



Novobolt – Self-Drilling Injection Bolt

Product Data





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Novobolt is a next generation self-drilling injectable rock bolt system. Many years of focussed development from mining, chemical and mechanical experts culminated in the development of the Novobolt system. Many self-drilling products and components are available throughout the world of mining and tunnelling, however very few complete systems exist. Novobolt provides all elements of the complete bolting process from the self-drilling rock bolt and anchorage chemicals through to the drilling and injection equipment.

The development of Novobolt is an ACARP sponsored project incorporating Rock Mechanics expertise from Ground Support Services, injection chemical expertise from the world's leading strata support company Minova, and mechanical expertise from successful underground drill rig manufacturer Alminco.

For many years the Global underground mining industry has sought a safer and more productive rock bolting process. Many hand and arm related injuries can be attributed to the multiple step process associated with conventional rock bolting. Novobolt reduces the existing process down to a single step enabling the use of multiple options in bolt type, bolt length and injection volume.

The Novobolt range includes a standard bolt, a point anchored and pre-tensionable bolt, an extendable bolt up to 4 metres, and a cuttable bolt. All Novobolt options utilise the same processes and equipment for total installation. The standard and pre-tensionable Novobolt drills a smaller diameter hole compared to other self-drilling bolt options, reducing the time taken to complete this largest time consuming step in the rock bolting process.

Ground Support Services lead the Novobolt development project from initial conception to commercial implementation. With more than 30 years experience in the field of rock mechanics, Dr Peter Gray designed the individual rock bolt options and garnered support from ACARP and relevant industry leaders to complete development of the full installation system.

As an industry recognised provider of quality drilling and bolting equipment, Alminco provided the expertise necessary to turn individual components into a fully installed rock bolt system. Throughout the project Alminco has provided the engineering expertise to assist development of specific mechanical and hydraulic components to create a unique installation system. This system, including resin pump station and reversible chuck, combined with the Novobolt injection system offers a single stage installation process.

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As the recognised world leader in strata support injection chemicals, Minova utilised a global resource to complete development of the Carbothix pumpable chemical system utilised in the Novobolt. Carbothix is a revolutionary system offering significant performance, safety and logistical benefits over traditional styrene based polyester resin systems, which are unable to be used for bulk pumping in underground mines.

Underground and surface trials have confirmed the performance of the Novobolt system. Novobolt will successfully move mining operations even closer to the pinnacle of bolting safety and efficiency. Novobolt is not just another bolt, it's the future.

Bar

NovoBolt is a 32 mm diameter 38 tonne hollow steel rock bolt. The outer surface of the bolt has a cold rolled R32 spiral right hand rope thread profile, which not only enables high load transfer through the encapsulating resin into the rock mass, but is also a very robust thread resistant to damage. No fine thread is rolled into the sinusoidal rope thread bar meaning no introduced stress raisers and higher stress corrosion cracking resistance. This R32 bar is a standard product that has over 20 years historical use for rock bolting in tunnelling and hard rock applications throughout the world.

Drive Nut

The nut consists of a unique designed two stage system providing initial take up through the coarse thread of the NovoBolt bar before enabling higher torque tension to be applied via the fine 1.5 mm pitch thread within the nut. The fine thread is totally protected inside of the nut at all times and cannot be fouled or damaged prior to installation.

This unique drive nut enables drilling installation of the bolt and pre-tensioning using a two stage breakout pin. Drilling is undertaken using left hand rotation and the nut is tightened using right hand rotation.

