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## Klingenburg rotary heat exchangers



**REZNOR UK LTD**

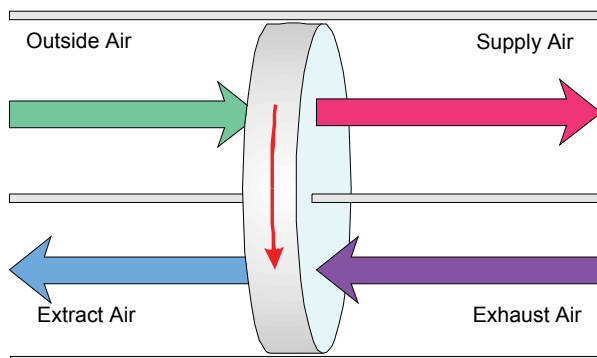
# The principle of the rotor

## Regenerative heat recovery systems / rotors

The issues of climate change and the need to reduce emissions of CO<sub>2</sub> and other greenhouse gasses highlights the need for energy conservation. Since ventilation losses account for the major part of energy use in HVAC it is imperative to reduce these losses as much as possible.

Rotary heat exchangers are a well proven means of high efficiency energy recovery, typically recovering up to 80% in typical HVAC applications.

The rotor matrix consists of corrosion resistant aluminium foil with alternate corrugated and flat layers wound and bonded together to form multiple narrow triangular air channels in an axial direction, the depth of the matrix is 200mm in direction of air flow. This air permeable storage mass is then rotated through adjacent exhaust and supply air streams, the air flows are in counter flow, as shown in the illustration below.



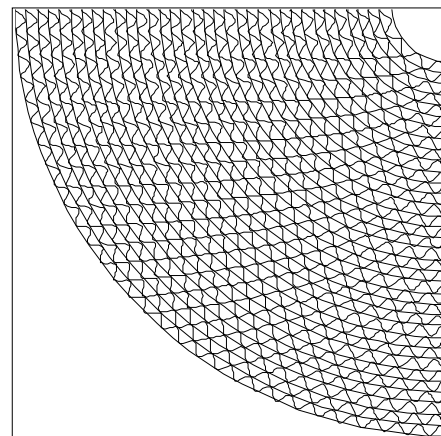
As the matrix rotates through the exhaust air it absorbs energy which is then released as the wheel rotates through the cooler supply air, for optimum efficiency in standard installations the matrix rotates ten times a minute. The number of rotations can be controlled to suit differing conditions or change the recovery ratio. The alternative heating and cooling of the matrix is classed as regenerative energy recovery and is ideally suited for recovery from heated or cooled air i.e. winter and summer operation.

Depending on the air conditions the rotors can also transfer moisture, and optional coated wheels or desiccant wheels are available.

Depending on the heights of the waves in the aluminium foil, air channels of different sizes can be supplied, smaller air channels increase operating efficiency but increase the pressure drop. The standard range of wave height available is 1.6mm to 2.5mm.

Depending on the type of matrix employed rotors are available from 500mm diameter to 6000mm diameter.

## Matrix geometry



# The types of rotors

## Condensation rotors type P/PT

The heat storing matrix is made out of special seawater resistant Aluminium, composed of wavy and flat continuous wound layers to guarantee laminar air flow.

Rotors of this type are preferably used for sensible energy recovery. Humidity transfer by condensation only occurs as the exhaust air in the heat wheel is cooled down below to the dew point.

## Epoxy rotors

Rotors are also available with epoxy coated aluminium matrix in order to increase the corrosion resistance. The performance can be compared to the performance of condensation rotors and also humidity transfer is only ensured as soon as the exhaust air in the wheel is cooled down below the dew point temperature. These rotors are very suitable for adiabatic cooling.

## Enthalpy rotors type E/ET

Rotors of this type have a hygroscopic surface which support to transmit moisture. This implicates a higher total energy transmission. The performance regarding moisture transmission do not comply with the features of moisture transmission of special sorption rotors (type X/XT or Seco).

## SECO

The matrix of the SECO is constructed of cellulose. It has a very high capacity for moisture absorption. SECO can be used both as total energy recovery rotor and as drying rotor for air dehumidification.

## Sorption rotors type X/XT

Sorption rotors of this type are made of aluminium with a high hygroscopic coating which allows high sensible and latent efficiencies - all the year.

