

SIGRAFLEX[®] Foil

Approvals

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® registered trademark of SGL CARBON SE

effective May 2015, superceding all previous versions

Additional information on our SIGRAFLEX sealing materials can be found in the Download Center on our homepage.



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CERT

DIN-DVGW-Baumusterprüfzertifikat

DIN-DVGW type examination certificate

NG-5124AQ1478

Registriernummer
registration number

Anwendungsbereich <i>field of application</i>	Produkte der Gasversorgung <i>products of gas supply</i>
Zertifikatinhaber <i>owner of certificate</i>	SGL CARBON GmbH Werner-von-Siemens-Straße 18, D-86405 Meitingen
Vertreiber <i>distributor</i>	SGL CARBON GmbH Werner-von-Siemens-Straße 18, D-86405 Meitingen
Produktart <i>product category</i>	Schmier-/Dicht-/Betriebsmittel: Flachdichtungswerkstoff auf Basis Graphit (5124)
Produktbezeichnung <i>product description</i>	Flachdichtungswerkstoff auf Basis Graphit
Modell <i>model</i>	®SIGRAFLEX unverstärkt
Prüfberichte <i>test reports</i>	Baumusterprüfung: 14/342/5124/1 vom 27.02.2015 (EBI)
Prüfgrundlagen <i>test basis</i>	DIN 3535-6 (01.01.2011)

Ablaufdatum / AZ 28.02.2020 / 14-0784-GNV
date of expiry / file no.

03.03.2015 Rie A-1/2

Datum, Bearbeiter, Blatt, Leiter der Zertifizierungsstelle
date, issued by, sheet, head of certification body

DVGW CERT GmbH ist von der DAkkS nach DIN EN 45011:1998
akkreditierte Stelle für die Zertifizierung von Produkten der Energie- und
Wasserversorgung.

DVGW CERT GmbH is an accredited body by DAkkS according to EN
45011:1998 for certification of products for energy and water supply industry.



Deutsche
Akkreditierungsstelle
D-ZE-16028-01-01

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PRÜFZEUGNIS (V)

über die Untersuchung von "SIGRAFLEX® FOLIE" gemäß KTW-Leitlinie des Umweltbundesamtes (UBA)

Hersteller: SGL CARBON GmbH, Meitingen
 Art der Proben: Graphitqualität
 Bezeichnung der Proben: "SIGRAFLEX® FOLIE"
 Art der Prüfkörper: Probeplatten
 Eingang der Proben: 13.05.2008
 Probenehmer: Auftraggeber
 TZW-Az.: KA 0010/13

Untersuchungsergebnisse

1. Rezeptur: wurde unter KC 103/13 vorgelegt und überprüft
 2. Migrationstest:

Kaltwasser 23°C	1. – 3. Tag	4. – 6. Tag	7. – 9. Tag	Richtwert für 3. Extraktion
Klarheit, Färbung, Geruch, Geschmack, Schaumbildung	n nb	n nb	n nb	nicht nennenswert beeinflusst
C-Abgabe [mg C/m²d]	< 1	< 1	< 1	≤ 125
Cl ₂ -Zehrung [mg Cl ₂ /m²d]	19	10	7	

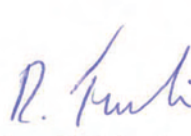
Die untersuchten Proben "SIGRAFLEX® FOLIE" entsprechen den Anforderungen der KTW-Leitlinie des Umweltbundesamtes (Bgesundhbl. 2005) im Bereich Dichtungen. DE

Anmerkung:

Dieses Prüfzeugnis basiert auf der Erstprüfung (TZW-Az.: KA 182A/08) vom 24.06.2008.

Die Gültigkeit dieses Prüfzeugnisses richtet sich nach andernorts festgelegten Bestimmungen. Sie endet jedoch spätestens am 23.06.2018.

