Tunnelling and Civil Engineering

CarboLith PL

Technical Data Sheet

Approval Z-42.3-383 (DIBT)

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Uses

Non-foaming elasticised three-component resin having good adhesion even on moist surfaces for the application of short liners in local sewer repair.

CarboLith PL

- **impregnates fibre glass mats (Advantex™) and polyester fleeces well**
- **adheres to moist surfaces especially glazed stone ware**
- **does not foam, even in the presence of water**
- **cures well and fast even in thin layers**
- **can easily be demoulded**
- **has high resistance to aggressive water, acids as well as alkaline brines, does not hydrolyse**

CarboLith PL is a three component system, the curing time of which can be adjusted by the addition of component C.

Application:	**• German approval (DIBT)** **• fast application (cycle time 70 min.)** **• no emission of odour** **• high adhesive strength** **• high chemical resistance** **• low cost repair method**

Technical data

The data below are laboratory data only. They may vary in practice due to thermal exchange between resin and strata, surface properties of the stone, humidity, pressure and other factors. So the pot life basically depends on the temperature of the grout while the demould time depends on the ambient temperature.

Reaction data

Mixing ratio A:B:C	100:200:3.0 p.b.volume		Test Procedure
Start temperature °C	20 °C	25 °C	
Pot life (for spreading)	approx. 8'	approx. 10'	MCT PV 10-308
Time for placing	approx. 10'	approx. 15'	
Demould time	approx. 50'	approx. 60'	

For more details in temperature range (5°C to 25°C) see “Instruction CarboLith PL Spot Repair System”.

Material data

		Component A	Component B	Component C	Norm
Density at 25°C	kg/m³	1,490 ± 50	1,130 ± 40	1,120 ± 40	DIN 12 791
Colour		colourless	blackbrown	light brown	
pH value		12 – 13	-	12 – 13	DIN 19 268
Flash point	°C	none	>200	100	DIN 53 213
Viscosity at 25°C	mPa*s	270 ± 140	150 ± 100	40 ± 10	ISO 3219

Mechanical properties of the liner

				expertise
Ring stiffness (apex thrust)*	140	kPa	DIN EN 1228	5
Modulus apex thrust test	9,000	MPa	DIN EN 1228	5
Ring stiffness (apex thrust), short time** (S_O)	2.6	MPa	DIN EN 1228	2
Modulus apex thrust test, short time**	14,500	MPa	DIN EN 1228	2
Modulus apex thrust test, 400 d **	8,800	MPa	DIN EN 1228, DIN EN 761	2
Flexural strength, axial	140	MPa	DIN EN ISO 178	2,7
Flexural modulus, axial	5,600	MPa	DIN EN ISO 178	7
Flexural strength, radial	120	MPa	DIN EN ISO 178	7
Flexural modulus, radial	5,500	MPa	DIN EN ISO 178	7
Adhesive strength (glazed clay pipe)	2.2	MPa	DIN EN ISO 24 624	8
Adhesive strength (glazed clay pipe)	3.3	MPa	DIN EN ISO 24 624	2

*Pipe i.d 150 mm, liner thickness 4 mm; ** Pipe i.d 300 mm, liner thickness 4 mm
The values are taken from the indicated approvals, they are to be regarded as orientation values

Composition and properties

Components:
CarboLith PL component A is a special water-glass component (aqueous sodium silicate) with additives. Component B is a modified polyisocyanate. Component C is a blend of additives improving the components and regulating the pot life of the mix.

System:
The curing of component A results in a silicate; simultaneously a solid polyisocyanurate/polyurea is formed from the component B.

Final product:
Together they form an interpenetrating network, a tough-elastic, non-foamed silicate resin (organomineral resin)

- In conjunction with Advantex® glass, a properly placed short liner can endure multiple washings with 120 bar (1700 psi) (at the nozzle) without significant damage even after only 3 days curing.[6] Please note for safety reasons that you must limit the pressure at the rising nozzle on 80 bar (1130 psi) (water temperature < 20 °C, not longer than 3 min in a place)
- It is resistant against acids and alkali (24 hour storage in 10 % sulphuric acid or 5 % caustic soda)[2,7], likewise against a multiplicity of organic and inorganic liquids such as gasoline, diesel and mineraloils.[9]
- It complies with the German requirements for large and small scale seals in drinking water.[4]
- Also after 200000 changes of “Darmstäter Kipprinne” the short placed short liner was waterproof.[2]

Processing

Mixing

By appropriate addition of component C , the resin setting speed can be adjusted to meet the requirements of temperature, size of the liner and installation time. As a standard, we recommend the following dosage:

Temperature	above 18°C	2 p.b.v. C comp. On 100 p.b.v. A comp.
	below 18°C	3 p.b.v. C comp. On 100 p.b.v. A comp.
	below 10°C	4 p.b.v. C comp. On 100 p.b.v. A comp.

