QUALISCAN QMS–12

Traversing Quality Control System

Quality made
in Germany

TEXTILE   NONWOVEN   COATING & CONVERTING   PAPER   EXTRUSION
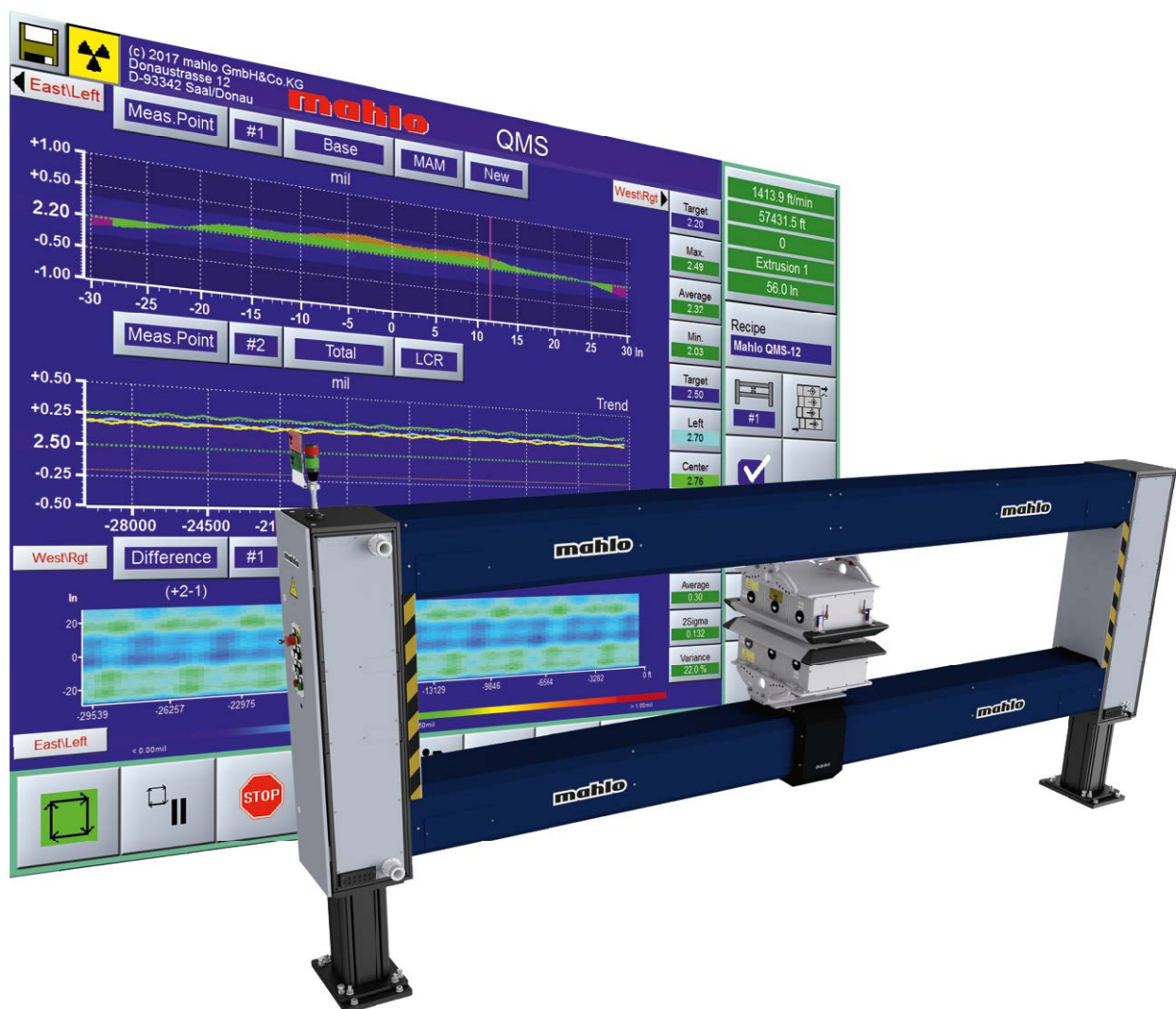
QUALISCAN QMS-12

A modular system for measuring, logging and controlling critical process parameters over the entire process including basis weight, coating weight, moisture, layer thickness etc.

Customer benefits

✓ Savings in raw materials and improvedeconomy of production process
✓ Uninterrupted monitoring and logging of actual product quality
✓ Improvement in product quality, especially in conjunction with autocontrol
✓ Very short amortization times for high profit potential
✓ Less rejects and material loss when changing products

Product highlights

✓ Modern construction with intelligent sensors and traversing frames
✓ Use of standard industry PCs with Windows Embedded operating system
✓ Components communicate through digital interfaces
✓ Easily expandable with additional measuring locations and sensors
✓ Open architecture: Standard components guarantee quick availability of spare parts

Control of basis weight and moisture on a Spunlace-Nonwoven system (courtesy of Selcuk Iplik Sanayi ve Ticaret A.S.)

Area of application

The Qualiscan QMS can be used in virtually every area of industry in which products are produced or finished (e.g. coated) as web. The versatile sensors and measuring devices of the Qualiscan QMS can sense, log and continuously control (in-process) such parameters as weight per area, coating weight, moisture or thickness of web-type products.

The sensors of the Qualiscan QMS product family scan and control the parameters
- Basis weight
- Moisture
- Thickness
- Layer thickness
- Air permeability
- Ash content
- Product temperature
- Measuring gap temperature control
- Autodie Profile Control

The areas of application range from coating paper, film, nonwoven, textiles, rubber and metal foils to paper and cardboard manufacture, film extrusion and extrusion coating as well as all types of building products. New areas of application open up continuously in cooperation with customers.

Principle of operation

Qualiscan QMS is a modular designed measuring and control system for process parameters of web-type products. Different measuring sensors (also called modules) measure the desired parameters either stationary or traversing across the entire working width. For this purpose, the sensors are installed in measuring frames (also called traversing frames or scanners). Depending on the measuring frame version, up to five sensors can be installed simultaneously.

The measured values are generated directly in the real-time processors of the sensors and measuring frames. The completed measuring data is transmitted to the central PC in the base via Ethernet. The latter handles the control of the measuring frames, visualization via touchscreen, logging of the data, recipes and (if desired) communication with host systems.

Basis weight control with the production of screen reinforcements from glass fibres and nonwovens
(courtesy of Kirson Industrial Reinforcements GmbH)

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OVERVIEW

QUALITY CONTROL FOR WEB PROCESSES

Mahlo offers a variety of measuring frames. The Qualiscan QMS is therefore optimally equipped for all tasks and requirements.

Basic components

- One Mahlo control and display station as a minimum
- Central control cabinet with I/O for linking the machine signals
- At least one Mahlo measuring frame, or permanently installed measuring devices
- Line speed tachometer for determining the web speed

Key operating functions

- Access to all functions via a rugged, industrial touchscreen
- Simultaneous representation of up to nine lateral or longitudinal profiles of all measured values
- Powerful recipe management for type-specific measuring and control tasks
- System access through up to five control and display stations linked per network
- Generous sizing of all symbols for ease of operation
- Incorporation and display of important machine functions

Optional add-ons

- PRINTSERVER roll reporting system, output to printer or network drive possible
- Freely configurable control outputs (PID), saving parameters in recipes
- OPC interface (server) for linking to host HMI systems

- Automatic generation of TEXT or EXCEL® files with all measured values
- Linking to the customer TCP/IP network
- A/C units for high temperatures available for all control cabinets and control and display stations
- EX protection design of the measuring frames and sensors, in accordance with directive 2014/34/EU (ATEX) and NEC 500 Class 1, Division 1
- Dust and corrosion protection for measuring frames, sensors and control cabinets
- Water cooling of sensors for very high ambient temperatures
- OEM variant of all components for integration into existing systems

System architecture
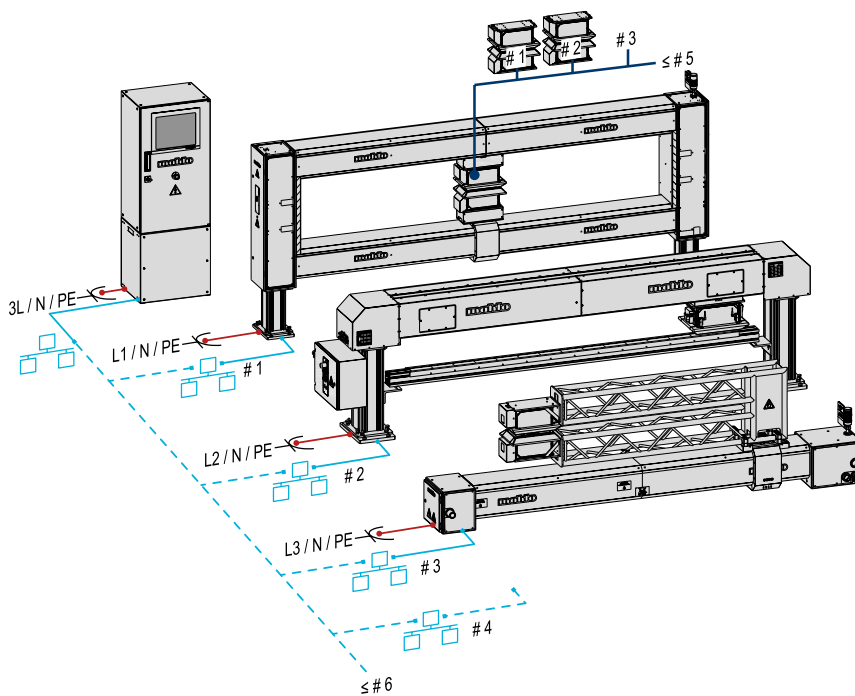
The network structure allows for the easy expansion of the system. The individual components are connected via standard Ethernet net-work lines. Both the basis and measuring frames can be connected to the regular line supply. A wide range of special voltage is available as option.
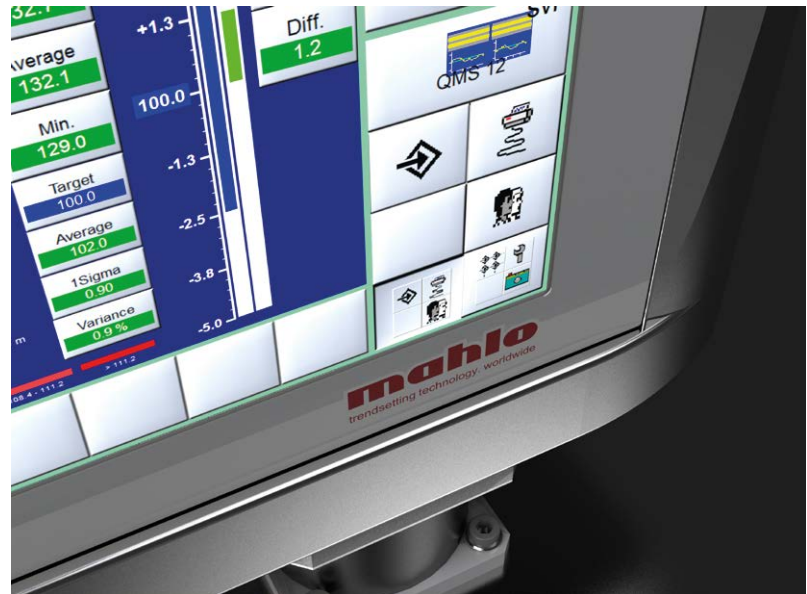
VISUALIZATION

EVERYTHING AT A GLANCE

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All entries are made directly on the touchscreen using large, ergonomic buttons. Operation is simple and in-tuitive. All key information is visible at a glance.

