



SLOVENSKI STANDARD
SIST EN 61800-3:1997/A11:2001
01-junij-2001

Adjustable speed electrical power drive systems - Part 3: EMC product standard including specific test methods - Amendment A11

Adjustable speed electrical power drive systems -- Part 3: EMC product standard including specific test methods

Drehzahlveränderbare elektrische Antriebe -- Teil 3: EMV-Produktnorm einschließlich spezieller Prüfverfahren

Entraînements électriques de puissance à vitesse variable -- Partie 3: Norme de produit relative à la CEM incluant des méthodes d'essais spécifiques

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Ta slovenski standard je istoveten z: EN 61800-3:1996/A11:2000

ICS:

29.200	Usmerniki. Pretvorniki. Stabilizirano električno napajanje	Rectifiers. Convertors. Stabilized power supply
33.100.01	Elektromagnetna združljivost na splošno	Electromagnetic compatibility in general

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EUROPEAN STANDARD
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EN 61800-3/A11

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ICS 29.020

English version

**Adjustable speed electrical power drive systems
Part 3: EMC product standard including specific test methods**

Entraînements électriques de
puissance à vitesse variable
Partie 3: Norme de produit relative
à la CEM incluant des méthodes
d'essais spécifiques

Drehzahlveränderbare elektrische
Antriebe
Teil 3: EMV-Produktnorm einschließlich
spezieller Prüfverfahren

This amendment A11 modifies the European Standard EN 61800-3:1996; it was approved by CENELEC on 2000-01-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

This amendment was prepared by the Technical Committee CENELEC TC 22X, Power electronics.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A11 to EN 61800-3:1996 on 2000-01-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2000-07-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2002-01-01

This amendment A11 is published as common modifications superseding all (sub)clauses listed in the table of contents.

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2 Normative references

Replace the references IEC/FDIS 61000-4-6 and IEC/CISPR 11: 1990 by the following.

IEC 61000-4-6:1996	Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 6: Immunity to conducted disturbances, induced by radio-frequency fields
IEC/CISPR 11:1997	Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement

Add:

IEC/TS 61000-3-4:1998	Electromagnetic compatibility (EMC) - Part 3-4: Limits - Limitation of emission of harmonic currents in low-voltage power supply systems for equipment with rated current greater than 16 A
IEC 61000-3-11 ¹⁾	Electromagnetic compatibility (EMC) - Part 3-11: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems for equipment with rated current ≤ 75 A and subject to conditional connection
IEC 61800-1:1997	Adjustable speed electrical power drive systems - Part 1: General requirements - Rating specifications for low voltage adjustable speed d.c. power drive systems
IEC 61800-2:1998	Adjustable speed electrical power drive systems - Part 2: General requirements - Rating specifications for low voltage adjustable frequency a.c. power drive systems

5 Immunity requirements

5.2 Replace the entire subclause by

5.2 Basic immunity requirements - Low-frequency disturbances

The requirements in these subclauses shall be used for designing the immunity of a PDS against low-frequency disturbances. The corresponding methods for demonstrating compliance, tests, calculations or simulation, shall be defined by the manufacturer. The results shall be given in the user documentation.

1) In preparation.

5.2.1 Harmonics and commutation notches / Voltage distortion

The PDS or BDM/CDM shall comply with the immunity levels given in Table 2.

Table 2 — Minimum immunity requirements for harmonics on power ports of power drive systems (PDSs)

Phenomenon	Level and reference document		Performance (Acceptance) criterion
	First environment	Second environment	
Harmonics (THD and individual harmonic orders)	IEC 61000-2-2 (THD = 8 %)	IEC 61000-2-4 - Class 3 (THD = 10 %)	A
Harmonics short term (< 15 s)	IEC 61000-2-2 1,5 times permanent levels	IEC 61000-2-4 - Class 3 1,5 times permanent levels	B
Commutation notches	No requirement	IEC 60146-1-1 - Class B (depth = 40 %, total area = 250 % x degrees)	A

The immunity of the PDS shall be verified by calculation, simulation or test, at the choice of the manufacturer.

