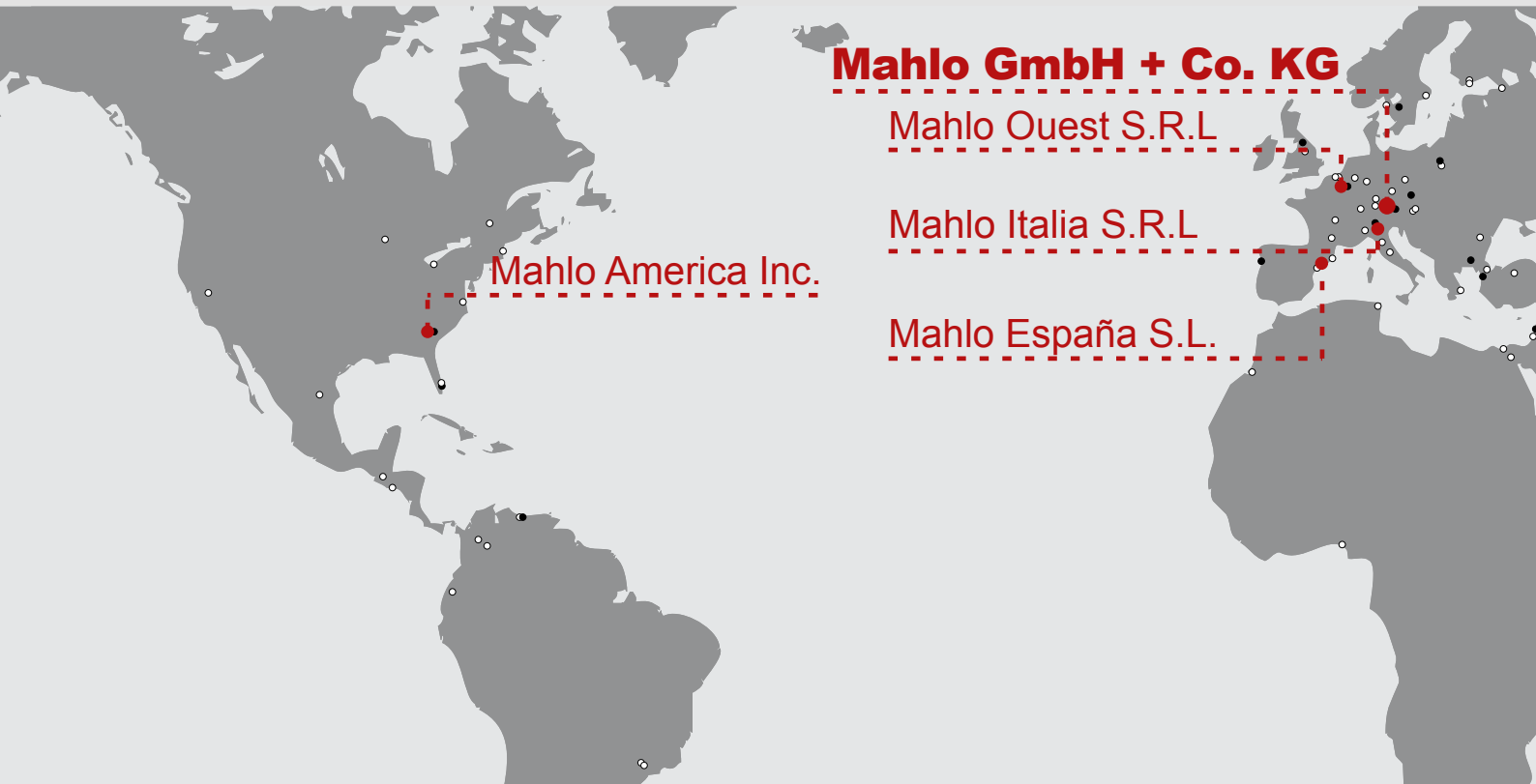


# PRODUCT OVERVIEW

Solutions from Mahlo



PRODUCT OVERVIEW



## **Mahlo GmbH + Co. KG**

Mahlo Ovest S.R.L.

Mahlo Italia S.R.L.

Mahlo España S.L.

Mahlo America Inc.

## **Dear customer,**



Mahlo is a global supplier of measurement, control and automation systems for the textile, nonwovens and finishing, refining, coating and converting, film and extrusion, battery production, pulp and paper industries.

Mahlo represents cutting-edge international technology from Bavaria, rooted in the tradition of a progressive, medium-sized family business that is close to its customers on the world's markets

- ✓ with research and development of innovative products
- ✓ with concept design and execution
- ✓ with technically sophisticated and economically sound solutions to problems
- ✓ and efficient after-sales service.

