

QUICK LOCK



Version 2018

Quick-Lock User Manual

UHRIG



Kanaltechnik

Preface

Dear Quick-Lock user,

This manual shows you how to use our Quick-Lock repair system. We have tried to put our 20 years of experience and that of our long-standing users into a clear, illustrated form for you.

Quick-Lock is one of the most user-friendly patch repair systems around, but it still requires plenty of experience in repairing pipes and knowledge of how they are constructed.

This manual cannot take the place of your own experience or practical instruction by the manufacturer, but it does have plenty of tips and tricks to help you use Quick-Lock.

We are always glad to hear about how you get on using Quick-Lock so that we can make the technology even better.

We wish you every success using our Quick-Lock repair system and are always happy to help if you have any queries.



Uhrig Kanaltechnik GmbH
Am Roten Kreuz 2
78187 Geisingen, Germany
Tel. +49 (0) 7704 / 806-0
Fax +49 (0) 7704 / 806-50
Internet www.uhrig-bau.de
E-mail info@uhrig-bau.de

Contents

1. Description of the Quick-Lock system	5
1.1 Intended use.....	5
1.2 Regulations	5
1.3 Certifications.....	5
1.4 Components and functions	6
1.5 Description of the system and installation procedure	7
1.6 Suitability and materials used	8
1.6.1 Properties of the pipe to be repaired.....	8
1.6.2 Stainless steel	8
1.6.3 EPDM rubber.....	8
1.6.4 Industrial use	8
1.6.5 Types of damage.....	9
1.6.6 Durability	9
2. How to use Quick-Lock	10
2.1 Preparation.....	10
2.1.1 Inspecting the pipe	10
2.1.2 Preparing the pipe	10
2.1.3 Space required by the packer	11
2.2 Equipment and material for using Quick-Lock.....	12
2.2.1 Equipment	12
2.2.2 Material	12
2.3 Selecting the Quick-Lock sleeve.....	13
2.4 Preparing the Quick-Lock sleeve	14
2.5 Installing Quick-Lock	17
2.5.1 Packer	17
2.5.2 Positioning the Quick-Lock sleeve on the packer.....	18
2.5.3 Single installation procedure.....	20
2.5.4 Serial installation (standard procedure)	24
2.5.5 Installation against the direction of flow (standard procedure).....	26
2.5.6 Passing through the projecting rubber end	28
2.5.7 The correct metal overlap	29
2.5.8 Alternative serial installation in the direction of flow (special procedure)	30
2.5.9 Using a laser marker.....	32

2.6	Special cases	34
2.6.1	Quick-Lock for joint misalignments	34
2.6.2	Groundwater infiltration.....	35
2.6.3	Root penetration	36
2.6.4	Corroded steel in reinforced concrete pipes.....	37
2.6.5	Repairing plastic pipes.....	38
2.6.6	Quick-Lock in non-permeable pipe systems	39
2.6.7	Using Quick-Lock to repair holes longer than the length of one sleeve	40
2.6.8	Removing Quick-Lock sleeves that have been installed	41
2.6.9	Deflating the packer more quickly using a vent valve.....	42
3.	Appendix.....	43
3.1	Appendix 1 Technical data	44
3.2	Appendix 2 Application pressures.....	46
3.3	Appendix 3 Auxiliary equipment.....	47
3.1	Appendix 4 Offset packer with adjustable chassis	48
3.1.1	Intended use.....	48
3.1.2	Conversion	48

1.4 Components and functions

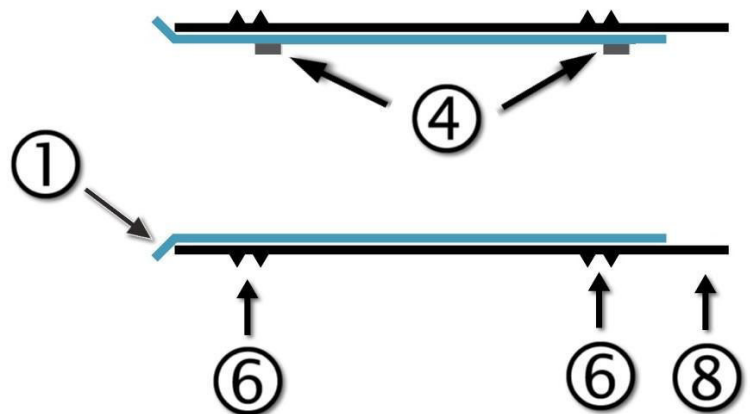
Stainless steel sleeve

- 1 **Flared end**
The flared end faces the direction of flow and improves the hydrodynamics, prevents solids from depositing and increases jetting resistance.
- 2 **Metal overlap**
The steel sleeve is rolled up smaller than its nominal diameter. The overlap is what is left over for expanding to the pipe wall.
- 3 **Toothed strip**
The locks that keep the sleeve expanded run along the toothed strip.
- 4 **Lock**
The lock is a small set of gears that only moves in one direction, thus keeping the sleeve expanded.
- 5 **Adhesive tape**
The tapes are put on at the factory to protect the sleeve during transport and prevent it from unrolling.



Rubber jacket

- 6 **Circumferential seals**
The actual seal is formed by the circumferential seals compressed against the host pipe. The damaged section must always be between these seals.
- 7 **Trimming line**
There is a trimming line marked in the rubber jacket. It shows you where to cut off the projecting rubber end (when a single sleeve is installed).
- 8 **Projecting rubber end**
The projecting rubber end acts as a seal between sleeves installed in series.



Cross section of steel sleeve and rubber jacket.

1.5 Description of the system and installation procedure

Quick-Lock consists of:

- A rolled-up V4A stainless steel sleeve
- A rubber jacket
- The damaged section is repaired and sealed by permanently clamping the steel sleeve in place.
- This exerts a pressing force which compresses the rubber jacket against the inside of the pipe.
- The area between the circumferential seals (1) is completely sealed.



When the steel sleeve is manufactured, it is rolled tighter than the diameter of the pipe to be repaired.

Two toothed strips are punched into the sleeve, on the left and right.

- In each toothed strip there is a lock.
- The lock is for clamping the steel sleeve.
- The lock can only move in one direction and stops the sleeve from contracting once it has been expanded.



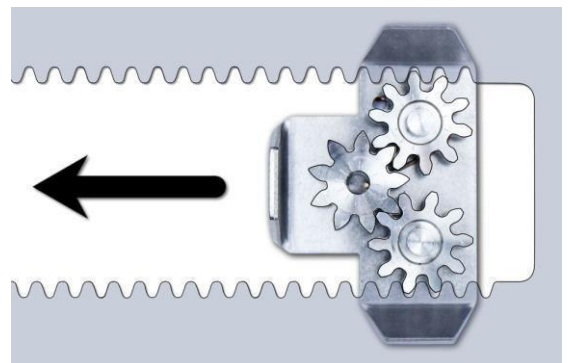
The lock moves along the toothed strip (to the left as shown here).

This means that the steel sleeve can only expand in one direction.

The lock prevents it from contracting again.

The increments are only 0.65 mm, which means that the sleeve is almost infinitely adjustable.

How it works: The middle gear wheel is on a spring and acts as a ratchet for the others.



1.6 Suitability and materials used

1.6.1 Properties of the pipe to be repaired

Quick-Lock can be used to repair all common types of pipe:

- Vitrified clay pipes
- Concrete pipes
- Plastic pipes (see section 2.6.5)
- Glass-reinforced plastic pipes
- Cast iron pipes
- Steel pipes

Quick-Lock is only suitable with restrictions in the following cases:

- Pipes with bends and fittings
- Pipes with damage near to the building connections (sockets, branches)
- Pipes with joint misalignments of more than 2.5 cm

In such cases, please contact us.

1.6.2 Stainless steel

The Quick-Lock sleeve is made of V4A stainless steel of grade **1.4404**. This grade of stainless steel is characterised by its high corrosion resistance.

- Quick-Lock is designed for use in municipal wastewater systems.
- For use with industrial wastewater or where the wastewater contains high levels of chloride salts, the required corrosion resistance must be ascertained.
- V4A stainless steel of grade 1.4404 may be used up to a chloride concentration of 600 mg/l.

1.6.3 EPDM rubber

Like the steel sleeve, the thermoset polymer EPDM jacket is designed for municipal wastewater systems. EPDM is characterised by its excellent physical properties and its resistance to ageing, ozone, weathering and environmental effects, alkalis and various chemicals.

EPDM is unsuitable, or only suitable with restrictions for:

- Solvents
- Ethers, esters, ketones, methylene chloride
- Animal and vegetable fats, oils, fuels
- Concentrated fruit juice, oxidising acids

Special version for oils, greases and hydrocarbons

An NBR rubber jacket is available on request for use with oils, greases and hydrocarbons. (NBR: nitrile butadiene rubber)

1.6.4 Industrial use

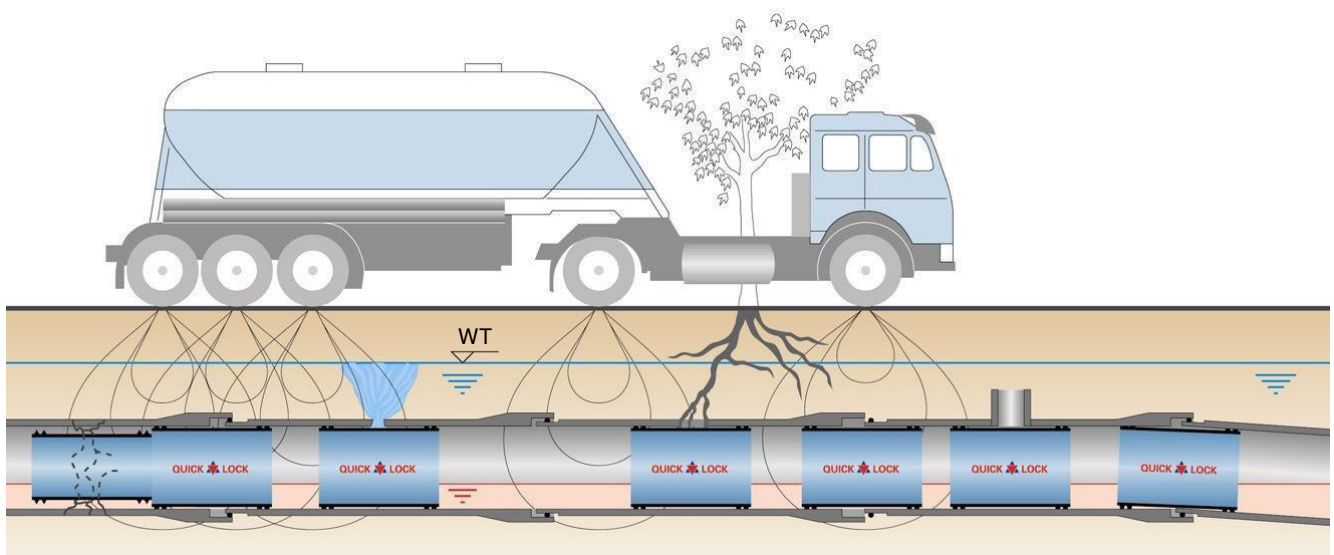
Quick-Lock is also suitable, with certain restrictions, for industrial use, depending on the properties of the fluids.

Note: Before using Quick-Lock in industrial, non-municipal wastewater systems, the corrosion resistance of the V4A stainless steel and the EPDM sleeve must be verified.

1.6.5 Types of damage

The Quick-Lock sleeve is suitable for the following types of damage:

- Cracks (longitudinal, radial and transverse)
- Fragmentation
- Leaking joints
- Displacement / joint misalignment
- Closing/sealing unused laterals
- Corrosion / spalling / wear (reinforced concrete pipes with exposed reinforcement)
- Leaks (groundwater infiltration and exfiltration)
- Improving the structural strength of pipes (cracks and fragmentation, deformation)
- Root penetration



Compound cracks, fragmentation, weakened pipe

Water ingress

Root penetration

Leaking joint

Unused lateral

Length of damage

When installed individually, Quick-Lock can be used for instances of damage up to the following lengths:

- DN 150-DN 400: max. damage length 270-300 mm (see appendix 1, sealed area)
- DN 450-DN 800: max. damage length 280-340 mm (see appendix 1, sealed area)

Instances of damage that are longer than this can be repaired by installing multiple sleeves in series.