Visualization and operation per touchscreen

The user interface consists of five areas:

1. Title line:
General information (including alarm bar)

2. Display area:
Selectable screen pages (display forms)
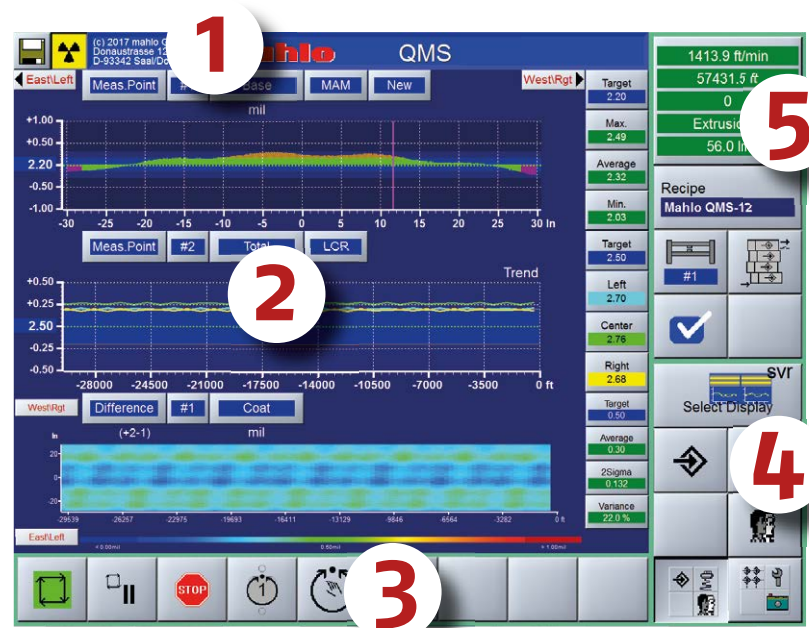
3. Horizontal block:
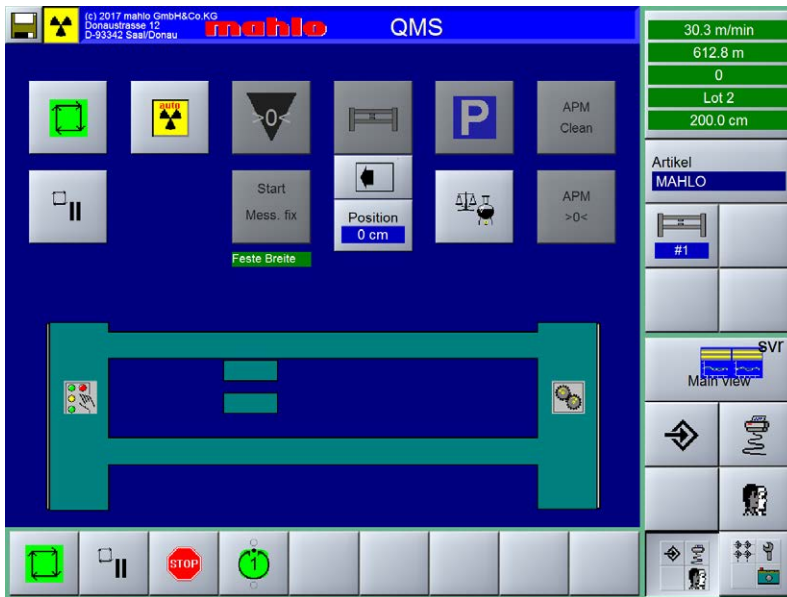Buttons for basic functions and submenus

4. Selection block:
Navigation within the operating software

5. Vertical block:
Operating buttons for the menu selection

Main page with display of basis weight profile, trend and 2D trend

Measuring frame overview menu

Selection options for logging

Customer benefits

✓ All key data at a glance
✓ Menu guide in all common languages
✓ Ergonomic user prompting
✓ Simple operation

Product highlights

✓ Simultaneous management of various sensors
✓ Freely scalable trend diagrams
✓ Password protection: Unauthorised users are prevented from accessing the operating software
✓ Recipe management

MEASURING FRAME TYPES

UNIVERSAL APPLICATION

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Principle of operation

The sensors, mounted on high-performance drive belts, traverse back and forth in the measuring frames on precision linear guides perpendicular to the running direction of the material web. A geared motor provides the movement with precision control by frequency converters. The precise reversing point, in most cases the edge of the product, can be defined by software or determined independently using edge sensors.

Inside 0-frames, a synchronous shaft ensures the exact simultaneous movement of sender and receiver at the top and bottom in the measuring frame. A processor prepares the measured data in the measuring frame and sends it via standard Ethernet network line to the central control and display station.

Variation Webpro MH:
with large measuring gap up to 600 mm for thick products such as insulating materials

Webpro L-II

The traversing frame Webpro L-II is the top model of the range of measuring frames from Mahlo. It is available for traversing widths of up to 6.6 meters, and moves up to five Mahlo sensors in uninterrupted continuous use at high speed and with great precision. Possible areas of application include lines
for the production of film, plastic sheet, nonwovens and textiles up to 6.6 meters wide and machine speeds up to 2000 m/min.
Other areas of application include:
- Production of fibreglass mats
- Various coating applications under challenging ambient conditions
- Paper impregnation for the production of furniture film and laminates
- PVC calendering for floors
- Coating of carpets
- Production of synthetic leather and plastic film
- Extrusion coating

Customer benefits

✓ Easy to install and connect
✓ Minimum upkeep and maintenance costs with a long service life
✓ Guarantees high measuring accuracies of the installed sensors with the greatest scanning accuracy
✓ Accident-safe thanks to continuous monitoring of the motor current and integrated safety shut off

Webpro M

The traversing frames of the Webpro M type are used for diverse applications in various industries. They are especially marked by their rugged and reliable design. Traversing frames of this type can be used for product widths up to max. 4 meters and can accommodate up to 3 Mahlo sensors. The compact design and use of precision linear guides permit installation even in restricted spaces and with widely different web angles.

Possible areas of application range from nonwoven production lines via coating applications for textiles, paper, film or floor covering up to systems for the manufacturing of synthetic leather and extrusion coating.

Product highlights

✓ Intelligent measuring frame with integrated real-time computer
✓ Extremely rugged, mechanical configuration for trouble-free operation and long service life
✓ Low-maintenance design
✓ Many variants for a wide range of applications
✓ Built with commonly available standard components for optimum spare part availability

MEASURING FRAME TYPES

MEASURING FRAME TYPES

UNIVERSAL APPLICATION

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Webpro S–II

The traversing frames of the WebPro S–II type were designed with the objective of providing an extremely compact but still rugged and reliable traversing platform for applications in which space conditions do not permit the use of a conventional 0-frame. The measuring frame manages a nominal width of max. 4 meters and can carry up to 2 sensors. The main area of application is fast-running coating machines, where their compact design usually leaves little space for the integration of conventional measuring frames. This includes systems for producing adhesive tapes, label rolls, self-adhesive films and light-tight coated textile and nonwoven substrates. The WebPro S–II measuring frame is also commonly found in the foil industry.

Customer benefits

✓ Easy to install and connect
✓ Minimum upkeep and maintenance costs with high a long service life
✓ Guarantees high measuring accuracies of the installed sensors with the highest guide accuracy
✓ Accident–safe thanks to continuous monitoring of the motor current and integrated safety shut off

Webpro XS

The traversing frames of the type WebPro XS are used for applications with smaller nominal web widths. These offer maximum functionality at minimum space requirements. Traversing frames of this type can be used for nominal widths from 0.2 to max. 2 meters and can accommodate one Mahlo sensor. The compact design and use of precision linear slides permit installation even in restricted spaces. Applications range from lab coating to coating for textiles, paper, film on to systems for the manufacturing of synthetic leather and extrusion coating.

Product highlights

✓ Intelligent measuring frame with integrated real–time computer
✓ Extremely rugged, mechanical configuration for trouble–free operation and long service life
✓ Low–maintenance design
✓ Many variants for a wide range of applications
✓ Built with commonly available standard components for optimum spare part availability

MEASURING FRAME TYPES

MEASURING FRAME TYPES

UNIVERSAL APPLICATION

TEXTILE **NONWOVEN** **COATING & CONVERTING** **PAPER** **EXTRUSION**

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Uniscan M / Uniscan S

The traversing frames of the types Uniscan M or Uniscan S are the single-sided counterpart to the dual-sided O-frames of the WebPro series. They have been specifically designed for measuring devices of the Mahlo range of sensors working on a single side. With the Uniscan M the maximum web width is 6 meters with 2 sensors and with the Uniscan S, 4 meters with 1 sensor. Because of the single-sided design, the traversing frame easily finds space on existing lines. The measuring sensors can hereby be positioned above, below or to the side of the measuring frame. Possible applications include foil calendering, nonwoven applications and pulp drying, extrusion coating and coating or impregnating of paper, cardboard, films/foils or textile.

Customer benefits

✓ Easy to install and connect
✓ Minimum upkeep and maintenance costs with high a long service life
✓ Guarantees high measuring accuracies of the installed sensors with the highest guide accuracy
✓ Accident-safe thanks to continuous monitoring of the motor current and integrated safety shut off

Webpro C

The traversing frames of the type WebPro C are used for applications where much dirt is generated or the measuring head 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 and dirt-resistant design. It can be vertically employed to a product width of 1.2 meters and one sensor or horizontally of 2 meters and 2 sensors.
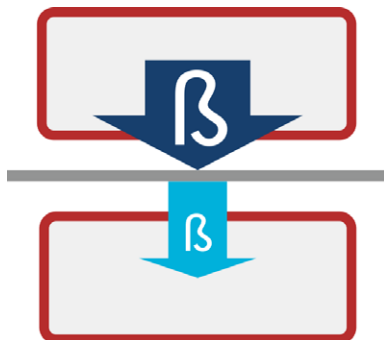
Product highlights

✓ Intelligent measuring frame with integrated real-time computer
✓ Extremely rugged, mechanical configuration for trouble-free operation and long service life
✓ Low-maintenance design
✓ Many variants for a wide range of applications
✓ Built with commonly available standard components for optimum spare part availability

MEASURING FRAME TYPES

MEASURING METHOD

COMPREHENSIVE SOLUTIONS
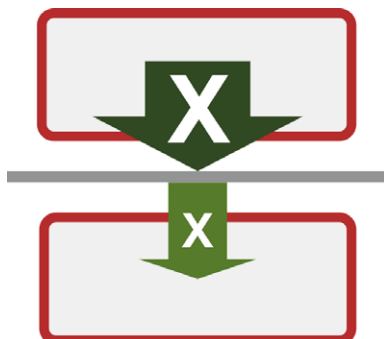
+ Beta transmission – Basis weight, Thickness, density

The intensity of beta rays is weakened according to the mass of the penetrated layer. This weakening allows determining the basis weight of nearly all materials. Different isotopes (Krypton, Strontium, Promethium) are used for different weight ranges. With coating processes, the application quantity can be determined as weight difference using several sensors.

The density of the product web can also be determined in combination with thickness sensors. If the density of the measured product is known, however, and remains constant, the material thickness can also be determined via the basis weight.

Beta transmission principle

+ X-Ray transmission – Basis weight, Thickness, density

The intensity of X-rays is weakened according to the mass of the penetrated layer. This weakening allows determining the basis weight of nearly all materials. Different high-voltage ranges are used for different weight ranges. No radiation protection precautions are required in Europe and many other countries for X-ray energy less that 5 kV.

X-Ray transmission is very suitable for materials consisting only of a single component. The advantage compared to beta emitters is the emission of the X-ray tube that can be shut off.

The density of the product web can also be determined in combination with thickness sensors. If the density of the measured product is known, however, and remains constant, the material thickness can also be determined via the basis weight.

X-ray transmission principle

+ Infrared transmission / reflection – Moisture, Basis weight

Water and other materials absorb light in the infrared range. Water and other materials can be differentiated through different spectral ranges and can be differentiated by their specific spectral absorption. The moisture content and basis weight of different materials can be determined by measuring the weakened radiation. IR measurement is especially suitable for the area of residual moisture and all materials that exhibit an absorption spectrum in the infrared range. The complete product thickness can be measured with a transmission measurement. This is necessary when the total composition of the material is of interest.

Measurement of the IR reflection is used primarily to determine the top layer or coating without measuring the underlying substrate material.
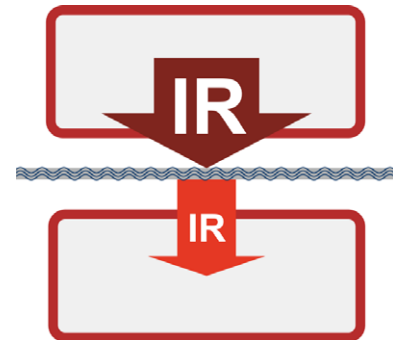

IR transmission principle
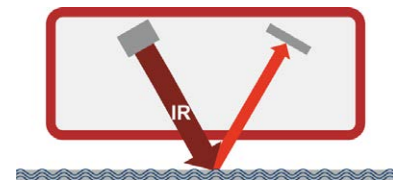
IR reflection principle

+ Microwave resonance measurement – Moisture

1 Reference resonance
2 Measuring resonance

Two standing microwaves are generated in the sensor. One is used as reference. The second is absorbed by water and therefore dampened as well, in addition, the resonance frequency changes. The moisture content in the material can be determined by comparing both waves. Measurement of the microwave resonance is suitable for residual and high moisture of all non-metallic products.
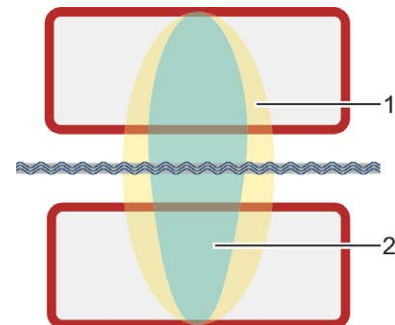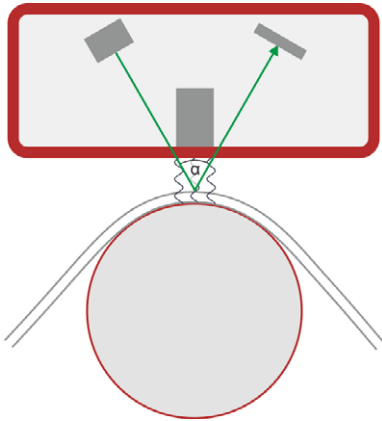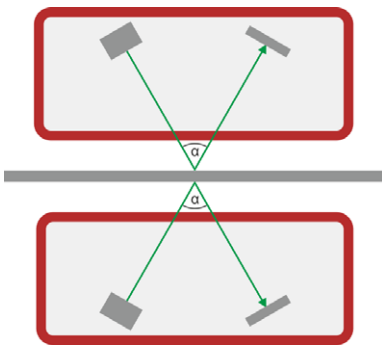

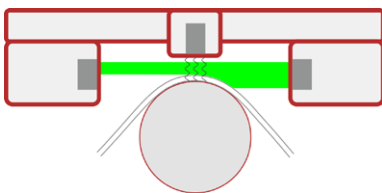Microwave resonance principle

MEASURING METHOD

MEASURING METHOD

COMPREHENSIVE SOLUTIONS

Laser triangulation principle, singlesided

Laser triangulation principle, doublesided

+ Laser triangulation – Thickness

Distance measurement through angle calculation a laser beam is projected onto a measuring object and reflected from there. Depending on the distance, the reflected laser beam hits a CCD receiver at a certain angle. The distance to the measuring object is calculated by the position of the light on the receiver as well as the distance of the laser to the receiver. The material thickness can be determined this way.
With the single–sided measuring process, measuring is done against a roller or product guide. Runout of the roller can be compensated by eddy current sensors. The singlesided variant is very suitable for variable density products and for products structured on one side.

