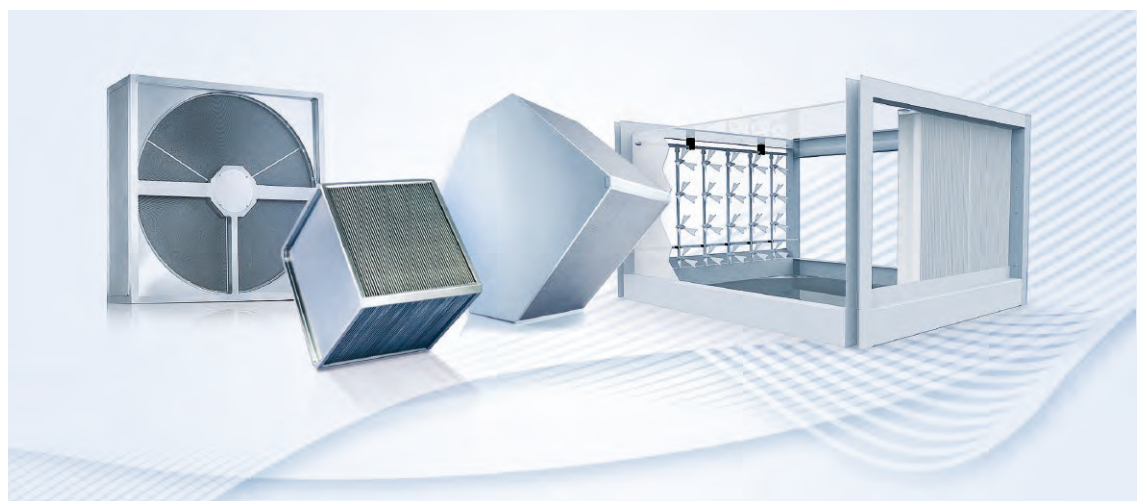
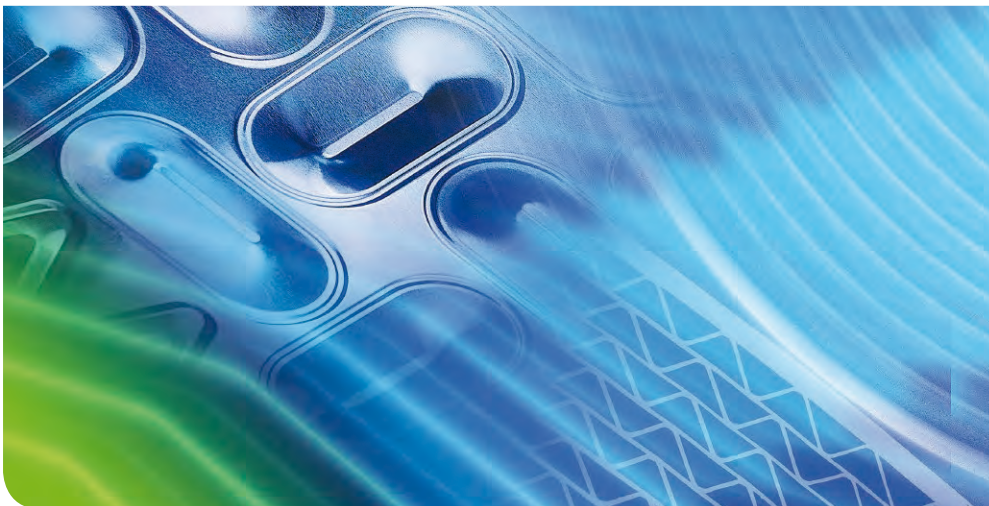
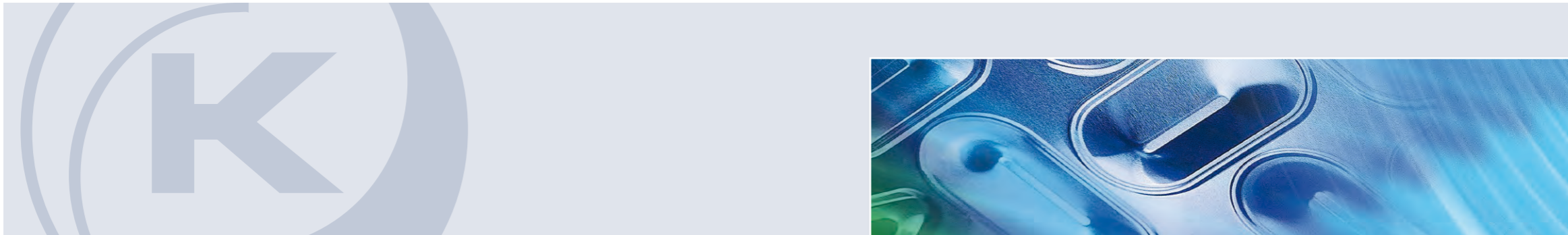




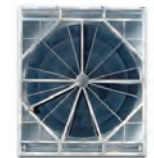
**Air - Energy - Klingenburg**  
Our Products







