BRITISH STANDARD

BS EN 817 : 1998

Sanitary tapware — Mechanical mixers (PN 10) — General technical specifications

The European Standard EN 817 : 1997 has the status of a British Standard

ICS 91.140.70

National foreword

This British Standard is the English language version of EN 817 : 1997.

The UK participation in its preparation was entrusted by Technical Committee B/504, Water Supply, to Subcommittee B/504/8, Terminal fittings, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled 'International Standards Correspondence Index', or by using the 'Find' facility of the BSI Standards Electronic Catalogue.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

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Descriptors: Sanitary valves, valves and fittings, mixing valves, designation, classifications, dimensions, leaktightness, performance evaluation, hydraulic properties, mechanical properties, fatigue tests, acoustic properties, marking

English version

Sanitary tapware — Mechanical mixers (PN 10) — General technical specifications

Robinetterie sanitaire — Mitigeurs mécaniques (PN 10) — Spécifications techniques générales

Sanitärarmaturen — Mechanisch einstellbare Mischer (PN 10) — Allgemeine technische Spezifikation

This European Standard was approved by CEN on 1996-11-30. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
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Europäisches Komitee für Normung

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Ref. No. EN 817 : 1997 E

Foreword

This European Standard has been prepared by the 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 February 1998, and conflicting national standards shall be withdrawn at the latest by February 1998.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Contents

0 Introduction

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

1) this 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;

2) 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:

- the dimensional, leaktightness, mechanical and hydraulic performance, mechanical endurance and acoustic characteristics with which mechanical mixing valves shall comply;
- the procedures for testing these characteristics.

It is applicable:

- to mechanical mixing valves, intended for use on sanitary appliances in washrooms (toilets, bathrooms, etc.) and in kitchens;
- to PN 10 mechanical mixing valves used under the following pressure and temperature conditions.

Table 1. Conditions for the use of mechanical mixing valves

	Limits of use	Recommended limits for correct operation
Dynamic pressure	0,05 MPa (0,5 bar) minimum	0,1 MPa $\leq P \leq$ 0,5 MPa (1 bar $\leq P \leq$ 5 bar)
Static pressure	1 MPa (10 bar) maximum	
Temperature	$\leq$ 90 °C	$\leq$ 65 °C

NOTE. Mechanical mixing valves for use at pressures lower than those in table 1 are covered by prEN 1286.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 31	*Pedestal wash basins — Connecting dimensions*
EN 32	*Wall hung wash basins — Connecting dimensions*
EN 35	*Pedestal bidets over rim supply only — Connecting dimensions*
EN 36	*Wall hung bidets over rim supply only — Connecting dimensions*
EN 111	*Wall hung rinse basins — Connecting dimensions*
EN 232	*Baths — Connecting dimensions*
EN 246	*Sanitary tapware — General specifications for flow rate regulators*
EN 248	*Sanitary tapware — General technical specifications for electrodeposited nickel chrome coatings*
prEN 695	*Kitchen sinks — Connecting dimensions*
prEN 1717	*Protection against pollution of potable water in drinking water installations and general requirements of devices to prevent pollution by backflow*
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/DIS 3822-1 : 1995)

EN ISO 3822-2	*Acoustics — Laboratory tests on noise emission from appliances and equipment used in water supply installations — Part 2 : Mounting and operating conditions for draw-off taps and mixing valves* (ISO 3822-2 : 1995)
EN ISO 3822-4 : 1997	*Acoustics — Laboratory tests on noise emission from appliances and equipment used in water supply installations — Part 4 : Mounting and operating conditions for special appliances*
ISO 228-1 : 1994	*Pipe threads where pressure-tight joints are not made on the threads — Part 1 : Dimensions tolerances and designation*
ISO 5167-1 : 1991	*Measurement of fluid flow by means of pressure differential devices — Part 1 : Orifice plates, nozzles and Venturi tubes inserted in circular cross-section conduits running full*

3 Definition

For the purposes of this standard, the following definition applies:

mechanical mixing valve

Valve which by means of a control device, mixes hot and cold water between the 'all cold water' position and the 'all hot water' position and adjusts the flow rate of the mixture obtained between the 'no flow' and 'maximum flow' positions, either using the same control device or another separate control device.

4 Classification

There are two types of mechanical mixing valve.

4.1 Single control mixing valve

Mechanical mixing valve with a single control device for adjusting flow rate and temperature.

4.2 Other mixing valves

Mechanical mixing valves with separate control devices for adjusting flow rate and temperature.

5 Designation

A mechanical mixing valve is designated by:

- type (see clause **4**), with or without diverter (see table 2);
- type of body (see table 2);
- type of nozzle (see table 2);
- the sanitary appliance on which it is to be used (see table 2);
- the method of mounting (see table 2);
- its acoustic group and flow rate class(es) (see table 14);
- reference to this standard (EN 817).

In the case of a mechanical bath/shower mixing valve, the flow rate shall be designated by both flow rate classes. The first for the bath outlet, the second for the shower outlet.

Example of designation, 'Single control mechanical mixing valve, with diverter, visible body and fixed nozzle outlet, for bath/shower, for horizontal mounting, Group I (class C.B) EN 817'.

Table 2. Designation

Diverter	With or without diverter
Type of body	Two-hole, single hole, visible or concealed
Type of nozzle	Fixed or moveable nozzle outlet, no nozzle outlet
Intended use	Basin, bidet, sink, bath or shower
Mounting method	Horizontal or vertical surfaces

6 Marking — Identification

6.1 Marking

Mechanical mixing valves complying with this standard shall be marked permanently and legibly on the body with:

- the mark or name of the manufacturer, the acoustic group and flow rate class.

In the case of a mechanical bath/shower mixing valve, both flow rate classes shall be marked. The first for the bath outlet, the second for the shower outlet.

6.2 Identification

The direction of movement of the control device for water temperature adjustment of mechanical mixing valves shall be identified:

- for cold water, by the colour blue;
- for hot water, by the colour red.

The identification of cold water shall be on the right and the hot water on the left.

7 Materials

7.1 Chemical and hygienic characteristics

All materials in contact with water intended for human consumption shall present no health risk up to a temperature of 90 °C. They shall not cause any deterioration in water intended for human consumption, with regard to food quality, appearance, odour or taste.

Within the recommended limit given in clause **1** for correct operation, the materials shall not be subject to any deterioration which might compromise the operation of the mechanical mixing valve. Pressurized parts shall withstand the limits of use set in table 1. Materials with inadequate corrosion resistance shall be given additional protection.

7.2 Exposed surface condition and quality of coating

Visible chromium plated surface and Ni-Cr coatings shall comply with the requirements of EN 248.

8 Dimensional characteristics

8.1 General remarks concerning the drawing

The design and construction of components without defined dimensions permits various design solutions to be adopted by the manufacturer.

Special cases are covered in **8.5**.

8.2 Mechanical mixing valves mounted on horizontal surfaces

The standardized dimensions of mechanical mixers:

- firstly, guarantee their mounting and interchangeability on sanitary appliances complying with the standards EN 31, EN 32, EN 35, EN 36, EN 111, EN 232, EN 695;
- secondly, give the various options for connection with the water supply.

8.2.1 ***Single-hole mixer — visible body*** (see table 3).

8.2.1.1 *Without spray attachment* (see figure 1a).

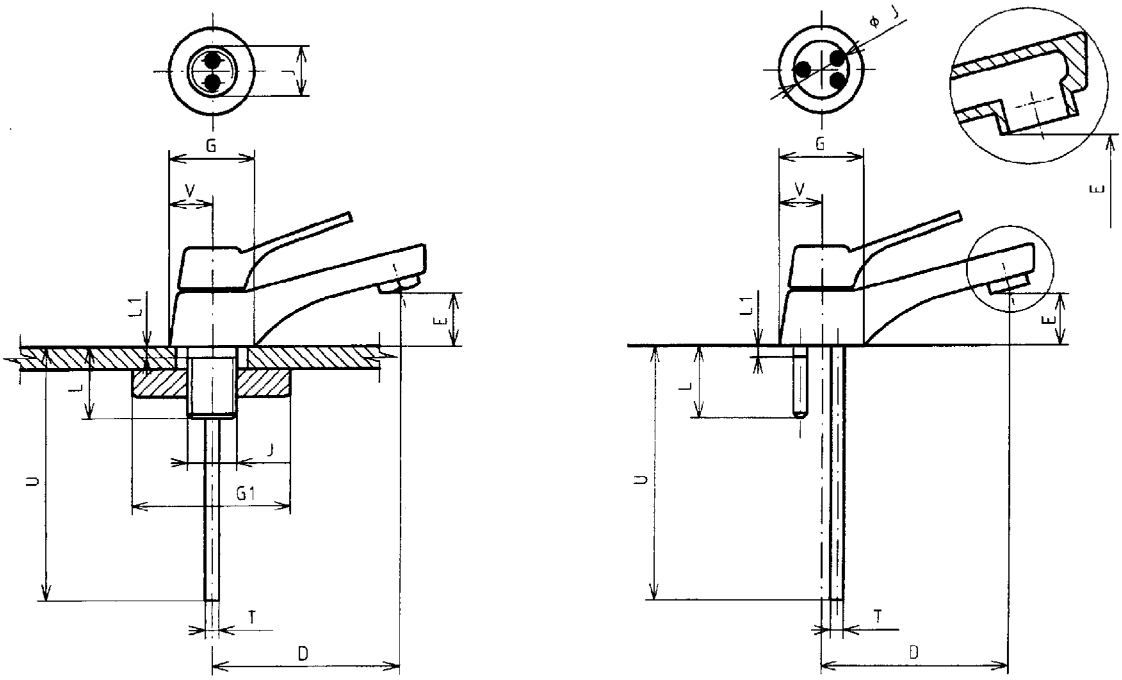


Figure 1a. Single-hole mechanical mixing valve without spray attachment

8.2.1.2 *With spray attachment* (see figures 1b and 1c)

