FläktGroup

WOODS | Air Movement

Magnelis® METALLIC COATING

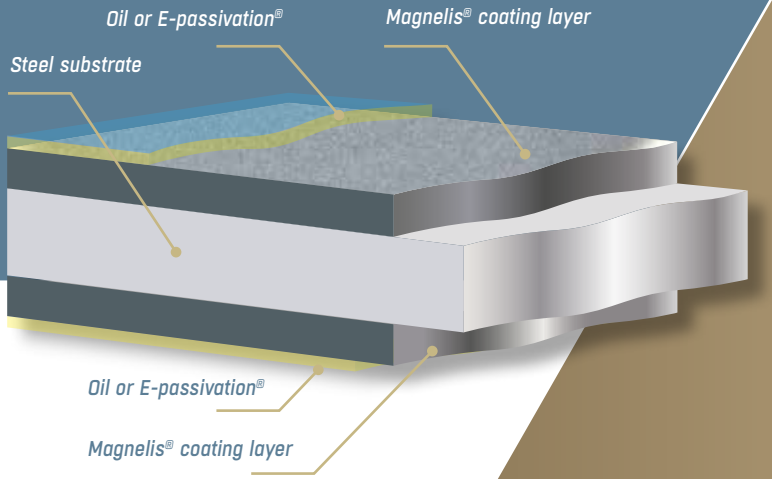
A BREAKTHROUGH IN CORROSION PROTECTION

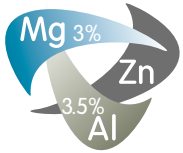
What is Magnelis®?*

Magnelis® is an exceptional metallic coating which provides a breakthrough in corrosion protection. Magnelis® is also the best choice for a wide variety of applications.

Thanks to its unique composition, Magnelis® provides an unprecedented level of surface and cut-edge protection, even in the most hostile environments.

Magnelis® is produced on a classic hot dip galvanising line, but the molten bath has a unique chemical composition including zinc, 3.5% aluminium, and 3% magnesium.





Magnelis® provides outstanding corrosion resistance, even in harsh environments

The Magnelis® coating has a naturally dark grey colour, which is superior to a hot dip galvanisation, as it has a more even and uniform finish, making it more attractive.

** Magnelis® is a registered trademark belonging to ArcelorMittal Flat Carbon Europe S.A.*

Main advantages

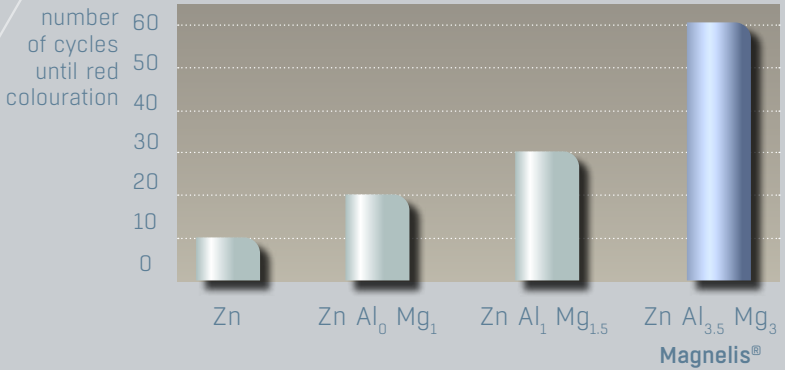
- Excellent corrosion resistance: three times better than galvanised steel (based on outdoor tests)
- Self-healing effect ensures excellent edge protection
- Best and most cost-effective alternative to post-galvanised steels
- Wide range of material thickness options
- Simplifies component manufacturing
- Environmentally friendly

Magnelis®

Outstanding corrosion performance

Magnelis® resists corrosion for longer than standard galvanised products and it outperforms coatings containing less magnesium.

The specific composition of Magnelis® (3% Mg and 3.5% Al) is crucial as it leads to a stable and durable layer across the entire surface and edges of the steel. This provides more effective corrosion protection than coatings with a lower magnesium content.



Magnelis® offers deformed surfaces extra protection

Data shown above relates to accelerated corrosion tests on steel samples having a 10 µm surface coating of Magnelis® . Samples were subjected to alternating 8 hours cycles of fog (5% NaCl), dry air and humidity.

