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### **Tunnelling and Civil Engineering**

### **CarboPur WFA**

### Uses:

Extremely fast reacting two-component-injection resin, CFC-free and halogen-free. This resin is designed for sealing and consolidation in water-bearing strata.

- Consolidation in wet and water-bearing strata
- □ Sealing against strong water ingress (also seawater)
- Sealing against water under pressure e.g. from strata, dams or shaft walls
- □ Stabilisation and sealing work in tunnels
- Repair of old shafts and tunnels
- □ Stabilisation of crown abutments in tunnelling
- □ Sealing of anchoring of sheet pilings etc. in ground water
- and many other special applications

Applicable at temperatures between -25 °C and +30 °C, recommended for sealing water at low temperatures.

CarboPur WFA fulfils the fire examination according to DIN 4102-1 – Building material class B2 (normally inflammable).

#### Advantages: constituent of the Minova CT sealing philosophy, compatible with CarboPur WF and WT for wide-ranging injections very fast setting immediate sealing effect stabilising effect compatible with groundwater

### **Technical Data:**

The data below are laboratory data. They may vary in practice due to thermal exchange between resin and strata, surface properties of the stone, humidity, pressure, and other factors

### **Reaction Data:**

	without c wa	ontact to ter	with contac (1 % relativ	t to water ve to mix)	with conta (2 % relati	ct to water ve to mix)	Test Proce- dure
Starting temperature	10 °C	15 °C	10 °C	15 °C	10 °C	15 °C	
Start of foaming	-	-	50 s ± 10 s	40 s ± 10 s	55 s ± 10 s	40 s ± 10 s	MCT PV 10- 301
End of foam- ing/Setting time	45 s ± 5 s	35 s ± 5 s	1 min 20 s ± 20 s	60 s ± 20 s	1 min 25 s ± 20 s	1 min 10 s ±20 s	MCT PV 10- 301
Foaming factor	1.0 – 1.3	1.0 – 1.3	3 – 8	3 – 8	3 – 15	3 – 15	MCT PV 10- 301



### Material Data:

		Component A	Component B	Norm
Density at 25 °C	kg/m <sup>3</sup>	1010 ± 30	1230 ± 30	DIN 12791
Colour		honey	dark brown	
Flash point	°C	> 150	> 150	DIN 53213
Viscosity at 25 °C	mPa*s	200 ± 50	$200 \pm 50$	ISO 3219
Viscosity at 15 °C	mPa*s	430 ± 100	550 ± 100	ISO 3219
Viscosity at 10 °C	mPa*s	640 ± 150	920 ± 150	ISO 3219
Surface tension (20 °C)	mN/m	36	48	EN 14210

### **Mechanical Data:**

		Norm	Expertise
Compression strength (unfoamed)	80 ± 10 MPa	ISO 604	
Upsetting at break	10 ± 1.0 %	ISO 604	
Compression strength (foam factor 1.7)	20 ± 5 MPa	ISO 604	
Compression strength (foam factor 2.1)	14 ± 4 MPa	ISO 604	
Upsetting at break	10 ± 1.0 %	ISO 604	
Tensile strength (unfoamed)	50 ± 10 MPa	ISO 527	
Elongation at break (unfoamed)	$2.3 \pm 0.5 \%$	ISO 527	
Adhesive strength (dry surface, 30 °C, 80 % rel. h.)	> 6,5 MPa after 1 h	DMT-Method	1
dyn. E-Modulus (unfoamed)	approx. 2500 MPa	EN 14146	4
dyn. E-Modulus (foam factor 3)	approx. 200 MPa	EN 14146	4
Creep (2 MPa load, 40 d; unfoamed)	0.1 %	DIN 4093	5
Creep (2 MPa load, 40 d; foam factor 1.7)	0.2 %	DIN 4093	5
Creep (2 MPa load, 40 d; foam factor 2.1)	0.3 %	DIN 4093	5
Shore Hardness	D 78 ± 5	ISO 7619-1	

### **Composition and Properties:**

#### Components:

CarboPur WFA, Comp. A is a mixture of various polyols and additives which reacts with the B-component to form a tough/hard polyurethane resin.

CarboPur, comp. B is a polyisocyanate.

System:

The mixed resin penetrates the structure to be sealed. The major part of water in there is displaced due to the hydrophobicity and the viscosity of the resin. Traces of water make the resin foam.

### Final Product:

According to its contact with water, the resin foams up more or less. Thus, the mechanical properties vary a lot. The cured resin is resistant against many acids, alkali and salt brines as well as organic solvents (if in doubt consult Minova CarboTech).

