

GUIDE

GUIDE

Electromagnetic compatibility – Guide to the drafting of electromagnetic compatibility publications

Compatibilité électromagnétique – Guide pour la rédaction des publications sur la compatibilité électromagnétique

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROMAGNETIC COMPATIBILITY –
GUIDE TO THE DRAFTING OF ELECTROMAGNETIC
COMPATIBILITY PUBLICATIONS**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This third edition of IEC Guide 107 has been prepared, in accordance with ISO/IEC Directives, Part 1, Annex A, by the Advisory Committee on Electromagnetic Compatibility (ACEC). This is a mandatory guide in accordance with SMB Decision 136/8.

This third edition cancels and replaces the second edition, published in 1998.

This guide has been revised in order to align with the second edition of Guide 108, which states: "For safety and EMC standards the principles of this guide are addressed by the specific technical provisions of IEC Guides 104 and 107 respectively."

The text of this IEC Guide is based on the following documents:

Four months' vote	Report on voting
C/1526/DV	C/1558/RV

Full information on the voting for the approval of this Guide can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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ELECTROMAGNETIC COMPATIBILITY – GUIDE TO THE DRAFTING OF ELECTROMAGNETIC COMPATIBILITY PUBLICATIONS

1 Scope

This guide describes procedures for the drafting of IEC publications, which relate wholly or partly to electromagnetic compatibility (EMC). They should be applied when preparing new electromagnetic compatibility publications or EMC clauses as well as when revising existing publications.

These procedures should be followed in order to ensure that the resulting publications are consistent with each other and current practice, and to avoid overlapping document scopes.

This guide has been revised in order to align with the second edition of Guide 108, which states: "For safety and EMC standards the principles of this guide are addressed by the specific technical provisions of IEC Guides 104 and 107 respectively."

2 Reference publications

Technical committees should consult the following reference documents when preparing EMC publications or EMC clauses.

IEC 60050(161), *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

ISO/IEC Directives – Supplement – Procedures specific to IEC, Annex K (normative): *Organization, rules and procedures of the International Special Committee on Radio Interference (CISPR)*

IEC Guide 108, *Guidelines for ensuring the coherency of IEC publications – Application of horizontal standards*

3 Terms, definitions and acronyms

3.1 Terms and definitions

For the purposes of this guide, the following definitions, together with those in IEC 60050(161), apply.

3.1.1 electromagnetic compatibility EMC

ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment

[IEV 161-01-07]

3.1.2 EMC committees

CISPR and TC 77 are referred to as EMC committees in this guide

3.1.3

(electromagnetic) compatibility level

the specified electromagnetic disturbance level used as a reference level for co-ordination in the setting of emission and immunity limits

NOTE 1 By convention, the compatibility level is chosen so that there is only a small probability that it will be exceeded by the actual disturbance level. However electromagnetic compatibility is achieved only if emission and immunity levels are controlled such that, at each location, the disturbance level resulting from the cumulative emissions is lower than the immunity level for each device, equipment and system situated at this same location.

NOTE 2 The compatibility level may be phenomenon, time or location dependent.

[IEV 161-03-10]

3.1.4

electromagnetic disturbance

any electromagnetic phenomenon which may degrade the performance of a device, equipment or system, or adversely affect living or inert matter

NOTE An electromagnetic disturbance may be an electromagnetic noise, an unwanted signal or a change in the propagation medium itself.

[IEV 161-01-05]

3.1.5

(electromagnetic) emission

phenomenon by which electromagnetic energy emanates from a source

[IEV 161-01-08]

3.1.6

electromagnetic environment

the totality of electromagnetic phenomena existing at a given location

[IEV 161-01-01]

3.1.7

electromagnetic interference

EMI

degradation of the performance of an equipment, transmission channel or system caused by an electromagnetic disturbance

NOTE In English, the terms "electromagnetic disturbance" and "electromagnetic interference" designate respectively the cause and the effect, but they are often used indiscriminately.

[IEV 161-01-06]

3.1.8

high frequency

frequency above 9 kHz

NOTE This is a special definition used in IEC EMC publications.

