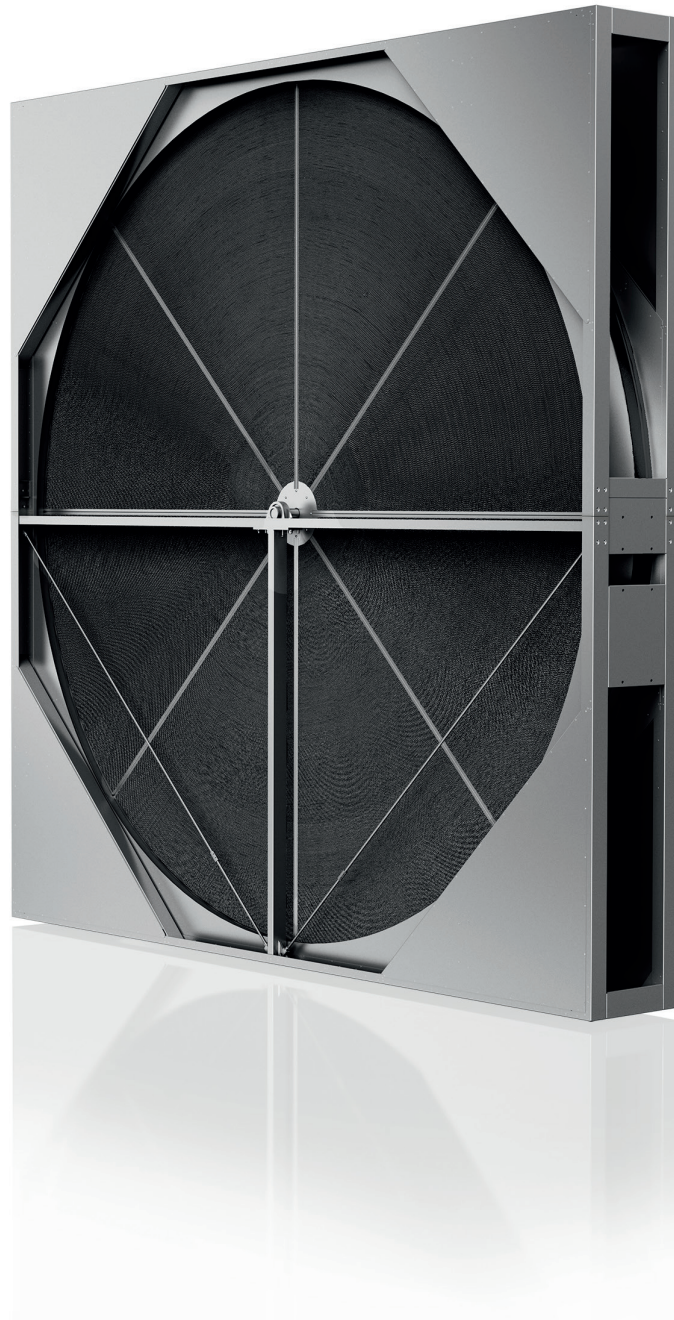


# **MODEL EQ**

## **TECHNICAL SPECIFICATION**



**AIR-TO-AIR HEAT EXCHANGERS**

# **HEATEX**

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## 1. GENERAL INFORMATION

The Heatex Model EQ is a segmented rotary air-to-air heat exchanger. It consists of a segmented rotor made of aluminum, a sheet metal casing and a drive unit. As the wheel rotates slowly, the heat from the exhaust air is picked up by the aluminum in the matrix and transferred to the cool supply air.

Rotary heat exchangers are often the preferred choice thanks to the low freezing risk as the wheels by definition defrost themselves, their small footprint and the high sensible efficiency that they provide. All Heatex heat exchangers are made to fit the specific air handling unit. There is a wide variety of options to suit various performance requirements. Rotary heat exchangers can be equipped with a purge sector in order to minimize the cross contamination of fresh air with exhaust air.

The Model EQ can be used and operated only in vertical position. For further information about Model EQ we refer to the Installation and Maintenance Manual.