1.6.6 Durability

Quick-Lock repairs are extremely durable.

The materials used – stainless steel and EPDM – have proven their worth in municipal wastewater systems for decades. A service life of more than 50 years can be expected.

WT = water table

2. How to use Quick-Lock

2.1 Preparation

2.1.1 Inspecting the pipe

Before using Quick-Lock, the pipe must be inspected to ascertain whether it can be repaired with the system.

There must be at least one access via a manhole or inspection chamber.

The manhole must have a diameter of at least DN 800 so that the camera/packer system can be inserted. The manhole flume must also be large enough to push the packer with the sleeve into the pipe.

2.1.2 Preparing the pipe

- The pipe to be repaired must always be cleaned with a high-pressure jet before using Quick-Lock.
- Hardened deposits, roots and protruding sockets must be removed with suitable milling or cutting tools.
- No obstacles may restrict movement through the pipe.
- There may not be any solids such as sand, gravel, hardened deposits or wastewater solids around the damaged area.
- Joint misalignments of more than 1.0 cm must be milled off before an individual sleeve is installed, or repaired using two Quick-Lock sleeves [see 2.6.1].
- According to DWA M 143 Part 5, no work may be done in wastewater, which means the pipe section must be closed off. Depending on the quantity of water, bypassing may be necessary.

Notes on DN 700 and DN 800

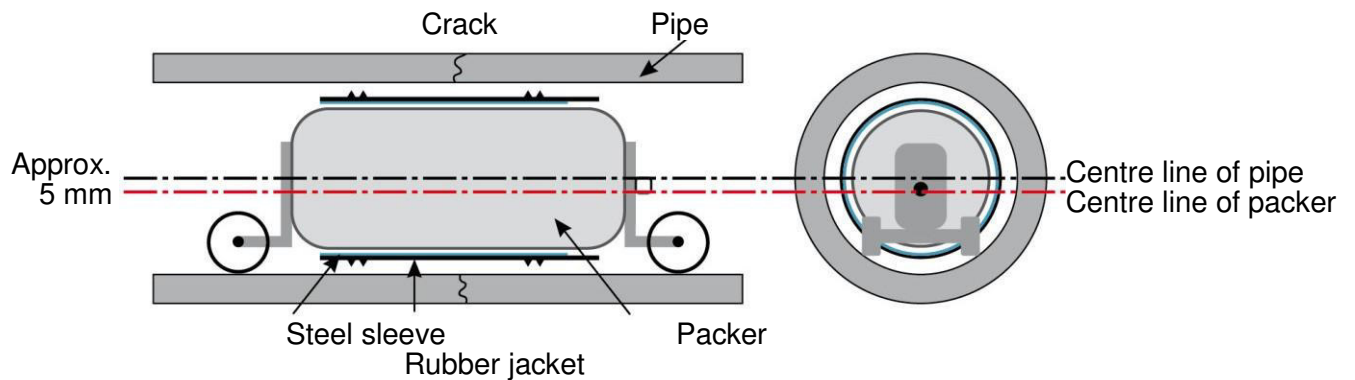
When using the Quick-Lock DN 700 sleeve, the top rungs in the manhole have to be removed.

The Quick-Lock DN 800 sleeve will not fit through a 625 mm manhole entrance (rolled up, its diameter is 695 mm).

- The cone section of the manhole must be removed.
- Depending on the type of damage, the Quick-Lock BIG DN 800 sleeve, which comes in two sections, can be used.

2.1.3 Space required by the packer

Example of the space required by the packer and sleeve in a pipe:



The centre line of the packer is approximately 0.5 cm below that of the pipe. This means the distances above and below the sleeve are slightly different.

Example calculation for space requirements:

Pipe diameter: 300 mm

Diameter of Q.L. rolled up, including rubber jacket: 250 mm (see technical data sheet)

$300 \text{ mm} - 250 \text{ mm} = 50 \text{ mm}$ above and below in total

Above: $50 \text{ mm} / 2 = 25 \text{ mm} + 5 \text{ mm}$ (pipe/packer offset) = 30 mm

Below: $50 \text{ mm} / 2 = 25 \text{ mm} - 5 \text{ mm}$ (pipe/packer offset) = 20 mm

The packer can pass through sleeves that have already been installed

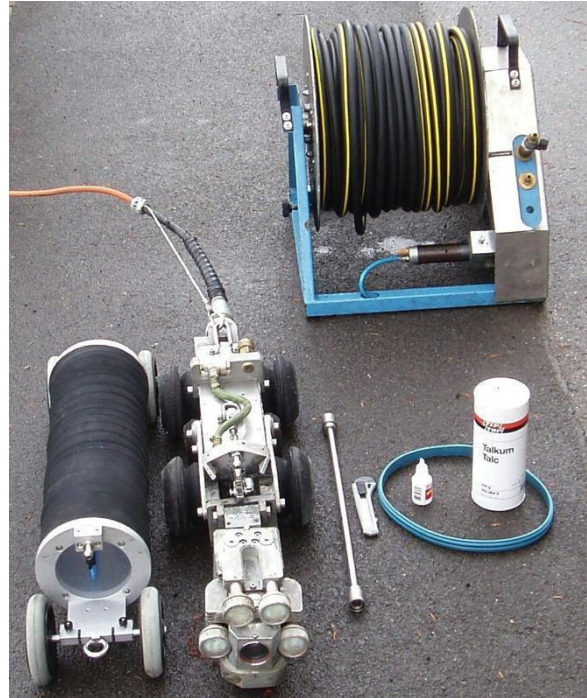
The sleeves are designed so that once they have been installed, the packer can pass through them with another rolled-up sleeve, except for the DN 150 version.

2.2 Equipment and material for using Quick-Lock

2.2.1 Equipment:

Keep the following equipment available for installing Quick-Lock efficiently:

- Inspection camera or robot adjusted to the diameter of the pipe. Ideally, the camera should have zoom and pan functions.
- Appropriate Quick-Lock packer for the pipe diameter.
- Quick-Lock link bar for connecting the camera to the packer.
- Vent valve [see 2.6.9]
- A compressed air unit on the tractor or a compressor with an output of at least 5.0 bar.
- An air hose on a drum with a length of at least 100 m.
- A robot cutter for preparatory tasks.



Equipment

2.2.2 Material

The following material is required in order to prepare the Quick-Lock sleeve, depending on the damage (for recommended products see appendix 3):

- Sharp knife
- Talcum powder
- Superglue
- Biodegradable penetrating oil or food-grade lubricant
- Hydrophilic waterstop (for groundwater infiltration and exfiltration only)
- Mineral-based flexible mortar (root penetration, corrosion on reinforced concrete pipes)

2.3 Selecting the Quick-Lock sleeve

Flared and non-flared versions of each Quick-Lock sleeve are available.

With flared end

The flared Quick-Lock sleeve improves flow, increases jetting resistance and makes a better-looking fit.

The flare of the stainless steel sleeve corresponds to the thickness at which the rubber can no longer be compressed, so that it does not press on the damaged host pipe.

When **installed individually**, a sleeve with a flared end is always used.

When **installed in series**, the first sleeve in the direction of flow always has a flared end.



Without flared end

Sleeves without flared ends are mainly used for installation in series (except for the first sleeve in the direction of flow).



2.4 Preparing the Quick-Lock sleeve

Inspection

- Check the Quick-Lock sleeve and rubber jacket for visible damage.

Setting up

- Place the Quick-Lock sleeve upright so that the writing on the tape is upside down.



Lubricating the sleeve

- Use biodegradable lubricant.
- Prise apart the metal overlap with a screwdriver.
- Lubricate the metal overlap so that the sleeve will slide apart evenly.
- Lubricate the two locks.
- Wipe off excess lubricant from the inside and outside of the sleeve.



Cutting the transport tapes

The adhesive tape and plastic rivet secure the sleeve against opening during transport.

- **The plastic rivet (1) must remain in the sleeve! It will be automatically sheared off during expansion.**
- **Cut half-way through the tapes on the metal overlap.**
- **Note:** If you cut right through the tapes, there is a risk that the sleeve might unroll when entering the pipe, thus restricting its movement.
- **Note:** If you do not cut the tapes at all there is a risk that the sleeve might unroll too suddenly during installation when the tape tears, and break the return stop in the gears.



Cutting halfway through the adhesive strip

Applying talcum powder to the rubber jacket

- For easier handling, sprinkle talcum powder on the inside of the rubber jacket.
- This makes it easier to slide the rubber jacket over the sleeve.
It also reduces the friction between the rubber and the steel sleeve during expansion.



Slipping on the rubber jacket

- If the sleeve is flared on one side, make sure you slip the projecting rubber end over the non-flared end.
- Slip the rubber jacket over the steel sleeve so that the marking seam is flush with the edge of the sleeve.



Trimming (if necessary)

When installing a single sleeve, always trim the projecting rubber end from the sleeve. Make sure beforehand that the distance between the circumferential seals is enough to seal the damaged area.

Single installation

- Use a sharp carpet knife or industrial scissors.
- Cut along the marking seam.

Serial installation

- When installed in series, the projecting rubber end is left on so that the join between the sleeves is sealed, **except** on the last sleeve to be installed.



Centring the jacket

- Centre the jacket on the sleeve so that the edge of the rubber is at least 5-10 mm behind the edge of the sleeve, or on flared sleeves behind the edge of the flared end.
(1): 5-10 mm
(2): 5-10 mm



Affixing the rubber jacket

- To stop the rubber jacket from slipping on the steel sleeve on the way to the damaged area, affix the jacket to the sleeve with a spot of superglue on both sides and at the ends above the locks.
- **Note: Do not** allow glue to drip onto the metal overlap, because it will stick and prevent the sleeve from opening.
- **Note:** If the rubber jacket is not properly affixed, there is a risk that it might bunch up at a constricted point in the pipe without you noticing.



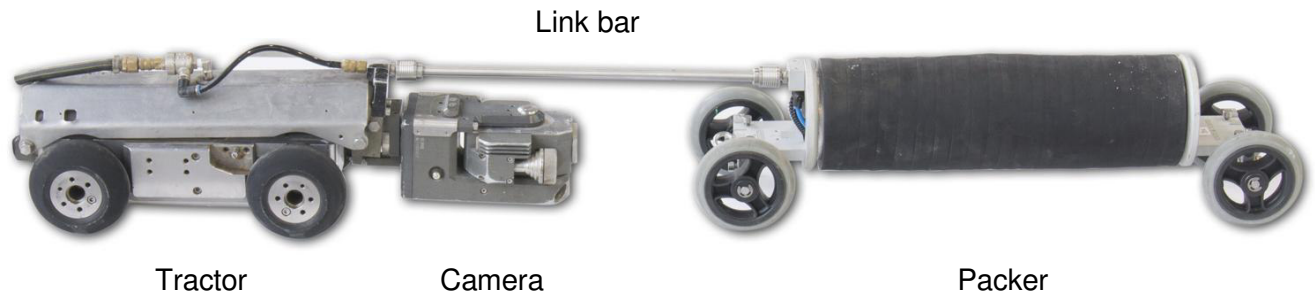
Position: 12 o'clock



Position: 6 o'clock

2.5 Installing Quick-Lock

2.5.1 Packer



The Quick-Lock sleeves are installed using a special device called a packer.

- Each packer can be used for at least two different pipe diameters and special sizes in between (see the technical data sheet (appendix 1)).
- For each standard pipe diameter there is a suitable set of wheels (or a set of wheels with a wider track).
- Special diameters usually require special sets of wheels, which are available on request.

The maximum installation pressures are listed in appendix 2.

