



EXCAVATION TOOLS

DURABILITY PAYS OFF

**PIONEERING
UNDERGROUND
TECHNOLOGIES**



Herrenknecht Services

Proven and reliable

The quality and lifetime of the excavation tools have a noticeable effect on tunnelling performance and the economic efficiency of mechanized tunnelling.

Herrenknecht’s technological leadership in tunnelling along with the great experience in manufacturing excavation tools for small and large tunnel diameters enables a long lifetime and top performance during tunnelling. At Herrenknecht, innovations in TBM technology and excavation tools go hand in hand.

With high quality materials Herrenknecht supports high excavation performance and low downtimes. Together with our customers, we gain ground even in geologies with extremely high rock strengths, abrasiveness and water pressures. Herrenknecht develops excavation tools like high quality disc cutters, cutting knives, buckets, rippers and their fastenings at four manufacturing facilities in Germany, USA, India and China.



PRODUCT HIGHLIGHTS
In-house manufacturing of high quality excavation tools
Rapid and worldwide delivery of all common excavation tools for soft ground and hard rock
Technical support on the jobsite
Refurbishment of disc cutters, on jobsite or in-house
Database-supported tool management on request
Disc cutters between 12 and 20 inches
Fast refurbishment and highest quality standards

At Herrenknecht, responsible behavior is evident in all areas. Every excavation tool is manufactured complying with highest standards of quality, sustainable use of resources and maximum safety at work. In addition to the certificates DIN ISO 9001, DIN ISO 14001,

BS OHSAS 18001 and DIN EN ISO 50001, which have been introduced at all manufacturing facilities, we also hold other technical approvals confirming the high level of safety and quality at Herrenknecht.

Full Excavation Tools Service



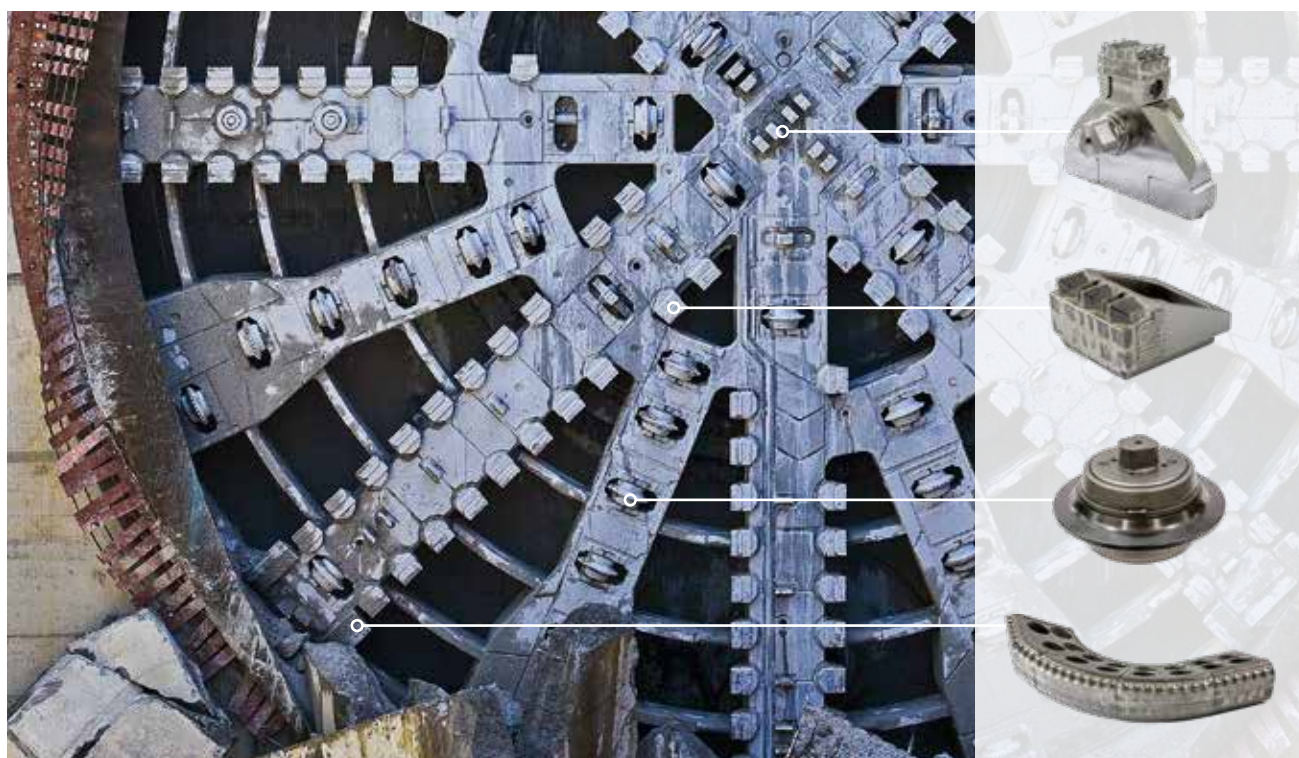
High project performance requires adequate excavation tools set-up. Herrenknecht offers different service models, which allows customers to focus on their own competencies.

