IEC 60598-2-22

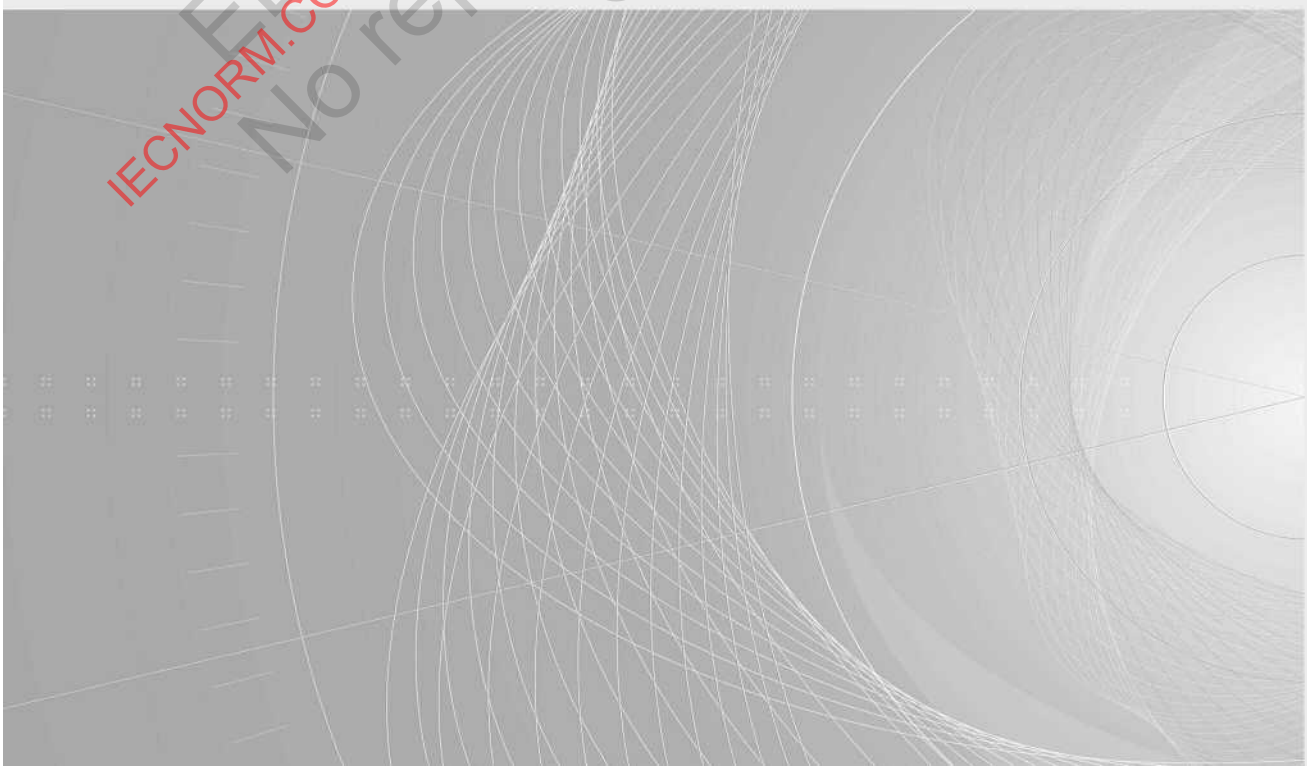
Edition 5.0 2021-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Luminaires –
Part 2-22: Particular requirements – Luminaires for emergency lighting

Luminaires –
Partie 2-22: Exigences particulières – Luminaires pour éclairage de secours



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LUMINAIRES –

Part 2-22: Particular requirements – Luminaires for emergency lighting

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC 60598-2-22 has been prepared by subcommittee 34D: Luminaires of IEC technical committee 34: Lighting. It is an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2014 and Amendment 1:2017. This edition constitutes a technical revision.

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

a) update of requirements for rest mode and inhibiting mode;
b) clarification of high temperature operation tests;
c) introduction of new requirements for lithium batteries;
d) introduction of new requirements for electric double layer capacitors (EDLCs);

e) clarification of resistance to heat, fire and tracking;

f) clarification of test facilities for self-contained luminaires;

g) clarification of the test method for contrast measurements of exit signs.

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

Draft	Report on voting
34D/1635/FDIS	34D/1642/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 2-22 is to be used in conjunction with the latest edition of IEC 60598-1 and its amendment(s). It was established on the basis of the ninth edition (2020) of that standard.

NOTE 1 When "Part 1" is mentioned in this document, it refers to IEC 60598-1.

NOTE 2 In this document, the following print type is used:

– compliance statements: *in italic type.*

A list of all parts in the IEC 60598 series, published under the general title *Luminaires*, 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.

LUMINAIRES –

Part 2-22: Particular requirements – Luminaires for emergency lighting

22.1 Scope

This part of IEC 60598 specifies requirements for emergency luminaires for use with electrical lamps on emergency power supplies not exceeding 1 000 V.

This document does not cover the effects of non-emergency voltage reductions on luminaires incorporating high pressure discharge lamps.

This document gives general requirements for emergency lighting equipment.

In this document, the term "lamp" which also includes "light source(s)" where appropriate, is used.

22.2 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 60073, *Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators*

IEC 60155, *Glow-starters for fluorescent lamps*

IEC 60598-1, *Luminaires – Part 1: General requirements and tests*

IEC 60896-21, *Stationary lead-acid batteries – Part 21: Valve regulated types – Methods of test*

IEC 61032:1997, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 61056-1, *General purpose lead-acid batteries (valve-regulated types) – Part 1: General requirements, functional characteristics – Methods of test*

IEC TR 61341, *Method of measurement of centre beam intensity and beam angle(s) of reflector lamps*

IEC 61347-2-2, *Lamp controlgear – Part 2-2: Particular requirements for d.c. or a.c. supplied electronic step-down convertors for filament lamps*

IEC 61347-2-3:2011, *Lamp control gear – Part 2-3: Particular requirements for a.c. and/or d.c. supplied electronic control gear for fluorescent lamps*

IEC 61347-2-7:2011, *Lamp controlgear – Part 2-7: Particular requirements for battery supplied electronic controlgear for emergency lighting (self-contained)*
IEC 61347-2-7:2011/AMD1:2017
IEC 61347-2-7:2011/AMD2:2021

IEC 61347-2-12, *Lamp controlgear – Part 2-12: Particular requirements for d.c. or a.c. supplied electronic ballasts for discharge lamps (excluding fluorescent lamps)*

IEC 61347-2-13, *Lamp controlgear – Part 2-13: Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules*

IEC 61951-1, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary sealed cells and batteries for portable applications – Part 1: Nickel-Cadmium*

IEC 61951-2, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary sealed cells and batteries for portable applications – Part 2: Nickel-metal hydride*

IEC 62034, *Automatic test systems for battery powered emergency escape lighting*

IEC 62133-2:2017, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications – Part 2: Lithium systems*

IEC 62391-1:2015, *Fixed electric double-layer capacitors for use in electric and electronic equipment – Part 1: Generic specification*

IEC 62391-2:2006, *Fixed electric double-layer capacitors for use in electronic equipment – Part 2: Sectional specification – Electric double-layer capacitors for power application*

IEC 62620:2014, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for use in industrial applications*

ISO 3864-4:2011, *Graphical symbols – Safety colours and safety signs – Part 4: Colorimetric and photometric properties of safety sign materials*

ISO 30061:2007, *Emergency lighting*

CIE 121 SP1, *The Photometry and Goniophotometry of Luminaires – Supplement 1: Luminaires for Emergency Lighting*

CIE S025, *Test Method for LED Lamps, LED Luminaires and LED Modules*

22.3 Terms and definitions

For the purposes of this document, the terms and definitions given in Part 1 and the following apply.

