Herrenknecht
A world leader in groundbreaking tunnelling technology.

Herrenknecht is a technology and market leader in the area of mechanized tunnelling systems. 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.

Pioneering Underground Technologies
HERRENKNECHT SSP
Making the invisible visible with Sonic Softground Probing
Herrenknecht SSP
Discovering safety-relevant obstacles.

Two factors are extremely important in mechanized tunnelling: underground safety, to ensure there is no danger to personnel or machinery and rapid construction progress, to ensure that the project time and costs are not exceeded. To support both of these, it is essential for the underlying geological conditions to be known as exactly as possible. Despite intensive preliminary geological investigations, the ground along in the tunnel route repeatedly throws up safety-relevant surprises. These are primarily boulders or artificial obstacles, such as old sheet piling.

With SSP, the required transmitter (T) and receivers (R1, R2, R3) are directly integrated in the cutting wheel of the tunnel boring machine. As the TBM advances, a signal is sent from the SSP transmitter in the cutting wheel into the soil. The signal energy is propagated at the relevant wave speed of the unconsolidated ground and is reflected from any occurring geological or artificial interfaces.

The reflected signals are received by a number of receivers and evaluated. On the basis of the detected density contrasts, it is possible to obtain three-dimensional visualization of the soil up to 40 meters in advance of the TBM, making obstacles visible.

SSP has been specifically designed for continuous monitoring of unconsolidated ground ahead of the tunnel face, parallel to tunnelling. The measured data is processed and evaluated in near real time. The SSP result shown in a 2-D and a 3-D diagram visualizes obstacles in unconsolidated ground up to 40 meters in advance of the TBM.

PRODUCT HIGHLIGHTS
Continuous preliminary exploration without delaying tunnelling.
Reliable detection up to a distance of 40m.
High degree of safety for personnel and machinery.
Simple system design.
Robust hardware.
High level of machine integration.

TECHNICAL DATA
- Rock type: unconsolidated ground
- Machine: Mixshield
- Measurement principle: reflection seismics
- Measured variables: amplitudes and travel time of sound waves
- Measurement: 3-D ground model of relative reflection energies
- Range: in direction of drive around 40m
- Resolution: > 0.5m

REFERENCES
4. Elbe Tunnel, Hamburg, Germany:
Mixshield, S-198
| Shield diameter: 14,200 mm |
| Tunnel length: 2,560 m |

Lefortovo, Moscow, Russia:
Mixshield, S-164
| Shield diameter: 14,200 mm |
| Tunnel length: 2,222 m |

Randstad Rail, Rotterdam, Netherlands:
Mixshield, S-293
| Shield diameter: 6,780 mm |
| Tunnel length: 4,677 m |

City Tunnel Leipzig, Germany:
Mixshield, S-326
| Shield diameter: 9,000 mm |
| Tunnel length: 2,489 m |

Karlsruhe Kombilösung, Germany:
Mixshield, S-869
| Shield diameter: 9,290 mm |
| Tunnel length: 2,046 m |

Zhuhai Hengqin Tunnel, China:
Mixshield, S-950
| Shield diameter: 15,000 mm |
| Tunnel length: 2x 1,080 m |

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