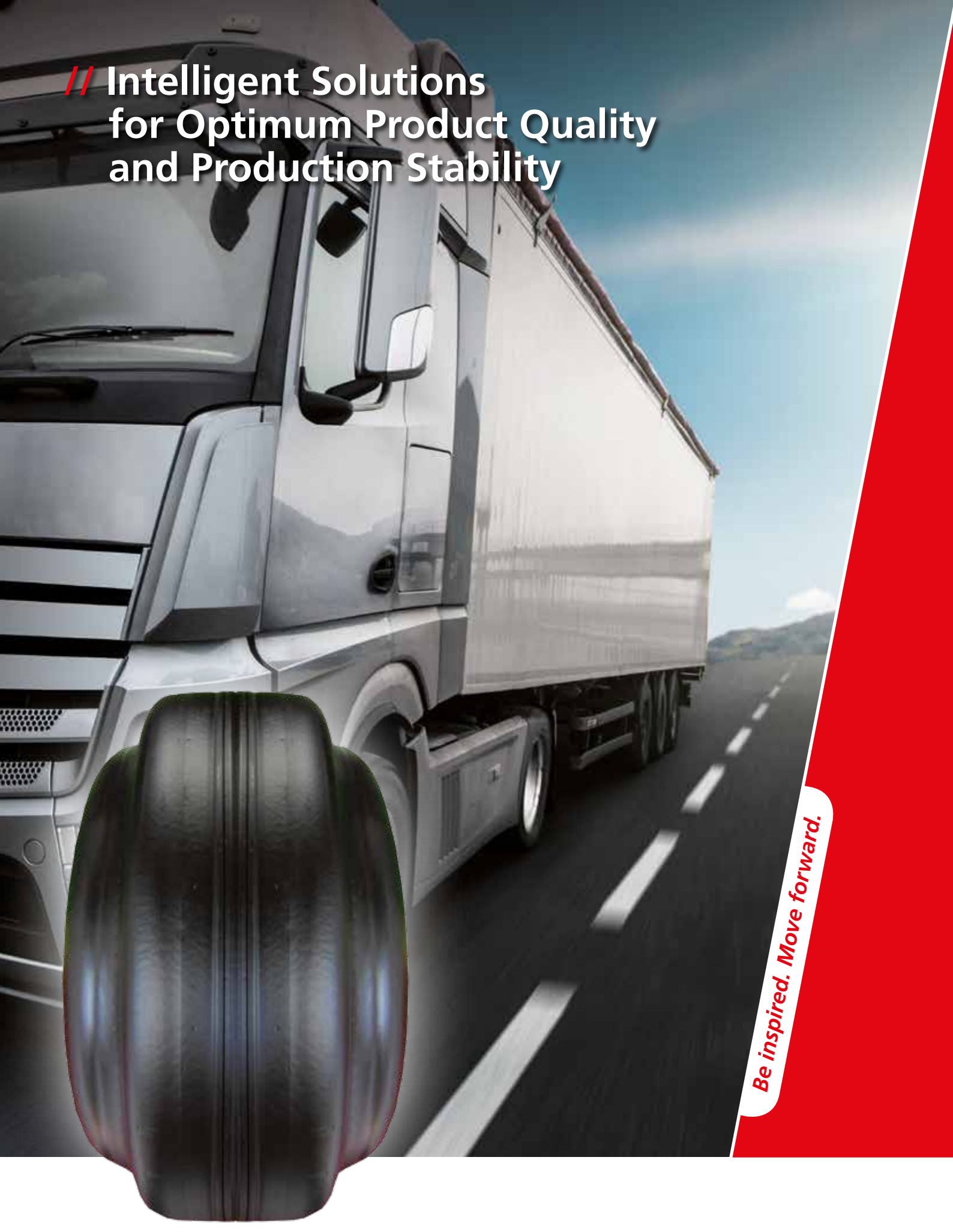


// Intelligent Solutions for Optimum Product Quality and Production Stability

Be inspired. Move forward.

BST eltromat INTERNATIONAL

// BST eltromat – Solutions for Tire Machines

QUALITY, SAFETY AND EFFICIENCY

High demands are placed on control and inspection systems in tire production as a result of progressing automation of the manufacturing processes and ever increasing expectations on the quality of the products.

Through many years' experience working together with the tire industry, BST eltromat is able to support its customers with solutions for the tasks at hand: With streamlined automation solutions, intelligent quality assurance systems and state-of-the-art control components.

Prepare to be impressed by our products and solutions:

- Web guide control systems for all manufacturing processes
- Web tension measuring systems in all load sizes
- Intelligent, high-precision sensors
- Profile scan systems for extrusion profiles
- Thickness measurement
- High performance camera systems – as easy to use as sensors
- Intelligent controllers

In addition to standard products, BST eltromat develops customer-specific and problem-related customized solutions.

CALENDER LINES

Web guiding and web tension control on unwinders, roller accumulators and heating and cooling towers, homogeneous textile cord distribution in front of the calender, thickness measurement on and after the calender, position-guided edge cutting systems, width measurement systems and the web guide control and web tension control on the system outfeed are performed in a safe and reliable manner by intelligent and low-maintenance BST eltromat sensor and actuator systems.

Swiveling Roller Guide

In combination with different sensors, the SmartGuide.SF is guiding web or textile cord. For calender lines, BST eltromat recommends the BST eltromat full width sensor [read more on page 41].

[read more on page 18]

Edge Guiding System

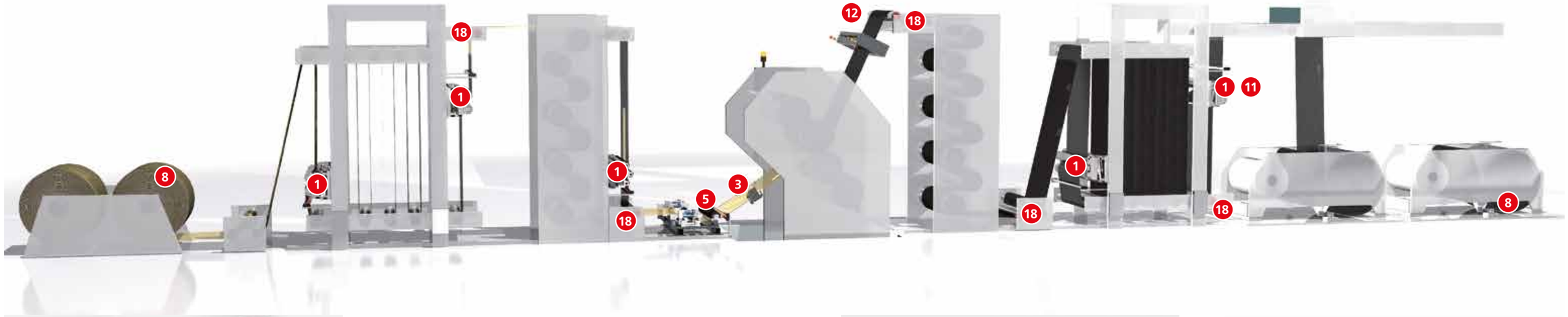
The Triokanter realizes the accurate positioning of the textile cord edges before the calender. The special BST eltromat proportional – integral guiding characteristic assures high precision independent of the web speed.

[read more on page 22]

Double Expander

Corrects the width and ensures a homogeneous distribution of textile cord for subsequent production processes. For tire calender lines, BST eltromat recommends the combination with the BST eltromat full width sensor.

[read more on page 23]



Winder Guiding System

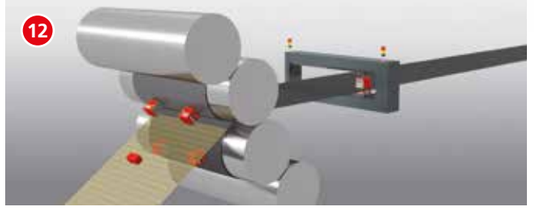
The SmartGuide.WF ensures the controlled unwinding and rewinding of the material and the liner. Customized solutions can be realized due to a large range of proven components, such as sensors and actuators.

[read more on page 28]

Width Measurement

The CCD CAM 100 system precisely measures the widths of material in reflecting or back light mode.

[read more on page 37]



Thickness Measuring System

The Indicon system delivers exact measurement results for: thickness of the individual layers of the top and bottom plate; and total thickness and location of the steel cord inside the overall composite.

[read more on page 34]

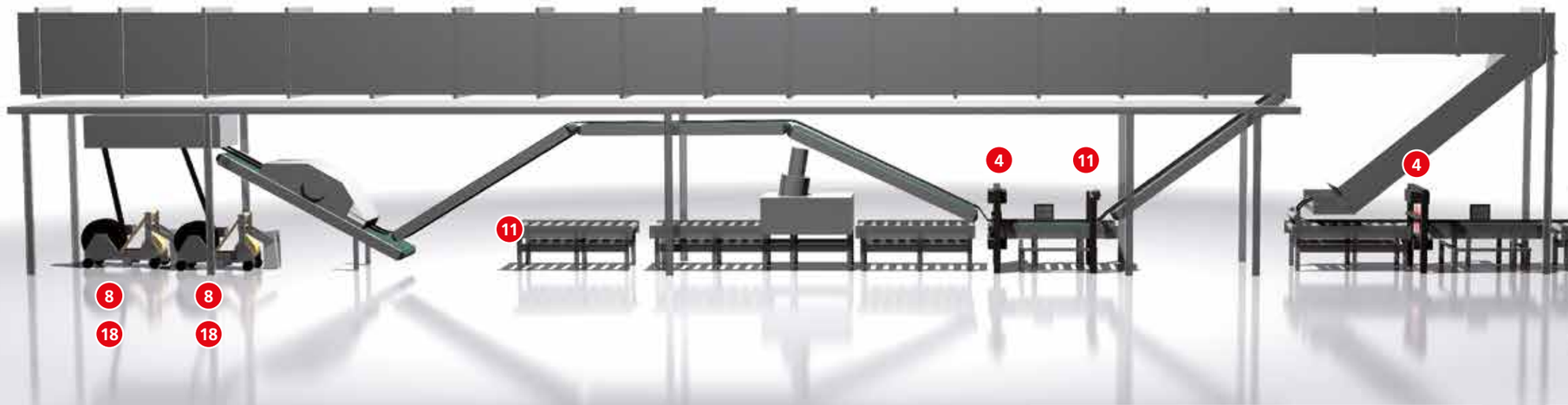
Web Tension Measuring Systems

The BTL Load 100-500 cells control the tensions of the rubber material and the textile cord during their run through the calender line.

[read more on page 46]

EXTRUSION LINES

BST eltromat 3D profilometers and web width measuring systems ensure consistent quality of the extruded material. Customer-specific mechanical solutions for liner web guide control systems and integrated web tension control on the winder reduce premature wear of the liner on cassette winders.



Extrusion Lines

Smart Profile Measuring System

The 3-D Laser triangulation Profile Scanning System precisely controls the dimensions of the extruded treads or sidewalls.

[read more on page 30]

Winder Guiding System

The SmartGuide.WF ensures the controlled unwinding and rewinding of the material and the liner. Customized solutions can be realized due to a large range of proven components, such as sensors and actuators.

[read more on page 28]

Width Measurement

The CCD CAM 100 system precisely measures the widths of material in reflecting or back light mode.

[read more on page 37]

Web Tension Measuring Systems

The BTL Load 100-500 cells control the tensions of the rubber material and the textile cord during their run through the calender line.

[read more on page 46]

Innerliner Calender Lines

INNERLINER CALENDER LINES

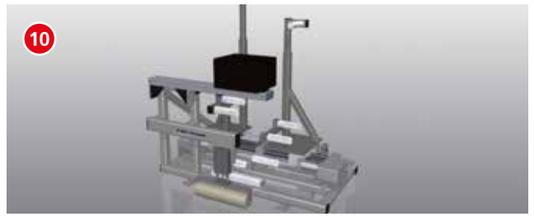
With winder guiding components, width measurement and web tension control systems, lasermarkers or edge cutting positioning systems BST eltromat helps to ensure a constant material quality.

Customer-specific and product-related solutions for material doubling or pre-assembling processes increase the production efficiency.

Winder Guiding System

The SmartGuide.WF ensures the controlled unwinding and rewinding of the material and the liner. Customized solutions can be realized due to a large range of proven components, such as sensors and actuators.

