

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Digital addressable lighting interface –
Part 202: Particular requirements for control gear – Self-contained emergency
lighting (device type 1)**

**Interface d'éclairage adressable numérique –
Partie 202: Exigences particulières pour les appareillages de commande –
Blocs autonomes d'éclairage de secours (dispositifs de type 1)**



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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	9
2 Normative references	9
3 Terms and definitions	9
4 General	12
4.1 General.....	12
4.2 Version number	12
4.3 Power supply of bus units	12
4.4 Power interruption at bus units.....	13
4.4.1 General	13
4.4.2 Power interruptions of external power supply.....	13
4.4.3 Communication requirements in rest mode and emergency mode	13
4.4.4 Endurance of REST MODE.....	13
5 Electrical specification	13
6 Interface power supply	13
7 Transmission protocol structure	13
8 Timing	14
9 Method of operation.....	14
9.1 General.....	14
9.2 Command execution	14
9.3 Non-controllable control gear	14
9.3.1 General	14
9.3.2 Command execution of non-controllable control gear.....	14
9.3.3 Status bits of non-controllable control gear.....	15
9.4 Emergency level	15
9.4.1 General	15
9.4.2 Emergency operation light output and emergency level	15
9.4.3 Emergency physical maximum and minimum level.....	15
9.4.4 Configuring emergency level.....	16
9.4.5 Testing of emergency level.....	16
9.5 Mode transition timing and behaviour.....	16
9.6 System failure	18
9.7 Modes of operation	18
9.7.1 General	18
9.7.2 Normal mode	19
9.7.3 Inhibit mode.....	20
9.7.4 Emergency mode.....	21
9.7.5 Extended emergency mode.....	22
9.7.6 Rest mode	23
9.7.7 Mode 'Function test in progress'	24
9.7.8 Mode 'Duration test in progress'	25
9.7.9 Mode 'Battery cut-off'.....	27
9.8 Emergency test functions and configuration	27
9.8.1 General	27
9.8.2 Automatic testing.....	27

9.8.3	Automatic test execution status	30
9.8.4	Querying test results.....	31
9.8.5	Extended test duration.....	31
9.8.6	Timing definitions	32
9.9	Protection functionalities in emergency mode	33
9.10	Emergency mode and operating modes	33
9.11	Hardwired emergency inputs.....	33
9.11.1	General	33
9.11.2	Hardwired inhibit input.....	33
9.11.3	Hardwired switch	33
9.12	Control gear status and capabilities	34
9.12.1	General	34
9.12.2	Modification to " <i>lampOn</i> "	34
9.12.3	Rated duration and battery charge.....	34
9.12.4	Emergency status	34
9.12.5	Emergency mode.....	35
9.12.6	Emergency features.....	36
9.12.7	Emergency failure status	37
9.12.8	Hardwired switch status.....	38
9.12.9	Emergency lamp operation time.....	38
9.13	Restricting device type support	39
9.14	Installation inhibit.....	39
9.15	Memory banks	39
9.15.1	General	39
9.15.2	Accuracy of measurements.....	39
9.15.3	Rounding of measurement values	39
9.15.4	Refresh rate of memory bank values.....	40
9.15.5	No overflow of counters	40
9.15.6	Memory bank 208: Emergency control gear information	40
10	Declaration of variables	45
10.1	General.....	45
10.2	Impact on control gear variables depending on control gear type	45
10.3	Control gear variables for all self-contained control gear.....	46
11	Definition of commands	47
11.1	General.....	47
11.2	Overview sheets	47
11.3	Level instructions.....	50
11.4	Configuration instructions	50
11.4.1	General	50
11.4.2	IDENTIFY DEVICE	50
11.5	Queries.....	50
11.5.1	General	50
11.5.2	QUERY ACTUAL LEVEL.....	50
11.6	Application extended commands.....	50
11.6.1	General	50
11.6.2	Configuration instructions	51
11.6.3	Queries.....	55
11.7	Special commands.....	58
11.7.1	General	58

11.7.2	ENABLE DEVICE TYPE (<i>data</i>)	58
Annex A (informative)	Enabling or re-enabling installation inhibit	59
A.1	General	59
A.2	Re-enabling installation inhibit	59
A.3	Modifying or cancelling installation inhibit operation	59
Bibliography		60
Figure 1	– IEC 62386 graphical overview	7
Figure 2	– Modes and transitions	19
Figure 3	– Timing diagram for function and duration tests	28
Figure 4	– Duration test execution time out example	31
Table 1	– Mode transition behaviour	17
Table 2	– Bus power interruption behaviour	18
Table 3	– Normal mode	20
Table 4	– Inhibit mode	21
Table 5	– Emergency mode	22
Table 6	– Extended emergency mode	23
Table 7	– Rest mode	24
Table 8	– Mode 'Function test in progress'	25
Table 9	– Mode 'Duration test in progress'	26
Table 10	– Mode 'Battery cut-off'	27
Table 11	– " <i>extendedDuration</i> "	32
Table 12	– Timing definitions	32
Table 13	– " <i>emergencyStatus</i> "	35
Table 14	– " <i>emergencyMode</i> "	36
Table 15	– " <i>emergencyFeatures</i> "	36
Table 16	– " <i>emergencyFailureStatus</i> "	37
Table 17	– " <i>hardwiredSwitchStatus</i> "	38
Table 18	– Memory bank 208: Self-contained emergency control gear information	40
Table 19	– Modifications of control gear variables	45
Table 20	– Declaration of additional variables	46
Table 21	– Application extended commands	48
Table 22	– Perform DTR selected function	55
Table 23	– Query selected variable	56

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DIGITAL ADDRESSABLE LIGHTING INTERFACE –**Part 202: Particular requirements for control gear –
Self-contained emergency lighting (device type 1)****FOREWORD**

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IEC 62386-202 has been prepared by IEC technical committee 34: Lighting. It is an International Standard.

This second edition cancels and replaces the first edition published in 2009. This edition constitutes a technical revision.

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

- a) scope updated,
- b) hardwired switch operation can be disabled,
- c) installation inhibit feature added,
- d) memory bank added,
- e) modes of operation clarified, with some changes and additions,
- f) command added to enter extended emergency mode,

g) command added to extend time in duration test mode.

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

Draft	Report on voting
34/986/FDIS	34/1000/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 was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

This Part 202 of IEC 62386 is intended to be used in conjunction with:

- Part 101, which contains general requirements for system components;
- Part 102, which contains general requirements for control gear.

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,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

IEC 62386 contains several parts, referred to as series. The IEC 62386 series specifies a bus system for control by digital signals of electronic lighting equipment. The IEC 62386-1xx series includes the basic specifications. 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. Part 104 and Part 105 can be applied to control gear or control devices. Part 104 gives requirements for wireless and alternative wired system components. Part 105 describes firmware transfer. Part 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 second edition of IEC 62386-202 is intended to be used in conjunction with IEC 62386-101 and IEC 62386-102 and with the various parts that make up the IEC 62386-2xx series for control gear, and can be used together with IEC 62386-103 and the various parts that make up the IEC 62386-3xx series of particular requirements for control devices. The division into separately published parts provides for ease of future amendments and revisions. Additional requirements will be added as and when a need for them is recognised.

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

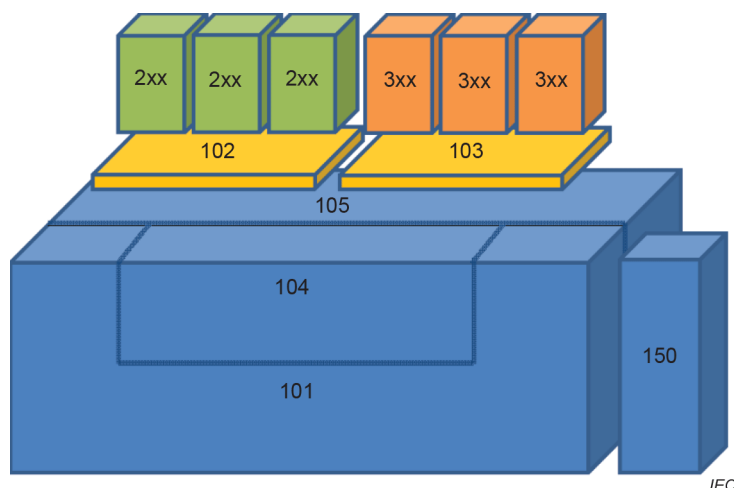


Figure 1 – IEC 62386 graphical overview

When this part of IEC 62386 refers to any of the clauses of the 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 and "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 202: Particular requirements for control gear – Self-contained emergency lighting (device type 1)

1 Scope

This part of IEC 62386 is applicable to control gear for control by digital signals of electronic lighting equipment which is associated with self-contained emergency lighting as described in IEC 61347-2-7 with additional control interface for configuring emergency operation.

