



## **Water supply—Valves for the control of heated water supply temperatures**

### **Part 4: Thermostatically controlled taps for the control of heated water supply temperatures**



This Australian Standard® was prepared by Committee WS-026, Valves Primarily for Use in Warm and Hot Water Systems. It was approved on behalf of the Council of Standards Australia on 9 May 2014.

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The following are represented on Committee WS-026:

- Australian Chamber of Commerce and Industry
  - Australian Industry Group
  - Building Officials Institute of New Zealand
  - Department of Health, South Australia
  - Employers and Manufacturers Association
  - Gas Appliance Manufacturers Association of Australia
  - Institute of Hospital Engineering Australia
  - Master Plumbers and Mechanical Services Association of Australia
  - Master Plumbers Association of NSW
  - Master Plumbers, Gasfitters and Drainlayers, New Zealand
  - NSW Ministry of Health
  - Plumbing Products Industry Group
- 

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Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

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Australian Standard<sup>®</sup>

**Water supply—Valves for the control of  
heated water supply temperatures**

**Part 4: Thermostatically controlled taps  
for the control of heated water supply  
temperatures**

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## PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee WS-026, Valves Primarily for Use in Warm and Hot Water Systems.

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

This Standard includes provision for electronically controlled valves and requirements for heated water shut-off performance.

This is a new Standard which forms Part 4 of a suite of Standards that cover products for the control of heated water temperatures, as follows:

AS

- 4032 Water supply—Valves for the control of heated water supply temperatures
- 4032.1 Part 1: Thermostatic mixing valves—Materials design and performance requirements
- 4032.2 Part 2: Tempering valves and end-of-line temperature-actuated devices
- 4032.3 Part 3: Requirements for field testing, maintenance or replacement of thermostatic mixing valves, tempering valves and end-of-line temperature control devices
- 4032.4 Part 4: Thermostatically controlled taps for the control of heated water supply temperatures

The objective of this Standard is to provide manufacturers, system designers, relevant authorities and others with performance requirements for thermostatic mixing taps, which provide a level of protection to users against exposure to high or excessive fluctuations in mixed water temperatures caused by variations, including shut-off, in the cold or heated water supply.

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

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of this Standard.

This Standard necessarily deals with existing conditions, but is not intended to discourage innovation or to exclude material, equipment and methods that may be developed in the future. Revisions will be made from time to time in view of such developments, and amendments to this edition will be made only when absolutely necessary.

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## STANDARDS AUSTRALIA

## Australian Standard

**Water supply—Valves for the control of heated water supply temperatures****Part 4: Thermostatically controlled taps for the control of heated water supply temperatures**

## SECTION 1 SCOPE AND GENERAL

**1.1 SCOPE**

This Standard specifies requirements for the design, construction, testing performance and means of compliance for thermostatic mixing taps—

- (a) for use with heated water at a supply temperature not exceeding 90°C;
- (b) for use with hot and cold water with working pressures not exceeding 1400 kPa; and
- (c) of nominal sizes not larger than DN 20.

When used for ablutionary purposes, thermostatic mixing taps complying with this Standard provide the user with reasonable protection against scalding or excessive temperature fluctuations due to variations of pressures and temperatures of the hot and cold water supplies, including thermal shut-off.

## NOTES:

- 1 Diagrams in this Standard are typical.
- 2 This Standard includes a method for assessing the flow performance of a thermostatic mixing tap but at the time of its publication, the Standard is not referenced in AS/NZS 6400.

**1.2 APPLICATION**

The operating range of the tap shall be nominated by the manufacturer.

When adjusted to an outlet temperature not exceeding 45°C, thermostatic mixing taps are intended for use in health care, aged care, childcare, care for people with disabilities or any other similar at risk situations.

When adjusted to an outlet temperature not exceeding 50°C, thermostatic mixing taps may be used for other applications.

Means for demonstrating compliance with this Standard shall be as given in Appendix A.

**1.3 REFERENCED DOCUMENTS**

The following are the normative documents referenced in this Standard:

## AS

- |        |  |
|--------|--|
| 1199   | Sampling procedures for inspection by attributes   |
| 1199.1 | Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection |
| 1432   | Copper tubes for plumbing, gasfitting and drainage applications                              |
| 1565   | Copper and copper alloys—Ingots and castings   |
| 1572   | Copper and copper alloys—Seamless tubes for engineering purposes                             |

AS	
1769	Welded stainless steel tubes for plumbing applications
1834	Material for soldering
1834.1	Part 1: Solder alloys
1881	Zinc alloys—Casting ingots and castings—Quality requirements
2136	Method for detecting the susceptibility of copper and its alloys to stress corrosion cracking using the mercurous nitrate test
2345	Dezincification resistance of copper alloys
2738	Copper and copper alloys—Compositions and designations of refinery products, wrought products, ingots and castings
3558	Methods of testing plastics and composite materials sanitary plumbing fixtures
3558.5	Part 5: Determination of degradation by ultraviolet light
3688	Water supply—Metallic fittings and end connectors
4032	Water supply—Valves for the control of heated water supply temperatures
4032.1	Part 1: Thermostatic mixing valves—Materials design and performance requirements
4032	Water supply—Valves for the control of hot water supply temperatures
4032.3	Part 3: Requirements for field testing, maintenance or replacement of thermostatic mixing valves, tempering valves and end of line temperature control devices
AS/NZS	
1167	Welding and brazing—Filler metals
1167.1	Part 1: Filler metal for brazing and braze welding
1567	Copper and copper alloys—Wrought rods, bars and sections
1568	Copper and copper alloys—Forging stock and forgings
3000	Electrical installations (known as the Australian/New Zealand wiring rules)
3499	Water supply—Flexible hose assemblies
3500	Plumbing and drainage
3500.0	Part 0: Glossary of terms
4020	Testing of products for use in contact with drinking water
6400	Water efficient products—Rating and labelling
NZS	
3501	Specification for copper tubes for water, gas and sanitation
ASTM	
A269	Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
A276	Standard Specification for Stainless Steel Bars and Shapes
A313/A313 M	Standard Specification for Stainless Steel Spring Wire
B127	Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip
B163	Standard Specification for Seamless Nickel and Nickel Alloy Condenser and Heat-Exchanger Tubes

## ASTM

B164	Standard Specification for Nickel-Copper Alloy Rod, Bar and Wire
B165	Standard Specification for Nickel-Copper Alloy (UNS N04400) Seamless Pipe and Tube

## SA

HB 18.28	Conformity assessment—Guidance on a third-party certification system for products
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**1.4 DEFINITIONS**

For the purpose of this Standard, the definitions in AS/NZS 3500.0 and those below apply.

**1.4.1 Cyclic actuator**

A device capable of activating the product under test through the cycles of movements specified in this Standard, to simulate normal usage over a relatively short period of time.

**1.4.2 Dynamic pressure ratio**

The ratio at the hot and cold inlets of the higher to the lower dynamic pressures under flow conditions.

