





**WMTS-528:2021**

**Plate heat exchangers - Indirect heating/cooling of water in a plumbing system**

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**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](http://www.abcb.gov.au)). These lists will be version controlled with appropriate historic references.



## **ACKNOWLEDGEMENTS**

WaterMark Technical Specification WMTS-528:2021 was prepared by industry and was approved by the Administering Body on 24 February 2021.

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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/cooling of water in a plumbing system. These plate heat exchangers are components of water heating/cooling 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 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

2129 Flanges for pipes valves and fittings

2345 Dezincification resistance of copper alloys

3688 Water supply and gas systems – Metallic fittings and end connectors

AS/NZS

3500.0 Plumbing and drainage – Part 0: Glossary of terms

4087 Metallic flanges for waterworks purposes

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

ISO



6957            Copper alloys – Ammonia test for stress corrosion resistance

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.

### **4.2        Single wall plate heat exchanger**

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

### **4.3        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 water shall conform to the composition requirements of EN 10088.2 or ASTM A240/A240 minimum grade 1.4301 (304).

Note: Consideration should be given to water quality as installed in selection of the appropriate grade.

### **5.3        Copper alloy**

Copper alloys in contact with water shall have a lead content of less than 4.5% and comply with the dezincification requirements of AS 2345. Components that are cold formed or cold pressed from copper-zinc alloys containing more than 10% zinc shall be capable of passing the stress corrosion test specified in ISO 6957 Clause 8 using a test solution of pH 9.5, without prior pickling and after all processing has been completed.

#### **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) Batch identification or serial number.
- c) Identification of connection ends.
- d) For single wall plate heat exchangers the following warning:

WARNING: REFER TO MANUFACTURER'S INSTRUCTIONS WHEN THIS PRODUCT IS USED IN A DRINKING WATER SUPPLY

### **7 PACKAGING**

The plate heat exchanger shall be packaged in such a manner so as to avoid damage during transportation, storage 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 Single wall plate heat exchanges**

Plate heat exchangers that include a single wall when installed shall include mechanisms to protect any drinking water supply from contamination from a transfer medium. This shall be by maintaining the pressure of the primary drinking water circuit higher than the secondary transfer medium circuit, unless the heating medium is drinking water or non-toxic.

NOTE 1: In the event of failure, the heat transfer medium should not contaminate a drinking water supply.

NOTE 2: The drinking water supply should be sustained at a pressure that protects it from contamination by a heat transfer medium.

### **8.4 Strength and sealing**

#### **8.4.1 General**

Plate heat exchangers shall be constructed so that there shall be no leakage from the primary and secondary circuits when subjected to the Maximum Operating Pressure (MOP) as declared by the manufacturer.

#### **8.4.2 Double wall plate heat exchangers**

For plate heat exchangers that include a double wall, the failure of one wall shall result in leakage that is 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 that will affect the operation of the heat exchanger. After applying the torque test, the plate heat exchanger shall be tested and comply with Clause 9.3 Strength and sealing test.

### **9.3 Strength and sealing test – Type 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 manufacturer's recommended MOP.

#### **9.4 Strength and sealing test – Batch release test**

The plate heat exchanger shall be tested for structural strength and leakage in each channel. Structural strength shall be assessed by testing to hydrostatic or pneumatic conditions at least to the MOP Leakage testing may be combined with structural strength testing or separate. The procedures utilised shall be validated and verified ongoing to detect any strength or leak faults.

#### **9.5 Double wall failure test**

When tested in accordance with Appendix C, for 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. This shall include critical data on the products, use and application, and any limitations.

The information shall be readily available, 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 MOP Jointing methods and adaptation to other piping systems.
- b) Product range and model identification.
- c) Performance data.
- d) Product limitations.

NOTE: Failure conditions of single wall plate heat exchangers and potential contamination of the drinking water supply may be a product limitation due to their installation. This information should be available in the product's Scope of Use for the appropriate selection of type of plate heat exchangers in system design.

## **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.

Annual product conformity surveillance shall be undertaken by the WaterMark Conformity Assessment Body in accordance with Paragraph A5 and Table A3. Re-evaluation testing for re-certification, as detailed in Paragraph A5 and Table A4, shall be used by the WaterMark Conformity Assessment Body.

### **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	Materials	Review of material certificates	At any change in design/specification
Markings	6	Marking	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	Single wall plate heat exchangers	Review of product documentation/Installation instructions	
	8.4	Strength and sealing - General	Clause 9.3 and Appendix B	
	8.4.2	Strength and sealing - Double wall plate heat exchangers	Clause 9.5 and Appendix C	
Performance	9.1	Products for use 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	Strength and sealing test	Appendix B	
	9.5	Double wall failure test	Appendix C	
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 WMCAB.

**TABLE A2  
BATCH RELEASE TESTS**

<b>Characteristic</b>	<b>Clause</b>	<b>Requirement</b>	<b>Test method</b>	<b>Frequency</b>
Materials	5	Material	Review of material certificates	Each batch
Markings	6	Marking	Visual inspection	Each unit
Design	8.1	End connectors	Relevant specification	One per batch
Performance	9.4	Strength and sealing test	Clause 9.4	Each unit

Product documentation	11	Product data/Installation and maintenance instructions	Product documentation	At any change to installation requirements
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**TABLE A3**  
**MINIMUM ANNUAL INSPECTION REQUIREMENTS**

<b>Characteristic</b>	<b>Clause</b>	<b>Requirement</b>	<b>Verification method</b>	<b>Frequency</b>
Design	8	General design/construction	Visual and component examination	Each inspection
Product marking	6	Product marking, use of the WaterMark logo and licence 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**

<b>Characteristic</b>	<b>Clause</b>	<b>Requirement</b>	<b>Test method</b>
Performance	9.3	Strength and sealing 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 ambient conditions 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 used.

- c) Temperature

A temperature gauge capable of indicating the required test temperature to within  $\pm 2\%$  of the true value.

- d) Time

A timing device capable of reading 1s.

### B.4 PROCEDURE

The procedure shall be as follows:

- a) Connect the supply water to the plate heat exchanger primary circuit whilst maintaining the secondary circuit at atmospheric.
- b) Increase the pressure at a constant rate in a period of no less than 30 seconds until it reaches the test pressure.

- c) Maintain this pressure for 15 +5, -0 min.
- d) Inspect the assembly for any leaks.
- e) Release the pressure and inspect for any permanent distortion.
- f) Record the test pressure, temperature and duration at this pressure.
- g) 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 FAILURE OF DOUBLE WALL TEST

(Normative)

### C.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.

### C.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 the time taken to evidence leakage is measured.

### C.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 used.

- d) Time

A timing device capable of reading 1s.

### C.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.

## C.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 C.



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