

Optimise your processes and increase your quality

# Quality assurance systems for cold and electrical strip





EMG

## perfecting your performance

EMG Automation GmbH

### 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 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, your requirements 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®:**  
Online roughness measurement
- » **EMG eMASS®:** Strip stabilisation
- » **EMG eBACS:** Baffle blade control
- » **EMG SOLID®:**  
Online oil layer and dry film thickness measurement
- » **EMG BREIMO:**  
Strip width measurement
- » **EMG iCAM®:**  
Online measurement of strip and slit strip width
- » **EMG iTiM:**  
Thickness measurement

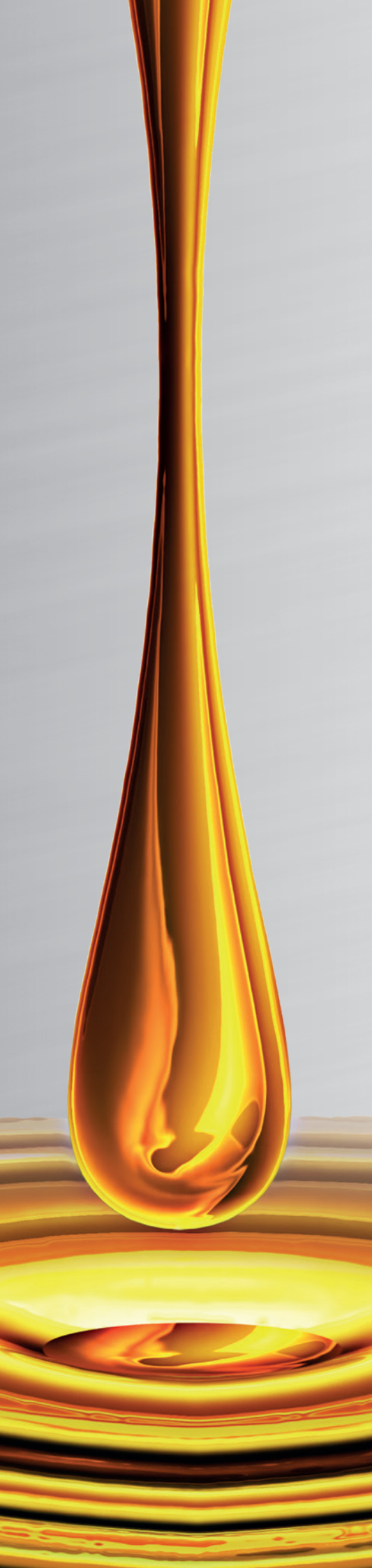
#### Solutions for the cold and electrical strip sector:

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 and electrical strip 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)!**





EMG SOLID®

## Online oil layer & dry film thickness measurement

EMG SOLID® is our system that is used for the online measurement of oil and dry film thickness 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.

### Application fields

By using EMG SOLID® you can optimise your pressing and coating processes by assigning the quality features to the corresponding strip sections and/or sheet panels.

### Advantages for your processes

- » Improved process stability and reliability
- » Transparency of input quality and targeted; control of the forming process
- » Minimised scrap
- » Secure production confirmation
- » Transparency of the essential quality features
- » Joint database and combined visualisation of the measured values possible
- » Delivery and system integration from a single source

EMG SOLID® performs an online measurement within the production line to determine the oil or dry film 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.

Typical fields of application are for example:

- » Rolling mills
- » Galvanising and strip processing lines
- » Slitting and cut-to-length (CTL) lines
- » Inspection lines
- » Press lines
- » Blanking lines
- » Solar panel mounting lines (surface purity measurement)
- » Electrical strip production

