws.
- The units positioned outdoors require greater care both for the reasons already considered previously and for the perfect application of the rain cover subject to gusts of wind.
- If the roof is to be installed, take an inventory of the supplied material: sheets, reinforcements, screws.
- Particular attention must be paid when assembling the gasket, if necessary use silicone for sealing.

JOINING THE SECTIONS

Control units often have to be supplied broken down into several sections. In this case, the installer must connect the various sections together when positioning the units.

To do this, using the materials supplied, located in the sections:

- apply the self-adhesive gasket on one of the adjacent sections, covering the front of the aluminum profile which forms the section frame
- Screw the corner stiffeners together
- Screw the “L” junctions together

Note: to do these last two operations, it may be necessary to disassemble the front and rear panels which are in any case simply screwed to the frame.

Reinforcement corner

Junction L

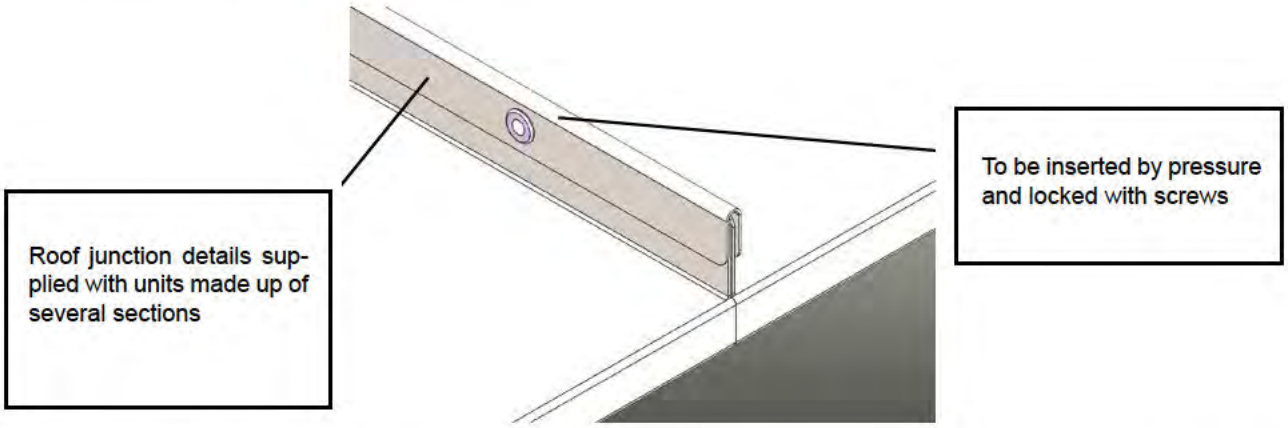
H < 1670 :	no L junction
H ≥ 1670 :	n°1 pair of junction L
W < 1510 :	no L junction
1510 ≥ W ≥ 2310 :	n°1 pair of junction L
2630 ≥ W ≥ 3270 :	n°2 pairs of junction L
W ≥ 3910 :	n°3 pairs of junction L

ASSEMBLY OF THE HEAT RECOVERY SECTIONS

For space reasons, the heat recovery units are supplied as a separate section and, on units larger than size 07xx, partially disassembled. In such cases, particular attention must be paid when assembling the recuperator, a fragile and delicate material.
Check that the gaskets and silicone coatings prevent any air by-pass.
Check that any air by-pass damper works perfectly to allow perfect closure.

ROOF ASSEMBLY

On units supplied in several sections and equipped with a roof, the latter must be completed by mounting the special sheet metal compensator and the plastic joint covers as illustrated below



ATTENTION!!!
DURING THE INSTALLATION PHASES OF THE ROOF JOINT COVERS IT IS NOT POSSIBLE TO WALK DIRECTLY ON THE ROOF OF THE SECTION.
USE SCAFFOLDING, PLATFORMS OR ANYTHING ELSE AVAILABLE TO COMPLETE THE INSTALLATION WITHOUT DAMAGING THE RAIN COVER.





Possibly place large rigid wooden boards to distribute the operator's weight on the surface of the structure.
The wooden planks must be close to all the perimeter edges of the roof. Climb on the cover in MAX 1 person.

EQUALIZER

The fans that introduce air into any type of plenum are equipped with an equalizer for uniform distribution of the air. For transport and handling reasons, the equalizer can be delivered disassembled; assembly is very simple as the holes are pre-drilled for screw fixing.

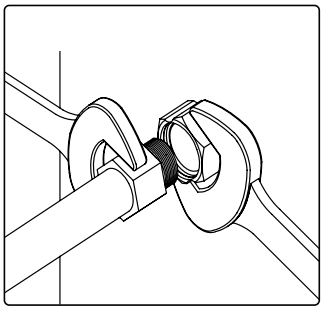
VENTILATION, WATER AND ELECTRICAL CONNECTIONS

VENTILATION CONNECTIONS

When connecting the suction and delivery ports to the air ducts it is recommended to interpose canvas anti-vibration joints, even if these are not supplied with the air handling unit. Anti-vibration joints must not be stretched to perform their function.

To connect the mouths:
- apply a gasket to the flanges to prevent air leaks.
- sufficiently tighten the screws, even those in difficult positions.
- apply silicone for the perfect closure of the cracks.

Note: the anti-vibration joints can be screwed directly to the aluminum frame of the control unit or to the panel near the perimeter of any vent provided on it.



WATER CONNECTIONS—GENERAL

It is recommended to:
- Install shut-off valves near parts subject to maintenance which allow their replacement without having to empty the system.
- install temperature and pressure indicators at the inlet and outlet of the exchangers; they will help in the normal control and maintenance of the group.
- Install a mesh filter to protect the heat exchangers from foreign material.
- Carefully check that there are no leaks in the pipes when filling the system.
- insulate the coil from vibrations, to avoid work hardening of the copper pipes and their consequent breakage.
- Do not twist the battery attachments. it is easy to damage the copper pipes and the drain connections of the tanks.

