

graphenbar
COMPOSITE REBARS

GraphenBar®

graphene rebars

www.graphenanosmartmaterials.com

Graphenano 
SMART MATERIALS



Graphene Reinforcement Rebars

The **GraphenBar®** rebars are **epoxy resin reinforcements with graphene and fiberglass (G-FRP)** designed to replace traditional steel in concrete applications, offering an alternative for residential and commercial projects.

Thanks to their manufacturing by **pultrusion** with high-performance fiberglass and specialized resins, they offer high tensile strength, durability, and corrosion resistance.

Their light weight, physical and chemical properties simplify transport, handling, and installation, reducing labor costs and increasing productivity. Ideal for foundations, slabs, terraces, patios, prefabricated elements, etc.

GraphenBar® withstands all weather conditions for long-lasting performance and no need for maintenance.

**Lightweight, durable, and non-conductive
reinforcement for reinforced concrete in
demanding infrastructures.**

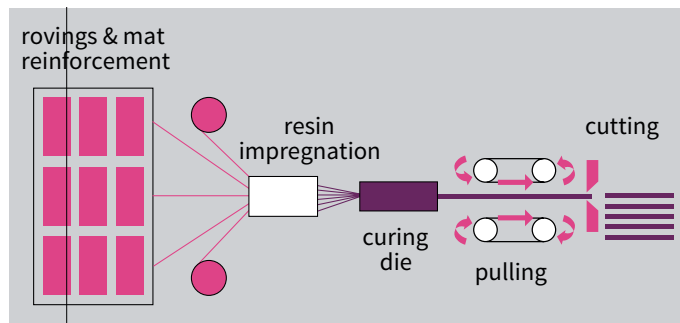




PULTRUSION PROCESS

Pultrusion is a continuous process for manufacturing composite profiles reinforced with graphene and with fiberglass. The process consists of pulling multiple fiberglass filaments through a resin bath with graphene and then into a temperature-controlled metal mold, in order to produce structural profiles of various shapes.

Pultruded profiles are used in **multiple applications**: industrial, energy, housing, and consumer goods. The global composites market for pultrusion exceeds 250,000 tons, with annual growth above 20%.



GRAPHENE PULTRUSION

Graphenano Composites works with **graphene, fiberglass, and epoxy resin.**

Our fiberglass is a good thermal insulator, capable of withstanding high temperatures. Meanwhile our resin infused with graphene provides more characteristics to the final composite, such as greater tensile, compressive, and interlaminar strength, flexibility, and anti-corrosive properties.

In the **pultrusion process**, the fiberglass impregnated with our graphene resin undergoes low-temperature pulling operations, so that the polymerization process guarantees the best quality.

Among its **advantages** over other processes are:

- High stiffness compared to pultrusion without graphene.
- Versatility of shapes, depending on the geometry of the mold.
- Custom cutting of profiles. Possibility of obtaining large lengths.
- High speed and continuity of production.
- Good surface finish.

ADVANTAGES OF GRAPHENBAR PROFILES vs STEEL

In a comprehensive analysis of an industrial platform, it has been shown that G-FRP parts have a lower environmental impact compared to the same parts made of steel:

- **Lower material weight**
- **Lower energy consumption** for transport
- **Lower environmental impact** across many categories, including global warming gases, air and water acidification, eutrophication, ozone layer depletion and smog formation.

An independent evaluation determined that the finished composite parts present life cycle analysis profiles that show advantages compared to steel and aluminum alternatives strength/weight ratio.

