



Trenchless Technology

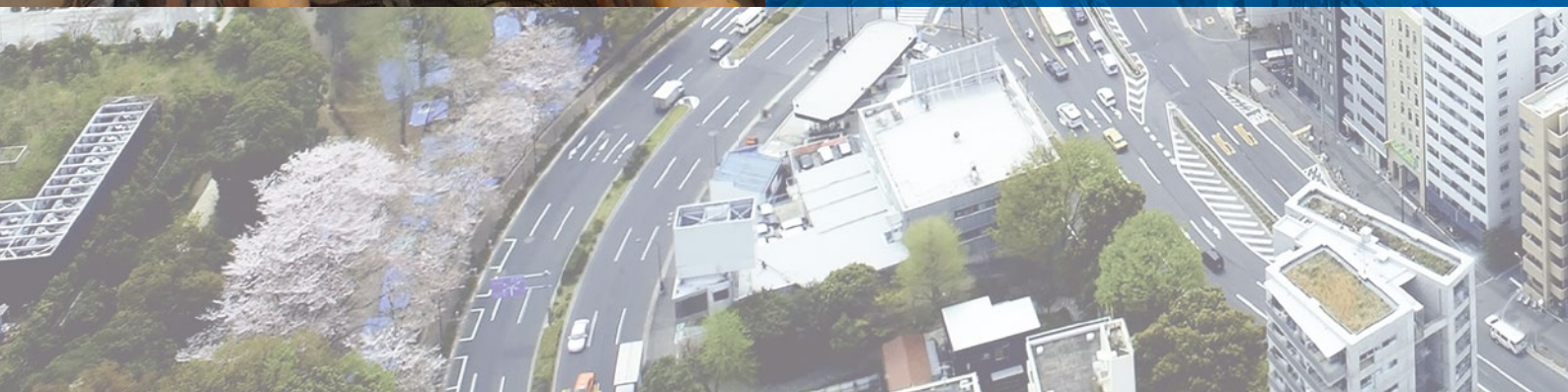
Trenchless Technology



Aljustrel, Portugal

YOUR BENEFITS

- Family-owned company with more than 80 years of experience in the construction industry
- Experienced and reliable construction company completing all projects
- Minimum underground works
- Minimum surface works
- Minimum traffic disruption
- Short construction times
- Minimum impact on residents
- No groundwater lowering
- High operational and working safety
- Environmentally friendly



Ludwig Pfeiffer is a German family-owned company, established in 1933 which focused on the new construction of water supply and waste disposal networks. Today, as a full EPC contractor, we operate in more than 30 countries worldwide, adopting the latest technologies both for open cut and trenchless works.

Our activities cover the whole water cycle, from extraction and capture, through transport, treatment and distribution up to collection, treatment and disposal (including outfall). Our activities also include other types of networks such as gas and district heating. We provide turnkey solutions for the construction, extension and improvement of new networks, pumping stations and complete treatment plants. Furthermore, we specialize in repair and rehabilitation of existing networks using our large portfolio of solutions of trenchless technologies.

Regardless of project type or size, we pursue an intelligent approach using state-of-the-art, sustainable technology. Our customers benefit from more than 80 years of experience and know-how. Offering the full range of available methods, we can handle every project – from individual household connections to the construction of whole plants, on any continent.

Diverse and flexible, our solutions will always meet the specific and challenging requirements of your project.

Everything from a single source.



