

ELEBOR[®]

ELEBOR S.A.

HELLENIC GEOTECHNICAL EQUIPMENT



Edition 2024

Catalogue

Self-Drilling Rock Bolting System



ELEBORTM
SD
Self-Drilling Rock Bolting System

Boring - Drilling - Tunnelling - Mining - Construction - Geotechnical



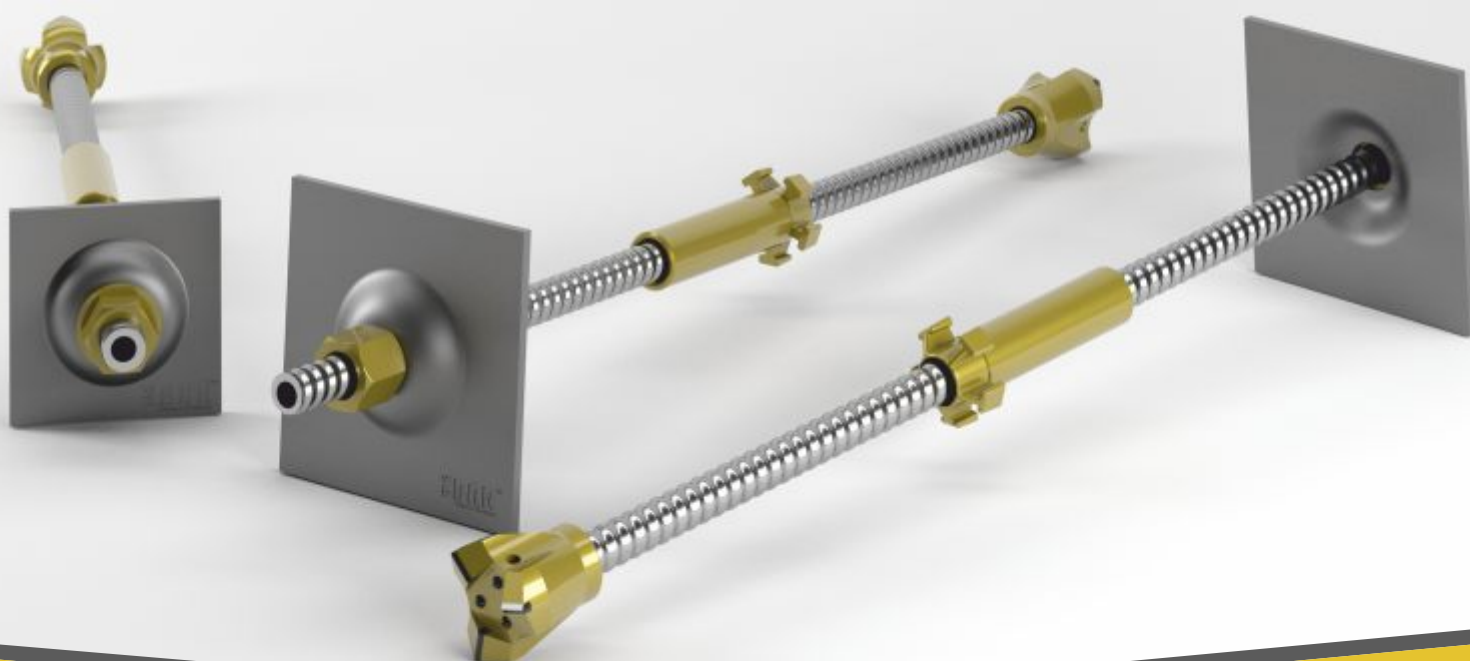


a complete rock-bolting system

Table of Content



Introduction	4
System description	5
Applications	6
Main components	7
ELEBAR™-SD technical specifications	8
ELEBAR™-SD drill bit models	10
ELEBAR™-SD drill bit coding	11
ELEBAR™-SD drill bit portfolio	12
ELEBAR™-SD parts	13
ELEBAR™-SD system accessories	14
ELEBAR™-SD anchorage parts	15
ELEBAR™-SD installation methods	16
ELEBAR™-SD installation equipment	18
ELEBAR™-SD grouting equipment	21
ELEBAR™-SD testing equipment	23



Introduction

The ELEBAR™-SD self-drilling rock bolting system is designed, developed and manufactured in Greece.

The hollow core thread bars are produced from premium grade steel tubing on automated production lines.

Entire process from raw material arrival to finish product despatch or storing is monitored and controlled in respect of quality assurance and traceability. Bars are tested at regular intervals to confirm declared mechanical properties.

System components and tools are designed and manufactured with the aid of the state-of-the-art three-dimensional (3D) parametric mechanical CAD/CAM software.



The **ELEBAR™-SD** Self-Drilling rock bolts is an anchoring system wherein the rock bolt itself acts as well as the drilling string with which the drilling is carried out to the desired anchoring depth and then is left in the bore-hole for grouting to commence.

The **ELEBAR™-SD** rock bolts consist of hollow bars that have an externally formed full-length threading and can be joined together with the aid of coupling sleeves to form long rock bolts. A low cost expendable one-use drill bit is threaded on to one of the two free ends of the rock bolt with which drilling is performed. The other free end accommodates the washer plate and the tensioning collar nut. Drilling is carried out by conventional means and subsequent cement grouting is executed through the central hole of the rods.

The **ELEBAR™-SD** rock bolts are commonly used in friable and loose ground/soil in which the drilled bore-holes are collapsing before insertion of the desired rock bolt can take place according to the conventional four (4) stages rock bolting method (i.e. drilling of the bore-hole, extraction of the drilling string, insertion of the rock-bolt and cement grouting).

Rock bolting with the **ELEBAR™-SD** system is fast and simple and requires only two (2) stages [drilling and cement grouting] or even only one (1) stage [simultaneous drilling and grouting].

Depending on the nature of the rock to be drilled, the appropriate drill bit is selected in order to achieve the optimum drilling speed.



**a fast, reliable, repeatable
and proven rock bolting system**

Applications

Tunneling - Underground mining

- radial rock bolting,
- forepoling,
- tunnel entrance preparation/support,
- tunnel face stabilization,
- slope stabilization,
- tunnel arch fixing,
- arch/frame foundation piling.

