



TIRE INDUSTRY

Product Overview

Control, measurement and inspection technology

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CUTTING-EDGE TECHNOLOGY AT HOME ALL OVER THE WORLD

Erhardt+Leimer

Global solutions for production of the future

Intelligent technologies and products in the highest quality designed to optimize the production processes of our customers all around the world. This is our claim as the internationally expanding Erhardt+Leimer group of companies.

With our global presence – from development to production and on to service – we are always close to the customer. We develop customer-specific solutions and provide our customers with excellent products either in digital or intelligent versions depending on their preference. Not only this, but we also set new standards for the production of tomorrow. In the process, it is not just our products that are increasingly becoming smart – our entire company is currently undergoing a digital transformation. One visible indication of this is the E+L online shop, which enables our customers to order products and spare parts quickly and easily from our website.

With more than 1,600 employees at sites across Europe, Asia, and America we deliver cutting-edge technology on-time to any location in the world.

In everything we do, we aim to use all company resources responsibly to protect the environment and demonstrate our commitment to increased sustainability.



Higher quality and productivity due to control, measurement and inspection systems

Today, the demands faced by tire producers are ever increasing. Production speeds should continue to increase, but with no compromises in terms of quality – while scrap and any machine downtime must be kept to a bare minimum.

Tires are typically manufactured with many different profiles, using a large number of different layers. Every web and strip of material must be produced within the required tolerances so that the finished tire meets the desired quality standards.

You can rely on reliable, precise E+L systems that not only control or spread webs but also measure features or inspect surfaces. Our advanced systems determine reliably and accurately, for instance, the profile and the length of a tread, measure the thickness of the material during different process stages and check whether all color lines are present. You can rely on our comprehensive solutions for optimal product quality, process control and material guiding, while at the same time reducing your costs, your consumption of resources and therefore your CO₂ footprint.

Web guiding systems for exact positioning of the web

Production processes are to be even faster and at the same time they are to be implemented with greater precision and the quality of the finished product further improved, while personnel, waste and, above all, downtimes, are to be reduced to a minimum. Web guiding systems make a crucial contribution to meeting these requirements. Typically, web-type materials are fed from a roll to the machine or extruded, finished and then rewound. During these stages, various position errors may occur. E+L web guiding systems are designed to eliminate these sources of errors and to ensure constant, precise web alignment and winding.

Surface inspection systems for a perfect end product

Flawless surfaces are a key quality characteristic in the tire industry. Any flaws in the rubber coating on the tire cord, or holes or dirt in rubber webs will lead to scrap. Only an efficient, automated surface inspection system of the type offered by Erhardt+Leimer will allow you to meet the highest quality requirements at acceptable cost.

Measurement systems for trouble-free tire production

The profile, length, width, thickness, angle and weight are all key parameters for reliable tire production. Our measurement systems use advanced sensor technology to detect defects and irregularities in tires. They monitor important parameters such as profile depth, tread quality or material thickness; they ensure the tires manufactured meet the highest quality standards, and that with optimal material use. Furthermore, the inspection systems offer comprehensive data analysis and reporting and provide the manufacturer with quality indicators and insights into the production activity.

Web tension measurement and control systems for sustainable production

Reliable web tension control using load cells helps to reduce web tears and therefore keeps production costs down. The use of modern sensors and measuring techniques makes possible the exact acquisition of the web tension profiles and real-time monitoring during the production process. E+L web tension measurement and control systems make us the perfect partner for the tire industry, we contribute to ensuring high quality and efficiency in production.

Depending on the type of material, application and task, Erhardt+Leimer offers a wide variety of systems with the latest networking technology: for decisively more quality and productivity that pays off!



E+L systems



FLEXIBLE

HIGH-PRECISION

USER-FRIENDLY

Tire cord coating line

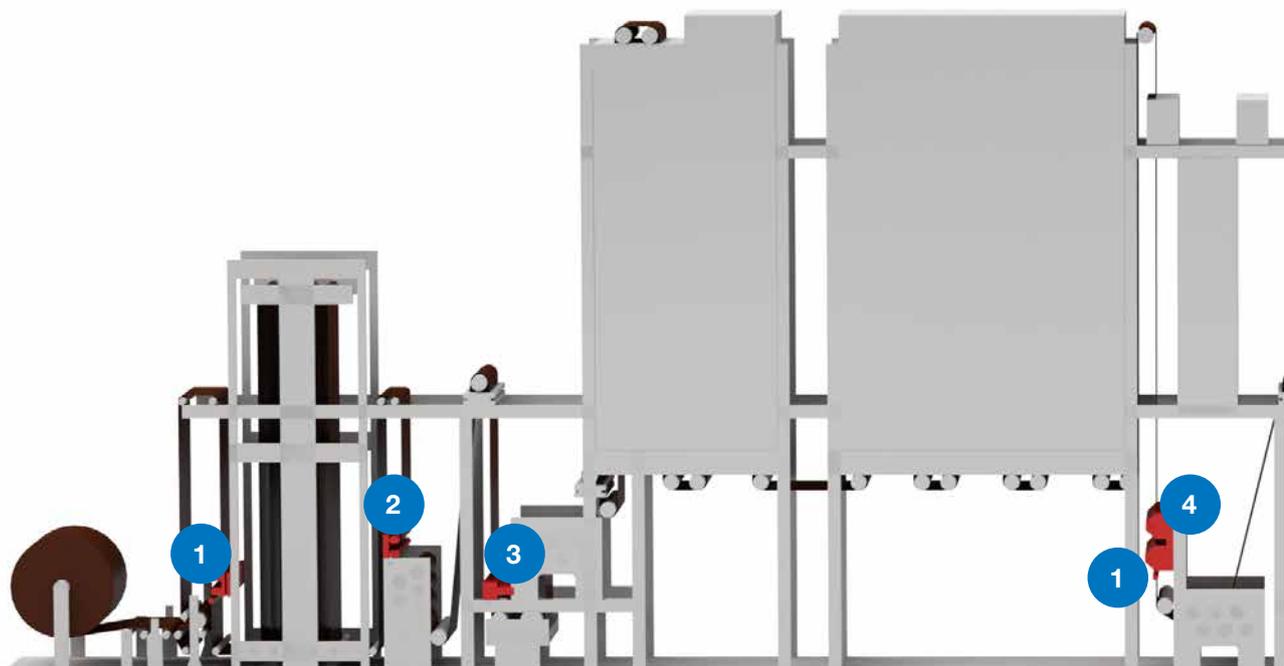
The tire cord coating system is the first station during the manufacture of high-quality, durable tires. The tire cord is fed through various immersion baths to improve the adhesion between the cord and rubber in the following production steps.

Each immersion bath contains a specific mixture of chemical compounds that provide specific characteristics and functions. After each immersion bath, the tire cord passes through a drying process during which surplus material is removed and the coating is dried.

The exact configuration and the scope of a coating system may vary by manufacturer and depending on the specific requirements. However, the general goal is to automate tire production and to apply the necessary coatings and layers to the tire cord for the manufacture of high-quality, high-performance tires.

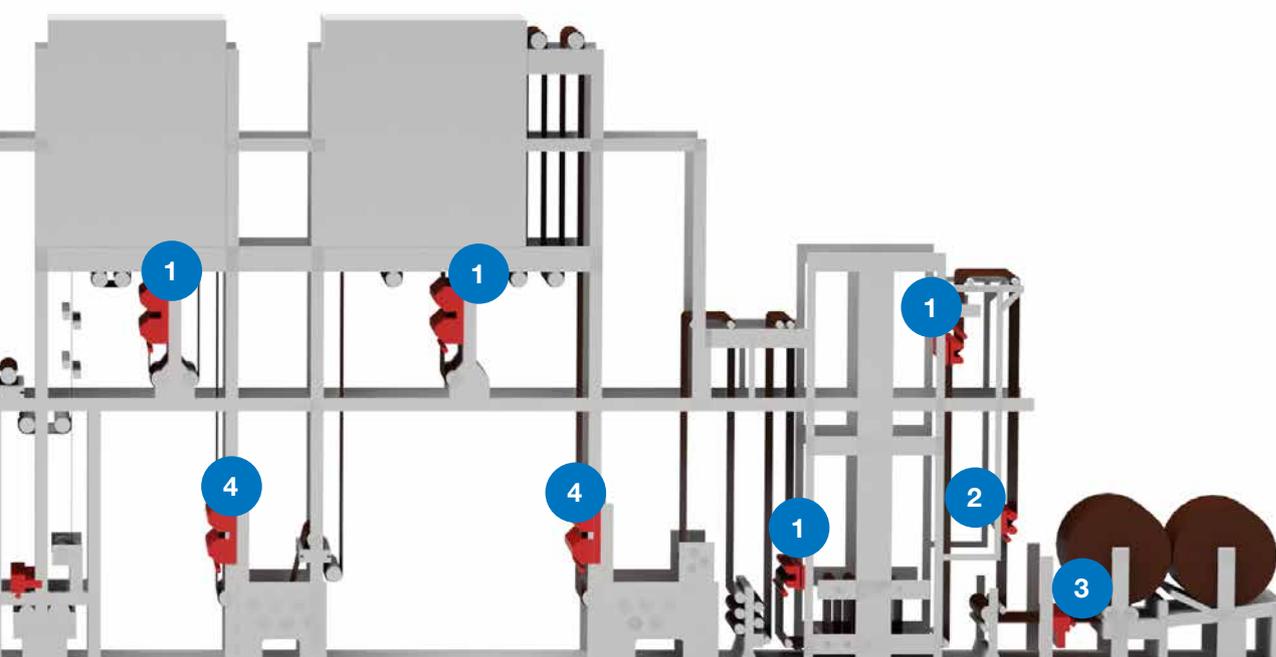
The use of our systems and products specifically matched to the needs of the tire industry in tire cord coating lines enables manufacturers to ensure high quality during the coating of the tire cord. In this way tires can be produced that meet the demanding requirements of the modern automotive industry in every way.

Due to modern web-based management technology (WBM), our equipment can also be operated straightforwardly from almost any browser in the network. Furthermore, we offer versatile options such as the intuitive command station OP 36 and our innovative ELQ software for controlling your systems and the statistical evaluation and monitoring of your production data. Maximize the efficiency and productivity of your line with our comprehensive range of solutions.



Our products

<p>1 ELROLLER – SRB63</p>	<p>Precise web guiding in one plane using the steering roller system SRB63. You will find a detailed description of this product on page 35.</p>	
<p>2 CordAliner – BCB21/31</p>	<p>Required material width using spreading systems BCB21/31. You will find detailed descriptions of these products on page 55.</p>	
<p>3 EPILiner – BCB11</p>	<p>Constant web width and individual spreading of the edges using the edge spreading system BCB11. You will find a detailed description of this product on page 53.</p>	
<p>4 X-Pander – BCB41/51</p>	<p>Constant web width and individual spreading of the edges using the spreading systems BCB41/51. You will find detailed descriptions of these products on pages 57/59.</p>	



Textile cord calender line

On the textile cord calender line, a rubber mixture is applied to the textile fabric prepared in the tire coating line. The resulting material contributes, among other aspects, to the strength and stability of the tire, in particular in relation to the lateral and longitudinal stiffness. It helps the tire to retain its shape under load and makes possible even distribution of the load.

The prepared textile web is fed into the textile cord calender line where it runs through various processes. First the textile web is fed through a pre-heating feature to improve the characteristics for the coating process. Then the textile material

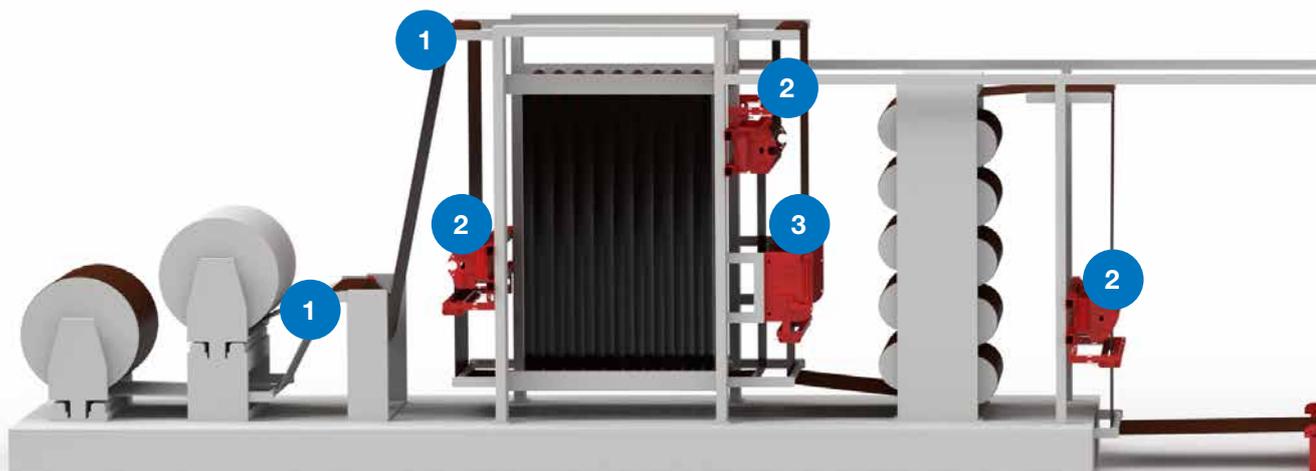
is fed through the calender where a rubber mixture is applied to both sides. After the calendaring process, the web produced is cooled and rewound for further processing.

The use of our systems and products specially tailored to the tire industry in the textile cord calender line enables manufacturers to ensure high quality during the production of textile cord materials, to optimize the use of material and, in this way, to manufacture tires that meet the demanding requirements of the modern automotive industry.

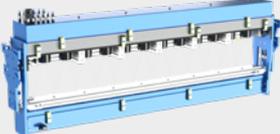
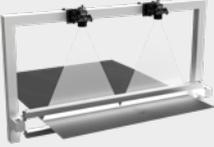
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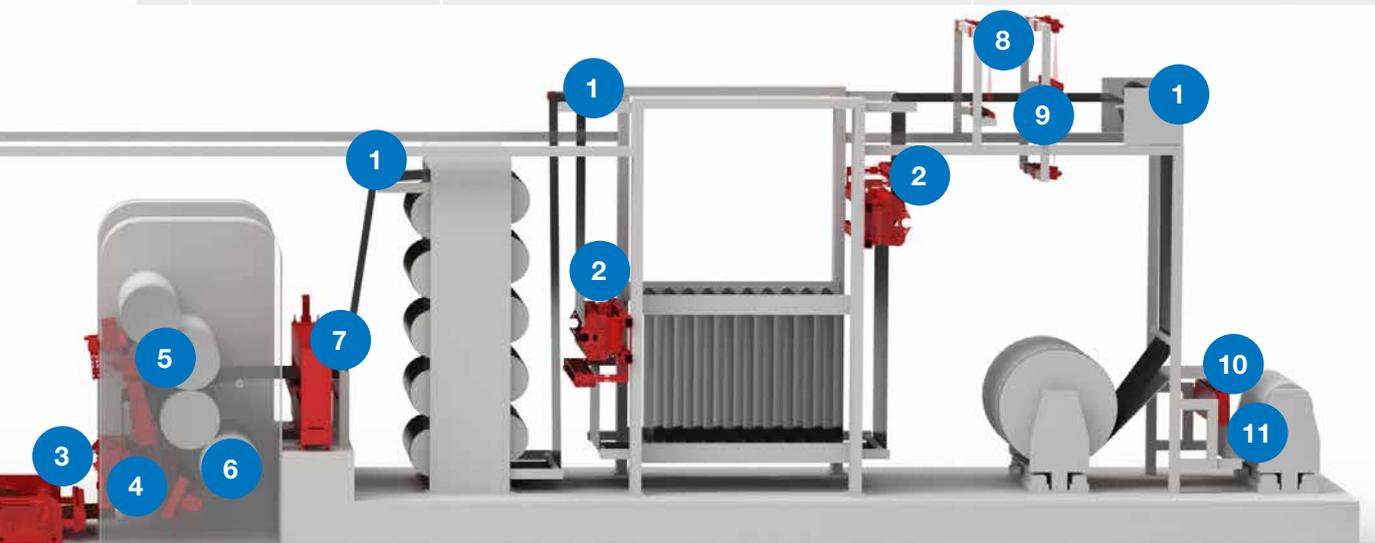
Our products

1	<p>ELTENS – PD 21/22</p> <p>Flange load cells PD 21/22 for constant web tension in the coating process. You will find a detailed description of these products on page 91.</p>	
2	<p>ELROLLER – SRB63</p> <p>Precise web guiding in one plane using the steering roller system SRB63. You will find a detailed description of this product on page 35.</p>	
3	<p>CordAliner – BCB21/31</p> <p>Required material width using spreading systems BCB21/31. You will find detailed descriptions of these products on page 55.</p>	
4	<p>EPIliner – BCB11</p> <p>Constant web width and individual spreading of the edges using the edge spreading system BCB11. You will find a detailed description of this product on page 53.</p>	



Our products

5	EPI	Monitoring of the cord distribution for an optimal result at the calender using the cord distribution system EPI. You will find a detailed description of this product on page 85.	
6	EL-THICKNESS – NDS4	Thickness measurement against calender or reference roller using our dual sensors NDS4. You will find a detailed description of this product on page 79.	
7	EL-THICKNESS – NDS1/2/3	Continuous measurement of the material thickness using modular thickness measurement systems NDS. You will find detailed descriptions of these products on pages 77/78.	
8	Web width measurement system – ABS	Web width measurement using OL 82 CCD cameras. You will find a detailed description of this product on page 80.	
9	Surface inspection system – RSI1/2	Highest precision and best quality using the surface inspection system RSI. You will find detailed descriptions of these products on page 87.	
10	ELROLLER – SRB43	Precise web guiding by web center using the steering roller system SRB43. You will find a detailed description of this product on page 34.	
11	ELWINDER – WSB93	Precise unwinding and rewinding of material webs using the winding station controllers WSB93. You will find a detailed description of this product on page 39.	



Steel cord calender line

On the steel cord calender line, wires are unwound from coils and a rubber mixture applied to both sides. The material produced here is an important component in many modern tire designs. After further processing, as a rule this material is arranged close to the tire tread and is used, for example, to improve the traction of the tire on the road. It increases the stiffness of the tire contact area and helps to optimize the transfer of power between the tire and the road. As a consequence, the tire's grip and the control of the vehicle improve.

The steel wires are unwound from coils and fed into the calender line. Then the wires are passed through the calender where a rubber mixture is

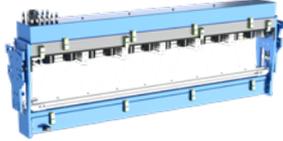
applied to both sides. After the calendaring process, the web produced is cooled and rewound for further processing.

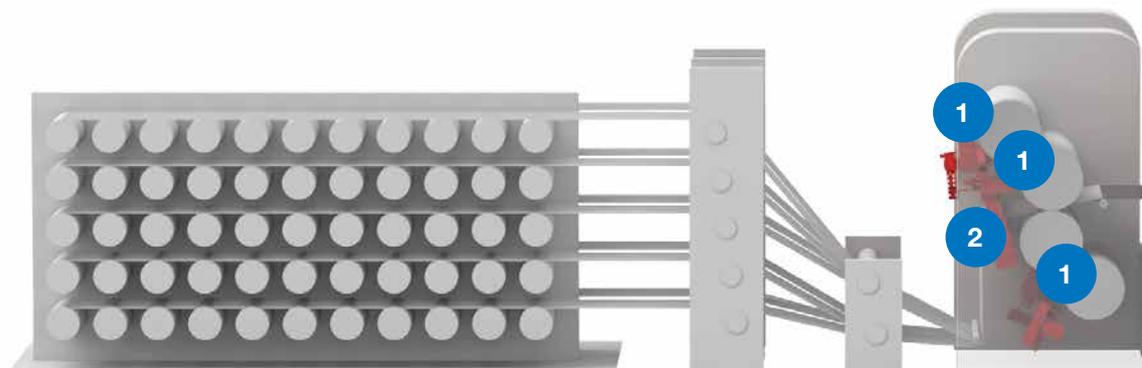
The use of our systems and products specially tailored to the tire industry in the steel cord calender line enables manufacturers to ensure high quality during the production of steel cord materials, to optimize the use of material and, in this way, to manufacture tires that meet the demanding requirements of the modern automotive industry.

Due to modern web-based management technology (WBM), our equipment can also be operated straightforwardly from almost any browser in

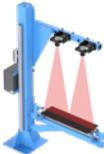
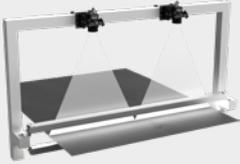
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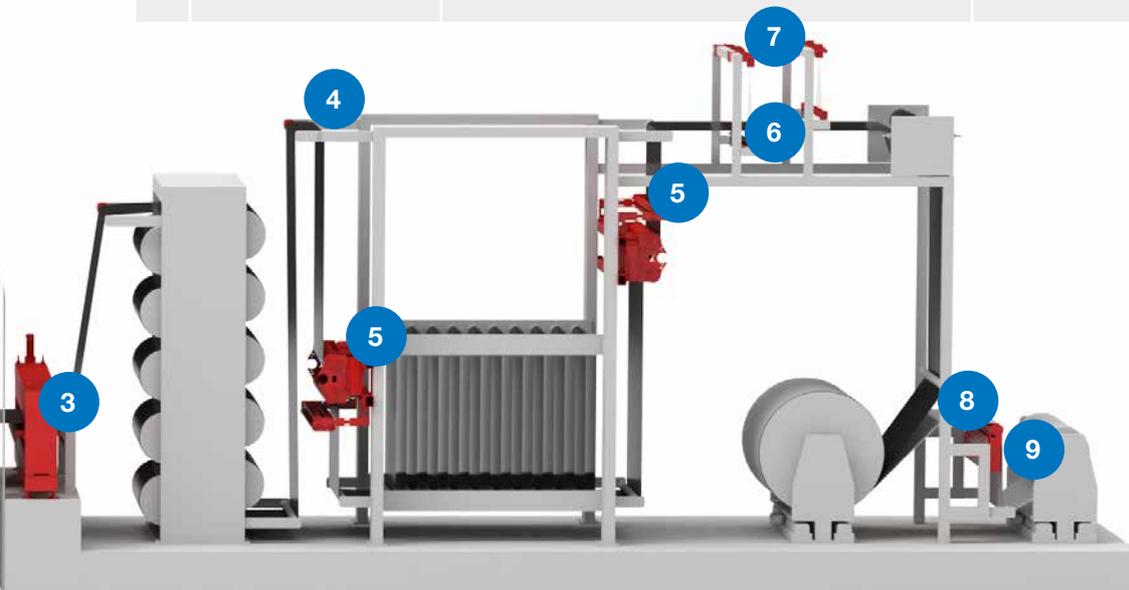
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2	EPI	Monitoring of the cord distribution for an optimal result at the calender using the cord distribution system EPI. You will find a detailed description of this product on page 85.	
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Our products

4	ELTENS – PD 21/22	Flange load cells PD 21/22 for constant web tension in the coating process. You will find a detailed description of these products on page 91.	
5	ELROLLER – SRB63	Precise web guiding in one plane using the steering roller system SRB63. You will find a detailed description of this product on page 35.	
6	Web width measurement system – ABS	Web width measurement using OL 82 CCD cameras. You will find a detailed description of this product on page 80.	
7	Surface inspection system – RSI1/2	Highest precision and best quality using the surface inspection system RSI. You will find detailed descriptions of these products on page 87.	
8	ELROLLER – SRB43	Precise web guiding by web center using the steering roller system SRB43. You will find a detailed description of this product on page 34.	
9	ELWINDER – WSB93	Precise unwinding and rewinding of material webs using the winding station controllers WSB93. You will find a detailed description of this product on page 39.	



Textile cord cutting line

The material produced in the calender is further processed on the textile cord cutting line. As a rule, the lines consist of a feeder unit that unwinds the prepared material and feeds it to the line, a cutter with adjustable cutting angle, a splicer for joining together the pieces cut to form a continuous web, and a discharge unit in which the web is rewound for further processing.

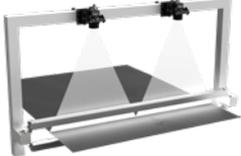
Depending on the manufacturer, there may be other processes before renewed rewinding, e.g. the application of further strips of rubber. Cutting lines ensure high precision and reproducibility while cutting textile cord to size. This aspect is

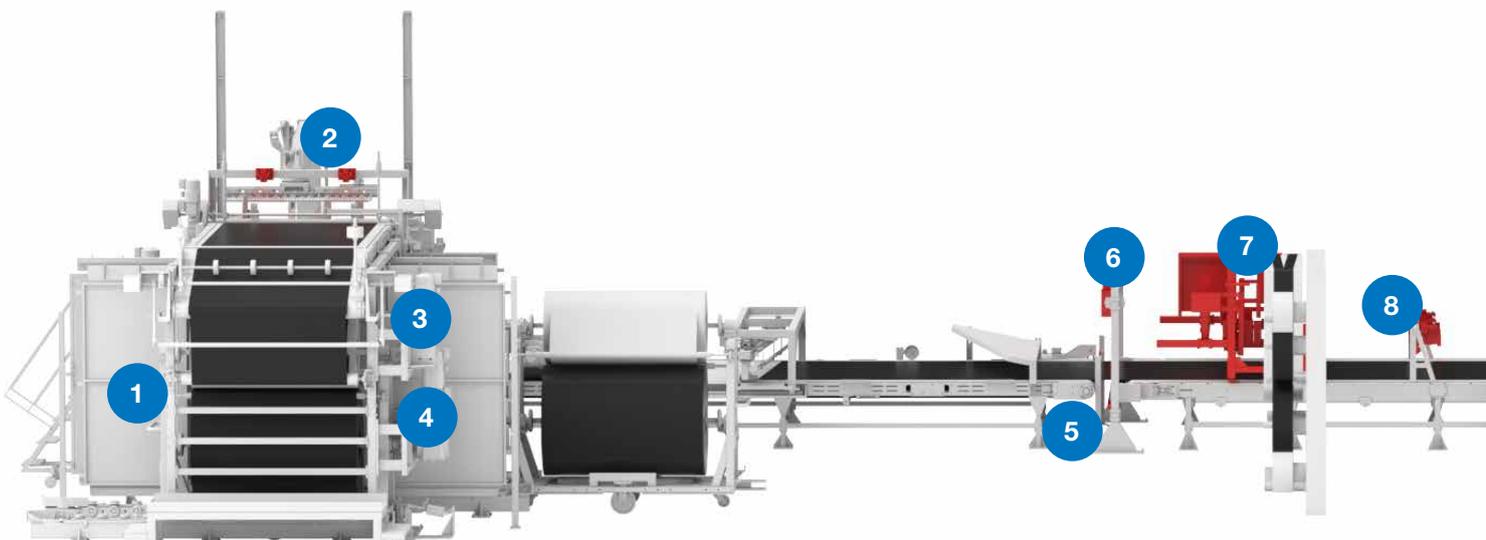
important for obtaining consistent results and ensuring that the layers of textile material meet the requirements of every tire. By precisely cutting the layers of textile cord, cutting lines make an important contribution to the optimization of material use and minimizing waste. In this way resource consumption and costs can be reduced.

The use of our systems and products specially tailored to the tire industry enables manufacturers to produce material webs of the highest quality that meet the demanding requirements of the modern automotive industry while optimizing the use of resources.

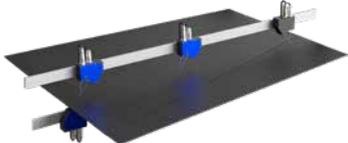
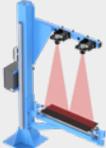
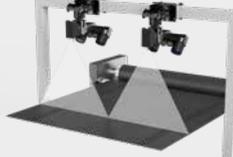
Due to modern web-based management technology (WBM), our equipment can also be operated straightforwardly from almost any browser in the network. Furthermore, we offer versatile options such as the intuitive command station OP 36 and our innovative ELQ software for controlling your systems and the statistical evaluation and monitoring of your production data. Maximize the efficiency and productivity of your line with our comprehensive range of solutions.

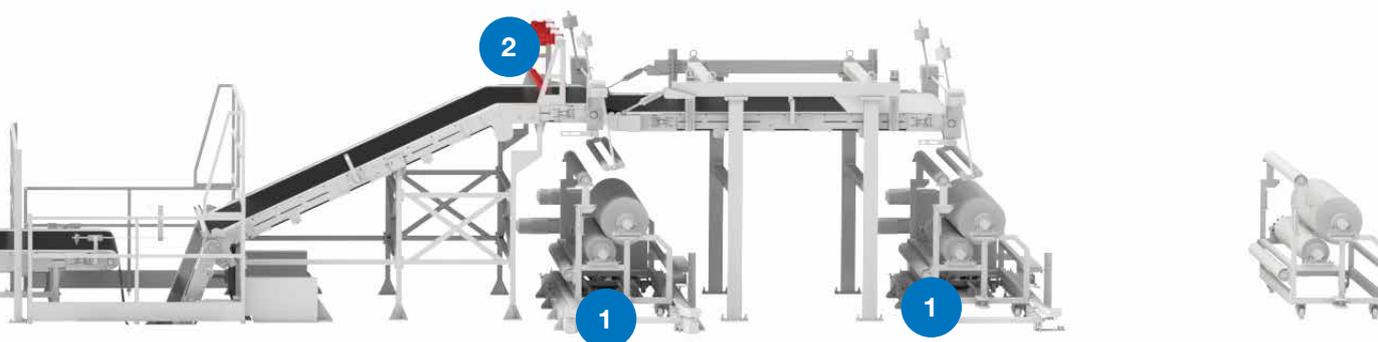
Our products

1	ELROLLER – SRB43	Precise web guiding by web center using the steering roller system SRB43. You will find a detailed description of this product on page 34.	
2	Surface inspection system – RSI1	Highest precision and best quality using the surface inspection system RSI. You will find a detailed description of this product on page 87.	
3	ELBANDER – VGB15	Exact positioning of the material by the control system VGB15 immediately after unwinding. You will find a detailed description of this product on page 37.	



Our products

4	ELWINDER – WSB93	<p>Precise unwinding and rewinding of material webs using the winding station controllers WSB93. You will find a detailed description of this product on page 39.</p>	
5	EL.SPLICE – SMS1	<p>Accurate measurement of the splices with the aid of the highly accurate measurement system SMS1. You will find a detailed description of this product on page 82.</p>	
6	Web width measurement system – ABS	<p>Web width measurement using OL 82 CCD cameras. You will find a detailed description of this product on page 80.</p>	
7	Complexer	<p>Highly accurate application of strips of material to a web with the aid of the modular laminating station. You will find a detailed description of this product on page 44.</p>	
8	EL.EDGE – EDS1	<p>Exact, reliable measurement of web edges and web widths without any requirements on the contrast using the edge acquisition EDS1. You will find a detailed description of this product on page 83.</p>	



Steel cord cutting line

The material produced in the calender is further processed on the steel cord cutting line. As a rule, the lines consist of a feeder unit that unwinds the prepared material and feeds it to the line, a cutter with adjustable cutting angle, a splicer for joining together the pieces cut to form a continuous web, and a discharge unit in which the web is rewound for further processing.

Depending on the manufacturer, there may be other processes before renewed rewinding, e.g. the application of further strips of rubber. Cutting systems allow high precision and reproducibility while cutting steel cord to size. This aspect is important for obtaining consistent results and ensuring that the steel cords meet the specific

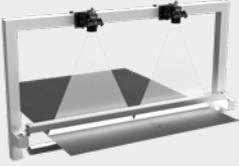
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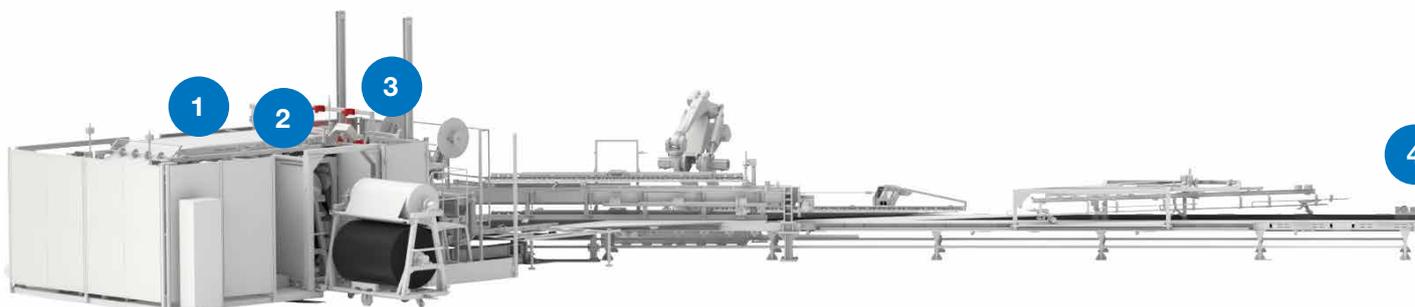
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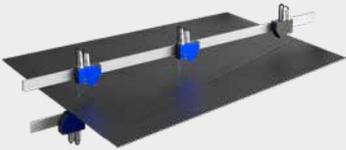
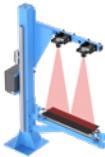
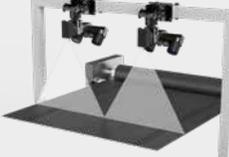
the network. Furthermore, we offer versatile options such as the intuitive command station OP 36 and our innovative ELQ software for controlling your systems and the statistical evaluation and monitoring of your production data. Maximize the efficiency and productivity of your line with our comprehensive range of solutions.

