BS EN 15092:2008

Building valves — Inline hot water supply tempering valves — Tests and requirements

ICS 91.140.60

National foreword

This British Standard is the UK implementation of EN 15092:2008.

The UK committee would like to draw attention to the following concerns:
1.Subclause 7.6.2 requires that flow changes be accomplished within 1±0,5 seconds. This necessitates that valve 5 shown in Annex B is more than a simple on/off control.
2.The acoustic test in Subclause 8.2 references EN ISO 3822. This requires the test to be conducted with cold water at both inlets; therefore arrangements need to be made to enable adjustment of the temperature setting of the valve over the whole range in order to satisfy the requirements of EN ISO 3822 and Subclause 8.2.
3.Annexes A and B are informative, yet there are several references to these Annexes within Clause 7. This could result in irreproducibility, and inconsistencies in certifications.

The UK participation in its preparation was entrusted to Technical Committee B/504/7, Valves and fittings for buildings.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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This European Standard was approved by CEN on 29 May 2008.

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Contents

Page

Foreword

This document (EN 15092:2008) has been prepared by Technical Committee CEN/TC 164 “Water supply”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2008, and conflicting national standards shall be withdrawn at the latest by December 2008.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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Introduction

In respect of potential adverse effect on the quality of water intended for human consumption, caused by the product covered by this European Standard:

a) this European Standard provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;

b) it should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

1 Scope

This European Standard specifies dimensions, materials and performance requirements (including methods of test) for in line hot water supply tempering valves for sanitary hot water systems, of nominal sizes from DN 15 to DN 50. Tempering valves reduce the temperature of sanitary hot water for distribution throughout the hot water system. The conditions of use are specified in Table 1.

The valves are intended to be used with storage water heaters to provide tempered hot water to the terminal fitting. They are not intended to control the temperature at the point of use.

Tempering valves control the distribution temperature from a water heater to a preset value or an adjustable range, both between 45 °C and 65 °C.

Table 1 — Conditions of use

	Limits of use	Recommended limits for operation
Dynamic pressure	0,02 MPa (0,2 bar) min.	0,1 MPa ≤ P ≤ 0,5 MPa (1 bar ≤ P ≤ 5,0 bar)
Static pressure	1 MPa (10 bar) max.	—
Hot water inlet temperature	T ≤ 90 °C	60 °C ≤ T ≤ 80 °C
Cold water inlet temperatures	T ≤ 25 °C	T ≤ 25 °C
Distribution (outlet) temperature	45 °C ≤ T ≤ 65 °C	

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1092-3, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 3: Copper alloy flanges*

EN 1254-1, *Copper and copper alloys — Plumbing fittings — Part 1: Fittings with ends for capillary soldering or capillary brazing to copper tubes*

EN 1254-2, *Copper and copper alloys — Plumbing fittings — Part 2: Fittings with compression ends for use with copper tubes*

EN 1254-3, *Copper and copper alloys — Plumbing fittings — Part 3: Fittings with compression ends for use with plastics pipes*

EN 1254-4, *Copper and copper alloys — Plumbing fittings — Part 4: Fittings combining other end connections with capillary or compression ends*

EN 1254-5, *Copper and copper alloys — Plumbing fittings — Part 5: Fittings with short ends for capillary brazing to copper tubes*

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

EN 12164, *Copper and copper alloys — Rod for free machining purposes*

EN 12165, *Copper and copper alloys — Wrought and unwrought forging stock*

EN 13959, *Anti-pollution check valves DN 6 to DN 250 inclusive family E, Types A, B, C and D*

EN ISO 228-1, *Pipe threads where pressure-tight joints are not made on the thread — Part 1: Dimensions, tolerances and designation (ISO 228-1:2000)*

EN ISO 3822-1, *Acoustics — Laboratory tests on noise emission from appliances and equipment used in water supply installations — Part 1: Method of measurement (ISO 3822-1:1999)*

EN ISO 3822-3, *Acoustics — Laboratory tests on noise emission from appliances and equipment used in water supply installations — Part 3: Mounting and operating conditions for in-line valves and appliances (ISO 3822-3:1997)*

EN ISO 6509, *Corrosion of metals and alloys — Determination of dezincification resistance of brass (ISO 6509:1981)*

ISO 7-1:1994, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
tempering valve
temperature activated valve which mixes hot and cold water to achieve a pre-determined outlet temperature and which is fitted between the water heater and the point of use to control the distribution temperature to between 45 °C and 65 °C

3.2
maximum distribution temperature
maximum hot water outlet temperature at which the tempering valve is designed to be used and which is 65 °C; national regulations may set a lower value distribution temperature

3.3
minimum distribution temperature
45 °C which is the minimum hot water outlet temperature at which the tempering valve is designed to be used

3.4
pre-set temperature
temperature as set by the manufacturer of the valve

3.5
set temperature
distribution temperature between 45 °C to 65 °C

3.6
adjustable valve
valve with a control mechanism which enables the distribution temperature to be adjusted from one set point to another set point within a pre-determined minimum and maximum value

3.7
temperature override function
facility for temporary use, that allows a temperature in excess of the normal distribution temperature of 65 °C to enter the hot water distribution system for thermal disinfection to control the growth of bacteria

3.8
Type 1 tempering valve
non-adjustable tempering valve with pre-set temperature

3.9
Type 2 tempering valve
tempering valve adjustable with or without tool and with pre-set temperature

3.10
nominal diameter (DN)
nominal diameter referring to the final outlet connection diameter to pipe, of the valve assembly

4 Materials and surface finishes

4.1 General

The selection of materials is the responsibility of the manufacturer, provided they satisfy the following requirements:

a) materials and coatings shall not contaminate the potable water, when in normal or accidental contact;

b) in a technical document, the manufacturer shall state the nature of the materials and coatings used;

c) material with inadequate corrosion resistance shall have additional protection;

d) the materials used shall not deteriorate at a temperature of 95 °C for 1 h and be suitable under the temperatures specified in the tests in this European Standard.

