

Low voltage power supplies, d.c. output —

Part 3: Electromagnetic compatibility (EMC)

The European Standard EN 61204-3:2000 has the status of a
British Standard

ICS 29.20; 33.100.01

National foreword

This British Standard is the official English language version of EN 61204-3:2000. It is identical with IEC 61204-3:2000.

The UK participation in its preparation was entrusted to Technical Committee PEL/22, Power electronics, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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Low voltage power supplies, d.c. output
Part 3: Electromagnetic compatibility (EMC)
(IEC 61204-3:2000)

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Partie 3: Compatibilité électromagnétique
(CEM)
(CEI 61204-3:2000)

Stromversorgungsgeräte für
Niederspannung mit Gleichstromausgang
Teil 3: Elektromagnetische Verträglichkeit
(EMV)
(IEC 61204-3:2000)

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 22E/75/FDIS, future edition 1 of IEC 61204-3, prepared by SC 22E, Stabilized power supplies, of IEC TC 22, Power electronics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61204-3 on 2000-11-01.

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Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A, F and ZA are normative and annexes B, C, D, E, G, H and I are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61204-3:2000 was approved by CENELEC as a European Standard without any modification.

CONTENTS

Clause	Page
1 Scope and object	5
2 Normative references	6
3 Terms and definitions	8
4 Applicability of tests to different PSU technologies	12
5 General requirements and test conditions	13
5.1 General requirements	13
5.2 Test conditions	13
6 Emission requirements	13
6.1 Limits in defined environments	13
6.2 Low frequency phenomena ($f \leq 9$ kHz; a.c. input only)	15
6.3 High frequency conducted phenomena	16
6.4 High frequency radiated phenomena	16
7 Immunity requirements	18
7.1 Performance criteria	18
7.2 Basic immunity requirements, high frequency disturbances	19
8 Configurations and combinations of power supplies	24
8.1 Modular PSUs	24
8.2 Power supply systems	24
8.3 Power supply installations	24
8.4 Distributed power supplies	24
8.5 Power supplies in parallel or in series	24
9 Power supply families	24
10 Statistical aspects	25
11 Safety aspects	25
12 Test report	25
Annex A (normative) Guidelines on the classification of PSUs	26
Annex B (informative) Commutation notches	28
Annex C (informative) Calculation and simulation of the input current harmonics	29
Annex D (informative) Special consideration for d.c. inputs	30
Annex E (informative) Critical frequency for high frequency power measurement	33
Annex F (normative) Guidelines on power supply families	34
Annex G (informative) Summary of classification of environments and limits	36
Annex H (informative) Emission Limits	37
Annex I (informative) Explanatory remark for applying criterion B for continuous disturbance phenomena (see 7.1)	38
Annex ZA (normative) Normative references to international publications with their corresponding European publications	39

	Page
Figure 1 – Test set-up for the measurement of disturbance power.....	18
Table 1 – Applicability of tests	12
Table 2 – Criteria to prove the performance of a PSU against EM disturbances.....	19
Table 3 – Immunity – Enclosure port.....	20
Table 4 – Immunity – Ports for signal lines and control lines.....	20
Table 5 – Immunity – DC input and output power ports.....	21
Table 6 – Immunity – AC input power ports	21
Table 7 – Immunity – Enclosure port.....	22
Table 8 – Immunity – Ports for signal lines and control lines.....	22
Table 9 – Immunity – DC input and output power ports.....	23
Table 10 – Immunity – AC input power ports	23
Table A.1 – Classification of power supplies and the relevant EMC standards	27
Table D.1 – Immunity – DC input power ports – Input category a).....	31
Table D.2 – Immunity – DC input power ports – Input category b).....	31
Table D.3 – Immunity – Enclosure port – Input categories a and b.....	32
Table G.1 – Summarized classification of environments and limits	36
Table H.1 – Limits of mains terminal disturbance voltage (a.c. input port).....	37
Table H.2 – Limits for electromagnetic radiation/interference power disturbance (all field strength limits refer to quasi-peak measurements).....	37

LOW VOLTAGE POWER SUPPLIES, DC OUTPUT –

Part 3: Electromagnetic compatibility (EMC)

1 Scope and object

This part of IEC 61204 specifies electromagnetic compatibility (EMC) requirements for power supply units (PSUs) providing d.c. output(s) up to 200 V at a power level of up to 30 kW, operating from a.c. or d.c. source voltages of up to 600 V.

