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INSTALLATION AND OPERATING INSTRUCTIONS XPXR

Rotary Heat Exchangers

AeroMaster
XP

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General Information

- This document updates information included in the original air-handling unit accompanying document "Installation and Operating Instructions - AeroMaster XP Air-handling Units".
- Keep these Instructions for further use. The installation and operating documentation must be available for the operating and servicing staff. It is advisable to store this documentation close to the product or installed air handling unit.
- Before any handling, installation or use of the heat exchanger, as well as during operation, maintenance or repairs of the air-handling unit, the operating staff must read and observe the applicable instructions and recommendations included in the following sections as well as the instructions included in the "Installation and Operating Instructions - AeroMaster XP Air-handling Units"

Use

Rotary regenerative heat exchangers are used for heat recovery, and are designed to transfer heat (non-hygroscopic version), or to transfer humidity (hygroscopic version) while simultaneously maintaining the ability to transfer heat from the outlet air to the inlet air. The heat or humidity transfer takes place in the rotor, one half of which reaches into the hot outlet air flow and the other half into the cold inlet air flow. As the rotor turns, the heat-exchange surface of the heat exchanger passes in turn through the outlet and inlet air flow, and thus heat or heat and humidity transfer is enabled.

Operating Conditions

- XPRJ and XPRF rotary heat exchangers are designed to be installed within the AeroMaster XP air-handling unit. Use and operating conditions are related to the entire AeroMaster XP air-handling unit, and they are specified in the air-handling unit's documentation.
- Heat exchangers are designed to transfer air heat at temperatures ranging from -20°C to +55°C, or up to +100°C if made to special order.
- Operation at temperatures below -20°C is possible providing antifreeze protection of the heat exchanger is ensured (refer to the section Heat Exchanger Antifreeze Protection on page 6).
- Maximum velocity of transported air through the rotor is 4.0 m/s (checked just after the rotor). A version for higher air velocities with a reinforced rotor can be ordered for an additional charge.
- Inlet and outlet air for the heat exchanger must be filtered to avoid fouling of the rotor's cells.
- To enable servicing, maintenance and cleaning of the heat exchanger, it is necessary to provide a service access from both sides of the heat exchanger by inserting the access section (service section, filtration section, etc.) in the air-handling assembly, respectively to enable the heat exchanger to be pushed out of the air-handling unit (more than 1/2 of the heat exchanger construction width).
- The flushing chamber carries out its function only if the directions of the inlet and outlet air flow oppose each other. The flushing chamber is always situated on the inlet air side behind the heat exchanger.
- If ordered and for an additional charge, the heat exchanger can be fitted in the factory with a collecting tray for condensate draining.

Design

The heat exchanger rotor is made of thin aluminium sheet in enthalpy version with sorption coating, and it is driven by a belt. The rotor shaft is supported by ball bearings, respectively taper roller bearings. The reinforced frame of the heat exchanger is made of galvanized sheet steel. The rotor is sealed to the flushing chamber by special brush sealing. The external casing is created by 25mm sandwich panels filled with mineral wool; the panels can be delivered either galvanized or with painted face sides.

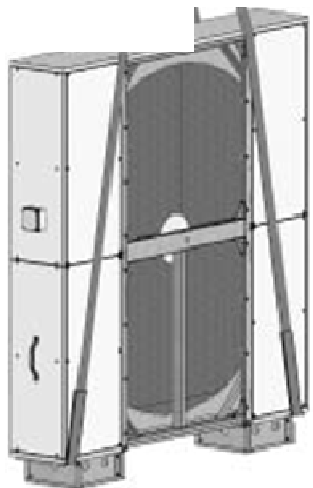
Handling and Transport

Increased attention must be paid to the safety of persons as well as of the product when handling the rotary heat exchanger, which due to its dimensions (tall and narrow), weight and high centre of gravity is very unstable. The manufacturer recommends always fixing the position of the rotary heat exchanger with suitable roping if it is not assembled in the section assembly! The rotary heat exchanger can only be stored, transported or handled in the vertical position. Any tilting leading to a change in the position of the rotation axis may

damage the rotor's evenness and bearing beddings. If the section dimensions exceed the height of the truck, it is necessary to cover it with an additional tarpaulin.

Larger heat exchanger sizes can be lifted using a crane. There is a space provided in the base frame to fasten lifting straps (see figure). The lifting straps must be protected by sleeves. The product can be transported by forklift truck only if secured against falling.

