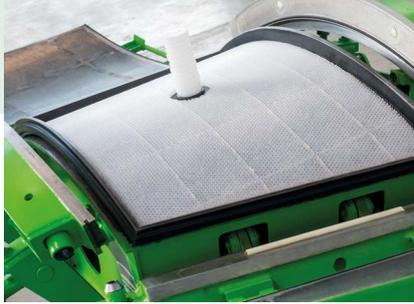




**HERRENKNECHT FORMWORK COMBISEGMENTS®:  
ONE-PASS SEGMENTAL LINING TECHNOLOGY.**



Use of Combisegments®-linings in our moulds:  
e.g. Type I with additional handling socket (left), Type II using AGRU HDPE liner sheet (middle).

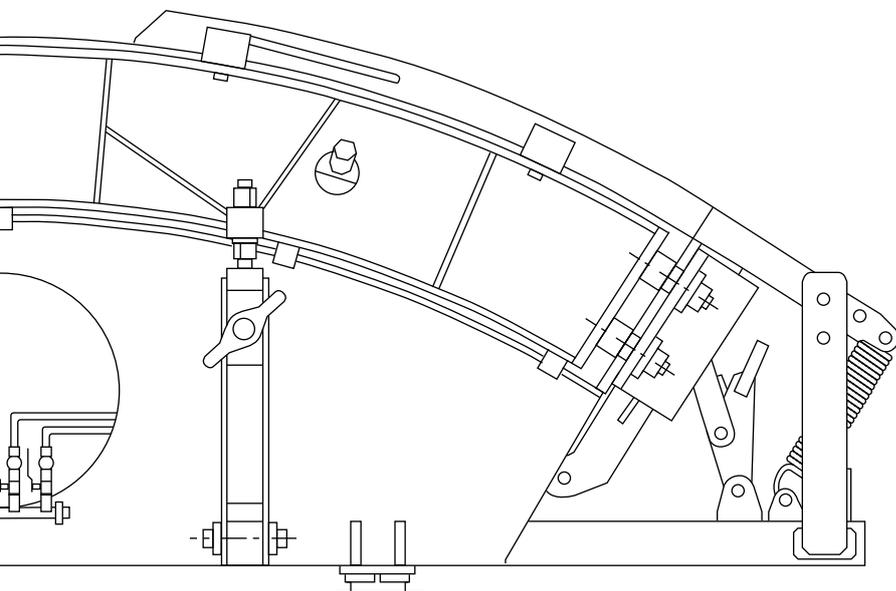
Combisegments® ready for delivery:  
segment with already integrated liner and gasket.



## SAVES TIME AND MONEY.

The Combisegments® technology by Herrenknecht Formwork combines high-precision precast segments with a smooth but protective liner frame resistant to chemicals for sewage, water and cable ducts. In one working step, precisely overmoulded sealing frames achieve immediate watertightness and concrete protection subsequent to the ring building. A costly and time-consuming second lining is no longer necessary to protect the tunnel lining, e.g. against aggressive or abrasive substances.

Designed for tunnel diameters from approx. 2,000mm, the Combisegments® innovation saves time and money. The integration of the corrosion-proof inliner reduces the outer diameter and, therefore, the excavation diameter because a second lining is no longer necessary. The smaller diameter reduces the concrete needed for lining the tunnel and the amount of material that has to be excavated and transported. In total, the project can be finished faster and with less budget with Combisegments® by cutting down the conventional two-step tunnel lining to an efficient one-step process.





Combisegments®-linings in focus:  
 Type I almost entirely made of Telene® pDCPD (left),  
 Type II with AGRU HDPE liner sheet (right).



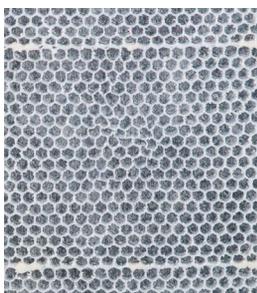
### Advantages

- Fast and simple segment manufacturing
- Enables integration of fastening accessories for tunnelling purposes
- Reliable dimensional stability by an automated manufacturing
- Accelerated tunnel construction in one pass

### Key elements

- Liner frame with integrated gasket sealing
- Smooth and resistant liner
- Project-specific liner design and manufacturing

## PRODUCT RANGE.



#### TYPE I

##### FEATURES

Liner frame:	Telene® pDCPD
Liner:	Telene® pDCPD
Liner thickness:	> 3mm
Concrete bond:	customized anchors
Liner colour:	black



