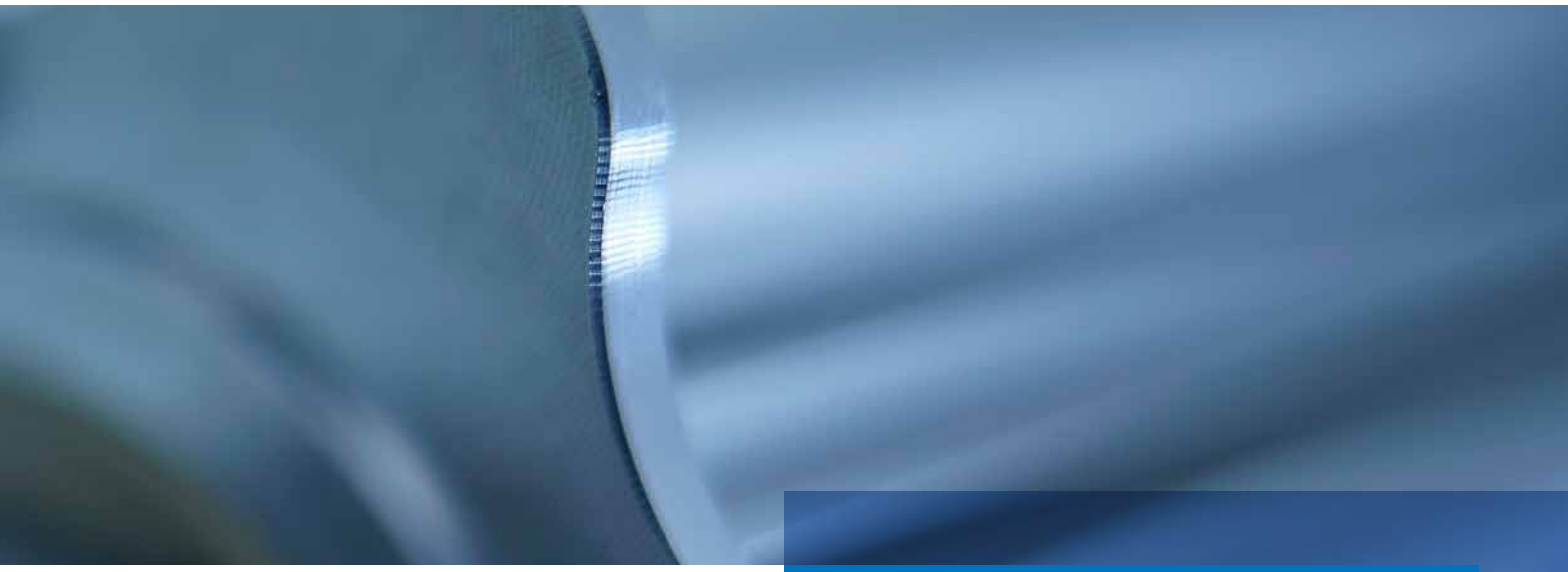


ELWINDER

Web guiding systems for winding stations with brush-less drive technology

Continuous acquisition
and control of the web position

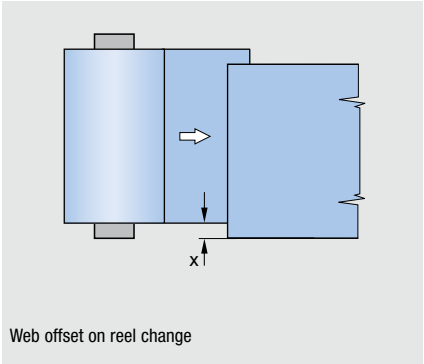
CONTENTS

Web guiding systems for improved quality and productivity

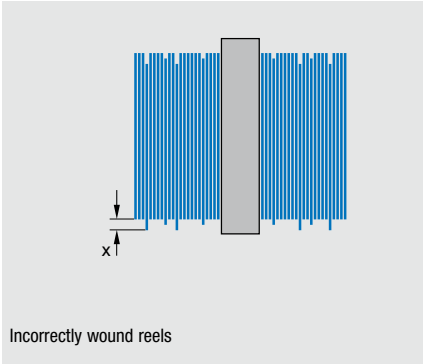
Today, the manufacturers and users of machines for processing web-type materials are confronted with ever increasing demands: production processes should be even faster, while at the same time performed with greater precision, the quality of the finished product further improved while personnel, waste and, above all, downtimes, should be reduced to a minimum.

A decisive contribution to the fulfillment of these prerequisites is made by web guiding systems. Typically, web-type materials are fed from a coil to the machine, finished and then rewound. During these stages, various position errors may occur, examples of which are illustrated on this page. E+L web guiding systems are designed to eliminate these sources of errors and to ensure permanent, precise web alignment and winding. 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!

