



# SLOVENSKI STANDARD

## SIST EN 12198-2:2003+A1:2008

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### Varnost strojev - Ocenjevanje in zmanjševanje nevarnosti sevanj, ki jih oddajajo stroji - 2. del: Postopek merjenja emisije sevanja

Safety of machinery - Assessment and reduction of risks arising from radiation emitted by machinery - Part 2: Radiation emission measurement procedure

Sicherheit von Maschinen - Bewertung und Verminderung des Risikos der von Maschinen emittierten Strahlung - Teil 2: Messverfahren für die Strahlenemission

Sécurité des machines - Estimation et réduction des risques engendrés par les rayonnements émis par les machines - Partie 2: Procédures de mesurage des émissions de rayonnement

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**Ta slovenski standard je istoveten z: EN 12198-2:2002+A1:2008**

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#### **ICS:**

13.110	Varnost strojev	Safety of machinery
17.240	Merjenje sevanja	Radiation measurements

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 12198-2:2002+A1**

September 2008

ICS 13.110; 17.240

Supersedes EN 12198-2:2002

English Version

**Safety of machinery - Assessment and reduction of risks arising  
from radiation emitted by machinery - Part 2: Radiation emission  
measurement procedure**

Sécurité des machines - Estimation et réduction des  
risques engendrés par les rayonnements émis par les  
machines - Partie 2: Procédures de mesurage des  
émissions de rayonnement

Sicherheit von Maschinen - Bewertung und Verminderung  
des Risikos der von Maschinen emittierten Strahlung - Teil  
2: Messverfahren für die Strahlenemission

This European Standard was approved by CEN on 16 October 2002 and includes Amendment 1 approved by CEN on 27 July 2008.

CEN 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 CEN Management Centre or to any CEN 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 CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.





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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**Management Centre: rue de Stassart, 36 B-1050 Brussels**

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## Foreword

This document (EN 12198-2:2002+A1:2008) has been prepared by Technical Committee CEN/TC 114 "Safety of machinery", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

This document includes Amendment 1, approved by CEN on 2008-07-27.

This document supersedes EN 12198-2:2002.

The start and finish of text introduced or altered by amendment is indicated in the text by tags  $\boxed{A_1}$   $\boxed{A_1}$ .

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EC Directive(s).

$\boxed{A_1}$  For relationship with EC Directives, see informative Annexes ZA and ZB, which are integral parts of this document.  $\boxed{A_1}$

This European Standard deals with the essential requirement "Radiation" (see EN 292-2:1991, annex A, paragraph 1.5.10).

Annex A is informative.

This document includes a Bibliography <https://standards.iteh.ai/catalog/standards/sist/e39e7b78-e7da-40e9-8ed3-51df7f69ca2f/sist-en-12198-2-2003a1-2008>

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

**EN 12198-2:2002+A1:2008 (E)****Introduction**

Machinery supplied by electrical power or containing radiation sources may emit radiation or generate electric and/or magnetic fields. The radiation emissions will vary in frequency and magnitude.

EN 12198-1 contains the general principles of risk assessment of radiation emission by machinery.

EN 12198-3 contains details of protective measures for avoiding or reducing radiation exposure of persons by reducing emissions and requiring the provision of information.

Designers should identify the radiation hazards arising from machinery in accordance with the general principles set out in EN 12198-1. In order to assess the risks and categorize the radiation emissions, designers need to quantify the hazards.

Measurements are made in accordance with the following clauses in order to:

- check the level of safety integration in the design of machinery;
- give a basis for the categorization according to 7.1 of EN 12198-1:2000;
- assess the ability of machinery to be operated, set and maintained without any hazard to persons when setting and maintenance operations are carried out under the conditions specified by the manufacturer;
- detect and measure, any radiation leakage;
- determine areas where radiation emissions may create a health and safety hazard;
- enable potential users to make comparisons of the radiation emission from different machines.

In case of particular difficulties, measurements can be supplemented by duly justified calculations.

Annex A gives information about the techniques of measurement of the different types of radiations. The standard techniques will be specified in other standards as they are developed. Other methods and detectors can be developed, their omission from this annex does not exclude their use.

If no standard measurement techniques exist, then an accepted scientific procedure should be applied and appropriate details given.

This document is a type B standard as stated in EN 1070.

The provisions of this document may be supplemented or modified by a type C standard.

**NOTE** For machines which are covered by the scope of a type C standard and which have been designed and built according to the provisions of that standard, the provisions of that type C standard take precedence over the provisions of this type B standard.

**1 Scope**

This European Standard defines basic technology and specifies general procedures for making and reporting measurements of quantities related to radiation emitted by machinery. It covers the different radiation emissions as defined in EN 12198-1.

This standard applies to machinery as defined in 3.1 of EN 292-1:1991.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 294:1992, *Safety of machinery - Safety distance to prevent danger zones being reached by the upper limbs*.

EN 1070:1998, *Safety of machinery – Terminology*.

EN 12198-1:2000, *Safety of machinery – Assessment and reduction of risks arising from radiation emitted by machinery – Part 1: General principles*.

IEC 60050-111:1996, *International Electrotechnical Vocabulary - Chapter 111: Physics and chemistry*.

