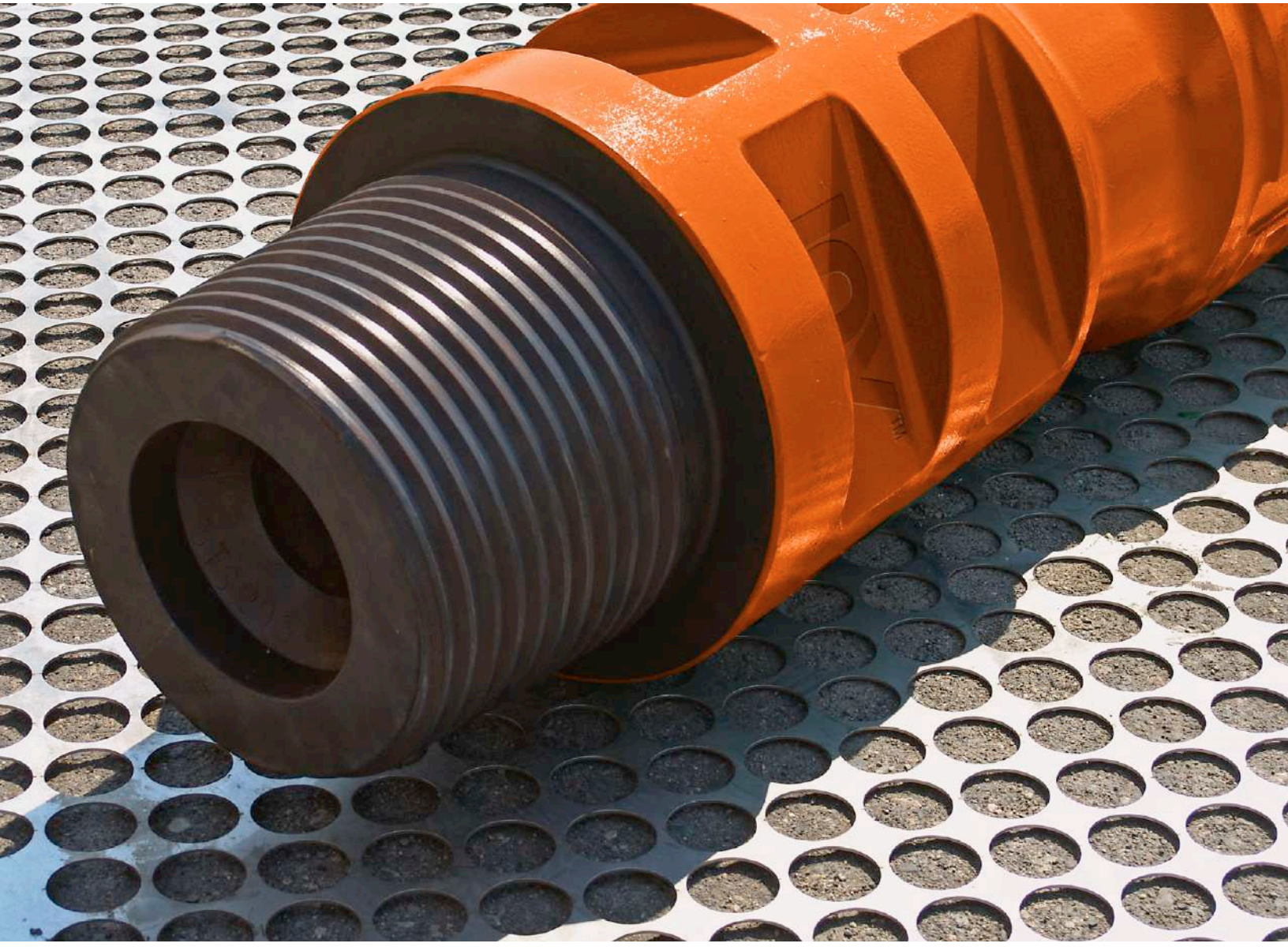
KOMATSU

JOY

Raiseboring Tools

Product Overview



Who we are:

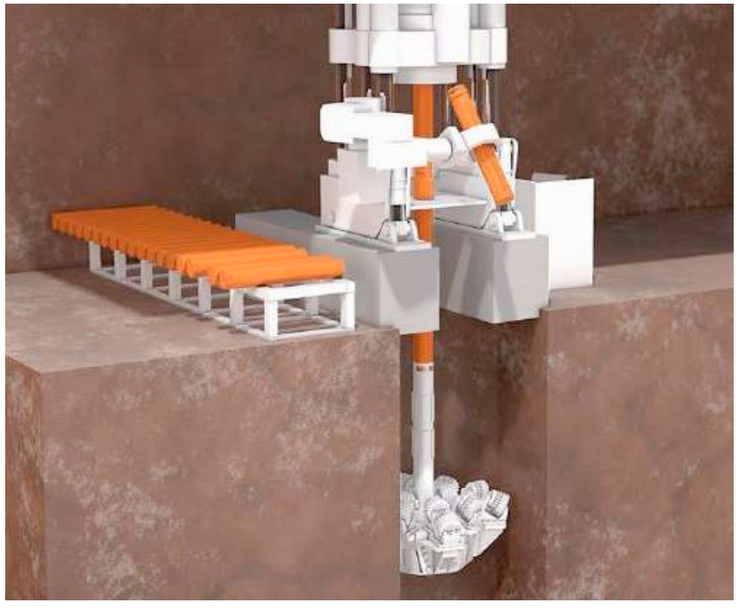
Since 1921, Komatsu has stood for unrivaled quality and reliability. Our enduring global success stems from the principles of our founder, Meitaro Takeuchi, who envisioned a sustainable future built through globalization, quality first, technology innovation and talent development. These defining principles, along with an emphasis on safety and compliance, remain part of our Komatsu DNA. With each brand and company added to the Komatsu family, we expand our capabilities, leveraging our global teams to push beyond what can be done and create what can be imagined. We believe partnering directly with our stakeholders and being in the workplace (gemba) is the best way to gain insight into their challenges, win their trust and develop cutting-edge solutions.

What we do:

Komatsu is an indispensable partner to the mining, forestry, industrial and construction industries that maximizes value for customers through innovative solutions. With a full line of products supported by our advanced IoT technologies and global service network, we help customers safely and sustainably optimize their operations. Our **Komatsu, P&H, Joy** and **Montabert** equipment and services are used to extract fundamental minerals and develop modern infrastructure.

Raiseboring tools

The rotary drilling method of boring large diameter holes for the mining and construction industries has proven to be very cost effective. Raiseboring has gained worldwide acceptance as the preferred method for constructing ventilation and hoisting shafts, ore passes and hydroelectric penstocks. Tremendous amounts of torque and thrust from the drilling machine are transmitted to the cutting head, each individual member of the drill string playing a vital role in the success of the project. Komatsu has been involved in the design and development of the threaded connections, material specifications and manufacturing of raiseboring tools, since the first raiseboring machines were built in the 1960s.



Steel quality

The steel used in the production of raiseboring tools is vitally important because raiseboring tools must be able to withstand tremendous loads. Understanding that not all steels of a specific grade are produced to the same quality level, and understanding the catastrophic effects of a drill string failure, Komatsu is committed to providing customer value through high quality products demonstrating durability and strength.

