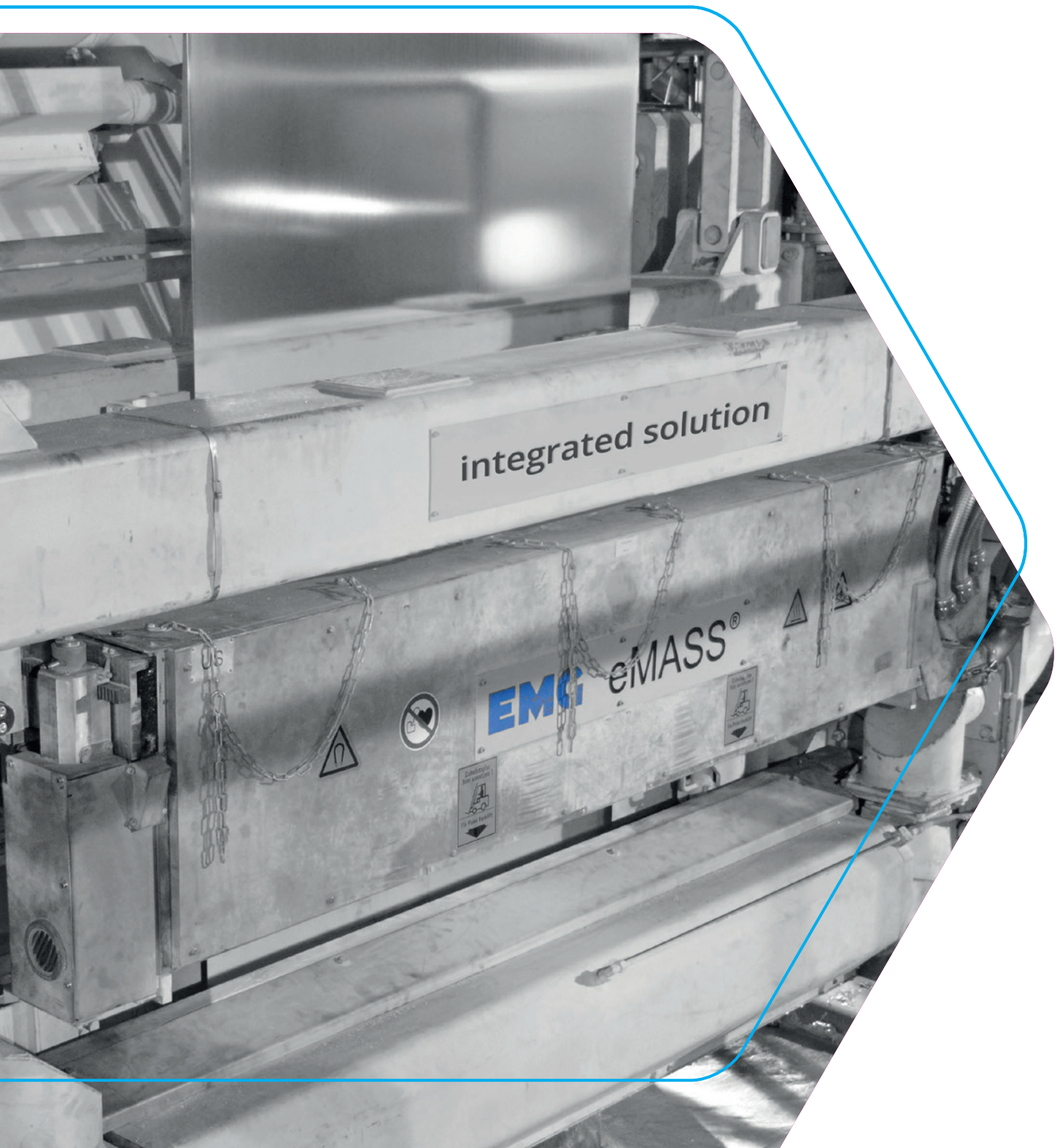


Strip stabilisation & edge mask control

EMG eMASS[®] & EMG eBACS



Electromagnetic strip stabilisation

Challenges in coating processes

Not only ensuring the minimum thickness of the coating but also its homogeneity is an important quality feature in the production of hot-dip coated flat steel. The key factor is that the strip is as stable and flat as possible in the "passline", the ideal centre line between the nozzle lips during the controlled stripping of the excess coating material.

