



Let's connect

NC-Bolt

Combination bolt



Combination bolt

A combination bolt is initially installed for immediate support by the use of an expansion shell, to be fully grouted at a later stage allowing it to be classified as permanent support. The advantage is that a single bolt is effective for immediate work protection at the face after torque tensioning, while later becoming permanently corrosion protected by the grouting, normally carried out before application of sprayed concrete.

The combination bolt may be used for most ground conditions, but excluding ground subjected to strain bursting and very large contour convergence. The injected grout improves the corrosion protection provided by the plastic grout pipe and the Pc-Coat. Such bolts are therefore highly attractive for very corrosive environments like subsea tunnels. The end-anchorage with tensioning of the rebar, plastic grouting pipe and the cementitious mortar embedment creates a very stiff system offering extended durability.

Any tunnel may cross zones of variable need of corrosion protection for bolts, but to classify the exposure level may be difficult. One mitigation strategy may be to use the well protected Combination Bolt along all of the tunnel length.

The NC-Bolt may be used under most ground conditions, except when very high rock stresses may produce large radial deformations or strain bursting.

We produce two types of combination bolts - NC-Bolt and Pc-Bolt (tube bolt).



Installation, equipment

Installation takes place in two steps:

- 1) Place the bolt in the hole and tension it by applying correct torque on the nut.
- 2) Grout injection for permanent protection.



Immediate support by placement and tensioning at the tunnel face.



The grouting tool gets attached to the bolt head before start of the mortar pump. (Two alternative types of grouting tools are available)



Mortar gets pumped through the hole in the bolt head to fill the annular space from bottom of hole out to the circular bearing plate.



In the bearing plate you can see the hole indicating completely filled borehole.

The pictures are freeze-frames from our animation film that can be found by searching for: "NC-Bolt" at www.youtube.com

Technical information



Specifications

Dimension	Material	Thread length	Weight	Borehole	Depth
M20x2,5	HRB500E	2xM20x150mm	2,47kg/m	Ø45-48	+150mm
M22x2,5	HRB630	2xM22x150mm	2,98kg/m	Ø45-48	+150mm
M33x3,5	HRB500E	2xM33x200mm	6,43kg/m	Ø64-68	+150mm

Mechanical properties

Dimensjon	Tension area A_s Threaded rod	Yield stress R_{eh}	Failure stress R_m	Ductility A_{gt}
M20x2,5	245-314 N/mm ²	Min. 500 N/mm ²	Min. 600 N/mm ²	Min. 8%
M22x2,5	303-380 N/mm ²	Min. 630 N/mm ²	Min. 790 N/mm ²	Min. 7,5%
M33x3,5	694-804 N/mm ²	Min. 500 N/mm ²	Min. 600 N/mm ²	Min. 8%

Minimum load capacity

Dimensjon	End anchored		Fully grouted		Torque Nm	Pre-tension kN
	Yield kN	Failure kN	Yield kN	Failure kN		
M20x2,5	123	147	157	186	150-250	40-60
M22x2,5	191	239	239	300	150-250	40-60
M33x3,5	347	416	402	482	200-300	40-60

Technical information

Mortar and grouting

Recommended w/c-ratio is 0.4 when using a suitable water reducing admixture. This is based on Mapei mortar type Zinkbolt.
To ensure proper grouting, the original Pretec grouting tool is recommended.



Stock program

Available in 3 different dimensions:
M20 and M22 in lengths from 2400mm to 6000mm
M33 from 3000mm to 12000mm (delivered with coupler)



Accessories

Circular bearing plate with hole for evacuation of air.
Suitable for angle deviation up to 30°.
Bearing plate must be ordered additionally.

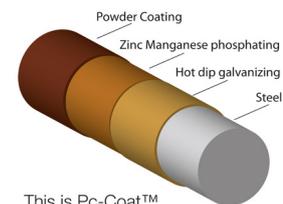


Expansion shell is mounted on the bolt from factory.



Corrosion protection / Pc-Coat™

Hot dip galvanizing is executed according to NS-EN-ISO 1461 and epoxy powder coating according to NS-EN 13438.



Please refer to product technical data sheet for Pc-Coat and relevant MOM documentation and Pc-Coat brochure which may be downloaded at www.pretec.no



Quality control

Our manufacturing plant Zhejiang Pretec Metal Products Co. Ltd. is certified according to ISO 9001 and environmentally certified to ISO 14001 and EN 1090-1 with complete manufacturing control of all production steps.

Our CE product marking provides trace documentation from the steel mill to the final product, allowing Pretec to take full responsibility for providing the specified quality through the whole value chain.

We are continuously testing during manufacturing to ensure that our products will satisfy both the specifications and the expectations of the market, our customers and the construction site owner.

Certificates in compliance with EN 10204 3.1 are available for inspection. Bolts are approved by the Norwegian Road and Rail Authorities.



Advantages: The NC-Bolt

- Duplex corrosion protection: Hot dip galvanized and epoxy powder coated rebar bolt placed within a plastic grouting pipe and completely embedded in mortar, provides extended durability under all conditions.
- Highly efficient because it is suitable in most ground conditions and covers both immediate and permanent support in a single bolt.
- Durability testing of NC-Bolts shows that to improve on the Duplex system, stainless steel would be required for bolts and accessories.
- Bolts are delivered with expansion shells with zinc coating. This ensures proper function of the threads and the coating prevents corrosion. Less work on site saves time and there are fewer parts to handle for stock management.
- Bolts are clamped in groups and loaded on EUR-pallets. This prevents transport damage and simplifies managing number of bolts in stock.
- Short distance from end of grouting pipe to expansion shell, ensures filling of borehole end, before mortar fills the rest of the hole.
- The bolt head design prevents leakage and risk of mortar spray against operators.
- Rebar anchorage tests show that the plastic grouting pipe bubble design provides excellent pull-out resistance for the rebar steel.



Norwegian Tunnelling Network (NTN) has issued a “Best Practice” document regarding installation of rock bolts:

www.norwegiantunneling.no

Look under “Best Practice” and “Installation of rock bolts”.



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