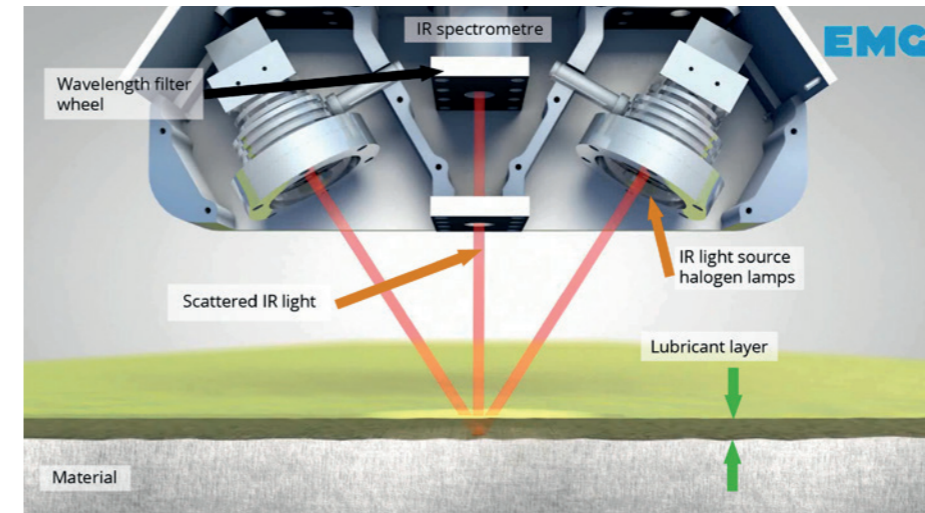
- » Intelligent combination of more quality assurance systems from EMG:
  - › electro mechanical and in respect to the software environment, especially EMG IMPOC for online measurement of material characteristics
  - › EMG SORM® for online roughness measurement
  - › EMG iTiM for thickness measurement
  - › additional systems, e.g. laser marking can be integrated

EMG SOLID®IR

## InfraRed spectroscopy

Our solution EMG SOLID® IR is based on the infrared spectroscopy. 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 range	0.1 – 6.0 g/m <sup>2</sup>
Measuring accuracy	<ul style="list-style-type: none"> <li>» Measuring range 0.1 - 0.5 g/m<sup>2</sup>: +/- 0.1 g/m<sup>2</sup></li> <li>» Measuring range 0.5 - 2 g/m<sup>2</sup>: +/- 0.2 g/m<sup>2</sup></li> <li>» Measuring range &gt; 2 g/m<sup>2</sup>: +/- 10 % from measuring value</li> </ul>

### Customer benefits EMG SOLID® IR

- » 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



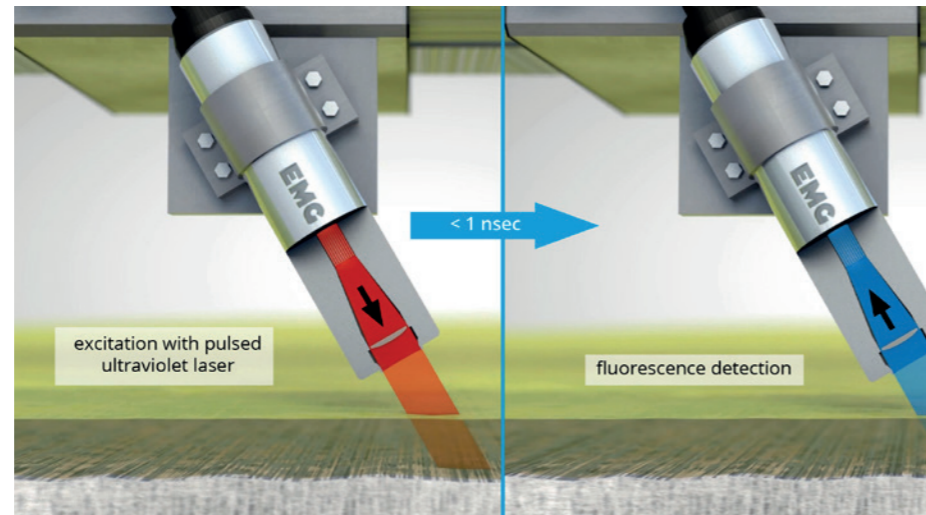
EMG SOLID®LIF

## LaserInduced Fluorescence-spectroscopy

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 and excites the oil to glow

