

Method Statement

# Horizontal barriers against rising damp with KÖSTER Crisin 76

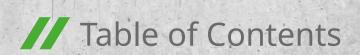


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## KØSTER Waterproofing Systems

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## 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 waterproofing system KÖSTER Crisin 76. While this document describes the tools, equipment,

materials and step by step 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

KÖSTER BAUCHEMIE AG
Dieselstraße 1-10 Tel. 04941/9709-0
D-26607 Aurich

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#### 1.3 Definitions

#### Moisture content

Refers to the amount of water that is contained in the pores (voids) of a material. It is usually expressed as the percentage by mass of the water present relative to the material's dry weight.

#### Rising damp

In buildings may be defined as the upwards flow of moisture through a permeable wall structure, the moisture being derived from groundwater. The moisture rises through the pores (capillaries) in the masonry by a process loosely termed "capillary action", which causes the masonry to act like a wick.

#### **Capillary action**

Capillary action is responsible for moving water (and all of the things that are dissolved in it) around. It is defined as the movement of water within the spaces of a porous material due to the forces of adhesion, cohesion, and surface tension.

#### Hydrophobizing effect

Is the observed tendency of nonpolar substances to aggregate in an aqueous solution and exclude water molecules. The word hydrophobic literally means "water-fearing", and it describes the segregation of water

and nonpolar substances, which maximizes hydrogen bonding between molecules of water and minimizes the area of contact between water and nonpolar molecules. Moisture contact angle measurements will classify a surface as hydrophobic when the contact angle of the water droplet exceeds 90 degrees.

#### Salt efflorescence

Is a deposit of salts, usually whitish in color, formed on the surface of concrete/masonry. It is derived from compounds dissolved within the concrete/masonry, transported to the surface and deposited upon evaporation. When precipitation occurs directly on the surface, it is termed efflorescence.

#### **Negative Side Waterproofing**

Negative side waterproofing means that the waterproofing layer is applied to the side of the construction member which is opposite to the side with direct contact to the water.

#### Pressureless injection system:

The material can flow without providing any pressure or force.

## 2 System description

#### 2.1 System features

KÖSTER Crisin 76 is a very thin, solvent free, concentrated liquid synthetic resin. It penetrates deeply into even the smallest capillaries and pores in building materials. Due to its very low density and a surface tension lower than that of water (density: 0.91 g/cm³, viscosity 15 mPa·s), KÖSTER Crisin 76 displaces the water in the capillaries. Capillaries treated with KÖSTER Crisin 76 are lined with resin and are hydrophobic. The curing of the injected product is independent of the drying of the masonry. Af-

ter full cure, KÖSTER Crisin 76 remains flexible, does not decay or decompose, acts neutrally, does not effloresce, and does not affect steel reinforcement. During application and after full cure, KÖSTER Crisin 76 is resistant to all aggressive media which are usually encountered in masonry such as acids, alkalis, and salts. Together with KÖSTER Restoration Plasters it is suitable for the restoration of masonry.

#### 2.2 Characteristics/Advantages

- Suitable even in cases of high moisture contents up to +95 % ±5 %
- Suitable even in cases of high salt contents
- Suitable for a variety of salts (sulfates, nitrates, chlorides)
- Solvent free
- The treated substrate does not have to be alkaline for the material to react
- No prior or subsequent drying of the wall is necessary, even in case of high moisture contents
- Cannot be diluted with water/is not water-soluble
- Resistant against most ordinary aggressive substances that are encountered in masonry such as acids, alkalis and salts
- Fast reaction, immediately effective
- Non bio-degradable

- Does not cause or promote corrosion of steel reinforcement
- Density (0.91 g/cm³); penetrates deeply even into the smallest capillaries of the construction material.
- The cured material deposits an elastic resin on the pore walls and mechanically blocks the pores.
- Can be applied to perforated brick and cracked or hollow masonry without having to fill the voids beforehand.
- No subsequent injection necessary, one-time installation, guaranteed success.
- Easy installation, horizontal drilling.
- Access required only to one side of the wall.
- The material's action principle is proven to be effective for more than 30 years.

#### 2.3 Main products and components







#### **KÖSTER Crisin 76**

Very low viscosity synthetic resin for waterproofing against rising damp (wicking moisture) even in case of high moisture and salt contents in the masonry. Due to its very low density and surface tension which is considerably lower than that of water, KÖSTER Crisin 76 displaces water from the capillaries. After full cure, KÖSTER Crisin 76 remains elastic and does not rot. Density: 0.91 g/cm<sup>3</sup>, viscosity 15 mPa·s. KÖSTER Crisin 76 is resistant to all aggressive media which are usually encountered in masonry such as acids, alkalis and salts, during application as well as after full cure. The cartridges are Re-usable.

