

Trenchless Innovations from Germany

made in Germany



Dr.-Ing. Klaus Beyer  
Executive Director

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

**GSTT**

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**TRENCHLESS ASIA 2018**  
7<sup>th</sup> May 2018, Kuala Lumpur



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**GSTT**



*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.*

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





- Inspection
- Repair / Renovation
- Renewal / New Construction

- Inspection
- Repair / Renovation
- Renewal / New Construction



## 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° from DN 80

Able to negotiate bends  
87° from DN 100

Camera diameter  
56 mm.

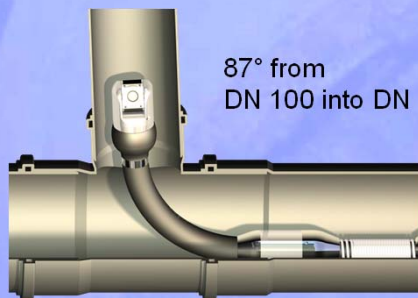


ritec

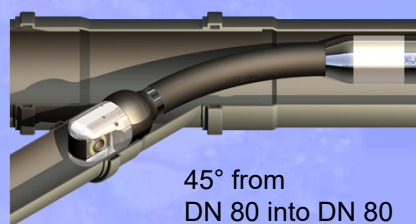
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## CCTV-Inspection for small diameter HD pushing with water

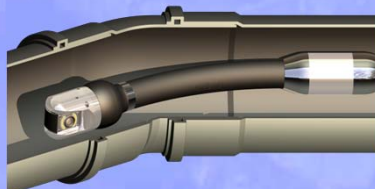
made  
in  
Germany



87° from  
DN 100 into DN 100



45° from  
DN 80 into DN 80



Pan & tilt camera head and  
unimpeded view

ritec

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## 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-seawage measurement ASYS 3D**



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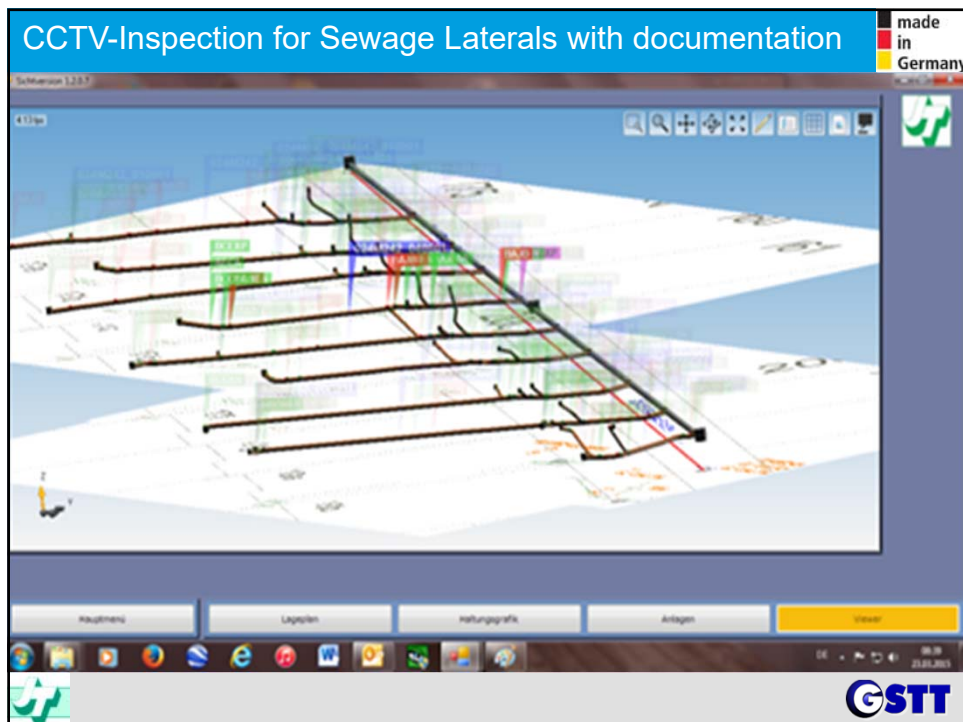
## CCTV-Inspection for small diameter HD pushing with water

made  
in  
Germany



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## LATERAL PREPARATION SYSTEM

made  
in  
Germany

### 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



IMS  
Robotics

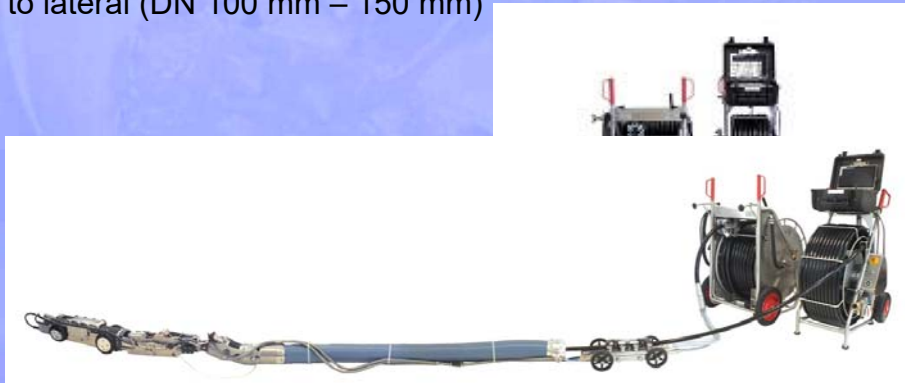
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## LATERAL PREPARATION SYSTEM

