

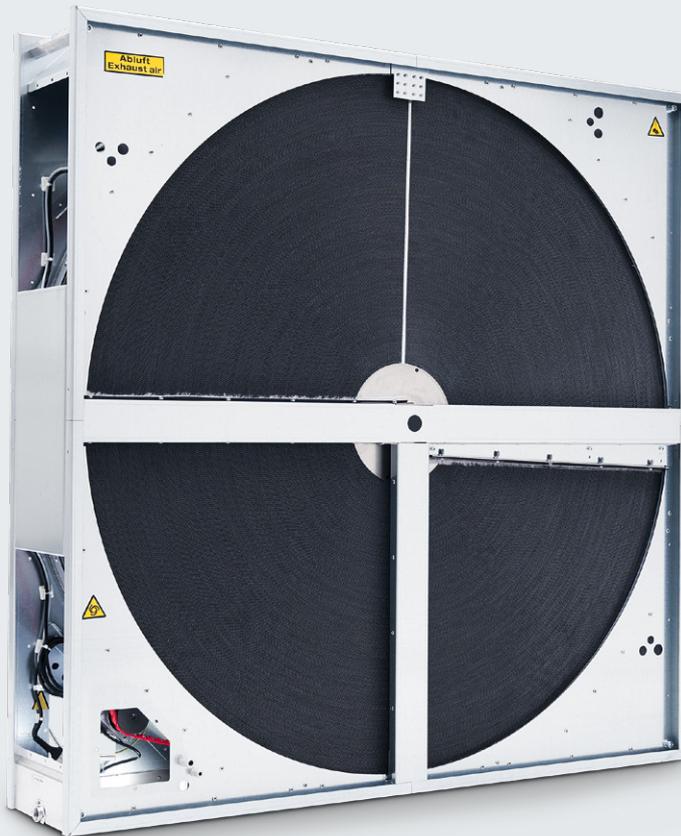


RRU ECO rotary heat exchanger

Installation and operating instructions

RRU

ECO



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1. General information

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Purpose of the document

The documentation is intended to make it easier to get to know the incomplete machine and use it for its intended purpose. The operating instructions contain important information on how to operate the incomplete machine safely, properly and economically. Observing these instructions helps avoid dangers, reduce repair costs and downtimes and increase the reliability and service life of the incomplete machine.

Target groups

The operator is responsible as a superordinate legal entity for the intended use of the incomplete machine and the training and use of authorised personnel. It defines the binding competencies and instruction authorities of the authorised persons for its operation.

A professional is defined as someone who, based on their technical training, knowledge and experience as well as knowledge of the relevant provisions, can assess the work, and possibly associated hazards, assigned to them. An instructed person is someone who has been informed by a professional about the tasks assigned to them and the possible hazards related to improper behaviour and, if necessary, has been trained and instructed in the necessary protective equipment and measures.

2. Safety instructions and warnings

Before installing and commissioning the rotor, please read this documentation carefully and observe all safety instructions and warnings. Always keep this documentation within easy reach near the rotor.

Conventions for the representation of safety instructions

The following illustrations for safety instructions are used in the operating instructions:



HAZARD

For an immediately threatening danger leading to serious bodily injury or death.



WARNING

For a potentially dangerous situation that could result in serious injury or death.



CAUTION

Indicates a potentially hazardous situation which may result in minor injury.



ATTENTION

Indicates a potentially hazardous situation which may result in property damage.

The basic prerequisite for the safe handling and trouble-free operation of this incomplete machine is knowledge of the fundamental safety instructions.

Fundamental safety instructions

Organisational measures

- ▶ Always keep the documentation at hand at the installation site and in a readable state.
- ▶ The documentation of the incomplete machine, together with the operating instructions for the ventilation and air-conditioning system in which the incomplete machine is to be installed, must always be kept available at the place of use and kept in a legible condition.
- ▶ The documentation must be read and understood. Instruct the user to comply with the documentation and check occasionally to confirm this.
- ▶ Only personnel with the necessary qualifications for the respective work may be commissioned to carry out work on the incomplete machine.
- ▶ In addition to the operating instructions, the binding occupational safety regulations applicable in the country of use must also be observed.
- ▶ The operator must be informed immediately of any malfunctions or hazards detected by the personnel. Have the faults and hazards rectified immediately and then resume operation.

Technically perfect condition

- ▶ Only operate and maintain the incomplete machine in technically perfect condition.
- ▶ Keep all safety and hazard notices at/on the machine in a readable state.
- ▶ Do not make any revisions, attachments or conversions to the machine that could impair safety without consulting the manufacturer.
- ▶ Comply with (legally) set deadlines or deadlines specified in the operating instructions for recurring tests/inspections as well as replacement deadlines for safety-critical components.
- ▶ Spare parts shall comply with the technical requirements established by the manufacturer.
- ▶ For the independent performance of maintenance work, it is essential that the workshop equipment appropriate to the work is provided.

Personnel selection and qualifications

- ▶ Only authorised and instructed personnel may work at/with the machine. Observe the legally permissible minimum age.
- ▶ Clearly define the responsibility and authorisation of the personnel for transport, assembly, commissioning, set-up, operation, maintenance, repair and disassembly.

- ▶ Personnel to be trained, instructed or undergo training must only be allowed to work on the machine under the supervision of a professional.
- ▶ Only a qualified electrician may be permitted to work on the electrical equipment of the machine.
- ▶ Only trained specialists may be permitted to work on pneumatic equipment.

Product-specific hazards

Hazardous situations on the machine that cannot be eliminated by structural or safety measures are referred to as 'residual hazards'. Below is a list of the residual hazards determined based on a risk assessment (e.g. compliance with safety instructions, use of personal protective equipment) and the associated instructions and recommendations for action.



Warning of dangerous electrical voltage. Risk of fatal electric shock!

- ▶ Even after the machine has been shut down by isolating it from the power supply, dangerous electrical voltages are still present on internal circuit components.
- ▶ Isolating the incomplete machine from the supply voltage before carrying out any work.
- ▶ Wait at least 5 minutes for the residual voltage to dissipate before working on electrical equipment.
- ▶ Check that there is no voltage before any intervention.
- ▶ Only qualified electricians may work on electrical equipment!
- ▶ The electrical equipment of the machine must be inspected regularly. Such defects as loose connections, damaged or burnt lines must be rectified immediately.
- ▶ Observe the accident prevention and safety regulations applicable to the use.
- ▶ In particular, both the general and regional installation and safety regulations for work on systems with dangerous voltages must be observed, as must regulations concerning the correct use of tools and the use of personal protective equipment.



Warning of hand injuries

- Do not attempt to reach into the machine when it is running.
- There is a risk of cutting injuries from sharp edges and corners during transport, assembly or similar handling of the housing or components of the rotary heat exchanger.



Warning of tipping hazard

- There is a risk of tipping during transport, assembly or storage of the rotary heat exchanger. The rotor must always be secured against falling over.

The personal protective equipment (PPE) described below must be provided by the operator and used by the responsible personnel when handling the machine.



Use hearing protection

- Hearing protection is recommended when the volume is above 80 dB/A. Wear hearing protection if the volume exceeds 85 dB/A!



Use eye protection

- Eye protection should be used for all work.



Use foot protection

- Safety shoes with steel toe cap and penetration protection should be used for all work.



Use hand protection

- Cut protection gloves must be worn when handling the heat exchanger masses.

Comply with instructions

- In addition, the information and notes in the other applicable documents of the supplier documentation listed in the appendix must be observed.

Hazardous areas



HAZARD

- Only persons designated and authorised to do so may enter hazardous areas where the machine is located!
- If several people are working on the machine, good cooperation, coordination and allocation of tasks is required.

Workstations of operating personnel

Workstations for assembly and service activities vary greatly depending on the installation location and position of the incomplete machine. The manufacturer of the air conditioning system must observe the binding regulations for workstation-specific occupational safety applicable in the country of use.

Electrical energy

- In case of faults in the electrical power supply, switch off the machine immediately.
- Machine and system parts on which inspection, maintenance and repair work on the electrical equipment is required must be isolated from the power supply and secured against being switched on again. First confirm that the disconnected parts are free of voltage, then ground and short-circuit them and insulate adjacent live parts.
- Work on electrical systems or equipment may only be carried out by a qualified electrician or by instructed persons under the direction and supervision of a qualified electrician according to electrotechnical regulations.
- The electrical components of the machine must be inspected regularly. Such defects as loose connections or burnt cables must be rectified immediately.

Noise

- Noise protection devices on the machine must be on while it is in operation.

Oils, fats and other chemical substances

- Operating and auxiliary materials must be used and disposed of according to the instructions of the manufacturers of these materials.
- Caution with hot operating and auxiliary materials. There is a risk of burns and scalding.

3. Product description

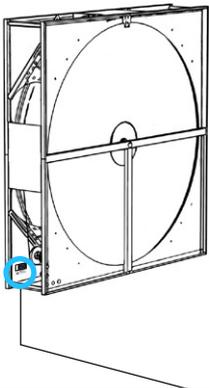
Product description

Intended use

The partly completed machine is built within the delivery limits according to the state of the art and the recognised safety rules. Nevertheless, their use may result in hazards for the user or third parties or impairment of the partly completed machine and other material assets.

The partly completed machine may only be operated in a technically perfect condition and in accordance with its intended use, in a manner that is conscious of safety and dangers and in compliance with the operating instructions.

The partly completed machine is intended exclusively for integration into a heating, ventilation air conditioning system. Any other use or use beyond this scope does not constitute an intended use. The manufacturer is not liable for any damage resulting from this.



Rotortyp	RRU (ECO) - E18-1500/1500-1375
Rotor-Nr.	R-3839-09475 1458
Kommission	16890
Klimagerät Unit	Z034556

KLINGENBURG GmbH
 Brüsseler Str. 77
 D-45968 Gladbeck
 Tel.: +49 (0) 20 43 / 96 36-0
 Fax: +49 (0) 20 43 / 7 23 62

Determination of the rotor type

On the type identification label attached to the inside of the rotor housing, you will find the following information: Rotor type and rotor number. For explanations of the rotor type code, see page 31.