The packer is usually connected to the camera or robot using a link bar and two ball joints.

Using a camera

The Quick-Lock system can be installed most efficiently when the packer is positioned using a camera. Push rods or other insertion apparatus can also be used. However, a camera must be used during installation.

Packer with adjustable chassis

As of 08/2014 two offset packers with adjustable chassis are available:

- Packer I: DN 200 to DN 300 (190 mm – 320 mm)
- Packer II: DN 350 to DN 500 (325 mm – 525 mm)

Follow the instructions in the appendix!

2.5.2 Positioning the Quick-Lock sleeve on the packer

Putting on the wheels

- Select the correct set of wheels for the pipe diameter (see appendix 1).

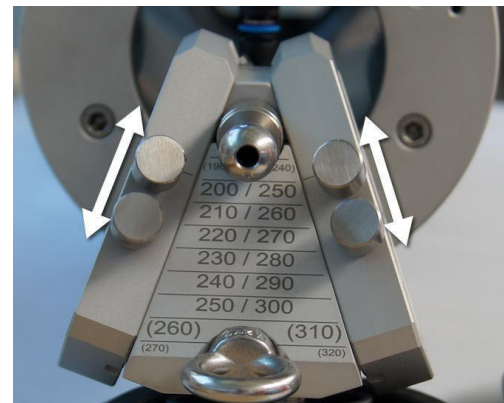
Or:



Set packer to nominal width

If using a packer with an adjustable chassis:

- Set the adjustable chassis of the packer to the nominal width of the host pipe.
(See also instructions “Offset packer with adjustable chassis” 3.4, Appendix 4.)



Aligning the sleeve on the packer

- The sleeve is usually positioned on the packer while in the manhole.
- When installing flared sleeves, the flared end should face against the direction of flow.
- Position the Quick-Lock sleeve so far forward on the packer so that it is flush with the front of the packer.



Laser alignment

- If you are using a packer equipped with a laser, position the sleeve so that the laser beam is reflected both on the edge of the sleeve and the host pipe.
- In both cases, the camera gives you a good view of the edge of the sleeve.



- It is a good habit to always position the sleeve on the packer with the ends of the toothed strips facing in the same direction. The result of this is that the sleeves are regularly aligned in the pipe, especially when multiple sleeves are installed.



Turning the toothed strip upwards

11:00 or 1:00 position

- Turn the Quick-Lock sleeve so that the middle of the toothed strip is in the 12:00 position.
- Depending on which way you are looking, the lock is in then the 11:00 or the 1:00 position.
- After installation, the lock is always at the top, in other words the 12:00 position.



11 o'clock position

1 o'clock position

Lock in the 12 o'clock position (if necessary)

- Depending on the design of the camera or the link bar holder, it may be necessary to position the sleeve on the packer with the lock in the 12 o'clock position, particularly when installing in series and where movement is restricted, in order to prevent the link bar from catching in a sleeve that has already been installed.
- It can also be preferable during serial installation if the view through the link bar is impaired by the locks on a sleeve that has already been installed, thus making positioning more difficult. After installation, the locks are in the 11:00 or 1:00 position, depending which way you look at them.



12 o'clock position

Balanced sleeve

- If the Quick-Lock sleeve is positioned on the packer with the lock in the 12 o'clock position, its weight is balanced.
- This makes it much easier to transport (especially in narrow pipes) and less likely to tip over in the pipe.



2.5.3 Single installation procedure

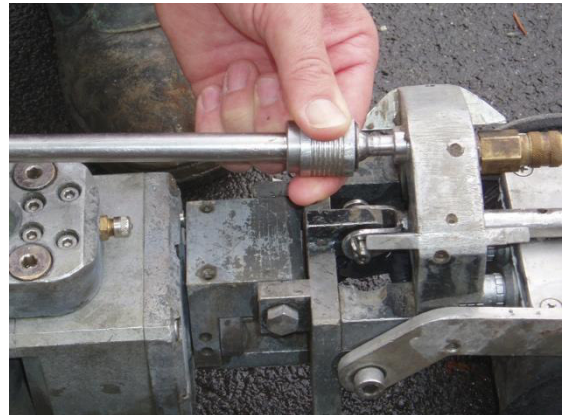
Quick-Lock sleeves can be installed individually to repair areas of damage smaller than the distance between the circumferential seals.

- See appendix 1, technical data, sealed area

Two manholes

- If two manholes are available, for reasons of space it is advisable to insert the camera with the packer in one manhole and collect it in the other.

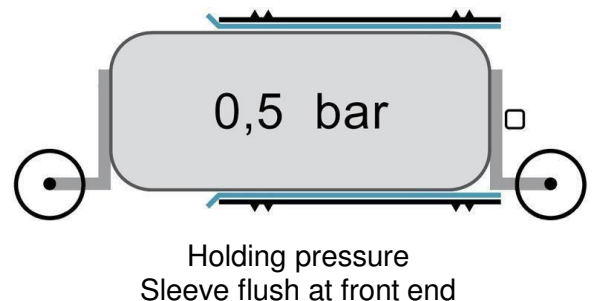
- Connect the camera to the packer using the link bar.
- Then connect the compressed air supply.



- For single installation, always use flared sleeves.
- The flared end must always face against the direction of flow.



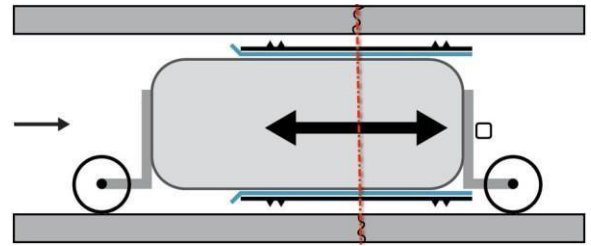
- Position the sleeve on the front of the packer.
- “Grip” the sleeve by inflating the packer balloon to a **holding pressure of approximately 0.5 bar**.
- This stops the sleeve from slipping off.
- The holding pressure of 0.5 bar can vary slightly depending on the compressed air unit, the pipe diameter and the packer.
We recommend finding out the correct pressure for your system yourself.
- The holding pressure is correct when the sleeve is firmly held on the packer but does not start to open.



- Position the packer with the Quick-Lock sleeve over the centre of the damaged area.
- There are three ways to do this:

1. By sight

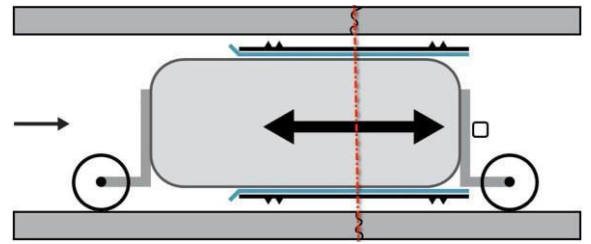
- Position the sleeve using only the image from the camera.



Positioning over the damage

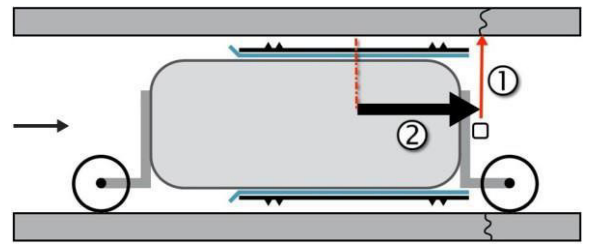
2. By measuring

- Measure the damaged area.
- Position the middle of the sleeve over the centre of the damage.



3. By laser (preferable)

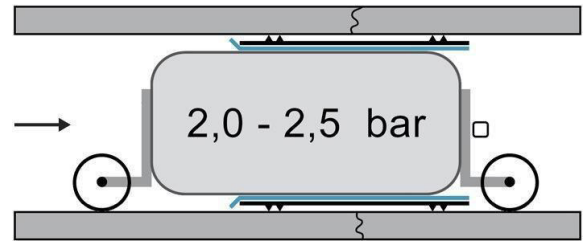
- The sleeve is on the front of the packer.
- (1) Position the laser on the centre of the damage.
- (2) Move the packer forward by half the length of the sleeve.



- **Note on the positioning pressure:**
For longitudinal cracks and fragmentation, particularly in vitrified clay pipes, do not expand the packer outside the sleeve, because this can damage the host pipe.
- When expanding, make sure the sleeve opens evenly.
The sleeve opens more easily if the metal overlap is lubricated.
- **Particularly in DN 450 - DN 800 pipes**, the sleeve needs plenty of time to open the full distance.
Increase the pressure to the sleeve in stages and let it expand to the fullest extent for each stage.
- If you notice that the sleeve is obstructed or not opening smoothly, reduce the application pressure and reposition the packer so that the middle of the balloon is in line with the middle of the sleeve.
- If the sleeve is expanded eccentrically (out of centre), it can produce torsion which may damage the lock or the toothed strips.

Positioning pressure

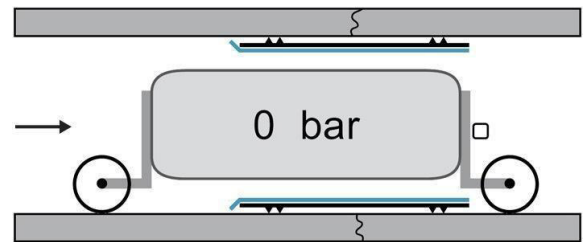
- Press the Quick-Lock sleeve to the wall of the pipe with a **positioning pressure** of approximately **2.0 – 2.5 bar**.



Positioning pressure

Deflating

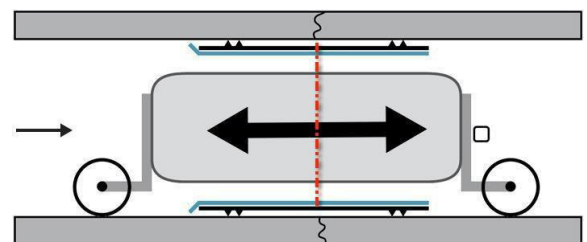
- Deflate the packer balloon slightly so that you can position it in the middle of the sleeve.



Deflating

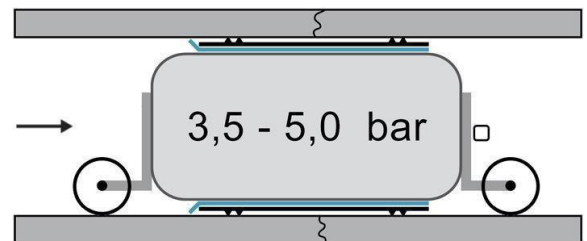
Alignment in the middle

- Align the packer so that the middle of the balloon is in line with the middle of the sleeve.



Application pressure

- Now apply the **application pressure** of **3.0 - 5.0 bar** [appendix 2] (depending on the type of damage and pipe).
- Repeat the same procedure (reduce the pressure, re-apply the application pressure).
- The rubber seal is now sufficiently compressed.



Packer in the middle
Application pressure

Inspection

- Using the camera, check that the sleeve is correctly fitted. Pan around the edges of the sleeve. The sleeve should now be fully pressed against the wall of the pipe.
- If there is any misalignment or displacement, one side of the sleeve may have to be expanded again.



Reflection

- In vitrified clay pipes, the glare of the camera light causes a reflection around the edge of the sleeve on the pipe wall.
- The customer might think that the sleeve is not properly fitted.
- This optical illusion can be eliminated by changing the camera position.