Rotor for ventilation systems



Paint booth rotor



High temperature rotor



SECO HYSG



HUgo



Counter flow plate heat exchanger



Cross flow plate heat exchanger



Humidifier CERTO

## Our Profile

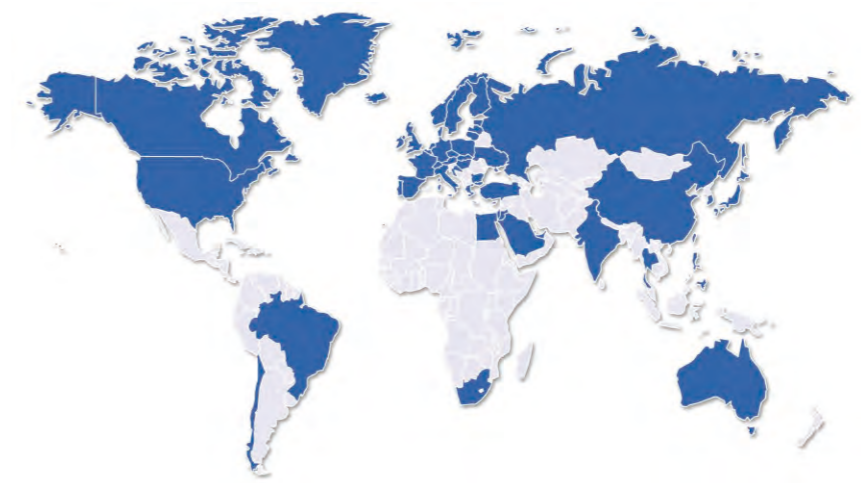
For more than 30 years now, we have been regarded as a leading manufacturer, developer and supplier of machines for heat and moisture recovery. We distribute our products throughout the world for the most diverse applications – from ventilation and air-conditioning technology via process industry to usage in large paint shops in the automobile industry.

Energy saving and CO<sub>2</sub> reduction can also be achieved in an ideal way through heat recovery. Offices, hospitals, factory halls, flats, just to name a few at random, all have a great need for air-conditioning. Up to 80% of the heat of the exhaust air can be recovered. There are various devices for saving heat – all built or distributed by Klingenburg.

Drying and humidification are further important components of air-conditioning.

## From Development to Sales

Research and development of our products, design and manufacture of our own machines, modern machine production and of course technical support and advise along with worldwide sales are the main focal points of our daily business. With our own laboratory and machine engineering department we remain flexible and react to the challenges of the global market and those of our customers.



Sales worldwide



**Klingenburg GmbH**  
Gladbeck, Germany  
Headquarters  
Production and Distribution



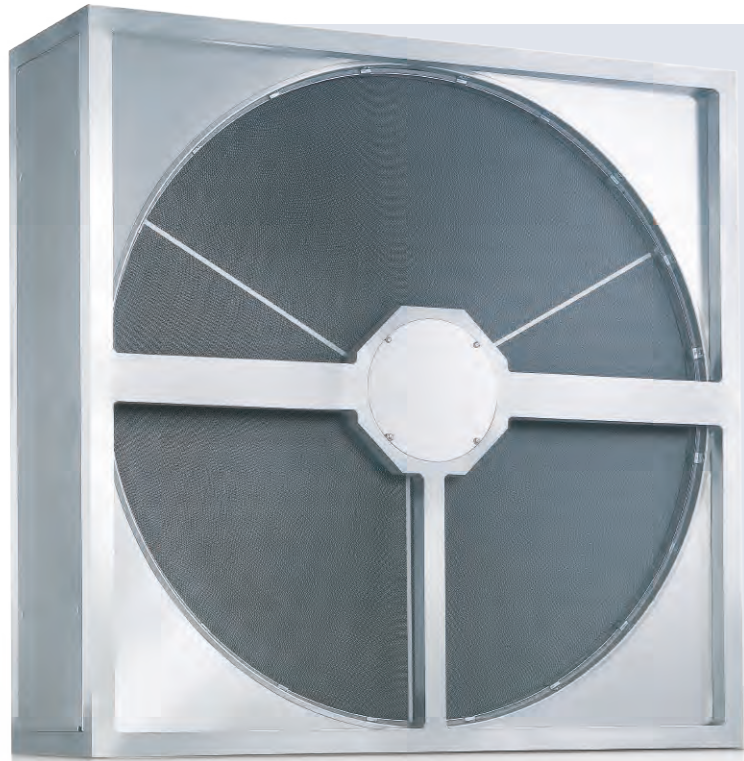
**Klingenburg International Sp. z o.o.**  
Swidnica, Polen  
Production and Distribution



**Klingenburg USA, LLC**  
High Point, USA  
Production and Distribution



**Klingenburg Shanghai**  
Shanghai, China  
Representative Office  
Distribution



## Rotors for ventilation systems

The highest form of thermal energy recovery in air handling systems is the rotary heat exchanger. There is no other system of energy recovery that can deliver high efficiencies with high air volumes in limited room spaces.

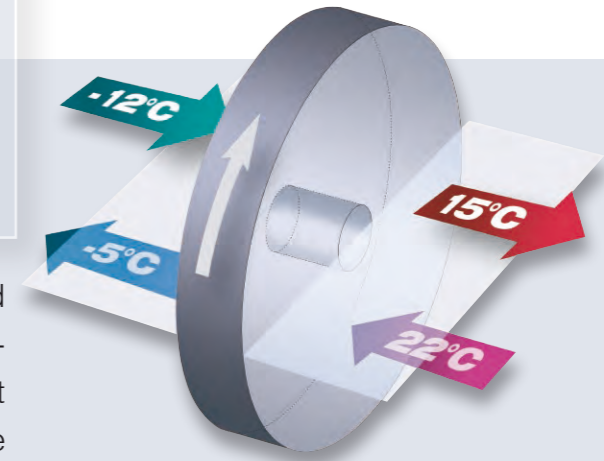
As an innovative market leader with over 30 years experience with numerous application possibilities and a manufacture of rotors, we possess the widest range of different types and versions available.

The housing of our Klingenburg rotors are optionally galvanized steel, aluminium, aluminium-zinc or V2A stainless steel including mounted motor systems and options for inspection either frontal or from the side. All dimensions of the housing are adaptable in steps of one millimeter.

If desired we can produce special housings with an integrated bypass.

### Functional principle

The rotor which is constructed like a honeycomb, rotates non-stop between the stream of hot air and the stream of cold air. The rotor is warmed up in the stream of hot air and transfers the heat to the stream of cold air. Up to 80% of the heat and humidity contained in the air can be recovered in this way.



