GROUND SUPPORT SOLUTIONS

- Roof control
- Cavity filling
- Ventilation control
- Backfilling
- Water stopping
- Ground consolidation
Orica is the world’s leading provider of ground support solutions in underground mining, construction, tunnelling and civil engineering.

Our products and services help customers to overcome the challenges of roof control and ground support in mining. Our focus is improving the safety and productivity of our customers’ operations.

Orica Mining Services South Africa (Pty) Ltd is Orica’s ISO 9001:2008 listed South African Ground Support division. It is a leading manufacturer of products for rock bolting, strata support and ventilation control in mines.

The company’s roots in South Africa go back to 1975, under the name “Fosroc”. The Ground Support business was previously known as Minova, which became part of the Orica Group of companies in 2007. In 2013 the decision was taken to integrate the Ground Support business into a single Orica structure, designed to reduce complexity, improve our services, and offer better value and make doing business with us easier.

The restructure has allowed Orica to more clearly present its offer and ensure you can more easily access Orica’s full range of products and services:

- **Ground Support Systems (formerly Minova):**
  With the integration of Minova, Orica is now the global leader in Ground Support Systems for mining, tunnelling and civil engineering. Our range includes steel and chemical products as well as a variety of strata support services.

- **Blasting Systems:**
  Orica is the largest supplier of commercial explosives and blasting systems to the mining and infrastructure markets worldwide. Our range includes bulk explosive systems, packaged explosives, initiating systems, electronic blasting systems and blasting services.

- **Mining Chemicals Systems:**
  Orica is a leading global supplier of sodium cyanide for gold extraction. We also supply other specialty chemicals such as frothers and collectors for mineral processing.

The company operates an integrated research, development and manufacturing facility in the hub of the diverse and technically demanding Southern African mining industry. Orica’s products are used in every sector of that industry and are exported world-wide.

Through our own research and access to the research of other Orica International companies we aim to ensure that our customers maintain leadership in improving the safety and productivity of underground excavation. The spectrum of products supplied enables mining engineers to choose unique solutions to unique rock engineering problems. We invite the active participation of our customers in product innovation and improvement.

Orica provides market-leading customer solutions to improve productivity and resource efficiency in the mining, quarrying and infrastructure sectors.

A global company head quartered in Australia with a diverse workforce of over 14,000 people, with operations in more than 50 countries and customers in more than 100

At Orica, we are committed to working with customers to overcome operational challenges. Our products and services are used in a wide range of applications including:

- Mine roof control
- Slope stabilisation
- Rock fall prevention and ground support
- Cavity filling
- Water stopping and gas sealing
- Backfilling
- Ground consolidation
- Ventilation control
- Rock surface protection
GROUND SUPPORT PRODUCT OFFERING

Lokset™ POLYESTER RESIN CAPSULES

Orica manufactures Lokset™ resin rockbolting capsules. Lokset™ is the leading rock-bolting resin in Southern Africa and has long held a similar position in North America, Australia and Europe.

Lokset™ capsules have a unique composition and construction. The resin compartment contains coarse filler particles, which aid in shredding the sheath and then interlock to increase the strength and rigidity of the grout. The catalyst compartment generally comprises 20 – 30 percent of the capsule, which materially improves intermixing of the components. These characteristics give the user unparalleled reliability of installation, tolerance of wide bar/hole annuli and simplicity of operation.


Lokset™ Standard and Lokset™ A Resin Capsules

These capsules are available in single setting times from 15 seconds to 10 minutes and diameters from 23 mm to 32 mm. Lokset™ A resin capsules have higher strength than standard capsules.

TOOSPEEDIE™ Lokset™ Resin Capsule

This resin capsule assists in achievement of 100% encapsulation using a single resin capsule rather than multiple capsules. Two different resin set times are packed within the same capsule, providing rapid insertion and guaranteeing that both fast and slow set resins are installed at once. Various standard diameter and length combinations are available. The fast and slow speeds are each colour coded to ensure that the fast end is inserted into the hole first.

Two-speed capsules are suitable for installations where the maximum capsule length required does not exceed 1,350 mm.

Double Clip Lokset™ Resin Capsule

Capsules are joined together during the manufacturing process, allowing for quick and easy full column installation, even in long holes. Various standard diameter, length and setting time combinations are available.

These capsules can be installed using either conventional installation methods or the Orica Quick-Chem installation tube system.

The Quick-Chem system

The system is used to ensure quick, safe, efficient and remote insertion of the Lokset™ resin capsules into bolt holes when using a mechanised bolting rig.

