**sales support for**

# KMA ULTRAVENT exhaust air filtration systems

**In textile industry**

## The ULTRAVENT
## Exhaust air treatment system

KMA ULTRAVENT exhaust air treatment systems were developed for use in the textile industry. They are characterized by a high degree of deposition of smoke and textile fiber dust. At the same time, ULTRAVENT systems enable the recovery of waste heat from the exhaust air. As a result, KMA ULTRAVENT exhaust air treatment systems pay off on their own: energy extracted from the exhaust air is made available to the process again, thus significantly reducing energy costs and carbon footprint in textile finishing. Depending on the local energy prices and the capacity of the ULTRAVENT system, the amortization period is sometimes less than 2 years!


Possible applications for KMA ULTRAVENT are

- Stenter frames
- dryer

This often produces exhaust air with heavy smoke missions, where oily, greasy or dusty exhaust air with high temperature and partly with strong odor pollution arises. Due to the stickiness of the substances to be separated, classic "filters" (cassettes, tube filters, cartridge filters, etc.) separate out as separators. They would quickly clobber themselves. Moreover, such filters are unable to handle odors.

With the ULTRAVENT exhaust air treatment system, KMA offers a process that combines heat recovery and exhaust air purification in an ideal way.

The most important features of the KMA ULTRAVENT exhaust air treatment system:

- Filter system consisting of lint filter and 2-stage fine particle filter (ESP)
- Heat recovery system for generating hot supply air (the supply air temperature is approx. 20 ° below the exhaust air temperature, eg at 180 ° C exhaust air temperature, a supply air temperature of 160 ° C is reached), hot water (up to 95 ° C ) or hot heat transfer fluid (up to 150 ° C). The temperatures depend on the height of the exhaust air temperature
- Available in different sizes - suitable for all tenter frames and dryers
- urable and wear-resistant, as the system is made of stainless steel, ceramic or aluminum in all parts in contact with the exhaust gas
- Modular design of the filter components allows adaptation to the specific requirements of the tenter frame or dryer
  Significant improvement in the carbon footprint (reduction of $CO_2$ emissions through the use of recovered energy)

### 1. Modules and filter sizes

The ULTRAVENT is an exhaust air treatment system consisting of particulate filter module and heat recovery module. Optionally, an odor filter module is available. In addition, fans for exhaust air and supply air are available. As a clamping frame is always fire-prone, ULTRAVENT systems can be optionally equipped with fire control and extinguishing systems.

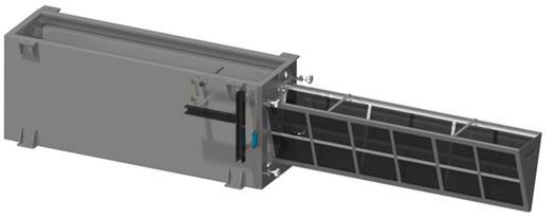
The linking of several modules, which function according to different separation principles, enables synergies that are not achievable with single-stage filters.

The ULTRAVENT system is available in capacity levels of 15,000, 20,000 and 30,000 m³ / h.

The heat exchanger module and the particle separator module are arranged side by side. The height is reduced to 3 - 3.5 m.

### a. Lint filter

The lint filter (lint separator) is the first module of the ULTRAVENT system. As lint separator a metal mesh filter is used. The exhaust gas to be cleaned flows vertically from top to bottom in the case of KMA ULTRAVENT filters.



### b. heat recovery modules

The process exhaust air of a stenter or dryer contains a lot of valuable energy. If it is recovered, it can be transferred to the supply air flowing into the clamping frame. Also, the hot air supply of other consumers such as e.g. Printer, dryer etc. possible. In addition, the waste heat can be used to produce a hot liquid medium such as hot water (for example for preheating boiler water or for dyeing and laundry) or ethylene glycol.

ULTRAVENT heat recovery modules are adapted to the harsh operating conditions in the treatment of hot and oily tarmac exhaust air. For heat recovery, an air / air module, an air / liquid module or the combination of air / air with air / liquid module are available.

