

electro MAgnetic Strip Stabilization



- ▶ zinc savings
- ▶ ideal strip shape
- ▶ rapid installation

Operating principle:

EMG-eMASS® is a turn-key system for stabilizing high speed ferromagnetic steel strips based on electro magnets. The main application is process optimization and zinc saving on the air knives of hot-dip galvanizing lines. But also hot-dip aluminizing or GALVALUME® sheet steel* does not make a difference for eMASS®.

The system is installed near to the air knife which wipes off the liquid zinc layer. A direct mounting on the air knife is possible and reasonable most of the time, but adjusted to special line environments EMG has also implemented different ways of installation.

eMASS® improves the strip shape (e.g. crossbow) and reduces the strip oscillation significantly. The zinc layer, which

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results from this herewith supported blowing off process, is more homogeneous over strip length and strip width and the zinc over-coating, which has been necessary so far to ensure that customer requirements for a minimum zinc layer thickness are met, can now be reduced remarkably.

Further optimizing activities on the air knife process are often possible, which then lead to less air knife pollution, lower strip scrap, higher safety, thinner zinc layers and a lower consumption of resources. The installation of eMASS® in a cooling tower of a hot-dip galvanizing line eliminates almost completely the torsion oscillation, which is caused by the cooling fan. By this a collision of the strip and the cooling unit is prohibited. An increase of the fan power and therewith a progression of the line throughput is additionally achievable.



Installation on the air knife equipment



Installation in the cooling section

EMG Automation GmbH specialises in the automation of continuous production processes in the metal, paper and plastics industries as well as in the foil and tyre industries. The company, which was established in 1946, is a leading provider of electro hydraulic control systems. Furthermore, EMG provides quality assurance systems for the manufacturing industry.

Based on the combination of more than 60 years of experience, the quality of our products and complete solutions as well as our advisory skills, our customer, by his trust, makes us the market leader.

In close co-operation with our customers, research facilities and universities we are permanently searching for innovative solutions to promote our new and further developments and therefore to design and form the market as innovation leader actively.

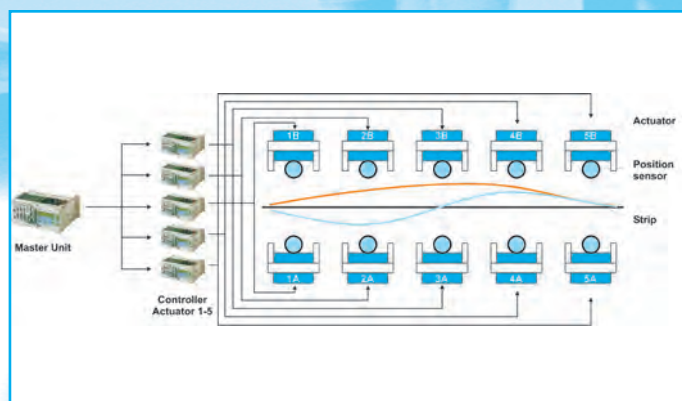


Installation on the air knife in a hot-dip galvanizing line

• zinc savings

Function principle:

The heart of eMASS® is a system consisting of electro-magnetic actuators and non-contact strip position sensors. Two air cooled and moveable housings being hold by a pair of steel beams are placed on both coating sides of the strip. In each of these housings a series of these systems is installed. Strip widths up to 2030 mm are covered by up to 8 actuator systems on each side. Opposing actuators are controlled in pairs. The sensors measure the strip's displacement of its optimum position, the passline. The measuring values are used for the controlled activation of the electro-magnetic actuators. Each of these actuators pulls the strip from the according side back to the passline and holds it there. As a result the natural mean strip shape (crossbow) is straightened and the strip calmness is increased.

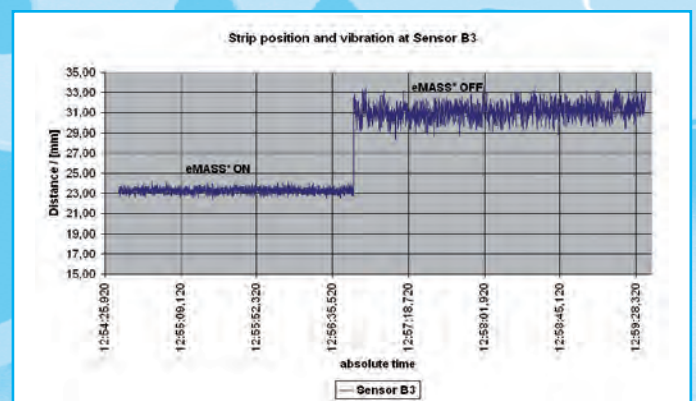


Functional principle

• ideal strip shape

Customer benefit:

- ▶ homogeneous zinc layer across strip width and along strip length
- ▶ zinc savings thanks to reduced over-coating
- ▶ stable passline and reduction of "crossbow"
- ▶ focussed, reliable production of low layer weights in hot-dip galvanizing lines
- ▶ less air and nitrogen consumption
- ▶ increased material throughput
- ▶ avoidance of strip damages by use in the cooling section
- ▶ enhanced weldability



Stabilization effect

Functional principle (picture above):

Due to the neutral behaviour of the strip with respect to magnetization, the strip can only be pulled by the actuators. This means that in example 1 – red – (strip with "crossbow"), actuators 1A, 2A, 3A, 4A and 5A are energised in order to draw the strip back to its reference position. In a situation as shown in example 2 – blue – (s-shaped strip), actuators 1B, 2B, 4A and 5A are active.