**1.4.3 Temperature control**

An essential feature and an integral part of a thermostatic mixing tap, which permits the user to adjust the temperature of the mixed water to suit personal needs.

**1.4.4 Thermal shut-off (sudden failure of the cold or heated water supply)**

An operating safety feature wherein, if a thermostatic mixing tap is subjected to the shut-off of the cold or heated water supply to it, the risk of scalding or cold shock to the user or person(s) exposed to the mixed water is minimized.

**1.4.5 Thermostatic mixing tap**

A tap into which hot and cold water entering through separate ports are mixed in a chamber and then delivered through a single common outlet, the temperature of the mixed water being automatically controlled at a user-adjustable temperature that is suitable for direct contact with the skin and which gives the user the ability to shut-off the outlet flow.

## NOTES:

- 1 A product with multiple outlets selected by an integral diverter valve is considered to have a single outlet.
- 2 The product may also deliver cold water without mixing.

**1.4.6 Water volume control**

A device that may be used to control the rate of discharge of the mixed water. It is an integral part of an end-of-line valve or connected to the outlet for an in-line valve, and which may incorporate a temperature control valve.

**1.5 PRODUCT DATA**

The product data shall be supplied with the tap and be readily available from the manufacturer or agent and shall comprise the following:

- (a) General information that includes—
  - (i) minimum and maximum specified dynamic pressures at the inlets, in kPa;
  - (ii) minimum and maximum permitted operating temperatures of the inlet hot and cold water, in °C;
  - (iii) minimum and maximum temperature settings of the mixed water, in °C;

- (iv) maximum dynamic pressure ratio;
  - (v) whether provided with integral isolating taps; and
  - (vi) details of any other relevant data.
- (b) Specified values, with equal dynamic pressures (dynamic pressure ratio equal to or less than 1.1:1), for the minimum and maximum—
- (i) dynamic pressures at the inlets, in kPa; and
  - (ii) flow rates at the outlet, in L/min, together with the pressure requirements for each when producing mixed water at the required temperature, as specified in Clause 4.12.1 or Clause 4.12.2, as applicable.
- (c) The overall block dimensions and the type (e.g. surface mounted or concealed).
- (d) Details of the end connectors.
- (e) The factory pre-set maximum temperature.

## 1.6 MARKING

Products complying with this Standard shall be marked with the following information:

- (a) Manufacturer's name, trademark or symbol.
- (b) Name or model number of the product.
- (c) Identification for traceability in the form of either—
  - (i) batch identification; or
  - (ii) individual serial number.
- (d) Certification mark.
- (e) Controls used to vary the temperature of the mixed water shall be permanently marked, to make the effect of movement understood by the user.
- (f) The letter 'H', the word 'HOT' or a red indicator for the heated water inlet. The letter 'C', the word 'COLD' or a blue indicator for the cold water inlet.
- (g) The number of this Standard (i.e. AS 4032.4).
- (h) The maximum working pressure.
- (i) For electronic taps, the following shall be included:
  - (i) Electrical supply information—operating voltage and the rating in amperes or loading in W or VA. Any limitation to the operation of the product shall also be marked (a.c., d.c., frequency, etc.).
  - (ii) A warning that the valve requires connection to electrical power and that it will not operate without power.

This information shall be permanently marked on the tap body or shown on a rating plate affixed to the valve.

### NOTES:

- 1 Manufacturers making a statement of compliance with this Australian Standard on a product, packaging, or promotional material related to that product are advised to ensure that such compliance is capable of being verified.
- 2 The intention is to achieve permanency of the marking for the life of the product.

## 1.7 INSTRUCTIONS

Each thermostatic mixing tap shall be accompanied by installation, commissioning and maintenance instructions, in English, in accordance with Appendix B.

## S E C T I O N 2 M A T E R I A L S

### 2.1 SCOPE OF SECTION

This Section specifies requirements for the materials for taps and component parts of thermostatic taps.

### 2.2 CORROSION-RESISTANT METALLIC MATERIALS

The parts of the thermostatic taps in contact with water shall be made from corrosion-resistant materials. For the purpose of this Standard, the following materials are deemed to be corrosion-resistant:

- (a) Copper, as specified in Clause 2.3.
- (b) Copper alloy, as specified in Clauses 2.4 and 2.5.
- (c) Stainless steel, as specified in Clause 2.6.
- (d) Material for springs, as specified in Clause 2.8(c).
- (e) Other materials, as specified in Clause 2.8.

### 2.3 COPPER

Copper shall comply with the following:

- (a) *Wrought products*—AS 2738.
- (b) *Tubular components*—Copper pipe shall comply with AS 1432 or NZS 3501.

### 2.4 COPPER ALLOY

Copper alloy shall comply with the following:

- (a) *Castings*—AS 1565 and have a lead content of not greater than 4.5%.
- (b) *Hot pressing*—AS/NZS 1568.
- (c) *Rod for machined parts*—AS/NZS 1567.
- (d) *Tubular components*—Copper alloy pipe shall comply with AS 1572 alloy, designation C 26130. Where bent or stamped in the fabrication process, the pipe shall be sufficiently stress-relieved, so that it is capable of passing the mercurous nitrate test specified in AS 2136 after all fabrication processes are completed.

NOTE: AS 2136 requires that the entire pipe component be tested before any coating or plating operation.

### 2.5 DEZINCIFICATION-RESISTANT (DR) COPPER ALLOY

Copper alloys in contact with water, except where used as outlets not of unit construction with the thermostatic mixing tap body, shall comply with AS 2345.

### 2.6 STAINLESS STEEL

Stainless steel shall comply with the following:

- (a) *Wrought components*—ASTM A276, series 300, and UNS S32750, S32304, S31803, S31500 duplex (ferritic-austenitic) stainless steels.
- (b) *Tubular components*—ASTM A269 or AS 1769 and UNS S32750, S32304, S31803, S31500 duplex (ferritic-austenitic) stainless steels.

## 2.7 PLASTICS MATERIALS

### 2.7.1 General

Plastics materials used in thermostatic tap components shall be of a type recommended by the polymer manufacturer as suitable and appropriate for use in the manufacture of the thermostatic tap component. Characteristics to be taken into account shall include compatibility and resistance to variations in water quality and elevated temperatures.

### 2.7.2 Acetal

Acetal plastics in contact with the water supply shall be copolymer.

### 2.7.3 Resistance to chemical degradation

When tested in accordance with the requirement of Clause 4.10, plastics-bodied taps shall comply with the following:

- (a) Upon completion of the exposure period, samples shall show no cracking, crazing or surface degradation visible to the naked eye.
- (b) Upon completion of the exposure period and subsequent short-term endurance test, samples shall comply with the requirements of Clauses 4.3 (watertightness at ambient temperature) and Clause 4.7 (watertightness at operating temperature).

### 2.7.4 UV resistance

Plastics components that are designed to be exposed to direct sunlight when installed shall not crack, craze or exhibit signs of any defect when tested in accordance with AS 3558.5.

