Sandvik Injection chemicals

Crack injection

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Treatment of cracks with Sandvik injection products

Existing cracks in concrete are a natural part of its behavior and can arise from various mechanical or physical influences. They often occur during the curing process due to shrinkage, leading to the formation of fine hairline cracks which generally do not have a negative impact on structural capacity.
Temperature variations and restraint stresses can also cause cracking, as structural elements expand and contract unevenly. Typical cracks, often running diagonally, are frequently the result of differential settlement of the subsoil.

This type of damage can be further intensified by external influences such as earth or water pressure, which impose additional loads on the structure. Very fine cracks below 0.1 mm are rarely critical and usually reflect the normal behavior of concrete. Modern injection techniques provide effective methods for targeted crack repair: depending on the requirements, cracks can be flexibly sealed using polyurethane esins, structurally bonded and permanently repaired using epoxy resins, or reliably sealed in water-bearing areas – sometimes even reversibly – using acrylate gels.

Causes of cracks in concrete structures

Cause	Description	Typical timing
Plastic shrinkage	Rapid water evaporation from the surface before the concrete has set.	Early stage (fresh concrete)
Thermal stress	Temperature differences between the core and the surface (heat of hydration) or ambient changes.	Early stage to long-term
Drying shrinkage	Volume reduction as the hardened concrete loses excess moisture over time.	Medium to long-term
Structural overload	Tensile or shear stresses exceeding the design capacity of the reinforced concrete.	During service life
Settlement	Uneven movement or sinking of the foundation or subsoil.	Early to long-term
Rebar corrosion	Expansion of rusting steel reinforcement, causing the surrounding concrete to “spall” or crack.	Long-term
Chemical attack	Reactions like sulfate attack or alkali-silica reaction (ASR/concrete cancer) causing internal expansion.	Long-term

Type of cracks

Objective	Functional description	Main cause
Settlement cracks	Often diagonal, wider at the top or bottom	Uneven subsidence of the foundation or soil
Stress cracks	Often perpendicular to component edges	Restrained deformation (constraint), e.g., due to temperature differences
Hairline cracks	Extremely fine (< 0.1 mm), often barely visible	Normal shrinkage behavior, usually no effect
Horizontal cracks	Run horizontally, often in the middle of the wall	High external earth pressure or deficiencies in the stone-to-concrete bond

Execution with polyurethane, epoxy resins, and acrylic gels

Crack injection is used for the structural, sealing or flexible repair of cracks in concrete. The selection of the injection material depends on the rehabilitation objective, the moisture condition or water ingress of the crack, as well as the expected movement of the structure. For structural repair, epoxy resins are used, providing a rigid, high-strength bond between the crack flanks and restoring the load-bearing capacity. In the case of water-bearing cracks, foaming 1-component PU is first applied as a temporary water stop. For permanent sealing or flexible crack injection, elastic PU resins are used, which ensure reliable sealing even in the presence of moisture and structural movement. Alternatively, acrylate gels can also be applied. Execution is carried out after proper cleaning of the crack by injection via installed packers. Injection packers are typically installed at an angle of approximately 45°, with spacing equal to half the thickness of the structure, to reliably intercept the crack at mid-depth. Glue packers are used where drilling is not possible or not permitted; they are generally installed at intervals equal to the thickness of the structure. Injection is carried out under controlled pressure and, if required, in multiple stages (e.g. temporary water stop followed by permanent sealing injection). After curing, the packers are removed and the drill holes are properly sealed.
When injection is performed in accordance with EN 1504-5, only products classified and CE-marked according to this standard shall be used to ensure compliant application. Sandvik offers a comprehensive portfolio of compliant products.

Polyurethane resins

1C-PUR (1-component): one-component polyurethane resins are usually high-foaming systems that react upon contact with water, making them ideal for rapid sealing of leaks. They are widely used in different injection applications and can be applied easily using simple 1C-pumps. Advanced additives can accelerate the reaction or even enable curing without the presence of water.
2C-PUR (2-component): two-component polyurethane resins are among the most versatile injection systems available. They are widely used for sealing, stabilizing, lifting, and reinforcing structures both underground and above ground. Available in foaming and non-foaming variants, fast and slow reaction, high and low strength, flexible and non-flexible these systems can be precisely adapted to the specific conditions and demands of each project.

Epoxy resins

2C-EP (2-component): two-component epoxy resin is used for the structural bonding and injection of cracks in construction elements, restoring their load-bearing capacity. It provides excellent adhesion to both dry and damp substrates and forms a rigid, high-strength bond. Different formulations are available with varying workability times, allowing adaptation to specific application conditions and temperatures.

Acrylic gels

Acrylic gels: multi-component acrylic gels are used for water sealing in basements, walls, and underground structures, as well as for joint injection and soil consolidation. Their very initial low viscosity enables deep penetration, while the cured material shows elastic behavior for durable sealing. The acrylic systems can be fast-reacting and particularly suitable for water stopping. Adjustable reaction times enable use across a wide range of applications.

Product portfolio

Enhance safety, health, and environmental protection with certified materials, CE-marked, and tested according to DIN EN 1504-5.

