

IEC Basic Standards Update

January 2019



An ISO 9001:2015 registered company

Preliminary remark

This presentation only considers the IEC basic standards to which HV TECHNOLOGIES and EMC Partner AG offer test systems.

Which IEC basic standard has been updated?



Standard	Update
IEC 61000-4-2	✗
IEC 61000-4-4	✗
IEC 61000-4-5	✓
IEC 61000-4-8	✗
IEC 61000-4-9	✓
IEC 61000-4-10	✓
IEC 61000-4-11	✓
IEC 61000-4-12	✓
IEC 61000-4-16	✗
IEC 61000-4-18	Expected in 2019
IEC 61000-4-19	✗
IEC 61000-4-29	✗
IEC 61000-4-34	✗

New requirement in IEC 61000-4-5 Edition 3.0 (2014) + Amendment 1/2017

Surge

Standard

Update

IEC 61000-4-5



New requirement in IEC 61000-4-5 Edition 3.0 (2014) + AMD1/2017

Informative Annex:

- Amendment to clause 7.3 of IEC 61000-4-5 Ed 3.0
- Practical problems when testing DC/DC converters
 - EUT may not power-up
 - Potential for EUT damage
- Annex with description of potential issues
- Proposes some solutions

New requirement in IEC 61000-4-5 Edition 3.0 (2014) + AMD1/2017

New requirement:

- Amendment to clause 7.3

Add to clause 7.3 at the end of the 2nd paragraph the following sentences:

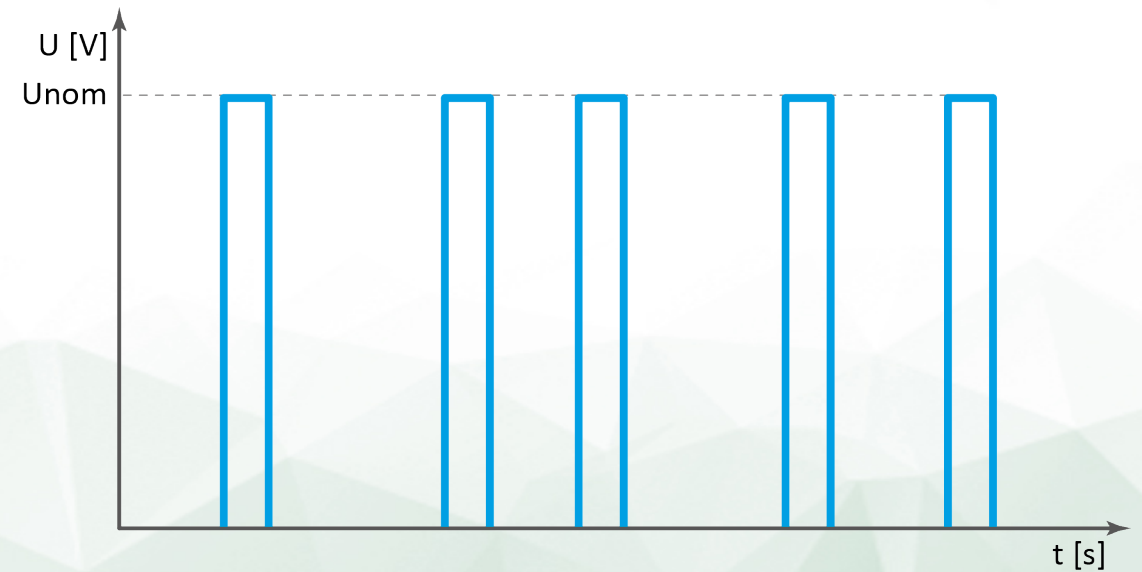
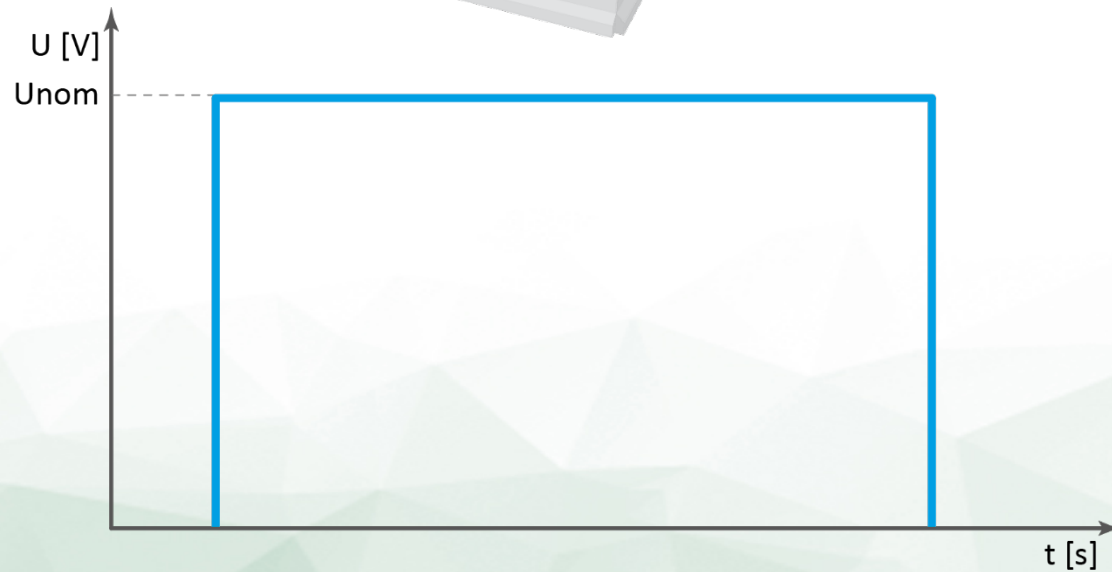
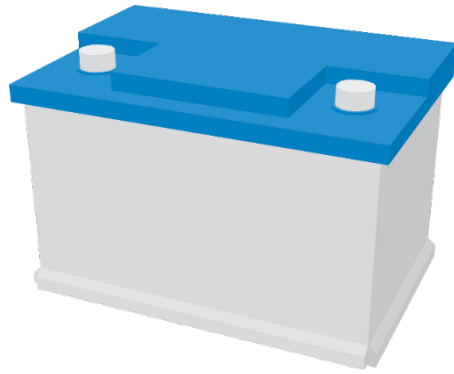
In case, where an EUT having DC-DC input converters cannot power up through the appropriate current-rated CDN, it is permitted to use a larger current-rated CDN with ratings $\geq 100A$, which fulfils the specifications according to its current rating given in Table 4. In such case, the use of this higher rated CDN shall be described in the test report. Annex I includes further information regarding this special case.

[Source: IEC 61000-4-5 Ed. 3.0 AMD1]