4.2 Nature of materials

Examples of bronze and brass which may be used, without coating, for manufacturing purposes are given in Table 2.

Table 2 — Examples of copper alloys

Material designation		European Standard
Symbol	Reference number	
CuSn10-C	CC480K	EN 1982
CuSn5Pb5Zn5-C	CC491K	EN 1982
CuSn3Zn8Pb5-C	CC490K	EN 1982
CuZn39Pb3	CW614N	EN 12164/EN 12165
CuZn40Pb2	CW617N	EN 12164/EN 12165
CuZn36Pb2As	CW602N	EN 12164/EN 12165

Copper-zinc alloys containing more than 10 % zinc are subject to dezincification when submitted to water capable of dezincification. In the countries where the use of products made of dezincification resistant materials is required, the products have to guarantee a dezincification depth of less than 200 µm in any direction; they have to be tested in accordance with EN ISO 6509 and have to be marked in compliance with the indications specified in Clause 11, Marking.

5 Design and dimensional requirements

5.1 Backflow prevention

Integral backflow prevention devices shall comply with the appropriate standard in their own right.

When fitted check valves, they shall comply with the requirements of EN 13959.

5.2 Dimensional characteristics

5.2.1 General

Tempering valves shall be classified by the nominal size (DN) of outlet end connection.

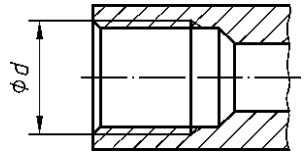
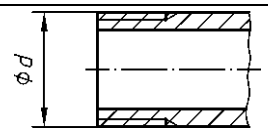
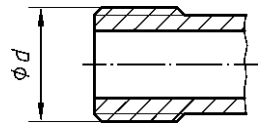
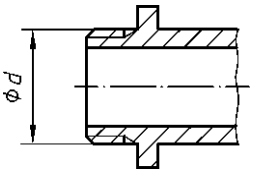
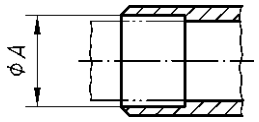
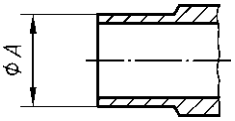
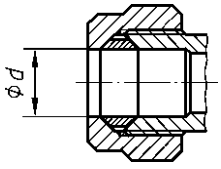
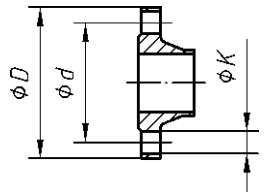
5.2.2 End connections

Examples of end connections are given in Table 3. All end connections shall comply with EN 1254. Connections requiring the use of heat to make or break the joint (e.g. capillary) are not permitted directly on the valve body.

5.2.3 Other connections (e.g. unions)

Connections, other than those specified in 5.2.1, shall comply with the functional aspects of the equivalent part of EN 1254.

Table 3 — Examples of end connections and nominal sizes (DN 15 to DN 50)

Type	a	DN 15	DN 20	DN 25	DN 32	DN 40	DN 50
 Internal thread to ISO 7-1:1994	*d*	Rp ½	Rp ¾	Rp 1	Rp 1 ¼	Rp 1 ½	Rp 2
 External thread to ISO 7-1:1994	*d*	R ½	R ¾	R 1	R 1 ¼	R 1 ½	R 2
 External thread to EN ISO 228-1	*d*	G ¾ B	G 1 B	G 1 ¼ B	G 1 ½ B	G 1 ½ B G 1 ¾ B	G 2 B
 External thread with shoulder to EN ISO 228-1	*d*	G ½ B	G ¾ B	G 1 B	G 1 ¼ B	G 1 ½ B G 1 ¾ B	G 2 B G 2 ⅜ B
 Capillary socket to EN 1254-1	*A*	15/18	22	28	35	42	54
 Male capillary end to EN 1254-1	*A*	15/18	22	28	35	42	54
 Compression end for copper pipe to EN 1254-2	*d*	15/18	22	28	35	42	54
 EN 1092-3	*D* *d* *K*	95 75 14	105 75 14	115 85 14	140 100 18	150 110 18	160 120 18

5.3 Set temperature adjustment

If provided for, the limitation of temperature adjustment shall comply with the following.

Pre-set adjustable temperature (Type 2: Valve)

The pre-set temperature mechanism shall:

a) be capable of adjustment to the required distribution water temperature;

b) be lockable at the required distribution water temperature; or

c) require the use of a tool other than a standard screwdriver to access or make the adjustment;

d) comply with the requirements of 6.3.

5.4 Temperature override function

If provided for, the override function shall:

a) allow the valve to deliver mixed water above the maximum distribution temperature of 65 °C up to the hot water inlet supply temperature;

b) require extra handling to actuate the override;

c) be resettable after use;

d) comply with the requirements of 6.3.

6 Mechanical tests and requirements

6.1 Body strength test

6.1.1 Procedure

Seal all apertures and via the hot inlet connection apply a pressure of $(2{,}5 \pm 0{,}1)$ MPa [(25 ± 1) bar], for a period of $(10\ ^{+2}_{0})$ min.

6.1.2 Requirement

The tempering valve body shall not show any visible sign of external leakage, permanent deformation or fracture.

6.2 Bending moment test for tempering valves

6.2.1 Principle

The mechanical bending strength of the body is tested by a bending moment test, in which a force is applied for a pre-determined period.

