pipetronics®
Intelligent Pipe Robots

Intelligent robotic systems and forward-looking solutions for trenchless sewer rehabilitation

www.pipetronics.com

Robotics house connection

Internal pipe sealing systems
Seals

Vehicle extension &
Generator construction

Robotics main sewer

Contents

Note: To enable a better flow of reading, we only use one gender form in our texts if possible. Unless expressly stated otherwise, the statements naturally refer to both female and male and gender-neutral persons.

Pipetronics®
Profile, Philosophy and Product Range

Powerful
Multifunctional
Economical

Autonomous milling robots for the main sewer and house connection, filling, grouting and internal pipe sealing systems, vehicle extension and generator construction, service and accessories – Pipetronics® provides you with customised all-inclusive packages from one single source. Our innovative technologies and pioneering solutions for trenchless sewer rehabilitation support sustainably your economic success.

Whether for the rehabilitation of small (DN 100) or large diameters (DN 800), circular or ovoid-profiles, sewers or house connections – the Pipetronics® robots and products provide you with the optimum technology for every area of application. This enables fast and reliable completion of even the most demanding sewer rehabilitation projects.

We bring intelligence to sewer rehabilitation robotics!

Our Pipetronics® experts are constantly working on making trenchless rehabilitation easier, more flexible and more economical. The intensive use of automation and digitalization in Pipetronics® robotic systems facilitates the operation and control of the technology, accelerates the work processes and effectively ensures the quality of the rehabilitation measure. Our Pipetronics® team includes specialists from the sewer rehabilitation industry with over 30 years of experience in development as well as professionals specialised in automation and digitalization. Their ambition is not merely to equip the sewer robots with ever-newer intelligent applications, but also to configure holistic systems.

Pipetronics®
Customer Service

Fast
Reliable
Competent

Close proximity to the customer is one of the cornerstones of the Pipetronics® philosophy. This is why we are continuously expanding our service network – both nationally and internationally. Our all-round service guarantees you smooth maintenance and repair work. Each of our robotic systems is equipped with remote access to provide your staff with quick and uncomplicated support whenever it is needed.

Pipetronics® has four service centres in Germany alone. The headquarters is in Stutensee near Karlsruhe, the branches in Röthenbach a. d. Pegnitz, Rheda-Wiedenbrück and Gelsenkirchen are additional high-performance cornerstones of our service network in Germany. Through our subsidiary Pipetronics® Swiss AG in Dübendorf near Zurich, we provide reliable and local support to our customers in Switzerland.

Our comprehensive knowledge of the industry and ongoing communication with our customers form the basis of successful cooperation and are at the forefront of every new development.

Our proficient application technicians are capable of offering on-site recommendations and showcasing the efficiency of Pipetronics® systems, providing you with a first-hand experience of their capabilities. Our demonstration systems are available for practical demonstrations and can even be rented immediately in case of urgent need.

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Robotics main sewer

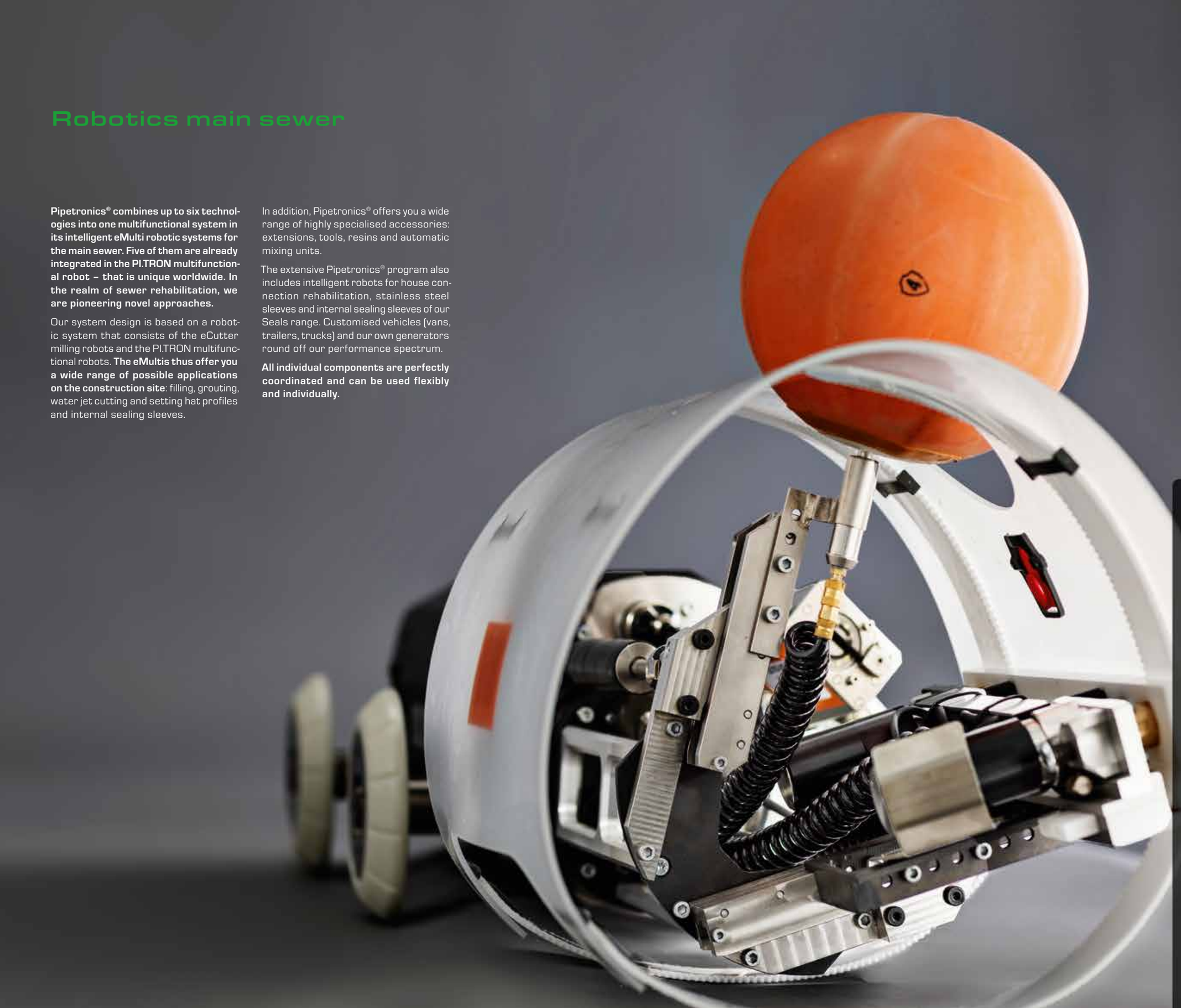
Pipetronics® combines up to six technologies into one multifunctional system in its intelligent eMulti robotic systems for the main sewer. Five of them are already integrated in the PI.TRON multifunctional robot – that is unique worldwide. In the realm of sewer rehabilitation, we are pioneering novel approaches.

