SLOVENSKI PREDSTANDARD

OSIST prEN 60519-8:2004

junij 2004

Safety in electroheat installations -- Part 8: Particular requirements for electroslag remelting furnaces

ICS 25.180.10

Referenčna številka
OSIST prEN 60519-8:2004(en)

27/411/CDV

COMMITTEE DRAFT FOR VOTE (CDV)
PROJET DE COMITÉ POUR VOTE (CDV)

	Project number Numéro de projet	60519-8/Ed.2
IEC/TC or SC: **27** CEI/CE ou SC:	Date of circulation Date de diffusion **2004-04-30**	Closing date for voting (Voting mandatory for P-members) Date de clôture du vote (Vote obligatoire pour les membres (P)) **2004-10-01**
Titre du CE/SC: Chauffage électrique industriel		TC/SC: Title: Industrial electroheating equipment
Secretary: Prof. T. Skoczkowski Secrétaire:		
Also of interest to the following committees Intéresse également les comités suivants		Supersedes document Remplace le document 27/383/CD & 27/394/CC

Functions concerned
Fonctions concernées

☒ Safety / Sécurité ☐ EMC / CEM ☐ Environment / Environnement ☐ Quality assurance / Assurance qualité

Titre:
CEI 60519-8 Ed. 2 : Sécurite dans les installations électrothermiques –Partie 8: règles particulières pour fours de refusion sous laitier électroconducteur

Title:
IEC 60519-8 Ed. 2: Safety in electroheat installations – Part 8: Particular requirements for electroslag remelting furnaces

Note d'introduction

Ce projet a été établi par l'EM 28.

Introductory note

This draft has been prepared by MT 28.

ATTENTION	ATTENTION
CDV soumis en parallèle au vote (CEI) et à l'enquête (CENELEC)	**Parallel IEC CDV/CENELEC Enquiry**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60519-8 has been prepared by IEC technical committee 27: Industrial electroheating equipment.

This second edition cancels and replaces the first edition published in 1983 and constitutes a technical revision.

Significant changes with respect to the previous edition result from adjustment to the third edition of IEC 60519-1, in conjunction with which this standard shall be read. The clauses of this standard supplement the corresponding clauses of IEC 60519-1.

The text of this standard is based on the following documents:

FDIS	Report on voting
27/XXX/FDIS	27/XXX/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until _____. At this date, the publication will be

- reconfirmed;
- withdrawn;

- replaced by a revised edition, or
- amended.

IEC 60519 consists of the following parts, under the general title *Safety in electroheat installations:*

— Part 1: General requirements

— Part 2: Particular requirements for resistance heating equipment

— Part 3: Particular requirements for induction and conduction heating and induction melting installations

— Part 4: Particular requirements for arc furnace installations

— Part 5: Specifications for safety in plasma installations

— Part 6: Specifications for safety in industrial microwave heating equipment

— Part 7: Particular requirements for installations with electron guns

— Part 8: Particular requirements for electroslag remelting furnaces

— Part 9: Particular requirements for high-frequency dielectric heating installations

— Part 10: Particular requirements for electrical resistance trace heating systems for industrial and commercial applications[1]

— Part 11: Particular requirements for installations for electromagnetic stirring, transport or pouring of metal liquids

— Part 21: Particular requirements for resistance heating equipment – Heating and melting glass equipment

NOTE If necessary, additional parts covering particular industrial electroheat equipment may be prepared.

[1] Under preparation

SAFETY IN ELECTROHEAT INSTALLATIONS –

Part 8: Particular requirements for electroslag remelting furnaces

1 General

1.1 Scope

This Part of IEC 60519 applies to electroheat installations for the remelting and in some cases for refining processes of metals through direct resistance heating of a conductive slag.

This International Standard shall be used in conjunction with IEC 60519-1.

1.2 Object

The particular requirements for the safety of persons in electroslag remelting furnace are the subject of this standard. The general requirements are included in IEC 60519-1. Test methods for electroslag remelting furnaces are specified in IEC 60779.

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.

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

IEC 60519-1: 2003, *Safety in electroheat installations – Part 1: General requirements*

IEC 60779:XXXX[2], *Industrial electroheat equipment - Test Methods for electroslag remelting furnace*

3 Terms and definitions

Terms used in this standard are defined in IEC 60519-1, IEC 60050-841 and in IEC 60779.

4 Classification of electroheat equipment according to voltage bands

Clause 4 of IEC 60519-1 is applicable except as follows.

4.1 *Addition:*

The voltage band is determined by the line-to-line open circuit rated supply voltage to the electrode(s).

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[2] Ed. 2 under preparation.

5 Classification of electroheat equipment according to frequency bands

Clause 5 of IEC 60519-1 is applicable.

6 General requirements

The requirements of Clause 6 of IEC 60519-1 apply, except as follows.

6.1.2 *Addition:*

The slag melting furnace and ingot moulds shall be covered by a collecting system to extract fume from the working area.