Geotechnics - Civil engineering

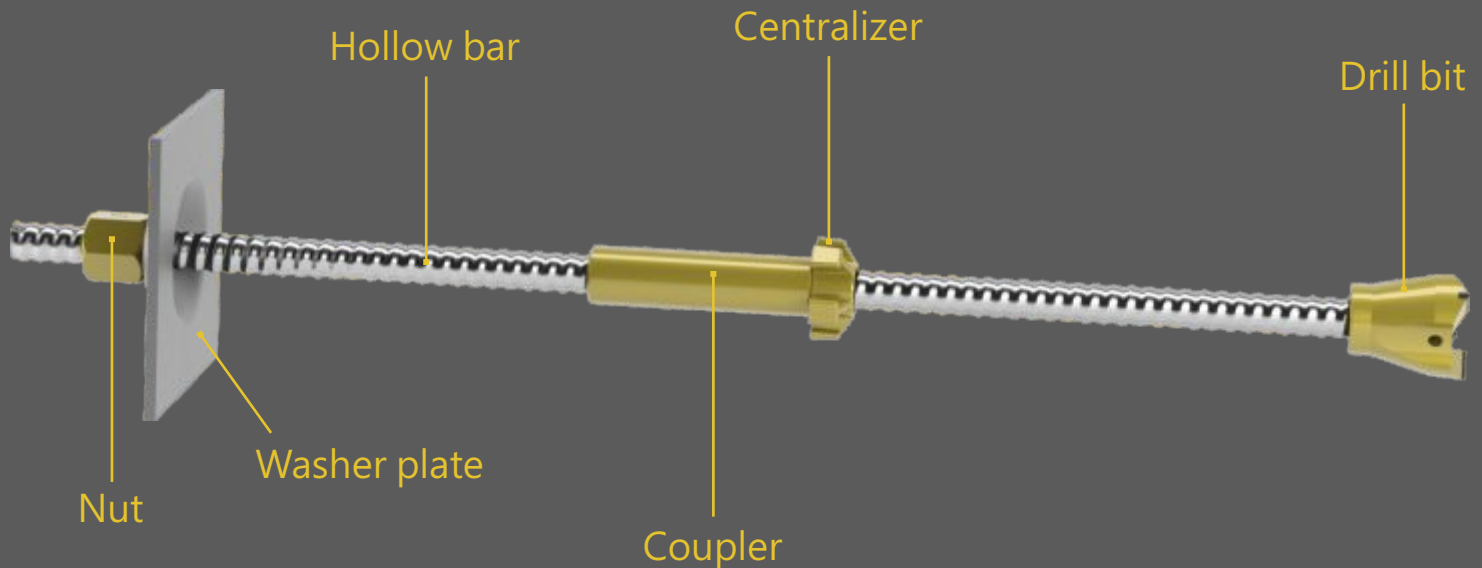
- slope/embankment stabilization,
- soil nailing,
- injection piling,
- foundation strengthening,
- ground anchoring (temporary SCP or permanent DCP).

Energy projects

- fixing of photovoltaic solar cell panel frame bases,
- foundation of wind turbines, etc.



Main system components



Hollow bar

Main component of the Self-Drilling Rock-Bolting system. Is a hollow tube featuring an external continuous Rope Thread formed by cold-rolling.

- External continuous thread enhances mechanical interlocking with the grout offering very effective ground/rock improvement.
- Industry standard left-hand Rope-Threads R32, R38 & R51 offer compatibility with common rock-drilling equipment.
- Varying tube thicknesses and material grades offer a wide range of models with mechanical performances ranging from 200kN to 930kN
- Versatile system with connecting bars that can achieve long bolting lengths regardless of rock-drilling machine size.
- Hollow core provides both the path to the drill bit for of the flushing medium but also is acting as the grouting tube when drilling completes.

Anchor nut

The nut provides fixing of the washer plate against the rock surface and enables tensioning of the system. Is available as standard in flat versions or in spherical or domed versions for inclined bore-holes.

Sacrificial drill bit

The component of the Rock-Bolt that enables the Self-Drilling capability of the entire system.

- A wide range of models available to match any kind of soil and rock formation.
- Sizes vary from 51 to 150 mm.
- Low cost hardened steel bits for cost-effective rock-bolting.
- Bits with tungsten carbide inserts (widia) are also available for all models to enable drilling in harder and cohesive formations.

Coupler

The component enabling the extension of the system to the desired final rock-bolting length.

- Transfers the rotation and percussive energy to the drilling bit for effective drilling.
- Designed for full load capacity to match the each available model.
- Features a middle stop to ensure adequate threading length is achieved for each connection joint.

ELEBAR™-SD technical specifications



ELEBAR™-SD-R32

			R32/2S	R32/3S	R32/4S	R32/6S	R32/7L	R32/7S
Thread type			R32, left hand according to ISO 10208					
External diameter, nominal	mm		32					
External diameter, actual	OD	mm	31,10 ± 0,10					
Internal diameter ^[2]	ID	mm	20,5	19,5	18,4	16,5	15,1	13,1
Cross-section, nominal	A	mm ²	330	370	410	470	510	595
Weight, nominal	W	kg/m	2,7	2,9	3,2	3,7	4,1	4,6
Standard bar length	L	m	1 1.5 2 3 4 ^[1] 6					
Yield strength	R _e	MPa	540	540	540	550	550	550
Ultimate strength	R _m	MPa	680	700	680	680	700	680
Yield load, typical	F _{p0.2}	kN	180	200	220	260	280	330
Fracture load, typical	F _m	kN	220	260	280	320	360	400
Colour coding			GREY	BLUE	GREEN	RED	BLACK	WHITE

ELEBAR™-SD-R38

			R38/7L	R38/8N	R38/9L	R38/10N
Thread type			R38, left hand according to ISO 10208			
External diameter, nominal	mm		38			
External diameter, actual	OD	mm	37,80 ± 0,10			
Internal diameter ^[2]	ID	mm	21	18,8	16,6	13,6
Cross-section, nominal	A	mm ²	660	750	800	900
Weight, nominal	W	kg/m	5,2	5,9	6,3	7,0
Standard bar length	L	m	1 1.5 2 3 4 ^[1] 6			
Yield strength	R _e	MPa	540	540	540	550
Ultimate strength	R _m	MPa	680	700	680	680
Yield load, typical	F _{p0.2}	kN	350	400	450	480
Fracture load, typical	F _m	kN	420	500	540	600
Colour coding			BLUE	RED	GREEN	YELLOW

[1] Available on request (min order 15tons)