Product	Product characteristic	CE mark	Application	Viscosity after mixing	Open time at 20 °C
One component polyurethane resins					
DSI Inject PUR 1C-100-II-R	— Water ractive — Medium setting — Ready for use without mixing		— Water stopping temporary	300 mPa·s	25 sec
DSI Inject PUR 1C-400	— Water reactive — Elastic foam resin with medium setting — High viscos		— Water stopping temporary	400 mPa·s	50 sec
DSI Inject PUR 1C-400-II-R	— Water ractive — Elastic foam resin with short setting — Medium viscos — Ready for use without mixing		— Water stopping temporary	220 mPa·s	3-15 sec
Two component polyurethane resins					
DSI Inject PUR E203	— Water ractive — Elastic with extended setting time — Very low starting viscosity — Long open time — Limited foam factor in the contact with water	2+	— Concrete, brick walls injection (dry/wet, fine crack) — Crack sealing flexible permanent — Sand, soil injection — Injection hoses — Soil strengthening	45 mPa·s	45 min
DSI Inject PUR E206	— Water ractive — Elastic with long setting time — Very low starting viscosity — Long open time — Limited foam factor in the contact with water — Prolonged reaction time in the contact with water	4	— Concrete, brick walls injection (dry/wet, fine crack) — Injection hoses — Good for wet condition	120 mPa·s	120-190 min
DSI Inject PUR E209	— Water ractive — Elastic with very long setting time — Very low starting viscosity — Long open time — Limited foam factor in the contact with water — Prolonged reaction time in the contact with water	4	— Concrete, brick walls injection (dry/wet, fine crack) — Injection hoses — Good for wet condition	96 mPa·s	225 min
Epoxy resins					
DSI Inject Epoxy R305	— Rigid — Low starting viscosity — Long open time	2+	— Concrete, brick walls injection (dry/wet, fine crack)	220 mPa·s	70 min
DSI Inject Epoxy R305F	— Rigid — Low starting viscosity — Shorter open time	4	— Concrete, brick walls injection (dry/wet, fine crack)	220 mPa·s	40 min
Acrylic gels					
DSI Inject GELE F	— Rubber-like 4C acrylic resin — Elastic — Very high adhesion — Low starting viscosity — Fast reaction	4	— Water stopping — Contact grouting — Injection hoses — Fast reaction can be delayed with retarder	40 mPa·s	15-45 sec
DSI Inject GELE V	— Rubber-like 3C acrylic resin — Elastic — Very high adhesion — Low starting viscosity — High shrinkage	4	— Sand, soil injection — Contact grouting — Injection hoses	40 mPa·s	2-8 min

Method of application

Product	Crack injection sealing	Crack injection solid structure	Curtain injection	Masonry injection	Horizontal barrier	Joint injection	Water stop	Injection of grouting hoses	Soil stabilisation	Stabilisation of masonry	Rock stabilisation	Hydraulic failure	Anchor injection	Subsoil consolidation	Sealing building pits
DSI Inject PUR 1C-100-II-R	✓						✓		✓		✓				✓
DSI Inject PUR 1C-400	✓					✓	✓					✓			✓
DSI Inject PUR 1C-400-II-R	✓						✓					✓			✓
DSI Inject PUR E203	✓			✓	✓	✓	✓	✓		✓				✓	
DSI Inject PUR E206	✓			✓		✓		✓							
DSI Inject PUR E209	✓			✓		✓		✓							
DSI Inject Epoxy R305		✓								✓	✓		✓		
DSI Inject Epoxy R305F		✓								✓	✓		✓		
DSI Inject GELE F	✓		✓			✓								✓	
DSI Inject GELE V			✓			✓								✓	

Crack width

Crack width	Injection material	EN 1504-5 category	Purpose
0.1-0.2 mm	Epoxy resin (EP): DSI Inject 305R	Category F (force-transmitting)	Structural bonding: restores load-bearing capacity; extremely low viscosity
0.1-0.3 mm	Polyurethane (PUR): DSI Inject E203 (E206, E209)	Category D (ductile)	Flexible sealing: remains elastic to accommodate movement; ideal for moisture/sealing
Variable > 0.05 mm	Acrylic gel: DSI Inject GELE F	Category S (swelling)	Swellable sealing: expands in the contact with water; “reversible”

Preliminary crack investigation overview

Parameter	Focus area	Why it matters
Crack width	Measurement (e.g., < 0.1 mm to > 0.3 mm)	Determines the injection pressure and material viscosity.
Moisture level	Dry, damp, or pressurized water	Dictates the resin type (e.g., epoxy for dry vs. PUR for leaks).
Movement	Active vs. dormant (static)	Decides between a rigid (structural) or flexible (sealing) fix.
Structure status	Concrete quality and temperature	Ensures the resin cures correctly and packers can be anchored.
Contamination	Dirt, oils, or carbonation	Essential for ensuring the injection material bonds to the concrete.

Objectives of crack injection

Objective	Functional description
Closing	Protecting the component by preventing corrosive or harmful substances from entering cracks or voids.
Sealing	Eliminating leaks and water ingress caused by cracks or cavities.
Flexible bonding	Establishing a connection between crack flanks that accommodates limited movement.
Structural bonding	Restoring structural integrity through a tension- and compression-resistant connection in cracks and voids.

Preparation of cracks

— The proper preparation of the crack is crucial to ensure best adhesion, withstand high injection pressures, and allow the resin to penetrate deeply into the capillary structure of the concrete.
— Clean the crack surface and loose particles, dust or coating by using a wire brush, or by grinding and air.
— Very fine cracks with less than 0,2 mm should be widened slightly by using a cutter to allow the resin entry.

Contact

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All dimensions, weights, quantities, and specifications are those applicable at the time of this publication and may be amended from time to time. Please contact your local representative for final confirmation of any key specifications.

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