We are your partner for the future!

**Contact us!**



**Mahlo Shanghai**

Mahlo® International:  
With 5 branch offices,  
over 70 agencies and 40 service  
stations we operate in more than  
100 countries worldwide.

Mahlo GmbH + Co. KG  
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93342 Saal/Donau  
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Fax: +49-9441-601-102  
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### **Standard systems and customised solutions**

Precision and reliability – high quality products thanks to automation and monitoring! This reduces costs and increases production efficiency.

Mahlo has over 80 years of experience in the processes and procedures of the industries it serves. Not only the standard Mahlo systems are used here.

The modular design of the systems allows them to be flexibly adapted to all applications. This means both standard and highly customised requirements are met.

For Mahlo, customers are partners whose requirements we tailor our systems to, in order to achieve the best possible cost-benefit ratio.































### **Philosophy**

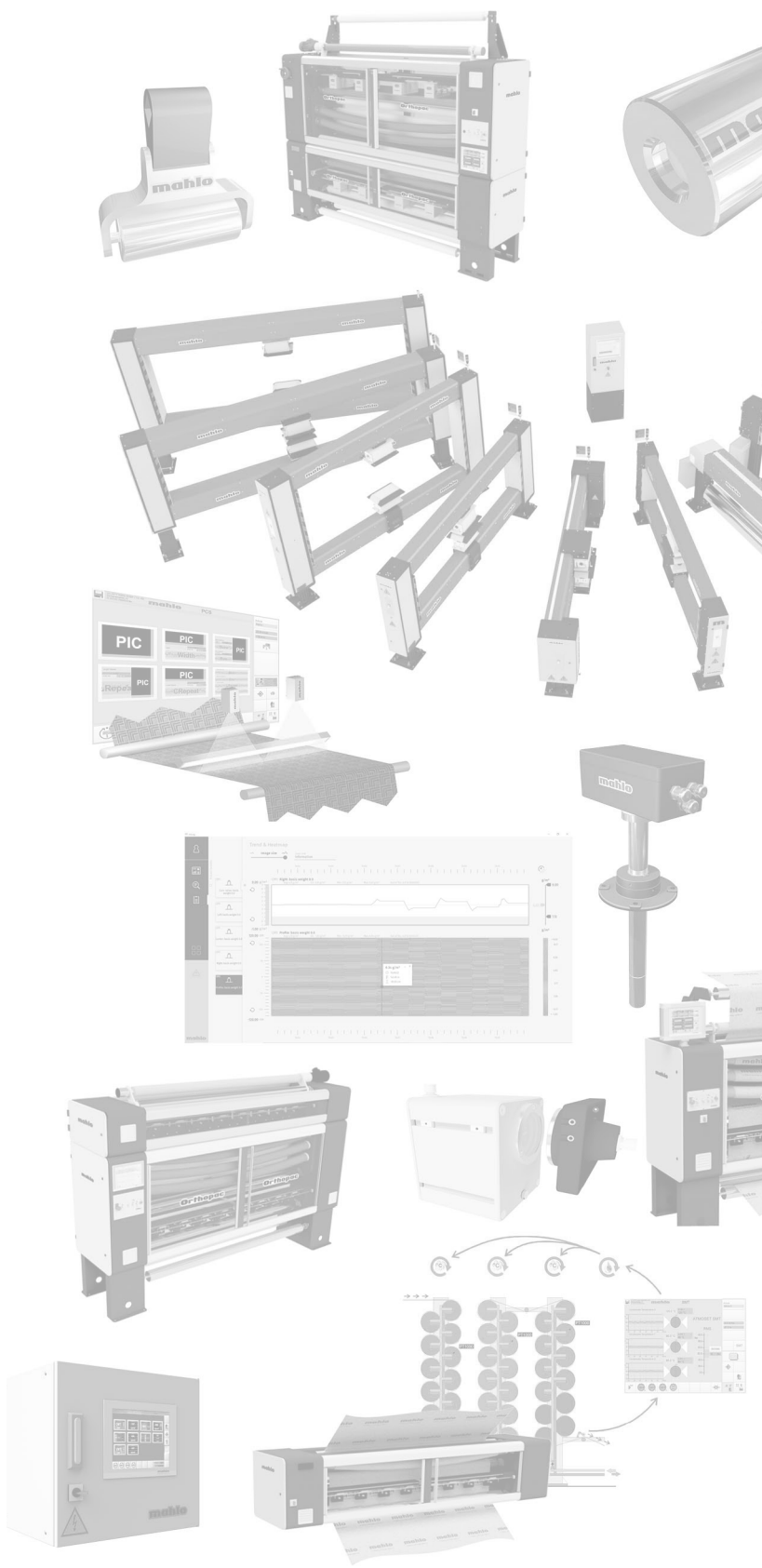
The company's success is the result of the perfect interaction between our customers, the products from Mahlo and our workforce realising the demands of our customers together. Implementing solutions for your problems is one of our strong competitive hallmarks.