Sea outfall in Catania, Italy

The specialist for your projects

Our services

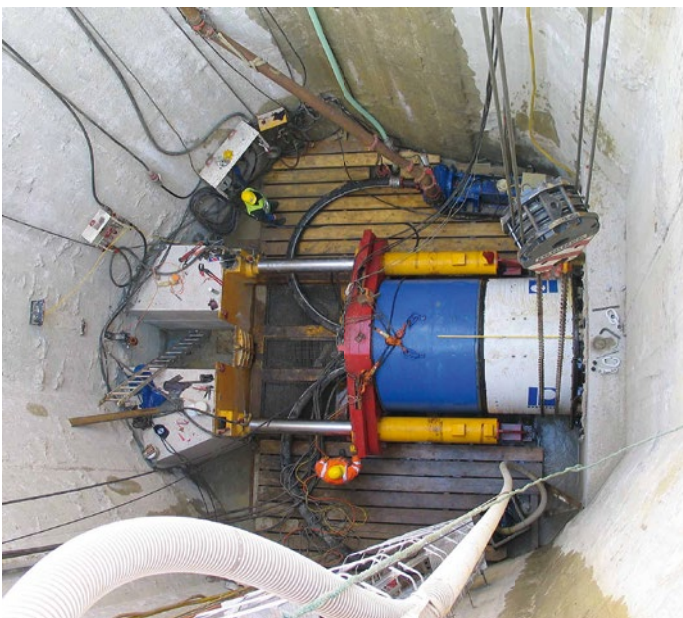
Ludwig Pfeiffer specialises in trenchless construction. We provide complete solutions for your projects, from design to completion. Solving the toughest problems is what we do every day.

DESIGN AND ENGINEERING

- Feasibility studies
- Soil tests
- Surveying
- Network layout and profile design
- Detailed planning
- Selection of pipeline materials
- Hydraulic calculations
- Pipeline statics
- Statics for launching and receiving shafts

PROCUREMENT

- Local or factory pipe manufacturing
- All materials (e.g. reinforced concrete, clay, steel, plastic)



Launch shaft, Paris, France



Arrival shaft at Lisbon Airport, Portugal

EXECUTION

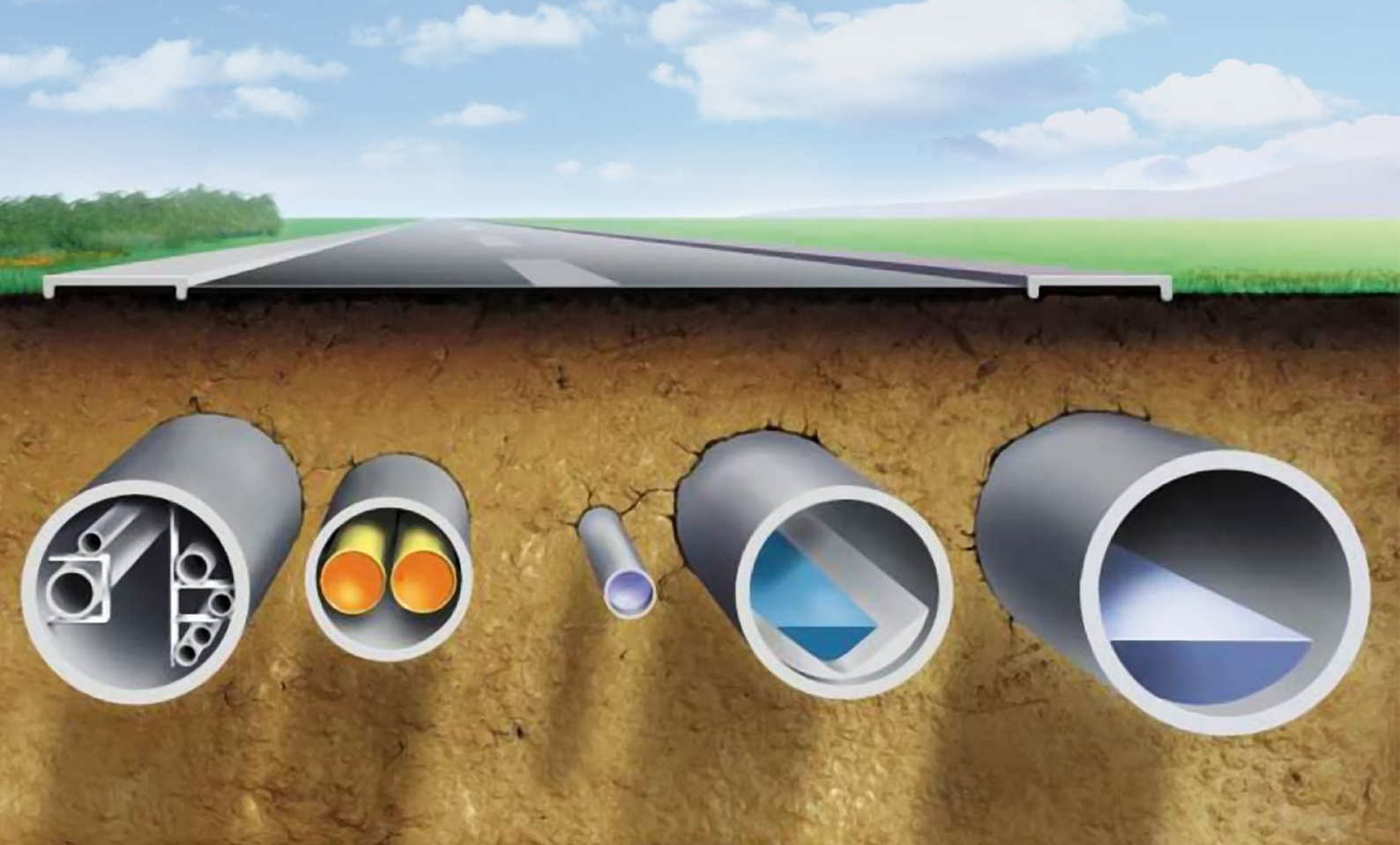
- Construction of launch and arrival shafts
- Manufacturing pipes on site
- Microtunnelling
- Horizontal Directional Drilling (HDD)
- Auger boring
- Direct Pipe
- Construction of structures and shafts
- Insertion of supply lines
- Surface restoration

