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| TEST REPORT AS/NZS 2293.3 Emergency escape lighting and exit signs for buildings Part 3: Emergency escape luminaires and exit signs | |
| Report Number : 423896-1 Date of issue : 2022-04-18 Total number of pages : 61 (Including attachment) | |
| Name of Project handling laboratory preparing the Report .. : Nemko Shanghai Ltd. Shenzhen Branch | |
| Applicant's name : SPARKELEC PTY LTD Address : 56 Parramatta Rd Croydon NSW 2132, Sydney, Australia | |
| Test specification: Standard : AS/NZS 2293.3:2018 Test procedure : Type test Non-standard test method : N/A | |
| Test Report Form No. : AS/NZS 2293.3A Test Report Form(s) Originator : Nemko Shanghai Ltd. Shenzhen Branch Master TRF : Dated 2021-05-21 | |
| General disclaimer: The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report. | |
| | |
| Test item description : Trade Mark : Manufacturer : Model/Type reference : Ratings : | LED lighting lamps and lanterns with emergency lighting SPARKELEC Same as applicant SPxxxxyy-zz ("xxxx" in the type designation can be 2001, 2002, 2003, indicating different enclosure. "yy" can be DA or FE, indicating different function. DA is manual test with DALI function, FE is manual test without DALI function. "zz" can be WH or BK, indicating different enclosure / exit signs colour. WH: white, BK: black.) 220-240VAC; 50/60 Hz; 4W |

| | | |
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| Responsible Testing Laboratory (as applicable), testing procedure and testing location(s): | | |
| <input checked="" type="checkbox"/> | Laboratory preparing the test report: | Nemko Shanghai Ltd. Shenzhen Branch |
| Location address..... : | | Unit CD, Floor 2 & Floor 10, Tower 2, Kefa Road 8#, Hi-Technology Park, Nanshan District, Shenzhen, Guangdong, China |
| Tested by (name, function, signature) : | | <div>Emily Zeng (Project handler)</div>  |
| Approved by (name, function, signature) .. : | | <div>Benny Lan (Verificator)</div>  |

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| List of Attachments (including a total number of pages in each attachment): | |
| Attachment No. 1: Photo documentation (14 pages) | |
| Summary of testing: | |
| Tests performed (name of test and test clause): AS/NZS 2293.3 :2018 The submitted samples were found to comply with the above specification. | Testing location: Dongguan Hongnuo Product Testing Service Co., Ltd No. 8, Jinqianling Wujie, Huangjiang, Dongguan, Guangdong, China |

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



LED lighting lamps and lanterns with emergency lighting

SPARKELEC PTY LTD

Model No.: SP2001DA-WH

Input: 220-240 VAC, 50/60 Hz





Power consumption: 4W **Life of light source: 54000h**

CAUTION-See instruction manual for installation, Operating and maintenance instructions.

Replace battery with LiFePO4 3.2V 1500mAh

| | | | |
|---|---|----|-----|
| X | 1 | AG | 180 |
|---|---|----|-----|

Notice-Suitable for dry location. For use in 25 °C - 40 °C ambient temperature.

Made in China

Rating label for other models are same as above models except that model number and classification are different.

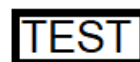


View distance 32 m is marked at safety sign for all models

WARNING

- IN ORDER TO ENSURE PERSONNEL SAFETY & INTEGRITY OF THE LUMINAIRE, ELECTRICAL SUPPLY MUST BE ISOLATED TO THIS LUMINAIRE BEFORE CARRYING OUT ANY MAINTENANCE WORK.
- ALL MAINTENANCE, SUCH AS BATTERY CHANGE ON THIS LUMINAIRE, TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY.
- DE-ENERGISE ALL SUPPLIES BEFORE MAINTENANCE.

Notice regarding isolation of the electrical supply or supplies, if necessary, to ensure the safety of persons working on the emergency luminaire or the integrity of operation of the emergency luminaire.



Location: printed on the enclosure
(size: 60x40mm)

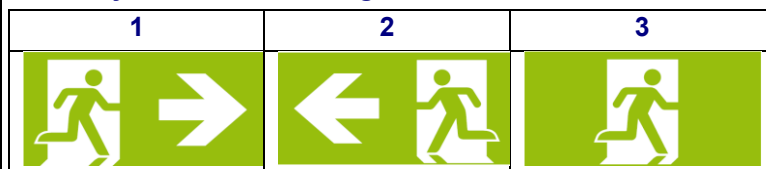
printed on enclosure
(size: 10mm)

printed near test switch

| | |
|--|---|
| Test item particulars | : Emergency lighting |
| Classification of installation and use | : For SP2001yy-zz and SP2003yy-zz: Fixed mounting, For SP2002yy-zz: Recessed mounting |
| Supply Connection | : Screw terminal for SP2001yy-zz and SP2003yy-zz Supply cord with plug for SP2002yy-zz |
| Protection Class | : II |
| Degree of Protection | : IP20 |
| Range of Ambient Temperatures | : 25°C to +40°C |
| ta | : 40°C |
| Possible test case verdicts: | |
| - test case does not apply to the test object : N/A | |
| - test object does meet the requirement : P (Pass) | |
| - test object does not meet the requirement : F (Fail) | |
| Testing | |
| Date of receipt of test item : 2021-05-21 | |
| Date (s) of performance of tests : 2021-05-21 to 2022-04-18 | |
| General remarks: | |
| "(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a <input checked="" type="checkbox"/> comma / <input type="checkbox"/> point is used as the decimal separator. | |
| Name and address of factory (ies) : REMOVED | |

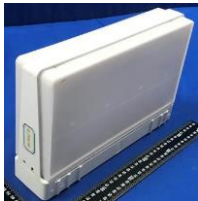


General product information:

There are 3 kinds of safety sign used only for models with suffix WH
Internally illuminated exit sign.



There are 3 kinds of safety sign used only for models with suffix BK
Low illuminance area exit sign.


Model list:

| Model name | Ratings and characteristics | Installation | Photo of enclosure | Enclosure colour |
|--------------------|--|----------------------------------|---|------------------|
| SP2001DA-WH | 4 W, 3 hours duration, LiFePO4 battery 3.2 V, 1.5 Ah; Maintained, manual test & DALI. | Ceiling mounting & wall mounting |  | White |
| SP2001DA-BK | | | | Black |
| SP2001FE-WH | 4 W, 3 hours duration, LiFePO4 battery 3.2 V, 1.5 Ah; Maintained, manual test. | | | White |
| SP2001FE-BK | | | | Black |
| SP2003DA-WH | 4 W, 3 hours duration, LiFePO4 battery 3.2 V, 1.5 Ah; Maintained, manual test & DALI. | Ceiling mounting & wall mounting |  | White |
| SP2003DA-BK | | | | Black |
| SP2003FE-WH | 4 W, 3 hours duration, LiFePO4 battery 3.2 V, 1.5 Ah; Maintained, manual test. | | | White |
| SP2003FE-BK | | | | Black |
| SP2002DA-WH | 4 W, 3 hours duration, LiFePO4 battery 3.2 V, 1.5 Ah; Maintained, manual test & DALI. | Recessed mounting |  | White |
| SP2002DA-BK | | | | Black |
| SP2002FE-WH | 4 W, 3 hours duration, LiFePO4 battery 3.2 V, 1.5 Ah; Maintained, manual test. | | | White |
| SP2002FE-BK | | | | Black |

Model difference:

All models have same parameters and similar construction.

The emergency driver of SP2001yy-zz and SP2003yy-zz have same circuit diagram, same PCB layout and same transformer.


The emergency driver of SP2001yy-zz and SP2002yy-zz have same circuit diagram and same transformer, only differ in PCB layout.

The emergency driver of SPxxxxDA-zz is identical to the emergency driver of SPxxxxFE-zz, only differ in the emergency driver with a DALI subsidiary circuit board for model SPxxxxDA-zz.

Unless otherwise specified, the SP2001DA-WH, SP2001FE-BK, SP2003DA-WH and SP2002DA-WH with safety sign 1 are chosen as representative models to perform all tests.

| AS/NZS 2293.3:2018 | | | |
|--------------------|---|------------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | GENERAL REQUIREMENTS FOR EMERGENCY ESCAPE LUMINAIRES | | — |
| 2.2 | Luminaire classification | | N/A |
| | Emergency escape luminaires shall be classified in accordance with Appendix C and shall be approximately marked | (See Appendix 1) | N/A |
| 2.3 | Suitability for Operating Conditions | | P |
| | Emergency luminaires and exit signs shall start and operate as nominated in Appendix D and comply with AS/NZS 60598.2.22. | (See Appendix 4) | P |
| | Where a product states suitability for operation at different conditions (for instance, at higher or lower voltage, temperature or humidity) then it shall be tested under these conditions in order to confirm that it will— | | P |
| | (a) start and operate satisfactorily under these different conditions; and | | P |
| | (b) meet the performance requirements of this standard as applicable. | | P |
| 2.4 | Illumination at switch on | | N/A |
| 2.4.1 | Maximum delay | (See Appendix 1) | N/A |
| | Emergency luminaires shall provide a light output of at least - (a) 10 % of the reference value within 1 s of energization. | | N/A |
| | (b) 80 % of the reference value within 15 s of energization | | N/A |
| | The reference value shall be taken as the luminous intensity assigned in terms of the classification procedure of Paragraph C3.2 of Appendix C. | | N/A |
| | The requirements of items (a) and (b) shall apply both when the emergency escape luminaires are initially switched on (i.e. cold start) and when the emergency escape luminaires are switched on immediately after operation for a periods of 15 min. (i.e. hot start). | | N/A |
| 2.4.2 | Conditions for assessing compliance with Clause 2.4.1 | | P |
| | For the purpose of assessing compliance with the requirements of Clause 2.4.1, the following conditions shall apply: | | P |
| | a) Before the emergency escape luminaires are operated they shall be conditioned by connection to the normal supply in an ambient atmosphere at $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for a period of at least 1 h. | | P |
| | b) Centrally-supplied emergency escape luminaires shall be operated at their rated voltage | | N/A |

| AS/NZS 2293.3:2018 | | | |
|--------------------|---|---------------------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | or, where marked for operation within a range of voltages, the lowest marked voltage. | | |
| | c) Self-contained emergency escape luminaires Utilize their in-built battery supply but the battery shall be in the fully charged state at the commencement of each assessment. | | P |
| | For the assessment of light output required following a 15 min period of operation, the battery shall be in the fully charged state at the commencement of that period of operation. | | P |
| | Loss of supply shall be simulated immediately afterwards for assessment of compliance with the light output criteria. | | P |
| 2.5 | LIGHT SOURCES | | P |
| | Where LED light sources are used as the emergency light source in emergency luminaires and exit signs, they shall comply with all of the following requirements: | | P |
| | (a) The LED(s) used shall have an LM80 test report. | Report No.: STD180704NB-B | P |
| | (b) For maintained emergency luminaires or exit signs, the LED(s) shall fall within the parameters of the LM80 test report whilst operating within the luminaire or exit sign at an ambient temperature of 40°C. | | P |
| | (c) For non-maintained emergency luminaires (and for New Zealand exit signs), the LED(s) shall fall within the maximum operating parameters of the LED data sheet (or as advised by the LED manufacturer) whilst operating within the luminaire or exit sign at an ambient temperature of 40°C. | | N/A |
| 2.6 | CONVERSION PACKS | | P |
| | When embodying an emergency module (also known as a conversion pack) within a luminaire in order to convert it to an emergency luminaire, the converted luminaire shall be subjected to all the requirements of this standard. | | P |
| 2.7 | MARKING | | P |
| | In addition to the information required by AS/NZS 60598.2.22, each emergency luminaire and exit sign shall be legibly and durably marked with the following information, as applicable. | | P |
| | The following information shall be marked on a non-detachable part of the luminaire and not on the diffuser or other optical control media: | | P |

| AS/NZS 2293.3:2018 | | | |
|--------------------|---|---|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | (a) Luminaire classification(s) determined in accordance with Appendix C in respect of the following factors, as applicable: | | N/A |
| | (i) Differences in the luminous intensities emitted in the transverse (C_0) and longitudinal (C_{90}) vertical planes (see Paragraph C3.1). | | N/A |
| | (ii) Light sources of differing lumen output with which it may be used (see Paragraph C3.1). | | N/A |
| | (iii) Alternative forms in which the luminaire may be used (see Paragraph C2.2). | | N/A |
| | (iv) Designed mounting positions (see Paragraph C2.3). | | P |
| | (b) Where the luminaire has a different classification in the C_0 and C_{90} planes and the C_0 plane is not obvious, luminaires shall be marked to identify the orientation of the C_0 plane through the luminaire (see Appendix C). This marking shall be clearly visible during installation and subsequent inspection of the completed lighting system. NOTE: The C_0 plane may be designated by the location of the identification symbol of Figure 2.1 at the appropriate position on the surroundings of the luminaire body, i.e. by placing the symbol on the C_0 axis relative to the light source. | | N/A |
| | (c) The identification symbol specified in Figure 2.1. The symbol shall be black and white in colour and not less than 10 mm in diameter. It shall be located in a position where it will be visible from below when the luminaire is installed, except in cases where no appropriate surface exists on the luminaire e.g. where only diffusing media or similar are visible below the ceiling. |  | P |
| | (d) Information necessary to ensure correct lamp replacement. This shall include the following as applicable: | | N/A |
| | (i) For fluorescent lamps, a statement of acceptable light source technologies that will not detrimentally affect such aspects as lumen output or the life of control gear. Statements of unacceptable technologies may also be included. Examples of technologies to be considered include tri-phosphor lamps and 'amalgam' lamps. | | N/A |
| | (ii) For incandescent lamps, a statement of the minimum acceptable nominal lumen output. | | N/A |
| | (iii) The colour temperature of acceptable lamps. NOTE: This will typically be designated by colour designation or colour temperature, e.g. 'cool white' or '4000K' | | N/A |

| AS/NZS 2293.3:2018 | | | |
|--------------------|---|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | (e) Warning notice regarding isolation of the electrical supply or supplies, if necessary, to ensure the safety of persons working on the emergency luminaire or the integrity of operation of the emergency luminaire. | | P |
| | (f) Where combined or sustained emergency luminaires are used, the location of the emergency light source shall be clearly marked, together with any information necessary to ensure correct light source replacement. | | N/A |
| | (g) Designed mounting positions and orientation (related to luminaire position/safety IP rating, etc.). This information shall be marked on luminaire to enable identification of the classification for each mounting position. NOTE: Marking on the luminaire to relate the classification to the mounting position is not required where the luminaire is designed for mounting only in the horizontal plane. | | N/A |

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|-------|--|---------------------------|-----|
| | SECTION 3 PARTICULAR REQUIREMENTS FOR EXIT SIGNS | | — |
| 3.1 | APPLICATION | | P |
| | Exit signs, in addition to complying with the requirements of Sections 2, 4 or 5 as applicable, shall comply with the requirements of this Section. NOTE: Photometric classification in accordance with Appendix C in itself does not indicate conformance with this Section. | (See Appendix 2) | P |
| 3.2 | TYPES OF EXIT SIGN | | P |
| | Exit signs shall be classified as one of four types, as follows: | | P |
| | (a) Internally illuminated exit sign. | For models with suffix WH | P |
| | (b) Dual function internally illuminated exit sign. | | N/A |
| | (b) Low illuminance area exit sign. | For models with suffix BK | P |
| | (c) Externally illuminated exit sign. | | N/A |
| | NOTE: In New Zealand: (a) Non-maintained exit signs are allowed in New Zealand, provided they comply with the requirements of New Zealand Building Code, Clause F8/AS1, for such signs. (b) Photoluminescent sign complying with the requirements of Zealand Building Code, Clause F8/AS1. | | N/A |
| 3.3 | APPEARANCE OF EXIT SIGN FACE | | P |
| 3.3.1 | Basic pictorial elements and shape | | P |

| AS/NZS 2293.3:2018 | | | |
|--------------------|--|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | The basic pictorial elements from which the face of any exit sign is constructed shall be in direct proportion to the applicable elements displayed in and specified by Figure 3.1. | | P |
| | An exit sign shall consist of one or more of these elements, combined only in accordance with one of the combinations specified in Figure 3.2 or Figure 3.3. | | P |
| | The green section of an exit sign shall be in the shape of a rectangle or square. The use of variations to these basic shapes (e.g. large-radius corners proposed due to manufacturing considerations) shall be acceptable only where specifically agreed by the relevant regulatory authority. The green section of an exit sign shall not be in the shape of a circle, nor of a triangle. | | P |
| 3.3.2 | Optional additional elements | | P |
| | As well as the basic pictorial elements, an exit sign face may also contain additional background and optional additional background in accordance with Clause 3.3.4, and in the case of a standard self-illuminated exit sign only, a white border in accordance with Clause 3.3.5. | | P |
| 3.3.3 | Location of elements | | P |
| | Where a sign consists of one pictorial element (i.e. Figure 3.1(a) or (b)) this element shall be located in the centre of the additional background. (See also Clause 3.3.4.) Where a sign consists of two pictorial elements, these shall be immediately adjacent to each other and located in the centre of any optional additional background. | | P |
| 3.3.4 | Additional background | | P |
| | Where a standard or dual function internally illuminated or externally illuminated exit sign has only a single pictorial element, the face of the sign shall include additional background of an area at least equal to the total area of the pictorial element and this additional background shall comply with the requirements of Clause 3.4.2 (d). Both additional background and optional additional background shall comply with the requirements of Clause 3.3.6. | | P |
| 3.3.5 | Borders | | P |
| | For a standard and dual function self-illuminated sign and for an externally illuminated sign, white transilluminated areas lying outside the areas of green background shall be acceptable on condition that any such areas— | | P |

