

**MINING / CONSTRUCTION**

# Shaft bolts

**TYPE M1, W1, W2, W2-Z**

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No. 74/4/2017*

**DESCRIPTION**

Depending on the design the following types of bolts can be distinguished:

- M1 wedge bolt applied at pretension of up to 60 kN
- W1 wedge adhesive bolt at pretension of up to 100 kN
- W2 cylindrical adhesive bolt at pretension of up to 80kN

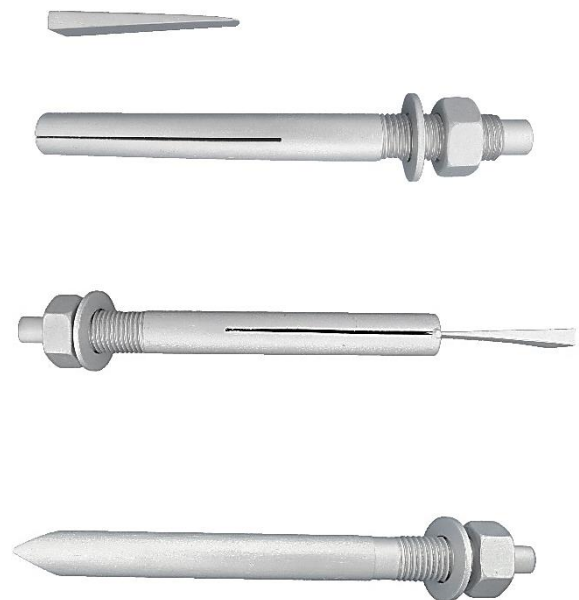
**APPLICATION AND USE**

Shaft bolts type M1, W1, W2 and W2-Z are used to connect the reinforcement support with the shaft lining and to fit pipeline or cable holders and other fixtures in the shaft.

The bolts are also used to fix equipment and machines installed in horizontal roadways.

Application conditions – according to BN-78/0436-03 standard - "Bolts"

| Bolt type | Name                      | Curing agent  | Recommended use     | Comments   |
|-----------|---------------------------|---------------|---------------------|--|
| M1        | wedge bolt                | cement grout  | concrete            | suitable for shafts with hoisting equipment using vessels of pay load up to 10 kN and for anchorage of additional elements in the shaft    |
| W1        | wedge resin bolt          | polymer grout | all types of lining | suitable for shafts with hoisting equipment using vessels of pay load up to 30 kN; loads may be applied immediately after installation     |
| W2        | cylindrical adhesive bolt | polymer grout | all types of lining | suitable for shafts with hoisting equipment using vessels of pay load up to 20 kN, loads may be applied 30 minutes after bolt installation |



*From top: Shaft bolt type M1, Shaft bolt type W1, Shaft bolt type W2.*

**ADVANTAGES**

- For special purposes bolts may be galvanized
- Bolts M1, W1, W2 can be made of stainless or acid-resistant steel

**TECHNICAL DATA**

| Bolt type | Rod length Lp | Rod diameter | Rod thread | Hole length Lo | Hole diameter | Max.pretension Nw |
|-----------|---------------|--------------|------------|----------------|---------------|-------------------|
| M1        | 320 mm        | ø30 mm       | M30        | 235÷255 mm     | ø33±1 mm      | 40 kN             |
|           | 400 mm        |              |            | 315÷335 mm     |               | 60 kN             |
| W1        | 320 mm        |              |            | 235÷255 mm     |               | 70 kN             |
|           | 400 mm        |              |            | 315÷335 mm     |               | 100 kN            |
| W2        | 320 mm        |              |            | 215÷235 mm     |               | 60 kN             |
|           | 400 mm        |              |            | 295÷315 mm     |               | 80 kN             |

The rods M1, W1, and W2 is made of plain bar of ø30 mm. and the bolt length is 320 ÷ 400 mm (or different according to requirement – max. 2500 mm).

The rod W2-Z is made of ribbed reinforcing bars of d<sub>n</sub>=32 mm.

**APPLICATION METHOD**

M1, W1 and W2 bolts should be installed in compliance with the BN-84/0436-04 standard "Bolt connection of reinforcement and shaft lining".

- M1 bolt installation procedure

Insert the rod with the wedge into the borehole of ø33 ± l made in the concrete lining.

Hammer the rod until it refuses to go further. After placing the attached element and a round washer of ø31 on the rod, put and tighten the M30 nut with appropriate torque tensioning the nut to the desired prestress.

- W1 bolt installation procedure

Insert an adhesive cartridge in the borehole of ø33 ± l made in the shaft. Insert the rod with the wedge to the desired depth and rotate while pushing causing the adhesive to mix.

Then, hammer the rod until it refuses to go any further. After placing the attached element and a round washer of ø31 on the rod, put and tighten the M30 nut with appropriate torque tensioning the nut to the desired pretension.

- W2 bolt installation procedure

Insert a resin cartridge in the borehole of ø33 ± l made in the shaft. Insert the rod with the wedge to the desired depth and rotate while pushing causing the adhesive to mix.

Leave until the adhesive has set After placing the attached element and a round washer of ø31 on the rod, put and tighten the M30 nut with appropriate torque tensioning the nut to the desired pretension.

**PACKAGING AND TRANSPORTATION**

As standard, the anchor posts are packed in bundles of 10 pieces.

Washers and nuts are packed in containers or cartons.

Other packing options available on request.

**APPROVALS AND CERTIFICATES**

- M1, W1, W2 and W2-Z shaft bolts have Certificate of Compliance No. 74/4/2017 issued by "INOVA" Technical Innovation Centre Ltd. in Lubin.

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