MPA NRW.
Materialprüfungsamt Nordrhein-Westfalen
PRÜFEN ▪ ÜBERWACHEN ▪ ZERTIFIZIEREN

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Test report no. 220012506-2-1-e

Client

Primasil Silicones Ltd.
Kington Rd
Weobley
HR4 8 QU Herefordshire

United Kingdom

Date of order
18.08.2017

Receipt of samples
07.11.2017

Date of the tests
till 29.01.2018

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 W2 K2 I**

Description of specimen

Elastomer	: **EPDM PR1050/65 – Batch-no (5063B/107)**
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 sigle 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 ± 2)°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 7 of DIN EN 14241-1 for corrosion class 2 related to construction class 2. Storage conditions: (90 ± 1)°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 ± 1)°C and at (110 ± 2)°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°C/110°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 W2 K2 I.

Dortmund, 06. April 2018
By Order

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

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

Material type no.: **EPDM PR 1050/65** Classification: **EN 14241-1 T120 W2 K2 I**
Corrosion class 2, construction class 2
Thermal load: 120°C

Property	n No. of single values	Storage conditions		Results Extreme values (Min/max)		Median	Change absolute	Change %	Total	Requirement *)
	6	New condition		64	66	65			---	
Hardness	6	Air	28 days	64	65	64	**-1**			
[Shore A]	6	120°C	56 days	64	66	65	**+1**		**0**	≤ 7/10
	6	Condensate	28 days	61	63	62	**-3**			
	6	90°C	56 days	57	59	58	**-4**		**-7**	≤ 7/10
	6	New condition		66	68	67				
Hardness	6	Air	28 days	64	65	64	**-3**			
[IRHD]	6	120°C	56 days	67	68	68	**+4**		**+ 1**	≤ 7/10
	6	Condensate	28 days	62	64	63	**-4**			
	6	90°C	56 days	58	59	58	**-5**		**-9**	≤ 7/10
	6	New condition		10,1	11,1	10,5				
Tensile	6	Air	28 days	8,9	9,9	9,4	-1,1	**-10,5**		
strength	6	120°C	56 days	7,4	9,5	8,7	-0,7	**-7,4**	**17,1 %**	≤30/50%
[N/mm^2]	6	Condensate	28 days	9,2	10,3	9,8	-0,7	**-6,7**		
	6	90°C	56 days	9,1	9,7	9,6	- 0,2	**-2,0**	**8,6 %**	≤30/50%
Tensile	6	New condition		2,8	3,1	2,9				
stress	6	Air	28 days	3,0	3,2	3,1	+0,2	**6,9**		
at 100%	6	120°C	56 days	3,2	3,5	3,2	+0,1	**3,2**	**10,3 %**	≤ 35/45%
elongation	6	Condensate	28 days	2,6	2,9	2,7	-0,2	**6,9**		
	6	90°C	56 days	2,6	2,8	2,6	-0,1	**3,7**	**10,3 %**	≤ 35/45%
	6	New condition		338	362	345				
Elongation	6	Air	28 days	277	307	290	-55	**15,9**		
at break	6	120°C	56 days	234	267	251	-39	**13,4**	**27,2 %**	≤ 30/50%
[%]	6	Condensate	28 days	342	362	351	+6	**1,7**		
	6	90°C	56 days	323	350	337	-14	**4,0**	**2,3 %**	≤ 30/50%

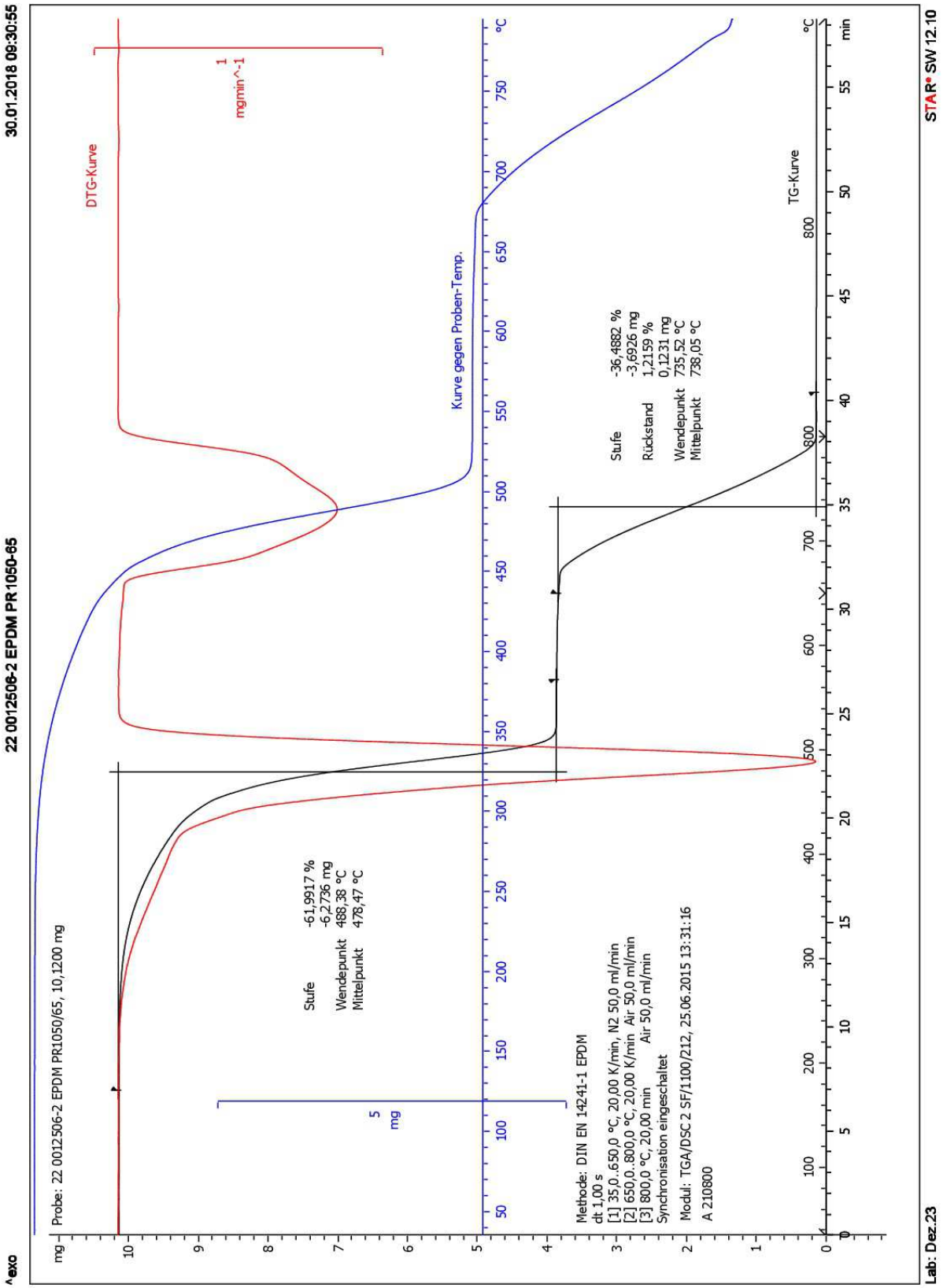
All changes absolute (by unit) or relative (%) are relating to the changes In-between values/starting values and final values/in-between values.

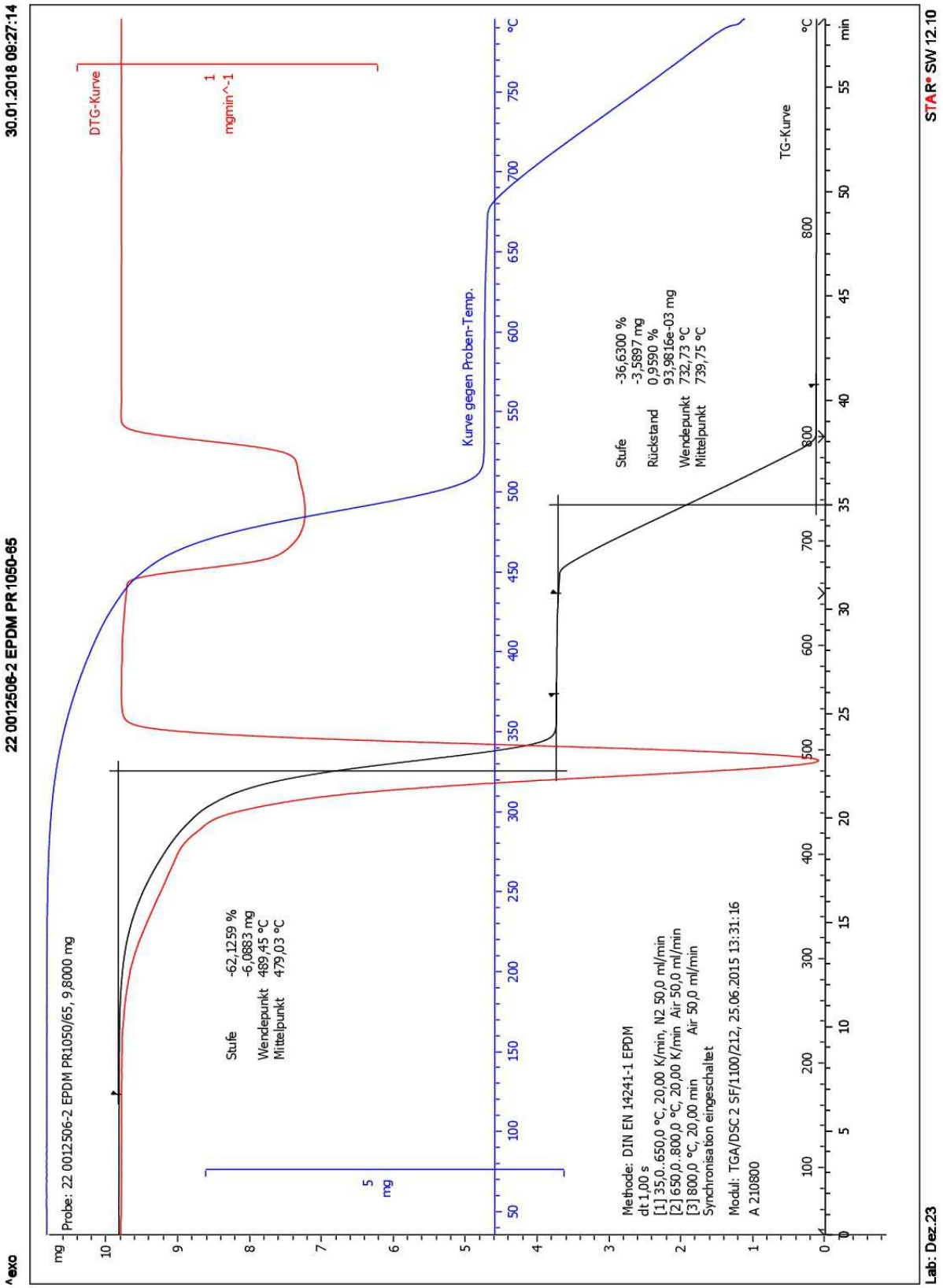
***)** After 56 days of exposure the properties hardness, tensile strength, and tensile stress at 100 % elongation shall not deviate from the original value by more than the first values as listed in the table, column “Requirement”. If the change of a property is bigger, then the deviation from the original 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.: **EPDM PR 1050/65** Classification: **EN 14241-1 T120 W2 K2 I**
Corrosion class 2, construction class 2
Thermal load: 120°C

Property	n No. of single values	Storage conditions		Results Extreme values (Min/max)		Median	Change absolute	Change %	Total	Requirement ***)**
Density [g/cm^3]	6	New condition		1,10	1,10	1,10	---	---	---	---
Compression set [%]	6	New condition 120°C		9,5	10,2	10,0	---	---	---	≤ 25%
Stress relaxation [%]	3	Air 120°C 6,3 mm	21 days	13,2	14,9	13,8	---	---	---	≤ 50%


30.01.2018 09:30:55
22 0012506-2 EPDM PR1050-65
Probe: 22 0012506-2 EPDM PR1050/65, 10,1200 mg
DTG-Kurve
1
mgmin^-1
Kurve gegen Proben-Temp.
TG-Kurve
Stufe -61,9917 %
-6,2736 mg
Wendepunkt 488,38 °C
Mittelpunkt 478,47 °C
5
mg
Stufe -36,4882 %
-3,6926 mg
Rückstand 1,2159 %
0,1231 mg
Wendepunkt 735,52 °C
Mittelpunkt 738,05 °C
Methode: DIN EN 14241-1 EPDM
dt 1,00 s
[1] 35,0..650,0 °C, 20,00 K/min, N2 50,0 ml/min
[2] 650,0..800,0 °C, 20,00 K/min Air 50,0 ml/min
[3] 800,0 °C, 20,00 min Air 50,0 ml/min
Synchronisation eingeschaltet
Modul: TGA/DSC 2 SF/1100/212, 25.06.2015 13:31:16
A 210800
mg
°C
min
Lab: Dez.23
STAR° SW 12.10


30.01.2018 09:27:14
22 0012506-2 EPDM PR1050-65
DTG-Kurve
1
mgmin^-1
Kurve gegen Proben-Temp.
TG-Kurve
Probe: 22 0012506-2 EPDM PR1050/65, 9,8000 mg
Stufe -62,1259 %
-6,0883 mg
Wendepunkt 489,45 °C
Mittelpunkt 479,03 °C
5
mg
Stufe -36,6300 %
-3,5897 mg
Rückstand 0,9590 %
93,9816e-03 mg
Wendepunkt 732,73 °C
Mittelpunkt 739,75 °C
Methode: DIN EN 14241-1 EPDM
dt 1,00 s
[1] 35,0..650,0 °C, 20,00 K/min, N2 50,0 ml/min
[2] 650,0..800,0 °C, 20,00 K/min Air 50,0 ml/min
[3] 800,0 °C, 20,00 min Air 50,0 ml/min
Synchronisation eingeschaltet
Modul: TGA/DSC 2 SF/1100/212, 25.06.2015 13:31:16
A 210800
mg
°C
min
STAR° SW 12.10
Lab: Dez.23