Flexible High Pressure Pipelines
Primus Line® is a trenchless technology for the rehabilitation of pressure pipelines for different media such as water, gas and oil. The process is based on a flexible high-pressure hose which is specially developed for the connection technique of the system.

Due to its multi-layered structure and very small wall-thickness, the Primus Line hose provides both flexibility and ultra high material strength.

The inner layer of the hose can be selected for the specific media. The outer layer - regardless of medium - is made of wear-resistant PE. Seamless aramid fabric is between the inner and outer layers, functioning as a static load-bearing layer.

Primus Line® is produced in nominal diameters from DN 150 to DN 500.

The hose is inserted into the host pipe from small construction pits - thus avoiding large roadworks. Primus Line® is not attached to the host pipe and is self-supporting. An annulus remains between Primus Line® and the host pipe.

Via a specially developed high-pressure connector on each end, the Primus Line hose is connected to the host pipe (steel, iron cast, PE or other materials), and thus to the pipe network.

Primus Line® has short rehabilitation times and rapid recommissioning, and thus represents not only an inexpensive alternative to open rehabilitation, but also a high-quality method for the renewal of pressure pipes.
**Primus Line Connector**

At the ends, the Primus Line hose is connected to the existing pipe using Primus Line connectors. The high-pressure connector consists of a contoured internal core and external sleeve. The external sleeve has a malleable steel jacket on the inside. A resin, which is injected through a valve on the external sleeve, forces the steel sleeve and Primus Line® into the contours of the internal core. So we obtain a durable, pull-proof connection.

After pressure-resistant sealing of the connector on the rehabilitated pipe section, a leak test is performed.

Depending on requirements, the Primus Line can be fitted either with a flange or welded ends. This way, it is also possible to join bends, tees or other fittings and fixtures (made of different materials).

**Water:**
Drinking water, hot water, industrial water, waste water and sea water

**Gas:**
Natural gas, sweet gases, sour gases, gas mixtures

**Mineral Oil:**
Crude oil, refined oils, fuel oil, fuels, oil sludge

**Other Media:** Chemicals, abrasive media
In order to maximize the use of products for you, we are constantly improving and refining them. For this reason we have optimized our system for drinking water and developed Primus Line® low pressure system. Primus Line® was originally developed for the high-pressure gas sector.

The advantages of the Primus Line® system have been found useful in other forms of media as well; therefore the new Primus Line® system has been adapted especially for these areas of application. The new alternative has been designed for applications for which Primus Line® has, up to now, been too large. The aramid fabric for the new system has been modified and the connector technology has been revised to adapt it to the operating pressure of the media.
The Primus Line Low Pressure Connector

- Compact construction with double-sided DIN flange
- High-quality epoxy powder coating
- Immediately ready for operation after installation
- Can be removed and is therefore reusable
- Light weight
- Short delivery times due to modular construction
- Cost-optimised solution

<table>
<thead>
<tr>
<th>Nominal Size</th>
<th>Burst Pressure [bar]</th>
<th>Operating Pressure [bar]</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 150</td>
<td>74</td>
<td>28</td>
</tr>
<tr>
<td>DN 200</td>
<td>53</td>
<td>20</td>
</tr>
<tr>
<td>DN 250</td>
<td>40</td>
<td>15</td>
</tr>
<tr>
<td>DN 300</td>
<td>33</td>
<td>12</td>
</tr>
</tbody>
</table>

Commonalities with the High Pressure System

- Same insertion technology
- Easy connector installation; no complex special tools required
- Connector technology has been subjected to long-term testing and is resistant to burst pressure
- Suitable for drinking water, approved acc. to the German standards KTW and W270
- Operating temperature up to +50 °C
1 Shutdown of host pipe, establish construction pit, cut and drain pipe
2 Sectional pipe inspection with a mobile TV camera and subsequent analysis of video recordings
3 Insertion of an auxiliary rope via TV camera
4 Mechanical coarse cleaning of the pipe interior using scraper pigs and pull through pigs
5 Positioning of the Primus Line coiled hose at the start pit and the pulling winch at the destination pit
6 Installation of pulling head, hose guides and feeder cable
7 Insertion of the Primus Line hose (folded or unfolded)
8 Assembly of the connector fixed to the host pipe
9 Running of pressure tests
10 Integration of the renewed pipe in the pipeline network and commissioning
11 Pit closure
### Technical Details

