SLOVENSKI STANDARD
SIST EN 50499:2009

01-marec-2009

Postopki ocenjevanja izpostavljenosti delavcev elektromagnetnim sevanjem

Procedure for the assessment of the exposure of workers to electromagnetic fields

Verfahren für die Beurteilung der Exposition von Arbeitnehmern gegenüber elektromagnetischen Feldern

Procédure pour l'évaluation de l'exposition des travailleurs aux champs électromagnétiques

Ta slovenski standard je istoveten z: **EN 50499:2008**

ICS:

13.280	Varstvo pred sevanjem	Radiation protection
17.240	Merjenje sevanja	Radiation measurements

SIST EN 50499:2009 **en,fr,de**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 50499

December 2008

ICS 17.240

English version

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Verfahren für die Beurteilung der Exposition von Arbeitnehmern gegenüber elektromagnetischen Feldern

This European Standard was approved by CENELEC on 2008-10-21. 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.

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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

Ref. No. EN 50499:2008 E

Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 106X, Electromagnetic fields in the human environment.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50499 on 2008-10-21.

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)	2009-11-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2011-11-01

This European Standard has been prepared under Mandate M/351 given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directive 2004/40/EC.

This standard is intended to be a standard under which other standards related to the assessment of a work place can be used.

The approaches outlined in this standard, are intended to be simple, allowing most employers to make an assessment with the minimum of technical knowledge and effort.

Contents

1 Scope

The scope of this European Standard is to provide a general procedure in order to assess workers' exposure to electric, magnetic and electromagnetic fields in a work place to demonstrate compliance with exposure limit values and action values as stated in the Council and European Parliament Directive 2004/40/EC.

The purpose of this European Standard is to

- specify how to perform an initial assessment of the levels of workers' exposure to electromagnetic fields (EMF), if necessary including specific exposure assessment of such levels by measurements and/or calculations,

- determine whether it is necessary to carry out a detailed risk assessment of EMF exposure.

This European Standard can be used by employers for the risk assessment and, where required, measurement and/or calculation of the exposure of workers. Based on specific workplace standards it can be determined whether preventive measures/actions must be taken to comply with the provisions of the Directive.

The frequencies covered are from 0 Hz to 300 GHz.

NOTE 1 This European Standard is written under Mandate M/351 and relates to the exposure limits as specified in the Directive 2004/40/EC. It is intended to protect workers from risks to their health and safety arising or likely to arise from exposure to electromagnetic fields (0 Hz to 300 GHz) during their work. However, this and other directives may include additional measures for the protection of specific groups of workers and/or specific work places for which the employer is required to investigate other protective measures as a part of the overall risk assessment. See Annex A.

NOTE 2 The Council and European Parliament Directive 2004/40/EC will be transposed into national legislation in all the EU member countries. It is recommended that users of this standard consult the national legislation related to this transposition in order to identify the national regulations and requirements. These national regulations and requirements may have additional requirements that are not covered by this standard.

2 Normative references

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.

EN 50371, *Generic standard to demonstrate the compliance of low power electronic and electrical apparatus with the basic restrictions related to human exposure to electromagnetic fields (10 MHz – 300 GHz) – General public*

EN 50400, *Basic standard to demonstrate the compliance of fixed equipment for radio transmission (110 MHz – 40 GHz) intended for use in wireless telecommunication networks with the basic restrictions or the reference levels related to general public exposure to radio frequency electromagnetic fields, when put into service*

EN 50413, *Basic standard on measurement and calculation procedures for human exposure to electric, magnetic and electromagnetic fields (0 Hz – 300 GHz*)

EN 60335-2-29, *Household and similar electrical appliances – Safety – Part 2-29: Particular requirements for battery chargers* (IEC 60335-2-29)

EN 60335-2-45, *Household and similar electrical appliances – Safety – Part 2-45: Particular requirements for portable heating tools and similar appliances* (IEC 60335-2-45)

EN 60745-1, *Hand-held motor-operated electric tools – Safety – Part 1: General requirements* (IEC 60745-1, mod.)

EN 61029-1, *Safety of transportable motor-operated electric tools – Part 1: General requirements* (IEC 61029-1, mod.)

EN 62226-1, *Exposure to electric or magnetic fields in the low and intermediate frequency range – Methods for calculating the current density and internal electric field induced in the human body – Part 1: General* (IEC 62226-1)

EN 62226-2-1, *Exposure to electric or magnetic fields in the low and intermediate frequency range – Methods for calculating the current density and internal electric field induced in the human body – Part 2-1: Exposure to magnetic fields – 2D models* (IEC 62226-2-1)

EN 62226-3-1, *Exposure to electric or magnetic fields in the low and intermediate frequency range – methods for calculating the current density and internal electric field induced in the human body – Part 3-1: Exposure to electric fields – Analytical and 2D numerical models* (IEC 62226-3-1)

EN 62311, *Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz – 300 GHz)* (IEC 62311, mod.)