Karlsruhe, den 20.02.2013


 Dr. J. Klinger / i.A. Dr.-Ing. R. Turkovic
 Leiter der Prüfstelle

Die Veröffentlichung des Prüfzeugnisses – vollständig oder in Auszügen – ist ohne ausdrückliche Genehmigung von seiten der Prüfstelle nicht gestattet

Das Technologiezentrum Wasser ist eine
 Einrichtung des DVGW Deutscher Verein
 des Gas- und Wasserfaches e. V.
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Translation
of BAM-Test Report Ref.-No. II-2473/2007 I of May 30, 2008

**Bundesanstalt für
Materialforschung
und -prüfung**

Report
on Testing a Sealing Material for Reactivity with Oxygen

Reference Number 2-2776/2013 E
Copy 1. Copy of 2 Copies

1 Application

Customer SGL Carbon GmbH
Werner-von-Siemens-Straße 18
86405 Meitingen
Germany

Order Date October 15, 2013

Receipt of Order October 17, 2013

Test Samples SIGRAFLEX® foil (unreinforced) for use as a gasket material in flanged connections in piping, valves and fittings or other components for gaseous oxygen service up to 130 bar and at temperatures up to 200 °C as well as for use as a sealing material in valves and fittings or other components at temperatures greater than 60 °C for gaseous oxygen service and for liquid oxygen service; BAM-Order No. 2.1/51 779

Receipt of Samples October 17, 2007

Test Date February 5, 2008 to May 30, 2008

Test Location BAM - Working Group "Safe Handling of Oxygen"; building no. 41, room no. 073 and room no. 120

Test Procedure According to DIN EN 1797: 2002-02
"Cryogenic Vessels - Gas/Material Compatibility"
Annex of technical bulletin M 034-1 (BGI 617-1)
"List of nonmetallic materials compatible with oxygen by BAM Federal Institute for Material Research and Testing.",
to pamphlet M 034 „Sauerstoff“ (BGI 617)
German Social Accident Insurance Institution for the raw materials and chemical industry,
Edition: October 2007;
according chapter 3.17 „Gleitmittel und Dichtwerkstoffe“
to rule BGR 500 „Betreiben von Arbeitsmitteln“ part 2,
chapter 2.32 „Betreiben von Sauerstoffanlagen“,
Edition: March 2007.

All pressures of the report are excess pressures.
This test report consists of page 1 to 6 and annex 1 to 5.

This test report may only be published in full and without any additions. A revocable permission in writing has to be obtained from BAM for any amended reproduction of this certificate or the publication of any excerpts. The test results refer exclusively to the tested materials.

In case a German version of the test report is available, exclusively the German version is binding.



2 Documents and Test Samples

The following documents and samples were submitted to BAM:

- 1 Test Application
- 1 Safety Data Sheet
- 16 Disks of SIGRAFLEX® foil (unreinforced)
Outer-Ø: 140 mm; Thickness: 1 mm
Color: Grey
- 3 Sheets of SIGRAFLEX® foil (unreinforced)
150 mm x 98 mm x 1 mm
Color: Grey

3 Test Methods and Results

3.1 Autogenous Ignition Temperature (AIT)

The test method is described in annex 1.

Results:

Test No.	Initial Oxygen Pressure p_i [bar]	Final Oxygen Pressure p_f [bar]	AIT [°C]
1	84	223	> 500
2	84	223	> 500
3	84	221	> 500
4	84	222	> 500
5	84	222	> 500

Up to temperatures of 500 °C, no ignition of the sample could be detected in five tests with initial oxygen pressures of $p_i = 84$ bar. The final oxygen pressure p_f was approximately 222 bar.

3.2 Artificial Aging

The test method is described in annex 2.

Results:

Time [h]	Temperature [°C]	Oxygen Pressure [bar]	Mass Change [%]
100	225	220	0

After aging of the sealing material SIGRAFLEX® foil (unreinforced) at 220 bar oxygen pressure and 225 °C, the test sample was apparently unchanged. The mass of the test sample did not change.

3.2.1 AIT after Artificial Aging

The test method is described in annex 1.

Results:

Test No.	Initial Oxygen Pressure p_i [bar]	Final Oxygen Pressure p_F [bar]	AIT [°C]
1	84	224	> 500
2	84	225	> 500
3	84	222	> 500
4	84	221	> 500
5	84	222	> 500

Up to temperatures of 500 °C, no ignition of the sample could be detected in five tests with initial oxygen pressures of $p_i = 84$ bar. The final oxygen pressure p_F was approximately 220 bar.

This shows, that, as the non-aged sample, also the aged sample did not ignite at temperatures up to 500 °C.

3.4 Flange Test

The test method is described in annex 3.

