

Test report no. 220012506-1-e

Client

Primasil Silicones Ltd.
Kington Rd
Weobley
HR4 8 QU Herefordshire

United Kingdom

Date of order

18.08.2017

Receipt of samples

22.01.2018

Date of the tests

till 18.04.2018

Instructions

Material tests to DIN EN 14241-1:2013-11 „Chimneys – Elastomeric seals and elastomeric sealants – Material requirements and test methods – Part 1: Seals in flue liners“

Classification: **EN 14241-1 T120 W1 K2 I**

Description of specimen

Elastomer : **Silicone** (PR410/60) X5726/1.
Number of specimens : 15 plates – specimen from production tool
Form of specimens : 15 plates (300x300) x 2 mm and 16 Buttons (6mm thickness)

Underlying regulations

DIN EN 14241-1:2013-11 „Chimneys - Elastomeric seals and elastomeric sealants -Material requirements and test methods - Part 1: Seals in flue liners“

Description of the tests

Storage and testing of the test pieces were carried out in a standard conditioning atmosphere, DIN EN ISO 291 - 23/50 - class 2 provided that nothing else is expressly stated or specified by the underlying regulations.

The results of the tests refer exclusively to the above described samples/objects for testing.

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This test certificate comprises of 3 pages and 4 enclosure.

This document was originally written in German. In cases of doubt the German version shall prevail

Shore A hardness

ISO 7619-1:2012-02 "Rubber, vulcanized or thermoplastic - Determination of indentation hardness - Part 1: Durometer method (Shore hardness)

Testing instrument : Shore Durometer type A
Form of specimens : Standard specimens, thickness of the individual layer 2,2 mm, 3 layers
Number of specimens : 6 in new condition, and 6 of each type of storage

Hardness IRHD

DIN ISO 48:2016-09 "Rubber, vulcanized or thermoplastic - Determination of hardness (hardness between 10 IRHD and 100 IRHD)"

Test device: : Hardness tester IRHD-M according to DIN ISO 48
Test method: : Method M, thickness of single layers 2,2 mm
Shape of specimens: : Standard specimen
No. of specimens: : 6 in new condition, and 6 of each type of storage

Density

ISO 2781:2008-05 "Rubber, vulcanized or thermoplastic - Determination of density"

Testing method : Method A, Immersion method
Form of specimens : Stripes
Number of specimens : 6

Compression set

DIN ISO 815-1:2016-09 "Rubber, vulcanized or thermoplastic - Determination of compression set - Part 1: At ambient or elevated temperatures".

Test conditions : 25% deformation, 24 h storage at nominal temperature
Form of specimens : Type B, thickness of the individual layer 2,2 mm, 3 layers
Number of specimens : 6

Tensile properties (tensile strength, elongation, modulus at 100%)

ISO 37:2017-11: "Rubber, vulcanized or thermoplastic - Determination of tensile stress-strain properties"

Testing instrument : Universal tester - class 1, in accordance with DIN EN ISO 7500-1 supplement 1-100 N - with touchless extensometer
Test speed : 500 mm/min
Form of specimens : Type 2, thickness of the individual layer 2,2 mm
Number of specimens : 6 in new condition, and 6 of each type of storage

Resistance to thermal load

Test pieces were stored for 28 and 56 days in a heating cabinet with enforced aeration to ISO 188 at $(120 \pm 2)^\circ\text{C}$. After reconditioning to the standard conditioning atmosphere DIN ISO 23529 the test pieces were submitted to the tests of hardness, tensile strength, tensile stress at 100 % elongation and elongation at break. The changes of the properties were calculated.

Resistance to condensate exposure

Test pieces were immersed for 28 and 56 days in a test condensate according to the applied classification. The test condensate was mixed according to table 6 of DIN EN 14241-1 for corrosion class 1 related to construction class 2. Storage conditions: $(90 \pm 1)^\circ\text{C}$ to ISO 1817. After reconditioning to the standard conditioning atmosphere DIN ISO 23529 the test pieces were submitted to the tests of hardness, tensile strength, tensile stress at 100 % elongation and elongation at break. The changes of the properties were calculated.

Cyclic condensate resistance test

The test was performed according to DIN EN 14241-1, clause 6.5. Test pieces were tested cyclically by immersion in test condensate mixed according to the applied classification for corrosion class 2 related to construction class 2 - at the storage temperature of $(60 \pm 1)^\circ\text{C}$ and at $(110 \pm 2)^\circ\text{C}$ in air, respectively.

