

Edition 3.0 2020-05

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

Safety in installations for electroheating and electromagnetic processing – Part 8: Particular requirements for electroslag remelting furnaces

Sécurité dans les installations destinées au traitement électrothermique et électromagnétique didads.iteh.ai/catalog/standards/sist/f07a88c1-4aa3-4fcb-a7cf-Partie 8: Exigences particulières: pour/fours de refusion sous laitier électroconducteur





## THIS PUBLICATION IS COPYRIGHT PROTECTED Copyright © 2020 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

**IEC Central Office** 3, rue de Varembé CH-1211 Geneva 20 Switzerland

Tel.: +41 22 919 02 11 info@iec.ch www.iec.ch

#### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

#### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

#### IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

# IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and 19.67 2000 electrotechnical terminology entries in English and once a month by email. https://standards.iteh.ai/catalog/standa

IEC Customer Service Centre - webstore.iec.ch/csc/ca890/icc collected from earlier publications of IEC TC 37, 77, 86 and If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22,000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary SEV online. 21

#### IEC Glossary - std.iec.ch/glossary

French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been CISPR.

#### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

#### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Recherche de publications IEC -

#### webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

#### Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

#### Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### Glossaire IEC - std.iec.ch/glossary

67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.



Edition 3.0 2020-05

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

Safety in installations for electroneating and electromagnetic processing – Part 8: Particular requirements for electroslag remelting furnaces

Sécurité dans les installations destinées au traitement électrothermique et électromagnétique and ards.iteh.ai/catalog/standards/sist/f07a88c1-4aa3-4fcb-a7cf-Partie 8: Exigences particulières pour fours de réfusion sous laitier électroconducteur

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 25.180.10

ISBN 978-2-8322-8267-0

Warning! Make sure that you obtained this publication from an authorized distributor. Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

 Registered trademark of the International Electrotechnical Commission Marque déposée de la Commission Electrotechnique Internationale

# CONTENTS

| FOF   | REWORD   | 3  |  |
|---|--|----|--|
| INT   | RODUCTION  | 5  |  |
| 1   | Scope  | 6  |  |
| 2   | Normative references   | 6  |  |
| 3   | Terms and definitions  | 6  |  |
| 4   | Classification and sub-division of equipment and installations                 | 7  |  |
| 5   | Risk assessment  | 7  |  |
| 6   | General provisions   | 7  |  |
| 7   | Protection against hazards from electric shock                                 | 7  |  |
| 8   | Protection against hazards from electric or magnetic fields                    | 8  |  |
| 9   | Protection against hazards from radiation                                      | 8  |  |
| 10  | Protection against hazards from thermal influences                             | 8  |  |
| 11  | Protection against hazards from fire   | 10 |  |
| 12  | Protection against hazards from fluids   | 10 |  |
| 13  | Specific requirements for components and subassemblies                         | 10 |  |
| 14  | Control of the installation or equipment                                       | 10 |  |
| 15  | Protection against mechanical hazards  | 11 |  |
| 16  | Protection against hazards (resulting from use iteh.ai)                        | 12 |  |
| 17  | EMC  | 12 |  |
| 18  | Verification and testing   | 12 |  |
| 19  | Information for use  | 13 |  |
| Annex A (normative) List of significant hazards15                                     |  |    |  |
| Annex B (normative) Limits to touch currents  |  |    |  |
| Annex C (normative) Non-coherent optical radiation – Limits and risks classes         |  |    |  |
| Annex D (normative) Electric and magnetic fields                                      |  |    |  |
| Annex E (normative) Surface temperature limits  |  |    |  |
| Annex F (normative) EH, EPM and fire24  |  | 20 |  |
| Ann   | ex G (normative) Marking and warning   | 21 |  |
| Ann   | ex H (informative) Guidelines on using this document                           | 22 |  |
| Ann   | ex I (informative) Connection with ISO 13577 (all parts)                       | 23 |  |
| Ann   | Annex J (informative) Requirements specific to the EU and associated countries |    |  |
| Bibliography2   |  |    |  |
|   |  |    |  |
| Table A.1.101 – List of hazards dealt with in this document and added to Table A.1 of |  |    |  |
| Part  | 1  | 15 |  |

