



WMTS-528:2020

Plate heat exchangers - Indirect heating of drinking water

WaterMark Technical Specification

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PREFACE

This WaterMark Technical Specification was prepared in accordance with the Manual for the WaterMark Certification Scheme, Appendix 4, Protocol for Developing Product Specifications.

The objective of this WaterMark Technical Specification is to enable product certification in accordance with the requirements of the Plumbing Code of Australia (PCA).

The word 'VOID' set against a clause indicates that the clause is not used in this WaterMark Technical Specification. The inclusion of this word allows a common use clause numbering system for the WaterMark Technical Specifications.

The term 'normative' has been used in this WaterMark Technical Specification to define the application of the appendices to which they apply. A 'normative' appendix is an integral part of a WaterMark Technical Specification.

The test protocol and information in this WaterMark Technical Specification was arranged to meet the authorisation requirements given in the PCA.

The WaterMark Schedule of Products and the WaterMark Schedule of Excluded Products are dynamic lists and change on a regular basis. Based on this function, these schedules are now located on the ABCB website (www.abcb.gov.au). These lists will be version controlled with appropriate historic references.



ACKNOWLEDGEMENTS

WaterMark Technical Specification WMTS-528:2019 was prepared by industry and was approved by the Administering Body on XX XX 2020.

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1 SCOPE

This Specification sets out requirements for plate heat exchangers which are intended to be used in heated water supply systems for the indirect heating of drinking water at a maximum operating temperature of 90°C. These plate heat exchangers are components of water heating systems and designed in various configurations including number of plates, plate design and size in order to suit the installation.

The plate heat exchangers may be single or double wall construction and function with a heat exchange fluid in the primary circuit and drinking water in the secondary circuit.

2 APPLICATION

Appendix A sets out the means by which compliance with this WaterMark Technical Specification shall be demonstrated by a manufacturer for the purpose of product certification.

3 REFERENCED DOCUMENTS

The following documents are referred to in this Specification.

AS

2845 Dezincification resistance of copper alloys

AS/NZS

3500.0 Plumbing and drainage, – Part 0: Glossary of terms

3500.1 Plumbing and drainage, – Part 1: Water services

3500.4 Plumbing and drainage, – Part 4: Heated water services

4020 Testing of products for use in contact with drinking water

ASTM

A240/ A240M Standard specification chromium and chromium-nickel stainless steel plate, sheet and strip for pressure vessels and for general applications

EN

10088.2 Stainless steels – Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes

NCC

PCA Plumbing Code of Australia

4 DEFINITIONS

For the purpose of this WaterMark Technical Specification, the definitions given in the Manual for the WaterMark Certification Scheme, Plumbing Code of Australia (PCA), AS/NZS 3500.0 and the following apply.

4.1 Plate heat exchanger

An assembly consisting of a series of plates joined together to form two separate fluid circuits, so that heat may transfer between the two fluids.

4.2 Single wall plate heat exchanger

A plate heat exchanger where the primary and secondary fluids are separated by one wall

4.1 Double wall plate heat exchanger

A plate heat exchanger where the primary and secondary fluids are separated by two walls

5 MATERIALS

5.1 General

This section specifies requirements for materials utilised in the construction of the product. Materials in contact with water shall be corrosion resistant or protected against corrosion

5.2 Stainless Steel

Stainless steel in contact with the water shall conform to EN 10088.2 or ASTM A240/A240 minimum grade 1.4301 (304)

5.3 Copper Alloy

Copper alloys in contact with water shall conform to AS 2345.

5.4 Gaskets and Seals

Elastomeric gaskets or seals utilised in the construction of the Plate Heat Exchanger shall comply with the performance requirements of this Specification and be suitable for use for the application and fluid

5.5 Other Materials

Other materials utilised in the construction of the product shall be fit for the intended purpose and comply with the performance requirements of this Specification.

6 MARKING

Markings to be placed on products or packaging shall be in accordance with the Manual for the WaterMark Certification Scheme.

In addition product shall be permanently and legibly marked with the following:

- a) Model identification.
- b) Identification of connection ends

7 PACKAGING

The plate heat exchanger shall be packaged in such a manner so as to avoid damage during transportation and handling.

8 DESIGN

8.1 General

The plate heat exchanger may be of various types including fused, brazed or gasketed and single or double wall construction.