ELECTRICAL CONNECTIONS—GENERAL

! ATTENTION!
ALL ELECTRICAL EQUIPMENT CONNECTION OPERATIONS MUST BE CARRIED OUT IN THE ABSENCE OF ELECTRIC POWER SUPPLY. MAKE SURE THAT THE MAIN DISCONNECTING SWITCH OF THE MACHINE AND THE DISCONNECTING DEVICE AT THE START OF THE LINE ARE OPEN.

- The air handling units are supplied without an electrical panel. It is the installer’s responsibility to wire the motors directly to the terminal board of the latter.
- Pay particular attention to the fact that:
- The electrical connections must be made by qualified installers.
- The power cables must be protected upstream against the effects of short circuits and current overloads by a suitable device, compliant with current regulations.
- The section of the cable must be commensurate with the calibration of the upstream protection system and must take into account the temperature, the type of laying, the number of cables laid in parallel and their type of insulation. Refer to the appropriate tables provided by current regulations.
- It is of fundamental importance that the connection to the equipotential network of the earth protection is carried out with due care, using cables of adequate section and quality (refer to the regulations in force). It is important that the protection cable runs parallel and close to the power cables.
- For sizing the power supply line of the machine, the total values of Absorbed current, Absorbed power and Starting current shown in the technical data table and on the motor plate must be taken into consideration.

WATER BATTERY CONNECTION

! BURN HAZARD

- The batteries must be connected following the indications on the plates; the fluid will have to travel through the thickness of the coil in counter-current with respect to the direction of the treated air in order to obtain the maximum thermal yield.
- Mount the air vent for each coil at the highest point in the loop.
- Provide a drain in the lower part of the circuit in order to be able to carry out any complete drainage.
- It is advisable not to size the circuit pipes referring to the diameter of the coil connections, as these are sized according to construction requirements and in any case standardized.
- The loop connections must not cause any impediment to the possible removal of the battery from the unit.
- Do not unload the weight of the connection pipes on the coil connections: it is therefore advisable to prepare suitable brackets.
- Overheating inside the unit with the fan stopped is dangerous! Accidental stopping of the fan would cause overheating of the stagnant air in the unit with consequent damage to the motor, bearings, insulation and parts made of plastic material. It is essential to equip the system with adequate equipment which excludes the passage of water in the coil itself in the absence of air flow.
- To avoid rupture of the coils caused by freezing, when the air temperature drops below 3°C, add antifreeze to the water or drain the coil completely. These precautions are mainly indicated for systems operating intermittently.

STEAM BATTERY CONNECTION

! BURN HAZARD

All coils are already set up with inclined pipes towards the outlet manifold to facilitate the discharge of the condensate, or with vertical pipes.

- The batteries must be connected following the indications on the plates; the steam must enter from the collector placed at the top and, generally, of a larger diameter and the condensate must exit from the bottom.
- It is advisable not to size the circuit pipes referring to the diameter of the coil connections, as these are sized according to construction requirements and in any case standardized.
- The loop connections must not cause any impediment to the possible removal of the battery from the unit.
- Do not unload the weight of the connection pipes on the coil connections: it is therefore advisable to prepare suitable brackets.
- Overheating inside the unit with the fan stopped is dangerous! Accidental stopping of the fan would cause overheating of the stagnant air in the unit with consequent damage to the motor, bearings, insulation and parts made of plastic material. It is essential to equip the plant with adequate equipment which prevents the passage of steam in the coil itself in the absence of air flow.
- In order to avoid damage to the coil (water hammer), it is advisable to pay particular attention to the sizing and adjustment of the valves and condensate drains.
- Avoid the formation of condensation inside the coil, in the collectors and in the power supply network.
- Each coil must be equipped with its own condensate drain.

DIRECT EXPANSION BATTERY CONNECTION

- The connection of the direct expansion coils must be carried out by a refrigeration technician.
- The batteries are charged with nitrogen gas to prevent the accumulation of moisture inside the batteries. Open the manifolds only when connecting them to the system.
- The batteries must be connected following the indications on the plates; the fluid will have to travel through the thickness of the coil in counter-current with respect to the direction of the treated air in order to obtain the maximum thermal yield.
- It is advisable not to size the circuit pipes referring to the diameter of the coil connections, as these are sized according to construction requirements and in any case standardized.
- The loop connections must not cause any impediment to the possible removal of the battery from the unit.
- Do not unload the weight of the connection pipes on the coil connections: it is therefore advisable to prepare suitable brackets.
- It is essential to equip the system with adequate equipment which excludes the operation of the refrigeration circuit in the event of a lack of air flow.

DOUBLE BATTERY RECOVERY UNITS

- The batteries must be connected following the indications on the plates; the fluid will have to travel through the thickness of the coil in counter-current with respect to the direction of the treated air in order to obtain the maximum thermal yield.
- Mount the air vent for each coil at the highest point in the loop.
- Provide a drain in the lower part of the circuit in order to be able to carry out any complete drainage.
- It is advisable not to size the circuit pipes referring to the diameter of the coil connections, as these are sized according to construction requirements and in any case standardized.
- The loop connections must not cause any impediment to the possible removal of the battery from the unit.
- Do not unload the weight of the connection pipes on the coil connections: it is therefore advisable to prepare suitable brackets.
- To avoid rupture of the coils caused by freezing, when the air temperature drops below 3°C, add antifreeze to the water or drain the coil completely. These precautions are mainly indicated for systems operating intermittently.
- Pump, expansion vessel, connection pipes are not included in the supply.