## 2.8 OTHER COMPONENT MATERIALS

The following applies:

- (a) *Ceramics* Ceramic materials may be used.
- (b) *Filler metals* Filler metal shall be one of the following:
  - (i) Silver brazing alloy containing not more than 0.05% cadmium, complying with AS/NZS 1167.1.
  - (ii) Copper-phosphorus brazing alloy complying with AS/NZS 1167.1 with a minimum of 1.8% silver.
  - (iii) Solder complying with the requirements of AS 1834.1 and having a maximum of 0.1% lead.
- (c) *Material for springs* Materials for springs shall comply with one of the following:
  - (i) Stainless steel to ASTM A313/A313M.
  - (ii) Phosphor bronze to AS 2738, Alloy C51800.

NOTE: Other grades may be used, provided they meet the performance requirements of this Standard and have the equivalent corrosion-resistant properties.
- (d) *Nickel-copper-iron* Nickel-copper-iron shall comply with one of the following:
  - (i) AS 2738; or
  - (ii) ASTM B127, ASTM B163, ASTM B164 and ASTM B165.
- (e) *Seat and diaphragm materials* Diaphragm and seat materials shall have corrosion-resistant properties and, where used in contact with heated water, heat-resistant properties. Seat materials shall also have anti-adhesion properties for the conditions of intended use.
- (f) *Zinc alloy die castings* Zinc alloy die castings shall only be used for non-pressure applications and shall comply with AS 1881.

## SECTION 3 DESIGN AND MANUFACTURE

### 3.1 GENERAL

The body and component parts of thermostatic taps shall be designed and manufactured to perform their intended functions reliably so that, in the course of handling, installation, commissioning, normal operation or maintenance, damage that would prevent their continued compliance with this Standard does not occur.

### 3.2 END CONNECTORS

End connectors for connection to the piping system shall comply with AS 3688.

### 3.3 LIMITATION OF TEMPERATURE ADJUSTMENT

The limitation of temperature adjustment shall comply with the following:

- (a) *Maximum temperature stop* A maximum temperature stop shall be capable of adjustment to the required maximum mixed water temperature.
- (b) *User temperature adjustment* The user-accessible temperature adjustment shall not allow the mixed water temperature to be set to greater than 45°C or the maximum temperature stop setting, whichever is the lower.

### 3.4 ELECTRONIC VALVES

#### 3.4.1 Electrical safety

All electrical components shall comply with the requirements of the electrical regulator.

#### 3.4.2 Electromagnetic compatibility

The product shall comply with the requirements of the relevant regulator.

### 3.5 CROSS-FLOW PREVENTION DEVICES AND STRAINERS

Cross-flow prevention devices and strainers shall—

- (a) be provided by the manufacturer of the thermostatic tap;
- (b) comply with the relevant clauses of this Standard;
- (c) be provided separate from or integral with the thermostatic tap; and
- (d) be downstream of the isolating valves and in the order strainer then cross-flow prevention device.

### 3.6 ISOLATING VALVE

Where provided, inlet isolating valves of thermostatic mixing taps shall comply with the performance requirements of the relevant Standard.

### 3.7 WATER SHUT-OFF DEVICE

The water outlet shut-off device may be of the manufacturer's own design.

## SECTION 4 PERFORMANCE REQUIREMENTS

### 4.1 GENERAL

The thermostatic mixing tap shall be tested complete with cross-flow prevention devices, strainers, and any integral isolating valves.

### 4.2 PRODUCTS IN CONTACT WITH DRINKING WATER

Materials in contact with drinking water shall comply with AS/NZS 4020.

Thermostatic mixing taps shall be tested as end-of-line fittings.

### 4.3 WATERTIGHTNESS AT AMBIENT TEMPERATURE

When tested in accordance with the ambient temperature hydrostatic test of Appendix C, each thermostatic mixing tap shall not leak at hydrostatic pressures up to the lesser of 2000 kPa or 1.5 times the manufacturer's specified maximum working pressure.

### 4.4 THERMAL SHUT-OFF

#### 4.4.1 General

All thermostatic taps shall comply with Clauses 4.4.2 and 4.4.3.

#### 4.4.2 Cold water isolation

When tested in accordance with Appendix D, the thermal shut-off under cold water isolation of each thermostatic tap, when pre-adjusted to supply mixed water at temperatures of  $38 \pm 1^\circ\text{C}$ ,  $45 \pm 1^\circ\text{C}$  and the manufacturer's nominated maximum setting, shall not exceed the temperature rises and durations given in Table 4.1 during both the period of shut-off of the cold water supply and immediately following the restoration of the cold water supply.

The mixed water shall stabilize to within  $2^\circ\text{C}$  of the preset temperature, in not more than 20.0 s following restoration of the cold water supply.

#### 4.4.3 Heated water isolation

When tested in accordance with Appendix D, the thermal shut-off under heated water isolation of each thermostatic tap, when pre-adjusted to supply mixed water at temperatures of  $38 \pm 1^\circ\text{C}$ ,  $45 \pm 1^\circ\text{C}$  and the manufacturer's nominated maximum setting, shall not exceed the temperature rises and durations given in Table 4.1.

The amount of water discharged following thermal shut-off under heated water isolation of each thermostatic tap shall not exceed 0.75 L within 5–35 s following heated water supply isolation.

The mixed water shall stabilize to within  $2^\circ\text{C}$  of the preset temperature, in not more than 20.0 s following restoration of the heated water supply.

#### 4.4.4 Electronic taps—Power failure

If electrical power is not available when outlet water flow commences, the outlet water temperature shall not exceed  $50^\circ\text{C}$ .

If electrical power failure occurs while the tap is delivering water, then the outlet water temperature shall not exceed  $50^\circ\text{C}$  under steady supply pressures and temperatures (see Appendix D).

#### 4.5 MIXED WATER TEMPERATURE OVERSHOOT ON STARTING FROM AMBIENT

When tested in accordance with Appendix E, the mixed water temperature overshoot, starting from ambient for each thermostatic tap when pre-adjusted to supply mixed water at temperatures of  $38 \pm 1^\circ\text{C}$ ,  $45 \pm 1^\circ\text{C}$  and the manufacturer's nominated maximum setting, shall not exceed the temperature rises and durations given in Table 4.1.

#### 4.6 TEMPERATURE STABILITY OF MIXED WATER

When tested in accordance with Appendix F, at the prescribed flow rates (see Table D1, Appendix D), the temperature of the mixed water shall stabilize to within  $2^\circ\text{C}$  of the preset temperature, in not more than 20.0 s following an applied change in the water supply conditions.

The duration of temporary rises in the temperature of the mixed water, within the 20.0 s stabilization period, shall not exceed the values given in Table 4.1.