Lighter



Up to 70% weight reduction compared to steel

Resistant



High tensile and compressive strength

Inherent thermal and electrical insulators



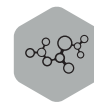
Non conductivity

Cost effective



Lower cost thanks to its easy handling and lower weight

Great chemical resistance



Resistant to chemicals and immune to corrosion

No interference electrical



Non magnetic



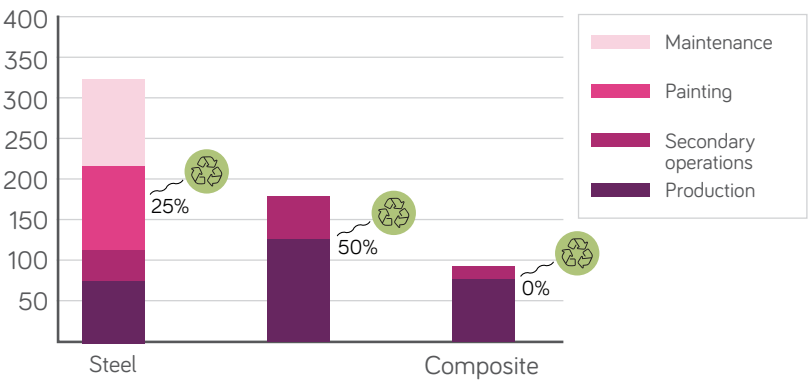
Unlike conventional pultrusion, our
process allows us to **RECYCLE 100% OF**
OUR MATERIAL as the cohesion achieved
enables crushing and micronization
for reuse in other composite parts with
equal or greater strength.

SUSTAINABILITY

The following results come from a preliminary or abbreviated life cycle assessment (LCA) that examined some specific pultruded parts.

In both case studies, the data are based on the aggregation of various types of pultruded structural components for outdoor applications, such as decks and platforms.

Composites have a lower energy impact even without recycled content.



CASE STUDY NO. 1: STEEL VS. COMPOSITE

The steel grid is 3.5 times heavier than the composite grid.

Energy used in Steel parts		
	MJ / Kg	Criteria
Primary Steel Production	262	5% recycled
Secondary operation	4 to 6	Hot/cold section roll
On-site installation	0 to 35	Blasting and painting
“Use” maintenance phase	30 to 35	Blasting and painting
Totals 90 to 106		

Energy used in Composite parts		
	MJ / Kg	Criteria
Primary raw material	0-74	Glass and resin min.
Secondary operation	to 6	Comp. Part Mfg
On-site installation	0	Blasting and painting
“Use” maintenance phase	0	Blasting and painting
Totals 74 to 80		

The higher specific strength of composite materials allows for more efficient energy use per component.



The graphene, epoxy resin, and fiberglass reinforcement rods from **Graphenano Smart Materials** offer a superior alternative to traditional steel for a multitude of projects. Designed with high tensile strength, compression, durability, and corrosion resistance, **GraphenBar®** redefines concrete reinforcement. Its lightweight, rustproof design simplifies transport, storage, handling, and installation, reducing labor costs and increasing productivity. Ideal for foundations, driveways, pool decks, patios, concrete slabs, precast elements, etc., **GraphenBar®** withstands all weather conditions ensuring long-lasting, maintenance-free performance.

**Choose GraphenBar® for projects that
require strength, ease of use, and durability**

Reliable performance designed for professionals

GraphenBar® offers professionals an alternative to steel without rust or corrosion, guaranteeing full performance in any climate with no risk of material deterioration, especially in saline environments. Lightweight yet robust, it allows for faster and safer installations, reducing labor time and effort. Designed to meet the demands of the most challenging and hard-to-access worksites, **GraphenBar®** provides a durable solution, being the only alternative to steel.

Meets and exceeds standards

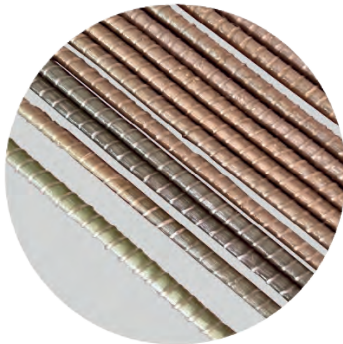
GraphenBar® is designed to meet or exceed key industry standards, codes, and specifications, providing contractors and professionals with confidence in its performance, safety, and compliance. Designed to achieve optimal results in all construction projects, **GraphenBar®** facilitates an optimized approval process to simplify permit processing and reduce delays in compliance checks.

Applications



- Driveways
- Sidewalks
- Pool decks
- Basements
- Basement walls
- Footings
- Concrete masonry
- ICF construction
- Warehouse floors
- Agricultural slabs
- Loading docks
- Architectural
- Prefabricated
- Truck platforms
- Prestressed concrete slabs
- Stair openings
- Elevator shafts
- Step crack repair
- Existing masonry rehabilitation
- Exterior walls
- Parking slabs
- Pillars, pilings, etc.

