

HERRENKNECHT MINING

FULL SPECTRUM OF MINING SOLUTIONS

HERRENKNECHT



Tunnelling Systems

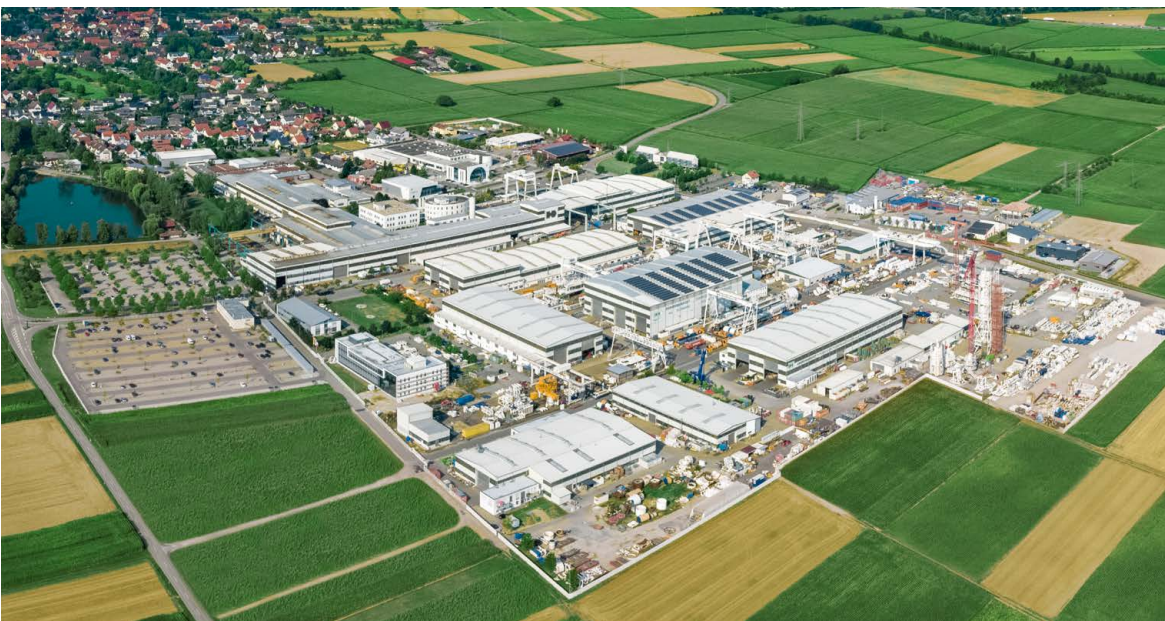
Pioneering Underground Technologies

For more than 45 years, Herrenknecht has been engaged in the tunnelling business and is the global market leader providing innovative and customized tunnelling technology for diameters of 0.1 to 19 meters. Furthermore, Herrenknecht provides technical solutions for successfully excavating inclined shafts and sinking vertical shafts down to great depths. Herrenknecht's references include more than 5,700 completed projects around the world with the support of more than 5,000 employees worldwide.

Based on its proven experience, Herrenknecht now provides an entire range of innovative machines for the mechanized construction of underground mining infrastructure. Whether for vertical access or produc-

tion shafts, inclined vehicle access ramps, ventilation shafts or transport tunnels, Herrenknecht mining technology is designed for diameters of 0.3 to 12 meters and can reach depths of up to 2,000 meters. Our innovative solutions are based on proven technology that can achieve high advance rates and occupational health and safety using compact construction designs which have already proven their value in reference projects.

At Herrenknecht we see ourselves as technical pioneers in underground construction and in the future we will continue to develop new ideas together with our clients and contractors to make the development of mining infrastructure even safer and more efficient.



Headquarters in Germany, active worldwide. With more than 5,700 project references, we are a market leader all around the globe.