6.2.2 Procedure

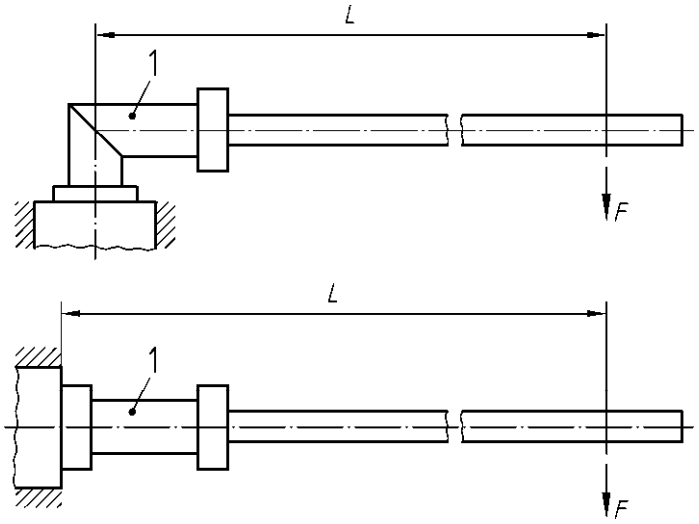
Attach the tempering valve onto the test equipment by one of its supplied inlet connections (see Figure 1). Apply a load F as shown in Figure 1, F corresponding to the bending moment shown in Table 4, with a pressure of 1,6 MPa (16 bar) applied in increments of 0,1 MPa (1 bar) per 5 s. Maintain the bending moment and the pressure for 10 min. Repeat for the other inlets.

6.2.3 Requirement

There shall be no rupture, leakage, visible damage or permanent deformation of the tempering valves.

Table 4 — Bending moments

Nominal diameter (DN)	15	20	25	32	40	50
Bending moment, Nm $(F \times L)$ **for compression fittings**	50	85	125	160	200	300
Bending moment for other end connections, Nm $(F \times L)$	80	150	300	400	500	600



Key
1 – Tempering valve
F – Force
L – Moment arm of force

Figure 1 — Bending moment

6.3 Torque tests for temperature stops

Principle:

Is to determine the resistance of the temperature stops to the stresses of operation. The test consists of subjecting the temperature control to stress, by applying torque, in order to verify its strength.

Procedure:

The test is carried out using a torque wrench adapted to the tempering valve Type 2 adjustment control device, or a lever arm and instrument for measuring the applied force.

The test shall be carried out on both the minimum distribution temperature stop and maximum distribution temperature stop, and the override temperature stop, if applicable.

No water is supplied to the valve during testing, and is carried out at ambient temperature.

Attach the tempering valve under test, by the hot water inlet connection, to a test apparatus representing a water heater outlet connection or adapted fitting.

Gradually apply the torque over a period of 4 s to 6 s and maintain for 1 min a torque of 6 $(^{+0,6}_{0})$ Nm to both the minimum distribution temperature stop and maximum distribution temperature stop and the override temperature stop if applicable.

Requirement:

Visually inspect, without disassembling the valve under test, the minimum distribution temperature stop and maximum distribution temperature stop, and the override temperature stop if applicable, as well as test associated components of the valve for cracking, breaking, part separation or other failures. There shall be no visible damage or permanent deformation of the tempering valve.

After visual inspection, this should be verified by carrying out the tests described in 6.1, 6.2 and Clause 7.

7 Performance tests and requirements

7.1 General

All performance tests shall be carried out with a suitable backflow prevention device fitted to the cold and hot water inlet. Valves can be supplied for testing with or without check valves. If not submitted with check valves, then the test is performed with suitable check valves complying with EN 13959 and the DN of the check valves shall be the same as the inlet of the valve. Backflow devices will be fitted to both the hot and cold inlets. All performance tests shall be carried out in the order that they appear in Clause 7.

7.2 Standard test conditions

7.2.1 General

Standard test conditions should be used for each test as stated in Table 5, unless otherwise specified. With both hot and cold supply pressures of (0,3 ± 0,02) MPa [(3 ± 0,2) bar] and the inlet control valves open, adjust the outlet flow rate to the normal testing flow rate given in Table 5. Adjust the temperature control device to give a blend water temperature at the outlet of (50 $^{+2}_{0}$) °C. In the case of Type 1 valves the outlet temperature is preset so testing should be done at the preset outlet temperature. In all tests a minimum differential temperature of 15 °C between the hot inlet temperature and the mixed water outlet temperature shall be maintained unless specified otherwise within the test procedure.

7.2.2 Expression of results

For each test, calculate the mean average of three test results, but each individual result shall not deviate by more than 10 % of the stated requirement.

7.2.3 Testing temperatures by adjustment types

Type 1: Pre-set temperature, non-adjustable

Valves shall be tested at the pre-set temperature.

Type 2: Pre-set temperature, adjustable

The valves shall be tested at the temperatures specified in each performance test.

Torque to be applied in order to change temperature settings shall be < 2,5 Nm.

Table 5 — General testing conditions

Nominal diameter (DN)	15	20	25	32	40	50
Normal testing flow rate (l/min)	12	12	20	40	80	100
Reduced testing flow rate (l/min)	6	6	10	20	40	50
Test 7.7 Mixed water flow volume (ml)	100	100	200	500	not applicable	not applicable
	Hot water			**Cold water**		
Inlet pressures	0,3 MPa ± 0,02 MPa (3 bar ± 0,2 bar)					
Inlet temperatures (unless otherwise specified)	65 °C or to 80 °C as necessary to maintain a ≥ 15 °C, differential between the hot water and mixed water temperatures			15 °C to 20 °C		

The flow tolerances are ± 0,5 l/min or ± 5 %, whichever is the greater.

7.3 Verification of valve temperature settings

7.3.1 Type 1: Pre-set temperature, non-adjustable

7.3.1.1 Principle

Is to confirm that the pre-set outlet temperature of the valve is as specified in the information obtained from the manufacturers of the valve and does not exceed the minimum and maximum temperatures specified in the scope of this European Standard.