Reflection caused by glare



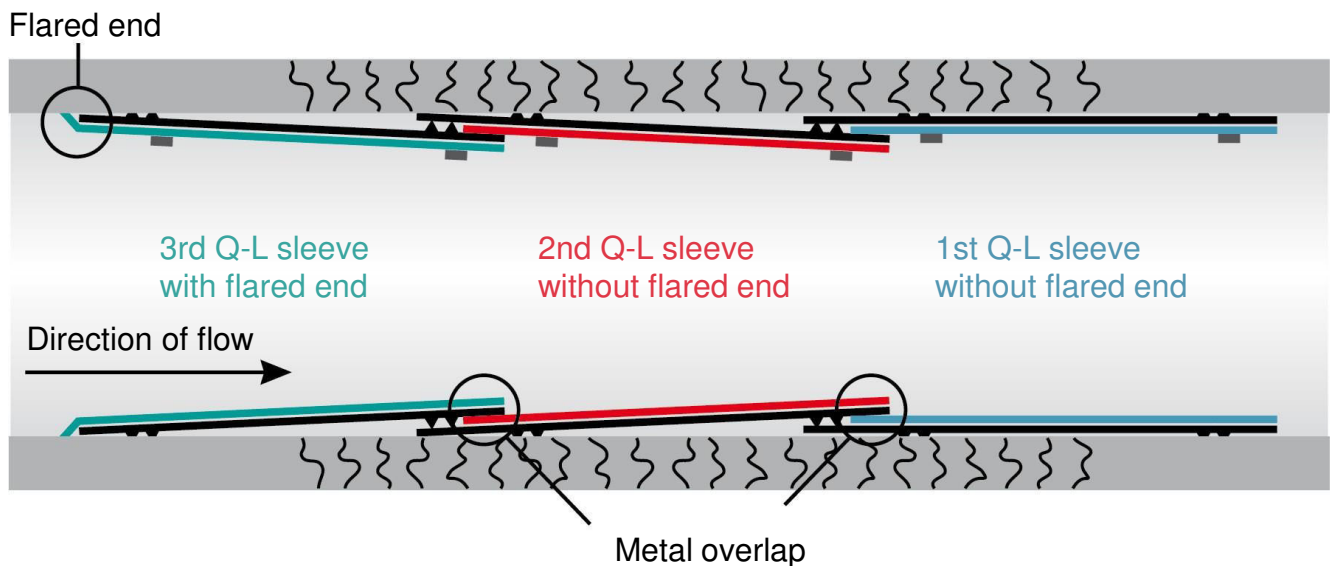
2.5.4 Serial installation (standard procedure)

Sleeves are installed in series when the damage extends longer than the distance between the circumferential seals of a single sleeve.

- During preparation, the projecting part of the rubber jacket is only trimmed off on the last sleeve to be installed.
- The installation procedure and installation pressures are the same as when installing single sleeves.
- The first sleeve facing against the direction of flow (no. 3 in the picture) must always have a flared end (all the others are non-flared).

Overview

Ideally, you should work **against the direction of flow** when installing the sleeves. This way, the small step where the sleeves overlap does not obstruct the flow, because water flows downwards.



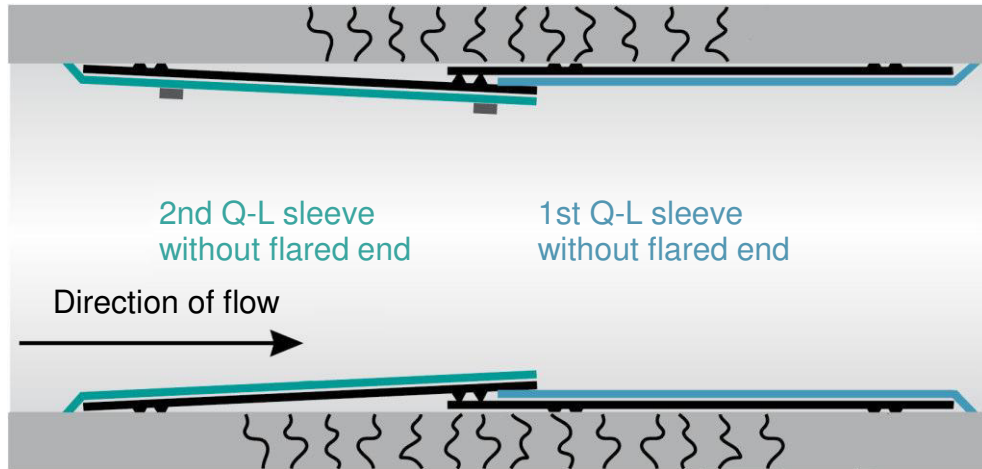
Special cases

In the case of extreme fragmentation or longitudinal cracks, reduce the application pressure by 0.5 - 1.0 bar.

- First place all the sleeves with a reduced application pressure.
 - Only then apply the full application pressure to all the sleeves, in the same order as above.
 - In this way you can prevent fragments from coming loose or the pipe from collapsing, particularly if the pipe bedding is damaged.
-
- Where there is an incipient longitudinal crack, the entire length of the host pipe must be repaired, because the crack will continue to the end of the pipe regardless of the repair.
 - DN 150 sleeves cannot currently be installed in series.

Special case with two sleeves

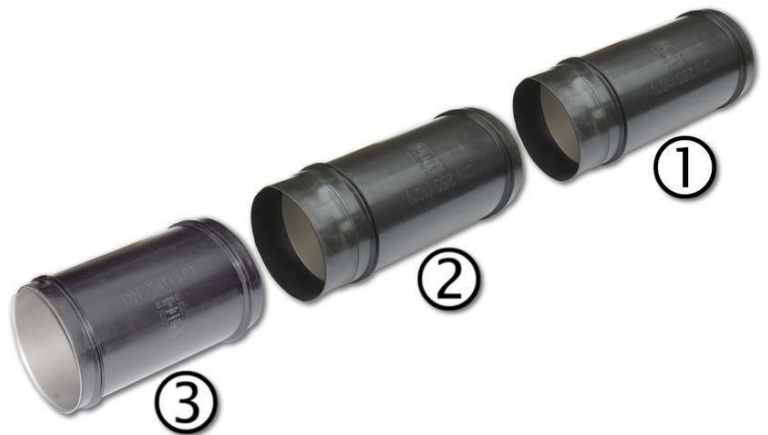
If you want to install two sleeves, you can do it with two flared sleeves as follows:



Ideally, you should work **against the direction of flow** when installing the sleeves.

Preparing and laying out the sleeves

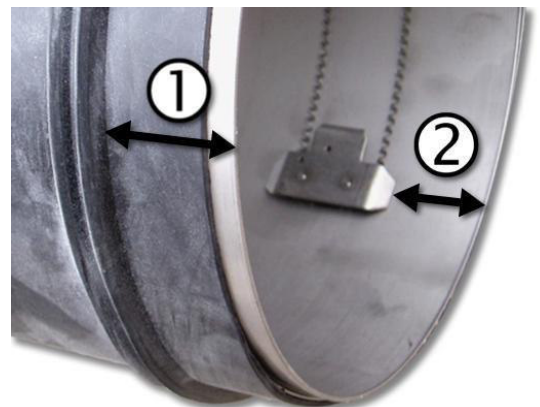
- (1) First sleeve with projecting rubber end
- (2) Second and additional sleeves with projecting rubber end
- (3) Third sleeve, flared, without projecting rubber end



- Slip the rubber jacket over the steel sleeve so that the **distance between the circumferential seal and the edge of the sleeve (1)** is at least equal to the **distance between the lock and the edge of the sleeve (2)**.

$$(1) \geq (2)$$

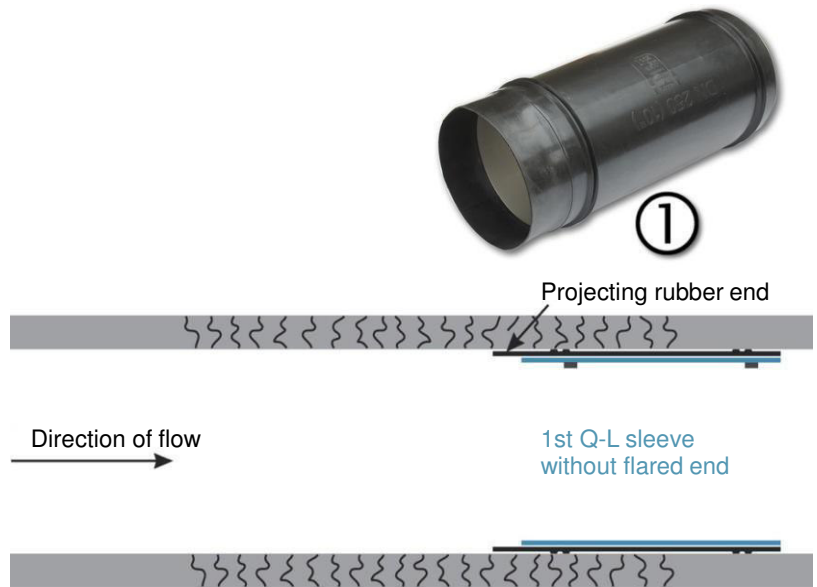
Only then is it ensured that the two circumferential seals form a tight seal within the projecting rubber end.



2.5.5 Installation against the direction of flow (standard procedure)

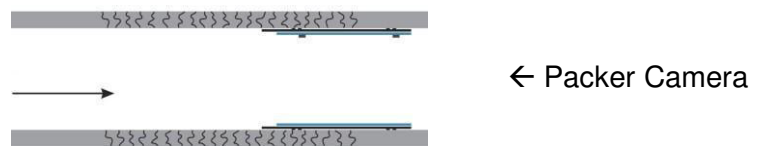
Installing the **first** sleeve

- Non-flared sleeve
- With projecting rubber end
- Make sure that first sleeve is installed with one pair of circumferential seals in an intact section of the pipe.



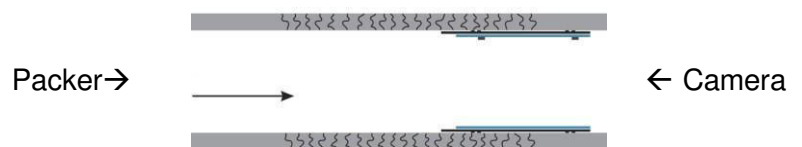
With one manhole

If you are operating the packer and camera from one manhole, work against the direction of flow, as illustrated.



With two manholes

If you can use two manholes, the camera can come from the second manhole to meet the packer with the sleeve.

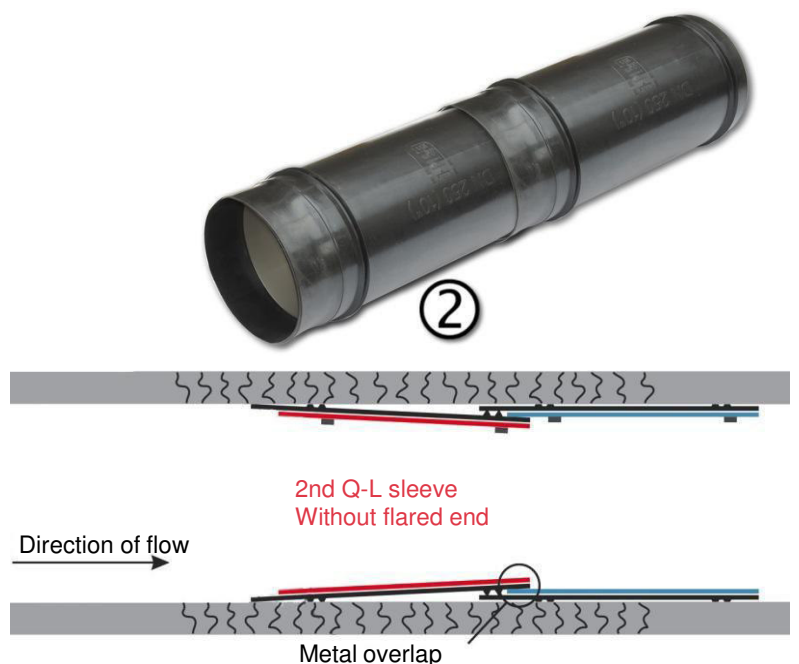


Installing the **second** sleeve (and others)

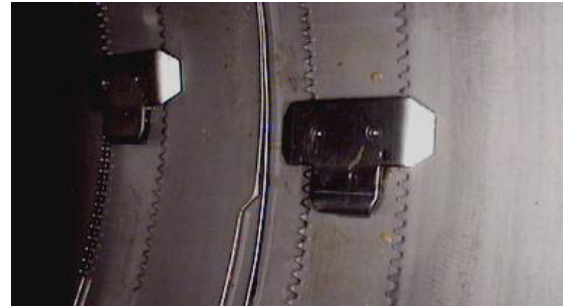
- Non-flared sleeve
- With projecting rubber end

Note: When the packer passes through the projecting rubber end, it is folded inwards.