The system consists of a specially designed retainer caps fitted to Lokset™ resin capsules, and an insertion tool made up of a threaded R32 adaptor attached to a 3 m length of clear, high strength, flexible plastic tubing. The tube is fitted onto the drifter and the operator uses the boom of the rig to insert the tube into the rock bolt hole, securely carrying the resin capsule(s) into the hole, while working from a remote location under supported ground. The Quick-Chem components are available 28 mm, 30 mm and 32 mm resin capsules.
Lokset™ ANCHOR PACK POURABLE RESIN GROUTS

Scraper winches, conveyor belt drive or tail ends and other machinery may be rapidly bolted into place with Lokset™ Anchor Pack pourable resin grouts.

These are supplied as 10 kg two-component packs in mixing buckets. For use, the two components are mixed and poured into the anchoring holes, before or after inserting the bolts. The resin sets within 20 minutes and full load can be applied to the anchor bolt after 2 hours.

Capcem™ CEMENT GROUT CAPSULES FOR ROCKBOLTING

Orica manufactures small diameter rockbolting cement capsules which are used with grout bars to achieve full-column cement grouting.

The blended cement is encapsulated in a porous sheath, which allows controlled water absorption for correct wetting of the grout. A 200 mm length of ultra fast setting grout can support a 100 kN load applied to an embedded 16 mm rebar, after only 1 hour.

Capcem™ capsules are available in 25 mm and 28 mm diameters as ultra fast, fast, medium and slow setting formulations. The capsules comply with South African National Standard (SANS) 1745 and carry the SABS mark of quality.

Capram™ CEMENT GROUTING CAPSULES

The Capram™ system was designed to afford an easy method of reliably achieving full column cement grouting in a hole of any size. It can be used for pre- or post grouting. The equipment components are a simple pressure-differential axial pump which operates on compressed air (minimum pressure 3 bar) and a lance of 12 mm to 30 mm diameter.

The grout is pre-packed in a porous sheath designed to optimise water absorption. The wetted grout bag is inserted into the pump and the grout ejected through flexible piping and the lance to the back of the rock bolt hole. The sheath is retained in the pump and discarded after use.

NON-WEEPING HIGH-YIELD GROUTS

Orica manufactures non-weeping, pack pre-stressing cements. These patented high-yield grout formulations are mixed with a fixed quantity of water and pumped under pressure into high strength polypropylene bags used for timber pack pre-stressing. The grout will generate a minimum strength of 0.3 MPa in 2 hours and achieve a minimum strength of 4 MPa within 7 days. The primary use is to pre-stress underground timber packs, giving semi-active and immediate support as well as making the packs blast-resistant. The grouts are supplied in nominal 13 kg bags.

Capcem™ PUMPABLE CEMENT GROUTS FOR ROCKBOLTING

These grouts, manufactured by Orica in South Africa, are usually supplied as 90 mm diameter x 400 mm long capsules, packed in a semi-permeable sheath. Setting times are generally medium and fast set.

Capcem™ KT is a range of high compressive strength thin spray liner coatings, generally applied with a thickness between 4 mm and 8 mm. When sprayed onto the surface of a tunnel or excavation, they set within one hour and form a membrane which locks and restrains loose rock, inhibits deterioration, protects against weathering and adds to structural strength. Capcem™ KT is available as normal-speed (Capcem™ KT Grey or White), fast-setting (Capcem™ KT fast) and as 2-component Capcem™ KT 2C, with enhanced adhesion strength.

This range of thin spray liners offers early strengths from 2 to 3 hours after application, achieving up to 8 MPa with high bond strength.

Air-O-Cem™ AND Tekseal™ FOAMED GROUTS

Placed with a custom-made pump, these grouts produce low-density cement foams suitable for void filling and the creation of ventilation, backfill and blast barriers. These are supplied in 25 kg bags. Cement foams can be produced from as few as 8 bags per cubic metre, with strengths from 0.5 MPa to 6 MPa.

Fillset™ AND Conbex™ BACKFILLING SYSTEMS

Orica has developed cementitious binders that make run-of-mine tailings into effective backfill material. The binders cement the tailings and chemically retain water, accelerating strength gain and preventing shrinkage as the backfill sets. As each backfilling operation is unique, Orica provides advice on design of backfill formulations and placing systems and supplies the necessary binder.
**AUTOROCK DRILL RIG**

The Autorock drill rig makes rockbolting in narrow stopes a viable proposition by combining safe operation, accurate drilling and high output, all at a fraction of the capital and operating costs of fully mechanised rock bolting rigs.

Since its first use on low stoping width gold-mines, the Autorock has been continuously improved and has been adapted for drilling in coal mines, in working places over 5m high and to a variety of power sources, from the usual compressed air to hydropower, hydraulic power, water and electricity.

The careful design and proven performance of the Autorock drill rig was recognised by the SABS and was one of the winners of the 2008 SABS Design Excellence Awards.

