

AS/NZS 3120:2021



STANDARDS
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Australian/New Zealand Standard™

Approval and test specification — Cord extension sockets



AS/NZS 3120:2021

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Australian/New Zealand Standard™

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Preface

This standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-004, Electrical Accessories, to supersede AS/NZS 3120:2011.

AS/NZS 3120:2011 incorporating Amendment 1 will also remain current for 24 months after the date of publication of this standard and after this time it will be superseded by AS/NZS 3120:2021. Regulatory authorities that reference this standard in regulation may apply these requirements at a different time. Users of this standard should consult with these authorities to confirm their requirements.

This standard is one of a series to be read in conjunction with AS/NZS 3100, *Approval and test specification—General requirements for electrical equipment*. This document includes undated references to AS/NZS 3112:2017 Figure 2.1. If AS/NZS 3112 is revised, users should refer to the AS/NZS 3112 figure titled “Dimensions of plugs”. The purpose of the series is to outline the conditions to be met to secure approval for the sale and use of electrical equipment. Only safety matters and related conditions are covered.

The objective of this standard is to set out essential safety requirements for cord extension sockets and inlet plugs intended for use at extra-low or low voltages, and inlet plugs with rated voltages not exceeding 250 V and current ratings not exceeding 20 A in accordance with the pin configurations given in AS/NZS 3112.

The essential safety requirements in AS/NZS 3820, *Essential safety requirements for electrical equipment*, that are applicable to inlet plugs and cord extension socket-outlets that are covered by this standard, taken in conjunction with any other relevant requirements affecting safety.

NOTE Inlet plugs were previously specified in AS/NZS 60320.1 as Group 2 appliance inlets.

This edition of the standard incorporates changes to the previous edition and includes the following technical and editorial changes to the content of the previous editions:

- (a) Alignment of cord retention tests with tests for cord retention of plugs in AS/NZS 3112
- (b) Removal of requirements for cord extension sockets outside the scope of this standard
- (c) Requirements added for locking sockets
- (d) Editorial changes to clearly define requirements

Section 1 Scope and general

1.1 Scope and application

1.1.1 Scope

This standard sets out essential safety requirements for cord extension sockets and inlet plugs, as defined in [Clause 1.3](#), intended for use at extra-low or low voltages, and inlet plugs with rated voltages not exceeding 250 V and current ratings not exceeding 20 A in accordance with the pin configurations given in AS/NZS 3112.

This standard does not apply to cord extension sockets that are enclosed within an appliance in such a way that they are not exposed to personal contact, or that are intended for use solely where they will be so enclosed.

1.1.2 Application

1.1.2.1 General requirements of AS/NZS 3100

This standard shall be read in conjunction with AS/NZS 3100. The appropriate provisions in AS/NZS 3100, as identified in [Clause 1.2](#), shall apply to the construction of a cord extension socket and an inlet plug.

1.1.2.2 Specific requirements of this standard

A cord extension socket and inlet plug shall be deemed to conform to this standard provided it conforms to all the requirements of this standard and passes the tests specified herein.

NOTE Plugs, socket-outlets and connectors incorporating retaining means of the type specified in AS/NZS 3123, or similar, need not conform to all general dimensional requirements of this standard, provided the safe functioning of accessories in a particular system is not impaired and, where applicable, dimensions relevant to specified pin configurations are applied.

1.2 Normative references

The following standards are referred to in the text in such a way that some or all of their content constitutes a requirement of this standard:

AS 60529, *Degrees of protection provided by enclosures (IP Code)*

AS/NZS 3100, *Approval and test specification—General requirements for electrical equipment*

AS/NZS 3112, *Approval and test specification—Plugs and socket-outlets*

AS/NZS 3121, *Approval and test specification—Insulating mouldings*

AS/NZS 3123, *Approval and test specification—Plugs, socket-outlets and couplers for general industrial application*

AS/NZS 3133, *Approval and test specification—Air-break switches*

AS/NZS 60320.1, *Appliance couplers for household and similar general purposes, Part 1: General requirements (IEC 60320-1, Ed 2.1 (2001) MOD)*

AS/NZS 60335.1, *Household and similar electrical appliances—Safety, Part 1: General requirements (IEC 60335-1 Ed. 5.0(2010), MOD)*

1.3 Terms and definitions

For the purpose of this standard, the definitions below apply.

1.3.1**cord extension socket
socket**

device arranged for attachment to a flexible cord and having contacts whereby a detachable connection can be made with pins of a plug

1.3.2**inlet plug**

accessory, having pins designed to engage with the contacts of a cord extension socket, integrated or incorporated into equipment or intended to be fixed to it

Note 1 to entry: Inlet plugs were previously specified in AS/NZS 60320.1 as Group 2 appliance inlets.

1.3.3**sockets with clamping or locking mechanism**

sockets that provide additional clamping of all live pins of a plug conforming to AS/NZS 3112 to increase the withdrawal force required to remove a plug from the socket

Section 2 Cord extension sockets

2.1 General

Cord extension sockets covered in this Section are intended for use with plugs conforming to AS/NZS 3112 and/or the corresponding inlet plugs conforming to this standard.

2.2 Exemptions for extra-low voltage sockets

Extra-low voltage type sockets are not required to conform to the requirements for internal connections, prevention of contact with live pins and withdrawal force test.

2.3 Limitation of outlets

Sockets shall accommodate one plug only.

2.4 Terminals and internal connections

2.4.1 Material

Terminals and internal connections that are intended primarily for carrying current shall be of corrosion-resisting metal.

Conformance shall be checked by inspection and, if necessary, by chemical analysis.

NOTE Examples of conforming metals, when used within the permissible temperature range and under normal conditions of chemical pollution, are as follows:

- (a) Copper.
- (b) An alloy containing at least 58 % copper for parts that are worked cold or at least 50 % copper for other parts.
- (c) Stainless steel containing at least 13 % chromium and not more than 0.09 % carbon.

Terminals and internal connections that are intended primarily for carrying current shall conform to the mechanical strength requirements in AS/NZS 3100.

Conformance shall be checked by the tests referenced in Section titled "Protection against mechanical and electrical failure" of AS/NZS 3100.

2.4.2 Construction of terminals

The terminals shall be capable of accommodating the conductors of a flexible cord of current rating, corresponding to the marked current rating of the socket.

Facilities shall be provided to prevent slipping or spreading of the conductors or conductor strands. Where the facilities are such that the conductor is to be located around the shank of the terminal screw and clamped under the screw head, the following shall apply:

- (a) When the terminal screw is screwed in to the limit of its thread, the clearance between the head of the screw and the washer or means of retention of the conductor shall not exceed 0.4 mm.
- (b) The length of the terminal screw shall enable it to be backed off from the washer or means of retention of the conductor so that the conductor may be located around the shank without difficulty.
- (c) Where the means of retention of the conductor is not continuous (e.g. prongs), there shall be at least three points of retention and the maximum angle between any two points shall not exceed 150°.
- (d) Where the means of retention of the conductor is continuous (e.g. a portion of the insulating moulding), the angle subtended by the arc of the means of retention shall be not less than 180°.

