

AS/NZS 60335.2.81:2015
(Incorporating Amendments up to and including No. 3)



Australian/New Zealand Standard™

Household and similar electrical appliances — Safety

**Part 2.81: Particular requirements for foot warmers and heating mats
(IEC 60335-2-81 Ed 3.2, MOD)**



AS/NZS 60335.2.81:2015

This Joint Australian/New Zealand Standard™ was prepared by Joint Technical Committee EL-002, Safety of Household and Similar Electrical Appliances and Small Power Transformers and Power Supplies. It was approved on behalf of the Council of Standards Australia on 19 October 2015 and by the Council of Standards New Zealand on 6 November 2015.

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The following are represented on Committee EL-002:

- Association of Accredited Certification Bodies
- Australian Industry Group
- National Retailers Association (Australia)
- Business New Zealand
- Consumer Electronic Suppliers Association, Australia
- Consumers' Federation of Australia
- Electrical Regulatory Authorities, Australia
- Electrical consultants
- Engineers Australia
- JAS-ANZ
- Testing Interests New Zealand
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- New Zealand Electric Fence Energizer Manufacturers' Standards Group

This Standard was issued in draft form for comment as DR 15904.

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Australian/New Zealand Standard™

Household and similar electrical appliances — Safety

Part 2.81: Particular requirements for foot warmers and heating mats (IEC 60335-2-81 Ed 3.2, MOD)

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

AS/NZS 60335.2.81:2015

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES –
SAFETY –

Part 2.81: Particular requirements for foot warmers and heating mats

Foreword

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-002- Safety of Household and Similar Electrical Appliances and Small Power Transformers to supersede AS/NZS 60335.2.81:2012 three years from the date of publication.

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The objective of this Standard is to provide manufacturers, designers, regulatory authorities, testing laboratories and similar organizations with safety requirements designed to give the user protection against hazards that might occur during normal operation and abnormal operation of the appliance and which may be used as the basis for approval for sale or for connection to the electricity supply mains in Australia and New Zealand

The text of IEC 60335-2-81 Ed 3, prepared by IEC Technical Committee TC 61, was submitted to the Standards Australia/Standards New Zealand Combined Procedure (dual public comment and committee vote) for adoption of the IEC standard as a Standards Australia/Standards New Zealand joint standard.

The principal changes in this edition as compared with the 2012 edition of AS/NZS 60335.2.81 are as follows (minor changes are not listed):

- Requirements for washable appliances (5.3, 7.1, 7.6, 7.12);
- Requirements for controls in flexible cords (15.1.1, 24.2, 25.14);
- Requirements for appliance inlets (22.105, 24.1.5, 29.1.3);

The text of IEC 60335-2-81 edition 3 amendment 1, prepared by IEC Technical Committee TC 61, was submitted to the Standards Australia/Standards New Zealand Combined Procedure (dual public comment and committee vote) for adoption as an amendment to the Standards Australia/Standards New Zealand joint standard AS/NZS 60335.2.81:2015.

This standard incorporates Amendment No.1 (February 2017) and Amendment No. 2 (November 2018). The changes introduced by the amendments are indicated in the text by a marginal bar and amendment number against the part affected. Where an application date other than immediate is applicable to an amendment the date of application (DOA) and the date of withdrawal (DOW) if relevant, is indicated by the marginal bar against the part affected. Unless otherwise indicated, the application date of the changes introduced by Amendment No. 1 is 3 February 2019.

NOTE: Regulatory authorities that reference this Standard in regulation may apply these amendment requirements at a different time. Users of this Standard should consult with these authorities to confirm their requirements

This standard is an adoption with national modifications of the third edition of IEC 60335-2-81, *Household and similar electrical appliances – Safety – Part 2-81: Particular requirements for foot warmers and heating mats* including its amendment 1 (2017). It has been varied as indicated to take account of Australian and New Zealand conditions.

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DOW
25/6/23

The text of IEC 60335-2-81 edition 3 amendment 2, prepared by IEC Technical Subcommittee TC 61, was submitted to the Standards Australia/Standards New Zealand Combined Procedure (dual public comment and committee vote) for adoption as an amendment to the Standards Australia/Standards New Zealand joint standard AS/NZS 60335.2.81:2015.

This standard incorporates Amendment No.1 (February 2017), Amendment No. 2 (November 2018) and Amendment No. 3 (June 2021). The changes introduced by amendments are indicated in the text by a marginal bar and amendment number against the part affected. Where an application date other than immediate is applicable to an amendment the date of application (DOA) and the date of withdrawal (DOW) if relevant, is indicated by the marginal bar against the part affected. Unless otherwise indicated, the application date of the changes introduced by Amendment No. 3 is 25 June 2023.