Herrenknecht

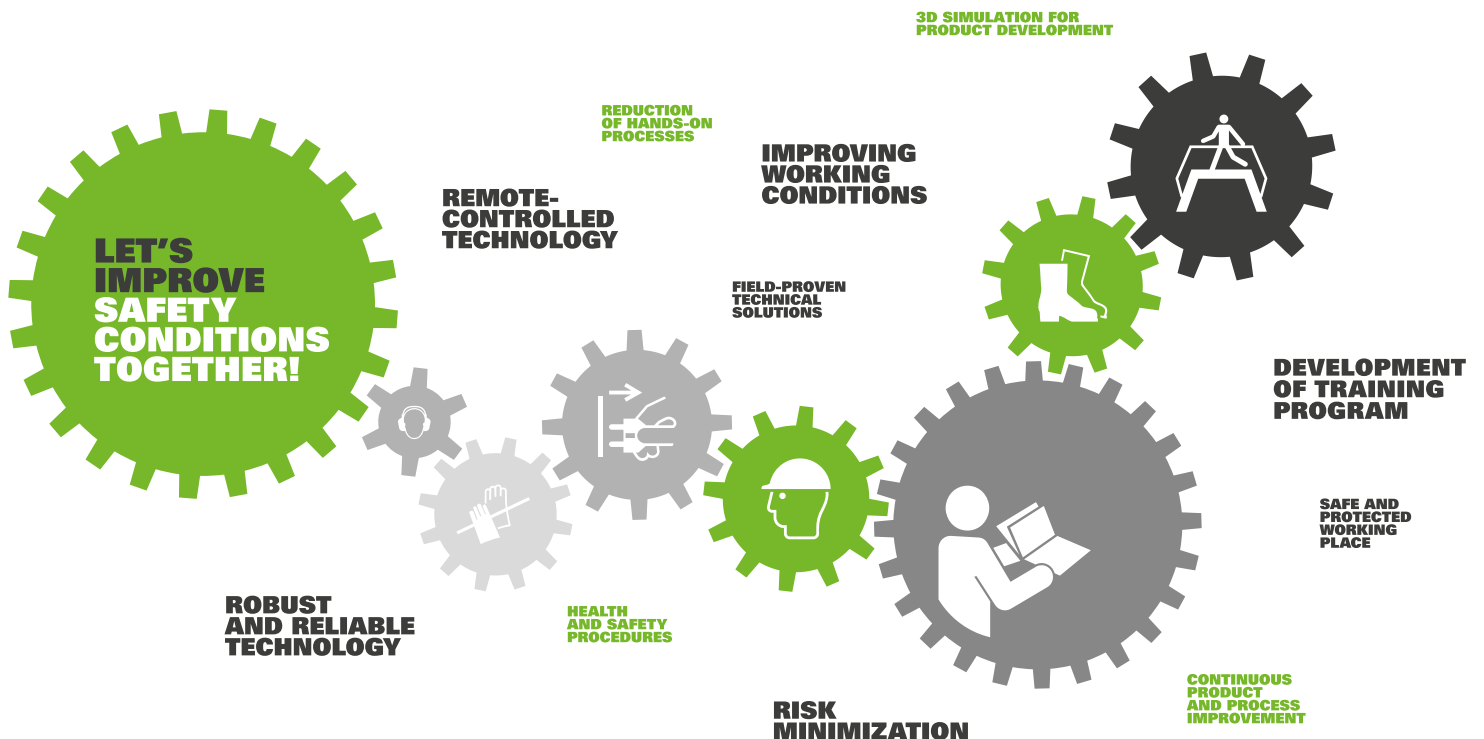
Safety Underground

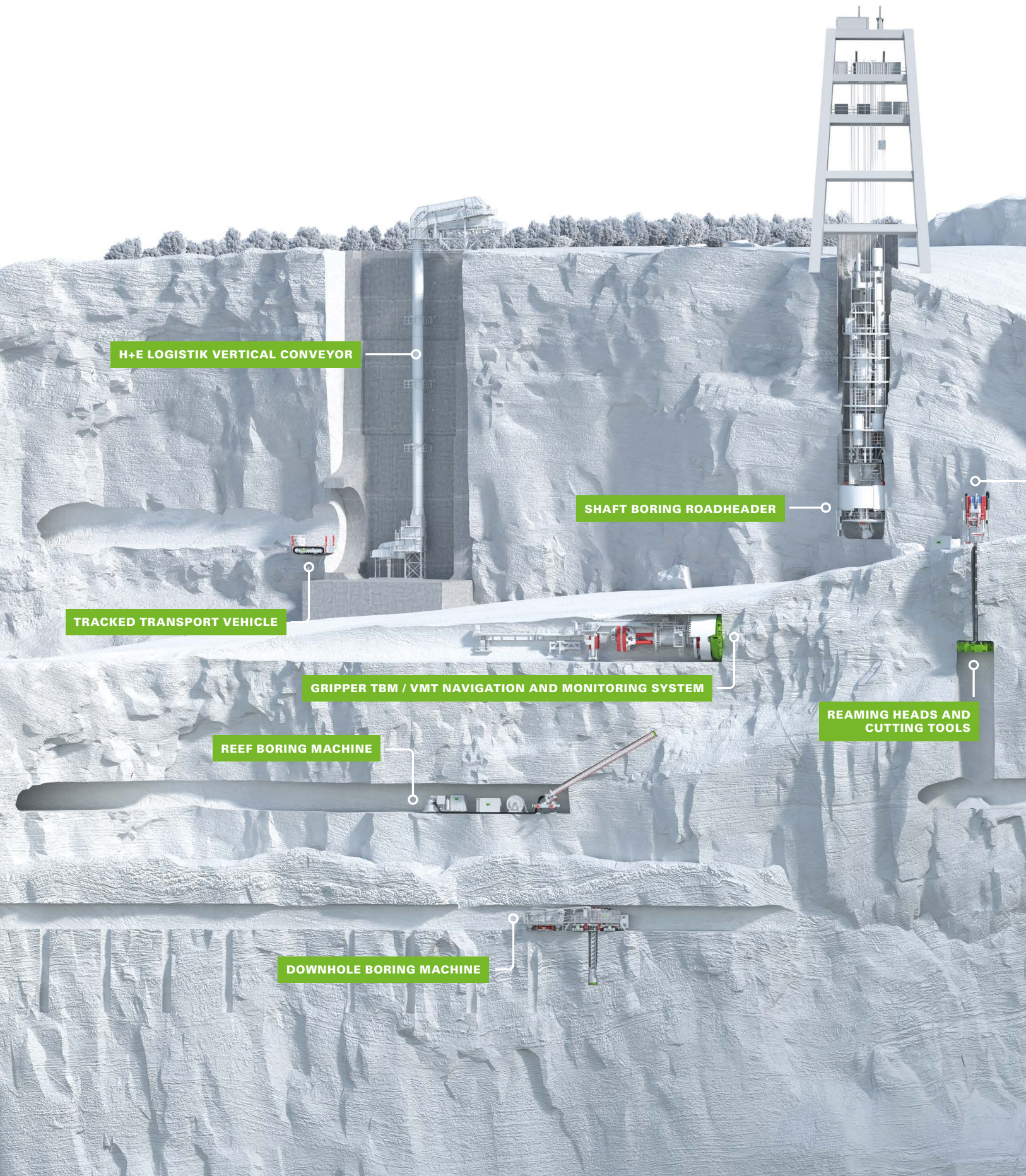
The health and safety of every employee are essential prerequisites for all activities in the challenging work underground. As a premium supplier, Herrenknecht sets the highest standards in terms of health protection, occupational safety and quality.

The use of innovative technology in mining eliminates the need for explosives and leads to reduced manual processes during the development of mine infrastructure and production. We optimize our products

through 3D-based safety management in the design process and we increase work safety through remotely controlled work operations.

As a result, Herrenknecht delivers tailor-made products securing the essential specifications for a safe and protected working place which also decreases environmental impacts. Moreover, together with mine owners and mine contractors we achieve production targets in a safe and cost efficient manner.





H+E LOGISTIK VERTICAL CONVEYOR

SHAFT BORING ROADHEADER

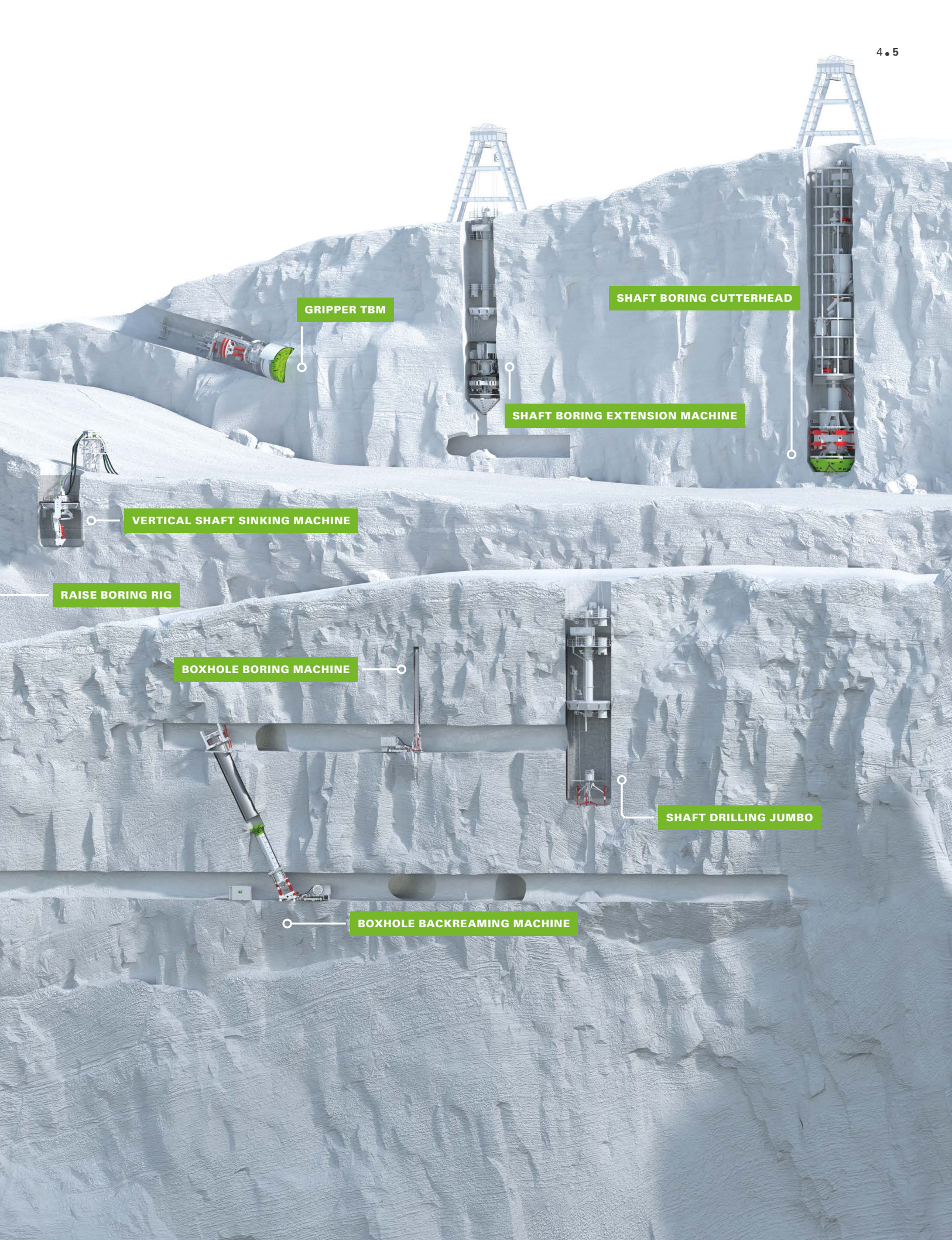
TRACKED TRANSPORT VEHICLE

GRIPPER TBM / VMT NAVIGATION AND MONITORING SYSTEM

REAMING HEADS AND CUTTING TOOLS

REEF BORING MACHINE

DOWNHOLE BORING MACHINE



GRIPPER TBM

SHAFT BORING CUTTERHEAD

SHAFT BORING EXTENSION MACHINE

VERTICAL SHAFT SINKING MACHINE

RAISE BORING RIG

BOXHOLE BORING MACHINE

SHAFT DRILLING JUMBO

BOXHOLE BACKREAMING MACHINE

Mechanized Shaft Sinking Systems

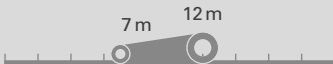
Highest precision under toughest conditions

Herrenknecht shaft boring systems stand for innovative machine concepts that reach deposits at great depths of up to 2,000 meters safely and efficiently. They thus meet all requirements of the modern mining industry: short construction times for deep shafts with maximum safety. Thanks to simultaneous process steps, our mechanized systems can achieve high shaft sinking speeds and at the same time con-

siderably improve work safety in mines. Shaft wall over-excavation is drastically reduced compared to conventional methods. All common lining methods can be used for securing the shaft wall. The mucking system can be selected according to the project requirements: pneumatic, slurry or mechanical mucking as well as muck haulage to a lower level through a pilot hole are possible.