This is the only way to avoid overcoating resulting in higher production costs. This is exactly what is achieved by using EMG eMASS® – our turnkey system for stabilising fast-running ferromagnetic steel strips by using electromagnets.

The main areas of application are process and quality optimisation as

well as raw material savings in hot-dip coating lines for different runs (such as zinc, GALVALUME®* and aluminium).

EMG eMASS® – THE solution

EMG eMASS® distinctively improves the strip shape and significantly reduces the amount of strip oscillation. This optimised blow-off process results in a significantly more homogeneous coating over the length and width of the strip. The excessive coating that was previously required to ensure a minimum layer thickness can be significantly reduced and costs lowered as a result.

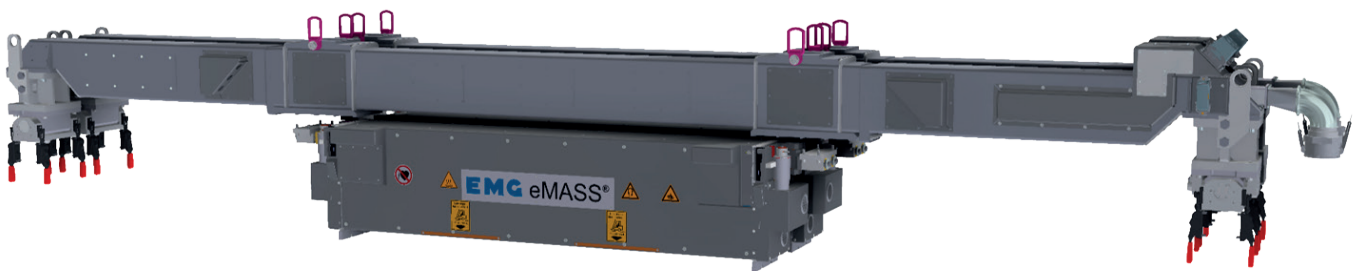
The air knife process can often be enhanced. This leads to less frequent air knife cleaning procedures, reduced scrap, higher process safety,

thinner coatings and an overall lower consumption of resources and consequently to considerable energy savings.

From the more than 80 installations that have been implemented, a wide range of solutions have been developed to arrange the EMG eMASS® system as close as possible to the "technology point" (i.e. the air knife lip) while maintaining accessibility.

All of the project-specific boundary conditions are taken into account individually and the solution is developed with the customer.

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



Huge savings possible with EMG eMASS®

Our experience has shown that the EMG eMASS® system achieves savings of around 50 % with regard to the average over-coating!

Steffen Dombrowski,
Product manager EMG eMASS®



THE solution: homogeneous coating

The core component of EMG eMASS® is a system consisting of electromagnetic actuators and contact-free strip position sensors. Two air-cooled and movable housings are arranged on both coating sides of the strip. A row of these systems is mounted in each of these housings. Strip widths of up to 2100 mm are covered with up to 8 actuator systems per side.