| AS/NZS 2293.3:2018 | | | |
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| Clause | Requirement + Test | Result - Remark | Verdict |
| | <p>(a) form a continuous border around the green background; or</p> <p>(b) form lines of even thickness either at the sides or above and below the green background areas; or</p> <p>(c) comprise a total projected area not more than 20% of the combined area of the pictorial elements plus additional background.</p> <p>Borders shall not be permitted on low illuminance area exit signs.</p> | | |
| 3.3.6 | Colours | | P |
| 3.3.6.1 | <p>General</p> <p>For all types of exit sign, the colour of any additional background shall be identical to that of the background within the pictorial element(s), and there shall be no other color or marking present in either of these backgrounds except where allowed for under Clause 3.6.2.</p> | | P |
| 3.3.6.2 | <p>Standard and dual function internally illuminated exit signs</p> <p>The white and green colour portions of the face of a self-illuminated exit sign shall lie within the areas defined by the chromaticity coordinates specified in Table 3.1.</p> | (see appendix 3) | P |
| 3.3.6.3 | <p>Low illuminance area exit signs</p> <p>The symbols on the face of a low illuminance self-illuminated sign shall be green and comply with the requirements specified in Table 3.1. The background shall be opaque and a colour other than green.</p> <p>NOTE: A dark colour shall be used.</p> | | P |
| 3.3.6.4 | <p>Externally illuminated exit sign</p> <p>The green and white portions of an externally illuminated exit sign shall comply with the relevant colour specification requirements specified in Clause 3.3.6.2.</p> | | N/A |
| | In New Zealand, the externally illuminated exit sign colour shall comply with New Zealand Building Code, Clause F8/AS1 3.1, Tables 2 and 3. | | N/A |
| 3.3.7 | Size of pictorial elements | | P |
| 3.3.7.1 | <p>3.3.7.1 Minimum size</p> <p>The minimum pictorial element height for any exit sign shall be 100 mm.</p> | | P |
| 3.3.7.2 | <p>Maximum size</p> <p>There shall be no limit on the maximum pictorial element height.</p> | | P |

| AS/NZS 2293.3:2018 | | | |
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| Clause | Requirement + Test | Result - Remark | Verdict |
| 3.3.7.3 | Recommended sizes It is recommended that the pictorial element height on any exit sign correspond to one of the following discrete sizes. | | P |
| 3.4 | ILLUMINATION | | P |
| 3.4.1 | General Exit signs, when illuminated, shall comply with the requirements of Clauses 3.4.2 to 3.4.4 as applicable. Where there is a difference in the luminous output of an exit sign face(s) between normal mains operation and emergency operation, the operating condition that results in the lower luminous output shall be used when assessing conformance with these clauses. Luminance measurements of C0 values shall be made within 5° from the normal to the face of the exit sign, using a meter with a circular measurement field of diameter not less than 75% and not more than 85% of the arm width as specified in Figure 3.4. Luminance measurements of C60 (horizontal) values shall be made at an angle between 55° and 75° in the horizontal plane to the normal to the face of the sign. They shall also comply with the requirements of Clause 2.3 except that the reference value shall be the luminance value after stable photometric conditions have been attained. | | P |
| 3.4.2 | Standard and dual function internally illuminated exit signs The following requirements apply: (a) On the green areas of the pictorial elements, at each applicable measurement site specified in Figure 3.4, the C0 luminance measured shall be not less than 8 cd/m ² and the C60 luminance shall be not less than 10% of the C0 value. (b) The ratio of the C0 luminance measured at each applicable white measurement site specified in Figure 3.4 to the C0 value at the nearest green measurement site shall be not less than 4:1. (c) The variation in C0 luminance between any two white measurement sites specified in Figure 3.4, or between any two green measurement site in the same figure, shall not be greater than 5:1. (d) For a single element sign, at no point shall the luminance be less than the minimum C0 and C60 values stated in Item (a) for an additional background, which shall be adjacent to the pictorial element and have a minimum area that is at least equal to | (see appendix 3) | P |

| AS/NZS 2293.3:2018 | | | |
|--------------------|--|------------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | the area of the pictorial element. NOTE: Refer to Clause 3.3.4 for further requirements. | | |
| 3.4.3 | Low illuminance area exit signs The requirements are: (a) At each applicable green measurement site specified in Figure 3.4, the C0 luminance measured shall be not less than 2 cd/m ² and not greater than 25 cd/m ² ; the C60 luminance shall be not less than 10% of the C0 value. (b) The variation in C0 luminance between any two applicable measurement sites specified in Figure 3.4 shall be not greater than 5:1. | (see appendix 3) | P |
| 3.4.4 | Externally illuminated exit signs shall be in accordance with AS/NZS 2293.1:201X, Clause 5.7.2. | | N/A |
| 3.4.5 | Projected light source life in LED exit signs For exit signs utilizing LEDs as their light source, a projection of the light source life shall be undertake in accordance with Appendix E. | 54000h | P |
| 3.5 | MAXIMUM VIEWING DISTANCES For exit signs of pictorial element height greater than 200 mm, the maximum viewing distance shall be calculated by the following equation: Maximum viewing distance = 160 × element height For any exit sign of pictorial element height less than or equal to 250 mm the maximum viewing distance shall be as specified in Table 3.2. | | P |
| 3.6 | MARKING | | P |
| 3.6.1 | On body of exit sign The requirements of Clause 2.6 shall apply. (See also Clause 4.6). For LED exit signs the body shall also be marked with the Projected Light Source Life in accordance with Appendix E. | | P |
| 3.6.2 | On face of exit sign | | P |

| AS/NZS 2293.3:2018 | | | |
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| Clause | Requirement + Test | Result - Remark | Verdict |
| 3.6.2.1 | <p>Maximum viewing distance</p> <p>The maximum viewing distance in accordance with Table 3.2 shall be marked on the face of the exit sign, located on the background either within one of the elements or on additional background. The distance shall be displayed as a one or two digit number (as applicable) followed by the letter 'm'.</p> <p>The digits and lettering shall be not less than 5 mm high and not more than 10 mm high. Transilluminated white writing shall be acceptable on white and green signs but not on signs for low illuminance areas.</p> | | P |
| 3.6.2.2 | <p>Other information</p> <p>The manufacturer may display an identifying name or company logo on the face of an exit sign. This shall not be more than 10 mm high and displayed close to and in the same colour as the figures maximum viewing distance.</p> | | P |

| | | | |
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| | SECTION 4 PARTICULAR REQUIREMENTS FOR SELF-CONTAINED EMERGENCY LUMINAIRES AND EXIT SIGNS | | — |
| 4.2 | ARRANGEMENT AND CONTROL | | P |
| 4.3.1 | Automatic battery cut off | | P |
| | Means shall be provided to automatically disconnect the battery from the load before the cell voltage falls below the minimum value recommended by the cell manufacturer. For this requirement, the minimum voltage recommended by the cell manufacturer shall be -- | | P |
| | (a) Relevant to the number of cells used in the battery at the discharge rate applicable for the emergency luminaire or exit sign; and | | P |
| | (b) Selected to avoid the possibility of individual cells in the battery pack going into reverse polarity within 10 charge/discharge cycles. | | P |
| | The means of disconnection shall - | | P |
| | (i) Automatically reset upon restoration of the normal supply | | P |
| | (ii) be arranged so that, after disconnection, the drain imposed on the battery is not greater than that recommended by the cell manufacturer for the operating conditions, so that the battery will not be discharged to the extent that it is incapable of recovery. | | P |
| 4.3.2 | Test switch | | P |
| | A switch shall be provided to permit the operation of each emergency luminaire or exit sign to be | | P |

| AS/NZS 2293.3:2018 | | | |
|--------------------|--|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | checked by simulating a supply circuit failure. The switch shall be -- | | |
| | (a) accessible from the exterior of the emergency luminaire or exit sign and in a convenient position for operation; | | P |
| | (b) of a type which cannot be maintained in the test position without the attendance of the person conducting the test; | | P |
| | Notwithstanding the above requirements, the following exemptions shall apply: | | N/A |
| | (i) An internal test switch may be provided for Emergency luminaires or exit signs of a type for which it is impractical to incorporate an external test switch, e.g. vandal resistant luminaires or recessed luminaires. The internal test switch shall be located in a position which is normally accessible during light source and/or battery replacement (where applicable). | | N/A |
| | (ii) No test switch need to be provided for Emergency luminaires or exit signs which are designed for use in hazardous locations, where the possibility of sparking resulting from operation of the switch would compromise safety features of the luminaire design. | | N/A |
| | (iii) For remote self-contained luminaires or exit signs, the test switch may be located on either the luminaire or remote mounted control gear enclosure where the emergency luminaire or exit signs are located greater than 2m apart from its control gear. Where the test switch is located on the luminaire, the maximum separation distance and cable type shall be specified by the manufacturer and Appendix D tests shall be performed at the worst case (i.e. at the claimed maximum distance as advised by the manufacturer). | | N/A |
| 4.2.3 | Battery isolation facility | | P |
| | Any facility which is provided for the purpose of preventing operation of the emergency luminaire or exit sign from the emergency power source when disconnected from the normal supply shall - | | P |
| | (a) Only be capable of operation by the use of a key of special tool; | | P |
| | (b) Be clearly marked as to its function and operation position. | | P |
| 4.3 | Batteries | | P |

| AS/NZS 2293.3:2018 | | | |
|--------------------|---|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 4.3.1 | Required type | | P |
| | Batteries shall be suitable for use in emergency luminaires and exit signs when subjected to the tests of Appendix D and are safe for charging, discharging and storage for extended periods at elevated temperature. Batteries shall be of the sealed rechargeable type specially designed for emergency or standby use. The batteries shall be fitted with self-resealing gas vents or similar, as required by battery/cell chemistry and/or relevant safety standards. | | P |
| | Batteries which are designed for operation only in specified positions, e.g. vertical, may be used provided that any restriction which this may place on the mounting of the luminaire is clearly marked. | | N/A |
| | Batteries other than nickel-cadmium, lead-acid, nickel metal hydride, or lithium shall comply with a relevant AS, NZS, IEC or ANSI battery product standard for extended charge at elevated temperatures (elevated temperature is the maximum operating temperature as specified by the cell manufacturer in accordance with the relevant performance standard for the particular battery/cell chemistry). Where such standards do not exist, conformance shall be tested against the cell manufacturer's specifications. | | P |
| | Batteries which utilize sealed nickel-cadmium cells shall comply with the requirements of IEC 61951-1 for cells intended for permanent charge at elevated temperatures. | | N/A |
| | Batteries which utilize sealed nickel metal hydride cells shall comply with the requirements of IEC 61951-2 for cells intended for permanent charge at elevated temperatures. | | N/A |
| | Valve regulated lead-acid batteries shall comply with the relevant requirements of IEC 60896-21. | | N/A |
| | Lithium cells shall comply with the requirements of IEC 62133 and IEC 62620. | | P |
| 4.4.2 | Battery capacity | | P |
| | Each battery shall be legibly and durably marked with the ampere-hour capacity assigned by the battery manufacturer at a specified rate of discharge | | P |
| 4.4.3 | Intercell connections | | N/A |
| | Connections between the cells of a battery shall be made by a reliable means such as soldering, welding, bolting or the use of quick-connect tab and receptacle connections. Such connections | | N/A |

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| Clause | Requirement + Test | Result - Remark | Verdict |
| | shall either be inherently corrosion-resistant or shall be treated to prevent corrosion. | | |
| 4.4.4 | Battery circuit protection | | P |
| | Batteries circuit protection shall comply with the relevant section of AS/NZS 60598.2.22. | | P |
| 4.4.5 | Provision for battery replacement | | P |
| | Where batteries are intended to be replaceable they shall be located and secured within emergency luminaires and exit signs in a manner that will enable their replacement to be readily effected without dismantling or replacing other components. | | P |
| | Connections between batteries and other equipment in emergency luminaires and exit signs shall be made by easily replacement. | | P |
| 4.4 | Battery charges | | P |
| 4.4.1 | General | | P |
| | The design of the battery charger shall be such that, when connected to a battery at zero potential, it will either -- | | P |
| | (a) Continue to function; | | P |
| | (b) Fail in a safe manner. | | N/A |
| | The rating of battery charger shall be such that-- | | P |
| | (i) After the battery has been discharged from Fully-charged state by operating the emergency Luminaire or exit sign for the initial duration of operation specified in Section 2 of AS/NZS 2293.1:201X; and | | P |
| | (ii) After recharging for a period of not more than 16 hours | | P |
| | The battery shall have recovered to the extent that it is capable of sustaining an additional discharge as specified in Item (i). The output voltage at the end of each discharge period shall be not less than that recommended by the cell manufacturer. | | P |
| | The battery charger shall recharge and maintain the battery automatically while the normal supply to the emergency luminaire or exit sign is available. The system shall be arranged so that the battery will not receive a charge in excess of the of the limits recommended by the battery manufacturer under any condition of operation. | | P |
| | Compliance with the above shall be assessed by the relevant tests of Appendix D. | | P |
| 4.5.2 | Visual indicator | | P |

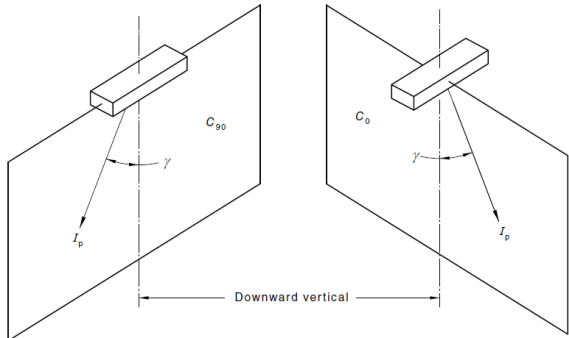
| AS/NZS 2293.3:2018 | | | |
|--------------------|---|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Visual indication of the battery charger operation shall be provided. The indicator shall be-- | | P |
| | (a) Either red or green in colour under normal operating conditions; | Green | P |
| | (b) Connected to the output side of the battery charger; | | P |
| | (c) Arranged such that failure of the indicator device will not render the emergency luminaire or exit sign inoperative; and | | P |
| | (d) Located in a position which will be visible when mounted in any designed attitude or adjacent to the test switch where the control gear is remote mounted. | | P |
| | It is permissible to use this indicator to display additional information –for example by flashing | | N/A |
| 4.5 | Self-contained automatic discharge testing facility | | N/A |
| 4.5.1 | Application | | N/A |
| | This clause applies to emergency luminaires and exit signs which are provided with self-contained, automatic facilities for discharge testing, i.e. fully stand-alone systems. | | N/A |
| 4.5.2 | General requirements | | N/A |
| | The testing system used shall comply with the general requirements for automatic testing facilities in Section 3 of AS/NZS 2293.1 and with the following: | | N/A |
| | (a) The test facility shall not interfere with the capacity of the emergency luminaire or exit sign to operate correctly in response to loss of the normal supply. | | N/A |
| | (b) The test facility shall automatically subject the emergency luminaire or exit sign to a discharge test at intervals of not more than specified in AS/NZS 2293.2. The system used to time the interval between successive discharge tests shall not be affected during periods when the normal supply interrupted. | | N/A |
| | (c) The test facility shall provide for the discharge test to continue for at least the required duration and for the period of the test, the battery shall receive no charge. | | N/A |
| | (d) Sensing means shall be provided to confirm that the emergency light source(s) remained illuminated for the required duration | | N/A |
| | (e) If loss of normal supply occurs while the test is in progress, the emergency luminaire or exit sign shall remain connected in the | | N/A |

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|--------------------|--|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | emergency mode until the test has been completed or, if the normal supply has not been restored, until emergency luminaire or exit sign is disconnected by the automatic battery cut off device. | | |
| 4.5.3 | Required indications | | N/A |
| | Distinctive indications shall be provided at each emergency luminaire or exit sign to identify the following operational states: | | N/A |
| | (a) Normal state – an indication that the emergency luminaire or exit sign is in the normal mode, awaiting the next discharge test. | | N/A |
| | (b) Recently tested and complies – a temporary indication that the emergency luminaire or exit sign was recently tested and remained illuminated for the required duration. The indication shall be maintained for at least 5 days following completion of the test after which the indication shall revert to the that described in Item (i) below. | | N/A |
| | (c) Tested and failed – an indication that the emergency light source(s) failed to remain illuminated for the required duration when subjected to a discharge test. This indication shall be maintained until the fault has been rectified and the emergency luminaire or exit sign successfully passes a subsequent discharge test. | | N/A |
| | Where a single visual indicator is used to provide all of the indications required by Items (a) to (c), it shall be yellow in colour and the following illuminated states shall have meanings given: | | N/A |
| | (i) Continuously illuminated – to indicate the normal state, See Item (a) | | N/A |
| | (ii) Slow flash – to indicate recently tested and complies. See Item (b) | | N/A |
| | (iii) Fast flash – to indicate tested and failed. See Item (c). | | N/A |
| 4.6 | MARKING | | P |
| | Self-contained emergency luminaires and exit signs shall be marked in accordance with the requirements of Clauses 2.7 or 3.6 as applicable, and shall also be marked with the following information: | | P |
| | (a) The information necessary to ensure correct replacement of the batteries, or to indicated that the battery is not replaceable. | | P |

