MS IN 2IN1 A 07.23

Method Statement

Crack injection with KÖSTER 2 IN 1

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KÖSTER
Waterproofing Systems

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Waterproofing Systems

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 injection system KÖSTER 2 IN 1.

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

1.2 Manufacturer

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KÖSTER
Waterproofing Systems

1.3 Definitions

Closed-cell foam
Closed-cell foams tend to be water-resistant due to the closed nature of the cells that make up the foam. The smaller and compact these cells are, the more resistant to water the material will be.

Construction joint
A construction joint is formed when new concrete is poured against already set concrete. This joint is intentionally placed to divide and facilitate the construction process. Construction joints are typically found in large foundation slabs, wall/floor connections and columns, among others.

Cracks
A construction element cracks if stresses inside of it become larger than the resistance of the construction element. 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 constructiozn elements. In most cases however, it is a combination of the following reasons: stresses through load, shrinkage, ground movement and dilatation.

Dry, moist, wet and water bearing cracks
Cracks in the building substance are structurally weak points. Additionally, penetrating water may cause damage and may reduce the usage and lifetime of the building. Dry, moist, wet and water bearing cracks are the 4 defined crack conditions for which an injection material can be suitable.

Expansion time
Is the time in which the foam continues to form.

Isocyanate
Isocyanates are a family of chemicals used in the production of polyurethane. They are identified by the number of NCO (nitrogen-carbon-oxygen) groups that they contain, and most are liquid at room temperature. Isocyanates are highly reactive, have a low molecular weight, and are commonly employed as an ingredient in the manufacture of flexible and rigid foams.

Multiple-stage injection
In case of water bearing cracks, multiple-stage (at least two) injection is applied, which means injection of KÖSTER 2 IN 1 until the resin is discharged as foam from the adjoining borehole, from the crack itself or until counter pressure develops. Follow-up injection with KÖSTER 2 IN 1 within approx. 10 to 15 minutes of the preceding injection with KÖSTER 2 IN 1. The follow-up injection has to be carried out within the pot life of the ready mixed material.

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.

The surface adhesion is important during waterproofing and high-pressure injection. They produce less heat during the exothermic reaction than epoxy resins. Development of heat during the reaction of the injection material can cause stresses to the substrate. Polyurethanes are non-corrosive to steel reinforcement which is an important advantage to maintain the integrity of the structure.

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.

Starting time
Is the time which a foam forming resin needs, after contact with water, to begin to form a foam.

Single-stage injection
In case of dry and moist cracks, single-stage injection is applied, which means that all injection ports are injected once until the crack is filled.

2 System description

2.1 System features

KÖSTER 2 IN 1 is a broadly applicable polyurethane injection resin for dry, moist, wet and water bearing cracks. The specialty of KÖSTER 2 IN 1 is that it forms an elastic foam when coming into contact with water which pushes the water out of the crack. If no water is present, the material forms an elastic solid body resin which permanently seals the crack.

KÖSTER 2 IN 1 unites two resins in one product. KÖSTER 2 IN 1 is resistant to hydrolysis and does not react aggressively when coming into contact with steel or iron, so that corrosion protection is achieved.

2.2 Characteristics/Advantages

- Intelligent material that foams in contact with water or creates an elastic resin in dry conditions
- Only one product is needed on the jobsite
- Easier calculation of consumption
- Applicator no longer needs to verify if a crack is wet or dry
- Comparably long pot life
- Re-injection is done through the same packers as initial injection within the potlife
- Does not turn brittle over time
- Resistant to hydrolysis
- Free of solvents

2.3 Main products and components

KÖSTER 2 IN 1
Broadly applicable PU injection resin for single and multiple-stage injection (at least two) of dry, moist, wet and water bearing cracks. The specialty of KÖSTER 2 IN 1 is that it forms an elastic foam when coming into contact with water which pushes the water out of the crack. If no water is present the material forms an elastic solid body resin and permanently seals the crack.