**TABLE 4.1**  
**MAXIMUM PEAK TEMPERATURES**  
**AND DURATION**  
**(Mixed water, temperature rise**  
**and corresponding duration)**

Temperature rise $^\circ\text{C}$	Duration s
+4	20
+5	6.3
+6	4.0
+7	2.5
+8	1.9
+9	1.2
+10	0.75
+11	0.5
+12	0.25

#### 4.7 WATERTIGHTNESS AT OPERATING TEMPERATURE

When tested in accordance with the operating temperature hydrostatic test of Appendix C, each thermostatic mixing tap and, if provided, integral isolating valves and cross-flow prevention device shall not leak at hydrostatic pressures up to the lesser of 2000 kPa or 1.5 times the manufacturer's specified maximum working pressure.

#### 4.8 ENDURANCE OF CONTROL SYSTEM AND OPERATING MECHANISM

When tested in accordance with Appendix G, each thermostatic mixing tap shall meet the requirements of Clauses 4.4 to 4.6.

#### 4.9 SEQUENCE OF PERFORMANCE TESTS

The sequence for the performance tests shall be as follows:

- (a) Watertightness at ambient temperature (see Clause 4.3).
- (b) Thermal shut-off (see Clause 4.4).
- (c) Mixed water temperature overshoot on starting from ambient (see Clause 4.5).

- (d) Temperature stability of mixed water (see Clause 4.6).
- (e) Endurance of control system and operating mechanism (see Clause 4.8).
- (f) Watertightness at operating temperature (see Clause 4.7).
- (g) Repeat thermal shut-off (see Clause 4.4).
- (h) Repeat mixed water temperature overshoot on starting from ambient (see Clause 4.5).
- (i) Repeat temperature stability of mixed water (see Clause 4.6).

#### **4.10 PLASTICS MATERIALS USED FOR PLASTICS-BODIED TAPS**

When tested in accordance with Appendix H, a plastics-bodied tap assembly shall exhibit characteristics for compatibility and resistance to variations in water chemistry and elevated temperatures.

#### **4.11 SURFACE-MOUNTING STRENGTH TEST FOR TAPS**

When tested in accordance with Appendix I, the surface-mounting components of the tap shall show no signs of cracking, deformation, stripping of threads or unsecured mounting, and shall comply with the requirements of the Clause 4.3.

NOTE: This Clause does not apply to recessed, wall-mounted thermostatic mixing taps.

#### **4.12 NOMINAL FLOW RATE**

##### **4.12.1 High pressure**

The flow rate of a tap or tap outlet shall be determined in accordance with Appendix J.

##### **4.12.2 Low and unequal pressure**

The flow rate of a tap or tap outlet shall be determined in accordance with Appendix K.

#### **4.13 TORQUE OF FABRICATED ASSEMBLIES**

When a fabricated tap assembly is tested in accordance with Appendix L, the fabricated joint shall show no signs of splitting, cracking, distortion or thread damage. This test is a test of a fabricated joint and twisting of copper pipe tails is not a failure of the test.

#### **4.14 TORQUE OF HANDLE AND HANDLE ATTACHMENT**

When a handle assembly is tested in accordance with Appendix M, the handle and handle attachment shall show no signs of cracking, breaking or stripping of thread.

#### **4.15 TORQUE OF OPERATING MECHANISM**

When tested in accordance with Appendix N, a tap-operating mechanism shall show no signs of cracking, bending or damage.

#### **4.16 RESISTANCE OF HANDLE TO REMOVAL**

The handles of wall-mounted bath or shower thermostatic mixing taps shall not fracture or pull off under an axial static load of 650 +0, -50 N.

## APPENDIX A

### MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS STANDARD

(Normative)

#### **A1 SCOPE**

This Appendix sets out the means by which compliance with this Standard has to be demonstrated by a manufacturer for product certification.

Products covered by this Standard are required to be certified under the National Certification Scheme.

#### **A2 PRODUCT CERTIFICATION**

The purpose of product certification is to provide independent assurance of the claim by the manufacturer that products comply with the stated Standard.

The certification scheme shall meet the criteria described in HB 18.28 in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective quality planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard.

Product certification shall be conducted by an accredited certification body.

The frequency of the sampling and testing schedule, as detailed in Tables A1 and A2, shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and documented procedures shall take precedence for the purpose of product certification.

#### **A3 TESTING**

##### **A3.1 General**

Table A1 sets out the requirements for type testing for a manufacturer to demonstrate compliance of product(s) to this Standard for initial certification.

Table A2 is a schedule identifying those tests and minimum frequencies to be undertaken on a routine batch-by-batch or continuous basis.

##### **A3.2 Inspection and test schedule**

The licensee's quality plan shall include an inspection and test schedule/plan that identifies the quality control tests undertaken and their frequencies, to maintain objective evidence of ongoing compliance of product manufactured to AS 4032.4. Refer to Table A2 for minimum sampling and testing frequency.

### **A3.3 Re-testing**

In the event of a test failure, the products manufactured since the previous test(s), conforming to the requirements outlined in Table A1 and A2, shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to AS 1199 for an acceptable quality level (AQL) of 2.5 and an inspection level of S3. If the re-testing requirements are met, the batch may be released and compliance with this Standard for the quarantined batch may be claimed.

Should failure on re-testing occur, the quarantine batch shall be rejected, and claims and marking indicating compliance to this Standard shall be suspended until the cause of the failure has been identified and corrected.

### **A3.4 Rejection after re-test**

In the event of a quarantined batch being rejected after re-testing in accordance with the procedures set out in Paragraph A3.3, it may be subjected to 100% testing for the failed requirement(s), and only those items found to comply may be claimed or marked as complying with this Standard.

The tests set out in Paragraphs A3.5, A3.6 and A3.7 shall be undertaken on product at a laboratory recognized by the certification body. Other design requirements shall be verified by the submission of documentation that confirms compliance (e.g. drawings).

### **A3.5 Thermostatic element/sensor and operating mechanism**

Thermostatic mixing taps of the same nominal size but a different valve configuration with identical thermostatic element/sensor and operating mechanisms shall be deemed to comply without the need to be re-tested.

### **A3.6 Isolating valves, cross-flow prevention devices and control valves**

Isolating valves, cross-flow prevention devices (non-return valves) and control valves, which are identical to those in certified products, shall be deemed to satisfy the relevant requirements of this Standard.

### **A3.7 Type testing**

#### **A3.7.1 General**

Testing to the performance requirements of Section 4 and material requirements of Section 2 shall be undertaken under the direct supervision of and at a laboratory. Other design and construction requirements of Section 3 shall be verified by the submission of documentation (e.g. drawings/test reports or visual examination that confirms compliance).

Frequency of retesting shall be as specified in Table A1.

#### **A3.7.2 Integral components**

Where backflow prevention devices, shut-off valves or in-line strainers are supplied as integral parts, they shall be either independently certified or demonstrated to comply with the requirements of the relevant specification or standard. The assembly shall demonstrate compliance with Clause 4.3.