[2] Calculated value

ELEBAR™-SD technical specifications

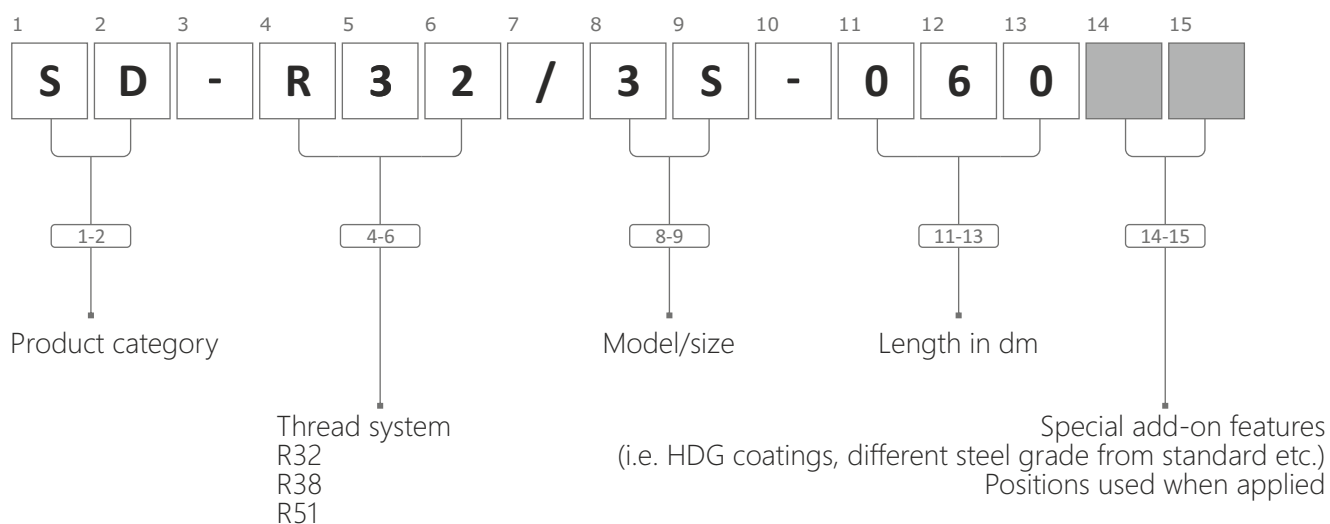
ELEBAR™-SD-R51

			R51/6N	R51/7S	R51/10N	R51/10S
Thread type			R51, left hand according to ISO 10208			
External diameter, nominal	mm		51			
External diameter, actual	OD	mm	49,80 ± 0,10			
Internal diameter ^[2]	ID	mm	35	32,2	27,8	26
Cross-section, nominal	A	mm ²	810	975	1.210	1.335
Weight, nominal	W	kg/m	6,4	7,7	9,5	10,5
Standard bar length	L	m	1 1.5 2 3 4 ^[1] 6			
Yield strength	R _e	MPa	550	550	530	550
Ultimate strength	R _m	MPa	680	680	660	700
Yield load, typical	F _{p0.2}	kN	450	540	640	730
Fracture load, typical	F _m	kN	550	660	800	930
Colour coding			BLUE	RED	GREEN	YELLOW

[1] Available on request (min order 15tons)

[2] Calculated value

guide to coding system



ELEBAR™-SD drill bit models

SW4

Soft clay
and soil

Hardened steel



4 wing clay bit, 4 flushing holes

SC / SC4

Loose to dense soil/sand
and soft rock

Hardened steel



Cross bit, 4 flushing holes

SA

Loose to dense soil/sand
and soft rock

Hardened steel



Arch style bit, 3 flushing holes

SC3

Loose to dense soil/sand
and soft rock

Hardened steel



3 edge style bit, 3 flushing holes

SBF

Weakly coherent soil/sand
fractured rock

Hardened steel



Flat face button bit, 3 flush holes

SBD

Weakly coherent soil/sand
fractured rock

Hardened steel



Drop-centre button bit

SW3

Weakly coherent soil/sand
fractured rock

Hardened steel



3-wing D/C button bit

CW3

Medium to hard weathered or
coherent rock

Widia



3-wing D/C button bit

CC

Medium to hard weathered or
coherent rock

Widia



Cross bit, 4 flushing holes

CBF

Medium to hard weathered or
coherent rock

Widia



Flat face button bit

CBF

Medium to hard weathered or
coherent rock

Widia



Flat face button bit

CC

Medium to hard weathered or
coherent rock

Widia

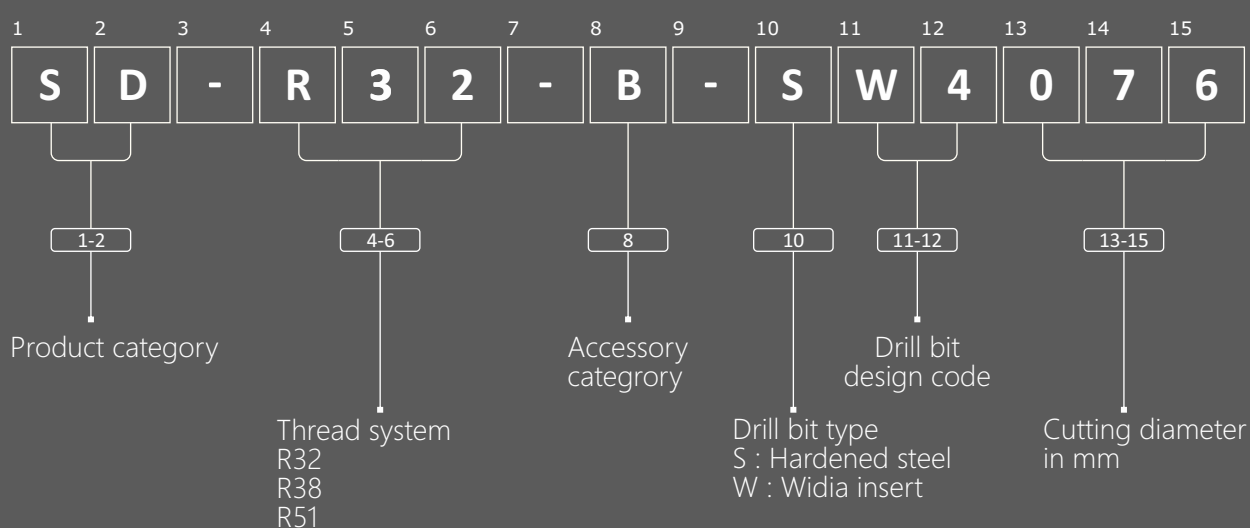


Cross bit, 5 flushing holes



**drill bits to match any rock
you are drilling**

guide to coding system



ELEBAR™-SD drill bit portfolio

		Diameter (mm)									Diameter (mm)						
		51	76	90	100	110	130	150			51	76	90	100	115	130	150
	SW4	R32		✓	✓	✓	✓	✓		SW3	R32		✓	✓			
		R38		✓	✓	✓	✓	✓			R38		✓	✓			
		R51					✓	✓			R51			✓			
	SC	R32	✓	✓	✓	✓				SA	R32	✓	✓				
		R38		✓	✓	✓	✓				R38						
		R51				✓	✓				R51						
	SBF	R32	✓	✓	✓	✓				SBD	R32				✓		
		R38		✓	✓	✓					R38				✓		
		R51				✓		✓			R51				✓		
	SC3	R32		✓	✓		✓			CC / CC3	R32	✓	✓	✓			
		R38		✓	✓		✓				R38		✓	✓		✓	
		R51			✓		✓				R51			✓		✓	
	CW3	R32		✓	✓					CBF	R32	✓	✓	✓			
		R38		✓	✓						R38		✓	✓	✓	✓	
		R51			✓						R51		✓	✓	✓	✓	✓