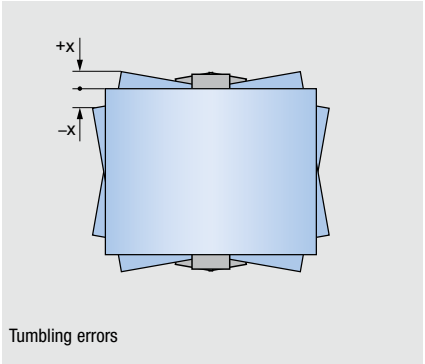
Typical position errors



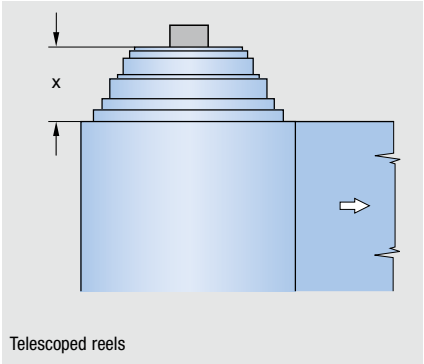
Web offset on reel change



Incorrectly wound reels

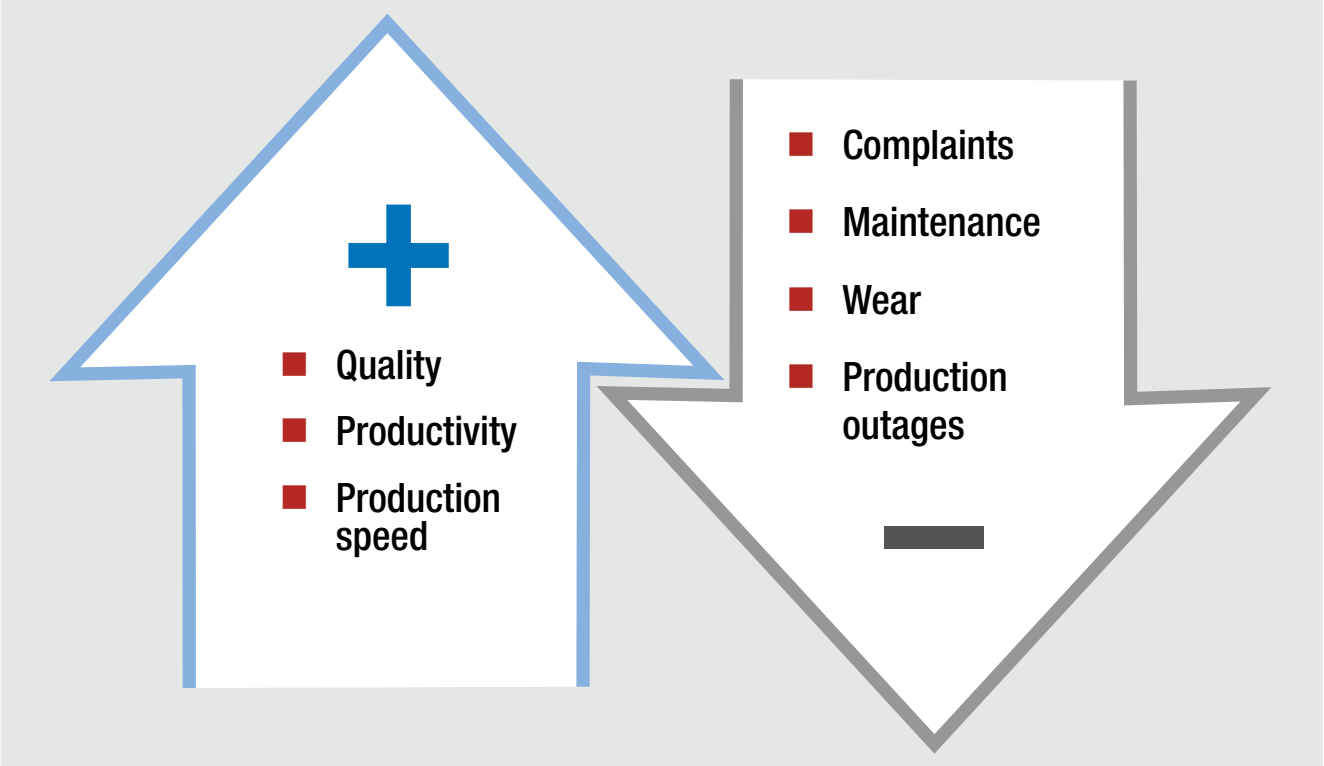


Tumbling errors



Telescoped reels

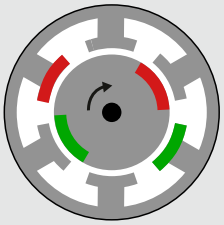
Your benefits



The highlights at a glance

1 Brushless technology

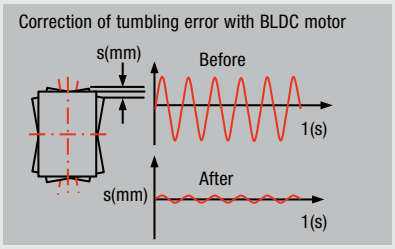
- Rotor with lowest mass inertia

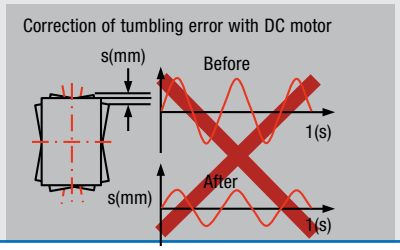


- No brush sparking
- No brush wear

2 Maximum dynamic performance

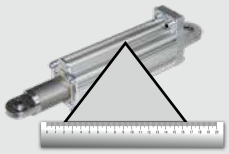
- Improved correction of tumbling errors even at high reel weight
- Control frequencies up to 4 Hz possible