[read more on page 28]



Doubling

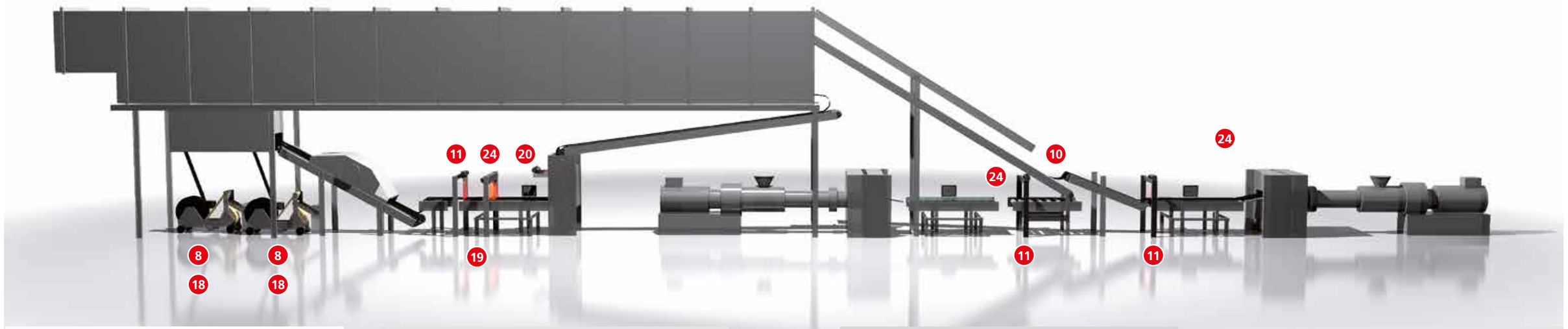
Depending of the tire design BST eltromat provides individual doubling solutions on the base of proven components and guiding technologies and in combination with the high performance camera CCD CAM 100.

[read more on page 36]

Width Measurement

The CCD CAM 100 system precisely measures the widths of material in reflecting or back light mode.

[read more on page 37]



Web Tension Measuring Systems

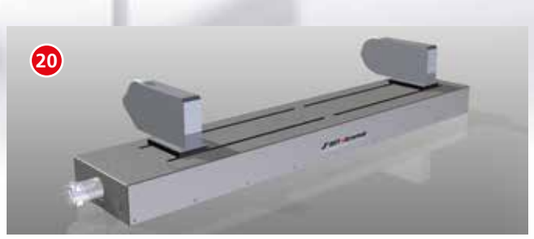
The BTL Load 100-500 cells control the tensions of the rubber material and the textile cord during their run through the calender line.

[read more on page 46]

Laser Marker

Based on the recipe data the Lasermarker LPS100 indicates the correct edge position of the material.

[read more on page 47]



Edge Cutting Positioning System

Measures the width of the material and edge positions to control the edge knife position.

Thickness Measuring System for Innerliner

With a large portfolio of thickness measurement systems BST eltromat is able to ensure a high measurement accuracy in various applications.

[read more on page 32]

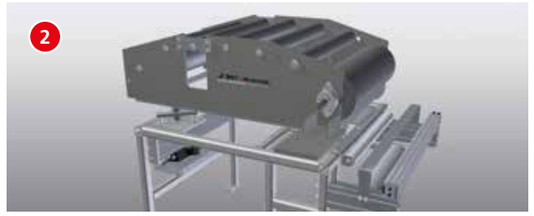
CUTTERS

Web guiding for unwinders and winders, guiding from the loop, web width measurement systems with the high performance CCD CAM 100 camera from BST eltromat product range form the basis for top product quality on textile and steel cord cutters.

Swiveling Roller Guide

In combination with different sensors, the SmartGuide.SF is guiding web or textile cord. For calender lines, BST eltromat recommends the BST eltromat full width sensor [read more on page 41].

[read more on page 18]



Pivoting Frame Guide

The SmartGuide.DF corrects the lateral offset of running materials. In combination with various sensors that are selected according to the material to be controlled, the unit guides the web to its correct position.

[read more on page 20]

Smart Profile Measuring System

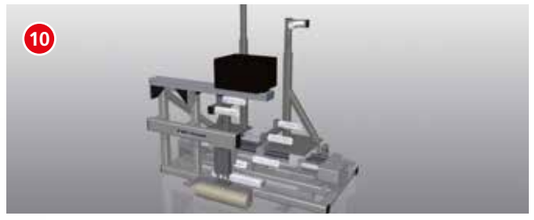
The 3-D Laser triangulation Profile Scanning System precisely controls the dimensions of the extruded treads or sidewalls.

[read more on page 30]

Winder Guiding System

The SmartGuide.WF ensures the controlled unwinding and rewinding of the material and the liner. Customized solutions can be realized due to a large range of proven components, such as sensors and actuators.

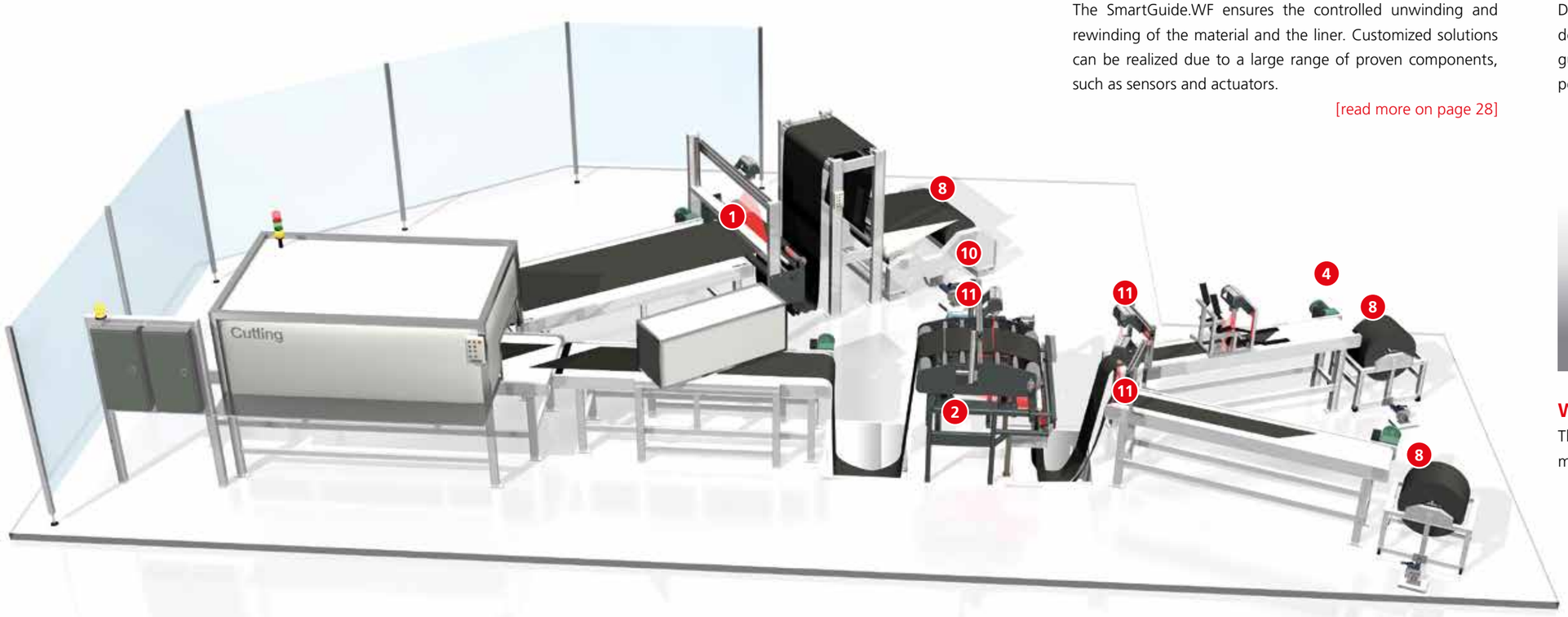
[read more on page 28]



Doubling

Depending of the tire design BST eltromat provides individual doubling solutions on the base of proven components and guiding technologies and in combination with the high performance camera CCD CAM 100.

[read more on page 36]



Width Measurement

The CCD CAM 100 system precisely measures the widths of material in reflecting or back light mode.

[read more on page 37]

Doubling Lines

DOUBLING LINES

The CCD CAM 100 high-resolution cameras provide the ideal basis for perfect doubling. In conjunction with BST eltromat web tension measuring systems and intelligent actuators, high-precision results can be achieved in the doubling of primary materials. On the winder, web guide controllers and web tension control systems ensure winding with straight edges and gentle liner handling.

Smart Profile Measuring System

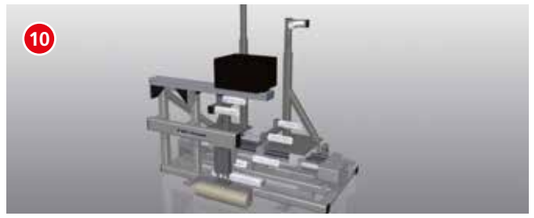
The 3-D Laser triangulation Profile Scanning System precisely controls the dimensions of the extruded treads or sidewalls.

[read more on page 30]

Winder Guiding System

The SmartGuide.WF ensures the controlled unwinding and rewinding of the material and the liner. Customized solutions can be realized due to a large range of proven components, such as sensors and actuators.

[read more on page 28]



Doubling

Depending of the tire design BST eltromat provides individual doubling solutions on the base of proven components and guiding technologies and in combination with the high performance camera CCD CAM 100.

[read more on page 36]

Web Tension Measuring Systems

The BTL Load 100-500 cells control the tensions of the rubber material and the textile cord during their run through the calender line.

[read more on page 46]

Laser Marker

Based on the recipe data the Lasermarker LPS100 indicates the correct edge position of the material.

[read more on page 47]

Conveyor Guiding

In combination with various sensors that are selected according to the material to be controlled, the actuators control the conveyor belts to bring the material to its correct position.

TIRE BUILDING MACHINES

A precisely-positioned material infeed from the unwinder, accurate web guiding from the loop, high-precision web guiding in the immediate vicinity of the drum on the ply server, and intelligent geometry-related control algorithms on the belt server represent the key components of the BST eltromat control systems developed espcially for tire building machines. The base element of these control systems is the high-resolution CCD CAM 100 camera.

Winder Guiding System

The SmartGuide.WF ensures the controlled unwinding and rewinding of the material and the liner. Customized solutions can be realized due to a large range of proven components, such as sensors and actuators.

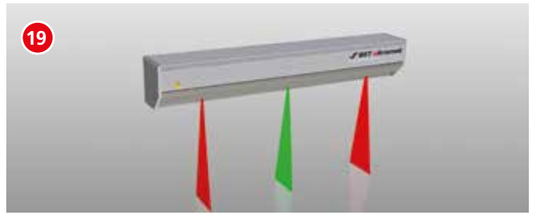
[read more on page 28]

Alternative:

Guiding from the Loop

Realizes edge or center-line guiding of material webs. A lateral movement of the roller corrects the material position. The principle is specially made for start – stop applications.

