

Jerzy Rus, Minova Arnall Sp. Z o.o.

## MINOVA ARNALL ANCHORS FOR MODERN UNDERGROUND APPLICATIONS

### ABSTRACT

Minova Arnall is a leading bolt manufacturer in Poland and Europe. Company has over forty years of experience in that field. In this paper are presented chosen products from the wide range of production. Examples of bolts for underground mines, civil engineering and tunneling are shown. Customers can order special bolts according to requirement. Company exports its products to over twenty countries all over the world.

### BOLTS FOR UNDERGROUND MINES

#### Resin Bolts.

1. AP bolts are designed to be used for roof and ribs support in mines as an independent or secondary support system. These bolts can also be used for attachment of various components of mining equipment. AP bolts are high capacity bolts and are produced in three version according to capacity ; APP, APG and APB.

Technical data :

#### Technical description

- AP bolts are modern design anchors with load capacity of up to 300 kN and a nut locking system (shearpin).
- APP; APG; APB anchor rod is made from a reinforcing bar of 21.70 mm in diameter according to ZN-95/AP-1; ZN-02/AP-6 made of the following type of steel:
- M24 nut is connected with the rod by means of a "SPIROL"  $\varnothing 3$  or  $\varnothing 6$  pin.
- Spherical washer makes it possible to fix the anchor at  $18^\circ$  angle.
- The anchor can be used with a square, round or square washer with an eyelet made of 8 or 10 mm plate.



Technical Data :

- **Rod diameter** dr = 21,70 mm
- **Thread size** M24
- **Thread length** 150 mm
- **Rod length** from 400 to 4000 mm
- **Torque shearing the ø3 pin** 80 ÷ 120 Nm
- **Torque shearing the ø6 "SPIROL" pin-(light)** 40÷60 Nm
- **Torque shearing the ø6 "SPIROL" pin - (medium)** 90 ÷ 120 Nm
- **Torque shearing the ø6 "SPIROL" pin - (heavy)** 140 ÷ 160 Nm
- **Anchor capacity required by documentation**
- APP - min 190 kN
- APG - min 230 kN
- APB - min 260 kN
- **Effective anchor capacity**
- APP - 220 kN
- APG - 250 kN
- APB - 300 kN

2. RM 20, POK 22 bolts are designed to be used for roof and ribs support in mines as an independent or secondary support system. These bolts can also be used for attachment of various components of mining equipment.



Technical Data

- |   |  |
|---|--|
| Rod diameter                                  | dn = 20mm for RM-20<br>dn = 22 mm for POK-22 |
| Thread size                                   | M20  |
| Thread length                                 | 150 mm                                       |
| Overall rod length                            | from 400 to 4000 mm                          |
| Torque shearing the ø3 pin                    | 80 ÷ 120 Nm                                  |
| Torque shearing the ø6 "SPIROL" pin - (light) | 40 ÷ 60 Nm                                   |

Torque shearing the ø6 "SPIROL" pin - (medium) 90 ÷ 120 Nm  
 Torque shearing the ø6 "SPIROL" pin - (heavy) 140 ÷ 160 Nm  
 Bolt capacity required by regulations 120 kN  
 Effective bolt capacity 180 kN  
 Coupling sleeve: Sleeve diameter ø 25 mm, thread size M20 Sleeve length 55 mm

**Expansion shell bolts.**

*KE -3W, KE3-2K*

KE-3W and KE3-2K reinforced expansion shell bolts are designed to be used for roof and ribs support in mine working areas as an independent or secondary bolting support system. They are also used for the attachment of various components of mining equipment.



*Technical Data*

Rod diameter	ø18,3 mm
Thread size	M20
Thread length	80 mm (rods for KE-3W shells), 170 mm (rods for KE3-2K shells)
Rod length	acc. To requirements
Shell diameter	ø36 mm
Shell length KE-3W	93 mm
KE3-2K	136 mm
Bolt capacity	min 100 kN
Effective bolt capacity	170 kN

*KR-1/Ø25-M18, KR-2/Ø25-M18*

KR-1/Ø25-M18 and KR-2/Ø25-M18 expansion bolts are designed to be used for roof and ribs support in mine working areas as an independent or auxiliary roof support system. They are also used for the attachment of various components of mining equipment.