ELECTRIC BATTERY CONNECTION

- The connection of the electric batteries by an electrician.
- The batteries must be connected following the wiring diagram attached to the unit documentation
- It is essential to connect the manual reset safety thermostat to the auxiliaries of the battery activation contactors
- It is essential to equip the system with adequate equipment which excludes the operation of the coil in the absence of air flow. The shutdown of the battery must be anticipated with respect to that of the fan by at least 2 minutes to ensure cooling

EVAPORATING PACK HUMIDIFIERS AND DISPOSABLE WATER

! Attention: the evaporating packs mounted in the humidifier have a pre-established position to respect the direction of the air and the water in counter-current. The wrong position compromises the correct functioning and can cause water to be carried into the downstream sections.

- Connect the humidifier to the water supply network.
- Connect the tub drain
- Fit the tub drain pipe with a siphon.
- The supply must be equipped with an ON-OFF valve (not included in the standard supply) servo-controlled by a humidistat or by the control of the air handling unit
- The supply must be equipped with a calibration valve (not included in the standard supply) to regulate the water flow to the pack according to the network pressure

EVAPORATING PACK AND RECIRCULATED WATER HUMIDIFIERS

! Attention: the evaporating packs mounted in the humidifier have a pre-established position to respect the direction of the air and the water in counter-current. The wrong position compromises the correct functioning and can cause water to be carried into the downstream sections.

- Connect the humidifier to the water supply network.
- Connect the tub drain
- Fit the tub drain pipe with a siphon.
- Connect the three-phase electric pump to the electricity mains with CE standard equipment.
- Check the direction of rotation.
- Check the electrical absorption.

ATOMIZED WATER HUMIDIFIERS

! Warning: atomised water humidifiers can only work with osmotic water. Then rearrange the necessary equipment

- Prepare a 304 stainless steel supply line with osmotic water
- Connect the humidifier to the osmotic water supply network
- Connect the high pressure hose between the pressurization cabinet and the nozzle network
- Fit the tub drain pipe with a siphon.
- Connect the regulating solenoid valves mounted on the nozzle ramp to the pressurization cabinet
- Connect the three-phase pressurization cabinet to the mains with a line in compliance with CE standards.

STEAM HUMIDIFIERS

! BURN HAZARD

- Connect the inlet valve to the steam distributor (valve not included in the standard delivery)
- Connect the condensate drain of the distributor to the valve-condensate separator unit (not included in the standard supply)
- Connect the tub drain
- Fit the tub drain pipe with a siphon.

STEAM HUMIDIFIERS WITH IMMERSED ELECTRODE GENERATOR

! BURN HAZARD
! Attention: Immersed electrode generators cannot work with demineralised water.

- Connect the reinforced rubber supply hose between the generator and the steam distributor
- Connect the condensate drain of the distributor to the generator
- Connect the generator drain
- Connect the tub drain
- Fit the tub drain pipe with a siphon.
- Connect the generator to the mains with a line compliant with CE standards.
- Connect the control signal from the air handling unit controller to the generator

AIR WASHERS

- Connect the washer to the water supply.
- Connect the tub drain
- Connect the overflow drain
- Fit the tub drain pipe with a siphon.
- Connect the three-phase electric pump (or electric pumps if there are two) to the mains with equipment complying with CE standards.
- Check the direction of rotation of the pump
- Check the electrical absorption of the pump

NOTES ON CONDENSATE DRAIN

The condensate collection tanks, both of the cold coils and of the humidifiers, are equipped with a 1” male threaded drain. The exhaust has an elbow visible laterally (connections side) in the thickness of the base.

- It is essential to fit the drain with a siphon to prevent the unit fan from sucking in miasmas or bacteria from sewage decomposition, creating ideal conditions inside the unit for the proliferation of pathogenic germs, fungi and microorganisms, also favoring the spread of “Legionella Pneumophila”, responsible for the “Legionnaire’s Syndrome”.
- Drainage without a siphon or with an incorrect siphon causes an inflow of air from it and it becomes difficult to drain the condensate which overflows into the adjacent sections and comes out of the air conditioner when the fan stops, flooding the entire surrounding area.
- The siphon must not be connected to the drain in a hermetic way, in order to allow the air to vent and the absorption of any possible sewage returns.
- A siphon under pressure must never be connected to another under vacuum.
- The connecting pipe, after the siphon, must have a sufficient slope towards the sewer and a diameter no smaller than the drain pipe
- The drain lines can be made in various materials: steel-copper -PVC. If the line is badly anchored it can bulge creating air pockets preventing a regular outflow of the condensate.
- It is a good rule that the pipe and the siphon are externally insulated to avoid dripping condensate, and in an anti-freeze function; possibly introduce antifreeze liquid into the siphon during the cold season.
- Pay attention to the evaporation of the siphon during the non-functioning period of the condensation. The maintenance technician must always keep the siphon full of water.
- The siphon must be equipped with a purge sleeve with relative cap in the most suitable position.
- The tank must be periodically cleaned to avoid stagnant condensation, deposits and the formation of algae.

THE THEORETICAL CALCULATION OF THE TRAP

Failure to comply with the rules set out below causes the siphon to empty and therefore incorrect drainage of the tank.

DISCHARGE UNDER PRESSURE	EXHAUST IN VACUUM
Formula	
T = 2 p	T = - 2 p
S = T /2	S = T /2
H = T - S	H = T - S
Example	Example
p = 400 Pa = 40 mm w.c.	p = - 250 Pa = - 25 mm w.c.
T = 80mm	T = 50mm
S = 40mm	S = 25mm
H = 40mm	H = 25mm

CONNECTION OF THE MICROSWITCH

The ventilating sections are equipped with a microswitch and/or safety net behind the access door. If the N.O. type microswitch is present, connect it to the auxiliary of the motor contactor. In this way, when the door is opened, the fan will still be switched off.

ELECTRIC MOTOR CONNECTION

- The connection of the electric batteries by an electrician.

