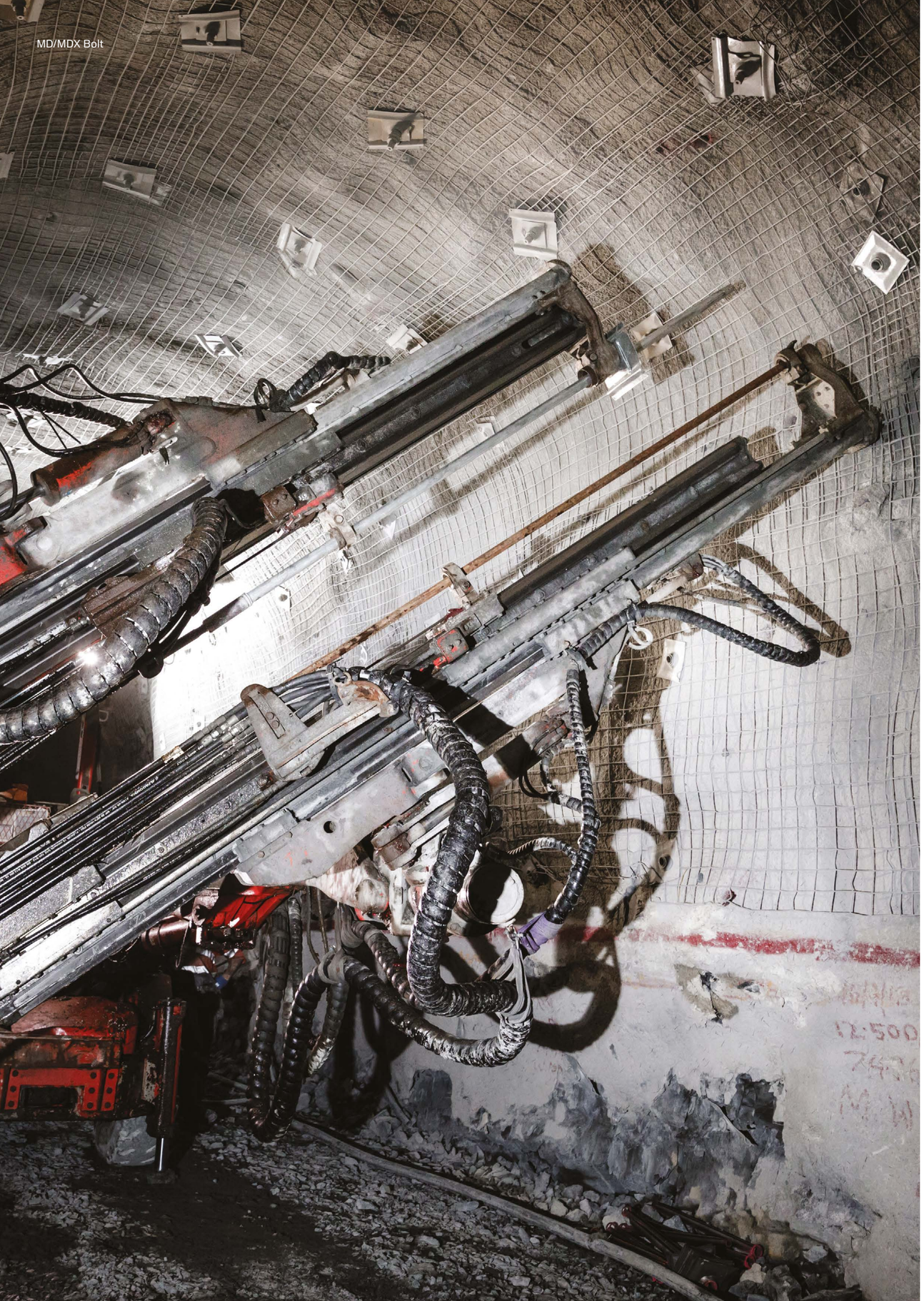
# MD/MDX Bolt



SANDVIK





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# Putting your safety first

The mining industry continues to demand even higher levels of safety and productivity. In order to meet these requirements, we work continuously to develop safer products, and to produce comprehensive manuals on the safe and effective use of our products.

