

PIONEERING SOLUTIONS IN GROUND SUPPORT FOR YOUR SUSTAINABLE FUTURE





D47 MD BOLT



The D47 Mechanical Dynamic (MD) Bolt is a 47 mm friction bolt reinforced with a 20 mm bar and a wedge arrangement at the bolt top end. Once the bolt is fully driven into the hole (like the friction bolt), the nut at the bottom is rotated to actuate a set of wedges that firmly anchor the bolt top end in the rock.

The D47 MD Bolt was the first in the emerging hybrid bolt technologies developed to produce a high capacity single pass bolt.

Mining methods, and ground conditions continuously vary while the ultimate safety of personnel and profitability must continue.

The D47 MD Bolt is the ideal product to achieve these goals.

D47 MD BOLT FEATURES

- Good all purpose bolt useful for all conditions (including normal rock conditions)
- A productivity improving bolt with high static capacity
- Very simple bolt installation (similar to a standard friction bolt)
- No resins or grouts required, making it far easier to install, able to hammer straight in through wet and broken ground with no complications
- High friction anchorage capacity at the bolt top end
- Applicable to moving ground conditions
- High tensile and shear strength
- Rock plate secured to allow transfer of load to friction bolt and 20 mm bar
- The stopper safety device eliminates possible bar ejection
- The bottom of the tube is sealed to prevent atmospheric corrosion
- Low profile bolt head (no bar protrusion below the nut)
- Accessories can be screwed directly onto the installed bolts
- Fully galvanized for corrosion protection
- Bolt installation quality apparent to operator
- With the common size being 2.4 m these bolts are available in a range of sizes from 1.8 m, 2.1 m, 2.4 m and 3.0 m

SAFETY FIRST

Sandvik's objective is zero harm to our people, the environment we work in, our customers and our suppliers.

COMPONENT PROPERTIES

Bar Diameter	Ø20 mm
Bar Elongation (5d)	22%
Bar Rolled Thread	M22x2.5 LH
Bar Ultimate Tensile Strength	225 kN
Bar Yield Strength	180 kN
Tube Thickness	3.0 mm
Tube Ultimate Tensile Strength	165 kN Typical
Tube Yield Strength	140 kN Typical
Drill Bit Size	Ø43-45 mm

BOLT TECHNICAL SPECIFICATIONS

Property	Minimum	Typical
Ultimate Tensile Strength	280 kN	300 kN
Shear Strength (calculated)	246 kN	270 kN
	Maximum	
Wedge Expansion	52 mm	

PART NUMBER	DESCRIPTION	WEIGHT
BMG2018S	1.8 m Long MD Bolt Galvanized	10.2 kg
BMB2018S	1.8 m Long MD Bolt Black	9.8 kg
BMG2021S	2.1 m Long MD Bolt Galvanized	12 kg
BMB2021S	2.1 m Long MD Bolt Black	11.7 kg
BMG2024S	2.4 m Long MD Bolt Galvanized	13.2 kg
BMB2024S	2.4 m Long MD Bolt Black	12.9 kg
BMG2030S	3.0 m Long MD Bolt Galvanized	16.5 kg
BMB2030S	3.0 m Long MD Bolt Black	16.2 kg

TURN COMPRESSION INTO CALM

In underground mining, choosing the right ground support is critical. Without it, there's a constant risk of rock fall. Effective ground support is an essential part of reducing the risk of injury to operators in the mine, as well as keeping the excavation going and the tunnels stable.

MDX Bolts – holding back the forces of nature.





D47 MDX BOLT



Designed and developed in Australia for underground hard rock mines. The D47 Mechanical Dynamic Extra (MDX Bolt) has unparalleled "extra expansion" for extremely effective anchorage using the unique wedge design that is able to expand up to 60 mm. The D47 MDX Bolt is particularly suitable for seismic rock conditions and is the new benchmark in seismic ground support stability.

The Sandvik D47 MDX Bolt has been developed to provide strata support in a wide variety of rock conditions (weak and competent), and in particular seismic rock conditions.

This development is a progression on the successful MD Bolt being used in Australian mines since 2010.

While the MDX Bolt maintains the key features of the MD Bolt, regarding the ease of installation (single pass with no grout), its performance in both the seismic and very weak rock conditions has been significantly improved.

