Client	Rhino Innovation Ltd
Report Issued	16/08/2024
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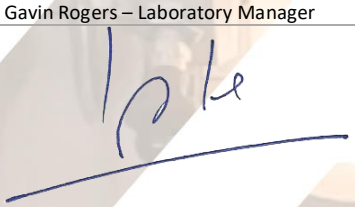
Electrostatic Properties Assessment

Black ESD Matting with Earthing Stud

Report compiled & checked by:	 Gavin Rogers – Laboratory Manager	**Date:** 14/08/2024
Approved by:	 Dr Sampuran Singh – C.E.O	**Date:** 15/08/2024

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1 Contents

Version	History	Issue Date
1	New document	See front cover

2 Introduction

This laboratory report, details safety testing conducted for Rhino Innovation Ltd on samples supplied. The following areas and parameters have been assessed:

Electrostatic Properties	• Surface Resistance / Resistivity

The testing request and test sample(s) were both supplied by Rhino Innovation Ltd. Quotation number Q004902 is used for all references to this work.

The following marked procedural dates should be noted:

Sample received:	12/08/2024
Purchase order received:	29/07/2024
Analysis started:	14/08/2024
Analysis finished:	14/08/2024

This report details all investigations into sample characterisation, including, moisture content and any sample preparation. An executive summary is followed by individual test sections describing the test procedures and detailed test data. The final section provides conclusions and if possible specific application of test data.

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Interpretations and/or recommendations contained within this report are opinions generated by Sigma-HSE (UK) Ltd and although founded on knowledge, experience and if possible published literature, they are not covered by accreditation.

Unless specifically requested any material(s) remaining from this study will be held for a minimum of 2 months after the report issue date. If further testing is required after this time frame, then additional material may be required.

3 Client & Sample Information

3.1 Client Details

Company	Rhino Innovation Ltd
Contact	Jake Douglass
Address	Cherwell House, Farm Road, Buckingham Road Ind Est, Brackley, United Kingdom NN13 7AW

3.2 Sample Identification & Preparation Details

Material Name	**Black ESD Matting**
Sigma Reference Number	043024
Appearance / Description	Large black plastic sheet with approximate dimensions: 1000 x 600 x 4 mm Metal earthing stud located in one corner of sheet
Preparation Details	None

4 Results Summary

The final test values determined for the sample supplied have been summarised in Table 4.1 below:

Table 4.1: Summary of Results

Measured Surface Resistance (Ω)	Calculated Surface Resistivity (Ω/ □)	Classification as per BS EN 61340-5-1
9.6×10^2	9.6×10^3	**Static Dissipative**

Resistance measurement taken from matt surface to earthing stud. Probe placed 30 cm away from stud – 3.0×10^4 Ω

Individual test sections detail any sample preparation conducted prior to testing.

The values above should only be applied to the material(s) submitted for analysis. Therefore, the results are not transferable to similar materials or different grades of the same material. If the materials composition or physical state changes then a review of the data generated is recommended.

5 Surface Resistivity to BS EN 61340-2-3

Information

Surface resistivity is defined as the ratio of a d.c. voltage applied between two electrodes on a surface of a specimen and the current between the electrodes or resistance between opposite edges of a square, and the unit is ohm (per square). Surface resistivity is an inherent property and is independent of sample size. The test is conducted to BS EN 61340-2-3 “Methods of test for determining the resistance and resistivity of solid planar materials to avoid electrostatic charge accumulation”

Test Equipment

Concentric Ring Test Cell
Insulation Tester (megger MIT 430)

Picture 1
Test Cell (Body & Terminals)

Picture 2
Test Cell (Concentric Rings)

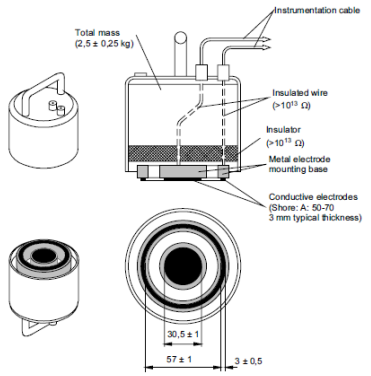

Figure 1
Test Cell (Dimensions and Wiring)

