

## **AS/NZS 3112:2004**

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-004, Electrical Accessories. It was approved on behalf of the Council of Standards Australia on 24 November 2004 and on behalf of the Council of Standards New Zealand on 3 December 2004.  
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## Australian/New Zealand Standard™

### Approval and test specification—Plugs and socket-outlets

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### 2.13.7 Mechanical strength of pin tests

#### 2.13.7.1 Tumbling barrel test

Three plugs, not subjected to any previous tests, are tested in a tumbling barrel as described in AS 60068.2.32. Rewireable plugs are 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 plug.

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

Non-rewireable plugs are tested with the flexible cord as delivered, the cord being cut so that a free length of approximately 100 mm projects from the outer end of the guard or the plug (if any).

The samples are dropped from a height of 500 mm onto a steel plate, 3 mm thick. After each 100 drops the pins are inspected and straightened to pass through the gauge of Figure A1 or F1. The total number of falls shall be 1000.

The barrel is turned at a rate of 5 r/min, to yield 10 falls per minute. Only one sample is tested at a time.

After the test, the sample shall show no damage within the meaning of this Standard. In particular the following shall apply:

- (a) Live parts shall not have become exposed to the standard test finger.
- (b) For earth pins, the resistance of the plug/socket-outlet circuit shall be such that compliance with Clause 3.14.7 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 2.9).
- (e) The pins shall be inspected with normal, or corrected to normal, vision. Insulation may be removed if necessary. Pins shall not be broken or show cracking.

#### NOTES:

- 1 Special attention is 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.
- 2 Slight damage to the finish and small dents are neglected.
- 3 The specified free length of flexible cord of 100 mm may be reduced if the overall length of the plug and flexible cord approaches the width of the tumbling barrel test apparatus.
- 4 Tests to ascertain compliance with Items (a), (b) and (c) are conducted only in case of doubt.
- 5 Minor damage to plug pins is ignored.

#### 2.13.7.2 Pin bending test

All flat-pins of plugs rated up to and including 15 A shall be subjected to a pin bending test.

Three sample plugs not subjected to any previous tests shall be tested as follows:

Pins of assembled plugs shall be tested by clamping the plug in a rigid holding block and applying a bending force, as shown in Figure 2.8, to the pin under test.

The pins shall be straight at the beginning of the test. If there is any doubt about the straightness of the pin, it shall be checked by the appropriate plug gauge shown in Appendices A, B or F.

The point of application of the force shall be  $14 \pm 0.5$  mm from the face of the plug.

The direction of the force shall be along a line parallel to the face of the plug.

Active and neutral pins shall be forced towards the centroid of the plug and then back to the starting point. Any earth pin shall be forced but in one direction only and then back to the starting point

NOTE: This is intended to simulate damage that may occur when a plug is walked on and bent pins are straightened.

The distance moved from the point of application shall be  $7.5 \pm 0.3$  mm, and then the pin shall be forced back to the starting point. Any 'spring-back' is ignored.

NOTE: 'Spring-back' means that the pin is allowed to move back to a position less than the travel distance, when the force is removed.

The travel from the starting point, to the end point (7.5 mm), and back to the starting point is one cycle (i.e. one cycle is two separate movements).

The speed of deflections shall be a maximum of 50 mm/s, without intentional delay between consecutive movements within each cycle.

The interval between successive cycles shall be a minimum of 10 s.

The duration of one cycle shall be a maximum of 60 s.

The pins shall be tested for 20 complete cycles.

After the tests the pins shall be inspected with normal or corrected to normal vision.

The pin shall not be broken off.

NOTE: Cracking of the pin, less than full thickness, is not deemed to be broken off.

If in doubt pins shall be disassembled from the plug and any insulation removed.

NOTE: In some cases the break may be below the face of the plug or the insulation may hold the broken pieces together, retaining electrical contact.

#### **2.13.8 Temperature rise test**

Plugs shall be so constructed that they comply with the following temperature rise test:

- (a) Non-rewireable plugs are tested as delivered (specially prepared sample with access to terminals for temperature measurement).
- (b) Rewireable plugs are fitted with polyvinyl chloride flexible cords with conductors having the minimum cross-sectional area specified in the manufacturers instructions.

The terminal screws or nuts are tightened with a torque equal to two-thirds of that specified in test No. 5.

NOTE: To ensure normal cooling of the terminals, the conductors connected to plugs should have a length of at least 1 m.

The test socket shall consist of a fixed socket outlet of a type complying with this Standard.

NOTE: In the case of a dispute, the test should be repeated using a new socket outlet.

The fixed socket outlet shall be mounted in an appropriate metal-wall box installed in a draught free position, and fitted with PVC insulated conductors at least 2.5 m long, having nominal cross-sectional areas as shown in Table 3.4.