#### TYPE II

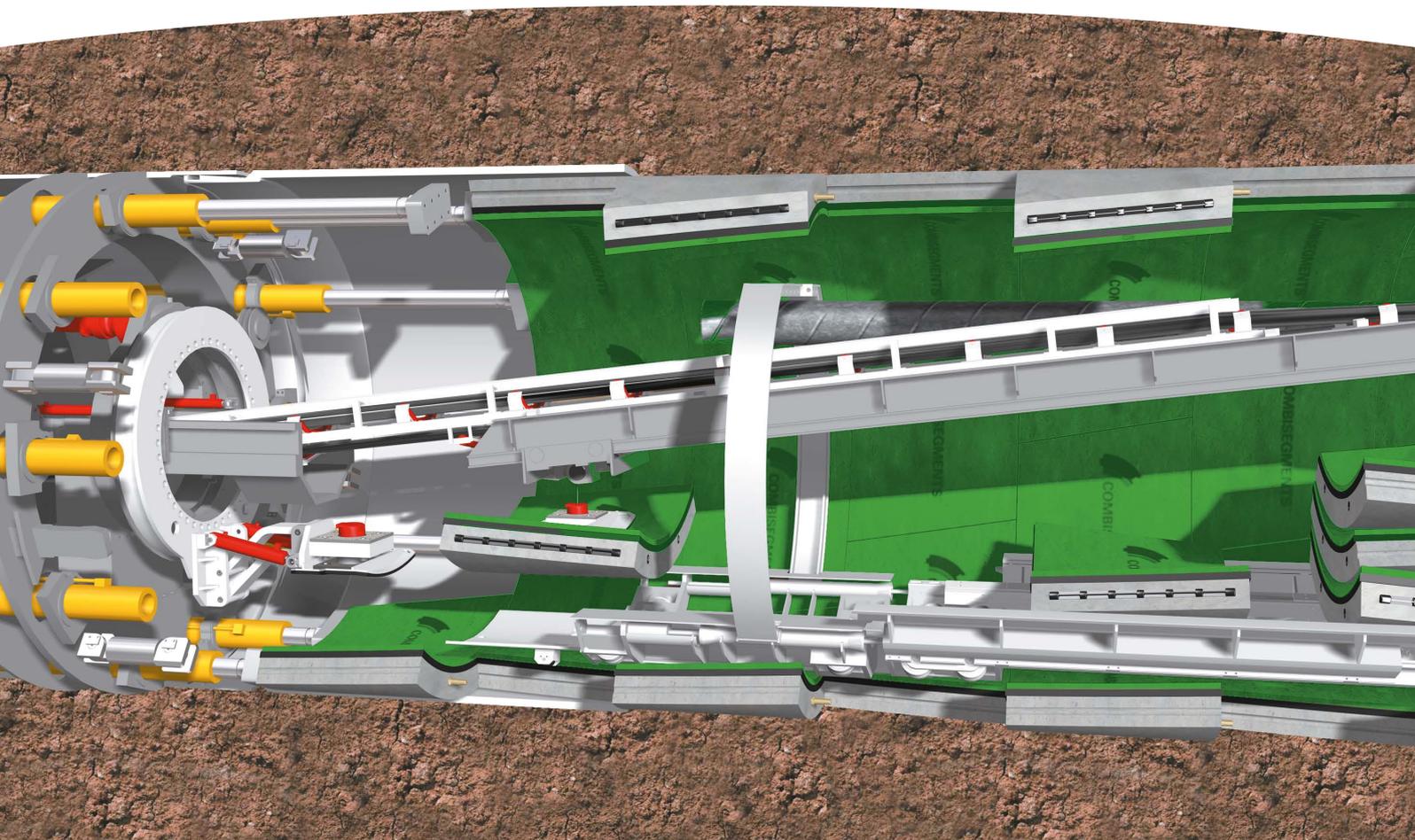
##### FEATURES

Liner frame:	Telene® pDCPD
Liner:	AGRU SURE/ULTRA GRIP HDPE
Liner thickness:	2.5mm – 4mm
Concrete bond:	anchor studs; formed during HDPE extrusion
Liner colour:	variety

## CUSTOMIZED PRODUCT AND MATERIAL DESIGN.

**Combisegments®-linings** to be set in concrete are available in different product and material designs, each adaptable to individual project requirements. Manufactured by means of Reaction Injections Molding (RIM), both tunnelling accessories, i.e. erector sockets and dowels as well as high-density polyethylene (HDPE) lining sheets are integrated form- and force-locking. Type I is entirely made of a thermosetting polymer (Telene® pDCPD) and incorporates a honey-combed concrete anchoring structure throughout the reverse surface of the main pDCPD liner. In contrast, in case of type II, the main lining area is produced using thermoplastic sheets (AGRU SURE/ULTRA GRIP), chemically connected to the Telene pDCPD liner frame.