### Rotor types

#### ■ Condensation rotors

Condensation rotors are primarily used for sensible energy recovery.

#### ■ Enthalpic rotors

This kind of rotor has a hygroscopic surface, which supports the transfer of moisture.

#### ■ Sorption rotors

Rotors of this type have a high hygroscopic coating which allows high sensible and latent efficiencies – all year round.

#### ■ Epoxy-coated rotors

In order to increase corrosion resistance, rotary heat exchangers are also coiled out of epoxy-coated aluminium foil.

### Advantages

The adjustability, the self-cleaning effect, the compactness and the high degree of efficiency are the advantages which no other system can offer.



Foreword



Rotor for ventilation systems



Paint booth rotor



High temperature rotor



SECO HYSG



HUGO



Counter flow plate heat exchanger

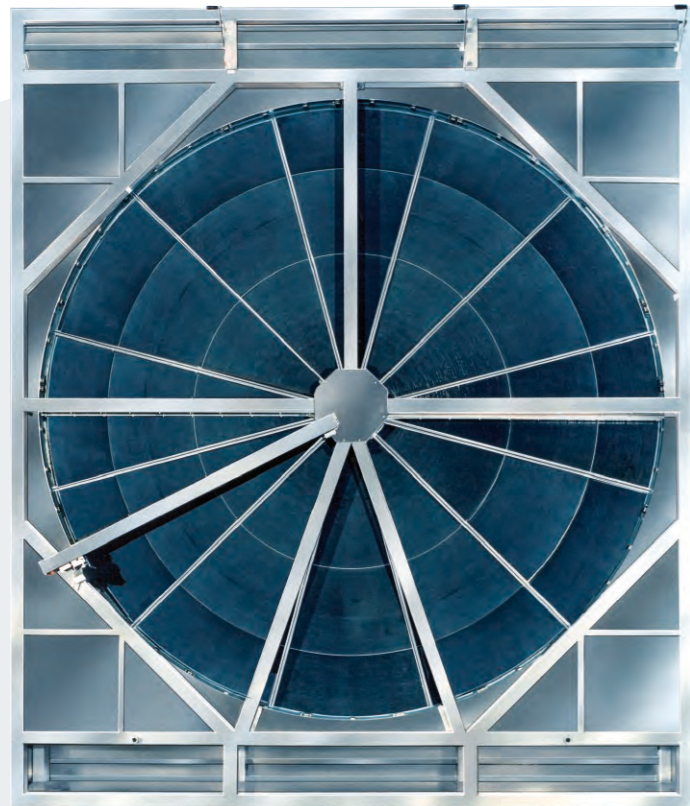


Cross flow plate heat exchanger



Humidifier CERTO





## Paint booth rotor



**IVECO**



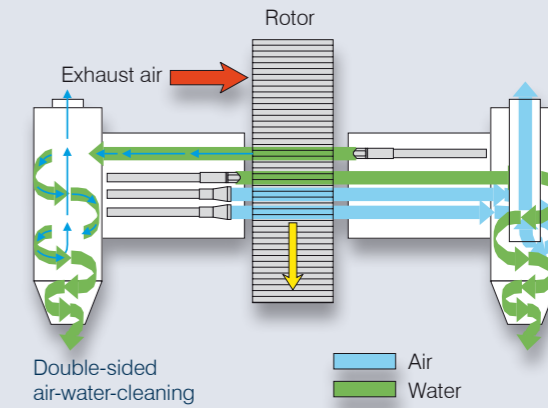
It is quite impossible to imagine today's large-size paint booths in the automotive industry without rotary heat recovery systems. The economic benefits are indisputable.

Paint-application systems today are in constant use, maintenance intervals are growing and this requires heat recovery systems with high standards of operational safety.

We collaborate with leading manufacturers of paint-booth systems and the automotive industry to advance the technological development of rotors used in paint-application units.

## Cleaning devices

Independent of the type of deposition process or the filter levels used in the exhaust air – paint shop rotors are exposed to strong contamination.



Due to the various paints and exhaust air treatment processes used in surface technology, the cleaning of the rotors demands the highest standards.

### The cleaning must fulfil two functions:

- Cleaning of paint particles on rotor wheel surface
- Removal of substances in the exhaust air which would induce corrosion of the rotor wheel

The selection of the optimum cleaning methods depends on the degree of contamination of the rotor and the exhaust air's paint deposition process.

### Controller

- Unparalleled operational reliability and durability.
- Controllers for stepless, continuous regulation of rotary heat exchangers.
- Integrated frequency converter through which standard AC motors can be installed.



### Features

- CE Conformity
- Protection IP54
- Aluminium housing
- Acceleration and deceleration ramp
- Interference suppression
- Most modern processor technology
- 3 button system with display
- Thermally insulated contacts
- Earth and short circuit proof
- Cleaning operation

### Regulation for Cleaning

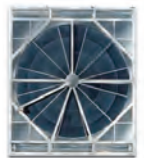
- AS2:**
- Control unit for the cleaning device
  - Compact control cabinet available