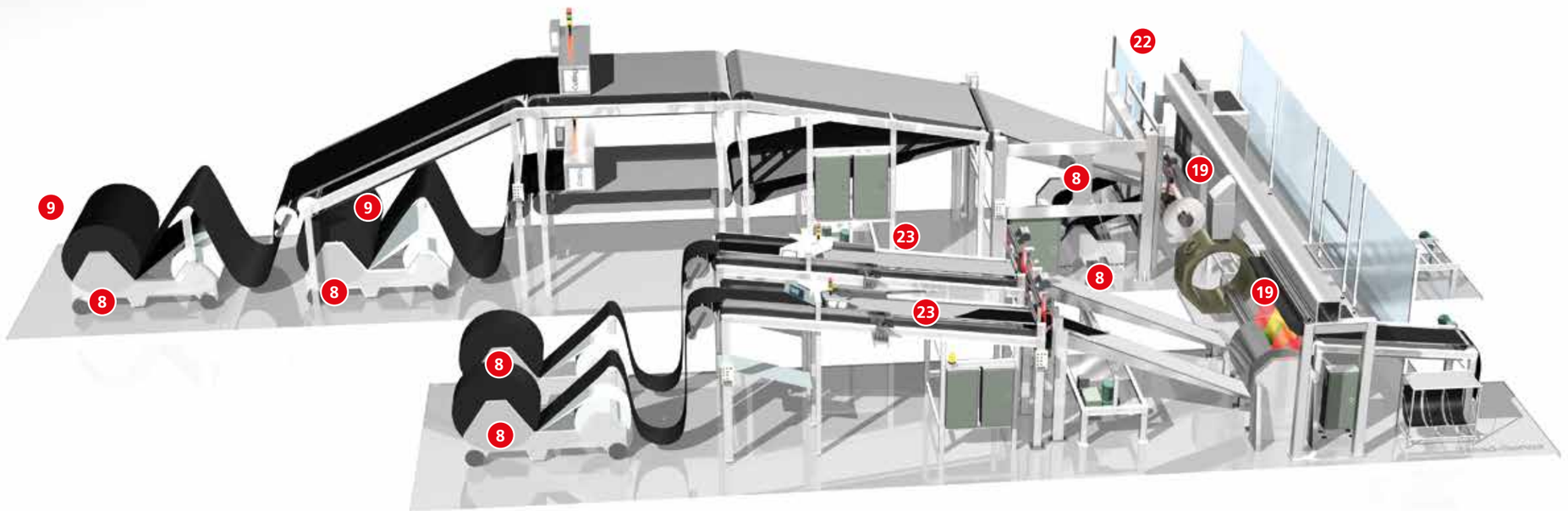
[read more on page 25]



Laser Marker

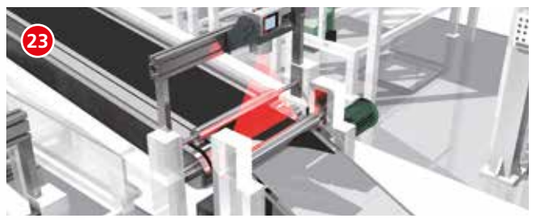
Based on the recipe data the Lasermarker LPS100 indicates the correct edge position of the material.

[read more on page 47]



Plyserver Guiding

The plyserver guiding system provides accurate material positioning due to light sources that are specially designed to be near as possible to the drum.



Beltserver Guiding

Intelligent software solutions with high performing mathematical procedures allow in combination with the high performance camera CCD CAM 100 the maximum belt guiding precision.

// Products and Components for your Machine

SWIVELING ROLLER GUIDE

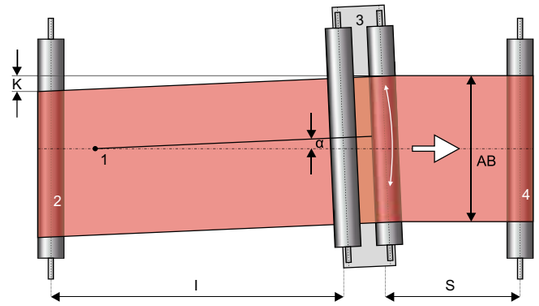
The SmartGuide.SF corrects the lateral offset of running product webs. In combination with various sensors, that are selected according to the material to be controlled, the actuator turns around an imaginary pivot point at the infeed side and transfers the web to the outfeed side in the correct position. The proportional / integral control algorithm permits a highly accurate and speed-independent web edge or center line guiding of the product web.

Options

- Version with 1, 2 or 3 rollers
- Version that can be moved in for applications on cassette winders
- Version for controlling from a loop
- Integrated web tension measurement

System accuracy

Depending on the sensor used the achieveable system precision can be less then 1 mm.



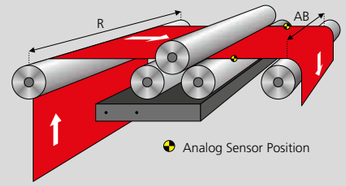
Key

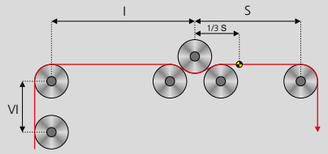
K	web travel correction	1	pivot point (virtual)
AB	operation width	2	entry roll
α	correction angle	3	pivoting frame
		4	exit roll

Components of the SmartGuide.SF

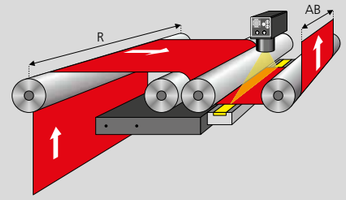
Sensors	The sensors detect the position of the material. Analog sensors, full width sensors or CCD digital cameras are used.
Drive	The drive moves the actuating element into the required correction position.
Controller	The controller processes the sensor signals and controls the actuating element drives. It also communicates with other BST eltromat controllers and higher-level logic systems.

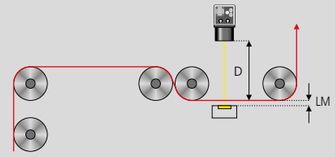
3-roll swiveling roller guide (SF) with analog sensors



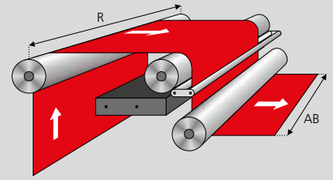


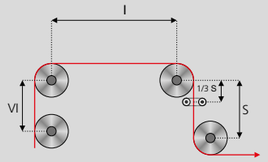
2-roll swiveling roller guide (SF) with CCD Camera





Single roll swiveling roller guide (SF) with full width sensor





Dimensioning of the control system

Special features and notes

AB = Working width:
The working width **AB** is the width of the material to be processed. There is a differentiation between maximum working width (**ABmax**) and minimum working width (**ABmin**).

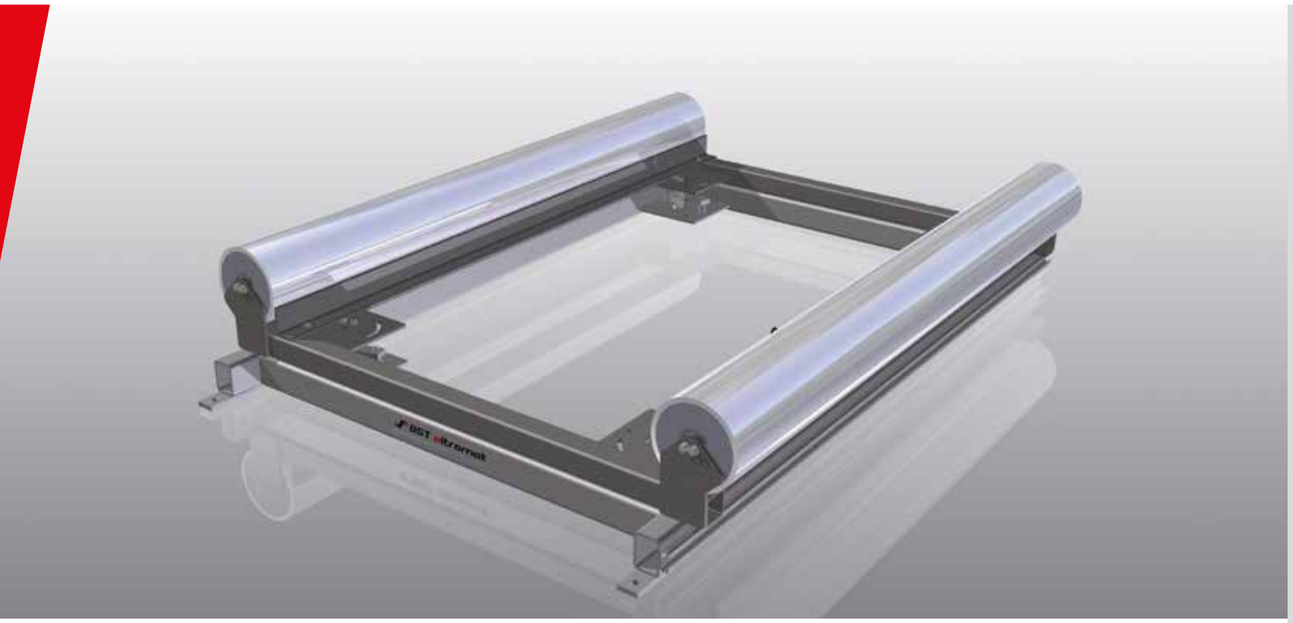
I = Infeed path and S = outfeed path:
The infeed path **I** and the outfeed path **S** are material-dependent. For materials typical of tire production, we recommend twice the maximum material width **ABmax** for the infeed path **I** and the maximum material width **ABmax** for the outfeed path **S**.

VI = Preliminary infeed path:
To minimize any retroactive effect of the swiveling roller guide on the material running in, and to prevent the control system overshooting, the preliminary infeed path **VI** must be made considerably shorter than the infeed path **I**.

R = Roller width:
The roller width **R** is the width of the rollers.

LM = Camera distance to the light source:
The camera distance between the lower edge of the material and the upper edge of the light source.

D = Camera distance to material:
D is the camera distance between the lower edge of the material and the lower edge of the camera lens. The distance required is calculated using the lens opening angle and the material width. **D** must not be less than 500 mm. If the required space is not available, a two camera system must be installed.

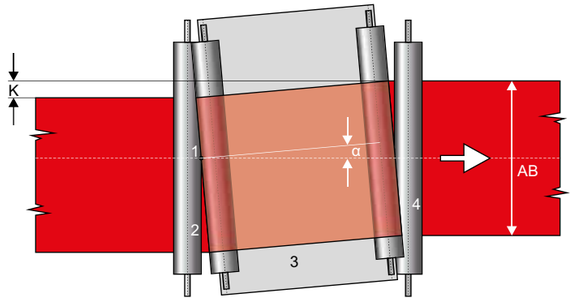


PIVOTING FRAME GUIDE

The SmartGuide.DF corrects the lateral offset of running product webs.

In combination with various sensors, selected according to the material to be controlled, the actuator turns around its pivoting point at the infeed side and transfers the web to the outfeed side in the correct position.

The proportional / integral characteristic behavior permits a highly accurate and speed-independent web edge or center line guiding of the product web.



Key

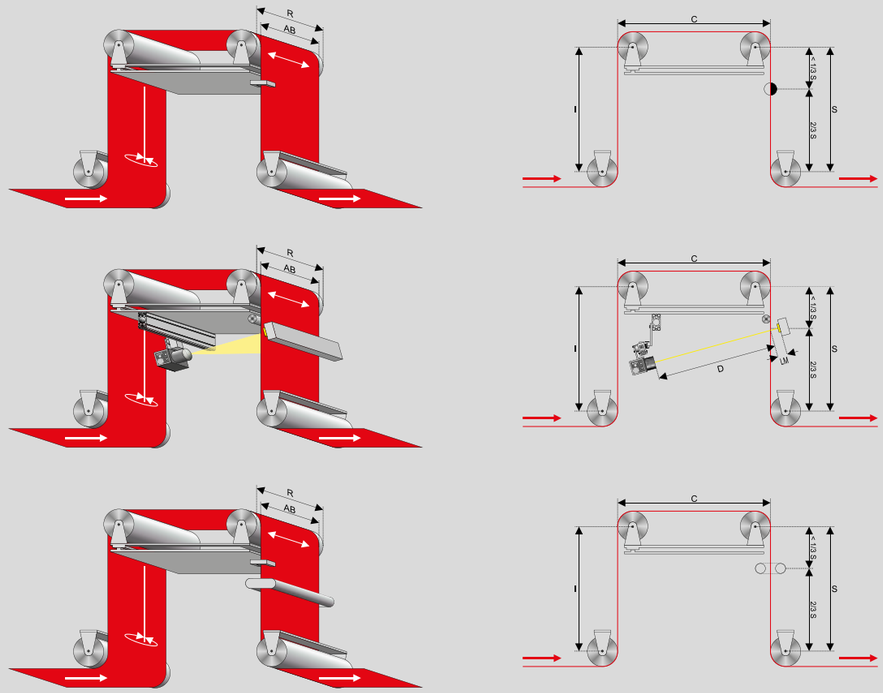
K	web correction	1	pivot point (virtual)
AB	operation width	2	entry roll
α	correction angel	3	pivoting frame
		4	exit roll

System accuracy

Depending on the sensor used the achieveable system precision can be less then 1 mm.