- » The more oil there is on the material surface, the stronger the glow effect
- » A microcontroller controls the analysis system, manages the system calibrations and calculates the results



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

### Customer benefits EMG SOLID® LIF

- » 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/m<sup>2</sup> in principle possible, therefore usable for cleanliness measurements
- » Proof of transparent laque layers on electrical strips

EMG SOLID®DFT

## Dry Film Thickness measurement

A special field of application for laser-induced fluorescence spectroscopy is the measurement of coating film thickness on electrical steel.

Under the name EMG SOLID® DFT (Dry Film Thickness), EMG SOLID® checks the weight per unit area of the transparent and low-pigmented coating layer on electrical steel and then visualises it over the entire material surface.

EMG SOLID®DFT  
Measuring head  
for coating thickness measurement



Measuring range	0 - 9 µm (depending on the lacquer type)
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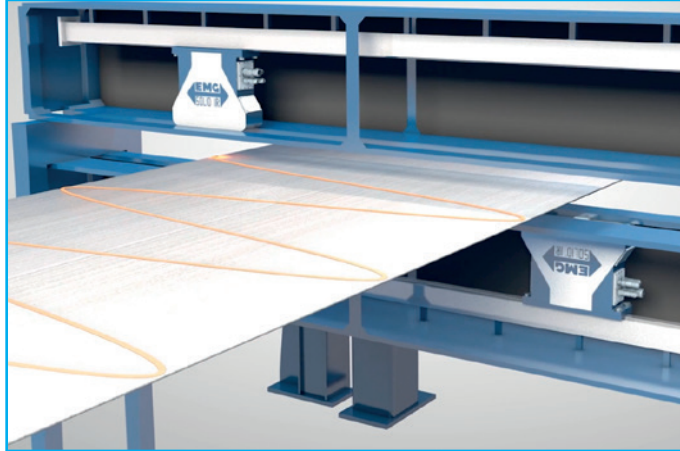
Measuring accuracy +/- 10 % of upper measuring range value (e.g. in the set measuring range of 0 - 0.5 µm: Measurement accuracy: +/- 0.05 µm)

### Customer benefits EMG SOLID® DFT

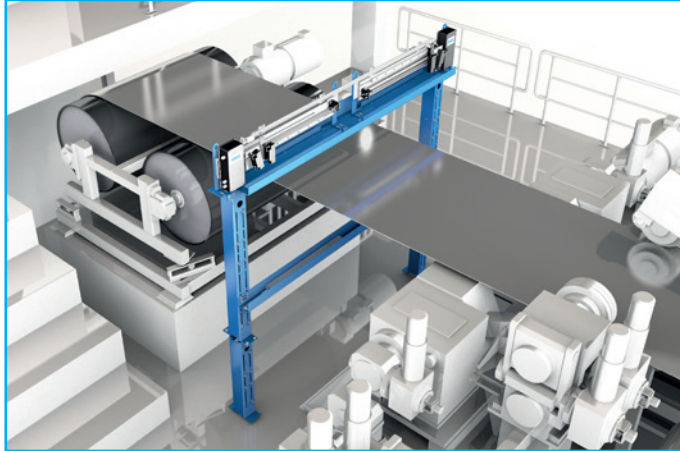
- » Delivery and system integration from a single source
- » Low influence of roughness and textures, therefore no homogenisation rolls necessary
- » Only very small space required
- » Relative measurement possible
- » Special EMG solution for keeping the lens clean

