High Performance structural coated steel grades

S420GD-HyPer® – S450GD-HyPer® – S550GD-HyPer®

Metallic coated structural steel grades are widely used in the construction market for a range of applications, including building (load-bearing profiles for roofs & walls, purlins, rails, facade understructures, prefabricated frames, flooring, door & window frames etc), solar mounting structures, silos and scaffolding tubes.

Steels for construction, defined according to the EN 10346:2015 standard, are normally used for these applications. However, the market is continuously demanding for more cost-effective steel solutions. ArcelorMittal has therefore developed lighter, stronger, thinner, more reliable, more durable and more sustainable products to build long-lasting and robust structures:

- Lighter and stronger product – thickness and weight reduction combined with higher strength allowing new design opportunities or increased load-bearing capacity.
  In addition, the structures must be better able to withstand wind and pressure and offer very good seismic resistance.
- Durable – improved corrosion resistance with the use of zinc or zinc-aluminium-magnesium Magnelis® coating to protect the structures.
- Sustainable product, reduced environmental impact linked to lightweight and reduced material use. Fully recyclable or reusable at end of life.
- Cost-effective – overall cost savings due to weight reduction and lower manufacturing costs.

ArcelorMittal now offers three new steel grades covered by these new guarantees:
S420GD-HyPer® +Z/ZM,
S450GD-HyPer® +Z/ZM and
S550GD-HyPer® +Z/ZM

These grades have additional technical guarantees compared with the EN 10346:2015 standard and fulfil the ductility requirements of "Eurocode 3 parts 1-1, 1-3 and 1-12":

- A minimum proportional elongation of 15% for grades S420GD-HyPer®, S450GD-HyPer® and S550GD-HyPer®
- Ultimate strain higher than 15x yield strain
- Ratio of min. tensile strength to min. yield strength on parts is more than 1.1 for grades S420GD-HyPer® and S450GD-HyPer® and more than 1.05 for grade S550GD-HyPer®, in line with Eurocode EN 1993 ductility requirements (in parts EN 1993-1-3 and EN 1993-1-12).

These steel grades are available in the form of coils, slit coils and cut-to-length sheets.

Technical characteristics

Chemical composition

The guaranteed values for the chemical composition of these new grades are shown in the table below.

Grade	Guaranteed chemistry, ladle analysis, mass %				
	C	Mn	Si	P	S
S420GD-HyPer®	≤ 0.2	≤ 1.7	≤ 0.6	≤ 0.1	≤ 0.045
S450GD-HyPer®	≤ 0.2	≤ 1.7	≤ 0.6	≤ 0.1	≤ 0.045
S550GD-HyPer®	≤ 0.2	≤ 1.7	≤ 0.6	≤ 0.1	≤ 0.045

S550GD-HyPer® is an alloyed steel grade conform to EN 10020 and a structural steel grade conform to EN 10346:2015, for which the composition of the steel shall be mentioned on the product test certificate.

Tensile properties

The tensile properties of these new grades are shown in the table below.

Grade	Thickness range (mm)	Longitudinal direction			
		Yield strength R_{eH} (MPa)	Ultimate tensile strength R_m (MPa)	A_{80} (%)	Ultimate tensile strength/ Yield strength
S420GD-HyPer®	0.5 - 0.7	≥ 420	480 - 620	≥ 15	≥ 1.1
	0.7 - 3	≥ 420	480 - 620	≥ 15	≥ 1.1
	3 - 6	≥ 420	480 - 620	≥ 15	≥ 1.1
S450GD-HyPer®	0.5 - 0.7	≥ 450	510 - 650	≥ 15	≥ 1.1
	0.7 - 3	≥ 450	510 - 650	≥ 15	≥ 1.1
	3 - 6	≥ 450	510 - 650	≥ 15	≥ 1.1
S550GD-HyPer®	0.7 - 2	≥ 550	600 - 760	≥ 13	≥ 1.05
	2 - 3	≥ 550	600 - 760	≥ 13	≥ 1.05
	3 - 5	≥ 550	600 - 760	≥ 13	≥ 1.05
	5 - 6	≥ 550	600 - 760	≥ 14	≥ 1.05

Bending ability

Bending angle	Direction	Radius/ Thickness
90°	Rolling direction	1
	Transverse direction	1
180°	Rolling direction	1
	Transverse direction	1.5

Dimensional feasibility

S420GD-HyPer®, S450GD-HyPer® and S550GD-HyPer® steel grades are available in coils in gauges from 0.5 to 6 mm and widths from 800 to 1680 mm. These grades can also be delivered as slit coils and cut-to-length sheets. Other dimensions can be supplied on request.

Tolerances

S420GD-HyPer®, S450GD-HyPer® and S550GD-HyPer® steel grades can be delivered with mill edges or trimmed edges. Thickness tolerances correspond at least to Tables 3 and 4 in EN 10143:2006.
On request, it is possible to deliver material with tighter tolerances. Standard flatness tolerances on sheets correspond to EN 10143:2006 but narrower tolerances are possible on request.

Coating weight and surface finish

S420GD-HyPer®, S450GD-HyPer® and S550GD-HyPer® steel grades are available with zinc coating weights from Z100 to Z600. They are also available with Magnelis® coating with coating weights from ZM90 to ZM430[(1)].

They can be ordered with an A or B finish. Oiling, E-Passivation® or Easyfilm® [(2)] protections are possible.

Finally, they can also be delivered in a pre-painted state with the Granite® range developed by ArcelorMittal.

In-use properties

Cold forming

S420GD-HyPer®, S450GD-HyPer® and S550GD-HyPer® steel grades have excellent cold forming, cutting and piercing performance. They are specifically designed for bending, profiling and light drawing operations. However, the use of these grades will require, at equal thickness, higher punching and shearing forces. In addition, higher springback must be expected after roll forming, which can nevertheless be compensated by adjusting the roll position.

As with all metallic coated steel grades, caution is recommended during bending, profiling or drawing operations to avoid damaging the coating by cracking or peeling, which are associated with these severe deformations. In addition, the presence of the metallic coating has a significant effect on the tribological behaviour of the product compared to bare product. ArcelorMittal can advise end users about the best material choice for a given tool or surface treatment.

(1) Maximum coating thickness depends on the substrate
(2) Easyfilm® currently only on Z coatings

Assembling

S420GD-HyPer®, S450GD-HyPer® and S550GD-HyPer® steel grades are compatible with several commonly used joining techniques.

Screwing

Screwing is generally performed using self-tapping screws. It is important to note that the screws must be appropriate for the mechanical properties of steel. Screw manufacturers can provide a complete range of products suitable for every type of steel grade.

Welding

S420GD-HyPer®, S450GD-HyPer® and S550GD-HyPer® steel grades can be welded using all common joining methods, such as MIG/MAG or TIG. The MAG process is, however, most recommended. Specific wire and shielding gas (Ar/CO_2) must be used to avoid porosities in the weld seam caused by trapped zinc fumes emanating from the coating. Specific flux-cored wires are available for this application. And finally, the welding of galvanised steels or Magnelis® requires an efficient fume extraction system.

Seam or spot welding is also possible with these grades. However, welding conditions may need to be adapted, depending on the level of mechanical properties and the coating: increased electrode force and welding time, type of electrode and welding schedule.

Re-protection of welds using common methods may be necessary on fusion- and heat-affected zones to ensure continuity of the corrosion protection.

Any questions?

Ask them via our contact form on
industry.arcelormittal.com/getintouch

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PR-LE-HYP-EN – 10/2020 – Published by ArcelorMittal Europe Communications