Drill Tip

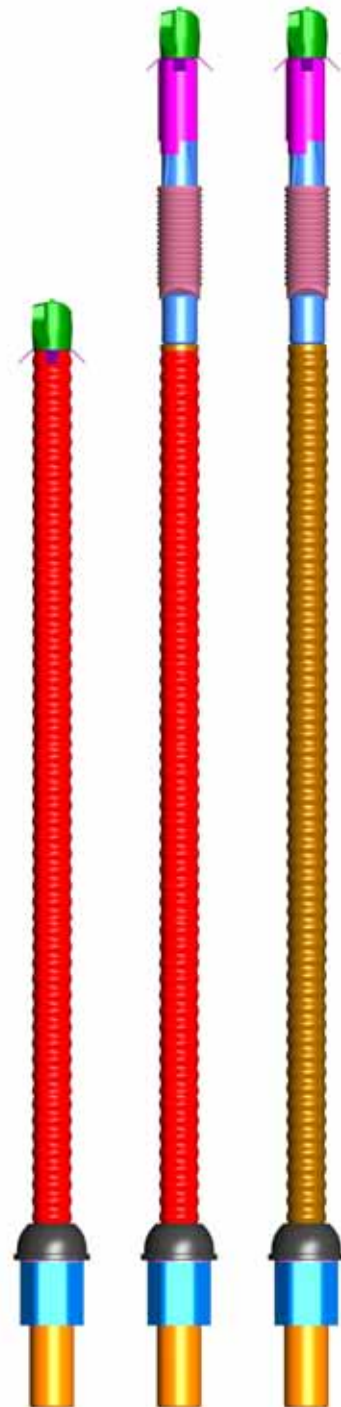
The NovoBolt incorporates an interchangeable 38 mm tungsten carbide drill tip. This drill tip can be changed to best suit the particular strata type and conditions at each individual customer site.

Cam Anchor

The pre-tensionable NovoBolt is anchored in place using a revolutionary Cam Anchor system, which provides immediate anchorage of the bolt. The Cam Anchor provides over 200 mm of anchorage length and can support up to 15 tonnes of tensile load depending on rock conditions. Up to 8 tonnes of torque tension can be applied to the NovoBolt via the Cam Anchor using the unique two stage drive nut.

Resin Mixing

The bolt has an internal diameter of 16 mm and includes a series of specially designed mechanisms to enable the two resin components to be perfectly mixed to guarantee effective anchorage and encapsulation. These internal mechanisms also ensure repeatability of the injection process and prevent the escape of resin from within the NovoBolt, ensuring that installed bolts are effectively filled internally and encapsulated externally with reacted resin. A major advantage of the Carbothix pumped resin systems is that 100% encapsulation is guaranteed every time, with the additional benefit of filling all cracks and cavities in the roof to maximise load transfer capacity and minimise corrosion.



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Advantages – Novobolt

The Novobolt range currently includes four separate bolt options. In addition to the well recognised safety and productivity advantages associated with self-drilling bolts the specific advantages of each individual Novobolt option include:

Standard

- rapid installation with excellent quality and consistency for bolting applications where pre-tension may not be required

Pre-tensionable

- rapid installation and pre-tension with guaranteed encapsulation in all roof conditions. The cam anchor system provides immediate anchorage and is not subject to the variability of resin mix and set times or storage and shelf life issues.

Extendable

- telescopic bolt designed to automatically unwind during installation and extend up to 4 metres for additional primary support in gate roads and intersections

Cutable

- a GRP version of the Standard bolt for guaranteed installation quality and effectiveness in rib bolting applications

Technical Data – Novobolt

Mechanical Properties	Standard	Pre-tensioned	Extendable	Cutable
Ultimate Tensile Stress (strength MPa)	850	850	850	500
Tensile Force Typical (MT)	38	38	38	25
Yield Stress (strength MPa)	550	550	550	N/A
Yield Force Typical (MT)	24	24	24	N/A
Elongation (minimum)	15%	15%	15%	1%
Nominal external diameter	32 mm	32 mm	46 mm	32 mm
Central hole diameter	16 mm	16 mm	16 mm	16 mm
Drill bit size	38 mm	38 mm	50 mm	38 mm

Note: Metric Tonne (MT)

Cutable version, 7mm pitch rope thread, Thread load > 10 tonnes

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Carbothix Pumpable Resin System

Historically resin encapsulated rock bolting has been undertaken using polyester based resin capsules. Whilst contained in capsule form the polyester based resin mastic and organic peroxide catalyst are a safe and effective bolt anchorage medium, these components are generally not permitted for bulk handling and pumping applications in underground mines.

Carbothix is a fast curing two component silicate resin system designed specifically for injection bolts. When the two components are adequately mixed they form a tough elastic and non-porous resin that will not mix with water and be diluted in wet holes. Carbothix provides superior strengths to typical polyester resin systems, and is considerably lower in viscosity enabling easier handling and long distance pumping.