New requirement in IEC 61000-4-5 Edition 3.0 (2014) + AMD1/2017

Practical problems when testing DC/DC converters

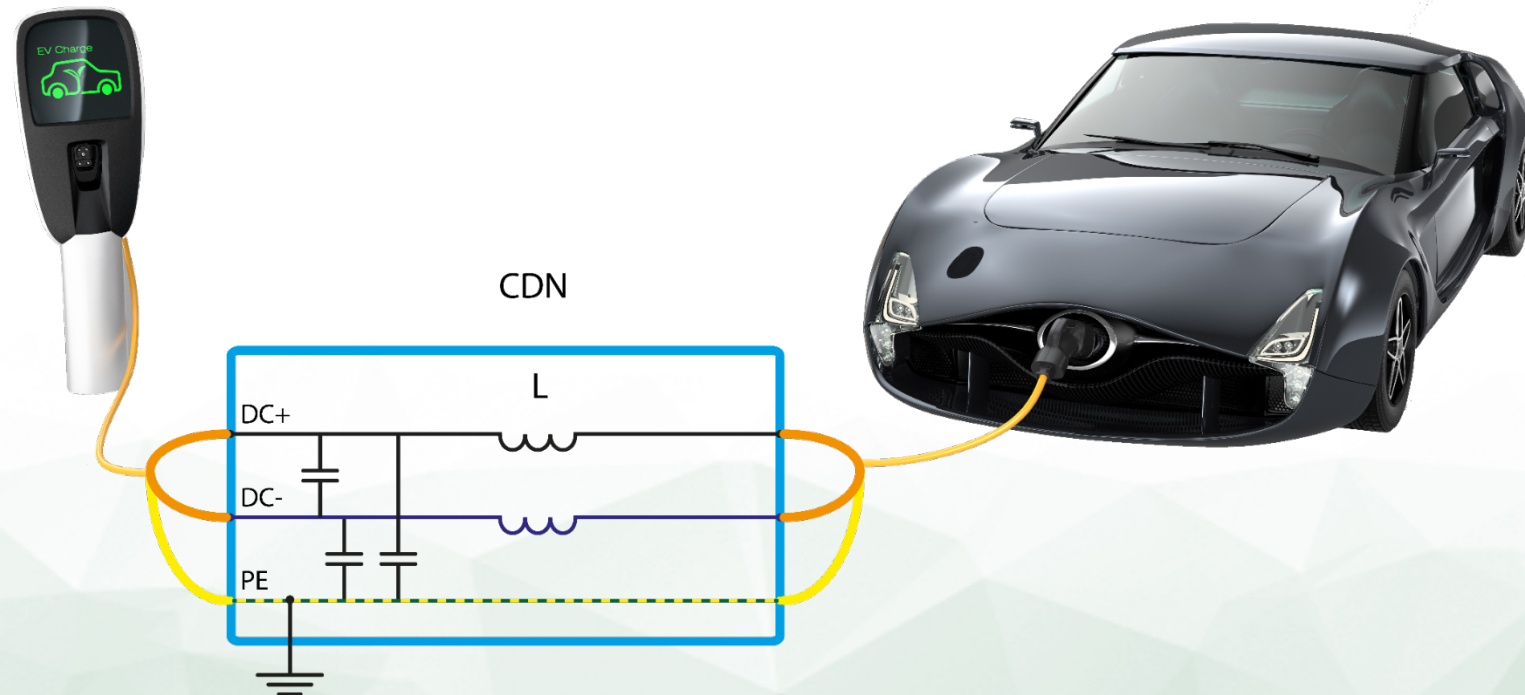
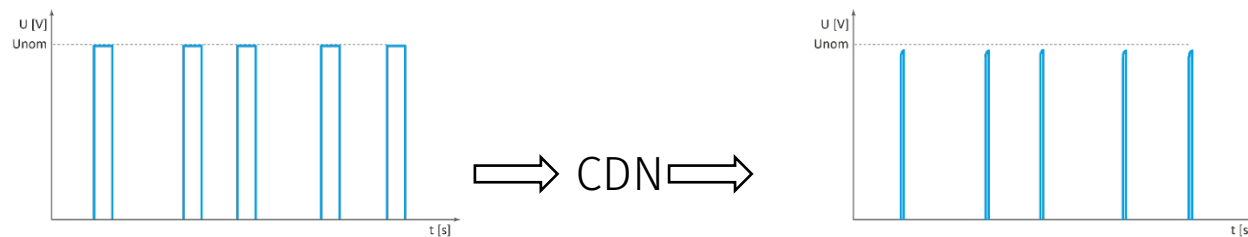
DC voltage and current are not “DC” anymore



New requirement in IEC 61000-4-5 Edition 3.0 (2014) + AMD1/2017

What is happening actually?

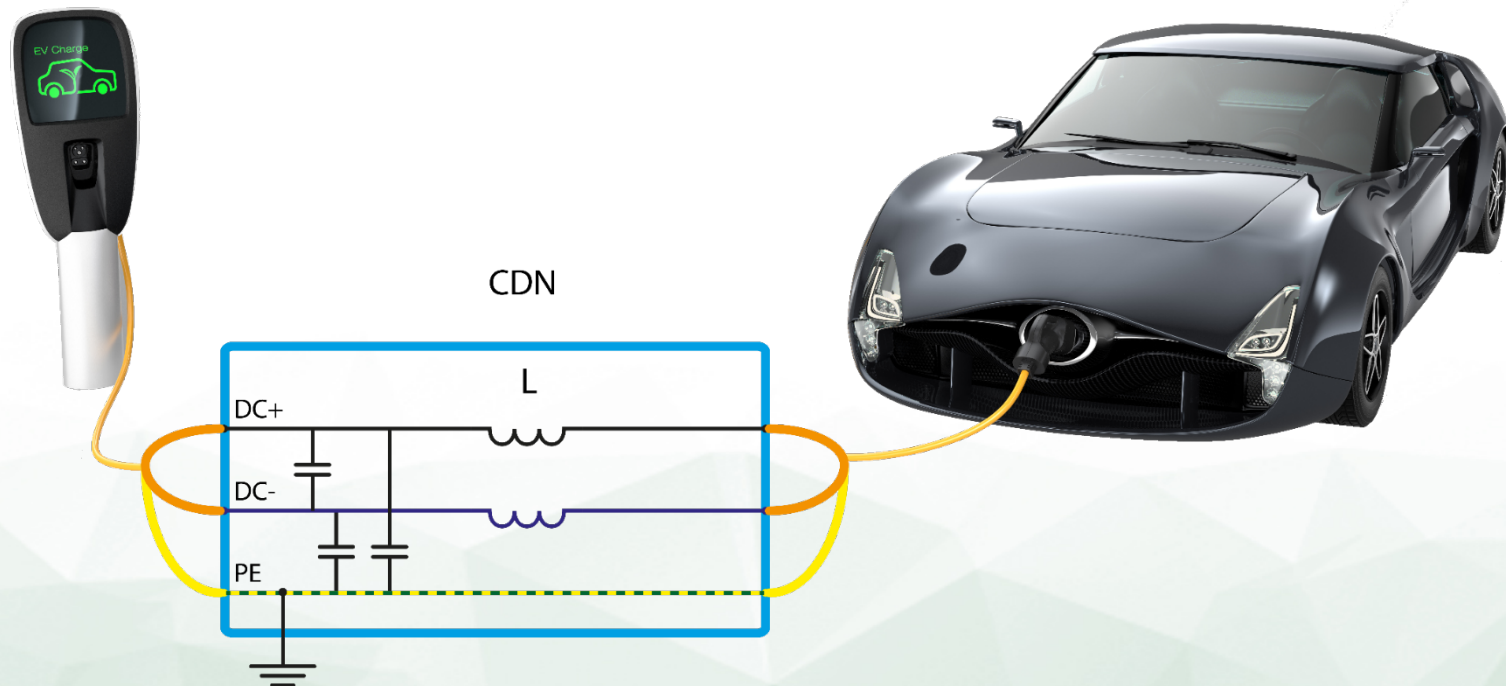
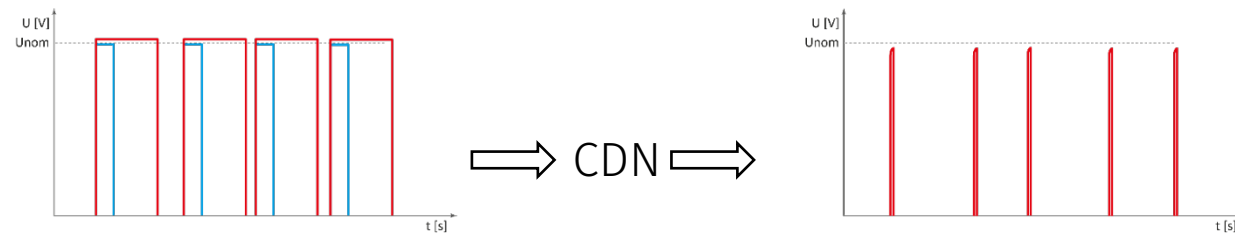
DC voltage and current are not «DC» anymore



New requirement in IEC 61000-4-5 Edition 3.0 (2014) + AMD1/2017

What is happening actually?

How does the charging station react?



New requirement in IEC 61000-4-5 Edition 3.0 (2014) + AMD1/2017

What is happening?

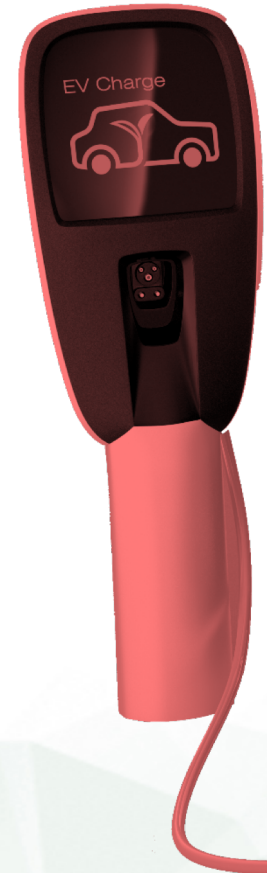
What is the result?

