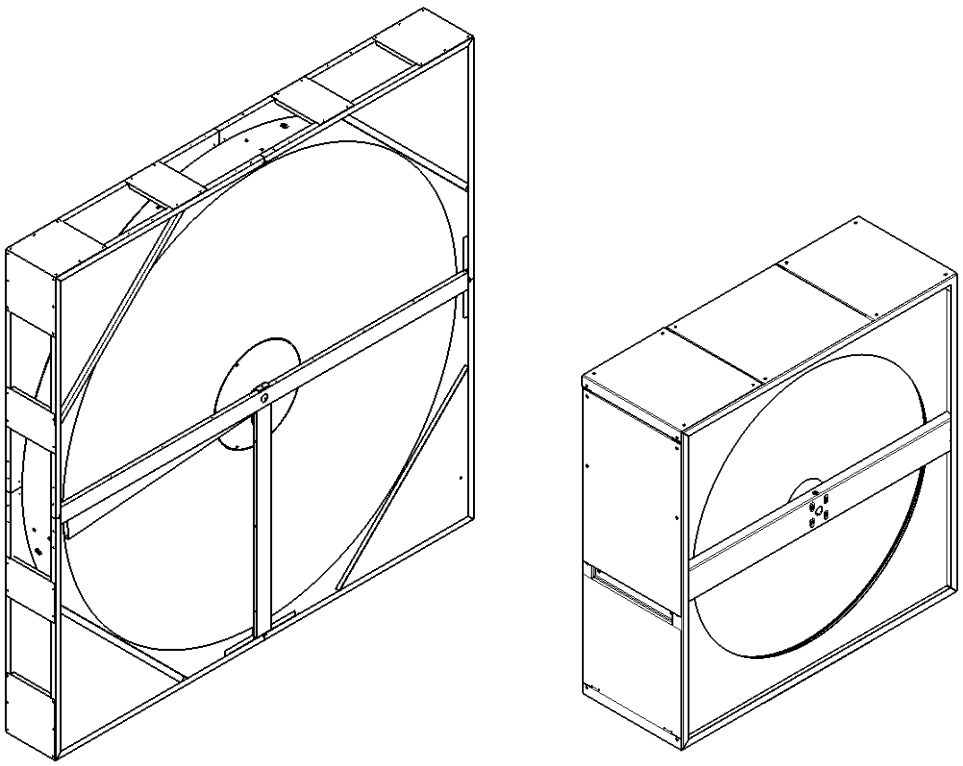
ROTARY HEAT EXCHANGERS

INSTALLATION AND MAINTENANCE MANUAL

Rev 1.0

Rotary heat exchangers



Rev 1.0 Emission

Recuperator S.p.A.
a socio unico
via Valfurva, 13
20027 Rescaldina
Milano, Italy

tel. +39 0331 185 31
fax +39 0331 185 3000
recuperator@recuperator.eu
recuperator@pec.recuperator.net
www.recuperator.eu

C.F./P.I. 01816030157
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1 General information

1.1 Scope of the instruction manual

This instruction manual is intended to provide installers general knowledge of the **Recuperator** heat recovery unit for safe handling and installation.

This manual is an integral part of the heat recovery unit and has the purpose of providing all the required information for:

- Safe handling, packing and unpacking the unit;
- Correct installation;
- Knowledge of its technical specifications;
- Information on operator qualifications and specific training;
- Safe decommissioning of the heat recovery unit, in compliance with the regulations in force, to protect the health and safety of workers and the environment.

This document assumes that, in the systems where the heat recovery unit is to be installed, all health and safety regulations in force are observed.

The person in charge of these operations is required, in accordance with the regulations in force, to carefully read the contents of this instruction manual and ensure it is read by the installers with regard to their specific responsibilities.

The instructions, documentation and drawings contained in this manual are confidential and the property of **Recuperator**. Consequently, outside of the scope of this manual, no reproduction, either in part or in full, of the contents and/or format is permitted without the prior consent of **Recuperator**.

Recuperator reserves the right to modify the features of the heat recovery unit described in this manual without prior notice.

1.2 Symbols used in the manual

Certain symbols are used in this manual to draw the reader's attention and highlight important aspects.

The meanings of the symbols used are described below.

HAZARD!

This highlights a situation that may be hazardous to people.

ELECTRICAL HAZARD!

Risk of physical contact with live parts.

CAUTION:

This describes a situation in which the procedures, if carried out carelessly or incorrectly, may damage the heat recovery unit, at times irreparably.

NOTICE

This highlights important information outside of the main text regarding key features and useful details.

1.3 Intended readers of the instruction manual

This instruction manual is intended for installers and qualified personnel who are authorised to perform maintenance on the heat recovery unit, with the aim of describing the main technical specifications.

Such personnel need to have good knowledge of the unit's operating principles and mechanical design, and include both the operators responsible for handling and installation and the maintenance technicians.

The heat recovery unit is intended for industrial use, and therefore may only be used by qualified, specialist personnel.

Such qualified/specialist personnel, having the necessary training and professional experience, must be expressly authorised to install and carry out maintenance on the heat recovery unit.

1.4 How to keep the manual

The instruction manual must be kept with care and must accompany the heat recovery unit should this be transferred to another owner throughout its life cycle.

It must be handled with care, with clean hands and not placed on dirty surfaces.

No parts of the manual may be removed, torn or arbitrarily modified.

The manual must be kept in a place protected against humidity and heat, and in the immediate vicinity of the heat recovery unit it refers to.

1.5 Updates to the manual

Recuperator is only responsible for the instructions that it has drafted and validated directly (original instructions); any translations must always be provided together with the original instructions, in order to verify their correctness. **Recuperator** is in no way responsible for translations it has not approved. In the event of discrepancies, always refer to the original language and if necessary contact the **Recuperator** sales office, which will make any required modifications.

Recuperator reserves the right to make changes to the design, changes/improvements to the heat recovery unit and updates to the instruction manual without prior notice.

Nonetheless, in the event of modifications to heat recovery units already installed at the customer's site, agreed on with the **Recuperator** and involving changes to one or more chapters of the instruction manual, the manufacturer will send the customer the parts of the instruction manual that have been affected by the changes, together with the new overall revision number.

Recuperator, in accordance with the instructions provided with the updated documentation, will replace the sections that are no longer valid with the new updated versions, in all available copies.

Recuperator reserves the right to charge the costs for any additional copies requested, in addition to requiring acceptance of specific clauses regarding the protection of intellectual property rights, patents and the functional identity of the product and/or parts of it.

Recuperator declines all liability resulting from any modifications, additions or removal of parts or components without its prior consent.

1.6 User obligations

End users must follow the instructions provided by **Recuperator** regarding:

- correct installation;
- correct use and regular maintenance of all components;
- legal requirements in force.

1.7 Reference standards and documentation

The following are the reference standards and documents for the design and construction of the rotary heat exchanger manufactured by **Recuperator**:

- Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast).
- Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast) and assessed in accordance with EN 61800-3:2004, emissions category C1 and immunity category C2.
- All speed controllers comply with the Low Voltage Directive 2014/35/EU, as required by EN 61800-5-1.

The standards listed below - or parts thereof - have been adopted as the reference for the design and manufacture of the rotary heat exchanger; this does not however mean that the requirements of such standards have been complied with in full:

- IEC EN 60204-1:2006. Safety of machinery. Electrical equipment of machines. Part 1: General requirements.
- EN 349:2008. Safety of machinery. Minimum gaps to avoid crushing of parts of the human body.
- EN 547-1:2009. Safety of machinery - Human body measurements - Part 1: Principles for determining the dimensions required for openings for whole body access into machinery.
- EN 547-2:2009. Safety of machinery - Human body measurements - Part 2: Principles for determining the dimensions required for access openings.
- EN 547-3:2009. Safety of machinery - Human body measurements - Part 3: Anthropometric data.
- EN 614-1: 2009. Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles.
- EN 1005-3:2009. Safety of machinery - Human physical performance - Part 3: Recommended force limits for machinery operation.
- EN 10025-1:2005; Hot rolled products of structural steels - Part 1: General technical delivery conditions
- EN 12464-1:2011- Light and lighting - Lighting of work places - Part 1: Indoor work places
- EN ISO 13855:2010. Safety of machinery. Positioning of safeguards with respect to the approach speeds of parts of the human body.
- EN ISO 13857:2008. Safety of machinery. Safety distances to prevent machinery hazard zones being reached by upper and lower limbs.
- EN ISO 14120:2015. Safety of machinery. Guards. General requirements for the design and construction of fixed and movable guards.

1.8 Product description

Recuperator's air-to-air rotary heat exchangers are made from a rotating matrix containing thousands of channels with a very large surface area, a containment frame (complete with brush seals to minimise leakage between the supply and exhaust air flows), and a drive system comprising an electric motor with speed control where required.

The general features of these rotary heat exchangers are:
› Very high heat exchange surface area in relation to volume, giving very high efficiency compared to other types of heat recovery units, even up to 85%.
› This high efficiency, together with the possibility to recover both humidity and sensible heat (sorption wheel) make it possible to considerably reduce system installed capacity.
› Possibility of latent heat transfer.
› Recovery of humidity makes it possible to reduce the use of humidifiers.
› Compact dimensions, even for large units.
› Low pressure drop

In rotary heat exchangers, heat is exchanged by accumulating in the matrix; in fact, as the wheel slowly rotates, the exhaust air flows through one half of the wheel, transferring heat to the matrix, where it is accumulated. The fresh outside air, which flows through the other half, then absorbs the accumulated heat. As rotation continues, the parts that adsorb and release heat alternate continuously, and so the process can continue indefinitely. Wheel rotation speed can be constant, or adjusted by a speed controller.