**Air / air heat exchanger module**

Here, the energy of the hot exhaust air is immediately transferred to the supply air of the stenter or dryer. In this way, the supply air can be heated while entering the clamping frame. The supply air temperature is approximately 20 ° below the exhaust air temperature: If the exhaust air temperature is, for example, 180 ° C, a supply air temperature of up to 160 ° C is reached. As a result, energy savings of partly over 500 kW / hour possible!

**Air / liquid heat exchanger module**

In this method, the energy extracted from the exhaust air is transferred to a liquid heat transfer medium. As a heat carrier both water and ethylene glycol are used. In this case, water can be heated to a maximum of 95 ° C. If the water quality is sufficient (see data sheet water quality requirements for heat exchan-gers.pdf), the water can be led directly into the heat exchanger. In this case, the heat exchanger on the input side needs a continuously regulating flow valve, which is controlled by the control of the ULTRAVENT system. The water flow is made by the pressure in the line. Therefore, it must be ensured in this solution that sufficient fresh water is available and can also be consumed in the production. Based on the exhaust air temperature and the exhaust air volume of the stenter, the potential of hot water that can be generated per hour, determined by an energy bill.

If the water quality is too low for direct flow through the heat exchanger, an indirect system can be used. In this case, a circulating circuit is generated by means of a volume flow adjustable pump between the heat exchanger and the heat consumer. The heat consumer may be a plate heat exchanger, a storage tank or other consumer. Depending on the temperature of the exhaust air of the stenter, suitable heat transfer fluids are available, which allow temperatures of up to 150 ° C.

All KMA heat exchanger modules are optimized for automatic cleaning via the CIP cleaning system integrated in the ULTRA-VENT system. Automatic cleaning means less service and increased efficiency of the heat exchanger, as the transfer surfaces always remain relatively clean.

### c. Particle filter module for smoke separation

The particle separator is the most important element for exhaust air purification in the ULTRAVENT system. The particle separator filters highly effective smoke, oil aerosols and fine dust particles from the exhaust air. Prerequisite for good separation is a sufficient cooling of the exhaust air in the upstream heat exchanger, since in this way gaseous air contaminants can condense to form aerosols and can be separated in the electrostatic precipitator. A temperature of approx. 60 ° C at the electric filter inlet has proven to be optimal. This e-filter is designed as a two-stage electrostatic filter, so that even highly concentrated smoke is reliably filtered. The substances deposited by the filter first reach the aluminum collector plates of the filter by electrostatic charging. From there they flow largely by gravity and pass through a drainage valve in a collection container. Firmly adhering substances, on the other hand, remain on the metal surfaces of the collector plates and will not be removed until the next cleaning process.

KMA electrostatic filters have been specially developed for maintenance-free automatic washing via the KMA CIP washing system: the special filter design ensures that the washing water reaches all parts of the filter unit and reliably removes dirt deposits.

### d. UV light module for increased odor separation

The use of a KMA ULTRAVENT system with the two heat recovery modules and particle separators described above also results in a relatively high degree of odor separation. This is due to the fact that so-called gas phase is condensed by the cooling in the heat exchanger and the intensely smelling oil aerosols are subsequently separated from the air in the electrostatic precipitator.

However, if due to the location of the factory increased demands are placed on the odor in the exhaust air, the ULTRAVENT system can be equipped with an additional odor filter stage. In addition, proven UV lamps are used in the odor filtration. As the exhaust air passes through the UV light zone, long-chain odorous molecules are oxidized. The result is a significant reduction of odor in the exhaust air.

The UV light module is also regularly washed automatically by connection to the KMA ULTRAVENT CIP washing system.

## 2. Assembly

KMA ULTRAVENT systems are often installed directly on the tender or dryer. The advantage: The pipe path from the existing exhaust air ducts to the ULTRAVENT system is short. The pipes for the heated supply air are accordingly short. This minimizes the thermal energy loss and the energy needed to transport the air. In addition, there is often sufficient space above the stenter to set up the filter system. However, a mounting platform of sufficient size and statics must be provided on site. If required, KMA will provide suggestions for the size of the stages.

If there is no space available above the clamping frame, alternatively the installation of the ULTRAVENT system at another location, as close as possible to the clamping frame, is an option. This can be a place inside or outside the building. When installing outdoors, it must be ensured that the ULTRAVENT system must be installed dry and frost-free.