## 2. AHU DESIGN REQUIREMENTS

The air handling unit or installation area where the heat exchanger is to be installed needs to meet the following requirements:

- The floor must be able carry at least the weight of the heat exchanger (up to 1400 kg (3086 lb)), plus the weight of the lifting equipment (eg a fork lift or other lifting machinery).
- If there is a risk for condensation, the floor must withstand water and or a special trough should be ordered as an option. This trough will be mounted below the wheel, inside the casing, to collect the condensate.
- There must be an electrical outlet of either (single-phase) 230V, or (three-phase) 230V/400V, depending on what type of drive the heat exchanger is ordered with. A heat exchanger with a control unit requires always a single phase 230V outlet for the control unit.
- Make sure that the main power supply outlet has a lockable switch, so that the power can be switched off securely. This is to enable a safe maintenance work environment.
- The Model EQ heat exchanger can be assembled before or after it is lifted into place. If it is assembled first and then lifted into place, there must be enough room for a lifting device to lift the assembled heat exchanger into place.

- The bearings of the Model EQ heat exchanger must always be easily accessible (above and below the L-shaped beam), if future adjustments should be required. (H:200 mm (7.87") W:200 mm (7.87"))

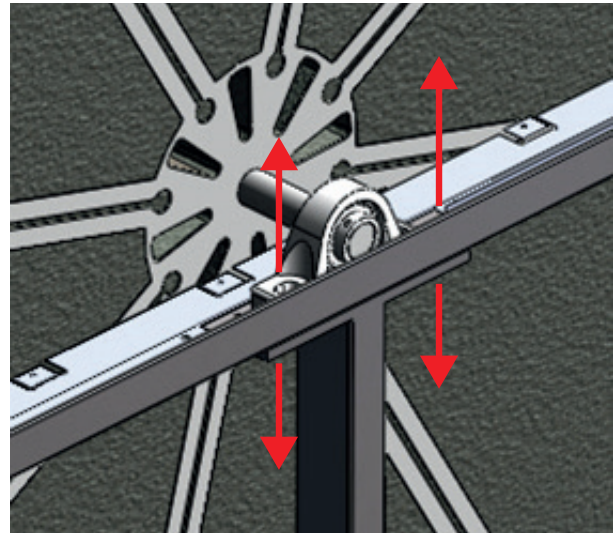


Figure 1. Adjustment bearings.

- After the Model EQ heat exchanger is built into the AHU, the gable where the motor is fitted must be accessible to secure access for maintenance.

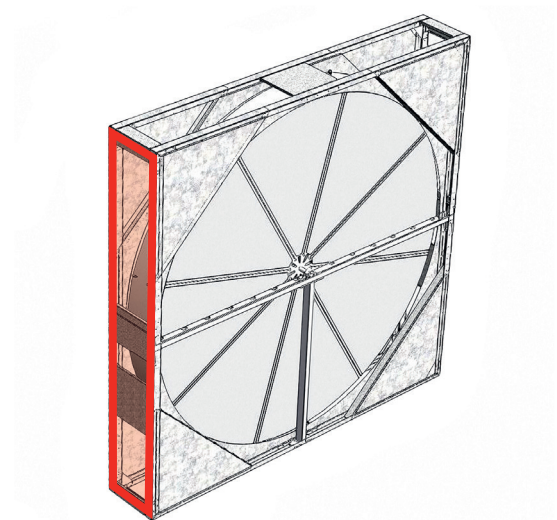


Figure 2. Model EQ gables.

- Warranty terms are only valid as long as original parts are used, the rotor is secured to the AHU according to the instructions below (see next pages) and the instructions in the installation manual have been followed.
- Model EQ must be secured to the AHU in order to function properly. The unit surrounding the heat exchanger must withstand the force loads according to picture and chart below.