3.1.9

horizontal standard

standard on fundamental principles, concepts, terminology or technical characteristics, relevant to a number of technical committees and of crucial importance to ensure the coherence of the corpus of standardization documents

NOTE In the context of this guide, basic EMC standards have the same status as horizontal standards.

3.1.10

immunity (to a disturbance)

ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance

[IEV 161-01-20]

3.1.11

low frequency

frequency up to and including 9 kHz

NOTE This is a special definition used in IEC EMC publications.

3.1.12

port

particular interface of the equipment which couples this equipment with or is influenced by the external electromagnetic environment

NOTE Examples of ports of interest are shown in Figure 1. The enclosure port is the physical boundary of the apparatus (e.g. enclosure). The enclosure port provides for radiated and electrostatic discharge (ESD) energy transfer, whereas the other ports provide for conducted energy transfer.

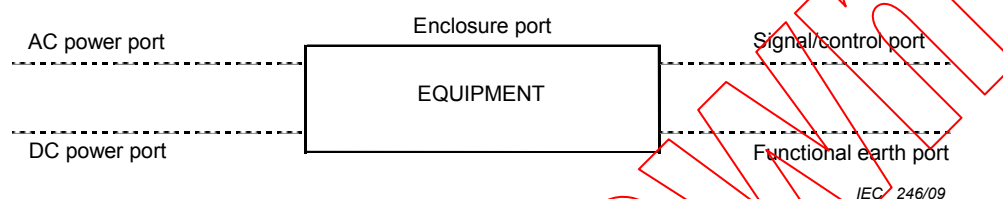


Figure 1 – Equipment ports

3.2 Acronyms

CENELEC	European Committee for Electrotechnical Standardization
CIGRE	International Conference on Large High Voltage Electric Systems
CISPR	International Special Committee on Radio Interference
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
HEMP	High-altitude Electromagnetic Pulse
HPEM	High-power Electromagnetics
IEEE	Institute of Electrical and Electronic Engineers
ISO	International Organization for Standardization
ITU	International Telecommunication Union
OIML	International Organization of Legal Metrology
PLT	Power Line Telecommunications
SMB	Standardization Management Board

4 General

Aspects of EMC and methods to achieve it have developed over a long period of time and are fairly complex subjects. Many IEC technical committees are concerned with general aspects or with particular aspects relating to specific products.

Work related to EMC has been carried out over many years in the IEC by the International special committee on radio interference (CISPR). The CISPR was set up in 1934 as a joint committee of international organizations including the IEC, but became later a special committee under the sponsorship of the IEC. The scope of the CISPR is given in Annex A.

TC 77 was organized in 1974 as a technical committee of the IEC to cover various aspects of EMC with the emphasis on dealing with standards. The scope of TC 77 is also given in Annex A.

CISPR and TC 77 will be referred to in this guide as EMC committees, and the organization of the IEC work on EMC is given in Annex A.

In the context of this guide, EMC covers radiated and conducted phenomena over the whole frequency range from 0 Hz to 400 GHz (and possibly to higher frequencies) and relates to phenomena listed in Table B.1.

The task of the EMC committees in the IEC includes standardization relating to electrical and electronic equipment, to public and industrial electricity supply systems, and also to radiocommunication and telecommunications. This may be done in liaison with the relevant specialized organizations.

EMC requirements have economic and social impact, and this should be recognized in the development of any standards, which might affect the performance of equipment. Both inadequate electromagnetic compatibility and the imposition of unnecessary requirements should be avoided.

EMC work in IEC may also have implications for safety, particularly the effects of electromagnetic disturbances on the functional safety of equipment. Direct effects on biological materials are not included, but the measurement of fields, which may produce such effects, is included.

5 Basic principles

5.1 General

The advisory committee on EMC (ACEC) advises the Standardization Management Board (SMB) with regard to the coordination of IEC work relating to EMC matters in order to avoid duplication and conflict in IEC standards. This coordination shall relate primarily to electromagnetic emission, coupling and immunity to disturbances. ACEC will maintain a close liaison with technical committees dealing with EMC matters including product committees and EMC committees. ACEC reports to the SMB with recommendations to resolve conflicts as needed. ACEC is also responsible for updating IEC Guide 107.

