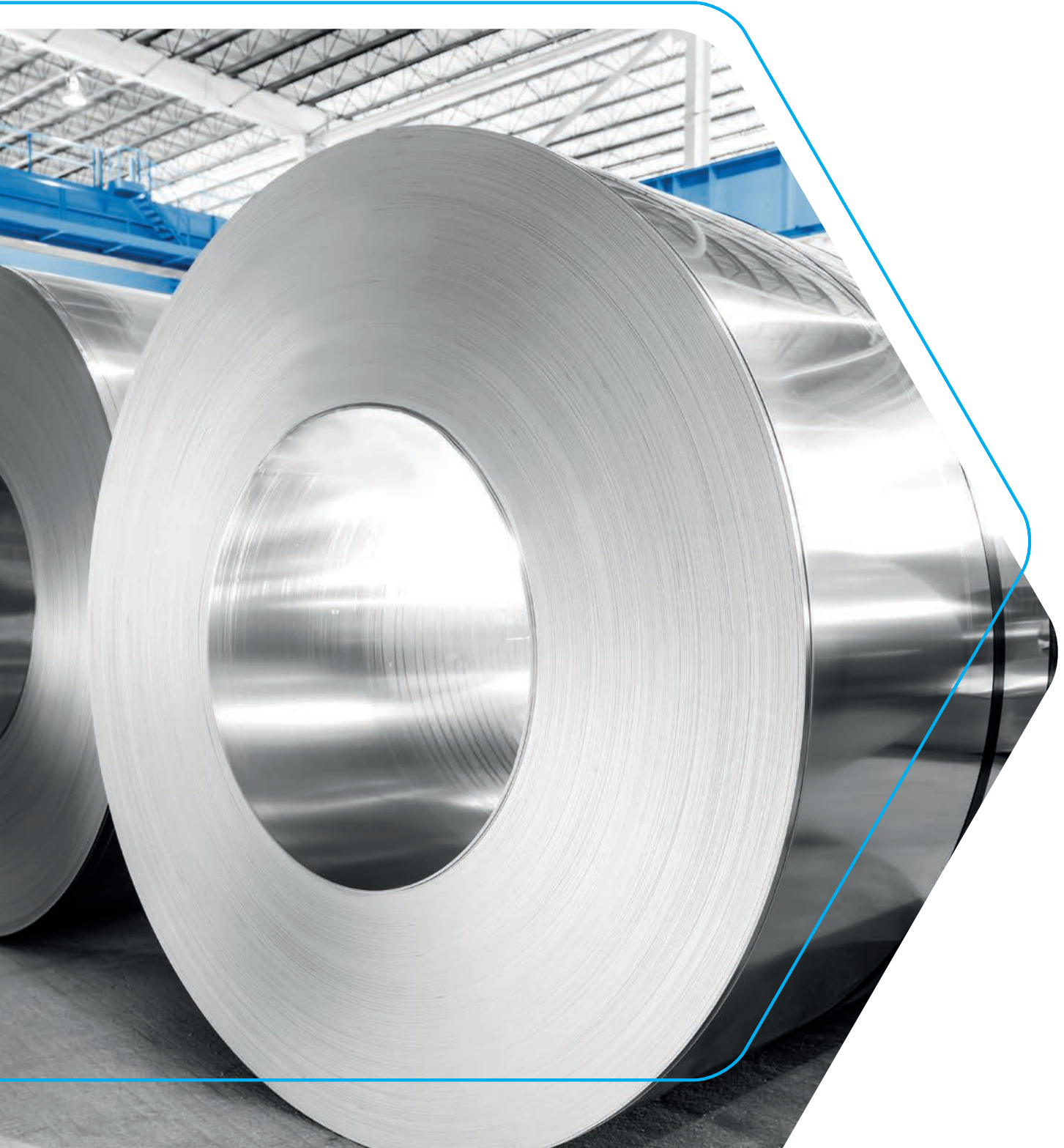


Optimise your processes and increase your quality

Quality assurance systems for cold and electrical strip





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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 more 80 years of experience, EMG 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.

