

GFRP Combination Bolts

Glass Fiber Reinforced Polymer (GFRP) Bolting System

DESCRIPTION

Normet's GFRP Combination bolt is an innovative solution comprising a GFRP fully threaded bar, a corrugated HDPE pipe, and an expansion shell, designed for use in both temporary and permanent applications in underground excavations.

Normet's range of Glass Fiber Reinforced Polymer (GFRP) rock reinforcement provides an alternative to steel products for applications where steel is unsuitable. GFRP is a composite material made of high-tensile fibers embedded in a polyester or epoxy resin matrix. This composition offers unique properties, including exceptional tensile strength, light weight, corrosion resistance, and durability. Additionally, GFRP is chemically inert, non-magnetic, and easily cut by common excavation equipment, making it ideal for temporary excavation support.

KEY BENEFITS

GFRP bolts are typically installed in applications where non-steel reinforcement is preferred. Below are the main GFRP characteristics:

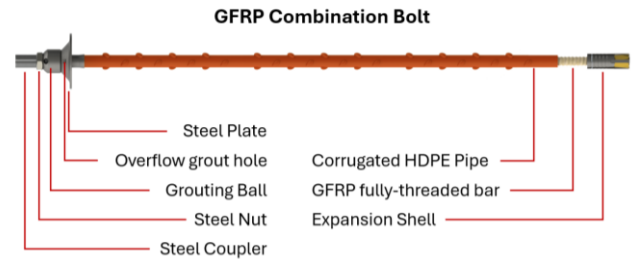
- › **Stronger than Steel:** GFRP reinforcement offers exceptionally high tensile strength compared to its steel counterparts. This higher specification can result in cost-saving design opportunities and optimizations
- › **Lightweight:** GFRP reinforcements are four times lighter than steel, resulting 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.
- › **Cuttability:** 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.

TYPICAL APPLICATIONS

- › Permanent reinforcement for metro/roadway tunnels.
- › Permanent support for oil/gas storage caverns with highly corrosive environments

- › Permanent support for subsea tunnels
- › Temporary reinforcement of underground applications
- › Immediate support system.

FUNCTIONALITY & INSTALLATION



GFRP Combination Bolts

Normet's GFRP Combination Bolt System is composed of a GFRP fully threaded bar encased in a hollow, corrugated HDPE pipe with an expansion shell at the distal end.

The expansion shell enables tensioning upon installation, providing immediate support, while the corrugated HDPE pipe allows for post-grouting by directing grout into the HDPE sleeve, which reaches the distal end of the borehole and exits through the overflow grout hole.

The bolts can be installed and pre-tensioned using manual or jumbo setup without any special modifications. It is ideal for carousel systems and is compatible with automatic grouting processes.

TECHNICAL DATA

GFRP Combination Bolts

Parameter			GFRP - CT
Material Specifications	Outer Diameter (mm)		25
	Length (mm)		4,000
	Thread Direction		Left
	Bar (GFRP)		ECR+ Epoxy Resin
	Coupler (Steel)		M36 x 120
	System Weight, 4.0m (kg)		6.8
Fully Threaded Bar Mechanical Properties	Nominal Diameter (mm)		25
	Core Diameter (mm)		21
	Cross Sectional Area (mm²)		346
	Ultimate Tensile Load (kN)		350
	Ultimate Tensile Strength (MPa)		1,000
	Modulus of Elasticity (GPa)		55
System Mechanical Properties	Fully Grouted:	Failure (kN)	300
	Pre-Tension:	Load (kN)	250 – 300
		Torque (N·m)	40 – 50
Recommended Borehole Diameter (mm)			Ø43 - Ø45
Recommended Borehole Depth (mm)			L+50

Custom sizes can be produced upon request

Whilst any information and/or specification contained herein is to the best of our knowledge, true and accurate, we always recommend that a trial be carried out to confirm suitability of the product. Please note regional climatic conditions may cause a variation in the performance of the product. No warranty is given or implied in connection with any recommendations or suggestions made by us or our representatives, agents or distributors. The information in this data sheet is effective from the date shown and supersedes all previous data. Please check with your local Normet office to confirm that this is current issue.