*Technical Data*

Rod diameter	ø18,3 mm
Thread size	M18
Rod length	acc. To needs
Shell diameter	ø25 mm
Shell length:	
KR-1/Ø25-M18	74 mm
KR-2/Ø25-M18	110 mm or 130 mm
Bolt capacity	min 100 kN
Effective bolt capacity	130 kN

**Friction pipe bolts.**

KRSz-C-Ø39 - friction pipe bolts are designed for roof and ribs support in mine working areas as an independent or secondary bolting roof support system. They are also used for the attachment of various components of mining equipment.



*Technical Data*

Outside rod diameter	ø39mm
Rod length	from 1600 to 2600 mm
Bolt capacity	min 80 kN
Effective bolt capacity	100 kN

### **Cable bolts.**

KL - 15,5; KL - 15,5K cable bolts are designed to be used in ground and rock reinforcement near mining excavations and in particular near workings in weak strata with lower strength or entering mining pressure zones.

#### *Technical Data*



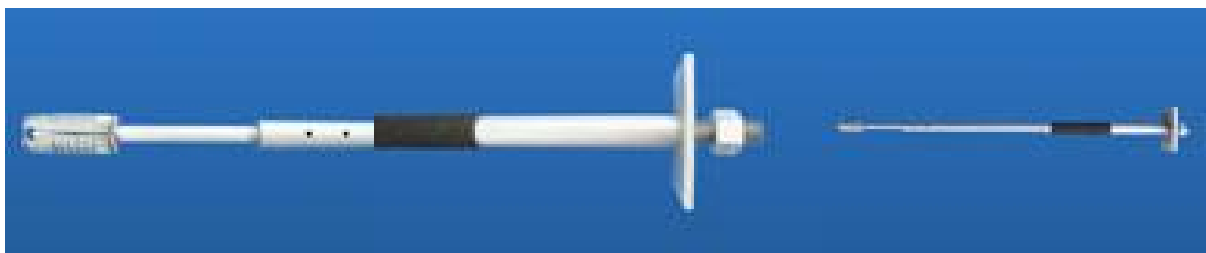
Cable diameter	15,5mm
Cage diameter	26 – 28mm
Cage distance	200, 300, 400.. so on Recommended 500mm
Bolt length	1 to 10m
Capacity	Min. 200kN
Effective load	260 kN



### **Injection bolt.**

AP-KI-ø42 injection bolts injection bolts are designed to support mine working areas as an independent or auxiliary roof support system. AP-KI-ø42 tube injection bolt is used to reduce static load on support systems in mining areas cut in adverse mining and geological conditions, such as:

- fault zones,
- areas of increased pressure (roadways),



#### *Technical Data*

Tube diameter                     $\varnothing$  30x6,3 mm  
Bar diameter                      $\varnothing$ 18,3 mm  
Tube thread size                M20 internal, M30 x 2 external

Bar thread size                 M20  
Bolt length                      from 1300 to 5000 mm (or other as required)

Shell diameter                     $\varnothing$  42 mm  
 Head length                      93 mm  
 Bolt capacity                    over 120 kN  
 Nominal injection pressure    10 MPa

**W straps**    SP-220, SP-270, SP-320.

SP W straps (roof bolting lining) are used for crosswise and lengthwise support of roofs and ribs in mine working areas.

They are suitable to be used with expansion, resin, cable and tubular friction anchors.

Mat type	SP-220	SP-270	SP-320
Working width	220 mm	270mm	320mm
Overall width	270 mm	320 mm	370 mm
Sheet thickness	2; 2,5; 3 mm	2; 2,5; 3 mm	2; 2,5; 3 mm
Hole distance	500; 800 mm (or according to customer's specification)		
Hole diameter	$\varnothing$ 45 or 45/80 mm		
Length	1000 ÷ 7000		



**Construction bolts**

Bolts are designed for fastening statically loaded elements of building structures in non-cracked, reinforced or unreinforced gravel concrete of classes  $\geq$  B15 and in clay solid brick wall, class  $\geq$  7,5.

