

AS/NZS 2007.1:2021
(Incorporating Amendment No. 1)



Australian/New Zealand Standard™

Performance of household electrical appliances — Dishwashers

Part 1: Methods for measuring performance, energy and water consumption



AS/NZS 2007.1:2021

This Joint Australian/New Zealand Standard™ was prepared by Joint Technical Committee EL-059, Dishwashers, Clothes Washers and Dryers. It was approved on behalf of the Council of Standards Australia on 24 November 2020 and by the New Zealand Standards Approval Board on 03 February 2021.

This Standard was published on 19 February 2021.

The following are represented on Committee EL-059:

- Australian Industry Group
- Business New Zealand
- CHOICE
- Consumer Electronics Suppliers Association
- Consumers' Federation of Australia
- Department of Agriculture, Water and the Environment (Australian Government)
- Department of Industry, Science, Energy and Resources (Australian Government)
- Electrical Compliance Testing Association of Australia
- Energy Efficiency and Conservation Authority of New Zealand
- Energy Safe Victoria

This Standard was issued in draft form for comment as DR AS/NZS 2007.1:2019.

Keeping Standards up-to-date

Ensure you have the latest versions of our publications and keep up-to-date about Amendments, Rulings, Withdrawals, and new projects by visiting:

www.standards.org.au

www.standards.govt.nz

ISBN 978 1 76113 206 3

Australian/New Zealand Standard™

Performance of household electrical appliances — Dishwashers

Part 1: Methods for measuring performance, energy and water consumption

Originated as AS 2007—1977.
Jointly revised and redesignated as AS/NZS 2007.1:1998.
Fifth edition 2005.
This edition AS/NZS 2007.1:2021.
Reissued incorporating Amendment No 1 (October 2021).

© Standards Australia Limited/the Crown in right of New Zealand, administered by the New Zealand Standards Executive 2021

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Cth) or the Copyright Act 1994 (New Zealand).

Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-059, Dishwashers, Clothes Washers and Dryers, to supersede AS/NZS 2007.1:2005, *Performance of household electrical appliances — Dishwashers, Part 1: Energy consumption and performance*.

Ⓐ This Standard incorporates Amendment No. 1 (October 2021). The start and end of changes introduced by the Amendment are indicated in the text by tags including the amendment number 1. **Ⓐ**

The objective of this Standard is to specify test procedures and minimum performance criteria for determining the performance characteristics of electric household dishwashers that are within the scope of the relevant legislation.

This Standard does not specify safety requirements.

The AS/NZS 2007 series comprises two parts, as follows:

AS/NZS 2007.1, *Performance of household electrical appliances — Dishwashers, Part 1: Methods for measuring performance, energy and water consumption* (this Standard)

AS/NZS 2007.2, *Performance of household electrical appliances — Dishwashers, Part 2: Energy efficiency labelling requirements*.

The parts of this series are summarized as follows:

- (a) *Part 1* — Specifies performance test procedures and minimum performance criteria for dishwashers.
- (b) *Part 2* — Includes algorithms for the calculation of the energy efficiency star rating and comparative energy consumption, performance requirements, details of the energy rating label and information on the requirements for the valid application for registration for energy efficiency labelling. It also includes information for registration for water efficiency labelling. Part 2 is to be used in conjunction with Part 1.

The overall objective of the AS/NZS 2007 series is to promote high levels of performance, energy efficiency and water efficiency in electric dishwashers.

The main changes in this Standard are as follows:

- (i) Inclusion of an alternative reference machine.
- (ii) Alternative soils are listed.
- (iii) Addition of alternative load items.
- (iv) The relevant legislation is described.

As documented in ISO 80000-1, *Quantities and units — Part 1: General*, the SI unit for litres may be either “L” or “l”. For the purpose of this document, and in conformance with Australian and New Zealand Standards, “L” is used as the unit for litres.

This Standard has been developed in consultation with regulatory authorities and is intended to be considered with reference to the relevant legislation. This Standard refers to AS/NZS 2007.2 for energy efficiency labelling requirements. AS/NZS 6400, *Water efficient products — Rating and labelling*, references this Standard for water efficiency labelling requirements.

Standards Australia thanks the International Electrotechnical Commission (IEC) for permission to reproduce extracts from its international Standards. All such extracts are copyright of IEC, Geneva, Switzerland. All rights reserved. Further information on the IEC is available from www.iec.ch. IEC has no responsibility for the placement and context in which the extracts and contents are reproduced by the author, nor is IEC in any way responsible for the other content or accuracy therein.

