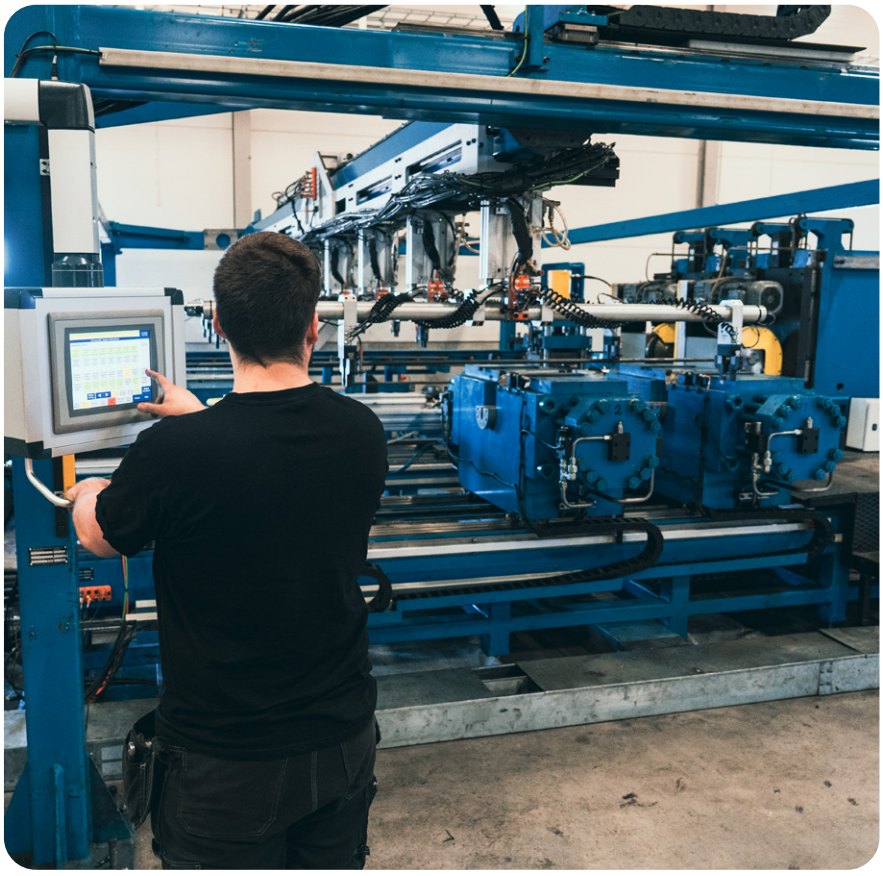


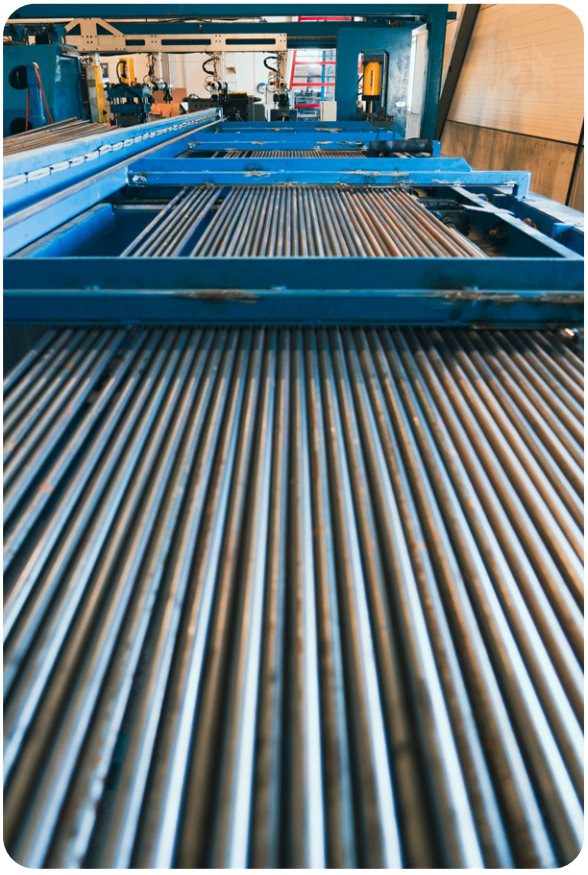
Strongly committed to Rock Reinforcement