IEC 60050-121:1998, *International Electrotechnical Vocabulary – Part 121: Electromagnetism*.

IEC 60050-161:1990, *International Electrotechnical Vocabulary - Chapter 161: Electromagnetic compatibility*.

IEC 60050-881:1983, *International Electrotechnical Vocabulary – Chapter 881: Radiology and radiological physics*.

## 3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 1070:1998 and the following apply. Additional definitions specifically needed for this standard are contained in EN 12198-1:2000.

The terms and definitions given in IEC 60050-111:1996, IEC 60050-121:1998, IEC 60050-161:1990 and IEC 60050-881:1983, are also applicable.

### 3.1

#### **operating conditions**

conditions existing, including operating parameters, during the mode or phase of operation of the machine under test

### 3.2

#### **no-load operation**

operation during which the machinery operates without any processed material in place, with all its components and special auxiliaries in operation (pumps, hydraulic set, suction system, etc.) and all moving parts in action (spindles, tables, carriages, etc.) within the limits of its possibilities

### 3.3

#### **operation under load**

operation during which the machinery is running in an operational way with processed material and with all its components and special auxiliaries

### 3.4

#### **phase of operation**

time interval during which the machine performs a particular function

### 3.5

#### **operating cycle**

complete sequence of phases of operation from the introduction of the processed material to its removal or transfer to the next workstation

### 3.6

#### **measurement time**

the period during which radiation measurements are made

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This will be specified by both the duration of the measurement and the point in time related to the phase of operation of the machine at which the measurement is made

### 3.7

#### **averaging period**

period over which the characterization assessment shall be made. The measured emissions are time averaged as appropriate in order to take into account any variation in emission over this averaging period

## 4 Classification of radiation

Classification of radiation is given in clause 4 of EN 12198-1:2000.

Machinery shall be so designed and constructed that any emission of radiation is limited to the extent necessary for its operation and that the effects on exposed persons are non-existent or reduced to non-dangerous proportions (see EN 292-2:1991, annex A, subclause 1.5.10).

## 5 Physical quantities to be measured

The physical quantities to be measured and their associated units are given in annex B of EN 12198-1:2000.

## 6 Measurement procedure

### 6.1 Warning

Before carrying out measurements, estimates of the level of emission should be made to ensure that persons are not exposed to hazardous radiation emission without adequate protection. This estimation should also prevent overloading of measurement equipment.

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### 6.2 Measurement apparatus

Accuracy, measuring range, selectivity, directionality, time resolution, and spectral sensitivity of the measurement device shall be appropriate to measure the radiation emission and enable the result to be compared with the specified radiation emission category values, given in annex B of EN 12198-1:2000.

The selection of the measurement equipment and the procedure shall be made so that the introduction of the equipment or the presence of the person carrying out the measurement do not significantly perturb the radiation field under consideration.

The calibration of the measurement equipment shall be traceable according to the relevant national calibration standards.

### 6.3 Procedures

#### 6.3.1 General

Measurements shall be performed in conditions such that there are no reflections or they can be neglected, so that the radiation emissions will not be overestimated. The area around the machine shall be cleared of any objects not required for the machine's operation and which might hinder the free propagation of the radiation(s) to be measured.

#### 6.3.2 Operating conditions

During measurement, the specified operating conditions shall be representative of the greatest emission of radiation during intended use of the machinery.



Simulated and/or simplified operating conditions may be used provided that the manufacturer's documentation has specified that these conditions are representative of the maximum radiation emissions.

### 6.3.3 Measurement points

— Requirements for classification

Sufficient points (in number and location) shall be specified as measurement points in order to adequately characterize the radiation fields around the machine (and particularly those where operators or other people may be exposed):

a) measurement shall be made at the distance or points specified in annex B of EN 12198-1:2000;

and

b) if the location of the maximum radiation emission is at a greater distance from the accessible surface than the measurement distance specified in annex B of EN 12198-1:2000, then measurement shall be made at the point where the maximum emission occurs;

and

c) if there are openings in the housing in which operators may insert parts of their body then measurements shall be made inside the accessible zone (see EN 294);

and

d) if operators must view into the housing through windows or installed optical devices then measurements of the radiation intensity at the eye position shall be made.

— Additional requirements

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If relevant, additional measurements shall be made at the following points:

- 1) at operator working positions or positions where people may be in the radiation field around the machine;
- 2) at points where radiation leakage may occur (e.g. penetrations through shields, joints etc.), inside covers which are removed for maintenance and at service openings which are specified in a "C" type standard or;
- 3) on the surface of the machine housing;

or,

- at the nearest distance of approach of the detector due to it having a large sensitive volume or an integral spacing device;
- at the location of one or more iso flux density lines.

All measurement points shall be specified, so that they are uniquely identified.

In case of particular difficulties, measurements can be supplemented by detailed theoretical predictions.

NOTE Useful information about the pattern of radiation emission around a machine can be presented in a form of ISO flux density lines.

### 6.3.4 Measurement time

The measurement time shall be chosen in such a way that all the important characteristics of the radiation and the measuring instrument and the operating conditions of the machine are taken into consideration.