Changes in IEC/EN 61000-4-2

Application 800

HAEFELY

Current and voltage – our passion

Generalities

IEC/EN 61000-4-2 edition 3 was published on March 7, 2025 and replaces edition 2 which was published in 2009. The most significant change to the standard was changes regarding the calibration of the ESD generators and a procedure on calibrating air discharge.

Changes

The most important change was the calibration measurements needed. In edition 2 a calibration of an ESD generator only needed 4 points:

1) I_{P1} – 1st peak value of the discharge current [A]
2) I_{30} – Value of the current at 30 ns
3) I_{60} – Value of the current at 60ns
4) Tr – Rise time of the current [ns]

Edition 3 now requires a 5th point of measurement:

5) IP2 – 2nd peak value of the discharge current [A]

An example of these points can be seen at this ideal contact discharge current waveform at 4kV below.

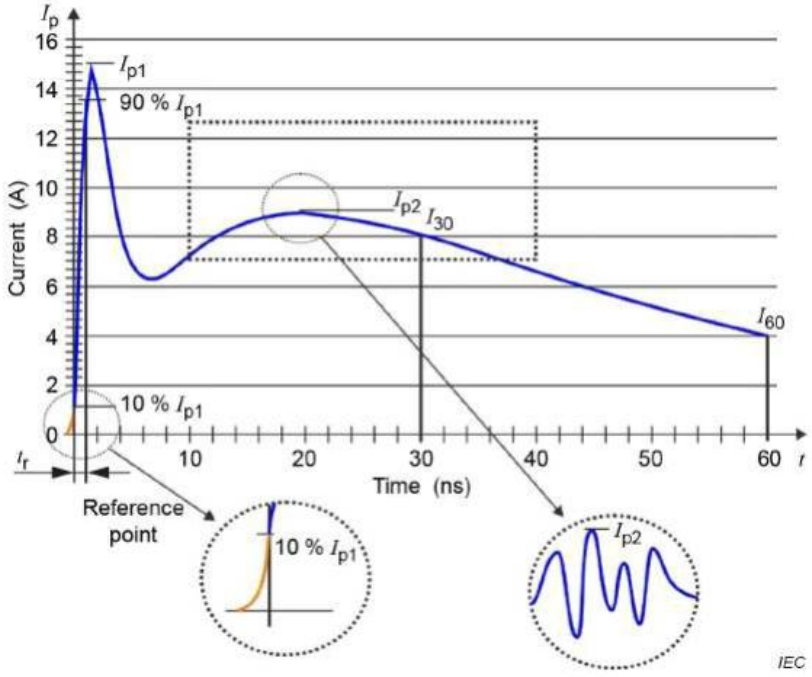

Figure 1: Discharge current waveform

Level		Associated voltage level (Table 2)	First peak current I_{p1} of discharge	Rise time [a] t_r	Second peak current [b] I_{p2} of discharge	Current I_{30} at 30 ns	Current I_{60} at 60 ns
			(±15 %)	(±25 %)	(-20 %/+40 %)	(±30 %)	(±30 %)
CD	AD	kV	A	ns	A	A	A
1	1	2	7,5	0,8	4,5	4,0	2,0
2	2	4	15,0	0,8	9,0	8,0	4,0
3	---	6	22,5	0,8	13,5	12,0	6,0
4	3	8	30,0	0,8	18,0	16,0	8,0
---	4	15	56,3	0,8	33,8	30,0	15,0

Figure 2: Discharge current waveform parameters

I_{P2} was implemented to improve the accuracy and consistency of ESD testing. The standards committee found that ringing, an unwanted oscillation that leads to distorted waveshapes of a discharge current waveform, was found in numerous ESD generators on the market. In order to determine if an ESD generator is performing within acceptable standards with limited ringing, that I_{P2} point must be measured during calibration.

Another point of change to the standard was the introduction of air discharge calibration requirements. Prior to the change in editions, there was not a requirement for air discharge calibrations. Air discharge tests are difficult to reproduce because the testing can be influenced by approach speed of the tip of the generator and humidity of the testing environment, and this is why a general procedure was needed.

The standards committee determined that the discharge current shape is independent of which tip (contact tip or air discharge tip) was used as long as the generator is used in contact discharge mode for the calibration. As long as the tip is just a conductive material with no additional active or passive elements, the calibration can be limited to the measurement of the open circuit voltage at the air discharge tip for the maximum test voltage. Some generators are not able to be calibrated at 15kV due to their design, so the next lower air discharge voltage would be tested. Table 3 in the standard shows required test levels:

Level		Associated voltage level (Table 2)	First peak current I_{p1} of discharge	Rise time [a] t_r	Second peak current [b] I_{p2} of discharge	Current I_{30} at 30 ns	Current I_{60} at 60 ns
			(±15 %)	(±25 %)	(-20 %/+40 %)	(±30 %)	(±30 %)
CD	AD	kV	A	ns	A	A	A
1	1	2	7,5	0,8	4,5	4,0	2,0
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3	---	6	22,5	0,8	13,5	12,0	6,0
4	3	8	30,0	0,8	18,0	16,0	8,0
---	4	15	56,3	0,8	33,8	30,0	15,0

Figure 3: Discharge current waveform parameters

The test setup for calibration has also had some minor changes.

1) Vertical calibration plane – 1.2 x 1.6m
2) Reference ground plane – 1.5 x 1.2m
3) ESD target center should be 1m above ground
4) Ground point location – 0.5m

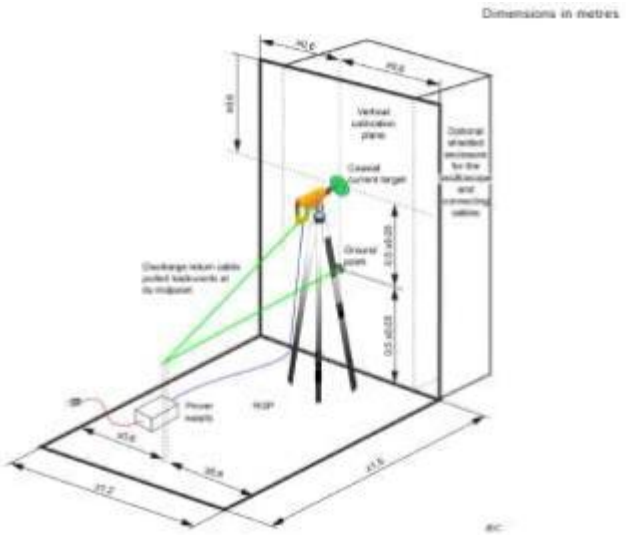

Figure 4: Test setup

The Haefely ONYX series of ESD generators are able to meet this new edition and samples of the calibration certificate can be requested. IEC 61000-4-2: 2025 was directly used in creation of this article.

Jon Nguyen
Haefely AG
Basel, Switzerland

Global Presence

Europe
HAEFELY AG
Birsstrasse 300
4052 Basel
Switzerland

☎ + 41 61 373 4111
sales@haefely.com

China
HAEFELY AG Representative Office
8-1-602, Fortune Street, No. 67
Chaoyang Road, Beijing 100025
China

☎ + 86 10 8578 8099
sales@haefely.com.cn

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