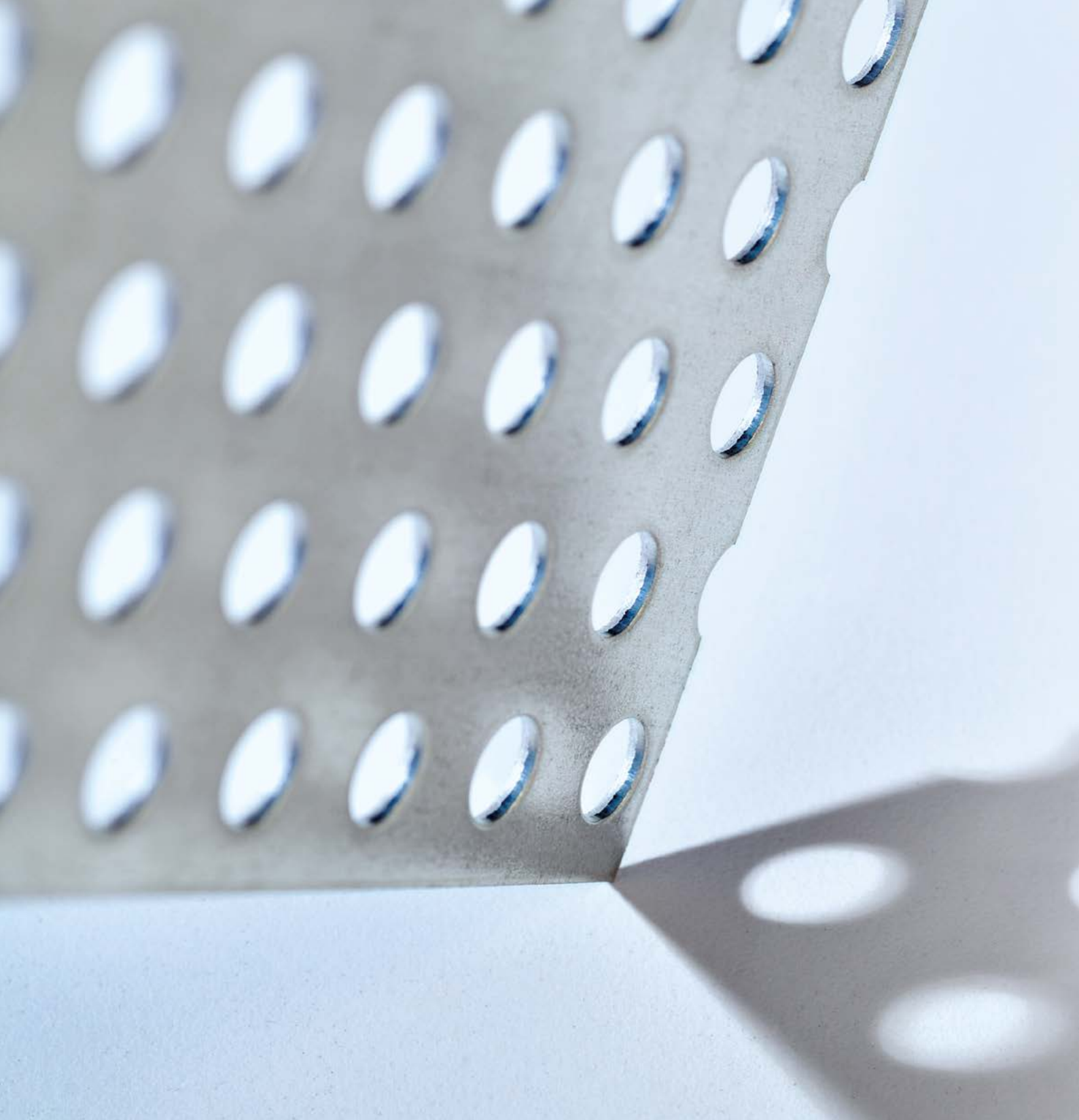
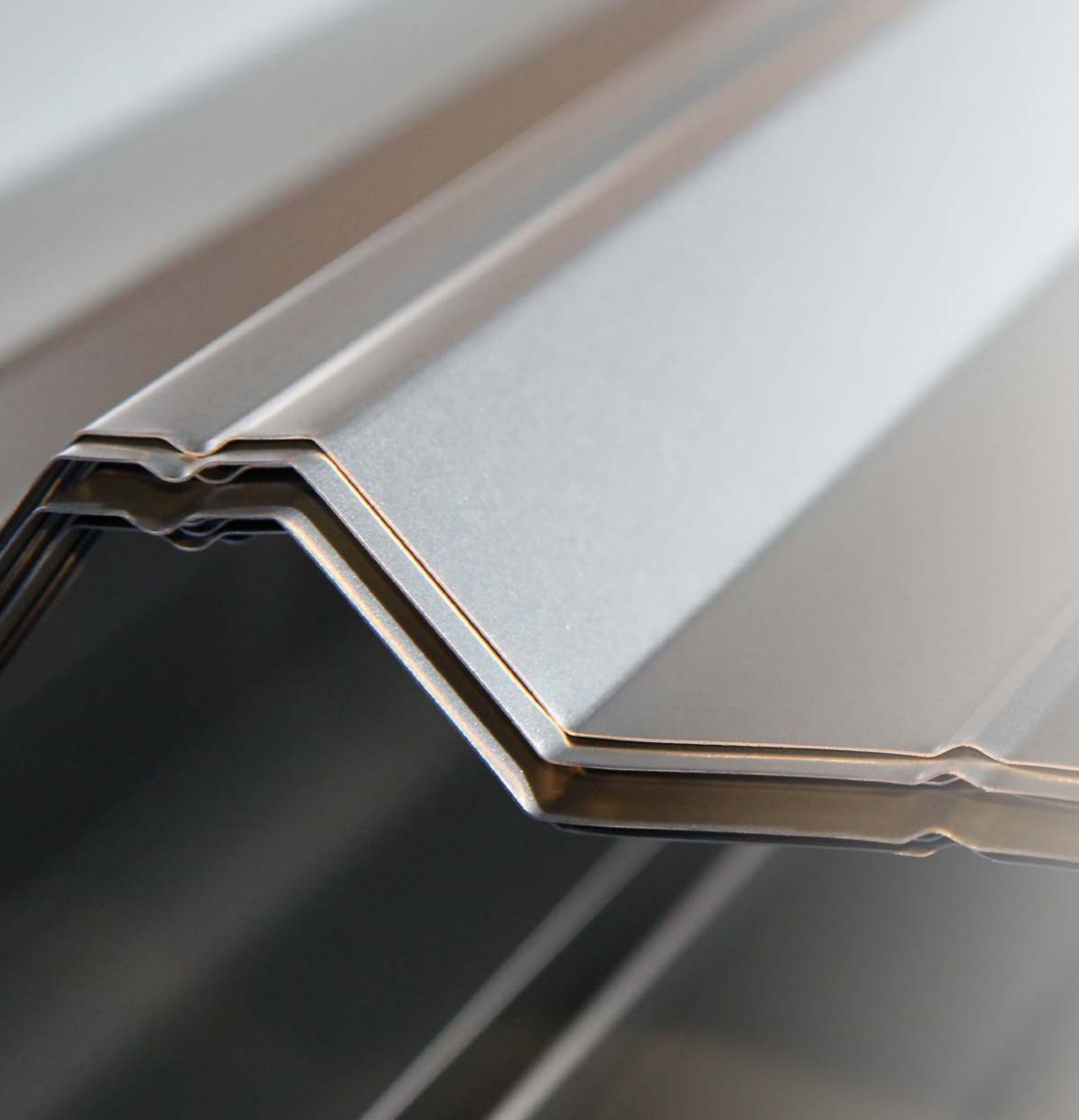
ArcelorMittal Europe – Flat Products

ArcelorMittal

Protected by Magnelis®




Protected by
Magnelis®



Protected by

Magnelis®

Main advantages

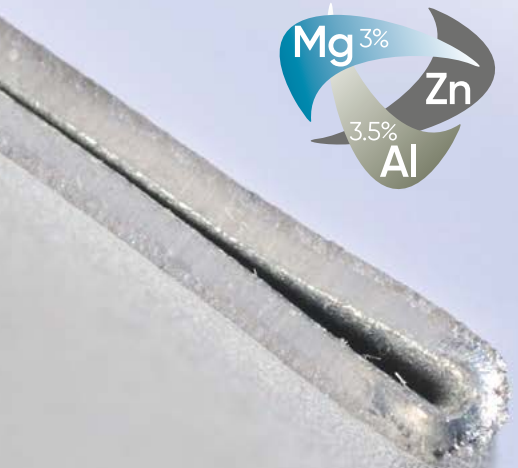
- Excellent corrosion resistance:
  three times better than galvanised steel
  (based on outdoor tests)
- Self-healing effect
  ensures excellent edge protection
- Best and most cost-effective alternative
  to post-galvanised steels
- Wide feasibility range
- Excellent processing properties
- Environmentally friendly

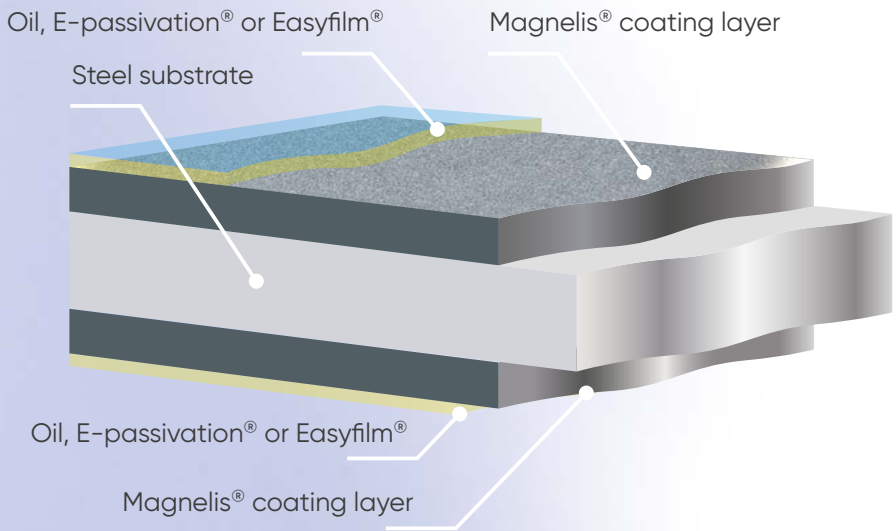
What is Magnelis® ?

