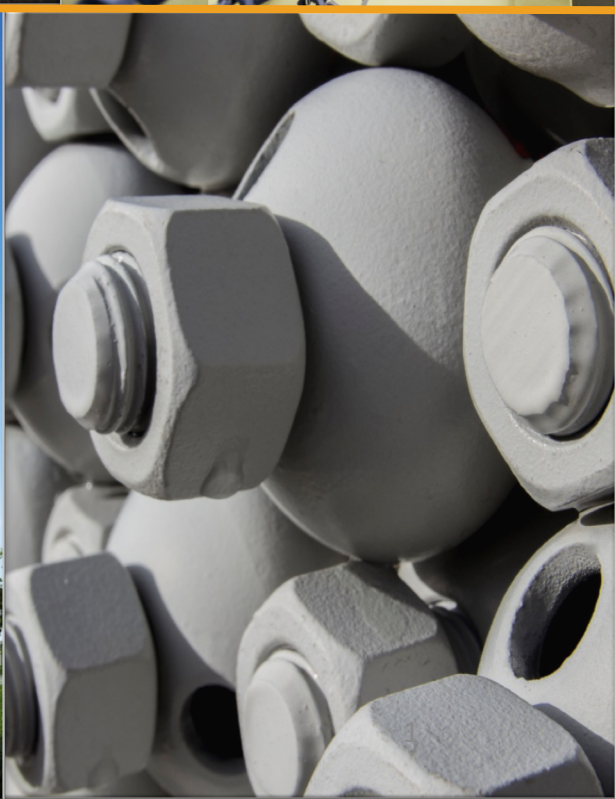




PRETEC



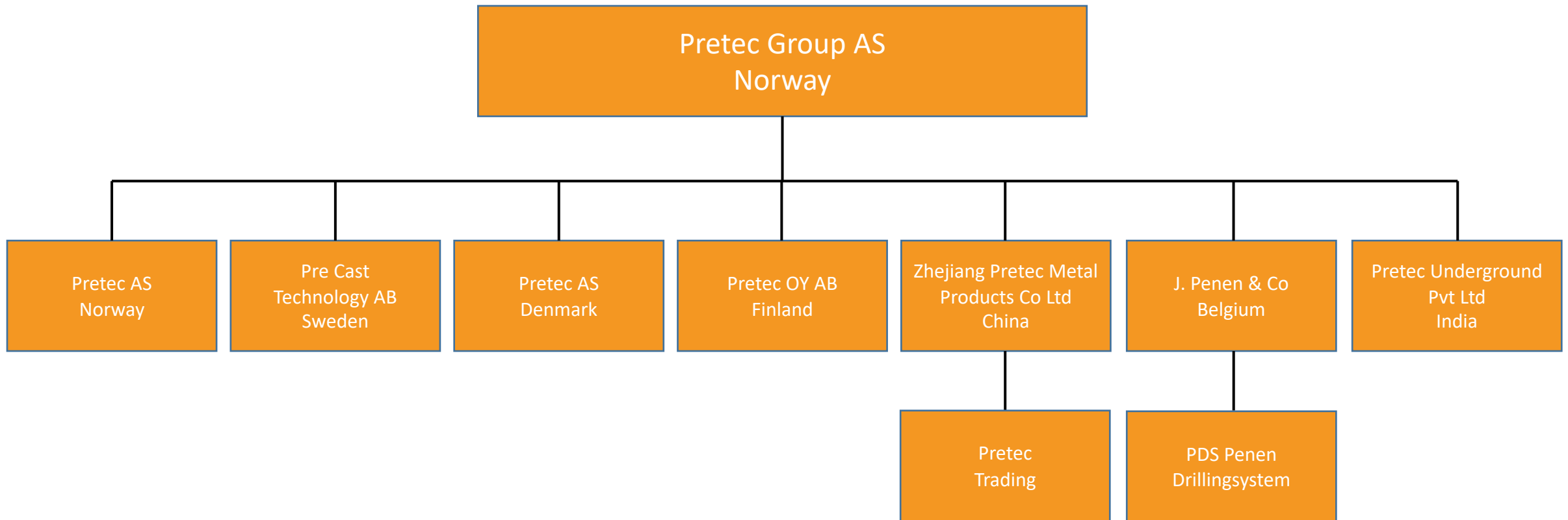
Let's connect
Rock support





Let's connect

• Pretec • Introduction



Norwegian tunneling needs Combination bolts

- Combination bolts = immediate -, temporary – and permanent support
- Rock ‘support’ in Norway is in most cases in reality rock reinforcement. The normally applied principle in Norwegian tunneling is based on rock support being adapted to the local rock conditions. The surrounding rock is taken into consideration as part of the overall structure that creates stability for the underground opening. This approach offers the advantage of saved time and materials.
- Rock reinforcement will typically be some selection of different rock bolts installed in boreholes combined with surface reinforcement by fibre reinforced sprayed concrete.
- The most common rock bolt used in Norway is combination bolt. This 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.