The charging station is overloaded.

Charging voltage / current is not reached.

The charging station will finally give up.

The car is not charging.



New requirement in IEC 61000-4-5 Edition 3.0 (2014) + AMD1/2017

Solution 1 (in case equipment is not powered up)

Use a CDN with higher current ranking that meets the requirement for its current rating.

EMCP AG address 3-phase CDNs for current values 32A, 63A, 125A and 200A up to 8kV.

Here is an example of
a 200A CDN



New requirement in IEC 61000-4-5 Edition 3.0 (2014) + AMD1/2017

Solution 2 (in case overvoltage / oscillations appear)

Use a damping circuit

R is selected to dampen oscillation
while meeting DC-DC supply specs

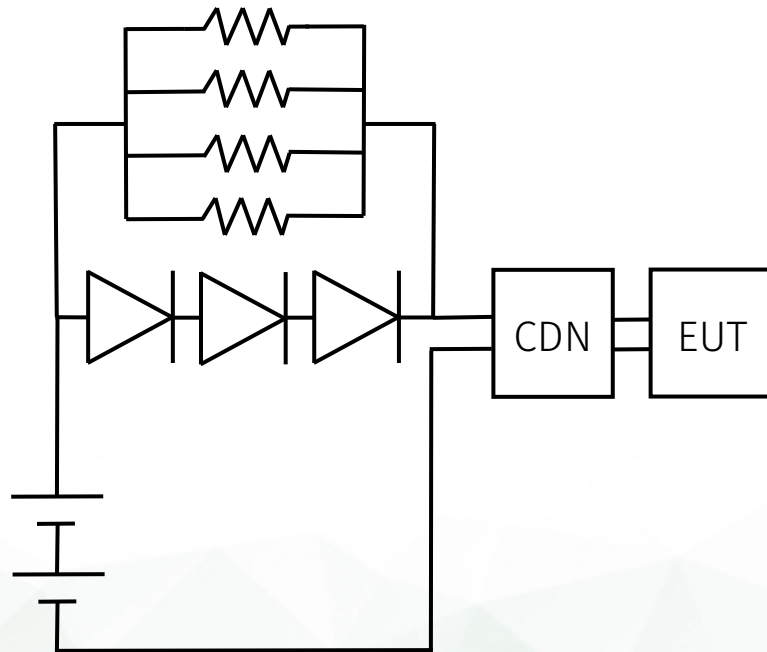
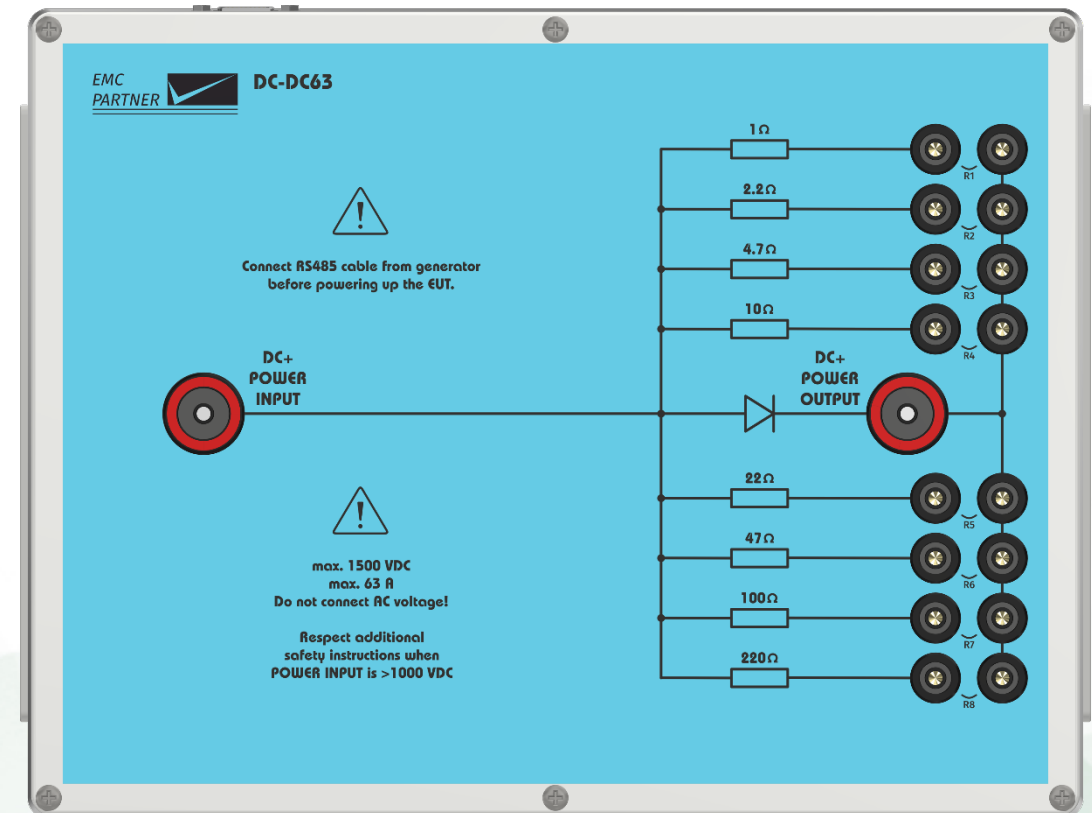


Figure I.1 – Example of adding a damping circuit to the CDN for DC-DC converter EUTs

OPT-63 DC-DC



New requirement in IEC 61000-4-9 2.0 (2016)

Pulsed Magnetic Field

Standard

Update

IEC 61000-4-9



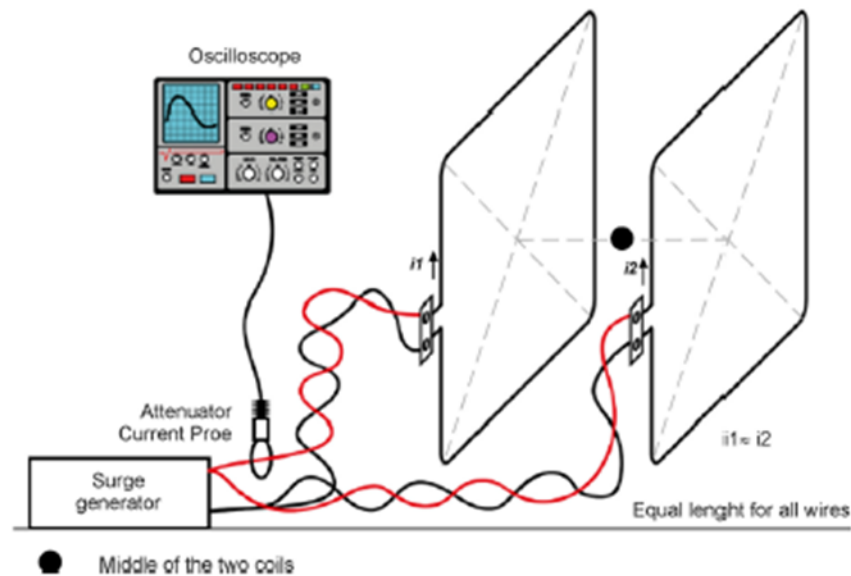
New requirement in IEC 61000-4-9 2.0 (2016)

- New pulse definition 8/20 μ s (new)
- Definition of pulse tolerance for different size of antennas

Antenna	Front time	Duration
1m x 1m induction coil	$T_f = 1.25 \times T_r = 8\mu\text{s}$ $\begin{matrix} +2.4 \\ -0.8 \end{matrix} \mu\text{s}$	$T_d = 1.18 \times T_w = 20\mu\text{s}$ $\begin{matrix} +6 \\ -2 \end{matrix} \mu\text{s}$
1m x 2.6m induction coil	$T_f = 1.25 \times T_r = 8\mu\text{s}$ $\begin{matrix} +3.2 \\ -0.8 \end{matrix} \mu\text{s}$	$T_d = 1.18 \times T_w = 20\mu\text{s}$ $\begin{matrix} +6 \\ -2 \end{matrix} \mu\text{s}$

