

Trenchless Innovations from Germany



Dr.-Ing. Klaus Beyer  
Executive Director

German Society of Trenchless  
Technology e.V. (GSTT)



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World Trenchless Congress  
25<sup>th</sup> September 2017, Medellin



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**GSTT** – German Society for Trenchless Technology e.V. 

*The German Society for Trenchless Technology advocates the pioneering trenchless technology that **combines economic efficiency and environmental protection.***

*This modern approach for installing underground supply lines can be utilized for **drinking water, wastewater, gas, heating, telecommunications or electricity lines.***

*GSTT's goal is to promote this modern technology that has been **proven and tested worldwide over 30 years.** Together with international partners, GSTT is continuously working on advancing the science and the practice of trenchless technology for the public and environmental benefit.*



**iSTT** – International Society for Trenchless Technology

Approx. 3.500 members in approx. 55 countries (Societies in 28 regions)



## Trenchless Innovations from Germany



- Inspection
- Repair / Renovation
- Renewal / New Construction



## Trenchless Innovations from Germany



- Inspection
- Repair / Renovation
- Renewal / New Construction



## CCTV-Inspection - Electronical sewer mirror FastPicture

made  
in  
Germany

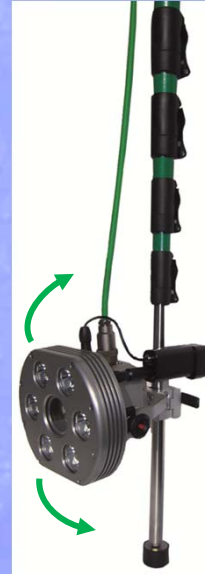
The new **FastPicture** camera was developed to quickly monitor the condition of the sewer.

### Technical Properties:

- **FULL HD** -camera (1920x1080)
- Zoom 360 x (30 x optical / 12 x digital)
- Battery and mains operation power supply
- Recording with digital recorder (H.264) by USB

Some new options :

- Tilt angle  $-45^{\circ}/+90^{\circ}$
- Gas-sensor
- Additional HDMI output
- Changable battery
- Tripod und harness
- Holder for drop manhole
- Sun shade



**GSTT**

## CCTV-Inspection for small diameter HD pushing with water

made  
in  
Germany

Pan & tilt camera, turn off able

**Operating range DN 80 – 200**

Able to negotiate bends  
 $45^{\circ}$  from DN 80

Able to negotiate bends  
 $87^{\circ}$  from DN 100

Camera diameter  
56 mm.

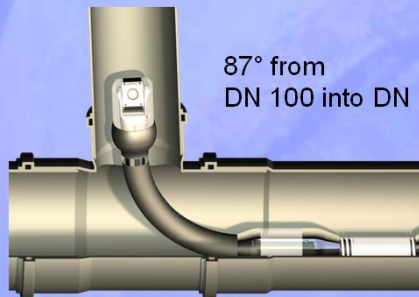


**ritec**

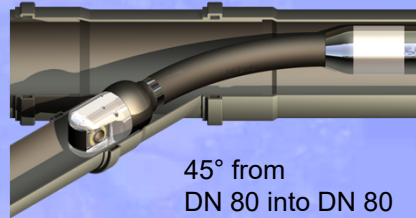
**GSTT**

## CCTV-Inspection for small diameter HD pushing with water

made  
in  
Germany



87° from  
DN 100 into DN 100



45° from  
DN 80 into DN 80



Pan & tilt camera head and  
unimpeded view

ritec

GSTT

## CCTV-Inspection for Sewage Laterals with documentation

made  
in  
Germany



### Lindauer Schere & ASYS 3D (scissors from the German town Lindau)

- bendable pan and tilt colour camera for the holistic recording and documentation of lateral sewer
- Retractable guide device allows always a free and clear camera image  
→ completely panned by
- 90° degrees and circled 360 degrees
- Inspection of branched pipe systems from DN 100 to DN 200
- Range up to 40 m in the lateral pipe (pushing technology)
- Range up to 120 m in the lateral pipe (water high pressure technology)
- **3D-sewage measurement ASYS 3D**

ritec

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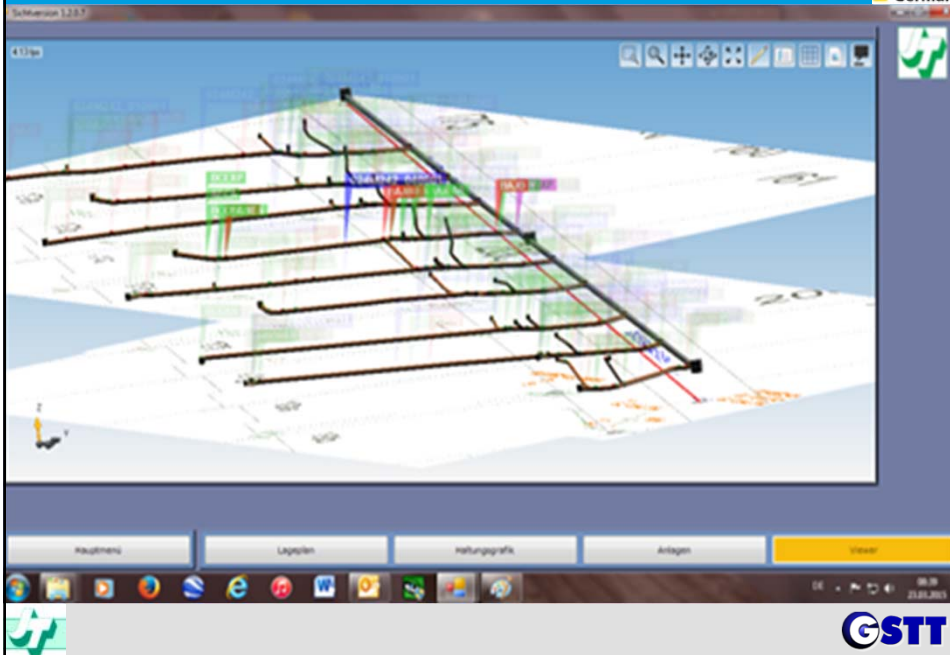
# CCTV-Inspection for smal diameter HD pushing with water

made  
in  
Germany



# CCTV-Inspection for Sewage Laterals with documentation

made  
in  
Germany



## Trenchless Innovations from Germany



- Inspection
- Repair / Renovation
- Renewal / New Construction



## LATERAL PREPARATION SYSTEM



### SEWER to LATERAL (STL)

WORLDWIDE UNIQUE SATELLITE SYSTEM

for cutting, inspection and cleaning  
from main sewer (DN 200 mm – 600 mm)  
to lateral (DN 100 mm – 150 mm)