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® has a naturally dark grey aspect. It is available with environmentally-friendly surface treatments: E-passivation® and Easyfilm®. It can be oiled on request.

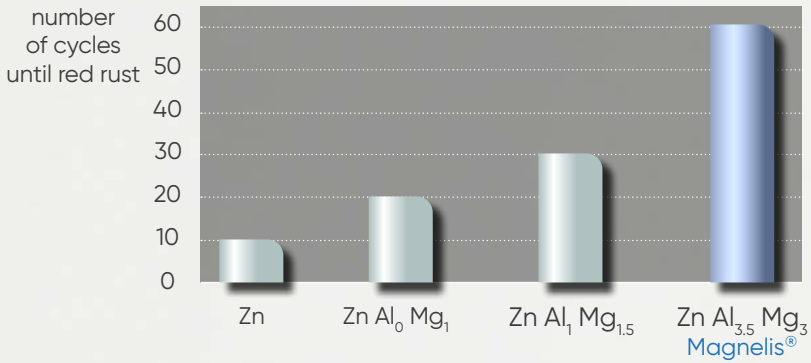
Magnelis® provides
outstanding corrosion resistance,
even in harsh environments

Outstanding corrosion performance

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

Corrosion resistance in cyclic test for different Zn, Al, Mg compositions



10 µm of coating submitted for an alternated cycling of 8 hours fog cycle (5% NaCl) / dry cycle / humidity cycle
Source: ArcelorMittal Global R&D

Magnelis® offers
deformed surfaces
extra protection

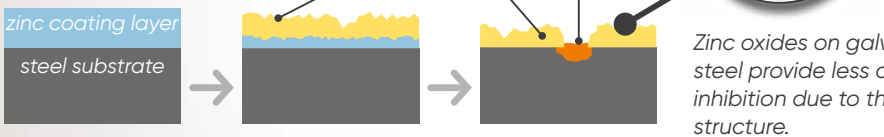
Corrosion protection mechanism

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

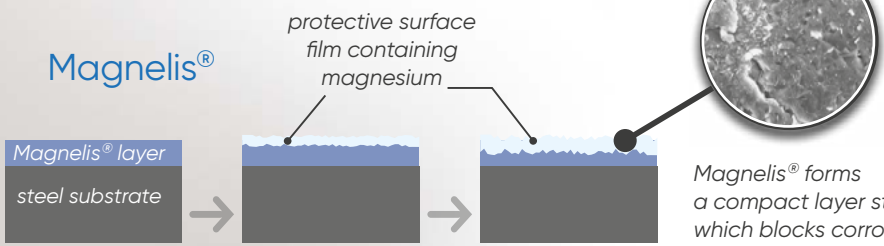
Magnelis® will even form a dense layer on highly deformed zones. This gives deformed steel shapes the same protection as flat surfaces. This is a key advantage of Magnelis® compared to other metallic coatings.

Galvanised



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

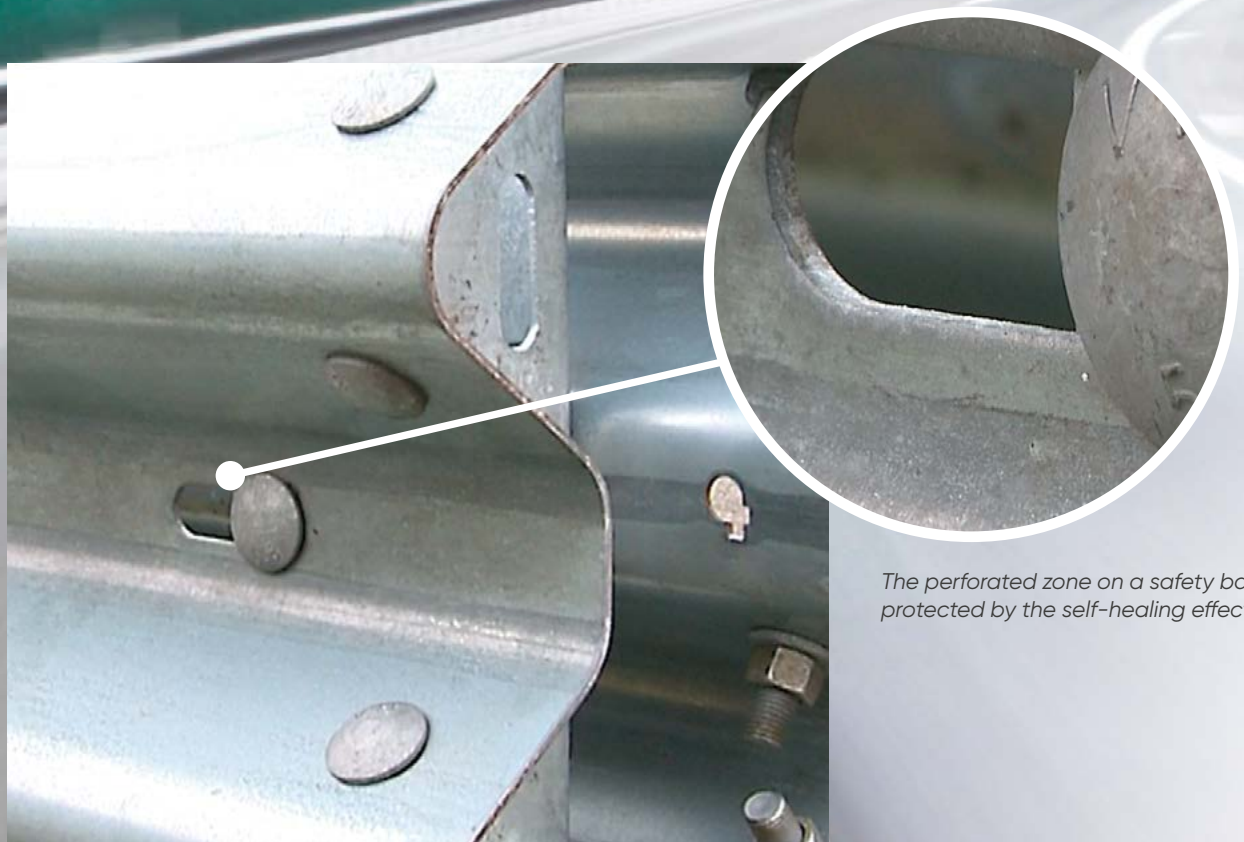
Magnelis®



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

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

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



The perforated zone on a safety barrier is protected by the self-healing effect of Magnelis®.

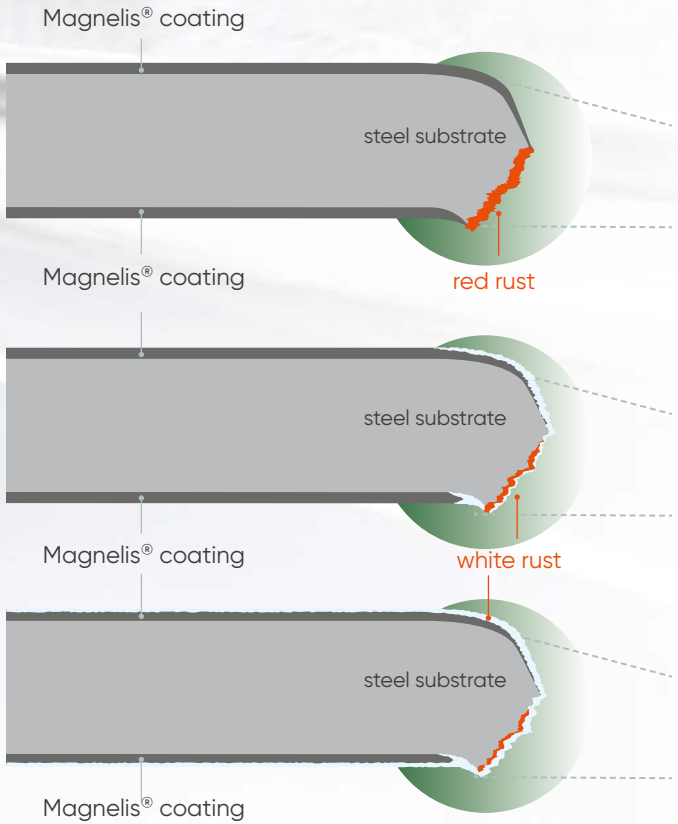
Edge protection with self-healing effect

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 rust was present on these uncoated zones, the red rust 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.

Increasing the coating weight will improve edge protection, especially for thick material.



Initial exposure period (up to several weeks)*

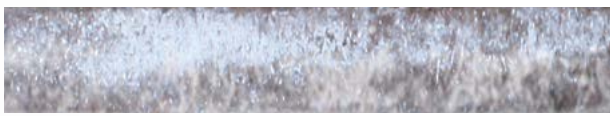
The exposed cut end of the substrate is oxidised and forms red rust.

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)*

Disappearance of red rust and increase in white rust.



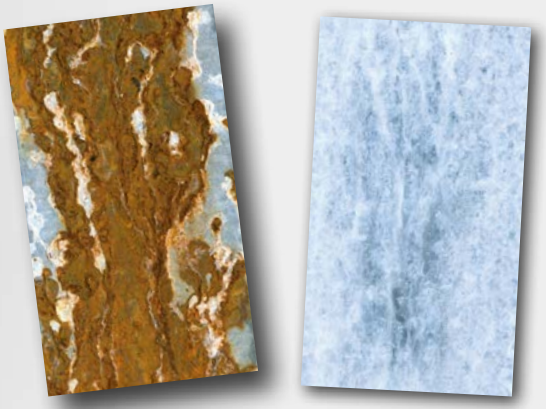
** The speed of the self-healing depends on the environment.*

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

Magnelis® samples are tested in the laboratory.

