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mKnowledge Scanning systems

Distortions always in sight

Quality made in Germany

TEXTILE NONWOVEN COATING & CONVERTING PAPER EXTRUSION

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OVERVIEW OF THE MAHLO SCANNING SYSTEMS

Whether woven, knitted or tufted fabric, whether printed, coated, dyed, laminated light or heavy - every textile manufacturer must produce thread, stitch or pattern straight goods.

In most applications, distorted fabric is one of the biggest problems to be solved for the textile finisher. Distortions reduce the quality, thus the prices to be achieved, and must be removed in order to maintain the utility value of the fabric. This must be done fully automatically at today's high fabric speeds, regardless of surface effects, pile, loops or hair.

Whereas earlier generations of automatic straightening machines could only detect simple fabric structures and straighten them accordingly, today practically the entire spectrum of textile fabrics can be detected automatically with Mahlo sensors.

Due to the further development of textile manufacturing technologies in spinning, surface production and finishing, textiles have evolved from simple structures for clothing applications to highly technical applications for aerospace. Textiles could not be more different, depending on the application of the end product, they differ in factors such as technical properties, feel and look.

This has resulted in new standards during production in terms of product variety, speed, accuracy and the amount of data to be evaluated. Continuous improvements, further developments and many new developments, coupled with the use of state-of-the-art technology (e.g. AI-based evaluation algorithms), were and are necessary to keep pace with this development.

SCANNING SYSTEMS AND THEIR METHODS – AN OVERVIEW

Today, sophisticated sensors - optimally positioned across the width of the fabric - provide accurate and reproducible information about the distortion in real time. In this way, we provide the user with the right tool to evaluate and monitor the condition of the textile goods - and thus to meet the increasing demands of the market.

For this purpose, Mahlo offers a portfolio of different, highly developed sensors.

After detailed consultation with our specialists in sales and application technology, the user can choose the warp detection system that is best suited for his product mix from a wide range of products:

- Optoelectronic scanning
- Imaging scanning
- Hybrid scanning
- Imaging scanning especially for carpets
- Scanning for pattern recognition

Optoelectronic scanning – TK-12 scanner

Over decades, the principle of optoelectronic scanning has proven to be a true stroke of genius and continues to set the standards in the field of distortion detection. No other measuring principle can cover so many materials and applications fully automatically without special settings. Constant improvement, further development and the use of the latest digital technology make it possible to stay one step ahead of the growing demands of the ever more complex textile structures.

A photocell behind an oscillating lens registers the light and dark modulation that produce the weft or loop course position of the passing textile web.

Optoelectronic scanning – TK-12 scanner

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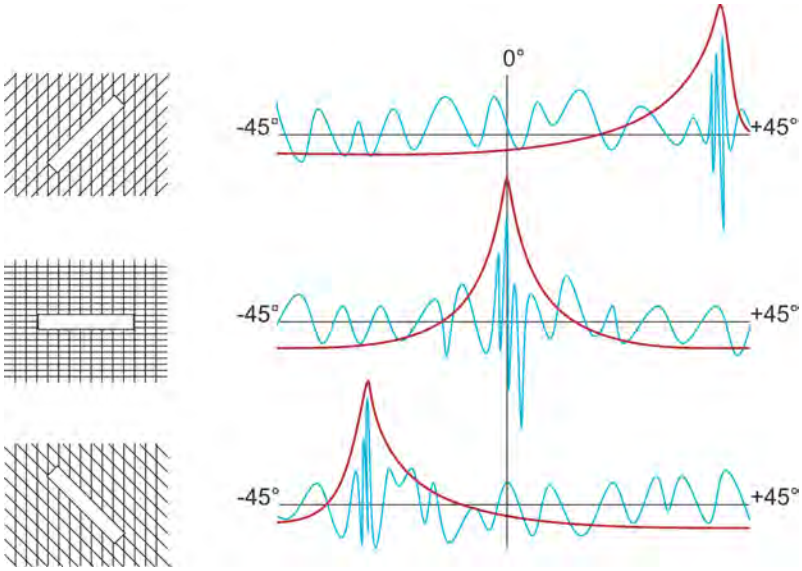
Operating principle of distortion detection



Scanning principle Fast Fourier Transformation with the TK-12

Several TK-12 scanners (four, six or eight) are evenly distributed across the width of the textile web. The fabric continuously passes the scanner at a defined distance and thus creates a light and dark modulation.

A centrally swivelling cylindrical lens in the scanner oscillates at an angle of -45° to + 45 ° around its centre. As soon as the weft thread or the row of loops is parallel to the lens, the signal modulation on the photo element illuminated by the lens is at its maximum. The angular position of the weft thread in the textile structure can be derived. An internal digital signal processor in the sensor housing then evaluates the distortion-relevant signals. All sensors, optimally distributed over the fabric width, simultaneously deliver a signal proportional to the angle. The evaluation electronics process the signals in fractions of a second and calculate the total distortion.

