EMC Integrity: EMC emissions and immunity testing services for commercial, military and aerospace industries.

EMC Testing, Troubleshooting, Mitigation, Design

Commercial

- **Overview**
- **Information Technology**
- **Medical**
- **Scientific, Test & Measurement**
- **Industrial**
- **Light Industrial**
- **Other**

Light Industrial Equipment: Generic, EN 61000-6-1 & EN 61000-6-3

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Overview

This standard applies to equipment which connects to a low-voltage public mains network which is not covered under a product family or product specific standard. It should be noted that generic standards should only be used when neither product specific nor product family standards exist for a product.

Country or Economic Area	Potentially Applicable EMC Standards
European Union (EU)	EN 61000-6-1, EN 61000-6-3, EN 55011, EN 61000-3-2, EN 61000-3-3
United States	Code of Federal Regulation (CFR) Title 47, Part 18

Emission limits for light industrial electronics may be defined by either EN 61000-6-3 or EN 55011. EN 61000-6-3 is a generic standard, while EN 55011 is a product family standard (largely based on CISPR 11) for industrial, scientific and medical equipment. Since product family standards take precedence over generic standards, it will, in many cases, be preferable to declare to EN 55011 for compliance with emissions. It is interesting to note, however, that limits for EN 61000-6-3 are equivalent to Class B limits defined by other standards. Clearly, this standard assumes "light industrial" products could, and most likely would be used in residential environments.

In order to simplify matters, we will assume that emissions will be tested to EN 55011. For most cases, this is preferable from a technical perspective. In addition, the scope of work and cost for this testing will effectively be the same as if one were testing to the generic emission standard.

The European Union (EU) regulates both emissions and immunity, and EMC requirements for light industrial environments are defined in EN 55011 and EN 61000-6-1, respectively. It should be noted that EN 61000-6-1 replaces the old generic immunity

standard for light industrial locations, which was EN 50082-1. Light industrial environments are defined by EN 61000-6-1 (***Ref. Section 1 Scope and Object***) as follows:

- Residential properties, for example houses, apartments
- Retail outlets for example shops, supermarkets
- Areas of public entertainment, for example cinemas, public bards, dance halls

In the United States, compliance of this type of equipment with federal requirements is governed by the Federal Communications Commission (FCC). Limits are defined by the Code of Federal Regulations (CFR) Title 47, Part 18, which regulates the emissions (unintentional and intentional) from industrial, scientific and medical (ISM) products.

Sample Test Matrix [**top of page**]

A typical test matrix for a product being tested to EN 55011 and EN 61000-6-1 is shown in the following table.

Test	Standard	Description
Radiated E-field emissions, 30-1000 MHz	EN 55011	Measures unintentional E-field emissions from product in normal operating mode.
Conducted emissions, 0.15 - 30 MHz	EN 55011	Measures unintentional emissions conducted back on the AC power mains.

Emission Requirements

Test	Standard	Description	Performance Criteria for Immunity
Electrostatic discharge (ESD)	IEC 61000-4-2	Performed to determine immunity of product to ESD Contact discharge @ ±2 kV & ±4 kV Air discharge @ ±2 kV, ±4 kV & ±8 kV Indirect discharge via HCP & VCP @ ±2 & ±4 kV	B

Radiated RF immunity	IEC 61000-4-3	Performed to determine immunity of product to fields generated by intentional transmitters (radio, TV, cell, etc.) Electric field immunity, 3 V/m from 80 - 1000 MHz. (Field is amplitude modulated with a 1 kHz sine wave to a depth of 80%.) Additional requirement is 3 V/m from 1.4 to 2.0 GHz and 1 V/m from 2.0 to 2.7 GHz. (These fields are also amplitude modulated with a 1 kHz sine wave to a depth of 80%.)	A
Electrical fast transient/burst	IEC 61000-4-4	Performed to determine immunity of product to switching and transient noise; applicable to AC/DC input (±1 kV) and I/O cabling greater than 3 meters (±0.5 kV)	B
Surge immunity	IEC 61000-4-5	Performed to determine immunity of product to switching and lightning-induced transients; applicable to AC and DC power inputs. AC Mains (DM): ±0.5 kV, ±1.0 kV AC Mains (CM): ±0.5 kV, ±1.0 kV & ±2.0 kV DC Mains (DM & CM): ±0.5 kV	B
Conducted RF immunity	IEC 61000-4-6	Performed to determine immunity of product to low frequency fields generated by intentional transmitters (AM radio, TV, cell, etc.); applicable to AC input and I/O cabling greater than 3 meter in length; 3 Vrms from 0.15 to 80 MHz. (Voltage is amplitude modulated with a 1 kHz sine wave to a depth of 80%.)	A