Winner of the



NO DIG  
AWARD 2015

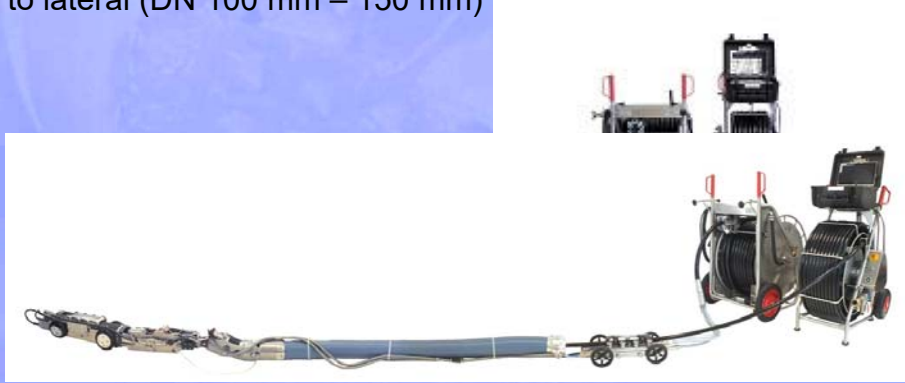


## LATERAL PREPARATION SYSTEM

made  
in  
Germany

### SEWER to LATERAL (STL)

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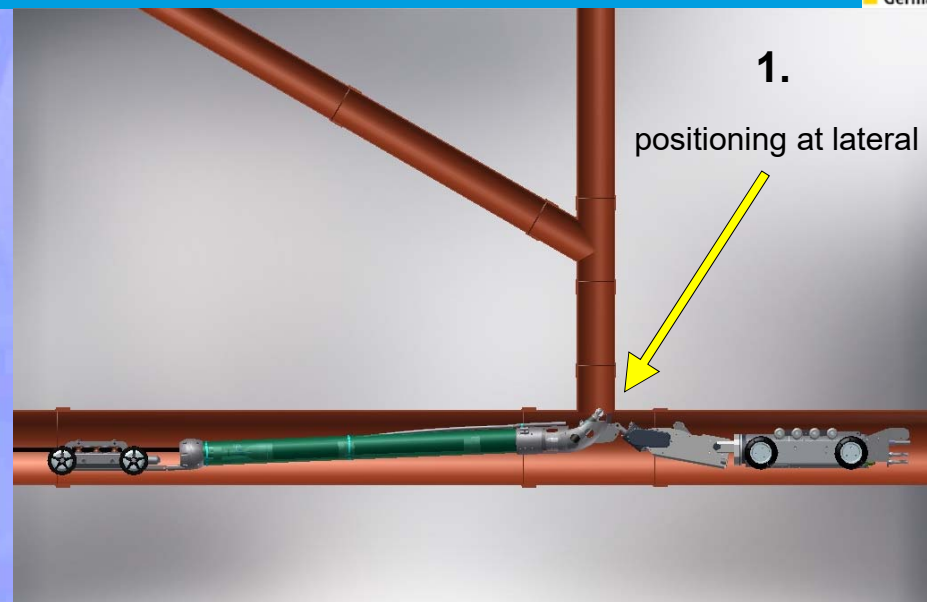


IMS  
Robotics

GSTT

## LATERAL PREPARATION SYSTEM

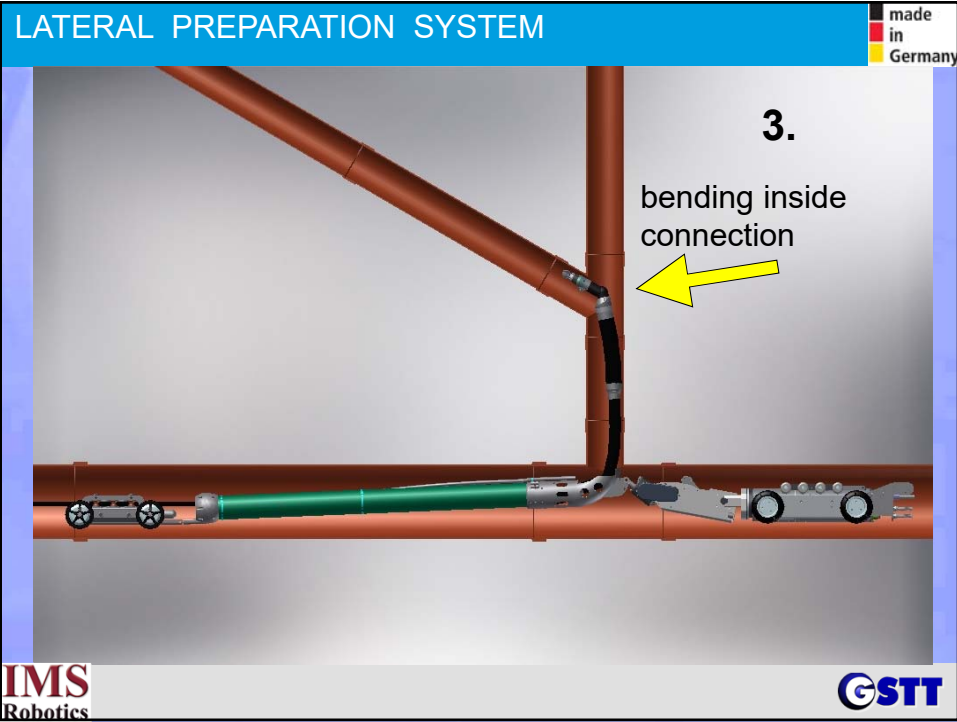
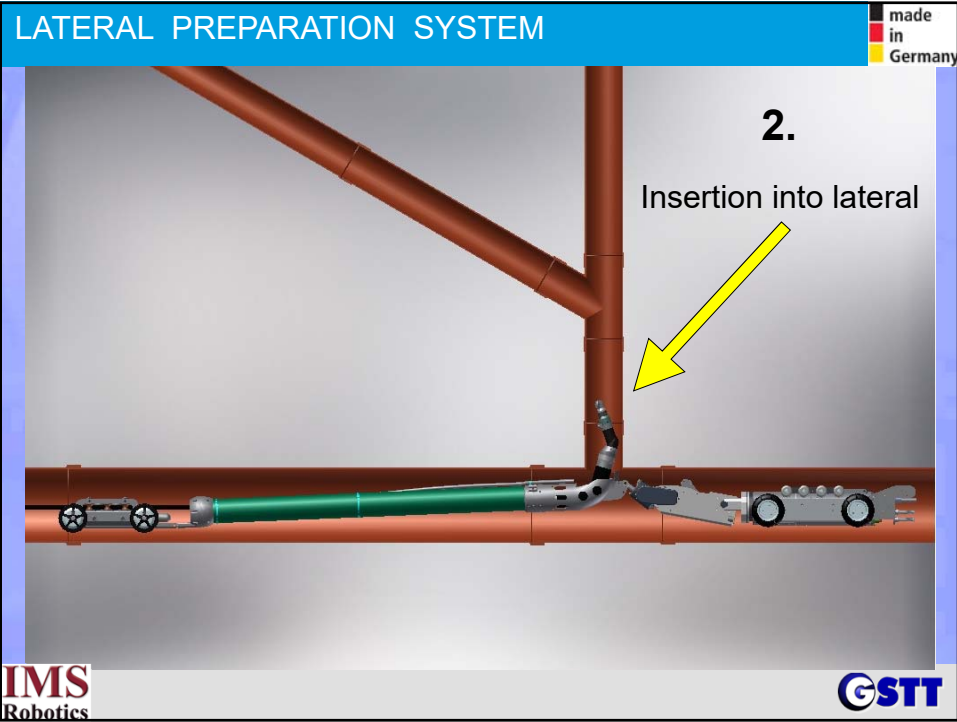
made  
in  
Germany