Source: ArcelorMittal R&D

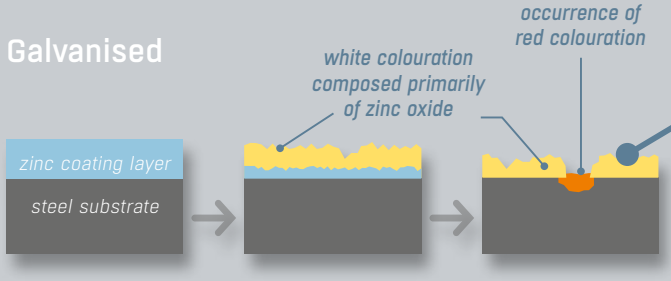
Corrosion protection mechanism

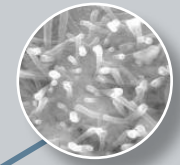
The specific composition of Magnelis® (3% Mg and 3.5% Al) is crucial as it leads to the formation of a very dense, stable, and durable layer of protection. The compact layer of Magnelis® acts as a barrier to corrosion, preventing the underlying steel from coming into contact with the ambient environment. The result is highly effective corrosion protection, even in the harshest environments.

Best protection for deformed areas

Magnelis® will even form a dense layer on highly deformed zones. This gives deformed steel shapes the same protection as flat surfaces. This is a key advantage of Magnelis® compared to other metallic coatings.

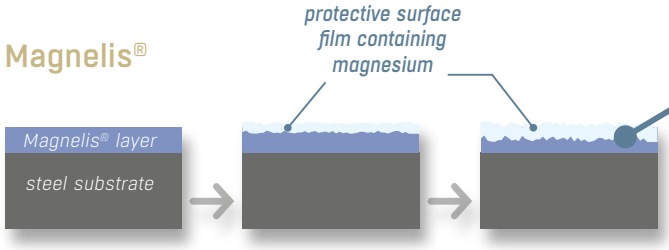
Galvanised

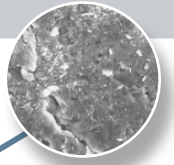




Zinc oxides on galvanised steel provide less corrosion inhibition due to their porous structure.

Magnelis®





Magnelis® forms a compact layer structure which blocks corrosion. Compact structure of Magnelis® Simonkolleite and Layered Double Hydroxyde (LDH) blocks corrosion mechanism.

No red colouration observed after 1440 hours of salt spray testing on Magnelis® cup, where the galvanised cup is completely corroded.

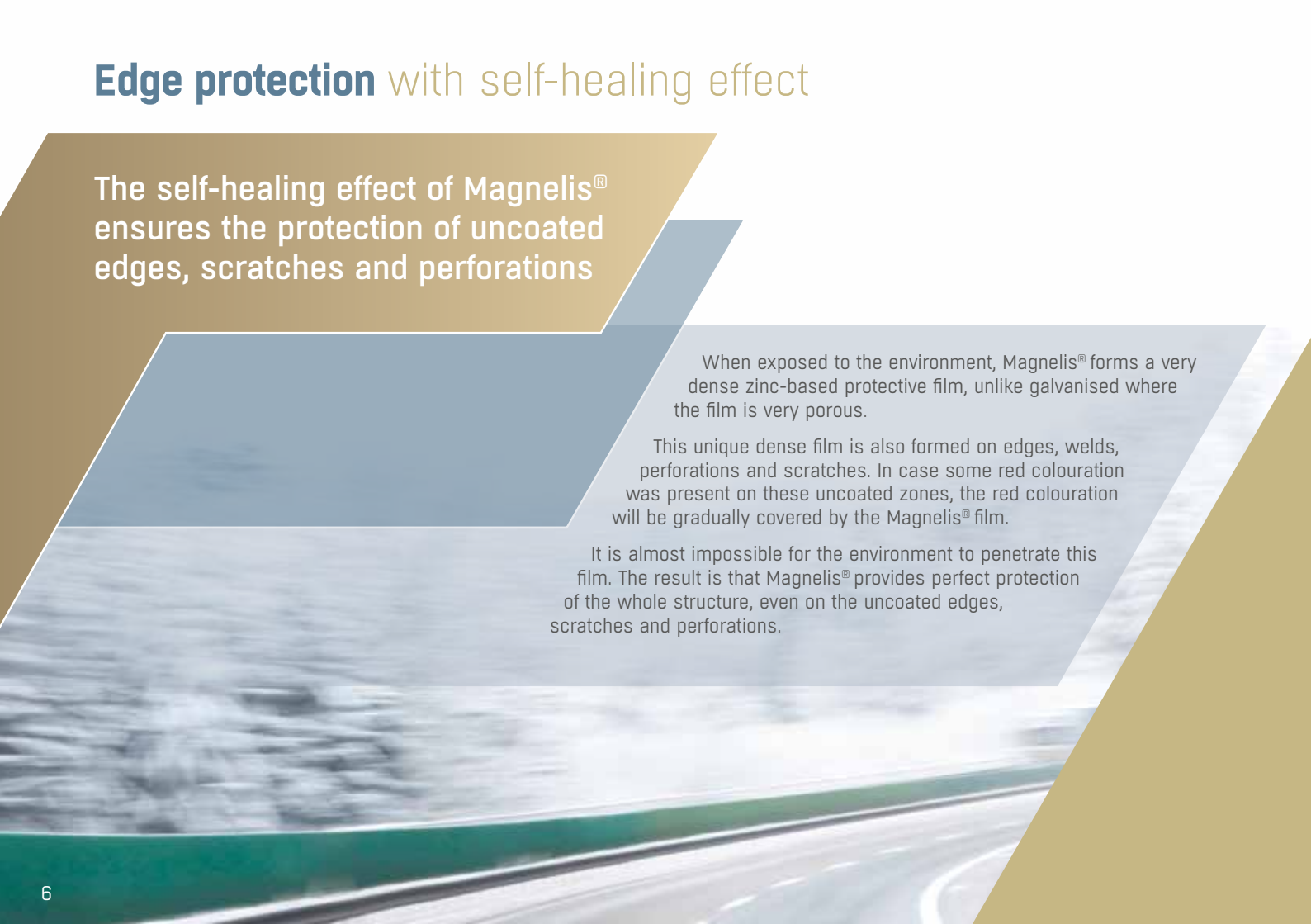
Edge protection with self-healing effect

