IEC TR 63139

Edition 1.0 2018-10

TECHNICAL REPORT

colour inside

Explanation of the mathematical addition of working voltages, insulation between circuits and use of PELV in TC 34 standards

IEC TR 63139:2018-10(en)

Documents
Document Sharing Hub

Full document details: IEC TR 63139 2018

THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2018 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.

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 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 - 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 It also gives information on projects, replaced and withdrawn publications.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 also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 21 000 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
67 000 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: sales@iec.ch.

AVA Documents
Document Sharing Hub

Full document details: IEC TR 63139 2018

IEC TR 63139

Edition 1.0 2018-10

TECHNICAL REPORT

colour inside

Explanation of the mathematical addition of working voltages, insulation between circuits and use of PELV in TC 34 standards

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.140.01

ISBN 978-2-8322-6163-7

Warning! Make sure that you obtained this publication from an authorized distributor.

® Registered trademark of the International Electrotechnical Commission

Documents
Document Sharing Hub

Full document details: IEC TR 63139 2018

CONTENTS

FOREWORD 3
INTRODUCTION 5
1 Scope 6
2 Normative references 6
3 Terms and definitions 6
4 Mathematical addition of working voltages 6
5 Insulation between circuits 9
5.1 General 9
5.2 Insulation requirements between active parts and accessible conductive parts 9
5.3 Possible failure conditions 11
6 Circuits analysis 13
7 Use of PELV 15
7.1 General 15
7.2 Characteristics of PELV (protective extra low voltage) circuits 16
7.3 Requirements for PELV circuits in addition to SELV 16
7.3.1 Voltage limitations 16
7.3.2 Touch current and protective conductor current 17
7.4 Summary of the proposed changes to IEC 60598-1 and IEC 61347-1 18
8 Insulation between LV supply and control line conductors 18
Bibliography 20

Figure 1 – Input/output failure simulation 8
Figure 2 – Examples of controlgear with different insulation systems 11
Figure 3 – Condition A: failure between input and output circuits 11
Figure 4 – Condition B: earth failure/equipotential bonding failure (interruption of the connection continuity) 12
Figure 5 – Condition C: insulation failure between output circuits and accessible earthed metal part 12
Figure 6 – Condition D: insulation failure between output circuit to conductive parts which are connected together (equipotential bonding) 12
Figure 7 – Condition E: insulation failure between output circuit and different conductive parts not connected together (no equipotential bonding) 13
Figure 8 – PELV circuit in the most adverse condition (touch voltage is the sum of U_E and U_2) 17
Figure 9 – PELV circuit with a person located in an equipotential location (touch voltage is U_2 only) 17

Table 1 – Addition of voltages 8
Table 2 – Insulation requirements between active parts and accessible conductive parts 10
Table 3 – Circuit analysis overview 13

Documents
Document Sharing Hub
Full document details: IEC TR 63139 2018

INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLANATION OF THE MATHEMATICAL ADDITION OF WORKING VOLTAGES, INSULATION BETWEEN CIRCUITS AND USE OF PELV IN TC 34 STANDARDS

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 63139, which is a Technical Report, has been prepared by IEC technical committee 34: Lamps and related equipment.

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

DTR	Report on voting
34/415/DTR	34/493A/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.

Documents
Document Sharing Hub

Full document details: IEC TR 63139 2018

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

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.

Documents
Document Sharing Hub

Full document details: IEC TR 63139 2018

INTRODUCTION

This document provides background information to the following subjects being introduced into IEC TC 34 standards to cover new technologies associated with the use of LED light sources and controllable products.

This document consists of the following subdivisions:

Clause 4 – Mathematical addition of working voltages;

Clause 5 – Insulation between circuits;

Clause 6 – Use of protective extra low voltage (PELV);

Clause 7 – Insulation between LV supply and control line conductors.

Documents
Document Sharing Hub

Full document details: IEC TR 63139 2018

EXPLANATION OF THE MATHEMATICAL ADDITION OF WORKING VOLTAGES, INSULATION BETWEEN CIRCUITS AND USE OF PELV IN TC 34 STANDARDS

1 Scope

This document is related to the insulation coordination in TC 34 standards and provides explanations on mathematical addition of working voltages, insulation between circuits, use of protective extra low voltage (PELV) and insulation between LV supply and control line conductors in order to cover new technologies associated with the use of LED light sources and controllable products.

It describes in which way the addition of supply voltages and working voltages can be arranged for an assessment of the electrical insulation requirements (e.g. creepage distances and clearances) in a system if a first failure occurs.

Furthermore the actual failure scenarios given in IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017, Annex X and IEC 61347-1:2015, Clause 15 are explained in greater detail and the rationale behind the protective requirement for each situation is given (e.g. possible LV primary to ELV secondary does not lead to an overburden of the insulation in the second circuit).

This document also describes the possibility to increase immunity and reliability of electronic circuits, used in combination with LEDs, with the use of PELV and the associated safety consequences for this system.

The insulation between LV supply and control line conductors is also important and this document explains why this is an essential safety consideration for a complete installation system.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 Mathematical addition of working voltages

Insulation requirements between live parts and accessible conductive parts as function of the controlgear input/output insulation classification and the insulation class of the luminaire are given in IEC 60598-1:2014, Table X.1 and IEC 61347-1:2015, Table 6.

Insulation requirements in TC 34 standards are based on a hazard assessment with the assumption that a certain failure will occur.

AVA Documents
Document Sharing Hub
Full document details: IEC TR 63139 2018