SHAFT BORING ROADHEADER – SBR


EXCAVATION DIAMETER



EXCAVATION DEPTH

2,000 m

GEOLOGY

 Rock, soft to medium-hard consolidated rock

ADVANTAGES

High level of work safety through remote controlled operation from the higher work decks

Higher sinking speed

Parallelization of the work steps

Variably adaptable to different shaft diameters, shaft geometries and lining methods

Adaptation of proven technologies such as the cutting drum and material transport system of existing systems

CONTROL CABIN

The SBR operator controls all functions and the semi-automatic excavation process

STABILIZER

Transfers cutting forces to the shaft wall. Adaptable to different diameters

EXCAVATION CHAMBER

Man access only for maintenance. Installation of segments or shotcrete possible as well

SHEAVES DECK

SBR suspended by shaft ropes, can be lifted or lowered as required

WORK DECKS

Several decks with installations, infrastructure and supply line extensions for power, air and ventilation

PNEUMATIC MUCKING SYSTEM

Demucking method cleans bench and collects cuttings in suction tank

MUCK BUCKET

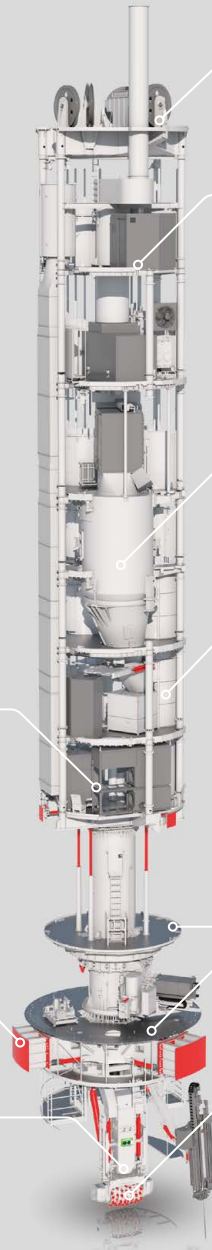
The muck is hoisted to the surface. Auxiliary and man buckets are also used

ROCK SUPPORT DECK

Several applications can be installed: shotcrete, rock bolts, mesh, segments or liner plates

ROADHEADER

Excavation unit can cut different diameters and shaft recesses as required



Shaft sinking innovation for hard rock

The SBC was developed for the excavation of blind shafts in hard rock in close cooperation with a leading mining contractor. The machine design is based, on the one hand, on the experience from decades of engineering of tunnel boring machines for hard rock. On the other hand, the experiences from successful operations of the SBR are incorporated in the SBC concept.

The newly developed SBC full-face cutterhead was optimized for the best possible material flow. The Herrenknecht disc cutters, which have proven their worth in numerous hard-rock tunnelling projects,

can be used to effectively cut rock up to 250 MPa at high advance rates with the thrust forces transferred to the shaft wall by a gripping unit. The pneumatic mucking system, optimized for the excavation of hard rock, conveys the cuttings from the bench to the suction tank on the SBC. The muck is transported to the surface via a muck bucket. In the process, dust and water are also evacuated from the bench. The shaft lining can be installed depending on the project-specific requirements on different work decks. The SBC can be suspended by ropes or be self-supporting on its gripper system.

SHAFT BORING CUTTERHEAD – SBC

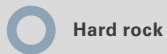
EXCAVATION DIAMETER



EXCAVATION DEPTH

2,000 m

GEOLOGY



ADVANTAGES

Parallelization of work steps

Increased sinking speed

High level of work safety

No impairment of the surrounding geology

Flexibility in the shaft lining method

Safe operation even with high water ingress

WORK DECKS

Several decks with installations, infrastructure and supply line extension for power, air and ventilation

CONTROL CABIN

The SBC operator controls all functions and the semi-automatic excavation process

GRIPPER SYSTEM

Creating additional thrust force for the cutterhead and steering the cutterhead according to the guidance system

SHEAVES DECK

SBC is suspended by shaft ropes and can be lifted or lowered as required

PNEUMATIC MUCKING SYSTEM

Demucking method cleans bench and collects cuttings in suction tank

MUCK BUCKET

The muck is hoisted to the surface. Auxiliary and man buckets are also used

ROCK SUPPORT DECK

Several applications can be installed: shotcrete, rock bolts, mesh, segments or liner plates

CUTTERHEAD

Equipped with cutting discs and can be adapted to different diameters



SHAFT BORING EXTENSION MACHINE – SBE

EXCAVATION DIAMETER



EXCAVATION DEPTH

>2,000 m

GEOLOGY

Rock, hard rock

ADVANTAGES

Parallelization of work steps

Increased sinking speed

High level of work safety

No impairment of the surrounding geology

Flexibility in the shaft lining method

Safe operation even with high water ingress

CONTROL CABIN

The SBE operator controls all functions and the semi-automated excavation process

ROCK SUPPORT DECK

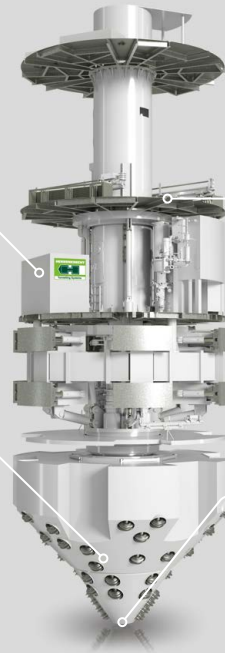
Anchors and probe drill units are fixed on this deck

CUTTERHEAD

Equipped with cutting discs and can be adapted to different diameters

MUCKING

Via pilot hole to the shaft bottom, also used for ventilation



SHAFT DRILLING JUMBO – SDJ

DIAMETER



DEPTH

>2,000 m

GEOLOGY

Rock, medium-hard to hard rock

ADVANTAGES

Suitable for blind shaft construction and shaft enlargement

Applicable in mining and underground construction

Fast and precise shaft construction

TELESCOPIC STABILIZERS

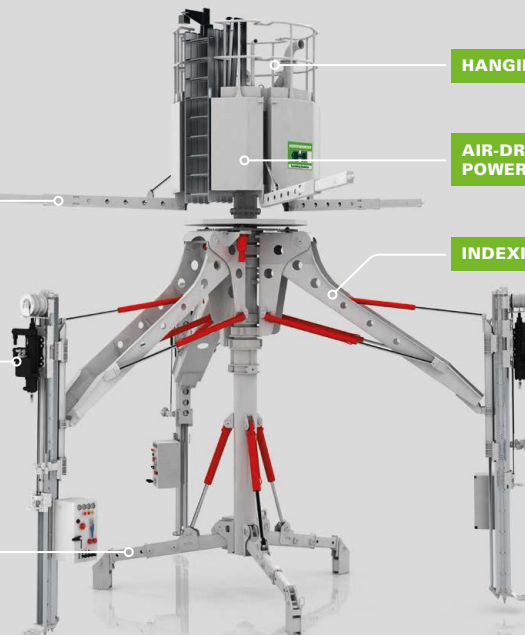
DRILLING RIGS WITH PNEUMATIC ROCK DRILLS

HYDRAULIC JACK LEGS

HANGING POINTS

AIR-DRIVEN HYDRAULIC POWER UNITS

INDEXING BOOMS



VERTICAL SHAFT SINKING MACHINE – VSM

EXCAVATION DIAMETER



EXCAVATION DEPTH

Up to 150 m

GEOLOGY



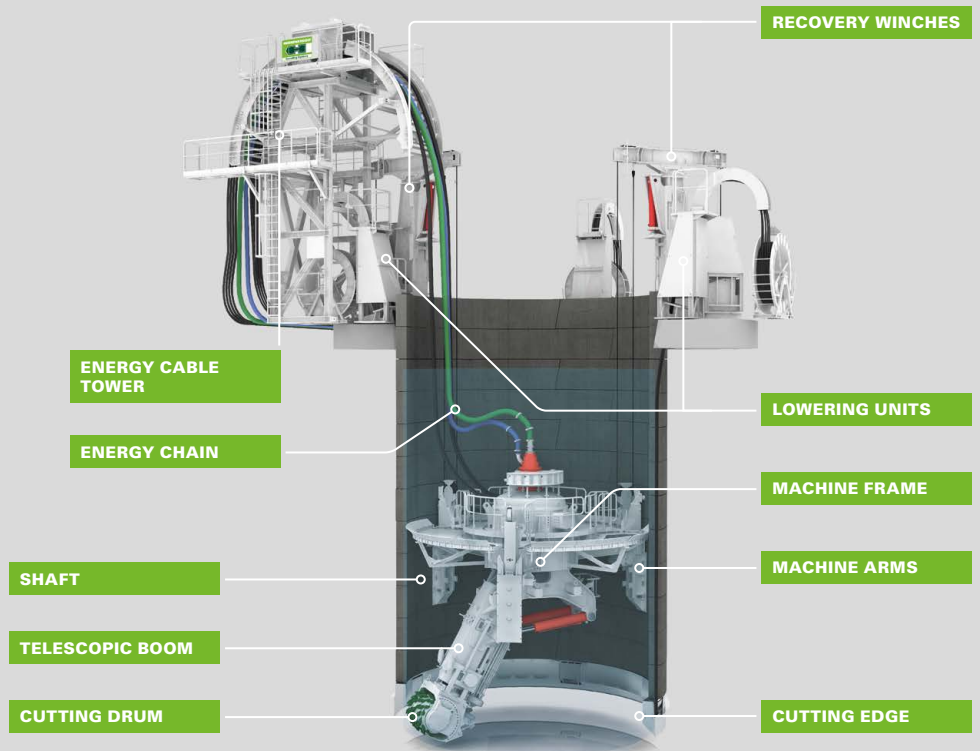
Soft ground,
heterogeneous
ground, rock

ADVANTAGES

For soft and heterogeneous ground up to 80 MPa and below groundwater

High advance rates of up to 5 m per shift due to parallel work processes

Flexible arrangement of the machine equipment enables use even under tight space constraints



