

## **Rotary heat exchangers**

Transportation, installation and  
manual instruction

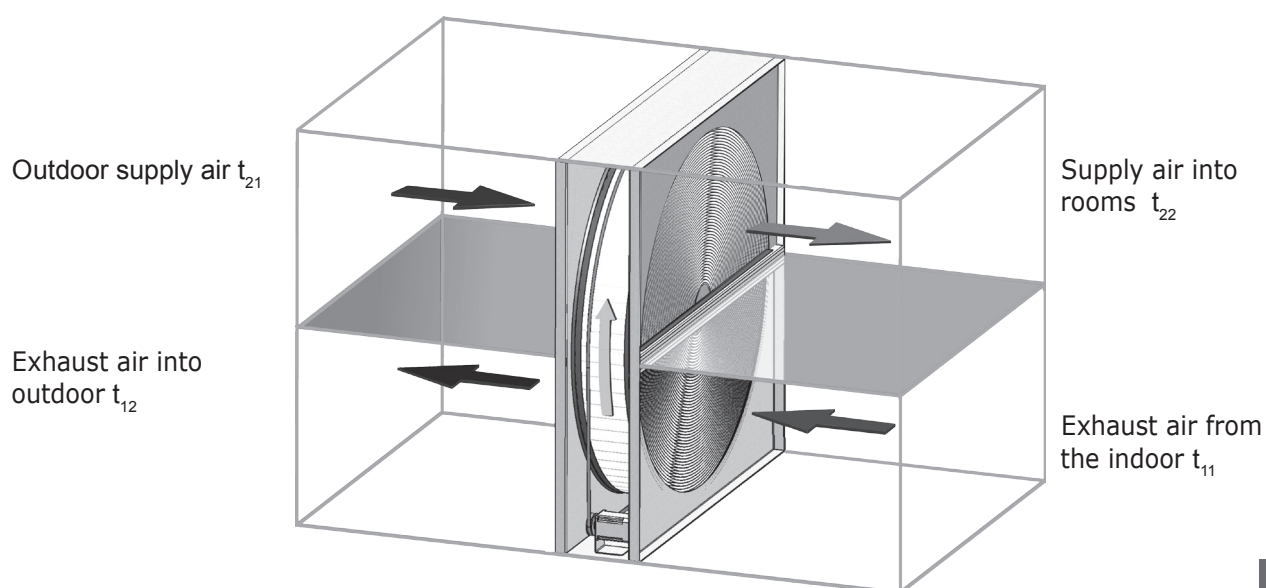


## The purpose of the rotary heat exchanger

Rotary heat exchangers are designed for heat regeneration in air handling units to recover heat or cooling energy from exhaust air.

### Operation principle

Rotary heat exchangers operation is based on heat regeneration: whilst rotating aluminum rotor absorbs heat from exhaust air and transfers it to the supply air. Supply and exhaust air flows are in opposite directions, as shown in picture:



Heat efficiency:  $\Phi = (t_{22} - t_{21}) / (t_{11} - t_{21})$

$t_{21}$  – temperature of outdoor supply air [°C]

$t_{22}$  – temperature of supply air into rooms [°C]

$t_{11}$  – temperature of the exhaust air from the indoor [°C]

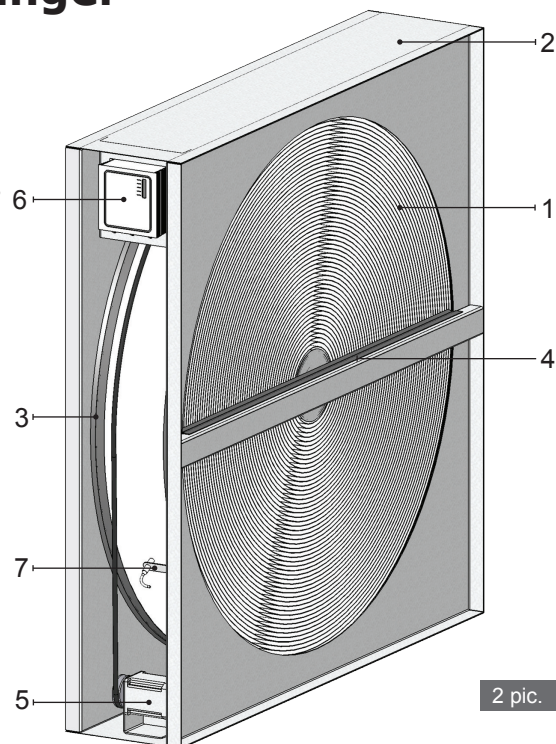
$t_{12}$  – temperature of the exhaust air into outdoor [°C]

The rotation speed of the rotor can be adjusted by speed controller.

Efficiency of the rotary heat-exchanger reaches up to 85 %.

## The design of rotary heat-exchanger

- 1 – impeller of rotary heat-exchanger (rotor)
- 2 – casing
- 3 – rotor sealing brushes
- 4 – crossarm with sealing brushes for separation of air flows
- 5 – rotor actuator
- 6 – rotation speed controller
- 7 – rotation sensor



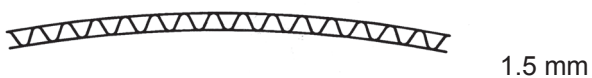
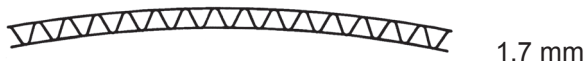
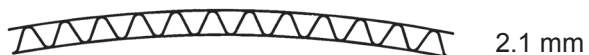
### Rotary heat-exchanger

Diameter up to 3000 mm.

Width of the rotor 200 mm.

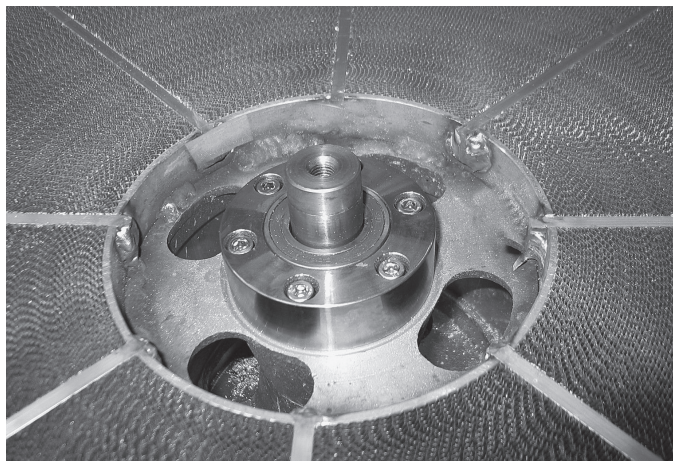
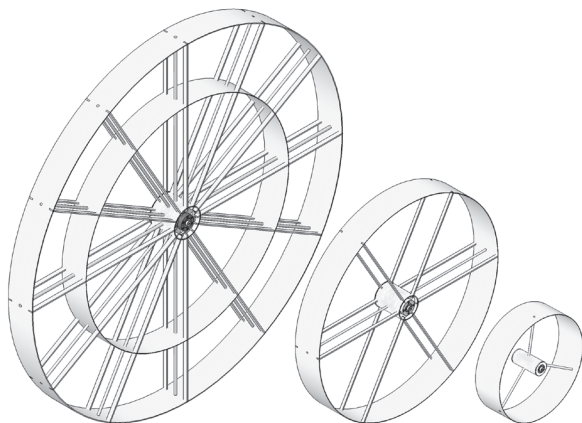
Rotary heat-exchangers are produced from alternate layers of plain and corrugated 70  $\mu$ m thickness aluminum foil.

