

GeoSteel G2000

Hardwire™ unidirectional, extra-high strength galvanized steel fibre sheets, made of steel micro-cords, fixed to a fibreglass micromesh. GeoSteel G2000 is specific for use in structural strengthening in combination with GeoLite® Gel organic matrix.

Thanks to its characteristics GeoSteel G2000 is easy to shape and has excellent installation and durability properties. GeoSteel sheets guarantee superior properties than traditional carbon-glass-aramide fibre textiles, and are particularly effective in various structural strengthening and anti-seismic improvement or compliance operations, as well as in the creation of connection systems.



CE mark in combination with GeoLite® Gel for concrete structures

PRODUCT STRENGTHS

- High durability thanks to the special steel wire galvanization process, tested using strict durability tests in a chloride, freeze-thaw and high humidity environment
- Specifically intended for structural strengthening using: GeoLite® Gel, epoxy mineral matrix, ideal for structural fixing of sections of reinforced concrete, prestressed reinforced concrete, masonry, wood and steel
- Can be tensioned to create structural reinforcements and active devices using particular mechanical anchoring systems, thanks to the unique characteristics of the textile which do not require advance impregnation of the sheet, and at the same time allow it to be anchored and fastened with metal plates without having to take particular precautions, as is necessary for all the other types of fibre and textile on the market
- Can be shaped using GeoSteel benders which allow the sheet to be modelled easily without altering its mechanical properties to create surround brackets for beams and pillars and other bent elements required during structural consolidation works

AREAS OF USE

Use

- Static and seismic upgrade or compliance retrofit of structural elements in reinforced concrete, prestressed reinforced concrete, masonry, wood and steel
- Compressive and flexural stress, shear, and confinement reinforcing for partitions in reinforced concrete, prestressed reinforced concrete and wall panels
- Confinement and banding of reinforced concrete, prestressed reinforced concrete or masonry structural elements
- Consolidation of masonry arches, vaults and domes
- Flexural strengthening for timber elements
- Flexural strengthening for steel girders
- Execution of special single- or double-fibre thread connectors for anchoring sheets and grids and executing reinforced injections

INSTRUCTIONS FOR USE

Preparation

The ultra-high strength galvanized steel fibre sheet GeoSteel G2000 Hardwire™ is ready-to-use.

The sheet can be cut at right angles to the cords with manual or electric shears, or parallel with the cords using a normal box cutter. The sheet, cut into strips even just a few cm wide and a number of metres long, ensures perfect stability without in any way compromising the workability of the material and its application.

Preparation of substrates

The substrate must be properly prepared and cleaned, always in accordance with the instructions dictated by the construction supervisor.

In the case of substrates that are not degraded, prepare the surfaces as indicated in the technical data sheet for GeoLite® Gel.

When the substrate is clearly degraded, uneven, or damaged by significant events, proceed as follows, always in accordance with the construction supervisor:

INSTRUCTIONS FOR USE

Substrates in reinforced concrete or prestressed reinforced concrete:

- Thorough removal of weakened concrete if necessary, through mechanical scarification or hydro-demolition, making sure to roughen the substrate to a depth of at least 5 mm, equal to level 8 of the Test Kit for preparation of reinforced concrete and masonry substrates;
- Removal of rust, if any, from reinforcing bars, which must be cleaned by brushing (manual or mechanical) or sandblasting;
- Monolithic reconstruction or smoothing of the section, if needed, using geo-mortar based on a mineral geo-binder such as GeoLite®.
- When applying the strengthening system with an organic matrix, the substrate must be dry and free of humidity and with a roughness of at least 0.5 mm, equal to level 5 of the Test Kit for preparation of reinforced concrete and masonry (follow the instructions on the GeoLite® Gel data sheet).

Application

The execution of the structural strengthening in Steel Reinforced Polymer steel fibre (a combination of steel fibre and GeoLite® Gel epoxy mineral matrix) will be performed after having appropriately levelled the surface using GeoLite®, for reinforced concrete substrates, GeoCalce® G Antisismico or GeoCalce® F Antisismico for masonry substrates, taking care to allow the geo-mortar to cure for a period of time sufficient to guarantee a suitable humidity of the substrate before applying GeoLite® Gel. Before application of the first layer of GeoLite® Gel, the substrate must be clean, dry, free from damp and roughened, by sanding or mechanical scarification, to a depth of at least 0.5 mm, equal to level 5 of the Test Kit for preparation of reinforced concrete and masonry. The first layer of adhesive must be an average thickness of $\approx 2 - 3$ mm. Afterward, working over the matrix while it is still fresh, apply the GeoSteel G2000 sheet in Hardwire™ extra-high strength galvanized steel fibre, making sure that the sheet is perfectly incorporated into the matrix by pressing gently with a spreader or steel roller, and also checking that it comes out between the cords to ensure optimum mechanical and chemical adhesion between the first and second layers of matrix. At longitudinal joint points, overlap two layers of steel fibre textile by least 20 cm. Finally, apply a fresh on fresh final protective smoothing in order to completely incorporate the reinforcement and seal any underlying voids for a total thickness of the reinforcement of $\approx 3 - 4$ mm. If there are additional layers after the first, proceed with laying of the second layer of steel fibre over the matrix while it is still wet. In the event that the system must be plastered or concealed by smoothing, we recommend that while the resin is still wet that you apply a spray of mineral quartz to provide better adhesion for subsequent layers.