Components of the SmartGuide.DF

Sensors	The sensors detect the position of the material. Full width sensors or CCD digital cameras are used.
Drive	The drive moves the actuating element into the required correction position.
Controller	The controller processes the sensor signals and controls the actuating element drives. It also communicates with other BST eltromat controllers and higher-level logic systems.



Dimensioning of the control system with analog sensors

Special features and notes

AB = Working width:
The working width **AB** is the width of the material to be processed. There is a differentiation between maximum (**ABmax**) and minimum working width (**ABmin**).

I = Infeed path and S = outfeed path:
The infeed path I and the outfeed path S are material-dependent. For materials typical of tire production, we recommend twice the maximum material width **ABmax** for the infeed path I and the maximum material width **ABmax** for the outfeed path **S**.

C = Correction length:
The correction length is approximately equal to **ABmax**.

R = Roller width:
The roller width **R** is the width of the rollers.

LM = Camera distance to the light source:
The camera distance between the lower edge of the material and the upper edge of the light source **LM**.

D = Camera distance to material:
D is the camera distance between the lower edge of the material and the lower edge of the camera lens. The distance required is calculated using the lens angle and the material width. **D** must not be less than 500 mm. If the required space is not available, a two camera system must be installed.

EDGE SPREADING SYSTEM TRIOKANTER

A correct textile cord width and homogeneous cord distribution are decisive prerequisites for a high quality of preliminary products in the calendaring process. The Triokanter spreads textile cord apart at the edge areas.
It is a control device that operates proportionally / integrally. Only this process generates a high-precision and, in particular, speed-independent control result. The control intensity is defined by the three-edge fingers spreader's mechanical skew, which can be finely adjusted.

Application areas

Textile cord calender in tire production and hot stretching systems in textile cord production.

Options

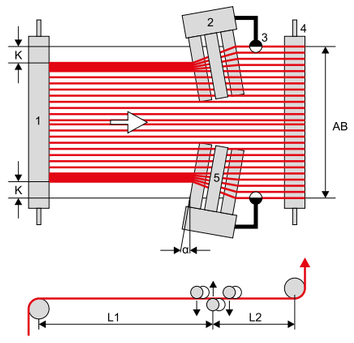
Data communication with web guide controller DF and double expander in the BST eltromat control system calender.

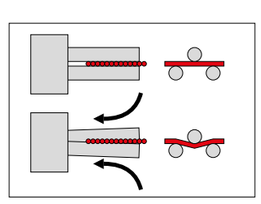
Special features

The material web must be guided straight through the three rollers. The outfeed path after the three-fingers spreaders should be kept as short as possible to keep the shrinkage of the material after the controller as low as possible. For greater material width adjustments (material change), the three-fingers spreader must be repositioned according to the new material edges.

System accuracy

Depending on the sensor used the achieveable system precision can be less then 1 mm.





Function
Speed independent, high positioning accuracy through to 2-axis movement of the guiding rolls

Key

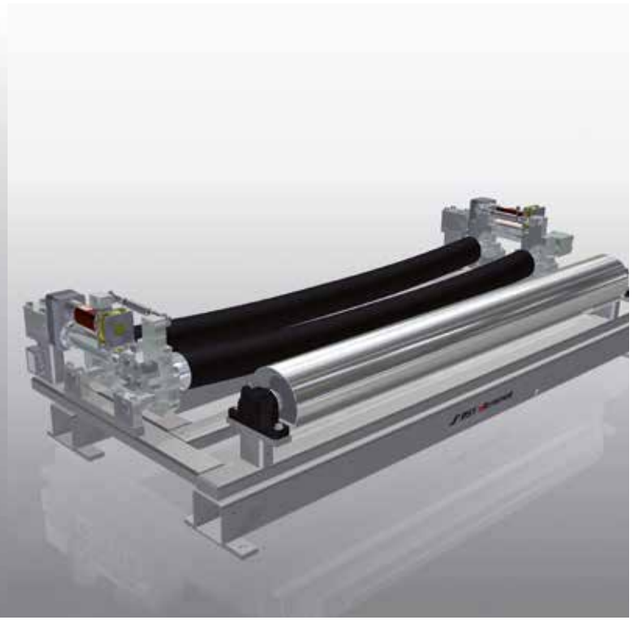
K	correction	1	entry roll
α	cant angel	2	edge spreader
L1	entry span	3	sensor
L2	exit span	4	exit roll
AB	operational width	5	plunge roll

Components of the Triokanter

Sensors	The sensors detect the position of the material. Analog sensors are used.
Drive	The drive closes or opens the 3 fingers and moves them lateral.
Controller	The controller processes the sensor signals and controls the actuating element drives. It also communicates with other BST eltromat controllers.

DOUBLE EXPANDER

Correct width and homogeneous distribution of textile cord are decisive prerequisites for the best quality of preliminary products. The spreading system implements these requirements with high accuracy and reliability. It operates in combination with downstream and upstream BST eltromat controllers for control purposes. It regulates the material width and position with two curved spreader rollers that, depending on the measured material width and material position, can be swung onto and away from the material by an actuator.



Application areas

Textile cord calender in tire production and hot stretching systems in textile cord production.

Options

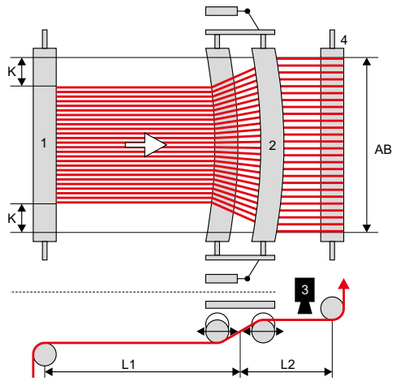
- Scanning with CCD camera sensor
- Scanning with full width sensor
- Output of material width and position
- Stand alone or data communication for fully integrated processes

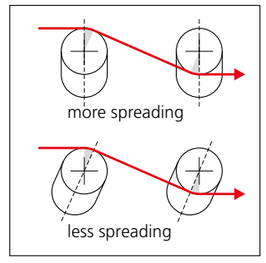
Special features

The infeed path **L1** – the distance between the last fixed roll in front of the spreader unit and the first spreader roller – should be approx. twice the average working width. The outfeed path **L2** after the last roll of the spreader system to the next processing station should be as short as possible to prevent the material from shrinking.

System accuracy

Depending on the sensor used the achieveable system precision can be less then 1 mm.





Key

K	correction	1	entry roll
AB	operational width	2	spreading system
L1	entry span	3	camera or full width sensor
L2	exit span	4	exit roll

Components of the Double Expander

Sensors	The sensors detect the position of the material. Full width sensors or CCD digital cameras are used.
Drive	The drive turns spreader rollers into the required correction position.
Controller	The controller processes the sensor signals and controls the drives. It also communicates with other BST eltromat controllers and higher-level logic systems.

DOUBLE EXPANDER HT100

Homogeneous cord distribution during the textile cord production is essential for a high tire cord quality. The specially-designed spreading and web guiding system for textile cord regulation is made up of two sets of rollers. As the upper rollers plunge between the two lower, fixed rollers, the cord is brought into contact with the rollers to a greater or lesser extent. As a result of this contact, and in conjunction with the special roller surface, a transverse deviation of the web occurs, which has a spreading and control effect. In combination with the BST eltromat full width sensor, this forms an accurate, maintenance-free and extremely robust web guiding system.

Special features

The infeed path – the distance between the last fixed roll in front of the spreader unit and the first spreader roller – should be approx. twice the average working width. The outfeed path after the last roll to the next processing station should be as short as possible to prevent the material shrinking.

Application areas

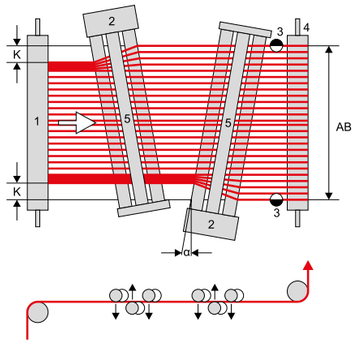
Tire cord treating lines (DIP-Lines)

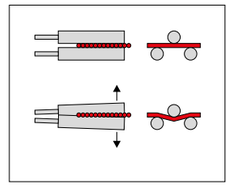
Options

- Scanning with CCD camera sensor
- Scanning with full width sensor

System accuracy

Depending on the sensor used the achieveable system precision can be less then 1 mm.





Function

Key

K	correction
α	pivot angle
AB	operational width
1	entry roll
2	plunge side
3	sensor
4	exit roll

Components of the Double Expander HT100

Sensors	The sensors detect the position of the material. Full range sensors or CCD digital cameras are used.
Drive	Each drive brings one of the three rollers more or less in contact with the material.
Controller	The controller processes the sensor signals and controls the actuating element drives.

SWIVELING-SLIDING ROLLER

The Swiveling-Sliding Roller SRD is used for edge or center-line guiding of materials.

The material running in the machine is accurate guided by a lateral adjustment of the positioning roller to the target material position.

Special features

A fixed roller or a conveyor belt, must be provided behind the swiveling-sliding roller. The distance between the positioning roller and the next roller or the conveyor belt is typically $^1/_3$ of the maximum working width, but depends on the material and the incoming error. Since the SRD control system offers solely proportional control, it is only suitable for machines that operate intermittently. During downtime, the material is raised by the free-running roller and the positioning roller moves to the central position.

Application areas

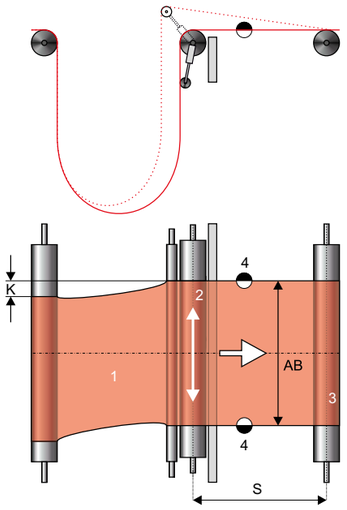
Tire building machines and cutters

System accuracy

Depending on the sensor used the achieveable system precision can be less then 1 mm.

Sensors

- Analog IR sensors
- Digital camera CCD CAM 100 for edge scanning
- Sensors for detecting V marks
- Full range sensors



Key

K	correction
AB	operational width
S	exit span
1	material loop
2	sliding roller
3	exit roll
4	sensors or camera

Options

- Manually-operated sensor adjustment device HFVG
- Motorized sensor adjustment device with automatic edge detection FVG
- Swiveling-sliding roller with alternative pneumatic cylinder attachment

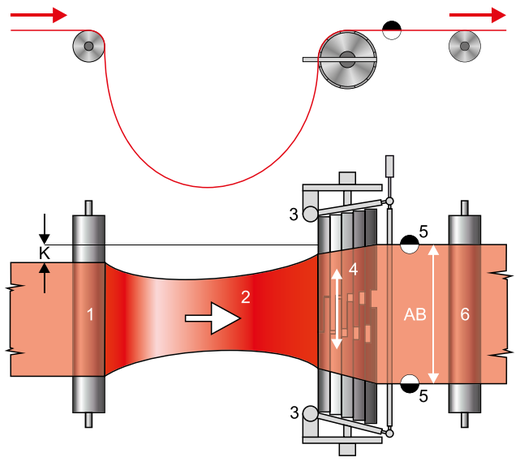
Components of the Swiveling-Sliding Roller SRD

Sensors	The sensors detect the position of the material.
Drive	The drive moves the positioning roller into the required correction position.
Controller	The controller processes the sensor signals and controls the actuating element drives.

SLATTED ROLL GUIDE

The SmartGuide.RS consists of a system of slats that move in axially direction during the rotation of the roller.

The slats are connected with a guiding plate. The guide plate angle is changed and is controlled with a drive. The offset of the material achieved by this axial movement of the slats is used for the guiding process. The system provides an accurate and reliable rubber stripe guiding.

