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TECHNICAL REPORT

Electrical interface specifications for self ballasted lamps and controlgear in phase-cut dimmed lighting systems

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CONTENTS

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ELECTRICAL INTERFACE SPECIFICATIONS FOR SELF BALLASTED LAMPS AND CONTROLGEAR IN PHASE-CUT DIMMED LIGHTING SYSTEMS

FOREWORD

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IEC TR 63037, 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:

Enquiry draft	Report on voting
34/305/DTR	34/325/RVC

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.

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- withdrawn,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.

INTRODUCTION

This document describes the technical requirements for self-ballasted lamps and controlgear to work with phase-cut dimmers. For a complete picture of the technical requirements the user should also refer to the companion document that contains technical requirements and testing methods for phase-cut dimmers (IEC TR 63036).

ELECTRICAL INTERFACE SPECIFICATIONS FOR SELF BALLASTED LAMPS AND CONTROLGEAR IN PHASE-CUT DIMMED LIGHTING SYSTEMS

1 Scope

This document specifies the electrical interface between phase-cut dimming equipment and lighting equipment, such as LED integrated lamps and light sources with external controlgear, with the intention of helping designers of both types of equipment to develop products that will work together properly.

This document describes both the dimming phase and the off phase. In addition to the specification of the interface, test procedures are given for testing the proper operation.

It may be expected that controlgear fulfilling the requirements of this document are also suited to be used with electronic switches that use a circuitry comparable with that of a phase-cut dimmer, but do not contain means for the adjustability of the phase-cut angle.

Safety requirements are not covered by this document, but by respective product standards

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60050-845, *International Electrotechnical Vocabulary. Lighting* (available at http://www.electropedia.org)

IEC 62504, *General lighting – Light emitting diode (LED) products and related equipment - Terms and definitions*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62504 and IEC 60050-845 as well as the following apply.

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

3.1.1
phase-cut dimmed lighting system
combination of a phase-cut dimmer and one or more controlgear and light sources

3.1.2
off state
state of a phase-cut dimming system when no light is emitted

3.1.3
on state
state of a phase-cut dimming system when light is emitted

3.1.4
phase-cut dimmer
electronic switch which is connected in series with a load and changes the supply voltage waveform applied to the load from the pure mains voltage waveform to a leading edge (forward phase) or a trailing edge (reverse phase) AC voltage waveform or is capable of switching between both waveforms

Note 1 to entry: The output voltage waveform of a phase-cut dimmer is applied to one or more loads. The conduction angle of the voltage waveform is adjustable.

Note 2 to entry: Within this document, where the term “dimmer” is used the term “phase-cut dimmer” is meant.

3.1.5
two-wire phase-cut dimmer
phase-cut dimmer which is connected in series with the load and has no connection to neutral

3.1.6
three-wire phase-cut dimmer
phase-cut dimmer which is connected in series with the load and has in addition a connection to neutral

3.1.7
controlgear
device between the phase-cut dimmer and one or more lamps which may serve to transform the AC mains power, limit the current of the lamp(s) to the required value, provide starting voltage and preheating current, prevent cold starting, correct power factor or reduce radio interference

Note 1 to entry: Lamps may have integrated controlgear such as an integrated LED lamp. Any references to controlgear will include any such integrated lamps.

3.1.8
load side
connection from the output of the phase-cut dimmer to the supply input of one or more controlgear

3.1.9
conducting period
time period during which the phase-cut dimmer supplies power to a controlgear

3.1.10
non-conducting period
time period during which the phase-cut dimmer does not supply power to a controlgear

3.1.11
half-wave
positive or negative 180 degrees of an AC sine wave starting and ending at the zero crossing point

3.1.12
phase angle
position within a half-wave expressed in degree, being in the range of 0° to 180°, referred to the beginning of the half-wave

3.2 Abbreviated terms

To describe the electrical characteristics of the phase-cut interface, the following abbreviations are used:

α_x	Angle where the test voltage starts rising with the given slew rate SR as shown in Figure A.1
β_x	Angle where the test voltage starts falling with the given slew rate SR as shown in Figure A.2
C_f	Filter capacitor to reduce high frequency disturbances
EC_CG	Equivalent circuit that represents a controlgear for phase-cut dimmer testing purposes
EC_D	Equivalent circuit that represents a phase-cut dimmer for controlgear testing purposes
I_{CG}	Current through the input terminals of the controlgear
I_{CG_pk}	Repetitive peak current of the controlgear in leading edge mode
I_{CG_SL}	Current-carrying capability of the controlgear with $V_{CG} \leq V_{SW}$ in leading edge mode
I_{CG_STH}	Current-carrying capability of the controlgear with $V_{CG} \leq V_{SW}$ in trailing edge mode
I_{CG_STL}	Current-carrying capability of the controlgear with $V_{CG} > V_{SW}$ in trailing edge mode
I_D	Current through the load side terminal of the phase-cut dimmer
I_{D_nc}	Maximum current through the phase-cut dimmer during the non-conducting period, limited by the phase-cut dimmer
I_{EC_CG}	Value of test current of EC_CG in the test circuit in Figure A.1
I_{PO}	Minimum current carrying capability of the controlgear during the electronic off state
I_{trans}	Current sourced by the phase-cut dimmer during the transition from the conducting to the non-conducting state in trailing edge mode.
n	Required minimum number of controlgear connected with one phase-cut dimmer (named in phase-cut dimmer installation sheet)
P_{CG}	Rated input power of the controlgear (as marked)
P_{max}	Maximum permissible nominal load of phase-cut dimmer (according to installation sheet)
P_{min}	Minimum nominal load required by phase-cut dimmer (according to installation sheet)
R_R	Resistance value of resistive load R of the test circuit of Figure 5 (according to 8.3.3), dependent on maximum permissible load of phase-cut dimmer P_{max}
SR	The absolute value of the slew rate of the decrease of the voltage across the input terminals of a controlgear in trailing edge dimming mode when the phase-cut dimmer switches off at time t_{s1} (see Figure 3).
SR_L	The absolute value of the slew rate of the increase of the voltage across the input terminals of a controlgear in leading edge dimming mode when the phase-cut dimmer under test switches on (according to Clause 8)
SR_T	The absolute value of the slew rate of the decrease of the voltage across the input terminals of a controlgear in trailing edge dimming mode when the phase-cut dimmer under test switches off (according to Clause 8)
t_{HW}	Time related to previous zero crossing of the mains to the subsequent zero crossing of the mains (duration of a half-wave)