made  
in  
Germany

### SEWER to LATERAL (STL)

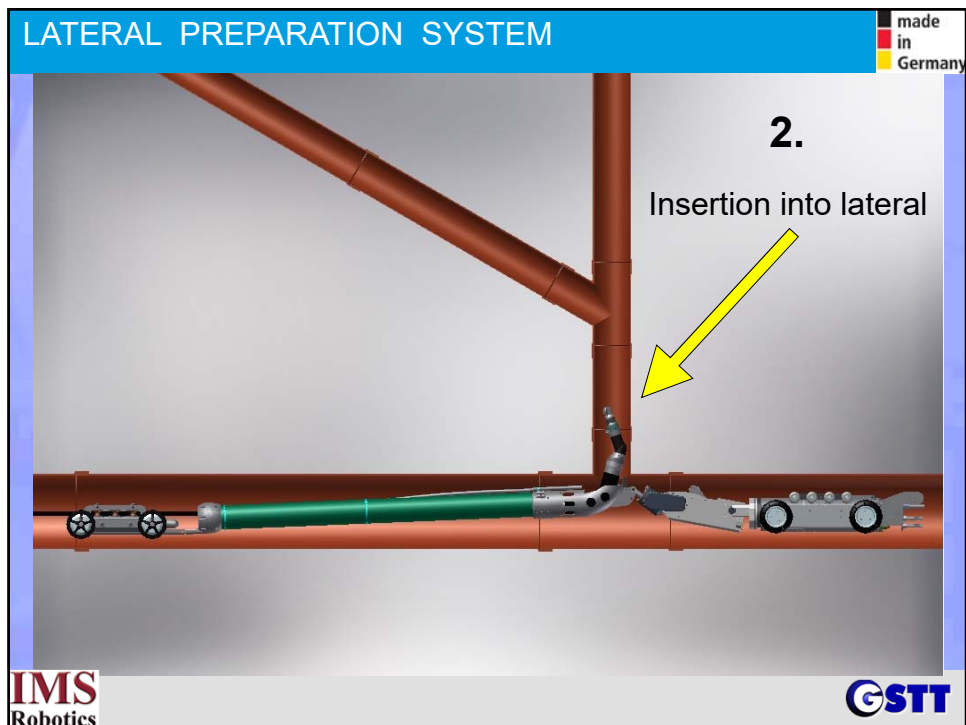
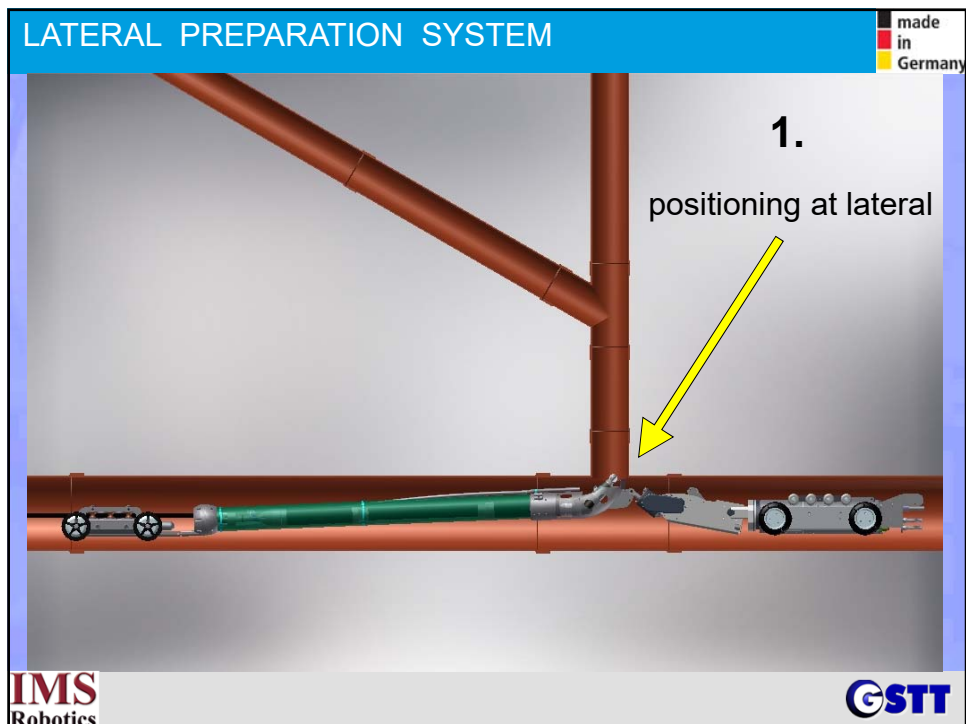
WORLDWIDE UNIQUE SATELLITE SYSTEM  
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IMS  
Robotics

GSTT









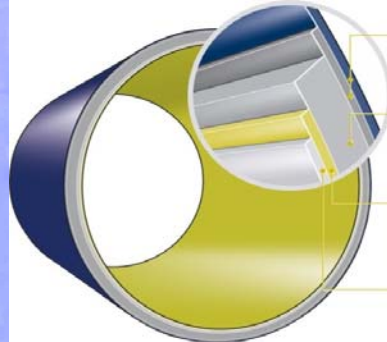


## CIPP - Cured-in-place pipe rehabilitation with double wall



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

**RELINEEUROPE®**



## 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 - Cured-in-place pipe rehabilitation of pressure pipes



- ❖ A new company in the RELINE UV®-Group since January 2017
- ❖ APTEC = Advanced Liner Technology for Pressure Pipes
- ❖ Development and manufacturing of UV light-curing GRP hose liner for rehabilitation of pressure mains
- ❖ Offering system solutions for no-dig rehabilitation of
  - ❖ Pressure drainage pipelines (sewerage, fire water mains, industrial and raw water)
  - ❖ Gas pipelines
  - ❖ Potable water pipelines

**RELINE**APTEC  
Advanced Liner for Pressure Pipes



## Rehabilitation of pressure pipes with **The Primus Line® system**



**The Primus Line® system** is a trenchless technology for the rehabilitation of pressure pipelines for different applications such as water, gas and oil.