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

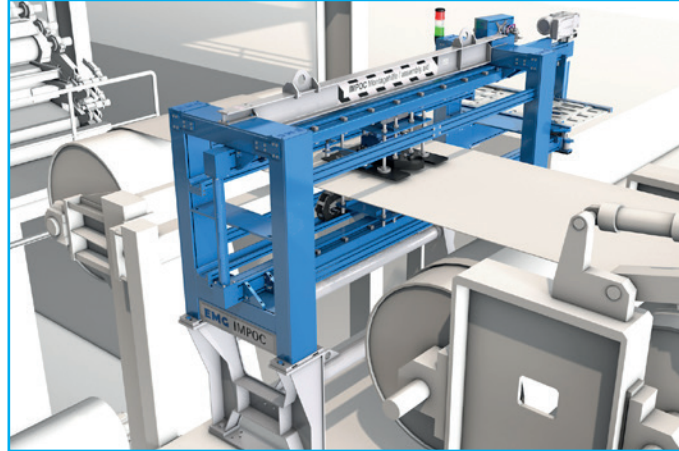
Oil layer measurement with EMG SOLID® IR



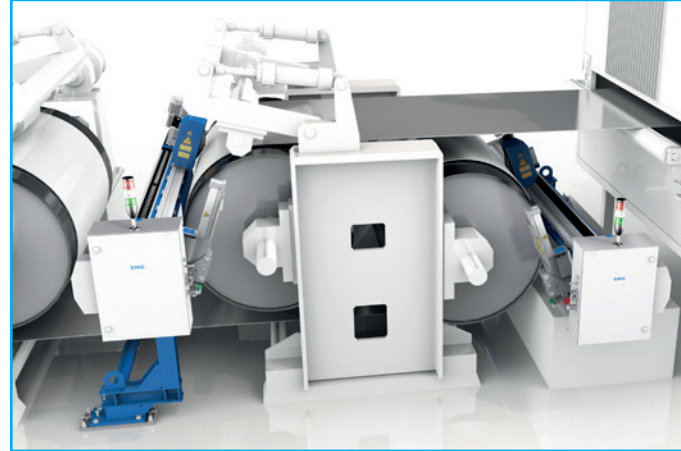
Strip width measurement with EMG BREIMO



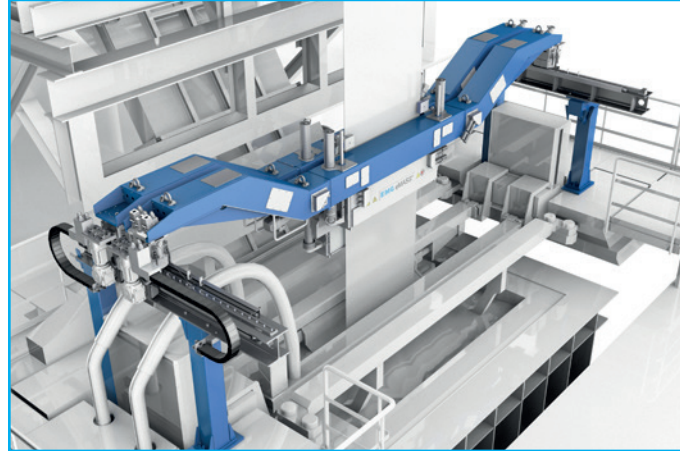
Online measurement of tensile and yield strength with EMG IMPOC



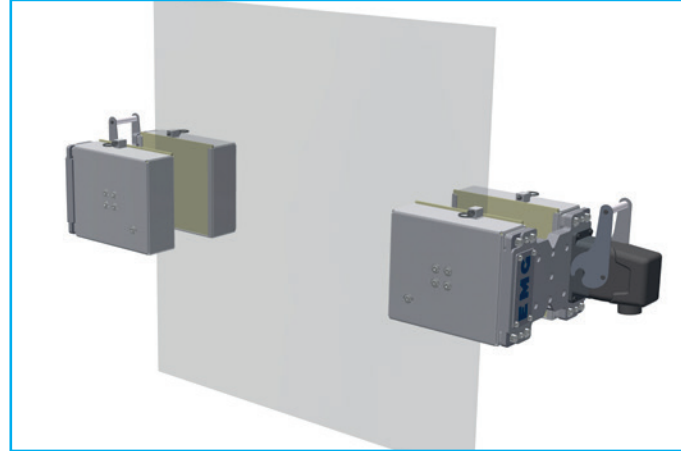
Online roughness measurement with EMG SORM®



