

LOKSET® J SERIES

HARD ROCK MINING – WEST COAST LONG TENDON RESIN CAPSULE

DESCRIPTION

The Lokset® J series is a long tendon resin capsule that contains specially formulated resin mastics to aid insertion and push through where long tendon support is required (example up to 8 meters).

The Lokset J series resin capsule consists of a reinforced, thixotropic polyester resin mastic in one compartment and an organic peroxide catalyst separated by a physical barrier in the other. The rotation of the bolt during installation ruptures the capsule, shreds the skin and mixes the two components causing a chemical reaction and transforming the resin mastic into a solid anchor.

APPLICATION AND USES

The Lokset J Series Resin Capsules are normally used as an anchoring support in strata where larger annular gaps between bolt and hole diameters are encountered with long tendon strand cables:

- ▶ Intersections
- ▶ Cut throughs
- ▶ Long life roadways e.g. belt roads
- ▶ Secondary support
- ▶ Additional primary support

The capsule can be used with a range of long tendon support cables:

- ▶ HI-TEN Strand cables
- ▶ SuperStrand cables
- ▶ Flexibolts
- ▶ Spinbolts
- ▶ Multicables
- ▶ Megabolts
- ▶ Megastrands
- ▶ Flexicables
- ▶ Cable bolts
- ▶ Flex-bolts



Figure 1 – Long Tendon Resin Capsule

ADVANTAGES

- ▶ Lokset J Series aids mixing in larger annular gaps due to a specially formulated resin mastic and catalyst
- ▶ Full encapsulation with pre-tensioning utilising combination of fast and slow speed capsules
- ▶ Point anchor installation with fast capsule
- ▶ Full encapsulation without pre-tensioning using slow speed capsule
- ▶ A unique design of capsule configuration enabling extremely effective mixing of resin mastic and catalyst compartments
- ▶ Rapid insertion, easy and quick to use
- ▶ Higher compressive strength, strong, rapid and consistent anchorage
- ▶ Higher modulus
- ▶ Protects bolt from corrosion, can be used in wet or underwater conditions
- ▶ Unaffected by vibration
- ▶ No expansion stresses, can be used in weak strata.

TECHNICAL DATA

Typical insertion properties at 25°C:

Speed	¹ Spin Time	² Hold time	Capsule colour	Label colour
J Slow	20 sec	>60 ³ sec	Blue	Blue
J Medium	12 sec	>20 ³ sec	Red	Red

¹Approximate spin time in seconds
²Minimum hold time in seconds
³Where high tension loads are applied to the system the hold time may be several minutes.

The hold time is the **minimum** time allowed after completion of the spin time before bolt tensioning is attempted. In many cases the hold time will be greater than that listed.

The times listed are an indication only, they may vary with temperature, mining conditions, equipment, hole: bolt annulus, age and storage conditions of resin capsules. Each mine site should be evaluated to determine optimum installation parameters.

Temperature / Mastic Gel Time

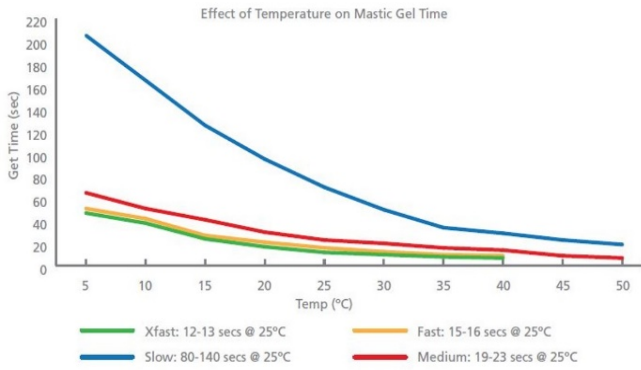


Figure 2 - Effect of Temperature on Mastic Gel Time

Compressive Strength

Tested in accordance with ¹BS 7861:Part 1:1996. Tested on 40 mm cubes with slow set resin.