Reduces labor time and effort
Does not rust and has high strength



GRAPHENBAR® FIBERGLASS EPOXY

Product description:

Graphene reinforcement bars with fiberglass (G-FRP) and epoxy resin, designed to replace steel in reinforced concrete structures. They combine high mechanical strength, lightness, and dielectric stability, ideal for bridges, docks, water treatment plants, structures near sensitive equipment, and works where quick installation and long service life are desired.

Diameters:

6, 9, 10, 12, 14, 16, 18, 20 mm.

other sizes available upon request, maximum 32mm equivalent to 40mm of steel. Equivalency table p. 14

Use of our graphene composite rods

Our structural graphene composite rods **are manufactured in accordance with Eurocode requirements and Annex 2R for composite materials**, guaranteeing the highest standards of mechanical strength, durability, and safety.

Currently, the rods are marketed under a responsible declaration certificate, which allows their use in any type of conventional construction (housing, industrial buildings, unique buildings, precast, etc.), fully complying with the applicable structural regulations.

The only temporary limitation is their use in public civil works (infrastructures such as bridges, tunnels, roads, or dams), since in this area it is required to have the specific CE marking, a process currently underway.

In summary:

- Suitable and safe for all types of private and conventional constructions.
- Certified under a responsible declaration certificate according to European regulations.
- Limited only in public civil works until the final CE certification is obtained.





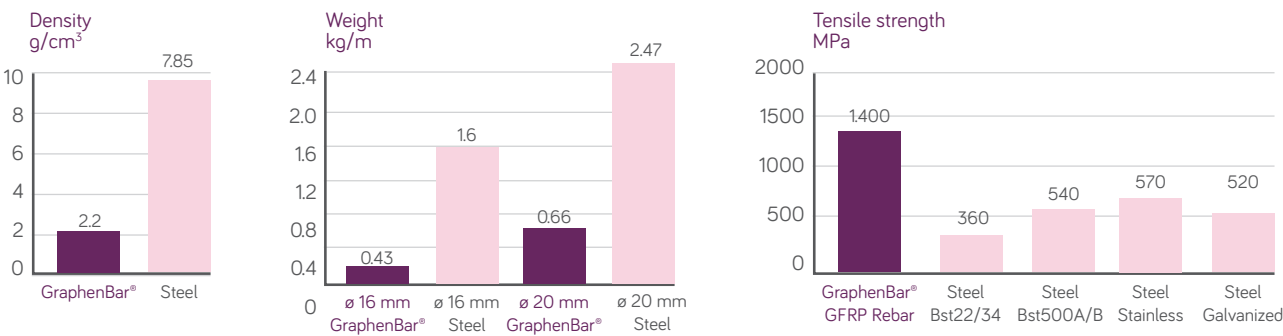
**More than double the interlaminar
strength
compared to rods made of
pultrusion without graphene**



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COMPOSITE REBARS

**Lightness, strength, and sustainability,
The only smart alternative
to steel**

Technical data bars GraphenBar®



G-FRP reinforcement **Graphenbar®** have only about 27% of the weight of steel reinforcement bars. This allows for lighter structures with maximum stability and lower dead weight, as well as much easier handling at construction sites.

G-FRP reinforcement **Graphenbar®** have a tensile strength three to four times greater than conventional reinforcement bars made of unalloyed steel and stainless steel.

METRIC		#6	#9	#10	#12	#14	#16	#18	#20
Minimum Tensile Load	kN	33	54	74	132	167	202	244	285
Cross Sectional Area	mm²	28	64	78	113	154	201	254	314
Weight	kg/m	0,065	0,246	0,181	0,260	0,354	0,462	0,585	0,723