See online

2.4 Associated products

KÖSTER 1C Injection Pump

See online

KÖSTER KB-Fix 5

See online

KÖSTER Hand Pump
without manometer

See online

KÖSTER Hand Pump
with manometer

See online

KÖSTER PUR Cleaner

See online

KÖSTER Packer
13 mm x 130 mm CH

See online

KÖSTER Impact Packer
12 mm x 70 mm

See online

KÖSTER Superpacker
10 mm x 115 mm CH

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

See online

KÖSTER Injection Barrier

See online

2.5 Associated literature

- Technical Data Sheet
- System brochure: Crack Repair and Crack Injection
- KÖSTER Product Flyer: Injection Resins
- Fields of application for KÖSTER Injection Packers
- Environmental Product Declaration (EPD): KÖSTER 2 IN 1
- Product Declaration of Performance: KÖSTER 2 IN 1
- KÖSTER Injection matrix: Resins

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 tools immediately after use with KÖSTER PUR Cleaner.

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.

When handling with chemical substances, protective gloves must be worn with the CE-label including the four control digits. Suitable material: NBR (Nitrile rubber). Penetration time (maximum wearing period): 480 min. Breakthrough times and swelling properties of the material must be taken into consideration.

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 irregular breathing or respiratory arrest provide artificial respiration. Medical treatment necessary.

After ingestion:
Rinse mouth immediately and drink plenty of water. Caution if victim vomits: Risk of aspiration!

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. Remove contact lenses, if present and easy to do. Continue rinsing. Subsequently consult an ophthalmologist.

After contact with skin:
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water (or shower). Medical treatment necessary.

4.3 Waste disposal

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

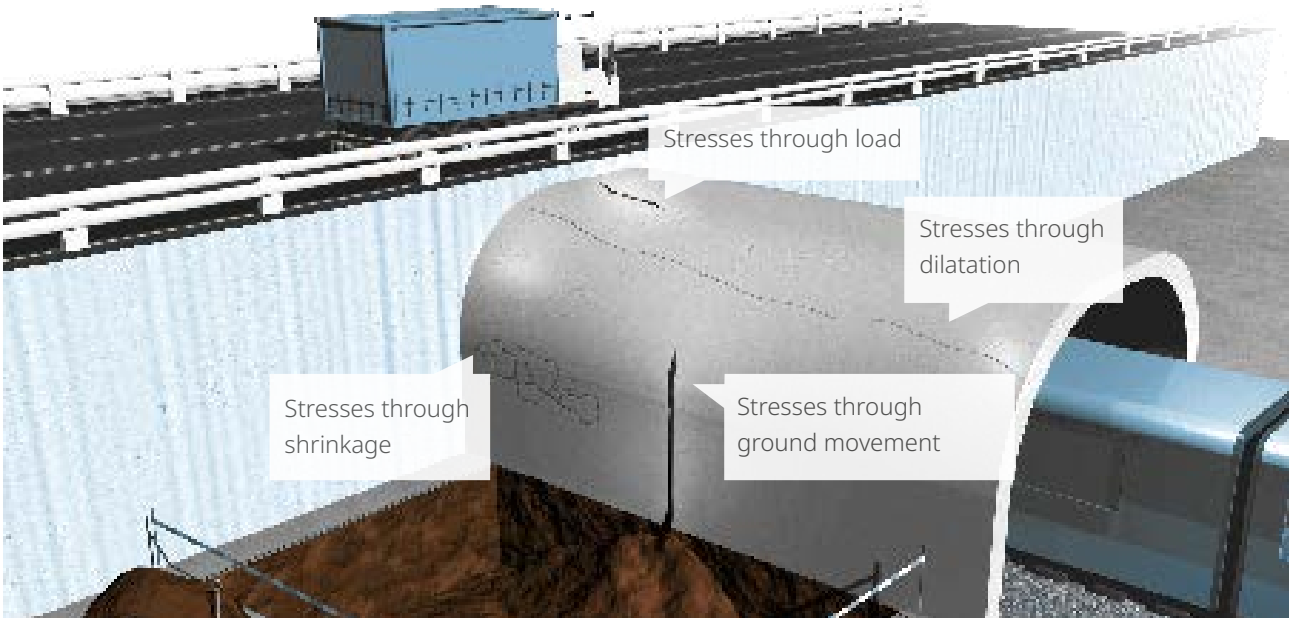
Contaminated packaging
Completely emptied packages can be recycled.

