De Neef Conchem

1-component polyurethane resin injection manual

MANUAL OF TECHNICAL PROCEDURES
Version 20-10-03

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HYDRO ACTIVE GROUTS
INJECTION RESINS

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1. Introduction

A crack or joint in the concrete can be a real problem for the structure.
However when water enters through the crack, this can be as much or more of a problem than the crack itself.

Corrosion to the reinforcing steel or freeze-thaw action caused by water seeping into the structure, can greatly contribute to structural weakness. Water bearing cracks can cause dangerous situations.

Stores and goods can be damaged by the water. Most of the times, the wet area can not be used to its full potential.

2. Selection of the 1-component PU resin

Polyurethane grouts are used to stop running water and moisture infiltration through concrete and masonry structures.

1-component resins can be pumped as a single component.
A catalyst can be added to the resin to increase reaction speed and waterproofing performance.
Hydro Active Grouts (HAG) are activated when brought into contact with water, i.e. the resin will not cure until in contact with water in the joint or cavity to be filled.
Due to their hydrophobic characteristics, the resin will not dilute when in contact with water, making these resins the ideal choice for dealing with water leaks.

Depending on the type of application, a large selection of 1-component PU resins is available in the De Neef range of waterproofing products.

HA CUT: 1-component, low viscosity, hydrophobic, rigid polyurethane injection grout for cutting off gushing water leaks with a high flow rate and/ or high hydrostatic pressure. HA Cut can also be used for filling ultra-fine to medium sized cracks.

HA Cut CFL: 1-component, low viscosity, hydrophobic, semi-rigid polyurethane injection grout for cutting off gushing water leaks with a high flow rate and/ or high hydrostatic pressure which can be subject to movements and settlements.

HA FLEX: 1-component, hydrophobic, flexible polyurethane injection grout for filling and repairing of joints which have water infiltrations in concrete constructions which can be subject to movements and settlements.

HA FLEX LV: 1-component, low viscosity, hydrophobic, flexible polyurethane injection grout for filling and repairing of joints which have water infiltrations in concrete constructions which can be subject to movements and settlements.

HA FLEX SLV: 1-component, super low viscosity, hydrophobic, flexible polyurethane injection grout for filling and repairing of ultra-fine cracks and joints which have water infiltrations in concrete and masonry constructions which can be subject to movements and settlements.

HA SAFEFOAM: Environmentally safe low viscosity hydrophilic polyurethane injection resin designed for grouting joints or repairing leaks in concrete structures. HA Safefoam can be used as a flexible 1-component system for injecting leaking joints**.**

HA SEALFOAM NF: Low viscosity hydrophilic polyurethane injection resin designed for grouting joints or repairing leaks in concrete structures. HA Safefoam can be used as a flexible 1-component system for injecting leaking joints**.**

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Overview of the principal properties of the 1-component polyurethane resins

Product	Foam	Type	Colour	Accelerator	Min - Max %	Reaction time (20 °C)	Viscosity (mPas)	Expansion
HA Cut	Hard	Hydrophobic	Brown	HA Cut Cat	2 - 10	9'55" - 2'24"	< 190	20-30 V
HA Cut CFL	Semi-flexible	Hydrophobic	Brown	HA Cut Cat	2 - 10	4'46" - 1'10"	180-260	20-30V
HA Flex	Flexible	Hydrophobic	White	HA Flex Cat	1 - 5	6'40" - 2'00"	850-1200	8V
HA Flex LV	Flexible	Hydrophobic	Yellow	HA Flex Cat	1 - 5	6'00" - 1'55"	450-850	8V
HA Flex SLV	Flexible	Hydrophobic	Yellow	HA Flex Cat	1 - 5	6'50" - 3'05"	150-250	8V
HA Safefoam	Flexible	Hydrophilic	Yellow	Pre-catalysed		2"	600	20V
HA Sealfoam NF	Flexible	Hydrophilic	Yellow	Pre-catalysed		20"	650-950	4V

3. Selection of the injection equipment

3.1. 1-component manual pump IP 1C-100-H

Single piston hand pump for resin injections.

