IEC 62756-1

Edition 1.0 2015-05

INTERNATIONAL STANDARD

colour inside

Digital load side transmission lighting control (DLT) – Part 1: Basic requirements

IEC 62756-1:2015-05(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 It also gives information on projects, replaced and withdrawn publications.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 more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
More than 60 000 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 62756-1

Edition 1.0 2015-05

INTERNATIONAL STANDARD

colour inside

Digital load side transmission lighting control (DLT) – Part 1: Basic requirements

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 29.140.99

ISBN 978-2-8322-2711-4

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

____

DIGITAL LOAD SIDE TRANSMISSION LIGHTING CONTROL (DLT) –

Part 1: Basic requirements

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 62756-1 has been prepared by subcommittee 34C: Auxiliaries for lamps, of IEC technical committee 34: Lamps and related equipment.

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

CDV	Report on voting
34C/1054/CDV	34C/1081B/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.

A list of all parts in the IEC 62756 series, published under the general title *Digital load side transmission lighting control (DLT)*, can be found on the IEC website.

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

This standard concerning Digital Load Side Transmission Lighting Control (DLT) describes a protocol for simple control of brightness, colour, colour temperature, and other parameters for the purpose of controlling lighting sources such as CFLi, LED light engines, electronic control gear and any other light source with integrated or external control gear.

This protocol uses existing wiring and allows easy retrofit of standard switches, dimmers and lamps with the new devices described in this standard, with little or no configuration.

The following standards contain safety requirements for control devices and control gear:

– IEC 60669-2-1, Switches for household and similar fixed electrical installations – Part 2-1: Particular requirements – Electronic switches,

– IEC 61347, Lamp control gear,

– IEC 60968, Self-ballasted lamps for general lighting services – Safety requirements,

– IEC 62560, Self-ballasted LED-lamps for general lighting services by voltage > 50 V – Safety specifications.

DIGITAL LOAD SIDE TRANSMISSION LIGHTING CONTROL (DLT) –

Part 1: Basic requirements

1 Scope

This International Standard specifies a protocol, electrical interface and test procedures for control of electronic lighting equipment by digital signals over the load side mains wiring.

Safety requirements are not covered by 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 60364 (all parts), *Low-voltage electrical installations*

IEC 60038, *IEC standard voltages*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
load side
wire from the output of the control device to the supply input of one or more control gear

3.2
interface
wires used for both supply of AC mains power and data transfer

3.3
control device
device that is connected to the interface and sends commands to at least one control gear

[SOURCE: IEC 62386-101:2009, 3.1, modified — "in order to control other devices (for example lamp control gear) connected to the same interface" has been replaced by "to at least one control gear"]

3.4
control gear
one or more components between the supply and one or more lamps which may serve to transform the supply voltage, 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 an integrated control gear such as an integrated compact fluorescent lamp or integrated LED lamp. Any references to control gear will include any such integrated lamps.

[SOURCE: IEC 62386-101:2009, 3.2]

3.5
master
device that initiates transmission of data on the interface

3.6
slave
device that reacts to data on the interface

3.7
supply period
time period during which power is supplied to a control device

3.8
operating period
time period during which power is supplied to a control gear

3.9
data period
time period during which data is transmitted

3.10
brightness
lumen output of the light source

3.11
frame
sequence of consecutive bits

3.12
telegram
complete sequence of consecutive frames causing a reaction in the slave

3.13
group number
number used to address a collection of control gear

3.14
response time
time taken from the end of a telegram to the reaction of a control gear

3.15
half wave
positive or negative 180° of an a.c. sine wave starting and ending at the zero crossing point

3.16
lighting system
combination of a control device and one or more control gear

3.17
telegram type
specific content of the telegram defining the message transmitted

3.18
two-wire device
control device where the current for the internal power supply flows through the control gear

3.19
three-wire device
control device where the current for the internal power supply is supplied directly from the mains

3.20
transmission signal
difference of the voltage across the control device between logical states during the data period

3.21
start-up
transition from zero light output to a state with greater than zero light output

4 General description

4.1 General

The standardization of the control protocol for control of electronic lighting equipment by load side digital signals is intended to achieve multi-vendor interoperabilityy between control devices and control gear, including but not limited to: CFL integrated lamps, LED integrated lamps and light sources with external control gear.

4.2 Master-slave structure

The control gear operates in slave mode only. Consequently the control gear receives information only.

The control device operates in master mode only. Consequently the control device transmits information only.

NOTE Bi-directional communication could be introduced in future parts or editions of this standard.

4.3 Specification overview

Below is a list of key capabilities of this protocol:

– Only one control device on the interface operates as a master.
– The control gear operates as a slave.
– The maximum number of control gear on one interface is limited only by the capabilities of the control device.
– The capabilities of a control device include the maximum permissible power of total connected control gear and the maximum permissible number of connected control gear.
– The maximum number of individual groups addressable on one interface is three.
– Bi-phase coding (Manchester coding) with error detection.
– Effective transmission rate: 200 bit/s at 50 Hz and 240 bit/s at 60 Hz.
– Compatible with mains voltages 100 V to 277 V.
– Supply of power to two-wire control devices is provided.

5 General requirements

5.1 Voltage rating

This standard applies to one or more of the following mains voltages: 100 V, 120 V, 200 V, 230 V, 277 V, according to IEC 60038.