The manufacturer shall verify that each of the above levels will not cause the ratings for the input circuits (including snubbers, phase detection circuits, input filters, etc.) to be exceeded.

Any analysis of commutation notches shall be in the time domain. A frequency domain analysis of their contribution to the total harmonic distortion will not fully identify their harmful effects (see B.1).

5.2.2 Voltage changes, fluctuations, dips and short interruptions

The PDS or BDM/CDM shall comply with the immunity levels given in Table 3.

Table 3 — Minimum immunity requirements for voltage changes on power ports of power drive systems (PDSs)

Phenomenon	Level and reference document		Performance (Acceptance) criterion
	First environment	Second environment	
Voltage variations and fluctuations	IEC 61000-2-2 ¹⁾ ± 10 %	IEC 61000-2-4 ¹⁾ - Class 3 ± 10 %	A ²⁾
Voltage variations and fluctuations less than 1 min	IEC 61000-2-2 ¹⁾ ± 10 %	IEC 61000-2-4 ¹⁾ - Class 3 + 10 % to - 15 %	A ²⁾
Voltage dips and short interruptions	IEC 61000-2-1 ³⁾ 10 % to 100 %	IEC 61000-2-1 ³⁾ 10 % to 100 %	C ⁴⁾
<p>1) Typical shapes of voltage fluctuations are given in Figures 3 to 6 of IEC 61000-2-1. 2) When the voltage is below nominal, the maximum output power ratings - speed and/or torque - may be reduced. 3) Typical depths and durations of voltage dips are given in 8.1.2 of IEC 61000-2-1. 4) Blowing of fuses is allowed for line commutated converters operating in inverting mode.</p>			

The immunity of the PDS shall be verified by calculation, simulation or test, at the choice of the manufacturer.

NOTE 1 A PDS is used for energy conversion and a voltage dip represents a loss of available energy. It may be necessary to trip for safety reasons, even during a voltage dip of 30 % to 50 % amplitude and 0,3 s duration.

NOTE 2 The effect of a voltage dip (energy reduction) on the process cannot be defined without detailed knowledge of the process itself. This effect is a system and rating aspect, and will generally be greatest when the power demand (including losses) on the PDS is higher than the available power.

NOTE 3 A decreasing input voltage, even with a duration of a few milliseconds, may result in blowing of fuses when applied to a line commutated thyristor converter operating under regeneration mode.

Where it is possible and not dangerous (see clause 7) the behaviour of the PDS during short interruptions may be verified by switching off and on the mains supply during the standard operating conditions of the PDS (see B.4.1).

The manufacturer shall state in the user documentation the behaviour of the PDS or BDM/CDM during voltage dips and short interruptions.

If a higher level of immunity is required, this shall be stated by the user.

NOTE 4 Improvements to the immunity (use of UPS, stand-by generator, derating, etc.) may result in a considerable increase in the size and cost of the PDS and may reduce the efficiency or power factor. Operation such as automatic restart may have safety consequences, which are the installer's or user's responsibility, and are not covered by this standard (see clause 7).

5.2.3 Voltage unbalance and frequency variations

The PDS or BDM/CDM shall comply with the immunity levels given in Table 4.

Table 4 — Minimum immunity requirements for voltage unbalance and frequency variations on power ports of power drive systems (PDSs)

Phenomenon	Level and reference document		Performance (Acceptance) criterion
	First environment	Second environment	
Voltage unbalance ¹⁾	IEC 61000-2-2 (2 % negative sequence component)	IEC 61000-2-4 - Class 3 (3 % negative sequence component)	A
Frequency variations and Rate of change	IEC 61000-2-2 ± 2 % 1 % / second	IEC 61000-2-4 ± 2 % ²⁾ 1 % / second	A
1) Voltage unbalance is explained in B.3. 2) ± 4 % with rate of change 2 % / second where the supply is separated from public supply networks.			

