IEC 62386-105

Edition 2.0 2024-12
REDLINE VERSION

INTERNATIONAL STANDARD

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Digital addressable lighting interface –
Part 105: Particular requirements for control gear and control devices – Firmware transfer

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IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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Part 105: Particular requirements for control gear and control devices – Firmware transfer

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62386-105:2020. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 62386-105 has been prepared by IEC technical committee 34: Lighting. It is an International Standard.

This second edition cancels and replaces the first edition published in 2020. This edition constitutes a technical revision.

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

a) several commands have been modified, renamed and added;
b) variables have been modified and added;
c) recommendations for implementation within emergency control gear have been added;
d) requirements for block acceptance have been changed;
e) example process-flow diagrams have been added;
f) requirements for restarting and power-on have been changed.

The text of this International Standard is based on the following documents:

Draft	Report on voting
34/1258/FDIS	34/1281/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

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The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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This document is intended to be used in conjunction with:

- IEC 62386-101, which contains general requirements for system components;
- IEC 62386-102, which contains general requirements for the relevant product type (control gear), and with the appropriate parts of the IEC 62386-2xx series (particular requirements for control gear);
- IEC 62386-103, which contains general requirements for the relevant product type (control devices), and with the appropriate parts of the IEC 62386-3xx series (particular requirements for control devices);
- IEC 62386-104, which contains general requirements for wireless and alternative wired system components.

A list of all parts in the IEC 62386 series, published under the general title *Digital addressable lighting interface*, 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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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INTRODUCTION

IEC 62386 contains several parts, referred to as a series. The IEC 62386 series specifies a bus system for control by digital signals of electronic lighting equipment. The IEC 62386-1xx series includes the basic specifications. IEC 62386-101 contains general requirements for system components, IEC 62386-102 extends this information with general requirements for control gear and IEC 62386-103 extends it further with general requirements for control devices. IEC 62386-104 and IEC 62386-105 can be applied to control gear or control devices. IEC 62386-104 gives requirements for wireless and alternative wired system components. IEC 62386-105 describes firmware transfer. IEC 62386-150 gives requirements for an auxiliary power supply which can be stand-alone, or built into control gear or control devices.

The IEC 62386-2xx series extends the general requirements for control gear with lamp specific extensions (mainly for backward compatibility with Edition 1 of IEC 62386) and with control gear specific features.

The IEC 62386-3xx series extends the general requirements for control devices with input device specific extensions describing the instance types as well as some common features that can be combined with multiple instance types.

This ~~first~~ second edition of IEC 62386-105 is intended to be used in conjunction with IEC 62386-101, IEC 62386-102 and the various parts that make up the IEC 62386-2xx series for control gear, together with IEC 62386-103 and the various parts that make up the IEC 62386-3xx series of particular requirements for control devices. The division into separately published parts provides for ease of future amendments and revisions. Additional requirements will be added as and when a need for them is recognized.

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The setup of the standards is graphically represented in Figure 1 below.

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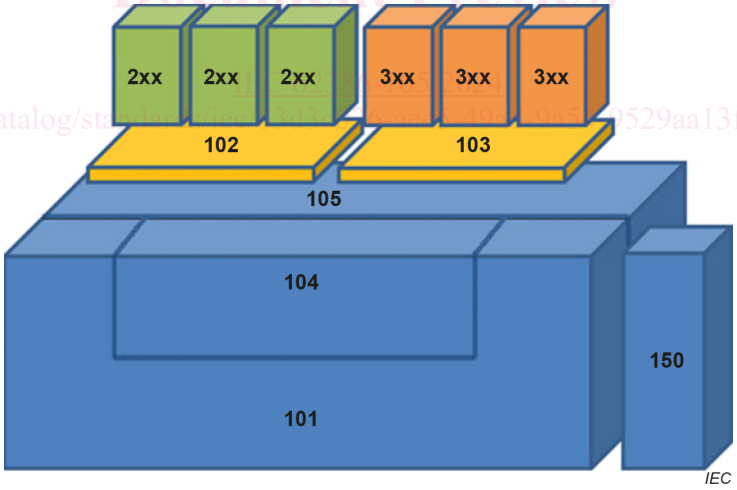

Figure 1 – IEC 62386 graphical overview

When this document refers to any of the clauses of the IEC 62386-1xx series, the extent to which such a clause is applicable ~~and the order in which the tests are to be performed are~~ is specified. The other parts also include additional requirements, as necessary.