The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

Contents

Preface	ii
Introduction	vi
Section 1 Scope and general	1
1.1 Scope	1
1.2 Application	1
1.3 Normative references	1
1.4 Terms and definitions	1
1.5 Rounding	5
Section 2 Test requirements and measurements	6
2.1 General	6
2.2 Test conditions, instrumentation and materials	6
2.3 Preparation of a dishwasher for testing	6
2.4 General test procedures	6
2.5 Check of rated capacity	6
2.6 Preparation and soiling of loads	6
2.7 Washing performance	6
2.8 Energy consumption, water consumption and standby power	6
2.9 Drying performance	6
2.10 Evaluation and calculation of washing and drying indices	6
2.11 Reference machine	6
Section 3 Use of reference machine	7
3.1 General	7
3.2 Program	7
3.3 Detergent	7
3.4 Water softener	7
3.5 Test conditions	7
3.6 Reference machine	7
3.7 Reference machine log	8
3.8 Record of results	8
3.9 Checks and repairs	8
3.10 Calibration checks	8
Section 4 Performance requirements	9
4.1 General	9
4.2 Water pressure	9
4.3 Rated capacity	9
4.4 Washing index	9
4.5 Water consumption	9
4.6 Drying index	9
Section 5 Requirements for accompanying information	10
5.1 General	10
5.2 Rated capacity	10
5.3 Loading pattern	10
5.4 Detergent	10
5.5 Rinse aid	10
5.6 Program	10
5.7 Additional requirements	10
Appendix A (normative) Test conditions, instrumentation and materials	12
Appendix B (normative) Preparation of dishwasher for testing and general test procedures	23
Appendix C (normative) Preparation and method of soiling standard test loads	26
Appendix D (normative) Washing performance, energy and water consumption and standby power	28

Appendix E (normative) Drying performance	42
Appendix F (normative) Evaluation and calculation of washing and drying indices	44
Appendix G (informative) Example calculations of washing and drying indices and energy consumption	51
Appendix H (normative) Reference machine specifications	55
Appendix I (informative) Adjusting water consumption in the reference machine	60
Appendix J (informative) Correcting for variations in energy consumption during a test series	62
Appendix K (normative) Dishwasher test report	64
Appendix L (normative) Viewing cabinet	68
Appendix M (informative) Examples of standby modes	70
Bibliography	71
Amendment control sheet	72

Introduction

For comparative testing, the most reliable results will be obtained from the methods of measurement given in this Standard when the measurements are conducted in the same laboratory, at one time, by the same operators.

For determination of the washing and drying indices, the procedures and timing in [Appendices D and E](#) are provided to ensure consistent results. For determination of washing performance in accordance with this Standard, it is essential to use a reference machine.

This Standard is based on concepts published in IEC 60436:2004, *Methods for measuring the performance of electric dishwashers* (Edition 3).

The reference program on the reference machine used in this Standard is Gentle 45 °C which is used to set a pass/fail for washing performance. IEC 60436:2004, uses the Universal 65 °C as the reference program as the washing reference. This was originally used to determine a relative performance index for declaration by the manufacturer (washing and drying performance was included on the EU energy label). The EU EcoDesign regulation (2009) set a minimum wash performance standard for dishwashers as a function of this reference. IEC 60436:2004, also uses the reference machine to determine drying performance whereas it is not used for determining drying performance in this Standard.

NOTE 1 This Standard uses the term “washing performance” to refer to the assessment of removing soil from the load. IEC 60436 refers to this assessment as the “cleaning performance”.

This Standard differs from IEC 60436:2004, (with differences to IEC 60436:2015 (Edition 4) noted in brackets, where relevant) as follows:

- (a) This Standard allows the use of an IEC load (without serving items). IEC also allow an AHAM (US) load as an alternative to the “European” load. (IEC 60436:2015 only specifies a European load and some load items have changed).
- (b) There are slight differences in the ambient humidity requirements between this Standard (60 %) and IEC 60436:2004 (55 % or 65 % dependent on the soil drying method).
- (c) Food items used for soiling the load in this Standard more closely resembles the soiling from IEC 60436:1981. This Standard still uses tomato juice while the IEC 60436:2004, uses milk treated in a microwave as well as minced meat. Some soil items (e.g. tinned spinach versus frozen spinach), the preparation of some items, and the allocation of soils to the load itself are also slightly different in some cases.
- (d) Cold water supply temperature in this Standard is 20 °C while IEC 60436:2004 is 15 °C.
- (e) Ambient temperature for testing in this Standard is 20 °C (while IEC 60436:2015 specifies an ambient temperature for testing of 23 °C).
- (f) Water hardness in this Standard is soft (45 ppm CaCO₃ equivalent)) while IEC 60436:2004 specifies both soft ($\leq$ 70 ppm) and hard (250 ppm) water alternatives.
- (g) Water pressure in this Standard is 320 kPa while IEC 60436:2004 is 240 kPa.
- (h) Reference detergent in this Standard is based on the old IEC type A (phosphate based with chlorine bleach), while IEC 60436:2004 specifies type C detergent (phosphate based with oxygen bleach and enzymes). IEC 60436:2004 also has two rinse aid formulations (types III and IV). ¹(IEC 60436:2015 provides a new detergent specification type D detergent (non-phosphate based with oxygen bleach and enzymes) and only specifies one rinse aid (type III formulation)). ²
- (i) This Standard requires the manufacturer to specify the amount of detergent to be used, whereas IEC 60436:2004 specifies a default detergent quantity where an amount is not specified by the manufacturer. This Standard and IEC 60436:2004 both specify maximum detergent quantities which may be used for testing.

- (j) In this Standard the reference machine water softener is de-activated while in IEC 60436:2004 it is allowed to operate normally (noting that most IEC tests will be done with hard water and tests under this Standard use soft water). Most dishwashers in Australia and New Zealand do not have a water softener, or these are usually deactivated in soft water regions.
- (k) This Standard uses the reference machine only for determining the washing performance while IEC 60436:2004 uses it for determining washing and drying performance.

