

# ISOTEC ENERJİ / TECHNICAL REPORT

## General Technical Review of ZM Coatings and Magnelis

This report is based on the S355 / S350GD / S420GD / S450GD steel grades and the ZM310 / ZM430 / ZM620 coating classes used in ISOTEC Enerji's ground-mount PV (solar) structures.

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Prepared By	Technical assessment study for ISOTEC Enerji
Usage Note	This report is based on standards uploaded by the user, manufacturer publications, EN 10204 Type 3.1 certificates, and publicly available sources verified as of 16.04.2026.

**Critical terminology note:** "Magnelis" is a registered trademark. For technical accuracy, the generic term "ZM (Zn-Al-Mg) coated steel" is used wherever possible in this study; manufacturer-specific data are separated accordingly.

## Executive Summary

- EN 10346:2015 defines the ZM coating as a coating produced by continuous hot-dip immersion in a Zn-Al-Mg bath. The standard specifies a combined Al+Mg content of 1.5% to 8% and a minimum Mg content of 0.2% in the bath.
- The S350GD, S420GD, and S450GD grades used by ISOTEC fall within the scope of EN 10346; their minimum yield strengths are 350 MPa, 420 MPa, and 450 MPa, respectively.
- ZM310 and ZM430 are listed directly in the EN 10346 tables, with typical single-side thicknesses of approximately 24 µm and 35 µm, respectively. ZM620 appears in manufacturer technical publications but is not normatively included in EN 10346:2015.
- Magnelis® is a trademark of ArcelorMittal; its official technical publication lists the coating bath as Zn - 3.5% Al - 3% Mg. POSCO PosMAC® 3.0, according to publicly available technical literature, is defined as Zn - 3% Mg - 2.5% Al.
- The current EN 10204 Type 3.1 certificates you have uploaded indicate POSCO PosMAC-based product rather than Magnelis. Therefore, procurement and warranty language must distinguish between the brand-independent "ZM" designation and the brand-specific "Magnelis / PosMAC" designations.
- In PV plant mounting structures, the most critical engineering topics are: coating class, steel strength, cut-edge behavior, contact with soil or alkaline media, abrasion, post-weld repair, and compliance with EN 1090-2 and TS 13891.

## 1. ISOTEC Material Matrix and Current Usage Overview

Within the ISOTEC product catalog, the ground-mount ISOGROUND system specifies SDG ST52 steel for columns, beams, and braces, and SDG/ZMI S355 steel and/or aluminum 6063-T66 for purlins. The same catalog provides a 12-year warranty for all mounting systems.

Element Group	Main Material at ISOTEC	Surface Protection Approach / Note
Main load-bearing column / beam / brace	ST52 / S355 grade hot-rolled steel	Typical approach: black steel supply followed by hot-dip galvanizing

Element Group	Main Material at ISOTEC	Surface Protection Approach / Note
Purlins / secondary profiles	S355 and higher-grade coated flat steel or aluminum	Pre-galvanized / ZM-coated product is suitable for thin-walled formed profiles
Fasteners	Stainless steel A2-70	Interface control required to mitigate galvanic-coupling risk
Rails / clamps	Aluminum 6063-T66 / EN 6005	Insulation and water drainage are critical where steel contacts aluminum

**Important finding:** In the uploaded 3.1 certificates, the product is listed as "EN 10346 S350GD + ZM310" and "EN 10346 S450GD + ZM310", while the commercial product name is shown as POSCO / PosMAC (Zn-Mg-Al coated coil). Therefore, the current supply is — as a brand — not Magnelis, but — as a generic class — ZM-coated steel.

## 2. Terminology: ZM, Magnelis, and PosMAC Are Not the Same

Term	Correct Technical Meaning	Implication for ISOTEC
ZM coating	Generic Zn-Al-Mg coating family within the scope of EN 10346	This is the primary technical class for specification language
Magnelis®	ArcelorMittal trademark; official composition Zn - 3.5% Al - 3% Mg	Performance / warranty claims are manufacturer-specific
PosMAC® 3.0	POSCO trademark; Zn - 3% Mg - 2.5% Al per publicly available data	Your current 3.1 certificates point to this family
"Magnelis sheet" phrasing	Widely used in the field, but technically brand-confusing	In internal procedures, this should be revised to "ZM-coated steel"

From a technical and legal standpoint, the safest approach is to state "ZM-coated steel in accordance with EN 10346" when brand-independent performance is required, and to separately specify "Magnelis®" or "PosMAC® 3.0" (supplier-specific identification) when brand-specific performance is required.

## 3. Steel Grades and Minimum Mechanical Requirements per EN 10346

EN 10346 lists S350GD, S420GD, and S450GD as coated steels intended for structural use. Per the chemical and mechanical tables of the same standard, these three grades are subject to the following minimum mechanical values.