3 different wave heights available:



3 pic.

Rotors are reinforced by means of aluminum spokes and external rotor shell. Rotor axis equipped with durable bearings (4, 5 pictures).



## Casing

The casing for rotary heat exchanger is produced from steel sheets.

Spaces between rotor and casing also spaces between air streams are sealed with special long-lasting sealling brush.

Rotary heat exchangers can be equipped with purge section. There is probability that small volume of exhaust air can get into supply air. Purge section can be used to avoid that.

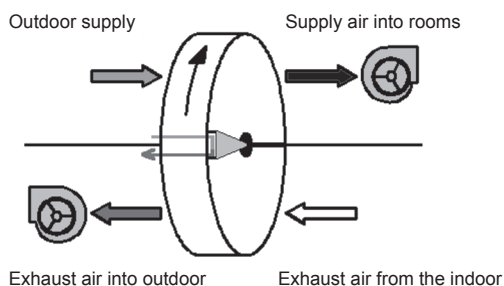
The use of purge section:

Pressure difference:

Lower than 200 Pa – Purge section is not effective

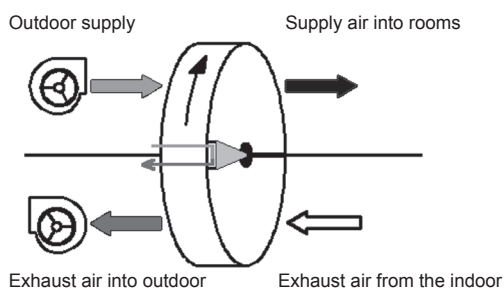
200...800 Pa – Purge section is required

Over 800 Pa – Purge section is not effective



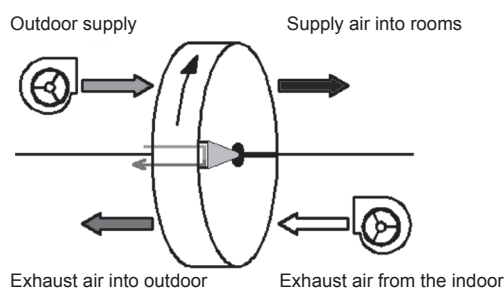
**Supply fan – suction effect**  
**Exhaust fan – suction effect**

Purge section 2x5° can be used, if pressure drop between supply and exhaust air is in between 200...500 Pa.



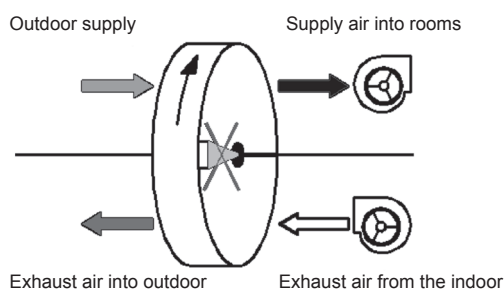
**Supply fan – pushing**  
**Exhaust fan – suction effect**

Purge section 2x5° can be used, if pressure drop between supply and exhaust air is in between 500...800 Pa.



**Supply fan – pushing**  
**Exhaust fan – pushing**

Purge section 2x5° can be used, if pressure drop between supply and exhaust air is in between 200...500 Pa.



**Supply fan – suction effect**  
**Exhaust fan – pushing**

The use of purge section is not effective.  
Air mixing is inevitable.

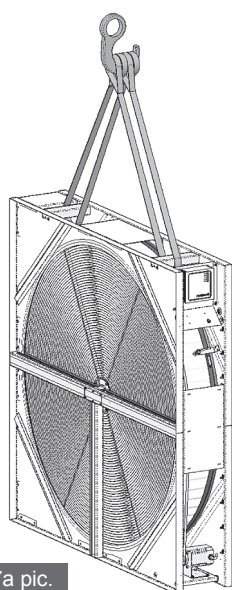
6 pic.

### Rotary heat exchanger transportation by crane, truck, and trolley

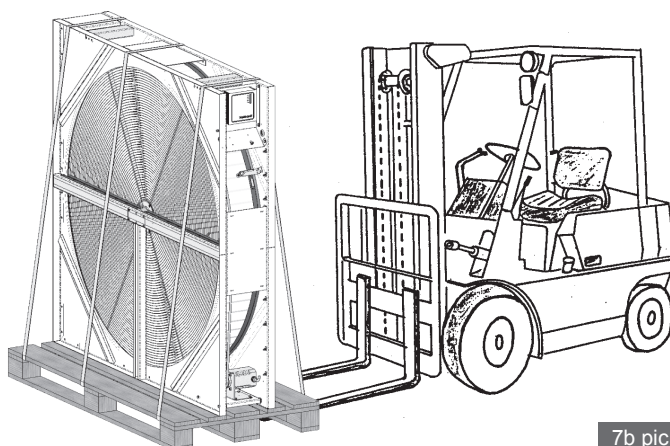
Loading or unloading equipment by crane, lifting straps should be fixed to holders which are designed on the casing of heat exchanger as shown in the picture 7a.

Equipment mounted on wooden pallet can be moved by truck or trolley as shown in the picture 7 b, c.

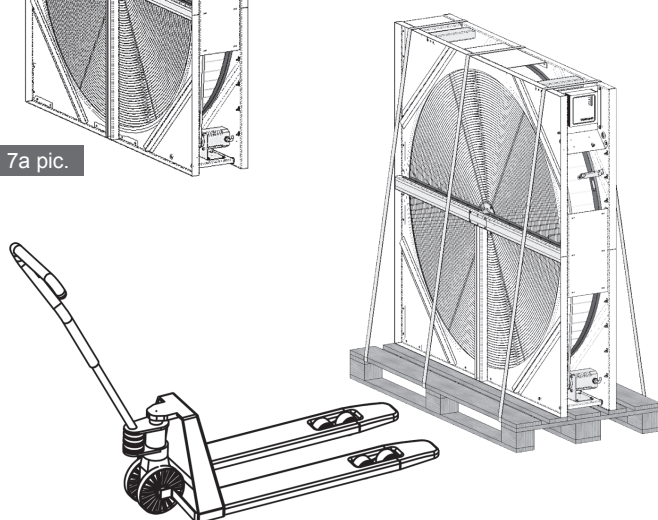
It is not allowed to move rotors if they are not fixed to pallet with special safety straps or other fixing as it is possible for rotor to fall down because of its high center of gravity (8 pic.).



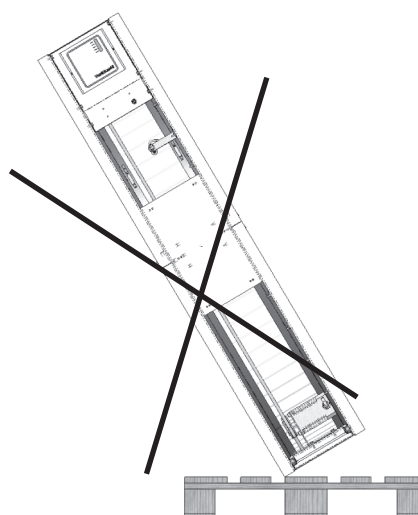
7a pic.



7b pic.



7c pic.



8 pic.