**It's all about everyone's health**
Helping you to ensure a safer workplace and healthier workforce is of the utmost importance to us. The wellbeing of any person coming into contact with our equipment is paramount. Therefore, we strive to identify and assess potential risk factors that could threaten the health of you and your employees.
All products in this catalogue are designed to meet safety requirements.

**Be aware of all safety procedures**
We ask that you start by obeying all instructions given. Never work under an unsupported roof or close to potential pinch point locations. Beware of the potential hazards of a loose roof and ribs. Beware of possible coal burst. The use of temporary roof support is recommended. Scale down roof and ribs prior to bolting. It is important to bolt early in the mining process – as soon as it is safely and practically possible.
Safe work procedures should incorporate inspection – before the machine operates, and also through regular monitoring based upon mining conditions, safety and hazard management systems. Workers should be provided with safety information, instruction and training on transportation, installation, operational care and disposal of drilling tools.

**Dress right from head to toe**
You must wear appropriate personal protective equipment (PPE) at all times. This is what we strongly recommend to help avoid injury:

— Safety helmet
— Hearing protection
— Safety glasses
— Protective, high visibility clothing
— Respiratory protection
— Safety boots
— Any site-specific PPE as required

**Make a risk analysis before you start**
Pay attention to safety when planning all of your work. Before you start, always take the time to go through all operations. Identify any potential risks and take appropriate measures to avoid them.
If necessary, seek expert advice on how to help minimize risks. Finally, make sure that you have the right resources to perform all tasks in the safest manner possible.





# 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.

**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, 3.0 m and 3.8 m

**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 diameter | 47 mm |
| Bolt length | 1.8 m, 2.1 m, 2.4 m, 3.0 m and 3.8 m |

**Bolt technical specifications**

| Property | Minimum | Typical |
|---|---|---|
| Ultimate tensile strength | 280 kN | 300 kN |
| Shear strength (calculated) | 246 kN | 270 kN |
| Dynamic capacity | 19 kJ | 21 kJ |
| Dynamic displacement | 60 mm | 200 mm |
| | **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 | 12.0 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 |
| BMG2038S | 3.8 m long MD Bolt galvanized | 21.0 kg |





# 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.

**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

**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 diameter | 47 mm |
| Bolt length | 1.8 m, 2.1 m, 2.4 m, 3.0 m, 3.8 m and 4.0 m |

**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 (47 mm) | Weight |
|---|---|---|
| BXG4718 | 1.8 m long MDX Bolt galvanized | 9.5 kg |
| BXG4721 | 2.1 m long MDX Bolt galvanized | 10.9 kg |
| BXG4724 | 2.4 m long MDX Bolt galvanized | 12.3 kg |
| BXG4730 | 3.0 m long MDX Bolt galvanized | 15.4 kg |
| BXG4738 | 3.8 m long MDX Bolt galvanized | 19.4 kg |
| BXG4740 | 4.0 m long MDX Bolt galvanized | 20.5 kg |

# D39 MDX Bolt



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, when drilled with 35-38 mm drill bits. The D39 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.

**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

**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 diameter | 47 mm |
| Bolt length | 1.8 m, 2.1 m, 2.4 m and 3.0 m |

**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 (39 mm) | Weight |
|---|---|---|
| BXG3918 | 1.8 m long MDX Bolt galvanized | 8.4 kg |
| BXB3918 | 1.8 m long MDX Bolt black | 8.1 kg |
| BXG3921 | 2.1 m long MDX Bolt galvanized | 9.9 kg |
| BXB3921 | 2.1 m long MDX Bolt black | 9.6 kg |
| BXG3924 | 2.4 m long MDX Bolt galvanized | 11.1 kg |
| BXB3924 | 2.4 m long MDX Bolt black | 10.8 kg |
| BXG3930 | 3.0 m long MDX Bolt galvanized | 14.1 kg |
| BXB3930 | 3.0 m long MDX Bolt black | 13.8 kg |