When the socket is correctly assembled, the terminals shall be held firmly in position.

2.5 Contacts

2.5.1 Material

Contacts shall be of corrosion-resisting metal.

Conformance shall be checked by inspection and, if necessary, by chemical analysis.

NOTE Examples of conforming metals, when used within the permissible temperature range and under normal conditions of chemical pollution, are as follows:

- (a) Copper.
- (b) An alloy containing at least 58 % copper for parts that are worked cold or at least 50 % copper for other parts.
- (c) Stainless steel containing at least 13 % chromium and not more than 0.09 % carbon.

Contacts shall conform to the mechanical strength requirements in AS/NZS 3100.

Conformance shall be checked by the tests referenced in Section titled "Protection against mechanical and electrical failure" of AS/NZS 3100.

2.5.2 Construction

The contacts shall be such that they make and maintain, under normal service conditions, electrical and mechanical contact with the pins of the corresponding type of plug. For sockets intended to accommodate plugs with flat pins, contact shall be made with both sides of each pin.

The alignment and contact-making properties of contacts shall be independent of terminal screws.

The effectiveness of the contacts shall be independent of pressure from any thermoplastic or resilient moulding.

In sockets designed for use with plugs conforming to AS/NZS 3112, the contacts shall be self-adjusting in pitch and contact-making.

2.5.3 Depth of contacts

The depth of contact requirements of AS/NZS 3112 shall apply.

2.6 Dimensions

2.6.1 Pin entry apertures for flat-pin plugs

Pin entry apertures in sockets intended for use with flat-pin plugs conforming to the dimensions of flat-pin plugs specified in Figure 2.1 of AS/NZS 3112 shall conform to the requirements for pin entry apertures for plugs as specified in Figure 2.1 of AS/NZS 3112.

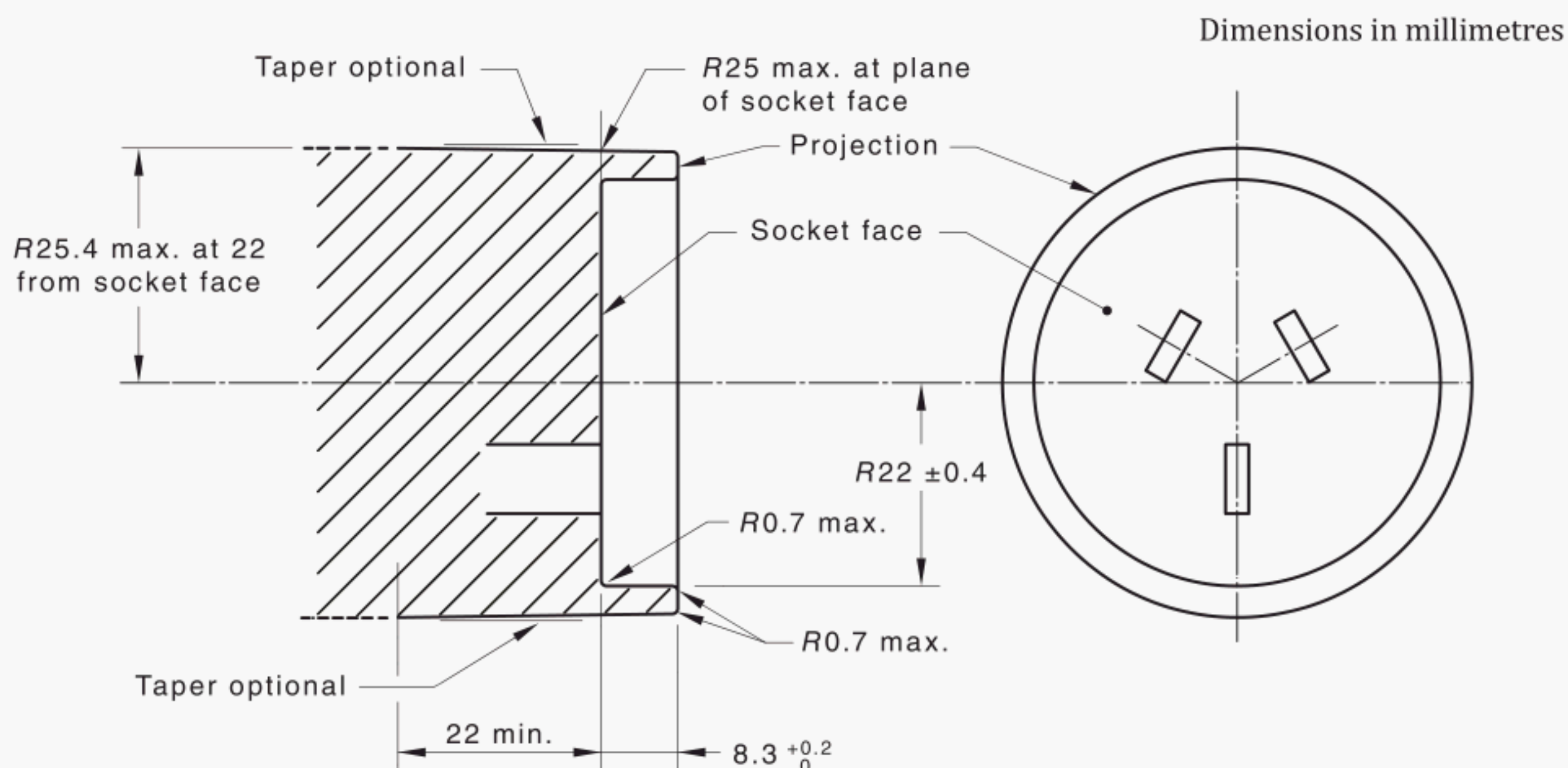
2.6.2 Socket face projection

2.6.2.1 Socket face of sockets rated at 10 A and 15 A

The socket face of a 10 A and 15 A rated socket shall be surrounded by a full 360° projection conforming to [Figure 2.1](#).

The projection shall not be removable without the use of a tool.

NOTE The test for non-detachable parts in AS/NZS 60335.1 may be used for testing non-detachable parts.



NOTE Flat apertures are shown for illustrative purposes only.

Figure 2.1 — External shape and socket face of sockets with 360° projection

2.6.2.2 Configurations covered

The configuration specified in [Clause 2.6.2.1](#) shall apply to the following 10 A configurations illustrated in Figure 2.1 of AS/NZS 3112.

- (a) Three-pin plug (10 A rating).
- (b) Two-pin plug (10 A rating).
- (c) Two-pin plug (up to 10 A rating).
- (d) Three-pin plug with round earth pin (10 A rating).
- (e) 125 V max. three-pin plug with round live pins (10 A rating).