Our system design is based on a robotic system that consists of the eCutter milling robots and the PI.TRON multifunctional robots. **The eMultis thus offer you a wide range of possible applications on the construction site**: filling, grouting, water jet cutting and setting hat profiles and internal sealing sleeves.

In addition, Pipetronics® offers you a wide range of highly specialised accessories: extensions, tools, resins and automatic mixing units.

The extensive Pipetronics® program also includes intelligent robots for house connection rehabilitation, stainless steel sleeves and internal sealing sleeves of our Seals range. Customised vehicles (vans, trailers, trucks) and our own generators round off our performance spectrum.

All individual components are perfectly coordinated and can be used flexibly and individually.



eMulti

eCutter

Milling work
DN 150 - 800; circular/ ovoid-profiles

PI.TRON Filling system

Filling of cracks, damaged areas etc. with epoxy resins
DN 200 lined - 800; circular/ ovoid-profiles

PI.TRON Grouting system

Grouting of closures, side inlets or tying of pipe liners in the inlet area with the help of formwork with epoxy resins
DN 200 lined - 800; circular/ ovoid-profiles

PI.TRON HatSet

Heatable setting tool for hat profiles with epoxy resins, e.g. for tying pipe liners in the inflow area
DN 200 lined - 800; circular/ ovoid-profiles

PI.TRON HydroJet Kit

Water jet cutting of massive deposits and obstacles (adaptation for HD systems)
DN 150 - 800; circular/ ovoid-profiles

PI.TRON Seals Setting Tool

Adaptation for displacement packers for setting internal sealing systems
DN 200 - 800; circular profiles

eCutter
The intelligent electrical milling robot

Powerful
Intelligent
Robust

Up to any task!

The electrically operated eCutter robot reliably and powerfully handles any milling work in non-accessible piping.

- For milling
  - Edges
  - Persistent deposits
  - Root invasion
  - Sleeve displacement
  - Chipped spots
  - Cracks
  - Damaged sockets
  - Protruding obstacles
- To open closed sewers and inlets
  - Lateral
  - Frontal (without conversion)
- Extensive selection of milling, grinding and brushing attachments

With its range of variants, the **eCutter** offers custom-fit solutions for basic applications. On top of that, it impresses with its state-of-the-art technology for complex and technically demanding tasks in the sewer. For example, in addition to preparatory work during pipe liner rehabilitation, the eCutter is also ideal for opening inlets after a liner has been installed.

Intelligent applications and assistance systems using the **latest CAN bus technology** enable the eCutter to be used much more efficiently and economically than conventional milling robots. Networking a variety of control units and the deployment of sensors make it much easier for your employees to accomplish the work at hand.

- **Pressure sensors**
  permanently check the internal pressure in the robot housing and warn the operator of possible damage to the equipment in the event of a drop in pressure
- **Position sensors**
  determine the exact position of the robot as well as the orientation of the robot axes and enable the exact location of the inlets
- **Remote function**
  enables remote access to the robot system (e.g. for remote maintenance and analysis of error codes)
- **Steplessly swivelling milling head thanks to 4th axle**
  enables milling in all directions – without conversion measures (up, down, sideways and frontally)
- **Milling extensions**
  facilitate deeper milling into the inlet due to mounted milling cutting shaft extensions

eCutter
The product range

Quiet
Electrical

Whether as a mobile system or as a fixed installation in a vehicle – the eCutter is configured exactly to your requirements. You can choose between battery operation (up to 12 hours of continuous use) and drive via a generator (from the Pipetronics® brand Quickland), auxiliary generator or external power supply.

Quiet operation

The electrical eCutter operates particularly quietly. This means that work can be carried out even in the early morning or late evening hours without disturbing residents with noise.

Electric system

The brushless and temperature-monitored 48 V milling motor impresses with its high torque and a speed of 5,000 rpm.

Innovative combination cable: power-water-air

The eCutter is supplied with power, water and compressed air via a 100 m-long combination cable. This makes it easy to reach damaged areas deep in the sewer. The water supply cools the milling tool during work and rinses any milling debris from the camera and the work site. The compressed air supply allows the pressure roller to clamp the robot firmly in the sewer, ensuring safe and clean working in the sewer.

The combi-cable is installed in a supply unit with a cable drum, controller, water tank and air unit. The cable is easily guided into the shaft via a guide arm. A laying shaft ensures that the cable runs smoothly on the drum. The connector is user-friendly and can be bent up to 90°. That makes it easier to insert the robot even into very narrow shafts.