The air handling units are supplied as follows:

STANDARD motor single polarity up to Kw 4:
- Motor with direct start 230/400 V: Triangle on 230 V Star on 400 V

STANDARD single polarity motor over 4 Kw:
- Motor with star/delta starting 400 V: Delta on 400 V star on 690 V

Note: Even 230/400 motors can be connected in star/delta only in cases where 230 three-phase voltage is available.

- Remove the cover from the electric motor terminal box and check that the terminal connections comply with the supply voltage.
- Connect the line cable to the terminal block including the earth connection, in compliance with CE standards.
- The cable passage hole to
  an adequate cable gland.

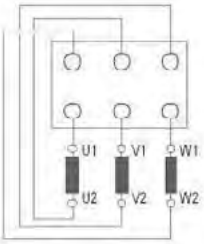
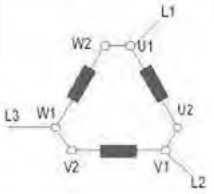
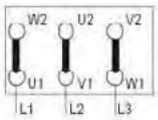
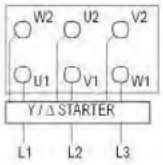
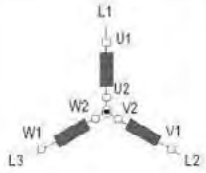
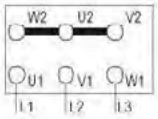
- The ca es side th fan s ct mus be r fully fixed and lo ked to the structure as they are i rent su k d by the a .

The electri po s pp y sy te o mu t pro e te ith fuse and t e a sorption of th mo r will be controlled y a thermal p o ct o h se alue ust b acco d nce wit he data on the plate of the motor ts f
To avoid h i y in e b , m ke re that t e gask s fi ed n s sea a ell x y th co e

The followi g figures show the connection diagrams of the standard motors. In any case, always check the diag am stamped o he motor (usua y o the back of the terminal box cover).

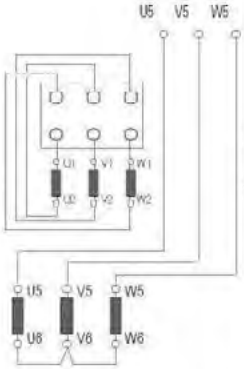
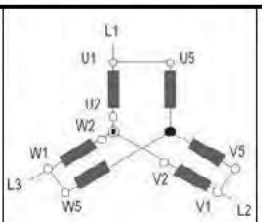
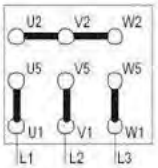
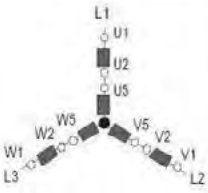
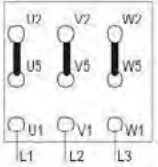
SINGLE SPEED MOTORS FOR DIRECT OR STAR-DELTA START

BI-VOLTAGE TYPE MOTORS WITH Y, Δ CONNECTION (6 TERMINALS)

Voltages and connections	Internal wiring diagrams	Basic schemes	External connection diagrams: Direct starting	External connection diagrams: Y/Δ starting
Voltage: U Connection: Δ (at lower voltage) e.g.: 230V/Δ				
Voltage: U√3 Connection: Y (at higher voltage) e.g.: 400V/Y				—

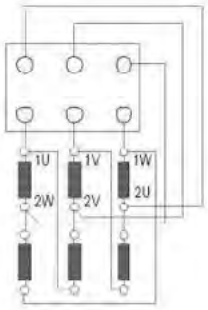
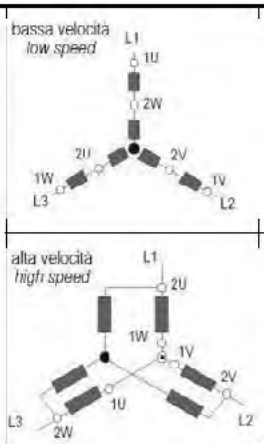
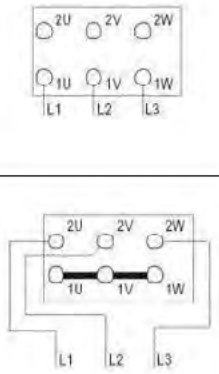
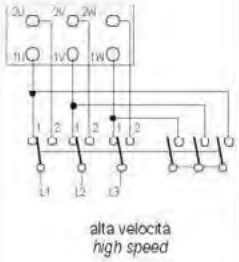
SINGLE SPEED MOTORS FOR SERIES/PARALLEL CONNECTION

BI-VOLTAGE TYPE MOTORS WITH SERIES/PARALLEL CONNECTION (9 TERMINALS)

Voltages and connections	Internal wiring diagrams	Basic schemes	External connection diagrams: Direct starting	External connection diagrams: Y/Δ starting
Voltage: U Connection: YY (at lower voltage) e.g.: 230V/YY				—
Voltage: 2U Connection: Y (at higher voltage) e.g.: 460V/Y				—

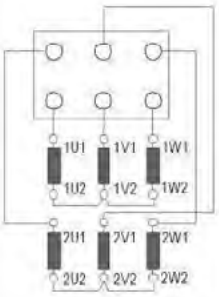
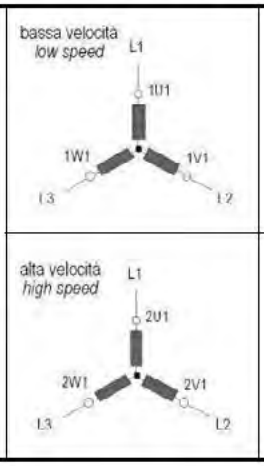
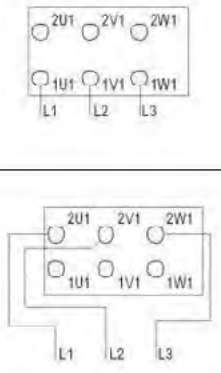
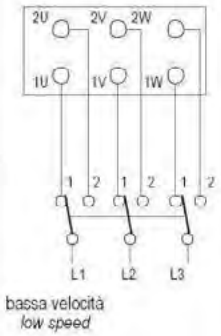
DAHLANDER TWO-SPEED ENGINES FOR DIRECT START