With the double–sided measuring process the top and back side of the product is scanned and the thickness is thus determined. This method achieves good results with both flexible and rigid foam and sheet products and nonwovens.

Light–band shadowing principle

**+ Light–band shadowing measurement – Thickness**

A light–band is directed onto a measuring object running over a roller. According to the thickness of the measuring object, the light–band is partially shadowed; this is measured. An eddy current sensor measures the roller position. The material thickness of the measuring object can be determined from the difference of both measured values.
The shadowing sensor is a good choice for structured flexible products up to a thickness of approx. 10 mm.

+ White light interference – Thickness

White light is reflected differently from the upper and lower bound-
ary surfaces of thin films. The reflected light waves are overlaid; they
interfere. This interference is related to the coating thickness and can
be measured with a spectrometer.
Different measuring ranges are covered by different types of light.
The white light interference meter is especially suitable for transpar-
ent layers and film.
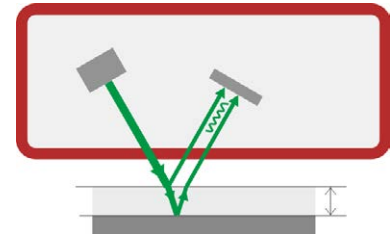
White light interference principle

+ Air flow measurement / permeability – Air permeability

Air is suctioned through the material to be measured with a specific
pressure. The generated air flow is measured, and the air permeabil-
ity of the material can thus be determined.
Permeability measurement is used for all air-permeable materials
such as textile, nonwoven, paper or composite material. The applica-
tions range from simple textiles to highly complex filter materials.
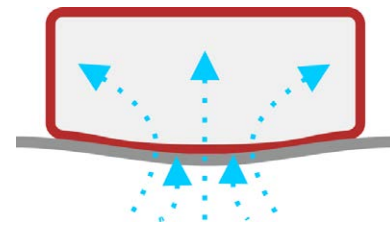
Air flow measurement principle

MEASURING METHOD

SELECTION OF SENSORS
ACCORDING TO APPLICATIONS

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Applications	Basis Weight				
	Sensors				
	Beta Transmission Gravimat FMI/DFI	X-Ray Transmission Gravimat FMXT	NIR Discrete Filter Infralot IMF	NIR Spectrometer Infrascope NIR	Gamma Transmission Ashpro FMA
Polymer Extrusion					
Single-Layer Weight/Thickness	+	+	+		
Multi-layer Weight/Thickness	+	+		+	
Sheet Weight/Thickness	+	+	+		
Foam Weight/Thickness/Density	+	+			
Extrusion Coating	+	+	+	+	
Blown Film	+	+	+	+	
Coatings					
Aqueous Coating on Paper/Polymer	+	+	+	+	
Solvent Coating on Paper	+	+	+	+	
Solvent Coating on Polymer	+	+			
Extrusion Coating on Paper	+	+	+	+	
Extrusion Coating on Polymer	+	+		+	
Silicone Coating on Paper				+	
Silicone Coating on Polymer					
Nonwovens					
Nonwoven Weight/Thickness/Density	+	+	+	+	
Moisture in Nonwovens					
Nonwoven Permeability					
Textile Coating					
Textile Weight/Thickness/Density	+	+	+	+	
Moisture in Textile					
Nonwoven Permeability					
Paper					
Paper Weight/Thickness	+	+	+	+	
Moisture in Paper					
Ash in Paper				+	
Building Products					
Asphalt Shingles	+				
Fiberglass Wool Weight/Thickness/Density		+			
Foam Board Weight/Thickness/Density	+				
Fiberglass Mat Weight/Thickness	+	+			
Fiberglass Mat Binder		+	+		+
Fiberglass Mat Permeability					
Additional Applications					
Calender Weight/Thickness	+	+			
Paper/Polymer Filtration	+	+	+	+	
Battery Electrode	+	+			
Abrasives	+				+
Annular Extrusion	+	+			
Lamination	+	+	+		

Typical application scenarios and respective suitable sensors

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Measurement Tasks						
Thickness			**Moisture**			**Permeability**
Laser Caliper Calipro DML	LED Array Shadow Caliper Calipro DMS	White Light Interferometer Optoscope WLI	NIR Discrete Filter Infralot IMF	Microwave Resonance Aqualot HMF	NIR Spectrometer Infrascope NIR	Air Permeability Airpro APM
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GRAVIMAT FMI/DFI

BETA TRANSMISSION: BASIS WEIGHT, THICKNESS, DENSITY

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Area of application

The beta sensor Gravimat DFI is universally suited for all products: Nonwovens, film, textile, carpet, synthetic leather, PVC floor covering, paper, carton, coating, lamination, extrusion, sheet production, etc.

The Mahlo Gravimat DFI (Dynamic Flutter Independent) uses a revolutionary new sensor technology with the following properties:

- Complete insensitivity to passline, edge curling and web flutter across the entire measuring gap
- Smallest beta ray source with maximum measuring capacity
- Highest scanning rates to detect smallest flaws of the product web
- Permanently error-free and cost-effective operation under toughest conditions.

Problems with product flatness exist with almost all manufacturing methods for product webs. Cast and extruded film exhibit ripples and flutter, triggered by tension changes, electrostatic charges or band vibration. Paper and coating converters must deal with faulty substrates, edge curl and unsupported product web areas. Manufacturers of nonwovens and fabric are facing fluctuations of degree of drying, density and thickness of their product webs, caused by changes in center of gravity.

All these effects cause measuring inaccuracies with conventional measuring systems. Backscatter measuring procedures with gamma rays and X-rays are very sensitive toward distance changes to the sensor, some even require contact with the web.

Customer benefits

✓ Non-destructive, continuous determination of the basis weight of product webs
✓ Material savings
✓ Increased production
✓ Quality assurance and documentation
✓ Long service life through high-grade components

Gravimat FMI/DFI sensor response curve
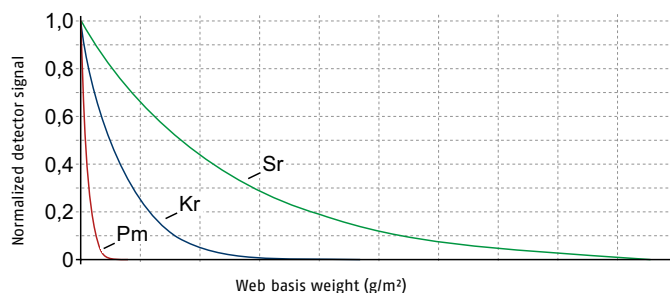
The new patented Mahlo DFI beta sensor is not affected by product flutter, passline sagging or edge curl. The sensor measures with precision and is not affected by changes in the degree of drying, density or thickness.

Material saving, quality assurance, production increase

The automatic basis weight control significantly reduces the spread of the basis weight and thereby ensure a more consistent end product. Suitable defined setpoints with minimum tolerance ranges save material and energy costs to a significant degree, in addition to safeguarding product quality. In addition, process reliability and production throughput increase.

Product highlights

✓ Intelligent sensor with microprocessor for measurement preprocessing
✓ Unaffected by product flutter, sagging or edge curling
✓ Compensation of variations in temperature and air pressure
✓ High stability and measuring accuracy with minimal calibration effort
✓ Variable measuring gap geometry and wide measuring range for different customer requirements

GRAVIMAT FMI/DFI

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**CONVERTING**
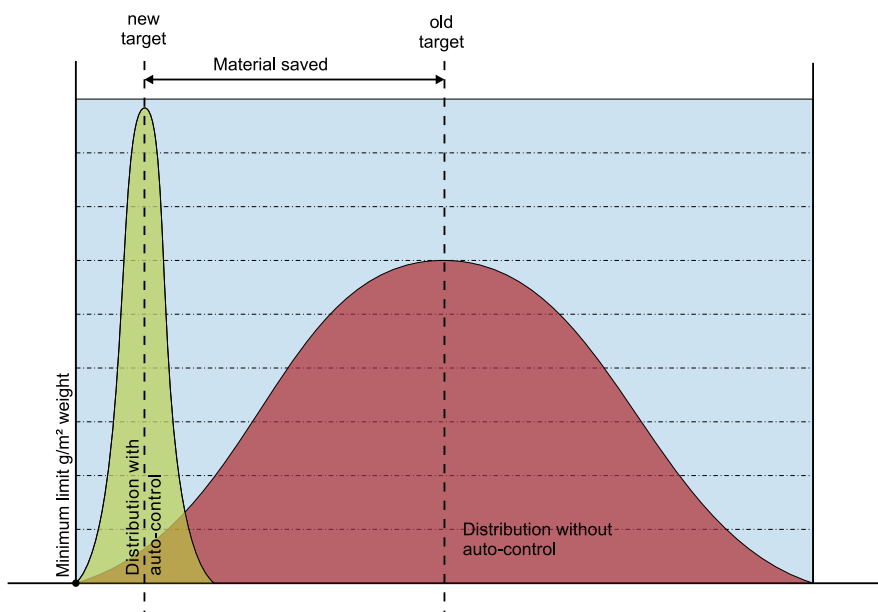
GRAVIMAT FMI/DFI

BETA TRANSMISSION: BASIS WEIGHT, THICKNESS, DENSITY

Principle of operation

The Mahlo DFI uses a multiple detector technique that captures the full measurement signal regardless of where the web is within the gap. The resulting measurement is determined only by the basis-weight, not by the position of the web in the measurement gap. This solution is quite simple and industrially rugged, but it is completely effective. So effective in fact, that Mahlo has been awarded international patents for the DFI.
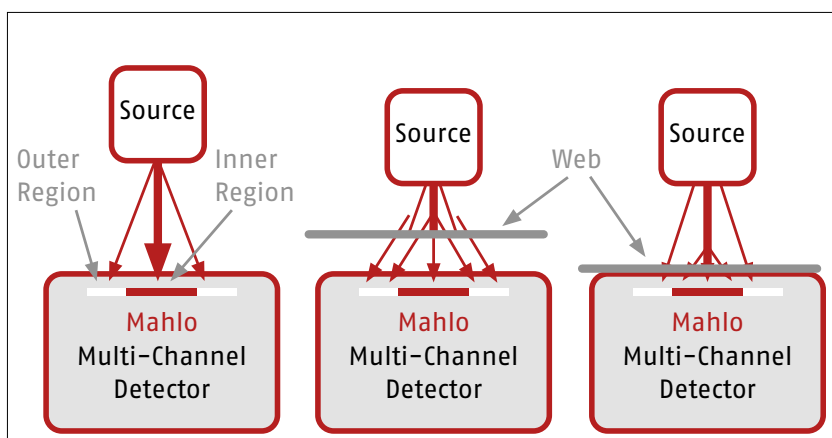
Principle of operation, unaffected by web position

No heavy absorbers or highly radioactive sources are necessary, yetthe accuracy, speed and resolution of the Mahlo DFI are the best yet offered. An additional advantage of the Mahlo DFI is that measurement gaps can now be substantially increased without worrying about additional web movement. Soft, easily damaged webs, or wet coatings no longer need to run the risk of contacting the sensor due to a narrow gap. The Kr85 DFI can use measurement gaps of 2 inches and more while measuring even light weight webs!