MDX BOLT FEATURES

- A universal bolt suitable for broken, very weak, strong and seismic rock conditions
- A very quick and simple "one-pass" installation-same as the MD Bolt
- No resins or grouts required, making it far easier to install, able to hammer straight in through wet and broken ground with no complications
- Easily installed with standard jumbo tools
- Unique wedge design
- Unique yield design capable of absorbing very high dynamic loads
- High tensile and shear strength
- Fully galvanized for corrosion protection
- The stopper safety device arrests bar ejection
- The bottom of the tube is sealed to prevent atmospheric corrosion
- Low profile head, no protrusion below the nut
- Accessories can be screwed directly onto the installed bolts
- Bolt installation quality apparent to operator
- These bolts are available in a range of sizes from 1.8 m, 2.1 m, 2.4 m, 3.0 m, 3.8 m and 4.0 m

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COMPONENT PROPERTIES

Bar Diameter	Ø20 mm
Bar Elongation (5d)	22%
Bar Rolled Thread	M22x2.5 LH
Tube Thickness	2.5 mm
Drill Bit Size	Ø43-45 mm

BOLT TECHNICAL SPECIFICATIONS

Property	Minimum	Typical
Ultimate Tensile Strength	205 kN	225 kN
Yield Strength	155 kN	180 kN
Shear Strength (calculated)	225 kN	246 kN
Dynamic Capacity	28 kJ	30 kJ
Dynamic Displacement	129 mm	142 mm
	Maximum	
Wedge Expansion	60 mm	

PART NUMBER	DESCRIPTION	WEIGHT
BXG4718	1.8 m long MDX Bolt Galvanized (47 mm)	9,5 kg
BXG4721	2.1 m Long MDX Bolt Galvanized (47 mm)	10.9 kg
BXG4724	2.4 m Long MDX Bolt Galvanized (47 mm)	12,3 kg
BXG4730	3.0 m Long MDX Bolt Galvanized (47 mm)	15,4 kg
BXG4738	3.8 m long MDX Bolt Galvanized (47 mm)	19.4 kg
BXG4740	4.0 m long MDX Bolt Galvanized (47 mm)	20.5 kg



D39 MDX BOLT



Designed and developed in Australia for underground hard rock mines. The D39 Mechanical Dynamic Extra (MDX Bolt) has unparalleled "extra expansion" for extremely effective anchorage using the unique wedge design that is able to expand up to 47 mm. The MDX Bolt is particularly suitable for seismic rock conditions and is the new benchmark in seismic ground support stability.

The Sandvik D39 MDX Bolt has been developed to provide strata support in a wide variety of rock conditions (weak and competent), and in particular seismic rock conditions.

This development is a progression on the successful MD Bolt being used in Australian mines since 2010.

While the MDX Bolt maintains the key features of the MD Bolt, regarding the ease of installation (single pass with no grout), its performance in both the seismic and very weak rock conditions has been significantly improved.

D39 MDX BOLT FEATURES

- A universal bolt suitable for broken, very weak, strong and seismic rock conditions
- A very quick and simple "one-pass" installation
- No resins or grout required
- Installed with standard bolting equipment and tools
- Yielding design capable of absorbing high dynamic loads
- High tensile and shear strength
- Fully galvanized for corrosion protection
- The stopper safety device eliminates bar ejection
- The bottom of the tube is sealed to prevent atmospheric corrosion
- Low profile head, no protrusion below the nut
- Accessories can be screwed directly onto the installed bolts
- Bolt installation quality apparent to operator
- These bolts are available in a range of lengths from 1.8 m, 2.1 m, 2.4 m and 3.0 m

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COMPONENT PROPERTIES

Bar Diameter	Ø20 mm
Bar Elongation (5d)	22%
Bar Rolled Thread	M22x2.5 LH
Tube Thickness	2.3 mm
Drill Bit Size	Ø35-38 mm

BOLT TECHNICAL SPECIFICATIONS

Property	Minimum	Typical
Ultimate Tensile Strength	205 kN	225 kN
Yield Strength	155 kN	180 kN
Shear Strength (calculated)	207 kN	227 kN
Dynamic Capacity	24 kJ	28 kJ
Dynamic Displacement	108 mm	129 mm
	Maximum	
Wedge Expansion	47 mm	

PART NUMBER	DESCRIPTION	WEIGHT
BXG3918	1.8 m long MDX Bolt Galvanized (39 mm)	8.4 kg
BXB3918	1.8 m long MDX Bolt Black (39 mm)	8,1 kg
BXG3921	2.1 m long MDX Bolt Galvanized (39 mm)	9.9 kg
BXB3921	2.1 m long MDX Bolt Black (39 mm)	9.6 kg
BXG3924	2.4 m long MDX Bolt Galvanized (39 mm)	11.1 kg
BXB3924	2.4 m long MDX Bolt Black (39 mm)	10.8 kg
BXG3930	3.0 m long MDX Bolt Galvanized (39 mm)	14.1 kg
BXB3930	3.0 m long MDX Bolt Black (39 mm)	13.8 kg

GREATER EXPANSION EXTRA ANCHORAGE



MDX BOLT

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TOE ANCHOR

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MESH CLAMP

Designed and developed in Australia for underground hard rock mines, the mesh clamp is an accessory product for the MD/MDX rock bolt range which is suitable for installation by the Jumbo or Rock Bolters with the D47 MD, D47 MDX and D39 MDX bolts.