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

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

22.3.1
emergency lighting
lighting for use when the supply to the normal lighting fails

Note 1 to entry: Emergency lighting includes emergency escape lighting, high-risk task-area lighting and standby lighting.

22.3.2
emergency escape lighting
that part of emergency lighting that provides illumination for the safety of people leaving an area or attempting to terminate a dangerous process before vacating an area

22.3.3
standby lighting
that part of emergency lighting that enables normal activities to continue substantially unchanged

22.3.4
high-risk task-area lighting
part of emergency lighting provided to ensure the safety of people involved in a potentially dangerous process or situation and to enable proper shut-down procedures for the safety of the operator and occupants of the premises

22.3.5
maintained emergency luminaire
luminaire in which the emergency lighting lamps are energized at all times when normal or emergency lighting is required

22.3.6
non-maintained emergency luminaire
luminaire in which the emergency lighting lamps are in operation only when the supply to the normal lighting fails

22.3.7
combined emergency luminaire
luminaire containing two or more lamps, at least one of which is energized from the emergency lighting supply and the others from the normal lighting supply

Note 1 to entry: A combined emergency luminaire is either maintained or non-maintained.

22.3.8
self-contained emergency luminaire
luminaire providing maintained or non-maintained emergency lighting in which all the elements such as the electric source for safety services (ESSS), the lamp, the control unit and the test and monitoring facilities, where provided, are contained within the luminaire or adjacent to it (that is, within 1 m cable length)

22.3.9
centrally supplied emergency luminaire
luminaire for maintained or non-maintained operation which is energized from a central emergency power system that is not contained within the luminaire

22.3.10
compound self-contained emergency luminaire
self-contained luminaire providing maintained or non-maintained emergency lighting and also providing emergency supply for operating a satellite luminaire

22.3.11
satellite emergency luminaire
luminaire for maintained or non-maintained operation which derives emergency operation supply from an associated compound self-contained emergency luminaire

22.3.12
control unit
unit or set of units comprising a supply changeover system, an electric source for safety services (ESSS) charging device and, where appropriate, a means for testing

Note 1 to entry: This unit can also contain the lamp controlgear.

22.3.13
normal supply failure
condition in which the normal lighting can no longer provide a minimum illuminance for emergency escape purposes and when the emergency lighting should become operative

22.3.14
emergency luminaire rated luminous flux
lumen output as claimed by the luminaire manufacturer, 60 s (0,5 s for high-risk task-area luminaires) after failure of the normal supply, and continuously maintained to the end of the rated duration of operation

22.3.15
rated duration of emergency operation
time, as claimed by the manufacturer, during which the rated emergency lumen output is provided

22.3.16
normal mode
state of a self-contained emergency luminaire that is ready to operate in emergency mode while the normal supply is on

Note 1 to entry: In the case of a normal supply failure, the self-contained luminaire automatically changes over to the emergency mode.

22.3.17
emergency mode
state of a self-contained emergency luminaire that provides lighting when energized by its internal power source, the normal supply having failed

22.3.18
rest mode
state of a self-contained emergency luminaire that has been intentionally extinguished while the normal supply is off and that, in the event of restoration of the normal supply, automatically reverts to normal mode

22.3.19
maximum overcharge rate
maximum continuous charge rate (e.g. current or voltage) that can be applied to a fully charged electric source for safety services (ESSS)

22.3.20
remote inhibiting facility
means for inhibiting remotely a luminaire associated with an emergency lighting system

22.3.21
remote inhibiting mode
state of a self-contained emergency luminaire which is inhibited from operating by a remote device while the normal supply is on and in the case of a normal supply failure when the luminaire does not change over to emergency mode

22.3.22
internally illuminated safety sign
self-contained or centrally supplied emergency luminaire intended to provide a specific safety message obtained by a combination of colour and geometric shapes

Note 1 to entry: Details are given in ISO 3864-1 and ISO 3864-4.

22.3.23
practical emergency lamp flux
PELF
minimum luminous flux of the lamp observed during the rated duration of the emergency mode

Note 1 to entry: PELF = LDL × EBLF
where LDL is the rated luminous flux of fluorescent or discharge lamp; this is taken as the initial lighting design lumens at 100 h.

22.3.24
self-contained portable emergency luminaire
portable luminaire providing emergency lighting where all of the elements, such as the electric source for safety services (ESSS), the lamp(s), the control unit, a manual switch for switching on or off one or more lamp and the test and monitoring facilities, where provided, are contained within the luminaire which can be detached from its base unit for use in the emergency mode

22.3.25
emergency ballast lumen factor
EBLF
ratio of the emergency luminous flux of the lamp supplied by the emergency controlgear to the luminous flux of the same lamp operated with the appropriate reference ballast at its rated voltage and frequency

Note 1 to entry: The emergency ballast lumen factor is the minimum of the values measured at the appropriate time after failure of the normal supply and continuously to the end of the rated time duration.

[SOURCE: IEC 61347-2-7:2011, 3.13]

22.3.26
emergency luminaire mounted on lighting track system
emergency luminaire specifically designed to be used on luminaire track systems

22.3.27
remote box
box complying with the same requirements as the emergency luminaire

Note 1 to entry: Its purpose is to contain any of the components e.g. battery, controlgear that will not be fitted into the emergency luminaire.

22.3.28
practical emergency light source flux
PELSF
minimum luminous flux of the light source observed during the rated duration of the emergency mode

Note 1 to entry: For LED light sources:

a) if EOF_l is given: PELSF = LDL × EOF_l

b) if $I_{emergency}$ from constant current controlgear is defined: PELSF = LDL × ($I_{emergency}$ / $I_{normal\ mode}$)
where LDL is the lumen output of the LED module under the condition corresponding to the operation in the luminaire (identical t_p) operated at the same current ($I_{normal\ mode}$).

22.3.29
battery manufacturer's declaration of design
document issued by the battery manufacturer that provides technical information necessary to evaluate the safe use of the battery and its operating regime in accordance with the requirements of this document

Note 1 to entry: Examples of the battery manufacturer's declaration of design for a lithium battery is given in IEC 61347-2-7.

22.3.30
rated capacity
capacity value of a battery determined under specified conditions and declared by the manufacturer

[SOURCE: IEC 60050-482:2004, 482-03-15]

22.3.31
electric source for safety services
ESSS
energy source for self-contained emergency luminaire, intended to supply the emergency lighting luminaire in emergency mode

Note 1 to entry: The ESSS can also supply the luminaire in rest mode and inhibiting mode.

22.3.32
electric double-layer capacitor
EDLC
device that stores electrical energy using a double-layer in an electrochemical cell

22.4 General test requirements

The provisions of Section 0 of Part 1 shall apply. The tests described in each appropriate section of Part 1 shall be carried out in the order listed in this document.

When testing combined emergency luminaires in accordance with the requirements of this document, the tests shall cover those parts of the luminaire which are involved with providing emergency lighting taking into account the influence of all other luminaire parts and components. The components and parts of the luminaires designed to provide only normal lighting shall be subjected to the tests in accordance with the requirements of the relevant part of IEC 60598-2 (for example, if the luminaire is recessed, it shall be tested in accordance with the requirements of the part dealing with recessed luminaires).

If some elements of an emergency luminaire are adjacent (within a 1 m cable length) to the main part of the luminaire, all the elements of the luminaire, including the means of inter-connection, shall satisfy the relevant requirements of this document.

The additional requirements covering self-contained portable emergency luminaires are given in Annex E.

The photometric tests of Clause 22.17 shall be made on a separate sample luminaire.

Derating factors should be applied during the emergency lighting installation scheme design which is relevant to the application. These factors are normally defined by the relevant application standard.

22.5 Classification of luminaires

Emergency luminaires shall be classified in accordance with the provisions of Section 2 of Part 1 except that all emergency luminaires shall be classified as suitable for direct mounting on normally flammable surfaces.