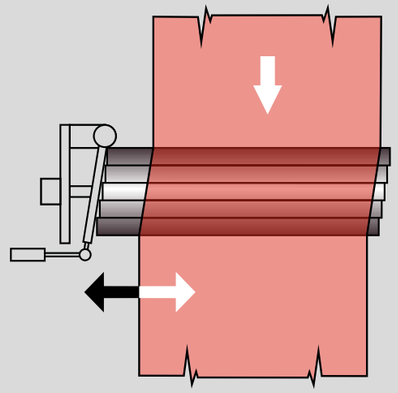


Key

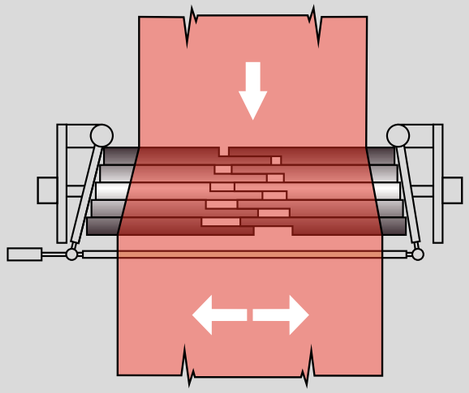
K	correction	1	entry roll
AB	operational width	2	material loop
		3	swivel axis
		4	slatted roller
		5	sensors
		6	exit roll

Components of the SmartGuide.RS

Sensors	The sensors detect the position of the material. Full range sensors or CCD digital cameras are used.
Drive	The drive turns the guiding plate into the required correction angle.
Controller	The controller processes the sensor signals and controls the actuating.



web guiding only



web guiding with spreading

Application areas

- Guiding the longitudinal cut on steel cord cutters
- Guiding from the loop with doubling systems
- Guiding from the loop at the material infeed on tire building machines

Special features

- Material-friendly
- Accurate
- Easy to use

System accuracy

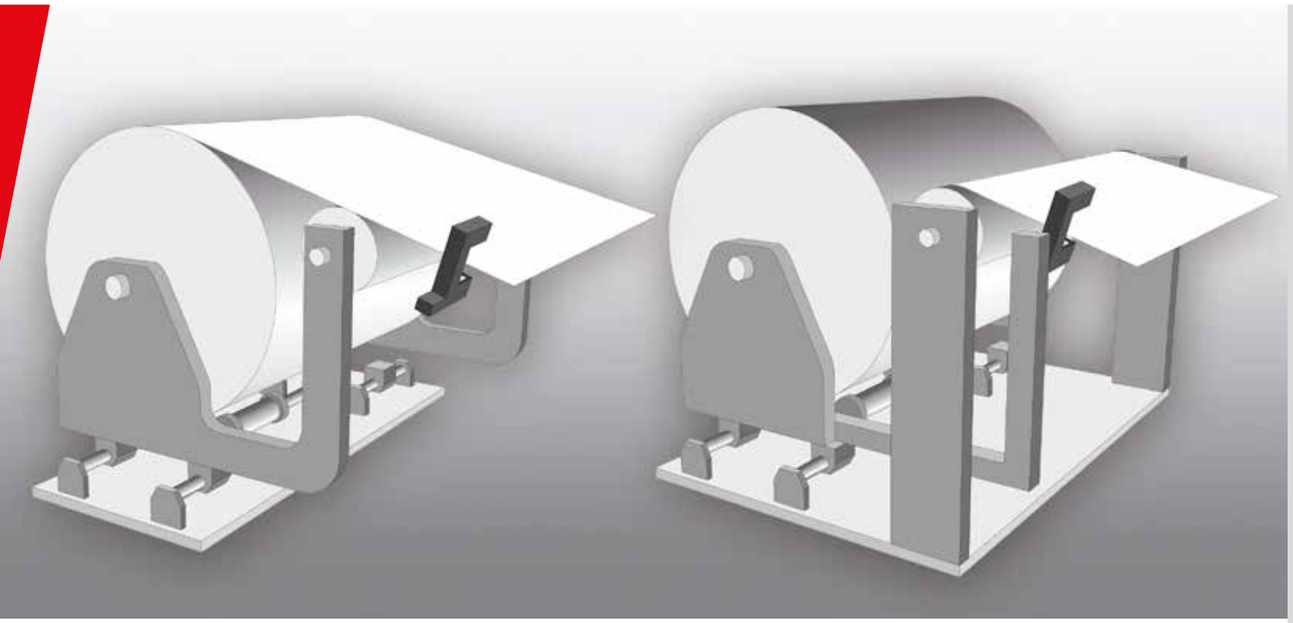
Depending on the sensor used the achieveable system precision can be less then 1 mm.

Application

The centering roller works in combination with the applicable sensors for the respective application. For high accuracy guiding, e.g. the longitudinal cut on steel cord scissors or guiding from the loop in the case of doubling systems, the centering rollers work together with the high-resolution BST eltromat camera CCD CAM 100. For systems with less strict requirements in terms of the positioning accuracy, the system operates with the BST eltromat full width sensor or other sensors. The additional drive on the centering roller ensures that the product is handled in a low-tension and product-friendly manner, in particular from the loop.

Technical data

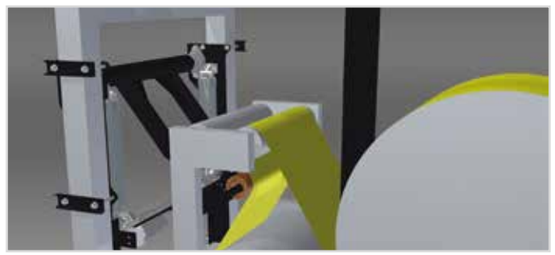
Working width	400 mm up to 2,500 mm
Max. working speed	150 m/min
Bar material	Steel or stainless steel
Operation voltage	400 V AC, 50 Hz, other voltages are available
Drive	Brushless DC actuator
Working area temperature	0 to 60 °C



WINDER CONTROL

When unwinding a web, the material should run into the machine in defined position. At the end of the machine the material should be rewound in optimum quality to make the material positioning at the subsequent process machines more easily.

The BST eltromat unwinder and rewinder web guiding systems allow precise material guiding with application dependent sensors, controllers and actuators.



Customized cassette liner winding version available

Use

Static and minor dynamic errors in the position of the incoming material

Application areas

All unwinder and rewinder applications

Options

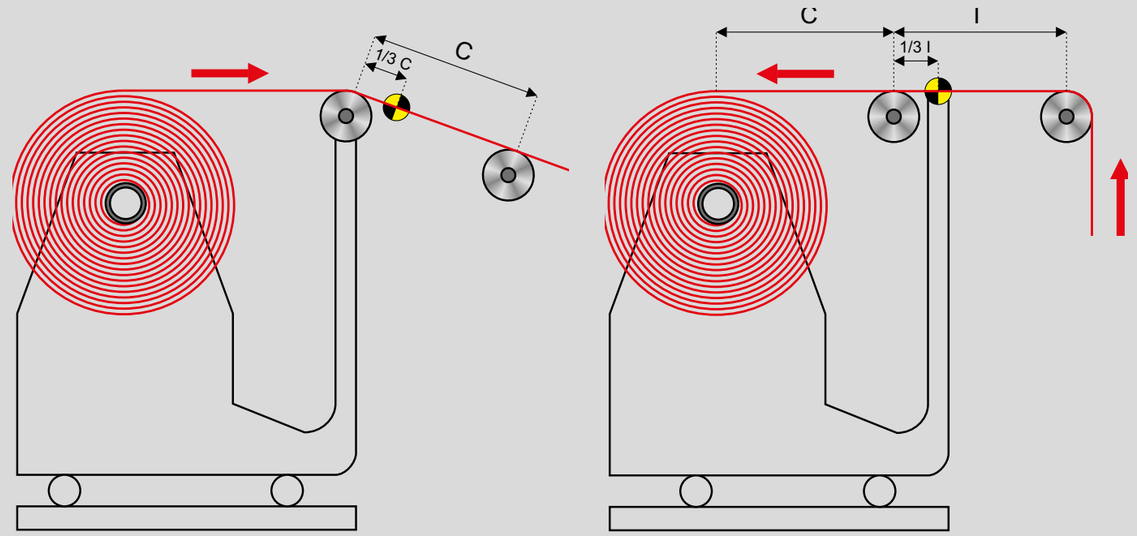
- Rewinder control with CCD cameras
- Manually-operated sensor adjustment device HFVG
- Motorized sensor adjustment device FVG with automatic edge detection

System accuracy

Depending on the sensor used the achieveable system precision can be less then 1 mm.

Components of the Winder Control

Sensors	The sensors detect the position of the web. Analog sensors, full range sensors or CCD digital cameras are used.
Drive	The drive moves the winder stand or positioning rollers into the required correction position.
Controller	The controller processes the sensor signals and controls the actuators. Optionally it communicates with other BST eltromat controllers or PLCs.



Dimensioning of the control system

Special features and notes

I = Infeed path (Rewinder):

The infeed path **I** (that is the distance between the two last fixed rollers in the machine) depends on the material. It should be approx. 0.5 to one times the maximum working width. The sensor should be mounted in the last third of the infeed path.

C = Correction path (Rewinder):

The correction path **C** (the distance between the last machine roller and the the winder) depends on the material. It should be approx. 0.5 to one times the maximum working width.

C = Correction path (Unwinder):

The correction path **C** (the distance between the last roller of the winder stand and the first machine roller) depends on the material. It should be approx. 0.5 to one times the maximum working width.

AB = Working width:

The working width **AB** is the width of the material to be processed. There is a differentiation between maximum (**ABmax**) and minimum working width (**ABmin**).

Infeed and correction paths:

The infeed and correction paths are decisive for the control process to produces good results and gentle guiding of the material. Paths that are too long reduce the control accuracy. Paths that are too short lead to damage to the material.

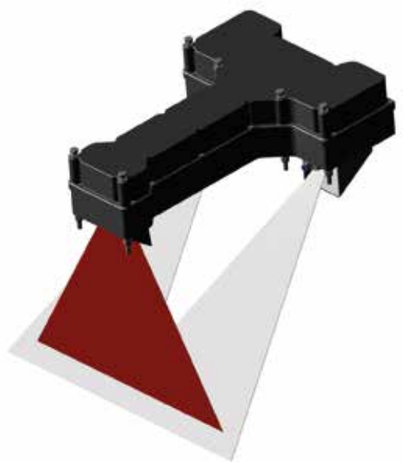
Smart Inline Profile
Measuring System CS200

Smart Offline Profile
Measuring System CS100

SMART PROFILE MEASURING SYSTEM

The smart profile measuring system is used for the high-precision measuring of extruded semi-finished products for tire production. It is primarily intended for use on extrusion systems for treads or side walls, directly after the extruder and after cooling.

It uses the contact-free 3D laser triangulation method and projects a laser line onto the material. This laser line is detected and processed by CCD cameras. By applying different methods of filtering and signal processing, a high-precision representation of the cross-section of the extruded material is produced.



Special features

Both the operator panel and the profile measuring system can be adapted for mobile use and used at different measuring positions. The measuring heads can be fitted in such a way that the height may be varied. A compressed air adapter allows the sensors to be kept clean and cool.

Options

- Depending on the material the width variants with 2 or 4 measuring heads
- Thanks to the modular construction, different working widths can be implemented in combination with standard sensors
- The software offers comprehensive options for processing the signal, e. g.:
  - an alarm when specified limit values are exceeded
  - quality reports, etc.

