IEC TR 61547-1

Edition 2.0 2017-10

TECHNICAL REPORT

colour inside

Equipment for general lighting purposes – EMC immunity requirements– Part 1: An objective light flickermeter and voltage fluctuation immunity test method

IEC TR 61547-1:2017-10(en)

IEC Central Office
3, rue de Varembé
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.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
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 It also gives information on projects, replaced and withdrawn publications.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 also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC 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.

IEC TR 61547-1

Edition 2.0 2017-10

TECHNICAL REPORT

Equipment for general lighting purposes – EMC immunity requirements– Part 1: An objective light flickermeter and voltage fluctuation immunity test method

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.140.20

ISBN 978-2-8322-4904-8

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

EQUIPMENT FOR GENERAL LIGHTING PURPOSES – EMC IMMUNITY REQUIREMENTS–

Part 1: An objective light flickermeter and voltage fluctuation immunity test method

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.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a Technical Report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 61547-1, which is a Technical Report, has been prepared by technical committee 34: Lamps and related equipment.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

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

a) the title of Part 1 has been changed to reflect the more general application of the objective flickermeter;

b) the specific voltage fluctuation immunity test method has been extended for lighting equipment rated for 120 V AC and 230 V AC, 50 Hz and 60 Hz.

The text of this Technical Report is based on the following documents:

Draft TR	Report on voting
34/387/DTR	34/398A/RVDTR

Full information on the voting for the approval of this Technical Report 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 61547 series, published under the general title *Equipment for general lighting purposes – EMC immunity requirements*, can be found on the IEC website.

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.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The fast rate at which solid state light (SSL) sources can change their intensity is one of the main drivers behind the revolution in the lighting world and applications of lighting. Linked to the fast rate of the intensity change is a direct transfer of the modulation of the driving current, both intended and unintended, to a modulation of the luminous output. This light modulation can give rise to changes in the perception of the environment. While in some very specific entertainment, scientific or industrial applications, a change of perception due to light modulation is desired, for most everyday applications and activities the change is detrimental and undesired. The general term used for these changes in the perception of the environment is “temporal light artefacts” (TLAs) and these can have a large influence on the judgment of the light quality. Moreover, the visible modulation of light can lead to a decrease in performance, increased fatigue as well as acute health problems like epileptic seizures and migraine episodes [18][19][1].

Different terms exist to describe the different types of TLAs that may be perceived by humans. The term ‘flicker’ refers to light variation that may be directly perceived by an observer. ‘Stroboscopic effect’ is an effect which may become visible for an observer when a moving or rotating object is illuminated (CIE TN 006:2016[22]).

Possible causes for light modulation of lighting equipment that may give rise to flicker or stroboscopic effect are:

– AC supply combined with light source technology and its driver topology;
– dimming technology of externally applied dimmers or internal light level regulators;
– mains voltage fluctuations caused by electrical apparatus connected to the mains (conducted electromagnetic disturbances) or intentionally applied for mains-signalling purposes.

Lighting products that show unacceptable flicker or stroboscopic effect are considered as poor quality lighting.

This document provides an objective light flickermeter and a method for testing the immunity of lighting equipment against mains voltage fluctuations caused by electrical apparatus connected to the mains at levels that are allowed through IEC 61000-3-3.

Flicker perception, as well as IEC 61000-3-3 and IEC 61000-4-15, the associated standards for voltage fluctuations and flickermeter, are based on the 60 W incandescent lamp. As a result of the phasing out of incandescent lamps and the widespread introduction of alternative lighting equipment technologies, a new reference lamp was considered. It has been demonstrated that new lighting technologies are in general less but sometimes also more sensitive to supply voltage fluctuations than the current 60 W incandescent lamp. A CIGRE working group has assessed the impact of new lighting technologies on the existing flicker standards [17]. For the moment, the present flicker sensitivity curve of IEC 61000-3-3 remains as the reference. However, because of the increased diversity of sensitivity of lighting equipment to voltage fluctuations, there is a future need for a voltage-fluctuation immunity test specifically for lighting equipment. In this way, the full EMC approach (Figure 1) is introduced for flicker, i.e. with a view to limiting voltage fluctuations caused by equipment connected to the grid, and in addition to establishing a minimum level of flicker immunity of lighting equipment against these voltage fluctuations.

This document will allow the lighting industry to gain experience in flicker immunity test methods. Results of actual tests will be reported in a separate IEC Technical Report. Based on the experience gained on this immunity test method, the adoption of a similar test to be applied for IEC 61547, the immunity standard for lighting equipment, will be considered.

[1] Numbers in square brackets refer to the Bibliography.