Solutions for the metal and electrical strip sector:

In this brochure, you will get to know EMG's innovative quality assurance systems for the metal 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)!



Perfecting your performance

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 IMPOC:**
Online measurement of tensile and yield strength
- » **EMG SORM®:**
Online roughness and waviness 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 and hole detection

EMG process optimisation with AI

In recent years, EMG has been intensively focusing on the application of analysis and modelling methods for process improvement and control in flat metal production lines.

The result of this development work is the software platform **EMG iCASS®** (intelligent Control and Analytical Software Solutions). It can be seamlessly integrated into a wide range of sensors, machines and higher-level systems (such as MES or ERP) and provides the necessary basis for monitoring, analysing and optimising production processes.

Directly to our strip guiding solutions



*Directly to our
quality assurance systems:*



Directly to EMG iCASS®



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*

		IMPOCpro	Power IMPOC
Measuring range	» Strip thickness	0.15 – 3 mm	0.15 – 6 mm
	» Strip width	> 500 mm	> 700 mm
	» Strip speed	6 – 900 m/min	6 – 600 m/min

Measuring accuracy

- » IMPOC value: +/- 5 % [A/m²]
- » tensile strength: +/- 5 % of measuring value [MPa]*
- » yield strength: +/- 10 % of measuring value [MPa]*

Tensile strength and yield strength are calculated using linear regression models.

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

EMG IMPOC Booster^{AI}

- » Combination of the IMPOC magnetic-inductive signal and the EMG iCASS[®] software platform
- » EMG iCASS[®] enables AI-based modelling using additional relevant process parameters and material data
- » Improved model stability
- » Increased accuracy

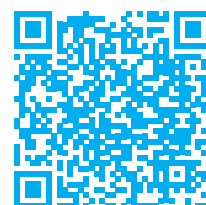
EMG Virtual IMPOC^{AI}

- » Data-driven models can be trained to predict material properties without the need for a physical sensor

Customer benefits

- » Transparency about material properties over strip length
- » Precise coil handling during post-processing and final inspection
- » Cutting optimisation
- » Increase in yield and material output
- » Reduction of destructive material testing
- » More robust determination of tensile strength and yield strength under varying production conditions

Directly to
EMG IMPOC:



EMG SORM®

Inline roughness & waviness measurement

Roughness and waviness parameters are important quality features of uncoated and surface-refined strip material.

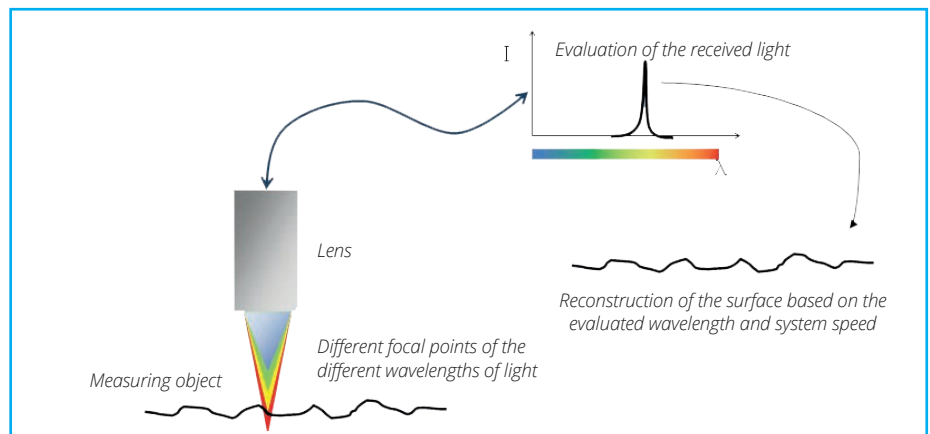
EMG SORM® is our contact-free, inline roughness and waviness measuring system that can be used for metallic and many non-metallic surfaces.