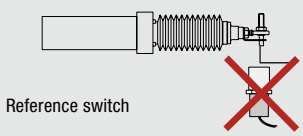


3 Absolute position detection

- The absolute position is always available
- Compactly integrated



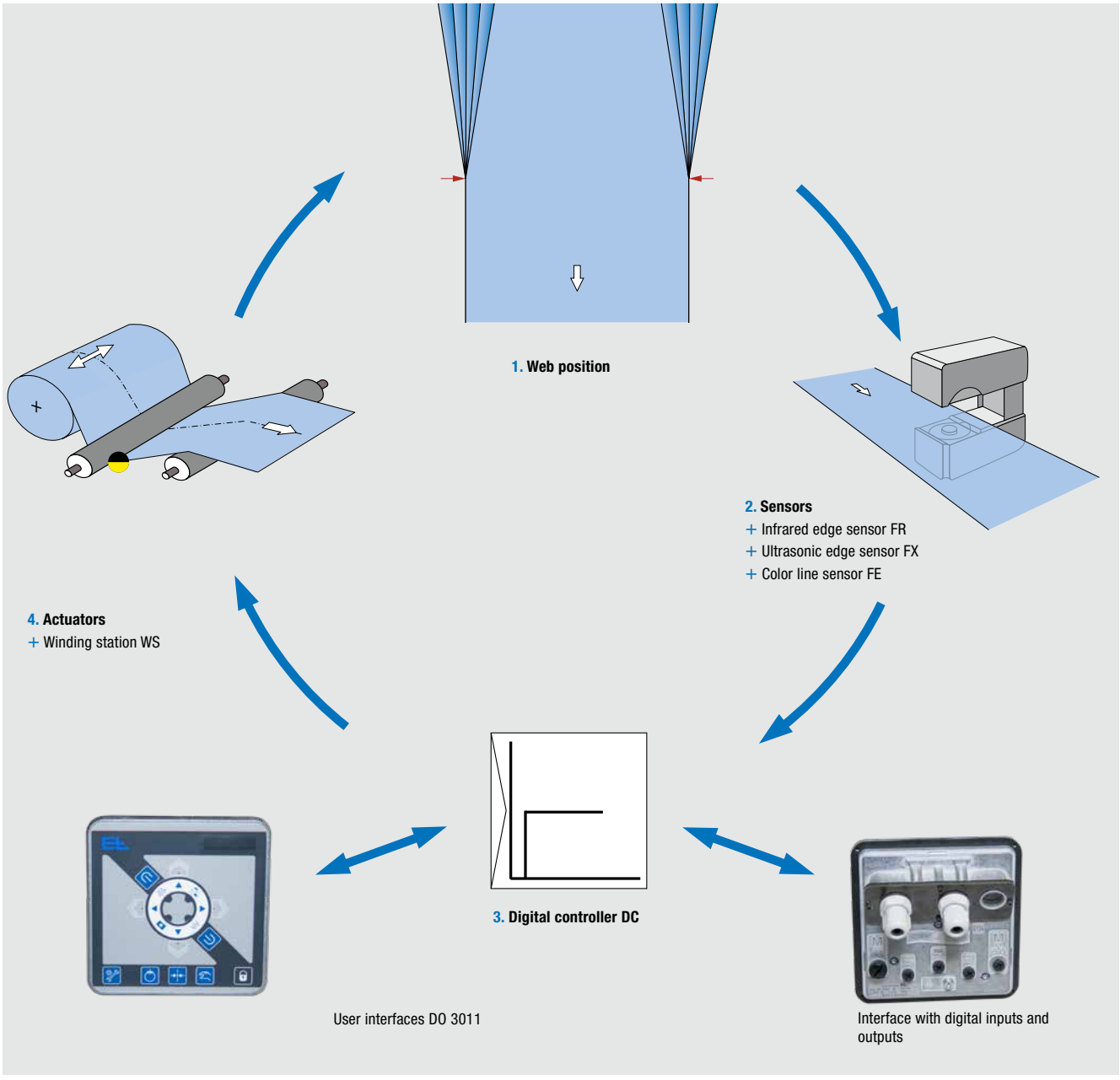
- No reference run necessary
- No reference sensor
- No position loss on power off



Closed loop control circuit

Any automation of a controller is based on the principle of a simple closed loop. Even the most complex of tasks may be reduced to this closed loop.

1. The starting point is the actual web position.
2. A sensor detects the web actual position without physical contact. Depending on the task and fabric properties, this may be an infra-red, ultrasonic or line sensor.
3. The controller compares the actual web value with the specified set value and transmits the relevant corrective signal to the actuator.
4. The actuator corrects the web travel. Depending on the application and the fabric type, the actuator may be a pivoting frame, a steering roller, a turning bar or a linear drive for a winding station.



Infrared edge sensor FR 52

Infrared edge sensor FR 52

+ Infrared edge sensor based on the principle of retroreflection
+ Field of view ±10 mm with a resolution of 0.02 mm
+ Distance-independent edge evaluation based on parallel light beams
+ Acquisition of edges and threads
+ Scanning with CCD array guarantees a stable operating point independent of the material transparency
+ Exposure controller for the compensation of soiling
+ Optional integrated clearing device in case of extreme dust conditions
+ Bar display for the indication of the current edge position or diagnostic information

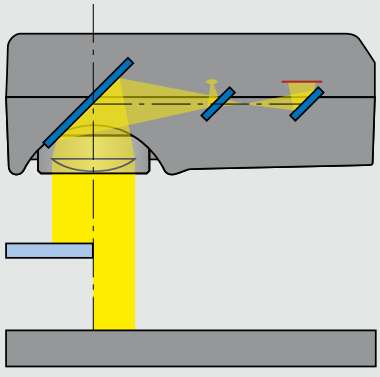
Infrared edge sensor FR 52

FR 52 with reflector bar

Infrared edge sensor FR 52 for mesh acquisition

Selection table

Reflector bar	
Type	Fork width (mm)
FR_5000-95	30
FR_5000-97	75
FR_5000-98	160



Principle of operation FR 52

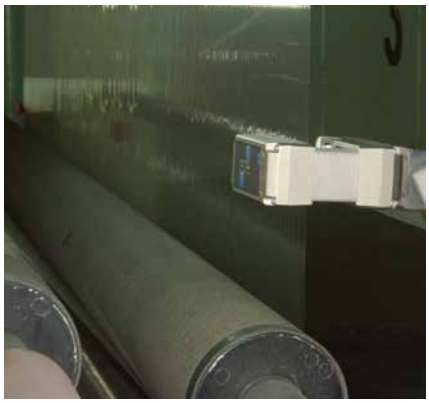
Technical data

Infrared edge sensor FR 52	
Operating voltage	
Nominal value	24 V DC
Nominal range (ripple included)	20 to 30 V DC
Current consumption	80 mA DC
Ambient temperature	10 to 50 °C
Measuring range	±10 mm
Resolution	0.02 mm
Linearity	±0.1 mm
Wavelength	850 nm
Scan rate	200 Hz
Cable length	Max. 10 m
Protection class	IP 54
Weight	0.3 kg
Air purge system operating pressure	Min. 0.1 bar; max. 0.2 bar
Service unit filter	5 µm
Service unit residual oil content	< 0.01 mg/m³
Fork width	See selection table
Dimensions (L x W x H)	105 x 50 x 40 mm

Ultrasonic edge sensor FX 42/FX 52

Ultrasonic edge sensor FX 42/FX 52

+ Ultrasonic edge sensor with digital evaluation
+ Field of view ±3 mm or ±10 mm
+ Fork widths 30, 60 and 124 mm
+ Insensitive to soiling due to dust
+ Scanning of materials opaque to sound such as paper, plastic and metal films independent of the material transparency
+ Internal temperature compensation for stable operating point
+ Bar display for the indication of the actual edge position or diagnostic information