ETSI TR 101 870, *Fixed radio transmitter sites – Exposure to non-ionising electromagnetic fields – Guidelines for working conditions*

1999/519/EC, *Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)*

2004/40/EC, *Directive 2004/40/EC of the European Parliament and of the Council of 29 April 2004 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) (18th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC)*

Further information on the scopes of these standards can be obtained from a national standardisation body who is a member of CENELEC or at the CENELEC web site www.cenelec.eu.

3 Terms and definitions

3.1
action values
magnitude of directly measurable parameters provided in terms of electric field strength (*E*), magnetic field strength (*H*), magnetic flux density (*B*) and power density (*S*), contact current and limb induced current at which one or more of the specified measures in this Directive must be undertaken. Compliance with these values will ensure compliance with the relevant exposure limit values (from 2004/40/EC)

3.2
employer
any natural or legal person who has an employment relationship with the worker and has responsibility for the undertaking and/or establishment (from 89/391/EEC)

3.3
equipment
for the purpose of this standard, the term equipment is understood in a broad sense covering all sources of electromagnetic emission, including devices, products, instrumentation, installations and prototypes under development

3.4
exposure
exposure occurs whenever and wherever a person is subjected to external electric, magnetic or electromagnetic fields or to contact current

3.5
exposure limits
guideline or restriction values on exposure that are given in international or national standards, guidelines or directives on human exposure to electromagnetic fields. For Directive 2004/40/EC the exposure limits are the action values and the exposure limit values and also the other specific requirements in that directive to avoid other risks related to workplace exposure to electromagnetic fields

3.6
exposure limit values
limits on exposure to electromagnetic fields which are based directly on established health effects and biological considerations. Compliance with these limits will ensure that workers exposed to electromagnetic fields are protected against all known adverse health effects (from 2004/40/EC)

3.7
risk assessment
process of determining compliance of a work place environment with the limits set in the Directive 2004/40/EC by performing the actions stated in Article 4 of the Directive 2004/40/EC

3.8
work place
location where workers have access as part of their duties

3.9
worker
any person employed by an employer, including trainees and apprentices but excluding domestic servants (from 89/391/EEC)

4 General considerations on assessment

4.1 Introduction

This clause describes the general concept of an initial assessment of a work place, how to compare assessment results with the action values and exposure limits, and further actions if needed.

The exposure to be assessed is at the work place(s) where a worker is permitted to be present. Work place exposure level is assessed at locations (“work spaces”) to which a worker would have access as part of their duties, and its contributors are emissions from equipment affecting that location.

Other health and safety issues covered by the Directive, in particular workers with active implanted medical devices (AIMDs), pregnant workers, and indirect effects shall be addressed, e.g. as outlined in Annex A.

Annex B offers two forms that may be used to document the result of the assessment.

4.2 Overview of risk assessment procedure

The flowchart presented in Figure 1 shows graphically the assessment process. Prior to commencing the assessment process, and in order to determine what level of work place assessment, if any, is necessary the work place must first be characterised. This requires the employer to establish what electrical equipment exists in the work place and is emitting electromagnetic fields into the work place.