This document is only applicable to control gear complying with IEC 62386-102.

This document does not apply to centrally supplied emergency lighting control gear, which is specified in IEC 62386-220.

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 62386-102:2022, *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 IEC 62386-101 and IEC 62386-102 and the following apply.

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

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

3.1

battery cut-off

mode of operation in which the normal supply is disconnected and the battery voltage is below the battery cut-off voltage

Note 1 to entry: Reaching this point can trigger the device to protect against extensive discharge as defined in IEC 61347-2-7:2011, 3.4 and IEC 61347-2-7:2011/AMD2:2021, 3.4.

3.2

battery cut-off voltage

battery voltage, below which the battery can no longer power the control gear or lamp(s)

3.3 duration test

DT

mode of operation in which a test is performed to check the capability of the battery to supply the control gear and lamp, within the limits of rated duration of emergency operation

[SOURCE: IEC 62034:2012, 3.7, modified – The definition has been revised to clarify that this is a mode of operation.]

3.4 emergency level

value representing the light output for emergency lamp operation

Note 1 to entry: In some control gear, the emergency level is configurable.

3.5 emergency mode

mode of operation in which the normal supply has failed and the control gear powers the lamp from the battery

[SOURCE: IEC 60598-2-22:2021, 22.3.17, modified – The definition has been revised to apply to the control gear.]

3.6 emergency physical maximum level

level corresponding to the maximum light output the control gear can operate at when in emergency mode

Note 1 to entry: The light level behaviour in normal mode is not affected by the emergency physical maximum level.

3.7 emergency physical minimum level

level corresponding to the minimum light output the control gear can operate at when in emergency mode

Note 1 to entry: The light level behaviour in normal mode is not affected by the emergency physical minimum level.

3.8 extended emergency mode

mode of operation in which the normal supply is present, with the control gear operating the lamp(s) at the emergency level and drawing power from either source

3.9 extended test duration

additional period of time for which the control gear operates the lamp during a duration test, before indicating a pass result

3.10 function test

FT

mode of operation in which a test is performed to check the integrity of the circuit, change over device, battery and function of the emergency lamp(s)

[SOURCE: IEC 62034:2012, 3.6, modified – The existing term "functional test" has been replaced with "function test" and the definition has been revised to clarify that this is a mode of operation.]

3.11**hardwired inhibit input**

optional additional input of the control gear which prevents the control gear from going into the emergency mode while activated

Note 1 to entry: The hardwired inhibit input is specified by the manufacturer. The state of the input can be "active" or "inactive".

3.12**hardwired switch**

optional additional input of type A, B and C control gear, that is used to switch the lamp on and off in normal or inhibit modes

Note 1 to entry: The hardwired switch input is specified by the manufacturer. The state of the switch can be "ON" or "OFF".

3.13**inhibit mode**

mode of operation in which the control gear is powered from the normal supply but prevented from switching to emergency mode in the event of normal supply failure

[SOURCE: IEC 60598-2-22:2021, 22.3.21, modified – The definition of "remote inhibiting mode" has been modified to apply to the control gear.]

3.14**integral emergency control gear**

lamp control gear which forms a non-replaceable part of an emergency luminaire and which cannot be tested separately from the luminaire

[SOURCE: IEC 61347-1:2015, 3.1.3, modified – In the term "lamp controlgear" has been replaced with "emergency control gear" and in the definition, "emergency" has been added.]

3.15**lamp cut-off voltage**

battery voltage, below which the battery can no longer power the lamp(s), and which is higher than the battery cut-off voltage

3.16**normal mode**

mode of operation in which the normal supply is available and powers the control gear

3.17**normal supply**

external supply used for normal operation of the control gear that explicitly excludes the self-contained DC source

3.18**normal supply failure**

condition in which the normal supply has failed

3.19**prolong time**

time the extended emergency mode will last after restoration of normal supply, before switching to normal mode

3.20**rest mode**

mode in which the lamp is intentionally extinguished whilst the normal supply is not available

[SOURCE: IEC 60598-2-22:2021, 22.3.18, modified – The definition has been revised to apply to the control gear.]

3.21

type A control gear

maintained, dimming controllable self-contained emergency control gear with PHM (physical minimum level) < 254 (100 %)

Note 1 to entry: If the normal supply is present, type A control gear acts like a standard dimmable device. Therefore, type A control gear supports the execution of level instructions.

3.22

type B control gear

maintained, on/off controllable self-contained emergency control gear with PHM (physical minimum level) equal to 254 (100 %)

Note 1 to entry: If the normal supply is present, type B control gear acts like a standard dimmable device with its minimum level set to 254. Therefore, type B control gear supports the execution of level instructions.

3.23

type C control gear

maintained, non-controllable self-contained emergency control gear which operates the lamp(s) in normal and inhibit modes, but does not support level instructions nor corresponding configuration commands

Note 1 to entry: The lamp can still be controlled by a hardwired switch or separate interface.

[SOURCE: IEC 60598-2-22:2021, 22.3.5, modified – The term "maintained emergency luminaire" has been replaced with "type C control gear"; the definition has been revised and the note to entry has been added.]

3.24

type D control gear

non-maintained, non-controllable self-contained emergency control gear which does not operate the lamp(s) in normal or inhibit modes, and does not support level instructions nor corresponding configuration commands

Note 1 to entry: Type D control gear can have a switched live (SL) input that can control companion gear on a "piggyback" type emergency control gear. For the purposes of this document this switched live input on type D control gear is not considered a hardwired switch.

[SOURCE: IEC 60598-2-22:2021, 22.3.6, modified – The term "non-maintained emergency luminaire" has been replaced with "type D control gear"; the definition has been revised and the note to entry has been added.]

4 General

4.1 General

The requirements of IEC 62386-102:2022, Clause 4 apply, with the restrictions, changes and additions identified below.

4.2 Version number

In 4.2 of IEC 62386-102:2022, "102" shall be replaced by "202", "version number" shall be replaced by "extended version number", "*versionNumber*" shall be replaced by "*extendedVersionNumber*" and "Table 16" shall be replaced by "Table 20".

4.3 Power supply of bus units

Control gear according to this document shall not be bus powered.

4.4 Power interruption at bus units

4.4.1 General

The requirements of IEC 62386-101:2022, 4.11 apply, with the following changes and additions.

4.4.2 Power interruptions of external power supply

Interruptions of the external power supply shall be defined as the period of time beginning with failure of the normal supply and ending when the normal supply has been re-established within the manufacturer-defined operating range. See IEC 62386-101:2022, 4.11.1.

For the case where the battery is connected and remains above the battery cut-off voltage, the short interruption time as specified in IEC 62386-101:2022, 4.11.1 shall apply, otherwise the short interruption time is modified to 2,5 cycles (AC supply) or 50 ms (DC supply).

4.4.3 Communication requirements in rest mode and emergency mode

During both rest and emergency modes, the control gear shall be capable of processing commands received via the interface. These commands are limited as per 9.2.

NOTE 1 It is the responsibility of the manufacturer to show that in case power is drawn from the battery, the additional amount of power required for communication during the rated emergency operation is considered when determining the battery capacity.

NOTE 2 It is considered that those commands in 9.2 are limited to those required for managing emergency lighting.

4.4.4 Endurance of REST MODE

With a fully-charged battery, if rest mode is entered from inhibit mode, or from execution of REST within 1 min of entering emergency mode, the power consumption whilst in rest mode shall be sufficiently low such that rest mode continues for at least twice the rated duration time without battery cut-off mode being entered.

It is recommended that the control gear and battery combination can operate in rest mode for a time equal to the rated duration or longer, after being in emergency mode for the rated duration or longer with "*emergencyLevel*" equal to "*emergencyPhMaxLevel*".

5 Electrical specification

The requirements of IEC 62386-102:2022, Clause 5 apply.

6 Interface power supply

The requirements of IEC 62386-102:2022, Clause 6 apply, with the following changes.

If a bus power supply is integrated, the maximum supply current specified in IEC 62386-101:2022, 6.5.1, shall be no more than 242 mA.

NOTE This allows for the possibility of an additional bus power supply in the system, such that the bus can still be powered even when the normal supply fails, allowing bus communications whilst in emergency mode or rest mode.

7 Transmission protocol structure

The requirements of IEC 62386-102:2022, Clause 7 apply.

8 Timing

The requirements of IEC 62386-102:2022, Clause 8 apply.

9 Method of operation

9.1 General

The requirements of IEC 62386-102:2022, Clause 9 apply, with the following restrictions, changes and additions. These restrictions, changes and additions apply to all types (A, B, C and D), unless specified otherwise.