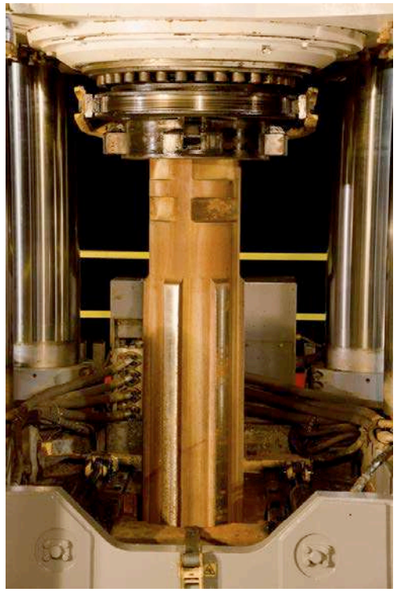
Since the manufacture of the first raiseboring machines, Komatsu has been developing and refining the material specifications for steel used in the production of raiseboring tools. With an uncompromising commitment to product quality, our engineers and metallurgists work directly with qualified steel mills to continuously refine the melting, ingot pouring, forming, heat treating and testing processes. The result is a steel product that balances high strength and toughness, developed specifically for our customers in the raiseboring industry.

Standard Strength steel is an AISI 4145H modified grade

Products are offered in two distinct grades of steel according to the size of the drill and the size of the shaft. Standard Strength steel is an AISI 4145H modified grade with chemistry that has been altered to produce a deeper hardening level when heat treated. Standard Strength steel is formed by the rolling process and provides 758 MPa (110,000 psi) minimum yield strength for machines using drill string up to 286 mm (11.25 inch) diameter.

High strength steel is an AISI 4330 modified grade

High strength steel is an AISI 4330 modified grade that is produced exclusively by open die forging. The forging process presses and forms the ingot, reducing the ingot diameter significantly. The forging process produces a highly refined grain structure in the steel that cannot be achieved from the rolling process. When quenched and tempered under closely controlled conditions, High strength steel has very favorable hardening properties, combining high strength with high toughness.



Drill Rods

Both High Strength and Standard Strength drill rods are designed and manufactured with an emphasis on durability, weight reduction, and serviceability. Komatsu drill rods are designed to be compatible with all of the raise drills operating around the world.

The threaded connections on the rods are cut to exacting standards and verified using precision gauges prior to leaving the factory.

The rods are also designed with features that contribute to long life and serviceability. Each connection is treated in a kemplating process that coats the threads with protection against galling. Anti-galling protection assists in the retention of thread lubricant and the prevention of metal to metal contact. With proper care and maintenance, the threaded connections are designed to provide years of trouble-free service.

Ribbed stabilizers

Joy six-ribbed stabilizers are designed to stabilize and centralize the drill string. Ribbed stabilizers are critical for the reduction of vibration and to maintain pilot hole accuracy. Joy six-ribbed stabilizers also support and stabilize the cutting head in the reaming cycle. Typically, multiple stabilizers are positioned behind the bit reamer stabilizer during the piloting cycle. When the piloting tools are removed for the reaming cycle, the ribbed stabilizer is connected directly to the reamer.

Ribbed stabilizers are offered with spiral or straight ribs, either tungsten carbide inserts (TCI) or a re-buildable carbide hard-facing. All ribbed stabilizers are finished to exact dimensions across the ribs to suit the pilot hole size for the purpose of achieving optimal stabilization.

Bit reamer stabilizers

Joy bit reamer stabilizers are designed to center and stabilize the bit during the pilot hole cycle. They incorporate multiple carbide-tipped rollers that are able to cut and size the hole to finished dimension, effectively compensating for minor pilot bit wear. With a properly-sized pilot hole, normal wear on the ribbed stabilizers can be reduced. Joy bit reamer stabilizers are particularly effective in very hard and abrasive conditions.

The bit reamer stabilizer features carbide inserts pressed into hardened steel rollers that run on hardened steel shafts. All the wear items on the stabilizer, including the rollers, shafts, and retaining blocks, are replaceable.

Bit reamer stabilizers are designed to accept standard back flow valves, and come with box connections to suit standard pilot bits.

Raiseboring accessories

Thread protectors – Protect your investment from damage due to handling, transportation, moisture and debris. Impact-resistant, high strength Joy thread protectors made from non-metallic composite material completely cover the threads and shoulders and resist fading and distortion from heat or cold.