Device versions

Specifi-cation	Value			Unit
Isotope	Krypton-85 (Kr-85)	Strontium-90 (Sr-90)	Promethium-147 (Pm - 147)	
Measuring range	10–1400	100 – 6000	2,5 – 160	g/m²

GRAVIMAT FMX-T

X-RAY TRANSMISSION: BASIS WEIGHT, THICKNESS, DENSITY

Area of application

The Gravimat FMX-T sensor is ideal for products consisting of constant composition. This measuring technique is mainly used for film, nonwovens, textile, sheet production and extrusion. X-ray tubes with different voltage ranges provide the Gravimat FMX-T with a wide scope of applications. The sensor <5 kV is suitable for measuring ranges under 1000 g/m². Thanks to the low radiation energy, it is completely exempt from radiation safety requirements in Europe and many other countries. Sensors up to 50 kV are available for higher measuring ranges. They are suitable for thick materials such as insulating materials and allow for measuring gaps up to 600 mm.

Principle of operation

X-Ray transmission functions in similar principle as beta transmission. Radiation penetrates the product to be measured and is weakened in the process. The basis weight can be determined by the degree of weakening. If the density of the measured product is known, and remains constant, the material thickness can also be determined via the basis weight. The difference is the type of radiation – that is, X-rays.

The benefit of X-rays is the higher local resolution, especially with lower weight ranges. Contrary to beta radiation, X-rays can be disabled.

Because of the optimised sensor design, temperature variations in the measuring gap affect the measuring value only to a very minor degree and can be compensated.

Device versions

Specification	Value			Unit
Acceleration voltage	<5	8 - 15	15 - 50	keV
Measuring range	PET: 5 - 1000	PET: 14000	PET: 99000 Glas: 20000	g/m²
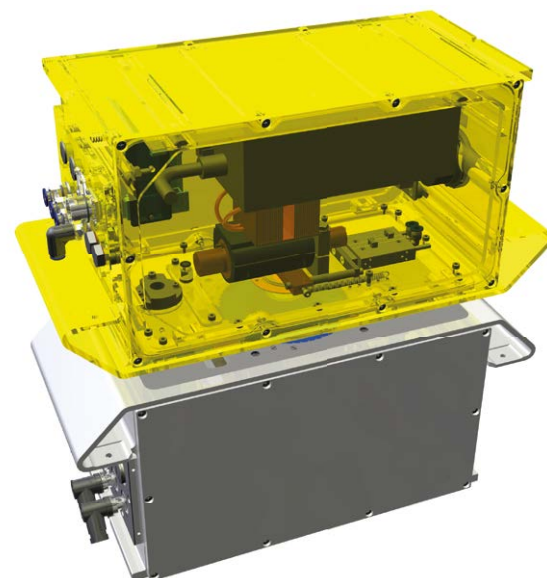
Customer benefits

✓ Non-destructive, continuous determination of basis weight / thickness
✓ High measuring accuracy
✓ Little maintenance required and low overall operating cost

Product highlights

✓ Non-radioactive
✓ Non-contacting, nondestructive
✓ Intelligent sensor with its own fast microprocessor
✓ High resolution

GRAVIMAT FMI/DFI/FMX-T
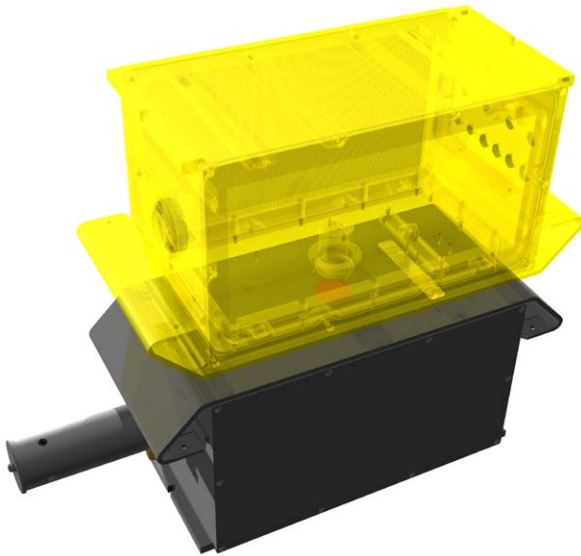
**TEXTILE NONWOVEN COATING & PAPER EXTRUSION
CONVERTING**

INFRASCOPE NIR

IR TRANSMISSION, IR REFLECTION: MOISTURE, BASIS WEIGHT

Area of application

Contactless and continuous monitoring of all quality parameters with highest accuracy is extremely important for all web producing industries. The Infrascope NIR sensor can be used in many different ways in the film and extrusion industry, the coating and finishing sector as well as the production of cellulose and paper.

Principle of operation

The Infrascope NIR is available both as transmission and reflection sensor. Both are working according to the same principle. Water and other materials absorb light in the infrared range and weaken the penetrating or reflected infrared radiation. A spectrometer measures the incoming infrared energy and converts it into measurements.

With the transmission sensor, the light source is located in the sender, the spectrometer in the receiver. With the reflection sensor, both components are in the sender housing. By analysing different absorption spectra the moisture content and basis weight of different materials in the product web can be determined at the same time.

Considering the entire spectral range offers many advantages.
– By simultaneously analysing the entire NIR Spectrum, the sensor is able to differentiate between multiple components in the material web.
– Due to very high spectral resolution, the sensor can distinguish between components with nearly similar, but not identical, IR absorption.
– Improved process understanding by direct NIR spectral measurements and use of multivariate calibration modelling.

Customer benefits

✓ Non-contacting, non-destructive and continuous measurement
✓ Simultaneous determination of several components in a single material
✓ Less waste by monitoring quality features and through process optimization
✓ High measuring accuracy

Device versions

NIR-T (Transmission): To measure the entire thickness of the product web
NIR-R (Reflection): To measure coatings

Specification	Value		Unit
Parameter	Basis weight & Humidity	Basis weight	
Type	NIR	NIR-Light	
Spectral range	900 – 2200	900 – 1700	nm
Transmission, Measuring range Basis weight	1 – 300 [1]	1 – 300 [1]	g/m²
Reflection, Measuring range Basis weight	1 – 60 [1]	1 – 60 [1]	g/m²

[1] Measuring range and measuring accuracy depending on the material (analysis of material sample necessary)

Product highlights

✓ Non-radioactive
✓ Intelligent sensor with its own fast microprocessor
✓ High spectral resolution
✓ Relatively insensitive against product flutter

DEVELOPMENT
To ensure high performance capability and maximum customer benefit of our products, we use the newest technologies and strong commitment to develop the products of tomorrow. So that the future can start for you today.

INFRASCOPE NIR

INFRALOT IMF

IR REFLECTION: MOISTURE, BASIS WEIGHT

TEXTILE NONWOVEN COATING &
CONVERTING PAPER EXTRUSION
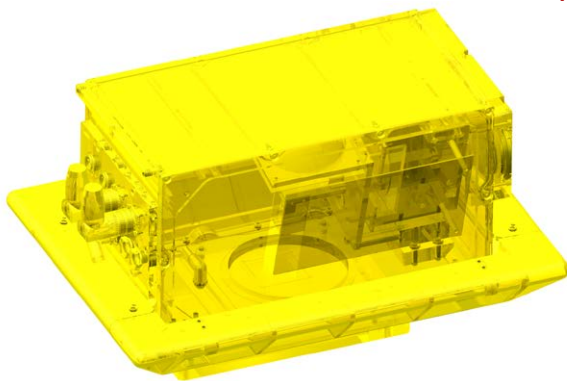
Area of application

By means of optical evaluation of the reflected light energy in the near-infrared range (NIR), important product-specific parameters such as moisture (water), coating weights or organic components in nonwovens can be measured during the manufacturing process. This is done non-destructively and without undesired effects on the product characteristics. The NIR backscatter instruments of the Infralot IMF sensor series are based on a classic 6-filter measuring principle. However, this is implemented with advanced optical components and based on the latest findings of optical measuring technology.

Customer benefits

- ✓ Non-destructive, continuous analysis of various web or sheet parameters
- ✓ Exceedingly accurate and stable measurements; calibration reduced to a minimum
- ✓ Long life expectancy through the use of high-quality components
- ✓ Wide range of applications by using various measuring wavelengths
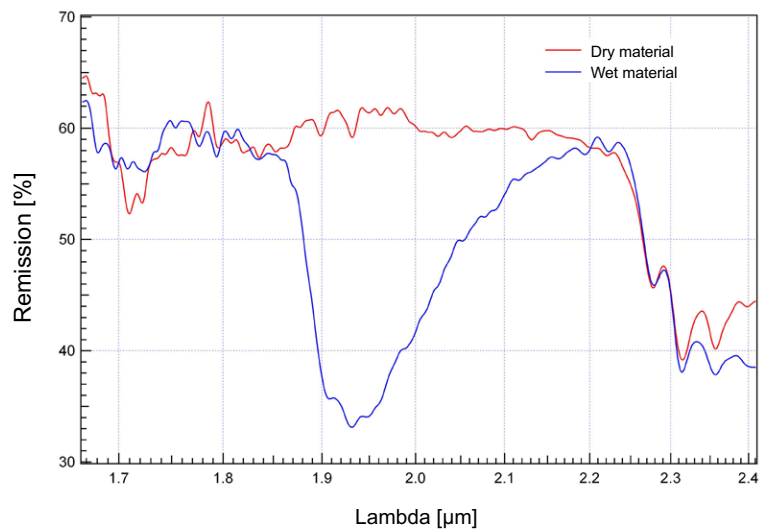
Absorption of IR energy through water

Principle of operation

Light-specific wavelengths can excite the atomic bonds of certain molecules to a multiple of their base resonance so that they oscillate, with the greatest portion of the incident light energy being absorbed by the measured item. If the light reflected from a sample is evaluated for its energy separately for each wavelength, a relationship between the degree of absorption of these resonance wavelengths and the number of absorbing molecules can be determined. The graph shows this clearly. In this example, depending on the moisture content of the sample, the absorbed light energy changes significantly for the resonance wavelength of the water molecule. To obtain a stable measurement in practice, the reflected light energy at the resonance wavelength is compared with other wavelengths in which there is no absorption (references). This principle is effective for most organic molecules.

Product highlights

✓ Non-radioactive
✓ intelligent sensor with its own fast microprocessor
✓ high spectral resolution
✓ relatively insensitive against product flutter

FIRST AID

You can count on our service team, especially when 'first-aid' is required. A call is all it takes to get our technicians on-site. Around the clock – and around the globe. So that you can concentrate on your work without worry.

Online-Support:
SERVICE@MAHLOAMERICA.NET

Support-Hotline:
864-576-6288

INFRALOT IMF

AQUALOT HMF

MICROWAVE UNIT RESONANCE: MOISTURE, BASIS WEIGHT

TEXTILE   NONWOVEN   COATING & CONVERTING   PAPER   EXTRUSION

Area of application
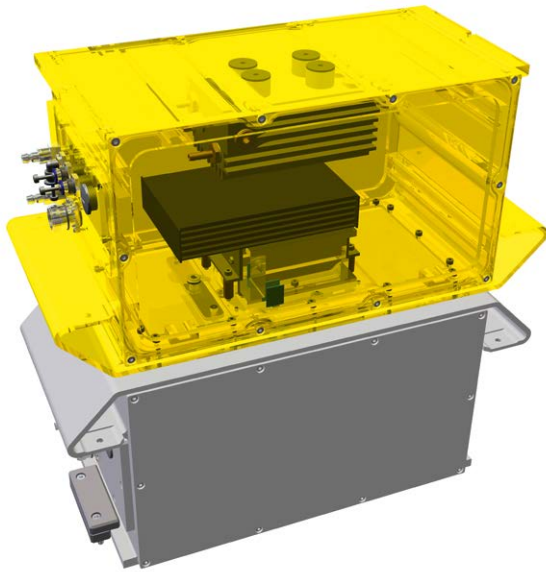
Product moisture is an extremely important parameter during the manufacturing process of many web products such as paper, textiles, cardboard and nonwovens. The microwave absorption technology has been utilised for some time to perform online moisture measurement during the process. However, until now this was limited to detecting larger amounts of water due to the limited resolution. Utilisation with thin products or low moisture was not possible.