8.2 End connections

End connectors for connection to metallic pipes or fittings shall comply with AS 3688, AS 4087 or AS 2129. Other connection ends shall comply with the requirements relevant to the connection

8.3 Double wall heat exchangers

For plate heat exchangers that include a double wall the failure of one wall shall be visibly evident.

9 PERFORMANCE REQUIREMENTS AND TEST METHODS

9.1 Products for use in contact with drinking water

Products for use in contact with drinking water shall comply with AS/NZS 4020.

9.2 Torque test

When a torque of 34Nm is applied to the end connector for a period of at least 10s there shall be no damage likely to affect the operation of the heat exchanger. After applying the torque test the plate heat exchanger shall be tested and comply with Clause 9.4 Watertightness Test

9.3 Hydrostatic strength test

When tested in accordance with Appendix B, the plate heat exchanger shall not leak or show signs of distortion, splitting, cracking, breakage or other failure when tested at 1.5 times the manufacturers recommended Maximum Operating Pressure.

9.4 Watertightness test

When tested in accordance with Appendix C, the plate heat exchanger shall not leak when tested at the manufacturers recommended Maximum Operating Pressure

9.5 Double wall failure test

When tested in accordance with Appendix D plate heat exchangers that include within the design a double wall failure of either wall shall be visibly evident within 300 seconds

10 TEST SEQUENCE AND TEST SAMPLE PLAN

Independent samples covering the range of plate heat exchangers shall be used for testing of the performance requirements of Clauses 9.1 9.2 9.3 and 9.5.

11 PRODUCT DOCUMENTATION

Information shall be available to aid the installer and user in the correct installation, operation and ongoing maintenance of the product and include critical data on the products, use and application and any limitations.

The documentation shall satisfy the requirements of a warranty as referenced in the PCA and those requirements of the AS/NZS 3500 series of Standards. The information shall be readily available and be in plain English and supplemented by figures and diagrams as applicable.

11.1 Product data

Product data shall be available that identifies the following critical product characteristics as a minimum:

- a) Maximum Operating Temperature and Maximum Operating Pressure Jointing methods and adaptation to other piping systems.
- b) Product range and model identification.

- c) Performance data.

11.2 INSTRUCTIONS

11.2.1 Installation instructions

Instructions shall be provided that give full details of installation procedures for the plate heat exchanger including:

- a) Reference to installation in accordance with the PCA, including the installation of any non-integral backflow prevention device, means of expansion control and any limitations on the product.

Note: A material or product that is listed on the WaterMark Product Database and is marked in accordance with the WaterMark Certification Scheme is recognised by authorities having jurisdiction as being authorised for use in a plumbing or drainage installation. This is because the material or product complies with the applicable product specification. The installation of an authorised material or product must meet the requirements of the PCA. Where the PCA does not contain installation requirements applicable to the authorised material or product, acceptance of the installation is at the discretion of the authority having jurisdiction.

- b) The need for additional control equipment.
- c) Detailed step by step instructions.
- d) The need for special tools or training.
- e) Commissioning procedures and adjustments required.
- f) Troubleshooting guide.
- g) Contact details for after sales service.

11.2.2 Operating and maintenance instructions

Operating and maintenance instructions shall be provided that include:

- a) Any regular maintenance requirements.
- b) Troubleshooting guide.
- c) Contact details for after-sales service.

APPENDIX A MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS PRODUCT SPECIFICATION

(Normative)

A.1 SCOPE

This appendix sets out the means by which compliance with this WaterMark Technical Specification shall be demonstrated by a manufacturer under the WaterMark Certification Scheme.

A.2 RELEVANCE

The long-term performance of plumbing systems is critical to the durability of building infrastructure, protection of public health and safety, and protection of the environment.

A.3 PRODUCT CERTIFICATION

The purpose of product certification is to provide independent assurance of the claim by the manufacturer that products comply with this WaterMark Technical Specification.

The WaterMark Certification Scheme serves to indicate that the products consistently conform to the requirements of this WaterMark Technical Specification.

The sampling and testing plan, as detailed in Paragraph A5 and Table A1, shall be used by the WaterMark Conformity Assessment Body. Where a batch release testing program is required, it shall be carried out by the manufacturer as detailed in Paragraph A5 and Table A2.

A.4 DEFINITIONS

A.4.1 Batch release test

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

A.4.2 Production batch

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

A.4.3 Sample

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

NOTE: The number of units of product in the sample is the sample size.