Advantages – Carbothix

Carbothix has several benefits over traditional polyester resin systems including:

Resin to Catalyst ratio

- 2:1 or 1.5:1

Low Viscosity

- Long distance pumping, up to 500 metres

High Flash Point

- Component A N/A , Component B > 100°C

Long Shelf Life

- 12 months

Easy Storage

- Carbothix does not require cool room storage and can be safely stored at temperatures up to 40°C

Technical Data – Carbothix

Carbothix – @ 2:1 ratio	2 minutes	3 minutes	5 minutes	10 minutes	30 minutes	1 hour	24 hours
Punched Shear Strength (MPa)		4.8	14.2			25.7	
UCS (MPa)						70	75
Shore D Hardness	42		55	62	70		
@ 25°C							
Gel Time (seconds)		10					
Cure Time – Hardness Test (seconds)		33					
Viscosity (mPa*s) Component A		320 – 420					
Viscosity (mPa*s) Component B		300 – 400					

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Installation Equipment

Development of the complete Novobolt system included the design and commissioning of specific drilling and injection equipment. An important design parameter of the project was a system to enable drilling and resin injection without the need to change equipment or to detach and reattach the bolt.

The drilling and injection system ensures that the two separate resin components do not actually come into contact until they are inside the bolt, allowing repeatability of the drilling and injection process. A linked dual pumping system ensures that the correct ratio of Part A and B Carbothix resin components can be injected into the installed Novobolt. A resin supply and pumping system can be setup on the continuous miner or at an out by pumping station.

The system has been developed for ease of installation on individual

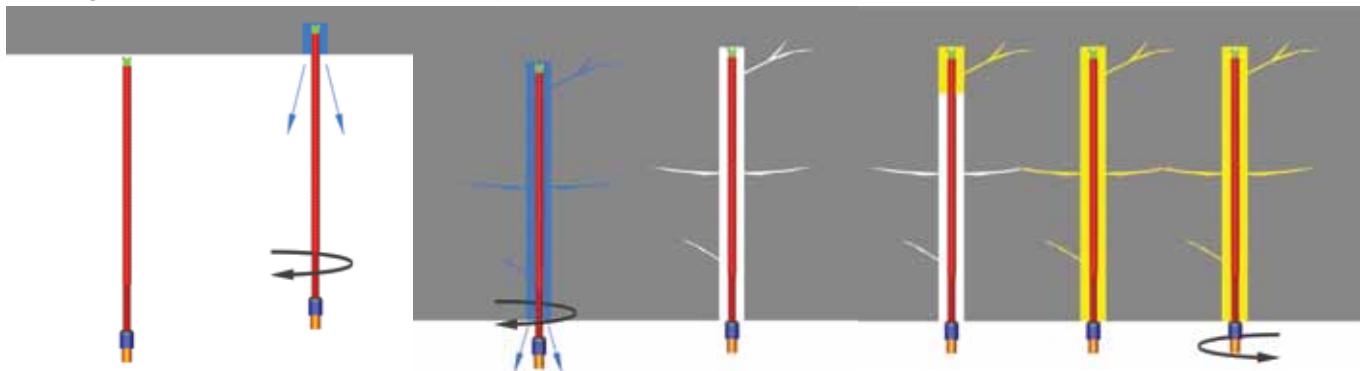
or multiple feed frames. All driven equipment is hydraulic. Recognizing the type and configuration of numerous continuous miners, the resin pumping station is designed specifically to house standard components, yet not restrict operation of the continuous miner. The unique chuck drive and injection units are available in a kit form to facilitate efficient installation to either Joy or Sandvik Mining feed frames.

Alminco supports a large fleet of customer owned and hired drilling and bolting equipment with a team of qualified personnel located at bases in the Illawarra, Hunter Valley and Bowen Basin coal fields. Alminco can provide full installation, commissioning and scheduled service support of the Novobolt drilling, pumping and grouting equipment to ensure safe, consistent and efficient rock bolting quality and efficiency.

