

JIS

JAPANESE INDUSTRIAL STANDARD

**Luminaires for
explosive atmospheres**

JIS C 8001—1991

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In the event of any doubt arising,
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Luminaires for explosive atmospheres

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1. Scope

This Japanese Industrial Standard specifies luminaires of explosion protected construction [fixed luminaires (including luminaires containing batteries) and portable luminaires, (hereafter referred to as "luminaires")] which are installed individually or integrated into a device as a component and are used in a hazardous atmosphere zone (zone 1 and zone 2) defined in JIS C 0903. Luminaires for mines and ships are excluded.

Matters relating to explosion protected construction not specified in this Standard shall be as specified in JIS C 0903.

Remarks 1. The Standards cited in this Standard and the International Standards Corresponding to this Standard are shown in Attached Table 1.

2. The units and numerical values given in { } in this Standard are based on the traditional unit system and are appended for informative reference.

2. Definitions

For the purposes of this Standard, in addition to the definitions of JIS C 0903, the following principal definitions shall apply:

- (1) fixed luminaire A luminaire which is used fixed on a structure, machine, equipment, etc.
- (2) luminaire containing batteries A fixed luminaire containing an accommodated power source.
- (3) portable luminaire A hand lamp connected to a power supply with a movable wire, or other movable luminaire.
- (4) accommodated power source A power supply device which is accommodated in a luminaire and automatically operates the emergency light at the instant that the normal power supply is out off. This is sometimes called a "battery unit".
- (5) protective lamp cover A cover which covers a lamp, is transparent to light, and serves as a component of the explosion-protected enclosure.
- (6) glove A protective lamp cover of a shape other than cylindrical or flat plate.
- (7) tempered glove A glass gove which has been tempered.
- (8) guard A lattice shaped component which protects the protective lamp cover from external shock.
- (9) protective panel A transparent component of plate shape to protect the lamp protective cover from external shock.

- (10) interlock switch A power supply disconnecting device built in a luminaire such that the enclosure cannot be opened unless no voltage is applied to the luminaire.

3. Classification

Luminaires are classified by the combination of (1), (2), (3) and (4) given in Table 1.

Table 1. Classification by which kind of luminaire is determined

(1) Classification by condition of use	(2) Classification by explosion-protected construction	(3) Classification by light source	(4) Classification by waterproof construction
Fixed luminaire	Flameproof type Increased safety type	Incandescent lamp Fluorescent lamp High-pressure mercury lamp	(Exclusively in-door use) Outdoor use
Portable luminaire	Flameproof type	Incandescent lamp	—

Remarks 1. The applicable incandescent lamps are in the incandescent lamps for explosion-protected luminaires shown in Annex 1 or the lamps specified in JIS C 7501. The applicable fluorescent lamps are the fluorescent lamps specified in JIS C 7601. The applicable high-pressure mercury lamps are the high-pressure mercury lamps specified in JIS C 7604.

2. The power consumption of a lamp applicable to a portable luminaire shall be not more than 200 W.

4. Performance

4.1 Resistance to explosion pressure The enclosure of a flameproof luminaire shall not cause damage or deformation which impairs the flame transmission proof when tested in accordance with the method of 6.3.

4.2 Flame-transmission proof The enclosure of a flameproof luminaire shall not cause flame transmission, when tested in accordance with the method of 6.4.

4.3 Airtightness The enclosure accommodating lamp(s) and glow starter(s) of an increased safety luminaire shall not cause a pressure change of 0.98 kPa {100 mmH₂O} or more, when tested in accordance with the method of 6.5.

4.4 Temperature rise

- (1) The temperature rise of the outside surface of the enclosure of a flameproof luminaire and that of the outside surface of the enclosure and every part in the enclosure accessible to explosive gas of an increased-safety luminaire shall not exceed the appropriate values given in Table 2, when measured in accordance with the method of 6.6 (1).

Table 2. Limit of temperature rise

Unit: °C

Ignition category ⁽¹⁾	G 1	G 2	G 3	G 4	G 5	G 6
Limit of temperature rise	320	200	120	70	40	30

Note ⁽¹⁾ The classification of the ignition category is based on 3. (1) (Ignition category) of JIS C 0903.