ROCKY PROBLEMS - SOLID SOLUTIONS













Innovative solutions to complicated problems

Carefully planned rock reinforcement provides stability and safety for tunnels, mines, and other underground structures. By reinforcing fractures and weak zones within the rock mass, the risk of collapse, deformation, and accidents is reduced. *GMA Ground Machinery Applications* is the innovative specialist in products and solutions for reliable rock reinforcement.

With high flexibility and one of Europe's most modern manufacturing facilities, GMA develops and produces large volumes of rock reinforcement products for customers worldwide. We offer both standardised products and customised bolting systems tailored to meet specific requirements. Our products are designed for rapid installation, high load capacity, and long service life.



ROCK BOLTS

When it comes to *rock bolts,* we are a well-known and respected subcontractor that tailors bolt solutions to each customer's unique requirements. We also offer a wide range of in-house developed products. Our *GE bolt* is a well-known and respected quality solution within tunnelling, mining, and underground construction.

THORBOLT®

We also offer our own patented *Thorbolt®* to install rebars in leaking boreholes. The operation is carried out by injection with 5-10 Bar overpressure in addition to the current water table in the borehole.

ENVIRONMENTALLY FRIENDLY BOLTS

Our rock bolts are entirely made from Scandinavian raw material in order to minimize CO_2 emissions. All GE Bolts have EPD certificates. The factory uses 100% renewable energy during the production. **We do care about the environment!**



CUSTOMIZED ROCK BOLTS



GE BOLT



THORBOLT®

Customised rock bolting solutions

GMA operates one of Europe's most modern and flexible rock bolt manufacturing facilities, with a production capacity of over 1 000 000 bolts per year.

As a subcontractor, we manufacture rock bolts in a wide range of lengths and dimensions. We offer full flexibility to adapt each bolt to specific customer requirements.

Our in-house production of dome plates, in a variety of designs, together with a comprehensive range of nuts, spherical washers, and cement wedges, makes GMA a complete supplier of rock bolting solutions.



GE Bolt

In addition to our roll as a subcontractor we manufacture and distribute an in-house developed selection of rock bolts, the so-called *GE Bolt*.

Cement bolts



Dynamic rock bolts for mechanical installation in cement-filled boreholes, M22 and M24.



Resin bolt



Dynamic rock bolts with a 45° cut in the top, for resin installations M22, M24 and M27.

Rebar bolt

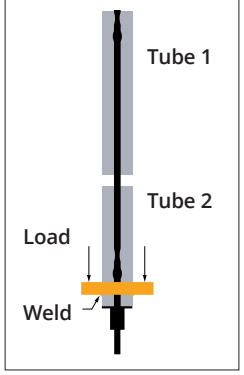


Solid rebar bolts with cement wedge, M20 and M24, in lengths from 1800 to 3000 mm.

Facts – GE bolt

Specifications		GE-BOLT M22	GE-BOLT M24	GE-BOLT M27
Diameter	mm	20,3	22,0	25,0
Yield load bar	kN	146	171	221
Yield load bar (typical)*	kN	159	195	251
Ultimate Tensile strength	kN	188	220	285
Ultimate Tensile strength (typical)*	kN	224	245	319
Elongation	%	19	19	19
Elongation (typical)*	%	26,1	28,2	28,0
Dissipated Energy dynamic drop test min.**	kJ	42	50	77
Package	number/bundle	60 alt. 50	50	25
Weight per meter	kg	2,54	2,98	3,85

SPLIT TUBE



**Tensile tests at Bergskolan, Filipstad, Sweden* ***Dynamic drop test at Swerim, Luleå and Wallenstadt Testing Facility, Geobrügg, Switzerland*

About the GE bolt

The GE Bolt is available in a number of designs adapted primarily for cement or resin installation. The bolt is offered in diameters of 20 mm (M22), 22 mm (M24), and 25 mm (M27), with right- or left-hand threads, and in lengths ranging from 1,800 mm up to 3,000 mm. With one set of anchor points in the top of the bolt, the long smooth steam provides an excellent energy absorption.