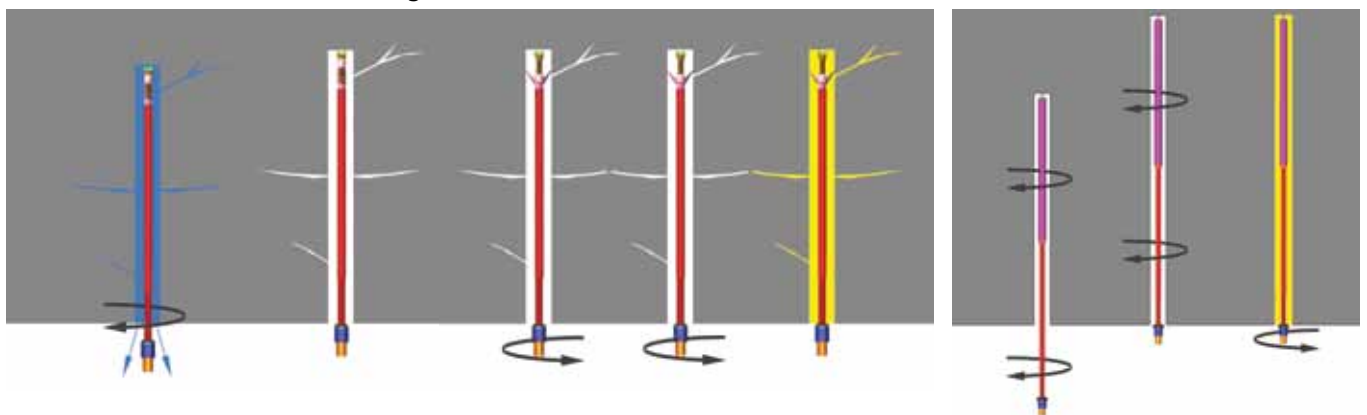
Installation Process

The Novobolt installation process is very simple. The Novobolt and plate is placed into the drill chuck and is then drilled into the roof or rib using standard left and rotation. The drilling stage should take approximately 30 seconds to complete for a standard 1.8m bolt. At this point using the pre-tension bolt the mechanical anchor can be set in place using right hand rotation. Once sufficient load is applied to the mechanical anchor the breakout pin will shear in the nut allowing the plate to be tightened against the roof and pre-tension to be applied to the bolt. Injection of the bolt can then commence with resin being pumped until reacted resin is visible around the plate. Using a standard bolt sufficient time should be allowed for the resin to set (approximately 15 seconds) before the nut can be tightened against the plate using right hand rotation.

The diagram below indicates the installation process for the standard Novobolt.



The diagrams below indicate the installation process for the pre-tensioned Novobolt on the left, and the drilling installation of the extendable Novobolt on the right.



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Production / Operations Sites

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Nowra NSW

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+61 (0)2 4428 5200

Wyong NSW

Amsterdam Circuit
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Arndell Park NSW

2 Squill Place

Mackay QLD

Southgate Drive Paget
+61 (0)7 4968 5300

Welshpool WA

8 Dampier Place
+61 (0)8 9356 5902

Sales Offices & Branches

Parkes NSW

Adelaide SA

Townsville QLD

Minova Worldwide

Australia

Group Headquarters

Production Sites

Germany

Minova CarboTech GmbH
Minova BWZ GmbH

India

Minova Minetek Pvt. Ltd.

Poland

Minova Ekochem S.A.
Minova Arnall Sp. z o.o.
Minova-Ksante Sp. z o.o.

Russia

ZAO Carbo-ZAKK
OOO Minova TPS
Branch OOO Minova (Ural)

South Africa

Minova RSA

Kazakhstan

TOO Minova Kasachstan

Ukraine

OOO Minova Ukraina
AOZT Carbo i Crep

United Kingdom

Minova Weldgrip Ltd.

France

Branch Minova AG
(Minova SA)

Australia

Minova Australia Pty Ltd.

Canada

Minova Canada Inc.

Chile

Minova Mining Services SA

People's Republic of China

Ruichy Minova Synthetic
Material Co., Ltd.

Taiwan R.O.C.

Minova Asia Pacific Ltd.

USA

Minova USA Inc.

Sales Offices & Branches

Austria

Minova GmbH

Czech Republic

Minova Bohemia s.r.o.

Italy

Minova CarboTech GmbH
Branch Italy

Romania

Minova Romania S.R.L.

Russia

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Spain

Minova Codiv S.L.U.

Sweden

Minova Nordic AB

Switzerland

Minova AG

Turkey

Minova CarboTech GmbH
Branch Turkey

United Kingdom

Minova Weldgrip Ltd.



The Ground Support Company



A member of the Orica Group