7.3.1.2 Procedure

Connect the tempering valve to the test rig (see Annex B).

Fully open any integral flow control.

Fully open valve 5 and the tap 6.

Ensure that the bleed valves 8 are closed.

Adjust to initial settings given in Table 5 with reduced flow rate.

The pressure of (0,3 ± 0,02 MPa) [(3 ± 0,2) bar] should be applied to both hot and cold supplies and maintained throughout the entire procedure, as per Table 5.

Adjust tap 6 to give a pressure reading at pressure take off 4 (outlet of tempering valve) and outlet pressure applied and maintained, equal to a $1^{0}_{-0,05}$ bar dynamic pressure drop across the valve.

After 30 s record the tempering valve's mixed water temperature and compare this temperature to the information obtained from the manufacturers of the valve.

7.3.1.3 Requirement

After 30 s of stable supply conditions, the mixed water temperature shall be within ± 2 K from the stated pre-set temperature and within the minimum and maximum temperatures specified in the scope of this European Standard.

7.3.2 Type 2: Pre-set temperature, adjustable

7.3.2.1 Principle

Is to confirm that the adjustable outlet temperature range of the valve does not exceed the minimum and maximum temperatures specified in the scope of this European Standard.

7.3.2.2 Procedure

Connect the tempering valve to the test rig (see Annex B).

Fully open any integral flow control.

Fully open valve 5 and the tap 6.

Ensure that the bleed valves 8 are closed.

Adjust to initial settings given in Table 5 with reduced flow rate.

The pressure of (0,3 ± 0,02) MPa [(3 ± 0,2) bar] should be applied to both hot and cold supplies and maintained throughout the entire procedure, as per Table 5.

Adjust tap 6 to give a pressure reading at pressure take off 4 (outlet of tempering valve) and outlet pressure applied and maintained, equal to a $1^{0}_{-0,05}$ bar dynamic pressure drop across the valve.

Using the integral temperature adjustment mechanism adjust the valve to the maximum temperature setting.

After 30 s record the tempering valve's mixed water temperature.

Using the integral temperature adjustment mechanism, adjust the valve to the minimum temperature setting.

After 30 s record the tempering valve's mixed water temperature.

7.3.2.3 Requirement

After 30 s of stable supply conditions, the mixed water temperature shall be within ± 2 K from the stated temperature range and within the minimum and maximum temperatures specified in the scope of this European Standard.

Torque to be applied in order to change temperature settings shall be < 2,5 Nm.

7.4 Determination of minimum flow rate

7.4.1 Principle

Is to determine:

the flow rate of mixed water, as a function of the pressure loss across the valve.

7.4.2 Procedure Type 1 valves

Connect the tempering valve to the test rig (see Annex B).

Fully open any integral flow control.

Fully open valve 5 and the tap 6.

Ensure that the bleed valves 8 are closed.

Adjust to initial settings given in Table 5.

Adjust tap 6 to give a pressure reading at pressure take off 4 (outlet of tempering valve) and outlet pressure applied and maintained, equal to a $1^{0}_{-0,05}$ bar dynamic pressure drop across the valve.

After 15 s record the valve's mixed water outlet flow rate.

7.4.3 Procedure Type 2 valves

Connect the tempering valve to the test rig (see Annex B).

Fully open any integral flow control.

Fully open valve 5 and the tap 6.

Ensure that the bleed valves 8 are closed.

Adjust to initial settings given in Table 5.

Adjust tap 6 to give a pressure reading at pressure take off 4 (outlet of tempering valve) and outlet pressure applied and maintained, equal to a $1^{0}_{-0,05}$ bar dynamic pressure drop across the valve.

Using the valve's integral temperature adjustment mechanism, adjust the valve to its maximum temperature setting.

After 15 s record the valve's mixed water outlet flow rate.

Using the valve's integral temperature adjustment mechanism, adjust the valve to its minimum temperature setting.

After 15 s record the valve's mixed water outlet flow rate.

7.4.4 Requirement

After 30 s of stable supply conditions, the mixed water temperature shall remain within a temperature band of $\pm$ 2 K.

The average of the stable mixed water temperatures shall not differ more than $\pm$ 3 K from the stated pre-set or set temperature or range; however the measured mixed water temperatures shall be above 45 °C and below 65 °C.

At both min. and max. temperatures, the valve shall achieve the minimum flow rate specified in Table 6.

Table 6 — Minimum flow rate

Nominal diameter (DN)	15	20	25	32	40	50
Minimum flow rate l/min	20	25	45	75	120	180

The flow tolerances are ± 0,5 l/min or ± 5 %, whichever is the greater.

7.5 Test for temperature stability starting from ambient

7.5.1 Principle

Is to determine:

a) the change in mixed water temperature when the valve has not been used for a long period, and is at ambient temperature;

b) the steady temperature to which the mixed water returns when flow rate is stabilised.

7.5.2 Procedure

Connect the tempering valve to the test rig (see Annex B) and adjust to the normal testing conditions given in Table 5 with a valve set temperature of (50 °± 1) °C.

For Type 1 valves test at pre-set temperature.

After 15 s record the tempering valve's mixed water temperature.

Isolate hot supply, and open cold bypass (valve 7) to hot inlet connection to valve, allow flow through valve, when mixed water temperature is at cold water temperature, maintain for 15 s.

Close mixed water flow using valve 5.

Close cold bypass to hot inlet, open hot supply.

Open mixed outlet.

Continuously measure mixed water temperature.

Repeat testing at reduced flow rates as per Table 5.

7.5.3 Requirements

The time at or above + 5 °C transient shall not exceed 5 s.