Ultrasonic edge sensor FX 5 in film manufacturing machine

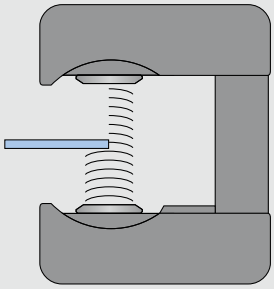
Ultrasonic edge sensor FX 52

Ultrasonic edge sensor FX 42

Selection table

Ultrasonic edge sensors FX 4/5

Type	Measuring range ±(mm)	Fork width LW (mm)
FX 4230	3	30
FX 4260	3	60
FX 4200	3	124
FX 5230	10	30
FX 5260	10	60
FX 5200	10	124



Principle of operation FX 42

Technical data

Ultrasonic edge sensor FX 4/5	
Operating voltage Nominal value Nominal range (ripple included)	 24 V DC 20 to 30 V DC
Current consumption	170 mA DC
Ambient temperature	10 to 50 °C
Measuring range	See selection table
Linearity deviation (measuring range 10 – 90 %)	±1 %
Ultrasonic frequency	~ 200 kHz
Resolution	0.02 mm
Scan rate	200 Hz
Cable length	Max. 10 m
Protection class	IP 54
Installation altitude	0 to 3000 m above sea level
Weight	0.7 kg
Fork width	See selection table
Dimensions (L x W x H)	105 x 50 x (LW + 80 mm)

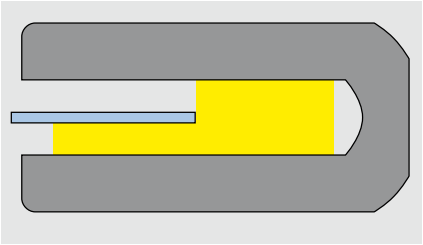
Broadband sensor FR 60

Infrared broadband sensor FR 60

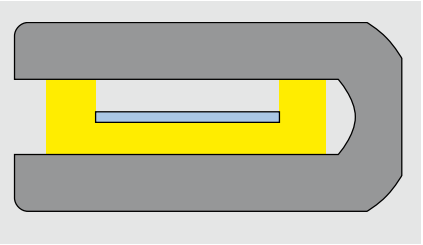
+ Infrared transmitted light transmitter with large field of view of 150 mm
+ Electronic web offset in the sensor field of view without manual adjustment of the sensor
+ Scanning of homogeneous materials such as non-woven fabric, woven and knitted fabrics with a transparency of up to 70 %
+ Simultaneous evaluation of up to four edges
+ Insensitive to external light
+ Stable operating point independent of the material transparency
+ Exposure controller for the compensation of soiling
+ Optional integrated clearing device in case of extreme dust conditions
+ Bar display for the indication of the current edge position or diagnostic information

Broadband sensor FR 60

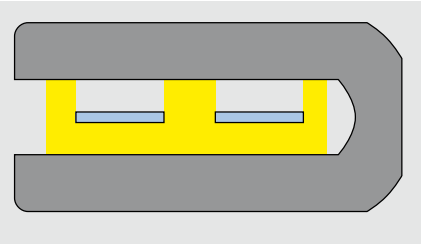
Edge configurations



+ Acquisition and evaluation of a web edge

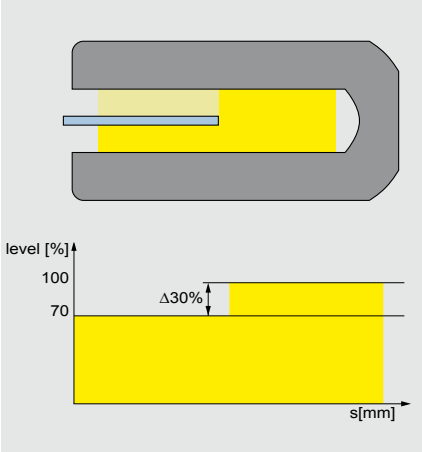


+ Acquisition and evaluation of two web edges
+ Application for narrow webs from 10 to 130 mm



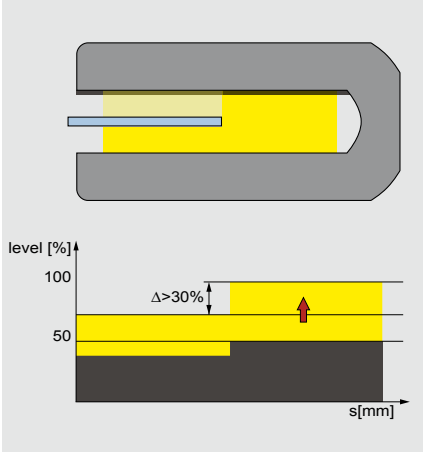
+ Acquisition and evaluation of four web edges
+ Application for two narrow webs from 10 to 55 mm

Edge acquisition on transparent webs



+ Reliable edge detection at max. 70 % transparency of the material webs

Edge acquisition on transparent webs in case of soiling



+ Integrated exposure controller ensures constant light intensity even in case of soiling
+ Reliable acquisition of transparent webs even in case of heavy dust deposits

Selection table

Broadband sensor FR 60	
Type	Air purge system
FR 6001	Yes
FR 6011	No

FR 60 in baby diaper machine

Technical data

Infrared broadband sensor FR 60	
Measuring range	±79 mm
Operating voltage Nominal value Nominal range (ripple included)	 24 V DC 20 to 30 V DC
Current consumption	150 mA DC
Ambient temperature	10 to 50 °C
Resolution	0.1 mm
Linearity	±0.2 mm
Scan rate	200 Hz
Cable length	Max. 10 m
Protection class	IP 54
Weight	1.25 kg
Number of edges evaluated	Max. 4 edges (= 2 narrow strips)
Air purge system operating pressure	2.0 bar
Air purge system air consumption	1.55 m^3/h (at 2.0 bar)
Service unit filter	5 µm
Service unit residual oil content	< 0.01 mg/m^3
Fork width	40 mm
Dimensions (L x W x H) FR 6001 FR 6011	 232 x 106 x 31 mm 221 x 106 x 31 mm