Let's connect

Combination bolts



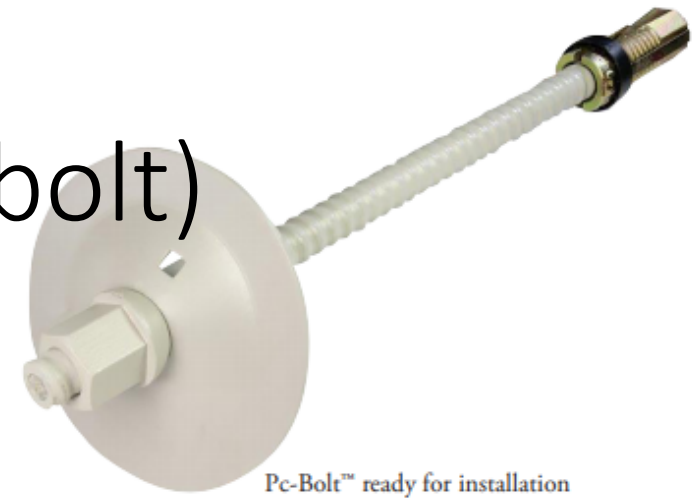
- The advantage is that a single bolt is effective for immediate work protection at the face after torque tensioning, to be fully grouted at a later stage, allowing it to be classified as permanent support
- Drilling continues while workers are installing rock bolts
- Grouting is done behind the face of the tunnel. (Normally 50m)
- Combination bolt is an important part to achieve effective tunnel production.



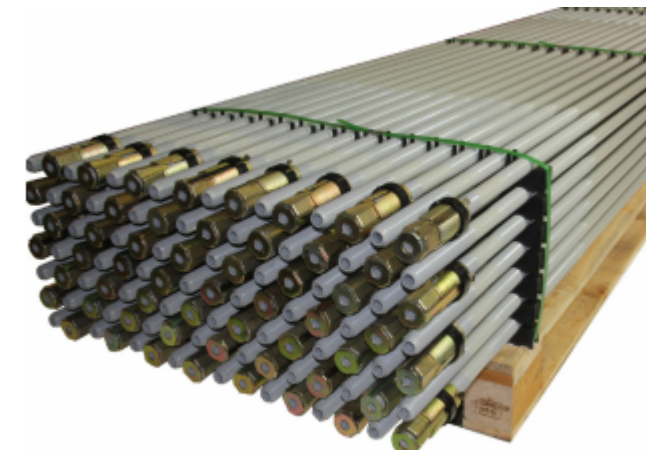
Pc-Bolt™ - combination bolt (tube bolt)

- A favorite for the tunnel workers. Its lean and simple design ensures the most efficient installation and grouting.
- Can be supplied in a range of dimensions and lengths.
- Easy and fast to grout. Also, the grouting process with Pc-Bolt is a minimal risk for the operators because the grouting tool is mounted directly on the bolt with threads.
- Same capacity whether it is temporarily end-anchored or fully embedded. Fully embedded provides an extra corrosion protection which ensures durability of the bolt.
- Bolts are clamped in groups and loaded on pallets. This prevents transport damage and simplifies managing stock.
- Pc-Bolt™ is approved by the Norwegian Public Road Administration, Bane NOR (Norwegian Railway Authority) and Swedish Road Administration.

[Link for installation video](#)



Pc-Bolt™ ready for installation



Pc-Bolt™ packed on pallet

Pc-Bolt™ Common dimensions in Scandinavia

For other requirements please contact us.

Specifications

Dimension	Material	Thread length	Weight	Borehole	
				Diameter, mm	Depth ³⁾
M27/15	40Cr ¹⁾	2xM27x150mm	2,51kg/m	Ø45-48	L+150mm
R27/15	40Cr ¹⁾	R27 whole length	2,78kg/m	Ø45-48	L+150mm
R27/12	40Cr ²⁾	R27 whole length	3,12kg/m	Ø45-48	L+150mm

Mechanical properties

Dimensjon	Tension area A _s	Yield stress ReH	Tensile stress Rm	Ductility Agt
M27/15	314 N/mm ²	Min. 500 N/mm ²	Min. 600 N/mm ²	Min. 8%
R27/15	319 N/mm ²	Min. 500 N/mm ²	Min. 600 N/mm ²	Min. 8%
R27/12	382 N/mm ²	Min. 660 N/mm ²	Min. 830 N/mm ²	Min. 12% ⁴⁾

Minimum load capacity

Dimensjon	End anchored ⁵⁾		Fully grouted		Torque Nm	Pre-tension kN
	Yield kN	Failure kN	Yield kN	Failure kN		
M27/15	157	186	157	186	200-300	40-70
R27/15	159	191	159	191	200-400 ⁶⁾	20-40
R27/12	246	270	246	270	200-400 ⁶⁾	20-40

¹⁾According to DIN EN 10083-3. Heat treated according to GB/T 16923 ²⁾8.8 according to ISO 898-1

³⁾L=bolt length ⁴⁾Elongation, A₅ ⁵⁾Poor and soft rock quality may give lower values. Test on site under actual conditions to correctly establish representative values. ⁶⁾Recommended torque with hexagon dome nut.



