Secoroc Rock Drilling Tools

Secoroc shaft drilling products

Shaft drilling cutters
Shaft drilling – preferred in almost all situations

Shaft drilling is defined as the application of rotary drilling techniques for excavating large diameter vertical or near vertical openings or shafts.

Shaft drilling is defined as the application of rotary drilling techniques for excavating large diameter vertical or near vertical openings or shafts. Shafts are vertical openings which are driven downward. Decisions about the size, shape and positioning of shafts are taken based on the purpose they are intended to serve. Usually circular shafts are preferred in almost all situations because they are very stable. Major advantages of shaft drilling over conventional drill and blast methods are the safety, speed, less fragmentation on the ground providing fewer losses in air flow for ventilation, utilization of capital and inherent ability to cope with adverse geological conditions.

Advantages

• A single drilled shaft replaces a group of piles and their pile cap.
• Shafts can be constructed in denser soils and are easier than driving piles.
• There is little noise or ground vibration compared to pile driving.
• Piles driven into soils may produce ground heaving which can cause previously driven piles to move laterally.
• The base of a drilled shaft can be enlarged to provide a greater resistance to uplift (under-reaming or “bell”).
• The surface over which the base of the drilled shaft is constructed can be visually inspected.
• Drilled shafts have very high resistance to lateral loads.

Shaft applications:

Hydro-electric projects
• Surge chamber
• Ventilation shaft
• Elevator shaft
• Pressure shaft
• Cable shaft

Municipal water supply
• Access or service shaft
• Ventilation
• Supply riser
• Uptake or down-take shaft

Waste water shafts
• Wells
• CO₂ sequestration, injection or hazardous waste wells

Bridges, Piers
• Onshore
• Offshore

Windmill Farms
• Onshore
• Offshore

Harbor, Dry Docks

Tunnel projects
• Ventilation
• Accelerators housing
• Access
Why Secoroc shaft drilling products?

Atlas Copco has been in the mining and construction market for many years and is committed to innovative, productive, market leading solutions.

**Benefits and values:**

- Faster rate of penetration for greater production.
- Most complete formation and hole coverage.
- Uses less weight of bit requiring less energy.
- Fail-safe load pin mechanism, so cutters aren't lost in hole.
- Hydrostatically sealed and can be submerged under water without affecting bearing performance.
- Random Cutting Structure on cutters allow a single cutter type to dress all positions and minimize inventory.
- Random Cutting structure is design to optimize the drilling parameters whenever machine load capacity is limited.
- Cutters are designed with replaceable load carrying elements.
- Aggressive cutting structure on center cutters to maximize the performance on medium to harder rocks.
- Random TCI and paired milled tooth cutting structures are designed for optimum face coverage and drilling efficiency.
- Dual seals keep the lubricating grease inside the bearings, and the cutting and contamination out of the bearings.
- Bearings are designed with pressure compensation to equalize internal and external pressures to prevent seal damage.

All shaft cutters are hydrostatically sealed and can be used in submerged applications without affecting the bearings.

The center of all shaft bits are typically dressed with a center cutter, specifically designed for small turning radius. Atlas Copco Secoroc offers center cutters with either milled tooth cutting structures for soft to medium ground formations, or with randomly placed tungsten carbide inserts for medium hard to hard ground formations.

The rest of the shaft bit is dressed with one of the three available cutter models depending on the drilling diameter. The 3 available models are the Series 8, the Series 12, and Series 13.

**Series 8 cutters** are the smallest of the cutters and are used to dress shaft bits smaller than 48 inches.

**Features:**
- Load Pin Cutters and Saddles
- Sealed Bearing Cutters
- Bores up to 1.2 meters (47” – 236”)
- Pressure-Compensated
- Hard or Soft rock

**Series 12 cutters** are mid-size cutters commonly used in diameters larger than 42 inches and less than 12 feet.

**Features:**
- Load Pin Cutters and Saddles
- Sealed Bearing Cutters
- Bores up to 1.2 meters (48”)
- Pressure compensated
- Hard or Soft rock

**Series 13 cutters** were designed for bolt on saddles; used for diameters up to 20 feet.

**Features:**
- Bolt-on Cutters
- Mag 99 Bolt-on Cutters
- Typical Cutter Layout
- Bores up to 6 meters (236”)

All cutters are available with different cutting structures. Details are provided on the product specification pages of this catalog.
**18 3/8” Center Cutters**

Center cutters are used to cover the center of the shaft bit. Their greater cone angle allows them to cut the rock at the center of the shaft, with maximum rolling efficiency. Atlas Copco Secoroc offers both milled tooth (MT) center cutters and random TCI center cutters. The bearing design for both cutters, utilize three rows of roller bearings, and one row of ball bearing.

