SLOVENSKI STANDARD
SIST EN 50519:2010

01-maj-2010

Ocena izpostavljenosti delavcev električnim in magnetnim poljem opreme za industrijsko indukcijsko gretje

Assessment of workers' exposure to electric and magnetic fields of industrial induction heating equipment

Beurteilung der Exposition von Arbeitnehmern gegenüber elektrischen und magnetischen Feldern von industriellen induktiven Elektrowärmeanlagen

Evaluation de l'exposition des travailleurs aux champs électriques et magnétiques produits par les équipements industriels de chauffage par induction

Ta slovenski standard je istoveten z: **EN 50519:2010**

ICS:

13.280	Varstvo pred sevanjem	Radiation protection
25.180.10	Električne peči	Electric furnaces

SIST EN 50519:2010 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50519

March 2010

ICS 13.280; 25.180.10

English version

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CENELEC

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

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 50519:2010 E

Foreword

This European Standard was prepared by WG 9 WP 1 “Induction Heaters” of the Technical Committee CENELEC TC 106X, Electromagnetic fields in the human environment.

The text of the draft was submitted to the formal vote in February 2009. On the basis of the established voting results, CLC/TC 106X decided to prepare an amendment for inclusion in the standard to make it fully protective for doing workers exposure assessments in all eventualities.

The text of the draft amendment (FprAA) was submitted to the Unique Acceptance Procedure and the combined text was approved by CENELEC as EN 50519 on 2010-02-01.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

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) 2011-02-01

- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2013-02-01

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.

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1 Scope

This European Standard specifies procedures for assessment of electric, magnetic and electromagnetic fields produced by industrial and professional induction heating equipment.

NOTE This European Standard does not apply to household appliances.

Typical induction heating applications are for example:

- melting;
- zone-melting;
- heating before hot forming;
- heating by tunnel-inductor;
- hardening / coaxial transformer handheld devices;
- tube welding;
- tube annealing;
- hardening;
- soldering;
- hard-soldering /brazing;
- bonding;
- annealing;
- metal-strip and wire heating;
- tempering;
- sintering;
- shrinking.

This product standard covers the frequency range up to 30 MHz taking into account the specific characteristics of industrial and professional induction heating equipment and its usage.

This European Standard may also be used for assessment regarding the requirements of Directive 2004/40/EC [1] *on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields),* provided that no other relevant field sources are present in close proximity. If other field sources are present, additional assessment according to EN 50499:2008 is necessary.

This European Standard does not cover protective measures for people with active implants.

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 50413:2008, *Basic standard on measurement and calculation procedures for human exposure to electric, magnetic and electromagnetic fields (0 Hz – 300 GHz)*

EN 50499:2008, *Procedure for the assessment of the exposure of workers to electromagnetic fields*

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

IEC 60050-841:2004, *International Electrotechnical Vocabulary - Part 841: Industrial electroheat*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

SI-units are used throughout the standard.

3.1
action values
the 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*), at which one or more of the specified measures in Directive 2004/40/EC must be undertaken. Compliance with these values will ensure compliance with the relevant exposure limit values (from 2004/40/EC)
[EN 50413:2008, 3.1]

3.2
contact current (I_C)
current flowing into the body resulting from contact with a conductive object in an electromagnetic field. This is the localised current flow into the body (usually the hand, for a light brushing contact), expressed in Ampere (A)
[EN 50413:2008, 3.4]

3.3
electric field strength (*E*)
vector quantity obtained at a given point that represents the force (*F*) on an infinitely small charge (*q*) divided by the charge:

$$E = \frac{F}{q}$$

electric field strength is expressed in volt per metre (V/m)
[EN 50413:2008, 3.7]

3.4
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)
[EN 50499:2008, 3.2]

3.5
exposure
for the purpose of this standard exposure occurs whenever and wherever a worker is subjected to magnetic fields from industrial induction heating equipment

3.6
exposure limit values
limits of 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)
[EN 50413:2008, 3.9]

3.7
induced current (*I*)
current induced inside the body as a result of direct exposure to electromagnetic fields, expressed in Ampere (A)
[EN 50413:2008, 3.13]

3.8
inductor
a heating inductor for creating the magnetic field, which induces currents in a metal charge or in a crucible of conductive materials
[IEV 841-27-48:2004, mod.]

3.9
iso-field-line
line with constant values of a recorded field (e.g. magnetic field strength *H* or magnetic flux density *B*)

3.10
magnetic field strength (*H*)
vector quantity obtained at a given point by subtracting the magnetization *M* from the magnetic flux density *B* divided by the permeability of free space μ_0:

$$H = \frac{B}{\mu_0} - M$$

Magnetic field strength is expressed in Ampere per meter (A/m)

NOTE In vacuum, the magnetic field strength is at all points equal to the magnetic flux density divided by the permeability of free space: $H = \frac{B}{\mu_0}$.

[EN 50413:2008, 3.16]

3.11
magnetic flux density (*B*)
the field vector in a point that results in a force (*F*) on a charge (*q*) moving with the velocity (*v*):

$$F = q\,(v \times B)$$

The magnitude of the magnetic flux density is expressed in Tesla (T)

[EN 50413:2008, 3.15]

3.12
measuring distance
distance between a reference surface of the appliance and the geometrical centre of the field probe

3.13
modulation
process of modifying the amplitude, phase and/or frequency of a periodic waveform in order to convey information
[EN 50413:2008, 3.17]

3.14
peak value
the peak value of the electric or magnetic field strength or magnetic flux density represents the maximum magnitude of the field vector. It is composed of three individual components of the electric or magnetic field strength or magnetic flux density, which are instantaneous values in three mutually orthogonal directions

$$V_P = \max\left[\sqrt{V_x^2(t) + V_y^2(t) + V_z^2(t)}\right]$$

[EN 50413:2008, 3.19]

3.15
probe
input device of a measuring instrument, generally made as a separate unit, which transforms the measured input value to a suitable output value
[EN 50413:2008, 3.24]

3.16
worker
any person employed by an employer, including trainees and apprentices but excluding domestic servants (from 89/391/EEC)

NOTE This definition may be subject to national adaptation which then takes precedence.

[EN 50499:2008, 3.9]

3.17
work place
location where workers have access as part of their duties
[EN 50499:2008, 3.8]

3.18
worst case operating conditions
operating conditions of the equipment, where the maximum exposure occurs

(See also Annex A, list of relevant items for particular equipment with reference to the list of typical application in Clause 1).

4 General considerations

The principle layout of an induction heating installation consisting of power source and load is shown in Figure 1 as a parallel compensated circuit. Serial compensated circuits are used as well. The load is a resonance circuit comprising a compensating capacitor bank, high current conductors and an inductor or an inductor coil including matching transformer, if applicable.

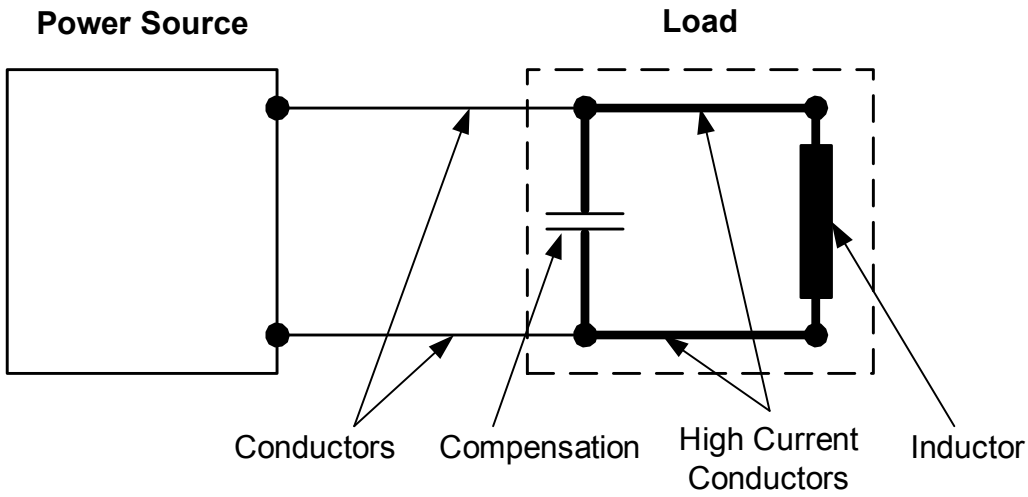

Figure 1 – Principle layout of an induction heating installation

Inductor and high current carrying conductors are the main sources of magnetic fields.

Contact currents generated by electromagnetic fields and electric fields from induction heating installations with frequencies below 1 MHz are usually below the action values. Therefore they are not taken into account in the context of this standard.