IMS  
Robotics

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**LATERAL PREPARATION SYSTEM** made in Germany

**4.**  
start working  
(cutting, cleaning,  
reopen the lateral)

**IMS Robotics** **GSTT**

**CIPP - Cured-in-place pipe rehabilitation with double wall** made in Germany

Alphaliner500G with double wall construction:

- A special, patented double wall construction
- Extremely tight, resin rich back wall with closed foil shell
- Covering of the structural load-bearing core of the Alphaliner
- Protection against environmental influences
- Perfect long-term safety
- Extension of the service life
- DIBt approval Z-42.3-447

Double wall and outer film  
Structural thickness –  
Statically relevant element  
Defined wear protection layer  
Removable inner film

**RELINNEUROPE** **GSTT**

## CIPP - Cured-in-place pipe rehabilitation up to 1800 mm



Alphaliner1800 for diameters up to DN 1800:

- Unique glass fibre material based on the innovative “Ultrapipe” ECR glass fibre
- Higher transparency, better and quicker curing
- Different layout of the random and transverse fibre orientation to create technical properties

Alphaliner1800	Technical data
Elastic modulus short-term value acc. DIN EN 1228	20380 MPa
Elastic modulus short-term value 5% quantile acc. DIN EN 1228	16304 MPa
Elastic modulus long-term value acc. DIN EN 1228	12445 MPa
Elastic modulus short-term value 5%- quantile acc. DIN EN ISO 178	13857 MPa
Bending strength short-term value 5% quantile acc. DIN EN ISO 178	280 MPa
Bending strength long-term value	213 MPa
Reduction factor 50 years	1,31 [-]
Wearout value as per CEN/TR 15729	0,23mm
Wear layer	0,5mm
Grouping DWA-M 144-3	MKG 24
DIBt approval	Z-42.3-447

**RELINEEUROPE®**



## CIPP - UV curing technology - Benefit of the undersize



- No wrinkles in deformed pipes and offsets.
- Lateral connections easily detected.
- Reduction and prevention of annular gaps between host pipe and the liner (corrosion in concrete pipes can increase its diameter).
- Static design formulas allow only very limited gaps. Annular gaps dramatically influence the loading capability of a CIPP.



CIPP - Cured-in-place pipe rehabilitation - expandability

made  
in  
Germany

Job site - Berolina-Liner ID 800 [32 inch] 11,0 mm wall thickness



Before installation  
of the Berolina-Liner



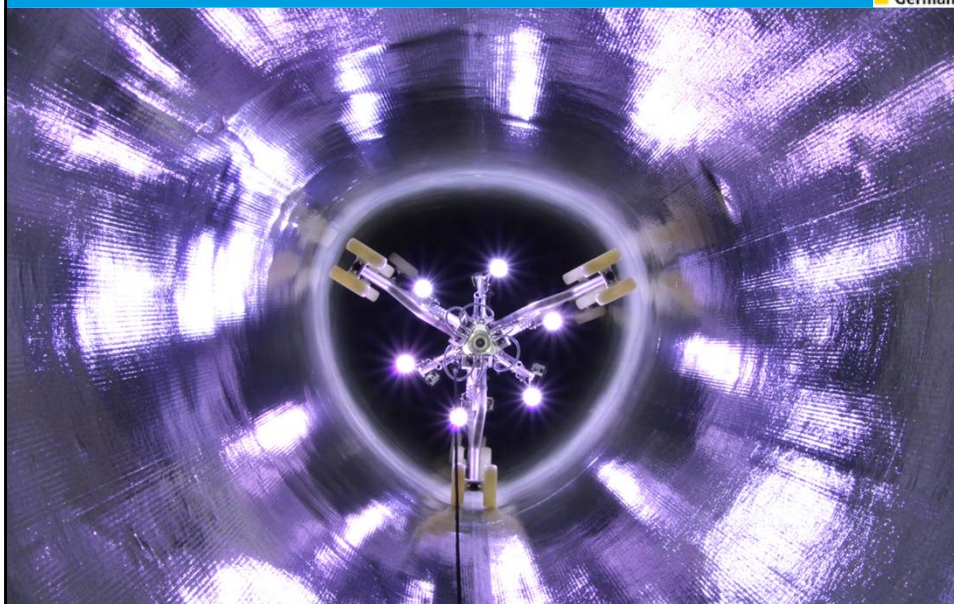
After installation  
of the Berolina-Liner

SL 11.1 m HR 3:00 HP -0°↑



UV – Light -Train

made  
in  
Germany





## CIPP - UV curing technology for Drinking Water



### SAERTEX-LINER® H<sub>2</sub>O

The world's first curable GRP-Liner for the trenchless rehabilitation of potable water pipes: **Third party approved, environmentally friendly & sustainable!**

Structural classification of the Liner

- according to DIN EN ISO 11295 / AWWA M28

Certifications:

- NSF / ANSI Standard 61
- DVGW – W 270 and KTW Guideline,
- Ordinance 2914:2011

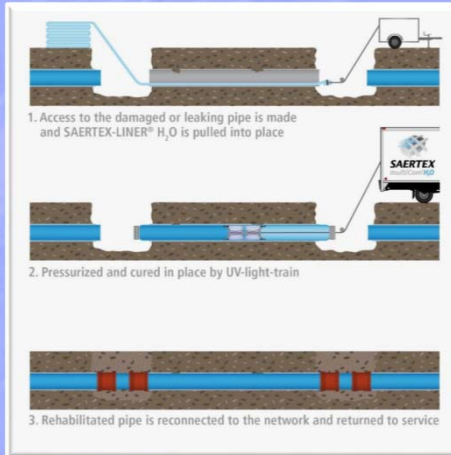
Due to high mechanical properties

- Very thin walls are used
- High pressure applications are possible

Diameter range

- 8 - 48 in (200 - 1200 mm)

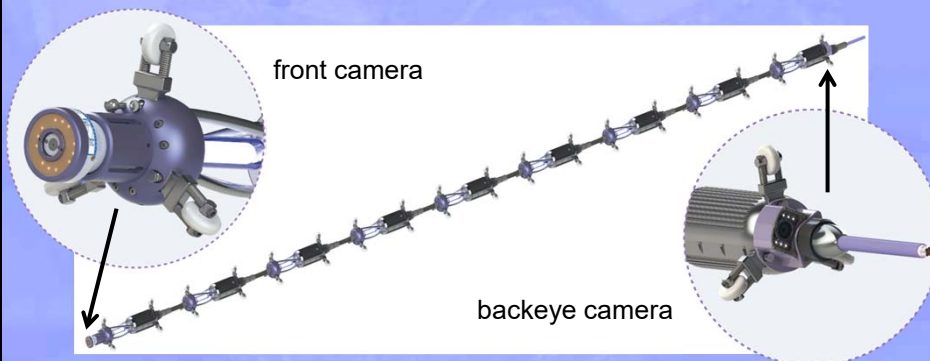
The Liner can withstand external and internal pressure, including a vacuum.