**In-Stope Bolting System with Autorock drill rigs and Lokset™ Resin Capsules**

It is widely recognised that resin-grouted rock bolts provide the strongest form of rock support, coupled with immediate support action and long-term durability. Where conditions permit, Orica recommends the use of a Lokset™ resin capsule and steel bolt for in-stope and other support.

Use of the Autorock drill rig facilitates the safe and effective installation of resin-grouted rock bolts, especially in small excavations such as tabular stopes. It provides a “built-in discipline” for complete support installation with resin bolts.

**Advantages**

The drilling of the support hole and the complete installation of a steel rock bolt with resin capsules offers a cost effective, safe, simple and fast support solution.

**Speed of drilling and installation**

Resin bolting with an Autorock drill rig ensures support installation discipline in that the rig is not moved away from the installation until the installation is 100% complete. (No pre-drilling and post installation of bolts.) The drilling and complete installation of a 0.9m bolt should take no longer than 6 minutes per installation.

TOOSPEEDIE™ Lokset™ resin capsules provide almost fool-proof full-column grouting when used with along with the correct hole size, appropriate bolt and washer, shear pin nut and load indicator. Immediate high quality support is ensured, once bolt is tensioned with the rock drill. Shearing of the shear pin in the nut and deformation of the load indicator provide visual proof of a successful installation, giving management peace of mind. The Autorock drill rig offers approximately 3 tonnes of static load resistance offering additional support to personnel.

**Maintenance Programme**

To ensure success of rock bolting programmes, Orica offers maintenance services to suit customer requirements. A well functioning maintenance system is essential to obtain the highest standards of availability, optimum performance and safe use of the Autorock drill rigs.

Orica has fully equipped an SABS ISO 9001:2008 accredited repair workshops, in Johannesburg and Rustenburg. After maintenance each rig and every component is checked and tested before despatch. Repaired rigs are tested to the same standards as new rigs and are covered by a 3 month manufacturer’s warranty. Rigs can be maintained/serviced with or without their rock drills.

**CLEVER RESOURCEFUL SOLUTIONS**

Orica offers a complete solution for rock bolting in narrow stops.

This disciplined system comprises the Autorock drill rig, optimised drill rods and bits, Lokset™ resin capsules and resin grouted rock bolts.

The system is supported by Orica’s Autorock maintenance and planning programme, training and demonstrators.

Statistics are collected on all maintenance work. Orica can provide reports to mine management on repair and maintenance costs and cost drivers. The statistics are also used by Orica to guide its programme of continuously improving the Autorock rigs. For operators in areas where it is not feasible to return the rigs to Orica for maintenance, Orica will assist the customers to establish on-site maintenance programmes.

**Maintenance Planning**

Autorock rigs use aluminium and galvanised steel for longer life and are constructed robustly with crash bars as well as impact-protected cylinders. Under conditions of fair wear and tear, the Autorock rig can be expected to...
require maintenance every 4 to 6 months. Sufficient spare rigs should be available in a mine “pool” so that rigs taken out of working places for maintenance and repair are immediately replaced and no drilling shifts are lost. Typically, about 10% of operating rigs need to be available as spare rigs to keep all working places served.

Training
The correct training of the rig operators and all other personnel involved in the operation and management of the Autorock rigs is of critical importance to ensure the successful operation of the Autorock Rig and ultimately the rock bolting strategy.

Training packages to meet individual customer’s needs are available.

Demonstrators
Orica provides the additional service of qualified underground demonstrators to assist in introduction of new technologies and equipment, as well as on-going training and performance monitoring. This service is recommended as part of a roll-out. Thereafter it can be provided by means of a service contract, at an additional charge.

ADDITIONAL SUPPORT PRODUCTS
As part of Orica’s complete support offering the following products are available.

Rock bolts, tendons and mesh
- Rock bolts
- Secura™ rock bolts*
- Friction rock anchors
- Washers and plates
- Welded mining mesh
- Osro straps
- Shepherd’s crooks
- Cable anchors
- Mechanical end anchor bolts
- Pigtail eyebolts
- Self drilling anchors
- GRP rock bolts and mesh
- Polymer meshes and nets

“The patented Secura™ rock bolt has formed ribs at the tip and along the last section of the bolt to enhance resin mixing and bolt pull-out resistance. This bolt is recommended for use with Lokset™ resin capsules whenever the hole diameter is more than 8 mm larger than the bolt diameter.

The Autorock drill rig, Secura™ bolts and Lokset™ resin capsules provide the complete solution to rock bolting in most hard rock applications.