Figure 1: Handling the heat exchanger



Installation Site

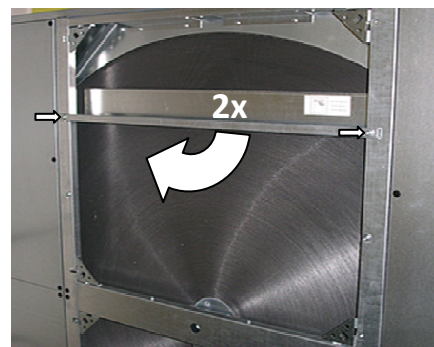
The surface of the site for the air-handling unit installation must be level and flat. Maximum misalignment of the floor or supporting structure intended for the air-handling unit installation must not exceed 1 mm per 1 meter. Observance of this condition is important for installation as well as for the air-handling unit operation.

To enable regular servicing, maintenance, guarantee and post-guarantee servicing, it is necessary to provide a service access from both sides of the heat exchanger's rotor. If this is not enabled by the air-handling unit assembly arrangement, the air-handling assembly must be designed so that the heat exchange can be pushed out from the air-handling assembly. Minimum required space is 1.15 x width of the XP air-handling unit.

Removing the Rotor Fixation

The heat exchanger rotor is in its upper part fixed with two clamping bars to avoid dynamic loading of the rotor during the transport. These two bars must be removed before the heat exchanger installation.

Figure 2: Rotor Fixation Removal



Installation

During installation, it is ESSENTIAL to retain alignment of the AeroMaster XP unit and rectangularity of the heat exchanger. Failing to maintain the above-mentioned condition will result in rotor displacement, which will influence the tightness and service life of the air-handling assembly. If 300 mm or 400 mm base frames are used, it will be necessary to install a separate foot on the heat exchanger base frame before installing the heat exchanger in the assembly to eliminate the height difference (see figure # 3).

It is advisable to connect one side of the heat exchanger to the assembly first and then check the rotor alignment (the distance between the wheel circumference and face walls must be aligned and the rotor must not drag in any position when freely rotated). If any problem occurs, wheel centring must be performed, refer to the section Troubleshooting (if you have any questions or doubts, contact the manufacturer's service department).

The limits are as follows:

- Depressing the brushes to 1.5mm (i.e. the distance of the brush plastic bar from the face sheet).
- The gap between the brush and the face sheet: 1.0mm.

If the brushes are not tight, they can be adjusted by changing the position of the plastic support bar.

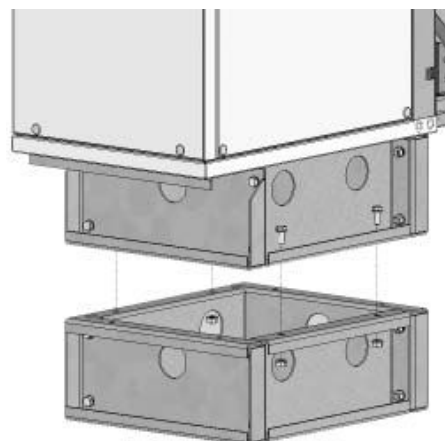


Figure 3: Frame height adjustment

Warning:

A rotary heat exchanger is one of the most expensive components in an air-handling assembly; poor and/or incorrect installation can result in costly repairs. Misalignment can be caused by improper handling during transport and/or failing to observe conditions for its correct installation. If the misalignment prevents free rotation of the rotor, the rotor will have to be centred using a centre screw. If this is the case, contact the manufacturer of the air-handling device.

Wiring

To connect the heat exchanger to the power supply, use the terminal box situated on the side panel above the service panel.

