

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Digital addressable lighting interface –
Part 206: Particular requirements for control gear – Conversion from digital
signal into d. c. voltage (device type 5)**

**Interface d'éclairage adressable numérique –
Partie 206: Exigences particulières pour les appareillages de commande –
Conversion du signal numérique en tension continue (dispositifs de type 5)**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

DIGITAL ADDRESSABLE LIGHTING INTERFACE –**Part 206: Particular requirements for control gear –
Conversion from digital signal into d. c. voltage
(device type 5)**

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International Standard IEC 62386-206 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/820/CDV	34C/841/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.

This Part 206 is intended to be used in conjunction with IEC 62386-101 and IEC 62386-102, which contain general requirements for the relevant product type (control gear or control devices).

A list of all parts of the IEC 62386 series, under the general title: *Digital addressable lighting interface*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,
- replaced by a revised edition, or
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INTRODUCTION

This first edition of IEC 62386-206 is published in conjunction with IEC 62386-101 and IEC 62386-102. 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.

This International Standard, and the other parts that make up the IEC 62386-200 series, in referring to any of the clauses of IEC 62386-101 or IEC 62386-102, specify the extent to which such a clause is applicable and the order in which the tests are to be performed; The parts also include additional requirements, as necessary. All parts that make up the IEC 62386-200 series are self-contained and therefore do not include references to each other.

Where the requirements of any of the clauses of IEC 62386-101 or IEC 62386-102 are referred to in this International Standard 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 101 or Part 102 apply, except any which are inapplicable to the specific type of lamp control gear covered by Part 206.

All numbers used in this International Standard 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".

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DIGITAL ADDRESSABLE LIGHTING INTERFACE –

Part 206: Particular requirements for control gear – Conversion from digital signal into d. c. voltage (device type 5)

1 Scope

This International Standard specifies a protocol and test methods for the control by digital signals of electronic control gear, associated with the conversion from digital signal into d.c. voltage.

2 Normative references

The following referenced documents are indispensable for the application 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 62386-101:2009, *Digital addressable lighting interface – Part 101: General requirements – System*

IEC 62386-102:2009, *Digital addressable lighting interface – Part 102: General requirements – Control gear*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in Clause 3 of IEC 62386-101:2009 and Clause 3 of IEC 62386-102:2009 apply.

4 General description

The requirements of Clause 4 of IEC 62386-101:2009 and Clause 4 of IEC 62386-102:2009 shall apply.

5 Electrical specifications

The requirements of Clause 5 of IEC 62386-101:2009 and Clause 5 of IEC 62386-102:2009 shall apply.

6 Interface power supply

The requirements of Clause 6 of IEC 62386-101:2009 and Clause 6 of IEC 62386-102:2009 shall apply if a power supply is integrated with the control gear.

7 Transmission protocol structure

The requirements of Clause 7 of IEC 62386-101:2009 and Clause 7 of IEC 62386-102:2009 shall apply.

8 Timing

The requirements of Clause 8 of IEC 62386-101:2009 and Clause 8 of IEC 62386-102:2009 shall apply.

9 Method of operation

The requirements of Clause 9 of IEC 62386-101:2009 and Clause 9 of IEC 62386-102:2009 shall apply, with the following exception:

Addition to Clause 9 of IEC 62386-102:2009:

9.9 Changing of physical min level

Changing the physical minimum level shall force the minimum level and maximum level to be in a valid range.

If operating with the logarithmic dimming curve, the PHYSICAL MIN LEVEL can be adjusted to allow the minimum arc power level of connected control gear to be matched to the logarithmic dimming curve of 9.1 of IEC 62386-102:2009.

A control gear with physical minimum arc power level of X %, requires the “PHYSICAL MIN LEVEL” to be set as follows:

$$n = \frac{253}{3} (\log_{10} X + 1) + 1$$

where n should be rounded to the nearest integer (1 to 253) and stored as “PHYSICAL MIN LEVEL”.

If operating with a linear dimming curve, the PHYSICAL MIN LEVEL can be adjusted to allow the minimum arc power level of connected control gear to be matched to the linear curve as described below.

Control gear with physical minimum arc power level of X %, requires the “PHYSICAL MIN LEVEL” to be set as follows:

$$n = \frac{253}{99,9} (X - 0,1) + 1$$

Where n should be rounded to the nearest integer (1 to 253) and stored as “PHYSICAL MIN LEVEL”.

If the arc power level is 0 (OFF), the output voltage shall be 0 V (0 V – 10 V mode) or 1 V (1 V – 10 V mode). If the control gear contains an output switch, this shall be on except when arc power level is 0 (OFF).