The immunity of the PDS shall be verified by calculation, simulation or test, at the choice of the manufacturer.

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5.2.4 Supply influences - Magnetic fields

Immunity tests according to IEC 61000-4-8 are not required. (See A.4.1 for explanation).

PDS intended to be used in the following environments may require additional tests :

- for electrical generating plants and telecontrol centres, the test to be performed is against pulse magnetic field according to IEC 61000-4-9;
- for medium or high-voltage substations, the test to be performed is against damped oscillatory magnetic field tests according to IEC 61000-4-10.

In both cases, the decision to apply the test or not shall be agreed between the manufacturer and the customer according to the actual location planned for the installation of the PDS within the site.

5.3 Replace the entire subclause by:

5.3 Basic immunity requirements - High-frequency disturbances

In the following Table 5 and Table 6, the minimum immunity requirements for high-frequency disturbance tests, and acceptance criteria are stated. The acceptance criteria refer to subclause 5.1.1. Explanations are given in A.4.

5.3.1 First environment

The levels in Table 5 shall be applied to PDSs which are intended to be used in the first environment.

Table 5 — Minimum immunity requirements for power drive systems (PDSs) intended for use in the first environment

Port	Phenomenon	Basic standard for test method	Level	Performance (Acceptance) criterion
Enclosure port	ESD	IEC 61000-4-2	6 kV CD or 8 kV AD if CD impossible	B
	Radio-frequency electromagnetic field, amplitude modulated.	IEC 61000-4-3 see also 5.3.3	80 to 1000 MHz 3 V/m 80 % AM (1 kHz)	A
Power ports	Fast transient-burst	IEC 61000-4-4	1 kV / 5 kHz ¹⁾	B
	Surge ²⁾ 1,2/50 μ s, 8/20 μ s	IEC 61000-4-5	1 kV ³⁾ 2 kV ⁴⁾	B
	Conducted radio-frequency common mode ⁵⁾	IEC 61000-4-6 see also 5.3.3	0,15 to 80 MHz 3 V 80 % AM (1 kHz)	A
Power interfaces	Fast transient-burst ⁵⁾	IEC 61000-4-4	1 kV / 5 kHz Capacitive clamp	B
Ports for process measurement control lines and signal interfaces	Fast transient-burst ⁵⁾	IEC 61000-4-4	1 kV / 5 kHz Capacitive clamp	B
	Conducted radio-frequency common mode ⁵⁾	IEC 61000-4-6 see also 5.3.3	0,15 to 80 MHz 3 V 80 % AM (1 kHz)	A

CD = contact discharge
AD = air discharge

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- 1) Power ports with current rating ≤ 100 A : direct coupling using the coupling and decoupling network. Power ports with current rating ≥ 100 A : direct coupling or capacitive clamp without decoupling network. If the capacitive clamp is used, test level shall be 2 kV / 5 kHz.
- 2) Applicable only to power ports with current consumption < 63 A during light load test conditions as specified in 5.1.3.
The rated impulse voltage of the basic insulation shall not be exceeded (see IEC 60664-1).
- 3) Coupling line to line.
- 4) Coupling line to earth.
- 5) Applicable only to ports or interfaces with cables whose total length according to the manufacturer's functional specification may exceed 3 m.

5.3.2 Second environment

The levels in Table 6 shall be applied to PDSs which are intended to be used in the second environment.

Table 6 — Minimum immunity requirements for power drive system (PDSs) intended for use in the second environment