Follow the instructions in section 2.5.6 below.



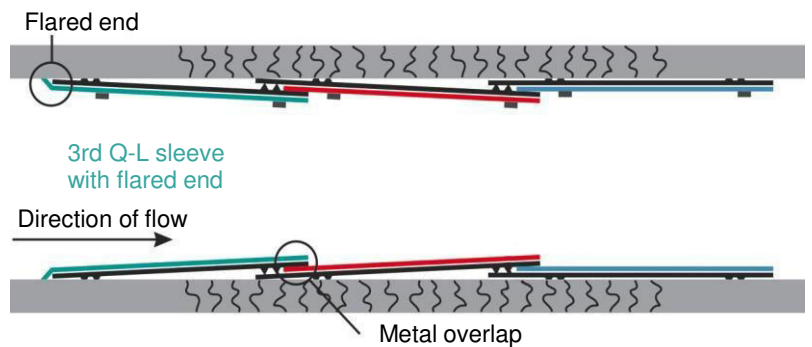
- Position the metal of the new sleeve to leave a space of approximately 0.5 cm to the lock.
- The sleeve may not touch the lock.
- If possible, use the laser as described in section 2.5.9 “Using a laser marker”.



Installing the **last** sleeve
(in this case the 3rd)

- Flared sleeve
(the flared end faces against the direction of flow)
- Without projecting rubber end

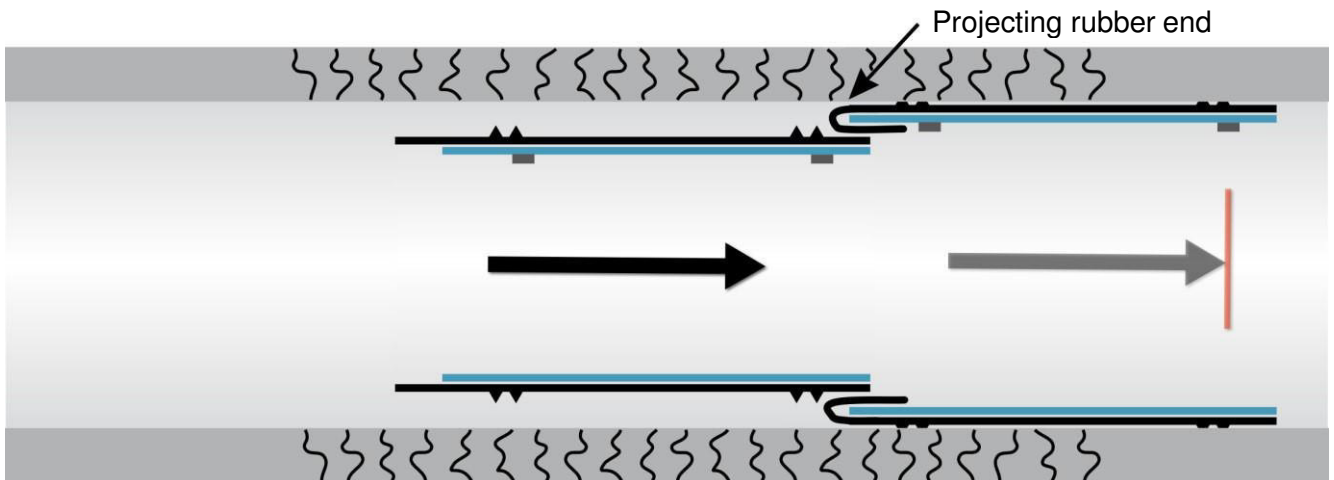
Note: When the packer passes through the projecting rubber end, it is folded inwards. Follow the instructions in section 2.5.6 below.



The sleeves installed in series have a uniform, consistent appearance.



2.5.6 Passing through the projecting rubber end



When the packer passes through the projecting rubber end, the new sleeve catches it and pulls it inwards.

This is what to do:

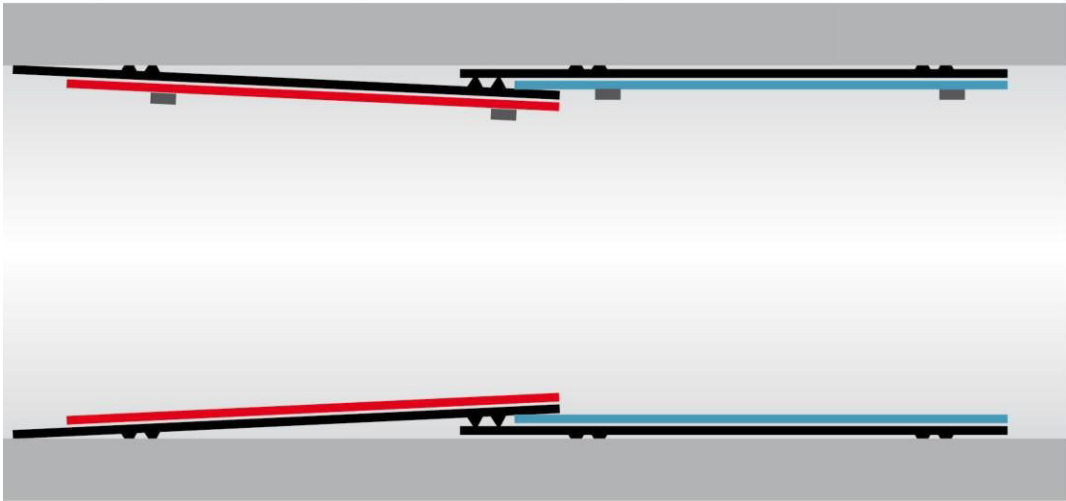
- Move the new sleeve all the way into the previously fitted sleeve up to the first lock.
- Then move it back.
- This folds the projecting rubber end back outwards.
- If you move it too far out, you must do it again.

- Position the sleeve.

Note: When moving back and forth to position the sleeve, there is also a risk of catching the projecting rubber end and creasing it. A tight seal is no longer possible.

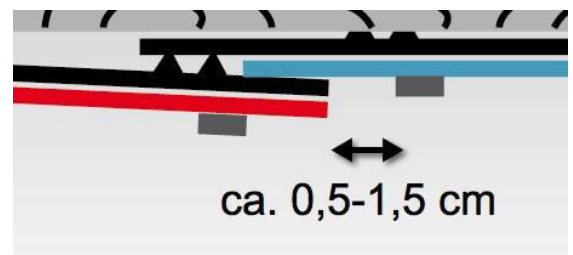
- In this case, proceed as described above.

2.5.7 The correct metal overlap



The metal overlap between sleeves installed in series is correct when the following conditions are met:

- The edge of the new steel sleeve is 0.5 – 1.5 cm in front of the lock of the previous one.



- The circumferential seals of the new sleeve form a tight seal with the projecting rubber end of the previous sleeve.



2.5.8 Alternative serial installation in the direction of flow (special procedure)

In exceptional cases, sleeves can be installed in series in the direction of flow, for example:

- When shaft structures are inaccessible
- When the manhole flumes are at too tight an angle

However, this method has serious drawbacks and should only be used when absolutely necessary.

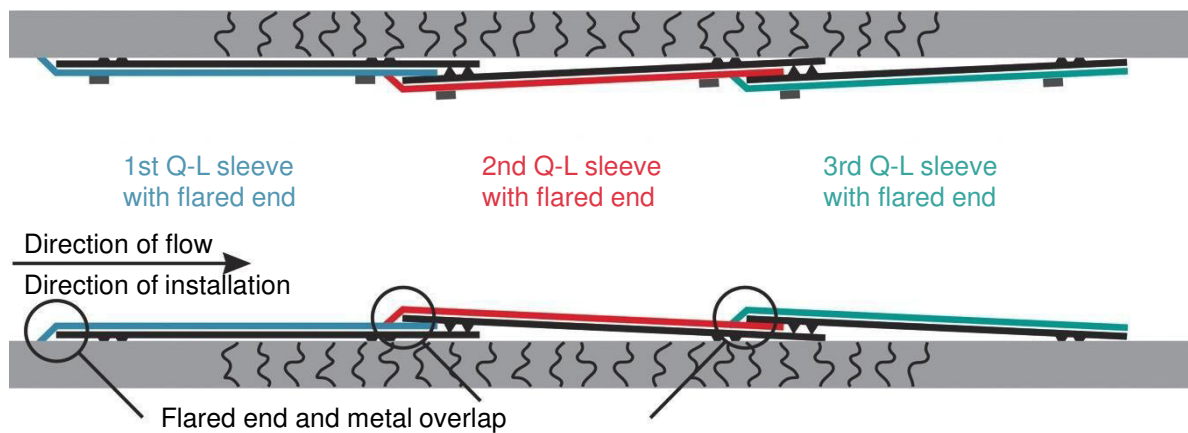
Do not use this method without permission from the customer.

Drawbacks:

- Reduced pipe diameter
- Step in metal overlap faces against the direction of flow (impaired pipe flow)
- Sleeves are harder to pass through once installed

When installing sleeves in series in the direction of flow, either flared or non-flared sleeves can be used, but the first sleeve facing against the direction of flow must have a flared end (no. 1 in the illustration).

When installing a series of sleeves all with flared ends, you must always work in the direction of flow.



The 2nd and 3rd sleeves can also be non-flared.

When sleeves are installed in the direction of flow, the steps where the metal overlaps face against the flow. This has drawbacks in terms of both appearance and hydraulic properties compared to the standard method.

Reduced pipe diameter

Because of the flared end, the diameter of the pipe is 2 to 4 mm less than with the standard method. In narrow pipes and/or if there is any deformation, it may be difficult or impossible for the packer to pass through installed sleeves with the next ones.

Procedure

Preparing and laying out the sleeves

- (1) First sleeve, with projecting rubber end and with flared end
- (2) Second and additional sleeves, with projecting rubber end with or without flared end
- (3) Last sleeve, without projecting rubber end, with or without flared end



Installing the first sleeve

- Make sure that first sleeve (1) is installed with one pair of circumferential seals in an intact section of the pipe.



Installing the second sleeve (and others)

- Move the new sleeve through the previously installed sleeve(s) (1).
- **Note:** Watch out for the projecting rubber end. See section 2.5.6
- Install the sleeve (2) with the correct metal overlap as described in 2.5.7



Installing the last sleeve

- Move the new sleeve through the previously installed sleeves (1) and (2).
- **Note:** Watch out for the projecting rubber end. See section 2.5.6.
- Install the sleeve with the correct metal overlap. See section 2.5.7.



2.5.9 Using a laser marker

If the packer is equipped with a laser marker, the sleeves can be installed in series much more quickly and precisely.

Observe the safety instructions in the operating manual for the laser marker.

Note:

With the method described here, the packer is not in the middle of the sleeve during expansion.

To prevent the sleeve from expanding eccentrically, it is essential to lubricate the overlap of the stainless steel plates beforehand.