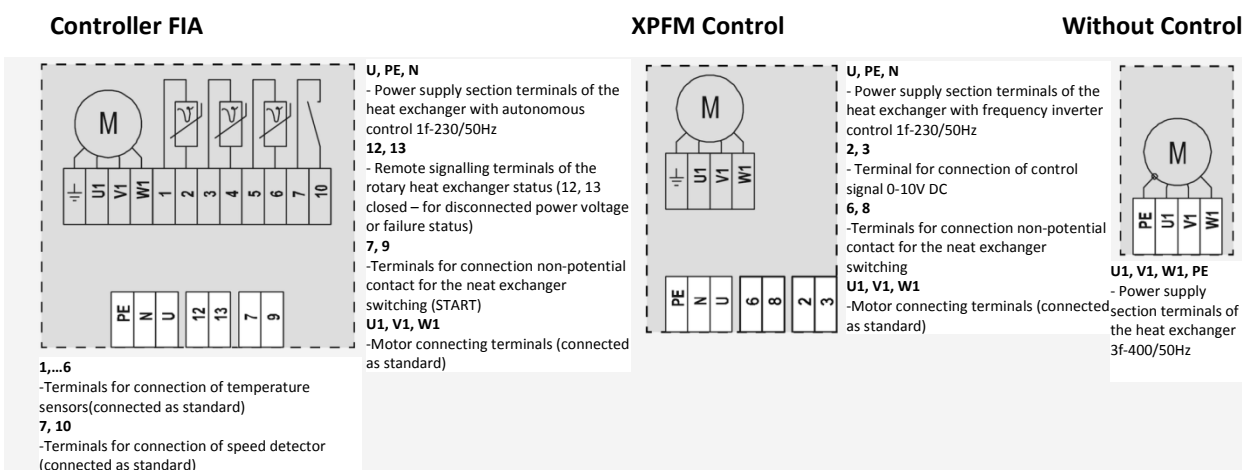
The heat exchanger's operation can be controlled by a frequency inverter as follows:

- Autonomous control using an FIA controller
- Control using a frequency inverter (XPFM) and a control unit

When positioning the frequency inverter, observe its operating conditions (degree of protection, temperatures, wiring harness, etc.) in accordance with the accompanying documentation, respectively the type plate.

Connection without control - 3x400 VD/50Hz; connection with the supplied frequency inverter - 3x230 VY/50Hz.

Figure 4: Heat Exchanger Wiring Diagram



Commissioning

Before the first start-up, perform the following checks:

- Check the rotor and exchanger's frame alignment.
- Check the rotor for free rotation.
- Belt tension
- Close fitting of sealing brushes
- Check the motor for correct wiring.
- Motor running direction
- Input current of the motor (refer to the type plate)

When handing over the air-handling unit, create records of operating staff training, operation, inspections and cleaning of the rotary heat exchanger in accordance with this document (subject to guarantee validity).

Regular Inspections



Before starting maintenance, cleaning and/or any service work on the rotary heat exchanger, it is essential to disconnect the power supply and take precautions to avoid the accidental switching on of the motor during performance of these works.

Rotary heat exchanger condition inspections must be performed regularly; checking the rotor for cleanliness is the most important part of these inspections. To monitor the heat exchanger rotor fouling, it is advisable to perform regular checking of the heat exchanger rotor pressure loss. The heat exchanger rotor pressure loss must not exceed 15% of the pressure loss value measured on a new rotary heat exchanger. The user will determine the intervals for regular inspections according to the operating conditions, however, at least once every 3 months. At the same time, the user must perform the following checks:

- Check the functionality.
- Check the rotor for cleanliness.
- Check the sealing brushes for tightness.
- Check the rotor condition and tension of the driving belt.
- Check fouling of filters; inlet and outlet.

If fouled or damaged, the filters must be replaced with new ones immediately. If any fouling of the rotor is found, the user must ensure its expert cleaning. Failure to perform maintenance can result in permanent damage to the rotary heat exchanger rotor and very expensive repairs.

Heat Exchanger Antifreeze Protection

At very low temperatures, usually from -15°C to -20°C, the heat exchanger will start to freeze on the outlet side (hot and moist air will condense on the cold rotor surface). Excessive ice build-up can restrict the air flow through the rotor to such an extent that the heat exchanger pressure loss exceeds the bearing capacity, causing the rotor to collapse (tearing of the reinforcement bars from the rotor centre).

The general rule is that the thermal capacity of the heat exchanger directed from the room towards the outdoor space must be higher than the thermal capacity coming in. The following antifreeze protections can be used with rotary heat exchangers:

- Speed control or safety turning off of the heat exchanger
- Inserting a preheating device on the cold air side

Downward speed control using a frequency inverter can reduce the heat (cold) transfer and thus adjust the thermal capacities of the heat exchanger above freezing level. The advantage of this solution is that the heat exchanger is not stopped. If antifreeze protection without output control (FM) is used, the rotor will

be stopped if frozen, and simultaneously the entire heat transfer capacity through the heat exchanger is stopped, too.