Let's connect

Pc-Packer

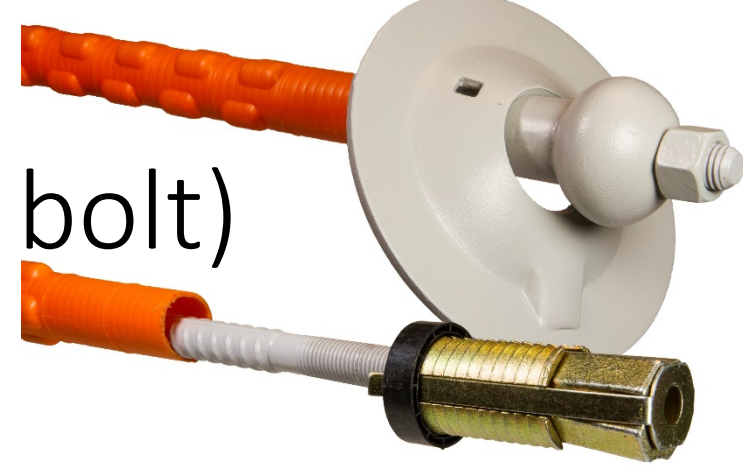


Pc-Bolt™ with Pc-Packer mounted, ready for installation

- Problems with water ingress in boreholes? Add the Pc-Packer to ensure full embedment of the bolt.
- During tensioning of the bolt the rubber packer is squeezed into the bore hole and seals it completely. The bolt should be grouted through the metal pipe in the Pc-Packer using the interior hole in the bolt for evacuation of air and possible water. For grouting we recommend using the safe grouting tool for Pc-Packer. When grout is coming out of the interior hole in the bolt end, it can be sealed using a cap nut with hose.
- A flexible and simple solution.
- Allows grouting under pressure.



NC-Bolt - Combination bolt (rebar bolt)



- The most used combination bolt design.
- Multiple choice of materials and diameters can be provided.
- Plastic tube provide an extra barrier in protection against corrosion
- Rebar anchorage tests show that our plastic grouting pipe bubble design provides excellent pull-out resistance for the rebar steel
- NC-Bolt is approved by the Norwegian Public Road Administration and Bane NOR (Norwegian Railway Authority).

[Link to installation video](#)



Nc-bolts with mounted expansion shells

NC-Bolt Common dimensions in Scandinavia

For other requirements please contact us.

Specifications

Dimension	Material ¹⁾	Thread length	Weight	Borehole	
				Diameter, mm	Depth ²⁾
M20x2,5	HRB500E	2xM20x150mm	2,47kg/m	Ø45-48	L+150mm
M22x2,5	HRB630	2xM22x150mm	2,98kg/m	Ø45-48	L+150mm
M33x3,5	HRB500E	2xM33x200mm	6,43kg/m	Ø64-68	L+150mm

Mechanical properties

Dimension	Tension area A_s Thread-shank	Yield stress R_{eh}	Tensile 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

Dimension	End anchored ³⁾		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

¹⁾ According to GB1499.2-2007

³⁾ Poor and soft rock quality may give lower values.

²⁾ L = bolt length

Test on site under actual conditions to correctly establish representative values.



Let's connect

Pc-Bolt and NC-Bolt completely embedded





Expansion shell - superior design

- Our expansion shell is normally mounted on the bolt from factory, but is also available loose. Due to superior design, the expansion shell will provide immediate anchoring effect when the bolt has been installed and tensioned.
- Large assortment in stock:

Bolt dia:	M20	M20	M22	M27	R27	R27	R32	M33	R38
Drill hole dia:	Ø32-36	Ø45-48	Ø45-48	Ø45-48	Ø45-48	Ø64-68	Ø64-68	Ø64-68	Ø64-68