**Your success is our philosophy – simple as that!**



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# DISTORTION DETECTION AND DISTORTION CORRECTION

## Automatic straightening and process control system Orthopac

Better fabric quality, straight fabric and resource savings in one step: using the **Orthopac® straightening and process control system** from Mahlo®.



Mahlo's Orthopac family of straightening systems are generally automatic roller straightening systems that combine a scanning system with straightening rollers. However, the scanning bridge is available as a stand-alone device as well as a manual straightening system without a scanning bridge. A wide range of variants and options are available to meet the needs of the textile industry. From a simple distortion detection system to large, reinforced straightening machines for wide and heavy fabrics such as carpets or combination systems.

### Straightener and process control device combined

All Orthopac family systems can be equipped with a modular process control system, combining the functionality of Orthopac straightening machines and Optipac VMC process control in a single device.



### + Orthopac FMC-15 – Distortion detection

The Orthopac FMC automatic straightening function is the heart and core of the Orthopac. The device consists of an optical scanning system and an electronic control for distortion correction. It is mainly used to detect and record residual distortion in the outfeed of a system, e.g. in the stenter frame. The thread density can be determined at the same time. However, it can also be connected to external straightening machines and then serves as a control unit.

**+ Orthopac RXVMC-20 – Precision straightening machine**

Feed Forward and Closed Loop Control at the same time!  
Orthopac RXVMC is the only straightening system to offer this unique combination. This concept was developed for the processing of textiles with highly variable distortions (= high distortion dynamics). Independently controlled straightening modules ensure maximum control over the straightening process.



**+ Orthopac RVMC-20 plus – Straightener with dual scanning**

Feed Forward and Closed Loop Control at the same time!  
A revolutionary guide concept has been developed to meet the stringent residual distortion requirements that most textile manufacturers have to comply with today.  
The Orthopac RVMC-20 plus builds on the success of the proven Orthopac range and is specifically designed for processing textiles with highly variable distortion (high distortion dynamics). Two scans, one before and one after the straightening rollers, combined with an AI-driven controller concept, ensure the greatest possible control of the straightening process and minimum residual distortion.



**+ Orthopac RVMC-15 – Classic straightening machine**

The Orthopac RVMC is the universally applicable straightening system from Mahlo for correcting web distortion for almost all applications. Available with hydraulic or electric straightening roller adjustment. The modular design allows upgrading to a customised version if requirements change.



**+ Orthopac MFRC-15 – Fine-tune straightening machine**

This model is a compact fine-straightening system for the correction of residual distortion. The special strength of the Orthopac MFRC is its very high straightening accuracy with relatively low web distortion. The compact straightening unit is equipped with a skew and a bow roller as standard. This arrangement allows very fine control of the straightening effect with small device dimensions. Available with hydraulic or electric straightening roller adjustment.





**+ Orthopac GRVMC-15 – Heavy-duty straightener**

Heavy-duty construction. High demands due to large product widths (e.g., carpet) or dimensionally stable textiles with defined distortion settings (e.g., denim) require a more solid design. Frame, bearings and rollers are designed for high loads. Available for a working width up to 5500 mm.



**+ Orthopac GMFRC-15 – Heavy-duty fine-tune straightener**

Heavy-duty construction. High demands due to large product widths (e.g., carpet) or dimensionally stable textiles with defined distortion settings (e.g., denim) require a more solid design. Frame, bearings and rollers are designed for high loads. Available for a working width up to 5500 mm.



**+ Orthopac CRVMC-15 – Special straightener for carpet, technical textiles and glass fibre**

The Orthopac CRVMC is designed for particularly high mechanical stress. Thanks to its reinforced components, it is particularly suitable for processing very heavy and wide carpets. The arc of contact of the straightening rollers depends on the desired straightening effect. Fabric that has no skew or bow distortion does not wrap around the straightening rollers unnecessarily. When the straightening rollers engage with the product, the uniform contact of the straightening rollers with the product is ensured over the entire width thanks to the innovative roller positioning drive.

**Pin wheel straightening systems**



**+ Orthomax RFMB-15 – Fusion of pin wheel and roller straightening system**

Reliable, fast distortion correction even with asymmetrical fabric web distortion. The fusion of pin wheel and roller straightening system perfectly combines the advantages of both technologies and ensures excellent straightening results. An infinitely variable unclipping roller minimises residual bow and edge distortions. The intelligent drive station with special tension control for smallest product distortion activates or deactivates automatically (e.g. in case of blockages). A bypass function is available at the push of a button for products that cannot be straightened with the pin wheel.

