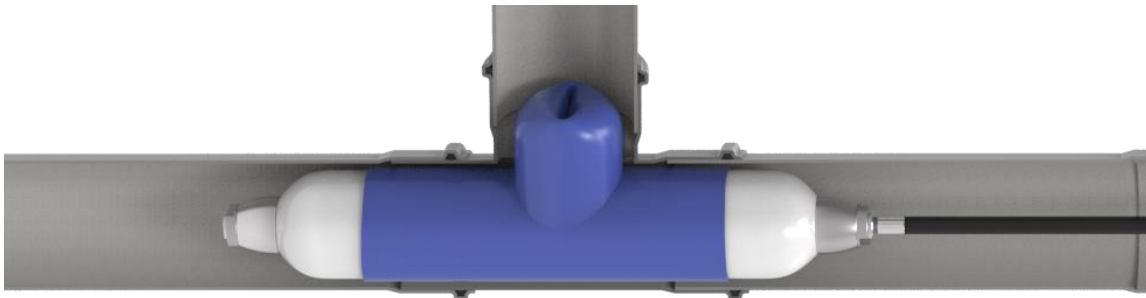




SANIPRO

GLOBAL LEADERS IN PIPE LINING

SANI PACKER SYSTEM – **IR CURE** INFRARED PATCHING TECHNOLOGY



Connection sleeves with designated IR COMPATIBLE LINER for the rehabilitation of damage sewage, rainwater & collection lines within building in the nominal size range DN70 to DN200.

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1. INTRODUCTION

The Sani T-Packer system is used to repair the side connections of pipes (40° - 90°). This system has impressive and uncomplicated handling and unbelievable efficiency.

The lateral connection is lined using inversion technology. Comparable to an open-end liner.

Under observation of a camera positioned in the side connection. The packer is moved into position using our specialized air push rods.

SCOPE OF APPLICATION

It is suitable for the rehabilitation of damaged waste water, rainwater and collecting pipes within buildings in the nominal diameter range DN50 to DN200 made of concrete, steel, reinforced concrete, stoneware, fiber cement, the plastics GRP, PVC, PE, PP, & Cast Iron.

The process applies in each case in connection with the two-component epoxy resin system EXRR-2 and EXR-2 (A) RESIN + (B) HARDENER and the Liner for the diameter DN70 to DN200.

DAMAGE ASSESSMENT

For assessment, a camera inspection is essential in the 1st step.

The Damage must be then classified accordingly, and the relevant preparation work needs to be defined (e.g. use milling robots, installation of additional short liners etc.)

DAMAGE PATTERNS

The SANI T-PACKER system is suitable to be used for the following types of damage:

1. Leaks with and with or without groundwater infiltration or exfiltration at pipe connections, pipe walls, connection and transition areas etc.
2. Position Misalignments, cracks, shards & fractures
3. Mechanical wear & tear
4. Corrosion

OPERATING CONDITIONS

The SANI T-PACKER system can be used regardless of the wastewater temperature and sewerage atmosphere. The curing temperatures depend on the reaction resin used.

1. The leak test is carried out in accordance with DIN EN 1610 and thus meets their requirement.
 2. Abrasion resistance according to DIN 19545-1
 3. For subsequent sewer cleaning, the instructions in ATV worksheet 143-7 must be observed.
 4. Maximum spray jet Power density according to DIN 19523 : 330mm² + max. 15 W/mm².
 5. Minimum cleaning speed: 0.1m/s – 0.02m/s
- Inform cleaning team about the rehabilitation work that has been carried out BEFORE starting.

2. WORK PREPARATION

EQUIPMENT / MATERIAL - Components of SANI IR Packer System – Infrared Technology.

SANIPRO Global offers all the technical components and consumables required for this process, all of which are tailored to the respective area of application, enable the simplest possible handling and an optimal rehabilitation result.

The basic equipment of the SANI IR PACKER System consists of the following technical components and consumables:

2.1 TECHNICAL COMPONENTS

PACKER BASE for Silicone hose – 1m, 2m, 3m in length



ITEM NUMBER	PACKER SIZE	RECOMMENDED SILICONE BLADDER SIZE
12311	SB Holder DN 30mm Flex	DN 70
12312	SB Holder DN 45mm Flex	DN 100
12313	SB Holder DN 64mm Flex	DN125 – DN150
12543	SB Holder DN 87mm Med Flex	DN 200

SILICONE BLADDER

The Silicone Bladder Sheath is a fabric-backed silicone with slight elasticity. The Packer is used without a release agent as no resin adheres/sticks to it. However a release agent can be used to help. The packer system is suitable for both cold and IR curing.