1.8.1 Intended use

Rotary heat exchangers can be used in the following applications:

- Air conditioning and heating
- Industrial ventilation
- Marine applications

1.9 Labelling

1.9.1 Rated data

The rotary heat exchangers are equipped with a rating plate showing the minimum data required by Machinery Directive 2006/42/EC, as illustrated in Figure 1-1- Rating plate:

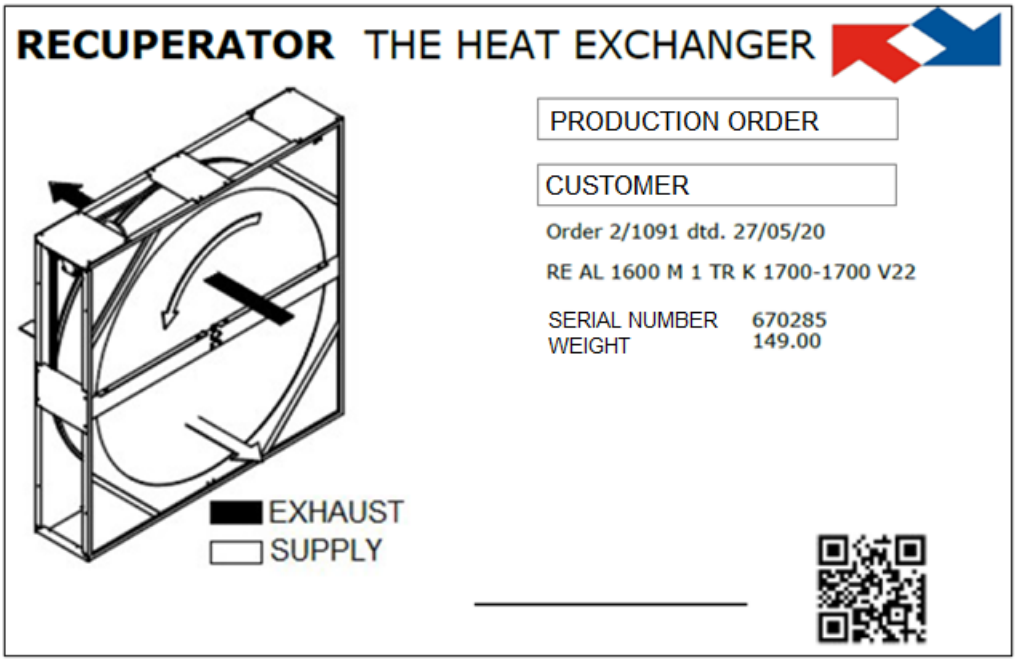


Figure 1-1- Rating plate

The rating plate and labels affixed to the rotary heat exchanger should not be removed and must be kept well secured, intact and be perfectly legible at all times.

The data shown on the rating plates will be required for service and spare parts.

2 Safety

2.1 General safety warnings

Most accidents in the workplace are the result of failure to comply with the most basic safety standards. All personnel who handle the unit and carry out installation must be fully aware of and comply with the instructions contained in this manual and on any warning labels.

Do not carry out work on or make any type of modification to the heat recovery unit or its accessories. Do not modify any parts of the heat recovery unit in any way whatsoever, in order to allow the possible addition of components or the like. **Recuperator** is not liable for any consequences in the event of malfunctions/accidents due to failure to comply with the above warnings. Please contact **Recuperator** in the event of any requirements regarding modifications to be made to the heat recovery unit.

When designing and manufacturing the heat recovery unit, specific criteria and measures were adopted in order to comply with the essential health and safety requirements set out in Annex I of the Machinery Directive 2006/42/EC .

The heat recovery unit has been designed and built in accordance with the principle of integrated safety, meaning personnel is not exposed to any types of risks.

The risk assessment carried out by **Recuperator** is limited to the parts it supplies.

The accurate risk assessment carried out by **Recuperator** has made it possible to eliminate most of the risks associated with the typical operating conditions of the heat recovery unit, both intended and reasonably foreseeable.
Recuperator has drafted and archived the required technical file.
Operators must comply with the procedures specified in this manual, using the required personal protective equipment.

Recuperator declines all liability for any damage to persons or things resulting from:

- Failure to comply with occupational health and safety standards and with the recommendations contained in the documentation provided;
- Employment of unqualified operators;
- Failure to comply with the specified precautions or failure to use the required PPE.

2.2 Warnings for handling the unit

- Lifting and handling of the heat recovery unit must only be performed by experienced and qualified personnel.
- The heat exchanger must be handled with care, to avoid damage to the frame and the matrix.
- The straps used must comply with ISO standards.
- Follow the operating instructions provided by the supplier of the straps.

- Always check the straps before lifting the unit, and in the event of damage or cuts, do not use them.
- The straps must not be twisted or knotted.
- To ensure their safety, operators must use adequate protection for lifting loads with sharp edges.
- When lifting and handling the heat exchanger, ensure that the lifting forces are applied uniformly to all lifting points.
- Lifting tension must be vertical.
- Use a lifting spreader bar.

Operators must not carry out operations or movements on their own initiative that are not their responsibility and that may endanger their own safety and that of other people.
With specific regard to accident prevention, all personnel (operation, maintenance, service, etc.) must scrupulously observe the requirements of national, local and company regulations in force, as well as the instructions indicated below and in the specific sections of the heat recovery unit user manual.

Handle the heat recovery unit and work equipment with care.

Immediately notify the employer, the manager or supervisor of any defects or problems identified when carrying out the operations.

Recuperator instructs personnel on the risks of accidents and on the general rules on occupational health and safety in accordance with European directives and the laws in the country where the heat recovery unit is installed.

Unauthorised tampering with or replacement of one or more parts, the use of accessories that modify the installation of the heat recovery unit, and the use of materials other than those recommended in this manual, may lead to the risk of accidents.

2.3 Personal protective equipment

Wear protective equipment suitable for the operations being carried out. All clothing must be tight fitting.

Before starting work, authorised installers and maintenance technicians must wear the following personal protective equipment.

Protective gloves.

Hard hat.

Wear protective clothing. The clothing worn by personnel who operate or carry out maintenance on the heat recovery unit must comply with the essential safety requirements defined by the European directives and the laws in force in the country where the heat recovery unit is installed.

Wear safety shoes and protective gloves during all operations.

Always use a safety harness for any maintenance work carried out above ground.

2.4 Lighting of the work area

The heat recovery unit must be placed in a well-lit environment, so as to guarantee the installer and maintenance technician maximum visibility of the work area.

In the event of maintenance carried out in poorly lit areas, use additional lighting to ensure safe working conditions, in accordance with the requirements of the legislation in force.

It is recommended to use a lighting no less than that specified by EN 12464-1:2011, which defines a required lighting value of 500 lux for these types of systems.

As regards lighting for handling, installation and maintenance operation, spot lights must be used.

2.5 Residual risks

During design and construction of the unit, all areas or parts subject to risk were assessed and, consequently, all necessary precautions were taken to avoid risks to people and damage to the components of the heat recovery unit.

Such risks are those that may occur for the following reasons:

- errors during handling;
- lifting loads with sharp edges;
- incorrect use of personal protective equipment.

Operators must use personal protective equipment.

2.5.1 Risk of impact/crushing during lifting

Given that the presence of two or more operators is not required in the area surrounding the heat recovery unit during lifting and installation operations,

the operators may be exposed to the risk of impact/crushing.

Access to this area is the direct responsibility of the operator.

2.5.2 Risk of cuts during lifting and installation

The sheet metal used to construct the heat recovery unit may have burrs on the corners and edges.

Operators may consequently be at risk of cuts to their upper limbs due to incorrect handling or working without using the required personal protective equipment.

Access to this area is the direct responsibility of the operator.

3 Transport and handling

The unit must be placed in a suitable position on the transport vehicle, with the solid parts of the heat recovery unit positioned on a flat surface.

The fixed parts must be secured by specialist personnel to ensure safety and avoid damage to the mechanical parts.

If an open vehicle is used, suitable tarpaulins are required to prevent damage to the heat recovery unit.

During transport, make sure that the heat exchanger is suitably packaged and protected, to avoid damage.

Before unloading from the vehicle, check that no parts of the heat exchanger have been damaged during transport.

Before opening the package, make sure that there are no damaged parts; if damage is found, contact the **Recuperator** office.

If the heat recovery unit is not installed immediately after delivery, it must be wrapped in film to protect it against the elements and dust, especially if stored outdoors.

3.1 Handling

The heat recovery unit must be lifted and handled using suitable equipment for the weight of the parts, as specified above, always using lifting slings.

The mechanical structure of the heat recovery unit is designed and built with adequate safety margins, under conditions of static stress, and so as to define the serviceability limit state as specified by the Machinery Directive 2006/42/EC Annex I point 4.1.2.5 letter d).

All transport and handling operations must be carried out by suitably trained personnel.

Before beginning to lift the unit, check that the capacity of the lifting equipment is suitable for the weight of the heat recovery unit being handled.

Before beginning to lift the unit, always make sure that there are no other personnel near the load being lifted, i.e. in the “danger area”; operators must never pass or stand underneath any suspended loads.

When placing the handled load on the ground, place it down gently so as to prevent the parts of the heat recovery unit from being damaged.

3.2 Lifting

The heat recovery unit can be lifted from above using slings, cables or chains fixed to the hooks the heat recovery unit. Make sure that the bridge crane is equipped with slings or chains of suitable length and capacity.

Before moving the heat recovery unit, it is recommended to carry out a number of lifting tests, so as to make sure that the position of the slings ensures balanced distribution of the weights and to verify the stability and tightness of the attachments.