## New UV System for Renovating Drinking-water Pipelines



With the revolutionary **nUVision** concept for light curing of drinking-water pipelines, I.S.T. is putting a patent-protected technology on the market that allows for cables up to 1,000 meters in length.



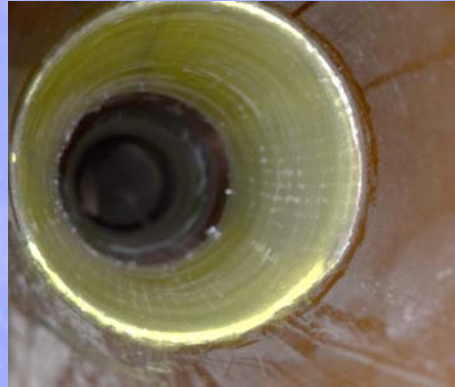


## UV-Patch System for short liners

made  
in  
Germany

allows the rehabilitation of  
damaged pipe sections  
From DN 150-600 (6" – 24")

- max. occupancy with short liners up to 100 cm (40")
- 3 UV-bulbs (250 watts each)
- articulated joint for better inserting through manhole into the channel
- curing time of only 8 minutes



IBG HydroTech<sup>®</sup>  
Cleaning • Robotic • WPT  
Lining Systems

GSTT

## Multi Tophat cap placement-system

made  
in  
Germany

for lateral rehabilitation in main pipes from  
DN 250-600 (10" – 24")

Flexible system to use for:

1. cold-curing  
top-hat profiles  
with silicate resins
2. top-hat profiles  
with epoxy resins  
(incl. heating shield)
3. UV-curing  
with UP-resin  
(polyester)



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Lining Systems

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## STREET TO HOME

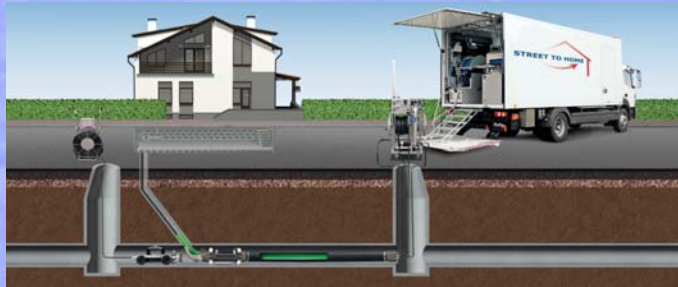
made  
in  
Germany

For lateral relining from of the main pipe

The system allows inverting GRP-Liner against flow direction with open-end-method:

Positioning unit and inversion unit are placed into the main pipe (> DN 250 relined) from two opposing manholes.

From there, after coupling of the units, the rehabilitation of the lateral (> DN100) is carried out.



IBG HydroTech<sup>®</sup>  
Cleaning • Robotic • WPT  
Lining Systems

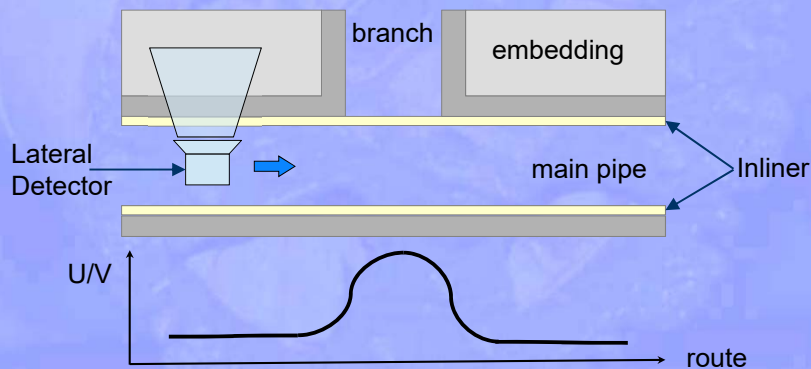
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## CIPP – Lateral detector

made  
in  
Germany

**IBAK – Lateral Detector** Sensor system for locating branches in rehabilitated sewer pipes

Proceeding: An antenna is routed along the liner wall. The output signal of the sensor changes depending on the structure detected behind the wall.

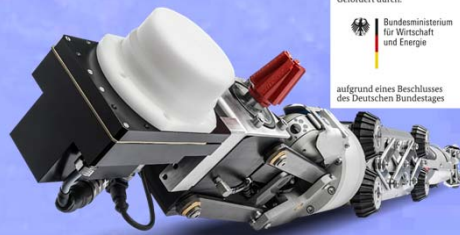


IBAK  
robotics

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IBAK – Lateral Detector Sensor system for locating branches in rehabilitated sewer pipes

With this innovative technology it is possible to locate and cut open branches (size DN 80 or larger) to be opened after liner insertion.



Gefördert durch:  
Bundesministerium  
für Wirtschaft  
und Energie  
aufgrund eines Beschlusses  
des Deutschen Bundestages

IBAK – Lateral Detector Sensor system for locating branches in rehabilitated sewer pipes

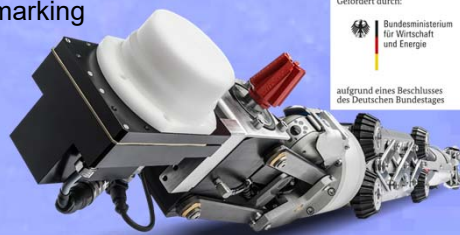
The sections graphic from the camera inspection serves as basis

- it is not necessary to scan the entire pipe again.

It is possible to find dry branches as well as those with water behind the liner.

The operator receives a visual reference of where the optimal opening point is.

- 1<sup>st</sup> step: it can be marked with a marking device that is adapted on the cutter robot
- 2<sup>nd</sup> step: the cutter automatically moves to the optimal opening point, and thus it can be reliably opened

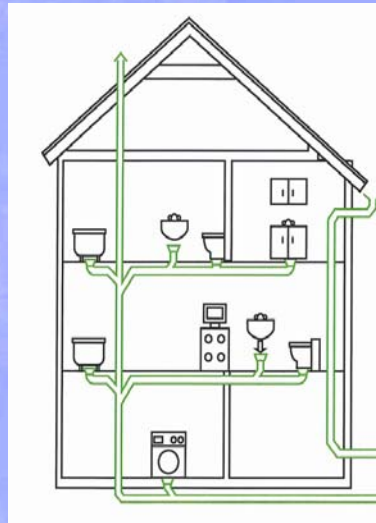


Gefördert durch:  
Bundesministerium  
für Wirtschaft  
und Energie  
aufgrund eines Beschlusses  
des Deutschen Bundestages

pipe rehabilitation with spraying method for small diameter

made in Germany

- Spray-Liner® is innovative and combines specific techniques and materials of pipe renovation.
- This patented spraying method allows to renovate sewage pipes with inner diameters starting from 34 mm, horizontally or vertically.
- Spray-Liner renovates without any demolition or excavation work.
- clean, rapid and cost-effective.
- It can be used for inhouse rehabilitation or laterals