FIELD SERVICE

The Herrenknecht excavation tools group offers customized solutions and support in each project phase. We provide high quality excavation tools adjusted to your project conditions. To ensure excellent service solutions, in addition to standard excavation tools, Herrenknecht provides customized and innovative products. To complete the portfolio, Herrenknecht offers excellent service on site as well as disc cutter refurbishment and training for customers. Our goal for our service is to support customers in all related excavation tools issues right from project start.

Together with the customer this mainly includes an excavation tools wear estimation, the right jobsite set-up and logistics as well as constantly increasing TBM performance thanks to the right selection and development of excavation tools. Based on this foundation, customized services, refurbishment solutions and customized excavation tools service contracts are common.

The described products and service solutions are available for TBM from different sources.



EXCAVATION TOOLS

Disc cutters, buckets, cutting knives and rippers are some of the most important parts of every TBM. Regardless of whether excavation is in hard rock or soil, whether atmospheric or under pressure, optimized excavation tools are crucial for the successful construction of a tunnel.

In this key role the choice of excavation tools makes the difference. With this knowledge, Herrenknecht excavation tools are supplied with the highest possible standards everywhere and every time. Our experiences shows that a full product and service supplier reduces the effort on the jobsite.

Disc Cutters

In the Herrenknecht portfolio, disc cutters are divided into the body design and the cutting ring design. This disc cutter design is adapted to the TBM requirements and expected geology. On these, the complete portfolio of suitable cutter rings can be mounted.

The disc cutter fastenings are designed for back-load disc cutter change. To perform excavation under all conditions, a pressure compensation unit can be used for excavation between four bar up to 18 bar of pressure.






MONOBLOCK

Monoblock disc cutters are designed for very challenging conditions in heterogeneous soft grounds and mixed face conditions. "Hub" and cutting rings

are produced as one single piece, which gives additional durability. These disc cutters are available with one or two tips.



MOST COMMON TYPES OF DISC CUTTERS

	Standard size							Position			Comments
	14"	15"	17"	18"	19"	20"		Center	Face	Gage	
Disc cutter			X	X	X	X			X	X	Single/double cutting ring options available
Disc cutter (compact)			X	X	X	X		X	X	X	Single/double cutting ring options available
Twin disc cutter			X		X			X			
Monoblock disc cutter	X	X	X	X	X	X		X	X	X	Single/double cutting tip options available

Cutting Rings

All cutting rings are manufactured out of heavy-duty tool steel. The geometry of the cutting ring shape as well as the cutting ring hardness/toughness can be adapted to the requirements of the project. Furthermore, special application cutting rings with a different

heat treatment process or cutting rings with high wear resistant tungsten carbide hard facing or tungsten carbide inserts are available. The cutting ring product range includes cutting rings which may be the customized solution for your specific project circumstances.

HD-CUTTING RING

Tough missions all over the world.

- › Made from heavy tool steel with a hardness of HRC 56 +/- 1
- › Best compromise between hardness and toughness
- › It is the first choice for all hard rock and soft ground projects
- › The ring tip width can be adapted

W15-CUTTING RING

- › Special hardening process
- › More impact resistant
- › Hardness of HRC 56 +/- 1
- › Reduces chipping and mushrooming
- › Results in more regular wear development

W06-CUTTING RING

- › Cutting ring with higher toughness
- › Absorbs high shock loads
- › Typical range of applications
 - › heterogeneous soft rocks
 - › mixed face conditions
 - › hard bands





CARBIDE-PROTECTED CUTTING RINGS

- › Increase lifetime in highly abrasive soft ground
- › Different types of carbide-protected cutting rings
- › Different manufacturing process combines
 - › wear resistance of tungsten carbide
 - › toughness of heavy duty tool steel

The production processes follow different approaches for the best fitting product. Selection together with Herrenknecht cutter specialists based on detailed geological conditions in the project



CUTTING RING

	Operation area
TCBI 	<ul style="list-style-type: none">› Tungsten carbide insert› Braced on tool steel for soft ground
LMC 	<ul style="list-style-type: none">› Low-melted carbide› Applied on a conventional cutter ring› Hardening process increases strength of carbide and steel
SBCS 	<ul style="list-style-type: none">› Tungsten carbide inserts are screwed on a hardened carrier ring
TCI HF 	<ul style="list-style-type: none">› Cutter ring of tool steel› Press-fitted tungsten carbide elements› Laser-cladded hard facing

Softground Tools

Herrenknecht has a wide portfolio of specialized soft ground excavation tools. Depending on the geology, Herrenknecht offers excavation tools with

- › High wear resistance
- › High impact customized solutions

In homogeneous soil, sharp, exposed teeth improve the excavation potential. For mixed face conditions, less aggressive shapes make them more durable. The tungsten carbide inserts are selected in different ratios of hardness/toughness to match the encountered conditions and protect most of their surfaces.