Corrosion resistance, accelerated corrosion tests

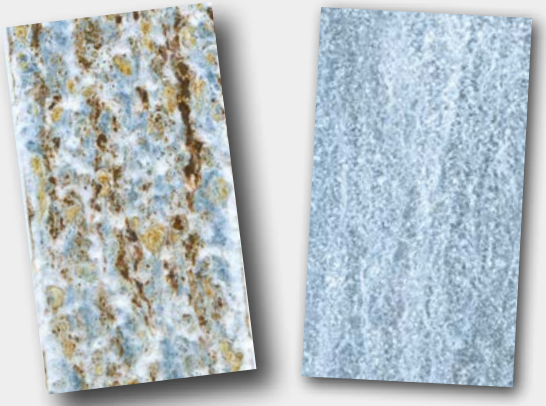
Magnelis® versus pre-galvanised (salt spray test)



Hot dip galvanised 20 µm after 6 weeks

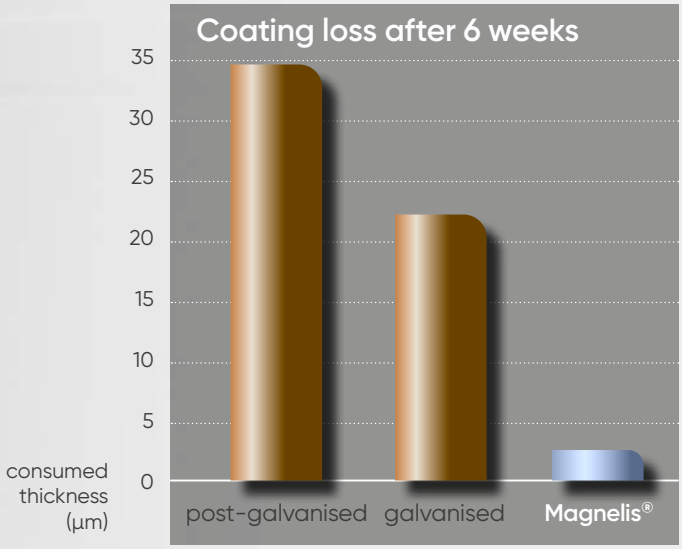
Magnelis® 20 µm after 34 weeks

Magnelis® versus post-galvanised (salt spray test)



Post-galvanised 85 µm after 12 weeks

Magnelis® 20 µm after 12 weeks

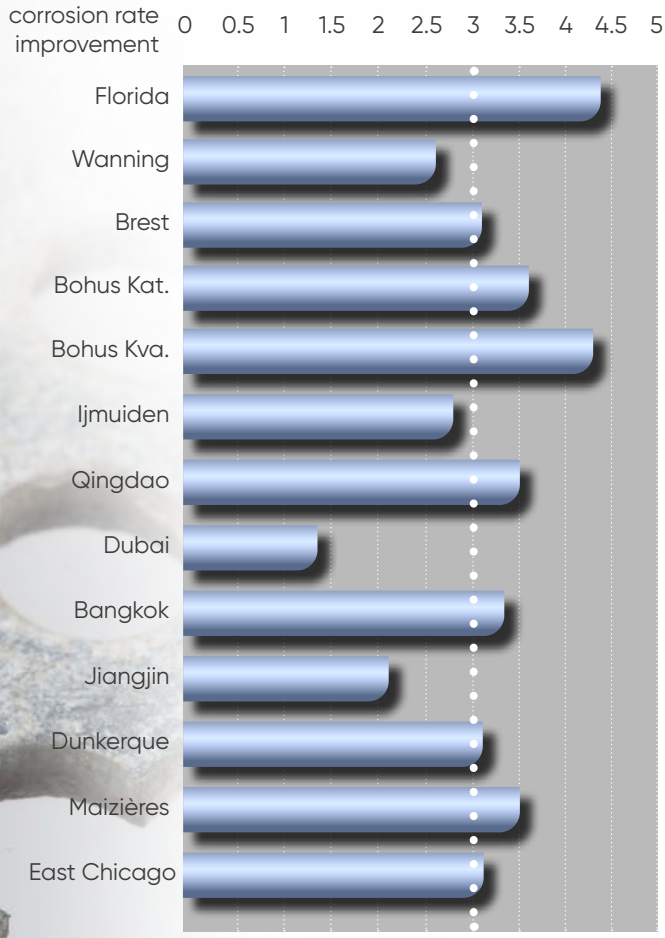


These are results from a 3CT (VDA 621-415) cyclic corrosion test. Source: ArcelorMittal Global R&D

Salt spray and cyclic corrosion test results highlighted the superior performance of Magnelis® compared to other metallic coatings.
No red rust was observed on steel with a 20 µm coating of Magnelis® after 34 weeks of salt spray testing. Magnelis® offers a real advantage over post-galvanised steel.

Magnelis® outperforms galvanised steel in all types of environments

After 6 years of testing, Magnelis® behaves on average 3 times better than regular galvanised steel



Highly perforated Magnelis® ZM250 sample after 10 years outside exposure at the French Corrosion Institute in Brest.

Corrosion resistance, proven across the world

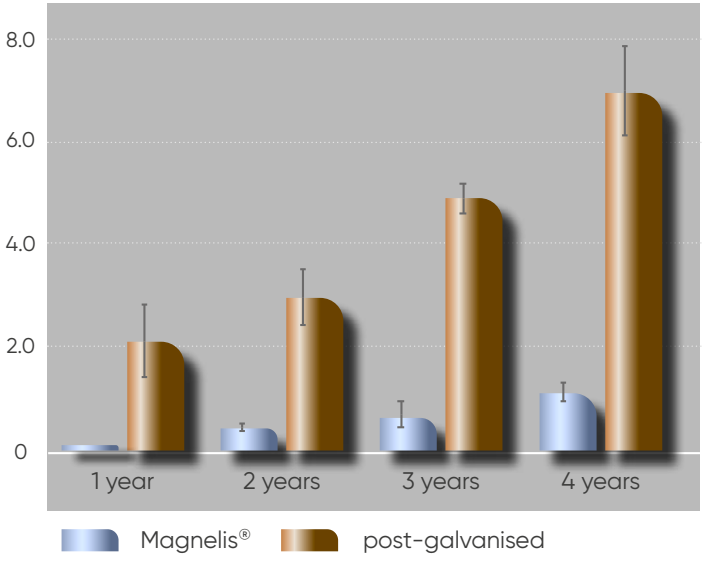
More than a thousand Magnelis® samples have been exposed to a variety of different environments around the world in outdoor tests. These tests covered the full range of outdoor environment categories (rural, industrial, marine, tropical, ...).

The samples included shapes such as flat sheets, tubes and profiles, and a range of different dimensions.

These tests have proven the improved durability of Magnelis® compared with regular galvanised steel.

In addition, updated Brest testing field results confirm the outstanding performance of Magnelis® compared with post-galvanised steel.

Average total coating consumption (µm) with standard deviation measured in Brest testing field








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

Magnelis® samples at the French Corrosion Institute in Brest.

Coating design life of 50+ years

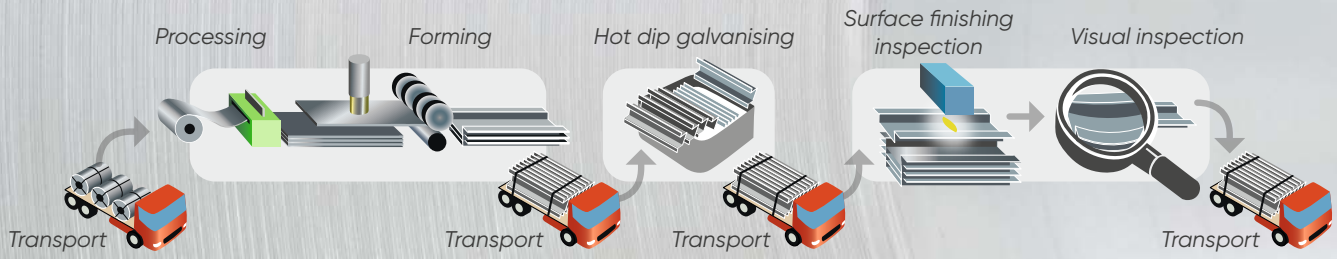
Based on all outdoor field tests, ArcelorMittal has calculated the coating design life[1] expectations for Magnelis® ZM310, ZM430 and ZM620 (respectively 25, 35 and 50 microns per side).

Corrosion category EN ISO 9223	Coating expected design life (years[1])		
	Magnelis® ZM310	Magnelis® ZM430	Magnelis® ZM620 [2]
C2	> 50	> 50	> 50
C3	30 to > 50	40 to > 50	> 50
C4	15 to 30	20 to 40	30 to > 50
C5	8 to 15	10 to 20	15 to 30

[1] *The expected coating design life is the average time until 100% of the undamaged coating, exposed only to atmospheric conditions, is consumed on the surface. At that point, the structural integrity of the coated part is no longer assured and major repair is necessary. These estimates are valid for both outdoor and indoor applications, excluding situations where the coating is in permanent contact with a moisture source, such as soil or concrete. These durations are indicative and non binding.*

[2] *feasibility on request*
Magnelis® ZM620 and ZM800 are not yet included in the EN10346:2015 norm.

Post-galvanised versus Magnelis®



Magnelis®

Cost 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.

Cost effective compared to stainless steel and aluminium

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

Reduces maintenance costs compared to post-painting:

- The use of Magnelis® can avoid the need for post-painting. This leads to cost savings and productivity improvement
- The extended durability of Magnelis® results in reduced maintenance.

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.

