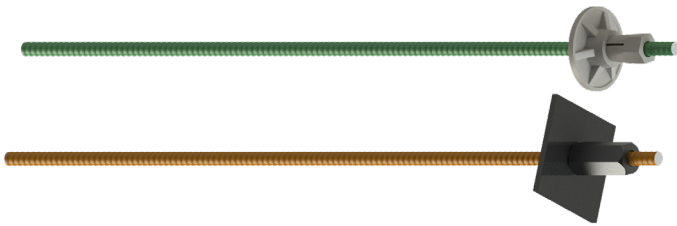


ROCK REINFORCEMENT

GFRP Standard Fully Threaded Bolts Glass Fiber Reinforced Polymer (GFRP) Bolting System



Normet's Glass Fiber Reinforced Polymer (GFRP) rock reinforcement systems offer superior alternatives to steel in applications where steel is unsuitable. Made from high-tensile fibers embedded in a polyester or epoxy resin matrix, GFRP offers greater tensile strength than steel while being four times lighter, ensuring easier handling and logistics. It is highly durable, corrosion-resistant, non-magnetic, chemically inert, and easily cuttable, making it suitable for both temporary and permanent applications.

Normet offers standard fully threaded GFRP bolts as an alternative to steel bolts, available in either hollow or solid configurations for temporary or permanent applications.

WORKING PRINCIPLE

Normet's standard fully threaded GFRP bolts are designed with a system similar to that of steel bolts. The threaded bars are available in four combinations:

Product Code	Description	
Standard Fully Threaded Bolts		
GFRP - ST Bolts		Solid bolt for temporary applications
GFRP - SP Bolts		Solid bolt for permanent applications
GFRP - HT Bolts		Hollow bolt for temporary applications
GFRP - HP Bolts		Hollow bolt for permanent applications

Solid bolts are typically used for applications involving pre-grouted holes, while hollow bolts are suited for post-grouting applications.

Temporary-grade bolts are made from polyester resin, whereas permanent-grade bolts use vinyl-ester resin and have a design life of more than two years. Permanent bolts retain over 85% of their tensile strength after prolonged exposure to harsh alkaline environments.

BENEFITS

- > **Stronger than Steel:** GFRP reinforcement offers exceptionally high tensile strength compared to its steel counterparts. This higher specification can result in cost-saving design opportunities and optimizations.
- > **Lightweight:** GFRP reinforcements are four times lighter than steel, resulting in ease of handling, faster installation, and cost savings on labour and transportation.
- > **Corrosion Resistant:** GFRPs are non-steel, durable materials that prevent premature bolt failure. Its exceptional corrosion and chemical resistance result in long durability and a long lifespan, making it an ideal and cost-effective alternative to coated steel.
- > **Cutability:** GFRPs are easily cuttable and crushable, reducing concerns about steel being hauled and transported on conveyors into crushers, where steel elements can cause significant damage. It also eliminates resources and efforts associated with removing support elements from excavated ground.
- > **Sustainability:** GFRPs offer direct reductions in embodied carbon, and their higher strengths provide opportunities for further material reduction through design optimization.

RANGE AND SPECIFICATIONS

Standard Fully Threaded Hollow FRP Bolts (GFRP – HT/HP)

Outer Diameter		25 mm	32 mm	35 mm	38 mm
Inner Dia (mm)		12	12	15	20
Nominal CSA (mm ²)		250	350	365	500
Pitch (mm)		10	10	10	10
Temporary Bar	Resin	Polyester			
	Ult. Tensile Load (kN)	180	260	280	400
	Ult. Tensile Strength (MPa)	720	740	765	800
Permanent Bar	Resin	Vinyl-ester			
	Ult. Tensile Load (kN)	220	320	365	500
	Ult. Tensile Strength (MPa)	880	900	1000	1000

Standard Fully Threaded Solid GFRP Bolts (GFRP – ST/SP)

Product		20 mm	22 mm	25 mm	32 mm
Nominal Dia (mm)		16	18	21	27
Nominal CSA (mm ²)		200	250	350	580
Pitch (mm)		10	10	10	10
Temporary Bar	Resin	Polyester			
	Ult. Tensile Load (kN)	200	250	350	560
	Ult. Tensile Strength (MPa)	1000	1000	1000	960
Permanent Bar	Resin	Vinyl-ester			
	Ult. Tensile Load (kN)	200	250	350	560
	Ult. Tensile Strength (MPa)	1000	1000	1000	960

DEFINING THE FUTURE
UNDERGROUND

