

STN	Priemyselné elektrotepelné zariadenia. Skúšobné metódy pre infračervené elektrotepelné zariadenia.	STN EN 62693 36 1114
------------	---	--

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 12/13

Obsahuje: EN 62693:2013, IEC 62693:2013

**Industrial electroheating installations -
Test methods for infrared electroheating installations
(IEC 62693:2013)**

Installations électrothermiques
industrielles -
Méthodes d'essais relatives aux
installations électrothermiques par
rayonnement infrarouge
(CEI 62693:2013)

Industrielle Elektrowärmeanlagen -
Prüfverfahren für Infrarot-
Elektrowärmeanlagen
(IEC 62693:2013)

This European Standard was approved by CENELEC on 2013-07-23. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

CENELEC

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 27/877/CDV, future edition 1 of IEC 62693, prepared by IEC/TC 27 "Industrial electroheating and electromagnetic processing" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62693:2013.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2014-04-23
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2016-07-23

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

Endorsement notice

The text of the International Standard IEC 62693:2013 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60038	NOTE	Harmonised as EN 60038.
IEC 60398:1999	NOTE	Harmonised as EN 60398:1999.
IEC 60519-2:2006	NOTE	Harmonised as EN 60519-2:2006.
IEC 60825-1:2007	NOTE	Harmonised as EN 60825-1:2007.
IEC 61010-1:2010	NOTE	Harmonised as EN 61010-1:2010.
IEC 62471:2006	NOTE	Harmonised as EN 62471:2008 (modified).
ISO 638:2008	NOTE	Harmonised as EN ISO 638:2008.
ISO 2813:1994	NOTE	Harmonised as EN ISO 2813:1999.
ISO 8254-1:2009	NOTE	Harmonised as EN ISO 8254-1:2009.
ISO 8254-2:2003	NOTE	Harmonised as EN ISO 8254-2:2003.

Annex ZA
(normative)
Normative references to international publications
with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60519-1 + corr. November	2010 2012	Safety in electroheating installations - Part 1: General requirements	EN 60519-1	2011
IEC 60519-12	2013	Safety in electroheating installations - Part 12: Particular requirements for infrared electroheating installations	EN 60519-12	2013



INTERNATIONAL STANDARD

NORME INTERNATIONALE

Industrial electroheating installations – Test methods for infrared electroheating installations

Installations électrothermiques industrielles – Méthodes d'essais relatives aux installations électrothermiques par rayonnement infrarouge





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2013 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 la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
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 corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you 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 on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) 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 CEI

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

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI 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.

Just Published CEI - webstore.iec.ch/justpublished

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

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

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



IEC 62693

Edition 1.0 2013-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Industrial electroheating installations – Test methods for infrared electroheating installations

Installations électrothermiques industrielles – Méthodes d'essais relatives aux installations électrothermiques par rayonnement infrarouge

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX



ICS 25.180.10

ISBN 978-2-83220-866-3

**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.**

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	5
1 Scope and object.....	6
2 Normative references	7
3 Terms and definitions	7
3.1 General	7
3.2 States and parts	8
3.3 Workload	8
4 Boundaries of the installation during tests	9
4.1 Energy considerations	9
4.2 Batch type installations.....	9
4.3 Continuous type installations	10
5 Types of tests and general test conditions	10
5.1 General	10
5.2 List of tests	11
5.3 Test conditions	11
5.3.1 Operating conditions during tests	11
5.3.2 Environmental conditions during tests.....	11
5.3.3 Supply voltage.....	12
5.4 Infrared dummy workload	12
6 Measurements	12
6.1 General	12
6.2 Time resolution.....	12
6.3 Measurements of electric data.....	12
6.4 Temperature measurement.....	13
7 Technical tests	13
7.1 Installation performance dependence on supply voltage	13
7.2 Energy consumption and time of cold start-up operation.....	14
7.3 Power consumption of hot standby operation.....	14
7.4 Power consumption of holding operation	14
7.5 Shut-down operation energy consumption and time	15
7.6 Energy consumption during a regular maintenance operation	15
7.7 Energy consumption during normal operation	15
7.8 Cumulative energy consumption and peak power consumption.....	16
7.9 Net production capacity	16
7.10 Efficiency of energy transfer to the workload	17
7.11 Processing range of intended operation.....	17
7.12 Homogeneity of the processed workload	17
7.13 Infrared radiation distribution in the heating chamber	17
8 Efficiency of the installation	17
8.1 General	17
8.2 Infrared electric conversion efficiency.....	18
8.2.1 General	18
8.2.2 Calculation	19
8.3 Electroheating efficiency	19
8.4 Power usage efficiency.....	19

8.5 Energy consumption of the workload	19
Annex A (normative) Energy transfer efficiency.....	21
Annex B (normative) Homogeneity of the workload	25
Annex C (informative) Measurement of radiation distribution inside the installation	28
Bibliography.....	29

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL ELECTROHEATING INSTALLATIONS –
TEST METHODS FOR INFRARED ELECTROHEATING INSTALLATIONS**
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 liaising with the IEC also participate in this preparation. 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 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.
- 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.
- 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 62693 has been prepared by IEC technical committee 27: Industrial electroheating and electromagnetic processing.