The following pipe diameters and lengths are available. The silicone hose MUST always be 20cm longer than the packer base body is when assembled.

MAINLINE: DN70 – DN200

BRANCH LINE: DN100 – DN200

INSTALLATION & CURING PRESSURE: 0.4 -0.8 BAR MAXIMUM PRESSURE: 1.0 BAR

STANDARD LENGTH SIZES: 1m, 2m, and 3m

SPECIALIZED PROFILES:



CONTROL UNIT

- Compressed Air & Vacuum switches
- Manometer for Pressure Monitoring
- Pressure Regulator (Curing pressure control)
- Compressor Connection (Volume minimum 60 liters/minute)



PUSHROD FOR IR PACKER SYSTEM 1.5 METER LENGTH



TURNING HANDLE FOR IR PACKER SYSTEM



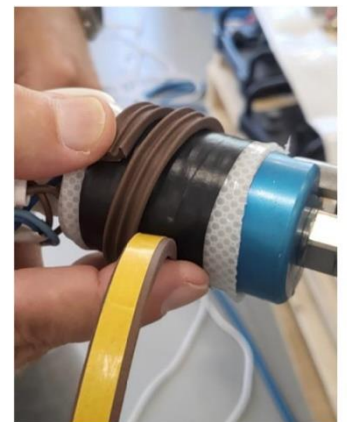
ADDITIONAL COMPONENTS FOR STEAM CURING

- Sani IR Power box
- 25m Cable for IR Packer



MOUNT THE SILICONE BLADDER ON THE PACKER BASE:

We recommend wrapping a layer of silicone bladder material around the aluminum end element to achieve a better seal. You can also use simple window sealing tape.



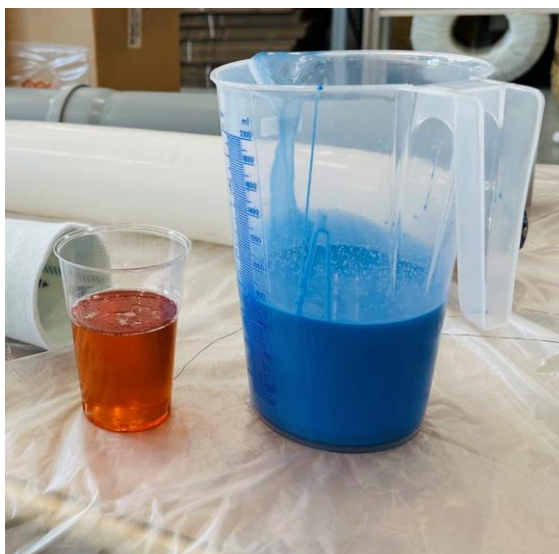


The Silicone bladder is wrapped in and fixed with insulation tape. Which also serves as a protection for the silicone hose. Then tightened tightly with a hose clamp.

2.2 CONSUMABLES

SANI – IR EPOXY RESIN SYSTEM – **INFRARED COMPATIBLE** – A (Resin)+ B (Hardener)

Hardener comp. B	Processing Time 20°C	Curing Time 20°C	IR Curing Time Shortliner	IR Cooling Time
SANI EXRR-2 100:30; 4,2 kg	10-12 min	2-2,5 h/Std	15 min	15 min
SANI EXR-2 100:28; 3,92kg	15-18 min	3 h/Std	20 min	
SANI EX1-2 100:25; 3,5 kg	30-35 min	8 h/Std	30 min	
SANI EX2-2 100:25; 3,5 kg	60-70 min	17 h/Std	40 min	
SANI EX4-2 100:25; 3,5 kg	2,5-3 h/Std	24 h/Std	60 min	
IR Harz vertical Komp. A 14 kg				



SANI LINER SELECTIONS – IR COMPATIBLE LINING MATERIAL -

SANI CONCEPT SX4.1 - 3D LINER – PU COATING - UP TO 90° BENDS

Part Number	Liner	thickness Wandstärke
12729	SX4-1 100-150	4,5mm
12730	SX4-1 125-150	4,5mm
12731	SX4-1 150-200	4,5mm
12732	SX4-1 200-250	4,5mm
12733	SX4-1 250-300	4,5mm