SINGLE VOLTAGE TYPE MOTORS WITH SINGLE WINDING (6 TERMINALS)

Voltages and connections	Internal wiring diagrams	Basic schemes	External connection diagrams with switch	External connection diagrams Manual
Dahlander or PAM centrifugal machines 6 terminals (internal Y) Y-YY				

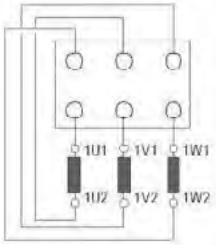
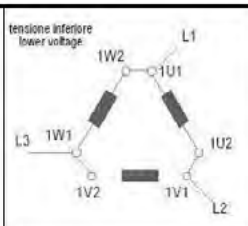
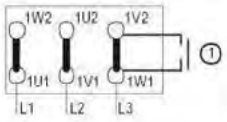
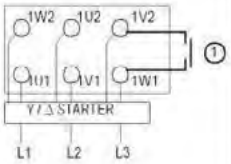
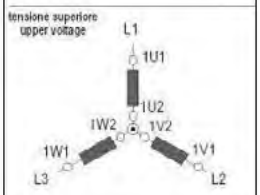
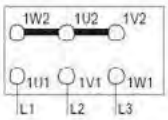
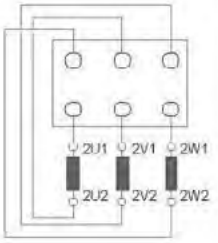
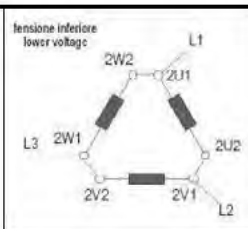
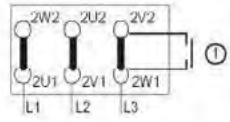
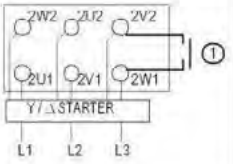
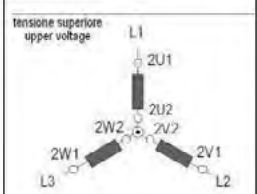
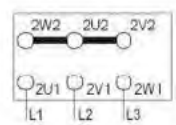
TWO SPEED DOUBLE WINDING MOTORS FOR DIRECT START

SINGLE VOLTAGE MOTORS WITH DOUBLE WINDING (6 TERMINALS)

Voltages and connections	Internal wiring diagrams	Basic schemes	External connection diagrams with switch	External connection diagrams Manual
Two separate windings 2x3 terminals (internal Y)				

TWO SPEED DOUBLE WINDING MOTORS FOR DIRECT OR STAR-DELTA START

BI-VOLTAGE TYPE MOTORS WITH Y, Δ CONNECTION (12 TERMINALS)

Voltages and connections	Internal wiring diagrams	Basic schemes	External connection diagrams: Direct starting	External connection diagrams: Y/Δ starting
Voltage: U Connection: Δ (at lower voltage) e.g.: 230V/Δ	bassa velocità *low speed* 			
Voltage: U√3 Connection: Y (at higher voltage) e.g.: 400V/Y				
Voltage: U Connection: Δ (at lower voltage) e.g.: 230V/Δ	alta velocità *high speed* 			
Voltage: U√3 Connection: Y (at higher voltage) e.g.: 400V/Y				

ROTARY FILTER

- The connection of the electric batteries by an electrician.
- F r the e ect ical connection, refer to the documentation supplied by the manufacturer inside the electrical panel of the filter.
- Connect the gearmotor e ectrically, checking the direction of rotation.
- Assem le t r mat c ec ing the sq are alignment t allow o rect rewinding.
- The ele i connection must be c rried out according to CE standards.

ROTARY RECOVERY UNITS

- The connection of the electric batteries by an electrician.
- For the electrical connection, follow the manufacturer's instructions enclosed with the appliance.
- The e ectrical connection must be carried out according to CE standards.
- The acce s door must be equipped with a microswitch.

PRECAUTIONS DURING START-UP

- The doors must only be opened when the unit is stopped. Turn off the fan before working on the unit.
- When the fan is running, the inspection door must be closed to avoid overloading the motor and tripping the thermal protection.
- The inspection doors are equipped with microswitches and/or safety net in front of the door: unscrew the safety net with a tool before accessing the fan.
- The fan may, depending on the size, take even more than 1 minute before stopping completely. Wait for it to stop completely before approaching it

CHECKS BEFORE AND DURING START-UP

ELECTRICAL PANEL (SUPPLIED BY OTHERS)

- Check the calibration of the thermal protections.

AIR DISTRIBUTION NETWORK (SUPPLIED BY OTHERS)

- Check the position of any shutters. must be in the position intended for normal operation. Otherwise, they could induce a pressure drop in the system that is different from the design one, distorting the operating point of the air handling unit.

SHUTTERS

- Check its functionality and avoid starting the fan with the shutters closed. Otherwise, with machines equipped with high pressure blowers, structural damage could occur.

CELL FILTERS

- Verify that the pre-filters have been correctly installed.
- The pre-filters must be inserted into the unit at first start-up.
- Make sure that the gaskets are positioned to avoid any air by-pass.

ROTARY FILTERS

- Observe that the drive chain is properly aligned and properly greased.
- Check that the filter mat is aligned to allow for correct roll-up.