All numbers used in this document are decimal numbers unless otherwise noted. Hexadecimal numbers are given in the format 0xVV, where VV is the value. Binary numbers are given in the format XXXXXXXXb or in the format XXXX XXXX, where X is 0 or 1, "x" in binary numbers means "don't care".

The following typographic expressions are used:

Variables: *variableName* or *variableName[3:0]*, giving only bits 3 to 0 of *variableName*;

Range of values: [lowest, highest];

Command: "COMMAND NAME".

Function or command parameters: *parameter name*.

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DIGITAL ADDRESSABLE LIGHTING INTERFACE –

Part 105: Particular requirements for control gear and control devices – Firmware transfer

1 Scope

This part of IEC 62386 applies to control gear and control devices for control by digital signals of electronic lighting equipment.

Typically, a bus unit according to the IEC 62386 series contains firmware. There are circumstances where it ~~might~~ can be necessary to change the firmware after production or shipping of the product, for example if the bus unit does not operate as intended. In such a case, a firmware update of a bus unit via the interface is beneficial.

This firmware update process is primarily designed to be a bug fix process, not a feature extension process. Nevertheless, the firmware update process can be used for feature extensions. But it is important that the risk of negative effects to the complete system be considered in detail.

NOTE Annex D provides a "Firmware update management check sheet" to support risk estimation.

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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 62386-101:~~2014~~2022, *Digital addressable lighting interface – Part 101: General requirements – System components*
~~IEC 62386-101:2014/AMD1:2018~~

IEC 62386-102:~~2014~~2022, *Digital addressable lighting interface – Part 102: General requirements – Control gear*
~~IEC 62386-102:2014/AMD1:2018~~

IEC 62386-103:~~2014~~2022, *Digital addressable lighting interface – Part 103: General requirements – Control devices*
~~IEC 62386-103:2014/AMD1:2018~~

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62386-101, IEC 62386-102, IEC 62386-103 and the following apply.

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

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

3.1
FW
firmware
software programmed into a control gear or control device

Note 1 to entry: Firmware can be changed during an update.

~~Note 1 to entry: This note applies to the French language only.~~

3.2
CRC
cyclic redundancy check
checksum used to prevent data corruption

Note 1 to entry: Annex B provides detailed information about CRC calculation.

3.3
block
unit of data containing information

Note 1 to entry: Information in a firmware update block usually contains firmware content.

3.4
programming
writing firmware transfer data to non-volatile memory (NVM)

3.5
normal operation
operation according to IEC 62386-102 or IEC 62386-103

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4 General

4.1 General

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The requirements of IEC 62386-101:~~2014 and IEC 62386-101:2014/AMD1:2018~~2022, Clause 4 apply, with the restrictions, changes and additions identified below.

NOTE Systems with a single-master application controller are unlikely to operate correctly when other master control devices, such as ~~upgrade~~ firmware update tools, are connected.

~~**4.2 Transmitters and receivers in bus units**~~

~~The requirements of IEC 62386-101:2014 and IEC 62386-101:2014/AMD1:2018, 4.6.1 shall be extended as follows.~~

~~Bus units supporting firmware transfer shall be additionally capable of receiving 32 bit forward frames as specified in IEC 62386-101:2014, 7.4.3 (Reserved forward frame).~~

4.2 Logical units in a bus unit

If the firmware update process is started on a bus unit, all logical units inside the bus unit shall be affected. All variables defined in Table 5 shall be shared by all logical units of the bus unit. Commands addressed to one or more logical units within the bus unit shall be accepted by the bus unit according to the requirements of 9.2.

4.3 Updating control gear for emergency lighting

If IEC 62386-105 is implemented in control gear for emergency lighting, the product manual or data sheet should include guidance on the safety implications of a firmware update that should be considered.

