RedEx®

Installation Manual

For inner sealing sleeves in accessible pipelines,
nominal diameters DN 32 – 95 inch and Liner End Seal ≥ DN 8 inch

- General information
- Preparing the installation positions
- Installation of the RedEx® inner seal
- Technical Data

Before starting the installation and removal, carefully read all instructions!

Before starting the installation and removal, the pipeline system must be depressurized and emptied!

ATTENTION Put on personal protective equipment, safety goggles, head protection and safety shoes.

Non-observance of instructions and information in the installation manual could result in malfunctions/defects of the product and system, whereby, injury to persons and/or tangible damage could occur.

If additional installation instructions are required, or there are questions about the product, contact the Pipe-Seal-Tec GmbH & Co. KG:

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1. General Information

1.1 Determining Risks

The risk levels are given as follows.

DANGER

"DANGER" indicates an impending risk that results in death or injury to persons if the instructions and precautionary measures recommended are not observed.

ATTENTION

"ATTENTION" draws attention to risks or hazardous procedures present that could result in death or serious injury to persons if the instructions and precautionary measures recommended are not observed.

CAUTION

"CAUTION" determines possible risks or hazardous risks that could result in physical injuries and tangible damage if the instructions and precautionary measures recommended are not observed.

1.2 Introduction to System RedEx®

This installation manual contains instructions about the mechanical-hydraulic clamping of the RedEx® inner seal system in a pipeline and container system. The installation manual imparts the basics for installation of the system. There is no claim that all aspects of installation are explained. Special installations are illustrated on request.

The installation manual considers the following products of the RedEx® system in the diameter range DN 32 – 95 inch. Diameter ranges greater than 95 inch are given on request:

Installation of individual sleeves

- RedEx® width 10 inch
- RedEx® width 15 inch
- RedEx® width 20 inch
- Liner End Seal

Installation of continuous sleeves

- RedEx® connect width 20 inch

The sequence of the individual steps must be observed and adhered to. Physical parameters specified for temperature, pressure and media stabilities must be observed.

CAUTION

- The system is only used in pipeline systems that are statically self-supporting.
- The manufacturer accepts no liability in the event of incorrect ordering with regard to media stabilities and physical parameters such as pressure, temperature and dimensions.
- The manufacturer accepts no responsibility in the event of incorrect construction of individual system components by the customer. Substitution of individual components of the system is not permitted.
- The manual does not replace the installation instructions on-site by the service personnel of the manufacturer.

DANGER

During installation, observe the national, relevant statutory provisions, regulations and works standards for the prevention of occupational accidents.

2. Application Fields RedEx®

Pressure gauge ranges:

- accessible range DN 32 – 95 inch
- inaccessible range DN 8 – 47 inch (as liner end sleeve)

Pressure ranges:

- max.: 363 psi

CAUTION

Vacuum: possible, installation instructions on request

Temperature:

- -68° – 284° F
- 338° – 446° F (conditional)

CAUTION High-temperature requirements: construction on request

Damage image:

- leaking sleeves
- radial cracks
- corrosion

CAUTION

Longitudinal cracks: If there are longitudinal cracks, the pipe can be destroyed!

Pipe materials:

- Steel
- Cast iron
- PVC
- AC
- PE
- GRP
- Reinforced, on-site, prestressed concrete
- Cement mortar

Profile cross-sections:

- Round profiles
- Special profiles such as ovoid, jaw, ellipse and corner profiles
  (Construction of the special profiles on request)

CAUTION Polypropylene only conditionally possible

Choice of elastomers:

- EPDM
- NBR
- SBR

Types of water conditions:

- Potable water
- Untreated water
- Service water
- Waste water

CAUTION Construction for leaches, acids, oils, gas on request.