## 3. Oil drainage

When operating the filter system, large quantities of oil can be separated depending on the concentration of oil smoke. Therefore, care must be taken to ensure that a sufficiently large receptacle (drum, tank) is placed below the filter system. It should be noted:

- The container should be below the filter attachment so that the separated oil flows gravimetrically (by gravity) into the container
- The container must either be easily accessible and replaceable (eg IBC Containers) or with a drainage pump or similar. be equipped, as depending on the application, large quantities of oil are removed from the exhaust air.

## 4. Filter washing system (CIP)

KMA ULTRAVENT systems are equipped with a highly effective washing system for the regular cleaning of all installations (eg heat exchangers, electrostatic filters, UV lamps). It is cleaned by washing water, which is located in a tank below the system. Cleaning is automatic and monitored by the PLC. Here you can also set all relevant parameters (eg weekday of cleaning, start time, length of cleaning, desired water temperature, etc.). At the start of the cleaning, the washing water is heated to the desired temperature. Then the washing process takes place. The washing water circulates and is sprayed between the exhaust air modules to be cleaned via a movable nozzle. The returning water gets back into the tank where it is filtered and reused in the washing process. After completion of the washing process, floating oils in the tank are skimmed off and discharged by means of a skimmer.

The used oil / water mixture must be collected in a waste water collection tank or fed to a suitable treatment plant. Usually fall per wash 300 liters of wastewater and lasts an average of 3 hours.

**We recommend one wash cycle per week. For heavy loads it may be necessary to shorten the frequency. During the washing process, the filter system is switched off.**

**The advantage of the CIP system is that the components do not have to be removed for cleaning. This ensures a long service life of all components and a minimum of work.**

## 5. Fire protection, over-temperature protection

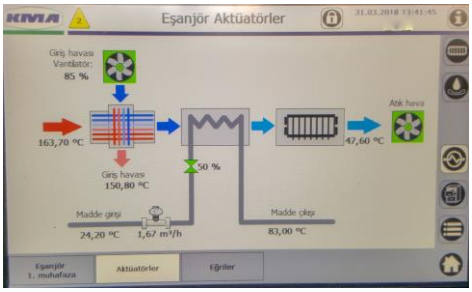
ULTRAVENT systems are equipped as standard with an overtemperature protection system. If an exhaust air temperature above the permissible limit value is registered (if the control is set to 210 ° C before and to 100 ° C after the heat recovery module), the filter system switches off for safety reasons. The air duct goes to bypass, so that the exhaust air is led directly into the open air. In addition, a steam inlet valve opens, through which LP steam is directed into the interior of the filter (steam must be provided by the operator).

Optionally, a certified extinguishing system can also be used. The system autonomously monitors the temperature inside the system (ie without integration into the central PLC). If the specified limit temperature is exceeded, the monitoring system switches off the system. The air duct is simultaneously switched to bypass mode. At the same time, the housing of the ULTRAVENT system is flooded with a quenching gas (for example CO2, argon).

## 6. PLC control

The central control of the ULTRAVENT system performs the following functions:

- Filter operation: continuous control of all parameters (input temperature, output temperature, filter voltage and current consumption, control of the valves for flow control for cooling liquid or fresh air, ...)
- Heat recovery: Yield of recovered energy with marginal energy recovery data, cumulative data per day, week or year




- Filter cleaning: time of cleaning, length of cleaning time, water temperature, other parameters
- Filter monitoring: Overtemperature control, emergency shutdown or bypass operation
- Remote access via external system from other locations via Internet / GSM. This program allows e.g. the remote access to the system for maintenance purposes.

The controller is a Siemens S7-1500 PLC.

