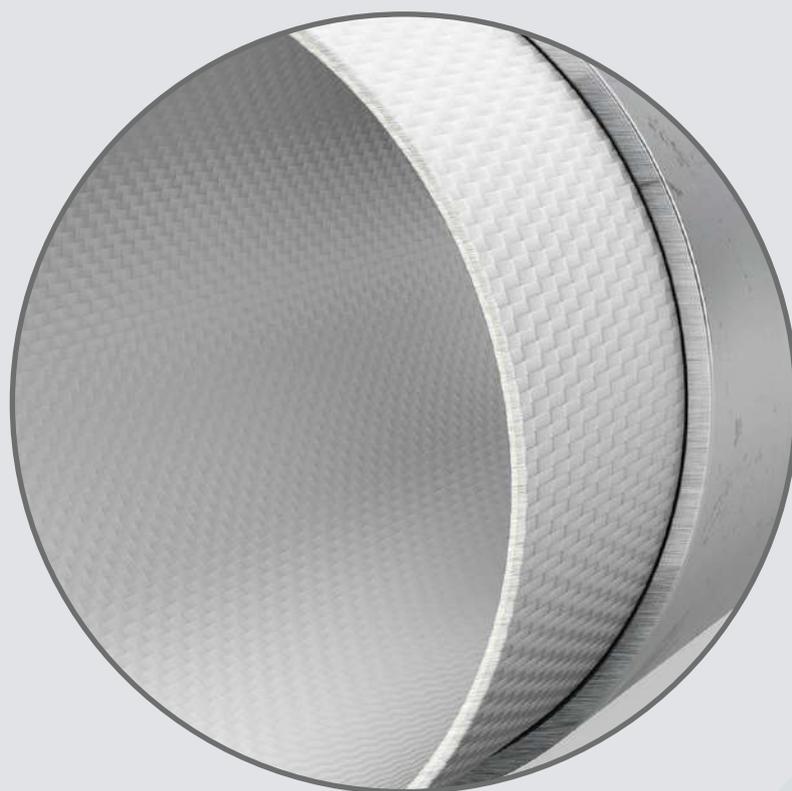


AMEX SANIVAR

Installation Manual SaniTube®



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SaniTube®

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Company details

Amex Sanivar® is a Swiss-German company that has specialized in trenchless pipe rehabilitation for over 40 years. Amex Sanivar® combines the bespoke nature of a small family owned business, with the growing need to become an international supplier. This allows the company to build customer-centric solutions and handle difficult conditions. This innovative, forward-thinking approach forms the basis of our future.

For more information, contact us at:

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Product details

SaniTube® is a high resistant PET - multifilament yarn hose with a dual-sided polyurethane or polyethylene coating that is used to rehabilitate pressurized pipes for: potable water, industrial water, sewage, petro chemicals, oil, and gas. SaniTube® can be pulled through bends of up to 45 degrees, installed in pipes ranging from DN80 to DN400 and requires little equipment to install. It also has a minimum burst pressure of 25 bar, is environmentally friendly, requires no adhesive, is able to line sections of pipe up to 1 KM at a time, is installed into any pipe type, and requires small trenches for installation.

The rehabilitation system SaniTube® is certified after the DVGW- (German Association for Water and Gas trades) according to DIN 30685-1, guideline W270 and the coating guideline KTW from the national environmental agency in Germany. These certificates prove the following properties of the liner:

- Impermeability
- Durability against wastewater
- Chemical durability
- Potable water save
- 50 year design life

Since SaniTube® is a semi-structural element, load bearing capacity has to be provided by the existing pipe. Further information concerning dimensions, material components and mechanical properties are provided in the SaniTube® Specifications sheet.

This installation manual provides a step-by-step guidance for the rehabilitation of pipes using SaniTube®. A correct implementation of this manual is the responsibility of the on-site team and the site supervisor. For the guarantee to be considered valid, this manual must be followed exactly, with all proper documentation completed and returned to Amex Sanivar® after each installation.