We offer full *traceability* for all deliveries from the steel mill to installation.



THOROUGHLY TESTED

Bolts and accessories are thoroughly tested using several methods, such as *split tube tests, continuous tube tests* and *tensile tests.*

Accessories

In addition to the bolt program we offer a broad assortment of dome plates, spherical washer and nuts. We also provide a wide range of wear parts to tunnel and mining machines such as spray nozzles, boom, drill rod and drill arm supports.
Please contact us for further information!

Dome plates and nuts



Broad assortment of dome plates and nuts.

Wear parts



Spray nozzles, boom, drill rod and drill arm supports.

Thorbolt® prevents leakage

Thorbolt® is our patented solution for installing rebars in leaking boreholes and carrying out grouting in one step. Grouting is done with an overpressure of 5–10 bar above the existing water table creating a dry area around the rebar bolt as well as casting the bolt. The system saves time and costs and eliminates the need for additional boreholes for grouting in the event of leakage.



DESIGNED FOR DEMANDING CONDITIONS

Thorbolt® is engineered to deliver reliable reinforcement in a wide range of geological conditions. Its robust design ensures high load capacity and efficient load transfer, contributing to stable and secure installations over time. Whether in tunnelling or mining operations, Thorbolt® provides a solution capable of handling high stress and harsh environments.

EFFICIENT INSTALLATION

With a focus on ease of use and installation efficiency, Thorbolt® is designed for fast and safe installation. This minimizes downtime and contributes to a smoother work flow on site. The result is increased productivity and reduced overall project costs.

EXTENSIVE TESTING

To ensure the highest level of quality and performance, Thorbolt® undergoes rigorous testing. Bolts and accessories are thoroughly and regularly tested using several methods, including tensile tests, pull-out tests, and fatigue testing. The tests are carried out in accordance with international standards and, in some cases, also in real tunnel and mining environments to verify performance in practice.

TWO VERSIONS

Thorbolt® is available in two versions: *Galvanized* and *Combi Coated,* designed for different environmental conditions and protection requirements.

Galvanized



The Galvanized version provides reliable corrosion protection through a zinc coating, making it suitable for standard conditions.