2.7 Arrangement of earthing connections

Where the socket is provided with earthing connections, the construction shall be such that, during normal insertion of any corresponding plug, the earthing connection is made before the connection of the live pins and, during normal withdrawal, the earthing connection is broken after disconnection of the live pins.

2.8 Insulating materials

The insulating portions of a socket shall consist of —

- (a) insulating materials, having properties not inferior to those of Class 60 mouldings conforming to AS/NZS 3121; or
- (b) ceramic material of a type such that, after immersion in water for 48 h and after all visible drops of water have been removed from the surface by means of a clean dry cloth, shall not have increased in mass by more than 2 %.

All insulating portions, except ceramic, of a socket shall conform to the requirements for ignitability for sockets of AS/NZS 3112.

2.9 Attachment of covers

The design of the socket shall ensure that its cover, when correctly fitted, does not cause the conductors of the attached flexible cord to move from their correct positions. Where a cover is not fixed by screws, and its removal exposes live parts, it shall conform to the requirements of the test for attachment of covers (see [Clause 2.20.12](#)).

2.10 External shape

2.10.1 General

2.10.1.1 10 A and 15 A sockets with 360° projection

For a longitudinal axial distance of at least 22 mm from the socket face, no part of a socket with a 360° projection, including the switch (if any), shall project radially more than 25.4 mm from the longitudinal axis through the centre. (See also [Figure 2.1](#).)

2.10.1.2 20 A sockets without a 360° projection

20 A sockets designed for use with flat-pin plugs conforming to the dimensions specified in AS/NZS 3112 shall be of a form such that the body will either —

- (a) have a maximum external diameter of 44.2 mm at any point on its body between the face and a distance of 22.2 mm along its side from the face, and be of such design that it can be easily inserted into, and removed from, an inlet plug of the type described in [Section 3](#) of this standard; or
- (b) have a minimum external diameter of 47.5 mm at any point on its body between the face and a distance of 22.2 mm along its side from the face..

2.10.2 Pendent type sockets

A pendent type socket shall be designed for secure attachment to a supporting means, such as a chain. The supporting means may be detachable from the socket.

Facilities for entry of a flexible cord shall be provided to ensure that, when mounted in the intended manner, the cord will exit along the line of the supporting means.

2.10.3 Other than pendent type sockets

Sockets other than pendent type, except where they are designed to prevent the insertion of, three-pin flat-pin plugs of 20 A rating conforming to AS/NZS 3112, or where they are fitted with a full 360° projection in accordance with [Clause 2.6.2.1](#), shall conform to the following:

- (a) The external body of the socket shall be such that there is no projection of the body more than 0.5 mm from the face of the outlet.
- (b) Any protective covering forming part of the socket shall project not more than 0.5 mm beyond the face of the socket.

2.10.4 Finger grip

A socket shall be provided with a finger grip to permit easy insertion and withdrawal of a plug conforming to AS/NZS 3112, or an appliance inlet conforming to AS/NZS 60320.1.

Conformance shall be checked by inspection.

2.11 Exposed metal

A socket intended for use with plugs conforming to AS/NZS 3112 shall not have exposed metal parts.

NOTE This requirement does not preclude a cord extension socket having an external metal enclosure, provided that it is separated from live parts by double insulation.

Metal clamps, fitted at the cord entry and designed to grip a flexible cord, may be used provided that —

- (a) double insulation is maintained between the metal of the clamp and live parts of the socket; and
- (b) the clamp is not provided with facilities for earthing.

2.12 Means of entry and cord anchorage for flexible cord

A socket shall be provided with a single aperture for the entry of a flexible cord within its protective covering (if any).

Provision shall be made for entry of a flexible cord together with any protective covering, and for effective anchorage of the flexible cord or range of cords that the cord extension socket is intended to accommodate, so that any stress on the terminals will be substantially reduced.

For rewirable cord extension sockets, the anchorage shall be effective for the range of flexible cords listed in [Table 2.1](#) except where the cord or range of cords identified by the manufacturer is marked as required by [Clause 2.19.3](#) (d).

For rewirable sockets rated at 15 A or less, a supplementary means of anchoring each insulated core of the flexible cord shall be provided in the form of a pillar, post, grip, tortuous path, or other equally effective means.

A dual-purpose device incorporating both methods of anchorage may be used.

The cord anchorage devices shall conform to the flexible cord anchorage test. Non-rewirable sockets shall conform to the additional tests for non-rewirable sockets (see [Clause 2.20.4](#)).

Table 2.1 — Range of flexible cords

Socket rating A	Flexible cord	
	Size, mm ²	Type
10	1.0	Light duty Ordinary duty Heavy duty
> 10	Size in accordance with the rating of socket	Ordinary duty or heavy duty, as applicable

2.13 Ratings

2.13.1 Voltage rating

Sockets intended to supply equipment rated at 200 V or more shall have a marked voltage rating of 240 V or 250 V.

NOTE The preferred voltage rating is 250 V.

2.13.2 Current rating

The marked current rating of sockets shall be —

- (a) 10 A for sockets for use with 10 A plugs;
- (b) 15 A for sockets for use with 15 A plugs; and
- (c) 20 A for sockets for use with 20 A plugs.

2.14 Internal connections

The design and construction of a socket (see exception in [Clause 2](#)) provided with an earthing connection shall be such that when the socket is correctly wired and completely assembled —

- (a) a loose terminal screw or conductive material cannot bridge any live parts or earthing parts;
- (b) the earthing parts are effectively isolated from contact with a live conductor that may become detached; and
- (c) the live parts are effectively isolated from contact with an earthing conductor that may become detached.

2.15 Prevention of contact with live pins

2.15.1 Assembly

Component parts of sockets (see exception in [Clause 2.2](#)) shall be designed so that they are positively located in their correct position during assembly.

2.15.2 During normal insertion

At any stage during normal insertion of a plug into a socket, with the faces of the plug and socket in parallel planes, it shall not be possible to touch, with the standard test finger (see AS/NZS 3100) a pin that might become alive.

Sockets for use with two-pin parallel-pin flat-pin 10 A 125 V max. plugs shown in Figure 2.1 of AS/NZS 3112.

Figure 2.1 of AS/NZS 3112 shall be checked for conformance to this requirement by means of a test plug having the minimum diameter of face and maximum length of live pins shown in AS/NZS 3112.

NOTE For minimum clearance from pins to the edge of the plug, see requirements regarding ratings and dimensions of low voltage plugs in AS/NZS 3112.

Sockets rated at 15 A or 20 A for use with three-pin flat-pin plugs of the type shown in Figure 2.1 of AS/NZS 3112.

Figure 2.1 of AS/NZS 3112 and two-pin non-parallel-pin flat-pin 10 A max. plugs of the type shown in Figure 2.1 of AS/NZS 3112 shall be checked for conformance to the requirements of this Clause by means of the corresponding test plug having the dimensions specified in Figure 2.1 of AS/NZS 3112 for gauges for three-pin flat pin plugs.