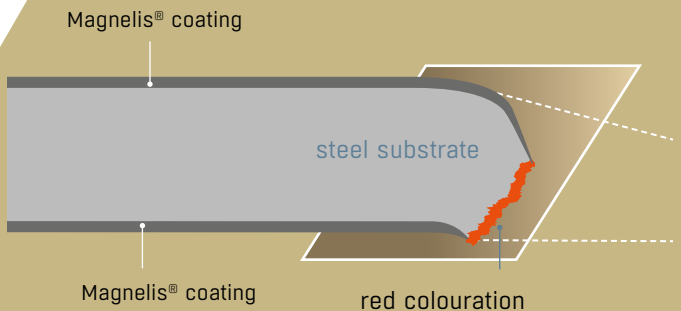
The self-healing effect of Magnelis® ensures the protection of uncoated edges, scratches and perforations

When exposed to the environment, Magnelis® forms a very dense zinc-based protective film, unlike galvanised where the film is very porous.

This unique dense film is also formed on edges, welds, perforations and scratches. In case some red colouration was present on these uncoated zones, the red colouration will be gradually covered by the Magnelis® film.

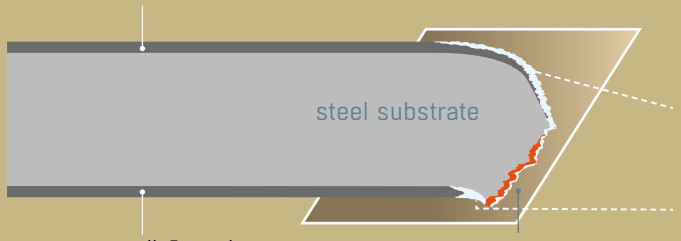
It is almost impossible for the environment to penetrate this film. The result is that Magnelis® provides perfect protection of the whole structure, even on the uncoated edges, scratches and perforations.





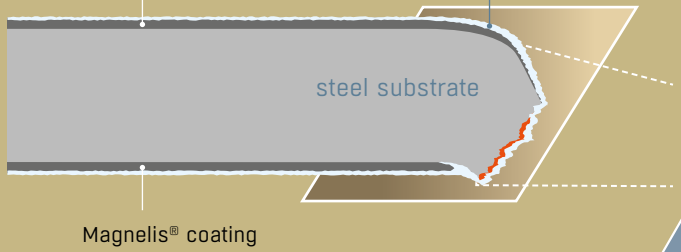
Initial exposure period (up to several weeks*)

The exposed cut end of the substrate is oxidised and forms red colouration.



Subjected to rain and condensation (beyond several weeks*)

The zinc-based film containing magnesium on the coating layer migrates over the cut end.



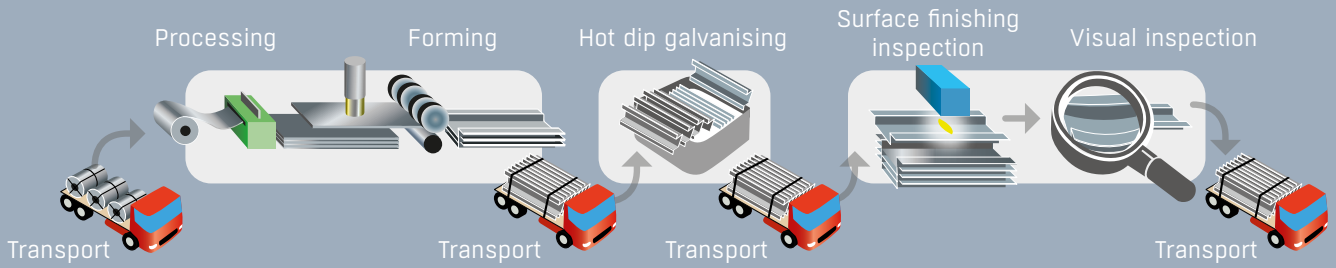
Long exposure period (after more than a year*)

Over time, areas of material which exhibit red colouration will reduce, as they are replaced by zinc oxide, which is a natural part of the Magnelis® self-healing process.