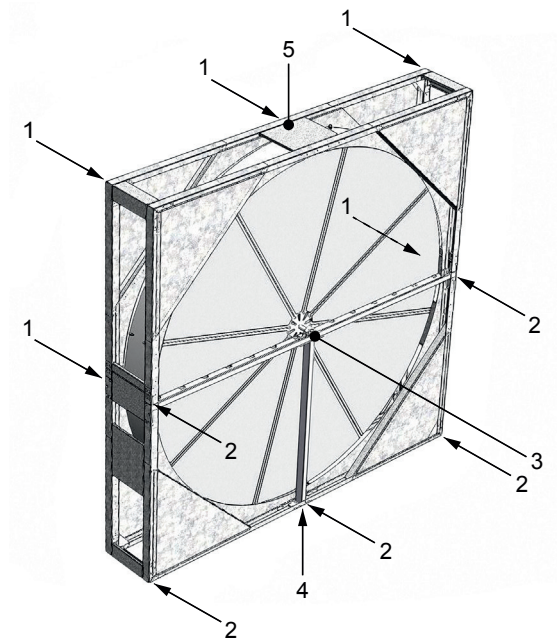
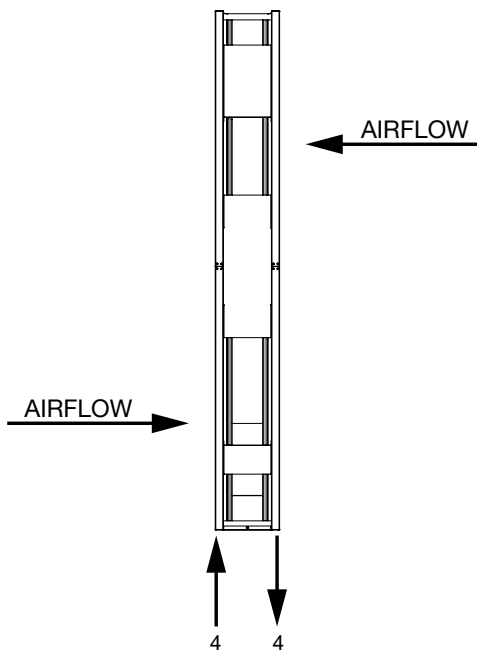


Figure 3. Model EQ force schedule.



Force	Direction of force	Ø 1600–2200 mm (Ø 62.99–86.61")	Ø 2201–3000 mm (Ø 86.65–118.11")	Ø 3001–3800 mm (Ø 118.15–149.61")
1	Against the airflow	0.7 kN	1.2 kN	1.9 kN
2	Against the airflow	0.7 kN	1.2 kN	1.9 kN
3	Horizontally out from the rotor (from both sides)	20 kN	20 kN	20 kN
4	Vertically up/ down	10.5 kN	22.5 kN	36 kN
5	Vertically up/down	0.75 kN	1.5 kN	6 kN

Table 1. Direction of forces.



In the picture below we show the areas (colored yellow) which must be secured to the air handling unit. The size of the areas are indicated. The heat exchanger should be fastened in the final product with screws or similar. Please notice point 4 in table 1 as it require extra attention due to large force from rotor.

Place the rotor on a horizontal surface since an uneven surface can warp the rotor and affect the factory adjustments.

When using a casing with vertical plane of intersection/side by side flow, special attention needs to be taken to the structure on the AHU side where the beam is fastened. This is due to that large part of the force 4 in figure 3 needs to be supported by the AHU side structure.

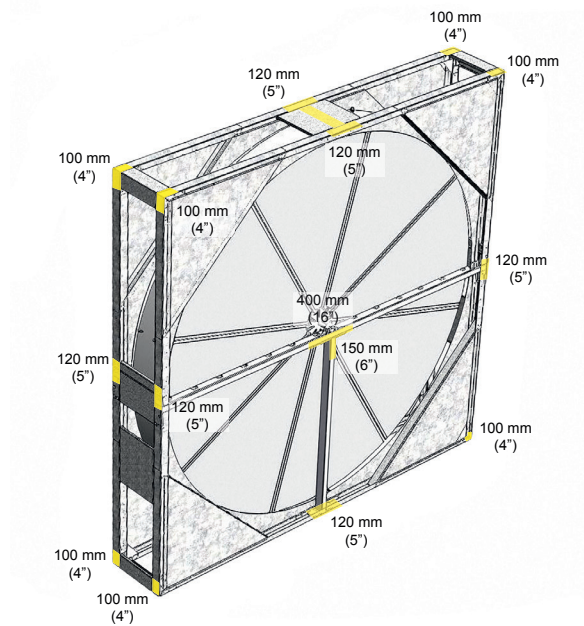


Figure 4. Model EQ fastening points.