When strapping the heat recovery unit, pay the utmost care to prevent the ropes or straps used from sliding over fragile parts. It is good practice for a section of sling or strap to be wrapped rigidly around the lifting hook, as any sliding in the stretched sections may lead to imbalances.

The use of slings with a vertical divergence of greater than 120° is not recommended, as beyond this limit, even slight variations in angle, as shown in Fig. 3-1 - Capacity as a function of the opening angle, will bring about a considerable reduction in capacity.

The following graph shows the coefficient to be applied to determine the capacity of slings according to the conditions:

EXAMPLE: if using a two-leg sling with a vertical capacity (90°) of 10,000 N, to calculate the capacity with a vertical angle of 70° (the angle can be identified in the table when knowing the ratio between each leg *L* and the distance of the attachment hooks *A*). Dividing the vertical capacity (10,000 N) by the coefficient found on the diagram corresponding to a vertical angle of 70° (C=1.054) gives:

effective capacity at an angle of

$$70° = \frac{10.000}{1,054} = 9.488 \text{ N}$$

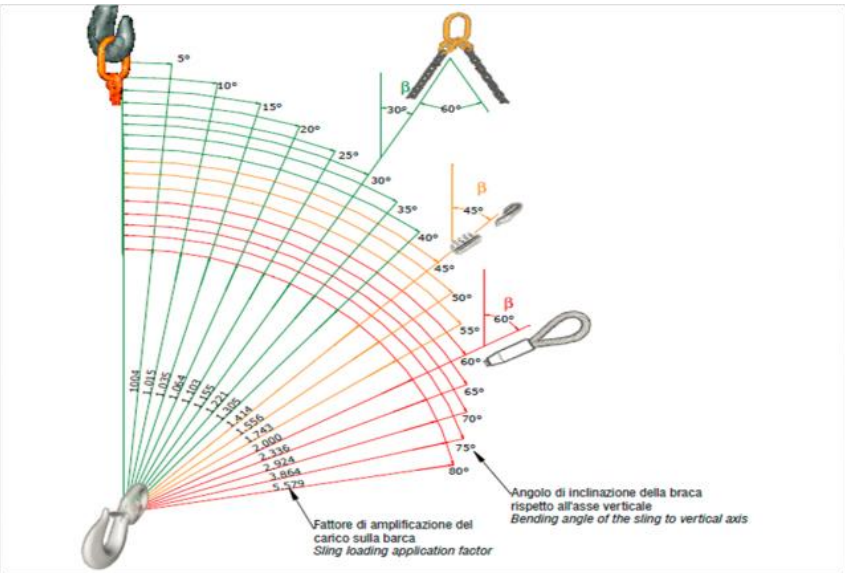


Figure 3-1 - Capacity as a function of opening angle

All capacities and technical references refer to the latest editions of international standards EN 13414-3 and EN 13411-1-2-3-4-5-6-8.

The capacity of a sling (whether made of rope, chain or fibre) varies according to the angle of inclination from the vertical axis (as per EN 13414-2).

All loading and unloading operations must comply with local and national safety regulations.

For the weights and dimensions of the heat recovery unit, see the data specified on the general assembly drawing.

The capacity of the lifting equipment and accessories must be adequate for the load being handled, always allowing a suitable safety margin.
Never use lifting equipment that does not comply with safety standards.

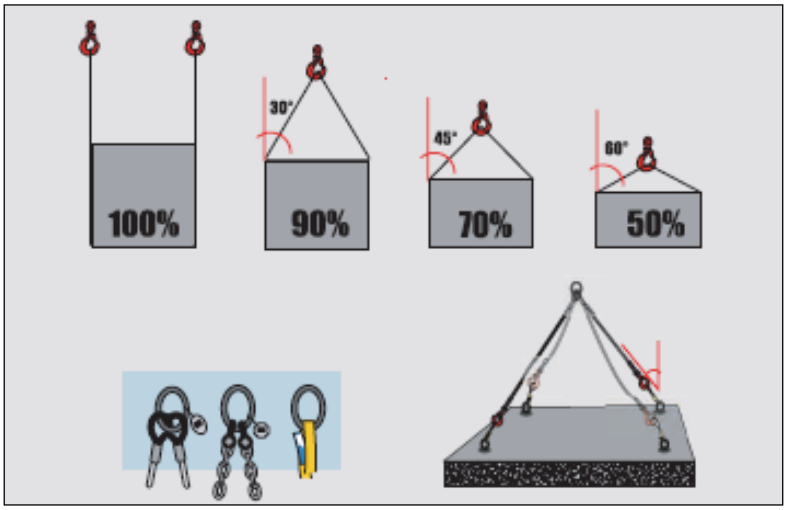


Figure 3-2 - Lifting diagram

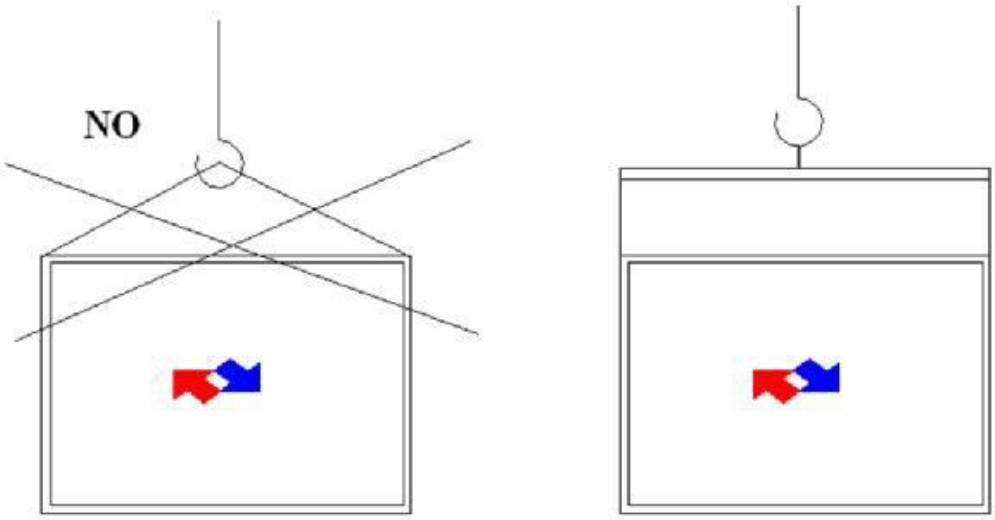


Figure 3-3 Lifting using a spreader bar

Figure 3-4 - Lifting spreader bar - Examples (not supplied)

The heat recovery unit must be lifted by hooking to the front panels (see figure) and the direction of tension must be vertical (parallel to the side panels) so as to avoid damage.

If the slings are not parallel to the sides, they exert a horizontal force that will bend the flanges and deform the sides.
Failure to use a spreader bar may cause irreparable damage to the heat recovery unit.

Do not lift the heat exchanger using the aluminium corner sections, as this may cause damage to the tightness of the heat exchanger.

In general, do not lift the heat exchanger from one point, rather always use a lifting spreader bar or beam (Figure 3-5 - Lifting the heat exchanger).

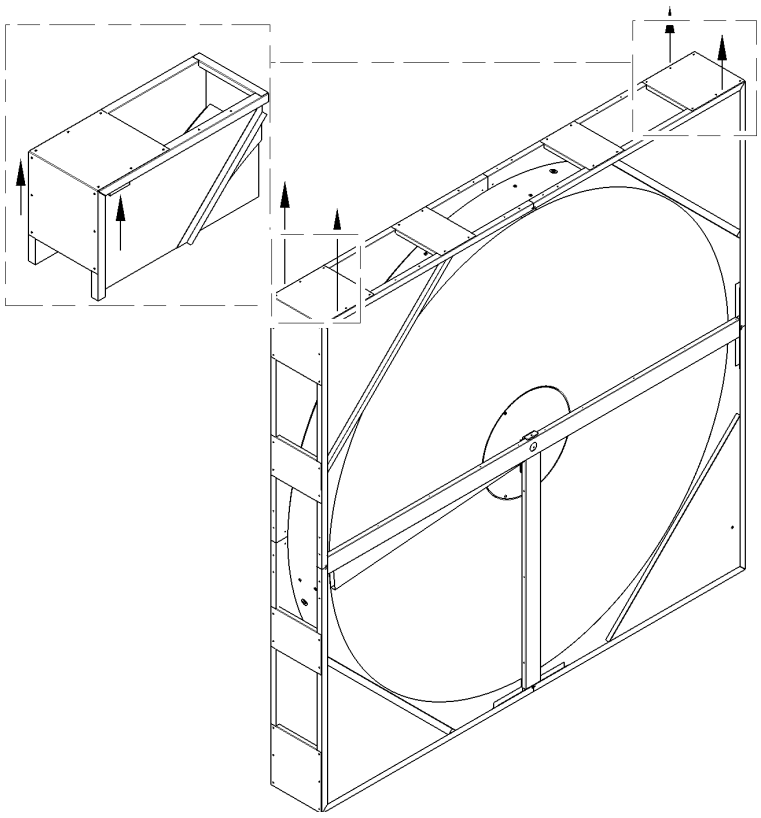


Figure 3-5 - Lifting the heat exchanger

4 Installation

The user must prepare the place of installation in a way that is suitable for the requirements of the heat recovery unit, as illustrated in this manual, in compliance with the technical specifications and the need for suitable clearance to carry out the required maintenance/adjustments.

Where possible, heat recovery unit installation area must be free of any materials that may impede or limit visibility.

If present, remove any fixing brackets used for handling.

The standard packaging is made from products that can be readily disposed of as municipal solid waste.
Nonetheless, it is recommended to dispose of the packaging separately for recycling, in compliance with the specific regulations in force in the place of installation.
Do not dispose of the packaging into the environment.