Results:

Test No.	Oxygen Pressure [bar]	Temperature [°C]	Comments
1	130	200	Only those parts of the gasket burn that project into the pipe
2	130	200	Only those parts of the gasket burn that project into the pipe
3	130	200	Only those parts of the gasket burn that project into the pipe
4	130	200	Only those parts of the gasket burn that project into the pipe
5	130	200	Only those parts of the gasket burn that project into the pipe

In five tests at 200 bar oxygen pressure and 130 °C, only those parts of the sealing material SIGRAFLEX® foil (unreinforced) burn that project into the pipe; the fire is neither transmitted to the steel nor does the gasket burn between the flanges. The flange remains gas-tight.

3.4 Ignition Sensitivity to Gaseous Oxygen Impacts

The test method is described in annex 4.

Results:

Sample temperature t_a [°C]	Initial Oxygen Pressure p_i [bar]	Final Oxygen Pressure p_F [bar]	Reaction on impact
60	1	280	no reaction*)
60	1	290	no reaction*)
60	1	300	no reaction*)
60	1	310	no reaction*)
60	1	320	no reaction*)
60	1	330	no reaction*)
60	1	350	no reaction*)
60	1	380	no reaction*)
60	1	400	no reaction*)
60	1	430	no reaction*)
60	1	450	no reaction*)
60	1	450	no reaction*)
200	1	280	ignition on 5. impact
200	1	270	ignition on 5. impact
200	1	260	no reaction*)
200	1	260	ignition on 5. impact
200	1	250	ignition on 5. impact
200	1	240	ignition on 5. impact
200	1	230	ignition on 5. impact
200	1	220	no reaction*)
200	1	220	no reaction*)

*) within a series of five consecutive impacts

In two test series, each consisting of five consecutive impacts, no reaction of the sealing material SIGRAFLEX® foil (unreinforced) with oxygen was observed at a sample temperature of 60 °C and an initial oxygen pressure of $p_i = 1$ bar and a final oxygen pressure of $p_F = 450$ bar. At a final oxygen pressure of 450 bar, the tests had to be finished, because the BAM test apparatus has not been designed for testing at pressures greater than 450 bar.

In two test series, each consisting of five consecutive impacts, no reaction of the sealing material SIGRAFLEX® foil (unreinforced) with oxygen was observed at a sample temperature of 200 °C and an initial oxygen pressure of $p_i = 1$ bar and a final oxygen pressure of $p_F = 220$ bar.

3.5 Reactivity with Liquid Oxygen on Mechanical Impact

The test method is described in annex 5.

Results:

Test No.	Drop Heights [m]	Impact Energy [Nm]	Reaction
1	0.67	500	no reaction
2	1.00	750	no reaction
3	1.00	750	no reaction
4	1.00	750	no reaction
5	1.00	750	no reaction
6	1.00	750	no reaction
7	1.00	750	no reaction
8	1.00	750	no reaction
9	1.00	750	no reaction
10	1.00	750	no reaction
11	1.00	750	no reaction

At drop heights of 1.00 m (impact energy 750 Nm), in ten separate tests, no reaction of the test sample with liquid oxygen could be detected.

4 Summary and Evaluation

Up to temperatures of 500 °C, no ignition of the sealing material SIGRAFLEX® foil (unreinforced) could be detected at a final oxygen pressure p_F of 220 bar.

At a temperature of 225 °C and an oxygen pressure of 220 bar, the sealing material SIGRAFLEX® foil (unreinforced) proved to be sufficient aging resistant.

On basis of the test results and the results of the flange testing, there are no objections with regard to technical safety to use the gasket material SIGRAFLEX® foil (unreinforced) in flange connections made of copper, copper alloys or steel at following conditions:

Maximum Temperature	Maximum Oxygen Pressure
200 °C	130 bar

This applies to flat faced flanges, male/female flanges, and flanges with tongue and groove.

According to DIN EN 1797: 2002-02 "Cryogenic Vessels - Gas/Material Compatibility", the criterion for a positive reaction of the sample to gaseous oxygen impacts is a temperature rise of at least 20 °C.

On basis of the above-mentioned criterion and the test results, there are no objections with regard to technical safety, to use the sealing material SIGRAFLEX® foil (unreinforced) in valves and fittings or other components for gaseous oxygen service at following operating conditions:

Maximum Temperature	Maximum Oxygen Pressure
60 °C	450 bar
> 60 °C up to 200 °C	220 bar

According to the BAM-Standard "Testing for Reactivity with Liquid Oxygen on Mechanical Impact", described in annex 5, there are no objections with regard to technical safety to use the sealing material SIGRAFLEX® foil (unreinforced) in components and apparatuses for liquid oxygen. It is not necessary to reduce the pressure range of liquid oxygen because a rising pressure does not influence the reactivity of the material.