The devices are for free-standing operation or for use in other equipment when used with adequate electrical and mechanical protection.

For certain specialized industrial PSUs, for example in the chemical and metallurgical industry, other product EMC standards may exist. In this case these standards can be used as an alternative.

Since many PSUs are used as components of larger units which are covered by different EMC standards, a classification of power supplies and the applicability of the relevant EMC standards is given in items a) and b) below. Further guidelines on classification are given in annex A.

a) Power supplies intended for free-standing operation (individual apparatus).

This part of IEC 61204 is applicable to PSUs developed as a unit with a direct function and sold on the market as a stand-alone unit.

b) Component power supplies

These can be divided into two categories:

1) Component power supplies considered as equivalent to apparatus.

This part of IEC 61204 is applicable to this category of component PSUs. These PSUs are considered to be apparatus with respect to their EMC requirements, for example those PSUs intended for use in installations or sold to the general public, cases where no further EMC tests are anticipated. This does not include PSUs sold as spares for repair which have been tested as part of an overall equipment.

2) Component power supplies intended for a professional assembler/installer

This part of IEC 61204 is applicable to this category of power supplies only as an aid to specify relevant EMC requirements in order that various end product standards may be met.

These are component power supplies that are intended for incorporation into a final product by a professional assembler. These products may be sold to a professional assembler or placed on the market for specialized distribution and use. In neither case do they perform in themselves a direct function for the user of an end-product. Further EMC tests of the assembly are assumed.

NOTE After incorporation into a final product, the emission values can be altered (e.g. because of modified earth connections).

The object of this part of IEC 61204 is to define EMC limits and test methods for PSUs. It includes limits for electromagnetic emissions which may cause interference to other electronic equipment (e.g. radio receivers, measuring and computer devices), as well as electromagnetic immunity limits for continuous and transient conducted and radiated disturbances including electrostatic discharges.

This part of IEC 61204 defines the minimum electromagnetic compatibility requirements for PSUs.

To comply with this part of IEC 61204, no additional EMC tests are required or necessary beyond those stated here.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61204. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61204 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050-121, *International Electrotechnical Vocabulary (IEV) – Part 121: Electromagnetism*

IEC 60051(131), *International Electrotechnical Vocabulary (IEV) – Chapter 131: Electric and magnetic circuits*

IEC 60050(151), *International Electrotechnical Vocabulary (IEV) – Chapter 151: Electrical and magnetic devices*

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

IEC 60050-551, *International Electrotechnical Vocabulary (IEV) – Part 551: Power electronics*

IEC 60146-1-1, *Semiconductor convertors – General requirements and line commutated convertors – Part 1-1: Specifications of basic requirements*

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements, tests*

IEC 61204, *Low-voltage power supply devices, d.c. output – Performance characteristics and safety requirements* (future IEC 61204-2)

IEC 61000-3-2, *Electromagnetic compatibility (EMC) – Part 3: Limits – Section 2: Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)* *

* There is a consolidated edition 1.2 (1998) that includes IEC 61000-3-2 (1995), and its amendment 1 (1997) and its amendment 2 (1998).