SANI SX4 – 3D LINER – PU COATING - UP TO 90° BENDS

Part Number	Liner	thickness Wandstärke
500	SX4 80-100	4,5mm
501	SX4 100-150	4,5mm
502	SX4 125-150	4,5mm
503	SX4 150-200	4,5mm
50401	SX4 200-250	4,5mm
122524	SX4 225-250	4,5mm
122534	SX4 250-300	4,5mm



SANI SX3 – 3D LINER – PU COATING – UP TO 90° BENDS

Part Number	Liner	thickness Wandstärke
12333	SX3 50-70	3mm
12332	SX3 70-100	3mm
12331	SX3 100-150	3mm
12271	SX3 125-175	3mm
121592	SX3 150-200	3mm
121272	SX3 200-250	3mm



SANI IN HOUSE LINER SX2 – PU COATING – UP TO 90° BENDS

Part Number	Liner	thickness Wandstärke
12221	SX2 DN 40	3mm
12222	SX2 DN 50	3mm
1215300	SX2 DN 70	3mm
1215400	SX2 DN 100	3mm
1215500	SX2 DN 125	3mm
1215600	SX2 DN 150	3mm
1215700	SX2 DN 200	3mm
121913	SX2 DN 225	3mm
121923	SX2 DN 250	3mm
121933	SX2 DN 300	3mm



LINER - RESIN CONSUMPTION

Harz Verbrauch EXRR-2 kg pro Meter

Resin Consumption EXRR-2 kg per meter

Ø (DN)	3 mm A / B	4,5 mm A / B	6 mm A / B
50	0,40 / 0,12		
70	0,56 / 0,17		
80	0,64 / 0,19		
100	0,80 / 0,24	1,20 / 0,36	
125	1,00 / 0,30	1,49 / 0,45	
150	1,24 / 0,31	1,79 / 0,54	2,39 / 0,72
200	1,66 / 0,41	2,39 / 0,72	3,19 / 0,96
225	1,87 / 0,47	2,69 / 0,81	3,59 / 1,08
250	2,07 / 0,52	3,53 / 0,90	3,99 / 1,20
300	2,49 / 0,62	3,59 / 1,08	4,78 / 1,43

Harz Verbrauch EXR-2 kg pro Meter

Resin Consumption EXR-2 kg per meter

Ø (DN)	3 mm A / B	4,5 mm A / B	6 mm A / B
50	0,44 / 0,11		
70	0,57 / 0,16		
80	0,65 / 0,18		
100	0,81 / 0,23	1,21 / 0,34	
125	1,01 / 0,28	1,52 / 0,43	
150	1,21 / 0,34	1,82 / 0,51	2,43 / 0,68
200	1,62 / 0,45	2,43 / 0,68	3,24 / 0,91
225	1,82 / 0,51	2,73 / 0,77	3,64 / 1,02
250	2,02 / 0,57	3,04 / 0,85	4,05 / 1,13
300	2,43 / 0,68	3,64 / 1,02	4,86 / 1,36

Harz Verbrauch EX1-2 u. EX2-2 kg pro Meter

Resin Consumption EX1-2 and EX2-2 kg per meter

Ø (DN)	3 mm A / B	4,5 mm A / B	6 mm A / B
50	0,44 / 0,10		
70	0,58 / 0,15		
80	0,66 / 0,17		
100	0,83 / 0,21	1,24 / 0,31	
125	1,04 / 0,26	1,55 / 0,39	
150	1,24 / 0,31	1,87 / 0,47	2,49 / 0,62
200	1,66 / 0,41	2,49 / 0,62	3,32 / 0,83
225	1,87 / 0,47	2,80 / 0,70	3,73 / 0,93
250	2,07 / 0,52	3,11 / 0,78	4,14 / 1,04
300	2,49 / 0,62	3,73 / 0,93	4,97 / 1,24

Harz Verbrauch EX4-2 kg pro Meter

Resin Consumption EX4-2 kg per meter

Ø (DN)	3 mm A / B	4,5 mm A / B	6 mm A / B
50	0,43 / 0,09		
70	0,60 / 0,12		
80	0,69 / 0,14		
100	0,86 / 0,17	1,30 / 0,26	
125	1,08 / 0,22	1,62 / 0,32	
150	1,30 / 0,26	1,94 / 0,39	2,59 / 0,52
200	1,73 / 0,35	2,59 / 0,52	3,45 / 0,69
225	1,94 / 0,39	2,91 / 0,58	3,89 / 0,78
250	2,16 / 0,43	3,24 / 0,65	4,32 / 0,86
300	2,59 / 0,52	3,89 / 0,78	5,18 / 1,04