Emergency luminaires shall also be classified as specified in Annex B.

22.6 Marking

The provisions of Section 3 of Part 1 shall apply together with the requirements of 22.6.1 to 22.6.20 below.

22.6.1 Luminaires shall be clearly marked with the rated supply voltage or voltage range(s).

22.6.2 Luminaires shall be clearly marked with details of their classification in accordance with Clause 22.5 (see Annex B).

22.6.3 Luminaires with replaceable lamps shall be clearly marked with details of the correct replacement lamp in a position visible during lamp replacement. This ensures that the emergency luminaire's rated luminous flux can be achieved.

NOTE The information relating to correct lamp replacement can include the number, type, rated voltage and rated wattage, etc.

22.6.4 Where appropriate, in addition to t_a marking, the range of ambient temperature shall be marked or given in the instruction leaflet supplied with the luminaire.

22.6.5 Emergency luminaires employing replaceable fuses and/or replaceable indicator lamps shall be marked with the details of fuse ratings and/or details of the indicator lamps.

22.6.6 For manual testing only, test facilities to simulate normal supply failure, where provided, shall be clearly marked so that the marking is visible during routine testing.

22.6.7 Self-contained luminaires shall be clearly marked with details about the nature of the ESSS it contains as follows.

22.6.7.1 Self-contained emergency luminaires with replaceable batteries shall be clearly marked with the details of the correct battery replacement. If the manufacturer indicates that the battery is only replaceable with a specific type, the battery technology (e.g. NiMH) and the type reference or the code of the replaceable battery shall be indicated. If the battery is replaceable with another type, the details shall include the battery technology (e.g. NiMH), rated voltage, capacity, temperature rating, and temperature classification.

Luminaires containing a non-replaceable battery(s) shall be marked to indicate that the battery is non-replaceable.

22.6.7.2 In self-contained luminaires with batteries, the batteries shall be marked with the year and month or year and week of manufacture.

In self-contained luminaires with replaceable batteries, space shall be provided on the battery label to allow the marking, by the installer or commissioning engineer, of the date of commissioning of the battery.

For luminaires with non-replaceable batteries, the space for marking the date of commissioning shall be provided on the battery or on a label visible during maintenance.

22.6.7.3 Self-contained emergency luminaires with an EDLC shall be clearly marked with the details for correct EDLC replacement. If the manufacturer indicates that the EDLC is only replaceable with a specific type, it shall indicate the type reference or the code of the replaceable EDLC. If the EDLC is replaceable with another type, the details shall include the type of EDLC (according to the applicable IEC standard), (e.g. rated voltage, capacity, temperature rating, temperature classification, dimensions).

Luminaires containing a non-replaceable EDLC shall be marked to indicate that the EDLC is non-replaceable.

22.6.8 Void.

22.6.9 Combined emergency luminaires shall be marked with details relating to correct lamp replacement for all lamps. If the lamps used in the emergency circuit and the normal supply circuit differ, the respective types shall be clearly identified.

Lampholders for emergency lighting lamps in combined luminaires shall be identified by a green dot, at least 5 mm in diameter, which shall be visible when replacing the lamp.

22.6.10 In the instruction leaflet supplied with the self-contained emergency luminaire, the manufacturer shall state that the replacement of the ESSS or of the whole luminaire (if equipped with a non-replaceable ESSS) is needed when they no longer meet their rated duration of operation after the corresponding recharge period.

All details for correct replacement of the ESSS shall be included in the instruction leaflet supplied with the self-contained emergency luminaire. If the manufacturer indicates that the ESSS is only replaceable with a specific type, the type reference or the code of the replaceable ESSS shall be indicated. If the ESSS is replaceable with another type, the instructions shall include: ESSS technology or type (battery, e.g. NiMH), applicable IEC standard (EDLC), rated voltage, capacity, temperature rating, temperature classification.

In addition, the instruction leaflet supplied with the self-contained emergency luminaire shall contain the substance of the following information: "The electric source for safety service is not a user serviceable item and shall only be replaced by the manufacturer service agent or a similar qualified person".

22.6.11 In the instruction leaflet supplied with the luminaire, the manufacturer shall give details of test facilities incorporated in the luminaire or appropriate instructions if these test facilities are supplied separately. The instructions shall include details of test procedures.

22.6.12 In the instruction leaflet supplied with the luminaire, the manufacturer shall give details of the connection leads to be used between a compound self-contained luminaire and an associated satellite luminaire. The maximum length of cables that limits the voltage drop to 3 % shall be specified.

22.6.13 Void.

22.6.14 In the instruction leaflet supplied with self-contained emergency luminaires, the manufacturer shall give details of any device which changes the mode of operation.

22.6.15 The manufacturer shall make available the photometric data in accordance with Clause 22.17.

22.6.16 Any normal preparation procedure for use of the luminaire shall be stated in the manufacturer's installation instructions. This preparation shall be carried out before type tests are made.

22.6.17 The marking required by 22.6.1, 22.6.2, 22.6.7.1 2nd paragraph, 22.6.7.3 2nd paragraph and 22.6.20 shall be in a position such that the information can be seen when the luminaire has been installed.

The marking in 22.6.5, 22.6.7.1 1st paragraph, 22.6.7.3 1st paragraph and 22.6.9 shall be visible during the maintenance of the relevant component.

NOTE For recessed luminaires, this information can be marked on the interior of the luminaire so that it is visible when the light controlling cover is removed.

22.6.18 The mounting instructions for luminaires intended for external plug and socket connections, without provisions to prevent accidental disconnection, shall be provided with the warning: "This luminaire is intended only for mounting in locations where the plug and socket are protected from unauthorized disconnection".

22.6.19 In the instruction leaflet supplied with the luminaire, the manufacturer shall specify if the lamp(s) and/or the ESSS is/are non-replaceable.

22.6.20 For emergency luminaires mounted on lighting track systems, they shall be marked to indicate that they are an emergency luminaire and shall not be adjusted by unauthorized persons. In the instruction leaflet supplied with the adjustable emergency track mounted luminaire, the manufacturer shall provide the photometric data.

22.6.21 In self-contained luminaires, the rated charge time, if lower than 24 h, can be declared in the instruction leaflet.

22.6.22 Where applicable, for self-contained luminaires, the manufacturer shall make available information for the allowed time for the luminaire to stay in rest mode or remote inhibiting mode after a full charging period, in order for the luminaire to provide at least 50 % of its rated duration of emergency operation.

The time shall be declared in the instruction leaflet supplied with the luminaire in days and calculated according to the procedure in IEC 61347-2-7:2011/AMD2:2021, 25.6.2.

NOTE 1 Examples of declared periods are 7, 30 or 90 days.

NOTE 2 The characteristics of rest mode and inhibiting mode are explained in Annex D.

22.6.23 *Compliance with the requirements of 22.6.1 to 22.6.22 is checked by inspection.*

22.7 Construction

The provisions of Section 4 of Part 1 shall apply together with the requirements of 22.7.1 to 22.7.23 below. In addition, emergency luminaires with automatic testing systems shall comply with the additional requirements of IEC 62034 as identified in Annex K of IEC 61347-2-7:2011 and Annex K of IEC 61347-2-7:2011/AMD1:2017.

22.7.1 In emergency luminaires, fluorescent lamps used to provide emergency lighting shall start in the emergency mode without the aid of glow starters as specified in IEC 60155. Such starters shall not be in circuit during the emergency mode. The emergency lighting shall not be provided by means of fluorescent lamps with built-in glow starters.

Compliance is checked by inspection.

22.7.2 Lamp controlgear for operating the emergency lamp(s) and control units incorporated into emergency luminaires shall comply with IEC 61347-2-2, IEC 61347-2-3, IEC 61347-2-7, IEC 61347-2-12 and IEC 61347-2-13 as appropriate and with the additional safety requirements for electronic controlgear for emergency lighting in the appropriate annex of the standards (e.g. Annex J of IEC 61347-2-3:2011).