9.2 Command execution

To ensure compliance with emergency lighting requirements, it is sometimes necessary for self-contained emergency control gear to deviate from the behaviour specified in IEC 62386-102. Whilst in any of the following modes:

- emergency mode,
- REST mode,

the following restrictions shall apply:

- The control gear shall discard all instructions, all special commands and all application extended instructions, including those defined in this document, those defined in IEC 62386-102, and those defined in other parts of the IEC 62386-2xx series, with the following exceptions (see IEC 62386-102:2022, 9.7):
 - "DTR0(*data*)", "DTR1(*data*)", "DTR2(*data*)";
 - "READ MEMORY LOCATION (*DTR1*, *DTR0*)";
 - "ENABLE DEVICE TYPE (*data*)";
 - any command marked in Table 21 as 'Executed in mode' for the current mode.
- The control gear shall continue to process query commands. The contents of their answers shall be adapted according to 10.2.
- The control gear is not required to provide reliable responses to queries of other parts of the IEC 62386-2xx series related to light output.

NOTE The above requirements imply that as long as one of the mentioned modes of operation is active, only commands according to this document are executed where applicable. This also applies for all parts of the IEC 62386-2xx series.

Where applicable, these requirements apply in addition to the restrictions given in 9.3.2.

9.3 Non-controllable control gear

9.3.1 General

Types C and D control gear are non-controllable and are not intended to be used for standard lighting purposes. Therefore, their interface serves purely for setting and querying emergency operation related variables and functionality. Light output in normal mode cannot be affected via the interface. The light output in normal mode of a type C control gear can be affected by the state of a hardwired input.

9.3.2 Command execution of non-controllable control gear

Types C and D control gear shall discard all commands described in IEC 62386-102:2022, Clause 11, except for the following:

- configuration instructions (IEC 62386-102:2022, 11.4) listed here:

- "RESET";
 - "SET OPERATING MODE";
 - "RESET MEMORY BANK";
 - "IDENTIFY DEVICE";
 - "ADD TO GROUP (*group*)";
 - "REMOVE FROM GROUP (*group*)";
 - "SET SHORT ADDRESS (*DTR0*)";
 - "ENABLE WRITE MEMORY";
- queries (IEC 62386-102:2022, 11.5), also see 10.2;
 - special commands (IEC 62386-102:2022, 11.7).

Types C and D control gear shall discard all level instructions and configuration commands related to the level described in other parts of the IEC 62386-2XX series.

9.3.3 Status bits of non-controllable control gear

For non-controllable control gear (types C and D), the following restrictions apply to the status bits as described in IEC 62386-102:2022, 9.16:

- Bit 2: "*lampOn*"
Shall be FALSE for type D if normal mode or inhibit mode is active.
- Bit 3: "*limitError*"
Shall be FALSE for types C and D in any case.
- Bit 4: "*fadeRunning*"
Shall be FALSE for types C and D in any case.
- Bit 7: "*powerCycleSeen*"
Shall be FALSE for types C and D in any case.

9.4 Emergency level

9.4.1 General

Subclauses 9.4.2 to 9.4.5 contain information related to emergency level.

9.4.2 Emergency operation light output and emergency level

"*emergencyLevel*" shall comply with the dimming curve given in IEC 62386-102:2022, 9.3, where "*actualLevel*" is replaced by "*emergencyLevel*".

It is recommended that the light output at any level with emergency mode active is similar to the light output at the same level when in normal mode.

9.4.3 Emergency physical maximum and minimum level

While operating in emergency, extended emergency or test modes, it is possible that the control gear will not be able to provide the same dimming range as in normal mode.

Therefore "*emergencyPhMaxLevel*" and "*emergencyPhMinLevel*" shall restrict the usable range of "*emergencyLevel*", as follows:

$$"emergencyPhMinLevel" \leq "emergencyLevel" \leq "emergencyPhMaxLevel"$$

NOTE An example case where restricting light output via *"emergencyPhMaxLevel"* can be required is when there is a requirement for operation at higher ambient temperatures in emergency mode.

"emergencyPhMaxLevel" can be queried with "QUERY EMERGENCY PHYSICAL MAX LEVEL".

"emergencyPhMinLevel" can be queried with "QUERY EMERGENCY PHYSICAL MIN LEVEL".

If the control gear does not support a change of emergency level, then *"emergencyPhMinLevel"* shall equal *"emergencyPhMaxLevel"*.

9.4.4 Configuring emergency level

"emergencyLevel" shall be set using STORE EMERGENCY LEVEL (*DTR0*) and can be queried using QUERY EMERGENCY LEVEL.

9.4.5 Testing of emergency level

To facilitate testing of *"emergencyLevel"* it shall be possible to manually enter the extended emergency mode by using PERFORM SELECTED FUNCTION (*DTR1*, *DTR0*).

To ensure battery discharge is limited to an absolute minimum, the instruction shall be executed only if *"prolongTime"* equals 0x09 (4 min 30 s) or less, and shall be discarded otherwise.

The extended emergency mode shall be cancelled on reception of command REST, in accordance with 9.7.5.

NOTE 1 Use of this mode can affect the battery charge level, which can be considered by application controllers intending to use this feature.

NOTE 2 This method allows for adjustment and/or verification of emergency lighting levels without actively switching of the normal supply being necessary.

9.5 Mode transition timing and behaviour

There are two separate sources of supply. As a result, power-on and receiver start-up behaviour require special attention.

Table 1 describes the power-on and receiver start-up behaviour, according to the mode transition.

Table 1 – Mode transition behaviour

Initial mode	New mode	Behaviour related to IEC 62386-102 power-on	Behaviour related to IEC 62386-101 receiver start-up
Battery cut-off	Normal mode	Power-on behaviour according to IEC 62386-102:2022, 9.13	According to IEC 62386-101:2022, 4.11.6
Rest mode	Normal mode Inhibit mode	Power-on behaviour according to IEC 62386-102:2022, 9.13	According to IEC 62386-101:2022, 4.11.6 ^d
Emergency mode	Extended emergency mode	Modified power-on behaviour ^c	According to IEC 62386-101:2022, 4.11.6 ^d
Extended emergency mode	Normal mode	a	b
Duration test Function test Inhibit mode	Normal mode	a	b
Normal mode	Duration test Function test Inhibit mode Extended emergency mode	a	b
Rest mode	Emergency mode	a	b
Emergency mode	Rest mode	a	b
Normal mode Duration test Function test Extended emergency mode	Emergency mode	a	According to IEC 62386-101:2022, 4.11.6 ^d
Inhibit mode	Rest mode	a	According to IEC 62386-101:2022, 4.11.6 ^d
Rest	Battery cut-off	Not applicable	Not applicable
NOTE 1 The battery supply is normally permanently connected to the control gear.			
NOTE 2 Low power clock circuits can take several seconds to start.			
NOTE 3 As a result, it is possible that the power-on time of emergency control gear will not be well synchronized with the power-on time of other control gear in the same system.			
^a Not considered a power-on event. Variables are not reset to power-on state. ^b There shall be no interruptions to the receiver availability. ^c The control gear shall • set variables to their power-on values, except for "actualLevel" and "targetLevel"; • immediately calculate "targetLevel" on the basis of "powerOnLevel". If "powerOnLevel" equals MASK, "targetLevel" shall be set to "lastLightLevel". "actualLevel" shall be set to "targetLevel". This means that power-on behaviour is applied on restoration of the normal supply, the same trigger as for non-device type 1 control gear, but with "powerOnLevel" being activated immediately instead of following the power-on timing stated in IEC 62386-102:2022, 9.13, so avoiding the possibility that the lamp is momentarily switched off then back on. The light output whilst in extended emergency mode is determined according to Table 6. ^d Receiver start-up timing applies due to the possibility of a momentary power interruption during the transition between the normal supply and battery supply used to power the control gear.			

9.6 System failure

Behaviour on interruptions of bus power shall differ depending on the control gear type. Behaviour according to Table 2 shall apply:

Table 2 – Bus power interruption behaviour

State of bus power	Applicable modes of operation	Type	Resulting behaviour
Short interruptions of bus power	All	All	According IEC 62386-101:2022, 4.11
Bus power down			According IEC 62386-101:2022, 4.11
System failure	Normal mode, inhibit mode	A, B	System failure according IEC 62386-102:2022, 9.12
	Emergency mode, extended emergency mode, rest mode, function test, duration test		No reaction
	All	C, D	No reaction

9.7 Modes of operation

9.7.1 General

The state transition diagram in Figure 2 shows the different modes of operation and the conditions for mode transitions.