Installed with existing tools within the meshing cycle, the mesh clamp will save up to nine bolt installations per round making for a very quick and easy one pass installation.

The installation process follows a smooth application on first thread, before pin shear resulting in actuating the second thread. Focusing on functionality and strength, the mesh clamp is stronger than the mesh, (min 50 kN) ensuring that the mesh would be first to fail.

BOLT MESHING CLAMP FEATURES

- · Allows securing of mesh to pre-installed MD/MDX bolt
- No need to install extra bolts
- A simple "one-pass" installation
- Installed with standard bolting equipment and tools
- Clamps the mesh firmly
- Fully galvanized for corrosion protection

LOAD VS DISPLACEMENT



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The following products are protected by patents in the United States of America, Australia and elsewhere. The following list of Sandvik products may not be all inclusive, and other Sandvik products not listed here may be protected by one or more patents. • SANDVIK MD & MDX BOLTS: U.S. PATENT NO. 8714883 B2; AUSTRALIAN PATENT NO. 2010223134 B2.

- SANDVIK EYE HANGER: AUSTRALIAN PATENT NO. 2011236039 B2.
- SANDVIK IN-SITU DROP TEST RIG: U.S. PATENT NO. 9927339 B2; AUSTRALIAN PATENT NO. 2014213657 B2.
- SANDVIK MD BOLT: U.S. PATENT NO. 9797249 B2; AUSTRALIAN PATENT NO. 2015273708 B2.
- ADDITIONAL PATENTS MAY BE GRANTED OR PENDING IN THE U.S., AUSTRALIA AND ELSEWHERE.





TECHNICAL SPECIFICATIONS

Typical clamping force developed at 400Nm	70 - 80 kN
Laboratory load tested with typical 100x100x5.6 mm welded mesh	50 kN push load without failure of the Mesh Clamp

PART NUMBER	DESCRIPTION	WEIGHT
BMCG	Mesh Clamp Galvanized	1.98 kg

SANDVIK X-PLATE



The new X-Plate from Sandvik is specifically developed to offer cutting-edge ground support in seismic ground conditions, and to complement the MDX bolts. The Sandvik X-Plate can absorb more energy thanks to its stronger plate and improved design, compared to current versions of the rock plates and combination plates, while at the same time being a thinner material. Test results, conducted in both static and dynamic test rigs, show that the X-Plate can absorb 22% more load than a standard product in static loading conditions, and 54% more energy in dynamic loading conditions.

+54%stronger than standard product in dynamic conditions product in static conditions

+22% stronger than a standard

BENEFITS

- State-of-the art rock plate, designed to improve performance in seismic conditions.
- Increased product strength during a seismic event providing more energy absorption.
- When tested in accordance with ASMT F432-19, the X-plate meets grade rating '4'.

SUSTAINABLE SOLUTION

The new X-Plate is a more sustainable solution than a standard rock plate. The X-Plate requires 14% less steel in manufacturing, which represents great CO₂ savings in both manufacturing and shipping.

-14% reduction in steel reduced CO₂

Test results and calculations are to be considered as results reached under certain and controlled conditions. These test results and calculations should not be treated as specifications and Sandvik does not guarantee, warrant or represent the outcome of test results or calculations in any or all circumstances.

LOAD RATING STAMP TO COMPLY WITH ASMT F432-1

REINFORCED DOME FOR INCREASED STRENGTH

BUTTERFLY PLATE FOR SPREADING LOAD AND PREVENTING SHEARING OF MESH

HANGING LOOP FOR SECURING SERVICES

X-PLATE WELDED TO BUTTERFLY PLATE

PIONEERING SOLUTIONS IN GROUND SUPPORT



MD/MDX BOLT INSTALLATION STEPS

Using the MD or MDX "one-pass" bolting system, an average of 30 – 45 bolt installations can be performed per hour and in some cases peaking to 60 bolts per hour (using a HLX5 drifter). Compared to resin and grouted bolts, the MDX or MD bolting system is very quick to install and with a simple twist after installation the operator knows that it has been a successful install, which is somewhat unknown with resin or grouted bolts,



STEP 1. Drill your hole with the recommended bit size.



STEP 2. Hammer the bolt into the hole with no driver rotation and with water on.



STEP 3. After the bolt is fully inserted, rotate the driver* left hand rotation without percussion until drifter stalls (350-450 Nm). * MD/MDX Bolt driver must be used for installation with no other tools required for installation.