Moisture is transferred through pore sorption and remains almost constant throughout the year, since relative humidity does not have a significant effect on moisture recovery efficiency, Sorption rotors are recommended for plants with moisture control

# Housing RRU - Model STANDARD



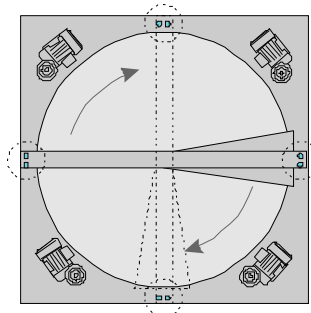
Strong screwed housing design, made of galvanised steel

Airflow can be altered from horizontal (over & under) to vertical (side by side)

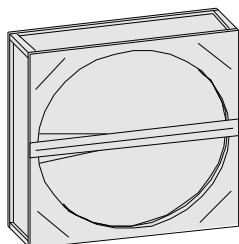
Cleaning sector position is moveable and different angles from 0° to 10° are applicable

Motor position is changeable to any corner

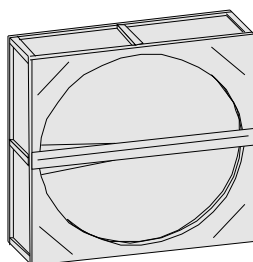
Thereby optimal use for direct and subsequent storage



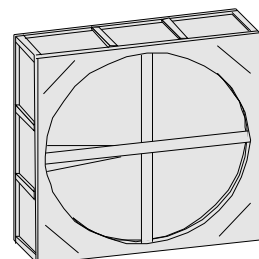
**RRU 600**



**RRU 800-1375**



**RRU 1400-2500**



Prefabricated holes and blind plugs make conversion a snap



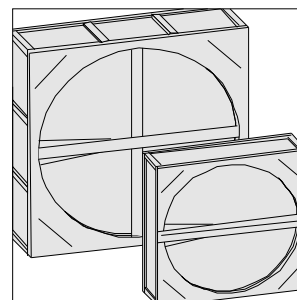
Adjustable and wear resistant seals separate the two air streams

Vertical installation for every size

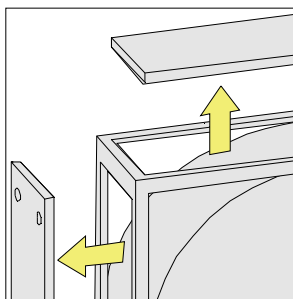
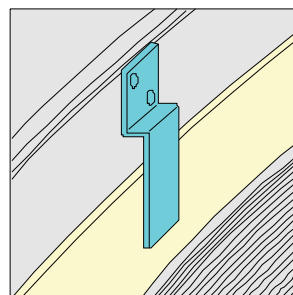
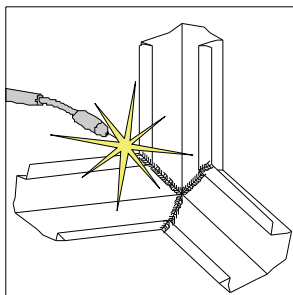
Preferred use as fitting rotor in air conditioner

Square housing in many sizes up to max. 2500mm in height and width

Variable housing dimension available on request



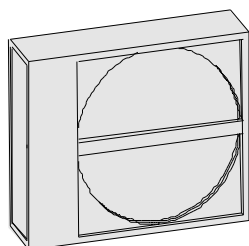
# Housing RRS - Model CLASSIC



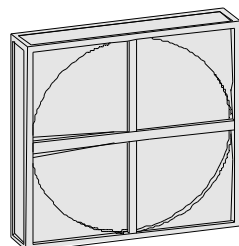
As circumferential seals, adjustable seals are used, which are held in position by means of retaining rings and clamps. In this way, a maximum seal is achieved

When used in industrial installations, special seals are used

**RRS 600-800**



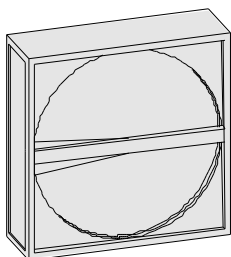
**RRS 2000**



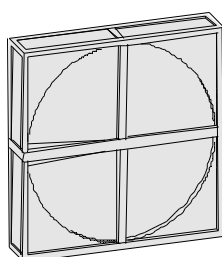
Strong welded frame construction, made of galvanised steel