Pumps
- Grout pumps (hand-operated and pneumatic: Combo 2000, S1 & S2, MK1, 2, 3)
- TSL combo pump
- Injection resin pumps

Accessories
- Pinch bars
- Bobbin and rotary telltailes
- Resin injectors
- Capsule loaders

Additional Products
- Plystem blasthole tamping
- Capcem™ plug borehole sealing grout
- Fosgel water absorbing powder

For more detailed information on our solutions, refer to our Technical Data Sheets.

DISTINCTIVE STRENGTHS

Established Reputation
Orica’s major products have been established in the South African mining industry for many years and in most cases form the de facto standard. The company enjoys a strong reputation for the reliability of its products and service and for responsiveness to customer requirements.

Research and Development
Product life cycles are constantly being extended by cost reduction, performance enhancement and modification to extend their use into new market segments and applications.

Orica’s local research and development is linked with the worldwide activities to enable transfer-in of new technologies and rapid sourcing of advice and experience to solve problems or create new product solutions which facilitates productivity improvements to our customers and industry stakeholders.

Intensive Field Service and Distribution
Orica’s direct field presence enables it to successfully apply sophisticated products and to find solutions for new and unique mining problems.

FACILITIES

Lokset™ Resin Capsule Production
Capsule production lines employ mechanised and automated mixing to produce polyester and catalyst mastics for encapsulation by chub machines. The production lines are supported by a dedicated analytical laboratory for checking of incoming, in-process and finished goods. Capacity: at least 1200 tonnes per month.

Orlica has fully equipped and SABS ISO 9001:2008 accredited repair workshops, in Johannesburg and Rustenburg.
Autorock Repair Workshop
After maintenance each rig and every component is checked and tested before despatch. Repaired rigs are tested to the same standards as new rigs and are covered by a 3 month manufacture warranty. Rigs can be maintained/serviced with or without their rock drills.

Cementitious Grout Manufacture
Automatically controlled blenders produce the grout blends for the packaging lines. Small diameter grouting capsules (Capcem™) are formed on banks of automatic filling machines. Large diameter capsules (Capram™ and Injection Grout) have their own filling section. Bagging lines produce Non-weeping grout, Air-O-Cem™, Tekseal™ and other bagged products. The Cements Plant has its own Quality establishment, including laboratories for routine quality control and product testing. Capacity: at least 3,500 tonnes per month.

RESEARCH AND DEVELOPMENT
Laboratories and workshops are available for development and testing of new formulations and components. Equipment includes compressive and tensile testing machines, apparatus for conventional chemical analyses and rigs for testing anchor installation equipment and techniques.

TECHNICAL SERVICE
All field staff are experienced in mining and have received training in the characteristics and proper use of all our products. Orica’s services include:
• Product selection
• Application training and in-use auditing
• Stock management, transport and packaging

QUALITY, SAFETY AND ENVIRONMENTAL MANAGEMENT
Orica gives quality management the highest priority.

The quality management systems are listed by the South African Bureau of Standards (SABS) as complying with the requirements of ISO 9001:2008.

Orica’s Lokset™ resin capsules have been granted the SABS mark for quality conforming to the requirements of National Standard SANS 1534:1991 for rock bolting resin capsules and its Capcem™ small diameter grouting capsules carry the SANS 1745:1991 mark for rockbolting cement capsules, the only product with this mark in South Africa.

The SABS conducts six-monthly audits of the quality systems as well as tests on the mark-bearing products.

QUALITY POLICY
Orica’s management is committed to the quality policy to ensure compliance to the requirements of the quality management system that is dedicated to ensure that its products and services fully meet the requirements of its customers at all times. This commitment will support continual improvement through the implementation and support of managerial and business operational systems in realizing the purpose and scope refer to the above.

Orica supports the concept of client and supplier working together in pursuing this policy to ensure continual improvements and effectiveness in its products and service quality. The Quality Policy supports a Quality Management Framework based on fundamental principles:
• Establishing Quality Objectives as an Organization, ensuring each Business Unit subscribe to the overall outcomes.
• Ensuring that we fully identify and conform to the needs and requirements of our customers.
• Looking at our processes, identify the potential for errors and taking the necessary corrective and preventive action to eliminate them.
• Promoting a work ethic which is predicated upon safety and quality first.
• Everyone understanding how to do their job and doing it right first time.

The quality policy will be communicated to ensure understanding of its intent and available to staff at all times.

Objectives needed to be determined and set to ensure that the requirements of this policy are met and that continual improvement is sustained in line with the spirit of the policy monitoring and review will be done at management reviews.

Training will be an integrated part of the strategy to achieve the quality policy.

Within the policy, we are committed to operating our Company under the disciplines and control of a Quality Management System conforming to the International Standard ISO 9001:2008, planned and developed jointly with our other management functions.