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Fire emergency luminaries

消防应急灯具

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Fire emergency luminaries

1 Scope

This standard specifies the definition, classification, technical requirements, test methods, signs, inspection rules, instructions for use of fire emergency luminaries.

This standard is applicable to fire emergency luminaries installed in general industrial and civil buildings. Fire emergency luminaries which have special performance and are installed in other environments shall, unless otherwise specially required to follow relevant standards, also implement this standard.

2 Normative references

The provisions in following documents become the provisions of this standard through reference in this standard. The versions indicated at the time of publication of this standard are valid. All standards are subjected to revision, parties are encouraged to study if the latest versions of these documents are applicable.

GB 16838-1997 Environmental test methods and severities for fire electronic products

3 Definition

This standard uses the following definition.

3.1

Fire emergency luminaries

When the fire occurs, various types of luminaries that provide signs and/or illumination for personnel evacuation and firefighting operations.

3.2

Fire emergency lamps

Fire emergency luminaries that provide illumination for personnel evacuation and/or firefighting operations.

sub-fire emergency luminaries but are powered by a related mother fire emergency luminaire.

3.9

Independent fire emergency luminaries

Fire emergency luminaries which independently complete the transfer from the main power state to the emergency state.

3.10

Fire emergency luminaries of centralized control type

Fire emergency luminaries whose working state is controlled by a controller.

3.11

Fire emergency luminaries of mother-child control type

A group of fire emergency luminaries the sub-fire emergency luminary's emergency state of which is controlled by the mother fire emergency luminaries.

3.12

Termination voltage

The terminal voltage at which the over-discharge protection part is activated, whilst the fire emergency luminaries no longer have emergency functions.

4 Classification

4.1 According to the form of emergency power supply:

- a) Self-contained power supply type;
- b) Centralized power supply type;
- c) Mother-child power supply type.

4.2 According to the purposes:

- a) Marker lamp;
- b) Lighting;
- c) Lighting, marker lamp.

5.1.5 Illuminated marker lamps shall meet the requirements of 5.1.3 and 5.1.4 at the same time.

5.1.6 For the fire emergency luminaries which use the fluorescent lamps as the light source, it shall not connect the starter into the emergency circuit.

5.1.7 The emergency state of fire emergency luminaries of self-contained power supply type and mother-child power supply type shall not be affected by the short circuit and grounding of the main power supply line.

5.1.8 The fire emergency luminaries of non-centralized control type shall be equipped with self-resetting test buttons (or switches) that simulate the failure of main power supply. It shall not be provided with switches that affect the emergency functions.

5.1.9 The fire emergency luminaries of self-contained power supply type and mother-child power supply type shall be provided with the indicator lamp for the fault of main power, charging, fault state. The main power state is green, the charging state is red, the fault state is yellow. The fire emergency luminaries of centralized control type shall be provided with the indicator lamps for the main power and emergency power state; the main power state is green, the emergency state is red. The fire emergency luminaries whose main power and the emergency power share the power supply line may use the red indicator lamp only.

5.1.10 When the fire emergency luminaries are in such abnormal states as that the light source is not connected, the light source cannot work normally, the specification of light source fails to comply with requirements, the maximum temperature at the surface of the internal component shall neither exceed 90 °C, nor affect the normal charging of the battery. After the light source is restored, the fire emergency luminaries shall be able to work normally.

5.1.11 For the fire emergency luminaries of mother-child power supply type, the voltage drop of the line which connects the sub-fire emergency luminaries and the mother fire emergency luminaries shall not exceed 3% of the output voltage of the mother fire emergency luminaries.

5.1.12 For fire emergency luminaries with voice prompts, the voice prompt should be such as "Safe (Emergency) Exit Here", "No Entry", etc.

5.1.13 For flashing marker lamps, the flashing frequency shall be 1 Hz $\pm 10\%$; the ratio of lighting time to non-lighting time is 4:1.

