IEC 62386-302

Edition 1.1 2024-04
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

colour inside

Digital addressable lighting interface –
Part 302: Particular requirements – Input devices – Absolute input devices

IEC 62386-302:2017-05+AMD1:2024-04 CSV(en)

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DIGITAL ADDRESSABLE LIGHTING INTERFACE –

Part 302: Particular requirements – Input devices – Absolute input devices

FOREWORD

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 62386-302 edition 1.1 contains the first edition (2017-05) [documents 34C/1312/FDIS and 34C/1332/RVD] and its amendment 1 (2024-04) [documents 34/1012/CDV and 34/1077A/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 62386-302 has been prepared by subcommittee 34C: Auxiliaries for lamps, of IEC technical committee 34: Lamps and related equipment.

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

This Part 302 of IEC 62386 is intended to be used in conjunction with:

- Part 101, which contains general requirements for system components;
- Part 103, which contains general requirements for control devices.

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 and its amendment 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- withdrawn, or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.

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

IEC 62386 contains several parts, referred to as series. The 1xx series includes the basic specifications. Part 101 contains general requirements for system components, Part 102 extends this information with general requirements for control gear and Part 103 extends it further with general requirements for control devices.

The 2xx parts extend 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 3xx parts extend 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 edition of IEC 62386-302 is intended to be used in conjunction with ~~IEC 62386-101:2014, IEC 62386-101:2014/AMD1:—~~ IEC 62386-101:2022, ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—~~ IEC 62386-103:2022. The division of IEC 62386 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.

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

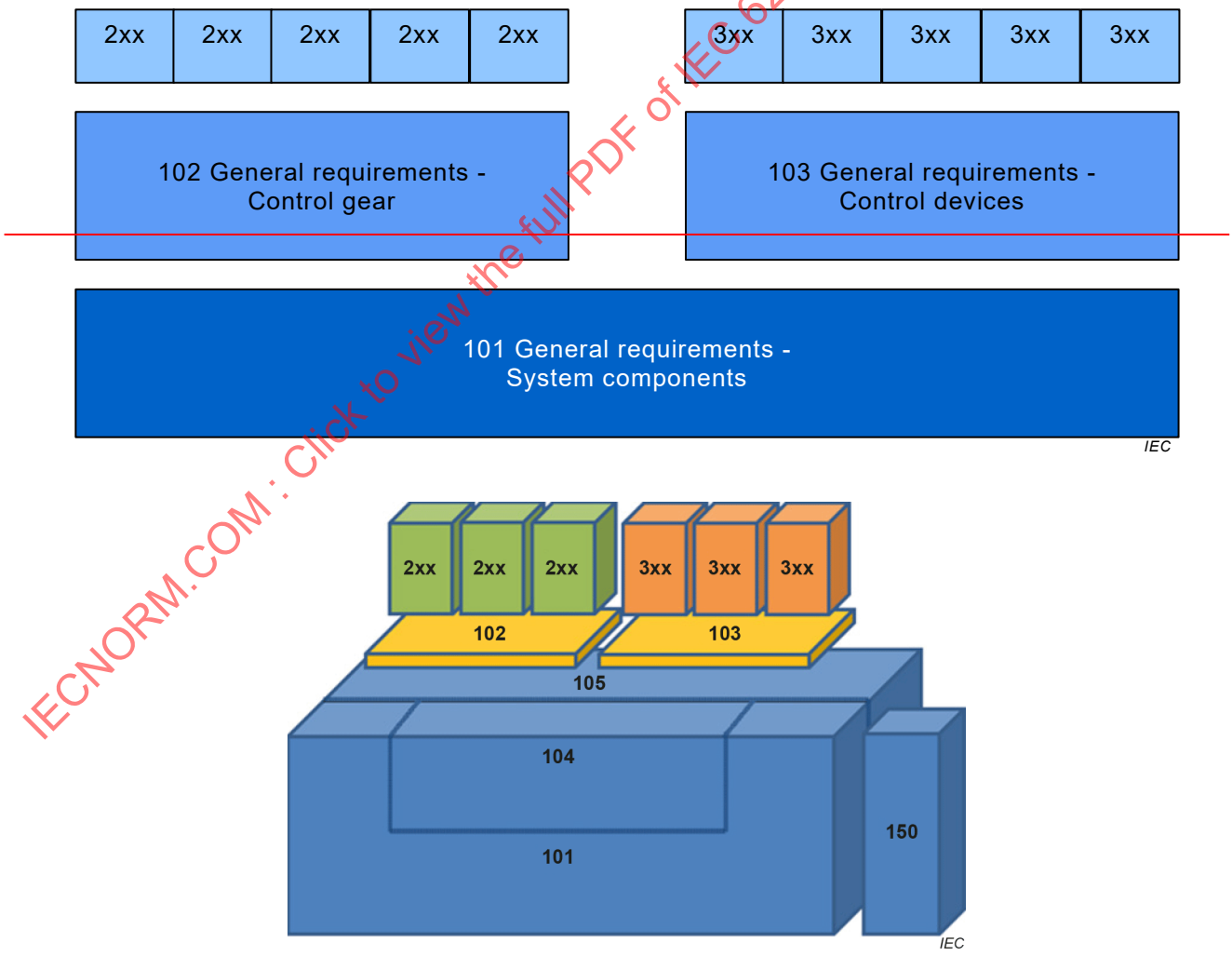

Figure 1 – IEC 62386 graphical overview

This document, and the other parts that make up the IEC 62386-300 series, in referring to any of the clauses of IEC 62386-1XX, specifies the extent to which such a clause is; the parts also include additional requirements, as necessary.