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

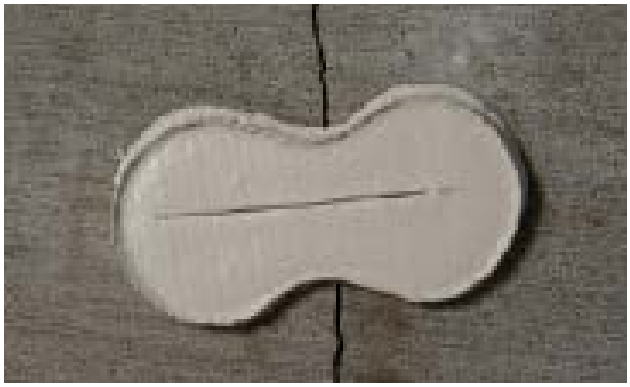
Stresses through ground movement occur through earthquakes, through setting of the building, through increases or decreases in the water table, through new construction sites in the vicinity, etc. Because of these movements, changes may occur during the load transfer from the building through the foundations 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.



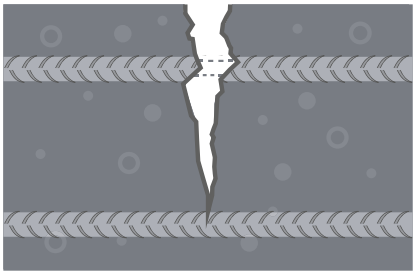
5.3 Reasons for injection

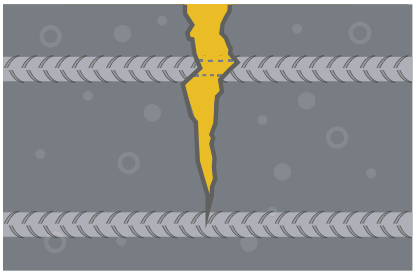
Cracked construction elements
Construction Elements like columns, slabs, beams ….etc. must be injected when cracked for the following reasons:

- 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

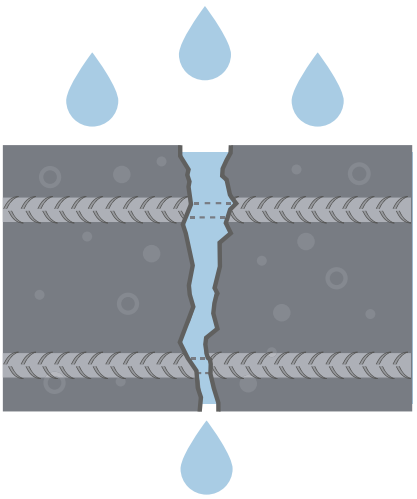
If cracks only represent minor defects, they are often repaired preventively in order to avoid further damage. This particularly includes corrosion prevention, the consequential damage of which (e.g. spalling of the concrete cover) later inevitably leads to higher renovation costs.

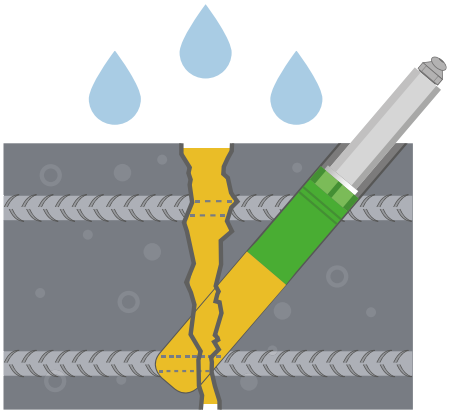




Waterproofing

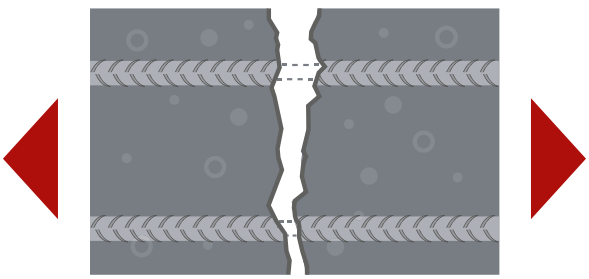
If the cracks represent a major deficiency, for example because water penetrates through cracks in basements, such cracks can limit the usability of the building. Penetrating water often causes consequential damage, for example corrosion of the reinforcement and restricted usability. In these cases, 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.