5.2 Emission limits

TC 77 and CISPR are EMC committees having responsibility for developing emission limits and emission measurement requirements to achieve EMC. These committees shall take into consideration the needs (e.g., practicality and cost effectiveness with respect to measurement methods) of the product committees.

CISPR is responsible for emissions above 9 kHz, and TC 77 for emissions at and below 9 kHz. To ensure uniformity and to maintain control of the electromagnetic environment, product committees shall use the emission limits developed by EMC committees by making reference to the standards of EMC committees. Product committees are not free to set their own emission limits since there would be no guarantee that acceptable compatibility levels or disturbance levels would be respected.

CISPR and TC 77 are also responsible for the generic emission standards that may be applied to those products for which a separate product emission standard is not deemed necessary.

When the EMC standards developed by EMC committees are not considered suitable for a particular product or electromagnetic environment, product committees shall seek the assistance and advice of the EMC committees for any change in the emission limits and/or measurement requirements.

5.3 Immunity requirements

TC 77 has the responsibility for developing the basic EMC standards for immunity of products. If product committees intend to require immunity to particular disturbances, they shall refer to these basic EMC immunity standards for the specification of test techniques. They are responsible for defining the relevant performance criteria and selecting the appropriate immunity test levels for their products, taking into account the expected electromagnetic environment. It is noted that TC 77 is available to the product committees to provide advice and support in the setting of immunity levels. TC 77 has the responsibility for developing generic immunity standards, which should be used as a guide by the product committees.

6 Types of EMC publications

6.1 General

EMC publications and standards developed by the IEC including CISPR and other standardization bodies can broadly be placed in four categories, which are described in the following subclauses. Lists of current EMC publications defined below are available on the EMC Zone of the IEC web site under <http://www.iec.ch/zone/emc>.

NOTE Many standards were produced before these categories were developed and therefore standards exist which do not completely conform to these categories.

6.2 Basic EMC publications

Basic EMC publications give the fundamental principles, concepts, terminology or technical characteristics for the achievement of EMC and should be used as reference documents by product committees.

Basic EMC publications

- a) may be standards, technical specifications or technical reports;
- b) are general and hence are not dedicated to EMC for specific product families or products;
- c) may concern in particular (but not exclusively):
 - 1) terminology
 - 2) descriptions of electromagnetic phenomena
 - 3) specification of compatibility levels
 - 4) general requirements for the limitation of emission of disturbances
 - 5) recommendations for test levels with regard to the immunity of the equipment
 - 6) measurement and test equipment
 - 7) measurement techniques, test techniques and their applicability
 - 8) descriptions and classification of the electromagnetic environment
- d) should not include prescribed limits and specific performance criteria. These are covered by the generic, product family or product standards;
- e) shall be identified on the front page by the indication "BASIC EMC PUBLICATION".

6.3 Generic EMC standards

Generic EMC standards are designed to apply, for a defined electromagnetic environment, to products for which no dedicated product family EMC/product EMC standards exist. They specify a set of essential requirements, test procedures and generalized performance criteria applicable to such products or systems operating in this electromagnetic environment. Product committees should determine if the tests, test levels and performance criteria for the particular electromagnetic environment covered in a generic EMC standard are adequate for their products before developing a separate product EMC standard.

Generic EMC standards

- a) do not include detailed measurement and test methods, etc., but refer for that purpose to the basic EMC standards;
- b) provide requirements and tests related to emission and immunity, possibly in separate documents;
- c) specify a limited number of essential emission and immunity tests, maximum emission levels as well as minimum immunity test levels, in order to achieve a technical/economical optimum;
- d) shall be identified on the front page by the indication "GENERIC EMC STANDARD".

6.4 Product family EMC standards

6.4.1 General

A product family, for EMC, is a group of similar products for which the same standards can be applied.