Please use the rotor number for all technical enquiries, especially for service cases and requests for spare parts. This allows the manufacturer to view all relevant production documents.

The type identification label is attached to the inside of the housing

Transport and storage

If the heat exchanger is not installed directly, it should remain in its original packaging and stand on a level surface that is free from vibration and protected from frost, rain and sunlight. The formation of condensation can never be ruled out due to the air pockets in film packaging. This should be taken into account and monitored during longer storage periods. It may be necessary to open the film to allow the packaging to breathe. Otherwise, colour deviations may occur on galvanised surfaces. This does not constitute a defect and is not accepted as such by the manufacturer.



Transport rack Klingenburg



Warning of danger of tipping over

The heat exchanger can tip over if not secured and cause serious injury and damage. Always ensure that the heat exchanger is secured against tipping over during transport, handling, storage and installation. If in doubt, use suitable transport racks (Fig. left) for long-term storage or frequent moving of units with a high centre of gravity, which safely prevent them from tipping over. If you are unsure of appropriate measures, contact the manufacturer for guidance on the subject.

Hoisting the rotor

 **DANGER**

Any form of transport and handling must be carried out by qualified personnel. When lifting loads, observe a max. angle of 60° for the hoisting straps (Fig. 2 and Fig. 3). Avoid abrupt stopping or hard touching down to prevent damage to the housing. The load-bearing points (spacer tube Fig. 1) are designed only for the dead weight of the rotary heat exchanger. To gain access to the hexagonal profile for housing sizes up to 1250 mm, the outside housing cover **B** must be removed for the crane operation (see Figs. 1.1 and 1.2).

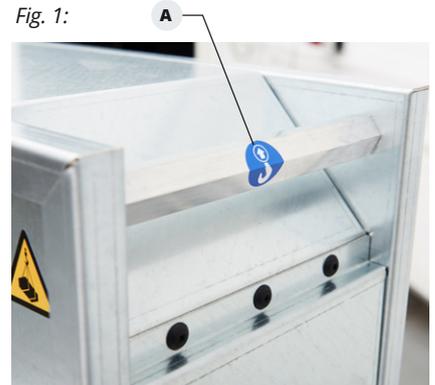


Fig. 1: Hoist the housing only at the two upper corners using the hexagonal profiles provided there **A**.



The anchor points are marked with corresponding stickers (see Fig. 1 **A**)



Suspended load warning. Caution! Do not stand or pass under suspended load.

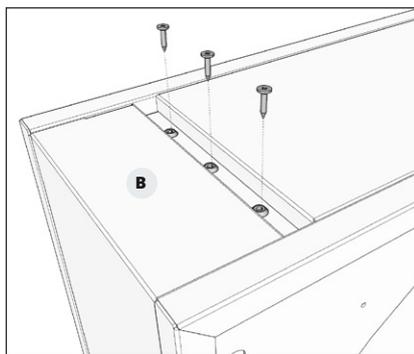


Fig. 1.1

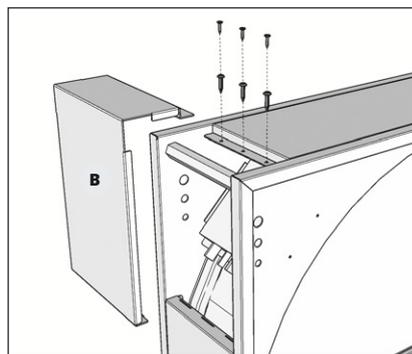
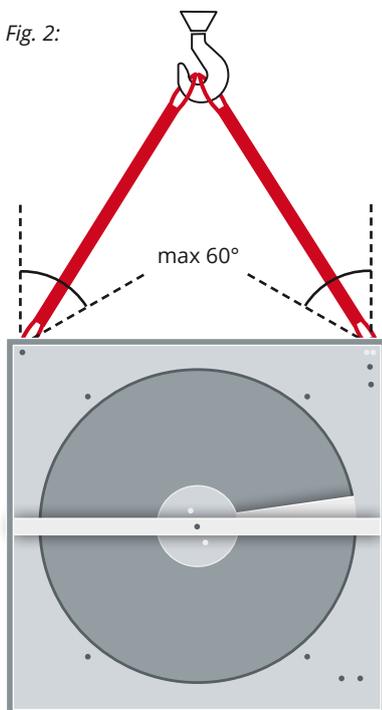


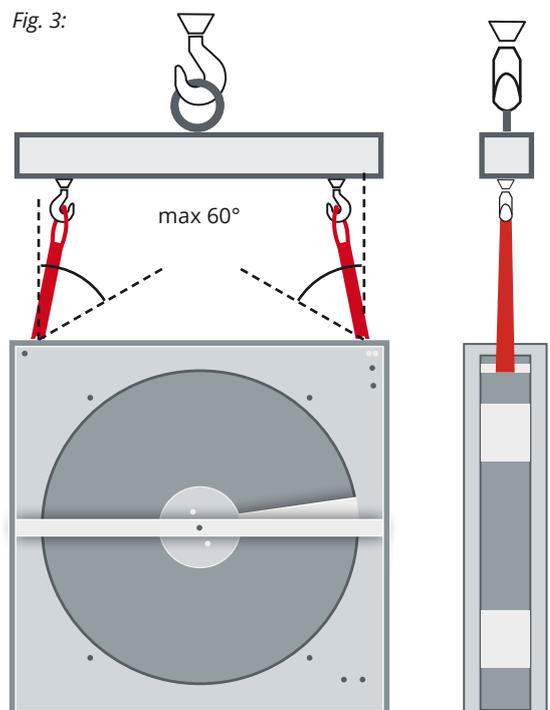
Fig. 1.2

Fig. 2:



Note that the hoisting straps must not exceed a max. angle of 60° when lifting loads.

Fig. 3:



Lifting the rotor by means of a lifting beam as a load hoisting device. A max. angle of 60° also applies here for the hoisting straps

Installation

Slide-in unit

As this is a slide-in unit, mounting with the air conditioner is required.

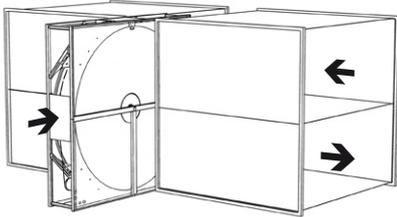


Fig. 4.1

The units are available for airflow separations one above the other (Figs. 4 and 4.1) and side by side (Fig. 4.2).

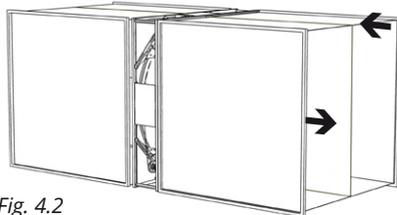


Fig. 4.2

In the case of side-by-side airflow separation, we recommend a double-sided and upstream and downstream facing.

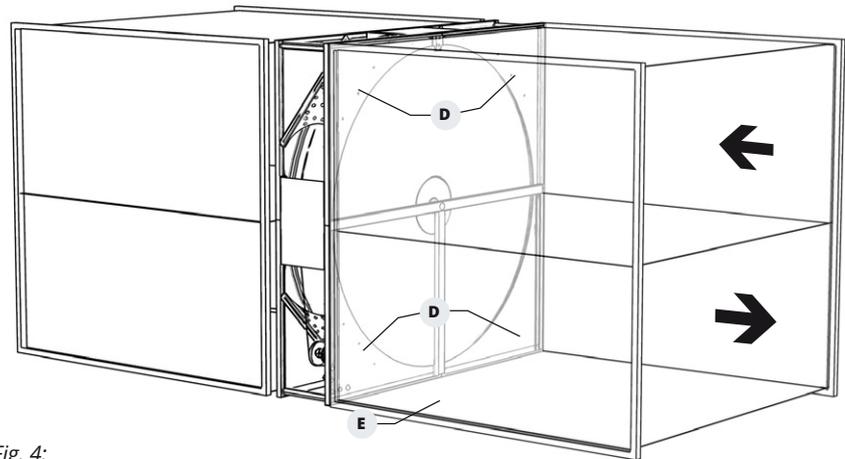


Fig. 4:

Mounting in the air conditioner upper Fig. shows airflow separation one above the other

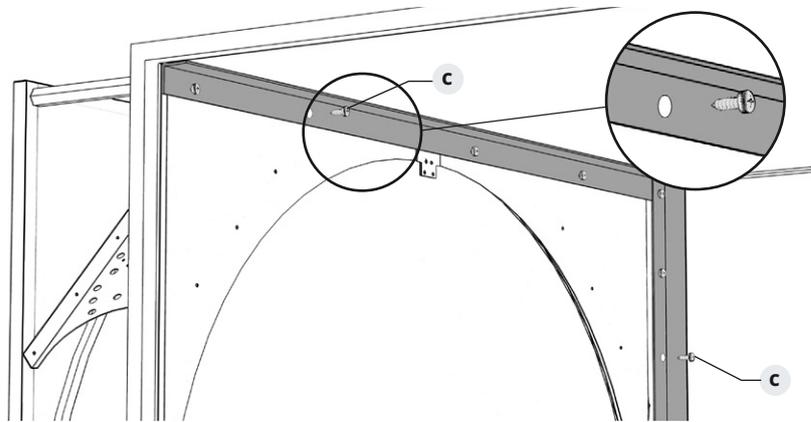


Fig. 5: The surrounding frame can be used to connect to the air conditioner unit, provided that screw connections do not deform it. The figure shows a possible mounting option with angles

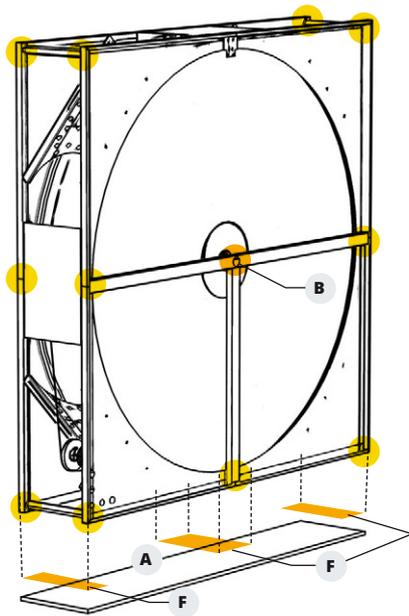


Fig. 6: Mounting in the air conditioner unit. Provide support surface **F** over the entire depth

The units must not be tilted without consulting the manufacturer. Only use units that have been manufactured specifically for horizontal installation. An inclined installation position is not permitted for either variant. A form-fitting support construction for frame and spar along the airflow separation is mandatory. The unit housings are not self-supporting. To avoid collisions between the storage mass and the housing, the housing must be placed horizontally on a stable base **A**.