The IP 1C-100-H hand pump is a hand driven pump specifically designed for injecting 1-component polyurethane resins or pre-mixed 2-component epoxy resins of low to medium viscosity. The IP 1C-100-H hand pump is ideal for small injection work at pressures up to 100 bar. For high volume / high pressure applications, it is recommend to use the De Neef IP 1C-210-E airless diaphragm pump.

3.2. 1-component airless diaphragm pump IP 1C-210-E

Ideally suited for polyurethane resins, the IP 1C-210-E also fulfils all the requirements to be used with premixed 2-Component grouts and epoxy resins with a longer pot life. The IP 1C-210-E is a medium power electrical airless diaphragm pump for the injection of 1-component polyurethane resins such as the HAG series. The pump can deliver up to 210 bars.

3.3. Packers / connectors and accessories

Please refer to separate leaflet for more information on our available packers, connectors and accessories.
Please make sure to chose the right packer for the job at hand.

4. Fields of application and special considerations

4.1. Fields of application

Our series of Hydro Active Grouts are 1-component polyurethane resins, used for the following applications:

- Cutting off gushing water leaks.
- Waterproofing joints in concrete and masonry structures.
- Preventative injections into joints to prevent water leaks and infiltrations.

4.2. Special considerations

4.2.1. Gushing water leaks

Gushing water leaks should in the first instance be stopped by injecting with HA Cut.
HA Cut however cures into a very rigid plastic which is prone to cracking when subject to movement and settlements.

A follow up injection with flexible resins such as the HA Flex series, will ensure a durable and effective seal for years to come.

If the structure is subject to small movements or settlements, use HA Cut CFL.

4.2.2. Structural behaviour of the substrate

For injecting structures which are subject to movement or settlement, only use the HA Flex series of resins.

For injecting structures which are subject to small movement or settlements and where a high compressive strength is required, use HA Cut CFL resin.

4.2.3. Substrate composition

Always bear in mind the expansive properties of the HAG injection resins. Hydro-expansive resins are therefore less suitable for injections into masonry structures than for instance Gelacryl poly-acrylate resin.

4.2.4. Joint and crack dimensions.

Always select a resin based on the crack or joint size to be injected.
Small cracks will require low or ultra-low viscosity resins to ensure good crack penetration.

For ultra-fine cracks, it is recommended to use HA Flex SLV.

4.2.5. Chemical contamination

When the pure resin or the cured foam will be in contact with contaminated water or chemicals, it is advised to check with the De Neef Conchem Technical Department or your local supplier for chemical compatibility.

5. Preparation for injection.

5.1. Preparation of surface / crack

Remove surface contamination and debris to establish the pattern of the crack or joint.
Active leaking cracks larger than 0.5 mm need to be sealed with an approved method (e.g. fast curing cement, epoxy gel, polyurethane saturated oakum).This surface sealing can be done before or after the drilling of the injections holes, depending on the situation.

5.2. Drilling of the injection holes

All crack should be mapped and marked prior to installation of the packers.

The drilling pattern for the appropriate number of injection ports should be determined and laid out.
Preferably the holes should be drilled staggered around the crack to insure good coverage of the crack in case this is not perpendicular to the concrete surface.

Drill holes of the correct diameter for the selected packer.
Drill at an angle of 45° in the direction of the crack.
The depth of the bore should be approximately half of the thickness of the concrete.
As a rule of thumb the distance of the drill point to the crack is taken as

$$\frac{\text{Wall Thickness}}{2} = \text{Drilling distance from crack.}$$

Distance between holes can vary between 15 to 90 cm, depending on the actual situation.

For very large cracks, drill the holes directly into the crack.
Special size packers are available for these circumstances.