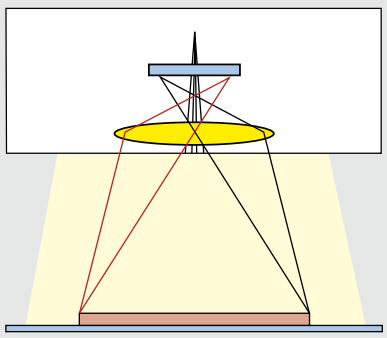
Color line sensor FE 52 with DO 4021

Color line sensor FE 52

+ Digital color matrix sensor for the acquisition of color lines and color contrasts
+ Exposure controller for the compensation of soiling
+ Integrated light source with automatic adaptation to matt and gloss surfaces
+ Adjustable search range for masking interfering contours

Command station DO 4021

+ Intuitive operation with color touch display
+ Real 2D depiction of the guiding criterion
+ Straightforward teach-in of the guiding reference using color touch display
+ Display of scanning quality
+ Operation of line sensor and web guider
+ Connection to the FE 52 via PoE (Power over Ethernet)



Principle of operation FE 52

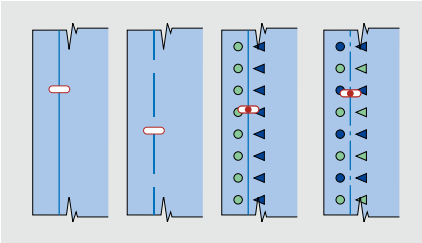
Technical data

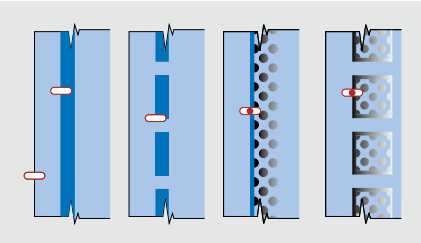
Color line sensor FE 52	
Operating voltage Nominal value Nominal range	 24 V DC 20 to 30 V DC
Current consumption	300 mA DC
Ambient temperature	10 to 50 °C
Measuring range	±10 mm
Resolution	0.02 mm
Sensor/web spacing	28 mm, ±2 mm
Scan rate	200 Hz
Cable length to the controller	Max. 10 m
Protection class	IP 54
Weight	0.75 kg
Dimensions (L x W x H)	126 x 80 x 46 mm
Command station DO 4021	
Operating voltage is supplied with power by the FE 52 color line sensor via PoE (Power over Ethernet)	
Current consumption	200 mA DC
Ambient temperature	10 to 50 °C
Display resolution	320 x 240 pixels
Length of cable to FE 52	Max. 20 m
Protection class	IP 54
Weight	0.5 kg
Dimensions (L x W x H)	100 x 100 x 29 mm

Guiding criteria
+ Line scanning, light line on dark background
+ Line scanning, dark line on light background
+ Contrast scanning

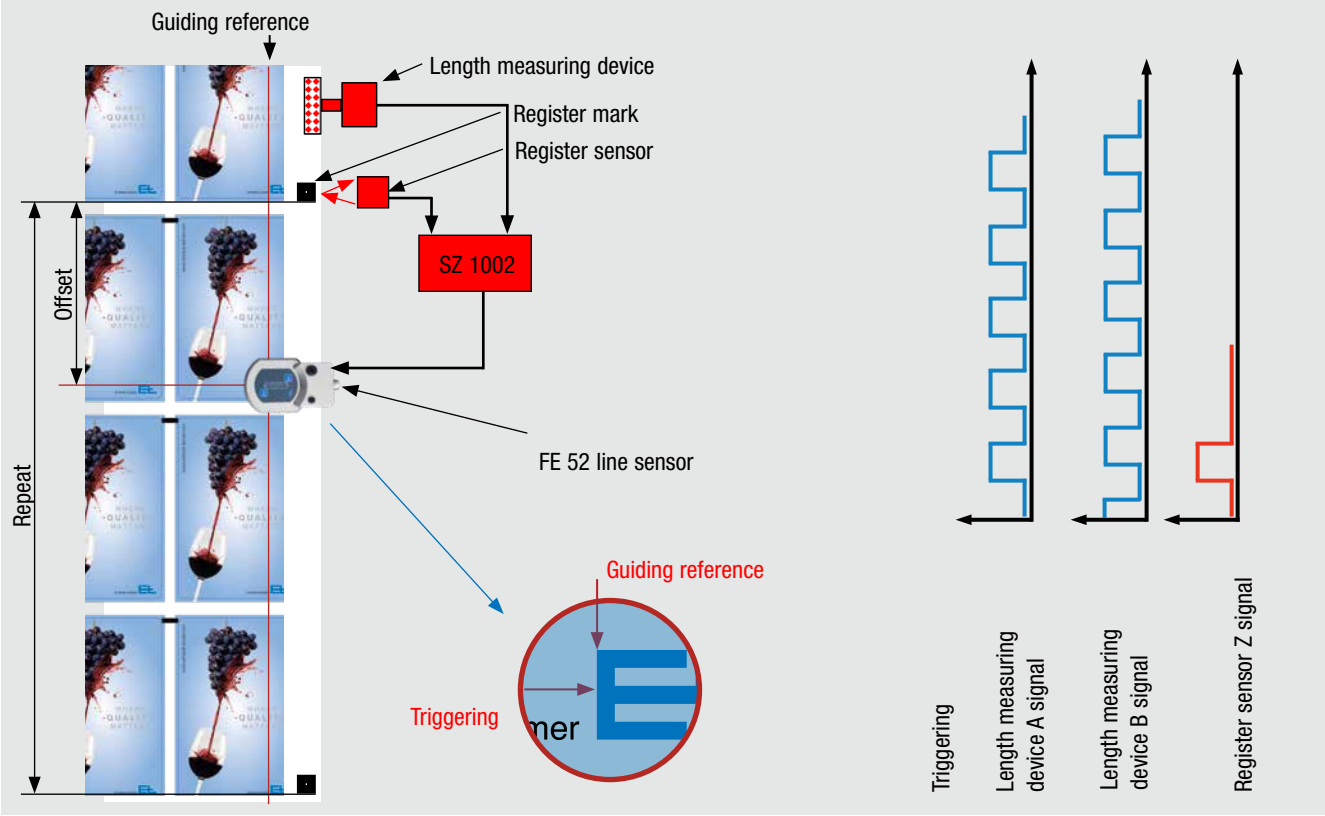
Line scanning
+ Continuous line with even background
+ Broken line with even background
+ Continuous line with uneven background
+ Broken line with uneven background
+ Line width 0.5–8 mm (nominal width 2–3 mm)
+ Background width on both sides minimum 1 mm
+ Field of view can be restricted to double line width