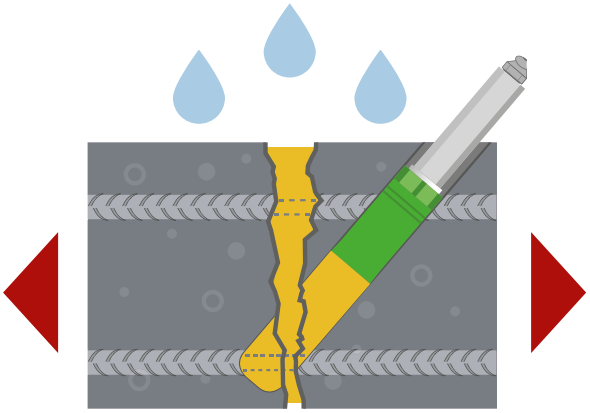




Elastic bonding or structural repair

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

- Sealing of dry cracks with solid body resin
- Elastic crack injection by pressure injection on dry or wet/moist cracks
- Pressure injection of water bearing cracks
- Waterproofing of construction joints in the wall/floor, wall/wall and wall/ceiling junction

6.2 Example: Elastic crack injection by pressure injection on dry or wet/moist cracks

1. Installing the packers	KÖSTER Packer 13 mm x 130 mm CH KÖSTER One-Day-Site Packer 13 mm x 120 mm CH
2. Injection resin	KÖSTER 2 IN 1
3. Pump	KÖSTER 1C Injection Pump

Installation process:

If needed, open the crack in a V-shape 1 - 2 cm deep and remove loose particles and dust with a wire brush. Depending on the crack size and water conditions, it is preferred to seal it first with KÖSTER Injection Barrier or KÖSTER KB-Fix 5 (crack with widths smaller than 1 mmm may not required sealing on the surface).

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 - 15 cm. The holes are drilled toward the crack at an angle of approx. 45°. If possible the crack should be crossed by the borehole in the middle of the wall.

Clean the boreholes using pressurised air, KÖSTER Drill Hole Cleaner or clean water. Close the crack along its course with KÖSTER Injection Barrier or KÖSTER KB Fix 5. Closing the crack prevents injection material from prematurely flowing out of the crack during the injection.

Install KÖSTER Packers in the boreholes and tighten the packer by using a wrench.

Fill the required amount of the A component into a clean bucket. Then, add the B component. Thoroughly mix the A and B component in a mixing ratio by weight of 1:1 (A:B) using a slowly rotating mixer until a homogeneous color (free of streaks) is reached.

Prepare the pump for injection as recommended in the operating manual. Fill the mixed resin into the material hopper. The ready mixed material must be used within the pot life.

Connect the KÖSTER Grip Head to the fitting of the KÖSTER Packer and open the valve on the injection whip by turning the lever 90°. Inject the KÖSTER 2 IN 1 injection resin via the KÖSTER Packers into the crack, proceeding from bottom to top.

For example: For a wall, KÖSTER 2 IN 1 is injected using conventional single component injection pumps such as the KÖSTER 1C Injection Pump.

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 Example: Pressure injection of water bearing cracks

1. Installing the packers	KÖSTER Packer 13 mm x 130 mm CH or others KÖSTER One-Day-Site Packer 13 mm x 120 mm CH
2. Injection resin	KÖSTER 2 IN 1
3. Pump	KÖSTER 1C Injection Pump

Installation process:

If needed, open the crack in a V-shape 1 - 2 cm deep and remove loose particles and dust with a wire brush. Depending on the crack size and water conditions, it is preferred to seal it first with KÖSTER Injection Barrier or KÖSTER KB-Fix 5 (crack with widths smaller than 1 mmm may not required sealing on the surface).

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 - 15 cm. The holes are drilled toward the crack at an angle of approx. 45°. If possible the crack should be crossed by the borehole in the middle of the wall.

Clean the boreholes using pressurised air, KÖSTER Drill Hole Cleaner or clean water. Close the crack along its course with KÖSTER Injection Barrier or KÖSTER KB Fix 5. Closing the crack prevents injection material from prematurely flowing out of the crack during the injection.

Install KÖSTER Packers in the boreholes and tighten the packer by using a wrench.