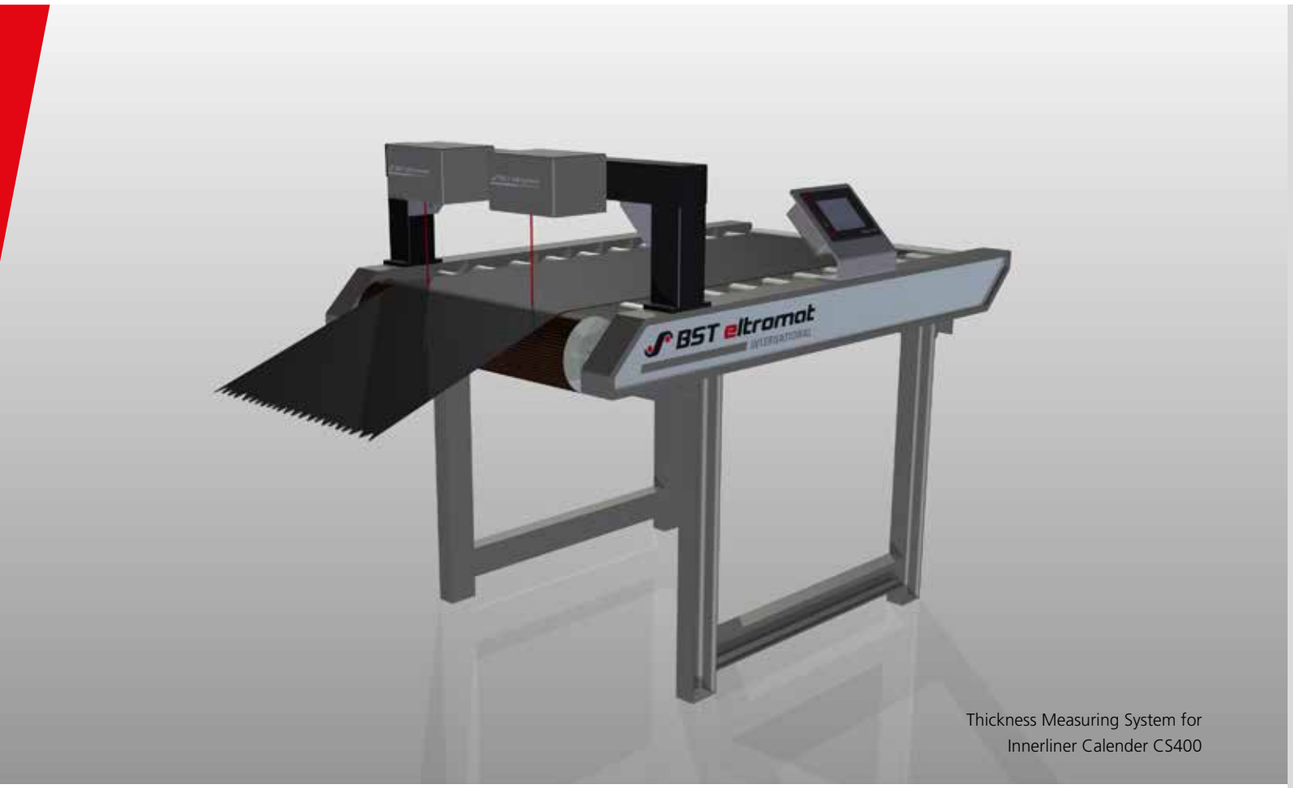
Display

Technical Data Inline-Version CS200

Working width	530 mm or 1,000 mm
Measuring resolution	> 0.05 mm
Measuring frequency	50 Hz
Vertical measuring accuracy	0.1 mm
Horizontal measuring accuracy	0.17 mm
Protection class	IP 54
Working area temperature	0 to 50 °C without cooling

Technical Data Offline-Version CS100

Working width	1,000 mm
Measuring resolution	> 0.05 mm
Measuring frequency	16 kHz
Vertical measuring accuracy	0.025 mm
Horizontal measuring accuracy	0.05 mm
Protection class	IP 54
Working area temperature	0 to 50 °C without cooling



Thickness Measuring System for Innerliner Calender CS400

THICKNESS MEASURING SYSTEM FOR INNERLINER CALANDER

The exact material thicknesses in the innerliner production process are the basis for the best product quality. BST eltromat thickness measuring systems especially developed for innerliner applications, offer high accuracy, reliability and simplicity. Depending on the application, different versions are available.

Technical data CS400

Measurement Range	Customized
Clearance distance	Standard 100 mm
Resolution	0.01 mm
Laser Class	2 (ref EN 60825-1 and IEC 60825-1)
Spot Size	2 mm
Interface	Ethernet
Protection class	IP 67
Working area temperature	0 to 50 °C without cooling

Application areas

Innerliner calender lines

Options

- Using 3D laser triangulation technology thickness measurement in combination with width measurement
- Direct measurement with four 2D single spot laser sensors
- Measurement on a roller with two 2D single spot laser sensors

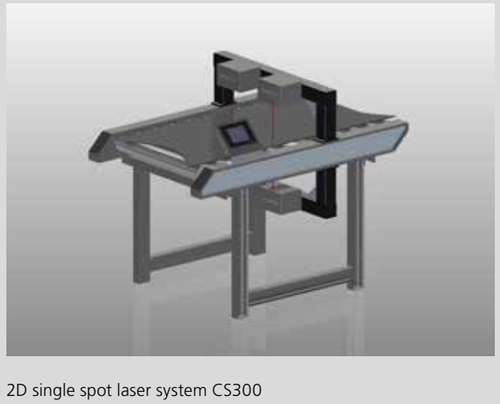
Special features

Three systems are available. All systems are using laser sensors for the measurement thickness. The high-end version with the 3D laser sensor offers up to 60 thickness measuring positions and a contemporarily width information.

The 2D single spot laser systems offer direct material measurement from the top and the bottom or a one side measurement on a roller.

All versions allow data display, tolerance setting, alarm output and optional data communication with the customers PLC.

3D laser triangulation system CS500



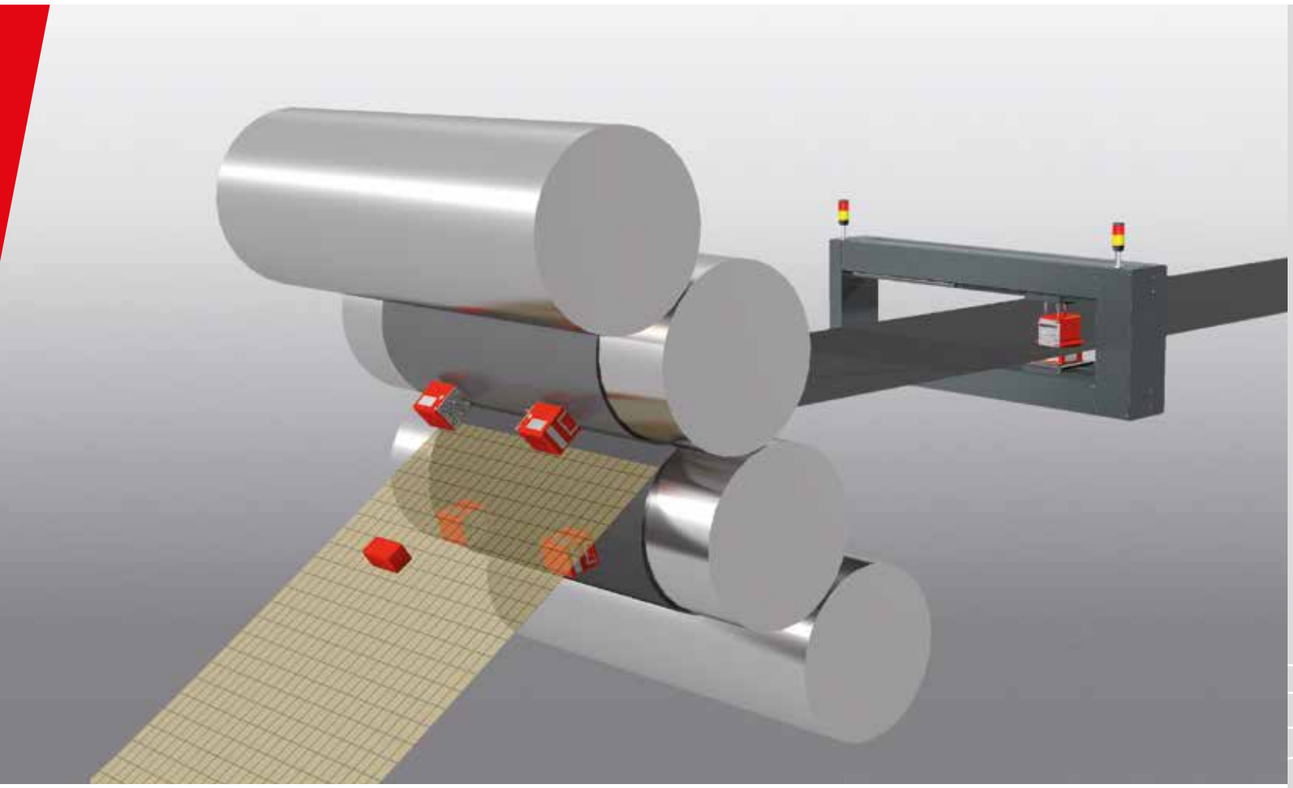
2D single spot laser system CS300

Technical data CS500

Working width	530 mm or 1,000 mm
Measuring resolution	> 0.05 mm
Frequency measurement	50 Hz
Vertical measuring accuracy	0.1 mm
Horizontal measuring accuracy	0.17 mm
Protection class	IP 54
Working area temperature	0 to 50 °C without cooling

Technical data CS300

Working width	1,000 mm
Measuring resolution	> 0.05 mm
Frequency measurement	16 kHz
Vertical measuring accuracy	0.025 mm
Horizontal measuring accuracy	0.05 mm
Protection class	IP 54
Working area temperature	0 to 50 °C without cooling



THICKNESS MEASURING SYSTEM FOR RUBBER CALENDER

Exact material thicknesses in the calender process are the basis for a high end product quality in tire production. The BST eltromat ProControl Indicon thickness measuring system makes it possible to determine the thickness of individual rubber plates on the top and bottom calender rollers and of the calendered material after the calender. High-precision, low-level radioactive isotopic sensors or laser sensors are used for measuring.

The values of the individual measuring positions are evaluated in a controller. In the data exchange with the calender controller, the positions and the axis positions of the calender rollers can be controlled over several closed control circuits. Comprehensive software tools are available for processing the measurement values in process data management systems.

Measuring system with an optical thickness sensor ‚Shadex'

Technical data rubber calender

Working width	500 mm … 2,500 mm
Measuring accuracy	0.01 mm
Frequency measurement	50 Hz
Protection class	IP 65
Max. work temperature	70 °C with air cooling
Max. humidity	95 %, non-condensing
Compressed air	6 bar, consumption, approx. 2 m^3 / h

Technical data measuring system ‚shadex'

Measuring range, typical	0 - 5.000 µm or 0 – 10.000 µm
Measuring accuracy, typical	+/- 3 µm or +/- 6 µm
Repeatability	0,25 %
Light source	Laser, class II
Wavelength	780 nm
Power	3 mW
Measuring spot (CD x MD) depending on application	1 x 5 mm, 1 x 10 mm (1 x 30 mm)
Ambient temperature	0....+45 °C
Max. Humidity	90 %, non-condensing

Options

- Versions with either two or three fixed sensors on the calender rollers
- Version with one traversing sensor on the calender rollers
- Single system, only for thickness measurement on the rollers or after the calender

Sensors

- Low-level radioactive isotopic sensors (Strontium 90; 0.37 GBq, type X.117)
- Laser-Triangulation-Sensors

The measurements in detail

- Measurement of the top and bottom rubber plate directly on the calender rollers
- Measurement of the total thickness or the weight per unit area
- Determination of the steel cord height position within the overall composition
- Measurement of the humidity of the textile cord in front of the calender

The control procedures in detail

Different control algorithmes can be implemented for a calender:

- Gap control
- Bending control
- Cross axis control
- Wire position control
- Cascade control

DOUBLING CONTROL WITH CHASE & FOLLOW FUNCTION

Doubling systems permit different strips to be placed on top of each other with precise edge alignment. The doubling control places a slave strip symmetrically or asymmetrically on top of a master material. The application position is specified via recipes.

CCD cameras detect the position of the master material and guide the strip to be applied to the master material.The movement of the strips is carried out in two phases. The first phase is pre-positioning. The fine positioning of the strips is carried out in a second phase via a machine speed-dependent controller with higher-ranking disturbance elimination.

Special features

The special guiding principle of BST eltromat avoids the tilting of the material after the guiding roller and increases the system accuracy.