5 Comments

The test results refer exclusively to the tested material.

Products on the market that contain a reference to BAM testing shall be marked accordingly to the evaluation in the BAM test report.

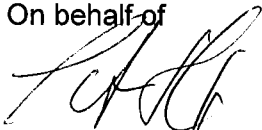
Products that have been tested by us, and which are on the market, shall be marked according to our evaluation in the BAM test report. A label on a product saying that a BAM test has been performed and (or) citing our reference number, only, is not tolerable. The use of the product and its safe operating conditions must also be given.

It shall be clear that the product may only be used for gaseous oxygen service and/or liquid oxygen service. The maximum safe oxygen pressure of the product and its maximum use temperature as well as other restrictions in use shall be given.

**BAM Federal Institute for Materials Research and Testing
12200 Berlin, December 5, 2013**

Division 2.1 "Gases, Gas Plants"

On behalf of



Dipl.-Ing. P. Hartwig
Study Director "Safe Handling of Oxygen"

Copies: 1. Copy: SGL Carbon GmbH
2. Copy: BAM – Division 2.1 "Gases, Gas Plants"

Zertifiziert nach DIN EN ISO 9001/14001

Prüfbericht / Test Report

L G A QualiTest GmbH • Postfach 3022 • 90014 Nürnberg

SGL Carbon GmbH
 Postfach 1193
 D-86400 Meitingen

5681826-AT1

Auftraggeber / Orderer: wie Adressat / see consignee

Auftrag vom / Order Date: 15.09.2008

Prüfgegenstand /
 Test Specimen: Graphit-Folie / graphite foil
 SIGRAFLEX F05010Z

Inhalt des Auftrages /
 Scope: Chemische Prüfung / Chemical Test

Eingang der Proben /
 Samples Received: 15.09.2008

Untersuchungszeitraum /
 Testing Period: 17.09. bis / until 07.10.2008

Untersuchungsergebnis / Test Result:

Prüfanforderungen für / test-requirements for:	
Abgabe von Schwermetallen / Release of Heavy Metals	erfüllt / passed
Abgabe von Cyanid / Release of Cyanide	erfüllt / passed
Farblässigkeit / Transfer of Colourants	erfüllt / passed
Gesamtmigration / Total Migration	erfüllt / passed
Polycyclische aromatische Kohlenwasserstoffe (PAK) / Polycyclic aromatic Hydrocarbons (PAH)	erfüllt / passed
Phthalatweichmacher in Bedarfsgegenständen mit Lebensmittelkontakt / Phthalate Softeners in Food Contact Materials	erfüllt / passed
Sensorische Prüfung / Sensory Test	erfüllt / passed
(Details siehe nachfolgenden Bericht / for details see the following report)	

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Probenbezeichnung / Tested Materials



Abgabe von Schwermetallen / Release of Heavy Metals

Untersuchungsverfahren / Test Method

Migrationsbedingungen / migration conditions :
3 % Essigsäure / 3 % acetic acid, 10 d, 40°C
Bestimmung mittels ICP-MS. / Determination by means of ICP-MS.

Untersuchungsergebnisse / Test Results

Probe / sample	Cr	Ni	Pb	Cd	Bewertung / Assessment
Graphit-Folie / graphite foil	< 0,01 mg/dm ²	< 0,01 mg/dm ²	< 0,01 mg/dm ²	< 0,001 mg/dm ²	erfüllt / passed

Probe / sample	Cd	Sb	As	Hg	Bewertung / Assessment
Graphit-Folie / graphite foil	< 0,001 mg/dm ²	< 0,001 mg/dm ²	< 0,001 mg/dm ²	< 0,001 mg/dm ²	erfüllt / passed

Probe / sample	Se	Zn
Graphit-Folie / graphite foil	< 0,001 mg/dm ²	< 0,001 mg/dm ²

Prüfbericht Nr. /
 test report no. 5681826-AT1.doc

Eine Abgabe an toxischen Schwermetallen war nicht bzw. nur in gesundheitlich unbedenklichen Spuren feststellbar. Die Zusammensetzung von Lebensmitteln wird dadurch nicht beeinträchtigt. / A release of toxic heavy metals was not detectable respectively only in harmless traces. The composition of foodstuffs will not be affected.

