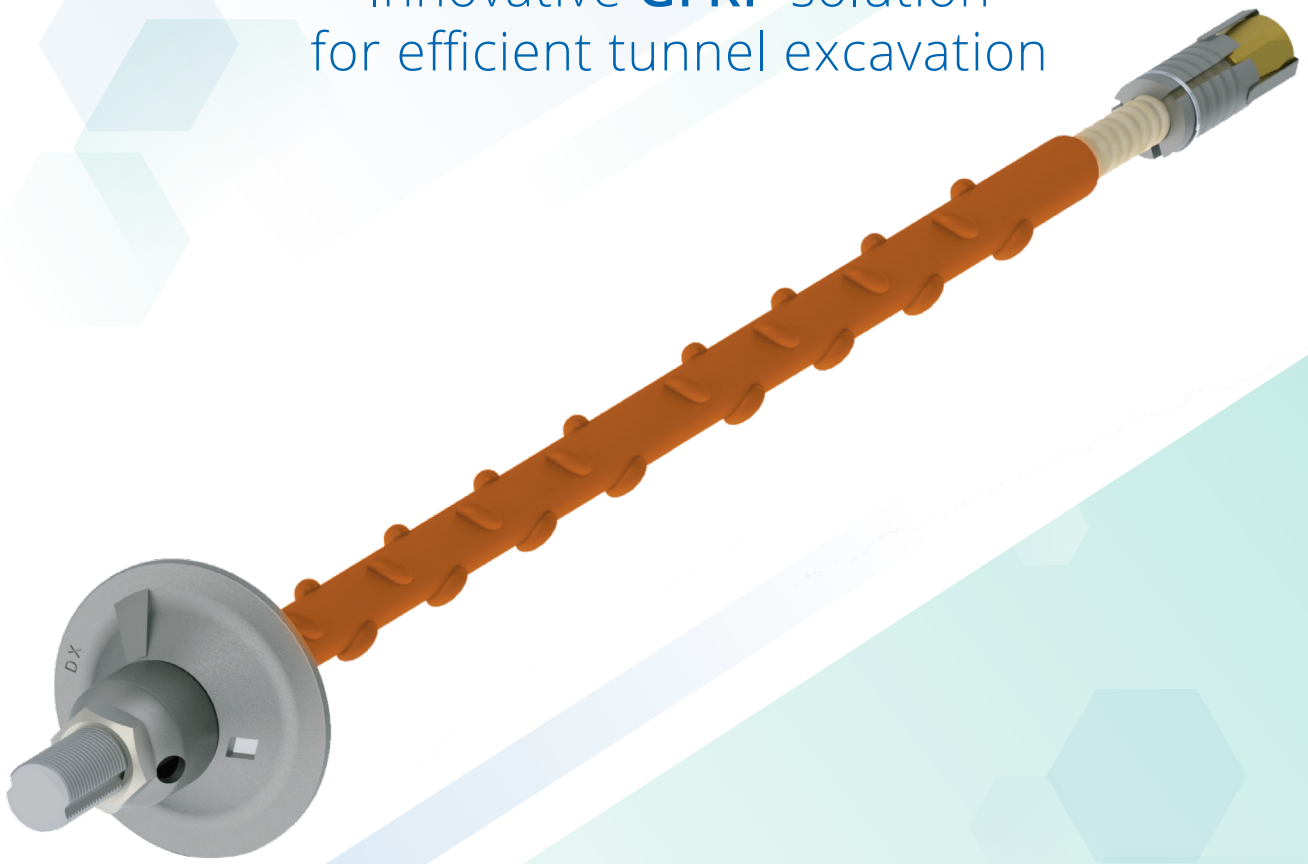


ASTEC

COMBINATION BOLT

Innovative **GFRP** solution
for efficient tunnel excavation



Dextra

www.dextragroup.com

About Combination Bolt

Combination Bolt is a unique and innovative GFRP solution precisely designed by Dextra.

In unconsolidated excavation areas, like steel bolts, GFRP Combination Bolt can be automatically installed by jumbo machine or manually installed.