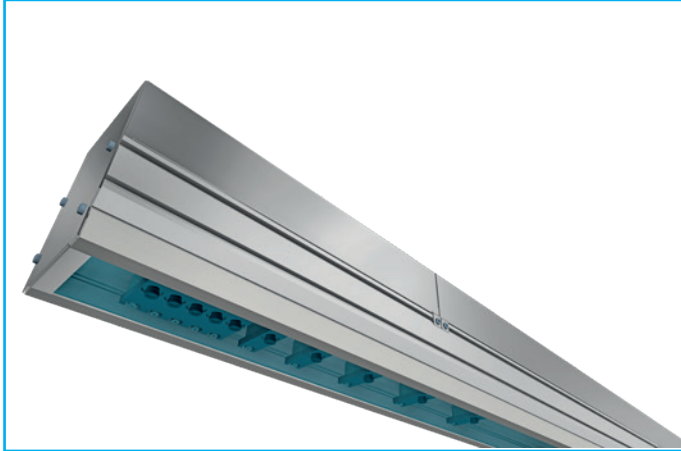
Electromagnetic strip stabilisation with EMG eMASS®



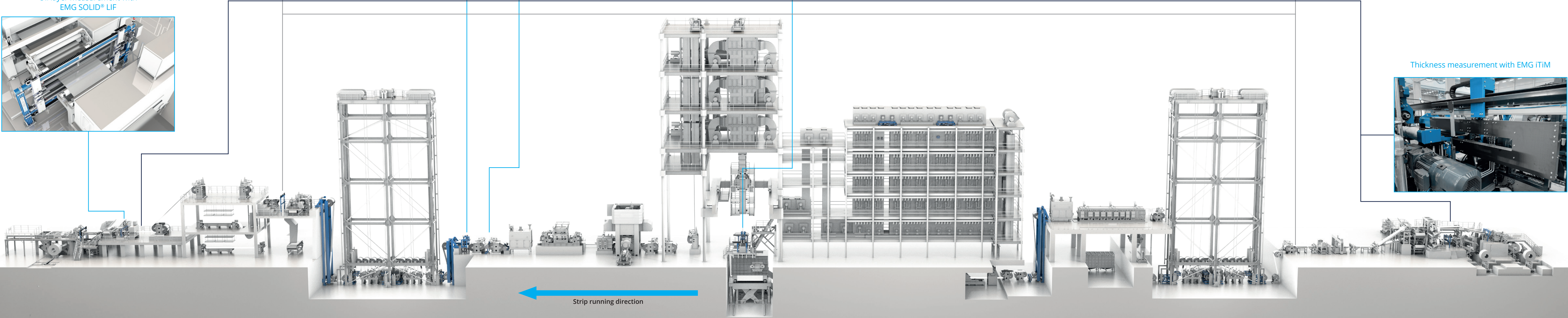
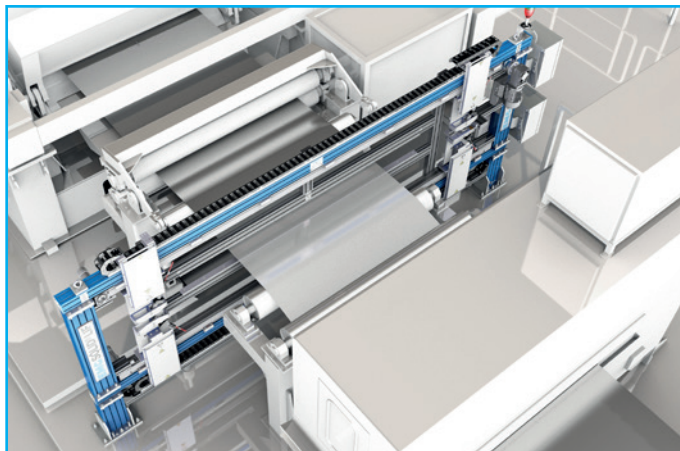
Edge mask control with EMG eBACS