5 Electrical specification

The requirements of IEC 62386-101:~~2014 and IEC 62386-101:2014/AMD1:2018~~2022, Clause 5 apply.

6 ~~Interface~~Bus power supply

The requirements of IEC 62386-101:~~2014 and IEC 62386-101:2014/AMD1:2018~~2022, Clause 6 apply.

7 Transmission protocol structure

7.1 General

The requirements of IEC 62386-101:~~2014~~2022, Clause 7 apply, with the following additions.

7.2 32-bit forward frame encoding

The forward frame format used for firmware update consists of n = 32 data bits as described in IEC 62386-101:~~2014~~2022, 7.4.3 (~~Reserved~~ 32-bit forward frame).

For commands, the 32-bit forward frame ~~for 32 bit frames~~ shall be encoded as shown in Table 1.

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Table 1 – 32-bit command frame encoding

Bytes/Bits											Device addressing method
Address byte								Opcode byte			
								1	2	3	
31	30	29	28	27	26	25	24[a]	23…16	15…8	7…0	
0	64 short addresses						x				Short addressing
1	0	1	1	1	1	0	1				Data transfer command[b]
1	1	0	0	1	0	1	1				Data transfer command[b]
1	1	1	1	1	1	0	x				Broadcast unaddressed
1	1	1	1	1	1	1	x				Broadcast
All other address byte values											Reserved

[a] ~~For bit 24~~ Where bit 24 is shown as "x", 0 indicates address space for control gear, 1 indicates address space for control devices.

[b] See Table 7 for data transfer commands.

8 Timing

The requirements of IEC 62386-101:~~2014 and IEC 62386-101:2014/AMD1:2018~~2022, Clause 8 apply.

9 Method of operation

9.1 General

~~The requirements of IEC 62386-101:2014 and IEC 62386-101:2014/AMD1:2018, 9.8 (Dealing with frames and commands), 9.2 (Transactions) with the exception that the total duration may exceed 400 ms, 9.4 (Command iteration) and 9.6 (Use of multiple bus power supplies) apply.~~

The requirements of IEC 62386-101:2022, Clause 9 apply, with the exception that the total duration of a transaction may exceed 400 ms (IEC 62386-101:2022, 9.3).

9.2 Commands

A bus unit shall check the device addressing scheme to see if it is addressed by a command. The bus unit shall accept the command, unless any of the following conditions hold:

- The command is sent using short address, broadcast addressing or broadcast unaddressed addressing, and bit 24 of the command frame does not match the type of bus unit (control gear or control device).
- The command is sent using short addressing and the given short address is not equal to its short address.
- The command is sent using reserved addressing.
- The command is sent using broadcast unaddressed addressing and the short address is not MASK.
- The command is not defined (e.g. reserved command).

The following command groups can be identified:

- standard commands;
  - instructions;
  - queries;
- data transfer commands.

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9.3 Data transmission

A bus unit receives a new FW block by block. The first block (block 0) contains information about the type of bus unit (see Table 3), which receives a new FW. This avoids transferring the wrong FW to a bus unit if more than one bus unit is updated at a time.

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~~NOTE Annex A provides detailed information about the update file.~~

~~The opcode byte 1 shall be 0xFB for 32-bit standard commands (see Table 6). If the opcode byte 1 in a standard command is not equal to 0xFB, the bus unit shall not accept the standard command.~~

The update file shall contain release notes as described in Annex A.

9.4 Duration of firmware update

A data transmission frame consists of a start bit, a 32-bit data ~~bits~~ transfer command and a stop condition, which occupies the bus for around 30 ms. With a settling time of less than 15 ms ~~(maximum frame priority)~~ (priority 1 settling time), the transmission of three bytes takes less than 45 ms. For an update of 64 ~~kByte~~ kB it is expected to take less than 20 min.

9.5 Security

This document specifies the use of CRC checksums to help ensure error-free transfer of data. In addition, it is recommended that the individual manufacturer ensures firmware image integrity and authenticity, for example by making use of the device key.

9.6 Firmware update features

Each bus unit shall expose its firmware update features as a combination of device properties as given in Table 2.