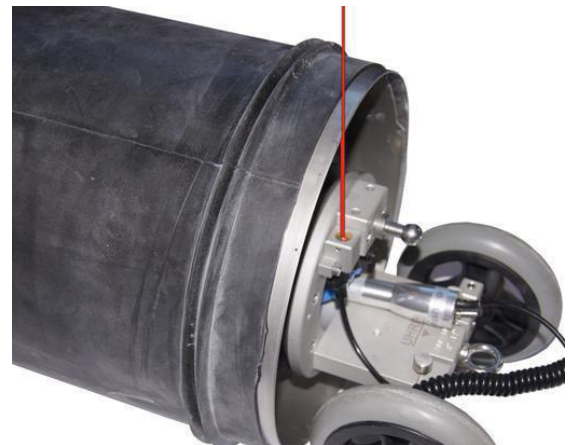


You can make a mark to help you before installing the sleeve:

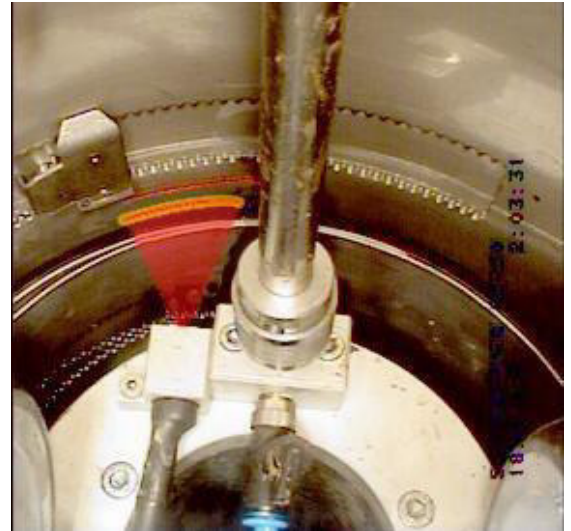
- 0.5 – 1.0 cm in front of the toothed strip
Flush with the edge of the cover plate
- The laser beam is aligned to this mark.
- The edge of the next sleeve is directly behind it.



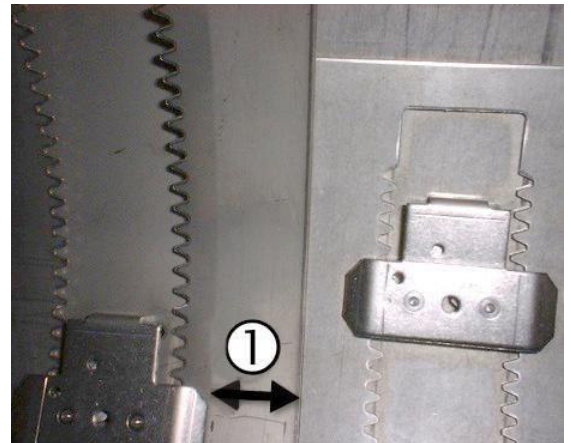
- Position the Quick-Lock sleeve on the packer so that the laser beam can be seen both on the edge of the sleeve and on the host pipe.



- The laser is mounted on the front of the packer.
- It is level with the edge of the sleeve.
- Position the packer with the sleeve in the pipe so that the laser beam strikes the rear edge of the lock or the marking line on the installed sleeve.

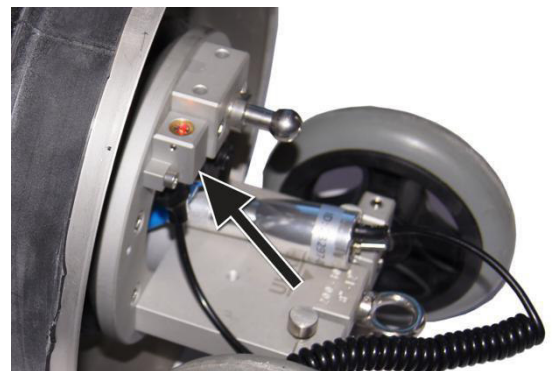


- After installation, the edge of the sleeve is 0.5 – 1.0 cm (1) behind the lock of the installed sleeve.



Positioning a retrofitted laser

- The laser marker is attached to the front plate of the packer, either next to the air connection or directly at the top.
- The laser may not protrude over the front plate.
- If your packer does not come with a hole for mounting the laser, then cut a 4 mm thread no more than 13 mm deep in the front plate.



2.6 Special cases

2.6.1 Quick-Lock for joint misalignments

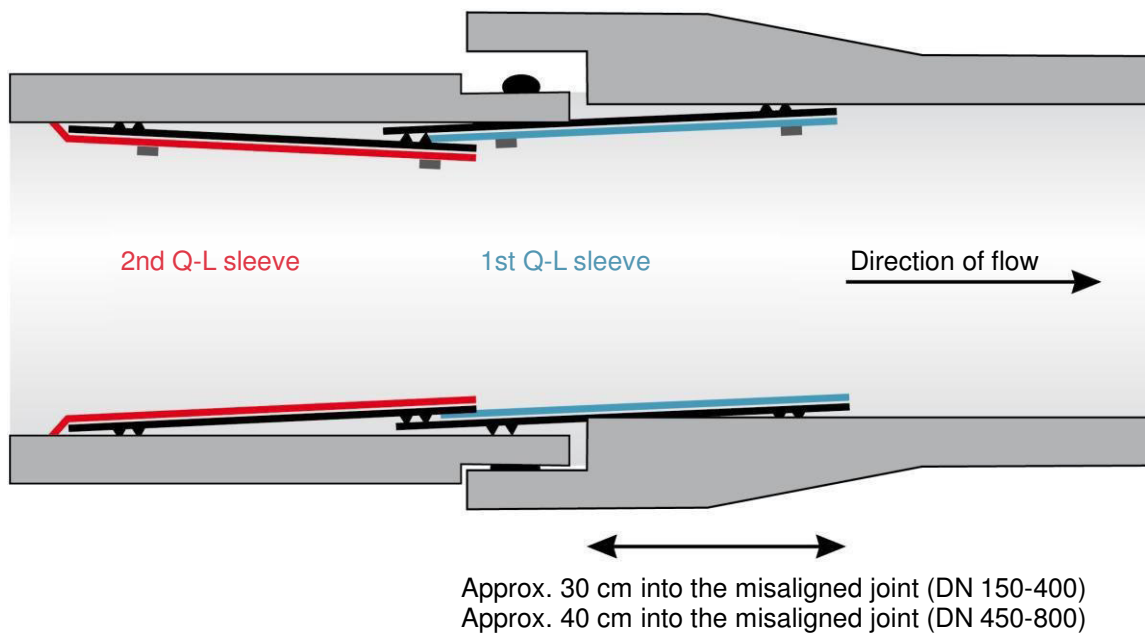
Joint misalignments of **up to 1.0 cm** can be repaired with a single sleeve.

- Joint misalignments of 1 cm to 2.5 cm must be milled out and can then be repaired with a single sleeve.

Repairing joint misalignments with two sleeves

If the joint cannot be milled, misalignments between 1 cm and 2.5 cm can be repaired using two sleeves installed in series.

- The procedure for installing the sleeves is the same as standard serial installation, except that the sleeves are positioned slightly differently.
- Where the two sleeves overlap, they form an angled joint that compensates for the misalignment and ensures that the pairs of circumferential seals are sufficiently compressed.



Installing the first Quick-Lock sleeve

- Without flared end
- With projecting rubber end
- Placed approx. 30 (or 40) cm into the misaligned joint.

Installing the second Quick-Lock sleeve

- Flared sleeve
- Without projecting rubber end
- Approx. 1.5 cm metal overlap with the first sleeve.

2.6.2 Groundwater infiltration

Where there is heavy groundwater infiltration and the pipe has a rough surface structure, we recommend **always** using an additional hydrophilic waterstop affixed to the rubber jacket to ensure a tight seal.

- Always use a hydrophilic waterstop if you are not certain that the circumferential seal is sufficiently thick for sealing.
- On badly corroded surfaces in host pipes, especially concrete pipes, a hydrophilic waterstop must always be used.

Attaching a hydrophilic waterstop

- Only use a waterstop recommended by us in appendix 3.
- Stretch the waterstop to tear the layer that protects it against premature expansion.
- Cut the waterstop to length so that it will form a tight seal around the sleeve.



- Glue the ends of the waterstop together with superglue.



- Pull the waterstop seal rings you have made over each pair of circumferential seals, making sure they fit snugly.
- Pull the waterstop seal rings up to the inside of the pairs of circumferential seals.
- Glue the waterstop to the rubber jacket all the way round.



Note: The waterstop seals add to the amount of material to be compressed.
Increase the application pressure by 0.5 bar.

**Application pressure
+ 0.5 bar**

2.6.3 Root penetration

A special method can be used for root penetration.

- This prevents the root from growing along the Quick-Lock sleeve and finding a way through the circumferential seals.
However, although this method has had positive long-term results, we cannot guarantee its success.
- Use highly alkaline mineral-based flexible mortar.
(See appendix 3 for recommended products).
- You must use a product with **adhesive properties** so that the material applied is not lost in the pipe.
- In addition, the flexibility stops the material from stretching with the rubber jacket and cracking.

-
- Remove all protruding roots.

-
- Apply a band of mortar to the rubber jacket.
 - All the way round
 - To a width of approx. 15 cm
 - Up to the maximum thickness of the circumferential seals

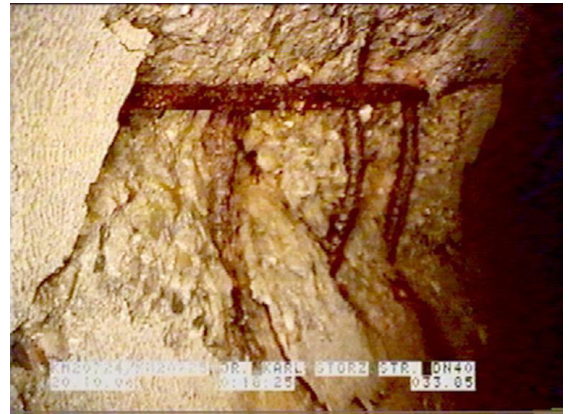


2.6.4 Corroded steel in reinforced concrete pipes

Flexible mortar can also be used for reinforced concrete pipes where the steel has become exposed.

- In this case, the highly alkaline coating ensures that the alkaline area around the exposed reinforcement is restored
- Alkalinity is used in concrete manufacturing to protect the steel reinforcements from corrosion.

- Remove any protruding reinforcements.



- Apply a patch of mortar large enough to cover the damaged area.

Note: Never completely coat the rubber jacket with mortar, because this would impair the compression of the circumferential seals.



2.6.5 Repairing plastic pipes

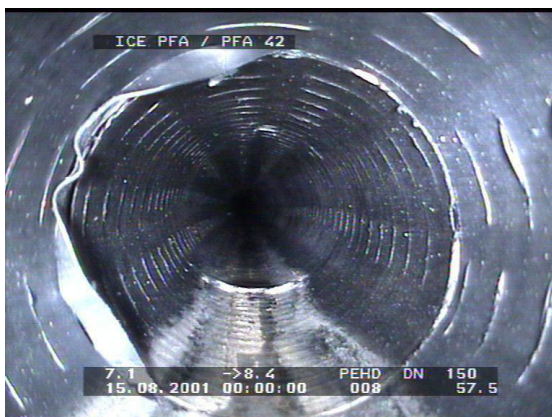
Plastic pipes can be repaired with Quick-Lock sleeves installed either individually or in series in the normal way. However, note the following details:

- The stated pipe diameters of plastic pipes often do not refer to the inside diameter, but to the outside. If the diameter of a pipe is given as DN 250, for example, it does not necessarily mean that the inside diameter is 250 mm.
- With plastic pipes you must always expect deformation, which can restrict access inside them. If the packer with the Quick-Lock sleeve can be positioned at the point of damage despite the deformation, the sleeve adapts to the deformation and increases the structural strength of the pipe.
- Contact us if you are unsure whether a non-standard pipe diameter can be repaired using Quick-Lock.

We will check whether we can supply a suitable sleeve and will provide a set of wheels modified for the inside diameter if necessary.

- Circular perforated drain pipes can also be repaired with Quick-Lock while maintaining their seepage capability. We are also happy to provide advice on this.

Example



Before

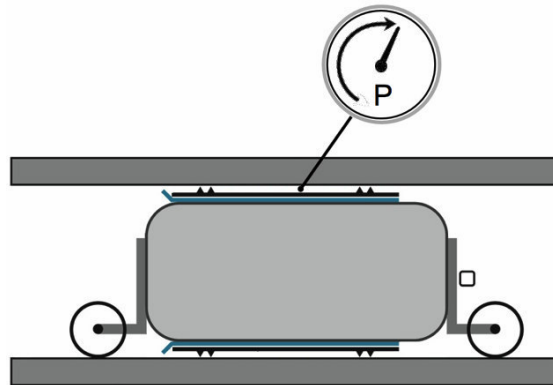


After

The example shows a perforated pipe before and after repair.

