



National Standards Authority of Ireland

IRISH STANDARD

I.S. EN 50178:1998

ICS 29.240

National Standards  
Authority of Ireland  
Dublin 9  
Ireland

Tel (01) 807 3800  
Tel (01) 807 3838

**ELECTRONIC EQUIPMENT FOR USE IN  
POWER INSTALLATIONS**

*This Irish Standard was  
published under the  
authority of the National  
Standards Authority of  
Ireland  
and comes into effect on:  
July 10, 1998*

**NO COPYING WITHOUT NSAI  
PERMISSION EXCEPT AS  
PERMITTED BY COPYRIGHT  
LAW**

© NSAI 1998

**Price Code AC**

Údarás um Chaighdeán Náisiúnta na hÉireann



EUROPEAN STANDARD

**EN 50178**

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 1997

---

ICS 29.240.00

Descriptors: Electrical installation, industrial electrical installation, electronic equipment, definitions, design, safety, protection against electric shocks, protection against live parts, climatic conditions, electrical properties, mechanical properties, tests, marking

English version

## **Electronic equipment for use in power installations**

Équipement électronique utilisé dans  
les installations de puissance

Ausrüstung von Starkstromanlagen mit  
elektronischen Betriebsmitteln

This European Standard was approved by CENELEC on 1997-07-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard 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 European Standard 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, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

# **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 European Standard was prepared by the Task Force CENELEC BTTF 60-1, Assembly of electronic equipment.

A first draft was submitted to CENELEC enquiry (6MP) in August 1994 but failed to be accepted. A second draft was submitted to CENELEC enquiry (2MP) in September 1995 and was accepted. The text of the final draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50178 on 1997-07-01

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1998-06-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2003-06-01

Annexes designated "informative" are given for information only. In this standard annexes A and B are informative.

Annex A offers additional information e.g. as a basis for design purposes. It also indicates items where new standards are expected to be established. Functions or characteristics presented in the informative annex A may be used as options of the electronic equipment, provided that test methods are specified and test equipment is available. In any case, these points have to be discussed and clarified between customer and manufacturer

Annex B is under consideration. It is intended to contain tables with all important figures and values. It shows a condensed overview on the conditions and requirements for convenience of the user of the standard.

The requirements of this European Standard are based on basic or generic standards issued by IEC or CLC where these standards exist. This is valid especially for safety and environmental requirements. Additional requirements are stipulated where necessary

This European Standard is a harmonized standard for electronic equipment for use in power installations according to the Low Voltage Directive 73/23/EEC. No additional requirements are to be met for compliance with this directive

## Contents

	Page
<b>Foreword</b> .....	<b>2</b>
<b>Introduction</b> .....	<b>10</b>
<b>1 Scope</b> .....	<b>11</b>
<b>2 Normative references</b> .....	<b>11</b>
<b>3 Definitions</b> .....	<b>14</b>
<b>4 Requirements for entire system</b> .....	<b>21</b>
4.1 Normal function.....	21
4.2 Damage to persons or material.....	21
4.3 EE connected to unearthed supply mains under condition of earth fault.....	22
4.4 Earthing requirements (Grounding, earthing and screening).....	22
4.5 Wires and cables for interconnection.....	22
4.6 Fuses in neutral and protective conductors.....	22
<b>5 Safety requirements</b> .....	<b>23</b>
5.1 General requirements.....	23
5.2 Requirements for EE with regard to protection against electric shock.....	25
5.2.1 Requirements for protection against electric shock.....	25
5.2.2 Protection against direct contact.....	25
5.2.3 Protection by means of insulation of live parts.....	25
5.2.4 Protection by means of enclosures and barriers.....	27
5.2.4.1 Distances.....	27
5.2.5 Discharge of capacitors.....	28
5.2.6 Built-in devices.....	28
5.2.7 EE for closed electrical operating areas.....	28
5.2.8 Protection in the case of direct contact.....	28
5.2.8.1 Protection by means of extra-low voltage with protective separation (SELV- and PELV-system).....	28
5.2.8.2 Protection by means of limitation of the discharging energy.....	29
5.2.8.3 Protection by means of protective impedance.....	29
5.2.8.4 Protection by using limited voltages in control circuits.....	29
5.2.8.5 Connectors.....	29
5.2.9 Protection with regard to indirect contact.....	30
5.2.9.1 Insulation between live parts and exposed conductive parts.....	30
5.2.9.2 Protective bonding.....	30
5.2.9.3 Rating of protective bonding.....	31
5.2.9.4 Protection against corrosion.....	31
5.2.9.5 Protective bonding conductor with low cross section.....	31
5.2.9.6 EE with voltage above a.c. 1 400 V or d.c. 2 000 V.....	31
5.2.9.7 Interruption.....	31
5.2.9.8 Marking.....	31
5.2.10 Means of connection for the protective conductor.....	32
5.2.11 Leakage current and fault current.....	32
5.2.11.1 High leakage current.....	32
5.2.11.2 Compatibility with residual-current-operated protective devices in case of low leakage current.....	33
5.2.12 Special features in EE for protective class II.....	34
5.2.13 Decisive voltage.....	35
5.2.14 Solid insulation, insulation of circuits.....	38
5.2.14.1 Between circuits and exposed conductive parts or accessible surfaces of EE.....	38
5.2.14.2 Between circuits.....	38
5.2.14.3 Bridging of the insulation via conductive parts.....	39
5.2.15 Clearances and creepage distances, pollution degree.....	39
5.2.15.1 Clearances and creepage distances.....	39
5.2.15.2 Pollution degree.....	46
5.2.16 Clearances.....	46

	Page
5.2.16.1	Clearances between mains-circuits and their environment..... 47
5.2.16.2	Clearances between non-mains-circuits and their environment..... 49
5.2.16.3	Clearances within a circuit..... 50
5.2.17	Creepage distances..... 52
5.2.18	Protective separation..... 54
5.2.18.1	Constructive measures..... 55
5.2.18.2	Protective separation by double or reinforced insulation..... 56
5.2.18.3	Protective separation by protective screening..... 56
5.2.18.4	Clearances and creepage distances in case of protective separation..... 57
5.2.18.5	Partial discharge..... 57
5.2.18.6	Components and other electrical sub-assemblies..... 58
5.3	Requirements for EEs in installations with regard to protection against electric shock..... 58
5.3.1	Protection with regard to direct contact..... 58
5.3.1.1	Cables and leads..... 58
5.3.1.2	Connection of EE with protective separation..... 58
5.3.1.3	Built-in devices in installations..... 59
5.3.1.4	EE in closed electrical operating areas..... 59
5.3.2	Protection with regard to indirect contact..... 59
5.3.2.1	Leakage current through the protective conductor..... 59
5.3.2.2	Permissible touch voltage..... 60
5.3.2.3	Protection of EE by residual-current-operated protective device..... 60
<b>6</b>	<b>Environmental requirements and conditions..... 60</b>
6.1	Climatic condition..... 60
6.1.1	Temperature..... 62
6.1.1.1	Ambient air temperature..... 62
6.1.1.2	Cooling medium temperature..... 62
6.1.2	Humidity and air pressure..... 62
6.1.3	Pollution..... 62
6.2	Mechanical requirements (general)..... 63
6.2.1	Mechanical shock..... 63
6.2.2	Mechanical vibration..... 63
6.2.2.1	Immunity requirement to mechanical vibration..... 63
6.2.2.2	Mechanical vibration emission constraints..... 63
6.2.3	Sealing in case of liquid cooling..... 64
6.2.4	Sealing against dust ingress to EE..... 64
6.3	Electrical and electromagnetic requirements..... 64
6.3.1	Conditions in the system (immunity level for EE)..... 64
6.3.2	EE connected to a.c. supply mains (immunity)..... 64
6.3.2.1	Supply voltage variation..... 64
6.3.2.2	Frequency..... 65
6.3.3	EE connected to d.c. supply mains (immunity)..... 65
6.3.4	Short-circuit withstand capability (immunity)..... 65
6.3.5	Immunity from electromagnetic disturbance..... 66
6.3.6	Effects of EE(s) on the system (emission)..... 66
6.3.7	Rating of power electronic equipment..... 66
<b>7</b>	<b>Requirements for electronic equipment..... 66</b>
7.1	Design and construction..... 66
7.1.1	General..... 66
7.1.2	Quality and reliability..... 66
7.1.3	Working life..... 67
7.1.4	Insulation..... 67
7.1.5	Component selection and use..... 67
7.1.5.1	Selection criteria for components..... 67
7.1.5.2	Hazards arising from components..... 67
7.1.6	Power supply switching, fusing and usage..... 68
7.1.6.1	Fire protection and fire risk..... 68
7.1.6.2	Operation under fault conditions..... 68
7.1.7	Construction..... 68

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

- 
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
  - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-