

AS 3499:2022



STANDARDS
Australia



Water supply — Flexible hose assemblies



AS 3499:2022

This Australian Standard ® was prepared by WS-001, Water and Gas fittings. It was approved on behalf of the Council of Standards Australia on 18 October 2022.

This Standard was published on 04 November 2022.

The following are represented on Committee WS-001:

- Association of Accredited Certification Bodies
- Australian Building Codes Board
- Australian Chamber of Commerce and Industry
- Australian Industry Group
- Australian Plumbing Manufacturing Association
- Department of Climate Change, Energy, the Environment and Water
- Gas Technical Regulators Committee
- Housing Industry Association
- International Copper Association Australia
- Master Plumbers Australia and New Zealand
- National Association of Testing Authorities Australia
- Plastics Industry Pipe Association of Australia
- Plumbing Products Industry Group
- The Institute of Plumbing Australia
- Water Services Association of Australia

Additional Interests

- Plastics New Zealand
- Plumbing Distributors Association of New Zealand

This Standard was issued in draft form for comment as DR AS 3499:2022.

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

ISBN 978 1 76113 954 3

Water supply — Flexible hose assemblies

Originated in Australia as AS 3499—1992.
Jointly revised and redesignated as AS/NZS 3499:1997.
Previous edition 2006.
Revised and redesignated as AS 3499:2022.

© Standards Australia Limited 2022

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).

Preface

This Standard was prepared by the Australian members of Joint Standards Australia/Standards New Zealand Committee WS-001, Water Fittings, to supersede AS/NZS 3499:2006.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this document as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this document is to specify requirements for flexible hose assemblies for use with both heated water and cold water supplies with a maximum heated water temperature of 90 °C used for applications above ground and accessible. Nominal sizes range up to DN 50, a maximum length of 10 m and with an allowable operating pressure of 1 400 kPa for sizes up to and including DN 25 and progressively lower pressures for increasingly larger diameters.

Performance tests are based in part on EN 13618.

The major change in this edition involves the addition of new [Clauses 6.11](#), [6.12](#) and [6.13](#), which specify requirements for resistance to corrosion, resistance to ultraviolet degradation and conformance to product specification, along with their respective methods of test in [Clauses B.10](#), [B.11](#) and [B.12](#). The new performance requirement, [Clause 6.11](#), provides for higher levels of corrosion resistance for hoses intended to be submerged.

Performance test sequencing and sample numbering is displayed in [Tables A.1](#) and [A.2](#).

The term “normative” is used in Standards to define the application of the appendix to which it applies. A “normative” appendix is an integral part of a Standard.

Contents

Preface	ii
Section 1 Scope and general	1
1.1 Scope	1
1.2 Normative references	1
1.3 Terms and definitions	2
1.4 Product conformity	3
Section 2 Designation	4
2.1 General	4
2.2 Sizes	4
2.2.1 Tube	4
2.2.2 End connectors	4
2.2.3 Hose assembly	4
Section 3 Materials	5
3.1 General	5
3.1.1 Corrosion resistance	5
3.1.2 Contamination of water	5
3.2 Plastic and elastomeric material	5
3.2.1 General	5
3.2.2 Cross-linked polyethylene	5
3.2.3 Acetal	5
3.3 Metallic materials	5
3.3.1 Copper	5
3.3.2 Copper alloy	6
3.3.3 Stainless steel	6
3.4 Seals for end connections and O rings	6
Section 4 Design	7
4.1 End connectors	7
4.1.1 General	7
4.1.2 Threads	7
4.1.3 Thread engagement	7
4.2 Working conditions	7
4.2.1 Operating temperature	7
4.2.2 Operating pressure	7
4.3 Classification	7
4.4 Marking	8
Section 5 Product documentation	10
5.1 General	10
5.2 Installation instructions	10
Section 6 Performance requirements	11
6.1 General	11
6.2 Watertightness test	11
6.3 Accelerated ageing by heat treatment test	11
6.4 Tensile stress resistance test	11
6.5 Hydraulic pulsation durability test	11
6.6 Thermal cycling test	11
6.7 Burst pressure test	11
6.8 Bending test	11
6.9 Contamination of water	12
6.10 Elastomeric materials (tube) — Compression set	12
6.11 Resistance to corrosion	12
6.12 Resistance to ultraviolet degradation	12
6.13 Conformance to specification	12

Appendix A (normative) Evaluation of product conformity with this document.....13

Appendix B (normative) Tests on flexible hose assemblies.....19

Bibliography 39

Australian Standard®

Water supply — Flexible hose assemblies

Section 1 Scope and general

1.1 Scope

This document specifies requirements for flexible hose assemblies for use with water up to 70 °C and high temperature water at 70 °C to 90 °C and used for applications not buried and accessible.