The time at or above + 10 °C transient shall not exceed 1 s.

The deviation from the set temperature of mixed water 30s after opening the mixed water outlet with normal supplies shall not exceed + 3K. (see Annex D).

7.6 Test for temperature stability with changing flow rates

7.6.1 Principle

Is to determine:

its ability to cope with rapid changes in flow rates:

a) the change in mixed water temperature when the flow rate is reduced to a minimum;

b) the change in mixed water temperature when the flow rate is increased to a maximum;

c) the steady temperature to which the mixed water returns when flow rate is restored.

7.6.2 Procedure

Flow rate changes shall be completed within (1 ± 0,5) s.

Connect the mixing valve to the test rig (see Annex B) and adjust to the initial setting given in Table 5 with a valve set temperature of 50 °C ± 1 °C.

For Type 1 valves test at pre-set temperature.

After 15 s record the tempering valve's mixed water temperature.

Reduce the mixed water flow rate to the reduced flow rate given in Table 5, by adjusting valve 5.

Recover the mixed water flow rate to the normal testing flow rate given in Table 5, by adjusting valve 5.

Increase the mixed water flow rate to 150 % of the normal flow rate given in Table 5 or the maximum flow-obtained by opening valve 5 fully, whichever is the lesser.

Recover the mixed water flow rate to the normal testing flow rate given in Table 5, by adjusting valve 5.

Measure and record the transient mixed water temperature after each flow change.

Measure and record the mixed water temperature after each flow change allowing a minimum of 30 s for the valve to stabilise.

Repeat the procedure to give 3 sets of results.

7.6.3 Requirements

The deviation from the set temperature of mixed water after 30 s from each time the equilibrium is disturbed shall not exceed 3 K (see Annex D).

The time at or above + 5 °C transient shall not exceed 5 s.

The time at or above + 10 °C transient shall not exceed 1 s.

7.7 Test for thermal shutoff with cold water supply failure

7.7.1 General

This test is for valves up to and including sizes DN 32 only.

7.7.2 Principle

Is to determine:

a) the ability of the tempering valve to react to the instantaneous isolation of the cold water supply;

b) the amount of discharged hot water;

c) the steady temperature to which the mixed water returns when the cold water supply is restored.

7.7.3 Procedure

Connect the tempering valve to the test rig (see Annex B) and adjust to the initial setting given in Table 5 with a valve set temperature of (50 ± 1) °C. For Type 1 valves test at pre-set temperature.

After 15 s record the tempering valve's mixed water temperature.

Isolate any branched take-offs in the cold water supply line, including the cold water pressure measuring line. Also isolate the outlet pressure measuring line, if open.

Instantaneously isolate the cold water supply.

Wait 3 s, then collect the mixed outlet water discharge for 10 s.

Leave the cold water supply isolated for (60 ± 3) s and then restore the cold water supply at its original pressure and monitor the mixed water temperature.

Repeat the procedure to give 3 sets of results.

7.7.4 Requirements

The mixed water flow volume should not exceed millilitre volume stated in Table 5.

The deviation from the set temperature of mixed water after restoration of the cold water and stabilisation shall not exceed 3 K.

7.8 Test for temperature stability with changing inlet pressure

7.8.1 Principle

Is to determine:

a) the change in mixed water temperature when one inlet pressure is reduced or increased whilst the other inlet pressure remains constant;

b) the steady temperature to which the mixed water returns when supply pressure is restored.

The testing sequence shall be in accordance with Table 7.

7.8.2 Procedure

Connect the tempering valve to the test rig (see Annex B) to the initial setting given in Table 5, and for Types 2 adjust the valve to a temperature of 50^{0}_{-2} °C.

For Type 1 valves test at pre-set temperature.

Ensure required reduced testing flow rate is as per Table 5, in subclause 7.2.

After 30 s begin recording the tempering valve's mixed water temperature, and continue recording throughout the full set of tests.

Reduce the cold water supply pressure to (0,2 ± 0,01) MPa [(2,0 ± 0,1) bar] over a period of (1 ± 0,1) s.

After (30 ± 2) s restore the cold water pressure to (0,3 ± 0,01) MPa [(3,0 ± 0,1) bar] over a period of (1 ± 0,1) s.

Repeat procedure for hot water.

Repeat the procedure to give 3 sets of results.

7.8.3 Requirement

The time at or above + 5 °C transient shall not exceed 5 s.

The time at or above + 10 °C transient shall not exceed 1 s.

The deviation from the set temperature of mixed water after 30 s from each occasion of disturbing the equilibrium shall not exceed 3 K (see Annex D).

Table 7 — Testing sequence for 7.8

Step reference	**Duration per step** (s)	**Test temperature** °C	**Test flow, normal or reduced**	**Cold water pressure** (bar)	**Hot water pressure** (bar)
1	30	50	Reduced	3,0	3,0
2	30			2,0	3,0
3	30			3,0	3,0
4	30	50	Reduced	3,0	3,0
5	30			3,0	2,0
6	30			3,0	3,0

7.9 Test for temperature stability with changing inlet temperature

7.9.1 Principle

Is to determine:

a) the change in mixed water temperature when hot supply temperatures are varied over the whole operating range;

b) the steady temperature to which the mixed water returns when supply temperatures are restored.

7.9.2 Procedure

Connect the tempering valve to the test rig (see Annex B) and adjust to the initial setting given in Table 5 with a valve set temperature of (50 ± 1) °C, but adjust hot water inlet temperature to (80 ± 1) °C.

For Type 1 valves, test at pre-set temperature.

After 30 s of stabilization record the tempering valve's initial mixed water temperature, continue to monitor the temperature throughout the test.

Gradually reduce the hot water supply temperature to (65 ± 1) °C over a period of (25 ± 5) s.

Repeat testing at reduced flow rates as per Table 5.