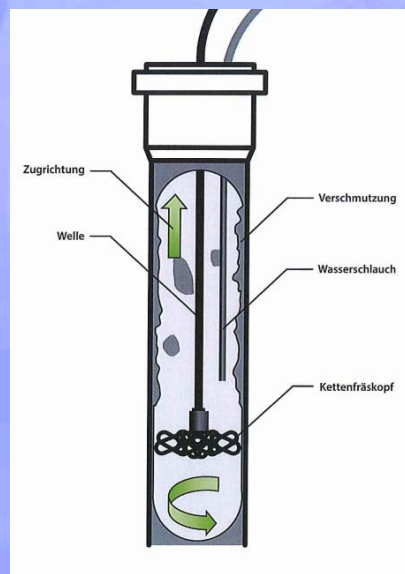


spray-liner®

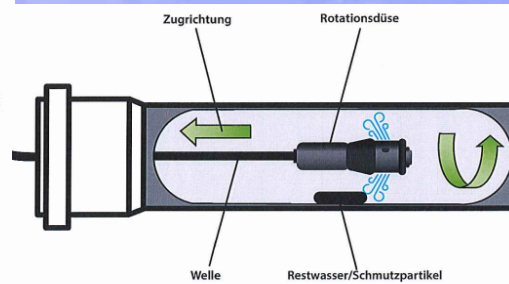
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pipe rehabilitation with spraying method for small diameter

made in Germany



Cleaning before



spray-liner®

GSTT



pipe rehabilitation with spraying method for small diameter

made  
in  
Germany

Excellent for pipe diameters from 34mm to 155mm  
Can also be used in combination with liners



spray·liner™

GSTT

Manhole rehabilitation technologies

made  
in  
Germany

cleaning  
equipment



M-Coating ready to begin, after cleaning with the TSSR

HERMES TECHNOLOGIE RH

GSTT



## Manhole rehabilitation technologies

made  
in  
Germany

motar  
coating  
equipment



**M-Coating**  
**Automatic**  
**shaft renovation**

**Spray motor**

- Thickness 5 – 100 mm
- Depth until 30 m
- Diameter 0.5 – 3,0 m
- Anticorrosion
- Structural renovation

HERMES  
TECHNOLOGIE 



## Manhole rehabilitation technologies

made  
in  
Germany

motar  
coating



**M-Coating after**  
**partial coating with**  
**ERGELIT**

HERMES  
TECHNOLOGIE 



## Manhole rehabilitation technologies

made  
in  
Germany

Automatically coating of hybrid-silicate ombran CPS  
in the case of biogenic acid corrosion



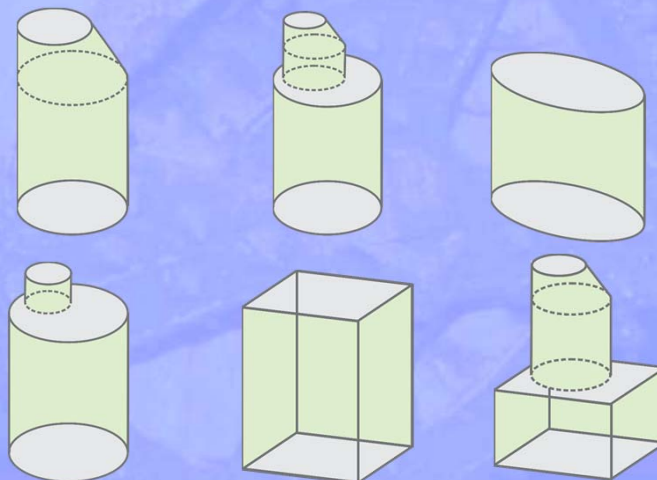
HS Coating Head



## Manhole rehabilitation technologies

made  
in  
Germany

GRP – Liner with UV curing technology  
in different shapes of usual manholes



# Manhole rehabilitation technologies

made  
in  
Germany



# Manhole rehabilitation technologies

made  
in  
Germany





## Trenchless Innovations from Germany



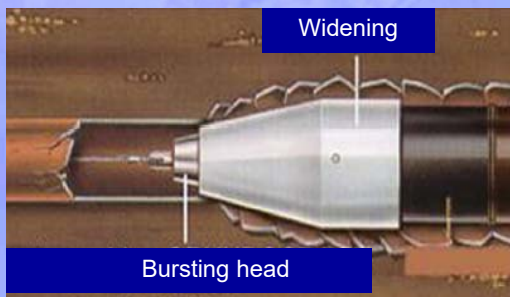
- Inspection
- Repair / Renovation
- Renewal / New Construction



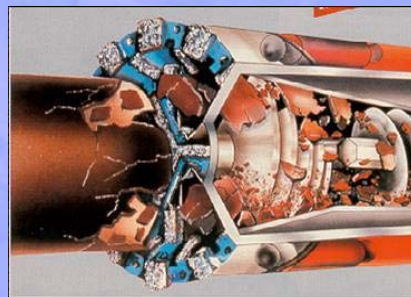
## PRM – Pipe Replacement Method



So far only pipe bursting and modified micro tunneling systems (pipe-eating method) are available for a pipeline corridor, trenchless replacement of old pipelines.



pipe bursting



pipe eating

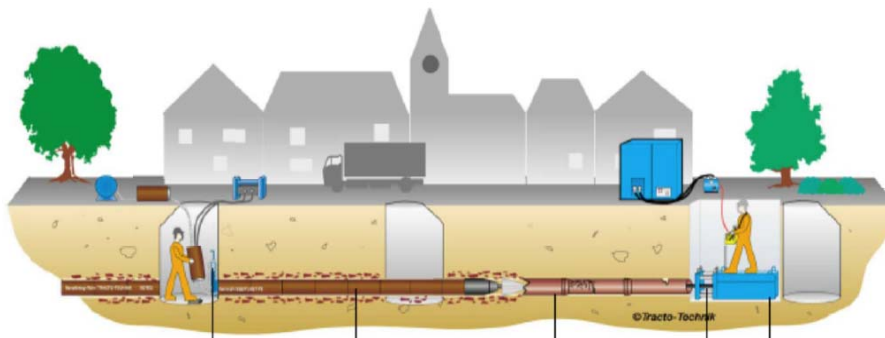


## PRM – Pipe Replacement Method

made  
in  
Germany

### Pipe bursting method

A prerequisite to utilize this method is that the surrounding ground can be displaced; major increases of dimensions are often problematic or impossible.



