MS-IN-IN8-07.23

Method Statement

KÖSTER IN 8

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Table of Contents

KÖSTER
Waterproofing Systems

Table of Contents

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1 General information

1.1 Scope

This method statement is intended for use by developers, contractors and applicators as a general guideline for the application of the single component water-reactive PU injection foam KÖSTER IN 8.

While this document describes the tools, equipment, materials and process for preparing and installing the injection system product, it must be used and referred to, in combination with all other relevant technical information available for the products and their components.

1.2 Manufacturer

KÖSTER BAUCHEMIE AG
Dieselstraße 1-10 Tel. 04941/9709-0
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KÖSTER
Waterproofing Systems

1.3 Definitions

Polyurethane resin
Polyurethanes can be designed to form a soft elastic or flexible material such as a foam, but also to form a rigid material such as solid body resin. Both foams and solid body resins can be made of polyurethanes. Polyurethanes bond very well to dry and even to wet surfaces.

Water-reactive
Construction chemicals which start a reaction in contact with water - in this case a PU will start foaming.

Viscoelastic
Viscoelasticity refers to material behavior that is both elastic as well as viscous. Viscoelastic materials combine the properties of solids and liquids.

Pot life
The technical definition for the “pot life” of a resin is the time the resin takes to develop a viscosity of above 800 mPa.s. If the viscosity is above 800 mPa.s, the resin can no longer be satisfactorily injected.
The pot life of the material is important to the applicator, because it defines the time remaining for the injection of the material after it has been mixed properly. The pot life is influenced by the surrounding temperature and by the amount of material mixed at one time.

2 System description

2.1 System features

KÖSTER IN 8 is a water-reactive polyurethane prepolymer. The product only reacts in contact with water and then spontaneously forms a firm, tough, elastic, waterproof polyurethane foam. Contact with water is required for curing and foaming reaction.
After the reaction, KÖSTER IN 8 remains viscoelastic and is therefore able to follow crack movements and to permanently waterproof without an elastic solid polyurethane resin re-injection. KÖSTER IN 8 is hydrolysis-resistant.
KÖSTER IN 8 can be accelerated by adding max. 10 % by weight of KÖSTER IN 8 Accelerator. The time until the material is tack-free is then only approx. 2.5 minutes.

2.2 Characteristics/Advantages

- Single component, no mixing necessary
- The fast-foaming effect stops water in seconds
- Very high expansion volume, up to 30 times (only if there is enough space to expand)
- Starting reaction time approx. 30 seconds
- No pot life since it only reacts with water
- Non-sticky after approx. 3.5 min.
- Resistant to hydrolysis and acid
- The material remains viscoelastic and is therefore able to follow crack movements
- Injectable on moist and water-bearing cracks
- Free of solvents and fillers

2.3 Main products and components

KÖSTER IN 8
Viscoelastic, single-component water-reactive PU injection foam. Reacts immediately on contact with water to form a firm, viscoelastic, waterproof polyurethane foam capable of following crack movements. Filler-free, hydrolysis and acid resistant.

See online

2.4 Associated products

KÖSTER 1C Injection Pump

See online

KÖSTER IN 8 Accelerator

See online

KÖSTER Hand Pump without manometer

See online

KÖSTER Hand Pump with manometer

See online

KÖSTER PUR Cleaner

See online

KÖSTER Injection Barrier

See online

KÖSTER One-Day-Site Packer 13 mm x 90 mm CH

See online

KÖSTER One-Day-Site Packer 13 mm x 120 mm CH

See online

KÖSTER One-Day-Site Packer 13 mm x 90 mm PH

See online

KÖSTER Superpacker 10 mm x 85 mm CH

See online

KÖSTER Packer 13 mm x 130 mm CH

See online

KÖSTER Superpacker 10 mm x 115 mm CH

See online

KÖSTER Superpacker 13 mm x 130 mm CH

See online

KÖSTER One-Day-Site Packer 13 mm x 120 mm PH

See online

KÖSTER Impact Packer 12 mm x 70 mm

See online

KÖSTER KB-Fix 5

See online

2.5 Associated literature

- Technical Data Sheet
- Product Flyer IN 8
- System brochure: Crack Repair and Crack Injection
- Fields of application for KÖSTER Injection Packers
- KÖSTER Injection matrix: Resins
- Abdichtungsreport 2-2007 (Only German)

