

## CONSTRUCTION

# CarboLith PL

## THREE-COMPONENT RESIN FOR SPOT REPAIR IN SEWER

### DESCRIPTION

CarboLith PL is a three-component system to be used for the application of short liners for spot repair in sewer.

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 mixture.

The curing of component A results in a silicate. Simultaneously a solid polyisocyanurate/polyurea is formed from the component B. Together they form an interpenetrating network, a tough-elastic, non-foamed silicate resin (organomineral resin).



### APPLICATION AND USE

Used for the application of short liners in sewer for spot repair.

- Impregnates E-CR-glass fibre mats
- Adheres to moist surfaces especially glazed stone ware
- Does not foam, even in the presence of water

### ADVANTAGES

- Fast application (cycle time approx. 60 min)
- No emission of odour
- High adhesive strength even on wet surfaces
- High chemical resistance - resistance to aggressive water, acids as well as alkaline brines, does not hydrolyse
- Low cost repair method
- Cures well and fast even in thin layers
- Can easily be demoulded

### TECHNICAL DATA

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

### MATERIAL DATA

Parameter	Unit	Comp. A	Comp. B	Comp. C	Standard
Density at 25 °C	kg/m <sup>3</sup>	1490 ± 50	1130 ± 40	1120 ± 40	DIN 12791-1
Colour	-	colourless	blackbrown	light brown	
pH-value		12-13	n. a.	12-13	DIN 19268
Flash point	°C	none	> 200	100	DIN 53213
Viscosity at 25 °C	mPa*s	270 ± 140	150 ± 100	40 ± 10	DIN EN ISO 3219

**REACTION DATA (TYPICAL VALUES)**  
**CARBOLITH PL 3K**

Start temperature (°C)	10 °C	15 °C	20 °C
Pot life (for spreading)	approx. 10 min		
Time for placing	approx. 20 min		
Demould time	approx. 60 min		
Mixing ratio A : B : C (Vol.-T.)	100 : 200 : 4	100 : 200 : 3	100 : 200 : 2

**REACTION DATA (TYPICAL VALUES)**  
**CARBOLITH PL 2K SUMMER**

Start temperature (°C)	20 °C	25 °C	30 °C
Pot life (for spreading)	approx. 15 min	approx. 12 min	approx. 8 min
Time for placing	approx. 25 min	approx. 20 min	approx. 10 min
Demould time	approx. 90 min	approx. 60 min	approx. 50 min
Mixing ratio A : B : C (Vol.-T.)	100 : 200 Vol.-T.		

**REACTION DATA (TYPICAL VALUES)**  
**CARBOLITH PL 2K WINTER**

Start temperature (°C)	10 °C	15 °C	20 °C
Pot life (for spreading)	approx. 12 min	approx. 10 min	approx. 8 min
Time for placing	approx. 25 min	approx. 20 min	approx. 10 min
Demould time	approx. 90 min	approx. 60 min	approx. 50 min
Mixing ratio A : B : C (Vol.-T.)	100 : 200 Vol.-T.		

**REACTION DATA (TYPICAL VALUES)**  
**CARBOLITH PL 2K FAST**

Start temperature (°C)	10 °C	15 °C	20 °C
Pot life (for spreading)	approx. 8 min	approx. 6 min	approx. 4 min
Time for placing	approx. 15 min	approx. 10 min	approx. 5 min
Demould time	approx. 50 min	approx. 40 min	approx. 35 min
Mixing ratio A : B : C (Vol.-T.)	100 : 200 Vol.-T.		

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

**MECHANICAL PROPERTIES OF RESIN**

Parameter	Value	Unit	Standard
Density	1270	kg/m <sup>3</sup>	DIN EN 1183-1
Tensile strength	≥ 11	MPa	DIN EN 527-2
E-modulus tensile	≥ 90	kPa	DIN EN 527-2
Compressive strength	≥ 35	MPa	DIN EN 604
E-modulus compression	≥ 500	MPa	DIN EN 604
Flexural stress at 2% elongation	≥ 9	MPa	DIN EN ISO 178
Shore D-hardness	>60	MPa	DIN 53505
Shrinkage value	≤ 0.1	%	based on ISO 2577:2007

