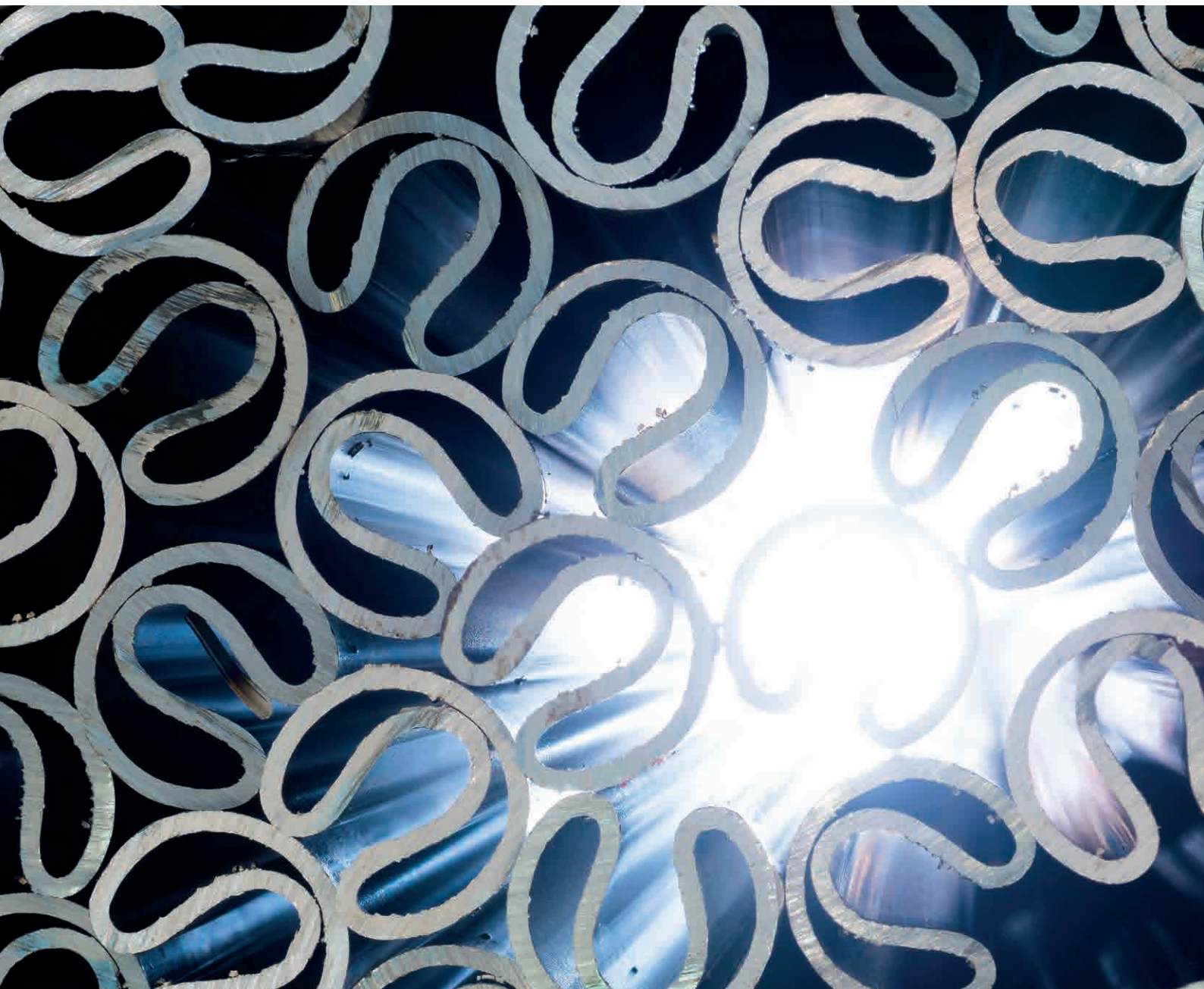


SSAB ERB - Expandable Rock Bolts



Fast and reliable rock reinforcement with guaranteed mechanical properties

ROCK REINFORCEMENT WITH EXPANDABLE ROCK BOLTS

Rock surrounding underground excavations needs to be reinforced and stabilized in order to provide for a stable and safe working environment. The ERB - Expandable Rock Bolt is a full column anchored rock bolt that forms a mechanical interlock between the borehole wall and the bolt over the full bolt length. This is achieved by inflating the ERB by means of high water pressure. When the pump stops the ERB immediately provides full rock support action. Also when the ERB is inflated it causes a contraction in the bolt length which effectively tensions the face plate against the rock surface.

The ERB is a cost effective means of rock reinforcement in a variety of rock conditions from soft to hard rock. It is flexible and will allow variations in the borehole diameter. The ERB is designed to accommodate large rock movements and still maintain its high load bearing capacity. Further the ERB is an environmentally friendly rock reinforcement solution with no cement grout or other chemicals required to anchor the bolt. The ERB may be installed manually or fully mechanist - just add water.

Applications

- Underground mining
- Underground civil engineering work
- Road- and railway tunnels
- Underground storage facilities



Figure 1. ERB before and after expansion.

Main advantages using ERB

- Provides immediate and full support action
- Accommodate large rock movements and still maintain its high load bearing capacity