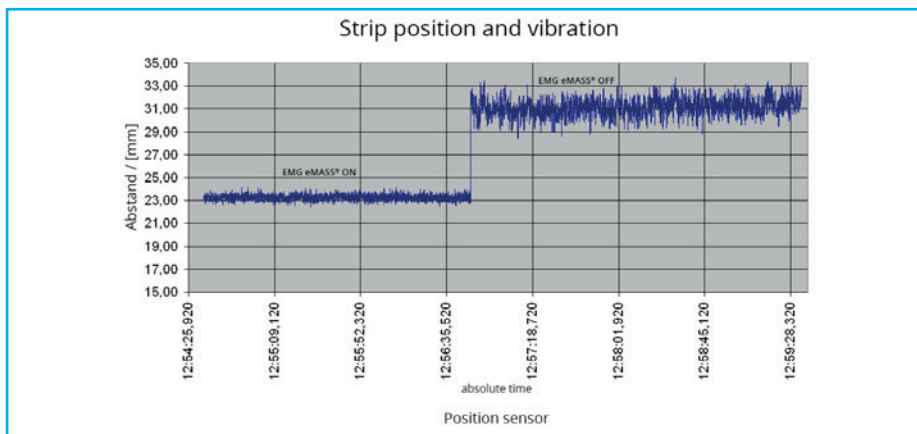
The unique, flexible and individual traversability of each actuator system guarantees optimum coverage of all strip widths and especially of the strip

edges, even when the strip moves sideways.

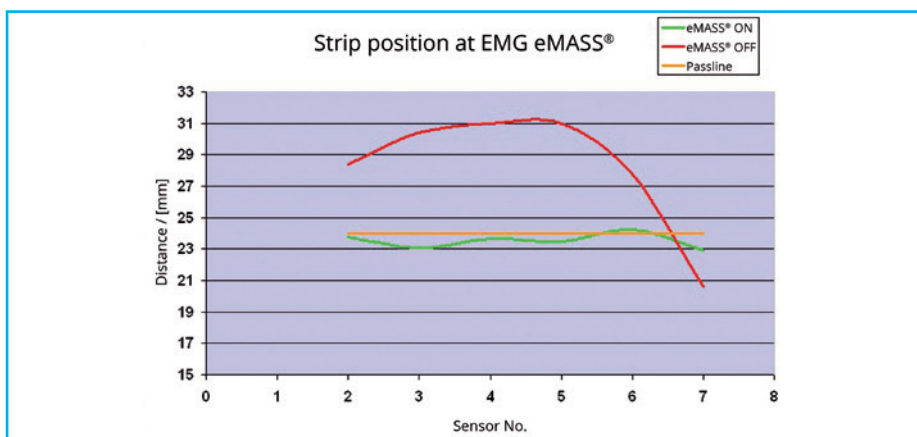
The eddy current-based strip position sensors measure the deflection of the strip from its optimum position, i.e. the "pass line", in an extremely quick and accurate manner. The measuring values are used for the controlled activation of the electromagnetic actuators. Each of these actuators pulls the strip from the corresponding side back to the pass line, or an adjustable reference position, and reliably holds it in this position (see pictures below).

Performance features

- » stabilisation for ferromagnetic strips
- » the system can be freely scaled up to strip widths of 2100 mm, +/- 50 mm lateral strip offset
- » up to 8 magnet / sensor pairs, individually movable
- » low maintenance / maintenance-friendly
- » extensive safety functions
- » high-performance system interface (Profibus DP, Profinet)
- » various software functions for system conditions
- » latest EMG iCON® technology with Profinet
- » optimum installation thanks to the modular design and minimised size of the actuator housings
- » installation close to air knife thanks to a slim, space-saving design
- » uncomplicated handling thanks to tried and tested quick connectors (fixation, electrical system, cooling air, etc.)
- » low energy consumption (< 2 kW per actuator pair)
- » high cut-off frequency and extremely fast generation and reduction of force
- » quick strip position control (cycle time < 1 ms)
- » emergency manual adjustment in the event of a power failure
- » automatic tracking of changes to the strip pass line, with the integrated solution automatic tracking of the nozzle



Stabilisation effect



"Crossbow" reduction: 6 active actuators are used to pull the originally unfavourable and twisted strip position (red) far from the pass line into a position that is parallel and near to the pass line (orange), thereby straightening the bent strip shape (green).



Curious?

Watch the individual traversability of the actuator systems live in the video.

EMG eMASS®

Individual solution: for all types of air knives.

The strip vibration damping results and the increased added value that can be achieved through the use of an electromagnetic strip stabilisation system depend significantly on the optimum arrangement of the strip stabilisation system in distance to the air knife system.