- Long installation lengths of up to 2,500 m per pull and bends of up to 45 degrees
- Pressure rates with up to 82 bar, independent from host pipe
- Small footprint and minimal equipment requirements
- Factory produced product: No curing, steaming or adhesion process
- Life span of 50 years

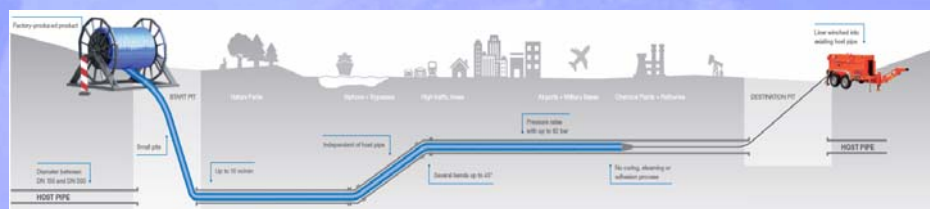
**PRIMUS**  **LINE**





## Rehabilitation of pressure pipes with The Primus Line® system

made  
in  
Germany



- Long installation lengths of up to 2,500m per pull and bends of up to 45 degrees
- Pressure rates with up to 82 bar, independent from host pipe
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- Life span of 50 years

PRIMUS LINE

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## CIPP - UV curing technology for Drinking Water

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in  
Germany

### 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

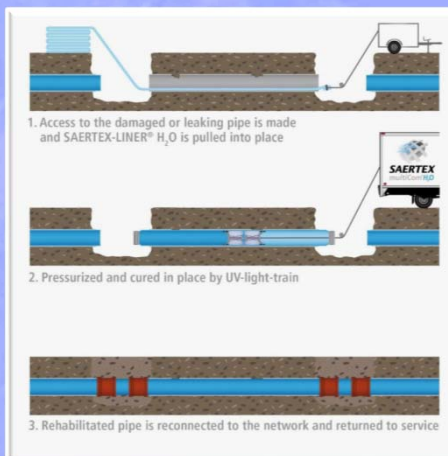
Due to high mechanical properties

- 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.



SAERTEX  
multiCom H<sub>2</sub>O

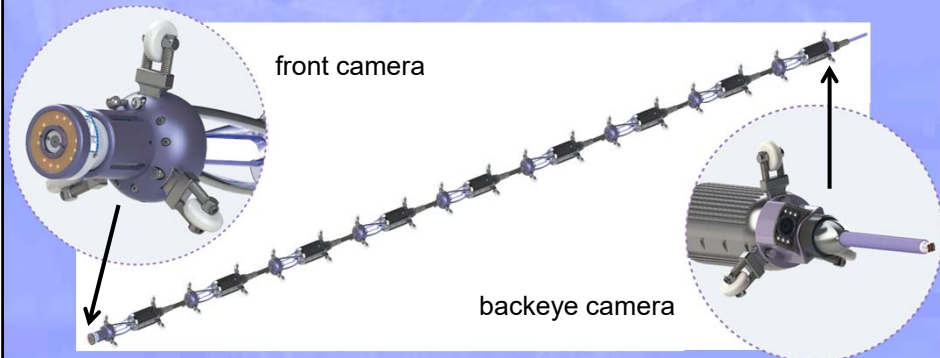
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## New UV System for Renovating Drinking-water Pipelines



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.

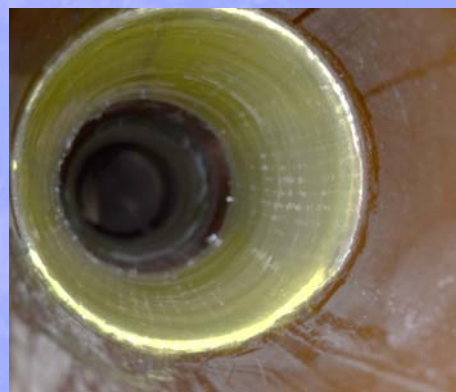


## UV-Patch System for short liners



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





## STREET TO HOME

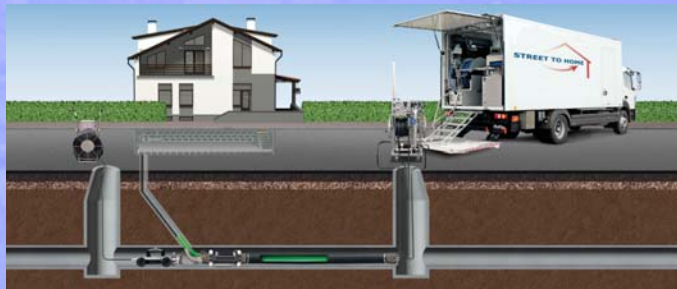
made  
in  
Germany

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®  
Cleaning • Robotic • WPT  
Lining Systems