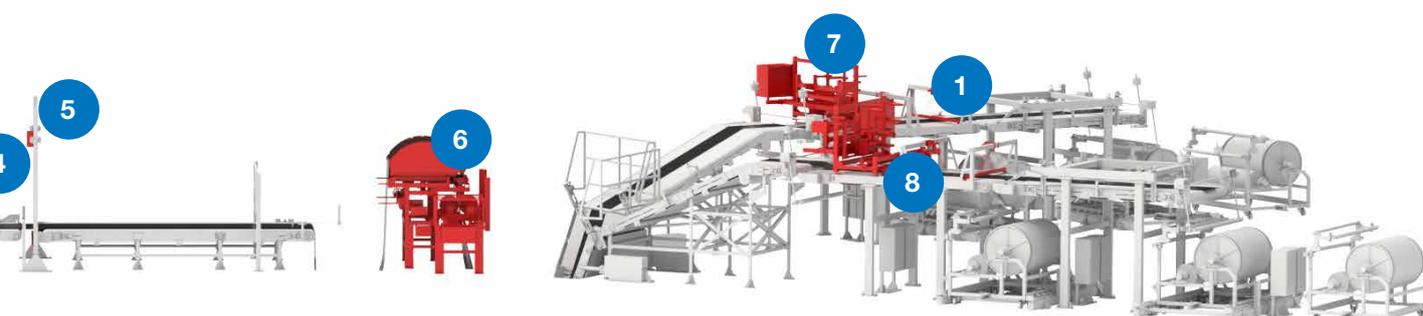
Our products

1	Surface inspection system – RSI1	Highest precision and best quality using the surface inspection system RSI. You will find a detailed description of this product on page 87.	
2	ELROLLER – SRB43	Precise web guiding by web center using the steering roller system SRB43. You will find a detailed description of this product on page 34.	
3	ELBANDER – VGB15	Exact positioning of the material by the control system VGB15 immediately after unwinding. You will find a detailed description of this product on page 37.	



Our products

4	EL.SPLICE – SMS1	Accurate measurement of the splices with the aid of the highly accurate measurement system SMS1. You will find a detailed description of this product on page 82.	
5	Web width measurement system – ABS	Web width measurement using OL 82 CCD cameras. You will find a detailed description of this product on page 80.	
6	ELGUIDER – DRB73 with roller basket	Precise web correction by means of pivoting frame system DRB73 with roller basket. You will find a detailed description of this product on page 31.	
7	Complexer	Highly accurate application of strips of material to a web with the aid of the modular laminating station. You will find a detailed description of this product on page 44.	
8	EL.EDGE – EDS1	Exact, reliable measurement of web edges and web widths without any requirements on the contrast using the edge acquisition EDS1. You will find a detailed description of this product on page 83.	



Roller-head line

Unlike multiple roller calender systems, with the roller-head principle, a mixture from an extruder with a wide extrusion die is applied to the calender gap. The extruded material is pressed through the gap between the rotating rollers, in this way it is possible to manufacture wide rubber webs that are very thin. The web produced is then cooled and rewound for further processing.

Depending on the design of the lines, there may be further processes before and after the cooling, for example the application of further strips of material and cutting the material to size.

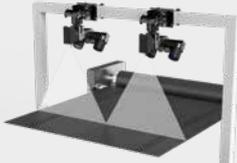
This specialized type of line is generally used to manufacture the inner liner for the tire. The main function of the inner liner layer is to make the tire air-tight. It forms a barrier against the loss of air and helps to maintain the tire pressure over an extended period. In this way the inner liner layer contributes to the safety, stability and performance of the tire.

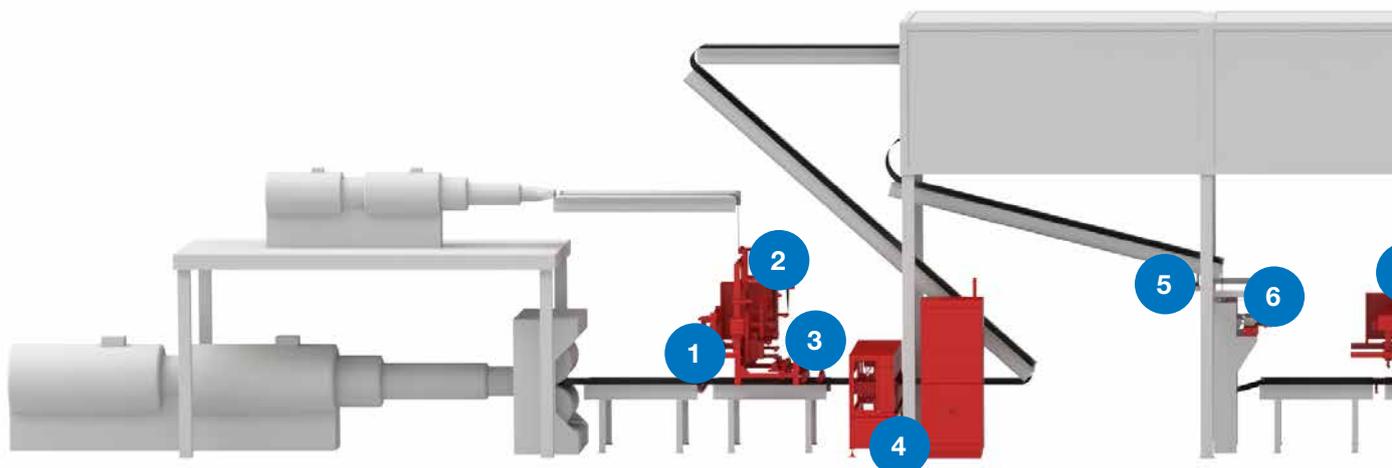
The use of our products specially tailored to the tire industry for control and inspection in roller-head lines enables manufacturers to ensure high quality during the manufacture of the inner liner

and to produce a product that meets the demanding requirements of the modern automotive industry.

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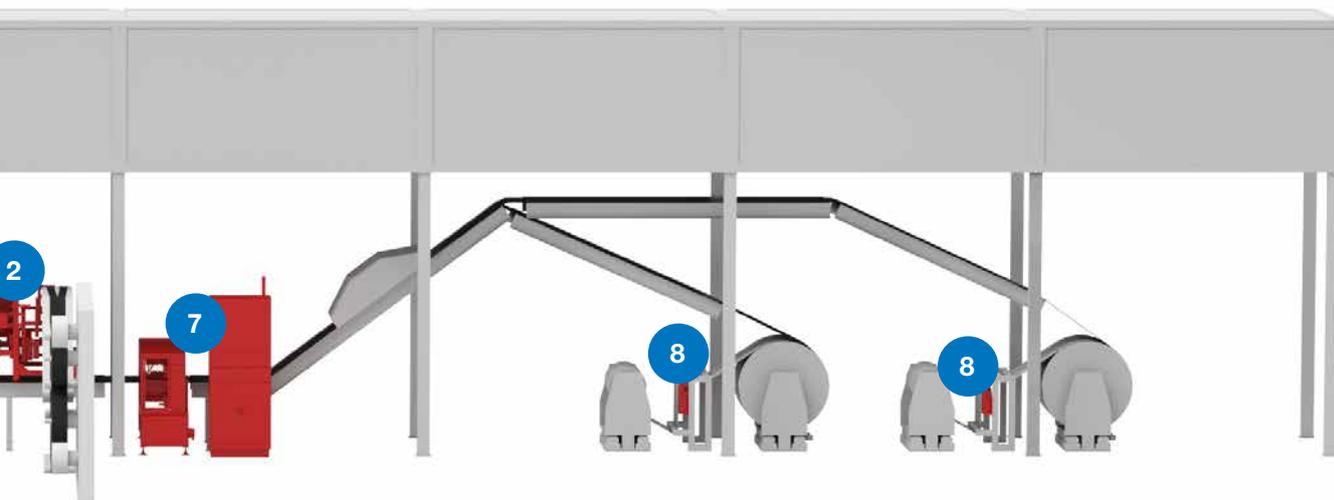
Our products

1	Surface inspection system – RSI3	Hole and splice inspection using CCD line scan camera OL 91. You will find a detailed description of this product on page 88.	
2	Complexer	Highly accurate application of strips of material to a web with the aid of the modular laminating station. You will find a detailed description of this product on page 44.	
3	EL.EDGE – EDS1	Exact, reliable measurement of web edges and web widths without any requirements on the contrast using the edge acquisition EDS1. You will find a detailed description of this product on page 83.	



Our products

4	EL-THICKNESS – NDS1/2/3	<p>Continuous measurement of the material thickness using modular thickness measurement systems NDS. You will find detailed descriptions of these products on pages 77/78.</p>	
5	Conveyor belt control system	<p>Correct positioning of the conveyor belt with the aid of specific E+L components. You will find detailed descriptions of these products on page 47.</p>	
6	ELPOSER – VSB97	<p>Exact positioning of tools, blades or sensors using the support beam VSB97. You will find a detailed description of this product on page 61.</p>	
7	EL-TRISCAN TR – NRS50 EL-TRISCAN LS – NLS10	<p>Highly accurate measurement of the profiles with the aid of online profile measurement systems in the EL-TRISCAN series. You will find detailed descriptions of these products on pages 67/68.</p>	
8	ELROLLER – SRB43	<p>Precise web guiding by web center using the steering roller system SRB43. You will find a detailed description of this product on page 34.</p>	



Complexing and assembly line

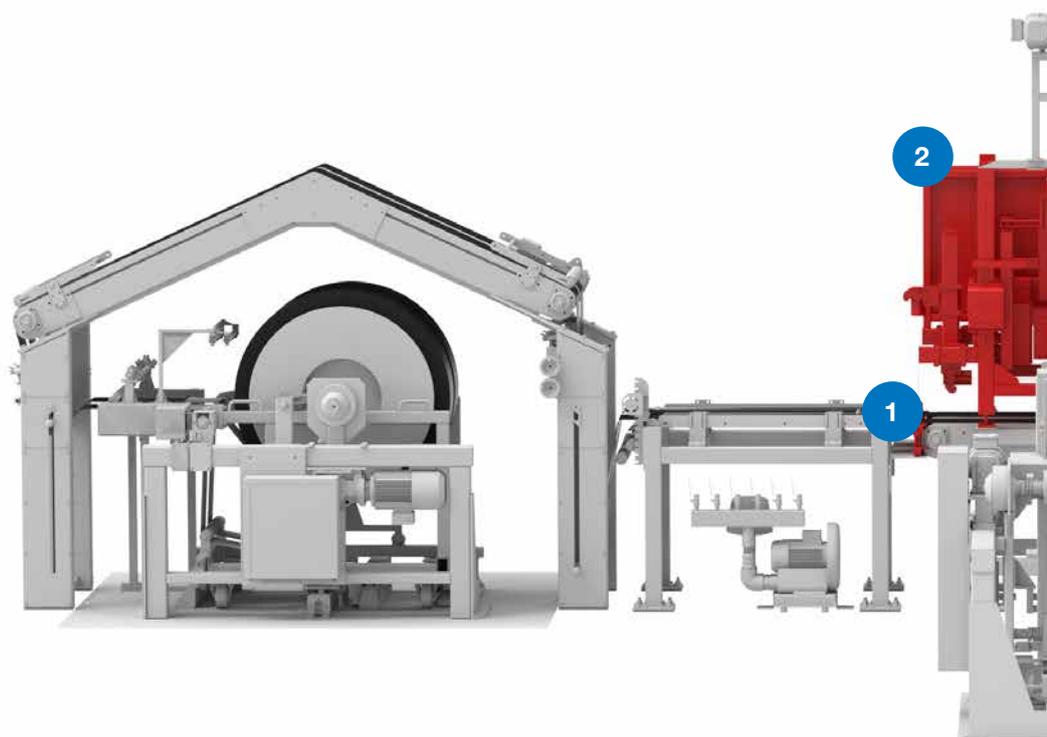
The function of these lines is to combine the various layers and strips of semi-finished products stored in cassettes or coils to produce a functional unit. The line can be used on its own or integrated into an extrusion line. Depending on the design of the lines, material strips can also be added using mini-extruders.

These systems often include mechanisms or processes for quality assurance. These processes can include checking for the correct positioning of components, measuring and checking tolerances, or the detection of defects. The goal is to ensure the product produced meets the stipulated specifications and quality standards. They contribute to efficiency, quality and flexibility during production and are available in numerous designs.

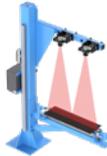
The use of our products specially tailored to the tire industry for control and inspection enables manufacturers to ensure high quality during the manufacture of complex webs and to produce a product that meet the demanding requirements of the modern automotive industry.

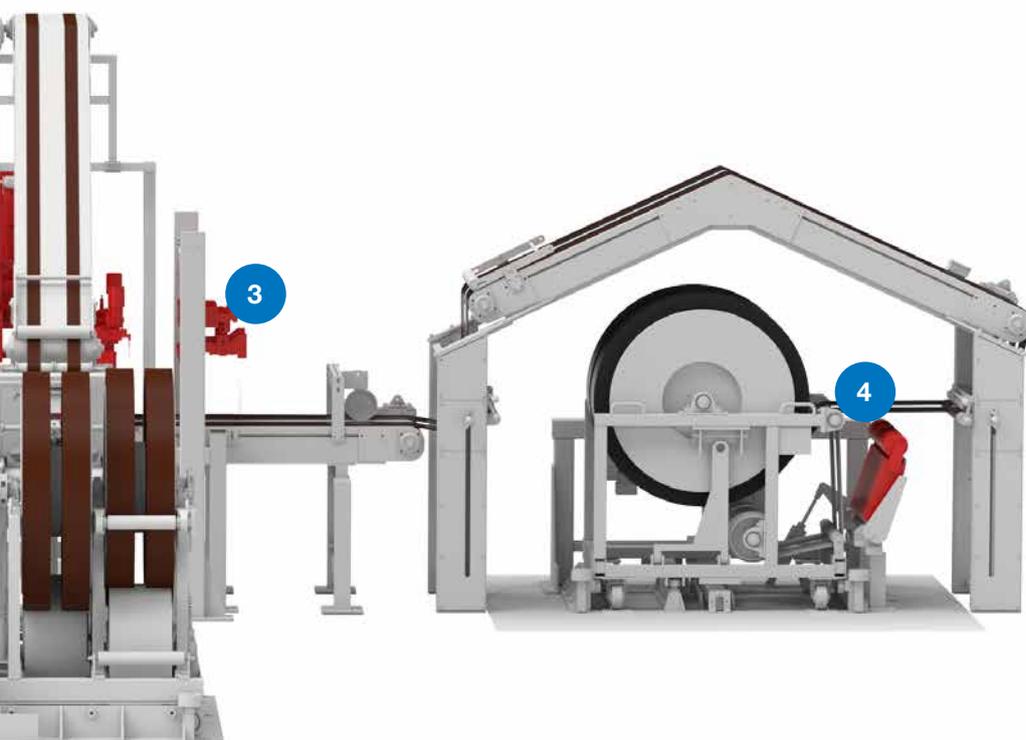
Due to modern web-based management technology (WBM), our equipment can also be operated straightforwardly from almost any browser in the network. Furthermore, we offer versatile options such as the intuitive command station OP 36 and our innovative ELQ software for controlling your systems and the statistical evaluation and monitoring of your production data. Maximize the efficiency and productivity of your line with our comprehensive range of solutions.

Complexing and assembly lines are part of the machine program produced by our subsidiary in Italy. For information about specific solutions and machine components for the tire industry, please scan the QR code.



Our products

1	Web width measurement system – ABS	Web width measurement using OL 82 CCD cameras. You will find a detailed description of this product on page 80.	
2	Complexer	Highly accurate application of strips of material to a web with the aid of the modular laminating station. You will find a detailed description of this product on page 44.	
3	EL.EDGE – EDS1	Exact, reliable measurement of web edges and web widths without any requirements on the contrast using the edge acquisition EDS1. You will find a detailed description of this product on page 83.	
4	ELROLLER – SRB43	Precise web guiding by web center using the steering roller system SRB43. You will find a detailed description of this product on page 34.	



Extrusion line

Rubber mixtures with specific shapes are produced on the extrusion line. The mixture is fed to an extrusion head where it is shaped into a continuous strand with controlled pressure and temperature. The material is given the required shape by the die. Extrusion lines also enable layers to be built up during the manufacture of complex tire components. By means of the simultaneous extrusion of several material layers, layered composites can be produced as are required for certain tire structures and functions. These composites are required, for example, for the manufacture of treads or side walls. The tire elements manufactured, such as the tread, play a crucial role in the quality of the finished tire. The tread affects the traction and therefore the grip between the

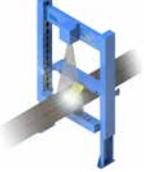
tires and the road, as well as the braking performance. The tread must be durable and should generate as little tire noise as possible and conduct electrical charging from the vehicle to the road.

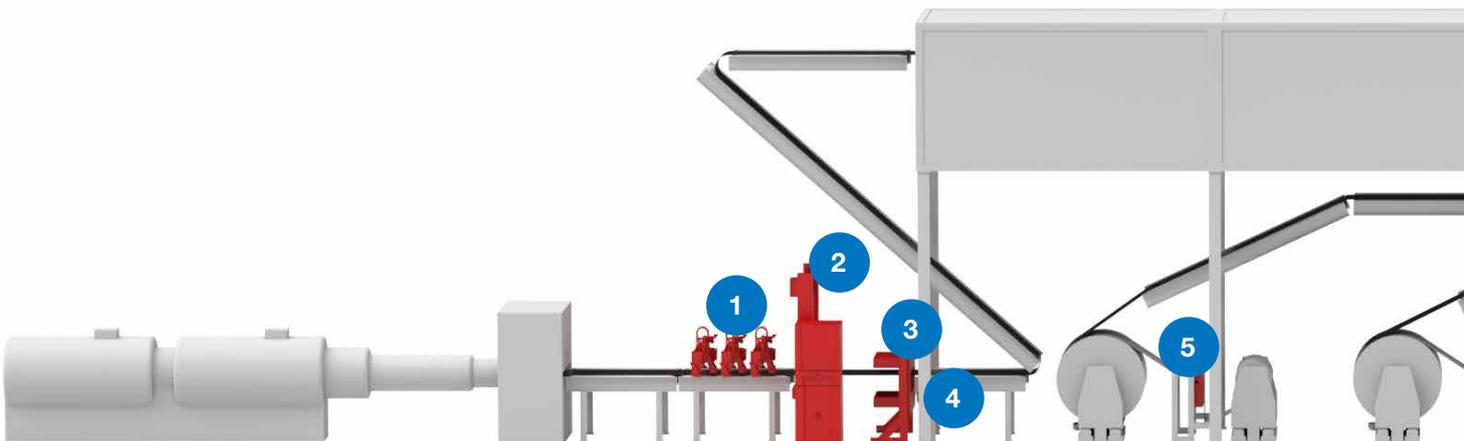
The use of our products specially tailored to the tire industry for control and inspection of material thicknesses and profiles in extrusion lines ensures high quality during the manufacture of all shaped or flat materials and therefore a product that meets the demanding requirements of the modern automotive industry.

Due to modern web-based management technology (WBM), our equipment can also be operated straightforwardly from almost any browser in

the network. Furthermore, we offer versatile options such as the intuitive command station OP 36 and our innovative ELQ software for controlling your systems and the statistical evaluation and monitoring of your production data. Maximize the efficiency and productivity of your line with our comprehensive range of solutions.

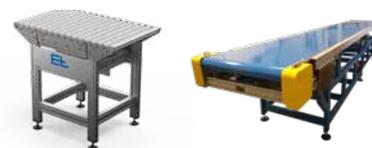
Our products

1	EL-PAPS – NPS10	Highest quality during ink application by means of the ink bottle positioning NPS10. You will find a detailed description of this product on page 60.	
2	Surface inspection system – RSI6	Continuous checking of ink application using the color line monitoring system RSI6. You will find a detailed description of this product on page 89.	
3	EL-TRISCAN LS – NLS10	Real-time measurement of profiles with the aid of the online profile measurement systems in the EL-TRISCAN LS series. You will find a detailed description of this product on page 68.	



Our products

- 4** EL-WEIGHT – NWS10/20
 Weight measurements for moving webs or for pieces of material.
 You will find detailed descriptions of these products on pages 74/75.



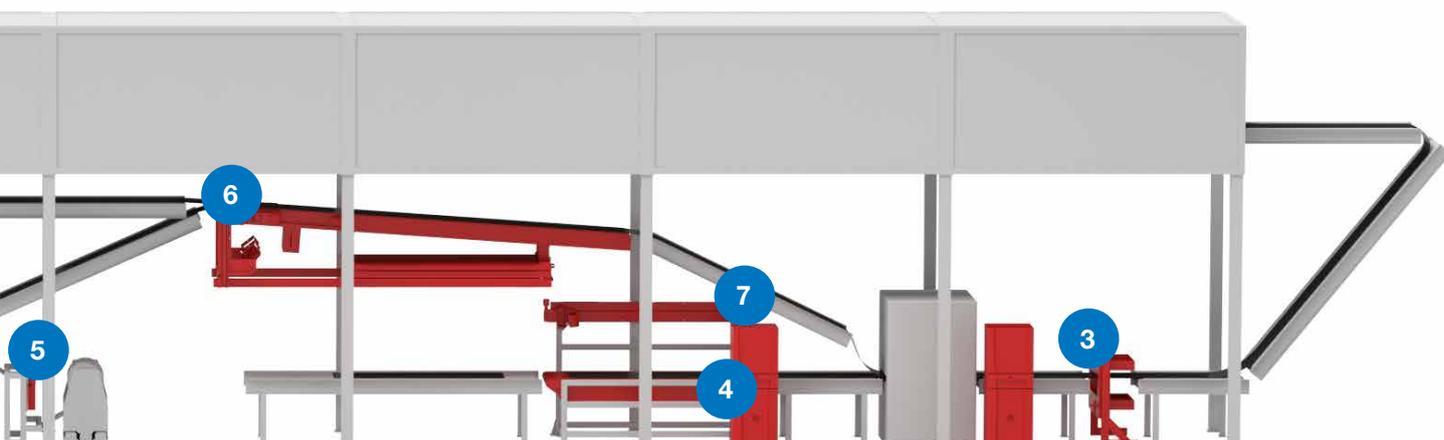
- 5** ELROLLER – SRB43
 Precise web guiding by web center using the steering roller system SRB43.
 You will find a detailed description of this product on page 34.



- 6** Conveyor belt control system
 Correct positioning of the conveyor belt with the aid of specific E+L components.
 You will find detailed descriptions of these products on page 47.



- 7** EL-LENGTH – NMS10
 Length measurements for pieces of material.
 You will find a detailed description of this product on page 73.



Tire building machine

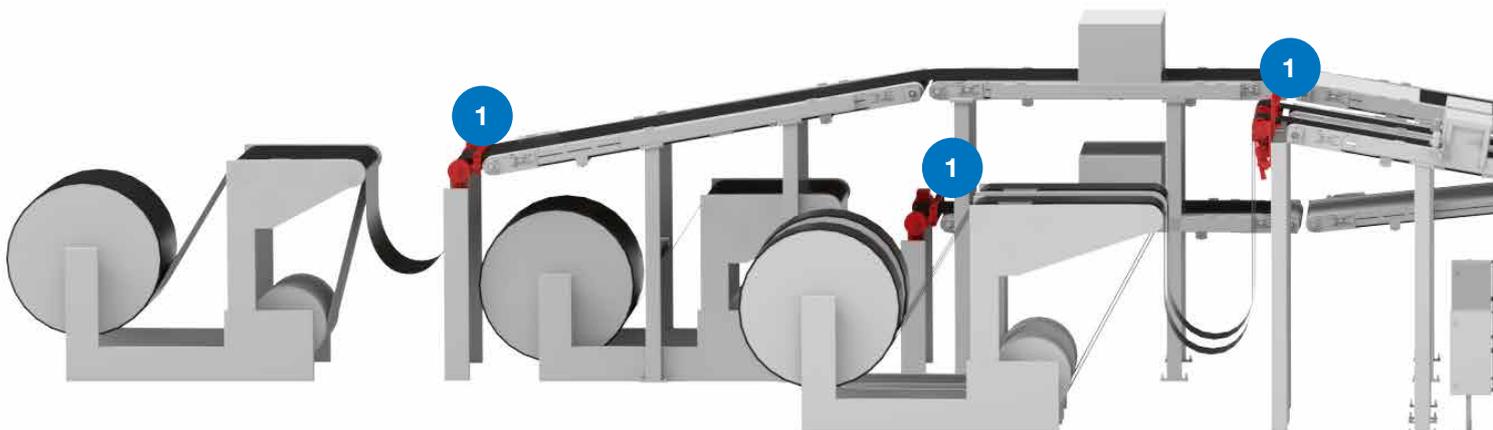
A tire building machine is used to combine the various layers of the tire manufactured in the previous lines and to build them into a tire.

The machine makes it possible to combine the various materials required to build a tire in a controlled manner. This action includes the provision of rubber compound materials for the individual tire layers such as tread, side wall, carcass, bracing ply, etc. The tire building machine combines the individual layers of the tire in the correct sequence and with the correct positioning. This action is undertaken by positioning the components precisely on a building drum.

The machine often permits monitoring and checking of the quality parameters during the building process. This can include the monitoring of the positioning of the components as well as the monitoring of the splices and other parameters to ensure the tires meet the specified standards and quality requirements. The green tire produced in this manner then becomes a finished tire in the next process where it is vulcanized.

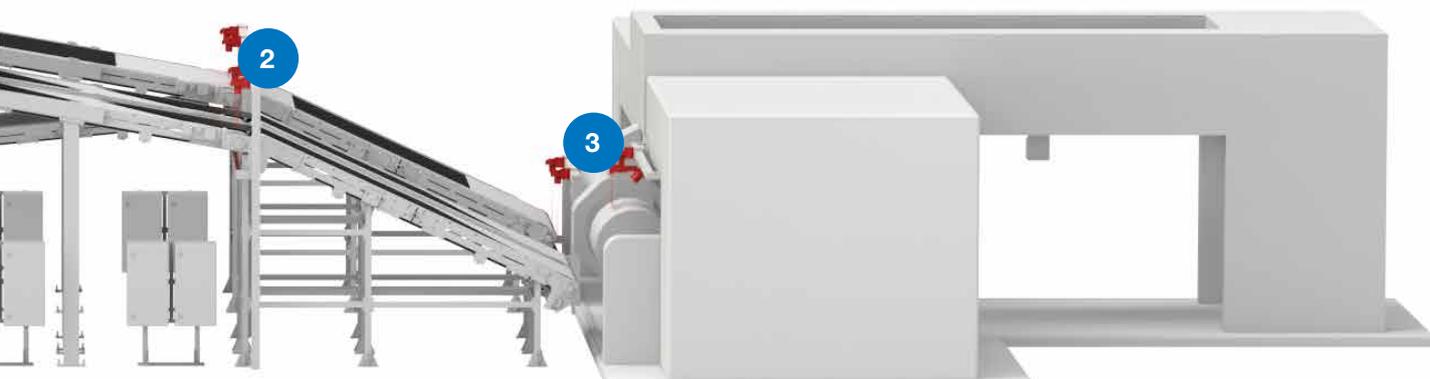
The use of our products in a tire building machine enables precise, efficient tire building. Due to the automated processes and the exact control of the components, tires of consistent quality and fit accuracy are achieved. It is also possible to maintain a high machine production speed and meet the high demand from industry.

Due to modern web-based management technology (WBM), our equipment can also be operated straightforwardly from almost any browser in the network. Furthermore, we offer versatile options such as the intuitive command station OP 36 and our innovative ELQ software for controlling your systems and the statistical evaluation and monitoring of your production data. Maximize the efficiency and productivity of your line with our comprehensive range of solutions.



Our products

<p>1</p>	<p>ELPLACER – SVB13 ELSMART – SWB11</p>	<p>Exact pre-positioning by means of the lateral displacement roller and segmented roller guider systems SVB13 and SWB11. You will find detailed descriptions of these products on pages 41/43.</p>	
<p>2</p>	<p>Carcass control system Belt control system Tread control system</p>	<p>Perfect application of the materials to the drum by means of various control modes on the tire building machine. You will find detailed descriptions of these products on page 51.</p>	
<p>3</p>	<p>Tire building inspection – EDS2</p>	<p>Fully automatic checking of positioning and splicing of the materials on the drum with tire building inspection EDS2. You will find a detailed description of this product on page 84.</p>	



EL.TAG machine

Unique solution for high-quality RFID tags

- Insertion of RFID chips between the two layers in only a few seconds thanks to a robot-assisted process
- Durable ultrasonic rubber strip cutter
- 2-D camera system for monitoring the robotic process
- Double quality control: dimensional check by inspection system and functional check by direct reading
- Identification system for the final bobbin (upon request)
- Scanner and labeling systems (upon request)

The machine to be delivered meets the following standards:

- Machinery Directive 2006/42/EC
- Low Voltage Directive 2014/35/EU
- Electromagnetic Compatibility Directive 2014/30/EU
- Electrical Equipment Directive EN 60204-1-2018
- Design and construction meet the requirements of the quality assurance system in accordance with ISO 9001

Technical data

Rubber bobbin

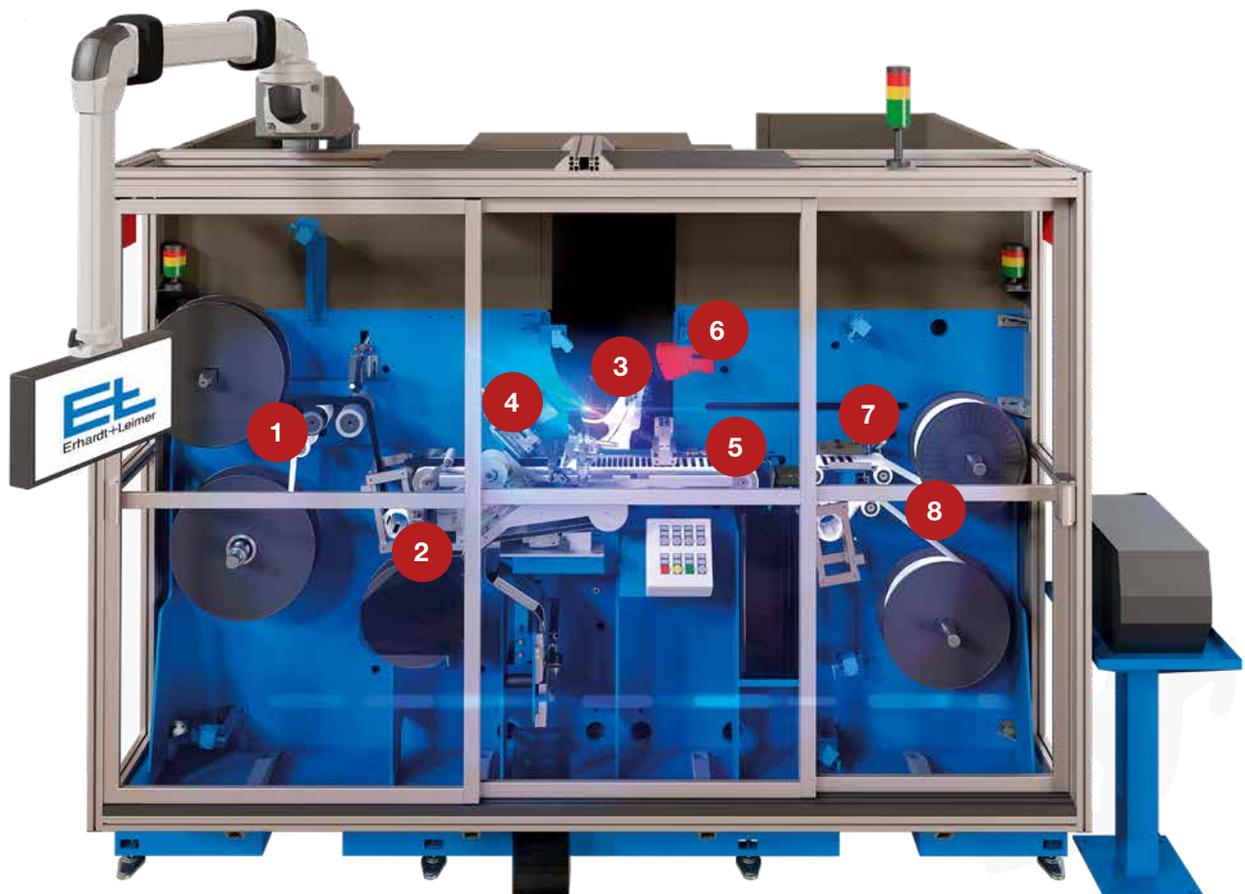
Thickness	0.6 to 0.8 mm
Length	50 to 70 mm

RFID chip

Blister belt fed in (ISO 60286-3), 72 mm

Final tag

Minimum width of final tag	10 mm
Maximum width of final tag	12 mm
Length of final tag	50 to 70 mm
Cycle time, blister processing	1 piece / 4 s
Width tolerance	± 2 mm
Incoming rubber material tolerance	$\pm t_1$ (depending on customer material)
Length process tolerance	t_2 0 to 2 mm
Final length tolerance	$\pm t_1 + t_2$
Edge 1 / 3	$\geq [(\text{rubber length} - t_1 - \text{antenna length}) / 4]$
Edge 2 / 4	≥ 2 mm



EL.TAG machine layout

<p>1 Rubber strip unwinding</p>	<p>The bobbin is fixed on an expanding shaft with a 40 mm square profile. A brake is used for controlling the tensile force during unwinding. The material continues on to the cutting and doubling device via a belt conveyor. The protective film (polyethylene film) removed from the rubber strip is wound directly onto an expanding shaft with a diameter of 60 mm. It is possible to wind bobbins with a maximum diameter of 390 mm. An aluminum tool is provided to simplify the removal of the film. An actuating drive is mounted directly on the axle for the shaft.</p>
<p>2 Blister feeder Blister and film disposal</p>	<p>The bobbin meets the ISO standard 60286-3. Bobbin size 72 mm, diameter 330 mm. The blister is pulled step-by-step with a pneumatic device. Two pneumatic up / down locking systems keep the blister in position during processing. Then a sliding plate transports the empty blister to the cutting unit and the film removed to a sleeve. Compact FESTO valve units with quick-release connections are placed directly on the device. The empty blister enters a chute at the exit of which is a cutting blade programmed to perform a cut after the required number of cycles. The cutting blade cuts the empty blister into correctly sized pieces for disposal.</p>
<p>3 Robot assembler with 2D camera</p>	<p>The operating cycle of the robot is as follows: the first strip is cut and placed on the conveyor belt. While the RFID chip is picked up, the conveyor belt moves a step forward and the second strip is cut and picked up. The RFID chip is placed on the first strip and then the second strip is placed on top. The 2D camera above the assembly area monitors the entire sequence to ensure the correct dimensions of the final product. The unit is equipped with a FESTO pneumatic vacuum suction nozzle and a special MATRIX quick action valve.</p>
<p>4 Ultrasonic cutter</p>	<p>A 40 kHz ultrasonic cutting system cuts endless rubber strips into pieces. The unit consists of an ultrasonic frequency generator, a frequency amplifier, a head cap and an oscillating blade.</p>
<p>5 Doubling unit</p>	<p>The doubling unit presses the two rubber strips together with the RFID chip in between. It consists of twin pressure rollers with pressure regulation.</p>
<p>6 Dimensional conformity check with 3-D camera</p>	<p>The RFID tag is checked with the aid of a 3-D camera inspection system and an RFID checker. This checker is connected to an IPC that displays the results of the inspection process. The 3-D inspection system allows the measurement of all dimensions to ensure the two strips and the RFID chip are positioned within the tolerances.</p>
<p>7 RFID checker</p>	<p>The RFID checker, positioned as a final check before the pick & place system, is used to check directly that the data in the RFID chip can be read. In this way it is ensured that all RFID tags function correctly. On request this system can automatically run a validation to verify the calibration procedure and check the repeatability of the measurements. All the measurements can be sent, via OPC UA, to an online ERP (if available) to provide complete traceability of the production and control data.</p>
<p>8 Final rewinder</p>	<p>The winding unit for laminated and cut RFID tags on film can be used to wind up a strip of film onto bobbins with a maximum diameter of 350 mm. The bobbins are fixed on an expanding shaft with a 43 mm square profile. An actuating drive is mounted on the axle for winding. The unwinding unit for the plastic backing film is able to unwind a strip from bobbins with a maximum diameter of 400 mm. The bobbins are fixed on an expanding shaft with a 43 mm square profile. An actuating drive is available for unwinding. Bidirectional rotation is possible.</p>



The EL.TAG machine is part of the range of machines produced by our subsidiary in Italy. For information about further specific solutions and machine components for the tire industry, please scan the QR code.