The general rule is: the better the strip stabilisation system is integrated into the air knife arrangement and the closer the strip stabilisation system is located to the level of the air knife lips (i.e. the actual point of technology), the better the results for vibration damping and crossbow reduction.

To achieve this goal, from the more than 80 installations realised so far a wide variety of solutions are available to integrate EMG eMASS® into an existing or new system above the blow-off nozzle.

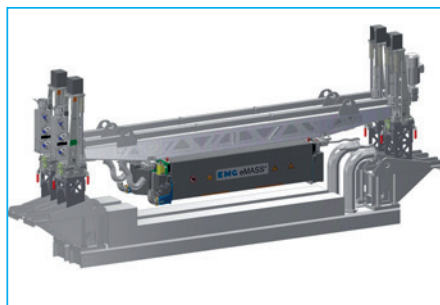
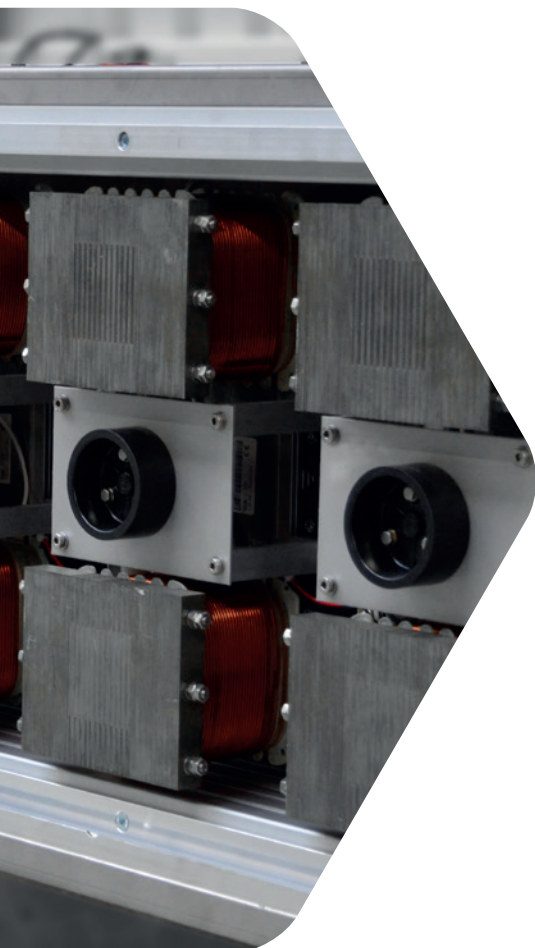
The supports can, for example, be straight or cranked in order to arrange the EMG eMASS® actuator housings as close as possible to the air knife lip in combination with the order-related design of the support structure. Here flexible adapters for individual situations exist.

Depending on the respective air knife, its vertical and horizontal travel possibilities and load capacities, the support structure can be attached

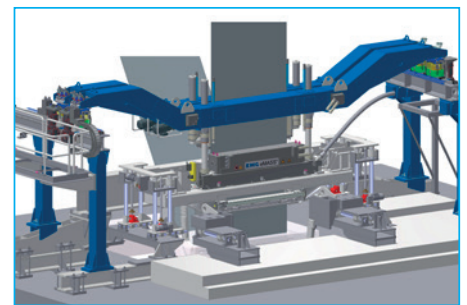
to the air knife, for example at the air knife height adjustment or on the plant floor. Versions with horizontal movement of the beams as well as vertical adjustment of the beams or the actuator housings under the beams are possible.

For many years, in close cooperation with DUMA-BANDZINK GmbH, the "Integrated Solution" with complete mechanical and electrical integration of EMG eMASS® in the air knife has been offered and successfully used worldwide.