The fabric is illuminated by long-life LEDs in the infrared range. For optimal adaptation of the lighting to the goods, the user can choose between reflected and translucent infrared light in the software. The light intensity automatically adapts to the goods.

Applications

With a few exceptions, the TK-12 distortion scanning head is able to scan all textile structures for weft and loop course distortion and to determine the total distortion reliably and in real time.

Product highlights

- Suitable number of sensors evenly distributed across the fabric width: enables distortion calculation in real time
- Optimised optics for the best possible resolution and capture
- Contactless scanning of textile structures
- Scanning is not influenced by the colour of the textile structure
- High production speeds possible (up to 250 m/min)
- Fixed focus

For more information visit our website

Imaging scanning – CK-15 scanner

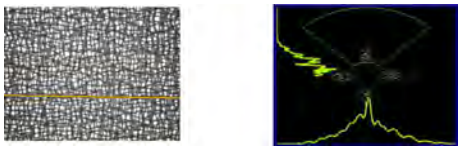
For the few exceptions that cannot be scanned with the TK-12 optoelectronic sensor, Mahlo offers imaging scanning as a supplement.

Exceptions are e.g. fabrics with low yarn speeds and yarn counts resulting in a low yarn frequency with little pronounced light-dark modulation.

An imaging process is also used for woven crepe, certain blackout fabrics, fabrics with untwisted weft or structures with small patterns.

A high-resolution area scan camera with an imaging area of 4x3 cm serves as the basis. An intelligent algorithm in the software evaluates the captured image and determines the degree of distortion.

Operating principle of distortion correction



Crepe, 100% PES

Several high-resolution cameras (four, six or eight CK-15 scanners) are distributed evenly across the width of the textile web. A predetermined defined distance to the passing fabric maintains the camera focus, which is a decisive factor for image acquisition. The intelligent algorithm of the software evaluates the captured image and summarises the generated pixel information in an FFT analysis. All sensors simultaneously deliver a signal proportional to the angle. The evaluation electronics process the signals in fractions of a second and calculate the total distortion more or less in real time.

LEDs in the infrared range are used to illuminate the fabric. The CK-15 probe is available in a transmitted light version that backlights the structures or in a reflected light version that illuminates dense opaque structures with a reflective light source. If both types of light are available, the more suitable one can be selected via the software and the setting can be saved as a recipe.

Applications

- Textile structures with low yarn frequency
- Textile structures with untwisted yarn e.g. blackout
- Textile structures with very fine pattern structures
- Crepes bindings

Product highlights

- Suitable number of sensors evenly distributed across the fabric width: enables distortion calculation in real time
- Latest camera technology
- Non-contact sensing of the weft yarn – course distortion
- Fixed focus due to defined camera distance
- Scanning possible at low web speeds (>5 m/min)

For more information visit our website

Hybrid scanning – combination of TK-12 and CK-15 scanner

Hybrid scanning is a combination of the two previously introduced scanning systems TK-12 and CK-15. Two independent systems are combined to form a superior scanning system. Hybrid scanning combines the advantages of the two individual systems and eliminates/compensates for the respective limitations.

Both scanning systems face each other at a defined distance from the passing web. The TK-12 sensor scans the back of the fabric and the CK-15 the top.

Depending on the type of material, the software selects the distortion detection system that produces the most stable scanning and evaluation of the weft threads and mesh rows. The hybrid system can of course be used in reflex or transmitted light mode. Whenever a wide range of products needs to be covered in the best possible and reproducible way, a Mahlo hybrid scanning system can show its strengths to the full.

Applications

- Common structures of weaving production (canvas, rib stop, waffle, etc.)
- Common structures of knitted fabric production (knitted, warp knotted, etc.)
- Textile structures with untwisted yarn e.g. blackout
- Textile structures with very fine pattern structures
- Crepes & Piqué bindings
- Denim fabrics
- Jacquard fabric
- Mattress cover fabrics
- Etc., etc……

Product highlights

- Suitable number of sensors evenly distributed across the fabric width: enables distortion calculation in real time
- The best of two scanning systems
- Latest camera technology
- Non-contact sensing of the weft yarn – course distortion
- Permanent fixed focus due to defined camera distance
- Scanning possible at low web speeds (>5 m/min)

For more information visit our website

Imaging scanning especially for carpets – CTK-15 scanner

The CTK-15 sensor is specially designed for applications in the carpet sector (woven or tufted). Due to their mostly coarse yarn qualities, carpets have a very low weft or tufting row density. At the same time, the fabric speeds on most coating machines are relatively low. The scanning systems presented so far are designed to scan significantly higher yarn densities and yarn frequencies. It was therefore necessary to develop a special scanning system for carpet applications.

Only in an enlarged scanning area do coarse transverse structures become clearly visible. The camera used with a significantly higher resolution therefore captures an area of 9x9 cm. Since the transverse structure of almost all carpets is only visible on the reverse side of the fabric, the CTK-15 is always exposed in reflected light.

