

NORDIC GEO SUPPORT

Bolting Technologies

FOR
MINING, TUNNELLING AND
GEOTECHNICAL APPLICATIONS



NordicSDA – Self Drilling Anchors

Efficiency



Self-Drilling bolts (also known as Self Drilling Anchors or SDAs) are versatile and offer an efficient way for rock bolting in projects. Ideal in unstable ground conditions, the bolt acts as a drill string that remains in the hole after drilling. The bolt is post grouted to secure the bolt in position. The bar can be extended by using couplings where deeper tendons are required for securing ground, replacing cable technologies, especially in unstable ground conditions. Bolts can be supplied to required lengths as non-standard supply. Bolts can be single or double corrosion protected to meet requirements.

Technical Data	Unit	R25	R32L	R32N	R32S	R38	R51L	R51N	T76N	T76S	T103N	T103S
Outer diameter	mm	25	32	32	32	38	51	51	76	76	103	103
Average inner diameter	mm	14	22	18.5	15	19	34	28	46.6	40	75	53
Average cross sectional area	mm ²	314	341	471	547	768	926	1217	2468	2800	3450	5200
Ultimate load *1	kN	200	220	280	360	500	550	800	1600	1900	2380	3550
Yield load *1	kN	150	180	230	280	400	450	630	1200	1500	1900	2680
Average tensile strength *1	N/mm ²	690	650	650	690	650	610	750	840	790	690	680
Average yield strength *1	N/mm ²	520	530	530	540	520	485	590	630	630	560	520
Weight	kg/m ³	2.1	2.9	3.5	4.2	6.0	7.5	9.4	18.5	22.6	27.3	42.0
Thread standard	–	ISO 102008					ISO 1720			Internal standard		
Steel grade	–	Acc. to. EN 10083-1										
Standard Delivery lengths	m	1, 2, 3, 4, 6							1, 2, 3, 4		2, 3, 4	

*1 The ultimate load and yield load capacity are measured values. The tensile-/yield strengths are calculated as average values.

** Corrosion and double corrosion protection available upon request.

NordicGeo FRP Fibre Reinforced Polymer

Sustainability

Composite technologies positively benefit the environment and your workforce. Compared to the standard permanent steel rock bolt, GFRP bolts reduce Green House Gas emissions (such as CO₂) by up to 60% in manufacturing and transportation. GFRP is significantly better than traditional steel bolts in all categories of environmental impact. GFRP is much lighter than steel so this improves the work environment and increases productivity. GFRP offers superior durability compared to combination coated steel bolts, with a long potential design life for the bolt. A variety of GFRP products are available for various applications including continuous thread bars, self-drilling bolts, cable bolts, hollow bars, reinforcement bars and meshes, along with a full range of accessories such as face plates and nuts in both steel and GFRP.

In mining, the development of GFRP bolting, improves productivity and in face bolting applications removes the after effect of ore contamination introduced by steel and reduces wear of the crusher and conveyer belt systems.

Advantages include:

- Corrosion resistance
- Ease of cutting
- Electrically insulated
- Flexibility for installation in confined spaces
- High tensile strength
- High torsional strength
- High thermal isolation
- Lightweight (up to 75% lighter than steel)
- A wide range of diameters and shapes in solid or hollow bar

Indicative characteristics		
	GFRP	Steel
Typical weight (kg/m ³)	1900	7800
Tensile strength MPa	1 000	600
E modulus GPa	45	Approx. 200
Deformation (%)	> 3.5	>8

Nordic Geo Support is working with Dextra, the global leading supplier of Glass Fibre Reinforced Polymers. Dextra recently won several prestigious projects and has been developing their technology. Documents available on request include:

- Durability certification and test reports
- Certificate of Analysis reports
- Shear and Apparent shear test reports

Table of typical physical and mechanical properties of bolts

Solid bar				Hollow Bar			
Nominal Dia. (mm)	Internal Dia. (mm)	Nominal CSA (mm ²)	Thread Direction	Nominal Dia. (mm)	Internal Dia. (mm)	Nominal CSA (mm ²)	Thread Direction
25	21	350	Left	32	15	365	Left
Resin	Ultimate Tensile Load (kN)	Ultimate Tensile Strength (MPa)	Transverse Shear Strength (MPa)	Resin	Ultimate Tensile Load (kN)	Ultimate Tensile Strength (MPa)	Transverse Shear Strength (MPa)
PE or VE	350	1000	150	PE or VE	365	1000	150

NordicGEO Friction Bolts

Immediate Roof Support

Friction bolts are much more cost effective compared to inflatable bolt technologies which require the investment in additional complex pumps and equipment. This is a very cost-effective technology for short-term applications.

