COMMITTEE: EL-002 Safety of Household and Similar Electrical Appliances and Small Power Transformers

DR 25041



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DR 25041



Approval and test specification -

Hand-held portable electric tools





DRAFT FOR COMMENT STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Committee EL-002, Safety of household and similar electrical appliances and small power transformers

DRAFT Australian/New Zealand Standard

DR 3160:202x

Approval and test specification -

Hand-held portable electric tools

NOTE OF THE SECRETARY:

Comment on the proposal is invited from persons and organisations concerned with this subject.

Attention is drawn to the fact that this document is a draft only and is liable to alteration in the light of comment received. It is not to be regarded as an Australian/New Zealand standard until finally issued as such by Standards Australia and Standards New Zealand.

In particular, commentators are asked to state if the standard is still needed after 29 November 2027, after which date the safety requirements for all hand-held portable electric tools will be covered by the AS/NZS 62841 series Parts 2. If no response is given to this question, it will be assumed that the standard is no longer needed and AS/NZS 3160:2009 and its amendments will be withdrawn on 29 November 2027.



Approval and test specification – Hand-held portable electric tools



DR AS/NZS 3160:202x

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.* It was approved on behalf of Standards Australia's Standards Development and Accreditation Committee on xxxxxxx and by the New Zealand Standards Approvals Board on xxxxxxx. It was published on xxxxxxx.

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We also welcome suggestions for improvement in our standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comment to either the Chief Executive of Standards Australia or the New Zealand Standards Executive at the address shown on the title page.

This standard was issued in draft form for comment as DR 25041.

DR 3160:202x

Australian/New Zealand Standard

Approval and test specification -

Hand-held portable electric tools

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PREFACE

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 3160:2009 and its amendments on 29 November 2027.

This Standard is one of a series of Approval and Test Specifications issued by Standards Australia and Standards New Zealand. These Standards are to be read in conjunction with AS/NZS 3100, *Approval and test specification – General requirements for electrical equipment.* The objective of these Standards is to outline the conditions which must be met to secure approval for the sale and use of electrical equipment. Only safety matters and related conditions are covered.

The term 'normative' has been used in this Standard to define the application of the appendix to which it applies. A 'normative' appendix is an integral part of a Standard.

This Standard was revised to delete the text relating to all tools that are now covered by other standards such as those in the AS/NZS 60745 series and the AS/NZS 62841 series Parts 2. These changes affect clauses, 11.2, 17.2 and Appendix B. Consequential editorial changes have also been incorporated.

		Page
1	SCOPE	5
2	APPLICATION	5
	2.1 General requirements of AS/NZS 3100	5
	2.2 Specific requirements of this Standard	5
	2.3 Requirements of other Standards	5
3	REFERENCED DOCUMENTS	5
4	DEFINITIONS	6
5	MECHANICAL GUARDING	7
6	MEANS OF CONNECTION	7
7	FLEXIBLE CORD AND CONNECTING PLUG	7
	7.1 Details of supply flexible cord	7
	7.2 Protection of supply flexible cord	7
8	CORD ANCHORAGE	7
9	TYPE OF INSULATION	7
10	TOOLS WITH EARTHING FACILITIES (CLASS I TOOLS)	8
11	TOOLS WITH DOUBLE INSULATION (CLASS II TOOLS AND TOOLS WITH CLASS II CONSTRUCTION)	8
	11.1 General	8
	11.2 Tools designed for use with a liquid distribution accessory	8
12	EQUIPMENT WIRING	9
13	BRUSH CAPS	9
14	PROTECTION AGAINST DAMAGE	9
15	MATERIAL OF ENCLOSING CASE	
16	SWITCHES AND SPEED CONTROL DEVICES	
17	MARKING	
	17.1 General	
18	TESTS	11
	18.1 General	
	18.2 Conditioning	11
	18.3 Rating	12
	18.4 Temperature test	12
	18.5 Test of switch or speed control device	12
	18.6 Mechanical strength test	13
	18.7 Resistance to heat fire and tracking	13
	18.8 Atomized spray test	13

CONTENTS

APPENDIX A (normative)	DIMENSIONS OF TEST PIN	15
APPENDIX B (normative)	TEST LOAD CONDITIONS	16

TABLE 1 - TESTS TO BE APPLIED AND ORDER OF APPLICATION	11
TABLE 2 - MAXIMUM PERMISSIBLE DEVIATION FROM RATED INPUT	12

FIGURE 1 - ATOMIZED SPRAY NOZZLE	14
FIGURE 2 - ATOMIZED SPRAY PATTERN	14

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

AUSTRALIAN/NEW ZEALAND STANDARD

Approval and test specification – Hand-held portable electric tools

1 SCOPE

This Standard applies to hand-held portable electric tools as defined in Clause 4.1, which are intended for electrical operation at low voltage operating at not more than 60 Hz.