Depending on the application, the eCutter is available in different model variants for different pipe diameters. All models have the same performance values and pressure and position sensors:

- **eCutter 15/40:**

  For small diameters from DN 150 - 400 consisting of eCutter EF 150, cable drum, controller and accessories

- **eCutter 15/60:**

  For small and medium diameters from DN 150 - 600 consisting of eCutter EF 150 and EF 250, cable drum, controller and accessories

- **eCutter 15/80:**

  For small and large diameters from DN 150 - 800 consisting of eCutter EF 150 and EF 250, incl. wheel extension, cable drum, controller and accessories

Technical data	eCutter EF 150 Item no. 2110-001	eCutter EF 250 Item no. 2120-001
Pipe diameter	DN 150 - 300 (400)	DN 250 - 600 (800)
Weight	35 kg (without milling tool)	80 kg (without milling tool)
Dimensions	length 795 mm (without camera)	length 970 mm (without camera)
Travel of the milling head	up to 88 mm	up to 160 mm
Rotation	630°	630°
Speed	0 - 10 m/min	0 - 12 m/min
Pressure roller for sewers	up to DN 400	up to DN 800
Voltage	48 V	48 V
Power	2.0 kW approx.	3.0 kW approx.
Max. speed	5,000 rpm	5,000 rpm
Optional	• Extension up to DN 400 • Additionally mounted cutting shank extensions	• Extension up to DN 800 • Additionally mounted cutting shank extensions

PI.Cutter
The tried and tested hydraulic milling robot

Powerful
Durable

The technology of the hydraulically operated PI.Cutter has not only been well established and proven over the past decades – it is already a classic in the industry. The powerful robot drive reliably removes deposits, root invasions, sleeve displacements, chipping, damaged sockets as well as protruding obstacles. The powerful milling motor has a high torque, which ensures increased energy efficiency.

Pipetronics® also offers a wide range of accessories for the **PI.Cutter**:

- Wheels and wheel extensions for different diameters and bases
- Milling tools
- Cutting shank extensions
- Common spare parts for carrying out simple repairs on site

Single or multifunctional solution – the choice is yours

The Pipetronics® hydraulic milling robot can be purchased as a single solution for milling functions or as a multifunctional tool. The multifunctional solution complements the milling robot with the PI.TRON multifunctional applications of filling, grouting, hat setting, waterjet cutting and collar setting. Subsequent expansion of the individual solution is easily possible.

Technical data	PI.Cutter FR 150 Item no. 303-910	PI.Cutter FR 250 Item no. 307-925
Pipe diameter	DN 140 - 300	DN 250 - 800
Weight	40 kg (without milling tool)	78 kg (without milling tool)
Dimensions	length 750 mm (without camera)	length 865 mm (without camera)
Travel of the dmilling head	with milling stroke extension up to 87 mm	with milling stroke extension up to 140 mm
Rotation	900°	900°
Speed	0 - 12.5 m/min	0 - 16.5 m/min
Pressure roller for sewers	up to DN 250	up to DN 800
Hydraulics	140 bar	140 bar
Power	2.0 kW approx.	3.0 kW approx.
Max. speed	5,500 rpm	3,600 rpm
Optional	• Front milling • Additional cutting shank extensions	• Front milling • Additional cutting shank extensions

PI.TRON[5]

The multifunctional robot for five different applications

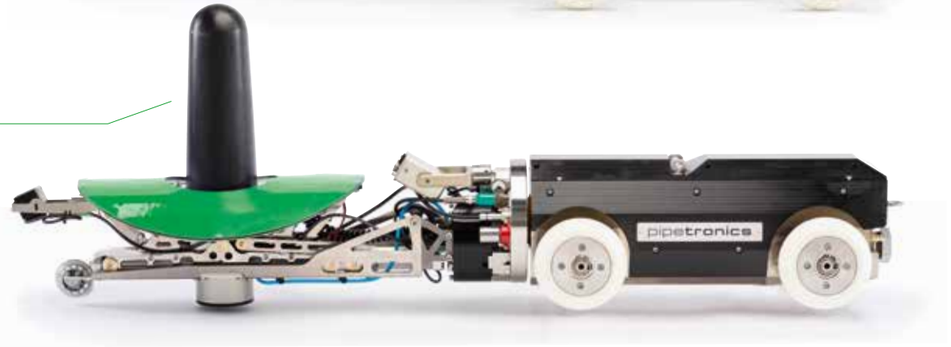
Complex damage patterns, porous subsoil, projecting obstacles – all these can affect the smooth progress of rehabilitation work on a construction site, despite prior sewer inspection and planning. To ensure that you are prepared for such unforeseeable events, Pipetronics® has bundled five rehabilitation and repair techniques in one robot – this is unique worldwide.

The **PI.TRON multifunctional robots SR 178** and **SR 300** can be quickly and easily adapted to the filling and grouting system, the HatSet heatable setting tool for hat profiles, the HydroJet Kit waterjet cutting adaptation and the Seals Setting Tool for setting internal sealing systems using a bayonet lock. The individual techniques are operated via a robot with a control stand.

PI.TRON Filling system
with PI.TROC SP resin
DN 150 - 800; circular/ ovoid-profiles

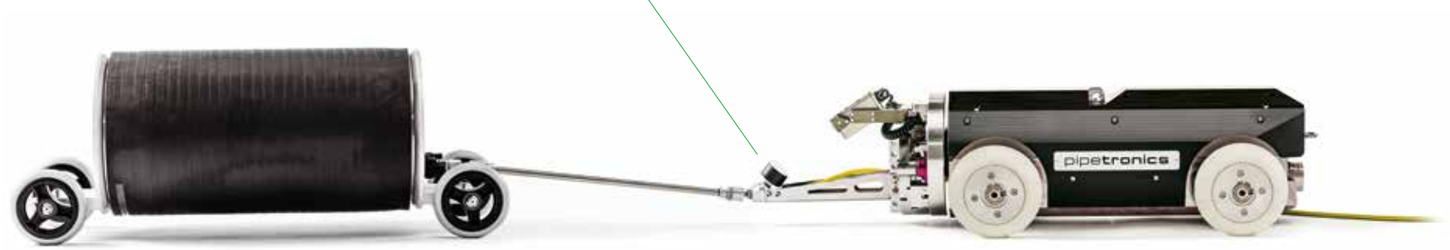
PI.TRON Grouting system
with PI.TROC 21 resin
DN 200 lined - 800; circular/ ovoid-profiles

PI.TRON HatSet
with PI.TROC TH resin
DN 200 lined - 800; circular/ ovoid-profiles



PI.TRON HydroJet Kit
DN 150 - 800; circular/ ovoid-profiles

PI.TRON Seals Setting Tool
DN 200 - 800; circular profiles



Sophisticatedly multifunctional

Our innovative **PI.TRON Filling robots SR 150**, **SR 178** and **SR 300** can easily be expanded with technologies through adaptations with bayonet lock and can therefore be used as **PI.TRON multifunctional robots**. These include the **PI.TRON Grouting system** for grouting closures and tying pipe liners in the inlet area using formwork, the **PI.TRON HatSet** for setting hat profiles, the **PI.TRON HydroJet Kit** for waterjet cutting and the **PI.TRON Seals Setting Tool** for setting internal sealing sleeves.