FLOSS BAG FILTERS

! Warning: the bag filters, absolute or activated carbon, are fitted in the unit after half an hour of system operation. This period of operation cleans the ducts from dust, slag and various debris due to the assembly operation of the same; this will prevent clogging, consumption or possible damage to the non-regenerable filter.

- Check that the pockets are free, and do not find obstacles during the passage of air.
- The pockets are easily perishable at the point of attachment to the frame due to their continuous sagging and the accumulation of dust.

RIGID BAG FILTERS

! Warning: the bag filters, absolute or activated carbon, are fitted in the unit after half an hour of system operation. This period of operation cleans the ducts from dust, slag and various debris due to the assembly operation of the same; this will prevent clogging, consumption or possible damage to the non-regenerable filter.

! Pay attention to their handling as the paper filter material with glass fibers is very delicate.

- Check that the gaskets are positioned to avoid any air by-pass.

ABSOLUTE FILTERS

! Warning: the bag filters, absolute or activated carbon, are fitted in the unit after half an hour of system operation. This period of operation cleans the ducts from dust, slag and various debris due to the assembly operation of the same; this will prevent clogging, consumption or possible damage to the non-regenerable filter.

! Attention: the cells are very delicate, any breakage of the filtering material forces it to be replaced.

- Check the integrity of the sealing gasket
- Check that the filter support wall has not undergone deformation during positioning of the unit
- If necessary, seal each crack with silicone to prevent possible air by-passes.

ACTIVATED CARBON FILTERS

- Check the correct insertion of the cartridges containing the carbon and the functioning of the air seal.

DIRTY FILTER DETECTION EQUIPMENT

- On request, a differential pressure gauge can be supplied to be applied to the pre-filter, pocket filter and absolute filter sections. Check its calibration:

1. synthetic and roller filters max 200 Pa
2. Soft pocket filters: 250 Pa
3. Rigid bag filters: 400 Pa
4. Absolute filters: 600 Pa

- Under the same conditions, a differential pressure switch, visual or audible, can be supplied.
- The rotary filter is supplied as standard with a differential pressure switch.

FAN

- Remove any safety locks from the motor-fan unit so as to leave the
- shock absorbers in operation.
- Check the alignment of the pulleys and the tension of the belts (see section “Maintenance”).
- Check the correct direction of rotation of the fan by observing the applied arrow.
- Check that the motor-fan unit works without vibration. If not
- carry out a thorough check.
- Check that, after the first hour of operation, the temperature of the fan supports does not exceed 60°C.
- Measure the effective absorption of the motor and compare it with the data on the plate. When the motor absorption is too high, beyond the data on the plate, or on the contrary it is lower than expected, it is necessary to recheck the load losses of the system circuit. A high absorption is indicative, particularly for forward blade fans, of an excessive air volume due to lower resistance in the circuit. Conversely, a low absorption is indicative of a low air flow due to pressure drops higher than expected. To normalize the system, it is essential to intervene on the transmission by varying the fan revolutions. A precise calculation of the load losses of the entire circuit is therefore indispensable, a calculation which prevents the above mentioned drawbacks.

ORDINARY MAINTENANCE

GENERALITY

Maintenance operations must only be performed by authorized technical personnel.
The maintenance personnel must strictly comply with the accident prevention regulations in force.
Before carrying out any intervention, the maintenance technician must isolate the unit from the electricity and put it out of service.
In addition, indicate the maintenance intervention with special signs.

SHUTTERS

For the extruded aluminum dampers with nylon gears supplied as standard only normal cleaning is required as there is no need for lubrication. On the other hand, shutters with lever systems may require a check of the lubrication of the pins.

CELL FILTERS

- The pressure drop values increase in proportion to the accumulation of dust. When a pressure drop of a maximum of 200 Pa is reached, the filter must be cleaned or replaced: The periodicity depends on the level of dust concentration in the air.
- If the unit is equipped with a differential pressure gauge for the acoustic or visual detection of load losses or a pressure switch, the operation is facilitated, otherwise we will act according to experience, establishing the intervention times case by case.
- It is advisable to have a set of spare filter cells to avoid long stops of the unit, or worse, operation without filters.
- The pre-filter cells are introduced laterally into the unit on U-shaped guides, except in the case in which they are mounted in combination with pocket filters on the same frame. In this case, refer to the pocket filters paragraph.
- The introduction and extraction are manual, with the help where necessary, of a hook.
- The U-shaped guides must be clean and the cells inserted well side by side to avoid the inconvenience of an air “by-pass”.

CELLS IN REGENERABLE SYNTHETIC MATTRESS

The filters can be cleaned:

- by simple shaking;
- with a vacuum cleaner, taking care to orient the suction device in the opposite direction to the flow of air crossing the filter;
- with the use of drinking water, always in the opposite direction to the air flow;
- In the absence of a pressure gauge or pressure switch, the replacement of the filter mat or of the cell itself is left to the judgment of the maintainer.

METALLIC MAT CELLS

- Clean with hot water and detergents, or with a caustic soda bath and oil with mineral oil.

These filters can be washed 2 or 3 times: after that they must be replaced

ROTARY FILTERS

The rotary filter mat cannot be regenerated. Replace the entire roll when depleted

FLOSS BAG FILTERS

- The pressure drop values increase in proportion to the accumulation of dust. When a pressure drop of a maximum of 250 Pa is reached, the filter must be replaced: The periodicity depends on the level of dust concentration in the air.
- The unit must be equipped with a differential pressure gauge for acoustic or visual detection of pressure drops or a pressure switch.
- The pocket filters are inserted for their operation in metal counter-frames
- The counterframe is equipped with a gasket glued to the filter support lip to ensure perfect airtightness and the exclusion of any by-pass.
- The filter cell is fixed to the counterframe with clips.
- The pockets, not being regenerable, must be replaced. To lengthen their life, it is advisable to equip them with a cell pre-filter.
- The gasket, which must be intact and perfectly sealed, must be checked at each change of filters, in case of anomaly it is advisable to replace it.
- The four fixing clips must all be in operation, the lack of even one of them could cause air “by-pass”.
- The pocket full of powder must be removed by closing the air inlet side (for example with a sheet of paper) to prevent the contents from escaping.