This type of bolt provides immediate support to the rock.

Available in sizes $\varnothing 33$, $\varnothing 39$ and $\varnothing 48$

- Fast to install using the hammer from the drill for insertion
- Immediate support to the roof using the interference fit concept
- Acts as an independent or secondary bolting roof support system
- Various lengths are available to meet mine requirements

Table of typical physical and mechanical properties of bolts

	Minimum		Typical	
Yield Strength	415 MPa	80 kN	510 MPa	100 kN
Ultimate Tensile Strength of Tube	510 MPa	100 kN	610 MPa	120 kN
Friction Bolt Diameter	$\varnothing 33$ mm x 2.3 mm			
Hole Diameter Range	30 mm min. / 32mm max.			
Weight per metre	1.53 kg			
	Minimum		Typical	
Yield Strength	415 MPa	90 kN	510 MPa	115 kN
Ultimate Tensile Strength of Tube	510 MPa	115 kN	600 MPa	135 kN
Friction Bolt Diameter	$\varnothing 39$ mm x 2.3 mm			
Hole Diameter Range	35 mm min. / 38mm max.			
Weight per metre	1.77 kg			
	Minimum		Typical	
Yield Strength	345 MPa	120 kN	445 MPa	160 kN
Ultimate Tensile Strength of Tube	460 MPa	165 kN	510 MPa	180 kN
Friction Bolt Diameter	$\varnothing 48$ mm x 3.2 mm			
Hole Diameter Range	44 mm min. / 46.5mm max.			
Weight per metre	2.86 kg			

The stiff bolt technology

This is a unique technology combining capsuled cements and friction bolts increasing bolting performance.

Stainless Steel Bolt

Nordic Geo Support has developed a leading-edge stainless-steel bolt for longer term rock support.

NordicGEO Expandable Friction Bolts

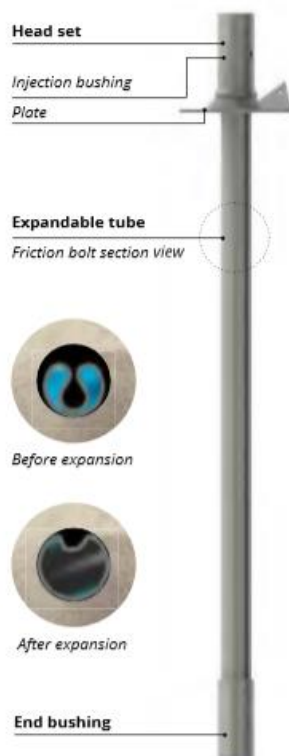
Immediate Roof Support

NordicGeo Expandable Friction Bolts are designed for easy and fast installation into the borehole. The products feature:

- Steel grade S355MC as per EN10149-2
- Load capacities of 12, 16 and 24 tons

Table of typical physical and mechanical properties of bolts

Description	Product Type			
	DM 120	DM 160	DM 200	DM 240
Variable Length	Up to 12 meters			
Bolt Diameter (mm)	27,5	36		
Primary Tube (mm)	41	54		
Hole Diameter (mm)	35-38	48-52		48-51
Ultimate Load (kN)	120	160	200	240
Weight kg/m	2	2.8	3.45	4.1
Tube Elongation %	≥ 20	≥ 6		≥ 20
Typical Elongation %	30	10		30



Advantages:

- High load-bearing capacity combined with excellent ductility elongation properties.
- The ductility elongation properties allow substantial rock movement without the bolt shearing.
- Immediate full-length support for faster excavation.
- Simple and clear installation.
- Adjusts to borehole irregularities.
- Reliable installation quality.
- Flexible to variations in drill hole diameter.
- Versatile bolting solution for variable ground conditions.
- No grouting or chemical needed.
- Manual or mechanical installation at choice.