Certifications

All Amex Sanivar® seals and liners maintain the highest quality and environmental standards according to ISO 9001 and ISO 14001:1. SaniTube® maintains certificates and approvals from the DVGW, SVGW, KTW, ACS, Hygiene Institute Moscow, WRAS, and Israel for potable water. It has also successfully passed test according to DIN 14811, and DIN EN 14811:2008-01. Additional tests have been successfully completed that cover gas, jet fuel, pressure tests, and abrasion tests.

Requirements

Installation must be completed by or under an Amex Sanivar® certified installation team. Installation by any other individual is against company policy and can affect the validity of any guarantee. Please contact Amex Sanivar® for certification requirements. To carry out a proper installation, the following criteria must be met:

- The pipe should be under pressure or the external pressure can not exceed the internal pressure.
- The maximum operating pressure of the host pipe is below 35 bar
- All bends and house connections are accounted for
- A maximum of 1500m of SaniTube® can be pulled into the host pipe, with the average pull length of one trench being approx. 450m
- The pipe is circular and made of one of the following: steel, ductile, cast-iron, steel reinforced concrete, in-situ concrete, PVC, AZ, GRP, clay, PP, or PE
- The proper equipment has been obtained from Amex Sanivar® and is clean and ready for use
- The required liner length is determined based on the pipe diameter and the number of bends. The maximum installation length in relation to the diameter is shown in the table below:

Pipe diameter	Approx. max installation length	Pipe Bends
DN80 - 100	1500	11° to 22°
DN150	1000	11° to 22°
DN200 - 250	650	22° to 30°
DN300 - 400	500	22° to 30°

Safety

All installers and on-site operators must be trained and competent in all of the required equipment and must follow all instructions from the safety lead. As with any job site, the area must be cleared of all ground level obstructions, and tools and equipment must be returned to their proper place after use.

The main hazards present on a job site are:

- Injury from slips, trips and falls
- Disease from standing/stagnant water
- Injury to members of the public during operations
- Injury from incorrect manual handling of equipment
- Ill health from breathing solder fumes
- Injury to other contractors during works
- Injury from machine and tool hazards
- Working at height
- Possible presence of asbestos

Preventive measures you must take:

- You must NOT carry out this task alone
- Erect barriers at entrances and around the work area, if deemed necessary by the foreman or safety officer to protect tenants
- You must not lift beyond your capabilities - get help if necessary
- Visitors and other members of staff are prohibited from entry unless accompanied by a competent person. All visitors must be issued with personal protective equipment
- You must read and be familiar with the Safety Data Sheets for the installation for SaniTube®, which contains first aid, firefighting, and accidental release measures.

Transportation and storage

SaniTube® is transported from the manufacturer in factory-sealed packaging by a haulage company with an appropriate quality management system. It is sent using a metal drum, wooden wheel, or, in the smaller diameters, folded in a box. Upon receipt of the liner, an inspection must be conducted. If any damage is noticed, the receiver must notify Amex Sanivar® and the courier immediately. In cases where damage is substantial, the receiver should reject the shipment.

At the job-site, the liner must be stored and protected from sun and rain. When unpacking the liner, proper caution must be used in order to ensure no damage is done.

Planning the job

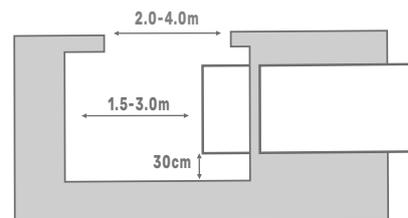
SaniTube® is produced in dimensions of DN80 up to DN400. Planning a proper job requires:

- Determining the medium
- Measuring the pipe's internal diameter
- Understanding any changes in size throughout the pipe
- Clarifying the number of bends and the degrees of each bend
- Determining the length of the pipe
- Establishing sufficient access points
- Confirming if house connections need to be re-established, and, if so, how many and where

Site survey and excavation

Prior to installation, a site survey and excavation must be conducted. This includes double checking all documentation, the dig location, equipment, and material. Then the working pits must be dug, with the locations of all T-sections and service connections, valves and other pipe attachments identified and dug as well. The width of the working pits is recommended to be between 2-4m with 30cm dug below the pipe. Excavation length and pipe cut-outs are dependent upon pipe diameter and should be:

Pipe diameter	Excavation length	Pipe cut-out
DN80 - 100	2.0m	1.5m
DN125 - 200	2.5m	2.0m
DN250 - 300	3.0m	2.5m
DN350 - 400	4.0m	3.0m



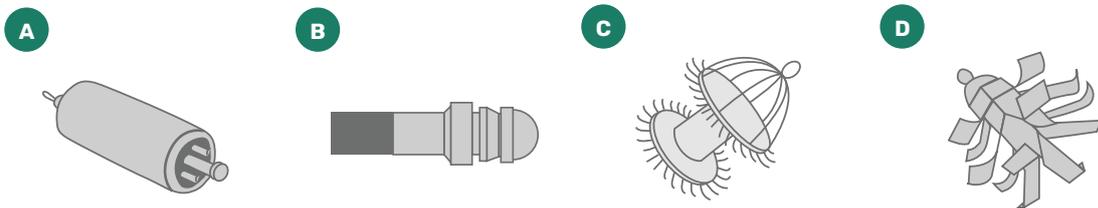
The following factors need to be documented for each job at the time of the site survey:

- The proper size and length of SaniTube® has been delivered
- All supporting documentation is gathered and the installers have inspected the job-site
- All proper equipment is at the job-site and operational
- The pits have been properly dug, the pipe is cut, and any valves, reductions, etc. have been removed
- The edges of the pipe have been grinded/sanded to protect the liner

Pipe preparation and cleaning

Cleaning of the pipe should involve equipment such as brushes, scrapers, pigs and calibration pistons. For severe incrustations or heavy mud sediments, water jetting may be required.

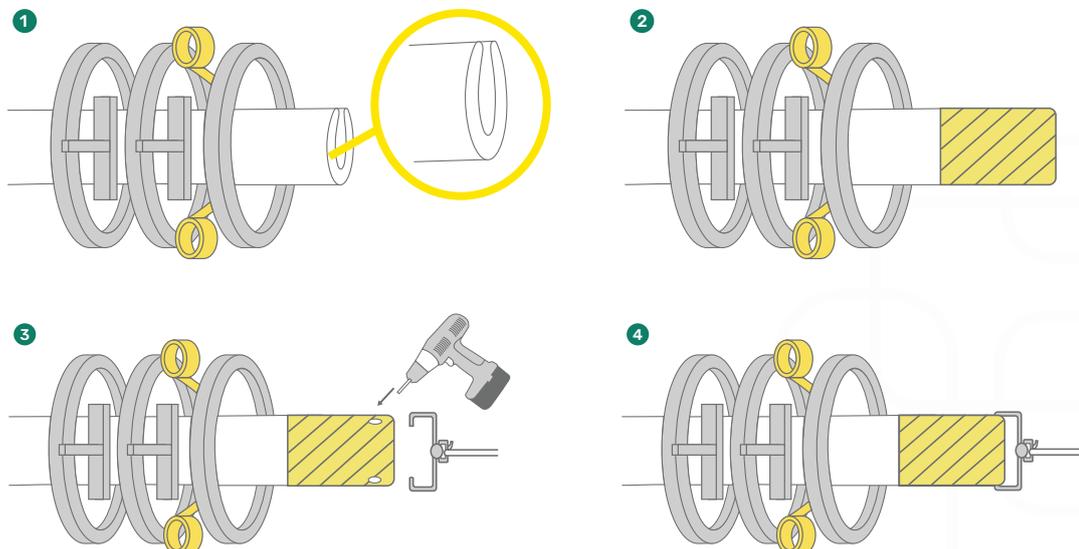
- ☑ Provide a rope connection with a pig/plastic bag (A), or a foil parachute, by means of vacuuming or blowing with a compressor
- ☑ Pull scrapers (C) and brushes (D) through the pipe with a winch while letting the vacuum/air compressor system continue to run
- ☑ Be aware not to use too many scrapers and brushes behind each other
- ☑ In case of heavy incrustations, starting with small scrapers/brushes is also recommended, while gradually increasing the size when incrustations are heavy
- ☑ In the case of severe sediment, use a high-pressure water-jetting unit with a rotating nozzle (B)
- ☑ Closed Circuit TV (CCTV) inspections can be carried out if required



