

Quality assurance systems for cold rolling processes



- ▶ Optimise your processes and increase your quality!
- ▶ Increase your cost efficiency through process transparency!
- ▶ Satisfy the ever-growing customer demands in the long-term!

The Company:

EMG is the specialist when it comes to intelligent and complex automation solutions. As a technology leader, EMG is the first point of contact for you, our customers.

Central areas of application for series products, individual components and complex system solutions from EMG are continuous production processes in the metal industry.

As a traditional company and world market leader with 75 years of experience, EMG's Metals business unit offers its customers, i.e. you, complete solutions for your respective individual requirements. Consultation, joint planning and intensive support of the customer up to commissioning therefore play a decisive role in addition to the pure technical products. Here, we focus on process automation and visualisation as well as process control and monitoring.

EMG Strip Guiding Solutions:

With our high-quality strip guiding systems, we provide safe, low-maintenance and technically mature components as well as complete solutions that optimally support your respective technological production process.

Due to the constantly increasing demands on quality and high availability in combination with reduced operating and maintenance personnel, the requirements of our customers are also constantly increasing. Through the continuous optimisation of our solutions, we are able to meet these requirements.

Together with our quality assurance systems, we offer versatile and reliable solutions for improving your process and product quality - all from one single source!

Our goal: **Perfecting your performance!**

EMG Quality Assurance Systems:

EMG's innovative quality assurance systems enable you, as our customer, to continuously optimise your manufacturing processes and increase your production quality in order to optimally meet the constantly growing demands on your end product in the long term.

- ▶ EMG iSCAN®: Slab dimension / position measurement and tracking
- ▶ EMG hotCAM: Strip position measurement and guiding
- ▶ EMG IMPOC: Online measurement of tensile and yield strength
- ▶ EMG SORM 3plus: Online roughness measurement
- ▶ EMG eMASS®: Strip stabilisation
- ▶ EMG eBACS: Baffle blade control
- ▶ EMG SOLID®: Online oil layer measurement
- ▶ EMG BREIMO: Strip width measurement
- ▶ EMG iCAM®: Online measurement of strip and stripe width, edge cracks, hole and pinhole detection

Solutions for the hot area:

The increased demands on new materials and ever more complex components require ever higher process reliability in the production of steel and aluminium strips.

In this brochure, you will get to know EMG's innovative quality assurance systems for the cold rolling sector in order to optimise your processes and thus your product quality!

All EMG systems are based on the same hardware and software structure.

Benefit from the use of our broad solution portfolio and reduce your TCO (**Total Cost of Ownership!**)



Online measurement of tensile and yield strength EMG IMPOC

Fields of application:

EMG IMPOC is our tried and tested, magnetic-inductive measuring system for automatic, non-destructive online determination of the mechanical properties (tensile and yield strength) of ferromagnetic steel strip material.

Areas of application include the production of cold-rolled and surface-coated steel strip material, for example, in:

- ▶ Hot-dip galvanising lines
- ▶ Continuous annealing lines
- ▶ Tinning lines
- ▶ Continuous pickling lines*
- ▶ Processing lines*

*on request

Measuring accuracy	<ul style="list-style-type: none"> • IMPOC value: +/- 5 % [A/m²] • tensile strength: +/- 5 % of measuring value [MPa]* • yield strength: +/- 10 % of measuring value [MPa]* <p>*this accuracy will be reached at 90 % of the measured values</p>		
	Measuring range	IMPOCpro	Power IMPOC
	• strip thickness	0.15 - 3.0 mm	0.15 - 6.0 mm
	• strip width	> 500 mm	> 500 mm
	• strip speed	6 - 900 m/min	6 - 600 m/min

Customer benefits:

- ▶ Transparency about material properties over strip length
- ▶ Cutting optimisation
- ▶ Increase in yield and material output
- ▶ Reduction of destructive material testing
- ▶ Statements regarding the degree of recrystallisation

Online roughness measurement EMG SORM 3plus

Fields of application:

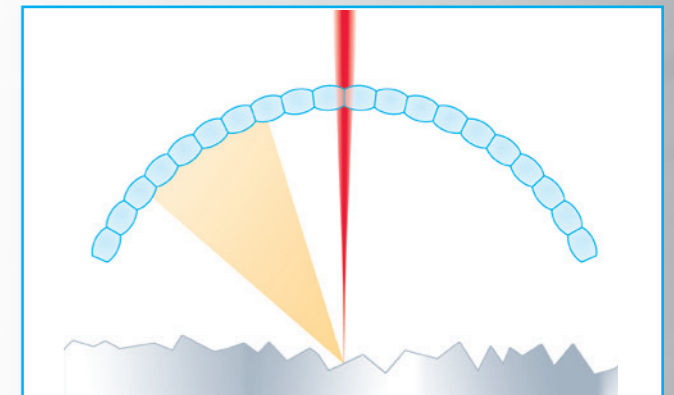
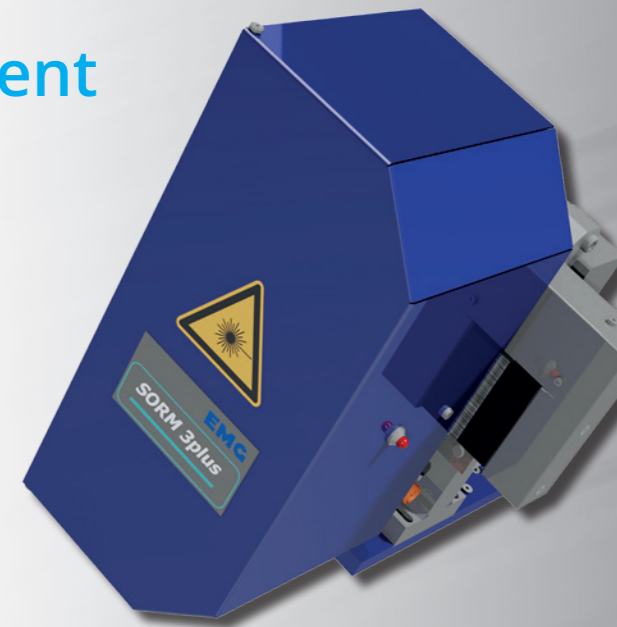
Roughness parameters are an important quality feature of uncoated and surface-refined strip material.

SORM 3plus is our contact-free, online roughness measuring system that can be used for metallic and many non-metallic surfaces at production speeds of up to 2400 m/min.

Measuring accuracy	<ul style="list-style-type: none"> • Ra: +/- 1 σ = +/- 10 % from measuring value (acc. to gaussian distribution) • RPC: +/- 20 % from measuring value (absolut)
	Measuring range
	<ul style="list-style-type: none"> • Ra = 0.1 - 3.0 μm • RPC: up to 120 peaks/cm

Customer benefits:

- ▶ Control and optimisation of the skin pass and/or rolling process
- ▶ Reduction of complaints thanks to an early detection of deviations from the requested roughness range
- ▶ Excellent coating results due to a homogeneous surface roughness
- ▶ Cost savings in comparison to manual stylus measurement



EMG SORM Measuring principle



Online oil layer measurement EMG SOLID®

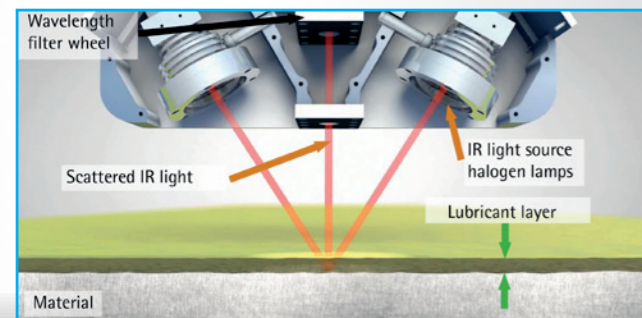
Fields of application:

EMG SOLID® is our system that is used for the online measurement of oil layers on running strip material.

The typical application spectrum of EMG SOLID® ranges from the rolling mill, where the initial application of oil is implemented, to metal processors, for whom sufficient lubrication in the forming process and an oil-free surface before coatings or paintings are applied, are essential.

EMG SOLID® performs an online measurement within the production line to determine the oil layer over the entire width and length and then visualises it over the entire measured surface. Thereby it reliably detects dry spots and over-oiling.