RIGID BAG FILTERS

- The pressure drop values increase in proportion to the accumulation of dust. When a pressure drop of a maximum of 400 Pa is reached, the filter must be replaced: The periodicity depends on the level of dust concentration in the air.
- The unit must be equipped with a differential pressure gauge for acoustic or visual detection of pressure drops or a pressure switch.
- The pocket filters are inserted for their operation in metal counter-frames. Filters up to efficiency F7 can also be mounted on U-shaped guides.
- The counterframe is equipped with a gasket glued to the filter support lip to ensure perfect airtightness and the exclusion of any by-pass.
- The filter cell is fixed to the counterframe with clips.
- The pockets, not being regenerable, must be replaced. To lengthen their life, it is advisable to equip them with a cell pre-filter.
- The gasket, which must be intact and perfectly sealed, must be checked at each change of filters, in case of anomaly it is advisable to replace it.
- The four fixing clips must all be in operation, the lack of even one of them could cause air “by-pass”.
- The pocket full of powder must be removed by closing the air inlet side (for example with a sheet of paper) to prevent the contents from escaping.

ABSOLUTE FILTERS

- The pressure drop values increase in proportion to the accumulation of dust. When a pressure drop of a maximum of 600 Pa is reached, the filter must be replaced: The periodicity depends on the level of dust concentration in the air.
- The unit must be equipped with a differential pressure gauge for acoustic or visual detection of pressure drops or a pressure switch.
- The EU11 and EU13 absolute filters equipped with a gasket are inserted in special metal counterframes.
- The application takes place by means of four removable tie rods with thumbscrews.

ACTIVATED CARBON FILTERS

- The cartridges must be replaced when the measurement of the polluting gas concentration exceeds the maximum level foreseen

WATER BATTERIES

- Periodically vent the air contained in the pipes of the water coils using the vent valve
- Gently wash the battery exchange pack with jets of water at the beginning of each season
- Clean the condensate collection tray of the cooling coils

PLATE RECOVERY UNITS

- Clean periodically with a vacuum cleaner or jets of water, taking care not to damage the plates
- Clean the condensate collection tray

ROTARY RECOVERY UNITS

- Periodically clean with a vacuum cleaner or jets of water, taking care not to damage the rotor
- Check the drive belt for wear

EVAPORATING PACK HUMIDIFIERS AND DISPOSABLE WATER

- Close the water shut-off gate valve
- Extract the evaporator pack
- Check for any limescale encrustations on the pack and on the distributor tube above it. The holes of the PVC distributor tube can be cleaned, the package must be replaced if necessary.
- Wash the inside of the tank and the various components.
- Reassemble the pack checking the correct direction according to the air direction

EVAPORATING PACK AND RECIRCULATED WATER HUMIDIFIERS

- Deactivate the circulation pump
- Close the water shut-off gate valve
- Extract the evaporator pack
- Check for any limescale encrustations on the pack and on the distributor tube above it.
- The holes of the PVC distributor tube can be cleaned, the package must be replaced if necessary.
- Remove and clean the filter on the pump support.
- Wash the inside of the tank and the various components.
- Reassemble the pack checking the correct direction according to the air direction

STEAM HUMIDIFIERS

! BURN HAZARD

- Clean the condensate collection tray

STEAM HUMIDIFIERS WITH IMMERSED ELECTRODE GENERATOR

! BURN HAZARD

- Clean the condensate collection tray
- Check the degree of encrustation of the boiler and the electrodes and replace them if necessary

ATOMIZED WATER HUMIDIFIERS

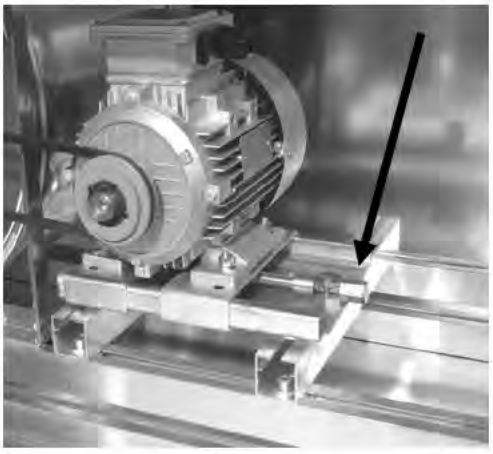
- Clean the tub
- Clean the filters in the pressurization cabinet

AIR WASHERS

- Clean the water collection basin
- Clean the filter
- Check the degree of fouling of the nozzles and if necessary disassemble and clean them

FAN

- ! Before working on the motor-fan unit, make sure that the main switch is off and cannot be switched on by others.
- After the first period of operation (two days) and subsequently at longer intervals, check the tension of the transmission belts, restoring their initial tension by moving the engine backwards or forwards using a normal spanner on the worm screw of the belt tensioner slide.
- The tension of the belts is ideal when they allow, by acting in the midpoint between the pulleys, a bending of about two centimeters.
- Excessive belt tension damages the bearings.
- Check that the motor and fan axes are parallel and that the alignment of the pulleys has been maintained.
- Fans equipped with supports with open type bearings require periodic lubrication (approximately 6 months), as opposed to self-lubricating closed supports which do not require interventions for a limit duration of 20,000 operating hours.
- The deterioration of the bearings is signaled by the increase in noise and by their overheating with the leakage of liquid grease.