NOTE 2 The reference machine specified in IEC 60436:2015, is now permitted as an alternative in this Standard.
- (l) IEC allows the use of either oven drying or air drying of the soiled load prior to washing while this Standard only allows air drying.
- (m) Both this Standard and IEC 60436:2004 specify the lighting conditions for washing and drying evaluations, making use of a viewing cabinet voluntary. Where used, specifications for a viewing cabinet are included in [Appendix L](#) of this Standard.
- (n) This Standard and IEC 60436:2004 evaluation scoring systems are aligned.
- (o) This Standard requires filter cleaning between test runs while IEC 60436:2004 specify that filters are not cleaned between runs. IEC 60436:2004 classify filters into three main categories and require a minimum of five tests (but could be as many as 10 tests) on each dishwasher, depending on variability and performance without filter cleaning.
- (p) This Standard requires standby power measurements on a number of modes.

NOTE 3 IEC standby modes were introduced after the publication of AS/NZS 2007.1—2005 by IEC 60436:2004 Amendment 2 (2012), and while the modes defined are very similar there are some minor differences. Both Standards reference IEC 62301 as the measurement method (IEC 60436:2015 has introduced some small adjustments to mode definitions and measurement requirements for low power modes).
- (q) IEC requires that the load be pre-conditioned in a dishwasher with IEC rinse aid prior to use in a performance test. This Standard does not specify any particular requirements other than the load is clean prior to use.

NOTES

Australian/New Zealand Standard

Performance of household electrical appliances — Dishwashers

Part 1: Methods for measuring performance, energy and water consumption

Section 1 Scope and general

1.1 Scope

This Standard specifies test procedures and minimum performance criteria for determining the performance characteristics of electric household **dishwashers** that are within the scope of the **relevant legislation**.

In particular, this Standard specifies the following:

- (a) States and defines the principal performance characteristics of electric **dishwashers**, which are —
 - (i) washing performance;
 - (ii) drying performance (irrespective of whether the **dishwasher** has a specific drying **operation** within the selected **program**);
 - (iii) energy and water consumption; and
 - (iv) **standby power**.
- (b) Specifies methods of measuring these characteristics.
- (c) Sets levels of acceptable performance for washing and drying.

1.2 Application

This Standard **shall** be read in conjunction with AS/NZS 2007.2.

1.3 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document:

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS 2700, *Colour standards for general purposes*

AS 2706, *Numerical values — Rounding and interpretation of limiting values*

AS/NZS 2007.2, *Performance of household electrical appliances — Dishwashers, Part 2: Energy efficiency labelling requirements*

AS/NZS IEC 62301, *Household electrical appliances — Measurement of standby power*

IEC 60436, *Electric dishwashers for household use — Methods for measuring the performance*

1.4 Terms and definitions

For the purposes of this Standard the definitions below apply.

NOTE The following defined terms are bolded in this Standard.

1.4.1

check test

test to determine whether an appliance complies with the **relevant legislation**, which is intended to verify claims about a model in relation to one or more of the following:

- (a) *Energy consumption* — Indicated on the **energy rating label**.
- (b) *Water consumption* — Indicated on the water rating label in accordance with AS/NZS 6400.
- (c) *Product performance*.

1.4.2

competent person(s)

person who has acquired through training, qualifications or experience, or a combination of these, the knowledge and skills enabling that person to perform a specified task

1.4.3

cycle

series of **operations** and other activities that occur within the **cycle time**

1.4.4

cycle time

duration of time measured from the initiation of the **program** (excluding any user-programmed delay) until all activity ceases

Note 1 to entry: Activity is considered to have ceased when the power consumption reverts to a steady-state condition that persists indefinitely without user intervention. If there is no activity after the end of the **program**, the **cycle time** is equal to the **program time**.

Note 2 to entry: **Cycle time** includes any activity that **may** occur after the **program** is completed until a steady-state condition is reached. This could include fans, any electronic activity or any additional mechanical activity that occurs for a limited period after any end of **program** indicator. Any cyclic event that occurs indefinitely is considered to be steady-state, see [Appendix M](#) for examples.

1.4.5

delay start mode

mode where the model has a user option used to delay commencement of the **program**

Note 1 to entry: See also [Clause D.5](#).

1.4.6

dishwasher(s)

machine which cleans, rinses and dries dishware, **glassware**, **cutlery**, and, in some cases, cooking utensils by chemical, mechanical, thermal and/or electric means, which **may** or **may not** have a specific drying **operation** at the end of the **program**

1.4.7

end of cycle mode

state that the appliance enters at the end of the **cycle**, during which appliance power is in a steady-state condition that persists indefinitely

Note 1 to entry: **End of cycle mode** is applicable to all products, see also [Clause D.4](#).

Note 2 to entry: In some products this mode **may** be an equivalent power to **off mode**, while in other products **end of cycle mode** will persist until **off mode** is initiated by the user via a power switch.

1.4.8**energy rating label**

label that provides consumers with information concerning the energy consumption and energy efficiency of household **dishwashers**

Note 1 to entry: The **energy rating label** displays the product's **CEC**, **star rating**, rated load capacity and the program nominated for energy efficiency testing.

1.4.9**laboratory**

facility that tests products for conformance to the requirements of this document

1.4.10**manufacturer's instructions**

information that is provided with the product in the form of a user manual, instruction sheet, information affixed to the product itself or information that is available on a public website

Note 1 to entry: **Manufacturer's instructions** do not include any special directions provided by the product supplier to the test **laboratory** especially for testing purposes.