Technical data	Filling robot SR 150 Item no. 1601-001	Filling robot SR 178 Item no. 313-910	Filling robot SR 300 Item no. 315-910
Drive	electric	electric	electric
Pipe diameter	DN 200 lined - 300	DN 200 lined - 300	DN 250 - 800
Weight	30 kg	35 kg	55 kg
Dimensions	length 1,200 mm	length 1,150 mm	length 1,050 mm
Contents of filler magazine (cartridge)	1.7 l	1.8 l	2.75 l
Outbound route	80 mm	80 mm	88 mm
Rotation	continuous	continuous	continuous

PI.TRON Filling system
For precise repair of damaged areas

Versatile
Exact
Extendable

The PI.TRON Filling system guarantees you highly precise and flexible work in the partial repair of leaking pipe connections, damaged areas, in the filling of longitudinal and transverse cracks and in the repair of holes in DN 200 lined to DN 800 sewers and in common ovoid-profiles.

Pipetronics® Filling robot

The **Pipetronics® Filling robots SR 150**, **SR 178** and **SR 300** are equipped with radial and axial filling tools for filling. These tools, together with an infinitely adjustable electrical drive and rotation drive, ensure control that is accurate to the millimetre, with which even complex damage patterns can be permanently and reliably rehabilitated. A wide range of accessories is available for implementation for all diameters from 200 mm lined to 800 mm, such as different filling attachments, tensioning belts/gear racks, wheels and wheel extensions.

The specially adapted epoxy resin **PI.TROC SP** has been developed for the optimal implementation of the **PI.TRON Filling process**. The paste-like synthetic resin can be worked into the substrate by circular movements and ensures tight and clean filling. This makes sealing damaged areas up to 5 cm deep possible.

Upgrade to a complete system

The hydraulically and electrically operated Pipetronics® milling robots can be upgraded to a complete system in no time with the PI.TRON Filling system.

PI.TRON Grouting system
The effective method for leaking pipe connections

Proven
Reliable
Future-oriented

The PI.TRON Grouting method enables clean and force-fit repair of various damaged areas in sewers DN 200 lined to DN 800 and in common ovoid-profiles:

- Tight integration of house connections in the main sewer with and without liner
- Repair of leaking pipe connections with socket formwork
- Sealing of connections

As a supplement to the PI.TRON multifunctional robot, the **SM 150**, **SM 200** and **SM 300 Grouting systems** can be adapted as a further multifunctional application with a simple bayonet lock. A wide range of accessories is available for implementation, such as formwork without holes and with different hole diameters, socket formwork, tensioning belts/gear racks, wheels and wheel extensions.

House connection rehabilitation with the Pipetronics® formwork collar

For the rehabilitation of house connections, the PI.TRON method with a formwork collar coupled to the filling robot has proven its worth. As a result, you can meet the legal requirements for permanent tightness of the connections between the main sewer and the house connection in many places – so there is no leakage of wastewater into the groundwater (exfiltration) or entry of groundwater into the sewer (infiltration).

Pipetronics® has developed the epoxy resin **PI.TROC 21** especially for side inlet rehabilitation. It features a very high viscosity and spreads particularly quickly and evenly. You can see how the blue resin flows steadily and fills cavities through the transparent formwork of the **PI.TRON Grouting system.**

The PI.TROC 21 has proven its quality in rehabilitation with the grouting system and has the necessary DIBt approval.

From practical experience for practical application

The procedure for the partial repair of damaged areas and the rehabilitation of connections in sewers has proven itself in trenchless sewer rehabilitation for over 25 years.

Supplemented by state-of-the-art CAN bus technology and intelligent sensors to support the work on-site, the **PI.TRON Grouting system** is a **future-oriented robot technology**.

Technical data	Grouting system SM 150 Item no. 1601-012	Grouting system SM 200 Item no. 320-910	Grouting system SM 300 Item no. 322-910
Pipe diameter	DN 200 lined - 300	DN 200 lined - 300	DN 300 - 800
Dimensions	length 1,300 mm	length 1,200 mm	length 1,200 mm
Weight without robot	10 kg	11 kg	8 kg

PI.TRON HatSet

The heatable setting tool for hat profiles

Uncomplicated
Clean
Dimensionally stable

There are always challenges in trenchless sewer rehabilitation:

- Connections and branches are not professionally integrated into the main pipes, the connecting pipes often protrude into pipes and cause leaks in the connection area.
- The use of the pipe liner method for rehabilitating damaged pipes is becoming more and more prevalent. Nevertheless, connections that are sealed using this method must be carefully milled out and reconnected securely to the main pipes.

Pipetronics® has developed the PI.TRON HatSet system, which can be heated to deliver optimal outcomes, to effectively tackle the intricacies stemming from various damage patterns in the house connection-piece area. With this tool, hat profiles for connecting side inlets can be set easily and quickly. The hat profile technique is mainly used for intact inlets in the sewer.

With the **PI.TRON HatSet** Pipetronics® has designed an innovative setting device that can be connected to the PI.TRON multifunctional robots SR 150, SR 178 and SR 300 with a simple bayonet lock. The HatSet for the PI.TRON multifunctional robot SR 150 and SR 178 consists of a unit that can be folded down to 90° from a packer and a vulcanized balloon with a heater inside. The HatSet for the PI.TRON multifunctional robot SR 300 consists of an arm, which is free-floating, rotatable and foldable, and a rigid moulded shield. Both modules can be heated and enable controlled curing of the hat profiles. By utilizing the scissor lift, inaccessible areas of the sewer system that are damaged can be easily rehabilitated without the need for excavation. The built-in compressed air cylinder ensures that the impregnated carrier material is pressed firmly and force-fit against the pipe wall.