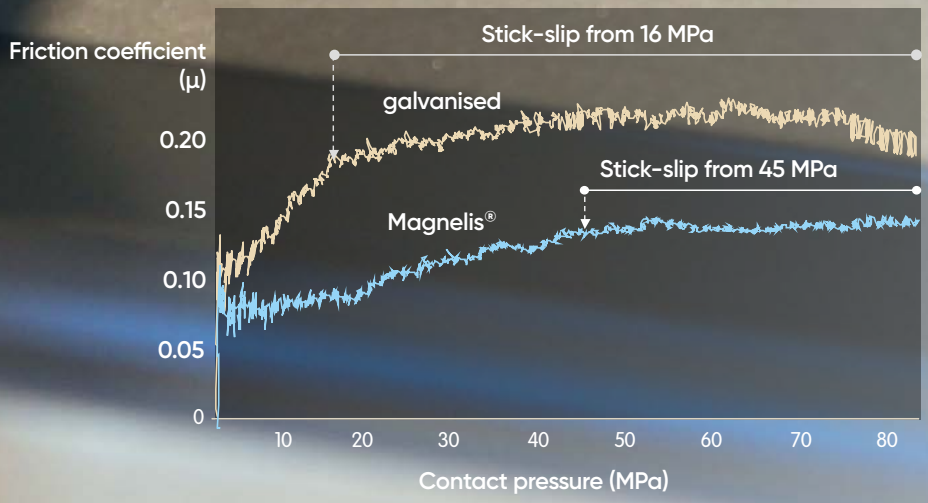
Steel thickness can range from 0.4 to 6 mm, while the coating can be from 5 to 65 µm/per side (ZM800).

Coating designation		ZM70	ZM90	ZM120	ZM175	ZM200	ZM250	ZM310	ZM430	ZM620 [1/2]	ZM800 [1/2]
Coating mass (total both sides)	g/m²	70	90	120	175	200	250	310	430	620	800
Coating thickness	µm/per side	5	7	10	14	16	20	25	35	50	65
Aspect		MA and MB aspect*									
Surface treatment		C (E-Passivation® CrVI-free), O (oiled), S (Easyfilm®)[2]									
Thickness		0.4 to 6.0 mm (0.016 to 0.236 inches)									
Width		Up to 1680 mm (66 inches)									
Steel grades [2]		DX51D to DX57D+ZM S220GD to S550GD+ZM (according to EN 10346:2015) S420GD-HyPer® to S700GD-HyPer®+ZM (Eurocode compliant) HX260LAD up to HX500LAD+ZM (according to EN 10346:2015) HX600LAD and HX700LAD+ZM									

[1] *Magnelis® ZM620 and ZM800 are not yet included in the EN10346:2015 norm.*
[2] *feasibility on request*

Friction test

Magnelis® offers improved friction behaviour.



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

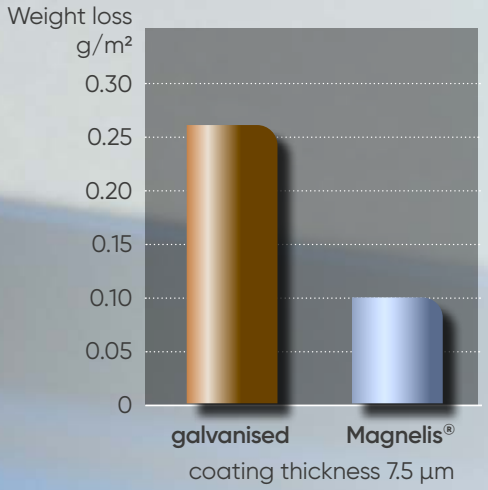
Easy to process

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 powdering behaviour.



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

Formability

Magnelis® provides better results for 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

Arc, spot, and high frequency induction (HFI) welding techniques are compatible with Magnelis®. Magnelis® offers improved weldability due to its thinner coating. Magnelis® can be welded with similar processes to zinc-coated products with adjusted parameters case by case. For arc welding, the same welding consumables, procedures, and guidelines can be used.

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.

Standards

Magnelis® is included in the EN 10346:2015 standard, extended in July 2015 to include zinc-aluminium-magnesium coatings. Whenever norm compliance is a prerequisite, architects, engineers and construction companies can now propose Magnelis®. Magnelis® is the preferred material for an increasing number of applications, including solar support structures, light steel framing in construction, agricultural applications and road infrastructure.

Magnelis® is included in the new version of ASTM A1046-17. Magnelis® is classified as a Type 2 coating.

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

Magnelis® complies with the European directives covering:

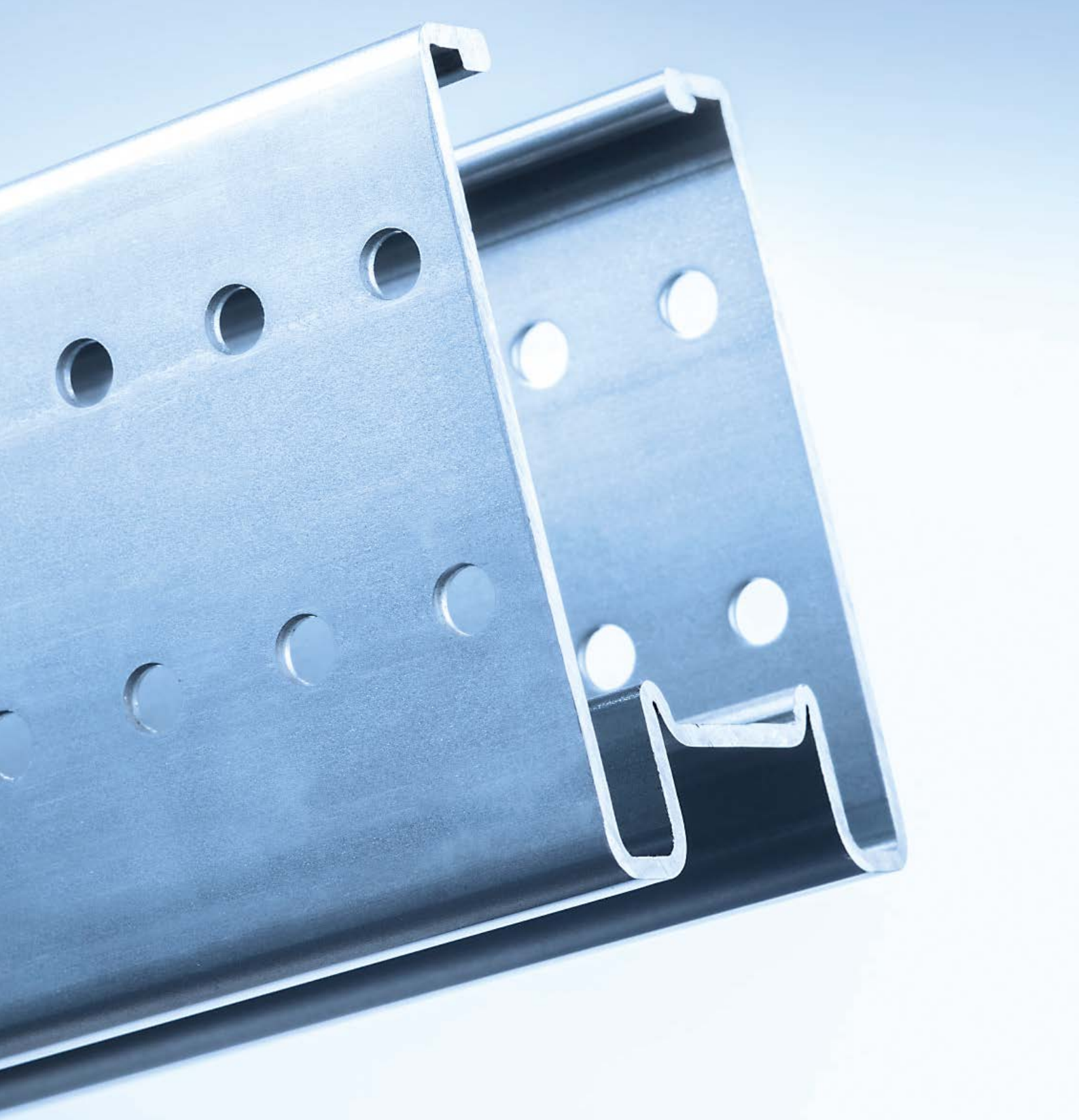
- Restriction of Hazardous Substances (RoHS)
- Registration, evaluation, authorisation and restriction of chemicals (REACH)
- Waste Electrical and Electronic Equipment (WEEE)

Coating weights

According to EN 10346:2015*

Coating Designation	Minimal total coating mass both surfaces (g/m²)		Theoretical guidance values for coating thickness per surface in the single spot test (µm)	
	Triple spot test	Single spot test	Typical value	Range
	Zinc-Magnesium alloy coating masses (ZM)			
ZM70	70	60	5.5	4 to 8
ZM90	90	75	7	5 to 10
ZM120	120	100	9	6 to 14
ZM175	175	145	13	9 to 18
ZM200	200	170	15	10 to 20
ZM250	250	215	19	13 to 25
ZM310	310	265	24	18 to 31
ZM430	430	365	35	26 to 46
ZM620*	620	525	50	34 to 66
ZM800*	800	680	65	44 to 85

** Magnelis® ZM620 and ZM800 are not yet included in the EN10346:2015 norm.*



Certifications & technical approvals

Germany: DIBt certification

Magnelis® is positioned as best-in-class for durability versus other ZM coatings according to DIN 55634-1- 2017.

Sweden: RISE certification

Technical approval no. SC0559-13: Magnelis® is the first metallic coated product that is certified for use in a C5 environment.

France: CSTB certification

Magnelis® has been recognised by CSTB as a superior coating after two technical studies (Evaluation Technique de Produits et Matériaux). The most recent conclusions include thickness up to 6.0 mm and coating up to ZM620.

UK: SCI performance review

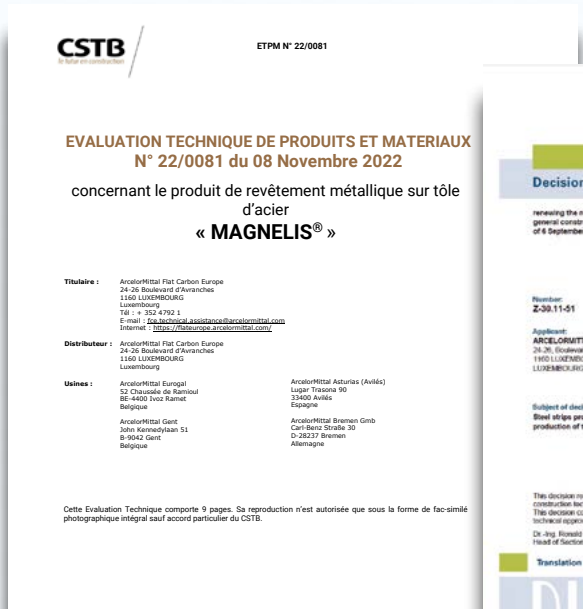
The Steel Construction Institute in UK concluded that Magnelis® ZM120 provides corrosion protection which is not less than the corrosion protection provided by Z275 coating and is well suited for the same applications as the Z275 coating when specified in UK and Irish construction. Additionally, they confirmed that Magnelis® ZM310 has, at least, the same corrosion protection as Z600.