6.2 *Addition:*

6.2.13 The following requirements shall be met to ensure adequate safety in operation:

1) The supply system shall be designed to withstand sudden current fluctuations occurring at the start of the melting process with dry slag.
2) The circuit-breaker shall be designed for frequent operation.

6.2.14 The following requirements apply to the power circuit:

1) This circuit shall include an earthing connection preferably at the base plate, which supports the ingot. If the installation enables several melting stations to be supplied from the same power supply, each station shall be provided with an earth connection.

   If the power circuit is multiple-earthed, care shall be taken about the current which flows between the earthing points and through components of the furnace.
2) The circuit of any melting station which is not working shall be isolated from the supply but not from earth.

6.6 *Addition:*

6.6.7 Special precautions shall be taken to ensure continuance of the cooling of the ingot mould and the ingot base in the event of power failure.

6.6.8 The following indications and measurements shall be provided for important cooling circuits, e.g. moulds, base plates, electrode clamps:

– monitoring of cooling water flow;
– measurement of cooling water outlet temperature.

Optimally, the measurement of cooling water inlet temperature shall be applied. The inlet temperature of cooling water shall not be less than the dew point of environment temperature to avoid the moisture condensation on the surface of water-cooled components.

The water flow and temperature rise of each cooling circuit shall be separately monitored.

Lack of cooling (in important circuits as stated above) shall switch off the furnace power supply.

6.6.9 The cooling system shall be designed to meet the following requirements:

a) The supply of the cooling water shall be adequate to prevent an undue heating of the cooled walls.

b) Cast and/or welded ingot moulds shall be free from porosities, cracks, etc., which could have a detrimental effect on water tightness and heat transfer.

c) The use of seals likely to come into contact with molten materials shall be prohibited.

7 Isolation and switching

The requirements of Clause 7 of IEC 60519-1 apply, except as follows.

Addition:

7.3 High-voltage circuit-breaker closing conditions

1) Isolator in closed position.

2) Check the setting of the secondary voltage.

3) Correct furnace operating conditions established.

NOTE It is desirable that provision be made for an illuminated or other signal indicating that the start-up conditions are satisfied and that the circuit-breaker can be closed.

7.4 Switching-on in power circuit

The following conditions shall be satisfied for the power circuit before switching-on:

a) Melting station change-over switches in closed position. The station in operation shall be indicated on the control board.

b) Electrode and ingot mould aligned in melting position.

c) Base plate in operating position.

d) Removable contact-making devices in closed position; in particular electrode clamps or contact shoes, either closed or at least with minimum pressure if a hydraulic or pneumatic system is used or locked if the system is mechanically operated. The same requirement shall be met by the clamping of the ingot base plate.

e) Connections of cooling circuit, if provided, in working order (flow, pressure, and temperature).

8 Connection to the supply network and internal connections

The requirements of Clause 8 of IEC 60519-1 apply.

9 Protection against electric shock

The requirements of Clause 9 of IEC 60519-1 apply.

10 Protection against overcurrent

The requirements of Clause 10 of IEC 60519-1 apply.

11 Equipotential bonding

The requirements of Clause 11 of IEC 60519-1 apply.

12 Control circuits and control functions

The requirements of Clause 12 of IEC 60519-1 apply, except as follows.

Addition:

12.3 Control station

The following indications and controls shall be grouped in the control room:

– flow, pressure and temperature indications of mould and base-plate cooling circuits;
– secondary current and voltage measurement;
– control of movements likely to occur during melting (furnace on-load);
– setting of desired operating values;
– alarms associated with the furnace;
– emergency stop switch.

The control station shall be located so that the furnace is in full view and, as far as possible; a distance between the control station and the furnace compatible with safety shall be provided.

12.4 Emergency stop switch

The emergency stop switch shall cause:

– automatic raising of the electrode(s) by a distance sufficient to clear the slag;
– disconnection of the furnace power supply.

It shall not cause stopping of cooling water pumps or closure of cooling circuits.

13 Protection against thermal influences

The requirements of Clause 13 of IEC 60519-1 apply, except as follows.

Addition:

13.6 The control station and the melting power supply shall be completely protected against the liquid metal and slag ejected from the melting area.

13.7 The electrical, mechanical and hydraulic equipment as well as the flexible connections of cooling circuits shall be protected against heat radiated directly from the slag and electrodes and convected hot gasses. They shall also be protected against heating in excess of admissible limits due to electric and electromagnetic phenomena (resistive or inductive).

So as not to impair safety, all metal parts which are subjected to high-intensity magnetic fields and are in contact with oil, shall be made of non-magnetic material and installed in such a way as to avoid formation of closed loops.

13.8 Access to the supporting structure above and under the melting area shall be forbidden whenever the furnace is energized. Operators who have to service the working furnace (e.g. temperature measurement, changing electrodes) and be near live or hot parts shall wear protective clothing: gloves, footwear, visors (goggles), non-metallic safety helmets, etc.