2.15.3 During other than normal insertion

The design and construction of a socket shall be such that it will not be possible for any pin of a plug, with which the socket is designed to be used with, to touch a live contact except during normal insertion, that is with each pin entering or adjacent to the access of the corresponding contact.

For sockets of resilient insulating material, no undue force shall be used in this test.

Sockets for use with two-pin parallel-pin flat-pin 10 A 125 V max. plugs of the type shown in Figure 2.1 of AS/NZS 3112 shall be checked for conformance to this requirement by means of a test plug having the minimum diameter of face and maximum length of live pins as specified in Figure 2.1 of AS/NZS 3112.

NOTE 1 For minimum clearance from pins to the edge of the plug, see requirements regarding ratings and dimensions of low voltage plugs in AS/NZS 3112.

Sockets rated at 15 A or 20 A for use with three-pin flat-pin plugs of the type shown in AS/NZS 3112 and two-pin non-parallel-pin flat-pin 10 A max. plugs of the type shown in AS/NZS 3112 shall be checked for conformance to the requirements of this Clause by means of a test plug having the dimensions shown in AS/NZS 3112 for three-pin test plug with flat pins for abnormal insertion test.

NOTE 2 This provision is intended to prevent the insertion of one pin while the other pin or pins are overhanging the socket, or the insertion of an earthing pin in a live contact.

2.16 Fuses

A fuse shall not be incorporated in a socket.

2.17 Switches

Where a switch is incorporated in a cord extension socket it shall be located and arranged to provide protection against physical damage and to prevent the ingress of foreign matter. Conformity shall be assessed by the tumbling barrel test, [Clause 2.20.4](#), and an IPXXD probe test. The switch shall also conform to the relevant requirements of AS/NZS 3133 and with the following requirements, as applicable:

- (a) Where manually operated, it shall be a Category 1 switch.
- (b) Where operated by the insertion and withdrawal of a plug, it need only open one live conductor. The mechanism of such a switch shall be operated only by a live pin of a plug. On the insertion of a plug, the switch shall “make” after the earthing contact is engaged with its socket contact. On withdrawal of the plug, the switch shall “break” before the earthing pin has disengaged from its socket contact.

2.18 Sockets with a clamping mechanism

Sockets with a clamping or locking mechanism shall limit the increase in clamping force so that the maximum socket withdrawal force for a two-pin plug is less than 120 N.

Conformance shall be verified by the withdrawal force test of [Clause 2.20.3](#).

NOTE The 120 N withdrawal force is to limit the clamping force to less than the minimum retaining force for plug pins in conforming plugs. This ensures that plug pins will not be pulled out of a plug if a plug is attempted to be removed from a socket that has an additional clamping or locking facility with the lock or clamp activated.

2.19 Marking

2.19.1 Required marking

Every socket shall be marked with the following information in accordance with AS/NZS 3100:

- (a) The name, trade name or mark of the manufacturer, or of the responsible vendor.
- (b) The current rating, in amperes.
- (c) The voltage.
- (d) If limited by any component to use on alternating current or direct current, the socket shall be marked "a.c." or "d.c." respectively.
- (e) If not the only type of socket marketed by the manufacturer or by the responsible vendor, the socket shall also be marked with a catalogue number, type number or name, or other marking that will distinguish it from any other type of socket marketed by the manufacturer or responsible vendor.
- (f) If a socket outlet has a locking or clamping facility as defined in [Clause 1.3.3](#), the socket shall be marked to indicate when it is locked and when it is unlocked. The locking mechanism position shall be marked with padlock symbols showing the padlock closed to indicate locked and the padlock opened to indicate unlocked.

NOTE Manufacturers making a statement of conformance to this Australian/New Zealand Standard on a product, packaging or promotional material related to that product, are advised to ensure that such conformance is capable of being verified.

2.19.2 Location of marking

The marking required by [Clause 2.19.1](#) shall be located on the external surface of the socket.

2.19.3 Additional requirements for rewirable sockets

A rewirable socket shall be supplied with instructions detailing the following:

- (a) A diagram illustrating the method of connection of the conductors and, in particular, the earthing conductor and the cord anchorage. This diagram shall show the earthing conductor printed in a combination of green and yellow colours. The live conductors shall not be coloured.
- (b) A full-scale diagram, showing the length of sleeving and insulation to be stripped back.
- (c) A description of the method of connection for each conductor, giving the alternative colours permissible for the active, neutral and earthing conductors, respectively.
- (d) The size and types of flexible cords with which it is intended to be used

NOTE Sockets intended to be marketed in bulk (e.g. for equipment manufacturers) may be supplied with one set of instructions per package.

2.19.4 Earthing connections

Where a rewirable socket incorporates a contact intended to provide an earthing facility, its terminal shall be distinguished by marking in accordance with AS/NZS 3100, located either on, or adjacent to, the earthing terminal.

Such marking shall be supplemented by the application of a conspicuous green colour, on or adjacent to, the earthing terminal, if the socket is of the rewirable type.

2.19.5 Live connections

2.19.5.1 General

The live connections of rewirable sockets shall be marked as required by AS/NZS 3100, except that the active connection of sockets intended for flat-pin plugs shall be indicated by the letter “L”, “A” or “P”

NOTE “L” is the preferred letter.

2.19.5.2 Location of marking

The marking shall be inside the body of the socket adjacent to the terminals if the terminals can become readily detached from the body or are required to be detached so that connection to the terminals can be effected.

NOTE In other cases, the marking may be on the terminals.

2.19.6 Configuration of sockets intended for flat-pin plugs

Where a socket is intended for use with flat-pin, non-parallel-pin plugs conforming to AS/NZS 3112, it shall have its pin apertures disposed so that, when the contacts are correctly connected, the aperture configuration viewed from the mating face of the socket shall be earth, active and neutral in a clockwise direction.

Where there is no provision for an earthing pin, the live apertures shall conform to the configuration specified in this Clause.

2.20 Tests

2.20.1 General

Sockets shall pass the tests specified in [Table 2.2](#), with tests carried out in the order set down. Where required by these tests, sockets intended for use with plugs of the types shown in AS/NZS 3112 shall be tested in conjunction with a corresponding type of plug conforming to AS/NZS 3112 or with any special plugs or gauges referred to.

Table 2.2 — Tests to be applied and order of application

Test No.	Description of test	Standard or Clause reference for test procedure and criteria	Sample identification
1	Withdrawal force test	2.20.2	A B C
2	Tumbling barrel test	2.20.4	A B C
3	Insulation resistance test No. 1	2.20.5	D
4	High voltage test	2.20.6	D
5	Screw threads and fixings	AS/NZS 3100	D
6	Current breaking test	2.20.7	D E ^a
7	Test of temperature rise	2.20.8	D
8	Insulation resistance test No. 2	2.20.9	D
9	Flexible cord anchorage test	2.20.10	D
10	Test of earthing connection	2.20.11	D
11	Test for attachment of covers	2.20.12	D
12	Test for the fixing of contacts in resilient or thermoplastic sockets	2.20.13	F
13	Additional tests for non-rewireable sockets	2.20.14	G H I J ^b
14	Determination of ignitability and combustion propagation	AS/NZS 3112	Any ^c
TOTAL NUMBER OF SAMPLES REQUIRED			12

^a Two samples are required for Test 6 if the sample is rated for use at a.c. and d.c.