3 Tools and Equipment

3.1 Tools

Measuring tool

Trowel

Wire brush

Tools for packers

KÖSTER 13 mm drill bit for SDS Plus Chuck (Masonry)

Drill bit 14 mm SDS Plus (Concrete)

KÖSTER Resin Stirrer 75 mm / 100 mm

KÖSTER Drill Hole Cleaner

Mixing vessels

Measuring cup

3.2 Equipment

Driller

KÖSTER Hand Pump
without manometer

KÖSTER Hand Pump
with manometer

KÖSTER 1C
Injection Pump

3.3 Cleaning

Clean all tools and equipment immediately after use with KÖSTER PUR Cleaner. Cured and hardened material can only be removed mechanically.

4 Environmental, health and safety

4.1 Personal Protection Equipment (PPE)

The following is a short overview of Personal Protective Equipment and serves only as a guideline. Contractors and employers are responsible for meeting the occupational safety guidelines in their countries, states, and localities.

Eye protection
Employers must be sure that their employees wear appropriate eye and face protection and that the selected form of protection is appropriate to the work being performed and properly fits each worker exposed to the hazard.

Head protection
Employers must ensure that their employees wear head protection if any of the following apply: Objects might fall from above and strike them on the head; they might bump their heads against fixed objects, such as exposed pipes or beams; or there is a possibility of accidental head contact with electrical hazards.

Foot and leg protection
Employees who face possible foot or leg injuries from falling or rolling objects or from crushing or penetrating materials should wear protective footwear.

Hand protection
When selecting gloves to protect against exposure hazards, always check with the manufacturer or review the manufacturer's product literature to determine the gloves' effectiveness against specific workplace chemicals and conditions. Gloves commonly used are: Coated fabric gloves and chemical - and liquid - resistant gloves.

Hearing protection
Suitable hearing protection must be provided for the job environment.

4.2 Material safety & First Aid

Every KÖSTER product is labeled with specific information and symbols as to the related dangers. Please consult the respective Material Safety Data Sheet for specifics.

You can access the Material Safety Data Sheets by scanning the QR codes on the packagings.

If inhaled:
Provide fresh air. In case of breathing difficulties administer oxygen. If breathing is irregular or stopped, administer artificial respiration. In all cases of doubt, or when symptoms persist, seek medical advice.

In case of contact with eyes:
If product gets into the eye, keep eyelid open and rinse immediately with large quantities of water, for at least 5 minutes. Subsequently consult an ophthalmologist. Remove contact lenses, if present and easy to do. Continue rinsing.

After ingestion:
If accidentally swallowed rinse the mouth with plenty of water (only if the person is conscious) and obtain immediate medical attention. Let water be drunken in little sips (dilution effect). Do NOT induce vomiting. Do not give fatty oils and milk.

After contact with skin:
Take off immediately all contaminated clothing. Rinse skin with water/or shower. If skin irritation occurs, get medical advice/attention.

4.3 Waste disposal

Disposal recommendations
Do not allow to enter into surface water or drains. Dispose of waste according to applicable legislation.