Contrast scanning
+ Web edge scanning
+ Contrast edge with even background
+ Broken contrast edge with even background
+ Contrast edge with uneven background
+ Broken contrasting edge with uneven background
+ Color contrast edge on both sides minimum 1 mm
+ Field of view can be restricted to 2 mm





Interrupted guiding reference with triggering *
If the pulse-pause ratio for a guiding reference is < 2:1, triggering is necessary.
Your benefit: material saving at the edge, as space for a guiding line not necessary.



* in preparation

Sensor mounting bracket VA 6

A stable sensor mounting bracket is a decisive factor in precision, vibration-free scanning of the line/color edge. This feature makes it possible to change the scanning angle quickly and straightforwardly without affecting the installation distance. Different versions are available depending on the application.

Variable sensor mounting bracket

Fixed sensor mounting bracket

Sensor mounting bracket VA 6

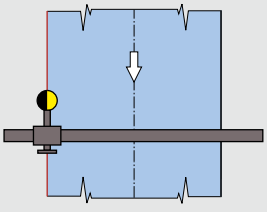
Type	Fastening square (mm)	Assembly
VA 6007	20 x 20	Fixed
VA 6027	20 x 20	Variable
VA 6107	40 x 40	Fixed
VA 6127	40 x 40	Variable

Position control methods

Web guiding is initially defined by the type of web processed. Unfinished fabric webs may only be guided by the edge as no other regular contrasting characteristics are featured.

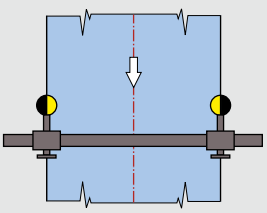
Finished webs offer a further field of possible guiding criteria. They may be controlled by a printed characteristic line, water marks, notching or in addition to the web edge, by a freely selected contrast.

Manual sensor positioning web edge guiding



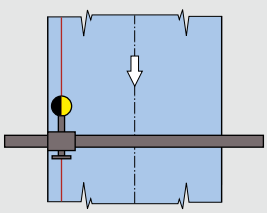
Guiding by the left or right web edge

Manual sensor positioning web center guiding



Guiding by the ideal web center line/machine center line

Manual sensor positioning web contrast guiding



Guiding by a printed line or existing contrasts

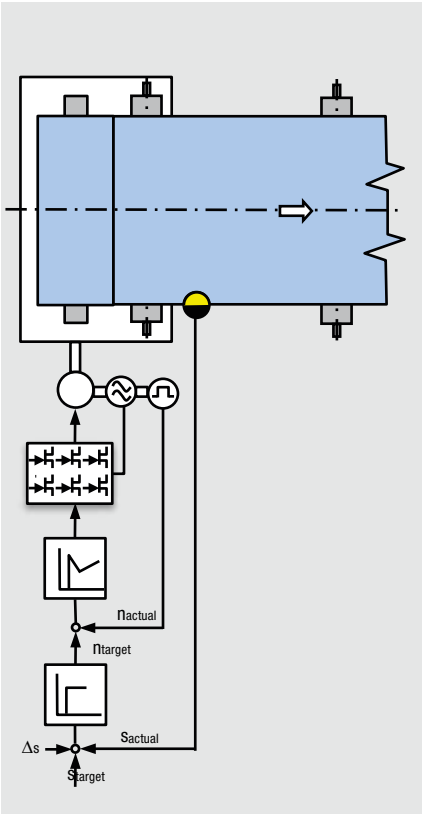
Position controller + motor end stage

Position controller + motor end stage

+ Highly compact position controller and motor output stage integrated in the actuator
+ Interference-free transmission of the encoder signals (angular position + absolute encoder)
+ Continuous temperature monitoring on the motor winding
+ Signal transmission actuator-command station via Ethernet

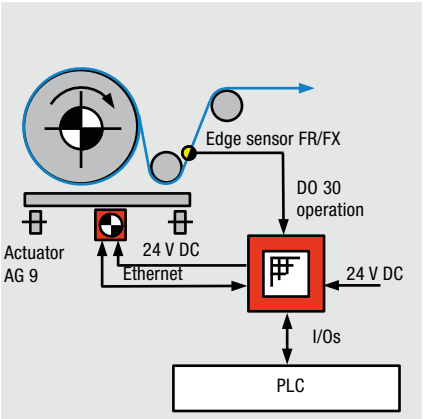
Control card RK 4070 integrated in actuator

Control structure

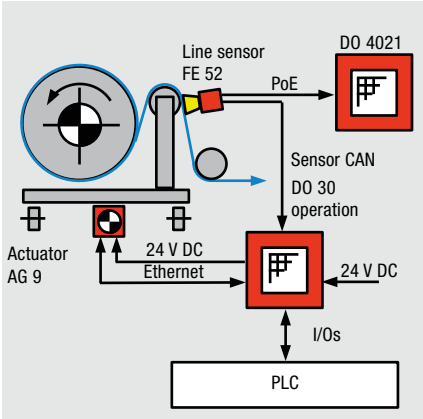


Block diagram

Block diagram edge control



Block diagram line control



Digital inputs

+ Automatic mode
+ Center position
+ Manual adjustment
+ Manual adjustment/web offset left
+ Manual adjustment/web offset right
+ Controller inhibit (automatic)
+ Selection left-hand edge sensor
+ Selection right-hand edge sensor
+ Line sensor
+ Determination of guiding set point (target position)
+ Pulse generator

Digital outputs

+ Fault indication

Operation

DO 30 operation

+ Touch operation and central connection point for all control components
+ Intuitive operation of the web guiding function
  - Sensor selection
  - Determination of guiding set point
  - Web offset
  - Oscillation
  - Selection of the operating mode
  - Adjustable gain and actuating speed
+ Button lock to prevent unintentional access