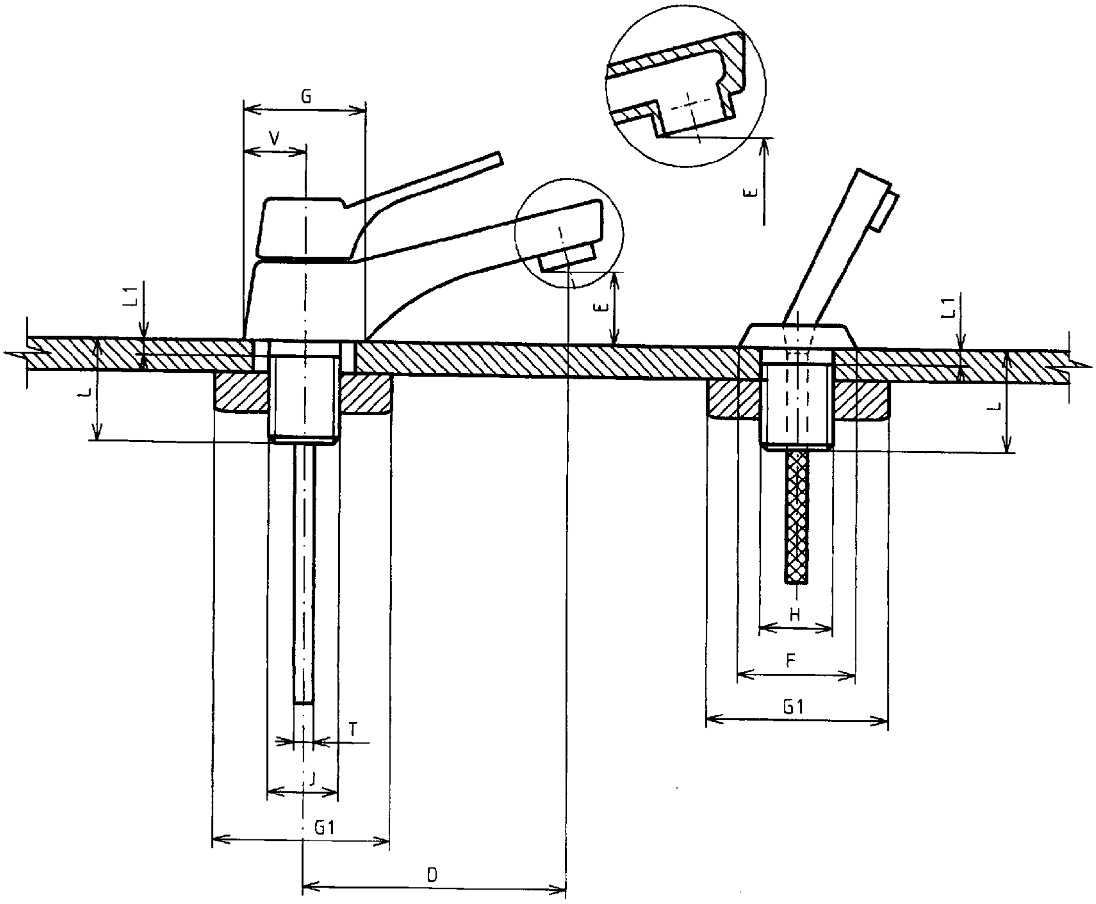


Figure 1b. Remote spray attachment

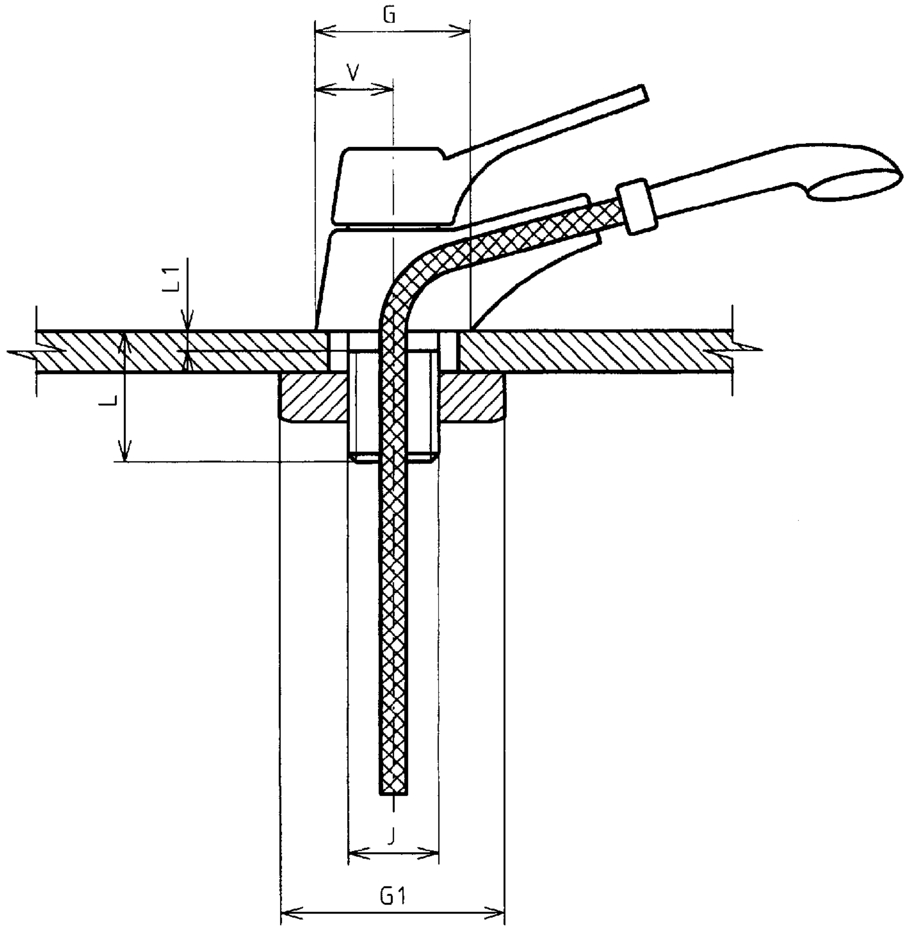


Figure 1c. Integral spray attachment

8.2.1.3 *Supply hoses*

Dimensions in millimetres

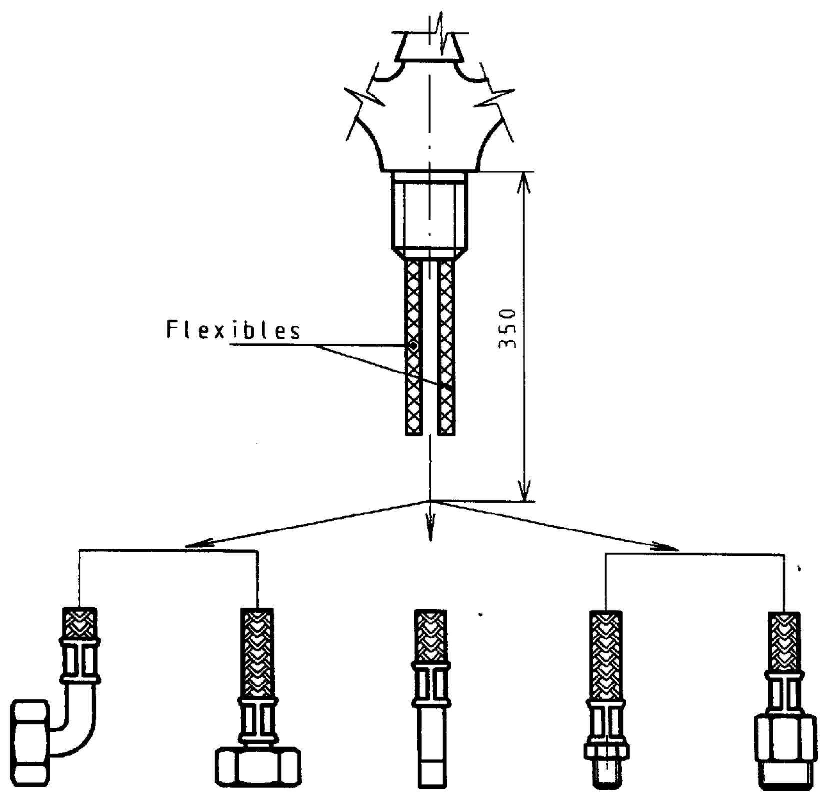


Figure 2. Flexible hoses for water supply

NOTE 1. Supply hoses can be used with the mixing valves shown in figures 1a, 1b, 1c, 5 and 6. Other methods of connection to the supply are permissible.

NOTE 2. Supply hoses should comply with the requirements of draft standard, *Flexible hoses for water supply*, (WI : 00164121).

Table 3. Single-hole visible body mixing valve with or without spray attachment
(See figures 1a, 1b, 1c)
Mechanical mixing valves with remote outlet (see figures 5 and 6)

Dimensions in millimetres

Dimensions	Measures	Comments
D	100 min.	Dimension from the centre of outlet, as supplied, i.e., orifice with or without flow rate regulator.
E	25 min.	Dimension from lowest point of the outlet orifice to the mounting surface
F	42 min. for wash-basins/bidets/sinks/baths	Smallest dimension of the remote spray attachment base
G	45 min.	Smallest dimension of the mixing valve base
G_1	External diameter 50 max.	Clamping washer
H	29 max.	Shank diameter of remote spray attachment
J	33,5 max.	The two inlet pipes and retention stud shall be contained in a circle of diameter *J*
L and L_1	Dimensions which allow mixing valves to be fitted on to supports of thickness between 1 mm and 18 mm	
T	Copper tube with an external diameter of 10 Hose in accordance with **8.2.1.3**	Plain – or G 3/8 male or female thread – or G 1/2 male or female thread Plain end with an external diameter of 10 – or with G 3/8 male or female thread – or G 1/2 male or female thread
U	350 min.	
V max.	35 max. for baths 32 max. for wash-basins/bidets/sinks	Projection of mixing valve base to rear, measured from axis of diameter *J*

NOTE. Dimensions *J*, *T* and *U* are not specified for baths and are left to the discretion of the manufacturer.

8.2.2 ***Two-hole mechanical mixing valve with visible body mounted on horizontal surface***
(see table 4 and figure 3)

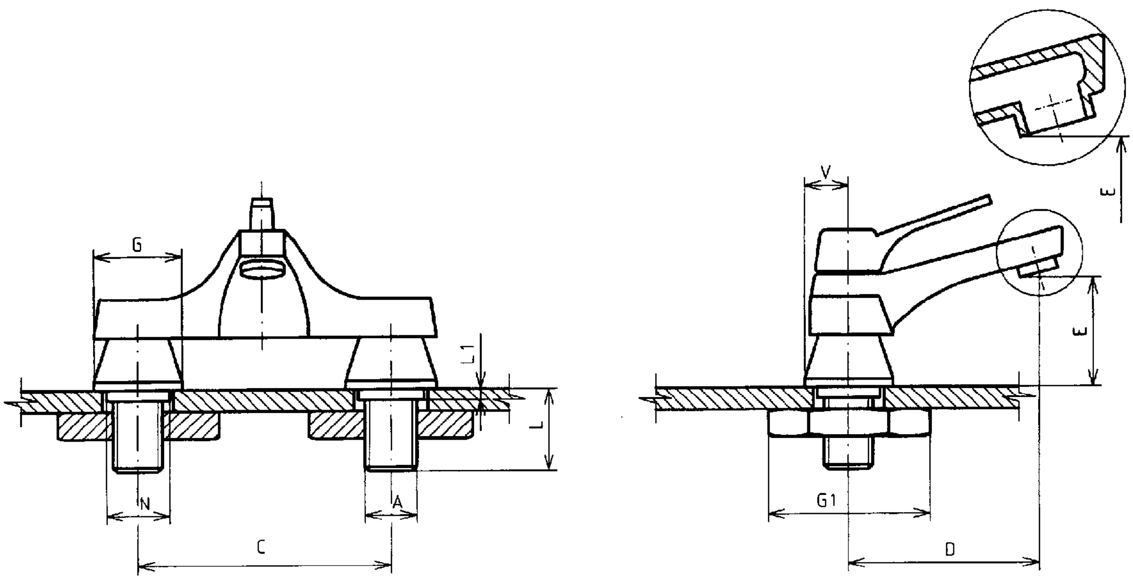


Figure 3. Two hole mixing valves with visible body on horizontal surface

Table 4. Two-hole mixing valves with visible body on horizontal surface

Dimensions in millimetres

Dimension	Measures	Comments
A	G 1/2 B	See ISO 228-1
C	$200^{+3,5}_{-1}$ for wash-basins/ bidets/sinks 150 ± 1 for baths	
D	100 min.	Dimension from the centre of outlet orifice, as supplied, i.e. with or without flow rate aerator
E	25 min.	Dimension from lowest point of the outlet orifice to the mounting surface
G	42 min. for wash-basins/ bidets/sinks 45 min. for baths	Smallest dimension of the base
G_1	External diameter: 50 max.	Clamping washer
L and L_1	Dimensions which allow mixing valves to be fitted on to supports of thickness between 1 mm and 18 mm and connection with the water supply	
N	24 max.	
V	35 max. for baths 32 max. for wash-basins/ bidets/sinks	Projection of mixer flange to rear measured from axis of diameter *A*

8.2.2.1 *Dimensions of connecting ends* (see figure 4 and table 5)

If the connecting ends are machined to accept a supply tube, the dimensions shall be as given in table 5 (e.g. Type 1 or Type 2).