5.1.14 For marker lamps that are sequentially flashed and form a guided optical flow, the sequential flashing frequency shall be in the range of 2 ~ 32 Hz, but the frequency change after setting shall not exceed $\pm 10\%$ of the set value.

5.1.21.3 When the connection line between the controller and the fire emergency luminaire connected to it is open or short-circuited (except where the fire emergency luminaries switch into the emergency state), it shall issue an acoustic and optical fault signal, indicate the fault location. The acoustic fault signal shall be able to be cancelled manually. When there is a new fault signal, the acoustic fault signal shall be able to restart. The optical fault signal shall be maintained before troubleshooting.

5.1.21.4 The controller shall have the working state indication of the main and standby power supplies. It can realize the automatic switchover of the main and standby power supply. The backup power supply shall ensure that the controller works normally for 2 h.

5.1.21.5 The controller shall issue an audible and optical fault signal under the following conditions and indicate the type of fault. The acoustic fault signal can be removed manually, whilst the optical fault signal shall be maintained before troubleshooting. During the failure, the fire emergency luminaries shall be able to switch into an emergency state.

- a) The main power supply of the controller is undervoltage;
- b) The connection line between the charger of the controller's backup power supply and the backup power supply is open-circuited or short-circuited;
- c) The connection line between the controller and the backup power supply which powers it is open-circuited or short-circuited.

5.1.21.6 When the controller controls the fire emergency luminaries of centralized power supply type, the controller shall be able to control and display the working state of the emergency power supply (main power, charging, fault state, battery's voltage, output voltage, output current); in case of open-circuit or short-circuit of the connection line with the emergency power supply, issue an acoustic and optical fault signal.

5.1.21.7 The controller shall be capable of performing functional checks on all indicators, displays and sounders on the unit and on the panel.

5.1.21.8 The controller shall be able to switch all fire emergency luminaries connected to it to the emergency state in both manual and automatic modes. It shall provide a button for forcing all fire emergency luminaries to be switched to the emergency state. After the button is activated, the emergency power supply shall not be affected by over-discharge protection.

5.1.21.9 When the connection line of a certain branch fire emergency luminaries and controller is open-circuited, short-circuited or grounded, it shall not affect the work of fire emergency luminaries and emergency power sources of other branches.

temperature of the battery (without touching the battery) does not exceed 30 °C.

5.2.7 For the fire emergency luminaries with voice function, the volume adjustment device shall be placed inside. The sound pressure level measured at 1 m in front shall be within the range of 70 ~ 115 dB (A-weighted) and clearly identifiable.

5.2.8 The stroke width of the text of the marker lamp shall be not less than 10 mm and easily identifiable. The stroke width of the auxiliary text may be customized. The resolution of the graphic mark shall also make reference to it. The text mark of the marker lamp should not use other words only than Chinese characters (except for the floor marker lamps). The graphics and text shall be selected from the graphics and texts in Appendix A.

5.2.9 Electronic components shall be subjected to moisture-proof, mildew-proof, salt-spray-proof treatment.

5.2.10 The light source shall be easy to replace.

6 Test methods

6.1 Test program of fire emergency luminaries

6.1.1 The test procedures of fire emergency luminaries are as shown in Table 3.

6.1.2 The number of test samples is three. It shall provide two controllers for the fire emergency luminaries of centralized control type. Each controller shall be equipped with at least two fire emergency luminaries. Fire emergency luminaries of centralized power supply type shall be provided with two sets of centralized emergency power supplies; each emergency power supply shall be equipped with at least two sets of fire emergency luminaries, which have the simulated load of 10% of full load and overload 20%. They shall be numbered before the test.

6.1.3 If not stated in the relevant clauses, each test shall be carried out under normal atmospheric conditions as described below.

Temperature: 15 ~ 35 °C;

Relative humidity: 45% ~ 75%;

Atmospheric pressure: 86 ~ 106 kPa.

6.1.4 If not stated in the relevant clauses, the tolerance of each test data is $\pm 5\%$.

6.2.3 Method

6.2.3.1 Check the battery type, fuse, corresponding protective device, marking of the fire emergency luminaries.

6.2.3.2 Check the outer casing, internal wiring, grounding of the fire emergency luminaries. Measure the oxygen index of the outer casing of the flame-retardant material.