It is now possible with the special measuring method employed here to detect even smallest amounts of water in a stable manner and with extremely high measuring accuracy. This allows usage even with thin print papers, airbag materials and nonwovens for the hygiene sector. Product colouration or material composition do not affect the measuring accuracy.
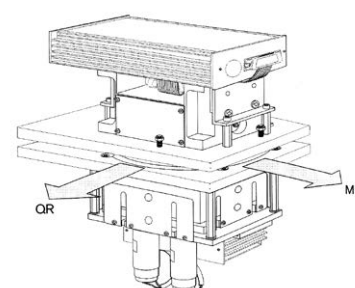
Sensor type DS–115

Customer benefits

✓ Non–destructive, continuous determination of the amount of moisture (H2O) in product webs

✓ Extremely accurate and stable measurements; calibration reduced to a minimum

✓ Long life expectancy through the use of highquality components

✓ Wide measuring range through the use of various resonance configurations

Principle of operation

The measuring instruments consist of two parts which together form a resonance chamber, so that the sample is located in the center of the divided chamber. A microwave emitter stimulates two standing waves in the resonance chamber, whereby one of the two corresponds to the absorption wavelength of the water molecule in the microwave spectrum while the second serves as a reference.
In contrast to the traditional absorption technique, the Aqualot HMF sensors do not evaluate the damping of the microwaves by the quantity of water molecules in the measuring gap, but rather the shift in the resonance frequency of the two standing waves with respect to each other. This special "microwave resonance" measuring principle is virtually insensitive to changes in product composition, which in daily practice results in the smallest possible number of product-specific calibration procedures. In addition, the device is characterised by extremely high resolution even at the smallest moisture levels, expanding the range of applications for microwave technology significantly compared with traditional measuring techniques.

Automatic scanner alignment

Product highlights

✓ Highly accurate and stable measurement thanks to microwave-resonance analysis
✓ Unaffected by the color of the product web or its chemical composition
✓ Temperature compensation by using a pyrometer to detect product temperature
✓ Servo-motor controlled tracking of the lower resonance chamber in traversing mode (sensor model DS-115)

Device versions

Specification	Value			Unit
Type	DS-115	DS-20	DS-30	
Measuring range	2 – 70	10 – 600	600 – 1500	g/m² H_2O

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                       CONVERTING
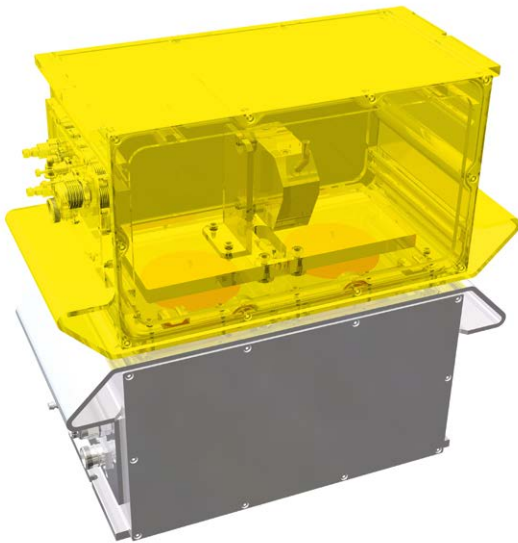
CALIPRO DML
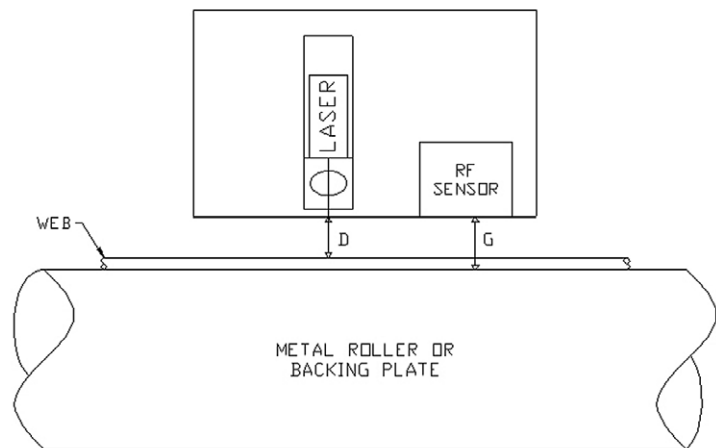
LASER TRIANGULATION: THICKNESS

Area of application

In principle the two-sided, non-contacting laser thickness measurement procedure can be used for virtually any form product. Successful applications for this technique can be found in the paper and cardboard industry, nonwovens, for PVC flooring or other calendered or extruded plastic web and sheets, as well as in artificial leather production.

Customer benefits

✓ Direct determination of the thickness of the product web, without inferring from the density
✓ Displays the thickness cross-section over the width of the web, since the measurement is traversing
✓ Non-contacting, so there is no effect on product quality or production process
✓ Insensitive to changes in the product surface, resulting in a highly stable measurement

Calipro DML, single-sided version

Principle of operation

Either one or two laser triangulation sensors determine the exact distance of the measuring head(s) from the product surface, either from one or both sides. Depending on the configuration, an additional sensor, usually a high-precision eddy-current sensor, determines the distance of the two measuring heads from each other, or the distance of the measuring head from the reference roller. Differentiating these detected values then allows the product thickness to be determined. In the Calipro DML this is done by an integrated microprocessor, which at the same time handles synchronising of the upper and lower laser, and in certain versions processes – in real-time – the measuring data from the numerous temperature sensors for compensating for thermal expansion and contraction.

QUICK INSTALL
Our service team guarantees on-time and smooth installation of our equipment. So that your investment is turned quickly into profit.
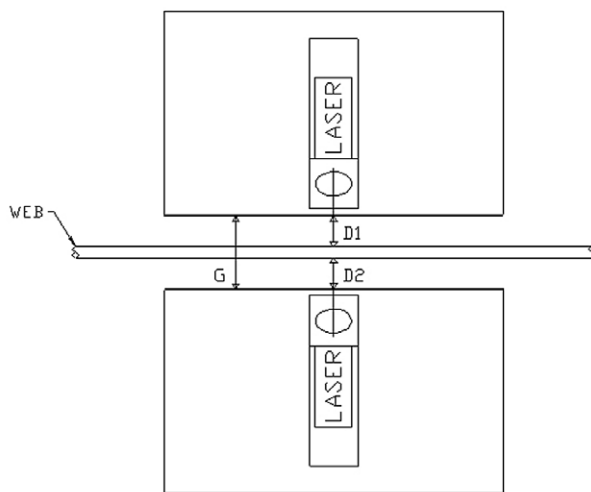
Calipro DML mit beidseitigem Laser-Sensor

Device versions

Product highlights

✓ Non-contacting, non-destructive and high-precision determining of product thickness inprocess
✓ Available in several variants for varying accuracy requirements
✓ Can be configured one-sided against a reference roller or two-sided
✓ Large variety of different measuring ranges with a single device series
✓ High sampling rate and resolution of the crosssection

Specification	Value		Unit
Type	DML-S (single-sided)	DML-D (dual-sided)	
Measuring range [1]	20 – 80	10 – 100	mm

[1] depending on the variant

CALIPRO DML

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CALIPRO DMS

LIGHT–BAND SHADOWING THICKNESS

Calipro DMS sensor

Area of application

Some areas of application in thickness measurement are difficult to cover with classic laser measuring systems. These systems reach their limits if the material surface is or very patterned. Laser triangulation is not suitable either with multi–colour, transparent or very translucent materials.
This is where the Calipro DMS LED shading sensor comes into play. The combination of eddy current sensor and shading sensor makes the measurement insensitive against material surface, colour, transparency, opacity and temperature variations.

Applications
– Film extrusion & plate extrusion
– Nonwoven
– Textile
– Finishing
– Calendaring

Materials
– Mesh
– Nonwoven, foam, film
– Film and paper combinations
– PVC floor covering, entire range of colours

Customer benefits

✓ Quick process optimization
✓ Material savings
✓ Quality assurance

Calipro DMS on one–sided Uniscan measuring frame

Principle of operation

A precision LED light curtain is directed as uniform, parallel light beam onto a measuring object. The transition between the bright and dark area at the receiver is detected as measuring value. Depending on the material thickness, a certain area is thus shaded at the detector. The eddy current sensor measures the current roller position. The material thickness is calculated from the difference between eddy current sensor and shading sensor.
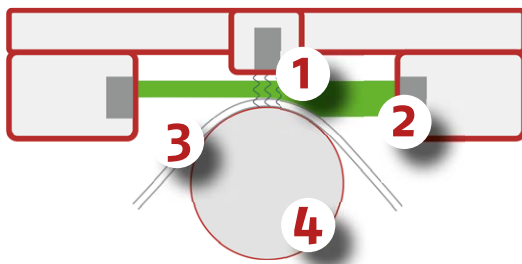
1 Eddy current sensor
2 New generation LED light curtain
3 Product
4 Reference roller

Shadowing sensor principle

CONTINUANCE
Our decades of experience have made us the reliable partner which we are today. Independent, determined and forward-thinking. So that we can also be here for you tomorrow.

Device versions

The standard version is intended to be installed on a single-sided measuring frame. With the variant for dual-sided measuring frames, the Calipro DMS is mounted next to the installed sensor above the guide roller.

Calipro DMS and DFI Beta Sensor on 0-frame
(e.g. Webpro M)

Product highlights

✓ High profile resolution
✓ Material-independent (colour, density, components, etc.)
✓ Contactless, wear-free measurement
✓ No calibration effort
✓ No radiometric measurements

CALIPRO DMS

OPTOSCOPE WLI

WHITE LIGHT INTERFERENCE: THICKNESS, LAYER THICKNESS

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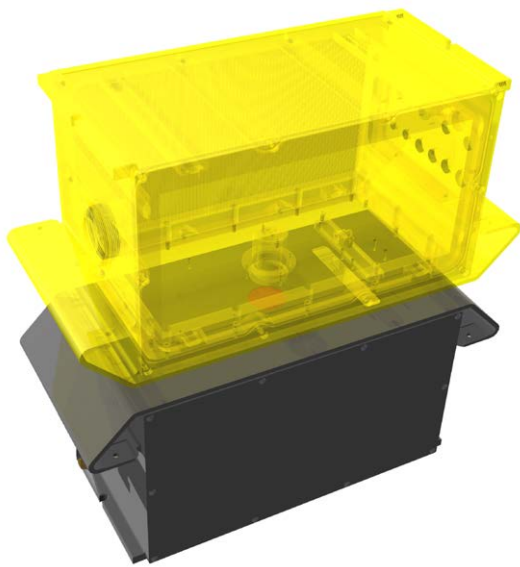
Area of application

The Optoscope WLI sensor can measure the thickness of very thin, transparent film, mono-film and transparent coating on films, metal and glass. Both, the layer thickness and film thickness can be determined online using a special measuring process. Simultaneous measurement of two coating thicknesses is also possible with multi-layer coatings. Single-sided measurements, i.e. including coating on metallization can be measured. Different measuring ranges are covered through two variants of the sensor using different types of light (visible light, IR).

Customer benefits

✓ Simultaneous determination of two coating thicknesses
✓ Quick process optimization
✓ Material savings
✓ Quality assurance

WLI interference spectrum of a paint-coated (approx. 4,3 gsm) PET film (approx. 23 µm), measured in reflection
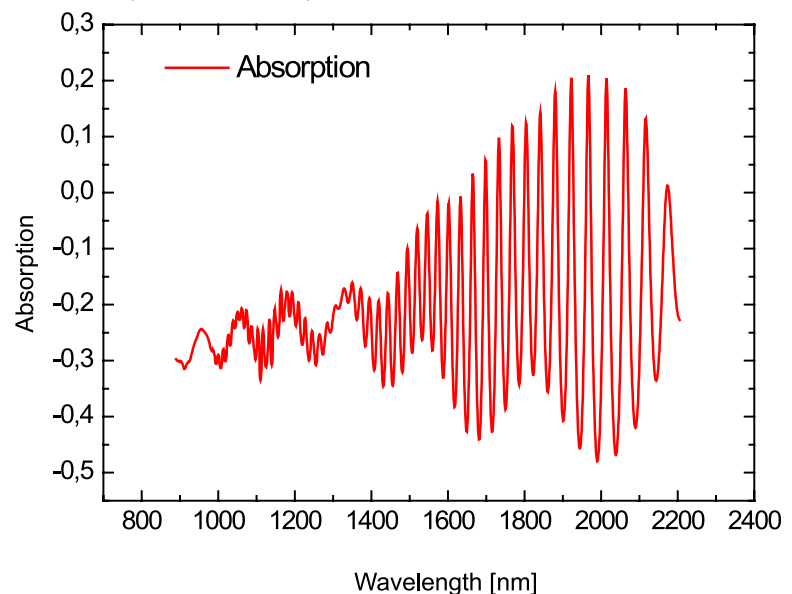
Principle of operation

If white light is reflected as thin layers, this reflection appears coloured like a rainbow. This effect can be observed, for example, with an oil film on a puddle of water. The light is partially reflected, both on the upper and lower oil–water interface. The overlaid reflections interfere. This interference is related to the coating thickness and can be measured with a spectrometer.
In addition, this method is insensitive to fluctuations of the product position.