IEC 61000-3-3, *Electromagnetic compatibility (EMC) – Part 3: Limits – Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current $\leq 16A$*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2: – Electrostatic discharge immunity test*. Basic EMC Publication *
Amendment 1 (1998)

IEC 61000-4-3, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 3: Radiated, radio-frequency, electromagnetic field immunity test* **

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test*. Basic EMC Publication

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 5: Surge immunity test*

IEC 61000-4-6, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 6: Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-11, *Electromagnetic compatibility (EMC) – Part 4: Testing and measuring techniques – Section 11: Voltage dips, short interruptions and voltage variations immunity tests*

CISPR 11, *Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement****

CISPR 14-1, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission – Product family standard*

CISPR 16-1, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1: Radio disturbance and immunity measuring apparatus*

CISPR 22, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

ISO/IEC Guide 25, *General requirements for the competence of calibration and testing laboratories*

* There is a consolidated edition 1.1 (1999) that includes IEC 61000-4-2 (1995) and its amendment 1 (1998).

** There is a consolidated edition 1.1 (1998) that includes IEC 61000-4-3 (1995) and its amendment 1 (1998).

*** There is a consolidated edition 3.1 (1999) that includes CISPR 11 (1997) and its amendment 1 (1999).

3 Terms and definitions

For the purpose of this part of IEC 61204, the definitions given in IEC 60050-121, IEC 60050(151), IEC 60050(161), IEC 60050-551 and IEC 60146-1-1, as well as the following definitions apply.

3.1 environment

3.1.1

residential environment

all domestic establishments which are directly connected to a low voltage public mains supply. The “protection distance” is 10 m, reflecting apartment size

3.1.2

commercial and light industrial environment

commercial and light industrial establishments which may or may not be connected to a low voltage public mains supply. The “protection distance” can be 10 m or 30 m depending on where the use of broadcast radio and television receivers may be expected

3.1.3

industrial environment

industrial establishments which are not connected to the low voltage public mains supply. The “protection distance” is 30 m, owing to larger premises

3.2

protection distance

distance for an electronic or electrical apparatus beyond which the interference levels shall not impair the use of other electronic or electrical equipment, for example broadcast radio and television receivers

3.3

distributed power system

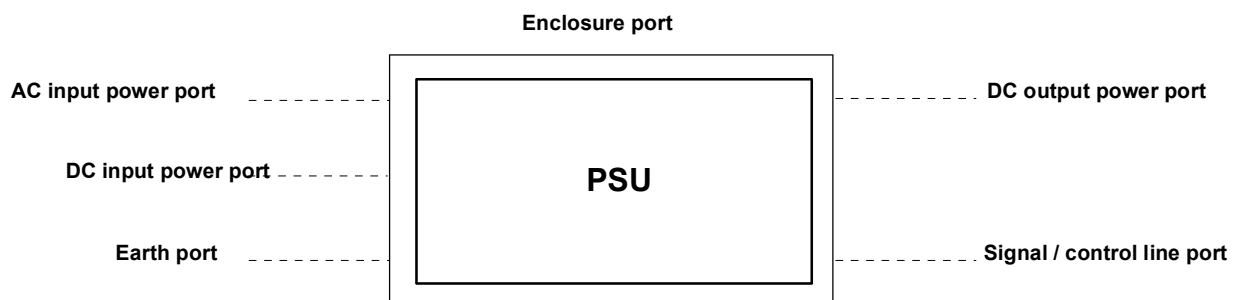
system of localized power converters supplied from a distributed power bus

3.4

port

particular interface of a product with the external electromagnetic environment.
[IEV 131-02-21 modified]

Examples of ports:



3.4.1

enclosure port

physical boundary of the PSU product through which and on which electromagnetic fields may radiate or impinge

3.4.2

signal or control line port

low energy level input or output port providing diagnostic or control information

3.4.3

d.c. input power port

external d.c. energy source connection point

3.4.4

d.c. output power port

external connection point for providing output d.c. energy

3.4.5

a.c. input power port

external a.c. energy source connection point

3.5

power supply (PSU)

an electrical or electronic device which transforms energy from an input source into a single or multiple output energy source

3.5.1

component power supply

modular PSU; sub-unit PSU:

assemblies of electrical and/or electronic devices designed to provide or modify energy. They are intended for incorporation into end-products by a professional assembler/installer. They are not intended for free-standing applications