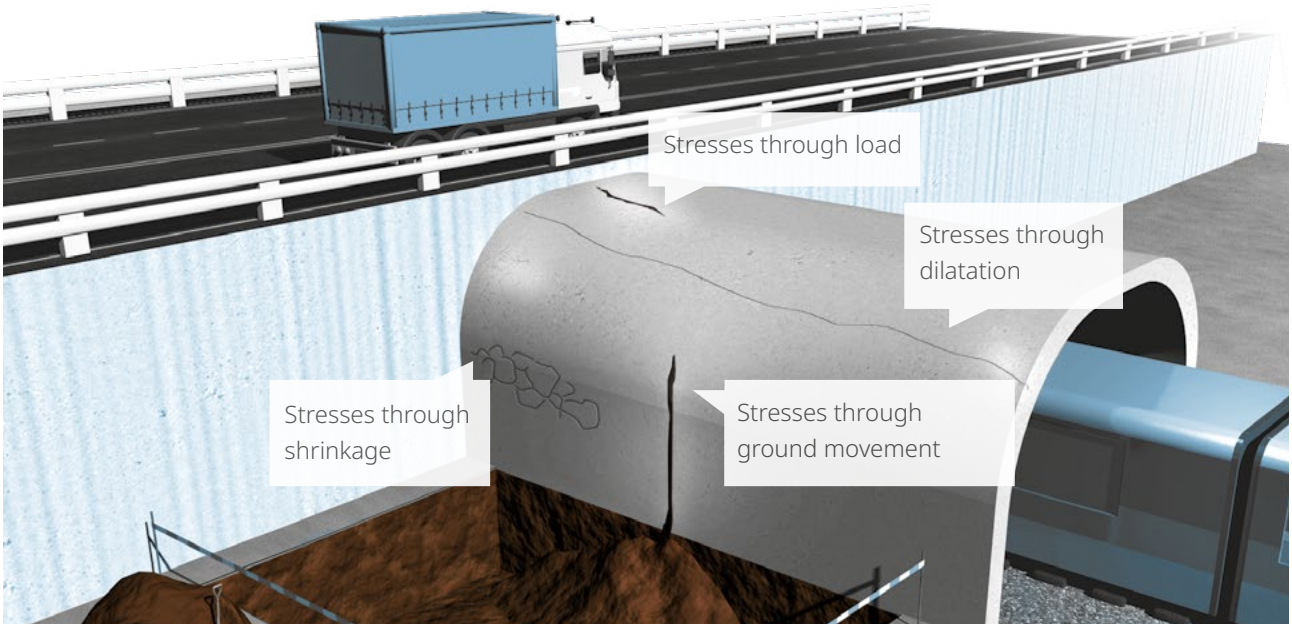
Contaminated packaging
Wash with water (cleaning agent). Completely emptied packages can be recycled.

Guidance on classification of waste according to EWC-Stat categories
List of Wastes Code -
Used product (080501)
WASTES FROM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS), ADHESIVES, SEALANTS AND PRINTING INKS; wastes not otherwise specified in 08; waste isocyanates; hazardous waste.

5 Crack details

5.1 How do cracks form?

A construction member cracks if stresses inside of it become larger than the resistance of the construction member. By cracking, the buildup of stresses is relieved. In comparison to the compressive strength, the tensile strength of concrete is quite low. This applies especially to fresh concrete. The most frequently encountered cracks are therefore tensile cracks and bending tensile cracks. There are many reasons which cause stresses in construction members. In most cases however, it is a combination of the following reasons:



5.1.1 Stresses through load

If a load is applied to a construction member, stresses develop inside which e.g. transmit the load into the foundation of the construction member. Loads which affect a building or construction member are e.g. vehicles crossing a bridge or even wind which impacts on a building. Also the self-weight of the construction member is a load which the construction member has to carry. If the load exceeds the load capacity of the construction member, cracks occur.

5.1.2 Stresses through shrinkage

Concrete shrinks during the curing process. Moreover, heat develops during the hydraulic reaction of the concrete. Both factors can, especially on long construction members, lead to strong interior stresses and hence to cracks. Usually, reinforcement and expansion joints help to avoid such cracks. If expansion joints do not exist or if they are not fully functional, stresses occur in the construction member. This can lead to cracks.

5.1.3 Stresses through ground movement

Stresses through ground movement occur through earthquakes, through setting of the building, through increases or decreases in the water table, through new construction sites in the vicinity, etc. Because of these movements, changes may occur during the load transfer from the building through the foundations into the supporting ground. These changes lead to stresses in the supporting and non-supporting construction members of the building which can lead to cracks.

5.1.4 Stresses through dilatation

Thermal impact, e.g. exposure to sunlight can warm up construction members. If building materials are warmed, they expand. If they are then cooled down, they shrink again. The movements which occur during warming up and cooling down cause stresses in the construction member and lead to cracks.

5.2 How to analyze crack movements?

A moving crack, is a crack where one of the flanks or both change their location.
In order to detect if the crack is moving (live crack) or not moving again (dead crack), we have to perform a simple Insite test.
A gypsum mark serves as a crack monitor. A bone-shaped layer of gypsum with a thickness of 10 mm is applied to the cracked surface. Gypsum marks must be numbered and dated. Moreover, the position and state of the installed gypsum marks is to be documented with drawings or photographs at regular intervals over a certain period of time.
The gypsum marks are frequently checked. If the mark is unbroken, the crack did not move. If the crack has moved, the gypsum mark will have cracked right over the crack in the substrate. Professional crack monitors measure and record the course of movements in the crack over time.