**+ Orthofact RMB-15 – Classic pin wheel straightening machine**

Asymmetrical distortions (wavy, S-shaped, etc.) in textiles have always represented a major challenge. A special straightening approach is needed particularly when the straightening process does not take place in combination with a stenter (e.g. before decatizers, digital printing systems, etc.). To restore the warp and weft threads to their original state, the Orthofact RMB generates a defined lateral tension using freewheeling, inclined pin wheels. This cross-tension stretches the warp threads. The resultant force controls the freewheeling pin wheels, since the weft threads will always seek the shortest path from selvage to selvage. Distortion, no matter whether wavy or S-shaped, will be corrected.



**Straightening combinations**

**+ Combination systems – Linking of straightening systems**

A single weft straightener in front of the stenter frame can be sufficient in many cases to detect and correct weft distortion. However, there are situations in which a combination of weft straighteners or additional distortion detectors are required both in front of and behind the stenter frame.

The most important reasons are:

- ✓ Process-related distortions in the stenter frame
- ✓ Different distortions due to thermal and mechanical impact
- ✓ Correction and quality assurance after thermal fixing

Almost all straighteners and distortion detections can be combined. The right combination is selected individually according to the application. A combination of weft straighteners or additional distortion detectors in front of and behind the stenter frame is particularly useful for demanding textiles, high-quality fabrics and delicate materials. It enables more precise distortion correction, optimizes production processes and results in higher quality end products.

**Pattern detection**

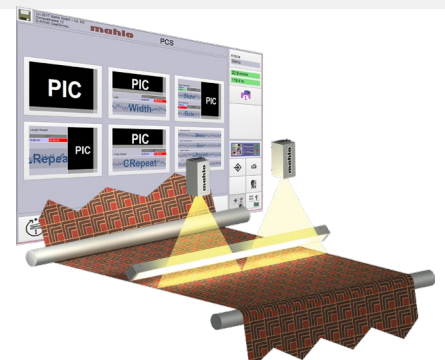
**+ Patcontrol PCS-20 – Pattern detection, Distortion correction, Repeat control**

The leading pattern detection system with camera technology. The repetitions of printed, woven or tufted patterns are evaluated according to specific algorithms and used to measure, correct and evaluate distortions and repeats. Depending on the area of application of the Patcontrol PCS, Mahlo configures the system individually. The system uses one or two cameras – depending on the width of the product to be processed – to automatically detect the position of the pattern and continuously determine the pattern repeat, measures the product width, and – together with a straightener – aligns the product distortion based on the print pattern.

**Variants:**

**Patcontrol PCS/PDS:** (Pattern Distortion System) Pattern distortion detection and control

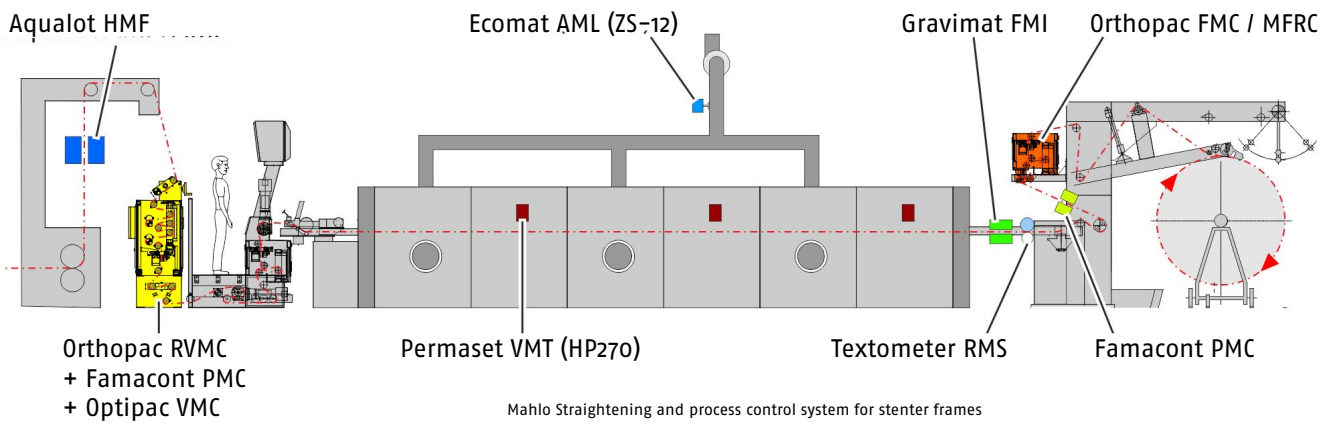
**Patcontrol PCS/PRS:** (Pattern Repeat System) Pattern repeat detection and control