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|--------------------|--|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | (b) Any restriction on luminaire orientation and the battery mounting position (see Clause 4.4.1). | | P |
| | Where the emergency power supply unit is located separately from the emergency luminaire or exit sign, each assemble shall be marked with the information required above. | | P |
| | Where combined or sustained emergency luminaires are used, the location of the emergency light source shall be clearly marked, together with any information necessary to ensure correct light source replacement. | | N/A |

| | | | |
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| | SECTION 5 PARTICULAR REQUIREMENTS FOR CENTRALLY SUPPLIED EMERGENCY LUMINAIRES AND EXIT SIGNS | | — |
| 5.2 | ARRANGEMENT AND CONTROL | | N/A |
| 5.2.1 | Test switch A centrally supplied emergency luminaire or exit sign does not require a test switch. | | — |
| 5.2.2 | Visual indicator A centrally supplied emergency luminaire or exit sign does not require a test switch. | | — |
| 5.3 | MARKING | | N/A |
| | Centrally supplied emergency luminaire and exit sign shall be marked in accordance with the requirements of Clauses 2.7 or 3.6 as applicable, and shall also be legibly and durably marked with the following information: | | N/A |
| | (a) Where the luminaire or exit sign has provision for connection to a single supply only: 'WARNING: Centrally supplied luminaire'. | | N/A |
| | (b) Where the luminaire or exit sign has provision for connection to two supplies: 'WARNING: Centrally supplied luminaire-Dual voltages within'. | | N/A |

| | | | |
|----|---|----------------|-----|
| | APPENDIX C CLASSIFICATION OF EMERGENCY LUMINAIRES AND DUAL FUNCTION EXIT SIGNS | | — |
| C1 | BASIS OF CLASSIFICATION The system specified in this Appendix for the classification of emergency luminaires and dual function exit signs is based on the following considerations: (a) The general shape of the intensity distribution curves in the transverse (C0) and longitudinal (C90) vertical planes through the luminaire (see | See appendix 1 | N/A |

| AS/NZS 2293.3:2018 | | | |
|--------------------|---|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | <p>Figures C1 and C2). The classification for each plane is considered separately.</p> <p>(b) The luminous intensity in the downward vertical direction. This intensity is used for convenience, but is related to the intensities at other angles by the characteristic distribution shape.</p> <p>The purpose of the classification is to facilitate the specification of requirements, in terms of luminaire mounting height and spacing, to simplify both the design of emergency lighting installations and the assessment of conformance.</p>  <p>I_p = luminous intensity in the measurement direction p, in the relevant plane of measurement (see Paragraph C3.1)</p> <p>FIGURE C1 VERTICAL PLANES THROUGH EMERGENCY LUMINAIRE OR DUAL FUNCTION EXIT SIGN FOR MEASUREMENTS OF LUMINOUS INTENSITY</p> | | |
| C2 | TEST CONDITIONS | | N/A |
| C2.1 | <p>General</p> <p>The emergency luminaire or dual function exit sign shall be tested in accordance with the requirements of this Appendix under the applicable conditions specified in AS/NZS 1680.3, CIE S025 or IES LM-79.</p> <p>NOTE: The luminous intensity data required above is of an abbreviated form, for use in establishing the classification of emergency luminaires and exit signs in accordance with this Appendix. Where maximum spacings of emergency luminaires and exit signs are to be determined by illuminance calculations (see AS/NZS 2293.1), more comprehensive luminous intensity data in accordance with CIE S025, AS/NZS 1680.3 or IES LM-79 will be required.</p> | | N/A |
| C2.2 | <p>Alternative luminaire combinations</p> <p>Where the emergency luminaire or dual function exit sign is designed for use in several different combinations (e.g. the same basic luminaire with different diffusers or wire guards) each combination shall be tested as specified by the</p> | | N/A |

| AS/NZS 2293.3:2018 | | | |
|--------------------|--|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | manufacturer. Exit signs shall be tested with a plain running man pictograph diffuser(s). | | |
| C2.3 | <p>Mounting position</p> <p>The emergency luminaire or dual function exit sign shall be mounted in the horizontal plane for the purpose of the tests unless of a type which is not designed for this application.</p> <p>Where designed for use in other mounting positions, e.g. on a wall or other vertical surface, the emergency luminaire shall be tested in the most onerous position.</p> | | N/A |
| C2.4 | <p>Test voltage and current</p> <p>For the photometry necessary to establish the classification of an emergency luminaire or dual function exit sign, the following conditions shall apply:</p> | | N/A |
| | <p>(a) Centrally supplied luminaires and dual function exit signs The test voltage shall be as follows:</p> <p>(i) For connection to d.c. supply—80% of the rated voltage of the luminaire.</p> <p>(ii) For connection to a.c. supply from central inverter—90% of the rated voltage of the luminaire.</p> <p>Where the luminaire is marked for operation within a range of voltages, the lowest marked voltage shall be used as the basis for determining the test voltage.</p> <p>(b) Self-contained emergency luminaires and dual function exit signs The test voltage shall be as determined in accordance with Paragraph D2 of Appendix D. The batteries shall be disconnected and replaced by a separate d.c. supply of the required voltage.</p> <p>The current delivered to the luminaire during the test shall be within 5% of the value determined in accordance with Paragraph D2 of Appendix D; however, this requirement need not apply if the tests of this Appendix and Appendix D are conducted sequentially in the same laboratory.</p> | | N/A |
| C3 | PROCEDURE FOR DERIVING THE LUMINAIRE CLASSIFICATION | | N/A |
| C3.1 | <p>General procedure</p> <p>The luminous intensities emitted by the luminaire shall be measured in both the C0 and C90 planes at intervals of not more than 5°, from the downward vertical direction, up to and including 90° above the downward vertical. The luminaire shall then be assigned an alphanumeric</p> | | N/A |

| AS/NZS 2293.3:2018 | | | |
|--------------------|---|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | <p>classification in accordance with Paragraph C3.2. Where the luminous intensities emitted on either side of the downward vertical in the C0 or C90 plane differ, i.e. the luminaire has an asymmetric light distribution in the particular plane, the luminous intensities for the half plane which produces the lowest classification shall be used.</p> <p>The luminaire or exit sign may be assigned more than one classification provided that it complies with the requirements that are applicable for each of the classifications assigned.</p> <p>Different classifications may be assigned in the C0 and C90 planes (see Figure C1) provided that each classification is specifically related to the relevant plane.</p> <p>Example</p> <p>Where a luminaire is assigned a C classification in the C0 plane and a B classification in the C90 plane, the luminaire would be marked as follows:</p> <p>C0/C...</p> <p>C90/B...</p> <p>Where the luminaire is not marked in accordance with Clause 2.7(b) and the location of the C0 plane is not obvious, luminous intensities shall be measured in at least eight equally spaced vertical planes. A single classification, corresponding to the lowest classification afforded by any one of the measurement planes, shall be adopted.</p> <p>Where light sources of differing light output are likely to be used, the luminaire shall be classified separately for each condition of use. Each alternative classification shall be indicated, together with information that will identify the light source to which the particular classification relates.</p> | | |
| C3.2 | Method of assigning the classification | | N/A |
| C3.2.1 | <p>General</p> <p>The classification assigned to an emergency luminaire or dual function exit sign shall comprise the combination of an alphabetic and a numerical designation, determined in accordance with Paragraph C3.2.2 and Paragraph C3.2.3 respectively.</p> | | N/A |
| C3.2.2 | <p>Alphabetic component of the classification</p> <p>The alphabetic component of the classification, in the form of the letters A, B, C, D or E, shall be assigned in accordance with the following procedure, based on the general shape of the</p> | | N/A |

| AS/NZS 2293.3:2018 | | | |
|--------------------|--|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | <p>luminous intensity distribution in the appropriate vertical plane (see Paragraph C3.1).</p> <p>NOTE: Figure C2 illustrates the characteristic shape of the luminous intensity distribution curves for the general classes of emergency luminaire that are specified in this Standard. The luminous intensities at each of the measured angles shall be not less than the values determined from the following equations, as applicable.</p> <p>(a) For Class A emergency luminaires or dual function exit sign—</p> $I_p = I_o \cos^4 \gamma \quad (\text{for } \gamma \leq 70^\circ) \quad \dots \text{C1}$ <p>(b) For Class B emergency luminaires or dual function exit sign—</p> $I_p = I_o \cos^3 \gamma \quad (\text{for } \gamma \leq 70^\circ) \quad \dots \text{C2}$ <p>(c) For Class C emergency luminaires or dual function exit sign—</p> $I_p = I_o \cos^{1.5} \gamma \quad (\text{for } \gamma \leq 70^\circ) \quad \dots \text{C3}$ <p>(d) For Class D emergency luminaires or dual function exit sign—</p> $I_p = I_o \frac{2 + \cos \gamma}{3} \quad (\text{for } \gamma \leq 70^\circ) \quad \dots \text{C4}$ <p>(e) For Class E emergency luminaires or dual function exit sign—</p> $I_p = I_o \left(1 + \frac{0.04 \gamma}{30} \right) \quad (\text{for } \gamma \leq 30^\circ) \quad \dots \text{C5}$ $I_p = 1.07 I_o \cos 2.6 (\gamma - 35) \quad (\text{for } \gamma \leq 30^\circ \leq 65) \quad \dots \text{C6}$ <p>where</p> <p>I_p = luminous intensity emitted at the particular angle, in candelas (cd)</p> <p>I_o = luminous intensity in the downward vertical direction, assigned in accordance with Paragraph C3.2.3, in candelas (cd)</p> <p>γ = angle from the downward vertical at which the luminous intensity is measured, in degrees</p> | | |
| C3.2.3 | <p>Numerical component of the classification</p> <p>The luminous intensity for any one measurement angle up to and including 30° from the downward vertical may, for that angle only, be up to 20% below the minimum value determined from the relevant equation prior to any application of the derating factor.</p> <p>The numerical component of the classification shall be assigned corresponding to any value in the following series which is equal to or less than the actual luminous intensity in the downward vertical direction: 1, 1.25, 1.6, 2, 2.5, 3.2, 4, 5, 6.3, 8, 10, 12.5, 16, 20, 25, 32, 40, 50 ...</p> <p>The above values are based on the R10 series of preferred numbers in AS 2752.</p> | | N/A |
| C3.3 | <p>Glare limitations</p> <p>In order to restrict disability glare at higher angles, limitations are applied to the luminous</p> | | N/A |

| AS/NZS 2293.3:2018 | | | | | | | | | | | | | | | | | |
|--|--|--|---|----------------|-----|----------------------|-----|----------------------|------|----------------------|------|----------------------|------|----------------|------|--|--|
| Clause | Requirement + Test | Result - Remark | Verdict | | | | | | | | | | | | | | |
| | <p>intensity of the luminaire based on the mounting height range in accordance with Table C1.</p> <p style="text-align: center;">TABLE C1</p> <p style="text-align: center;">DISABILITY GLARE LIMITS</p> <table><tr><th>Mounting height (<i>H</i>) above floor level m</th><th>Maximum luminous intensity from 60 to 90 degrees from nadir (<i>I</i>_{max}), cd</th></tr><tr><td><i>H</i> < 2.5</td><td>500</td></tr><tr><td>2.5 ≤ <i>H</i> < 3.0</td><td>900</td></tr><tr><td>3.0 ≤ <i>H</i> < 3.5</td><td>1600</td></tr><tr><td>3.5 ≤ <i>H</i> < 4.0</td><td>2500</td></tr><tr><td>4.0 ≤ <i>H</i> < 4.5</td><td>3500</td></tr><tr><td>4.5 ≤ <i>H</i></td><td>5000</td></tr></table> | Mounting height (<i>H</i>) above floor level m | Maximum luminous intensity from 60 to 90 degrees from nadir (<i>I</i> _{max}), cd | <i>H</i> < 2.5 | 500 | 2.5 ≤ <i>H</i> < 3.0 | 900 | 3.0 ≤ <i>H</i> < 3.5 | 1600 | 3.5 ≤ <i>H</i> < 4.0 | 2500 | 4.0 ≤ <i>H</i> < 4.5 | 3500 | 4.5 ≤ <i>H</i> | 5000 | | |
| Mounting height (<i>H</i>) above floor level m | Maximum luminous intensity from 60 to 90 degrees from nadir (<i>I</i> _{max}), cd | | | | | | | | | | | | | | | | |
| <i>H</i> < 2.5 | 500 | | | | | | | | | | | | | | | | |
| 2.5 ≤ <i>H</i> < 3.0 | 900 | | | | | | | | | | | | | | | | |
| 3.0 ≤ <i>H</i> < 3.5 | 1600 | | | | | | | | | | | | | | | | |
| 3.5 ≤ <i>H</i> < 4.0 | 2500 | | | | | | | | | | | | | | | | |
| 4.0 ≤ <i>H</i> < 4.5 | 3500 | | | | | | | | | | | | | | | | |
| 4.5 ≤ <i>H</i> | 5000 | | | | | | | | | | | | | | | | |
| C3.4 | <p>Colour temperature and colour rendering index</p> <p>The colour temperature shall fall with the range from 2500 K to 7000 K.</p> <p>The minimum value of the colour rendering index Ra of the light source utilized in any emergency luminaire shall be greater than 40.</p> <p>NOTE: The minimum Ra value is to assist in the recognition of safety colours.</p> | | N/A | | | | | | | | | | | | | | |

| | | | |
|------|--|--|---|
| | APPENDIX D TYPE TESTING OF SELF CONTAINED EMERGENCY LUMINAIRES AND EXIT SIGNS | | — |
| D1 | TEMPERATURE TESTS | | P |
| D1.1 | <p>Application</p> <p>Each design/type of self-contained emergency luminaire and exit sign shall be subjected to a high temperature test and a low temperature test, conducted in that order in accordance with Tables D1 and D2 respectively, and shall comply with the appropriate requirements stated therein. These tests shall be carried out at the temperature specified in an environment or enclosure designed to avoid excessive changes in ambient temperature. The sample shall be tested in the most arduous position allowed for in the manufacturer's instructions or as indicated/marked on the product. If there are no instructions or markings, then the product shall be tested in the most arduous position possible.</p> <p>The design for a draught proof enclosure and luminaire mounting arrangements are given in AS/NZS 60598.1. Other types of enclosures may be used if the results obtained are compatible with those that would be obtained by use of the draught proof enclosure and luminaire mounting arrangement described in AS/NZS 60598.1.</p> | | P |

| AS/NZS 2293.3:2018 | | | |
|--------------------|---|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | <p>Where a range of self-contained emergency luminaires or exit signs utilize the same circuit, components and enclosure, each luminaire or exit sign need not be tested, provided that—</p> <p>(a) the luminaire or exit sign selected for the high temperature test represents the form that will produce the highest internal temperatures, e.g. operate in maintained mode, polished reflector, dense diffuser; and</p> <p>(b) the luminaire or exit sign selected for the low temperature test represents the form that will produce the lowest internal temperatures, e.g. operate in non-maintained mode, diffuse reflector, operate without diffuser.</p> <p>Where there is doubt about which luminaire or exit sign is to be selected in accordance with Items (a) and (b), each luminaire or exit sign in the range shall be operated at an ambient temperature of $25 \pm 2^{\circ} \text{C}$ and the internal temperatures measured adjacent to the battery, until stable temperature conditions are attained. A change of CCT only for LEDs shall not count as a ‘change of component’, provided that each CCT version of the luminaire or exit sign is subjected to the measurement above.</p> <p>Test reports shall clearly indicate, by reference to catalogue numbers or other suitable identification markings, the luminaires or exit signs selected for testing and the range of emergency luminaires or exit signs which they represent. The test report shall also note all allowable mounting orientations where specified by the manufacturer.</p> <p>The tests conducted under this Appendix give guidance for performance at elevated and reduced temperatures. They do not imply any luminaire temperature rating (T_a) as defined in AS/NZS 60598.2.22.</p> | | |
| D1.2 | <p>General conditioning</p> <p>The three cycles of each test procedure shall follow sequentially in the order specified. The interval between successive cycles shall not exceed 12 h, during which time the ambient temperature shall be maintained at the specified value.</p> <p>The battery voltage shall be monitored continuously throughout each cycle. All other parameters shall be monitored at intervals of not more than 5 min.</p> <p>For the purpose of the tests, the ambient temperature shall be taken as the dry bulb temperature reading within the test room or enclosure under still air conditions. During</p> | | P |

| AS/NZS 2293.3:2018 | | | |
|--------------------|--|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | <p>measurement, the temperature sensing element shall be shielded from radiation from the luminaire or exit sign under test.</p> <p>All voltage measurements shall be taken while the battery is being charged or discharged.</p> | | |
| D2 | <p>LIGHT OUTPUT</p> <p>In addition to complying with this Appendix, each design/type of self-contained emergency luminaire and dual function exit sign shall be tested in accordance with the requirements of Appendix C and assigned an appropriate classification. Self-contained internally illuminated exit signs shall provide luminance values in accordance with the requirements of Clause 3.4.2. For photometric measurements, the test voltage and current shall be as follows:</p> <p>(a) The test voltage shall be the lowest battery voltage measured in any of the discharge cycles specified in Tables D1 and D2, after operation for the initial duration of operation specified in Section 2 of AS/NZS 2293.1.</p> <p>(b) The discharge current delivered to the luminaire shall be recorded when operated at an ambient temperature of 25° C. The batteries shall be disconnected and replaced by a separate d.c. power supply at the test voltage determined in accordance with Item (a). The luminaire shall be orientated in its intended mounting position and the discharge current shall be recorded when stable.</p> | | P |
| D3 | <p>LED OPERATING CONDITION TEST</p> <p>The LED(s) used in emergency luminaires and exit signs shall be tested in order to verify that the operating condition of the LEDs are, as a minimum, within the parameters of the LM80 test report for maintained luminaires and exit signs, and manufacturer's limits for non-maintained luminaires (and in New Zealand non-maintained exit signs).</p> <p>The attachment point of the fine wire thermocouple shall be as defined in the IES LM80 report for the emergency LED in question.</p> <p>For maintained emergency luminaires and exit signs, when the luminaire is tested at an ambient temperature of 40° C, the LED case temperature (Ts) and the LED drive current shall be measured. These measurements shall not exceed those values as given in the IES LM80 report.</p> <p>For non-maintained emergency luminaires (and in New Zealand non-maintained exit signs) when the luminaire is tested at an ambient temperature</p> | Maintained | P |