Online measurement of strip and slit strip width with EMG iCAM®



Oil layer measurement with EMG SOLID® LIF



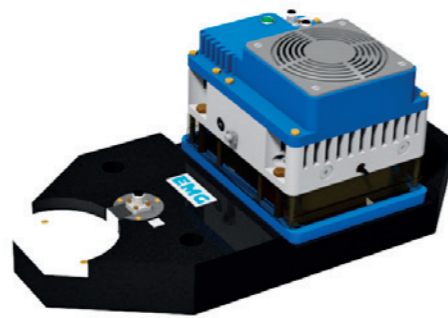
Thickness measurement with EMG iTIM



EMG IMPOC

## Online measurement of tensile and yield strength

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 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

- » IMPOC value: +/- 5 % [A/m<sup>2</sup>]
- » tensile strength: +/- 5 % of measuring value [MPa]\*
- » yield strength: +/- 10 % of measuring value [MPa]\*

Measuring accuracy

*\*this accuracy will be reached at 90 % of the measured values*

### 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

EMG SORM®

## Online roughness measurement

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

EMG SORM® is our contact-free, online roughness measuring system that can be used for metallic and many non-metallic surfaces.

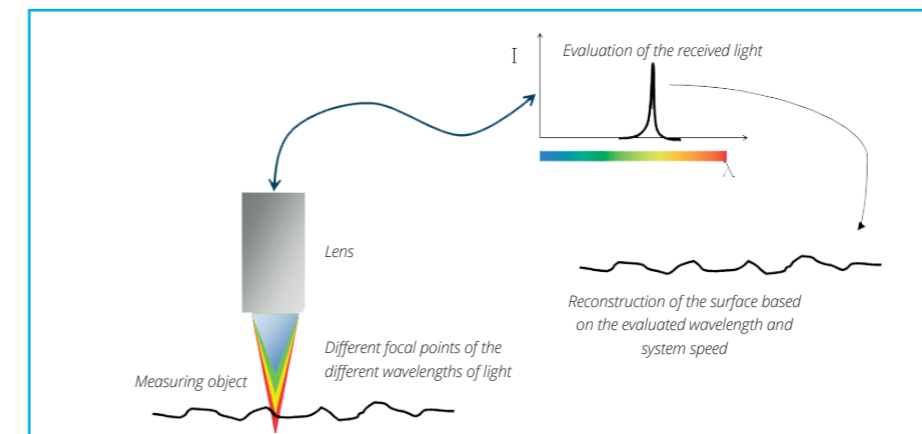


Measuring range (Sheet thickness)	3 mm (without focus unit)
Measuring accuracy*	» Ra/Wsa: +/- 15 % from current value (for 85 % of all values) » RPC: +/- 20 % from current value (for 80 % of all values)