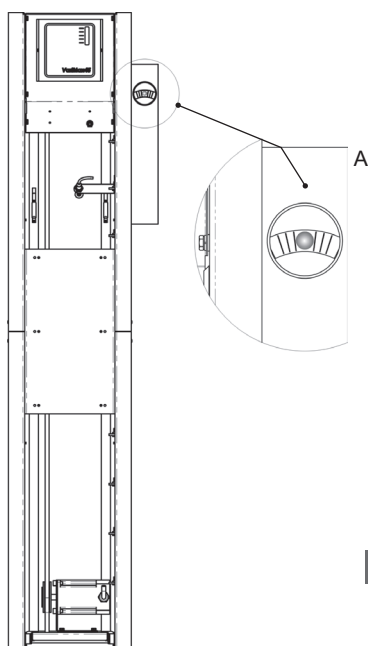
### Inspection of the rotary heat exchanger

After you receive the unit, please check it carefully and make sure that there has not been done any visible damage during transportation. If you will see any damage or missing parts notify the carrier immediately. You have to notify company KOMFOVENT in three days after receiving the item and send the written confirmation in seven days. UAB KOMFOVENT does not take any responsibility for damage done during transportation, while unloading or damage while installing the unit.

Check carefully that surface of the impeller, casing of the rotor and actuator are free of the damage.

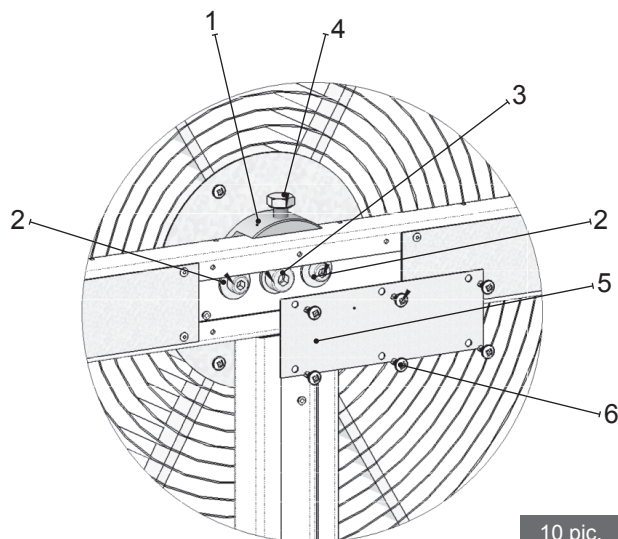
## Installation of rotary heat exchanger into air handling unit

Please check the rotary heat-exchanger if rotor rotates freely on the axis before installation. Big diameter rotors are fixed to casing with special transportation holders, which should be dismantled. Check if rotors sealing strip is evenly placed to wall of the casing. In case of small damages during transportation or installation of rotor, sometimes, it is needed to recenter the axis one more time. Correction of axis should be accomplished only when unit is strictly in vertical position on flat base as shown in the picture 9.

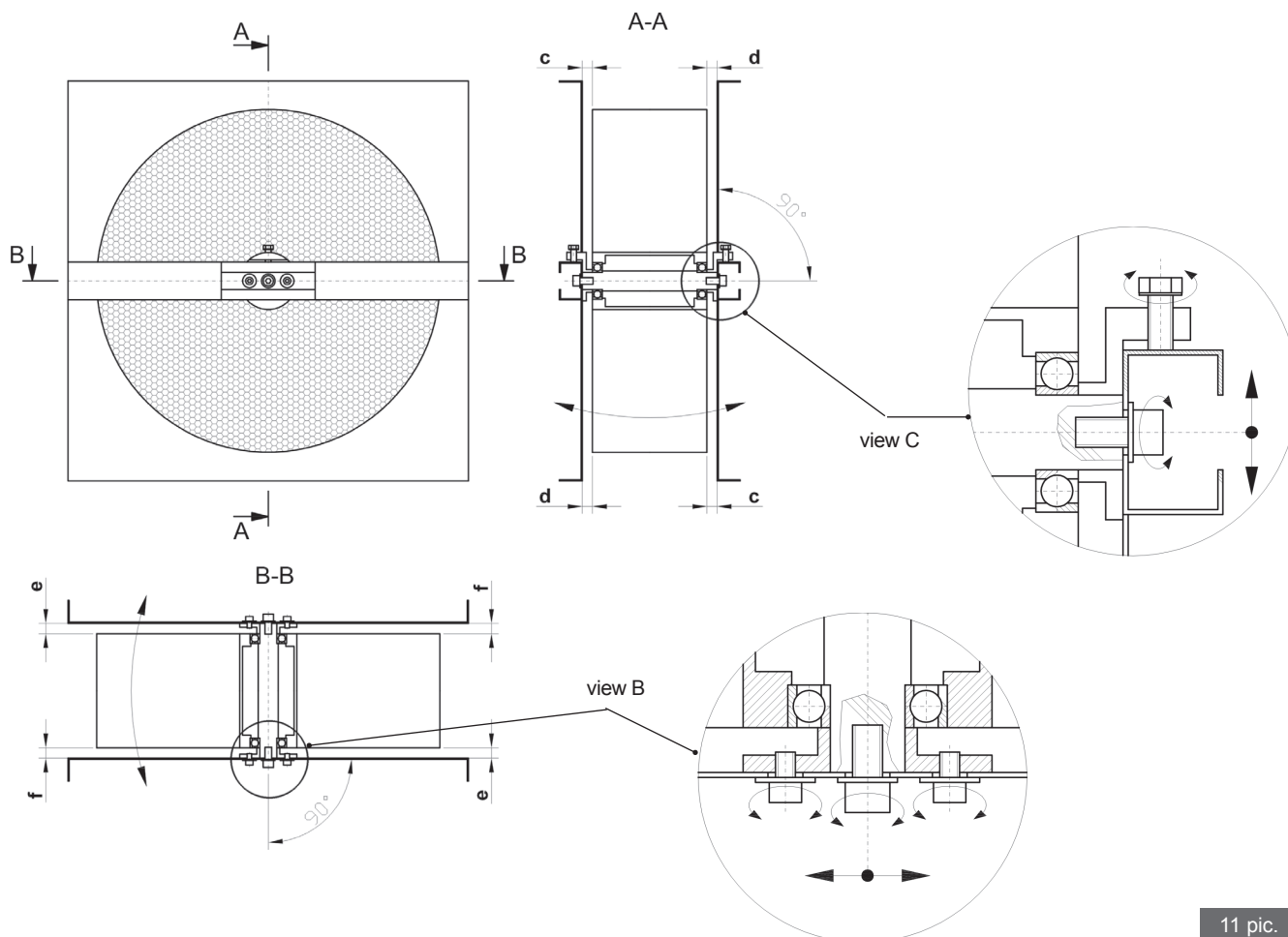


9 pic.

Axis of the rotor is fixed to the casing by the holders pos.1 (see picture at the bottom). To make correction of the axis you have to unscrew the bolts pos.6 and remove the lid pos.5. After that loosen the bolts pos.2 and pos.3. To center the axis use bolts pos.4 so that the spaces between c and d would be even as shown in the cut A-A (see drawing page 7). Later on check and make even spaces e and f as shown in cut B-B. Then tighten up bolts pos.2 and pos.3 and close the lid pos.5.