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|--------------------|--|------------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | of 40° C the LED Ts point temperature and the LED drive current shall be measured. These measurements shall not exceed those values as specified by the LED chip manufacturer. | | |
| D4 | <p>BATTERY CHARGER SHORT CIRCUIT TEST</p> <p>Each design/type of self-contained emergency escape luminaire and exit sign shall be tested under the following conditions:</p> <p>(a) The test shall be conducted in an ambient temperature of $40 \pm 2^{\circ}$ C.</p> <p>(b) The emergency escape luminaire or exit sign shall be connected to a 50 Hz a.c. supply at 106% of the rated voltage.</p> <p>(c) The battery shall be disconnected and a short circuit of negligible impedance applied in place of the battery.</p> <p>The test shall be continued for a period of 24 h and, during the test, there shall be no emission of flames nor molten material nor production of flammable gases. In addition, enclosures shall not have deformed to the extent that access to live parts is made possible by use of the standard test finger, as specified in AS/NZS 60598.1.</p> <p>The battery charger need not be capable of normal operation after the completion of the test but failure of any component shall not affect conformance with the above.</p> | 1,06x240V=254,4V | P |
| D5 | <p>TEST FOR AUTOMATIC DISCHARGE TEST FACILITIES</p> <p>Emergency escape luminaires and exit signs that are provided with self contained or centralized facilities for automatic discharge testing shall be subjected to the following additional test; the test shall be conducted at an ambient temperature of $25 \pm 5^{\circ}$ C:</p> <p>(a) Connect the emergency escape luminaire or exit sign to the supply at rated voltage for a period of 16 h.</p> <p>(b) Initiate the automatic discharge test facility and independently monitor the elapsed time and light output.</p> <p>(c) Check that the time taken for the completion of the test and restoration of normal conditions conforms to the general system requirement in Section 4 of AS 2293.1.</p> <p>(d) Check that correct indication of operational status is provided both during and after the discharge test.</p> | | P |

| AS/NZS 2293.3:2018 | | | |
|--------------------|---|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | (e) Simulate each of the following conditions, in turn, and check that the correct indications of operational status are provided: (i) Operation of the battery low voltage cut off. (ii) Failure of the emergency lamp(s). | | |

| | | | |
|------|---|----------------|---|
| | APPENDIX E PROJECTION OF LIGHT SOURCE LIFE (LSL) IN LED EXIT SIGNS | | — |
| E1 | PURPOSE The purpose of the projection is to provide maintenance personnel with light source life expectancy data for installed exit signs for inclusion in the baseline data required for any installation. | | P |
| E2 | BASIS OF PROJECTION The system described in this Appendix is for the projection of light source life in LED exit signs based on IES TM-21 methodology. It uses luminance data recorded as part of Clause 3 of this Standard, LED case temperature T_s and LED drive current recorded as part of Appendix D tests and LM-80 test report data for the LED employed. These are used as inputs in calculating the projected lumen depreciation life in exit signs (i.e. the lumen depreciation level that, when reached, would result in the sign being non-compliant with the minimum face luminance requirement of Clause 3). | See Appendix 5 | P |
| E3 | DATA REQUIRED The following data is required to calculate the light source life: (a) The minimum luminance recorded for the green background (hereafter referred to as L_{Gmin}). (b) The minimum luminance recorded for the white foreground (hereafter referred to as L_{Wmin}). (c) The LED case temperature T_s measured in Appendix D. (d) The applicable IES LM-80 report for the LED employed. | | P |
| E4 | METHOD TO DETERMINE LIGHT SOURCE LIFE | | P |
| E4.1 | CALCULATION OF THE MINIMUM FACE LUMINANCE FACTOR The method in Paragraphs E4.2 and E4.3 shall be used to determine the light source life. | | P |
| E4.2 | CALCULATION OF THE MINIMUM FACE LUMINANCE FACTOR | | P |

| AS/NZS 2293.3:2018 | | | |
|--------------------|---|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | <p>The maximum maintenance factor is the higher value calculated from both the formulae below:</p> <p>$8/LG_{min}$ = green background luminance factor 100</p> <p>$32/LW_{min}$ = white foreground luminance factor 100</p> <p>The maximum of these two factors is used in the light source life calculations. The factor represents the percentage of luminance at which the sign will no longer comply, and is comparable to the LXX lumen depreciation used in general LED lighting.</p> <p>For example, an LED exit sign has an LG_{min} of 12 cd/m², and an LW_{min} of 60 cd/m².</p> <p>The green background luminance factor is— $8/12 \times 100 = 67$</p> <p>Therefore L67 is applicable to green.</p> <p>The white background luminance factor is— $32/60 \times 100 = 53$</p> <p>Therefore L53 is applicable to white.</p> <p>The maximum value is used in the light source life calculations. This is 67 or L67.</p> | | |
| E4.3 | <p>CALCULATION OF THE LIGHT SOURCE LIFE</p> <p>A recognized IES TM-21 calculation spreadsheet shall be used to perform the calculation. The procedure shall be as follows:</p> <p>Enter the appropriate data into the spreadsheet. This includes the—</p> <ul style="list-style-type: none"> (a) LM-80 data for the LED being assessed; (b) LED T_s temperature measured; and (c) operating current. <p>In the spreadsheet results table:</p> <ul style="list-style-type: none"> (i) Vary the time (t) which estimates lumen maintenance hours (in steps of 1000 hours min) until the Lumen maintenance at time (t)% is within ± 2 of the value calculated in E4.1. (ii) Time (t) is the light source life in operating hours. Convert time (t) to an xxY/xxM format by rounding up or down to the nearest whole month. (iii) Include this value in the test report for Clause 3 requirements and express as 'Light source life = xxY/xxM'. <p>Example:</p> <p>For the purposes of this example, the Energy Star IES TM-21 calculator is used. Insert into the IES TM-21 inputs sheet the following:</p> <ul style="list-style-type: none"> (A) All appropriate (above) inputs. (B) At the cell marked 'Percentage of initial lumens to project (e.g. for L70 enter 70):' insert the appropriate value, e.g. 67 (found | | P |

| AS/NZS 2293.3:2018 | | | |
|--------------------|--|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | <p>above).</p> <p>(C) In the cell marked 'Time (t) at which to estimate lumen maintenance (hours):' the time entered is varied until the cell marked 'Lumen maintenance at time (t)(%):' reads the appropriate value within 2, e.g. for 67 (65–69).</p> <p>NOTE: The light source life is the time entered at 'Time (t)' rounded to the nearest thousand hours regardless of the time in the cell marked 'Reported L67 (hours):' This later cell is limited to 6 times LED test time due to known limitations in the formulae that are not a concern of this Standard.</p> | | |

| | | |
|--|--|------------|
| | Appendix 1: Illumination at switch on | N/A |
|--|--|------------|

Model:

The emergency luminaire/exit signs described on this report was tested in accordance with Clause 2.3 / Clause 2.4 of AS 2293.3:201X and the results were as follows:

Nominal battery voltage.....: VDC

Test voltage.....: VDC

| Measured parameter | Cold start | Hot start |
|-------------------------|------------|-----------|
| Light output after 1 s | | |
| Light output after 15 s | | |

The emergency luminaire/exit sign described in the report was tested in accordance with the Appendix C of AS 2293.3:201X and with the AS 1680.3. The test results were as follows:

Test voltage and, for self-contained emergency escape luminaires/exit signs, measured current: 0,75A

The intensity date (for luminaire classification): 2021-05-20

| Vertical angel x degree | Luminous intensity, cd | |
|----------------------------|------------------------|-----------------------|
| | C ₀ Plane | C ₉₀ Plane |
| 0 | | |
| 5 | | |
| 10 | | |
| 15 | | |
| 20 | | |
| 25 | | |
| 30 | | |
| 35 | | |
| 40 | | |
| 45 | | |
| 50 | | |
| 55 | | |
| 60 | | |
| 65 | | |
| 70 | | |
| 75 | | |
| 80 | | |
| 85 | | |
| 90 | | |

Maximum assignable classifications:

CHARCTERISTIC SHAPE OF INTENSITY DISTRITUTION CURVES

| | | |
|--|---|----------|
| | Appendix 2: DIMENSIONS AND ILLUMINATION (EXIT SIGNS) | P |
|--|---|----------|

SP2001DA-WH

☐ General egress ☐ Single sided
☒ Double sided ☐ Other
 Colour contrast: ☒ Normal (white/green) ☐ Low light level (green/opaque)
 ☒ Right arrow (show orientation) ☒ Left arrow (show orientation)
 ☐ Vertical arrow (show orientation)

Background size (h × w) 300x154 mm Height of symbol element of pictorial element(s) mm

The exit sign described above and in the report was tested in accordance with Clauses 3.3 and 3.4 of AS 2293.3:201X, and the results were as follows:

| Measured parameter | Result |
|---|--------|
| Shape and proportions of pictorial element(s) and background | Pass |
| Luminance of background | Pass |
| Luminance of pictorial element(s) | Pass |
| Variation of luminance within background | Pass |
| Variation of luminance within pictorial element(s) | Pass |
| Ratio of luminance of pictorial element(s) to adjacent background | Pass |

SP2002DA-WH

☐ General egress ☐ Single sided
☒ Double sided ☐ Other
 Colour contrast: ☒ Normal (white/green) ☐ Low light level (green/opaque)
 ☒ Right arrow (show orientation) ☒ Left arrow (show orientation)
 ☐ Vertical arrow (show orientation)

Background size (h × w) 300x154 mm Height of symbol element of pictorial element(s) mm

The exit sign described above and in the report was tested in accordance with Clauses 3.3 and 3.4 of AS 2293.3:201X, and the results were as follows:

| Measured parameter | Result |
|---|--------|
| Shape and proportions of pictorial element(s) and background | Pass |
| Luminance of background | Pass |
| Luminance of pictorial element(s) | Pass |
| Variation of luminance within background | Pass |
| Variation of luminance within pictorial element(s) | Pass |
| Ratio of luminance of pictorial element(s) to adjacent background | Pass |

SP2003DA-WH

☐ General egress ☐ Single sided
☒ Double sided ☐ Other
 Colour contrast: ☒ Normal (white/green) ☐ Low light level (green/opaque)
 ☒ Right arrow (show orientation) ☒ Left arrow (show orientation)
 ☐ Vertical arrow (show orientation)

Background size (h × w) 300x154 mm Height of symbol element of pictorial element(s) mm

The exit sign described above and in the report was tested in accordance with Clauses 3.3 and 3.4 of AS 2293.3:201X, and the results were as follows:

| Measured parameter | Result |
|---|--------|
| Shape and proportions of pictorial element(s) and background | Pass |
| Luminance of background | Pass |
| Luminance of pictorial element(s) | Pass |
| Variation of luminance within background | Pass |
| Variation of luminance within pictorial element(s) | Pass |
| Ratio of luminance of pictorial element(s) to adjacent background | Pass |

SP2001FE-BK

☐ General egress ☐ Single sided
☒ Double sided ☐ Other
 Colour contrast: ☐ Normal (white/green) ☒ Low light level (green/opaque)
 ☒ Right arrow (show orientation) ☒ Left arrow (show orientation)
 ☐ Vertical arrow (show orientation)

Background size (h × w) 300x154 mm Height of symbol element of pictorial element(s) mm

The exit sign described above and in the report was tested in accordance with Clauses 3.3 and 3.4 of AS 2293.3:201X, and the results were as follows:

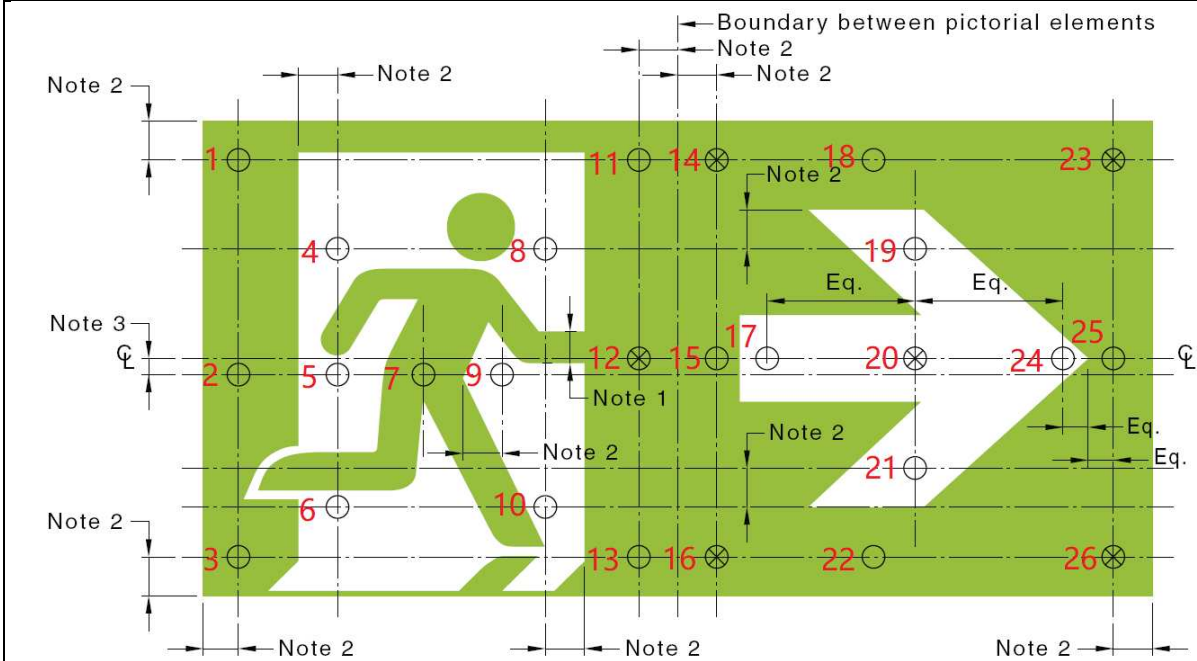
| Measured parameter | Result |
|---|--------|
| Shape and proportions of pictorial element(s) and background | Pass |
| Luminance of background | Pass |
| Luminance of pictorial element(s) | Pass |
| Variation of luminance within background | Pass |
| Variation of luminance within pictorial element(s) | Pass |
| Ratio of luminance of pictorial element(s) to adjacent background | Pass |

Appendix 3: Standard and dual function internally illuminated exit signs

P

SP2001DA-WH with safety sign 1

Luminance measurements of C0 values shall be made within 5° from the normal to the face of the exit sign, using a meter with a circular measurement field of diameter not less than 75% and not more than 85% of the arm width as specified in Figure 3.4. Luminance measurements of C60 (horizontal) values shall be made at an angle between 55° and 75° in the horizontal plane to the normal to the face of the sign.



NOTES:

- 1 Measure width of arm at this point to determine required luminance meter measurement field.
- 2 This distance shall be $1.2 \times$ arm width.
- 3 This distance shall be $0.5 \times$ arm width.
- 4 Refer to Clause 3.4.2(d).
- 5 Within the optional additional background area luminance measurements are not required.

Where there is a difference in the luminous output of an exit sign face(s) between normal mains operation (maintained mode) and emergency operation, the operating condition (maintained mode) that results in the lower luminous output shall be used when assessing conformance with these clauses.

| | C0 | C60 | C0 | C60 | C0 | C60 | C0 | C60 | C0 | C60 | C0 | C60 |
|----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Point | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 |
| (cd/m ²) | 20,62 | 17,64 | 20,43 | 19,84 | 16,98 | 14,12 | 245,2 | 229,4 | 164,9 | 156,0 | 219,8 | 198,3 |
| Point | 7 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 11 | 12 | 12 |
| (cd/m ²) | 27,39 | 22,60 | 226,9 | 204,9 | 183,5 | 163,7 | 209,5 | 189,1 | 22,46 | 16,69 | 27,11 | 20,79 |
| Point | 13 | 13 | 14 | 14 | 15 | 15 | 16 | 16 | 17 | 17 | 18 | 18 |
| (cd/m ²) | 29,11 | 23,06 | 22,34 | 18,23 | 27,90 | 23,03 | 31,51 | 28,31 | 185,6 | 174,0 | 20,92 | 16,74 |
| Point | 19 | 19 | 20 | 20 | 21 | 21 | 22 | 22 | 23 | 23 | 24 | 24 |
| (cd/m ²) | 216,5 | 200,6 | 187,0 | 173,9 | 180,1 | 166,2 | 34,05 | 24,13 | 20,57 | 17,41 | 162,0 | 145,2 |
| Point | 25 | 25 | 26 | 26 | | | | | | | | |
| (cd/m ²) | 20,29 | 17,34 | 28,52 | 20,35 | | | | | | | | |

a) On the green areas of the pictorial elements, at each applicable measurement site specified in Figure 3.4 the C0 luminance measured shall be not less than 8 cd/m² and the C60 luminance shall be not less than 10% of the C0 value

| Condition | Measured min. luminance (green) C0 at test point | Measured min. luminance (green) C60 at test point |
|--------------------------|--|---|
| Maintained mode (AC240V) | 16.98 (cd/m ²) | 14.12 cd/m ²) |
| Required | ≥8 (cd/m ²) | ≥10% of C0 (cd/m ²) |

b) The ratio of the C0 luminance measured at each applicable white measurement site specified in Figure 3.4 to the C0 value at the nearest green measurement site shall be not less than 4:1


| Maintained mode (AC240V) | | | | | | | | | | | | |
|--------------------------|------------|------------|------------|------------|------------|-------------|--------------|--------------|--------------|--------------|--------------|-----------------|
| Ratio of point | 4:1 | 5:2 | 6:3 | 5:7 | 9:7 | 8:11 | 10:13 | 17:15 | 19:18 | 21:22 | 24:25 | Require d ratio |
| Value | 11.89 | 8.07 | 12.94 | 6.02 | 6.70 | 10.10 | 7.20 | 6.65 | 10.34 | 5.29 | 7.98 | ≥4 |

c) The variation in C0 luminance between any two white measurement sites specified in Figure 3.4, or between any two green measurement site in the same figure, shall not be greater than 5:1.