So heat exchanger antifreeze protection can be resolved as follows:

1. By rotor speed control using a step-less controlled frequency inverter and a temperature sensor (reading the outlet air temperature behind the heat exchanger).
2. By monitoring the heat exchanger pressure loss and stopping it (without FM, or with FM FIA).
3. Using a preheating device.

Heat Exchanger Cleaning

There are several ways of how to clean rotary heat exchangers, including specially adapted cleaning machines. An appropriate cleaning method must be chosen depending on the level of rotor fouling. In normal conditions, the rotor has a certain self-cleaning ability due to continuous changing of the air flow direction (inlet x outlet). The flushing chamber prevents particles from the outlet air from passing due to rotation into the inlet air. However, this flushing chamber does not in any way contribute to rotor cleaning. If the sealing brushes are properly installed, they will help in cleaning (sweeping) the heat exchanger face surface.

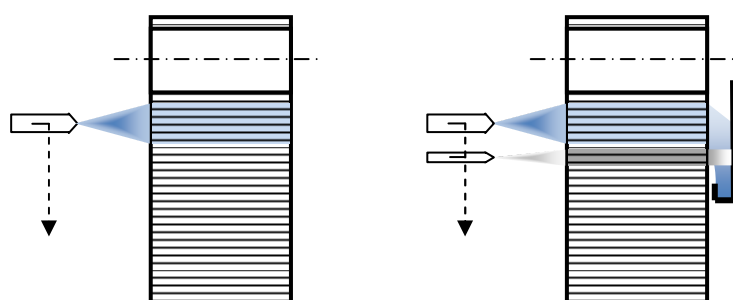
The most frequently used cleaning methods are:

- Cleaning using compressed air
- Cleaning using compressed water
- Steam cleaning
- Combined cleaning using hot water and compressed air

Compressed air can only remove dry, fibrous or larger particles. Material loosened during cleaning must be constantly removed from the entire chamber of the heat exchanger. Cleaning must always be performed following the air flow direction.

Sticky dirt can be removed by water. According to the type of fouling, cold water, water with detergent, hot water or compressed steam can be used. The need for water draining is a disadvantage of this type of cleaning. Combined cleaning using water and compressed air can be used to collect the water running down from the rotor; the air nozzle situated under the water nozzle enables the water, including the dirt, to be carried off by the air flow into the collecting canister situated on the other side of the rotor.

Figure 5: Basic methods of heat exchanger rotor cleaning



To clean heavily fouled rotors and/or to avoid damage to the rotor caused by an unqualified approach, we recommend hiring a specialized provider to clean the heat exchanger.

During the service life of heat exchangers equipped with an enthalpy coating, tiny particles of enthalpy coating can loosen. This is not a fault, and the quality of heat and humidity transfer is not affected.

Troubleshooting

Rotor Damage

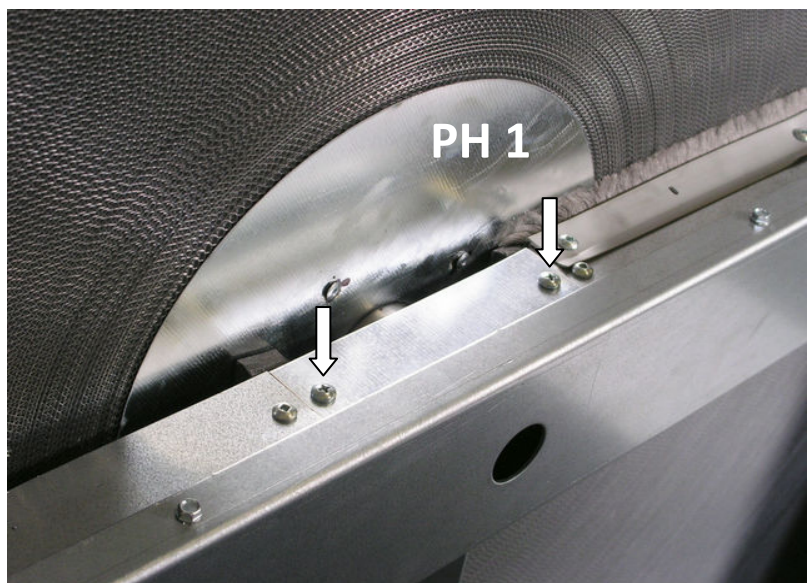
Rough and/or improper heat exchanger handling, exceeding maximum permissible air flow velocities as well as neglected maintenance can lead to permanent damage to the rotor, i.e. causing the wound layers to slip down, the reinforcement rotor spokes to break and the entire rotor to collapse. In these cases, expensive rotor replacement is inevitable.