<table>
<thead>
<tr>
<th>Nominal Sizes</th>
<th>150 - 500</th>
<th>DN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating pressure max. (water)</td>
<td>55 bar</td>
<td>Single-layer fabric</td>
</tr>
<tr>
<td>depends on diameter</td>
<td>76 bar</td>
<td>Double-layer fabric</td>
</tr>
<tr>
<td>Operating pressure max. (gas)</td>
<td>34 bar</td>
<td>Single-layer fabric</td>
</tr>
<tr>
<td>depends on diameter</td>
<td>46 bar</td>
<td>Double-layer fabric</td>
</tr>
<tr>
<td>Bursting pressure max.</td>
<td>137 bar</td>
<td>Single-layer fabric</td>
</tr>
<tr>
<td>depends on diameter</td>
<td>190 bar</td>
<td>Double-layer fabric</td>
</tr>
<tr>
<td>Wall thickness</td>
<td>6.0 mm</td>
<td>Single-layer fabric</td>
</tr>
<tr>
<td></td>
<td>8.0 mm</td>
<td>Double-layer fabric</td>
</tr>
<tr>
<td>Weight (from / to)</td>
<td>2.0 - 8.5 kg/m</td>
<td>Single-layer fabric</td>
</tr>
<tr>
<td>depends on diameter</td>
<td>4.0 - 8.7 kg/m</td>
<td>Double-layer fabric</td>
</tr>
<tr>
<td>Abrasion resistance (DIN 53516)</td>
<td>10.5 mm³</td>
<td></td>
</tr>
<tr>
<td>Insertion length max.</td>
<td>2.500 m</td>
<td></td>
</tr>
<tr>
<td>Hose length per drum max.</td>
<td>up to 6.000 m</td>
<td></td>
</tr>
<tr>
<td>depends on diameter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bendability</td>
<td>up to 45 degree</td>
<td></td>
</tr>
<tr>
<td>Bend radius</td>
<td>5 D</td>
<td></td>
</tr>
<tr>
<td>Continuous operating temperature</td>
<td>up to 50 °C</td>
<td></td>
</tr>
<tr>
<td>Service life duration</td>
<td>50 years</td>
<td></td>
</tr>
</tbody>
</table>
Water Project: Drinking Water Pipeline in Sao Paulo, Brasilia, Sanit Engenharia Sao Paulo

The renewed cast iron drinking water pipeline DN 500 runs in Sao Paulo along a main traffic road.

Laying of Primus Line DN 500 PN 16, MOP of pipe 10 bar
Total length: 230 m, 1 installation section

Water Project: Drinking Water Pipeline in Grums, Sweden, Scandinavia VA-Teknik

The drinking water pipeline runs between a railroad and a motorway, crosses under the railroad and passes through a bridge. Primus Line® was inserted from already existing concrete chambers and from chambers in the bridge abutment.

Laying of Primus Line DN 250 PN 30, MOP of pipe 10 bar
Total length: 330 m, 5 installation sections

Oil Project: Crude Oil Line in the Ruhlermoor Oil Field, Germany, ExxonMobil Production

The oil pipeline renewed runs crossways through the Ruhlermoor oil field in the administrative district of Meppen. ExxonMobil Production Deutschland GmbH was convinced of the concept and technology of Rädlinger primus line GmbH and achieved enormous cost savings versus conventional pipe construction in stainless steel.

Laying of Primus Line DN 250 PN 38 and DN 200 PN 39, MOP of pipe 32 bar
Total length: 2,200 m

Water Project: Parallel Drinking Water Pipelines in Dresden, Germany, DREWAG Stadtwerke

Renewal of parallel drinking water pipelines under the Elbe River. DREWAG Stadtwerke Dresden GMBH supplies approx. 500,000 residents with drinking water. The parallel drinking water pipelines constructed in 1929 using the open construction method represents a major part of the supply network. The client and the engineering consultant have decided on Primus Line® technology for economic and time-related reasons.

Laying of Primus Line DN 500 PN 16, MOP of pipe 10 bar
Total length: 2 x 220 m

Water Project: Drinking Water Pipeline in Telfs, Austria, Swietelsky-Faber Kanalsanierung GmbH

The renewed drinking water pipeline DN 150 PN 25 runs with a length of 175 m along a steep hillside through a wooded area and above a waste deposit in the town of Telfs.

Laying of Primus Line DN 150 PN 55, MOP of pipe 25 bar
Total length: 175 m
Gas Project: Gas Pipeline in Braunschweig, Germany, E.ON Avacon AG

The renewed gas pipe runs through the city of Braunschweig. The first section runs along a residential area. The second section passes under a driving practice ground and a federal road. A new high pressure gas pipeline was established in the existing pipe and the planned reduction of the host pipe diameter was achieved.

Laying of Primus Line DN 400 PN 25, MOB of pipe 25 bar
Total length: 2 x 360 m

Water Project: Drinking Water Pipeline in Kornwestheim, Germany, Zweckverband Landeswasserversorgung Stuttgart

The renovated drinking water pipe runs in Kornwestheim along busy roads. The supply of drinking water could be restarted after a short time and without any interference with the traffic. The security of supply is ensured for the next decades.