For the purpose of this Standard, a hand-held portable electric tool is called a 'tool' except where such term is associated with an implement required to remove covers, brush caps and the like which guard live parts.

This Standard does not deal with separate motors with or without capacitors, or with tools covered by separate Standards, or with equipment intended for the control of electric motors other than equipment which is built into the tool.

This standard does not apply to hand-held motor-operated electric tools within the scope of the AS/NZS 60745 series of standards or the AS/NZS 62841 series of standards after the dates specified in the parts 2 of those series.

2 APPLICATION

2.1 General requirements of AS/NZS 3100

This Standard shall be read in conjunction with AS/NZS 3100, and the appropriate provisions of that Standard shall apply to the construction of the tool and the insulation and safeguarding of parts which normally carry current.

2.2 Specific requirements of this Standard

A tool shall be deemed to comply with this Standard only if it complies with all the appropriate provisions of this Standard and passes the relevant tests specified herein.

2.3 Requirements of other Standards

Components incorporated in a tool, upon which safety depends, shall comply with the appropriate requirements of any relevant approval and test specification unless such requirements are varied herein.

3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

NOTE: Where no relevant New Zealand Standard is listed, the referenced Australian Standard is deemed to be appropriate for the purpose of this Standard.

STANDARDS

AS

60529 Degrees of protection provided by enclosures (IP code)

AS/NZS

- 60320.1 Appliance couplers for household and similar general purposes Part 1: General requirements
- 61558.2.4 Safety of transformers, reactors, power supply units and combinations thereof -Part 2.4: Particular requirements and tests for isolating transformers and power supply units incorporating isolating transformers for general applications

APPROVAL AND TEST SPECIFICATIONS

AS/NZS

- 3100 General requirements for electrical equipment
- 3112 Plugs and socket-outlets
- 3121 Insulating mouldings
- 3191 Electric flexible cords
- 3190 Residual current devices (current-operated earth-leakage devices)

4 DEFINITIONS

For the purposes of this Standard, the definitions below apply.

4.1

hand-held portable electric tool

an electric hand tool incorporating an electric motor, vibrator, solenoid or the like, and which is intended to be supported or guided by the operator

4.2

normal load

denotes the load to be applied to a tool so that the stress imposed corresponds to that occurring under normal conditions of use, any marking of short-time or intermittent operation being observed and unless otherwise specified, heating elements, if any, being operated as in normal use

NOTE 1 The normal load is based on the rated voltage or on the upper limit of the rated voltage range.

4.3

rated input

denotes the input under conditions of normal load and at normal operating temperature assigned to the appliance by the maker

5 MECHANICAL GUARDING

Moving parts of any tool shall, as far as is compatible with the normal use and working of the appliance, be so arranged or enclosed as to provide adequate protection against personal injury.

Protective enclosures, guards and the like shall have adequate mechanical strength. They shall not be removable without the use of a tool, unless their removal is necessary in normal use.

Where a particularly hazardous tool cannot be provided with effective mechanical guarding, other safeguards shall be provided to prevent inadvertent operation, such as---

- (a) two switches; or
- (b) one switch and an interlock.

These shall require sequential operation before the tool will operate.

6 MEANS OF CONNECTION

Facilities for the connection of the supply flexible cord shall be in accordance with the relevant requirements of Clauses 4.3 and 4.5 of AS/NZS 3100. Type Y and Type Z attachments may be provided subject to the conditions of Clause 4.5.1, Items (i) and (ii), of AS/NZS 3100.

7 FLEXIBLE CORD AND CONNECTING PLUG

7.1 Details of supply flexible cord

Where required by Clause 4.4 of AS/NZS 3100, the tools shall be supplied with a supply flexible cord complying with AS/NZS 3191, fitted with a connecting plug.

Such a supply flexible cord shall not have a natural rubber sheath for tools which may frequently come into contact with oil and grease.

7.2 Protection of supply flexible cord

Provision shall be made for the prevention of sharp bending or mechanical damage to the supply flexible cord where it enters any part of the tool. Where the protection is in the form of a sleeve, it shall be securely held in position, and for a Type X attachment, shall not be an integral part of the supply flexible cord.