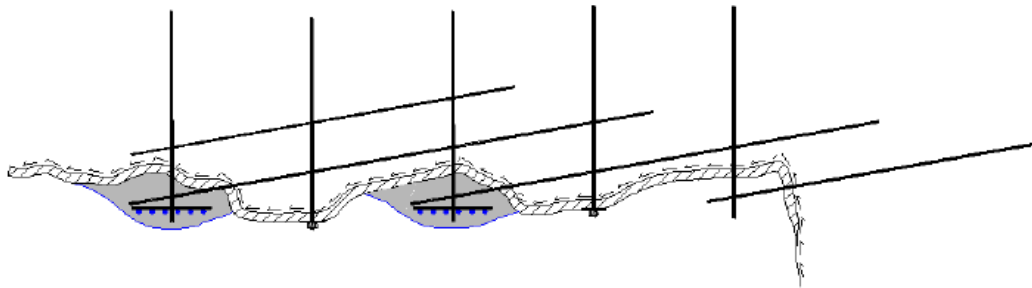
- Other needs on request



Let's connect

Reinforced ribs of sprayed concrete

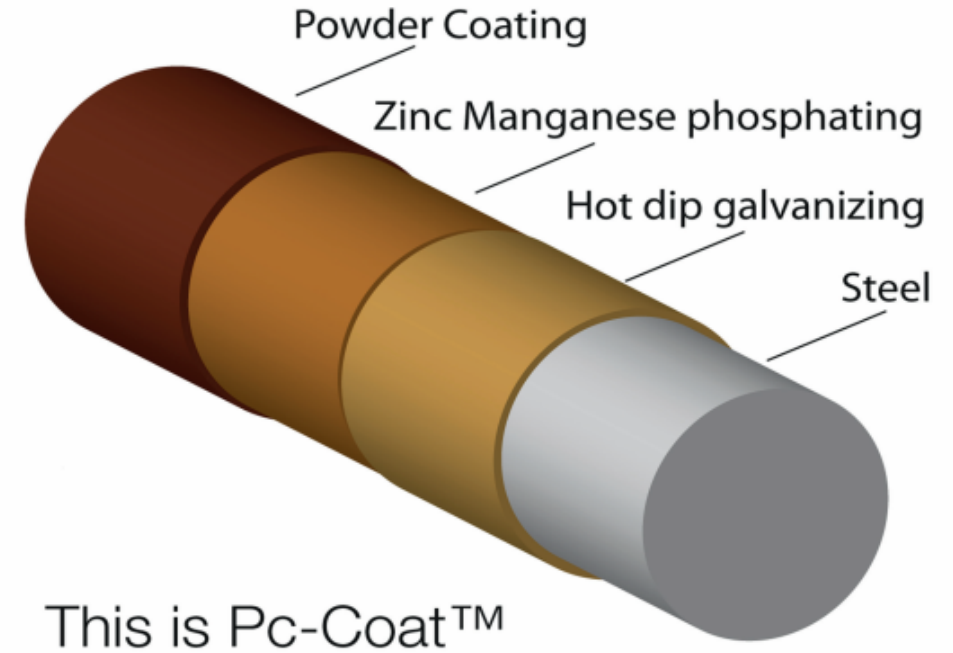
- Used when rock quality is poor, a simple alternative to traditional lattice girder systems.



Let's connect

Corrosion protection / Pc-Coat™ 100 years lifetime

- Hot dip galvanizing is executed according to NS-EN-ISO 1461 and epoxy powder coating according to NS-EN 13438.
- PC- coated products have shown extremely long life time exposed in rough environment. Research projects at SINTEF² have shown the same.
- Powder coating is an environmentally friendly and economical process with little waste and no volatile solvents. This provides a good working environment and significant cost savings.



Hardangerbrua – Norway

Recent projects:

- **The Ryfylke (Solbakk) subsea crossing, Norway (2013-2017)**

As the last bit was drilled 2017-10-26 Ryfast became the longest undersea road tunnel in the world with its 14.3 km length.

- **Road tunnels, Faroe Islands (2016-2021)**

Two sub-sea road tunnels, Eysturoy (11.2 km) and Sandoyar (10,5 km) tunnel. The largest-ever infrastructure project for the Faroes.

- **Länsimetro I/II, Subway under City of Helsinki, Finland (2009-2017/2014-2023)**

Phase I was completed in the autumn of 2017, about 14 kilometer of tunnel, some parts of the tunnel is subsea, including eight stations. Phase II did start 2014 and will be ready Year 2023. Phase II is about 7 kilometers long and have five stations and one train depot.

- **E4 The Stockholm bypass, (Road tunnel)**

4 The Stockholm bypass – Förbifart Stockholm – is a new route for the European highway (E4) past the Swedish capital.

- **Devoll hydropower (water tunnel), Albania (2016-2018)**

The 150 meter dam will be one of the highest in the world, connected to the production center with an 11 kilometer long tunnel.

- **The Harbour Area Treatment Scheme (HATS), Hongkong (2011-2012)**

The tunnel is collecting and treating the sewage on both sides of Victoria Harbour.

Why is quality



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





Let's connect

Thank you for watching!