Repeat the procedure to give 3 sets of results.

7.9.3 Requirement

Mixed water temperatures shall not differ by more than ± 3 K from the initial temperature setting.

7.10 Endurance test on the thermostat

7.10.1 Principle

Is to simulate the ability of valve to work correctly, by a number of cycles of operation which is representative of its normal operating life.

7.10.2 Procedure

The durability cycling should be carried out using the apparatus described in Annex A.

Connect the tempering valve to the test rig (see Figure A.1) and adjust to the initial setting given in Table 5 with a valve set temperature of 50 °C ± 1 °C but set the hot inlet temperature to 80 °C. For Type 1 valves test at pre-set temperature.

Ensure required reduced testing flow rate is as per Table 5, 7.2.

After 30 s record the tempering valve's mixed water temperature.

Having obtained the required settings, provision shall be made to prevent the setting of the inlet water temperature, mixed water temperature and flow rate from being disturbed.

The valves 5, 7 and 8 shall be controlled by a timing device to achieve the following sequence.

A. Valves 7 (hot) and 8 (cold) should be open and valve 5 closed.

B. After 10 s, close valve 7 and open valve 5.

C. After 15 s close valve 5 and open valve 7.

Repeat point B and C.

At intervals of not more than 5 000 cycles check that the water supply pressures and temperatures and the mixed water flow rate are within the limits specified in Table 5 for initial setting. Re-adjust, if necessary, the water supply pressures, temperatures and the mixed water flow rate to the values specified in Table 5.

Complete 30 000 cycles.

7.10.3 Requirements

When the operating conditions are checked and adjusted as specified in Table 5 the mixed water temperature, without any re-adjustment, shall not be more than ± 5 K removed from the actual initial setting.

On completion of the durability cycling the valve shall be tested and shall satisfy all of the performance requirements specified in 7.3, 7.5, 7.6, 7.7, 7.8 and 7.9.

8 Acoustic tests and requirements

8.1 General

This clause specifies the test method for classifying in line hot water supply tempering valves by acoustic group (I, II or not classified).

Acoustic Tests are only required on valve sizes up to and including DN 32.

8.2 Test method

Tempering valves are tested at flow rates QN as given in Table 5 in accordance with EN ISO 3822-1 and EN ISO 3822-3 with a valve set temperature of (50 ± 1) °C.

In principle only the test at 0,3 MPa (3 bar) is used for determining the acoustic group of tempering valves.

8.3 Expression of results

The results of the measurements taken in accordance with EN ISO 3822-1 and EN ISO 3822-3 are expressed by the acoustic level of the in line hot water supply tempering valve L_{ap} in dB (A).

8.4 Requirements

Classification is on the basis of the acoustic level of the valves L_{ap} according to Table 8.

Table 8 — Acoustic groups

Acoustic group	L_{ap} dB (A)
I	$L_{ap} \leq 20$
II	$20 < L_{ap} \leq 30$
Unclassified	$L_{ap} > 30$

9 Classification

The tempering valves are classified according to the inlet connection and nominal flow rate as given in Table 5, and acoustic group as given in Table 7.

10 Designation

A tempering valve shall be designated by:

a) reference to this European Standard, i.e. EN 15092;

b) its nominal size (DN) (see Table 5);

c) its tempering valve type (see 3.5);

d) its set outlet temperature or range, — i.e. "50 °C" or "45 °C to 65 °C" (see 3.5);

e) its acoustic group.

Example for a designation of a tempering valve of nominal size DN 15, adjustable Type 2, between 45 °C to 65 °C, acoustic group 1

Tempering valve, EN 15092, DN 15, Type 2, 45 °C to 65 °C, a I

11 Marking

11.1 Temperature marking

Each Type 2 tempering valve shall be legibly and permanently marked to identify the temperature adjustment from cold to hot or vice versa.

11.2 Flow marking

Each tempering valve shall be legibly and permanently marked to identify the hot and cold water inlet connections and the mixed water outlet. This marking shall be stamped, etched or cast onto the body of the tempering valve.

11.3 Identification marking

Each tempering valve shall be legibly and permanently marked with the following:

a) the manufacturer's name, trade mark or identification mark;

b) the name or model number of the valve;

c) the set outlet temperature or range, 45 °C or "45 °C to 65 °C"; and

d) In the countries where the use of products made of dezincification resistant materials is not required, the dezincification resistant products according to EN ISO 6509 as well as the products which do not contain zinc are allowed to be marked "DR". In the countries where the use of products made of dezincification resistant materials is required, the dezincification resistant products as well as the products which do not contain zinc shall be marked "DR".

12 Instructions

Installation and commissioning instructions shall be supplied with all in line hot water supply tempering valves. The instructions shall contain the following information as a minimum:

1) A schematic drawing or drawings to show the correct installation of an in line hot water supply tempering valve, i.e.: mounted in close proximity to the water heater.

2) Information on the designation of the tempering valve concerned.

3) Information on the commissioning and routine in-service tests to be performed.

4) Information on the need for any anti-backsiphonage devices (e.g. check valves) required to be installed with the tempering valve together with the specification of such devices. This specification shall be sufficient to enable the combination of tempering valve and anti-backsiphonage devices tested in accordance with this specification to be replicated on site.

5) The need for the inclusion of any isolating valves, etc., to enable tests to be made on site.

6) These devices do not limit the temperature of hot water to a safety value that avoids any scalding risk.

7) The set temperature shall comply with national regulations.