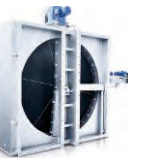
Foreword



Rotor for ventilation systems



Paint booth rotor



High temperature rotor



SECO HYSG



HUGO



Counter flow plate heat exchanger



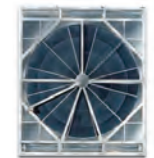
Cross flow plate heat exchanger



Humidifier CERTO



Rotor for ventilation systems



Paint booth rotor



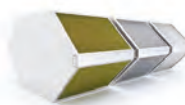
High temperature rotor



SECO HYSG



HUgo



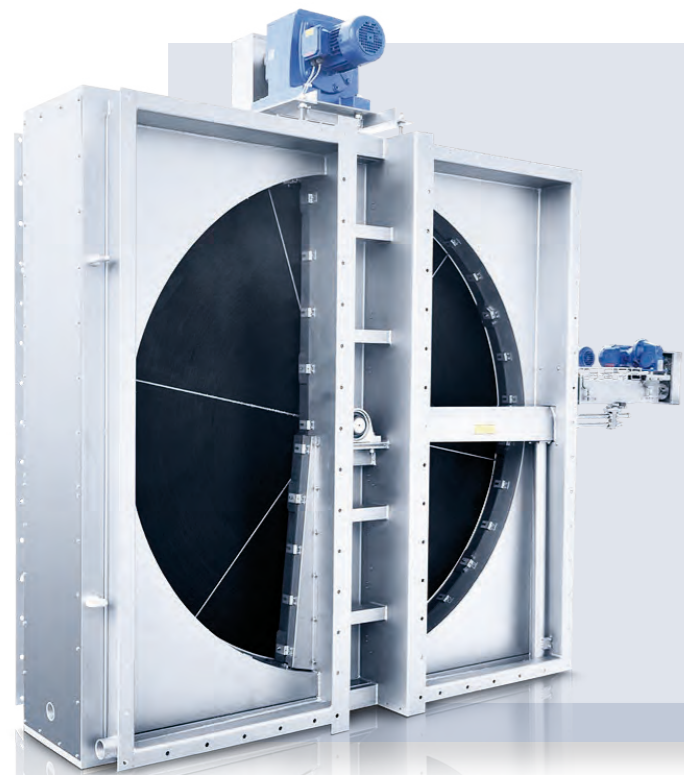
Counter flow plate heat exchanger



Cross flow plate heat exchanger



Humidifier CERTO



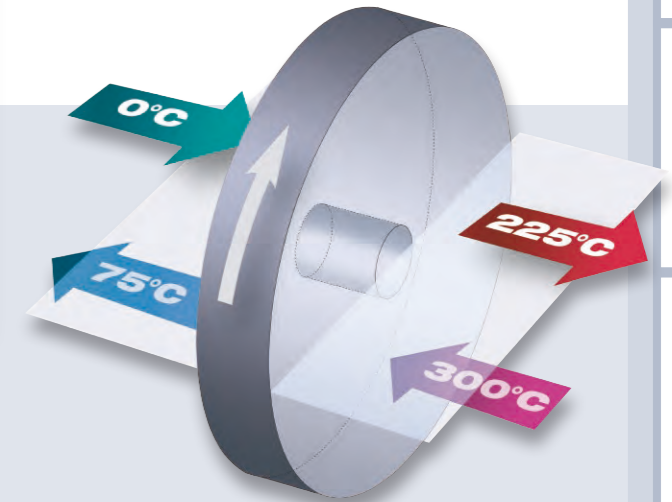
# High-temperature rotor

EM  
EH

## Functional principle

The rotor which is constructed like a honeycomb, rotates non-stop between the stream of hot exhaust air and the cold intake air.

The rotor is warmed up in the stream of exhaust air and transfers the heat to the stream of incoming cold air. Up to 75% of the heat contained in the exhaust air can be recovered in this way.



For energy recovery in the process industry with temperatures of over 150°C or where products are exposed to aggressive pollution of the return air stream, Klingenburg uses wheel materials made from stainless steel. The housings for these products will be equipped with double walled panels and thermal isolation.

### Types:

#### Type EM:

up to 300°C, housing up to Ø 3500 mm

#### Type EH:

up to 650°C, housing up to Ø 2650 mm

### Housing types

Robust, welded construction, double walled with thermal isolation. The housing can be constructed with flange fittings to ease connecting with the frame and ductwork.

Housing can be supplied in steel or stainless steel in all available types. The flange connection framework and the floor pans are fitted with oversized "run-off" drains to ensure drainage of

any cleaning fluids or condensation. A bypass can be fitted in the housing to ensure an efficient power control.

### Storage mass types:

Corrugated rotor mass with integrated, welded spoke construction made from stainless steel. Through a large cross section and an ever changing airflow direction through the rotor a self cleaning effect can be obtained.

### Corrugation heights:

2,1 mm for cases with a medium level of exhaust air pollution.

3,1 mm for cases with a high level of exhaust air pollution.

### Materials:

Stainless Steel – supply of all regular types is possible.

If required the rotormass can be supplied in a segmented version to ease installation and commissioning.

## Application area (Examples)

- Thermal afterburners
- Exhaust utilisation for heat power stations
- Exhaust utilisation for belt dryers:
  - Sludge drying
  - Coating industry
  - Textile industry
  - Film industry
- Exhaust utilisation for spray or blow dryers:
  - Washing powder production
  - PVC manufacture

## Cleaning

There are two solutions available for automatic cleaning:  
In case of low air pollution the implementation of compressed air will be sufficient.  
In cases of higher degrees of pollution the rotor can be cleaned with a combination of compressed air and high pressure water or steam.

## Economics

Through high temperature inclinations, high efficiencies and in most cases high operational times the amortization period of these components lies between 3 and 6 months. Through the high energy recoveries it is possible, in many cases, to reduce the connecting power requirements for the related equipment thus enabling by new installations a reduction of the total investment.

## Leasing

Because the proportion of running costs for heating in respect to the production costs are often underestimated, investments in the efficiency of the heating installations are often neglected.  
Relieve the environment and reduce your costs starting on the first day of installation by using our components! Talk to us.



