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National technical approval / General construction technique permit

Number:

Z-30.11-51

Applicant:

ARCELORMITTAL FLAT CARBON EUROPE

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Validity

from: **6 September 2021**

to: **17 September 2024**

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

The subject named above is herewith granted a national technical approval (*allgemeine bauaufsichtliche Zulassung*) / general construction technique permit (*allgemeine Bauartgenehmigung*). This decision contains eight pages.

This national technical approval / general construction technique permit replaces national technical approval / general construction technique permit no. Z-30.11-51 of 17 September 2019. The subject concerned was granted the first national technical approval on 23 July 2013.

Translation authorised by DIBt

DIBt

I GENERAL PROVISIONS

- 1 This decision confirms the fitness for use and application of the subject concerned within the meaning of the Building Codes of the federal states (*Landesbauordnungen*).
- 2 This decision does not replace the permits, approvals and certificates required by law for carrying out construction projects.
- 3 This decision is granted without prejudice to the rights of third parties, in particular private property rights.
- 4 Notwithstanding further provisions in the 'Special Provisions', copies of this decision shall be made available to the user and installer of the subject concerned. The user and installer of the subject concerned shall also be made aware that this decision must be made available at the place of use or place of application. Upon request, copies of the decision shall be provided to the authorities involved.
- 5 This decision shall be reproduced in full only. Partial publication requires the consent of DIBt. Texts and drawings in promotional material shall not contradict this decision. In the event of a discrepancy between the German original and this authorised translation, the German version shall prevail.
- 6 This decision may be revoked. The provisions contained herein may subsequently be supplemented and amended, in particular if this is required by new technical findings.
- 7 This decision is based on the information and documents provided by the applicant. Alterations to this basis are not covered by this decision and shall be notified to DIBt without delay.

II SPECIAL PROVISIONS

1 Subject concerned and field of use and application

1.1 Subject of approval and field of use

The subject of approval consists of steel flat products which have been continuously hot-dip coated with "Magnelis®", a metallic coating.

The field of use for the subject of approval is the production of corrosion-protected thin-walled members by means of cold forming. The hot-dip coated flat products can also be used as a substrate for additional organic coating systems. The products are usually supplied in the form of coils to downstream processing operations.

The national technical approval covered by this decision does not regulate the members manufactured from the flat products.

1.2 Subject of permit and field of application

The subject of the permit is the planning, design and execution of thin-walled, cold formed members manufactured from flat products coated with "Magnelis®".

The field of application is as follows: steel structures, in particular lightweight steel designs such as roof and wall elements or solar energy structures.

2 Provisions for the construction product(s)

2.1 Properties and composition

2.1.1 Materials and dimensions of the flat products

The steel grades stated in the following may be used in the manufacture of the flat products. The provisions and requirements of DIN EN 10346¹, Clauses 4 and 7, shall apply.

- a) Low carbon steels for cold forming: DIN EN 10346¹, Table 1
- b) Steels for construction: DIN EN 10346¹, Table 2, up to and including S450GD
- c) Steels with high proof strength for cold forming: DIN EN 10346¹, Table 3, up to and including HX420LAD

The sheet thicknesses of the uncoated flat products (intermediate products) range from at least 0.5 mm up to a maximum of 6.0 mm.

The mechanical properties of the finished hot-dip coated flat products shall meet the requirements set out in DIN EN 10346¹, Tables 7, 8 or 9.

DIN EN 10143² shall apply to the tolerances on dimensions and shape of the hot-dip coated flat products, irrespective of fact that the ZM coatings are not listed in the scope of the standard.

2.1.2 Materials and dimensions of the coatings

"Magnelis®" shall be categorised as a zinc-magnesium coating (ZM) in accordance with DIN EN 10346¹, Clause 3.4. More detailed information about the composition of the molten bath is deposited with DIBt.

The standard versions of "Magnelis®" are listed in Table 1. Regarding the coating mass, DIN EN 10346¹, Clauses 3.16 and 7.9, apply mutatis mutandis. The density of the coating can be assumed to be $d_{\text{Magnelis}} = 6.2 \text{ g/cm}^3$.

1	DIN EN 10346:2015-10	Continuously hot-dip coated steel flat products for cold forming – Technical delivery conditions
2	DIN EN 10143:2006-09	Continuously hot-dip coated steel sheet and strip – Tolerances on dimensions and shape

Table 1: Standard versions of "Magnelis®"

Coating Coating ID	Nominal coating mass [g/m ²]	Minimum coating mass (both surfaces)		Coating thickness (guidance value per side) Area [µm]
		Single spot test [g/m ²]	Triple spot test [g/m ²]	
Magnelis® ZM120	120	85	120	6 to 14
Magnelis® ZM250	250	215	250	13 to 25
Magnelis® ZM310	310	265	310	18 to 31
Magnelis® ZM430	430	365	430	26 to 46

2.2 Manufacture, packaging, transport, storage and marking

2.2.1 Manufacture

Unless otherwise specified in the national technical approval included in this decision and if no limitations are yielded through the selected steel grade, the manufacture of the steel and the processes of continuous hot-dip coating shall be left to the manufacturer.