The lateral covering sheets can be removed. The motor is easily accessible by quick snap locks

**RRS 1000-1250**



**RRS 2250-2500 undivided**



An alteration of the motor position into another rotor corner is possible without any problems

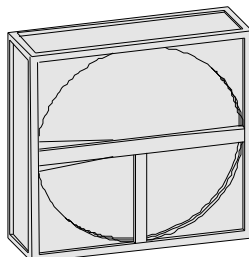


Vertical and horizontal installation position possible for every size

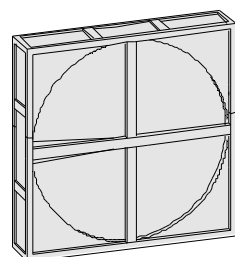
Applicable as flange or as fitting rotor

Variable housing dimension for all construction sizes, maximal height or width up to 4250 mm

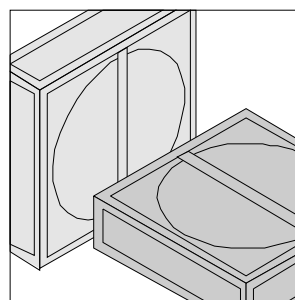
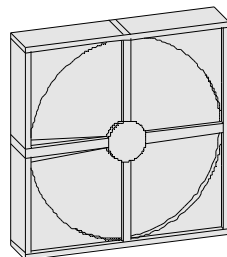
**RRS 1500-1750**



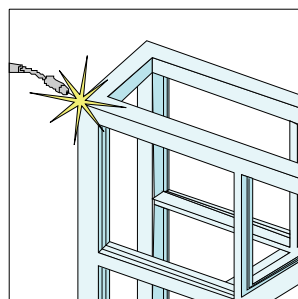
**RRS 2500-5000 divided**



**RRS 3001-4500 divided**

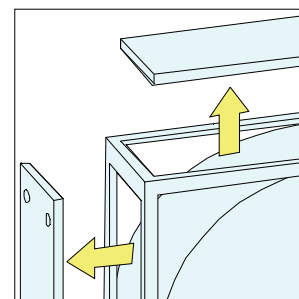


# Housing RRT - Model PREMIUM



Strong welded aluminium housing design, made of rectangular profiles

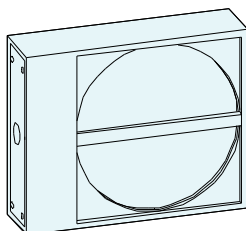
Corrosion resistance and lightweight construction



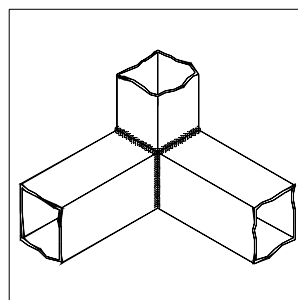
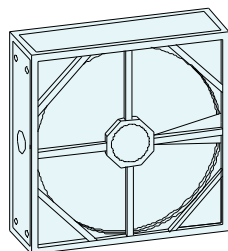
Removable panels for easy access

The motor is quickly accessible by quick snap locks

**RRT 600-800**

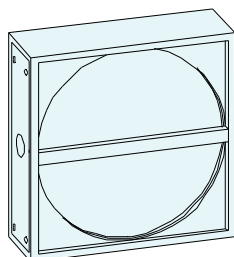


**RRT 2000**

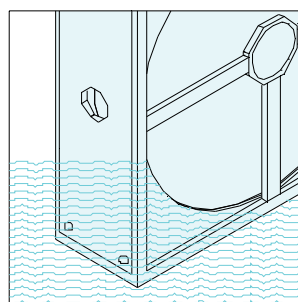
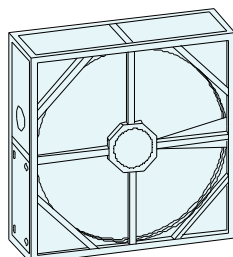


An alteration of the motor position into another rotor corner is possible without any problems

**RRT 1000**



**RRT 2250-2500 undivided**

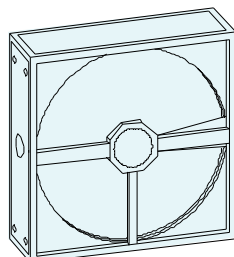


As circumferential seals, adjustable seals are used, which are held in position by means of retaining rings and clamps. In this way, a maximum seal is achieved