10 Declaration of variables

The requirements of Clause 10 of IEC 62386-101:2009 and Clause 10 of IEC 62386-102:2009 shall apply, with the following additional variables for this device type, indicated in Table 1.

Table 1 – Declaration of variables

Variable	Default value (control gear leaves the factory)	Reset value	Range of validity	Memory ^a
"DIMMING CURVE"	0	No change	0–1; (2–255 reserved)	1 byte
"CONVERTER FEATURES"	"factory burn-in"	No change	0–255	1 byte ROM
"FAILURE STATUS"	0000 0000 ^b	No change	0–255	1 byte RAM
"CONVERTER STATUS"	0000 0000	No change	0–255	1 byte
"EXTENDED VERSION NUMBER"	1	No change	0–255	1 byte ROM
"DEVICE TYPE"	5	No change	0–254, 255 ("MASK")	1 byte ROM
"PHYSICAL MIN LEVEL"	1	No change	1–253	1 byte
^a Persistent memory (storage time indefinite) if not stated otherwise. ^b Power-up value.				

11 Definition of commands

The requirements of Clause 11 of IEC 62386-101:2009 and Clause 11 of IEC 62386-102:2009 shall apply, with the following exceptions:

Amendment of Clause 11 of IEC 62386-102:2009
IEC 62386-206:2009
<https://standards.itec.org/en/standards/iec-62386-206-2009>
<https://standards.itec.org/en/standards/iec-62386-206-2009>

11.3.1 Queries related to status information

Amendment:

Command 146: YAAA AAA1 1001 0010 "QUERY LAMP FAILURE"

Ask if there is an analog output problem at the given address. The answer shall be "Yes" or "No".

"Yes" means the analog output is not at the correct level. "No" does not necessarily mean that no lamps have failed.

If the answer is "Yes", the lamp failure bit (see Command 144 "QUERY STATUS") shall also be set.

Command 153: YAAA AAA1 1001 1001 "QUERY DEVICE TYPE"

The answer shall be 5.

Application extended commands shall be preceded by command 272 "ENABLE DEVICE TYPE 5". A control gear acting as a converter to 1 V – 10 V signals shall not react to application extended commands preceded by command 272 "ENABLE DEVICE TYPE X" with X ≠ 5.

NOTE For device types other than 5, these commands may be used in a different way.

11.3.4 Application extended commands

Replacement:

11.3.4.1 Application extended configuration commands

Every configuration command (224–230) shall be received a second time within 100 ms before it is executed in order to reduce the probability of incorrect reception. No other commands addressing the same control gear shall be sent between these two commands, otherwise the first such command shall be ignored and the respective configuration sequence aborted.

Command 272 should be sent before the two instances of the respective control command, but not repeated between them (see Figure 1).

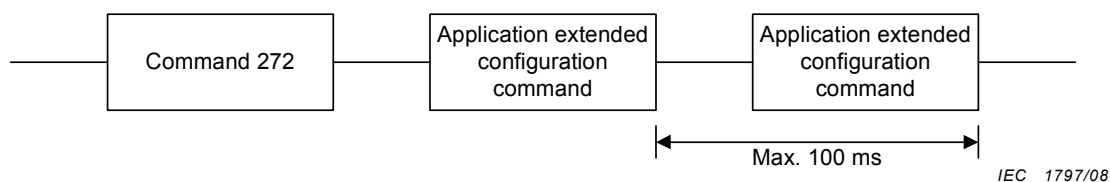


Figure 1 – Application extended configuration command sequence example

All values of DTR shall be checked against the values mentioned in Clause 10, RANGE OF VALIDITY. The value shall be set to the upper / lower limit if it is above / below the valid range defined in Clause 10.

Command 224: YAAA AAA1 1110 0000 "SET OUTPUT RANGE TO 1 V – 10V"

This command sets the output range to 1 V – 10 V.

Converters without this feature shall not react.

Command 225: YAAA AAA1 1110 0001 "SET OUTPUT RANGE TO 0–10V"

This command sets the output range to 0 V – 10 V.

Converters without this feature shall not react.

Command 226: YAAA AAA1 1110 0010 "SWITCH ON INTERNAL PULL-UP"

The internal pull-up of the control voltage output shall be switched on.

The electrical specification of the internal pull-up shall be defined by the converter manufacturer. Converters without this feature shall not react.

Command 227: YAAA AAA1 1110 0011 "SWITCH OFF INTERNAL PULL-UP"

Switch off the internal pull-up.