## 7. Additional modules

The following additional modules are available in the ULTRAVENT system:

- Exhaust air fans for transporting the stenter exhaust air. These fans are usually required for retrofits, since the existing fans of the clamping frame usually have no sufficient pressure reserve to compensate for the pressure loss of the ULTRAVENT system. The additional exhaust air fan is in this case in the air flow behind the system. It is speed-controllable and controlled by a vacuum sensor. In this way, the fan adapts to changing exhaust air volumes of the stenter frame. Should be dispensed with this additional fan, the existing exhaust fans of the stenter must have a pressure reserve of about 1000 Pascal available. In addition, it must be ensured that the filter system is operated under low pressure, ie the fans must be arranged in the air duct downstream of the filter system.
- One set (2 pieces) supply air fans for the hot air supply of the clamping frame. These

fans are located at the fresh air outlet of the air / air heat recovery module. They are frequency-controlled. The first fan is controlled by 2 sensors mounted at the entrance and exit of the stenter tunnel. You check that no hot air escapes from the clamping frame into the room and regulate the hot air volume of the ventilator 1 accordingly. The second fan is controlled by a temperature sensor in front of the electric filter inlet. It regulates the amount of hot air so that the exhaust air temperature at the filter inlet always corresponds to the desired value (usually about 60 ° C). The hot air from fan 1 is provided to the stenter for hot air supply. The hot air from fan 2 can be used for other applications or, if there is no user, must be brought outdoors.

- Pump circuit with expansion vessel and safety valves. This unit is used if instead of water ethyl-glycol or solar fluid is used in the heat exchanger. It ensures the circulation of the liquid medium between the heat exchanger and the heat consumer.

- plate heat exchanger. Used to transfer the recovered heat from the heat transfer medium (e.g., ethylene glycol) to water

## 8. What should be considered when selecting the system?

- ULTRAVENT systems are able to release the exhaust air of the clamping frame to a high degree from visible smoke components and odors. However, it is important to remember to select a system of suitable size. For this purpose, the maximum amount of exhaust air and the max. Off-air temperature of the stenter be determined. If there are uncertainties, we recommend exhaust air measurement.

- It is also necessary to determine at an early stage in which form the energy should be recovered. The ULTRAVENT system allows the recovery in the form of hot air (C) or hot water (W, WW). Also a combination of at-the is possible (CW). The operator must ensure that the recovered energy can flow back into the process.

- Use a filter unit per clamping frame! Often our customers ask us if we can offer a central filter system for the connection of several clamping frames. This is technically possible, but we advise against it. The reasons:

    - Central filter systems usually do not permit the return of the recovered heat to the clamping frame. Because the central heat exchanger receives a mixture of exhaust air from different clamping frames. This mixture is less hot than the segregated air volumes from the individual stenter frames due to longer tube paths and different temperatures in the clamping frame. Therefore, the returning temperature is also much lower. Result: the yield goes back. Also, the air volume management is much more complex. Here are usually quite expensive controls necessary to make sure that all attached stenter at any time get the right amount of hot fresh air.

    - Pipelines are much longer and more complex.

    - Each system requires individual project planning, in which the position of the filter system, the course of the air ducts and pipes, energy management etc. must be precisely defined. A sale according to the standard price list is not possible here.

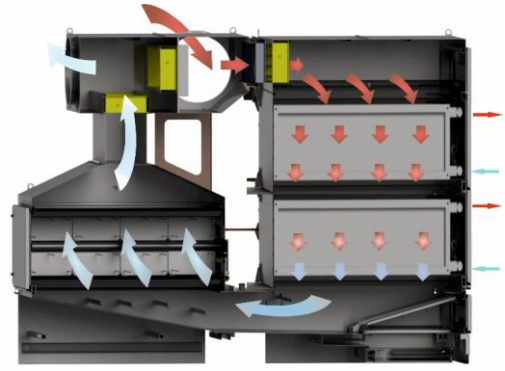
- The scope of delivery of KMA includes the following components: KMA inlet, outlet and bypass flap, lint filter, heat exchanger,

electrostatic precipitator, CIP and control cabinet incl. Control.

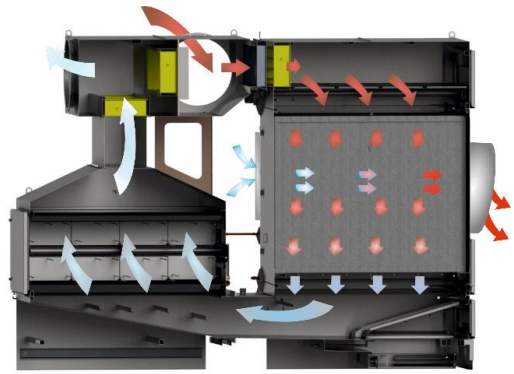
As an option, KMA supplies the exhaust fan, the pump circuit and plate heat exchanger, as well as the supply air fans for the hot air supply.