SPECIAL SHAFT SINKING MODULES

Specific applications based on proven technology

Herrenknecht provides drilling equipment and tubing segment handling devices for TBMs all over the world. This experience is used to modify the known technologies into tailor-made solutions for special shaft sinking applications.

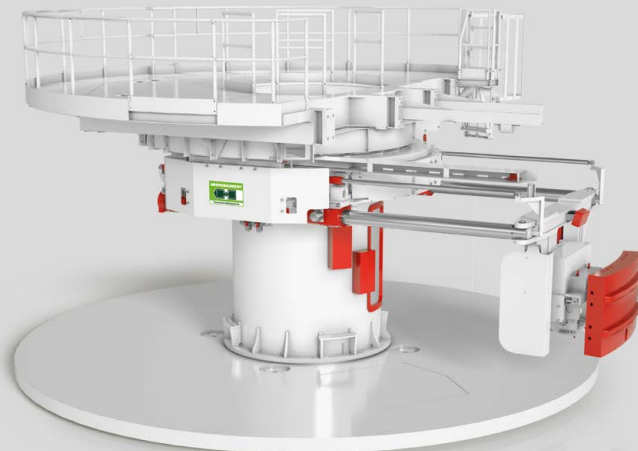
The Herrenknecht Ring Erector is able to handle liner plates, pre-cast concrete or steel segments as an integrated solution or stand-alone unit.

MACHINE DATA

Ring Erector

- › Operation in shaft diameter of 6 m – 12 m
- › Can handle tubing segments with mechanical gripping system
- › Remote-controlled system
- › Integrated safety interlocks and assistance systems
- › Alignment via laser target system

Can be equipped with several tools (small drilling rig, mesh handling tool, rock bolting unit, cutting drum, shotcrete robot) to suit special applications.



Powerful Shaft Boring

High performance Raise Boring Rigs

With the long-proven Raise Boring technology a broad variety of shafts in mining and civil projects can be drilled. This allows very fast and competitive construction of shafts with different diameters for various applications such as ventilation, hoisting, pressure shafts and ore passes. Even for shafts with the hardest rock the Herrenknecht Raise Boring Rigs with their highly efficient variable frequency drives have the torque and thrust capacities needed. High performance and occupational

health and safety have been core values in the design of the machine. Thanks to its compact and modular design, it can be shipped easily worldwide and delivers reliable operation wherever it is needed. In addition, customized solutions can be offered to adapt to special applications, increase automation and improve efficiency. With a wide portfolio of additional equipment, we can supply a complete Raise Boring system matching your needs and project requirements.

RAISE BORING RIG – RBR

EXCAVATION DIAMETER



EXCAVATION DEPTH

Up to 2,000 m

GEOLOGY



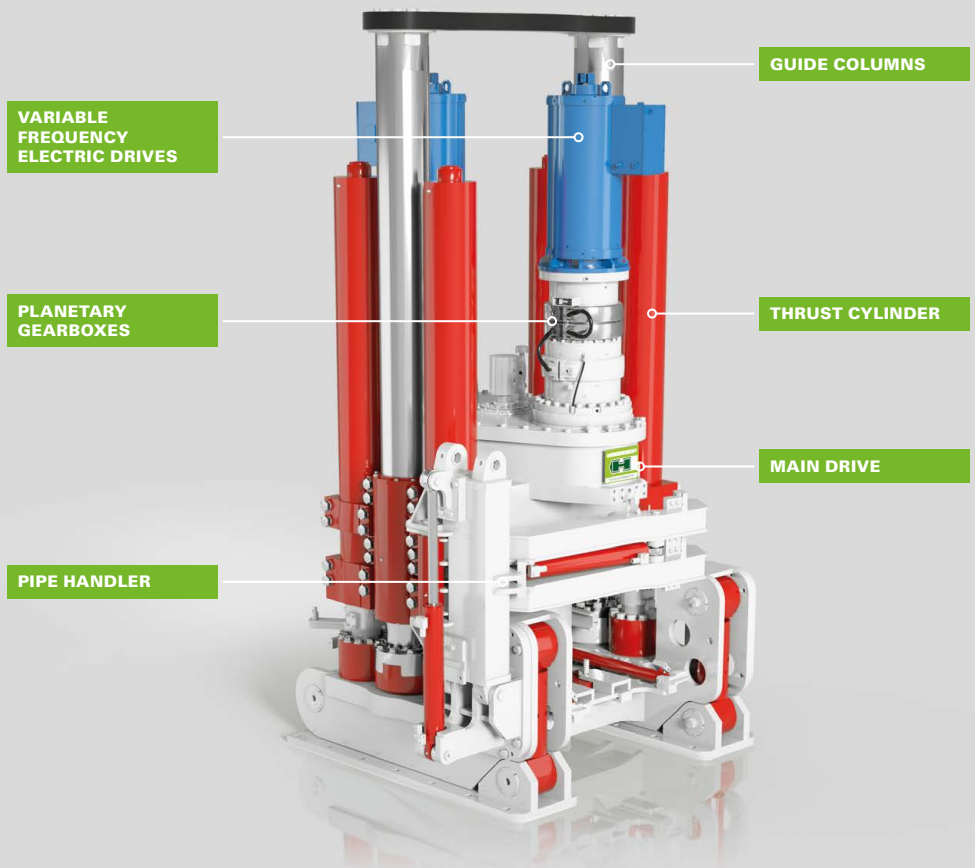
ADVANTAGES

For long raises and large reaming diameters

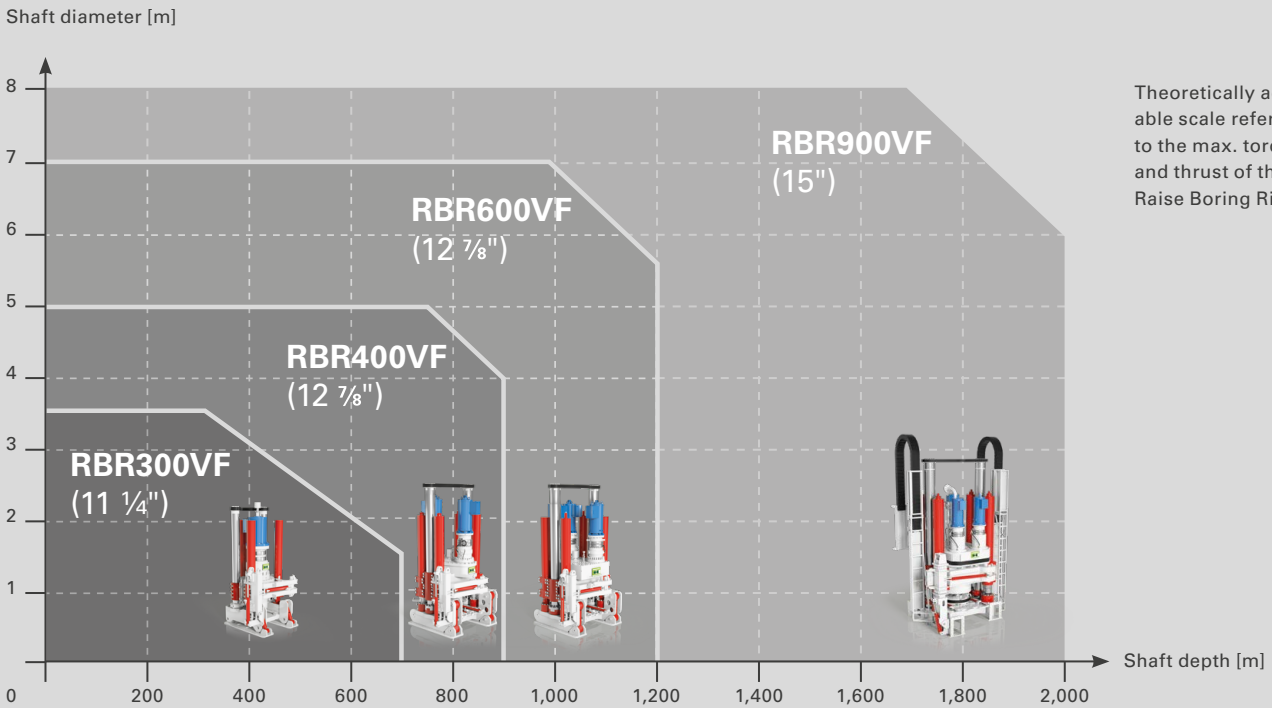
Robust and powerful design

Mechanized wrench system and rod handling for improved work safety

Highly efficient variable frequency drive



RAISE BORING CAPABILITIES



Reaming Heads and Cutting Tools

Herrenknecht offers a wide portfolio of additional equipment. The newly developed reaming heads and cutting tools supply a complete raise boring system, matching diverse project requirements such as variable diameters or customized design. The unique