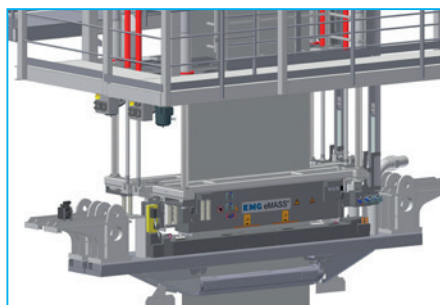
As the market leader with a large number of different integration solutions worldwide, EMG will find the optimal solution for you.



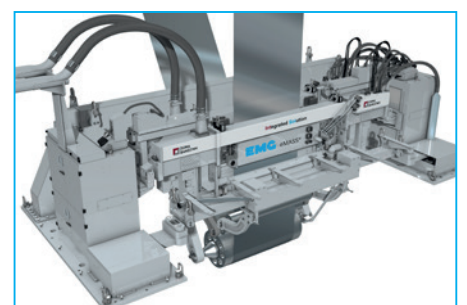
Very light solution due to special carrier construction



Height-adjustable actuator box and laterally-adjustable supporting construction



Variable height installation on mobile tower



Integrated solution with minimum distance to air knife lip

Technical data

Area of application	all ferromagnetic steel qualities at a strip temperature of < 600 °C, typ. GI, GF, GL higher strip temperatures (e.g. for hot-dip aluminisation) are available on request austenite content <=30 %, others on request
Weight (total) (additional air knife load)	typ. 900 kg per strip side, including brackets for inserting EMG eMASS® into the carrier system (8 pairs of magnets at a max. strip width of 2100 mm)
Strip thickness	typ. 0.3–3 mm (others on request)
Mechanics	
Dimensions with carrier (W x H x D)	typ. 8500 x 840 x 950 mm for max. strip width of 2100 mm
Actuator housing	one air-cooled stainless steel housing with a heat protection shield on each strip side (temperature-resistant up to 600 °C, optional up to 800 °C)
Time for assembly or disassembly with a crane	typ. 20 min including connectors and cooling air connection
Electro magnetic actuator	
Force	max. 250 N at max. 20 A, typ. operating distance 35 mm and 3 mm sheet thickness; max. strip temperature 600 °C
Strip position sensor	
Sensor type	eddy current sensor system consisting of sensor head, sensor cable and measurement amplifier
Measuring range / resolution	10-50 mm / ≤ 0,1 mm
Cooling fan	
Cooling air fan with intake filter	motor rating: 2.2 kW
Dimensions (W x H x D)	625 x 700 x 1000 mm
Ambient temperature	max. 50 °C
Temperature of intake air	max. 50 °C
Control cabinet components	
Power input	3~, max. 18 kVA, nominal voltage, customer-specific
Power amplifier	special power amplifier with high control frequency > 100 Hz max power dissipation: 50 W
Cable set	2 sets of max. 7 cables each, partially in protective hose, max. length 50 m
Dimensions (W x H x D) / weight	typ. 3600 x 2200 x 600 mm / typ. 1000 kg

Your benefits

- » homogeneous metal layer across the width and length of the strip
- » stable "pass line" of the strip and reduction of the „crossbow" effect
- » reducible air knife gap
- » potential for saving coating material and energy due to less overcoating and lower coating weights
- » reduced air and nitrogen consumption
- » higher strip speed

Edge mask control: 100 % contact-free.

In hot-dip coating lines, the air outlet gap of the blow-off nozzles (air knives) is at least as wide as the widest running strip. So-called "edge masks" or "baffle blades" are a feature of the air knives that widen narrower strip material to avoid air turbulence occurring at the edges.

This can prevent imperfections of the coating layer at the strip edges ("growths"), while also significantly reducing the level of noise generated by the flowing air.