| Condition | A Minimum luminance of safety colour (green) | B Maximum luminance of safety colour (green) | C Minimum luminance of contrast colour (white) | D Maximum luminance of contrast colour(white) |
|--------------------------|--|--|--|---|
| Maintained mode (240VAC) | 16.98 (cd/m ²) | 34.05 (cd/m ²) | 164,9 (cd/m ²) | 245,2 (cd/m ²) |
| | Ratio of green (B/A) | Radio of white (D/C) | -- | -- |
| maintained mode (240VAC) | 2 | 1.49 | -- | -- |
| Required | B/A≤5 | D/C≤5 | -- | -- |

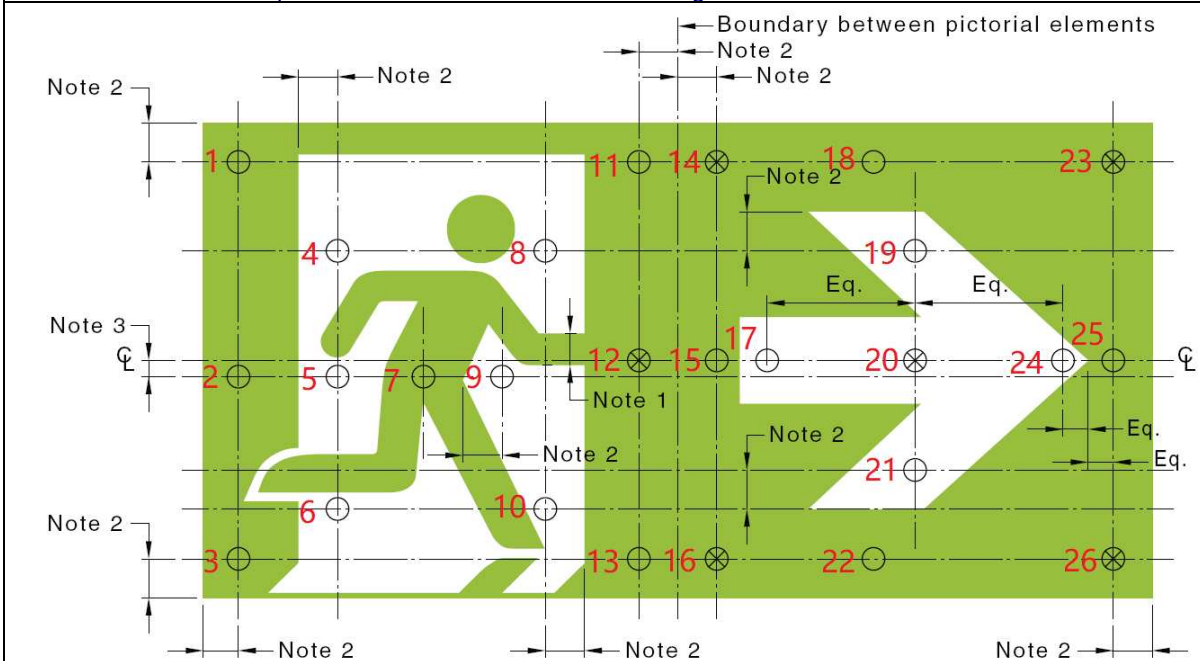
SP2001DA-WH with safety sign 3

d) For a single element sign, at no point shall the luminance be less than the minimum C0 and C60 values stated in Clause 3.4.2(a) for an **additional background**, which must be adjacent to the pictorial element and have a minimum area that is at least equal to the area of the pictorial element

| | | |
|--------------------------|--|-------------------------------------|
| Test luminaires point |  | |
| | Measured min. luminance (green) C0 | Measured min. luminance (green) C60 |
| Maintained mode (AC240V) | 27,90 (cd/m ²) | 23,03 (cd/m ²) |
| Required | ≥8(cd/m ²) | ≥10% of C0 (cd/m ²) |

SP2002DA-WH with safety sign 1

Luminance measurements of C0 values shall be made within 5° from the normal to the face of the exit sign, using a meter with a circular measurement field of diameter not less than 75% and not more than 85% of the arm width as specified in Figure 3.4. Luminance measurements of C60 (horizontal) values shall be made at an angle between 55° and 75° in the horizontal plane to the normal to the face of the sign.



NOTES:

- 1 Measure width of arm at this point to determine required luminance meter measurement field.
- 2 This distance shall be $1.2 \times$ arm width.
- 3 This distance shall be $0.5 \times$ arm width.
- 4 Refer to Clause 3.4.2(d).
- 5 Within the optional additional background area luminance measurements are not required.

Where there is a difference in the luminous output of an exit sign face(s) between normal mains operation (maintained mode) and emergency operation, the operating condition (maintained mode) that results in the lower luminous output shall be used when assessing conformance with these clauses.

| | C0 | C60 | C0 | C60 | C0 | C60 | C0 | C60 | C0 | C60 | C0 | C60 |
|----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Point | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 |
| (cd/m ²) | 38,85 | 32,43 | 27,66 | 22,66 | 27,50 | 22,42 | 205,0 | 194,8 | 171,0 | 156,3 | 172,6 | 162,2 |
| Point | 7 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 11 | 12 | 12 |
| (cd/m ²) | 28,27 | 23,59 | 215,7 | 205,0 | 177,1 | 168,1 | 182,3 | 174,2 | 42,59 | 36,82 | 27,23 | 22,88 |
| Point | 13 | 13 | 14 | 14 | 15 | 15 | 16 | 16 | 17 | 17 | 18 | 18 |
| (cd/m ²) | 30,75 | 25,35 | 44,25 | 36,39 | 29,28 | 23,52 | 31,58 | 26,34 | 184,5 | 169,2 | 40,46 | 34,50 |
| Point | 19 | 19 | 20 | 20 | 21 | 21 | 22 | 22 | 23 | 23 | 24 | 24 |
| (cd/m ²) | 209,9 | 201,7 | 192,2 | 179,6 | 180,6 | 168,4 | 30,20 | 25,07 | 28,78 | 24,15 | 166,6 | 154,4 |
| Point | 25 | 25 | 26 | 26 | | | | | | | | |
| (cd/m ²) | 24,48 | 20,14 | 26,13 | 21,76 | | | | | | | | |

a) On the green areas of the pictorial elements, at each applicable measurement site specified in Figure 3.4 the C0 luminance measured shall be not less than 8 cd/m² and the C60 luminance shall be not less than 10% of the C0 value

| Condition | Measured min. luminance (green) C0 at test point | Measured min. luminance (green) C60 at test point |
|--------------------------|--|---|
| Maintained mode (AC240V) | 24,48 (cd/m ²) | 20,14 cd/m ²) |
| Required | ≥8 (cd/m ²) | ≥10% of C0 (cd/m ²) |

b) The ratio of the C0 luminance measured at each applicable white measurement site specified in Figure 3.4 to the C0 value at the nearest green measurement site shall be not less than 4:1

Maintained mode (AC240V)

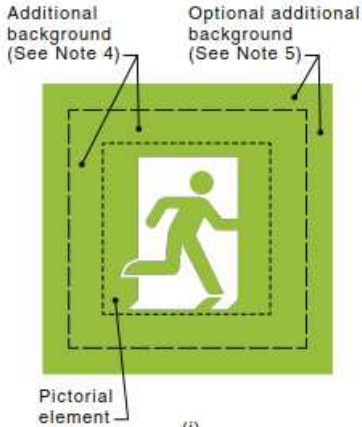
| Ratio of point | 4:1 | 5:2 | 6:3 | 5:7 | 9:7 | 8:11 | 10:13 | 17:15 | 19:18 | 21:22 | 24:25 | Require d ratio |
|----------------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-----------------|
| Value | 5.28 | 6.18 | 6.28 | 6.05 | 6.26 | 5.06 | 5.93 | 6.30 | 5.19 | 5.98 | 6.80 | ≥4 |

c) The variation in C0 luminance between any two white measurement sites specified in Figure 3.4, or between any two green measurement site in the same figure, shall not be greater than 5:1.

| Condition | A Minimum luminance of safety colour (green) | B Maximum luminance of safety colour (green) | C Minimum luminance of contrast colour (white) | D Maximum luminance of contrast colour(white) |
|--------------------------|--|--|--|---|
| Maintained mode (240VAC) | 24,48 (cd/m ²) | 44,25 (cd/m ²) | 166,6 (cd/m ²) | 215,7 (cd/m ²) |
| | Ratio of green (B/A) | Radio of white (D/C) | -- | -- |
| maintained mode (240VAC) | 1,8 | 1,3 | -- | |
| Required | B/A≤5 | D/C≤5 | -- | -- |

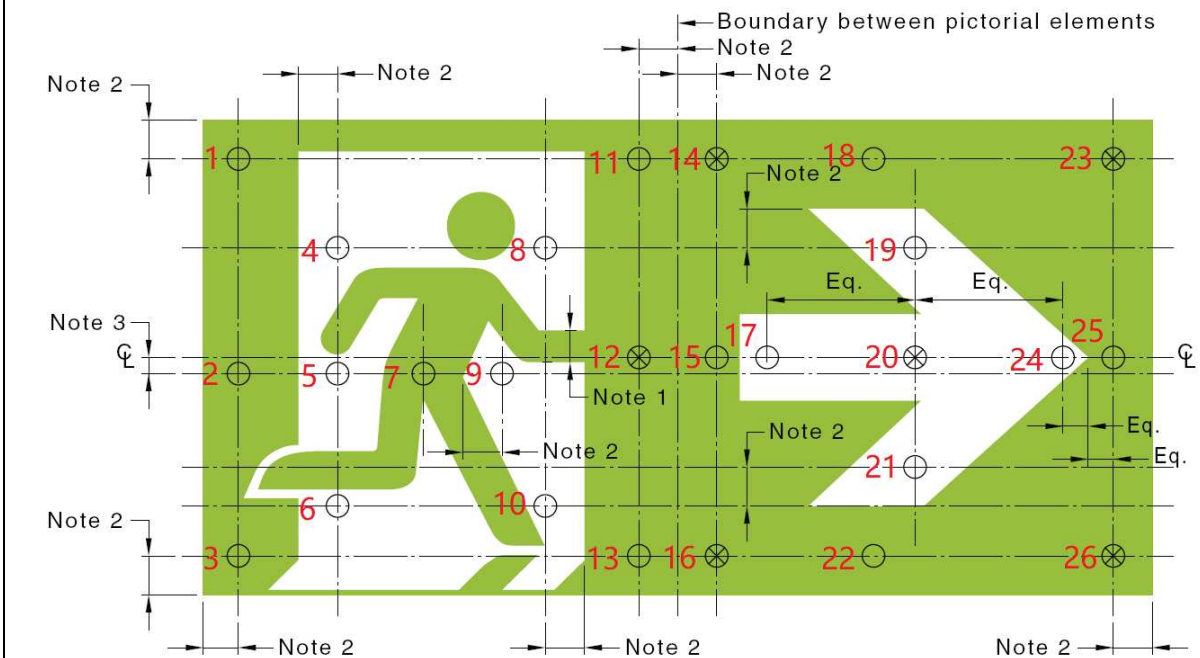
SP2002DA-WH with safety sign 3

d) For a single element sign, at no point shall the luminance be less than the minimum C0 and C60 values stated in Clause 3.4.2(a) for an **additional background**, which must be adjacent to the pictorial element and have a minimum area that is at least equal to the area of the pictorial element

| | | |
|--------------------------|--|-------------------------------------|
| Test luminaires point |  | |
| | Measured min. luminance (green) C0 | Measured min. luminance (green) C60 |
| Maintained mode (AC240V) | 29,28 (cd/m ²) | 23,52 (cd/m ²) |
| Required | ≥8(cd/m ²) | ≥10% of C0 (cd/m ²) |

SP2003DA-WH with safety sign 1

Luminance measurements of C0 values shall be made within 5° from the normal to the face of the exit sign, using a meter with a circular measurement field of diameter not less than 75% and not more than 85% of the arm width as specified in Figure 3.4. Luminance measurements of C60 (horizontal) values shall be made at an angle between 55° and 75° in the horizontal plane to the normal to the face of the sign.



NOTES:

- 1 Measure width of arm at this point to determine required luminance meter measurement field.
- 2 This distance shall be $1.2 \times$ arm width.
- 3 This distance shall be $0.5 \times$ arm width.
- 4 Refer to Clause 3.4.2(d).
- 5 Within the optional additional background area luminance measurements are not required.

Where there is a difference in the luminous output of an exit sign face(s) between normal mains operation (maintained mode) and emergency operation, the operating condition (maintained mode) that results in the lower luminous output shall be used when assessing conformance with these clauses.

| | C0 | C60 | C0 | C60 | C0 | C60 | C0 | C60 | C0 | C60 | C0 | C60 |
|----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Point | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 |
| (cd/m ²) | 35,43 | 34,68 | 34,47 | 29,12 | 38,57 | 33,69 | 222,8 | 216,7 | 219,0 | 209,7 | 230,2 | 229,1 |
| Point | 7 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 11 | 12 | 12 |
| (cd/m ²) | 36,16 | 30,35 | 239,9 | 229,8 | 234,4 | 223,8 | 246,8 | 239,0 | 47,15 | 38,62 | 34,33 | 32,18 |
| Point | 13 | 13 | 14 | 14 | 15 | 15 | 16 | 16 | 17 | 17 | 18 | 18 |
| (cd/m ²) | 44,58 | 36,42 | 35,99 | 31,01 | 35,97 | 29,76 | 44,12 | 37,09 | 212,8 | 197,1 | 41,86 | 34,69 |
| Point | 19 | 19 | 20 | 20 | 21 | 21 | 22 | 22 | 23 | 23 | 24 | 24 |
| (cd/m ²) | 219,9 | 205,7 | 221,4 | 206,8 | 238,6 | 222,7 | 42,51 | 35,15 | 36,05 | 29,79 | 207,7 | 193,4 |
| Point | 25 | 25 | 26 | 26 | | | | | | | | |
| (cd/m ²) | 31,56 | 25,75 | 40,39 | 31,47 | | | | | | | | |

a) On the green areas of the pictorial elements, at each applicable measurement site specified in Figure 3.4 the C0 luminance measured shall be not less than 8 cd/m² and the C60 luminance shall be not less than 10% of the C0 value

| Condition | Measured min. luminance (green) C0 at test point | Measured min. luminance (green) C60 at test point |
|--------------------------|--|---|
| Maintained mode (AC240V) | 31,56 (cd/m ²) | 25,75 cd/m ²) |
| Required | ≥8 (cd/m ²) | ≥10% of C0 (cd/m ²) |

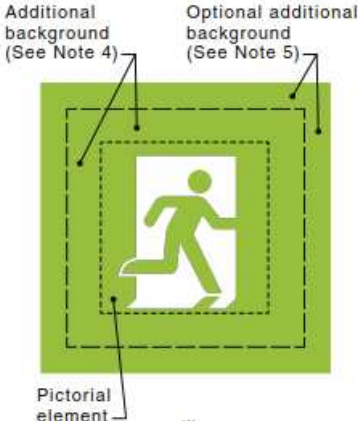
b) The ratio of the C0 luminance measured at each applicable white measurement site specified in Figure 3.4 to the C0 value at the nearest green measurement site shall be not less than 4:1

| Ratio of point | 4:1 | 5:2 | 6:3 | 5:7 | 9:7 | 8:11 | 10:13 | 17:15 | 19:18 | 21:22 | 24:25 | Require d ratio |
|----------------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-----------------|
| Value | 6.29 | 6.35 | 5.97 | 6.06 | 6.48 | 5.09 | 5.54 | 5.92 | 5.25 | 5.61 | 6.58 | ≥4 |

c) The variation in C0 luminance between any two white measurement sites specified in Figure 3.4, or between any two green measurement site in the same figure, shall not be greater than 5:1.

| Condition | A Minimum luminance of safety colour (green) | B Maximum luminance of safety colour (green) | C Minimum luminance of contrast colour (white) | D Maximum luminance of contrast colour(white) |
|--------------------------|--|--|--|---|
| Maintained mode (240VAC) | 31,56 (cd/m ²) | 47,15 (cd/m ²) | 207,7 (cd/m ²) | 238,6 (cd/m ²) |
| | Ratio of green (B/A) | Ratio of white (D/C) | -- | -- |
| maintained mode (240VAC) | 1.50 | 1.15 | -- | |
| Required | B/A≤5 | D/C≤5 | -- | -- |

SP2003DA-WH with safety sign 3

| | | | |
|--|--|-------------------------------------|--|
| <p>d) For a single element sign, at no point shall the luminance be less than the minimum C0 and C60 values stated in Clause 3.4.2(a) for an additional background, which must be adjacent to the pictorial element and have a minimum area that is at least equal to the area of the pictorial element</p> | | | |
| Test luminaires point |  | | |
| | Measured min. luminance (green) C0 | Measured min. luminance (green) C60 | |
| Maintained mode (AC240V) | 35,97 (cd/m ²) | 29,76 (cd/m ²) | |
| Required | ≥8(cd/m ²) | ≥10% of C0 (cd/m ²) | |

3.3.6.2 Photometric data-Chromaticity coordinates

| | | | | |
|--------------------------------------|-------|-------|-------|-------|
| Tested with safety sign 1 | | | | |
| | Green | Green | White | White |
| Chromaticity coordinates | X | Y | X | Y |
| Maintained mode (AC240V) SP2001DA-WH | 0,268 | 0,448 | 0,328 | 0,358 |
| Maintained mode (AC240V) SP2003DA-WH | 0,271 | 0,452 | 0,330 | 0,361 |
| Maintained mode (AC240V) SP2002DA-WH | 0,263 | 0,455 | 0,332 | 0,354 |