DO 3001 operation

Installation variants

DO 3001 front panel installation

DO 3001 console mounting

DO 3001 wall mounting

Technical data

DO 30 operation		
Operating voltage	Nominal value Nominal range	24 V DC 20 – 30 V DC
Current consumption	AG 91 (1000N) AG 93 (3000N)	6 A 8 A
Ambient temperature		0 – 50 °C
Dimensions	Housing Cut-out for panel mounting	135.5 x 135.5 x 100 mm 124 x 124 mm
Sensor connections	Edge sensor Line sensor	2xM8 SensorCAN 1xM8 SensorCAN
Interface to the actuating drive	Data exchange Operating voltage	1xM8 Ethernet 1xM12
Interface to the customer's system		12 digital inputs 2 digital outputs
Protection class		IP 54
Weight		0.6 kg

Winding station control ELWINDER

Function

Typically in production processes involving moving webs, the unwinder is located at the machine infeed and the rewinder at the outfeed. 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 always used if, due to cramped conditions, an ELGUIDER or ELROLLER system cannot be accommodated.

Application, unwinding

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

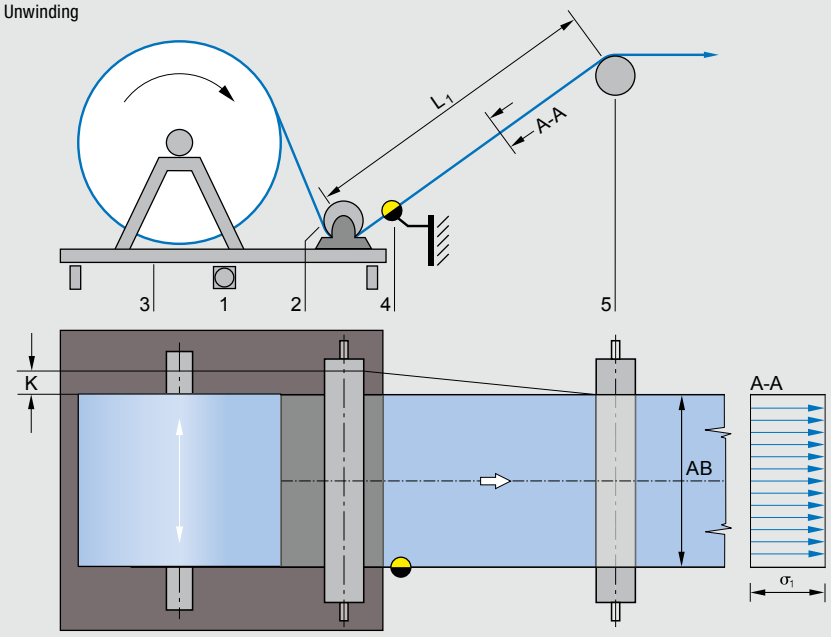
Application, unwinding with synchronous roller

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.

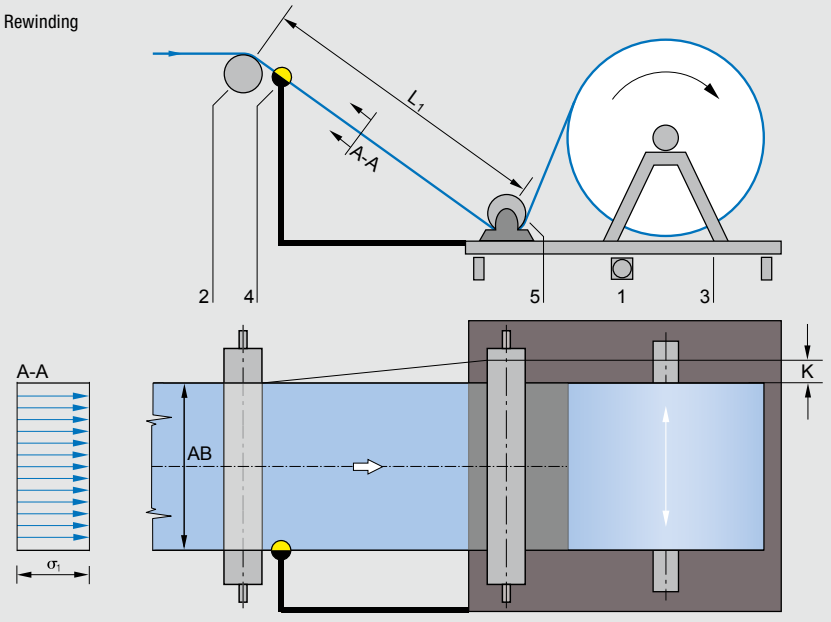
Application, rewinding

During rewinding the sensor is fastened to the winding station to set the target position of the winding station for the controller. Here, the position detection system should be located as close to the final machine guide roller as possible. The guiding path L1 depends on the elasticity of the web. The larger the transverse elasticity range, the shorter the path L1 can be. Experience has shown that the guiding path should be the equivalent of half a web width.

Unwinding



Rewinding



Legend

A-A Web tension distribution on the guiding path
K Web correction
α_1 Web basic tension
AB Operating width

1 Linear drive
2 Infeed rollers
3 Winding station
4 Sensor
5 Locking roller
L_1 Guiding path

Actuator AG 9

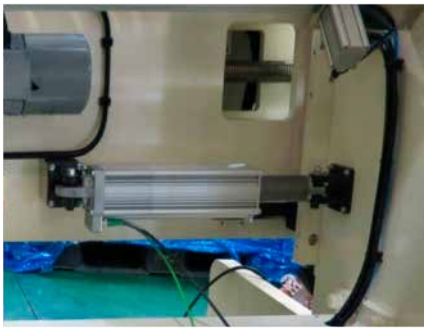
Actuator AG 9

+ Wear-free brush-less drive technology
+ Higher efficiency and dynamic performance due to gearless direct drive
+ Compact integrated end stage with position controller
+ Actuating travel and actuating force can be continuously adjusted
+ Absolute position detection already included in the actuator
+ Optionally with mounting brackets on both sides