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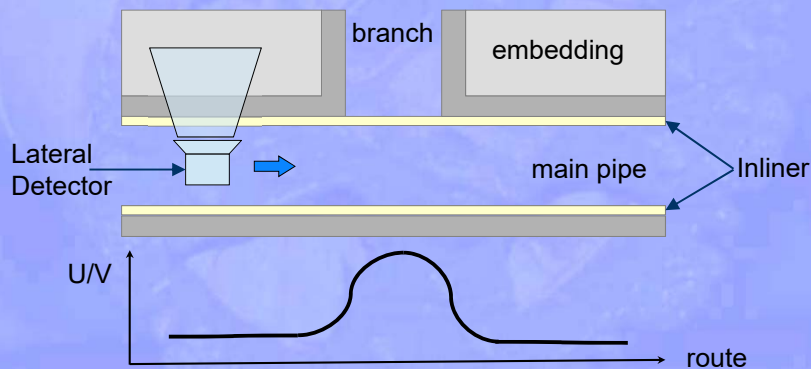
## CIPP – Lateral detector

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### 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

CSTT



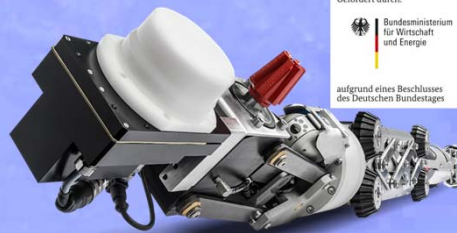
## CIPP – Lateral detector



### 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

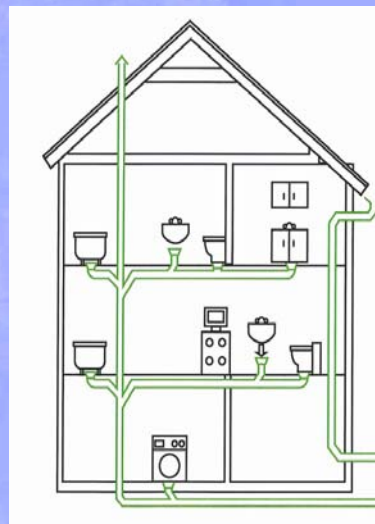
IBAK  
robotics

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## pipe rehabilitation with spraying method for small diameter



- 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

Zugrichtung

Welle

Verschmutzung

Wasserschlauch

Kettenfräskopf

Zugrichtung

Rotationsdüse

Welle

Restwasser/Schmutzpartikel

sprayliner

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pipe rehabilitation with spraying method for small diameter

made in Germany

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

sprayliner

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Manhole rehabilitation technologies

made in Germany

cleaning equipment

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



HERMES TECHNOLOGIE

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Manhole rehabilitation technologies

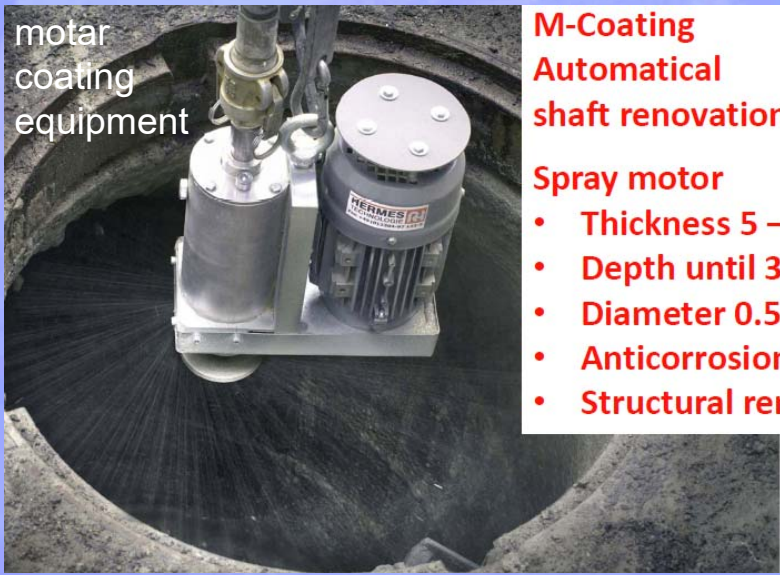
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motor coating equipment

**M-Coating Automatical shaft renovation**

**Spray motor**

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



HERMES TECHNOLOGIE

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## Manhole rehabilitation technologies

made  
in  
Germany

motar  
coating



M-Coating after  
partial coating with  
ERGELIT

HERMES  
TECHNOLOGIE

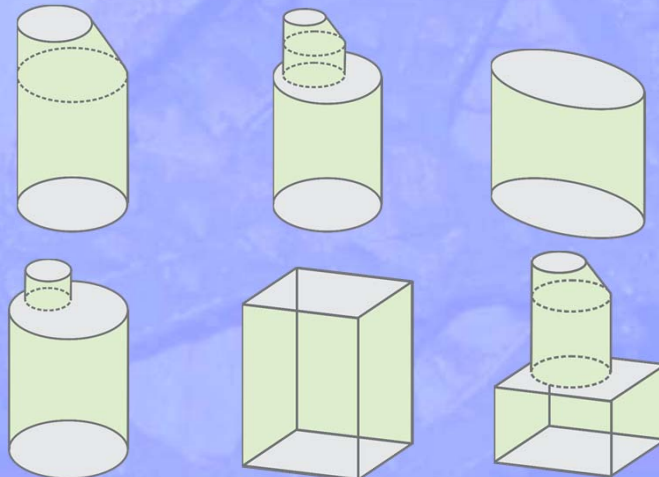


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## Manhole rehabilitation technologies