BUCKETS

Transportation of excavated material to the excavation chamber or into the reamer channels. They are built in lip segments for easy handling.

CUTTING KNIFES

Especially in soft geologies, cutting knives have a key role. For special solutions, cutting knives are customized. They scrape material from the face and transport it through the excavation chamber. The design reduces exposure of the disc cutter and protects the steel structure of the cutting wheel against wear.

RIPPERS

To supplement buckets and cutting knives, Herrenknecht produces rippers to install in housing or directly on the cutting wheel steel structure. These are specialized excavation tools which are commonly used as primary excavation tools only or together with disc cutters.

SOFTGROUND TOOLS

Buckets



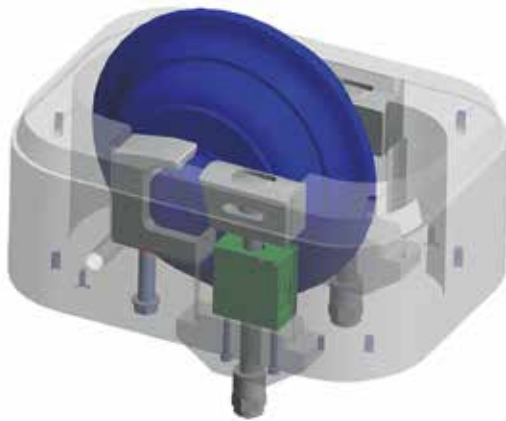
Cutting knives



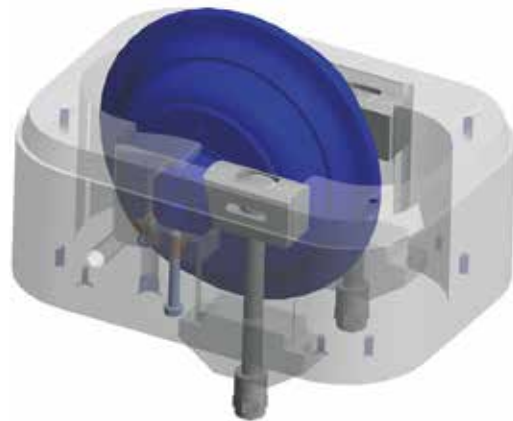
Rippers



Additional Equipment



DCRM: The DCRM system includes specialized disc cutters and a monitoring unit in the housing. This technology reduces the danger of blocking or sticking, which can easily damage disc cutters and the cutting wheel.



DCLM: The DCLM system includes a specialized monitoring unit in the cutter fastening set. This system monitors the forces on the disc cutter during excavation. This technology reduces the danger of blocking or damaged bearings.

Disc Cutter Management

Our service competence is the supply of high quality excavation tools adapted to your TBM and ground conditions. Furthermore, we store excavation tools around the world for fast reaction for urgent cases. Our product is accompanied by excellent service on site.

Regular visits by Herrenknecht on your jobsite give you the opportunity to keep in touch and get advice on questions about excavation tools.

With your skills and our experience, we can work together to increase the efficiency of your tunnel construction. To ensure the highest quality of our products, we monitor and develop excavation tools based on empirical methods to increase lifetime, reduce costs and improve efficiency.

Herrenknecht

A world leader in groundbreaking tunnelling technology.

Herrenknecht is a professionally positioned and internationally oriented family enterprise. As the only company worldwide, Herrenknecht delivers cutting-edge tunnel boring machines for all ground conditions and in all diameters – ranging from 0.10 to 19 meters. Under the umbrella of the Herrenknecht Group, a team of innovative specialists has formed to provide integrated solutions around mechanized tunnel construction with project-specific additional equipment and services.

Pioneering technology by Herrenknecht is always involved when paving the way for the future underground – whether for tunnelling, mining or exploration. Herrenknecht ensures safe and fast progress when constructing modern infrastructures in all areas of application. Exactly where they are needed.



Headquarters in Germany, active worldwide. With more than 4,800 project references, we are a market leader all around the globe.

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