

**CUTTERHEAD** The excavation tools are mounted in the cutterhead, which also supports the tunnel face.

**GOTTHARD BASE TUNNEL**  
 - Installed power: 3,500 kW  
 - Weight: around 220 t

**SHIELD** (partial shield) supports the rock behind the cutterhead.

**MESH INSTALLER** places steel mats in the inserted bolts.

**CONTROL CABIN** From here the TBM driver operates the machine and monitors tunnelling.

**BELT CONVEYOR** transports the excavated material to the end of the back-up system.

**GOTTHARD BASE TUNNEL**  
 - Overall volume of excavated material: around 10.5 million m<sup>3</sup>.

**WALKING DEVICE** The rear of the TBM and the back-up systems rest on the feet of the walking device. They are lifted as tunnelling progresses, and the back-up system follows.

**DISC CUTTERS** are mounted in the cutterhead and roll in concentric circles over the tunnel face. The rock is crushed by the contact pressure.

**GOTTHARD BASE TUNNEL**  
 - Weight per disc cutter: around 125 kg  
 - Contact pressure per disc cutter: up to 26 t

**SHOTCRETE ROBOT** lines the tunnel with shotcrete to stabilize it.

**ROOF BOLTING UNIT** can be moved around the machine's axis. Drills holes for the bolts which stabilize the rock.

**GRIPPER CYLINDERS** press the **GRIPPER PLATES** laterally against the tunnel wall.

**GOTTHARD BASE TUNNEL**  
 - Gripping force: 72,142 kN total

**THRUST CYLINDERS** brace against the gripper shoes and press the rotating cutterhead against the tunnel face.



**GOTTHARD BASE TUNNEL**  
 - Thrust force: 27,488 kN total  
 - Stroke: max. 2 m

**BUCKETS** transport the excavated rock behind the cutterhead onto a belt conveyor system.

**RING ERECTOR** installs steel arches to stabilize the excavated tunnel.

**IN ACTION ROUND THE WORLD** Herrenknecht Gripper technology can be found in action in projects all around the world for all types of tunnel use and all diameters.

**SELECTION OF REFERENCE PROJECTS GRIPPER TBM**

TUNNEL PROJECT	MACHINE DATA	CONTRACTOR
 <b>Jining Hydropower Station II, China</b> Tunnel length: 15,903 m	<b>S-405 Gripper TBM</b> Diameter: 12,400 mm	Ertan Hydropower Development Company Ltd.
 <b>Mumbai Freshwater Pipeline, India</b> Tunnel lengths: 4,366 m / 1,800 m / 1,675 m / 1,900 m	<b>M-1150M / M-1249M Gripper TBM3000XH / Gripper TBM2800XH</b> Diameters: 3,000 mm / 2,800 mm	Patel Engineering Ltd., Pratibha Industries Ltd.