To keep the optics clean all EMG SOLID® solutions have a special EMG blow-off device.



EMG SOLID® IR:

Within the infrared spectroscopy with EMG SOLID® IR the system emits an infrared light that passes through the oil layer, is reflected from the strip surface and passes through the oil layer again. In doing so the intensity of specific wavelengths of the oil layer is attenuated - the thicker the oil layer, the less light is reflected. According to the Lambert-Beer law, the layer thickness is then calculated.

Measuring accuracy	<ul style="list-style-type: none"> measuring range 0.1 - 0.5 g/m²: +/- 0.1 g/m² measuring range 0.5 - 2 g/m²: +/- 0.2 g/m² measuring range > 2 g/m²: +/- 10 % from measured value
Measuring range	0.1 - 6.0 g/m ²

Customer benefits:

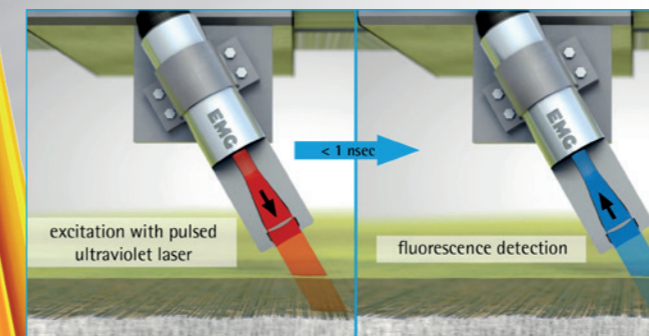
- ▶ Unaffected by oil mixtures
- ▶ Easy calibration of new oil types and clear oil type classification due to group calibrations
- ▶ No falsification through unevenly applied passivation coatings
- ▶ High measuring accuracy

Choose the ideal technology for your needs!

EMG SOLID® LIF:

Via laser-induced fluorescence spectroscopy our system measures the coating weight of the oil layer and visualises it over the entire measured material surface:

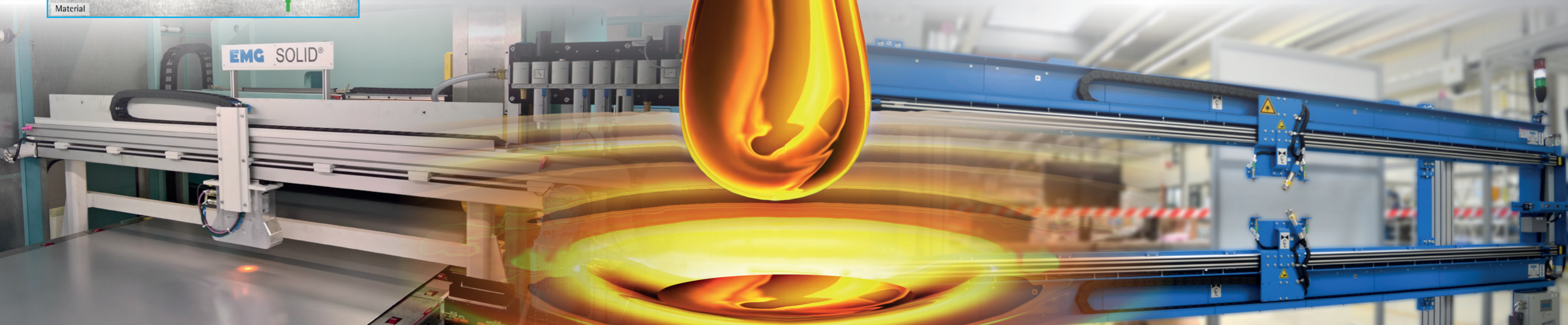
- ▶ Special solid state laser delivers 10.000 single pulses per second.
- ▶ Robust and flexible quartz fibre bundle transmits the light energy to the measuring spot.
- ▶ A second quartz fibre bundle transmits the fluorescence signal to the counting system, in which a photo multiplier detects single photons in a time-resolved manner and analyses them in nano seconds statistically.
- ▶ A micro controller controls the analysing system, manages the system calibrations and calculates the results.