Abgabe von Cyanid / Release of Cyanide

Untersuchungsverfahren / Test Method

Migrationsbedingungen / migration conditions :

Wasser / water, 10 d, 40°C

Bestimmung von Cyanid in Anlehnung an DIN 38405 D13. / Determination of cyanide following DIN 38405 D13

Untersuchungsergebnisse / Test Results

Probe / sample	CN ⁻	Bewertung / Assessment
Graphit-Folie / graphite foil	<0,001	erfüllt / passed

Farblässigkeit / Transfer of Colourants

Untersuchungsverfahren / Test Method

Prüfung in Anlehnung an die Empfehlung B II IX der Kunststoffkommission des BfR. / Test in dependence on Recommendation B II IX of the BfR:

Vier Filterpapiere wurden jeweils mit deionisiertem Wasser, 3 %iger Essigsäure, 10 % Ethanol und Erdnußöl getränkt und mit der Probe bei 50° C und einem Druck von 1 kg/dm² in Kontakt gebracht. Nach 5 Stunden wurde der Farbübergang auf das Filterpapier bewertet. / Four filter papers were soaked with either deionized water, 3 % acetic acid, 10 % ethyl alcohol and peanut oil and put in contact with the sample at 50°C and a pressure of 1 kg/dm².

Untersuchungsergebnisse / Test Results

	Graphit-Folie / graphite foil
Wasser	kein Farbübergang / no transfer of colourants
3 %ige Essigsäure	kein Farbübergang / no transfer of colourants
10 % Ethanol	kein Farbübergang / no transfer of colourants
Erdnußöl	kein Farbübergang / no transfer of colourants
Bewertung / Assessment*	erfüllt / passed

*Anforderung nach BfR: kein Transfer von Farbstoffen auf Lebensmittel / requirement according to BfR: no transfer of colourants to foodstuffs.

Gesamtmigration / Total Migration

Untersuchungsverfahren / Test Method

Migrationsbedingungen / migration conditions :

Wasser / water 10 d 40 °C

3 % Essigsäure / 3 % acetic acid 10 d 40 °C

Isooctan / isooctane 2 d 20 °C

95% Ethanol / 95% ethylalcohol 10 d 40 °C

Es wurde der Abdampfrückstand gravimetrisch durch Eindampfen des Migrats und Trocknen bei 105°C bestimmt. / The evaporation residue was gravimetrically determined by evaporating the migrate and drying it at 105°C.

Prüfbericht Nr. /
test report no. 5681826-AT1.doc

Untersuchungsergebnisse / Test Results

Probe / sample	Ergebnis / result [mg/dm ²]	Bewertung / Assessment*
Wasser / water		
Graphit-Folie / graphite foil	1,9	erfüllt / passed
3 % Essigsäure / 3 % acetic acid		
Graphit-Folie / graphite foil	1,4	erfüllt / passed
Isooctan / isooctane		
Graphit-Folie / graphite foil	< 1,0	erfüllt / passed
95% Ethanol / 95% ethylalcohol		
Graphit-Folie / graphite foil	1,4	erfüllt / passed

*Grenzwert nach Bedarfsgegenständeverordnung limit according to „Bedarfsgegenständeverordnung“:

10 mg/dm² bzw. 60 mg/kg /

Anmerkung / note:

Ein Bedarfsgegenstand, der den Gesamtmigrationsgrenzwert um höchstens den nachstehenden Analysentoleranzwert überschreitet, ist daher als richtlinienkonform zu betrachten. / A material or article that exceeds the overall migration limit by an amount not greater than the analytical tolerance mentioned below should therefore be deemed to be in compliance with this Directive.

Folgende Analysentoleranzen sind festgestellt worden / The following analytical tolerances have been observed:

- 20 mg/kg oder 3 mg/dm² bei Migrationsuntersuchungen, bei denen rektifiziertes Olivenöl oder seine Substitute verwendet werden / 20 mg/kg or 3 mg/dm² in migration tests using rectified olive oil or substitutes
- 12 mg/kg oder 2 mg/dm² in Migrationsuntersuchungen, bei denen die anderen in den Richtlinien 82/711/EWG und 85/572/EWG angegebenen Simulanzlösemittel verwendet werden. / 12 mg/kg or 2 mg/dm² in migration tests using the other simulants referred to in Directives 82/711/EEC and 85/572/EEC.