For the top-hat profile, a carrier material composed of either synthetic fibres or glass is saturated with a unique epoxy resin. The carrier material is selected to match the pipe diameter of the main and secondary line and the branch angle (e.g. 45° to 90°).

Since the **PI.TRON HatSet** has a **heating function**, the hardener should be adjusted for a controlled reaction. We recommend the specially matched 2C epoxy resin **PI.TROC TH** from Pipetronics®.

With the assistance of cameras and a rotatable robot head, the PI.TRON HatSet efficiently delivers the prepped hat profile materials to the connection point and accurately positions them at the work site. The heatable setting apparatus rapidly and precisely cures the resin. The positively-connected and dimensionally stable top-hat profile bonds with the main sewer or liner surface and the inlet pipe. Thanks to the special setting device design, the wall thickness of the top-hat profile brim tapers advantageously towards the edge.

Firmly install hat profiles with PI.TROC TH

With the epoxy resin **PI.TROC TH**, felt hats for the hat profile process can be impregnated by hand. Over time, the thixotropic viscosity of the resin decreases as a result of deformation or hand impregnation, facilitating a seamless and uninterrupted integration of the resin into the felt hat's profile.

Technical data	HatSet HSS 200 Item no. 371-940	HatSet HSS 300 Item no. 371-940
Pipe diameter	DN 200 - 300	DN 300 - 600 (800)
Weight	10.3 - 13.6 kg	12.6 kg
Dimensions	length 1,120 mm	length 780 mm
Rotation	670°	560°
Balloon size	Packer: 130/710 mm 170/710 mm 210/710 mm Conical balloon: 90/110 mm	Conical balloon: 80/100 mm 100/130 mm 120/150 mm Shield: 460/362 mm
Heating output	200 W balloon 200 W top hat brim	200 W balloon 200 W shield
Optional		• Extension for DN 800

PI.TRON HydroJet Kit

The adapter for water jet cutting

Powerful
Precise
Environmentally friendly

Water jet cutting is considered a very environmentally friendly method for removing stubborn dirt and incrustations, as no chemicals are deployed. Even lines that are completely blocked by deposits can be reopened using this method. The **PI.TRON HydroJet Kit** extends the capabilities of the PI.TRON multifunction robots SR 150, SR 178 and SR 300. Consequently, our sewer robots can be utilized for water jet cutting as well.

A rotating nozzle is attached to the PI.TRON HydroJet Kit in conjunction with a water jet unit. The exact position of the nozzle can be determined via a parallel lift, a manually adjustable nozzle inclination and by moving and turning the robot head. Coatings and obstructions in the piping can be thoroughly removed with confidence.

For the operation of the PI.TRON HydroJet Kit, a trailer system, inclusive accessories and rotating nozzle with 3,000 bar working pressure are required. Depending on the application and rehabilitation case, a different nozzle head (e.g. point jet nozzle) is used.

Further multifunctional application

In addition to the **PI.TRON Grouting system**, the **PI.TRON HatSet** and the **PI.TRON Seals Setting Tool**, the **PI.TRON HydroJet Kit** is another multifunctional extension of the **PI.TRON Filling/multifunctional system**. The adaptation can be easily attached to the **multifunctional robots SR 150**, **SR 178** and **SR 300** using a bayonet lock. The robot is controlled and the camera image is transmitted via the same control panel.

Technical Data	HydroJet Kit SR 150 Item no. 1910-006	HydroJet Kit SR 178 Item no. 1910-004	HydroJet Kit SR 300 Item no. 1910-001
Pipe diameter	DN 150 - 300	DN 200 - 300	DN 300 - 600 (800)
Weight	8 kg	8 kg	10 kg
Dimensions (L x W x H)	430 x 160 x 140 mm elongated state	500 x 175 x 145 mm elongated state	210 x 470 x 210 mm elongated state
Arm length	250 mm	230 mm	230 mm
Travel parallel lift electric	166 mm	up to 270 mm	up to 270 mm

PI.TRON Seals Setting Tool

For positive connection setting of sealing sleeves

Practical
Efficient
Functional

Not every damaged area in the sewer requires repair by milling, filling, grouting, hat setting or water jet cutting. Above all, standard tolerances in the pipe diameter or the material, axial angles and conical expansions can be quickly and cleanly rehabilitated with internal sealing systems. That is why Pipetronics® also offers the PI.TRON Seals Setting Tool. This displacement packer can be easily adapted to the PI.TRON multifunction robots or other inspection systems and is supplied with compressed air via a compressed air hose.

The **PI.TRON Seals Setting Tool** consists of a robust EPDM inflation hose that generates the necessary application pressure for the safe installation of the Pipe-Seal stainless steel sleeves.

Seals internal pipe sealing system

Pipetronics® offers a wide range of its own internal pipe sealing as well as liner end sleeves (LEM). Depending on the requirements, stainless steel sleeves and EPDM seals are available for overlapping line offset as well as for individual assembly and as a flexible sleeve for sleeve displacement, as conical widening and axial angles.

Technical Data	Displacement packer Item no. 509-998	Displacement packer for SR 178 Item no. 510-998 Item no. 511-998	Displacement packer for SR 300 Item no. 512-998 Item no. 513-998 Item no. 514-998 Item no. 515-998
Pipe diameter	DN 150 - 200	DN 200 - 300 DN 250 - 300	DN 350 - 500 DN 500 - 600 DN 600 - 700 DN 700 - 800

Ovoid-profile chassis
Effortless in the ovoid sewer

Electrical
Time-saving

The use of ovoid-shaped sewer pipes facilitates the disposal of wastewater, as their shape allows for even small volumes of wastewater to flow away with great ease. But not every sewer rehabilitation robot can be used in these pipes. All Pipetronics® robots can be adapted to **ovoid-profile chassis**, which are available in two versions:

- **Ovoid-profile chassis small,** for E200/300, E250/375, E300/450
- **Ovoid-profile chassis large** for E300/450, E400/600, E500/750, E600/900

Versions also in electrical versions:

The ovoid sewer chassis for the Pipetronics® eCutter and the PI.TRON multifunctional robots are also available as electrical versions. The chassis can be easily adjusted electrically in the pipe and adapted to dimensional offsets and sleeve displacements. This makes working in the sewer easier and saves expensive set-up times. This enables you to successfully and punctually finish even the most challenging sewer rehabilitation projects.