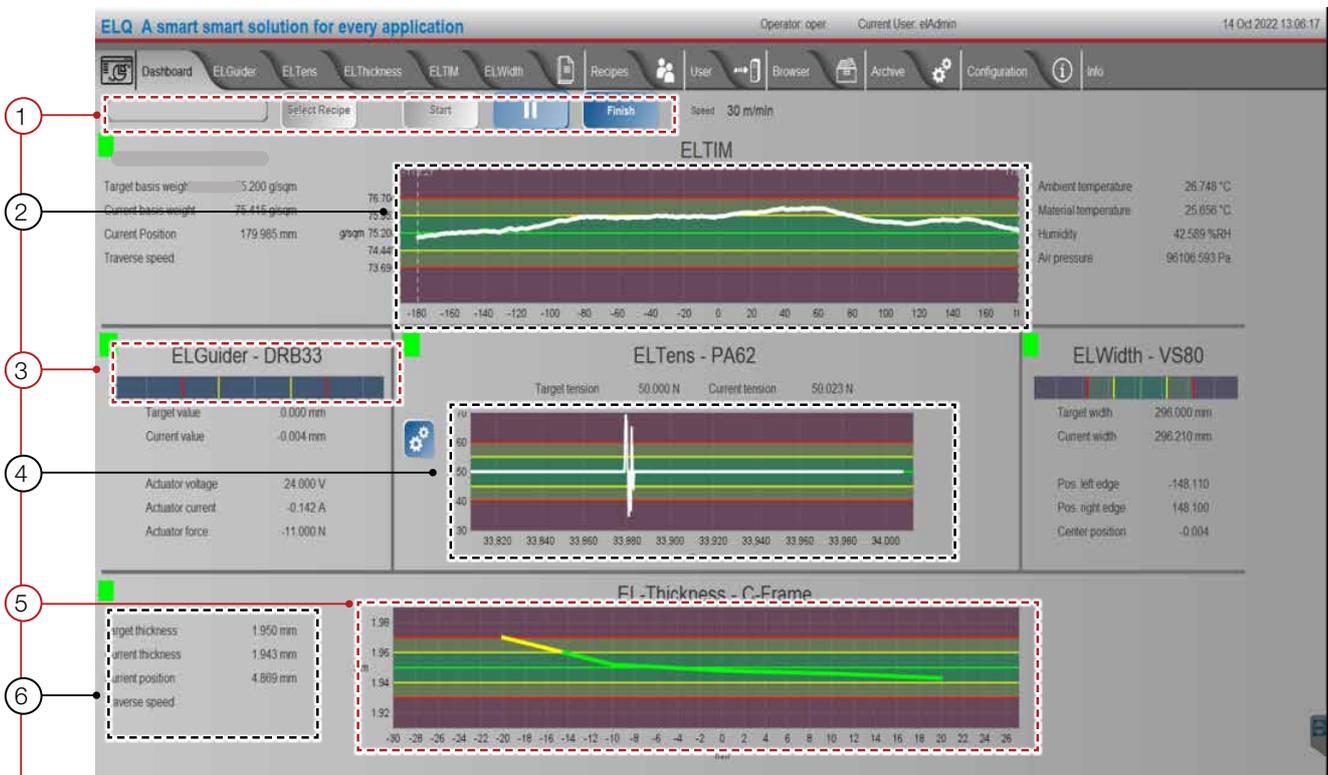
Control and data management software ELQ

Maximize the value of your knowledge

Our central intelligence software ELQ is designed for the operation and optimization of your E+L systems and handles data management for all production data, including data recorded from third-party systems via standard interfaces, for comprehensive quality evaluation, analysis, and reporting.

The modular layout means that it is possible to connect a wide range of different systems and sensors, whether thickness measurement systems with confocal, interferometric, or laser triangulation sensors, basis weight measurement systems, control systems based on the new EL.NET technology, or web tension measurement systems.

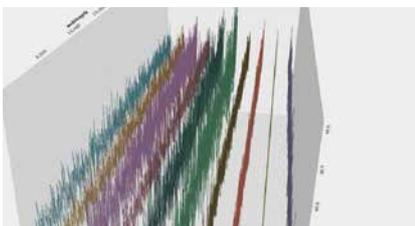
All data are displayed in a dashboard on the user-friendly touchscreen.



Legend

- 1 Manual mode
- 2 Profile view
- 3 Correction direction and intensity of the web guider
- 4 Trend display of measured values
- 5 Profile measurement zones
- 6 Numeric display of recipe and current measured values

Further views



3-D view



Calibration



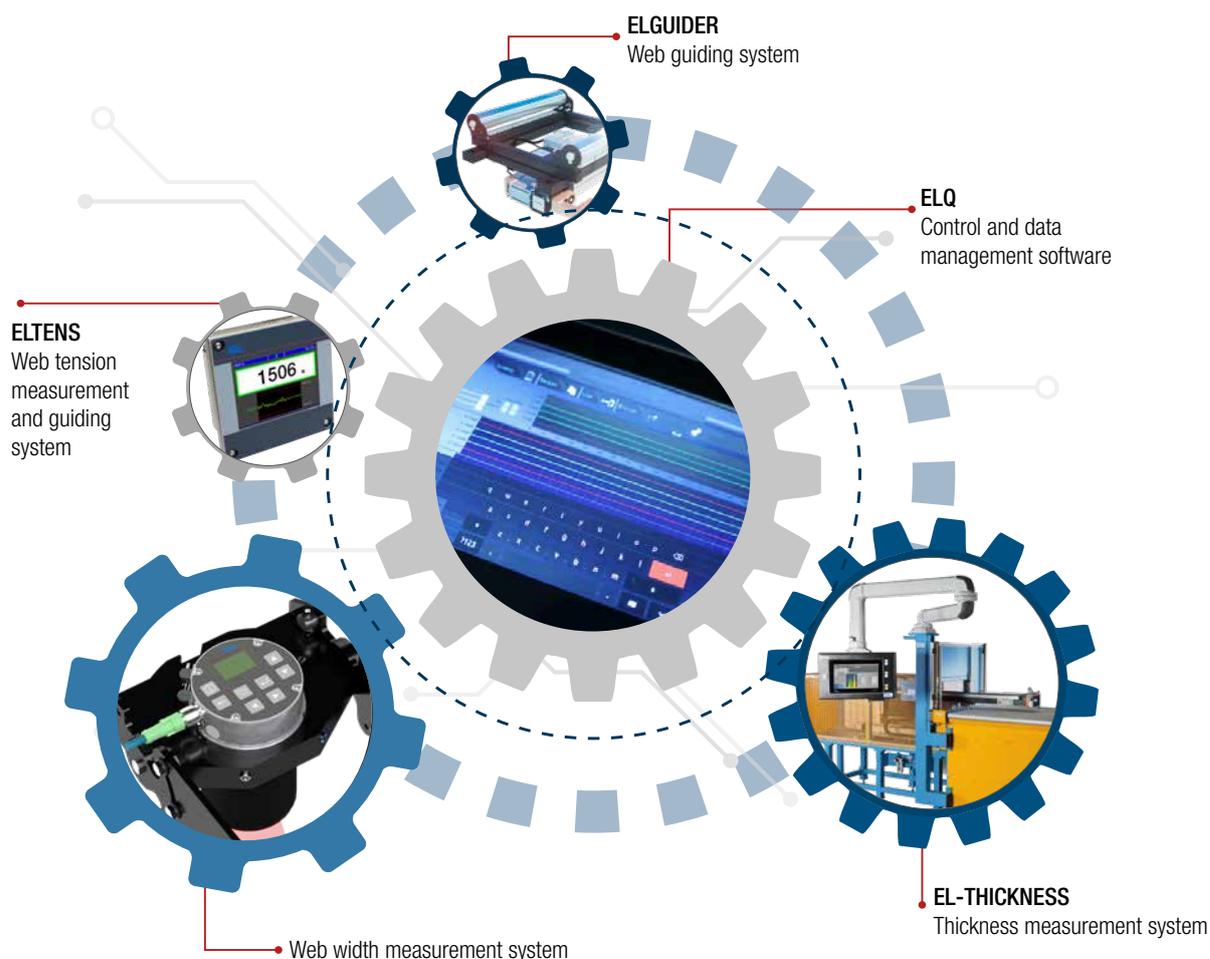
User login

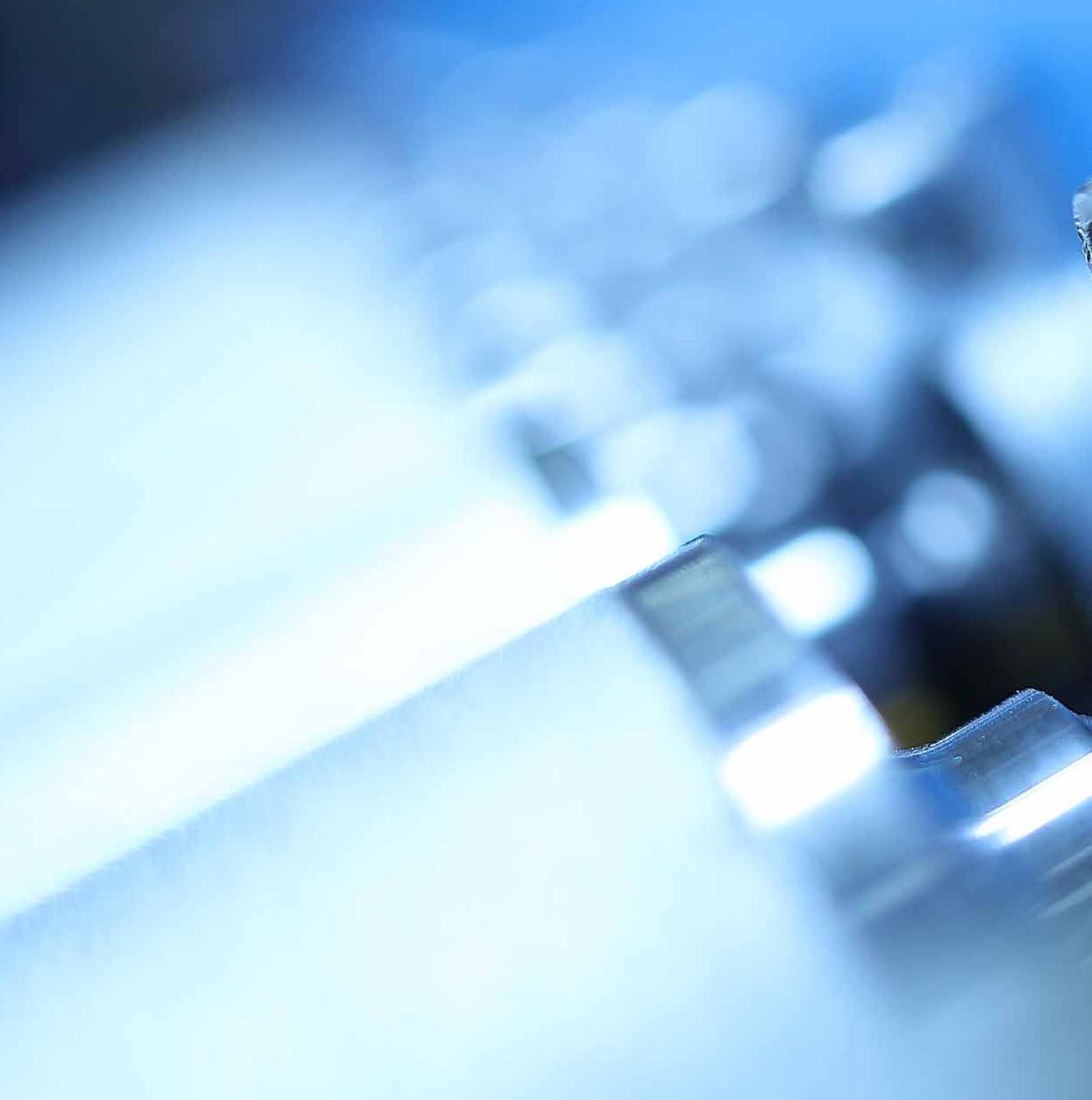
Smart data usage

Product description

- Process display, presentation and comparison of measured data for all connected systems using trend and bar displays
- Evaluation of measured data based on specified recipe data
- Automatic job/reel log
- Automatically printable reports for each job when machine reels are changed
- Output of CSV and PDF files
- Job archive
- Central recipe management via ELQ panel, PLC or database
- Statistical evaluation (max./min. values, standard deviation, CP, Cpk, etc.)
- Different customer interfaces (Ethernet IP/UDP, Profinet, SQL, OPC UA, and many more)
- Platform-independent, can run on Linux and Microsoft Windows
- Minimum system requirements: Intel Core i3 processor, at least 8 GB working memory, at least 512 GB SSD, resolution 1920 x 1080 Full HD (other specifications on request)

Modular systems connected with an intelligent unit





WEB GUIDING TECHNOLOGY

The precise positioning and guiding of a web during processing and finishing is of crucial importance throughout the entire production process.

Erhardt+Leimer offers a broad range of products and systems for the highest quality results.

Web guiding systems

Our systems for web guiding with state-of-the-art networking technology

The production of a tire requires different rubber webs, which are processed on different production machines. In the final step, the individual rubber webs are assembled on the tire building machine to form an unvulcanized tire. To meet the stringent requirements in the automotive industry, in every process step the rubber webs need to be fed into the process with great positional accuracy. And this is exactly what the products from Erhardt+Leimer enable.

We offer

- **Pivoting frame systems ELGUIDER**
 - Pivoting frame system DRB73
 - Pivoting frame system DRB73 with roller basket
- **Steering roller systems ELROLLER**
 - Steering roller system SRB33
 - Steering roller system SRB43
 - Steering roller system SRB63
- **Pivoting roller system ELBANDER**
 - Pivoting roller system VGB15
- **Winding station control systems ELWINDER**
 - Winding station control systems WSB91/93
- **Lateral displacement roller systems ELPLACER**
 - Lateral displacement roller system SVB13
 - Lateral displacement roller system SVB23
 - Lateral displacement roller system SVB43
- **Segmented roller guider system ELSMART**
 - Segmented roller guider system SWB11
- **Laminating station Complexer**
- **Conveyor belt control systems**
 - Conveyor belt control system
 - Carcass control system
 - Belt control system
 - Tread control system

Web spreading systems

Our width control systems guarantee high quality throughout

Every tire structure contains a carcass made up of multiple layers as the load-bearing structure. To build the structure, the tire cord must be guided on the calender line with a constant web width before the rubberizing process. The full-width expander systems from Erhardt+Leimer provide all the prerequisites for meeting today's quality standards in the automotive industry.

We offer

- **Edge spreading system EPILiner**
 - Edge spreading system BCB11
- **Spreading systems CordAliner**
 - Spreading system with one bow roller BCB21
 - Spreading system with two bow rollers BCB31
- **Spreading systems X-Pander**
 - Spreading system full-width X-Pander BCB41
 - Spreading system half-width X-Pander BCB51

Positioning and follow-up control systems

Our systems for exact positioning and follow-up control

When it comes to meeting the high quality requirements in the tire industry, accurate positioning of ink bottles for the application of the colored marking lines on the tread or the precise positioning and follow-up of cutting systems are crucial. These high requirements are met with the systems from Erhardt+Leimer.

We offer

- **Ink bottle positioning EL-PAPS**
 - Ink bottle positioning NPS10
- **Support beams ELPOSER**
 - Motorized support beam VSB80/97

Pivoting frame systems ELGUIDER

Function

On an ELGUIDER pivoting frame system, the web changes direction four times, each time by 90°. The system is based on a pivoting frame with two path rollers. The imaginary pivot point is located on the infeed plane. Lateral web corrections can only be achieved by pivoting around this pivot point.

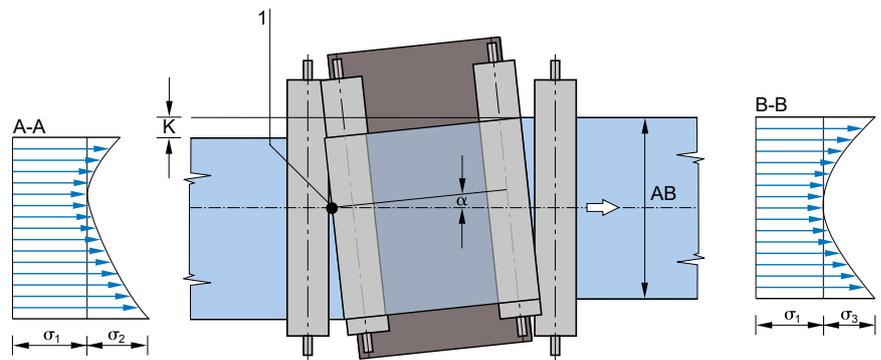
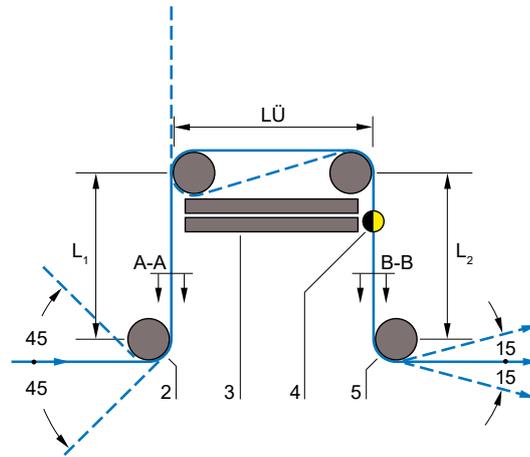
The prerequisite here is always sufficient tensile force for friction-locking between the web and the positioning roller.

Area of use

Thanks to optimized exploitation of the elasticity ranges, the pivoting frame is particularly suited to use even in tight spaces.

Application

The greater the web tension, the modulus of elasticity and the required correction, the longer the infeed, exit and transfer paths should be designed. Experience has shown that these paths should be the equivalent of 60 to 100 percent of the web width. The sensor should be positioned behind the positioning roller, as near to it as possible.



Legend

A-A	Web tension distribution at infeed	1	Pivot point
B-B	Web tension distribution at exit	2	Infeed roller
K	Web correction	3	Roller frame
α	Correction angle	4	Sensor
σ_1	Basic web tension	5	Locking roller
σ_2	Tension distribution due to pivoting movement of roller frame at the infeed	LÜ	Transfer length
σ_3	Tension distribution due to pivoting movement of roller frame at the exit	L ₁	Infeed path
		L ₂	Exit path
		AB	Operating width

Pivoting frame system DRB73 (with roller basket)

- Pivoting frame system in frame design with wear-free, brushless digital drive technology for the highest positional accuracy and control dynamics
- Can be combined with infrared wide band sensor FE 46 or CCD camera OL 82
- Integrated fieldbus interface Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems
- Operation, service and diagnostic capability via web-based management based on a standard web browser or via DO 32 or OP 34/36



Pivoting frame system DRB73

DRB73 with roller basket

Pivoting frame system with roller basket for control of steel cord from the loop



Pivoting frame system DRB73 with roller basket

Selection table

Height (mm)	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	
2500																			
2400																			
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900																			
800																			
700																			
600																			

LÜ = Transfer length NB = Nominal width

Technical data		
	DRB73	DRB73 with roller basket
Positional accuracy	< ±0.15 mm (sensor-dependent)	< ±0.2 mm
Nominal width	800 to 4000 mm	500 to 700 mm
Transfer length	600 to 2500 mm	1300 mm
Nominal actuating travel		
LÜ 600 to 700 mm	Max. ±25 mm	Max. ±25 mm
LÜ 800 to 1300 mm	Max. ±50 mm	
LÜ 800 to 2500 mm	Max. ±80 mm	
Nominal actuating speed at outfeed roller	1 to 30 mm/s (AG 93 with F = 3000 N)	1 to 30 mm/s (AG 93 with F = 3000 N)
Web tension	Max. 2000 N (reinforced version up to 3000 N, optionally up to 20,000 N)	Max. 2000 N
Roller diameter	100/120/160/200 mm	2 x 168 / 5 x 84 mm
Ambient temperature	+10 °C to +50 °C	
Relative humidity	15 to 95 % (non-condensing)	
Operating voltage		
Nominal value	24 V DC	
Nominal range	20 to 30 V DC (ripple included)	
Nominal range with power supply	100 to 240 V, 50/60 Hz	
Current consumption	Max. 7.7 A DC	Max. 5.5 A DC
Interface	Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems	
Protection rating	IP 54	

Steering roller systems ELROLLER

Function

ELROLLER steering roller systems correct the web position already in the infeed plane. They consist of a fixed base frame and a moving guide frame. The latter accommodates one or two positioning rollers and swivels around an imaginary pivot point in the infeed plane. The pivot point should, on the one hand, be far enough away from the infeed roller to ensure the web correction does not influence the infeed roller. On the other hand, it must be far enough away from the positioning roller to ensure the elasticity of the web is fully exploited but not overstrained. A steering roller is termed a proportional actuator. It must therefore operate in a friction-locked manner and must not permit any sliding between the web and the positioning roller.

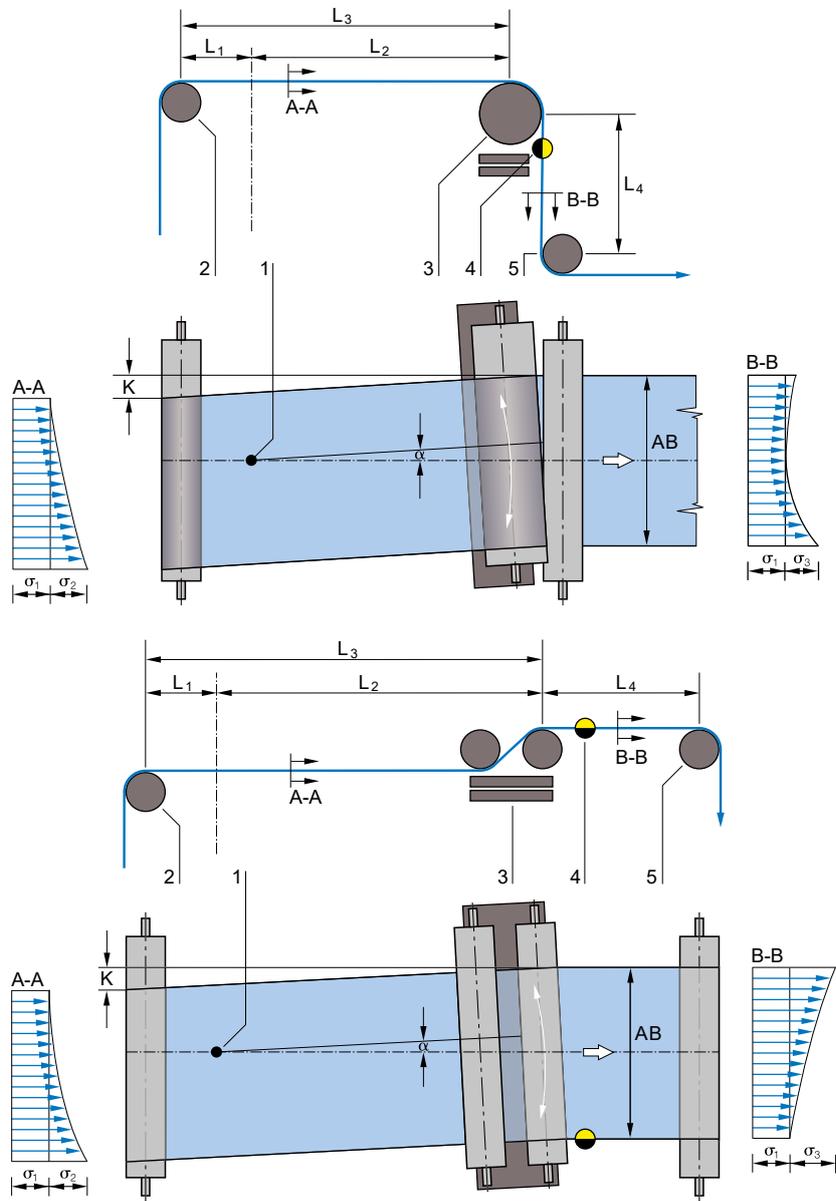
Area of use

ELROLLER systems are always used where there is a long infeed path for process-related reasons.

Application

Depending on the space available, steering rollers may be fitted with one or two positioning rollers. On versions with one positioning roller, the web is guided with wrapping of 90°. On versions with two positioning rollers, less wrapping is possible. In this case, the web runs in almost the same plane as the outfeed roller.

The following applies when mounting an ELROLLER: the infeed path should be the equivalent of two to three times the web width, the exit path should be the equivalent of between 50 and 100 percent of the web width. The sensor should be positioned behind the positioning roller, as near to it as possible. As a consequence, improved control dynamics are achieved thanks to the resulting short response time.



Legend

A-A	Web tension distribution at infeed	1	Pivot point
B-B	Web tension distribution at exit	2	Infeed roller
K	Web correction	3	Positioning roller(s)
α	Correction angle	4	Sensor
σ_1	Basic web tension	5	Locking roller
σ_2	Tension distribution due to pivoting movement of roller frame at the infeed	L ₁	Infeed path to the pivot point
σ_3	Tension distribution due to pivoting movement of roller frame at the exit	L ₂	Infeed path to the steering roller
		L ₃	Infeed path
		L ₄	Exit path

Steering roller system SRB33

- Compact steering roller system with one roller and wear-free, brushless digital drive technology for highest positional accuracy and control dynamics
- Can be combined with various sensors for the acquisition of the web edge
- Integrated fieldbus interface Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems
- Operation, service and diagnostic capability via web-based management based on a standard web browser or via OP 34/36



Steering roller system SRB33

Selection table		
Type	Nominal width min.	Nominal width, max.
SR 3319	200 mm	250 mm
SR 3329	300 mm	350 mm

Sensors

FR 53, FR 60, light sensor

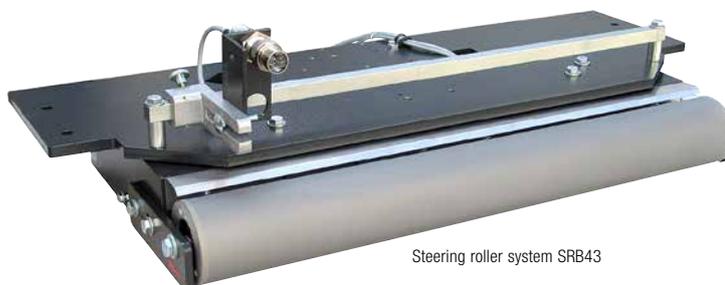
Actuators

AG 9

Technical data	
Positional accuracy	< ±0.15 mm (material-dependent)
Nominal width	200/250/300/350 mm
Nominal actuating travel	±22 mm
Nominal actuating speed at outfeed roller	1 to 60 mm/s (AG 91 with F = 1000 N)
Web tension	Max. 200 N
Roller diameter	60/80 mm
Ambient temperature	+10 °C to +50 °C
Storage temperature	-20 °C to +80 °C
Relative humidity	15 to 95 % (non-condensing)
Operating voltage	24 V DC
Nominal value	20 to 30 V DC (ripple included)
Nominal range	100 to 240 V, 50/60 Hz
Nominal range with power supply	
Current consumption	Max. 5.5 A DC
Interface	Ethernet UDP/IP, EtherNet/IP Optional: Profinet and other databus systems
Protection rating	IP 54

Steering roller system SRB43

- Compact steering roller system with one roller and wear-free, brushless digital drive technology for highest positional accuracy and control dynamics
- Can be combined with various sensors for the acquisition of the web edge
- Integrated fieldbus interface Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems
- Operation, service and diagnostic capability via web-based management based on a standard web browser or via OP 34/36



Steering roller system SRB43

Selection table			
Type	NB min.	NB max.	With PD 2115
SR 4309	400 mm	600 mm	
SR 4309	300 mm	500 mm	x
SR 4319	700 mm	800 mm	
SR 4319	600 mm	700 mm	x
SR 4329	900 mm	1200 mm	
SR 4329	800 mm	1100 mm	x
SR 4339	1300 mm	1800 mm	
SR 4339	1200 mm	1700 mm	x

Sensors

FR 53, FR 60, light sensor

Actuators

AG 9

Technical data	
Positional accuracy	< ±0.15 mm (material-dependent)
Nominal width	400 to 1800 mm
Nominal actuating travel	±25 mm
Nominal actuating speed at outfeed roller	1 to 60 mm/s (AG 91 with F = 1000 N)
Web tension	Max. 500/700 N
Roller diameter	120 mm
Ambient temperature	+10 °C to +50 °C
Storage temperature	-20 °C to +80 °C
Relative humidity	15 to 95 % (non-condensing)
Operating voltage	
Nominal value	24 V DC
Nominal range	20 to 30 V DC (ripple included)
Nominal range with power supply	100 to 240 V, 50/60 Hz
Current consumption	Max. 5.5 A DC (manual sensor positioning)
Interface	Ethernet UDP/IP, EtherNet/IP Optional: Profinet and other databus systems
Protection rating	IP 54

Steering roller system SRB63

- Compact steering roller system with two or three rollers and wear-free, brushless digital drive technology for highest positional accuracy and control dynamics
- Can be combined with infrared wide band sensor FE 46 or CCD cameras OL 82 for the acquisition of the edges of the tire cord and rubber
- Integrated fieldbus interface Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems
- Operation, service and diagnostic capability via web-based management based on a standard web browser or via DO 32 or OP 34/36



Steering roller system SRB63 with 2 rollers



Steering roller system SRB63 with 3 rollers

Selection table

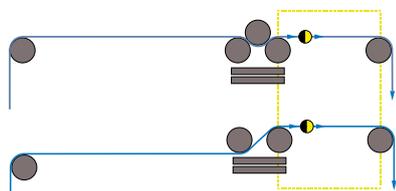
Type	Roller diameter	Number of rollers	Web tension max.
SR 6311	157 mm	2	5000 N
SR 6315	120 mm	3	20,000 N

Sensors

FE 46, OL 82

Actuators

AG 9



Attention! Straight web outfeed only

Technical data

Positional accuracy	< ±0.15 mm (sensor-dependent)
Nominal width	1400 to 1800 mm
Nominal actuating travel	±75 mm
Nominal actuating speed at outfeed roller	1 to 30 mm/s (AG 93 with F = 3000 N)
Web tension	See selection table
Roller diameter	See selection table
Ambient temperature	+10 °C to +50 °C
Storage temperature	-20 °C to +80 °C
Relative humidity	15 to 95 % (non-condensing)
Operating voltage	24 V DC
Nominal value	20 to 30 V DC (ripple included)
Nominal range	100 to 240 V, 50/60 Hz
Nominal range with power supply	
Current consumption	Max. 7.7 A DC
Interface	Ethernet UDP/IP/IP, EtherNet/IP Optional: Profinet and other databus systems
Protection rating	IP 54

Pivoting roller system ELBANDER

Function

Rollers at an angle to the direction of belt travel cause the belt to move laterally. This principle is used by the pivoting roller systems ELBANDER. The pivot point for the pivoting roller is one of the two bearings at the ends. The positioning roller is positioned at an angle around this point, depending on the correction required.