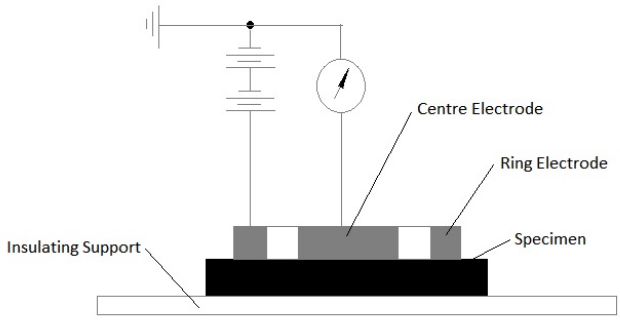

Figure 2
Connections of the electrodes for surface resistance measurements

The test cell electrode assembly (Pictures 1 & 2 / Figure 1) contains a central disc, surrounded by a concentric ring, separated by an insulating P.T.F.E mount. Both disc and ring are made of conductive rubber which make contact with the materials surface under test.

Preparation, Conditioning & Test Environment

Test specimens are either tested as they are or cut into test coupons with a minimum size of at least 80 mm x 120 mm or 110 mm diameter.

The volume resistivity of a material can be influenced by atmospheric moisture (humidity). For this reason, testing is performed at a relative humidity condition of 25 % RH ± 5 %), The sample is conditioned within the stated tolerances for at least 24 hours prior to testing.

Test Procedure

The electrode assembly as described above is connected to the instrumentation. The specimen is placed onto the test support with the surface to be tested facing upwards. The electrode assembly is then placed onto the approximate centre of the specimen or at least 10mm away from the edges.

The instrumentation is then energised at 10 V and a reading is taken after 15 s. If the measured resistance is less than 1.0 x 10^6 Ω then this value is recorded and the procedure is repeated on a new specimen. If the calculated resistance is equal to or greater than 1.0 x 10^6 then the instrumentation is de-energised and the procedure is repeated using 100 V and the resistance recorded after the predetermined electrification time. Both sides of a test specimen are analysed, and a minimum of two measurements per surface made.

The Surface Resistivity, (in ohms per square), is calculated using the following formulas and using values as obtained from the testing described above.

$$\rho_s = R_x \left(d_1 + g\right) \cdot \pi / g$$

where

P_s	=	Surface resistivity of material (in Ω/□)
R_x	=	Measured surface resistance (in Ω)
d_1	=	Diameter of the inner contact electrode (in m)
g	=	Distance between contact electrodes (in m)

The physical unit of surface resistivity is Ohm (Ω). The legitimate unit of the surface resistance is also Ohm. Because of that surface resistivity and the surface resistance are often mixed up. In order to differentiate between the two, surface resistivity is often expressed also in Ohm/square (Ω/ sq.)

5.1 Test Results for Black ESD Matting with Earthing Stud

Humidity	25	% RH
Temperature	24	°C
Operator	G. Rogers	

Table 5.1 – Final Values

	25 % Humidity
Mean Surface Resistance Value (Ω)	9.6×10^3
Mean Surface Resistivity Value (Ω/□)	9.6×10^4

Table 5.2 – Detailed Test Data

25 % Relative Humidity			**Conditioning**	
Temperature : 24 °C			**Start Time: 12:00**	
Measuring Device : Megger MIT410			**Start Date: 13/08/2024**	
Test Side	**Test Voltage (V)**	**Current (A)**	**Resistance (Ω)**	**Surface Resistivity (Ω/□)**
Operating Side	100	-	1.0×10^3	1.0×10^4
Operating Side	100	-	9.0×10^2	9.0×10^3
Operating Side	100	-	9.5×10^2	9.5×10^3
Operating Side	100	-	1.0×10^3	1.0×10^4

6 Conclusions

6.1 Electrostatic Properties

As per the definition of a static dissipative packaging material, stipulated within BS EN 61340-5-1, the ESD matt tested, based, on its surface resistance / resistivity, should be classed as conductive.

For follow-up enquiries regarding this report, please contact the report author or info@sigma-hse.com

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END OF REPORT