#### INTERNATIONAL ELECTROTECHNICAL COMMISSION

## SAFETY IN INSTALLATIONS FOR ELECTROHEATING AND ELECTROMAGNETIC PROCESSING –

#### Part 8: Particular requirements for electroslag remelting furnaces

#### FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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 for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- The formal decisions or agreements of 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 IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user. (Standards.iten.al)
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter. https://standards.iteh.ai/catalog/standards/sist/f07a88c1-4aa3-4fcb-a7cf-
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. 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 and electromagnetic processing.

This third edition cancels and replaces the second edition published in 2005. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) the structure has been redrafted according to IEC 60519-1:2020;
- b) the Scope has been redrafted;
- c) the terms and definitions, normative references and bibliography have been updated and completed;
- d) all requirements and content from IEC 60519-8:2005 that have been included in IEC 60519-1:2020 have been removed to avoid any duplication.

The text of this International Standard is based on the following documents:

| FDIS         | Report on voting |
|--------------|------------------|
| 27/1127/FDIS | 27/1129/RVD      |

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

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

A list of all parts in the IEC 60519 series, published under the general title *Safety in installations for electroheating and electromagnetic processing*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

This part of IEC 60519 is to be read in conjunction with Part 1. It supplements or modifies the corresponding clauses of Part 1. Where the text indicates a "modification" of, "addition" to or a "replacement" of the relevant provision of Part 1, these changes are made to the relevant text of Part 1. Where no change is necessary, the words "This clause of Part 1 is applicable" are used. When a particular subclause of Part 1 is not mentioned in this part, that subclause applies as far as is reasonable. When a particular subclause of Part 1 is not applicable, the word "Void" is used.

Additional specific provisions to those in Part 1, given as individual clauses or subclauses, are numbered starting from 101.

#### IEC 60519-8:2020

NOTE The following number intersystem the used alog/standards/sist/f07a88c1-4aa3-4fcb-a7cf-

- subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;
- unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;
- additional annexes are lettered AA, BB, etc.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

#### INTRODUCTION

The scope of this document covers very different types and designs of equipment used for many different purposes by the industry. It is intended to cover all industrial equipment based on electroslag heating of the workload, with examples described in Clause 1.

# iTeh STANDARD PREVIEW (standards.iteh.ai)

IEC 60519-8:2020 https://standards.iteh.ai/catalog/standards/sist/f07a88c1-4aa3-4fcb-a7cf-43dbc40ca890/iec-60519-8-2020

## SAFETY IN INSTALLATIONS FOR ELECTROHEATING AND ELECTROMAGNETIC PROCESSING –

## Part 8: Particular requirements for electroslag remelting furnaces

#### 1 Scope

This clause of Part 1 is modified as follows.

#### Modification:

This part of IEC 60519 specifies particular safety requirements for electroslag remelting equipment and installations.

This document specifies safety requirements applicable to mainly electroheating installations for remelting and, in some cases, for refining processes of metals through direct resistance heating of a conductive slag.

The object of this document is to specify the particular requirements for the safety of persons in or around an electroslag remelting furnace. The general requirements are included in IEC 60519-1.

# (standards.iteh.ai)

#### 2 Normative references

IEC 60519-8:2020

This clause of Part https://standards.iteh.ai/catalog/standards/sist/f07a88c1-4aa3-4fcb-a7cf-43dbc40ca890/iec-60519-8-2020

Addition:

IEC 60519-1, Safety in installations for electroheating and electromagnetic processing – Part 1: General requirements

## 3 Terms and definitions

This clause of Part 1 is applicable except as follows.