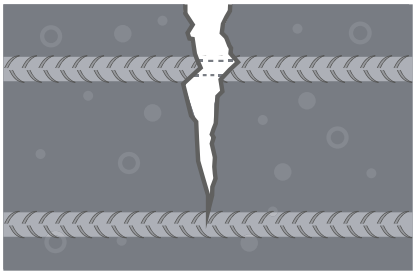
5.3 Reasons for injection

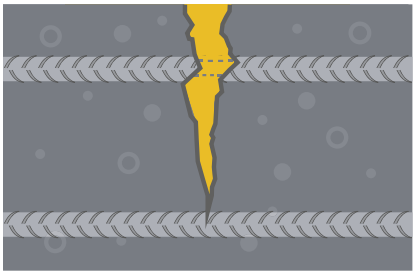
Cracked construction elements
Construction Elements like columns, slabs, beams ….etc. must be injected when cracked for the following reasons:

- Restoring the mechanical strengths of the construction element (compressive, tensile, flexure…etc) and therefore retaining the efficiency and performance of those elements.
- Preventing water/fluids leakage through the concrete.
- Preventing corrosion of the reinforcement steel bars inside the concrete element due to water and CO2 penetration through cracks.
- Retaining the element features and shape, to restore the initial Architectural design.

Preventive waterproofing

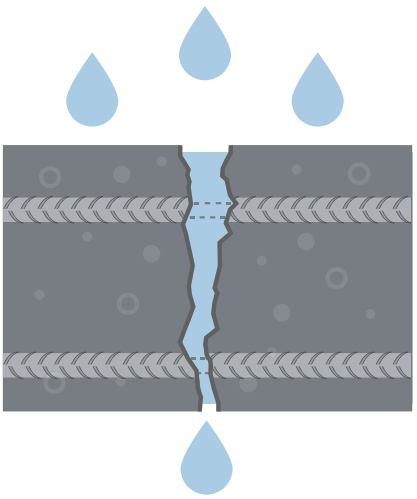
If cracks only represent minor defects, they are often repaired preventively in order to avoid further damage. This particularly includes corrosion prevention, the consequential damage of which (e.g. spalling of the concrete cover) later inevitably leads to higher renovation costs.

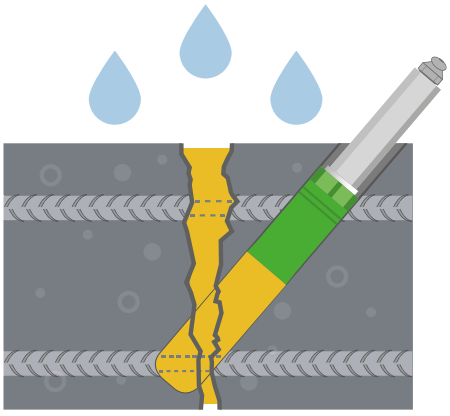




Waterproofing

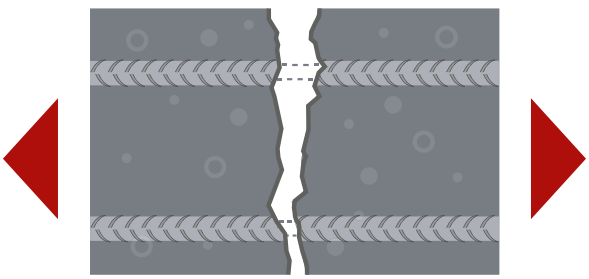
If the cracks represent a major deficiency, for example because water penetrates through cracks in basements, such cracks can limit the usability of the building. Penetrating water often causes consequential damage, for example corrosion of the reinforcement and restricted usability. In these cases, active water flow must first be stopped. The cracks are then permanently waterproofed over their entire cross-section. Cracks that still show movement must be filled with an elastic material that is able to absorb the movement of the building component such as KÖSTER 2 IN 1 or KÖSTER IN 5.