Customer benefits:

- ▶ Low influence of roughness, textures, oil droplets, hotmelt structures, therefore no homogenisation rolls necessary
- ▶ Only very small space required
- ▶ Very high measuring frequency (10 kHz) and high definition of measuring spot (Ø = 8 mm)
- ▶ Proof of very thin layers < 20 mg/m² in principle possible, therefore usable for cleanliness measurements

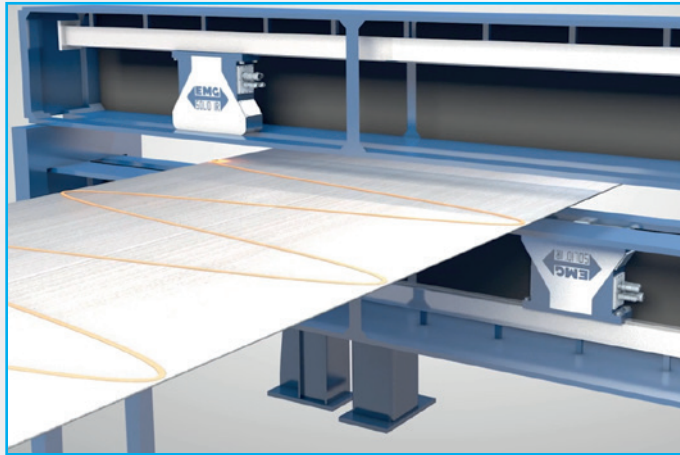
Measuring accuracy	+/- 10 % of upper measuring range value (e.g. measuring range: 0 - 2 g/m ² : +/- 0.2 g/m ²)
Measuring range	0.0 - 6.0 g/m ²



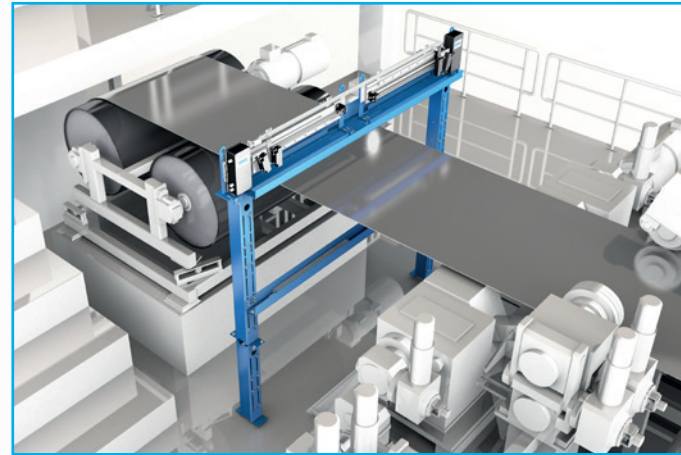
Typical installation positions of EMG quality assurance systems in the process line



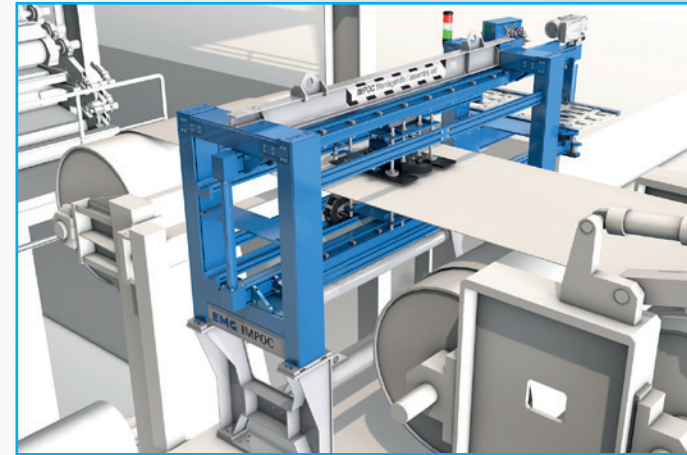
Oil layer measurement with EMG SOLID® IR