3. Equipment

Installation material:

- Elastomer sleeves
- Clamping rings
- Shims
- Lock elements
- Synthetic material backing tape
- (Valves)

General equipment safety:

- Air fan (pneumatic), electric fan
- Pipe carriage
- Measuring wheel / measuring tape
- Laser distance measurement device

- Manual grinding machine
- Hydraulic press and piston / support spindle
- Box for adaptors
- Test fitting and hose
- Electronic pressure recorder / diagrams
- Torches and forehead lamps
- Knee and elbow protectors
- Dust masks
- Personal protective equipment, life saver
- Ladders, tripod
- Toolbox and hammer:
  - No recoil
  - Plated stainless steel hammer
  - Stainless steel horn
- Batteries, charger
- Compressed air bottles
- Welding device / electrodes
- Angle grinder

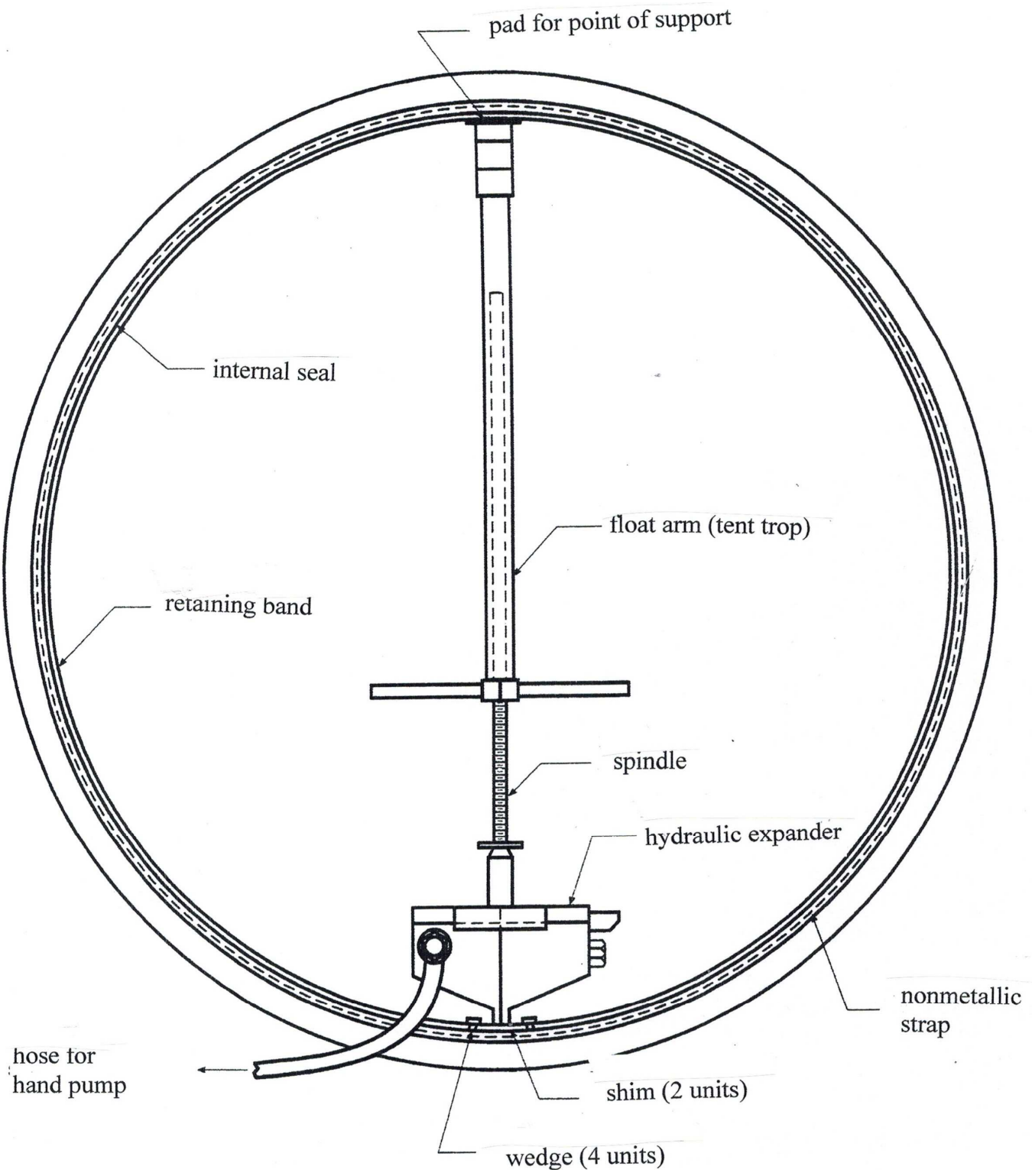
Equipment depending on the DN:

- Hydraulic expander
- Pressing-in fixture
- Support spindle

Consumables:

- Waste sacks
- Gloves
- Grinding discs
- Cutting discs
- Flex discs
- Knife / blades
- Adhesive tape
- Soap / grease / lubricants
- Marking / penetrating oil spray
- Oil chalks
- Soap / hand towel
- Disinfectant
- Disposable suits

4. Operating Principle – SchematicRedEx®



The system exclusively functions by applying radial tension to the band clamps using hydraulic expanders. Through this tension, surface compression is permanently applied on the elastomer seal and, thus, fixed on the pipe wall.

CAUTION

All components are under tension when installed.

5. Preparation Tasks for Installation

Before inspecting the pipe, a proven and reliable water retention system (plug, valve or bypass) must be in place.

DANGER

If the shut-off devices, such as bladders or gate valves fail, there is an acute risk to life.

Cleaning procedures must include a process for the proper removal and transport of all loose contamination prior to installation.

DANGER

If there is residue from the cleaning, comply with a reliable disposal chain: Before negotiating, pay attention to any residual contamination.

Before inspecting / negotiating the pipeline, establish forced ventilation.

DANGER

There is an acute risk of asphyxiation due to the accumulation of dangerous concentrations in the respiratory air.

Before entering, carry out the first air measurement in the pipe section. The personal protective equipment must also be worn if there is forced ventilation. Before installation, all installation components required must be approved by the operating company / client.

CAUTION

The hydraulic oil for the expander must only be operated with oils that can be decomposed biologically.

6. Installation

6.1 Cleaning / Checking the Installation Position

- Before installation, another check is carried out of the installation position in order to exclude any damage and unreliability of the sealing area of the sealing lips of the sleeve.

- In the event of contamination or incrustation or other deposits, loose contamination or adherent incrustation must be removed.

Remove dirt and incrustation

Check the damage

- After removing the deposits, a check must be carried out as to whether reprofiling is required in the area of the sealing lips. Mineral-based and epoxy-resin based materials are permitted to carry out the reprofiling tasks. However, these materials must conform to pressure conditions of

approx. 145 psi and be impermeable to water and gas. All procedures used for cleaning and reprofiling must conform to the respective environmental standards.

- Before installing the elastomer seal, check to make sure as to whether it is beneficial to use a lubricant, in order to reduce friction between the concrete and rubber, e.g. if the concrete surfaces are rough, that neither impairs the surface of the concrete nor rubber.

6.2 Storing the Installation Material

- Clamping rings, adapters, shims and installation tools are stored at the entrance area.
- Check that the installation parts and tools are complete

For potable water lines, pay attention to potable water hygiene.

DANGER

When removing the transport lock from the band clamps, make sure that the personnel are standing within the clamping rings.

The clamping rings are tensioned and release abruptly when opened. No persons should remain outside of the rings when opening!

Removing the transport lock.

6.3 Running-In Elastomer Seal, Clamping Rings, Tools

- The band clamps are in a rolled state through the entrance (manhole, shaft aperture) in the pipeline.

- The clamping rings are circularly formed in the pipeline and again have a transport lock.

CAUTION Band clamps are tensioned.

- Band clamps are moved to the installation position using a pipe carriage.
- All installation parts and tools are stored behind the installation position.