Strech (tension) unit    New pipe    Old pipe    Pull rod    Static pulling device

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INGENIEUR CONSULTING

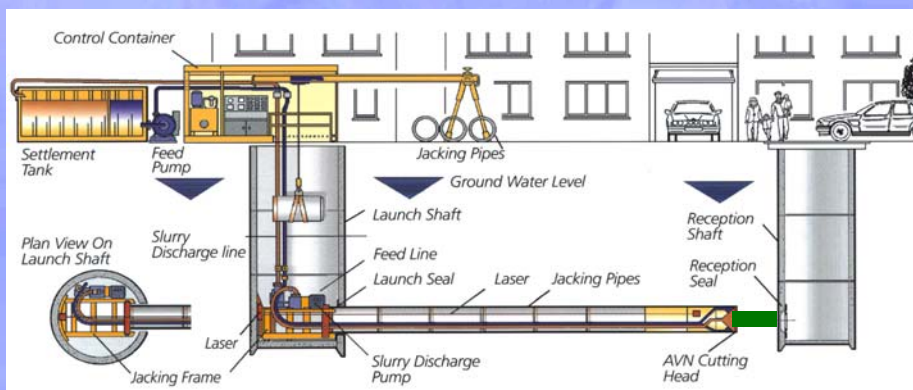
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## PRM – Pipe Replacement Method

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in  
Germany

### Pipe Eating systems

technical perfected systems  
...but too long construction time



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## PRM – Pipe Replacement Method

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An Example: Advance length 60 meters, d = days

Pipe-eating method with slurry system:

set up 3.5 d, pipe eating 6.0 d, dismantling 2.0 d  $\Sigma$  11.5 d

Pipe-eating method with guided auger system:

set up 2.5 d, pipe eating 6.0 d, dismantling 1.5 d  $\Sigma$  10 d

The new Invention method with short pipes\*:

set up 1.0 d, pulling process 2.5 d, dismantling 0.5 d  $\Sigma$  4 d

\*for example polymer concrete jacking pipe

The new Invention method with PE Long pipes:

set up 1.0 d, pulling process 1.0 d, dismantling 0.5 d  $\Sigma$  2.5 d

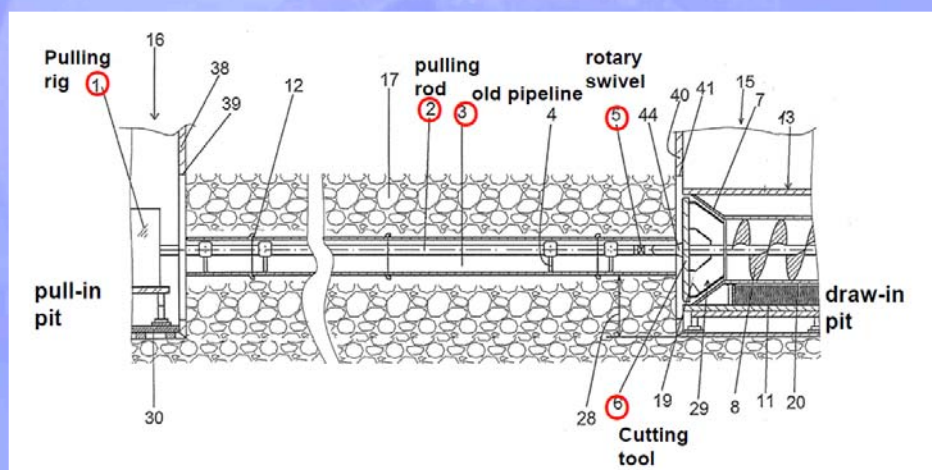
60 % - 80 % lower construction time!

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## PRM – Pipe Replacement Method

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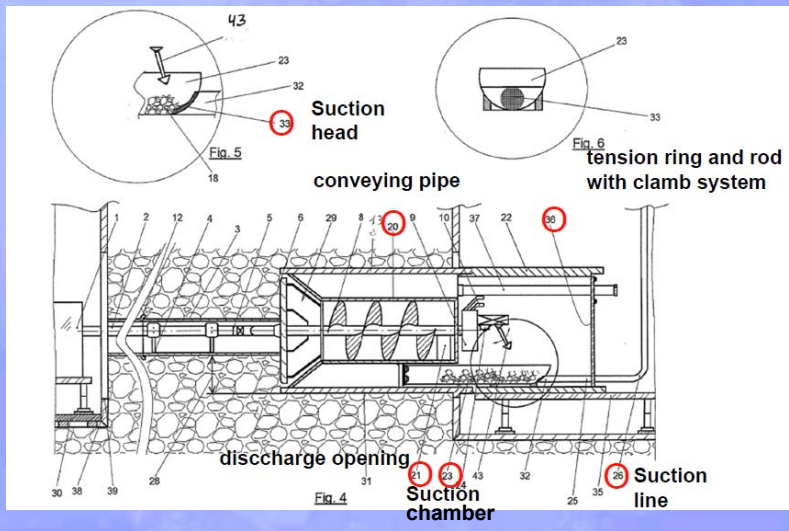


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PRM – Pipe Replacement Method

made  
in  
Germany



removal of drilled material is done with a suction excavator

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PRM – Pipe Replacement Method

made  
in  
Germany



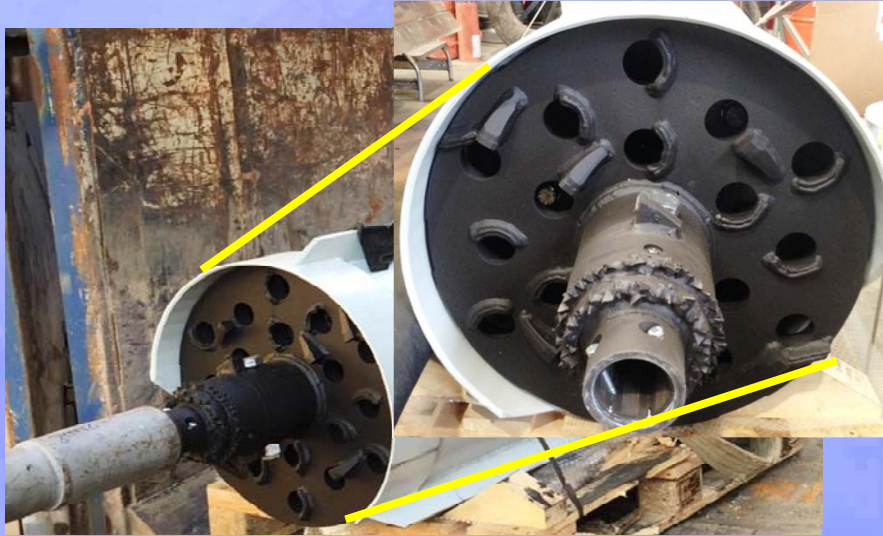
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Bohrtec

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PRM – Pipe Replacement Method

made  
in  
Germany



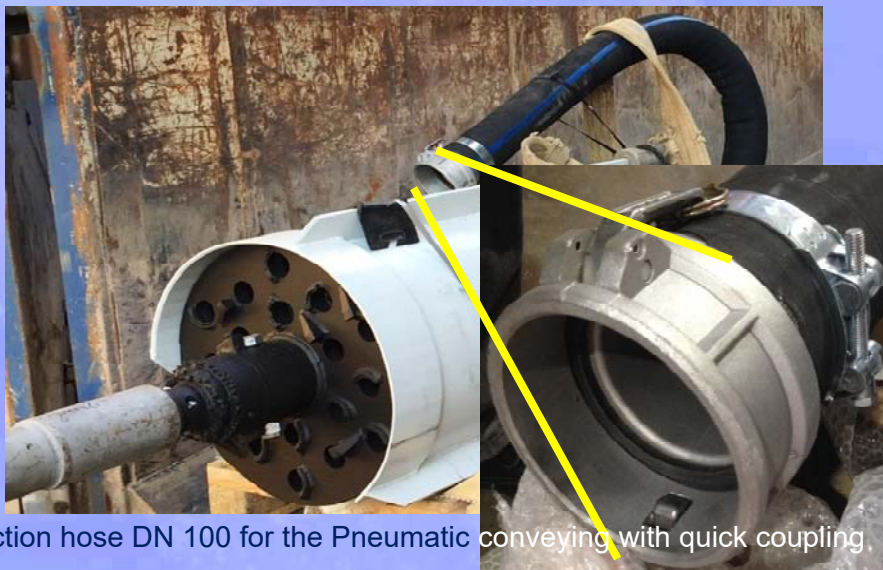
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PRM – Pipe Replacement Method

made  
in  
Germany



Suction hose DN 100 for the Pneumatic conveying with quick coupling.