Milled tooth cutters are designed for soft to medium formations. Their teeth are long and sharp to create a gouging action on soft formations.

The random TCI (tungsten carbide inserts) cutter uses an aggressive cutting structure to maximize performance in medium to hard rock.

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**18 3/8” Center Cutters available**

<table>
<thead>
<tr>
<th>Cutter Size</th>
<th>Product No.</th>
<th>Product Code</th>
<th>IADC</th>
<th>Special Features</th>
<th>Kerf Length</th>
<th>Mount Pad</th>
<th>Weight estimate</th>
<th>Maximum Cutter Operating Parameters</th>
<th>WOB RPM</th>
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<tr>
<td>18 3/8”</td>
<td>467</td>
<td>31001791</td>
<td>CNT-04-RJS12</td>
<td>1-2-6</td>
<td>Milled Tooth, High Durability Hardfacing</td>
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<td>232</td>
<td>MT</td>
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<td>31000703</td>
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<td>236</td>
<td>TCI</td>
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**18 3/8” Center Cutters Fastener Kit**

**Series 8 Cutters**

Series 8 shaft cutters are commonly used for 24" to 47” diameter bores. They are the smallest saddle mounted cutters manufactured by Atlas Copco Secoroc. Series 8 cutters are available in either paired steel tooth cutter M1X and M2X or with random tungsten carbide cutting structure.

**Series 8 M1X cutter with saddle.**

**Series 8 M2X cutter with saddle.**

**Series 8 HH1X TCI random cutting structure cutter with saddle.**

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**Series 8 Cutters Parameters**

<table>
<thead>
<tr>
<th>Product No.</th>
<th>Product Code</th>
<th>IADC</th>
<th>Product</th>
<th>Special Features</th>
<th>Kerf Length</th>
<th>Suggested Bore Diameter</th>
<th>Weight estimate</th>
<th>Maximum Operating Parameters</th>
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<td>91000386</td>
<td>CET-12-RJS12</td>
<td>S8 M1X</td>
<td>Milled tooth, high durability hardfacing</td>
<td>4.04</td>
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<td>24-47</td>
<td>610-1194</td>
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<td>91000357</td>
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<td>S8 M2X</td>
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<td>100</td>
<td>24-47</td>
<td>610-1194</td>
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<td>91000358</td>
<td>CEN-00-RJS8</td>
<td>S8 HH1X</td>
<td>TCI random cutting structure</td>
<td>4.25</td>
<td>108</td>
<td>24-47</td>
<td>610-1194</td>
<td>53</td>
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**Series 8 fastner kit and individual piece parts**

<table>
<thead>
<tr>
<th>Item A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<tr>
<td>33°</td>
<td>6.3</td>
<td>4.125</td>
<td>4.25</td>
<td>107.95</td>
<td>1.016</td>
<td>25.81</td>
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<tr>
<td>30°</td>
<td>6.3</td>
<td>4.125</td>
<td>4.25</td>
<td>107.95</td>
<td>1.016</td>
<td>25.81</td>
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<tr>
<td>30°</td>
<td>6.3</td>
<td>4.125</td>
<td>4.25</td>
<td>107.95</td>
<td>1.016</td>
<td>25.81</td>
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**Series 8 Gage and Inner Saddles**

<table>
<thead>
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<th>Position</th>
<th>Angle</th>
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<tr>
<td>91000729</td>
<td>Gage</td>
<td>30</td>
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<tr>
<td>91000725</td>
<td>Inner</td>
<td>12.5</td>
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</table>
Series 12 Cutters

Series 12 cutters are generally used for drilling holes 48” to 120” in diameter. Series 12 cutters feature a high capacity bearing package design using three rows of rollers and one row of balls (Roller-ball-roller design). The bearing is protected by seals that keep the grease in and abrasive materials out. Several cutter designs are available including milled tooth and tungsten carbide inserts. The random TCI cutters are used in medium-hard to hard formations. Kerf cutters are most efficient in medium to hard formations. A disk type cutting action is simulated for the shaft bit.