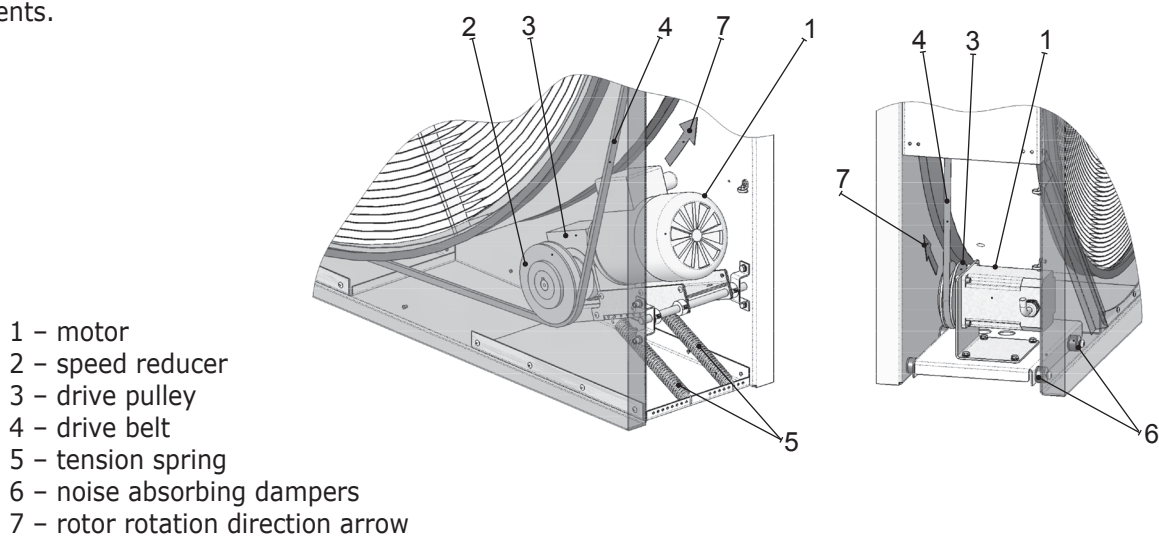
10 pic.



11 pic.

## Rotor actuators

Rotors' actuator consists of motor, speed reducer, drive pulley, drive belt, drive tensioner and other elements.



12 pic.

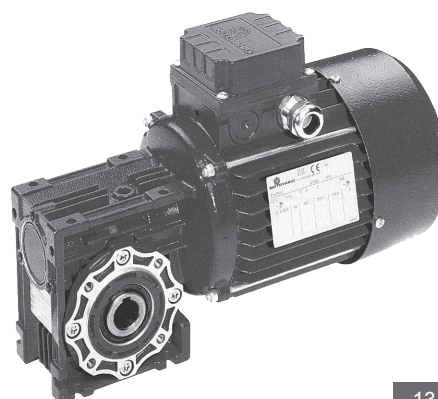
## Actuator types:

### 1. ST type actuator with standard asynchronous motor without speed controller

For these actuators standard three-phase motors are used with worm type reducers.  
Reducer ratio and drive pulleys are selected so that the rotor speed would be approximately 10 rpm.

#### Advantages:

- Standard three-phase asynchronous motor
- Isolation class – F
- 4 pol / 1500 rpm
- Worm type reducer
- Greased for life with synthetic oil
- Motor connection flange – B14
- On request can be supplied with thermocontacts.



13 pic.

Rotor diameter / mm	1000-1099	1100-1199	1200-1299	1300-1699	1700-1899	1900-2599	2600-3000
Motor type	56B4	56B4	63B4	63B4	71B4	71B4	80B4
Input voltage / V	3L AC 230/400	3L AC 230/400	3L AC 230/400	3L AC 230/400	3L AC 230/400	3L AC 230/400	3L AC 230/400
Frequency / Hz	50	50	50	50	50	50	50
Power / W	90	90	180	180	370	370	750
Rated current / A	0.78/0.45	0.78/0.45	0.97/0.56	0.97/0.56	1.82/1.05	1.82/1.05	3.5/2
Motor protection class	IP55	IP55	IP55	IP55	IP55	IP55	IP55
Type of reducer	NMRV 025	NMRV 030	NMRV 030	NMRV 030	NMRV 040	NMRV 040	NMRV 040
Reducer ratio	15:1	15:1	15:1	10:1	10:1	7,5:1	7,5:1
Ambient temp. non condensing	-5°...+40°C	-5°...+40°C	-5°...+40°C	-5°...+40°C	-5°...+40°C	-5°...+40°C	-5°...+40°C
Weight (motor + reducer) / kg	4,7	4,8	5,4	5,4	8,4	8,4	13,6

## Electrical connection

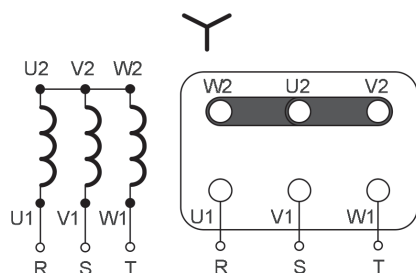
Motor must be connected to three-phase alternating electricity. The right power supply and winding connection is shown in electrical scheme, which is shown in description bellow and on cover of motor terminal box. Selection of all connections, grounding, voltage protection must be made according national standards.

In order to connect motor properly, motor should be connected according electrical scheme on terminal box. If the scheme is missing or it is not possible to read the data please contact the sales office.

It is needed to choose right voltage protection to save motor from overheating. It is recommended to set voltage protection on 115% maximum possible voltage value, which is shown on motor terminal box, when outside temperature is 40°C. All three phase motors must be protected.

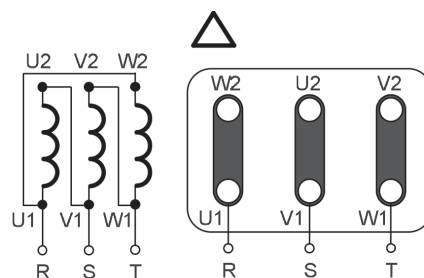
There are two additional connection wires, if motor has thermocontacts. Depending on motor type it could be bi-metal contacts (thermocontacts) or "PTC" resistive protection. This protection must be connected to control circuit.

### Electrical scheme



Connection scheme using voltage 3x400V

14 a pic.



Connection scheme using voltage 3x230V

14 b pic.

### The change of rotation direction

Avoid moving parts and save clothing from possible hooking.

Check rotation direction of the rotor, in as short period as it takes just to see the direction it turns, turn on the engine. The turning direction should match the direction shown on rotor casing. Switch places of any two from three motor power wires if the rotor turning direction is wrong.

## 2. VM type actuator with speed controller VariMax



15 pic.

These actuators are designed for condensation rotors up to Ø 600 mm and hygroscopic up to Ø 2599 mm. Actuator consists of multipolar motor, controller, speed sensor.

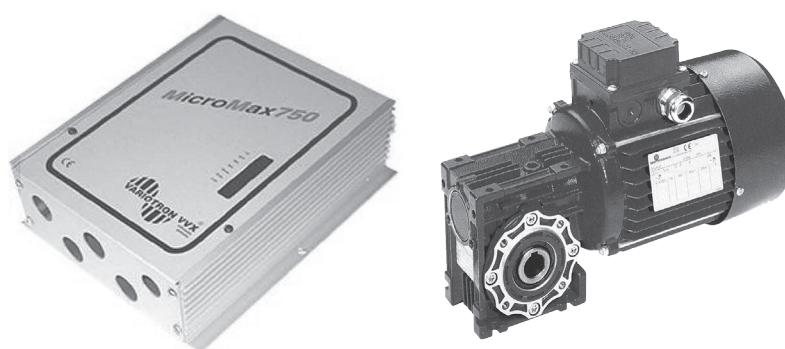
#### Advantages:

- Actuator is perfectly designed for most commonly used controlling systems in air handling units and allows to optimize action of rotary heat exchanger.
- Controlling signal is directly proportional to rotors efficiency.
- Multipolar motor supports high torque in all speed control range.
- VariMax controller has purge section function installed already. If rotor is not rotating longer than 30 minutes, the cleaning function switches on and rotor turns for 10 seconds in low speed.
- High range of speed control 0,1–12 rpm for condensation rotors and 0,2–20 rpm for hygroscopic rotors.
- Soft start reduces the load on startup.
- Electronic motor control saves the need for external overheat protection.
- Motor failure indication if belt breaks.