# PROCESS CONTROL SYSTEM AND PROCESS MONITORING

Textile manufacturers and suppliers are struggling with rising production and energy costs, shrinking margins, shorter production times, and higher demands for quality and flexibility. Cost-efficient and quality-oriented textile finishing is therefore becoming increasingly important. Sustainable production and the trend towards higher quality and more technically sophisticated textiles also play an important role. Suitable measuring and control technology from Mahlo can significantly increase the efficiency of production systems. At the same time, this means increased productivity with usually improved, repeatable quality, optimised raw material and labour costs, and significantly improved plant utilisation.



Mahlo Straightening and process control system for stenter frames



## Modular process control systems

### + Optipac VMC-15 – Modular process control system

The Optipac VMC is a modular process control system for textile refinement. It optimises drying or fixing processes as well as the processes all about the stenter. The system measures, logs and regulates critical process parameters such as the following over the entire working width: dwell time, thread density, residual moisture, basis weight, exhaust air moisture, etc. This increases quality and saves resources and energy. The modular design of the system allows its flexible adaptation to all applications. Both standard requirements and highly customised demands are thus met. The system can also be integrated into an Orthopac straightening system. It thereby combines the functionality of a straightener with that of a process control system in one compact device.



**+ Permaset VMT – Dwell time / Fixing time**

Infrared pyrometer. To determine the dwell time or fixing time for a desired product temperature, the surface temperature of the product is measured without contact at several locations in the dryer using high-temperature resistant infrared pyrometers. Up to 64 sensors are possible. The dryer speed is optimised accordingly.



**+ Famacont PMC – Thread density / Course density**

Optoelectronic sensor/camera sensor. The Famacont PMC determines the thread density by means of a non-contacting, optoelectronic or imaging process. With the optoelectronic process individual threads or courses pass the sensor and are projected onto the photocell using a precision optical lens. The resulting frequency is proportional to the thread count. A high-resolution camera is used for the imaging process. The image is analysed with suitable software. The thread density can be determined here at the same time in weft and warp direction with maximum precision.



**+ Textometer RMS – Residual moisture**

Measurement of electrical resistance. Moisture retention (residual moisture) is an important criterion in terms of later finishing, finished product scrap and energy optimizing. Electrodes determine the residual moisture at the outlet of the dryer utilising electrical resistance measurement. The dryer speed is automatically adjusted until the desired degree of drying has been achieved. Many different electrodes are available for a wide variety of applications.



**+ Ecomat AML – Exhaust air moisture**

Measurement of water vapour. Much unused energy is wasted through the exhaust air during drying processes without appropriate control. The Ecomat AML adapts the heating energy to the actual demand by monitoring charging of the exhaust air with water vapour and controlling this factor through the fan speed or the exhaust air vent control.



**+ Wilot WMR – Product width**

Reflection of infrared light. Automatic width measurement on a running product web. IR LEDs used in reflective mode continuously and precisely determine the product width. The sensor module only needs to be attached on one side of the product. The compact design allows it to be installed even in the tightest mounting spaces. Retrofitting is possible virtually anywhere.



## Process control system for drying processes

### + Ecopac EMC-15 – Process control system for drying processes

The Ecopac EMC uses the state of the art microprocessor technology to ensure product quality and optimise the energy balance for drying processes. The modular system for monitoring and controlling residual moisture, product temperature, dwell time and exhaust air humidity can be flexibly adapted to current production. Up to three of the same or different modules may be used as needed.

### + Permaset VMT – Dwell time / Fixing time

Infrared pyrometer. To determine the dwell time or fixing time for a desired product temperature, the surface temperature of the product is measured without contact at several locations in the dryer using high-temperature resistant infrared pyrometers. Up to 64 sensors are possible. The dryer speed is optimised accordingly.



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Measurement of water vapour. Much unused energy is wasted through the exhaust air during drying processes without appropriate control. The Ecomat AML adapts the heating energy to the actual demand by monitoring charging of the exhaust air with water vapour and controlling this factor through the fan speed or the exhaust air vent control.



## Stand-Alone systems

### + Famacont PMC-15 – Thread density / Course density

Optoelectronic sensor/camera sensor. The Famacont PMC determines the thread density by means of a non-contacting, optoelectronic or imaging process.