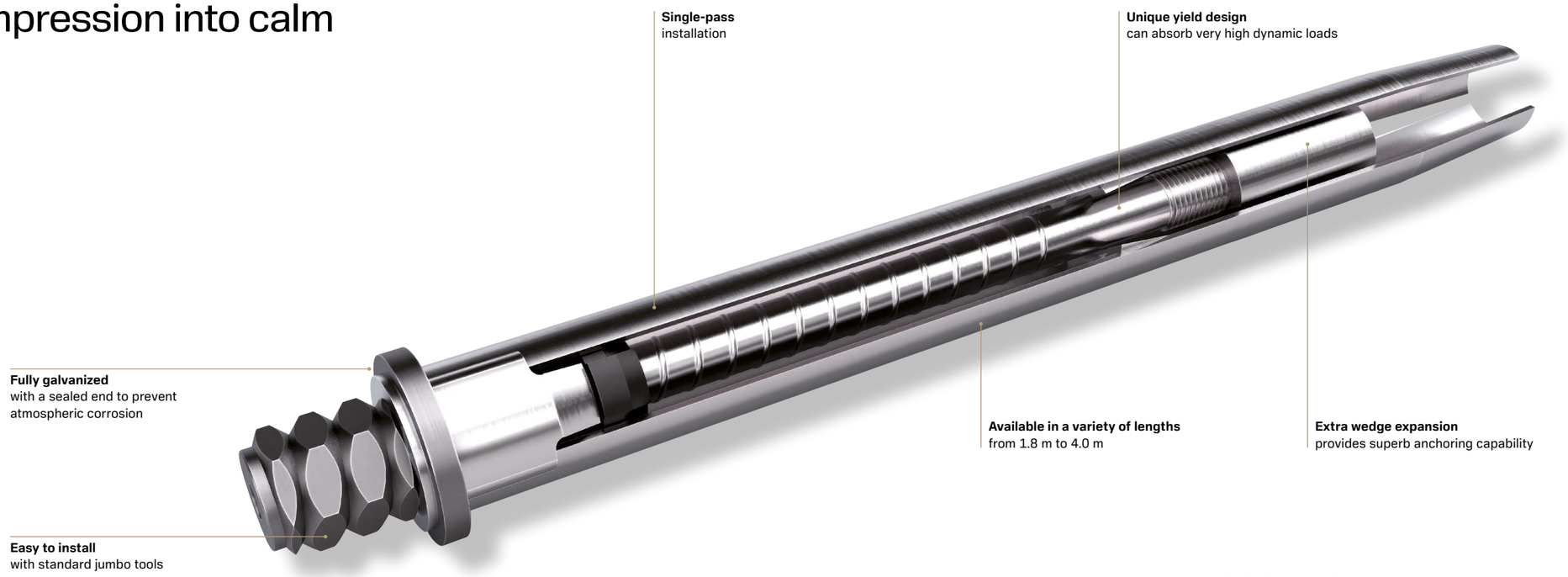




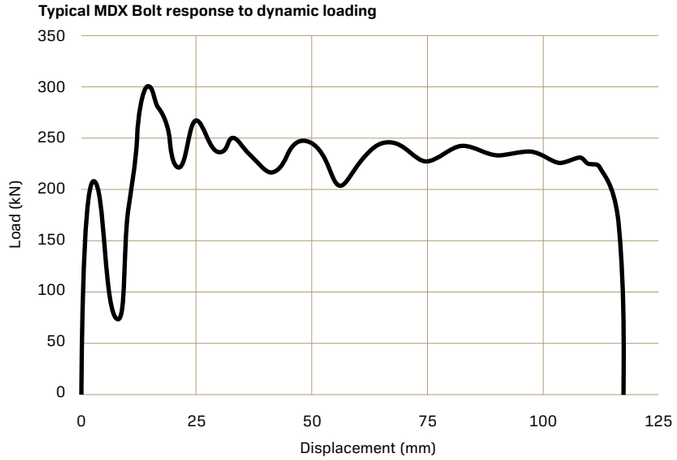
MD/MDX Bolt


# MDX Bolt: greater expansion, extra anchorage

## Turn compression into calm




**Typical MDX Bolt response to dynamic loading**



# Mesh clamp

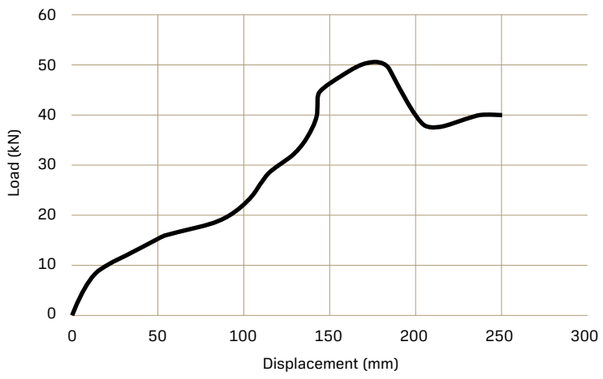


Designed and developed in Australia for underground hard rock mines, the mesh clamp is an accessory product for the MD/MDX rock bolt range which is suitable for installation by the jumbo or rock bolters with the D47 MD, D47 MDX and D39 MDX Bolts.

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.

**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**




**Technical specifications**

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

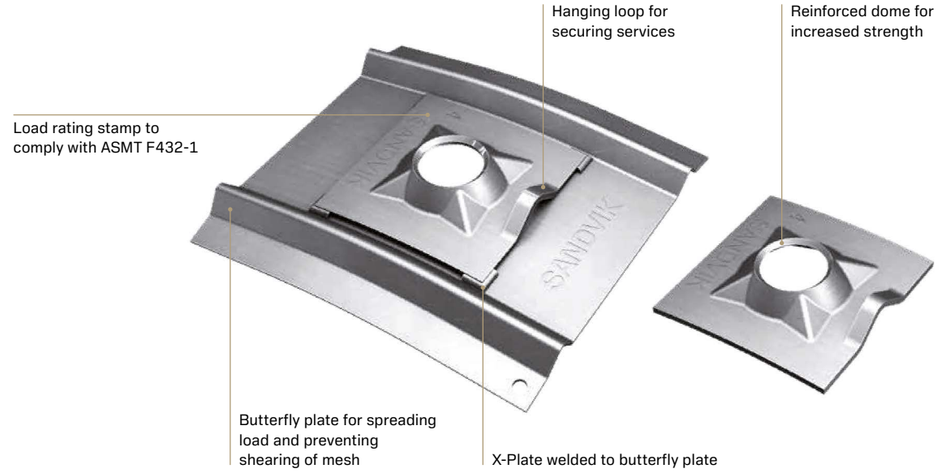
| Part number | Description | Weight |
|---|---|---|
| BMCG | Mesh clamp galvanized | 1.98 kg |



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 and 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



# 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.

**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 $CO_2$ savings in both manufacturing and shipping.
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.

**+54%**
Stronger than a standard product in dynamic conditions

**+22%**
Stronger than a standard product in static conditions

**-14%**
Reduction in steel reduced $CO_2$

MD/MDX Bolt



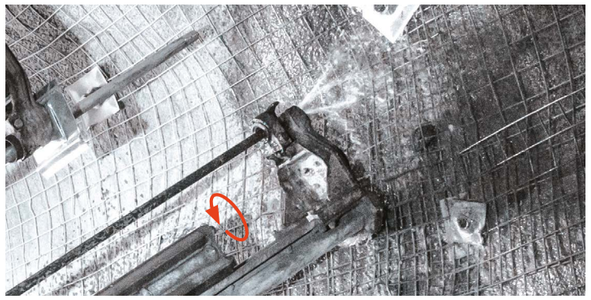
# Extreme performance

**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.

**Hazard notification**
Never work under, or enter “unsupported ground”. 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.