¹Strata reinforcement support system components used in coal mines: Part 1, specification for rock bolting.

Typical results:

Age (hours)	Uniaxial compressive Strength (MPa)
24	>60

Pull Strength

Tests performed by Wollongong University Dept of Mining and Civil Engineering on 21.7 mm bolt encapsulated to 250 mm depth in 35 mm hole with J Series slow set resin

Typical results:

Age (hours)	Pull out Force (kN)	Tonnes
24	>150	>15

Punched Shear Strength

This test (according to BS 2782 Part 3) provides excellent correlation with mine pull out tests (without the variances) and is directly related to the strength of the resin. With fast setting resins the test can be performed in a very short time after the resin mixture has gelled (15 seconds).

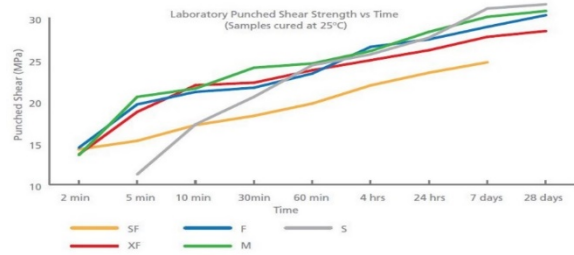


Figure 3 - Punched Shear Strength vs Time

APPLICATION METHOD

It is essential that good bolting procedures are followed and the instructions on the box are observed. As a guide the following steps must be taken:

- 1) Drill hole to correct diameter ensuring water/air flush is used. The hole should be clean and free from dust and other loose particles. In Coal mining 27-28 mm hole diameters are normally preferred with 22 mm core diameter roof bolts or cables. Do not exceed the manufacturers recommended diameter.
- 2) Drill hole to correct length for bolt. The ideal hole length should be at least 100 mm shorter than the bolt, dependent on the bolt/cable being used. Do not deviate from the manufacturers recommended length of hole in relation to the bolt.
- 3) Select the correct resin capsule(s) that has been specified for the job
- 4) Check that the use by date on the box label has not expired.

- 5) The manufacturers operating instructions for the use of the drilling and insertion machine must be followed. Where pneumatically operated machines are used it is essential the minimum required air supply pressure is exceeded.
- 6) When pre-tensioning and when FR Slow and FR Extra Extra Slow capsules are used together follow the below steps:

Step 1 *Insert the slow set (light green) capsule first*

Step 2 *Next insert the Extra Extra Slow set (light pink) capsule.*

Cable ties may be used to lodge the capsules in the hole and conduit tubes to assist in insertion. **Ensure the capsule reaches the top of the hole.**

Usually the correct length, diameter and number of capsules are inserted to ensure full column encapsulation. Should insertion problems occur then the problem must be investigated.

- 7) Connect the bolt to the spinning dolly/spanner.
- 8) The bolt is pushed and spun at maximum rpm at a constant feed rate through the entire length of the capsule(s). When the top of the hole has reached a further 2 - 4 seconds spinning will suffice to ensure complete mixing. Total spin time through the capsule and at the top of the hole should not exceed the "approximate spin time" on the box label. It is essential the bolt is pushed and spun to the top of the hole before mixing is completed.
- 9) Do not over mix the resin. If mixing continues beyond the recommended spin time and into the gel time, the solidifying chemical may be ground up and destroyed.
- 10) The bolt is then held stationary and after the hold time has elapsed the bolt may be tensioned as required. The hold time is the minimum time allowed after completion of the spin time before bolt tensioning can be attempted. In many cases the hold time will be greater than that listed. Where high tension loads are applied to the system the hold time will be extended significantly. As a rough guide, in laboratory tests, approximately half the ultimate strength of the resin is reached after 30 minutes.