1.4.11**may**

indicates the existence of an option

1.4.12**off mode**

mode present on appliances that have a power or off switch that is operated via controls intended to be normally accessible to the user, and activated where the appliance remains connected to the mains electricity **supply** and where the power or off switch is activated to put the appliance into a state where it is not in use and no short duration **operations** are in progress

Note 1 to entry: **Off mode** is a state that persists until the user activates the product via the power or on switch, see also [Clause D.6](#).

Note 2 to entry: In some products, some short-term duration **operations may** be present for a period after **off mode** is initiated. An off or power switch **may** be present as a separate user operated control or **may** be integrated into another device operated by the user such as a door.

1.4.13**operation(s)**

each event that occurs during the **dishwasher cycle**, such as washing, rinsing or drying

1.4.14**place setting(s)**

one **place setting** consists of one each of the following items:

- (a) Crockery (items specified in [Table A.8](#)).
- (b) Glassware (items specified in [Table A.8](#)).
- (c) Cutlery (items specified in [Table A.8](#)).

1.4.15**program**

series of **operations** pre-defined within the **dishwasher**, for specified levels of soil and/or type of load

1.4.16**program time**

duration of time measured from the initiation of the **program** (excluding any user programmed delay) until the end of **program**

Note 1 to entry: If the end of **program** is not indicated, the **program time** is equal to the **cycle time**.

Note 2 to entry: The end of the **program** is intended to be the earliest point where the consumer would normally be able to access the load, which at this time meets all performance requirements for the **program**.

Note 3 to entry: In some machines there **may** be a short delay from an end of **program** indicator until the load is accessible by the user.

1.4.17

rated capacity

maximum whole number of **place settings** stated by the manufacturer, which can be washed and dried when loaded in accordance with the **manufacturer's instructions**

1.4.18

reference machine

dishwasher of specified repeatable performance against which the performance of **dishwashers** under test is compared

Note 1 to entry: See also [Section 3](#) and [Appendix H](#).

1.4.19

reference program

reference program selected and used on a **reference machine**

1.4.20

relevant legislation

legislative requirements governing the **supply** of electric household **dishwashers** in Australia and New Zealand

Note 1 to entry: For Australia, the **relevant legislation** is *Greenhouse and Energy Minimum Standards (Dishwashers) Determination* (GEMS Determination) and *Greenhouse and Energy Minimum Standards Act 2012 (Cth)* (GEMS Act), which can be accessed at www.legislation.gov.au. The GEMS Determination covers household **dishwashers** that are ordinarily supplied and used for household or similar use. The GEMS Determination covers household **dishwashers** irrespective of the context in which they are used. For example, the GEMS Determination applies to household **dishwashers** used in a commercial context.

Note 2 to entry: For New Zealand, the **relevant legislation** is *Energy Efficiency (Energy Using Products) Regulations 2002 (New Zealand Regulations)*, which can be accessed at: www.legislation.govt.nz/regulation/public/2002/0009/latest/DLM108730.html.

1.4.21

shall

indicates that a statement is mandatory

1.4.22

should

indicates a recommendation

1.4.23

standby power

power consumption that **may** occur while the **dishwasher** is not performing its main function

Note 1 to entry: The main modes specified in this Standard where **standby power** occurs are **off mode**, **end of cycle mode** and **delay start mode** (other modes **may** be present in some machines).

1.4.24

supply

supplying (or offering to **supply**) electric household **dishwashers** that are that are within the scope of the **relevant legislation**

Note 1 to entry: For Australia, **supply** covers sale, exchange, gift, lease, loan, hire or hire purchase. **Supply** is defined in the **relevant legislation**.

Note 2 to entry: For New Zealand, **supply** is offered for sale, lease, hire or hire purchase. **Supply** is defined in the **relevant legislation**.

1.4.25**test program**

program to be used in the test, as specified by the client commissioning or requesting the test

1.4.26**tested energy consumption** **E_t**

sum of the **program** energy (including electrical and water energy components used during the **program**) and, if applicable, the post **program** energy (energy consumed during the period from the end of the **program** to the end of the **cycle**)

1.5 Rounding

Unless otherwise stated, calculated numbers **shall** be rounded and recorded to not less than five significant figures in accordance with AS 2706.

NOTE Spreadsheets carry more than five significant figures in their calculations so specific adjustments to spreadsheets to conform to the rounding requirements of this Standard are not required.

Section 2 Test requirements and measurements

2.1 General

This Section sets out the requirements for testing a **dishwasher** and reporting test results. [Clauses 2.2 to 2.11](#) also serve as a key to the intended use of [Appendices A to K](#).

2.2 Test conditions, instrumentation and materials

All tests **shall** be carried out using a test room, instrumentation and associated materials, and under the conditions specified in [Appendix A](#).

2.3 Preparation of a dishwasher for testing

Prior to carrying out any test on a **dishwasher**, it **shall** be prepared as specified in [Appendix B](#).

2.4 General test procedures

All tests **shall** be carried out according to the relevant procedures specified in [Appendix B](#).

2.5 Check of rated capacity

The **dishwasher** **shall** be loaded to the **rated capacity** and inspected for conformance with [Clause 4.3](#).

2.6 Preparation and soiling of loads

The preparation and application of soil to a test load **shall** be as specified in [Appendix C](#).

2.7 Washing performance

The determination of washing performance **shall** be in accordance with [Appendix D](#).