Component C is first homogenised and then mixed into the A component at the required dosage. This blend is mixed with double the volume of B comp and stirred vigorously for two minutes.

Soaking of the fibre glass mats

The fibre glass shall be of the Advantex® type or comparable. In order to achieve the prescribed liner thickness of at least 3 mm, either a double folded mat of 1,386 g/m³ or a triple folded mat of 1,086 g/m³ is used. The random layer (CSM) has to be on the exposed surface.
The mat of appropriate size is spread on a PE sheet. The resin mix is applied on either side by spatula or rubber wiper. Twice the resin mass is needed relative to the mass of the glass mat. If the surface is uneven (e.g. corroded concrete) or shows a high degree of cracking, the quantity must be accordingly higher. A second PE sheet is laid on top; by rolling it with a metal roll, the mat is completely impregnated.

Placing of the liner

An inflatable packer is wrapped with a cling foil (in order to prevent adhesion). Then it is wrapped tightly with the impregnated mat. The packer is put into position at the place requiring repair within the placing time. The packer is then inflated and kept at 1-2 bar pressure for one hour, deflated and withdrawn.

Curing of the liner

After demoulding the sewage water may pass through the liner. Complete curing is achieved within one week; the sewer then can be flushed with high pressure water. More details see “Instruction CarboLith PL Spot Repair System”.

Risk and safety phrases for CarboLith PL

Observe the usual precautionary measures for handling chemicals.

Component A:

Symbol Xi (irritant)
R36/38 Irritating to eyes and skin.
S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28 After contact with skin, wash immediately with plenty of water and soap. S36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

Component B:

Symbol: Xn (harmful)
Contains: Diphenylmethandiisocyanate, isomeres and homologues
R20 Harmful by inhalation. R36/37/38 Irritating to eyes, respiratory system and skin. R42/43 May cause sensitisation by inhalation and skin contact.
S23 Do not breathe fumes/aerosol. S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28 After contact with skin, wash immediately with plenty of water. S36/37/39 Wear suitable protective clothing, gloves and eye/face protection.S38 In case of insufficient ventilation, wear suitable respiratory equipment. S45 In case of accident or if you feel unwell, seek medical advice immediately (safety data sheet available from manufacturer on request).
Persons who are exposed to CarboLith PL or to any other polyurethane resins on a regular basis should undergo preventive medical examinations. Consult safety data sheets for additional information.

Component C:

Symbol: Xn (harmful)
R22 Harmful if swallowed. R36/38 Irritating to eyes and skin. S26 In case of contact with eyes, rinse immediately with plenty of water. S36/37/39 Wear suitable protective clothing, gloves and eye/face protection. S60 This material and its container must be disposed of as hazardous waste.

Packing

All forms of packing are approved to the danger goods regulation road (German GGVS).

Component A	Component B	Component C
7 kg in a can	5.5 kg in a can	1 kg in a can
28 kg in a can	21 kg in a can	5 kg in a can

Other packing units on request.

Storage, shelf life: at least six months from date of delivery when stored in a dry place between 10 and 30 °C. Frost may damage the A-component (if flocculation occurs please consult Minova CarboTech). If this time is exceeded, we recommend having the material checked by Minova CarboTech for compliance with specification

Disposal

Follow local regulations.
We recommend either to dispose of liquid residues in an incineration plant (EU disposal code 07 02 08 „other reaction and distillation residues“) or to cure the liquids with each other and dispose of the cured material in a domestic waste landfill or an incineration plant (EU disposal code 20 01 39„plastic parts“). Empty cans should be cleared of liquid by punching a hole through the edge of the cover and turn them upside down, until no liquid flows out any longer.

Certificates and expertise available

1. German approval Z-42.3-383 (DIBT, 2005)
2. Test report about short liners (PA 0529, IKT Gelsenkirchen, 2005)
3. Material test report on a liner for spot repair (P 00529, IKT Gelsenkirchen, 2005)
4. Expertise on drinking water compatibility and groundwater hygiene (Hygiene-Institut, Gelsenkirchen, 1999)
5. Material test report on a liner for spot repair (Report 00.04905 S Ingenieurbüro Siebert, Oststeinbek, 2000)
6. High pressure washing test according to the Hamburg standard (Report 02.057598 S Ingenieurbüro Siebert, Oststeinbek, 2002)
7. Bending strength, chemical resistance (Report 02.08394 S Ingenieurbüro Siebert, Oststeinbek, 2002)
8. Tear-off strength (Report 03.09773 S Ingenieurbüro Siebert, Oststeinbek, 2003)
9. Chemical stability CarboLith PL/Advantex Komposit (Minova CarboTech GmbH, 2005)

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