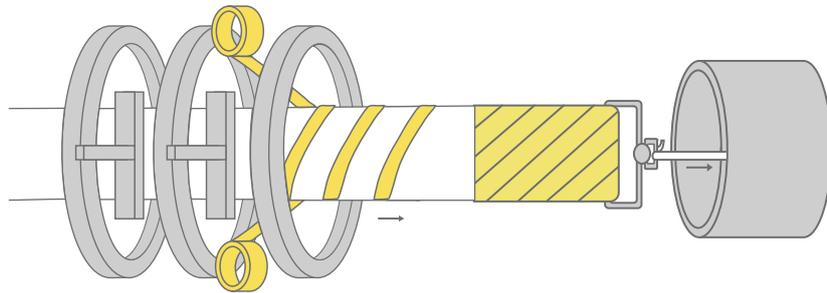
Installing SaniTube®

The installation of SaniTube® begins with the guide rollers being placed at the top of the pit and top of the pipe at both entrance and exit. Then, the winch is pulled through the pipe to be attached to the SaniTube® liner. SaniTube® is pulled through the pipe via the folding machine, cut, inflated, and secured to the host pipe with SaniGrip® couplings. The following steps should be followed exactly:

- ☑ Place the guide rollers at the overhang of the trench and the liner roller at the overhang of the pipe, at both entrance and exit
- ☑ Pull the winch from the exit trench to the entry trench - place in front of folding machine
- ☑ Fold the liner end in half and pull it to the end of the folding machine. Note: Liner can be delivered pre-folded
- ☑ Pull the liner end through the folding machine, attach it to the winch
- ☑ Load tape to the liner folding machine and adjust pressure

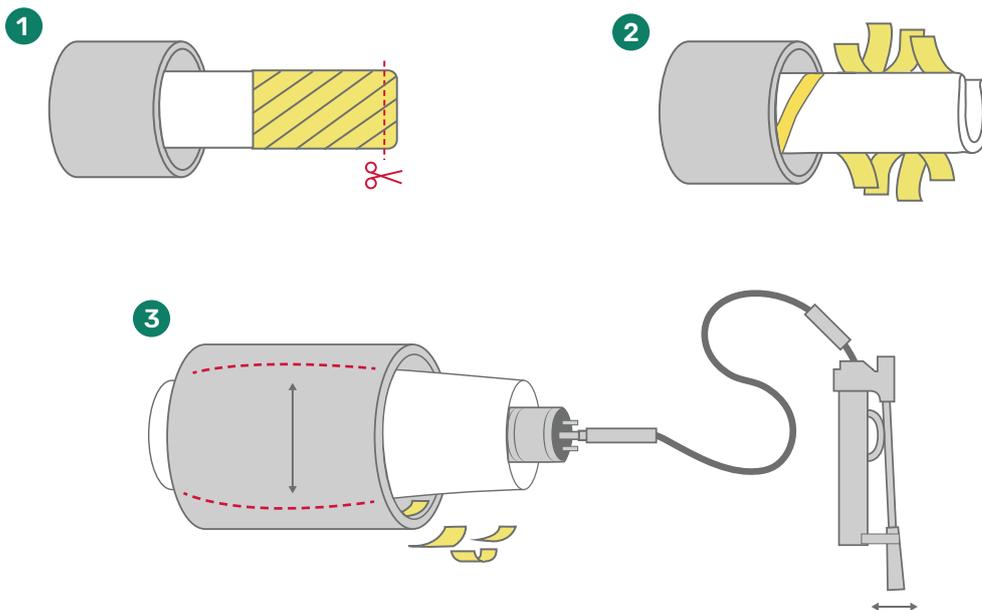


- ☑ Start the winch and pull the liner into the pipe at a tensile speed of 3 - 5m/min
- ☑ Adjust wrapping speed of liner folding machine if necessary and monitor continuously
- ☑ Pull the liner through the pipe until it overhangs about 2m - during the process of expanding the liner the extra space is required