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Germany

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



VERTILINER®

GSTT



## Manhole rehabilitation technologies

made  
in  
Germany



VERTILINER®

CSTT

## Manhole rehabilitation technologies

made  
in  
Germany



VERTILINER®

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## Trenchless Innovations from Germany



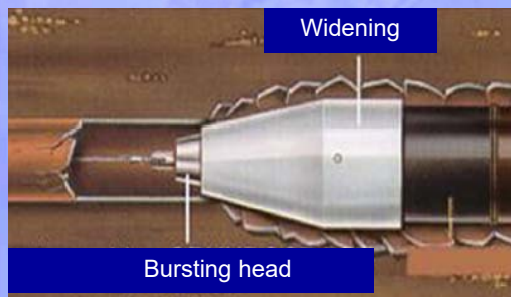
- Inspection
- Repair / Renovation
- Renewal / New Construction



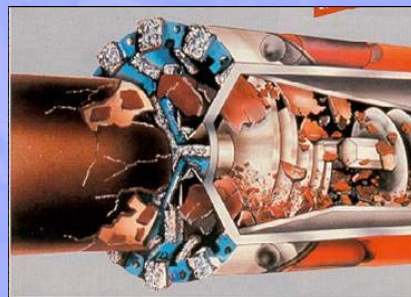
## PRM – Pipe Replacement Method



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

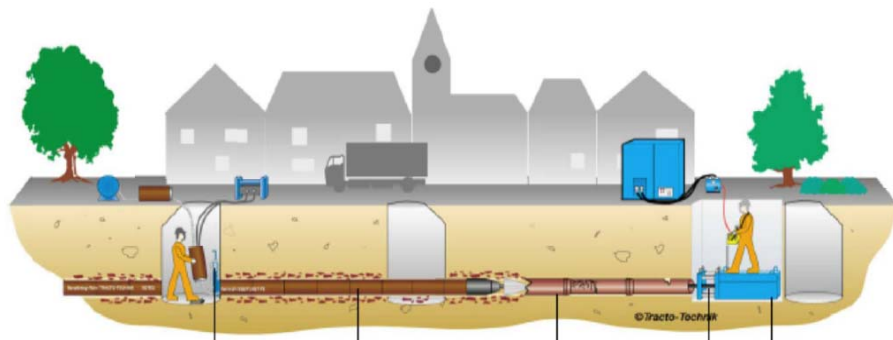


## PRM – Pipe Replacement Method

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### 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

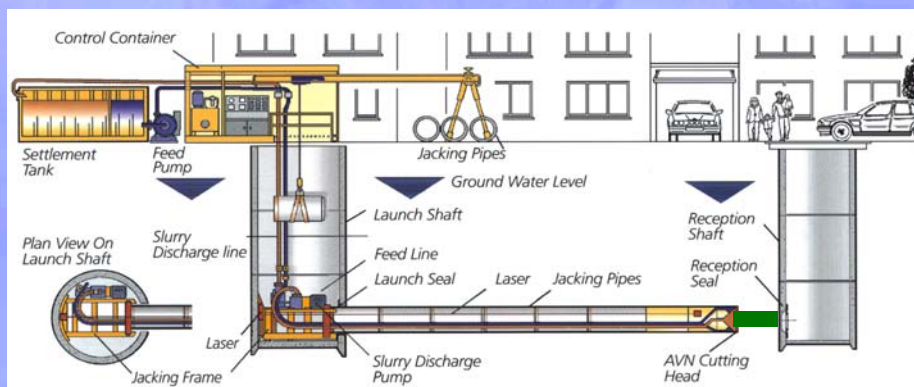
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## PRM – Pipe Replacement Method

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### Pipe Eating systems

technical perfected systems  
...but too long construction time



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## PRM – Pipe Replacement Method



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:

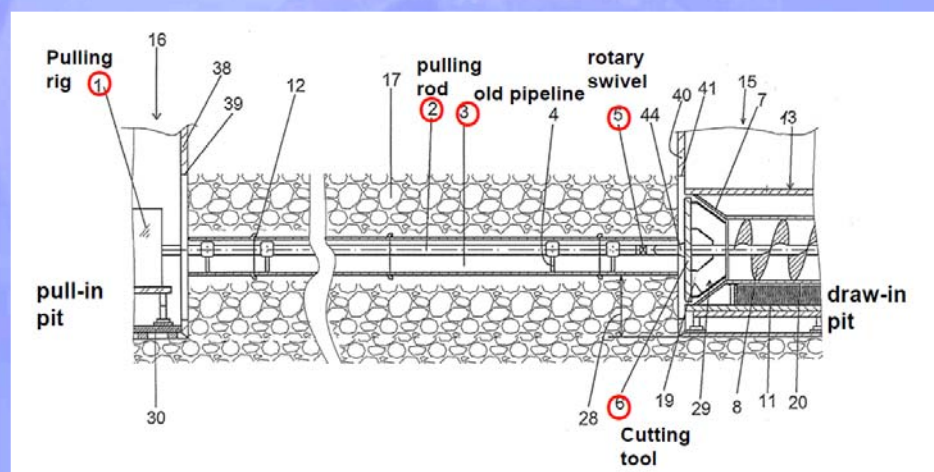
set up 1.0 d, pulling process 1.0 d, dismantling 0.5 d  $\Sigma$  2.5 d

60 % - 80 % lower construction time!