- High deformability to accommodate ground movements in tension as well as in shear

Safe and easy installation

- Accommodate variations in borehole diameter
- Quality assured installation - when the pump stops the bolt is successfully installed
- No cement grout or other chemicals required to anchor the bolt

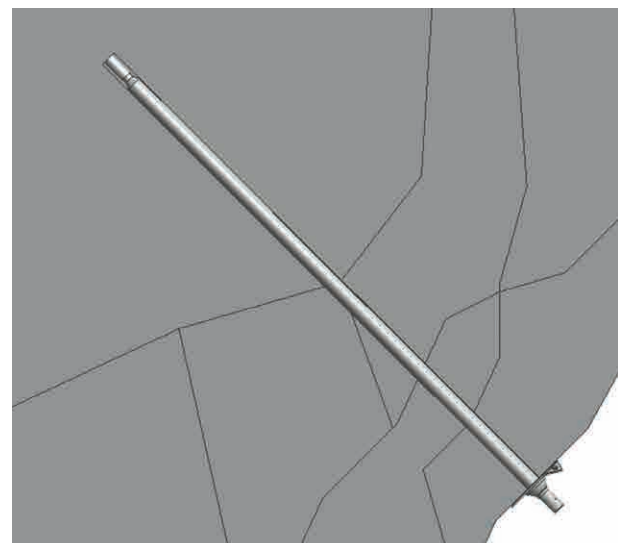


Figure 2. The folded tube is expanded inside the bore-hole and immediately provides full rock support action.



Figure 3. Quality assured ERB ready to be shipped to underground construction and mining sites worldwide. The ERB may be delivered in full container load, FCL or less container load, LCL at customer request.

SSAB'S SOLUTION

SSAB's ERB offers fast and reliable rock reinforcement with quality assured and guaranteed mechanical properties.

With our own steel manufacturing as well as our own ERB profiling and assembly plant in Virsbo, Sweden, we guarantee seamless production control and a very high quality finished product. Since 1979 SSAB has been a trusted partner and valued supplier to several leading distributors of rock bolts globally.

SSAB ERB consists of folded steel tube with upper bushing and inflation bushing welded at each end of the tube. A specially designed adjustable face plate is delivered as an option.

ERB requires steel with extremely good elongation and formability properties. This produces a finished bolt that will be able to accommodate large rock movements and still maintain its high load bearing capacity. The SSAB ERB delivers a high level of safety and uninterrupted production in the customer's operations.