6.2.3.3 Under the condition of ambient temperature $25\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$, let the fire emergency luminaries be charged for 48 h and discharged for 30 min. During the period, respectively and continuously measure the surface temperature of the heat-generating elements such as built-in transformer and ballast. Measure the ambient temperature around the battery before the discharge.

6.2.3.4 Check the volume adjustment device of the fire emergency luminaries which have a voice prompt function. Make the luminaries be in an emergency state. Use a sound level meter (A-weighted) to measure its sound pressure level at 1 m in front of it.

6.2.3.5 Measure the graphic size of the surface of the marker lamp and the stroke width of the text. At a point 20 m in front of it, observe the clearness of markings on the marker lamp.

6.2.3.6 Check the handling of the three-defenses.

6.2.3.7 Check the replaceability of the light source.

6.3 Basic function test

6.3.1 Purpose

Check the basic functions of fire emergency luminaries.

6.3.2 Requirements

6.3.2.1 The basic functions of fire emergency luminaries shall meet the requirements of 5.1.1 ~ 5.1.14.

6.3.2.2 The controller system of the fire emergency luminaries of centralized control type shall also meet the requirements of 5.1.21.

6.3.3 Methods

6.3.3.1 Switch the fire emergency luminaries which had been charged for 24 h charging into the emergency state. Check the startup conditions of the starter of the fire emergency luminaries which have fluorescent light source (short-circuit the starter if necessary). Record the switchover time. Start timekeeping

source of different specifications. Charge this emergency luminary for 24 h and discharge it for 45 min, during which measure the surface temperature of the internal heating element continuously. Then reinstall the normal light source, to check the operation of the luminary.

6.3.3.9 According to the product's design requirements, connect the fire emergency luminaries of the mother-child power supply type according to the longest wiring method. Respectively measure the battery's voltage of the mother luminary and the power supply voltage of the sub-luminary.

6.3.3.10 Make the fire emergency luminaries with voice prompts in emergency working state, to check their voice playback.

6.3.3.11 Make the flashing marker lamp in an emergency state, to measure its flashing frequency and the ratio of lighting time to non-lighting time.

6.3.3.12 Make the successive flashing marker lamps in an emergency state, to measure their successive flashing frequencies.

6.3.3.13 Operate the control mechanism of the controller, to respectively make its controlled fire emergency luminaries in the main power state, emergency state, charging state, fault state, and to observe the display condition of the controller. Meanwhile check whether the controller has corresponding measures to prevent operation by non-professionals.

6.3.3.14 Test of connection line

- a) Make the connection line between the controller and any fire emergency luminaries be open-circuited or short-circuited, to check the acoustic and optical fault conditions of the controller and the working state of the fire emergency luminaries;
- b) Manually eliminate the acoustic fault signal. Then make the connection line between the controller and the other fire emergency luminary in another line be open-circuited or short-circuited, to check the acoustic and optical fault conditions of the controller and the working state of the fire emergency luminaries.

6.3.3.15 After disconnecting the main power supply of the controller, connect the main power supply, to check the switchover of the main power and backup power of the controller as well as the indications of power state. Then make the controller be in the backup power supply state, until the backup power is insufficient to guarantee the normal work of the controller. Record the working time of the backup power.

6.3.3.16 Power supply test of the controller

backup power working state, to check the display conditions of the main power's voltage, battery's voltage, output voltage, output current as well as the color of the indicator lamp.

