

**Test report no. 220000631-21-(Sys C)-L-e dated 18.02.2022****Client Saudi Vitrified Clay Pipe Co., Ltd.**  
P.O. Box 6415Riyadh 11442  
Kingdom of Saudi-Arabia**Manufacturing plants Frechem GmbH & Co. KG**  
Frechen**Surveillance contract 220000631****Underlying specification** Material tests on Polyurethane (PUR)-sealing- and rigid fairing materials according to the surveillance contract**Subject of inspection** Polyurethane (PUR)- sealing- and rigid fairing materials for jointing vitrified clay pipes – **system C** – according to DIN EN 295-1:2013-05  
**Dispensing unit Fittings Spigot, PUR elastic**  
**Dispensing unit Big Carousel Spigot, PUR elastic**  
**Dispensing unit Small Carousel Spigot, PUR elastic**  
**Dispensing unit Fittings Socket, PUR hard**  
**Dispensing unit Big Carousel Socket, PUR hard**  
**Dispensing unit Small Carousel 1/2, PUR hard****Surveillance period:** Manufacturing year 2021**Inspection date/date of sampling:** 27.11. – 02.12.2021**Receipt of samples:** 13.12.2021**Period of testing:** 31.01.2022*The results of the tests refer exclusively to the samples named above.**Test reports may only be published or reproduced without the permission of MPA NRW if unchanged in form and content. The abridged reproduction of a test report requires the consent of MPA NRW.*

This test report consists of 4 pages and 4 enclosures.

**1. Subject of inspection**

Sample designation: Polyurethane (PUR)- sealing- and rigid fairing materials for jointing vitrified clay pipes – **system C** –

Manufacturing plant: Frechem GmbH & Co. KG, Frechen

Raw material supplier: Frechem GmbH & Co. KG, Frechen

Elastic sealing material: J77/VP 902

Rigid fairing material 033/033A or KS45/033A, resp.

Dispensing unit	PUR-elastic		PUR-hard		
	Samples	Designation	Samples	Type	Designation
Products sampled:	Fittings Spigot	Test sheets 5mm / 2mm	No. 1 29.11.2021	Test sheets 5mm / 2mm	Socket compact No. 2 29.11.2021
	Big Caroussel Spigot	Test sheets 5mm / 2mm	No. 3 29.11.2021	Test sheets 5mm / 2mm	Socket compact No. 4 29.11.2021
	Small Caroussel Spigot	Test sheets 5mm / 2mm	No. 5 29.11.2021	1 Piece	Small C. 1 Foam No. 6 29.11.2021
	Small Caroussel 2			1 Piece	Small C. 2 Foam No. 7 29.11.2021

Place of sampling: Plant of client

Place of testing: MPA NRW, Dortmund

Sampling executed by: Employee of MPA NRW

## 2. Underlying specifications

### 2.1 Basic underlying

DIN EN 295-1:2013-05	„Vitrified clay pipe systems for drains and sewers - Part 1: Requirements for pipes, fittings and joints“
DIN EN 295-2:2013-05	„Vitrified clay pipe systems for drains and sewers - Part 2: Evaluation of conformity and sampling“
DIN CEN/TR 16626 DIN SPEC 19629:2014-04	„Vitrified clay pipe systems for drains and sewers - Guidance for voluntary third-party certification procedures“
DIN EN 295-3:2012-03	„Vitrified clay pipe systems for drains and sewers - Part 3: Test methods; German version EN 295-3:2012“
DIN EN 681-4:2006-11	„Elastomeric seals – Material requirements for pipe joint seals used in water and drainage applications – Part 4: Cast polyurethane sealing elements; German version EN 681-4:2000 + A1:2002 + A2:2005“

### 2.2 Storage and handling

DIN ISO 23529:2020-10	„Rubber - General procedures for preparing and conditioning test pieces for physical test methods (ISO 23529:2010)“, Unless specified deviantly
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### 2.3 Mechanical tests on sealing elements

DIN EN 681-4:2006-11	„Elastomeric seals – Material requirements for pipe joint seals used in water and drainage applications – Part 4: Cast polyurethane sealing elements; German version EN 681-4:2000 + A1:2002 + A2:2005“
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### 2.4 Mechanical tests on Duromers

DIN EN 295-3:2012-03, Clause 25	„Creep behaviour of rigid fairing materials“
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### 3. Results

The results of tests are stated in **enclosures 1-4**.