# Klingenburg Sorption rotor for drying and enthalpy recovery



## Sorption-rotor

SECO  
HYSG

Too much atmospheric humidity causes a muggy climate. This is why, in summer, the intake air not only has to be cooled but also dehumidified. Without dehumidification, processes within the pharma and food industry would not be possible

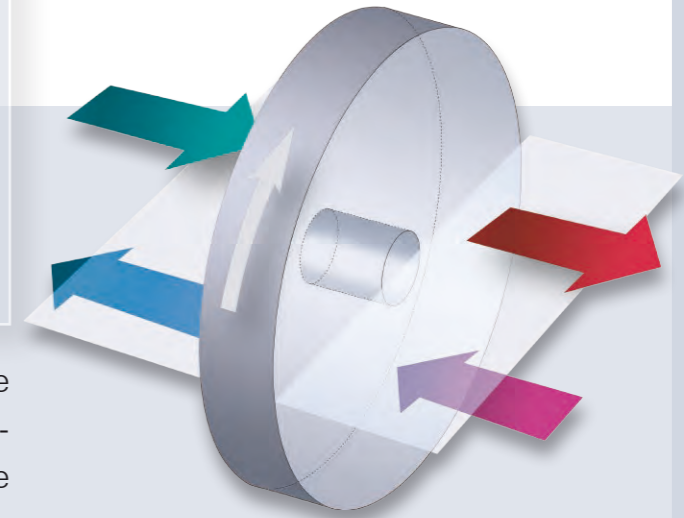
SECO HYSG is a further development of the rotary heat exchanger and not only transfers perceptible heat but also a major part of the atmospheric humidity. It can be used for enthalpy recovery as well as for active dehumidification.

The high efficiencies are reached through the use of a highly active silica gel impregnated rotational media.

## Functional principle

Outside air and exhaust air are forced through the rotor in separate air ducts according to the counter flow principle.

The rotation of the wheel transfers the heat and latent moisture energy of the airstreams. Up to 80% of the heat and humidity contained in the exhaust air can be recovered in this way.



## Range of use:

- As an Enthalpy Recovery device, the SECO HYSG saves up to 80% of the heating and dehumidification costs.
- As a dehumidifier, it enables a significant reduction of the cooling load with the usual refrigeration systems, and air-conditioning by utilizing regenerative energies.
- In tropical regions, the SECO-HYSG can reduce the initial dimensioning of the cooling devices resulting in a reduction of the electrical consumption demands.

Air-conditioning is used a lot in southern European countries as well as in the wet tropical regions of the world. This is already causing shortages in the energy supply. Research institutes throughout the world are looking for energy-efficient cooling methods.

SECO HYSG has made a contribution to solving these problems and has substantial technical as well as economic growth potential.



Foreword



Rotor for ventilation systems



Paint booth rotor



High temperature rotor



SECO HYSG



HUGO



Counter flow plate heat exchanger



Cross flow plate heat exchanger



Humidifier CERTO

# Klingenburg Sorptions rotor for enthalpy recovery



## Sorption rotor

### HUgo



Heat exchangers which transfer also moisture besides sensible heat (temperature), save expensive energy:

- in humid climate zones in which outside air is pre-dehumidified and the air conditioning unit's load will be reduced in moderate climate zones
- in which outside air will be humidified, the energy demand of the supply air humidification will be minimized.

Enthalpy rotors currently existing on the market work under the principle of adsorption and are usually made of SilicaGel or zeolite coating, respectively a mix of both.

#### HUgo is different

HUgo is different as the size of its particles are clearly smaller compared to other Zeolites. In consequence the adsorption kinetics (speed of adsorption and desorption) is much higher as the distance to the pore is smaller. Additionally the number of particles are higher and therefore the total surface area is larger. HUgo

stands for highest performance without growth of bacterias and without formation of odours and at the same time low pressure losses and fair acquisition costs.

The Klingenburg Hugo is available with a 3 Å or 4 Å Zeolithe coating with particle sizes in the range of nanometers. The desiccant is produced in house. The coating process is conducted by the self-developed DEKATRU® coating process.

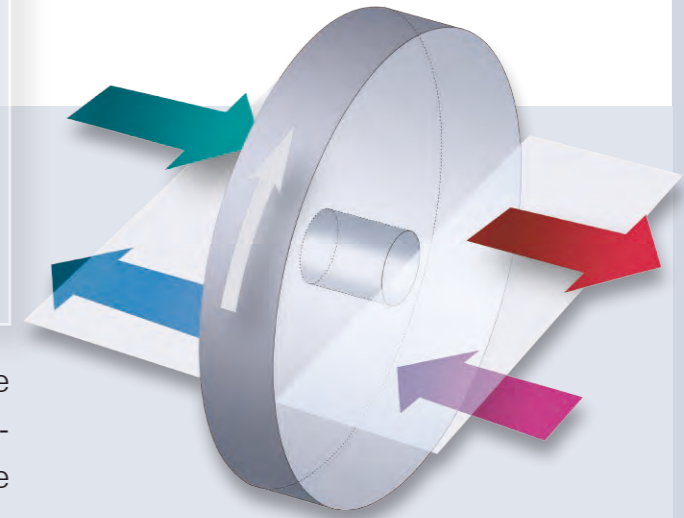
The DEKATRU®-coating technology stands for unique advantages:

- Cleanable with high pressure water as possible with sensible rotors, without wear and tear of the coating and without loss of performance.
- Very high sensible and latent efficiency with one of the lowest pressure drops on the market due to homogeneous and fine coating thickness.
- No restriction of life-time of Klingenburg Hugo rotors with desiccant coating

## Functional principle

Outside air and exhaust air are forced through the rotor in separate air ducts according to the counter flow principle.

The rotation of the wheel transfers the heat and latent moisture energy of the airstreams. Up to 80% of the heat and humidity contained in the exhaust air can be recovered in this way.



