StoCretec

Building with conscience.

Systems for the injection of cracks

Permanent sealing of cracks in concrete members

Concrete repair and concrete protection

Injection of cracks

Not every crack is a defect. But if cracks put the structural integrity of a construction at risk, a crack repair is required. Depending on the application objective, special injection resins are used: to perform force-transmitting or flexible filling of crack sides, to waterproof cracks, or to fill cavities. Our range of products and professional information is here to help you with these tasks.

Contents

Basics

Fillers and accessories

Cover photo:
Flehe Bridge, Düsseldorf, DE
StoCretec expertise: StoConcrete Inject IHS

Application

Cracks in concrete members

Putting the structural integrity of construction works at risk

Cracks in reinforced concrete cannot be avoided entirely. Building owners should therefore determine the type and cause of the cracks at an early stage. Not every crack is a defect.

How cracks occur
The tensile strength of concrete is rather low compared to its compressive strength. Tensile stresses have to be absorbed by the reinforcing steel. It must be dilated for this purpose. Cracks occur when the steel expansion exceeds the flexibility of the concrete. A structural engineer distributes the large crack width of a single crack into several fine cracks with non-critical crack widths. DIN EN 1992-1 (Eurocode 2) regulates these permissible crack widths:

- Reinforced concrete, dry or constantly wet: 0.4 mm
- Reinforced concrete, wet: 0.3 mm
- Reinforced concrete, wet and loaded with chloride: 0.3 mm

If the permissible widths are observed, the cracks are generally harmless.

However, even very fine cracks can constitute a defect. The permissible crack width for prestressed concrete is just 0.2 mm. The reason for this is the susceptibility of prestressing steels to corrosion. In the case of water containers, cracks measuring 0.1 mm and above restrict serviceability. Much larger crack widths can even put structural integrity at risk.

Causes of cracks
There are many different reasons that can cause the permissible crack width to be exceeded:

- Incorrect load assumptions or incorrect structural calculation and assessment
- Failure to consider temperature restraints
- Incorrect crack width restriction
- Incorrectly installed reinforcement
- Water/cement ratio too high
- Inadequate curing
- Earthquakes
- Vehicle impact
- Fire, explosion

Protection against corrosion
The concrete protects the reinforcing steel against corrosion. If water or harmful substances such as de-icing salt reach the reinforcing steel through cracks, the steel will corrode. Corrosion can reduce the cross section of the reinforcing steel. In the medium term, this puts the structural integrity of the building element at risk. It is essential that a repair is carried out on the cracked building element.

Injection of cracks is a tried-and-tested repair measure. It involves injecting special reaction resins or mineral injection products into cracks or cavities.

Image below:
Rappbode Dam, DE
The dam was repaired with our injection resins.
Photo: mrvisual/Adobe Stock

Image on right:
Water tower, Ludwigsburg, DE
Our injection products were used to permanently ensure the structural integrity of the water tower.
Photo: euroluftbild.de/Werner Riehm

Survey and application objectives

From crack analysis to suitable filler

The characteristics of all cracks must be recorded before injection work is planned. The technical rule on maintenance from the Deutsches Institut für Bautechnik lists the factors to be examined. In the case of cracks that affect the structural integrity of the construction or building element, the following must be observed in particular:

- Type of crack: crack which can be expected to pass through the full thickness of the section or surface crack
- Crack progression
- Crack width
- Crack movement: short-term, daily, long-term
- Cause of crack
- Measures taken previously
- Accessibility
- Moisture level in cracks
- Condition of crack sides

The survey reveals the following:

- Need for pressure grouting
- Application objectives
- Type of filling
- Risks of repeat crack formation

The technical rule on maintenance from the Deutsches Institut für Bautechnik distinguishes between the following application objectives in relation to the injection of cracks:

- Closure of cracks
- Crack waterproofing
- Force-transmitting filling of crack sides
- Flexible filling of crack sides

Top image:
Determining the crack width with a crack width ruler

Image on right:
Telecommunications tower, Schnait-see-Garting, DE
Repair to the platform with our injection products.

Overview of our injection products

Properties, application range, and application method

Depending on the application objective, we offer two types of injection products. Epoxy resins (EP) enable the force-transmitting filling of crack sides. They transfer forces from one side of a crack to the other without deformation. Force-fitted filling with EP resins is only possible with dry cracks.

Polyurethane resins (PUR) are used to flexibly fill crack sides. They reliably protect the reinforcement steel against corrosion. PUR resins also permanently seal damp cracks and cracks with pressing water.

Image on right:
Bridge at A44/A46 Holz motorway junction, Jüchen, DE
StoCretec expertise: crack soaking with StoJet IHS 93

PUR injection products

System	**StoConcrete Inject PIH 200**	
Filler	**StoJet PIH 200**	**StoJet PU VH 200**
Binding agent	Polyurethane resin	Polyurethane resin
Properties	· Two-component · Externally monitored · BASt-listed	· Two-component · Quick-foaming · Externally monitored
Application range		
Flexible filling	■■	■ [2]
Force-transmitting filling		
Moisture level in cracks		
Dry	■■	
Damp	■■	
Wet	■■	
Flowing water	■■ [1]	■■ [2]
Application		
Soaking		
Injection	■■	■■
Recommended packers	StoJet P 210 StoJet P 214	StoJet P 210 StoJet P 214