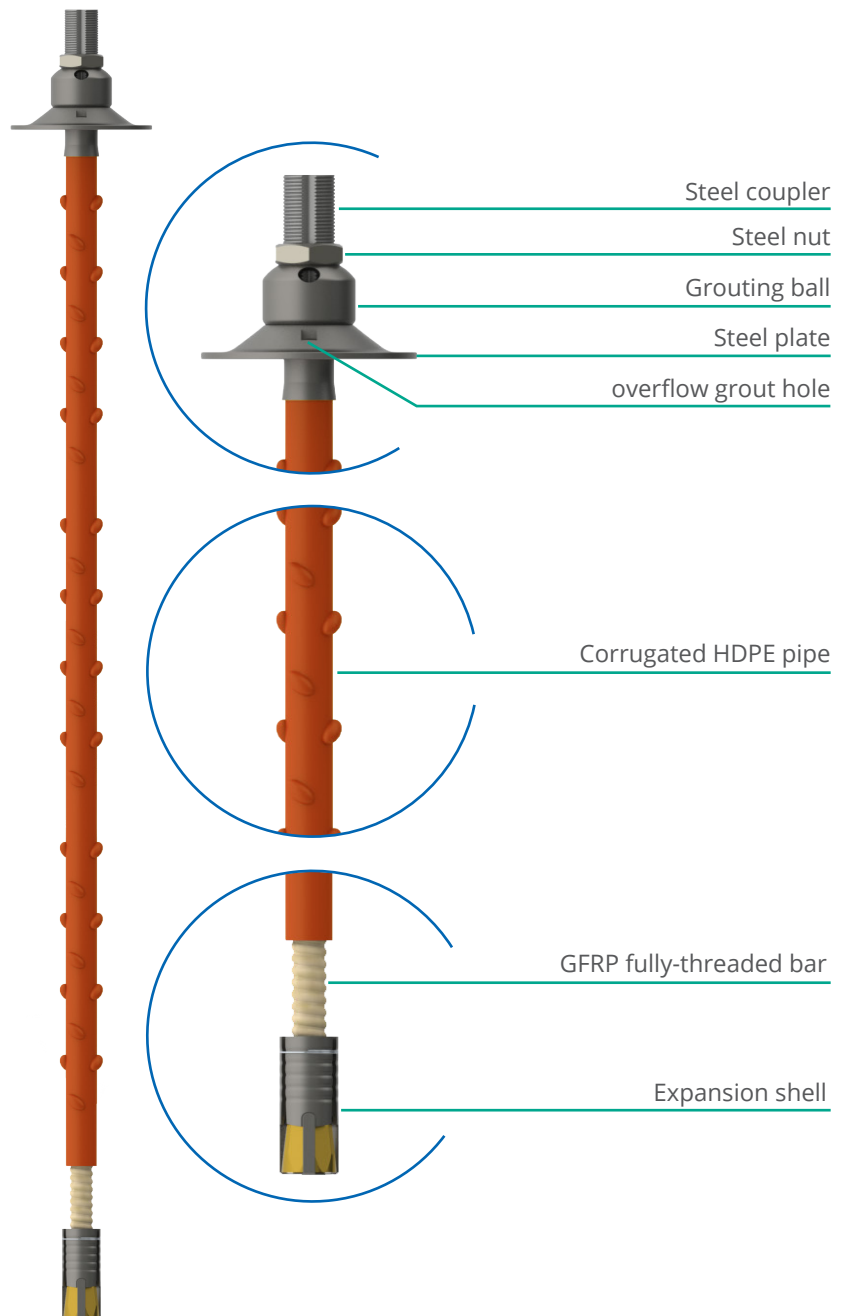
Thanks to the characteristic of the FRP material, Combination Bolt can easily be cut by common excavation equipment, which makes the product an ideal solution for temporary application for tunnel excavation projects.

Key benefits

1. Provide immediate support.
2. Ideal for Jumbo carousel equipment.
3. No special setup needed on the Jumbo machine to install the product.
4. Thanks to its metric metal nut, the number of rotations is similar as steel bolts. During the installation, the operator will not notice any difference when pre-tensioning the bolt.
5. Clearance inside the tunnel is maximized due to its short tail length. This also limits the concrete lining thickness if the head have to be embedded.
6. Just like conventional steel bolts, Combination Bolt is compatible with automatic grouting process.
7. The steel coupler permits an easy connection for the pull out test.



Product design & concept



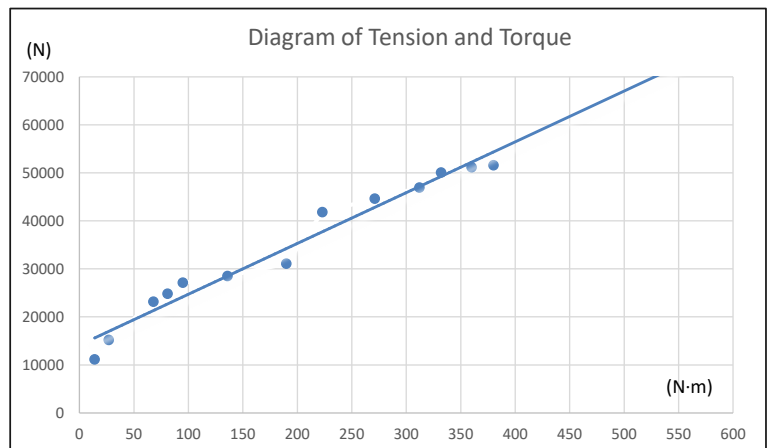
Can be easily cut by common excavation equipment.
Best alternative to steel bolts.