Customer benefits using SSAB ERB

- High quality raw materials
- Energy efficient steel production
- Seamless production control in our own facilities throughout the manufacturing process
- Production according to ISO 9001 & ISO 14001
- QA and certified engineered rock reinforcement product
- Full production chain customization on request
- Traceability throughout the manufacturing process
- Short delivery times
- All ERB may be supplied with a protective coating
- Reliable logistics

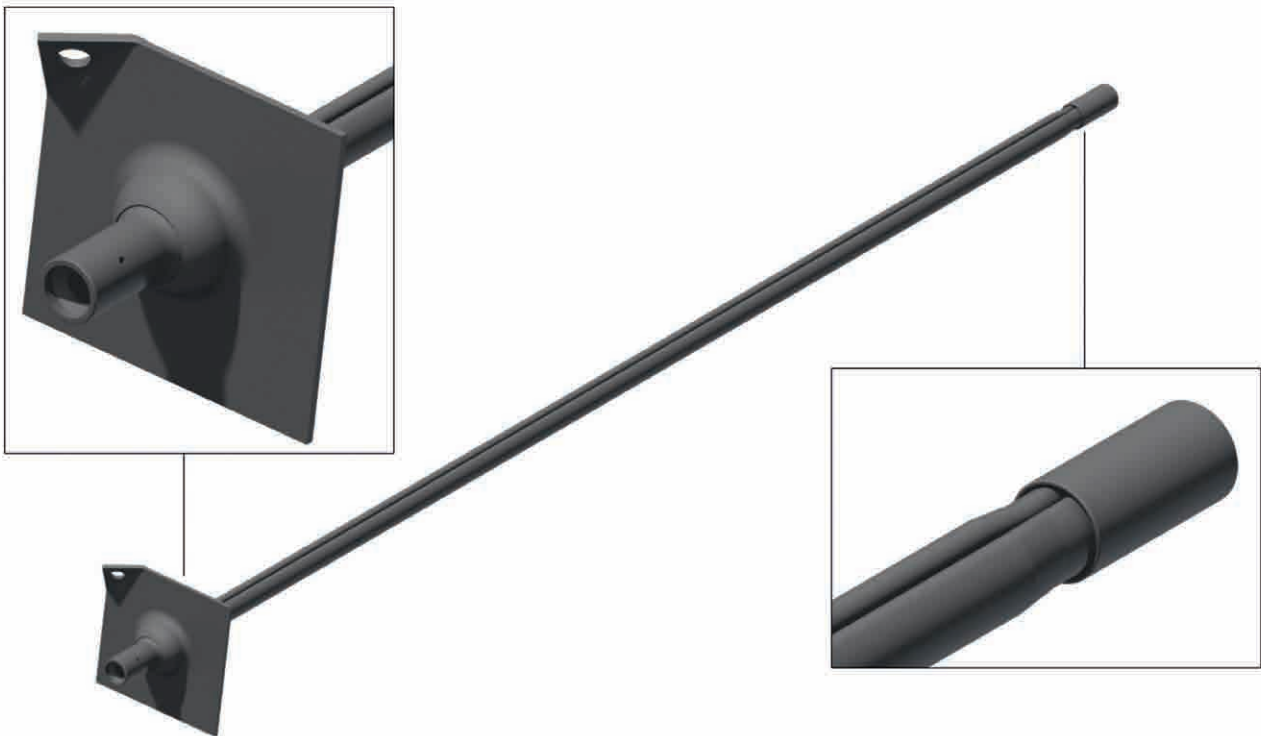


Figure 4. SSAB ERB consists of folded steel tube with upper bushing and inflation bushing welded at each end of the tube. A specially designed adjustable face plate is delivered as an option.



Figure 5. We guarantee seamless production control and a very high quality finished product.