- Tensile strength
 - >1000 MPa
 - >145 ksi
- Modulus of Elasticity (Young's Modulus)
 - >60 GPa
 - >8702 ksi
- Ultimate deformation
 - >1.7%
- Transverse shear strength
 - >220 MPa
 - >31.9 ksi
- Bond Strength to Concrete
 - 24 MPa Minimum
 - 3100 Psi Minimum
- Flexural strength (straight part)
 - >980 MPa
- Flexural strength (straight part)
 - >700 MPa
- Bending strength (bent area with minimum radius: Bar diameter 4x)
 - 58 GPa
- Glass transition temperature (Tg)
 - 130 and 140 °C

Packing, handling and storage

GraphenBar® is weather resistant, although exposure to UV rays may cause discoloration, fading, or surface chalking. These effects are purely aesthetic and do not affect its performance. For prolonged exposure to sunlight, it is recommended to use a protective cover. **The product can be ordered with a UV protection additive at an additional cost.**

When handling and installing, use a fine-toothed saw, a carbide-grit blade saw, a grinder, or a diamond blade to cut; it is not necessary to seal the ends. Place the spacers properly for adequate concrete coverage and use standard tying methods.

Ensure that the concrete cover exceeds twice the diameter of the bar to prevent thermal cracking and follow general guidelines on reinforcement practices.

FRP Ø (mm)	STEEL Ø (mm)	kg/m FRP	kg/m steel	FRP truck (20t)	steel truck (20t)
#6	8	0,065	0,395	207.546	50.686
#9	12	0,146	0,888	136.687	22.527
#10	14	0,181	1,208	110.716	16.551
#12	16	0,260	1,578	76.886	12.672
#14	20	0,354	2,466	56.488	8.110
#16	22	0,462	2,984	43.249	6.702
#18	24	0,585	3,551	34.172	5.632
#20	26	0,723	4,168	27.679	4.799

A single GraphenBar® truck equals six steel trucks





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COMPOSITE REBARS

Does not rust
Guaranteed structural safety

Graphenano
High-Quality GFRP Rebar
Production Line



 **graphenbar**
COMPOSITE REBARS

Frequently Asked Questions

Performance

How does the strength of GraphenBar® compare to steel?

GraphenBar® has a tensile strength greater than 1000 MPa (145 ksi), compared to steel, GraphenBar® can withstand more than 3 times the tensile load of steel before failure.

How does the modulus of elasticity of GraphenBar® compare to steel?

GraphenBar® has a tensile modulus greater than 67 GPa (9427 ksi), compared to steel, the GFRP rebar is more flexible, better absorbing energy in an earthquake due to its improvement and its density.

How does the strain of GraphenBar® compare to steel?

GraphenBar® has a tensile strain between 1.5% and 2.5%.

What is the resistance of GraphenBar® to alkaline environments?

GraphenBar® has been tested according to ISO and ASTM standards for durability criteria, both retain +90% of the final tensile capacity after 2210 hours of

direct exposure to an alkali solution with a pH level of 13 at 60 degrees Celsius, compared to steel, GFRP rebar is much more resistant than the highest grade of stainless steel.

What is the maximum operating temperature of GraphenBar®?

GraphenBar® and other G-FRP bars that comply with ISO and ASTM standards, which have a glass transition temperature of more than 130 degrees Celsius, can be in direct contact with heat up to 110 degrees Celsius without losing strength. GraphenBar® at 400 degrees Celsius will lose its tensile strength from 1500 MPa to approximately 700 MPa, which is still higher than steel rebar at room temperature. IN CASE OF FIRE, THE TEMPERATURE IS NOT TRANSMITTED THROUGH THE METALLIC STRUCTURE, WHICH CAN DEFORM AS IN STEEL.

What is the minimum operating temperature of GraphenBar®?

GraphenBar® was tested according to ISO standards at -40 degrees Celsius, and the effect was zero and in some cases performance increases.

Operation

What sizes of graphene fiberglass rods are available?

Graphene fiberglass rods are available in standard sizes from 6mm to 20mm. We have other sizes available upon request.

How are graphene fiberglass rods cut on site?

Use a fine-toothed saw, a high-speed grinder, and a carborundum or diamond disc

Is it necessary to use a respirator when cutting the rod?

No, but it is recommended to use a dust mask. Please refer to our Safe Use Instruction Sheet for more information

Is it possible to get splinters when handling graphene fiberglass rods?

It is recommended to use protective gloves as a safety measure to avoid cuts and scrapes, especially on the cut ends.