Fill the required amount of the A component into a clean bucket. Then, add the B component. Thoroughly mix the A and B component in a mixing ratio by weight of 1:1 (A:B) using a slowly rotating mixer until a homogeneous color (free of streaks) is reached.

Prepare the pump for injection as recommended in the operating manual. Fill the mixed resin into the material hopper. The ready mixed material must be used within the pot life.

Connect the KÖSTER Grip Head to the fitting of the KÖSTER Packer and open the valve on the injection whip by turning the lever 90°. Inject the KÖSTER 2 IN 1 injection resin via the KÖSTER Packers into the crack, proceeding from bottom to top.

In case of water bearing cracks, the injection is carried out in two or more stages:

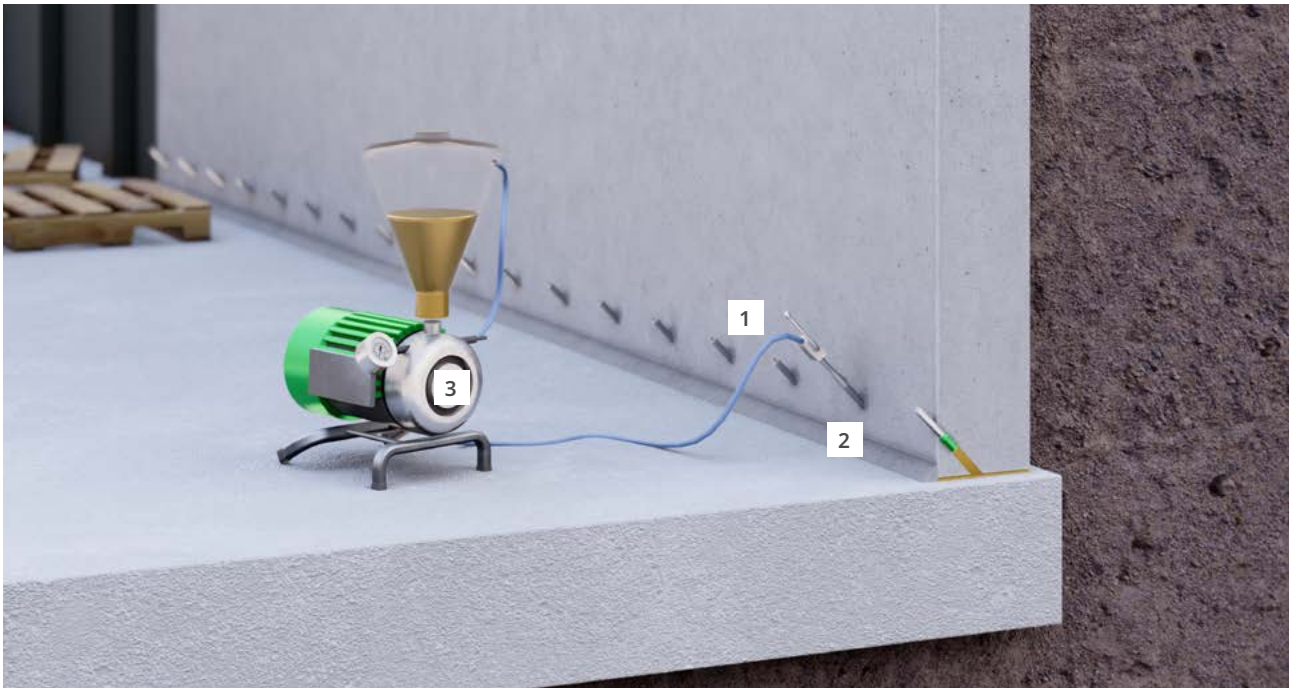
1. Injection of KÖSTER 2 IN 1 until the resin is discharged as foam from the adjoining borehole or respectively from the mouth of the crack.

2. Follow-up injection with KÖSTER 2 IN 1 within approx. 10 - 15 minutes of the preceding injection with KÖSTER 2 IN 1 until counter pressure develops. Follow-up injection could be carried out within the pot life of the ready mixed material.

After full cure of the injection resin, remove the injection packers and seal the boreholes with the KÖSTER KB-Fix 5.

