

IEC/EN 61000-4-11 IEC/EN 61000-4-34 Source inrush current capability of APS amplifiers

The relating standards:
IEC/EN 61000-4-11
IEC/EN 61000-4-34

The IEC/EN 61000-4-11/-34 specifications define the inrush current capability requirements for the test generator to be used.

While the IEC/EN 61000-4-11 defines the necessary inrush current capability based on the rated EUT voltage U_T , the IEC/EN 61000-4-34 inrush current definition is relevant to the rated current of the EUT.

For the IEC/EN 61000-4-11 it is also possible to use a power generator with a lower inrush current capability.

In this case the EUT's peak inrush current shall be measured and it must not exceed 70% of the generator's inrush current capability. ¹⁾

IEC/EN 61000-4-11 requirements

Table 4 – Generator specifications

Output voltage at no load	As required in Table 1, $\pm 5\%$ of residual voltage value
Voltage change with load at the output of the generator 100% output, 0 A to 16 A 80% output 0 A to 20 A 70% output, 0 A to 23 A 40% output, 0 A to 40 A	less than 5% of U_T less than 5% of U_T less than 5% of U_T less than 5% of U_T
Output current capability	16A _{rms} per phase at rated voltage. The generator shall be capable of carrying 20 A at 80% of rated value for a duration of 5s. It shall be capable of carrying 23A at 70% of rated voltage and 40A at 40% of rated voltage for a duration of 3s. (This requirement may be reduced according to the EUT rated steady-state supply current, see Clause A.3).
Peak inrush current capability (no requirement for voltage variation tests)	Not to be limited by the generator. However, the maximum peak capability of the generator need not exceed 1000A for 250V to 600V mains, 500A for 200V to 240V mains, or 250A for 100V to 120V mains.
Instantaneous peak overshoot/undershoot of the actual voltage, generator loaded with 100Ω resistive load	Less than 5% of U_T
Voltage rise (and fall) time t_r (and t_f), see Figures 1b) and 2, during abrupt change, generator loaded with 100 Ω resistive load	Between 1μs and 5μs
Phase shifting (if necessary)	0° to 360°
Phase relationship of voltage dips and interruptions with the power frequency	Less than +10 °
Zero crossing control of the generators	$\pm 10^\circ$

IEC/EN 61000-4-34 requirements

Table A.1 – Minimum peak inrush current capability

16A ... 50A	500A
50A ... 100A	1000A
More than 100A	Not less than 1000A, and sufficient to maintain $\pm 10\%$ of required voltage value during maximum peak inrush, measured as r.m.s. value refreshed each $\frac{1}{2}$ cycle per IEC 61000-4-30.

As a summary of both definitions the following table is a guideline for choosing the right test generator type:

<i>EUT Rated current</i>	<i>EUT Rated voltage $U_T^{2)}$</i>	<i>IEC/EN Inrush current capability</i>	<i>APS Power generator</i>	<i>APS Inrush current capability</i>
IEC/EN 61000-4-11 requirements:				
0A ... 16A	100V ... 120V	250A	APS 7500 or higher	264A _p
0A ... 16A	200V ... 240V	500A	APS 15000 or higher	616A _p
0A ... 16A	250V ... 600V	1000A	APS 25000 or higher	1056A _p
0A ... 16A	100V ... 120V or 200V ... 240V	250A 500A	APS with Option ICS.500 Inrush current source	500A _p ¹⁾
IEC/EN 61000-4-34 requirements:				
16A ... 50A	$U_T^{2)}$	500A	APS 15000 or higher	616A _p
50A ... 100A	$U_T^{2)}$	1000A	APS 25000 or higher	1056A _p
More than 100A	$U_T^{2)}$	Min 1000A plus stability of $U_T^{2)}$ within $\pm 10\% U_T^{2)}$	APS 25000 or higher	1056A _p

OPTION ICS.500: INRUSH CURRENT SOURCE for APS systems < 15000VA continuous power

This option enables the APS amplifiers with lower inrush current capability than 500A_p to deliver 500A_p inrush current for each type of EUT and frees from measuring the inrush current of the relevant EUT.

Please note: testing with less than 500A_p inrush current capability requires a measurement of the inrush current of the EUT which shall not exceed 70% of the inrush current capability of the generator.

Remark:

- 1) When it is believed that a generator with less than the specified standard generator peak inrush current may be used because the EUT may draw less than the specified standard generator peak inrush current (e.g., 500 A for 220 V-240 V mains), this shall first be confirmed by measuring the EUT peak inrush current. When power is applied from the test generator, measured EUT peak inrush current shall be less than 70 % of the peak current drive capability of the generator, as already verified according to Annex A. The actual EUT inrush current shall be measured both from a cold start and after a 5 s turn-off, using the procedure of Clause A.3.
- 2) U_T is the desired rated voltage of the EUT