Where the requirements of any of the clauses of IEC 62386-1XX are referred to in this document by the sentence “The requirements of IEC 62386-1XX, Clause “n” apply”, this sentence is to be interpreted as meaning that all requirements of the clause in question of Part 1XX apply, except any which are clearly inapplicable.

The standardization of the control interface for control devices is intended to achieve compatible co-existence and multi-master operation between electronic control gear and lighting control devices, below the level of building management systems. This document describes a method of implementing control devices.

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”

DIGITAL ADDRESSABLE LIGHTING INTERFACE –

Part 302: Particular requirements – Input devices – Absolute input devices

1 Scope

~~This part of IEC 62386 specifies a bus system for control by digital signals of electronic lighting equipment which is in line with the requirements of IEC 61347, with the addition of DC supplies.~~

~~This document is only applicable to IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:— input devices that make the lighting control system sensitive to absolute input devices such as switches or sliders. An absolute input device always has a deterministic state, such as a position between start and end point.~~

~~NOTE Requirements for testing individual products during production are not included.~~

This part of IEC 62386 is applicable to input devices that provide the lighting control system with absolute switch, slider or rotary switch information, such as a position between start and end points.

This document is only applicable to input devices complying with IEC 62386-103:2022.

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:— [1]~~

IEC 62386-103:~~2014~~2022, *Digital addressable lighting interface – Part 103: General requirements – Control devices*
~~IEC 62386-103:2014/AMD1 — [2]~~

IEC 62386-333:~~— [3]~~2018, *Digital addressable lighting interface – Part 333: Particular requirements for control devices – Manual configuration (feature type 33)*

3 Terms and definitions

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

~~[1] Under preparation. Stage at the time of publication: IEC ACDV 62386-101/AMD1:2017.~~

~~[2] Under preparation. Stage at the time of publication: IEC ACDV 62386-103/AMD1:2017.~~

~~[3] Under preparation. Stage at the time of publication: IEC CCDV 62386-333:2017.~~

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
instance
analogue or binary signal processing unit of an input device

[SOURCE: IEC 62386-101:~~2014~~2022, 3.29, modified — addition of “analogue or binary”]

3.2
analogue input
means for the environment to interact with the lighting control system and known to be represented by a specific value relative to the known upper and lower boundary

3.3
binary input
means for the environment to interact with the lighting control system and known to be in open or closed state

3.4
bouncing
tendency of any two contacts in an electronic device to generate multiple signals as the contacts close or open

3.5
debouncing
any kind of hardware device or software that ensures that only a single signal will be acted upon for a single opening or closing of a contact

3.6
slider
means for the end user to interact with a control lighting system and known to be in a specific position

3.7
strictly monotonic
either entirely increasing or decreasing without repeating values

~~Note 1 to entry: Function f defined on a subset of the real numbers with real values is called monotonically increasing, if for all x and y such that $x < y$ one has $f(x) < f(y)$, so f preserves the order. Likewise, a function is called monotonically decreasing if, whenever $x < y$, then $f(x) > f(y)$ so it reverses the order. For this document strictly monotonic is defined as either monotonically increasing or monotonically decreasing.~~

3.8
switch
means for the end user to interact with the lighting control system and known to be in open or closed state

4 General

4.1 General

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—~~ IEC 62386-103:2022, Clause 4 apply, with the restrictions, changes and additions identified below.

4.2 Version number

In 4.2 of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—~~ IEC 62386-103:2022, “103” shall be replaced by “302”, “version number” shall be replaced by “extended version number” and “*versionNumber*” shall be replaced by "*extendedVersionNumber*".

4.3 Insulation

According to ~~IEC 61347-1~~ applicable safety standards, it ~~might~~ can be required that the input device has at least supplementary insulation to accessible parts. This depends on the connected components. ~~In case internal sliders or switches are used, the input device shall have at least supplementary insulation. In case of external connected components, it depends on the requirements imposed on these components.~~ In this case special attention should be paid with respect to the switches, sliders, rotaries or other sensor input components being used.

NOTE ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—~~ IEC 62386-103:2022 requires system components to have at least basic insulation. Sliders and switches are intended to be safely operable by end users.

5 Electrical specification

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—~~ IEC 62386-103:2022, Clause 5 apply.

6 Interface power supply

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—~~ IEC 62386-103:2022, Clause 6 apply.

7 Transmission protocol structure

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—~~ IEC 62386-103:2022, Clause 7 apply.

NOTE Subclause 9.3.3.2 provides detailed event information applicable to instances.

8 Timing

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—~~ IEC 62386-103:2022, Clause 8 apply.

9 Method of operation

9.1 General

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—~~ IEC 62386-103:2022, Clause 9 apply, with the following restrictions and additions.