Compliance is checked by the relevant tests specified in these standards.

22.7.3 Emergency luminaires shall be equipped with a protection device which disconnects the luminaire from the supply in case of any failure within that luminaire affecting the circuit (short circuit or overcurrent consumption).

Compliance is checked by measurement and inspection.

22.7.4 For emergency luminaires, the mechanical strength tests given in Part 1 shall be applied with a minimum impact energy of 0,35 Nm to all external parts.

22.7.5 Whilst connected to a live supply, self-contained emergency luminaires shall have adequate separation between the normal supply and live parts in the circuit for ESSS charging. When there are exposed live parts, double insulation, reinforced insulation, earth screen or other equivalent techniques can be used.

Additionally, in the event of bare contacts in the ESSS charging circuit, a safety isolating transformer shall be used. If a separating transformer is used as insulation between the normal supply and the ESSS charging circuit, the insulation in the ESSS charging circuit shall consist of at least basic insulation.

Compliance is checked by inspection and by the tests of Clauses 22.8 and 22.15.

22.7.6 In centrally supplied combined emergency luminaires, electrical separation between normal and emergency supplies shall be ensured by double insulation, reinforced insulation, earthed screen or other equivalent means.

EXAMPLE The use of basic insulation only, for both circuits, or double or reinforced insulation on the normal supply circuit fulfils this requirement. The connection of both circuits to a terminal block where the required creepage and clearances are obtained by leaving one terminal free, without the possibility of connection between the circuits, is also acceptable.

Compliance is checked by inspection.

22.7.7 Self-contained emergency luminaires shall have adjacent to them or incorporated in them a device for charging the ESSS from the normal supply and an indicator visible in normal use, for example a lamp, which shows the following conditions:

a) the luminaire is connected and the charge of the ESSS is being maintained;

b) circuit continuity exists through the tungsten filament of emergency lighting lamps where appropriate.

Where an electrical light source indicator is used, it shall comply with the colour requirements of IEC 60073 and be green.

For emergency luminaires with tungsten filament lamp(s) both a) and b) apply at the same time, and for other emergency luminaires without tungsten filaments, such as fluorescent and LED lamps, only a) applies.

For emergency luminaires with tungsten filament lamps, compliance that circuit continuity exists through the tungsten filament is checked in the following manner: disconnection of one of the lamps, or all the lamps when connected in parallel, causes the indicator to extinguish or change colour in accordance with IEC 60073.

For all emergency luminaires, compliance that the charge indicator is correctly connected to the circuit is checked in the following manner: disconnection of the ESSS during the charging phase, causes the indicator to extinguish or change colour in accordance with IEC 60073.

22.7.8 Self-contained emergency luminaires shall incorporate an ESSS that meets the requirements of Annex A and is designed to provide the rated duration for at least four years of normal operation. This ESSS shall be used only for emergency related functions within the luminaire or its satellite.

Compliance is checked by inspection and the tests of Annex A.

22.7.9 Void

22.7.10 In self-contained emergency luminaires, there shall be no manual or non-self-resetting circuits between the ESSS and emergency lighting lamps other than the changeover device.

Self-contained emergency luminaires and centrally supplied emergency luminaires shall not contain any manual or non-self-resetting switch isolating the emergency circuit(s) from the mains supply other than facilities enabling rest mode or inhibiting mode.

NOTE Installation details can be found in IEC 60364-5-56.

Compliance is checked by inspection.

22.7.11 Lamp failure. Any lamp failure (emergency or normal operating lighting lamps) shall not interrupt the charging current to the ESSS and shall not cause an overload that could impair the operation of the ESSS.

Compliance is checked by the test of Clause 22.6 of IEC 61347-2-7:2011 and Clause 22.6 of IEC 61347-2-7:2011/AMD2:2021.

22.7.12 Self-contained emergency luminaires using a rechargeable battery as the emergency safety source shall comply with the requirements of Clause 23 of IEC 61347-2-7:2011 and Clause 23 of IEC 61347-2-7:2011/AMD2:2021.

22.7.13 The operation of a self-contained emergency luminaire in the emergency mode shall not be influenced by a short-circuit, a contact to earth or an interruption, in the wiring of the normal supply.

Compliance is checked by the test of Clause 28.2 of IEC 61347-2-7:2011.

22.7.14 Self-contained emergency luminaires with a remote inhibiting and/or rest mode function shall meet the requirements of Clause 25 of IEC61347-2-7:2011 and Clause 25 of IEC61347-2-7:2011/AMD2:2021.

22.7.15 Void. (The requirements in this clause were moved to IEC 61347-2-7:2011.)

22.7.16 Void. (The requirements in this clause were moved to IEC 61347-2-7:2011.)

22.7.17 Void. (The requirements in this clause were moved to IEC 61347-2-7:2011.)

22.7.18 Void. (The requirements in this clause were moved to IEC 61347-2-7:2011.)

22.7.19 In self-contained emergency luminaires providing emergency lighting by means of tungsten filament lamps, the lamp voltage, which, after 30 % of rated duration of operation, has elapsed in the emergency mode, shall not exceed 1,05 times the rated lamp voltage.

Compliance is checked by measuring the lamp voltage during the first 10 cycles of the endurance tests given in 22.13.1.

22.7.20 Self-contained emergency luminaires shall use a rechargeable battery in accordance with the technical specification provided by the controlgear manufacturer (see Clause 7 of IEC 61347-2-7:2011, Clause 7 of IEC 61347-2-7:2011/AMD1:2017 and Clause 7 of IEC 61347-2-7:2011/AMD2:2021) and Annex A of this document.

22.7.21 In self-contained emergency luminaires, the ESSS and chargers shall be contained within the emergency luminaire or a remote box.

22.7.22 In self-contained emergency luminaires, remote boxes shall comply with the same requirements for mechanical, thermal and resistance to heat, fire and tracking as for the emergency luminaire.

22.7.23 Emergency luminaires and adjustable emergency luminaires, mounted on lighting track systems which are intended to be used for display lighting applications, shall include a system for locking the luminaire in a fixed aiming direction and fixed position on the track. The locking system shall ensure that the luminaire can be locked in its final aiming position and location and that it cannot be adjusted or moved without the aid of a tool.

NOTE The tool does not include a ladder or other means required to gain access to the luminaire.

22.7.24 A luminaire incorporating an EDLC shall provide an adequate space around the capacitor free from other components, in order to allow the correct operation of the overpressure device.

After the operation of the overpressure device, creepage distances and clearances shall not be reduced below the required limits.

The capacitor manufacturer shall be consulted to define the increased dimensions of the capacitor after operation of the overpressure device.

Compliance shall be checked by inspection with reference to the dimensional information provided by the capacitor manufacturer.

22.8 Creepage distances and clearances

The provisions of Section 11 of Part 1 shall apply.

22.9 Provision of earthing

The provisions of Section 7 of Part 1 shall apply.

22.10 Terminals

The provisions of Sections 14 and 15 of Part 1 shall apply.

22.11 External and internal wiring

The provisions of Section 5 of Part 1 shall apply together with the requirements of 22.11.

22.11.1 Electrical connections to the mains, between separate parts of the luminaire (e.g. remote controlgear box) and between luminaire components shall be protected against the risk of accidental disconnection. Electrical connections shall be permanent or have a provision to prevent accidental disconnection. Internal plug and socket connections not having a provision against accidental disconnection are accepted if direct access to them is prevented (e.g. protected by a cover that cannot be removed by a single action with one hand). External plug and socket connections not having a provision against accidental disconnection are accepted if the luminaire is provided with a warning as required by 22.6.18.

NOTE In France and Denmark a permanent connection is required by the safety lighting regulation.

