

National technical approval / General construction technique permit

Zulassungsstelle für Bauprodukte und Bauarten Bautechnisches Prüfamt

Eine vom Bund und den Ländern
gemeinsam getragene Anstalt des öffentlichen Rechts

Mitglied der EOTA, der UEAtc und der WFTAO

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Applicant:

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Validity

from: 17 September 2019
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. 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 therein 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.
- 8 The general construction technique permit included in this decision also serves as a national technical approval for the construction technique.

II SPECIAL PROVISIONS

1 Subject concerned and field of use and/or application

This decision covers steel flat products which have been continuously hot-dip coated using "Magnelis®", a metallic coating. The flat products are usually supplied in the form of coils to downstream processing operations.

The field of application for the subject of approval is the production of corrosion-protected thin-walled load-bearing or non-load-bearing members by means of cold forming. The members can be used in accordance with the protective effect of the coating in interior or exterior areas. The subject of approval can also be used as a substrate for additional organic coating systems.

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

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, to S450GD
- a) Steels with high proof strength for cold forming: DIN EN 10346¹, Table 3, to HX420LAD

The sheet thicknesses of the uncoated flat products (intermediate products) shall be between 0.5 mm and 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 field of application 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 deposited with DIBt.

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

- designation of the construction product or the starting material and 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 be 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 deposited with DIBt.

The results of certification and external surveillance shall be kept for at least five years. They shall be presented 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

The respective protective effect to be expected for the members which are protected with "Magnelis®" can be taken from Table 2. The information is based on the assumption of a corrosion-resistant design and execution (see e.g. ISO 14713-1³) and especially the following marginal conditions:

- undamaged, evenly distributed coating
- no permanent dirt accumulations
- no continuous contact to the ground or with permanently water-soaked areas.

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 reshaping shall be verified separately.

- 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

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 the corrosion which may be clearly visible is acceptable.

Cut surfaces which remain uncovered after installation should always be vertical 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.

- | | |
|---------------------------------------|--|
| 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), an allowance shall be made for a loss of material due to corrosion in the design of the profile legs which contribute to the load-bearing effect or stabilisation. The "corrosion allowance" is 1 mm for members in environments of corrosivity category C2 and 2 mm from category C3 upwards. The allowance shall be applied across the entire metal sheet thickness in the direction of the respective leg length.

| | | |
|---|-------------------------|---|
| 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) |

3.3 Execution

For the installation of members made from the continuously hot-dip coated flat products, the execution standards decisive for the structure 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 made from them shall only be performed by certified companies and only on the basis of qualified welding procedure specifications (verified welding methods).

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 made from the hot-dip coated flat products, the provisions of Section 3 shall apply mutatis mutandis.

Andreas Schult
Head of Section

Drawn up by

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