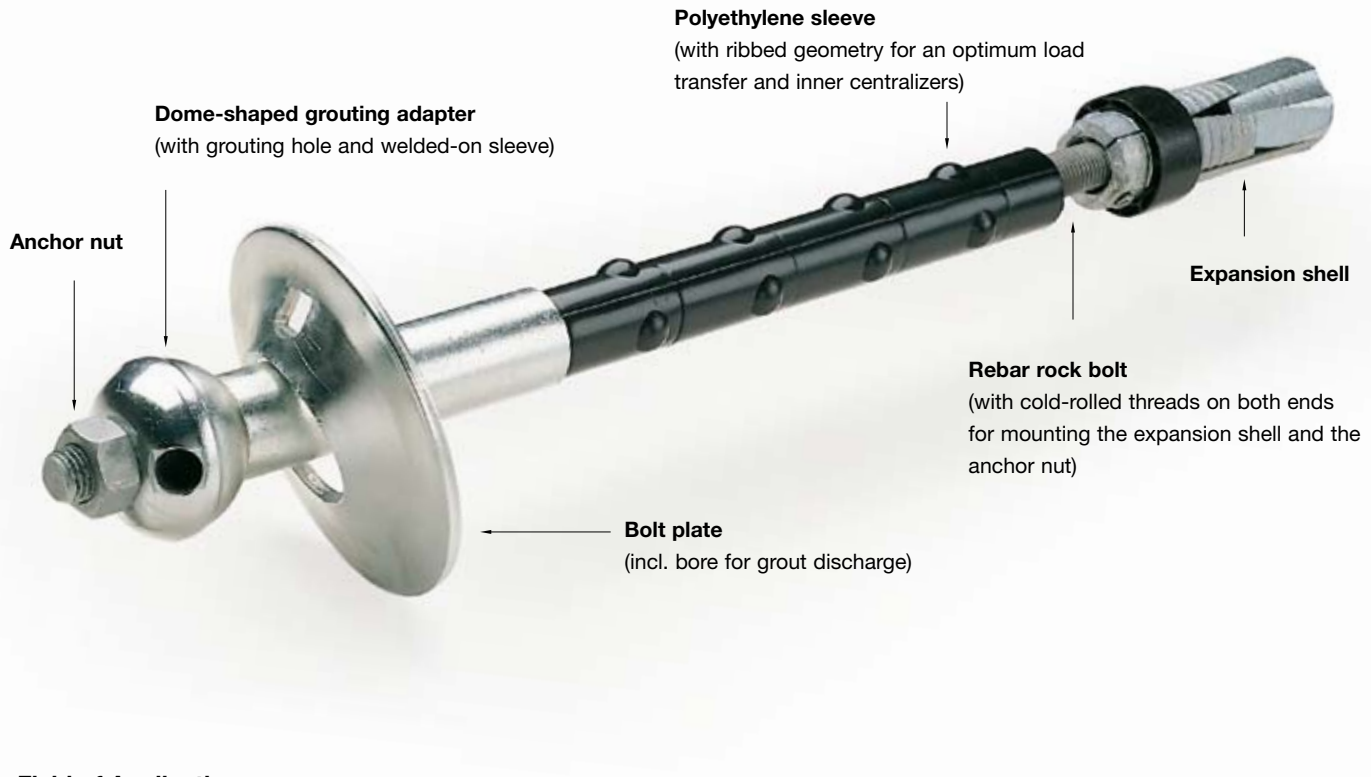


CT-Bolt™



System Description

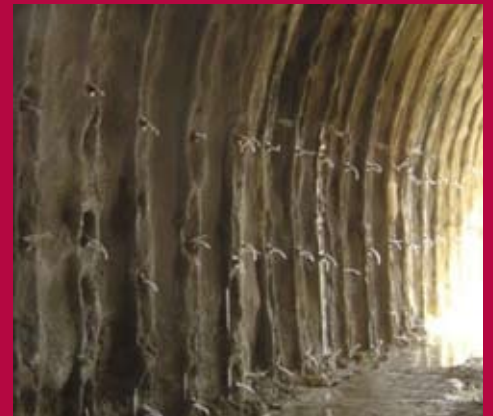
- Combination rock bolt
- Application as temporary and long-term ground control system
- Immediate point anchorage in terms of an expansion shell anchor
- Post-grouting assembly features double corrosion protection
- Fully automated or manual bolt installation