Converters without this feature shall not react.

Command 228: YAAA AAA1 1110 0100 "STORE DTR AS PHYSICAL MINIMUM"

The physical minimum level shall be changed to the value given in the DTR.

Command 229: YAAA AAA1 1110 0101 "SELECT DIMMING CURVE"

The dimming curve of the control gear shall be set according to the value of DTR.

DTR = 0 shall set the converter to a curve which, in 1–10 V mode, when operated with a specified manufacturer's 1 V – 10 V control gear, maintains the standard logarithmic curve between the arc power level and light level (9.1 de la IEC 62386-102:2009). This logarithmic curve may also be used with a 0 V – 10 V output range, again resulting in the standard

logarithmic curve between the arc power level and light level for a specified manufacturer's 0–10 V product.

DTR = 1 sets the dimming curve to linear. In this case, the output voltage shall be a linear function of the level given by any of the arc power control commands according to the formulae:

$$V_{\text{out}} = 10 \left(\frac{n - P_{\text{min}}}{254 - P_{\text{min}}} \right) \quad \text{[volts] for 0–10 V linear mode}$$

$$V_{\text{out}} = 1 + 9 \left(\frac{n - P_{\text{min}}}{254 - P_{\text{min}}} \right) \quad \text{[volts] for 1–10 V linear mode}$$

where

V_{out} is the converter output voltage;

n is the requested arc power level [range $P_{\text{min}} - 254$];

P_{min} is the physical minimum level.

If n is 0, the output shall be 0 V (0–10V mode) or 1 V (1–10V mode).

All other values of DTR are reserved for future dimming curves and shall not change the setting.

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This setting shall be retained in non-volatile memory, and shall not be cleared by a RESET command.

[IEC 62386-206:2009](#)

[https://standards.iteh.ai/catalog/standards/sist/a526b8a9-1d74-4c2e-b07b-](https://standards.iteh.ai/catalog/standards/sist/a526b8a9-1d74-4c2e-b07b-4ca27559627c-62386-206-2009)

Converters without this feature shall not react.

Command 230: YAAA AAA1 1110 0110 "RESET CONVERTER SETTINGS"

All converter settings not influenced by the RESET command shall be reset to the default values given in Clause 10.

Command 231: YAAA AAA1 1110 0111

Reserved for future needs. The control gear shall not react in any way.

Commands 232–235: YAAA AAA1 1110 10XX

Reserved for future needs. The control gear shall not react in any way.

Commands 236–237: YAAA AAA1 1110 110X

Reserved for future needs. The control gear shall not react in any way.

11.3.4.2 Application extended query commands

Command 238: YAAA AAA1 1110 1110 "QUERY DIMMING CURVE"

The answer shall be the dimming curve currently in use:

0 = standard logarithmic;

1 = linear;

2–255 = reserved for future use.

Command 239: YAAA AAA1 1110 1111 "QUERY OUTPUT LEVEL"

The answer shall be the analog output level in units of 0,04 V, giving a range of 0 V to 10,16 V.

254 = 10,16 V or greater.

255 = the output level is not known.

Converters without this feature shall not react.

Command 240: YAAA AAA1 1111 0000 "QUERY CONVERTER FEATURES"

The answer shall be the following "CONVERTER FEATURES" byte:

bit 0	0 V – 10 V output selectable;	"0" = No
bit 1	Internal pull-up selectable;	"0" = No
bit 2	Detection of output fault supported;	"0" = No
bit 3	The gear contains a mains relay for power switching;	"0" = No
bit 4	Output level can be queried;	"0" = No
bit 5	Non-logarithmic dimming curve supported;	"0" = No
bit 6	Physical selection / lamp fail detection by loss of output supported;	"0" = No
bit 7	Physical selection switch supported;	"0" = No

"Physical selection by loss of output" occurs when the converter is in physical selection mode, is using the 1 V – 10 V operating range, its internal pull-up is disabled, and the measured output voltage is below 0,75 V. If the converter is not in all of these modes, the physical selection state shall not be triggered as a result of the measured output being below 0,75 V.

NOTE This allows physical selection on some 1 V – 10 V ballasts, by electrically disconnecting the lamp after the converter receives command 270 "PHYSICAL SELECTION". For this feature to operate, the converter needs to have its own internal pull-up disabled.