Port	Phenomenon	Basic standard for test method	Level	Performance (Acceptance) criterion
Enclosure port	ESD	IEC 61000-4-2	6 kV CD or 8 kV AD if CD impossible	B
	Radio-frequency electromagnetic field, amplitude modulated.	IEC 61000-4-3 see also 5.3.3	80 to 1000 MHz 10 V/m 80 % AM (1 kHz)	A
Power ports	Fast transient-burst	IEC 61000-4-4	2 kV / 5 kHz ¹⁾	B
	Surge ²⁾ 1,2/50 μ s, 8/20 μ s	IEC 61000-4-5	1 kV ³⁾ 2 kV ⁴⁾	B
	Conducted radio-frequency common mode ⁵⁾	IEC 61000-4-6 but see also 5.3.3	0,15 to 80 MHz 10 V 80 % AM (1 kHz)	A
Power Interfaces	Fast transient-burst ⁵⁾	IEC 61000-4-4	2 kV / 5 kHz Capacitive clamp	B
Signal interfaces	Fast transient-burst ⁵⁾	IEC 61000-4-4	1 kV / 5 kHz Capacitive clamp	B
	Conducted radio-frequency common mode ⁵⁾	IEC 61000-4-6 but see also 5.3.3	0,15 to 80 MHz 10 V 80 % AM (1 kHz)	A
Ports for process measurement control lines	Fast transient-burst ⁵⁾	IEC 61000-4-4	2 kV / 5 kHz Capacitive clamp	B
	Conducted radio-frequency common mode ⁵⁾	IEC 61000-4-6 but see also 5.3.3	0,15 to 80 MHz 10 V 80 % AM (1 kHz)	A

CD = contact discharge

AD = air discharge

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- 1) Power ports with current rating < 100 A : direct coupling using the coupling and decoupling network.
Power ports with current rating \geq 100 A : direct coupling or capacitive clamp without decoupling network.
If the capacitive clamp is used, test level shall be 4 kV / 2,5 kHz.
- 2) Applicable only to power ports with current consumption < 63 A during light load test conditions as specified in 5.1.3.
The rated impulse voltage of the basic insulation shall not be exceeded (see IEC 60664-1).
- 3) Coupling line to line.
- 4) Coupling line to earth.
- 5) Applicable only to ports or interfaces with cables whose total length according to the manufacturer's functional specification may exceed 3 m.

5.3.3 Immunity against electromagnetic fields

If the PDS is :

- of rated voltage less than 500 V and
- of rated current less than 200 A and
- of total weight less than 250 kg and
- of height, and width, and depth less than 1,9 m

the tests of IEC 61000-4-3 and IEC 61000-4-6 shall be performed, see 5.3.1 and 5.3.2.

If the PDS is larger or of higher rating than in the above paragraph then the manufacturer shall choose either :

- to perform the tests of IEC 61000-4-3 and IEC 61000-4-6 on the PDS or
- to perform the tests of IEC 61000-4-3 and IEC 61000-4-6 on sensitive sub-components.

If the motor is too large to be put into service on a test site, the motor may be replaced by one of smaller size, provided this does not adversely affect the operation of the CDM/BDM.

In the case where only sub-components have been tested, a test against radio-communication devices of common industrial use should be performed on the complete PDS, as described in A.4.3.2 . This test is valid for the specific location, installed equipment and frequencies tested only.

6 Emission requirements

6.1.1 Replace by:

6.1.1 Commutation notches

Commutation notches are measured on the power ports using an oscilloscope (see B.1.1). They are produced by controlled line commutated converters (see 2.5.4.1 of IEC 60146-1-1).

Where it is known that the input circuit of the PDS does not produce notches or only produces notches of negligible amplitude (example diode rectifiers), emission of notches need not be considered.

NOTE 1 The main practical case where emission of notches should be considered is the case of thyristor converters (line commutated). RFI filters are a practical case of equipment which can be affected by notches. They can be overloaded or subjected to repetitive over-voltages.

NOTE 2 A diode rectifier is an uncontrolled line commutated converter, which produces commutation notches of negligible amplitude. Some self commutated converters (for example an indirect converter of the voltage source inverter type with an active front end) can produce commutation notches depending on the PWM pattern.

Where notches are to be considered, the manufacturer shall provide the following information to the user :

- value of any decoupling reactances which are included in the PDS;
- available decoupling reactances which can be externally added for mitigation (see B.1.2 and B.1.3).

The recommendations of B.1.4 should be followed.