Once the heat recovery unit has been positioned and assembled, it must be levelled where necessary. Use a spirit level with decimal gauge.

The heat recovery unit must always be firmly secured to the support surface.

Caution! The frame is self-supporting, however it cannot support any additional loads!

The images below illustrate the possible installation layouts, showing the direction of air flow and the correct position of the fans.

The direction of rotation of the heat exchanger is indicated by a label with an arrow. Installation and air flow must comply with the above requirements.

The supply and exhaust air flows must pass through the rotary heat exchanger.

The unit must be placed on a smooth, level surface. In that position, the connecting ducts can be blocked directly.

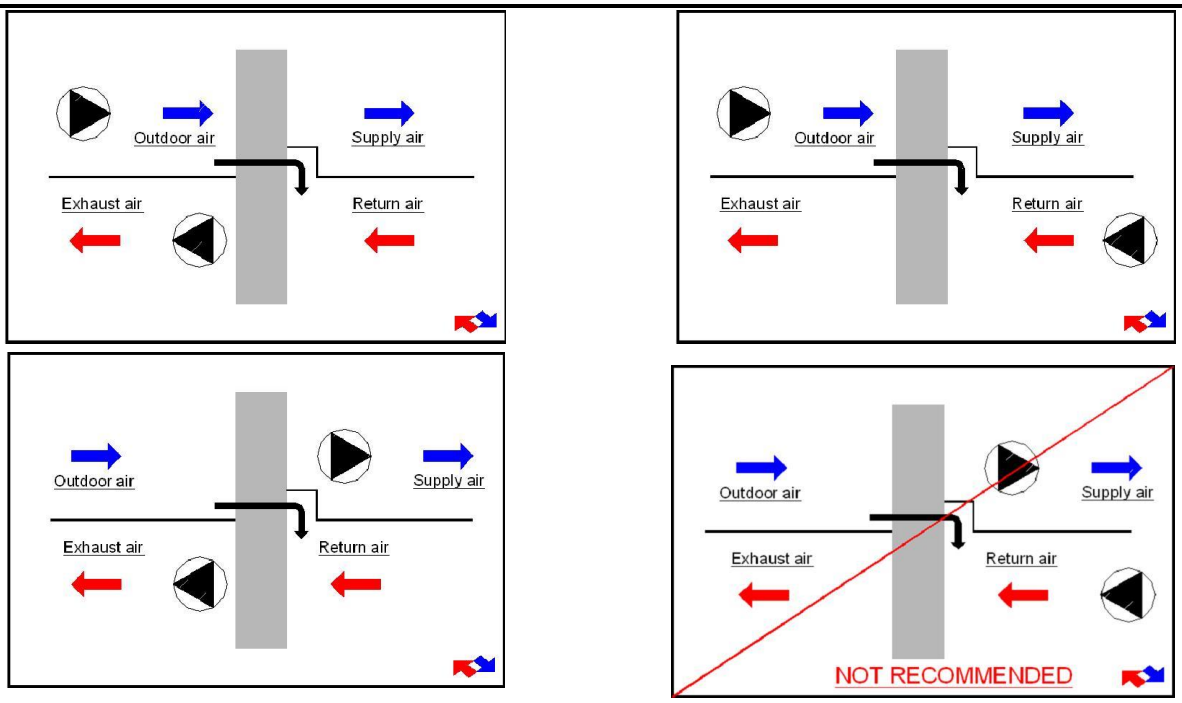


Figure 4-1 - Installation layout

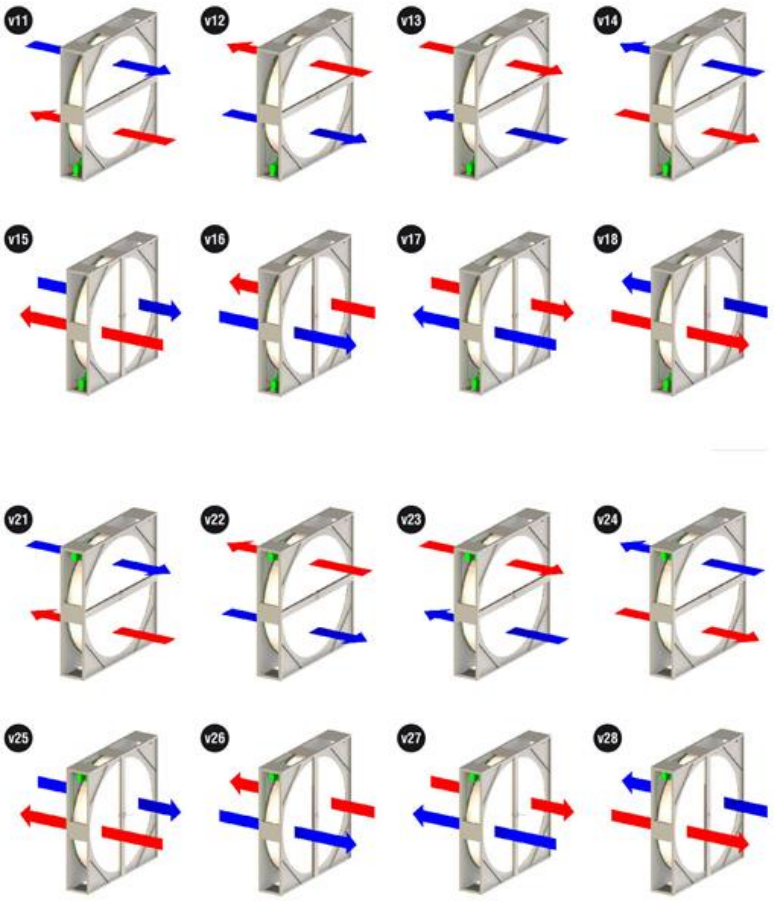


Figure 4-2 - Motor positioning

4.1 Direct drive motor connection

The electric motor that drives the heat recovery unit is sized according to the dimensions of the rotor. For constant speed operation a 400 V motor is used, while if the unit is equipped with a speed controller, a 230 V motor is used.
Before switching on the controller, verify whether the motor has a 3x230 V connection.

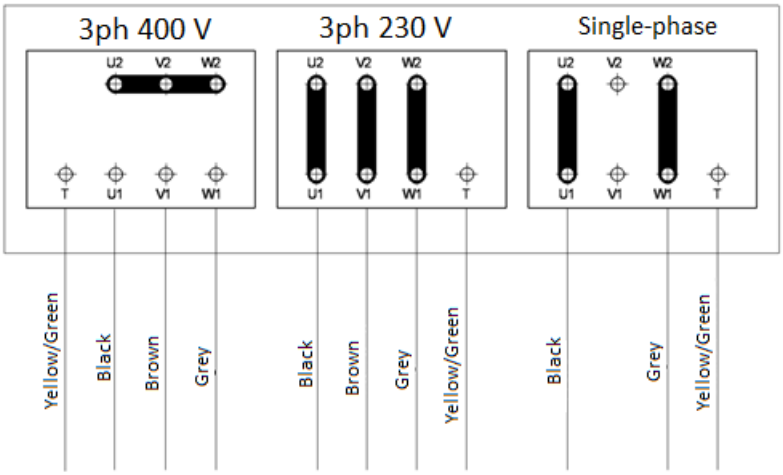


Figure 4-3 - Motor terminal block connection

Only change the direction of rotation of the motor after the motor has come to a complete stop.

If attempting to change the direction of rotation while the motor is still turning, the motor may ignore the reverse command or change the direction of rotation after a slight delay.

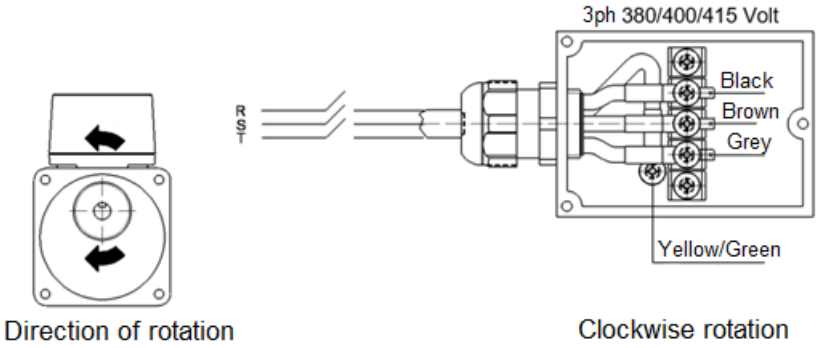


Figure 4-4 - Direction of rotation

For anti-clockwise rotation, reverse any of the two connections between R, S and T

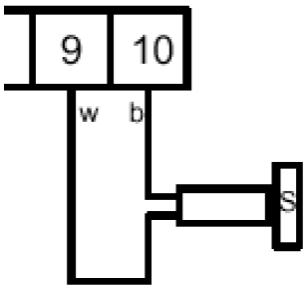
4.2 Speed controller installation

A magnetic sensor, as shown in the following figures detects rotor movement.

Sensor and fixing bracket Magnet with fixing screw

Figure 4-5 - Speed measurement - Accessories

The sensor is mounted on the frame, and must be connected to the Micromax speed controller as shown in the following diagram:



- white wire to terminal 9
- brown wire to terminal 10

Sensor assembly

The magnet (2) must be screwed to the rotor (1) at a maximum distance of around 15 mm from the sensor and with the south pole facing the sensor (3).

Note that the south pole is marked with an (S) on the magnet.