Rotor diameter	600-1199 mm	1200-1999 mm	2000-2599 mm
<b>Control units</b>	<b>VariMax 25</b>	<b>VariMax 50</b>	<b>VariMax 100</b>
Power input max	110 W	240 W	500 W
Connection voltage	1x230V +6-10 % 50/60 Hz	1x230V +6-10 % 50/60 Hz	1x230V +6-10 % 50/60 Hz
Protection class	IP54	IP54	IP54
Ambient temp. non condensing	-30 – +40 °C	-30 – +40 °C	-30 – +40 °C
Weight	1,3 kg	1,6 kg	3 kg
<b>Motor type</b>	<b>VariMax-motor 25</b>	<b>VariMax-motor 50</b>	<b>VariMax-motor 100</b>
Maximal torque	2,1Nm	4Nm	10Nm
Minimal rotating speed	1 rpm	1 rpm	1 rpm
Maximal rotating speed	350 rpm	375 rpm	400 rpm
Maximal temperature on the casing	+110 °C	+110 °C	+110 °C
Ambient temp. non condensing	-30 – +45 °C	-30 – +45 °C	-30 – +45 °C
Protection class	IP54	IP54	IP54
Weight	2,6 kg	4 kg	8,4 kg

Users manual for rotary heat exchanger with VM actuator comes with separate Varimax actuators user manual complete with installation guide.

### 3. MM type motor for big wheels with MicroMax 750 speed controller



16 pic.

These actuators are designed for condensation and hygroscopic rotors from Ø 2600 mm and up to Ø 3000 mm. Actuator consists of 3 phase motor, gear, controller, speed sensor.

- Actuator is perfectly designed for most commonly used controlling systems in air handling units and allows to optimize action of rotary heat exchanger.
- Controlling signal 0 to 10 V is directly proportional to rotors efficiency.
- MicroMax 750 controller has purge section function installed already. If rotor is not rotating longer than 30 minutes, the cleaning function switches on and rotor turns for 10 seconds in low speed.
- High range of speed control.
- Soft start reduces the load on startup.
- Electronic motor control saves the need for external overheat protection.
- Possibility manually adjust rotation speed.
- Motor failure indication if belt breaks.

Rotor diameter	2600-3000 mm
<b>Control units</b>	<b>MicroMax 750</b>
Power input max	750W
Connection voltage	1x230V +6-10% 50/60Hz
Output frequency	4-100/150Hz
Output voltage	3x0-230V
Protection class	IP54
Ambient temp. non condensing	0-45°C
<b>Motor type</b>	<b>80B4</b>
Motor power	750 W
Voltage	3L AC 230/400V
Frequency	50 Hz
Rated current	3.5/2 A
Motor protection class	IP55
Ambient temp. non condensing	-5-+40°C
<b>Type of reducer</b>	<b>NMRV 050</b>
Reducer ratio	7,5:1
Weight (control unit + motor + reducer)	14,8 kg

#### 4. SZ step actuator (StepSyn) for small rotors

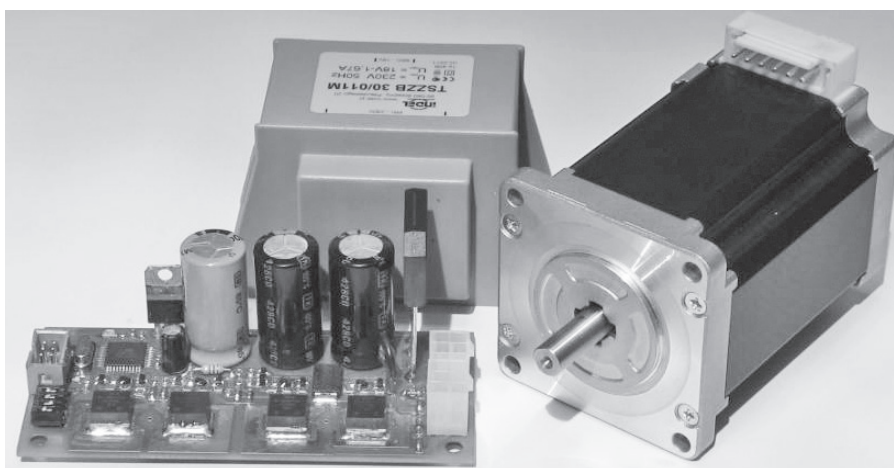
These actuators are designed for small condensation rotors up to Ø 650 mm.

The actuator consist of step motor and control board.

Actuators control board and drive pulleys are selected so, that rotor would rotate aproximately 10 rpm.

Advantages:

- Step motor has long life cycle.
- Low level noise.
- Lower motor work temperature.
- Up to 30 % lower energy rate.



17 pic.

### Motor control board KOMFOVENT R3

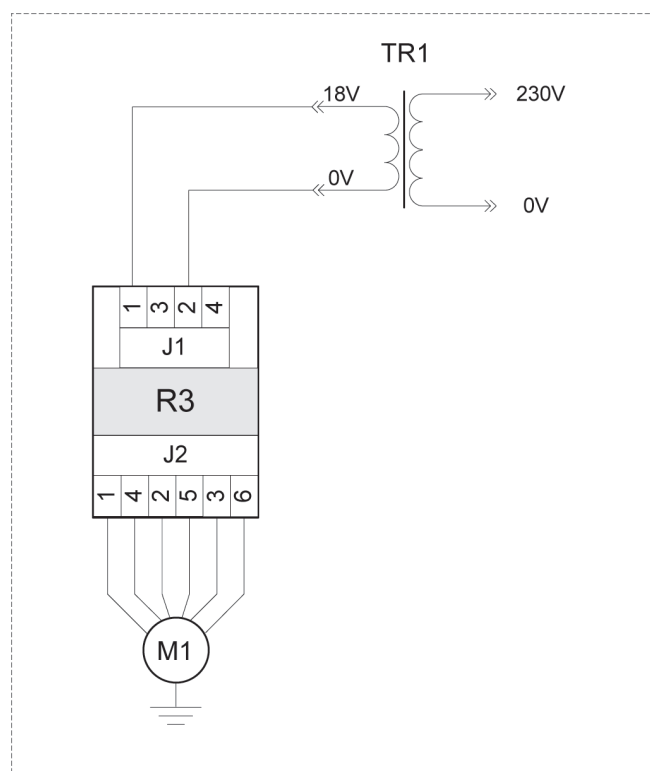
Maximal power	30 VA
Power supply	1x230V +6-10% 50/60Hz
Protection class	IP20

### Motor

Maximal torque	2 Nm
Nominal rotation speed	100 aps/min.
Protection class	IP20
Weight	0.77 kg

Working temperature for these actuators is from -10 °C to +40 °C.

### Actuator electrical connection:



18 pic.

R3 – control board  
M1 – step motor 2 Nm  
TR1 – transformer 30 VA

### 5. SP and SPT type actuators with AC induction motor for small rotors

These actuators are designed for small condensation and hygroscopic rotors up to Ø 1000 mm.