The fastening points (marked yellow) can be found in Fig. 6. Pay particular attention to a stable connection in the area of the hub **B**. The surrounding frame can be used to connect to the air conditioner unit, provided that screw connections **C** do not deform it (Fig. 5).

The plates **D** for the upstream and downstream cover must be at right angles to the bot **E** of the air conditioner unit (Fig. 4), otherwise the entire installation situation must be checked before commissioning. Especially at the support points, the unit must be supported by the substructure **A** of the air conditioner unit (Fig. 6) so that the housing does not warp.

The construction must be dimensioned in such a way that the forces occurring in relation to the size of the storage mass (Tab. 1) can be absorbed at 300 Pa pressure.

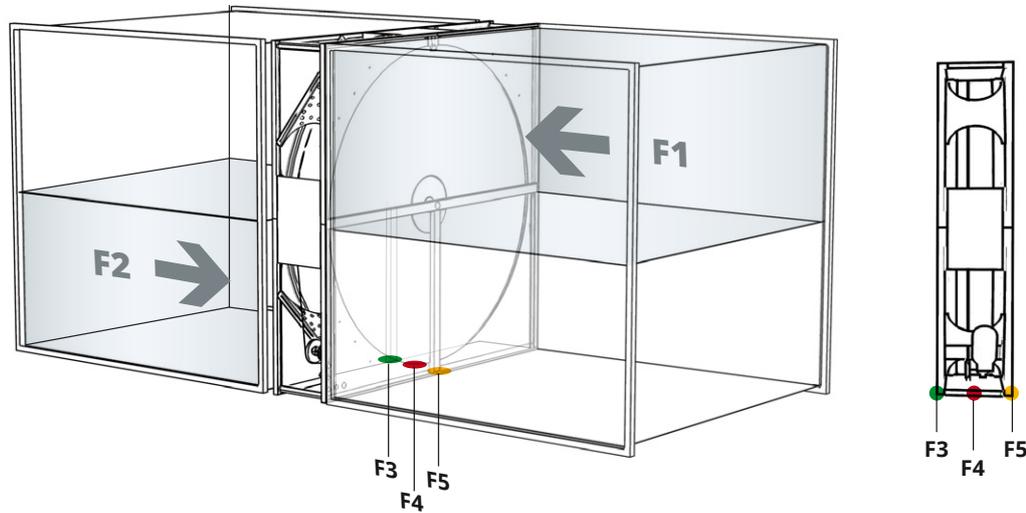


Fig. 7: In the counterflow principle, it is imperative that the storage mass rotates absolutely vertically in the housing under pressure conditions.

Rotor Ø* (A)	F1 [N]	F2 [N]	Operating- pressure** [Pa]	F3 [N]	F4 [N]	F5 [N]
500	29,45	29,45	300	249,73	461,66	212,45
700	57,73	57,73	300	371,10	638,63	267,52
900	95,43	95,43	300	538,36	855,82	317,45
1200	169,65	169,65	300	896,21	1268,04	371,85
1400	230,91	230,91	300	1287,58	1669,37	417,72
1600	301,59	301,59	300	1647,76	2050,19	414,76
1800	381,70	381,70	300	2109,30	2451,22	340,55
2000	471,24	471,24	300	2715,45	3031,78	316,30
2200	570,20	570,20	300	3502,73	3777,83	275,09
2400	678,58	678,58	300	4149,42	4104,01	45,42*** ↓
2500	736,31	736,31	300	4606,24	4473,73	132,91*** ↓
2700	858,83	858,83	300	7105,06	4966,31	499,33*** ↓

Tab.1: All force calculations refer to the housing depth 330 mm and a pressure loss of 300 Pa per mass flow.

* Reference values, always use the larger reference value for intermediate dimensions

** Operating pressure of 300 Pa referred to an airflow

*** Change of direction of the force

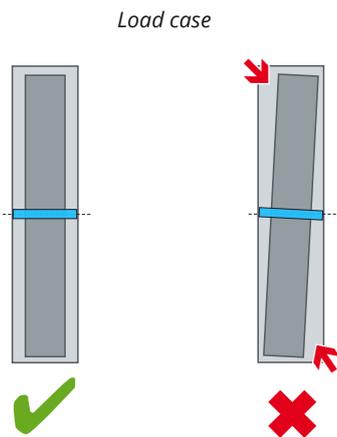


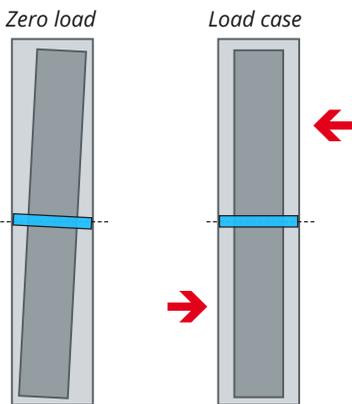
Fig. 8: Once loaded, the storage mass must rotate centred in the housing. If this does not happen, leaks can occur.

The attachment of the rotor housing to the air conditioner must be checked before the rotor is put into operation. The free running of the storage mass must be guaranteed when loaded. If necessary, the rotor must be pre-adjusted in the vertical position.

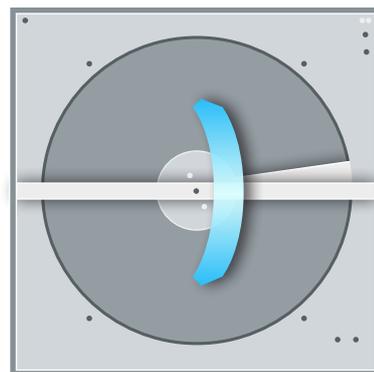
As a general rule, no forces may be introduced into the frame that are likely to cause the storage mass in the housing to tilt. Their position in the housing must be centred. The final adjustment is made after checking the presettings during operation with the fans running, if their pressure increase makes this necessary. The rotor must not be operated in a tilted position.

To ensure that the storage mass is centred in the housing under load (Fig. 8), a tilt of up to 3° can be set by means of a spherical washer/conical socket at the storage mass wave ends. To do this, proceed as follows:

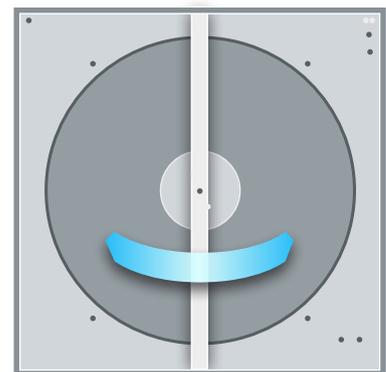
Aligning the storage mass in the housing



(1) The storage mass may have to be placed in a tilted position according to the load case



(2) Inclination of the heat wheel with a horizontal airflow separation



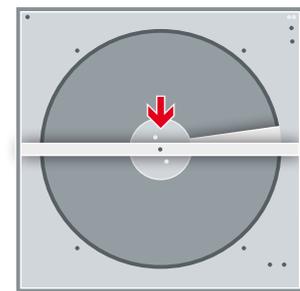
(3) Inclination of the heat wheel with a vertical airflow separation



(4) Cut the brush seal as marked in the picture and loosen the fastening screws of the bearing cover



(5) Remove the brush seal and the bearing cover



(6) Position of the screws to be loosened

Tab. 2
Torques

Wave Ø [mm]	Screw size	Width across flats	Torque [Nm]
20	DIN 933 M10x30-8.8	SW 17	53
30	DIN 933 M12x35-8.8	SW 19	93

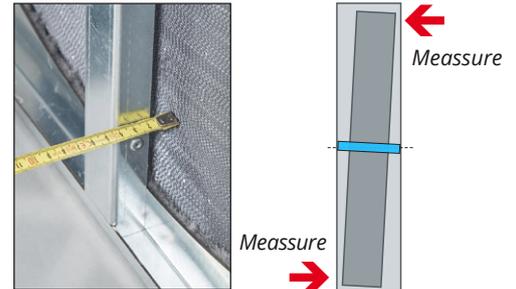
Horizontal airflow separation



(7) Loosen the hexagon head screw



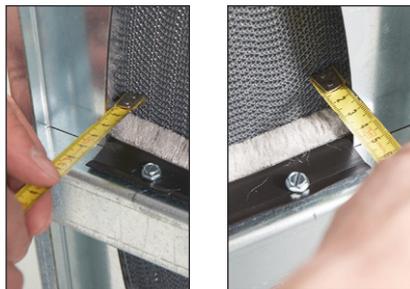
(8) Incline the warming wheel carefully. Be careful not to damage the delicate storage mass



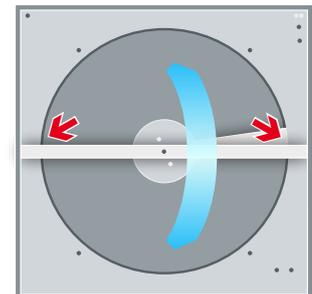
(9) Check the tilt position by measuring on the opposite sides



(10) Once the heat wheel has been set to the appropriate inclination, the position is fixed by tightening the hexagon head screw (for torque, see Tab. 2)



(11) Check the centring of the heat wheel in the horizontal centre of the housing, measuring points see (9)



(12) ↑ Measuring points for centring
 ↪ Tilt of the heat wheel

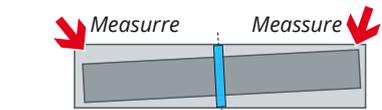
Vertical airflow separation



(7) Loosen the hexagon head screw



(8) Incline the warming wheel carefully. Be careful not to damage the delicate storage mass



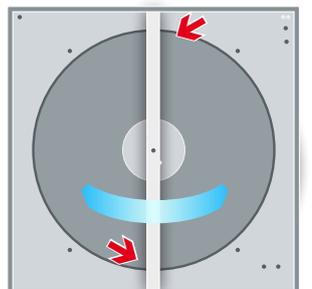
(9) Check the tilt position by measuring on the opposite sides



(10) Once the heat wheel has been set to the appropriate inclination, the position is fixed by tightening the hexagon head screw (for torque, see Tab. 2)



(11) Check the centring of the heat wheel in the vertical centre of the housing, measuring points see (9) on both sides.