5.3. Installation of the packers

Insert the correctly sized packer into the hole for about 2/3 of its length.
Tighten with a wrench or spanner by turning clockwise until sufficient tension has been reached to keep the packer in place during injection.

5.4. Flushing of the joint

It is advised to flush the crack with water before injection with resin.

This will flush out dust, debris and prime the crack for the injection resin and improve penetration of the product into the crack.
Water in the crack will activate the resin.

The flushing may also reveal hidden cracks and help to understand how the crack will behave under injection.
Blind holes can be eliminated and cavities or honeycombs can be marked for special attention.

Start flushing at the lowest point of the crack or the narrowest part of a horizontal crack. As you proceed from one packer to the next, flush water should flow from the crack. If flush water will not flow into the packer, consider the hole as blind. Remove the packer and close up the hole with a fast setting cement.

A wide crack will allow more volume at a lower pressure than a narrow crack, but always increase volume and pressure levels slowly.
Flush the crack with the highest possible flow volume practical bearing in mind not to exceed the pressure limits permissible by the age, thickness and state of the concrete.

We recommend to use a separate pump for flushing with water. If this is not practical, then make sure that the pump is sufficiently flushed with Washing Agent ECO to dry the pump and prevent resin from reacting inside the pump.

5.5. Resin preparation

Prepare the resin with the predetermined quantity of accelerator.
No reaction with the resin will occur until the resin comes into contact with water.

Keep the resin protected from water, since this will trigger a reaction in the vessel used and might cause the resin to harden or foam prematurely within the injection equipment.

5.6. Preparation of the injection equipment.

It is highly recommended to use separate pumps for water and resin injection to prevent contamination and blockages.

The pumps must be thoroughly primed with Washing Agent ECO to lubricate and dry the system before injection.

6. Injection

6.1. Resin injection

It is recommended to consult the Technical Data Sheets and Material Safety Data Sheets of all products and equipment prior to starting the work.

Fill the pump with resin and charge the hose and gun. Keep the resin supply covered from dripping water.

Start the injection at the first packer (i.e. the lowest packer in a vertical crack or the packer at the narrowest end of a vertical crack).
Start injecting at the lowest pressure setting of the pump.
If the resin does not flow through the line into the crack, slowly increase the pump pressure until the resin shows good regular flow. Pressures may vary between 14 bar to 200 bar depending on the size of the crack, thickness of the concrete and general condition of the concrete.

When the resin starts to flow, water will be observed flowing out of the crack.
Continue injecting until resin starts to flow from the crack.
Then wait for a few minutes to allow for initial reaction of the resin with the water and then inject again.

Large spills of resin should be stopped by filling up the crack with rags or dry oakum, wait for the resin to cure, then pump again to fill up the crack and densify the foam gasket.

A little leakage of resin through the concrete or crack is useful in showing the extent of resin travel.

During the injection under normal circumstances first water will flow from the crack, followed by foaming resin. After this, pure resin will flow from the crack.
Stop pumping when the pure resin reaches the next packer.

After injection a few packers, go back to the first one and re-inject with resin.
This will seal the injection port and further densify the crack.

Tip : Wet the underground before injection. Any spilled resin will immediately react with the water on the ground and cure without adhering to the surface. The spilled resin can then be peeled away and disposed off.

6.2. Re-injecting with water

After the resin injection, a small amount water can be re-injected into the ports to cure resin left behind.
Let the resin cure thoroughly before removing packers.

6.3. Removing packer

Always wear a face mask.
Let the resin cure thoroughly, before removing the packers.
Packers can be removed by cutting flush with the concrete surface or by untying with spanner or wrench.
The resulting holes can be filled with a hydraulic cement and the surface treated as wanted.
Excess resin on the surface can be removed by wire brush, scraper or
hand held grinder.

6.4. Cleaning equipment

When the injection is finished, clean all parts which have been in contact with the resin with Washing Agent ECO.
This should be done as soon as the injection is finished.