Determination of layer thickness by Fourier transformation
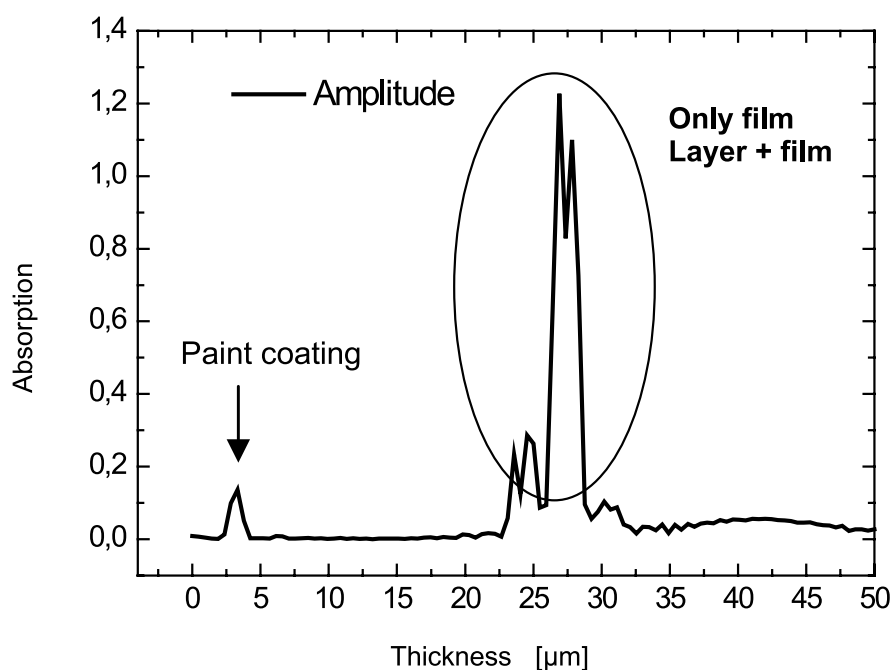
Product highlights

✓ Simple and fast measurement method
✓ High measuring accuracy and durability
✓ Measures thickness of the application coat and film thickness

Device versions

Specification	Value		Unit
Type	WLI–VIS	WLI–NIR	
Spectral range	400 – 1000	900 – 1700	mm
Measuring range	0,2 – 25	1 – 100	µm

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# AIRPRO APM

AIR FLOW MEASUREMENT: PERMEABILITY

Area of application

In the textile and clothing sector, air permeability is important for the exchange of air between the inner layers of clothing and the environment. This will substantially influence the wearing comfort of clothes. Air permeability is also important for filtration and breathable membranes – or with air bags in the automotive industry. 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 filter material.

Customer benefits

✓ Simple, fast measuring method
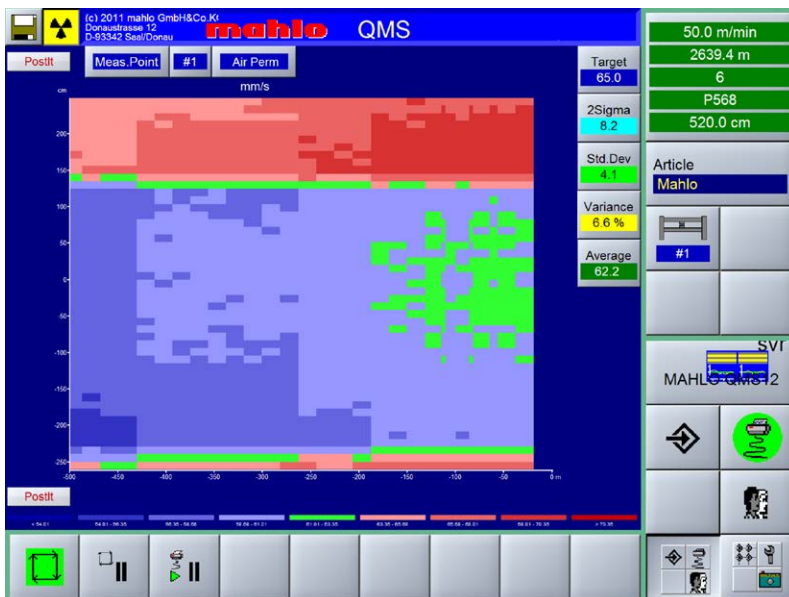✓ Many units of measurement possible
✓ Logged quality
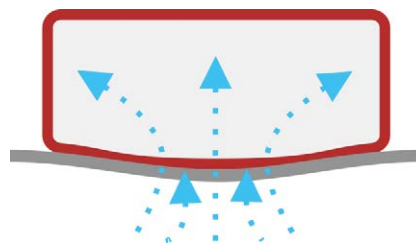
Air flow measurement principle

Principle of operation

Air is suctioned through the material to be measured with a specific pressure. The generated air flow is measured, and the air permeability of the material can thus be determined.

2D trend display of permeability

The operating software displays the measured values in real-time A target-actual comparison makes quality problems immediately apparent. This allows still influencing the production process. The graphic 2D trend depicts the exact curve of the air permeability profile over time and records it. This enables a detailed quality protocol – the grade of the product can be detected.

Product highlights

✓ Large measuring range
✓ High measuring accuracy
✓ Lange service life

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CONVERTING

DIECONTROL APC PRO

AUTOMATIC CONTROL OF THERMO DIES ON EXTRUSION NOZZLES

The DieControl APC Pro automatically controls an automatic extrusion die based on the CD profile measurement. This produces uniformly thick film, sheet or coating even in case of variations in feed, material change or when starting up the line. The automatic control and nominal value optimization achieves significant material saving and quality improvement.

Extrusion nozzle

Die control with PVC film

1 Start of APC Pro control
2 Standard deviation ≤ 0.5
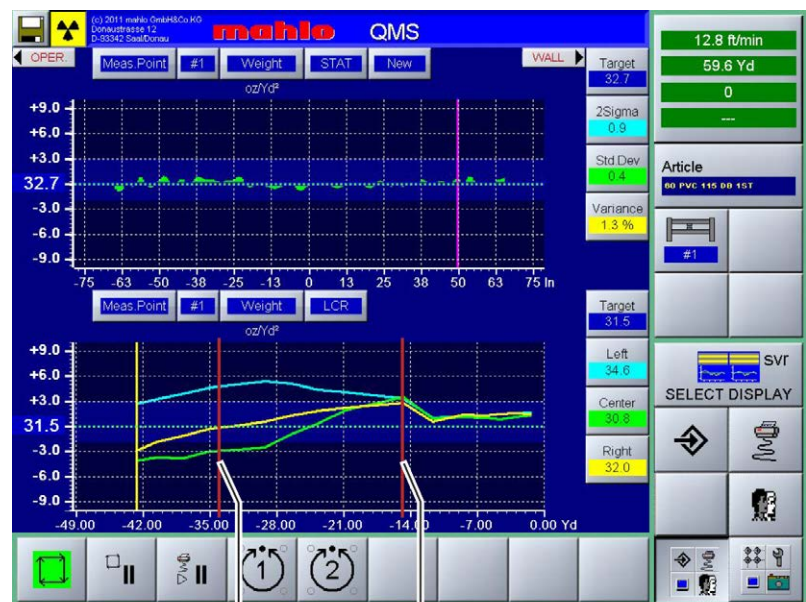
Customer benefits

✓ Fully automatic reduction of the standard deviation of the cross-machine direction thickness
✓ Fast control for minimum production loss when at the start and when changing batches
✓ Competitive advantage through marked quality improvement of the end product
✓ Significant raw material saving ensures short amortization times
✓ Fully automatic control reduces operator involvement
✓ Real-time monitoring of diebolt condition with alarm function for fast correction
✓ Reduced thickness variations by a factor of 10 compared to manual control

Area of application

These extrusion dies are used chiefly for film extrusion (cast film) and extrusion coating. However, special applications such as the production of special diaphragms are also possible. In all applications, the DieControl APC Pro is used to compensate deviations of thickness or the basis weight across the web. The DieControl APC Pro compensates nominal value deviations of the thickness or the basis weight with extrusion − exactly in the segment of the extrusion die in which the deviations occurred.

Increasing quality requirements necessitate constantly improved control procedures. For over two decades. Mahlo has been offering the right measuring and control system for coating and finishing – including automatic die control. The DieControl APC Pro is coupled to a Qualiscan QMS measuring system. It constantly measures deviations of the CD profile. This is how Mahlo APC Pro controls the extrusion die. Variations in the cross-machine direction are reduced quickly and automatically.
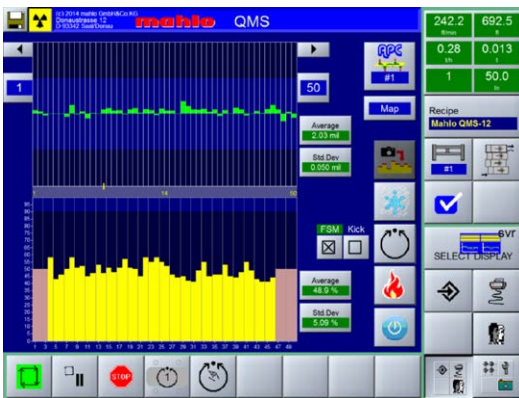
APC Pro operation via touchscreen

Principle of operation

A flexible lip at the outlet of the extrusion die, controlled by many individual diebolt heaters, regulates the uniform thickness of the material. Thus, the thickness can be set precisely in narrow segments. This is automated via automatic dies that change the applied temperature according to their length. The Mahlo APC Pro is able to control the die with precision.

The user-friendly operation of our automatic process control system of the latest generation is completely integrated in the operating software of the Qualiscan QMS-12. The control hardware works with a reliable industrial PLC with quickly responding semiconductor relays. All components are individually protected and contain status indicators for communication and I/O. The Mahlo-APC-Pro systems are usually configured ready with matching connection for the extrusion die. This enables true plug & play.

FAST & EFFICIENT
Innovative functions such as controller initialisation, anticipatory neck-in compensation and rapid start focus on a single goal: to control the CD profile in the shortest amount of time as evenly and uniformly as possible with minimum material effort.

Product highlights

✓ Quick-start – accelerated control with start and product change
✓ Continuous monitoring of the diebolts for continuity errors (standard!)
✓ Automatic die-product web mapping
✓ Simple controller initialization and setting
✓ Anticipatory neck-in and edge bead compensation
✓ Compatible with all automatic dies
✓ Modular construction for easy maintenance and expandability

DIECONTROL APC PRO

TECHNICAL DATA | BASE UNIT

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CONVERTING

Specification	Value		Unit
Control and display station	Touchscreen LCD TFT Panel		
Number Scanning frame, maximum	6		
Temperature range (without Cooling)	5 – 45		°C
Power supply [1, 2]	230 L / N	400 3L / N	VAC
Line frequency	50 / 60		Hz
Power consumption, maximum [1]	6,2		kVA
Interface	TCP/IP (Ethernet)		

[1] Depending on equipment
[2] Custom voltages possible

Dimensions of base
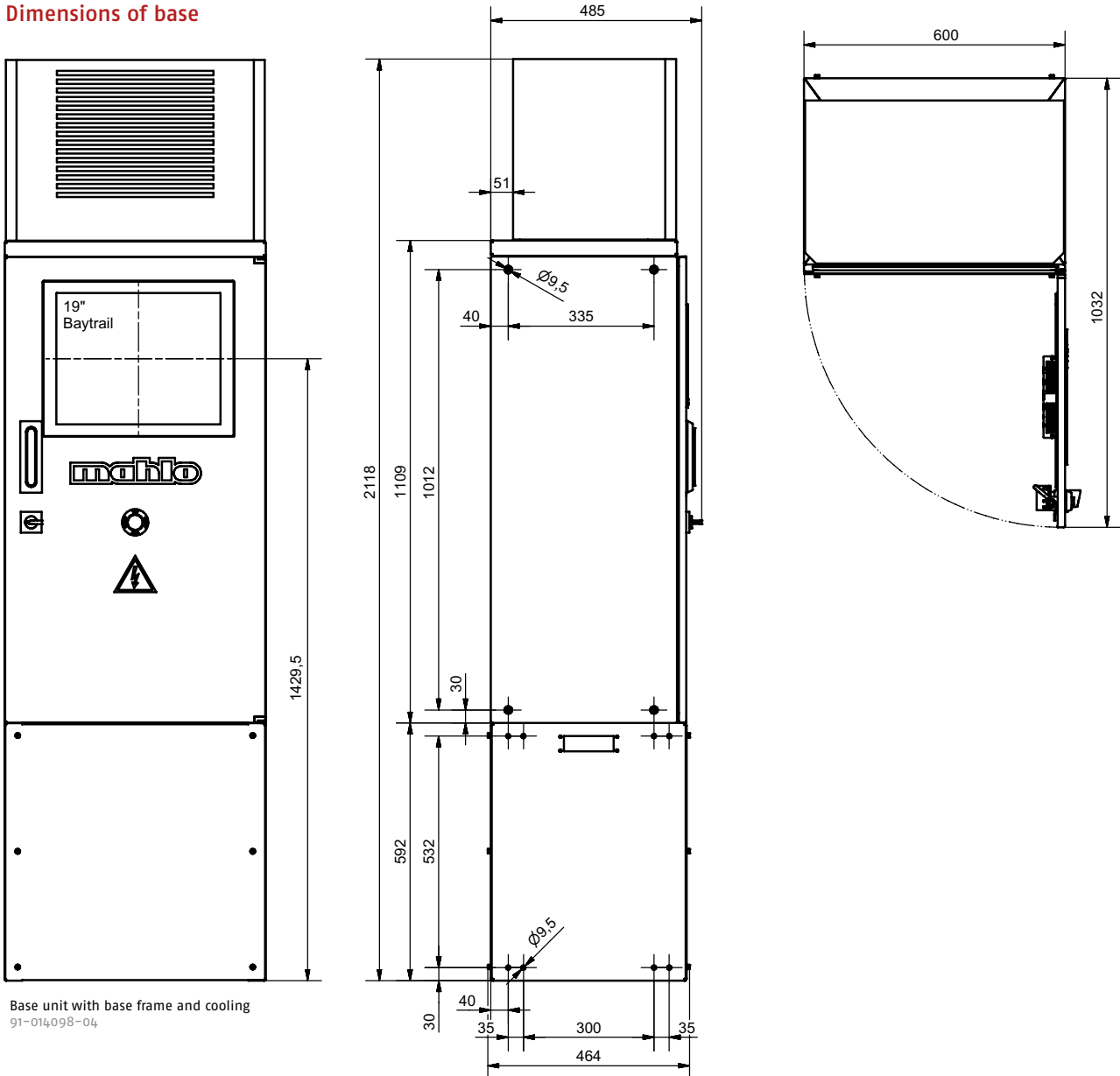
Base unit with base frame and cooling
91–014098–04