**TABLE A1**  
**TYPE TESTING**

Clause No./Issue	Test method	Frequency
<b>Section 2 Materials*</b>		
2.2 to 2.6 Materials (metallic components)	Relevant standards	At change in materials
2.7 Plastics materials	Relevant standards	
2.8 Other materials	Relevant standards	
<b>Section 3 Design and manufacture</b>		
3.2 End connectors	AS 3688	At change in design
<b>Section 4 Performance requirements</b>		
4.2 Products in contact with drinking water	AS/NZS 4020	At change in materials or design or every 5 years, whichever occurs first
4.3 Watertightness at ambient temperature	Appendix C	
4.4 Thermal shut-off	Appendix D	
4.5 Mixed water temperature overshoot on starting from ambient	Appendix E	
4.6 Temperature stability of mixed water	Appendix F	
4.7 Watertightness at operating temperature	Appendix C	
4.8 Endurance	Appendix G	
4.10 Plastics materials	Appendix H	
4.11 Surface mounting	Appendix I	
4.12 Nominal flow rate	Appendices J, K	
4.13 Fabricated joints	Appendix L	
4.14 Handle attachment	Appendix M	
4.15 Operating mechanism	Appendix N	
4.16 Resistance of handle to removal	Clause 4.16	

\* Material requirements may be verified by the submission of recent test certificates that confirm compliance. Any test certificates submitted need to provide traceability to material/formulation and manufacturer/site of manufacture. The certifying body reserves the right to independently verify compliance

#### **A4 BATCH TESTING**

The tests listed in Table A2 shall be undertaken on product by the manufacturer/supplier using their own calibrated testing equipment.

Table A2 includes those tests undertaken on a routine batch-by-batch or continuous basis and identifies those tests and frequencies to be applied for certification purposes.

**TABLE A2**  
**BATCH TESTS**

Clause No./Issue	Test method	Routine test frequency
<b>Section 2 Materials*</b>		
2.2 to 2.6 Materials (metallic components)*	AS 2345 and chemical composition	Each batch or lot
2.7 Plastics materials	Relevant standards	Each batch or lot
2.8 Other materials	Relevant standards	Each batch or lot
<b>Section 3 Design and manufacture</b>		
3.2 End connectors	Relevant standards	AS 1199.1, Insp. Level II
<b>Section 4 Performance requirements</b>		
4.3 Watertightness at ambient temperature	Appendix C (see Note)	100%
4.4 Thermal shut-off	Appendix D (see Note)	100%
4.6 Temperature stability of mixed water	Appendix F (see Note)	100%
4.12 Nominal flow rate**	Appendix J or Appendix K	Each batch or lot

\* Critical materials used (e.g. brass body and brass water contact materials)

\*\* Compliance may be based on supplier certificates for a WaterMark approved component or product that defines the nominal flow rate

NOTE: The method used shall be based on the relevant appendix and reflect the general intent of the particular method.

## APPENDIX B

## INSTALLATION, COMMISSIONING AND MAINTENANCE INSTRUCTIONS

(Normative)

**B1 INSTRUCTIONS**

Instructions, in English, as specified in Paragraphs B2, B3 and B4, shall accompany each product and be available after sale.

**B2 INSTALLATION INSTRUCTIONS**

The installation instructions shall include the following:

- (a) Clear and prominent indication of the operating temperature range of the thermostatic mixing tap.
- (b) Name and address of the manufacturer and the relevant agent in the country of intended sale.
- (c) Full and comprehensive installation diagrams including the specification and positioning, if necessary, of non-integral line strainers, cross-flow prevention devices (non-return valves) and isolating valves, and pressure and temperature controls devices.

Strainers and cross-flow prevention devices shall be installed downstream of the isolation valves and in the order strainer then cross-flow prevention device [see Clause 3.5(d)].

- (d) The maximum and minimum working pressure, in kPa, and details for the fitting of any necessary pressure control device where the maximum pressure could be exceeded.
- (e) The maximum heated water operating temperature, in °C, and details for the fitting of any necessary temperature-control device where this temperature could be exceeded.
- (f) The minimum heated water operating temperature, in °C. Specify any relationship between the minimum operating temperature of the heated water and the required temperature for the mixed water, to provide effective and rapid heated water shut-off of the mixed water upon sudden reduction in pressure or shut-off of the cold water supply.
- (g) The minimum and maximum cold water operating temperatures, in °C. Specify any relationship between the maximum operating temperature of the cold water and the required temperature of the mixed water.
- (h) Full details of requirements for mounting and connecting the thermostatic mixing tap.
- (i) The necessary requirement for the provision of access for adjustment, maintenance, repair and replacement of the thermostatic mixing tap.
- (j) A statement that installations are subject to the requirements of the relevant regulatory authority.
- (k) Details of any other relevant installation instructions, including the source of the commissioning and maintenance instructions.
- (l) A statement that the thermostatic mixing tap shall be commissioned in accordance with the requirements of Paragraph B3 after the hot and cold water services are commissioned.

- (m) If required, a statement that the electrical installation of taps shall be carried out in accordance with AS/NZS 3000.

### **B3 COMMISSIONING INSTRUCTIONS**

The commissioning instructions shall include the following:

- (a) Name and address of the manufacturer and the relevant agent and source of maintenance instructions.
- (b) Full directions for the commissioning and operation of the thermostatic mixing tap.
- (c) The method for setting the maximum temperature of the mixed water if the means for this is provided, including the method for checking the temperature of the mixed water.
- (d) Procedures for problem solving and corrective actions.
- (e) Details of any other relevant commissioning instructions.

### **B4 MAINTENANCE INSTRUCTIONS**

The maintenance instructions shall include the following:

- (a) Name and address of the manufacturer and the relevant agent.
- (b) Complete written sequential maintenance details for the referenced thermostatic mixing tap, including an exploded view with reference to all parts.
- (c) Identification of spare parts including lubricants and sealants for recommended routine servicing.
- (d) Procedures for problem-solving and corrective actions.
- (e) Instruction that the maximum time interval between routine services is 12 months.
- (f) Details of any other relevant instructions.

APPENDIX C  
WATERTIGHTNESS TEST  
(Normative)

**C1 SCOPE**

This Appendix sets out the method for hydrostatic pressure testing for leakage of each thermostatic mixing tap at both ambient temperature and maximum nominated operating temperature. The test extends to the temperature control assembly and, where provided, volume control valves, cross-flow prevention devices and integral isolating valves.

The sequence for this performance test is specified in Clause 4.9.

**C2 PRINCIPLE**

The valve under test is subjected to a hydrostatic pressure equal to the lesser of 2000 kPa or 1.5 times the manufacturer's specified maximum working pressure.

**C3 APPARATUS**

The following apparatus is required:

- (a) Suitable hot and cold water system capable of producing test pressures without shock or pulsation, and in accordance with Appendix P.
- (b) A stop valve for the outlet of each in-line test thermostatic mixing tap, that is, where no integral water flow control is provided.

