Wilhelm-Jost-Institut

Institute for applied physical-chemical Process- and Safety engineering

Research- and Test Laboratory of the INBUREX Consulting GmbH

Test Report

Determination of the safety characteristics

of different Poly Urethane samples

for Filcoflex B.V.

NL – 5171PW Kaatsheuvel, Netherlands

Project-No. TL/11590/17

Möhnesee, 09 May 2017

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Safety characteristics of PU-UF 1, Poly Urethane (1.0 mm)

Test No.	Test Methode	Test Result
TL11590OW01	Surface resistance	$5 \times 10^{12}\ \Omega$
TL11590DW01	Volume resistance	$3*10^{11}\ \Omega m$
TL11590PBD01	possible generation of propagation brush discharges	No propagating brush discharges could be determined with respect to the described test procedure.

Safety characteristics of PU-UF 3, Poly Urethane (1.0 mm)

Test No.	Test Methode	Test Result
TL11590OW02	Surface resistance	$2 \times 10^{12}\ \Omega$
TL11590DW02	Volume resistance	$2*10^{11}\ \Omega m$
TL11590PBD02	possible generation of propagation brush discharges	No propagating brush discharges could be determined with respect to the described test procedure.

Place, Date Möhnesee, 09 May 2017

Signatures

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Laboratory Technician

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Manager Test Laboratory

Test results are obtained exclusively with the substance provided for the purpose of investigation by the customer and are based on the sample state at the time of analysis. Further conclusions and evaluations based on these findings are exclusively in the customer's sphere of responsibility. It is only permitted to pass the complete test report without the written consent of the test laboratory, but not in part.

Determination of the Surface resistance and surface resistivity according to IEC 60093/EN 1149

Test Report No.	TL/11590/17_OW01	**Classification**	Highly confidential
Sample	PU-UF 1, Poly Urethane (1.0 mm)	**Client**	Filcoflex B.V.
Sample No.	11590/1		5171 PW Kaatsheuvel, Netherlands
Test No.	TL11590OW01	**Contact person**	Werner van Loon

Test method

As measuring tool a Teraohm-Meter from the company ELTEX has been used. The surface resistance is the electrical resistance between two electrodes contacting the same surface of a material or object. It is depending on the geometry of the electrode arrangement and is commonly expressed in ohms. The surface resistivity is the resistance across opposite sides of a surface of unit length and width and is commonly expressed also in [Ω] or in [Ωm]. With regard to the TRBS 2153 respectively IEC 60079-32-1 materials or objects can be classified according to their surface resistance at test conditions of 23 °C and 30 % relative humidity as **conductive** ($\leq 10^4\Omega$), **electrostatically dissipative** ($10^4\Omega$ up to $10^{11}\Omega$) or **non-conductive** ($>10^{11}\Omega$).

Remarks

The room temperature was 23 °C, the relative humidity 30 %rF.

Results

Test	Surface resistance [Ω]
1	$5.0*10^{12}$
2	$3.2*10^{12}$
3	$5.5*10^{12}$
4	$5.5*10^{12}$
5	$4.0*10^{12}$

The sample can be classified as **non conductive**.

(Median value: $5*10^{12}\ \Omega$, at a measuring voltage of 100 V)

Determination of the volume resistance and volume resistivity according to IEC 60093/EN 1149-1

Test Report No.	TL/11590/17_DW01	**Classification**	Highly confidential
Sample	PU-UF 1, Poly Urethane (1.0 mm)	**Client**	Filcoflex B.V.
Sample No.	11590/1		5171 PW Kaatsheuvel, Netherlands
Test No.	TL11590DW01	**Contact person**	Mr. Werner van Loon

Test method

As measuring tool a Teraohm-Meter from the company ELTEX has been used. The volume resistivity is the electrical resistance between two electrodes contacting the top and bottom side of a material or object. It is depending on the geometry of the electrode arrangement and is commonly expressed in ohms.
Materials or objects can be classified according to their volume resistivity at test conditions of 23 °C and 50 % relative humidity as **conductive** ($\leq 10^4 \Omega m$), **electrostatically dissipative** ($10^4 \Omega m$ up to $10^9 \Omega m$) or **non conductive** ($>10^9 \Omega m$).