ADDITIONAL EQUIPMENT REQUIRED – PROVIDED BY THE EQUIPMENT USER

- Vehicle to move equipment from job to job.
- Power Supply (power generator)
- Compressor (Volume about 60 liters/minute)
- Scale for weighing resin.
- Mixer for resin
- Dewatering equipment E.g., SANI shut off plugs or discs)
- Sewer Inspection devices (CCTV Camera)
- Sewer cleaning accessories E.g., Milling robot or mechanical pipe cleaning device.
- Personal protective equipment
- Usual hand tools
- Drill & mixing tip for resin.
- Waste bins and Sanitary rooms for staff
- Hand washing facilities
- Spill Kit for environmental protection in the event of a resin spill

WORK PREPARATION – JOB SITE SAFETY

All legal regulations applicable to the security and management of the construction site, e.g. regarding traffic safety, accident prevention, and/or environmental or occupational safety etc. MUST be adhered to. The user bears sole responsibility for safety on each jobsite. The description of the necessary measures is not the subject of this manual. We recommend speaking to workplace, health & safety specialist in your region, to ensure you adhering to the rules and regulations associated with your jobs.

JOB SITE - PREPARATIONS

1. Take written note of ALL lateral connections / junctions (distance from US & DS + location)
 - Measure the distance in the pipe to the connection (measure on the camera cable – do NOT trust the reading on the monitor).
 - Also mark the position of the connector on the push rod (including packer).
 - Check the accessibility to the pipe to be able to position the packer.
2. Determination of the rehabilitation period. During this period, no wastewater may be discharged into the rehabilitation section. Take appropriate preparatory measures.
3. Review all technical equipment.
4. Mill away any obstacles to flow that could damage the packer during installation.
5. To ensure permanent bonding with the old pipe, the wall of the old pipe must be cleaned immediately before the pipe liner installed. The surface of the pipe must be free from grease and other residues.
6. Before starting the relining process, double check that the entire section of pipe that requires repair is thoroughly cleaned for the best possible outcome.
7. Determination of the required packer size.
8. Determine the required liner size & curing method.

PREPARATION OF INSTALLATION – RESIN SELECTION

Criteria influencing the choice of resin

- Air Temperature
- Pipe Temperature
- Resin Temperature
- Distance to the Connection / Branch line
- Locate a cool or shaded area to set up your Portable Resin Wet out Table.
- Impregnation of the T-Felt Liner or Top Hat must be conducted in a cool shaded area.
- Temperature control areas are ideal for consistency – but are not required.
- Temperature and sunlight have a major impact on the pot life of resin.
- Calculate the time you need to impregnate and install the T-Liner

PLEASE NOTE: The processing time of the resins was determined at a temperature of 22°C.

+10°C (32°C) means a 50% reduction in processing time.

-10°C (12°C) means a 50% increase in processing time.

With the information that you have collected above – select your appropriate resin.

CHECK LIST BEFORE INSTALLATION

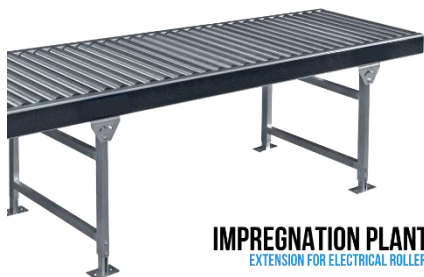
Prepare your equipment before you install your SANI IR Pipe repair.

- Apply 2 layers of disposable gloves.
- Ensure you have clean rags handy in case of spills and to wipe your hands.
- Prepare working area in shaded area for extra working time.
- Cover your wet out table with a disposable clear sheet.
- Ensure Control Unit is in position.
- Ensure Power Box in position.
- Ensure Power cable for packer in position.
- Ensure Push rods are in position.
- Ensure Drill & mixing tip are in position to mix your Part A & B resins.
- Mark the position of the T-Liner Material and the seams with a black permanent marker.
- Position the CCTV camera in the lateral connection for a clear view of the T-Packer.
- IF required, pull the pull-in cable or rope into the pipe.
- Check fuel levels on your air compressor if required.
- Connect the compressed air hoses and carry out a compressor test run.
- Access your packer is it slippery inside? Apply oil or Talc powder for easy install & removal.

6. SANI IR LINER INSTALLATION – IMPREGNATION

Prepare your Liner material for Impregnation.