Measuring range (strip thickness)	2.5 mm (a focusing unit is also recommended)
Measuring accuracy*	» Ra/Wsa: +/- 15 % compared to tactile measurement (for 85 % of all values) » RPC: +/- 20 % compared to tactile measurement (for 80 % of all values)
Measuring parameter	Ra, RPC, Wsa
Measuring principle	confocal-chromatic with LED (laser-free)
Operating distance	25 mm (+/- 1.5 mm)
Strip speed	max. 350 m/min (Ra, Wsa), max. 120 m/min (RPC)

* 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 and waviness range
- » Excellent coating results due to a homogeneous surface
- » Cost savings in comparison to manual stylus measurement



EMG SORM® measuring principle

Directly to
EMG SORM®



EMG eBACS

Baffle blade control

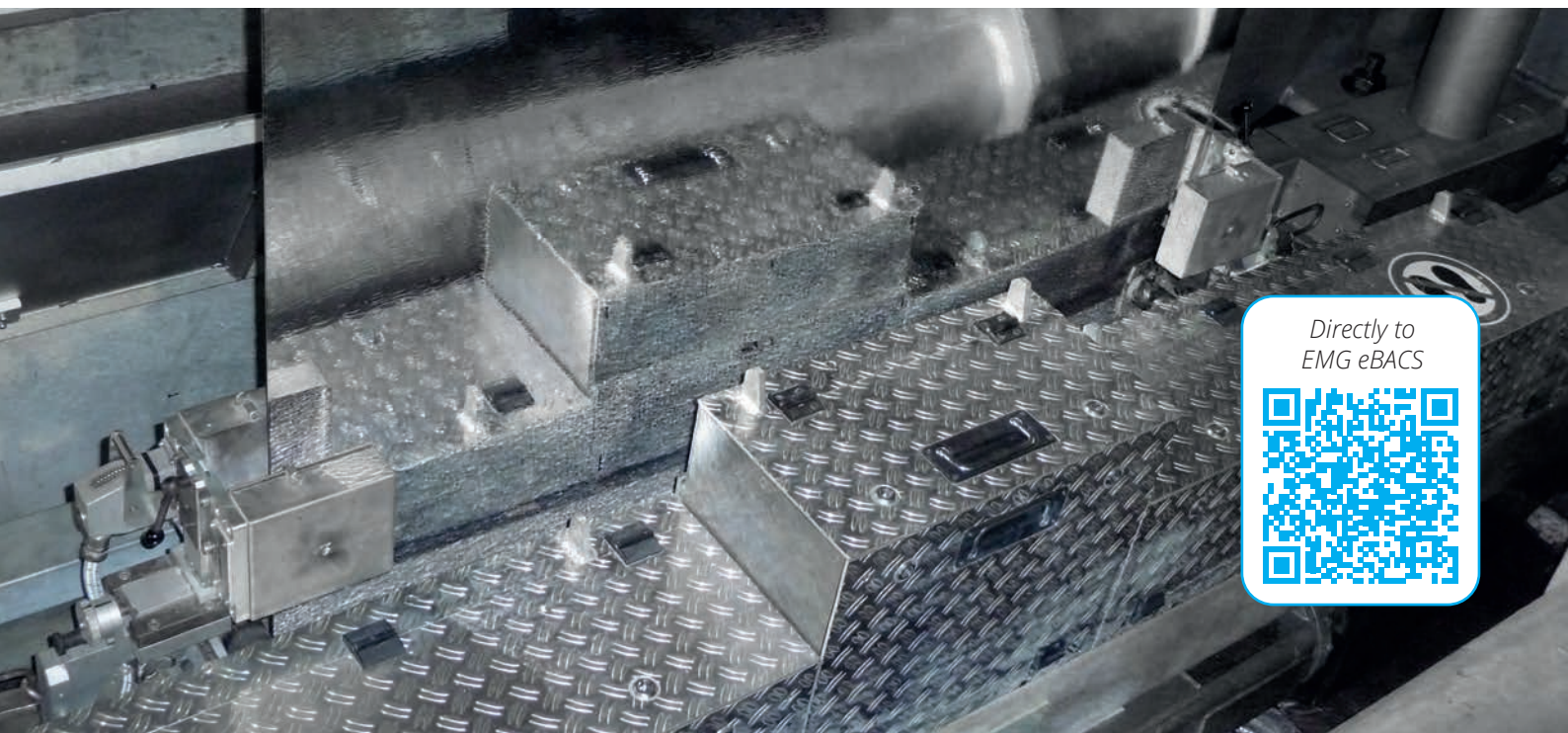
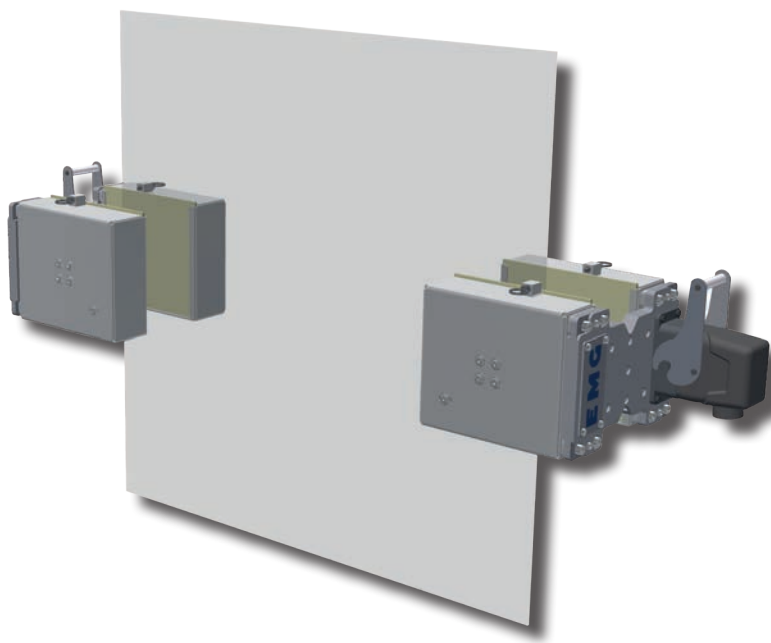
In the area of the blow off nozzles the metal strip passing through the system is enlarged by so called "baffle blades" to avoid any form of air turbulence, which can lead to damage of the zinc layer around the strip edge.