(12) ↑ Measuring points for centring
 ↪ Tilt of the heat wheel

4. Technical data

Housing

The RRU ECO is offered across all sizes in a standardised, undivided housing design (Fig. 7). The housing is made of galvanised steel sheets and is suitable for vertical installation positions in the appropriate design. Since this is a built-in unit, a positive or non-positive connection to the air conditioner is required (see page 9).

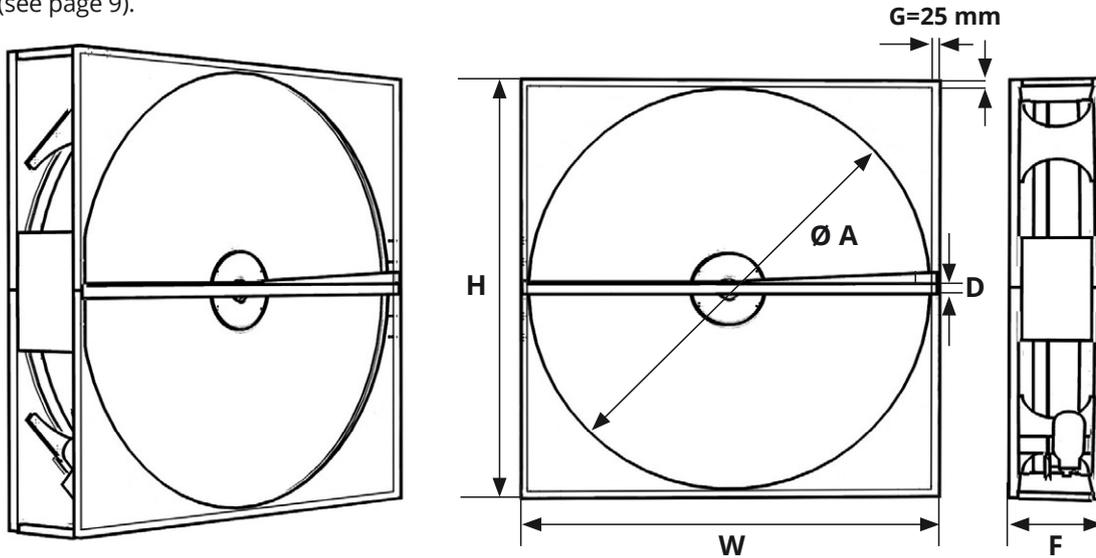


Fig. 7:
Housing design

Overview of sizes [mm] (other sizes possible)

Storage mass Ø (A)	Housing size (W,H)	Web (D)	Depth (F)	Drive package stepper motors		Narrow sided cladding	Drive package geared motors		Conden- sate drip tray
				Controller in hous- ing	Motor KL MRHX		Controller in hous- ing	Motor RGM	
550 - 679	Ø (A) + 50 mm	60	290/ 330	outside	✓				
680 - 749				✓	✓				
750 - 1149				✓	✓	✓		✓	
1150 - 1200	Ø (A) + 50 mm	60	290/ 330	✓	✓	✓	✓	✓	✓
1201 - 2500	Ø (A) + 50 mm	80	290/ 330	✓	✓	✓	✓	✓	✓

Tab. 3: Sizes equal to reference sizes

Due to the extremely compact housing, rotary heat exchangers with wheel diameters of 500-1150 mm are not supplied square if they are equipped with geared motors.

Stepper motor control units are fitted as standard and connected to the motors. Klingenburg offers optional installation and wiring for control units type KR MicroMax.

5. Components

Storage mass

Klingenburg offers various storage mass types and wave heights (Fig. 8-10). Smaller wave heights generally offer higher efficiencies with a moderate increase in pressure loss.

Condensation:

Rotor wound from corrosion-resistant aluminium alloy, mainly for temperature exchange. Moisture recovery only if the temperature in the extract air falls below the dew point.

Hybrid (enthalpy):

Rotor wound from alternating layers of aluminium alloy and zeolite-coated foil. Provides increased moisture transfer compared to condensation, based on the different potentials in outside air and extract air, as well as classic condensation effects.

Sorption:

Rotor wound in completely zeolite-coated film for maximum moisture transfer. Excellent for use in systems with supply air humidification and/or cooling.

Epoxy:

Rotor wound from epoxy-coated film for improved corrosion protection in HVAC and industrial systems, as well as for adiabatic extract air humidification.

Bearings

The bearings used are protected, internally mounted, single-row deep groove ball bearings, which are hardwearing in their dimensioning and grease filling and are designed to last the service life of a rotor.



Fig. 8: Storage mass

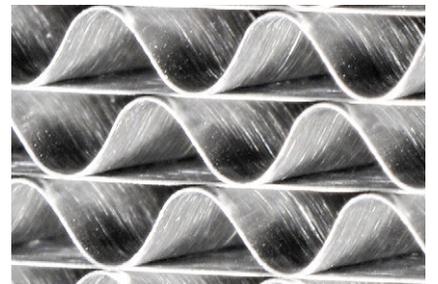


Fig. 9: Detailed view of storage masses

1,4 mm	
1,6 mm	
1,8 mm	
2,0 mm	
2,2 mm	
2,4 mm	

Fig. 10: Wave heights of the storage masses

Drive

RRU ECO rotors are optionally supplied with a complete drive package:

Drive variant with stepper motors



Fig. 11: Stepper motor with control unit for variable or constant speed (Tab. 4).

	KL-MRHX-3P02N-03C5	KL-MRHX-3P04N-03C5	KL-MRHX-3P08N-03C5
Stepper motor			
Power	55 W	110 W	220 W
Motor torque	2 Nm*	4 Nm	8 Nm**
Can be used with storage mass - Ø [mm]	Ø 500 - 600 / 10 rpm	Ø 601-1800 / 10 rpm Ø 500-1150 / 20 rpm	Ø 1801-2500 / 10 rpm Ø 1151-1900 / 20 rpm
Stepper motor voltage	3 x 0-200 V~	3 x 0-200 V~	3 x 0-200 V~
Minimum revolutions/min	1 rpm	1 rpm	1 rpm
Maximum revolutions/min	400 rpm	400 rpm	400 U/min
Cable length	300 mm	300 mm	300 mm
Electrical connection	4-pole Tyco MATE-N-LOK	4-pole Tyco MATE-N-LOK	4-pole Tyco MATE-N-LOK
Dimensions of stepper motor (W/H/D) [mm]	85 / 85 / 67	85 / 85 / 97	85 / 85 / 156
Wave diameter	Ø 12	Ø 12	Ø 12
Protection type	IP54	IP54	IP54

* Max. 250 rpm with KL-DRHX-1055-MXX5 control unit and up to max. 400 rpm with DRHX-1220-MXX5 control unit

** Max. torque of 8 Nm at 250 rpm, torque of 5 Nm at max. speed 400 rpm

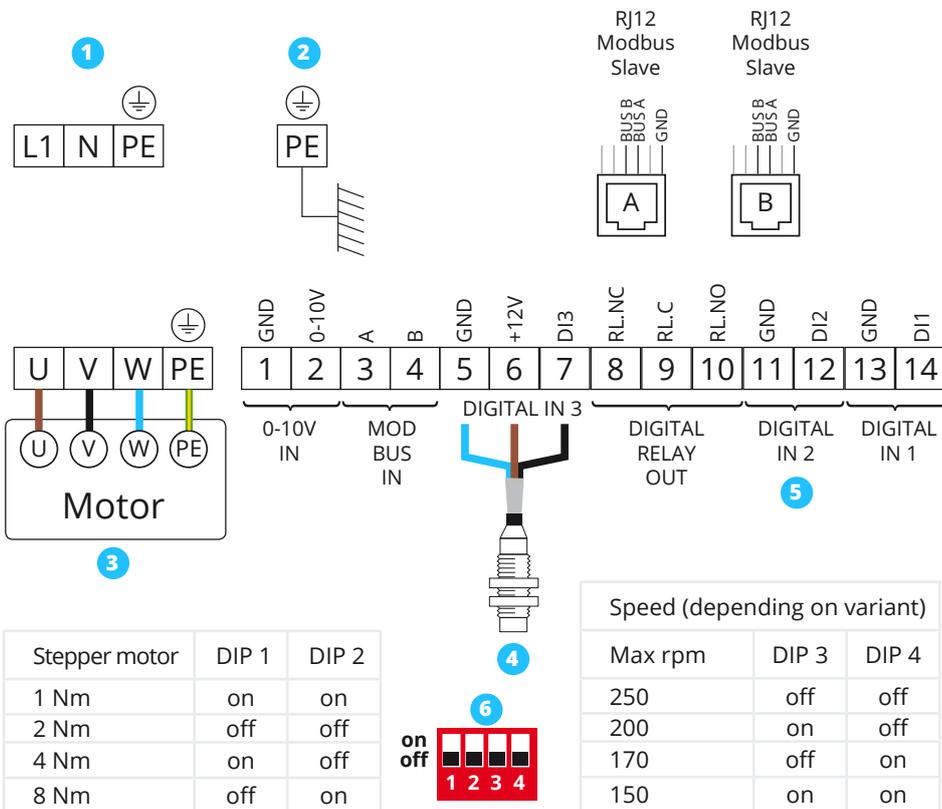
Tab. 4: Stepper motor characteristics



Control Unit	KL-DRHX-1055-MAD5	KL-DRHX-1220-MAD5
Modbus	yes	yes
0 -10 V	yes	yes
Display	yes	yes
Internal rotation monitoring	Standard	Standard
External rotation monitoring	Accessory	Accessory
Automatic air purification function	yes	yes
Deformation protection	yes	yes
Power (max)	55 W	110 / 220 W
Power supply Voltage	1 x 230 V~	1 x 230 V~
Nominal torque	2 Nm	4 / 8 Nm
Maximum revolutions/min	250 rpm	400 rpm
Motor voltage	3 x 0-200V~	3 x 0-200V~
Dimensions (W/H/D) [mm]	183 x 142,7 x 55	183 x 142,7 x 55
Protection class	IP54	IP54