See online

#### **KÖSTER Capillary Rods**

For targeted installation of horizontal barriers against rising damp (wicking moisture) with the KÖSTER Suction Angle System. The KÖSTER Capillary Rod releases the liquid evenly and directly to the masonry, effectively bridging cracks and voids. No material is wasted in cavities.

See online

#### **KÖSTER Suction Angle**

Plastic angle for the pressureless and material supply installation of horizontal barriers against rising damp (wicking moisture) with the KÖSTER Suction Angle System. Re-usable.

See online

#### 2.4 Associated products



**KÖSTER** KB-Fix 5

See online



KÖSTER Polysil TG 500

See online



KÖSTER NB 1 Grey

See online



**KÖSTER** WP Mortar

See online



**KÖSTER** Restoration Plaster Key

See online



**KÖSTER** Restoration Plaster White

See online



**KÖSTER** Restoration Plaster White/Light

See online



**KÖSTER** Restoration Plaster White/Fast

See online



**KÖSTER** Restoration Plaster Grey

See online



**KÖSTER** Fine Plaster

See online



**KÖSTER** Renovation Paint White

See online

#### 2.5 Associated literature

- Technical Data Sheet 🗹
- <u>Waterproofing Report 2-2007 Negative Side</u> <u>Waterproofing</u> **□**
- <u>System brochure Horizontal Barriers Against</u> <u>Rising Damp in Masonry</u> □
- Abdichtungsreport 1-2010 Altes Rathaus Potsdam 🗹

## Tools and Equipment 3.1 Tools



**KÖSTER** Cutting Device



**KÖSTER** Spatula (20 mm or 50 mm)



**KÖSTER** Diagnosis Case



**KÖSTER** Protimeter



14 mm drill bit for SDS Plus Chuck (masonry)



KÖSTER Drill Hole Cleaner



Measuring tool



Trowel

#### 3.2 Equipment



Drill

#### 3.3 Cleaning

Clean tools immediately after use with water. Clean cartridges and suction angles for re-use with water and a bottle brush. Rinse clean.



### 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 occu-

pational 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.

#### If inhaled:

Provide fresh air

#### After ingestion:

Rinse mouth immediately and drink plenty of water. Caution if victim vomit: Risk of aspiration. Do NOT induce vomiting. Medical treatment necessary.

#### In case of contact with eyes:

Rinse immediately carefully and thoroughly with eye-bath or water. In case of troubles or persistent symptoms, consult an ophthalmologist.

#### After contact with skin:

Wash immediately with plenty of water. Change contaminated clothing. Medical treatment necessary.

#### 4.3 Waste disposal

#### Disposal recommendations

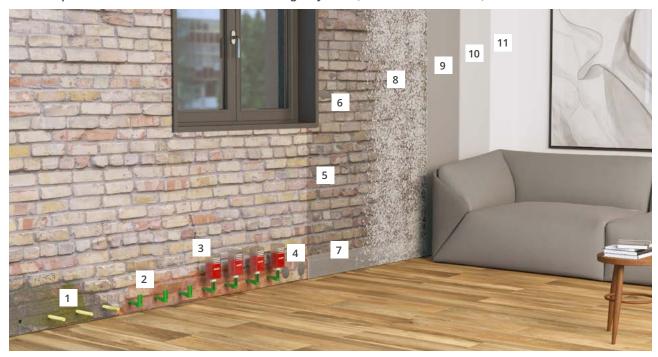
Dispose of waste according to applicable legislation. Delivery to an approved waste disposal company.

#### Contaminated packaging

Non-contaminated packages may be recycled. Handle contaminated packages in the same way as the substance itself.

## Fields of application

#### 5.1 Example: Horizontal barriers with suction angle system (horizontal boreholes)



1. Accessories

2. Accessories

3. Cross Section waterproofing

4. Closing holes

5. Primer

6. Leveling

7. Negative side waterproofing

Layers (two coats)

8. Plaster key

9. Plaster

10. Fine Plaster

11. Paint

KÖSTER Capillary Rods

KÖSTER Suction Angle

KÖSTER Crisin 76

KÖSTER KB-Fix 5

KÖSTER Polysil TG 500

KÖSTER WP Mortar

KÖSTER NB 1 Grey

KÖSTER Restoration Plaster Key

KÖSTER Restoration Plaster White

KÖSTER Restoration Plaster white/Light

KÖSTER Restoration Plaster White/Fast

KÖSTER Restoration Plaster Grey

KÖSTER Fine Plaster

KÖSTER Renovation Paint White

#### **Installation process:**

Damage from rising moisture can be avoided by the installation of a horizontal barrier. The easiest and most successful KÖSTER system is to install a horizontal barrier in existing walls with KÖSTER Crisin 76.