Compliance is checked by inspection.

22.12 Protection against electric shock

The provisions of Section 8 of Part 1 shall apply.

22.13 Endurance test and thermal test

The provisions of Section 12 of Part 1 shall apply together with the requirements of 22.13.1 to 22.13.7.

22.13.1 For self-contained emergency luminaires, the endurance test shall be as specified in Part 1 except that the requirements of items c) and d) shall be replaced by the following.

The luminaire shall be tested in the enclosure for a total duration of 390 h, made up of 10 successive cycles of 36 h and a final normal operation for 30 h, at maximum rated supply voltage. The luminaire shall be operated normally from maximum supply voltage for 30 h and for 6 h in the emergency mode, in each of the 10 cycles. In the case of durations longer than 6 h, the emergency period shall be extended until the lamp extinguishes and the total duration shall be increased accordingly. For both combined and maintained emergency luminaires, the normal lamp shall be operated during the 30 h periods.

Luminaires with an IP classification greater than IP20 shall be subjected to the relevant tests given in Clauses 12.4, 12.5, 12.6 and 12.7 of Section 12 of Part 1 after the test(s) given in 9.2 of Part 1 but before the test(s) given in 9.3 of Part 1 specified in 22.14 of this document. The test in 22.13.7 shall be carried out after the endurance test in 22.13.1 but before the thermal tests in 22.13.2 to 22.13.6.

Compliance is checked by the requirements of 12.3.2 of Part 1.

Additionally the luminaire shall operate satisfactorily during 50 supply voltage switching operations after the endurance test. Each switching operation shall consist of connection to the normal rated supply for 60 s and disconnection from the supply for 20 s.

Compliance is checked by inspection.

For luminaires with short-rated durations or with an inbuilt delay, after restoration of the normal supply and before the emergency lamp extinguishes, the duration of the 50 switching operations test should be modified as follows, to ensure that the batteries are not fully discharged before the completion of the test:

– mains off = 20 s;
– mains on = *delay* + {(20 + *delay*) × I_{dmax}} ÷ (0,65 × I_c);
– delay = time of delay [s];
– I_{dmax} = maximum discharge current [A], in accordance with item d) of A.4.2;

– I_c = charge current [A].

For luminaires with an inbuilt delay, the emergency lamp may be switched off after 20 s using the appropriate device, for example rest mode facility, switch, push-button.

NOTE The 11th 30 h charge at the end of the endurance test is such that the 50 switching operations test can be started with the batteries fully charged. The luminaire could not otherwise be expected to perform satisfactorily with discharged batteries.

22.13.2 The thermal tests given in Clauses 12.4 and 12.5 of Part 1 shall be carried out in both the normal operating mode and the emergency lighting mode. Luminaires designed to have pictograms applied to translucent parts shall be tested with those pictograms applied that give the most unfavourable thermal effect.

22.13.3 The conditions of test for luminaires in the emergency mode shall be as follows:

– for self-contained emergency luminaires: the temperature limits of Section 12 of Part 1 shall apply at any time between switch-on of the emergency mode and complete ESSS discharge;

– for combined emergency luminaires: the two circuits shall be tested together unless it is evident from the construction that the two circuits are not designed for operation together.

22.13.4 For the purposes of 22.13.3, voltage limits for discharge durations in Table 1 shall be used.

Table 1 – Voltage per cell to which the battery is discharged

Battery type	Discharge condition per cell V	
	Up to 1 h duration	Greater than 1 h duration
NiCd	1,0	1,0
Pb	1,75	1,8
NiMH	1,0	1,0
$Li(NiCoMn)O_2$	3,0	3,0
$LiFePO_4$	2,0	2,0
LTO	1,5	1,5
The values given apply at an ambient temperature of (20 ± 5) °C. The above-mentioned limits may be modified if supported by the battery manufacturer's declaration of design.		

For other battery types, these values are given by the battery manufacturer.

For EDLCs, the value is the lowest value measured at the end of the emergency operation, immediately before the light source extinguishes.

22.13.5 The temperature allowance of 5 °C specified in the first sentence of item a) of 12.4.2 of Part 1 shall be reduced to 2 °C for the limiting temperature of the ESSS.

22.13.6 Self-contained emergency luminaires shall be subjected to an additional thermal test in accordance with Clause 12.5 of Part 1 except that the abnormal service condition shall be the replacement of the internal ESSS with a short-circuit link across the ESSS charger output.

The luminaire shall comply with 12.5.2 of Part 1 and shall not become unsafe. After removal of the short circuit link, reconnection of the ESSS and replacement of user serviceable fuse-links where necessary, the luminaire shall continue to function as intended. Internal component failures within the controlgear caused by the ESSS short circuit should not be repaired unless user servicing of these parts is intended. In these cases, the luminaire should continue to function as intended following replacement of the complete item of controlgear.

22.13.7 On completion of the endurance test, after a complete ESSS discharge in accordance with 22.13.4, a self-contained emergency luminaire shall be allowed to cool to its rated ambient temperature (t_a) or to 25 °C, whichever is the higher and shall be subjected to a 24 h charging cycle, or the charging time declared by the manufacturer as in 22.6.21, at 0,9 times the rated supply voltage after which the luminaire, with the lamp as tested, shall, at the end of the rated duration with the lamp operating, provide the V_{min} value established in Clause 20 of IEC 61347-2-7:2011, Clause 20 of IEC 61347-2-7:2011/AMD1:2017 and Clause 20 of IEC 61347-2-7:2011/AMD2:2021.

22.14 Resistance to dust and moisture

The provisions of Section 9 of Part 1 shall apply. For luminaires with IP classification greater than IP20, the order of tests specified in Section 9 of Part 1 shall be as specified in Clause 22.12 of this document.

22.15 Insulation resistance and electric strength

The provisions of Section 10 of Part 1 shall apply.

22.16 Resistance to heat, fire and tracking

The provisions of Section 13 of Part 1 shall apply together with the following requirements.

For emergency luminaires containing an electrical source for safety services (ESSS), any part or component of the luminaire that it is possible to move and can come into possible contact with the ESSS, or the leads from the charger to the ESSS or charger circuit, shall be compliant with the glow wire test as stated in 13.3.2 of Part 1 but at a test temperature of 850 °C. Other parts of the luminaire which do not perform this protective function do not need to be subjected to this test at 850 °C.

Where the external cable length from a remote box is within 1 m and does not include an ESSS or charging leads then no special protection to the cable is required.

In the case where the connecting cable from the remote box is within 1 m and includes an ESSS or charging leads, the cable shall be in a sleeve meeting the 850 °C glow wire requirement or the cable shall provide an equivalent fire resistance. This requirement is not applicable if the leads from the charger to the ESSS or charger circuit are protected to limit any fault current higher than 6 A within 1 s of applying a fault.

Compliance is checked by applying the fault conditions as described in the controlgear standard and any short circuit between conductors of the external cable. After 1 s the current shall not be higher than 6 A.

NOTE Where a remote box is more than 1 m from the emergency luminaire, which is no longer a self-contained luminaire, then refer to national installation rules.

Compliance is checked by the test in 13.3.2 of Part 1.

22.17 Photometric data

22.17.1 The manufacturer shall make available the intensity distribution data necessary for the calculation of the emergency lighting installation in accordance with ISO 30061. The intensity data in emergency mode may be provided in candelas or in relative cd/1 000 lm. If the values are declared in candelas, the manufacturer shall provide the emergency luminaire rated luminous flux derived from the intensity distribution table.

Compliance is checked by direct measurements in emergency operating condition taking into account the test operating condition described in 22.17.3 or by measurements in normal operating condition and calculation as described in 22.17.2.

22.17.2 If values are declared in cd/1 000 lm, the manufacturer shall also provide the reference flux in emergency mode.

In the case of luminaires with tubular fluorescent lamps or other discharge lamps, the reference flux is the practical emergency light source flux PELF calculated as the rated flux of the lamp multiplied by the EBLF of the associated emergency ballast.