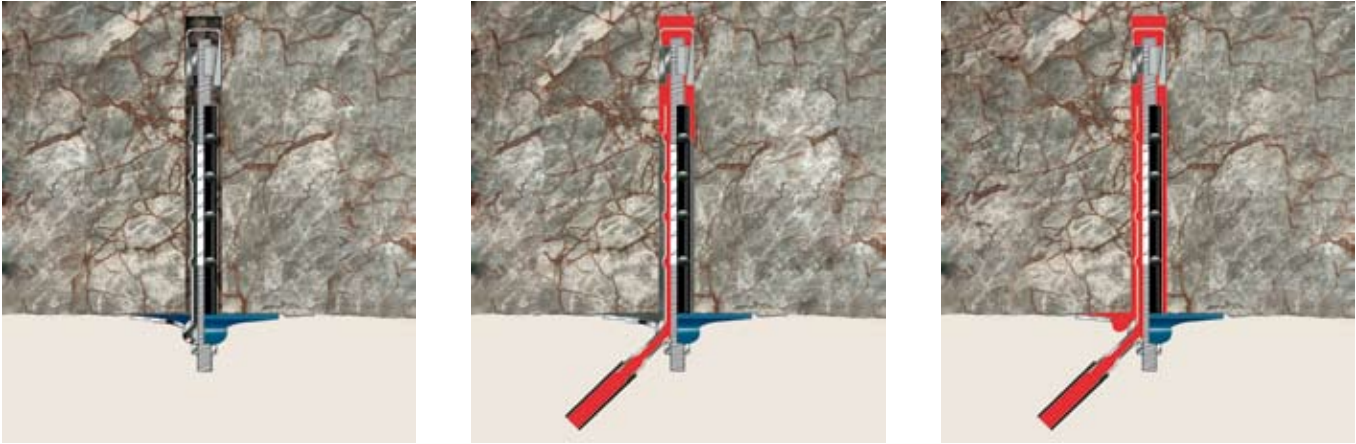
Field of Applications

Main applications of the CT-Bolt™:

- Systematic permanent reinforcement of underground excavations
- Ground support for areas with limited or no access during operational lifetime
- Mining: permanent roadways and excavations
- Hydropower and underground oil or gas storage caverns
- Sub-sea and sewer tunnels



Installation Procedure



Borehole drilling

- Drilling of a borehole \varnothing 44-51 mm
- Recommended borehole length: about 100 mm longer than the bolt length

Bolt installation

- Insertion of the assembled CT-Bolt™ into the pre-drilled borehole
- Pressing the bolt plate firmly against the excavation surface
- Activation of the expansion anchor by pre-stressing of the anchor nut provides immediate point anchorage
- Typical required torque: 200-300 Nm

Flexible bolt grouting

- Preparation of either mortar or cement according the given specifications
- Connection of an injection adapter to the grouting adapter of the CT-Bolt™
- Primary grout flow inside the polypropylene sleeve towards the bolt's toe (expansion shell) - complete grout coverage of the rebar
- Secondary grout flow outside the polypropylene sleeve until the grouting medium flows out at the bore for grout discharge at the hemispherical bolt plate

Fully automated installation

- Optional automation unit available



Technical Features

Combination rock bolt

- Active reinforcement by pre-stressing of the expansion anchor
- Allowance of a certain amount of elastic deformation of the rebar induced by displacements of the rock mass
- Flexible grouting behind the working face allows an optimum adaption of the CT-Bolt™ to given ground and operating conditions
- Optimum alignment and assurance of complete grout coverage of the of the rock bolt by the polypropylene sleeve

Unique choice of the corrosion protection level

- Protection of the load-bearing components of the CT-Bolt™ according to given levels of corrosive environments
- Bolts are available black, hot dip galvanised, or with a special Combi Coat® (combination of hot-dip galvanizing, zinc phosphate, and powder coating)
- Indicated lifetimes for load-bearing components of the fully-grouted CT-Bolt™ by accelerated corrosion tests performed by Vik Ørsta AS from 50 (black type) to 150 (Combi Coat® type) years

Rock bolt testing equipment

- Rock bolt testing provides a quality control of the rock bolt system behaviour in combination with given ground conditions
- Bolt load indicators and custom-specific pull test kits are provided upon request



Specifications and Prime Advantages of the CT-Bolt™

Specifications

#	Parameter	Unit	CT-M20	CT-M22
1	Outer Rebar Diameter	[mm]	20	21.7
2	Thread Designation	[mm]	M20	M22
3	Characteristic Yield Load ¹⁾	[kN]	140	230
4	Characteristic max. Tensile Load ¹⁾	[kN]	170	290
5	Borehole Diameter Range	[mm]	44 – 51 ²⁾	
6	Delivery Lengths	[m]	1.5 – 6.0 ³⁾	

1) After grouting

2) Expansion shells for larger borehole diameters available on request

3) Delivery lengths up to 8.0 m are available on request



Prime Advantages

Combination rock bolt

- Efficient, practically proven, and reliable rock reinforcement system
- Combination of an immediate point anchorage and a fully grouted rock bolt
- Immediate load-bearing capacity after installation by the mechanical anchor
- Fast installation and flexible post-grouting behind the working face
- Double corrosion protection by the polypropylene sleeve and grout coverage
- Easy adjustment of the corrosion protection level to customer demands
- Fully automated or manual installation procedure



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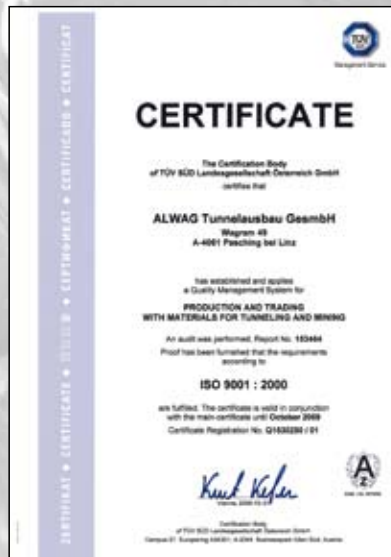
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