9.2 Instance type

The instance type (*“instanceType”*) shall be equal to 2.

9.3 Input signal and value

9.3.1 General

"inputValue" is an *N*-byte variable as defined in IEC 62386-103:2022, 9.8.2, and shall reflect the input signal as shown in Table 1.

Table 1 – Relation of input signal and "*inputValue*"

"inputValue" [d]	Slider	Analogue input	Switch or binary input
0x00	Minimum position	Lower boundary value	Open contact
[0x01,2^"*resolution*" - 2] [a]	Position indication, linear between min. and max. position [a]	Linear [b] representation of the value between the upper and lower boundary	Closed contact [c]
[2^"*resolution*" - 1]	Maximum position	Upper boundary value	

[a] Only applicable if "*resolution*" ≥ 2.

[b] Unless specifically stated otherwise.

[c] The maximum value depends on the available positions of the switch with respect to the reported resolution.

[d] For sliders and analogue inputs, this column represents the "*resolution*" most significant bits of "*inputValue*", with the remaining bits in accordance with IEC 62386-103:2022, 9.8.2.

An ~~bouncing~~ input signal shall be adequately debounced to ensure

- a single change of *"inputValue"* reflects the new state of the input signal a maximum of 80 ms from the first change of a bouncing or non-bouncing input signal;
- a single "INPUT NOTIFICATION" event message.

9.3.2 Binary inputs

9.3.2.1 General

For binary inputs the manual/documentation shall clearly state the relationship between "*inputValue*" and the externally applied signal. At least the following parameters shall be specified:

- input signal range that shall be considered to represent an open contact;
- input signal range that shall be considered to represent a closed contact.

9.3.2.2 Switch input

For switch inputs the manual/documentation shall clearly state any particular requirements for the switches that can be connected.

A position change for a switch shall be considered as one action leading to one event at most.

9.3.3 Analogue inputs

9.3.3.1 General

For analogue inputs the manual/documentation shall clearly state the relationship between ~~"*inputValue*"~~ the measured value defined in IEC 62386-103:2022, 9.8.2, and the externally applied signal. At least the following parameters shall be specified:

- input signal that shall be ~~considered to represent the "*inputValue*" (0)~~ represented by a measured value of 0;

- input signal that shall be ~~considered to represent the "*inputValue*"~~ represented by a measured value of ([2^"*resolution*" - 1]);
- the physical limits of the input signal that the analogue input can withstand.

Unless specifically stated otherwise the relationship between the input signal and "*inputValue*" shall be linear.

9.3.3.2 Slider input

For slider inputs the manual/documentation shall clearly state any particular requirements for the sliders that can be connected.

9.4 Events

9.4.1 Priority use

9.4.1.1 General

The default *"eventPriority"* shall be priority 3. Since the application controller needs a timeslot to respond, "*eventPriority*" should not be set to 2.

9.4.1.2 Periodic events

The periodic "INPUT NOTIFICATION" message to report the position event shall always be sent with priority 5.

NOTE This makes "*eventPriority*" inapplicable for this event only.

9.4.2 Bus usage

9.4.2.1 Instance level

Multiple events from an instance shall not be sent in a transaction. There is a configurable delay $T_{deadtime}$ that shall be taken into account. See 9.5.2 for more information.

9.4.2.2 Device level

At the device level, events from different instances may be sent in a transaction.

9.4.3 Encoding

Position events shall be encoded as shown in Table 2.

Table 2 – Position events

Event name	Event information	Description
Position report	*positionEvent*	A position report, passing the actual position along.

For the event information of a binary/switch input see Annex A for possible encodings.

The event information of an analogue/slider input shall be encoded as follows:

- if "*resolution*" ≤ 10: "*positionEvent*" shall be encoded in such a way that the resulting event information is a 10-bit value, according to ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:~~ IEC 62386-103:2022, 9.8.2;
- in all other cases: "*positionEvent*" shall provide the 10 MSB bits of the "*inputValue*".

9.4.4 Event configuration

~~The application controller may not need all the events mentioned in 9.4.3. The instance shall allow the application controller to set the *"eventFilter"* (see IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—, 9.7.4) to inhibit those events that the application controller does not need. For this document, *"eventFilter"* shall be reduced to one byte.~~

Events shall be enabled or disabled according to the value of "*eventFilter*". For this document, "*eventFilter*" shall be reduced to one byte. No configuration of *"eventFilter"* shall prevent the periodic "INPUT NOTIFICATION" message triggered by the report timer (9.5.1).

NOTE Inhibiting events increases the effective bus bandwidth availability.

The *"eventFilter"* shall have the definition as given in Table 3:

Table 3 – Event filter

Bit	Description	Value	Default
0	Position event enabled?	"1" = "Yes"	1
1	Reserved	0	0
2	Reserved	0	0
3	Reserved	0	0
4	Reserved	0	0
5	Reserved	0	0
6	Reserved	0	0
7	Reserved	0	0

The filter can be set via "SET EVENT FILTER (*DTR0*)" and be queried using "QUERY EVENT FILTER 0-7", see ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—~~ IEC 62386-103:2022 for details.