SSAB ERB - HIGH PERFORMANCE PRODUCT FEATURES

SSAB guarantees a minimum breaking load as well as corresponding elongation for all ERB. SSAB's ERB are available in two types, SSAB ERB (cold formed) and SSAB ERB+ (cold formed and normalized). Each type includes bolts with three different load bearing capacities: SSAB ERB120 and ERB+120 with a load bearing capacity of 12 metric tonnes. SSAB ERB160 and ERB+160 with a load bearing capacity of 16 metric tonnes. SSAB ERB240 and ERB+240 with load bearing capacity of 24 metric tonnes.

The difference between the SSAB ERB and SSAB ERB+ is the elongation characteristics: the cold formed type,

the SSAB ERB has an elongation A5 ~ 15 % and the cold formed and normalized type the SSAB ERB+ has an elongation of A5 ~ 30 %. With SSAB ERB+, SSAB is the leading manufacturer of expandable rock bolts.

The SSAB ERB+ is made of special steel which go through a specially developed annealing process which give the bolts their exceptional elongation characteristics and still maintain the high load bearing capacity. This gives the SSAB ERB+ superior properties in order to accommodate large rock deformation in high deformability rock masses, e.g. squeezing rock.

Table 1. Technical properties for SSAB ERB and SSAB ERB+ series.

	ERB 120	ERB 120+	ERB 160	ERB 160+	ERB 240	ERB 240+
Bolt diameter	28 mm		38 mm		38 mm	
Profile diameter	27.5 mm		36 mm		36 mm	
Material thickness	2 mm		2 mm		3 mm	
Upper bushing diameter	28 mm		38 mm		38 mm	
Inflation bushing diameter	30/37 mm		41/48 mm		41/48 mm	
Hole diameter	32 - 39 mm		43 - 52 mm		43 - 52 mm	
Minimum breaking load	120 kN		160 kN		240 kN	230 kN
Minimum elongation	10 %	20 %	10 %	20 %	10 %	20 %
Typical elongation	15 %	30 %	15 %	30 %	15 %	30 %
Standard lengths*	1.5 – 4.0 m		2.4 – 6.0 m		2.4 – 6.0 m	

*other lengths upon request



Figure 6. Our own steel manufacturing as well as our own ERB profiling and assembly plant in Virsbo, Sweden.



TOP QUALITY PRODUCT WITH HIGH DELIVERY PERFORMANCE

SSAB steel guarantees homogenous material for SSAB ERB, Expandable rock bolts.

Expandable rock bolts are manufactured from unique SSAB steel in the Nordics. Each production stage from steel manufacturing to profiling and assembling of rock bolts belongs to SSAB's own production and quality control chain. Quality control secures that the product is regularly tested to guarantee quality and safety. Each individual ERB is marked with a unique code, which enables full traceability of the bolts. SSAB ERB are delivered in standard bundles, loaded on trucks or in 20' containers. The ERB may be delivered in full container load, FCL or less container load, LCL at customer request. Further on customer request all ERB may be supplied with a protective coating against corrosion during transport and storage.

SSAB's delivery performance is high due to effective logistics and short delivery times, which makes SSAB ERB a desired and cost effective solution worldwide.

Figure 7. Full control of materials and processes.



Figure 8. SSAB's expandable rock bolts have been used to secure rock in mines and tunnels for more than 30 years (Photo: Atlas Copco).

SSAB is a Nordic and US-based steel company. SSAB offers value added products and services developed in close cooperation with its customers to create a stronger, lighter and more sustainable world. SSAB has employees in over 50 countries. SSAB has production facilities in Sweden, Finland and the US. SSAB is listed on the NASDAQ OMX Nordic Exchange in Stockholm and has a secondary listing on the NASDAQ OMX in Helsinki. www.ssab.com

The accuracy of this instruction sheet has been inspected with utmost care. However, we do not assume responsibility for any mistakes or direct or indirect damages due to incorrect application of the information. The right to make changes is reserved.

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The SSAB logo consists of the letters "SSAB" in a bold, blue, sans-serif font. The letters are slightly italicized, giving them a dynamic feel.