

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Digital addressable lighting interface –
Part 207: Particular requirements for control gear – LED modules (device type 6)**

**Interface d'éclairage adressable numérique –
Partie 207: Exigences particulières pour les appareillages de commande –
Modules de DEL (dispositifs de type 6)**



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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX



ICS 29.140.50; 29.140.99

ISBN 978-2-88910-693-6

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DIGITAL ADDRESSABLE LIGHTING INTERFACE –

**Part 207: Particular requirements for control gear –
LED modules (device type 6)**

FOREWORD

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International Standard IEC 62386-207 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:

FDIS	Report on voting
34C/888/FDIS	34C/892/RVD

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 207 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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INTRODUCTION

This first edition of IEC 62386-207 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 recognised.

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 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 207.

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'.

DIGITAL ADDRESSABLE LIGHTING INTERFACE –

Part 207: Particular requirements for control gear – LED modules (device type 6)

1 Scope

This International Standard specifies a protocol and test procedures for the control by digital signals of electronic control gear for use on a.c. or d.c. supplies, associated with LED modules.

NOTE Tests in this standard are type tests. Requirements for testing individual control gear during production are not included.

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 shall apply, with the following additional definitions.

3.1 reference measurement

process during which control gear determines the actual LED load with internal procedures and measurements

NOTE The details of this process are a matter of detailed design of control gear and are outside the scope of this standard.

3.2 detection of load decrease

recognition that the actual LED load is significantly below the load measured during a successful “reference measurement”

NOTE The criteria for regarding a load increase or decrease as significant can only be decided by the manufacturer and these criteria should be described in the manual.

3.3 detection of load increase

recognition that the actual LED load is significantly above the load measured during a successful “reference measurement”

NOTE The criteria for regarding a load increase or decrease as significant can only be decided by the manufacturer and these criteria should be described in the manual.

3.4 current protector

protective device switching off the output if the actual LED load differs by more than ΔP from the load detected during the “reference measurement”

NOTE The value ΔP can only be specified by the manufacturer of the control gear and this value should be stated in the manual.

3.5 thermal overload

scenario where the maximum permissible control gear temperature is exceeded

3.6 thermal shut down

scenario where control gear switches off the LED because of a persistent thermal overload

3.7 light level reduction due to thermal overload

reduction of light level with the objective of decreasing control gear temperature

4 General

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

5 Electrical specification

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

6 Interface power supply

The requirements of Clause 6 of IEC 62386-101:2009 and Clause 6 of IEC 62386-102:2009 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 apply.

8 Timing

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

9 Method of operation

The requirements of Clause 9 of IEC 62386-101:2009 and Clause 9 of IEC 62386-102:2009 apply, except as follows:

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

9.9 Detection of load decrease

If the actual LED load is significantly below the load measured during a successful “reference measurement”, the gear may switch off the lamp if this is necessary for its safe operation. The flag bit ‘load decrease’ is to be set.

9.10 Detection of load increase

If the actual LED load is significantly above the load measured during a successful “reference measurement”, the gear may switch off if this is necessary for its safe operation. The flag bit ‘load increase’ is to be set.

9.11 Current protector

If the actual LED load of the control gear differs by more than a defined amount ΔP from the load detected during the reference measurement, the current protector becomes active and switches off the LED.

The current protector shall not become active until there has been a successful reference measurement.

There are two possible situations in which the current protector becomes active:

- Overload: The actual LED load is higher than the load detected during the reference measurement by at least ΔP .
- Underload: The actual LED load is lower than the load detected during the reference measurement by at least ΔP .

The current protector shall become inactive either on mains voltage interruption or on receipt of a command which causes the arc power level to be 0. If after switching on again, the situation causing the current protector to become active still remains, the current protector shall become active again.

The current protector can be enabled and disabled by the commands 225 “ENABLE CURRENT PROTECTOR” and 226 “DISABLE CURRENT PROTECTOR”.

An active current protector shall become inactive upon reception of command 226 “DISABLE CURRENT PROTECTOR”.

If the current protector is active, command 224 “REFERENCE SYSTEM POWER” shall be ignored.

9.12 LED replacement on gear with load increase/decrease or current protector feature

If a LED is replaced with one of a different wattage without a new “REFERENCE SYSTEM POWER” measurement being performed, the control gear shall detect a load increase or load decrease as appropriate.