Epoxy resins
Resins for sewer rehabilitation robots

High quality
Effective

The right resin for every application

To ensure top-notch results in repair work, Pipetronics® provides an extensive selection of our own specially developed epoxy resins. You can obtain universal resins for all damaged areas and special resins for specific repair areas (closures, side inlets, cracks etc.) All **Pipetronics® epoxy resins** can of course also be used in similar processes and systems from other manufacturers.

PI.TROC SP for clean filling

The epoxy resin **PI.TROC SP** is ideal for the rehabilitation of closures, voids, holes, cracks and connection pieces with the filling technique. The pasty viscosity of the resin allows it to be worked into the substrate by circular movements. This ensures dense and very clean filling. With this epoxy resin, you can seal damaged areas up to a depth of 5 cm.

Force-fit grouting with PI.TROC 21

The epoxy resin **PI.TROC 21** has been specially developed for side inlet rehabilitation. Thanks to its very high viscosity, it spreads extremely quickly and evenly. For even faster curing of the resin, PI.TROC 21 is also available as a rapid version **PI.TROC 21 R**. The blue colour of the resin shines through the transparent formwork of the PI.TRON Grouting system. This enables precise observation of the cavity-filling process.

Firmly install hat profiles with PI.TROC TH

Felt hats for the hat profile method can be impregnated manually with **PI.TROC TH** epoxy resin. Due to the thixotropic viscosity of the resin, it becomes thinner through the duration of the deformation/manual impregnation and can thus be worked into the hat profile (felt hat) continuously and without gaps.

Mixing and proportioning station SAM 700

The **SAM 700** pneumatic mixing and proportioning station processes two-component resins on the construction site largely automatically and in consistently high quality. It is the only system of its kind **designed for 4 x 700 ml tubular bags** (perfect for **PI.TROC 21**, **PI.TROC 21 R** and **PI.TROC SP**), but can also process 500 ml tubular bags. The resin and hardener are mixed in the correct ratio via a static mixer and then filled directly into the cartridge of the sewer robot.

DIBt approval

The epoxy resins PI.TROC 21 and PI.TROC 21 R have impressively proven their high quality in rehabilitation with the grouting method and have the necessary DIBt approval.

Seals

Fast
Secure
Sustainable

Whether leaking or larger damaged areas, standard tolerances in pipe diameter or dimension changes – with our **internal sealing and liner end sleeves** we offer you the right solution for every construction site.

Internal pipe sealing systems
For damaged areas, leaking closures and liner end connections

Pipe-Seal

For sealing leaks, the Pipetronics® **Pipe-Seal** stainless steel sleeve technology is particularly well suited for non-accessible piping in the potable water, service water, salt water and wastewater sectors from DN 150 to DN 800. The specially developed and patented locking system enables oblique locking even with pipe offset, axis deviation and conical expansion. This guarantees secure and sustainable locking of the inner sealing sleeve.

The compression seal made of EPDM and the stainless steel V4A grade mounting system are flexible in terms of their mechanical usage and application dimensions. This allows for versatile use in the appropriate areas. Damage repair is achieved by permanently pressing the respective stainless steel sleeve in conjunction with an EPDM rubber seal against the existing pipe wall. The installation of the internal sealing sleeves is carried out using the inflatable **PI.TRON Seals Setting Tools** or suitable liner end and displacement packers from other manufacturers.

Pipe-Seal-Fix[1]

The **Pipe-Seal-Fix** internal sealing sleeve proves reliable for individual installation, but larger damaged areas can also be repaired in a form-fitting and force-fitting manner by overlapping them to form the so-called line offset. The stainless steel sleeves are available in widths of 420 mm and 500 mm and can be used in pipes and sewers with diameters of 150 mm to 800 mm.

Pipe-Seal-Flex[1, 2]

With **Pipe-Seal-Flex,** sleeve displacements of up to 25 mm and dimensional changes of up to a 30 mm diameter deviation can be compensated efficiently and specifically. The Pipe-Seal-Flex internal sealing sleeves are also excellently suited for axial angles of 8° to 12°.

The patented, one-piece construction in the stainless steel sleeve enables Pipe-Seal-Flex with the EPDM seal element to be pressed with a positive connection against the pipe wall. The operational reliability of the old pipe can thus be restored quickly and easily. Pipe-Seal-Flex internal sealing sleeves can be used in DN 200 to DN 600 piping that cannot be walked on.

Pipe-Seal-End[1]

The liner end sleeve (LEM) **Pipe-Seal-End** seals permanently – even in the case of pressing groundwater – between the liner, old pipe and manhole and at the same time protects the cut edges on the liner from damage. The stainless steel sleeve with the asymmetrical EPDM seal is available in widths of 250 mm and 300 mm, depending on the nominal width, for pipes and sewers with diameters from 150 mm to 800 mm.

Pipe-Seal-Fix
DN 150 - 800

Pipe-Seal-Flex
DN 200 - 600

Pipe-Seal-End
DN 150 - 800

[1] Inner sealing sleeve with improved locking mechanism, according to German patent no. 10 2012 111 341, German utility pattern no. 20 2012 012 667.9 and international patent application no. PCT/EP 2013/074424.

[2] Sealing sleeve with formable intermediate section, according to German utility pattern no. 20 2013 103 336.7.

RedEx®

Leaky closures and damaged areas in accessible piping in the drinking, service, salt and wastewater sector from DN 800 to DN 6000 can be partially and permanently repaired with the **RedEx® internal sealing sleeve. RedEx® liner end sleeves (LEM)** are great for the protection and clean sealing of liner ends in pipe diameters from 190 mm to 1,200 mm. In addition to damaged areas and leaking closures, dimensional changes and larger damaged areas in line offsets can also be sealed using **RedEx® Connect special solutions.**

The RedEx® internal pipe sealing systems have national and international approvals including evidence for dynamic load changes in pressure pipes.