- (2) The temperature rise of the lamp cap shall not exceed 155°C, when measured in accordance with the method of 6.6 (1). Luminaires which employ only a lamp for which the cap is mechanically secured are exempted from this requirement.
- (3) The temperature rise of windings in an increased-safety ballast shall not exceed the appropriate value given in Table 3, when measured in accordance with the method of 6.6 (2).

Table 3. Limit of temperature rise of ballast winding

Unit: °C

Class of insulation	A	E	B
Limit of temperature rise	55	65	70

4.5 Resistance to thermal shock Luminaires for outdoor use and protective lamp covers of portable luminaires shall not suffer cracking or damage, when tested in accordance with the method of 6.7.

4.6 Resistance to impact The protective lamps cover and protective panel of a luminaire shall not suffer cracking or damage to such a degree that will impair explosion protective capability, when tested in accordance with the method of 6.8.

4.7 Robustness against fall Portable luminaires shall not suffer damage or deformation detrimental to practical service, when tested in accordance with the method of 6.9.

4.8 Strength of external conductor entry The external conductor entry of portable luminaire shall not suffer displacement of the conductor, when tested in accordance with the method of 6.10.

4.9 Waterproof Luminaires for outdoor service shall not show any ingress of water detrimental to use, when tested in accordance with the method of 6.11.

4.10 Insulation resistance The insulation resistance of a luminaire shall be not less than 5 MΩ (not less than 30 MΩ at ordinary temperature in the acceptance inspection), when measured in accordance with the method of 6.12.

4.11 Electrical strength Luminaires shall withstand the test voltage, when tested in accordance with the method of 6.13.

5. Construction, materials and components

5.1 Construction and materials

5.1.1 General requirements Luminaires shall comply with the following:

- (1) The enclosure which contains the light source shall be equipped with a robust protective lamp cover and guard. The guard may be omitted for luminaires which utilize a tempered glove or the tempered plate glass specified in R 3206, for luminaires which have a protective lamp cover not exceeding 4000 mm² in exposed surface and so constructed that there is low probability of receiving damage from outside, or guide lamp luminaires equipped with the protective panel specified in 5.4.
- (2) Materials for each part shall not easily be affected by explosive gas for which the luminaire is designed, and shall withstand the temperature of service.
- (3) The internal wiring and lead wires shall be insulated wires, cords or cables which have conductors of 1.25 mm² or more in normal sectional area and can endure the temperature attained in the luminaire. For fluorescent lamps, however, wires of 0.75 mm² or more in conductor nominal sectional area may be used.
- (4) The terminal or lead wire which is to be connected to the grounded side of power supply wires shall be identified in accordance with JIS C 0602 or by means of a graphic symbol (⊖).
- (5) The temperature rise of the junction with external conductors shall be not more than 30°C.
- (6) Luminaires of such construction that the wires are drawn out together with the lampholders at the time of replacement of the lamp or glow starter shall be specially designed so that the insulating covering of wire will not be damaged.
- (7) In general, the container which accommodates the light source or the storage battery of a luminaire containing battery shall be so designed that the container can not be opened unless the circuit is not under voltage or current by cutting off the battery from the circuit using an interlock switch.

When the battery is cut off by a switch not interlocked with the opening and closing of the container, the handle of the switch shall be located in a position easily operated from the outside, and suitable marking to prevent incorrect operation shall be placed in the vicinity of the handle.

- (8) Shrouds shall be provided as specified in 6.5 of JIS C 0903. Shrouds may be omitted on the parts which are protected by the interlock switch.
- (9) Luminaires of outdoor service shall be so constructed that they can withstand weathering.

5.1.2 Flameproof fixed luminaire The construction and materials of the luminaire shall, in addition to compliance with 5.1.1 of this Standard and 7. (Flameproof construction) of JIS C 0903, comply with the following:

- (1) Mounting of the protective lamp cover to the supporting frame shall follow one of the methods described below. Such a construction where opening of the mounting part is necessary at the time of replacement of the lamp is not allowed.
 - (a) Keep the joint surface as specified in 7.2.1 (Joint surface) of JIS C 0903.
 - (b) Utilize the gasket as specified in 7.4.2 (Gasket fitted on part not to be opened) of JIS C 0903.
 - (c) Fit firmly using cement or other adhesive of good quality which is durable and heat resistant. No cracks or splits which will impair the explosion protection shall appear under service conditions.
- (2) When the lampholder assembly is used as a part of the explosion-protecting partition, the flameproof stud type conductor entry system specified in 1.1 (Flameproof stud type conductor entry) of Annex 3 in JIS C 0903 shall be employed.
- (3) The external conductor entry into a luminaire shall be a flameproof conduit type, flameproof packing type, flameproof sealing type or flameproof sleeve assembly type MI cable entry specified in 1. (Conductor entry of flameproof terminal box) of Annex 4 to JIS C 0903, according to the kind of conductor to be used.