### 3. WHEEL

#### 3.1. Matrix Material

Model EQ is available in six different matrix materials: two materials for condensation and four which enable humidity transfer in various ways.

##### Aluminum - A

Plain sheet (uncoated) aluminum is the base for Model EQ.

##### Epoxy - E

For use in corrosive environments Heatex recommends to use of epoxy coated aluminum. For this option other wheel parts are made in corrosion resistance materials as well.

##### Silica Gel Adsorption - D

Silica gel coating is as adsorption coating material an humidity transferring material of high quality.

##### Hybrid Adsorption - K

The matrix referred to as hybrid is a combination of a non-coated corrugated aluminum foil and a non-corrugated foil with a silica gel based coating with a high moisture transfer capability.

##### Molecular Sieve - M

For applications with high demand on odor free moisture transfer Heatex recommends a matrix coating with Molecular Sieve 3A (3 Angstrom), which only will transfer water molecules.

##### Hygromix Coated - H

Hygromix is an combination of the silica gel and molecular sieve coating. This combines the features of both coatings.



**NOTE!** Surplus coating material leaving the matrix during the first time of usage will result in a thin layer of harmless dust. This will NOT affect the hygroscopic properties of the wheel.

#### 3.2. Sizes

The wheel diameter size ranges from 1600 mm (62.99") up to 3800 mm (149.61") and with a fixed width of 200 mm (7.87") for all versions. The rotor can be made in any size between 1600 mm (62.99") and 3800 mm (149.61") at the incremental step of 1 mm (0.039").

#### 3.3. Well Heights

Heatex offers six different well heights for easy adaptation to the customer needs, all made from a unique set of tools to achieve optimal shape.

##### 1.4 mm (0.055") - Very High Efficiency

1.4 mm (0.055") well height gives a very high efficiency rate due to its very large heat transferring surface, but at the cost of a very high pressure drop. This well height is not available in silica gel, molecular sieve and hygromix versions.

##### 1.6 mm (0.063") - High Efficiency

1.6 mm (0.063") well height gives a high efficiency due to its large heat transferring surface but at the cost of a high pressure drop.

##### 1.8 mm (0.071") - Standard

1.8 mm (0.071") well height is the most common configuration due to its good balance between high efficiency and moderate pressure drop.

##### 2.0 mm (0.079") - Low Pressure

2.0 mm (0.079") well height gives a very low pressure drop at the expense of a lower efficiency. This well height is not available for the adsorption matrix.

##### 2.2 mm (0.087") - Low Pressure

2.2 mm (0.087") well height gives a very low pressure drop at the expense of a lower efficiency. This well height is not available for the adsorption matrix.

##### 2.5 mm (0.098") - Low Pressure

2.5 mm (0.098") well height gives a very low pressure drop at the expense of a lower efficiency. This well height is not available for the adsorption matrix.

### 3.4. Wheel Construction

All sectorized wheels will be glued and will have spokes. The spokes are an integral part of the system for assembling the rotor.

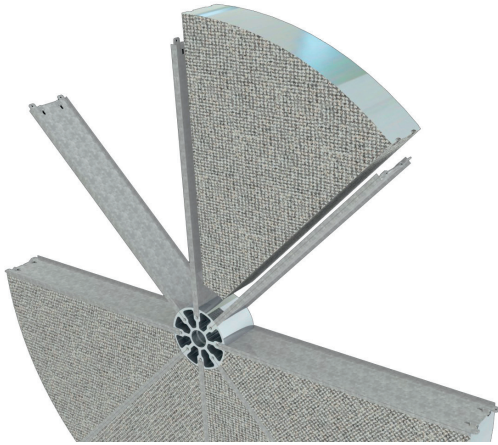


Figure 5. Model EQ spokes and segments.