A.4.4 Sampling plan

A specific plan that indicates the number of units of components or assemblies to be inspected.

A.4.5 Type test batch

Schedule of units of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The batch is defined by the manufacturer.

A.4.6 Type testing (TT)

Testing performed to demonstrate that the material, component, joint or assembly is capable of conforming to the requirements given in the WaterMark Technical Specification.

A.5 TESTING

A.5.1 Type testing

Table A1 sets out the requirements for type testing and frequency of re-verification.

A.5.2 Batch release testing

Table A2 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to this WaterMark Technical Specification on an ongoing basis. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of the sampling and testing nominated by the manufacturer's quality plan and/or documented procedures shall take precedence for the purposes of WaterMark product certification.

A.5.3 Retesting

In the event of a batch release test failure, the products within the batch may be retested at a frequency agreed to with the WaterMark Conformity Assessment Body and only those batches found to comply may be claimed and/or marked as complying with this WaterMark Technical Specification.

A.5.4 Minimum annual inspection requirements

Table A3 sets out the minimum annual inspection requirements to be undertaken.

A.5.5 Re-evaluation testing

Table A4 sets out the requirements for re-evaluation testing.

**TABLE A1
TYPE TESTS**

Characteristic	Clause	Requirement	Test method	Frequency
Materials	5	Composition	Review of Material Certificates	At any change in design/specification
Markings	6	Labelling/markings	Review of documentation/physical examination	At any change in design/specification
Packaging	7	Avoid damage during transportation and handling	Review of documentation/physical examination	At any change in design/specification
Design	8.1	General	Review of design	At any change in the design
	8.2	End Connections	Relevant Specification	
	8.3	Double wall heat exchangers	Design Review/Clause 9.5	
Performance	9.1	Products in contact with drinking water	AS/NZS 4020	At any change in material or manufacturing process
	9.2	Torque test	Clause 9.2	At any change in the design
	9.3	Hydrostatic strength test	Appendix B	
	9.4	Watertightness test	Appendix C	
	9.5	Double wall failure test	Appendix D	
Product documentation	11	Product data/Installation and maintenance instructions	Product documentation	At any change to installation requirements

Note: Changes in design or specification for one off applications that are variations on the certified product, eg change in number of plates or fitting size or type that would still comply with the intent or referenced standards need not be type tested, at the discretion of the certifying body

TABLE A2
BATCH RELEASE TESTS

Characteristic	Clause	Requirement	Test method	Frequency
Materials	5	Composition	Review of Material Certificates	Each Batch
Markings	6	Labelling/markings	Visual inspection	Each Unit
Design	8.1	End connectors	Relevant Specification	One per Batch
Performance	9.4	Watertightness test	Appendix C	Each Unit
Product documentation	11	Product data/Installation and maintenance instructions	Product documentation	At any change to installation requirements

TABLE A3
MINIMUM ANNUAL INSPECTION REQUIREMENTS

Characteristic	Clause	Requirement	Verification method	Frequency
Design	8.1 - 8.2	General design/construction	Visual and component examination	Each Inspection
Product marking	6	Product marking, use of the WaterMark logo and license number	Visual inspection of marked product, relevant packaging and documentation	
Product documentation	11	Product data/Installation and maintenance instructions	Product documentation	

TABLE A4
RE-EVALUATION TESTING

Characteristic	Clause	Requirement	Test method
Performance	9.3	Hydrostatic strength test	Appendix B

APPENDIX B PLATE HEAT EXCHANGER - HYDROSTATIC STRENGTH TEST

(Normative)

B.1 SCOPE

This Appendix sets out the method for determining the ability of components and joints of the plate heat exchanger to withstand hydrostatic pressure without leakage or permanent distortion.

B.2 PRINCIPLE

The components and joints subject to permanent hydrostatic pressure within the plate heat exchanger are subjected to a hydrostatic pressure for a period of time at 90° C and inspected for leakage and permanent distortion. Both primary and secondary circuits are tested independently.

B.3 APPARATUS

The following apparatus is required:

- a) Water supply sufficient to maintain the required pressure and temperature.
- b) Pressure gauge.

A pressure gauge complying with the requirements of AS 1349 for industrial gauges and capable of indicating the required test pressure to within $\pm 2\%$ of the true value.