^b These unmoulded samples are only required for non-rewireable sockets.

^c Ignitability and combustion propagation testing may require a further sample in new and clean condition.

NOTE Sample D may be used to verify the general requirements and dimensional requirements of this standard.

2.20.2 Withdrawal force test

The withdrawal force test shall apply only to sockets rated at up to and including 10 A and intended for use with three-pin flat-pin plugs conforming to AS/NZS 3112. The test shall be applied to three sockets not subjected to any previous tests of this standard. (See exemption in [Clause 2.2](#).)

For sockets with clamping or locking mechanism this test shall be conducted without the clamp mechanism engaged / clamped.

Three-pin flat-pin 10A plugs conforming to AS/NZS 3112 and not subjected to any previous tests shall be used. A separate plug shall be used for each test.

The plug shall be fully inserted into and withdrawn 10 times from the socket by manual means.

The plug shall be manually aligned in the socket to minimize the effects of misalignment between mating components and any other friction-increasing factors, so as to attain the best position for minimum resistance to withdrawal.

NOTE When testing in other than the horizontal plane, the mass of the plug and socket should be considered in all measurements.

The plug shall then be fully reinserted, and a withdrawal force gradually applied until the plug is withdrawn. The withdrawal force during three subsequent and consecutive disengagements shall be measured.

The withdrawal forces so measured shall be between 20 N and 50 N.

2.20.3 Additional test for sockets with clamping or locking mechanism

Following the withdrawal force test of [Clause 2.20.2](#), this test shall apply only to sockets incorporating a clamping or locking mechanism designed to hold the plug pins by extra contact pressure on socket contact.

Two-pin test plugs rated at 10 A conforming to AS/NZS 3112 Figure 2.1(c) which have not been subjected to any previous tests shall be used. Then a withdrawal force shall be gradually applied on the plug until the plug is withdrawn. The withdrawal force during three subsequent and consecutive disengagements of the plug shall be measured.

The withdrawal forces so measured shall be less than 120 N.

2.20.4 Tumbling barrel test

Three sockets shall be tested in a tumbling barrel in accordance with AS/NZS 60320.1. Rewireable sockets shall be fitted with a flexible cord, as specified in [Table 2.1](#), having the smallest cross-sectional area of the lightest type and a length of approximately 100 mm, measured from the outer end of the guard (if any) or the socket.

Terminal screws and assembly screws shall be tightened with a torque equal to two-thirds of the torque specified in the test for screw threads and fixings in AS/NZS 3100.

Non-rewireable sockets shall be tested with the flexible cord as delivered. The flexible cord shall be cut so that a free length of approximately 100 mm projects from the outer end of the guard (if any) or the socket.

The samples shall be dropped from a height of 500 mm onto a 3 mm thick steel plate, the number of falls being 1000.

The barrel shall be turned at a rate of 5 rpm, 10 falls per minute thus taking place. Only one sample shall be tested at a time.

After the test, the sample shall show no damage, in accordance with the following:

- (a) Live parts shall not have become exposed to the standard test finger.
- (b) For earth contacts, the resistance of the plug/socket circuit shall be such that conformance to [Clause 2.20.11](#) is maintained.
- (c) Any other function affecting safety shall not be impaired.
- (d) No live part shall have become detached or loosened to the extent that a hazardous situation is created (see [Clause 2.14](#)).

NOTE 1 Special attention should be paid to the connection of the flexible cord. Small pieces may be broken off without causing rejection, provided that the protection against electric shock is not affected.

NOTE 2 Slight damage to the finish and small dents can be ignored.

NOTE 3 The specified free length of flexible cord of 100 mm may be reduced if the overall length of the socket and flexible cord approaches the width of the tumbling barrel test apparatus.

NOTE 4 Tests to ascertain conformance to Items (a), (b) and (c) are conducted only in cases of doubt.

2.20.5 Insulation resistance test No. 1

The insulation resistance of a socket shall be measured at a voltage of 500 V d.c. with the socket fitted with the corresponding plug, as follows:

- (a) Between live terminals of the socket, the plug terminals being open-circuited.
- (b) Between live terminals of the socket and any external metal, the live terminals of the plug being connected together.
- (c) Between live terminals of the socket and the earthing terminal (if any), the live terminals of the plug being connected together.
- (d) Between live terminals of the socket and a flexible electrode applied to non-conducting parts handled in service.

The insulation resistance so measured shall be not less than 50 MΩ.

2.20.6 High voltage test

The socket shall withstand without failure an a.c. voltage of the value indicated in [Table 2.3](#), applied between the parts set out in Items (a) and (c) of [Clause 2.20.5](#) for 1 min in each case. The socket shall be fitted with the corresponding plug during the test.

The socket shall further withstand without failure a voltage of 3500 V a.c. applied between the parts set out in Items (b) and (d) of [Clause 2.20.5](#) for 1 min in each case.

There shall be no arcing or other failure during these tests. The insulation resistance test of [Clause 2.20.5](#) shall then be repeated, and the socket shall conform to its relevant requirements.

Table 2.3 — Test voltages for high voltage test

Working voltage (r.m.s.) between parts ^a	Testing voltage
≤ 32	500
> 32 ≤ 250	1 000
> 250 ≤ 650	1000 + (2 × working voltage) but not exceeding 2000
^a For example, a low voltage accessory for connection to a system operating at 415 V between phases and 240 V to earth would require a test of 1000 + (2 × 415) V between live terminals and a test of 1 000 V between live parts and exposed metal parts.	

2.20.7 Current breaking test

The socket shall satisfactorily withstand the following cycle of operations 12 times in succession:

- (a) A plug shall be inserted in the socket with no current flowing.
- (b) Immediately following each full insertion, a current as specified in Items (i) and (ii) below shall be passed through a circuit including the plug and socket for 15 s.
- (c) The plug shall be then withdrawn from the socket under load at a rate of approximately 150 mm/s, and shall remain withdrawn for approximately 105 s.

For the purpose of this test, the testing current shall be —

- (i) 50 % in excess of the full load current for sockets rated at or above 10 A; or
- (ii) 100 % in excess of full load current for sockets rated at less than 10 A, but shall not exceed 15 A.

The testing current shall be a.c. with a power factor of approximately 0.75 lagging, or d.c., as applicable. Where a socket is intended for both a.c. and d.c. operation, a separate sample shall be tested on each source of supply.