In the case of luminaires with LED light source, the reference flux is:

– the practical emergency light source flux PELSF

  The value may be calculated as the light source luminous flux of the LED module (LDL) in reference condition corresponding to the luminaire (at the same t_p) and at rated current ($I_{\text{normal mode}}$) multiplied by the EOF_I or ($I_{\text{emergency}}/I_{\text{normal mode}}$) of the associated constant current emergency controlgear.

NOTE 1 In this case the LOR of the luminaire has influence on the calculation of the emergency rated luminaire flux.

– the emergency luminaire rated luminous flux

  This value shows the rated luminous flux of the luminaire in normal mode ($I_{\text{normal mode}}$) multiplied by the EOF_I or ($I_{\text{emergency}}/I_{\text{normal mode}}$) of the associated constant current emergency controlgear.

NOTE 2 In this case the LOR of the luminaire is considered as 1.

The factor EOF_I can only be used under the following conditions:

– The forward current of the LED is controlled by the controlgear only.
– All LEDs mounted in the luminaire are supplied both in normal operating conditions and in emergency mode.
– The luminaire luminous flux and/or the LED light source luminous flux is measured at $I_{\text{normal mode}}$ corresponding to the $I_{\text{normal mode}}$ of the controlgear (e.g. in the case of a luminaire to be used with independent controlgear).
– The current in emergency mode is equal to or lower than $I_{\text{normal mode}}$ (EOF_I equal to or lower than 1).

NOTE 3 The use of emergency output factors different from EOF_I (e.g. EOF_U or EOF_P) are not part of the scope of 22.17.2. They can only be used for design purposes and not for testing.

22.17.3 Emergency luminaires shall provide at least 50 % of the level declared photometric data claimed by the manufacturer during operation in emergency mode 5 s after failure of the normal supply, and full rated photometric performance after 60 s and continuously to the end of the rated duration of the emergency operation. Emergency luminaires used for high-risk task-area lighting shall provide 100 % of the level declared photometric data within 0,5 s after failure of the normal supply, and continuously to the end of the rated duration of the emergency operation.

Compliance is checked by measurement, including the necessary calculation where required, and the following test conditions:

a) for self-contained luminaires in emergency mode during operation from the internal ESSS after a 24 h charge time, or the charging time declared by the manufacturer as in 22.6.21 at 0,9 times the minimum rated voltage;

b) for centrally supplied luminaires, the measurements for 5 s and 60 s shall be made at maximum supply voltage and all other measurements at 0,9 times the minimum rated supply voltage when stable photometric conditions have been reached.

Measurements for both self-contained emergency luminaires and centrally supplied emergency luminaires shall be made using a new lamp which has been aged according to the appropriate lamp standard for initial luminous flux measurements.

Photometric measurements shall be made in accordance with the requirements of CIE 121 SP1 taking into account the specific type of light source of the luminaire. For LED luminaires, measurements shall be made in accordance with the requirements of CIE S025. For emergency safety signs, the photometric distribution requirements of 22.17.1 do not apply. However, they do apply for the emergency lighting component if the sign also has an emergency lighting function.

All values shall be at least the minimum declared data.

NOTE 1 For verification purposes, if photometric data are declared in cd/1 000 lm, they can be recalculated in candelas taking into account the practical emergency lamp flux. In case of non-compliance, the luminous flux of the lamp used can be checked in reference conditions and the measured photometric data can be corrected to the rated value of the lamp.

NOTE 2 The verification of intensity distribution in relative values of the emergency luminaire and EBLF (or PELF) of the circuit can be made independently of each other.

22.17.4 In order to identify safety colours, the minimum value for the colour-rendering index of the light source in an emergency escape luminaire shall be R_a > 40.

Compliance is checked by inspection.

22.17.5 Internally illuminated emergency safety signs shall meet the requirements of ISO 30061.

The luminance of permanently illuminated safety signs in non-emergency mode shall meet the requirements of ISO 30061.

Compliance in emergency mode operation is checked by measurement in similar testing conditions as described in 22.17.1.

Luminance measurements shall be made in accordance with Annex C only.

22.18 Changeover operation

Devices for changeover from normal to emergency mode shall comply with the requirements of Clause 21 of IEC 61347-2-7:2011, Clause 21 of IEC 61347-2-7:2011/AMD1:2017 and Clause 21 of IEC 61347-2-7:2011/AMD2:2021, and for guidance see Annex L of IEC 61347-2-7:2011.

22.19 High temperature operation

Emergency luminaires shall be capable of operating in the emergency mode at an ambient temperature of 70 °C for at least 30 min after the start of the emergency operation.

Compliance is checked by satisfying the following test.

The relative light outputs of the luminaire operating in the emergency mode at t_a and at an ambient temperature of 70 °C shall be compared.

The battery shall be charged for 24 h at rated supply voltage. The emergency luminaire shall then be placed in a test chamber incorporating a remote light meter with fixed geometry in relation to the luminaire. With the ambient inside the chamber at t_a, the luminaire shall be disconnected from the supply and the relative light output measured 60 s after interruption of the supply.

The luminaire shall be removed from the chamber and the battery, after being fully discharged, is charged for 24 h at rated supply voltage. The test chamber shall be pre-heated to give an internal ambient temperature of 70 °C ± 5 °C. The emergency luminaire shall be returned to the same position as for the previous test. After 1 h, the luminaire shall be operated from the emergency supply. The light output reading shall not fall below 50 % of the initial 60 s result at any time from 60 s until 30 min after the start of the emergency operation.

For central battery systems, the voltage is considered constant and the battery may be substituted with a power supply. The test voltage is the rated voltage of the emergency luminaire. The light output reading shall not fall below 50 % of the initial 60 s result at any time from 60 s until 30 min after the start of the emergency operation.

NOTE The light meter can have the photometer head outside of the enclosure so that it is not affected by the ambient temperature. This can be achieved by the use of a clear glass window, fibre optic light guides, etc.

22.20 Battery chargers for self-contained emergency luminaires

Devices for recharging batteries in self-contained emergency luminaires shall comply with the requirements of Clause 22 of IEC 61347-2-7:2011, Clause 22 of IEC 61347-2-7:2011/AMD1:2017 and Clause 22 of IEC 61347-2-7:2011/AMD2:2021.

22.21 Test devices for emergency operation

22.21.1 Self-contained emergency luminaires shall be provided with:

– an automatic test facility complying with IEC 62034, or

– a manual integral test facility, or

– the means of connection to a remote test facility, for simulating failure of the normal supply.

Manually operated test switches shall be self-resetting or key operated.

Compliance is checked by inspection with reference to the manufacturer's operating instructions.

NOTE The third dashed item can be satisfied by a device which is provided in the associated fixed wiring installation.

22.21.2 Any remote test device used in conjunction with emergency lighting luminaires shall not influence the proper function of the safety illumination.

22.21.3 Indicators shall conform to the colour requirements given in IEC 60073.

Compliance is checked by inspection and by operating the test device in accordance with the instructions given by the manufacturer in the instruction leaflet.

Annex A
(normative)

ESSSs for self-contained emergency luminaires

A.1 General

ESSSs incorporated in emergency luminaires shall be one of the following types:

a) sealed nickel cadmium;
b) valve regulated lead acid;
c) nickel metal hydride;
d) lithium iron phosphate ($LiFePO_4$), lithium nickel manganese cobalt oxide ($Li(NiCoMn)O_2$), lithium titanate oxide (LTO);
e) EDLC.

Other battery or EDLC types may be allowed provided they conform to their relevant safety and performance standard and the relevant requirements of this document.