Dimensions in millimetres

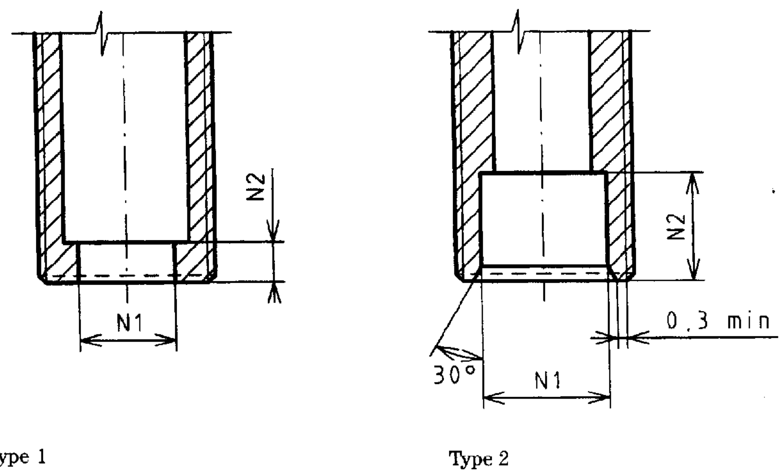


Figure 4. Dimensions of connecting ends

Table 5. Dimensions of connecting ends		
		Dimensions in millimetres
Dimension	**Measure**	
	Type 1	**Type 2**
N_1	$12,3^{+0,2}_{0}$	15,2 ± 0,05
N_2	5 min.	13 min with a 30°chamfer and a flat of 0,3 min. at the entry to the bore

8.2.3 ***Mechanical mixing valves with remote outlet*** (see table 3)

8.2.3.1 *With separate spray attachment*

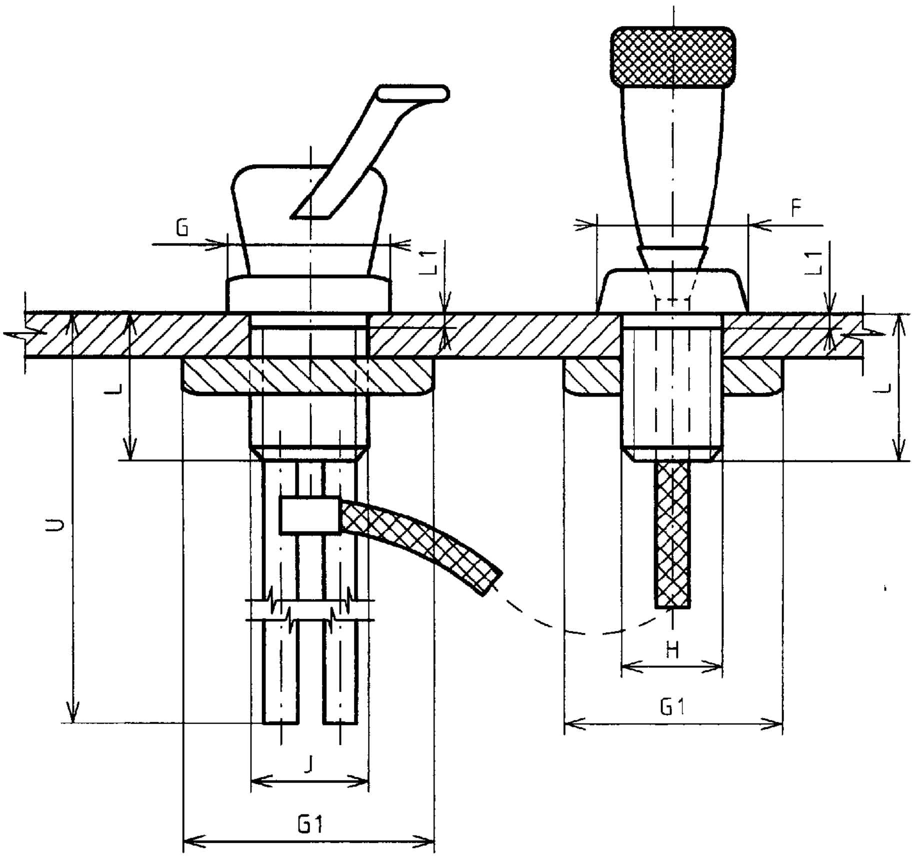


Figure 5. Mixing valve with remote spray attachment

8.2.3.2 *Mixer with separate nozzle outlet*

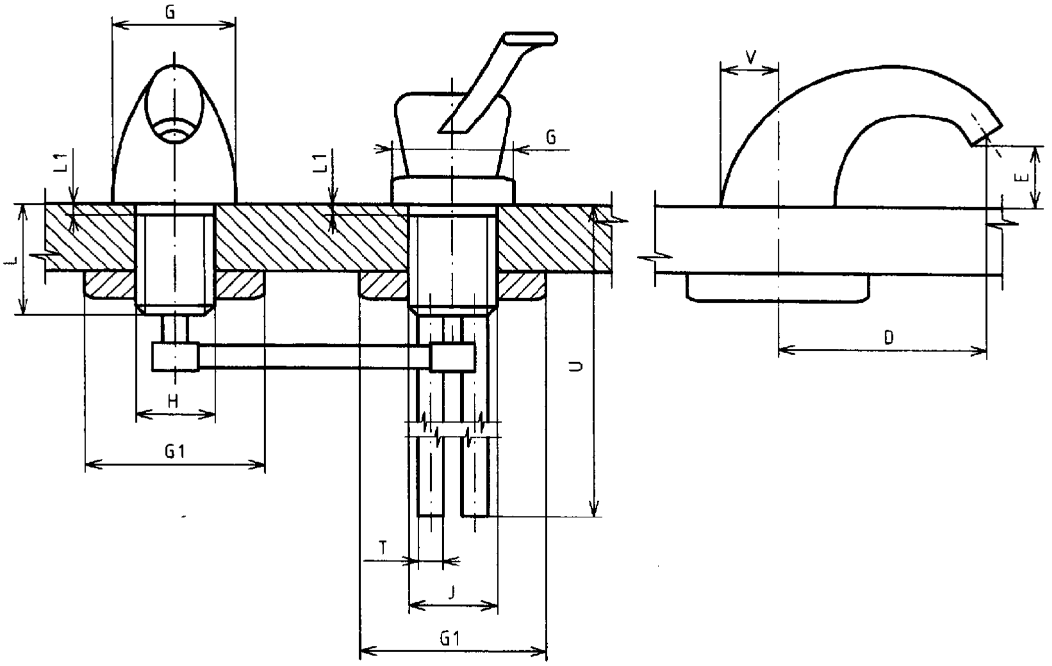


Figure 6. Mixing valve with separate nozzle outlet

8.2.4 ***Mechanical mixing valve remotely mounted from sanitary appliance***

The design, execution and dimensions are left to the discretion of the manufacturer. The connecting threads shall comply with ISO standards.

If the air gap, $E \geq 25$ mm, is not complied with, a suitable backflow protection device in accordance with prEN 1717 is required.

8.3 Mechanical mixing valves mounted on vertical surfaces

The specified dimensions of mixers allow the different possibilities of connections to the water supply.

8.3.1 ***Two hole mechanical mixing valves with visible body***

8.3.1.1 *Mechanical mixer with straight unions* (see figure 7)

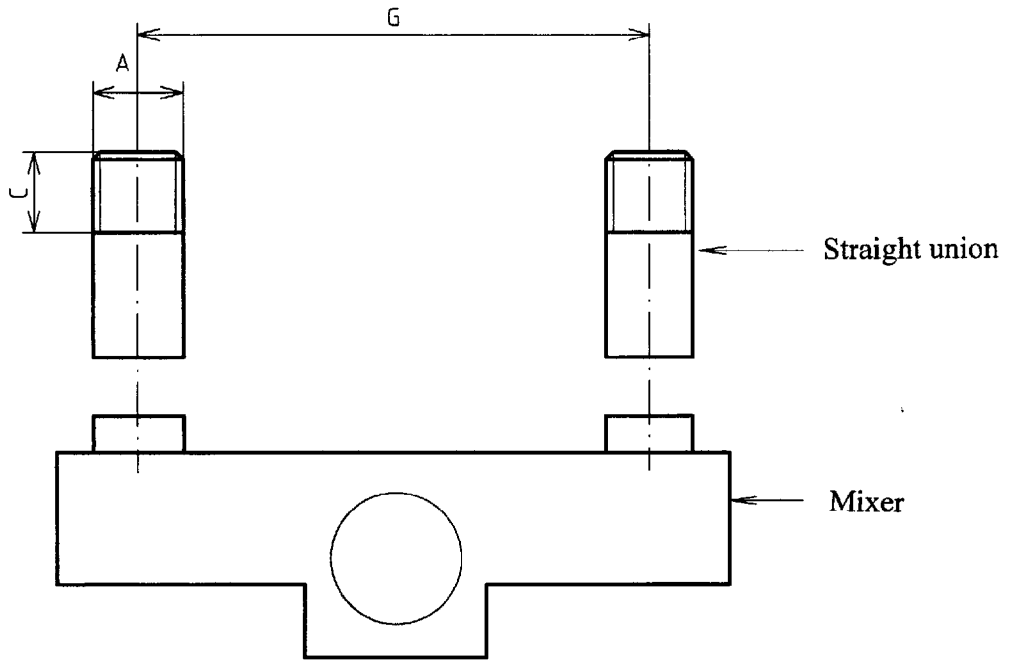


Figure 7. Mechanical mixing valve with straight unions

8.3.1.2 *With eccentric unions* (see figure 8)

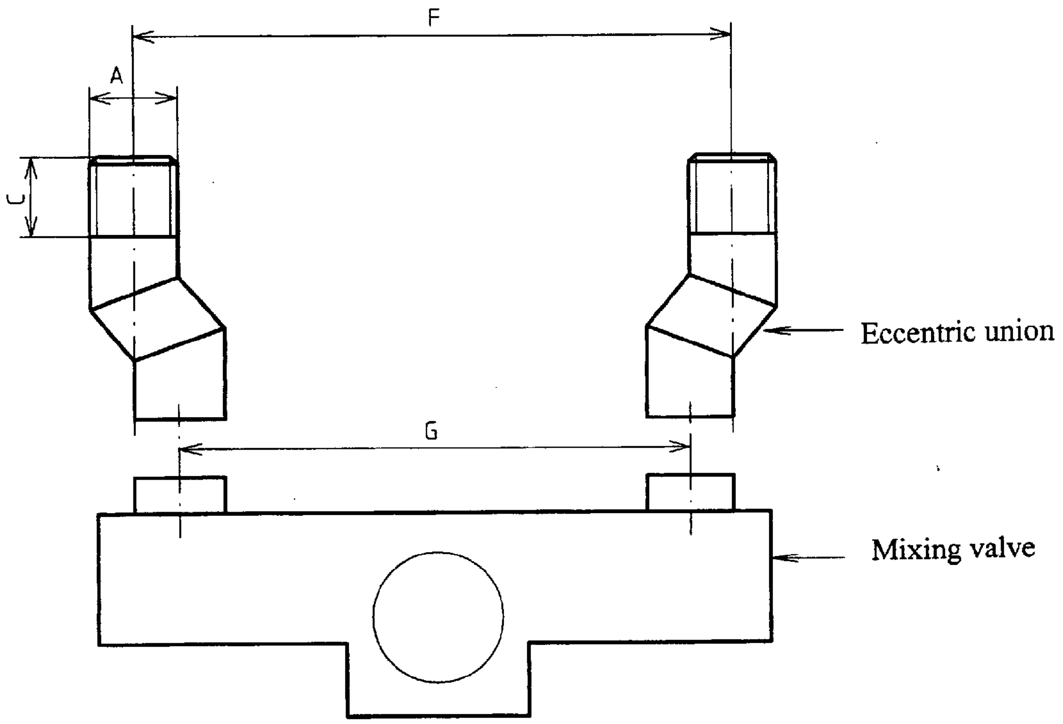


Figure 8. Mechanical mixing valve with eccentric unions

8.3.1.3 *With captive nuts* (see figure 9)

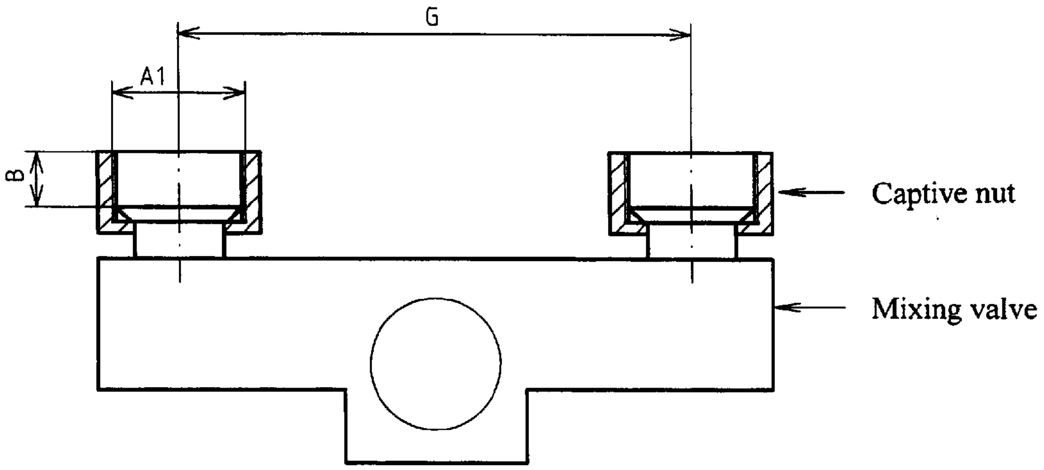


Figure 9. Mechanical mixing valve with captive nuts

Table 6. Connection dimensions (see figures 7, 8 and 9)

Dimensions in millimetres

Dimension	Measure	Comments
A[1)]	G 1/2 B	ISO 228-1
A[1)]	G 3/4	ISO 228-1
B	9 min.	Useful thread length (excluding washer)
C	15 min.	Useful thread length
F	140 to 160	Extension of this range is permitted
G	150 ± 1	

[1)] It is permitted to serrate or knurl this thread to assist the retention of sealing tape or compounds. In such cases the lower deviation tolerance on the basic major diameter indicated in ISO 228-1 may be increased to −0,35 mm.