Lifting bails - Certified lifting bails come complete with shackle and are threaded for connection to your drill rods, stabilizers, or reaming head stems.

Ring gauges – Use for accurate sizing of all bottom hole components including bits, stabilizers and stems.

Makeup/breakout tools – Manually operated or remote-mounted tools are available to makeup or breakout threaded connections, allowing personnel to work at a safer distance from open hole conditions.

Custom equipment – In addition to a broad range of standard products, Komatsu has extensive experience in engineering and design of customized equipment to suit your specific application.

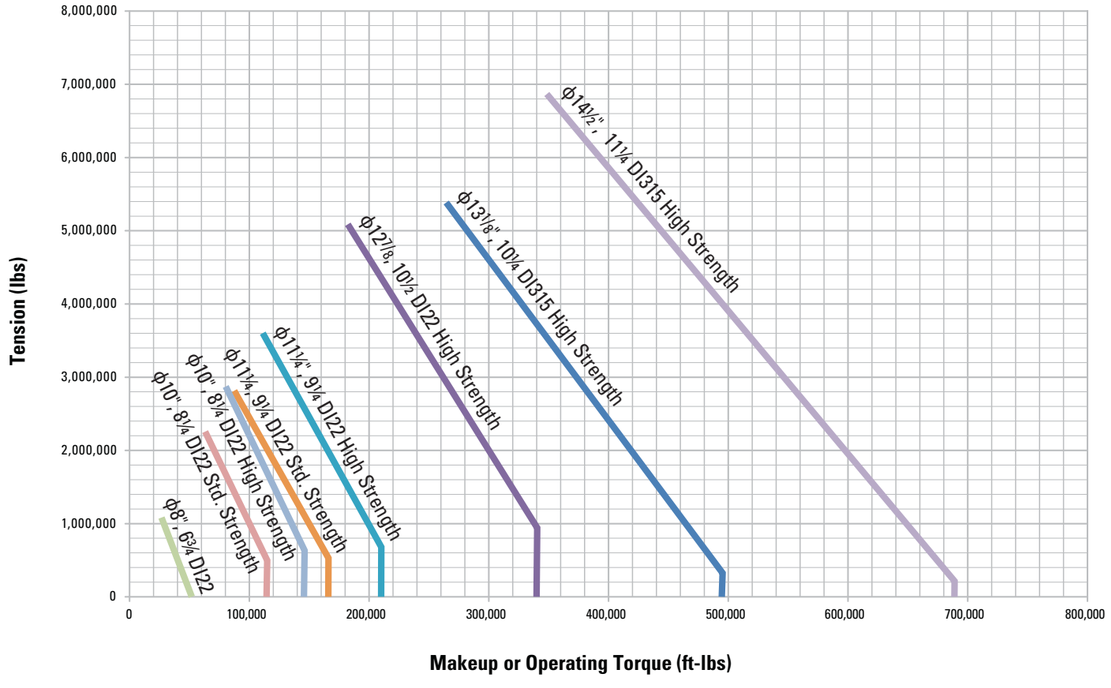
DI connections

The DI22 series of threaded connections was designed and developed specifically for the raiseboring industry. The tapered design of DI22 threaded connections allows for connections to be self-centered prior to engagement. Self-centering reduces the chance of cross threading or other damage during engagement. The coarse thread profile is capable of withstanding the extreme torsional and thrust loads that are applied during reaming. Properly lubricated and torqued, DI22 threaded connections will provide many years of trouble-free operation.

In recent years, the DI315 series of threaded connections was developed to meet the needs of the industry as larger, more powerful drills were designed. The unique thread profile and pitch of the DI315 threaded connections were designed to transmit higher levels of torque and thrust than the DI22 series, without the need for a drastic increase in pipe diameter.

To determine the appropriate drill rod and threaded connection to suit your rig's capabilities for torque and thrust, consult the chart below.

Contact your Komatsu Mining Corp. service representative for more information or visit mining.komatsu



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