#### 3.2 Equipment and state of equipment

Addition:

#### 3.2.101

#### electroslag remelting furnace

remelting furnace in which the charge, usually a consumable electrode, is remelted by direct resistance heating of an electrical conductive molten slag

Note 1 to entry: The slag is contained in a mould (crucible).

#### 3.3 Parts and accessories

Additions:

## 3.3.101 multi-station configuration

electroslag remelting furnace configuration having more than one melt station

# 3.3.102 cooling-water flow rate

addition of the following flow rates:

- flow rate of water to cool mould and base plate
- flow rate of water to cool high-current line
- flow rate of water to cool the furnace transformer
- flow rate of water to cool the other elements of the furnace

Note 1 to entry: The cooling-water flow rate is expressed in m<sup>3</sup>/h.

#### 4 Classification and sub-division of equipment and installations

This clause of Part 1 is applicable except as follows.

# 4.1 Classification by processing frequency D PREVIEW

Addition:

The voltage band is determined by the <u>Eline-to-line 20</u>pen-circuit rated supply voltage to the electrode(s). https://standards.iteh.ai/catalog/standards/sist/f07a88c1-4aa3-4fcb-a7cf-43dbc40ca890/iec-60519-8-2020

(standards.iteh.ai)

#### 5 Risk assessment

This clause of Part 1 is applicable.

## 6 General provisions

This clause of Part 1 is applicable.

#### 7 Protection against hazards from electric shock

This clause of Part 1 is applicable except as follows.

#### 7.6 Protective equipotential bonding

Addition:

7.6.101 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. For the particular case of a single-head multi-station co-axial electroslag remelting furnace, it is preferable to ground the power circuit at the power supply instead of at the base. In no case shall the operating personnel be exposed to harmful voltages.

If the power circuit is multiple-earthed, care shall be taken with 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.

#### 8 Protection against hazards from electric or magnetic fields

This clause of Part 1 is applicable.

#### 9 Protection against hazards from radiation

This clause of Part 1 is applicable.

#### **10** Protection against hazards from thermal influences

This clause of Part 1 is applicable, except as follows.

#### 10.1 General

Additions:

**10.1.101** Perforation of the crucible and base plate can cause a fire or an explosion due to the cooling-water flow into liquid metal and slag. The following special measures for design and operation of equipment shall be taken to ensure the protection of personnel and equipment.

- a) Sufficient water-cooling to the crucible and base plate shall be ensured in the hot state. For further detailsps/eeu10.5.iteh.ai/catalog/standards/sist/107a88c1-4aa3-4fcb-a7cf-
- b) The size of electrode(s) relative to the crucible shall be carefully designed and manufactured in such a way that they remain at a reasonable distance between the crucible and the electrode(s) to avoid the occurrence of arcing. The position of electrode(s) relative to the crucible shall be monitored during melting and aligned.
- c) The mechanical properties of graphite electrode(s) and consumable electrode(s) shall be ensured to avoid cracking and a part of electrode dropping into the crucible that can cause arcing during the operation. The electrode(s) with horizontal cracks in the surface or inside is (are) unacceptable.
- d) The strength of the welded zone between the consumable electrode and the electrode stub in the operation condition shall be sufficient to avoid it breaking away.
- e) The voltage and current in the secondary circuit shall be carefully set and controlled to the limited values in the starting phase, especially in the case of cold starting with solid conductive slag, in order to avoid the electrode arcing or short circuit occurring with the base plate that can cause perforation of the base plate.

**10.1.102** Slag materials shall be sufficiently dried before use in order to decrease the moisture so that molten slag cannot be ejected from the crucible during the melting of the slag.

**10.1.103** The relative positions between the mould and the base plate shall be fixed and the gap between them shall be so narrow that the molten slag cannot leak out.

**10.1.104** Water accumulation in the area around the melting station shall be avoided. Measures shall be taken to remove any water from this area in the event of leakage.

#### **10.3 Hazards caused by working conditions**

Additions:

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

**10.3.102** 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 gases. 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.