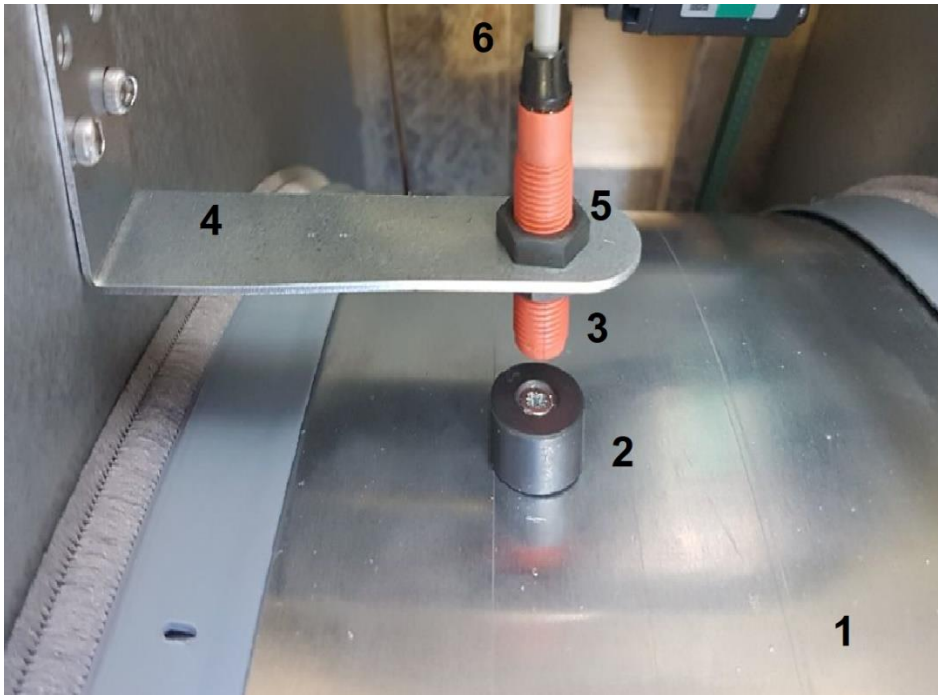


Figure 4-6 - Speed measurement

1. Rotor
2. Magnet
3. Measurement sensor
4. Sensor fixing bracket
5. Sensor fixing nuts
6. Connection cable

Reed sensor

Depending on the type of controller used, a different magnetic rotation sensor may be installed.
A passive magnetic reed sensor is required for ABB inverters.
To connect to the inverter, see the inverter instruction manual.

4.3 Inverter assembly (if featured)

Figure 4-7 – Micromax inverter

The inverter must only be used if in perfect technical conditions. Any damage may affect safety and should be notified immediately.

Maintenance/repairs

Operation of the inverter must be checked regularly.

Troubleshooting and repairs may only be performed by qualified personnel.

All electrical safety regulations must be complied with.

Disposal and recycling

When replacing some components or when needing to replace the entire inverter, adopt the following recommendations:

- Never dispose of electrical components as ordinary waste, always use designated collection points.
- Disposal must be managed respecting the environment. Maximise the recycling of raw materials so as to reduce environmental impact.

4.4 Inverter connections (if featured)

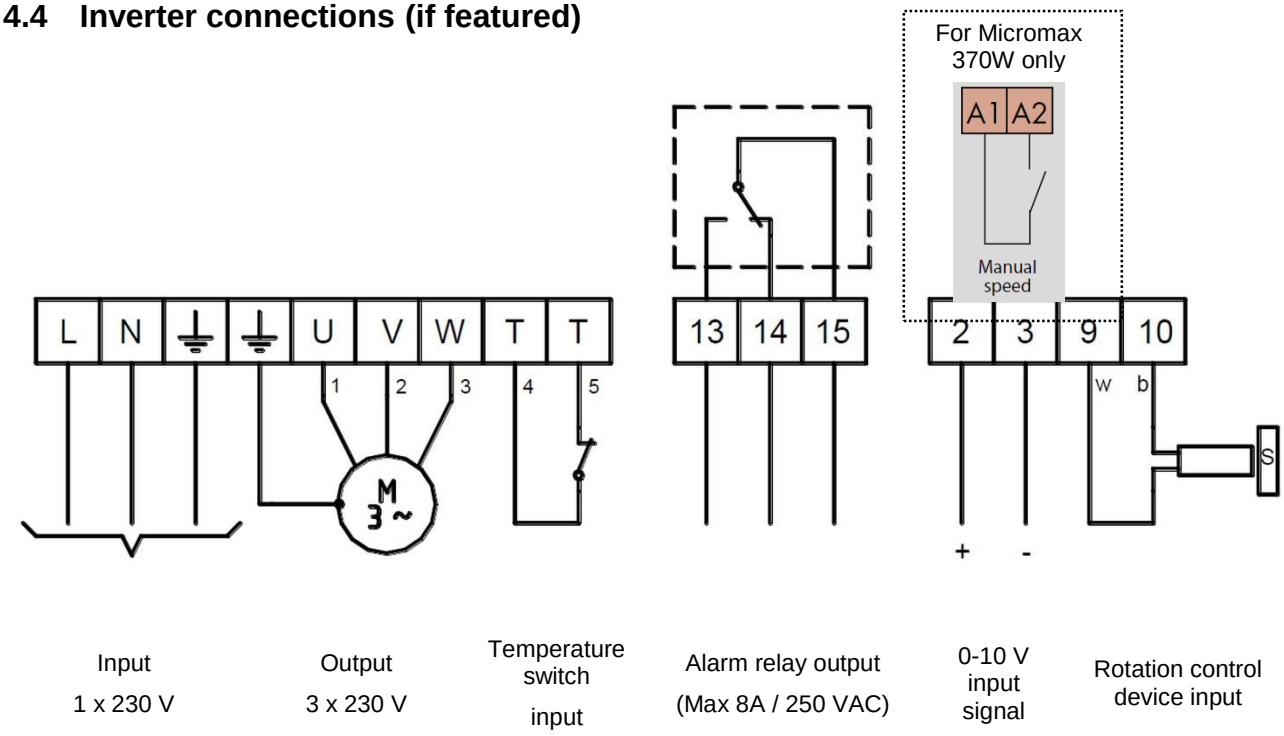


Figure 4-8 - Inverter connection diagram

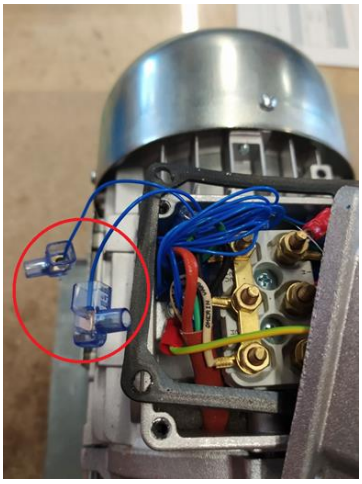
Disconnect power before starting any work on the equipment.

Recommended terminal tightening torque 0.5 Nm; maximum tightening torque 0.8 Nm.

Input voltage (L-N-PE)	1x230-240 V +/-15%, 50/60 Hz.
Temperature switch (T-T)	This must be bridged if the motor temperature switch is not connected.
Alarm relay (13-14-15)	Closes contact 14-15 in the event of an alarm or power failure. Max 8 A / 250 VAC.
Input signal (2-3)	0-10 V
Rotation control device (9-10)	• Connect the white wire to terminal 9 and the brown wire to terminal 10. • Install the magnet so that the south pole faces the transmitter (sensor). • Max distance 15 mm.
Manual speed (A1-A2)	Maximum rpm regardless of the input signal value.

Protective earthing: connection required by current legislation (In Italy, CEI 64-8/4) to keep the metallic masses at earth potential in normal operating conditions.

4.5 Thermal protection



All electric motors are equipped with internal thermal protection.

In some cases, special sensors can be used to connect this to the inverter, which will then signal any interruptions to operation due to overheating.

To connect to the Micromax inverter, remove the protective caps at the ends of the six blue cables and connect them to the inverter.

If not needing to connect the thermal protection cables, the temperature switch terminals T-T must be jumpered.

Figure 4-9 - Thermal protection

4.6 Alarm management in installations with inverters

In the event of an alarm, the green LED flashes and the red LED underneath comes on steady.

All alarms need to be reset manually.

In the following cases, the speed controller needs to be reset.

Rotation (red 1)	**The controller has sensed activation of the rotation control device.**
Possible causes due to installation errors:	• Magnet positioned incorrectly. • Magnetic transmitter connected incorrectly (polarity reversed). • See the links in paragraph 4.4.
Possible causes due to errors during operation:	• The belt is broken. • The belt slips. • The rotor is blocked. • The magnetic transmitter or magnet is faulty.
Motor temperature (red 2)	**The motor temperature switch has tripped due to overheating of the windings.**
Possible causes of the error:	• See point 1 Overcurrent. • The motor temperature switch is deactivated when the temperature decreases.
Overvoltage (red 3)	**Overvoltage.**
Possible causes of the error:	• The controller activates the error if the supply voltage exceeds 250 V (276 V for Micromax 370W inverter) for more than 4-5 seconds.
Undervoltage (red 4)	**Undervoltage.**

Possible causes of the error:	• The controller activates the error if the supply voltage is below 205 V (195 V for Micromax 370W inverter) for more than 4-5 seconds.
Short circuit / Overvoltage and undervoltage, both LEDs flash (red 3 and 4)	**Item 1. Overcurrent /*Short Circuit*.** The controller limits the current to 1.2 A (90 W), 2.4 A (180 W), 4 A (370 W) and activates the error if the condition persists for more than 4-5 seconds.
Possible causes of the error:	• The motor is undersized for the rotor diameter. • The rotor has difficulty rotating. • The motor is defective, for example, faulty bearings. Measure the current draw.  If the heat exchanger is equipped with a 25 W/75 rpm motor, the controller will not activate the error as the current is less than 1.2 A (90 W), 2.4 A (180 W) even when the motor shaft has stopped. Consequently, the controller activates the error after 5-6 minutes, due to activation of the rotation control device or the temperature switch as a result of motor overheating.
	Item 2. Phase-phase short circuit. The controller limits the current to 1.2 A (90 W), 2.4 A (180 W) and activates the error if the condition persists for more than 4-5 seconds.
Possible causes of the error:	• Faulty motor winding. Measure the motor resistance, it should be more or less the same for all phases. • Short-circuit between the phase wires.
	Item 3. Phase-to-earth short circuit (earth fault). The controller immediately activates the error.
Possible causes of the error:	Earth fault in the motor or cable.  To reset the controller after an earth fault, disconnect power.

 Correct voltage and current values can only be read using a moving iron ammeter.

4.7 Starting the heat recovery unit

Start-up includes checking correct mechanical and electrical installation.

- Make sure that the air flows can pass freely through the heat exchanger.
- Check that the heat exchanger has been installed correctly and make sure that the operating limits (temperature, pressure difference, etc.) cannot be exceeded.
- Check that the rotor rotates smoothly, without impediments. Visually check the adjustment of the seal brushes: these brushes should lightly touch the rotor.
- Check free access to the drive motor.
- Check the direction of rotation.

- Check tension of the drive belts.
- Check the electrical connection. Change the direction of rotation if necessary by reversing the phases.
- If the speed controller is fitted, see the specific start-up instructions.

5 Maintenance

The matrix can be cleaned using compressed air (for dust deposits), making sure not to damage the plates and seals, or by spraying with detergents for greasy deposits. Strongly alkaline solutions or other substances that are aggressive to aluminium or the sealant obviously must be avoided.

In countries where there may be sandstorms, provide sand filters and high efficiency pocket filters on the outside air intake.

To ensure the highest performance, rotary heat exchangers require simple periodic maintenance, which includes:
a) cleaning the matrix from build-up of fibres, dust or other;
b) checking the motor;
c) checking the condition and tension of the transmission belts.

5.1 Service and maintenance

The environment around a heat exchanger affects its operation, efficiency and pressure drop.
The main parts of the heat exchanger need to be checked regularly, especially if there is a deterioration in air quality.
Periodical visual inspection is sufficient.

5.2 Rotor maintenance

The rotor must be checked regularly to avoid the build-up of dust and dirt. Even if the air handling unit is equipped with filters, these may break and allow dirt to pass and block the rotor.

If dust and dirt build up on the rotor, it can be easily removed using one of the following methods:
- Vacuum cleaner, for dry dirt;
- Compressed air, for large amounts of dry dirt; be careful not to damage the rotor;
- High pressure cleaner with warm water (max. 70°C) or with detergent spray (e.g., decade, nd-150, chem zyme, primasept, poly-det, oakite 86m or the like) to remove for large greasy deposits.

Strongly alkaline substances or solutions or other substances that are corrosive to the rotor must of course be avoided.

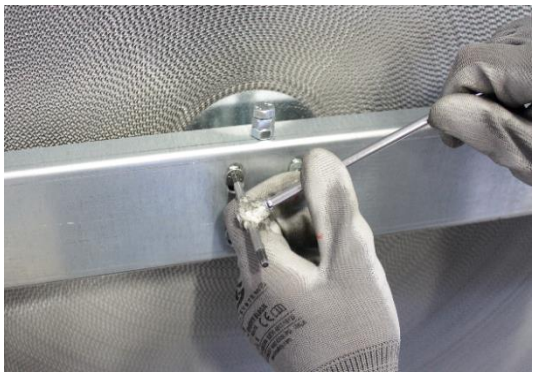
- The minimum distance of the spray nozzle from the rotor must be no less than 30 cm, the maximum pressure must be 50 bar (e.g. Karcher cleaner).
- The detergent must be mild (it must not be strongly alkaline or acidic as it may react with the aluminium)
- After cleaning, blow away any water that may have formed inside the rotor.

- When cleaning, make sure not to damage the heat exchanger mechanically or chemically.

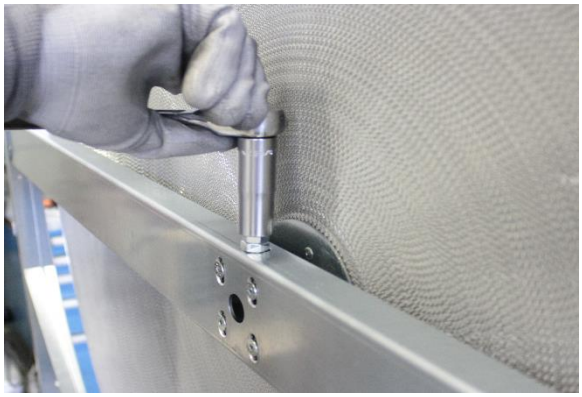
5.2.1 Rotor adjustment

Check the correct alignment of the heat exchanger's rotor by disconnecting the power supply and turning the wheel by hand.
The wheel can only be adjusted by acting on its vertical axis, using the screws on each side.

From Ø 500 mm to Ø 1350 mm



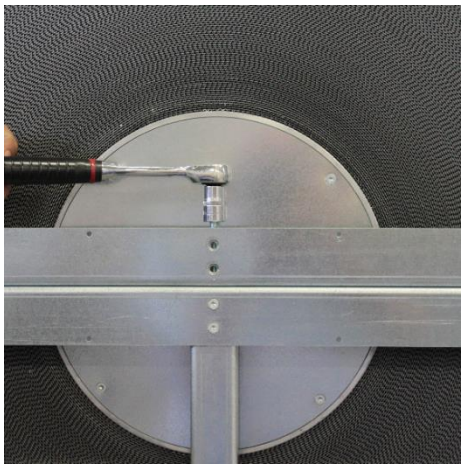
1) Loosen the 4 centre screws



2) Adjust convergence of the wheel using the vertical screw.

From Ø 1400 mm - Ø 1950 mm

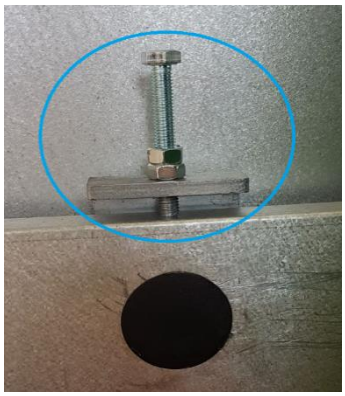
2) Loosen the two screws

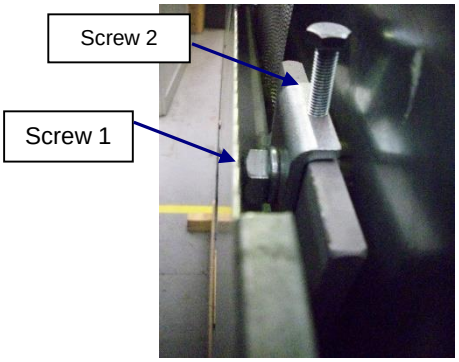


3) Adjust convergence of the wheel using the vertical screw

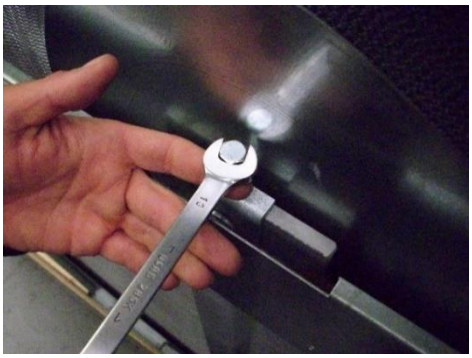
From Ø 2000 to 2400 mm

1) The adjustment screws are located in the centre of the heat exchanger, screw 1 is covered by a cap or by adhesive tape.





2) Loosen screw 1



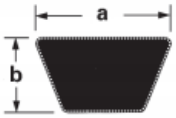
3) Adjust convergence of the wheel using the vertical screw (screw 2)

5.2.2 Belt

PERFORATED V-belt

Made of a special rubber and canvas compound, it can be removed without needing to take off the pulley.
The V-belt is available in two versions:
CR-TR-A13T and CR-TR-Z10T, depending on the pulley used.

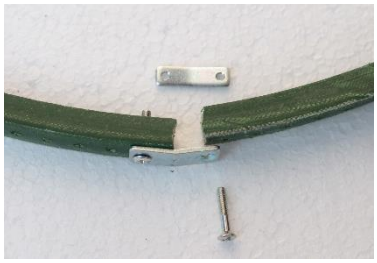
Sezioni	a [mm]	b [mm]
Z	10	6
A	13	8



For correct operation:

- Check drive belt tension after the first 100 hours of operation.
- Regularly check the condition of the drive belt for wear and tension when the wheel is stationary.
- Tension can be increased by shortening the belt
- Check that the length of the belt is such as to ensure correct transmission of rotation, without slipping.

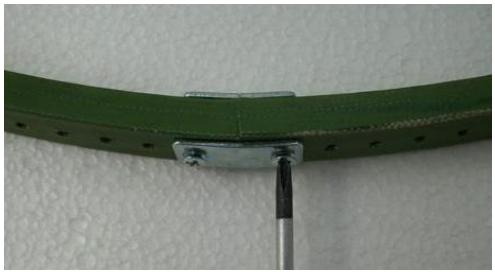
To replace the belt:



- Open the connecting link and slide the old belt off the pulley.

- Check that one end of the new belt is cut near a through hole, otherwise cut as required.

- Place the new belt around the rotor, pull it hard and cut it to the required length.