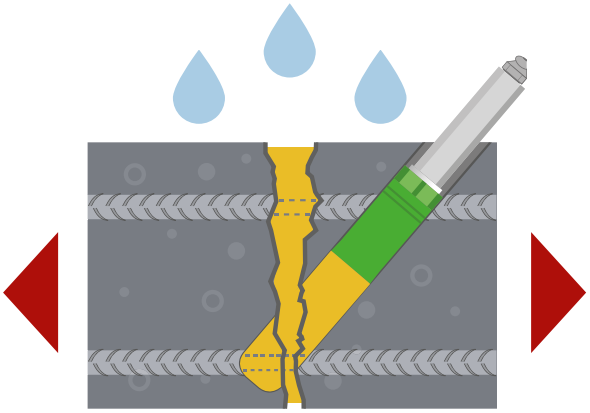




Elastic bonding or structural repair

Cracks that still show movement must be filled with an elastic material that is able to absorb the movement of the building component. Cracks which, on the other hand, are not subject to changes in the width can be connected structurally. Such cracks are injected with a rigid resin (KÖSTER KB-Pox IN) in order to restore the structural strength of the component. The here used Injection materials – regardless of their chemical concept - always have adhesive tensile values that exceed the tensile strength of healthy concrete (well over 1.5 N/mm^2). In this way, the integrity of the component is completely restored at this point.





6 Fields of application

6.1 General examples

- Stopping fast large water leakages with foaming action
- Waterproofing horizontal and vertical cracks
- Filling of voids within or behind structures
- Sealing wall/floor joints
- Create a flexible bond
- Pressure injection of water bearing cracks

6.2 Example for pressure injection of water bearing cracks

1. Installing the packers	KÖSTER Packer 13 mm x 130 mm CH
	KÖSTER Superpacker 10 mm x 115 mm CH
	KÖSTER Superpacker 10 mm x 85 mm CH
	KÖSTER Superpacker 13 mm x 130 mm CH
	KÖSTER One-Day-Site Packer 13 mm x 90 mm CH
	KÖSTER One-Day-Site Packer 13 mm x 90 mm PH
	KÖSTER One-Day-Site Packer 13 mm x 120 mm PH
	KÖSTER One-Day-Site Packer 13 mm x 120 mm CH
2. Injection resin	KÖSTER IN 8
3. Pump	KÖSTER 1C Injection Pump

Injection process:

KÖSTER IN 8 reacts only when in contact with water and spontaneously forms a compact, viscoplastic, waterproof polyurethane foam with a volume expansion of up to 30 times, which allows movements of the structure while maintaining a watertight system.

Install the packers parallel to the crack pathway on both sides. Start injection from bottom to top under suitable pressure using a one component PU injection resin pump like for example the KÖSTER 1C Injection Pump. Depending on the application, different packers are available.

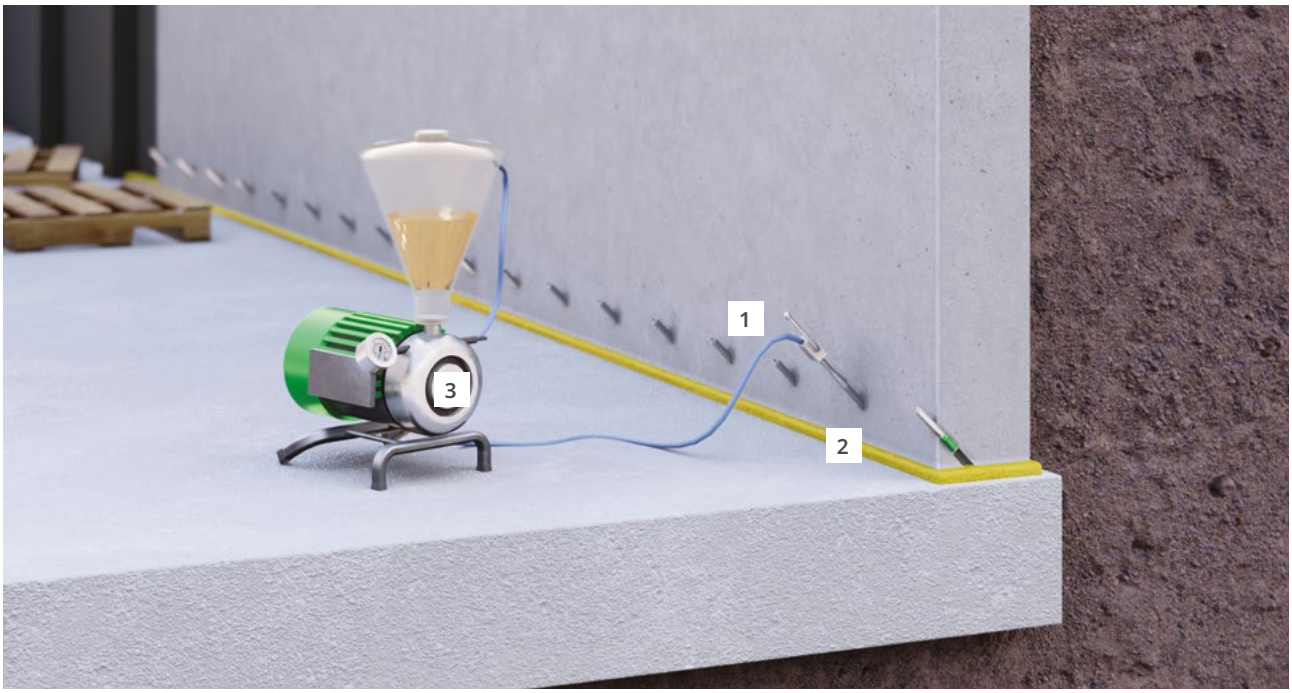
KÖSTER Packers and KÖSTER Superpackers are used for all applications from low to high pressure.