Cleaning of the pump can be done by circulating Washing Agent ECO for 10 to 20 minutes.
Insert the suction hose in the pail of Washing Agent ECO and insert the pressure hose in an old pail.
Start the pump and wait for the Washing Agent ECO to push all the resin out of the pump and the hoses. Then clean the pump by pumping through another 1-2 litres of Washing Agent ECO.
Then flush the pump by recirculating for 10 minutes with clean Washing Agent ECO.

7. Disposal

Disposal of the products will be done according to local legislation.
Refer to Material Safety Data Sheet for general recommendations.

8. Health and Safety

In case of spills and accidents, refer to the Material Safety Data Sheet of the products or when in doubt contact the De Neef Division responsible for your territory.

Always wear appropriate protective gear for the job at hand according to local standards and prescriptions.
We recommend to wear gloves, protective goggles and a face mask when handling chemical products.
See TDS and MSDS for further recommendations.

9. Operating instructions of the injection pumps

9.1. IP 1C-100-H

1. Before injecting, flush the pump with Washing Agent Eco to dry and lubricate the pump.
2. Perform a pressure test to ensure the pump is in perfect running order. This test is executed by pumping with Washing Agent Eco against the closed discharge valve. At a pressure of 100 bar, no leaks should occur.
3. Empty / discharge all the Washing Agent Eco from the pump and discharge hose.
4. Insert the suction hose in the pail of pre-mixed resin. Remember that although De Neef Hydro Active Grouts will only react in the presence of water, for epoxies and 2-component systems, the pot life has to be respected.
5. Start the injection by slowly pumping the resin into the crack.
6. When the crack has been filled, slowly raise the pressure to densify the foam.
7. After injecting, it is necessary to clean the pump immediately with Washing Agent Eco (Polyurethane resins) or MEK (epoxy resins).
8. After cleaning, empty the pump and discharge hose from the cleaning solvent.
9. Disassemble the pump to check the cleaning and conditions of the piston and ball valves.
10. If necessary, clean the valve balls and valve seats to remove any remaining resin.
11. Replace the piston O-ring on a daily basis.
12. Reassemble the pump. Take care to mount the valve springs with the broad side upwards in both valves.
13. Perform a function test with Washing Agent Eco.
14. Empty the pump and pressure hose and store the pump in a dry place.

9.2. IP 1C-210-E

1. Check if the master switch is in the ‘O’ position (off position).
2. Pour Washing Agent ECO in the hopper before switching on the pump. Never let the pump run dry.
3. Set the pressure regulator at minimal pressure.
4. Switch the master switch to the ‘1’ position (on position).
5. Washing Agent ECO is now circulated through the system to dry and lubricate the pump. Let the pump circulate for 2 to 3 minutes in with the bypass open and minimal pressure.
6. Close the bypass and open the valve of the discharge hose.
7. Allow all Washing Agent ECO to flow out of the pump.
8. Switch the pump off.
9. Pour the prepared resin into the hopper.
10. Set the pressure regulator at minimal pressure.
11. Switch the master switch to the ‘1’ position (on position).
12. Pump all remaining Washing Agent ECO into a disposal container until pure resins flows out of the pump.
13. Connect the pressure hose to the packer and open the ball valve.
14. Start injecting at the lowest possible pressure.
15. When ,necessary, slowly increase the injection pressure with the pressure regulator until the resin starts to flow smoothly.
16. When the injection is finished, lower the pressure with the pressure regulator and close the ball valve.
17. Pump all remaining resin out of the pump.
18. Fill the hopper with Washing Agent ECO and flush the pump.
19. Empty the pump
20. Fill the hopper with clean Washing Agent ECO and circulate at minimal pressure for 10 to 20 minutes.
21. Empty the pump.
22. Switch the pump off.
23. Strip the inlet and outlet valve to check the cleaning. Clean the valves with a tear-free rag drenched with Washing Agent ECO.
24. If the pump will not be used for a long period, it is recommended to slightly oil the pump.