Kerf cutters are most efficient in medium to hard formations. This requires only one type of cutter that will fit all the inner and gage positions on the shaft bit. Kerf cutters have cutting structures that allow them to be paired as required.

The milled tooth cutters have hardfaced cutting structures that enable them to be paired as required.

Series 8 Riser Block

Series 8 cutters are mounted with a riser block for height adjustment and cutting structure optimization.

Series 8 Cutters

Series 12 Cutters

Series 8 Cutters

Series 12 Saddles

Series 12 fastener kit and individual piece parts

Product No. Description Required Per Cutter

Series 12 fastener kit

Product No. Description Required Per Cutter

Series 12 fastener kit

Product No. Description Required Per Cutter

Series 12 fastener kit

Product No. Description Required Per Cutter

Series 12 fastener kit

Product No. Description Required Per Cutter

Series 12 fastener kit

Product No. Description Required Per Cutter

Series 12 fastener kit

Product No. Description Required Per Cutter

Series 12 fastener kit

Series 8 Cutters

Series 8 Cutters

Series 8 Cutters

Series 8 Cutters
## Cutter Selection Chart

### Shaft Cutter Type vs. Rock Hardness

<table>
<thead>
<tr>
<th>Rock UCS (PSI)</th>
<th>Cutter Types</th>
<th>Rock Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Milled Tooth</td>
<td>Claystone, Mudstone</td>
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<tr>
<td>4,000</td>
<td>TCI Random Cutting Structure</td>
<td>Chalky Limestone</td>
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<tr>
<td>8,000</td>
<td>TCI Kerf Cutting Structure</td>
<td>Soft Shale</td>
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<td>12,000</td>
<td>TCI Kerf Cutting Structure</td>
<td>Loose Sandstones</td>
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<tr>
<td>16,000</td>
<td>TCI Kerf Cutting Structure</td>
<td>Limestone, Siltstone</td>
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<tr>
<td>20,000</td>
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<td>Solid Sandstones</td>
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<td>24,000</td>
<td>TCI Kerf Cutting Structure</td>
<td>Medium Shales</td>
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<td>28,000</td>
<td>TCI Kerf Cutting Structure</td>
<td>Tuff, Soft Schist</td>
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<td>32,000</td>
<td>TCI Kerf Cutting Structure</td>
<td>Andesite, Rhyolite</td>
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<td>36,000</td>
<td>TCI Kerf Cutting Structure</td>
<td>Quartzite (Sand, Silt)</td>
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<td>Monzonite, Granite</td>
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<td>56,000</td>
<td>TCI Kerf Cutting Structure</td>
<td>Hard Shale, Slate</td>
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<td>60,000</td>
<td>TCI Kerf Cutting Structure</td>
<td>Limestone, Dolomite</td>
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<td>TCI Kerf Cutting Structure</td>
<td>Quartzite</td>
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<td>Amphibolite</td>
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<tr>
<td></td>
<td>TCI Kerf Cutting Structure</td>
<td>Hornfels</td>
</tr>
<tr>
<td></td>
<td>TCI Kerf Cutting Structure</td>
<td>Hematite Ore</td>
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</tbody>
</table>

Rock UCS hardness (Unconfined Compressive Strength) is only one factor that contributes to the “drillability” of any rock. Other factors strongly influencing drillability are: fracture toughness, shear strength, Young’s Modulus of Elasticity, Poisson’s Ratio of Stress vs. Strain, internal angle of friction. Any particular bit may be used in harder or softer rock than this chart indicates.
Catalog code key

