XP Power

XPerts in Power – Module 19
Conducted & Radiated Immunity

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Applicable standards

Historically, the generic standards EN50082-1,-2 were used to define the tests which needed to be done.

Now we have a relevant product standard: EN61204-3, Low voltage power supplies, d.c. output - Part 3: Electromagnetic compatibility (EMC).

This standard now re categorises power supplies into those intended for free standing applications, component supplies considered as equivalent to apparatus and component supplies intended for a professional assembler.

This is the standard which we must now use to show conformance with the EMC Directive.

Performance criteria

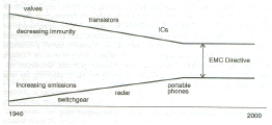
	Performance criteria		
	A	B	C
Basic specifications	No loss of function or performance during the test	Temporary loss of function or performance during the test Self-recoverable	Loss of function or performance Not self-recoverable Not damaged
Remarks	Operating as intended within specified tolerance	Degradation of performance shall be specified by the manufacturer PSU shall continue to operate as intended after the test	Any resettable condition allowed including shut-down

Why do we have to test

The essential requirements of the EMC Directive are that apparatus shall be so constructed that:

the electromagnetic disturbance it generates does not exceed a level allowing radio and telecommunications equipment and other apparatus to operate as intended;

the apparatus has an adequate level of intrinsic immunity to electromagnetic disturbance to enable it to operate as intended.



Basic standards

- IEC61000-4-2 Electrostatic discharge
- IEC61000-4-3 RF radiated electromagnetic field
- IEC61000-4-4 Fast transients
- IEC61000-4-5 Surges
- IEC61000-4-6 RF conducted
- IEC61000-4-11 Voltage dips and interruptions

IEC61000-4-2 Electrostatic discharge

Test item	Test specification
Contact discharge Air discharge	+/-4kV Level 3 +/-8kV Level 3
Performance criteria	B
Description	At least 10 single discharges to pre-selected points, accessible to personnel during normal usage, in the most sensitive polarity. Contact method is to be used unless impractical, as in case of open frame power supply. Discharges onto coupling planes are also required.

IEC61000-4-3 RF radiated electromagnetic field

Test item	Test specification
Frequency Field strength Amplitude modulation	80-1000MHz 10V/m Level 3 3V/m Level 2 80% at 1kHz
Performance criteria	B
Description	Field is generated by an antenna in a shielded anachoic chamber. Eight tests are needed, one in each polarisation for each of the four sides. Test also includes a keyed carrier test at 900MHz.

IEC61000-4-4 Fast transients

Test item	Test specification
Line to ground voltage Tr/Th Repetition frequency	+/-2kV Level 3 +/-1kV Level 2 5/50ns 5kHz
Performance criteria	B
Description	The 5kHz burst is applied for a duration of 15ms and a period of 300ms, applied in both polarities between line, neutral and earth together and a reference ground plane

IEC61000-4-5 Surge

Test item	Test specification
Line to ground voltage	+/-2kV
Line to line voltage	+/-1kV
Tr/Th	1.2/50µs
Performance criteria	B
Description	At least 5 surges, at a repetition rate no faster than 1 per minute both positive and negative. Generator impedance is 2Ω for differential measurements, 12Ω for common mode measurements.

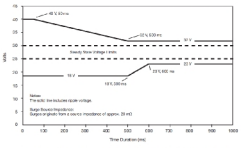
IEC61000-4-6 RF conducted

Test item	Test specification			
Frequency	0.15 to 80MHz			
Voltage	10V	Level 3	3V	Level 2
Amplitude modulation	80% at 1kHz			
Performance criteria	B			
Description	Signal is injected using a coupling/de-coupling network (CDN), which looks like a current clamp. Requires a sweeping signal generator with 1kHz modulator and an RF amplifier			

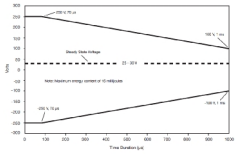
IEC61000-4-11 Voltage dips and interruptions

Test item	Test specification		
Reduction	30%	60%	>95%
Duration	10ms	100ms	5000ms
Performance criteria	B	C	C
Description	The reduction is taken a percentage of the nominal of equipment's rated voltage (U_T). If the rated voltage is specified as a range such as 100-230VAC, then the test is applied at both voltages. If the range is less than 20% of the lower rated voltage,then U_T can be selected from the range.		

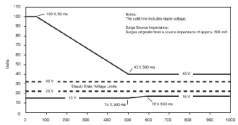
MIL-STD 1275-D



Envelope of surges in normal operating mode for 28 VDC systems

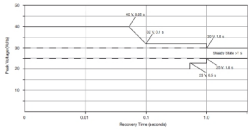


Envelope of spikes in normal operating mode for 28 VDC systems

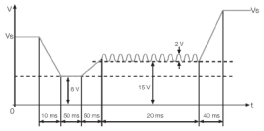


Envelope of surges in generator only mode for 28 VDC systems

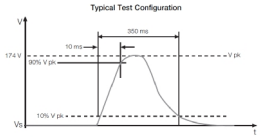
DEF STAN 61-5 pt 6



Envelope of spikes in normal operating mode for 28 VDC systems



Typical Test Configuration

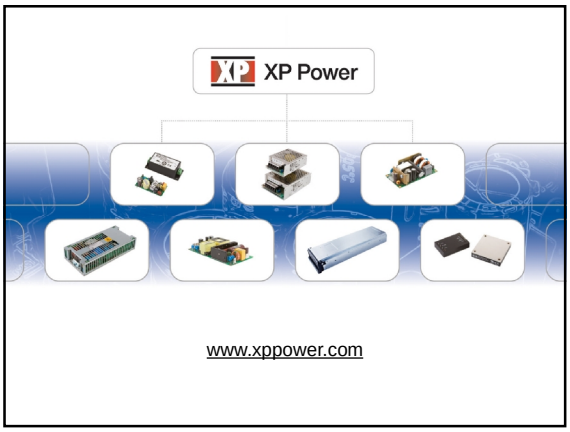


Surge (Load Dump)

SEMI-F47

Table 1 Required Voltage Sag Immunity

Sag depth[B]	*Duration at 50 Hz*	*Duration at 60 Hz*
50%	10 cycles	12 cycles
70%	25 cycles	30 cycles
80%	50 cycles	60 cycles



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