6.4 Inserting the Seal, Shims, Clamping Rings

- The seal must be aligned parallel to the joint.
- Important: Align the seal at right angles to the pipe axis.

Align the seal at right angles to the pipe axis.

- If a test valve is installed with the sleeve, make sure that the valve is aligned in the 3 o'clock or 9 o'clock position. The seal is provisionally attached at the centre using a band clamp.

Insertion of the shim is very important and must never be forgotten. The shim ensures that the distribution of the radial tension below the lock elements

CAUTION

- The position of the shim should be between 8 o'clock and 4 o'clock.

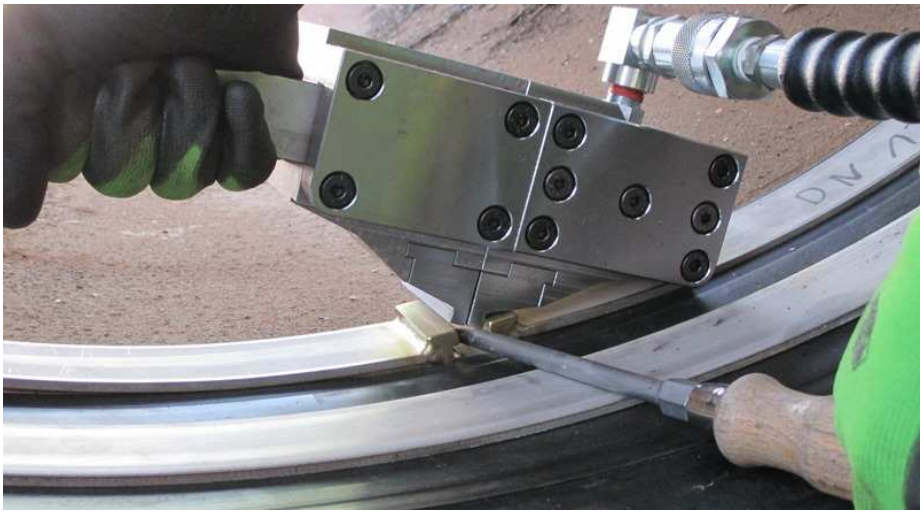
- Apply a layer of lubricant to the seal in the area where the clamp bands are installed.

- The clamp bands are positioned so that the lock elements of the clamp bands sit on the shim approximately in the center.

- Make sure that the clamp bands are in the groove of the seal provided.

6.5 Inserting the Hydraulic Expander

- The hydraulic expander must be inserted between the lock elements, so that the press jaws of the expander form a line in the band clamps (not eccentric).



Wrong: setting the expander eccentric

- Furthermore, make sure that the expander is always inserted perpendicular to the pipe tangents.

Wright: setting the expander centered

- Close the manual valve on the handpump and pump until the clamping jaws expand. Pumping is carried out until the band clamps rest circumferential in the groove of the seal. Thereby, make sure that the band clamp sits in the groove of the seal.

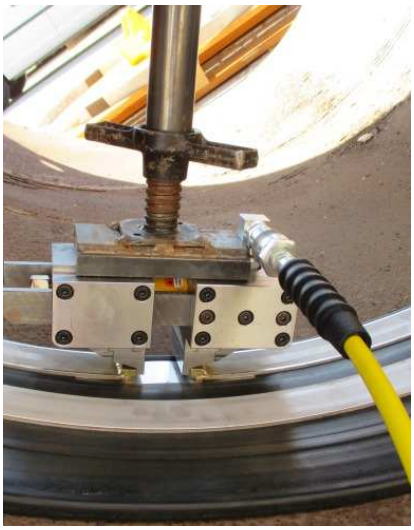
Turn the valve right.

- The pressure is increased until a pressure increase is registered on the manometer.
- Subsequently, the extruders and band clamps are checked for correct seating.
- Install the spindle foot, with the spindle rods, on the back of the hydraulic expander.

CAUTION

Make sure that the spindle rods sit vertical on the expander.