Russia: Gost assessment

Low carbon steels with Magnelis® coating have high protective properties.

Technical approvals for crash barriers

Magnelis® solutions have been certified by bodies which oversee the crash barrier product regulations in Austria, Belgium, the Czech Republic, Norway and Spain. Certification is ongoing in other countries.



CSTB

ETPM N° 22/0081

EVALUATION TECHNIQUE DE PRODUITS ET MATERIAUX
N° 22/0081 du 08 Novembre 2022

concernant le produit de revêtement métallique sur tôle d'acier
« MAGNELIS® »

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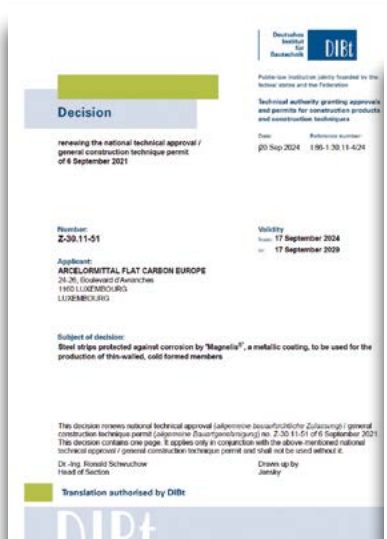


DIBt

Decision

renewing the national technical approval / general construction technique permit of 6 September 2021

Number: Z-30.11-51

Validity: 17 September 2024 to 17 September 2029

Applicant: ARCELORMITTAL FLAT CARBON EUROPE
24-26, Boulevard d'Avranches
1160 LUXEMBOURG
LUXEMBOURG

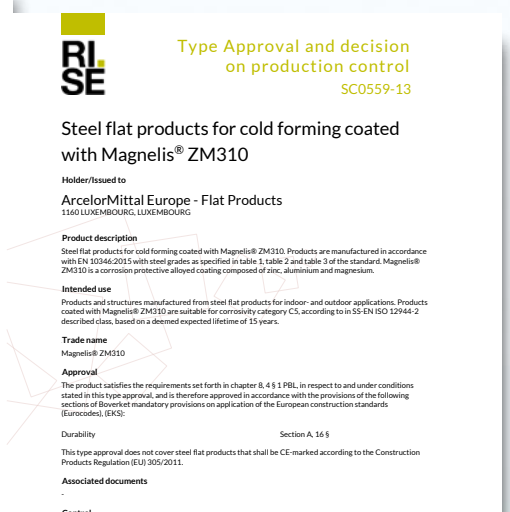
Subject of decision: Steel strips protected against corrosion by "Magnelis®", a metallic coating, to be used for the production of thin-walled, cold formed members

This decision renews national technical approval / general construction technique permit no. Z-30.11-51 of 6 September 2021. This decision contains one page. It applies only in conjunction with the above-mentioned national technical approval / general construction technique permit and shall not be used without it.

Dr.-Ing. Ronald Schwuchow
Head of Section

Drawn up by
Jansky

Translation authorised by DIBt



RI. SE

Type Approval and decision on production control
SC0559-13

Steel flat products for cold forming coated with Magnelis® ZM310

Holder/Issued to

ArcelorMittal Europe - Flat Products
1160 LUXEMBOURG, LUXEMBOURG

Product description

Steel flat products for cold forming coated with Magnelis® ZM310. Products are manufactured in accordance with EN 10346:2015 with steel grades as specified in table 1, table 2 and table 3 of the standard. Magnelis® ZM310 is a corrosion protective alloyed coating composed of zinc, aluminium and magnesium.

Intended use

Products and structures manufactured from steel flat products for indoor- and outdoor applications. Products coated with Magnelis® ZM310 are suitable for corrosivity category C5, according to in SS-EN ISO 12944-2 described class, based on a deemed expected lifetime of 15 years.

Trade name

Magnelis® ZM310

Approval

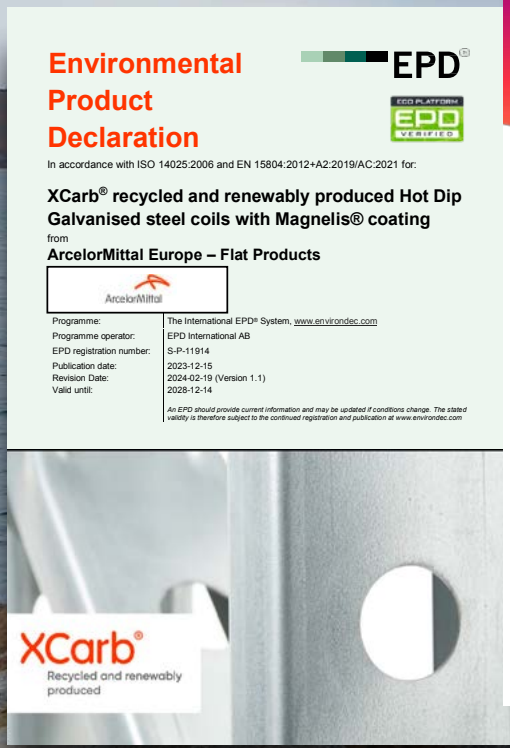
The product satisfies the requirements set forth in chapter 8, 4 § 1 PBL, in respect to and under conditions stated in this type approval, and is therefore approved in accordance with the provisions of the following sections of Boverket mandatory provisions on application of the European construction standards (Eurocodes), (EKS):

Durability Section A, 16 §

This type approval does not cover steel flat products that shall be CE-marked according to the Construction Products Regulation (EU) 305/2011.

Associated documents

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



Magnelis® is available as XCarb® recycled and renewably produced coated steel exhibiting a CO_2 footprint reduced by 65% compared with the conventional blast furnace route.

XCarb® steel certificates can be purchased alongside your Magnelis® order.

Review of Magnelis® coating performance as corrosion protection

Report to: ArcelorMittal Flat Carbon Europe
Document: RT1892
Version: 03
Date: September 2021

This report describes an independent review of the performance of the Magnelis® coating for corrosion protection which has been carried out by SCI in the UK and Ireland in September 2021.

The environmentally responsible coating

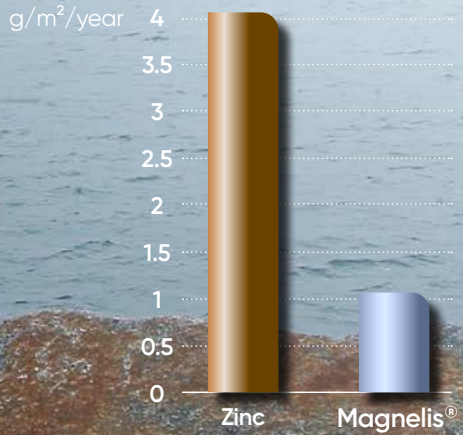
The application of a Magnelis® coating ensures the preservation of natural resources as it uses significantly less zinc than pure zinc coatings. Magnelis® also reduces zinc runoff* to soils.

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

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

Zinc runoff rate*

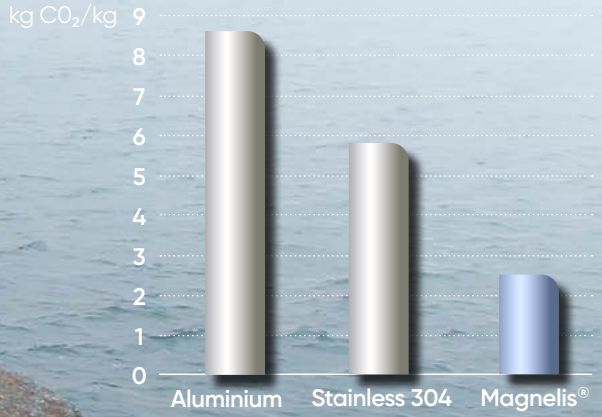
Magnelis® considerably reduces zinc runoff into soil.



