Test report | Surface resistance

1. Introduction

Filcoflex B.V. manufactures flexible connections for the food industry. In many applications, the flexible connection must comply to certain propeties regarding electrostatic energy in relation to ATEX.

IMQ S.p.A was commissioned to develop and conduct a suitable test procedure for the evaluation of various flexible materials named in chapter 2, hereinafter collectively referred to as the "materials", to test the surface resistance. These materials were tested by Fabio Elli and approved by Manuela Grassi of IMQ S.p.A and were released at the 24th of February in 2021.

Whenever this test report mentions "supplier", this refers to Filcoflex B.V.'s (raw) material supplier.

2. Tested materials

For these tests the following materials were used and tested:

Material	Description
PU-AS10	Sheet of non-metallic material
PU-AS10 Blue	Sheet of non-metallic material

The tested specimens are thin sheets of non-metallic material selected, sent and provided by supplier.

The dimensions of the sample sheets are 210×300mm.

3. General data

3.1 Sample details

Samples received on:	14 January 2021 Items sampled and sent by supplier
IMQ samples reference:	BEM 102422
Samples tested amount:	4 samples total 2 of each material
Samples accepted on:	18 January 2021
Object under analysis recognition:	Not carried out Unless otherwise stated, the characteristics of the materials were taken from supplier description and were not verified by the laboratory.

3.2 Testing location

Testing dates:	15 and 16 February 2021
Testing laboratory:	IMQ S.p.A. - Via Quintiliano, 43 - I-20138 Milano
Testing site:	Via Quintiliano, 43 - I-20138 Milano

3.3 Environmental conditions

Ambient temperature:	23,2°C
Relative humidity:	28,1% RH
Atmospheric pressure:	1010 mBar

4. Test setup

4.1 Possible case verdicts

Along with the volume resistance, the surface resistance of a material determines its electrostatic properties. In the table below, the value ranges and their meaning regarding the material for both these resistances are stated.

These tests should be performed at a relative humidity of 30% RF (±5%) and a temperature of 25°C (±5°C).

	Surface resistance	Volume resistance
Insulating	> 10^{11} Ω	> 10^{9} Ωm
Electrostatically dissipative	10^{4} Ω up to 10^{11} Ω	10^{4} Ωm up to 10^{9} Ωm
Non-conductive	< 10^{4} Ω	< 10^{4} Ωm

4.2 Test performed

Test performed	Clause	Sample amount
Surface resistance test of parts of non-metallic materials	26.13	4

4.3 General remarks

Throughout this report, a comma is used as the decimal separator.

Unless otherwise stated, the uncertainties for the tests and measurements are evaluated in accordance with the IMQ Operational Instruction IO-LAB-001, IO-LAB-004 and IO-LAB-U12.

The uncertainties evaluation has been carried out in accordance with IECEx OD 012 (only when the IECEx scheme is applicable) or IEC guide 115 "Application of uncertainty of measurement's to conformity assessment activity in the electrotechnical sector" and IECEE OD 5014.

IMQ's internal procedure PG-037 ensures that the requirements for traceability of calibrations, of all test equipment requiring calibration, and the calibration intervals are met.

The ability or reliability of the materials to perform their intended function in a particular application has not been investigated.

Unless otherwise specified, warnings, installation instructions and/or user manuals provided with the samples have been checked in Italian or English.

Filcoflex B.V. declines any responsibility derived from missing or incorrect information provided by the supplier.

5. Test results

5.1 Dimensions

Sample dimensions:	210×300 mm
Electrode 1 Length:	100 mm
Electrode 2 Length:	100 mm
Electrode 1 Width:	1 mm
Electrode 2 Width:	1 mm
Electrode internal distance:	10 mm

5.2 Desired conditions

The table below shows the desired conditions for the room during the surface resistance tests. The IMQ test specialists have started regulating these factors of the room 24 hours prior to testing.

Room temperature:	23 °C
Relative humidity:	30% RH
Duration:	24 hours

5.3 Conditions during test

After regulating the conditions in the room for 24 hours, the measured conditions during the tests can be found below.

Room temperature:	23,5 °C
Atmosphere pressure:	1010 mBar
Relative humidity:	28,1% RH
Direct Voltage applied:	500 V
Test duration:	65 seconds

5.4 Surface resistance test result

Shown below are the measurements of the tests. All tests were performed with surface test apparatus P-03503 and under the conditions mentioned in chapter 5.3.

Material	Sample	Surface resistance
PU-AS10 Clear	1A	$8{,}46\times10^{9}\ \Omega$
PU-AS10 Clear	2A	$8{,}28\times10^{9}\ \Omega$
PU-AS10 Blue	1B	$7{,}21\times10^{9}\ \Omega$
PU-AS10 Blue	2B	$6{,}21\times10^{9}\ \Omega$

See appendix in chapter 9 for the photographic documentation.

