

© Copyright SEK. Reproduction in any form without permission is prohibited.

## Kärnteknisk mätutrustning – Mätutrustning för strålskyddsändamål – Fast utrustning för övervakning och detektering av gammastrålning från material på fordon

*Installed monitors for the control and detection of gamma radiations contained in recyclable or non-recyclable materials transported by vehicles*

Som svensk standard gäller europastandarden EN 62022:2007. Den svenska standarden innehåller den officiella engelska språkversionen av EN 62022:2007.

### Nationellt förord

Europastandarden EN 62022:2007

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 62022, First edition, 2004 - Installed monitors for the control and detection of gamma radiations contained in recyclable or non-recyclable materials transported by vehicles**

utarbetad inom International Electrotechnical Commission, IEC.

---

ICS 13.280

---

Denna standard är fastställd av SEK Svensk Elstandard, som också kan lämna upplysningar om **sakinnehållet** i standarden.  
Postadress: SEK, Box 1284, 164 29 KISTA  
Telefon: 08 - 444 14 00. Telefax: 08 - 444 14 30  
E-post: sek@elstandard.se. Internet: www.elstandard.se

---

### *Standarder underlättar utvecklingen och höjer elsäkerheten*

Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

### *SEK är Sveriges röst i standardiseringsarbetet inom elområdet*

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

### *Stora delar av arbetet sker internationellt*

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

### *Var med och påverka!*

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

### **SEK Svensk Elstandard**

Box 1284  
164 29 Kista  
Tel 08-444 14 00  
[www.elstandard.se](http://www.elstandard.se)

**Installed monitors for the control and detection of gamma radiations  
contained in recyclable or non-recyclable materials  
transported by vehicles  
(IEC 62022:2004, modified)**

Moniteurs fixes de contrôle et de détection  
d'émetteurs de rayonnements gamma  
contenus dans des matériaux recyclables  
ou non recyclables, transportés  
dans des véhicules  
(CEI 62022:2004, modifiée)

Fest installierte Monitore  
für die Überwachung und den Nachweis  
von Gammastrahlen-Emittern  
in von Fahrzeugen transportierten,  
wiederverwertbaren  
oder nicht wiederverwertbaren Materialien  
(IEC 62022:2004, modifiziert)

This European Standard was approved by CENELEC on 2007-07-01. 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, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the 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

The text of the International Standard IEC 62022:2004, prepared by SC 45B, Radiation protection instrumentation, of IEC TC 45, Nuclear instrumentation, together with the common modifications prepared by CENELEC BTTF 111-3, Nuclear instrumentation and radiation protection instrumentation, was submitted to the formal vote and was approved by CENELEC as EN 62022 on 2007-07-01.

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) 2008-07-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2010-07-01

Clauses, subclauses, notes, tables and figures which are additional to those in IEC 62022:2004 are prefixed “Z”.

Annex ZA has been added by CENELEC.

-----

### Endorsement notice

The text of the International Standard IEC 62022:2004 was approved by CENELEC as a European Standard with agreed common modifications as given below.

#### COMMON MODIFICATIONS

- [Redacted]
- [Redacted]
- [Redacted]
- [Redacted]
- [Redacted]
- [Redacted]
- [Redacted]

[Redacted text block containing multiple paragraphs of blacked-out content]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60038 (mod)	1983	IEC standard voltages	HD 472 S1 <sup>1)</sup> + corr. February	1989 2002
A1	1994		-	-
A2	1997		-	-
IEC 60050-151	2001	International Electrotechnical Vocabulary (IEV) - Part 151: Electrical and magnetic devices	-	-
IEC 60050-393	1996	International Electrotechnology Vocabulary (IEV) - Chapter 393: Nuclear instrumentation: Physical phenomena and basic concepts	-	-
IEC 60050-394	1995	International Electrotechnical Vocabulary (IEV) - Chapter 394: Nuclear instrumentation: Instruments	-	-
IEC 60068-2-27	1987	Basic environmental testing procedures - Part 2: Tests - Test Ea and guidance: Shock	EN 60068-2-27	1993
IEC 61000-4-3	2006	Electromagnetic compatibility (EMC) - Part 4-3 : Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	2006
IEC 61000-4-4	2004	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4	2004
IEC 61000-4-5	2005	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5	2006
IEC 61000-4-6	2003	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4-6	2007

<sup>1)</sup> The title of HD 472 S1 is: Nominal voltages for low voltage public electricity supply systems.

IEC 61000-4-11	2004	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	EN 61000-4-11	2004
IEC 61187 (mod)	1993	Electrical and electronic measuring equipment - Documentation	EN 61187 + corr. March	1994 1995
ISO 4037-1	1996	X and gamma reference radiation for calibrating dosimeters and doserate meters and for determining their response as a function of photon energy - Part 1: Radiation characteristics and production methods	-	-

## CONTENTS

1	Scope .....	11
2	Normative references .....	13
3	Terms, definitions, quantities and units .....	13
3.1	Terms and definitions .....	13
3.2	Quantities and units .....	17
4	Design requirements .....	19
4.1	General characteristics .....	19
4.2	Configuration .....	19
4.3	Indication facilities .....	21
4.4	Vehicle speed .....	23
5	Test procedures .....	23
5.1	General test conditions .....	23
5.1.1	Nature of tests .....	23
5.1.2	Reference conditions and standard test conditions .....	25
5.1.3	Tests performed under standard test conditions .....	25
5.1.4	Tests performed with variation of influence quantities .....	25
5.1.5	Statistical fluctuations .....	25
5.1.6	Test vehicle .....	25
5.2	Radiation characteristics .....	27
5.2.1	Reference gamma radiation .....	27
5.2.2	Reference radioactive sources .....	27
5.2.3	Background effect .....	27
5.2.4	Sensitivity of the radiation detection assembly for radioactive sources placed in free air .....	29
5.2.5	Alarm test with test vehicle .....	29
5.2.6	False alarm test with test vehicle .....	31
5.3	Overload test .....	31
5.3.1	Requirements .....	31
5.3.2	Method of test .....	31
5.4	Electrical characteristics .....	31
5.4.1	Requirements for power supplies .....	31
5.4.2	Method of test .....	33
5.5	Mechanical characteristics .....	33
5.5.1	Mechanical shocks .....	33
5.5.2	Vibration test .....	33
5.6	Environmental characteristics .....	35
5.6.1	Ambient temperature .....	35
5.6.2	Relative humidity .....	35
5.6.3	Sealing .....	37
5.6.4	External magnetic fields .....	37
5.6.5	Storage .....	37

5.7	Electromagnetic compatibility.....	37
5.7.1	Radiated electromagnetic fields.....	37
5.7.2	Conducted disturbances induced by bursts and radio-frequencies.....	39
5.7.3	Surges.....	39
5.7.4	Voltage dips and short interruptions .....	39
6	Documentation .....	41
6.1	Type test report.....	41
6.2	Certificate.....	41
6.3	Operation and maintenance manual .....	41
	Annex A (informative) Test vehicle .....	47

## **INSTALLED MONITORS FOR THE CONTROL AND DETECTION OF GAMMA RADIATIONS CONTAINED IN RECYCLABLE OR NON-RECYCLABLE MATERIALS TRANSPORTED BY VEHICLES**

### **1 Scope**

This International Standard is applicable to installed monitors for the control and detection of radioactivity of gamma emitters contained in recyclable or non-recyclable material waste to be transported by vehicles.

This standard is designed to provide the purchaser with an indication of the performance of the equipment in detecting radioactive sources left in the material being monitored, and not to measure quantity.

This standard does not apply to hand-held equipment. It is not applicable to the monitoring of materials on conveyors, in grabs or being moved by electromagnets.

This standard is not intended for the monitoring of radioactive waste or detection of fissile materials.

The object of this standard is to define an installed monitor for the control and detection of radioactivity of gamma emitters contained in recyclable or non-recyclable materials transported by vehicle, the conceptual requirements, general characteristics, mechanical characteristics, environmental conditions, minimal requirements, test procedures and documentation.

The selection of the location of the instrumentation on the site needs to be optimised to achieve the best performance of measurement, but this is beyond the scope of this standard.

The gamma radiation detected by these monitors may be emitted by one or several discrete radioactive sources included in the loading, or by the presence of radioactive material in the vehicle being monitored.

These monitors are to be used outdoors. The radiations detected are gamma emissions of energy at least from 50 keV to 1 500 keV.

It is advantageous if the equipment can give the approximate location of a radioactive source but this is not a mandatory requirement of this standard.

Conformance with the requirements of this standard is no guarantee that a radioactive source will always be discovered. The shielding of the high-density materials will mean radioactive substances buried deep in the material could be missed.