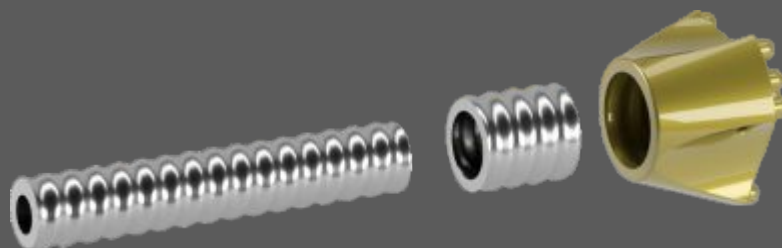
✓ : Available as standard, typically stocked item

✓ : Available upon order

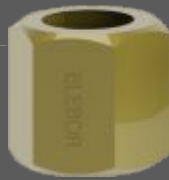
☑ : Possible with use of drill bit adapter

Drill bit adapters

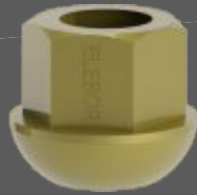
Drill bit adapters enable the use of drill bits with larger thread to be used with bars of smaller thread diameter. However, this kind of choice should be restricted to limited use and preferably for loose ground.



Part Nr.	Description	Weight
SD-R32-A-DBR38	R32 x R38	0,11 kg
SD-R38-A-DBR51	R38 x R51	0,13 kg
SD-R32-A-DBR51	R32 x R51	0,24 kg



Flat nut

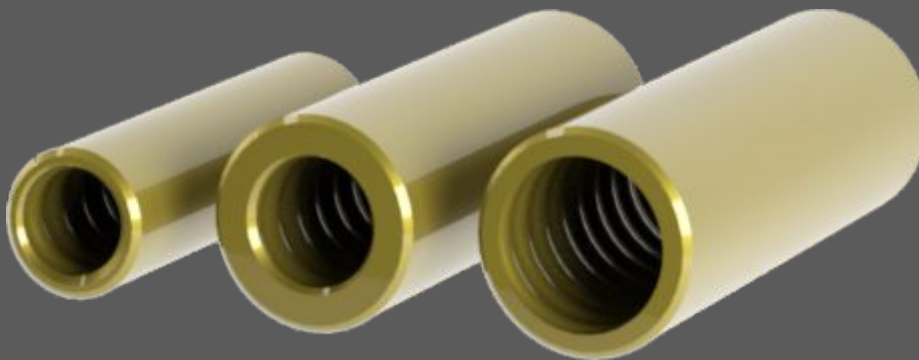


Dome nut

Hexagonal nuts

Part Nr.	Thread	Design type	Height H (mm)	Key size SW (mm)	Hemispherical seat HS (mm)	Weight kg
SD-R32-N-H46L45	R32	FLAT, MACHINED	45	46	-	0,37
SD-R32-N-H46L45X	R32	FLAT, CASTED	45	46	-	0,37
SD-R32-N-H46L45T	R32	FLAT, MACHINED HD	45	46	-	0,37
SD-R32-N-D46L50	R32	DOMED, MACHINED	50	46	56	0,52
SD-R38-N-H50L60	R38	FLAT, MACHINED	60	50	-	0,51
SD-R51-N-H75L70	R51	FLAT, MACHINED	75	70	-	0,70
SD-R51-N-H75L70T	R51	FLAT, MACHINED HD	75	70	-	0,70

Couplers



Part Nr.	Thread	Design type	Length L (mm)	Diameter D (mm)	Weight kg
SD-R32-C-42F160	R32	STANDARD w/STOP, MACHINED	160	42	0,80
SD-R32-C-42L160X	R32	STANDARD w/STOP, CASTED	160	42	0,80
SD-R38-C-52L180	R38	STANDARD w/STOP, MACHINED	180	52	1,40
SD-R38-C-52L220	R38	STANDARD w/STOP, MACHINED	220	52	1,80
SD-R51-C-63L140	R51	STANDARD w/STOP, MACHINED	140	63	1,15
SD-R51-C-63L200	R51	STANDARD w/STOP, MACHINED	200	63	1,90

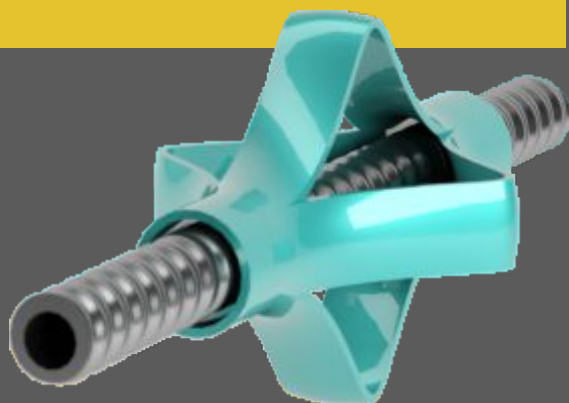
ELEBAR™-SD system accessories

Steel centralizers



Part Nr.	Thread	Centering diameter D (mm)	Weight kg
SD-R32-K-S5072	R32	72	0,20
SD-R38-K-S5090	R38	90	0,40
SD-R51-K-S5090	R51	90	0,75

Plastic basket type centralizers



Part Nr.	Thread	Centering diameter D (mm)	Weight kg
DSP-A320-0075	R32	75	0,05
DSP-A320-0090	R32	90	0,06
DSP-A320-0110	R32	110	0,08
DSP-A320-0130	R32	130	0,10
DSP-A400-0090	R38	90	0,07
DSP-A400-0110	R38	110	0,09
DSP-A400-0130	R38	130	0,11
DSP-A500-0110	R51	110	0,10
DSP-A500-0130	R51	130	0,12
DSP-A500-0150	R51	150	0,14