8 CORD ANCHORAGE

Anchorage of the supply flexible cord shall comply with the appropriate requirements of AS/NZS 3100, with the additional requirement that the device shall provide anchorage for the complete flexible cord within its sheathing.

9 TYPE OF INSULATION

Tools may have basic insulation with any exposed metal parts earthed (see Clause 10) or may be of double insulated construction (see Clause 11).

10 TOOLS WITH EARTHING FACILITIES (CLASS I TOOLS)

Where a tool is not provided with double insulation, (see Clauses 9 and 11), all exposed metal parts shall be in effective electrical contact with an earthing terminal. The earth and the supply terminal shall be so constructed and located that, when the tool is completely assembled and correctly wired

- (a) no live conductor, which has become detached from its terminal, can make contact with the earthing terminal or any metal bonded thereto;
- (b) no earthing conductor, which has become detached from its terminal, can make contact with live parts; and
- (c) no terminal screw, which has become loose or detached, can bridge between live parts, or between any live part and the earthing terminal or any metal bonded thereto.

11 TOOLS WITH DOUBLE INSULATION (CLASS II TOOLS AND TOOLS WITH CLASS II CONSTRUCTION)

11.1 General

Any tool or component provided with double insulation shall comply with the appropriate requirements of AS/NZS 3100.

Any openings in the body of the tool shall be so designed and located as to

- (a) prevent the entry of any cuttings of a particle size so that the effectiveness of any insulation provided for the safety of the operator is reduced; and
- (b) not permit live parts or basic internal insulation to be touched by the test pin shown in Appendix A.

11.2 Tools designed for use with a liquid distribution accessory

11.2.1 General

Tools designed for use with a liquid distribution accessory shall satisfy the requirements of either 11.2.2 and, 11.2.3 or 11.2.4, and 11.2.5. In addition, they shall be either class I tools or class II tools. Parts of class I tools that in normal use are continuously in direct contact with the hand, shall be of class II construction.

NOTE Chucks and gear box assemblies are not considered to be continuously in direct contact with the hand during normal use.

11.2.2 Opening in body

Any openings in the body of the tool shall be so designed and located as to prevent live parts or basic internal insulation being touched by the test pin shown in Appendix A.

11.2.3 Residual current devices

Class I tools shall be fitted with a residual current device having a rated residual current not exceeding 30 mA which complies with AS/NZS 3190. Class II tools shall be fitted with a residual current device having a rated residual current not exceeding 30 mA which complies with AS/NZS 3190 or shall comply with the atomized spray test of Clause 18.8.

In Australia residual current devices shall be at least Type A as defined in AS/NZS 3190. In New Zealand residual current devices shall be Type FS and Type A as defined in AS/NZS 3190.

The residual current device shall be fitted

- (a) in the supply plug; or
- (b) in the power supply cord.

Where fitted in the supply cord the residual current device shall

- (i) comply with classification IPX4 in AS 60529 and be located within a distance of 0.5 m from the supply plug; and
- (ii) be provided with Type Y or Type Z attachment for connection with the supply cord and interconnecting cord.

When tools are tested in accordance with Clause 18.8

- (A) the tools shall not allow test liquid to bridge basic insulation; and
- (B) the leakage current when measured in accordance with Clause 8.3.2 of AS/NZS 3100 shall not exceed 0.1 mA.

11.2.4 Isolating transformer

A tool which is not tested to, or does not satisfy the requirements of Clause 11.2.3, shall be used with a suitable isolating transformer. The transformer shall comply with AS/NZS 61558.2.4 and have an enclosure complying with classification IPX4 of AS 60529.

In addition, the tool shall be marked 'Use only with an isolating transformer of "xxx" rating'. It shall also be supplied with literature giving details of the transformer.

11.2.5 Means of connection

The tools shall be fitted with a Type Y or Type Z attachment and a heavy duty flexible cord with a minimum length of 3 m. The flexible cord connected to the transformer shall be terminated in a connector not of a type similar to those described in Figure 2.1 of AS/NZS 3112 or standard sheets C1 to C24 of AS/NZS 60320.1 or shall be permanently connected to the transformer. The transformer supply cord shall not be inferior to an ordinary duty, sheathed flexible cord.

NOTE The length of the supply cord includes the length of the interconnecting cord between the tool and any residual current device.