The cables supplying the socket outlet shall be enclosed for a distance of 1 m in conduit terminated at the wall box.

The plug is inserted into the socket outlet and an alternating current of 1.1 times rated current is passed for 1 h.

The temperature of the flexible cord terminal is determined by means of melting particles, colour changing indicators or thermocouples, so chosen and positioned that they have negligible effect on the temperature being determined.

The temperature rise of the terminals shall not exceed 45 K.

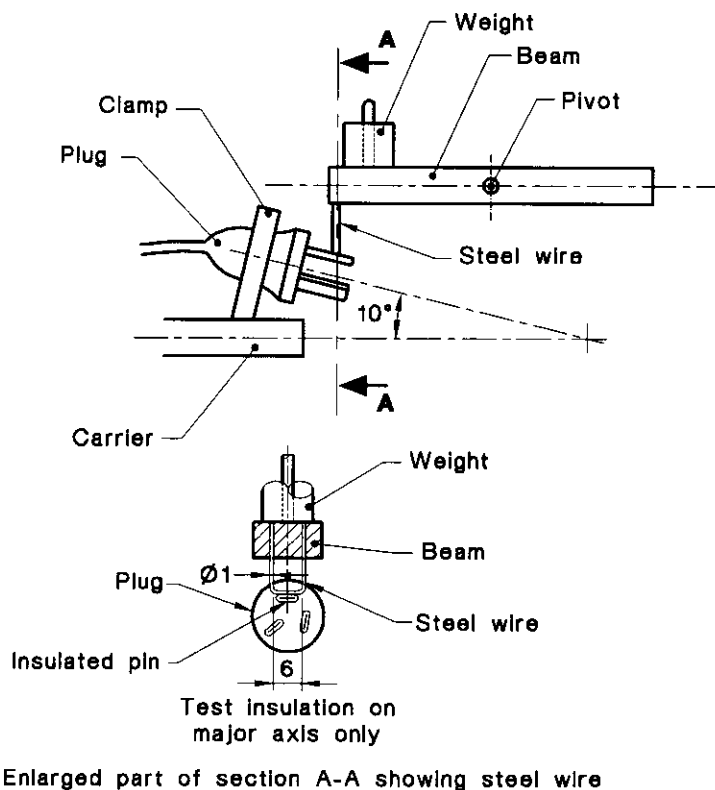


FIGURE 2.7 ABRASION TEST APPARATUS FOR INSULATION ON INSULATED PIN PLUGS

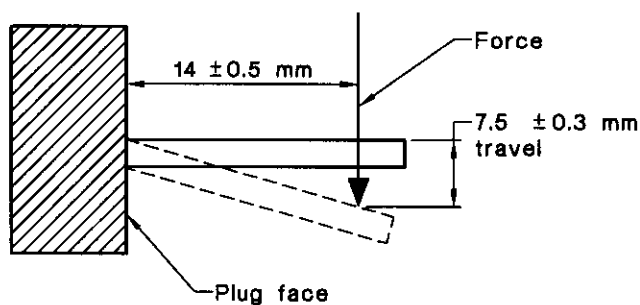


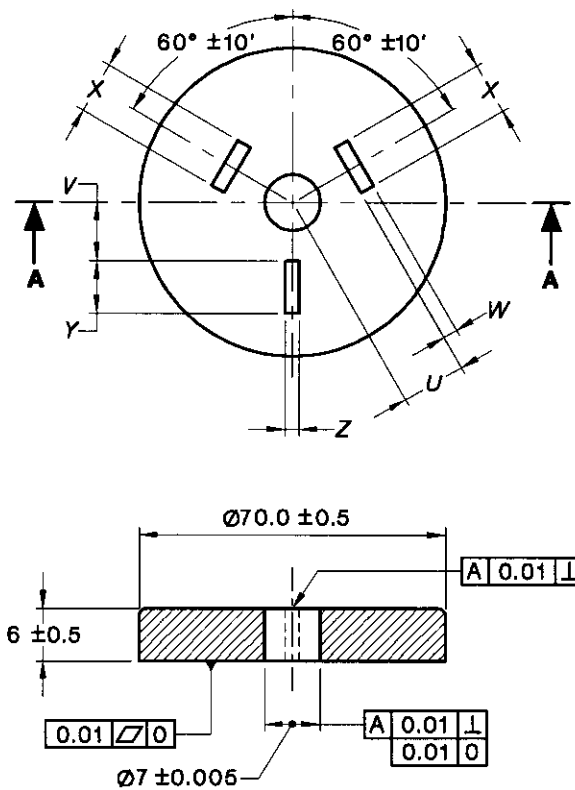
FIGURE 2.8 APPLICATION OF FORCE FOR PIN BENDING TEST

APPENDIX A  
GAUGE FOR THREE-PIN FLAT-PIN PLUGS

(Normative)

The disposition of pins of flat-pin plugs of the types shown in Figure 2.1(a) and Figure 2.1(c) shall be checked by means of the appropriate gauge complying with Figure A1.