The following items must also be checked where hand-held (air operated) equipment is utilised:

- ▶ Clean and dry supply of compressed air
- ▶ Air supply from roof bolter to miner should not be more than 100 metres of 2" hose

- ▶ Air pressure must be between 85 - 100 psi (586 - 690 KPa) when bolter(s) are operating
- ▶ Water pressure should be between 80-90 psi (550 - 620 KPa) and hoses flushed out prior to connection

SAFETY INSTRUCTIONS AND LIMITATIONS

The annular gap between bolt and hole diameter should be at a minimum. It is recommended the annular gap be between 4 - 6mm e.g.

Bolt Diameter	22mm
Hole Diameter	28mm
Annular Gap	6mm

Where long tendon bulbed cables or larger bolts are used a larger hole diameter may be needed, then consult the bolt supplier for further information.

The Lokset J Series resin contains a specially formulated resin mastic and catalyst to aid mixing in larger annular gaps. Where larger annular gaps are encountered (e.g. in Hardrock mines) the bolt must possess larger deforms or a mixing device such as mixing wire or paddles. Follow the installation guidelines.

Larger hole diameters/annular gaps may result in extended cure times, less efficient mixing, finger gloving of the bolt into the resin capsule, a reduction in load transfer (strength), a reduction in encapsulation length.

In all cases it is strongly recommended that short encapsulation pull tests be performed to verify that required load strengths are achieved.

Extended tensioning times may be due to:

- ▶ Low temperatures
- ▶ Broken ground
- ▶ Large hole diameters
- ▶ Insufficient spinning
- ▶ High nut break out loads
- ▶ High machine torque load levels
- ▶ Excessive thrust/feed on the installation rig
- ▶ Intermixing of slower setting resin into faster setting resin capsules.
- ▶ Excessive water inflow

The resin appearing to be "too quick" with the bolt not reaching the top of the hole may be due to:

- ▶ High temperatures
- ▶ Smaller diameter holes
- ▶ Hole closure
- ▶ Angled holes
- ▶ Misaligned holes/rigs
- ▶ Low feed pressure
- ▶ Premature nut break out
- ▶ Old/out of date resin

All bolting parameters will vary depending on several factors such as:

- ▶ Strata condition/type
- ▶ Temperature
- ▶ Hole: bolt annulus
- ▶ Age of resin capsule
- ▶ Equipment
- ▶ Installation method

Volume

It is essential the correct length of capsule is selected to fill the volume left in the hole after allowing for the volume of the bolt.

It is good practice to use a capsule size which exceeds this volume by around 10% to allow for variations in hole diameter and length, bolt size and strata conditions.

25 mm nominal diameter capsule with 22 mm core diameter bolt
Theoretical encapsulation + 10%

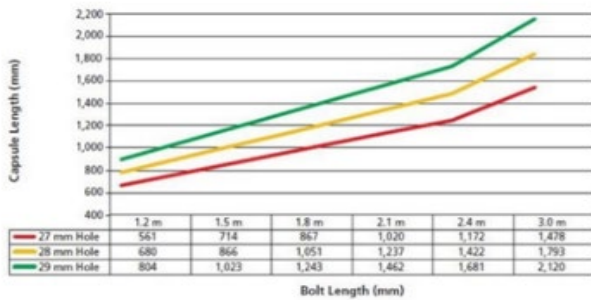


Figure 4 - 25mm nominal diameter capsule with 22mm core diameter bolt (Theoretical encapsulation + 10%)

PACKAGING AND TRANSPORTATION

Lokset J Series Resin Capsules are available in standard diameters of 36 mm. Lengths range from 300 mm to 1700 mm.

Resin capsules are packaged in water resistance cardboard cartons labelled with colour codes and supplied on wooden pallets. Capsules are packed according to their length and in quantities relative to the capsule size.