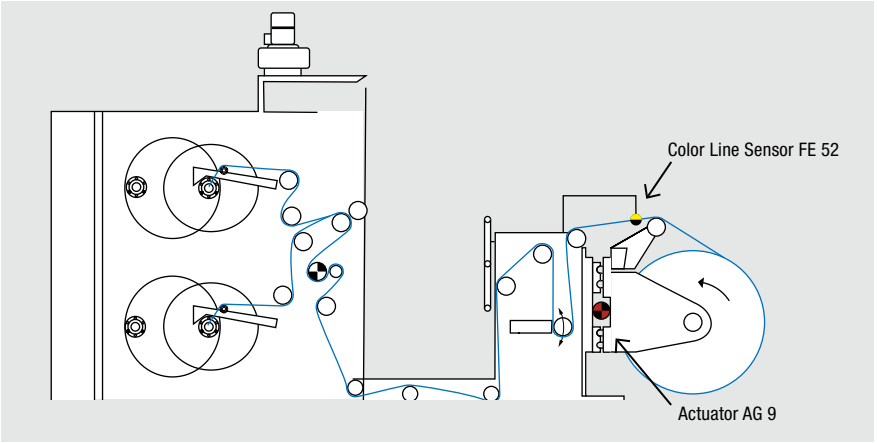
Your benefits

+ Straightforward mounting, even in difficult situations, due to highly compact actuator
+ Quick commissioning due to plug-in design and absolute position detection
+ Maximum control accuracy, even with high frequency tumbling errors
+ Can be used in cleanrooms without problems
+ Maintenance-free technology

Actuator AG 9



Actuator AG 9 on winding station



ELWINDER WSB 52 on slitter rewinder

Selection table

Actuator AG 9

Type	Nominal actuating travel (mm)	Nominal actuating force (N)
AG 9101	±25	1000
AG 9111	±50	1000
AG 9121	±75	1000
AG 9311	±50	3000
AG 9331	±100	3000

Technical data

Actuator AG 9	
Nominal actuating travel	See table
Nominal actuating force	See table
Nominal actuating speed	0 – 30 mm/s adjustable (3000 N) 0 – 60 mm/s adjustable (1000 N)
Positional accuracy	<±0.2 mm (material-dependent)
Error frequency	Max. 4 Hz
Operating voltage Nominal value Nominal range	 24 V DC 20 – 30 V DC
Nominal current AG 91 (1000N) AG 93 (3000N)	5,6 A 7,7 A
Ambient temperature	0 to + 55 °C
Weight	4.7 kg (±50 mm) 5.2 kg (±100 mm)

Questionnaire

General data

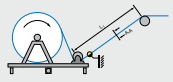
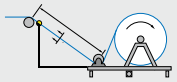
Customer			
Street			
Zip code		**City/town**	
Country		**Internet**	
Telephone		**Fax**	
Contact person			
Telephone		**E-mail**	
Project			

Technical data

Type of machine					
Make					
Position on the machine					
Type of web	❑ Paper ❑ Textiles	❑ Card ❑ Carpet	❑ Film ❑ Non-woven fabric	❑ Metal	❑ Rubber ❑
Web surface	❑ Not transparent	❑ Transparent	❑		
Web width	Min. _____ mm		Max. _____ mm		
Web speed	Min. _____ m/min		Max. _____ m/min		
Web tension	Min. _____ N		Max. _____ N		
Web condition in operation	❑ Dry	❑ Moist	❑ Wet	❑	
Ambient temperature	_____ °				
Ambient conditions	❑ Dry	❑ Moist	❑ Wet	❑	
Infeed error	±_____ mm				
Error frequency	_____ Hz				
Operating voltage	❑ 24 V DC	❑ _____ V	❑ _____ Hz		

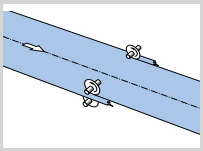
Technical specifications

Type of control	❑ By web edge	❑ By line	❑ By web center	
Sensor	❑ Ultrasonic	❑ Infrared	❑ Line	
	Cable length sensor operation	❑ 3 m	❑ 5 m	❑ 10 m
Operation	❑ Front panel installation	❑ Wall mounting	❑ Console mounting	
	Cable length actuator operation	❑ 3 m	❑ 5 m	❑ 10 m

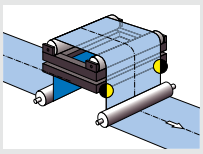
❑ **Winding station**	**Version**	❑ Unwinding	❑ Winding	
	Bearing	❑ Plain bearing	❑ Roller bearing	❑ Linear bushing
	Friction factor	_____		
	Weight winding station	_____		
	Actuating travel	±_____ mm		

Date		**Issuer**	

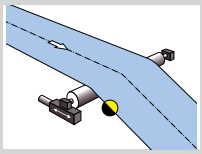
Other products for the paper and film industry



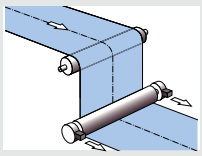
ELCUT – Web cutting systems



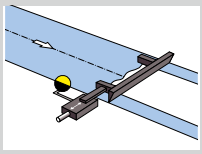
ELGUIDER – Web guiding systems



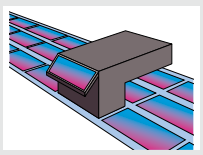
ELBANDER – Conveyor belt control systems



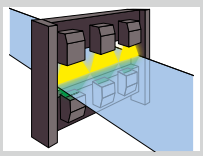
ELTENS – Web tension control systems



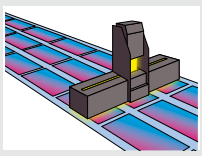
ELPOSER – Positioning and follow-up control systems



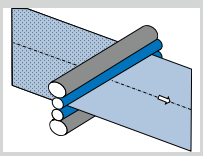
ELSCAN – Web monitoring systems



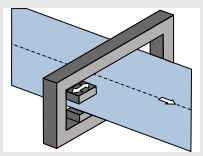
ELSIS – Surface inspection systems



SMARTSCAN – Print inspection systems



ELCLEAN – Web cleaning systems



ELTIM – Thickness measuring systems

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