New requirement in IEC 61000-4-9 2.0 (2016)

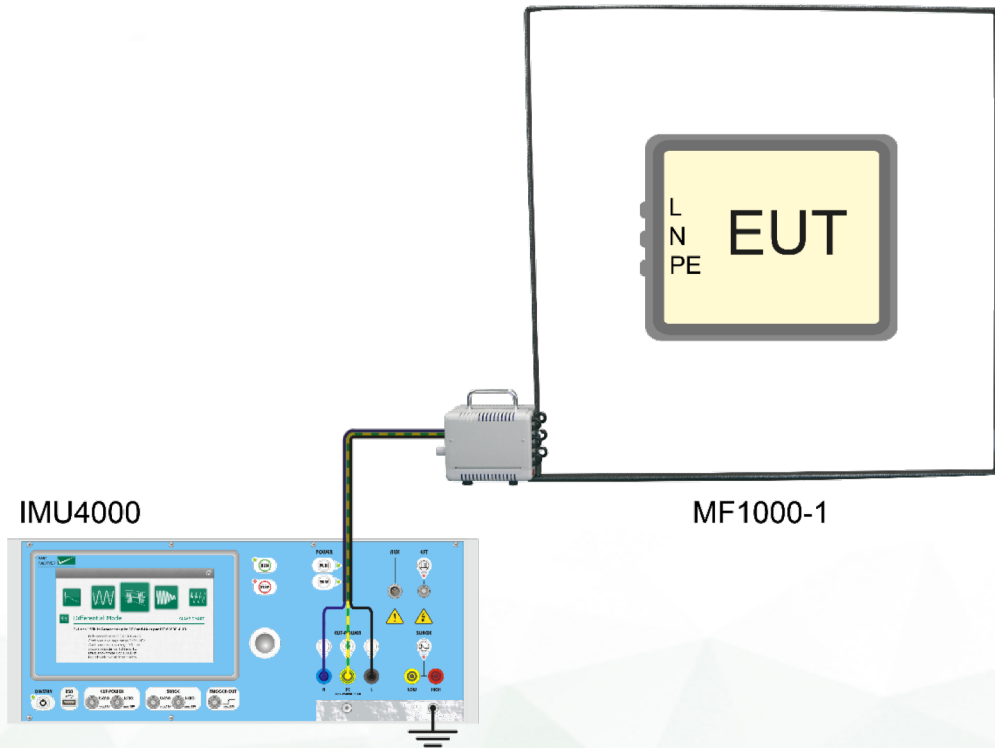
- Informative Annex F
 - Describes the use of 2 antennas (1m x 1m) connected in parallel for larger EUTs



- Proximity method as alternative, for large EUTs.
The double induction coil to obtain a better homogeneity and for testing larger EUTs.

New requirement in IEC 61000-4-9 2.0 (2016)

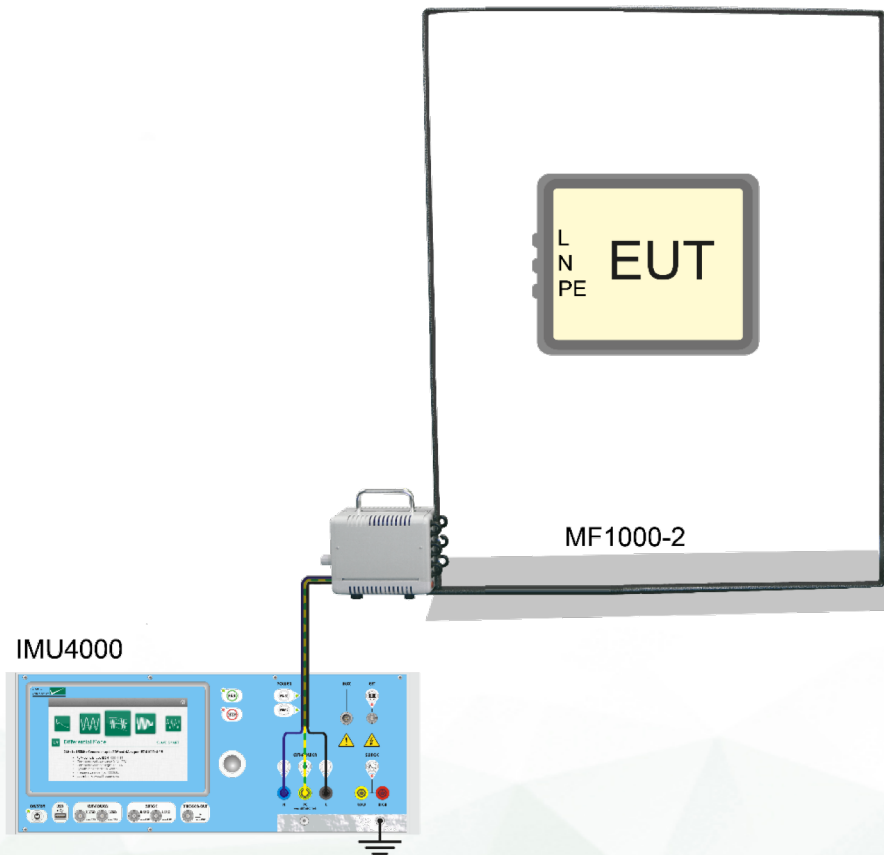
Test set-up example with generator IMU4000 and 1m x 1m antenna MF1000-1



Adjustable pulses in the range 90 A/m – 1400 A/m

New requirement in IEC 61000-4-9 2.0 (2016)

Example of test set-up with generator IMU4000 and 1m x 2.6m antenna MF1000-2



- ✓ Normative levels reached with internal variac of generator
- ✓ No high current cables between generator and antenna
- ✓ Improved safety
- ✓ Reduced exposure of user to magnetic fields during the test

Adjustable pulses in the range 63 A/m – 1025 A/m

New requirement in IEC61000-4-10 2.0 (2016)

DOW magnetic field

Standard

Update

IEC 61000-4-10



New requirement in IEC 61000-4-10 2.0 (2016)

- Schematic for calibration setup
- Peak current specifications for 1 x 1 m and 1 x 2.6 m antennas

Peak current I [A] ± 20%		
Test Level	Antenna 1m x 1m standard induction coil	Antenna 1m x 2.6m standard induction coil
1	not applicable	not applicable
2	not applicable	not applicable
3	11.1	15.2
4	33.3	45.5
5	111	See note 2 of IEC 61000-4-10 2.0 (2016)
X	Special/0.9	Special/0.66

- New waveform definition
- Proximity method as alternative for large EUTs

New requirement in IEC 61000-4-10 2.0 (2016)

- New waveform definition

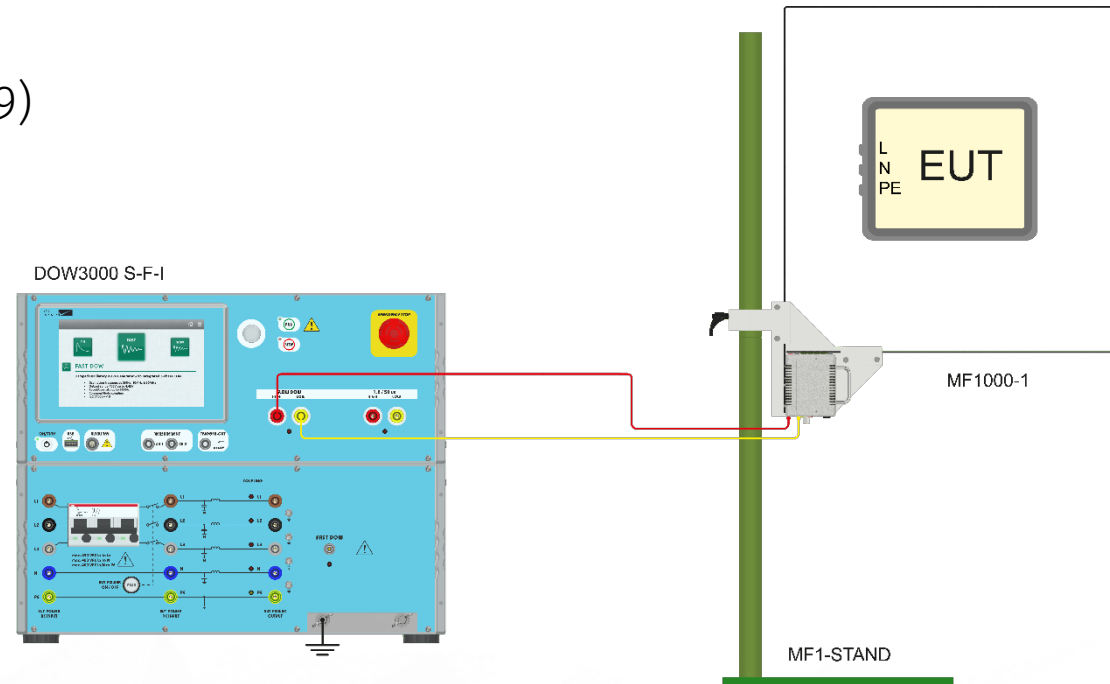
Calibration items	Oscillation frequency	
	100kHz	1MHz
Oscillation period	$T = 10\mu\text{s} \pm 1\mu\text{s}$	$T = 1\mu\text{s} \pm 0.1\mu\text{s}$
Repetition time of the pulse	$T_{\text{rep}} = 25\text{ms} \pm 2.5\text{ms}$	$T_{\text{rep}} = 2.5\text{ms} \pm 0.25\text{ms}$
Decay rate of one pulse	$D_{r1} = I(\text{PK}_5) \div I(\text{PK}_1) > 50\%$ $D_{r2} = I(\text{PK}_{10}) \div I(\text{PK}_1) < 50\%$	$D_{r1} = I(\text{PK}_5) \div I(\text{PK}_1) > 50\%$ $D_{r2} = I(\text{PK}_{10}) \div I(\text{PK}_1) < 50\%$

- Proximity method as alternative for large EUTs
It is a practical test method for in-situ testing.

New requirement in IEC 61000-4-10 2.0 (2016)

Test set-up example:

- Generator DOW3000 S-F-I
- Antenna MF1000-1 (1m x 1m)
(Same antenna for IEC 61000-4-8/9)

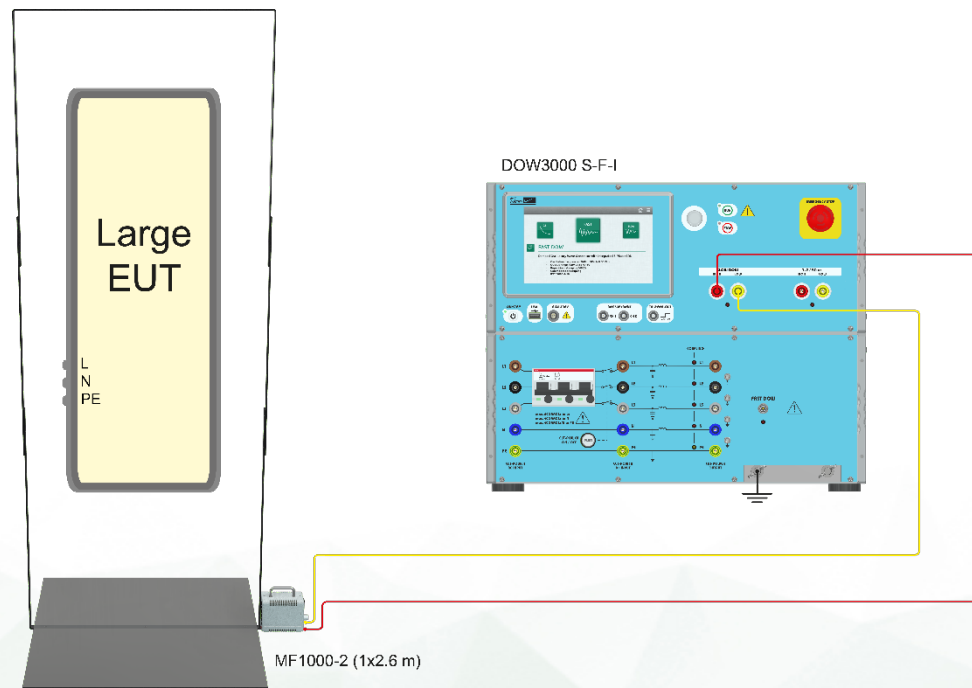


Adjustable level from 5 A/m to 220 A/m @ 100 kHz with coupling device MF1000-1
Adjustable level from 2.5 A/m to 110 A/m @ 1 MHz with coupling device MF1000-1

New requirement in IEC 61000-4-10 2.0 (2016)

Test set-up example:

- Generator DOW3000 S-F-I
- Antenna MF1000-2 (1m x 2.6m)
(Same antenna for IEC 61000-4-8/9)



✓ A fully compliant test system that meets all test levels with both antennas

Adjustable level from 5 A/m to 160 A/m @ 100 kHz with coupling device MF1000-2

Adjustable level from 2.5 A/m to 60 A/m @ 1 MHz with coupling device MF1000-2

New requirement in IEC 61000-4-11 2.0 + AMD1/2017

Dips

Standard

Update

IEC 61000-4-11



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New requirement in IEC 61000-4-11 2.0 + AMD1/2017

- The new “Informative Annex” clarifies the rationale for voltage rise and fall time, inrush current
- Why was this annex required?
It explains that power sources can be used for “pre-compliance testing” only it maintains that a full-compliance test requires a full compliant generator.
- Switching time requirement remains 1 ... 5 μs (annex explains why)
- Inrush current requirement remains 500 A (annex explains partially why)
For the switching time a value of 1 to 5 μs was chosen for representing the short circuit worst case occurring at a distance of up to 50 m between the source and the affected equipment.
[Source: IEC 61000-4-11 Ed. 2.0 AMD1]
- No new requirements for existing full-compliant test systems

New requirement in IEC 61000-4-11 2.0 + AMD1/2017

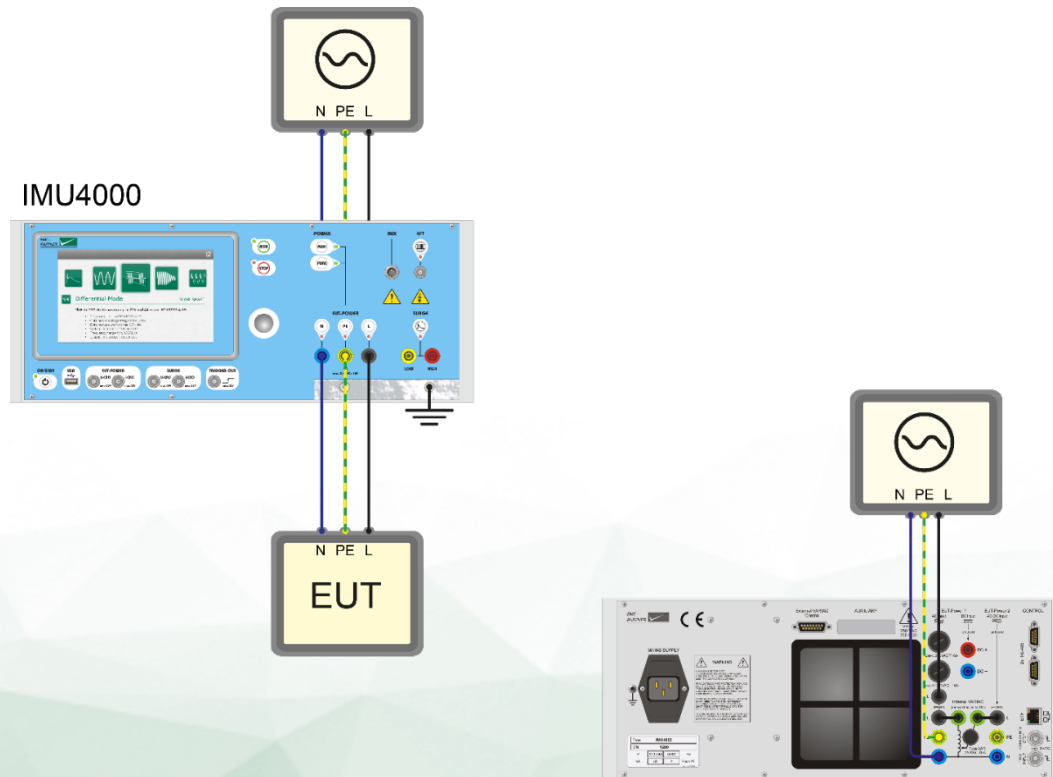
Requirement IEC 61000-4-11 EUT current < 16A

Dips	40%, 70%, 80%
Interruption	0%
Variation (optional)	40%, 70%

New requirement in IEC 61000-4-11 2.0 + AMD1/2017

Test set-up example:

- 1-phase dips/interruption up to 300VAC / 16A, 50/60Hz
- 1-phase variation up to 250VAC / 5A
- Generator IMU4000 D-V



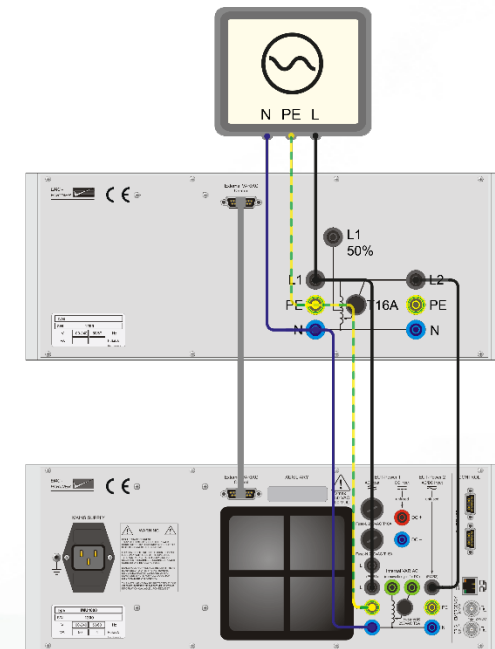
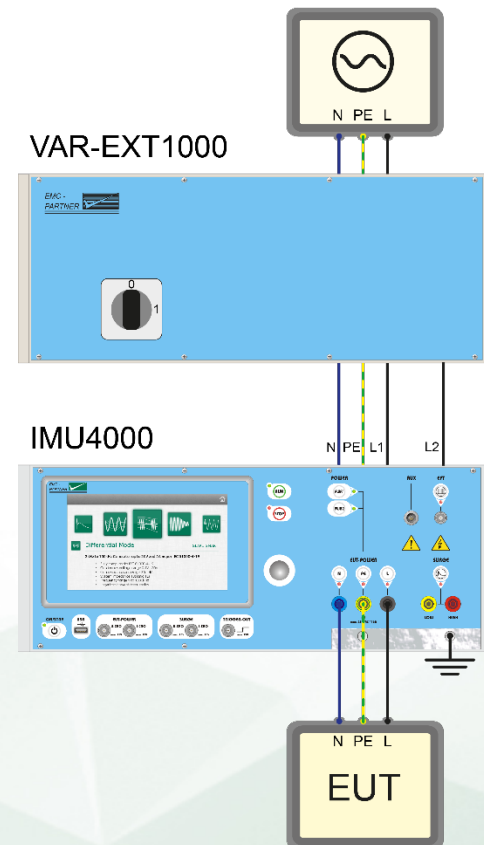
- ✓ Unique internal variac for equipment with consumption $\leq 5A$
- ✓ The 5 A variac is built-in the generator

New requirement in IEC 61000-4-11 2.0 + AMD1/2017

Test set-up example:

- 1-phase dips/interruption up to 300VAC / 16A, 50/60Hz
- 1-phase variation up to 250VAC/16A, 50/60Hz
- Generator IMU4000 D or IMU3000 D
- External variac VAR-EXT1000

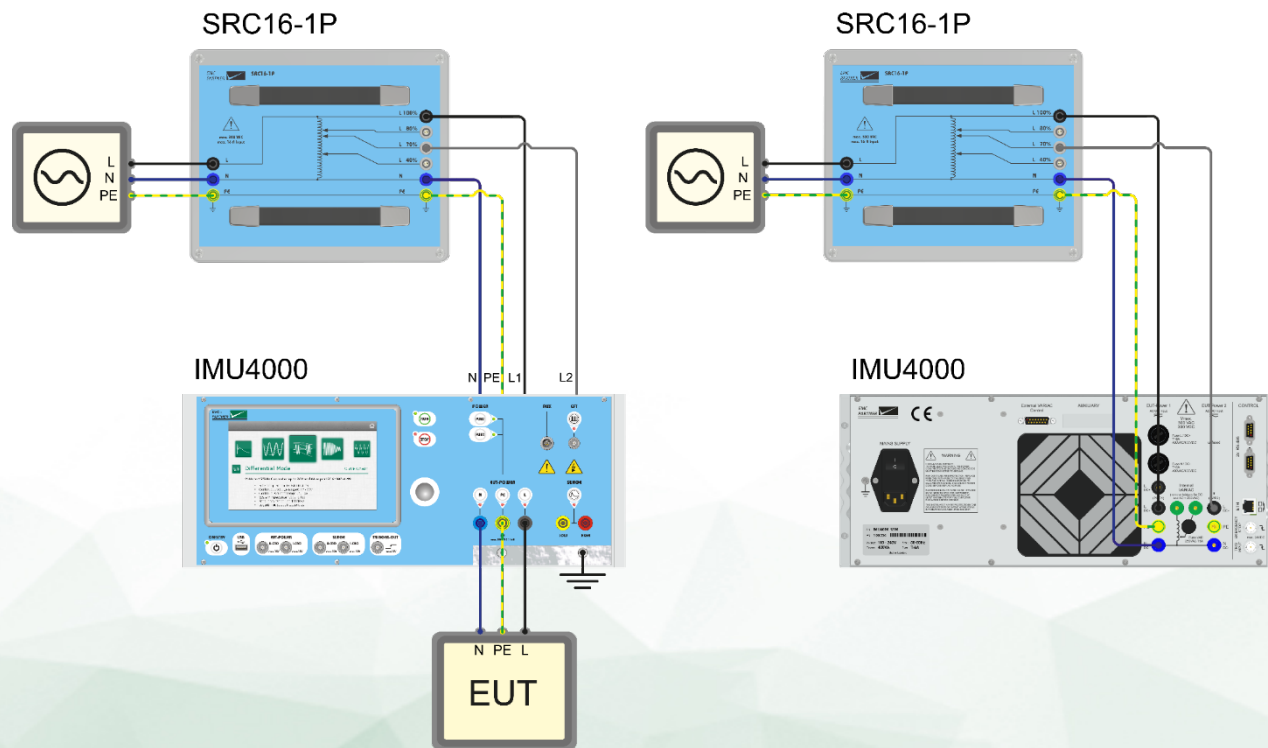
✓ Extension up to 16A with external variac, if required



New requirement in IEC 61000-4-11 2.0 + AMD1/2017

Test set-up example:

- 1-phase dips/interruption 100VAC – 300VAC / 16A, 50/60Hz
- Generator IMU4000 D or IMU3000 D
- Manual step transformer SRC16-1P



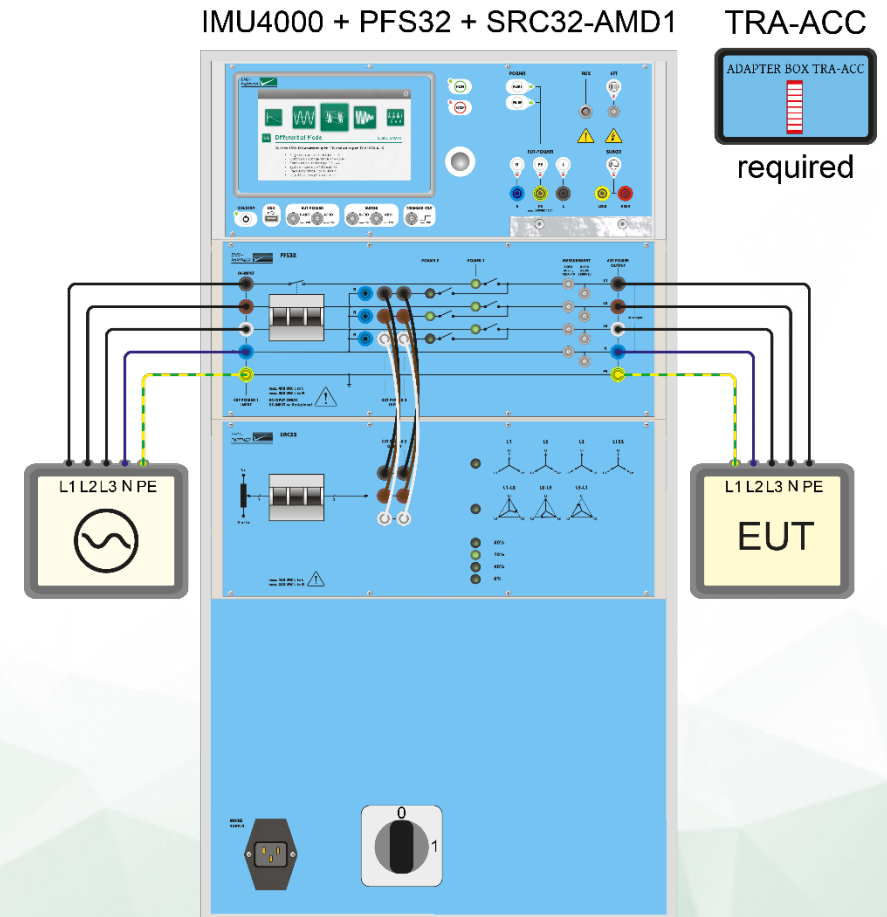
- ✓ Fulfills 80%, 70%, 40% and 100% test levels
- ✓ Simple external connection can be added to existing generators without any modification