Label colour is dependent on resin speed and resin combination:

Resin Speed	Colour of Label
Super Fast	
Extra Fast	
Fast	
Medium	
Slow	

Example of capsule label, Lokset J Series Medium

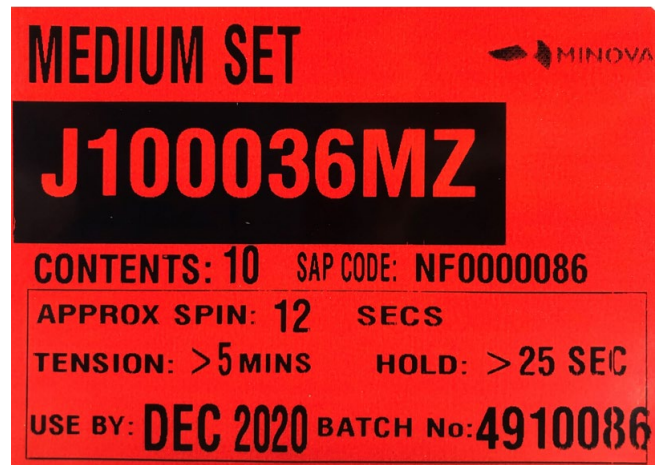


Figure 5 - Capsule Label

STORAGE AND SHELF LIFE

Suggested shelf life for Lokset J Series resin capsule is 4 months when stored between 20-25°C. Extended shelf life can be expected when stored at lower temperatures of 0-5°C in cool rooms and is highly recommended. Stock rotation is strongly recommended. Storage at higher temperatures will severely reduce shelf life.

STORAGE CONDITIONS

Store in a cool, dry place away from direct sunlight. Do not double stack pallets. When using cool room storage the resin capsules should be allowed time to attain ambient temperature before use otherwise SPIN and HOLD TIMES will be extended.

HEALTH AND SAFETY

For further information see the Lokset Safety data sheet on www.minovaglobal.com/apac

TECHNICAL SUPPORT

We provide technical advisory service by a team of specialists in the field. The service includes on site assistance and advice on evaluation trials and laboratory work.

Packed in water resistant cardboard cartons labelled with colour codes and supplied on wooden pallets.

QUALITY

The superior quality of the Lokset resin capsule is assured through a four-part quality control program:

- 1) Raw Material Testing
- 2) In-process quality control testing
- 3) Finished product acceptance testing
- 4) Quality system management to ISO 9001

Testing levels and specifications for each of the above programs have been established statistically, based on actual historical data to ensure the customer receives a uniform quality product which will perform dependably under field conditions

MANUFACTURER

Minova trading name of Orica Australia Pty Ltd
George Booth Drive
Kurri Kurri NSW 2327 AUSTRALIA

An ISO 9001: 2015 Quality Management Certificated Company



CUSTOMER SERVICE & SUPPORT

Product & Technical

Minova Australia

George Booth Drive
Kurri Kurri NSW 2327 AUSTRALIA

(1800 Minova) 1800 646 682
(1300 Minova) 1300 646 682
+61 2 4939 5159 (international)
Email: sales_au@minovaglobal.com

Sales & Logistics

Split Set Mining Systems

99-105 McDowell Street
Welshpool WA 6106 AUSTRALIA

Phone: +61 (0) 8 9458 1188
Email: mining@phoenixmetal.com.au
Customer Orders Email:
orders.desk@phoenixmetal.com.au

DISCLAIMER

All information contained in this document is provided for informational purposes only and is subject to change without notice. Since Minova and SSMS cannot anticipate or control the conditions under which this information and its products may be used, each user should review the information in the specific context of the intended application. To the maximum extent permitted by law, Minova and SSMS specifically disclaims all warranties express or implied in law, including accuracy, non-infringement, and implied warranties of merchantability or fitness for a particular purpose. Minova and SSMS specifically disclaims, and will not be responsible for, any liability or damages resulting from the use or reliance upon the information in this document.

The Minova Logo is a registered trademark.

© 2018 Minova Australia Pty Ltd

® Registered trademark of Minova International Limited