Tab. 5:
Control unit characteristics
Variable speeds
KL-DRHX-1055-MAD5 and
KL-DRHX-1220-MAD5 for stepper motors

Electrical wiring motor/control unit MAD



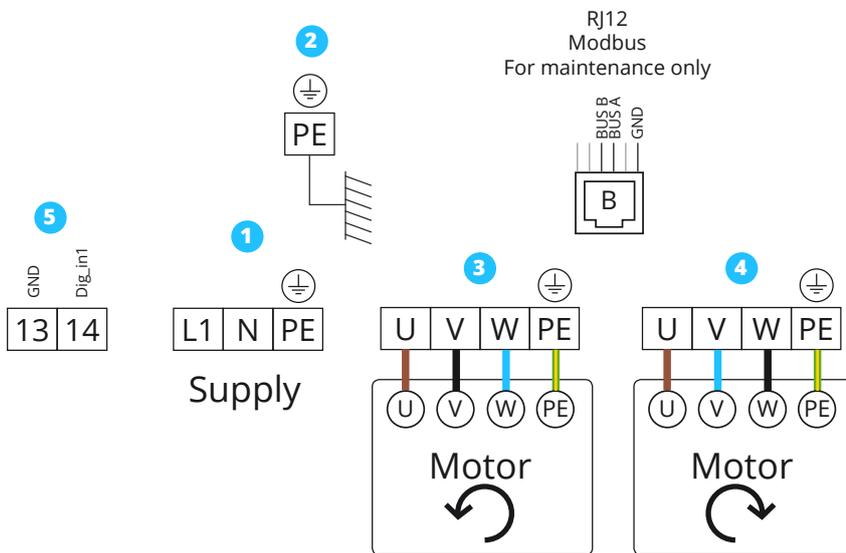
- 1** Mains supply (L, N, PE)
1x 230 V AC
 - 2** PE protective conductor (⊥)
Note! The protective earth conductor must always be connected
 - 3** Motor connection (U, V, W, PE)
 - 4** External rotor monitoring
Sensor optional accessory
 - 5** Activate external rotor monitoring
 - 6** DIP-switch
Figure shows setting for 2 Nm and 250 rpm
- Factory setting:**
Internal rotor monitoring (sensorless, software-based)



Control Unit	KL-DRHX-1055-NCN5	KL-DRHX-1220-NCN5
Modbus	No	No
0 -10 V	No	No
Display	No	No
Internal rotation monitoring	Standard	Standard
External rotation monitoring	No	No
Automatic air purification function	No	No
Deformation protection	yes	yes
Power (max)	55 W	110 / 220 W
Power supply Voltage	1 x 230 V~	1 x 230 V~
Nominal torque	2 Nm	4 / 8 Nm
Maximum revolutions/min	250 rpm	400 rpm
Motor voltage	3 x 0-200V~	3 x 0-200V~
Dimensions (W/H/D) [mm]	183 x 142,7 x 55	183 x 142,7 x 55
Protection class	IP54	IP54

Tab. 6:
Control unit characteristics for **constant speeds**
KL-DRHX-1055-NCN5 and
KL-DRHX-1220-NCN5 for stepper motors

Electrical wiring motor/control unit NCN



- 1 Mains supply (L, N, PE)**
1x 230 V AC
- 2 PE protective conductor (⊥)**
Note! The protective earth conductor must always be connected
- 3 Motor connection Direction of rotation counter-clockwise (U, V, W, PE)**
- 4 Motor connection Clockwise direction of rotation (U, V, W, PE)**
- 5 Digital Input**
for Start/Stop
- 6 DIP-switch**
Figure shows setting for 2 Nm and 250 rpm

Stepper motor	DIP 1	DIP 2
1 Nm	on	on
2 Nm	off	off
4 Nm	on	off
8 Nm	off	on



Speed (depending on variant)			
Speed	DIP 3	DIP 4	
Speed 1	off	off	
Speed 2	on	off	
Speed 3	off	on	
Speed 4	on	on	

Drive variant with geared motors



Fig. 12: For constant drive or operation on the frequency converter, 3-phase 50 Hz motors (Tab. 5) are optionally provided , executed with worm gear.

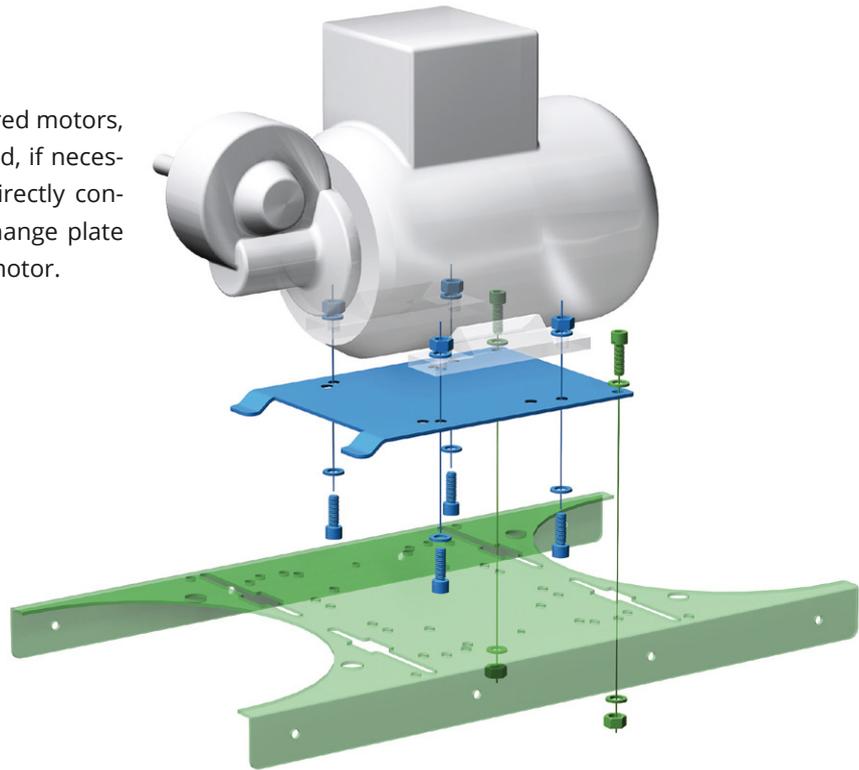
	RGM90	RGM180	RGM370
Geared motor			
Power	90 W	180 W	370 W
Can be used with storage mass -Ø [mm]	Ø 1150 - 1419 / 10 rpm Ø 1150 - 1419 / 20 rpm	Ø 1420-2379 / 10 rpm Ø 1420-1919 / 20 rpm	Ø 2380-2500 / 10 rpm Ø 1920-2500 / 20 rpm
Geared motor voltage	3 x 0-230/400 V	3 x 0-230/400 V	3 x 0-230/400 V
Frequency	50 Hz	50 Hz	50 Hz
Power consumption	0,69 A	1,09 A	2,30 A
Weight	4,2 kg	6,5 kg	10 kg

Tab. 5: Characteristics of geared motors

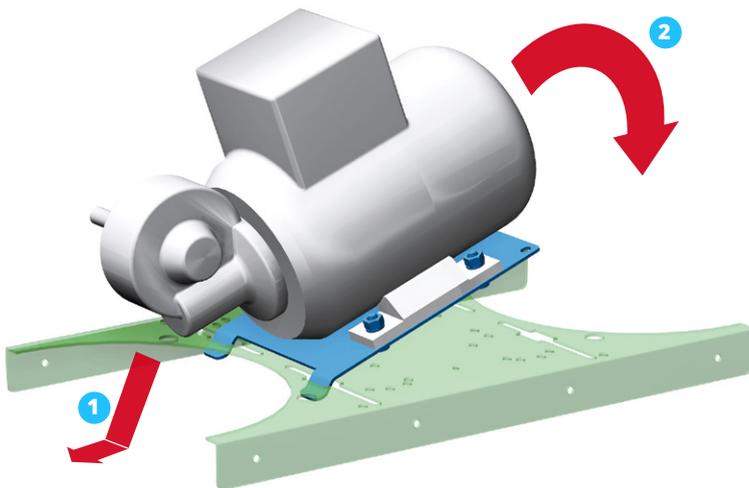
If no variable speed of the rotors is required, the control unit can be omitted in favour of constant operation. In this case, however, we recommend to connect a soft start control to prevent damage (ramp function start/stop with min. 30 seconds).

Retaining plate geared motors

To ensure better accessibility to the geared motors, to simplify their electrical connection and, if necessary, their replacement, they are not directly connected to the housing but to a quick-change plate that can be removed together with the motor.