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

CDV	Report on voting
27/877/CDV	27/902/RVC

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.

INTRODUCTION

This standard on particular test methods for infrared electroheating installations is one of TC 27 standards that describe test methods for various types of electroheating installations.

Test methods for ovens under the scope of IEC 60397 [3]¹ are also covered in this standard when infrared radiation is the intended heat transfer in such equipment – this is assumed to be valid above an actual or processing temperature of 700 °C, independently of the rated temperature of the oven.

This standard is solely concerned with tests for infrared equipment and installations. Tests that focus on the performance of infrared emitters will be covered by IEC 62798 ² [11]. The rationale for this separation is that infrared installations are usually manufactured by other companies than infrared emitters. Still, infrared emitters are a very important and distinct part of infrared installations and a set of tests that allow for proper comparison of different infrared emitters will be valuable to manufacturers of infrared installations.

The major guiding principle in this standard is to define tests that can be performed with the usual test and measuring equipment available to most kinds of companies, large or small.

The tests focus on the performance and efficiency of installations, as these are of major interest for manufacturers and users of such installations. The tests are intended to enable a fair comparison of installations belonging to a given class. The standard includes considerations and tests concerned with energy efficiency, so that the tests can be used for assessment of energy use and for energetic optimisation of installations as well.

¹ Numbers in square brackets refer to the Bibliography.

² Under consideration.

INDUSTRIAL ELECTROHEATING INSTALLATIONS – TEST METHODS FOR INFRARED ELECTROHEATING INSTALLATIONS

1 Scope and object

This International Standard specifies test procedures, conditions and methods according to which the main parameters and the main operational characteristics of industrial infrared electroheating installations are established.

A limitation of the scope is that the infrared emitters have a maximum spectral emission at longer wavelengths than 780 nm in air or vacuum, and are emitting wideband continuous spectra such as by thermal radiation or high pressure arcs.

In industrial infrared electroheating installations, infrared radiation is usually generated by infrared emitters and infrared radiation is significantly dominating over heat convection or heat conduction as means of energy transfer to the workload.

IEC 60519-1:2010 defines infrared as optical radiation within the frequency range between about 400 THz and 300 GHz. This corresponds to the wavelength range between 780 nm and 1 mm in vacuum. Industrial infrared heating usually uses infrared sources with rated temperatures between 500 °C and 3 000 °C; the emitted radiation from these sources dominates in the wavelength range between 780 nm and 10 µm.

Installations under the scope of this standard typically use the Joule effect for the conversion of electric energy inside one or several sources into infrared radiation emitted onto the workload. Such infrared emitters are especially

- thermal infrared emitters in the form of tubular, plate-like or otherwise shaped ceramics with a resistive element inside;
- infrared quartz glass tube or halogen lamp emitters with a hot filament as a source;
- non insulated elements made from molybdenum disilicide, silicon carbide or comparable materials;
- restive metallic heating elements made e.g. from nickel based alloys or iron-chromium-aluminium alloys;
- wide-spectrum arc lamps.

This standard is not applicable to

- infrared installations with lasers or light-emitting diodes (LEDs) as main sources – they are covered by IEC 62471:2006 [9], IEC 60825-1:2007 [6] and IEC/TR 60825-9:1999 [7];
- appliances for use by the general public;
- appliances for laboratory use – they are covered by IEC 61010-1:2010 [8];
- electroheating installations where resistance heated bare wires, tubes or bars are used as heating elements, and infrared radiation is not a dominant side effect of the intended use, covered by IEC 60519-2:2006 [5];
- infrared heating equipment with a nominal combined electrical power of the infrared emitters of less than 250 W;
- handheld infrared equipment.

The tests are intended to be used to enable a fair comparison of the performance of installations belonging to the same class.

Tests related to safety of the installations are defined in IEC 60519-12:2013. Tests related to the performance of infrared electroheating emitters are specified in IEC 62798:— [11].

Therefore, this standard is applicable to ovens and furnaces with resistive heating elements if they fall under the scope of this standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60519-1:2010, *Safety in electroheating installations – Part 1: General requirements*

IEC 60519-12:2013, *Safety in electroheating installations – Part 12: Particular Requirements for infrared electroheating installations*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN