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AMENDMENT 1
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Road vehicles — Test methods for electrical disturbances from electrostatic discharge

AMENDMENT 1

Véhicules routiers — Méthodes d'essai des perturbations électriques provenant de décharges électrostatiques

AMENDEMENT 1

Reference number
ISO 10605:2008/Amd.1:2014(E)

Foreword

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The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electric and electronic equipments*.

Road vehicles — Test methods for electrical disturbances from electrostatic discharge

AMENDMENT 1

Page 5, Table 2

Replace: “charge voltage” with “test voltage”. Replace Table 2 with the following.

Table 2 — Contact discharge mode current specifications

Typical capacitance/ resistance values	Peak current/ test voltage A/kV	Tolerance %	Current at t_1/ test voltage A/kV	Tolerance %	Current at t_2/ test voltage A/kV	Tolerance %
150 pF/330 Ω	3,75	±10	2 (at t_1 = 30 ns)	±30	1 (at t_2 = 60 ns)	±30
330 pF/330 Ω	3,75	±10	2 (at t_1 = 65 ns)	±30	1 (at t_2 = 130 ns)	±30
150 pF/2 000 Ω	3,75	+30 0	0,275 (at t_1 = 180 ns)	±30	0,15 (at t_2 = 360 ns)	±50
330 pF/2 000 Ω	3,75	+30 0	0,275 (at t_1 = 400 ns)	±30	0,15 (at t_2 = 800 ns)	±50

NOTE 1 The peak current level is taken from the measurement system without any data interpolation.

NOTE 2 The target used with this measurement system fulfils the requirements of A.1 and A.2. An example is defined in Annex B.

NOTE 3 The measurement times (30 ns, 60 ns, 65 ns, 130 ns, 180 ns, 360 ns, 400 ns and 800 ns) are derived from the resistance-capacitive (RC) time constant −40 % (current t_1) and +20 % (current t_2), to define two values on the falling slope of the current pulse in accordance with IEC 61000–4-2.

Pages 19 to 21, Annex A

Replace the following in Annex A (see below).

In the second sentence of A.2.3.1, replace: “Table A.1” with “Table 1”.

At the beginning of the first paragraph of A.2.3.4, add: “The measurement discharge current procedure is shown in Table A.1”.

Replace the title of Table A.1: “Contact discharge verification procedure” with “Contact discharge current waveform verification procedure”.

Replace: “output voltage” with “test voltage” and replace: “charge voltage” with “test voltage”.

A.2.3.1 Prior to verifying the discharge current, the amplitude of the ESD generator's test voltage should be determined using a high-voltage meter at the electrode tip. The accuracy of the test voltage measurement shall be as specified in Table 1.

NOTE The verification of electrode output voltage should consider electrical structure of ESD generator (e.g. electrical circuit structure) and specification (e.g. input impedance and input stray capacitance) of high-voltage meter for correct measuring.

A.2.3.4 The measurement discharge current procedure is shown in Table A.1. The following parameters shall be measured, or obtained from measured values, in order to verify whether or not the current waveform of an ESD generator is within specifications:

— I_p, the peak value of the discharge current, in A;

— I_1, the value of the current at t_1, in A (from Table 2);

— I_2, the value of the current at t_2, in A (from Table 2);

— t_r, the rise time of the current, in ns.

The average value of a parameter X_x is indicated by $\bar{X}_x$.

EXAMPLE $\bar{I}_p$ signifies the average of the peak current values.

Table A.1 — Contact discharge current waveform verification procedure

Step	**Resistance**				**Explanation**
	330 Ω		2 kΩ		
	Capacitance		**Capacitance**		
	150 pF	330 pF	150 pF	330 pF	
Discharge the ESD generator at a given test voltage 10 times, store each result					Multiple measurements are taken as the acceptance criteria are given for parameters obtained on the average value by this 10 times discharge data. This is done because there will be some discharge-to-discharge variations.
Measure I_p, I_1, I_2 and t_r on each waveform					The parameters have to be checked at each test level.
Calculate the averages $\bar{I}_p$, $\bar{I}_1$, $\bar{I}_2$ and $\bar{t}_r$ of the measured I_p, I_1, I_2 and t_r values					Average is taken on the parameters, not by averaging the waveforms. This way, any jitter on the trigger will not influence the averaging.