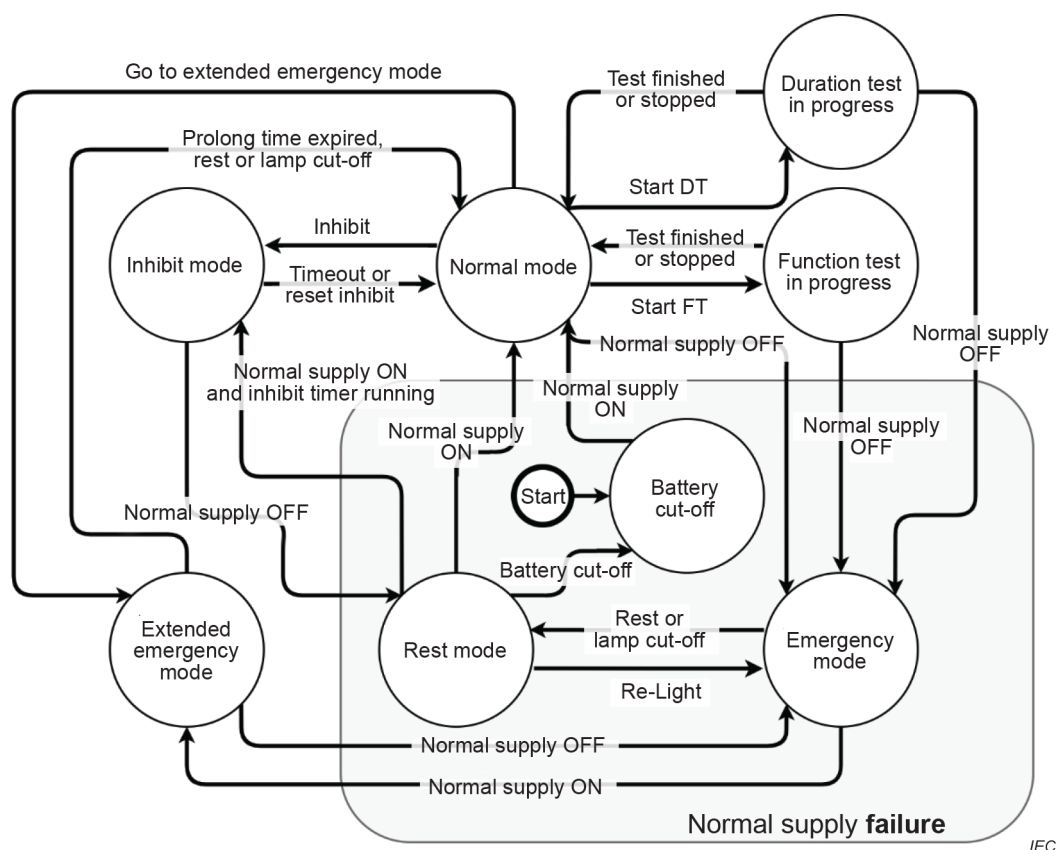


Figure 2 – Modes and transitions

In Figure 2, "battery cut-off" in a state transition means "battery voltage below battery cut-off voltage", and "lamp cut-off" in a state transition means "battery voltage below lamp cut-off voltage".

The commands processed by the control gear differ depending on the mode of operation. See 9.2 and 9.3.

9.7.2 Normal mode

Normal mode is the standard mode of operation while the normal supply is provided to the control gear. Table 3 shows the supply, behaviour and exit conditions for normal mode. Depending on the type of control gear, the light output can or cannot be adapted via level instructions according to IEC 62386-102:2022, 9.7.

Table 3 – Normal mode

Name of mode	Normal mode	
Supply	Normal supply	
Behaviour upon activation	• <i>"emergencyStatus"</i> shall be set to: 0XXX XXX0. • <i>"emergencyMode"</i> shall be set to: XX00 0010.	
Behaviour whilst active	• The control gear shall charge or maintain the battery. • Light output shall be calculated according to <i>"actualLevel"</i> and <i>"targetLevel"</i>. • Reaction to commands shall be – Type A or B control gear: no restrictions; – Type C or D control gear: according to 9.3.2.	
Exit conditions	Mode shall be exited upon the first occurrence of the following conditions, evaluated in the following order:	
	Condition	New mode
	Normal supply fails	Emergency mode
	Command "INHIBIT" is executed. or Bit 6 of <i>"emergencyMode"</i> = TRUE or <i>"installationInhibitTimer"</i> > 0	Inhibit mode
	Request to enter extended emergency mode is executed. See 9.4.5	Extended emergency mode
	Any of the below-left conditions AND any of the below-right conditions	
	• <i>"emergencyStatus"</i> = XXX1 XXX0	• Battery charge sufficient^a • (battery voltage < battery cut-off voltage)^b
	All of the following conditions	
	• <i>"emergencyStatus"</i> = XX1X 1XX0 • <i>"emergencyfailureStatus"</i> = XXXX XXX0	Mode duration test in progress

^a Battery charge sufficient is manufacturer-specific. At any time bit 3 of *"emergencyStatus"* = True, the battery charge is sufficient for the purposes of this requirement.

^b This condition means that a battery voltage below battery cut-off voltage will result in the control gear entering the function test mode and immediately failing. This is to ensure that a control gear with the battery removed can still execute and fail a function test.

If both a function test and duration test are pending, the control gear shall run the function test first.

The exit conditions imply that if the control gear is ready to run a function test, the function test shall run even whilst the duration test is still pending.

NOTE If the normal supply is removed during normal mode whilst the battery is not connected (battery voltage < battery cut-off voltage) then it is assumed that the control gear will instantaneously transition through emergency mode and rest mode into battery cut-off.

9.7.3 Inhibit mode

Inhibit mode is a mode of operation similar to normal mode, but where the control gear is prevented from switching into emergency mode upon normal supply failure. Table 4 shows the supply, behaviour and exit conditions for inhibit mode. Inhibit mode is used to prevent the control gear from operating the lamp in case of normal supply failure.

Table 4 – Inhibit mode

Name of mode	Inhibit mode	
Supply	Normal supply	
Behaviour upon activation	"emergencyStatus" shall be set to: 0XXX XXX1. "emergencyMode" shall be set to: XX00 0010.	
Behaviour whilst active	- The control gear shall charge or maintain the battery. - Light output shall be calculated according to "actualLevel" and "targetLevel". - If "installationInhibitTimer" > 0, then it shall be decremented at the end of each complete hour of uninterrupted normal supply. If "installationInhibitTimer" reaches 0, "installationInhibitHours" shall also be set to 0, so disabling the installation inhibit functionality. - Reaction to commands shall be - Type A or B control gear: no restrictions; - Type C or D control gear: according to 9.3.2.	
Exit conditions	Mode shall be exited upon the first occurrence of the following conditions:	
	Condition	New mode
	Normal supply fails	Rest mode
	Any of the below-left conditions AND all of the below-right conditions	
	- Command "RE-LIGHT/RESET INHIBIT" is executed. - Inhibit timer expired AND "installationInhibitTimer" = 0	Bit 6 of "emergencyMode" = FALSE
Action upon exit to normal mode	"installationInhibitHours" shall be set to 0.	

NOTE If the normal supply is removed during inhibit mode and there is no battery connected (battery voltage < battery cut-off voltage) then it is assumed that the control gear will instantaneously transition through rest mode into battery cut-off.

It is recommended that whilst "installationInhibitTimer" is not 0, an indicator such as an LED is used to show that the installation inhibit feature is currently active, and this indication is distinguishable from that used to show the control gear is in the usual "healthy, no-fault state".

9.7.4 Emergency mode

Emergency mode is the standard mode of operation when the normal supply has failed, with the control gear operating the lamp from the battery. Table 5 shows the supply, behaviour and exit conditions for emergency mode. During the emergency mode, command execution is restricted.

Table 5 – Emergency mode

Name of mode	Emergency mode	
Supply	Battery	
Behaviour upon activation	"<i>emergencyStatus</i>" shall be set to: 00XX XXX0. "<i>emergencyMode</i>" shall be set to: XX00 0100. - Light output shall be calculated according to "<i>emergencyLevel</i>" and shall be adjusted as quickly as possible with "<i>targetLevel</i>" unchanged. "<i>installationInhibitHours</i>" and "<i>installationInhibitTimer</i>" shall be set to 0, so disabling this feature.	
Behaviour whilst active	- Reaction to commands shall be in accordance with 9.2. - The light output shall only depend on "<i>emergencyLevel</i>". This shall apply even if other parts of the IEC 62386 series require a different light output.	
Exit conditions	Mode shall be exited upon the first occurrence of the following conditions:	
	Condition	New mode
	Normal supply restored	Extended emergency mode
	Command "REST" is executed OR Battery voltage < lamp cut-off voltage	Rest mode

9.7.5 Extended emergency mode

In extended emergency mode the control gear is operating at the same level as in emergency mode, but with the difference that the normal supply is available. Table 6 shows the supply, behaviour and exit conditions for extended emergency mode. Extended emergency mode can be used for two scenarios.