- Mix your PART A & PART B resin in a cool area in preparation for Liner Impregnation.
- The Part A & B resin **MUST** be mixed in the correct ratio to adhere to the host pipe.
- Mix resin for 3 minutes to ensure it is mixed evenly all the way through.
- Pour ½ of the thoroughly mixed resin onto the T-Felt liner and massage deep into the structure of the material.
- Flip the material over, and apply the remaining resin. Ensuring there are NO dry areas and that the resin is completely saturated. Squeeze off any large excess of resin.
- Double check material to ensure complete saturation of resin with NO WHITE SPOTS.



EQUIP PACKER WITH LINER– IN PREPARATION FOR INSTALLATION

- Place the packer under the vacuum.
- Pull the Liner material over the packer.
- Fix the Liner material to the packer using Electrical tape or binding wire (max 0.7mm)
- If you choose to use binding wire to fix the liner onto the packer, please ensure that the wire is twisted tightly with only half a turn. Cut the wire ends to a maximum of 1cm.

PACKER POSITIONING – INSIDE THE PIPELINE

- Push the packer through the pipe.
- To pass the arches easily, push the packer through the arch with a slight twist/rotation.
- The rotation of the packer must always be combined with a forward or backward movement to prevent twisting of the push rods.
- After positioning packer, increase the pressure in the packer with light bursts of air pressure.
- Take your time.... Don't hurry or rush the process.
- Once the liner is fully installed, adjust the curing pressure on the pressure regulator.
- Maintain pressure for the entire curing process/time.
- After curing/hardening is complete, use the vacuum to deflate packer as quick as possible.
- Remove the packer from the pipeline with a slight twist and careful back & forward movement.

SANI RESIN POT LIFE – PROCESSING TIME

Härter Komponente B <i>Hardener comp. B</i>	Verarbeitungszeit 20°C <i>Processing Time 20°C</i>
SANI EXRR-2 100:30; 4,2 kg	10-12 min
SANI EXR-2 100:28; 3,92 Kg	15-18 min
SANI EX1-2 100:25; 3,5 kg	30-35 min
SANI EX2-2 100:25; 3,5 kg	60-70 min
SANI EX4-2 100:25; 3,5 kg	2,5-3 h/Std
Resin vertical IR Base comp. A 14kg IR Harz vertical Komp. A 14 kg	

SANI IR RESIN - CURING TIME

The following information refers to the time **AFTER** switching on the power box.

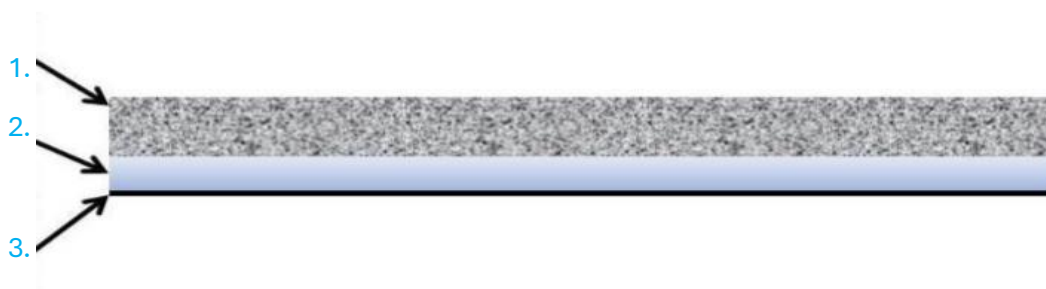
PLEASE NOTE: The Volt and Ampere values should remain unchanged. IF the values change, the IR light source may be damaged, and the curing time may need to be extended accordingly. The resin will still cure without the IR Light system @ 20°C. Please check your IR light system **BEFORE** starting the installation process and adjust curing times - only if required.



WALL CONSTRUCTION OF - SANI T-FELT LINER

1. Existing host pipe
2. Cured with resin impregnated polyester mash hose, SANI T-Liner (3mm)
3. PU Coating of SANI T-Felt Liner (0.3mm)

GRAPH BELOW:



FINAL WORK & TESTS – FINAL CHECKLIST

- After completion of the work, the rehabilitated pipe section must be clean, visually inspected and the rehabilitation measures documented.
- It must be determined if any material residue has been removed or if there are any hydraulically disadvantageous folds.
- After the connection sleeve has hardened, the tightness must be checked to ensure the liner has locked into place.
- If necessary, include the connected pipes in your final checks to ensure everything is flowing.
- The tightness of the rehabilitated pipes is to be checked using water method “W” or air method “L” according to [DIN EN 1610](#).
- Ensure the jobsite has been cleaned, that there are NO resin spills, follow your local environmental practices.