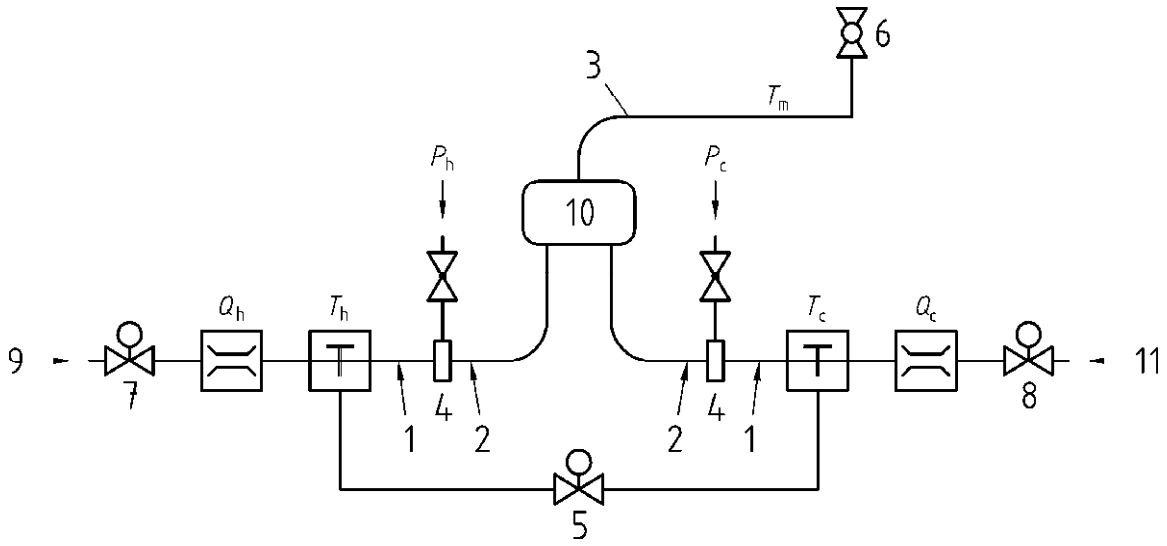
Annex A
(informative)

Apparatus for endurance test on thermostat

A.1 Test rig

A.1.1 General

Example see Figure A.1.



Key

1 pipe
2 pipe
3 pipe
4 pressure measurement connection
5 by pass valve, quick acting
6 outlet control valve
7 hot inlet control valve
8 cold inlet control valve
9 hot water direction of flow
10 tempering valve under test
11 cold water direction of flow

Q_h hot water flow meter
Q_c cold water flow meter
T_h hot water temperature measuring device
T_c cold water temperature measuring device
P_h hot water pressure measuring device
P_c cold water pressure measuring device
T_m mixed water temperature measuring device

Some detail may need to differ in order to suit particular tempering valves and water supply facilities.

Figure A.1 — Test rig for durability test on thermostat

A.1.2 Inlets

The inlet pipe work should incorporate:

a) three quick acting shut-off valves (5), (7) and (8) with remote actuation, such as a solenoid valve, one in each supply and one in the cross-connecting arrangement — see f);

b) ability to measure and control the mixed water flow rate. The mixed water flow rate should be controlled by means of a downstream resistance;

c) provision to accommodate two temperature measuring devices (T_h and T_c);

d) a branch to an arrangement for cross-connecting the supplies;

e) provision to accommodate two pressure measuring devices (P_h and P_c)

f) an arrangement for cross-connecting the supplies through a branch containing valve (5);

g) pipe lagging should cover the whole length of both inlet pipes between the temperature measuring device and the inlet connection of the tempering valve.

A.1.3 Operating devices

The valves (5), (7) and (8) should be operated by means of a timing device in a defined cycle as given in 7.10.

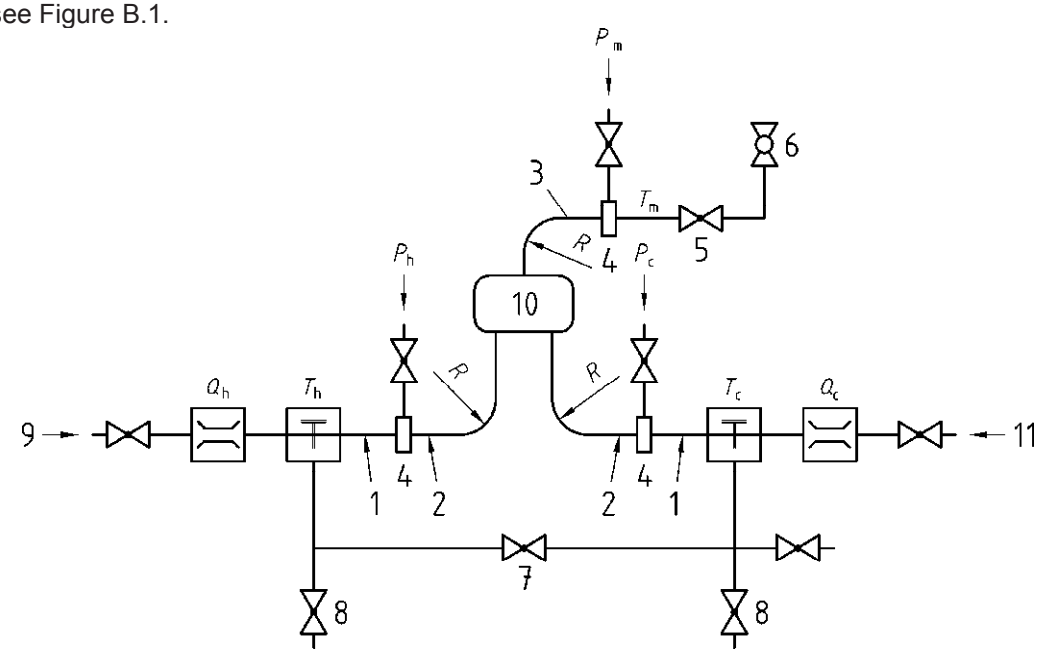
Annex B
(informative)

Apparatus for performance test

B.1 Test rig

B.1.1 General

Example see Figure B.1.