## Customer benefits::

- HUgo adsorption rotor with corrosion resistant aluminium core. No use of hazardous fibrous respirable elements
- Very high performance by means of high adsorption capacity
- Low pressure drop
- No formation of odours as pore diameters are not larger than 3 resp. 4 Angstrom
- Sorption coating requires a thin layer of coating
- No wear and tear of the sorption material
- Layers of the wheels storage mass absolutely flush at front
- Foil thicknesses 70 - 100 microns depending of the application

- Wheels of different packing density / wave height available
- Available with different housing constructions and housing materials
- Rotor wheels are built to the customers specifications
- Very long lifespan
- Sizes from Ø 300 mm up to 6000 mm
- Cleaning by pressure washer is possible without loss of sorption material resp. performance
- Very high sensible and latent efficiency with one of the lowest pressure drops on the market due to homogeneous and fine coating thickness.
- No restriction of life-time of Klingenburg Hugo rotors with desiccant coating
- DEKATRU®-Coating technology



Foreword



Rotor for ventilation systems



Paint booth rotor



High temperature rotor



SECO HYSG



HUgo



Counter flow plate heat exchanger

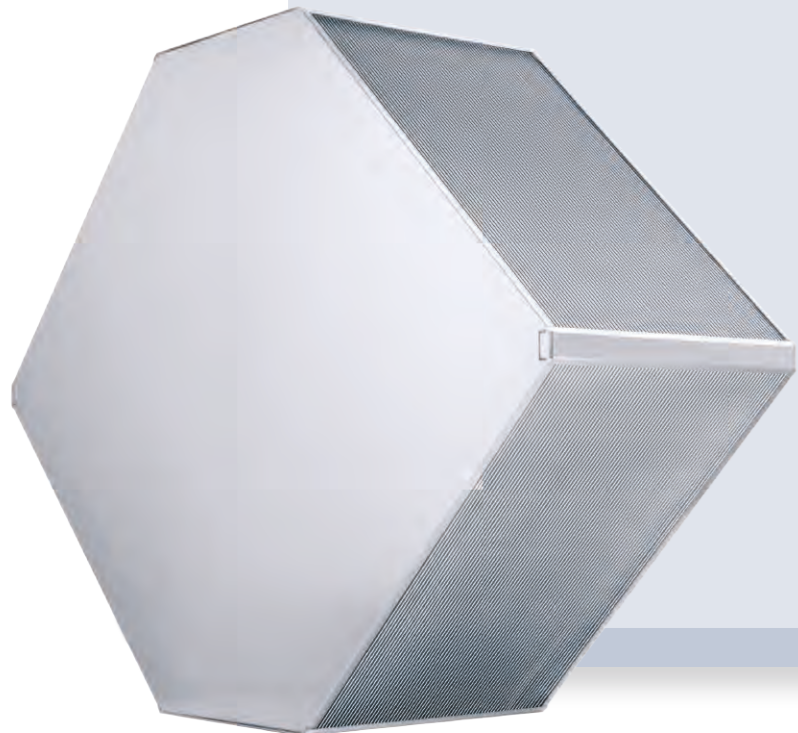


Cross flow plate heat exchanger



Humidifier CERTO





## Counterflow plate heat exchangers

GS

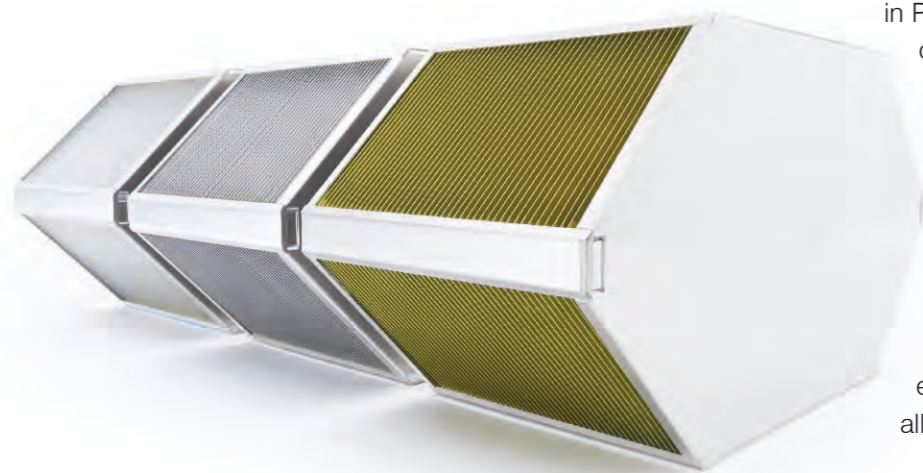
The „real“ GS counterflow plate heat exchangers from Klingenburg – superior quality now and in the future.

Energy savings of up to 90% and higher in cases of condensation.

Machine finished „real counterflow heat exchangers with channeled airflow guides“ made from seawater resistant aluminium or in PET to achieve higher efficiencies over the entire volumetric spectrum.

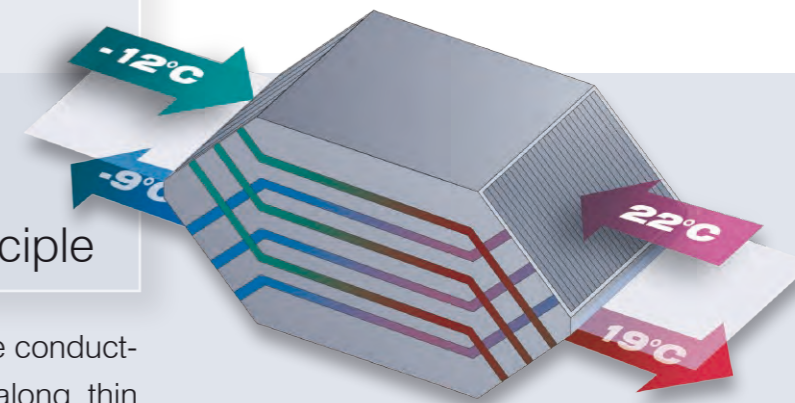
### Applications:

Air conditioning units, controlled accommodation ventilation, warmth recovery in winter and cooling recovery in summer or wherever there is no recirculation allowed.