Application areas

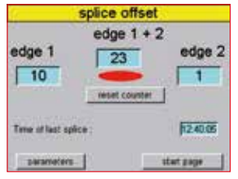
- Extrusion lines
- Calender lines
- Assembly lines

Options

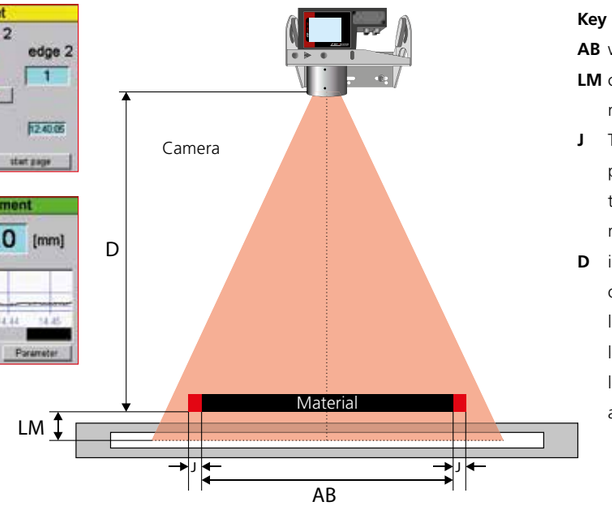
- Symmetrical doubling to the machine center
- Symmetrical doubling to the machine center with chase & follow function
- Monitoring
- Asymmetrical doubling to the machine center with chase & follow function

Components of the Doubling Control with Chase & Follow Function

Sensors	The sensors detect the position of the material. Analog sensors or CCD cameras are used.
Drive	Drive move correction rollers to the required position.
Controller	The controller processes the sensor signals and controls the actuating element drives.



Display



Key

AB working width of the material to be processed.

LM camera distance between the lower edge of the material and the upper edge of the light source **LM**.

J The running-in fault **J** is the max. incoming position error compared to the set position at the measuring points. It must be factored in as a measuring range extension on both sides.

D is the camera distance between the lower edge of the material and the lower edge of the camera lens. The distance required is calculated using the lens angle and the material width. **D** must not be less than 500 mm. If the required space is not available, a two camera system must be installed.

WIDTH MEASUREMENT WITH SPLICE OFFSET DETECTION

The BST eltromat width measurement can be used to measure material widths using the reflected light or transmitted light procedure. The material edges detected by the camera or the sensors are converted to web width values in a controller. The width values can be displayed on the device or via large displays, or transferred to a higher level controller.

Measuring range / working width

One or two cameras are used depending on the maximum material width. When using analog sensors, two sensors are used, regardless of the working width. These are mounted on sensor positioning devices with diverse specifications.

Splice offset detection

With splice offset detection, splice offsets are detected at the material edges. The number of faults determined per material edge and the time of the last fault occurring is represented on the display or transferred to a higher level process control system. Typical application of width measurement using the BST eltromat operating and display device Protouch.

Options

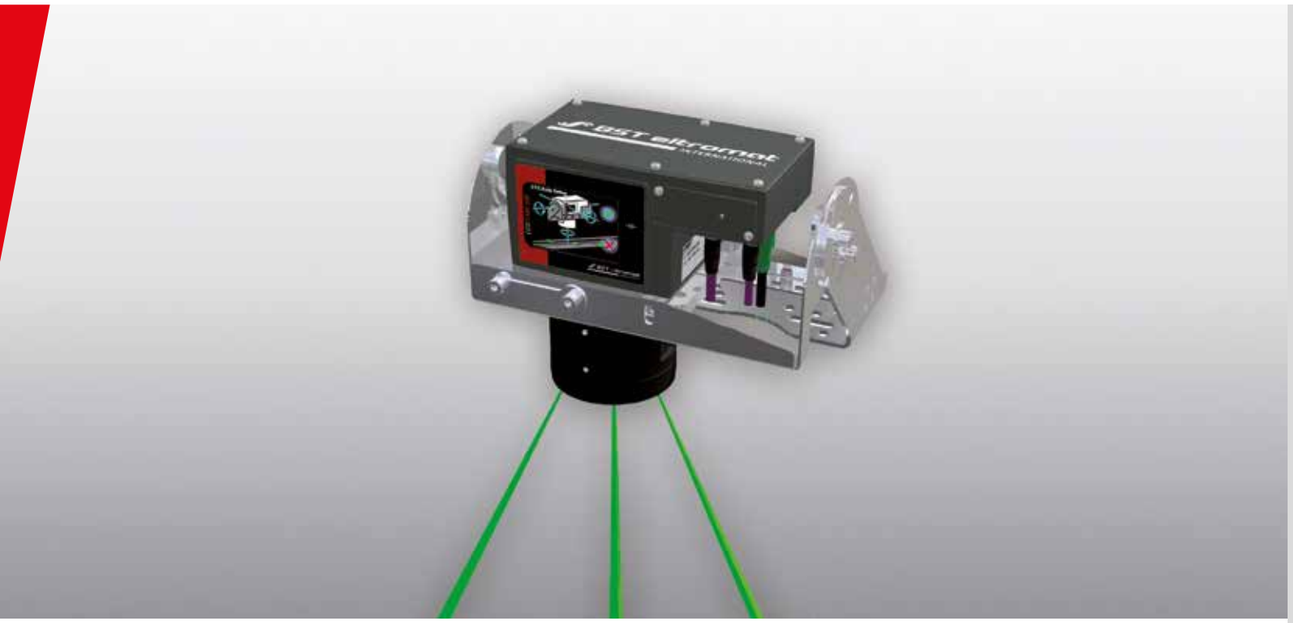
- Data exchange via Ethernet, other interfaces on request
- Hardware extension output to a large display
- Splice offset detection
- Changing the language
- Material thickness compensation when using recipes
- Display of the width path for the previous minutes
- Sensor positioning device in the following variants: manual, symmetrically by motor or asymmetrically by motor
- Potential-free contacts for output of width fault messages
- Application-related programmable digital inputs and outputs, 24 VDC

System accuracy

up to 0.01 mm

Components of the Width Measurement with Splice Offset Detection

Sensors	Analog edge sensors or digital cameras detect the edge value of the material and transfer these to the BST eltromat controller.
Calibration template	The template is used to callibrate the measuring system.
Controller	The controller generates the width values using the edge values transferred by the sensors.

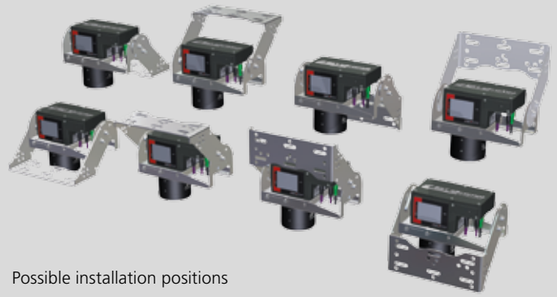


CCD CAM 100

High End CCD color line scan camera for high-resolution and quick detection of edges, elements and surfaces. 10,000 pixels physical resolution and up to 6-fold sub-pixel interpolation. High resolution paired with a high scanning rate – the ideal basis for accurate edge and center-line guiding, surface inspections, hole detection, width measurement, splice monitoring, cord inspection and other inspection tasks.

Components of the CCD CAM 100

Chip / physical resolution	Color chip RGB / 3 x 10,000 pixels
Max. resolution with interpolation	3 x 60,000 pixels
Scanning rate	up to 10 kHz
Lens	The measuring range can be varied using the zoom lens
Installation and setting aids	Representation of the measuring range using LED projection points
Connectivity	CAN-Bus, Ethernet (including POE Power over Ethernet)
Inputs / outputs	2 electric trigger inputs (isolated visually) 4 universal outputs
Parameter backup	Storage on an SD card
Color display 320 x 240 pixels with the following functions	Setting the parameters Representation of the operating modes Output of the video curve Output of error messages in clear text etc.
Operation / Set-up	Using the integrated touchscreen
Maximum number of edges that can be read	256 (only useful via Ethernet)
Connections	Via plug connectors
Compatibility	Functionally compatible with previous BST eltromat CCD cameras



Possible installation positions

Special features

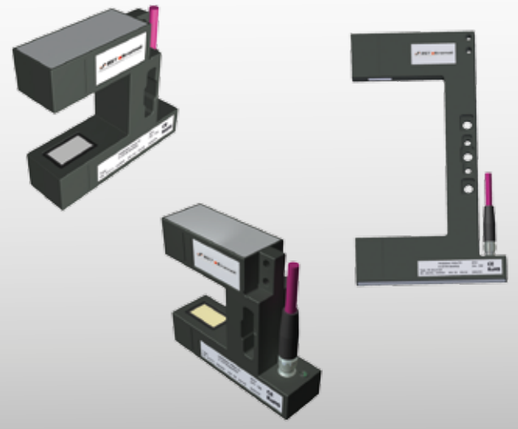
- Performance – High end camera
- Handling – as simple to use as a sensor

Quick setup

In addition to its excellent technical performance, the camera includes features that have been specially developed to ensure quick and simple installation, commissioning, maintenance and interchangeability, and also keep the commissioning time and downtimes to a minimum. The cameras are equipped with integrated LEDs that emit light via the lens. The interaction with the highly-simplified mechanical fine adjustment and other specially developed features permit a high-precision, simple and extremely quick installation or re-adjustment of the camera.

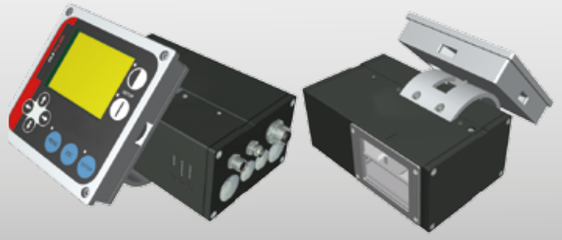
Features

Built-in LEDs	Three light spots are emitted via the lens' original optical beam path. This allows quick and accurate 3-axis adjustment of the camera to the material position.
Lens with variable zoom	In conjunction with the 3 light spots, the lens permits quick and accurate adaptation of the measuring width to the product width. The distance of the camera to the product can thus be varied within a wide range. This is beneficial both for new constructions and also when replacing cameras and with defined space conditions.
Backup on an SD card	All parameters are saved on an SD card. This reduces the downtimes when a camera is replaced in the event of maintenance.
Mechanical fine adjustment	Ergonomic – Simple – Precise: simple mechanical features are helpful during fine adjustment
Touchscreen	User navigation on the touchscreen simplifies the parameterization required for installation. (e. g., setting the IP address, definition of the function modes, etc.)

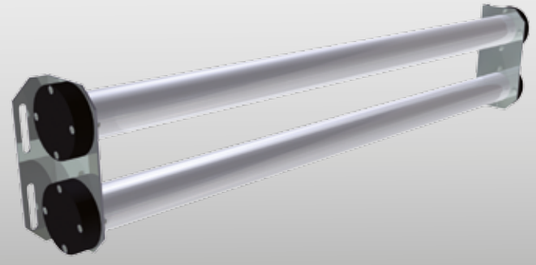


Optical Sensors (IR)

Reflective Sensors (RS)



CLS Pro 600 sensors



Full range sensor IR SEN 300

SENSORS

Properties of the Optical Sensors (IR)

The scanning of the web edge is carried out contact-free using light.

- Pulsed light (insensitive to ambient light)
- Height fluctuations of the material web in the measuring light beam have no influence on the measured values
- Optional flushing air connection protects the lens against soiling from paper dust or abrasion particles
- Large proportional measuring range also permits web center-line guiding with relatively large web width deviations

Application area Optical Sensors (IR)

- Semi-transparent and non-transparent materials
- Thick materials

Properties of the Reflective Sensors (RS)

The RS sensor range is used for the optical, contact-free detection of objects / edges on the basis of differences in contrast.

- Opto-electronic contrast sensor with reflector based on the CCD Line Chip Technology
- Analog output signal for use with BST eltromat control devices
- Selectable measuring modes: Contrast transition point (left/right), center measurement, width measurement
- No material matching necessary
- Insensitive to ambient light
- LED display of the measuring mode

Application area Reflective Sensors (RS)

- High-transparent and non-transparent materials
- Thick materials

Technical data

Sensor type	Design	Measuring range	Edges	Measuring media	Measuring distance
IR 2011	Fork width 40 mm / 70 mm	Analog: 12 mm Digital: 20 / 24 mm	1	LED (infrared)	
IR 2012	Fork width 125 mm	12 mm	1	LED (infrared)	
RS 20-B	Sensor with reflector	20 mm	1	LED (white)	25 (+/- 5) mm
RS 30-B	Sensor with reflector	30 mm	1	LED (white)	100 (+/- 10) mm
RS 22	Sensor with reflector	22 mm	1	LED (infrared)	0 – 200 mm
RS 150	Sensor with reflector	150 mm	1	LED (infrared)	200 mm
RS 350	Sensor with reflector	350 mm	1	LED (infrared)	500 mm

Properties of the CLS Pro 600 sensors

The scanning of the material is carried out contact-free by detecting light contrasts.