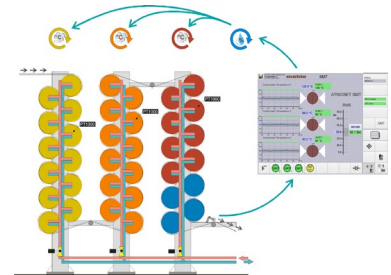
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**Stand-Alone systems**

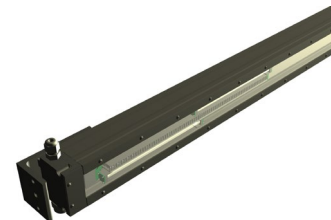
**+ Atmoset SMT-15 – Drum dryer control**

The Atmoset SMT regulates the residual moisture of the fabric with steam-heated cylinder dryers. The deviation of the condensate temperature from a preset target value is used to directly calculate the amount of energy required for drying. The heating output is optimised according to the product. The Atmoset SMT enables a stable and effective drying process. The optimal degree of drying is always reached, regardless of the weight of the product or the web speed.



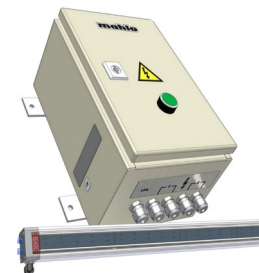
**+ Wilot WMR-12 – Product width**

Reflection of infrared light. Automatic width measurement on a running product web. IR LEDs used in reflective mode continuously and precisely determine the product width. The sensor module only needs to be attached on one side of the product. The compact design allows it to be installed even in the tightest mounting spaces. Retrofitting is possible virtually anywhere.



**+ Antistat AMW-12 – Ioniser – Effective against static charges**

Ionisation of the air. The Antistat AMW ioniser for trouble-free processing of synthetic materials and of textiles with high charge separation. By ionising the ambient air, the electrostatic charge is diverted from the product sheet. Antistat AMW can be used at high or low speeds.



**+ Ecosense ZS-12 – Exhaust air moisture**

Much unused energy is wasted through the exhaust air during drying processes without appropriate control. Ecosense ZS-12 monitors the loading of the exhaust air with water vapour. Connected to an existing system, it can be used to control the fan speed or exhaust air flaps of a stenter frame. In this way, the heating energy is adapted to the actual demand.



**+ Thermosense HP270 – Product temperature profile**

Thermosense HP270 is used for non-contacting temperature measurement in driers and stenters and records the temperature of running product webs. The sensor is temperature-resistant up to 270 °C. It can therefore be mounted inside driers.





# QUALITY CONTROL SYSTEMS

Increase efficiency. Ensure quality. Save resources. Rising raw material and energy costs, increasing quality requirements and the pressure to optimise processes present manufacturers with major challenges. Mahlo's measurement and control technology offers an intelligent solution: it recognises deviations in real time, automatically adjusts and thus ensures consistently high product quality with reduced waste and lower energy consumption. Thanks to their modular design, the systems can be flexibly integrated into existing systems and grow with your requirements. Radiation-free technologies are becoming increasingly popular – they offer additional benefits in terms of safety and sustainability.

## Modular quality control and process optimisation



### + Qualiscan QMS-12 – Traversing quality control system

The Qualiscan QMS is a modular system for measuring, logging and controlling critical process parameters across the entire working width – including basis weight, coating weight, moisture, layer thickness and more. Up to six scanners can be operated simultaneously, whereby each scanner can be equipped with up to five sensors, depending on the model.

#### Options:

- **Qualiscan QMS Base:** System for solely stationary measuring points (Profix) on mounting frames.
- **Diecontrol APC Pro:** Module for cross profile control for customary extrusion dies with thermal diebolts for film extrusion (flat sheets – cast film) and extrusion coating.

Sensors: see p. 16

## Scanners



### + Webpro L-II – For large widths

The Webpro L traversing frames represent the pinnacle of the Mahlo scanning frame family. They are available in traverse widths of up to 6.6 meters, and can run up to five Mahlo sensors continuously, precisely and rapidly across the web. A stainless steel version is also available for the paper industry or for hazardous atmospheres.



### + Webpro M – For standard widths

Webpro M traversing scanners are used for a wide variety of applications in different industries, and are legendary for their robust and reliable construction. Scanners of this type can handle products of up to 4 meters in width with up to a total of 3 Mahlo sensors.



### + Webpro S-II – For confined spaces

The Webpro S traversing frames have been designed specifically to provide an exceedingly compact but rugged and reliable traversing platform for situations where space limitations at the installation site would rule out the use of a conventional O-frame.



### + Webpro XS-II – For narrow widths

The traversing frames of the type Webpro XS are used for many applications in various industries and are distinguished especially by their rugged, reliable and compact design. Traversing frames of this type can be used for product widths from 0.2 to max. 2.2 metres and can accommodate one Mahlo sensor.