The plug pins shall pass easily through the gauge at all depths of insertion.



SECTION A-A

Dimension	10 A	15 A	20 A	Tolerance
U	6.83	6.83	6.05	±0.03
V	6.96	5.59	7.16	±0.03
W*	2.18	2.18	2.18	±0.03
X	7.09	7.09	9.80	±0.03
Y	6.71	9.42	9.42	±0.03
Z	1.93	1.93	1.93	±0.03

\* Applies to both live pins.

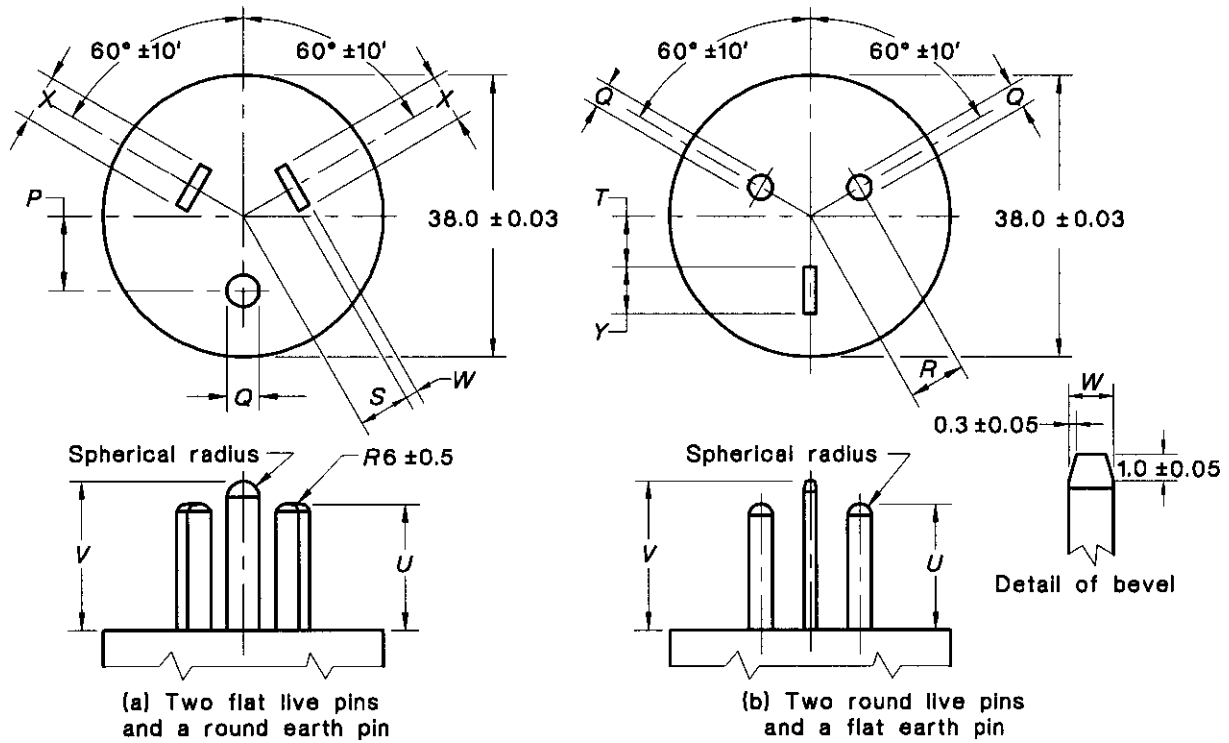
DIMENSIONS IN MILLIMETRES

FIGURE A1 GAUGE FOR THREE-PIN 250 V MAX FLAT-PIN PLUGS

APPENDIX G

THREE-PIN TEST PLUG WITH FLAT AND ROUND PINS FOR THE FULL-INSERTION TEST AND THE FINGER TEST DURING NORMAL INSERTION TEST

(Normative)



Dimension	10 A and below	Tolerance
P	10.31	nominal†
Q	4.80	±0.01
R	7.92	nominal†
S	7.05	±0.03
T	7.07	±0.03
U	17.46	±0.03
V	20.64	±0.03
W*	1.75	±0.03
X	6.50	±0.03
Y	6.50	±0.03

\* Applies to both live pins.

† Dimensions without tolerances are nominal and are to be checked in samples by application of the gauge specified in Appendix F, as appropriate.

DIMENSIONS IN MILLIMETRES

FIGURE G1 THREE-PIN TEST PLUG WITH FLAT AND ROUND PINS FOR TESTS TO CLAUSES 3.3.4 AND 3.8.1