remote monitoring of the reaming heads' raise boring cutters and stems as well as the cutters' changeable bearings increases the efficiency and therefore reduces costs.

ADVANTAGES

Raise Cutter Monitoring

Rotational and temperature monitoring to detect worn cutters in real time and to optimize the maintenance intervals

Stem Monitoring

Load monitoring of the reaming head's stem to prevent overloading in difficult ground conditions

Increased bearing capacity and cutter lifetime

Changeable bearings allow cutter refurbishment

Customized solutions: special diameters, fractured ground, horizontal raise boring



Wide range of modular reamers from 1 to 8 meters.

Mobile Boxhole and Reef Boring Machines

Rapid and safe drilling of small diameter shafts

Herrenknecht has developed customized state of the art mining machines for the excavation of vertical and inclined slot holes and shafts in hard rock for a wide range of underground applications. The design of the Herrenknecht mining machines focuses on high productivity, optimal mobility and minimal space requirements as well as improved occupational health and safety through remote control.

The Reef and Boxhole Boring Machines' concept is based on the proven pipe jacking technology that has been adapted for upward vertical and inclined

excavation. They do not require any concrete slabs or special preparatory work before excavation begins, saving time and costs. The Boxhole Backreaming Machine offers shaft lining simultaneous to the reaming process.

For their relocation, remote-controlled crawler units make the Herrenknecht machines independent of other operations in the mine. The modular design enables high flexibility with time and space-saving setup in a confined environment.

BOXHOLE BACKREAMING MACHINE – BBR

EXCAVATION DIAMETER



EXCAVATION LENGTH

Up to 70m

GEOLOGY

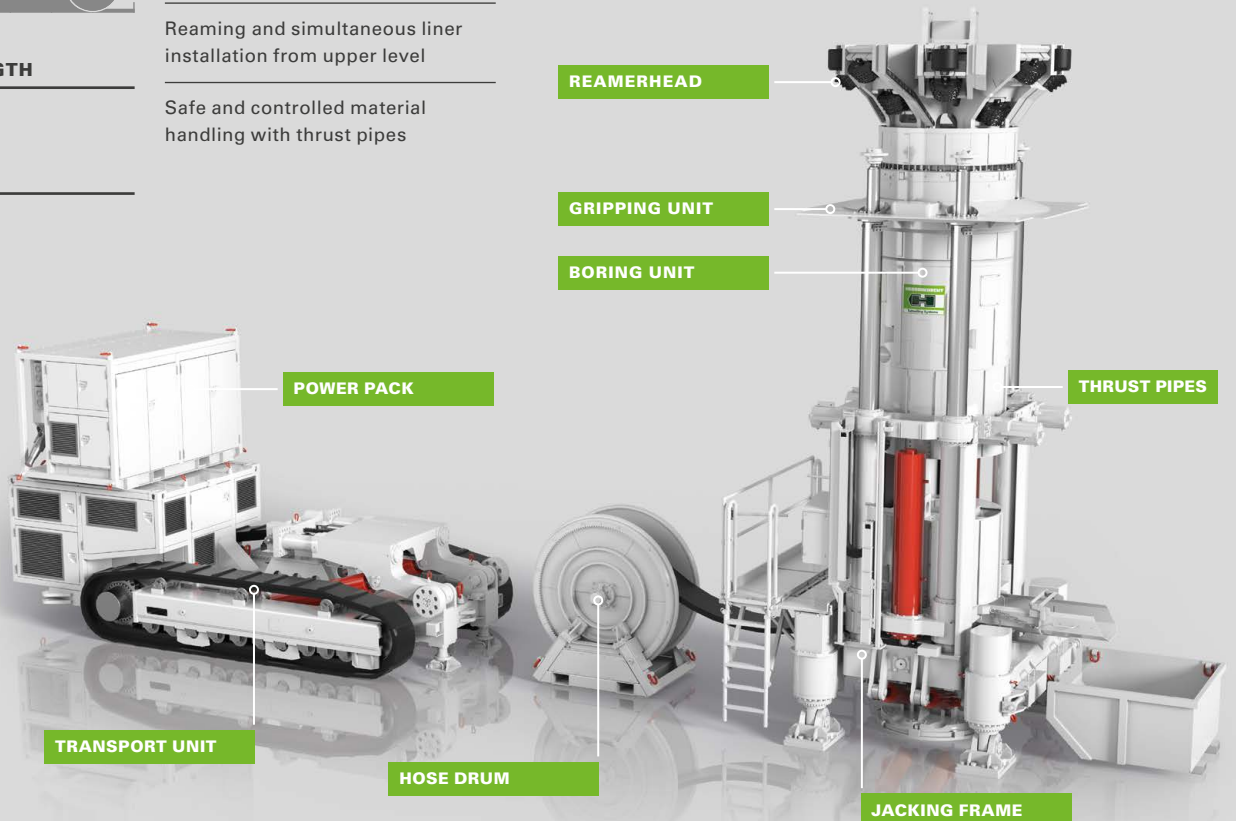


ADVANTAGES

Based on proven BBM method with increased diameter range

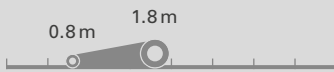
Reaming and simultaneous liner installation from upper level

Safe and controlled material handling with thrust pipes



BOXHOLE BORING MACHINE – BBM

EXCAVATION DIAMETER



EXCAVATION LENGTH

Up to 70 m

GEOLOGY



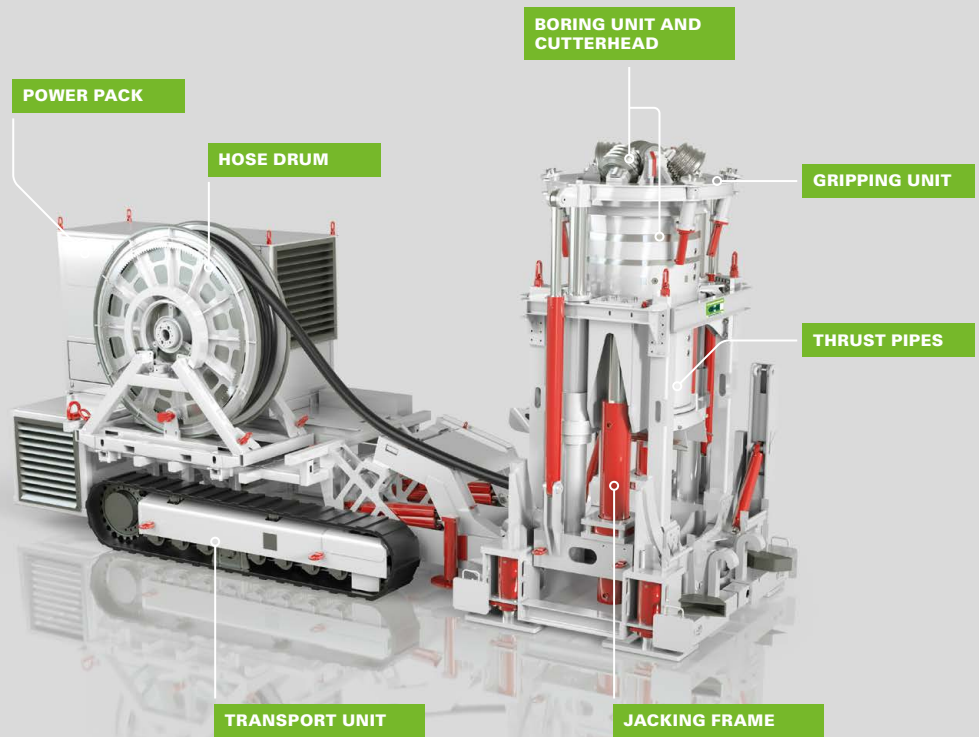
Rock

ADVANTAGES

Designed for stable rock up to 300MPa

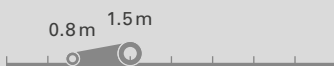
Compact, modular design for use under space constraints