12 EQUIPMENT WIRING

Equipment wiring shall comply with the appropriate requirements of AS/NZS 3100.

13 BRUSH CAPS

Brush caps which are accessible from the outside of the tool shall be effectively covered with robust insulating material not less than 1.4 mm thick. Such brush caps shall be protected against mechanical damage by virtue of their design or by recessing below the external body surface or by other appropriate means. Brush caps shall not be removable except with a tool.

NOTE The thickness of insulating material on brush caps depends largely on the type of material used. Brittle materials such as phenol formaldehyde should be substantially thicker than those having more elastic properties.

14 PROTECTION AGAINST DAMAGE

The tool shall be designed and constructed so that, under conditions likely to arise in normal use, all component parts are effectively protected against mechanical damage and against the ingress of metal cuttings or other material likely to cause danger in normal use.

15 MATERIAL OF ENCLOSING CASE

The enclosing case shall be of robust construction and of adequate mechanical strength. Insulating mouldings used in the construction of the enclosing case shall be not inferior to Class 80 mouldings complying with AS/NZS 3121.

16 SWITCHES AND SPEED CONTROL DEVICES

Every tool shall be provided with a Category 2 switch or with a speed control device which incorporates a Category 2 switch and complies with the following additional requirements:

- (a) The switch or speed control device shall be located so that the creepage distance over the surface insulation or air gap between live parts and exposed metal shall be not less than 4 mm. A lining of suitable insulating material will be required if adequate clearance is not provided. Such lining shall be securely located in position.
- (b) The switch or speed control device shall be located or shrouded so as to prevent accidental damage due to normal handling, and so constructed as to minimize the ingress of fine conductive grit and dust.
- (c) The switch or speed control device shall comply with Clause 18.5.

Overload protection devices incorporated in hand-held motor-operated electric tools shall be of the non-self-resetting type.

Electronic speed and load regulators that interrupt the operation of the tool and that allow automatic resumption of the operation of the tool within 2 s are not considered to be overload protection devices.

17 MARKING

17.1 General

Every tool shall be marked in a legible and indelible manner with the following particulars:

- (a) The name or registered trade name or mark of the manufacturer or responsible vendor, or of the applicant for approval.
- (b) Rated voltage.
- (c) Rated input in watts or kilowatts, or rated current in amperes (no input marking is required if the input is less than 25 W).
- (d) If the use of the tool is limited to either alternating or direct current, it shall be marked 'alternating current' or 'a.c.' or '~' or 'direct current' or 'd.c.', as appropriate.
- (e) The frequency, if limited by the design of any component of the tool. The presence of marking which indicates the frequency of the supply voltage shall render the marking 'alternating current' or 'a.c.' or '~' unnecessary.
- (f) If more than one type of tool is marketed by the manufacturer or applicant for approval, each type shall be marked with a catalogue number, or type number, or name which will distinguish it from any other type marketed by that manufacturer or applicant for approval.
- (g) The intended operating position if applicable.
- (h) Rated operating time, or rated operating time and rated resting time, in hours, minutes or seconds, if applicable.

NOTE 1 See Clause 11.2 and Clause 18.2 for additional marking requirements for individual tools.

NOTE 2 Marking required under Items (b), (c), (d), (e), (f), (g) and (h) shall be grouped together either on the tool or on a nameplate securely attached thereto.

If a tool is suitable for use only in a particular operating position, literature shall be provided to advise of any limitations and graphically show the intended operating position.

For tools intended to be used with liquids, the literature shall include information as to whether the liquid supply to the tool is by gravity feed or water mains pressure, and the maximum flow rate, in litres per minute, shall be specified.

18 TESTS

18.1 General

The tool shall be subjected to and pass the tests prescribed in Table 1, with such tests being carried out in the order stated. The general conditions specified in Clause 8.1 of AS/NZS 3100 shall be observed in the testing of the tool. Temperature limits specified herein shall be based on a reference ambient of 25°C.