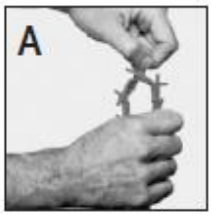
- Secure it with the connecting link, tightening the two screws in the existing holes. Finally, couple the belt to the motor pulley.

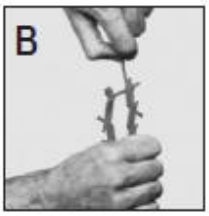
- Finally, check that the belt is correctly tensioned before restarting the rotor.

Powerbelt

This is a modular belt made from polyurethane with polyester fabric inserts

It is available in two versions: CR-HV-Z10P and CR-HV-A13P. Both have a V shape and comprise several links; the instruction manual will be attached for assembly.





5.3 Maintenance of the gaskets between the rotor and frame

The gap between the rotary gaskets and the rotor must be checked during inspection and corrected if necessary.

The gaskets require no further maintenance.

The nylon brushes used on the rotors cover the perimeter of the wheel to keep it clean and isolate the two air flows.

Regularly check that the brushes are intact, when the rotor is not turning. If worn, they must be adjusted or replaced.

There are eyelets on the internal brush guides to allow the gap between the motor and the side of the casing to be adjusted.

- Gasket replacement

Loosen the fixing screws on the brush and rotor gaskets.
Remove the brushes from the rotary heat exchanger and replace the gaskets with identical spares, making sure tightness is correct.
Tighten the screws.

5.4 Drive maintenance

The rotor is driven by a motor via a belt wound around the rotor.

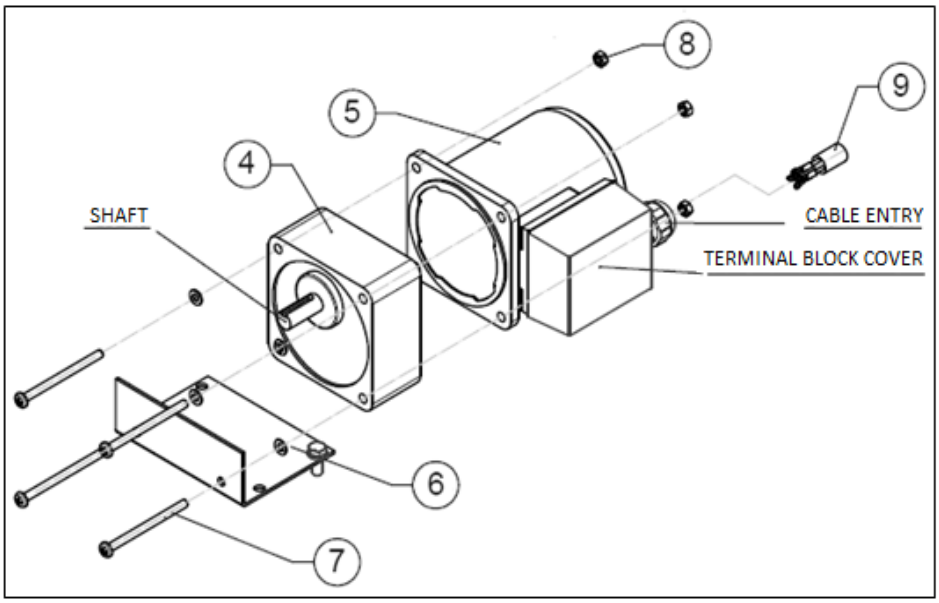
Drive belt tension should be checked after the first 24 hours of operation and a second time after 100 hours of operation.

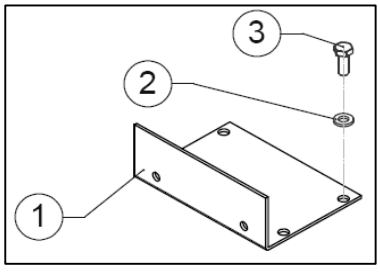
Tension can be increased by shortening the belt.

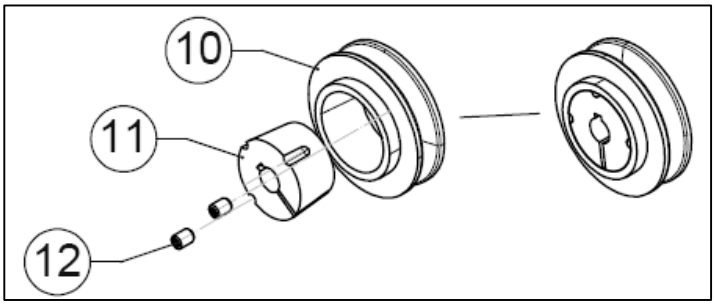
The motor itself is maintenance-free.

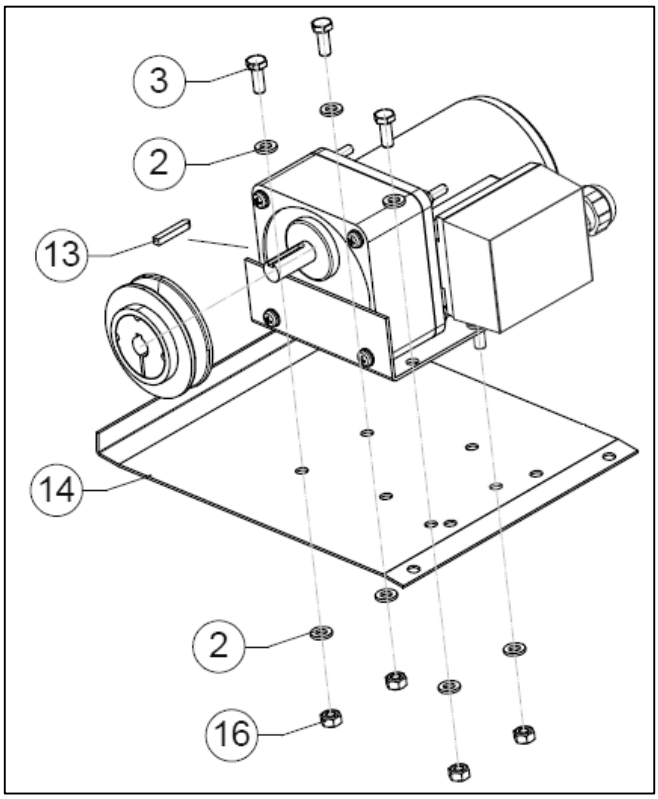
5.5 Direct drive motor replacement

The assembly sequence for the rotor drive motor is described below.