The results comply with the requirements of the standards mentioned under point 2.

All results are stated within the scope of the underlying product surveillance contract not considering measurement uncertainties.

Dortmund, den 18. February 2022

By order

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Liratsch

Official in charge

**Properties of polyurethane (PUR) sealing and fairing materials**

**Dispensing unit** Elastic sealing material: **J77/VP 902**  
**Line Fittings Spigot** Raw material supplier: Frechem GmbH & Co. KG  
 No.:1 Date of production: 29.11.2021

Table 1: Tests and requirements according to DIN EN 681-4:2006-11 in conjunction with DIN EN 295-3:2012-03, Section 18

Property	n No. of single values	Unit	Test results			Requirement
			Extreme values		Median	
Tensile strength	6	N/mm <sup>2</sup>	3,2	4,9	<b>4,3</b>	≥ 2
Elongation at break	6	%	84	145	<b>118</b>	≥ 90
Hardness	5	Shore A	67	67	<b>67</b>	67 ± 5
Compression set						
24 h, 70°C	3	%	14,1	15,4	<b>15,3</b>	< 20
70 h, 23°C	3	%	1,9	2,6	<b>1,9</b>	< 5
Resistance to ageing						
Hardness after 7 d/70°C	5	Shore A	62	63	<b>62</b>	67 ± 5
Stress relaxation in compression						
7 d ( $\Delta\sigma$ 1:4)	1	%	<b>4,6</b> (evaluation test only)			≤ 14
100 d	-	%				≤ 16
Behaviour at low temperature -10°C						
Hardness	5	Shore A	69	71	<b>70</b>	≤ 80

**Dispensing unit** Polyurethan rigid fairing material: **033/033A**  
**Line Fittings Socket** Raw material supplier: Frechem GmbH & Co. KG  
 No.: 2 Date of production: 29.11.2021

Table 2: Tests and requirements according to EN 295-1:2013-05, section 6.1.4 and EN 295-3:2012-03, section 25.1

Property	n No. of single values	Unit	Test results			Requirement
			Extreme values		Median	
Creep deformation at 1,25 N/mm <sup>2</sup> acc. to DIN EN 295-3:2012-03, sec. 25						
ε <sub>0</sub>	3	%	0,9	2,3	<b>1,6</b>	≤ 5
Δε <sub>4,0</sub>	3	%	2,7	4,8	<b>3,3</b>	≤ 8

**Properties of polyurethane (PUR) sealing and fairing materials**

**Dispensing unit** Elastic sealing material: **J77/VP 902**  
**Big Caroussell Spigot** Raw material supplier: Frechem GmbH & Co. KG  
 No.:3 Date of production: 29.11.2021

Table 3: Tests and requirements according to DIN EN 681-4:2006-11 in conjunction with DIN EN 295-3:2012-03, Section 18

Property	n No. of single values	Unit	Test results			Requirement
			Extreme values		Median	
Tensile strength	6	N/mm <sup>2</sup>	2,6	5,1	<b>4,6</b>	≥ 2
Elongation at break	6	%	86	129	<b>119</b>	≥ 90
Hardness	5	Shore A	67	68	<b>68</b>	67 ± 5
Compression set						
24 h, 70°C	3	%	14,5	15,6	<b>15,1</b>	< 20
70 h, 23°C	3	%	1,3	2,6	<b>1,9</b>	< 5
Resistance to ageing						
Hardness after 7 d/70°C	5	Shore A	65	66	<b>65</b>	67 ± 5
Stress relaxation in compression						
7 d ( $\Delta\sigma$ 1:4)	1	%	<b>3,4</b>			≤ 14
100 d	-	%	(evaluation test only)			≤ 16
Behaviour at low temperature -10°C						
Hardness	5	Shore A	73	75	<b>74</b>	≤ 80