The band clamp, support foot, spindle rods and expander must be in a straight line. Only thus, can the application of force be carried out correctly.



The spindle rods sit vertical on the expander

Band clamp, support foot, spindle rods and expander must be in a straight line

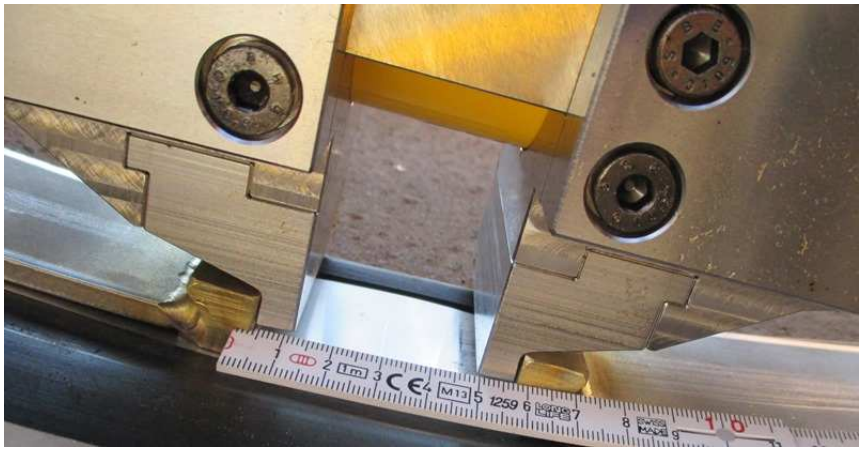
- Impact on the spindle must be carried out until the first signs of deformation on the rubber seal are visible. Impact on the spindle is carried out using the black side of the hammer.

6.6 Inserting presses and adapter

- The pressure is now uniformly increased by pumping the handpump. Simultaneously, the circumference of the band clamps is hit using a dead blow, plastic hammer.

- This process is repeated until the required pressure is attained and there is no more pressure drop when hitting the bands (affix 1).

- By hitting the bands, a uniform, radial tension is attained.



- An adapter, supplied, is inserted in the gap between the lock elements. This adapter must be tapped in with a stainless steel mandrel using the stainless steel side of the hammer. Make sure that the inscription (number) points upwards and that this closes flush with the outer edge of the band clamps.

DANGER

Before the spindle is removed, it is essential that the press is depressurized.

6.7 Repressing

Due to the settlement characteristics of elastomers, it is necessary to apply tension after a minimum of 30 minutes. The tensioning process is repeated until the required pressure is attained. The existing adapter is now replaced by a larger one.

Installation of support bands must be carried out in the same way – in the sequence band clamp, support band and band clamp. If plastic backing bands are required, make sure that the seal lips do not sit on the plastic backing bands.

After final check the adapter is put by hammer (stainless steel side).

Using the stainless steel side the adapter is put by hammer

6.8 Design of the number of support bands

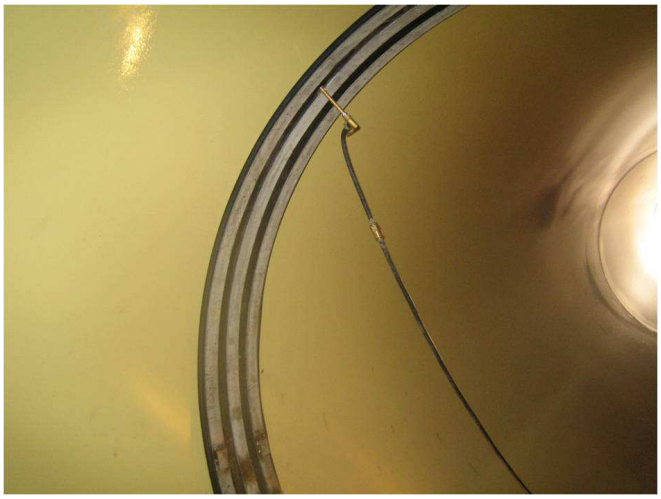
Support bands are required for infiltration pressures and vacuum loading and high flow velocities. Normally, for the width

10 inch	one
15 inch	two
20 inch	three

is / are installed. The final design for the number of bands is at the discretion of the user: depending on the requirements resulting from the operation of the pipeline or duct.