3.5.2

stand alone power supply

intended for use in laboratories, workshops and other areas in free-standing applications. They are end-products, completely enclosed with full protection against electrostatic discharge and contact with hazardous parts which are accessible to the end-user. Typical examples include adjustable or fixed output bench-top units, plug-top units, free-standing and wall-mounted units

3.5.3

bench-top power supply

intended for laboratory or similar use. They are stand alone PSUs, sometimes with monitoring and measuring facilities

3.5.4

open card power supply

(frameless PSU)

printed circuit board devoid of a metal mounting bracket. It is a component PSU intended for use by a professional assembler

3.5.5**open frame power supply**

generally uses a printed circuit board mounted on a metal bracket for attachment to the professional assembler's equipment chassis. This bracket provides heat transfer for the cooling of power semiconductors. Optionally, a cover may be used for safety reasons and/or to reduce radiated interference

3.5.6**plug-in card power supply**

intended to be plugged into a subrack. The design may be "open-card", "open-frame" or "cased". A plug-in card PSU is generally intended for use by a professional assembler

3.5.7**enclosed/cased power supply**

fully enclosed/cased/housed PSU. The design uses the housing as a heat sink or employs fan(s) for forced air cooling

3.5.8**plug-top (direct plug-in) power supply**

power supply built into a mains voltage plug top

3.5.9**uninterruptible power supply (UPS)**

intended to provide a source of energy secure against mains failure. This type of product would normally be free-standing

3.6**end-product**

finished unit which is designed to stand alone, useable by an end-user and having a direct function for the end-user. It is intended to be placed on the market and/or taken into service as a single unit or as part of a system or installation

3.7**system**

localized group of interconnected products which is easily relocatable. Typical examples of this would be a computer, including mouse, keyboard, printer and monitor, or a hi-fi system, TV and video recorder

3.8**installation**

collection of interconnected products which is not easily relocatable. Typical examples of this include an industrial process installation or a power plant control installation

3.9**non-professional**

person or organization assumed to have little or no technical knowledge or facilities

3.10**professional assembler/installer**

technically competent person or organization capable of correctly assembling/installing components and subassemblies into an end-product, or end-products into a system or installation, and, in so doing, fully complying with the technical and legal requirements of the end-product, system or installation

3.11

full rated load

maximum continuous or average power a product is marked to supply

3.12 mains supply

3.12.1

industrial mains supply

source of electrical energy provided solely for industrial use

3.12.2

private mains supply

localized source of electrical energy (e.g. generator or UPS) which is not directly connected to the public network

3.12.3

public mains supply

source of electrical energy provided for general public use in domestic, commercial or light industrial environments

3.13

critical frequency of a PSU

The frequency, the wavelength of which is equal to four times the longest side length of the PSU

4 Applicability of tests to different PSU technologies

PSUs differ greatly in their technology; it is neither reasonable nor necessary to apply all EMC tests to all PSU technologies.

The following table is applicable to free-standing PSUs and component PSUs considered as equivalent to apparatus (see also annex A).

In the case of component PSUs intended for a professional installer, this table is provided as a guide.

Table 1 – Applicability of tests

Group	Technology	Clause or subclause				Remarks
		Emission			Immunity	
		6.2	6.3	6.4	7	
I	Modules with pin or screw connections for use on PCBs	NA	R	R	R	These are component power supplies
II	AC/DC rectifier-filtered or Ferro-resonant PSU	M	M	NA	NA	If only rectifier disturbances
III	AC/DC linear controlled PSU	M	M	NA	M	No switching (note)
IV	DC/DC converters, battery or rectifier powered	NA	R	M	M	No primary rectifier, no direct connection to a.c. supply
V	AC/DC PSUs not covered by I, II, III or IV	M	M	M	M	
NOTE When products or system are within the scope of CISPR 14-1, the incorporated group III PSUs may be tested according to CISPR 14-1.						
M = Mandatory.						
R = Recommended.						
NA = No measurement.						