- b) Respectively, use the automatic and manual methods to switch the emergency power supply into the battery working state, to check the output conditions of the main power and backup power of the emergency power supply.
- c) Start the forced emergency start button, so that the fire emergency luminaries can be switched to the emergency state, until the discharge is terminated, to check the over-discharge protection conditions and fault conditions of the emergency power supply.
- d) Respectively, make any power supply branch to the fire emergency luminaries of the centralized power supply type be open-circuited and short-circuited; then make the fire emergency luminaries of another branch be in the main power state and the emergency state, respectively, to check the working conditions of the fire emergency luminaries.
- e) Respectively, make the emergency power supply to the fire emergency luminaries of the centralized power supply type be in the no load, 10% of full load, full load, overload 20% state, to check the working conditions of the emergency power supply.
- f) Check the rated voltage and staged protection of the battery (pack). Then, under the fully-charged conditions of the battery (pack), respectively measure the voltage of each stage of battery (pack).
- g) Respectively, make the connection line between the charger of the emergency power supply and the battery be open-circuited and short-circuited, to check the fault condition.
- h) Respectively, make the connection line between the main output line of the emergency power supply and the branch line be open-circuited and short-circuited, to check the fault conditions.
- i) Respectively, make the emergency control circuit of the emergency power supply be open-circuited and short-circuited, to check the fault conditions.

6.4 Charging-discharging test

6.4.1 Purpose

Check the charging-discharging performance of fire emergency luminaries.

6.4.2 Requirements

6.6.2 Requirements

The main power supply's voltage fluctuation performance of the fire emergency luminaries shall meet the requirements of 5.1.18.

6.6.3 Methods

Adjust the test device, to respectively make the main power supply voltage of the fire emergency luminaries (including the controller of the fire emergency luminaries of centralized control type) be at 242 V and 187 V, to check the working state.

6.6.4 Test equipment

The test equipment shall meet the following conditions:

Output voltage: Continuously adjustable from 100 to 250 V. The AC frequency range is 50 Hz $\pm$ 1%.

6.7 Test of switchover voltage

6.7.1 Purpose

Check the main power supply's voltage at which the fire emergency luminaries are switched from the main power state to the emergency state, from the emergency state to the main power state.

6.7.2 Requirements

The switchover voltage of the fire emergency luminaries shall meet the requirements of 5.1.19.

6.7.3 Methods

Connect the main power plug of the fire emergency luminaries to the test device, to make it in the main power state. Adjust the test device, to reduce the output voltage, until the fire emergency luminaries switch into the emergency state. Record the output voltage. Then rise the output voltage, until the fire emergency luminaries switch back to the main state. Record the output voltage.

6.7.4 Test equipment

The test equipment shall meet the following conditions:

Output voltage: Continuously adjustable from 100 to 250 V;

Frequency: 50 Hz $\pm$ 1%.

6.8 Test of charging-discharging endurance

instruments).

Test voltage: $500\text{ V} \pm 50\text{ V}$, DC;

Measuring range: $0 \sim 500\text{ M}\Omega$;

Time: $60\text{ s} \pm 5\text{ s}$.

6.10 Test of withstanding voltage

6.10.1 Purposes

Check the withstanding voltage performance of fire emergency luminaries.

6.10.2 Requirements

The withstanding voltage performance of fire emergency luminaries shall meet the requirements of 5.1.24.

6.10.3 Methods

Through the test device of withstanding voltage, at a voltage rising rate of $100 \sim 500\text{ V/s}$, respectively apply a AC voltage of $50\text{ Hz} \pm 1\%$ and $1500\text{ V} \pm 10\%$ (when the rated voltage exceeds 50 V) or $50\text{ Hz} \pm 1\%$ and $500\text{ V} \pm 10\%$ (when the rated voltage does not exceed 50 V) to the following parts of the fire emergency luminaries (including the controller of the fire emergency luminaries of centralized control type).

- a) Between all external live terminals and casing which have insulation requirements.
- b) Between the AC power input and the casing (the power plug is not connected to the grid).

Make it last for $60\text{ s} \pm 5\text{ s}$. Observe and record the phenomenon that occurred in the test.

After the test, after gradually reduce the voltage at a voltage-decreasing rate of $100 \sim 500\text{ V}$ to a value less than the rated voltage, turn off the power.

6.10.4 Test equipment

The test device of withstanding voltage that satisfies the following technical requirements.