NOTE: Digital or analogue pressure gauges with equivalent or better accuracies may be use

- c) Temperature

A temperature gauge capable of measuring $\pm 1^\circ\text{C}$

- d) Time

A timing device capable of measuring $\pm 1\text{s}$

B.4 PROCEDURE

The procedure shall be as follows:

- a) Connect the supply water at a temperature of $90^\circ\text{C} \pm 1^\circ\text{C}$ to the plate heat exchanger primary circuit whilst maintaining the secondary circuit at atmospheric.
- b) Circulate water for a period of 20 minutes then close shut off valve.
- c) Slowly increase the pressure until it reaches the test pressure.

- d) Maintain this pressure for 15 +5, -0 min.
- e) Inspect the assembly for any leaks
- f) Release the pressure and inspect for any permanent distortion
- g) Record the test pressure, temperature and duration at this pressure.
- h) Repeat a) to g) for secondary circuit

B.5 REPORT

The following shall be reported:

- a) Manufacturer, model and description of plate heat exchanger.
- b) Test pressure temperature and testing time
- c) Any leakage or structural damage.
- d) Reference to this test method, i.e., WMTS 528, Appendix B

APPENDIX C PLATE HEAT EXCHANGER - WATERTIGHTNESS TEST

(Normative)

C.1 SCOPE

This Appendix sets out the method for determining any leakage of the heat exchanger assembly.

C.2 PRINCIPLE

The components and joints subject to permanent hydrostatic pressure within the heat exchanger are subjected to a pressure for a period of time at ambient temperature and assessed for leakage. Both primary and secondary circuits are tested independently.

C.3 APPARATUS

The following apparatus is required:

- a) Water or air/pneumatic supply sufficient to maintain the required pressure.
- b) Pressure gauge.

A pressure gauge complying with the requirements of AS 1349 for industrial gauges and capable of indicating the required test pressure to within $\pm 2\%$ of the true value.

NOTE: Digital or analogue pressure gauges with equivalent or better accuracies may be use

- c) Time

A timing device capable of measuring ± 1 s

C.4 PROCEDURE

The procedure shall be as follows:

- a) Connect the supply water or air to the heat exchanger primary circuit whilst maintaining the secondary circuit at atmospheric
- b) Slowly increase the pressure until it reaches the test pressure.

Hydrostatic – Maximum Operating Pressure of the plate heat exchanger

Air/Pneumatic – minimum 700kPa

- c) Maintain this pressure for a minimum of 30s and assess the assembly for any leaks
- d) Release the pressure.

- e) Record the test pressure and duration at this pressure.
- f) Repeat a) to e) for secondary circuit

C.5 REPORT

The following shall be reported:

- a) Manufacturer, model and description of heat exchanger.
- b) Test pressure and time at pressure
- c) Any leakage.
- d) Reference to this test method, i.e., WMTS 528, Appendix C

APPENDIX D FAILURE OF DOUBLE WALL TEST

D.1 SCOPE

This Appendix sets out the method for determining that the failure of a wall within a double wall plate heat exchanger is visibly evident.

D.2 PRINCIPLE

The plate heat exchanger is examined for the most critical point in terms of the observed leakage. At this point a 2mm hole is drilled through both primary and secondary walls. The primary and secondary circuits are pressurised and time taken to evidence leakage is measured.

D.3 APPARATUS

The following apparatus is required:

- a) Drilling equipment and 2mm drill bit
- b) Water supply sufficient to maintain the required pressure at ambient temperature.
- c) Pressure gauge.

A pressure gauge complying with the requirements of AS 1349 for industrial gauges and capable of indicating the required test pressure to within $\pm 2\%$ of the true value.
NOTE: Digital or analogue pressure gauges with equivalent or better accuracies may be use

- d) Time

A timing device capable of measuring $\pm 1s$

D.4 PROCEDURE

The procedure shall be as follows:

- a) Identify the most critical point in the heat exchanger
- b) Drill a 2mm continuous hole through both partitions at this location
- c) Fill the primary circuit with water and pressurise to 50kPa and measure the time taken from reaching this pressure and visually detecting the leakage.
- d) Repeat this procedure on the secondary circuit.

D.5 REPORT

The following shall be reported:

- a) Manufacturer, model and description of heat exchanger.
- b) The point at which the 2mm penetration was made and reason for the location
- c) Time taken to detect leakage on both primary and secondary circuits of heat exchanger.
- d) Reference to this test method, i.e., WMTS 528, Appendix D