**C4 PROCEDURE****C4.1 General**

The hydrostatic pressure tests shall be performed under no-flow conditions as follows:

- (a) *Ambient temperature hydrostatic test*—with a cold water supply at ambient temperature.
- (b) *Operating temperature hydrostatic test*—with a heated water supply at the manufacturer's specified maximum heated water operating temperature and a cold water supply at ambient temperature.

**C4.2 Ambient temperature hydrostatic test**

Each in-line thermostatic mixing tap under test shall have a stop valve fitted to the mixed water outlet.

The procedure shall be as follows:

- (a) Connect the thermostatic mixing tap or component to be tested to the pressurizing system.
- (b) Purge air from the test rig pipework and the valve or component under test.
- (c) Fully close either the water flow control or the stop valve fitted to the mixed water outlet.
- (d) Slowly increase the pressure to the specified maximum test pressure to the inlets of the valve under test, and maintain for 60 +5, –0 s.
- (e) Where fitted, open and close the integral isolating valves 5 +2, –0 times, whilst subjected to the test pressure in Step (d). Observe and record any leakage.

- (f) Fully close the integral isolating valves and, while maintaining the specified maximum test pressure to the inlets of the valve under test, slowly open either the water flow control or the stop valve fitted to the mixed water outlet to depressurize the valve body. Allow excess water to drain from the valve body and observe and record any leakage through the integral isolating valves.
- (g) Where fitted, test integral cross-flow prevention device as follows:
  - (i) Purge air from the test rig pipework and the valve under test.
  - (ii) Fully close either the water flow control or the stop valve fitted to the mixed water outlet.
  - (iii) Open one inlet of the valve under test to the atmosphere, slowly increase the pressure to the other inlet to the specified maximum test pressure and maintain for  $60 \pm 5, -0$  s.
  - (iv) Observe and record any leakage from the open inlet.
- (h) Repeat Step (g) for the other inlet of the valve under test.

#### **C4.3 Operating temperature hydrostatic test**

The procedure shall be as follows:

- (a) Connect the valve or component to be tested to both hot and cold water supply. Set the temperature control of the valve under test to  $38 \pm 1^\circ\text{C}$ . Allow mixed water to flow at  $10 \pm 1$  L/min for not less than 5 min.
- (b) Repeat Steps (c) to (h), as applicable, of Paragraph C4.2 but with heated water at the manufacturer's specified maximum operating temperature.

#### **C5 REPORT**

The report shall include the following information for each test valve or component:

- (a) The manufacturer, model and designation.
- (b) Ambient temperature hydrostatic test, as follows:
  - (i) The maximum test pressure, in kPa, and temperature, in  $^\circ\text{C}$ , specified by the manufacturer and applied.
  - (ii) The ambient water temperature and temperature of heated water.
  - (iii) The location of any observed leakage or other failure, as applicable, including—
    - (A) thermostatic mixing tap body test;
    - (B) control valve closing test;
    - (C) isolating valve closing/opening test; and
    - (D) cross-flow prevention device closing test.
  - (iv) Compliance or non-compliance with the criteria specified in Clause 4.3.
  - (v) Reference to this test method (i.e. AS 4032.4, Appendix C).
- (c) Operating temperature hydrostatic test—
  - (i) as for Items (b)(i) to (iii); and
  - (ii) compliance or non-compliance with the criteria specified in Clause 4.7.
- (d) Completed record sheets and recorded data.
- (e) Reference to this test method (i.e. AS 4032.4, Appendix C).

## APPENDIX D

### THERMAL SHUT-OFF TEST FOR COLD WATER AND HEATED WATER ISOLATION

(Normative)

#### D1 SCOPE

This Appendix sets out the method of testing the response to a sudden shut-off of the cold water supply (thermal shut-off) and of the heated water supply to the thermostatic mixing tap, and its ability to recover when the supply is re-established.

For electronic valves, additional tests are required for power failures.

The sequence of this performance test is specified in Clause 4.9.

#### D2 PRINCIPLE

The tap under test, mounted in accordance with manufacturer's instructions, is held in a test rig and entrapped air bled off. The tap is tested with the temperature control set at  $38 \pm 1^\circ\text{C}$ , then the procedure repeated with the temperature control set at  $45 \pm 1^\circ\text{C}$  and the manufacturer's nominated maximum temperature setting. The cold water supply is isolated and then restored. The response of the outlet water temperature is monitored for the amount and duration of temperature rises. The heated water is then isolated and restored, and the response and volume of discharged water is measured.

#### D3 APPARATUS

The following apparatus is required:

- (a) Test rig for temperature stability, thermal shut-off and flow temperature tests.  
NOTE: A typical test rig is shown in Figure R1, Appendix R.
- (b) A stop valve, which shall be fitted to the outlet of each in-line test thermostatic mixing tap, that is, where no integral water flow control is provided.
- (c) Apparatus and piping as specified in Appendices P and Q, respectively.
- (d) Independently controllable hot and cold water supplies, capable of delivering water within the tolerances stated for the duration of the test with—
  - (i) a temperature range for the respective water supplies to the upper tolerance limits as specified in the testing procedure; and
  - (ii) a pressure range for the respective water supplies to the upper tolerance limits as specified in the testing procedure.

#### D4 PROCEDURE

##### D4.1 Test conditions

Each tap shall be tested with the flow rate as given in Table D1 and with the temperature control set at each of the following:

- (a)  $38 \pm 1^\circ\text{C}$ .
- (b)  $45 \pm 1^\circ\text{C}$ .
- (c) Manufacturer's recommended maximum temperature setting.

#### D4.2 Test set-up (see Figure R1, Appendix R)

The following shall apply:

- (a) Mount the tap under test (18 on Figure R1), orientated in accordance with the manufacturer's installation instructions in the test rig. The tap under test shall not be removed from the test rig for the duration of the test unless it is essential for the purpose of repairs to the test rig.
- (b) Connect the controllable cold water supply to valve (1 on Figure R1) and the controllable heated water supply to valve (2 on Figure R1).
- (c) Set the temperature control of the tap under test (18 on Figure R1) to a position that ensures there is a flow of water through both inlets. Purge air from test rig pipework and tap under test. Seal off additional outlets, if applicable.
- (d) Adjust the temperatures and dynamic pressures of the hot and cold water supplies for the respective test in accordance with Tables D2 and D3. With water flowing through the thermostatic mixing tap under test, complete final adjustments to the temperature control for the mixed water being discharged to the preset temperature (see Clause 4.4) and flow rates (see Table D1). After these adjustments, the temperature control of the valve shall not be altered for the duration of each set of tests.

**TABLE D1**  
**MIXED WATER FLOW RATES**

Nominal size DN	Flow rate L/min
≤15	8 ±1
>15	14 ±1

NOTE: Where the mixed water flow rates listed in Table D1 are not achievable due to fitment of flow restriction devices or by design of the thermostatic mixing tap, the product shall be tested at the highest flowrate achievable with the inlet pressures and conditions as described in the test method.