- ☑ Disconnect the liner from winch rope and cut the endings
- ☑ Expand the liner by using a stopping bladder. Place the bladder in the beginning of the 2m-overhang, inflate the bladder and inflate the liner slowly with 1 to 2 bar compressed air. The tape around the liner will start to burst while air is filling the liner (Attention: very loud bang)
- ☑ There needs to be an overhang of approx. 20cm to install the coupling, but it is recommended to cut the liner with an extra 2-3m

2



SaniTube® size	Inflation pressure
DN80-150	1.5 bar
DN200-250	1.2 bar
DN300-400	1.0 bar

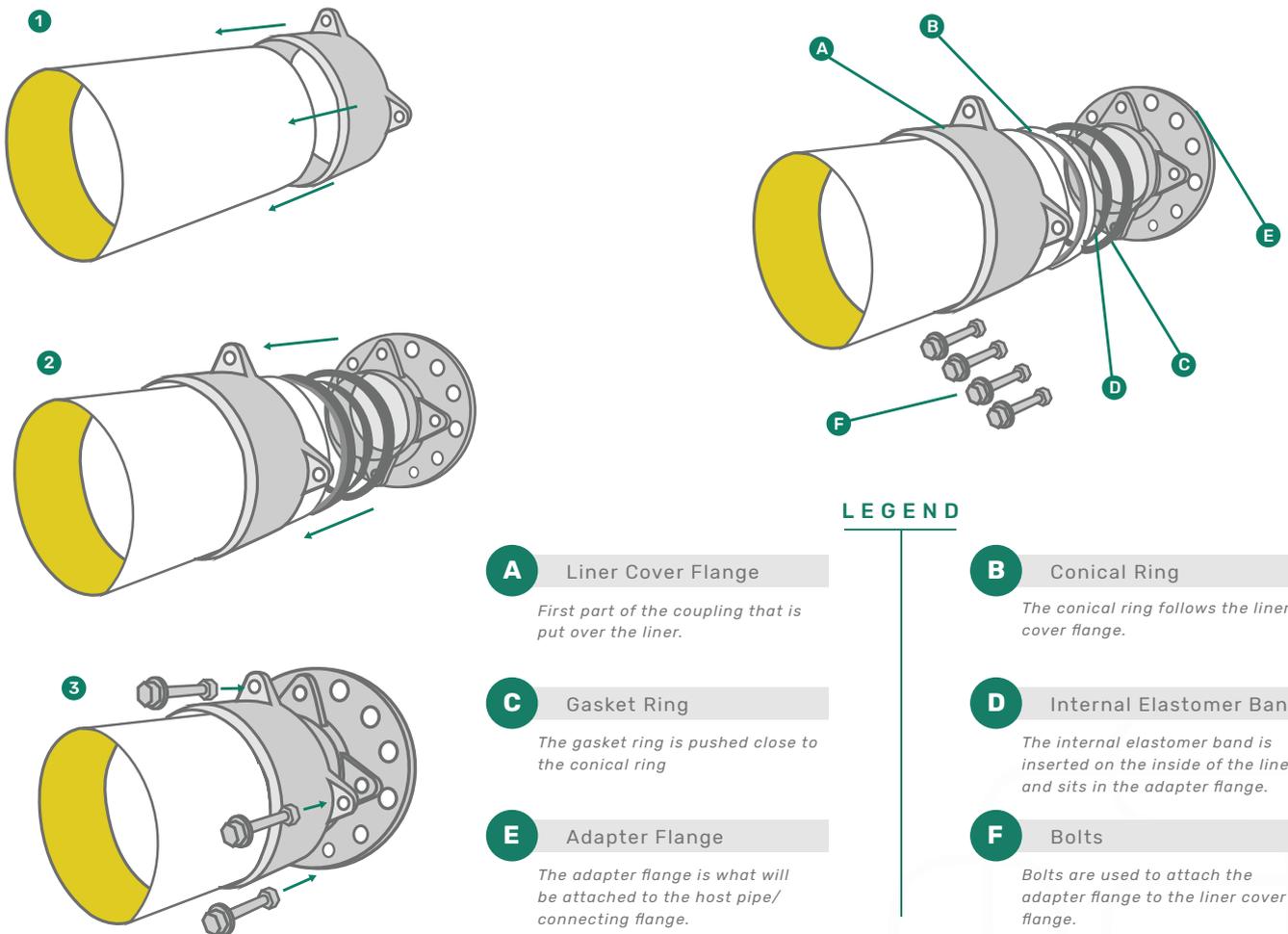
*Note: Make sure to check that:

- ☑ the liner sits tight in the pipe
- ☑ the liner length is proper after any shrinkage
- ☑ any wrinkles are removed and the liner sits round.

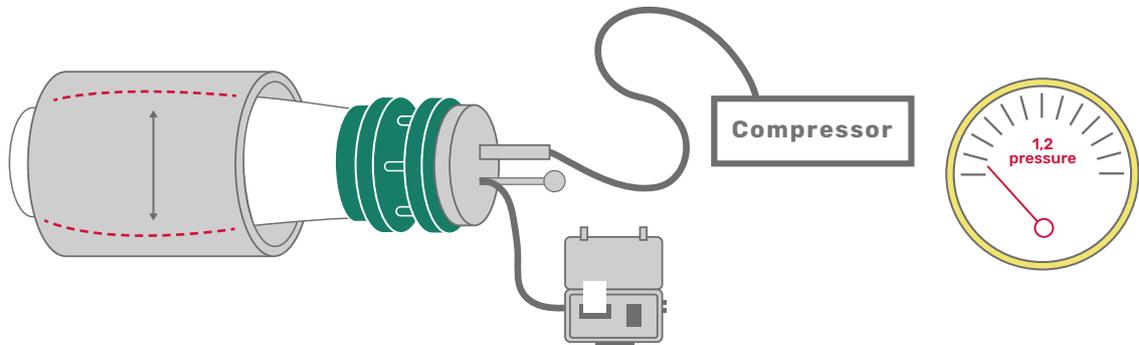
Installing SaniGrip®

The SaniGrip® coupling is used to attach the liner to the host pipe. To install, the liner is first cut back 10cm and then installation can follow.

- ☑ Push the first part of the coupling (A) and conical white (open) ring (B) over the liner
 - The smaller side of the conical white ring faces the first part of the coupling/host pipe
 - Cut the liner 15cm in front of the conical white ring
 - Cover the gasket ring (C) (black rubber), the coupling, and the liner end with lubricant
 - Push the gasket ring to the conical white ring over the liner
 - You need a straight cut to connect the second part of the coupling: Pull the black gasket ring a little back, draw a straight line with an Edding pen along the black gasket ring onto the liner and cut it along the line for a better installation of the coupling
- ☑ Insert the second part of the coupling flange (E) into liner
 - Attention: Before you push both parts of the coupling finally together, please check the conical white ring – There has to be a gap between the conical white ring of approx. 1cm! If there is no gap in it, you have to shorten the ring to get this gap. Otherwise the coupling can not tighten
- ☑ Fix screws cross-wise and secure evenly using a torque-key. The torque has to be 90Nm and must be tightened in an alternating fashion (Note: The tiny rubber rings at the end of the screws are just a transportation protection and waste)

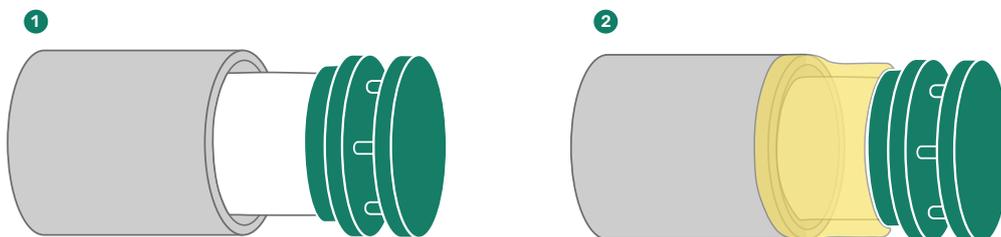


- ☑ Mount testing caps and end caps to both pipe endings along with the pressure reader
- ☑ Apply testing pressure through air
- ☑ It is recommended to leave the system under pressure for 12 hours, but this can be adjusted to meet the needs of the customer. If necessary, the line can be re-instated in as little as one hour after installation of the couplings.
- ☑ If the pressure remains constant, the liner is left under pressure for the amount of time defined by the end client. Monitor the pressure in the liner and make sure it remains constant.