**Dispensing unit** Polyurethan rigid fairing material: **033/033A**  
**Big Caroussell Socket** Raw material supplier: Frechem GmbH & Co. KG  
 No.: 4 Date of production: 29.11.2021

Table 4: Tests and requirements according to EN 295-1:2013-05, section 6.1.4 and EN 295-3:2012-03, section 25.1

Property	n No. of single values	Unit	Test results			Requirement
			Extreme values		Median	
Creep deformation at 1,25 N/mm <sup>2</sup> acc. to DIN EN 295-3:2012-03, sec. 25						
ε <sub>0</sub>	3	%	1,3	2,5	<b>2,2</b>	≤ 5
Δε <sub>4,0</sub>	3	%	4,3	5,4	<b>4,5</b>	≤ 8

**Properties of polyurethane (PUR) sealing and fairing materials**

**Dispensing unit** Elastic sealing material: **J77/VP 902**  
**Small Caroussell Spigot** Raw material supplier: Frechem GmbH & Co. KG  
 No.:5 Date of production: 29.11.2021

Table 5: Tests and requirements according to DIN EN 681-4:2006-11 in conjunction with DIN EN 295-3:2012-03, Section 18

Property	n No. of single values	Unit	Test results			Requirement
			Extreme values		Median	
Tensile strength	6	N/mm <sup>2</sup>	4,1	5,5	<b>4,8</b>	≥ 2
Elongation at break	6	%	101	157	<b>136</b>	≥ 90
Hardness	5	Shore A	67	68	<b>68</b>	67 ± 5
Compression set						
24 h, 70°C	3	%	11,8	15,3	<b>13,6</b>	< 20
70 h, 23°C	3	%	3,8	5,6	<b>4,2</b>	< 5
Resistance to ageing						
Hardness after 7 d/70°C	5	Shore A	65	66	<b>65</b>	67 ± 5
Stress relaxation in compression						
7 d ( $\Delta\sigma$ 1:4)	1	%	<b>4,7</b> (evaluation test only)			≤ 14
100 d	-	%				≤ 16
Behaviour at low temperature -10°C						
Hardness	5	Shore A	69	70	<b>70</b>	≤ 80

**Dispensing unit** Polyurethan rigid fairing material: **Foam KS45/033A**  
**Small Caroussell 1** Raw material supplier: Frechem GmbH & Co. KG  
 No.: 6 Date of production: 29.11.2021

Table 6: Tests and requirements according to EN 295-1:2013-05, section 6.1.4 and EN 295-3:2012-03, section 25.1

Property	n No. of single values	Unit	Test results			Requirement
			Extreme values		Median	
Creep deformation at 1,25 N/mm <sup>2</sup> acc. to DIN EN 295-3:2012-03, sec. 25						
ε <sub>0</sub>	3	%	1,9	3,5	<b>3,2</b>	≤ 5
Δε <sub>4;0</sub>	3	%	3,0	5,5	<b>5,5</b>	≤ 8

<b>Dispensing unit</b>	Polyurethan rigid fairing material:	<b>Foam KS45/033A</b>
<b>Small Caroussell 2</b>	Raw material supplier:	Frechem GmbH & Co. KG
No.: 7	Date of production:	29.11.2021

Table 7: Tests and requirements  
 according to EN 295-1:2013-05, section 6.1.4 and EN 295-3:2012-03, section 25.1

Property	n No. of single values	Unit	Test results		Requirement	
			Extreme values	Median		
Creep deformation at 1,25 N/mm <sup>2</sup> acc. to DIN EN 295-3:2012-03, sec. 25						
$\epsilon_0$	3	%	1,0	3,0	<b>1,2</b>	≤ 5
$\Delta\epsilon_{4,0}$	3	%	1,9	5,1	<b>2,5</b>	≤ 8