■ Good
■■ Very good
[1] Pre-injection with StoJet PU VH 200
[2] Subsequent injection with StoJet PIH 200

EP injection products

System	**StoConcrete Inject IHS**	
Filler	**StoJet IHS**	**StoJet IHS 93**
Binding agent	Epoxy resin	Epoxy resin
Properties	· Two-component · Slow-curing · Low viscosity · Not pigmented	· Two-component · Low viscosity · Not pigmented · High tensile strength · Low volume reduction · Externally monitored · BASt-listed
Application range		
Flexible filling		
Force-transmitting filling	■■	■■
Moisture level in cracks		
Dry	■■	■■
Damp		
Wet		
Flowing water		
Application		
Soaking	■■	■■
Injection	■■	■■
Recommended packers	StoJet P 106 StoJet P 110 StoJet P 113 StoJet K 300	StoJet P 210 StoJet P 214 StoJet K 300

■ Good
■■ Very good

Packers

Properties and application

StoJet P 210 hammer-in drill packer
- Diameter: 10 mm
- For injection of epoxy resins and polyurethane resins
- Suitable for all types of cracks
- For injection at high pressure
- For filling cracks from interior to exterior

StoJet P 214 drill packer
- Diameter: 13 mm
- Material: brass
- With double seal and nominal crack point
- For injection of epoxy resins and polyurethane resins
- Suitable for all types of cracks
- For injection at high pressure
- For filling cracks from interior to exterior

StoJet P 106 hammer-in packer
- Diameter: 6 mm
- Universal packer
- For force-transmitting, flexible, or filling injection of cracks
- For injection of epoxy resins and polyurethane resins
- For dry and damp cracks
- For injection at high pressure
- For filling cracks from exterior to interior

StoJet P 110/113 hammer-in packer
- Diameter: 10 mm/13 mm
- Universal packer
- For force-transmitting, flexible, or filling injection of cracks
- For injection of epoxy resins and polyurethane resins
- For dry and damp cracks
- For injection at high pressure
- For filling cracks from exterior to interior

StoJet K 300 adhesive packer
- For dry cracks
- For injection at low pressure
- For filling cracks from exterior to interior
- Suitable for thin building elements, building elements with dense reinforcement, and prestressed concrete, as no drilling required
- For filling surface cracks

Crack sealing

Tasks and suitable products

Sealing is a temporary crack repair measure used on the surface of the building element. It has two tasks:

- It ensures the required injection pressure is established.
- It prevents the injection product escaping during the injection process and up to the point it has cured.

A mechanical substrate preparation ensures good adhesion for the sealing materials. The ends of the cracks remain unsealed to a length of approx. 3 cm. The displaced air can escape and the filling of the crack can be controlled.

StoJet PUK sealing filler
StoJet PUK is an elastic sealing filler and adhesive. It is two-component. StoJet PUK is suitable for building elements with dynamic stress in building engineering and civil engineering.

With StoJet PUK, the StoJet K 300 adhesive packer is also bonded to the surfaces of the building elements. After the injection process, StoJet PUK can be removed by heating it with an industrial dryer.

StoCrete SM quick repair mortar
StoCrete SM is a polymer-modified mortar for building engineering. The single-component repair mortar cures quickly. StoCrete SM is used to seal cracks when injecting rigid cracks and on damp substrates.

Bell tower, Heilig-Geist-Kirche, Hanau, DE
StoCretec expertise: StoConcrete Inject PIH 200

Injection of cracks in practice

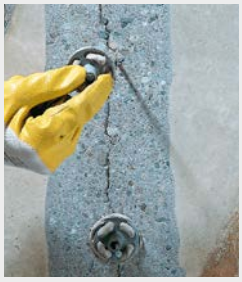
Work steps

After sealing, a check must be carried out to ensure the injection product can pass through the packers. In the case of vertical cracks, injection is performed from bottom to top. In the case of horizontal cracks, injection is performed on alternate sides. The first nipple is screwed onto the lowest packer.

The injection product is injected until it escapes at the next packer. The next nipple is mounted at this point. The process is repeated until the injection is complete. The permissible injection pressure must be observed.

Image on right: Injection of the injection product

Substrate preparation



Affixing the packer

Sealing

Screwing in the cone nipple

Injection

Subsequent injection

Removing the sealing

Cleaning tools, equipment, and machines

StoDivers EV 100
For cleaning tools soiled with epoxy resin or polyurethane resin.

StoJet NR
Post-cleaning agent and preservative for the injection system.

Recommended machines and equipment

Injection pumps for reaction resins:

WIWA Wilhelm Wagner GmbH & Co. KG
Gewerbestrasse 1–3
35633 Lahnau
Germany

Telephone +49 6441 6090
info@wiwa.de
www.wiwa.de

Grip couplings, sliding couplings, accessories:

PPW-POLYPLAN-WERKZEUGE GmbH
Riekbornweg 20
22457 Hamburg
Germany

Telephone +49 40 5597260
www.polyplan.com

Headquarters StoCretec

StoCretec GmbH
Gutenbergstrasse 6
65830 Kriftel
Germany

Phone +49 6192 401-0
stocretec@sto.com
www.stocretec.de

Headquarters Sto

Sto SE & Co. KGaA
Market Development
Ehrenbachstrasse 1
79780 Stühlingen
Germany

Phone +49 7744 57-1131
info.international@sto.com
www.sto.com

Art. no. 015304 Rev. no. 01/05.25 Printed in Germany