KÖSTER Crisin works irrelevant of salt or moisture contents. KÖSTER Crisin 76 is a very thin fluid resin that penetrates into the smallest capillaries in the building material, stops the capillary action permanently and creates a hydrophobizing effect within the structure.

Boreholes are drilled regularly spaced depending on the wall thickness and afterwards the holes are cleaned with a KÖSTER Drill Hole Cleaner or flushed with water. KÖSTER Crisin 76 is injected without pressure into the wall via the KÖSTER Suction Angle and the KÖSTER Capillary Rod which acts as a wick. The pressureless system uses the same capillary action which is the cause for rising dampness. Thereby, rising moisture is stopped with the aid of its cause. The big advantage of the KÖSTER Capillary Rod is that it doesn't waste material in cracks or voids. Only where the rod touches the wall of the borehole will the material be released. Boreholes are sealed with KÖSTER KB-Fix 5.

The surface is primed first with KÖSTER Polysil TG 500 and then leveled using KÖSTER WP Mortar.

Before further work begins, such as the application of a KÖSTER Restoration Plaster, the area underneath the horizontal barrier must be secured against the moisture trapped under the newly installed horizontal barrier with KÖSTER NB 1 Grey applied in two layers (cross wise). KÖSTER Restoration Plasters are available in different varieties (Grey, White, Fast, and Light). KÖSTER Restoration Plaster White is often used in older buildings without subsequent painting. KÖSTER Fine Plaster creates a smooth decorative surface and can be applied when desired to meet architectural goals.

KÖSTER Restoration Plasters can only be painted over with breathable (open to vapor diffusion) paint such as KÖSTER Renovation Paint White.



#### Substrate condition

#### 6.1 Project site conditions

#### 6.1.1 Application temperature

Do not apply in temperatures below 0 °C, apply only as long as the masonry is not frozen.

#### 6.2 Substrate requirements

The substrate (masonry) can be dry or wet.

#### 6.2.1 Salt contamination levels

Salt contamination levels in mass %

Salt type	Low	Medium	High
Sulfate	< 0.5	0.5 – 1.5	> 1.5
Nitrate	< 0.1	0.1 – 0.3	> 0.3
Chloride	< 0.2	0.2 - 0.5	> 0.5

According to WTA leaflet 4-5-99/D; (09/99), Table 8

#### 6.2.2 Salt analysis

#### Wet chemistry method:

- KÖSTER Diagnosis Case Prod. No. X 919 001
- With this method the effective salt concentration can be analyzed with a rapid test

#### Chlorides:

Lower test field only slightly discolored—the value can be interpolated accordingly—chlorides in this case approx. 200 mg/l

#### Sulfates:

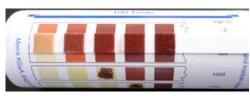
Test fields display virtually no discoloration–sulfate content in this case <200 mg/l

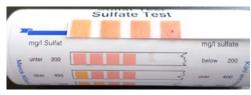
(Gypsum residues result in an immediate yellow coloration of all test fields)

#### Nitrates:

All test fields are without discoloration-no damaging salt

After determining the salt content, the result is converted into mass-percent.







## 7 Application/Installation instructions

The application of KÖSTER Crisin 76 is carried out by:

- The KÖSTER Suction Angle System for a horizontally installed damp proof course (for wall thicknesses over 24 cm).
- Installation with the KÖSTER Cartridge System for diagonally installed damp proof course (wall thickness up to 24 cm).

#### 7.1 Installation with the KÖSTER Suction Angle System



First the old damaged plaster is removed from the masonry



In case of a 50 cm wall thickness the drill hole spacing is 10 cm (see Technical Data Sheet).



Drill horizontal holes (14 mm diameter) according to the table overleaf in the lowest horizontal joint with a depth of 5 cm less than the thickness of the masonry.



Clean the holes with KÖSTER Drill Hole Cleaner or flush with water.