If the reinforcing system is installed in especially aggressive environments, or you otherwise wish to ensure additional protection beyond that already provided by the matrix, we recommend applying Kerakover Eco Acrilex Flex.

If the works are in permanent or occasional contact with water, the cycles described above must be replaced with a polyurethane epoxy cycle or an osmotic cement depending on the needs of the worksite and the design specifications.

For technical specifications, the application and preparation of the matrix, and the most suitable protective system, please consult the relevant technical data sheets.

ABSTRACT

SRP-GeoLite® Gel & GeoSteel G2000

Execution of repair, structural strengthening, improvement or seismic upgrade of reinforced concrete and prestressed reinforced concrete elements and structures using an organic matrix composite system, SRP (Steel Reinforced Polymer), CE-marked, made from Hardwire™ unidirectional, extra-high strength galvanized steel fibre sheets, made of steel micro-cords compliant with standard ISO 16120-1/4 2017 fixed to a fibreglass micromesh, net weight of ≈ 2000 g/m² – such as GeoSteel G2000 by Kerakoll Spa – with the following certified technical characteristics: tensile strength, characteristic value > 3000 MPa; elastic modulus > 190 GPa; ultimate break warp $> 1.5\%$; actual area of a cord 3x2 (5 wires) = 0.538 mm²; no. cords per cm = 4.72, with wire winding at high torque angle, compliant with standard ISO/DIS 17832; equivalent thickness of the sheet = 0.254 mm, impregnated with eco-friendly, epoxy mineral adhesive in gel form for structural bonding of galvanised steel fibre sheets or other types of composite materials, CE-marked and compliant with the performance requirements indicated in Standards EN 1504-4 and EN 1504-6 for bonding structural elements and following the guidelines of CNR-DT 200 R1/2013, without the need for an adhesion primer, solvent-free, with very low volatile organic compound emissions – such as GeoLite® Gel by Kerakoll Spa – to be applied directly to the structure requiring strengthening.

The procedure is conducted as follows:

1. Any restoration of degraded, weakened, non-cohesive, or non-planar surfaces, using GeoLite® by Kerakoll Spa and in any case as prescribed and approved by the construction supervisor;
2. Preparation of the substrate for application of the first layer of GeoLite® Gel, the substrate must be adequately roughened by sanding or mechanical scarification, taking care to guarantee a roughness of at least 0.5 mm (equal to level 5 of the Test Kit for preparation of reinforced concrete and masonry), clean and free from damp;
3. Application of a first layer with an average thickness of $\approx 2-3$ mm of epoxy mineral matrix GeoLite® Gel by Kerakoll Spa;
4. While the mortar is still wet, lay the ultra-high strength galvanized steel fibre sheet GeoSteel G2000 Hardwire™ by Kerakoll Spa, and by pressing firmly with a smooth spreader or metal roller, make sure that the sheet is completely impregnated and avoid allowing any gaps or air bubbles to form, because these can compromise the adhesion of the sheet to the matrix or to the substrate;
5. Working fresh on fresh, apply the second layer of epoxy mineral matrix GeoLite® Gel by Kerakoll Spa, until the reinforcing sheet is fully incorporated and any underlying voids are filled, giving an overall reinforcement thickness of $\approx 3-4$ mm;
6. Repeat steps (4) and (5) if necessary for all subsequent reinforcing layers called for by the design;
7. Any insertion of thread connectors made from unidirectional, extra-high strength galvanized steel fibre sheets, after: preparation of the entrance hole, with a size suited to the nature of the connector to be fitted, preparation of the steel connector by cutting, “teasing” and final rolling of the steel fibre sheet, locking it in place with a plastic tie, insertion of the pre-formed connector into the hole with final, low pressure injection of GeoLite® Gel epoxy mineral matrix.

Delivery and installation of all the materials described above as well as everything else required to finish the job is included. The following are excluded: removal of any existing plaster/render, restoration of degraded areas and repair of the substrate; connectors, their injection and all the costs and charges required to create them; material acceptance tests; pre- and post-procedure testing, all aids required to perform the work.

The price is by unit of reinforcing surfaces actually laid, including overlaps.