### + WebPro C – For challenging conditions

The traversing frames of the type Webpro C are used for applications where much dirt is generated or the traversing frame must be moved completely out of the product web. This type is available for horizontal or vertical product guidance and distinguishes itself by the robust, reliable and dirt-resistant design. Can be used vertically up to 1.2 metres web width and one sensor, horizontally up to 2 metres and 2 sensors.



### + Uniscan M-II / XS-II – For single sided measuring tasks

The Uniscan traversing scanners are the single-sided counterpart to the double-sided O-frames of the Webpro series. They are specially designed to accommodate the single-sided sensors of the Mahlo Qualiscan QMS family.



## Sensors



Beta transmission principle of operation

### + Gravimat DFI – Basis weight / Thickness

Transmission of beta rays. The basis weight measuring and control system measures the basis weight continuously, without contact, non-destructive and on the moving product web. The measurement is based on the attenuation of radioactive rays through the substrate located in the measuring gap. This attenuation in intensity is an indication of the basis weight of the product.

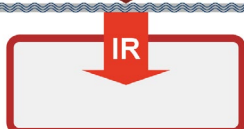
The basis weight control restricts the variation range of the grammage significantly and thereby ensures a more consistent end product.



X-Ray transmission principle of operation

### + Gravimat FMX-T – Basis weight / Thickness

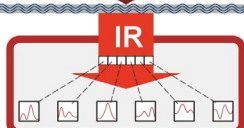
Transmission of X-rays < 5 kV. The Gravimat FMX-T permits the non-contacting and traversing measurement of basis weight / thickness of the running product webs over the entire product width. The sensor measures thin film, nonwovens and other fabric with high resolution, measuring accuracy and absence of flaws.



IR transmission principle of operation

### + Infrascopie NIR – Basis weight / Moisture

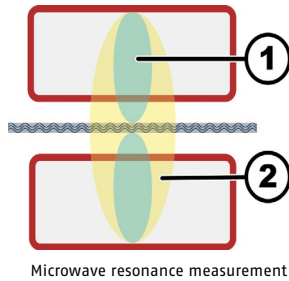
Transmission / Reflection of infrared light. The Infrascopie NIR monitors the absorption of infrared energy of all components on or in the web in the near infrared range. Measuring over the entire spectrum range and applying multivariate data analysis tools produces highly accurate calibration results from information in redundant spectra. The Infrascopie NIR is available in transmission (NIR-T) and reflection (NIR-R) mode.



IR transmission principle of operation with simultaneous filter

### + Infracot IMF – Moisture / Basis weight / Thickness

Transmission / Reflection of near infrared light. Infracot IMF uses optical evaluation of the light energy in the near-infrared range to continuously measure and control material moisture, coating weights or organic components in nonwovens on the running web. 6 channels are evaluated simultaneously via an optical filter. Available for different requirements in the transmission (IMF-T) and reflection (IMF-R) modes.

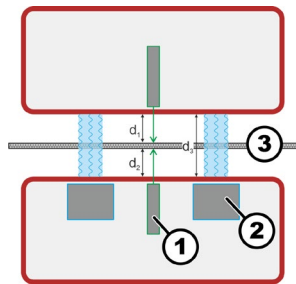


Microwave resonance measurement

**+ Aqualot HMF-T – Moisture / Basis weight**

Microwave resonance measurement. The Aqualot HMF-T uses microwave technology to measure moisture without contact. It does so regardless of the composition of the water, pH value changes in the material, material fillers or colour pigments.

- ① Reference resonance
- ② Measurement resonance

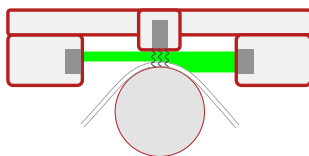


Laser triangulation principle of operation, both sides

**+ Calipro DML – Thickness**

Laser triangulation. The Calipro DML optical system uses laser triangulation online to measure the thickness or coating thickness of various materials with the highest accuracy. Available for different applications in the variants both sides (DML-D), one side (DML-S) and as line sensor (DML-S-L).

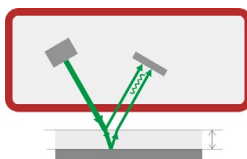
- ① Laser
- ② Eddy current sensor
- ③ Product



Light-band shadowing principle of operation

**+ Calipro DMS – Thickness**

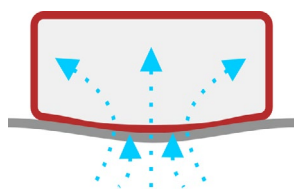
LED Micrometer. Calipro DMS measures the material thickness of the product using a light curtain. It is insensitive to colour, transparency and opacity as well as largely independent of the material surface.