The length of the capillary rods must be at least 7 cm longer than the depth of the drill hole. Measure and cut the capillary rods accordingly.



Insert the end of the capillary rod into the suction angles' supply tank and then push the capillary rod and the suction angle together into the drill hole so that the suction angle is securely stuck in the hole. The suction angle is reusable. The KÖSTER Capillary rods are not prewetted.



Place the KÖSTER Crisin 76 cartridge in the suction angle's clamping device, so that the supply tank fills up with KÖSTER Crisin 76.



The cartridges remain in the wall for up to 7 days.



Remove cartridges after this period, empty cartridges can be removed immediately.



After applying the injection, the capillary rods remain in the masonry. Protruding ends are pulled out and cut off.



After cutting, the rods are pushed back 2-3 cm into the wall. The rods remain inside the wall.



The drill holes are sealed with KÖSTER KB-Fix 5.

In case the surface needs to be leveled, first it is primed with KÖSTER Polysil TG 500, and the touch-ups are done with KÖSTER WP Mortar.

Before further work begins, such as the application of a KÖSTER Restoration Plaster, the area underneath the horizontal barrier must be secured against the moisture trapped under the newly installed horizontal barrier with KÖSTER NB 1 Grey applied as a negative side waterproofing in two layers (crosswise) with a KÖSTER Brush for slurries.







After the material has cured, the KÖSTER Restoration Plaster Key is splashed onto the substrate so that the plaster key is no thicker than 5 mm and covers approximately 50 % of the area. This step will ensure the optimal adhesion of the KÖSTER Restoration Plaster.

The KÖSTER Restoration Plaster is applied with a trowel or an appropriate mortar pump on the cured layer of the KÖSTER Restoration Plaster Key. In the last step, the surface is floated smooth.



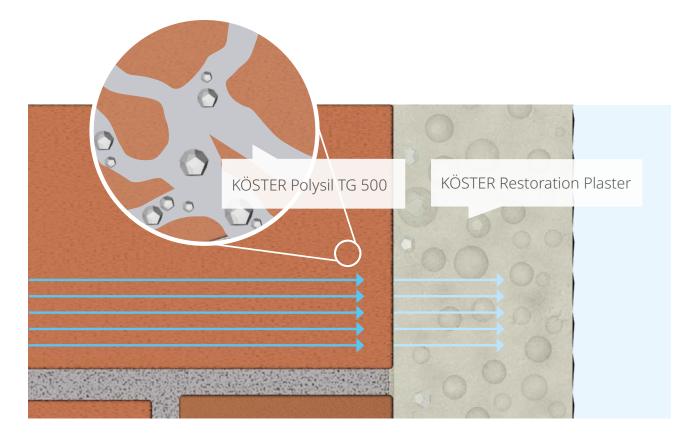




KÖSTER Restoration Plaster allows the masonry to dry without damage. KÖSTER Restoration plaster is hydrophobic and open to vapor diffusion. Salts remaining in the wall are absorbed by the KÖSTER Restoration Plaster preventing salt effloresce and damage to the plaster or paint. Various KÖSTER Restoration Plasters are available (Grey, White, Fast and Light). KÖSTER Restoration Plaster

White is often used without subsequent painting. In cases where a smooth decorative surface is required, KÖSTER Fine Plaster can be applied to meet architectural goals.

KÖSTER Restoration Plasters can only be painted over with breathable paints (open to vapor diffusion) such as KÖSTER Renovation Paint White.



#### 7.2 Installation with the KÖSTER Cartridge System (diagonal boreholes)

- This installation system is used for walls with a thickness of up to 20 cm
- Drill the required number of holes according to the table overleaf. The holes should be cleaned with a KÖSTER Drill Hole Cleaner, an industrial vacuum cleaner or, if necessary, be briefly flushed out with water. Holes should be drilled at an approximate 40° downward angle until approximately 5 cm before the end of the masonry. At least one horizontal joint should be traversed. The application can be carried out from the inside or the outside.
- After the drill holes have been cleaned, the KÖSTER Capillary Rods are inserted into the drill holes. Through this, prior filling of cavities, fissures and joints utilizing

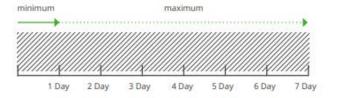
- suspensions is usually not necessary. Put in the capillary rods so that approximately the first 4 cm of the drill hole are left clear. In this space, the cartridge will later be placed. The capillary rods saturated with KÖSTER Crisin 76 remain in the drill holes once the application is completed.
- Then put the KÖSTER Crisin 76 cartridges in the drill holes. Do not apply in temperatures below 0 °C, apply only as long as the masonry is not frozen.
- The cartridges remain in the wall for 7 days.
   Remove cartridges after this period, empty cartridges can be removed immediately. After that, the drill holes can be sealed with KÖSTER KB-Fix 5.

