

ZM / Magnelis® / PosMAC®: Protection Level Beyond Standard HDG for Utility-Scale PV Steel

Zinc-Aluminium-Magnesium (ZM) coated steel — especially on thin-gauge, perforated, roll-formed, bent, and series-produced components — delivers significantly higher corrosion resistance, self-healing behaviour at cut edges, and a leaner production flow compared to conventional hot-dip galvanising (HDG).

Steel Grades and Coating Classes

Steel grades: S350GD / S420GD / S450GD

ZM coating classes: ZM310 / ZM430 / ZM620

Standard: EN 10346:2015 (continuously hot-dip Zn-Al-Mg coated steel)

The Three Core Advantages Over Standard HDG

1. Up to 3× Longer Service Life

Under comparable atmospheric conditions, ZM achieves considerably longer coating lifetimes across corrosivity categories C2 to C5 than a standard hot-dip galvanised coating of equivalent thickness.

2. Self-Healing

At cut edges and minor mechanical damage, a protective zinc-rich oxide film forms: the active Mg-Al-Zn chemistry actively "heals" the exposed steel area — a behaviour that pure HDG does not provide.

3. Fewer Process Steps, Lower Cost

Because the steel strip is pre-coated in a continuous coil coating process, the post-fabrication immersion galvanising of individual components is eliminated. Result: less rework, reduced distortion risk, higher series productivity.

Easy Explanation: Why ZM Protects More Intelligently

Topic	ZM (Magnelis® / PosMAC®)	Standard HDG
Coating logic	Zn-Al-Mg alloy bath: thinner layer, longer life	Pure zinc bath: thicker, but less corrosion reserve
Cut edge	Self-healing — no additional effort required	Additional protection recommended at exposed edges
Perforated parts	Protection penetrates the entire surface, including inside holes	Applications with tight cavities problematic
Coating process	Directly on the coil — no post-dip galvanising	Individual galvanising + inspection + control
Production flow	Direct, streamlined workflow	Bath → cooling → inspection

Conclusion: ZM technology (Magnelis® or PosMAC®) is the competitive next-generation solution for PV series production: not an ordinary coating, but a new generation that clearly surpasses standard HDG.

Why Is ZM Superior to HDG from the Customer's Perspective?

- Proven higher atmospheric durability

- Cut edges, perforations, and joint areas actively protected
- Roll-forming and bending process capability
- No post-bending rework required
- Stable structural geometry and tight dimensional tolerance

Why Does This Create Added Value in Utility-Scale PV?

1. Lightweight, sharp-edged, series-produced profiles — particularly for mid-clamps, end-clamps, cable holders, rails, and substructures. 2. Consistent surface quality and colour tone — critical for tenders with high aesthetic requirements. 3. Series-capable, high-availability components — stable supply and quality chain.

The Difference That Makes the Difference: Self-Healing

At cut edges, drilled holes, or minor surface damage, the Zn-Al-Mg chemistry forms a new protective phase and actively stops corrosion. This behaviour is the decisive criterion that sets ZM apart from standard HDG in PV series production.

ZM Group vs. Standard HDG: The Decision Matrix for Utility-Scale PV

Short version: For secondary, perforated, and series-produced PV components, ZM offers a clear advantage in the majority of scenarios.

Decision Matrix

Decision topic	ZM (Magnelis® / PosMAC®)	Standard HDG
Atmospheric corrosion	Long service life in most atmospheric classes	Base-level protection, limited edge reserve
Cut edge and perforation	No additional effort required thanks to self-healing	Additional treatment required at open edges
Hole / cutout / opening	Active protection throughout the entire surface chemistry	Application challenging in tight regions
Process and supply chain	Direct from the coil coating process	Individual galvanising + additional inspection + control
Dimensional stability	No shock-distortion risk after dip bath	Thermal bath distortion must be managed
Coating density and flat-sheet coverage	Target performance at lower coating mass	Typically thicker coating required
Heavy structural primary parts	Application-specific evaluation required	Established solution remains valid

Process Difference = Time Difference

- Standard (HDG): Black steel element → rework/pickling → hot-dip bath → cooling → inspection
- ZM / Magnelis® / PosMAC®: Pre-coated coil → roll-forming/profile shaping → finishing
- Result: fewer process steps, shorter lead time, lower cost burden.

Concrete Gains for the Customer

1. Rapid series delivery — because parts are produced directly from pre-coated strip. 2. Confidence at edges and perforations — through active self-healing. 3. Stable structural geometry — no shock-distortion risk in the dip bath. 4. Leaner project flow — fewer processes, fewer open risks, more consistent quality.

Where Does HDG Remain Justified?

- On heavy, massive primary structural profiles and node components.
- In fields where a proven zinc reserve is part of the safety concept.
- On components that can only be coated after final machining.

Closing Statement

ZM / Magnelis® / PosMAC® is, in secondary utility-scale PV steel, not an ordinary coating but the new generation of protection that clearly surpasses standard HDG.

Standard references: EN 10346 | EN 10204 | ISO 9227 | ISO 12944 | ISO 8353:2024

This document is based on technical publications by ArcelorMittal and POSCO, standards EN 10346 and ISO 8353:2024, as well as openly available public sources. Data as of: 16.04.2026.