Key

1 pipe
2 pipe
3 pipe
4 pressure measurement connection
5 stop valve
6 control valve
7 by-pass control valve
8 bleed valve
9 hot inlet control valve
10 tempering valve under test
11 cold inlet control valve

Q_h hot water flow meter
Q_c cold water flow meter
T_h hot water temperature measuring device
T_c cold water temperature measuring device
P_h hot water pressure measuring device
P_c cold water pressure measuring device
T_m mixed water temperature measuring device
P_m mixed water outlet pressure measuring device

Some detail may need to differ in order to suit particular tempering valves and water supply facilities.

Figure B.1 — Test rig for performance tests

B.1.2 Inlets

The inlet pipe work should incorporate:

a) a stop valve in each supply pipe;

b) a flow meter (Q_h and Q_c) in each supply pipe;

c) provision to accommodate temperature measuring devices (T_h and T_c);

d) a branch in each supply pipe to bleed valve (8);

e) straight piping (1), of a nominal bore which ensures that the speed of the water at normal test conditions does not exceed 5 m/s and of length 250 mm ± 10 mm between the temperature measuring devices and the location where the pressure is measured (4);

f) provision to measure the pressure at various locations;

g) piping (2) of the same nominal bore as the inlet connection of the tempering valve under test and of length 300 cm ± 10 mm. Only bends of radius $R \geq 4 \times$ the bore of the pipe are permitted in this pipe;

h) an arrangement for cross-connecting the supplies through a branch containing valve (7) connected between the branches to bleed valves (8);

i) pipe lagging should cover the whole length of both inlet pipes between the temperature measuring device and the inlet connection of the tempering valve.

B.1.3 Outlet

The outlet pipework should be made of copper pipe according to EN 1057, half hard and should be of the same nominal bore as the tempering valve. Only bends of radius $R \geq 4 \times$ the bore of the pipe are permitted in the pipework.

The pipework should have a length between the tempering valve outlet connection and T_m of 550 mm ± 50 mm and incorporating:

a) a provision to measure pressure at a distance of 300 mm ± 50 mm of the tempering valves outlet connection;

b) a provision to mount a temperature measuring device.

After the temperature measuring device a stop valve (outlet control valve) in the same nominal diameter as the tempering valve should be placed.

Annex C
(normative)

Measurement of parameters

C.1 Temperature measurement

C.1.1 Mounting

C.1.1.1 Ensure the full immersion of the thermally sensitive part of sensing elements.

C.1.1.2 In the case of the mixed water temperature, T_m, mount the thermometer element in the pipe work 50 mm to 75 mm before the control valve (6).

C.1.2 Accuracy

The temperature of the hot water supply, T_h, the cold water supply, T_c, and the mixed water, T_m, shall be measured with an accuracy of ≤ 0,5 K.

C.1.3 Response time

Measure the mixed water temperature with instrumentation having a total system response such that a change in reading equal to 90 % of a step change is indicated in a time of 0,3 s. Use a type T thermocouple.

C.1.4 Frequency of measurement

The sampling rate shall be at least ≥ 50 Hz.

C.2 Pressure measurement

The flow pressures of the hot water supply, P_h, the cold water supply, P_c, and the mixed water, P_m, shall be measured with an accuracy of ≤ 1 %.

C.3 Flow measurement

The flow rates of the hot water, Q_h, and cold water, Q_c, shall be measured with an accuracy of ≤ 2,0 % of the normal testing flow. The flow rate of mixed water is the sum ($Q_h + Q_c$).

Annex D
(informative)

Temperature transient requirements

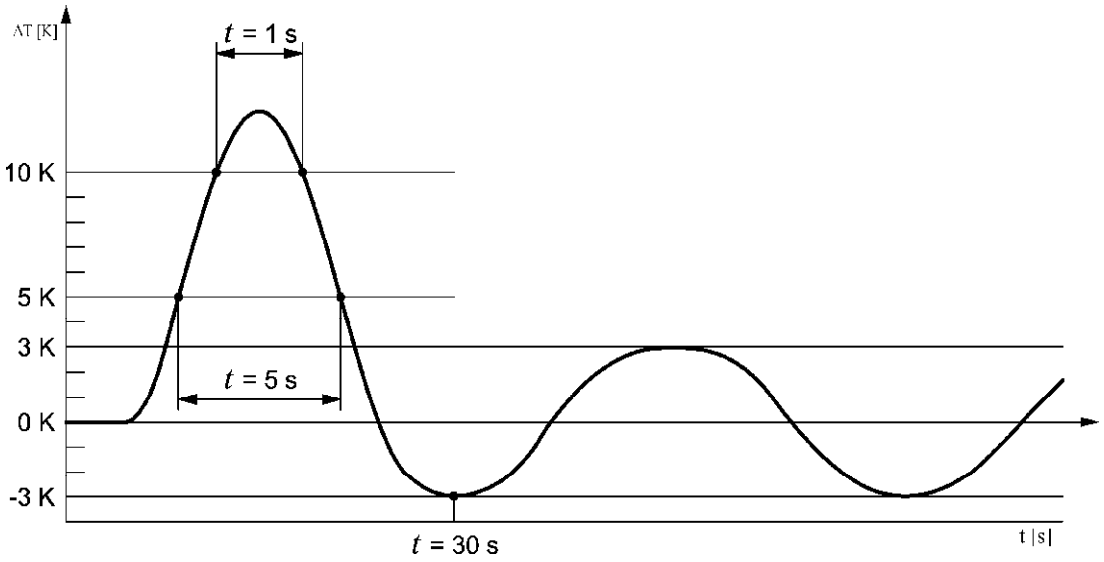


Figure D.1 — Temperature transient requirements

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