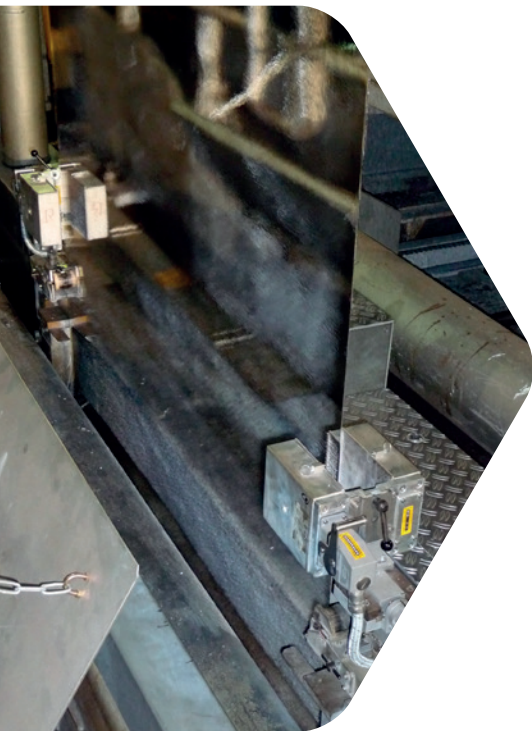
The edge masks are normally controlled pneumatically and pressed against the strip edges by contact rolls, which is particularly disadvantageous for thin strip material.

Deposits of hot coating material such as zinc, GALVALUME® and aluminium, however, also result in problems.

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



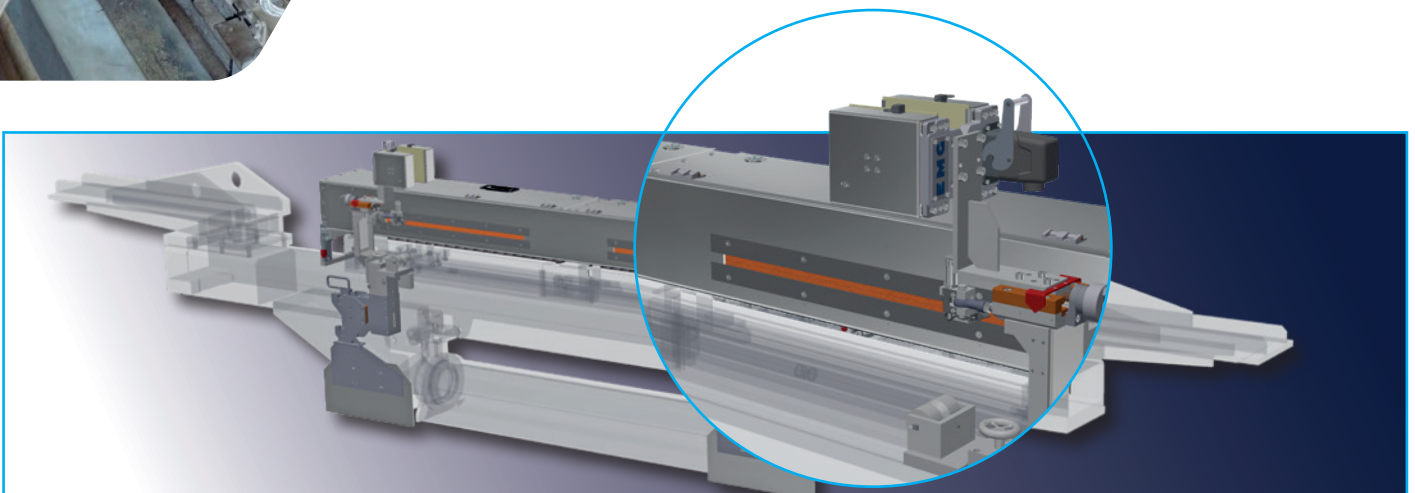
*Curious?
See the edge mask control live in the video.*



The solution

The EMG eBACS contact-free inductive measuring system with the new generation ES11 (patent application DE10 2020 120 238 A1) edge sensors replaces these contact rolls. The use of high-precision linear drives also allows the edge masks to be positioned in a very flexible manner compared to pneumatic operation with only two positions (open/closed).

The edge mask distance can be adjusted remotely. The gap width for the critical weld seam pass, which must be signalled by the system control unit in a timely and sufficiently long manner, can be minimised and the edge masks follow the strip edges precisely and without contact.