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.

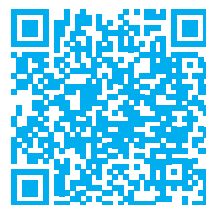
The inductive edge sensors used with **EMG eBACS** enable high precision and contact-free tracking of the baffle blades.

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



Directly to
EMG eBACS





Directly to
EMG eMASS®:



EMG eMASS®

Electromagnetic strip stabilisation

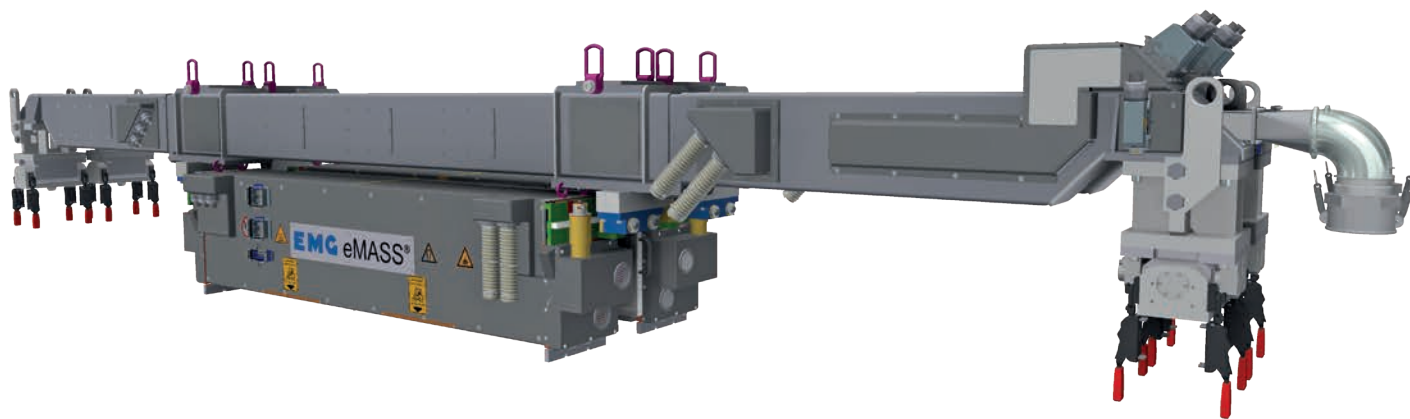
In hot-dip galvanising lines the zinc coating thickness is determined by air knives. This is where **EMG eMASS®**, our turnkey system for stabilising fast-running ferromagnetic steel strips based on electromagnets, is mainly used. **EMG eMASS®** optimises and economises the use of the metal coating at 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 “crossbow” effect
- » Narrower air knife gap
- » Zinc savings as a result of reduced overcoating
- » Targeted and reliable production of low coating weights



EMG iCASS® for the hot-dip galvanizing process

- » Modular software platform tailored to your individual needs
- » Optimisation of your hot-dip galvanizing process through
 - › virtual hot measurement
 - › optimisation of the safety margin for zinc coating
 - › air knife position control
 - › closed-loop control



Online measurement of oil layers and insulating varnishes on running strips

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

The **EMG SOLID®** product family covers a wide spectrum of applications, as the optimal technology – infrared or laser-induced fluorescence spectroscopy – is selected on a case-by-case basis for use in either in-line or laboratory applications.

Oil layer with EMG SOLID® IR & LIF

- » Precise measurement of the surface weight of oil layer thicknesses on:
 - › Coils
 - › Plates
 - › Slit strip and stripes
 - › Sheets
- » Reduction of rejects in the pressing process
- » Provision of measurement values for end customers or downstream processes
- » Increased material yield
- » Can be used in various industries, e.g.:
 - › Steel and aluminium service centre
 - › Automotive
- » Can be used in various lines, e.g.:
 - › Process line
 - › Shearing line
 - › Slitting line

Insulating varnish with EMG SOLID® DFT

- » Precise measurement of the dry film thickness of the transparent and low-pigmented coating layer on electrical steel strip
- » Application on non-grain-orientated (NGO) material in
 - › Annealing and coating lines [ACL]

Coating measurement under laboratory conditions with EMG SOLID® LAB

- » **Convenient measurement**
Ergonomic, portable handheld device for simple and flexible sample analysis
- » **Highest precision**
Solid-state laser with up to 10,000 pulses per second
- » **Material-specific analysis**
Fluorescence analysis for precise detection of minute quantities of material
- » **Real-time display & automatic documentation** of measurement data
- » **Meaningful evaluation**
Calculation and display of average values from multiple measurements

» Custom calibration

Depending on the coatings to be measured, calibrations can be created in-house.