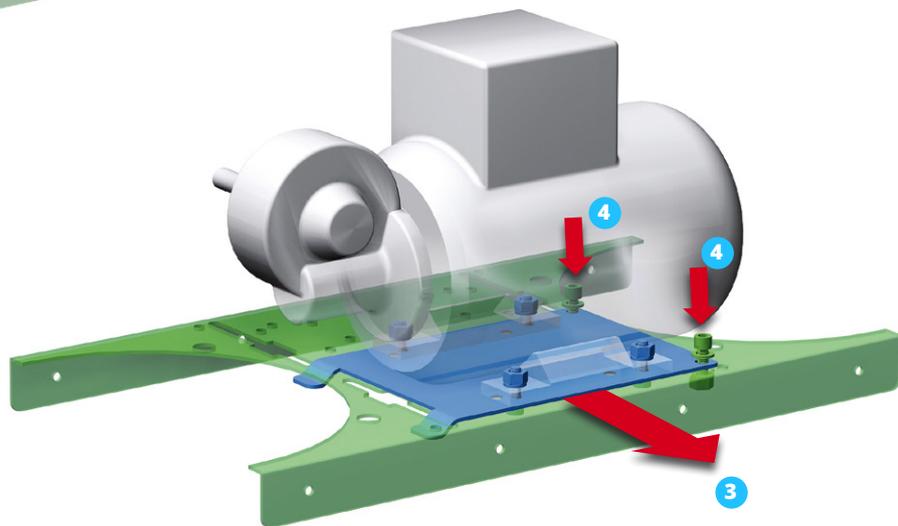


Connection to motor - quick release plate (blue in the figure):
 4 x countersunk head screws M6 x 25
 Allen key size 5
 4 x self-locking nut with serrated bearing M6 key size 10



Connection of quick-release plate (blue in the figure) with base plate ④ (green in the figure):

- 2 x inner countersunk head screws M6 x 16
Allen key size 5
- 2 x washers 6.4
- 2 x self-locking nut with serrated bearing M6 key size 10



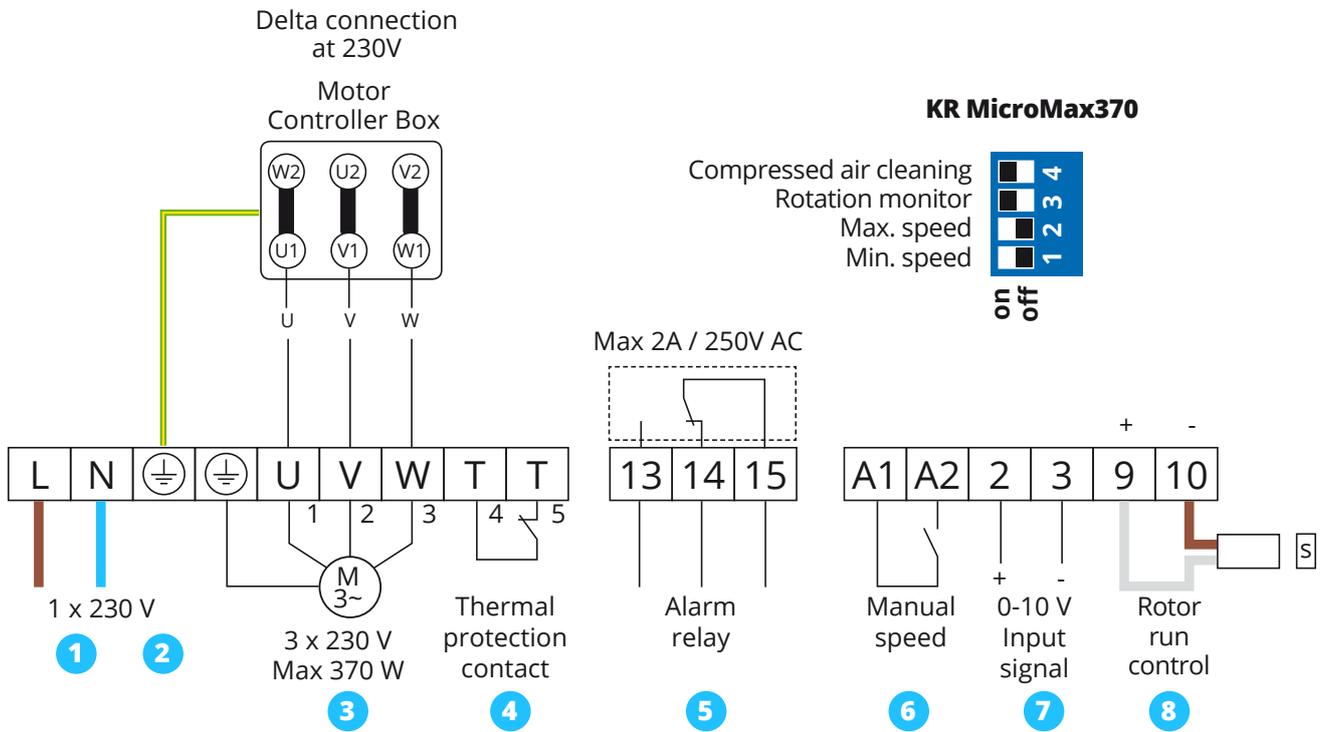
As an option, Klingenburg also supplies control units for geared motors, as shown in Tab. 6.

Control units for geared motors	KR MicroMax 370
	
Voltage input	1x 230-240 V ±15%
Frequency input	50 - 60 Hz
Motor type	Asynchronous up to 370 W
Ambient temperature	-25°C - +45°C
Signal input for control signal	0-10 V
Rotation monitoring	Proximity switch
Interval operation	10 seconds, every 30 minutes
Notifications	Operation, alarm, run control
Max. rotor diameter	2500 mm for all rotor types
Dimensions (H/W/D) [mm]	198 x 165 x 60
Protection class	IP54

Tab. 6: Characteristics of KR MicroMax control units for geared motors

Due to the extremely compact housing, rotary heat exchangers with wheel diameters of 500-1150 mm are not supplied as square units if they are equipped with gear motors.

Electrical wiring geared motor with controller KR MicroMax 370 (3-Ph three-phase current)



- 1 Mains supply (L, N, PE)**
1x 230-240 V +/- 15%, 50/60 Hz
- 2 PE protective conductor (PE)**
Note! The protective earth conductor must always be connected
- 3 Motor connection (U, V, W)**
Three-phase asynchronous motor connected for 3 x 230 V (D circuit). Max. 370 W. The direction of rotation is changed by swapping two phases
- 4 Thermal protection contact motor (T,T)**
The thermal contact in the motor should be used as overtemperature protection. T-T terminals must be bridged if the thermal contact is not connected
- 5 Alarm relay (13-14-15)**
Closes between 14-15 in case of alarm or power failure. Max. 2 A resistive load / 250 V AC
- 6 Manual speed (A1-A2)**
Generates the set maximum speed regardless of the input signal value when closing
- 7 Input signal (2-3)**
0-10 V. Terminal 2 (+), Terminal 3 (-)
- 8 Rotation Monitor (9-10)**
Connect the white cable to terminal 9 (+). Brown cable is to be connected to terminal 10 (-). Mount the magnet with the south side (S) to the encoder (distance max. 15 mm)

Controller retaining plate

To improve ergonomics and readability of motor control units mounted in the housing, they are mounted on a slide-out plate for housing sizes up to 1250 mm to ensure better accessibility (Figs. 13 and 14).



Fig. 13: Loosen controller slide-out plate 1



Fig. 14: Move the plate down 2

Drive belt

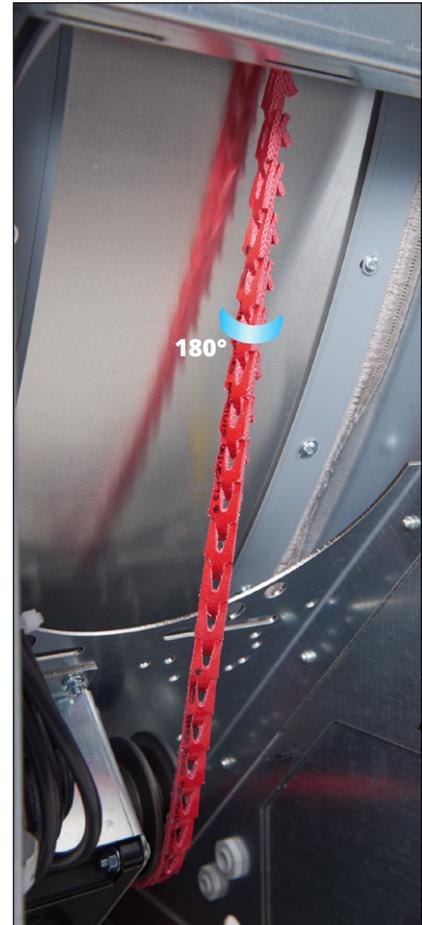
The storage masses of the RRU ECO are connected to the drive units via a belt drive. Irrespective of the size and drive system, only PowerTwist V-belts in profiles A/10 or A/13 are used. The belts are made of an extremely durable polyester fibre/PU structure with minimal linear expansion, can be replaced without tools and are characterised by high resistance to moisture, oils and fats, as well as common household chemicals and solvents. Drive belts lose elasticity during their service life and also wear out due to friction. Therefore, as a minimum, visual inspections are recommended at regular intervals (maintenance intervals).



Made of polyurethane and reinforced with several polyester inserts



When fitting the drive belt, pay attention to the direction of rotation of the storage mass. The running direction is marked on the belt elements by an arrow



After a few revolutions of the storage mass, the drive belt twists once in such a way that the locking pins turn outwards

Sealing system

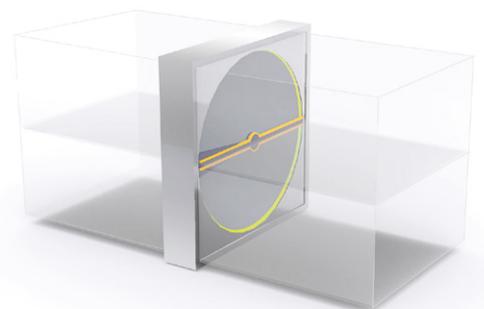
The RRU ECO is supplied with a double-row brush seal, which, fixed on the circumference, rotates with the storage mass and seals against the housing. In contrast to sealing brushes, which work against the rotor profile of the storage mass, this design generates less friction and is therefore less subject to wear.



