IEC 62386-306

Edition 1.0 2023-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Digital addressable lighting interface – Part 306: Particular requirements – Input devices – General purpose sensor

Interface d'éclairage adressable numérique – Partie 306: Exigences particulières – Dispositifs d'entrée – Capteur à usage général

IEC 62386-306:2023-12(en-fr)

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FOREWORD

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IEC 62386-306 has been prepared by IEC technical committee 34: Lighting. It is an International Standard.

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

Draft	Report on voting
34/1132/FDIS	34/1146/RVD

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

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

This document has been drafted in accordance with the 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/standardsdev/publications.

This document is intended to be used in conjunction with:

- IEC 62386-101, which contains general requirements for system components;
- IEC 62386-103, 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 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- withdrawn, or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 document 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

The IEC 62386 series specifies a bus system for control by digital signals of electronic lighting equipment and contains several parts, referred to as series. 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 edition of IEC 62386-306 is intended to be used in conjunction with IEC 62386-101 and IEC 62386-103. 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.

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

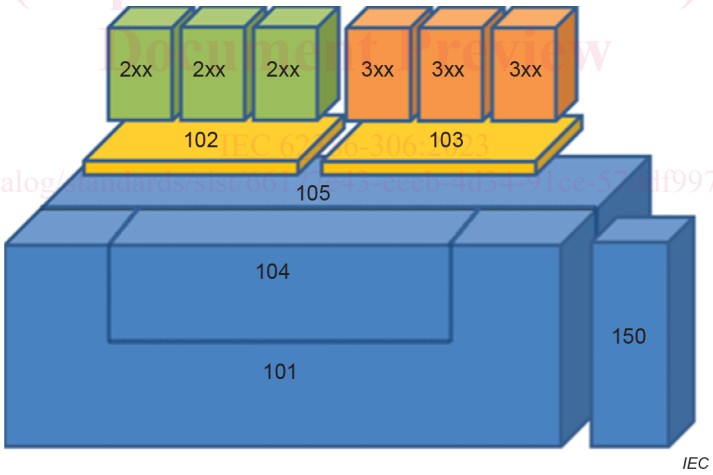

Figure 1 – IEC 62386 graphical overview

When this part of IEC 62386 refers to any of the clauses of the parts of the IEC 62386-1xx series, the extent to which such a clause is applicable 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". Where a variable is referred by a bit number, bit 0 is the least significant bit.

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 306: Particular requirements – Input devices – General purpose sensor

1 Scope

This part of IEC 62386 is applicable to input devices that provide sensor information or measurements to the lighting control system.

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

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 terminology 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
sensor signal processing unit of an input device

[SOURCE: IEC 62386-101:2022, 3.29, modified – "sensor" has been added, narrowing the definition to a sensor.]

3.2
strictly monotonic
either entirely increasing or decreasing without repeating values

3.3
unit of measurement
real scalar quantity, defined and adopted by convention, with which any other quantity of the same kind can be compared to express the ratio of the second quantity to the first one as a number

Note 1 to entry: A sensor detecting a temperature of 26 °C would have a unit of measurement designated as degrees Celsius.

[SOURCE: IEC 60050-112:2010, 112-01-14, modified – Note 1 to entry has been deleted and Notes 2, 3 and 4 to entry have been replaced by a new Note 1 to entry.]

3.4
quantity name
term designating a property of a phenomenon, body, or substance, where the property has a magnitude that can be expressed by means of a number and a reference

Note 1 to entry: A sensor detecting a temperature of 26 °C would have a quantity name defined as temperature.

[SOURCE: IEC 60050-112:2019, 112-01-01 and 112-01-02, modified – The two definitions have been combined and the Notes to entry have been replaced with a new Note 1 to entry.]

4 General

4.1 General requirements

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

4.2 Version number

In IEC 62386-103:2022, 4.2, "103" shall be replaced by "306", "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 sensor(s) being used.

NOTE IEC 62386-103:2022 requires system components to have at least basic insulation.

5 Electrical specification

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

6 Bus 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 9.4 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 6.

9.3 Input signal and value

9.3.1 Input value

The measured input signal shall be scaled and an offset applied for bipolar inputs, with *"measuredValue"* containing the result with a precision of *"resolution"* bits. *"measuredValue"* shall be encoded in "*inputValue*" as described in IEC 62386-103:2022, 9.8.2.

NOTE 1 *"measuredValue"* has *"resolution"* bits, whereas *"inputValue"* has a multiple of 8 bits. For example if *"resolution"* = 27 then *"measuredValue"* will be a 27-bit value and *"inputValue"* will be a 32-bit value.