The use of deformable washers is permitted.

8.3.2 ***Outlet dimension*** (see figure 10 and table 7)

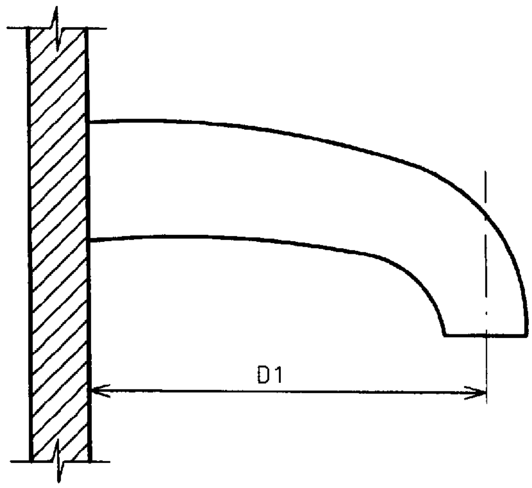


Figure 10. Mechanical mixer mounted on vertical surface

Table 7. Outlet dimension		
		Dimensions in millimetres
Dimension	**Measure**	**Comments**
D_1	115 min.	The actual manufacturing dimension shall be such that the mixing valve can fulfil its function depending on the sanitary appliance for which it is intended

8.3.3 ***Mechanical mixing valves with concealed or single hole body***

The design, execution and dimensions are left to the discretion of the manufacturer. The connecting threads shall comply with ISO 228-1.

8.4 Dimensions of water outlets

8.4.1 ***Nozzle outlets for use with flow rate regulators***

When nozzle outlets are used with flow rate regulators:

a) conforming with EN 246, dimensions are indicated in tables 8 and 9;

b) not conforming with EN 246, those mechanical mixing valves are covered by **8.5**.

In order to ensure interchangeability of flow rate regulators, the manufacturing tolerances chosen for the connecting threads of the outlets shall be compatible with those of the standard connecting threads of the flow rate regulators.

8.4.1.1 *Nozzle outlet for flow rate regulator with internal* thread (see figure 11 and table 8)

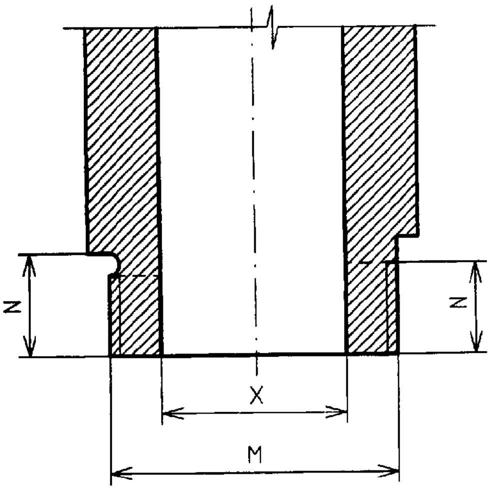


Table 8. Dimensions for nozzle outlet	
	Dimensions in millimetres
M	M 22 × 1 − 6g
X	14 min. to 17 max.
N	4,5 min.

Figure 11. Nozzle outlet for flow rate regulator with internal thread

8.4.1.2 *Nozzle outlet for flow rate regulator with external thread* (see figure 12 and table 9)

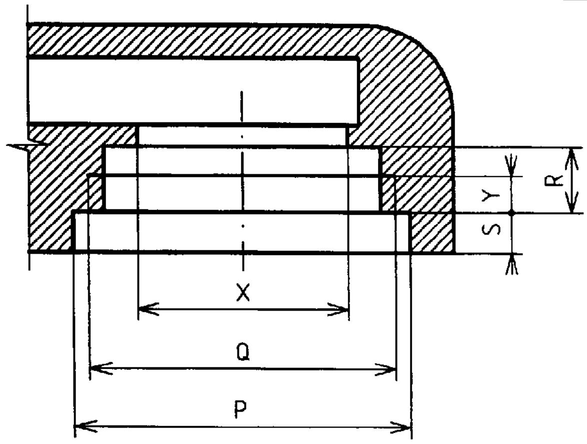


Table 9. Dimensions for nozzle outlet		
		Dimensions in millimetres
Q	M 24 × 1 − 6H	M 28 × 1 − 6H
P	Diameter 24,2 min.	Diameter 28,3 min.
R	4,5 ± 0,2	6 ± 0,2
S	1,5 to 4,5	3,5 to 9.5
X	14 min. to 17 max.	15 min. to 19 max.
Y	3 min.	4,5 min.

Figure 12. Nozzle outlet for flow rate regulator with external thread

8.4.2 ***Shower outlet connection*** (see figures 13, 14 and table 10)

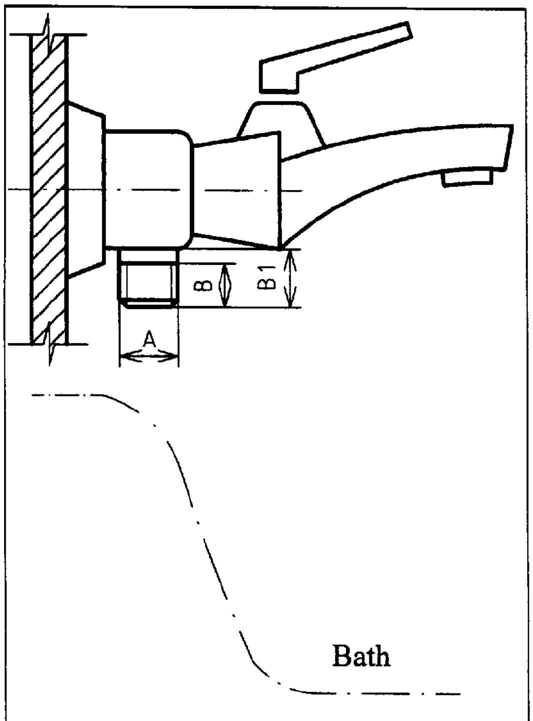


Figure 13. Downward shower outlet

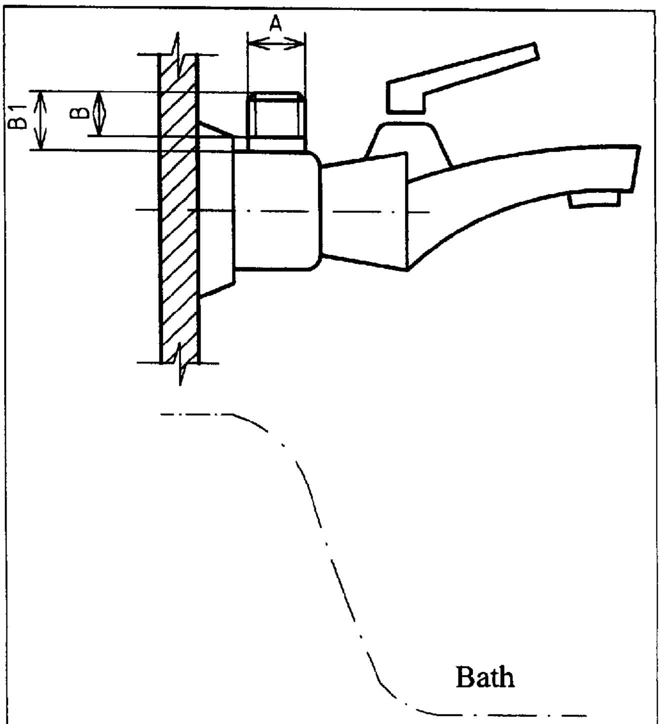


Figure 14. Upward shower outlet

Table 10. Shower outlet — Dimensions		
		Dimensions in millimetres
Dimension	**Measure**	**Comments**
B	7,5 min.	Connecting thread for shower hoses Useful thread length
B_1	9,5 min.	Free length for connecting nut
A	G 1/2 B [1] or G 3/4 B	ISO 228-1
[1] Preferred dimension		

There shall be sufficient space between the wall and the shower connection to allow tightening, release and appropriate directional adjustment of the shower connections.

8.5 Special cases

8.5.1 ***Special mechanical mixing valves for installation on horizontal surfaces***

Mechanical mixing valves intended for special application, e.g. for installation on sanitary appliances not conforming with European standards or where dimensional interchangeability is not a requirement, etc., may incorporate dimensional deviations, provided:

- all other requirements of this standard are satisfied;
- secure fixing to the mounting surface is provided with all fixing holes covered and watertight connections to the supplies achieved;
- water can be delivered without undue splashing;
- the air gap $E \geq 25$ mm. If E is less than 25 mm an additional backflow prevention device is necessary in accordance with prEN 1717;
- the manufacturer's literature, including the installation instructions supplied with the mixing valve, indicates clearly that this mixing valve is a special case.

8.5.2 ***Special mechanical mixing valves for installation on vertical surfaces***

Mechanical mixing valves with a visible body intended for special applications or, where interchangeability is not a requirement can incorporate dimensional deviations, provided:

- all other requirements of this standard are satisfied;
- secure fixing and watertight connections to the water supply are achieved and if connection to the pipes is by means of a thread, this shall comply with ISO 228-1;
- the manufacturer's literature, including the installation instructions supplied with the mixing valve, indicates clearly that this mixing valve is a special case.

9 Leaktightness characteristics

9.1 General

The tests described are type tests (laboratory tests) and not quality control tests carried out during manufacture.

This clause specifies test methods for verifying the leaktightness of the mixer and gives the corresponding specifications.

9.2 Test methods

9.2.1 ***Principle***

This consists of checking, under cold water pressure, the leaktightness of:

a) the obturator (see **9.3** and **9.4**);

b) the complete mixing valve (see **9.3** and **9.5**);

c) diverters with manual control (see **9.6**) or automatic return (see **9.7**) if provided.

In the case where the diverter with automatic return is considered to ensure an anti-polluting function, it shall comply with specific requirements (see clause **15**).

9.2.2 ***Apparatus***

Hydraulic test circuit, capable of supplying the static and dynamic pressures required and of maintaining them throughout the duration of the test.

9.3 Leaktightness of the mixing valve upstream of the obturator, and of the obturator

9.3.1 ***Procedure***

- Connect the two test circuit water supplies to the mixing valve.
- With the outlet orifice open and the obturator closed, apply a water pressure of (1,6 ± 0,05) MPa ((16 ± 0,5) bar) to the mixer for (60 ± 5) s, for the full operating range of the temperature control device.

9.3.2 ***Requirements***

a) Verification of leaktightness upstream of the obturator.

For the duration of the test there shall be no leakage or seepage through the walls.

b) Verification of leaktightness of the obturator.

For the duration of the test there shall be no leakage at the obturator.

9.4 Leaktightness of the obturator: cross flow between hot water and cold water

9.4.1 ***Procedure***

- Connect one inlet of the mixing valve to the test circuit.
- With the outlet orifice open and the obturator closed, apply a water pressure of (0,4 ± 0,02) MPa ((4 ± 0,2) bar) to the mixing valve for (60 ± 5) s for the full operating range of the temperature control device.
- Repeat the test, reversing the water supply connection to the other inlet.

9.4.2 ***Requirements***

For the duration of the test, there shall be no leakage or seepage at the outlet or at the end of the unconnected inlet.

9.5 Leaktightness of the mixing valve downstream of the obturator

9.5.1 ***Procedure***

- Connect the two test circuit water supplies to the mixing valve.
- With the outlet orifice closed and the obturator open, apply a water pressure of (0,4 ± 0,02) MPa ((4 ± 0,2) bar) to the mixer for (60 ± 5) s, for the full operating range of the temperature control device.
- Repeat the test with a water pressure of (0,02 ± 0,005) MPa (0,2 ± 0,05 bar) for (60 ± 5) s.