NOTE If a LED is replaced with one of the same wattage, the user should initiate a new ‘REFERENCE SYSTEM POWER’ measurement only if this is recommended by the manufacturer.

9.13 Fast Fade Time

The Fast Fade Time is used instead of the Fade Time if the Fade Time is equal to 0. The Fast Fade Time can be set to zero or to any value in the range “Min Fast Fade Time” to 27 as defined in Table 1.

Programming the Fast Fade Time to 0 means “no fade” (change of light output as quickly as possible).

Table 1 – Fast fade time

N°	Fast fade time ms	N°	Fast fade time ms	N°	Fast fade time ms	N°	Fast fade time ms
0	< 25	7	175	14	350	21	525
1	25	8	200	15	375	22	550
2	50	9	225	16	400	23	575
3	75	10	250	17	425	24	600
4	100	11	275	18	450	25	625
5	125	12	300	19	475	26	650
6	150	13	325	20	500	27	675

The “Min Fast Fade Time” can be queried by command 253 “QUERY MIN FAST FADE TIME”.

10 Declaration of variables

The requirements of Clause 10 of IEC 62386-102:2009 apply, with the following additional variables for this device type, as indicated in Table 2:

Table 2 – Declaration of variables

Variable	Default value (control gear leaves the factory)	Reset value	Range of validity	Memory ^b
“MIN FAST FADE TIME”	factory burn-in	no change	1 – 27	1 byte ROM
“FAST FADE TIME”	0	0	0 MIN FAST FADE TIME – 27	1 byte
“GEAR TYPE”	factory burn-in	no change	0 – 255	1 byte ROM
“POSSIBLE OPERATING MODES”	factory burn-in	no change	0 – 255	1 byte ROM
“FEATURES”	factory burn-in	no change	0 – 255	1 byte ROM
“FAILURE STATUS”	???? ???? ^c	no change	0 – 255	1 byte RAM ^a
“OPERATING MODE”	0000 ???? ^c	no change except bit 4 is reset to 0	0 – 255	1 byte RAM ^a
“DIMMING CURVE”	0	0	0 – 1	1 byte
“EXTENDED VERSION NUMBER” (See command 255)	1	no change	0 – 255	1 byte ROM
“DEVICE TYPE”	6	no change	0 – 254	1 byte ROM
? = undefined ^a Bit 7 of “FAILURE STATUS” and bit 4 of “OPERATING MODE” shall be stored in persistent memory. ^b Persistent memory (storage time indefinite) if not stated otherwise. ^c Power up value, except bit 7 of “FAILURE STATUS” and bits 4-7 of “OPERATING MODE”				

11 Definition of commands

The requirements of Clause 11 of IEC 62386-102:2009 apply, except as follows:

11.3.1 Queries related to status information

Command 146: **YAAA AAA1 1001 0010** **“QUERY LAMP FAILURE”**

Replacement:

Ask if there is a lamp problem at the given address. Answer shall be ‘Yes’ or ‘No’.

“Yes” means either open circuit or short circuit or load increase or load decrease or current protector active.

“No” does not necessarily imply that no lamps have failed.

Command 153: **YAAA AAA1 1001 1001** **“QUERY DEVICE TYPE”**

Replacement:

The answer shall be 6.

11.3.4 Application extended commands

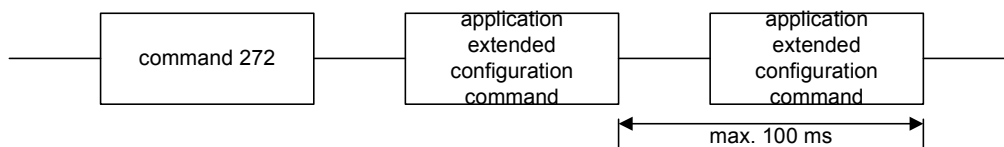
Replacement:

Application extended commands shall be preceded by command 272 “ENABLE DEVICE TYPE 6”. For device types other than 6 these commands may be used in a different way. A control gear for LED modules shall not react to application extended commands preceded by command 272 “ENABLE DEVICE TYPE X” with $X \neq 6$.

11.3.4.1 Application extended configuration commands

Every configuration command (224 to 228) shall be received a second time within 100 ms before it is executed 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 shall be aborted.

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



IEC 1665/09

Figure 1 – Application extended configuration command sequence example

All values of DTR shall be checked against the values mentioned in Clause 10, i.e. the value shall be set to the upper / lower limit if it is above / below the valid range specified in - Clause 10.