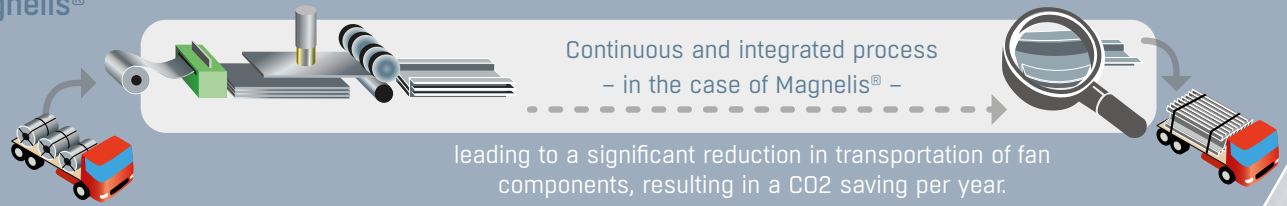
** The speed of the self-healing may depend on the environment.*

Save on lead times

Post-galvanised versus Magnelis®



Magnelis®



leading to a significant reduction in transportation of fan components, resulting in a CO_2 saving per year.

As we can significantly reduce the need for transporting components to off site coating contractors, we are able to reduce both our production lead times and environmental impact.

Advantages over competing solutions

Advantages over post-galvanised steels

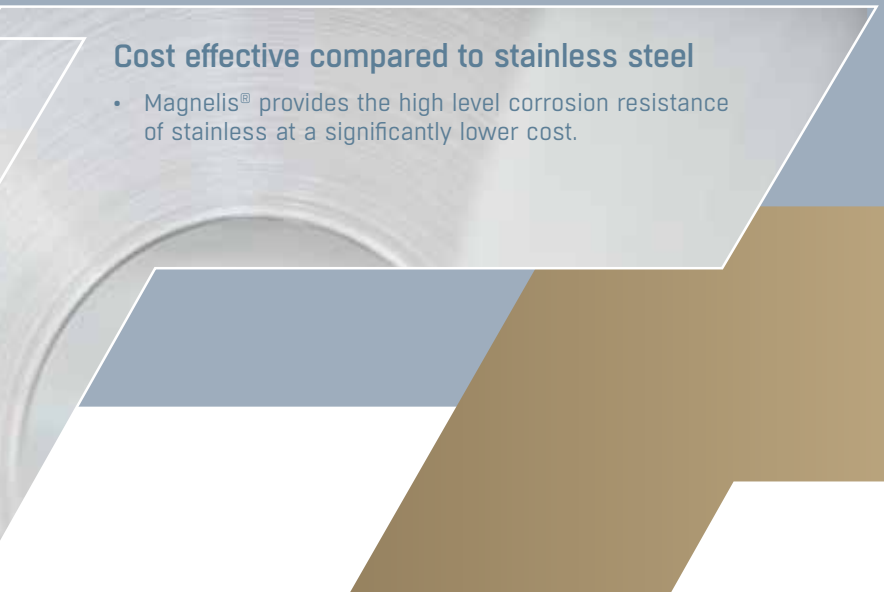
- Freedom to optimise designs thanks to the ability of Magnelis® to protect deformed shapes
- Lower weight of Magnelis® coating (depending on environment) to obtain the same level of corrosion resistance
- Protects flat and deformed surfaces as well as cut edges
- Shortens the logistics chain thanks to simpler fabrication processes.

Reduces maintenance costs compared to post-painting:

- The use of Magnelis® can avoid the need for post-painting.
- The extended durability of Magnelis® results in reduced maintenance.

Cost effective compared to stainless steel

- Magnelis® provides the high level corrosion resistance of stainless at a significantly lower cost.



Magnelis®
Think strategy

Technical specifications

Magnelis® is applied to the steel on a continuous hot dip galvanising line. The steel strip is dipped into a molten bath of Magnelis® which includes zinc, 3.5% aluminium, and 3% magnesium.

By closely controlling the process conditions, ArcelorMittal is able to ensure the optimal properties of the final product.