Power frequency H-field immunity	IEC 61000-4-8	Performed to determine immunity of product to low frequency magnetic fields; 3 A/m at 50 and 60 Hz (power frequencies) on all three axes of product.	A
Voltage dips and interruptions	IEC 61000-4-11	Performed to determine immunity of product to fluctuations on AC power input Line @ 0% of nominal for 0.5 cycle Line @ 0% of nominal for 1 cycle Line @ 70% of nominal for 25 cycles (50 Hz) Line @ 70% of nominal for 30 cycles (60 Hz) Line @ 0% of nominal for 250 cycles (50 Hz) Line @ 0% of nominal for 300 cycles (60 Hz)	B B C C C C

Immunity Requirements

Whether a product is tested to Class A or B limits for emissions will be determined by where the product will be marketed and/or used. Class B emission limits apply to residential environments; Class A emission limits apply to commercial, industrial and all other environments.

Technical Notes Regarding Performance Criteria [**top of page**]

When performing immunity testing, keep in mind that the product will need to be monitored to ensure that its level of performance meets the requirement defined for the test being performed.

Technical Notes Concerning I/O Cables [**top of page**]

Approximately 80% of EMC compliance issues are related to cables. Power and I/O cables create the "antenna structure" for a product. These unintentional antennas can both radiate electromagnetic energy generated by electronics inside the product and receive electromagnetic energy impinged upon the product. The former could result in non-compliance with regard to emissions and the latter could create an immunity problem.

Since cables are an integral part of a product's function and configuration, clients should realize some significant factors about cables prior to testing for EMC compliance.

- For emissions testing, all I/O ports (excluding service or maintenance) should be loaded with a cable of at least 2 meters in length, per CISPR 16
- For immunity testing, if a cable can be greater than 3 meters in length, electrical fast transient testing via capacitive clamp applies to this cable

- Non conductive cables (e.g., fiber optic or plastic tubes) are exempt from cable testing requirements

Scheduling [**top of page**]

EMC Integrity generates a detailed quotation for all formal compliance testing that we perform. Our quotations state the name of the product to be tested, the standards to which the product will be tested, the individual tests that will be performed and any additional testing that may be requested by the client. Tests are listed on a line-item basis, thus clearly delineating both the scope of work and the cost of each test. An outline of our process is given below.

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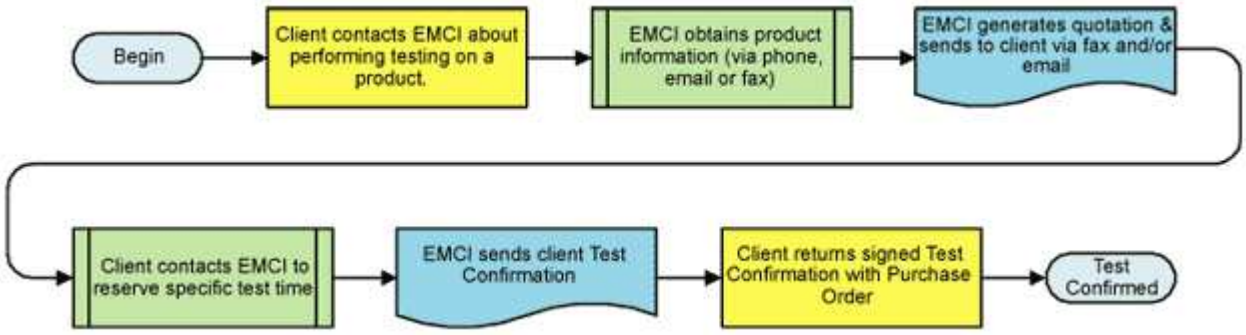

Overview of EMCI's RFQ Process.

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