Brush seal for airflow separation (■)



Brush seal on rotor circumference (■)



A distinction is made between two types of seal:
Airflow separation (■)
Rotor circumference (■).



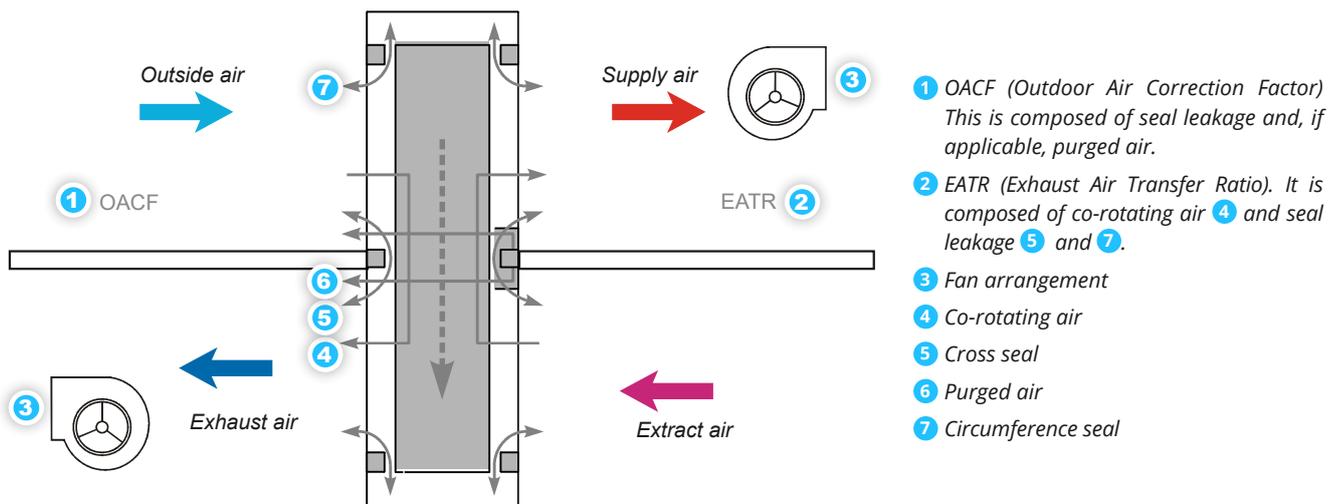
Airflow separation



The circumference seal can be adjusted with a slotted hole on the seal carrier on the storage mass. This allows the seal to be optimally sealed between the storage mass and the housing.

Purge chamber

On request, each RRU ECO can be equipped with a so-called one-sided purge chamber (Fig. 9), which effectively displaces the co-rotating air from the storage mass at a suitable pressure gradient of outside air to exhaust air. Depending on the available purge pressure (recommended min. 200 Pa, max. 800 Pa), the size of the purge chamber can be selected so that only as much outside air is used as necessary. Where small amounts of recirculated air are generally permissible, there is usually no need to use a purge chamber, since the purged air used and thus the lost amounts of outside air are to be regarded as leakage.



Purge chamber dimensioning in relation to the pressure difference between the volume flows

Pressure [Pa]	Requirements purge chamber	Dimension
< 0	Overflow of the exhaust air into the outside air	No
0 - 200	Effect of the purge chamber not guaranteed	No
200 - 500	Large purge chamber	5°
500 - 800	Small purge chamber	2,5°
> 800	Purge air volume too high	No

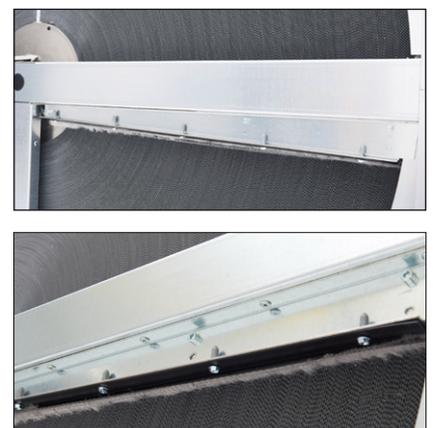
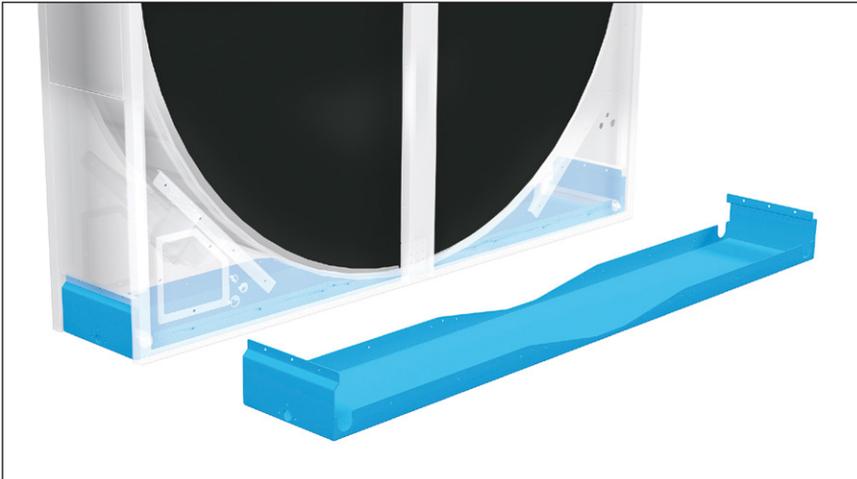
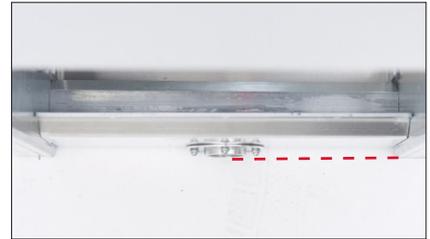


Fig 9: Purge chamber

Condensate drip tray



A condensate drip tray (see Tab. 3 page 13) made of corrosion-resistant aluminium alloy can be optionally used to collect condensate or cleaning fluid at the bottom of the housing and to drain it out of the air handling unit. To avoid transport damage, the drain is flush with the housing. The on-site connection can be made via the 3/4" internal thread.



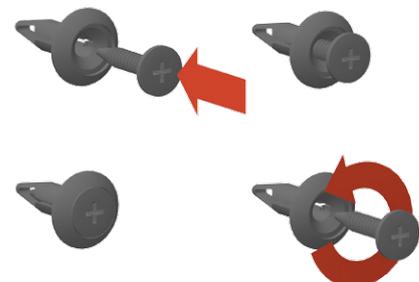
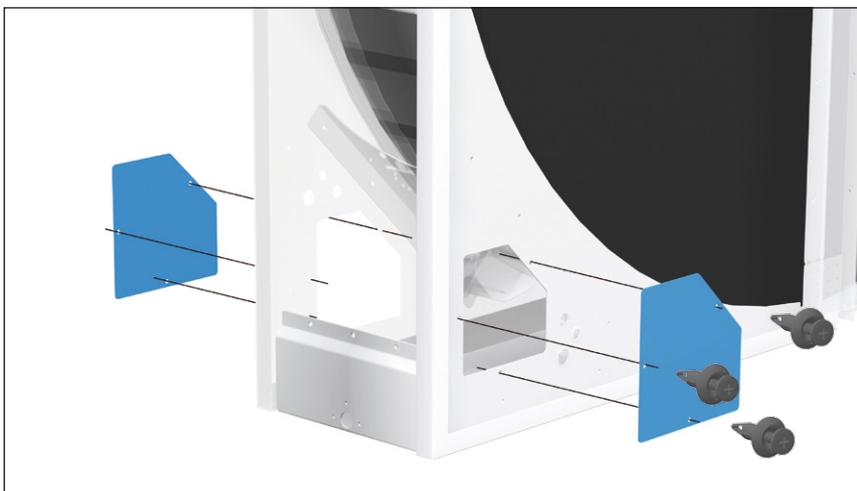
To avoid transport damage, the drain is flush with the housing



The on-site connection can be made via the 3/4" internal thread

Inspection opening

Optionally, the housing can be provided with inspection openings on both sides. These are graded in size from a rotor diameter of 1201 mm and allow inspection of the drive system if not otherwise accessible. The openings are closed with a screwable cover; the quick-release fastener is made with plastic expanding rivets that can be either screwed or clipped during assembly.



*For fastening:
Clip*

*So loosen:
Screw*

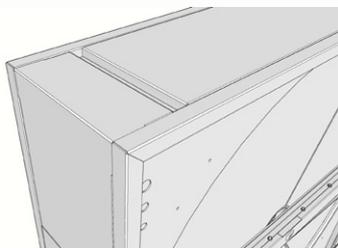
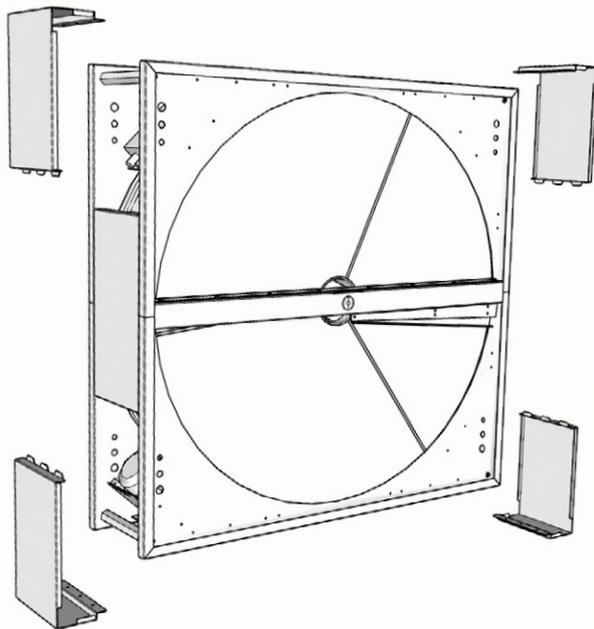
The screwable cover is closed with plastic expanding rivets that can be either screwed or clipped during assembly.