9.4.5 Event generation

An event shall be generated on every change of "*inputValue*" or when the report timer expires.

In case a new event occurs before the current event is being sent the new event shall replace the current event. This could be caused for example by bus unavailability or the deadtime timer.

9.5 Configuring the input device

9.5.1 Using the report timer

If the report timer is set, it shall trigger an event every T_{report} even if the "*inputValue*" has not changed. The report timer shall be restarted every time an event is sent.

The report timer shall be started

- at power-on: if enabled, immediately after the receiver has started up, with the time to the first trigger recommended to be shortened to a random time between 0 s and T_{report} s;
- otherwise immediately after enablement.

This implies that the first "INPUT NOTIFICATION" message due to the report timer is sent at a maximum time of T_{report} after starting. This may be delayed by other "INPUT NOTIFICATION" messages, or by bus availability.

NOTE If multiple devices have the report timer enabled, they might send out conflicting data used by application controllers to control the same control gear. ~~Depending on the application care needs to be taken when enabling the report timer.~~ Application controllers can avoid this problem by enabling only the required report timer(s).

9.5.2 Using the deadtime timer

If the deadtime timer is set, the instance shall not send out an event until the deadtime timer has expired. The deadtime timer shall be restarted every time an event is sent.

9.5.3 Setting the timers

The ~~event~~ deadtime and report timers shall be programmable as is indicated in Table 4.

For each timer, a fixed minimum duration and a fixed increment duration are given. The application controller can set the desired actual timer duration by setting the number of increments to some value in the range [0,255]. The resulting time shall be strictly monotonic according to the following formula:

Time = T_{incr} * *multiplier*

Only on (re-)starting a timer the actual time shall be calculated based on the corresponding variable. This implies that the times only change after any running timer has been cancelled or expired. The tolerance on the time shall be ±5 %.

Table 4 – Event timer setting

Time	Multiplier	Default value	T_{incr}	T_{default}	T_{min}	T_{max}
T_{deadtime}	*"tDeadtime"*	2	50 ms	100 ms	0 s	12,75 s
T_{report}	*"tReport"*	0	1 s	∞ s	1 s	4 min 15 s

The input device shall expose the following operations to set and observe the timer multipliers:

- "SET REPORT TIMER (*DTR0*)", "QUERY REPORT TIMER" to set or query "*tReport*";
- "SET DEADTIME TIMER (*DTR0*)", "QUERY DEADTIME TIMER" to set or query "*tDeadtime*".

"SET REPORT TIMER (*DTR0*)" shall set "*tReport*" depending on the "*DTR0*" value. If "*tReport*" is set to 0, the report timer shall be disabled immediately.

"SET DEADTIME TIMER (*DTR0*)" shall set "*tDeadtime*" depending on "*DTR0*". If "*tDeadtime*" is set to 0, the deadtime timer shall be disabled immediately, but shall not affect T_{report} until the report timer is (re-)started.

If $T_{\text{report}} < T_{\text{deadtime}}$, T_{report} shall be T_{deadtime} (independent of the value of "*tReport*").

9.5.4 Manual configuration

If IEC 62386-333 is implemented, the instance level variables according to Table 5 may be manually configured. QUERY MANUAL CONFIGURATION CAPABILITY 3xx (see IEC 62386-333) shall return the byte as defined in Table 5:

Table 5 – "*manualCapabilityInstance3xx*" values

Bit	Description	Value
0	Manual configuration of "*tReport*" supported	"1" = "Yes"
1	Manual configuration of "*tDeadtime*" supported	"1" = "Yes"
2	Reserved	"0"
3	Reserved	"0"
4	Reserved	"0"
5	Reserved	"0"
6	Reserved	"0"
7	Reserved	"0"

9.6 Exception handling

9.6.1 Manufacturer specific errors

If a manufacturer specific error is detected, the instance shall set *"instanceError"* to TRUE, from the moment the error occurs until the error is gone.

9.6.2 Error value

"instanceError" can be observed via "QUERY INSTANCE STATUS".

While *"instanceError"* is set, "QUERY INSTANCE ERROR" shall return *"instanceErrorByte"* according to Table 6:

Table 6 – "*instanceErrorByte*" values

Bit	Description	Value
0	Reserved	"0"
1	Reserved	"0"
2	Reserved	"0"
3	Reserved	"0"
4	Manufacturer specific error 1?	"1" = "Yes"
5	Manufacturer specific error 2?	"1" = "Yes"
6	Manufacturer specific error 3?	"1" = "Yes"
7	Manufacturer specific error 4?	"1" = "Yes"

If used, the meaning of bits [7:4] of "*instanceErrorByte*" shall be documented in the manual/documentation. The impact on event generation shall also be documented.

10 Declaration of variables

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—~~ IEC 62386-103:2022, Clause 10 apply, with the following considerations.

Table 7 shows additions to the device variables.

Table 7 – Declaration of device variables

Variable	Default value (factory)	Reset value	Power on value	Range of validity	Memory type
"extendedVersionNumber"	2.0	no change	no change	00001000b	ROM

Table 8 shows restrictions to the instance variables.