Table A.1 *(continued)*

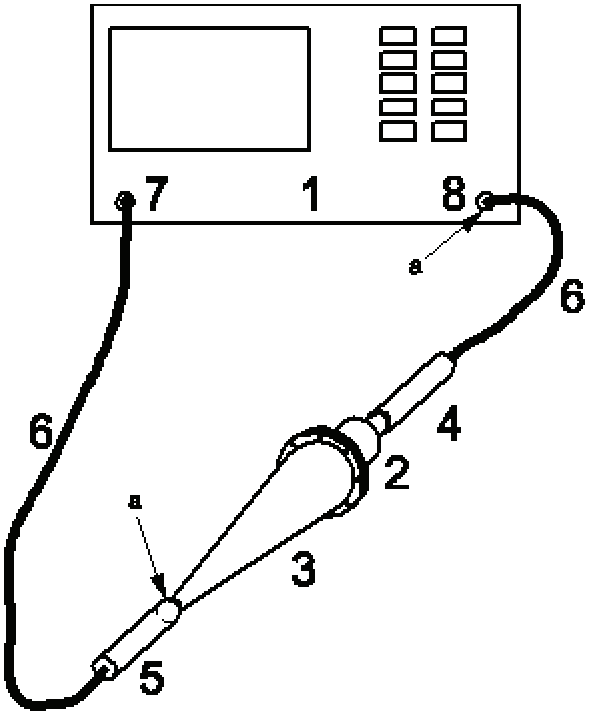
Step	Resistance				Explanation
	330 Ω		2 kΩ		
	Capacitance		**Capacitance**		
	150 pF	330 pF	150 pF	330 pF	
Check: current at t_1/test voltage (A/kV)	Check if $\overline{I}_1 = 2 \pm 30\,\%$	Check if $\overline{I}_1 = 2 \pm 30\,\%$	Check if $\overline{I}_1 = 0{,}275 \pm 30\,\%$	Check if $\overline{I}_1 = 0{,}275 \pm 30\,\%$	Again, compliance of the ESD generator is verified on the average of the parameter.
Check: current at t_2/test voltage (A/kV)	Check if $\overline{I}_2 = 1 \pm 30\,\%$	Check if $\overline{I}_2 = 1 \pm 30\,\%$	Check if $\overline{I}_2 = 0{,}15 \pm 50\,\%$	Check if $\overline{I}_2 = 0{,}15 \pm 50\,\%$	Again, compliance of the ESD generator is verified on the average of the parameter.
Check: peak current/test voltage (A/kV)	Check if $\overline{I}_\mathrm{p} = 3{,}75 \pm 10\,\%$		Check if $\overline{I}_\mathrm{p} = 3{,}75^{+30}_{\ 0}\,\%$		Again, compliance of the ESD generator is verified on the average of the parameter.
Check rise time	Check if 0,7 ns ≤ $\overline{t}_\mathrm{r}$ ≤ 1 ns				

Pages 33 to 34, Annex B

Add to Figure B.8, key item 6, the following text: “(between attenuator A and network analyser and between attenuator B and network analyser)”.

In B.2.3, in the paragraph following Figure B.8, delete: “(between attenuator and target and between attenuator and target adapter line)”.

In B.2.4, in the first list item following Figure B.9, replace: “output voltage” with “voltage”.



Key

1 network analyser

2 ESD current target

3 50 Ω conical adapter line

4 attenuator A

5 attenuator B

6 coaxial cable (between attenuator A and network analyser and between attenuator B and network analyser)

7 network analyser output connector

8 network analyser input connector

NOTE The ESD current target, attenuator A and the coaxial cable are the target-attenuator-cable chain, which is verified using this set-up.

a Calibrate the network analyser at these points.

Figure B.8 — Network analyser measurement of the insertion loss of a current target-attenuator-cable chain

The measurement procedure for the insertion loss is to calibrate the network analyser at the verification points shown in Figure B.8.

B.2.4 Determining the d.c. transfer resistance of a target-attenuator-cable chain

The d.c. system transfer resistance of the target-attenuator-cable chain may be determined by the method below.

– Inject a current I_{sys} of approximately 1 A into the front side of the current target. The front side is the side to which discharges are made. The current shall be known within ±1 %. Larger currents may be used if they do not thermally stress the target beyond its specifications. Measure the test voltage, V, across the precision 50 Ω load.

Page 42, E.2

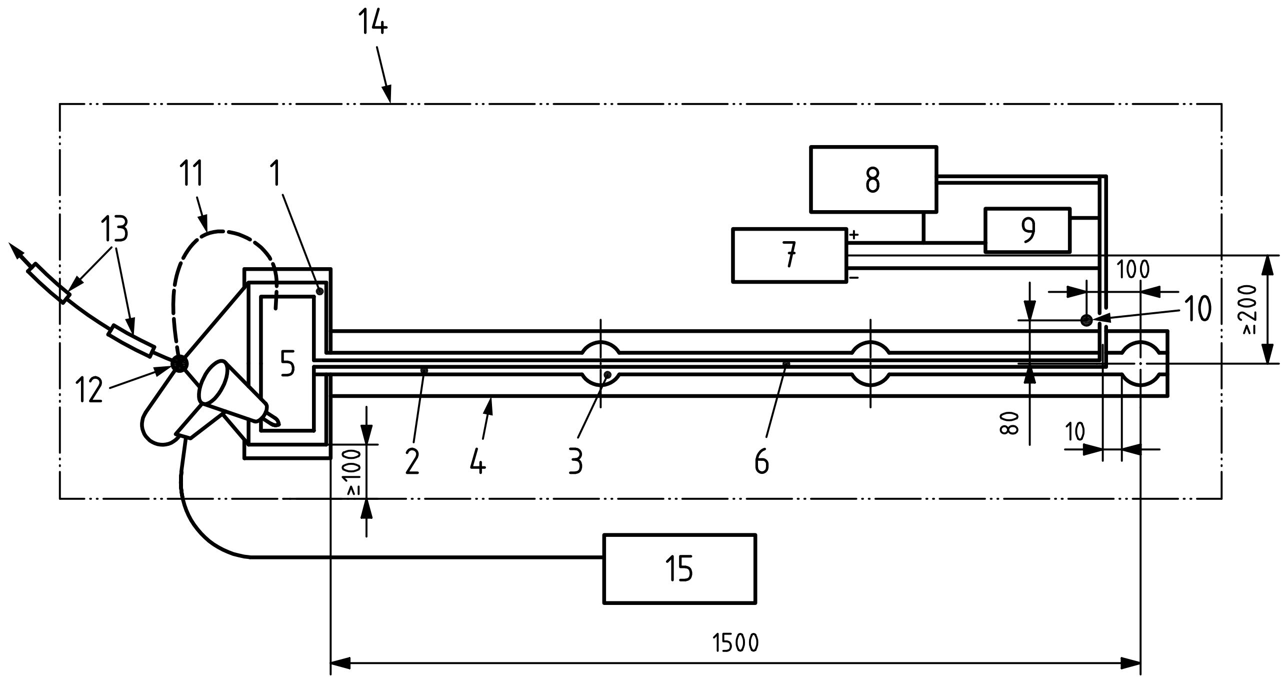
Replace the paragraph following list item c) with the following, replacing “charge voltage” with “test voltage”.

Due to the complexity of air discharge, no satisfactory verification method has been developed. Therefore it was decided not to require an air discharge verification. The operator should be aware that using a fully compliant contact mode generator in the air discharge testing mode can result in a small or very large rate of ESD current change (for the same generator electrode test voltage) between discharges. This is exactly what happens in realistic air discharge ESD events.