In the case there is exposed SaniTube® between the host pipe and SaniGrip®, the following steps are taken:

- ☑ A protective piece of pipe, or protective material is cut
- ☑ This then covers the exposed pipe, being taped, clamped, pressed, or fused, into place



Final steps

After successful pressure tests the pipe can be re-connected and returned to service. Make sure to then complete all documents listed in "Documentation."

Documentation

The installation must be documented and archived so that any arising defects can be targeted and suitable corrective measures can be taken. The storage period for such documents corresponds to the warranty period and lasts at least 5 years.

All relevant documents and data have to be collected from the client and local authorities, specifically the following:

- Differences in the inner diameter (dimension changes)
- Directional changes (bends)
- Pipe offsets and joint gaps
- Connections
- Root ingrowth
- Groundwater infiltration
- Drain obstacles
- Deformation
- Deposits / contaminations
- Damage pattern
- Operating pressure
- Operating temperature
- CCTV inspection of damage and pipe condition

After Installation the following must be completed:

- Fill out pressure chart
- Fill out course report
- Complete site-diary

In addition to these, for quality assurance purposes, the following must also be documented:

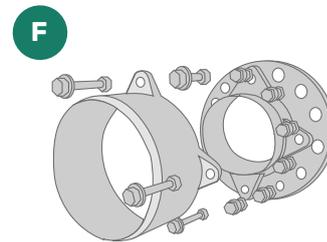
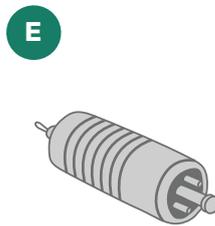
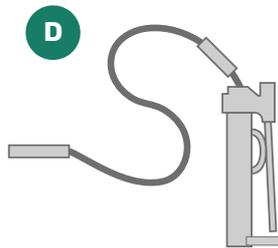
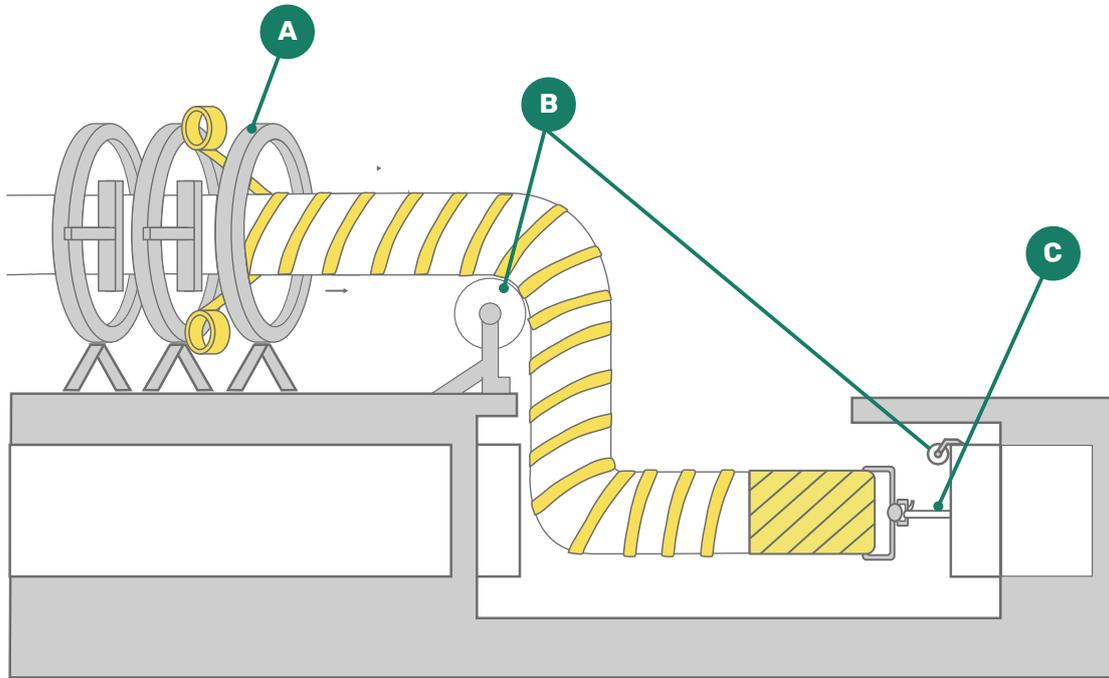
- Installation Manual must be followed exactly
- Proper pressure tests must be completed and documented after installation
- Pull speed at m/min