Cable passages/glands

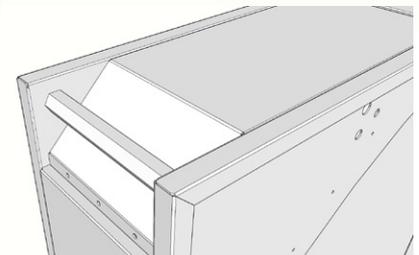
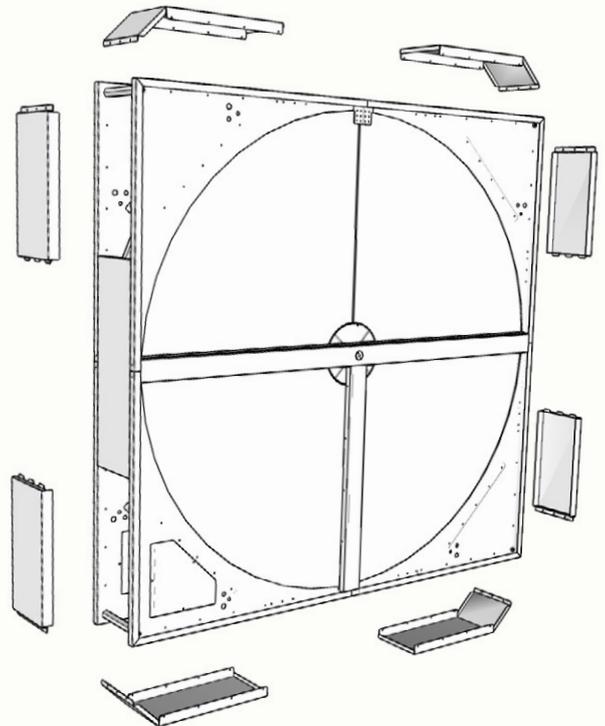
If selected as an option, the housing is provided with cable passages on both sides, in all four corners, which are closed with cover caps. There, power and signal cables can be led out via cable glands for strain relief. A matching set, made of plastic, protection type IP68, can be ordered separately.

Side cladding

The housing is also available in an enclosed version with fitted panels. They correspond in material quality and thickness to the other metal sheets used for cladding and are connected by means of plastic expanding rivets which serve as quick-release fasteners.



Up to size 1200 mm



From size 1201 mm

Please note that other options, such as inspection openings or cable glands, can usefully complement the closed side panel. Attention: If motor control units are mounted in the housing, accessibility via the inspection side must be ensured even after installation in the air conditioner!

6. Commissioning

Caution! Automatic start-up.

When voltage is applied to the motor or control unit, the rotor may start to rotate without warning. Touching the rotor surface or reaching between the rotor and the housing can lead to serious injuries.

Installation in HVAC unit	OK	NOK
The air directions of the air conditioning unit match the air direction arrows on the unit housing of the heat wheel.		
The unit housing of the heat wheel stands on a straight and horizontal base, usually the floor of the HVAC.		
The unit housing of the heat wheel is anchored in the base of the HVAC and the crossbar for airflow separation is positively or non-positively connected to the HVAC.		
Control of the rotor	OK	NOK
The heat wheel is installed centred in the unit housing. Otherwise, the position of the heat wheel in the unit casing must be adjusted vertically and/or horizontally		
The warming wheel can be turned by hand with some force. Otherwise, the position of the seals, the centring in the housing, or other blockages must be checked.		
Drive package	OK	NOK
Checking the direction of rotation. The direction of rotation of the heat wheel must correspond to the direction of the arrow on the stuck-on label.		
Control of the rotation speed. The speed of the sorption heat wheel (Hugo, type N) is a maximum of 20 revolutions per minute. Condensation and enthalpy rotors (type E) have a maximum speed of 10 revolutions per minute.		

7. Limitation of use

Temperature

Values given below reflect the permissible ambient temperatures for continuous operation of standard components.

Component	Min. temperature	Max. temperature
Bearings	-30°C	+70°C
Powerbelt drive belt	-40°C	+116°C
Seal	-40°C	+70°C
Geared motor	-15°C	+40°C
KR MicroMax control units	-25°C	+45°C
Stepper motor + control component	-40°C	+40°C

Pressure loss

The max. permissible pressure loss is 250 Pa. Higher pressure losses can lead to impairment of the mechanics.

Differential pressure

During the planning process, pressure differences between the air mass flows at the RRU ECO should be kept as small as possible. Higher pressure differences lead to more leakage and may not allow the use of a purge chamber.

Condensation

If the extract air falls below the dew point, water can condense via the rotary heat exchanger, which – depending on the operating point – cannot be completely removed by the heated supply air. Therefore, the manufacturer of the ventilation unit containing the rotary heat exchanger must ensure that suitable measures are taken to collect and drain condensate, e.g. watertight floor in front of/behind the rotor in the form of a drip tray, piped with a siphon. Optionally, the rotary heat exchanger can be equipped ex works with a condensate drip tray integrated in the housing. Drain drip trays must be inspected and disinfected regularly to prevent germs.

Air quality

The rotor must be protected against contamination by suitable filtration. Minimum filter classes depend on the outside air quality and the requirements of the room air.

Recommended class ISO ePM_{2,5} ≥ 50% before heat recovery (extract air), but at least ISO ePM₁₀ ≥ 50%

For supply air filtration at least ISO ePM₁₀ ≥ 50%,

For single-stage supply air filtration, at least ISO ePM₁ ≥ 50% (see also RLT-Richtlinie 01 [HVAC Guideline 01]).

8. Maintenance instructions

Component	after 1000 h operation	Quarterly
Rotor	Check that rotor is vertical and centred in the housing. Adjust vertical and horizontal position if necessary.	Check that rotor is vertical and centred in the housing. Adjust vertical and horizontal position if necessary.
Seal	Visual inspection of the seal for damage and to ensure that the seals are in contact with the housing (circumferential) and the storage mass (central).	Visual inspection of the seal for damage and to ensure that the seals are in contact with the housing (circumferential) and the storage mass (central).
Drive	Check that the tension of the drive belt is sufficient. If slippage occurs, especially during start/stop, replacement is necessary, see separate instructions.	Check that the tension of the drive belt is sufficient. If slippage occurs, especially during start/stop, replacement is necessary, see separate instructions.
Bearings	Check bearings for noise and strong vibrations.	Check bearings for noise and strong vibrations. Relubrication is not necessary under normal conditions, as the filling is for life.
Controller	See separate controller description (controller scope of delivery).	See separate controller description (controller scope of delivery).

9. Cleaning

The surface of the rotor must be checked at regular intervals. The contamination of the rotor is influenced by the air quality. The type and condition of the filter upstream of the heat recovery, as well as the inspection intervals, should be adapted to the air quality. The valid standardisation specifications serve as a guideline.

The following cleaning measures are recommended as part of the annual inspection:

Hoover with soft brush attachment, for low contamination of the storage mass with dry dusts.

Compressed air (4-6 bar) for heavy but non-sticky contamination.

Warm water and normal household cleaners for heavy and sticky contamination (check the material compatibility of the cleaner according to the manufacturer's instructions and contact our service department if in doubt).

Rotors with a high cleaning requirement (due to lack of maintenance of the system and/or long downtimes) can also be cleaned using the high-pressure process if necessary. Contact us for more information.

10. Troubleshooting

If the heat wheel does not rotate properly, you can check the rotary heat exchanger in the following steps to locate the problem:



WARNING



Only qualified electricians may work on electrical equipment!

Fault	Cause	Debugging
Rotor does not rotate (electrical)	Defective electrical components, missing power supply	Check voltage supply/check electrical connection
	Control unit faulty	See operating instructions for control unit
Rotor does not rotate (mechanical)	Belt drive tension insufficient	Replace belt (see round belt instructions)
	Damage to geared motor	Measure current consumption of motor (belt not fitted), contact service
Rotor stiff	Resistance due to friction on the gaskets too high	Check the position of the gaskets; re-adjust if necessary
	Storage mass not correctly centred in housing	Adjusting the storage mass (see page 11)
	Bearing failure	Contact Service

11. Explanation for the type code

You will find the rotor type on the type identification label, which is attached to the inside of the housing (see Fig. 13).

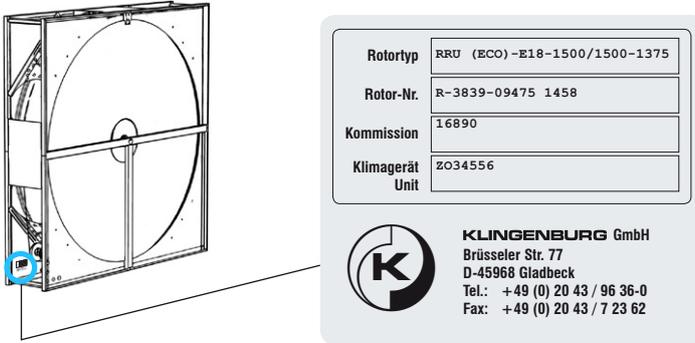


Fig. 13.: The type identification label is attached to the inside of the housing

Example: RRU (ECO)-E18-1500/1500-1375

RRU ECO	P	E	14	XXXX	/	XXXX	-	XXXX
	E		16					
	N		18					
	K		20					
			22					
			24					
Housing	Rotor type	Thickness of storage mass foil	Height of matrix/wave	Housing height [mm]	Housing width [mm]	Wheel diameter [mm]		
RRU ECO	P: Condensations rotor E: Enthalpie rotor N: Sorption rotor HUgo K: Epoxy coated rotor	E - 0.06	14 16 18 20 22 24					

