

STEELGRID® HR SYSTEM HIGH RESISTANCE GEOCOMPOSITE MESH SYSTEM

The new **Steelgrid®** HR System is an innovative complete system for rockfall mitigation and slope consolidation works. The **Steelgrid®** HR System combines a patented high strength steel wire mesh geocomposite which is used in conjunction with anchor plates, specific U-bolts and mesh connectors. The **Steelgrid®** HR mesh is a composite of double twisted steel wire hexagonal mesh with high tensile strength steel cables, woven into the mesh during the manufacturing process.

The high level corrosion protection for the steel wire mesh and ropes (Class A Zn-Al5% Galvanised), and for the accessories makes the **Steelgrid®** HR System ideal for rockfall protection in all continental environments.

Innovation in the Maccaferri manufacturing process adapts the traditional twisting process to create a 'hybrid mesh'; the mesh features a combination of full and half-hexagonal shaped mesh apertures. To provide high tensile strength and punching resistance at low-strain, the steel cables lie predominantly straight within the hexagonal mesh. As the



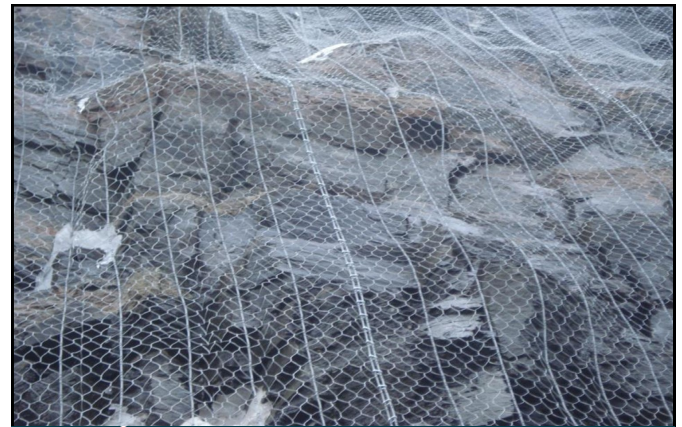
Figure 1: Steelgrid HR 30

mesh offers immediate resistance to loads at minimal strain, there is no requirement to pre-tension the mesh.

The post-manufacturing alignment of the steel cables within **Steelgrid®** HR can vary depending on the rope spacing and position within the roll. Performance testing is carried out in compliance with this natural variability. When the mesh is installed and loaded, the ropes lie straight within the mesh offering high strength and stiffness (strength at low strain) in comparison with traditional double twist and single twist meshes; elongation of **Steelgrid®** HR is in the range of 5-7% compared with 16-23% for double twist meshes depending on mesh / wire combinations. Punch resistance, tested in accordance with UNI 11437, shows a greater improvement with average increases of 20-40% compared with double twist meshes.

Steelgrid HR Variant	Nominal longitudinal tensile strength (Peak value)
HR 30	177 kN/m
HR 50	122 kN/m
HR 100	80 kN/m

Table 1: Longitudinal Tensile Performance



Steelgrid® HR System

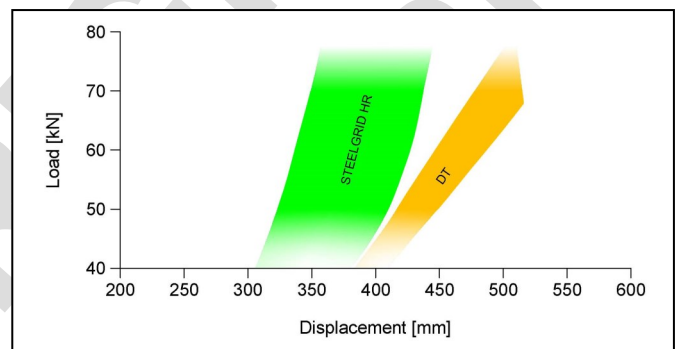


Figure 2: Punch test performance comparison

Steelgrid HR variant	Punching displacement at 50kN punching force	Ultimate punching force	Ultimate punching displacement
HR 30	<330 mm	149 kN	420 mm
HR 50	<360 mm	125 kN	470 mm
HR100	<420 mm	85 kN	455 mm

Table 2: Punch test performance (UNI 11437)

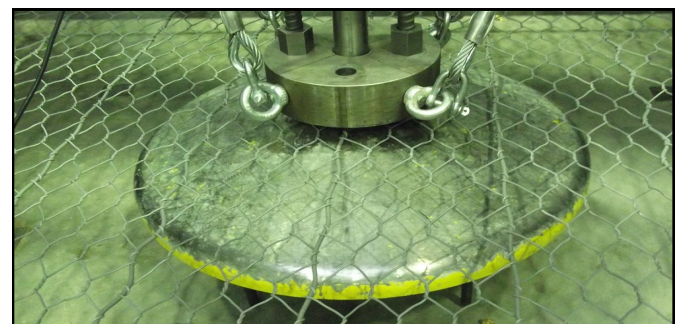
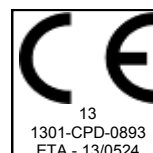


Figure 3: Punching test



n° 226/001

Steelgrid® HR system is installed in the same general way as conventional double twist mesh. It is easy to handle and will not require extensive modification of existing method statements and installation techniques. The inclusion of the steel ropes greatly enhances the transfer of loads from the mesh into the anchorage system thereby increasing safety, capacity and durability of the mesh as a complete system. The accessories supplied by Maccaferri together with the **Steelgrid® HR system** (especially the steel plate to be combined together with possible anchors) deliver a system characterized by high performance and reassurance.

Steel wire used for double twist hexagonal mesh

- **Tensile strength:** The wire used for the manufacture of mesh shall have a tensile strength between 380-550N/mm² (EN 10223-3). Wire tolerances (see Table 3) are in accordance with EN 10218 (Class T1).
- **Elongation:** Elongation shall be not lower than 9%, (EN 10223-3).
- **GalMac® coating:** Minimum quantities of GalMac® shown at Table 2 meet the requirements of EN 10244-2 (Class A).
- **Adhesion of GalMac®:** The adhesion of the GalMac® coating to the wire shall be in accordance with EN 10244-2.
- **Outwearing accelerated aging test:** In a general condensation of moisture containing sulfur dioxide test (28 cycles) according to EN ISO 6988 (without showing signs of red rust).

Steel wire ropes

- **Surface finish of component rope wires:** Zinc-Aluminium alloy (Zn-5%Al) coated to Class A ["A (Zn/Al)"] in accordance with EN 10244-2.
- **Rope outside diameter:** 8 mm.
- **Rope construction:** "6x7WC - WSC" described in accordance with EN 12385-2 2008 and EN 12385-4 2008.
- **Nominal grade of rope:** 1770 N/mm² according to EN 12385-4 2008.
- **Minimum breaking load (MBL) of rope:** 40.7 kN as defined in EN 12385-4 2008.

Table 3: Standard production data

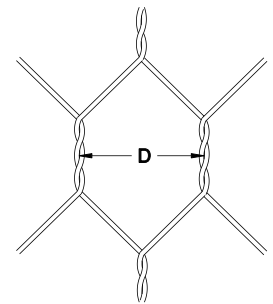
Steelgrid HR variant	Nominal roll width (by truck)	Nominal roll width (by container)	Nominal roll length
HR 30	3.15m	2.85m	25/40m
HR 50	3.25m	2.75m	25/40m
HR 100	3.10m	2.85m	25/40m

All sizes and dimensions are nominal. Confirmation should be sought from regional office prior to placement of an order. Mesh production tolerances of ±3% of the length, ±5% of the width, ±8% of rope spacing shall be permitted.

Table 4: Standard double twist mesh and wire data

Mesh type	D (mm)	Ø Wire (mm)
8x10	80	2.70
Mesh wire diameter	Ø mm	2.70
Wire diameter tolerance	(±) Ø mm	0.06
GalMac® minimum quantity	gr/m ²	245
Longitudinal rope diameter	Ø mm	8.00

The tolerance on the opening of mesh 'D' being the distance between the axis of two consecutive twists, is according to EN 10223-3



Double Twist Hexagonal Mesh detail information



U-bolt wire rope grip ("HR GRIP")



Steel plate ("HR PLATE")



Mesh connectors ("HR LINK")

WARNING: Install all rockfall and mesh products in accordance with National or Local Legal and Security Requirements. If the installation is performed by working insuspension or using security ropes, personal protective equipment against fall risk must be connected with anchor points in agreement with EN 795 or other relevant regional equivalent standards and practices.

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