Test No.	Description of test	Clause reference for test procedure and criteria
1	Conditioning	18.2 herein
2	Insulation resistance test	8.3.1 of S/NZS 3100
3	High voltage test	8.4 of AS/NZS 3100
4	Test of earthing connection	8.5 of AS/NZS 3100
5	Test of cord anchorage	8.6 of AS/NZS 3100
6	Test of screw threads and fixings	8.7 of AS/NZS 3100
7*	Rating	18.3 herein
8*	Temperature test	18.4 herein
9†	Leakage current	8.3.2 of S/NZS 3100
10‡	High voltage test	8.4 of AS/NZS 3100
11‡	Insulation resistance test	8.3.1 of S/NZS 3100
12	Test of switch or speed control device	18.5 herein
13	Mechanical strength test	18.6 herein
14	Resistance to heat fire and tracking	18.7 herein
15	Atomized spray test (where applicable)	18.8 herein

TABLE 1 - TESTS TO BE APPLIED AND ORDER OF APPLICATION

* See Appendix B for details of test loads.

† These test may be conducted in conjunction with the test specified in Clause 18.4.

‡ Attention is drawn to Clause 18.4 which requires that Test Nos. 10 and 11 be carried out immediately after Test No. 8, while the equipment under test is still hot.

18.2 Conditioning

The tool shall be conditioned in a humidity cabinet containing air with a relative humidity of $93 \pm 3\%$ and temperature of 25 ± 2 °C. The tool shall be kept in the cabinet

(a) for tools not marked with a degree of protection 48 h; and

(b) for tools marked with a degree of protection designated IPX1 to IPX8 in AS 60529 168 h.

18.3 Rating

If the current rating exceeds 1 A, the test current determined in accordance with Appendix B shall not exceed the rated current by more than 10%. For the purpose of this test, any control device shall be set in the position giving maximum load.

Where the normal load specified in Appendix B is not equivalent to the rated input, the measured deviation shall not exceed the value specified in Table 2.

Rated input	Deviation
w	
≤ 33.3	+ 10 W
> 33.3 ≤ 150	+ 30 %
> 150 ≤ 300	+ 45 W
> 300	+ 15 %

TABLE 2 – MAXIMUM PERMISSIBLE DEVIATION FROM RATED INPUT

18.4 Temperature test

The tool shall be operated at the test load as specified in Appendix B with any speed control set to the maximum speed position, and the temperature of materials and insulation shall be measured during such operation.

The measured temperatures shall not exceed the limiting temperatures specified in Clause 8.12 of AS/NZS 3100 for the particular item concerned.

The temperature of windings shall be measured by the increase of resistance method. Immediately after this test, Test Nos. 10 and 11 shall be carried out while the equipment under test is still hot.

18.5 Test of switch or speed control device

Any switch or speed control device shall comply with Clause 16. The switch or device shall be tested at rated voltage, the current being that determined under the test load conditions of Appendix B.

The switch or speed control device, unless so arranged that it cannot be operated to break the locked rotor current, shall then be subjected to 50 cycles of operation making and breaking the locked rotor current of the tool. A separate sample of the switch or speed control device may be used for this part of the test. The following test conditions shall apply:

- (a) The switch or speed control device may be tested in the tool with the rotor locked or in an external circuit which gives the same circuit characteristics such as current, power factor, resistance, inductance and the like.
- (b) Switches or speed control devices in appliances not marked with a type of current or marked for use with a.c. or d.c. shall be tested with whichever type of current is deemed to be most arduous.
- (c) Switches or speed control devices marked for use with a.c. or d.c. shall be tested with the type of current as marked.
- (d) The rate of operation shall be such that there is no undue temperature rise of contacts or of the tool and in any case a period of make shall be not more than 2 s with at least 1 min between each operation.

During the test, any exposed metal parts of the tool shall be earthed.

The switch or speed control device shall not fail to interrupt the current, nor fail in any way electrically or mechanically.

18.6 Mechanical strength test

Tools shall be tested according to their mass as follows:

(a) Tools having a mass not exceeding 7 kg

The tool shall be released from a clamp, so as to fall freely through a distance of 750 mm onto a steel plate not less than 5 mm thick, supported on a concrete surface. The steel plate shall have a surface area not less than the projected area of the tool when supported in the clamp.

(b) Tools of a mass greater than 7 kg

The tool shall be so placed that, when supporting its own mass and allowed to fall freely, in the most unfavourable attitude, to the horizontal position onto a steel plate not less than 5 mm thick, supported on a concrete surface.

The test shall be performed once. On completion of this test, the external body of the tool shall not be damaged to such an extent as will permit the standard test finger to contact live parts.

18.7 Resistance to heat fire and tracking

This test shall be carried out in accordance with the provisions of Section 6 AS/NZS 3100. For the purposes of the tests of Clause 6.3, appliances are considered to be attended.