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Device		Nominal product width [mm] [1]		Number of sensors	Temperature range (without Cooling) [°C] [2]
		minimum	maximum		
Webpro	L–II	600	6600	5	5 – 45
	M	200	4000	3	
	MH	200	4000	3	
	S–II	200	4000	2	
	XS	200	2000	1	
	C (horizontal)	400	2000	1	
	C (vertical)	400	1200	1	
Uniscan	M	1000	6000	2	
	S	200	4000	1	
Fixed measuring point		200	6000	3	

[1] Additional nominal web widths available upon inquiry
[2] Cooling available for higher temperatures

Dimensions Webpro L–II

b+1940
(b+1220)
360
lifting eyes
325
b/2+490
b
120
A
b/2+730
central lubrication opposite
360
lifting eyes
A-A
380
operator side electrical side panel >Mahlo<
420
emitter
receiver
1498
park side drive side panel >Mahlo<
420
emitter
receiver
button for uncoupling the sensors
G
option: guide rollers
460
805
PH = 805 + H
30
B
cable connection
center product
center machine
Y
central lubrication opposite
B
H
X
200
b/2+570
A
b/2+810
200
b+1380
product direction

product
365
doorway
260
doorway
365
M16
260
b+1320
260
b+1840

Measuring frame Webpro L–II
91–017707–1

PERSONALITY

You're not just a number to us. Your individual needs and special requirements are our highest priority. We are there for you with our expertise, trend-setting technology and full dedication. So you can always play to win.

TECHNICAL DATA | SCANNING FRAME

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Dimensions Webpro M

Scanning frame Webpro M
91–015450–11

mahlo
trendsetting technology. worldwide.

Dimensions Webpro MH

Scanning frame Webpro MH
91–016945–02

Labels in the main diagram:
- b+1780
- b+1020
- b/2+390
- b/2+630
- 380
- 30
- 120
- b
- 270
- 326
- lifting eyes
- central lubrication
- lifting eyes
- operator side electrical side panel <Mahlo>
- *option* explosion protection
- park side drive side panel <Mahlo>
- emitter
- product
- button for uncoupling the sensors
- emergency stop
- 1840
- receiver
- Y
- 960
- $PH = H + 960 - G/2 + D$
- 126,5
- cable connection
- center product
- center scanner
- central lubrication
- 340
- H
- A
- b/2+450
- b/+690
- 250
- b+1140
- 250

A–A view:
- 280
- product
- PT
- G
- D
- *option* ø101,6 / ø150
- Z
- product direction

Bottom view:
- b+1670
- b+1110
- 280
- 280
- *option* explosion protection
- 265
- 565
- 220
- 269
- product
- M16

INNOVATIONS

We love being technological leaders. And our R&D team works every day to make sure it remains so. Innovations, inventive talent and future-oriented thinking – to guarantee your success.

TECHNICAL DATA | SCANNING FRAME

TEXTILE **NONWOVEN** **COATING & CONVERTING** **PAPER** **EXTRUSION**

Dimensions Webpro S–II
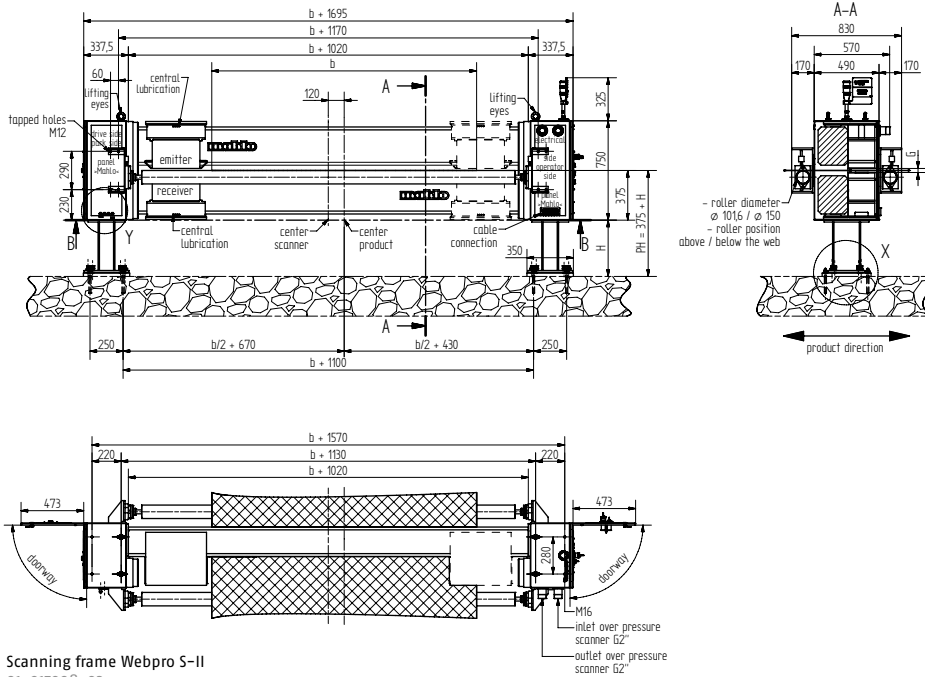
Scanning frame Webpro S–II
91–017098–02

Dimensions Webpro XS
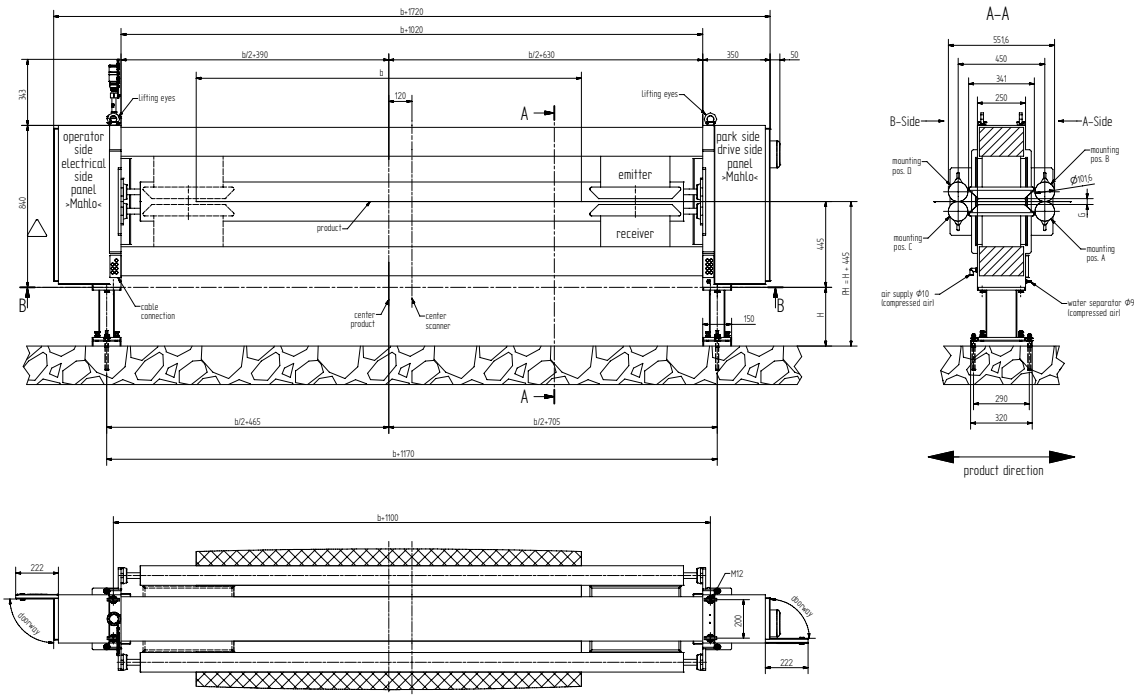
Scanning frame Webpro XS
91–015735–06

Dimensions Webpro C (horizontal)

Scanning frame Webpro C (horizontal)
91–016712–01

Dimensions Webpro C (vertical)

Scanning frame Webpro C (vertical)
91–016712–01

TECHNICAL DATA | SCANNING FRAME
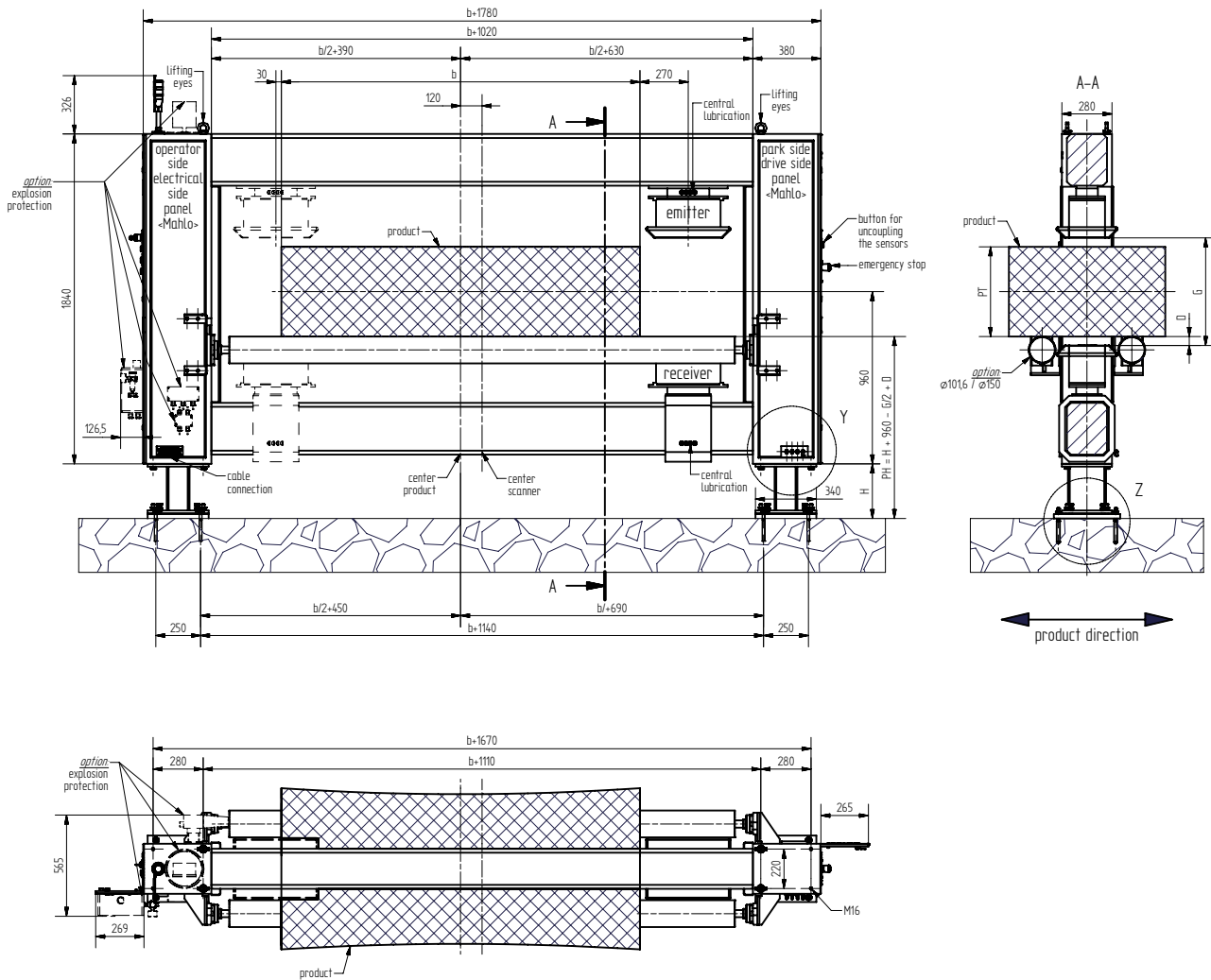
TEXTILE   **NONWOVEN**   **COATING & CONVERTING**   **PAPER**   **EXTRUSION**