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**PRM – Pipe Replacement Method** made in Germany

Computer-optimized sound-absorbing unit	efficient micromesh filter	patented separation system	standard radio remote control
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**Suction Excavator - patented suction principle**

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INGENIEUR CONSULTING
**GSTT**

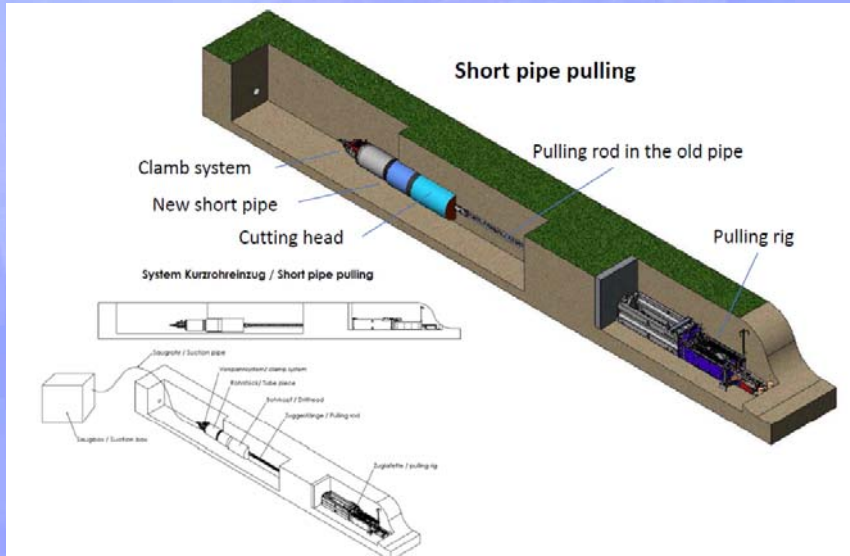
**Suction Excavators – a wealth of applications** made in Germany

CIVIL ENGINEERING			
	DISPOSAL		
		CLEANING OF FLAT ROOFS	

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# PRT – Pipe Replacement Technology

made  
in  
Germany

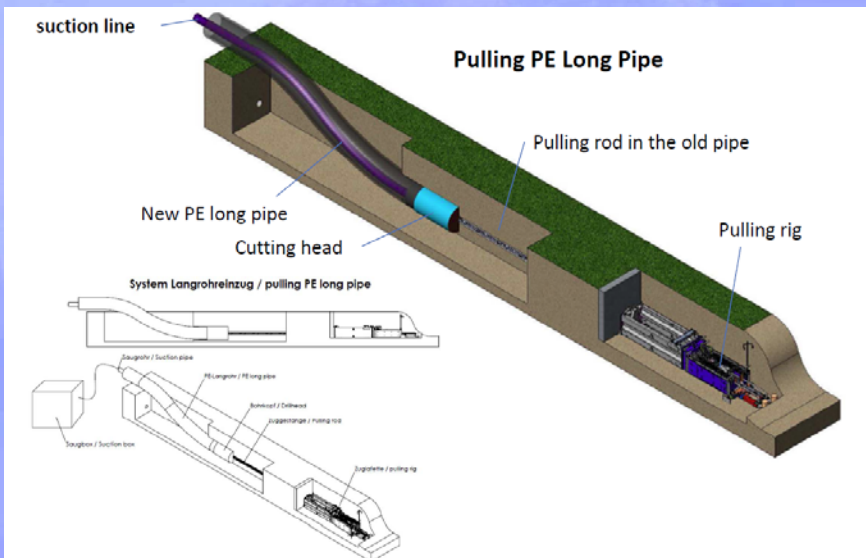


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# PRT – Pipe Replacement Technology

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Germany



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## PRM – Pipe Replacement Method

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in  
Germany



Pulling rig



Clamb system



Pulling rod



Hydraulic aggregate

A lot of the components can be used for other applicabilities (pipe bursting etc.)

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## High speed pipe and cable ploughing technology for open te

made  
in  
Germany



winch rope of up to 130 m length

Hydraulic spider plough unit

pulling winch,  
pulling force up to 160 t

For power and broadband cables over long distances as well as **water and gas pipes** up to 355 mm Ø OD (in soft soils up to 450 mm Ø OD). Daily performance (meters installed) with a ploughing unit can **exceed 5.000 m** with only a small start and construction pit.

FRANK  
FÖCKERSPERGER

GSTT

## High speed pipe and cable ploughing technology for open te

made  
in  
Germany

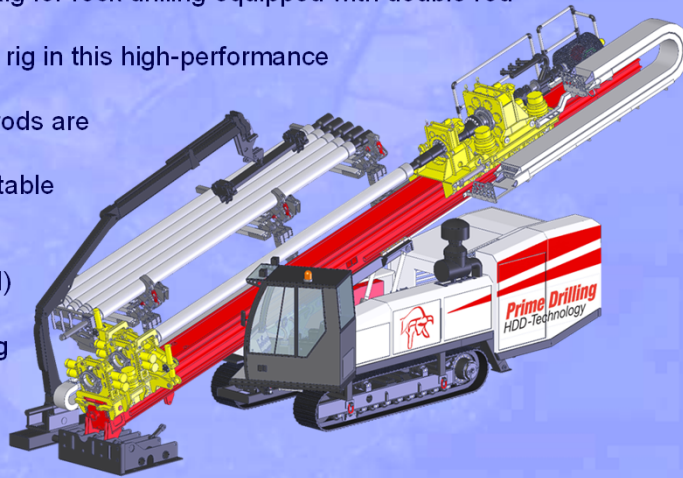


## HDD - Rock Drilling Rig

made  
in  
Germany

with Prime Double Rod System and „on board“ pump

- HDD-Compact Rig for rock drilling equipped with double rod magazine
- First rock drilling rig in this high-performance category (> 50 t)
- Inner and outer rods are independently
- driven by two flotate rotary heads
- high torque (up to 90,000 kN)
- Use of any common locating system possible
- Application with standard drill pipes