Laying of Primus Line DN 300 PN 26, MOB of pipe 16 bar
Installation: 300 m and 1,100 m

Gas Project: Gas Siphon Pipeline in Sibiria, Russia, E.On Ruhrgas Ag and OAO Gazprom

Gas transportation siphon pipeline under the Ob River in the Siberian taiga, OAO Gazprom, OAO Tomsktransgaz. Within the scope of the technical co-operation with E.ON Ruhrgas AG, OAO Gazprom was looking for suitable technical solutions for the sustainable renewal of the gas pipeline, which has laid under the Ob River for 40 years. The solution was Primus Line® technology.

Due to the successful implementation of the Primus Line® system the gas and heat supply of the city is assured on a long-term basis with far more favourable cost conditions for the households connected.

Laying of Primus Line DN 150 PN 45, MOB of pipe 25 bar
Total length: 2,500 m

Licence Partners

Rädlinger primus line GmbH works successfully with national and international partners from the pipe rehabilitation industry. Due to the low-investment cost and simple process, Primus Line® convinces both sales and co-operation partners.

To implement our high quality standards in construction, licensees are trained in a several-day course which combines theory and practice in mutually reinforcing ways. In addition, we offer reliable technical support to local construction sites.

Are you interested in becoming our licensing partner and tapping into new markets with us? Then please contact us. Of course we are happy to give you more information on the telephone or at a visit to our offices.
Benefits of Trenchless Pipe Rehabilitation Technology

Compared to open construction, trenchless construction methods have environmental and economic benefits.

In terms of environmental protection and constant increasing traffic density laying pipes without damaging the surface makes economic sense. Because of the expense of road surfaces, soil replacement and high groundwater levels, trenchless design can be more economical than conventional construction even at relatively shallow depths.

In addition, there are also considerable economic savings such as the avoidance of congestion, environmental protection and the elimination of weather-related downtime.

Benefits at a Glance
- Low intervention in landscapes and protected areas
- No disruption to road, rail and shipping traffic
- Reduction of noise and emissions
- Low interference with existing structures
- Protection of vegetation and species due to small construction sites
- Sustainability due to the use of existing infrastructure (host pipes)

Specific Benefits of Primus Line®

Easy to Use
- Reduced use of machinery
- Up to 6,000 m at a time can be delivered on a transport drum
- Short construction period due to long insertion lengths
- Small pits and reduction of roadworks
- Elimination of digging and transporting large soil masses
- Omission or limitation of groundwater treatment
- Coarse cleaning of the host pipe only, as no adhesive is required
- Fast recommissioning
- Full piggability, also during operation

High Strength and Quality
- Pipe renovation with a lifetime of at least 50 years
- High abrasion and cut resistance of the outer coating
- No corrosion of Primus Line®

High Flexibility
- Fewer construction pits due to bendability
- Insertion through bends of up to 45°

High Performance
- Minimal cross-section loss due to low wall thickness of 6.0 and 8.0 mm
- Improved flow properties of the pipe
History

Rädlinger primus line GmbH is part of the Rädlinger Group which has been active in the construction sector for over 40 years. Today, the company is one of the most successful construction companies in Germany whose expertise mainly lies in road construction, civil engineering and asphalt construction.

From the Idea to Success

Primus Line® was developed to solve the recurring, time-consuming and costly problem of run-down pipelines in existing buildings.

Josef Rädlinger already had the idea of using a hose for civil engineering 20 years ago. The hose was to be characterised by flexibility, portability, light weight and low wall thickness, while having the material strength of a steel pipe.

Ten years later, with being open to new ideas, the know-how from the fields of construction, mechanical engineering and web technology were combined to find a creative and efficient solution. Together with research and industry partners, Rädlinger experts developed the Primus Line® technology. This technology now sets new standards in gas and liquid transportation.

Milestones

1963 Establishment of Josef Rädlinger Kiesbaggerei und Fuhrunternehmen e.K in Cham
1971 Establishment of Josef Rädlinger Bauunternehmen GmbH in Cham
1988 Establishment of Rädlinger Maschinen- und Anlagenbau in Cham
- Production of circular looms for fabric hoses
- Production of construction equipment
1995 Opening of the new ready-mixed concrete mixing plant in Weiding
1996 Establishment of Rädlinger Straßen- und Tiefbau GmbH in Selbitz / Frankenwald
1996 Development of a high-pressure hose for pipe rehabilitation
2000 Establishment of Rädlinger Asphaltbau GmbH
2001 Establishment of Rädlinger primus line GmbH
- Production and distribution of the flexible, high-pressure pipe Primus Line®
2002 Establishment of Josef Rädlinger Ingenieurbau GmbH in Vilshofen
2004 Establishment of Rädlinger Bauunternehmen Ges.m.b.H. in St. Pölten Austria
2005 Establishment of S.C. Trust Constructii Rädlinger S.R.L. in Romania
2006 Establishment of RWenergy GmbH in Schwandorf
2006 Takeover of the Berufsbildungszentrum in Schwandorf (BBZ)
2008 New construction of the production plant for Primus Line® in Weiding