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

6.4 Example: Waterproofing of joints in the wall/floor junction



1. Installing the packers	KÖSTER Packer 13 mm x 130 mm CH KÖSTER One-Day-Site Packer 13 mm x 120 mm CH
2. Injection resin	KÖSTER 2 IN 1
3. Pump	KÖSTER 1C Injection Pump

Installation process:

Mark the positions where the boreholes are going to be drilled. Boreholes are placed along the horizontal wall/floor junction at intervals of approx. 10 – 15 cm. The boreholes have to be drilled transecting the construction joint, at an angle of approx. 45°. The boreholes should cross the wall floor junction in the middle of the wall

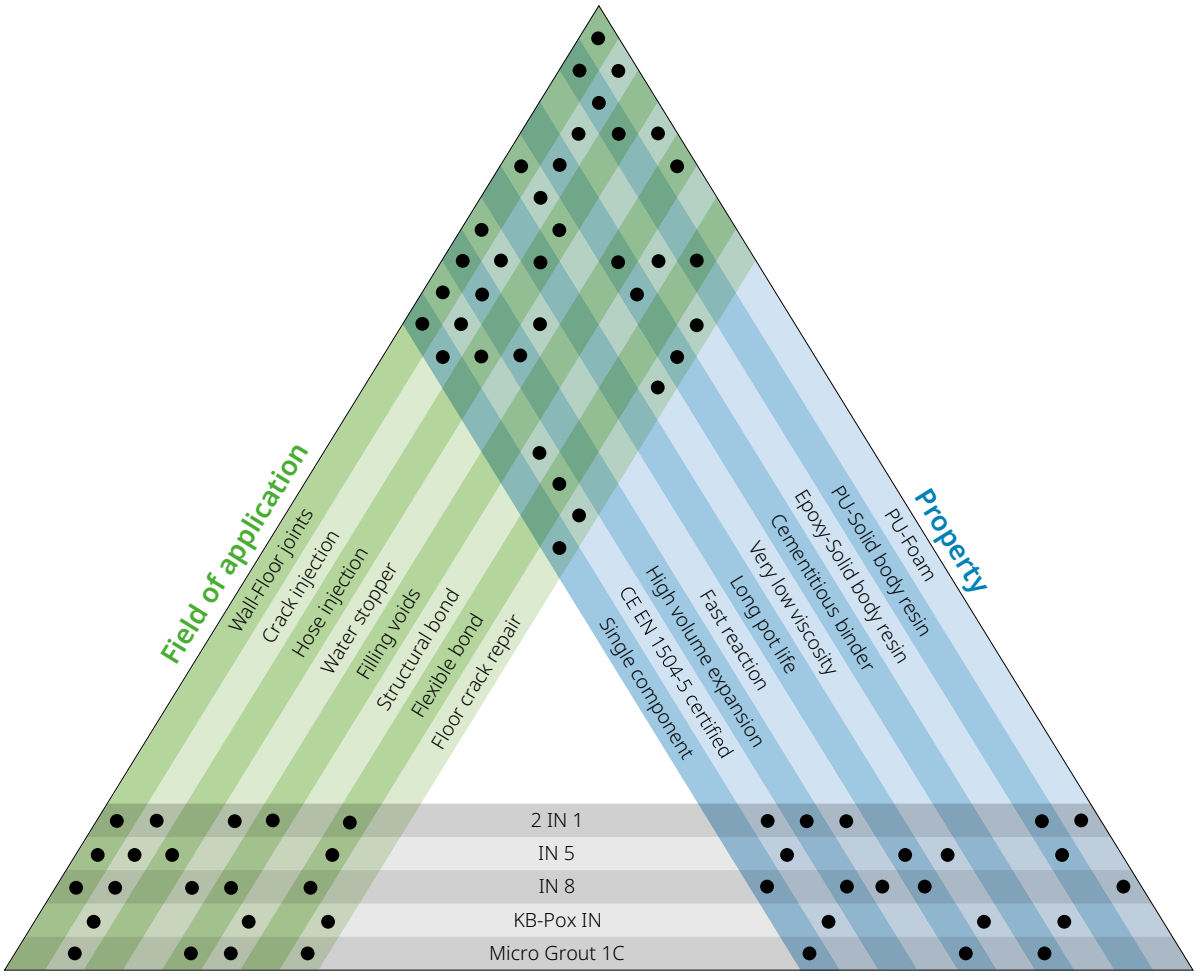
Clean the boreholes using pressurised air, KÖSTER Drill Hole Cleaner or water. In case of flowing water or when it is not certain if the crack is dry or wet, KÖSTER 2 IN 1 is injected.