2.6.6 Quick-Lock in non-permeable pipe systems

The Quick-Lock sleeve is tightly sealed with the rubber jacket by means of compression. This achieves excellent sealing results.



- If Quick-Lock is used in **non-permeable pipe systems**, there is a risk of **excess pressure** arising in the space between the two pairs of circumferential seals and the host pipe. This effect occurs mainly in pipes that have smooth walls and are made of material that is non-permeable to gas (plastic pipes, GRP pipes and vitrified clay pipes).
- The trapped air cushion can impair **jetting resistance**. The Quick-Lock sleeve might be displaced when the high-pressure jet strikes the edge of it, or the jet might penetrate between the sleeve and the host pipe and further increase the pressure already present there.
- Tests have shown that the pressure gradually decreases as a result of diffusion.

Preventing excess pressure

The following method can be used to prevent excess pressure:

- Make a leak in the rubber jacket between the circumferential seals.
- To do this make a small incision in the jacket along the circumference of the sleeve.



Alternatively:

- Cut away the rubber between the circumferential seals so that only the rings of the circumferential seals are left.



2.6.7 Using Quick-Lock to repair holes longer than the length of one sleeve

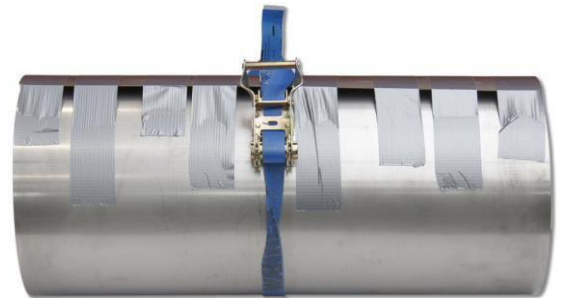
If the damaged section is larger than the width between the circumferential seals, the pipe can be repaired with the aid of a protector tube.

- The Quick-Lock system is based on compressing the circumferential seals against the inner wall of the pipe.
- If the pipe wall is missing in the area to be sealed, it must first be restored using a protector tube.
- For longer holes, several tubes can be installed in succession (not overlapping).

The protector tube should have the following properties:

Material:	1.4404 or 1.4571
Plate thickness:	0.5 – 1.0 mm
Length:	approx. 20 cm longer than the damaged area
Diameter:	nominal diameter of the host pipe
Metal overlap:	approx. 50 mm

- Roll the protector tube up to the next smaller nominal diameter.
- Use a ratchet strap if necessary.



- Secure the rolled-up tube with several strips of tape.

- Extend the wheelbase of the packer accordingly.



- Use the packer or a robot to position the tube.
- Inflate the packer to expand the tube.
- Increase the pressure slowly until the protector tube springs open (the tapes break).
- The protector tube presses against the inside of the pipe.
- Install the Quick-Lock sleeves in series.
- The outermost circumferential seals must be outside the protector tube, pressing against the host pipe.

2.6.8 Removing Quick-Lock sleeves that have been installed

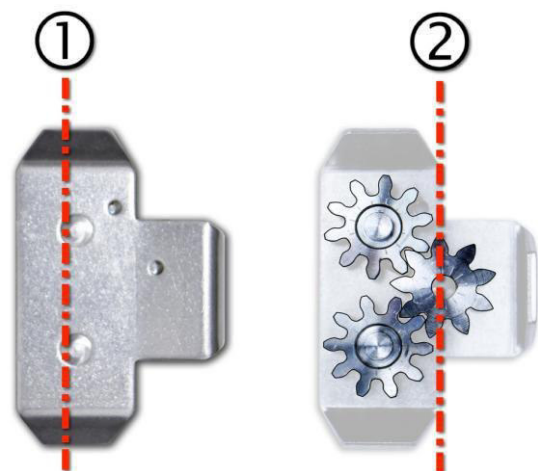
It is possible to remove Quick-Lock sleeves after they have been installed.

- You may need to do this, for example, after temporary sealing unused laterals or if they have been installed incorrectly.
- To remove the sleeve, the lock must be broken. After this, the sleeve cannot be used again.
- To remove an installed Quick-Lock sleeve, you need a robot cutter with a standard metal-cutting disc.
- You usually need to have a holder made for the cutting disc on the robot.



Make two cuts on each lock.

- The first cut (1) removes the cover plate rivets and the cover plate falls off.
- The second cut (2) is through the locking gear.



- The Quick-Lock sleeve collapses under its own tension and that of the stretched rubber sleeve.
- The sleeve can then be picked up on the holder head of the robot cutter and taken out of the pipe.

2.6.9 Deflating the packer more quickly using a vent valve

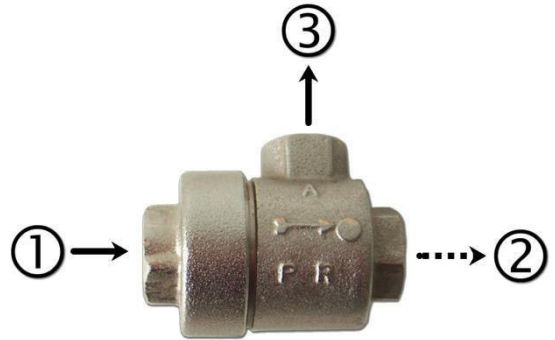
To deflate the packer more quickly, a vent valve can be fitted on the camera between the air hose and the link bar.

This is much faster than deflation via the compressed air unit.

When the pressure is removed, the packer balloon is deflated more quickly.

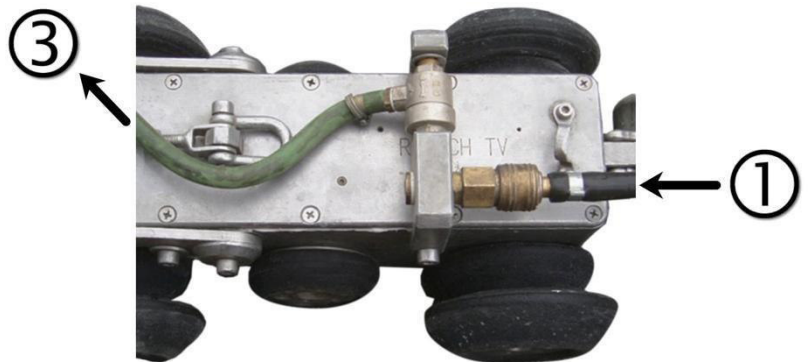
Vent valve

- (1) Air hose connection
- (2) Vent outlet
- (3) Packer connection



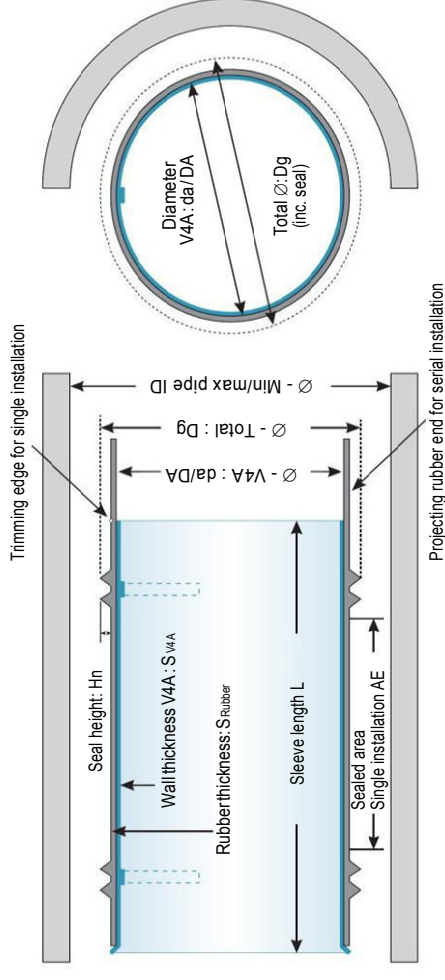
Example installation

- (1) From the compressed air unit
- (3) To the packer



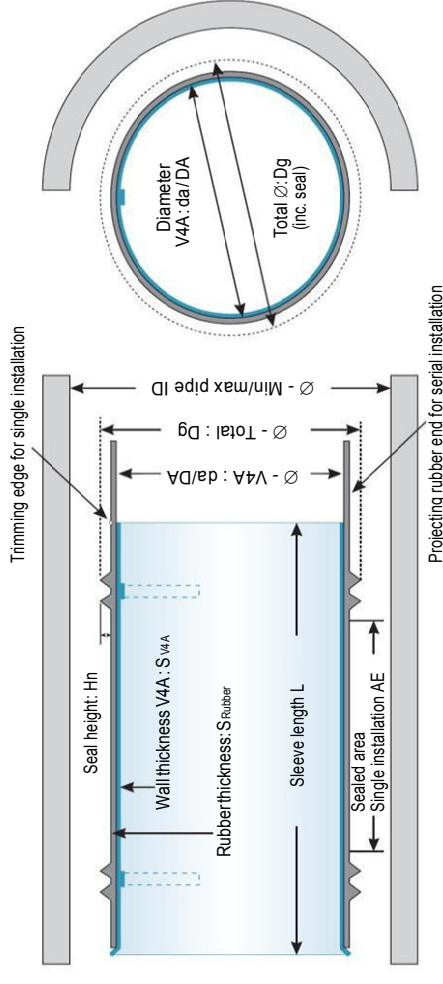
3. Appendix

3.1 Appendix 1 Technical data sheet



Quick-Lock sleeve DN	Rubber jacket DN	Sleeve length	Total diameter rolled	Suitable for pipes from / to		Sealed area Single installation	Packer	Wheelbase	Stainless steel sleeve			Rubber jacket			Stock item
				Pipe ID min.	Pipe ID max.				Wall thickness s	V4A pipe rolled da	Max. expanded diameter DA	Rubber thickness	Height of seals	Total weight	
mm	mm	mm	mm	mm	mm	mm			mm	mm	mm	mm	mm	mm	kg
Designation:	Desig.:	L	Dg	DN min	DN max	AE	VP	RS	S V4A	da	DA	S Rubber	Hn	G	
150	150	400	129	147	155	320	VP 150-200	RS 150	1	119	149	2	4.0	2.3	X
158	150	400	138	156	165	320	VP 150-200	RS 158	1	131	158	2	4.0	2.5	
176	176	400	151	171	182	315	VP 150-200	RS 176	1.2	144	177	2	4.0	3.0	
188	188	400	162	185	196	320	VP 150-200 / VP 200-300	RS 188 / RS 188	1.2	150	189	2	5.0	3.2	X
200	200	400	172	196	207	320	VP 150-200 / VP 200-300	RS 200 / RS 200	1.2	159	202	2	5.0	3.3	X
210	200	400	182	207	219	320	VP 150-200 / VP 200-300	RS 210 / RS 210	1.2	173	212	2	5.0	3.5	
225	225	400	192	221	233	315	VP 200-300 / VP 250-300	RS 240+SPV 300	1.2	186	227	2	5.0	3.9	X
240	250	400	202	237	249	315	VP 200-300 / VP 250-300	RS 240+SPV 300 / RS 240	1.2	198	242	2	5.0	4.2	X
250	250	400	212	247	261	315	VP 200-300 / VP 250-300	RS 250 / RS 250	1.2	199	252	2	6.0	4.4	X
276	276	400	234	271	285	315	VP 200-300 / VP 250-300	RS 275+SPV 300 / RS 275	1.2	224	278	2	6.0	4.6	
286	276	400	244	280	294	315	VP 200-300 / VP 250-300	RS 280+SPV 300 / RS 280	1.2	232	287	2	7.0	5.4	
300	300	400	255	293	313	310	VP 200-300 / VP 250-300	RS 250+SPV 300 / RS 300	1.2	238	305	2	7.0	5.4	X
315	300	400	270	308	324	310	VP 200-300 / VP 250-300	RS 250+SPV 300 / RS 300	1.5	259	315	2	7.0	6.6	
330	300	400	286	320	341	310	VP 200-300	RS 330	1.5	271	335	2	7.0	7.0	