#### 7.3 How fast does KÖSTER Crisin 76 become active?

The KÖSTER Crisin 76 cartridges empty between 24 hours and a maximum of 7 days after they have been installed. Now the horizontal barrier has been successfully installed. Due to the hydrophobic characteristics of the KÖSTER Crisin 76, the reduction of rising damp starts immediately after the installation. The horizontal barrier becomes fully effective within the curing time of the resin which can take up to 10 days. During this period, the masonry already begins to dry. The drying time depends mainly on the moisture content and the thickness of the walls. The moisture content can be determined by taking core samples which are then weighed and dried according to the kiln-dry method.

Often masonry burdened by rising damp contains high salt concentrations. Therefore, during the first weeks of drying after the installation of a horizontal barrier, salts may diffuse to the surface causing salt efflorescence. This is part of the drying process. The efflorescence should be removed mechanically (do not use water) after about two weeks.

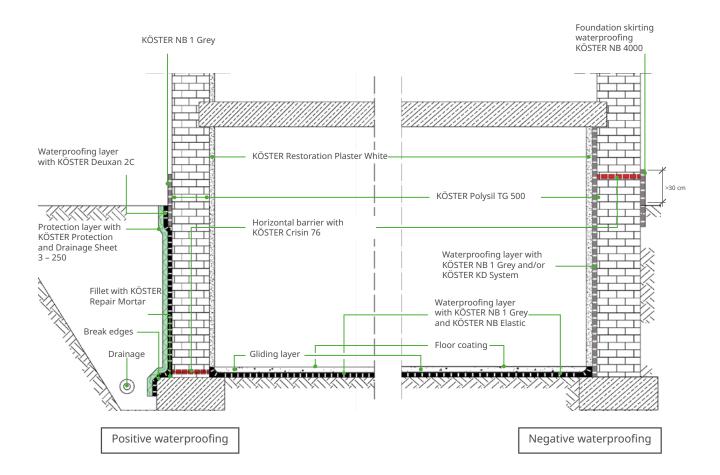
To fully immobilize the remaining salts, apply KÖSTER Polysil TG 500. After deep priming, KÖSTER Restoration Plaster Key is splashed onto the wall and afterwards the surface is plastered with KÖSTER Restoration Plaster. The system is now fully functional and the structure is protected against rising damp and further damage caused by salt efflorescence.



#### 7.4 How is a horizontal barrier installed in combination with negative side or positive side waterproofing?

Subsequent waterproofing normally includes various measures such as the installation of area waterproofing for walls and floors and the installation of a horizontal

barrier within the masonry. The installation of a horizontal barrier is a key element in any restoration waterproofing project.



The left side of the drawing shows the solution with positive side waterproofing. It requires that the ground on the outside of the basement wall is excavated and the waterproofing is installed on the exterior of the wall. The advantage is that the wall is dry after the waterproofing has been installed.

This solution can be implemented by using the KÖSTER Deuxan system. In this case, the horizontal barrier with KÖSTER Crisin 76 is placed as low as possible. The purpose of the horizontal barrier here is to ensure that moisture cannot rise from the foundation into the masonry wall.

The right side shows negative side waterproofing. It is usually the cheaper and faster possibility because it is carried out from the inside. The KÖSTER KD-System and KÖSTER NB 1 Grey are the perfect choice for such a solution. The horizontal barrier with KÖSTER Crisin 76 is placed 30 cm above ground level. The waterproofing layer on the inside of the wall ensures that no water can penetrate into the basement. The purpose of the horizontal barrier in this case is to ensure that moisture cannot rise anywhere into the construction members above.