It is injected in minimum 2 stages, 10 to 15 minutes apart, to ensure that the joint is permanently and elastically sealed. Follow-up injections could be carried out several times within the pot life of the ready mixed material.

The boreholes can be sealed with the KÖSTER KB-Fix 5 immediately after the injection works and removing the packers.

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 Substrate preparation

8.1 Project site conditions

8.1.1 Application temperature

The A and the B component are recommended to be mixed at +15 °C in the given mixing ratio by weight 1:1 (A:B) using a slowly rotating electrical mixer preferably equipped with a KÖSTER Resin Stirrer. The material must be mixed until it is streak free and homogeneous in appearance and consistency. The ready mixed material must be used within the given pot life. Application temperature is between +5 °C and +30 °C. Ideally, the material should be tempered to +15 °C before mixing and injection. Temperatures above +25 °C will increase the reaction rate and reduce the pot life.

8.1.2 Relative humidity

The humidity may promote reaction of the material and foam creating a foam skin on top. The foam must be removed when fresh material is added, otherwise it acts as a cover and protects the material from further reaction.

8.1.3 Rain and frost

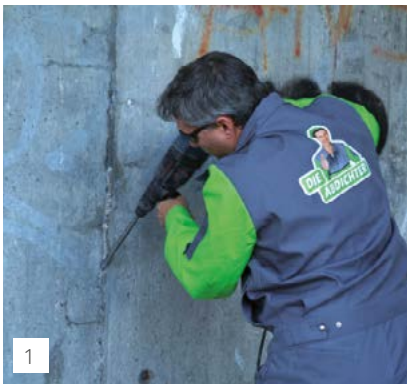
KÖSTER 2 IN 1 material should be protected from all external sources, against humidity in general to avoid premature reaction of the resin.

8.2 Substrate requirements

Cleaning the surface helps the specialist to identify the exact location and the width of the crack that has to be injected. Things that obscure the crack should be removed since the crack must be seen in order to lay out the drilling patterns for the intake holes. The cracks must be free from loose particles, dust, oil, grease, or any other contamination.

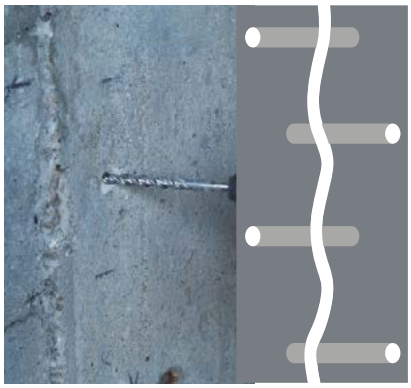
9 Application/Installation instructions

9.1 Crack preparation and packer installation



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

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.

Clean the crack using a wire brush.

Pre-wet the crack.

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.

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

Use a wrench to tighten the packer.

9.2 Mixing of the KÖSTER 2 IN 1

Fill the required amount of the A component into a clean bucket. Then, add the necessary amount of the B component.

Thoroughly mix the A and B component in a mixing ratio by weight of 1:1 (A:B) using a slowly rotating mixer with KÖSTER Resin Stirrer until a homogeneous color (free of streaks) is reached.

Use a clean mixing vessel for each container or respectively clean the mixing vessel every time before mixing a new container.

In case of partial mixing

When partial portion to be used, keep in mind the mixing ratio by weight is 1:1 (A:B) and by volume is 1.2:1 (A:B). Also for mixing complete containers same ratios respectively are used.

After partial removal, the containers must be closed immediately (do not swap the caps) and turned "upside down" once to seal the closures from the inside.

9.3 Filling and preparing the pump

Prepare the pump for injection as recommended in the operating manual. Fill the mixed resin into the material hopper. The ready mixed material must be used up within the pot life.