Actuator consist of AC induction motor and gearwheel reducer.

Reducer and drive pulleys are selected so, that rotor would rotate approximately 10 rpm.

All SP and SPT motors has integrated thermal protection (thermo contacts).

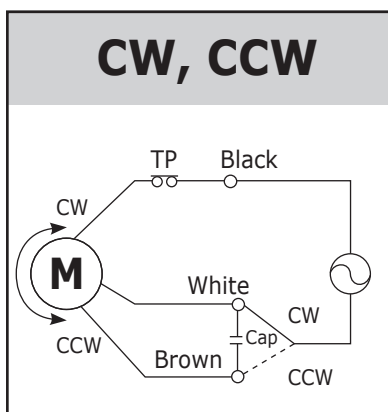


19 pic.

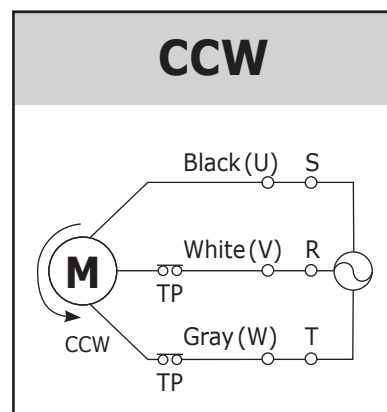
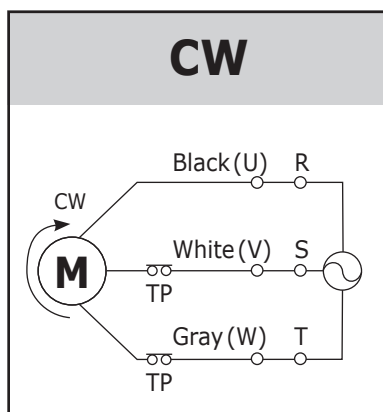
Rotor diameter	500-699 mm		700-1000 mm	
Actuators type	SP	SPT	SP	SPT
Motor type	S8I25GXCE	S8I25GTCE	S9I40GXHCE	S9I40GTHCE
Number of poles	4	4	4	4
Power	25 W	25 W	40 W	40 W
Input voltage	1L AC 220~240V	3L AC 220V	1L AC 220~240V	3L AC 220V
Frequency	50 Hz	50/60 Hz	50 Hz	50/60 Hz
Condenser capacity	1,3 µF	–	2,0 µF	–
Rated current	0,23-0,25 A	0,28/0,24 A	0,34-0,37 A	0,39/0,33 A
Motor protection class	IP23	IP23	IP23	IP23
Type of reducer	S8KA15B		S9KB15BH	
Reducer ratio	15:1		15:1	
Ambient temp. non condensing	-10 °C...+40 °C		-10 °C...+40 °C	
Weight (motor + reducer)	1,89 kg		3,03 kg	

## Electrical connection

### SP type actuators



### SPT type actuators



20 pic.

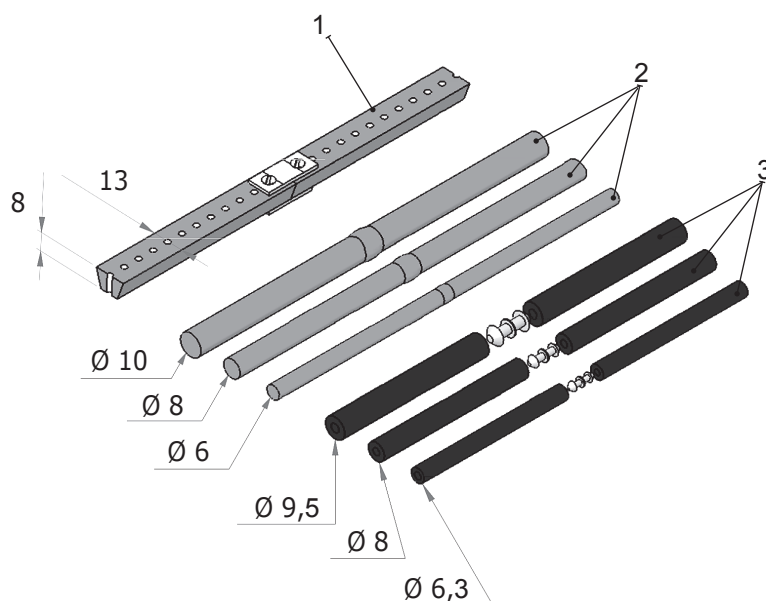
## Rotor actuator belts

Depending on type of actuator and rotor diameter there are such belts for actuators:

Pos.1 – trapezoidal belt with holes A/13 DIN2216. These belts are supplied with special connectors

Pos.2 – round PVC belts Ø 10 mm, Ø 8 mm or Ø 6 mm, green colour ~880 Shore A hardness, rough surface. These belts are connected with special welding technology.

Pos.3 – round connecting belts Ø 9,5 mm, Ø 8 mm, Ø 6,3 mm, red colour ~800 Shore A hardness. Belts supplied with special connector. These belts could be used as repair belts if the original green belt brakes. The diameter of the repair belt should be closest diameter to the broken belt.

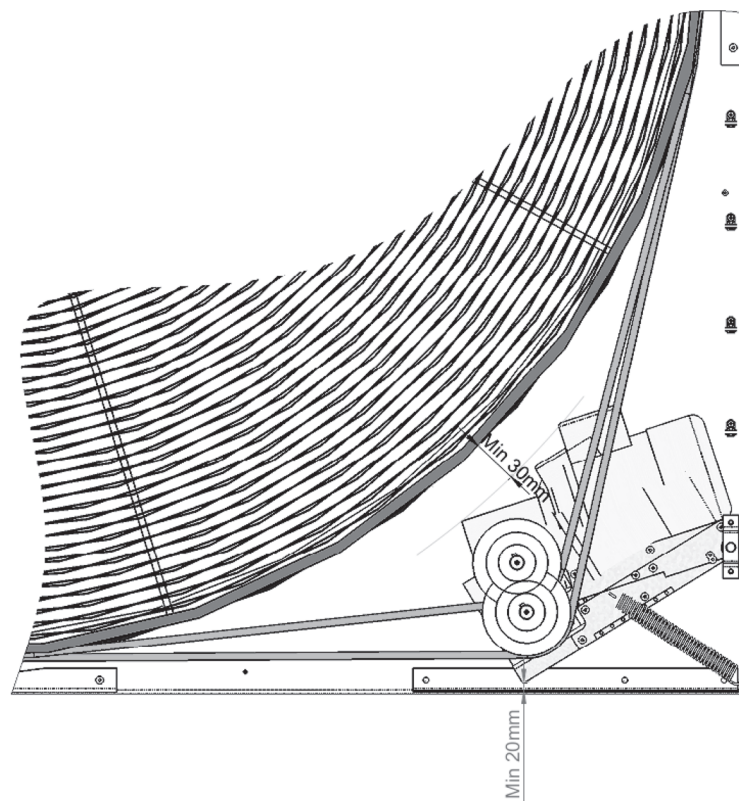


21 pic.