High occupational safety thanks to remote-controlled operation



REEF BORING MACHINE – RBM

EXCAVATION DIAMETER



EXCAVATION LENGTH

Up to 40 m

GEOLOGY



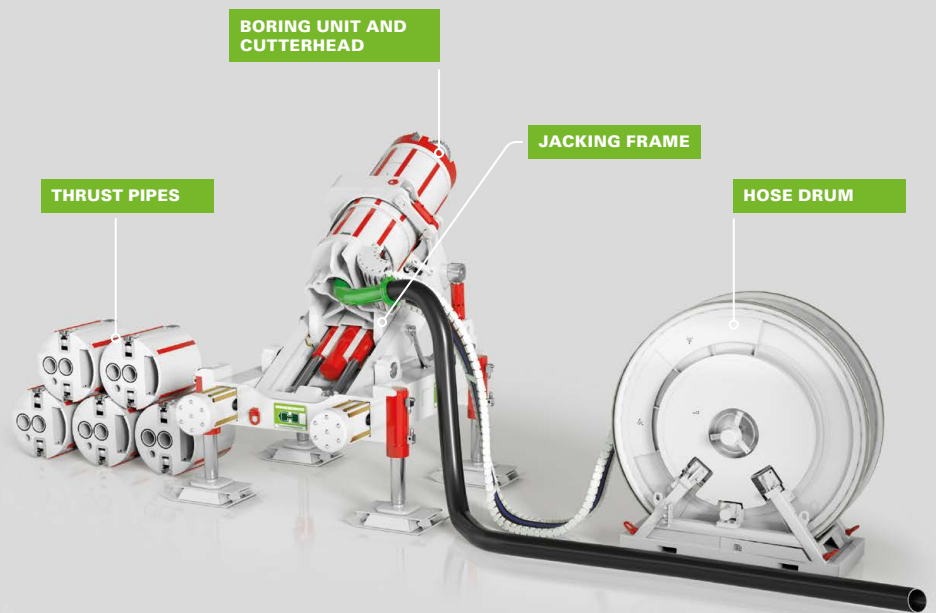
Rock

ADVANTAGES

Mechanized reef miner offers high safety and productivity and continuous operation

RBM method allows accurate steered drilling minimizing dilution

Material handling with pneumatic suction unit reducing water consumption and losses



Downhole Boring Machine – DHBM

High precision drilling of top-down vertical blind holes

In mining and civil projects around the world, there is a demand for smaller diameter top-down blind holes when access from underground is not available and methods such as raise boring cannot be used. The innovative Downhole Boring Machine (DHBM) offers a technical solution to this challenge. The mechanized excavation process creates vertical top-down blind holes quickly and safely in hard rock with a depth of up to 10m (32.8ft) and more with highest precision in a continuous manner. During development, a high level of work safety was of utmost priority and the

possibility to operate the machine in confined working environments. Its compact dimensions in combination with the crawler carrier allows very flexible and precise maneuvering in narrow spaces. The powerful full-face cutting technology with its cutterhead for hard geologies is based on Herrenknecht’s proven technology and decades of experience to achieve maximum performance. Together with the slurry mucking system and a separation plant, high productivity and drilling efficiency can be achieved.

DOWNHOLE BORING MACHINE – DHBM


EXCAVATION DIAMETER



EXCAVATION LENGTH

≥ 10m

GEOLOGY

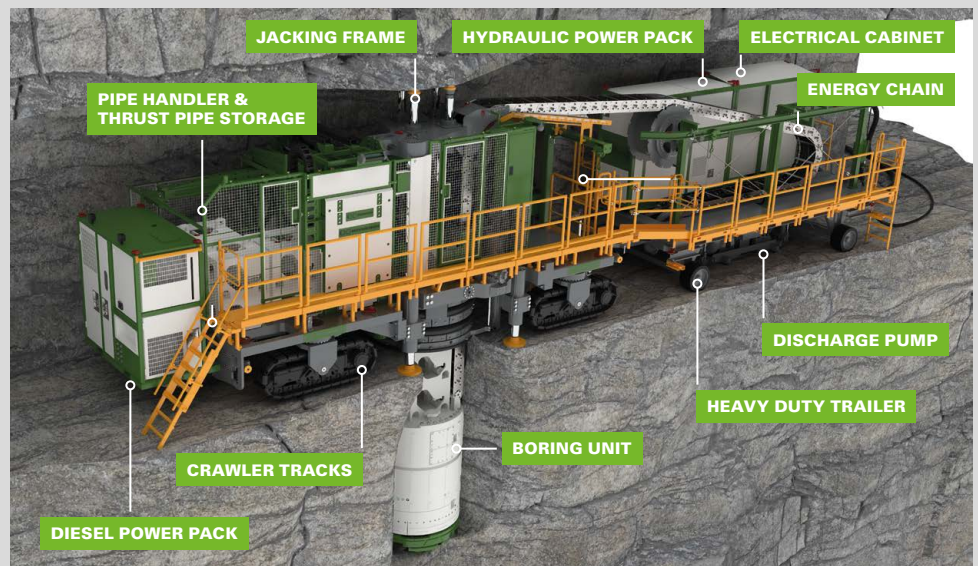
 Rock, hard rock

ADVANTAGES

Highly efficient and proven cutting and muck removal technology for high excavation rates in hard rock

Quick positioning and relocation in narrow drives and tunnels

Improved working conditions and low risk exposure through various safety features

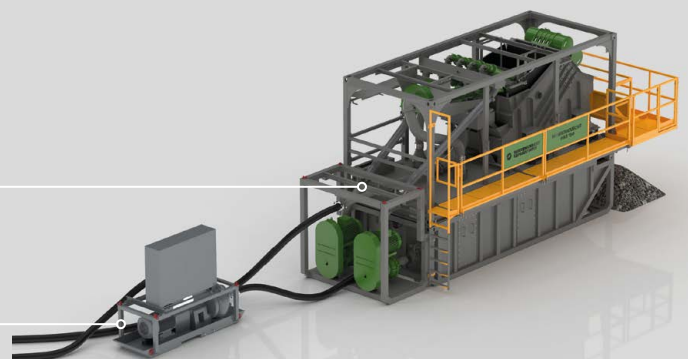


SEPARATION PLANT

150m³/h max. flow rate

MACHINE EQUIPMENT

Pumps, cooling unit, etc.



Fast and Safe Transport of Heavy Loads

Facilitating logistical support for the development and operation of underground mines

During the development and the operation of underground mines, it is necessary to transport heavy loads and equipment in narrow drifts. Often, only simple sleds are used for this purpose, which do not allow easy and safe handling. The Tracked Transport Vehicle (TTV) was specially developed for the fast

and safe transport of heavy goods in underground drifts. It carries loads up to 60,000 kg (132,28 lb) and can adjust the height of its carrier platform for loading and unloading. All functions are remote controlled and provide a high level of safety during operation.