9.5.2 ***Requirements***

For the duration of the test, there shall be no leakage or seepage.

9.6 Leaktightness of manual diverters

9.6.1 ***Procedure***

- Connect the mixing valve, in its position of use, to the test circuit.
- Put the diverter in the bath position, with the bath outlet artificially closed and the shower outlet open.
- Apply a static water pressure of (0,4 ± 0,02) MPa ((4 ± 0,2) bar) for (60 ± 5) s. Check that leaktightness is obtained on the shower outlet.
- In addition, where leaktightness of the diverter is provided by one or more toroidal seals, apply a static water pressure of (0,02 ± 0,005) MPa ((0,2 ± 0,05) bar) for (60 ± 5) s. In this case, apply the highest pressure first and then gradually reduce to the lower pressure. Check that leaktightness is obtained on the shower outlet.
- Put the diverter in the shower position with the shower outlet artificially closed and the bath outlet open.
- Apply a static water pressure of (0,4 ± 0,02) MPa (4 ± 0,2) bar for (60 ± 5) s. Check that leaktightness is obtained on the bath outlet.
- In addition, where leaktightness of the diverter is provided by one or more toroidal seals, apply a static water pressure of (0,02 ± 0,005) MPa ((0,2 ± 0,05) bar) for (60 ± 5) s. In this case apply the highest pressure first and then gradually reduce to the lower pressure. Check that leaktightness is obtained on the bath outlet.

9.6.2 ***Requirements***

For the duration of the test there shall be no leakage at the outlet points indicated.

9.7 Leaktightness of diverters with automatic return

9.7.1 ***Procedure***

- Connect the mixing valve, in its position of use, to the test circuit with the outlets fully open.
- Connect the hydraulic resistance *A*[1] to the shower outlet (see **14.3.3**).
- Put the diverter in the bath position and apply a dynamic water pressure of (0,4 ± 0,02) MPa ((4 ± 0,2) bar) for (60 ± 5) s. Check that leaktightness is obtained on the shower outlet.
- Put the diverter in the shower position. Check that leaktightness is obtained on the bath outlet.
- With the diverter still in the shower position, reduce the dynamic pressure to a value of (0,05 ± 0,005) MPa ((0,5 ± 0,05) bar). Check that the diverter is not dislodged. Maintain this pressure for (60 ± 5) s and check that leaktightness is obtained on the bath outlet.
- Turn the water off. Check that the diverter returns to the bath position.
- Reapply the dynamic pressure of (0,05 ± 0,005) MPa ((0,5 ± 0,05) bar) for (60 ± 5) s. Check that leaktightness is obtained on the shower outlet.

9.7.2 ***Requirements***

For the duration of the test there shall be no leakage.

9.8 Summary of requirements

NOTE. A summary of requirements is shown in the table C.1.

10 Hydraulic operating characteristics

10.1 General

The test described is a type test (laboratory test) and not a quality control test carried out during manufacture.

This clause specifies a test method, the aim of which is to determine the following characteristics at equal and constant pressure on the two supplies (cold water and hot water):

- flow rate (see **10.6.1**);
- sensitivity (see **10.6.2**).

10.2 Test method

The tests for verifying the characteristics in **10.6** are carried out either on the basis of a series of curves or representative test values for the different functions of the mixing valve.

10.3 Apparatus

This comprises:

- two supply circuits (hot water and cold water) (figure 15);
- one test circuit (figure 16).

[1] A resistance which, tested alone at a dynamic pressure of 0,3 MPa, gives a flow rate = 0,25 l/s.

10.3.1 ***Supply circuits***

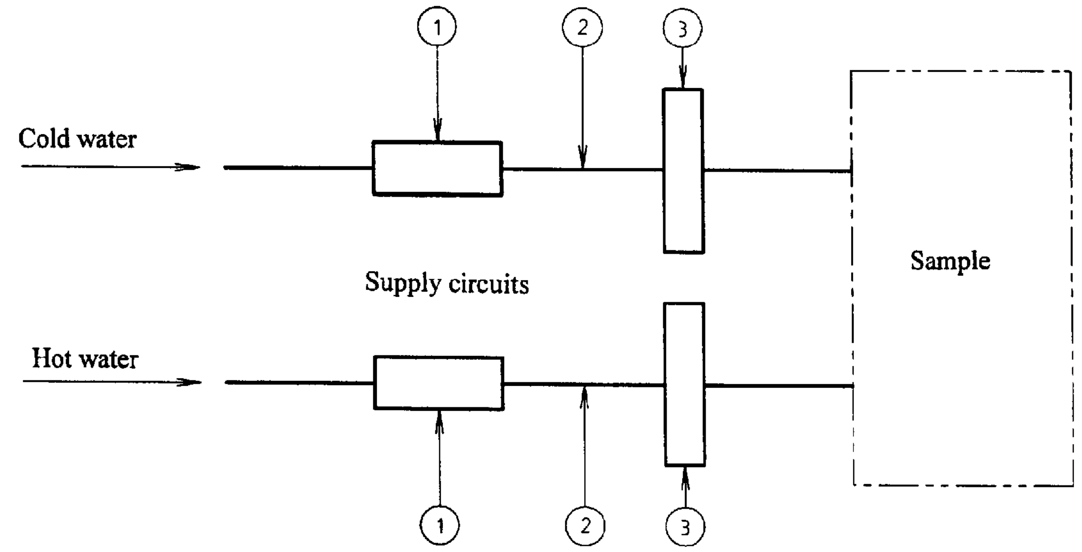


Figure 15. Supply circuits

Each circuit comprises:

– a temperature regulating device (not shown) for adjusting:

the temperature of the cold water to a value between 10 °C and 15 °C;

the temperature of the hot water to a value between 60 °C and 65 °C;

– a device (1) for obtaining the required pressures;

– piping (2) of appropriate cross-section for the flow to be obtained;

– a device (3) for measuring the flow rate.

10.3.2 ***Test circuit*** (see figure 16)

Each hot water or cold water supply to the mixer comprises:

a) piping made from a rigid metal tube of diameter and length in accordance with the dimensions in table 11 and figure 16 comprising:

– a device for connecting this piping to the supply circuit;

– a pressure take-off tee;

– a temperature probe;

– a connection to the reinforced flexible pipe.

b) a reinforced flexible pipe, 500 mm long, of minimum internal diameter equal to that of the metal tube, with a device at the end for connection to the mixing valve;

c) a temperature probe for the water at the mixing valve outlet;

d) a device without backlash for automatic or non-automatic operation at a rate of approximately 0,5°/s or 0,8 mm/s of the temperature and flow rate adjustment devices of the mixer;

e) equipment for measuring:

– pressures (measurement accuracy ± 1 % of the measured values);

– flow rates (measurement accuracy ± 2 % of the measured values);

– temperatures (measurement accuracy ± 1 % of the measured values);

– movement (G) of the temperature control device.

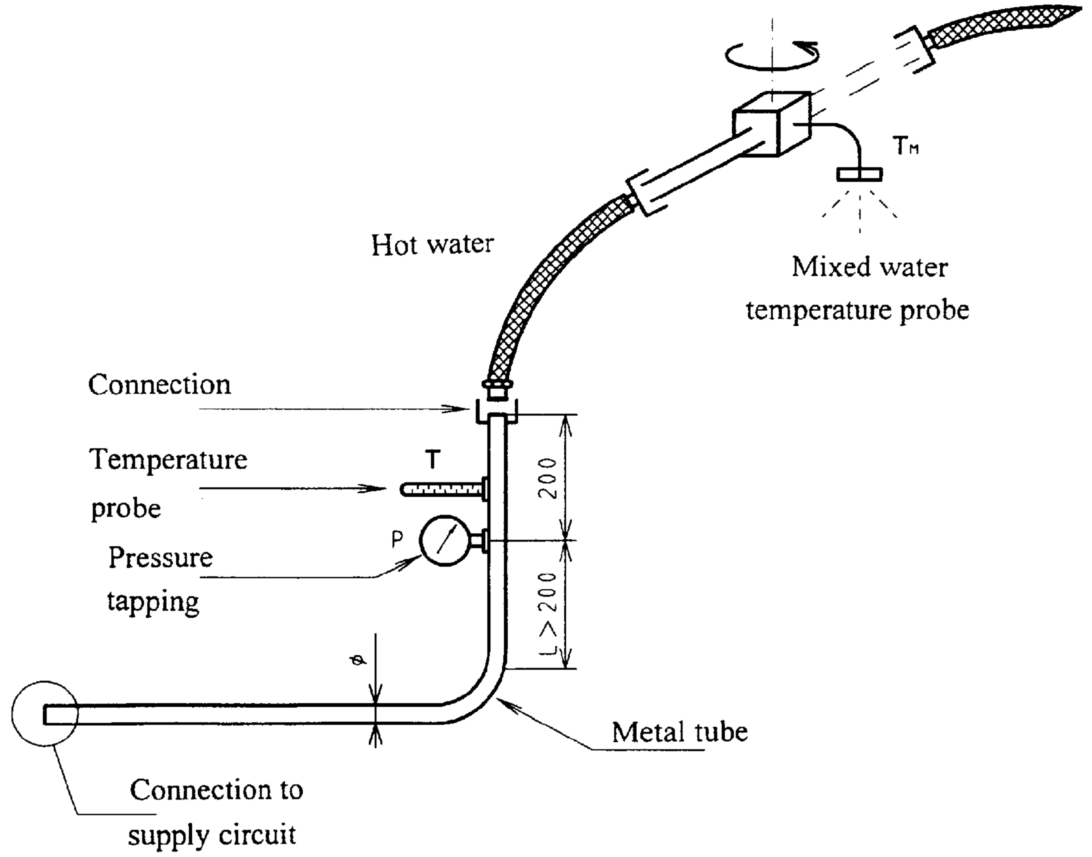
NOTE. The various parameters Q_C, Q_H, Q_M and G may be recorded continuously.

Where:

Q_C is the quantity of cold water;

Q_H is the quantity of hot water;

Q_M is the quantity of mixed water.



Dimensions in millimetres

Figure 16. Test circuit

10.3.3 *Pipework*

Material: There is no specific requirement for the nature of the tubes, provided that they are metal. The internal surface shall be smooth

Dimensions: In addition to the dimensions given in figure 16, the following dimensions shall be observed.

Table 11. Connecting dimension

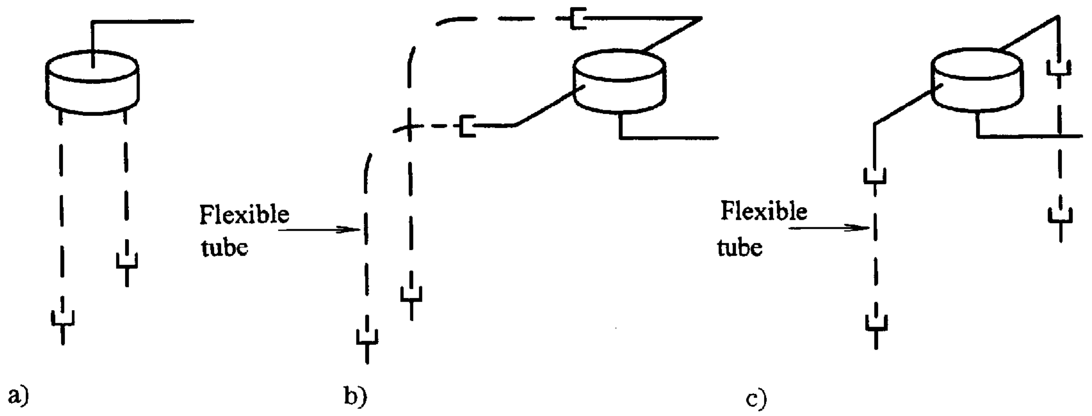
Connecting dimension of mixer	Internal diameter mm	Union nut
1/2	13 min.	G 1/2
3/4	20 min.	G 3/4

10.3.4 *Pressure take-off tees*

Pressure take-off tees shall be of the individual pressure tapping type or the annular slit type (see annex A).

10.4 Mounting of the mixing valve

Depending on the type of mixing valve, one of the following mounting arrangements shall be used:



NOTE. For mixing valves which cannot be connected directly to the union nut of the test circuit, intermediate connecting pieces shall be used which give minimum pressure losses.