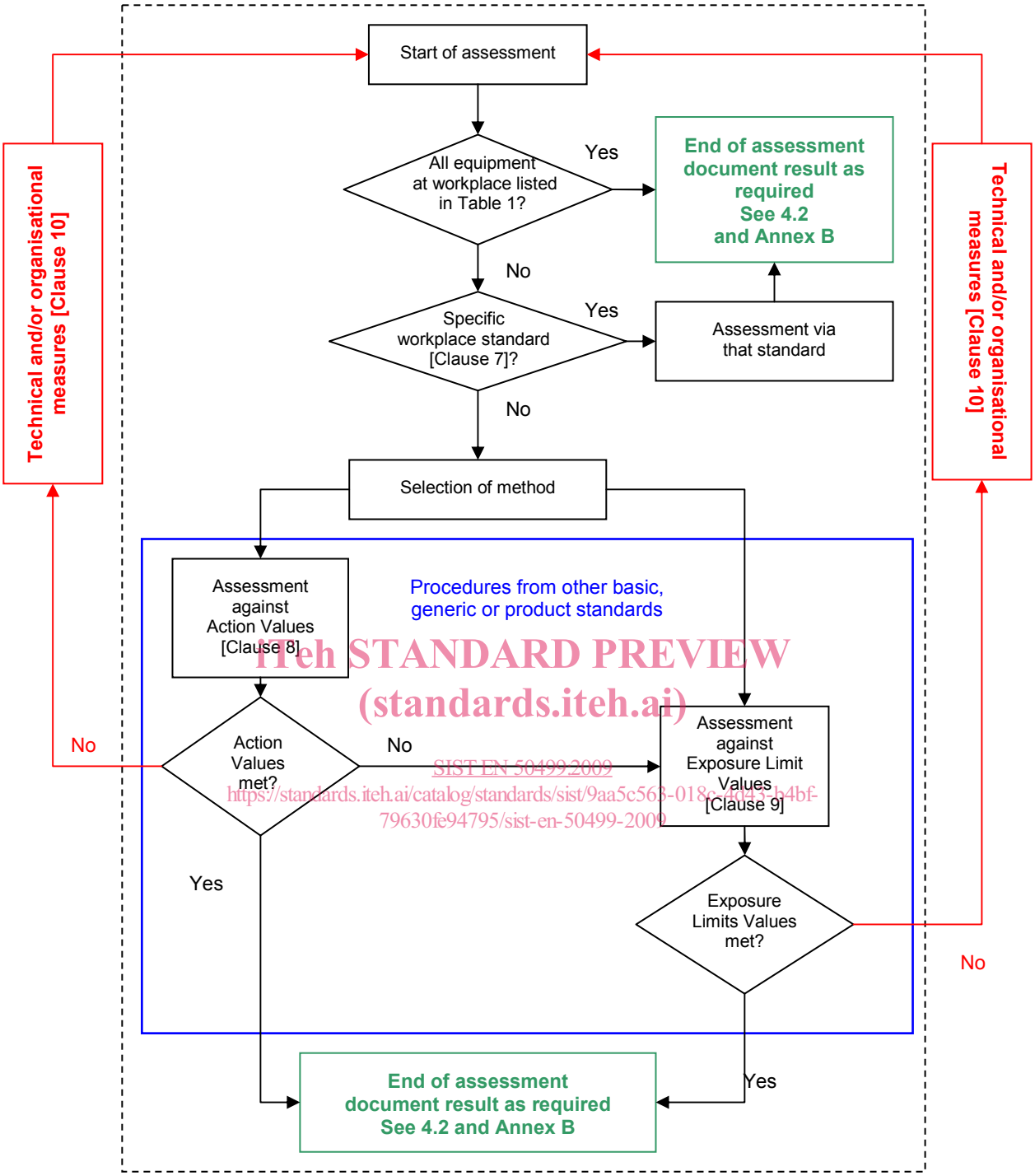
The first decision box of Figure 1 relates to compliant equipment. Most work places will contain only electrical equipment which either does not produce electromagnetic fields or produces them at levels below general public exposure limits. These work places will require no further assessment. Clause 5 defines which electrical equipment can be excluded from detailed exposure assessment. Table 1 defined in Clause 5 provides examples of such equipment. It includes in particular any equipment which has been placed on the European market in compliance with the relevant community directives. Examples of EMF related harmonised standards are listed in Annex C.

NOTE Zoning concepts defined when the compliance of the equipment was assessed can be implemented in agreement with Annex G.

Table 2 in Clause 6 gives a non-exhaustive list of equipment which is likely to require further assessment In preparation for this, the employer should identify the type of equipment in the work place, characteristics (e.g. frequency, emitted power, duty factor) and its normal conditions of use (e.g. normal position of operator, position of other workers than the operator, time spent at normal position, operations or maintenance or repair at distances from the emitting equipment closer than those recommended in the manufacturers instructions etc.). See Clause 6.

The term “normal” covers the intended use, the use as specified in the employers instructions to the workers, the installation(s) used, the instructions from the employer on how maintenance and repair shall be performed, situations of foreseeable incidents, and situations of foreseeable misuse.

Situations with simultaneous exposure to multiple sources and/or multiple frequencies shall be addressed. The employer can use the equations defined in Annex D, which provide a conservative way to demonstrate compliance with Directive 2004/40/EC. The employer may optionally use other appropriate methods e.g. time domain assessment procedures as provided in EN 62311 or the *TEQ* approach described in Annex E, which includes additional overestimation.



NOTE Optional measures to reduce exposure may be introduced at any point of the assessment in order to achieve compliance.

Figure 1 – Assessment process

If a specific standard is applicable to the working environment or type of work place, then it is recommended to use that for the assessment. See Clause 7. If this standard contains other exposure limits than those stated in the Directive then the exposure limits from the Directive shall be applied.

If no such standard exists or if the employer considers it unsuitable then an exposure assessment shall be performed either against action values (see Clause 8) or directly against exposure limits (see Clause 9) using procedures from other basic, generic or product standards.

NOTE For some equipment considered in the assessment of the work place it may be appropriate to undertake an assessment against the exposure limits directly, and specific assessment standards for that equipment will indicate how that should be done. Other equipment in the same work place may be assessed by comparison with the action values.