The RedEx® products can be installed quickly and easily by hand. Stainless steel rings are installed with the help of a hydraulic expander, which presses the prefabricated sealing sleeve against the old pipe wall. Should RedEx® products ever need to be removed, they can be dismantled cleanly and without great effort.

For an optimal installation of the sealing sleeves, Pipetronics® offers you a selected range of coordinated tools – either for purchase or for cost-effective rental.

Pressure pipe area

The RedEx® system is also tested and approved for potable water and wastewater pressure applications for the tight connection of a liner and the old pipe flange or also as an internal sealing system in nominal widths that can be walked on.

RedEx® internal sealing systems are available in standard widths of 260 mm, 360 mm or 500 mm – special widths on request.

Internal sealing sleeves on special request

No two damaged areas in a pipe are alike. To have a solution for every problem, our RedEx® internal sealing and liner end sleeves can be assembled according to your requirements on a project-specific basis. Depending on your needs, special profiles, special widths and conical transitions can be made especially for the respective construction site.

RedEx®
DN 800 - 6,000
LEM DN 190 - 2,400

Robotics house connection

Powerful and compact – with the **purely electrical house connection robot eCutter lateral**, you are ideally equipped to deal with deposits and obstructions in house connections.

eCutter lateral
Mill, inspect and flush with one tool

100% electric
Powerful
Low-emission

It is not only in main sewer pipes that persistent deposits, sleeve displacements and protruding connectors can cause problems. Connecting pipes in the main sewers are also affected. House connections in particular must then be milled free quickly, reliably and cost-effectively.

The electrically operated house connection robot eCutter lateral precisely removes deposits and obstacles in DN 100 lined to DN 200 house connections. Inlets can also be opened effortlessly after integrating hose liners. In contrast to other house connection robots, the curved eCutter lateral is operated purely electrically and is therefore quieter and produces fewer emissions than conventional house connection robots. If required, the milling robot can be easily connected to a high-pressure water supply in order to flush the pipe at the same time as milling. Deposits and obstacles that have been milled off are thus channelled straight out of the pipe and do not require any subsequent flushing work. The high-pressure jet also supports pushing into the sewer, and the high-pressure nozzles can be controlled separately to bend effortlessly in pipe branches.

With a 40 V milling motor, the **eCutter lateral** has above-average power to powerfully remove obstacles. The milling head can also be raised electrically and extended by up to 45 mm, and with its endless rotation it can access even hard-to-reach areas in the house connection. Even deep milling in inlets can be carried out. The pneumatic centring in the pipe ensures firm clamping and safe working. A powerful front and rear camera with LED lighting ensure optimum condition detection and visibility of the work site.

The modular system of the **eCutter lateral** enables the robot to be customised to the needs of the user, thus offering maximum flexibility on the construction site. Various milling head variants, drum and operating units are available, so that the optimum configuration can be found for every application. The robot can be equipped with either a large control console with a 19-inch monitor or a compact control box with a 12-inch monitor. The control unit is included in both equipment variants, enabling precise control of the robot during rehabilitation in both cases. The CableReel reel units are available in the Extended, Rotate and Fixed versions.

All components are coordinated so that the robot equipment can be individually configured and cameras, robot heads and tensioning balloons can be replaced quickly and easily.

Intelligent design

The **eCutter lateral** is controlled by a frequency converter located in the drum or the control unit. Even our smallest electrical milling robot is equipped with a PLC controller via CAN bus technology.

Technical Data	eCutter lateral Item no. 1501-001
Pipe diameter	DN 75 - 300
Robot head variants	eCutter EL 75 for DN 75 eCutter EL 100 for DN 100 - 200 eCutter EL 200 for DN 200 - 300*
Dimensions/ weight of operating units	Control console 440 x 600 x 145 mm (L x W x H) 20 kg Control box 300 x 400 x 195 mm (L x W x H) 6 kg
Dimensions/ weight of control unit	240 x 590 x 430 (L x W x H) 30 kg
Dimensions/ weight of drum units	CableReel Extended 920 x 700 x 1100 mm (L x W x H) 55 kg CableReel Rotate 735 x 640 x 800 mm (L x W x H) 27 kg CableReel Fixed 750 x 640 x 810 mm (L x W x H) 25 kg
Rotation	continuous
Power	400 W
Power supply	230 V
High-pressure water supply required for water connection	90 bar / 30 l/min

* Variant eCutter EL 200 for DN 200 to 300 are under development

Vehicle extension and Generator construction

Sophisticated
Holistic
Tailor-made

Whether sprinter, truck, trailer or compact solution: In our design department, Pipetronics® experts design, realise and optimise state-of-the-art operator vehicles.

Even the accessories for the deployment of sewer robots – from wheel nuts to control units – are individually tailored to customer requirements so that nothing stands in the way of successful trenchless sewer rehabilitation.

In addition, Pipetronics® designs, produce and sells its own Quickland built-in diesel power generators. Whether installed in a system vehicle or self-sufficient for individual deployment, Quickland generators are a powerhouse.

Vehicle extension

Individual system vehicles for trenchless sewer rehabilitation

Delivery variants of the Pipetronics® milling robots

Tailor-made to your requirements, the electrical and hydraulic milling robots are delivered ready for use and, if necessary, with individually selectable system vehicles. Functionality and comfort are of extraordinary importance for sewer rehabilitation vehicles. Using this approach is the sole method of guaranteeing that both the technology employed and the performance potential of your staff are utilized effectively and efficiently.

The proven standard: The manoeuvrable Sprinter version

Pipetronics® 3.5 t panel van system vehicles (e.g. Mercedes Sprinter) are equipped with everything you need to operate Pipetronics® electric and hydraulic milling robots.

The Sprinter version is based on interior equipment that has been tried and proven for decades. All units such as cable drum, water system, crane unit, hydraulic unit, compressor or tool cabinet are installed in the rear part of the Sprinter.

The control panel with keyboard, the controller and the electrical cabinet are included in the command room at the front. In the front cockpit, the operator controls the robot via camera or screen and has a clear view of all parameters important for operation. The integrated air conditioning ensures comfortable working conditions, while the ergonomic layout of the operating components allows fatigue-free control of the robots in the sewer. Even remote construction sites can be reached and rehabilitated with this robot system.