TABLE 3.1
CHROMATICITY COORDINATES

| Colour | | Corner points of colour region above the points | | | |
|--------|---|---|-------|-------|-------|
| | | 1 | 2 | 3 | 4 |
| White | x | 0.290 | 0.265 | 0.370 | 0.460 |
| | y | 0.260 | 0.310 | 0.405 | 0.425 |
| Green | x | 0.285 | 0.285 | 0.170 | 0.026 |
| | y | 0.707 | 0.441 | 0.364 | 0.399 |

NOTES:

- These chromaticity coordinates are based on ISO 3864-4:2011, Table 2—Colour regions: Chromaticity coordinates and luminance for maintained internally illuminated safety sign colours.
- The boundary for the green colour is extended towards the yellow boundary such that $x = 0.285$. This results in the y co-ordinates shifting to 0.707.

| | | |
|--|--|----------|
| | Appendix 3: Low illuminance area exit signs | P |
|--|--|----------|

SP2001FE-BK with safety sign 1

- a) At each applicable measurement site specified in Figure 3.3, the C0 luminance measured shall be not less than 2 cd/m² and not greater than 25 cd/m² and the C60 luminance shall be not less than 10% of the C0 value
- (b) The variation in C0 luminance between any two applicable measurement sites specified in Figure 3.4 shall be not greater than 5:1

Test luminaires point



(indicated by letter A and B)

| Test point | A (cd/m ²) | B (cd/m ²) | C (cd/m ²) | D (cd/m ²) |
|--------------------------|---------------------------------|---------------------------------|----------------------------------|----------------------------------|
| Condition | Minimum luminance of green (C0) | Maximum luminance of green (C0) | Minimum luminance of green (C60) | Maximum luminance of green (C60) |
| Maintained mode (240VAC) | 9,8 | 24,2 | 8,2 | 17,5 |
| Required | ≥2 (cd/m ²) | ≤25 (cd/m ²) | ≥10% of C0(cd/m ²) | ≥10% of C0(cd/m ²) |
| | Ratio of green (B/A) (C0) | Ratio of white (D/C) (C60) | | |
| maintained mode (240VAC) | 2,47 | 2,13 | | |
| Required | B/A≤5 | D/C≤5 | | |

| | | |
|--|--|----------|
| | Appendix 4: High temperature and low temperature test | P |
|--|--|----------|

Model: SP2001DA-WH

The self-contained emergency escape luminaire / exit sign was tested in accordance with Appendix D of AS/NZS 2293.3:201X and the results were as follows:

Test condition: a) High temperature test (40°C±2°C); b) Mount in designed position and produce the highest temperature rise, test results:

| Measured parameter (Charge) | Cycle No.1 | Cycle No.2 | Cycle No.3 | Limit |
|---|--------------------------------------|--------------------------------------|---|--------------|
| Test duration (h) | 72 | 16 | 16 | -- |
| Test voltage (V)/ Frequency (Hz) | <u>1.06x240=254.4 V/50Hz</u> | <u>220V/50Hz</u> | <u>220V/50Hz</u> | -- |
| Maximum battery voltage (V) | 3,36 | 3,36 | 3,35 | 3,65 |
| Maximum battery current (A) | 0,21 | 0,21 | 0,20 | 1,5 |
| Max. battery / case temp. (°C) | 44,6 | 44,6 | 44,4 | 45,0 |
| Max. LED temperature (Ts) (°C) | 52,7 | 52,7 | 52,5 | 85,0 |
| Max LED current (A) | 0,008 | 0,008 | 0,008 | 0,06 |
| Indicating lights to function correctly | Yes/No | Yes/No | Yes/No | -- |
| Measured parameter (Discharge) | Cycle No.1 | Cycle No.2 | Cycle No.3 | Limit |
| Test duration | Until disconnected by cut off device | Until disconnected by cut off device | Until 15 min after disconnected by cut off device | -- |
| Maximum battery current (A) | 0,43 | 0,43 | 0,42 | 1,5 |
| Maximum battery voltage (V) | 3,23 | 3,23 | 3,21 | 3,65 |
| Battery current (A) at 2 h | 0,42 | 0,42 | 0,42 | 1,5 |
| Battery voltage (V) at 2 h | 3,09 | 3,09 | 3,07 | 3,65 |
| Battery volts at cut off (V) | 3,15 | 3,15 | 3,13 | Required 2,5 |
| Cut off occurred at mins | 195 | 199 | 190 | -- |
| Battery drain current (A) | 0,01 | 0,01 | 0,01 | 0,075 |
| Max. LED temperature (Ts) (°C) | 48,3 | 48,3 | 48,1 | 85,0 |
| Max LED current (A) | 0,0032 | 0,0032 | 0,0032 | 0,06 |
| All emergency lighting light sources remain illuminated | Yes/No | Yes/No | Yes/No | -- |

Low temperature test (10°C±2°C), test results:

| Measured parameter (Charge) | Cycle No.1 | Cycle No.2 | Cycle No.3 | Limit |
|--|--------------------------------------|--------------------------------------|--|-----------------------------|
| Test duration (h) | 16h | 16h | 16h | -- |
| Test voltage (V)/ Frequency (Hz) | <u>0.94x240=225.6 V/50Hz</u> | <u>225.6V/50Hz</u> | <u>225.6V/50Hz</u> | -- |
| Maximum battery voltage (V) | 3,44 | 3,46 | 3,44 | 3,65 |
| Maximum battery current (A) | 0,21 | 0,23 | 0,20 | 1,5 |
| Indicating lights to function correctly | Yes/No | Yes/No | Yes/No | -- |
| Measured parameter (Discharge) | Cycle No.1 | Cycle No.2 | Cycle No.3 | Limit |
| Test duration | Until disconnected by cut off device | Until disconnected by cut off device | Until 15min after disconnected by cut off device | -- |
| Maximum battery current (A) | 0,38 | 0,38 | 0,37 | 1,5 |
| Battery current (A) at 2 h | 0,42 | 0,42 | 0,40 | 1,5 |
| Battery voltage (V) at 2 h | 3,09 | 3,09 | 3,07 | 3,65 |
| Battery volts at cut off (V) | 3,15 | 3,15 | 3,15 | Required 2,5 |
| Cut off occurred at mins | 195 | 198 | 197 | -- |
| Battery drain current (A) | 0,01 | 0,01 | 0,01 | 0,075 |
| Test data for both high temperature and low temperature tests: | | | Result | |
| (a) Emergency light source(s) illuminated continuously | | | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| (b) Emergency source(s) reconnected after cut off | | | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| (c) Battery current after cut off in accordance with recommendation of cell manufacturer | | | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |

| | |
|---|---|
| (d) If LED light source(s) are employed, LM80 temperatures are not exceeded | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| (e) Maximum temperature of battery or battery case | 44.6°C |
| (f) Test voltage for photometric tests | -- |

SP2001DA-WH

| | | | | | |
|--|--|---------------------------------------|----------------------------------|---|--|
| Min. luminance of green background (LG _{min}) (cd/m ²) | Min. luminance of white background (LW _{min}) (cd/m ²) | Single LED case temperature (Ts) (°C) | Single LED operating current (A) | Green background luminance factor (8/ LG _{min} ×100) | White background luminance factor (32/ LW _{min} ×100) |
| 24.48 | 166.6 | 52.7 | 0.0142 | 32.68 | 19.21 |

1. Test data extract from LM-80 test Report which generated for Bridgelux Inc. (Report No.: STD180704NB-B, Issued date: 2018-10-22, Issued by Ningbo TengLi Testing Co., Ltd
2. The above values are generated from the Energy Star TM-21 Calculator rev. 06.18.18.

| Min. luminance of green background (LG _{min}) (cd/m ²) | Min. luminance of white background (LW _{min}) (cd/m ²) | Single LED case temperature (Ts) (°C) | Single LED operating current (A) | Green background luminance factor (8/ LG _{min} ×100) | White background luminance factor (32/ LW _{min} ×100) |
|--|--|---------------------------------------|----------------------------------|---|--|
| 31.56 | 207.7 | 52.7 | 0.0166 | 25.35 | 15.40 |

1. Test data extract from LM-80 test Report which generated for Bridgelux Inc. (Report No.: STD180704NB-B, Issued date: 2018-10-22, Issued by Ningbo TengLi Testing Co., Ltd
2. The above values are generated from the Energy Star TM-21 Calculator rev. 06.18.18.

| | | | | | |
|--|--|---------------------------------------|----------------------------------|---|--|
| Min. luminance of green background (LG _{min}) (cd/m ²) | Min. luminance of white background (LW _{min}) (cd/m ²) | Single LED case temperature (Ts) (°C) | Single LED operating current (A) | Green background luminance factor (8/ LG _{min} ×100) | White background luminance factor (32/ LW _{min} ×100) |
| 9.8 | -- | 52.7 | 0.008 | 81.63 | -- |

1. Test data extract from LM-80 test Report which generated for Bridgelux Inc. (Report No.: STD180704NB-B, Issued date: 2018-10-22, Issued by Ningbo TengLi Testing Co., Ltd
2. The above values are generated from the Energy Star TM-21 Calculator rev. 06.18.18.

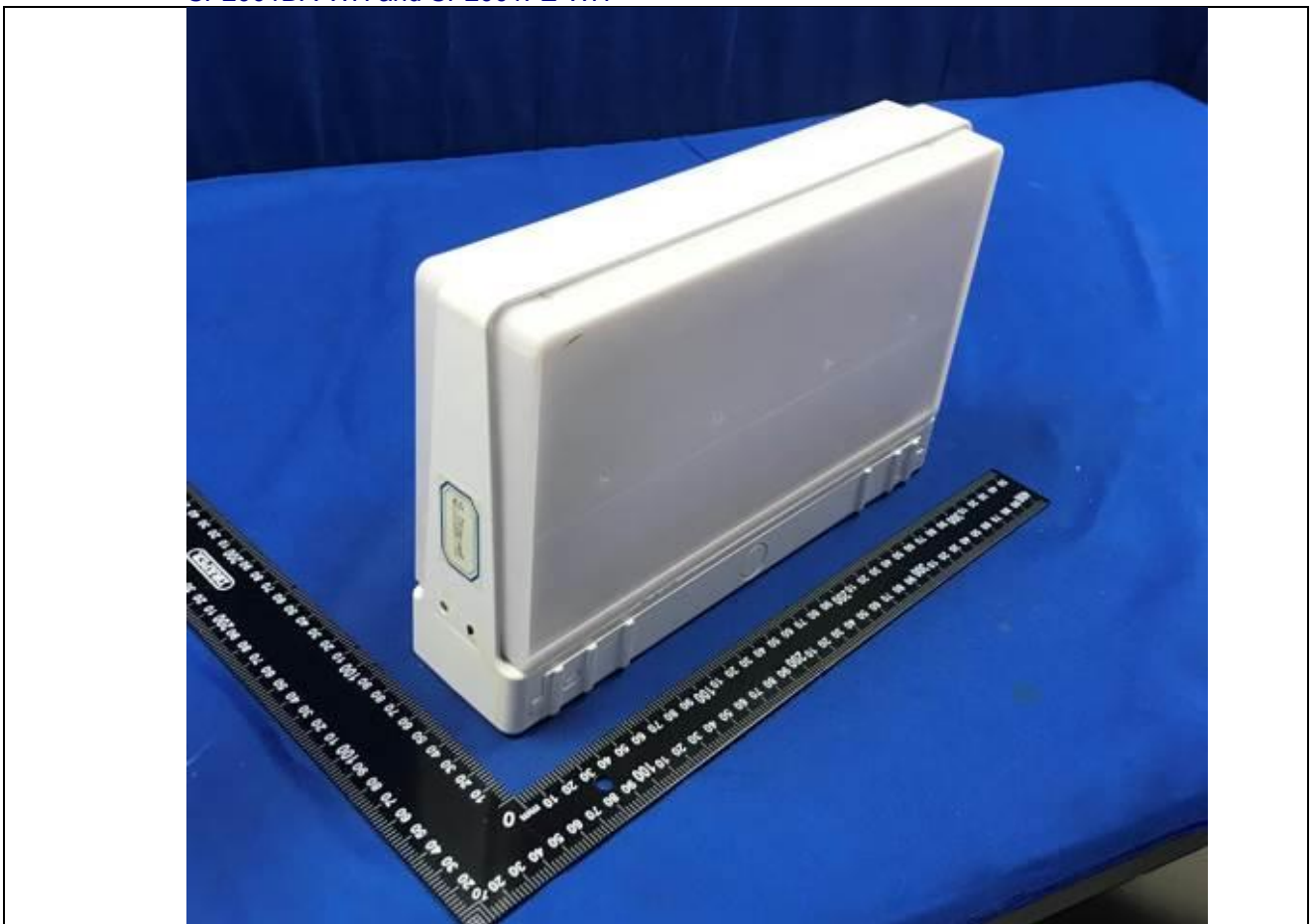
Attachment No. 1



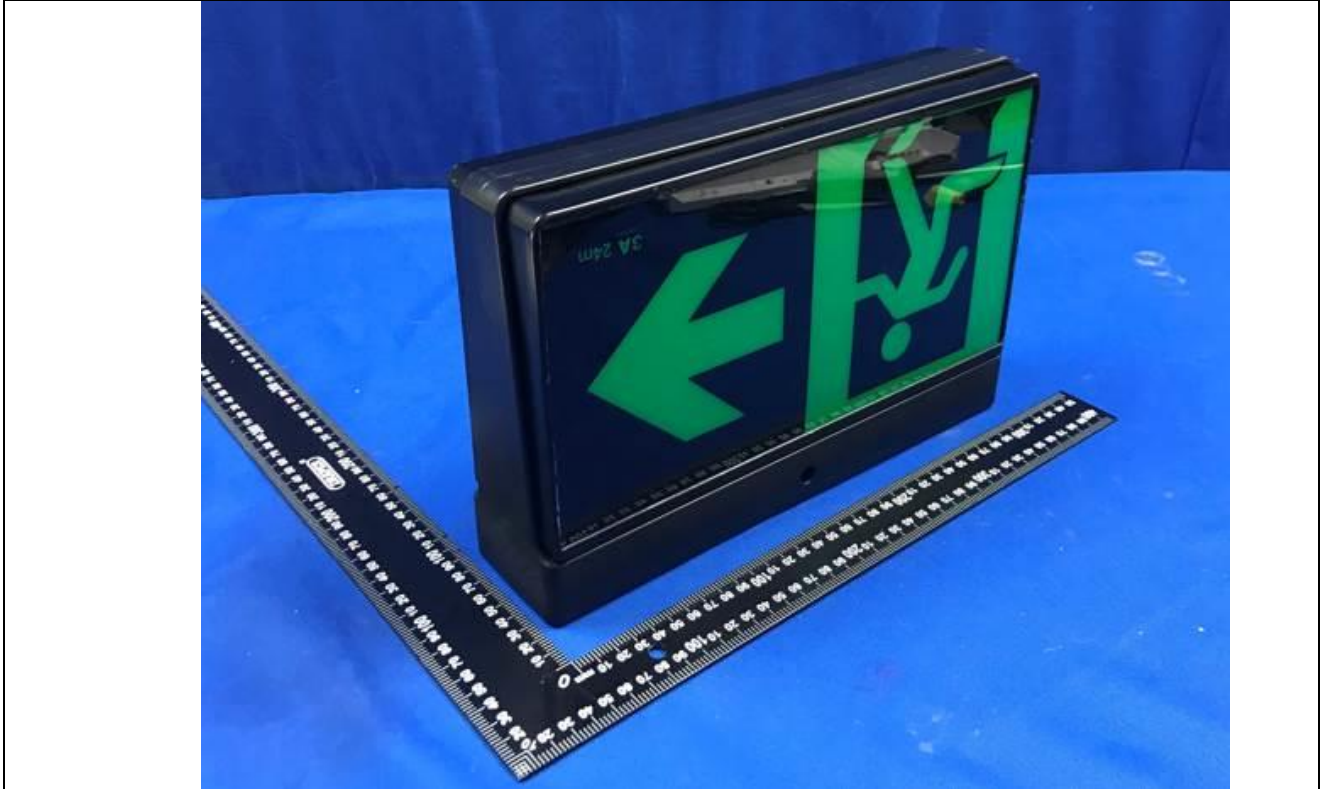
Details of: Overall view after removal of safety sign sheet
SP2001DA-WH and SP2001FE-WH



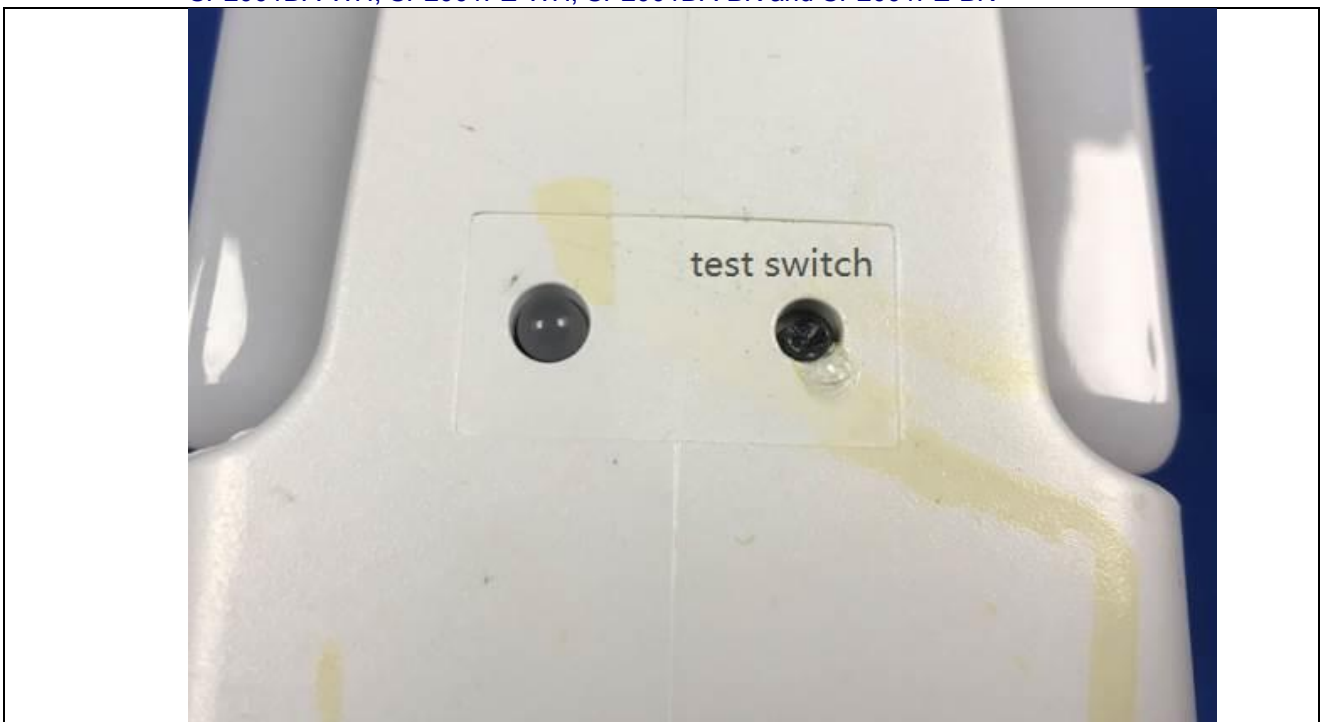
Details of: Overall view after removal of safety sign sheet
SP2001DA-WH and SP2001FE-WH