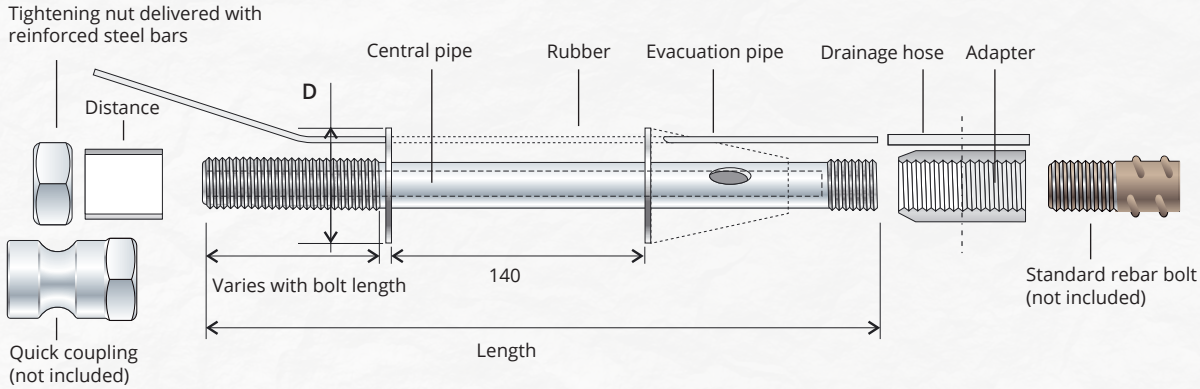
Combi Coated



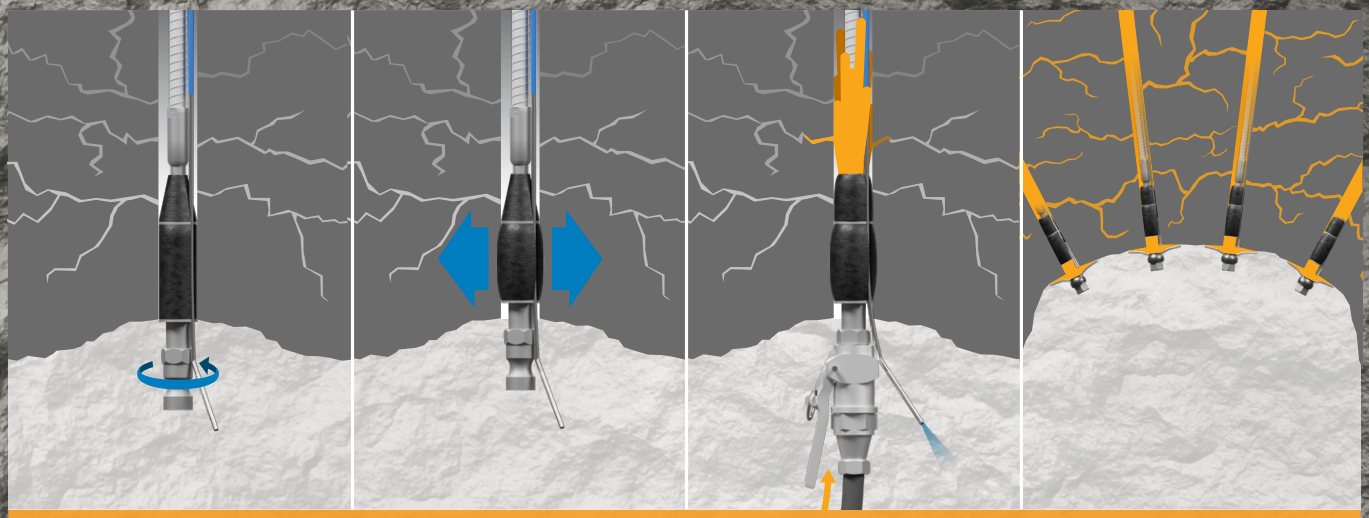
Enhanced corrosion resistance by combining multiple protective layers, making it ideal for extended life in more aggressive environments.

Facts about the Thorbolt® system

Principle sketch



Variables	Specifications
Standard dimensions (for bore hole)	45, 48, 51 and 54 mm (other dimensions on request)
Length	420, 620 or 1 000 mm
Surface treatment	Hot Dip Galvanized or Combi Coated (Hot Dip Galvanized + Heat Treated Epoxi)
Rebar adapters	M20, M24, M27, R25, R27, R32
Central pipe	Ø25x8 mm
Material	S355.C enl EN 10305-1.
Yield load	190 kN
Central pipe, thread	M24x3
Ultimated load	205 kN
Injection pressure	Up to 70 bar
Water/Cement ratio	Recommended 0,28 - 0,70
Evaluation pipe	Ø6x1 mm
Drainage hose	Ø8x1 mm
Rubber	Natural SBR



1. Insert

Insert the Thorbolt packer with the rebar and drainage hose into the bore hole. Tighten the nut.

2. Expand

By tensioning the nut, the rubber is compressed and expanded radially against the bore hole wall and the system is tight and fixed.

3. Grout

Connect the grout hose to the Thorbolt by the quick coupling. The grout is then pumped into the drill hole and filling the annulus.

4. Mount

Release the quick coupling from the Thorbolt and let the groute harden under pressure.

