

CC Dr. Schutz GmbH
Dr. Olaf Janßen
Steinbrinksweg 30
31840 Hessisch Oldendorf



Dresden 17th Nov.2011

Test Report
Order no. 271309, part 2

Client: CC-Dr.Schutz GmbH
Steinbrinksweg 30
31840 Hessisch Oldendorf

Test commissioned on: 4th Oct.2011

Subject of Order: determination of surface and transit resistances on
coated resilient floor coverings

Commissioned contractor: EPH – laboratory area of surface testing (OP)

Responsible Engineer: Detlef Kleber, engineer with academic diploma



Signed by R.Emmler,
Doctor of engineering & Director of laboratory area OP

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1. Test formulation

The development and testing laboratory for floor technology GmbH (EPH) was commissioned by CC-Dr.Schutz GmbH to carry out the requirements for resilient floor coverings of surface and transit resistances, according to the German standards DIN EN 61340-4-1, DIN EN 61340-2-3 and DIN EN 61340-4-5, and to evaluate their suitability for use in ESA areas, according to German standard DIN EN 61340-5-1, as well as in areas at risk from explosions, according to TRBS 2153.

2. Test materials

The following samples were supplied by the client to be tested:

Sample	Description of Manufacturer
Floor Covering	Conductive floor covering, size 600 x 600 mm, coated with Dr. Schutz ESD Long Life PU Sealer

3. Tests carried out

The following tests were to be carried out:

Sample	Resistance Measurement	Conditioning
Floor Covering	R_{gp} , R_{p-p} according to DIN EN 61340-4-1 (point 9.2, 9.4) and DIN EN 61340-2-3 (point 8.6.3), R_g according to DIN EN 61340-4-5, R_D according to DIN EN 61340-4-1(point 9.3)	48 hour conditioning at 23°C +/- 2°C, 12% +/-3% relative humidity

R_{gp} represents the resistance to an earthing point (fig.1). In order to determine this resistance an earthing point on the upper side of the edge of the test sample was contacted with a 5cm long and 1cm wide strip-electrode made of Cu-band (with conductive adhesive $R < 0.001 \Omega$).

R_{p-p} represents the point-to-point resistance (distance to electrode 300mm) (fig.2).

R_g represents the (earth) derivative resistance (person/ESD footwear/floor covering against earth), which is also described as system resistance (fig.3).

For the tests according to DIN EN 61340-4-1 and DIN EN 61340-2-3 (earthing point) removable electrodes with a diameter of 63.5mm and a weight of 2.27kg were used.

R_D represents the transit resistance R_D (fig.4, weight of removable electrode 5kg)

The voltage used during testing was 100V for all measured values. To determine the resistances according to DIN EN 61340-4-1, DIN EN 61340-4-1 six values of each were ascertained, according to DIN EN 61340-4-5 five values.