Polycyclische aromatische Kohlenwasserstoffe (PAK) / Polycyclic aromatic Hydrocarbons (PAH)

Untersuchungsverfahren / Test Method

AA-QCPR-307_03: Extraktion mit n-Hexan, GC-MS. / Extraction with n-hexane, GC-MS.

Untersuchungsergebnisse / Test Results

Parameter / parameter	Dimension	Graphit-Folie / graphite foil
Naphthalin	mg/kg	<0,1
2-Methylnaphthalin*	mg/kg	<0,1
1-Methylnaphthalin*	mg/kg	<0,1
Acenaphthylen	mg/kg	<0,1
Acenaphthen	mg/kg	<0,1
Fluoren	mg/kg	<0,1
Phenanthren	mg/kg	<0,1
Anthracen	mg/kg	<0,1
Fluoranthren	mg/kg	<0,1
Pyren	mg/kg	<0,1
Chrysen	mg/kg	<0,1
Benzo(a)anthracen	mg/kg	<0,1
Benzo(b)fluoranthren und / and Benzo(k)fluoranthren	mg/kg	<0,1
Benzo(a)pyren	mg/kg	<0,1
Dibenzo(a,h)anthracen	mg/kg	<0,1
Indeno(c,d)pyren	mg/kg	<0,1
Benzo(g,h,i)perylene	mg/kg	<0,1

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Parameter / parameter	Dimension	Graphit-Folie / graphite foil
Summe / sum	mg/kg	0,0

Phthalatweichmacher in Bedarfsgegenständen mit Lebensmittelkontakt /
Phthalate Softeners in Food Contact Materials

Untersuchungsverfahren / Test Method

Extraktion mit TBME, Bestimmung mittels GC-MS. / Extraction with TBME, determination by means of GC-MS.

Untersuchungsergebnisse / Test Results

Parameter / parameter	Dimension / dimension	Graphit-Folie / graphite foil
Diethylhexylphthalat (DEHP)	%	< 0,03
Dibutylphthalat (DBP)	%	< 0,03
Benzylbutylphthalat (BBP)	%	< 0,03
Diisononylphthalat (DINP)	%	< 0,03
Diisodecylphthalat (DIDP)	%	< 0,03
Mischung aus 50% n-Decyl-n-octylphthalat, 25% Di-n-octylphthalat (DNOP) und 25% Di-n-decylphthalat (DNDP) / mixture of 50% phthalic acid n-decyl n-octyl ester, 25% phthalic acid di-n-decyl ester, 25% phthalic acid di-n-octyl ester	%	< 0,03
Kategorie / category	-	Mehrwegartikel / repeated use article
Bewertung / assessment*	-	erfüllt / passed

Grenzwerte gem. 2007/19/EG für die Verwendung als Hilfsagens /
limit according to 2007/19/EC as technical support agent :

- DEHP 0,1 %, zulässig als Weichmacher in Mehrwegartikeln für fettfreie Lebensmittel /
permitted as plasticizer in repeated use articles for nonfat foods
- DBP 0,05 %, zulässig als Weichmacher in Mehrwegartikeln für fettfreie Lebensmittel/
permitted as plasticizer in repeated use articles for nonfat foods
- BBP 0,1 %, zulässig als Weichmacher in Mehrwegartikeln und Einwegartikel für fettfreie Lebensmittel, außer für Säuglingsanfangsnahrung und Folgenahrung gemäß der Richtlinie 91/321/EWG und bei Erzeugnissen gemäß der Richtlinie 96/5/EG /
permitted as plasticizer in repeated use articles and single use articles for nonfat foods, except for infant formulae and follow-on formulae as defined by Directive 91/321/EEC and products according to Directive 96/5/EC
- DINP 0,1 %, zulässig als Weichmacher in Mehrwegartikeln und Einwegartikel für fettfreie Lebensmittel, außer für Säuglingsanfangsnahrung und Folgenahrung gemäß der Richtlinie 91/321/EWG und bei Erzeugnissen gemäß der Richtlinie 96/5/EG /
permitted as plasticizer in repeated use articles and single use articles for nonfat foods, except for infant formulae and follow-on formulae as defined by Directive 91/321/EEC and products according to Directive 96/5/EC
- DIDP 0,1 %, zulässig als Weichmacher in Mehrwegartikeln und Einwegartikel für fettfreie Lebensmittel, außer für Säuglingsanfangsnahrung und Folgenahrung gemäß der Richtlinie 91/321/EWG und bei Erzeugnissen gemäß der Richtlinie 96/5/EG /
permitted as plasticizer in repeated use articles and single use articles for nonfat foods, except for infant formulae and follow-on formulae as defined by Directive 91/321/EEC and products according to Directive 96/5/EC