5.2 Frequency rating

This standard applies to one or more of the following mains frequencies: 50 Hz, 60 Hz, according to IEC 60038.

5.3 Marking of control devices and control gear

The following information shall be provided by the manufacturer.

Supported telegram types.

Indication if a control gear does not support group number assignment.

Factory assigned group number for control gear with a fixed factory group assignment other than group 0.

Maximum number of group number assignments for control gear with limited number of group number assignments.

Required minimum number of connected control gear for control devices requiring more than one control gear to be connected.

NOTE Two-wire control devices could need a supply current that exceeds the current-carrying capability provided by a single control gear.

6 Electrical specification

6.1 General

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

V_M	Mains voltage (rated nominal value)
$V_M(t)$	Instantaneous value of V_M
V_{Pk}	Peak voltage of V_M
V_{CD}	Voltage between the line side (L) and load side terminals of the control device (see Figure 1)
I_{CD}	Current through the load side terminal of the control device (see Figure 1)
Z_{CD}	Impedance between the line side (L) and load side terminals of the control device
V_{CG}	Voltage across the input terminals of the control gear (see Figure 1)
I_{CG}	Current through the input terminals of the control gear (see Figure 1)
Z_{CG}	Impedance across the input terminals of the control gear
P_{CG}	Rated input power of the control gear
n	Number of control gear connected with one control device
V_{SW}	Voltage across the input terminals of the control gear at the time that leads to disabling (supply period) or enabling (data period) the bypass
V_{Data}	Voltage between the line side (L) and load side terminals of the control device during the data period (see 6.7)
V_{TS}	Transmission voltage, difference of the voltage between the line side (L) and load side terminals of the control device between logical states; signal amplitude of the transmission signal
V_{CDmin}	Voltage between the line side (L) and load side terminals of the control device when its impedance Z_{CD} is minimal

I_{CG_LC} Current-carrying capability of the control gear during the low current intervals and the data period

I_{CG_HC} Current-carrying capability of the control gear during the high current interval

V_{CG_HC} Maximum value for V_{CG} during the high current phase with I_{CG} = I_{CG_HC}

I_{CD_HC} Limit for current I_{CD} during the high current interval, defined by the control device

t_{HB} Period time of one half-bit (see Figure 7)

t_{rise} Time needed to increase the voltage between the line side (L) and load side terminals of the control device (V_{Data}) from V_{CDmin} + 0,1× V_{TS} to V_{CDmin} + 0,9×V_{TS}

t_{fall} Time needed to decrease the voltage between the line side (L) and load side terminals of the control device (V_{Data}) from V_{CDmin} + 0,9×V_{TS} to V_{CDmin} + 0,1×V_{TS}

t_{CD_S} Time after zero crossing when the control device stops applying voltage to the control gear

I_{PO_low} Lower most level for current carrying capability of the control gear during power controlled off state

I_{PO_high} Upper most level for current carrying capability of the control gear during power controlled off state

V_{PO_low} Lower limit for voltage across the input terminals of the control gear to provide a current carrying capability IPO_low during power controlled off state

V_{PO_high} Upper limit for voltage across the input terminals of the control gear to provide a current carrying capability IPO_high during power controlled off state

6.2 Wiring method

The wiring of the devices is in accordance with the installation rules given in the IEC 60364 series, and also with the national wiring rules applicable in the country where the devices are installed.

6.3 Wiring diagram

The wiring of the lighting system uses the traditional method of breaking the control device into the mains connection to the control gear. Figure 1 is an example of a lighting system with one control device and one or two control gear.

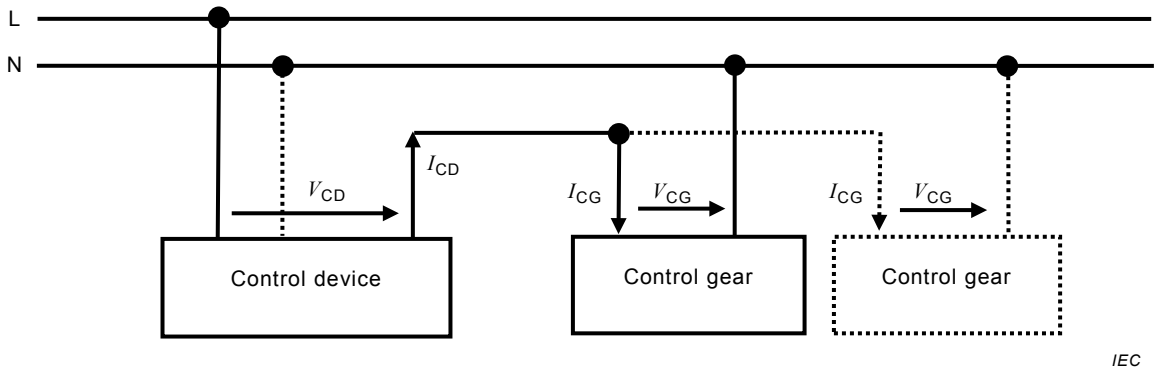

Figure 1 – Example wiring diagram

6.4 Block diagram of the control gear

For the DLT function, in addition to the parts usually used in a control gear, the following may be required (see Figure 2):

- a rectifier unit for rectifying the mains voltage;
- a bypass that is able to carry specified currents as defined for different periods;