Table 8 – Restrictions to instance variables defined in ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—~~ IEC 62386-103:2022

Variable	Default value (factory)	Reset value	Power on value	Range of validity	Memory type
"instanceType"	2	no change	no change	2	ROM
"eventFilter"	0000 0001b	0000 0001b	no change	0000 000xb	NVM
"eventPriority"	3	3	no change	[2,5]	NVM
"*instanceConfiguration[x]*"[a]	reserved	reserved	reserved	reserved	reserved
[a] Where *x* is in the range [0,190].					

Table 9 shows additions to the instance variables.

Table 9 – Declaration of instance variables

Variable	Default value (factory)	Reset value	Power on value	Range of validity	Memory type
"instanceErrorByte"	[a]	no change	0[b]	xxxx 0000b	RAM
"tDeadtime"	2	2	no change	[0,255]	NVM
"tReport"	0	0	no change	[0,255]	NVM
[a] Not applicable.					
[b] The value should reflect the actual situation as soon as possible.					

11 Definition of commands

11.1 General

Unused opcodes shall be reserved for future needs.

11.2 Overview sheets

11.2.1 General

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:—~~ IEC 62386-103:2022, 11.2 apply, with the following additions.

11.2.2 Standard commands

Table 10 gives an overview of the additional commands.

Table 10 – Standard commands

Command name	Address byte	Instance byte	Opcode byte	DTR0	DTR1	DTR2	Answer	Send twice	See subclause	Command subclause
SET REPORT TIMER (*DTR0*)	*Device*	*Instance*	0x10	✓				✓	9.5.1	11.8.2
SET DEADTIME TIMER (*DTR0*)	*Device*	*Instance*	0x11	✓				✓	9.5.2	11.8.3
QUERY DEADTIME TIMER	*Device*	*Instance*	0x1D				✓		9.5.2	11.9.3
QUERY REPORT TIMER	*Device*	*Instance*	0x1E				✓		9.5.1	11.9.4
QUERY SWITCH	*Device*	*Instance*	0x1F				✓			11.9.5

11.3 Event messages

11.3.1 INPUT NOTIFICATION (*device/instance, event*)

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:~~ IEC 62386-103:2022, 11.3.1 apply.

Refer to 9.4.3 for an overview of *event* values.

11.3.2 POWER NOTIFICATION (*device*)

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:~~ IEC 62386-103:2022, 11.3.2 apply.

11.4 Device control instructions

The requirements of ~~62386-103:2014 and IEC 62386-103:2014/AMD1:~~ IEC 62386-103:2022, 11.4 apply.

11.5 Device configuration instructions

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:~~ IEC 62386-103:2022, 11.5 apply.

11.6 Device queries

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:~~ IEC 62386-103:2022, 11.6 apply.

11.7 Instance control instructions

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:~~ IEC 62386-103:2022, 11.7 apply.

11.8 Instance configuration instructions

11.8.1 General

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:~~ IEC 62386-103:2022, 11.8 apply, with the following additions and replacements:

11.8.2 SET REPORT TIMER (*DTR0*)

"tReport" shall be set to "*DTR0*".

Refer to 9.5.1 for more information.

11.8.3 SET DEADTIME TIMER (*DTR0*)

"tDeadtime" shall be set to "*DTR0*".

Refer to 9.5.2 for more information.

11.8.4 SET EVENT FILTER (*DTR0*)

"eventFilter" shall be set to *DTR0* if the value is within the valid range. Otherwise, the command shall be ~~ignored~~ discarded.

11.9 Instance queries

11.9.1 General

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:~~ IEC 62386-103:2022, 11.9 apply, with the following additions and replacements:

11.9.2 QUERY INSTANCE ERROR

The detailed error information shall be "*instanceErrorByte*".

Refer to 9.6.1 for more information.

11.9.3 QUERY DEADTIME TIMER

The answer shall be *"tDeadtime"*.

Refer to 9.5.2 for more information.

11.9.4 QUERY REPORT TIMER

The answer shall be *"tReport"*.

Refer to 9.5.1 for more information.

11.9.5 QUERY SWITCH

The answer shall be YES in case the device represents a switch and NO otherwise.

NOTE This query helps the application controller to correctly interpret the values returned, as it is not possible to distinguish a value returned by a switch from a value returned by a slider.

11.10 Special commands

The requirements of ~~IEC 62386-103:2014 and IEC 62386-103:2014/AMD1:~~ IEC 62386-103:2022, 11.10 apply.