Dimensions Uniscan M

Scanning frame Uniscan M / Sensor Gravimat FMX
91–013784–02

Dimensions Uniscan S

Scanning frame Uniscan S / Sensor Calipro DMS
91–018997–00

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Gravimat FMI / DFI

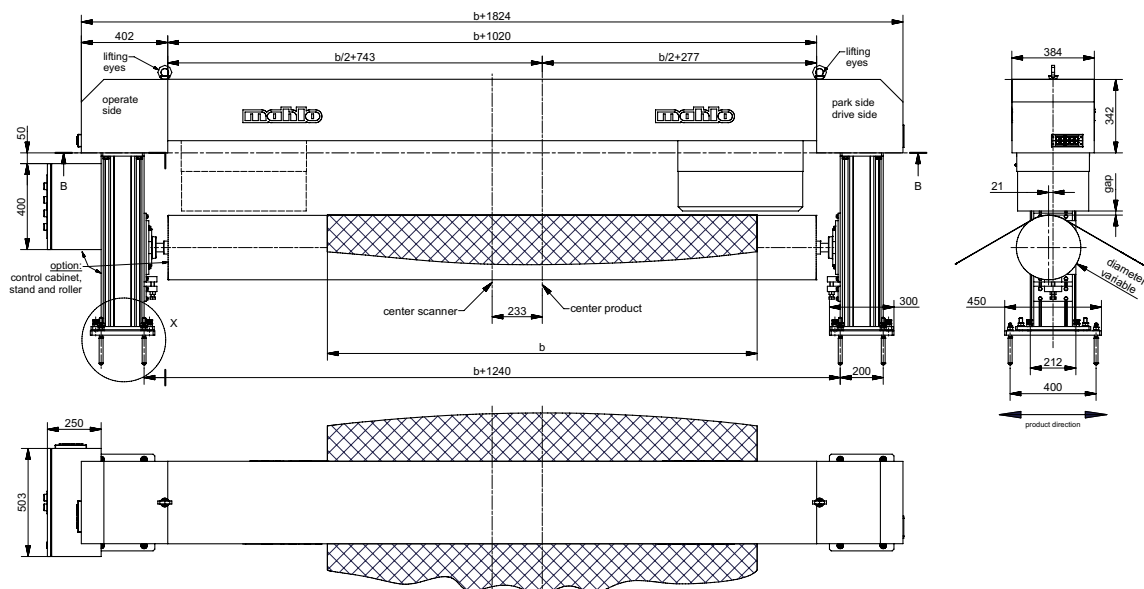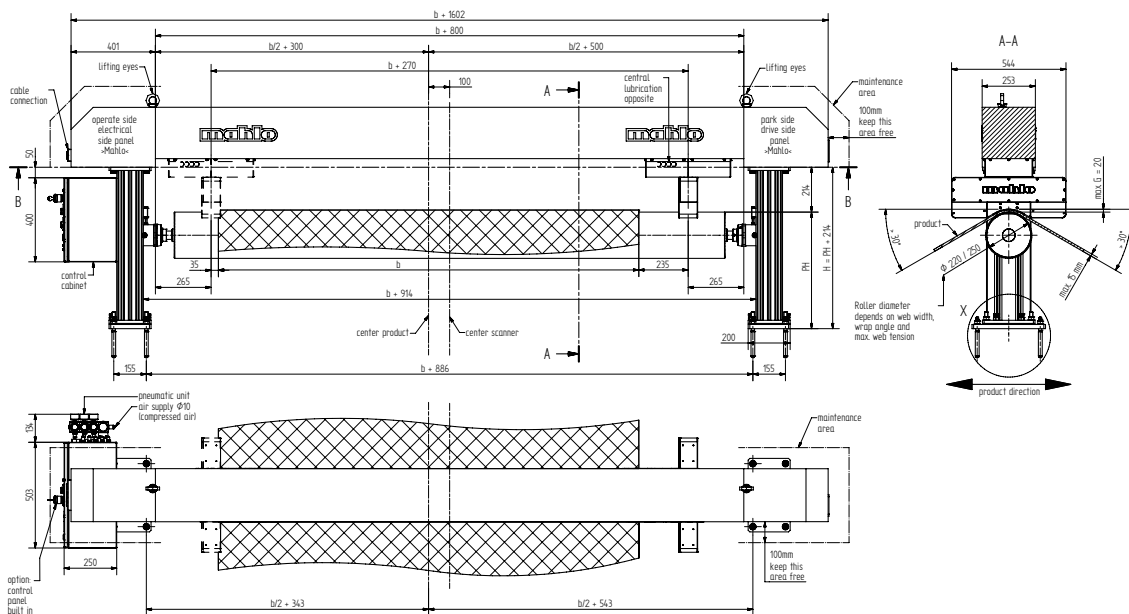| Specification	Value				Unit
Measuring principle	Transmission von Betastrahlen				
Isotope	Krypton-85 (Kr-85)		Strontium-90 (Sr-90)	Promethium-147 (Pm-147)	
Activity	3	9,62	0,5	37	GBq
Measuring range [1]	10 – 1400	10 – 1400	100 – 6000	2,5 – 160	g/m²
Repeatability (1σ, 1s)	0,2	0,12	0,5	0,06	
Measuring gap	10 / 15 / 30 [2]			10 / 15	mm
Temperature range without cooling	10 – 45				°C

[1] Referring to PET
[2] Up to max. 100 mm at reduced accuracy

Gravimat FMX-T

Specification	Value			Unit
Measuring principle	Transmission of X-rays			
Acceleration voltage	<5	8 – 15	15 – 50	kV
Measuring range	PET: 5 – 1000	PET: 14000	PET: 99000 Glas: 20000	g/m²
Repeatability (1σ, 1s)	0,08	0,1	–	
Measuring gap	10 / 15 / 30	10 – 60	10 – 600	mm
Temperature range without cooling	10 – 50	10 – 60	10 – 60	°C

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Infrascope NIR

NIR-T (Transmission)

Specification	Value		Unit
Measuring principle	Transmission of infrared light		
Type	NIR–T	NIR–T–Light	
Parameter	Basis weight & Humidity	Basis weight	
Spectral range	900 – 2200	900 – 1700	nm
Measuring range Basis weight	1 – 300 [1]	1 – 300 [1]	g/m²
Measuring range Humidity	0 – 15 [1]	–	% H_2O
Measuring gap	10 / 15 / 30		mm
Temperature range	10 – 60 [2]		°C

NIR-R (Reflection)

Specification	Value		Unit
Measuring principle	Reflection of infrared light		
Type	NIR–R	NIR–R–Light	
Parameter	Basis weight & Humidity	Basis weight	
Spectral range	900 – 2200	900 – 1700	nm
Measuring range Basis weight	1 – 60 [1]	1 – 60 [1]	g/m²
Measuring range Humidity	0 – 15 [1]	–	% H_2O
Measuring gap	10 / 15 / 30		mm
Temperature range	10 – 60 [2]		°C

[1] Measuring range and measuring accuracy depending on the material (analysis of material sample necessary)
[2] NIR: with cooling; NIR–Light: without cooling

Infralot IMF

Specification	Value	Unit
Parameter	Basis weight & Moisture	
Measuring principle	Reflection of near infrared light	
Measuring range Basis weight	0,5 – 100 [1]	g/m²
Measuring range Moisture	0,1 – 80 [1]	% H_2O
Measuring gap	15 / 30 / 60	mm
Temperature range without cooling	10 – 45	°C

[1] Materialabhängig (Analyse einer Materialprobe notwendig)

Aqualot HMF

Specification	Value			Unit
Parameter	Humidity			
Measuring principle	Absorption of microwavesn			
Type	DS–115	DS–20	DS–30	
Measuring gap	10	13	13	mm
Measuring range	2 – 70	10 – 600	600 – 1500	g/m² H_2O
Temperature range without cooling	10 – 60			°C

Calipro DML

Specification	Value		Unit
Parameter	Thickness		
Measuring principle	Laser triangulation [1]		
Type	DML–S (single–sided)	DML–D (dual–sided)	
Measuring range [2]	20 – 80	10 – 100	mm
Measurement accuracy [2]	20 – 150	5 – 150	µm
Temperature range without cooling	10 – 50		°C

[1] Laser with / without distance compensation through eddy current sensors
[2] According to variant

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Calipro DMS

Specification	Value	Unit
Parameter	Thickness	
Measuring principle	LED micrometer against reference roller	
Necessary reference roller arc of contact	>60	°
Measuring gap, maximum	20	mm
Measuring range	product-dependent – 15	mm
Measurement accuracy [1]	± 8	µm
Repeatability (1σ, 1s)	static: 0,2 [1] dynamic: 3 [2]	µm
Temperature range without cooling	10 – 50	°C

[1] With stationary roller and fixed position. The measuring accuracy depends very much on the measured object or its surface.
[2] With rotating reference roller, traversing measurement and zero profile without measured product, referring to the traversing width.

Optoscope WLI

Specification	Value		Unit
Parameter	Thickness, Layer thickness		
Measuring principle	White light interference		
Type	WLI-VIS	WLI-NIR	
Spectral range	400 – 1000	900 – 1700	nm
Measuring range	0,2 – 25	1 – 100	µm
Measurement accuracy	0,01	0,02	µm
Temperature range without cooling	10 – 60		°C

Airpro APM

Specification	Value	Unit
Parameter	Permeability	
Measuring principle	Measurement of pressure drop	
Measuring range	1 – 5000	mm/s
Measurement accuracy	± 3 [1]	%
Temperature range without cooling	10 – 50	°C

[1] of the measured value

LISTENING

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Diecontrol APC Pro

Specification	Value			Unit
Type	1	2	3	
Number Bolt, maximum	180	162	144	
	1 – 200	201 – 370	371 – 440	W
Switching power per output,maximum	1	2	2	A
Power supply	400 3L / N			VAC
Line frequency	50/60			Hz
Interface	TCP/IP			

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TYPICAL APPLICATIONS

USE IN EVERYDAY INDUSTRIAL ROUTINES

Installation at Selcuk Iplik , Turkey

The nonwoven manufacturer controls basis weight and moisture in its Spunlace lines with Qualiscan QMS from Mahlo. All images with courtesy of Selcuk Iplic.

A Qualiscan QMS with a Webpro M measuring frame measures basis weight with beta sensor and moisture with an infrared sensor.

The traversing measuring frame of the Qualiscan QMS allows generating precise CD and MD profiles of parameters such as basis weight, thickness or moisture. They are presented clearly arranged in the operating software of the Mahlo system on a touchscreen (in the foreground).

Installation at Kirson Industrial Reinforcements GmbH, Germany

Kirson monitors the quality of its roving reinforcements for products such as roof sheeting, floor covering or nonwovens with Mahlo Qualiscan QMS.

Checking the basis weight with the Gravimat DFI beta sensor in the O-frame Webpro M for the production of screen reinforcements from fibreglass and nonwovens.

The beta sensor measures basis weight via isotope rays. Complete insensitivity to web flutter across the entire measuring gap through DFI technology (Dynamic Flutter Independent). Even smallest beta ray sources thereby achieve their maximum measuring performance.

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Mahlo GmbH + Co. KG Germany
Donaustr. 12, 93342 Saal/Donau
Telephone: +49-9441-601-0
Fax: +49-9441-601-102
Email: info@mahlo.com

Mahlo Italia S.R.L. Italy
Via Fiume 62, 21020 Daverio
Telephone: +39-0332-94-95-58
Fax: +39-0332-94-85-86
Email: mahlo.italia@mahlo.com

Mahlo America Inc. USA
P.O. Box 2825, Spartanburg, S.C. 29304
Telephone: +1-864-576-62-88
Fax: +1-864-576-00-09
Email: mahlo.america@mahlo.com

Mahlo Ouest S.R.L. Belgium
Quartum Center
Hütte 79 – Bte 10
4700 Eupen
Telephone: +32-87-59-69-00
Fax: +32-87-59-69-09
Email: mahlo.ouest@mahlo.com

Mahlo España S.L. Spain
Calle Luxemburgo nº 4
08303 Mataro (Barcelona)
Telephone: +34-938-640-549
Email: mahlo.espana@mahlo.com

Mahlo Shanghai Rep. Office China
Bldg 2, 569 Hua Xu Road
Xu Jing Town
Shanghai 201702
Telephone: +86-1390-1804736
Email: frank.fei@mahlo.com

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