A.2 Safety and lifetime

To comply with the requirements of 22.7.8, two aspects shall be met. Firstly the ESSS shall conform to its relevant standard and secondly the luminaire shall operate within specific tolerances to ensure that the required performance can be maintained by the ESSS throughout its four year normal operating life.

A.3 Charge capacity

An ESSS's capacity shall be chosen so that the luminaire will achieve its rated duration for at least four years of normal operation.

Compliance is checked by the following tests in Clause A.4 to Clause A.10.

A.4 Sealed nickel cadmium batteries

A.4.1 The battery shall conform to IEC 61951-1 for cells intended for permanent charge at elevated temperatures.

A.4.2 The battery in the luminaire shall operate within the following limits.

a) The maximum continuous surface temperature of the battery shall be:
   1) 40 °C for designated T type cells;
   2) 50 °C for designated U type cells.

It is important to determine the position of the maximum surface temperature of the battery, particularly with respect to multi-cell battery packs as the life of the battery is highly dependent on cell temperature.

b) The maximum continuous overcharge rate shall be 0,08 C_5A (at 1,06 rated mains voltage).
c) The minimum continuous ambient temperature of the cells within the luminaire shall be 5 °C (occasional outage to 0 °C).

d) The maximum discharge rates shall be for 1 h: 0,6 C_5A and for 3 h: 0,25 C_5A (excluding the initial starting period). The maximum discharge rates for other time periods may be interpolated from these values.

Other recharge and discharge modes are allowed provided they are in accordance with the battery manufacturer's data sheet.

A.5 Sealed nickel metal-hydride batteries

A.5.1 The battery shall conform to IEC 61951-2 for cells intended for permanent charge at elevated temperatures.

A.5.2 The battery in the luminaire shall operate within the following limits.

a) The maximum continuous case temperature of the cell shall be:
   1) 40 °C for designated T type cells, and
   2) 50 °C for designated U type cells.

b) The maximum continuous overcharge rate shall be 0,08 C_5A (at 1,06 rated mains voltage).

c) The minimum continuous ambient temperature of the cells within the luminaire shall be 5 °C.

d) The maximum discharge rates shall be for 1 h: 0,6 C_5A and for 3 h: 0,25 C_5A (excluding the initial starting period). The maximum discharge rates for other time periods may be interpolated from these values.

Other recharge and discharge modes are allowed provided they are in accordance with the battery manufacturer's data sheet.

A.6 Valve regulated lead acid batteries

A.6.1 The battery in the luminaire shall conform to the relevant requirements of IEC 60896-21 or IEC 61056-1.

A.6.2 The battery in the luminaire shall operate within the following limits.

a) The maximum continuous surface temperature of the battery shall be:
   1) 30 °C with temperature compensation of float charge voltage normally between –3 mV/cell/°C and –4 mV/cell/°C or as recommended by the cell manufacturer, or
   2) 25 °C without temperature compensation, the float charge voltage at 25 °C shall be between 2,22 V/cell and 2,4 V/cell or as recommended by the cell manufacturer.

b) The maximum recharge current shall be 0,4 C_{20}.

c) The maximum discharge rates shall be for 1 h: 0,4 C_{20} and for 3 h: 0,17 C_{20} (excluding the initial starting period). The maximum discharge rates for other time periods may be interpolated from these values.

d) The maximum RMS ripple current shall be not more than 0,1 C_{20}.

e) The minimum continuous ambient temperature close to but not touching the cells within the luminaire shall be 5 °C (occasional outages to 0 °C).

Other recharge and discharge modes are allowed provided they are in accordance with the battery manufacturer's data sheet.

A.7 Lithium iron phosphate ($LiFePO_4$), lithium nickel manganese cobalt oxide ($Li(NiCoMn)O_2$), lithium titanate oxide (LTO) batteries

A.7.1 The cells shall conform to IEC 62620 and IEC 62133-2.

A.7.2 A battery shall conform to the following subclauses of IEC 62133-2:2017:

- 7.2.2 – Case stress at high ambient temperature (battery);
- 7.3.2 – External short-circuit (battery);
- 7.3.6 – Over-charging of battery;
- 9.2 – Battery marking;
- 9.4 – Other information.

A.7.3 A battery shall conform to the following subclauses of IEC 62620:2014:

- 5.3 – Battery designation;
- 6.3.1 – Discharge performance at +25 °C;
- 6.3.2 – Discharge performance at low temperature;
- 6.3.3 – High rate permissible current;
- 6.5 – Cell and battery internal resistance;
- 6.6.2 – Endurance in storage at constant voltage (permanent charge life).

NOTE For lithium batteries conformity with UN38.3, covering United Nations recommendations for the transport of dangerous goods, is often a mandatory requirement. There exists significant commonality between the requirements of UN38.3 and the requirements of the IEC lithium battery standards detailed in Clause A.7. Where equivalent or more onerous assessments have been conducted to demonstrate UN38.3 conformity, these same results can also be used as a basis to demonstrate conformity with the mentioned IEC standards. The establishment of common UN/IEC assessment protocols by a manufacturer can be used to limit the need for repeated testing against IEC standards.

A.7.4 Test and assessment data established to confirm the conformity of a lithium battery to the requirements of this document may be used to demonstrate the conformity of similar batteries (i.e. other family members of the same battery design, as compared to the tested battery, which is here referred to as the reference battery), provided the following criteria are met:

a) The cells used to construct the battery are of identical make and type to those used in the reference battery.

b) The battery being assessed has the same cell quantity and electrical configuration (series/parallel arrangement).

c) If the battery being assessed is connected by a set of cables and plug:
   - the plug type shall provide equivalent electrical connection characteristics;
   - the resistance of the battery cables shall be no higher than those of the reference battery.

d) If a battery protection device is used on the battery pack:
   - the DC resistance of the battery system including the protection module/circuit and its connection shall be equal to or less than the value of the reference sample;
   - evidence of the equivalent design, components and operation (including maximum temperature of components) of the protection circuit, compared to the reference battery, needs to be provided.

e) The addition or removal of a mounting bracket is permitted, provided it does not mechanically or electrically interfere with the battery cell's operation.

A.7.5 The battery shall integrate a built-in protection device against over-discharge, discharge overcurrent, and overcharge if the luminaire is designed for battery replacement. In addition, unless otherwise declared by the battery and/or cell manufacturer, if two or more cells are connected in series, each cell voltage shall be monitored separately with appropriate control to ensure that the specified voltage limits are not exceeded. This control may be contained within the battery, as part of the battery protection, or as part of the controlgear.

If a single cell can be removed as a separate component, then controlgear with a protection device shall be used unless the cell includes a battery protection.

If the battery is not replaceable, the protection device shall either be incorporated in the lamp controlgear or in the battery, and the following provisions shall apply:

a) The battery shall not be accessible during normal operation or installation. To assess compliance the following criteria shall be met:
   i) The battery pack or cell shall be located in a position where it cannot be touched by a test finger in accordance with test probe B of IEC 61032:1997.
   ii) The battery pack or cell shall be labelled, in addition to the requirements of 22.6.7, with the text "DO NOT REMOVE".
b) The battery shall be secured and prevented from being dislodged during installation, operation and transportation. The product, contained within its packaging, shall be subjected to a 1,2 m drop test, onto a concrete floor in any orientation. Following the test, the battery or cell and connections shall not be damaged and shall remain secure in its mounting. *Compliance is checked by inspection following the drop test.*
c) If the protection device is not contained within the battery, then the protection device shall be contained within and assessed as part of the controlgear.

A.7.6 For lithium battery types, a fully discharged battery shall be charged for 48 h during which time the maximum surface temperature of the battery shall not exceed that stated on the battery manufacturer's declaration of design or Table 3 of IEC 61347-2-7:2011/AMD2:2021.

A.8 EDLC

A.8.1 The EDLC in the luminaire shall conform to the relevant requirements of IEC 62391-1 and IEC 62391-2.