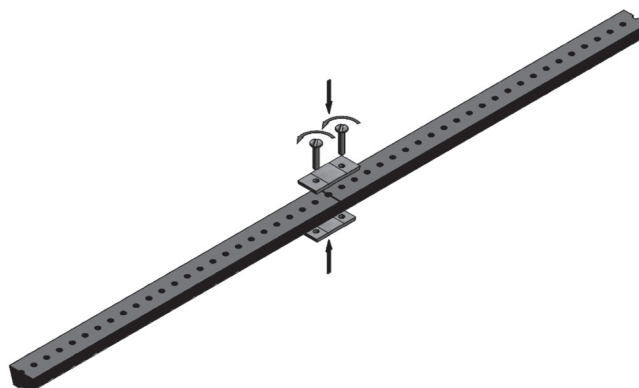
### Periodic inspection of rotor belts

If a V-belt with holes is mounted in the rotary heat exchanger, it is necessary to carry out the periodic inspection of belt tension in such rotors. After a certain time new belts tend to stretch. As a result, the actuator may become loose and cannot properly turn the rotor. If the drive area gets loose to the extent that less than 20 mm remain to resting on the bottom of the rotor, it is necessary to reduce the length of the belt. The picture shows the drive belt tension range.

The belt has to be shortened so that there is a minimum spacing of 30 mm between the actuator and the rotor, as shown in the figure. Perform the first rotor belt revision inspection during the rotor start-up, and the second in about after the first 100 hours of the rotor operation. After the belt shortening, perform revision inspections at least every 6 months. Round polyurethane belts are fitted with high tension and no shortening is required. Round belt inspection must be performed once every 6 months.

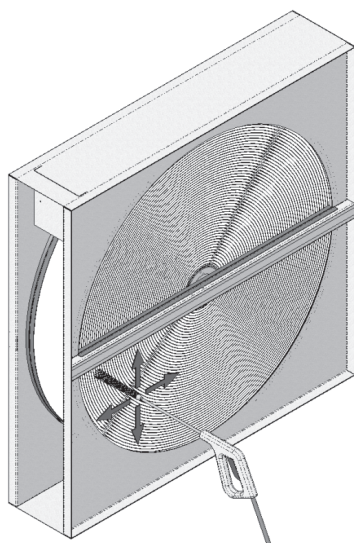


Trapezoidal rotor belts are equipped with a special joint. Belt connection is performed by mechanically joining the coupling parts, as shown in the figure.



## Cleaning of the rotary heat exchanger

Rotor air channels in time can get clogged by grease, oil, chalk limescale or other impurities. It can happen if low level filters will be used. Efficiency of the clogged rotor is getting lower so it is needed to clean it. It is enough to clean rotor with compressed air (~6 bar) if it is not clogged with grease, chalk limescale or other hard to clean impurities. It is possible to wash rotary heat exchangers with high pressure washing equipment. The rotor section should be extracted from the unit before washing it.



24 pic.

Actuator and controller should be unmounted or properly protected from washing liquid. It is not allowed to use more than 10 bar pressure while washing in single jet method. It is possible to use higher pressure (~20 bar) when using sprayer with jet separation. As an additive it is possible to use neutral or lightly alkaline washing liquid.

The washing agent should be harmless to environment, non aggressive to foil, should be adapted to high pressure equipment, should not require special protective equipment for the washing operator.

It is possible to use FLORE CHEMIE universal degreaser "Flamil 50 Super". It is necessary to dry heat exchanger after washing it with alkaline detergents. It is necessary to comply to washing machine user guide and safety data described in washing medium safety sheet.

### Rotary heat exchanger order key

Example: RR - AL - 1200 - M - O - S(1300x1300x290) - PN - A1 - VM

↓   ↓   ↓   ↓   ↓   ↓   ↓   ↓   ↓

1   2   3   4   5   6   7   8   9

1 - RR - rotary heat exchanger

2 - Wheel material:

AL - aluminium for condensation rotary heat exchangers

AH - aluminium with hygroscopic treatment for hygroscopic rotary heat exchangers

AJ - aluminium prevented of seawater influence (not in production right now)

3 - Rotor diameter, mm

4 - Wave height:

XL - smallest (~1,5 mm)

L - small (~1,7 mm)

M - middle (~2,1 mm)

5 - Rotor construction:

O - one-piece

S - sectorized, (not in production right now)

6 - Casing:

N - no casing

S - casing from sheet steel

Numbers in the brackets - measurements of the casing (length x height x width), mm

7 - Purge section:

PN - no purge section

P2 - purge section 2x5°

8 - Installation and motor position:

A, B, C, D, E, F, G, H - installation position (see attachment)

1, 2 - motor position (see attachment)

Note: when ordering without purge section, rotor turn direction and deployment of air flows is not important. In this case it is needed to indicate only the traverse position - horizontal A or vertical E, and motor mounting position - below 1 or above 2. There are only 4 possible installation positions when ordering rotary heat exchanger without purge section - PN-A1, PN-A2, PN-E1, PN-E2.

9 - Actuator type:

ST type actuator with standard asynchronous motor without speed controller and sensor (rotors from 1000 to 3000 mm);

VM type permanent magnet actuator with speed controller (rotors from 600 to 2599 mm);

MM type asynchronous motor with speed controller and sensor (rotors from 2600 to 3000 mm);

SZ step actuator without speed controller and sensor (rotors up to 600 mm);

SP type actuators with AC induction motor without speed controller and sensor (rotors from 500 to 1000 mm);

SPT type actuators with AC induction motor without speed controller and sensor (rotors from 500 to 1000 mm).

## Ordering scheme

-PN-A1; -PN-A2	-P2-A1; -P2-A2	-P2-B1; -P2-B2	-P2-C1; -P2-C2	-P2-D1; -P2-D2
-PN-E1; -PN-E2	-P2-E1; -P2-E2	-P2-F1; -P2-F2	-P2-G1; -P2-G2	-P2-H1; -P2-H2

Supply air →

Exhaust air →

**Note:** Classical design of the heat exchanger, where the drive is located at the bottom of the casing. If the rotary heat exchanger is ordered with drive at the bottom, then speed controller is mounted on the top. Only on request can be ordered motor and controller mounting on the top.

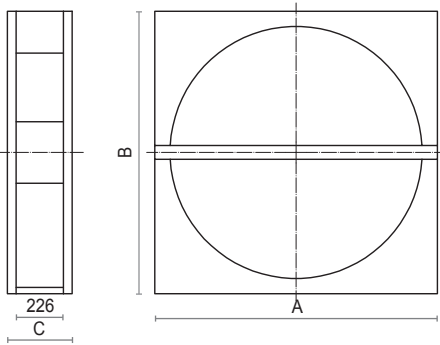
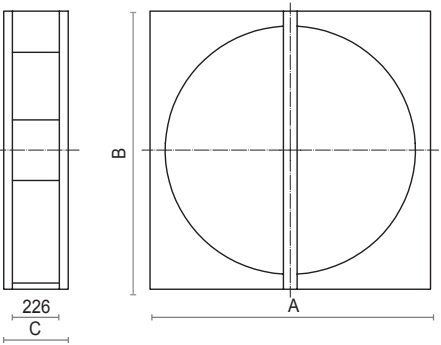
## Dimensions of rotary heat exchangers

Construction, dimensions and weight of rotary heat exchanger depends on rotor diameter, on air separation traverse position, on actuators type and size. Rotary heat exchangers weight is also affected by the wave height of the foil. In the table below you can see rotary heat exchangers standard dimensions and weights without actuators and packaging.