Ring eye nuts



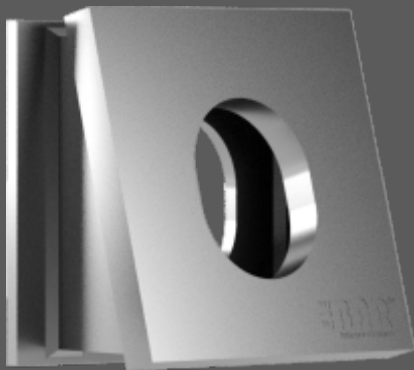
Part Nr.	Thread	Internal opening (mm)	Weight kg
SD-R32-N-R50127	R32	60	0,90
SD-R38-N-R60127	R38	60	1,20

ELEBAR™-SD anchorage parts



Washer plates

Bearing plates are available in flat or domed forms, in square, round or diamond shape geometries. The centre hole can be machine chamfered to house dome nuts. Depending on choices, it is possible to achieve articulation up to 15 degrees in all directions.



Angle compensation constructions

Angle compensation constructions can be made to customer or to project designer requirements. Bearing plates can be incorporated into the design.

Anchorage protection systems

Anchorage protection systems can be fitted if requested by design. The KP type cap system is bolted onto the bearing plate.

The system features a UV resistant cap with 3 threaded plugs that provide access to the internal compartment in case greasing operations are to be carried out without being necessary to remove the entire cap assembly.

A large gasket provides hermetical sealing ensuring a high quality protection level.

Caps in short and long height versions are available to ensure fitment up to 280mm bar protrusions.



ELEBAR™-SD installation methods

Standard self-drilling installation

Drilling to final rock-bolt length and subsequent grouting

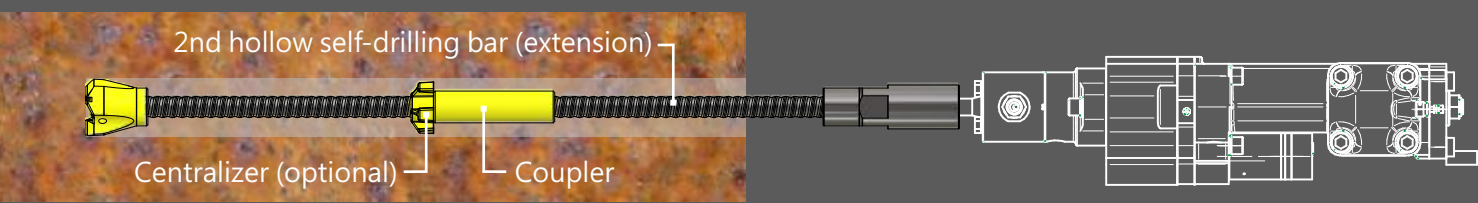
Stage 1

Percussion rotary drilling of 1st hollow bar with the chosen drill bit type and size. Flushing water or air is injected through the shank adapter and exits from the drill bit.



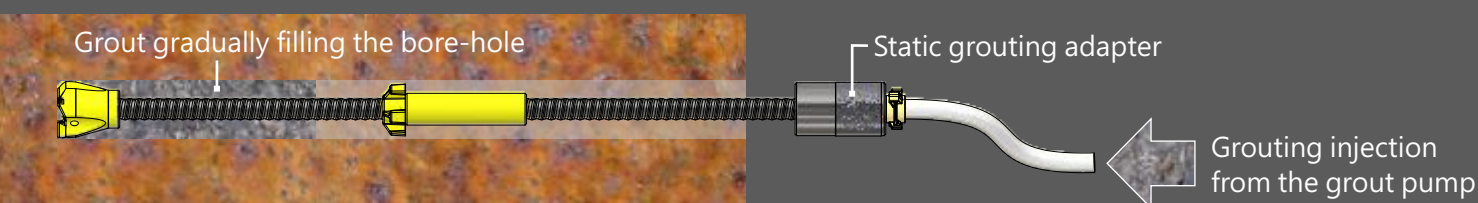
Stage 2

In case rock bolt length is longer than the 1st bar, a 2nd hollow bar is connected and drilling is continued. This step is repeated until all required bars are connected.



Stage 3

After reaching final rock bolt length, drilling tools are removed. A grouting adapter is connected to the protruding hollow bar end and grouting takes place.



Stage 4

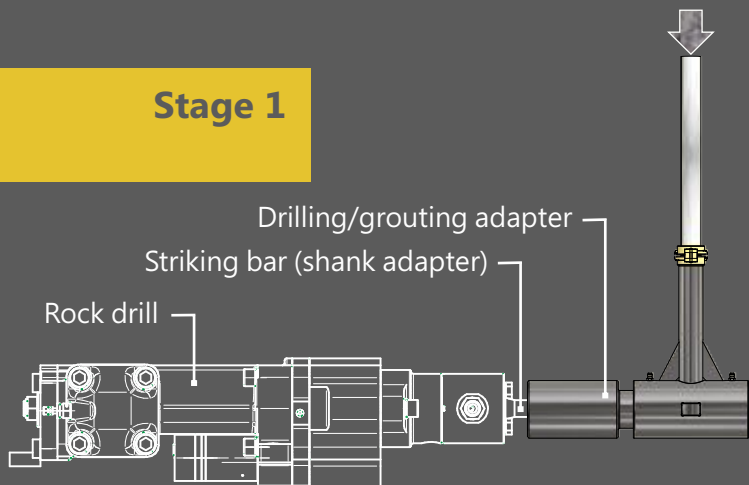
Removal of grouting equipment and installation of the anchorage.