White light interference

**+ Optoscope WLI – Thickness / Layer thickness**

White light interference. White light from the upper and lower boundary surfaces of thin films is reflected differently. Interference measurement allows for the precise measuring of transparent coatings on films and mono-films. Both, the layer thickness and film thickness can be determined with a special measuring process.



Air flow measurement

**+ Airpro APM – Air permeability / Permeability**

Measurement of pressure drops. Airpro APM allows for a highly dynamic and traversing measurement of air permeability and pressure drops on the running product web across the entire product width. Applications range from all types of surface structures, felts, dense paper and airbag fabric to extremely open nonwovens and paper filters.



# MOBILE RESIDUAL MOISTURE MEASURING SYSTEMS



## Hand-held measuring devices

### + Textometer DMB-15 – Moisture measuring device

The Textometer DMB is a mobile handy device for measuring moisture on textile webs and bobbins on a wide variety of versions. It determines the moisture content of raw materials, semi-finished products and finished products precisely and quickly. With special accessories, the Textometer DMB can also be used as a conductivity measuring device for electrostatic flocking.



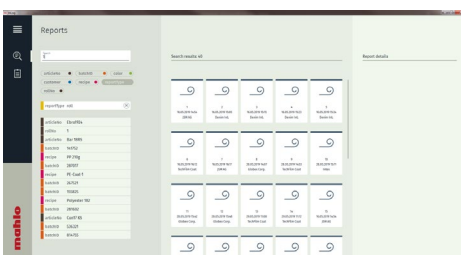
# DATA MANAGEMENT

## Software



### + mLog enhanced – Data analysis of the new generation

The mLog enhanced software is an application for data logging and interactive analysis of historical data for Mahlo equipment as a desktop application for the office PC. The interactive user interface with an outstanding look and feel makes data analysis and data transfer child's play. Scrolling, zooming, fine comparison, data picker and an advanced search function are available to enable users to analyse their process thoroughly and conveniently.

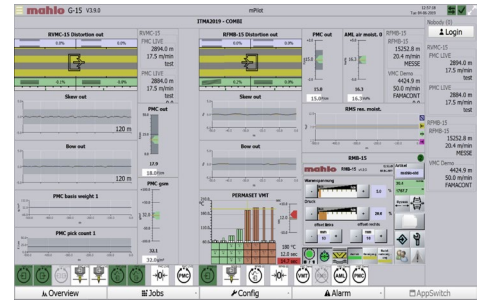


### + mLog – Logging

The mLog software is a data logging application for Mahlo equipment. The desktop application runs on an office PC and provides comfortable creation and archiving of PDF protocols of running measurements.

## + mPilot – Control room software

mPilot is a control room application for Mahlo equipment. The software allows the user to configure up to ten Mahlo devices with one control centre. Individually selected data of several devices are clearly arranged. The innovative control tool supports production and shift managers in handling their daily business as efficiently as possible.

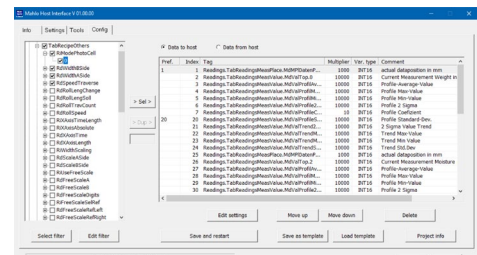


## + Host Computer Interface – Communication protocols

Communication interface between a host computer and the Mahlo devices in the production environment. It is used to transfer data between higher-level IT systems (ERP, MES) and the control systems of individual machines or systems (PLC, SCADA).

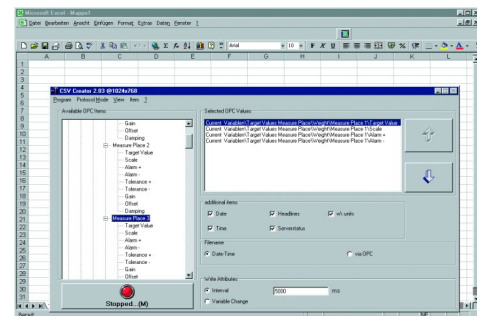
The following protocols are supported:

- EtherCat
- EtherNet / IP
- Profibus
- Profinet
- Modbus
- OPC / OPC-UA



## + CSV-Creator – CSV-Export

Windows application that generates files using the log data created. The files can be opened and analysed using spreadsheet programs. The user can select exactly which of the available data is to be logged. This application requires an OPC server.



Monitoring and control systems, automation

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