- after restoration of normal supply to ensure a minimum lighting level whilst other lighting systems start up or are established;
- for recall of "emergency level" for testing or configuration purposes.

Table 6 – Extended emergency mode

Name of mode	Extended emergency mode	
Supply	Battery (although normal supply is available) OR Normal supply	
Behaviour upon activation	- The light output shall be calculated according to "<i>emergencyLevel</i>" and shall be adjusted as quickly as possible without affecting "<i>targetLevel</i>". "<i>emergencyStatus</i>" shall be set to: 00XX XXX0. "<i>emergencyMode</i>" shall be set to: XX00 1000. - A timer of length "<i>prolongTime</i>" shall be started.	
Behaviour whilst active	- Reaction to commands shall be in accordance with 9.2. This includes fading, but without affecting the light output. - The light output shall only depend on "<i>emergencyLevel</i>". This shall apply even if other parts of the IEC 62386 series require a different light output.	
Exit conditions	Mode shall be exited upon the first occurrence of the following conditions:	
	Condition	New mode
	Normal supply fails	Emergency mode
	Prolong timer expires ^a OR Battery voltage < lamp cut-off voltage OR Command "REST" is executed	Normal mode
^a Changing the value of " <i>prolongTime</i> " will not affect the running timer.		

9.7.6 Rest mode

Rest mode is an additional mode of operation when the normal supply has failed. Table 7 shows the supply, behaviour and exit conditions for rest mode. During rest mode the light output is intentionally set to zero.

Table 7 – Rest mode

Name of mode	Rest mode	
Supply	Battery	
Behaviour upon activation	• "<i>emergencyStatus</i>" shall be set to: 00XX XXXX. • "<i>emergencyMode</i>" shall be set to: XX00 0001. • Bit 0 of "<i>emergencyStatus</i>" shall be set to: TRUE: If inhibit timer running OR bit 6 of "<i>emergencyMode</i>" = TRUE; FALSE: Otherwise. • The light output shall be adjusted to zero as quickly as possible with "<i>targetLevel</i>" unchanged.	
Behaviour whilst active	• Reaction to commands shall be in accordance with 9.2. • Whilst the inhibit timer has expired or is not running, bit 0 of "<i>emergencyStatus</i>" shall be set to the same value of bit 6 of "<i>emergencyMode</i>".	
Exit conditions	Mode shall be exited upon the first occurrence of the following conditions:	
	Condition	New mode
	Normal supply restored and bit 0 of " <i>emergencyStatus</i> " = FALSE	Normal mode
	Normal supply restored and bit 0 of " <i>emergencyStatus</i> " = TRUE	Inhibit mode
	Command RE-LIGHT/RESET INHIBIT is executed	Emergency mode
	Battery voltage < battery cut-off voltage	Battery cut-off

9.7.7 Mode 'Function test in progress'

In this mode, the control gear is executing a function test. Table 8 shows the supply, behaviour and exit conditions for 'function test in progress' mode.

Table 8 – Mode 'Function test in progress'

Name of mode	Function test in progress	
Supply	Battery (although normal supply is available)	
Behaviour upon activation	"emergencyStatus" shall be set to: 00X0 XX00. "emergencyMode" shall be set to: XX01 0000. - Light output shall be calculated according to "emergencyLevel" and shall be adjusted as quickly as possible with "targetLevel" unchanged.	
Behaviour whilst active	- Reaction to commands shall be in accordance with 9.2. This includes fading, but without affecting the light output. - The light output shall only depend on "emergencyLevel". This shall apply even if other parts of the IEC 62386 series require a different light output. - A function test shall be performed in accordance with the relevant emergency standard. "emergencyFailureStatus", "lampFailure", "controlGearFailure" shall be updated to reflect failures in accordance with 9.12.7.	
Behaviour when exited	If the test is aborted due to execution of STOP TEST, the control gear shall - clear bit 4 and bit 5 of "emergencyStatus" or, if the test is aborted due to occurrence of normal supply failure, the control gear shall - set bit 4 of "emergencyStatus". If the test has completed, whether passed or failed, the control gear shall, in order, - update "emergencyFailureStatus", "lampFailure", "controlGearFailure" to reflect the results of the test in accordance with 9.12.7. Remaining failure(s) are to remain flagged; - stop and clear the function test execution timeout timer; - set "emergencyStatus" to: 00X0 XX10. NOTE "emergencyStatus" is updated no earlier than other failure status flags, to aid application controller test logic.	
Exit conditions	Mode shall be exited upon the first occurrence of the following conditions:	
	Condition	New mode
	Normal supply fails	Emergency mode
	Execution of command STOP TEST OR Test completed ^a	Normal mode
^a "Test completed" means a test that ended successfully or after any detected failure.		

9.7.8 Mode 'Duration test in progress'

While this mode is active the control gear shall execute a duration test. Table 9 shows the supply, behaviour and exit conditions for 'duration test in progress' mode.

Table 9 – Mode 'Duration test in progress'

Name of mode	Duration test in progress	
Supply	Battery (although normal supply is available)	
Behaviour upon activation	"emergencyStatus" shall be set to: 000X X0X0. "emergencyMode" shall be set to: XX10 0000. - Light output shall be calculated according to "emergencyLevel" and shall be adjusted as quickly as possible with "targetLevel" unchanged. "durationTestResult" shall be set to 0 and the counter restarted.	
Behaviour whilst active	- Reaction to commands shall be in accordance with 9.2. This includes fading, but without affecting the light output. - The light output shall only depend on "emergencyLevel". This shall apply even if other parts of the IEC 62386 series require a different light output. - A duration test shall be performed in accordance with the relevant emergency standard. "emergencyFailureStatus", "lampFailure", "controlGearFailure" shall be updated to reflect failures in accordance with 9.12.7. - Update "durationTestResult" with the currently elapsed time in 2 min intervals. - Clear bit 1 of "emergencyFailureStatus", if "durationTestResult" ≥ "ratedDuration" + "extendedDuration[1:7]".	
Behaviour when exited	If the test is aborted due to execution of STOP TEST, the control gear shall - clear bit 4 and bit 5 of "emergencyStatus" or, if the test is aborted due to occurrence of normal supply failure, the control gear shall - set bit 5 of "emergencyStatus". If either of the following two conditions are met: - the test completed, whether passed or failed, or - battery voltage < lamp cut-off voltage, then the control gear shall, in order, - set bit 1 of "emergencyFailureStatus" according to Table 16; - update "emergencyFailureStatus", "lampFailure", "controlGearFailure" to reflect the results of the test in accordance with 9.12.7. Remaining failure(s) are to remain flagged; - stop and clear the duration test execution timeout timer; - set "emergencyStatus" to: 000X X1X0. In the event of a completed, passed test, the control gear shall - set "extendedDuration" = 0. NOTE "emergencyStatus" is updated no earlier than other failure status flags, to aid application controller test logic.	
Exit conditions	Mode shall be exited upon the first occurrence of the following conditions:	
	Condition	New mode
	Normal supply fails	Emergency mode
	Execution of command STOP TEST OR Test completed ^a AND bit 0 of "extendedDuration" = 0 OR Battery voltage < lamp cut-off voltage	Normal mode
^a "Test completed" means a test that ended successfully or after any detected failure.		

9.7.9 Mode 'Battery cut-off'

This mode is used to describe the state entered when the control gear is fully powered down and disconnected from any supply. Table 10 shows the supply, behaviour and exit conditions for 'battery cut-off' mode. This includes the state when the battery voltage is less than the battery cut-off voltage. The control gear shall remain in this mode until the normal supply is restored, even if the battery voltage rises above the battery cut-off voltage. With no power source, the control gear shall be in this state, thus the first start-up shall be considered a transition from battery cut-off mode to normal mode.

Table 10 – Mode 'Battery cut-off'

Name of mode	Battery cut-off	
Supply	None (battery voltage < battery cut-off voltage)	
Behaviour upon activation	None – control gear shall not operate or respond	
Behaviour whilst active	None – control gear shall not operate or respond	
Behaviour when exited	If " <i>functionTestDelay</i> " > 0 set " <i>emergencyStatus</i> " = XXX1 XXXX to request a function test. If " <i>durationTestDelay</i> " > 0 set " <i>emergencyStatus</i> " = XX1X XXXX to request a duration test.	
Exit conditions	Mode shall be exited upon the first occurrence of the following conditions:	
	Condition	New mode
	Normal supply restored	Normal mode

9.8 Emergency test functions and configuration

9.8.1 General

The control gear shall be capable of executing a function test and a duration test. If these tests are in accordance with emergency lighting standards, such standards shall be specified in the data sheet.