Complete system for edge mask control mounted on the air knife device (Focus: EMG eBACS sensor)

High-precision sensors: 100 % maintenance-free.

How does EMG eBACS work?

A patent application has been filed for the latest generation of ESI1 inductive strip edge sensors with high-precision printed ceramic coils. Transmitting and receiving coils are installed opposite of each other in a protective housing with robust connection plugs.

The sensors are connected to the SMI evaluation electronics with high-temperature-resistant special cables.

A passing strip edge changes the field between the coils, from which information about their changing position in the sensor is obtained for the control.

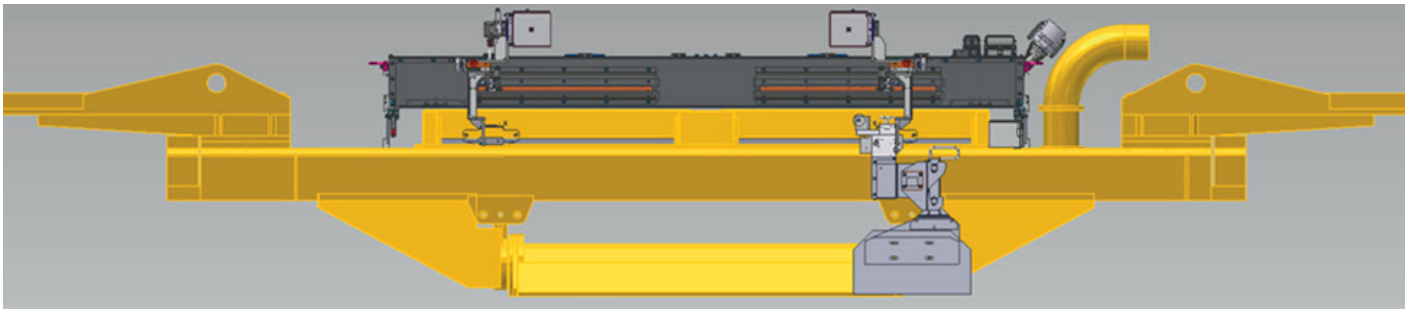
The EMG iCON® controller now processes the signals from the SMI evaluation electronics again for a third-party drive control system, or it regulates the correcting variable for the EMG eBACS drives in order to allow the edge masks of the strip edge to follow at a specified and adjustable distance.

Individual components for OEMs

EMG supplies components for the various providers of air knives with edge mask devices.

In the simplest case, these are just the strip edge sensors with special cables, but can also include actuators and position measurement systems.

EMG engineers individual solutions together with the air knife manufacturers and provides support for structural and electrical integration.



Installation as a platform system

EMG's eBACS system is frequently seen as a useful addition to the EMG eMASS® system, but it is also used as a separate solution in its own right.

For retrofitting existing nozzles and their edge mask device at the end users, EMG offers tailored platform systems after a feasibility check.

The EMG components (such as drives, drag chains, position measurement systems, etc.) are preassembled and wired in a housing.

This housing is then mounted above the existing structure by means of simple weld-on feet.

In most cases the system is connected to existing linear units, but it is also possible to insert new linear units as well.

The strip edge sensors are attached to the upper end of the edge masks and replace the contact rolls.

Your benefits

- » contact free and high-precision strip edge detection
- » elimination of mechanical contact rolls and all of their disadvantages
- » no deformation of the strip edge
- » a more homogeneous zinc coating of the strip edge
- » remote adjustment of the mask distance
- » maintenance-free strip edge sensors and low maintenance requirements for the drive technology
- » compact and air knife-specific integration
- » derivable strip position and strip width 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 industrial machinery, with large circular components and a metal structure visible. A white line graphic starts from the left edge, goes down, then right, then diagonally down to the right, and finally curves back to the left edge at the bottom.

an **eLEXIS** company

EMG Automation GmbH
Industriestraße 1
57482 Wenden
Germany

T +49 2762 612-0
www.emg.elexis.group
info@emg-automation.com