### Functional principle

The two airstreams are conducted past each other along thin parallel plates according to the counter flow principle.



Up to 90% of the heat in the exhaust air is transferred to the ingoing air, without, however, any smells or humidity being exchanged

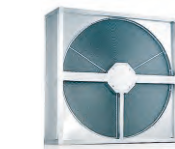
### Advantages:

- Distribution of airflow through definite channelled guides, thus high performances by simultaneous low pressure losses over the entire volumetrics spectrum
- Eleven sizes available to cover volumes from 50 -2000 m<sup>3</sup>/h for one unit for plate material in aluminium or in six sizes with plate material in PET.
- Application of seawater resistant aluminium or in PET
- Precise machine manufacturing
- Precision engineering with totally smooth outer surfaces to ensure optimum sealing and perfect matching to the A/C systems
- No use of screws, bolts or rivets
- Suitable for washing with dishwashers

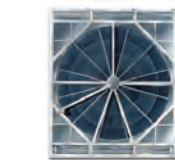
- Long lifespan
- Resistant against frost damage
- Insensitive to heat (i.e. installed near pre-heater)
- No dangerous gaseous emissions in case of fire
- Version with epoxy coating for special cases, swimming pools and agricultural stables for example
- Bypass version available

Sealing between plates is done through adhesive diffusion of the sealing substance, thus:

- High level of impermeability
  - Extremely hygienic through optimum drainage of all condensates
  - No uneven grooves or niches where condensate can collect.
- Inhibition of germ propagation or corrosion



Rotor for ventilation systems



Paint booth rotor



High temperature rotor



SECO HYSG



HUGO



Counter flow plate heat exchanger



Cross flow plate heat exchanger



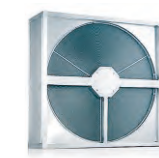
Humidifier CERTO



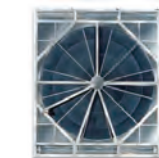
# Klingenburg Crossflow plate heat exchanger



Foreword



Rotor for ventilation systems



Paint booth rotor



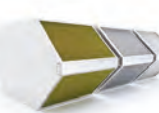
High temperature rotor



SECO HYSG



HUgo



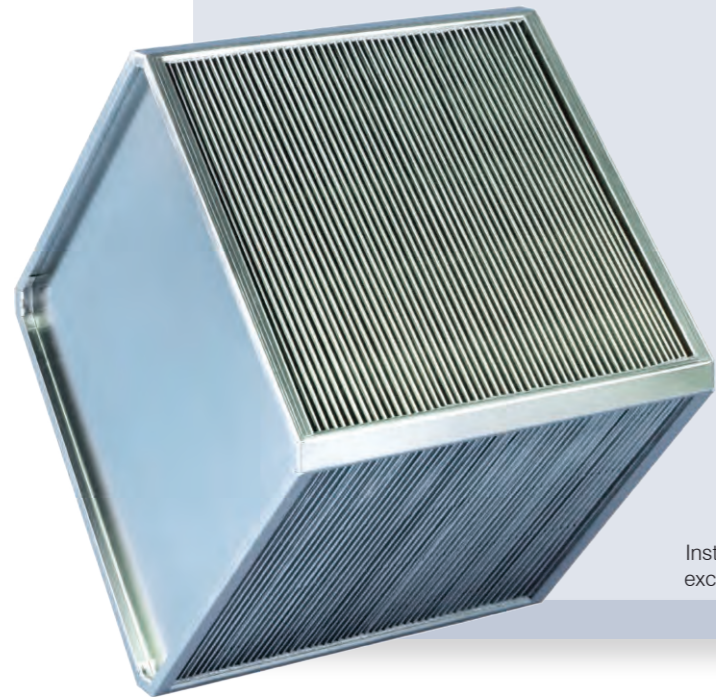
Counter flow plate heat exchanger



Cross flow plate heat exchanger



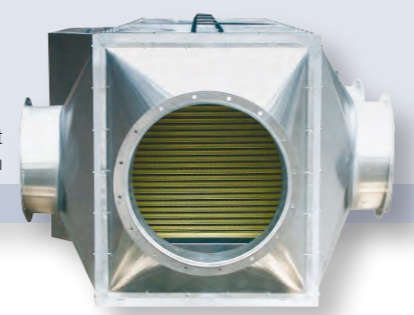
Humidifier CERTO



## Crossflow plate heat exchangers

PWT

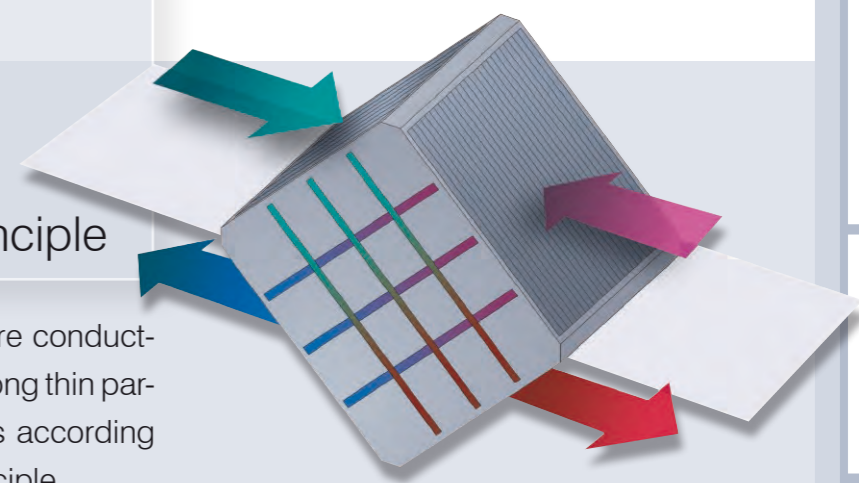
Installation ready, crossflow plate heat exchanger for an industrial application



### Functional principle

The two airstreams are conducted past each other along thin parallel aluminium plates according to the cross flow principle.