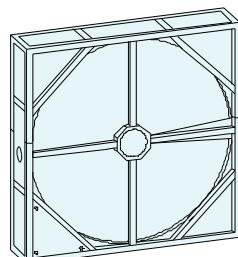
The casing and the housing are made of seawater-resistant aluminium

When used in industrial installations, special seals are used

**RRT 1250-1750**



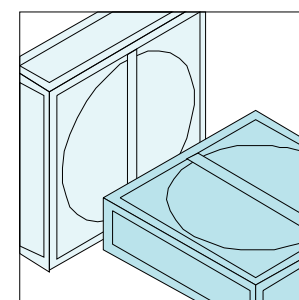
**RRT 2500-5000 divided**



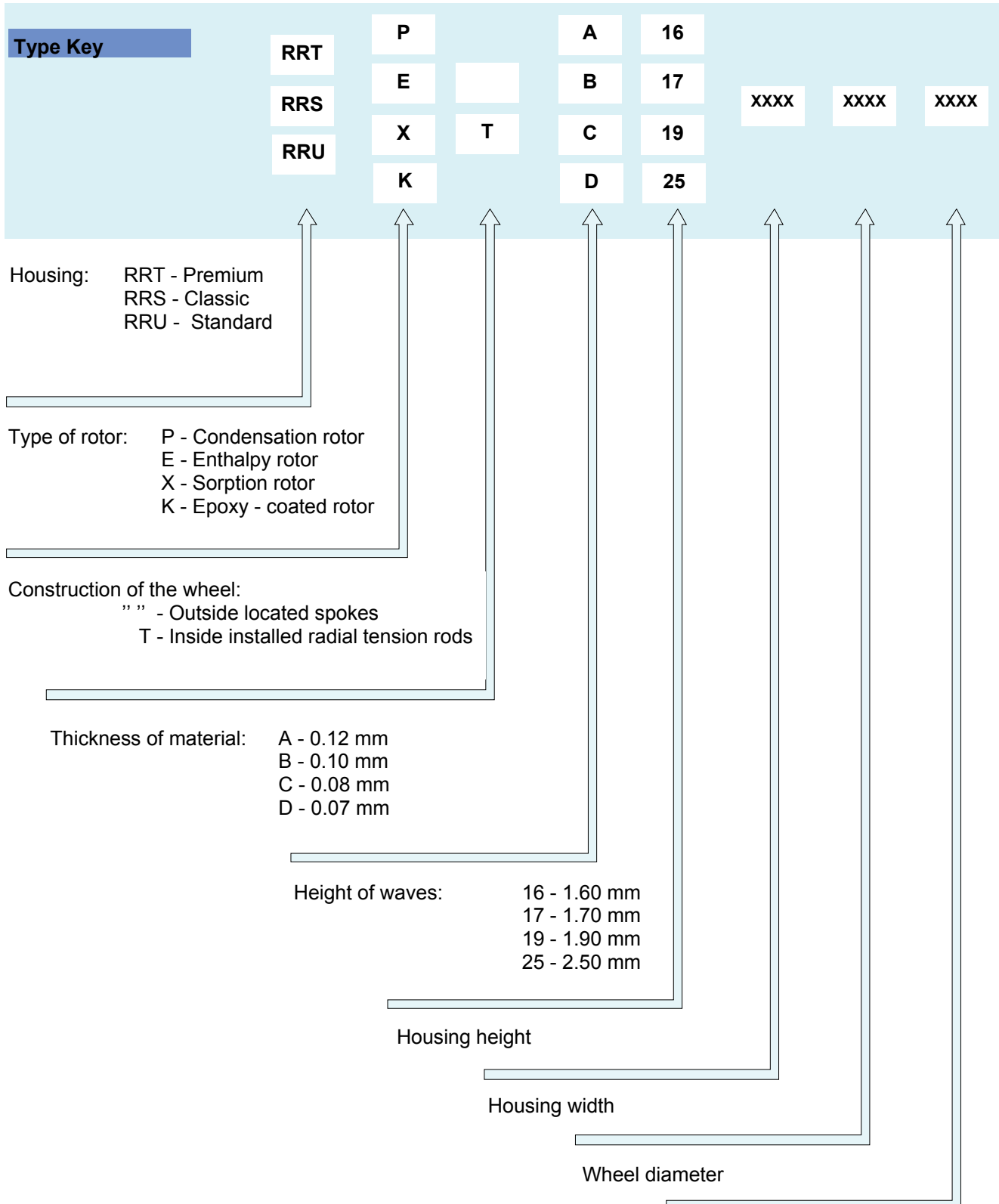
Vertical and horizontal installation position possible for every size