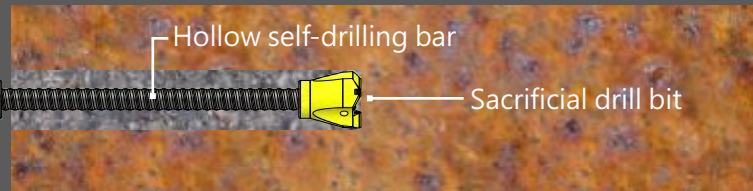
Combined self-drilling installation

Drilling and simultaneous grouting

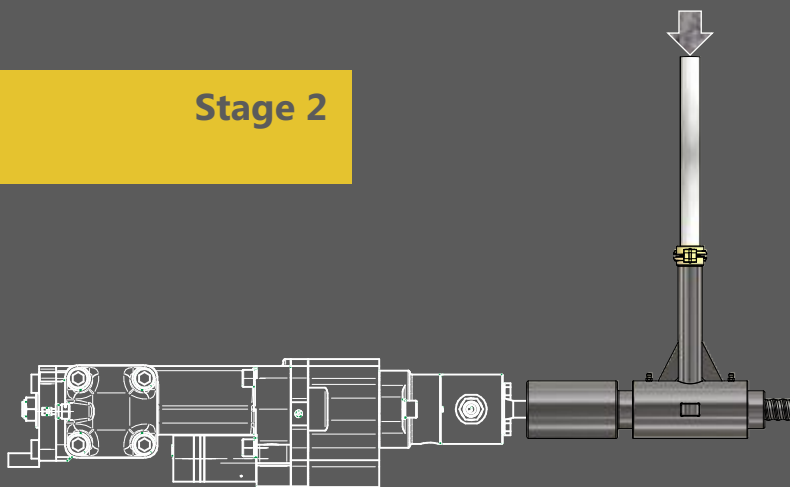
Stage 1



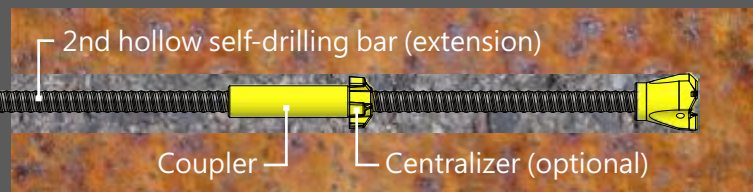
Percussion rotary drilling of 1st hollow bar with the chosen drill bit type and size. Drilling is made with a rotary drilling adapter through which grouting is injected into the system simultaneously flushing the bore-hole and grouting the rock-bolt.



Stage 2

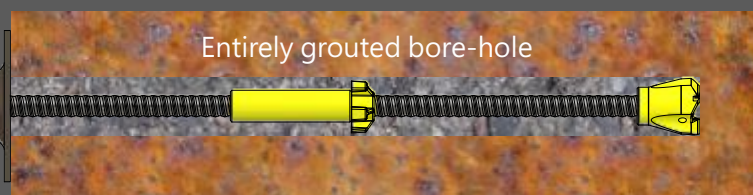
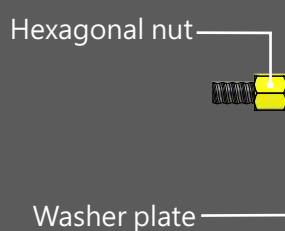


In case rock bolt length is longer than the 1st bar, a 2nd hollow bar is connected and drilling is continued. This step is repeated until all required bars are connected.



Stage 3

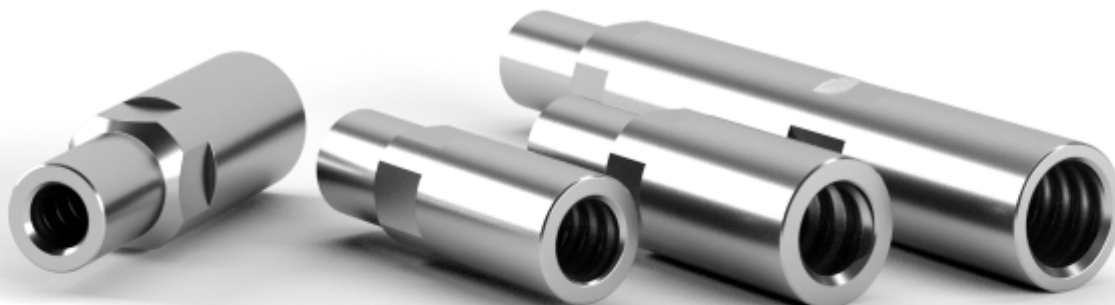
Removal of drilling/grouting equipment and installation of the anchorage.



ELEBAR™-SD installation equipment

Drilling adapters

Drilling adapters



Part Nr.	Thread Connections	OD D1/D2 mm	Key size SWxH mm	Length L mm	Weight kg
CS-R32F-R32F-2L	R32 F x R32 F	45	-	170	1,3
CS-R32F-R38F-1L	R32 F x R38 F	55	-	210	2,0
SD-R32-A-R38F20-10	R32 F x R38 F	68/50	SW60x30	200	5,5
SD-R32-A-R38F40-10	R32 F x R38 F	68/50	SW60x30	400	10,0
CS-R32F-T38F-3L	R32 F x T38 F	55	-	210	2,0
SD-R32-A-T38F20-10	R32 F x T38 F	68/50	SW60x30	200	5,5
SD-R32-A-T38F40-10	R32 F x T38 F	68/50	SW60x30	400	10,0
SD-R32-A-T45F20-10	R32 F x T45 F	68/50	SW60x30	200	5,4
SD-R32-A-T45F40-10	R32 F x T45 F	68/50	SW60x30	400	9,9
SD-R32-A-T51F20-10	R32 F x T51 F	68/50	SW60x30	200	5,3
SD-R32-A-T51F40-10	R32 F x T51 F	68/50	SW60x30	400	9,8
CS-R38F-R38F-3L	R38 F x R38 F	58	-	190	2,2
CS-R38F-T38F-3L	R38 F x R38 F	56	-	190	1,9
SD-R38-A-T38F21-10	R38 F x T38 F	68/50	SW60x30	210	5,6
CS-R38F-T45F-3L	R38 F x T45 F	58	-	190	2,2
SD-R38-A-T45F21-10	R38 F x T45 F	68/58	SW60x30	210	5,7
SD-R38-A-T51F22-10	R38 F x T51 F	68/58	SW60x30	220	7,5
SD-R51-A-T45F23-10	R51 F x T45 F	68/60	SW60x40	230	7,2
SD-R51-A-T51F24-10	R51 F x T51 F	68/60	SW60x40	40	8,0

A variety of standard drilling adapter models are available to suit most common requirements.

The adapters are manufactured from 42CrMo4 alloy steel subsequently case hardened for extra thread durability.

Entire range of the internationally standardized threads used in percussion-rotary drilling are available, such as R32, R38, T38, T45 and T51.

Custom models can be manufactured upon demand.