The input signal shall be scaled by the variable *"magnitude"*:

$$\text{scaled input signal} = \text{input signal}/10^{"magnitude" - 127}$$

An offset, K, is added to the scaled input signal, depending on the range of the input signal (see 9.3.3). K shall be calculated as follows:

- for bipolar input signals: $K = 2^{"resolution" - 1} - 1$,
- in all other cases: $K = 0$.

This gives:

$$"measuredValue" = \text{input signal}/10^{"magnitude" - 127} + K$$

The resulting *"measuredValue"* shall be a strictly monotonic function of the input signal. Units of measure are listed in Clause A.1, and quantity names are listed in Clause A.2.

NOTE 2 The measured value can be a relative value, depending on the quantity and unit of measure.

EXAMPLE The following example demonstrates the encoding: A sensor has *"resolution"* = 5, *"magnitude"* = 128 and measures input voltages that can extend to negative values. An input signal of −50 V is measured. Scaled input signal = $-50/10^{128 - 127} = -5$. Offset K = 15 is added to this, giving a *"measuredValue"* of 10 (01010b). This has a resolution of 5, so these 5 bits make up the top 5 bits of the 1-byte "*inputValue*" and are repeated in the 3 least significant bits of *"inputValue"*, resulting in 82 (01010010b). When encoding into a 9-bit measurement event (Table 1), this will be encoded as 512 + 165 (1010100101b) (Bit 9 = 1 indicating a measurement event.)

Annex B gives guidance for application controller developers in calculating the measured signal from the *"inputValue"* and other variables.

9.3.2 Sensor start-up and invalid measurements

After the receiver start-up, it can take the sensor some time before valid measurements are obtained. During this time, *"inputValue"* shall be MASK. After the first valid measurement is obtained, *"inputValue"* shall not be MASK, except in the case of physical sensor failure (see 9.6.1). When *"inputValue"* is MASK, *"measuredValue"* shall not change, meaning it shall stay at the power-on value, or the last valid measured value.

The following are examples of *"inputValue"* MASK values and highest valid values, for several values of "*resolution*":

- *"resolution"* = 4: *"inputValue"* is a 1-byte value
  - MASK is 0xFF, resulting in a QUERY INPUT VALUE reply of 0xFF.
  - After applying the scale and offset, the highest possible *"measuredValue"* is 0xE, which results in the 1-byte *"inputValue"* of 0xEE.
- *"resolution"* = 9: *"inputValue"* is a 2-byte value
  - MASK is 0xFFFF, resulting in a QUERY INPUT VALUE reply of 0xFF and a QUERY INPUT VALUE LATCH reply of 0xFF.
  - After applying the scale and offset, the highest possible *"measuredValue"* is 0x1FE, which results in the 2-byte *"inputValue"* of 0xFF7F.
- *"resolution"* = 18: *"inputValue"* is a 3-byte value
  - MASK is 0xFFFFFF, resulting in a QUERY INPUT VALUE reply of 0xFF and replies of 0xFF for each of the two QUERY INPUT VALUE LATCH commands sent after QUERY INPUT VALUE.
  - After applying the scale and offset, the highest possible *"measuredValue"* is 0x3FFFE, which results in the 3-byte *"inputValue"* of 0xFFFFBF.

9.3.3 Input signal range

To indicate an input signal that can extend into negative values as well as positive values, a Boolean factory programmed instance variable *"inputSignalSigned"* shall be maintained by the instance.

- if the input signal can be negative or positive, *"inputSignalSigned"* = 1 (TRUE), and K > 0;
- if the input signal can be positive only, *"inputSignalSigned"* = 0 (FALSE), and K = 0;

where K is the offset described in 9.3.1.

"inputSignalSigned" can be queried via QUERY MEASUREMENT VARIABLE (*DTR0*).

9.3.4 Minimum and maximum input values

On each change of *"measuredValue"*, the following shall be recalculated:

- If *"measuredValue"* > *"maxMeasuredValue"*, then *"maxMeasuredValue"* shall be set to *"measuredValue"*.
- If *"measuredValue"* < *"minMeasuredValue"*, then *"minMeasuredValue"* shall be set to *"measuredValue"*.

Querying of *"maxMeasuredValue"* and *"minMeasuredValue"* is described in 11.9.8.

9.3.5 Measurement accuracy

Measurement accuracy is manufacturer-specific and shall be stated in the product documents.