## MECHANICAL PROPERTIES OF LINER

Parameter	Value	Unit	Standard	Expertise
Ring stiffness (apex thrust)*	140	kPa	DIN EN 1228	5
Modulus apex thrust test*	≥ 4500	MPa	DIN EN 1228	5
Ring stiffness (apex thrust), short time ** (S <sub>0</sub> )	2.6	kPa	DIN EN 1228	2
Modulus apex thrust test, short time**	≥ 4500	MPa	DIN EN 1228	2
E Modulus apex thrust test, 400 d**	≥ 4500	MPa	DIN EN 1228, DIN EN 761	2
Flexural strength axial / radial	≥ 100	MPa	DIN EN ISO 178	2.7
Flexural modulus axial / radial	≥ 4500	MPa	DIN EN ISO 178	7
Adhesive strength (glazed clay pipe)	≥ 2.0	MPa	DIN EN ISO 24624	2/8

\*internal pipe diameter 150 mm, liner thickness 4 mm;

\*\*internal pipe diameter 300 mm, liner thickness 4 mm

The values are taken from the indicated approvals; they need to be observed as orientation values.

## APPLICATION METHOD

### 1. 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.

Component C has to be homogenised first 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.

### 2. Soaking of the fibre glass mats

The E-CR-glass fibre mats shall be a substrate for the resin. In order to achieve the prescribed liner thickness of at least 3 mm, either a double folded glass fibre mat of 1400 g/m<sup>2</sup> ±4 % or a triple folded mat of 1100 g/m<sup>2</sup> ±4 % 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. The resin volume which is needed is 1,9 times of the total area (m<sup>2</sup>) of the glass fibre

mat by using 1400 g/m<sup>2</sup> ±4 % glass fibre mat or is 1,5 times of the total area of the glass fibre mat by using the 1100 g/m<sup>2</sup> ±4 % glass fibre mat.

The information about a detailed chart containing different pipe diameters, damage lengths, resultant cuttings and resin quantities please find in the “Manual CarboLith PL Spot Repair System”.

If the surface is uneven (e.g. corroded concrete) or shows a high degree of cracking, the quantity must be accordingly higher.

### 3. 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 glass fibre mat. The packer is put into position at the place requiring repair within the placing time. The packer is inflated and, depending on used catalyst volume, kept at 1 - 2 bar pressure for approx. one hour, deflated and withdrawn.

### 4. 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. For complete details see “Instruction CarboLith PL Spot Repair System”.

### 5. Final product

In conjunction with E-CR-glass fibre mats, 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.<sup>6</sup> Please note for safety reasons that you must limit the pressure at the rising nozzle to 80 bar (1130 psi) (water temperature < 20 °C, not longer than 3 min in a place).

It is resistant against acids and alkali (24 hours storage in 10 % sulphuric acid or 5 % caustic soda) <sup>2,7</sup>, likewise against a multiplicity of organic and inorganic liquids such as gasoline, diesel and mineraloils.<sup>9</sup>

It complies with the German requirements for large- and small-scale seals in drinking water.<sup>4</sup>

Also, after 200 000 tilt movements of “Darmstädter Kipprinne” the placed short liner was waterproof <sup>2</sup>

## SAFETY INSTRUCTIONS AND LIMITATIONS

Observe the usual precautionary measures for handling chemicals, see MSDS.

## **PACKAGING AND TRANSPORTATION**

All forms of packing are approved to the danger goods regulation road, railway, domestic shipping.

The components A and B can be delivered in 5/20/200 l units; the C component in 1.5 l units.

The two- component systems are available in 10 l units as well in bottles (0.7 l and 1 l).

Other packaging units are available on request. Details are shown in the offer.

## **STORAGE AND SHELF LIFE**

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

## **DISPOSAL**

Follow local regulations.

## **APPROVALS AND CERTIFICATES**

1. **DIBt:** German approval Z-42.3-383 (DIBt, 2015)
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, 2005)
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 composite (Minova CarboTech GmbH, 2005)

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## **ADDITIONAL DOCUMENTATION**

- MSDS of CarboLith PL
- "Instruction CarboLith PL Spot Repair System"

## **LIST OF REPRESENTATIVES**

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