Test conditions: 25 % elongation
No. of cycles: 12
Shape of specimens: Test pieces
No. of specimens: 6

Stress relaxation in compression

ISO 3384-1:2015-12 "Rubber, vulcanized or thermoplastic - Determination of stress relaxation in compression - Part 1: Testing at constant temperature "

Test conditions: 25 % deformation, 3 weeks storage at nominal temperature
Shape of specimens: Standard test pieces, thickness 1,2 mm
No. of specimens: 3
Test method: Method A

Results

The results of the tests are listed in the table/enclosure 1-2.

Result of the cyclic condensate resistance test:

After 12 cycles at $60^\circ\text{C}/110^\circ\text{C}$ no cracking nor other damages at surfaces or edges were detected by visual inspection at 100 % elongation of the test pieces.

Assessment

The results of the performed tests meet the requirements of the underlying specification DIN EN 14241-1 for classification T120 W1 K2 I.

Dortmund, 25. April 2018
By Order

Dipl.-Ing. Julia Wendzinski
Head of the Testing Department

Properties of seals for chimneys to DIN EN 14241-1:2013-11

Material type no.: **Silicone (PR410/60) X5726/1.** Classification: **EN 14241-1 T120 W1 K2 I**
 Corrosion class 1, construction class 2
 Thermal load: 120°C

Property	n No. of single values	Storage conditions		Results			Change abso- lute	Change %	Total	Require- ment *)
				Extreme values (Min/max)		Median				
Hardness [Shore A]	6	New condition		59	61	60			---	
	6	Air	28 days	61	62	61	+1			
	6	120°C	56 days	61	63	62	+1		+ 2	≤ 7/10
	6	Condensate	28 days	63	64	63	+3			
	6	90°C	56 days	63	64	64	+1		+4	≤ 7/10
Hardness [IRHD]	6	New condition		67	69	68				
	6	Air	28 days	67	70	69	+1			
	6	120°C	56 days	69	70	70	+1		+ 2	≤ 7/10
	6	Condensate	28 days	71	73	72	+4			
	6	90°C	56 days	71	73	73	+1		+5	≤ 7/10
Tensile strength [N/mm ²]	6	New condition		9,0	10,5	9,7				
	6	Air	28 days	9,7	10,4	10,0	+0,3	+3,1		
	6	120°C	56 days	9,5	10,3	9,9	-0,1	-1,0	2,1 %	≤30/50%
	6	Condensate	28 days	7,1	7,7	7,5	-2,2	-22,7		
	6	90°C	56 days	6,1	7,1	6,2	- 1,3	-13,4	36,1 %	≤30/50%
Tensile stress at 100% elongation	6	New condition		1,5	1,7	1,6				
	6	Air	28 days	1,6	1,8	1,7	+0,1	+6,3		
	6	120°C	56 days	1,5	1,7	1,6	-0,1	-6,3	0 %	≤ 35/45%
	6	Condensate	28 days	1,7	1,9	1,7	+0,1	+6,3		
	6	90°C	56 days	1,6	1,8	1,8	+0,1	+6,3	12,5 %	≤ 35/45%
Elongation at break [%]	6	New condition		520	613	553				
	6	Air	28 days	522	608	585	+32	+5,8		
	6	120°C	56 days	529	591	558	-27	-4,9	0,9 %	≤ 30/50%
	6	Condensate	28 days	452	479	470	-83	-15,0		
	6	90°C	56 days	393	458	402	-68	-12,3	27,3 %	≤ 30/50%

All changes absolute (by unit) or relative (%) are relating to the changes in-between values/starting values and final values/in-between values.

*) After 56 days of exposure the properties hardness, tensile strength, and tensile stress at 100 % elongation shall not deviate from the original value by more than the first values as listed in the table, column "Requirement". If the change of a property is bigger, then the deviation from the original value shall not be more than the second values as listed in the table, column „Requirement“, and the change in properties, between 28 days and 56 days of exposure shall be smaller than the change between the original value and 28 days of exposure (stabilisation of the material).

Properties of seals for chimneys to DIN EN 14241-1:2013-11

Material type no.: **Silicone (PR410/60) X5726/1.** Classification: **EN 14241-1 T120 W1 K2 I**
 Corrosion class 1, construction class 2
 Thermal load: 120°C

Property	n No. of single values	Storage conditions		Results			Change abso- lute	Change %	Total	Require- ment *)
				Extreme values (Min/max)		Median				
Density [g/cm ³]	6	New condition		1,18	1,18	1,18	---	---	---	---
Com- pression set [%]	6	New condition 120°C		2,6	6,3	3,5	---	---	---	≤ 25%
Stress relaxation [%]	3	Air 120°C 6,3 mm	21 days	17,1	17,5	17,2	---	---	---	≤ 50%