Magnelis® can be applied to a very wide range of steel grades. These include steels for cold forming and deep drawing applications, as well as structural and high strength, low alloy steels.

Steel thickness can range from 0.45 to 6 mm, while the coating is 25 µm/per side.

Coating Designation		ZM310
Coating Mass (total both sides)	g/m²	**310**
	oz/ft²	**1.00**
Coating Thickness	(µm/per side)	**25**
Surface Treatment		C (E-Passivation® CrVI-free), O (oiled)
Thickness		0.45 to 6.00 mm (0.018 to 0.236 inches)
Width		Up to 1680 mm (66 inches)
Steel grades		
DX51 to DX57 + ZM S220 GD to S550 GD + ZM HX260 LAD up to HX700 LAD + ZM H240 + ZM		

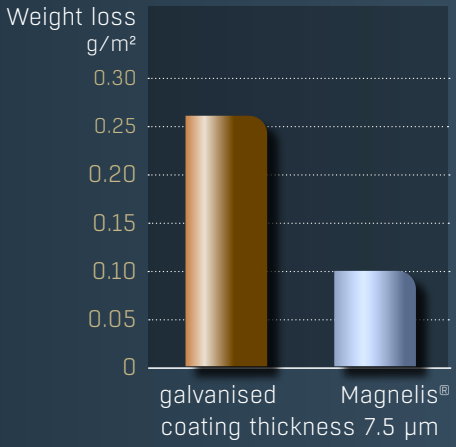
Easy to process

Thanks to its highly resistant, adherent metallic layer, Magnelis® can be processed using a variety of methods. These include bending, drawing, and profiling. Magnelis® maintains a high level of corrosion protection, even in the deformed zones.

Outdoor exposure tests have confirmed the exceptional corrosion resistance of Magnelis® on deformed parts compared to galvanised steel. The Magnelis® barrier protects the entire surface including cut edges and perforations.

Powder behaviour comparison

Magnelis® reduces the powdering behaviour.



Lubrication Oil Fuchs 41075 in excess. Source: ArcelorMittal R&D

Formability

Magnelis® proves better results on workability of the product and protection of the processing tools.

Friction tests show that Magnelis® performs better than hot dip galvanised steel.

Steels coated with Magnelis® are easy to process and do not harm processing tools. Magnelis® also enables manufacturers to deform the steel without the need for a lubricant, something that is not possible with galvanised steels.

Weldability

Magnelis® offers improved weldability due to its thinner coating. The process to weld Magnelis® is the same as that used for zinc-coated parts. The same welding consumables, procedures, and guidelines can be used. Arc, spot, and high frequency induction (HFI) welding techniques are all compatible with Magnelis®.

In cases where welded areas need to be re-protected, Magnelis® demonstrates even better corrosion resistance than a post-galvanised coating.

Paintability

Magnelis® can be post-painted and offers superior corrosion resistance compared to other metallic coated steels.

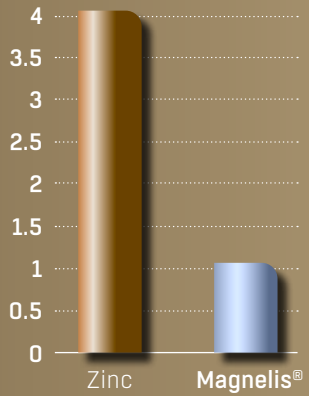
The **environmentally responsible** coating

The application of a Magnelis® coating ensures the preservation of natural resources as it uses significantly less zinc than pure zinc coatings. Magnelis® also reduces zinc runoff* to soils.

Magnelis® is 100% recyclable and does not contain any harmful elements. It is REACH compliant and an environmental product declaration (EPD) is available.

Zinc runoff rate*

Magnelis® considerably reduces zinc runoff into soil.

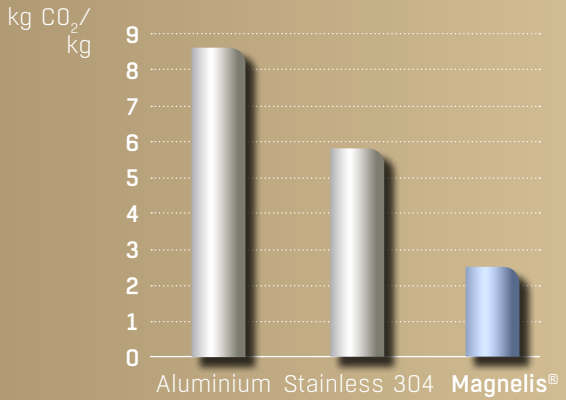


** the rate of dissolution of a material from its surface into the soil. Source: French Corrosion Institute*

The production of Magnelis® also has a lower environmental impact compared to other highly durable materials such as stainless steel or aluminium.