PROJECT MANAGEMENT

- Quality control
- Settlement measurements
- Documentation
- Approval



Microtunnel project in front of Jerónimos Monastery in Lisbon, Portugal



Schematic depiction of supply lines

Microtunnelling

Microtunnelling allows the trenchless installation of small to medium diameter service pipelines in situations where an open-cut solution would be impractical, dangerous or nearly impossible.

APPLICATION AREAS

- In challenging and changing geological conditions
- Below water level
- Where space is tight, e.g. in city centers
- To cross waterways, mountains and nature reserves
- To cross roads, airports and railway tracks
- To cross beneath buildings and foundations
- For river and sea outfalls
- Intake and discharge pipes at hydropower or desalination plants
- For driving long pipe sections
- Where precise curved paths involving one- or two-dimensional curves are required
- To cross and master natural and artificial obstacles
- Pipe lengths over 1,000 meters



Launch shaft for a microtunnel in Catania, Italy

MICROTUNNEL

Microtunneling technology has a wide range of application for:

- Pressure pipes for water and sewage
- Protective casing pipes for:
 - Water, stormwater and wastewater networks
 - Oil, gas and heating pipelines
 - Service pipelines (electricity and communications)
- Utility tunnels
- Escape tunnels
- Maintenance tunnels

MICROTUNNEL PIPES

Microtunneling uses special pipes which are made out of the following materials:

- Reinforced concrete with or without flume
- Composite reinforced concrete and plastic (e.g. GRP, PVC, Ceramic)
- Glass fiber reinforced plastic pipe (GRP)
- Vitrified clay
- Polymer concrete
- Steel
- Polymer concrete
- Ceramics (vitrified clay)
- Steel



Completed utility tunnel with kerosene pipe, crossing a runway at Lisbon Airport, Portugal

The method

Microtunnelling is an efficient and environmentally friendly alternative to conventional pipeline construction using the cut-and-cover method that is used in challenging conditions.

It uses pipes with an outside diameter of up to about 4 m, which are driven from a launching shaft to a receiving shaft. The microtunneling boring machine is driven by a hydraulic or electric motor and has a cutter head to excavate the ground material. A crushing cone crushes the larger particles into smaller sizes to transport through the slurry lines. The slurry cleaning system removes the spoil from the slurry water, allowing the drilling suspension to be reused. Hydraulic jacks are mounted in the launching shaft and are pushing the pipeline forward to the receiving shaft. A laser-controlled guidance system monitors the machine's position. This and other information is being transmitted through wire cables to a control cabin located on the surface. Precise control allows driving into the receiving shaft with a minimal degree of tolerance.