2.8 Energy consumption, water consumption and standby power

The determination of energy consumption, water consumption and **standby power** **shall** be in accordance with [Appendix D](#).

2.9 Drying performance

The determination of the drying performance **shall** be in accordance with [Appendix E](#).

2.10 Evaluation and calculation of washing and drying indices

Washing and drying indices **shall** be determined in accordance with [Appendix F](#).

NOTE See [Appendix G](#) for examples of the determination of the washing and drying indices.

2.11 Reference machine

The requirements that **shall** be met by a **dishwasher** prior to being used as a **reference machine** with respect to a particular machine under test are set out in [Appendix H](#).

Section 3 Use of reference machine

3.1 General

The purpose of the **reference machine** is to compensate for unavoidable differences in measurement conditions both between laboratories and within an individual **laboratory** over time. Such conditions include water hardness, changes in properties of the soil (variations in the soil itself and in its preparation), ageing of the detergent, different batches of detergent and subjective differences in determination between evaluators. To compensate for these variables, processes within the **reference machine** shall remain consistent and the **reference machine** subjected to the same conditions as those experienced by any **dishwasher** under test to which it will be compared.

The load for the **reference machine** and the **dishwasher** under test shall be soiled at the same time, using the same soils, and run in parallel. More than one test **dishwasher** can be run in parallel with a **reference machine**. Several people can prepare different parts of the soil in parallel, but one person only shall be responsible for each process for all loads, e.g. one person can prepare the soil and another person can apply the soil, as long as only one person undertakes each part of the process for all relevant **dishwashers**.

As the **reference machine** is an integral instrument in the test for wash performance because it is used as an absolute reference, it shall perform to specification. An acceptable **reference machine** design and performance shall be as specified in [Appendix H](#).

3.2 Program

The **program** to be used on the **reference machine** shall be the **reference program**.

3.3 Detergent

The detergent dose used in the **reference machine** for the **reference program** shall be 5 g in the pre-wash (placed in the door) and 20 g in the main wash (placed in the detergent dispenser). The same detergent batch shall be used in the **reference machine** and all test machines operated in parallel.

3.4 Water softener

The **reference machine** may have a water softener, which normally uses salt (sodium chloride granules) as a catalyst while softening the water. Remove all salt from the **reference machine** and run the machine until no salt is remaining. The “low salt” light, if present, should remain illuminated on the **reference machine**.

3.5 Test conditions

For each test run, the test conditions, **dishwasher** preparation and general test procedures for the **reference machine** shall be the same as for the **dishwashers** under test specified in [Appendices A](#) and [B](#). However, the electricity supply for the **reference machine** shall be 230 V $\pm$ 2 % and 50 Hz $\pm$ 1 % in all cases.

The load for the **reference machine** shall always be 12 place settings, irrespective of the number of place settings of the **dishwashers** under test. The **reference machine** shall always be installed as a free standing machine, independent of the types of **dishwasher** under test. The load in the **reference machine** shall be laid out as shown in [Figure H.1](#) for every run.

3.6 Reference machine

The **reference machine** shall be tested in accordance with this Standard concurrently with any **dishwashers** tested for washing performance.

NOTE 1 See [Clause D.4](#) for procedures to be observed in relation to the **reference machine**.

NOTE 2 It is not necessary to run the **reference machine** to determine the energy consumption or drying performance of a **dishwasher** under test. However, the **reference machine** needs to be run if the purpose of the test series is to make a declaration of energy consumption for registration purposes in conjunction with a washing performance test.

3.7 Reference machine log

A log **shall** be kept for each **reference machine** recording all calibration checks and relevant results, as well as any changes or repairs undertaken to the **reference machine**.

3.8 Record of results

A record **shall** be kept of the wash index test result for every test run performed on the **reference machine**. This record can be associated with the **reference machine** log, but **shall** be separable.

3.9 Checks and repairs

A **reference machine shall** be checked and repaired, as appropriate, if the machine yields a significantly unusual result.

3.10 Calibration checks

The calibration procedure and actions required when the **reference machine** is determined to be out of calibration **shall** be in accordance with [Clause H.2](#).

Calibration checks **should** be conducted at intervals which will maintain confidence in the performance of the **reference machine**. As a guide, calibration checks **should** be conducted at the beginning of each series of tests and after approximately every 10 tests within a test series.

A check of the calibration **shall** be carried out if the **reference machine** yields a result that is contrary to expectation, or if it is observed or otherwise suspected of operating with one or more parameters outside specified limits in [Appendix H](#).

Section 4 Performance requirements

4.1 General

When tested on the **program**, including all associated settings recommended for a normally soiled load equal to the **rated capacity** in the product literature (i.e. operating manual or user instructions), a **dishwasher shall** conform to [Clauses 4.3](#) to [4.6](#).

NOTE Refer to AS/NZS 2007.2 for requirements regarding energy consumption.

The supplier **shall** declare if there is a water/energy saving feature in the appliance. The test **laboratory should** indicate if any water/energy saving feature was active for each test run.

4.2 Water pressure

The test **dishwasher shall** be capable of operating at the maximum and minimum of the water pressure range stated by the **manufacturer's instructions**.

4.3 Rated capacity

When loaded to the **rated capacity** in accordance with the **manufacturer's instructions** and loading diagram (see [Clause 5.3](#) and [Figure 5.1](#)), the load items **shall** be supported. Plates, bowls and saucers **shall** each have a separate position so that support to each item is provided at a minimum of three points and there is no need for it to rest on any other item or items.