Nominal sizes range up to DN 50 (inclusive), a maximum length of 10 m for applications where the operating pressure does not exceed 1 400 kPa for sizes up to DN 25 and progressively lower pressures for larger diameters as given in [Table 4.3](#).

Shower hoses for bathing only are excluded from this document.

NOTE 1 Certification for plumbing and drainage materials and products under the *Plumbing Code of Australia* (PCA) is mandatory.

NOTE 2 Annular or convoluted hose assemblies are covered by WMTS 520.

1.2 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 681.1, *Elastometric seals—Material requirements for pipe joint seals used in water and drainage applications, Part 1: Vulcanized rubber*

AS 1199.1, *Sampling procedures for inspection by attributes, Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

AS 1432, *Copper tubes for plumbing, gasfitting and drainage applications*

AS 1565, *Copper and copper alloys — Ingots and castings*

AS 1572, *Copper and copper alloys — Seamless tubes for engineering purposes*

AS 1646, *Elastomeric seals for waterworks purposes*

AS 1683.13, *Methods of test for elastomers, Method 13: Compression set of vulcanized rubber under constant deflection*

AS 1722.2, *Pipe threads of Whitworth form, Part 2: Fastening pipe threads*

AS 2345, *Dezincification resistance of copper alloys*

AS 2738, *Copper and copper alloys — Compositions and designations of refinery products, wrought products, ingots and castings*

AS 3688, *Water supply and gas systems — Metallic fittings and end connectors*

AS ISO 7.1, *Pipe threads where pressure-tight joints are made on the threads, Part 1: Dimensions, tolerances and designation*

AS/NZS 1567, *Copper and copper alloys — Wrought rods, bars and sections*

AS/NZS 1568, *Copper and copper alloys — Forging stock and forgings*

AS/NZS 3500 (all parts), *Plumbing and drainage*

AS/NZS 3662, *Performance of showers for bathing*

AS/NZS 3707, *Method for testing pressure cycling resistance of pipes and fittings*

AS/NZS 4020, *Testing of products for use in contact with drinking water*

ISO 815-1, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*

ISO 6957, *Copper alloys — Ammonia test for stress corrosion resistance*

ASTM A269/A269M, *Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service*

ASTM A276/A276M, *Standard Specification for Stainless Steel Bars and Shapes*

ASTM A478, *Standard Specification for Chromium-Nickel Stainless Steel Weaving and Knitting Wire*

CEN/TS 13388, *Copper and copper alloys — Compendium of compositions and products*

EN 1982, *Copper and copper alloys — Ingots and castings*

1.3 Terms and definitions

For the purposes of this document, the terms and definitions given in AS/NZS 3500.0 and those below apply.

1.3.1

batch release test

test performed by the manufacturer on a production batch of components, which has to be satisfactorily completed before the batch can be released

1.3.2

end connectors

fittings for hose assemblies to connect water services to appliances and be permanently attached (non-reusable)

1.3.3

flexible hose assembly

hose assembly comprising a tube and permanently attached end connectors intended for use between a pipe work system and a fixture, fitting, valve, tap, appliance or similar, that is capable of being easily adapted or bent in any direction without damage

Note 1 to entry: The flexible hose assembly may consist of an inner liner and an outer reinforcement braid or sleeve with secured end connectors to ensure watertightness.

Note 2 to entry: Semi-flexible metallic hose assemblies are covered by WMTS 520.

1.3.4

length

effective length

length of connector measured from sealing face to sealing face, or for hoses with elbow end fittings, measured from the centre of the end fitting

1.3.5

may

indicates the existence of an option

1.3.6**nominal size****DN**

numerical designation of size, which in the case of flexible connectors within this document is the rounded measurement of the inside diameter of the flexible hose

1.3.7**production batch**

clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification

1.3.8**sample (batch or type)**

one or more units of product drawn from a batch, selected at random without regard to quality

Note 1 to entry: The number of units of product in the sample is the sample size as described in [Tables A.1](#) and [A.2](#).