Shaft drilling products

**Product type**
- **C = Cutter**

**Cutter type**
- **A-Z**
  - (see table below)

**Cutting structure**
- **A-Z**
  - (see table below)

**Number of cutting rows**
- 0-99
  - 00 = Random

**Special design features**
- (see table opposite page)

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### CUTTER TYPE TABLE

- **A = Magrok**
- **B = BH99 cutter**
- **C = C – cutter**
- **D = Down reamer cutter**
- **E = Series 8 cutter**
- **F = HDD Trojan B cutter**
- **G = Series 12 Wedglok cutter**
- **H = HDD Bit Third Weld on**
- **J = HDD Square Lug Weld on**
- **K = Disc cutter**
- **L = Series 12 load pin**
- **M = Magnum cutter**
- **N = Shaft centre cutter**
- **P = HDD Bolt on**
- **Q = HDD Q - cutter**
- **R = RCC cutter**
- **S = SRCC cutter for Sandvik housing**
- **T = HDD Trojan H cutter**
- **U = Ultra Magnum cutter**
- **V = Magnum cutter for Sandvik housing**
- **W = W – cutter**
- **Z = Mag99 (Magnum for Wirth Shaft Saddle)**

### CUTTING STRUCTURE TYPE TABLE

- **B = Ballistic insert**
- **C = Round top chisel insert**
- **D = Steel disc**
- **H = Chisel insert**
- **N = Conical insert**
- **P = Scoop insert**
- **S = Spherical insert**
- **T = Steel tooth**

### SPECIAL DESIGN FEATURES TABLE

- **G = Cutter with 1” row spacing on gauge.**
  - Used for cutter types with the same amount of carbide rows in a pair.
- **N = Cutter with 1” row spacing on nose.**
  - Used for cutter types with the same amount of carbide rows on each cutter in a pair.
- **M = Medium Formation (for HDD cutters)**
- **H = Hard Formation (for HDD cutters)**
- **K = Kerf Rows**
- **GH = Gage cutter with harder carbide**
- **NH = Nose cutter with harder carbide**
- **RH = Right Hand Helix**
- **LH = Left Hand Helix**

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**Bearing type**
- **F = Friction**
- **R = Roller**
- **T = Tapered**

**Seal type**
- **J = Journal Seal**
- **E = Journal Seal w/Excluder**
- **L = Lip**
- **M = Metal Face Seal**

**Compensation**
- **D = Dual**
- **N = None**
- **S = Single**

**IADC**
- **SA = 5 1/4”**
- **SB = 6 3/4”**
- **SC = 9”**
- **SD = 12 1/8”**
- **SE = 13”**
- **SF = 15”**
- **SG = 17”**
- **SH = 17 1/2”**
- **SJ = 24”**
Catalog code key

Rebuild/fastener kits

Product type
FAS = Fastner kit

Cutter type
A-Z (see table below)

Cutter structure type
T = TCI Random
S = Steel (Mill) Tooth
R = Taisoboring Cutters

Fastener class
M = Metric
P = Imperial

CUTTER TYPE TABLE

<table>
<thead>
<tr>
<th>Product type</th>
<th>Cutter type</th>
<th>Cutter structure type</th>
<th>Fastener class</th>
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<tbody>
<tr>
<td>FAS</td>
<td>L</td>
<td>M</td>
<td></td>
</tr>
</tbody>
</table>

Cutter type table

- A = Magrok
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- E = Series B cutter
- F = HDD Trojan B cutter
- G = Series 12 Wedgelok cutter
- H = HDD Bit Third Weld on
- J = HDD Square Wedge on
- K = Disc cutter
- L = Series 12 load pin

Terminology/Definitions

Center cutter The center most cutter placement on a bit.
Cutting structure The area of the cutter that is designed to come in contact with the ground to break or cut the formation.
Fastener kit kit specially design to assemble cutters to the saddles and to correctly place the saddles on the bit.
Hardfacing Special weld material used to improve wear properties.
Gage cutter The cutters of the bit that drills the outermost diameter of the hole.
IADC code International Association of Drilling Contractors code assigned to cutters for determining appropriate cutting structure.
Inner cutter The cutter that is placed between the center cutter and the gage cutter.
Kerf length The length of the cutting structure that comes in contact with the formation during drilling.
Load pin Metal pin that attaches the cutter to the saddle.
Pressure compensated The ability of the cutter to adjust internal pressure to external pressure to reduce stresses on internal components.
Product code Special code assigned to identify products and their special features.
Riser pad Metal plate used for adjusting height for a better cutting profile.
ROP Rate of penetration.
Shaft drilling Rotary drilling technique for excavating large diameter vertical or near vertical openings.
UCS Unconfined Compressive Strength of the rock.
WOB Weight on Bit.