KÖSTER One-Day-Site Packers have an extra valve so that the upper part of the packer can be removed directly after injection and the hole plugged. The borehole stays pressure sealed. Inject KÖSTER IN 8 in one or multiple steps until the crack or joint is closed or the leak has stopped.

After full cure of the injection resin, remove the injection packers and seal the boreholes with the KÖSTER KB-Fix 5. However, KÖSTER One-Day-Site Packer can be removed immediately after injection.

Clean the pump with the help of KÖSTER PUR Cleaner as recommended in the operating manual of the pump.

6.3 Waterproofing of construction joints in the wall/floor junction



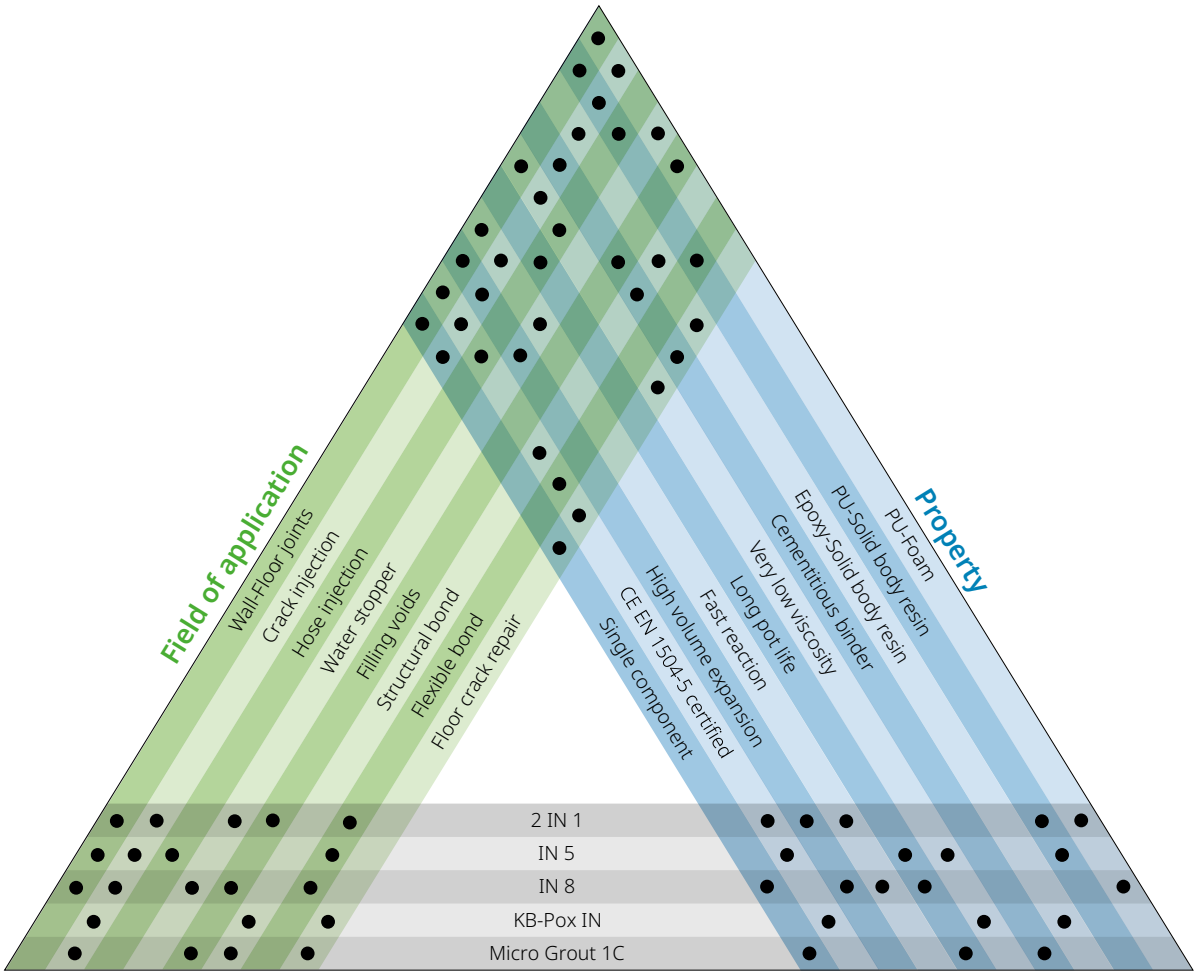
1. Installing the packers	KÖSTER Packer 13 mm x 130 mm CH KÖSTER Superpacker 13 mm x 130 mm CH
2. Injection resin	KÖSTER IN 8
3. Pump	KÖSTER 1C Injection Pump