ELEBAR™-SD installation equipment

Combined drilling & grouting adapters

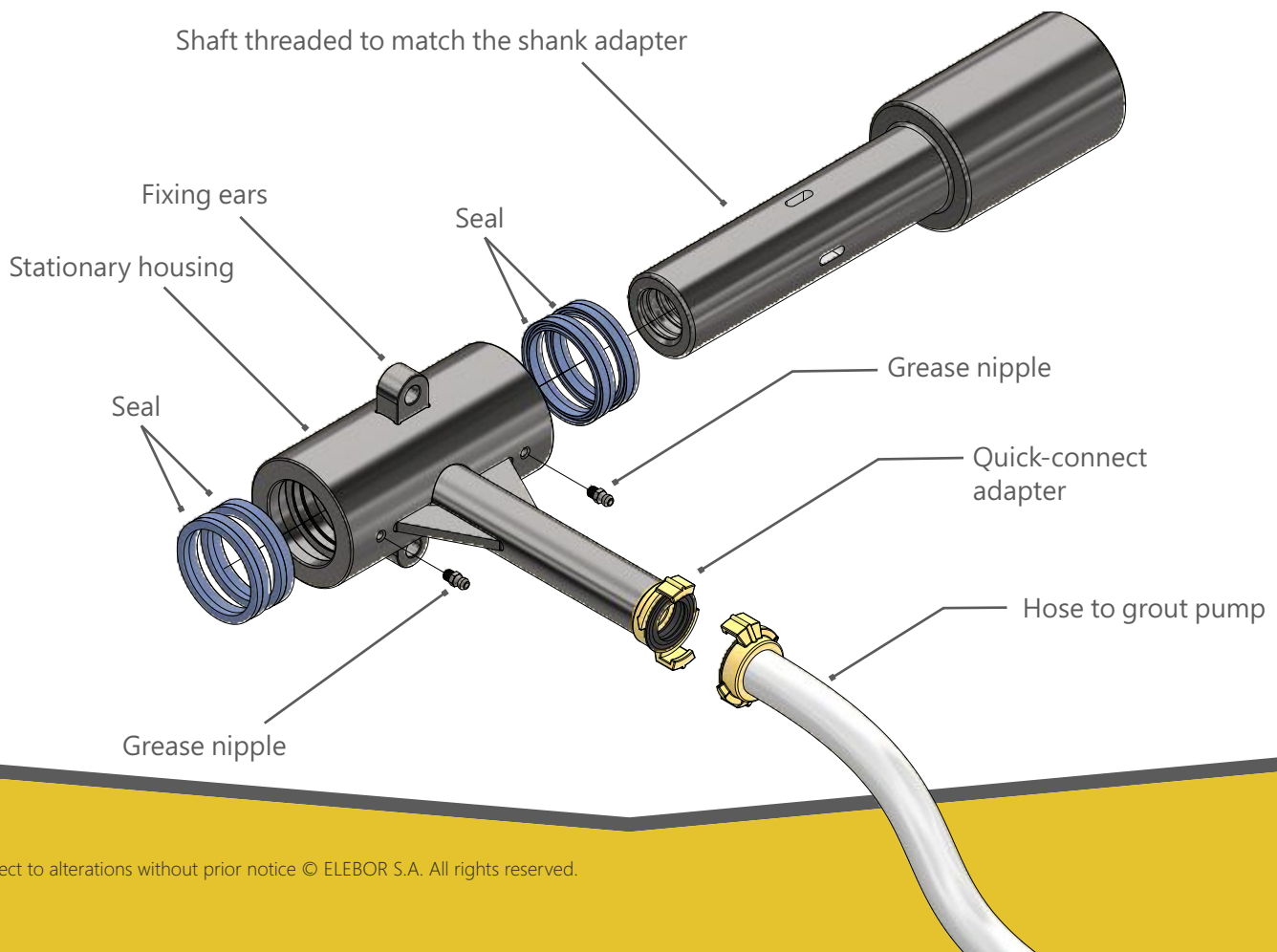


Percussion-rotary drilling & grouting adapter swivel

The Percussion-rotary drilling adapter is a specially engineered device that enables the simultaneous drilling and grouting operation as schematically described in page 17. The adapter is connected directly to the rock drill shank adapter and transfers the percussion and rotation to the drill bit while a non-rotating sleeve provides the inlet of grout to enter the system.

The adapter is carefully built to provide productive operation with minimal maintenance with no grout losses. It is made to various sizes to match entire ELEBAR™-SD rock bolt range and can be fitted with any type of the internationally standardized threads used in percussion-rotary drilling such as R32, R38, T38, T45 and T51.

Custom models can be manufactured upon demand.



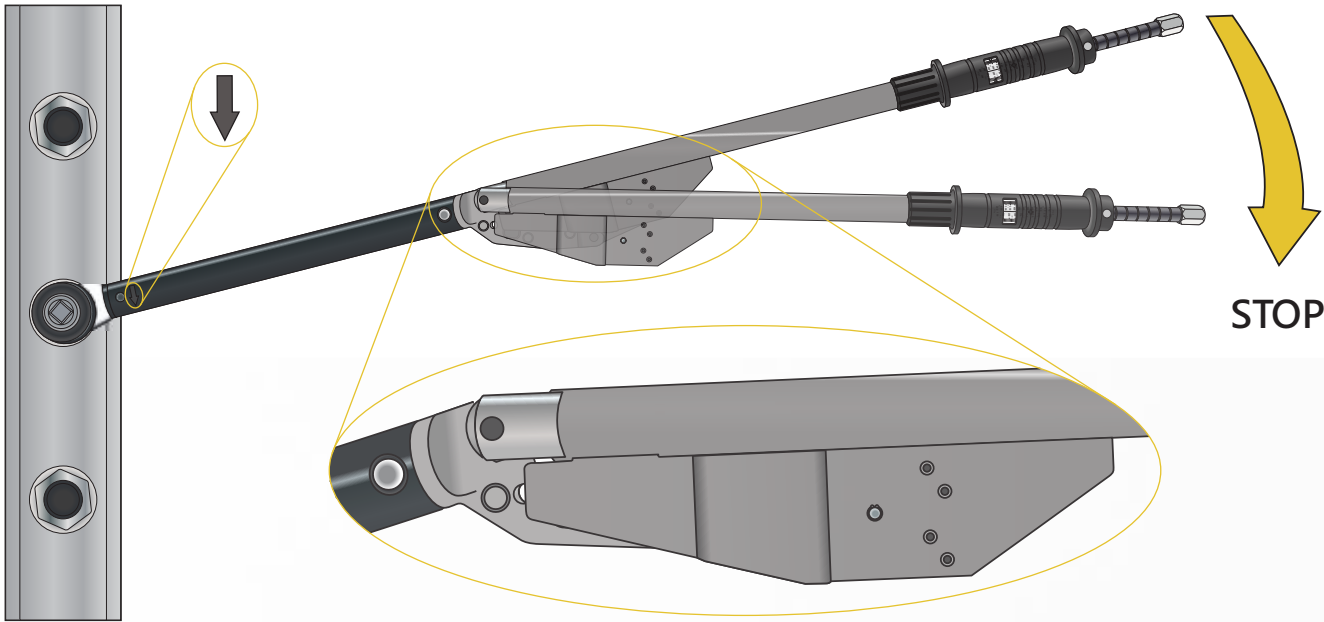
ELEBAR™-SD system installation tooling

Rock bolt nut torque wrenches

ELEBOR S.A. offers a range of heavy duty, industrial use, torque wrenches suitable for torque tensioning ELEBAR™-SD rock bolts. The list of tools includes a complete range of extended hexagonal sockets to suit the various types and sizes of ELEBAR™-SD nuts.