**10.3.103** 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 (for example, temperature measurement, changing electrodes) and be near live or hot parts shall wear protective clothing: gloves, footwear, visors (goggles), non-metallic safety helmets, etc.

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

#### 10.5 Cooling

Additions:

#### IEC 60519-8:2020

(standards.iteh.ai)

https://standards.iteh.ai/catalog/standards/sist/f07a88c1-4aa3-4fcb-a7cf-

**10.5.101** 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.

**10.5.102** The following indications and measurements shall be provided for important cooling circuits, for example, moulds, base plates, electrode clamps:

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

#### **10.6** Over-temperature protection

Addition:

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

- a) The water flow and temperature rise of each cooling circuit shall be monitored separately.
- b) A lack of cooling (in important circuits as stated above) shall switch off the furnace power supply.
- c) The supply of cooling water shall be adequate to prevent undue heating of the cooled walls.
- d) Cast and/or welded ingot moulds shall be free from porosities, cracks, etc., which could have a detrimental effect on watertightness and heat transfer.
- e) The use of seals likely to come into contact with molten materials shall be prohibited.

#### 11 Protection against hazards from fire

This clause of Part 1 is applicable.

### 12 Protection against hazards from fluids

This clause of Part 1 is applicable.

#### 13 Specific requirements for components and subassemblies

This clause of Part 1 is applicable except as follows.

#### 13.2 Electrical equipment and conductors

Addition:

- **13.2.101** The following requirements shall be met to ensure adequate safety in operation.
- a) The supply system shall be designed to withstand sudden current fluctuations occurring at the start of the melting process with dry slag.

(standards.iteh.ai)

- 10 -

b) The circuit-breaker shall be designed for frequent operation.

## 13.4 Isolation and switching TANDARD PREVIEW

Additions:

#### 13.4.101 High-voltage circuit-breaker closing conditions

- a) The isolator shall be in the closed position/iec-60519-8-2020
- b) The setting of the secondary voltage shall be checked.
- c) Correct furnace operating conditions shall be established.

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

#### **13.4.102** Switching-on in power circuit

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

- a) The melting station change-over switches shall be in the closed position. The station in operation shall be indicated on the control board.
- b) The electrode and the ingot mould shall be aligned in the melting position.
- c) The base plate shall be in the operating position.
- d) Removable contact-making devices shall be in the closed position; in particular, electrode clamps or contact shoes, are 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) The connections of the cooling circuit, if provided, shall be in working order (flow, pressure and temperature).

#### 14 Control of the installation or equipment

This clause of Part 1 is applicable except as follows.

#### 14.3 Emergency stop

#### Addition:

14.3.101 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.

#### 14.4 Control systems and their functions

Addition:

**14.4.101** 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 switchen STANDARD PREVIEW

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.

#### <u>IEC 60519-8:2020</u>

https://standards.iteh.ai/catalog/standards/sist/f07a88c1-4aa3-4fcb-a7cf-**15 Protection against mechanical**(hazards)0519-8-2020

This clause of Part 1 is applicable except as follows.

#### Addition:

# 15.101 Additional requirements for the safety of non-electrical components of furnace installations

**15.101.1** The following additional safety requirements for the safety of non-electrical components of electroslag remelting furnace installations are minimum requirements.

#### **15.101.2** Electrode and its auxiliaries

- a) The electrode holding structure shall be insulated from the drive mechanism and from the furnace frame. The drive mechanism and the frame shall be earthed.
- b) All movements shall be limited, and electrodes handled carefully.
- c) The electrode holder and lifting gear shall be designed to prevent the slipping down of electrodes.
- d) The vertical moving parts shall be kept in position (or slowly moved down) in the case of failure of the lifting devices.

#### 15.101.3 Sealed melting chamber

a) The sealed melting chamber of the furnace in which the consumable electrode is remelted under increased pressure (PESR), inert gas atmosphere (IESR) or vacuum (VAC-ESR) shall be made of non-magnetic steel plate and shall be cooled by water during the operation.