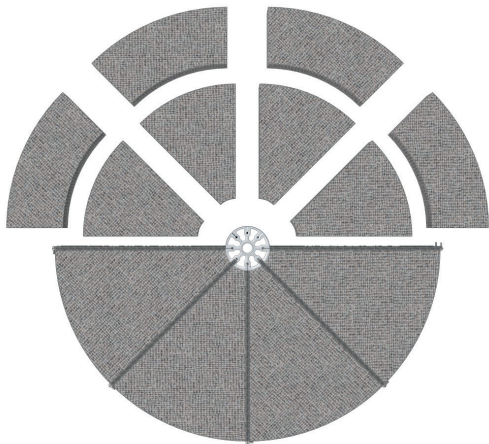


Figure 6. Model EQ segments.

The number of spokes is 4 for diameters 1600 - 2000 mm (62.99-78.74") and 8 for diameters 2001 - 3800 mm (78.78-149.61"). For wheels with diameter 3000 mm (118.11") and upwards, each segment is divided into two pieces to limit the weight. The spokes are made of aluzinc. At the outer periphery, there is a wrapping that also is a part of the system for assembling. The wrapping is made of galvanized steel.

#### 3.4.1. Bearing Units

The plummer block housing, for model EQ, is an external version, i.e. the rotor has a fixed shaft and the bearings are mounted on the casing. These units are also self-aligning. Alternatively, if the rotor is to be used as a replacement, it can be chosen with inter-

nal angular contact bearings. In both cases the rotor should be mounted vertically. The bearings are maintenance free. Both bearing alternatives have specially adapted grease suitable making it service free.

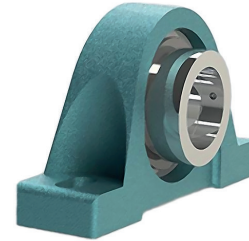


Figure 7. Model EQ bearing unit.

#### 3.5.2. Alignment and Adjustment

For both bearing alternatives it is rather simple to adjust and align the rotor in the casing with standard tools provided you have access to the bearings on both sides of the rotor.

## 4. CASING AND CASING COMPONENTS

The casing upon delivery is in two halves. It is constructed only for vertical mounting whereas the airflows can be configured side by side (left and right) or top and bottom. The frame is manufactured of galvanized steel. The depth of casing is 456 mm (17.95"), 460 mm (18.11") and 500 mm (19.69") depending on the diameter of the wheel (please see the EQ product data sheet for different sizes and depths). Casing dimensions for Model EQ are always at least the rotor diameter plus 140 mm (5.51"), but may be ordered up to 4000 mm (157.48"), which is the absolute maximum.

### 4.1. Casing Types

Two variations of casing are available.

#### 4.1.1. Standard Casing

As a standard, the casing has just an inner skin at the front and at the back (aluzinc 150 g (5.29 oz) surface treatment, steel core) for indoor applications. The sides and the top and bottom are open. The casing can be used for duct mounting or for mounting inside an AHU.





Figure 8. Model EQ standard casing.

#### 4.1.2. Covered Casing

Casing is as above, but with an outer skin additional at the two sides and at the top and bottom. At the location of the drive motor and controller (if present) there will be removable hatches for easy access to the drive. The casing is best suited for indoor applications with duct mounting or direct mounting to the AHU.

#### 4.2. Sealing System

All casing have adjustable brush sealants. The brush seal is made of a double layer of brush with an integrated plastic foil.



Figure 9. Brush seal.

#### 4.3. Purge Sector

The purpose of the purge sector is to clean the wheel from exhaust air before turning over to the supply airside. This prevents exhaust air from leaking into the supply air (fresh). The purge sector is made of metal

sheet in the size of 5° with start at the center of the wheel. Brush sealants are assembled at the upper and lower side. Purge sector is an option and can be positioned in all four positions according to customer's request.

Purge sector is only recommended for differential pressures (between supply air before rotor and exhaust air after rotor) of about 200 Pa (0.8" WC) to 600 Pa (2.4" WC).

Purge sector should also be avoided when the supply side fan is placed after the heat exchanger and the exhaust side fan is placed before the heat exchanger.