The heat energy of the airstreams is transferred via the plates. Outside air and exhaust are completely separate from each other.



Klingenburg plate heat exchangers are utilised for both the cold and warmth recovery in the A/C industry and the processing technology. These belong to the group of recuperative heat exchangers.

By means of the heat exchanger, two air currents of differing characteristics (i.e. warm return current and a cold supply current) are forced to pass by each other in opposite directions, parallel to each other through thin, specially structured plates without any contact between one air current and the other. The energy transfer is caused by the numerous plates present in the heat exchanger. A mixing of the two air streams will not occur. Consequently, the transfer of humidity, pollution, bacteria and odours is avoided.

As these heat exchangers are often used in environments where recirculated air is not allowed, it is imperative that there exists a high level of air tightness. Klingenburg heat ex-

changers are indisputably the number one on the market as far as quality is concerned.

Klingenburg produces plate heat exchangers with edges of between 200 mm and 1200 mm. Many desired dimensions are available which enables modular assembly. Crossflow plate heat exchangers can be fitted with actuated dampers, bypass and housings.

#### Advantages of Klingenburg crossflow plate heat exchangers at a glance:

- Double folding of the leading edges. Extreme tightness and stability due to 5-fold thickness of material (see image left)
- No non-ventilated zones or condensate niches due to perfect workmanship.
- Light, seawater resistant aluminium quality
- Any length of package can be delivered

#### Examples of application:

- Ventilation systems
- Industrial ventilation systems
- Adiabatic cooling
- Switchpanel cooling

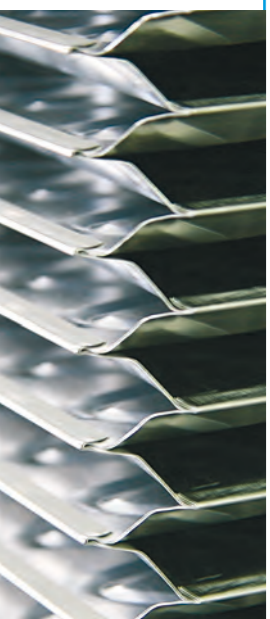
#### Plate heat exchangers for high temperature applications up to 300°C:

For applications in industrial environments we offer heat exchangers equipped with epoxy coated aluminium foil or stainless steel foil. With our stainless steel plate heat exchangers we use a special corrugated inlay upon a flat plate section which increases the pressure stability and decreases the pressure drop without incurring any negative effects on the performance.

Parallel to the different standard sizes that we produce, we also deliver, depending on the application, various modular versions, configurations and connection types made from steel, stainless steel and of course aluminium.

#### Examples of applications:

- Exhaust air from conveyor belts
  - Sludge drying
  - Coating industry
  - Textile industry
  - Film industry
- Exhaust air from spray dryers
  - Washing powder manufacture
  - PVC manufacture
- Vapour cloud reduction





# CERTO

## Air Humidifier

# CERTO



CERTO stands for reliability and safety and therefore for two criteria, which the Klingenburg air humidifier fulfils.

Humidification is very important for a healthy environment. The Klingenburg high pressure humidifier is an efficient and hygienic humidifying system for the general airconditioning and industrial applications. Our patented technology offers an extraordinary service friendly solution for your humidification requirements.

In the last few years, numerous humidification systems have disappeared from the market since they no longer meet hygienic requirements. The Klingenburg CERTO closes this gap.

The CERTO humidifier with its design approval is available as a complete unit with housing or as a installation kit adaptable to all airconditioning brands. It is ideal for re-fits or refurbishment for existing systems.



## Functional principle

The CERTO air humidifier functions according to the principle of fine atomisation. The incoming air flow is led through a patented vortex generator and nozzle system, generating stable longitudinal vortices. These vortices provide optimal mixing within the reaction chamber. In the centre of each vortex, the water is atomised at high pressure over nozzles. In this way, the air takes up the humidity and is also adiabatically cooled. The secondary evaporator at the air outlet separates and evaporates the water not taken up by the ambient air.



## Advantages of CERTO:

- **Appliance execution made from stainless steel**  
Durable corrosion resistance, no microbiological colonisation
- **100% saturation**  
Saturation of the air in all operation areas possible
- **Over saturation**  
With dry cold steam over saturation is possible
- **Complete emptying and drying of the condensate drain**  
No water storage in humidifier necessary. Conformation to hygienic requirements VDI 6022
- **Excellent controllability**  
Stepless power control ensures precise adherence to the given operational values
- **High air speeds**  
No power losses
- **Minimum pressure loss**
- **Power input**  
Low power consumption
- **Hygiene**  
Completely fulfils the hygienic requirements of ambient air conditioning systems without the need for chemicals such as silver ions, etc.

- **Water quality**  
Use of desalinated water ensures a high level of hygiene and low maintenance operation. The quality of the humidified air is directly dependent on the quality of the water used.
- **Maximum evaporation capacities**  
Highest evaporation capacities, up to 95% depending on operating mode

## Types of housings:

- The dimensions are decided solely by the customers preference
- The housing construction is isolated with robust framework made from seawater resistant aluminium
- Internal panelling is made from stainless steel
  - Complete unit construction or assembly kit adaptable to any empty humidifier chamber
  - Standard equipment includes inspection door, window and lighting (24V)
  - Delivery as a complete unit or disassembled for restrictive on site transport



Foreword



Rotor for ventilation systems



Paint booth rotor



High temperature rotor



SECO HYSG



HUgo



Counter flow plate heat exchanger



Cross flow plate heat exchanger



Humidifier CERTO



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www.klingenburg.cn

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