Production impact on CO_2 emissions

CO_2 emissions for the production of Magnelis® are much lower than for aluminium, a difference that is not compensated by aluminium during the use phase, even when aluminium parts are lighter than steel parts.



Sources: ArcelorMittal R&D, European Aluminium Association, World Steel Association, Eurofer

Magnelis® is the only metallic coating product certified for use in a C5 environment

Standards and certification

Magnelis® has been included in the European standard for hot dip galvanised steel (EN 10346) since July 2015 and Magnelis® is ASTM A1046-17 (2017) certified.

The excellent corrosion resistance of Magnelis® has seen it certified for use by Independent authorities including:

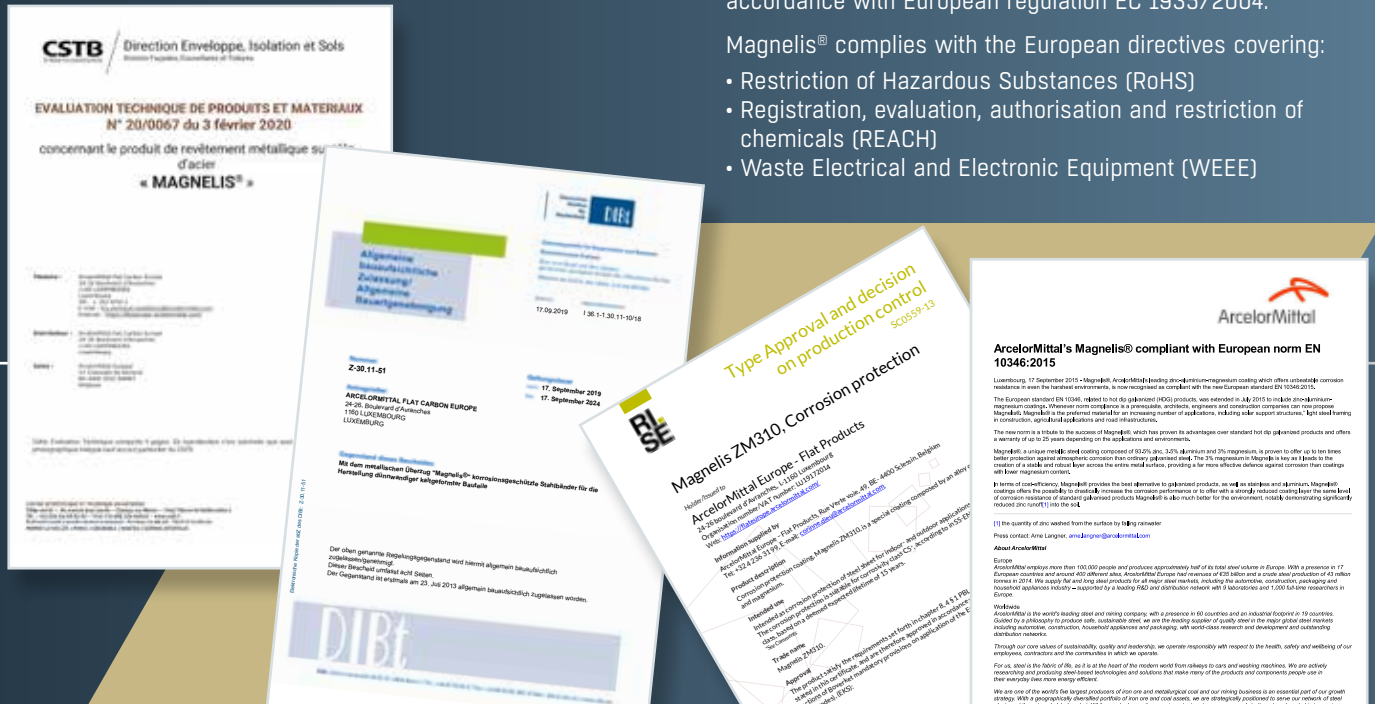
CSTB (France), DIBt (Germany), RISE (Sweden).

Magnelis® is the only metallic coating product certified for use in a C5 environment by the RISE certification body in Sweden. DIBt Z-30.11-51 allows the use of Magnelis® ZM310 in C4, Magnelis® ZM250 in C3 and Magnelis® ZM120 in C2 with durability H - high (> 15 years) in accordance with DIN 55634-1:2018 and EN ISO 12944-1 and -2 of 2017.

Magnelis® is suitable for food contact applications in accordance with European regulation EC 1935/2004.