The equipment is available for sale or rental.

Range Nm	Part Nr.	Length mm	Weight kg
150 - 700	TT-NOR-TW4R	910	6,3
200 - 800	TT-NOR-TW4AR	1.250	6,4
300 - 1.000	TT-NOR-TW5R	1.475	7,3
700 - 1.500	TT-NOR-TW5AR	1.475	10,4
900 - 2.000	TT-NOR-TW6R	1.920	13,0



ELEBAR™-SD installation equipment

Grouting plants



Illustrated model : CG-542A Rock Bolt & Cable Grouter

ChemGrout® grouting pumps & plants

ELEBOR is the exclusive distributor of U.S. ChemGrout®.

A complete line of grouting pumps or complete grouting plants are available to satisfy the most demanding grouting operation task.

Various types and sizes of grout pumps are available to cover a wide range of discharge pressures and pump grout volumes.

The range of pumps includes :

- piston grout pumps,
- progressive cavity pumps,
- double acting plunger pumps.

DM21/11 portable grout pump

Portable, compact electric driven injection screw pump with the following features :

- on-board electrical panel
- 5.5kW (7.5HP) electric motor
- depending on chosen rotor/stator set, flow rates from 20 to 60 liter per minute can be achieved
- depending on injection material characteristics, pumping distances up to 60m can be achieved
- hopper loading capacity of 60 kg
- unit is supplied with complete water system
- discharge valve with pressure gauge
- unit is supplied with 22m cable & remote control
- supplied with 20m grouting hose
- CE certified unit



ELEBAR™-SD installation equipment

Grouting accessories

Static grout adapters

Grout adapter is a handy device to speed-up the post-grouting of the installed self-drilling rock bolt.

The roughened knurled surface aids gripping and hand-rotation threading by the operator onto the protruding end of the hollow bar.

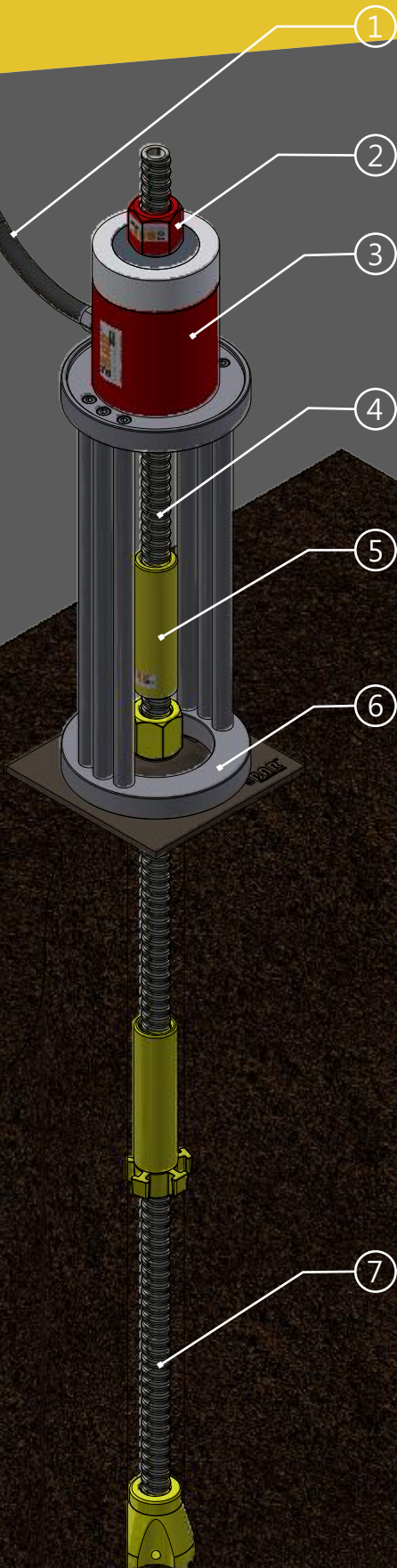
The adapter is supplied with a quick connector fitting that makes coupling with the injection hose fast and leakage-free.

Other type and size of quick connector coupler fixings can be supplied upon request.



Part Nr.	Thread	Quick coupling	Weight kg
SD-R32-A-G1IN	R32	Geka style 1"	3,06
SD-R38-A-G1IN	R38	Geka style 1"	2,79
SD-R51-A-G1IN	R51	Geka style 1"	2,16

ELEBAR™-SD testing equipment



ELEBAR™ pull testing equipment

A complete range of testing apparatus is available to perform pull-out tests in all types and sizes of installed ELEBAR™-SD self-drilling rock-bolts.

The main system components are:

- a hollow hydraulic cylinder (size matching the capacity of the bolt to be tested)
- a hydraulic pump (manual operated or electric driven)
- a manometer for monitoring the applied load
- a hydraulic hose with quick connection fittings
- a resting base bolted to the hydraulic cylinder providing the necessary room for rock-bolt elongation during the pull-out testing
- a set of accessories including an extension rod of suitable length, test coupler and nuts.

Cylinder capacity tons	Model Name	Center hole mm	Piston Stroke mm	Metric tons at 700 bar mm	Weight kg
30	RH302	32,9	63,5	28,8	11,6
30	RH306A	32,5	149,2	28,8	9,9
30	RH306	32,5	152,4	28,8	17,7
50	RH503	42,5	76,2	49,3	21,2
60	RH603	54,0	76,2	55,9	27,2
60	RH606	54,0	152,4	55,9	35,4
100	RH1003	79,4	76,2	93,5	52,2

* Other sizes of cylinders are available both in single action and double action versions. A : Aluminium version

1. High pressure hose
2. Locking nut
3. Hollow hydraulic cylinder
4. ELEBAR™ -SD extension bar
5. ELEBAR™ -SD coupler
6. Modular ELEBAR™ cylinder resting base
7. ELEBAR™ -SD-R installed rock-bolt



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