TRACKED TRANSPORT VEHICLE – TTV-120

GROSS WEIGHT

120,000 kg

PLATFORM DIMENSION

6 m x 2.7 m

PAYLOAD

60,000 kg

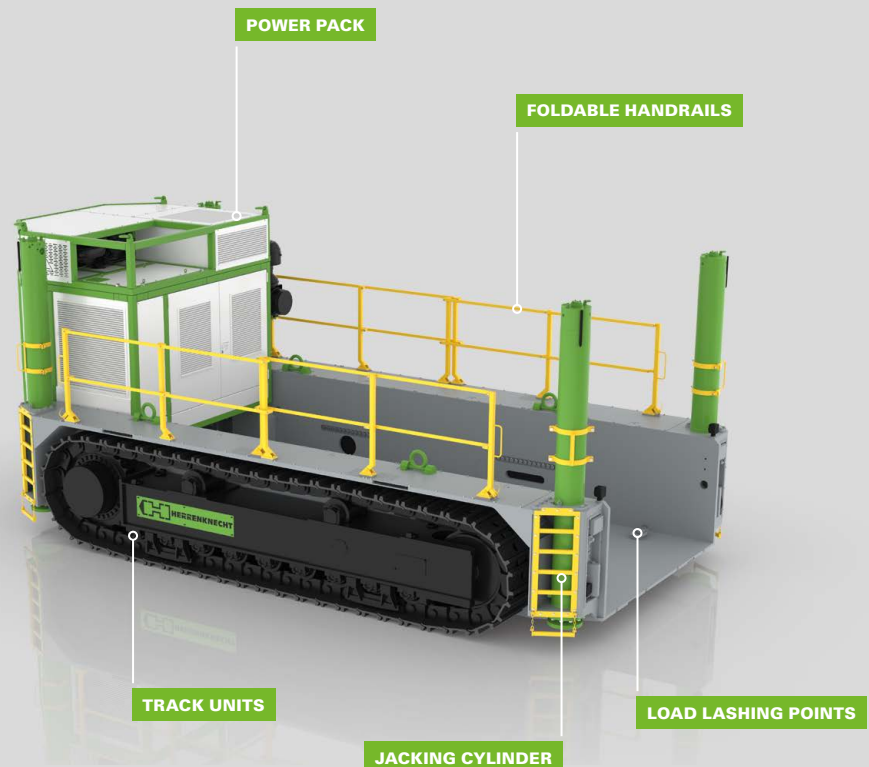
ADVANTAGES

Improved working conditions and reduced risk exposure due to remote-controlled operation and innovative safety features.

The customized carrier platform provides high load capacity and a large degree of flexibility

Compact, reliable, and efficient hydraulic drive powered by latest diesel engine generation

Independently carry out loading operations and adjust the height of its carrier platform to the docks



Tunnel boring machine for mining application

Experts for tough hard rock

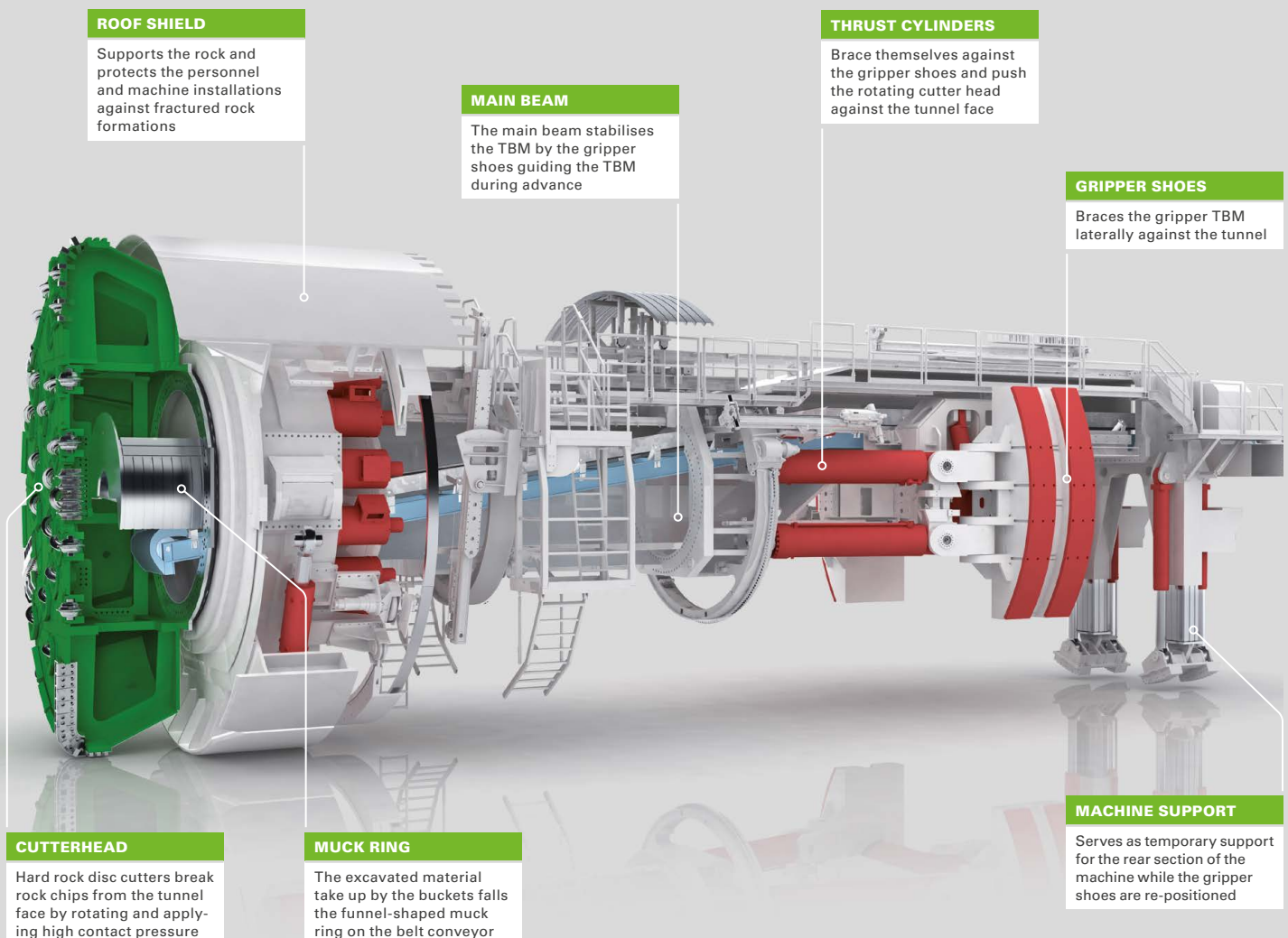
When advancing lateral developments, declines and ramps in underground mines, tunnel boring machines are the optimal solution to save costs and time. High work safety standards, the reduced impact on the surrounding geology as well as high advance rates make mechanized tunnelling in hard rock superior to conventional modes of excavation.

Gripper TBM: Herrenknecht Gripper TBMs reach high advance rates in medium to high rock strengths due to the process-typical rock support method without segments. In more fractured geological formations and fault zones, various systems for immediate rock support behind the cutterhead are installed on the TBM.

Mining TBM: Specially adapted to mining applications, the Herrenknecht Mining TBM is optimized for a small tunnel radius and possible retractability. Also, the machine's design was adapted for improved maneuverability, flexibility and especially for underground assembly situations.

The scope of supply of the Herrenknecht Mining TBM can include additional equipment and services, ranging from conveyor belts and multi-service vehicles to experienced experts for assembly and operations.

Resorting to a worldwide unique legacy of successful underground missions, Herrenknecht is a leading expert for innovating project-specific solutions in partnership with pioneering clients and contractors.




GRIPPER TBM AND MINING TBM

EXCAVATION DIAMETER



GEOLOGY

 **Rock** (hard, stable rock such as granite, gneiss or basalt)

ADVANTAGES

High and constant tunnelling performances and highly precise excavation in stable rock formations

Measures to secure the rock increase safety for personnel and machine in fault zones

Mobile partial shields allow for flexible reactions to convergences

FUNCTIONALITY

Excavation:
Disc cutters break chips from the tunnel face by applying high contact pressure

Removal:
Buckets, muck chutes and muck ring provide for an efficient removal of the excavated material onto a center belt conveyor

Thrust:
Hydraulic thrust cylinders brace against the gripper shoes and push the cutterhead forward

Tunnel lining:
With rock anchors, steel mesh, steel arches and shotcrete, depending on the geology

THURST CYLINDER

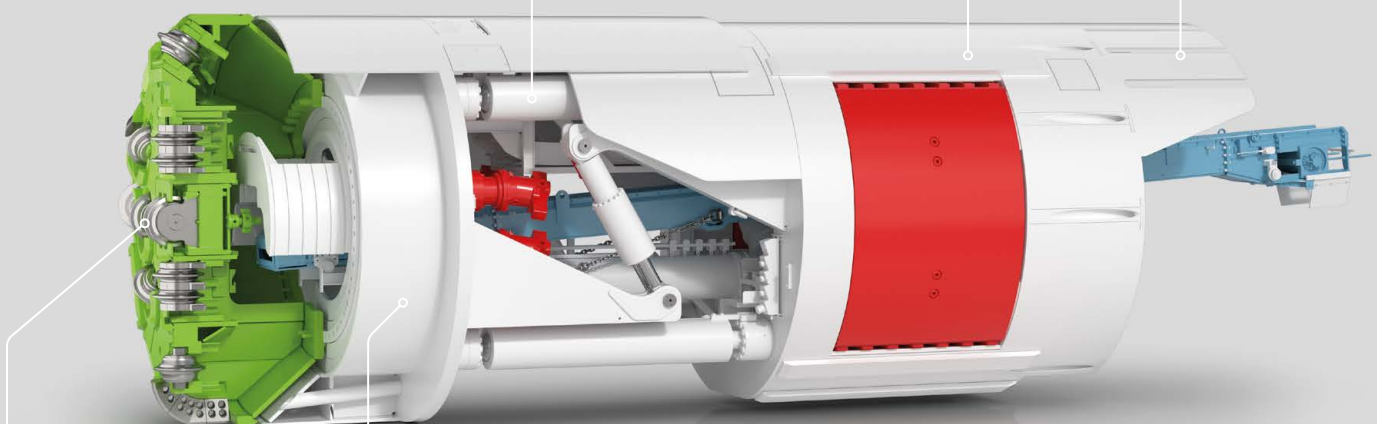
They generate the thrust by being supported on the gripper shield and thus also control the TBM in a small radius