NordicGEO Combination Bolts

A combination bolt is installed for immediate support of rock, anchored by an expansion shell, then grouted to form a permanent support element. The bolt and the mortar created a stiff system that can be used in most rock support applications. This bolt is not suitable at extreme depths, where high convergence and dynamic conditions exist. The twin coating combines to protect the steel from corrosion.

Corrosion protection: Hot dip galvanising according to NS-EN-ISO 1461 and epoxy coating according to NS-EN 13438.

Table of typical physical and mechanical properties of bolts

Solid Bolts				
Dimension	mm	M20 x 2,5	M22 x 2,5	M33 x 3,5
Thread		M20 x 150mm	M22 x 150mm	M33 x 200mm
Borehole Diameter	mm	45-48	45-48	64-68
Depth		L + 150mm	L + 150mm	L + 150mm
Ductility	kN	8%	7,5%	8%
Load Point Anchored (Yield/Fail)	kN	123 / 147	191 / 239	347 / 416
Load Fully Encapsulated (Yield/Fail)	kN	157 / 186	239 / 300	402 / 482
Weight	kg/m	2,47	2,98	6,43

Tubular Bolt				
Dimension	mm	M27 / 15	R27 / 15	R27 / 12
Thread		M27 x 150mm	R27 whole length	R27 whole length
Borehole Diameter	mm	45-48	45-48	45-48
Depth		L + 150mm	L + 150mm	L + 150mm
Ductility	kN	8%	8%	12%
Load Point Anchored (Yield/Fail)	kN	157 / 186	159 / 191	246 / 270
Load Fully Encapsulated (Yield/Fail)	kN	157 / 186	159 / 191	246 / 270
Weight	kg/m	2,51	2,78	3,12



NordicGEO Plain Bolts

Resin Bolts & Anchors

The resin cartridges are placed into the borehole and then the bolt with a special mixing blade is spun as it is inserted into the hole mixing and setting the resin. The setting time of the capsule is predetermined and allows for fast loading of the bolt.

Below are typical values that may be required for a project using plain bolting technologies. Because project needs will change, Nordic Geo Support will work with customers to match the right characteristics of products to the project.

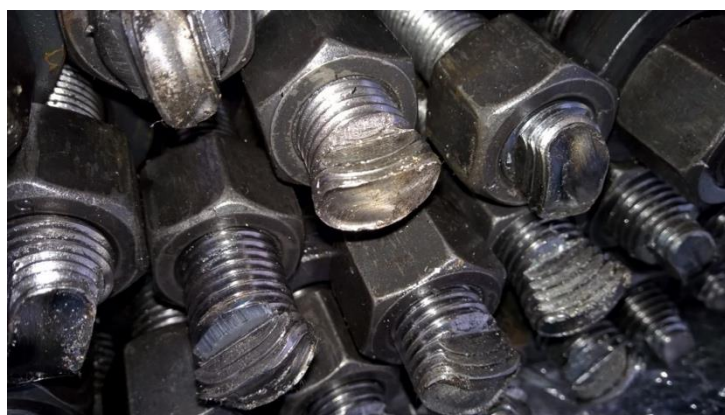
Typical Properties							
Bolt Outer diameter	mm	18	20	22	25	28	32
Thread		M 19	M 20	M 24	M 27	M 29	M 33
Yield strength of thread	kN	109	123	152	211	230	347
Yield strength of bar	kN	127	157	190	246	308	402
Breaking load of thread	kN	120	135	167	232	252	382
Break load of bar	kN	140	173	209	270	338	442
Approx. weight	kg/m	2.00	2.46	2.98	3.85	4.83	6.31

SN-Anchors

SN anchors are primarily used in tunnelling and special civil engineering applications. The bolts are ribbed increasing friction and bonding to the grout. The grout is injected into the borehole and the anchor is driven into the grout, creating an encapsulated bolt. Different characteristics are available depending on the application.

Below are typical values that may be required for a project using plain bolting technologies. Because project needs will change, Nordic Geo Support will work with customers to match the right characteristics of products to the project.

Typical Properties							
Bolt Outer diameter	mm	18	20	22	25	28	32
Thread		M 19	M 20	M 24	M 27	M 29	M 33
Yield strength of thread	kN	109	123	152	211	230	347
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Approx. weight	kg/m	2.00	2.46	2.98	3.85	4.83	6.31



NordicGEO Expansion Shells

Expanding shell anchors create a secure point at the toe of the bore hole, transferring load into the rock. Resins or mortars are not required to secure the anchor.