Area of use

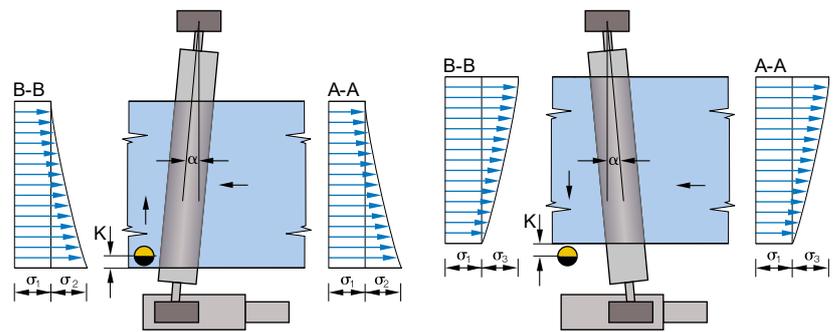
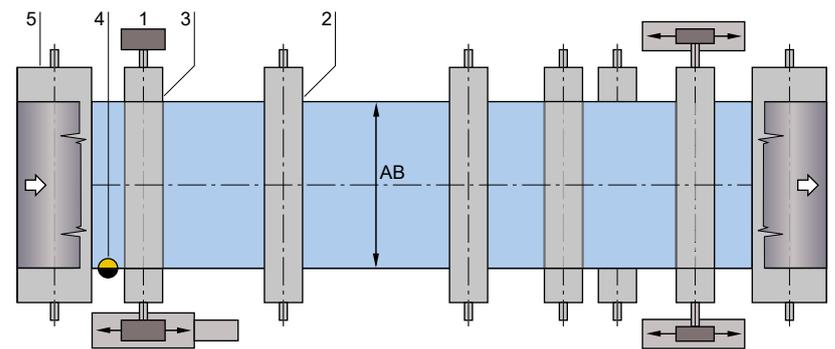
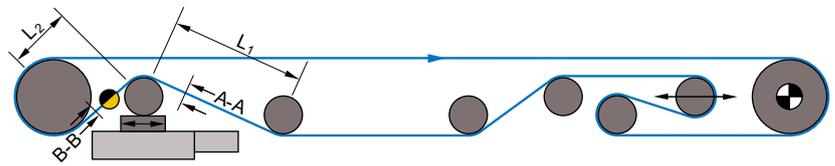
Pivoting roller systems are used to guide conveyor belts.

Application

On conveyor belts, the pivoting roller is mounted on the bottom run just ahead of the lock roller. The actuator is to be arranged parallel to the direction of travel of the belt. The actuating movement must be at the bisector between the infeed and exit path.

The infeed path should be the equivalent of at least one web width. The exit path is to be kept as short as possible. The wrapping around the positioning roller should be between 40° and 60°. For production speeds >1000 m/min the wrapping should be reduced to 10° to 20°. The position is acquired using an edge sensor immediately after the positioning roller.

To prevent possible interference from the stretch roller on the control system, this roller is only allowed to be positioned with its axis parallel.

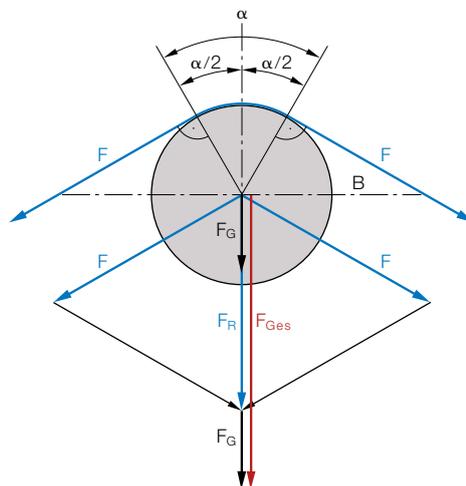


Legend

- | | | | |
|------------|---|-------|--------------------|
| A-A | Belt tension distribution at the infeed | 1 | Pivot point |
| B-B | Belt tension distribution at the outfeed | 2 | Infeed roller |
| K | Correction of the belt position | 3 | Positioning roller |
| α | Correction angle | 4 | Sensor |
| σ_1 | Basic belt tension | 5 | Locking roller |
| σ_2 | Tension distribution on actuating movement to left | L_1 | Infeed path |
| σ_3 | Tension distribution on actuating movement to right | L_2 | Exit path |
| | | AB | Operating width |

Calculation of bearing force

$$F_{Tot/2} = (F_R + F_G)/2$$



Legend

- | | |
|-------------|--------------------------------------|
| B | Movement plane of positioning roller |
| F | Belt tension |
| α | Wrap angle |
| F_R | Resulting fabric tension |
| F_G | Weight of the positioning roller |
| F_{Tot} | Total force |
| $F_{Tot/2}$ | Force per bearing side |

Pivoting roller system VGB15

- Compact pivoting roller system with contactless edge acquisition
- Infrared edge sensor FR 53 for the contactless acquisition of mesh belts
- Ultrasonic edge sensor for the contactless acquisition of closed conveyor belts particularly in dusty ambient conditions
- Digital position controller with control structure for integral actuators ensures a stable control loop
- Actuator with linear guide, self-locking trapezoidal spindle and torque arm for precise correction



Pivoting roller system VGB15

Sensors

OL 82, FR 53, light sensor

Actuators

AG 9

Technical data

Positional accuracy	±1 mm (depending on the quality of the belt)
Nominal actuating travel	±8 to 10 mm
Nominal actuating force	1 kN
Support load, actuator Ø 20 mm Fixed bearing Ø 20 mm	Max. 1 kN Max. 1 kN
Ambient temperature	+10 °C to +50 °C
Operating voltage Nominal value Nominal range Nominal range with power supply	24 V DC 20 to 30 V DC 115 to 460 V, 50/60 Hz
Current consumption	3.6 A DC
Protection rating	IP 54
Weight without positioning roller	14 kg
Weight fixed bearing	2 kg

Winding station control systems ELWINDER

Function

In production processes with moving webs, there is typically an unwinder at the machine infeed and a rewinder at the exit. During unwinding, the winding station is moved via a linear drive to feed the web in the desired position. On the other hand, during rewinding, the winding station follows the constantly changing web position via a linear drive to achieve an evenly wound reel.

Area of use

Web guiders with ELWINDER winding stations are used wherever it is not possible to use ELGUIDER or ELROLLER systems due to lack of space.

Application, unwinding

During unwinding, the sensor is mounted on the machine to define the target web position. The position should be acquired as close as possible to the final guide roller on the winding station.

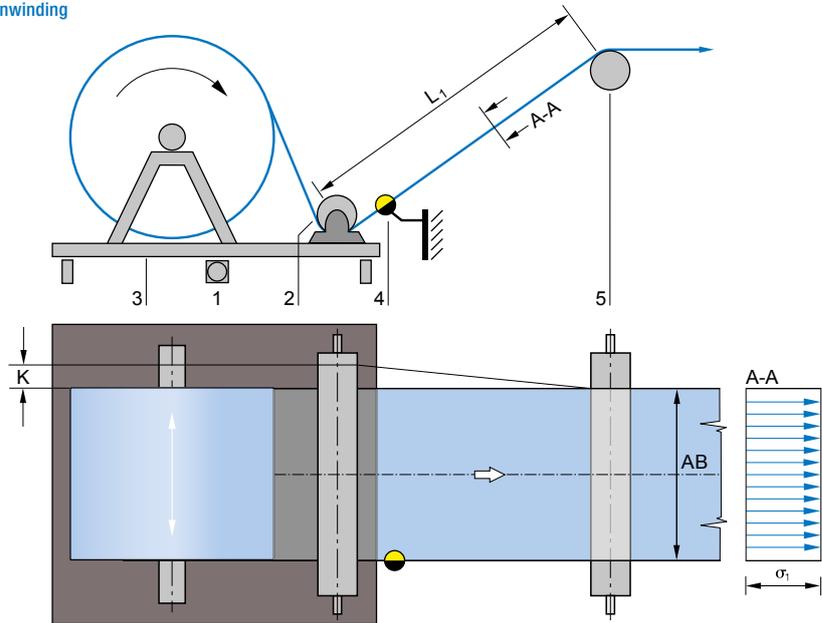
Application, unwinding with synchronous roller

If, for space reasons, it is not possible to fit a guide roller to the winding station, it can be designed as a synchronous electrically coupled roller.

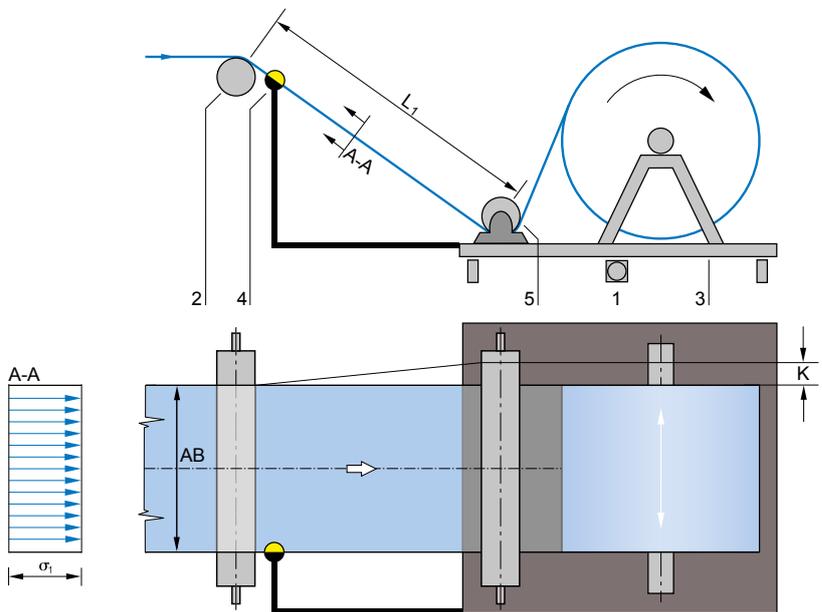
Application, rewinding

During rewinding, the sensor is fastened to the winding station to set the target position of the winding station for the controller. The position should be acquired as close as possible to the final guide roller on the machine. The guiding path L_1 depends on the elasticity of the web. The greater the elasticity range in the transverse direction, the shorter the path L_1 can be. Experience has shown that the guiding path should be the equivalent of half a web width.

Unwinding



Winding



Legend

- | | | | |
|------------|--|-------|-----------------|
| A-A | Web tension distribution on the guiding path | 1 | Linear drive |
| K | Web correction | 2 | Infeed rollers |
| σ_1 | Basic web tension | 3 | Winding station |
| AB | Operating width | 4 | Sensor |
| | | 5 | Locking roller |
| | | L_1 | Guiding path |

Winding station control systems WSB91/93

- Control components for winding stations with wear-free, brushless digital drive technology for highest positional accuracy and control dynamics
- Can be combined with infrared edge sensor FR 53 or infrared wide band sensor FE 46 or CCD camera OL 82
- Integrated fieldbus interface Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems
- Operation, service and diagnostic capability via web-based management based on a standard web browser or via DO 32 or OP 34/36



Infrared edge sensor FR 53



Data network center DN 40



Actuating drive AG 93



Command station DO 42

Actuating drive AG 9

Type	Nominal actuating travel	Nominal actuating force
AG 9003	±25 mm	800 N
AG 9013	±50 mm	800 N
AG 9023	±75 mm	800 N
AG 9033	±100 mm	800 N
AG 9103	±25 mm	1000 N
AG 9113	±50 mm	1000 N
AG 9123	±75 mm	1000 N
AG 9133	±100 mm	1000 N
AG 9313	±50 mm	3000 N
AG 9333	±100 mm	3000 N
AG 9343	±150 mm	3000 N
AG 9353	±200 mm	3000 N
AG 9613	±50 mm	5500 N
AG 9633	±100 mm	5500 N
AG 9643	±150 mm	5500 N
AG 9653	±200 mm	5500 N
AG 9709	±25 mm	6800 N
AG 9719	±50 mm	6800 N
AG 9729	±75 mm	6800 N
AG 9739	±100 mm	6800 N
AG 9749	±150 mm	6800 N

Technical data

Positional accuracy	< ±0.2 mm (sensor-dependent)
Nominal actuating speed	1 to 30 mm/s (AG 90/93) 1 to 60 mm/s (AG 91)
Ambient temperature	+10 °C to +50 °C
Storage temperature	-20 °C to +80 °C
Relative humidity	15 to 95 % (non-condensing)
Operating voltage	24 V DC
Nominal value	20 to 30 V DC (ripple included)
Nominal range	100 to 240 V, 50/60 Hz
Nominal range with power supply	Max. 2.2 A DC (AG 90 with man. sensor positioning)
Current consumption	Max. 5.5 A DC (AG 91 with man. sensor positioning)
	Max. 7.7 A DC (AG 93 with man. sensor positioning)
Interface optional	Ethernet UDP/IP, EtherNet/IP Optional: Profinet and other databus systems
Certifications	Declaration of incorporation according to Machinery Directive 2006/42/EC NRTL certificate CU 72170613 04 (AG 91/93) NRTL certificate CU 72210743 02 (DN 40)
Protection rating	IP 54

Sensors

FE 46, FR 53, OL 82

Actuators

AG 9

Lateral displacement roller systems ELPLACER

Function

Lateral displacement roller systems ELPLACER position moving webs via the axial movement of the positioning roller. Here, if the positioning roller reaches the end position, the material is lifted by a device, the positioning roller is centered and the web is set back down. As the lateral displacement roller is only used in production systems with cycled operation, the process of lifting the web must always take place during stop times.

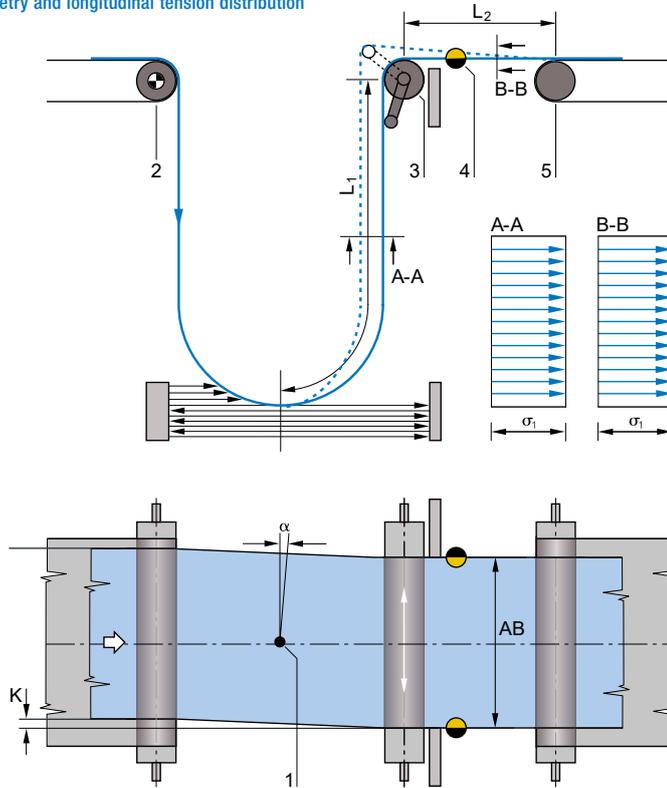
Area of use

The area of use extends primarily to tire building machines, because the webs such as the ply and the inner liner are fed in from the loop with cycled operation.

Application

Infeed is always from the loop from the bottom upward and should be kept as short as possible. The sensor should be positioned behind the positioning roller, as near to it as possible. The infeed path should be the equivalent of half to a full web width.

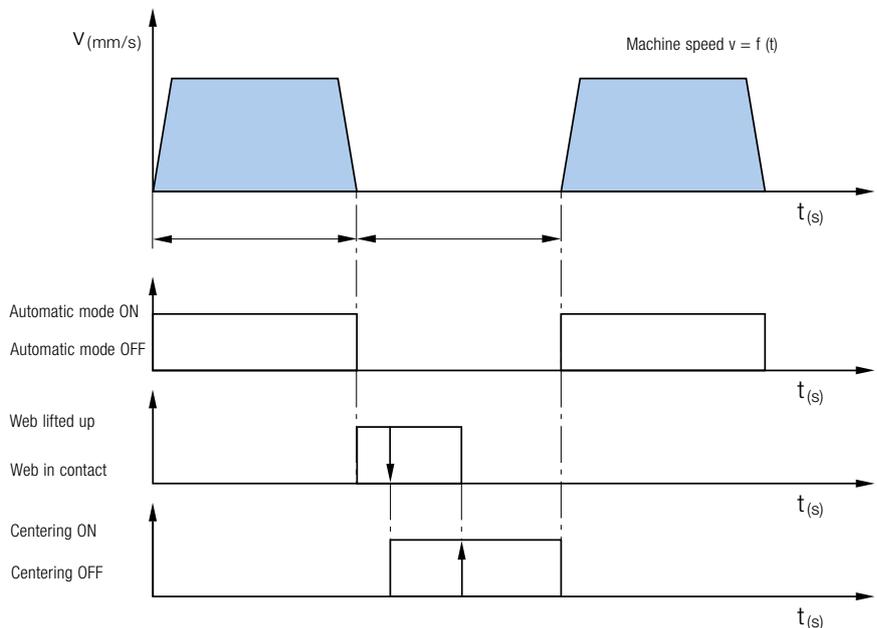
Guiding geometry and longitudinal tension distribution



Legend

- | | | | |
|------------|------------------------------------|-------|-----------------------------|
| A-A | Web tension distribution at infeed | 1 | Pivot point |
| B-B | Web tension distribution at exit | 2 | Infeed roller |
| K | Web correction | 3 | Lateral displacement roller |
| α | Correction angle | 4 | Sensor |
| σ_1 | Basic web tension | 5 | Locking roller |
| | | L_1 | Infeed path |
| | | L_2 | Exit path |

Function sequence – lateral displacement roller



Lateral displacement roller systems SVB13/23/43

- Wear-free, brushless digital drive technology for highest positional accuracy and control dynamics
- Can be combined with infrared edge sensor FR 53 or infrared wide band sensor FE 46 for the acquisition of rubber edges
- Integrated fieldbus interface Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems
- Operation, service and diagnostic capability via web-based management based on a standard web browser or via DO 32 or OP 34/36



Technical data

	SVB13	SVB23	SVB43
	Compact lateral displacement roller system with one roller for pre-control of inner liner and ply material on the tire building machine	Compact lateral displacement roller system with two rollers for pre-control of two sidewalls on the tire building machine	Compact lateral displacement roller system with three rollers for pre-control of a tread on the tire building machine
Sensors	FE 46/FR 53 Other sensors on request	FE 46/FR 53	FE 46/FR 53
Actuators	AG 9		
Positional accuracy	< ±1 mm (material-dependent)		
Nominal width	600 to 1900 mm	2 x 300 to 600 mm	400 to 1550 mm
Nominal actuating travel	±50 mm	±50 mm	±75 mm
Nominal actuating speed at outfeed roller	1 to 60 mm/s (AG 91 with F = 1000 N)		
Web tension	2 x 250 N	500 N	500 N
Roller diameter	160 mm	160 mm	3 x 60 mm
Ambient temperature	+10 °C to +50 °C		
Storage temperature	-20 °C to +80 °C		
Relative humidity	15 to 95 % (non-condensing)		
Operating voltage	24 V DC		
Nominal value	20 to 30 V DC (ripple included)		
Nominal range	100 to 240 V, 50/60 Hz		
Nominal range with power supply			
Current consumption	Max. 5.5 A DC		
Interface	Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems		
Protection rating	IP 54		
Operating pressure, lifting device	3 bar		

Segmented roller guider system ELSMART

Function

Guide profiles arranged around the circumference form the basis of the web guiding. In the basic version, the guide profiles are fixed to a guide plate so that they can be adjusted to the side via an actuating drive.

If two actuating drives are used, two webs can be controlled independently of each other, or a transversely elastic web can be guided based on a target width.

Area of use

Thanks to the minimum stress applied to the material by the segmented roller guider, the ELSMART system for web guiding and spreading can be used in practically all production processes.

Application

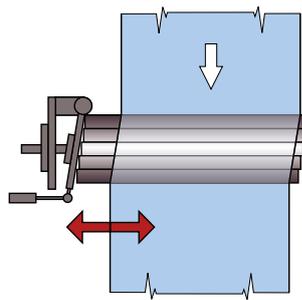
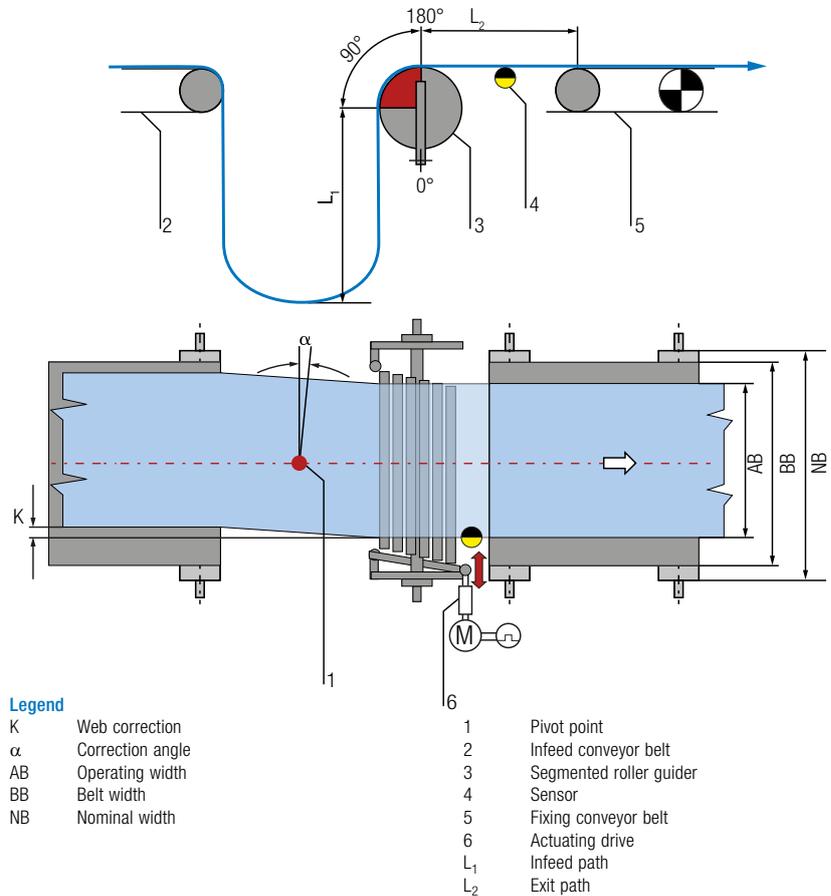
Segmented roller guiders can be used freely in terms of position. Wrapping of 90° is always required. Entry point 90°, exit point 180°. The infeed path should be the equivalent of at least one web width. By contrast, the exit should be kept as short as possible. Curled edges can be uncurled in the infeed plane with the aid of an additional spreading device.

Web guiding only

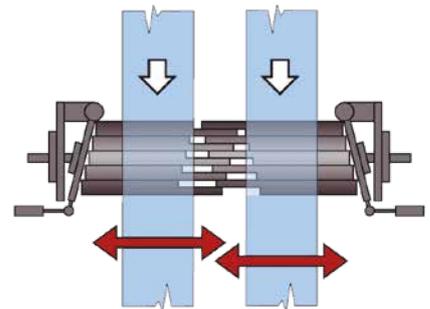
The version with undivided guide profiles across the full web width offers a particularly cost-effective solution for web guiding only.

Two-web operation

With this design two webs can be controlled independently of each other using split guiding slats and two independent drives. Spreading is not possible in this mode.



Web guiding only



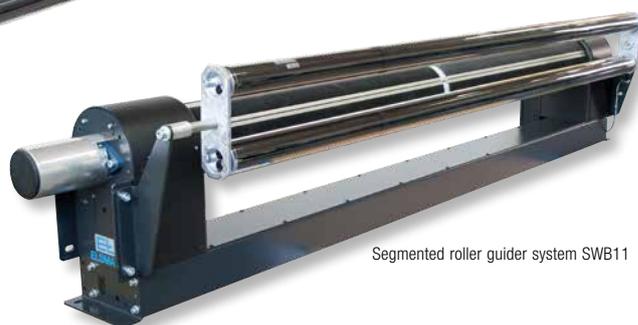
Two-web operation

Segmented roller guider system SWB11

- Compact segmented roller guider system for controlling one or two webs from the loop
- Wear-free, brushless digital drive technology for highest control accuracy and control dynamics
- Can be combined with infrared wide band sensors FE 46, FR 60 and OL 82 for the acquisition of the edges of the tire cord and rubber
- Integrated fieldbus interface Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems
- Operation, service and diagnostic capability via web-based management based on a standard web browser and via OP 34/36



Segmented roller guider system SWB11



Segmented roller guider system SWB11

Selection table

Type	Sensor	Type of control
SW 1162	FE 46	Web center, single web
SW 1180	FR 60	Web edge, two-web
SW 1170	FE 46	Web center, single web

Sensors

FE 46, FR 60, OL 82

Actuators

AG 9

Technical data

Positional accuracy	±1 mm (sensor-dependent)
Operating width	300 to 2600 mm
Nominal actuating travel	±17.5 mm
Nominal actuating speed	Up to 42 mm/s (AG 91 with F = 1000 N)
Web tension	500 N
Correction range	±100 mm (depending on web width, infeed path and web type)
Roller diameter	160 mm
Profile coating	Stainless steel profile with non-stick coating
Ambient temperature	+10 °C to +50 °C
Storage temperature	-20 °C to +80 °C
Relative humidity	15 to 95 % (non-condensing)
Operating voltage	
Nominal value	24 V DC
Nominal range	20 to 30 V DC (ripple included)
Nominal range with power supply	100 to 240 V, 50/60 Hz
Current consumption	Max. 5.6 A DC
Interface	Ethernet UDP/IP, EtherNet/IP Optional: Profinet and other databus systems
Protection rating	IP 54

Laminating station Complexer

Function

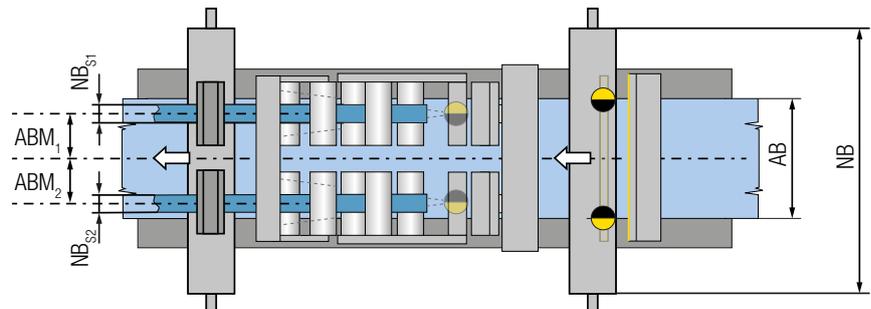
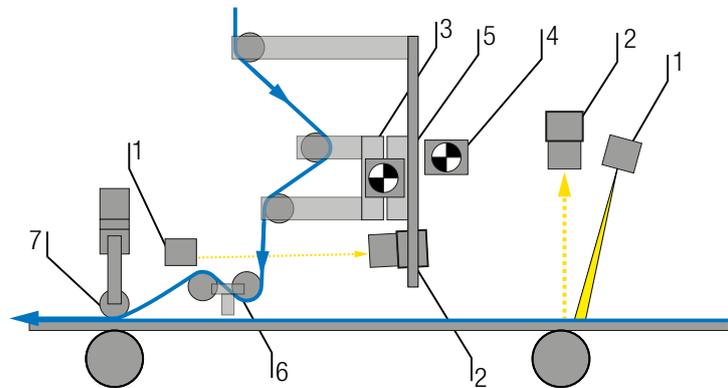
The infeed, the laying in place and the complexing of the pre-cut strips must be extremely exact to ensure precise tire building. CCD cameras or wide band sensors detect the current web position and control digital positioners and actuators. These in turn move pivoting conveyor belts, which enable the required correction of the web or strips.

Area of use

Laminating stations are used wherever rubber webs must be placed precisely on top of each other.

Application

It is to be noted that it is necessary to discuss the requirements in detail before the start of the project. Material width, thickness as well as the state of the material (hot or cold) have an effect on the infeed and the laminating roller. With the aid of all the details, the perfect solution for the related application can be found.

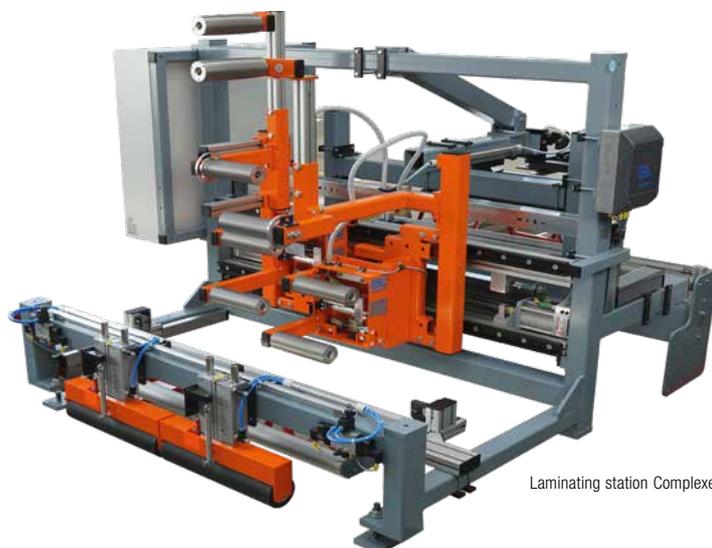


Legend

AB	Operating width	1	Light transmitter
NB	Nominal width	2	CCD line scan camera
NB_{S1}	Width, strip 1	3	Web guider
NB_{S2}	Width, strip 2	4	Support beam
ABM_1	Distance from strip 1 center - web center	5	Actuating drive
ABM_2	Distance from strip 2 center - web center	6	Locking roller
		7	Pressure roller

Laminating station Complexer

- Highly accurate positioning by means of pre-positioning and final fine control
- Individually matched material infeed so that delicate rubber strips can be applied without mechanical stress
- Can be combined with cameras, laser triangulation and infrared sensors
- Integrated fieldbus interface for communication with the customer PLC
- Comprehensive control modes for highest requirements and accuracy
- Operation, service and diagnostic capability via web-based management or directly connected command station



Laminating station Complexer

Sensors

OL 82, FE 46, FR 60

Actuators

AG 9

Technical data

Positional accuracy	Up to ± 0.2 mm (material and sensor-dependent)
Material width, master	Up to 1600 mm (larger on request)
Material width, slave	Up to 100 mm (depending on material thickness, larger on request)
Number of master webs	Up to 2
Number of slave webs	Up to 2
Ambient temperature	+10 °C to +50 °C
Storage temperature	-20 °C to +80 °C
Relative humidity	15 to 95 % (non-condensing)
Operating voltage	
Nominal value	24 V DC
Nominal range	20 to 30 V DC (ripple included)
Nominal range with power supply	100 to 240 V, 50/60 Hz
Current consumption	Max. 5.6 A DC
Interface	Ethernet UDP/IP, EtherNet/IP Optional: Profinet and other databus systems
Protection rating	IP 54

Conveyor belt control systems

Function

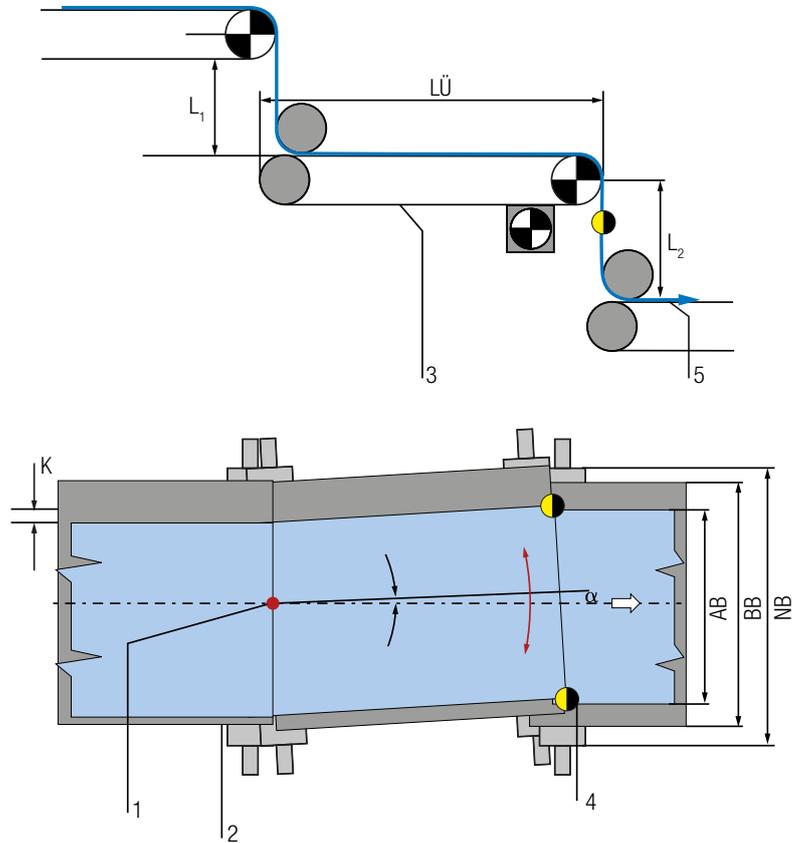
On a conveyor belt control system, the web changes direction four times, each time by 90°. A pivoting conveyor belt forms the basis here. Its pivot point is located on the infeed plane. Lateral web corrections can only be achieved by pivoting around this pivot point.