#### D4.3 Cold water isolation test

The procedure shall be as follows:

- (a) When pressures, temperatures and flow rates have been stabilized for not less than 15 s, observe and record the actual outlet temperature of the mixed water as registered on a temperature-measuring device (17 on Figure R1).
- (b) Start the temperature recorder.
- (c) Activate the valve (19 on Figure R1) to completely shut off the cold water supply to the tap under test.
- (d) Continue to isolate the cold water supply for a period of 30 ±1 min.
- (e) Restore the cold water supply. Readjust the inlet pressures if necessary. Stop the temperature recorder after a further period of not less than 30 s.

#### D4.4 Heated water isolation test

The procedure shall be as follows:

- (a) When pressures, temperatures and flow rates have been stabilized for not less than 15 s, observe and record the actual outlet temperature of the mixed water as registered on a temperature-measuring device (17 on Figure R1).

#### D4.2 Test set-up (see Figure R1, Appendix R)

The following shall apply:

- (a) Mount the tap under test (18 on Figure R1), orientated in accordance with the manufacturer's installation instructions in the test rig. The tap under test shall not be removed from the test rig for the duration of the test unless it is essential for the purpose of repairs to the test rig.
- (b) Connect the controllable cold water supply to valve (1 on Figure R1) and the controllable heated water supply to valve (2 on Figure R1).
- (c) Set the temperature control of the tap under test (18 on Figure R1) to a position that ensures there is a flow of water through both inlets. Purge air from test rig pipework and tap under test. Seal off additional outlets, if applicable.
- (d) Adjust the temperatures and dynamic pressures of the hot and cold water supplies for the respective test in accordance with Tables D2 and D3. With water flowing through the thermostatic mixing tap under test, complete final adjustments to the temperature control for the mixed water being discharged to the preset temperature (see Clause 4.4) and flow rates (see Table D1). After these adjustments, the temperature control of the valve shall not be altered for the duration of each set of tests.

**TABLE D1**  
**MIXED WATER FLOW RATES**

Nominal size DN	Flow rate L/min
≤15	8 ±1
>15	14 ±1

NOTE: Where the mixed water flow rates listed in Table D1 are not achievable due to fitment of flow restriction devices or by design of the thermostatic mixing tap, the product shall be tested at the highest flowrate achievable with the inlet pressures and conditions as described in the test method.

#### D4.3 Cold water isolation test

The procedure shall be as follows:

- (a) When pressures, temperatures and flow rates have been stabilized for not less than 15 s, observe and record the actual outlet temperature of the mixed water as registered on a temperature-measuring device (17 on Figure R1).
- (b) Start the temperature recorder.
- (c) Activate the valve (19 on Figure R1) to completely shut off the cold water supply to the tap under test.
- (d) Continue to isolate the cold water supply for a period of 30 ±1 min.
- (e) Restore the cold water supply. Readjust the inlet pressures if necessary. Stop the temperature recorder after a further period of not less than 30 s.

#### D4.4 Heated water isolation test

The procedure shall be as follows:

- (a) When pressures, temperatures and flow rates have been stabilized for not less than 15 s, observe and record the actual outlet temperature of the mixed water as registered on a temperature-measuring device (17 on Figure R1).

#### D4.2 Test set-up (see Figure R1, Appendix R)

The following shall apply:

- (a) Mount the tap under test (18 on Figure R1), orientated in accordance with the manufacturer's installation instructions in the test rig. The tap under test shall not be removed from the test rig for the duration of the test unless it is essential for the purpose of repairs to the test rig.
- (b) Connect the controllable cold water supply to valve (1 on Figure R1) and the controllable heated water supply to valve (2 on Figure R1).
- (c) Set the temperature control of the tap under test (18 on Figure R1) to a position that ensures there is a flow of water through both inlets. Purge air from test rig pipework and tap under test. Seal off additional outlets, if applicable.
- (d) Adjust the temperatures and dynamic pressures of the hot and cold water supplies for the respective test in accordance with Tables D2 and D3. With water flowing through the thermostatic mixing tap under test, complete final adjustments to the temperature control for the mixed water being discharged to the preset temperature (see Clause 4.4) and flow rates (see Table D1). After these adjustments, the temperature control of the valve shall not be altered for the duration of each set of tests.

**TABLE D1**  
**MIXED WATER FLOW RATES**

Nominal size DN	Flow rate L/min
≤15	8 ±1
>15	14 ±1

NOTE: Where the mixed water flow rates listed in Table D1 are not achievable due to fitment of flow restriction devices or by design of the thermostatic mixing tap, the product shall be tested at the highest flowrate achievable with the inlet pressures and conditions as described in the test method.

#### D4.3 Cold water isolation test

The procedure shall be as follows:

- (a) When pressures, temperatures and flow rates have been stabilized for not less than 15 s, observe and record the actual outlet temperature of the mixed water as registered on a temperature-measuring device (17 on Figure R1).
- (b) Start the temperature recorder.
- (c) Activate the valve (19 on Figure R1) to completely shut off the cold water supply to the tap under test.
- (d) Continue to isolate the cold water supply for a period of 30 ±1 min.
- (e) Restore the cold water supply. Readjust the inlet pressures if necessary. Stop the temperature recorder after a further period of not less than 30 s.

#### D4.4 Heated water isolation test

The procedure shall be as follows:

- (a) When pressures, temperatures and flow rates have been stabilized for not less than 15 s, observe and record the actual outlet temperature of the mixed water as registered on a temperature-measuring device (17 on Figure R1).

#### D4.2 Test set-up (see Figure R1, Appendix R)

The following shall apply:

- (a) Mount the tap under test (18 on Figure R1), orientated in accordance with the manufacturer's installation instructions in the test rig. The tap under test shall not be removed from the test rig for the duration of the test unless it is essential for the purpose of repairs to the test rig.
- (b) Connect the controllable cold water supply to valve (1 on Figure R1) and the controllable heated water supply to valve (2 on Figure R1).
- (c) Set the temperature control of the tap under test (18 on Figure R1) to a position that ensures there is a flow of water through both inlets. Purge air from test rig pipework and tap under test. Seal off additional outlets, if applicable.
- (d) Adjust the temperatures and dynamic pressures of the hot and cold water supplies for the respective test in accordance with Tables D2 and D3. With water flowing through the thermostatic mixing tap under test, complete final adjustments to the temperature control for the mixed water being discharged to the preset temperature (see Clause 4.4) and flow rates (see Table D1). After these adjustments, the temperature control of the valve shall not be altered for the duration of each set of tests.

**TABLE D1**  
**MIXED WATER FLOW RATES**

Nominal size DN	Flow rate L/min
≤15	8 ±1
>15	14 ±1

NOTE: Where the mixed water flow rates listed in Table D1 are not achievable due to fitment of flow restriction devices or by design of the thermostatic mixing tap, the product shall be tested at the highest flowrate achievable with the inlet pressures and conditions as described in the test method.