Details of: Overall view
SP2001DA-BK and SP2001FE-BK



Details of: Test switch and LED indicator
SP2001DA-WH, SP2001FE-WH, SP2001DA-BK and SP2001FE-BK



Attachment No. 1



Details of: Internal construction after removal of safety sign sheet
SP2001DA-WH, SP2001FE-WH, SP2001DA-BK and SP2001FE-BK



Details of: Internal construction
SP2001DA-WH, SP2001FE-WH, SP2001DA-BK and SP2001FE-BK



Attachment No. 1



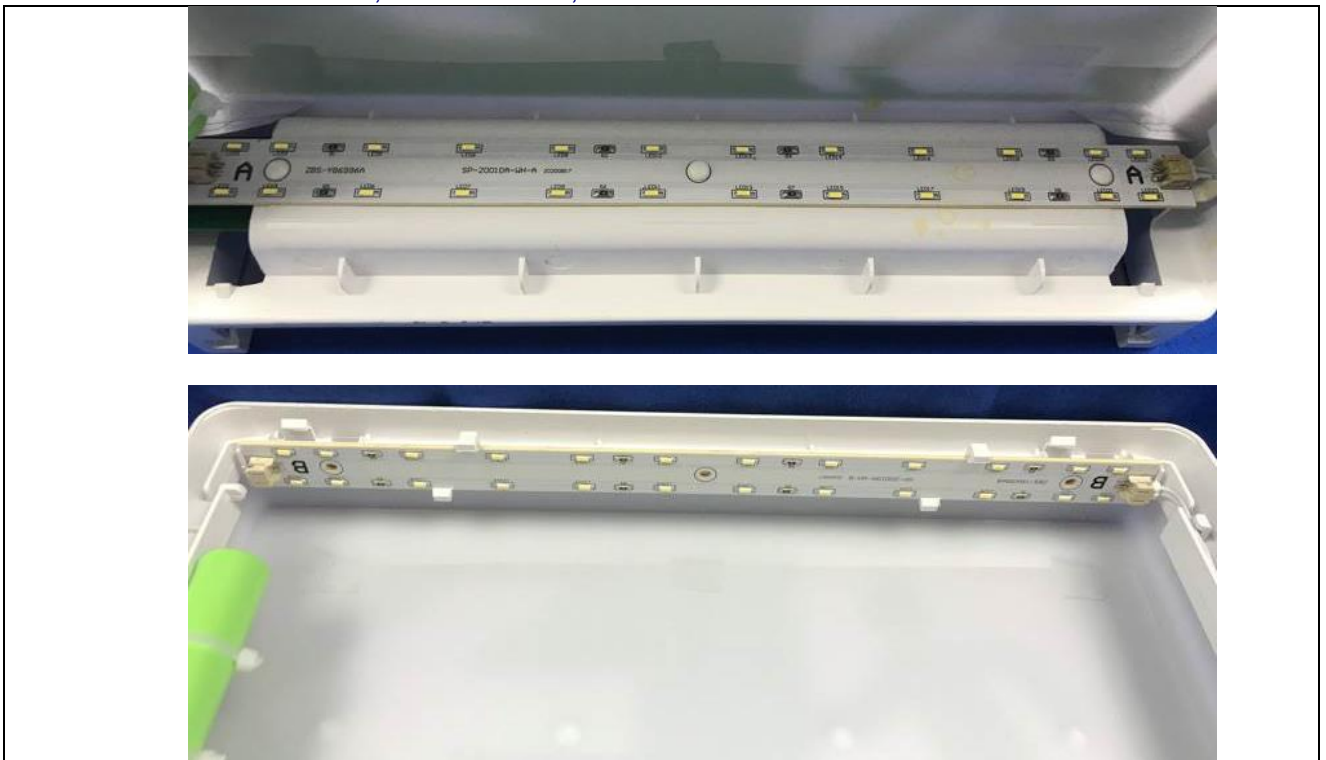
Details of: Emergency driver

SP2001DA-WH, SP2001FE-WH, SP2001DA-BK and SP2001FE-BK



Details of: LED module

SP2001DA-WH, SP2001FE-WH, SP2001DA-BK and SP2001FE-BK

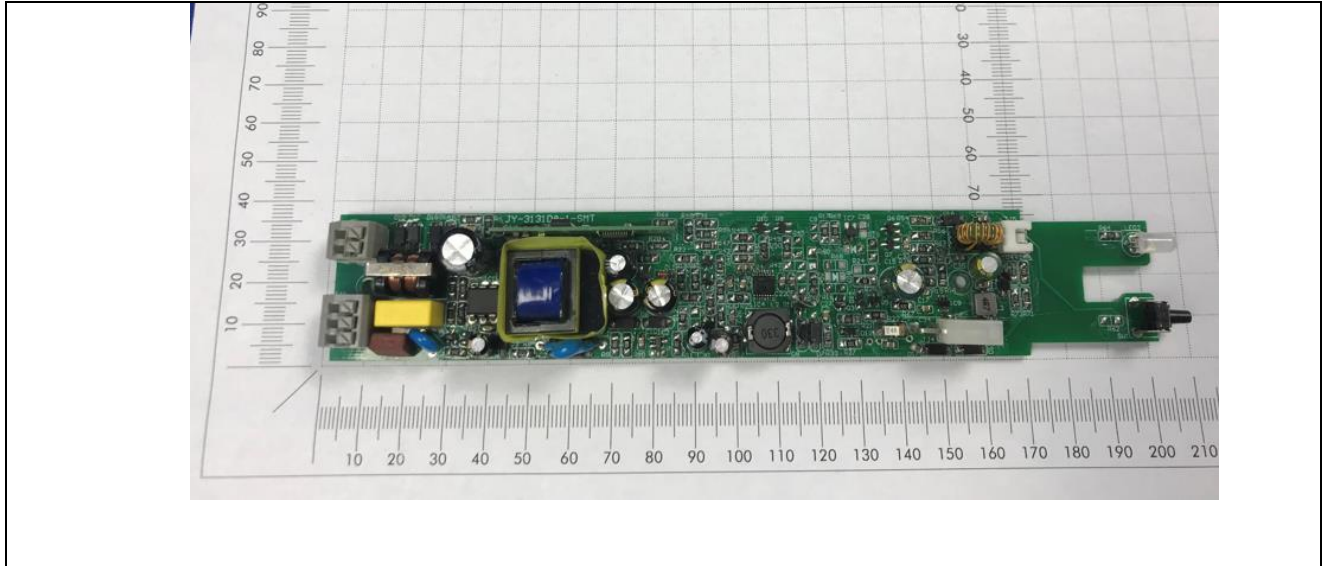


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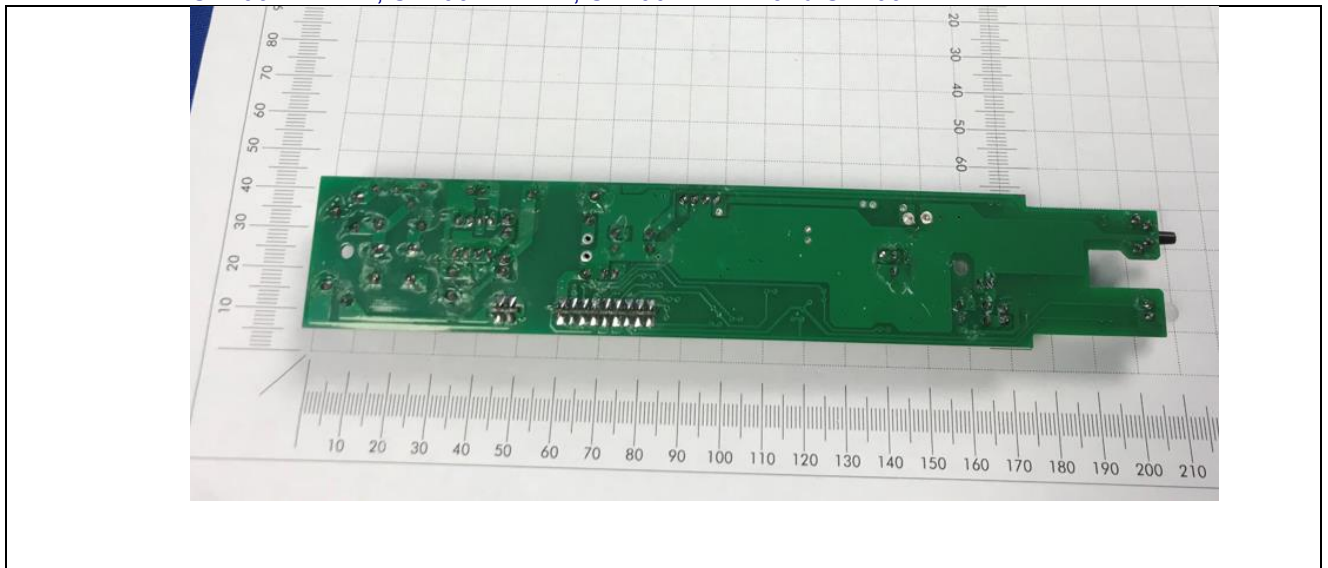
Details of: Emergency driver

SP2001DA-WH, SP2001FE-WH, SP2001DA-BK and SP2001FE-BK



Details of: Emergency driver

SP2001DA-WH, SP2001FE-WH, SP2001DA-BK and SP2001FE-BK



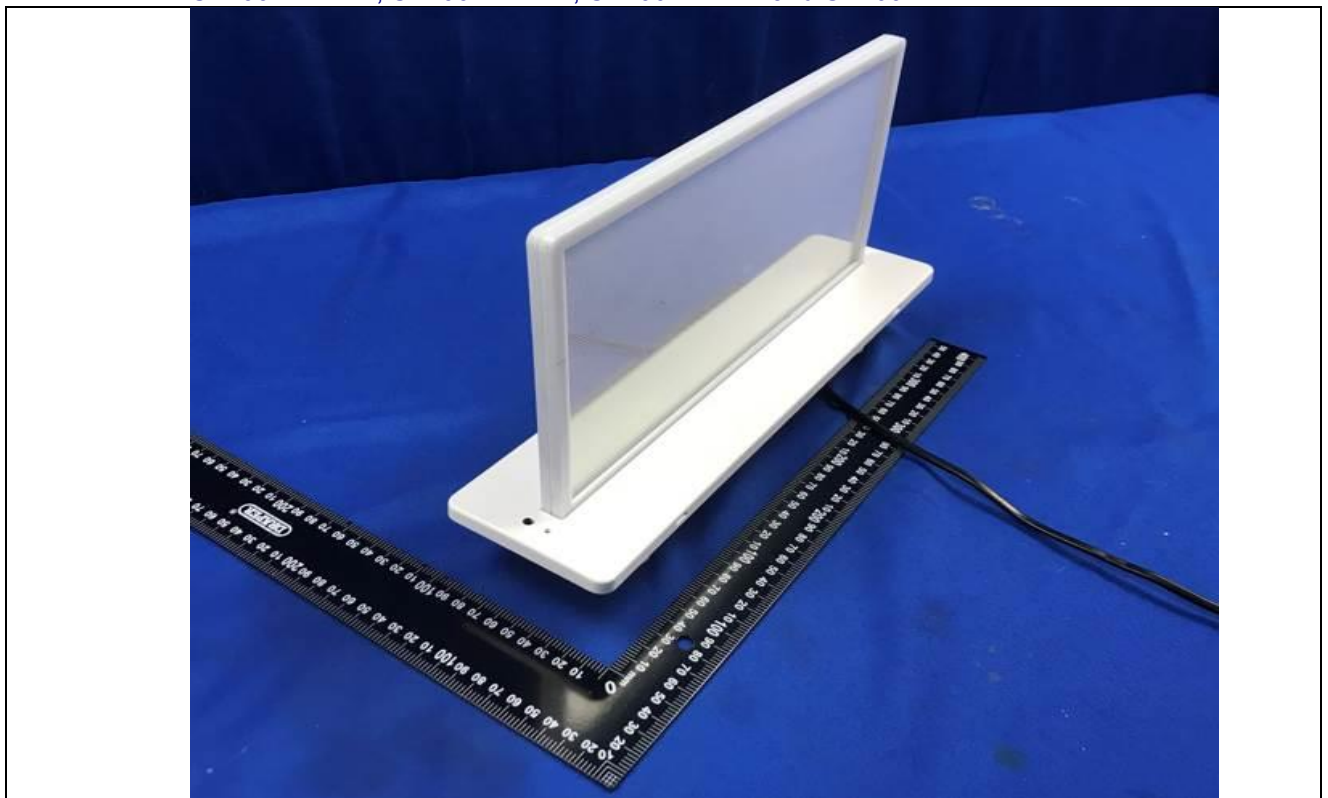
Attachment No. 1



Details of: Outlook (SP2002DA-WH, SP2002FE-WH as representative models)
SP2002DA-WH, SP2002FE-WH, SP2002DA-BK and SP2002FE-BK



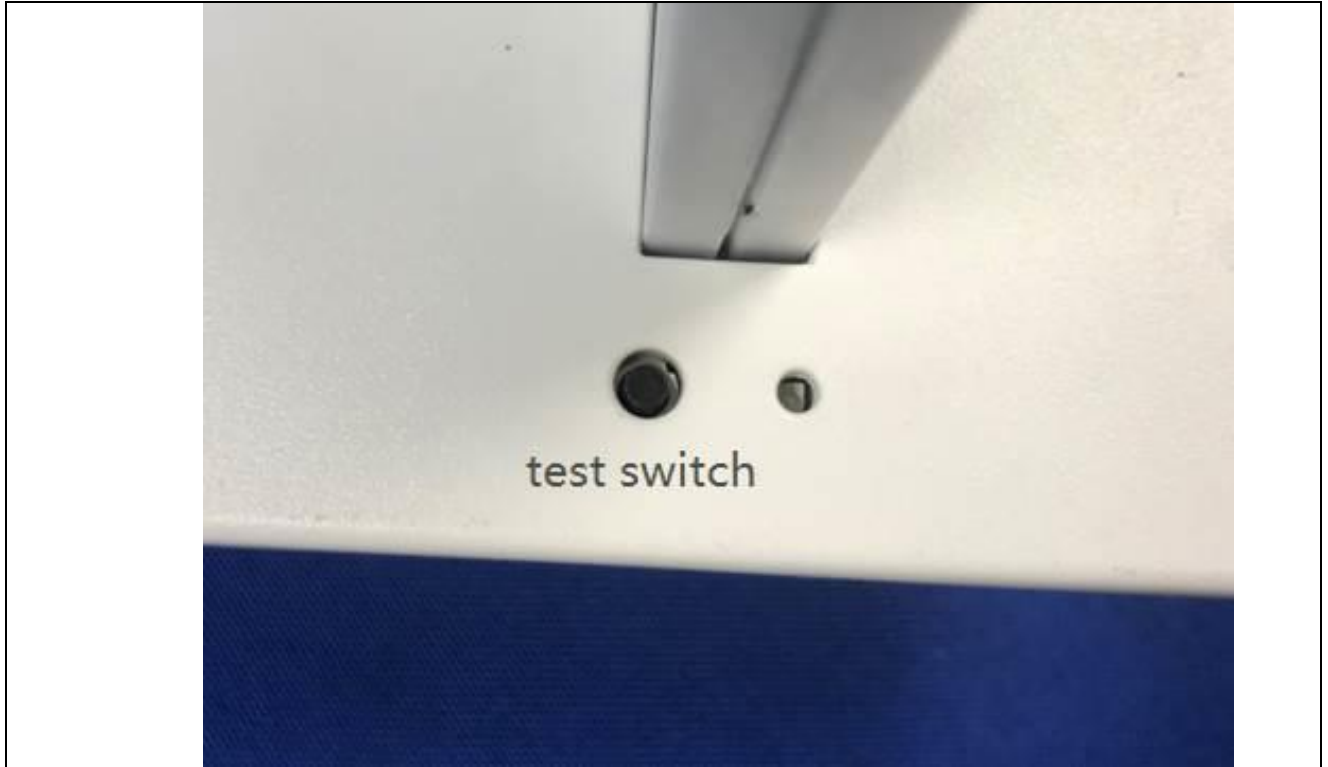
Details of: Outlook (SP2002DA-WH, SP2002FE-WH as representative models)
SP2002DA-WH, SP2002FE-WH, SP2002DA-BK and SP2002FE-BK