6.9 Test / Test valve

A test valve can be installed in the seal for the purpose to check the sleeve for leaks or installation of the seal. Using the valve, a flow pressure can be built up and the installation checked for leaks. In each case, one or multiple support bands must be placed, in accordance with Point 6.8.



6.10 Installation of the linerend and the connect sleeve

- Installation of linerend analog to regular sleeve.
- Exception sleeves to DN 450. Here you have to use small installation tool.
- Quantity of extra retaining bands is listed on 6.8.
- Cutting back liner: please ask customer, but minimum 10cm.
- Sealing surfaces of liner and old pipe should be under conditions of properly sealing.

- Installation of the connect sleeve is carried out analog to the standard sleeve width 10 / 15 / 20 inch. Make sure that this sleeve system always ends with a standard sleeve 10 / 15 / 20 inch.
- By overlapping the sleeves, the installation width is not 20 inch, but approx. 17 inch.
- The installation sequence and number of support bands is analog to the standard sleeves.

Affix

Affix 1: View about required pressure

16'' - 2700 psi
18'' - 2700 psi
22'' - 2700 psi
27'' - 3800 psi
32'' - 3800 psi
38'' - 3800 psi
43'' - 4000 psi
49'' - 4000 psi
52'' - 4000 psi
54'' - 4000 psi
65'' - 4000 psi
70'' - 4000 psi
76'' - 4000 psi
88'' - 4000 psi
98'' - 4000 psi
108'' - 4000 psi
124'' - 4000 psi

SAMPLE

Questionnaire RedEx® inner sealing system to determine project information:

1.Object / Designation	
2. Client	
3. Pipe offset / Sleeve width and depth	
4. Diameter (Di) / Quantity	Di: Qty.:
4.1 Safe data inside diameter	yes / no
4.2 Measurement required / Width	yes / no
5. Length of the Pipeline Routing of the line (diagrams)	
6. Position of the Pipeline	
6.1 Practicability	
6.2 Accesses / Number	
6.3 Length of the individual sections	
6.4 Distance to the location of installation	
7. Medium	
7.1 Water	
7.2 Waste water	
7.3 Potable water	
7.4 Other	
8. Analysis of the Medium	yes / no
9. Operating Condition / Operation /Fittings	
9.1 Vacuum	
9.2 Infiltration	
9.3 Temperature	
10. Operating Pressure (max.)	
11. Characteristics	

RedEx® - SLEEVE DIAGRAM

Location ……..

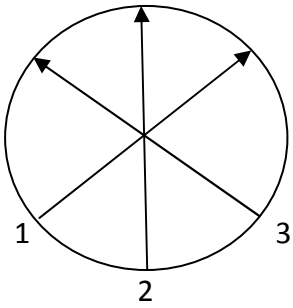
Route ……..

DN ……..

Length ……..

Number of sleeves / Damage ……..

Measuring points for exacty determination of dimensions/diameters:



Seal Nr.	Measuring point 1 (mm)	Measuring point 2 (mm)	Measuring point 3 (mm)	Type of damage	Width of the dama-ge (mm)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Specificities:

Date: Signature:

ORDER FORM RedEx®

Order Number:
Delivery date:
Location to deliver:
Contact person:

			Quality			Steel		Backing band	
Quantity	**Item in inch**	**DN in inch**	**EPDM**	**Potable water**	**NBR**	**1.4571**	**1.4307**	**PE**	**PVC**
	10 inch	63							
	15 inch								
	20 inch	32							
	Connect 17 inch								
	Extra band clamp	63							
	Backing band	32							
	Extra adapters								
	Special profile acc. to sketch	24 / 22							

Sketch / Comments for special profiles