Magnelis® complies with the European directives covering:

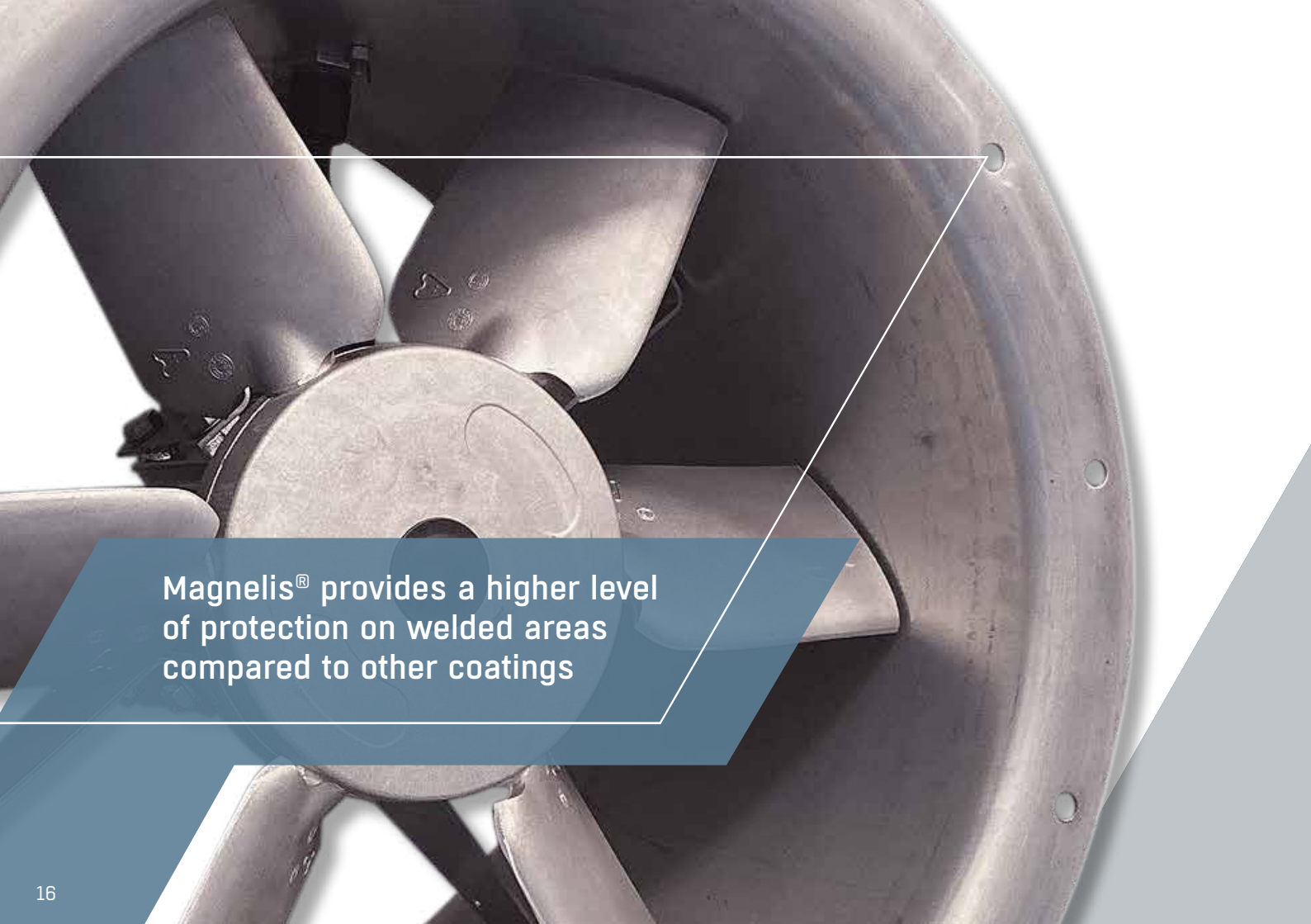
- Restriction of Hazardous Substances (RoHS)
- Registration, evaluation, authorisation and restriction of chemicals (REACH)
- Waste Electrical and Electronic Equipment (WEEE)



Environmental Product declaration

In production and during its service life, Magnelis® has a significant lower environmental impact compared to its competitors

Magnelis® meets the standard of the environmental product declaration (EPD) as per /ISO 14025/ and /EN 15804/.



Magnelis® provides a higher level of protection on welded areas compared to other coatings

Magnelis® outperforms pre-coated welded areas

Magnelis® has very clear advantages. On standard pre-galvanised, the welded area is the weak point for corrosion. Magnelis® increases the protection and lifetime of the welded zone to unprecedented levels.

Welding Process

Magnelis® offers similar weldability to standard hot dip galvanised steel. The same welding consumables, procedures, and guidelines can be used. Arc welding, spot welding, and high frequency induction (HFI) welding are all compatible with Magnelis®.