Appendices

Equipment List

The installer needs all equipment mentioned here to properly install SaniTube® and SaniGrip®. It is important to note that measuring and recording devices must be reviewed and calibrated regularly.

Additionally, the installer has to wear his or her PPE (Personal Protective Equipment). The PPE consists of: helmet, safety shoes, gloves, safety suit.



LEGEND

A Folding Machine

The Folding Machine folds the liner in half and tapes it shut.

C Winch

The Winch attaches to the liner and pulls it through the pipe.

E Stopping Bladder

The Stopping Bladder is used to inflate the liner after installation.

B Guide Rollers

Guide Rollers protect the liner and the pipe from the ground and the Winch.

D Pressurizer

The Roller protects the Pressure Hose from the ground.

F SaniGrip®

SaniGrip® couplings are used to connect the liner to the host pipe or house connection.

REPORT SANITUBE	
<p>Site</p> <p>Location: _____</p> <p>Street: _____</p> <p>Section: from _____ to _____</p> <p>Section No. _____</p> <p>Total length of distance: _____ m</p> <p>./ Total length of bridging: _____ m</p> <p>DN _____ Material GG/GGG/St/AZ/Concrete/PVC</p> <p>Measured inner pipe diameter</p> <p>Pipe beginning: Ø _____ mm</p> <p>Pipe ending: Ø _____ mm</p> <p>Temperature: Air ___ °C</p> <p>Ground: ___ °C</p> <p>Weather: <input type="checkbox"/> Dry <input type="checkbox"/> Rain <input type="checkbox"/> Fog</p>	<p>Material</p> <p>Liner No.: _____</p> <p>Charge-No.: _____</p> <p>Length of liner: _____ m</p>
<p>Carried out works</p> <p>Date of Renovation: _____</p> <p>Type of pollution: <input type="checkbox"/> Tar <input type="checkbox"/> Mud <input type="checkbox"/> Rust <input type="checkbox"/> Incrustation / _____ mm</p> <p>Way of cleaning: <input type="checkbox"/> Scraper <input type="checkbox"/> Brushes <input type="checkbox"/> Pig <input type="checkbox"/> High-pressure water cleaning</p> <p style="padding-left: 40px;"><input type="checkbox"/> Chain flail head <input type="checkbox"/> Water cleaning at max. pressure</p> <p>TV-Inspection: after cleaning <input type="checkbox"/> yes <input type="checkbox"/> no after renovation <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p>Width of grinder opening: _____ mm</p> <p>Inflation pressure min. _____ mbar max. _____ mbar</p> <p>Winch pull speed _____ m/min</p> <p>Pressure test: _____ bar from _____ / _____ h to _____ / _____ h</p> <p>Mean of testing-Nr.: _____</p>	
<p>Final works</p> <p>Folds: <input type="checkbox"/> yes <input type="checkbox"/> no</p> <p>Bends: 11° ___ Pcs. 22° ___ Pcs. 30° ___ Pcs. 45° ___ Pcs.</p> <p>Notes: _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	
<p>Date: _____ Signature: _____ Personal: _____</p>	