Injection process:
Wall/floor Junctions, especially those subjected to negative side pressurized water must be sealed, as the micro crack caused due to different time of concrete casting between the wall and the floor can cause water leakage through it.
For retroactive waterproofing of the wall/floor junction, the boreholes have to be drilled transecting the construction joint. The borehole should be drilled approximately into the middle of the construction joint. KÖSTER IN 8 is a unique product, which in wet cracks forms a water replacing foam. It stops water leakage immediately by foaming and blocking the path in front of the pressurized water.

All KÖSTER injection resins are installed with the KÖSTER 1C Injection Pump, or similar pumps, via injection valves called “Packers” into the crack. Depending on the application, different packers are available.
KÖSTER Packers and KÖSTER Superpackers are used for all applications from low to high pressure.
KÖSTER One-Day-Site Packers have an extra valve so that the upper part of the packer can be removed directly after injection and the hole plugged. The borehole stays pressure sealed.
The injection step can be repeated due to the water conditions and injection possibility.
After full cure of the injection resin, remove the injection packers and seal the boreholes with the KÖSTER KB-Fix 5.

7 Injection matrix

To be able to choose from the wide range of KÖSTER Injection resins, this chart will lead to the right choice:



8 Injection procedure

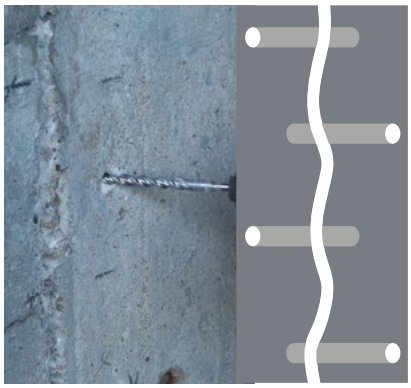
8.1 Drilling holes and fixing Packers

1

Open the crack in a V-shape 1 to 2 cm deep and remove loose particles and dust with a brush.


2

Mark the positions where the boreholes are going to be drilled. Boreholes are placed along the course of the crack on alternating sides at intervals of approx. 10 cm to 15 cm.



The holes are drilled toward the crack at an angle of approx. 45°. Clean the boreholes using pressurised air or water.


4

Clean the crack using a wire brush.


5

Pre-wet the crack.


6

Close the crack along its course with KÖSTER KB Fix 5. Closing the crack prevents injection material from prematurely flowing out of the crack during the injection. Setting time is approx. five minutes, depending on the surrounding temperature and humidity.


7

Install KÖSTER Superpackers in the boreholes leaving every third bore-hole open.


8

Use a wrench to tighten the packer.