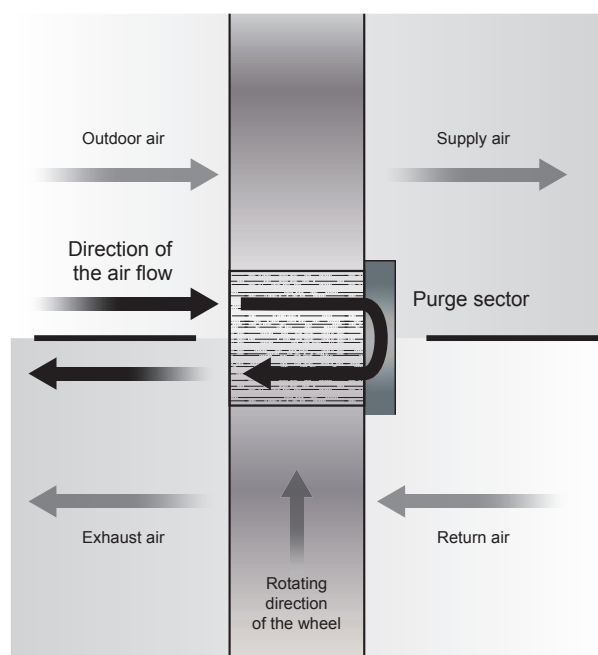


Figure 10. Purge sector function.

#### 4.4. Drive Units

Heatex offers constant drive or variable drive for rotary heat exchangers in all sizes. The motor can be placed in any corner, fully protected inside the casing. Motor and rotor are connected by a belt transmission: the V-type Powerbelt. In rotors equipped with a controller, the control-box is placed on the same side of the rotor as the motor but in the corner above or under.

Independent of drive unit type the rotor performance is based on standard rotation speeds, see table 2.

Matrix Material	Standard Rotational Speed (rpm)
Condensation & Enthalpy	12
Adsorption (Silica gel)	17
Adsorption (Molecular sieve)	25

Table 2. Standard rotational speed.



NOTE! Heatex strongly recommends that the motor and controls are placed easily accessible.

#### 4.4.1. Constant Drive

The constant drive provides the customer with a constant rotor speed. The speed is depending on matrix material, see table 2 with standard rotational speeds. All motors are induction motors, supplied with AC and are equipped with a thermo contact.

Condensation and hybrid rotor	Adsorption rotor	Nominal Power	Supply (V/Hz)	Nominal Speed (RPM)	Nominal current <sup>1</sup> (A)	Pole number	Iso class	IP code class	Mass with gear
1600-2100 mm (59.09-82.68")	-	180 W	3x400/50	1350	0.6-0.7	4	63	IP55	5.1 kg (11.24 lb)
-	1600-1700 mm (66.92-66.93")	180 W	3x400/50	2840	0.5-0.6	2	63	IP55	4.5 kg (9.92 lb)
2101-3100 mm (82.72-122.05")	1701-2500 mm (66.97-98.43")	370 W	3x400/50	2840	0.9-1.0	2	71	IP55	7.6 kg (16.76 lb)
3101-3800 mm (122.09-149.61")	2501-3800 mm (98.46-149.61")	750 W	3x400/50	2890	1.6-2.0	2	80	IP55	13.6 kg (29.98 lb)

<sup>1</sup>Current depends on motor brand.

Table 3. Constant drive.

#### 4.4.2. Variable Drives

Complete drive set with control unit, motor, pulley and rotation monitor. All the control units drive three-phase induction motors with associated gearing.

The unit includes motor, rotation detector and controller. The frequency controller allows use of standard 3-phase motors.

- Standard motors
- IP54
- Alarm indication
- Cleaning function
- Input signal 0-10V

MicroMax series are available for all rotor sizes, the control unit designation denotes motor output. Standard rotor speed according to Table 2 is set to provide the best performance. Rotor speed can be lowered if needed. The effect of lowered rotor speed can be calculated in Heatex Select.