Pages 45 to 46,Figures F.1 and F.2

Insert the following new Figures F.2 and F.3.

Dimensions in millimetres



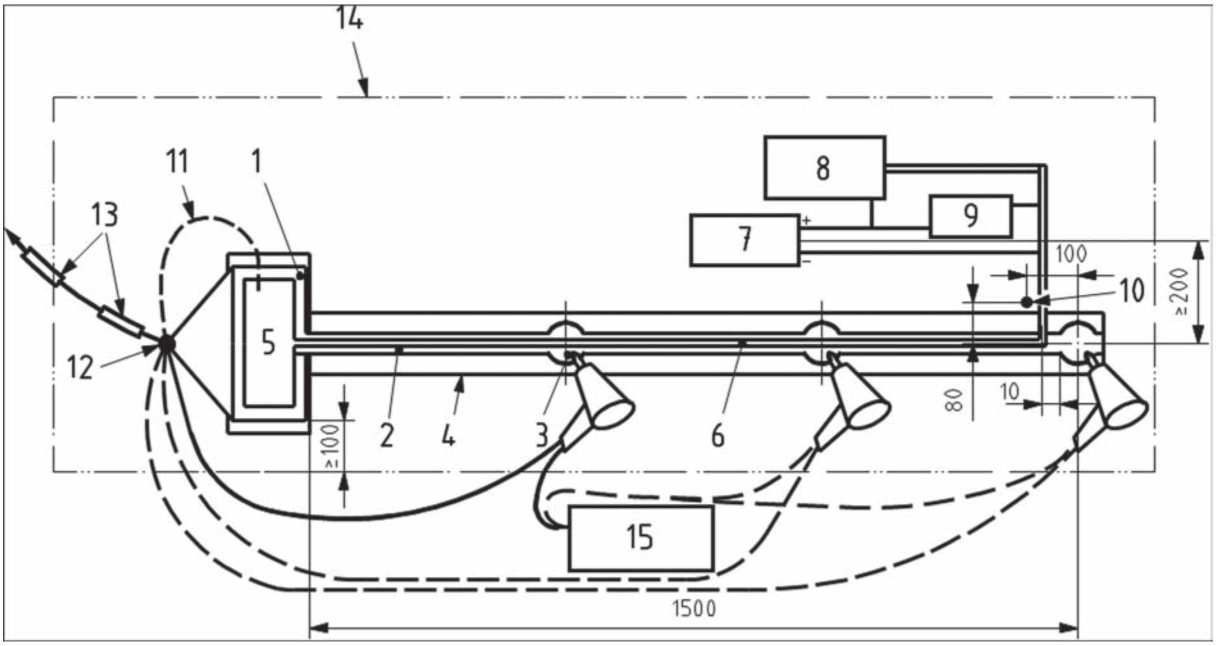
Key

1	field coupling plane	9	artificial network (AN) (if used)
2	field coupling strip	10	ground reference point for battery and support equipment
3	discharge island	11	DUT local ground (if required)
4	DUT and wiring harness isolation block	12	ground reference point for ESD coupling plane, ESD generator and safety ground connection
5	DUT	13	2 × 470 kΩ high-voltage resistors to safety ground
6	DUT wiring harness	14	HCP
7	battery	15	ESD generator main unit
8	peripheral or support equipment		

NOTE The tolerance of dimensions is ±5 %.

Figure F.2 — Test set-up — Application of direct discharges

Dimensions in millimetres



Key

1 field coupling plane

2 field coupling strip

3 discharge island

4 DUT and wiring harness isolation block

5 DUT

6 DUT wiring harness

7 battery

8 peripheral or support equipment

9 AN (if used)

10 ground reference point for battery and support equipment

11 DUT local ground (if required)

12 ground reference point for ESD coupling plane, ESD generator and safety ground connection

13 2 × 470 kΩ high voltage resistors to safety ground

14 HCP

15 ESD generator main unit

NOTE The tolerance of dimensions is ±5 %.

Figure F.3 — Test set-up — Application of indirect discharges

ICS 43.040.10

Price based on 6 pages