Applicable as flange or as fitting rotor

Variable housing dimension for all construction sizes, maximal height or width up to 8000 mm

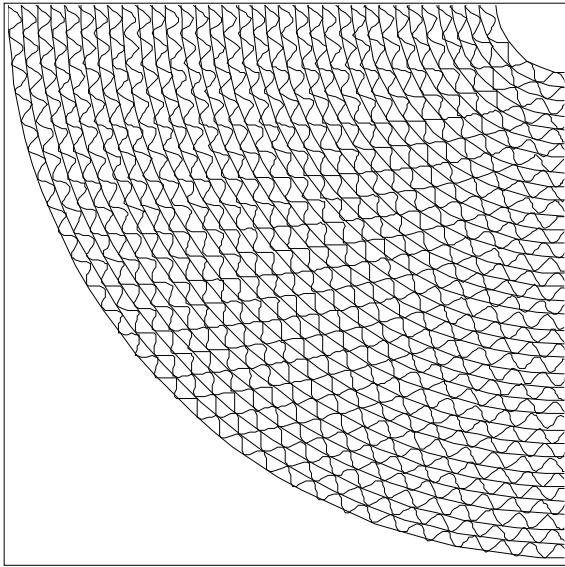


# Type Keys







# The matrix

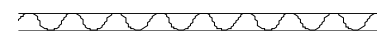
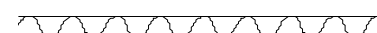

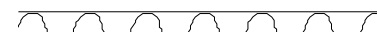
## Matrix geometry



## Thickness of material

	A: 0.12 mm
	B: 0.10 mm
	C: 0.08 mm
	D: 0.07 mm

## Height of waves

	16: 1.60 mm
	17: 1.70 mm
	19: 1.90 mm
	25: 2.50 mm

## Range of application of several rotor profiles

Material thickness:

- A: Special rotary heat exchanger, for example in laquer plants
- B: At frequent high pressure cleaning and special demand on durability
- C: Standard: air handling systems with moderate polluted exhaust air, qualified for high pressure cleaning
- D: Air handling systems with moderate polluted exhaust air

Wave height:

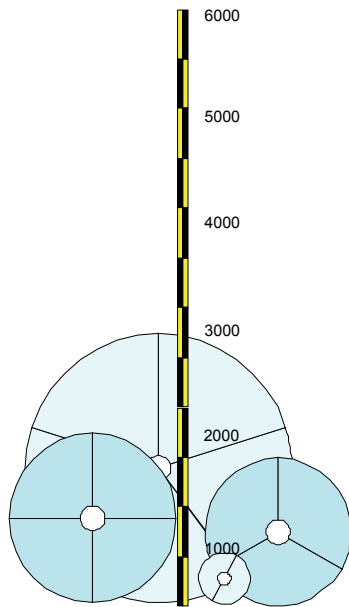
- 16,17: High efficiency due to tight coiling, but also increased pressure drop
- 19: Standard: air handling systems with moderate polluted exhaust air
- 25: Special design for more polluted exhaust air