The versatile version: Sprinter with a trailer for PI.TRON multifunctional applications

In addition to the 5 t panel van system vehicles, the PI.TRON trailers provide you with sufficient space for the PI.TRON multifunctional applications. The controller for the PI.TRON applications is the control stand for the milling robot, which can be installed in a Sprinter or optionally in a truck or compact version. In light of this, we suggest that sewer rehabilitation firms currently utilizing an electrical or hydraulic Pipetronics® milling robot consider using PI.TRON trailers.

In addition to the power generator, the trailers also provide storage space for the resin processing equipment. A maximum power requirement of around 10 kVA is needed for the filling, grouting and hat setting work involved, as well as for waterjet cutting. The independence of the power supply is ensured by a generator integrated in the trailer. **Pipetronics® manufactures its own powerful Quickland diesel generators for this purpose in the power range from 6 kW to 27 kW.**

The XXL solution: Truck extension

Our system components of the milling robots or the PI.TRON systems are also offered as a truck solution (from 7.5 to 15 t). Box bodies, space dividers and individual interior fittings are available in a wide variety of designs and sizes.

The box version can be tailored exactly to your requirements. With a self-contained power and water supply, the box version is very flexible and requires minimal preparation to carry out rehabilitation operations quickly and successfully.

The flexible solution: Compact version

By utilizing the compact version, the milling robot or multifunctional unit can be easily installed within a small and condensed steel frame. This frame can then be effortlessly plugged in, making it vehicle-independent and exceptionally adaptable.

The compact version enables rehabilitation in areas that are difficult to access and cannot be approached with large vehicles. This system offers considerable advantages, especially to international users who want to select and set up their own vehicles on-site.

Quickland supply unit
Special generators for sewer rehabilitation vehicles

Stage V
Low-emission
Highly developed

Quickland: Diesel Mobile Power
Powerful built-in diesel generators

Pipetronics® designs, manufactures and distributes its own Quickland Stage V diesel generator sets. The generators in the power range 6 kW to 47.7 kW are available not only as components installed in a vehicle but also individually, and are designed specifically for individual applications.

The latest technology, combined with highly developed installation concepts and materials, ensures the best possible fuel consumption/performance ratio and a very quiet operation for **Quickland's special generators**. An optional anti-vibration mounting of the unit on air springs supports the low-noise operation.

The in-house Design and Production Department plans and builds the power generators individually and application-specific according to customer requirements. Thanks to the compact design, the power generators can be individually installed in vehicles - longitudinally and transversely - or erected on a mount as a working machine for the construction site and road.

We consider it paramount to maintain a consistent and dependable supply of electricity from the generators. Quickland power generators come equipped with a digital 3-phase control system. The integrated fuel tank ensures long self-sufficient operation and can be connected to an external fuel/vehicle tank by means of a quick coupling if required. Quickland models 21350, 34350 and 50350 are equipped with automatic cleaning cycles that eliminate the need for AdBlue. The brushless synchronous internal pole generators are self-excited, self-regulating and maintenance-free. The automatic shutdown and process-relevant warnings (oil pressure too low, cooling water temperature too high and overspeed) ensure a high level of operational reliability and at the same time protect the engine.

For optimal serviceability, the generators are equipped with large maintenance flaps and a fold-out filter unit. The waste heat generated by the power unit can be used for space heating or also for preheating the resin. Quickland built-in generators can be used up to an ambient temperature of 45°C.

A wide range of accessories and installation materials complete the range.

The Quickland power generators of the Stage V series comply with the currently applicable standards of the EU Stage V. The installed power generators comply with the standards VDE 0875 (EN 50081-1 and EN 50082-1), VDE 0530, BS 4999-50000, IEC34-1, CEI2-3 and EN60034 and Protection Class IP 23.

Technical Data	Quickland KL-6150-PKa Item no. 3100-025	Quickland KL-6350-PKa Item no. 3100-019	Quickland KL-10350-PKa Item no. 3100-030	Quickland KL-14350-PKa Item no. 3100-034	Quickland KL-21350-PKa Item no. 3100-015	Quickland DL-34350-PKa Item no. 3100-041	Quickland DL-50350-PKa Item no. 3100-061
Power	6.0 kW	6.3 kW	10.3 kW	11.9 kW	21.5 kW	34.3 kW	47.7 kW
Dimensions in mm (L x W x H)	1,520 x 660 x 810	1,520 x 660 x 810	1,910 x 830 x 860	1,910 x 830 x 860	1,770 x 930 x 1,115	1,020 x 1,290 x 930	1,165 x 1,500 x 1,300
Weight	320 kg	320 kg	465 kg	510 kg	630 kg	930 kg	1,300 kg
Voltage	230 V	230/400 V	230/400 V	230/400 V	230/400 V	230/400 V	230/400 V
Frequency	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
Current	26.1 A	11.3 A	18.6 A	25.6 A	38.8 A	61.8 A	86.1 A
Phases	1	3	3	3	3	3	3
RPM	1,500	1,500	1,500	1,500	1,500	1,500	1,500

Nomenclature: K=Kubota motor, D=Doosan motor, L=slow, P=pusher, R=remote, Ka=capsule

pipetronics®
Intelligent Pipe Robots

About Pipetronics GmbH & Co. KG

Pipetronics® with headquarters in Stutensee near Karlsruhe offers innovative solutions for trenchless sewer rehabilitation. In our division Robotics, proven experts develop and implement pioneering robot systems for utilisation in main sewers and the area of house connections. Above that our range of services also includes the sale of a wide assortment of products for sewer repairs and innovative pipe sealing systems along with suitable equipment. The individual conversion of vehicles and trailers including accessories as well as the construction of generators represent another business area of Pipetronics®.

In addition, our specialists at a total of five locations guarantee competent advice, a high level of service quality and knowledgeable maintenance and repair of the Pipetronics® devices at any time. The management of Pipetronics® lies in the hands of Markus Lämmerhirt and Markus Brechwald.

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