Command 224: YAAA AAA1 1110 0000 “REFERENCE SYSTEM POWER”

The control gear shall measure and store system power levels to detect load increase or load decrease. This is an optional feature; it is up to the manufacturer to decide upon the number of system power levels each type of gear should measure.

The measured power level shall be stored in the persistent memory. Commands received during the measuring period shall be ignored except query commands and command 256.

After 15 min at most, the control gear shall finish the measurement process and shall go back to normal operation. The measurement process shall be aborted if command 256 “TERMINATE” is received.

If the current protector is active this command shall be ignored. In this case, bit 7 ‘reference measurement failed’ in the answer to command 241 “QUERY FAILURE STATUS”, shall be set and command 249 “QUERY REFERENCE MEASUREMENT FAILED” shall be answered with “Yes”.

Control gear without this feature shall not react (see command 240).

Command 225: YAAA AAA1 1110 0001 “ENABLE CURRENT PROTECTOR”

Enables the current protector of the control gear. The current protector can become active after a successful reference measurement started by command 224.

The default configuration of the gear is “current protector enabled”. The status of the current protector (enabled / disabled) shall be stored in the persistent memory of the control gear.

The current protector is an optional feature. Control gear without this feature shall not react (see command 240).

Command 226: YAAA AAA1 1110 0010 “DISABLE CURRENT PROTECTOR”

Disables the current protector of the control gear.

The current protector is an optional feature. Control gear without this feature shall not react in any way. (see command 240).

Command 227: YAAA AAA1 1110 0011 “SELECT DIMMING CURVE”

The dimming curve of the control gear shall be set in accordance with the value of DTR.

DTR = 1 sets the dimming curve to linear. In this case the light output shall be a linear function of the light level given by any of the arc power control commands in accordance with the formula

$$X(n) = \frac{n}{254} \cdot 100 [\%]$$

DTR = 0 sets the dimming curve to the standard logarithmic output characteristics.

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

When the dimming curve is changed, the PHYSICAL MINIMUM LEVEL shall also be adjusted to correspond to the physical minimum light output, which shall not be affected by the choice of dimming curve.

NOTE 1 There is no requirement for recalculating the programmable arc power levels when changing the dimming curve.

NOTE 2 It is recommended that the dimming curve be selected before arc power levels such as scenes, min level, max level, etc. are programmed.

Command 228: YAAA AAA1 1110 0100 “STORE DTR AS FAST FADE TIME”

If the content of DTR is zero or lies in the range MIN FAST FADE TIME to 27, it shall be stored as fast fade time. If the content of the DTR is greater than zero but less than MIN FAST FADE TIME then MIN FAST FADE TIME shall be stored as fast fade time. If the content of the DTR is greater than 27 then 27 shall be stored as fast fade time.

The control gear uses the fast fade time only if the standard fade time is 0.

Command 229: YAAA AAA1 1110 0101

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

Commands 230-231: YAAA AAA1 1110 011X

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.

11.3.4.2 Application extended query commands

Commands 236: YAAA AAA1 1110 1100

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

Command 237: YAAA AAA1 1110 1101 “QUERY GEAR TYPE”

Answer shall be the following GEAR TYPE byte:

bit 0	LED power supply integrated	'0' = No
bit 1	LED module integrated	'0' = No
bit 2	a.c. supply possible	'0' = No
bit 3	d.c. supply possible	'0' = No
bit 4	unused	'0' = default value
bit 5	unused	'0' = default value
bit 6	unused	'0' = default value
bit 7	unused	'0' = default value

Command 238: YAAA AAA1 1110 1110 “QUERY DIMMING CURVE”

Answer shall be the dimming curve currently in use:

- 0 means standard logarithmic dimming curve;
- 1 means linear dimming curve.

Command 239: YAAA AAA1 1110 1111 “QUERY POSSIBLE OPERATING MODES”

Answer shall be the following POSSIBLE OPERATING MODES byte:

bit 0	PWM mode is possible	'0' = No
bit 1	AM mode is possible	'0' = No
bit 2	output is current controlled	'0' = No
bit 3	high current pulse mode	'0' = No
bit 4	unused	'0' = default value
bit 5	unused	'0' = default value
bit 6	unused	'0' = default value
bit 7	unused	'0' = default value