4.4 Washing index

When tested in accordance with [Appendix D](#) at its **rated capacity**, with the loading pattern specified in [Clause 5.3](#), the washing index of a **dishwasher shall** be not less than 0.9.

4.5 Water consumption

The claimed water consumption **shall** be not less than the average water consumption of representative **dishwashers** when each is tested in accordance with [Appendix D](#) at its **rated loaded capacity**, with the loading pattern specified in [Clause 5.3](#).

Some **dishwashers may** contain a water softener. Where regeneration of the water softener depends on frequency of use and water hardness, it **may** only take place from time to time (i.e. not during every cycle). Where regeneration does not occur in every cycle, any energy, water and time associated with regeneration **shall** be disregarded when verifying the stated water consumption.

NOTE In some **dishwashers** the frequency of regenerations is not predictable and depends on the adjustment of the softener and the hardness of the water used.

4.6 Drying index

When tested in accordance with [Appendix E](#) at its **rated capacity**, with the loading pattern specified in [Clause 5.3](#), the drying performance index of a **dishwasher shall** be not less than 0.5, i.e. 50 %.

Section 5 Requirements for accompanying information

5.1 General

The information set out in [Clauses 5.2 to 5.7](#) **shall** be marked on the **dishwasher** or stated in the accompanying product literature, i.e. operating manual or user instructions.

5.2 Rated capacity

The **rated capacity** applicable to a normally soiled load **shall** be stated.

5.3 Loading pattern

Instructions **shall** be provided on the correct method for loading a test load as specified in [Appendix A](#), that is equal to the **rated capacity** of the **dishwasher**. Instructions **shall** include one or more photographs or line drawings that clearly show the required loading, see [Figure 5.1](#) for an example of an acceptable drawing.

5.4 Detergent

Instructions **shall** be provided on the amount of detergent to be used to wash a normally soiled load equal to the **rated capacity**, including any separate amount for pre-wash and main wash. The total amount of detergent **shall** not exceed 15 g + 1.25 g per **place setting**.

NOTE The supplier **should** include detergent amounts for all programs where detergent is required, see [Clause B.7](#).

5.5 Rinse aid

Instructions **shall** be provided regarding rinse aid dispenser settings to ensure the required amount of rinse aid is dispensed when performing a test in accordance with [Appendix D](#).

5.6 Program

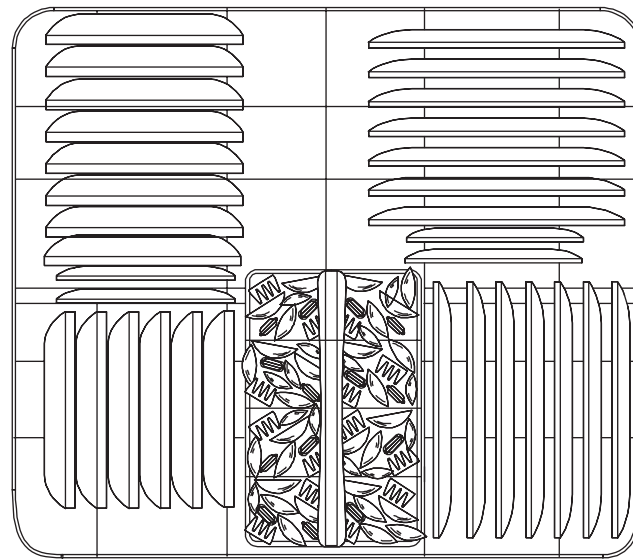
The **program**, including all associated specific settings, to be used for a normally soiled load equal to the **rated capacity** of the **dishwasher**, **shall** be supplied with the dishwasher, in accordance with this Standard.

Where an open door is required at the completion of the **program** for a drying performance test, the position of the door **shall** be specified in the product literature, i.e. operating manual or user instructions.

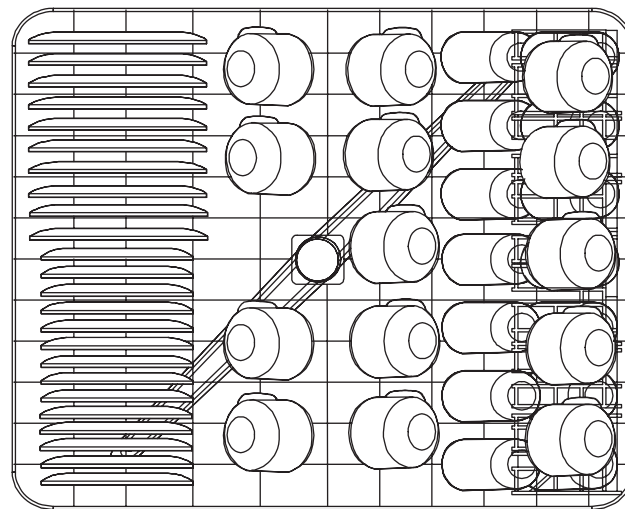
5.7 Additional requirements

The following **shall** also be supplied with the dishwasher:

- (a) Installation instructions.
- (b) Minimum and maximum water pressure requirements, if applicable.



(a) Lower basket



(b) Upper basket



(c) Cutlery basket

Figure 5.1 — Example of acceptable loading drawing

Appendix A (normative)

Test conditions, instrumentation and materials

A.1 General

This Appendix specifies the test conditions, instrumentation accuracies, and associated materials required to complete tests to determine performance of a **dishwasher** in accordance with [Appendices B to E](#).