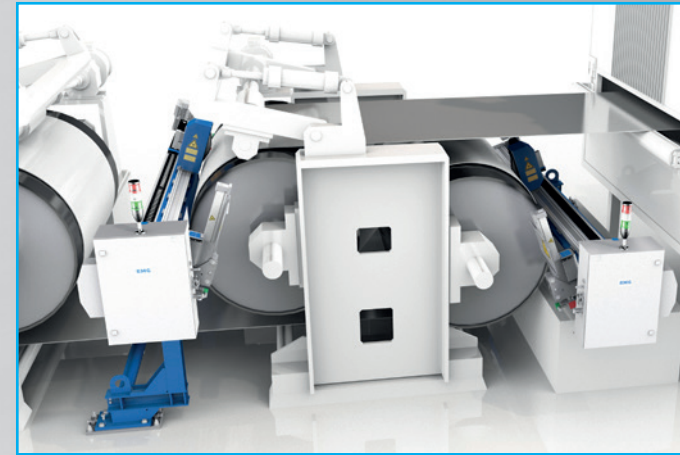
Strip width measurement with EMG BREIMO



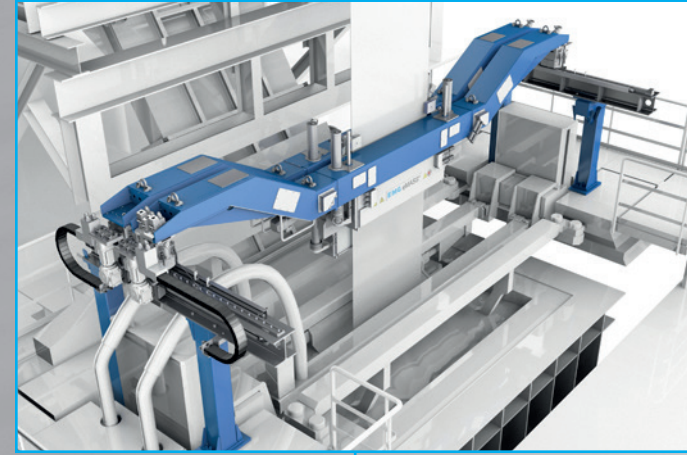
Online measurement of tensile and yield strength with EMG IMPOC



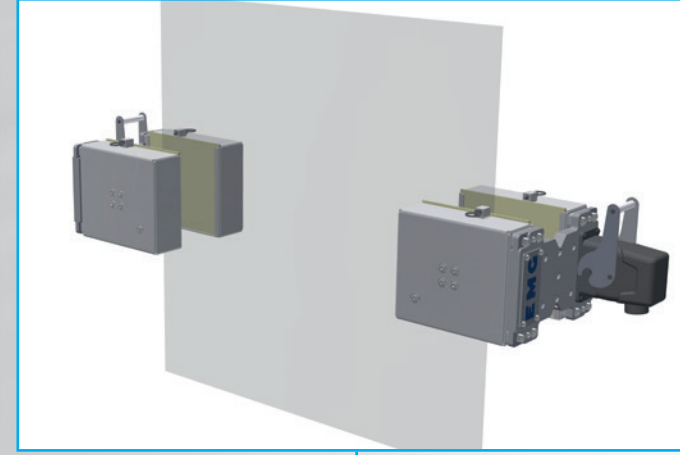
Online roughness measurement with EMG SORM 3plus



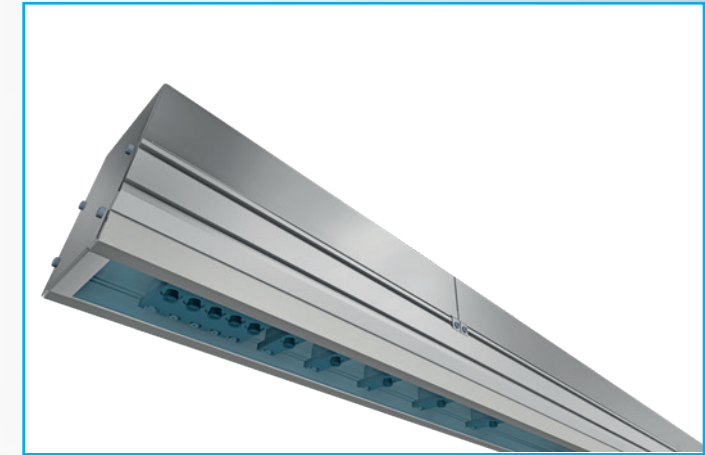
Electromagnetic strip stabilisation with EMG eMASS®