New requirement in IEC 61000-4-11 2.0 + AMD1/2017

Test set-up example:

- 3-phase dips/interruption 3 x 200VAC – 3 x 480VAC / 3 x 32A, 50/60Hz, star and delta connection
- Generator IMU4000 D or IMU3000 D
- Power source 3-phase tapped transformer SFRC32-AMD1

- ✓ **Selectable dips 0%, 40%, 50%, 70% and 80%**
- ✓ **Test system is also available for 3 x 63A with IMU4000 D + PFS63 + SRC63**
- ✓ **Test system is also available for 3 x 75A with IMU4000 D + PFS75 + SRC75**



New requirement in IEC 61000-4-12 3.0 (2017)

Ring wave

Standard

Update

IEC 61000-4-12



New requirement in IEC 61000-4-12 3.0 (2017)

New requirements

- Waveform defined at CDN output up to 63 EUT current (with 12 Ω output impedance)
- Figures 9 and 10 specify test on symmetrical I/O lines.

New requirement in IEC 61000-4-12 3.0 (2017)

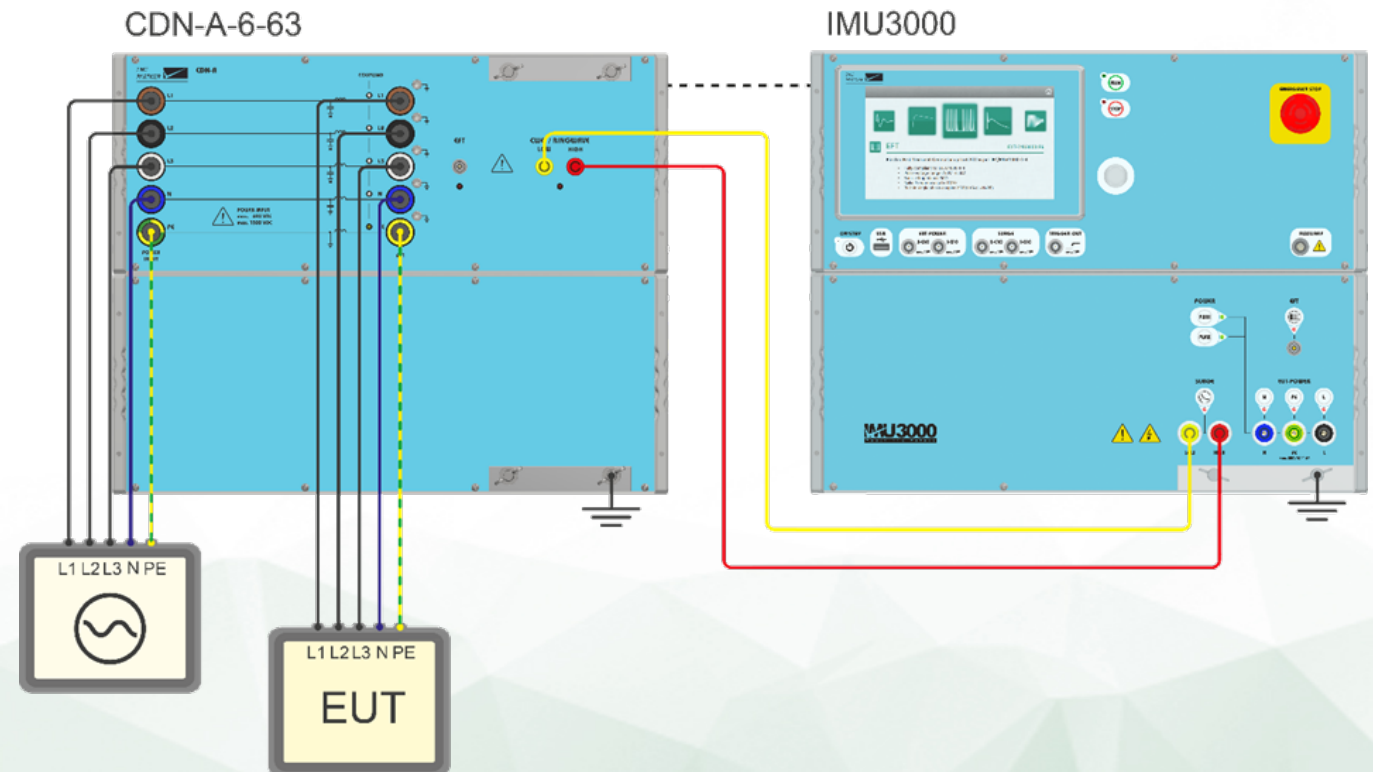
Requirement IEC 61000-4-12		
	AC/DC power ports at CDN output	Symmetrical interconnection lines at CDN output
Voltage max.	4kV	4kV
Current range	16A, 16A-32A, 32A-63A	--
I_{sc}		133.3A
Output impedance	12 Ω	30 Ω

New requirement in IEC 61000-4-11 2.0 + AMD1/2017

Test set-up example:

- Ring wave on AC/DC power ports
- Generator IMU3000 R6 up to 6kV
- 3-phase automatic RWG CDN-A-6-63, max. 3 x 690VAC / 3 x 63A, 50/60Hz

- ✓ **Test system is also available for 3 x 32A with IMU3000 R6 + CDN-M-32 (manual) or CDN-A-32 (automatic)**
- ✓ **Test system is also available for 3 x 125A with IMU3000 R6 + CDN-A-125 (automatic)**

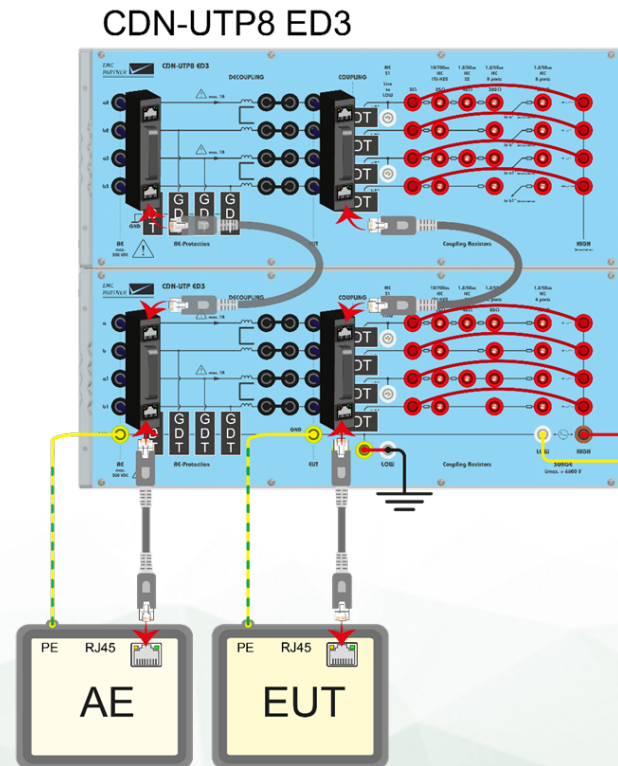


New requirement in IEC 61000-4-11 2.0 + AMD1/2017

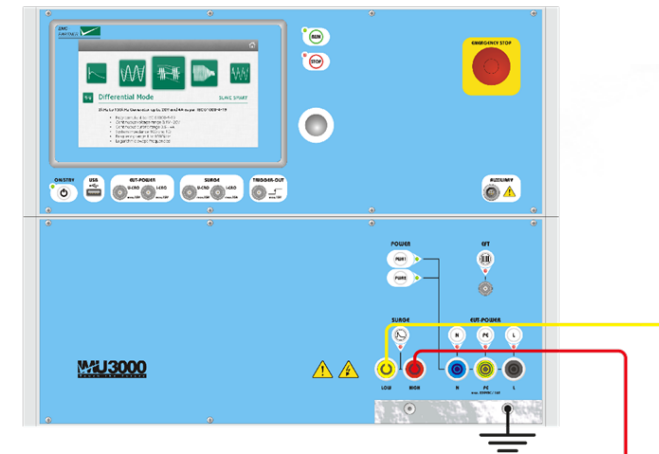
Test set-up example:

- Ring wave on 8 high-speed symmetrical lines
- Generator IMU3000 R6 up to 6kV
- CDN for interconnection lines (high-speed) for ring wave, combination wave, telecom testing
CDN-UTP8 ED3

- ✓ **Fulfills IEC 61000-4-12 figure 8 unshielded, unsymmetrical lines max. 6kV (2, 4 lines)**
- ✓ **Fulfills IEC 61000-4-12 figure 9 unshielded, symmetrical lines max. 6kV (2, 4, 8 lines)**
- ✓ **Fulfills IEC 61000-4-12 figure 10 unshielded, symmetrical lines max. 6kV (2, 4, 8 lines)**



IMU3000



New requirement expected in IEC61000-4-18 future 2.0 (2019?)

Damped oscillatory wave DOW

Standard

Update

IEC 61000-4-18

expected

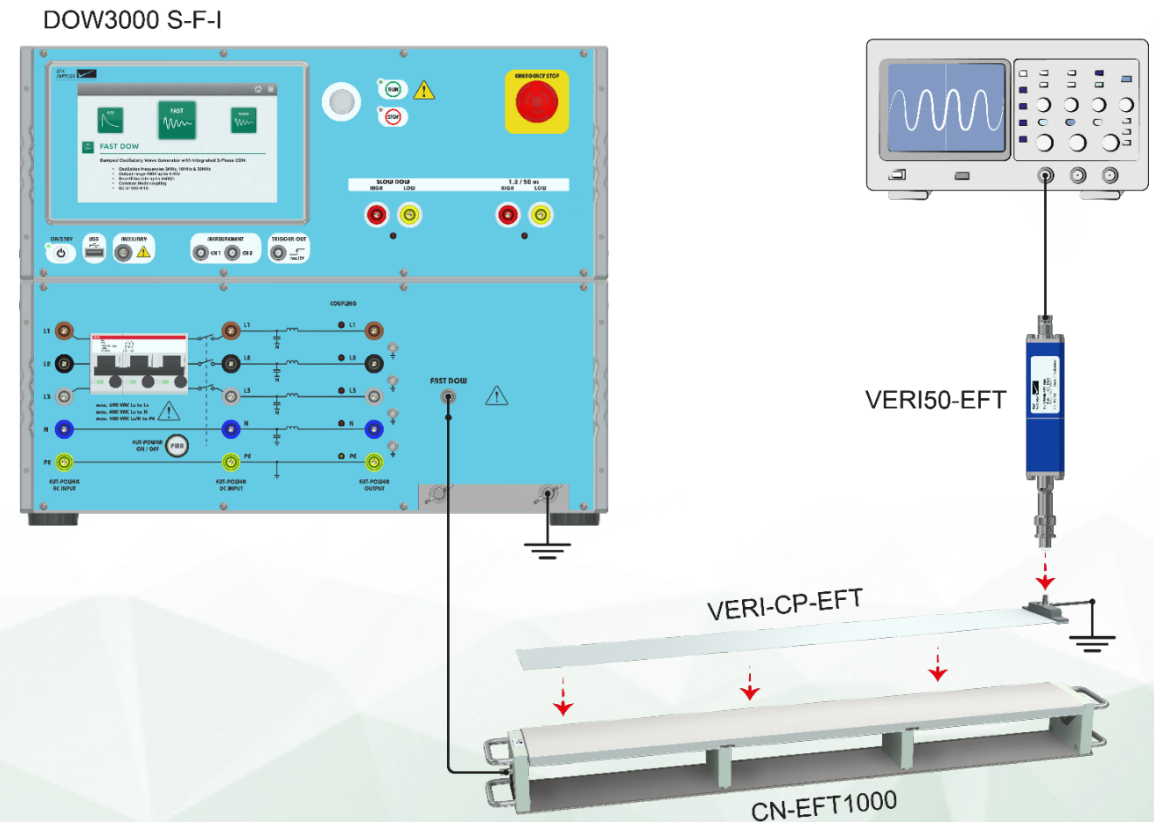


New requirement expected in IEC61000-4-18 future 2.0 (2019?)

New requirement expected

- Calibration method introduced for Fast DOW on I/O Lines
(EMC Partner AG has already an available solution with damped oscillatory wave generator DOW3000)

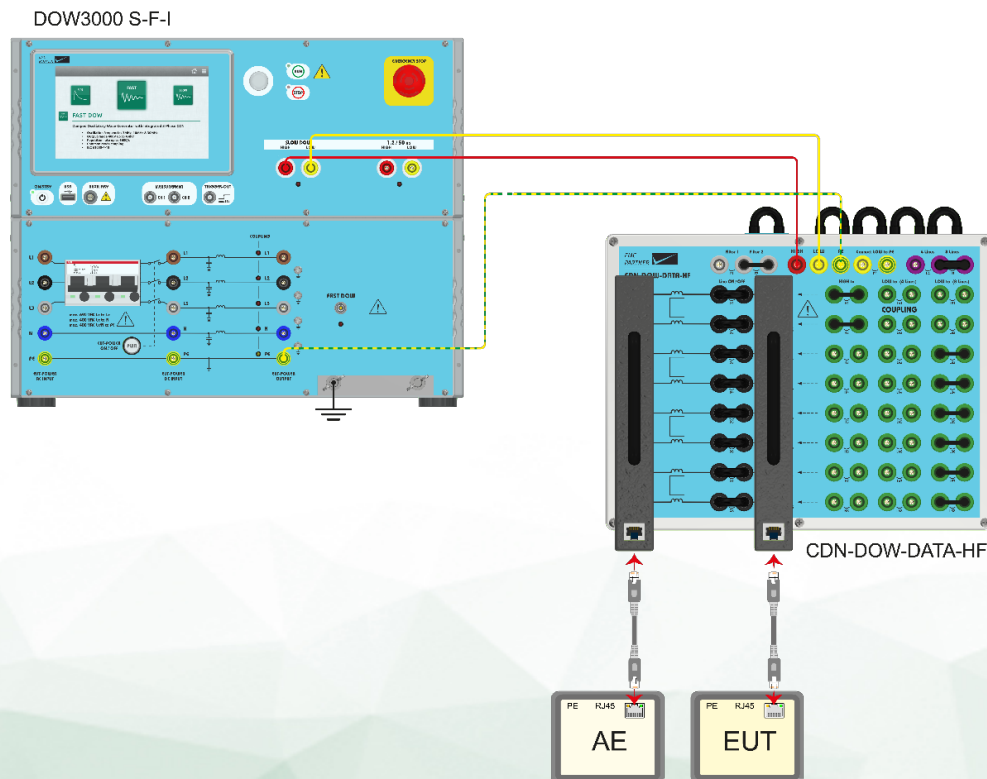
- ✓ Intuitive operation (assisted)
- ✓ Quick learning and accomodation process
- ✓ Comfortable and comprehensive operation



New requirement expected in IEC61000-4-18 future 2.0 (2019)

New requirement expected

- CDN defined for slow DOW on symmetrical lines: figures 12 and 13. Use CDN-DOW-DATA-HF18
- CDN defined for fast DOW on I/O unsymmetrical lines (can be performed with CN-EFT1000)



CDN-DOW-DATA-HF18

✓ EUT up to 1Gbps

✓ Test level up to 4.4kV

End of Presentation

Thank you !



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