The open-circuit voltage shall be 32 V for extra-low voltage sockets, sockets having a rating of 250 V or lower, 250 V and rated voltage for sockets of higher voltage.

The socket shall be mounted so that the withdrawal movement is approximately horizontal, and the earthing pin, if any, is at the lowest point.

A plug having a rating corresponding to that of the socket shall be used for this test.

Where an earthing contact and an earthing pin are included, the earthing terminal of the socket shall be connected to the neutral terminal during the test.

2.20.8 Test of temperature rise

After the socket with plug inserted has continuously carried its full rated current until a constant temperature has been attained, the temperature rise of the contacts and terminals shall be measured by means of the standard No. One thermocouple (method as specified in AS/NZS 3100). The current ratings of the flexible cords connected to the plug and socket shall correspond to the current ratings of the plug and socket. The test shall be carried out in a draught-free position.

The temperature rise of any terminal or contact shall not exceed 40 K.

2.20.9 Insulation resistance test No. 2

The insulation resistance test specified in [Clause 2.20.5](#) shall be repeated and the socket shall conform to the specified requirements.

2.20.10 Flexible cord anchorage test

The cord anchorage shall be tested with the conductors connected to the corresponding terminals. A direct pull of the values specified in Column 4 of [Table 2.4](#) shall be applied through the flexible cord in the direction in which the flexible cord enters the socket. Over a period of 10 s, the pull shall be increased uniformly to the test value, maintained at that value for a further 10 s, and then released. This test shall be performed three times.

The terminal screws shall then be loosened as much as possible without removing the screws and a direct pull of the values specified in Column 5 of [Table 2.4](#) shall be applied through the flexible cord. Over a period of 10 s the pull shall be increased uniformly to the test value, maintained at that value for a further 10 s, and then released. This test shall be performed three times.

The number of cores in the flexible cord shall correspond to the number of socket contacts. Notwithstanding Column 3 of [Table 2.4](#), where a socket has been designed to accommodate only a particular type of flexible cord (e.g. where the aperture is of a special shape), the socket shall be tested only with such cord. An entry hole of a size corresponding to the diameter of a particular type of circular flexible cord shall not be considered as restricting the use of the socket to that flexible cord.

The cord anchorage shall be deemed non-conforming if the flexible cord parts from the terminals, or if the terminals break away or are impaired or if, during the test with the terminal screws loosened, the flexible cord moves longitudinally by 2 mm in the anchorage, either before the direct pull reaches the specified value or during the time for which the pull is to be maintained.

Table 2.4 — Loads for cord anchorage test

1	2	3	4	5
Socket rating A	Flexible cord		Test force, N	
	Size mm ²	Type	Conductors connected to terminals	Conductors connected, terminal screws loosened
10	1.0	Light duty ^a or Ordinary duty ^a	110 ± 1	50 ± 0.5
15	1.5	Ordinary duty ^a		
20	2.5	Ordinary duty ^a or Heavy duty ^a , as applicable	110 ± 1	65 ± 0.7
^a PVC insulated and sheathed.				

2.20.11 Test of earthing connection

The resistance between the earthing terminal of any socket-outlet provided with an earthing contact and the earthing terminal of the plug used for testing shall be of a low resistance. Conformance shall be checked by the test of earthing connection specified in clause titled “Test of earthing connection of AS/NZS 3100”.

2.20.12 Test for attachment of covers

A socket with a removable cover that is not secured by screws and the removal of which exposes live parts shall, together with the test equipment, be heated to a temperature of 50 ± 2°C for 1 h and shall be maintained at that temperature during the test. The test shall be conducted without a cord attached to the socket.

The base of the socket shall be held in position. A force perpendicular to the socket face shall be applied evenly to the cover over a period of 10 s, the force shall be increased steadily to 60 ± 0.6 N and held at this value for a further 10 s. This procedure shall be conducted on the same socket, three times at intervals of 5 min, without disturbing the cover between tests.

During the test period, the cover shall not separate from the base to access live parts to the standard test finger conforming to AS/NZS 3100.

2.20.13 Test for the fixing of contacts in resilient or thermoplastic sockets

A separate sample of any socket made of resilient or thermoplastic material shall be heated to a temperature of 50 ± 2°C for 1 h and shall, together with the test equipment, be maintained at that temperature during this test.

The socket shall be held firmly with no undue squeezing or distortion of the body of the socket, and the means of holding shall not assist in maintaining the terminals in their original position. Each contact, in turn, shall have applied to it a force that shall be increased steadily to 60 ± 0.6 N over a period of 10 s and held at this value for 10 min. The force shall be in the direction in which a plug pin would move during insertion.

The attachment of contacts shall be deemed non-conforming if there is a displacement of any contact of more than 2.4 mm during this test, or if any contact fails to return to its original position within 5 min of the removal of the test load. Conformance shall be assessed in accordance with depth of contact test of AS/NZS3112, Clause titled “Depth of contact”.

For sockets moulded integrally with a flexible cord, any sheathing shall be removed where it leaves the socket and the force applied to each conductor in turn.

2.20.14 Additional tests for non-rewireable sockets

Non-rewireable sockets shall be rigidly held and shall pass the additional tests on non-rewireable plug and cord sets of AS/NZS 3112. The means of holding shall extend along the body of the socket for a distance of approximately 19 mm from the face of the socket.

NOTES

Section 3 Inlet plug

3.1 General

The two-pin and three-pin inlet plugs covered in this Section are intended for use with the corresponding cord extension sockets conforming to this standard.

NOTE Inlet plugs were previously specified in AS/NZS 60320.1 as Group 2 appliance inlets.

3.2 Standard ratings

Inlet plugs have preferred ratings of 10 A, 15 A and 20 A.

3.3 Marking

Every inlet plug shall be marked with the following information in accordance with AS/NZS 3100:

- (a) The name, trade name or mark of the manufacturer, or of the responsible vendor.
- (b) The current rating, in amperes.
- (c) The voltage.
- (d) If limited by any component to use on alternating current or direct current, the inlet plug shall be marked "a.c." or "d.c." respectively.
- (e) If not the only type of inlet plug marketed by the manufacturer or by the responsible vendor, the catalogue number, type number or name, or other marking that will distinguish it from any other type of inlet plug marketed by the manufacturer or responsible vendor.
- (f) The temperature class assigned by the manufacturer, having a temperature classification above 70 °C.
- (g) Designation of degree of protection (if greater than IP2X).