Remarks

The room temperature was 23 °C, the relative humidity 30 %rF.

Results

Test	Volume resistance [Ω]	Factor [m]	Volume resistivity [Ωm]
1	$4.4*10^{10}$	2.86	$1.3*10^{11}$
2	$1.0*10^{11}$	2.86	$2.9*10^{11}$
3	$1.0*10^{11}$	2.86	$2.9*10^{11}$
4	$5.0*10^{10}$	2.86	$1.4*10^{11}$
5	$1.0*10^{11}$	2.86	$2.9*10^{11}$

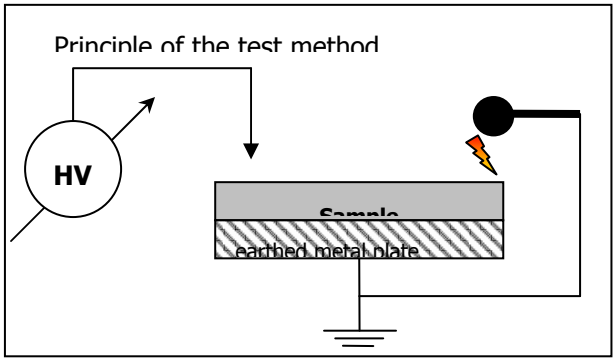
The sample can be classified as **non conductive**.

(Median value: $3*10^{11}$ Ωm, Test 2)

Determination of the possible generation of propagation brush discharges

Test Report No.	TL/11590/17_PBD01	**Classification**	Highly confidential
Sample	PU-UF 1, Poly Urethane (1.0 mm)	**Client**	Filcoflex B.V.
Sample No.	11590/1		5171 PW Kaatsheuvel, Netherlands
Test No.	TL11590PBD01	**Contact person**	Mr. Werner van Loon

Test method



an earthed metal sphere and the charged sample.

The sample is located on an earthed metal plate.

It was charged by means of a high voltage source (electrostatic gun, U = 70 kV) for about 120 sec.

Then it was tried to initiate a propagating brush discharge by decreasing the distance between

Remarks The room temperature was 23 °C, the relative humidity 30 %rF.

Results

Test	Determination of a propagating brush discharges
1 (200 mm x 200 mm)	No propagating brush discharges could be determined with respect to the described test procedure.
2 (465 mm x 465 mm)	No propagating brush discharges could be determined with respect to the described test procedure.

photo of the test sample

Determination of the Surface resistance and surface resistivity according to IEC 60093/EN 1149

Test Report No.	TL/11590/17_OW02	**Classification**	Highly confidential
Sample	PU-UF 3, Poly Urethane (1.0 mm)	**Client**	Filcoflex B.V.
Sample No.	11590/2		5171 PW Kaatsheuvel, Netherlands
Test No.	TL11590OW02	**Contact person**	Werner van Loon

Test method

As measuring tool a Teraohm-Meter from the company ELTEX has been used. The surface resistance is the electrical resistance between two electrodes contacting the same surface of a material or object. It is depending on the geometry of the electrode arrangement and is commonly expressed in ohms. The surface resistivity is the resistance across opposite sides of a surface of unit length and width and is commonly expressed also in [Ω] or in [Ωm]. With regard to the TRBS 2153 respectively IEC 60079-32-1 materials or objects can be classified according to their surface resistance at test conditions of 23 °C and 30 % relative humidity as **conductive** ($\leq 10^4\Omega$), **electrostatically dissipative** ($10^4\Omega$ up to $10^{11}\Omega$) or **non-conductive** ($>10^{11}\Omega$).

Remarks

The room temperature was 23 °C, the relative humidity 30 %rF.

Results

Test	Surface resistance [Ω]
1	$3.5*10^{12}$
2	$1.9*10^{12}$
3	$2.2*10^{12}$
4	$1.9*10^{12}$
5	$2.2*10^{12}$

The sample can be classified as **non conductive**.