2.2.2 Packaging, transport, storage

The packaging shall be arranged for in the order.

Transport and storage of the flat products shall be carried out such that their properties and appearance are not negatively altered. Information about ageing, surface alterations and effects of moisture given in DIN EN 10346¹, Clauses 6.2 and 11 shall be observed.

2.2.3 Marking

The packaging and the delivery note for the flat products which are hot-dip coated with "Magnelis®" shall be marked by the manufacturer with the national conformity mark (*Ü-Zeichen*) in accordance with the Conformity Marking Ordinances (*Übereinstimmungszeichen-Verordnungen*) of the federal states. The mark shall only be applied if the requirements given in Section 2.3 are met.

The name or identifier of the manufacturing plant as well as the steel used, including the coating ID, shall be specified in the delivery note.

2.3 Confirmation of conformity

2.3.1 General

The manufacturer shall confirm for each manufacturing plant that the surface-treated flat products comply with the provisions of the national technical approval included in this decision by way of a declaration of conformity based on factory production control and a certificate of conformity issued by a certification body recognised for these purposes as well as on regular external surveillance carried out by a recognised inspection body in accordance with the following provisions:

To issue the certificate of conformity and for external surveillance, including the associated product testing, the manufacturer of the construction product shall use a certification body and an inspection body recognised for these purposes.

The declaration of conformity shall be submitted by the manufacturer through marking of the construction products with the national conformity mark (*Ü-Zeichen*), including statement of the intended use.

The certification body shall send a copy of the certificate of conformity issued by it to DIBt.

2.3.2 Factory production control

A factory production control system shall be set up and implemented in each manufacturing plant. Factory production control shall be understood to be continuous surveillance of production by the manufacturer to ensure that the manufactured construction products satisfy the provisions of the national technical approval included in this decision.

The factory production control shall at least include the measures listed in the test plan of 17 September 2019 deposited with DIBt.

The results of factory production control shall be recorded. The records shall at least include the following information:

- designation of the construction product or the starting material or the components,
- type of check or test,
- date of manufacture and testing of the construction product or the starting material or the components,
- results of the checks and tests as well as, if applicable, comparison with requirements,
- signature of the person responsible for factory production control.

The records shall be kept for at least five years and submitted to the inspection body used for external surveillance. They shall be submitted to DIBt and the competent supreme building authority upon request.

If the test result is unsatisfactory, the manufacturer shall immediately take the necessary measures to resolve the defect. Construction products which do not meet the requirements shall be handled in such a way that they cannot be confused with compliant products. After the defect has been remedied, the relevant test shall be repeated immediately – where technically feasible and necessary to show that the defect has been eliminated.

2.3.3 External surveillance

The factory production control system shall be inspected regularly, i.e. at least once a year, by means of external surveillance at each manufacturing plant.

Initial type-testing of the construction product shall be carried out within the scope of external surveillance and samples shall be taken and inspected regularly. Samples shall be taken and tests be carried out in accordance with the test plan of 17 September 2019 deposited with DIBt.

The results of certification and external surveillance shall be kept for at least five years. They shall be submitted by the certification or inspection body to DIBt and the competent supreme building authority upon request.

3 Provisions for planning, design and execution

3.1 Planning

Unless otherwise specified below, the planning of the members protected by the "Magnelis®" coating shall be subject to the Technical Building Rules relevant for the structural works.

With regard to corrosion protection, the information given in DIN EN ISO 14713-1³ should be taken into account in the design of the structure. The protective effect of "Magnelis®" against atmospheric corrosion is shown in Table 2. The assignment is based on the assumption that the members have been formed without damage during production.

Table 2: Protective effect of "Magnelis®"

Coating	Expected protective life in years ^{a)} for exposure in corrosivity category in accordance with DIN EN ISO 55634-1 ⁴			
	C2	C3	C4	C5-M
Magnelis® ZM120	24 to > 50	8 to 24	6 to 12	- ^{b)}
Magnelis® ZM250	≥ 50	17 to 50	13 to 25	6 to 13
Magnelis® ZM310	> 50	21 to > 50	16 to 31	8 to 16
Magnelis® ZM430	> 50	29 to > 50	22 to 43	11 to 22

^{a)} Protective life based on corrosion losses determined in tests
^{b)} Application not recommended

Note: The protective effect of "Magnelis®" described in Table 2 is independent of the mechanical properties of the steel strip. When the conditions specified in this decision are adhered to, the respective protective life can also be transferred to strips, which have been continuously hot-dip coated with "Magnelis®", made of steel in accordance with Tables 1, 2 or 3 in DIN EN 10346¹ with higher strength properties than those specified in Section 2.1.1 of this decision.

If additional organic coating systems are to be applied, DIN EN 10169⁵ and DIN 55634-1⁴ shall be observed. If necessary, suitability for processing and forming shall be verified separately.