\* based on experience gained in online testing

### 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

EMG eMASS®

## Electromagnetic strip stabilisation

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

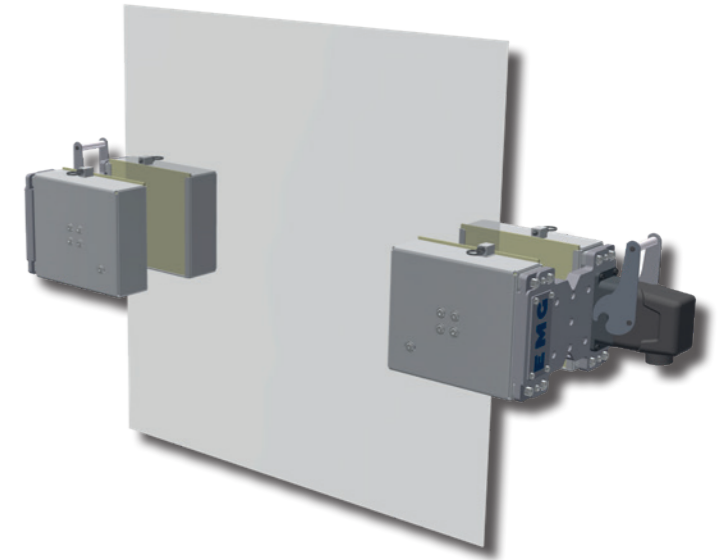
- » Homogeneous zinc layer across the width and length of the strip
- » Stable pass line of the strip and reduction of the “cross-bow” effect
- » Narrower air knife gap
- » Zinc savings as a result of reduced overcoating
- » Targeted and reliable production of low coating weights



EMG eBACS

## Edge mask control

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

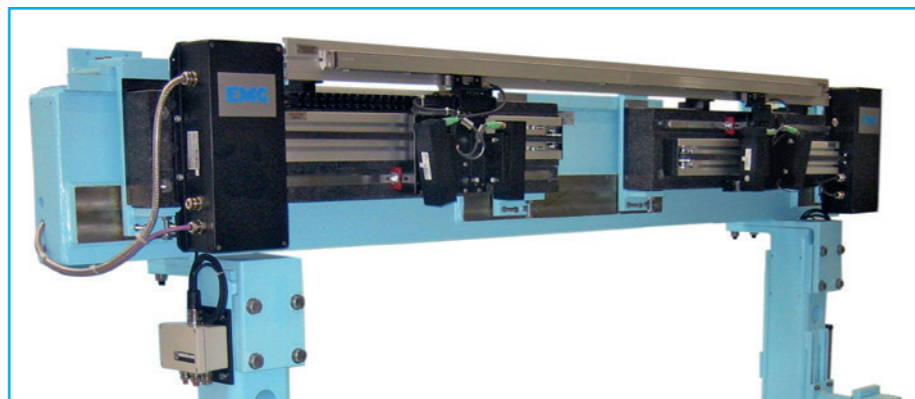
## EMG BREIMO

# Strip width measurement

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	EMG BREIMO-H
Measuring range	300 - 3,000 mm	
Measuring accuracy	+/- 0.5 mm	+/- 0.2 mm
Strip height variation	< +/- 20 mm	< +/- 10 mm



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)

## EMG iCAM®

# Online measurement of strip and slit strip width

EMG iCAM® is our modular solution that enables high-precision strip and slit strip width measurement. The various measuring tasks can be combined as desired.

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 CMOS cameras stereoscopically capture the light in the area of the measuring task. The result is the fast and precise calculation of strip or slit strip widths.

Measuring range	1,000 up to 2,250 mm strip width (others on request)
Measuring accuracy	up to +/- 0.05 mm (depending on the application)
Passline detection area (Passline variation + thickness)	19 mm

### Customer benefits

- » Transparent incoming inspection and precise process control
- » Minimisation of edge trim
- » Efficient process release through data management and visualisation of measurement data
- » Automatic dirt detection on the LED backlight unit
- » Insensitive to extraneous light
- » Stable, ready-to-install measuring frame according to individual customer requirements





## Applications of the highly accurate Thickness measurement with EMG iTiM

- » Manufacturing processes
- » Rolling mills and coating lines
- » Service centres
- » Automotive

Thickness measurement with EMG iTiM

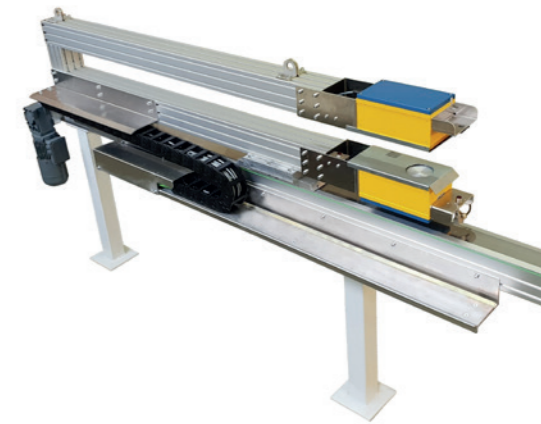
## Laser, X-ray and isotope technology 100 % exact