1.3.9**shall**

indicates that a statement is mandatory

1.3.10**should**

indicates a recommendation

1.3.11**tube**

internal hose in contact with the fluid being made from elastomeric or thermoplastic material

1.3.12**type testing**

testing performed to demonstrate that the material, component, joint or assembly is capable of conforming to the requirements given in this document

1.4 Product conformity

Product conformity to this document shall be in accordance with [Appendix A](#).

Section 2 Designation

2.1 General

Hose and hose assemblies shall be classified according to intended application, maximum working pressure, working temperature range and suitability for submersion as given in [Table 4.3](#).

2.2 Sizes

2.2.1 Tube

The size, by which a flexible hose is designated, shall be related to the nominal size of its internal diameter.

2.2.2 End connectors

The size and type of end connectors assembled to the tube shall be included in the product documentation.

2.2.3 Hose assembly

The size designation of the hose assembly shall include the tube DN, the end connector type and size, and the effective overall length.

Section 3 Materials

3.1 General

3.1.1 Corrosion resistance

All tube reinforcement, such as metallic braiding and crimp fittings, shall be corrosion resistant.

For the purpose of this document, the following materials shall be deemed to be corrosion resistant:

- (a) Plastic materials as specified in [Clause 3.2](#).
- (b) Copper as specified in [Clause 3.3.1](#).
- (c) Copper alloy as specified in [Clause 3.3.2](#).
- (d) Stainless steel as specified in [Clause 3.3.3](#).

3.1.2 Contamination of water

All materials in contact with drinking water shall conform to AS/NZS 4020.

3.2 Plastic and elastomeric material

3.2.1 General

Plastic and elastomeric materials used in hose assemblies, or their components, shall meet all of the performance requirements of this document.

NOTE Consideration should be given to the reaction of plastics and elastomers with other materials during normal life span and use. Characteristics to be taken into account should include compatibility and resistance to variations in water quality and elevated temperatures.

3.2.2 Cross-linked polyethylene

Cross-linked polyethylene (PE-X) materials used in hose assemblies, or their components, shall meet all of the performance requirements of this document.

3.2.3 Acetal

Acetal plastics used for structural components that are in contact with the water supply shall be copolymer.

This statement may apply to all other plastics.

3.3 Metallic materials

3.3.1 Copper

Copper shall conform to the following:

- (a) Wrought products — AS 2738.
- (b) Tubular components — Copper pipe conforming to AS 1432.

3.3.2 Copper alloy

Copper alloy shall conform to CEN/TS 13388 or the following:

- (a) Castings — AS 1565 or EN 1982 and a lead content of less than 4.5 %.
- (b) Hot pressings — AS/NZS 1568.
- (c) Rod for machined parts — AS/NZS 1567.
- (d) Tubular components — Copper alloy pipe conforming to AS 1572 alloy designation C26130. Where bent or stamped in the fabrication process, the pipe shall be sufficiently stress-relieved so that it is capable of passing the stress corrosion test specified in ISO 6957:1988 Clause 8, using a test solution of pH 9.5 without prior pickling, after all fabrication processes are completed.

NOTE ISO 6957 requires that the entire hose component be tested before any coating or plating operation.
- (e) Copper alloys in contact with water — To be dezincification-resistant in accordance with AS 2345.

3.3.3 Stainless steel

Stainless steel composition shall conform to the following:

- (a) Stainless steel in contact with water shall conform to ASTM A276/A276M for wrought components or ASTM A269/A269M for tubular components, Grades 316, 316L, 316Ti, UNS S31803 (2205) or equivalent.
- (b) Stainless steel not in contact with water shall conform to ASTM A276/A276M for wrought components or ASTM A269/A269M for tubular components, Grades 304, 304L, 304LN, 316, 316L, 316Ti, UNS S31803 (2205) or equivalent.
- (c) Stainless steel braid and ferrules shall be a minimum UNS S30400 and S30403 and conform to ASTM A478.

3.4 Seals for end connections and O rings

Seals for end connections and O rings shall conform to the following:

- (a) Elastomeric seals shall conform to AS 1646 and AS 681.1 or a recognized equivalent standard.

NOTE Recognized equivalent O-ring material standards include ASTM, EN and ISO.
- (b) All sealing materials shall conform to the performance requirements for completed hose assemblies (see [Clause 6](#)).