Rotor Centring

This procedure summarizes the minimum requirements for the heat exchanger rotor centring. The following conditions must be met:

- The heat exchanger rotor is axially attached to the frame using M16x30 bolts – wrench #24 is needed.
- Access to the rotor centre is enabled through the adjacent sections in the upper duct line.
- If access through the adjacent sections is not possible, these sections must be pulled out or removed from the air-handling unit assembly.

Figure 6: Access to the rotor shaft bolt



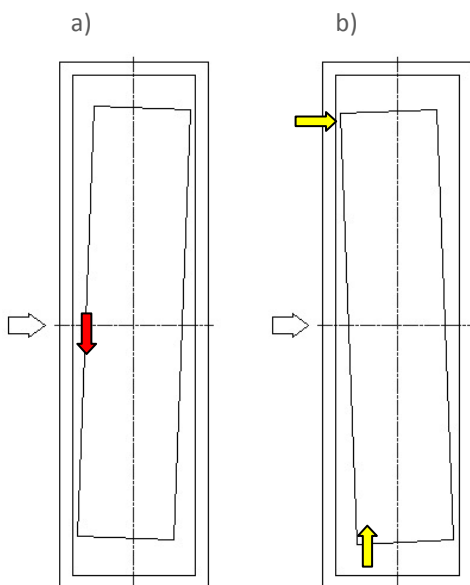
Step 1:

Release and remove the cover of the bolt; it is necessary to use a PH 1 tool.

Note: In some cases, it is possible to centre the rotor from one side; otherwise, it is necessary to have access to the bolts on both sides of the heat exchanger.

Step 2:

Basically, there are two ways of how to centre the rotor depending on the position and access to the shaft bolt:



a)

At least two persons are needed for the following procedure. Slowly loosen the bolt using a ring spanner. Turn a minimum of 1 to 2 turns, but no more! Never remove the bolt entirely! With an open palm, push the rotor into the required position. (Use gloves!) In this case, the weight of the heat exchanger rotor can also be conveniently used to adjust it to the proper position. Firmly tighten the shaft bolt and check the position.

Figure 7: Tighten the shaft bolt using wrench # 24



b)

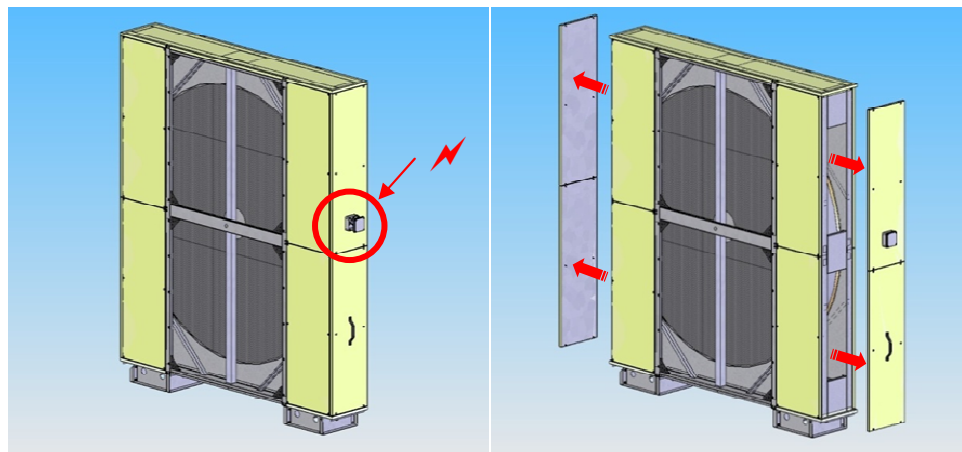
This way of centring is much more precise. The following centring procedure requires a tightening belt to be used; the belt length can be 4 to 8 meters depending on the rotor size. This centring procedure can be performed by just one person; however, the following preliminary actions are necessary:



- Disconnect the power supply
- Remove the 4 side panels

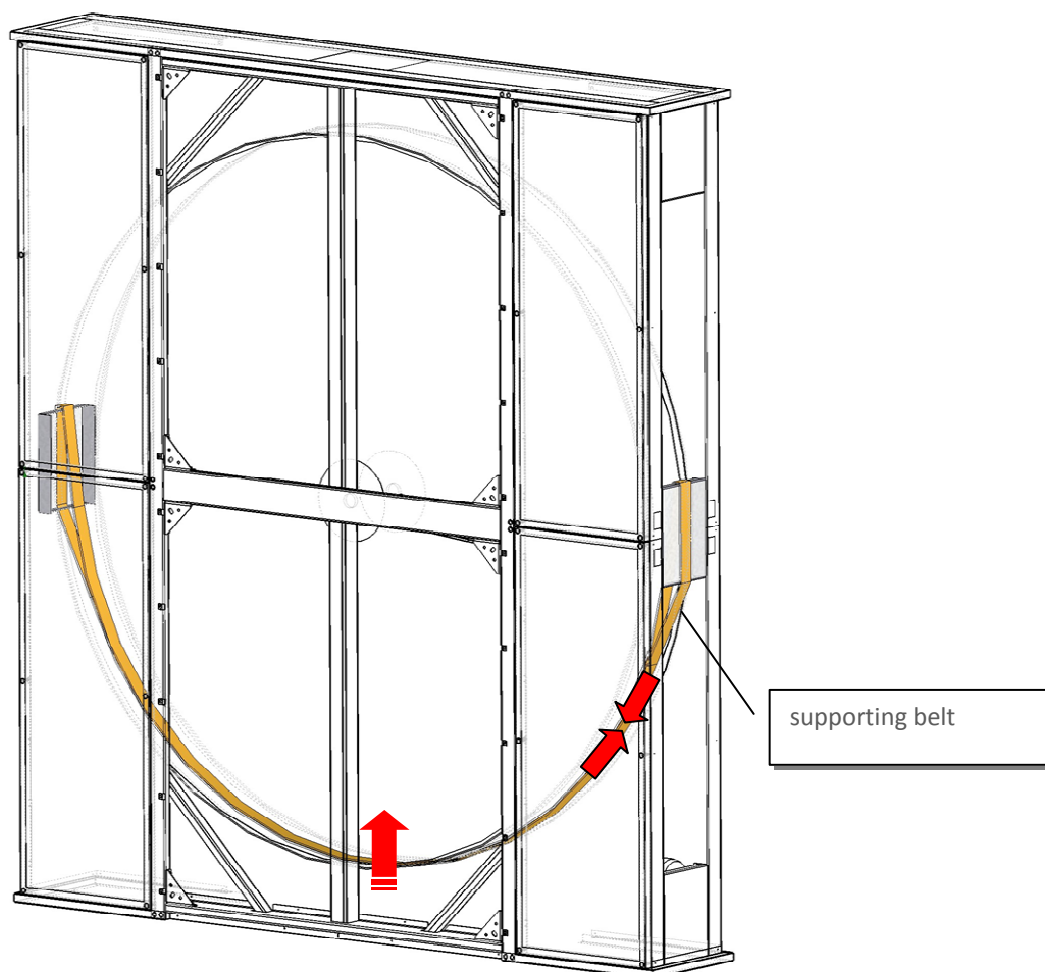
Note: The panel with interconnecting box can only be released, not removed from the heat exchanger frame.
The rotary heat exchanger must be disconnected from the power supply!

Figure 8: Access to centre the rotor



- Run the tightening belt under the heat exchanger rotor and attach it to both frame braces. Pulling the belt, shorten its length and tighten it against the rotor (see figure).

Figure 9: Supporting the rotor using a tightening belt



- Slowly loosen both shaft bolts using a ring spanner. Turn a minimum of 1 to 2 turns, but no more! Never remove the bolt entirely!
- With an open palm, push the rotor into the required position. (Use gloves!) The rotor can be raised by tightening the belt.
- Firmly tighten both shaft bolts and check the position. Then release the tightening belt.

Step 3:

Check all sealing brushes around the rotor circumference as well as in the dividing plane and around the flushing chamber circumference. If any leaks are found, adjust the sealing brushes by shifting the plastic bars to the new position. An SQ2 (square) tool is required to loosen the brushes.

Step 4:

Reassemble and reconnect all removed parts.