Test power: Voltage $0 \sim 1500\text{ V}$ (rms) continuously adjustable; frequency $50\text{ Hz} \pm 1\%$; voltage-rising (decreasing) rate: $100 \sim 500\text{ V/s}$;

Time: $60\text{ s} \pm 5\text{ s}$.

6.12.3.3 Perform basic functional tests as specified in 6.3.

6.12.4 Test equipment

The test equipment shall comply with the provisions of 4.3.4 of the national standard GB 16838-1997.

6.13 Constant damp heat test

6.13.1 Purposes

Check the ability of fire emergency luminaries to work properly in a constant damp heat environment.

6.13.2 Requirements

The performance of fire emergency luminaries in a constant damp heat environment shall meet the requirements of 5.1.24.

6.13.3 Methods

6.13.3.1 Put the fire emergency luminaries (including the fire emergency luminaries of centralized control type as well as the controller) under normal atmospheric conditions for 2 ~ 4 hours. Then put it into the damp heat test chamber. Turn on the power to make it in the main power working state.

6.13.3.2 Adjust the test chamber, so that the temperature is $40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$. After the temperature is stable, adjust the test chamber again so that the relative humidity is 90% ~ 95%. Hold it for 4 d.

6.13.3.3 Perform basic functional tests as specified in 6.3.

6.13.4 Test equipment

The test equipment shall comply with the provisions of 4.5.4 of the national standard GB 16838-1997.

6.14 Vibration test

6.14.1 Purposes

Check the adaptability of the fire emergency luminaries to vibration and the integrity of the structure.

6.14.2 Requirements

The anti-vibration performance of fire emergency luminaries shall meet the requirements of 5.1.26.

standard GB 16838-1997.

7 Inspection rules

7.1 Exit-factory inspection of product

The enterprise shall check the following test items for the fire emergency luminaries before the product exit-factory:

- a) Visual inspection;
- b) Inspection of major components;
- c) Test of basic functions;
- d) Charging-discharging tests;
- e) Test of insulation resistance;
- f) Withstanding voltage test;
- g) Test of repeated switchover;
- h) Test of switchover voltage;
- i) Test of charging-discharging endurance;
- j) Constant damp heat test.

Each fire emergency luminary shall be subjected to the inspection of six items from a) to f) (inspection) before exit-factory, where the item g) ~ j) may be tested by each set. If any one item of d) ~ g) is disqualified, this batch of products is judged as disqualified. However, if any two items of the test of the other six items are disqualified, it is allowed to make re-inspections after making adjustment; the number of cumulative re-inspections shall not exceed 2.

7.2 Type inspection

7.2.1 The type inspection items are items 6.2 ~ 6.15 as specified in clause 6 of this standard. For the test sample, randomly take three sets from the products which pass the exit-factory inspection.

7.2.2 Type inspection shall be carried out in any of the following cases.

- a) The finalization of trial-production of new product or the trans-plant production of old product;
- b) After formal production, the major changes in the structure, main parts or

components, production processes, etc. of the product may affect the performance of the product; or otherwise the it is officially put into production for four years;

- c) The production is restored after suspension for more than one year;
- d) The difference between the exit-factory inspection result and the previous type inspection result is large;
- e) Where there is a major quality accident;
- f) When the quality supervision agency makes a request.

7.2.3 If any of the two tests in 6.5 and 6.8 of this standard fails, the results of batch inspection is unqualified. For other items, it allows three re-inspections, but the number of re-inspections for each item shall not exceed two.

8 Markings

8.1 Each fire emergency luminary shall have clear and durable markings, including product markings and quality inspection markings.

8.2 Product's markings

The product's markings shall include the following:

- a) Name and address of manufacturer;
- b) Name of product;
- c) Model of product;
- d) Main technical parameters of product (emergency working time, lighting power);
- e) Trademark;
- f) Date of manufacture and product number;
- g) Implemented standard.

8.3 Quality inspection markings

The quality inspection markings shall include the following contents:

- a) Inspector;
- b) Qualified marking.

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