

# A New EMC Standard For Laboratory Equipment

*IEC 61326-1 will become an EN standard that is required by the countries in Europe before marketing in the EC.*

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## INTRODUCTION

A new International Standard on EMC Requirements for Laboratory Equipment has been released by the International Electrotechnical Commission. The standard is IEC 61326-1: *Electrical Equipment for Measurement, Control and Laboratory use - EMC Requirements - Part 1: General Requirements*. It is the first edition of the standard which contains both emission and immunity requirements as well as specifications on test plans, test results and test reports. The standard was prepared by Subcommittee 65A: System Aspects of IEC Technical Committee 65: Industrial-Process Measurement and Control, and by IEC Technical Committee 66: Safety of Measuring, Control, and Laboratory Equipment.

It should be noted that there are three other parts to be released in the future under the IEC 61326 number. They are:

- *Part 10: Particular Requirements for Equipment Used in Close Proximity or in Direct Contact with An Industrial Process*
- *Part 20: Particular Requirements for Equipment Used in Laboratories, or Test and Measurement Areas with a Restricted Electromagnetic Environment*
- *Part 30: Particular Requirements for Portable Test and Measurement Equipment That Is Powered by Battery or from the Measured Circuit*

## ANALOGY TO PRODUCT SAFETY

Table 1 draws a comparison between EMC and Product Safety Requirements for three different product families. It can be seen that IEC 61326-1 is to the EMC world what IEC 61010-1 is to the product safety world.

## SCOPE OF THE STANDARD

IEC 61326-1 specifies minimum requirements for immunity and emissions for electrical equipment (operating from a supply of less than 1000 volts of alter-

nating current or 1500 volts of direct current) intended for professional, industrial process and educational use, including (1) measurement and test, (2) control, (3) laboratory use, and (4) accessories for 1, 2, and 3.

Electrical measurement and test equipment includes signal generators, measurement standards, power supplies, and transducers. Electrical control equipment includes programmable controllers, process controllers and regulators, analog/digital indicators and recorders, process instrumentation, and transducers. Electrical laboratory equipment includes equipment which measures, indicates, monitors or analyzes substances, or is used to prepare material.

## EMC TEST PLAN

The subject standard requires that an EMC Test Plan be established prior to testing. The test plan should include the typical installation of different subassemblies in the equipment; the composition of the Equipment Under Test (EUT), including all devices, racks, modules and boards; the assembly of the EUT, Input/Output Port analysis; auxiliary equipment; and cabling/earthing (grounding). The plan should also in-

INDUSTRY	ITE	MEDICAL	LABORATORY
Product Safety Standard	IEC 60950	IEC 60601-1	IEC 61010-1
EMC Standard	CISPR 22 CISPR 24	IEC 60601-1-2	IEC 61326-1
<p>IEC 60950: Safety of Information Technology Equipment, Including Electrical Business Equipment</p> <p>IEC 60601-1: Medical Electrical Equipment</p> <p>IEC 61010-1: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use: Part I: General Requirements</p> <p>CISPR 22: Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment.</p> <p>CISPR 24: Information Technology Equipment—Immunity characteristics—Limits and Methods of Measurement. (Not yet released)</p> <p>IEC 60601-1-2: EMC for Medical Electrical Equipment</p>			

Table 1. Applicable Standards for EMC and Product Safety Requirements.

PORT	PHENOMENON	BASIC STANDARD	TEST VALUE
Enclosure	Electrostatic discharge (ESD) Electromagnetic	IEC 1000-4-2 IEC 1000-4-3	4 kV/ 4 kV contact/ air 3 V/m
AC power	Burst Surge Conducted RF Voltage interrupt	IEC 1000-4-4 IEC 1000-4-5 IEC 1000-4-6 IEC 1000-4-11	1 kV 0.5 kV <sup>1)</sup> /1 kV <sup>2)</sup> 3 V 1 cycle/100%
DC power <sup>4)</sup>	Burst Surge Conducted RF	IEC 1000-4-4 IEC 1000-4-5 IEC 1000-4-6	1 kV 0.5 kV <sup>1)</sup> /1 kV <sup>2)</sup> 3 V
I/O signal/control	Burst Surge Conducted RF	IEC 1000-4-4 IEC 1000-4-5 IEC 1000-4-6	0.5 kV <sup>4)</sup> 1 kV <sup>2)</sup> , 3) 3 V <sup>4)</sup>
I/O signal/control connected directly to mains supply	Burst Surge Conducted RF	IEC 1000-4-4 IEC 1000-4-5 IEC 1000-4-6	1 kV 0.5 kV <sup>1)</sup> /1 kV <sup>2)</sup> 3 V

<sup>1)</sup> Line to Line  
<sup>2)</sup> Line to Earth (ground)  
<sup>3)</sup> Only in the case of long distance lines (see Section 3.6)  
<sup>4)</sup> Only in the case of lines > 3m

Table 2. Immunity Test Requirements.

clude operation conditions of the EUT during testing, including operation modes, environmental conditions, and software. The final two elements in the plan are a specification of performance criteria and EMC test description.