Prime Drilling  
HDD-Technology

CSTT

**HDD - Rock Drilling Rig** made in Germany

**Prime Drilling**  
HDD-Technology

**GSTT**

**Guided Auger Boring with Front Steer and Optical Path in Extremest Ground Conditions** made in Germany

Hole Opener  
Bentonite HDPE Pipes  
Casing  
Auger

**Bohrtec**

**GSTT**



Guided Auger Boring with Front Steer and Optical Path in  
Extremest Ground Conditions

made  
in  
Germany



Bohrtec

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Guided Auger Boring with Front Steer and Optical Path in  
Extremest Ground Conditions

made  
in  
Germany

Here the construction as a pedestrian umbrella underpass



Bohrtec

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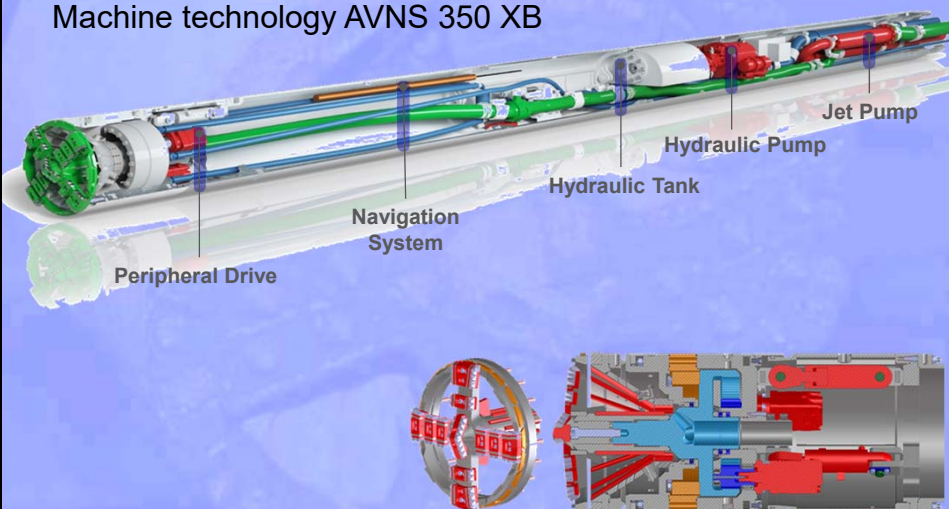


Requirements by Transition System Operator (TSO).

- Limited job site, construction roads, preparation area
- No heavy equipment between launch and reception point
- Steerable installation of casing pipes for AC & DC lines
- Length: 1.000m – 1.500m
- Depth: 1,5 m to 4 m, constant
- Diameter: approx. DN 250 – DN 400
- Casing material: plastic, non-conductive, e.g. PEHD
- Distance between lines: 1 m – 2 m, constant








Machine technology AVNS 350 XB



Trenchless underground cable construction **EPOWER PIPE** made in Germany

Principle

1. Pilot Bore with steel pipes
 
2. Removal of machine, jacking frame turned by 180°
 
3. Mounting of a pullhead for pull-in of casing pipe
 

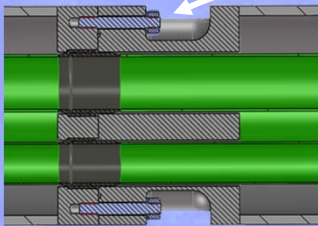
HERRENHECHT  

Trenchless underground cable construction **EPOWER PIPE** made in Germany

Steel pilot pipes & connection principle

Pilot pipe length: 9 m

Interlocking position for Jacking frame

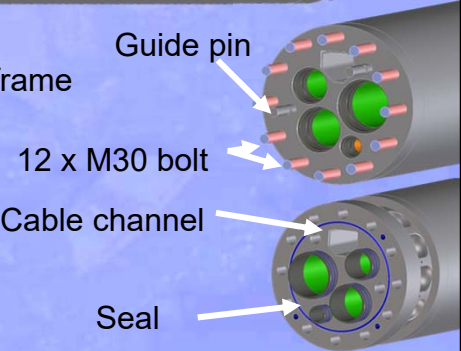




Guide pin

12 x M30 bolt

Cable channel

Seal



HERRENHECHT  

## Jacking Pipes - vitrified clay pipes

made  
in  
Germany

### INTERMEDIATE JACKING STATION FOR VITRIFIED CLAY JACKING PIPE DN 1200

- second Job site: Peine (Germany), Dungenbeck
- Length 260 m, DN 1200
- ground condition: gravel, sand and ground water level 0,5m under earth surfaces
- construction company: STRABAG Germany



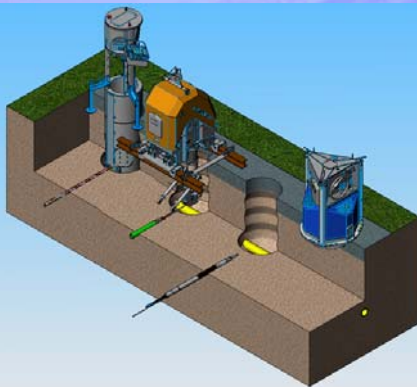
STEINZEUG  
KERAMO

GSTT

## Keyhole-Technology + Trenchless Technique

made  
in  
Germany

### A Tiny Circle - the Construction Pit of the Future



#### Application range:

- installation of new property service connections with non-directional **GRUNDOMAT impact moles**
- installation of new property service connections with the directional drill rig **GRUNDOPIT-K**
- replacement of new property service connections with the cable winch **GRUNDOTUGGER**
- sleeve sealing of cast iron and steel lines
- repair of high pressure PE pipe lines
- insertion of survey slots
- pipe line inspection
- corrosion protection sacrificial anodes

Where the keyhole technique is applied, surface damage and consequential costs only too well known from open trench installation methods are insignificant. The performance of soil and surface works is safer, more productive and less elaborate. Inspection of the construction pit is not required.

TRACTO-TECHNIK

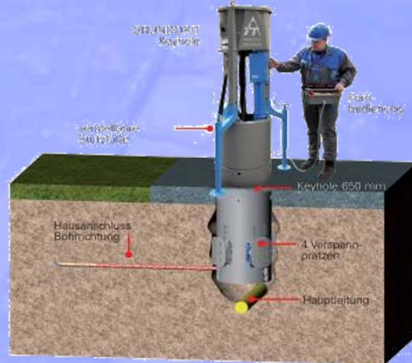
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## Keyhole-Technology + Trenchless Technique

made  
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Germany

### Establishing a keyhole using a core drill



- the core drill CD 650 bores a hole of 650 mm in diameter in the road surface.
- after all other jobs are done, the bore core yielded in this working step is reinserted into the road surface, fitting perfectly.
- a suction excavator takes up the soil covering the main line
- installation of the Pit K rig and performance of the bore with wall duct into the basement
- connection with the main line is carried out above the surface.



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## Trenchless Innovations from Germany

We invite you, to visit the NO DIG BERLIN 2019 in conjunction with WATER BERLIN INTERNATIONAL.

Here you can see life the newest Trenchless Innovations from Germany



Symposium and Exhibition  
26 – 28 March 2019  
[www.NODIGBERLIN.com](http://www.NODIGBERLIN.com)  
Berlin Exhibition Grounds

2017 would transported 600  
Visitors with 15 busses  
to 12 sitesites

made  
in  
Germany

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Trenchless Innovations from Germany

**Thank you for your attention**

Dr.-Ing. Klaus Beyer  
Executive Director

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