The material is resistant to both acidic and alkali environments.

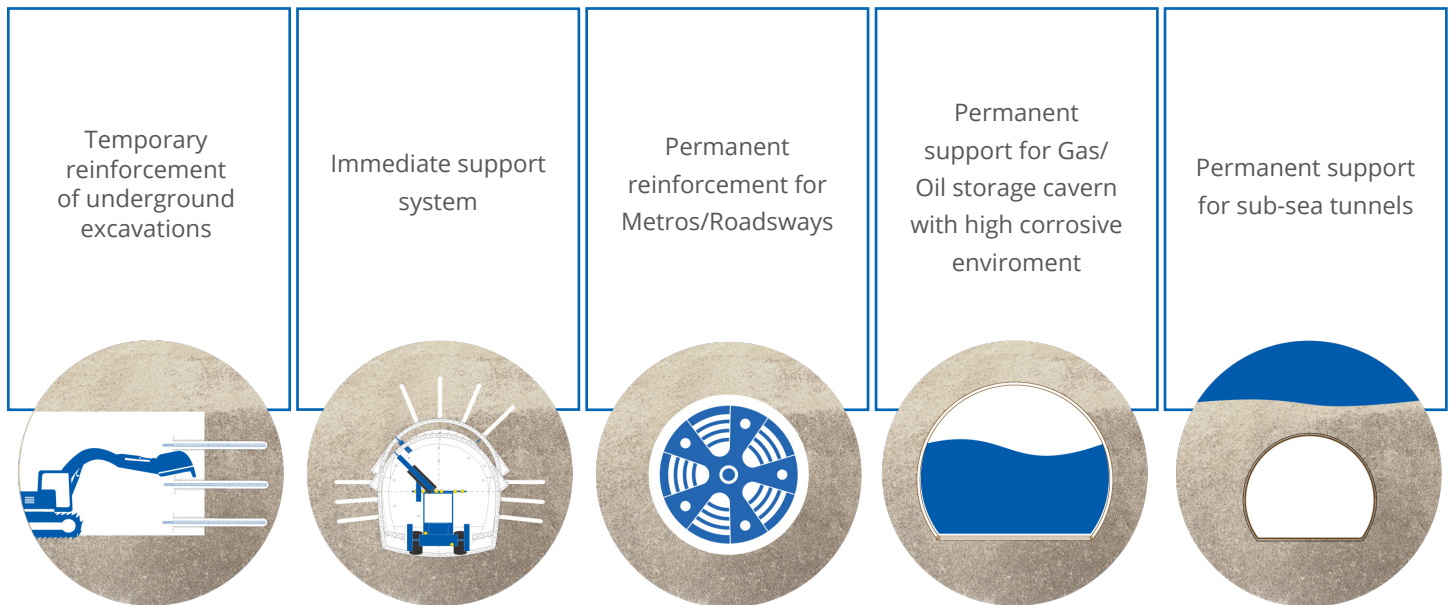


FRP profiles are twice as strong as steel in tensile strength, for only 25% of its weight.



*5 tons pretentions at 250N-300N·m like steel bolts.
No special setup is required on Jumbo for installation.*

Applications



Technical Information

Dimension* OD25 mm × L 4000 mm

Material Information

| GFRP Bar | Steel Coupler | System Weight/(4.0m) |
|-------------------|---------------|----------------------|
| ECR + Epoxy Resin | M36×120 | 6.80 kg |

GFRP Fully Thread Bar - Mechanical Properties

| Nominal Diameter | Core Diameter | Cross Sectional Area (mm ²) |
|----------------------------|---------------------------------|---|
| 25 mm | 21 mm | 346 |
| Ultimate Tensile Load (kN) | Ultimate Tensile Strength (MPa) | MoE (GPa) |
| 350 | 1000 | 55 |

System - Mechanical Properties

| Fully Grouted | Pre-Tension | |
|---------------|--------------|-----------|
| Failure (kN) | Torque (N·m) | Load (kN) |
| 300 | 250-300 | 40-50 |

Recommended Borehole

| Diameter (mm) | Depth |
|---------------|---------|
| Ø43 - Ø45 | L+50 mm |

* custom sizes can be produced upon request.



Commercial presence
in more than
55 countries



Dextra

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