Section 4 Design

4.1 End connectors

4.1.1 General

The design configuration shall be at the discretion of the manufacturer subject to conformance to the performance requirements of this document. All end connectors shall be capable of making a watertight joint when connected and tightened in accordance with the manufacturer's instructions.

Other connections (e.g. flange, camloc) shall conform to the relevant Australian or international standard.

For end fittings specific to a customer's requirement, the intended mating fitting shall be supplied and tested for conformance to [Clause 6.2](#).

4.1.2 Threads

Threads other than when intended to be used for a specific design connection shall conform to AS 3688.

4.1.3 Thread engagement

The length of thread engagement on assembly, when torqued to the manufacturer's recommended specification, shall allow a minimum number of full threads in accordance with [Table 4.1.3](#). The number of full threads shall be counted when the threaded joint is assembled with washers or seals.

Table 4.1.3 — Thread engagement

Thread nominal size ^a	Other threads (major diameter) mm	Minimum number of full threads engaged
≤ 1"/25 mm	≤ 35	3
> 1"/25 mm ≤ 2"/50 mm	> 35 ≤ 60	4
> 2"/50 mm ≤ 3"/80 mm	> 60 ≤ 90	5
^a Pipe threads shall conform to AS ISO 7.1 or AS 1722.2.		

4.2 Working conditions

4.2.1 Operating temperature

The working temperature shall be —

- (a) for water applications, up to 70 °C (L); and
- (b) for water applications, up to 90 °C (H).

4.2.2 Operating pressure

Operating pressures for each hose classification are included in [Table 4.3](#).

4.3 Classification

[Table 4.3](#) specifies flexible hose assembly classifications.

Table 4.3 — Flexible hose assembly classification

Class	Description	Application	Maximum operating pressure	Maximum length
1	End of line hoses with an open end	Hoses which have no isolation device after inlet. Not intended for use under static pressure	< 250 kPa (dynamic)	10 m
2	Flexible connectors up to and including DN 20	Connections between fixed points	1 400 kPa (static)	2 m
3	Flexible connectors > DN 20 and ≤ DN 50	Connections between fixed points	25 mm = 1 400 kPa 32 mm = 1 350 kPa 40 mm = 940 kPa 50 mm = 850 kPa (static)	10 m
4	End of line hoses with shut-off devices, pressurized	Hoses for wash down tapware or which have isolation after the inlet of the hose	1 400 kPa (static)	10 m < DN 25 2 m for ≥ DN 25

Test requirements for Class 1 hoses shall be in accordance with AS/NZS 3662 and as prescribed in [Table A.1](#) and at the maximum temperature for which the hose is rated (L or H).

Hoses intended for submersion shall have the suffix “S” following the class of hose in the marking. These flexible connectors may have a protective external coating or have additional resistance to corrosion.

Connectors for installations requiring submersion in water or in areas where there is an elevated risk of environmental corrosion shall be subjected to the conditions specified in [Clause 6.11](#).

NOTE 1 Classes 2 and 3 may be used to provide inline expansion and movement compensation.

NOTE 2 Class 1 hoses are intended for use for filling applications.

4.4 Marking

Flexible hose assemblies shall be permanently and legibly marked with the following:

- (a) Manufacturer's name, brand or trademark.
- (b) WaterMark.
- (c) Licence number.
- (d) The rated working temperature (70 °C or 90 °C) of the assembly. In the case of hoses less than DN 10, the letter “L” for flexible hoses for water applications up to 70 °C or “H” for flexible hoses for water applications up to 90 °C.

NOTE 1 A hose for water applications up to 90 °C (H) is automatically suitable for water applications < 70 °C (L).

- (e) Reference to this document, i.e. AS 3499.
- (f) Date or batch identification for product traceability.
- (g) Class and suffix if applicable.

Manufacturers making a statement of conformance to this document on a product, packaging or promotional material related to that product, are advised to ensure that such conformance is capable of being verified.

Class 1 hoses or their unit packaging shall be durably and legibly marked with Items (a), (b), (c), (e), (f) and (g), as well as any limitations on the product's installation and use, e.g. flow rate, maximum supply pressure, backflow prevention device where shower hoses are fitted.

NOTE 2 Additional marking requirements may be required by certification schemes.