- Professional processing provided, there are no objections against the use of CarboPur WFA in respect of groundwater and drinking water hygiene.
- CarboPur WFA is compatible with concrete and steel.
- After one year storage in air, water, sulphuric acid and sodium hydroxide solution, compressive strength and modulus are slightly increased: there is no swelling nor shrinking.
- CarboPur WFA can take a continuous load of 2 MPa at a foam factor of 2.1, the deformation increase in seven days is less than 0.02 %.



### Processing:

The two components are pumped by a dual component pump at the volumetric ratio of 1 : 1, they are mixed thoroughly in a static mixer unit prior to injection into the strata via a packer installed in a previously drilled borehole. In contact with water, the resin then foams up. The following reaction mix displaces then the preceding one. Since this mixture does not meet anymore water it hardens without foaming to form a pore-free material. Thus a water-tight shell is formed which, in turn, is surrounded by a zone consolidated by foamed-up polyurethane. This means that only one application cycle with one material is necessary for arriving at permanent sealing and consolidation.

#### Recommendation:

We recommend that before processing, the product be stored for at least 12 h at a minimum temperature of 15 °C to achieve the recommended processing temperature of between 15 °C to 30 °C. When the material is warmed up, local overheating, e. g. at the container wall, must be avoided by any means.

### Risk and safety phrases for handling CarboPur WFA:

Observe the usual precautionary measures for handling chemicals.

Component A: Symbol: Xn (harmful) Contains: Polypropylenglykol R22 Harmful if swallowed. S23 Do not breathe aerosol. S36 Wear suitable protection clothing. S60 This material and its container must be disposed of as hazardous waste.

<u>Component B:</u> Symbol: Xn (harmful)

R20 Harmful by inhalation. R36/37/38 Irritating to eyes, respiratory system and skin. Limited evidence of a carcinogenic effect. R42/43 May cause sensitization by inhalation and skin contact. R48/20 Harmful: Danger of serious damage to health by prolonged exposure through inhalation.

S9 Keep container in a well-ventilated place. S23 Do not breathe fumes/aerosol. S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S36/37 Wear suitable protective clothing and gloves. S45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S60 This material and its container must be disposed of as hazardous waste. Z1 Contains isocyanates: See information supplied by the manaufacturer.

Persons who are exposed to CarboPur WFA or to any other polyurethane resins on a regular basis should undergo preventive medical examinations. Consult safety data sheets for additional information.

Observe the usual precautionary measures for handling chemicals.

### Packaging:

All forms of packing are approved to the danger goods regulation road (German GGVS). The quantities of the individual components correspond to the mixing ratio of approx. 1 : 1 by volume.

### Component A:

20 kg in a tin can (blue cap) 200 kg in a drum

Component B:

24 kg in a tin can (black cap) 240 kg in a drum

Other packing units on request.



### Storage, shelf life:

At least six months from date of delivery or twelve months from date of production when stored in a dry place between 10 °C and 30 °C. When this time is exceeded, we recommend having the material checked by Minova Carbo-Tech for compliance with specification.

The local legislation on storage has to be observed.

### **Disposal:**

Follow local regulations.

We recommend either to dispose of liquid residues in an incineration plant (EU disposal code 08 04 10 resp. 08 05 01) or to cure the liquids and dispose of the cured foam in a domestic waste landfill or an incineration plant (EU disposal code 20 01 39).

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.

### **Expertise and Test Reports:**

1 Test report on adhesive strength (DMT MinTec Essen, 1999) 2

- Compatibility with building material (GHS Kassel)
- 3 Report on the fire properties (CSIR, Pretoria, RSA)
- 4 Test report on longterm compressive strength (Erdbaulabor Essen)
- 5 Test report on retardation and creep (Erdbaulabor Essen)
- 6 Test report to the DIBt-Working sheet "Assessment of the effects of construction products and groundwater" (Hygiene Institut Gelsenkirchen, 2006)
- 7 Registration number KR07-160 (Product register, Sweden 2008)
- 8 Certificate according to KTW-guidelines (LADR GmbH, 2010)

The data in this sheet conform to our best knowledge and experience at the date of printing, which is indicated below. The state of knowledge and experience are evolving constantly. Please pay attention therefore, that you always refer to the current version of this data sheet.

The description of the product application in this sheet cannot take the special conditions and circumstances into account emerging from the individual case. Please check our product therefore in any case prior to use for its aptitude in the actual application. Application, use and processing of our product occur outside of our control capabilities. That is why they as well as the processing result achieved based on our information are exclusively subject to your own responsibility.

No data in this sheet constitute a guarantee in a legal sense. It is clarified that our liability is limited to the contractual acknowledgements for the purchase of this product.

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