Annex A
(normative)

Examples of connecting external switches or sliders

A.1 Single switch

A single external switch shall be connected between the common contact and Contact 1. The resolution for such an input is 1. If the switch is open, the input value shall be 0. If closed, the input value shall be 1. See Figure A.1 below:

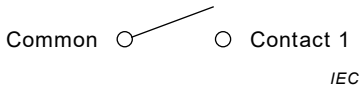

Figure A.1 – Single switch (single-pole, single-throw)

A.2 Single switch, two positions

A single external switch shall be connected between the common contact, Contact 1 and Contact 2. The resolution for such an input is 2. If the switch is in position one, the input value shall be 1. If moved to position two, the input value shall be 2. See Figure A.2 below:

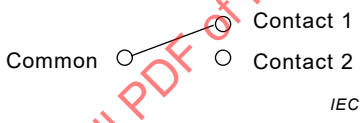

Figure A.2 – Single switch double throw (single-pole, double-throw)

A.3 Single switch with neutral position

A single external switch shall be connected between the common contact, Contact 1 and Contact 2. The resolution for such an input is 2. If the switch is in position one, the input value shall be 1. In the neutral position, the input value shall be 0. If moved to position two, the input value shall be 2. See Figure A.3 below:

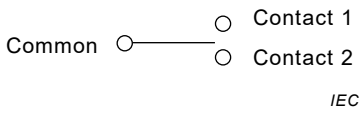

Figure A.3 – Single switch (single-pole, double-throw) with neutral position

A.4 Rotary switch

The central connection from the rotary switch shall be connected to the common contact and each position of the switch shall be connected to its respective contact. This implies that if the switch is moved, after the input is stable, the input value shall have a value corresponding to the current position. The resolution for such an input is x. See Figure A.4 below:

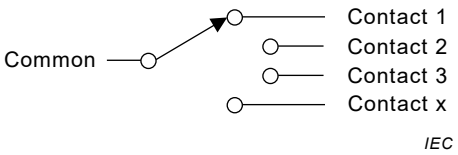

Figure A.4 – Rotary switch

A.5 Slider

An external slider shall be connected between the common contact, reference contact and Contact 1. Contact 1 will represent the changing value of the slider. While moving the slider, the input value shall have a value corresponding with the position. Typically the position of Contact 1 closest to the common contact is considered the minimum position, while Contact 1 closest to the reference contact is considered the maximum position. See Figure A.5 below:

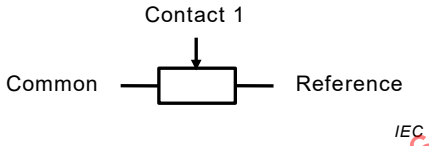

Figure A.5 – Slider

Bibliography

[1] IEC 61347 (all parts), *Lamp controlgear*

[2] IEC 61347-1, *Lamp controlgear – Part 1: General and safety requirements*

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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DIGITAL ADDRESSABLE LIGHTING INTERFACE –

Part 302: Particular requirements – Input devices – Absolute input devices

FOREWORD

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 62386-302 edition 1.1 contains the first edition (2017-05) [documents 34C/1312/FDIS and 34C/1332/RVD] and its amendment 1 (2024-04) [documents 34/1012/CDV and 34/1077A/RVC].

This Final version does not show where the technical content is modified by amendment 1. A separate Redline version with all changes highlighted is available in this publication.

International Standard IEC 62386-302 has been prepared by subcommittee 34C: Auxiliaries for lamps, of IEC technical committee 34: Lamps and related equipment.

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

This Part 302 of IEC 62386 is intended to be used in conjunction with:

- Part 101, which contains general requirements for system components;
- Part 103, which contains general requirements for control devices.

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 and its amendment 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.

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

IEC 62386 contains several parts, referred to as series. The 1xx series includes the basic specifications. Part 101 contains general requirements for system components, Part 102 extends this information with general requirements for control gear and Part 103 extends it further with general requirements for control devices.

The 2xx parts extend 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 3xx parts extend 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 edition of IEC 62386-302 is intended to be used in conjunction with IEC 62386-101:2022, IEC 62386-103:2022. The division of IEC 62386 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.

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

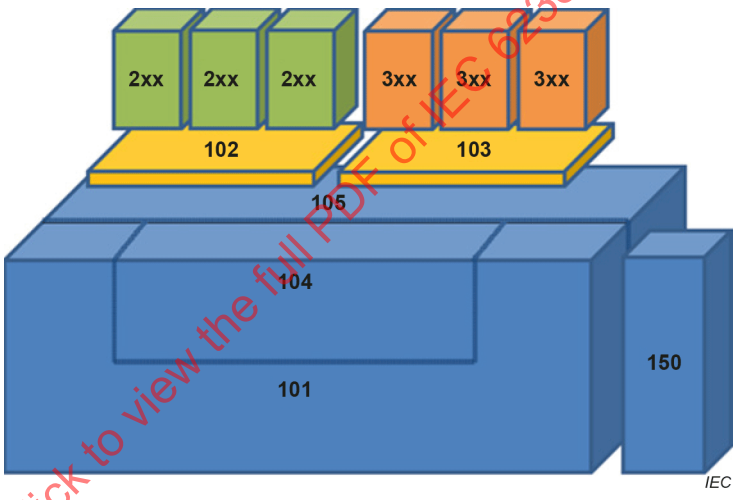

Figure 1 – IEC 62386 graphical overview

This document, and the other parts that make up the IEC 62386-300 series, in referring to any of the clauses of IEC 62386-1XX, specifies the extent to which such a clause is; the parts also include additional requirements, as necessary.

Where the requirements of any of the clauses of IEC 62386-1XX are referred to in this document by the sentence “The requirements of IEC 62386-1XX, Clause “n” apply”, this sentence is to be interpreted as meaning that all requirements of the clause in question of Part 1XX apply, except any which are clearly inapplicable.