Microtunnelling near the
Palace of Versailles, France

Jacking pipe

Bentonite lubrication

Laser target for laser navigation

Steering cylinder

Cutter head with cutting knives and disc cutters

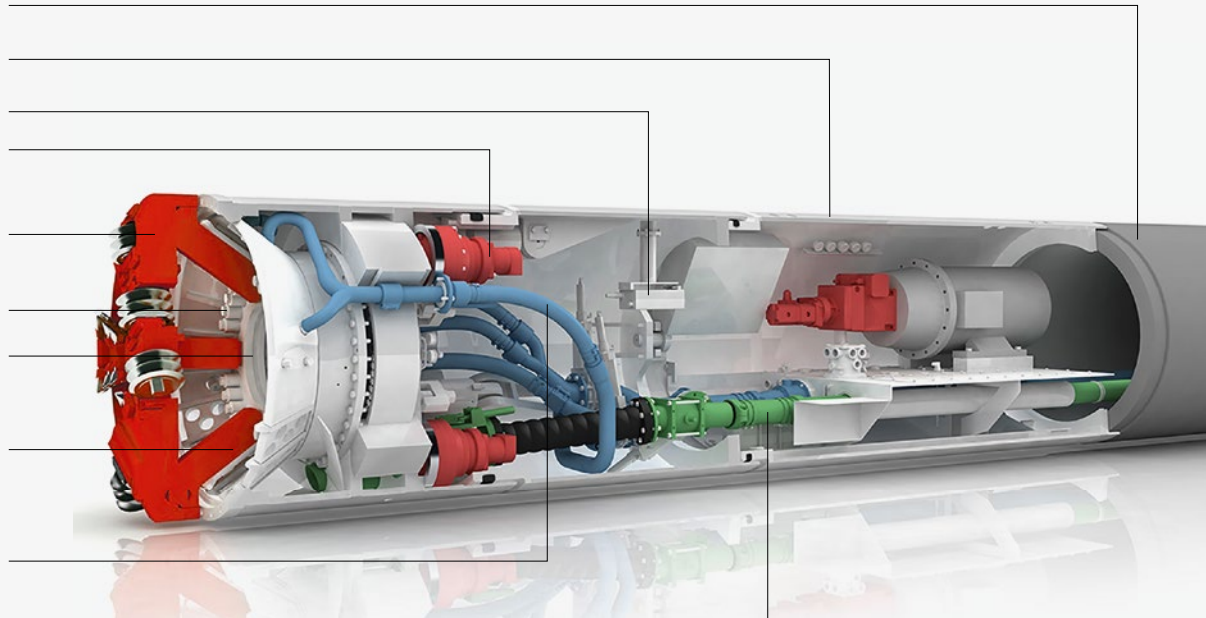
Water jets

Access door

Cone crusher

Feed lines

Slurry line



State-of-the-art technology

THE RIGHT CUTTER HEAD FOR EVERY SOIL TYPE

Depending on the geology the appropriate cutter head is selected:

Standard cutter head for stone-free and gravelly soil



Mixed-soil cutter head for gravelly and stony soil



Cutter head for rock



SOIL SEPARATION

Various desanding options are available to separate the drilling fluid from the soil:

- Coarse and fine screens
- Cyclones
- Centrifuges
- Filter press



Separation plant, Lisbon, Portugal

OVERCOMING OBSTACLES

Having to replace tools during longer drives does not mean having to interrupt perforation: a door inside the tunnelling machine provides access to the tunnel face if needed. Cutting tools can be replaced and maintenance or repair work can be executed. It is also possible to remove obstacles that cannot be drilled through such as unknown sheet piles.

Using air locks enables work to be carried out at the face itself, even under water pressure, below water table or in fluidized sand. This allows long drives in abrasive geological conditions and guarantees safe and accurate arrival at the target shaft.