KÖSTER 1C Injection Pump

Electrical 1C injection pump for injecting of cracks and voids. It is suitable for the injection of KÖSTER 2 IN 1. Operating pressure can be adjusted from 0-200 bar. The maximum delivery rate is approx. 2.2 l/min.

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

9.4 Injection of KÖSTER 2 IN 1

General steps for injection procedure:

1. Connect the grip head to the fitting of the packer. (grip head and the fitting of the packer should be in one line - otherwise it can leak!)
2. Open the valve on the high pressure ball valve by turning the lever 90°.
3. Now the injection material is being pumped into the crack.
4. Inject the material into the packers on a walls from bottom to top. Horizontal cracks are injected from one side to the other
5. Stop the injection if the injected material escapes from the crack excessively.
6. Areas where foam or resin leaks out of the crack must be injected multiple times.
7. Re-inject packers after a few minutes to ensure full filling of the crack and voids with resin.
8. After full cure of the injection resin, remove the injection packers and close the boreholes with a mortar e.g., KÖSTER KB-Fix 5

9.5 KÖSTER 1C Injection Pump cleaning

Clean the pump with the help of KÖSTER PUR Cleaner as recommended in the operating manual of the pump. Hardened material must be cleaned mechanically.

10 General consumption guidelines

Approx. 0.1 kg/l void (foam)
Approx. 1.1 kg/l void (solid resin)

How much material has to be injected into the crack?

It can only be indirectly determined if enough resin has been injected into the crack. The following three paragraphs describe the most frequently used ways to determine if enough material has been injected into the wall:

Prior to the injection, every third borehole is left open. When KÖSTER 2 IN 1 is injected via an injection packer, it can travel through the crack to the open borehole next to that injection packer. Enough material has been injected into that particular injection packer, when KÖSTER 2 IN 1 comes out of the next open borehole. Then the injection is stopped and an injection packer is installed in the open borehole. After that, the injection can be continued via the next injection packer. The newly set packer must then also be injected. After this, all packers must be injected at least a second time.

Another sign that the crack cannot be filled further via a certain injection packer is that a counter-pressure develops in the crack. The increase in pressure is shown on the pressure gauge of the injection pump. It indicates that no more material can be pumped into the crack via that particular injection port. Then the injection is interrupted and one can move on to the next injection packer.

Yet another and frequently occurring sign is that resin or foam comes out of the wall somewhere. If foam or resin escapes from the wall at the same speed as it is injected, no injection pressure can be built up. If only a small amount of foam is produced, post-injection should be used in these areas.

Attention:
Even the most experienced applicator cannot look into the wall. It must always be taken into consideration that even with the most diligent application it is possible that due to inconsistencies inside the wall or other reasons it can become necessary to reinject at a later date. This also includes setting new packers.

In Practice
a consumption of 1 - 1.5 kg/m has been found as an average value for a wall thickness of up to approx. 30 cm. Consumption may therefore vary and be less or even more than these average values.

11 General notes

11.1 Material storage

Store the material at temperatures between +10 °C and +30 °C. In originally sealed packages, the material can be stored for 6 months. After partial removal, the containers must be closed immediately (do not swap the caps) and turned “upside down” once to seal the closures from the inside.

11.2 Packaging

1 kg combipackage

5 kg combipackage

20 kg combipackage

11.3 Important considerations

- Contains diisocyanate. When working with the material, use clothes that covers arms and legs or a protective suit must be worn. When working in confined spaces or in the “overhead area”, hoods or covers must beworn. Wear suitable protective gloves (e.g., nitrile gloves) and protective goggles. 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.
- Pot life of KÖSTER 2 IN 1 is 45 minutes. Reaction time after water contact 1-6 minutes. Reaction time without water contact 24 hours. (At +20 °C, 1 l mixed amount)
- Cold temperatures slow down the reaction and higher temperatures accelerate the reaction.

11.4 Limitations

- Due to water displacements, reinjections may be necessary to address localized areas.
- KÖSTER 2 IN 1 is not suitable for wide moving joints with considerably high dynamic movements.

12 Certifications

- **Test of the Performance and Specific Properties of the Polyurethane Resin “KÖSTER 2 IN 1”** According to DIN EN 1504-5. MPA TU Braunschweig, Doc.-No. (5176/511/13) from 2015-01-20

13 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