5.1.3 Flameproof portable luminaire The construction and materials of the luminaire shall, in addition to compliance with 5.1.1 of this Standard and 7. (Flameproof construction) of JIS C 0903, comply with the following:

- (1) The enclosure and guard shall be made of metal which does not produce dangerous sparks due to impact or shall be covered with a safe material.
- (2) The mounting of the protective lamp cover to the supporting frame shall be as specified in 5.1.2 (1).
- (3) When the lampholder assembly is used as a part of the explosion protected partition, the procedure shall be as specified in 5.1.2 (2).
- (4) The external conductors shall be Class 3 chloroprene cable with three cores including a grounding wire, or cables at least equivalent thereto.
- (5) The external conductor entry into the luminaire shall be the flameproof packing type conductor entry system of portable apparatus shown in 1.2 (3) of Annex 4 to JIS C 0903.

5.1.4 Increased-safety fixed luminaire The construction and materials of the luminaire shall, in addition to compliance with 5.1.1 of this Standard and 10. (Construction of increased safety type) of JIS C 0903, comply with the following:

- (1) The container which accommodates lamps(s) and glow starter(s) shall be constructed as airtight as practicable.
- (2) The part necessary for sustaining the airtightness shall be so constructed that the airtightness will not be impaired by the operation of replacing the lamp or glow starter.

If a packing is used to keep the container airtight, the packing and associated parts shall be so constructed that the packing will not move or escape easily.

- (3) The packing, cement, adhesive, etc. used for the container shall have sufficient resistance and endurance to the environmental conditions during service.
- (4) The external conductor entry into the luminaire shall be the conduit type, packing type, or sealing type conductor entry specified in 2. (Conductor entry to increased safety terminal box) of Annex 4 to JIS C 0903.

5.2 Protective lamp cover The protective lamp cover shall comply with the following:

- (1) The material shall be glass. Chemically and physically stable materials other than glass may be employed for protective lamp covers of increased-safety fluorescent lamps.
- (2) Flat protective lamp covers shall be of the tempered glass specified in JIS R 3206. The flat protective lamp covers of increased-safety luminaires may be of other materials.
- (3) Covers which are directly threaded at the mounting part shall not be used.
- (4) The thickness of the glass cover shall be as given in Table 4. Tempered covers are exempted from this requirement.

Table 4. Thickness of glove (Made of glass) Unit: mm

Diameter of exposed surface of glove (2)	Thickness of glove	
	Flameproof type	Increased safety type
100 max.	5 min.	3 min.
150 max.	6 min.	4 min.
200 max.	7 min.	5 min.
250 max.	8 min.	6 min.
300 max.	9 min.	
Over 300	10 min.	7 min.

Note (2) If the exposed surface of the glove is oval, the minor axis shall be taken as the diameter.

- (5) The cylindrical protective lamp cover of a flameproof luminaire shall withstand an internal hydraulic pressure of 1961 kPa {20 kgf/cm²}.
- (6) The thickness of the plate glass shall comply with Table 5. Tempered plate glass is exempted from this requirement.

Table 5. Thickness of plate glass Unit: mm

Dimension of exposed surface of plate glass		Thickness of plate glass
Diameter of circular window (3)	Shorter side of rectangular window	
100 max.	70 max.	5 min.
Over 100	Over 70	The thickness is increased by 1 mm for each increase of 100 mm or its fraction in diameter for circular window, 70 mm or its fraction in the shorter side for rectangular window.

Note (3) If the exposed surface of plate glass is oval, minor axis shall be taken as the diameter.

- (7) The spacing between the protective lamp cover and the lamp (bulb) shall comply with Table 6.