What tie wire should I use for graphene fiberglass rods?

Use standard steel wire or plastic-coated wire for traditional rod tying methods. In non-magnetic applications, nylon ties prevent any electrical interference.

How do you tie GFRP rebar?

Tie the G-FRP rebar with stainless steel or nylon wire, you can also use a cable tie, and also fiberglass reinforced tapes. If corrosion or electromagnetic fields are not a concern, you can also use wires.

Can we bend Graphenbar in the workshop or on site?

GraphenBar® is manufactured with an epoxy thermoset matrix, it cannot be bent GraphenBar® after the curing cycle, all bends must be made at the MST rebar plants. Minor adjustments to bends are possible due to the inherent flexibility of the rebar

Frequently Asked Questions

Environment

Can we store GraphenBar® under exposure to sunlight?

Yes, but it is not recommended if it is more than 3 months. GraphenBar® is made of a very high-quality thermoset matrix that withstands UV radiation, due to cost competitiveness. UV protection can be requested as an extra.

Can we store GraphenBar® under rain and snow?

Absolutely, GraphenBar® can be stored under rain and snow without any problem, as the material cannot corrode and does not absorb water, although it is always recommended.

What is the end of life of GraphenBar® like?

GraphenBar® is made of fiberglass that is 100% recyclable and epoxy resin with graphene, when it is in concrete, the material can be crushed with the concrete without needing to remove it after +100 years and can be part of the next recycled concrete, making the concrete much stronger.

Can you cure concrete with seawater?

Yes, if GraphenBar® is being used, the concrete can be cured with seawater due to its non-corrosive nature. This could lead to the preservation of huge amounts of fresh water.

Price

How does the price of GraphenBar® compare to steel rebar and stainless steel rebar?

GraphenBar® is much lower than the cost of stainless steel. The price of GraphenBar® is lower than steel rebar, and if you consider all the savings due to labor costs, corrosion protection additives, cover concrete, and transportation, the cost is much lower than that of steel rebar.

Why does using GraphenBar® reduce the project cost?

Engineers are always taking into account all the associated costs of the project and its long-term maintenance. Some of these factors can be eliminated or reduced when considering the use of GraphenBar®.

- Installation time
- Transport
- Handling and cutting
- corrosion inhibitors
- Absence of short, medium, and long-term maintenance.

Engineering

Can we replace the GRP rebar in a ONE to ONE ratio with steel rebar?

GraphenBar® is three times stronger and more flexible than steel rebar. It behaves in a linearly elastic manner up to failure, which means there is no yield point to determine, but the material can withstand significantly higher loads. Engineers must follow the codes and standards for G-FRP rebar, not for steel. In most cases where serviceability does not govern the design and it is based on the Ultimate Limit State (ULS), you can simply substitute steel with high modulus GraphenBar®.

If serviceability governs the design, then it is recommended to carry out proper engineering to ensure that all deflections are controlled. We recommend redesign of parts using Graphenbar® specifications, to reduce material usage by optimizing the properties of graphene.

Can we use Graphenbar rebar in active seismic regions (earthquakes)?

YES, GraphenBar® bars can be used as reinforcement in concrete subjected to seismic loading conditions. GraphenBar® is capable of withstanding reverse voltage-compression cycles without failure. The high deformation exhibited by the GFRP material allows the GFRP-reinforced building to properly dissipate seismic energy. Currently, more than 100 bridges and structures are reinforced with GFRP rebar in seismic regions. Although it has not been part of the code, there is no limit as to why GraphenBar® cannot be used in seismic regions.





Transversely unbeatable
Up to 2.5 times more interlaminar strength
than conventional FRP bars

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COMPOSITE REBARS

GRAPHENBAR DIFFERENCES and other FRP BARS



FRP without



GraphenBar® FiberGlass Epoxy

The FRP rod without graphene exhibits an irregular break, with multiple fractured filaments and unstable deformation that compromises its integrity and durability. In contrast, **GraphenBar® FiberGlass Epoxy** breaks in a clean and controlled manner, with aligned fibers and a more cohesive structure, ensuring safer and more predictable behavior.

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