Depending on the application and requirements, we offer EMG measuring systems for simple thickness measurement (centre measurement), for traversing profile measurement up to complex multi-channel profile measurements with flatness, width and speed measurement.

For use in painting and galvanising plants, EMG supplies coating thick-

ness gauges based on isotope backscatter or X-ray fluorescence.

Adapted to your specific application conditions or requirements, we offer modular measuring systems as overall concepts or detailed solutions. Of course, we also develop and implement software and hardware applications for existing systems.



### Laser technology

The measuring system is low-maintenance and, due to its configuration as a plug-and-play solution, it can be easily integrated into existing production processes.

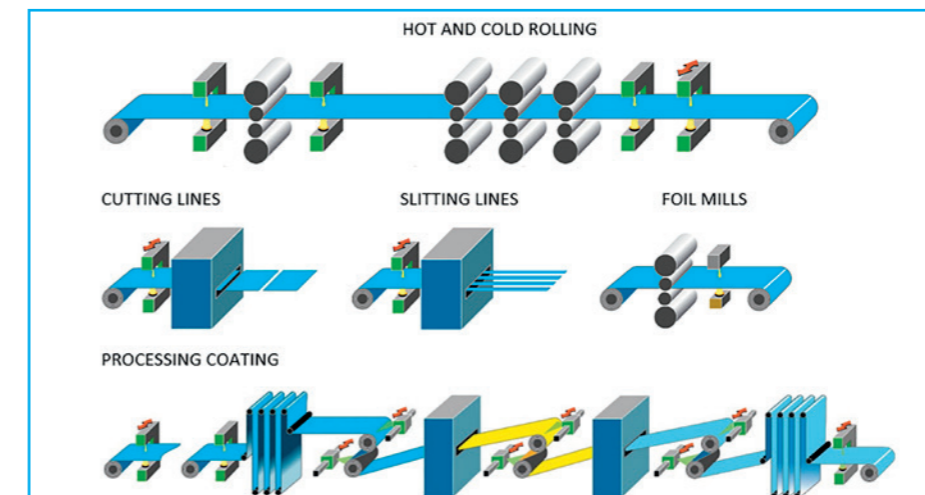
Based on the principle of laser distance or difference measurement, depending on the application, the laser triangulation method or the confocal chromatic measuring method is used, depending on the application, and enables precise, reliable measurements.

### X-ray technology

X-rays are used to ensure the highest measuring accuracy with the shortest integration times. With sampling times of up to 0.2 ms, the evaluation technology achieves optimum reference variables for reliable process control of high-quality products. Through the consistent use of metal-ceramic tubes operated in the medium power spectrum, the X-ray tube achieves service lives of more than five years. Integrated standardisation systems automatically compensate for any age-related fluctuations in the tube's energy spectrum.

### Isotope technology

For materials above the measurement limit for X-rays, the high-energy Cs137 isotope is used in hot rolling mills. For lower requirements or longer integration times, the Am241 isotope is used in cold rolling mills. Isotope systems are preferred, especially for the inlet and outlet thickness measurements of strip processing or partial plants. Multiple safety systems and the shutter in the beam head that closes in the de-energised state make the EMG isotope systems safe alternatives to X-ray thickness measurement.



The logo for EMG, consisting of the letters 'EMG' in a bold, white, sans-serif font. The background of the entire page is a blue-tinted photograph of a factory interior with large circular machinery components. A white line graphic starts from the left edge, goes down, then curves around the right side of the text area, and ends at the bottom right corner.

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