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## PRM – Pipe Replacement Method



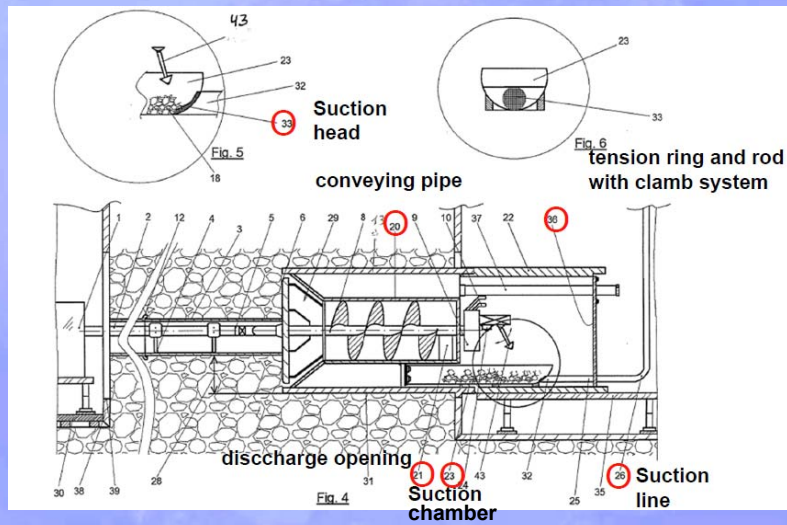
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## PRM – Pipe Replacement Method

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removal of drilled material is done with a suction excavator

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## PRM – Pipe Replacement Method

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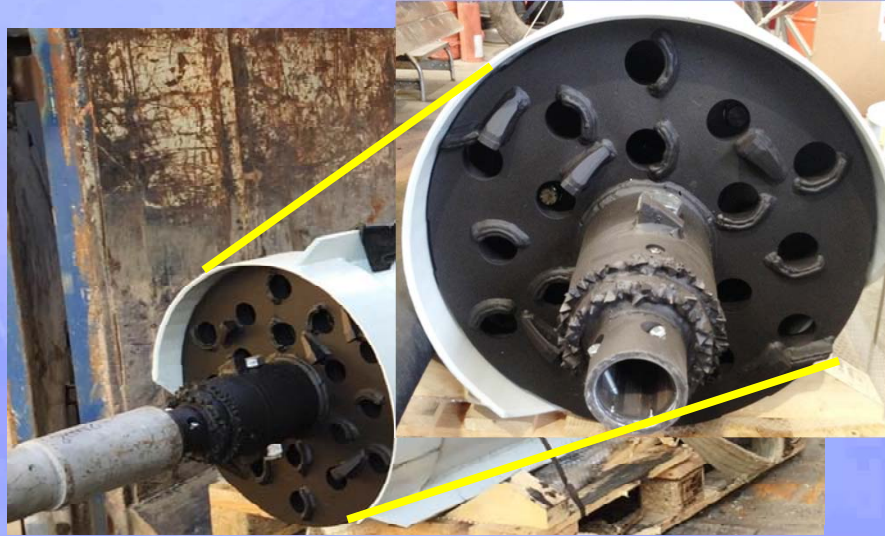
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## PRM – Pipe Replacement Method

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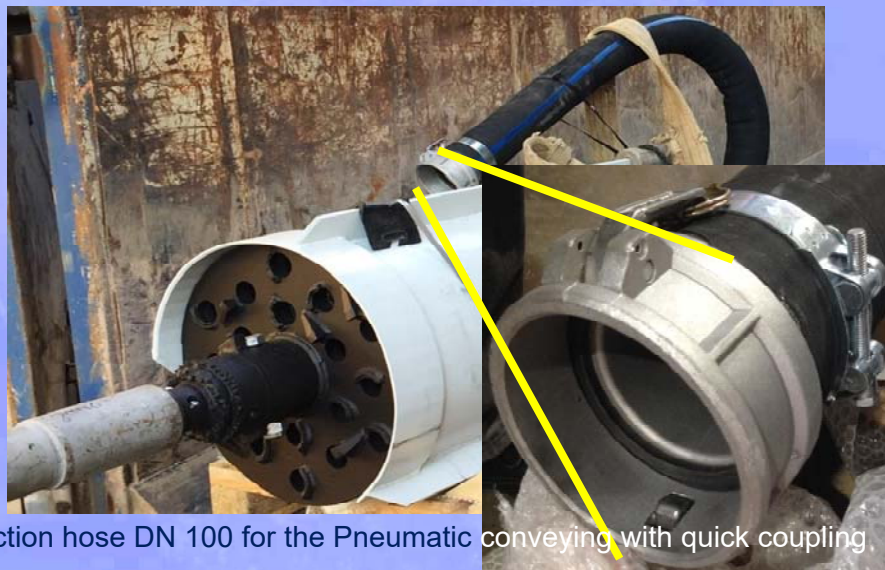
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## PRM – Pipe Replacement Method

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

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

The diagram shows a yellow truck-mounted suction excavator. The components labeled are:

- Computer-optimized sound-absorbing unit
- efficient micromesh filter
- patented separation system
- standard radio remote control
- high performance fan
- resistant tilting container
- integrated compressor
- hydraulik driven Articulated hose carrier

**Suction Excavator - patented suction principle**

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

The collage shows various applications of suction excavators:

- CIVIL ENGINEERING** (Red background)
- DISPOSAL** (Green background)
- CLEANING OF FLAT ROOFS** (Orange background)

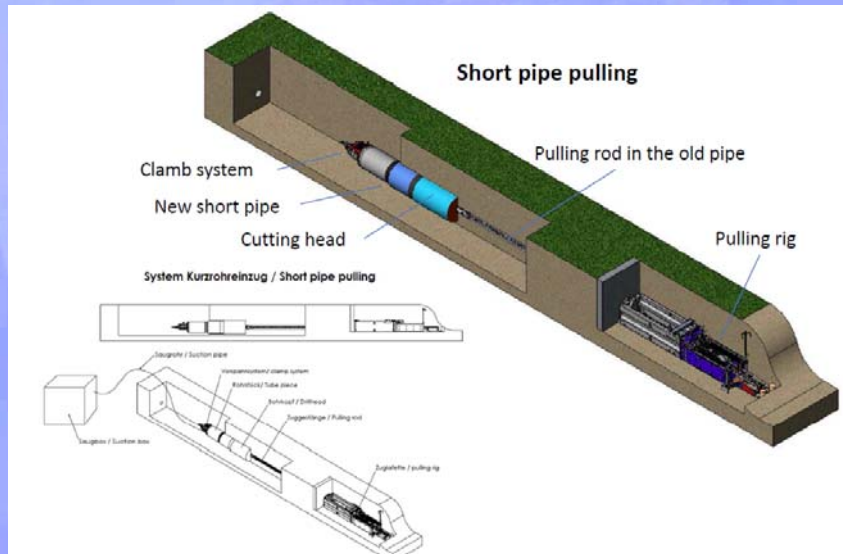
Other images show workers using suction excavators for trenching, pipe replacement, and debris removal.

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## PRT – Pipe Replacement Technology

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in  
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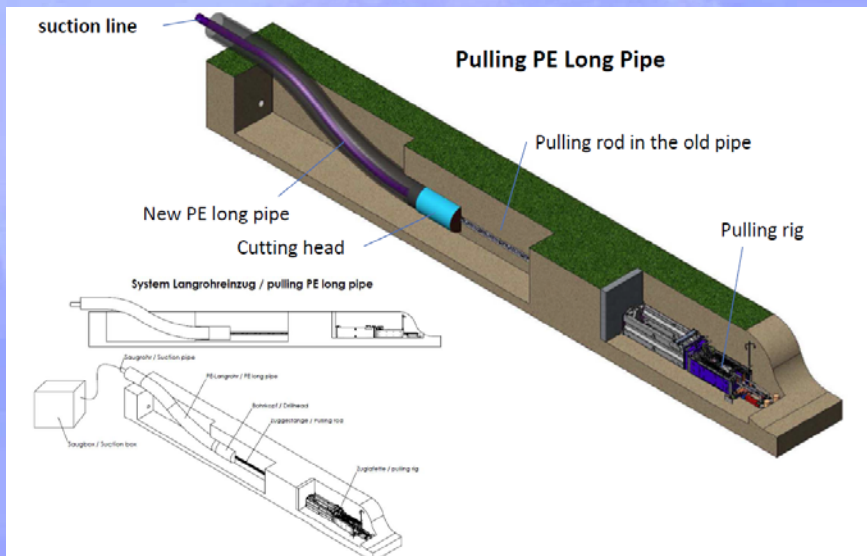


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## PRT – Pipe Replacement Technology

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## PRM – Pipe Replacement Method

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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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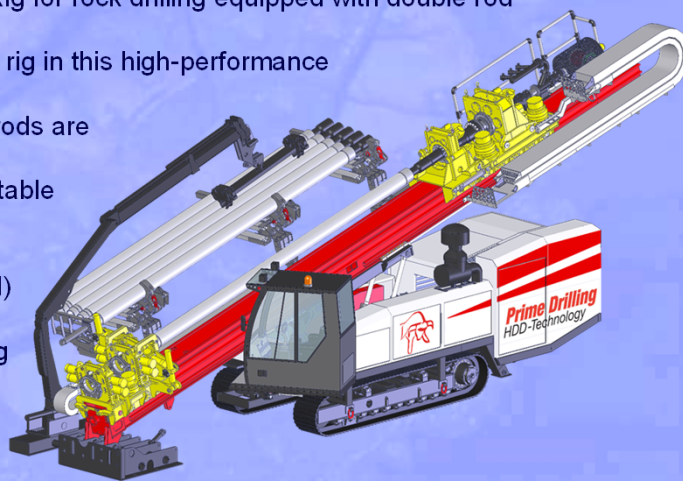
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## HDD - Rock Drilling Rig

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 flutable 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