3.1 Appendix 1 Technical data sheet



Quick-Lock sleeve DN	Rubber jacket DN	Sleeve length	Total diameter rolled	Suitable for pipes from / to		Sealed area Single installation	Packer	Wheelbase	Stainless steel sleeve			Rubber jacket		Total weight	Stock item
				Pipe ID min.	Pipe ID max.				Wall thickness s	V4A pipe rolled da	Max. expanded diameter DA	Rubber thickness	Height of seals		
mm	mm	mm	mm	mm	mm	mm			mm	mm	mm	mm	mm	kg	
Designation:	Desig.:	L	Dg	DN min	DN max	AE	VP	RS	S V4A	DA	S Rubber	Hn			
350	350	400	308	341	363	325	VP 350-500	RS 350	1.5	294	2	7	7.3	X	
380	350	400	318	367	386	325	VP 350-500	RS 380	1.5	304	2	7	7.7	X	
400	400	400	349	390	415	310	VP 350-500	RS 400	1.5	330	2	8	8.9	X	
450	450	500	378	438	464	395	VP 350-500	RS 400+SPV 450	2	367	2	8	15.9	X	
480	450	500	410	467	490	395	VP 350-500	RS 480+SPV 500	2	392	2	8	16.6		
500	500	500	446	487	515	385	VP 350-500 / VP 500-600	RS 400+SPV 500 / RS 500	2	428	2	9	16.8	X	
524	500	500	448	497	534	385	VP 500-600	RS 500	2	430	2	9	17.6		
560	500	500	477	540	568	385	VP 500-600	RS 560	2	455	2	9	20.2		
600	600	500	538	582	617	390	VP 500-600 / VP 600-700	RS 500+SPV 600 / RS 600	2	519	2.5	8	20.2	X	
600 NL	600	500	511	575	618	390	VP 500-600 / VP 600-700	RS 500+SPV 600 / RS 600	2	490	2.5	8	21.0	X	
650	600	500	586	632	667	390	VP 600-700	RS 650	2	568	2.5	8	22.0		
700	700	485	596	677	727	375	VP 600-700 / VP 700-800	RS 600+SPV 700 / RS 700	2	575	2.5	9	24.0	X	
750 ²	700	485	621	720	762	375	VP 700-800	SPV 750	2	595	2.5	9	25.2		
800 ^{3**}	800	485	721	780	827	375	VP 700-800	RS 700+SPV 800	2	695 ^{**}	2.5	9	27.0		

^{2,3} Not included in certification under building law

** Special sleeve rolled up to 695 mm, cone section usually has to be removed from manhole.

3.2 Appendix 2: Application pressures

Table of application pressures (compression)

Pipe type	Type of damage	Diameter from - to	Application pressure
Vitrified clay, asbestos cement, PVC and concrete pipes	Fragmentation and longitudinal cracks	DN 150	Approx. 4.5 – 5.0 bar
		DN 200	Approx. 3.5 – 4.0 bar
		DN 250-800	Approx. 3.0 – 3.5 bar
	Transverse cracks, leaking joints	DN 150	Approx. 4.5 – 5.0 bar
		DN 200	Approx. 4.0 – 4.5 bar
		DN 250-800	Approx. 3.5 – 4.0 bar
Reinforced concrete, GRP, plastic (PE,PP) and cast iron pipes	All types of damage	DN 150	Approx. 4.5 – 5.0 bar
		DN 200	Approx. 3.5 – 4.0 bar
		DN 250-800	Approx. 3.5 – 4.0 bar

- The application pressures listed here are merely **approximate values**. The actual pressures depend on the compressed air unit, the accuracy of the indicators and the precise nature of the damage.
- Give the compressed air unit **enough time** until the pressure shown on the pressure gauge reaches the packer and no longer drops.
- **When using hydrophilic waterstops**, you must increase the pressure by 0.5 bar.
- Increase the application pressure gradually, especially when repairing **longitudinal cracks and fragmentation**.
When you notice that despite the gradually increasing pressure, the locks have stopped moving along the toothed strips, the maximum compression pressure has been reached.



We only offer a warranty on the packer balloons we deliver if there are demonstrable production defects

We offer no warranty for damage to the balloon caused by sharp fragments or similar items.

3.3 Appendix 3 Auxiliary equipment

Recommended equipment for using Quick-Lock

Product name Item number	Manufacturer	Use
Lubricating oil saBesto 300 ml Food-grade lubricating oil Item no. 893 107 1	Würth GmbH & Co. KG 74650 Künzelsau, Germany Tel: +49 (0)7940 / 15 – 0 www.wuerth.de	Oiling the toothed strips and gears before installation. Biodegradable, used in the food processing industry.
Superglue Ropid 100 Low-viscosity cyanoacrylate adhesive Item no. 240460	Conrad Electronic Klaus-Conrad-Hirschstr. 1 92240 Hirschau, Germany Tel: +49 (0)180 / 531 21 11 www.conrad.com	Affixing the rubber jacket to the steel sleeve (You can also use gel-type superglue to prevent it running between the plates.)
Talcum powder TipTop talcum powder, 500g Powder dispenser	Car or bicycle parts dealer	For applying to the rubber jacket before pulling it over the steel sleeve. This significantly reduces the friction between the steel and the rubber.
Hydrophilic waterstop Hydrotite waterstop Rectangular beaded profile 2.5/4 x 20 Item no. 335110	TPH Techn. Produkte Handelsgesellschaft mbH Gutenbergring 55 c D-22848 Norderstedt, Germany Tel: +49 (0)40 / 501166	Additional seal for groundwater infiltration in conjunction with the rubber jacket.
Flexible mortar PCI Carrament Medium bed mortar with flexible properties Colour: grey	PCI Augsburg GmbH Piccardstraße 11 86159 Augsburg, Germany Tel: +49 (0)821 / 5901-0 www.pci-augsburg.de	Coating the rubber jacket to protect it from root penetration and for exposed steel reinforcements in concrete.

3.1 Appendix 4 Offset packer with adjustable chassis

3.1.1 Intended use



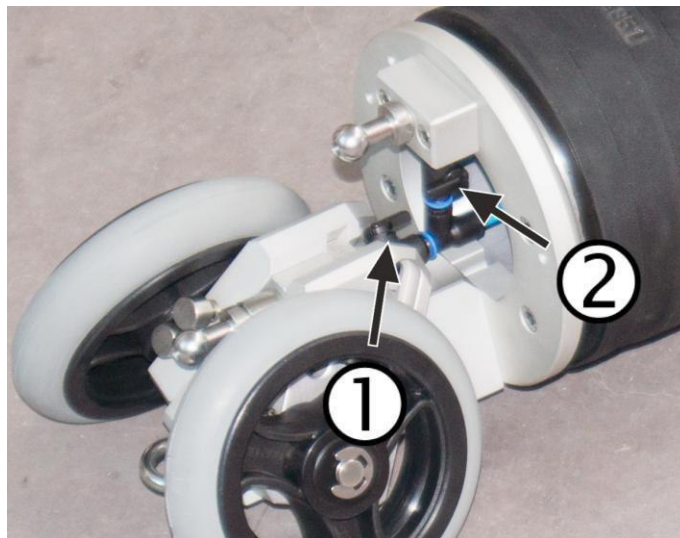
The packer with adjustable chassis is a universal packer for inserting and fitting Quick-Lock sleeves. The packer is available in two nominal widths:

- Packer I: DN 200 to DN 300 (190 mm – 320 mm)
- Packer II: DN 350 to DN 500 (330 mm – 540 mm)

The packer is equipped with an adjustable wheel pair for adapting to the pipe diameter.

3.1.2 Conversion

Setting the compressed air supply



There are two ball heads available for the compressed air supply. Both lines have a stop valve.

- Only open the stop valve of the ball head that will be used.
- Close the other stop valve.
 - (1) Stop valve of lower ball head
 - (2) Stop valve of upper ball head

Removal of the wheels

The wheels can be removed in order to adjust the nominal width.

- Press the corresponding clip (1) and remove the wheel.

Setting the nominal width

When the wheels are removed, you can set the nominal width.



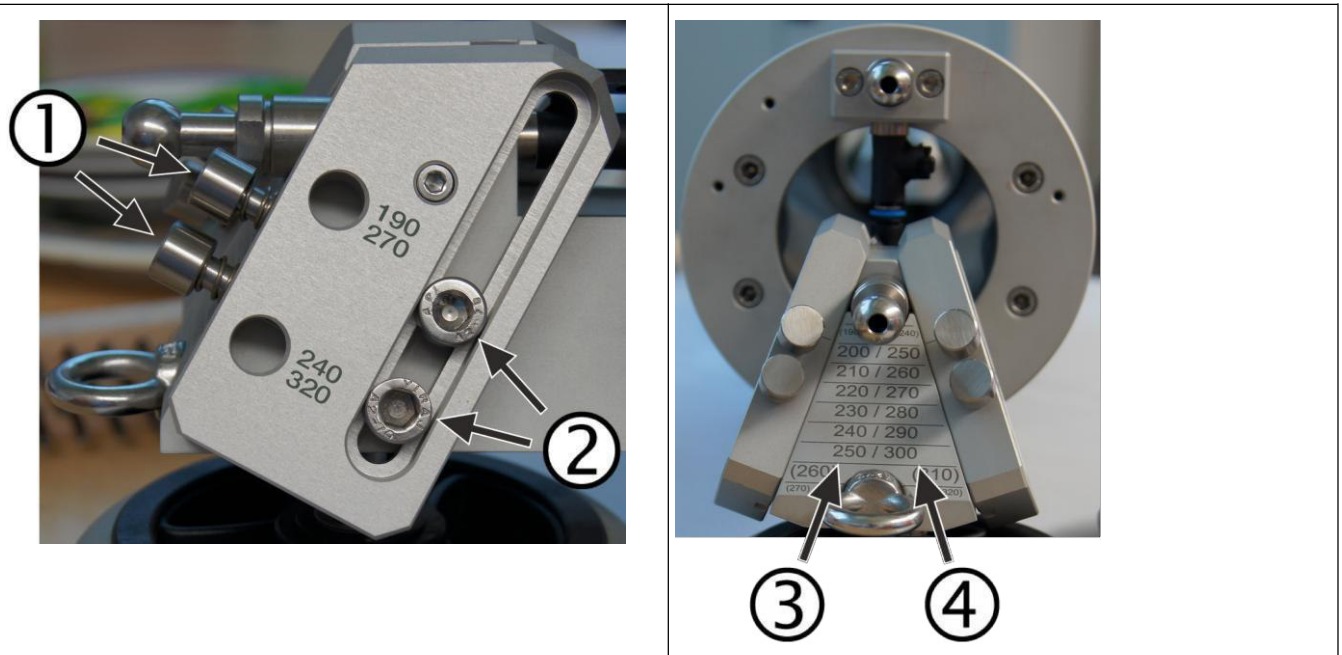
Note:

If you set a nominal width that is too large, use of the applied pressure will exert a very high force on the wheels and the pipe.

This can lead to damage of the host pipe or the packer.

Always set the wheel pair exactly to the nominal width of the host pipe!

Proceed as follows for each wheel:



- Undo the two fixing screws (2).
- Shift the plate until the line marking points to the desired nominal width. Use the left (3) or right column (4) for this.
- Tighten the two fixing screws (2).

Inserting the wheels

Depending on the nominal width range, insert the wheels in either the upper or lower hole:

- Left column (3): upper hole, 190–270 mm
- Right column (4): lower hole, 240–320 mm
- Hold the respective clip (1) firmly to insert the wheel.
- Insert the wheel until it latches.

End