Performance features:

- ▶ stabilization of ferromagnetic strips
- ▶ drastic "crossbow" reduction
- ▶ suitable for hot-dip galvanizing and hot-dip aluminizing
- ▶ system scaleable to strip widths up to 2030 mm
- ▶ suitable for strip speeds up to 200 m/min
- ▶ strip thicknesses from 0.3 to 3.0 mm
- ▶ no impact on strip surface quality (e.g. chatter marks)
- ▶ easy to maintain
- ▶ many security functionalities
- ▶ powerful plant interface (Profibus DP)

• rapid installation

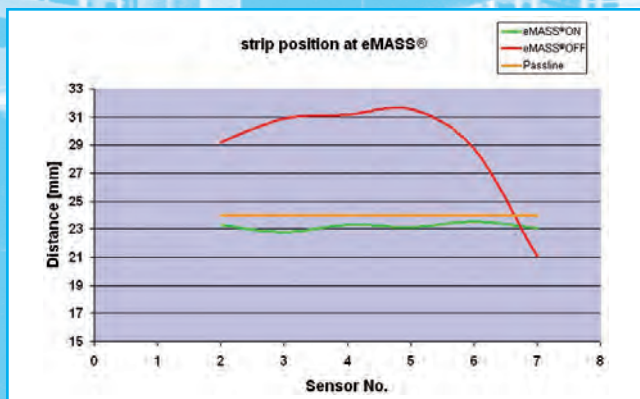
Requirements:

Not only zinc layer thickness but particularly zinc layer homogeneity are major quality features in the production of hot-dip galvanized flat steel. A controllable distance to the air knife, which should be as uniform as possible, is critical in terms of zinc layer thickness. Any inclination or even a bow-type shape of the steel strip in the air knife area must be avoided.

This is ensured by using eMASS®. The graphic below shows this for a strip width of 1607 mm and a strip thickness of 0.67 mm. With using 6 active actuators the former mean and twisted strip position (red) far from the passline (orange) is pulled to a position parallel and near to it (green) with a straightened strip shape.

Technical advantages:

- ▶ installation directly on the air knife by slim and space optimized mounting
- ▶ no interaction between magnetic field and material
- ▶ no impact on the liquid zinc layer
- ▶ easy and cost effective air cooling (< 2.5 kW)
- ▶ low energy consumption (< 2 kW per actuator pair)
- ▶ high threshold frequency and extremely fast force generation and reduction (> 100 Hz)
- ▶ fast controlling up to 5 kHz sampling
- ▶ no interference between coils
- ▶ fast mounting on the air knife (< 20 min) by snap closing technology and industrial connectors
- ▶ emergency manual box retraction at power failure



"Crossbow" reduction



Inside of the housing (sensors and actuators)



eMASS® quality check at EMG



Find further information of our eMASS®, e.g. a 3D animation that shows its function principle!

Finden Sie weitere Informationen zu unserem eMASS®, z.B. eine 3D-Animation, die die Funktionsweise verdeutlicht!

Technical data:

Fields of application	all ferromagnetic steel qualities at strip temperature < curie temperature (typically < 768 °C)
Air knife strain (total)	typ. 3500 kg incl. panels acc. to max. strip width and air knife design
Strip thickness	0.3–3 mm (others on request)
Strip width	200–2030 mm
Strip speed	0–200 m/min
Mechanics	
Design	2 coated steel beams with moveable actuator housings, snap closing for cooling air and electrics, cooling air and cable allocation inside; air knife specific welding panels with snap closing
Dimension (W x H x D)	typ. 5500 x 1372 x 950 mm for strip width of 2000 mm
Weight	2 beams with mounted acutator housings and panels typ. 3500 kg for maximum strip width
Actuator housing	2 air cooled stainless steel housings with steel sided heat shield (up to 600 °C; optional up to 800 °C)
Dimension (W x H x D)	typ. max. strip width + 400 x 530 x 300 mm
Time for mounting on the air knife	typ. 20 min incl. connectors and cooling air connection
Electro magnetic actuator	
Design	electro magnetic actuator with optimized pole shoes from special transformer sheet and intake for the strip position sensor
Power	max. 250 N at max. 20 A, typ. operating distance 35 mm and 3 mm sheet width; max. 2000 N for 8 actuators
Strip position sensor	
Sensor type	eddy current sensor system composed of sensor head, cable and measuring amplifier
Measuring range / resolution	10–50 mm / ≤ 0.1 mm
Blower	
Blower with filter	motor power 2.2 kW, max. 3000 rpm; flow rate typ. 25 m ³ /min at 35 mbar; frequency converter operation 0–50 Hz, filter G4
Dimension (W x H x D)	625 x 700 x 1000 mm
Ambient temperature	max. 50 °C
Temperature induction air	max. 50 °C
Components of control cabinet	
Power input	3~, max. 20 kVA, nominal voltage customized
Controller	<ul style="list-style-type: none"> • EMG-SPC16 master unit data gathering with Profibus DP interface to customer control • EMG-SPC16 controller (PID02) 1 controller for each actuator pair; short cycle time (250 μs) • EMG-SPC16 axial controller for automated starting of the actuator housings and fan control
Power amplifier	special power output with high control frequency > 100 Hz power loss max. 50 W
Cable set	2 sets about max. 50 m with industrial connectors
Dimension (W x H x D) / Weight	typ. 4000 x 2200 x 600 mm / typ. 1000 kg

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