Generally Herrenknecht Formwork  
Combisegments® can be employed with  
any type of tunnel boring machine that  
lines the tunnel with segments.





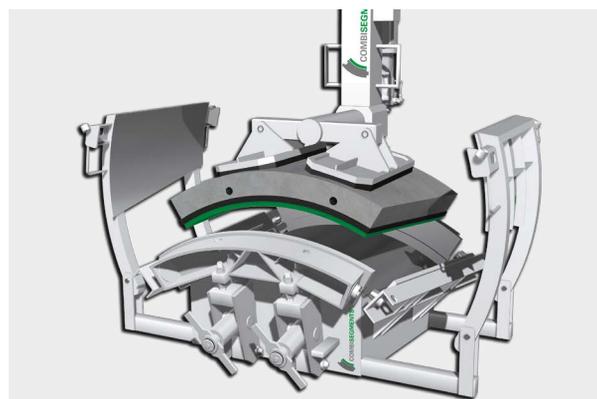
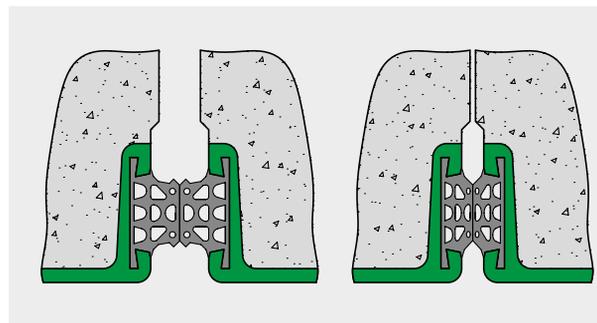
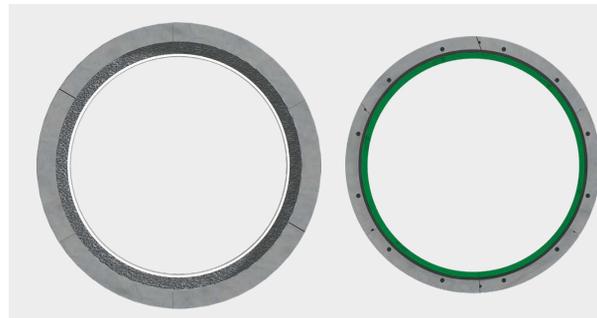
**Taylor-made solutions.** The Combisegments® technology can be adapted to inner diameter starting from approx. 2,000mm. Taylor-made solutions are possible for temporary makeshift infrastructures as well as monocoque corrosion resistant and durable high-tech tunnels due to the use of an integrated framed lining system with overmoulded gasket sealing.

**Simple but thoroughly-engineered production process.** The inliner-gasket element is placed at the bottom of the specially designed Combisegments® mould with its smooth surface facing the base plate, kept in place by the mould's groove system. Then, the concreting process including the installation of a reinforcing cage begins. This process already includes the installation of the gasket sealing frame enabling a watertight connection with the inliner. Thus, no further work on gaskets is necessary after hardening of Combisegments®. After the curing of the concrete and demoulding, the Combisegments® can be transported directly to the jobsite

**Reduced project time and costs.** The use of Combisegments® reduces the tunnel cross-section at constant internal diameter and, therefore, the amount of concrete necessary for the tunnel grout injection and also decreases transport of excavated material. Thus, construction costs can be significantly lower.

**One-step construction and efficient protection.** Combisegments® with protective inliner and mechanically integrated sealing cut down tunnel lining to an efficient one-step process. This avoids an additional installation of a protecting inner shell and minimizes the tunnel cross-section. Furthermore, the inliner and the gasket sealing provide effective protection against aggressive sewage and corrosion of the concrete caused by acids or gases.

**Quality and precision.** With a large number of successful project references worldwide, Herrenknecht Formwork offers the highest quality and precision in design and construction of moulds and handling equipment. Moulds and equipment are produced in own production plants in accordance with ISO 9001 quality management standards.





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Herrenknecht Formwork Technology GmbH is an independent subsidiary of Herrenknecht AG. Herrenknecht Formwork develops, manufactures and sells high-quality mould systems for mechanized tunneling worldwide. From mould systems for segment casting and production to the necessary handling and transportation equipment to turnkey segment plants, Herrenknecht Formwork offers everything from a single source. As an ISO 9001:2000 certified company Herrenknecht Formwork provides its customers worldwide proven quality and reliable service.

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