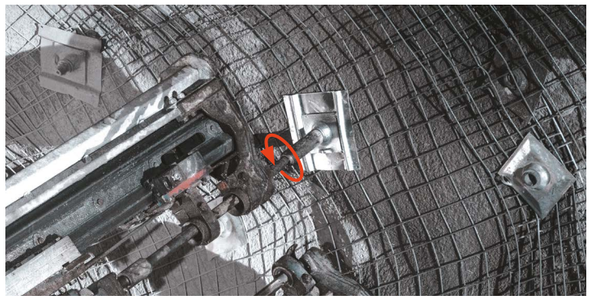
Sandvik rock bolts are offered in a hot dip galvanized coating (in accordance to AS/NZS 4680): however, certain ground conditions may elevate corrosion rates, please be sure to regularly inspect ground support to ensure excessive corrosion is not present. When fitting “pull collars” ensure that they are machined and not cast, as cast material can shatter under percussive loads.



**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.

**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 2 t 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.



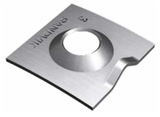
Combination plate galvanized



Bolt mesh clamp



Eye hanger galvanized



Rock plate



Bolt pull collar



Bolt drivers



D47 MD Bolt



D47 MDX Bolt



D39 MDX Bolt

| 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 |

**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.

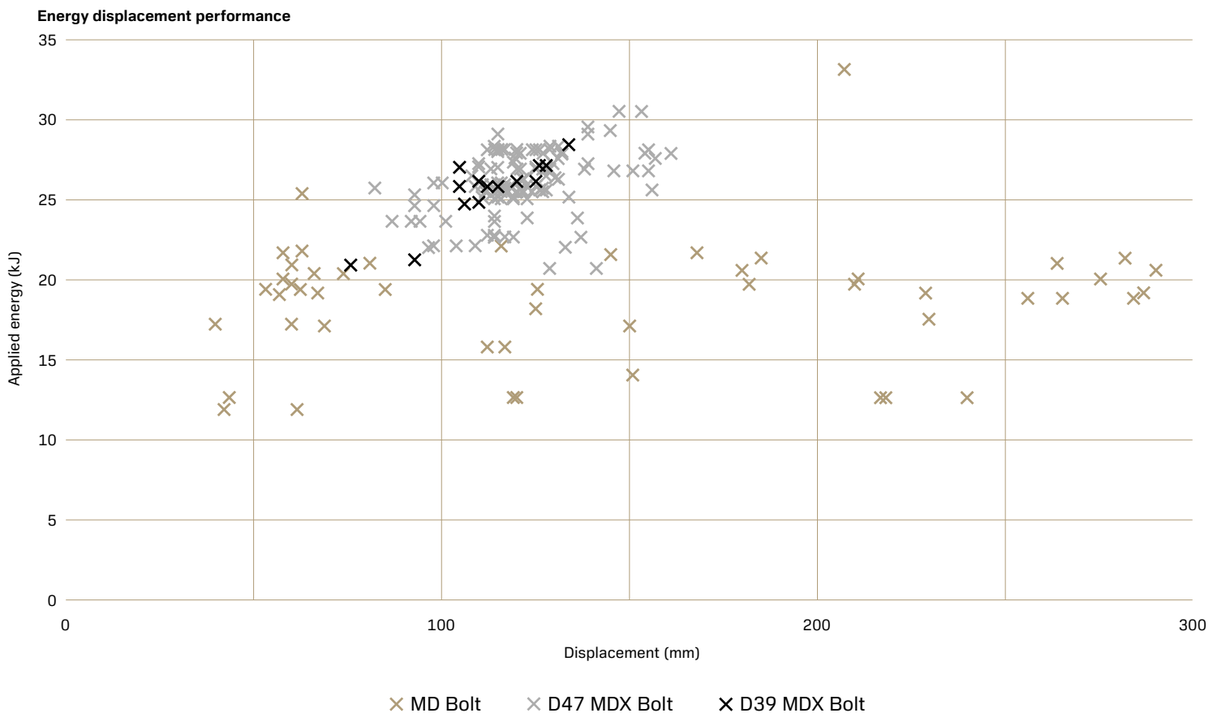
# Extreme load

**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.



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