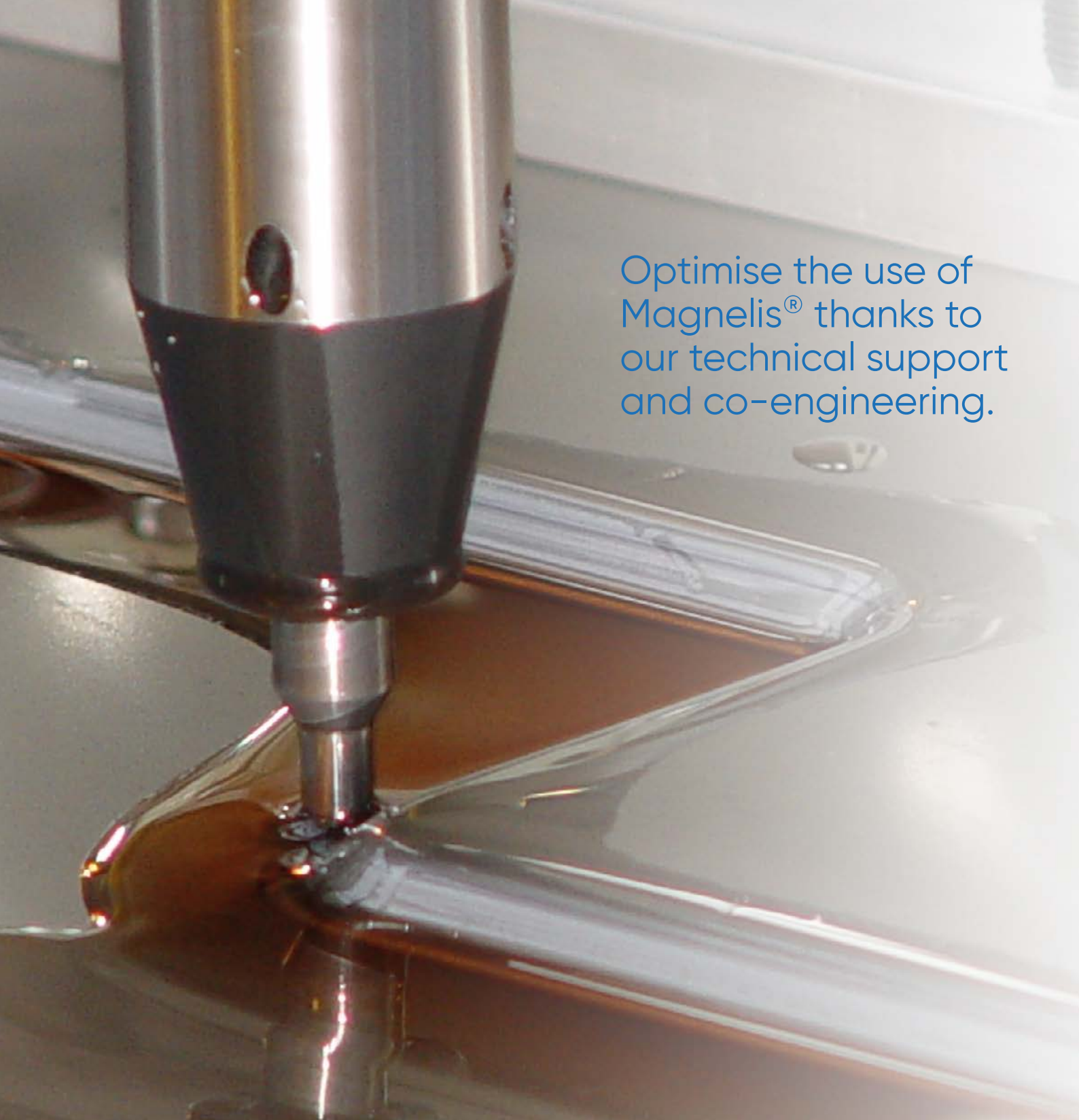
* *the rate of dissolution of a material from its surface into the soil*
Source: French Corrosion Institute

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.



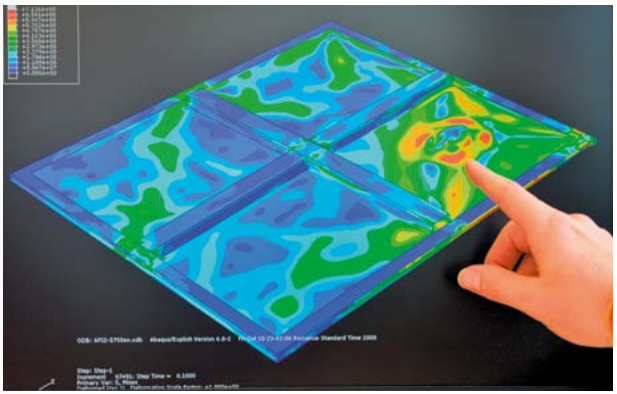
Sources: ArcelorMittal Global R&D, European Aluminium Association, World Steel Association, Eurofer


Optimise the use of
Magnelis® thanks to
our technical support
and co-engineering.

Co-engineering Magnelis® solutions

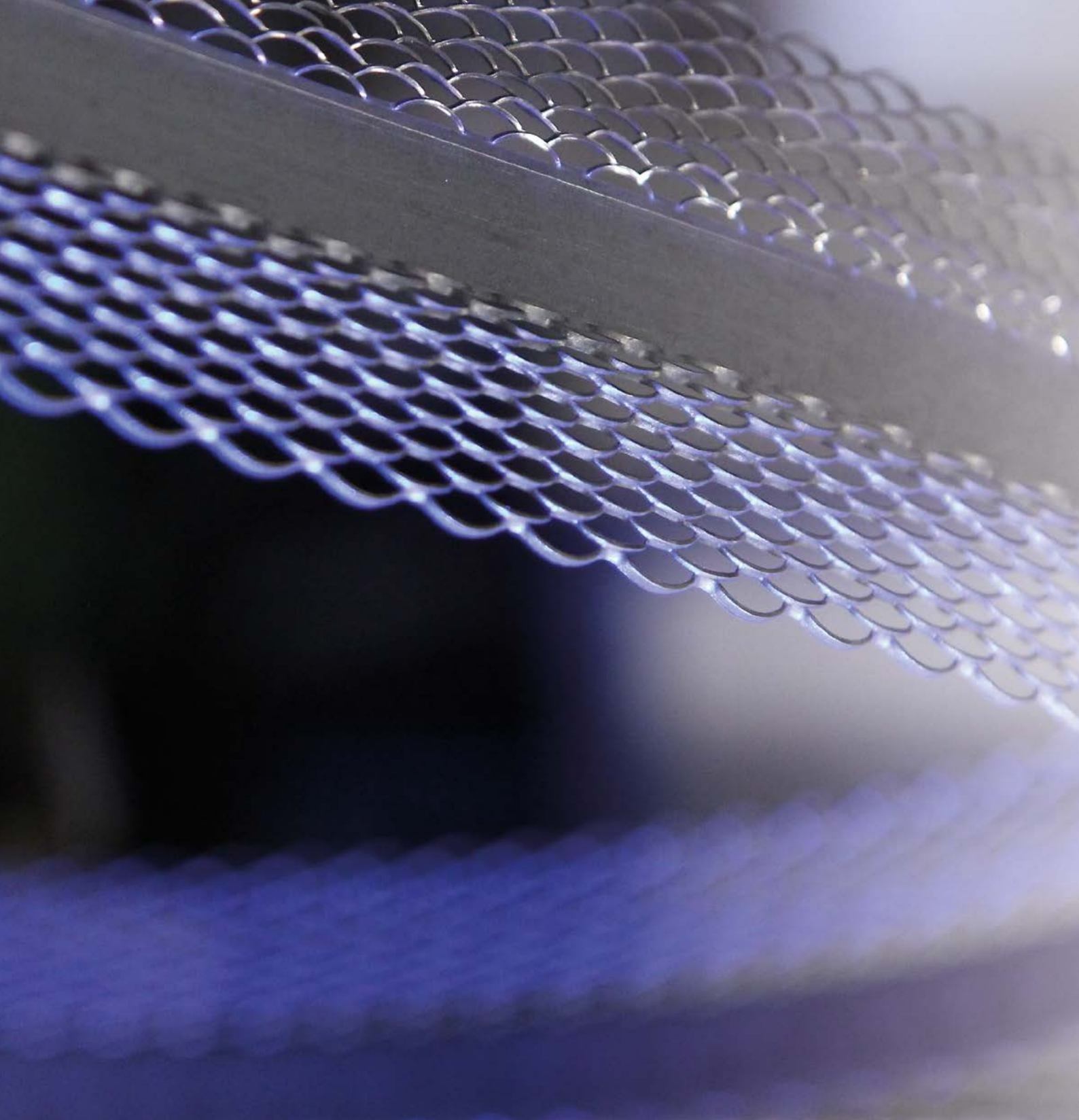
ArcelorMittal is offering an innovative co-engineering approach to its customers in order to optimise the use of Magnelis® and to achieve the best possible results and cost reduction.

Our co-engineering team includes researchers and technicians with a strong background in mechanical design.

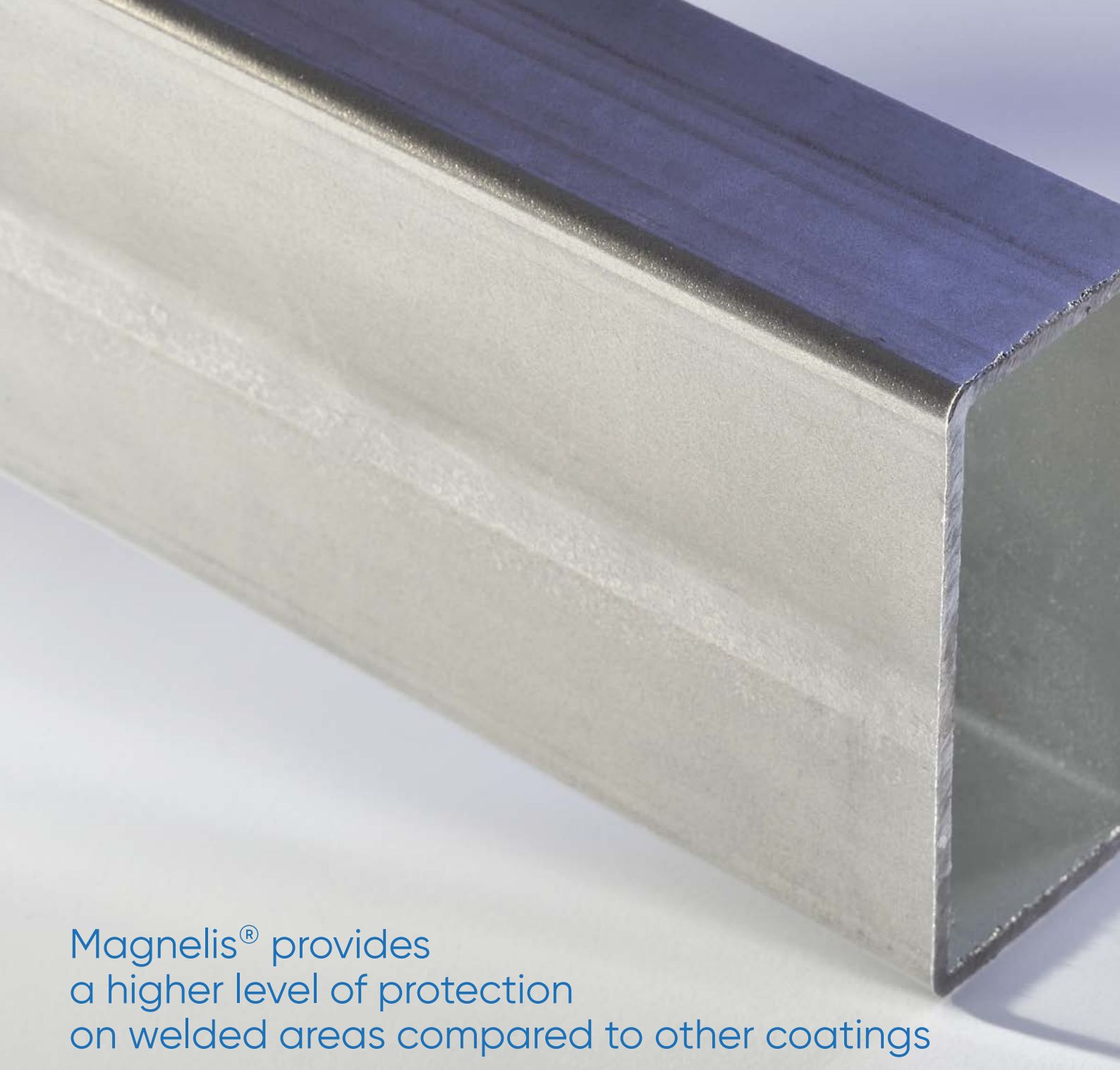


ArcelorMittal's assistance to customers can be applied at all stages of product development, from initial design through to serial production. We can help you to take every advantage of the benefits Magnelis® can offer:

- The most suitable steel grade and coating for your application
- Cost optimisation through thickness reduction and process improvements (using finite element simulations)
- Improving the quality and durability of your product
- Definition of minimal mechanical properties and thicknesses for successful production
- Deformation analysis of stamped parts to validate the theoretical analysis
- Technical support during production.



Magnelis®
the best metallic coating in a wide range of markets



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

Magnelis® outperforms pre-coated welded tubes

Magnelis® has very clear advantages when it comes to tubes. On a standard galvanised tube, the welded area is the weak point for corrosion. Magnelis® increases the protection and lifetime of the welded zone to unprecedented levels.

Processing

Arc, spot, and high frequency induction (HFI) welding techniques are compatible with Magnelis®. Magnelis® offers improved weldability due to its thinner coating. Magnelis® can be welded with similar processes to zinc-coated products with adjusted parameters case by case. For arc welding, the same welding consumables, procedures, and guidelines can be used.

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 tube can be extended significantly beyond that of a post-galvanised tube 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

The durable coating for solar structures

Magnelis® supports moves to generate clean and renewable energy by offering advanced corrosion protection for solar installations.

Magnelis® is the preferred coating solution for both concentrating solar power (CSP) plants and structural solutions for photovoltaic (PV) solar farms (ground-mounted or floating structures). It offers increased durability, the best possible protection against corrosion and abrasion.

In moderate soil conditions or areas that are subject to high levels of abrasion, we recommend Magnelis® ZM430 (35 µm coating per side). If the soil is more aggressive, Magnelis® ZM620 (50 µm/side) and Magnelis® ZM800 (65 µm/side) are recommended.

Magnelis® can be supplied in a wide range of steel grades and thicknesses up to 6 mm. This flexibility allows operators to optimise the design and total cost of their solar structures.

Magnelis® extends the life of solar structures so operators can maximise the return on their investment. Its key advantages in these applications are:

- Guaranteed* durability up to 30 years
- Improved resistance against abrasion
- Effective against corrosion even when placed in soil
- Large feasibility range both in thickness and steel grade
- Cost effective
- Rapid installation
- Reduces environmental impact.

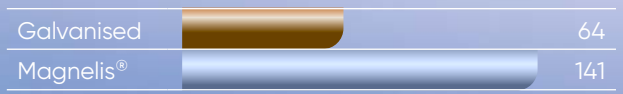
* *The Magnelis® guarantee is subject to project-specific conditions. Contact us for more information.*

Magnelis® is the preferred material for the structural components of solar fields

Optimum abrasion resistance for steel solar structures in deserts

Magnelis® has much higher hardness compared to standard zinc coatings. This has a direct and positive impact on the abrasive wear resistance of the coating.

The hardness of Magnelis® is much higher than that of hot dip galvanised coatings, increasing its resistance to abrasion

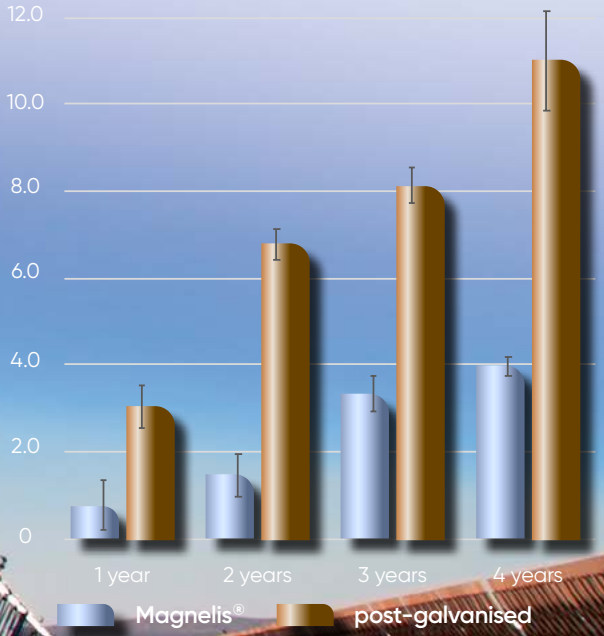


Hardness Vickers (HV)

The excellent abrasion resistance of Magnelis® has been proven through outdoor exposure tests in desert environments.

Dubai testing field updated results and confirms the outstanding performance of Magnelis® compared with post-galvanised steel.

Average total coating consumption (µm) with standard deviation



Institut de la Corrosion
French Corrosion Institute

Brest, France, October 10th 2024

Statement of the relative corrosion performance of Magnelis® in soils

The Institut de la Corrosion has performed a comparative corrosion study in soils of zinc-based coatings for ArcelorMittal. The materials studied were a continuous zinc aluminium magnesium coating (Magnelis®) with a chrome-based (Cr III) passivation, produced according to EN 10346 and a batch galvanized steel, produced according to EN ISO 1461. All samples were provided by ArcelorMittal.

The exposure consisted in a laboratory exposure under constant moisture level using i) an acidic natural sandy soil from Landes (France) and ii) a natural loam from Reminiac (France) for 1 year. The soil parameters and exposure conditions are detailed in Table 1.

Table 1: Soil parameter ranges in the corrosion studies including Magnelis® based on DIN50929-3

Parameter	Natural acidic sand (Landes)	Natural loam (Reminiac)
Exposure time	1 year	1 year
Moisture level [%water saturation]	62	61
Texture	Sand	Loam
pH	5.5	6.2
Resistivity [Ω.m]	525	170
Organic matter [g/kg]	9.8	26.6
Chlorides [mg/kg]	8.7	12.3
Sulfates [mg/kg]	440	70
Sulfides [mg/kg]	0	0
Cation Exchange Capacity [meq/kg]	13	76

The obtained results show that the average **corrosion resistance of the Magnelis® in these soils was improved by a factor of 7.1 and 1.8, compared to batch galvanized steel in Natural acidic sand and Natural loam respectively.** These factors were determined from mass losses according to the ISO 8407:2014 standard.

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Magnelis®, superior behaviour in soils

When it comes into contact with soils, Magnelis® also produces its protective film to cover the steel surface. This very dense film reduces the contact between the steel and the soil, dramatically slowing the progression of corrosion.

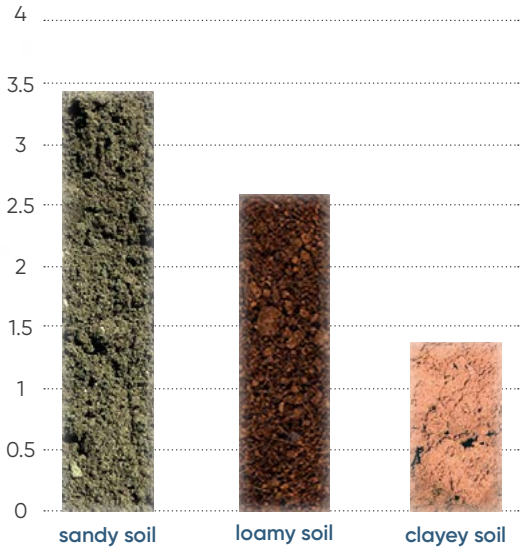
Magnelis® ZM430, ZM620 and ZM800 provide excellent corrosion protection for steel structures which are placed in soil. The exact coating should be chosen based on the local soil conditions in consultation with ArcelorMittal.

In October 2024, The French Corrosion Institute assessed the performance in soil of Magnelis®, based on mass loss according to the ISO 8407 standard.

"Corrosion resistance of Magnelis® in soils was improved by an factor of 7.1 and 1.8 compared to batch galvanized steel, depending on the soil"

In real soil field testing, Magnelis® behaves better than post-galvanised steel.

Corrosion rate improvement with Magnelis® versus post-galvanised steel



Source: ArcelorMittal Global R&D

Optimal protection for agricultural applications

Magnelis® is used in a variety of agricultural applications due to its excellent corrosion resistance in highly alkaline atmospheres (pH between 10 and 13) and those rich in ammonia.

Vineyards

Magnelis® ensures ultimate corrosion protection for vineyard poles. Poles coated with Magnelis® have a life span in line with that of the vines they support.

Poles account for more than 60% of the cost of vineyard fences. Magnelis® poles are at least 20% more cost-effective than wood and galvanised poles and can perform over the total lifetime of the vines.

Outdoor tests have proven that Magnelis® has superior corrosion resistance in soils compared to zinc-heavy coatings. Magnelis® is more stable than conventional coatings when it is placed in contact with soil.

Magnelis® is eco-friendly and reduces zinc runoff to soil considerably compared to post-galvanised products.

Greenhouses

Greenhouse structures must sustain extremely warm and humid atmospheres. Magnelis® offers excellent corrosion resistance in this application due to its very dense protective layer.