» Integrated analysis software

Powerful software for fast, reliable and precise analysis

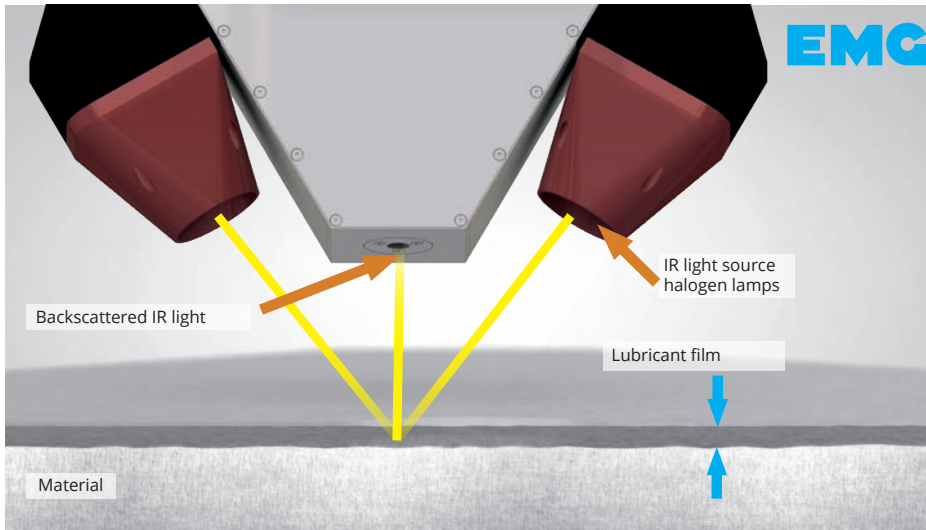
Cleanliness with EMG SOLID® LIF

- » Oil residues after cleaning lithium battery terminals, electrical components, air compressors, refrigeration machines, etc.
- » Oil residues on the exterior paneling parts of cars, on sunroof ceramics, on solder joints of car parts, etc.
- » Cleanliness of medical and laboratory equipment, wires, cables and terminals
- » Cleanliness of all types of parts after production processes involving the use of lubricants
- » Cleanliness of other bonding, welding and quick connection points



Always the ideal technology

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.

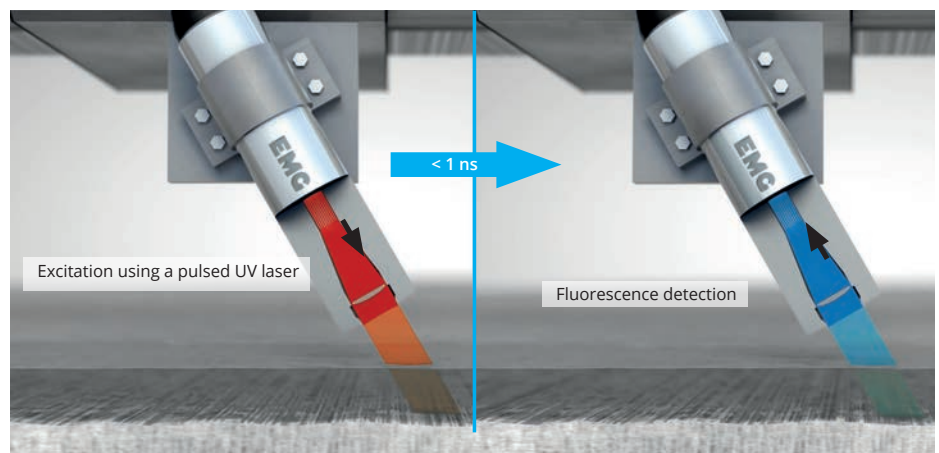
According to the Lambert-Beer law, the layer thickness is then calculated.

Measuring range	0.1 – 6 g/m ²
Measuring Accuracy	Up to 0.7 g/m ² : +/- 0.025 g/m ² From 0.7 g/m ² : +/- 3.5 % » The measurements are carried out on a flat specimen with an undamaged surface » The mean value of the gravimetric measurement serves as the reference; » Verification of measurement accuracy is permitted exclusively using a precision laboratory balance

EMG SOLID® LIF - LaserInduced Fluorescence spectroscopy

Via laser-induced fluorescence spectroscopy our system **EMG SOLID® LIF** measures the coating weight of the oil layer and visualises it over the entirely measured material surface:

- » A special solid-state laser generates 10,000 pulses per second and excites fluorescent molecules in the coating to emit fluorescence.
- » The more coating there is on the material's surface, the more intense the fluorescence signal.
- » A microcontroller controls the analysis system, manages the system calibrations and evaluates the measurement signals.