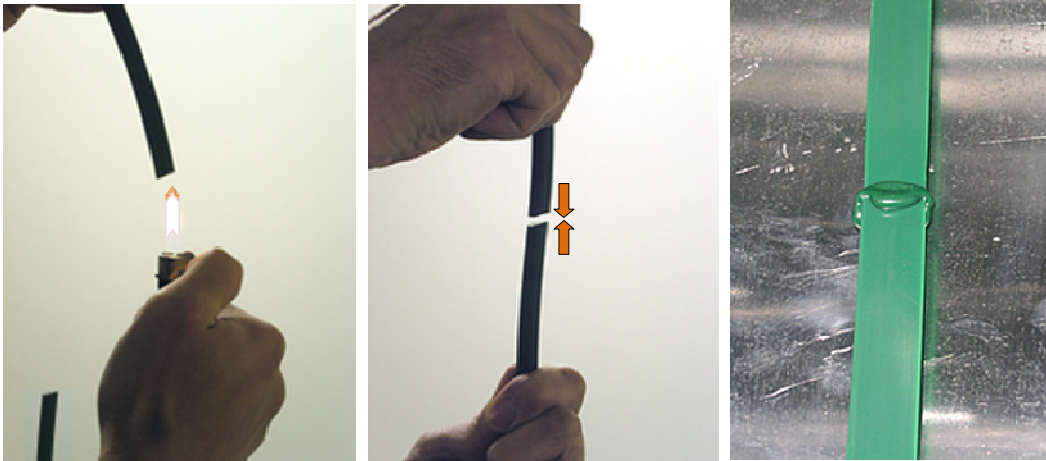
Belt Replacement:

If damaged or broken, the driving belt must be replaced with a new one. A new driving belt can be obtained as a spare part which must be thermally connected together. A special tool can be used to connect the driving belt safely. For quick connection of the driving belt, you can use a common lighter. To do so, follow the procedure below.

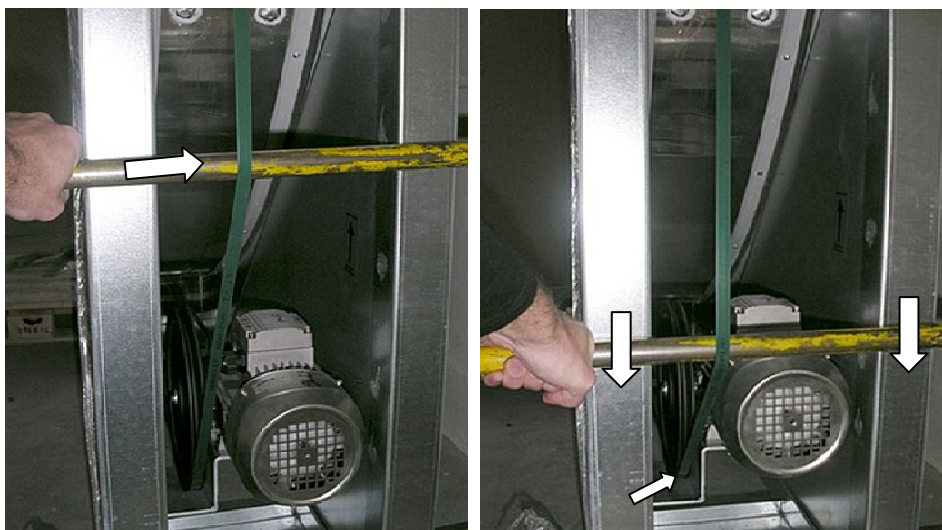


Before replacing the driving belt, ensure the heat exchanger is disconnected from the power supply. If the driving belt has broken, the heat exchanger rotor will stop but the motor and pulley will continue to run!!

1. Paste the new driving belt with adhesive tape to the rotor.
2. Rotate the rotor to wrap the driving belt around the rotor.
3. Measure the driving belt length, including the pulley.
4. Shorten this driving belt length by 8% (e.g. for $L\ 2.500\text{mm} = 200\text{mm}$).
5. Melt simultaneously both driving belt ends. (Use a contact iron at $t=400^{\circ}\text{C}$ or above a lighter flame; do not set the belt on fire!)
6. Press the driving belt ends together to connect them.



7. Let the connection cool down.
8. Check the proper position of the driving belt around the rotor.
9. Pull the driving belt down, a 0.5m log rod can be used, and put it on the motor pulley. Put the rod through the driving belt loop and lodge its end against the heat exchanger frame. Push the rod down towards the heat exchanger base and apply tension to the driving belt to pull it down and put it on the pulley from below. Pull the rod slowly up and remove it.



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