18.8 Atomized spray test

The tool shall be placed on a flat metal plate having dimensions of at least 0.6 m \times 0.6 m with the operating head of the tool close to one edge and the cutter set to the maximum depth of cut.

The spray nozzle shall be set up as shown in Figure 1. The nozzle shall internally mix the air and liquid at the pressure specified to produce an atomized mist of a vertical flat spray pattern of dimensions not less than shown in Figure 2. Additionally, the nozzle shall supply 5.4 l/h of liquid when operated at the specified 140 kPa liquid pressure and 260 kPa air pressure.

The discharge density over the object test area shall be directly proportional to the discharge rate over the complete spray pattern area.

The test liquid shall be water containing approximately 1% sodium chloride and a soluble dye to give a distinct indication of the liquid's presence.

The tool shall be energized and operated under no-load conditions for 15 min and the leakage current shall then be measured.

The tool shall again be energized and operated under no-load conditions and the compressed air and water supply turned on and stabilized at the specified pressures. The tool shall be run for 30 min and turned off immediately before turning off the air and water supplies. The leakage current shall again be measured.

The tool shall be immediately but carefully dismantled to check compliance with Clause 11.2.3, Item (A).



DIMENSIONS IN MILLIMETRES

FIGURE 2 – ATOMIZED SPRAY PATTERN

APPENDIX A

(Normative)

DIMENSIONS OF TEST PIN



DIMENSIONS IN MILLIMETRES

APPENDIX B (Normative)

TEST LOAD CONDITIONS

B1 GENERAL REQUIREMENTS

B1.1 Voltage

The applied voltage for the test shall be in accordance with Clause 8.1 of AS/NZS 3100.

B1.2 Frequency

For tools intended for use on a.c., the test shall be conducted at the rated frequency or frequencies.

B1.3 Operating conditions

The tool is operated in still air under normal load, or under the torque load necessary to attain rated input or under the loading conditions as specified in the following Paragraphs appropriate to the type of tool.

The torque is kept constant at the value recorded when operating at rated voltage.

When applying the torque load necessary to attain rated input, the operating time to be chosen is that specified for normal load.

The tool is operated

- (a) for the rated operating time for tools for short-time operation;
- (b) on consecutive cycles of operation, until steady conditions are established, for tools for intermittent operation, the 'on' and 'off' periods being the rated 'on' and 'off' periods; or
- (c) until steady conditions are established for tools for continuous operation.

B2 MOTOR-DRIVEN TOOLS – SERIES TYPE SPEED CHARACTERISTICS

Where the speed varies inversely with the load, the test shall be carried out with the tool in the normal operating position and with all covers in place.

The motor shall be operated for a period of 20 min or at the marked duty cycle with the speed adjusted to give the test current *I* as follows:

$$I = \frac{I_1 + I_2}{2}$$

where

- l_1 = the current input expressed in amperes when the tool is run without load
- I_2 = the current input, in amperes, marked on the nameplate or the current taken when the tool is loaded to produce approximately 65% of the no-load speed, whichever is the greater.

 I_1 and I_2 are steady state values.

B3 MOTOR-DRIVEN TOOLS – NON-SERIES TYPE SPEED CHARACTERISTICS

For non-series type speed characteristics, the test load of the tool shall be determined to ensure the tests are conducted under the most unfavourable combination of parameters that may affect compliance with requirements of this standard (for example: ambient operating temperatures, orientation of tool, operating mode, rated operating time, adjustments of controls/settings, marked ratings) having regard to any markings or operating instructions on the tool.

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The first national standards organisation was created in New Zealand in 1932. The New Zealand Standards Executive is established under the Standards and Accreditation Act 2015 and is the national body responsible for the production of standards.

Australian/New Zealand Standards

Under a Memorandum of Understanding between Standards Australia and Standards New Zealand, Australian/New Zealand standards are prepared by committees of experts from industry, governments, consumers, and other sectors. The requirements or recommendations contained in published standards are a consensus of the views of representative interests and also take account of comments received from other sources. They reflect the latest scientific and industry experience. Australian/New Zealand standards are kept under continuous review after publication and are updated regularly to take account of changing technology.

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Standards Australia and Standards New Zealand are responsible for ensuring that the Australian and New Zealand viewpoints are considered in the formulation of international standards and that the latest international experience is incorporated in national and joint standards. This role is vital in assisting local industry to compete in international markets. Both organisations are the national members of ISO (the International Organization for Standardization) and provide the secretariat to their respective national committees of the IEC (the International Electrotechnical Commission).

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