NOTE 1 An example of an emergency standard is IEC 62034.

Timing tolerances for the following shall be 5 % or better: test delays, test intervals and test durations.

NOTE 2 Other emergency lighting standards can require tighter tolerances.

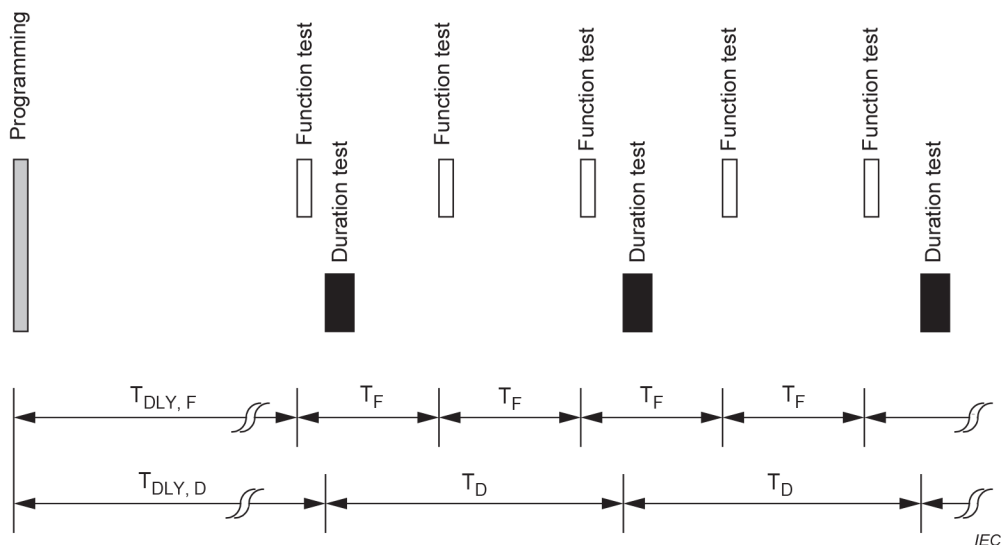
9.8.2 Automatic testing

9.8.2.1 General

The control gear shall be capable of self-initiating periodic execution of function and duration tests according to an automatic test schedule described in 9.8.2.2 to 9.8.2.6.

9.8.2.2 Automatic test schedule

The test schedule for both function and duration tests are defined by an initial test delay followed by a defined repetition interval. A separate initial test delay and repetition interval is maintained for function and duration tests. Figure 3 shows a typical timing diagram.



Key

$T_{DLY,F}$	function test delay time
$T_{DLY,D}$	duration test delay time
T_F	function test interval
T_D	duration test interval

Figure 3 – Timing diagram for function and duration tests

9.8.2.3 Automatic test delay

The test delays determine the initial delay to the first function and duration test.

The delay until the first function and duration test is stored in increments of 15 min in the 16-bit variables "*functionTestDelay*" and "*durationTestDelay*". These delays can be set by the following command sequences.

Function test delay

STORE TEST DELAY TIME HIGH BYTE (*DTR0*) where *DTR0* = "*testDelay*[8-15]";
 STORE TEST DELAY TIME LOW BYTE (*DTR0*) where *DTR0* = "*testDelay*[0-7]";
 STORE FUNCTION TEST INTERVAL (*DTR0*) where *DTR0* = "*functionTestInterval*".

Duration test delay

STORE TEST DELAY TIME HIGH BYTE (*DTR0*) where *DTR0* = "*testDelay*[8-15]";
 STORE TEST DELAY TIME LOW BYTE (*DTR0*) where *DTR0* = "*testDelay*[0-7]";
 STORE DURATION TEST INTERVAL (*DTR0*) where *DTR0* = "*durationTestInterval*".

On receipt of the command STORE FUNCTION TEST INTERVAL (*DTR0*) the behaviour of the controlgear is dependent on "*testDelay*".

If "*testDelay*" < 0XFFFF, the control gear shall

- set "*functionTestDelay*" = "*testDelay*";
- start the timer of duration "*functionTestDelay*". The control gear shall internally update "*functionTestDelay*" to reflect the current remaining delay;
- update the function test interval in accordance with 9.8.2.4.

Else, if *"testDelay"* = 0XFFFF, the control gear shall

- update the function test interval in accordance with 9.8.2.4.

Upon expiration of *"functionTestDelay"* the control gear shall act in accordance with 9.8.2.5.

On receipt of the command STORE DURATION TEST INTERVAL (*DTR0*) the behaviour of the control gear is dependent on *"testDelay"*.

If *"testDelay"* < 0XFFFF, the control gear shall

- set *"durationTestDelay"* = *"testDelay"*;
- start the timer of duration *"durationTestDelay"*. The control gear shall internally update *"durationTestDelay"* to reflect the current remaining delay;
- update the duration test interval in accordance with 9.8.2.4.

Else, if *"testDelay"* = 0XFFFF, the control gear shall

- update the duration test interval in accordance with 9.8.2.4.

Upon expiration of *"durationTestDelay"* the control gear shall act in accordance with 9.8.2.5.

The current value of *"functionTestDelay"* and *"durationTestDelay"* can be queried using QUERY SELECTED VARIABLE (*DTR0*).

The control gear shall update the variables *"functionTestDelay"* and *"durationTestDelay"* to represent the time until the next test.

NOTE Application controllers can send all test delay configuration commands in a single transaction to avoid any DTR change by other application controllers.

9.8.2.4 Automatic test interval

The test intervals determine the repeat period between two consecutive function and duration tests respectively.

The number of days between two consecutive function tests is determined by *"functionTestInterval"* which can be set by STORE FUNCTION TEST INTERVAL (*DTR0*).

The number of weeks between two consecutive duration tests is determined by *"durationTestInterval"*, which can be set by STORE DURATION TEST INTERVAL (*DTR0*).

An interval of 0 indicates that the test shall not repeat.

If both the interval and the test delay are 0, this indicates that automatic testing is disabled.

The current value of *"functionTestInterval"* and *"durationTestInterval"* can be queried using QUERY SELECTED VARIABLE (*DTR0*).

9.8.2.5 Test repeat behaviour

To ensure continuity of testing the control gear shall perform certain actions.

Upon expiration of timer *"functionTestDelay"*, the behaviour of the control gear shall be dependent on the value of *"functionTestInterval"*.

If *"functionTestInterval"* = 0, the control gear shall

- set *"emergencyStatus"* = XXX1 XXXX to request a function test.

If *"functionTestInterval"* > 0, the control gear shall

- set *"emergencyStatus"* = XXX1 XXXX to request a function test;
- set *"functionTestDelay"* to a time equivalent to *"functionTestInterval"*;
- start the timer *"functionTestDelay"*, on expiration of which this process shall repeat.

Upon expiration of timer *"durationTestDelay"* the behaviour of the control gear shall be dependent on the value of *"durationTestInterval"*.

If *"durationTestInterval"* = 0, the control gear shall

- set *"emergencyStatus"* = XX1X XXXX to request a duration test.

If *"durationTestInterval"* > 0, the control gear shall

- set *"emergencyStatus"* = XX1X XXXX to request a duration test;
- set *"durationTestDelay"* to a time equivalent to *"durationTestInterval"*;
- start the timer *"durationTestDelay"*, on expiration of which this process shall repeat.

9.8.2.6 Test timings after battery cut-off

When a battery reaches the battery cut-off voltage, the control gear will typically reduce battery current to zero, to avoid damaging the battery (see Note). As a result, it is possible the control gear will not be able to maintain its automatic test schedule. To ensure that a function or duration test is not missed, tests are requested on the transition from battery cut-off to normal mode if the control gear has a test scheduled. See 9.7.9.

NOTE It is a requirement of some emergency standards that the current drawn from the battery is to be below a particular "C" rating after the battery voltage has fallen below the battery disconnect voltage. Emergency control gear will typically disconnect from the battery to meet this requirement.

9.8.3 Automatic test execution status

Test execution timeout flags shall indicate that a function or duration test has been delayed excessively.

At such time that bit 4 of *"emergencyStatus"* becomes TRUE, a function test execution timeout timer shall either:

- be started, if such a timer is not currently running, or
- continue running unmodified, if such a timer is already running.

See Table 16 for updates to bit 4 of *"emergencyFailureStatus"*.