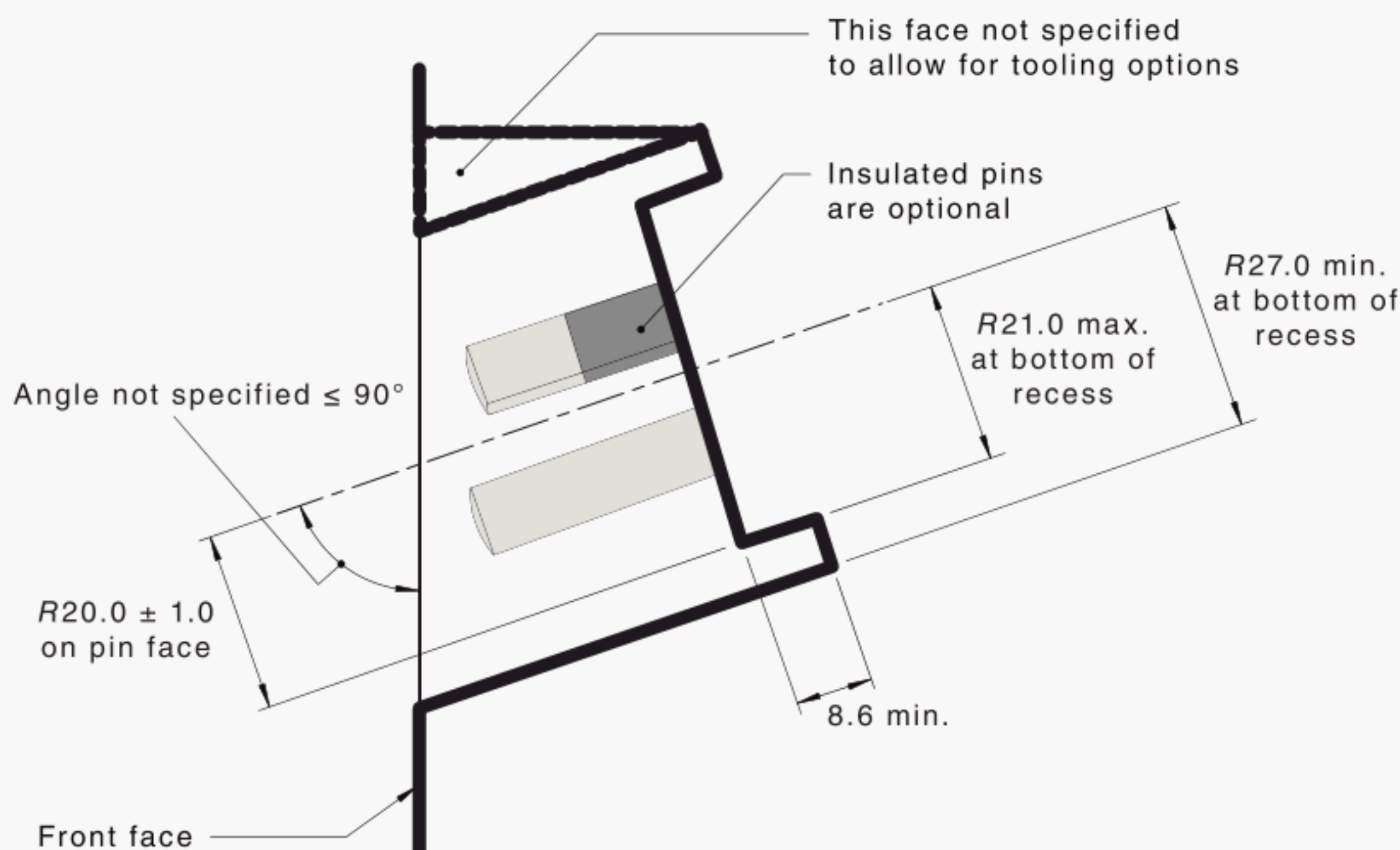
3.4 Dimensions and compatibility

Inlet plugs shall conform to the relevant requirements of AS/NZS 3112, with particular reference to dimensions of contact pins of the relevant plugs, and satisfactorily accommodate the full insertion of the corresponding cord extension socket.

All plug pins shall be below the front face of the inlet plug unless protected by a self-closing cover.

The plug pins are not required to be insulated if IP3X protection is met in accordance with [Clause 3.6](#).

In addition to the applicable dimensional requirements of AS/NZS 3112, inlet plugs shall conform to the dimension specified in [Figure 3.1](#).



NOTE Dimensions of the angled inlet plug are detailed where the angle is not specified and is less than or equal to 90°.

Figure 3.1 — Inlet plug recess details

3.5 Construction

3.5.1 Inlet plugs

Inlet plugs shall be designed so that there is no risk of accidental contact between the earthing contact pin of the inlet plug and the current-carrying contacts of the corresponding cord extension socket.

External parts accessible to the standard test finger, except for earth facilities, shall be insulated from live parts by either double insulation or reinforced insulation.

Conformance shall be checked by inspection.

Screws that fix a part to provide protection against electric shock shall be locked against loosening.

Conformance shall be checked by inspection and by test.

Pins of inlet plugs shall be retained and locked against rotation. The mechanical strength of pins shall be such that it shall not be possible to remove them without the aid of a tool. Conformance shall be checked by inspection and testing.

NOTE 1 This requirement does not exclude pins which are to some extent floating.

NOTE 2 The extent of permissible floating is not checked by measurement, but by using a gauge.

Inlet plugs shall be constructed to allow adequate finger grip on the cord extension socket for withdrawal purposes.

Conformance shall be checked by inspection and testing.

3.5.2 Terminals

Terminals shall be located or shielded so that loose wires of a conductor in the inlet plug will not present a risk of electric shock.

For rewirable inlet plugs, conformance shall be checked as follows:

- (a) A length of 6 mm of insulation shall be removed from the end of a flexible conductor, having a cross-sectional area of 0.75 mm².
- (b) One wire of the flexible conductor shall be left free and the remaining wires shall be fully inserted into and clamped in the terminal, as for normal use.
- (c) The free wire shall be bent, without tearing the insulation back, in every possible direction, but without making sharp bends around barriers.

NOTE The prohibition against making sharp bends around barriers does not imply the free wire has to be kept straight during the test. Sharp bends, moreover, are made if it is considered likely that such bends can occur during the normal assembly of the accessory, for example when a cover is pushed on.

The free wire of a conductor connected to a live terminal shall not touch any accessible metal part or be able to emerge from the enclosure when the inlet plug has been assembled.

The free wire of a conductor connected to an earthing terminal shall not touch a live part. If necessary, the test shall be repeated with the free wire in another position.

3.5.3 Mechanical strength

Inlet plugs shall be subjected to the mechanical strength test of AS/NZS 3100.

Inlet plugs with covers provided to protect protruding pins shall be tested with the covers in the open and closed position.

3.6 Parts providing protection

Parts providing protection against electric shock shall be subjected to the mechanical strength test of AS/NZS 3100. They shall be fixed in such a way that they will not work loose in normal use. It shall not be possible to remove these parts without the aid of a tool.

Inlet plugs with non-insulated pins shall be IP3X when tested with a non-shrouded cord extension socket inserted to the minimum depth required to energize the live pins.

Inlet plugs with an IP classification shall maintain that classification without a cord extension socket in position. In addition, they shall incorporate means for maintaining the degree of protection when the corresponding cord extension socket is completely engaged.