Area of use

Wherever rubber webs are transported on belts, these belts can also be used for web guiding.

Application

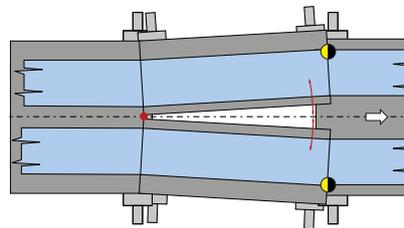
Care must be taken to ensure both the incoming and outgoing rubber web enter and exit at an angle of 90° to the conveyor belt. The infeed and exit path should be the equivalent of at least 50 percent of the maximum web width. The sensor must detect the rubber web as closely to the exit point from the conveyor belt as possible.



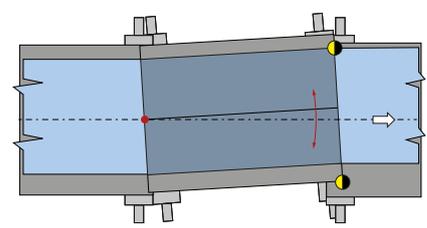
Legend

- | | | | |
|----------|-------------------|-------|----------------------|
| K | Web correction | 1 | Pivot point |
| α | Angle of cut edge | 2 | Infeed conveyor belt |
| AB | Operating width | 3 | Conveyor belt |
| BB | Belt width | 4 | Sensor |
| NB | Nominal width | 5 | Fixing conveyor belt |
| LÜ | Transfer length | L_1 | Infeed path |
| | | L_2 | Exit path |

Options



Option 1
Operation in split mode: sidewall control



Option 2
Operation in coupled mode: inner liner control

Conveyor belt control system

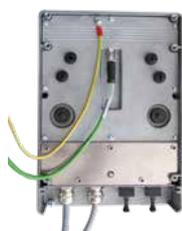
- Control components for winding stations with wear-free, brushless digital drive technology for highest positional accuracy and control dynamics
- Can be combined with infrared edge sensor FR 53 or infrared wide band sensor FE 46 or OL 82
- Integrated fieldbus interface Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems
- Operation, service and diagnostic capability via web-based management based on a standard web browser or via DO 32 or OP 34/36



CCD camera OL 82



Infrared edge sensor FR 53



Camera computer DO 82



FE 46 infrared wide band sensor



Camera holder VA 5538



Light transmitter FS 42



Actuating drive AG 9

Selection table		
Type	Nominal actuating travel	Nominal actuating force
AG 9111	±50 mm	1000 N
AG 9121	±75 mm	1000 N

Sensors

FE 46, FR 53, OL 82

Actuators

AG 9

Technical data	
Positional accuracy	< ±0.25 mm (sensor-dependent)
Nominal actuating travel	±25/50/75 mm
Nominal actuating speed	1 to 60 mm/s (AG 91)
Ambient temperature	+10 °C to +50 °C
Storage temperature	-20 °C to +80 °C
Relative humidity	15 to 95 % (non-condensing)
Operating voltage	24 V DC
Nominal value	20 to 30 V DC (ripple included)
Nominal range	100 to 240 V, 50/60 Hz
Nominal range with power supply	
Current consumption	Max. 5.6 A DC (AG 91 with man. sensor positioning)
Interface	Ethernet UDP/IP, EtherNet/IP Optional: Profinet and other databus systems
Protection rating	IP 54

Carcass control system

Function

The carcass is acquired with the aid of CCD cameras or laser triangulation sensors. The sensors scan the material either before the conveyor or in the gap between the conveyor and the tire building drum. The conveyor before the camera (viewed in the direction of transport) can be moved laterally, i.e. at an angle of 90° to the material transport direction, with the aid of an actuator (AG 9), to control the material. The conveyor after the camera (magnetic) fixes the material controlled.

Area of use

The carcass control system is used in tire building machines. It controls the various materials that form the carcass before they are applied to the tire building drum.

Application

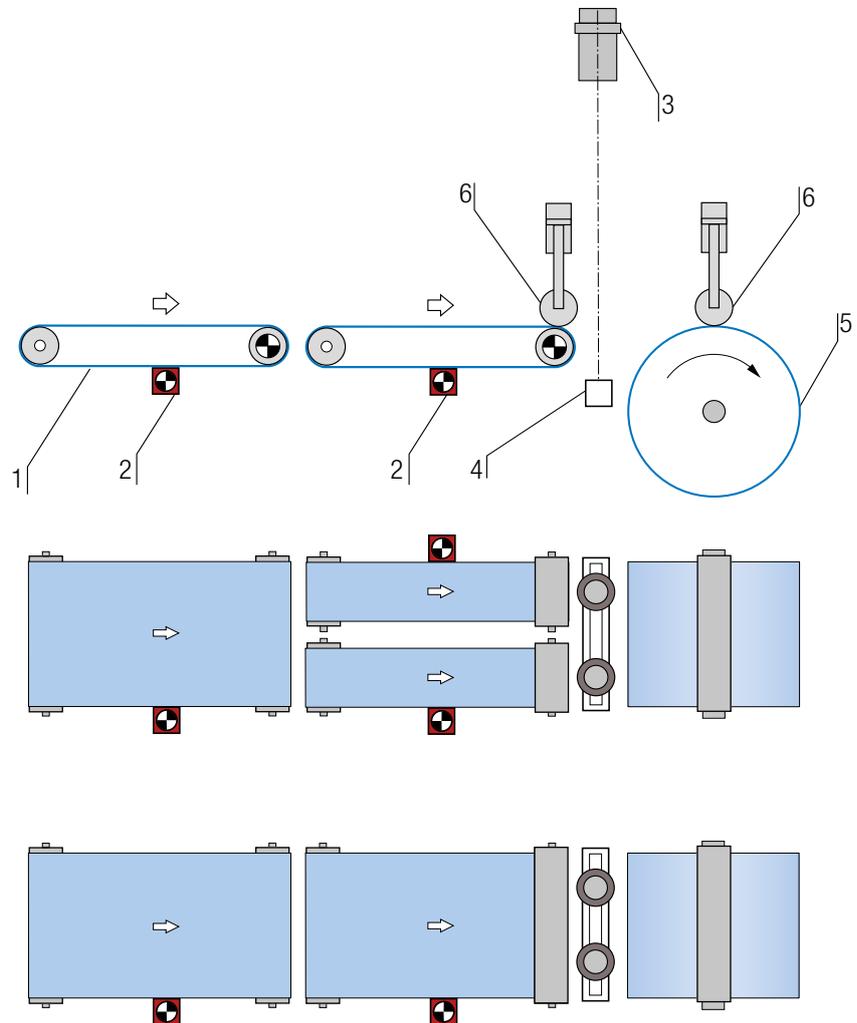
The various materials for the carcass arrive at the tire building drum via a final conveyor belt. Control can be by means of separate conveyor belts that are moved synchronously for wide materials, or by means of one wide conveyor belt. Narrow strips are then mostly pre-assembled.

The sensors are either in front of the drum or the final conveyor belt.

If the sensors are in front of the drum, the required control criterion is acquired and the material applied to the tire building drum by moving the conveyors in parallel.

If the sensors are in front of the final conveyor belt, the position of the materials is acquired and saved. The material is then applied to the tire building drum by moving the final conveyor in parallel based on the saved position data.

Depending on the selection of the sensor used, hole detection is also possible in addition to the position control.



Legend

- 1 Conveyor belt
- 2 Actuating drive
- 3 CCD camera
- 4 Light transmitter
- 5 Building drum
- 6 Locking roller

Belt control system

Function

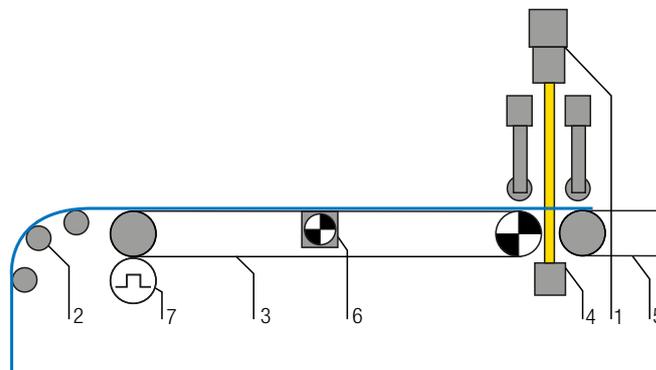
The belt (steel cord) is acquired with the aid of CCD cameras, infrared sensors or laser triangulation sensors. The sensors scan the gap between the two conveyors. The conveyor before the camera (viewed in the direction of transport) can be moved laterally, i.e. at an angle of 90° to the material transport direction, with the aid of an actuator (AG 9), to control the material. The conveyor after the camera or tire building drum locks the material controlled.

Area of use

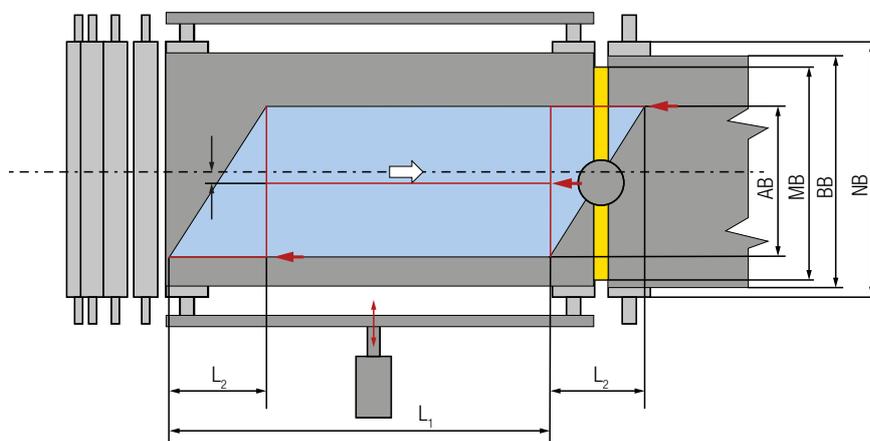
The belt control system is used in tire building machines and controls the steel belt before the tire building drum.

Application

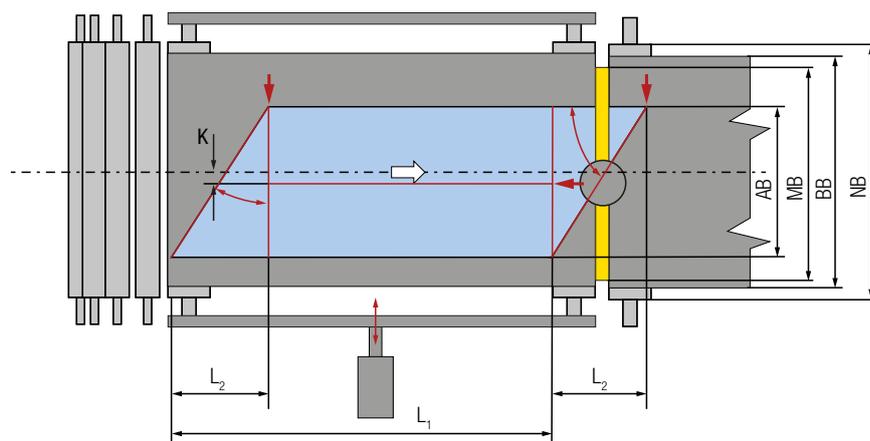
As soon as the camera detects the tip of the material, the conveyor is stopped and aligned laterally to suit the position of the material. Then, during further transport, the material is controlled in the area of the angled cut edge either by the outer edge or the cut edge itself. In the area without a cut edge, the control mode switches to "by center of material". The angled edge at the end of the material is then again controlled by an outer edge or the cut edge. Control by the cut edge is used mostly for wider materials (e.g. truck tires), as the cut edges may no longer be straight here due to tensions in the material and therefore gaps (poor splice) could potentially arise on the drum during control by the material edge.



Belt guiding – standard



Belt guiding – by cut edge



Legend

K	Web correction	1	CCD line scan camera
α	Angle of cut edge	2	Infeed rollers
AB	Operating width	3	Conveyor belt
BB	Belt width	4	Light transmitter
NB	Nominal width	5	Fixing conveyor belt
MB	Measuring width	6	Actuating drive
		7	Incremental encoder
		L_1	Length of belt
		L_2	Length of cut edge

Tread control system

Function

The tread is acquired using a CCD camera or a laser triangulation sensor. The sensor scans the material optionally before the conveyor or in the gap between the conveyor and the tire building drum. The conveyor before the camera (viewed in the direction of transport) can be moved laterally, i.e. at an angle of 90° to the material transport direction, with the aid of an actuator (AG 9), to control the material. The conveyor or the drum after the camera locks the material controlled.

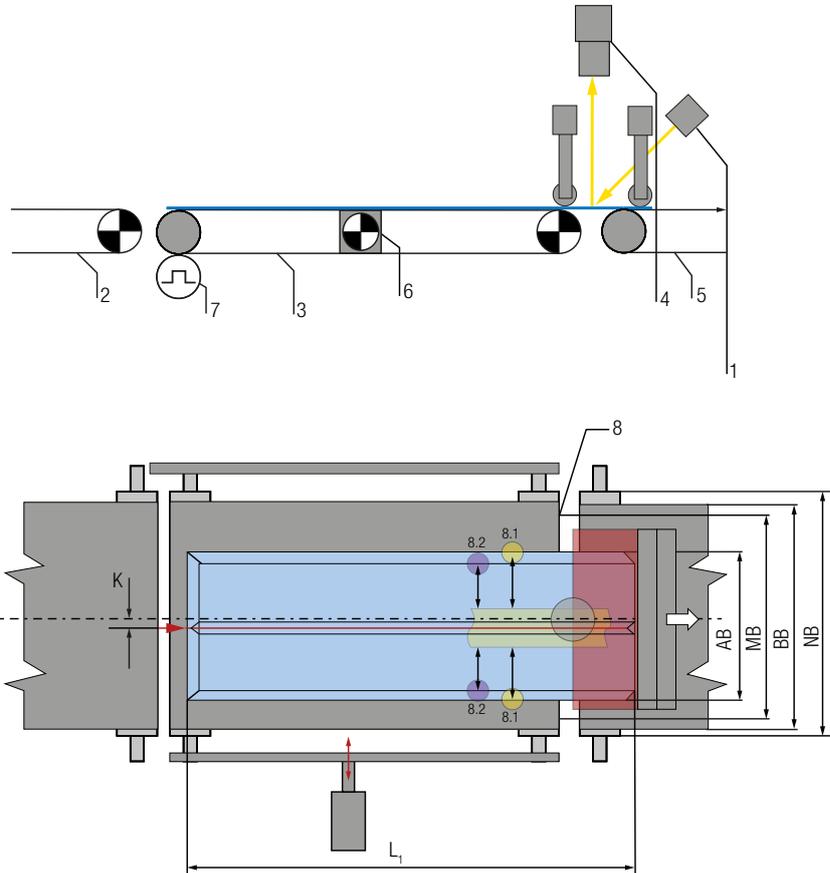
Area of use

The tread control system is used in tire building machines and controls the tread before the tire building drum.

Application

Control can be by various criteria for the material, for example groove, ridge or total width. As soon as the camera detects the control criterion, the conveyor is aligned laterally to suit the position of the material. Depending on the position of the camera, the conveyor is stopped briefly for this purpose or the transport speed is temporarily reduced. Afterwards the material is adjusted to suit the control criterion while the material is transported onward. If a control criterion is no longer detected, control is automatic by the outer edges.

The same camera can also be used for the measurement of the length of the tread.

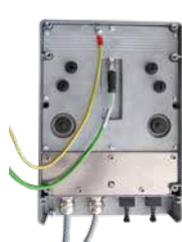


Legend

K	Web correction	1	Light transmitter
AB	Operating width	2	Infeed conveyor belt
BB	Belt width	3	Conveyor belt
NB	Nominal width	4	CCD line scan camera
MB	Measuring width	5	Fixing conveyor belt
L ₁	Length of tread	6	Actuating drive
		7	Incremental encoder
		8	"Lane" - search range dependent on:
			8.1 Outer edges
			8.2 Inner edges

Carcass, belt and tread control system

- Control components with wear-free, brush-less digital drive technology for highest positional accuracy and control dynamics
- Can be combined with cameras, laser triangulation and infrared sensors
- Integrated fieldbus interface for communication with the customer PLC
- Comprehensive control modes for highest requirements and accuracy
- Operation, service and diagnostic capability via web-based management or directly connected command station



Selection table

Type	Nominal actuating travel	Nominal actuating force
AG 9101	±25 mm	1000 N
AG 9111	±50 mm	1000 N
AG 9121	±75 mm	1000 N

Sensors

OL 82, OL 91, FR 60 and SL 23

Actuators

AG 9

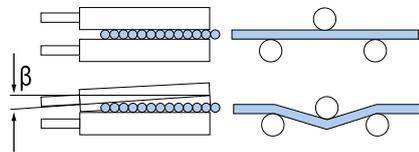
Technical data

	Carcass control system	Belt control system	Tread control system
Positional accuracy	< ±0.25 mm (sensor-dependent)	< ±0.25 mm (material-dependent)	< ±0.25 mm (sensor-dependent)
Nominal actuating travel	±25/50/75/100 mm	±25 mm	±25/50/75 mm
Nominal actuating speed	1 to 60 mm/s (AG 91)		
Nominal actuating force	1000 N		
Ambient temperature	+10 °C to +50 °C		
Storage temperature	-20 °C to +80 °C		
Relative humidity	15 to 95 % (non-condensing)		
Operating voltage	24 V DC		
Nominal value	20 to 30 V DC (ripple included)		
Nominal range	100 to 240 V, 50/60 Hz		
Nominal range with power supply	100 to 240 V, 50/60 Hz		
Current consumption	Max. 5.6 A DC		
Interface	Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems		
Protection rating	IP 54		

Edge spreading system EPILiner

Function

The edge spreading system EPILiner consists of two spreader units, each of which has a three-finger roller arrangement. The two fixed rollers are always in contact with the cord, the moving roller engages in the edge area of the cord. The width of the cord can be controlled by varying the bite angle of the roller. Spreading can be optimized by manually adjusting the correction angle.



Area of use

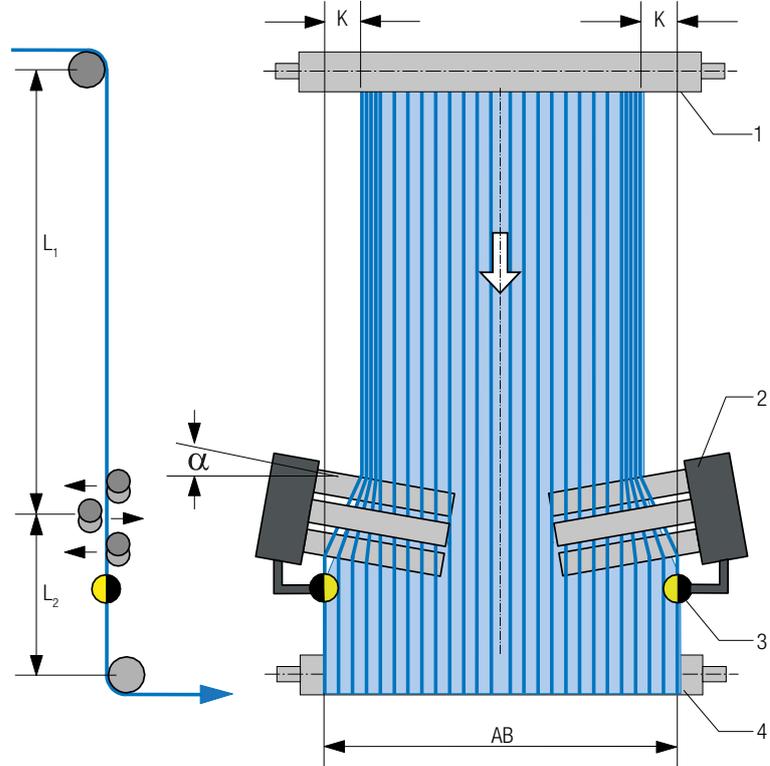
In particular on calender lines before the calender gap and in hot-stretching lines before coating or before the rewinder, the use of edge spreading systems is essential to ensure even cord distribution.

Application

The EPILiner edge spreading system can be mounted in all positions. The infeed path should be the equivalent of at least half a web width, while the exit path should be kept as short as possible. Optimal web width control can only be achieved with the aid of a web guider arranged before the spreading system.

Legend

K	Web correction	1	Infeed roller
α	Correction angle	2	Edge spreading system EPILiner
AB	Operating width	3	Sensor
L_1	Infeed path	4	Locking roller
L_2	Exit path	β	Bite angle



Edge spreading system BCB11

- Compact edge spreading system for constant web width control of tire cord in the edge area with wear-free, brushless digital drive technology for highest control accuracy and control dynamics
- Optimal spreading effect due to manually adjustable correction angle
- Can be combined with infrared edge sensor FR 53 for the acquisition of tire cord edges
- Integrated fieldbus interface Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems
- Operation, service and diagnostic capability via web-based management based on a standard web browser or via OP 34/36



Selection table

Type	Roller diameter	Roller length
BC 1133	3 x 38 mm	178 mm
BC 1135	3 x 57 mm	432 mm

Sensors

FR 53

Actuators

AG 9

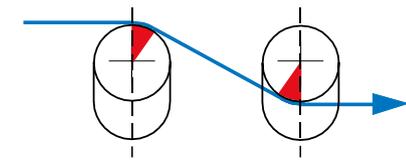
Technical data

Positional accuracy	±1 mm (infrared edge sensor FR 53)
Web edge feeding precision	±5 mm
Operating width	1400 to 1800 mm
Nominal actuating speed	3 mm/s (AG 91 with F = 1000 N)
Web tension	18,000 N
Ambient temperature	0 °C to +50 °C
Operating voltage	
Nominal value	24 V DC
Nominal range	20 to 30 V DC (ripple included)
Current consumption	
Manual positioning	Max. 12.4 A DC
Motorized positioning	Max. 27.8 A DC
Interface	Ethernet UDP/IP, EtherNet/IP Optional: Profinet and other databus systems
Protection rating	IP 54

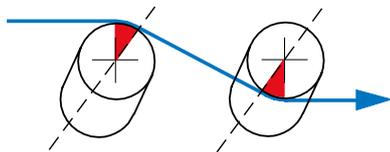
Spreading systems CordAliner

Function

The basis for the spreading system CordAliner is two bow rollers. Depending on the angle to which they are pivoted, the two mechanically coupled rollers either stretch or compress the tire cord.



Stretching



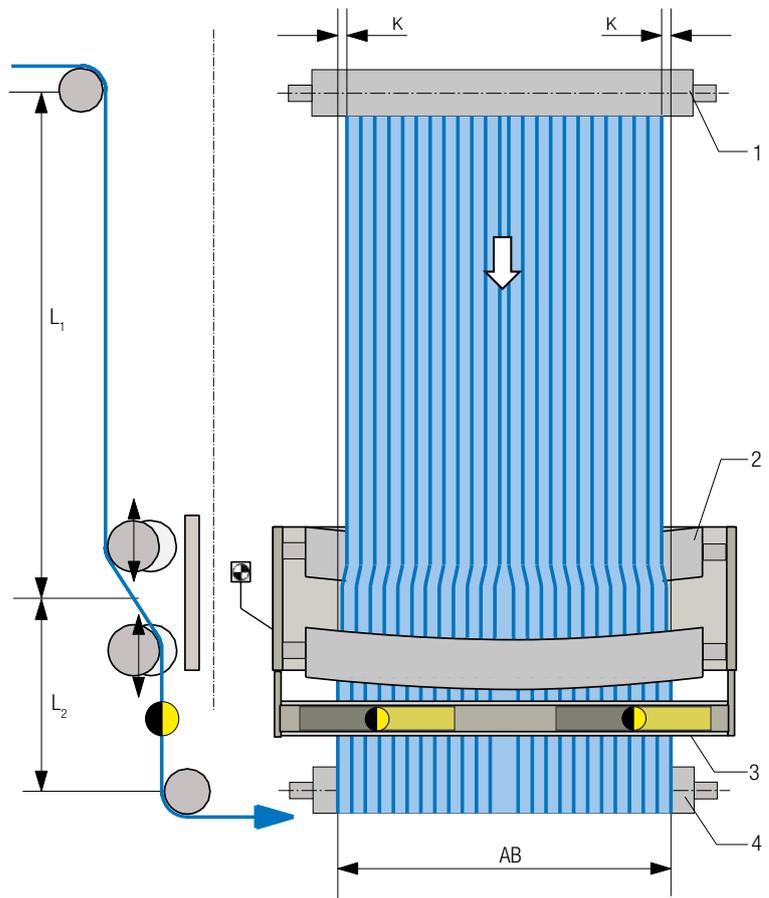
Compressing

Area of use

Web width control systems are necessary to ensure uniform cord distribution across the entire web width and to ensure consistently uniform material width.

Application

The spreading system can be mounted in all positions. The infeed path should be the equivalent of at least half a web width, while the exit path should be kept as short as possible. Optimal spreading is only ensured if the web is fed centrally into the spreading system.



Legend

- K Web correction
- AB Operating width
- L_1 Infeed path
- L_2 Exit path

- 1 Infeed roller
- 2 Spreading system CordAliner
- 3 Wide band sensor
- 4 Locking roller

Spreading systems BCB21/31

- Compact spreading system for constant web width control of tire cord across the entire web width with wear-free, brushless digital drive technology for highest control accuracy and control dynamics
- Improved quality of tire cord thread distribution in the high tension area of the calender system
- Can be combined with infrared wide band sensor FR 46 or CCD camera OL 82 for the acquisition of tire cord edges
- Integrated fieldbus interface Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems
- Operation, service and diagnostic capability via web-based management based on a standard web browser or via OP 34/36



Spreading system BCB21



Spreading system BCB31

Selection table

Type	Roller diameter	Roller length
BC 2135	2 x 150 mm	1400 to 2100 mm
BC 3135	2 x 150 mm	1400 to 2100 mm

Sensors

FE 46, OL 82

Actuators

AG 9

Technical data

	BCB21	BCB31
Positional accuracy	±1 mm (sensor-dependent)	
Spreading of the web	Max. 50 to 100 mm	
Web edge feeding precision	±10 mm	
Nominal width	1400 to 2100 mm	
Nominal actuating speed	1 to 10 mm/s	
Roller diameter	150 mm	
Roller lining	NBR, Hypalon, customer request	
Web tension	20,000 N	
Ambient temperature	0 °C to +50 °C	
Operating voltage	24 V DC	
Nominal value	20 to 30 V DC (ripple included)	
Nominal range		
Current consumption	Max. 7.7 A DC	Max. 15 A DC
Interface	Ethernet UDP/IP, EtherNet/IP Optional: Profinet and other databus systems	
Protection rating	IP 54	

Spreading system full-width X-Pander

Function

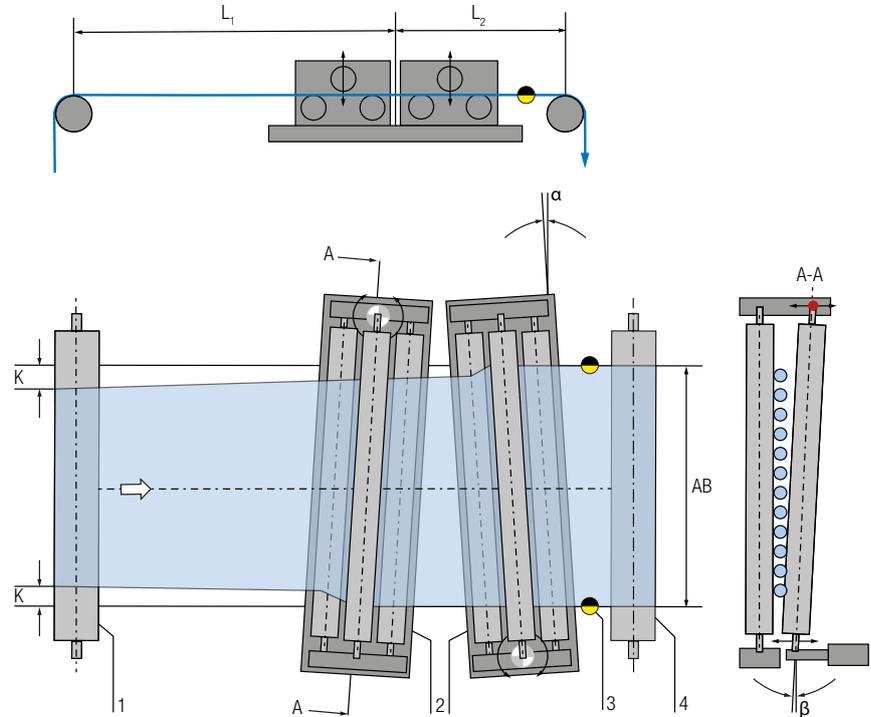
The spreading system full-width X-Pander consists of two roller units each with three rollers over the entire web width. Each unit has two fixed rollers and one moving roller. The width of the cord can be controlled by varying the bite angle of the moving center rollers. Spreading can be optimized by manually adjusting the correction angle.

Area of use

X-Pander spreading systems are used exclusively in hot-stretching plants before the traction station to achieve constant web width and uniform thread distribution.

Application

The X-Pander spreading system can be mounted in all positions. The infeed path should be the equivalent of at least half a web width, while the exit path should be kept as short as possible.



Legend

K	Spreading effect	1	Infeed roller
α	Skewed position	2	Spreading system X-Pander
AB	Operating width	3	Sensor
L_1	Infeed path	4	Outfeed roller
L_2	Exit path	β	Bite angle
A-A	Sectional view		

Spreading system BCB41

- Compact spreading system for constant web width control of tire cord across the entire web width with wear-free, brushless digital drive technology for highest control accuracy and control dynamics
- Improved quality of tire cord thread distribution in the high tension area of the hot spreading system
- Optimal spreading effect due to manually adjustable correction angle
- Can be combined with infrared wide band sensor FR 46 or CCD camera OL 82 for the acquisition of tire cord edges
- Integrated fieldbus interface Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems
- Operation, service and diagnostic capability via web-based management based on a standard web browser or via OP 34/36



Spreading system BCB41

Sensors

FE 46, OL 82

Actuators

AG 9

Technical data	
Positional accuracy	±3 mm (sensor-dependent)
Spreading of the web	Max. 50 to 100 mm
Nominal width	1400 to 2100 mm
Web tension	66,000/100,000 N
Ambient temperature	+10 °C to +60 °C
Nominal actuating speed	1 to 30 mm/s
Roller diameter (fixed rollers)	76 mm
Roller diameter (moving rollers)	102 mm
Relative humidity	15 to 95 % (non-condensing)
Operating voltage	
Nominal value	24 V DC
Nominal range	20 to 30 V DC (ripple included)
Current consumption	Max. 15 A DC
Interface	Ethernet UDP/IP, EtherNet/IP Optional: Profinet and other databus systems
Protection rating	IP 54

Spreading system half-width X-Pander

Function

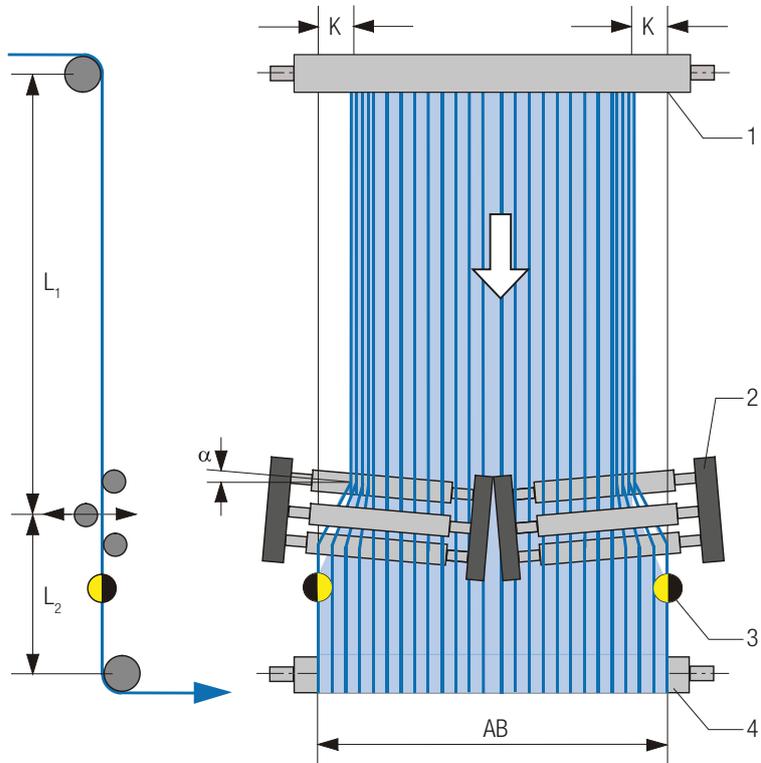
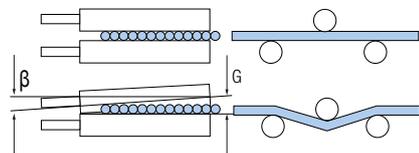
The spreading system half-width X-Pander consists of two roller units each with three rollers that meet in the middle. Each unit has two fixed rollers and one moving roller. The width of the cord can be controlled by varying the bite angle of the moving center rollers. Spreading can be optimized by manually adjusting the correction angle.