Attachment No. 1



Details of: Test switch and LED indicator (SP2002DA-WH, SP2002FE-WH as representative models)
SP2002DA-WH, SP2002FE-WH, SP2002DA-BK and SP2002FE-BK



Details of: Internal construction
SP2002DA-WH, SP2002FE-WH, SP2002DA-BK and SP2002FE-BK



Attachment No. 1



Details of: Internal construction
SP2002DA-WH, SP2002FE-WH, SP2002DA-BK and SP2002FE-BK



Details of: Internal construction
SP2002DA-WH, SP2002FE-WH, SP2002DA-BK and SP2002FE-BK



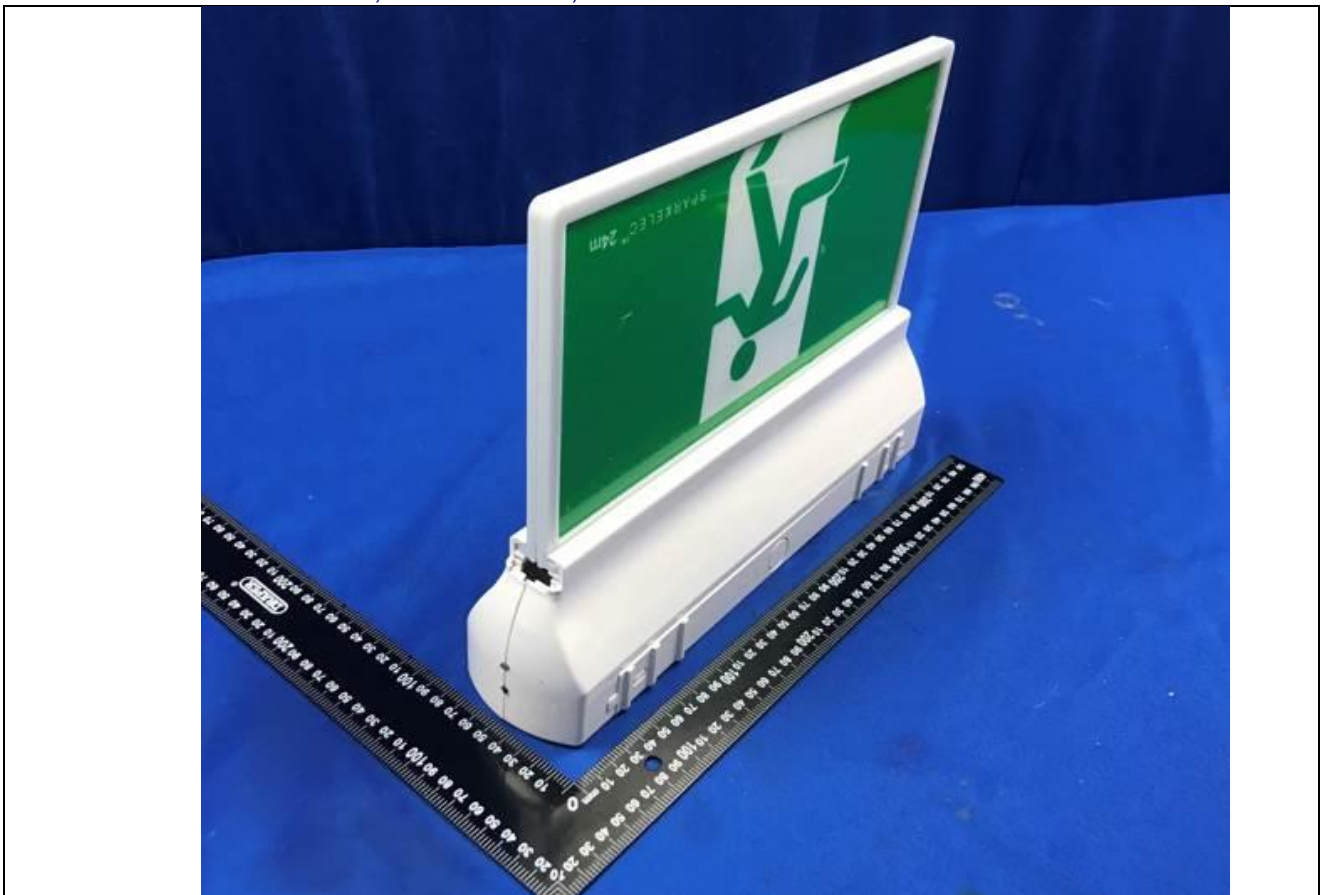
Attachment No. 1



Details of: Outlook (SP2003DA-WH, SP2003FE-WH as representative models)
SP2003DA-WH, SP2003FE-WH, SP2003DA-BK and SP2003FE-BK



Details of: Outlook (SP2003DA-WH, SP2003FE-WH as representative models)
SP2003DA-WH, SP2003FE-WH, SP2003DA-BK and SP2003FE-BK



Attachment No. 1



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Details of: LED indicator and test switch (SP2003DA-WH, SP2003FE-WH as representative models)
SP2003DA-WH, SP2003FE-WH, SP2003DA-BK and SP2003FE-BK



Details of: Disassembly view
SP2003DA-WH, SP2003FE-WH, SP2003DA-BK and SP2003FE-BK



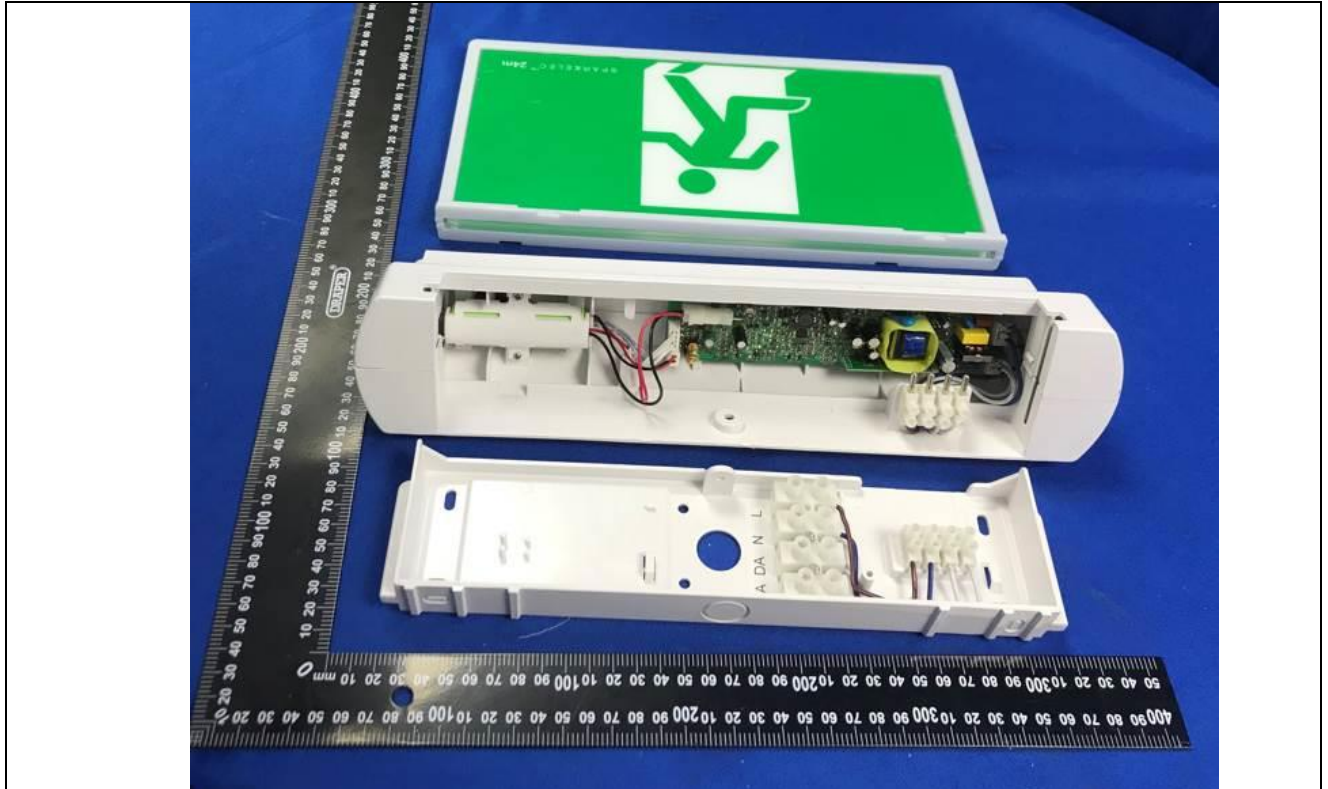
Attachment No. 1



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Report No.: 423896-1

Details of: Internal construction
SP2003DA-WH, SP2003FE-WH, SP2003DA-BK and SP2003FE-BK



Details of: Internal construction
SP2003DA-WH, SP2003FE-WH, SP2003DA-BK and SP2003FE-BK



Attachment No. 1



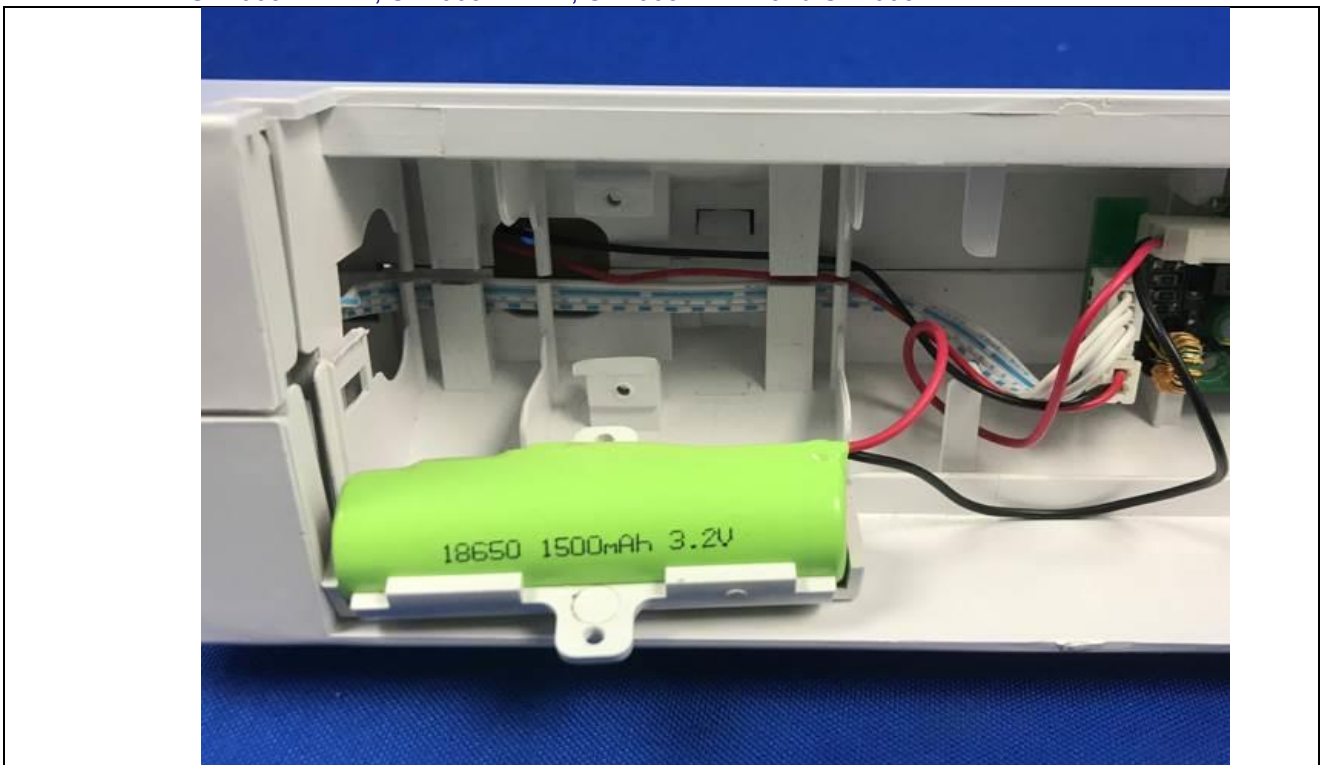
Page 59 of 61

Report No.: 423896-1

Details of: Internal construction
SP2003DA-WH, SP2003FE-WH, SP2003DA-BK and SP2003FE-BK



Details of: Battery
SP2003DA-WH, SP2003FE-WH, SP2003DA-BK and SP2003FE-BK

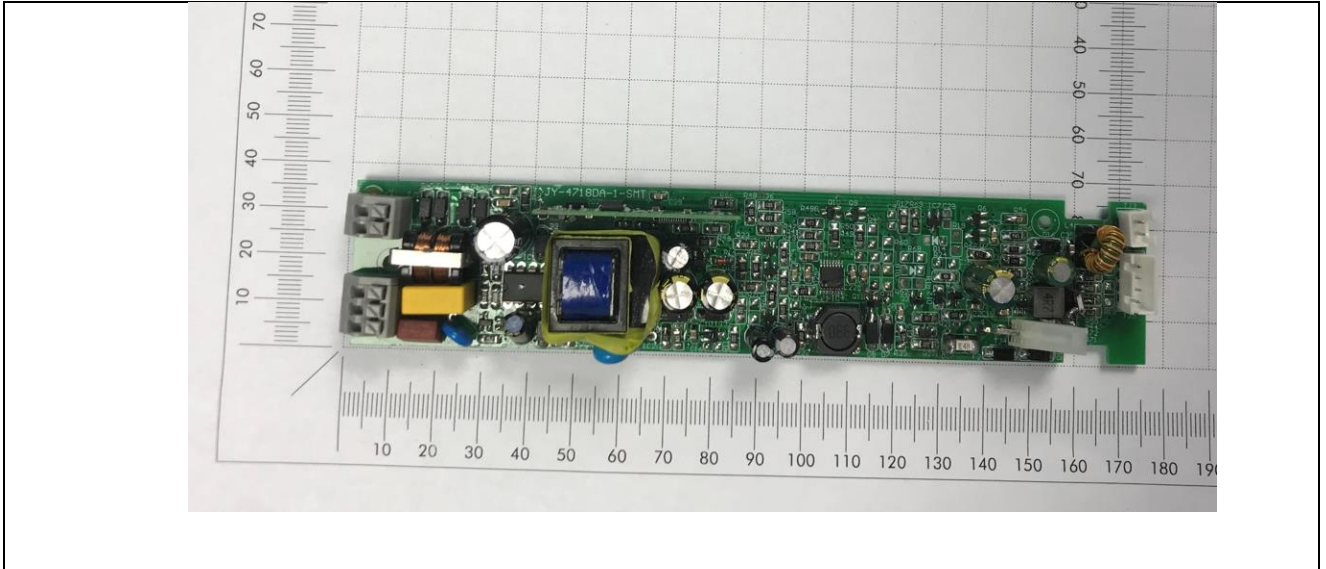


Attachment No. 1



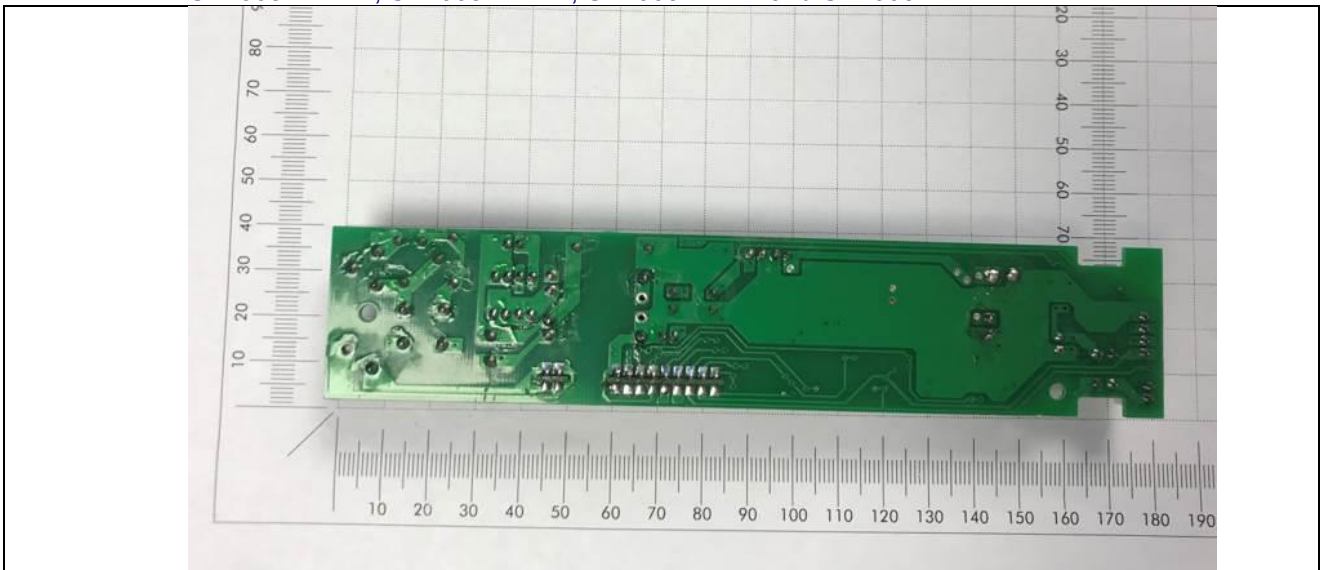
Details of: Emergency driver

SP2002DA-WH, SP2002FE-WH, SP2002DA-BK and SP2002FE-BK
SP2003DA-WH, SP2003FE-WH, SP2003DA-BK and SP2003FE-BK



Details of: Emergency driver

SP2002DA-WH, SP2002FE-WH, SP2002DA-BK and SP2002FE-BK
SP2003DA-WH, SP2003FE-WH, SP2003DA-BK and SP2003FE-BK



Attachment No. 1



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Report No.: 423896-1

Details of: Safety sign
For models with suffix WH



-- End of test report --