Measuring range	0 – 6 g/m ²
Measuring accuracy	+/- 10 % of the measuring range end value » permissible comparison with a precision laboratory balance

EMG BREIMO

Strip width measurement

EMG BREIMO is our contact-free, optical strip width measuring system for metal strip material in continuously running processes. Consisting of a measuring frame with two strip edge sensor positioners 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**)

Directly to
EMG BREIMO



EMG iCAM®

Online measurement of strip and slit strip width and hole detection

The **EMG iCAM®** system is based on CMOS multi-camera technology and can be used to measure

- » strip width,
- » slit strip width and
- » hole detection

with high precision in various strip processing lines.

High-precision measurement of strip and slit width

- » precise control of blade spacing and blade positions
- » thereby preventing inaccuracies in the subsequent process
- » improves the quality of the end products

Hole detection

Defects or foreign bodies that are pressed into the material during the production process cause holes to appear on the surface of the strip.

Hole detection enables

- » the selection of the required material quality in accordance with customer specifications
- » material that does not meet the required quality is sorted out and is thus not used in the pressing processes, which saves time, energy and money.

Holes should not be confused with pinholes at this point.

Measuring range	up to 2,950 mm strip width (others on request)
Measuring accuracy	» Strip width: up to ± 0.1 mm (2 σ) » Slit strip width: up to ± 0.05 mm (2 σ)
Passline detection area	19 mm (incl. strip thickness, strip edge ripple, strip waves)
Smallest detectable hole size	up to 0.2×0.2 mm*

*depends on the line speed and material thickness, deviations must be taken into account for holes that are not perfectly vertical

Customer benefits

- » Transparent incoming inspection and precise process control
- » Minimisation of edge trim and efficient process release through data management and visualisation of measurement data
- » Automatic dirt detection on the LED backlight unit
- » Insensitive to ambient light
- » Inline measurement (continuous strip measurement, logged)
- » No moving components; low maintenance



Directly to
EMG iCAM®:



Data-driven process analysis and optimisation

As digitalisation becomes increasingly important for the competitiveness of the industry, the ability to interpret and utilise production data has become a decisive competitive advantage for steel manufacturers.

The **EMG iCASS®** platform (intelligent Control and Analysis Software Solutions) was developed to harness this potential. It collects, links and analyses data from sensors, strip guiding systems and, in particular, from EMG's quality assurance systems, which provide comprehensive and valuable process and product information.

By utilising advanced analytical techniques and machine learning methods, **EMG iCASS®** identifies patterns, correlations and deviations that would be difficult to detect manually. This provides operators and process engineers with meaningful insights for optimising process parameters and for the early detection of anomalies.

The system's strength lies in the combination of reliable, high-quality measurement data from the EMG quality assurance systems and intelligent analysis methods.

EMG iCASS® supports steel manufacturers in optimising processes, reducing scrap and continuously improving production stability and product quality.

EMG's process and technical expertise, built up over eight decades, is a key factor in the successful implementation of **EMG iCASS®** projects.

For manufacturers who wish to harness the full potential of their process data, **EMG iCASS®** offers a future-proof path to smarter, more stable and more sustainable production.

Contact EMG today to discuss your specific application and begin your **EMG iCASS®** journey: iCASS@emg-automation.com.



Application fields

Applications galvanising lines:



Customer benefit:

- » Smooth transitions when changing coatings
- » No need for conventional hot measurement
- » Optimised coating profile
- » Minimal zinc consumption due to optimised safety margins
- » Process transparency and identification of process deviations
- » AI-based control as an alternative or supplement to conventional control systems

Applications process lines:

- » **EMG IMPOC Booster^{AI}:**
 - » Improving the accuracy of online measurement results for tensile strength and yield strength using EMG IMPOC
 - » Improving model stability
- » **EMG Virtual IMPOC^{AI}:**
 - » Process-data-based prediction of material properties for steel and aluminium strips as early as the initial stages of the process chain

Customer benefits:

- » Expanded scope for predicting material properties, including for non-ferromagnetic strips

Directly to
EMG iCASS®





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