(Median value: $2*10^{12}\ \Omega$, at a measuring voltage of 100 V)

Determination of the volume resistance and volume resistivity according to IEC 60093/EN 1149-1

Test Report No.	TL/11590/17_DW02	**Classification**	Highly confidential
Sample	PU-UF 3, Poly Urethane (1.0 mm)	**Client**	Filcoflex B.V.
Sample No.	11590/2		5171 PW Kaatsheuvel, Netherlands
Test No.	TL11590DW02	**Contact person**	Mr. Werner van Loon

Test method

As measuring tool a Teraohm-Meter from the company ELTEX has been used. The volume resistivity is the electrical resistance between two electrodes contacting the top and bottom side of a material or object. It is depending on the geometry of the electrode arrangement and is commonly expressed in ohms.
Materials or objects can be classified according to their volume resistivity at test conditions of 23 °C and 50 % relative humidity as **conductive** ($\leq 10^4 \Omega$m), **electrostatically dissipative** ($10^4 \Omega$m up to $10^9 \Omega$m) or **non conductive** ($>10^9 \Omega$m).

Remarks

The room temperature was 23 °C, the relative humidity 30 %rF.

Results

Test	Volume resistance [Ω]	Factor [m]	Volume resistivity [Ωm]
1	$1.2*10^{11}$	2.86	$3.4*10^{11}$
2	$7.8*10^{10}$	2.86	$2.2*10^{11}$
3	$6.2*10^{10}$	2.86	$1.8*10^{11}$
4	$6.0*10^{10}$	2.86	$1.7*10^{11}$
5	$8.5*10^{10}$	2.86	$2.4*10^{11}$

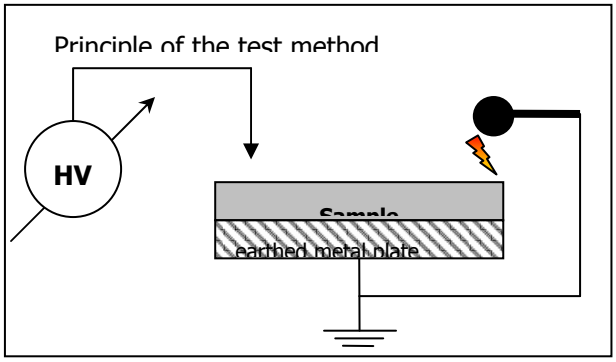
The sample can be classified as **non conductive**.

(Median value: $2*10^{11}$ Ωm, Test 2)

Determination of the possible generation of propagation brush discharges

Test Report No.	TL/11590/17_PBD02	**Classification**	Highly confidential
Sample	PU-UF 3, Poly Urethane (1.0 mm)	**Client**	Filcoflex B.V.
Sample No.	11590/2		5171 PW Kaatsheuvel, Netherlands
Test No.	TL11590PBD02	**Contact person**	Mr. Werner van Loon

Test method



an earthed metal sphere and the charged sample.

The sample is located on an earthed metal plate.

It was charged by means of a high voltage source (electrostatic gun, U = 70 kV) for about 120 sec.

Then it was tried to initiate a propagating brush discharge by decreasing the distance between

Remarks The room temperature was 23 °C, the relative humidity 30 %rF.

Results

Test	Determination of a propagating brush discharges
1 (200 mm x 200 mm)	No propagating brush discharges could be determined with respect to the described test procedure.
2 (465 mm x 465 mm)	No propagating brush discharges could be determined with respect to the described test procedure.

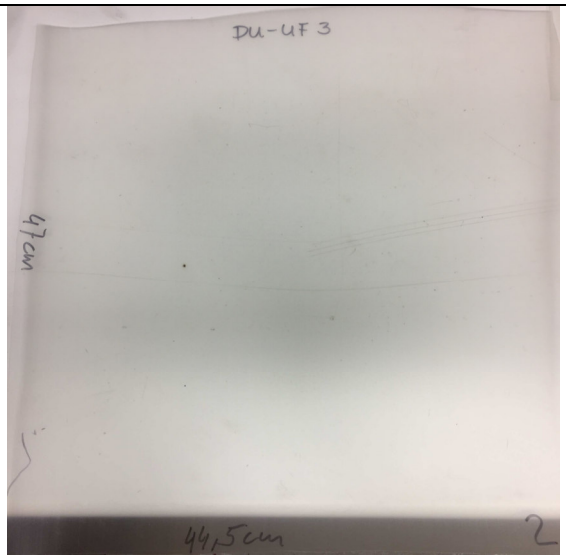



photo of the test sample