- Accurate scanning of lines, printing edges or web edges with color sensors
- Optimum lighting conditions from automatically controlled LED lighting
- Extremely reliable, even at the highest web guide speeds
- Clearly arranged display on the color display
- Simple operation from intuitive user navigation
- Positioning aid using a laser
- Convenient selection of the print line, print edge or web edge thanks to the colored display of the contrast transition points

Application area CLS Pro 600 sensors

- Guiding of the contrast edges
- Web edge or printed line

Properties of the full range sensor

The optical system measures the position of the material to be guided continuously and contact-free. The system comprises one opto-transmitter that radiates IR light, and one receiver whose receiving elements analyze the transition between the open and covered area. The measuring values are transferred to the web edge or web center guiding systems. Given the high luminosity of the IR sensor and the pulsed light there is a high insensitivity to ambient light.

Application area full range sensor

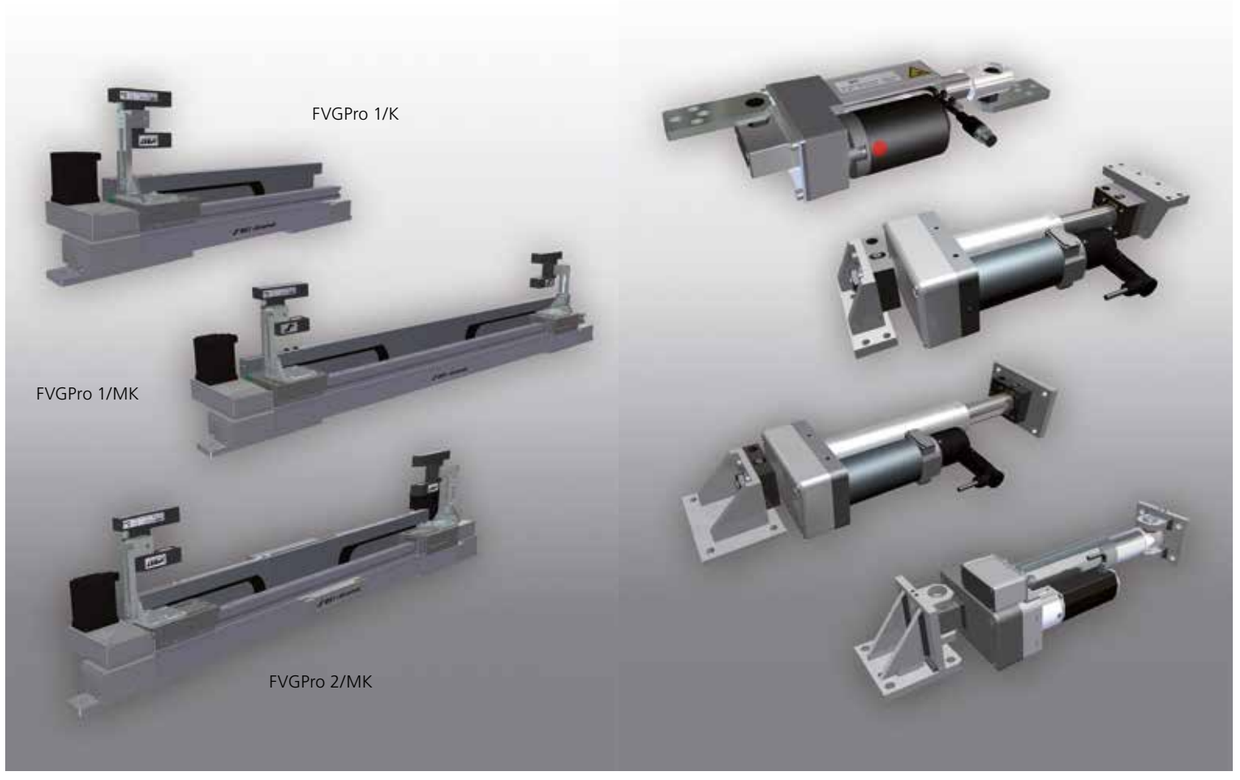
The system works in combination with BST eltromat web guide controllers in calenders and in guidings from the loop.

Technical data

Sensor type	Design	Measuring range	Edges	Measuring media	Measuring distance
CLS Pro 600	Camera	25 mm	2	LED (white)	25 mm
Full width sensor		1,400 – 3,000 mm		LED (infrared)	

SENSOR POSITIONING DEVICES

If the position of the sensor is difficult to access or the scanning position has to be changed frequently due to varying web widths, a BST eltromat sensor positioning device (FVG) undertakes the adjustment of the sensor position. Depending on the requirements, you are able to select from different automatic systems with electric motor drives.



Sensor positioning device FVGPro 2/MK

The FVGPro 2/MK sensor positioning devices are equipped with two sensor fixings and two separate drives which allows both sensors to be adjusted independently from one another. The device is used for both web edge guiding and web center-line guiding. Using a synchronous control of the drives, web displacement is possible over the entire range and is also recommended for (half) webs running off-center.

Sensor positioning device FVGPro 1/K

The simplest electric motor version of the sensor positioning device permits one sensor to positioned. It is used for web edge guiding.

Sensor positioning device FVGPro 1/MK

The FVGPro 1/MK sensor positioning device permits the positioning of two sensors at the same time. They are used for the web center-line guiding with a fixed web center. The position of the sensors is adjusted symmetrically to the center of the web in opposite directions using a driven positioning system.

Special features

- Accurate
- Easy to use
- Robust

Technical data

Type	Control	Function	Special functions
FVGPro 1/K	Web edge	Automatic edge detection	
FVGPro 1/MK	Two web edges with missing web center	Automatic edge detection	Web width measurement Web width setting
FVGPro 2/MK	Web edge / web center	Automatic web detection and guiding for edge 1, edge 2, web center (independent from one another)	Web width measurement Displacement of the center for (half) webs running off-center Web width setting

ELECTRIC MOTOR POWERED ACTUATORS

Electric motor powered actuators are used in all areas where very fast reactions have to made to changes in the web position. The actuator can be directly connected to the controller.

The ready-for-connection design permits quick and cost-effective assembly, which is also advantageous when retrofitting existing systems.

Application

Use the BST eltromat actuators in combination with our actuating elements for a variety of web guiding tasks. We offer electric motor powered drives with an actuating force of up to 9,000 N and strokes up to 300 mm in versions with and without position feedback.

The actuating forces of our hydraulic drives reach up to 20,000 N with different strokes.

Application areas

Position correction with the following web materials:

- Paper
- Synthetic materials
- Rubber
- Textiles

Special features

- Low-wear DC motors
- Ball screw spindle drives for high service life and minimum play
- Dimensioned for curved-shaped and linear actuating movements
- Different combinations of actuating path, actuating force and actuating speed are possible
- Available with and without position feedback (accurate detection of the current position of the actuating drive) as well as electronic end position switch-off
- Maintenance-free

Technical data

Actuator type	EMS 18	EMS 21	EMS 22	EMS 23
Nominal actuating force	420 / 840 N	840 / 1,680 N	1,125 / 2,250 N	9,000 N
Nominal actuating speed	10 / 20 mm/s	10 / 20 mm/s	10 / 20 mm/s	10 / 20 mm/s
Available stroke	50 / 100 / 200 mm	100 / 195 mm	195 mm	300 mm

CONTROLLERS AND INPUT DEVICES

BST eltromat controllers are used to process sensor signals and to control the EMS actuators.

In the most cases, the controllers are working in closed loops. In combination with the guiding systems, the BST eltromat controllers are working in proportional – integral regulation characteristics. The compact design and its easy operation characterize the EKR range of products.

The following models are available:

- ekr 500 digital
- ekrPro Com60
- ekrPro Com50

BST eltromat ProLogic System

The BST eltromat ProLogic top-hat rail module is a higher level logic unit, used for networking several control units and controllers. ProLogic modules can be easily incorporated, thanks to the space-saving housing.

The ProLogic system is made up of the following components:

- BST eltromat ProLogic CPU 32x
  (or BST eltromat ProLogic CPU 32x Compact)
- Diverse logic modules

BST eltromat ProLogic

- Application software tuned to the customer's needs
- High-performance processor
- Up to 4 separate CAN field buslines
- Can be integrated into Ethernet based networks
- Can be extended with different input and output assemblies

ProLogic

Special features

- Web guide controller
- IP 54 protection
- Compact design
- The system can be configured directly on the device without additional hardware.

Visualization modules and input devices

The following visualization modules and input devices are available for the convenient operation of BST eltromat control systems:

- Commander edition x
- BST eltromat ProTouch
- BST eltromat ProTouch x

CAN-To-Ethernet coupler (C2E)

The CAN-To-Ethernet coupler allows up to four BST eltromat web guide control devices to be remotely controlled by an external control system using an Ethernet interface (e. g. PLC, PC, machine controller, etc.):

- Standard: UDP communication
- Remote control of the ekr 500 digital and ekrPro Com60
- Application software tuned to the customer's needs

BST eltromat ProTouch / ProTouch x

With the ProTouch visualization module, BST eltromat offers a user interface designed according to the customer's wishes and requirements.

- Visualization for the application software tuned to the customer's needs
- Several ProTouch units can be placed at different points on the machine
- Visualization also possible on the customer's Windows PC (only ProTouch x)

Commander edition x

- Application software tuned to the customer's needs
- Cost-effective
- High-contrast color display

WEB TENSION MEASURING SYSTEMS

The BTL Load 100-500 cells have been developed for the greatest demands of modern production machines. The unique constructive design guarantees a high service life. BST eltromat web tension measuring systems are available in a variety of designs, depending on the application.

A number of different load ranges from 25N to 15,000N and also various installation types are available.

Application

The web tension measuring systems are used in all fields where precise control of the web tension and synchronization of the drives is important. We offer customized web tension measuring system solutions for the high web tensions in cord production and in calenders, but also for low web tensions on winders or in liner control.

Technical features

- Compact, high-quality design
- Stainless steel version available
- Double bending beam principle guarantees a high output signal with minimum sagging
- Compensation of axis expansion, non-aligned axes and sagging
- Different loading directions available
- Typical overload protection 200 - 500 %

Application areas

- Cord production
- Calender
- Winder
- Liner guiding

Special features

- Accurate
- Easy to use
- Robust

BTA CON 120/130

LASER MARKER LPS100

The BST eltromat laser marker LPS100 positions up to 4 line lasers at specified linear positions. It is primarily used in tire building machines to visually check the position of automatically positioned semi-finished products or to indicate the correct position to the operator when loading semi-finished products. In addition to a fixed center line, up to 4 laser lines can be positioned parallel to or independent from one-another with high accuracy. Absolute measuring systems and high-precision linear guides provide the highest system accuracy. The specification of the laser positions is carried out via data exchange with the machine PLC or ProLogic systems.

Special features

- Precise
- Easy to use
- Robust

Technical data

Working width	600 mm … 2,400 mm
Position accuracy	+ / - 0.1 mm
Traversing speed	500 mm / min
Interfaces	Ethernet
Protection class	IP 54
Working area temperature	0 to 60 °C
Laser colors	red, blue, green

SMART SERVICE TO HELP YOU ACHIEVE THE NEXT LEVEL.

No matter where you use our technologies, we are here for you, providing dependable BST eltromat service. Our experts are available internationally and will be quick to help you sort out any issues. You can rely on a broad global production and sales network, ensuring first-class service anywhere in the world.

Being partners for top quality: To ensure you achieve maximum value, all our systems are precisely aligned to your specific conditions. You define what you need: project-based cooperation or a full BST eltromat service package. No matter what you choose, we are fully committed to making your products define new benchmarks.

To learn more, please visit **www.bst-international.com**

Your contact

Be inspired. Move forward.

BST eltromat International
Heidsieker Heide 53 • 33739 Bielefeld • Germany
Tel.: +49 5206 999-0 • Fax: +49 5206 999-999
info@bst-international.com

BST eltromat INTERNATIONAL