Area of use

X-Pander spreading systems are used exclusively in hot-stretching plants before the traction station to achieve constant web width and uniform thread distribution.

Application

The X-Pander spreading system can be mounted in all positions. The infeed path should be the equivalent of at least half a web width, while the exit path should be kept as short as possible.



Legend

- | | | | |
|----------|-----------------------------|---------|---------------------------|
| K | Spreading effect | 1 | Infeed roller |
| α | Skewed position | 2 | Spreading system X-Pander |
| AB | Operating width (web width) | 3 | Sensor |
| L_1 | Infeed path | 4 | Locking roller |
| L_2 | Exit path | β | Bite angle |
| | | G | Center gap |

Spreading system BCB51

- Compact spreading system for constant web width control of tire cord across the entire web width with wear-free, brushless digital drive technology for highest control accuracy and control dynamics
- Improved quality of tire cord thread distribution in the high tension area of the hot spreading system
- Optimal spreading effect due to manually adjustable correction angle
- Can be combined with infrared wide band sensor FR 46 or CCD camera OL 82 for the acquisition of tire cord edges
- Integrated fieldbus interface Ethernet UDP/IP, EtherNet/IP, optional: Profinet and other databus systems
- Operation, service and diagnostic capability via web-based management based on a standard web browser or via OP 34/36



Spreading system BCB51

Sensors

FE 46, OL 82

Actuators

AG 9

Technical data

Positional accuracy	±2 mm (sensor-dependent)
Spreading of the web	25 to 50 mm
Nominal width	1400 to 2100 mm
Nominal actuating speed	Max. 1 to 30 mm/s
Roller diameter	89 mm
Web tension	Max. 20,000 N
Ambient temperature	0 °C to +50 °C
Relative humidity	15 to 95 % (non-condensing)
Operating voltage	
Nominal value	24 V DC
Nominal range	20 to 30 V DC (ripple included)
Current consumption	Max. 15 A DC
Interface	Ethernet UDP/IP, EtherNet/IP Optional: Profinet and other databus systems
Protection rating	IP 54

Ink bottle positioning EL-PAPS – NPS10

Function

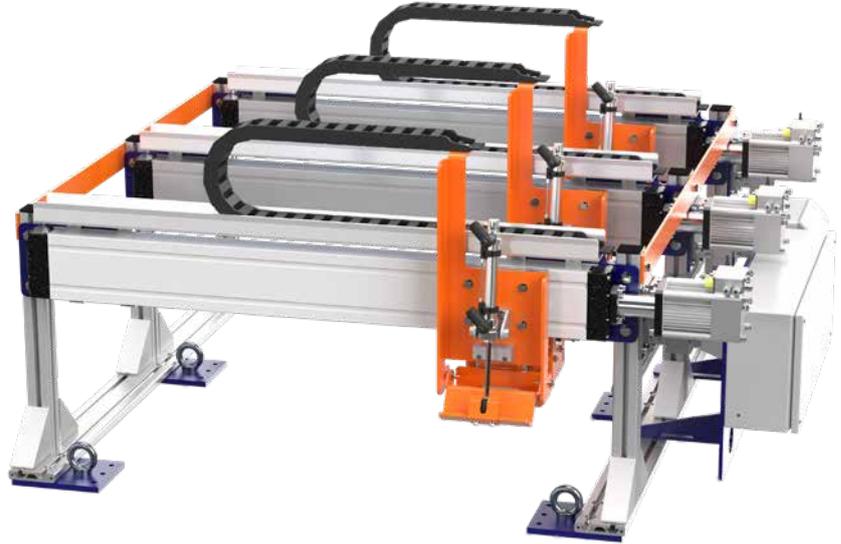
The ink bottle positioning EL-PAPS includes one or more linear guides for positioning the ink bottles, as well as optional feedback for which a color line monitoring system RSI6 is required. The ink bottles for applying the color code to the tread are positioned automatically. The target position for the color lines can be managed by the customer and specified using an interface.

Area of use

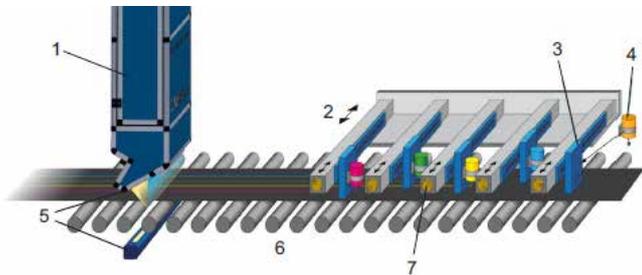
Ink bottle positioning is used on extrusion systems in the tire industry.

Application

In the extrusion system, the ink bottle positioning EL-PAPS is deployed immediately after the extruder.



Ink bottle positioning NPS10



Legend

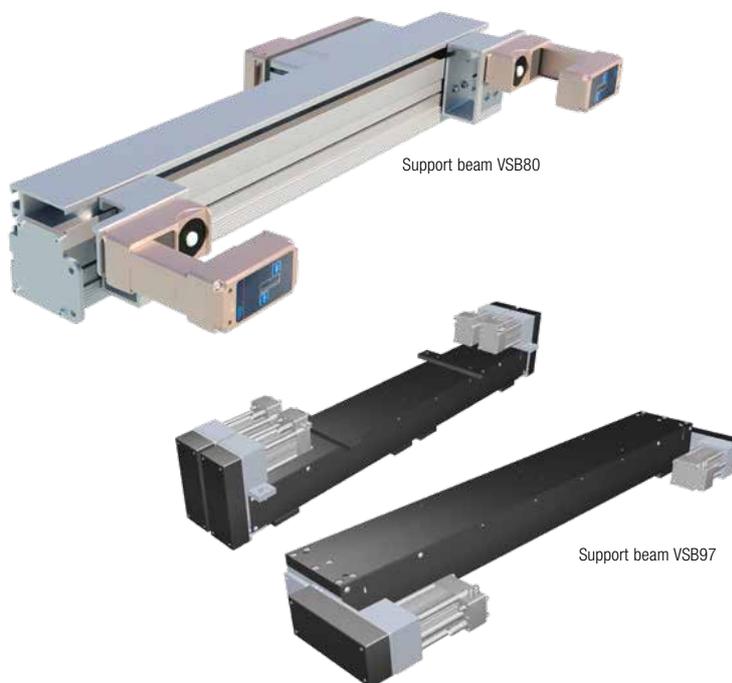
- | | | | |
|---|--|---|---|
| 1 | Line scan camera inside the protective housing | 5 | Background lighting |
| 2 | Independent ink positioning | 6 | Track (customer-side) |
| 3 | Holder for ink bottles | 7 | Individual positioning of the ink bottles using handwheel or automatically using motor (EL-PAPS optional) |
| 4 | Ink applicator | | |

Technical data	
Operating voltage	24 V DC
Nominal range	20 to 30 V DC (ripple included)
Current consumption	25 A (S1) (4 linear guides)
Interface	Ethernet UDP, Ethernet IP certified optional: Profinet
Positioning range	200 to 1300 mm
Nominal actuating speed	Up to 160 mm/s
Nominal actuating force	400 N
Support load	Max. 1000 N
Nominal torque	Max. 1.0 Nm (S1) / 1.2 Nm (S6)
Positioning accuracy	$\leq \pm 0.2$ mm
Ambient temperature	+10 °C to + 50 °C
Relative humidity	15 to 95 % (non-condensing)
Protection rating	IP 54

Support beam ELPOSER VSB80/97

Changing web widths and web positions require a wide range of linear positioning systems. E+L positioning systems make it possible to use, in a single unit, up to four completely independent adjustment units positioned along the web. Depending on the requirements, these units can e.g. move sensors or cutters to the required position.

- Highly compact design for best possible machine integration
- One, two or four motors
- Highly-precise positioning due to digital, brushless drive technology
- Ethernet connection for easy integration in web guiding systems
- Simple commissioning via web-based management
- Functions such as sensor pre-positioning, edge search, move clear and width measurement possible
- Integrated cable carrier



Electrical connections VSB80*	
Operating voltage 24 V DC	Spring terminal
Operating voltage AG 9	M12 connector, L-coded
Communication AG 9	M8 connector, D-coded
Sensor CAN	2 x M8 connectors
Sensor PoE	2 x M8 connectors
Ethernet networking	3 x M8 connectors
Digital inputs (configurable)	10 x spring terminals
Digital outputs (configurable)	2 x spring terminals

* VSB97 optional

Technical data		
	VSB80	VSB97
Operating voltage	24 V DC	
Nominal value	20 to 30 V DC (ripple included)	
Nominal range	1.4 A DC (1 positioning drive) 2.4 A DC (2 positioning drives)	
Current consumption		
Nominal operating width	Min. 160 mm Max. 5840 mm	Min. 160 mm Max. 2200 mm
Nominal actuating speed	1 to 100 mm/s	1 to 18 mm/s
Nominal actuating force (axial)	20 N	3000 N
Support load	Max. 50 N	Max. 500 N
Moment M1, M2, M3	Max. 2 Nm	Max. 3.8 Nm
Positioning accuracy	≤ ±0.1 mm (per slide)	
Ambient temperature	+10 °C to +50 °C	
Storage temperature	-25 °C to +80 °C	
Ambient conditions	Dry	
Relative humidity	15 to 95 % (non-condensing)	
Certifications	Declaration of incorporation according to Machinery Directive 2006/42/EC NRTL certificate CU 72210743 01	
Protection rating	IP 54	
Interface ("Standard/UDP" variant)	Ethernet protocol EL.NET, Ethernet UDP	
Interface optional ("Connect" variant)	Ethernet/IP, Profinet	



INSPECTION AND MEASUREMENT TECHNOLOGY

Flawless surfaces and optimal material characteristics are key quality features in the tire industry.

Here the systems from Erhardt+Leimer make a crucial contribution to a perfect end product.

Measurement systems

Measurement systems for trouble-free tire production

The profile, length, width, thickness, angle and weight are all key parameters for reliable tire production. Our measurement systems use the latest sensor technology to detect defects and irregularities in tires. They monitor important parameters such as profile depth, tread quality or material thickness, and ensure the tires manufactured meet the highest quality standards, and that with optimal material use. Furthermore, the inspection systems offer comprehensive data analysis and reporting; they also provide the manufacturer with quality indicators and insights into the production activity.

We offer

- **Online profile measurement systems EL-TRISCAN**
 - Online profile measurement system, traversing O-frame NRS50
 - Online profile measurement system, traversing C-frame NRS60
 - Online profile measurement system, light section NLS10
- **Offline profile measurement system EL-TRISCAN**
 - Offline profile measurement system NOS20
- **Cross section analyzer**
 - EL-CSA
- **Tread length measurement system EL-LENGTH**
 - Tread length measurement system NMS10
- **Weight per meter scales EL-WEIGHT – NWS10**
- **Weight per piece scales EL-WEIGHT – NWS20**
- **Thickness measurement systems EL-THICKNESS**
 - Thickness measurement system, O-frame NDS1
 - Thickness measurement system, C-frame NDS2
 - Thickness measurement against reference roller NDS3
 - Thickness measurement dual sensor NDS4
- **Web width measurement system ABS**
- **Measurement of the splice overlap length EL.SPLICE – SMS1**
- **Edge detection by laser triangulation EL.EDGE – EDS1**
- **Tire building inspection system EDS2**
- **Cord distribution system EPI**

Surface inspection systems

Surface inspection systems for a perfect end product

Flawless surfaces are one of the key quality characteristics in the tire industry. Any flaws in the rubber coating on the tire cord, or holes or dirt in rubber webs will lead to scrap. Only an efficient, automated surface inspection system of the type offered by Erhardt+Leimer will allow you to meet the highest quality requirements at acceptable cost.

We offer

- **Surface inspection systems**
 - Surface inspection systems RS1/2
 - Hole and splice inspection system RS13
 - Color line inspection system RS16

Web tension measurement systems

Web tension measurement and control systems for sustainable production

Reliable web tension control using load cells helps to reduce web tears and therefore keeps production costs down. The use of modern sensors and measuring techniques makes possible the exact acquisition of the web tension profiles and real-time monitoring during the production process. ELTENS web tension measurement and control systems make us the perfect partner for the tire industry, we contribute to ensuring high quality and efficiency in production.

We offer

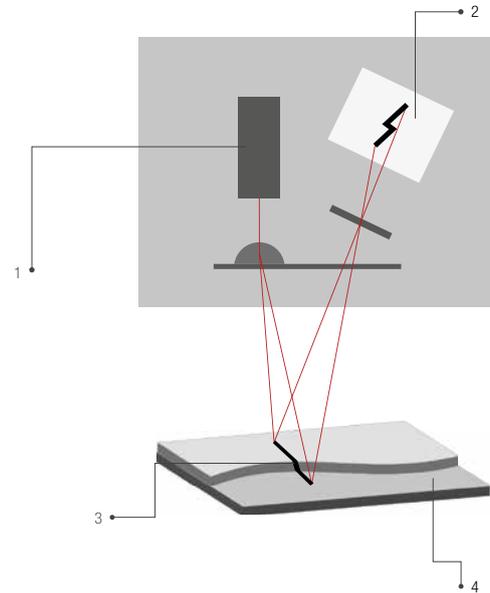
- **Web tension measurement system ELTENS**
 - Flange load cell, steel PD 21/22
 - Sensor roller PD 30
 - Sensor roller PD 40
- **Measuring amplifiers**
 - Analog measuring amplifier CV 22
 - Measuring amplifier with display PA 62

Sensor technologies

The light-section measuring method

The light-section measuring method is a method based on optical 3-D measuring technology and permits the measurement of a height profile along a projected line of light. It is based on the principle of triangulation. A light-section sensor consists of a camera and a line laser that projects a line as narrow as possible on the object measured. The camera acquires the line or the pattern projected on the surface of the object. If the object is curved or uneven, the line or the pattern is distorted correspondingly. The data points along the line or the pattern are combined to produce a complete 3-D model of the object. This model can consist of clouds of points or plots of the surface.

- Large acquisition ranges
- High reproducibility
- Resistant to environmental influences
- Real-time measurement
- No moving parts



Legend

- 1 Laser illumination
- 2 Detector
- 3 Line projection
- 4 Workpiece

Laser triangulation

A point laser triangulation sensor is an optical measuring device used for non-contact distance measurement and surface profiling. It is based on the principle of triangulation and uses a laser dot as a measuring mark.

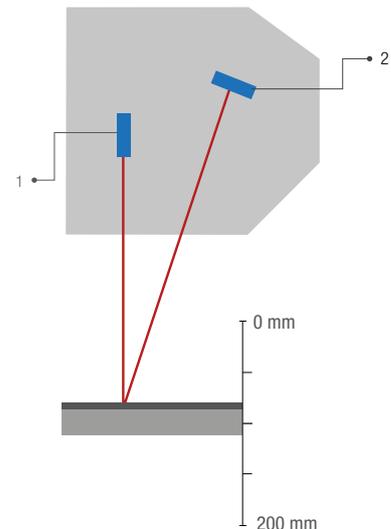
The sensor consists of a laser light source and a CCD element.

During laser triangulation, a laser beam is focused on the object measured and observed with a camera located in the sensor, a spatially resolving photodiode or a CCD line scan camera. If the distance between the object measured and the sensor changes, the angle at which the point of light is observed also changes, and with it the position of its image on the photo receiver.

The signal processing unit analyzes the measured position of the laser dot and calculates the distance to the object measured.

This analysis is undertaken using the principle of triangulation in which the distance between the sensor and the object is calculated from the angle or displacement of the reflected laser dot.

- High accuracy for dynamic measurements
- Resistant to environmental influences
- High scan rate



Legend

- 1 Laser
- 2 CCD element

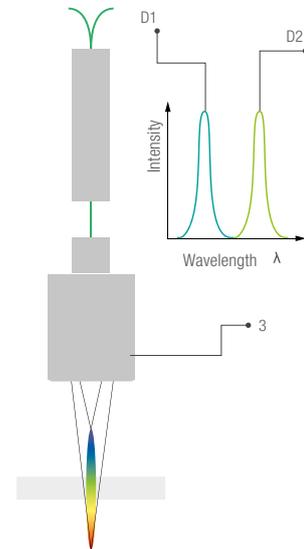
Chromatic-confocal

A chromatic-confocal sensor is an optical measuring device used for non-contact distance measurement. It is based on the principle of chromatic aberration and confocality.

The sensor consists of a light source, an optical system and a detector. The light source emits a broadband light signal containing various wavelengths. This light is passed through special optics, often a chromatic lens or an optical prism. The chromatic aberration in the optics causes the various wavelengths to be focused differently.

A white point light source is focused on the object using a non-color corrected lens. The dispersion focuses the blue light components closer to the lens and the red components further away. The reflected light is imaged again using the same lens, and a spectrometer then determines the dominant wavelength in the reflected light. From the knowledge of the focal lengths for the individual wavelengths, the object distance can be determined directly from the dominant wavelength.

- Measurement on different materials
 - Opaque or transparent
 - Absorbent or colored
 - Diffuse or reflective (specular)
 - Raw or polished
- Coaxial measurement avoids shadow effects
- Very high slope acceptance, high numerical aperture
 - Up to 45° on reflecting surfaces
 - 80° on diffuse surfaces
- No integrated laser, no speckle effect, no laser protection class requirements



Legend

- D1 Position of the front side of the transparent material
- D2 Position of the rear side of the transparent material
- 3 Chromatic scanning head

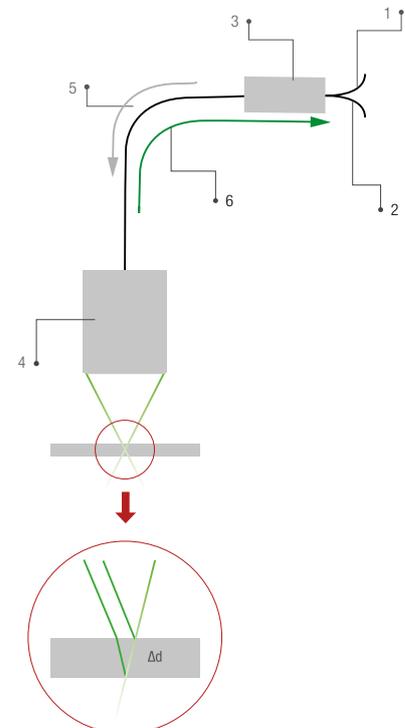
Interferometric

An interferometric sensor is based on the principle of the interference of light waves and is used to precisely measure distances, surface profiles or other physical quantities.

The sensor consists of a light source, a beam splitter, reference and measuring arms, a detector and a signal processing unit.

Broadband infrared or visual light is focused on the object by optical probes. In the coaxial configuration, the reflections from different surfaces are collected by the same optical probes and then spectrally analyzed. The slightest changes in the light paths lead to a change in the interference pattern. The thicknesses of all layers are then determined by Fourier analysis of the interference spectrum.

- Ultra-precise thickness measurement using the drift-free direct method (for transparent and semi-transparent materials)
- Thickness measurement of different materials
 - Raw or reflecting surfaces
 - Opaque objects (plastics, adhesives, bonds, etc.)
 - Transparent surfaces (glass, clear plastics, polymers, Si, GaN, SiC, etc.)
- Suitable for measurements in liquids (e.g. water, oil, acids)
- Thickness measurement of multi-layer materials
- Distance measurement possible by using a reference line
- Insensitive to heat, moisture or vibration
- Ideal for high-speed inline testing up to 70 kHz



Legend

- 1 Infrared broadband light
- 2 Spectrometer
- 3 Optocoupler or beam splitter
- 4 Achromatic scanning head
- 5 Broadband irradiated light
- 6 Both reflections

Online profile measurement systems EL-TRISCAN

Online profile measurement system | Traversing EL-TRISCAN TR

Function

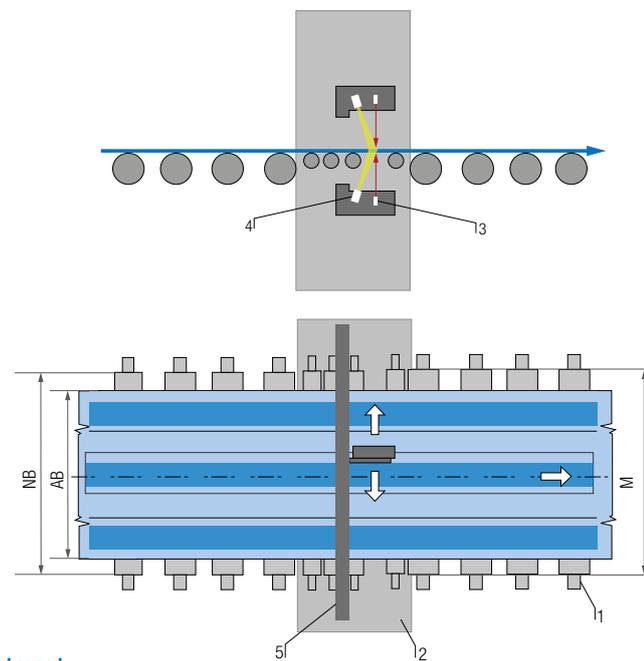
Two point-type laser sensors synchronously traverse over the moving product (tread, side wall, inner liner, cord) and measure its external contours. The granite frame, on which the linear guides are mounted, offers high thermal stability and reduced vibration for highly accurate profile measurement.

Area of use

High-accuracy online profile measurement is used primarily in extrusion systems for the inspection of treads and sidewalls, as well as inner liners. In the hot area, the profile measurement is used for production control to detect deviations from the specification as early as possible and alert the PLC. In the cold area, the profile measurement system is used for quality control and documentation.

Application

The EL-TRISCAN TR system for profile measurement is used in the extrusion line immediately after the extruder for process control and/or preferably at the end of the cooling line for quality assurance. The granite frame reduces thermally induced expansion many times over. The system can also be used for thickness measurements in roller-head calenders.



Legend

AB	Operating width (profile width)	2	Profile measurement
M	Measuring range	3	Point laser
NB	Nominal width	4	CCD sensor
1	Guide roller	5	Traversing device

Online profile measurement system | Light section EL-TRISCAN LS

Function

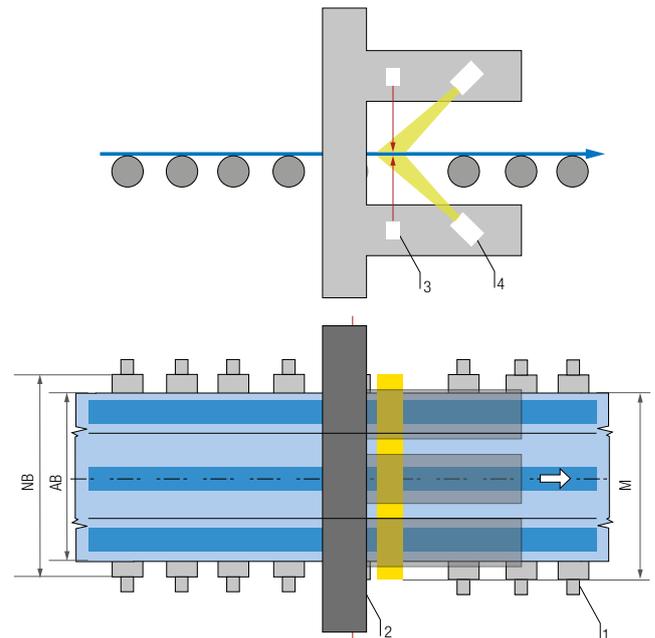
Light section sensors measure the external geometry of the moving product (tread, side wall). The granite frame, on which the sensors are mounted, offers high thermal stability and reduced vibration for highly accurate profile measurements.

Area of use

High-accuracy online profile measurement is used primarily in extrusion systems for the continuous inspection of treads and side walls, as well as inner liners. In the hot area, the profile measurement is used for production control to detect deviations from the specification as early as possible and alert the PLC. In the cold area, the profile measurement system is used for quality control and documentation.

Application

The EL-TRISCAN LS system for profile measurement is used in the extrusion line immediately after the extruder for process control and/or preferably at the end of the cooling line for quality assurance. The granite frame reduces the thermally induced expansion many times over.



Legend

AB	Operating width	2	Profile measurement
M	Measuring range	3	Laser line
NB	Nominal width	4	Matrix camera
1	Guide roller		

Possible applications

- Inner liner
 - Side wall
 - Steel cord & textile cord
 - Tread
 - Apex
-

Online profile measurement system | Traversing O-frame NRS50 and C-frame NRS60

- Contactless profile measurement of different materials
- Comparison of the actual profile with the target profile
- Detailed quality reports
- Traversing point-type laser sensor for precise profile acquisition
- Reliable acquisition by means of automatic intensity control for matt and glossy surfaces
- Thermally-stable, vibration-resistant O-frame made of granite
- Checking of the thickness, shoulder width, total width, cross-section area
- Trend display
- Reduction of scrap, highest quality assurance



Online profile measurement system | Traversing
O-frame NRS50

Technical data		
	O-frame	C-frame
Profile width	Up to 4000 mm	Up to 1400 mm
Laser triangulation sensors measuring range	Up to 78 mm	
Accuracy	Up to $\pm 10 \mu\text{m}$	Up to $\pm 3 \mu\text{m}$
Chromatic-confocal sensors measuring range	Up to 4 mm (freely scalable for vertical sensor repositioning)	
Accuracy	Up to $\pm 5 \mu\text{m}$	Up to $\pm 0.5 \mu\text{m}$
Interferometric sensors measuring range	Up to 8 mm (freely scalable for vertical sensor repositioning)	
Accuracy	Up to $\pm 5 \mu\text{m}$ (for layer thicknesses $< 0.5 \mu\text{m}$)	Up to $\pm 0.5 \mu\text{m}$ (for layer thicknesses $< 0.5 \mu\text{m}$)
Measuring equipment capability (Cg&Cgk): [TW* = 10 x accuracy]	≥ 1.67	
Sensor	Laser triangulation, chromatic-confocal, interferometric	
Measuring points	1 (traversing)	Up to 3
Scan frequency	Sensor technology-dependent	
Laser class (only for triangulation sensors)	2 (dedicated laser safety officer not required)	
Resolution of profile thickness	0.01 μm	
Displayed resolution, profile thickness	0.001 mm	
Displayed resolution, profile width	0.001 mm	
Traversing speed, sensor	150 mm/s (higher on request)	
Relative humidity	15 to 95 % (non-condensing)	
Ambient temperature	+10 °C to +50 °C	
Operating voltage	120 to 230 V, 50/60 Hz, 16 A	
Protection rating	IP 54	

* Dynamic inspection tool required for verification only

Online profile measurement system | Light section NLS10

- Contactless profile measurement system using differential method
- Comparison of the actual profile with the target profile
- Real-time measurement
- Final quality reports
- Includes communication with customer PLC
- Thermally-stable, vibration-resistant O-frame made of granite
- Checking of the thickness, shoulder width, total width, cross-section area
- Trend display



Online profile measurement system | Light section NLS10

Technical data

Profile width	150 to 1200 mm (steps of 150 mm)
Profile thickness	Up to 50 mm
Measuring accuracy, thickness	±0.03 mm
Measuring accuracy, width	±0.2 mm
Measuring equipment capability (Cg&Cgk): [TW* = 10 x accuracy]	≥1.67
Laser sensor	Light section sensor
Scan frequency	Max. 8 Hz
Laser class	2 (designated laser safety officer not required)
Displayed resolution, profile thickness	0.001 mm
Displayed resolution, profile width	0.1 mm
Opening height	Max. 280 mm
Interface	EtherNet/IP / Profibus / Profinet / CC Link / Device net
Relative humidity	15 to 95 % (non-condensing)
Ambient temperature	+10 °C to +50 °C
Operating voltage	115 to 230 V, 50/60 Hz
Protection rating	IP 54

* Dynamic inspection tool required for verification only

Offline profile measurement system EL-TRISCAN

Function

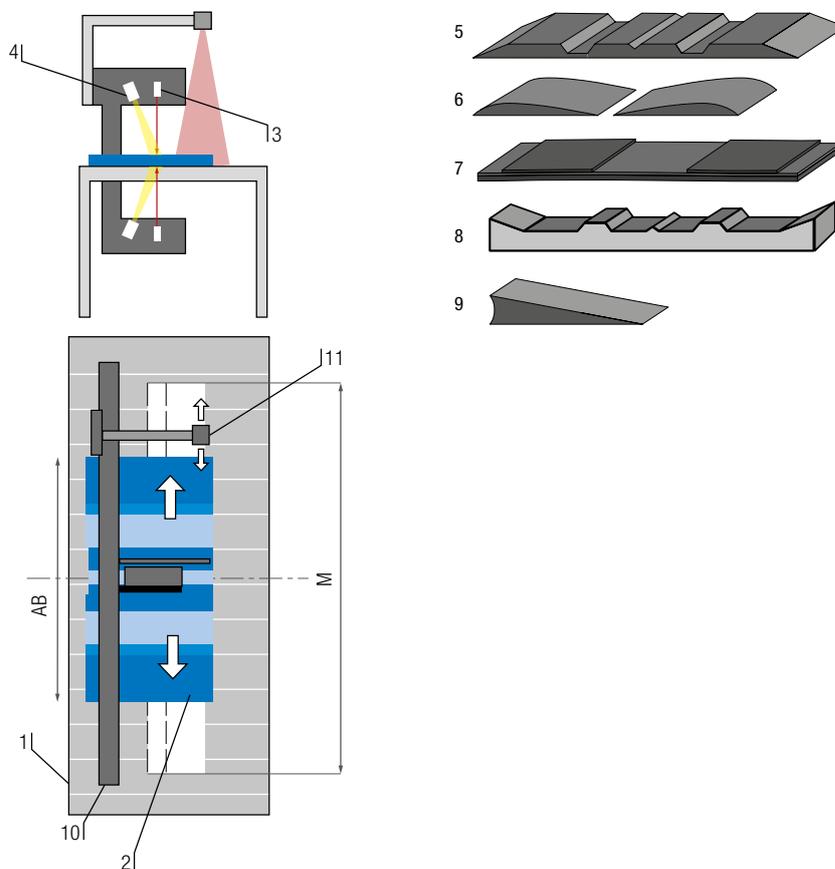
Two or three point-type laser sensors – depending on the required accuracy – traverse the resting product (tread, side wall, inner liner, cord) and measure its external geometry.

Area of use

In the DIE shop, profile measurement is used for DIE documentation (optional DIE measurement), while profile measurement is used in test laboratories and in extrusion lines for quality assurance and documentation purposes.

Application

The profile measurement system is used in DIE shops, test laboratories or directly in extrusion lines in a temperature-controlled measuring cabin.



Legend

AB	Operating width	6	Side wall
M	Measuring range	7	Inner liner
1	Measuring table	8	DIE
2	Profile measurement	9	Apex strips
3	Point laser	10	Traversing device
4	CCD sensor	11	Laser positioning aid
5	Tread		

Offline profile measurement system NOS20

- Offline profile measurement of treads, side walls and inner liners
- Optionally, also for measurement of the extrusion dies
- Traversing point-type laser sensor for precise profile acquisition
- Reliable acquisition by means of automatic intensity control for matt and glossy surfaces
- Replacement for manual measurements with statistical documentation for improved quality



Offline profile measurement system NOS20

Technical data

Profile width	750/1000/1250 mm
Profile thickness	Up to 68 mm
Measuring gap	Up to 258 mm
Measuring accuracy, thickness, laser triangulation sensors	Up to $\pm 5 \mu\text{m}$
Measuring accuracy, thickness Chromatic-confocal sensors	Up to $\pm 0.3 \mu\text{m}$
Measuring accuracy, width	$\pm 0.15 \text{ mm}$ ($\pm 0.1 \text{ mm}$ reduced speed)
Measuring equipment capability (Cg&Cgk): [TW* = 10 x accuracy]	≥ 1.67
Displayed resolution in profile width	0.001 mm
Displayed resolution in profile thickness	0.001 mm
Number of sensors	2
Traversing speed laser	Up to 150 mm/s (higher on request)
Laser sensor	Point sensor
Scan frequency	Sensor technology-dependent
Laser class	2 (designated laser safety officer not required)
Relative humidity	15 to 95 % (non-condensing)
Ambient temperature	+10 °C to +50 °C
Operating voltage	115 to 230 V, 50/60 Hz
Protection rating	IP 54
Dimensions (L x W x H)	Profile width 750 mm (710 x 1300 x 1266 mm) Profile width 1000 mm (710 x 1543 x 1266 mm)

* Dynamic inspection tool required for verification only

Cross section analyzer EL-CSA – NSS00

Function

During cross-section analysis, the pattern is scanned with the aid of a scanner. The image acquired can be evaluated geometrically using various functions.

Area of use

Cross-section analysis is used in the test laboratory for quality assurance on extrusion lines.

Application

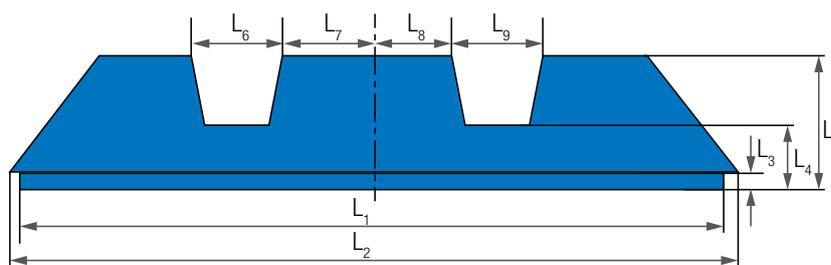
A prerequisite is a precise cross-section of the tread or side wall. The tread or side wall is placed upright in the holder above the scanner. After the acquisition of the cross-section profile, this profile can be evaluated using various tools.