Product family EMC standards define specific emission and immunity requirements as well as measurement and test procedures dedicated to particular product families. They indicate the relevant installation and operating conditions. They also give precise performance criteria, taking into account the purpose of the equipment.

It is recommended that product committees consult the relevant generic EMC standards for their electromagnetic environment of interest and consider whether those test methods and levels are adequate for their purposes; if so, the appropriate generic EMC standard should be referenced. If a product family EMC standard is developed, maintained or revised, the product committees should apply the basic EMC standards to the extent practicable.

Product family EMC standards

- a) may take either the form of a separate publication or the form of one dedicated clause in a comprehensive product family standard, although a separate publication is preferred;
- b) shall refer to the basic EMC standards for instrumentation, measurement and/or test methods, and test set-ups;
- c) should not deviate from the basic EMC standards; if a deviation is needed in exceptional cases, a justification shall be given in the product family EMC standard.

NOTE The work for the development of product family EMC standards may be carried out by EMC committees, product committees or other relevant committees. Two kinds of product family standards for EMC should be considered.

- a) Product family standards with a very wide field of application covering several product committees, in particular standards relating to emission of disturbances produced by numerous kinds of equipment, e.g.:
 - conducted disturbances in the mains network produced by non-linear loads;
 - radio frequency disturbances produced by industrial or household equipment.

In view of the necessity of coordinating a great number of product committees, such types of product family standards are developed by TC 77 or CISPR.

- b) Specific product family standards.

Normally the relevant product committees are responsible for the development of these standards. If it is unclear which committee should be responsible for this work, then ACEC may recommend a committee to carry out the work. Where a product committee does not have the relevant expertise or capacity, it should request ACEC to ask another committee to undertake the work, or to assist them with it.

6.4.2 Example of product family EMC standards

The following main product families have been identified for EMC (the list is not exhaustive):

- a) multimedia equipment including:
 - radio and TV receivers and associated equipment;
 - information technology equipment (ITE);

- telecommunication equipment (as far as it is within the scope of the IEC);
- power line telecommunications (PLT) terminal equipment;
- b) household and commercial equipment (other than ITE);
- c) industrial-process measurement and control equipment (other than ITE);
- d) traffic and transportation equipment;
- e) utilities equipment (electricity, gas, water, etc.);
- f) medical equipment;
- g) measuring and test equipment;
- h) equipment connected to the HV, MV and LV public mains networks.

Further information can be obtained by consulting the product family EMC publications prepared by EMC committees.

6.5 Product EMC standards

Product EMC standards relate to a particular type of product for which specific conditions should be considered. The same rules apply as for the product family EMC standards. Examples of product EMC standards may be found in the IEC EMC Zone <http://www.iec.ch/zone/emc>.

6.6 Comments on the application of the different types of EMC publications

The differences in the applications between these four different types of standards should be noted.

- a) Basic EMC standards relate to general information, to the disturbing phenomena and to measurement or test techniques.
- b) Generic EMC standards specify a number of disturbances and tests, applicable to products operating in a given electromagnetic environment. They can be applied to
 - 1) product families/products operating in the given electromagnetic environment when there are no specific EMC standards for these products;
 - 2) product families/products when the responsible product committee considers the requirements of the generic EMC standards sufficient for their products.

Product family/product EMC standards take into account their relevant electromagnetic environment and installation conditions for determination of appropriate phenomena, test levels and performance criteria. This should be done by also taking into consideration the relevant generic EMC standards for the selection of their tests, test levels and performance criteria. Where a product family/product EMC standard specifies less stringent test values for a phenomenon or if a phenomenon is only partially covered (e.g. the product family/product EMC standard only covers a subset of the recommended frequency range), either a justification or a reference to the relevant requirement in another EMC standard shall be given in the product family/product EMC standard. Since a product family/product EMC standard usually gives more specific requirements, it is generally considered that it takes precedence over the corresponding generic EMC standard.

7 Subjects of EMC publications

Table 1 below outlines what could be typical subjects of EMC publications. This list should not be considered as exhaustive and should be adapted by product committees as appropriate.