**Alternative rotor profiles are available for special applications**



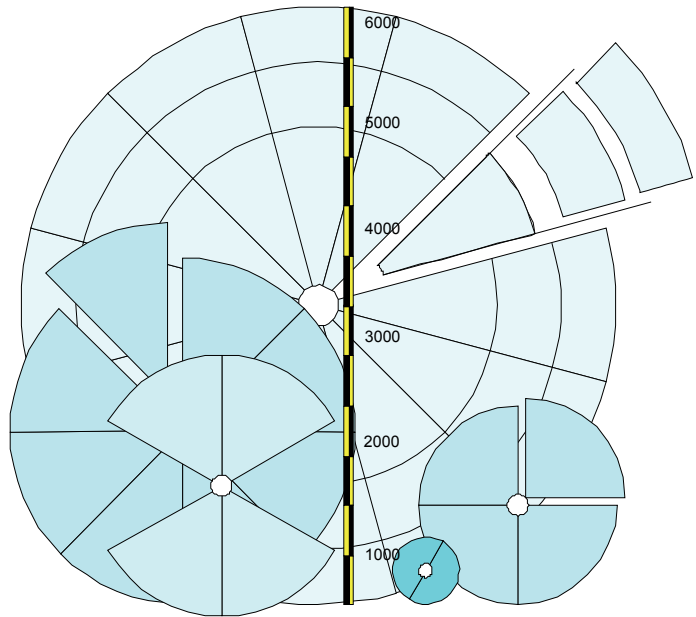
# Rotor sizes

## Undivided matrix

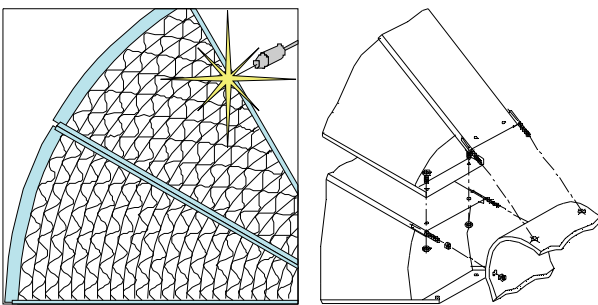


Up to a size of 2720 mm the rotors are undivided and depending on their size, provided with different numbers of spokes

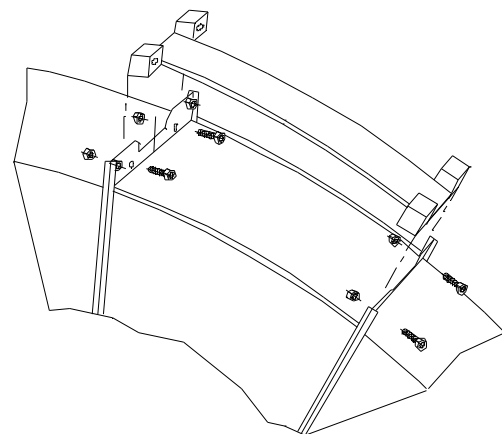
## Divided matrix



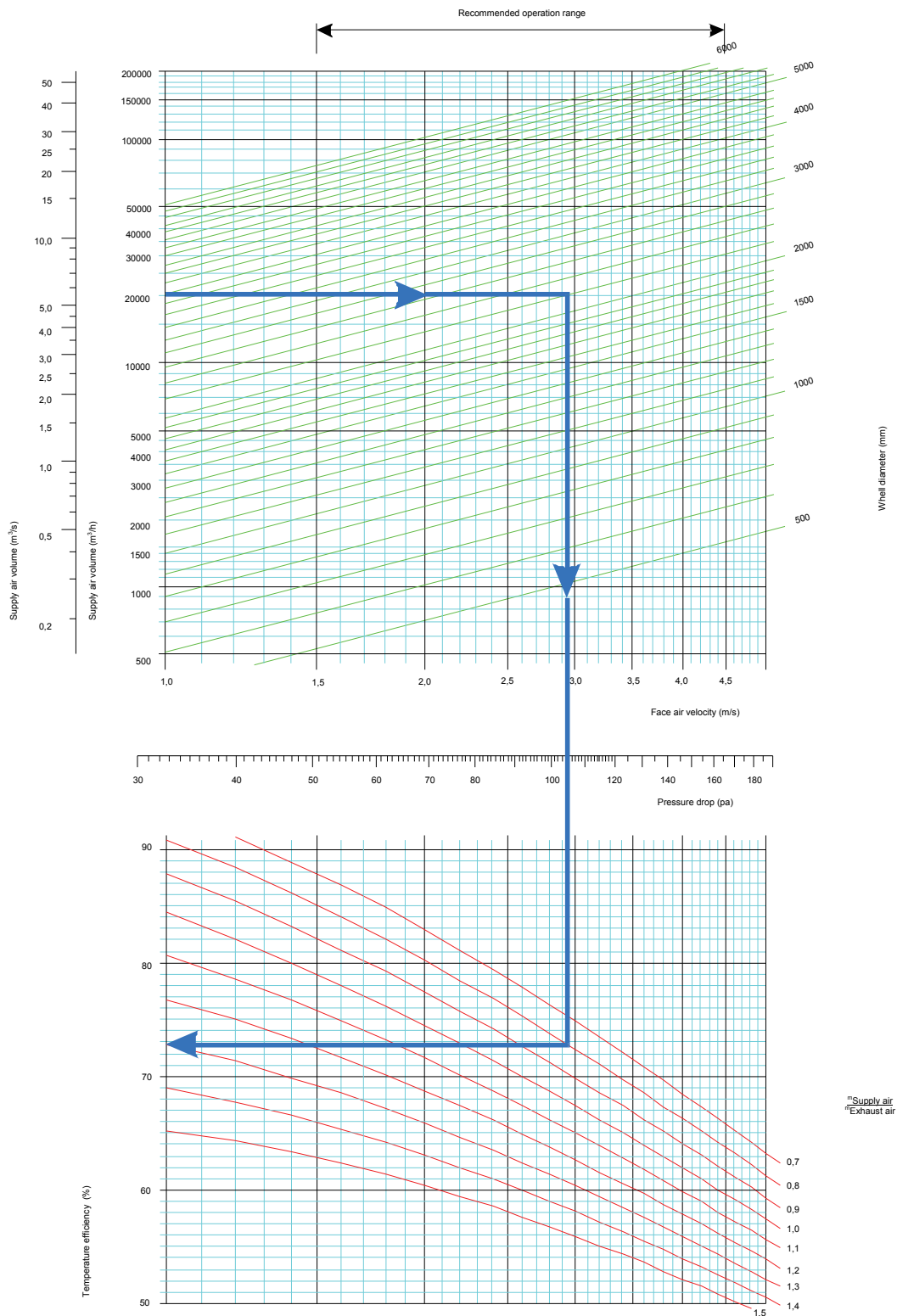
For reasons of transportation, rotors are divided or segmented above a housing-size of 2500 mm. Smaller rotors can also be segmented on request