EL-CSA

- System for the acquisition of the cross-section profile of a tread or side wall
- Manual measurement of the outer and inner geometries
- Generation of reports for the measured results
- Quality assurance documentation



Cross section analyzer NSS00



Legend

L ₁	Length 1	L ₆	Length 6
L ₂	Operating width	L ₇	Length 7
L ₃	Length 3	L ₈	Length 8
L ₄	Length 4	L ₉	Length 9
L ₅	Profile thickness		

Technical data

Scan area	297 x 421 mm (DIN A3)
Resolution	1200 dpi
Accuracy	±100 µm
Measuring equipment capability (Cg&Cgk): [TW* = 10 x accuracy]	≥1.67
Interface	Ethernet / RJ45
Operating voltage	115 to 230 V / 50/60 Hz / 16 A
Current consumption	1.5 A
Nominal temperature range	+10 °C to +35 °C
Storage temperature range	-25 °C to +60 °C
Relative humidity	15 to 80 % (non-condensing)
Dimensions (L x W x H)	710 x 1520 x 943 mm
Protection rating	IP 40
Weight	140 kg

* Dynamic inspection tool required for verification only

Tread length measurement system EL-LENGTH

Function

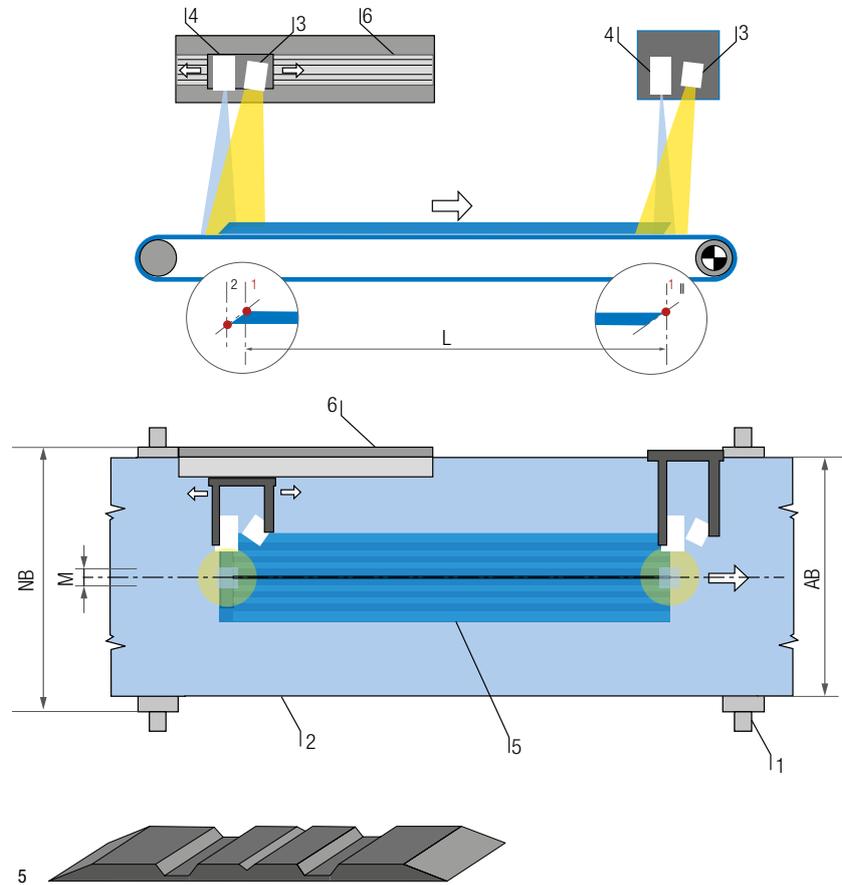
Two synchronized cameras acquire the ends of the cut product. The edges are detected in the image with the aid of a special algorithm. After prior calibration of the two cameras in relation to each other, the length measurement system can determine the final length of the tread measured.

Area of use

The length measurement system is used at the end of the extrusion line for quality documentation and for sorting out material that is out of tolerance.

Application

The tread length measurement system EL-Length is installed after the skiver. Due to material shrinkage, it is recommended that the measurements are taken as close as possible before the booking station. Only at this point has the tread almost reached its final length.



Legend

AB	Operating width (conveyor width)	3	Light spot
M	Measuring range	4	Matrix camera
NB	Nominal width	5	Tread
1	Guide roller	6	Side wall
2	Conveyor belt	L	tread length

Tread length measurement system NMS10

- Slip-free length measurement for cut treads and side walls
- Precise edge detection with matrix cameras with a wide field of view
- Display of the edge detection and the measured results
- Automatic pre-positioning of the upper matrix camera for the required profile length
- Quality assurance to avoid overlaps or the creation of gaps in the subsequent production process



Tread length measurement system NMS10

Technical data	
Measuring interval	1000/1500/2000/2500/3000 mm
Web speed	Max. 100 m/min
Number of cameras	2 to 6
Camera position	Camera can be positioned over the conveyor belt Fixed camera project-specific
Field of view matrix camera	60 x 60 mm
Displayed resolution	0.1 mm
Measuring accuracy for length up to 100 m/min	±0.4 mm
Measuring equipment capability (Cg&Cgk): [TW* = 10 x accuracy]	≥1.67
Interface	EtherNet/IP / Profibus / Profinet / CC Link / Device net
Relative humidity	15 to 95 % (non-condensing)
Ambient temperature	+10 °C to + 50 °C
Operating voltage	115 to 230 V, 50/60 Hz
Current consumption	16 A
Protection rating	IP 54

* Dynamic inspection tool required for verification only

Weight per meter scales EL-WEIGHT – NWS10

Function

The weight per meter scales (optionally weight per half-meter scales) allow the weight of rubber strands to be measured in the ongoing process. The precise weighing cells are matched to the product mass.

Area of use

The online weight per meter measurement is used in extrusion systems for weighing treads.

Application

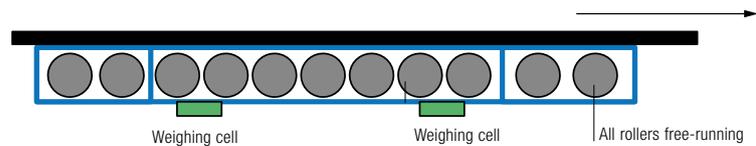
Weight per meter scales can be used for quality control and documentation of the material usage. The measurements can also be used to control the extrusion.



Weight per meter scale NWS10

EL-WEIGHT

- Weighing of endless material
- Robust, long-life weighing cells
- Fast acquisition of measured values
- Weighing terminal
- Also available as weight per half-meter scales



Technical data

Scale length	Weight per meter scales Weight per half-meter scales
Scale width	Customer-specific
Product length	Endless
Product width	<1000 mm
Weighing cells	Class C6 (optional C3)
Resolution	1 g
Static accuracy	±1.5 g (C6, 5 kg max., 1 m)
Measuring equipment capability (Cg&Cgk): [TW* = 10 x accuracy]	≥1.67
Product weight	Customer-specific
Protection class	IP 54
Temperature range	-10 °C to +40 °C
Operating voltage	230 to 400 V, 50/60 Hz
Power consumption	200 W
PLC interface	Ethernet TCP/IP

* Dynamic inspection tool required for verification only

Weight per piece scales EL-WEIGHT – NWS20

Function

The weight per piece scales allows dynamic measurement of the weight of treads or side walls. The precise weighing cells are matched to the product mass, length and the required accuracy.

Area of use

The online weight per piece measurement is used in production systems for weighing treads, for instance.

Application

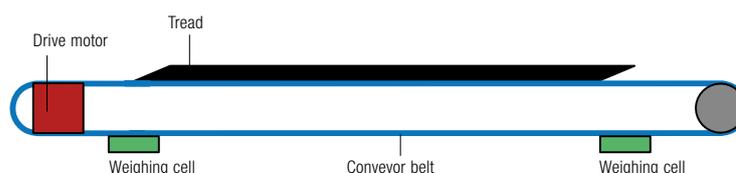
Weight per piece scales can be used for quality control and documentation of the material usage.



NWS20 piece weight scales

EL-WEIGHT

- Weighing of treads or side walls
- Robust, long-life weighing cells
- Fast acquisition of measured values
- Weighing terminal



Technical data	
Scale length	Customer-specific
Scale width	Customer-specific
Product length	<4000 mm
Product width	<1000 mm
Weighing cells	Class C6 (optional C3)
Resolution	10 g
Static accuracy	±10 g (C6, 50 kg max., 5 m)
Dynamic accuracy	±20 g (C6, 50 kg max., 5 m)
Measuring equipment capability (Cg&Cgk): [TW* = 10 x accuracy]	≥1.67
Product weight	Customer-specific
Protection class	IP 54
Temperature range	-10 °C to +40 °C
Operating voltage	230 to 400 V, 50/60 Hz
Power consumption	200 W (with motor drive correspondingly higher)
PLC interface	Ethernet TCP/IP

* Dynamic inspection tool required for verification only

Thickness measurement systems EL-THICKNESS

Function

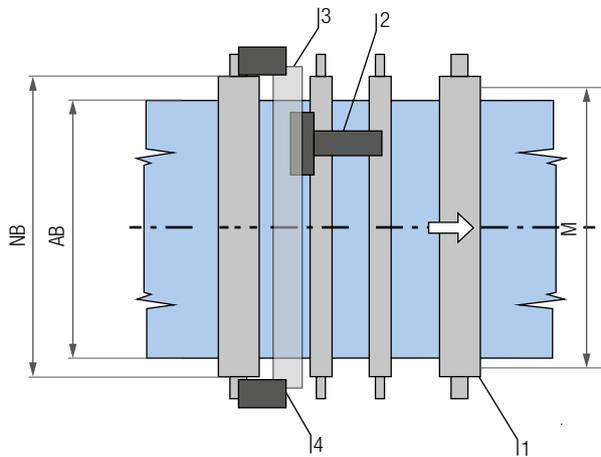
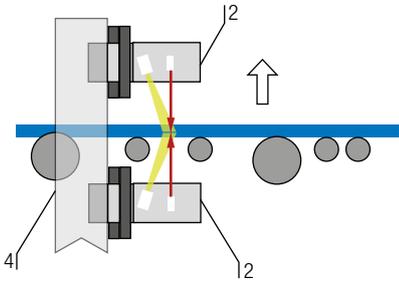
One or more sensors measure the product thickness in one or more locations continuously via differential measurements or reference measurements.

Here, there are various ways in which this system can be used: fixed measurement points or manually/automatically adopted/traversed measuring points.

Area of use

Systems for the measurement of thickness are mostly used in calender and extrusion lines. EL-THICKNESS systems are highly modular and can be integrated flexibly into production lines.

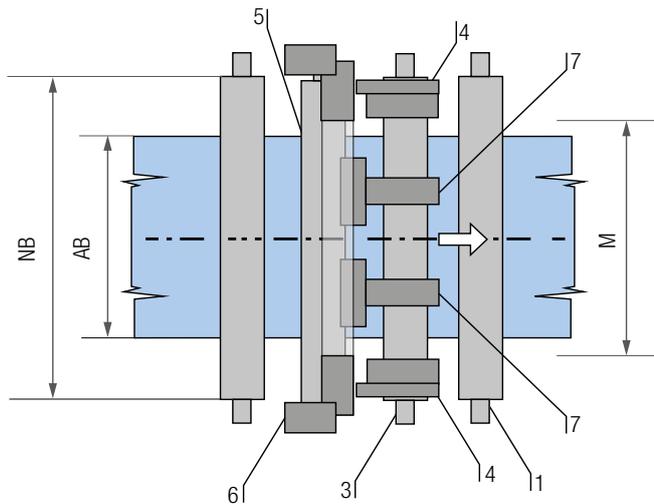
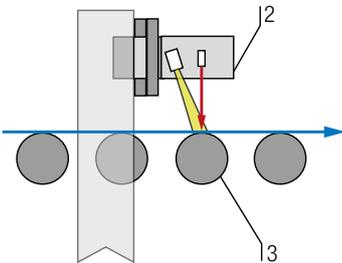
Differential measurement



Legend

- | | | | |
|----|-----------------|---|--------------------|
| AB | Operating width | 1 | Guide roller |
| M | Measuring range | 2 | Sensor |
| NB | Nominal width | 3 | Positioning device |
| | | 4 | Granite frame |

Reference measurement



Legend

- | | | | |
|----|-----------------|---|------------------------------|
| AB | Operating width | 3 | Reference roller |
| M | Measuring range | 4 | Reference sensors (optional) |
| NB | Nominal width | 5 | Positioning device |
| 1 | Guide roller | 6 | Frame |
| 2 | Sensor | 7 | Measuring sensors |

Differential measurement systems, O-frame NDS1 and C-frame NDS2

- Contactless online thickness measurement for material webs
- Precise determination of web thickness based on laser triangulation technology, chromatic-confocal or interferometric sensor technology
- Reduction of scrap, highest quality assurance
- Minimized thermal expansion and susceptibility to vibration due to the use of a granite frame
- Manual or motorized positioning of sensors is possible



Differential measurement system C-frame NDS2



Differential measurement system O-frame NDS1

Technical data		
	O-frame	C-frame
Profile width	Up to 4000 mm	Up to 1400 mm
Measuring range, laser triangulation sensors	Up to 78 mm	
Accuracy	Up to $\pm 10 \mu\text{m}$	Up to $\pm 3 \mu\text{m}$
Measuring range, chromatic-confocal sensors	Up to 4 mm (freely scalable for vertical sensor repositioning)	
Accuracy	Up to $\pm 5 \mu\text{m}$	Up to $\pm 1 \mu\text{m}$
Measuring range, interferometric sensors	Up to 8 mm (freely scalable for vertical sensor repositioning)	
Accuracy	Up to $\pm 5 \mu\text{m}$ (for layer thicknesses $< 0.5 \mu\text{m}$)	Up to $\pm 1 \mu\text{m}$ (for layer thicknesses $< 0.5 \mu\text{m}$)
Measuring equipment capability (Cg&Cgk): [TW* = 10 x accuracy]	≥ 1.67	
Sensor	Laser triangulation, chromatic-confocal, interferometric	
Measuring points	1	Up to 3
Scan frequency	Sensor technology-dependent	
Laser class	2 (dedicated laser safety officer not required)	
Resolution of profile thickness	0.01 μm	
Displayed resolution	1 μm / 0.01 for chromatic-confocal / interferometric	
Relative humidity	15 to 95 % (non-condensing)	
Ambient temperature	+10 °C to +50 °C	
Operating voltage	120 to 230 V / 50/60 Hz / 16 A	
Protection rating	IP 54	

* Dynamic inspection tool required for verification only

Thickness measurement against reference roller NDS3

- Contactless online thickness measurement for material webs
- Precise determination of web thickness based on laser triangulation technology, chromatic-confocal or interferometric sensor technology
- Reduction of scrap, highest quality assurance
- Manual or motorized positioning of sensors is possible



Thickness measurement against reference roller NDS3

Technical data	
Profile width	Dependent on position and number of measuring points
Measuring range, thickness	Up to 78 mm
Accuracy, thickness	Up to 5 μm (up to 0.5 μm for layer thickness measurements)
Measuring equipment capability (Cg&Cgk): [TW* = 10 x accuracy]	≥ 1.67
Sensor technologies	Laser triangulation / chromatic-confocal / interferometric
Measuring points	Up to 5
Scan frequency	Sensor technology-dependent
Laser class	2 (dedicated laser safety officer not required)
Resolution of profile thickness	0.01 μm
Displayed resolution	1 μm for laser triangulation 0.01 μm for chromatic-confocal/interferometric
Positioning/traversing speed of the sensor	Max. 133 mm/s (higher on request)
Relative humidity	15 to 95 % (non-condensing)
Ambient temperature	+10 °C to +50 °C
Operating voltage	120 to 230 V / 50/60 Hz / 16 A
Protection rating	IP 54

* Dynamic inspection tool required for verification only

Thickness measurement dual sensor NDS4

- All three sensor technologies are possible in combination with eddy current sensors
- Reference measurement against roller with metallic reference surface
- Real-time measurement
- Communication with customer PLC
- Provision of data for customer-side control of calender gap and the cross/axis parameters



Thickness measurement dual sensor NDS4

Technical data	
Profile width	Up to 3000 mm
Measuring range, thickness	Up to 8 mm
Accuracy, thickness	Up to 10 μm (for layer thickness measurement up to 1 μm)
Measuring equipment capability (Cg&Cgk): [TW* = 10 x accuracy]	≥ 1.67
Sensor technologies	Laser triangulation / chromatic-confocal / interferometric combined with eddy current sensor
Measuring points	Up to 5
Scan frequency	Sensor technology-dependent
Laser class	2 (dedicated laser safety officer not required)
Resolution of profile thickness	0.01 μm
Displayed resolution	1 μm for laser triangulation 0.01 μm for chromatic-confocal/interferometric
Positioning/traversing speed of the sensor	Max. 300 mm/s
Relative humidity	15 to 95 % (non-condensing)
Ambient temperature	+10 °C to +50 °C
Operating voltage	120 to 230 V / 50/60 Hz / 16 A
Protection rating	IP 54

* Dynamic inspection tool required for verification only

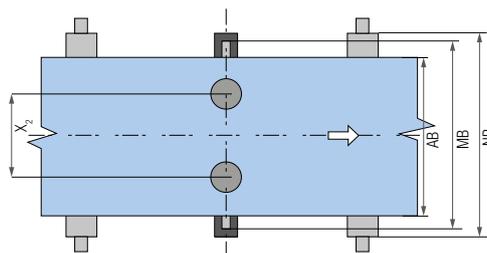
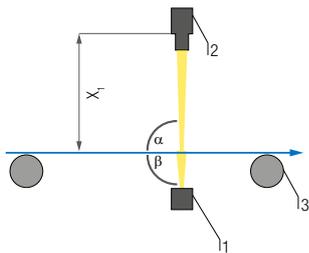
Web width measurement system ABS

Function

Highly compact CCD cameras or wide band sensors contactlessly measure the material edges and supply one or more width values, depending on the requirements.

These values can be displayed or also provided on an output for the purpose of quality control. Width monitoring is also possible with our systems.

Width measurement with CCD cameras

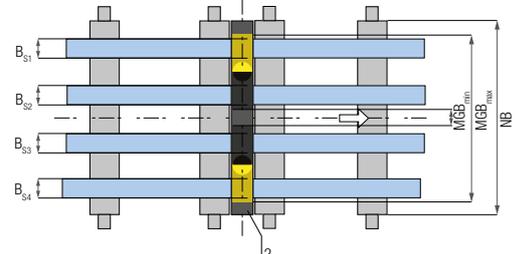
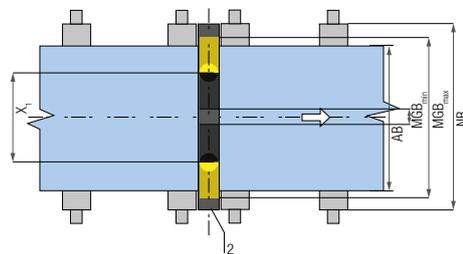
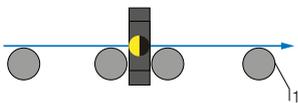


Legend

- AB Operating width (conveyor width)
- MB Measuring range
- NB Nominal width
- X₁ Distance, web surface – cameras
- X₂ Distance, cameras

- α Angle, web surface – camera
- β Angle, web surface – light transmitter
- 1 Light transmitter
- 2 CCD line scan camera
- 3 Guide roller

Width measurement with wide band sensor FE 46

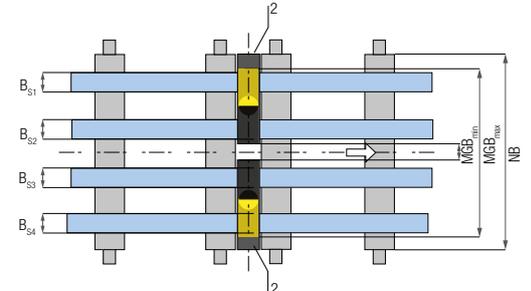
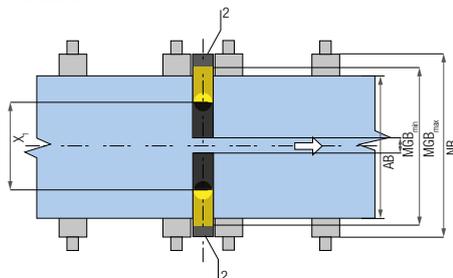
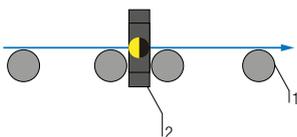


Legend

- AB Operating width (conveyor width)
- MBG_{min} Total measuring range, min.
- MBG_{max} Total measuring range, max.
- NB Nominal width

- X₁ Distance, sensors (center of measuring range)
- 1 Guide roller
- 2 Wide band sensor FE 46
- B_{sn} Width, strips 1 - n

Width measurement with wide band sensor FR 60



Legend

- AB Operating width (conveyor width)
- MBG_{min} Total measuring range, min.
- MBG_{max} Total measuring range, max.
- NB Nominal width

- X₁ Distance, sensors (center of measuring range)
- 1 Guide roller
- 2 Wide band sensor FR 60
- B_{sn} Width, strips 1 - n

Web width measurement system ABS

Area of use

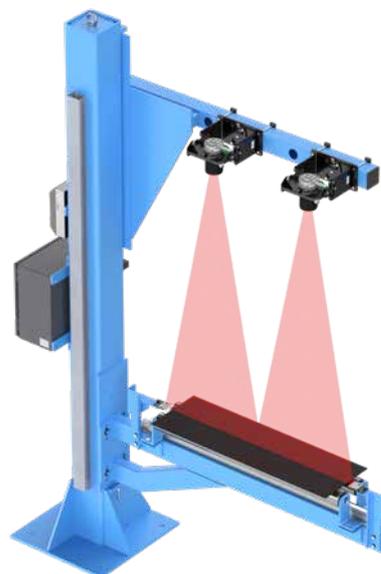
Web width measurement systems are used wherever the width of non-transparent webs must be monitored precisely and continuously.

Application

An interruption in the conveyor belt is necessary for width measurement systems. The web is measured using transmitted light and its height must not fluctuate at the measuring point.

Web width measurement system ABS

- Reliable, contactless detection of material edges
- Feedback of the material width to upstream control and spreading systems
- Width monitoring
- Continuous documentation and quality reports optional using ELQ
- Operation of I/O modules, for instance for signal lights
- Connection of large displays via Ethernet
- Remote maintenance via web-based management



Web width measurement system ABS25

Technical data

Measuring accuracy	±0.2 mm (material and sensor-dependent)
Cycle time	Up to 0.5 ms
Operating width	Dependent on sensor and variation in width
Sensors	SL 2362, OL 91, OL 82, FR 60, FR 53, FE 46
Relative humidity	15 to 95 % (non-condensing)
Ambient temperature	+10 °C to +50 °C
Operating voltage	
Nominal value	24 V DC
Nominal range	20 to 30 V DC (ripple included)
Nominal range with power supply	100 to 240 V, 50/60 Hz
Current consumption	Max. 5.6 A DC (AG 91 with man. sensor positioning)
Interface	Ethernet UDP/IP, EtherNet/IP Optional: Profinet and other databus systems
Protection rating	IP 54

Measurement of the splice overlap length EL.SPLICE – SMS1

Function

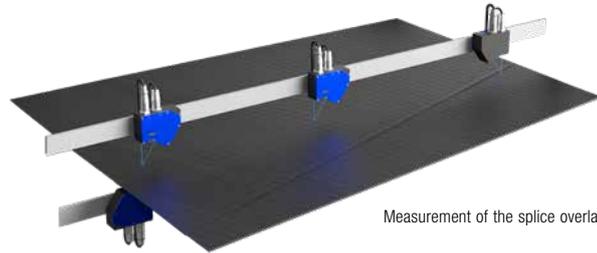
EL.SPLICE uses laser distance sensors to monitor the length of the overlap at the splice. This measurement system always consists of one or more sensor pairs with one sensor above the material and the other below. The overlaps are measured in the longitudinal direction by one, two or three sensor pairs in a gap between two conveyor belts.

Area of use

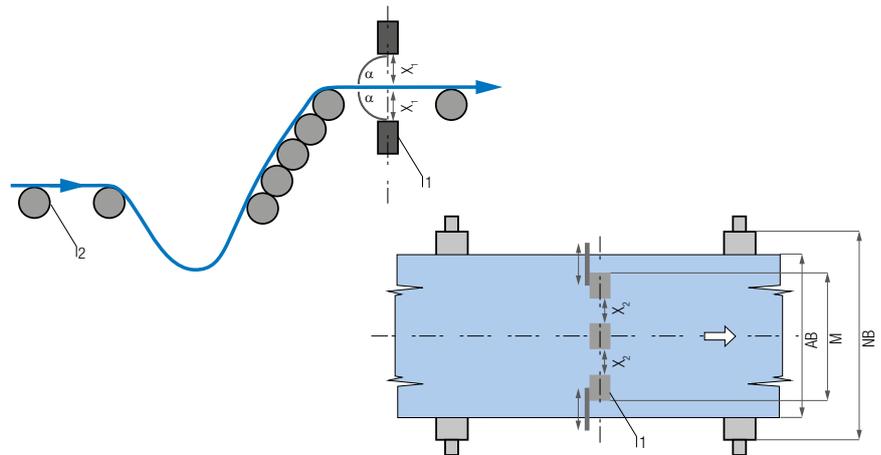
A typical application is in a cutting line immediately after the splice table. There the overlap is measured so the customer can optimize the production process.

Application

EL.SPLICE is normally mounted on the existing mechanical guide at the customer so that it is ideally adjusted to the actual material width. The height of the material must not fluctuate at the measuring point.



Measurement of the splice overlap length SMS1



Legend

AB	Operating width	X_2	Distance, sensors
MB	Measuring range	α	Angle, web surface – camera
NB	Nominal width	1	Sensor
X_1	Distance, web surface – sensors	2	Guide roller

EL.SPLICE

- Compact sensor design
- Mounting mechanism/holder for straightforward integration into the machine
- Straightforward operation, setup and quality control
- User-friendly user interface for commissioning
- Monitoring of overlap, thickness and angle at up to three measuring points with scan frequency of up to 30 kHz
- Maintenance-free and remotely controllable
- Components are Ethernet-based and can be maintained using remote access

Technical data

Measuring points	Up to 3
Sensor type	Point-type laser distance sensor
Laser class	2 (dedicated laser safety officer not required)
Wavelength	658 nm
Measuring distance	40 to 60 mm
Measuring range, thickness	30 mm
Resolution, vertical	0.05 mm
Linearity	± 0.010 mm
Accuracy (splice length)	± 0.1 mm
Accuracy (thickness)	± 0.1 mm
Accuracy (angle)	$\pm 1^\circ$
Minimum step height	0.4 mm
Measuring rate	Up to 30 kHz
Operating voltage	
Nominal value	24 V DC
Nominal range	20 to 30 V DC
Protection rating	IP 54 (when connected)
Ambient temperature	+10 °C to +40 °C

Edge detection by laser triangulation EL.EDGE – EDS1

Function

EL.EDGE makes possible the reliable, contactless detection of web edges with minimal contrast, such as strips of tire material on black conveyor belts, laminated strips, grooves and ridges. In this way width measurement and control are possible based on a minimal groove or a rubber strip. Fluctuations in the material thickness are compensated in the process without affecting the accuracy of the measurement.

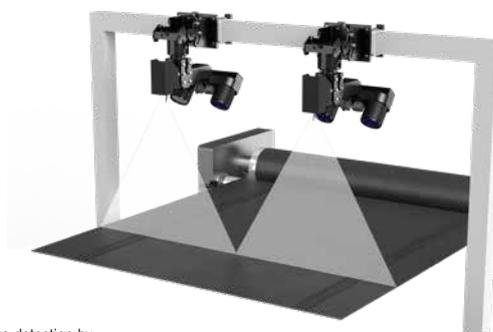
With the aid of an encoder, the cameras are synchronized with the production machine, so that the total running meters processed can be analyzed whenever needed.

Area of use

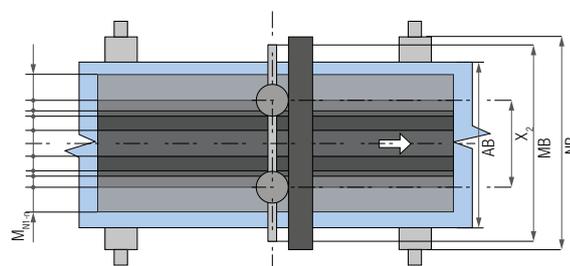
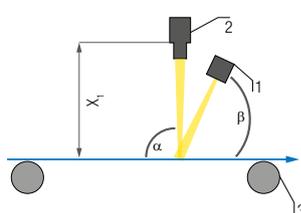
EL.EDGE has numerous possible applications. The system can be used for final quality control in laminating processes, for width measurements, or for the control of corresponding material characteristics.

Application

EL.EDGE has numerous possible applications. Because a light source is not required, the system can be used in all locations where the material is transported with support and without any fluctuations in its height.



Edge detection by laser triangulation EDS1



Legend

AB	Operating width (conveyor width)	β	Angle, web surface – light transmitter
MB	Measuring range	1	Light transmitter
NB	Nominal width	2	CCD line scan camera
X_1	Distance, web surface – cameras	3	Guide roller
X_2	Distance, cameras	M_{N1-n}	Measuring points 1 - n
α	Angle, web surface – camera		

EL.EDGE

- Straightforward integration into the machine
- An additional light source is not required
- Straightforward measurement directly at the conveyor belt
- Straightforward operation and setup
- Any PC in the same network can access the system
- Monitoring of production quality and transparent traceability via logs
- Maintenance-free and remotely controllable
- Components are Ethernet-based and can be maintained using remote access

Technical data

Measuring range	350 to 1650 mm (X direction/lateral) 40 mm (Z direction/vertical)
Measuring distance	335 mm (to the middle of the measuring range)
Resolution	0.1 mm (X direction/lateral) 0.001 mm (Z direction/vertical)
Accuracy (position)	± 0.2 mm (X direction/lateral)
Accuracy (width)	± 0.3 mm (X direction/lateral)
Step height	Min. 0.3 mm (Z direction/vertical)
Measuring rate	70 Hz (with max. vertical measuring range)
Laser class	2 (dedicated laser safety officer not required)
Laser wavelength	660 nm (red), 520 nm (green)
Operating voltage	
Nominal value	24 V DC
Nominal range	20 to 30 V DC
Power consumption	18 W
Interfaces	Power supply M12, Gigabit Ethernet RJ45
Protection rating	IP 54 (when connected)
Ambient temperature	+10 °C to +40 °C

Tire building inspection system EDS2

Function

With the aid of an SL series sensor (SL 2362), the material is detected and measured by means of laser triangulation on the tire building drum. This action is undertaken by measuring the distance to the surface of the drum and the material. Along with the outer edges and position, special attention is paid to the splice area. Here, various defects can occur that can be checked using the sensor.

Area of use

The tire building inspection system can be used in all lines where transmitted light measurement is not possible.

Application

The tire building inspection system is normally mounted on a mechanism provided by the customer so that it is always at a constant distance from the tire building drum. The signal from an incremental encoder is also required for the rotational speed of the drum. By measuring the distance to the surface of the drum and the material, the position of the material on the drum is determined. Particular attention is paid here to the area where the material is joined.

Tire building inspection system

- Intelligent triangulation sensor with dual matrix camera and integrated laser light
- Acquisition of height differences on moving webs
- With integrated evaluation and Ethernet/UDP interface for data transmission
- Suitable for use in position control and inspection systems



Triangulation sensor SL 23
(electronics unit can be positioned remotely)

Technical data

Measuring range	350 mm (X direction – width) 30 mm (Z direction – thickness)
Measuring distance	335 mm (to the middle of the measuring range)
Resolution	0.1 mm (X direction – width) 0.001 mm (Z direction – thickness)
Measuring accuracy	±0.2 mm (X direction – width) ±0.1 mm (Z direction – thickness)
Scan frequency	Max. 40 Hz
Laser class	2 (dedicated laser safety officer not required)
Laser wavelength	660 nm
Interface	Power supply M12, Gigabit Ethernet RJ45
Weight	9 kg
Protection rating	IP 54
Ambient temperature	+10 °C to +40 °C
Dimensions (sensor)	265 x 160 x 85 mm
Operating voltage Nominal value	24 V DC
Power consumption	18 W

Cord distribution system EPI

Function

An "EPI camera array" consists of a series of cameras fitted transversely over the calender material. Each camera determines the position of each individual cord in its field of view. The application creates a cord distribution curve and indicates the position of the left and right material edge and the position of the center cord. The position of the center cord is determined by counting all cords and halving the total number of cords. Alternatively, the center cord is marked by a cord with double thickness (two combined cords) and the camera searches for this double-thickness cord. The camera array detects double or missing cords.

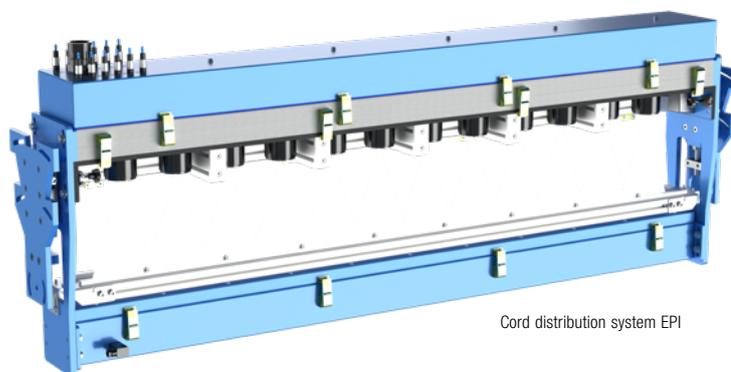
Area of use

The cord distribution system is used on calender lines immediately before the calender.