NOTE: Regulatory authorities that reference this Standard in regulation may apply these amendment requirements at a different time. Users of this Standard should consult with these authorities to confirm their requirements

This standard is an adoption with national modifications of the third edition of IEC 60335-2-81, *Household and similar electrical appliances – Safety – Part 2-81: Particular requirements for foot warmers and heating mats* including its amendment 1 (2017) and amendment 2 (2020). It has been varied as indicated to take account of Australian and New Zealand conditions.

This part 2 has to be used in conjunction with the latest edition of AS/NZS 60335.1 Household and similar electrical appliances – Safety – Part 1: General requirements and its Amendments. It was established on the basis of AS/NZS 60335.1:2020.

This part 2 supplements or modifies the corresponding clauses of AS/NZS 60335.1 so as to convert it into the Australian/New Zealand Standard: Safety requirements for foot warmers and heating mats.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When this standard states "addition", "modification" or "replacement", the relevant text of Part 1 is to be adapted accordingly.

NOTE 1 The following numbering system is used:

- subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;
- unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;
- additional annexes are lettered AA, BB, etc.;
- subclauses, notes and annexes that are additional to those in the IEC standard are prefixed with the letters AZ.

NOTE 2 The following print types are used:

- requirements: in roman type;
- *test specifications: in italic type;*
- notes: in small roman type.

Words in **bold** in the text are defined in Clause 3.

p NOTE 3 In this document, p is used in the margin to indicate instructions for preparing a consolidated version.

The essential safety requirements in AS/NZS 3820¹ that could be applicable to requirements for foot warmers and heating mats are covered by this standard.

The national variations to IEC 60335-2-81 Ed 3.1 form the Australian and New Zealand national variations for purposes of the IECEE scheme for recognition of results of testing to standards for safety of electrical equipment (the CB scheme).

The national variations to IEC 60335-2-81 Ed 3.2 form the Australian and New Zealand national variations for purposes of the IECEE scheme for recognition of results of testing to standards for safety of electrical equipment (the CB scheme).

¹ AS/NZS 3820 *Essential safety requirements for electrical equipment*

A3 DOW 25/6/23 | The text of the International Standard IEC 60335-2-81 Ed 3.1 was approved as a joint Australia/New Zealand Standard with the agreed national variations as given below.

A3 DOA 25/6/23 | The text of the International Standard IEC 60335-2-81 Ed 3.2 was approved as a joint Australia/New Zealand Standard with the agreed national variations as given below.

AUSTRALIAN NATIONAL VARIATIONS

A3 | The national variations to this Part 2 are additional to those listed in the national variations in AS/NZS 60335.1:2020.

1 Scope

p 1 *Insert* the following variation after the first paragraph:

This standard also deals with the safety of **electric hot water bottles**. Additional requirements for these appliances are given in Annex AZ.

p **Annexes** *Replace* the text by the following variations:

The annexes of part 1 are applicable except as follows.

Annex AZ (normative)

Electric hot water bottles

The following modifications to this standard are applicable for **electric hot water bottles**.

AZ.2 Normative references

IEC 60320-3, *Appliance couplers for household and similar general purposes - Part 3: Standard sheets and gauges*

AS/NZS ISO 8124.1: 2010, *Safety of toys Part 1: Safety aspects related to mechanical and physical properties*
Amendment 1 (2011)

BS 1970:2012, *Hot water bottles manufactured from rubber and PVC – Specification*

AZ.3 Terms and definitions

AZ.3.101

electric hot water bottle

appliance that is for application of heat to parts of the human body and incorporates a bladder containing a liquid and internal electrical components that are used in heating the internal liquid

AZ.3.102

electric hot water bottle bladder (bladder)

material that encloses and retains, and is in contact with, the liquid that is in contact with the internal electrical components and may comprise multiple layers

AZ.3.103

electric hot water bottle cover (cover)

any removable material that encloses the **bladder**

AZ.3.104

cradle

device specific for each electric hot water bottle that incorporates the appliance inlet for attaching the electric hot water bottle to the supply

AZ.5 General conditions for the tests

AZ.5.1 *Additional samples are required for the tests of AZ.16.3, AZ.22.7, AZ.22.101, AZ.22.102 and AZ.22.103.*

AZ.5.5 *The tests are carried out with any **cover** removed.*

AZ.6 Classification

AZ.6.1 **Electric hot water bottles** shall be **Class I**, **Class II** or **Class III**.