8.1.1 Horizontal wall/floor junctions

The distance of the packers should be 10 to 15 cm. For retroactive waterproofing of the wall/floor junction, the boreholes have to be drilled transecting the construction joint. The borehole should be drilled slightly behind the middle of the construction joint.

8.2 Injecting KÖSTER IN 8

KÖSTER IN 8 is a single component injection resin which does not require any previous mixing. To prepare for injection, fill the hopper of the injection pump or the tube from the hand pump and begin injection.

After partial removal and further storage, the containers must be closed immediately and turned “upside down” once to seal the closures from the inside.

At wall cracks, start injecting from bottom to top, inject in one or several stages (at least two injection stages). The multi-stage injection is recommended in case of heavy water pressure. KÖSTER IN 8 does not require a reinjection with KÖSTER solid resins.

After removing the injection packers. The drill holes are to be closed with the fast setting waterproof and weatherproof mortar KÖSTER KB-Fix 5.

8.3 KÖSTER IN 8 Accelerator

If a faster reaction is required, especially in case of a heavy pressurized water and in order to stop it the soonest, a maximum of 10 % by weight of KÖSTER IN 8 Accelerator can be added to the KÖSTER IN 8.
With the addition of KÖSTER IN 8 Accelerator, the reaction time can be reduced by up to one minute. The mixed material remains viscoplastic after the reaction and is, therefore, able to follow crack movements and seal permanently without re-injection of solid resins.

8.4 Post injection works

After finishing the injection process and closing the holes, the substrate can be covered with a KÖSTER Restoration Plaster System, composed mainly of the KÖSTER Restoration Plaster Key, the KÖSTER Restoration Plaster and if a fine finish is desired, a KÖSTER Fine Plaster.

9 KÖSTER 1C Injection Pump

KÖSTER IN 8 is a 1 component material ready to use and can be processed with conventional one-component injection devices.
The recommended injection pump for KÖSTER IN 8 is the KÖSTER 1C Injection Pump. This pump has the following features.

Characteristics	Value
Electrical connection	230 V/2.25 A/50 Hz
Operating pressure	0-200 bar
Delivery rate	max. 2.2 l/min
Capacity	6 l
Measurements h (with hopper)/w/l	44 (78)/30/50 cm

Included in the packaging

- 6 l material hopper
- 5 m high pressure material hose d=6 mm (inside)
- High pressure ball valve/mouth piece, M 10x1
- Manometer max. 200 bar
- Operating manual

After injection, the KÖSTER 1C Injection Pump must be cleaned using the KÖSTER PUR Cleaner. Add a convenient amount of the cleaner in the pump cone and start the machine until all the hoses and pipes are clean and clear before installing the KÖSTER IN 8 in the next cycle.

Follow the indications given in the instruction manual of the pump for further details on the cleaning process.

10 General notes

10.1 Consumption rate

Approx. 0.1 kg/l void

10.2 Packaging

5 kg jerrycan

KÖSTER IN 8 Accelerator

10.3 Important considerations

- KÖSTER IN 8 reacts with moisture. Avoid contact with rain, splashes, etc. at all costs.
- A skin can form in the material container of the injection pump due to the humidity. This skin should only be removed when the material hopper is refilled.
- KÖSTER IN 8 is not suitable for wide moving joints with considerably high dynamic movements

10.4 Limitations

- KÖSTER IN 8 contains diisocyanate. When working with the material, wear clothing that covers arms and legs or a protective suit must be worn.
- When processing the material, pressure is created. Please do not stand directly behind Packer.
- When carrying out injection work, make sure to protect the surrounding work area from injection resin that may be discharged from the wall, packers, drill holes, etc.
- Obey all local, state, and federal safety regulations when processing the material.
- Due to water displacements, reinjections may be necessary to address localized areas

10.5 Material Storage

In originally sealed containers the material can be stored for at least 6 months.
After partial removal and further storage, the containers must be closed immediately and turned “upside down” once to seal the closures from the inside.

11 Legal disclaimer

This method statement reflects general cases with standard parameters. It is not suitable as a step-by-step guide for all and each waterproofing projects as the conditions on site at the moment of the application cannot be foreseen. It is solely the applicator's responsibility to decide on the actual procedure considering the specific situation on the construction site. In any case, KÖSTER's Terms of business are valid and can be viewed under www.koester.eu