#### D4.3 Cold water isolation test

The procedure shall be as follows:

- (a) When pressures, temperatures and flow rates have been stabilized for not less than 15 s, observe and record the actual outlet temperature of the mixed water as registered on a temperature-measuring device (17 on Figure R1).
- (b) Start the temperature recorder.
- (c) Activate the valve (19 on Figure R1) to completely shut off the cold water supply to the tap under test.
- (d) Continue to isolate the cold water supply for a period of 30 ±1 min.
- (e) Restore the cold water supply. Readjust the inlet pressures if necessary. Stop the temperature recorder after a further period of not less than 30 s.

#### D4.4 Heated water isolation test

The procedure shall be as follows:

- (a) When pressures, temperatures and flow rates have been stabilized for not less than 15 s, observe and record the actual outlet temperature of the mixed water as registered on a temperature-measuring device (17 on Figure R1).

#### D4.2 Test set-up (see Figure R1, Appendix R)

The following shall apply:

- (a) Mount the tap under test (18 on Figure R1), orientated in accordance with the manufacturer's installation instructions in the test rig. The tap under test shall not be removed from the test rig for the duration of the test unless it is essential for the purpose of repairs to the test rig.
- (b) Connect the controllable cold water supply to valve (1 on Figure R1) and the controllable heated water supply to valve (2 on Figure R1).
- (c) Set the temperature control of the tap under test (18 on Figure R1) to a position that ensures there is a flow of water through both inlets. Purge air from test rig pipework and tap under test. Seal off additional outlets, if applicable.
- (d) Adjust the temperatures and dynamic pressures of the hot and cold water supplies for the respective test in accordance with Tables D2 and D3. With water flowing through the thermostatic mixing tap under test, complete final adjustments to the temperature control for the mixed water being discharged to the preset temperature (see Clause 4.4) and flow rates (see Table D1). After these adjustments, the temperature control of the valve shall not be altered for the duration of each set of tests.

**TABLE D1**  
**MIXED WATER FLOW RATES**

Nominal size DN	Flow rate L/min
≤15	8 ±1
>15	14 ±1

NOTE: Where the mixed water flow rates listed in Table D1 are not achievable due to fitment of flow restriction devices or by design of the thermostatic mixing tap, the product shall be tested at the highest flowrate achievable with the inlet pressures and conditions as described in the test method.

#### D4.3 Cold water isolation test

The procedure shall be as follows:

- (a) When pressures, temperatures and flow rates have been stabilized for not less than 15 s, observe and record the actual outlet temperature of the mixed water as registered on a temperature-measuring device (17 on Figure R1).
- (b) Start the temperature recorder.
- (c) Activate the valve (19 on Figure R1) to completely shut off the cold water supply to the tap under test.
- (d) Continue to isolate the cold water supply for a period of 30 ±1 min.
- (e) Restore the cold water supply. Readjust the inlet pressures if necessary. Stop the temperature recorder after a further period of not less than 30 s.

#### D4.4 Heated water isolation test

The procedure shall be as follows:

- (a) When pressures, temperatures and flow rates have been stabilized for not less than 15 s, observe and record the actual outlet temperature of the mixed water as registered on a temperature-measuring device (17 on Figure R1).

#### D4.2 Test set-up (see Figure R1, Appendix R)

The following shall apply:

- (a) Mount the tap under test (18 on Figure R1), orientated in accordance with the manufacturer's installation instructions in the test rig. The tap under test shall not be removed from the test rig for the duration of the test unless it is essential for the purpose of repairs to the test rig.
- (b) Connect the controllable cold water supply to valve (1 on Figure R1) and the controllable heated water supply to valve (2 on Figure R1).
- (c) Set the temperature control of the tap under test (18 on Figure R1) to a position that ensures there is a flow of water through both inlets. Purge air from test rig pipework and tap under test. Seal off additional outlets, if applicable.
- (d) Adjust the temperatures and dynamic pressures of the hot and cold water supplies for the respective test in accordance with Tables D2 and D3. With water flowing through the thermostatic mixing tap under test, complete final adjustments to the temperature control for the mixed water being discharged to the preset temperature (see Clause 4.4) and flow rates (see Table D1). After these adjustments, the temperature control of the valve shall not be altered for the duration of each set of tests.

**TABLE D1**  
**MIXED WATER FLOW RATES**

Nominal size DN	Flow rate L/min
≤15	8 ±1
>15	14 ±1

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The procedure shall be as follows:

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- (b) Start the temperature recorder.
- (c) Activate the valve (19 on Figure R1) to completely shut off the cold water supply to the tap under test.
- (d) Continue to isolate the cold water supply for a period of 30 ±1 min.
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**TABLE D1**  
**MIXED WATER FLOW RATES**

Nominal size DN	Flow rate L/min
≤15	8 ±1
>15	14 ±1

NOTE: Where the mixed water flow rates listed in Table D1 are not achievable due to fitment of flow restriction devices or by design of the thermostatic mixing tap, the product shall be tested at the highest flowrate achievable with the inlet pressures and conditions as described in the test method.

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The procedure shall be as follows:

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- (c) Activate the valve (19 on Figure R1) to completely shut off the cold water supply to the tap under test.
- (d) Continue to isolate the cold water supply for a period of 30 ±1 min.
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- (d) Continue to isolate the cold water supply for a period of 30 ±1 min.
- (e) Restore the cold water supply. Readjust the inlet pressures if necessary. Stop the temperature recorder after a further period of not less than 30 s.

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The procedure shall be as follows:

- (a) When pressures, temperatures and flow rates have been stabilized for not less than 15 s, observe and record the actual outlet temperature of the mixed water as registered on a temperature-measuring device (17 on Figure R1).

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**TABLE D1**  
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Nominal size DN	Flow rate L/min
≤15	8 ±1
>15	14 ±1

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**MIXED WATER FLOW RATES**

Nominal size DN	Flow rate L/min
≤15	8 ±1
>15	14 ±1

NOTE: Where the mixed water flow rates listed in Table D1 are not achievable due to fitment of flow restriction devices or by design of the thermostatic mixing tap, the product shall be tested at the highest flowrate achievable with the inlet pressures and conditions as described in the test method.

#### D4.3 Cold water isolation test

The procedure shall be as follows:

- (a) When pressures, temperatures and flow rates have been stabilized for not less than 15 s, observe and record the actual outlet temperature of the mixed water as registered on a temperature-measuring device (17 on Figure R1).
- (b) Start the temperature recorder.
- (c) Activate the valve (19 on Figure R1) to completely shut off the cold water supply to the tap under test.
- (d) Continue to isolate the cold water supply for a period of 30 ±1 min.
- (e) Restore the cold water supply. Readjust the inlet pressures if necessary. Stop the temperature recorder after a further period of not less than 30 s.

#### D4.4 Heated water isolation test

The procedure shall be as follows:

- (a) When pressures, temperatures and flow rates have been stabilized for not less than 15 s, observe and record the actual outlet temperature of the mixed water as registered on a temperature-measuring device (17 on Figure R1).