Self-healing effect

Magnelis® self-heals on cut edges and thin welded zones. The zone is progressively covered with protective Magnelis® compounds which act as a barrier to corrosion. The result is outstanding corrosion resistance, even on welded zones.

The life of a welded area can be extended significantly beyond that of a post-galvanised product if the welded area is re-protected with Magnelis®.

Magnelis® versus pre-galvanised

Magnelis® ZM120 welded, not re-protected

Galvanised Z275 welded, not re-protected

Magnelis® versus post-galvanised

Magnelis® ZM310 welded and re-protected

Post-galvanised welded

cyclic test 3CT (VDA 621-415) after 33 weeks of tests

Durability guaranteed

Longer lifetime

Magnelis® increases the lifetime of structures by a factor of three compared to hot dip galvanised solutions. In more severe environments, the benefits of Magnelis® can be even greater.

Self-healing effect

When cut, perforated, or scratched, Magnelis® slows down corrosion by forming a very dense zinc-based protective film. This ensures perfect protection of the whole structure.

Excellent workability

Profiling processes are facilitated by the excellent forming behaviour of Magnelis® as it has a lower friction coefficient than galvanised steel. The Magnelis® coating also adheres firmly to the steel to prevent powdering during processing.

Reduced coating thickness

The superior corrosion protection of Magnelis® offers our customers two possibilities. They can increase the level of corrosion protection with the same metallic coating thickness; or they can achieve the same protection while significantly reducing coating thickness.

Magnelis® guarantees a cost effective and long life solution

Low total cost of ownership

Magnelis® offers significant cost reductions as it reduces the need for ongoing maintenance and avoids the need for additional painting. This makes Magnelis® the most cost-effective solution compared to galvanised and post-galvanised corrosion protection.

Scratch resistance

As the surface of the Magnelis® material is very hard wearing, it offers excellent wear and abrasion resistance.

Outstanding corrosion protection

The excellent corrosion behaviour of Magnelis® has been extensively proven in outdoor tests. Magnelis® outperforms galvanised steel by a factor of three, and higher in more severe environments.

Improved productivity and paintability

The lower friction coefficient and improved adhesion of Magnelis® increases its processing properties. The easiness to post paint Magnelis® can bring a further improvement of corrosion resistance versus galvanised steel.

The superior corrosion resistance of Magnelis® has been demonstrated in accelerated laboratory testing and proven through outdoor tests

Appliances and Electrical Equipment

Manufacturers of appliances and electrical equipment are requesting significantly improved corrosion protection, whilst maintaining ease of manufacture and cost effectiveness. Magnelis® addresses these demands. Magnelis® is already widely used for the product casings, structural frames, and hinges of appliance units, cable trays, and cooling towers.

Construction

The remarkable corrosion resistance of Magnelis® allows it to be used for a wide range of structural applications. These include the sub-structures of ventilated facades, composite floors, purlins for roofs, side rails for walls, rainwater systems, and light steel framing. But it can also be used for roof and wall profiles in some corrosive environments such as coastal areas, agricultural structures, and water transport systems.

Rainwater

Magnelis® can be utilised in aggressive environments such as marine or agricultural areas. It is the first metallic coating steel to be classified for use in a C5 environment and comes with a guarantee up to 20-years.

Benefits of Magnelis® in a nutshell

Features		Magnelis® versus hot dip galvanised (Zn)
Anti-corrosion properties	Outdoor corrosion	+++
	Agricultural buildings (animal housing, barns, greenhouses, silos...)	+++
	Marine environments (construction, swimming pools...)	+++
	Industrial environments (acid- or alkaline-rich environments)	+
	High humidity	+++
	Contact with concrete	+++
	Abrasion	+++
	Soil corrosion	+++
	Edge protection thanks to self-healing effect	+++
	Perforations or scratches on exposed applications	+++
	Corrosion of formed parts (bent or stamped)	+++
	Temporary protection (transport, storage)	+++
Processing properties	Bending and profiling	++
	Forming and shaping	++
	Welding (equivalent coating thickness)	=
	Painting	++
	Aesthetic	++

Credits

cover	Kurp Dach
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FläktGroup

WOODS | Air Movement

EXCELLENCE IN SOLUTIONS

Fläkt Woods delivers smart and energy efficient Air Distribution and Air Quality solutions to support every application area. We offer our customers innovative technologies, high quality and outstanding performance supported by more than a hundred years of accumulated industry experience.
The widest product range in the market, and strong market presence in 65 countries worldwide, guarantee that we are always by your side, ready to deliver Excellence in Solutions.

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FläktGroup uses ArcelorMittal steels

ArcelorMittal

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