### **Consumption rates**

Guide value: 0.04 l/m per cm wall thickness

#### Maximum consumption rates in the KÖSTER suction angle method:

Wall thickness in cm (up to)	Drill hole spacing in cm	Cartridges per m	Cartridges per drill hole	Capillary rods (90 cm)**	Consumption of material per m
20	12.5	8	1	1 + 64 cm	1.6
30	12.5	8	1	2 + 76 cm	1.6
40	11.0	9	1	4 + 18 cm	1.8
50	10.0	10	1	5 + 70 cm	2.0
60	8.5	12	1	8 + 24 cm	2.4
70	7.0	14	1	11 + 18 cm	2.8
80	6.5	16	1	14 + 52 cm	3.2
90	11.0	9	2	9 + 18 cm	3.6
100	10.0	10	2	11 + 30 cm	4.0

<sup>\*</sup> Borehole diameter: 14 mm, distance: from hole center to hole center

#### Maximum consumption in the KÖSTER cartridge process:

Wall thickness in cm (up to)	Drill hole spacing in cm*	Cartridges per m	Cartridges per drill hole
10	12.5	8	1**
20	12.5	8	1
30	12.5	8	1

<sup>\*</sup> Borehole diameter: 14 mm, distance: from hole center to hole center



#### **General notes**

#### 9.1 Material storage

In originally sealed packages the material can be stored for a minimum of 6 months. Store frost free.

#### 9.2 Packaging



200 ml cartridge (M 279 200)



5 l jerrycan (M 279 005) Refill container



10 l jerrycan (M 279 010) Refill container



30 l jerrycan (M 279 030) Refill container

<sup>\*\*</sup> Measurements calculated; length can vary according to conditions on site

<sup>\*\*</sup> For wall thicknesses up to 20 cm, the contents of half a cartridge per borehole are sufficient. For wall thicknesses greater than 24 cm, the KÖSTER Suction Angle method must be used.



KÖSTER Capillary rods Length: 45 cm (M 963 045) Length: 90 cm (M 963 090)



KÖSTER Suction Angle Piece (M 930 001)



KÖSTER KB-Fix 5 7.5 kg bucket (C 515 007) 15 kg bucket (C 515 015)

#### 9.3 Important considerations

 Please be aware: After the installation of KÖSTER Crisin 76 salts can efflorescence on the surface due to the drying process. We suggest the use of KÖSTER Polysil TG 500 and the installation of a KÖSTER Restoration Plaster. The red color is an indicator pigment. It breaks down under UV light. This does not affect the function of KÖSTER Crisin 76.

The system's most important feature is its special adaptability to the specific requirements of the object at hand. By using the suction angle system:

- The actual required drill depth can be exactly calculated and adhered to.
- The horizontal barrier can be placed directly in the horizontal joint between the first and second rows of bricks.
- The holes can all be drilled from one side, even in case of greater wall thicknesses.
- Time and material are saved.

The advantages of pressureless injection are:

- 1. The injected liquid is transported effectively into the capillaries, which are part of the mechanism that causes rising damp. No material gets wasted in cracks or voids
- 2. The amount of material that is injected into the masonry is easily controlled. Pressurized injection does not allow such control over the injected material
- 3. Damage to the masonry and the structural stability due to pressurized injection is avoided
- 4. Capillary rods bridge the cavities and voids and remain in the boreholes as a material reservoir.

#### 9.4 Limitations

Do not apply in temperatures below 0 °C, apply only as long as the masonry is not frozen.

### 1 Certifications

Official Test Report, MFPA Leipzig - according to WTA Technical Bulletin 4-10, usable for moisture content up to 95 %

## Annendiy

Appendix	
Technical Data	Product Name: KÖSTER Crisin 76
Material Class	Synthetic hydrophobic resin
Alkalisation of masonry required before injection	No
Alkalisation of masonry required after injection	No
Drying of masonry required (before injection)	No
Reaction with salt	No
Injection system	Both pressurized and unpressurized
Water-soluble	No
Temperature range for application	>0℃
Consumption approx.	0.041 l/m per cm wall thickness
Color	Red
Solvent-Free	Yes
Can be plastered over	Yes (recommended to be primed with KÖSTER Polysil TG 500)
Penetration into surface	Yes
Mode of application	Injection (KÖSTER Suction Angle system/KÖSTER Cartridge System)
Diameter of the capillaries	10-7 – 10-4 m
Degree of moisture penetration before application	95% ± 5%
Simplicity of application	+++
Surface	
Masonry	+++
Mortar	+++
Concrete	+++
Limestone	+++
Concrete or ceramic bricks	+++
Sandstone	+++
Marble	+++
Porous mineral substrates	+++
Gypsum	Must be removed
Moisture condition of surface	Dry or Wet
Performance	
Waterproofing	Horizontal waterproofing against capillary water transport

Waterproofing Horizontal waterproofing against capillary water transport

Time until rainproof Immediately (hydrophobic)

Chemical resistance Good

Lower+ Medium++ High+++

12 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 project 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