The rotors provided with spokes are welded on the inside at the hub and on the outside with a cross-strut. This design lends the matrix a firm seat and prevents dirt ingress or condensate being created



# Layout diagram

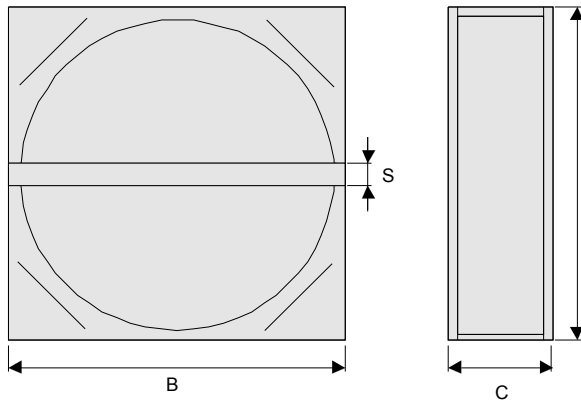


The design diagram refers to the most-used rotor profile C19

Design programmes for our products are available , either as an independent computer programme or also to be integrated into your existing application. The performance data are based on measurements according to DIN EN 308 but carried out under practice conditions

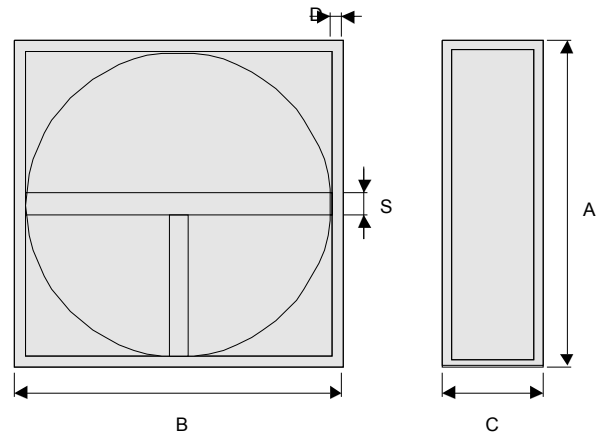
# The rotor sizes RRU and RRS

## Housing RRU - model STANDARD



Rotor Size	Diameter (mm)	Height A (mm)	Width B (mm)	Depth C (mm)	Rib Profile S (mm)	Weight (kg)
600	515	600	600	290	80	27
700	615	800	800	290	80	34
800	715	800	800	290	80	43
1000	915	1000	1000	290	80	61
1125	1040	1125	1125	290	80	76
1250	1165	1250	1250	290	80	93
1375	1290	1375	1375	290	80	111
1500	1415	1500	1500	330	80	135
1625	1540	1625	1625	330	80	156
1750	1625	1750	1750	330	80	175
1875	1750	1875	1875	330	80	199
2000	1875	2000	2000	330	75	225
2125	2000	2125	2125	330	75	269
2250	2125	2250	2250	330	75	299
2375	2250	2375	2375	330	75	331
2500	2375	2500	2500	330	75	364