Grade	Min. Yield Strength Rp0.2 (MPa)	Min. Tensile Strength Rm (MPa)	Min. A80 Elongation (%)	ISOTEC Comment
S350GD	350	420	16	Very close to S355; a transitional grade
S420GD	420	480	15	Strong candidate for section downsizing and weight reduction
S450GD	450	510	14	Strong candidate for more aggressive optimization

Figure 1. Comparison of minimum yield strengths for the structural steel grades in use.

On the chemistry side, EN 10346 sets the following upper limits for structural steels: C ≤ 0.20%, Si ≤ 0.60%, Mn ≤ 1.70%, P ≤ 0.10%, and S ≤ 0.045%. If the supplier uses additional alloying, this must be explicitly stated on the inspection document.

## 4. ZM Coating Classes and Practical Thickness Equivalents

EN 10346 expresses the coating designation as a total two-sided surface mass. In practice, ZM310 and ZM430 are the two most critical classes for PV plant mounting structures. ZM620, though common in manufacturer technical publications, is not listed in the normative table of EN 10346:2015.

Coating Class	Total Coating Mass (g/m <sup>2</sup> )	Typical Thickness per Side	Status
ZM310	310	≈ 24 µm/side	EN 10346 normative
ZM430	430	35 µm/side	EN 10346 normative
ZM620	620	≈ 50 µm/side	Manufacturer data / special class outside the standard

EN 10346 also provides an orientation value of 6.2 to 6.6 g/cm<sup>3</sup> for ZM coating density. Per the standard, if a single-side distribution assumption is required, it may be assumed that at least 40% of the total single test value applies to one side; however, the actual distribution can vary depending on the supplier's process.

## 5. Coating Chemistry: General Norm vs. Magnelis vs. PosMAC

Source / Product Family	Coating Chemistry Approach	Technical Implication
Generic ZM per EN 10346	Al + Mg total 1.5%-8%; Mg ≥ 0.2%; balance Zn	This is the brand-independent framework per the standard
Magnelis® (ArcelorMittal)	Zn - 3.5% Al - 3% Mg	High edge protection and manufacturer-specific performance claims are tied to this chemistry
PosMAC® 3.0 (POSCO)	Zn - 3% Mg - 2.5% Al	More consistent with your existing 3.1 certificates; performance must be verified against supplier data

Accordingly, "ZM coating" and "Magnelis" must not be used as synonyms. Per the standard, different manufacturers within the same ZM class may use different bath chemistries and process optimizations. Therefore, warranty terms, field performance, and brand-specific technical publications should be considered valid only for the specific branded product.

## 6. Most Critical Engineering Topics for PV Plant Mounting Structures

- **Cut edge and hole behavior:** The main advantage of ZM products emerges here; however, this performance is also manufacturer-specific.
- **Abrasion / desert applications:** The Magnelis technical publication reports higher hardness and better abrasion behavior than conventional hot-dip galvanizing.
- **Soil and concrete contact:** The atmospheric C1-C5 life table does not cover continuous moisture / soil / concrete contact; separate field data is required.
- **Post-weld and cut repair:** Per EN 1090-2, if a pre-coated product is to be welded, the repair method must be defined in advance.

- **Galvanic coupling:** TS 13891 and EN 1090-2 require prevention of galvanic coupling at steel-aluminum or stainless-steel contact zones.
- **Storage and shipment:** The oil/passivation protection specified in EN 10346 is temporary; it cannot be interpreted as field durability.

## 7. Conclusions and Recommended Terminology Revision for ISOTEC

For quality management and procurement discipline, the following language set is recommended:

- **Brand-independent specification:** "ZM430 coating on S420GD or S450GD grade steel, in accordance with EN 10346."
- **Brand-specific specification:** Where required, "ArcelorMittal Magnelis®" or "POSCO PosMAC® 3.0" must be explicitly named and the brand's publication attached.
- The phrase "Magnelis sheet" should only be used for lots where Magnelis is actually supplied.
- At minimum, the following four fields must be checked on 3.1 certificates: grade designation, coating class, mechanical results, and coating test / conformity declaration.

***The single most correct corporate approach:** Within ISOTEC, the term "ZM-coated steel" should be used as the generic technical class; brand names such as "Magnelis" and "PosMAC" should be managed separately as supplier / brand subclasses.*

## References

- TS EN 10346:2015 – pp. 7, 13, 20, 25, 26, 29, 32-34 (company-uploaded copy).
- TS 13891:2019 – pp. 5-9, clauses 5.2, 5.5, and 6.2 (company-uploaded copy).
- TS EN 1090-2:2018 – pp. 80-81, clauses 10.4, 10.5, and 10.9 (company-uploaded copy).
- ArcelorMittal Magnelis® technical brochure – pp. 19, 23, 27, 29, 39, 41, 43, 49 (uploaded file).
- POSCO / PosMAC publicly available technical document summaries and internally uploaded 3.1 certificates; access date: 16.04.2026.
- ISOTEC Product Catalog – pp. 2 and 5 (uploaded file).