Condensation & Enthalpy Wheels (Ø)	Adsorption Wheels Silica Gel (Ø)	Adsorption Wheels Molecular Sieve (Ø)	Drive Set
1600-2100 mm (59.09-101.38")	1600-1700 mm (39.41"-70.87")	1600-1700 mm (35.47-47.24")	MicroMax180
2101-3100 mm	1701-2500 mm (70.91-101.38")	1701-2500 mm (47.28-101.38")	MicroMax370
3101-3800 mm (19.69 - 59.06")	2501 - 3800 mm (19.69 - 39.37")	2501 - 3800 mm (19.69 - 35.43")	MicroMax750

Table 4. Variable drive unit and rotor material combinations.

Drive Set	Supply Voltage and frequency (V-Hz)	Input current max (A)	Protection form, controller and motor	Temp. min-max
MicroMax180	1x230 - 50/60	1.7	IP54	0-45°C (32-113°F)
MicroMax370	1x230 - 50/60	2.8	IP54	0-45°C (32-113°F)
MicroMax750	1x230 - 50/60	5	IP54	0-45°C (32-113°F)

Table 5. MicroMax.

## 4.5. Belts

### 4.5.1. Powerbelt

This belt is used without tensioning device and can be used at temperatures up to 110°C (230°F) and in humid climate. The belt is easily joined together without any tools or locks and is therefore easy to maintain.

Powerbelt can be offered for all rotor diameters.



Figure 11. Powerbelt.

## 5. TECHNICAL INFORMATION

### 5.1. Application Limits

#### 5.1.1. Recommended Air Temperatures

- Min: -40°C
- Max: 65°C

It is however important not to exceed the temperature limits on mounted components:

Component	Min Temp.	Max Temp.
Bearings	-40°C (-40°F)	110°C (230°F)
Powerbelt	-40°C (-40°F)	110°C (230°F)
Motor*	-10°C (14°F)	40°C (104°F)
Standard Controller	0°C (32°F)	45°C (113°F)

\* Thermo contacts release at 150°C (302°F) inner air temp.

Table 6. Temperature limits.

Temperature inside casing is approximately the mean temperature of supply and exhaust air temperatures.

### 5.1.2. Recommended Pressure Drop

Recommended pressure drop for rotary heat exchanger

- Pressure drop max 250 Pa (1" WC)
- Pressure drop recommended 100-200 Pa (0.4 - 0.8" WC)
- Differential pressure max 600 Pa (2.4" WC)

The maximum recommended pressure difference (between supply air inlet and exhaust air outlet) based on the life time expectations of the bearings is 600 Pa (2.4" WC) but should be kept to a minimum since otherwise wear of bearings and brush seals will be high.

The leakage rate will also increase with pressure difference. A high pressure difference may also cause the casing to deflect. Please be aware that for the purge sector to work the pressure difference should be higher than about 200 Pa (0.8" WC) and lower than 600 Pa (2.4" WC).

Recommended fan configuration is to have both fans on the exit sides of the heat exchanger and to always make sure that pressure is higher on the supply side than on the exhaust side so leakage will occur from the fresh airside to the exhaust side.

### 5.1.3. Freezing

#### 5.1.3.1. Freezing Process

Mean temperature of supply and exhaust inlet temperatures below 0°C (32°F) does not necessarily cause a freezing problem. The freezing process depends on the level of condensation building up and freezing when the matrix is below freezing temperature. Frost becomes a problem when it builds up faster than it melts. This process normally takes many hours. It is important to be observant if the pressure drop increases during long periods of cold inlet temperatures. Frost building up in the matrix can cause high pressure differences leading to severe damage on bearings.

#### 5.1.3.2. Preventive Measure

There are several methods to prevent frost to build up.

- Preheating of the outdoor air to a temperature that prevents the exhaust air from intersecting with the saturation line.
- Varying the rotor speed to reduce the moisture transfer. Exhaust air temperature and supply air temperature will approach each other when the rotor speed is reduced.
- By using a bypass to reduce the transfer rate to a point when the exhaust air no longer intersects with the saturation line.

## 5.2. Noise

The Model EQ heat exchanger does not emit noises that exceed 63 dB at any time during operation under normal conditions.

## 6. SUPPORT

For questions or other requirements regarding this product, please state order number, product name and message.