AZ.7 Marking and instructions

AZ.7.1 The appliance shall be marked with the substance of the following:

- details of the composition of the contained liquid;
- Do not use while charging;
- This appliance cannot be refilled.

The appliance shall be marked with the following warning:

WARNING: Use a Residual Current Device (RCD) while charging.

AZ.11 Heating

AZ.11.2 **Electric hot water bottles** are placed on the floor of the test corner away from the walls.

AZ.11.7 **Electric hot water bottles** are operated for a period of one hour or until steady conditions are established, whichever occurs first.

AZ.11.8 The temperature rise of the **bladder** surface in contact with the floor of the test corner and the temperature rise of the upper surface of the **bladder** shall not exceed 45 K. The internal fluid shall be mixed before determining the maximum temperature. After heating but before measurement of the temperature, the internal fluid shall be mixed by inverting the **bladder** 10 times and then allowing one minute to settle before determining temperatures of the **bladder**.

AZ.16 Leakage current and electric strength

AZ.16.3 **Electric hot water bottles** with heating elements of **Class II construction** are subject to the following additional electric strength test.

*In a new sample of the appliance, **double insulation** between the electric components and the liquid are separated and the **basic insulation** and the **supplementary insulation** are subject to the relevant electric strength test values of Table 7. For this test it is not permitted to test the two layers of insulation to the **reinforced insulation** electric strength test in lieu of conducting the separate tests on the **basic insulation** and **supplementary insulation**, if the layers cannot be separated specially prepared samples may need to be supplied.*

AZ.19 Abnormal operation

AZ.19.4 The appliance is operated until steady conditions are established.

AZ.19.13 During the test of 19.4 the temperature of the

- **bladder** surface shall not exceed 90 °C; and
- liquid shall not exceed 10 K below its boiling point.

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AZ.22 Construction

AZ.22.7 A new sample of the **electric hot water bottle** is tested as described in Annex F of BS 1970 modified as follows.

The upper and lower plates shall incorporate cut outs to avoid any contact between the plates and any incorporated appliance inlet or other solid components.

At the conclusion of the test there shall be no sign of leakage or other detrimental effect.

AZ.22.101 The **bladder** shall have adequate thickness.

Compliance is checked by the following test.

*In a new sample of the appliance, find the most likely thinnest point in the **bladder** material. If there is doubt as to the thinnest point, randomly choose ten points on a **bladder** in order to find the thinnest point. The thickness is then measured to a resolution of 0.01mm.*

A total of three specimens are subjected to this measurement.

All measurements shall exceed 0,7 mm.

AZ.22.102 Bonded or welded seams shall have adequate tensile strength.

Compliance is checked as described in Annex E of BS 1970 on a new sample of the appliance.

The tensile force so obtained shall be not less than 72 N.

AZ.22.103 The **bladder** shall have adequate strength against penetration from sharp objects.

Compliance is checked by the test procedure specified in 5.19 of AS/NZS ISO 8124.1.

At the conclusion of the test there shall be no leakage of liquid, there shall be no access to the liquid with the test probe B of IEC 61032 and there shall be no damage that would impair compliance with clause 8.

AZ.22.104 The **bladder** shall not be user refillable.

Compliance is checked by inspection.

AZ.22.105 The **electric hot water bottle** shall be supplied with a dedicated **cradle** that has the means of connection to supply. The **cradle** shall obstruct at least 10% of the largest projected surface area of the **bladder** on two opposing sides. The **cradle** shall extend 25% of the longest distance across the largest surface of the **bladder** on two opposing sides. The surface coverage shall be maintained during charging.

The **cradle** shall be made of a rigid material.

Compliance is checked by inspection and measurement.

AZ.23 Internal wiring

AZ.23.101 The internal wiring shall remain intact during **normal operation**.

Consideration shall be given when conducting this test as to how the internal wiring and fluid will behave. The most onerous operation is to be conducted based on good engineering judgment. This test is to be conducted twice, once each on different samples at right angles to one another to ensure that the assessment is thorough.

Compliance is checked by the following test.

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A new sample of the appliance is mounted on a flexing machine by supporting the appliance at four diagonally dispersed points of the enclosure. The cover, if supplied, can be suitable to hold the appliance.

*The unit is flexed by rotating the **electric hot water bottle** through 5000 flexings each of 360 degrees. One flexing being a rotation of 360 degrees in one direction and then back to its original position.*

A second test is taken on a new sample of the appliance, the new axis of rotation taken at 90° degrees to the axis of the preceding test.

*The appliance is supplied at **rated voltage** during the test.*

There shall be no damage or displacement of conductors or leakage of liquid.

After this test clause 16.3 is repeated on each sample tested.

AZ.24 Components

AZ.24.101 The **electric hot water bottle** shall have a detachable **cradle** incorporating an appliance inlet that complies with AS/NZS 60320.1 as a Group 2 appliance inlet. The **electric hot water bottle** shall not incorporate an appliance inlet complying with the standard sheets of IEC 60320-3 or AS/NZS 60320.1.

Compliance is checked by inspection and appropriate tests.

AZ.24.102 Devices incorporated in **electric hot water bottles** in order to comply with 19.4 shall not be self-resetting or manually resettable by disconnection of the appliance from the supply mains.

Compliance is checked by inspection.

AZ.25 Supply connection and external flexible cords

AZ.25.1 **Electric hot water bottles** shall not be fitted with a **supply cord** fitted with a plug or pins for insertion into socket outlets.

AZ.30 Resistance to heat and fire

AZ.30.101 The **bladder** and **cover** of **electric hot water bottles** shall be resistant to fire.

Compliance is checked by the following test.

*The **electric hot water bottle** is emptied of liquid by puncturing the enclosure or by some other suitable method. It is then supplied at **rated voltage**.*

*The **bladder** and **cover** shall not ignite or deform to such an extent that **live parts** become accessible to test probe B of IEC 61032.*

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NEW ZEALAND NATIONAL VARIATIONS

A3 | The national variations to this Part 2 are additional to those listed in the national variations in AS/NZS 60335.1:2020.

1 Scope

p 1 *Insert* the following variation after the first paragraph:

This standard also deals with the safety of **electric hot water bottles**. Additional requirements for these appliances are given in Annex AZ.

p **Annexes** *Replace* the text by the following variations:

The annexes of part 1 are applicable except as follows.

Annex AZ (normative)

Electric hot water bottles

The following modifications to this standard are applicable for **electric hot water bottles**.

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AZ.2 Normative references

IEC 60320-3, *Appliance couplers for household and similar general purposes - Part 3: Standard sheets and gauges*

AS/NZS ISO 8124.1: 2010, *Safety of toys Part 1: Safety aspects related to mechanical and physical properties*
Amendment 1 (2011)

BS 1970:2012, *Hot water bottles manufactured from rubber and PVC – Specification*

AZ.3 Terms and definitions

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electric hot water bottle

appliance that is for application of heat to parts of the human body and incorporates a bladder containing a liquid and internal electrical components that are used in heating the internal liquid

AZ.3.102

electric hot water bottle bladder (bladder)

material that encloses and retains, and is in contact with, the liquid that is in contact with the internal electrical components and may comprise multiple layers

AZ.3.103

electric hot water bottle cover (cover)

any removable material that encloses the **bladder**

AZ.3.104

cradle

device specific for each electric hot water bottle that incorporates the appliance inlet for attaching the electric hot water bottle to the supply

AZ.5 General conditions for the tests

AZ.5.1 *Additional samples are required for the tests of AZ.16.3, AZ.22.7, AZ.22.101, AZ.22.102 and AZ.22.103.*

AZ.5.5 *The tests are carried out with any **cover** removed.*

AZ.6 Classification

AZ.6.1 Electric hot water bottles shall be **Class I**, **Class II** or **Class III**.

AZ.7 Marking and instructions

AZ.7.1 The appliance shall be marked with the substance of the following:

- details of the composition of the contained liquid;
- Do not use while charging;
- This appliance cannot be refilled.

The appliance shall be marked with the following warning:

WARNING: Use a Residual Current Device (RCD) while charging.

AZ.11 Heating

AZ.11.2 *Electric hot water bottles are placed on the floor of the test corner away from the walls.*

AZ.11.7 *Electric hot water bottles are operated for a period of one hour or until steady conditions are established, whichever occurs first.*

AZ.11.8 *The temperature rise of the **bladder** surface in contact with the floor of the test corner and the temperature rise of the upper surface of the **bladder** shall not exceed 45 K. The internal fluid shall be mixed before determining the maximum temperature. After heating but before measurement of the temperature, the internal fluid shall be mixed by inverting the **bladder** 10 times and then allowing one minute to settle before determining temperatures of the **bladder**.*

AZ.16 Leakage current and electric strength

AZ.16.3 *Electric hot water bottles with heating elements of **Class II construction** are subject to the following additional electric strength test.*

*In a new sample of the appliance, **double insulation** between the electric components and the liquid are separated and the **basic insulation** and the **supplementary insulation** are subject to the relevant electric strength test values of Table 7. For this test it is not permitted to test the two layers of insulation to the **reinforced insulation** electric strength test in lieu of conducting the separate tests on the **basic insulation** and **supplementary insulation**, if the layers cannot be separated specially prepared samples may need to be supplied.*

AZ.19 Abnormal operation

AZ.19.4 *The appliance is operated until steady conditions are established.*

AZ.19.13 *During the test of 19.4 the temperature of the*

- **bladder** surface shall not exceed 90 °C; and
- liquid shall not exceed 10 K below its boiling point.

AZ.22 Construction

AZ.22.7 *A new sample of the **electric hot water bottle** is tested as described in Annex F of BS 1970 modified as follows.*

The upper and lower plates shall incorporate cut outs to avoid any contact between the plates and any incorporated appliance inlet or other solid components.

At the conclusion of the test there shall be no sign of leakage or other detrimental effect.

A1

AZ.22.101 The **bladder** shall have adequate thickness.

Compliance is checked by the following test.

*In a new sample of the appliance, find the most likely thinnest point in the **bladder** material. If there is doubt as to the thinnest point, randomly choose ten points on a **bladder** in order to find the thinnest point. The thickness is then measured to a resolution of 0.01mm.*

A total of three specimens are subjected to this measurement.

All measurements shall exceed 0,7 mm.

AZ.22.102 Bonded or welded seams shall have adequate tensile strength.

Compliance is checked as described in Annex E of BS 1970 on a new sample of the appliance.

The tensile force so obtained shall be not less than 72 N.

AZ.22.103 The **bladder** shall have adequate strength against penetration from sharp objects.

Compliance is checked by the test procedure specified in 5.19 of AS/NZS ISO 8124.1.

At the conclusion of the test there shall be no leakage of liquid, there shall be no access to the liquid with the test probe B of IEC 61032 and there shall be no damage that would impair compliance with clause 8.

AZ.22.104 The **bladder** shall not be user refillable.

Compliance is checked by inspection.

AZ.22.105 The **electric hot water bottle** shall be supplied with a dedicated **cradle** that has the means of connection to supply. The **cradle** shall obstruct at least 10% of the largest projected surface area of the **bladder** on two opposing sides. The **cradle** shall extend 25% of the longest distance across the largest surface of the **bladder** on two opposing sides. The surface coverage shall be maintained during charging.

The **cradle** shall be made of a rigid material.

Compliance is checked by inspection and measurement.

AZ.23 Internal wiring

AZ.23.101 The internal wiring shall remain intact during **normal operation**.

Consideration shall be given when conducting this test as to how the internal wiring and fluid will behave. The most onerous operation is to be conducted based on good engineering judgment. This test is to be conducted twice, once each on different samples at right angles to one another to ensure that the assessment is thorough.

Compliance is checked by the following test.

A new sample of the appliance is mounted on a flexing machine by supporting the appliance at four diagonally dispersed points of the enclosure. The cover, if supplied, can be suitable to hold the appliance.

*The unit is flexed by rotating the **electric hot water bottle** through 5000 flexings each of 360 degrees. One flexing being a rotation of 360 degrees in one direction and then back to its original position.*

A second test is taken on a new sample of the appliance, the new axis of rotation taken at 90° degrees to the axis of the preceding test.

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*The appliance is supplied at **rated voltage** during the test.*

There shall be no damage or displacement of conductors or leakage of liquid.

After this test clause 16.3 is repeated on each sample tested.

AZ.24 Components

AZ.24.101 The **electric hot water bottle** shall have a detachable **cradle** incorporating an appliance inlet that complies with AS/NZS 60320.1 as a Group 2 appliance inlet. The **electric hot water bottle** shall not incorporate an appliance inlet complying with the standard sheets of IEC 60320-3 or AS/NZS 60320.1.

Compliance is checked by inspection and appropriate tests.

A1 **AZ.24.102** Devices incorporated in **electric hot water bottles** in order to comply with 19.4 shall not be self-resetting or manually resettable by disconnection of the appliance from the supply mains.

Compliance is checked by inspection.

AZ.25 Supply connection and external flexible cords

AZ.25.1 **Electric hot water bottles** shall not be fitted with a **supply cord** fitted with a plug or pins for insertion into socket outlets.

AZ.30 Resistance to heat and fire

AZ.30.101 The **bladder** and **cover** of **electric hot water bottles** shall be resistant to fire.

Compliance is checked by the following test.

*The **electric hot water bottle** is emptied of liquid by puncturing the enclosure or by some other suitable method. It is then supplied at **rated voltage**.*

*The **bladder** and **cover** shall not ignite or deform to such an extent that **live parts** become accessible to test probe B of IEC 61032.*