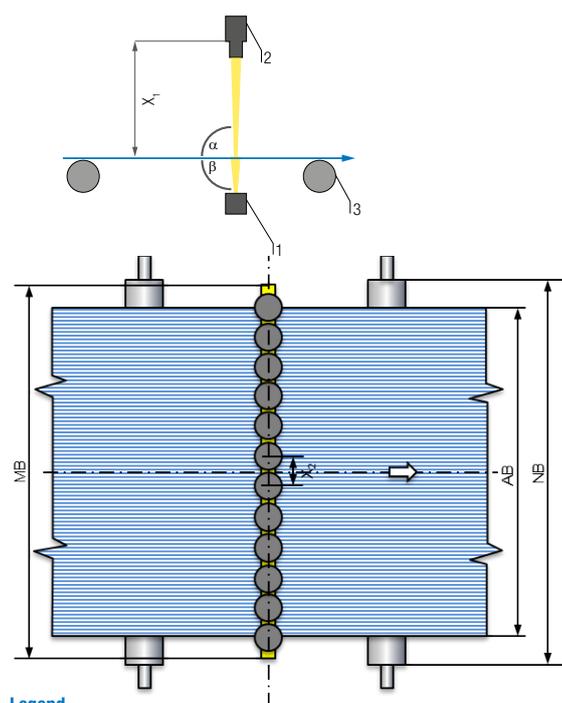
Application

An EPI system ensures that the material has the required total width and uniform cord distribution. A typical EPI system consists of a web guiding system SRB63, a spreading device BCB31 and an edge spreading system BCB11. This composite system is intended to counteract the natural tendency of the material to become narrower and thicker when subject to tension in the direction of web travel.

- Measurement of the cord distribution over the entire material width
- Feedback to the upstream control units
- Automatic detection of cord thickness and cord spacing
- Flexible control (outer edges, center cord, cord counting, even cord distribution)
- Recipe and user management including automatic recipe change if a splice is detected
- Online viewing and logging of defects
- Control via interface and/or command station using intuitive user interface
- Offline version for quality management for browsing the archive
- Statistical calculations (standard deviation, Cp, Cpk)
- PDF reports, CSV data export



Cord distribution system EPI



Legend

AB	Operating width	α	Angle, web surface – camera
MB	Measuring range	β	Angle, web surface – light transmitter
NB	Nominal width	1	Light transmitter
X_1	Distance, web surface – cameras	2	CCD line scan camera
X_2	Distance, cameras	3	Guide roller

Technical data

Camera	OL 82 CCD camera, up to 12
Pixels	5150
Scan frequency	Max. 125 Hz
Web speed	Max. 0 to 60 m/min
Measuring range	Up to 1600 mm (x direction)
Distance CCD camera (chip) – web	326 mm (clearance 230 mm)
Resolution	0.03 mm/pixel
Cord diameter	Min. 0.15 mm
Spacing, cords	Min. 0.15 mm
Relative humidity	15 to 95 % (non-condensing)
Ambient temperature	+10 °C to +50 °C
Operating voltage Nominal value Nominal range Nominal range with power supply	24 V DC 20 to 30 V DC (ripple included) 100 to 240 V, 50/60 Hz
Interface	Ethernet UDP/IP, EtherNet/IP Optional: Profinet and other databus systems
Protection rating	IP 54

Surface inspection systems

Function

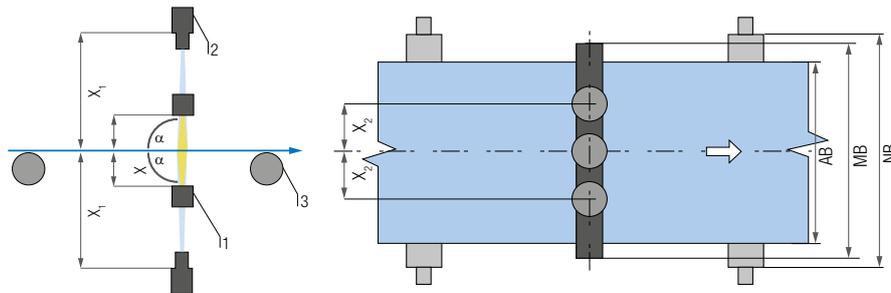
Surface inspection systems check the surface of the web for desired or undesired features using incident light. The basis for the system is a high-resolution camera (RGB or monochrome) and one or more specially arranged light transmitters. The image acquired by the camera is checked in an evaluation unit using various algorithms, for instance, for defects in the rubber coating, film or liner residue and other interfering structures, or for desired features such as the quality and position of color lines.

A prerequisite is always a stable web without height fluctuations at the measuring point. If this prerequisite is met, the systems acquire even the smallest defect, document it and make possible a statistical evaluation of the production.

Area of use

Surface inspection systems are always used if an irregularity in the material surface is to be detected.

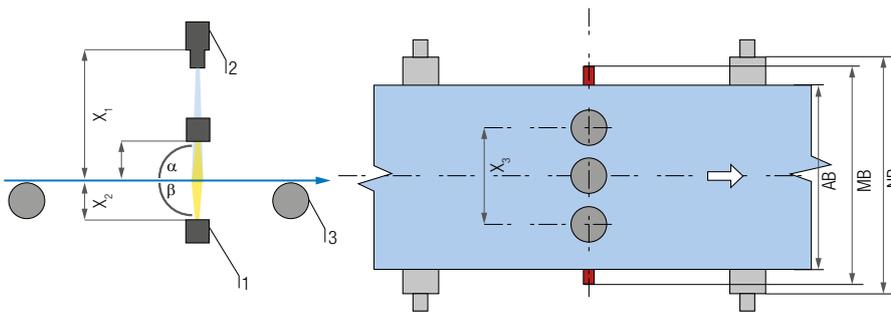
Surface inspection system RS1/2



Legend

- AB Operating width
- MB Measuring range
- NB Nominal width
- X Distance, web surface – light transmitter
- X₁ Distance, web surface – cameras
- X₂ Distance, cameras
- α Angle, web surface – camera/light transmitter
- 1 Light transmitter
- 2 CCD line scan camera
- 3 Guide roller

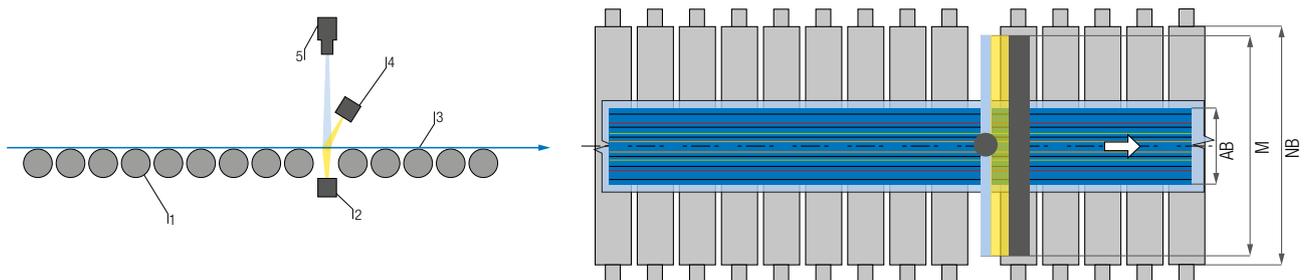
Hole and splice inspection system RS13



Legend

- AB Operating width
- MB Measuring range
- NB Nominal width
- X₁ Distance, web surface – cameras
- X₂ Distance, web surface – light transmitter
- X₃ Distance, cameras
- α Angle, web surface – camera
- β Angle, web surface – light transmitter
- 1 Light transmitter
- 2 CCD line scan camera
- 3 Guide roller

Color line monitoring system RS16



Legend

- AB Operating width (profile width)
- M Measuring range
- NB Nominal width
- 1 Feed rollers
- 2 Light transmitter, transmitted light
- 3 Tread
- 4 Light transmitter, incident light
- 5 Color line scan camera

Surface inspection system RSI1/2

Function

The surface inspection system RSI1 uses a series of color line scan cameras and very powerful LED light transmitters to inspect the rubber surfaces and to detect wetting defects (areas of the surface where the rubber is missing) or foreign objects such as pieces of color film. All defects detected are documented together with their position and a log can be prepared for every reel produced.

The defect detection system RSI2 uses a series of monochrome line scan cameras OL 91. The emphasis of this system is on the detection of defects on calender lines.

Area of use

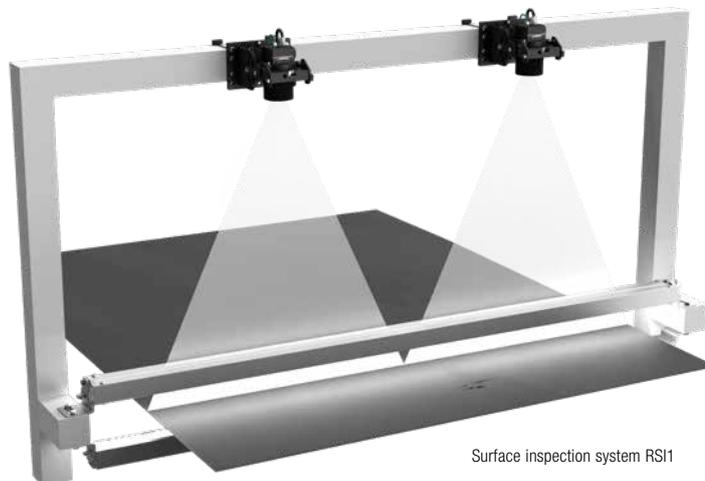
Surface inspection systems are used preferably on calender lines or cutting systems.

Application

The surface inspection systems RSI1/2 should be used in the area of the rewinder or unwinder. Depending on the requirements, the monochrome version RSI2 or the RGB version RSI1 can be used. The height of the material must be stable without fluctuations and it is necessary to interrupt the conveyor belt. A speed signal is required for the precise recording and measurement of defects.

Surface inspection system RSI1/2

- Mounting mechanism/holder for straightforward integration into the machine
- Straightforward operation, setup and quality control
- Statistical calculations (standard deviation, Cp, Cpk)
- PDF reports, CSV data export
- User-friendly user interface for commissioning
- Maintenance-free and remotely controllable
- Components are Ethernet-based and can be maintained using remote access



Surface inspection system RSI1

Technical data

Camera	Color line scan camera (double line), up to 3
Pixels	2 x 4096 (RGB), 6144 (monochrome)
Operating voltage	24 V DC
Scan frequency	Up to 10 kHz
X resolution (per camera)	Field of view = 500 mm => x res = 0.12 mm/pixel
Y resolution	Speed = 0 to 60 m/min => y res = 0.11 mm
Measuring range	500 to 1500 mm (x direction) (larger on request)
Distance, camera – web	600 mm
Lens type	50 mm
Defect size	Min. 3 x 3 mm

Hole and splice inspection system RSI3/4/5

Function

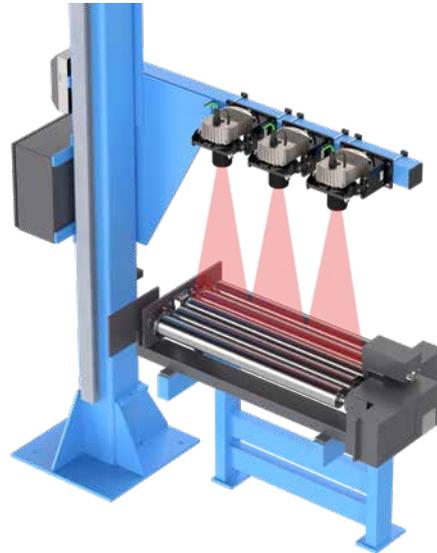
The material can be scanned using up to three line scan cameras and a scanning frequency of up to 10 kHz. With "simple" hole detection, the width of the holes is measured and a warning or an error is output to the customer's PLC if an adjustable tolerance limit is exceeded. With hole inspection, the size (area) and position of the holes detected is also determined in relation to the material transport and saved in a PC. High-quality precision camera lenses are used to determine accurately the sizes of the holes during the hole inspection. Reel logs can be produced and the holes detected displayed as a 2-D image using the E+L PC software.

Area of use

The hole and splice inspection system is used in roller-head lines and tire building machines for carcass control ahead of the drum.

Application

It is necessary to interrupt the conveyor belt for hole and splice inspection systems. The web is measured using transmitted light and its height must not fluctuate at the measuring point.



Hole and splice inspection system RSI3

Technical data

CCD camera	OL 91 (up to 3 units), OL 82 (up to 2 units)
Cycle time	Up to 0.1 ms
Number of pixels	Up to 6144
Defect size	Min. 0.2 mm (depending on the material thickness and camera type)
Relative humidity	15 to 95 % (non-condensing)
Ambient temperature	+10 °C to +50 °C
Operating voltage	
Nominal value	24 V DC
Nominal range	20 to 30 V DC (ripple included)
Nominal range with power supply	100 to 240 V, 50/60 Hz
Current consumption	Max. 5.6 A DC (length-dependent)
Operating voltage	120 to 230 V, 50/60 Hz
Interface	Ethernet UDP/IP, EtherNet/IP Optional: Profinet and other databus systems
Protection rating	IP 54

Color line inspection system RS16

Function

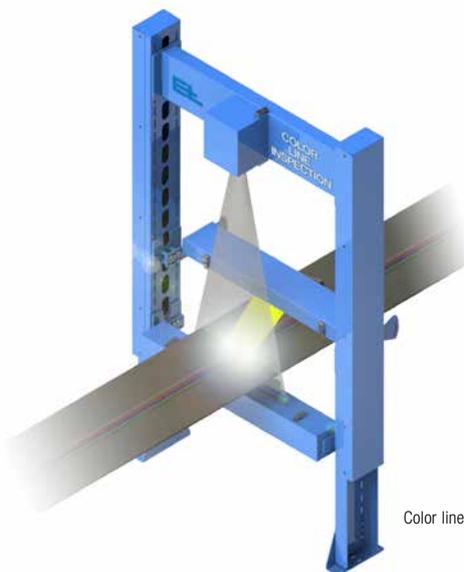
A triple-chip CCD camera compares the colors applied to the product with the nominal color sample. In this way it is possible to reliably detect irregularities in the application of the colors.

Area of use

The color line inspection system is used after the application of the colors for quality documentation and process control. In addition, it is also used to trigger alarms if colors are applied incorrectly or in the wrong positions.

Application

The color line inspection system is installed immediately after the application of the colors.

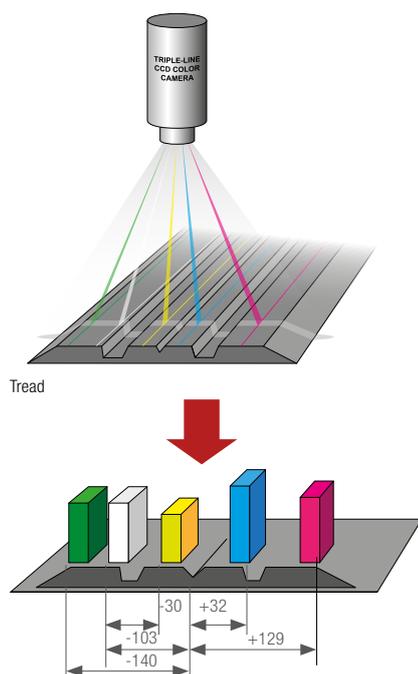


Color line inspection system RS16

Color line inspection system RS16

Monitoring of color lines on the tread

- Presence
- Number of lines
- Position of lines
- Color code
- Reliable color line detection with CCD color line scan camera
- Integrated LED light source for incident light illumination
- Integrated air purge system to prevent the deposition of sulfur vapors



Tread

Color line detection in reference to the center of the tread

Technical data

Measuring range	450 mm
Resolution	0.1 mm
Camera	RGB line scan camera with 3 x 4000 pixels
Color line width	Min. 1 mm
Distance to the marking point	Max. 1 m
Number of colors that can be differentiated	12 colors (15° color space tolerance)
Interface	Ethernet IP, Profibus, Profinet, CC Link, Device net, UDP
Relative humidity	15 to 95 % (non-condensing)
Ambient temperature	+10 °C to +50 °C
Current consumption	Max. 4 A
Operating voltage	120 to 230 V, 50/60 Hz
Protection rating	IP 54
Weight	Approx. 300 kg

Web tension measurement and control systems ELTENS

Function

The load cell comprises a stable outer ring with flange cover and centering collar for precision assembly. The inner ring in the form of a double bending beam ensures centered mounting of the ball bearing. The radial forces created by the web unbalance the strain gauges linked together to form a measuring bridge on the inner ring. This leads to an analog output signal proportional to the web tension.

Area of use

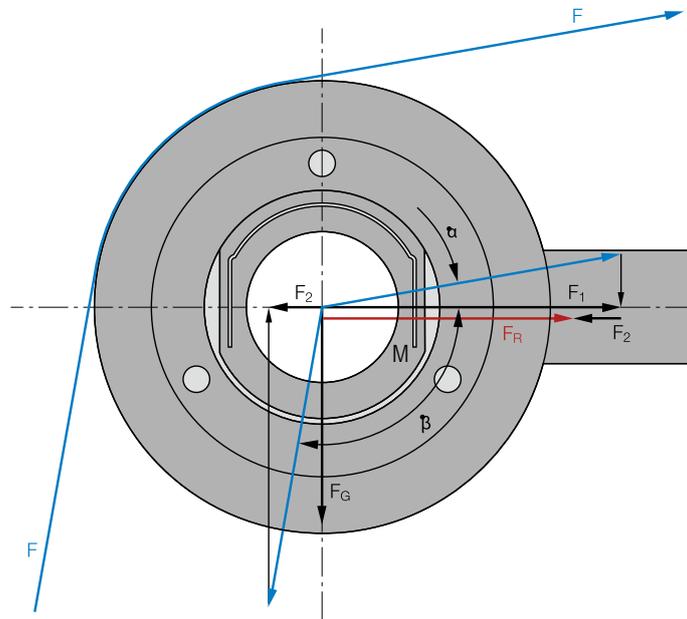
Flange load cells are used in practically all production plants where web-type materials are processed or finished. In front of processing stations, in particular, it is of fundamental importance that the web is transported with a continuous web tension.

Application

With a 90° horizontal-vertical wrapping angle on the measuring roller and a horizontal measuring direction, optimal acquisition of the web tension is assured. Only the double-sided acquisition of the resulting force on the left and right $F_{R/K}$ prevents incorrect measurements caused by lateral web movement and asymmetrical web tension distribution. Load cells incorporated into a closed control loop are to be mounted as near as possible to the actuator.

Calibration

The tensile force-path characteristic curve forms a straight line to the mechanical stop. All the load cells with the exception of the PD 25 series are calibrated to the nominal measuring force. Between the nominal measuring force and mechanical stop, a safety factor of 50 to 100 percent is taken into account to compensate for asymmetrical web tension distribution.



Legend

F	Web tension (N)	α	Angle between outgoing web and measuring direction
F_1	Force component 1 measuring direction (N)	β	Angle between incoming web and measuring direction
F_2	Force component 2 measuring direction (N)	M	Measuring direction
F_G	Weight force (N)		
F_R	Resulting force in measuring direction (N)		
$F_{R/K}$	Resulting force/load cell (N)		

Calculation, flange load cells

$$F_1 = F \times \cos \alpha$$

$$F_2 = F \times \cos \beta$$

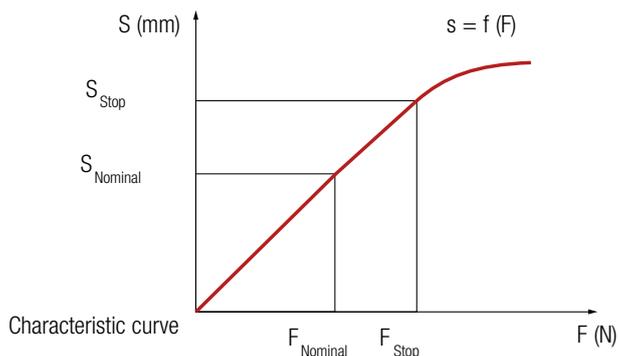
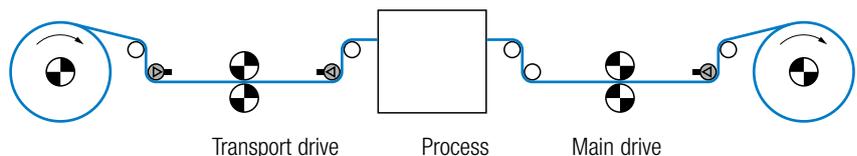
$$F_{R/K} = (F_1 + F_2)/2$$

Calculation, sensor rollers

$$F_1 = F \times \cos \alpha$$

$$F_2 = F \times \cos \beta$$

$$F_R = (F_1 + F_2)$$



Flange load cell PD 21/22

- Various mounting options such as flange bearings, pedestal bearings, inner/outer fastening enable position-independent installation
- Highly reliable in operation thanks to overload protection up to 20 times the nominal measuring force
- Different shaft diameters from 12 to 65 mm and nominal measuring forces from 0.05 to 10 kN ensure a high degree of flexibility
- For measurements in a horizontal direction, the weight of the roller does not affect the measured result
- Good thermal behavior and high degree of linearity of the measuring elements due to strain gauge application on a flat surface
- High permissible operating speed of the measuring roller due to high web load cell spring constant
- Best surface protection due to chemical nickel plating



Flange load cell PD 21/22

Selection table

Type, bore on one side	Type, bore on both sides	Type, bore d** (mm)	Nominal measuring force (kN)				
			0.05	0.1	0.2	0.5	
PD 2112	PD 2212	12	0.05	0.1	0.2	0.5	1
PD 2115	PD 2215	15	0.05	0.1	0.2	0.5	1
PD 2117	PD 2217	17	0.05	0.1*	0.2	0.5*	1
PD 2120	PD 2220	20		0.15	0.3	0.75	1.5
PD 2125	PD 2225	25		0.15*	0.3	0.75*	1.5
PD 2130	PD 2230	30		0.3	0.6	1.5	3
PD 2135	PD 2235	35		0.3*	0.6	1.5*	3
PD 2140	PD 2240	40		0.6	1.2	3	6
PD 2145	PD 2245	45		0.6	1.2	3	6
PD 2150	PD 2250	50		0.6*	1.2	3*	6
PD 2155	PD 2255	55		1	2	5	10
PD 2160	PD 2260	60		1	2	5	10
PD 2165	PD 2265	65		1	2	5	10

*Preferred sizes

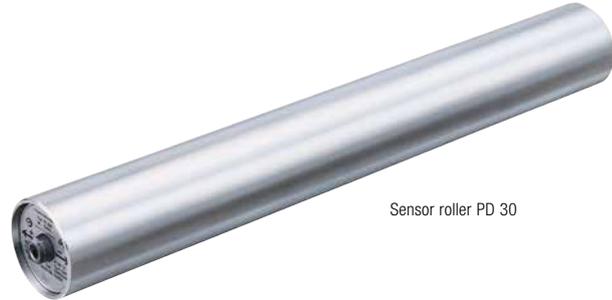
**Diameter of the axle journal

Technical data

Accuracy class	0.5
Nominal characteristic value (sensitivity)	1 mV/V
Combined error	<0.5 %
Characteristic value tolerance	0.2 %
Measuring principle	Full bridge strain gauge
Nom. resistance of strain gauge bridge	700 Ohm
Bridge supply voltage	10 V (nominal value) 14 V (max. permissible value)
Mechanical stop	1.8 to 2.4 x F _N depending on type
Operating load	1.8 to 2.4 x F _N
Limit load	20 x F _N
Nominal measuring deflection	0.1 to 0.2 mm depending on type
Nominal temperature range	-10 °C to +60 °C
Operating temperature range	-10 °C to +90 °C
Temperature coefficient	±0.3 %/10 K (characteristic value) ±0.3 %/10 K (zero point)
Protection rating	IP 50
Permissible axial lateral force	Max. 1 x F _N
Weight	2.3 kg (d = 17 mm), 3.6 kg (d = 25 mm), 8.5 kg (d = 35 mm)

Sensor roller PD 30

- Aluminum roller with fixed axle and two integrated load cells
- For straightforward installation between the side walls
- Highly reliable in operation thanks to overload protection up to 10 times the nominal measuring force
- Different roller diameters from 80 to 200 mm ensure maximum flexibility
- For measurements in a horizontal direction, the weight of the roller does not affect the measured result
- Good thermal behavior and high degree of linearity of the measuring elements due to strain gauge application on a flat surface
- The high value of the web load cell spring constant permits a high maximum operating speed for the measuring roller



Sensor roller PD 30

Selection table (sensor roller PD 30)

Type	ø d (mm)	NB min. (mm)	NW max. (mm)	L min. (mm)	ø d (mm)	Thread	Nominal measuring force F_N per roller (kN)		
PD 3008	80	300	1200	NW +10	20	M 12	0.2	0.4	1
PD 3010	100	300	1800	NW +10	20	M 12	0.3	0.6	1.5
PD 3012	120	400	2500	NW +10	20	M 12	0.3	0.6	1.5
PD 3016	160	600	3000	NW +10	40	M 16	0.6	1.2	3
PD 3020	200	600	3000	NW +10	40	M 16	0.6	1.2	3

Selection table (roller surface PD 30)

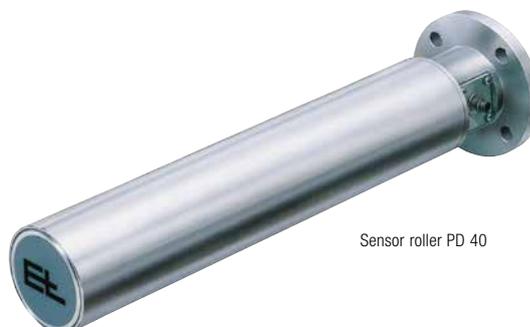
Surface index	Surface
01	Bare Ra 3.2 (standard)
02	Wound with rubber cork
03	Fine blasted with glass corundum Ra 6.3, hard anodized, layer thickness 30 µm 450 HV
04	Hard anodized, Ra 3.2, layer thickness 30 µm 450 HV
05	Spiral groove left + right, pitch 40 mm, groove radius 6 mm, groove depth 0.25 mm
13	Rough blasted with glass corundum Ra 12.5, hard anodized, layer thickness 30 µm 450 HV

Technical data (load cell)

Accuracy class	0.5
Nominal characteristic value (sensitivity)	1 mV/V
Combined error	<0.5 %
Characteristic value tolerance	0.2 %
Measuring principle	Full bridge strain gauge
Nom. resistance of strain gauge bridge	700 Ohm
Bridge supply voltage	10 V (nominal value) 14 V (max. permissible value)
Area	Max. 0 to 18 mV (at 1.8 x nominal force and 10 V bridge supply)
Mechanical stop	1.2 to 1.8 x F_N depending on type
Operating load	1.2 to 1.8 x F_N
Limit load	10 x F_N
Nominal measuring deflection	0.15 to 0.25 mm depending on type
Nominal temperature range	-10 °C to +60 °C
Operating temperature range	-10 °C to +70 °C
Temperature coefficient	±0.3 %/10 K (characteristic value) ±0.3 %/10 K (zero point)
Protection rating	IP 50
Permissible axial lateral force	Max. 1 x F_N
Connection cable	6 x 0.14 mm ² , 5 m/10 m long

Sensor roller PD 40

- Aluminum roller with fixed axle and two integrated load cells
- Mounting flange at one end for cantilever mounting
- Highly reliable in operation thanks to overload protection up to 10 times the nominal measuring force
- Different roller diameters from 60 to 120 mm ensure maximum flexibility
- For measurements in a horizontal direction, the weight of the roller does not affect the measured result
- Good thermal behavior and high degree of linearity of the measuring elements due to strain gauge application on a flat surface



Sensor roller PD 40

Selection table (sensor roller PD 40)

Type	ø d (mm)	NB min. (mm)	NB max. (mm)	Nominal measuring force F_N per roller (N)		
PD 4006	60	150	300	50	100	200
PD 4008	80	200	400	100	200	400
PD 4010	100	250	500	100	200	400
PD 4012	120	400	600	200	400	600

Selection table (roller surface PD 40)

Surface index	Surface
01	Bare Ra 3.2 (standard)
02	Wound with rubber cork
03	Fine blasted with glass corundum RA 6.3, hard anodized, Layer thickness 30 µm 450 HV
04	Hard anodized, Ra 3.2, layer thickness 30 µm 450 HV

Technical data (load cell)

Accuracy class	1
Nominal characteristic value (sensitivity)	1 mV/V
Combined error	<1 %
Characteristic value tolerance	0.2 %
Measuring principle	Full bridge strain gauge
Nom. resistance of strain gauge bridge	700 Ohm
Bridge supply voltage	10 V (nominal value) 14 V (max. permissible value)
Output voltage	
Nominal range	0 to 10 mV (for nominal force and 10 V bridge supply)
Area	Max. 0 to 18 mV (at 1.8 x nominal force and 10 V bridge supply)
Mechanical stop	1.2 to 1.8 x F_N depending on type
Operating load	1.2 to 1.8 x F_N
Limit load	10 x F_N
Nominal measuring deflection	0.15 to 0.25 mm depending on type
Nominal temperature range	-10 °C to +60 °C
Operating temperature range	-10 °C to +70 °C
Temperature coefficient	±0.3 %/10 K (characteristic value) ±0.3 %/10 K (zero point)
Protection rating	IP 50
Permissible axial lateral force	Max. 1 x F_N
Connection cable	6 x 0.14 mm ² , 5 m/10 m long

Digital measuring amplifier with display PA 62

- Digital two-channel measuring amplifier for the connection of two load cells with strain gauge bridge
- Menu-based, language-neutral commissioning wizard
- Online diagnostics for load cells including wiring
- X-t plotter for long-term display of the web tension
- Monitoring of the web tension for adjustable limits with digital alarm output
- Signal output analog or using Ethernet interface



Digital measuring amplifier with display PA 62

Selection table				
Type	Front panel installation	With housing	Top-hat rail mounting	Fieldbus
PA 6200	■			
PA 6210	■			■
PA 6201		■		
PA 6211		■		■
PA 6202			■	
PA 6212			■	■

Technical data	
Accuracy class	0.1
Operating voltage	24 V DC (18 to 30 V DC)
Current consumption	0.2 A
Strain gauge amplifier	2 channels
Input voltage	±25 mV, 14 bits
Bridge supply voltage	10 VDC
Measuring cycle time	1 ms
Analog outputs:	
Actual signal, direct	1 x 0 to 5/10 V 1 x 0/4 to 20 mA, R _{max} 500 Ω
Actual signal, filtered	1 x 0 to 5/10 V, f _g =0.2 to 20 Hz
Output signal (configurable)	Total signal/channel 1/channel 2/difference signal
Digital outputs	3 x floating, short circuit-proof
Output voltage	24 V, max. 500 mA
Output signal (configurable)	Limit/Alarm/Status
Digital input	1 x floating
Input voltage	24 V DC
Input signal (configurable)	Tare / recipe / stop recording
Display and control unit	Color touchscreen (LCD)
Interfaces	1 x RJ45, 100 Mbps EtherNet/IP (ODVA-compliant) or UDP/IP
Nominal operating temperature	+10 °C to +50 °C
Relative humidity	15 to 95 % (non-condensing)
Protection rating	IP 20 (plug-in) IP 54 (with housing)
Dimensions (W x H x D)	100 x 100 x 50 mm (plug-in) 130 x 155 x 106 mm (with housing) 90 x 90 x 90 mm (top-hat rail mounting)

Web tension controller DC 62

- Compact, digital web tension controller for different control structures including color touchscreen
 - Unwinder for pneumatic or electrical brakes
 - Rewinder or unwinder with speed-controlled drive
 - Transport unit with speed-controlled drive
 - Dancer position control
 - Braking torque control for pneumatic and electrical brake
- Menu-based, language-neutral wizard for quick commissioning
- Integrated measuring amplifier for evaluating load cell signals
- With output stage for direct actuation of electrical brakes
- Recipe management with up to 30 recipes



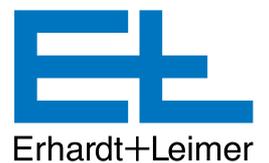
Web tension controller DC 62

Selection table			
Type	Plug-in	Housing	Ethernet
DC 6200	■		■
DC 6201		■	■
DC 6210	■		
DC 6211		■	

Technical data	
Operating voltage	24 V DC (20 to 30 V DC)
Current consumption (without el. brake)	0.3 A/4.3 A (elec. brake)
Control cycle time	1 ms
Strain gauge amplifier	2 channels
Input voltage	±30 mV, 14 bits
Bridge supply voltage	10 V
Analog inputs	
Guiding value/target value/dancer position	2 x 0 to ±10 V, 14 bits
Diameter	1 x 0 to 10 V, 12 bits
Analog outputs	
Electrical brake / coupling	PWM current output 0 to 4 A, 24 V
Controller actuating signal	1 x 0 to ±10 V, 14 bits 1 x 0/4 to 20 mA
Monitor output	1 x 0 to 10 V, 12 bits
Digital inputs	3 x floating Signal "0": -5 to +2 V Signal "1": +8 to +30 V
Digital outputs	2 x floating, short circuit-proof
Output voltage	24 V, max. 0.5 A
Interfaces	2 x RJ45, 100 Mbits: EtherNet/IP or UDP/IP 2x M16 E+L CAN Bus
Nominal operating temperature	+10 °C to +50 °C
Relative humidity	15 to 95 % (non-condensing)
Protection rating	IP 20 (plug-in) IP 54 (with housing)
Dimensions (W x H x D)	100 x 100 x 65 mm (plug-in) 130 x 155 x 106 mm (with housing)

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