Figure 17. Mounting of the mixing valve

10.5 Procedure

- Connect both supplies of the mixing valve to the test circuit.
- Fit the automatic operating device to the temperature regulator.
- For mixing valves with a flow rate control device which is separate from the temperature control device, set it at maximum flow position. For single control mixing valve, set the flow rate control device to the position providing maximum flow.
- On the cold water side, supply the mixer with water at a temperature T of between 10 °C and 15 °C $\pm$ 1 °C, with the hot water supply isolated.
- Adjust the pressure P to (0,3 ± 0,02) MPa ((3 ± 0,2) bar), with the mixer open.
- Repeat the operations for the hot water supply, with the water at a temperature T of between 60 °C and 65 °C, to $\pm$ 1 °C, so that ΔT = 50 K.
- Adjust the pressure P to (0,3 $\pm$ 0,02) MPa ((3 $\pm$ 0,2) bar), with the mixer open.

When these adjustments have been made, return the control device to the 'off' position with the mixer under pressure.

10.6 Verification of hydraulic characteristics

10.6.1 ***Determination of flow rate***

The flow rate being determined is equivalent to that of the mixing valve complete with its accessories.

10.6.1.1 *Principle*

To determine the flow rate of the mixing valve under test at a dynamic reference pressure of $\left(0{,}3\ ^{+0{,}02}_{0}\right)$ MPa $\left(\left(3\ ^{+0{,}02}_{0}\right) \text{bar}\right)$ applied to the hot and cold water supplies, for the full extent of the temperature control range.

The measurement is made on a fully open mixing valve, going from cold to hot, then from hot to cold. If the mixing valve has standard accessories (aerators, showers, etc.) the measurement is carried out replacing these by a hydraulic resistance having a calibrated flow rate, as defined in **14.3.3**.

10.6.1.2 *Requirements*

The flow rate measured at $\left(0{,}3\ ^{+0{,}02}_{0}\right)$ MPa $\left(\left(3\ ^{+0{,}2}_{0}\right)\text{bar}\right)$ shall, depending on the type of appliance for which the mixer is intended, be at least equal to:

- 0,33 l/s (20 l/min) for baths;
- 0,20 l/s (12 l/min) for wash-basins, bidets, sinks and showers.

For water economy, mixers may be fitted with a special water-saving aerator and can be approved if a flow rate of 12 l/min is achieved with one of the hydraulic resistances defined in **14.3.3**.

NOTE. For tapware for wash-basins, sinks and bidets fitted with special equipment such as:

- flexible inlet hose;
- pull out shower spray;
- backflow prevention device;
- water economy device;

a minimum flow rate of 0,15 l/s (9 l/min) is accepted subject to the minimum operating pressure being greater than 1 bar.

10.6.1.3 *Procedure*

Operate the temperature control device at a pressure of $\left(0{,}3\ ^{+0{,}02}_{0}\right)$ MPa $\left(\left(3\ ^{+0{,}2}_{0}\right)\text{bar}\right)$, with the flow rate control fully open. For various temperatures measure the flow rates Q_m of mixed water ($Q_m = Q_c + Q_h$) (at least the five indicated):

- full cold position;
- 34 °C;
- 38 °C;
- 42 °C;
- full hot position;

10.6.1.4 *Evaluation of results*

On the basis of the results of the tests carried out in accordance with **10.6.1.3**:

1) for wash-basins, bidets, sinks and showers, verify that the flow rates are not less than the values specified in **10.6.1.2** for the five specified temperatures;

2) for baths, verify that between 34 °C and 42 °C the flow rate is greater than or equal to 20 l/min (0,33 l/s) and that at the full cold water position and full hot water position the flow rate is not less than 19 l/min.

10.6.2 ***Sensitivity***

10.6.2.1 *Definition*

Sensitivity is characterized by the minimum amplitude movement of the temperature control device required for a limited temperature variation, within a given mixed water temperature range.

10.6.2.2 *Principle*

Verification that within the reference range 34 °C to 42 °C, the temperature deviation of 8 K corresponds to a movement of the temperature control device of amplitude greater than the values given in **10.6.2.4**.

10.6.2.3 *Procedure*

Operate the temperature control device at a rate of approximately 0,5° angular/s or 0,8 mm/s with a pressure of (0,3 ± 0,02) MPa ((3 ± 0,2) bar) and measure the mixed water temperature as a function of the movement of the temperature control device with the flow rate control being fully open.

In the event of linear movement, take the measurement at the end of the control device (for levers). When the temperature control device reaches the end of its movement return the device to its starting position.

If there is any doubt about the curve, repeat the test manually, with the appliance mounted in its normal installation position and compare the results. The most favourable result is used.

10.6.2.4 *Requirements*

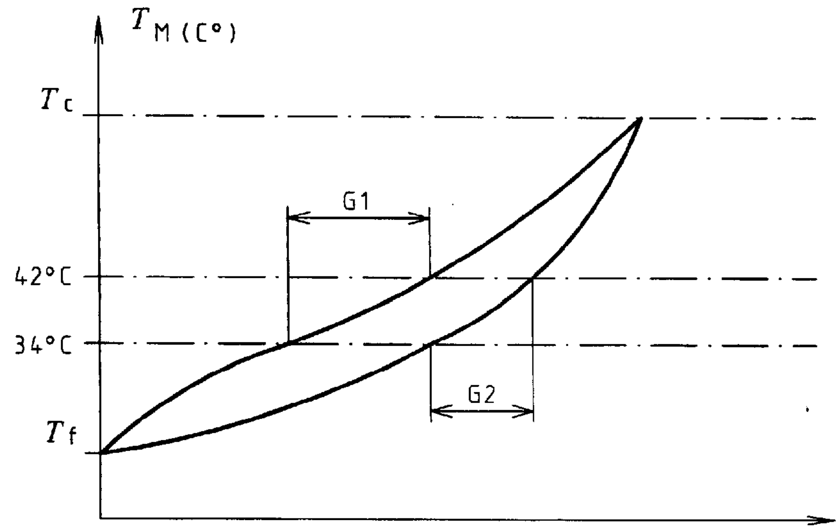
The adjustment range shall be such that the minimum linear movement of the temperature control device required for a variation of 8 K in the reference range is at least equal to 10 mm for sinks and 12 mm for baths, wash-basins, bidets, showers (this value is recorded at the end of the lever). Specially designed mixers which do not correspond to the requirements for linear movement with set values, may be accepted in accordance with the standard, if the verified sensitivity is deemed to be equivalent to the requirements of the standard.

In the case of a bath/shower mixer, the measurement will be made on the shower control only.

NOTE. Manufacturers are given a period of five years from acceptance of the draft standard at the formal vote stage to ensure that their product complies with this requirement.

10.6.2.5 *Evaluation of results*

On the basis of the measurements carried out in **10.6.2.3**, plot the curves of mean mixed water temperature (T) as a function of the movement G of the temperature control device.



G (in degrees or millimetres)

Figure 18. Sensitivity curve

From the curves obtained in this way, determine the two values of ranges G_1 and G_2 for the mixed water temperature zone between 34 °C and 42 °C.

Verify that the smaller of these two values G_1 and G_2 complies with the requirements of **10.6.2.4**.

11 Mechanical performance under pressure

11.1 General

The tests described are type tests (laboratory tests) and not quality control tests carried out during manufacture.

The principle of the test is to show any deformation of the mixing valve which might occur under high cold water pressure. The test is carried out upstream and downstream of the obturator.

11.2 Apparatus

A hydraulic test circuit capable of supplying and maintaining the required pressures for the duration of the test.

11.3 Testing the mechanical performance upstream of the obturator — obturator(s) in the closed position

11.3.1 *Procedure*

Apply a static water pressure of (2,5 ± 0,05) MPa ((25 ± 0,5) bar) for (60 ± 5) s to both inlets simultaneously.

11.3.2 ***Requirement***

For the duration of the test, there shall be no permanent deformation of the mixing valve upstream of the obturator.

11.4 Testing the mechanical performance downstream of the obturator — obturator(s) in the open position

11.4.1 ***Procedure***

With the obturator(s) in the open position, apply a water pressure of (0,4 ± 0,02) MPa ((4 ± 0,2) bar) for (60 ± 5) s of flow, this pressure being measured at the point of connection of the mixing valve to the pipework. The test is carried out on the mixing valve as supplied. For mixing valves with a removable flow rate regulator at the outlet, the test is carried out with and without this regulator.

11.4.2 ***Requirement***

For the duration of the test, there shall be no permanent deformation of the mixing valve.

Table 12. Summary of mechanical performance under pressure tests

Pressure applied	Obturator	Outlet orifice	Cold water test Test conditions Pressure	 Duration	Requirements
Upstream of obturator	Closed	Open	Static (2,5 ± 0,05) MPa ((25 ± 0,5) bar)	(60 ± 5) s	No permanent deformation
Downstream of obturator	Open	Open	Dynamic (0,4 ± 0,02) MPa ((4 ± 0,2) bar)	(60 ± 5) s	No permanent deformation

12 Mechanical endurance characteristics

12.1 Mechanical endurance of the control device

12.1.1 ***General***

The tests described are type tests (laboratory tests) and not quality control tests carried out during manufacture.

This clause specifies a test method to verify the mechanical endurance of the control device of mechanical mixing valves and gives the corresponding specifications.

12.1.2 ***Requirements***

During the test, no component fracture, sticking or leakage shall occur.

The operating torque for flow rate adjustment and temperature adjustment shall not exceed 3 N·m during the test.

Verify that at the commencement of each 4 h interruption (see **12.1.3.3**) and after 70 000 cycles, that the leaktightness requirements of **9.1** to **9.4** are still met.

12.1.3 ***Test method***

12.1.3.1 *Principle*

This consists of subjecting the control device to a specific number of movements, (with a dwell time) at specified cold water and hot water pressures and temperatures.

For mixing valves with separate controls for flow rate and temperature, the test shall be carried out on each of these devices.

For mixing valves with single lever control, the test is carried out for the indicated lever position specified in **12.1.3.2.2**.

12.1.3.2 *Apparatus*

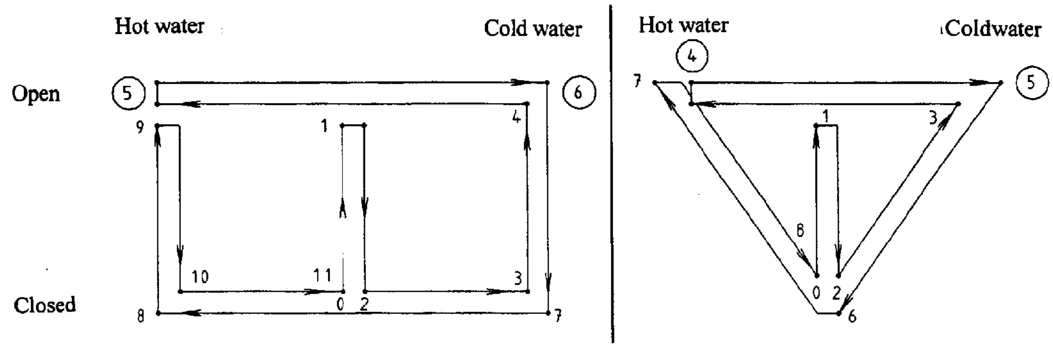
This comprises two supply circuits (hot water, cold water) and an automatic machine.

12.1.3.2.1 *Supply circuit*

Two supply circuits, each comprising a pump or similar device, capable of supplying the required pressure to each circuit, at a temperature ≤ 30 °C for the cold water and (65 ± 2) °C for the hot water.

12.1.3.2.2 *Automatic machine*

The machine's mechanism shall carry out one of the cycles defined in **12.1.3.3**, according to the movement of the mixer.



One cycle 0 to 11
Rectangular movement (a)

One cycle 0 to 8
Triangular movement (b)

NOTE. Continuous movements ensuring leaktightness on closure equal to approximately 95 % of the total travel.

Figure 19. Rectangular and triangular movements

For rectangular movement one cycle consists of three opening and closing movements and two complete cold water, hot water, cold water movements.

For triangular movement one cycle consists of three opening and closing movements and one complete cold water, hot water, cold water movement.