NOTE For further information on determination of uncertainty, refer to ISO/IEC 98-3, and R. R. Cook, *Assessment of Uncertainties of Measurement for calibration and testing laboratories*, see Bibliography.

A.2 Accuracy and precision of measurements

The tolerances specified for parameters within this Standard, using the symbol “ $\pm$ ”, indicate the allowable limits of variation from the specified parameter outside which the test or results **shall** be invalid. In each case the tolerance has been chosen to allow for factors such as —

- (a) drift of ambient conditions;
- (b) instrument error;
- (c) reading error;
- (d) uncertainty of instrument calibration; and
- (e) other influences.

The statement of tolerance does not permit deliberate variations of these specified parameters.

NOTE While it is required that test parameters remain within the stated tolerance, transient effects do not necessarily render a test invalid.

A.3 Ambient conditions

The ambient conditions of the room in which the performance is measured **shall** be maintained throughout the test process, including soiling, at the following levels:

- (a) *Temperature* — $20\text{ }^{\circ}\text{C} \pm 2\text{ K}$.
- (b) *Relative humidity* — $60 \pm 5\%$.

A.4 Water supply

The water supplied to the **dishwasher** under test **shall** be maintained at the following levels at the **dishwasher** inlet:

- (a) *Cold water temperature* — $20\text{ }^{\circ}\text{C} \pm 2\text{ K}$.
- (b) *Hot water temperature* — $60\text{ }^{\circ}\text{C} \pm 2\text{ K}$.
- (c) *Gauge pressure during water intake (hot and cold)* — $320\text{ kPa} \pm 20\text{ kPa}$.

If the **manufacturer's instructions** do not include the pressure range of 320 kPa, the **dishwasher** **shall** be tested at the pressure within that range that is nearest to 320 kPa.

A.5 Water hardness

Inlet water **shall** have total hardness (CaCO_3 equivalent) adjusted (if necessary) to (45 ± 5) ppm by mass, at a temperature of $20\text{ }^\circ\text{C} \pm 2\text{ K}$.

NOTE For water hardness less than 40 ppm, calcium sulfate and calcium chloride are suitable additives to achieve the specified hardness.

A.6 Electricity supply

The electricity **supply** to the **dishwasher** point of connection during all tests **shall** be maintained within the following limits:

- (a) *Voltage* — $230\text{ V} \pm 2\%$.
- (b) *Frequency* — $50\text{ Hz} \pm 1\%$ in all cases.

Where the **supply** is provided from sources other than mains **supply** in Australia or New Zealand, the source of the electricity **supply** **shall** be noted in the test report.

A.7 Measurement accuracies and instruments

A.7.1 Mass

Measurements of mass **shall** be made using instruments having an overall uncertainty of measurement of 2 % at the 95 % confidence level and a resolution of $\pm 0.1\text{ g}$ or better. All masses **shall** be recorded to the nearest 0.1 g or better.

A.7.2 Temperature

Measurements of both wet and dry bulb temperatures **shall** be made, using devices with a resolution of not more than $0.1\text{ }^\circ\text{C}$ and an overall uncertainty of measurement of better than $\pm 0.6\text{ K}$ at the 95 % confidence level. Temperature measurements **shall** be recorded to the nearest $0.1\text{ }^\circ\text{C}$.

A.7.3 Electrical energy consumption

Measurements of energy consumption **shall** be made with an instrument with a resolution of not more than 1 W-hour (Wh) and with an overall uncertainty of measurement of better than 2 % at the 95 % confidence level. Energy measurements **shall** be recorded to the nearest 1 Wh or better.

A.7.4 Length

Measurements of length **shall** be made using instruments with an accuracy and resolution of $\pm 1.0\text{ mm}$ or better. All lengths **shall** be recorded to the nearest 1 mm.

A.7.5 Time

Measurements of time **shall** be made using instruments with a resolution of 1 s or better and with an overall uncertainty of measurement of better than 1 % at the 95 % confidence level. Time measurement **shall** be recorded to the nearest 1 s or better.

A.7.6 Water consumption

Water consumption **shall** be measured using instruments with a resolution of 0.1 L or better and an overall uncertainty of measurement better than 2 % at the 95 % confidence level. Water consumption measurements **shall** be recorded to the nearest 0.1 L or better.

A.8 Detergent

A.8.1 Alternative detergents

The following detergents **may** be used as alternatives. However, where AS/NZS detergent as specified in [Clause A.8.2](#) is used, then AS/NZS rinse aid as specified in [Clause A.9.2](#) **shall** also be used in both the **reference machine** and all test machines. Where IEC detergent as specified in [Clause A.8.3](#) is used, then IEC rinse aid as specified in [Clause A.9.3](#) **shall** also be used in both the **reference machine** and all test machines. Detergent from the same batch **shall** be used in both the **reference machine** and all test machines.

NOTE Refer to *Factsheet: Sources of test materials*, available from www.energyrating.gov.au, for further information on detergent and rinse aid sources.

A.8.2 AS/NZS detergent

The AS/NZS reference detergent **shall** be as specified in [Table A.1](#).