für die Mischung aus 50 % n-Decyl-n-octylphthalat, 25 % Di-n-octylphthalat (DNOP) und 25 % Di-n-decylphthalat (DNDP) liegt der SML bei 5 mg/kg bzw. 0,8 mg/dm² / for the mixture of 50 % phthalic acid n-decyl n-octyl ester, 25 % phthalic acid di-n-decyl ester, 25 % phthalic acid di-n-octyl ester the SML is 5 mg/kg respectively 0,8 mg/dm²

Prüfbericht Nr. /
test report no. 5681826-AT1.doc

Sensorische Prüfung / *Sensory Test*

Untersuchungsverfahren / *Test Method*

Die Durchführung erfolgte nach DIN 10955. / *The test was carried out according to DIN 10955.*

Migrationsbedingungen / *migration conditions* :

Wasser / *water*, 10 d, 40°C

Anschließend erfolgte die Verkostung in Form einer paarweisen Vergleichsprüfung nach DIN EN ISO 5495. / *Afterwards the samples were tasted using a paired comparative test according to DIN EN ISO 5495.*

Untersuchungsergebnisse / *Test Results*

Probe / <i>sample</i>	Ergebnis / <i>result</i>	Bewertung / <i>Assessment*</i>
Graphit-Folie / <i>graphite foil</i>	0	erfüllt / <i>passed</i>

*Wenn eine Gesamtnote zwischen 0 bis 2,5 erreicht wird, liegt keine sensorische Abweichung vor und die Probe entspricht diesbezüglich den Anforderungen des § 31 Abs. 1 LFGB. / *If the evaluation is between 0 to 2.5 no sensory deviation is indicated. The sample fulfils the requirements of § 31 LFGB.*

Lebensmittelrechtliche Bewertung / *Assessment according to Food Legislation*

Bei dem geprüften Artikel handelt es sich um einen Bedarfsgegenstand im Sinne des § 2 Abs. 6 Nr. 1 Lebensmittel-, Bedarfsgegenstände- und Futtermittelgesetzbuch (LFGB).

Er unterliegt somit den lebensmittelrechtlichen Anforderungen. / *The article submitted to test is a consumer good in the sense of § 2 clause 6 no. 1 German Code for Foodstuffs, Commodities and Feeding Stuffs. Therefore it has to comply with the legal requirements.*

Hinsichtlich der geprüften Parameter entspricht der Artikel den Anforderungen des § 31 LFGB. / *Regarding the tested parameters the tested article complies with the requirements of § 31 LFGB.*

Nürnberg, 30.10.2008

LGA QualiTest GmbH
Chemische Produktprüfung /
Chemical Product Testing

Dr. Dorothee Boeck
Staatl. gepr. Lebensmittelchemikerin
Leiterin Fachzentrum /
Head Competence Centre



Sandra Wägner
Staatl. gepr. Lebensmittelchemikerin

Our Ref: GH/M100261

24th August 2010



SGL Technologies GmbH
Werner-von-Siemens-Strasse 18
86405 Meitingen
Germany

Dear Sir

**WATER REGULATIONS ADVISORY SCHEME
"ITEMS WHICH HAVE PASSED FULL TESTS OF EFFECT ON WATER QUALITY - BS 6920"**

We refer to your application for the material(s) described below to be approved arising from the results of the tests of effect on water quality that have been carried out on the product(s) so described, it has been decided that there is no objection to its/their use provided the source, nature and manufacturing processes of the ingredients and products are not changed. (See notes overleaf).

GRAPHITE – MATERIAL ONLY

5135

Sigraflex APX. Grey coloured graphite material. For use with water up to 85°C.