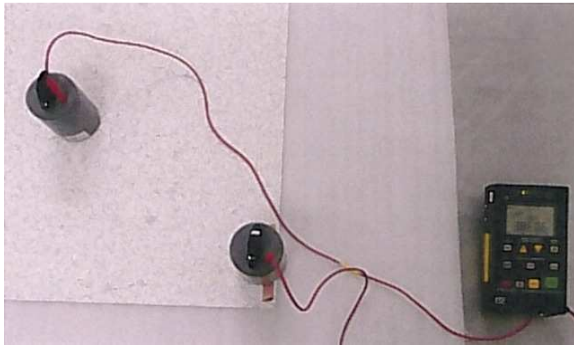


Fig.1 Ascertaining the resistance to an earthing point R_{gp}

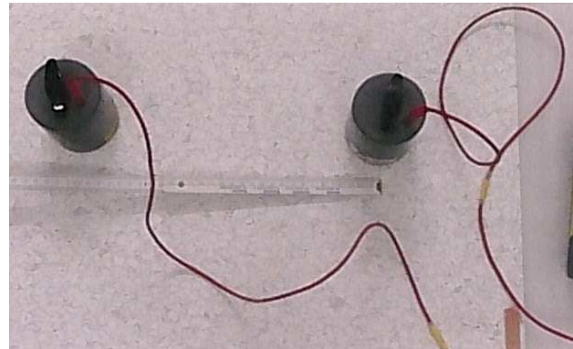


Fig.2 Ascertaining the point to point resistance R_{p-p}



Fig.3 Ascertaining the earth-derivative resistance R_g

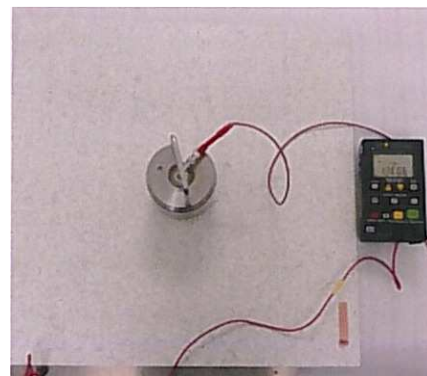


Fig.4 Ascertaining transit resistance R_D

4. Test results

The results of ascertaining the resistance to an earthing point R_{gp} according to DIN EN 61340-2-3 (point 8.6.3) / DIN EN 61340-4-1 (point 9.4) and of the point-to-point resistance according to DIN EN 61340-4-1 (point 9.2)

Measurement	Conditioning 23°C +/- 2°C and 12% relative humidity	
	R_{gp}/ Ω	R_{p-p}/ Ω
1	$4,3 * 10^5$	$3,5 * 10^5$
2	$4,7 * 10^5$	$3,4 * 10^5$
3	$4,3 * 10^5$	$3,5 * 10^5$
4	$4,3 * 10^5$	$3,6 * 10^5$
5	$4,2 * 10^5$	$3,5 * 10^5$
6	$4,4 * 10^5$	$2,6 * 10^5$
Geometric Mean	$4,4 * 10^5$	$3,3 * 10^5$

Results of ascertaining the derivative resistance R_g according to DIN EN 61340-4-5 and of the transit resistance R_D according to DIN EN 61340-4-1 (point 9.3):

Measurement	Conditioning 23°C +/-2°C and 12% relative humidity	
	R_g / Ω	R_D / Ω
1	$6,3 * 10^7$	$1,4 * 10^6$
2	$7,3 * 10^7$	$1,7 * 10^6$
3	$6,8 * 10^7$	$1,9 * 10^6$
4	$7,9 * 10^7$	$1,1 * 10^6$
5	$7,6 * 10^7$	$2,4 * 10^6$
6		$1,9 * 10^6$
Arithmetic (R_g), geometric (R_D) mean	$7,2 * 10^7$	$1,7 * 10^6$

5. Evaluation

The assessment of possibilities for use of the tested floor coverings in ESA areas of electronic manufacture is made according to DIN EN 61340-5-1:2008. This standard states that the product qualification for floor coverings must conform to a limit for the "resistance to an earthing point" $R_{gp} < 1 * 10^9 \Omega$, measured according to DIN EN 61340-4-1 and DIN EN 61340-2-3 (earthing point). The values ascertained from the tested floor covering are safely below the permitted limit and therefore can be used in ESA areas, according to DIN EN 61340-5-1 as agreed. The requirements of person-earthing according to DIN EN 61340-5-1 via the person/footwear/floor system (earth derivative resistance $R_g < 3,5 * 10^7 \Omega$) were negligibly exceeded by both variants with the ESD shoes. It is to be expected that the coated floor coverings can remain within the permitted limit of 100 V. for body tension, ascertained in the walk-over test according to DIN EN 61340-4-5.

For floors in areas at risk from explosions a derivative resistance of $R_E < 10^8 \Omega$ is required according to the Technical Rule for Operating Safety (TRBS) 2153:2009 and the CENELC Technical Reports CLC TR 50404:2003 and IEC DTS 60079-32-1:2011. The required derivative resistance corresponds to the ascertained resistance to an earthing point (R_{gp}) on the supplied samples. The values ascertained from the sample show that they are safely below the permitted limit. According to this criterion the coated floor coverings are suitable for use in areas at risk from explosions.



Signed by Detlef Kleber,
Responsible Engineer (with academic diploma)