GRIPPER SHIELD

The gripper shoes are installed in the gripper shield

FINGER SHIELD

Anchors can be placed on the finger shield to secure the tunnel roofs



CUTTERHEAD

Hard rock disc cutters break chips from the tunnel face by Rotating and applying high contact forces panels

FRONT SHIELD

The front shield protects the main drive, secures the area up to the Gripper Shield and can assist steering by activating side panels



NEZHINSKY MINE, BELARUS

- › **Machine:** 2 Shaft Boring Roadheaders
- › **Excavation depth:** 697 m / 750 m
- › **Diameter:** 8 m
- › **Geology:** heterogeneous ground, rock
- › **Contractor:** Redpath Deilmann GmbH
- › **Client:** IOOO Slavkaiy

21st century mining

For the first time in Europe, the Nezhinsky Mine in Belarus sank large-diameter service and production shafts using mechanized technology. With diameters of 8 meters each, the two shafts extend to depths of 697 and 750 meters respectively. The shaft structures are for the development and mining of large potash deposits primarily for the purpose of producing fertilizers.

Herrenknecht designed and manufactured two Shaft Boring Roadheaders (SBR) for this pioneering project, which were accepted by the customer in Schwanau in summer 2018 and were in Belarus ready for use just six months later. In the hands of an experienced shaft excavation team and under the direction of a bold mining company, the new technology was able to develop its full potential. Peak performances of up to 144 meters of excavation per month received international attention in the mining world.

In particular, further developments of the SBR technology based on experience from the initial SBR deployment for the Jansen Mine in Canada have proven themselves, such as the efficient Pneumatic Mucking System, which removes the soil excavated by the telescopic roadheader. After only two years, sinking of the two shafts was completed in 2020.



OLYMPIC DAM, AUSTRALIA

- › **Machine:** Raise Boring Rig
- › **Excavation depth:** 730 m
- › **Diameter:** 4.5 m
- › **Geology:** rock > 120 MPa
- › **Contractor:** Macmahon
- › **Client:** BHP Billiton Ltd.

Fast construction of deep hard rock shafts

The world's most powerful Raise Boring Rig, the RBR900VF manufactured by Herrenknecht, is in operation at BHP Billiton's Olympic Dam mine in South Australia. The powerful rig is employed for the construction of 730 meter deep ventilation shafts in hard rock. Thanks to its design, the remote-controlled system with the newly developed pipe feeder ensures both efficient workflows as well as significantly greater work safety for the personnel during installation and removal of the drill string.

Customer quote from Macmahon: "The design of the new raise drill has eliminated most of the manual lifting, pushing and manoeuvring efforts required by operators. This is a major step forward that will not only boost safety but also increase productivity." The machine is designed for long raises up to 2,000 meters and large reaming diameters for ventilation and haulage shafts. The robust and powerful rig with its highly efficient variable frequency drive ensures reliable operation in various conditions.



NANT DE DRANCE, SWITZERLAND

- › **Machine:** Raise Boring Rig, Shaft Drilling Jumbo, Gripper TBM
- › **Excavation depth:** 424 m
- › **Diameter:** 2.44 m–9.45 m
- › **Geology:** rock > 120 MPa
- › **Contractor:** Marti Tunnelbau AG, Marti Contractors Ltd., Östu-Stettin Hoch- und Tiefbau GmbH
- › **Client:** Alpiq, CFF, IWB, FMV

Underway in all directions

Where mechanized shaft sinking methods cannot be used, the Shaft Drilling Jumbo comes into its own. In this procedure, blast patterns with two to five rigs are created – either for blind shafts or shaft enlargement. The shaft is extended with each blast and the Jumbo is repositioned.

A fully proven technology at "Nant de Drance" power plant project in the Swiss canton of Valais. The power station will generate the energy from two reservoirs via pressure shafts to produce 900 megawatts. A Herrenknecht Gripper TBM excavated the 5.6 kilometer long access tunnel to the cavern of the pumped-storage power plant. The two RBR600VF Raise Boring Rigs are reaming two pre-shafts with a diameter of 2,44 meters. The Drilling Jumbo extended these two 424 meter-deep shafts to a diameter of 8 meters.

With its flexible and cost-effective technology, the "Jumbo" is an ideal extension to the existing Herrenknecht technologies.



MINERA SANTA CRUZ, ARGENTINA

- › **Machine:** Boxhole Boring Machine
- › **Excavation depth:** 70 m
- › **Diameter:** 1.5 m
- › **Geology:** rock > 100 MPa
- › **Contractor:** Perforaciones Santacruceñas
- › **Client:** Hochschild

Rapid and precise through hard rock

Since 2007, large deposits of gold and silver have been mined at Minera Santa Cruz in the province of Santa Cruz in southern Argentina. Since 2019, the mining contractor Perforaciones Santacruceñas has been using a BBM1500 Boxhole Boring Machine from Herrenknecht for the fast and safe construction of ventilation shafts and ore passes.

During development of the BBM, special attention was paid to improved work safety, higher productivity and optimal mobility of the equipment. The machine concept is based on the pipe jacking technology proven hundreds of times over in mechanized tunnelling. With this method, a boring unit at the head of a pipe string is pressed forward from the starting point. More jacking pipes are successively installed and pushed forward, increasing the length of the drive accordingly.

In Argentina, the BBM1500 bores ventilation shafts and ore passes with a diameter of 1.5 meters and lengths of up to 70 meters. To date the boring team has achieved top performances of up to 14 meters per 8 hour shift.



EL TENIENTE MINE, CHILE

- › **Machine:** Boxhole Backreaming Machine
- › **Excavation depth:** 70 m
- › **Diameter:** 1.5 m–3.8 m
- › **Geology:** rock > 180 MPa
- › **Contractor:** DMC Mining Services
- › **Client:** Codelco

Innovative Shaft Boring and Lining Solution

Herrenknecht has delivered a BBR1500 equipped with a shaft lining system for the El Teniente mine, the world's largest underground copper mine. Here, in the Chilean Andes, the BBR is employed for the construction of ore passes. The newly developed Boxhole Back Reaming technology allows the excavation of vertical and inclined shafts of up to 3.8 m in diameter and 70 m length.

The Herrenknecht BBR1500 for the El Teniente mine is equipped with a system that installs steel lining elements simultaneous with the back reaming process. The mechanized excavation and the mechanized lowering of the lining segments reduce manual processes and improve work safety for the personnel. Also, the ore passes can be constructed in poor ground conditions because the shaft walls' exposure time is reduced to a minimum.

The machine owned by DMC Mining Chile has been in production since mid-2021. The BBR offers mines the construction of the shafts in a faster, safer and more efficient way compared to conventional methods.



WARRIOR COAL MINE, USA

- › **Machine:** Raise Boring Rig
- › **Excavation depth:** 205 m
- › **Diameter:** 6.7 m
- › **Geology:** rock > 120 MPa
- › **Contractor:** Frontier-Kemper Constructors
- › **Client:** Warrior Coal, LLC

Large diameter Raise Boring Shaft

The US raise boring operator Frontier-Kemper ordered an RBR600VF from Herrenknecht, which proved itself in the 6.7 meter diameter access shaft for the Warrior Coal mine in Kentucky, USA. A Raise Boring Rig with its highly efficient variable frequency drive supplied the torque and thrust required for this challenging project. Customer support for the rig is provided by Herrenknecht Tunnelling Systems USA in Sumner, WA.

A world premiere is the system for remote maintenance of the rig with the "Digital Drilling Report", used here for the first time. Over a network connection it offers Frontier-Kemper the possibility of monitoring the drilling performance of the rig, its availability as well as any difficulties encountered during operation, in real time, from the jobsite office or from company headquarters. The system replaces the usual manual drilling report, simplifies evaluation and allows more reliable drilling data analyses that can be used for the optimization of future projects. The supplied integrated cooling unit ensures the operational readiness of the rig at outside temperatures up to 40°C.



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