Table A.1 — Ingredients of AS/NZS reference detergent

Ingredients	Percent by mass
Penta-sodiumtriphosphate (Tripoly) Thermphos NW	50.00
Sodium metasilicate KO (anhydrous)	40.00
Sodium sulfate (anhydrous)	5.75
Sodium dichloroisocyanurate-dihydrate CDB 56C	2.25
Plurafac RA43 or Teric 164 or Plurafac RCS43	2.00

The detergent **shall** be supplied in resealable containers of 200 g to 500 g capacity. These **should** be stored in a cool, dry location and used within three months of the date of manufacture.

Each container **shall** be marked with the date of manufacture, the chemical composition of the detergent and a statement of conformance with the requirements of this Standard.

A.8.3 IEC detergent D

The detergent specified in [Table A.2](#) conforms with detergent D in IEC 60436:2015. This detergent **may** be used as an alternative to that specified in [Clause A.8.2](#).

Table A.2 — Ingredients of reference detergent D

Chemical substance	Specification	Percent by mass
Sodium citrate dehydrate		30.0
Maleic acid/acrylic acid copolymer sodium salt	Sokalan CP 5 Gran (BASF), 50 % active on sodium carbonate	12.0
Sodium percarbonate		7.0
Tetraacetyl ethylene diamine (TAED)		2.0
Sodium disilicate		10.0
Linear fatty alcohol ethoxylate	Plurafac LF403 (BASF)	2.0
Protease	Savinase 6 T (Novozymes)	1.0
Amylase	Termamyl 120 T (Novozymes)	0.5
Sodium carbonate		Balance to 100
If using alternative components to those specified, it is essential that equivalent activity units, concentrations and ratios of active and carrier ingredients are used to obtain equivalent performance.		
[SOURCE: IEC 60436 ed.4.0, Copyright © 2015 IEC Geneva, Switzerland. www.iec.ch .]		

A.9 Rinse aid

A.9.1 Alternative rinse aids

The following rinse aids **may** be used as alternatives. However, where AS/NZS detergent as specified in [Clause A.8.2](#) is used, then AS/NZS rinse aid as specified in [Clause A.9.2](#) **shall** also be used in both the **reference machine** and all test machines. Where IEC detergent as specified in [Clause A.8.3](#) is used, then IEC rinse aid as specified in [Clause A.9.3](#) **shall** also be used in both the **reference machine** and all test machines.

NOTE Refer to *Factsheet: Sources of test materials*, available from www.energyrating.gov.au, for further information on sources for detergents and rinse aids.

A.9.2 AS/NZS rinse aid

The AS/NZS reference rinse aid specified in [Table A.3](#) **shall** consist of the following:

Table A.3 — Ingredients of AS/NZS reference rinse aid

Ingredients	Percent by mass
Low-foaming non-ionic wetting agent (Teric 164 or Triton DF12)	60
Isopropanol	20
Water	20

A.9.3 Rinse aid formula III

The rinse aid specified in [Table A.4](#) below is the neutral rinse aid formula III specified in IEC 60436:2015. This rinse aid **may** be used as an alternative to that of specified in [Clause A.9.2](#).

Table A.4 — Ingredients of neutral rinse aid formula III

Chemical substance	Specification	Percent by mass
Linear fatty alcohol ethoxylate (nonionic surfactant, low foaming)	Plurafac LF 221/BASF	15.0
Cumene sulfonate	Steoven potate SCS/Steoven pot (40 % solution in water)	11.5
Citric acid (anhydrous)	–	3.0
H ₂ O	Deionized water	Balance to 100
Physical parameters		
Viscosity (mpas)		17.0
pH (1 % in water)		2.2
[SOURCE: IEC 60436 ed.4.0, Copyright © 2015 IEC Geneva, Switzerland. www.iec.ch .]		

A.10 Soiling agents

Soiling agents **shall** be used within the use-by date and consist of the following:

- (a) *Tomato juice* — Tomato juice of such consistency that 1 g to 3 g of residue remains after the entire inner surface of a glass is wetted and then allowed to drain for 45 s.

NOTE 1 Berri™ and Heinz™ juice labelled as being without sugar are examples of commercially available products that **may** prove suitable.

Berri™ and Heinz™ are trademarks of third parties. This information is provided for example purposes and does not constitute any relationship, sponsorship or endorsement between the publisher and the third party trademark owners. Users **should** rely on their own enquiries as to whether a product meets the required specification.

- (b) *Egg yolks* — Standard top-grade hens' eggs at least 1 week old, weighing 50 g to 65 g each.

- (c) *Tea* — Tea meeting the following specifications:

- (i) *Tea quality* — Ceylon.
- (ii) *Leaf quality* — Orange pekoe.
- (iii) *Leaf size* — Broken.

NOTE 2 Lipton Royal Ceylon™ tea, Twinings Ceylon Orange Pekoe™ tea and Lyons Red Label™ tea (USA) are examples of commercially available products that **may** prove suitable.

Lipton Royal Ceylon™, Twinings Ceylon Orange Pekoe™ and Lyons Red Label™ are trademarks of third parties. This information is provided for example purposes and does not constitute any relationship, sponsorship or endorsement between the publisher and the third party trademark owners. Users **should** rely on their own enquiries as to whether a product meets the required specification.

- (d) *Reconstituted fortified skim milk* — Dried skim milk of approximately the analysis shown in [Table A.5](#) **shall** be used.

Table A.5 — Dried skim milk specification

Ingredients	Percent by mass
Fat	maximum 1.5 %
Protein	36 %
Lactose	51 %
Minerals	8 %