In addition to its excellent formability, Magnelis® also provides a high level of corrosion resistance on deformed parts.


OBIAL
OBIAL
OBIAL

Optimal protection for agricultural applications

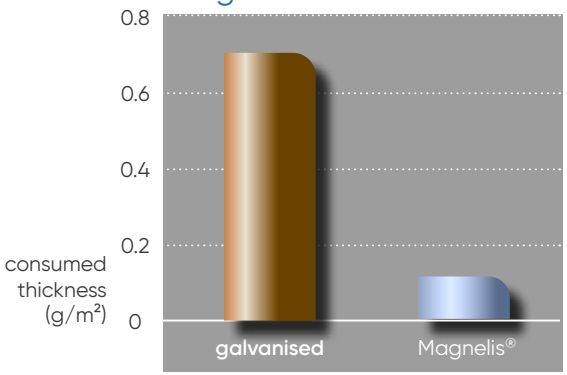
Animal housing and equipment

Farm buildings housing cattle, pigs, and poultry face severe challenges from atmospheric corrosion. Magnelis® coated profiles and tubes are the ideal answer to guarantee the durability of these structures. Multiple tests (including accelerated tests and long exposure on real farms) have demonstrated the outstanding corrosion performance of Magnelis® in animal housing. Magnelis® reduces the risk of corrosion and disease as bacteria have no corrosive areas in which to hide.

Thanks to its high surface hardness Magnelis® is also better at resisting animal scratches. Magnelis® also eliminates the need for post-painting, and can replace stainless steel or aluminium.

Magnelis® is available in all dimensions required for animal housing, and offers a very cost-effective solution.

Weight loss in g/m² in agricultural environments



Measurement of mass loss:
pH: 11.7 – Solution with 5% NH3 –
T: 20°C – Test duration 24 h

Source: ArcelorMittal Global R&D

Silos

Magnelis® offers excellent outdoor corrosion protection for silos, wherever they are located. The hard surface of Magnelis® also reduces the abrasive effect of grain on the coating.

Magnelis® is suitable for food contact applications such as the interiors of fermentation silos and meets the requirements of European regulation EC 1935/2004.

Magnelis® is available in thicknesses ranging from 0.4 to 6.0 mm, and in various steel grades, coating weights, and levels of protection.


Magnelis® guarantees a cost effective
and long life solution

Durability guaranteed

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.

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.

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.

Contact with concrete

As concrete hardens, a very alkaline environment is created. This can be extremely aggressive against coated steel. Magnelis® resists corrosion in these applications much better, and is the preferred metallic coating for applications which come into contact with concrete.

Wide feasibility range

Magnelis® is available in a wide range of high strength steels, allowing design optimisation.


Terminal de Transporte
SALIDA

Diverse range of applications

Building structures

Magnelis® is the perfect corrosion protection solution for roof structures and purlins, wall side rails, facade sub-structures, and light steel-framed structures. It can be utilised in outdoor, exposed, semi-exposed, or unexposed environments to ensure a longer lifetime than hot dip galvanised steel and other traditional coatings. The performance of Magnelis® has been proven in outdoor tests.

Rainwater and roofing systems

Magnelis® can be utilised for roofs and corrugated profiles in aggressive environments such as marine or agricultural areas. When used in rainwater systems, a 10-year guarantee is available.

Flooring

Composite floor systems made with steel and concrete are flexible and adaptable to any kind of structure or renovation. They allow large spans and reduce floor thickness while maximising interior space.

Metallic coated steel with Magnelis® is the ideal solution for durable, long lasting composite floors. It offers excellent corrosion performance when in contact with concrete or in high alkaline atmospheres.

Durable safety barriers, lighting poles, acoustic walls...

Magnelis® is widely used to protect safety barriers, lighting poles, road signs, acoustic walls, bridge parapets, and many other infrastructure applications.

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.

ArcelorMittal offers a guarantee for Magnelis® used in road safety applications.

Magnelis® is now included in the EN 1317 standard for road safety systems. Magnelis® solutions have also been certified by bodies which oversee the Construction Product Regulation. Certifications have been granted in Austria, Belgium, the Czech Republic, Norway, and Spain. Certification is ongoing in other countries.

Self-healing effect

Magnelis® offers protection for cut edges and perforations thanks to its inbuilt self-healing properties.

Reduced corrosion in soil

Outdoor tests have proven that Magnelis® has superior corrosion resistance in soils compared to zinc-heavy coatings. Magnelis® is more stable than conventional coatings when it is buried in the soil and results in less zinc runoff. Magnelis® ZM430, ZM620 and ZM800 offer the best possible corrosion protection depending on the type of soil.

Wide feasibility range

Magnelis® can be provided in a range of thicknesses and grades suitable for road safety and other infrastructure applications.

Cost competitive compared to post-galvanisation

Using Magnelis® for infrastructure applications offers clear cost advantages. Total cost of ownership is optimised as production, logistic, installation, and maintenance costs are reduced significantly.

Appliances and electrical equipment

Manufacturers of appliances and electrical equipment are requesting significantly improved corrosion protection, while maintaining processing and cost effectiveness. Magnelis® is the answer to these demands. Magnelis® is already widely used for the casings, structures, and hinges of appliance units, cable trays, and cooling towers.

Outstanding corrosion protection

The excellent corrosion behaviour of Magnelis® has been proven through extensive outdoor tests. Magnelis® outperforms galvanised steel by a factor three.

Self-healing effect

Magnelis® also protects edges and perforations thanks to its inbuilt self-healing properties.

Significantly improved protection against white rust

Conventionally galvanised steel shows substantial signs of white rust after a salt spray test. Magnelis® offers a huge improvement in white rust resistance. Salt spray tests have shown it lasts much longer.

Reduced coating thickness

The superior corrosion protection of Magnelis® offers our customers two possibilities. They can increase corrosion protection by applying the same coating thickness, or target the same level of protection with a significantly thinner metallic coating layer.

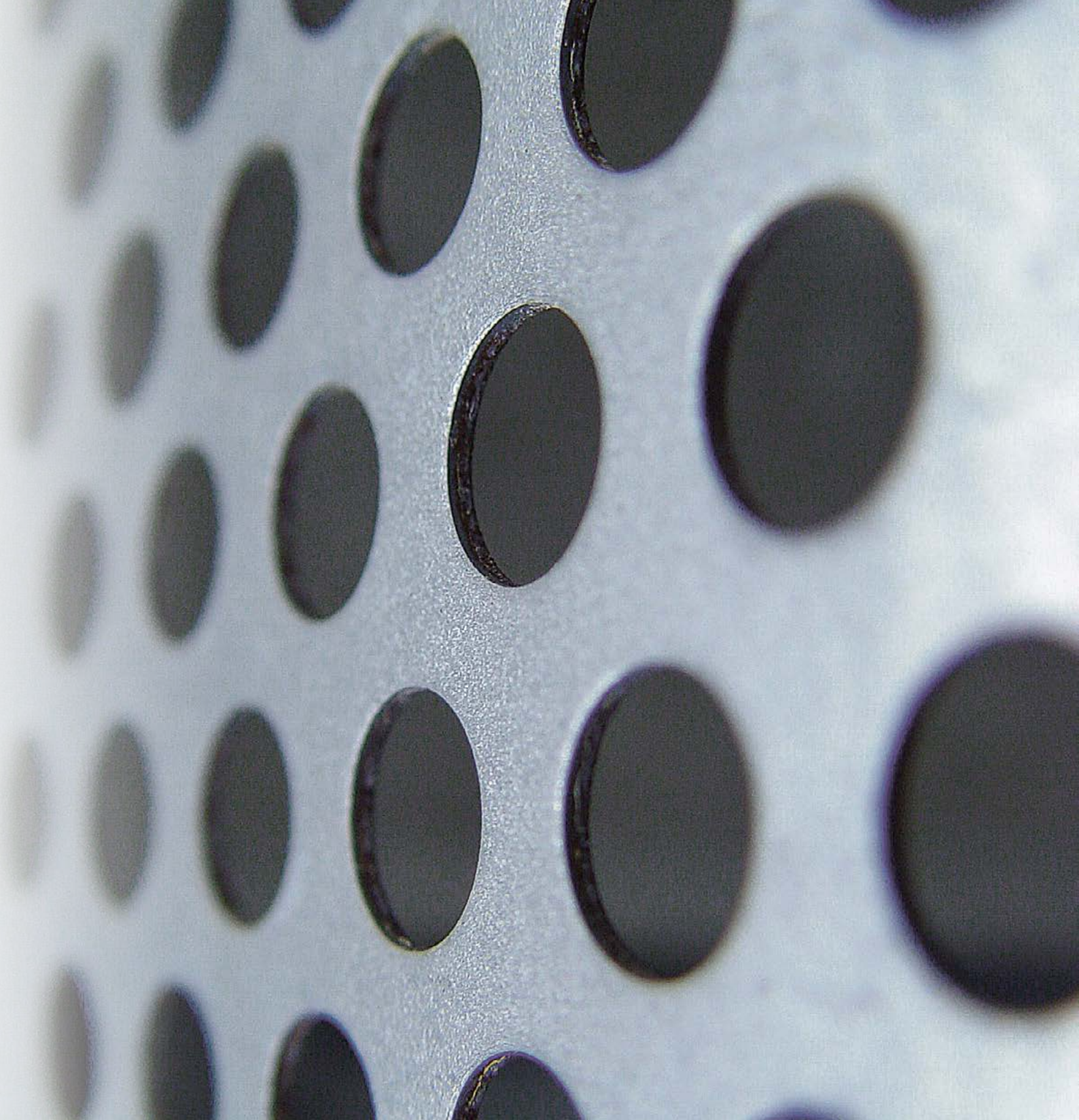
Scratch resistance

Thanks to its very high hardness, Magnelis® offers excellent wear and abrasion resistance.

Improved productivity and paintability

The lower friction coefficient and improved adhesion of Magnelis® increases its processing properties. Magnelis® is easy to post-paint, bringing a further improvement of corrosion resistance versus galvanised steel.

Magnelis® ensures corrosion resistance while maintaining the electrical conductivity of cable trays.



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	++

Credits

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