6. Measurement equipment

Cause	Testing	Equipment ID	Range used	Lastest calibration	Next calibration
26.13	Surface resistance test (Temp. and humidity)	Thermohygrometer Deltaohm S-08225	T: (0-70) °C U: (0-100)% RH	16 Nov. 2020	30 Nov. 2021
26.13	Surface resistance test (Electrical resistance)	Ohmmeter SEFELEC - M1500P S-01659	100 kΩ / 1 TΩ	20 Apr. 2020	30 Apr. 2021
26.13	Surface resistance test (Duration)	Chronometer Hanhart - Profil 2 S-05009	-	20 Apr. 2020	30 Apr. 2021
26.13	Surface resistance test (Dimensions - Thickness)	Caliper Mitutoyo - CD-15CPX S-06538	(0-150) mm	27 Feb. 2020	28 Feb. 2021
26.13	Surface resistance	Surface test apparatus ATS Galbusera P-03503	-	-	-
26.13	Surface resistance test (Dimensions - Distance)	Measuring tape BMI S-05781	(0-5) m	02 Jun. 2020	30 Jun. 2021

7. Measurement uncerainties

The measurement uncertainties stated in this document have been determined according to the ISO/IEC guide 98 and to EA-4/16. Usually, they have been estimated as expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of approximately 95%. Normally, this factor k is 2

Operational instruction	Test	Uncertainty	Range
IO-LAB-U01	Temperature (for regulating)	2 °C	-
IO-LAB-U02	Relative humidity (for regulating)	7% RH	-
IO-LAB-U04	Dimensions	0,05 mm 0,10 mm 0,5% 1,2%	≤1 mm 1 - 25 mm > 25 mm > 150 mm
IO-LAB-U07	Test duration	1%	-
IO-LAB-U08	Test Voltage	2,5%	DC - 1 kHz
IO-LAB-U12	Electric resistance in DC	8% 15%	1MΩ - 1 TΩ > 1 TΩ

8. Summary

As the test results in chapter 5.4 state, the measured surface resistance is less than or equal to (≤) 8,46 ×10⁹Ω for the tested materials.

Meaning that, according to the electrostatic properties data as shown in chapter 4.1, the surface resistance of the materials can be classified as electrostatically dissipative.

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Function: Managing Director
Date: 26/11/2026



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The information contained herein is believed to be accurate as of the date of this document. If any of the above mentioned regulations change after the date of declaration, this information is no longer valid.

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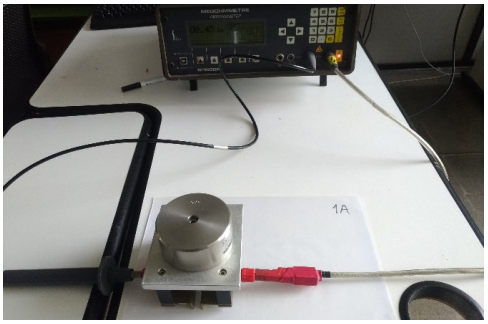
9. Appendix

9.1 Reference documents

Document	Date	Title
EN 60079-0	2018	Explosive atmospheres Part 0: Equipment - General requirements
EN 60079-32-2	2015	Explosive atmospheres Part 32-2: Electrostatic hazards - Tests

These attachments may include schematics, components information, component test reports, particular standards test reports, standard test reports, information from accompanying docuements and similar.

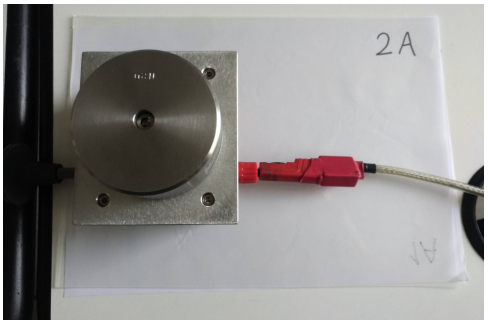
9.2 Photographic documentation



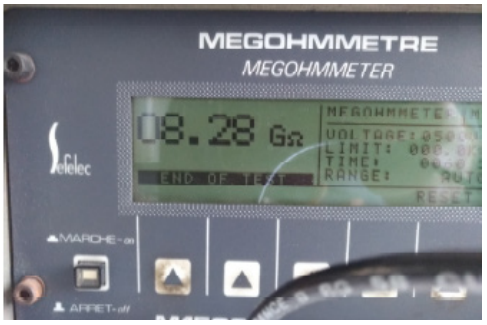
Sample 1A | Test setup



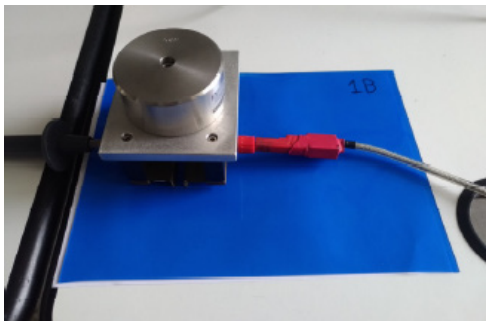
Sample 1A | Results



Sample 2A | Test setup



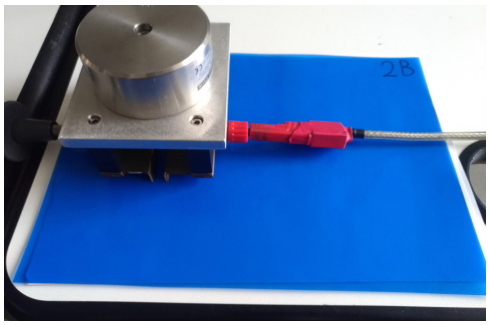
Sample 2A | Results



Sample 1B | Test setup



Sample 1B | Results



Sample 2B | Test setup



Sample 2B | Results