At such time that bit 5 of *"emergencyStatus"* becomes TRUE, a duration test execution timeout timer shall either:

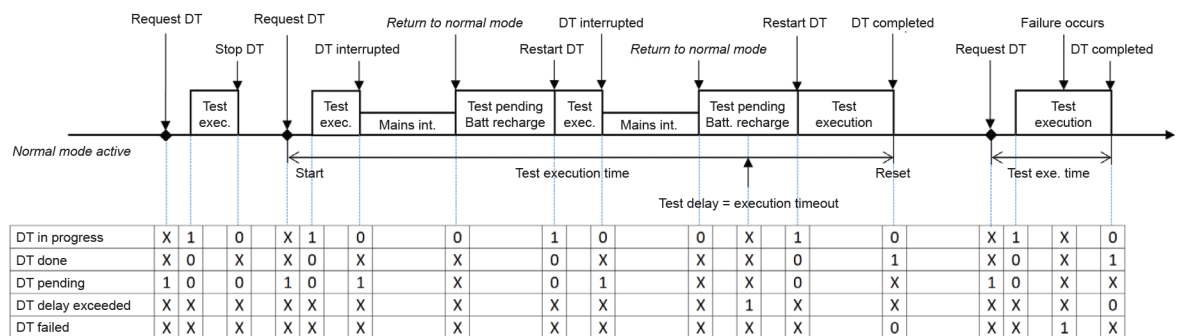
- be started, if such a timer is not currently running, or
- continue running unmodified, if such a timer is already running.

See Table 16 for updates to bit 5 of *"emergencyFailureStatus"*.

The timers shall be stopped and reset upon execution of command STOP TEST or upon completion of a test in accordance with 9.7.7 and 9.7.8.

Subsequent reception of commands REQUEST FUNCTION TEST or REQUEST DURATION TEST or any other internal process that can update bit 4 and bit 5 of "emergencyStatus" shall not reset a running timer if the relevant test pending flag is TRUE.

A test aborted due to failure of normal supply shall not reset a running timer. Figure 4 shows an example of a duration test execution.



IEC

Key

DT duration test

X unchanged

♦ requested start of a DT

DT in progress = Emergency mode bit 5

DT done = Emergency status bit 2

DT pending = Emergency status bit 5

DT delay exceeded = Emergency failure status bit 5

DT failed = Emergency failure status bit 7

Figure 4 – Duration test execution time out example

9.8.4 Querying test results

Upon completion of a function or duration test, a control gear shall update "emergencyStatus" and "emergencyFailureStatus" in accordance with 9.7.7 and 9.7.8. The control gear shall expose commands QUERY FAILURE STATUS and QUERY EMERGENCY STATUS to query "emergencyStatus" and "emergencyFailureStatus" respectively.

During a duration test the control gear shall update "durationTestResult" with the currently elapsed time in 2-min intervals in accordance with 9.7.8. The "durationTestResult" can be queried by command QUERY DURATION TEST RESULT.

NOTE Tests can be aborted by other application controllers, or due to a loss of normal supply. To ensure the failure status bits correspond to a completed test, application controllers can check the test done and valid status (bits 1 and 2 of "emergencyStatus") before reading "emergencyFailureStatus"

9.8.5 Extended test duration

The extended test duration enables continued operation of the emergency lamp in a duration test exceeding the rated duration. If the control gear cannot complete the extended test duration, the duration test shall be flagged as failed.

NOTE In some regions, emergency lighting installers are required to initially test new control gear and new batteries for a longer time than the standard rated duration. This allows for possible battery degradation over the lifetime of the battery.

Additionally, the control gear can be instructed to perform a duration test until the battery voltage reaches the lamp cut-off voltage, to help a test system determine battery capacity.

"*extendedDuration*" determines the test logic and additional test time in 2 min increments as described in Table 11.

Table 11 – "*extendedDuration*"

Bit	Description	Value
0	Test until lamp cut-off voltage reached	"0" = "NO"
1 to 7	Additional test time in 2 min increments	"0" = "No additional test time" "1-127" = "2 min to 254 min"

"*extendedDuration*" can be set via PERFORM SELECTED FUNCTION (*DTR1*, *DTR0*) and queried by QUERY SELECTED VARIABLE (*DTR0*).

"*extendedDuration*" will influence when a duration test is marked as passed and at which point the control gear shall exit mode "Duration test in progress". See 9.7.8.

Upon successful completion of a duration test, "*extendedDuration*" shall be set to 0.

The control gear shall not adjust the light output in an attempt to meet the extended test duration.

"*extendedDuration*" shall have no bearing on the operation of the control gear in emergency mode.

9.8.6 Timing definitions

Table 12 gives an overview of the resolution of the timing definitions used in this document.

Table 12 – Timing definitions

Time	Default value	Unit (resolution)	Default time	Min. time	Max. time
" <i>testDelayTime</i> "	0	15 min	0 min	0 min	682,6 days
" <i>functionTestDelay</i> "	0	15 min	0 min	0 min	682,6 days
" <i>durationTestDelay</i> "	0	15 min	0 min	0 min	682,6 days
" <i>functionTestinterval</i> "	7	1 day	7 days	1 day	255 days
" <i>durationTestinterval</i> "	26	1 week	26 weeks	1 week	97 weeks
" <i>testExecutionTimeout</i> "	7	1 day	7 days	0 = 15 min	255 days
" <i>durationTestResult</i> "	0	2 min	0 min	0 min	8,5 h
" <i>ratedDuration</i> "	factory burn-in	2 min	factory burn-in	0 min	510 min
" <i>extendedDuration</i> "	0	2 min	0 min	0 min	254 min
" <i>prolongTime</i> "	0	30 s	< 30 s	< 30 s	127,5 min
" <i>lampEmergencyTime</i> "	0	1 h	0 h	0 h	255 h
" <i>totalLampOperationTime</i> "	0	4 h	0 h	0 h	1 020 h
" <i>installationInhibitHours</i> "	factory burn-in	1 h	factory burn-in	0 h (disabled)	150 h
" <i>installationInhibitTimer</i> "	n.a.	1 h	n.a.	0 h (disabled)	150 h

9.9 Protection functionalities in emergency mode

Practicability of protection functionalities while emergency mode is active should be considered by the control gear manufacturer, as they can interfere with desired emergency operation, for example it is possible that reducing the light output to preserve the lifetime of the light source will not be suitable. The manufacturer can decide whether a certain type of protection is suitable while emergency mode is active.

It is recommended that any protection functionalities that are not directly safety related and which can interfere with the desired emergency operation when applied, are disabled as long as emergency mode is active.

9.10 Emergency mode and operating modes

The behaviour of the control gear can differ from this document in whole or in part depending on the selected manufacturer-specific operating mode. It is recommended that the factory default operating mode meets all the requirements in this document.

NOTE In accordance with 9.2, configuration changes, including a change of operating mode, is restricted in some modes.

9.11 Hardwired emergency inputs

9.11.1 General

Emergency control gear can have some additional hardwired inputs to support emergency related operation such as manual remote inhibit systems and manual switching of the lamp in normal operation. If such inputs exist, their behaviour shall be as specified in 9.11.2 and 9.11.3.

9.11.2 Hardwired inhibit input

Emergency control gear with a hardwired inhibit input shall indicate the presence of this feature by setting bit 5 of *"emergencyFeatures"*.

The status of the hardwired inhibit input shall be reflected in bit 6 of *"emergencyMode"* as follows:

- if *"emergencyFeatures"* bit 5 is TRUE and the hardwired inhibit input is active: TRUE;
- otherwise: FALSE.

In some modes, the act of setting bit 6 will result in a mode change or other action. See 9.7.

9.11.3 Hardwired switch

9.11.3.1 General

A hardwired switch may be supported in types A, B and C control gear. When operation of the hardwired switch is enabled, the ON/OFF state of the hardwired switch provides a means to manually switch the lamp on and off in normal and inhibit modes. Emergency control gear supporting a hardwired switch shall set bit 0 of *"hardwiredSwitchStatus"* (see 9.12.8).

9.11.3.2 Enabling and disabling operation of the hardwired switch

The hardwired switch input operation can be enabled or disabled by use of bit 1 of *"hardwiredSwitchStatus"*. Disabling the operation of the hardwired switch shall result in control of the lamp via the bus interface only.

9.11.3.3 Modification to standard behaviour

If *"hardwiredSwitchStatus"* = XXXX XX11, and the hardwired switch state is ON, then *"emergencyMode"* bit 7 shall be set. In all other cases, *"emergencyMode"* bit 7 shall be cleared.