The standardization of the control interface for control devices is intended to achieve compatible co-existence and multi-master operation between electronic control gear and lighting control devices, below the level of building management systems. This document describes a method of implementing control devices.

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”

DIGITAL ADDRESSABLE LIGHTING INTERFACE –

Part 302: Particular requirements – Input devices – Absolute input devices

1 Scope

This part of IEC 62386 is applicable to input devices that provide the lighting control system with absolute switch, slider or rotary switch information, such as a position between start and end points.

This document is only applicable to input devices complying with IEC 62386-103:2022.

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 62386-101:2022, *Digital addressable lighting interface – Part 101: General requirements – System components*

IEC 62386-103:2022, *Digital addressable lighting interface – Part 103: General requirements – Control devices*

IEC 62386-333:2018, *Digital addressable lighting interface – Part 333: Particular requirements for control devices – Manual configuration (feature type 33)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62386-101 and IEC 62386-103 and 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
instance
analogue or binary signal processing unit of an input device

[SOURCE: IEC 62386-101:2022, 3.29, modified — addition of “analogue or binary”]

3.2
analogue input
means for the environment to interact with the lighting control system and known to be represented by a specific value relative to the known upper and lower boundary

3.3
binary input
means for the environment to interact with the lighting control system and known to be in open or closed state

3.4
bouncing
tendency of any two contacts in an electronic device to generate multiple signals as the contacts close or open

3.5
debouncing
any kind of hardware device or software that ensures that only a single signal will be acted upon for a single opening or closing of a contact

3.6
slider
means for the end user to interact with a control lighting system and known to be in a specific position

3.7
strictly monotonic
either entirely increasing or decreasing without repeating values

3.8
switch
means for the end user to interact with the lighting control system and known to be in open or closed state

4 General

4.1 General

The requirements of IEC 62386-103:2022, Clause 4 apply, with the restrictions, changes and additions identified below.

4.2 Version number

In 4.2 of IEC 62386-103:2022, “103” shall be replaced by “302”, “version number” shall be replaced by “extended version number” and “*versionNumber*” shall be replaced by "*extendedVersionNumber*".

4.3 Insulation

According to applicable safety standards, it can be required that the input device has at least supplementary insulation to accessible parts. This depends on the connected components. In this case special attention should be paid with respect to the switches, sliders, rotaries or other sensor input components being used.

NOTE IEC 62386-103:2022 requires system components to have at least basic insulation. Sliders and switches are intended to be safely operable by end users.

5 Electrical specification

The requirements of IEC 62386-103:2022, Clause 5 apply.

6 Interface power supply

The requirements of IEC 62386-103:2022, Clause 6 apply.

7 Transmission protocol structure

The requirements of IEC 62386-103:2022, Clause 7 apply.

NOTE Subclause 9.3.3.2 provides detailed event information applicable to instances.

8 Timing

The requirements of IEC 62386-103:2022, Clause 8 apply.

9 Method of operation

9.1 General

The requirements of IEC 62386-103:2022, Clause 9 apply, with the following restrictions and additions.

9.2 Instance type

The instance type (*"instanceType"*) shall be equal to 2.

9.3 Input signal and value

9.3.1 General

"inputValue" is an *N*-byte variable as defined in IEC 62386-103:2022, 9.8.2, and shall reflect the input signal as shown in Table 1.

Table 1 – Relation of input signal and "*inputValue*"

"*inputValue*" [d]	Slider	Analogue input	Switch or binary input
0x00	Minimum position	Lower boundary value	Open contact
[0x01,2^"*resolution*" - 2] [a]	Position indication, linear between min. and max. position [a]	Linear [b] representation of the value between the upper and lower boundary	Closed contact [c]
[2^"*resolution*" - 1]	Maximum position	Upper boundary value	

[a] Only applicable if "*resolution*" ≥ 2.

[b] Unless specifically stated otherwise.

[c] The maximum value depends on the available positions of the switch with respect to the reported resolution.

[d] For sliders and analogue inputs, this column represents the "*resolution*" most significant bits of "*inputValue*", with the remaining bits in accordance with IEC 62386-103:2022, 9.8.2.

An input signal shall be adequately debounced to ensure

- a single change of *"inputValue"* reflects the new state of the input signal a maximum of 80 ms from the first change of a bouncing or non-bouncing input signal;
- a single "INPUT NOTIFICATION" event message.

9.3.2 Binary inputs

9.3.2.1 General

For binary inputs the manual/documentation shall clearly state the relationship between "*inputValue*" and the externally applied signal. At least the following parameters shall be specified:

- input signal range that shall be considered to represent an open contact;
- input signal range that shall be considered to represent a closed contact.

9.3.2.2 Switch input

For switch inputs the manual/documentation shall clearly state any particular requirements for the switches that can be connected.

A position change for a switch shall be considered as one action leading to one event at most.

9.3.3 Analogue inputs

9.3.3.1 General

For analogue inputs the manual/documentation shall clearly state the relationship between the measured value defined in IEC 62386-103:2022, 9.8.2, and the externally applied signal. At least the following parameters shall be specified:

- input signal that shall be represented by a measured value of 0;
- input signal that shall be represented by a measured value of ([2^"*resolution*" - 1]);
- the physical limits of the input signal that the analogue input can withstand.