LONG DRIVES

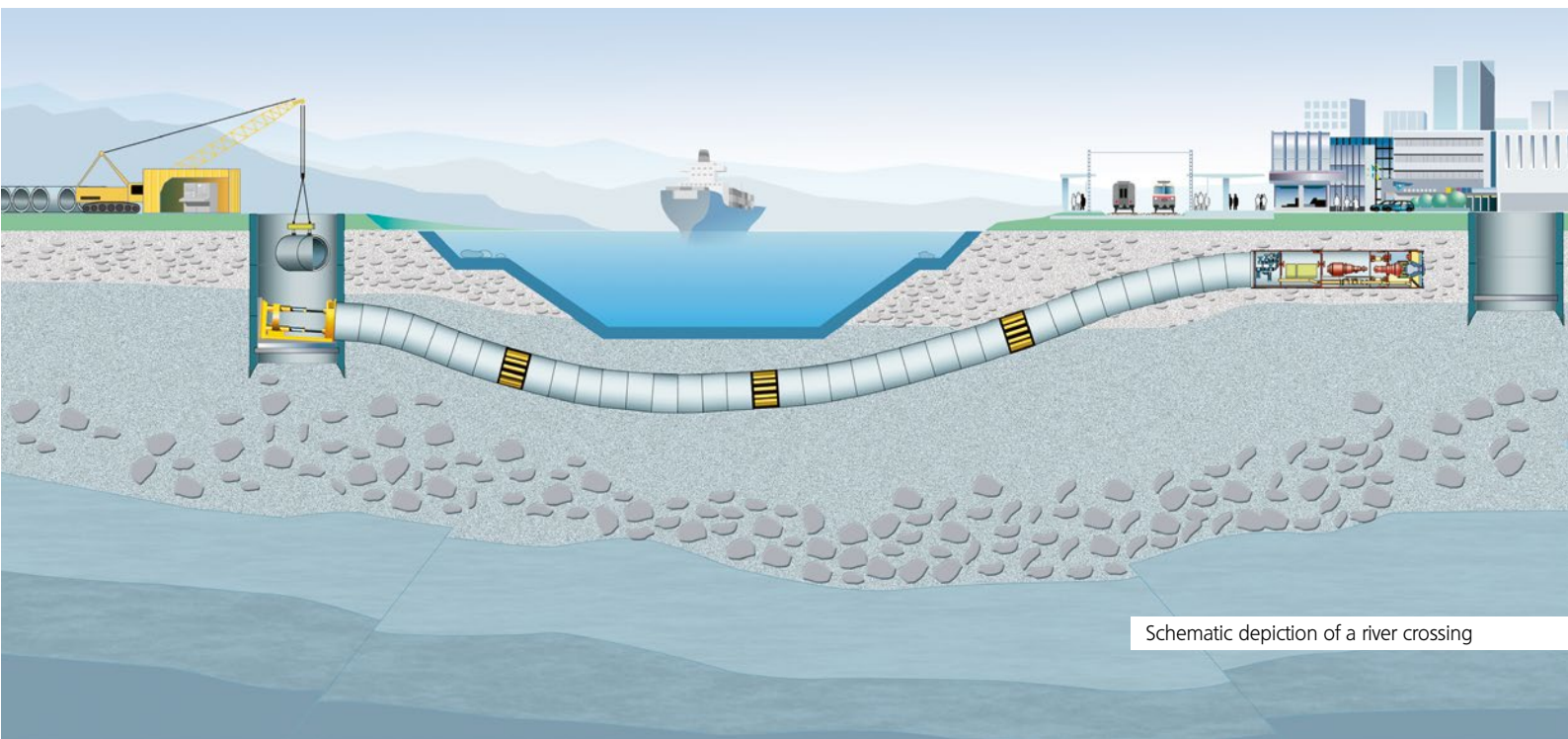
Depending on the diameter and the geological conditions, accessible drives of over 1,000 m are possible. A theodolite and laser station and a laser target determine the position, the longitudinal tilt and the roll of the cutter head. These ensure the required degrees of tolerance can be complied with, even in the case of long and curved drives. Low thrust pressures are achieved by the intermediate jacking stations together with a pressure and volume-controlled bentonite lubrication system that ensures the annulus around the pipe string is filled with bentonite at all times.



Barrage de Bimont, France

QUALITY

Constant quality checks, remote monitoring, complete documentation and quality assurance systems accompanying the drive, guarantee you a long-lasting structure.

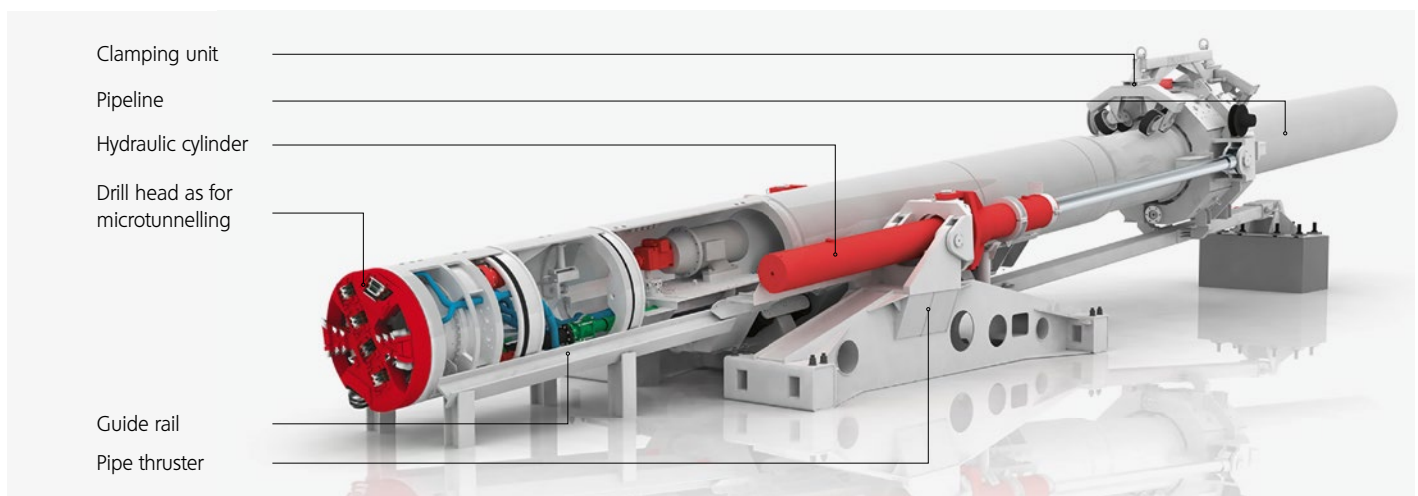


Schematic depiction of a river crossing



Commencing Direct Pipe Drilling

Direct Pipe



The pipeline is laid on roller blocks above ground and welded to a microtunnelling machine. A pipe thruster pushes the machine into the soil together with the pipes by means of a hydraulic clamping unit. Soil is excavated and removed in the same way as with the microtunnelling method. Control systems guarantee that upward and downward inclines and curved drives are no problem either. Pipelines are thus laid in a single step.

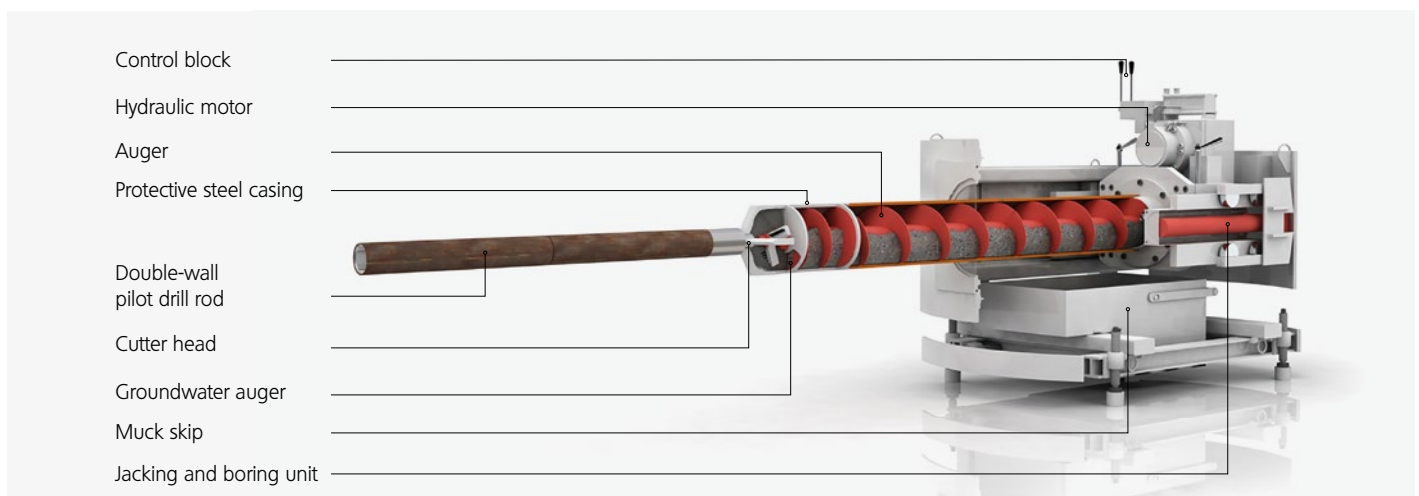
YOUR BENEFITS

- Ideal for pipe construction and sea outfalls
- Combines the benefits of HDD and microtunnelling
- Requires little space
- Short set-up and construction times
- Low costs
- High degree of precision
- No groundwater lowering required
- No shaft structures required
- Diameters 0.8 m – 1.5 m
- Permits lengths in excess of 1,500 m
- Can be used in any subsoil
- Minimal environmental impact



Launch shaft with auger boring in Italy

Auger Boring



The main range of Auger Boring application is underground pipe jacking with comparatively small diameters. The machines achieve high performances in displaceable, dry soft soils. The auger which is situated inside a steel casing, transfers the torque from the drive to the cutter head. At the same time, they transport the excavated material from the tunnel face to the launch shaft. Thus, the drill is driven into the ground pipe by pipe. In the receiving shaft, the steel casings are recovered as the product pipes are installed. The choice of steering methods depends to a great extent on the drive length as well as on the required degree of precision. Auger Boring is also suited to realize drills of up to three meters below the groundwater level.

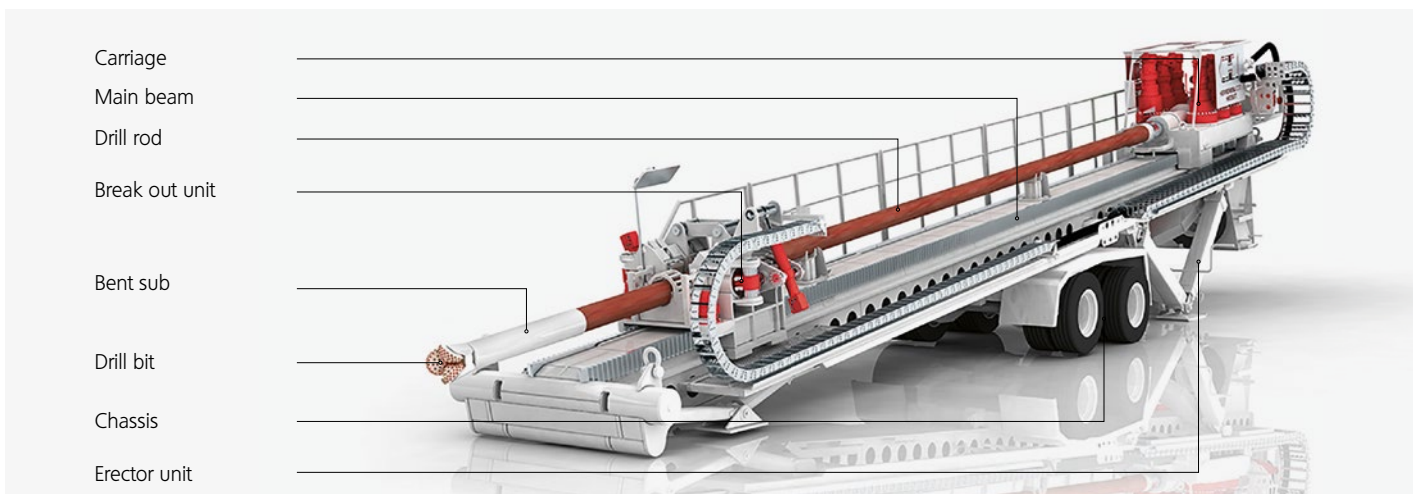
YOUR BENEFITS

- Very little space required
- Short set-up time
- Low costs
- High degree of precision
- Can be used up to 3 m below the groundwater level
- Diameters 0.1 m – 1.4 m
- Lengths up to 120 m
- Individual pipe lengths up to 18 m
- Minimal environmental impact