Table 13. Table of test conditions

Hot water temperature	65 ± 2 °C
Cold water temperature	≤ 30 °C
Flow rate in l/min adjusted by downstream resistance	6 ± 1
Dynamic pressure in MPa (bar)	0,3 ± 0,05 (3 ± 0,5)
Static pressure in MPa (bar)	0,4 ± 0,05 (4 ± 0,5)
Speed in degrees angle per second	90/(1,5 ± 0,2)
Dwell time in seconds	5 ± 0,2
Reversal time in seconds on each direction change	0,5 ± 0,2
pH value	8 ± 1
Water hardness	To be measured and included in the test report
Number of cycles	70 000 (rectangular or triangular or separate control movements)

12.1.3.3 *Procedure*

Install the mixing valve on the machine and connect it to both the cold water supply circuit and the hot water supply circuit.

Set the maximum force (*F*) transmitted by the machine to open and close the flow control and to move the temperature control to a torque *C* of 3 N·m. The machine shall stop if this torsional resistance value is reached on the mechanism (see figure 20).

With the mixing valve closed, set the hot water and cold water static pressures upstream of it at the values given in table 13.

The test is interrupted each week for a period of 4 h. The mixing valve is kept in the closed position and under pressure. The watertightness tests shall be carried out at the beginning of the 4 h interruption.

The mixing valve under test shall be connected to the machine in its normal position of use.

Eccentric forces, which may cause abnormal wear on the mixing valve, originating from horizontal or vertical movements of the machine, shall be eliminated.

Subject the mixing valve to 70 000 cycles of opening and closing, each cycle comprising see figure 19:

a) for rectangular movements:
- 0 Start in mean mixed closed position;
- 1-2 Open in mean mixed position then closed;
- 3 Move to cold water position (position 3);
- 4 Open in cold water position (position 4);
- 5 Move to full open hot water position (position 5) then dwell for 5 s;
- 6 Move to cold water position (position 6) then dwell for 5 s;
- 7 Close in cold water position (position 7);
- 8 Move to closed hot water position (position 8);
- 9 Open in hot water position (position 9) then close (position 10);
- 10 Return to closed mixed position (position 11).

b) for triangular movements:
- 0 Start in mean mixed closed position;
- 1 Open in mean mixed position;
- 2 Return to closed position;
- 3 Open in full cold water position;
- 4 Move to full hot water position then dwell for 5 s;
- 5 Move to full cold water position then dwell for 5 s;
- 6 Return to mixed closed position (position 6);
- 7 Open in full hot water position;
- 8 Close, return to position 0.

c) for dual control subject each control device to the relevant part of the rectangular movement series of tests.

Roational axis of flow rate adjustment control

C max. 3 N·m, $C = F \times D$

Examples:

1. If D = 100 mm, F has to be 30 N
2. If D = 50 mm, F has to be 60 N

Rotational axis of temperature adjustment control

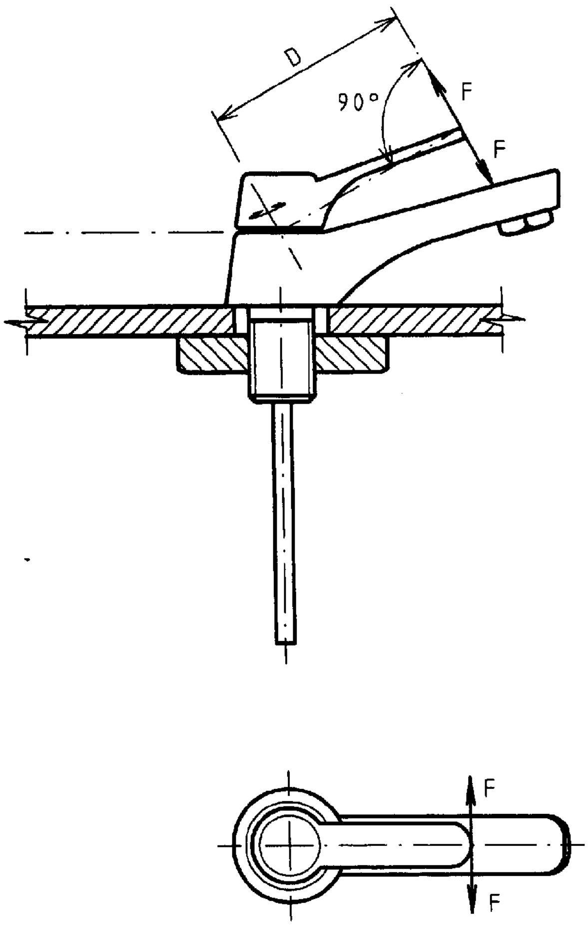


Figure 20. Machine adjustment torque

12.1.3.4 *Verification*

During the test, record any incidents: failure of leaktightness leakage in the assembly, fracture of components, stoppage of machine due to control difficulties, etc.

After 70 000 cycles, carry out the verifications described in **12.1.2.**

12.2 Mechanical endurance of diverters

12.2.1 ***General***

This clause specifies two methods of test for the mechanical endurance of diverters of mixing valves: one for manual diverters and one for diverters with automatic return, and gives the corresponding specifications.

12.2.2 ***Requirements***

During the test, no deformation, component fracture, blockage of the mechanism, leakage from the nozzle or shower/shower head or the diverter control joint shall be noted.

At the end of the test, check the leaktightness:

- in the conditions specified in **9.6** for manual diverters;
- in the conditions specified in **9.7** for diverters with automatic return.

12.2.3 ***Test method***

12.2.3.1 *Principle*

The principle of the test is to subject the diverter to a specified number of operations, with the mixer being supplied alternately with cold water, and with hot water at (65 ± 2) °C (thermal shocks), in order to test its behaviour over a period of time, taking into account temperature.

12.2.3.2 *Apparatus*

12.2.3.2.1 *Manual diverter,* automatic machine ensuring alternating movement of the diverter at a rate of 15 ± 1 returns per minute.

Supply circuits comprising a pump or a similar device by means of which the required static pressure can be obtained for cold water at ≤ 30 °C and hot water at (65 ± 2) °C.

12.2.3.2.2 *Diverter with automatic return,* mechanism for moving the diverter to the shower/shower head position under the conditions defined in **9.7**.

Supply circuits identical to those defined in **12.2.3.2.1** but also comprising a rapid closure valve coupled to the diverter mechanism on the joint circuit.

12.2.3.3 *Procedure*

12.2.3.3.1 *Manual diverter*

Mount the mixing valve, as supplied, onto the machine and connect to the supply circuit.

Connect the drive device to the diverter lever by means of a flexible component.

With the mixing valve closed, adjust the water pressure on the two supply circuit to (0,4 ± 0,02) MPa ((4 ± 0,2) bar).

Open the supply side of the mixing valve. Adjust the flow rate to 0,066 l/s to 0,100 l/s (4 l/min to 6 l/min), by partially obstructing the nozzle outlet.

Subject the diverter to an endurance test of 30 000 cycles, each cycle comprising a return movement between the extreme positions.

Throughout the test, record any incidence of leaks, failure of diverter to function as specified, jamming, etc.

Throughout the test, supply the mixing valve alternately with cold water for 15 min ± 30 s then hot water for 15 min ± 30 s.

Throughout the test, record any incidence of leaks, deformations, fracture, etc.

After 30 000 cycles, check the leaktightness of the diverter as defined in **9.6**.

12.2.3.3.2 *Diverter with automatic return*

Connect the hydraulic resistance A as described in **14.3.3** to the shower outlet.

Mount the mixing valve as fitted on to a support and connect to the supply circuit.

With the mixing valve closed, set the water pressure in the two supply circuits at (0,4 ± 0,02) MPa ((4 ± 0,2) bar).

Open the mixing valve supply inlet. Set the flow rate at the minimum value for the correct operation of the diverter.

Subject the diverter to an endurance test of 30 000 cycles, one cycle being defined as follows:

- with the diverter in the bath position, allow a flow of water through the nozzle for (5 ± 0,2) s;
- operate the diverter to move it to the shower position (by pulling or pushing);
- allow flow through shower outlet for (5 ± 0,2) s;
- shut off the supply (diverter returns to the bath position) then re-open the supply.

Throughout the test, supply the mixing valve alternately with cold water for 15 min ± 30 s then hot water for 15 min ± 30 s.

Throughout the test, record any incidence of leaks, deformations, fracture, etc.

After 30 000 cycles, check the leaktightness and function of the diverter and record any observed deteriorations.

12.3 Mechanical endurance of swivel nozzles

12.3.1 *General*

This clause specifies a method of testing the mechanical endurance of mixer swivel nozzles and gives the corresponding specifications.

12.3.2 *Test method*

12.3.2.1 *Principle*

The principle of the test is to reciprocate the nozzle of the mixing valve, with both inlets fed with cold water for a specified number of cycles, in order to test its behaviour over a period of time.

12.3.2.2 *Apparatus*

An automatic machine for reciprocating the nozzle at a rate of $\left(15\ _{-1}^{\ 0}\right)$ backwards and forwards motions per minute.

A cold water supply circuit (15 °C to 30 °C) with a pump or a similar device supplying the static pressure required.

A load concentrated at the nozzle outlet of:

- 1 kg $\left(_{-10}^{\ \ 0}\right)$ g if the projection of the nozzle is less than or equal to 200 mm (see dimension *D* table 3);
- a load giving a bending moment of $\left(2\ _{-0,2}^{\ \ 0}\right)$ N·m if the projection of the nozzle is greater than 200 mm.

12.3.2.3 *Procedure*

Mount the mixing valve on the machine and connect it to the supply circuit. If the nozzle has a flow rate regulator, leave it in position and verify there is no obstruction during the test.

From the end of the swivel nozzle, suspend a mass as defined in **12.3.2.2**.

Connect the drive device of the automatic machine to the swivel nozzle.

With the mixing valve closed, adjust the water pressure in the two supply circuits to a value between 0,2 MPa and 0,4 MPa (2 bar and 4 bar).

Open the mixing valve, set the flow rate to a value between 0,066 l/s and 0,1 l/s (4 l/min and 6 l/min) by obstructing the nozzle outlet.

Subject the swivel nozzle to a test of 80 000 cycles, each cycle comprising a reciprocating movement through an arc of 110° or, if there is a stop, over 90 % of the theoretical travel.

During the test, move the nozzle smoothly at as steady a speed as possible at a rate of $\left(15\ _{-1}^{\ 0}\right)$ backwards and forwards motions per minute.

12.3.3 ***Requirement***

During the test, there shall be no deformation, fracture of the swivel nozzle or the device connecting it to the body or any leakage of the assembly.

At the end of the test, leaktightness shall be verified in accordance with the specifications of **9.5**.

13 Torsion resistance characteristics of the control

13.1 General

The test described is a type test (laboratory test) and not a quality control test carried out during manufacture.

This test shall be carried out on different samples from those that have undergone the mechanical endurance test (see **12.1**).

This clause specifies a test method for verifying the resistance of the control device to the stresses of opening, closing and pivoting (temperature adjustments) and gives the corresponding specifications.

13.2 Test method

13.2.1 ***Principle***

The principle of the test consists of subjecting the control device, to a given torque in specified directions of operation, in order to verify its strength.

13.2.2 ***Apparatus***

This comprises either a torque wrench (2 % accuracy) which is adapted to the control device (crosstop, lever or other) or a lever arm and instrument for measuring the applied force.

Care shall be taken to ensure that eccentric forces do not occur.

13.2.3 *Procedure*

The mixing valve, fitted with its control device, shall not be supplied with water during the test.

The test is carried out at ambient temperature.

– Flow rate control:

Gradually apply over 4 s to 6 s and maintain for 5 min a torque of (6 ± 0,6) N·m to the end of the flow control device in the closing direction of travel and in the mid blend position for single control mixers.

– Temperature control:

Gradually apply over 4 s to 6 s and maintain for 5 min a torque of $\left(3\ _{-0,5}^{\ 0}\right)$ N·m to the end of the temperature control device both in the direction of cold water and separately in the direction of hot water.

This test is carried out on the temperature control device once with the flow control device in the open position and once in the closed position.

13.2.4 *Requirements*

After the test, there shall be no visible deformation on any component or any deterioration in operation with regard to leaktightness, flow rate and sensitivity.

After inspection, leaktightness, flow rate and sensitivity requirements are tested in accordance with **9.3**, **9.4**, **9.5**, **10.6.1** and **10.6.2**.

14 Acoustic characteristics

14.1 General

The tests described are type tests (laboratory tests) and not quality control tests carried out during manufacture.

This clause specifies the test method for classifying mixing valves by acoustic group (I, II or not classified) as well as an indication of the flow rate class (A, S, B, C or D) used to determine the acoustic group.