Codes & Standards:

- BS EN 1997-1
- BS EN 1537
- BS 7861-1

Tables of typical physical and mechanical properties of bolts

Expanding Anchor											
		Smooth bar						Ribbed bar			
Outer diameter	mm	16	18	20	22	25	30	18	20	22	25
Thread		103	M 20	M 22	M 24	M 27	M 33	M 19	M 20	M 24	M 27
Borehole size	mm	32-51	32-51	35-51	43-74	47-95	64-95	32-51	35-51	43-74	47-95
Yield strength	kN	95	115	145	165	190	300	109	123	152	211
Breaking load	kN	140	175	220	250	300	475	120	135	167	232
Approx. weight (without shell)	kg/m	1.6	2.0	2.5	3.0	3.5	5.6	2.0	2.6	3.0	3.8



NordicGEO Cable Bolts

Nordic Geo Support offers a range for pre-wound cable technologies for major brands of cable technologies. The fully mechanised rig for long hole drilling and cable bolting require technically sound cables for operational performance.

Working with the telescopic boom and cable handling, feeding and cutting systems to enable proportional movements and secure feeding of the cable.

Cable bolt:

Standard 15.2mm/bulb cable

Other diameters: available on request.

NordicGEO Mine Mesh

Safety overhead

NordicGEO mine mesh is manufactured to exact specifications to meet the demands of the mining industry. Mine mesh offers protection to the miners from loose scaling in the mines. Quality finish improves handling and installation.

Welded steel mine mesh is available in a range of sizes and configurations to suit most individual mine requirements.

For more information contact the Sales Representative in your region.

Available in:

- Sheet or rolls
- Optional galvanised for improved corrosion protection
- Different lengths, widths, wire gauges and aperture sizes to meet specific strata control needs
- Steel or GFRP
- Flexible mesh for rock convergence control



NordicGEO Accessories

Nordic Geo Support offers a range of bolting technologies for mining, tunnelling and construction applications. Because bolt sizes and lengths are determined by the geotechnical needs and equipment preferences, Nordic Geo Support works closely with each customer to offer the right product to meet the challenges of the conditions in the excavated area.

Plates, nuts and accessories

NordicGEO bolting accessories complete the bolting offer, a wide variety of standard and made to order products are available to meet the requirements of any project:

- Plates
- Nuts
- Spacers
- Centralisers
- Grout swivels
- Injection heads
- Shank adapters



Resin Cartridges

Typical applications include the temporary and permanent anchoring of bolts for rock support in slopes and underground spaces. The fast-acting nature of the capsules makes them ideal for application where time is of the essence – such as immediate rock support at the tunnel face (in tunnelling or mining), tunnel refurbishment, work on live transport links like roads or railways and work in places that are difficult to access such as steep slopes.



Drilling Consumables

A complete range of high performance and fit for purpose drilling consumables:

- Top hammer drill strings
- Down-The-Hole (DTH) hammers and drill strings
- Drill bits
- Rods and extension bars
- Shank adapters

Further drill bits on request



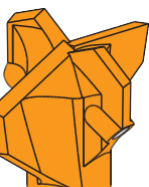
Cross bit



Asymmetrical-button bit



Button bit drop centre



Clay bit
It is not offered in Germany market

NordicGEO Service Hangers

Immediate support for your key services installation

A faster way to the management of services in mining, tunnelling and construction.

- Mounting within seconds without requirement for added cements or grouts
- Re-usable where required
- Expandable mounting based on shell technology
- Corrosion protection through shell design
- Various hole diameters
- Approved up to 420kg weight capacity
- Designed for immediate support of services
 - Electrical cables
 - Vent bags
 - Pneumatic hoses
 - Water lines