HAZARD NOTIFICATION

When handling Sandvik rock bolts, be aware of the bolt's weight and use correct lifting techniques; crates can be stacked to a maximum of four (4) high on compact and level ground, and one (1) high in all other instances. Use of Sandvik rock bolts may require personnel to enter the machine boom area, always ensure the boom is isolated in accordance with site requirements prior to entering boom operational area and remain clear of all pinch points. If a Sandvik rock bolt fails to install correctly (complete insertion and stalling rotation of the drifter (set to 350-450 Nm)), a secondary bolt must be installed adjacent to the failed bolt. A protruding partially installed bolt presents a hazard that should be immediately remediated. To ensure ongoing installation quality, routine static pull testing is recommended. Sandvik rock bolts are offered in a Hot Dip Galvanized coating (in accordance to AS/NZS 4680): however, certain ground conditions may elevate corrosion rates, please be sure to regularly inspect ground support to ensure excessive corrosion is not present.

EXTREME PERFORMANCE

MD/MDX BOLT ACCESSORIES

Available to the MD or MDX bolting system are a vast array of bolting accessories enhancing your mining operation with performance like no other. For example our patented Eye Hanger has an SWL of 2t for holding services such as vent bag, pipes and fans, installed in seconds the Eye Hanger makes hanging your mine services a breeze.

Other accessories include MD/MDX Bolt Drivers, Combination Plates, Rock Plates, Bolt Pull Collar, Meshing Clamp and Domed Nut.





Combination Plate Galvanized

Bolt Mesh Clamp



Bolt Pull Colla

Eye Hanger Galvanized





BOLT IDENTIFICATION SYSTEM

Once fully installed MD/MDX Bolts are easily identified by a colored tab inserted into the end of the blind nut. Bolt type and length can be identified from warehouse to post installation. Bolt traceability code is protected.

Since changing over to the Sandvik range of bolting products we have increased our production efficiency and dramatically reduced machinery downtime.

— Andreas Stiehl Senior Production Engineer Kirkland Lake Gold

PIONEERING SOLUTIONS IN GROUND SUPPORT

PART NUMBER	DESCRIPTION	WEIGHT
BDT38-200	Bolt Driver Thread T38 200 mm	3,1 kg
BDR38-200	Bolt Driver Thread R38 200 mm	3,1 kg
BDT38-400	Bolt Driver Thread T38 400 mm	6 kg
BDR38-400	Bolt Driver Thread R38 400 mm	6 kg
BDT38-600	Bolt Driver Thread T38 600 mm	10 kg
BDR38-600	Bolt Driver Thread R38 600 mm	10 kg
BDT38-900	Bolt Driver Thread T38 900 mm	15,2 kg
BDR38-900	Bolt Driver Thread R38 900 mm	15,2 kg
BPG3002806	Combination Plate Galvanized 6 mm Rock Plate	2.5 kg
BPB3002806	Combination Plate with Black 6 mm Rock Plate	2.4 kg
BPG3002808	Combination Plate with 8 mm Rock Plate	2.8 kg
BPB3002808	Combination Plate Black with 8 mm Rock Plate	2.7 kg
BPG150650	Rock Plate 150 mm sq x 6 mm	0,96 kg
BXPG150550	Dynamic X Rock Plate Galvanized 5 mm	0.8 kg
BXPG3002805	Dynamic X Combination Rock Plate Galvanized 5 mm	2.2 kg
BCG	Bolt Pull Collar Galvanized	0.38 kg
BHG	Eye Hanger Galvanized	0.35 kg
BHB	Eye Hanger Black	0.34 kg
BMCG	Bolt Mesh Clamp Galvanized	1.98 kg
RBDN	Domed Nut	0.62 kg



EXTREME LOAD

THE SANDVIK DROP TEST UNIT

Both the MD and MDX Bolts are able to yield and withstand changing ground conditions. But the finest attribute of the MDX Bolt is its' seismic capabilities, being able to withstand a 30.5 kJ dynamic load with as little as 153 mm displacement.

Sandvik has developed the first ever test apparatus that allows in-situ (installed as per standard practice) dynamic testing of ground support members with the ability to record both load and displacement of the bolt.

The apparatus allows for testing bolts installed up to 10° from vertical which allows application of shear loading, whereas existing laboratory testing is limited to purely axial loading.

This aspect is critical, as bolts are not always installed perfectly perpendicular to the rock surface.

There are no assumptions required with the rig or the testing, as bolts are installed in site rock and loaded as required by site.

Some features of the Dynamic Test Rig (DTR) include:

- The rig can be transported to any mine site and can be used to test any dynamic bolt
- The rig is fully self-contained (only requires access to mine supply air to run the lifting hoist)
- Energy application levels between 12 to 35 kJ in increments of 1.0 kJ
- Allows free displacement until drop rig impacts with floor (not typically experienced)

DROP TEST RESULTS

This summary of test data is achieved from 14 mine sites, across 3 different bolt systems.



ENERGY DISPLACEMENT PERFORMANCE

X MD BOLT

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★ D39 MDX BOLT