Unless specifically stated otherwise the relationship between the input signal and "*inputValue*" shall be linear.

9.3.3.2 Slider input

For slider inputs the manual/documentation shall clearly state any particular requirements for the sliders that can be connected.

9.4 Events

9.4.1 Priority use

9.4.1.1 General

The default *"eventPriority"* shall be priority 3. Since the application controller needs a timeslot to respond, "*eventPriority*" should not be set to 2.

9.4.1.2 Periodic events

The periodic "INPUT NOTIFICATION" message to report the position event shall always be sent with priority 5.

NOTE This makes "*eventPriority*" inapplicable for this event only.

9.4.2 Bus usage

9.4.2.1 Instance level

Multiple events from an instance shall not be sent in a transaction. There is a configurable delay $T_{deadtime}$ that shall be taken into account. See 9.5.2 for more information.

9.4.2.2 Device level

At the device level, events from different instances may be sent in a transaction.

9.4.3 Encoding

Position events shall be encoded as shown in Table 2.

Table 2 – Position events

Event name	Event information	Description
Position report	*positionEvent*	A position report, passing the actual position along.

For the event information of a binary/switch input see Annex A for possible encodings.

The event information of an analogue/slider input shall be encoded as follows:

- if "*resolution*" ≤ 10: "*positionEvent*" shall be encoded in such a way that the resulting event information is a 10-bit value, according to IEC 62386-103:2022, 9.8.2;
- in all other cases: "*positionEvent*" shall provide the 10 MSB bits of the "*inputValue*".

9.4.4 Event configuration

Events shall be enabled or disabled according to the value of "*eventFilter*". For this document, "*eventFilter*" shall be reduced to one byte. No configuration of *"eventFilter"* shall prevent the periodic "INPUT NOTIFICATION" message triggered by the report timer (9.5.1).

NOTE Inhibiting events increases the effective bus bandwidth availability.

The *"eventFilter"* shall have the definition as given in Table 3:

Table 3 – Event filter

Bit	Description	Value	Default
0	Position event enabled?	"1" = "Yes"	1
1	Reserved	0	0
2	Reserved	0	0
3	Reserved	0	0
4	Reserved	0	0
5	Reserved	0	0
6	Reserved	0	0
7	Reserved	0	0

The filter can be set via "SET EVENT FILTER (*DTR0*)" and be queried using "QUERY EVENT FILTER 0-7", see IEC 62386-103:2022 for details.

9.4.5 Event generation

An event shall be generated on every change of "*inputValue*" or when the report timer expires.

In case a new event occurs before the current event is being sent the new event shall replace the current event. This could be caused for example by bus unavailability or the deadtime timer.

9.5 Configuring the input device

9.5.1 Using the report timer

If the report timer is set, it shall trigger an event every T_{report} even if the "*inputValue*" has not changed. The report timer shall be restarted every time an event is sent.

The report timer shall be started

- at power-on: if enabled, immediately after the receiver has started up, with the time to the first trigger recommended to be shortened to a random time between 0 s and T_{report} s;
- otherwise immediately after enablement.

This implies that the first "INPUT NOTIFICATION" message due to the report timer is sent at a maximum time of T_{report} after starting. This may be delayed by other "INPUT NOTIFICATION" messages, or by bus availability.

NOTE If multiple devices have the report timer enabled, they might send out conflicting data used by application controllers to control the same control gear. Application controllers can avoid this problem by enabling only the required report timer(s).

9.5.2 Using the deadtime timer

If the deadtime timer is set, the instance shall not send out an event until the deadtime timer has expired. The deadtime timer shall be restarted every time an event is sent.

9.5.3 Setting the timers

The deadtime and report timers shall be programmable as is indicated in Table 4.

For each timer, a fixed minimum duration and a fixed increment duration are given. The application controller can set the desired actual timer duration by setting the number of increments to some value in the range [0,255]. The resulting time shall be strictly monotonic according to the following formula:

Time = T_{incr} * *multiplier*

Only on (re-)starting a timer the actual time shall be calculated based on the corresponding variable. This implies that the times only change after any running timer has been cancelled or expired. The tolerance on the time shall be ±5 %.

Table 4 – Event timer setting

Time	Multiplier	Default value	T_{incr}	$T_{default}$	T_{min}	T_{max}
$T_{deadtime}$	*"tDeadtime"*	2	50 ms	100 ms	0 s	12,75 s
T_{report}	*"tReport"*	0	1 s	∞ s	1 s	4 min 15 s

The input device shall expose the following operations to set and observe the timer multipliers:

- "SET REPORT TIMER (*DTR0*)", "QUERY REPORT TIMER" to set or query "*tReport*";
- "SET DEADTIME TIMER (*DTR0*)", "QUERY DEADTIME TIMER" to set or query "*tDeadtime*".

"SET REPORT TIMER (*DTR0*)" shall set "*tReport*" depending on the "*DTR0*" value. If "*tReport*" is set to 0, the report timer shall be disabled immediately.