14.2 Procedure

14.2.1 *Mounting and operating conditions for mechanical mixing valves*

These conditions are given in EN ISO 3822-2.

14.2.2 *Test method*

14.2.2.1 *General specifications*

The tests are carried out in accordance with the specifications of EN ISO 3822-1 and EN ISO 3822-2.

14.2.2.2 *Special cases*

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

If necessary, tests at different pressures may be carried out in accordance with national regulations, where these exist, and in accordance with current national criteria.

14.3 Requirements

14.3.1 *Expression of results*

The results of the measurements taken in accordance with EN ISO 3822 are expressed by the acoustic level of the mixer L_{ap} in dB(A).

NOTE. L_{ap} = 45 dB(A) − D_s.

14.3.2 ***Determination of acoustic groups***

Depending on the values of L_{ap} obtained at 0,3 MPa (3 bar), a mixer is classified in the following acoustic groups:

Table 14. Acoustic groups

Group	L_{ap} dB(A)
I	$L_{ap} \leq 20$
II	$20 < L_{ap} \leq 30$
Not classified	$L_{ap} > 30$

14.3.3 ***Flow rate class***

If a mixing valve has a flow rate regulator and/or a shower attachment outlet, the measurement is carried out without these fittings as these are subject to special acoustic measurements. The tests are then carried out, replacing these fittings by a hydraulic resistance with calibrated flow rate in accordance with annex A of EN ISO 3822-4 : 1997 and where necessary with adaptors in accordance with annexes B and C of EN ISO 3822-4 : 1997.

Hydraulic resistances tested alone are defined in five classes as a function of their calibrated flow rate at 0,3 MPa (3 bar):

Class A	q = 0,25 l/s
Class S	q = 0,33 l/s
Class B	q = 0,42 l/s
Class C	q = 0,50 l/s
Class D	q = 0,63 l/s

A mixing valve is allocated to the flow rate class which corresponds to the flow rate of the hydraulic resistance with calibrated flow rate with which it is tested.

A mixing valve, with no fittings, is tested as supplied with the flow rate obtained at a pressure of (0,3 ± 0,02) MPa ((3 ± 0,2) bar).

15 Protection against pollution of drinking water

A mixing valve fitted with a flexible outlet hose shall be equipped with an anti-pollution device in accordance with prEN 1717.

Annex A (normative)

Examples of pressure take-off tees

A.1 Recommendation for the design of pressure take-off tees

Figure A.1 shows three examples of pressure take-off tees giving equivalent results:

- individual types: A and B;
- annular slit type: C.

Requirements relating to the design and manufacture of pressure take-off tees are given in ISO 5167-1 : 1991. The main principles are:

A.1.1 *Individual type*

- The axis of the pressure orifices shall intersect the axis of the piping (or casing) and be perpendicular to it;
- the opening of the orifice shall be circular and the edges flush with the wall of the piping (or the casing). Slight rounding at entry is permitted (radius ≤ 1/10 diameter of the pressure orifice);
- the diameter of the pressure orifice shall be less than 0,1 D (D: internal diameter of the tube or casing);
- there shall be an even number (at least four) of the pressure orifices. The angles formed by the arcs of the pressure orifices shall be approximately equal;
- the area of the free cross-section of the annular chamber of the casing shall be greater than or equal to half the total area of the orifices connecting the chamber to the piping.

A.1.2 *Annular slit*

- The thickness f of the annular shall be equal to or greater than twice the width i of the slit;
- the area of the free section of the annular chamber should be equal to or greater than half the total area of the annular slit connecting the chamber to the piping;
- all surfaces coming into contact with the fluid measured shall be clean and well finished;
- the width i of the annular slit should be nominally 1 mm.

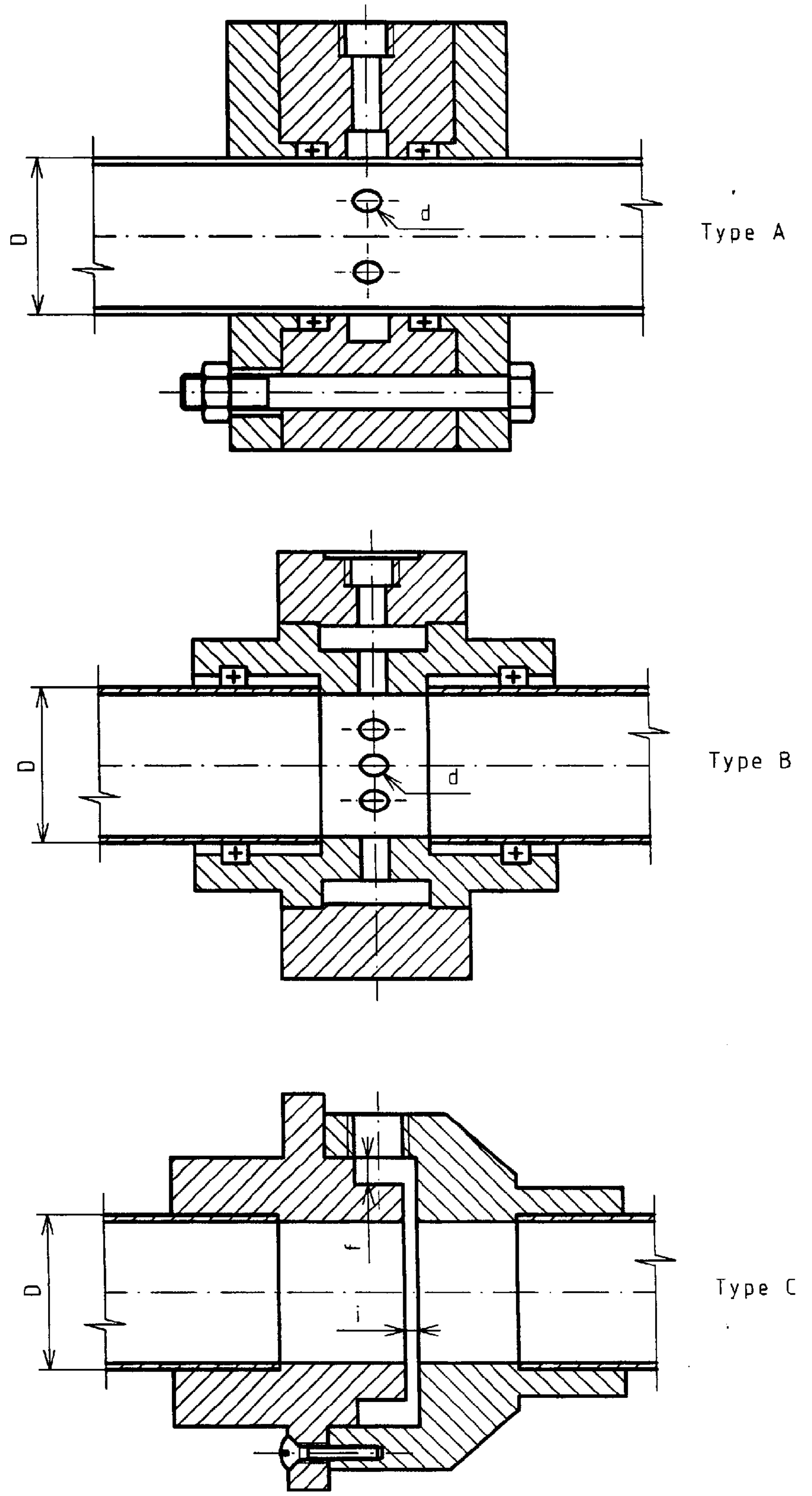


Figure A.1 Examples of pressure take-off tees

Annex B (informative)

Acoustic classification (example)

B.1 Mechanical mixing valve with nozzle

1) If the nozzle is fitted with a flow rate regulator, the mixing valve is classed:

a) as a function of acoustic group I or II;

b) as a function of the hydraulic resistance class used for testing:

- D, C or B for bath mixing valves;
- D to A for other mixing valves. However, unless otherwise requested by the manufacturer, the test will generally start with resistance A.

2) If the nozzle is not fitted with a flow rate regulator, the mixer is only classified as a function of acoustic group I or II.

B.2 Mechanical mixing valve with shower or shower head outlet

The mixing valve is classified:

- as a function of acoustic group I or II;
- as a function of the hydraulic resistance class used for testing: D, C, B, S or A.

B.3 Mechanical mixing valve with nozzle and shower or shower head outlet

If the nozzle is fitted with a flow rate regulator, the mixing valve is classified:

- as a function of the acoustic group obtained on both outlets if the results are identical, or as a function of the most unfavourable acoustic group if the results are different.

taking into account:

- the hydraulic resistance class used for testing the nozzle: D, C or B;
- the hydraulic resistance class used for testing the shower/shower head: D; C, B, S or A.

NOTE. If the classes are identical on both, only the letter of the class in question is given.

Example

A mixing valve, the acoustic group of which is I on the nozzle with resistance C, and I on the shower with resistance A, is classified I-C-A.

A mixing valve, the acoustic group of which is II on the nozzle with resistance B, and I on the shower with resistance B, is classified II-B.

If the nozzle is not fitted with a flow rate regulator, the mixing valve is classified solely on the basis of the most unfavorable acoustic group.

A mixing valve of a given class cannot be fitted with a fitting (flow rate regulator, shower fitting) of a higher flow class.

A mixing valve of a given flow class may be fitted with fittings of a lower flow class, on condition that it satisfies the requirements of **14.3.3**.

Annex C (informative)
Summary of leaktightness tests

Table C.1 Summary of leaktightness tests

Leaktightness		Connection to test circuit	Position of obturator or divertor	Outlet orifice	Position of temperature control	Test pressure	Duration	Requirements	
Mechanical mixing valves and obturator	Mixing valve upstream of obturator and of obturator	Both inlets	Closed	Open	Full operating range	(1,6 ± 0,05 MPa (16 ± 0,5 bar) Static pressure	(60 ± 5) s	No leakage through walls or at obturator	
	Obturator cross flow	Single inlet, one side then other	Closed	Open	Full operating range	(0,4 ± 0,02) MPa (4 ± 0,2 bar) Static pressure	(60 ± 5) s	No leakage at outlet orifice or unconnected inlet	
	Mixing valve downstream of obturator	Both inlets	Open	Closed	Full operating range	(0,4 ± 0,02) MPa (4 ± 0,2 bar) (0,02 ± 0,005) MPa (0,2 ± 0,05 bar) Static pressure	(60 ± 5) s (60 ± 5) s	No leaking	
Manual diverter	Shower outlet	Both inlets	Obturators open diverter to bath	Bath outlet closed artificially shower outlet open		(0,4 ± 0,02) MPa (4 ± 0,2 bar) (0,02 ± 0,005) MPa[1)] (0,2 ± 0,05 bar) Static pressure	(60 ± 5) s (60 ± 5) s	No leakage at shower outlet	
	Bath outlet	Both inlets	Obturators open diverter to shower	Shower outlet closed artificially		(0,4 ± 0,02) MPa (4 ± 0,2 bar) (0,02 ± 0,005) MPa[1)] (0,2 ± 0,05 bar) Static pressure	(60 ± 5) s (60 ± 5) s	No leakage at bath outlet	1) No disengaging of diverter 2) Shut water off 3) Automatic return of diverter in bath position fast closing water position
Diverter with automatic return	Shower outlet	Both inlets	Obturators open diverter to bath	Both outlets open		(0,4 ± 0,02) MPa (4 ± 0,2 bar) Dynamic pressure	(60 ± 5) s	No leakage at shower outlet	
	Bath outlet	Both inlets	Obturators open diverter to shower	Both outlets open		(0,4 ± 0,02) MPa (4 ± 0,2 bar) Dynamic pressure	(60 ± 5) s	No leakage at bath outlet	
	Bath outlet (1) (2) (3)	Both inlets	Obturators open diverter still in position	Both outlets open		(0,05 −0 +0,005) MPa (0,5 −0 +0,005 bar) Dynamic pressure	(60 ± 5) s	No rev. of diverter No leakage at bath outlet Diverter returns to bath	
	Shower outlet	Both inlets	Obturators open diverter to bath	Both outlets open		(0,05 ± 0,005) MPa (0,5 ± 0,05 bar) Dynamic pressure	(60 ± 5) s	No leakage at shower outlet	

1) Additional test carried out if leaktightness is obtained by one or more toroidal seals.

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