The images generated are evaluated with an intelligent algorithm using FFT analysis. All sensors simultaneously deliver a signal proportional to the angle. The evaluation electronics process the signals in fractions of a second and calculate the total distortion over the usual large fabric widths more or less in real time.

A large evaluation area can also be advantageous for some other applications. The distortions of fine pattern structures are best visible when the patterns repeat very frequently in the captured image.

Applications

- Carpets (woven, tufted) e.g. Axminster, Wilton, etc.
- Mattress cover fabrics
- Textile structures with fine pattern structures

Product highlights

- Suitable number of sensors evenly distributed across the fabric width: enables distortion calculation in real time
- Latest camera technology
- Non-contact sensing of the weft yarn – course distortion
- Permanent fixed focus due to defined camera distance
- Scanning possible at low web speeds (>5 m/min)

For more information visit our website

Camera-based scanning for distortion and repeat length detection: Patcontrol PCS-20

There are a number of textiles - e.g. patterned carpets, patterned woven and knitted fabrics, lace or terry fabrics - that are extremely difficult or impossible to scan with conventional techniques and therefore cannot be straightened. For these applications, straightening according to the weft thread is either not useful or not possible at all.

In order to nevertheless detect and successfully straighten the warpage value of lace and co, Mahlo uses the Patcontrol PCS-20. The Patcontrol PCS-20 is a camera-based system that was developed through intensive research with the camera technology used. Due to the coordinated camera hardware and the specially developed software, the system is able to detect, evaluate and record several parameters of a fabric web. These include:

- Skew and bow distortion detection
- Longitudinal rapport detection
- Cross-rapport detection
- Product width detection

The system consists of the camera (one or more), the light source (reflected and/or transmitted light), and the specially developed software. The use of high-resolution cameras in combination with a compact light source designed for this purpose is space-saving and can thus be integrated into already existing systems. The intensive LED light sources are maintenance-free and have a long service life. The current CMOS camera technology allows fine adjustments in brightness and exposure time for optimal image settings during detection.

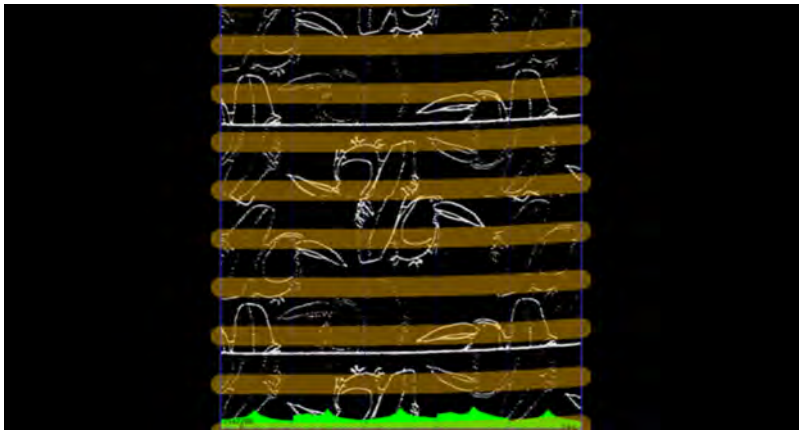
In order to guarantee the function of the system, the goods to be scanned must meet at least one of the following requirements:

- A repeating pattern across the width of the fabric
- A transverse and repetitive line structure (e.g. cut edges, borders and thick weft threads)
- A pattern that runs across the entire width of the fabric and is repeated in the direction of travel

Operating principle of distortion measurement

The PCS-20 generates images of the goods passing under the camera. The software evaluates these images and compares them with repeating lines or patterns of the passing goods. If positional deviations of the lines or patterns occur in the goods, e.g. due to existing warpage, these are detected and indicated by the software. The straightening unit then corrects this distortion to the desired position.

Camera-based scanning for distortion and repeat length detection:
Patcontrol PCS-20



Distortion detection with PCS

Applications

Warp and repeat length detection can be used for many different applications, including:

- Lace (curtains, linen, etc.)
- Woven and tufted carpets
- Mattress cover fabrics and car seat covers
- Technical textiles (airbag fabrics, sports shoe uppers)
- Towels, blankets, etc. (terry towel)

Other possible applications:

- Residual distortion correction of carpets at the stenter frame outlet
- Distortion correction of already printed webs
- Fabric width measurement
- Evaluation and measurement of technical textiles for position-dependent information
- Reporting and evaluation of delay and repeat length detection

Product highlights

- Latest camera technology
- Scanning over the entire fabric width
- Permanent fixed focus due to defined camera distance
- Scanning possible at low web speeds (>5 m/min)

For more information visit our website

SUMMARY

Summary

Scanning systems are indispensable for thread-straight and thus high-quality products. Mahlo makes different sensors available depending on the application. After intensive consultation, experienced experts custom-tailor the right system for each customer so that their requirements can be met exactly.

More questions? Please contact our experts

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