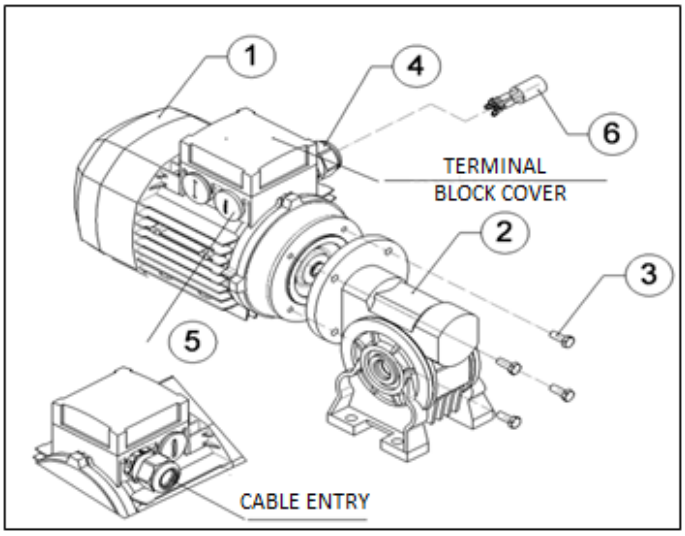


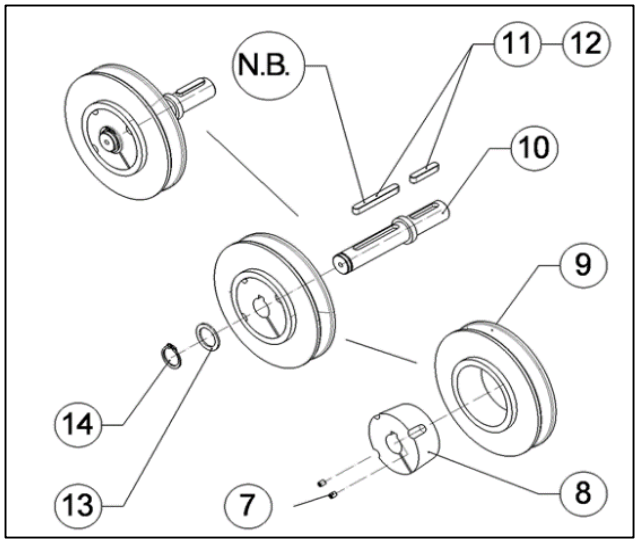


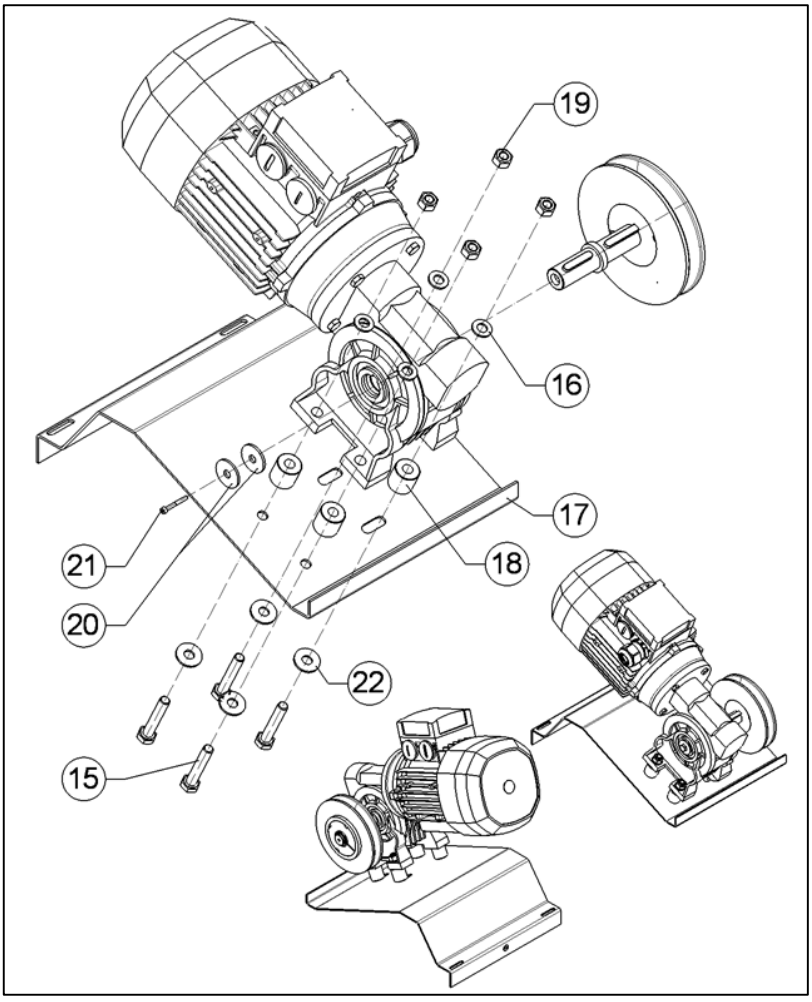
15	ISO 4033 M6 hex nut
14	Reduction drive L plate
13	Reduction drive key
12	Bush-pulley locking screw
11	Conical bush for SPZ pulley …. Hole Ø... mm
10	SPZ XXX 01 pulley hole suitable for conical bush ….
9	Ferrule-eyelet wiring kit, 1500 mm long
8	Motor fixing nut
7	Motor fixing bolt
6	Motor fixing washer
5	Three-phase motor, 230V or 400V 40W
4	Reduction drive
3	ISO 4017 M6x16 galvanised hex head screw
2	ISO 7089 galvanised washer ID 6 mm OD 12 mm
1	Reduction drive adapter plate

5.6 Drive motor with reduction drive replacement

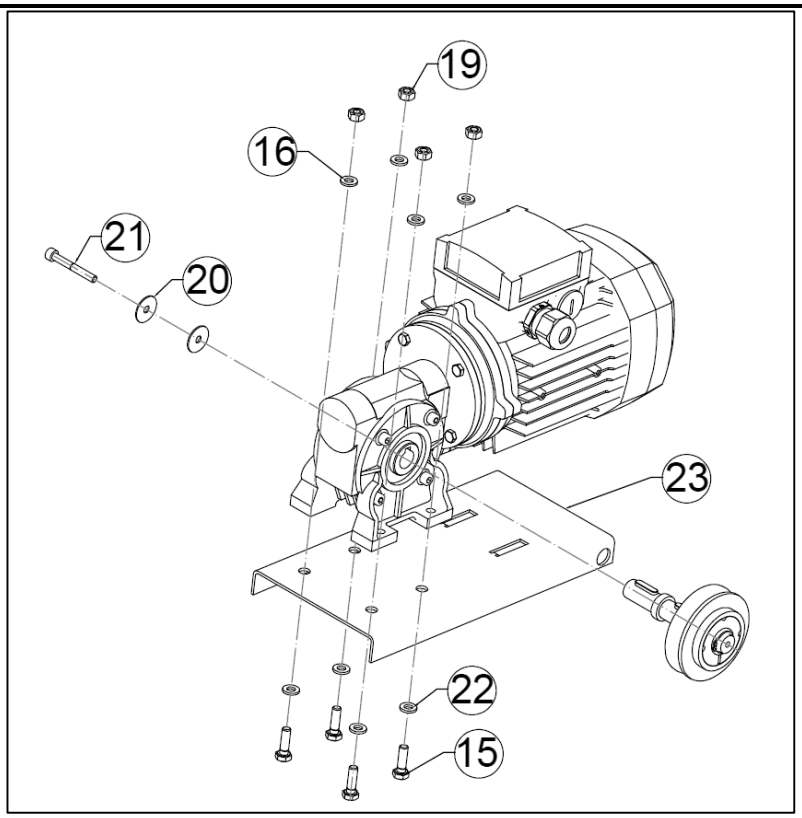
Type A:







Type B: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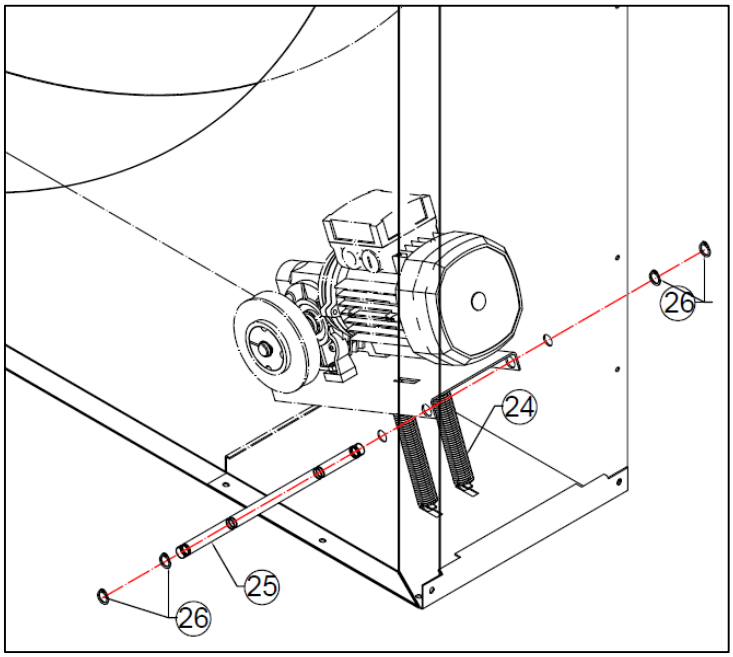
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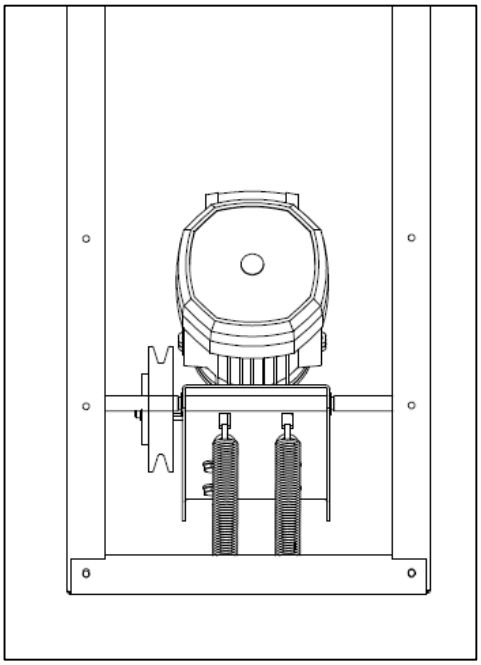

26	DIN 471 retaining rings
25	Pin for tilting plate
24	Tension springs
23	Rotary reduction drive plate from R1400 to R2400 for springs
22	ISO 7093 galvanised washer ID 6 mm OD 24 mm
21	ISO 4762 M5x40 galvanised cap head screw
20	ISO 7093 galvanised washer ID 5 mm OD 20 mm
19	ISO 4033 M6 hex nut
18	Spacer between motor plate and rotary reduction drive
17	Rotary reduction drive plate from R1400 to R2400
16	ISO 7089 galvanised washer ID 6 mm OD 12 mm
15	ISO 4017 M6x45 galvanised hex head screw
14	Bonfiglioli single shaft kit - retaining ring
13	Bonfiglioli single shaft kit - gasket
12	Bonfiglioli single shaft kit - large key
11	Bonfiglioli single shaft kit - small key
10	Bonfiglioli single shaft kit - pin
9	SPZ XXX 01 pulley hole suitable for conical bush ….
8	Conical bush for SPZ pulley …. Ø14 mm hole
7	Bush-pulley locking screw
6	Ferrule-eyelet wiring kit, 1500 mm long
5	Cap already on the terminal block
4	Cable gland already on the terminal block
3	Fixing screw between motor and reduction drive
2	Bonfiglioli VF 30 A xx PAM56 B14 B3 reduction drive
1	Bonfiglioli BN56B-4-B14 230/400V 50Hz 1350rpm 90W motor
Pos.	Description

6 Dismantling

The heat recovery unit must be dismantled by specialist personnel using the required equipment.

During the dismantling of the heat recovery unit, special attention must be paid to disposal of the components.

For some types of materials, such as hydraulic oils and lubricants or used filters, the regulations in force must be complied with for disposal.

Waste disposal operations must be carried out in accordance with the local and national legislation in the place where the heat recovery unit is installed.

Before starting to dismantle the unit, make sure there is sufficient space around the heat recovery unit to allow all movements to be performed without risk to personnel.

Before dismantling the heat recovery unit, switch off the power supply disconnect device and lock it in the open position.

- Remove the heat recovery unit from the installation area, adopting all the instructions shown in this manual; before lifting the unit, check that the lifting brackets and locking devices are tightly secured and only use suitable slings and equipment.
- Disassemble the various components of the heat recovery unit, separating them as far as possible by type of material; for example, separate the plastic parts, which must disposed of separately from the other material, in compliance with current regulations.

For most of the metallic components, simply separate the ferrous parts from other metals or alloys for correct recycling.