For further processing and assembly using processes in which the corrosion protection system is damaged or partially removed (e.g. drilling, dividing, welding), suitable measures for restoring the corrosion protection shall be defined. Cut surfaces above the cross-section of metal sheets up to a thickness of 1.5 mm may remain unprotected. For metal sheets coated with Magnelis® ZM250, Magnelis® ZM310 and Magnelis® ZM430, this also applies up to a thickness of 3 mm, unless there are requirements in relation to visual changes. In addition, the protection of the cut surfaces on metal sheets coated with Magnelis® ZM310 and Magnelis® ZM430 for metal sheet thicknesses larger than 3 mm and up to 6 mm can be omitted if the "corrosion allowance" defined in Section 3.2 is taken into account and if the corrosion which may be visible is acceptable.

- ³ DIN EN ISO 14713-1:2017-08 Zinc coatings - Guidelines and recommendations for the protection against corrosion of iron and steel in structures - Part 1: General principles of design and corrosion resistance
- ⁴ DIN 55634:2018-03 Paints, varnishes and coatings – Corrosion protection of supporting thin-walled building members made of steel Part 1: Requirements and test methods
- ⁵ DIN EN 10169:2012-06 Continuously organic coated (coil coated) steel flat products – Technical delivery conditions

Cut surfaces which remain unprotected after installation should always be perpendicular to the sheet metal surface. Refurbished members and areas with unprotected cut surfaces of metal sheets with a thickness of more than 3 mm should be designed to be accessible to inspection and possible repairs.

The required information and possible options for ordering the flat products which are hot-dip coated with "Magnelis®" (see DIN EN 10346¹, Clause 5) shall be agreed with the manufacturer in advance. However, options which contradict the provisions in this decision cannot be used. In relation to the inspection document to be provided with the delivery, Clause 8.1 of DIN EN 10346¹ applies.

3.2 Design

For the design of the members manufactured from the flat products which are hot-dip coated with "Magnelis®", the respective Technical Building Rules or construction technique permits apply.

The design may be carried out in accordance with Eurocode 3⁶, insofar as the decisive member regulation does not specify otherwise and the respective steel can be used in accordance with the corresponding part of DIN EN 1993⁶, taking into account the National Annex.

Unless specified otherwise in the applicable regulations, the sources listed below apply for the basic yield strength f_{yb} and the tensile strength f_u . This is not affected by the type of metallic coating (ZM) which may vary.

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|---------------------------------------|--|
| a) Low carbon steels for cold forming | DIN EN 1993-1-3 ⁷ , Table 3.1b |
| b) Steels for construction | DIN EN 10346 ¹ , Table 8, Columns 4 + 5
($f_{yb} = \min. R_{p0.2} // f_u = \min. R_m$) |
| c) Steels with high proof strength | DIN EN 1993-1-3 ⁷ , Table 3.1b |

If members are to be used which were manufactured from metal sheets with a core thickness larger than 3 mm and up to 6 mm with unprotected cut surfaces (see 3.1), the corrosion loss shall be taken into account in the design. This means that for profile legs with free ends which contribute to the load-bearing effect or stabilisation of members, shorter profile leg lengths shall be used in the design. For members used in C2 environments, the leg length used in the design shall be 1 mm shorter than the actual leg length. For members used in C3 to C5 environments, the leg length used in the design shall be 2 mm shorter than the actual leg length.

3.3 Execution

For the installation of members manufactured from the continuously hot-dip coated flat products, the execution standards decisive for the structural work shall apply (e.g. DIN EN 1090-2⁸ or DIN EN 1090-4⁹).

Damage to the corrosion protection system caused by assembly shall be suitably repaired (see Section 3.1).

Welding of the hot-dip coated steel flat products or the members manufactured from them shall only be performed by certified companies and only on the basis of qualified welding procedure specifications (verified welding methods).

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|---|-------------------------|--|
| 6 | DIN EN 1993 | Eurocode 3: Design of steel structures - various Sections (in connection with national annexes /NA) |
| 7 | DIN EN 1993-1-3:2010-12 | Eurocode 3: Design of steel structures – Part 1-3: General rules – Supplementary rules for cold-formed members and sheeting (in conjunction with National Annex EN 1993-1-3/NA:2017-05) |
| 8 | DIN EN 1090-2:2018-09 | Execution of steel structures and aluminium structures – Part 2: Technical requirements for steel structures. |
| 9 | DIN EN 1090-4:2018-09 | Execution of steel structures and aluminium structures – Part 4: Technical requirements for cold-formed structural steel elements and cold-formed structures for roof, ceiling, floor and wall applications. |

The executing company shall provide a declaration of conformity in accordance with Section 16a (5) in conjunction with Section 21 (2) of the Model Building Code to confirm the conformity of the structural work executed with members manufactured from the hot-dip coated flat products with this general construction technique permit.

4 Provisions for use, maintenance and repair

Maintenance work shall be carried out in a timely manner to ensure that the corrosion protection effect is preserved on a continuous basis.

For measures to repair or modify the members manufactured from the hot-dip coated flat products, the provisions of Section 3 shall apply mutatis mutandis.

Ronald Schwuchow
Head of Section

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