TECHNICAL DATA COMPLIANT WITH KERAKOLL QUALITY STANDARD

Values are for non-impregnated sheet

Cord 3x2 obtained by joining 5 filaments, of which 3 straight and 2 wrapped with a high torque angle

- actual area of a cord 3x2 (5 wires)	A_{cord}	0.538 mm ²
- n° cords/cm		4.72 cords/cm
- mass (inclusive of thermal welding)		≈ 2000 g/m ²
- tensile breaking load of a cord		> 1500 N
- tensile strength of the sheet, characteristic value	σ_{sheet}	> 3000 MPa
- tensile strength by unit of width		> 7.11 kN/cm
- normal elastic modulus of sheet, average value	E_{sheet}	> 190 GPa
- break warp of the sheet, characteristic value	ϵ_{sheet}	> 1.5%
- equivalent thickness	t_f	≈ 0.254 mm
Pack		30 m rolls (h 30 cm)
Weight of 1 roll		≈ 24 kg including packaging

PERFORMANCE

GeoSteel SRP system – ETA n° 18/0314

SRP – GeoLite® Gel & GeoSteel G2000

Performance characteristic	Test Method		GeoSteel SRP G2000 (1 layer) system performance	GeoSteel SRP G2000 (3 layers) system performance	Project data according to CNR-DT 200 R1/2013
Tensile strength (characteristic value)	EN 2561	σ_{SRP}	3046 MPa	2842 MPa	2850 MPa
Elastic modulus (average value)	EN 2561	E_{SRP}	214 GPa	206 GPa	210 GPa
Elongation at break (average value)	EN 2561	ϵ_{SRP}	1.95%	1.84%	1.85%
Lap tensile strength ¹ (characteristic value)	EN 2561	σ_{lap}	1923 MPa	NPD	-
Tensile strength on bent fabric (characteristic value)	EN 2561	$\sigma_{\text{u,f,bent}}$	NPD	NPD	-
Glass transition temperature	EN 12614	T_g	+60 °C	+60 °C	-
SUBSTRATE ADHESION²					
Pull-off strength (characteristic value)	EN 1542	f_h	2.2 MPa	NPD	-
Single-lap shear test (characteristic value)	Annex B EAD 340210-00-0104	σ_{deb}	830 MPa	NPD	-
Pull-out from substrate (average value)	Annex C EAD 340210-00-0104	$\sigma_{\text{pull-out}}$	1874 MPa	NPD	-
INSTALLATION CONDITIONS					
Maximum temperature (air and substrate)	-	-	-	< +35 °C	
Minimum temperature (air and substrate)	-	-	-	> +5 °C	
Relative air humidity	-	-	-	20 – 90 %	
Moisture of the substrate (gluing surface) ³	-	-	-	< 5 %	
SERVICE CONDITIONS					
Maximum temperature (air and substrate)	-	-	-	< +45 °C	
Minimum temperature (air and substrate)	-	-	-	> -25 °C	
Relative air humidity	-	-	-	irrelevant	
Contact with water ⁴	-	-	-	occasional	
Reaction to fire ⁵	EN 13501-1	-	-	Class D-s2, d0	

In the presence of installation and working temperatures outside the limits indicated above, contact the Kerakoll technical department to provide for suitable protective systems for application and operation of the GeoSteel SRP reinforcement system.

¹ Overlap length $l_{\text{lap}} = 200$ mm.

² Tests carried out on concrete prisms with compressive strength $f_c = 57.5$ MPa.

³ In the presence of a wet support, wait for it to completely dry or facilitate its drying before applying the product.

⁴ In the event of permanent contact with liquids, contact the Kerakoll technical department to provide for the most suitable protective system.

⁵ In case of exposure to fire load, or fire resistance, protect the GeoSteel SRP reinforcement system by means of an appropriate REI certified system. The GeoSteel SRP system has no fire resistance.

WARNING

- **Product for professional use**
- abide by any standards and national regulations
- when handling the sheet wear protective clothing and goggles, and follow the instructions regarding methods for applying the material
- contact with the skin: no special measures required
- storage on the work site: store under cover in a dry place, well away from substances that might damage it or its ability to adhere to the chosen matrix
- the product is an item according to the definitions of the EC Regulation No. 1907/2006 and therefore does not require a Safety Data Sheet
- for any other issues, contact the Kerakoll Worldwide Global Service +39 0536 811 516 - globalservice@kerakoll.com

The Rating classifications refer to the GreenBuilding Rating® Manual 2013. This information was last updated in November 2019 (ref. GBR Data Report - 12.19); please note that additions and/or amendments may be made over time by KERAKOLL SpA, for the latest version, see www.kerakoll.com. KERAKOLL SpA shall therefore be liable for the validity, accuracy and updating of information provided only when taken directly from its institutional website. The technical data sheet given here is based on our technical and practical knowledge. As it is not possible for us to directly check the conditions in your building yards and the execution of the work, this information represents general indications that do not bind Kerakoll in any way. Therefore, it is advisable to perform a preliminary test to verify the suitability of the product for your purposes.



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