GSTT



## HDD - Rock Drilling Rig

made  
in  
Germany

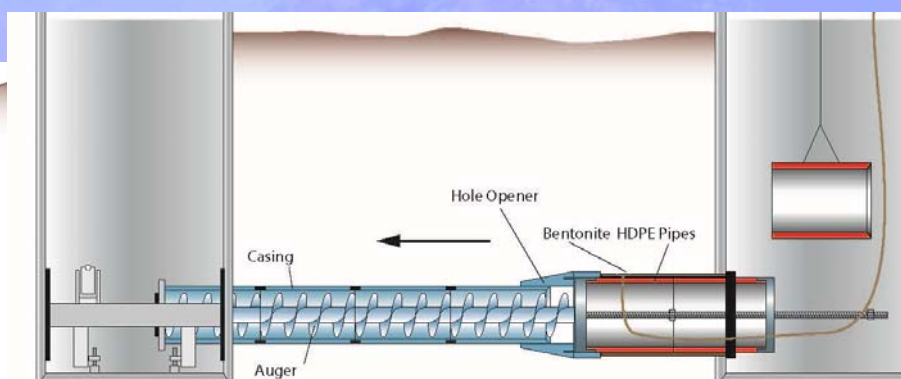


**Prime Drilling**  
HDD-Technology

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

made  
in  
Germany



**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  
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Here the construction as a pedestrian umbrella underpass



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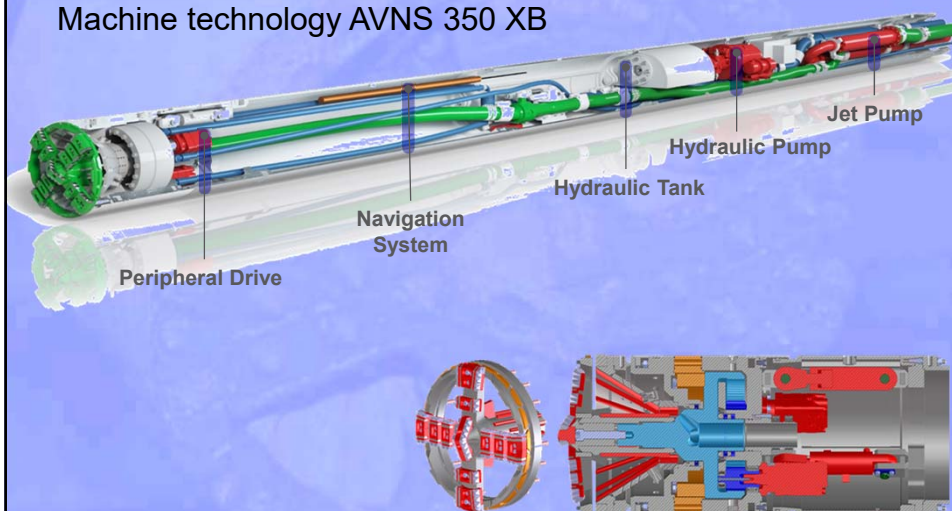


### Requirements by Transition System Operator (TSO).

- 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





### Principle

1. Pilot Bore with steel pipes



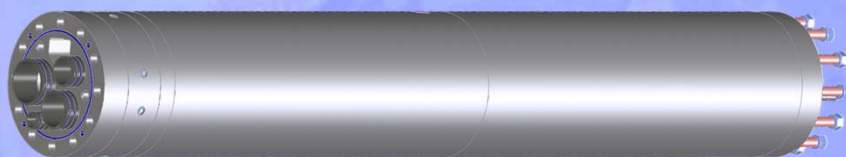
2. Removal of machine, jacking frame turned by 180°



3. Mounting of a pullhead for pull-in of casing pipe

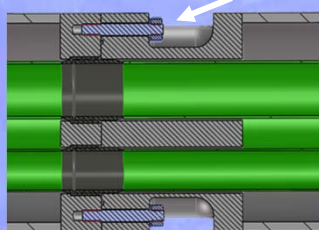


### Steel pilot pipes & connection principle



Pilot pipe length: 9 m

Interlocking position for Jacking frame

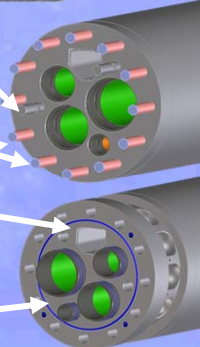


Guide pin

12 x M30 bolt

Cable channel

Seal

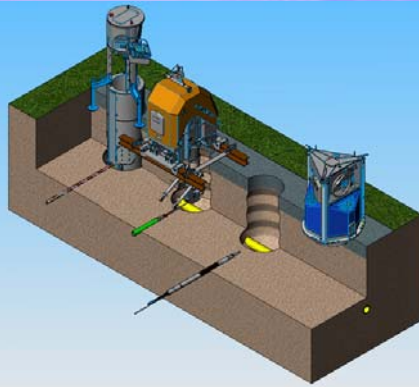




## Keyhole-Technology + Trenchless Technique



### 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

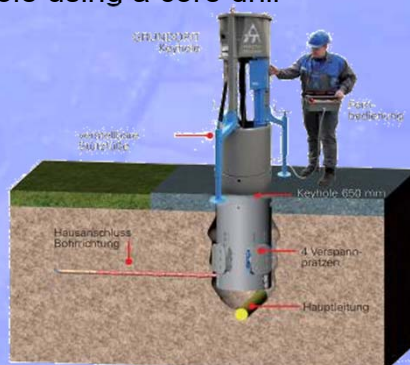
Where the keyhole technique is applied, surface damage and consequential costs only too well known from open trench installation methods are insignificant. The performance of soil and surface works is safer, more productive and less elaborate. Inspection of the construction pit is not required.



## Keyhole-Technology + Trenchless Technique



### 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.





## 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  
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## Trenchless Innovations from Germany

# Thank you for your attention

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