## IMMUNITY REQUIREMENTS

The immunity tests shall be performed with the Basic EMC Standards. (Basic EMC Standards give the general and fundamental conditions or rules for the achievement of EMC, which relate or are applicable to all product families, products, systems or installations, and serve as reference documents for the product committees.) The complete immunity requirements are shown in Table 2.

The performance criteria for the evaluation of the immunity test results are as follows:

Software Automated  
Measurements —  
The World in a Day!

Radiated Emissions  
Pre-Scans in  
Fully-Anechoic  
Chambers —  
Get the Answers *Fast!*

Radiated Immunity  
Testing in Fully-Anechoic  
Chambers —  
Avoid Overtesting!

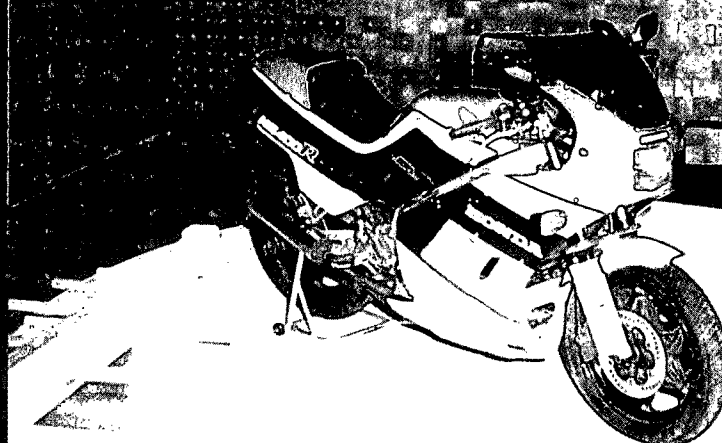
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**• Performance Criterion A:**

During testing, normal performance within the specification limits

**• Performance Criterion B:**

During testing, temporary degradation, or loss of function or performance which is self-recovering

**• Performance Criterion C:**

During testing, temporary degradation, or loss of function or performance which requires operator intervention or when system reset occurs

**• Performance Criterion D:**

Degradation or loss of function which is not recoverable due to damage to equipment, components, software, or to loss of data

## EMISSION REQUIREMENTS

To comply with the emission requirements of 61326-1, the designer must classify equipment either as Class A (non-domestic) or Class B (domestic). Once this decision is made, the emission requirements are as specified in Tables 3 and 4.

## TEST RESULTS AND TEST REPORT

The test results shall be documented in a test report with the necessary detail to provide for a repeatable test. The test report shall contain the following minimum information:

- EUT description
- EMC test plan
- Test data and results
- Test equipment and setup

## SUMMARY

IEC 61326-1 has been published internationally to cover general EMC requirements for laboratory, control and measurement equipment. When the standard is harmonized in Europe (as indicated by publication in the *Official Journal of the European Union*), it will become an EN standard that is required by the countries in Europe before marketing in the economic community.

The standard contains both emission and immunity requirements keyed to the Basic EMC standards. In terms of

PORT	FREQUENCY RANGE (MHz)	LIMITS	REFERENCE STANDARD
Enclosure	30 to 230	40 dB (μV/m) quasi peak, measured at 10-m distance	CISPR 16 <sup>1)</sup> and
	230 to 1000	47 dB (μV/m) quasi peak, measured at 10-m distance	CISPR 16-1
AC mains <sup>2)</sup>	0.15 to 0.5	79 dB (μV) quasi peak 66 dB (μV) average	CISPR 16 and CISPR 16-1
	0.5 to 5	73 dB (μV) quasi peak 60 dB (μV) average	
	5 to 30	73 dB (μV) quasi peak 60 dB (μV) average	

<sup>1)</sup>For alternative test site areas, see annex A of CISPR 22.

**Table 3. Emission Limits For Class A Equipment.**

PORT	FREQUENCY RANGE (MHz)	LIMITS	REFERENCE STANDARD
Enclosure	30 to 230	30 dB (μV/m) quasi peak, measured at 10-m distance	CISPR 16 <sup>1)</sup> and
	230 to 1000	37 dB (μV/m) quasi peak, measured at 10-m distance	CISPR 16-1
AC mains <sup>2)</sup>	0 to 0.002	As specified in the reference standard	IEC 1000-3-2 IEC 1000-3-3
	0.15 to 0.5	66 dB (μV) to 56 dB (μV) quasi peak 56 dB (μV) to 46 dB (μV) average Limits decrease linearly with log. of frequency	CISPR 16 and CISPR 16-1
	0.5 to 5	56 dB (μV) quasi peak 46 dB (μV) average	
	5 to 30	60 dB (μV) quasi peak 50 dB (μV) average	

<sup>1)</sup>For alternative test site areas, see annex A of CISPR 22.

<sup>2)</sup>For discontinuous disturbances, see CISPR 14.

**Table 4. Emission Limits For Class B Equipment.**

documentation, the standard calls for both an EMC test plan and an EMC test report.

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Dan is a member of the Association for the Advancement of Medical Instrumentation (AAMI), and the Institute of Environmental Scientists. He is also President of the dB Society. Dan holds an MBA from the University of Minnesota, an M.S. in physics from Louisiana State University, and a B.A. in physics from St. John's University. (612) 638-0250.

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