The compressed air, steam and water connections, the waste water connection, the power supply of the KMA control and the condensate / oil drain must be organized by the customer.

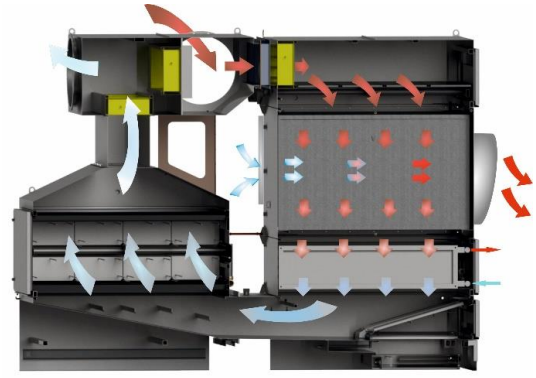
- KMA system as tandem series with air / liquid heat exchanger module for 22000 and 33000 m³ / h exhaust air volume



- KMA system as tandem series with air / air heat exchanger module for 22000 and 33000 m³ / h exhaust air volume



- KMA system as tandem series with combination of air / air heat exchanger module and air / liquid heat exchanger module for 22000 and 33000 m³ / h exhaust air volume

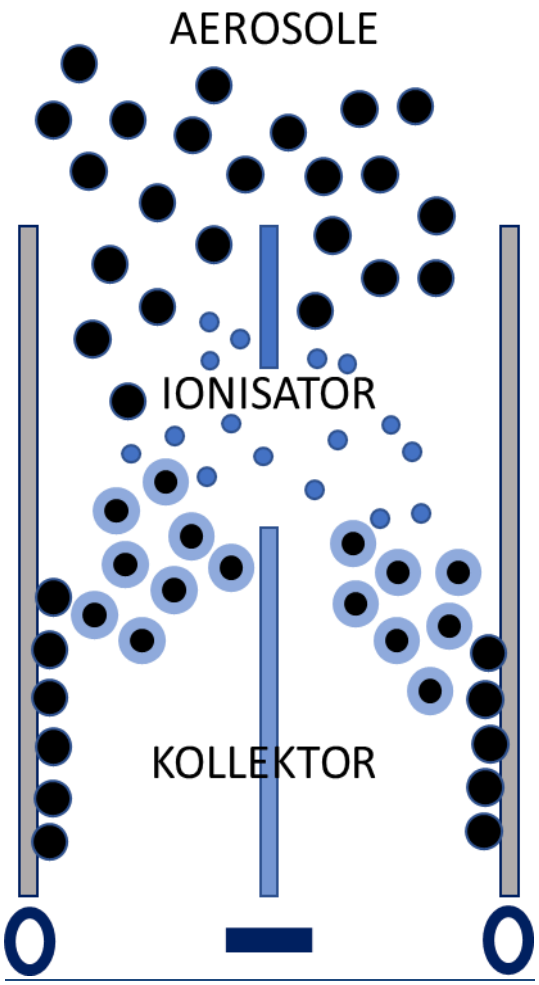


## 9. Further details for understanding an electrostatic precipitator:

- By cooling the exhaust air with gaseous air impurities condenses Aerosole, which can be separated with an electrostatic precipitator.

  For this purpose, the ionizer plate is charged so much that it sprays electrons. The electrons settle on the aerosols and are repelled by the negatively charged plate and directed to the neutrally charged collector plates.

  The contamination on the collector plate falls under gravity into the CIP washing system or is removed by cleaning.




- Due to condensation on the heat exchanger, the KMA ULTRAVENT also co-deposits many NMVOCs (non-methane volatile organic components), which condense at 60 ° C. An additional VOC separator can therefore be dispensed with in most stenter frame applications. Check the VOC content.

# delivery scope at the example of UV20000CW/EE Tandem