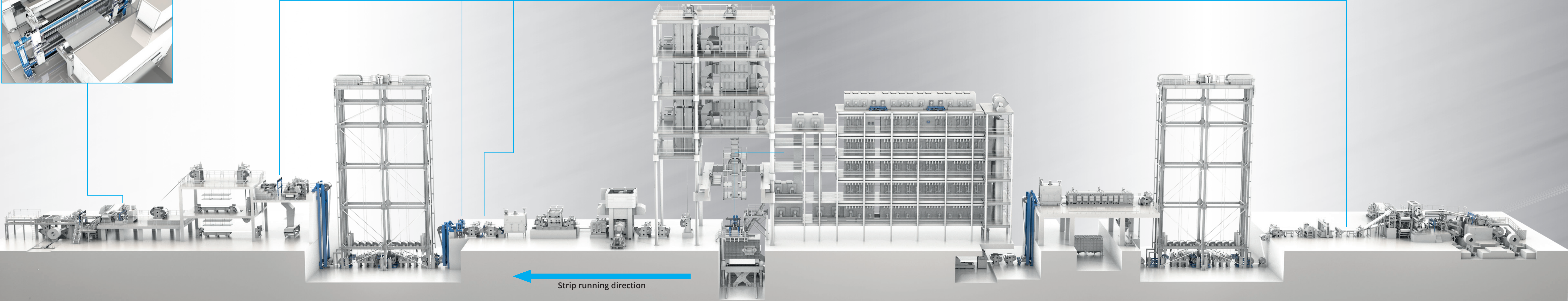
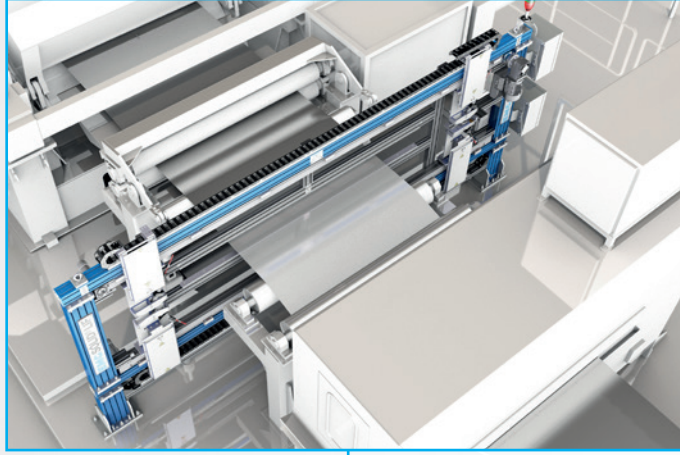
Edge mask control with EMG eBACS



Online measurement of strip and stripe width, edge crack, hole and pinhole detection EMG iCAM®



Oil layer measurement with EMG SOLID® LIF



Electromagnetic strip stabilisation

EMG eMASS®

Fields of application:

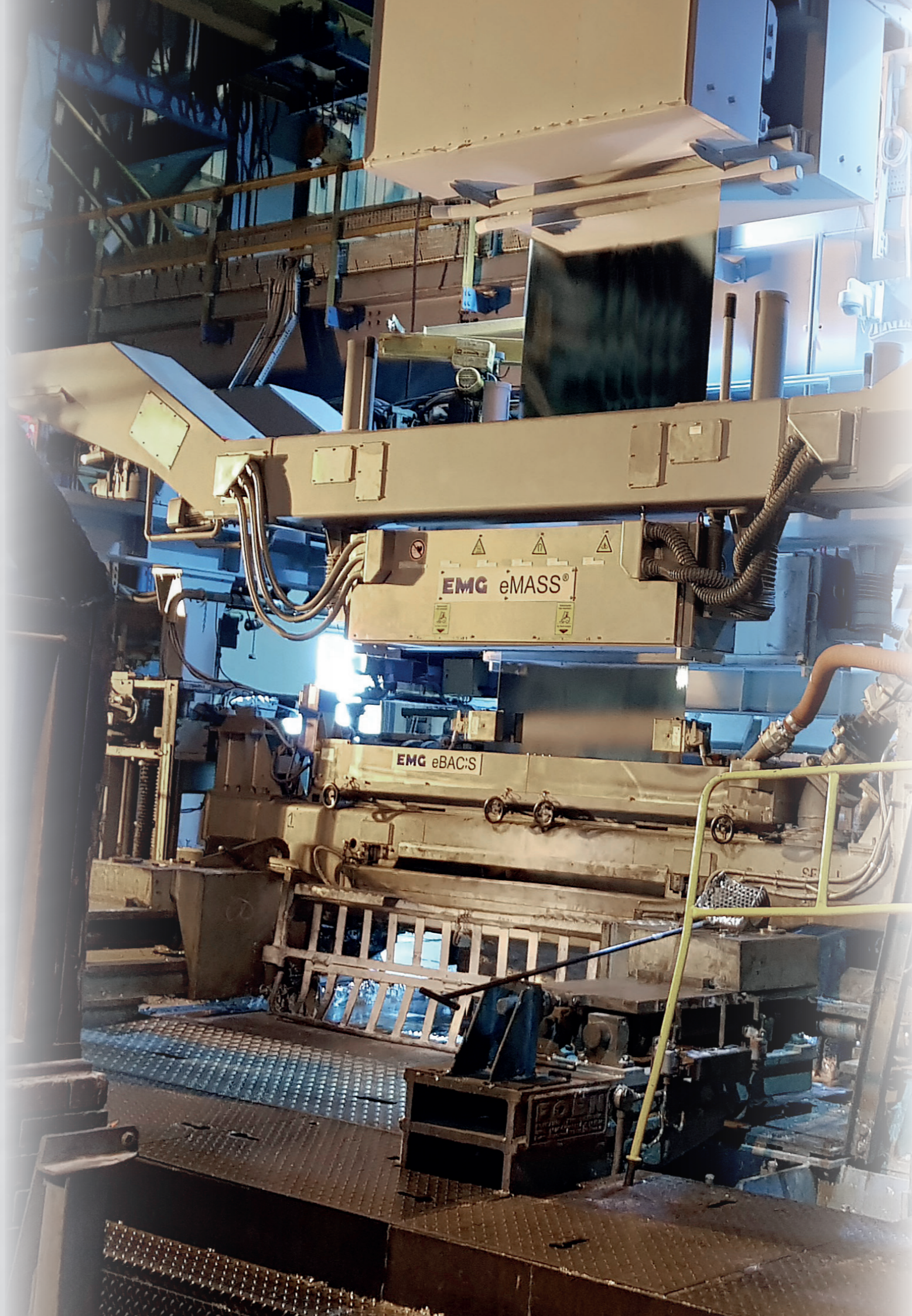
In hot-dip galvanising lines the zinc coating thickness is determined by air knives. This is where EMG eMASS®, our turnkey system for stabilising fast-running ferromagnetic steel strips based on electromagnets, is mainly used. EMG eMASS® optimises and economises the use of the metal coating at the blow-off nozzle of a hot-dip galvanising line for zinc coating, GALVALUME®* and aluminisation processes.

The system is installed above the air knife and as close as possible to the air knife lip, which wipes off the liquid metallic layer. Based on the experience of more than 75 installations around the world, EMG designs the integration of EMG eMASS® systems for the air knife area in an optimal and customer-specific manner.

*GALVALUME® is a registered trademark of BIEC International Inc.

Customer benefits:

- ▶ Homogeneous zinc layer across the width and length of the strip
- ▶ Stable pass line of the strip and reduction of the “crossbow” effect
- ▶ Narrower air knife gap
- ▶ Zinc savings as a result of reduced overcoating
- ▶ Targeted and reliable production of low coating weights

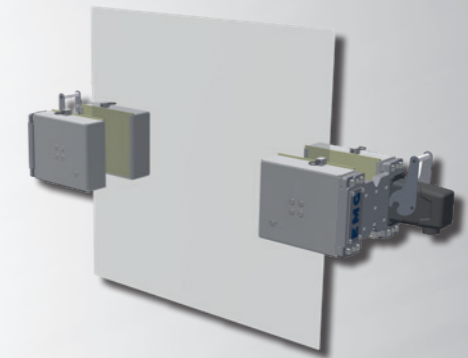


Edge mask control

EMG eBACS

Fields of application:

In the area of blow-off nozzles the metal strip passing through the system is enlarged by so called “baffle blades” to avoid any form of air turbulence, which can lead to damage of the zinc layer around the strip edge. The baffle blades must continuously follow the strip edges, the position of which can change due to swarming of the strip or alteration of the strip width. The inductive edge sensors used with EMG eBACS enable high precision and contact-free tracking of the baffle blades.