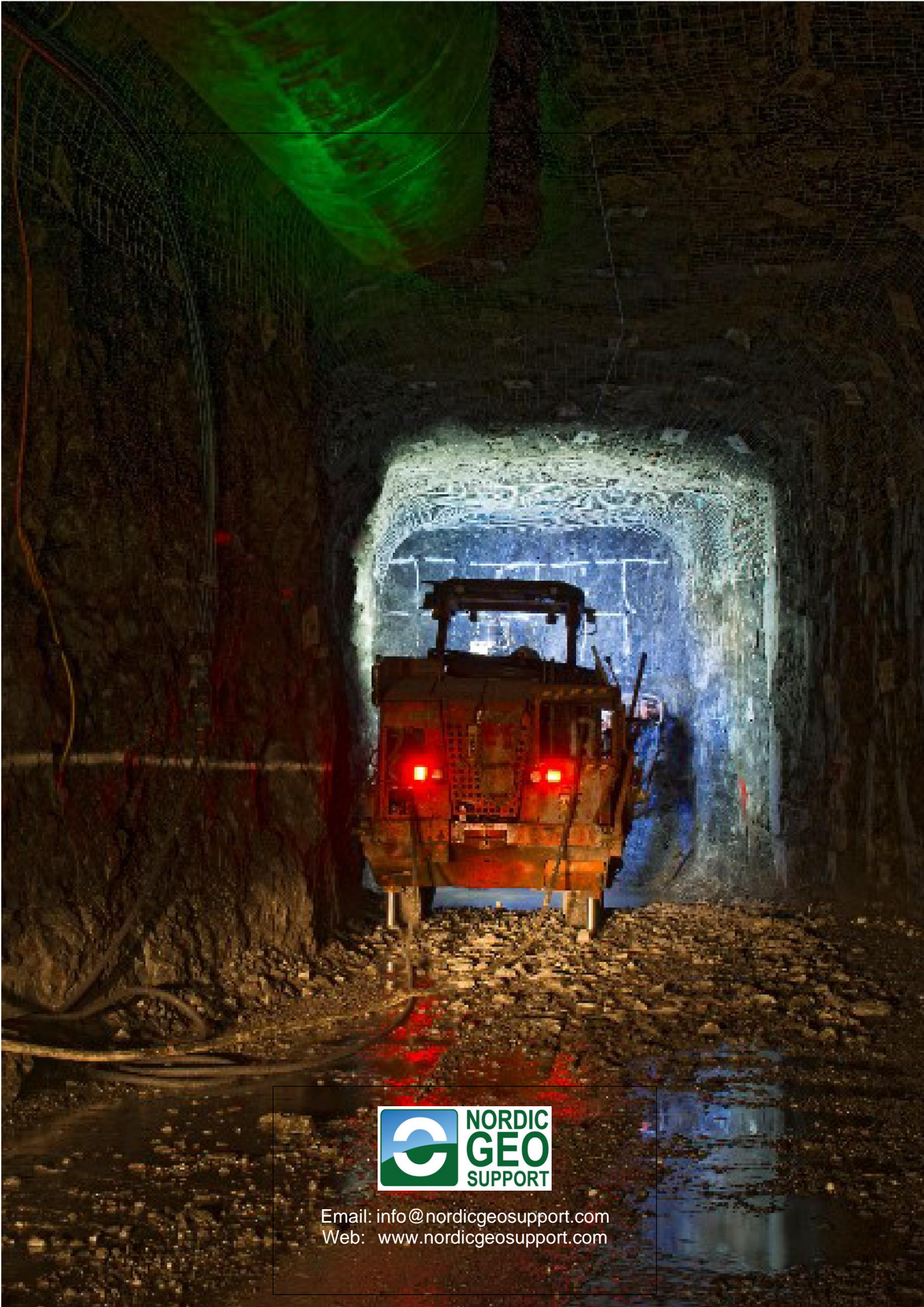
Product	C16	C28	C32	C42
Length	268mm	325mm	343mm	343mm
Hole Diameter	16mm	28-31mm	32-38mm	43-48mm
Max weight	100kg	420kg	420kg	420kg

NordicGEO Blasting Hooks

Cleaner ore recovery, reduced maintenance

Mining operations are looking for cleaner ore recovery and reducing cost related to repairs in downstream operations, such as crushers. The all-plastic design means that crushers and conveyers have less exposure to wear and tear, reducing operating costs. Combined with the use of GFRP rock bolts in production areas, this hooks further reduce the potential steel content that may contaminate ore recovery and reduces exposure of crushers, mills and conveyers to steel. The hooks are quick to install and provide a simple way to gather all the blast cables together neatly. This speeds up production compared to manual tying of cables and improves safety by minimizing the time spent at the face.





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