## Housing RRS - model CLASSIC



Rotor Size	Diameter (mm)	Height A (mm)	Width B (mm)	Depth C (mm)	Profile D (mm)	Rib Profile S (mm)	Weight (kg)
600	505	600	700	400	Sheet metal	60	70
800	705	800	900	400	Sheet metal	60	90
1000	905	1000	1000	400	40	60	115
1250	1155	1250	1250	400	40	60	155
1500	1380	1500	1500	400	40	75	225
1750	1630	1750	1750	400	40	75	285
2000	1880	2000	2000	400	40	75	415
2250	2090	2250	2250	440	60	110	535
2500	2340	2500	2500	440	60	110	620
2750	2590	2750	2750	440	60	110	780
3000	2840	3000	3000	440	60	110	1000
3250	3010	3250	3250	550	100	120	1170
3500	3260	3500	3500	550	100	120	1320
3750	3510	3750	3750	550	100	120	1460
4000	3760	4000	4000	550	100	120	1940
4250	4010	4250	4250	550	100	120	2130

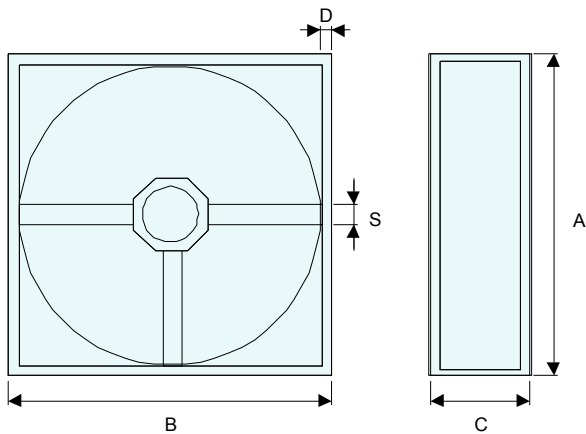
The sizes listed are standard sizes. They can readily be adjusted to the requirements of the customers

Tailor-made rotors can be supplied on request

The rotors can be supplied in a large variety of housing sizes which will be manufactured according to the requests of the customers

# The rotor sizes RRT

## Housing RRT - model PREMIUM



The sizes listed are standard sizes. They can readily be adjusted to the requirements of the customers

Tailor-made rotors can be supplied on request

The rotors can be supplied in a large variety of housing sizes which will be manufactured according to the requests of the customers

Rotor Size	Diameter (mm)	Height A (mm)	Width B (mm)	Depth C (mm)	Profile D (mm)	Rib Profile S (mm)	Weight (kg)
600	505	600	700	400	Sheet metal	80	35
800	705	800	900	400	Sheet metal	80	50
1000	905	1000	1000	400	40	80	70
1250	1170	1250	1250	400	40	80	120
1500	1420	1500	1500	400	40	80	160
1750	1670	1750	1750	400	40	80	200
2000	1920	2000	2000	400	40	80	260
2250	2130	2250	2250	440	60	80	340
2500	2380	2500	2500	440	60	80	470
2750	2630	2750	2750	440	60	80	550
3000	2800	3000	3000	510	80	80	680
3250	3050	3250	3250	510	80	80	800
3500	3300	3500	3500	510	80	80	900
3750	3550	3750	3750	510	80	80	1000
4000	3760	4000	4000	550	100	100	1330
4250	4010	4250	4250	550	100	100	1460
4500	4260	4500	4500	550	100	100	1590
4750	4510	4750	4750	550	100	100	1730
5000	4760	5000	5000	550	100	100	1870
5250	5010	5250	5250	550	100	100	2010
5500	5100	5500	5500	550	100	100	2090
5750	5350	5750	5750	550	100	100	2230
6000	5600	6000	6000	550	100	100	2400
6250	5850	6250	6250	550	100	100	2570
6400	6000	6400	6000	550	100	100	2670

An AmbiRad Group brand

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