Customer benefits:

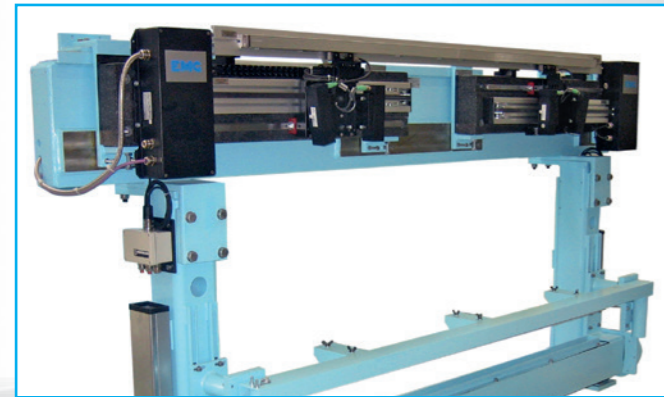
- ▶ Homogeneous zinc coating of the strip edge
- ▶ No chipping of the zinc layer
- ▶ No deformation of the strip edge
- ▶ Inductive, contact-free position measurement
- ▶ Insensitive to dust and zinc splashes
- ▶ Low maintenance requirements
- ▶ Compact integration
- ▶ Avoidance of mechanical contact rollers

Strip width measurement EMG BREIMO

Fields of application:

EMG BREIMO is our contact-free, optical strip width measuring system for steel strip material in continuously running processes. Consisting of a measuring frame with two sensor positioning devices EVK, the corresponding light emitters and a common linear stroke transducer, EMG BREIMO is an extremely reliable strip width measuring system.

EMG BREIMO offers a robustness to external malfunctions. Changes to the strip edge position are continuously detected and taken into account when calculating and displaying the strip width.



EMG BREIMO-H (high precision)

Customer benefits:

- ▶ Precise and reliable measuring accuracy
- ▶ Safety for incoming and outgoing material widths
- ▶ Active dirt compensation
- ▶ Insensitive to ambient light
- ▶ High availability
- ▶ Minimum installation space required
- ▶ Sturdy, ready-to-install measuring frame according to individual customer requirements
- ▶ Reduction in the amount of scrap from trimming (in combination with Strip Width Optimisation EMG SWOp)

	BREIMO:	BREIMO-H:
Measuring accuracy	+/- 0.5 mm	+/- 0.2 mm
Strip height variation	< +/- 20 mm	< +/- 10 mm

Online measurement of strip and stripe width, edge cracks, hole and pinhole detection EMG iCAM®

Fields of application:

EMG iCAM® is our modular solution that enables high-precision strip and stripe width measurement as well as edge crack, hole and pinhole detection. The various measuring tasks can be combined as desired.

EMG iCAM® thus increases your line availability by reducing the risk of strip breakage, holes are detected accurately over the entire surface and classified according to customer specifications.

The EMG iCAM® system consists of an LED backlight unit underneath the metal strip and a camera unit consisting of several CMOS cameras as receiver unit.

The standard strip width is 1,000 mm to 2,250 mm and is scalable in increments of 250 mm (other strip widths are available on request).

The CMOS cameras stereoscopically capture the light in the area of the tape or strip edges, the holes and the edge cracks. The result is the fast and precise calculation of band or strip widths, edge cracks and holes in shape and position.

Measuring accuracy	up to +/- 0.1 mm (depending on the application)
Measuring range	1,000 up to 2,250 mm strip width (others on request)

Customer benefits:

- ▶ Full-surface detection and customer specific classification of holes
- ▶ Transparent incoming inspection and precise process control
- ▶ Minimisation of edge trim
- ▶ Efficient process release through data management and visualisation of measurement data
- ▶ Reliable detection of edge cracks for detection of a possible belt breakage
- ▶ Automatic dirt detection on the LED backlight unit
- ▶ Insensitive to extraneous light
- ▶ Stable, ready-to-install measuring frame according to individual customer requirements



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