Using HDD, Phnom Penh Airport, Cambodia

Horizontal Directional Drilling



With Horizontal Directional Drilling (HDD), pipes are laid in three stages. First of all, the HDD rig powers a drill bit mounted on a rotating drill rod. A pilot hole is drilled from the start towards the end point. The drilled hole is supported with a bentonite suspension, which conveys excavated material to a separation plant. In the second stage, the hole is reamed by withdrawing the drill rod; it is then gradually expanded until it reaches the required diameter. Finally, the prefabricated pipe is connected to the drill rod at the exit point and pulled into the tunnel. During this process, bentonite minimizes the friction between the pipeline skin and the surrounding soil.

YOUR BENEFITS

- Requires little space
- Short set-up and construction times
- Low costs
- High degree of precision
- No groundwater conservation required
- Diameters 0.2 m – 2.0 m
- Lengths over 2,000 m possible
- No shaft required
- Pipes can be laid in curves
- Minimal environmental impact



Applying HDD in Dhaka, Bangladesh

Maximum working safety

While drilling is under way, the equipment required for new trenchless construction is operated by our specialists on the surface. Technicians only need to be deployed in the accessible tunnels for maintenance or repair purposes. Our employees receive regular training in accordance with current safety regulations.

Certified expertise

We understand quality as the best possible fulfillment of the performance promises we have given to our customers. Realizing top quality is a result of our continuous efforts and experience and by no means a routine job. We handle your entire project for you – planning, coordination, technology and construction – whether for water, gas, energy or district heating supply or the disposal of wastewater.

A wide range of certificates and licenses is ensuring our engineering and construction excellence. Company compliance with international standards and regulations is ensured by the application of our Quality, Environmental and Occupational Health and Safety Management Systems as received in:

- DIN EN ISO 9001:2008
- DIN EN ISO 14001:2004
- OHSAS 18001:2007





Ludwig Pfeiffer

At your service across the world.

In more than 30 countries worldwide.



We build pipelines and systems for water, wastewater and energy using open-cut method as well as the latest technologies for trenchless pipeline installation. Our services range from individual house connections to turn-key systems and include all nominal pipe diameters, pressure levels and materials. This makes us one of the few full-service providers in our sector – both within Europe and worldwide.



For further inquiries, please contact us!

contact@ludwigpfeiffer.com



LUDWIG PFEIFFER Germany
Lilienthalstraße 33
34123 Kassel
Phone +49 - 561 - 953 470
E-Mail kassel@ludwigpfeiffer.com

LUDWIG PFEIFFER Kyrgyzstan
Toktogula Street 212/1
Bishkek
Phone +996 - 555 - 370 123
E-Mail bishkek@ludwigpfeiffer.com

LUDWIG PFEIFFER Serbia
Kumodraska 241 b
11000 Belgrad
Phone +381 - 11 - 3982 667
E-Mail office@pfeiffer.rs

LUDWIG PFEIFFER Philippines
17 Lear Street, Filinvest East
Homes Cinta, Rizal 1900
Phone +63 - 917 - 846 9757
E-Mail philippines@ludwigpfeiffer.com

LUDWIG PFEIFFER Romania
Str. Aprodul Movila Nr. 15
300397 Timisoara
Phone +40 - 256 - 401 031
E-Mail office_tm@pfeiffer.ro

LUDWIG PFEIFFER Hong Kong
Unit A2- 10, 1/F, Phase 2 Hang Fung
Industrial Building, 2G Hok Yuen Street
Hung Hom, Kowloon
Phone +63 - 917 - 846 9757
E-Mail hongkong@ludwigpfeiffer.com

LUDWIG PFEIFFER Cameroon
Montée Essomba
B.P. 25292 Yaoundé
Phone +237 - 3300 2943
E-Mail cameroon@ludwigpfeiffer.com

LUDWIG PFEIFFER Nicaragua
Avenida La Sirena 208
Granada
Phone +505 - 8120 3578
E-Mail nicaragua@ludwigpfeiffer.com

More Group locations can be found on our website or by scanning the QR code.

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