Test Report: M 104803

1007518

SGL TECHNOLOGIES GMBH

An entry, as above, will accordingly be included in the Water Fittings Directory on-line, Part Two, under the section headed, "Materials which have passed full tests of effect on water quality".

Your attention is drawn to the statement overleaf. Manufacturers or applicants may only quote in their sales literature terms which are used in this letter, namely that the product as listed, having passed the tests of effect on water quality, is suitable for use in contact with potable water and that a reference to the product will be included in the Materials section, Part Two, of the Water Fittings Directory on-line: this may be abbreviated to "Water Regulations Advisory Scheme - Approved Material" or "WRAS - Approved Material". **Approval of this product does not signify the approval of its mechanical or physical properties for any use.**

The Technical Committee of the Scheme reserves the right to review approval. This product automatically becomes due for audit reassessment in July 2015.

Yours faithfully

Gareth Harris
WRAS Approvals Administrator
Water Regulations Advisory Scheme

SGL Technologies GmbH
Werner-von-Siemens-Strasse 18
86405 Meitingen
Germany

Dear Sir/Madam

SIGRAFLEX APX - DIRECTORY REFERENCE NUMBER 1007518

This listing will appear in the Water Fittings Directory on-line.

Please visit our website www.wras.co.uk for further details.

Yours sincerely

A handwritten signature in dark ink, appearing to read 'G. Harris', with a long horizontal flourish extending to the right.

Gareth Harris
WRAS Approvals Administrator
Water Regulations Advisory Scheme

MATERIALS WHICH HAVE PASSED FULL TESTS OF EFFECT ON WATER QUALITY AND ARE USED IN THE MANUFACTURE OF WATER FITTINGS AND WATER INSTALLATIONS AND IN THEIR ASSEMBLY, CONNECTION, DISCONNECTION AND REPAIR.

The material or product referred to in this letter is suitable for contact with, and for the manufacture of components of water fittings for use in contact with water for domestic purposes. The reference relates solely to its effect on the quality of the water with which it may come into contact and does not signify the approval of its mechanical or physical properties for any use. Certain products are approved in the full knowledge that for many plastic materials and natural and synthetic rubbers, variations in curing times and temperatures may have a significant effect on water quality. The right is reserved to require the testing of components made from any of these materials before listing those components if the scheme has any reason to believe that they differ from the materials originally tested and listed.

Entries in the Directory on-line relating to components made from listed materials are included on the understanding that the components are made of precisely the same materials as the test samples without any modification and without the addition or substitution of any ingredients, and that, as applicable, the curing times and temperature shall be as nearly as possible those recommended by the manufacturers of the materials or products and used for the production of test samples.

In order to avoid their affecting water quality, materials must be allowed to cure at the correct temperature for the necessary length of time. This cannot always be achieved where materials are mixed on site, often in approximate proportions, and cured in situ often under cold, ill-ventilated conditions. Entries relating to products or products produced under properly controlled factory conditions, cannot be guaranteed to apply to site conditions.

Herstellerbescheinigung

Manufacturer's Certificate

Die SGL CARBON GmbH als Lieferant der Graphitfolienmaterialien

SGL CARBON GmbH as supplier of the graphite foil materials

SIGRAFLEX® Folie C

SIGRAFLEX® Folie E

SIGRAFLEX® Folie APX

SIGRAFLEX® Folie Z

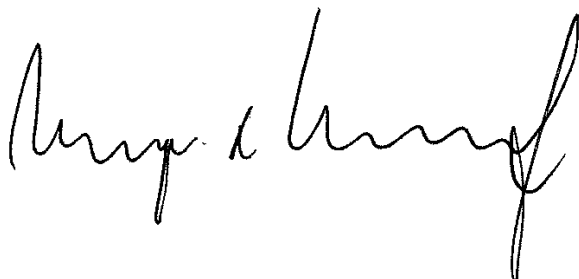
bestätigt, dass diese Materialien der Verordnung (EG) Nr. 1935/2004 über Materialien und Gegenstände, die dazu bestimmt sind, mit Lebensmitteln in Berührung zu kommen, entspricht.

confirms, that these materials comply with the Regulation (EC) No.

1935/2004 on materials and articles intended to come into contact with food.

Meitingen, 24. Febr. 2014

SGL CARBON GmbH
Arbeitssicherheit und Umweltschutz
Environment, Health and Safety



Dr. Meyer zu Reckendorf