A.8.2 The EDLC in the luminaire shall operate within the following limits:

a) The maximum continuous surface temperature of the EDLC shall be in accordance with the EDLC manufacturer's declaration.
b) The maximum charge voltage shall be in accordance with the EDLC manufacturer's declaration.

For items a) and b) the combination of voltage and temperature shall be chosen in accordance with the EDLC manufacturer's declaration to ensure the four-year life design.

NOTE The Class 2 is the most appropriate for this application, however, other classes can be used, if the required performance of the luminaire is delivered.

A.8.3 For a self-contained luminaire with an EDLC, the designed duration (when new) with the light source operating in emergency mode shall be increased to a factor that takes into consideration the capacitance degradation ($C_{\text{deg\%}}$) as declared by the EDLC manufacturer under the voltage and temperature conditions in A.7.2 for the four year lifetime.

During the test according to this document (22.17), the emergency duration (checked on the new luminaire) shall not be less than the rated duration multiplied by a factor calculated as follows:

$$\text{Test duration} = \text{Rated duration} \times K_{\text{d}}$$

where K_d is a factor that takes into consideration the capacitance degradation as follows:

$$K_d = 100/(100 - C_{deg\%})$$

EXAMPLE In the case where the capacitance degradation ($C_{deg\%}$) is 30 % as declared by the EDLC manufacturer, the rated duration will be increased by the factor:

$$K_d = 100/(100 - 30) = 1,42$$

A.9 Maximum surface temperature

The maximum surface temperature of the ESSS within the luminaire shall be measured after 48 h from start of recharge. For self-contained luminaires where the manufacturer declares a lower charging time in accordance with 22.6.1, the temperature shall be measured after twice the rated charge time with a minimum of 12 h.

A.10 Alternative operating parameters

If operating outside the limits given in Clauses A.4, A.5, A.6 and A.7, alternative operating parameters and evidence of the four-year design life for the ESSS shall be supplied by the ESSS manufacturer or the luminaire manufacturer.

A.11 ESSS replacement

The ESSS of a self-contained emergency luminaire is not a user serviceable item and shall only be replaced by a competent person.

Annex B
(normative)

Luminaire classification

Emergency luminaires shall be classified and marked as per their construction as follows.

A unique designation denoting the type, mode of operation, the facilities included and the rated duration of the luminaire shall be clearly affixed to the luminaire.

The designation consists of a rectangle, divided in three or four segments, each containing one or more positions. Relevant to the construction, a position will consist of a letter or a figure, or a point if no indication has to be given.

The shape of the emergency luminaire designation is as follows:

*	*	******	***

The segments and positions shall be completed by letters and figures indicating the intended constructions as identified in the following list.

a) First segment containing one character: Type
   - X self-contained
   - Z central supply

b) Second segment containing one digit: Mode of operation
   - 0 non-maintained
   - 1 maintained
   - 2 combined non-maintained
   - 3 combined maintained
   - 4 compound non-maintained
   - 5 compound maintained
   - 6 satellite

c) Third segment containing a possible seven characters: Facilities. To be completed where appropriate at the time of installation
   - A including test device
   - B including remote rest mode
   - C including inhibiting mode
   - D high-risk task-area luminaire
   - E with non-replaceable lamp(s) and/or ESSS
   - F automatic test gear complying with IEC 61347-2-7 denoted EL-T
   - G internally illuminated safety sign

d) Fourth segment containing up to three digits: For self-contained luminaires to indicate the minimum duration of the emergency mode expressed in minutes, for example:
   - 10 to indicate 10 min duration
   - 60 to indicate 1 h duration
   - 120 to indicate 2 h duration
   - 180 to indicate 3 h duration

The following two examples of marking are given to explain the method of using the coding:

X	1	BD	60

Meaning: self-contained, maintained luminaire including a remote rest mode and which is suitable for a high-risk task-area and having an emergency mode duration of 60 min.

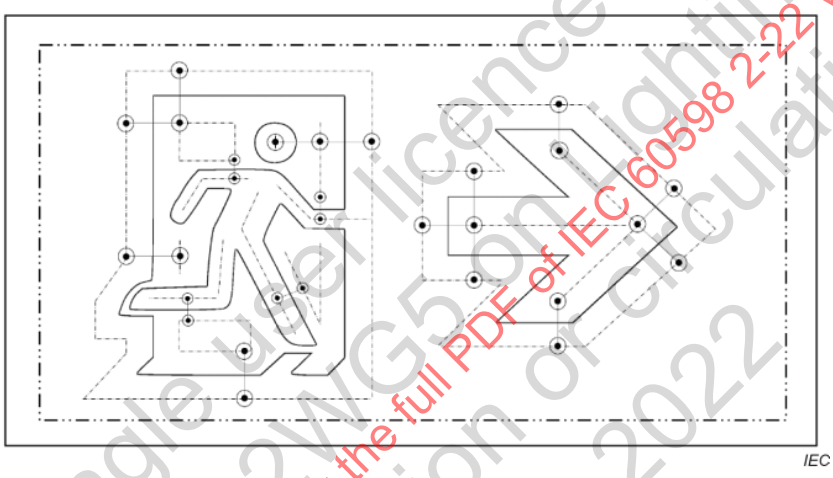
Z	1	F	

Meaning: centrally supplied, maintained luminaire with automatic test function having an emergency mode duration that will be defined by the emergency power supply used in the installation.

Annex C
(normative)

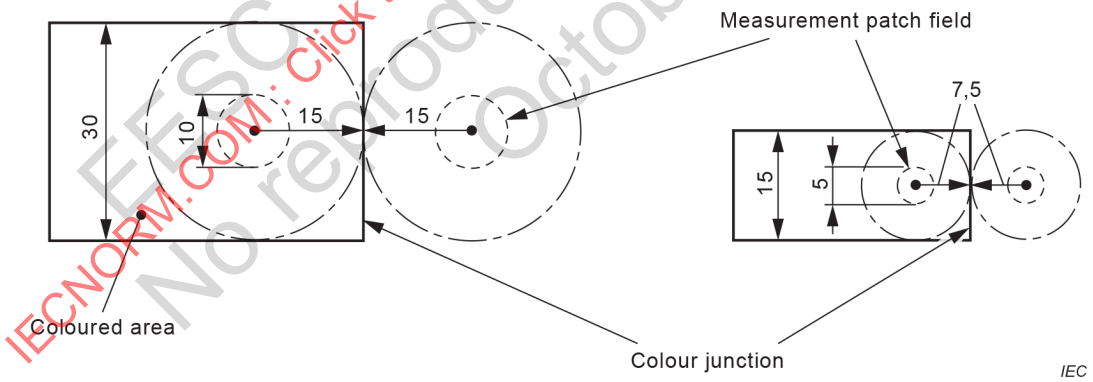
Luminance measurements

C.1 Contrast: Luminances are measured normal to the surface over a 10 mm diameter field for each coloured surface of the sign. The minimum and maximum luminance is measured over the areas for each colour and for the coloured background a 10 mm wide outer border of the whole pictogram is excluded from the measurements. In order to determine the luminance ratio between two adjacent colours, the luminance measurements shall be taken at a distance of 15 mm on either side of the junction of two colours. If the diameter of the coloured area is less than 30 mm, the patch diameter and the 15 mm distance shall be reduced proportionally (see Figure C.1). The measurements shall not be made outside of the square area as defined for the safety pictogram required by ISO 30061.



a) Typical example of measurement position

Dimensions in millimetres



b) Patch diameter

Figure C.1 – Typical example of measurement positions

C.2 On-site photometric tests: All illuminance measurements and all luminous measurements shall be made with a photopic, Vλ, corrected meter.

Measurement shall be carried out in accordance with Annex C of ISO 3864-4:2011.

At all times, the measured values shall be not less than those specified in this document.