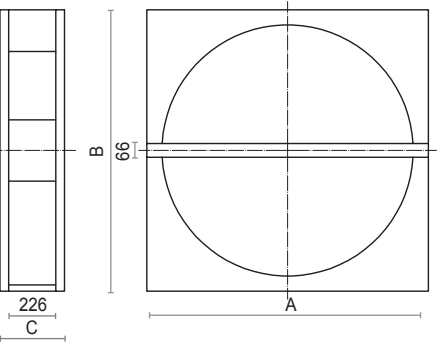
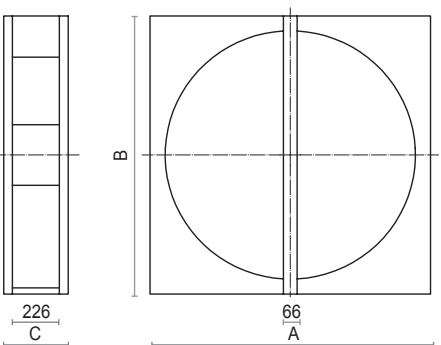
### Heat exchangers with SZ drives

Installation positions A, B, C, D	Installation positions E, F, G, H	Rotor diameter (mm)	Casing dimensions (mm)			Weight (kg)
			A	B	C	
		400	500	500	290	14
		500	600	600	290	24
		600	700	700	290	36

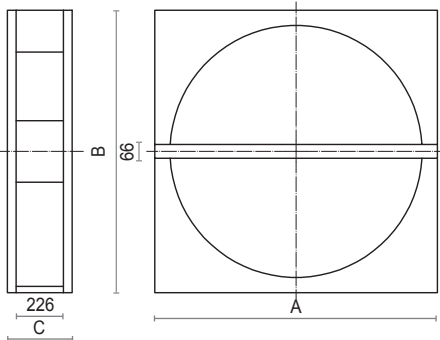
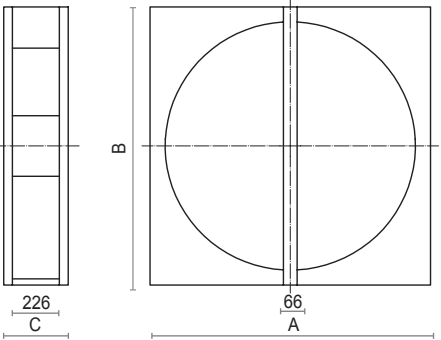
## Rotary heat-exchangers with SP actuators

Installation positions A, B, C, D	Installation positions E, F, G, H	Rotor diameter (mm)	Casing dimensions (mm)			Weight (kg)
			A	B	C	
		500	600	600	290	25
		600	700	700	290	37
		700	800	800	290	46
		800	900	900	290	60
		900	1000	1000	290	79
		1000	1100	1100	290	89

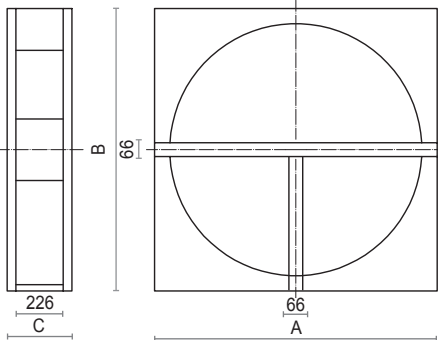
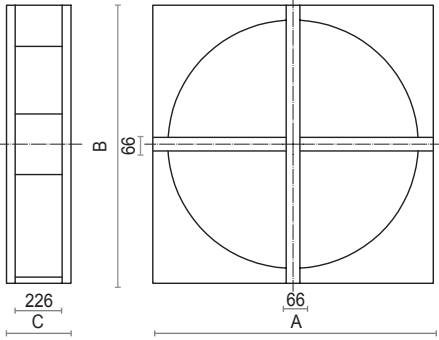
## Rotary heat-exchangers with VM actuators

		600	700	700	290	39
		700	800	800	290	48
		800	900	900	290	61
		900	1000	1000	290	80
		1000	1100	1100	290	90
		1100	1200	1200	290	100
		1200	1300	1300	290	125

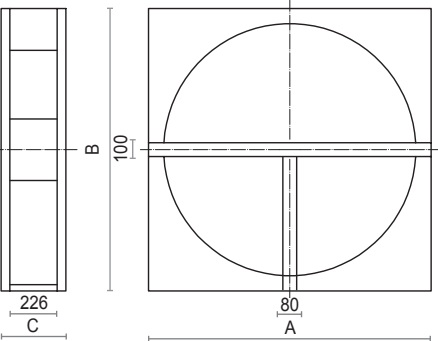
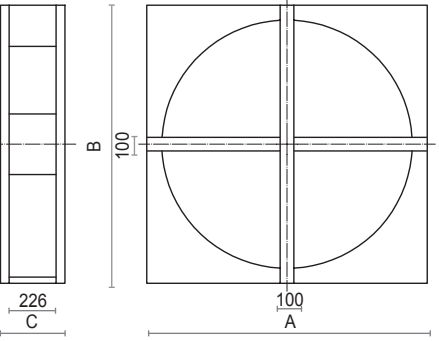
## Rotary heat-exchangers with ST actuators

		1000	1100	1100	290	90
		1100	1200	1200	290	101
		1200	1300	1300	290	126

## Rotary heat-exchangers with ST and VM actuators

Installation positions A, B, C, D	Installation positions E, F, G, H	Rotor diameter (mm)	Casing dimensions (mm)			Weight (kg)
			A	B	C	
		1300	1400	1400	310	145
		1400	1500	1500	310	163
		1500	1600	1600	310	181
		1600	1700	1700	310	203
		1700	1800	1800	310	228
		1800	1900	1900	310	248
		1900	2000	2000	310	268
		2000	2100	2100	310	293

## Rotary heat-exchangers with ST, VM and MM actuators

		2100	2200	2200	310	322
		2200	2300	2300	330	391
		2300	2400	2400	330	431
		2400	2500	2500	330	463
		2500	2600	2600	330	494
		2600	2700	2700	330	543
		2700	2800	2800	330	583
		2800	2900	2900	330	623
		2900	3000	3000	330	664
		3000	3100	3100	330	703

Note: there are shown rotary heat-exchangers weights in the table when rotors wave height are  $L = 1.7$  mm. On request dimensions A and B can be bigger than are showed in the table.

Also, on special request and arrangement we can offer other casing constructions with rotor wheels from  $\varnothing 230$  mm up to  $\varnothing 3000$  mm.

## Freezing protection

There is a risk for the rotor to freeze when outside air temperature drops down to  $-25$  °C (depending on the exhaust air temperature and relative humidity). In this case we recommend to use primary air heater. Also you can avoid the freezing by slowing the rotation speed of the rotor, but in this case the efficiency of the rotor also gets lower.

Rotor freezing affects heat exchangers lower heat transfer efficiency and bigger pressure losses. It is necessary to take measures to avoid rotor icing as it could cause rotor a failure.

## Conditions

- Standard rotary heat exchanger working temperature is from  $-30$ ° to  $+40$  °C;
- The maximum pressure difference between supply and exhaust air is 600 Pa;
- Pressure drop in the heat exchanger – recommended boundaries 80–230 Pa;
- Air flows should be filtered not lower than G3 (EN 779) type filters.

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	Merkapt	www.merkapt.hu
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	Hitataekni ehf	www.hitataekni.is
NL	Ventilair group	www.ventilairgroup.com
	DECIPOL-Vortvent	www.vortvent.nl
NO	Ventistål AS	www.ventistal.no
	Thermo Control AS	www.thermocontrol.no
PL	Ventia Sp. z o.o.	www.ventia.pl
SE	Nordisk Ventilator AB	www.nordiskventilator.se
SI	Agregat d.o.o	www.agregat.si
SK	TZB produkt, s.r.o.	www.tzbprodukt.sk

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