If *"hardwiredSwitchStatus"* = XXXX XX11, the control gear behaviour shall be modified as follows:

- If the hardwired switch state changes from ON to OFF, then:
 - set *"targetLevel"* = 0;
 - adjust light output to 0 as quickly as possible.
- While the hardwired switch state is OFF:
 - respond to changes in *"targetLevel"* (including calculation of *"limitError"*) as if *"maxLevel"* = 0.
This shall not prevent the control gear from executing configuration and query commands that relate to *"maxLevel"*.
- If the hardwired switch state changes from OFF to ON, then:
 - set *"targetLevel"* = 254;
 - adjust light output to *"targetLevel"* as quickly as possible.
- If the hardwired switch state is OFF, and *"hardwiredSwitchStatus"* is changed from XXXX XX11 to XXXX XX01, then:
 - set *"targetLevel"* = 254;
 - adjust light output to *"targetLevel"* as quickly as possible.

Whilst operating in a mode other than normal or inhibit mode, the light output shall not be adjusted to *"targetLevel"* or 0 as a result of hardwired switch behaviour.

NOTE When the mode changes back to normal or inhibit mode, the light output is then adjusted in the normal manner.

9.12 Control gear status and capabilities

9.12.1 General

Each control gear shall be capable of exposing its capabilities and current status as specified in 9.12.2 to 9.12.9.

9.12.2 Modification to *"lampOn"*

The requirements of IEC 62386-102:2022, 9.16.4 applies with the following addition.

If bit 1 of *"emergencyMode"* = FALSE, *"lampOn"* shall reflect the status of the emergency lamp.

9.12.3 Rated duration and battery charge

The emergency control gear is required to operate in emergency mode whilst being powered from its connected battery for at least *"ratedDuration"* minutes.

The control gear shall report its rated duration on execution of QUERY RATED DURATION.

The control gear shall report the current battery state of charge *"batteryCharge"* on execution of command QUERY BATTERY CHARGE. A reply of MASK shall indicate that the current state of charge is unknown or invalid.

9.12.4 Emergency status

The control gear shall expose its status as a combination of device properties as given in Table 13.

Table 13 – "emergencyStatus"

Bit	Name	Value	Function	See
0	Inhibit mode active?	"0" = "NO"	Set when inhibit timer is running or inhibit mode is active or the hardwired inhibit input is active whilst in rest mode.	9.7.3, 9.7.6
1	Function test done and results available?	"0" = "NO"	Set when function test has completed, and results are ready to be queried. Does not imply that the test was successful.	9.7.7
2	Duration test done and results available?	"0" = "NO"	Set when duration test has completed, and results are ready to be queried. Does not imply that the test was successful.	9.7.8
3	Battery charged? ^a	"0" = "NO"	Set when "batteryCharge" = 254.	9.12.3
4	Function test pending?	"0" = "NO"	Set when a function test has been requested and remains set until the control gear is able to execute the test.	9.7.7
5	Duration test pending?	"0" = "NO"	Set when a duration test has been requested and remains set until the control gear is able to execute the test.	9.7.8
6	Identify active	"0" = "NO"	Control gear is currently running identification procedure. See IEC 62386-102:2022, 11.4.6.	11.4.2
7	Physical selection active	0	Physical selection is not supported in IEC 62386-102:2022.	-
^a This indicates the battery is sufficiently charged to allow a duration test to be started immediately.				

The "emergencyStatus" can be queried using QUERY EMERGENCY STATUS. Bits 1 to 6 shall reflect the actual situation within 1 s after the occurrence of the state change, unless explicitly stated otherwise. Bit 0 shall be updated upon entry to any mode according to 9.7. Bit 7 shall always be set to "0" as physical selection is not supported in IEC 62386-102:2022.

9.12.5 Emergency mode

The "emergencyMode" variable contains information about the current mode of operation of the control gear as described in Table 14.

Table 14 – "emergencyMode"

Bit	Name	Value	Function	See
0	Rest mode active?	"0" = "NO"	Set when control gear is in rest mode.	9.7.6
1	Normal mode active?	"0" = "NO"	Set when control gear is in normal or inhibit mode.	9.7.2
2	Emergency mode active?	"0" = "NO"	Set when control gear is in emergency mode.	9.7.4
3	Extended emergency mode active?	"0" = "NO"	Set when control gear is in extended emergency mode.	9.7.5
4	Mode "Function test in progress" active?	"0" = "NO"	Set when control gear is running a function test.	9.7.7
5	Mode "Duration test in progress" active?	"0" = "NO"	Set when control gear is running a duration test.	9.7.8
6	Hardwired inhibit input active?	"0" = "NO" or not present	Set when hardwired inhibit input is active.	9.11.2
7	Hardwired switch is ON?	"0" = "NO"	Set when hardwired switch is ON. Control gear type A, B or C only.	9.11.3

The "emergencyMode" can be queried using QUERY EMERGENCY MODE. For bits 0 to 5 the control gear shall set the bits upon entry to that mode. Bits 6 and 7 shall reflect the actual situation within 1 s after the occurrence of the state change.

Bit 7 is only applicable for control gear types A, B and C. For type D control gear, bit 7 shall be "0".

9.12.6 Emergency features

The "emergencyFeatures" variable contains information about the control gear functional capabilities as described in Table 15.

Table 15 – "emergencyFeatures"

Bit	Name	Value	Function	See
0	Integral emergency control gear	"0" = "NO"	Indicates the control gear is integral in accordance with IEC 61347-1:2015, 3.1.3.	3.14
1	Maintained control gear – non controllable (type C)	"0" = "NO"	Indicates the control gear is type C.	3.23
2	Maintained control gear – controllable (type A or B)	"0" = "NO"	Indicates the control gear is of type A or B.	3.21 3.22
3	Auto test capability	"1" = "YES"	Indicates the control gear supports automatic testing. Function is mandatory.	9.8.2
4	Configurable emergency level	"0" = "NO"	Indicates the control gear supports a configurable emergency level, which implies "emergencyPhMinLevel" ≠ "emergencyPhMaxLevel".	9.4.3
5	Hardwired inhibit input supported?	"0" = "NO"	Indicates the presence of a hardwired inhibit input.	9.11.2
6	Physical selection supported	0	Physical selection removed from IEC 62386-102:2022.	-
7	Relight in rest mode supported?	"1" = "YES"	Indicates the control gear supports command RE-LIGHT/RESET INHIBIT. Function is mandatory.	11.6.2 .4

The *"emergencyFeatures"* can be queried using QUERY FEATURES.

Bits 2 and 1 shall indicate the control gear type as follows:

- Type D: both bit 1 and bit 2: "0";
- Type C: bit 1: "1", bit 2: "0";
- Type A or B: bit 1: "0", bit 2: "1".

Bit 3 and bit 7 shall always be set to "1" as functionality is mandatory.

Bit 6 shall always be set to "0" as physical selection is not supported in IEC 62386-102:2022.

9.12.7 Emergency failure status

The *"emergencyFailureStatus"* variable contains information about the control gear emergency failures as described in Table 16.

Table 16 – *"emergencyFailureStatus"*

Bit	Name	Value	Function	See
0	Emergency control gear failure?	"0" = "NO"	Set when a manufacturer-defined control gear failure is detected.	-
1	Battery duration failure?	"0" = "NO"	Set when <i>"durationTestResult" < ("ratedDuration" + "extendedDuration[1:7]")</i> at the time of the last duration test, if this test failed due to insufficient battery capacity.	9.7.8
2	Battery failure?	"0" = "NO"	Set when control gear has detected a battery failure.	-
3	Emergency lamp failure?	"0" = "NO"	Set when control gear has detected a lamp failure whilst battery supplied.	-
4	Function test max. delay exceeded?	"0" = "NO"	Set when function test is pending for <i>> "testExecutionTimeout"</i> .	9.8.3
5	Duration test max. delay exceeded?	"0" = "NO"	Set when duration test is pending for <i>> "testExecutionTimeout"</i> .	9.8.3
6	Function test failed?	"0" = "NO"	Set when the last completed function test failed.	9.7.7
7	Duration test failed?	"0" = "NO"	Set when the last completed duration test failed.	9.7.8

The *"emergencyFailureStatus"* can be queried using QUERY FAILURE STATUS. The bits shall reflect the actual situation within 1 s after the occurrence of the state change unless explicitly stated otherwise.

Setting any of bits [0:2] to "1" shall cause *"controlGearFailure"* to be set to TRUE.

Bit 0: Criteria for setting and clearing this bit shall be defined by the manufacturer. It is recommended to state these criteria in the literature.

Bit 1: shall be set and cleared only in accordance with the latest duration test results. The *"extendedDuration[1:7]"* refers to the extended test duration that applied during the last duration test.

NOTE 1 During a test, i.e., up until the corresponding bit 1 or bit 2 of *"emergencyStatus"* is set, this status bit can reflect the results of the previous or current test.