ABOUT GMA

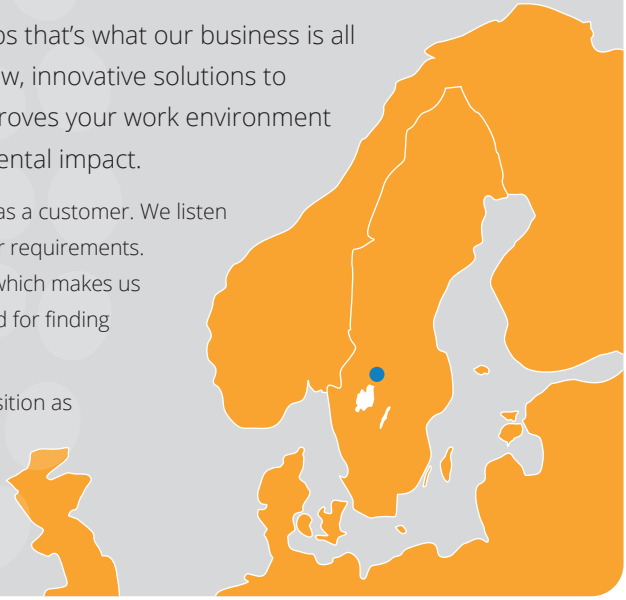


Rocky problems - solid solutions

Finding simple solutions to difficult problems, perhaps that's what our business is all about. GMA develops, manufactures and markets new, innovative solutions to complex problems. Solutions that simplifies and improves your work environment as well as economy with the least possible environmental impact.

The collaboration often takes place in close dialogue with you as a customer. We listen carefully to your ideas and develop products that will meet your requirements. Development and production take place under the same roof which makes us fast and flexible both for serial production, special products and for finding solutions to complex problems.

Knowledge and solid experience have given GMA a leading position as a supplier of high technology products. We are also a highly qualified subcontractor. You will find our customers both in Scandinavia and in the rest of the world.



ADDITIONAL PRODUCT RANGE

Injection and machine shoes

In addition to our assortment for *rock reinforcement* we provide a strong range of products for *injection,* a superior program of *compressible* as well as *inflatable packers* and *injection pipes.* We are also a well known supplier of customized injection products. Another product area is *machine shoes*, where we offer several models for leveling adjustment and effective vibration damping.



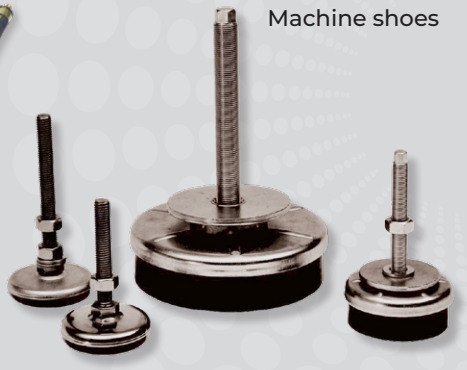
Compressible packers



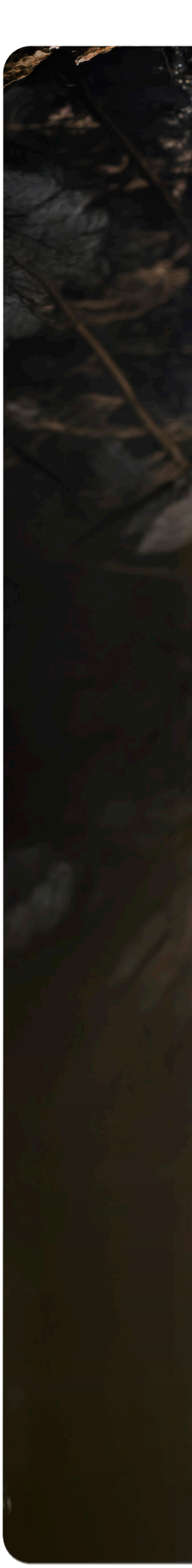
Inflatable packers



Injection pipes



Machine shoes



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