- b) The material, design and manufacture of the sealed melting chamber shall meet the requirements for the safety of personnel or equipment under the operation conditions agreed upon between the manufacturer and the user.
- c) Oxygen level sensors shall be installed and maintained in all areas where inert gas can accumulate, with an alarm system to warn the operating personnel not to enter such areas when not safe.

**15.101.4** Vibrations, in particular those caused by sudden variations of the electric melting current, shall not affect in a dangerous manner the mould position, the ingot or the electrode clamps.

## 16 Protection against hazards resulting from use

Only 16.2 in this clause of Part 1 is applicable.

## 17 EMC

This clause of Part 1 is applicable.

## **18 Verification and testing**

This clause of Part 1 is applicable except as follows **PREVIEW** 

#### 18.6 Measurements

# (standards.iteh.ai)

Additions:

IEC 60519-8:2020

# 18.6.101 Measurement of the temperature rise of the cooling-water

These measurements shall be carried out at maximum permissible power during continuous operation of the furnace after steady state has been achieved.

The test method given in 6.5.2 of IEC 60398:2015 shall be applied.

#### 18.6.102 Measurement of the cooling-water flow rate

The purpose of this test is to check the cooling-water flow rate as foreseen by the manufacturer during normal operation.

The test shall be carried out during continuous operation of the furnace after steady state has been achieved. The pressure, temperature and properties of the cooling water shall correspond to the requirements given in the technical documentation provided by the manufacturer.

The cooling-water flow rate is determined from the formula:

$$q = \frac{Q_{\rm m}}{t} \tag{1}$$

where

 $Q_{\rm m}$  is the quantity of water measured (m<sup>3</sup>);

*t* is the period of time during which the quantity of water flows through a separate cooling branch (h).

The measurement can also be made directly by means of a flow-rate meter.

During the test, it is desirable to determine the cooling-water properties (hardness, quantity of suspended particles, etc.) and compare them with the manufacturer's recommendations.

#### 18.6.4 Measurement of electric or magnetic fields

Addition:

**18.6.4.101** Measurement of the intensity of the magnetic field at or near an electroslag remelting furnace

The test shall be carried out during continuous operation of the furnace after steady state has been achieved.

The measurements at many points near the secondary electrical circuit of an electroslag remelting furnace are made in order to determine the position with the maximum value and the distribution of the magnetic field around the mould.

#### 18.6.10 Temperature of structural components subject to heat

Addition:

**18.6.10.101** Measurement of the temperature of components which are subjected to strong magnetic field and/or radiated or converted heat

## standards.iteh.ai)

The measurement shall be carried out during continuous operation of the furnace after steady state has been achieved while the furnace is working at its rated current  $(I_n)$ .

https://standards.iteh.ai/catalog/standards/sist/f07a88c1-4aa3-4fcb-a7cf-43dbc40ca890/iec-60519-8-2020

#### 19 Information for use

This clause of Part 1 is applicable except as follows.

#### **19.1 General requirements**

Addition:

**19.1.101** Details for isolation shall be laid down in separate instructions. These shall be indicated by post-up notices in the switching area and/or by giving appropriate personnel a book of instructions for which acknowledgement is obtained.

#### **19.5** Instruction handbook

Addition:

**19.5.101** Additional requirements for the setting-up and melting phases are as follows:

- a) The melting area shall be provided with a free exit area sufficient to enable rapid evacuation in emergency. Gangways shall be marked out and shall be kept clear and clean.
- b) Fire-proof clothing, fire-proof and electrically insulated gloves, footwear and tools, hightemperature visors of a size adequate to cover face and neck, and safety helmets (nonmetallic) shall be located at the melting area and be readily available.
- c) Tools, which can be used in contact with liquid metal or slag, shall be cleaned and dried before use.
- d) Adequate water drainage shall be provided.