The means for achieving the required degree of protection shall be fixed to the inlet plug.

Lid springs, if any, shall be of corrosion-resistant material, such as bronze or stainless steel.

Conformance shall be checked by inspection, by measurement, and by the cover operating test specified in [Clause 3.9.4](#), determination of IP classification test specified in AS 60529, and the high voltage test specified in [Clause 3.9.3](#).

3.7 Resistance to heat

The insulating portions of an inlet plug shall consist of —

- (a) insulating materials, having properties not inferior to those of Class 60 mouldings conforming to AS/NZS 3121; or
- (b) ceramic material of a type that, after immersion in water for 48 h and after all visible drops of water have been removed from the surface by means of a clean dry cloth, shall not have increased in mass by more than 2 %.

All insulating portions, except ceramic, of an inlet plug shall conform to the requirements of [Clause 3.9.5](#) for ignitability and combustion propagation.

3.8 Screws, current-carrying parts and connections

Connections, electrical or mechanical, shall withstand the mechanical stresses occurring in normal use.

Screws and nuts that transmit contact pressure and are operated when connecting and mounting an inlet plug during installation, and/or are likely to be operated during the life of the inlet plug shall be in engagement with a metal thread.

Screws for connecting conductors shall not be tapping screws.

Conformance shall be checked by inspection, and for screws and nuts that transmit contact pressure and for screws that are operated when connecting and mounting an inlet plug during installation and/or which are likely to be operated during the life of the inlet plug, by the screw thread and fixing test specified in [Table 3.1](#).

Electrical connections shall be designed so that contact pressure is not transmitted through insulating material other than ceramic or other material with equivalent characteristics

NOTE 1 The suitability of the material is considered with regard to the stability of the dimensions.

Conformance shall be checked by inspection.

Screws and rivets that serve as electrical as well as mechanical connections shall be locked against loosening or turning.

Conformance shall be checked by inspection and manual test.

Connections between terminals and other parts shall be designed so that they will not work loose in normal use.

Conformance shall be checked by inspection and manual test.

Current-carrying parts and earthing contacts shall be of corrosion-resisting metal.

Conformance shall be checked by inspection and, if necessary, by chemical analysis.

NOTE 2 Examples of conforming metals, when used within the permissible temperature range and under normal conditions of chemical pollution, are as follows:

- (a) Copper.
- (b) An alloy containing at least 58 % copper for parts that are worked cold or at least 50 % copper for other parts.
- (c) Stainless steel containing at least 13 % chromium and not more than 0.09 % carbon.

Current-carrying parts and earthing contacts shall conform to the mechanical strength requirements of AS/NZS 3100.

Conformance shall be checked by the tests specified in Section titled "Protection against mechanical and electrical failure of AS/NZS 3100".

3.9 Tests on inlet plugs

3.9.1 General

Inlet plugs shall be subjected to the tests specified in [Table 3.1](#), carried out in the stated order, and shall conform to the requirements specified for each test.

The general test conditions specified in the Sections titled “Protection against mechanical and electrical failure”, “Protection against risk of electric shock” and “Resistance to heat fire and tracking of AS/NZS 3100” shall apply to the tests specified in [Table 3.1](#).

Table 3.1 — Inlet plugs — tests to be applied and order of application

1	2	3	4
Test No.	Description of test	Reference for test procedure and criteria ^a	Sample identification
1	General and dimensions	AS/NZS 3120 and 3112	A
2	Insulation resistance test	Clause 3.9.2	A
3	High voltage test	Clause 3.9.3	A
4	Screw threads and fixings	AS/NZS 3100	A
5	Temperature rise test	AS/NZS 3112	A
6	Pin bending test	AS/NZS 3112	BCD
6a	Securement of pins	AS/NZS 3112	E
6b	Movement of pins	AS/NZS 3112	F
7	Fixing of pins	AS/NZS 3112	G
8	Mechanical strength test	AS/NZS 3100	H
9	Cover operating test	Clause 3.9.4	H
10	Determination of ignitability and combustion propagation	Clause 3.9.5	J
10a	Tests for plugs with insulated pins	AS/NZS 3112	
10b	Pressure test at high temperature	AS/NZS 3112	Pin _a ^b
10c	Static damp heat test	AS/NZS 3112	K ^c
10d	Low temperature test	AS/NZS 3112	L ^c
10e	Impact test at low temperature	AS/NZS 3112	Pin _b ^b
10f	Abrasion test	AS/NZS 3112	KL ^c
11	Determination of IP classification	AS 60529	H
11a	High voltage test	Clause 3.9.3	H
	Total number of samples required:		
	Tests 1 to 9, 11 and 11a	9 (A, B, C, D, E, F, G, H, J)	
	Test 10	2 (R, S) plus 2 (Pin _a and Pin _b) insulated pins	
^a Clause numbers refer to this standard			
^b Pin _a and Pin _b are samples of separate insulated pins only			
^c The manufacturer may indicate that K and L are the same sample			

3.9.2 Insulation resistance test

The insulation resistance of an inlet plug shall be measured at a voltage of 500 V d.c. with the inlet plug fitted with the corresponding cord extension socket, as follows:

- Between live terminals of the inlet plug, the cord extension socket terminals being open-circuited.
- Between live terminals of the inlet plug and any external metal, the live terminals of the cord extension socket being connected together.

- (c) Between live terminals of the inlet plug and the earthing terminal (if any), the live terminals of the cord extension socket being connected together.
- (d) Between live terminals of the inlet plug and a flexible electrode applied to non-conducting parts handled in service.

The insulation resistance so measured shall be not less than 50 MΩ.

3.9.3 High voltage test

The inlet plug shall withstand without failure an a.c. voltage of the value indicated in [Table 2.3](#), applied between the parts set out in Items (a) and (c) of [Clause 3.9.2](#) for 1 min in each case. The inlet plug shall be fitted with the corresponding cord extension socket during the test.

The inlet plug shall also withstand without failure a voltage of 3500 V a.c. applied between the parts set out in Items (b) and (d) of [Clause 3.9.2](#) for 1 min in each case.

There shall be no arcing or other failure during these tests.

3.9.4 Cover operating test

Covers shall be tested by completely opening and closing the lid 100 times.

For inlet plugs with covers provided to protect protruding pins, the covers shall be tested by completely opening and closing the lid 1 000 times.

Any latching mechanism shall be rendered inoperative for the cover operating test and made operational prior to any IP determination test.

At the conclusion of the test, the cover shall still be capable of functioning in the normal manner including the IP determination test. (See [Table 3.1](#).)

3.9.5 Determination of ignitability and combustion propagation

Plugs shall conform to the resistance to fire requirements of the AS/NZS 3100 Annex titled "Requirements from the 1994 edition", Section titled "Protection against heat and fire". The glow-wire test temperature "T" shall be 750 °C.

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