HANDLE CLOSURE ADJUSTMENT

HINGE ADJUSTMENT

TROUBLESHOOTING

GENERALITY

- The following table lists the possible malfunctions and their possible causes. The above does not fully cover the cases of malfunctions.
- The intervention of a safety device indicates an operating anomaly; before resetting the alarm signal, check and eliminate the cause.

! ATTENTION
- The operations must be carried out by specialized technical personnel, in possession of the legal requirements and operating in compliance with the safety regulations in force.
- Before carrying out any checks on moving parts and live parts, open the general isolating switch of the unit.

AT STARTING	
LOW AIR FLOW:	Uncalibrated damper
	Wrong direction of rotation of the fan
	Straps loose
	Supply voltage lower than expected
	Loop resistances higher than expected or accidental blockages
INSUFFICIENT HUMIDIFICATION	Wrong direction of rotation of the pump. Invert two motor power supply phases
	Dirty nozzles
	Insufficient water level in the tank due to imperfect adjustment of the float
WATER DRAG	Excessive air flow
	Excessive water flow to the humidifier
EXCESSIVE NOISE	Failure to unlock the fan motor unit
	Defective bearings
	Magnetic hissing of the motor due to voltage drop or construction defect
	Foreign material in the fan scroll
	Vibrating damper flaps
	Hissing due to vibration of channels, deflectors, vents, diffusers
	"Pumping" of the fan (excessive back pressure compared to the flow rate)
	Excessive air flow
POOR THERMAL PERFORMANCE OF THE BATTERY	Insufficient temperature or flow rate of the heat transfer fluid
	Incorrect hydraulic connections
	Presence of air in the battery. Vent.
	Malfunctioning automatic adjustment
	Unsuitable steam trap (steam coils).
EXCESSIVE AIR FLOW	Loop resistances lower than expected
	Shutters not calibrated
	Filters not inserted
	Doors open or panels missing
ELECTRIC MOTOR	Absorption higher than the plate value. Check for problems associated with excessive air flow.
	Wrong direction of rotation. Invert two motor power supply phases
EXCESSIVE AIR FLOW	Circuit resistance decrease for uncalibrated dampers
	Circuit resistance decrease due to missing or damaged filters
	Circuit resistance decrease for open doors
	Circuit resistance decrease for uncalibrated vents

IN EXERCISE	
DECREASE AIR FLOW	Circuit resistance increase for dirty filters or with frost formation
	Increased circuit resistance for encrusted coil fins
	Circuit resistance increase for uncalibrated dampers
	Increased circuit resistance for encrusted humidifier pack
	Dirty heat recovery circuit resistance increase
	Faulty transmission
	Accidental obstructions or clogged components in the air distribution network
WATER DRAG	Excessive air flow
	Excessive water flow to the humidifier
	Sealing defect of the separator closures
INSUFFICIENT HUMIDIFICATION	Dirty water filter
	Dirty nozzles
	Encrusted evaporator pack
	Insufficient water level in the tank due to imperfect adjustment of the float or accidental leaks
POOR THERMAL PERFORMANCE OF THE BATTERY	Insufficient temperature or flow rate of the heat transfer fluid
	Reduced air flow
	Presence of air in the battery. Vent
	Malfunctioning automatic adjustment
	Malfunctioning steam trap (steam coils)
EXCESSIVE NOISE	Belt slippage
	Defective bearings
	Magnetic hissing of the motor due to voltage drop or construction defect
	Foreign material in the fan scroll
	Vibrating damper flaps
	Hissing due to vibration of channels, deflectors, vents, diffusers
	Loosening of the impeller on the shaft
	Flap coming out of the fan (cut-off) loose
	Scaled engine cooling fan
	Excessive air flow

DISPOSAL

DISCONNECT UNIT

Unit disconnection operations must be carried out by a qualified technician who, before proceeding with disconnection, must read the contents of the residual risks section of this manual.

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

- for units equipped with direct expansion coil the refrigerant gas (if it is not possible to isolate the circuits): the extraction of the refrigerant gas must take place by means of suction devices operating in a closed circuit so as to ensure that there is no release of compounds into the atmosphere.
- the antifreeze present in the circuits: when removing it, make sure that there are no leaks or spills in the environment. The antifreeze liquid must be stored in special containers.

IMPORTANT:

- For all operations for the recovery of substances present in the unit, all precautions must be taken to avoid both damage to people and things and pollution of the surrounding area.
- While awaiting dismantling and disposal, the unit can also be stored outdoors, as bad weather and sudden changes in temperature do not cause harmful effects on the environment.

DISMANTLING AND DISPOSAL

! FOR DISMANTLING AND DISPOSAL, THE UNIT MUST ALWAYS BE DELIVERED TO THE AUTHORIZED CENTERS.

- During dismantling, the fan, motor and battery, if functioning, could be recovered by specialized centers for possible reuse.
- All materials must be recovered or disposed of in accordance with applicable national regulations.
- The materials used for the construction or present in the components can be seen in the following table

Material	**Use**	**Quantity in relation to the weight of the unit**	**Presence**
Steel sheet	Base, panels, ribs, motor, fan, droplet separators	High	Always
Aluminum	Frame, fan frame, motor casing, coils, dampers, condensate collection tanks, droplet separators	High	Always
Copper	Batteries, engine	Average	Always
Polyurethane	Panels	High	Optional
Mineral wool	Panels, mufflers	High	Optional
Rubbery materials	Gaskets, anti-vibration mounts, anti-vibration cloths. Always in short supply	Poor	Always
Nylon	Handles, hinges	Poor	Always
Paper	Evaporating pack	Average	Optional

CE

Due to Redge ongoing commitment to quality, the specifications, ratings and dimensions are subject to change without notice and without incurring liability.

Improper installation, adjustment, alteration, service or maintenance can cause property damage or personal injury.

Installation and service must be performed by a qualified installer and servicing agency.