When comparison is made between the measured exposure levels and the action values or exposure limits, then it may be appropriate to take into account the duration of exposure under normal working conditions, and also the duty cycle of the emission(s) from the equipment in the work place. In general time-averaging can be applied above 10 MHz, and cannot be applied below 100 kHz. Between these frequencies it may be permissible to apply time-averaging subject to constraints on maximum instantaneous exposure. For frequencies between 100 kHz and 10 MHz exposure limits based on *SAR* can be time averaged but exposure limits based on induced current in the central nervous system cannot. This is described more fully in generic or specific standards e.g. in EN 62311.

When measurements or calculations are used for a detailed exposure assessment, uncertainty analysis shall be performed according to the specific assessment method or standard applied.

If the assessment indicates that exposures in the work place do not meet the exposure limit values of the Directive, then measures must be taken to ensure that they do (see Clause 10) and the assessment process repeated until compliance is attained.

4.3 Indirect effects

The employer shall give particular attention, when carrying out the risk assessment, to any indirect effects as defined in Article 4, Clause 5(d) of the Directive 2004/40/EC. Information about the specific standards dealing with indirect effects can be found in Annex A.

4.4 Uncertainty for assessments using Clauses 7, 8 and 9

As a part of the assessment process measurements and/or calculations shall be associated with an uncertainty evaluation. Assessment uncertainty shall be reported (see Annex B) and it shall be taken into account when performing compliance evaluation according to national regulation in relation to the implementation of the directive.

5 Initial assessment

If the work place is affected only by equipment listed in Table 1 that work place is deemed to comply with this standard without further assessment. This is valid regardless of the number of pieces of electrical equipment present at the work place.

To be considered within this initial assessment the equipment must have been installed and must be used in accordance with the manufacturers´ instructions. Exposure situations for example during maintenance and production of equipment may be different from the exposure during normal usage of the equipment and should be assessed separately. In some situations a reassessment of exposure may be necessary after maintenance/repair/modification of an equipment.

Low power equipment that can be shown to comply with EN 50371, see note, is covered by Table 1 even if it is not CE-marked.

NOTE EN 50371 limits the frequency range to 10 MHz – 300 GHz and the transmitted power to 20 mW average and 20 W peak.

Table 1 – A priori compliant workplaces and equipment

Item	Designation of work place	Type of equipment	Remarks
T.1.1	Work places open to the general public covered by 4.3 of Directive 2004/40/EC		Work places open to the public and in compliance with the exposure limits given in the European Council recommendation 1999/519/EC are deemed to comply.
T.1.2	All places	CE-marked equipment which have been assessed using the harmonised EMF standards see examples in Annex C.	Equipment must be installed and used in accordance with the manufacturers instructions.
T.1.3	All places	Equipment placed on the European market in compliance with the European recommendation 1999/519/EC as required by the relevant directives in particular in compliance with their related harmonized standards listed in the OJEU. Examples are provided in Annex C.	Some equipment placed on the European market may also be compliant with the European recommendation 1999/519/EC although they have not received the CE marking, for example if it is part of an installation.
T.1.4	All places	Lighting equipment	Excluding specialized RF energized lighting.
T.1.5	All places	Computer and IT equipment	
T.1.6	All places	Office equipment	Tape erasers may need further assessment.
T.1.7	All places	Mobile phones, and cordless phones	
T.1.8	All places	Two-way radios	Only types with time averaged emitted power less than 20 mW.
T.1.9	All places	Base stations for DECT cordless phones and WLAN (e.g. Wi-Fi)	Limited to equipment intended for use by the general public.
T.1.10	All places	Non - wireless communication equipment and networks	
T.1.11	All places	Electric handheld and transportable tools	e.g. covered by the scope of EN 60745-1 and EN 61029-1 see Annex C.

Table 1 – A priori compliant workplaces and equipment
(continued)

Item	Designation of work place	Type of equipment	Remarks
T.1.12	All places	Portable heating tools	e.g. covered by the scope of EN 60335-2-45 (e.g. glue guns, heat guns) See Annex C. Induction heating tools and dielectric heating tools are excluded from Table 1.
T.1.13	All places	Battery chargers	Covered by the scope of EN 60335-2-29. The scope covers chargers for normal household use and chargers intended for use in garages, shops, light industry and on farms See Annex C.
T.1.14	All places	Electric operated garden appliances	
T.1.15	All places	Audio & video equipment	Special types using radio transmitters typically used by the broadcast industry may need further assessment.
T.1.16	All places	Portable battery powered equipment not including radio frequency transmitters	
T.1.17	All places	Electrical room heating equipment	Microwave heaters are excluded from this table.
T.1.18	All places	All non-electrical equipment	