Command 241: YAAA AAA1 1111 0001 "QUERY FAILURE STATUS"

The answer shall be the following "FAILURE STATUS" byte:

bit 0	Output fault detected;	"0" = No
bit 1	Reserved	"0" = default value
bit 2	Reserved	"0" = default value
bit 3	Reserved	"0" = default value
bit 4	Reserved	"0" = default value
bit 5	Reserved	"0" = default value
bit 6	Reserved	"0" = default value
bit 7	Reserved	"0" = default value

The "QUERY FAILURE STATUS" byte shall be updated regularly by the converter according to the actual situation.

Command 242: YAAA AAA1 1111 0010 "QUERY CONVERTER STATUS"

The answer shall be the following "CONVERTER STATUS" byte:

bit 0	0 V – 10 V operation;	"0" = No
bit 1	Internal pull-up ON;	"0" = No
bit 2	Non-logarithmic dimming curve active	"0" = No
bit 3	Reserved	"0" = default value

bit 4 Reserved
bit 5 Reserved
bit 6 Reserved
bit 7 Reserved

"0" = default value
"0" = default value
"0" = default value
"0" = default value

Command 243: YAAA AAA1 1111 0011

Reserved for future needs. The control gear shall not react in any way.

Commands 244–247: YAAA AAA1 1111 01XX

Reserved for future needs. The control gear shall not react in any way.

Commands 248–251: YAAA AAA1 1111 10XX

Reserved for future needs. The control gear shall not react in any way.

Commands 252–253: YAAA AAA1 1111 110X

Reserved for future needs. The control gear shall not react in any way.

Command 254: YAAA AAA1 1111 1110

Reserved for future needs. The control gear shall not react in any way.

Command 255: YAAA AAA1 1111 1111 "QUERY EXTENDED VERSION NUMBER"

The answer shall be 1.

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11.4.4 Extended special commands

Amendment: <https://standards.iteh.ai/catalog/standards/sist/a526b8a9-1d74-4c2e-b07b-4fca2753982/iec-62386-206-2009>
IEC 62386-206:2009

Command 272: 1100 0001 0000 0101 "ENABLE DEVICE TYPE 5"

The device type for converters to DC control voltage is 5.

11.5 Summary of the command set

Addition:

Table 2 shows the summary of the application extended command set specified in this standard.

Table 2 – Summary of the application extended command set

Command number	Command code	Command name
224	YAAA AAA1 1110 0000	SET OUTPUT RANGE TO 1–10V
225	YAAA AAA1 1110 0001	SET OUTPUT RANGE TO 0–10V
226	YAAA AAA1 1110 0010	SWITCH ON INTERNAL PULL-UP
227	YAAA AAA1 1110 0011	SWITCH OFF INTERNAL PULL-UP
228	YAAA AAA1 1110 0100	STORE DTR AS PHYSICAL MINIMUM
229	YAAA AAA1 1110 0101	SELECT DIMMING CURVE
230	YAAA AAA1 1110 0110	RESET CONVERTER SETTINGS
231	YAAA AAA1 1110 0111	^a
232–235	YAAA AAA1 1110 10XX	^a
236–237	YAAA AAA1 1110 110X	^a
238	YAAA AAA1 1110 1110	QUERY DIMMING CURVE
239	YAAA AAA1 1110 1111	QUERY OUTPUT LEVEL
240	YAAA AAA1 1111 0000	QUERY CONVERTER FEATURES
241	YAAA AAA1 1111 0001	QUERY FAILURE STATUS
242	YAAA AAA1 1111 0010	QUERY CONVERTER STATUS
243	YAAA AAA1 1111 0011	^a
244–247	YAAA AAA1 1111 01XX	^a
248–251	YAAA AAA1 1111 10XX	^a
252–253	YAAA AAA1 1111 110X	^a
254	YAAA AAA1 1111 1110	^a
255	YAAA AAA1 1111 1111	QUERY EXTENDED VERSION NUMBER
272	1100.0001.0000.0101	ENABLE DEVICE TYPE 5-

^a Reserved for future needs. The control gear shall not react in any way.

12 Test procedures

The requirements of Clause 12 of IEC 62386-102:2009 shall apply, with the following exceptions:

12.4 Test sequence “Physical address allocation”

Amendment:

Only control gear supporting this feature shall be tested.

Additional subclause:

12.7 Test sequences “APPLICATION EXTENDED COMMANDS FOR DEVICE TYPE 5”

The application extended commands defined for device type 5 shall be tested using the following test sequences. The sequences also check for possible reaction of the commands on other device types.

12.7.1 Test sequence “APPLICATION EXTENDED COMMANDS”

The following test sequences check the application extended commands 224 to 230, 238 to 242, and command 255.