BRITISH STANDARD

BS EN
816 : 1997

Sanitary tapware — Automatic shut-off valves PN 10

ICS 91.140.70

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee B/504, Water supply, upon which the following bodies were represented:

Association of Consulting Engineers
British Bathroom Council
British Non-Ferrous Metals Federation
British Plastics Federation
British Plumbing Fittings Manufacturers' Association
Chartered Institution of Water and Environmental Management
Department of the Environment
Department of the Environment (Drinking Water Inspectorate)
Fibre Cement Manufacturers' Association Limited
Institute of British Foundrymen
Institute of Plumbing
Local Authority Organizations
Scottish Association of Directors of Water and Sewerage Services
Water Companies Association
Water Services Association of England and Wales

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Association of Manufacturers of Domestic Unvented Supply Systems Equipment (MODUSSE)
Builders Merchants Federation
Consumer Policy Committee of BSI
Health and Safety Executive
Institution of Water Officers
Metal Sink Manufacturers Association
National Association of Plumbing, Heating and Mechanical Services Contractors
Society of British Gas Industries
Water Research Centre

This British Standard, having been prepared under the direction of the Sector Board for Building and Civil Engineering, was published under the authority of the Standards Board and comes into effect on 15 June 1997

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Contents

National foreword

This British Standard has been prepared by Technical Committee B/504, Water supply, and is the English language version of EN 816 : 1996 *Sanitary tapware — Automatic shut-off valves PN 10*, published by the European Committee for Standardization (CEN).

EN 816 was published as a result of international discussion in which the UK took an active part.

No national standard is withdrawn as a result of this publication.

Cross-references

Publication referred to	Corresponding British Standard
EN 31 : 1977	BS 5506 : Part 1 : 1977 *Specification for wash basins — Pedestal wash basins — Connecting dimensions*
EN 32 : 1977	BS 5506 : Part 2 : 1977 *Specification for wash basins — Wall hung wash basins — Connecting dimensions*
EN 111 : 1984	BS 6731 : 1988 *Specification for wall hung hand rinse basins — Connecting dimensions*
EN 200 : 1989	BS EN 200 : 1992 *Sanitary tapware: General technical specifications for single and mixer taps (nominal size 1/2) PN 10: Minimum flow pressure 0,05 MPa (0,5 bar)*
EN 246 : 1989	BS EN 246 : 1992 *Sanitary tapware: General specifications for flow rate regulators*
EN 248 : 1989	BS EN 248 : 1992 *Sanitary taps: General technical specifications for electrodeposited nickel chrome coatings*

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 26, an inside back cover and a back cover.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 816

September 1996

ICS 23.060.00; 91.140.70

Descriptors: Sanitary valves, cocks, mixing valves, designation, physicochemical properties, dimensions, leaktightness, pressure resistance, hydraulic properties, fatigue tests, wear resistance, acoustic properties, marking

English version

Sanitary tapware — Automatic shut-off valves PN 10

Robinetterie sanitaire — Robinets à fermeture automatique PN 10

Sanitärarmaturen — Selbstschlußarmaturen PN 10

This European Standard was approved by CEN on 1996-08-11. 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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard 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 March 1997, and conflicting national standards shall be withdrawn at the latest by March 1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, 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 is applicable to single and mixer taps with automatic shut-off for use with sanitary appliances installed in washrooms.

It does not apply to urinal or WC flushing valves or valves which open automatically.

The purpose of this standard is to specify the marking, identification, chemical/hygiene, dimensional, leaktightness, pressure resistance, hydraulic, mechanical endurance, and acoustical characteristics of automatic shut-off tapware.

The following conditions of pressure and temperature apply:

Table 1. Conditions for the use of self closing tapware

(The pressures given are flow pressures)

	Limits of use	Recommended limits of operation
Minimum dynamic pressure	0,05 MPa (0,5 bar)	0,1 MPa ≤ P ≤ 0,5 MPa (1 bar ≤ P ≤ 5 bar)
Maximum static pressure	1 MPa (10 bar)	—
Temperature	Max. ≤ 90 °C	Max. ≤ 65 °C

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 : 1977	*Pedestal wash basins — Connecting dimensions*
EN 32 : 1977	*Wall hung wash basins — Connecting dimensions*
EN 111 : 1984	*Wall hung hand rinse basins — Connecting dimensions*
EN 200 : 1989	*Sanitary tapware: General technical specifications for single and mixer taps (nominal size 1/2) PN 10 minimum flow pressure 0,05 MPa (0,5 bar)*
EN 246 : 1989	*Sanitary tapware: General specifications for flow rate regulators*
EN 248 : 1989	*Sanitary tapware: General technical specification for electro-deposited nickel-chrome coatings*
prEN 817	*Sanitary tapware — Mechanical mixers (PN 10) — General technical specifications*
prEN 1717	*Protection against pollution of potable water in internal systems and general requirements for protective devices to prevent pollution by backflow*
prEN 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 : 1995	*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)*
prEN ISO 3822-4 : 1995	*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: Designation dimensions and tolerances*
ISO 5167 : 1991	*Measurement of fluid flow by means of orifice plates, nozzles and venturi tubes inserted in circular cross section conduits running full*

3 Definition

For the purposes of this European Standard, the following definition applies:

Automatic shut-off tapware

Tapware in which opening is effected by operation of a device following which shut-off occurs automatically after a certain period.

This period may be adjustable.

4 Designation

An automatic shut-off tap is designated by:

– its type (single or mixer);

– its nominal size: 1/2, 3/4, male or female;

– reference to this standard (EN 816).

5 Marking — Identification

5.1 Marking

Tapware complying with this standard shall be permanently and indelibly marked on the body with the manufacturer's name or identification mark, the acoustic group and flow rate class.

5.2 Identification

a) The control devices of taps shall be identified:

– for cold water, by the colour blue;

– for hot water, by the colour red.

b) The direction of operation of the temperature control device of mixers shall be identified.

c) For taps with separate control devices, the cold water shall be on the right and the hot water on the left.

6 Materials

6.1 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 limits given in clause **1** for correct operation the materials shall not be subjected to any deterioration which might compromise the operation of the tapware.

Pressurized parts shall withstand the limits of use set out in table 1.

Materials with inadequate corrosion resistance shall have additional protection.

6.2 Exposed surface condition and quality of coating

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

7 Protection against pollution

Automatic shut-off tapware shall comply with the specification for hygiene and protection against pollution by backflow in accordance with prEN 1717.

8 Dimensional characteristics

General comment on drawings:

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

Special cases are covered in **8.8**.

8.1 Tap with visible body for horizontal surfaces (see figure 1 and table 2)

The standardized dimensions of self closing tapware:

– firstly, guarantee their mounting and interchangeability on sanitary appliances complying with the standards EN 31, EN 32 and EN 111;

– secondly, give the various options for connecting with the water supply.

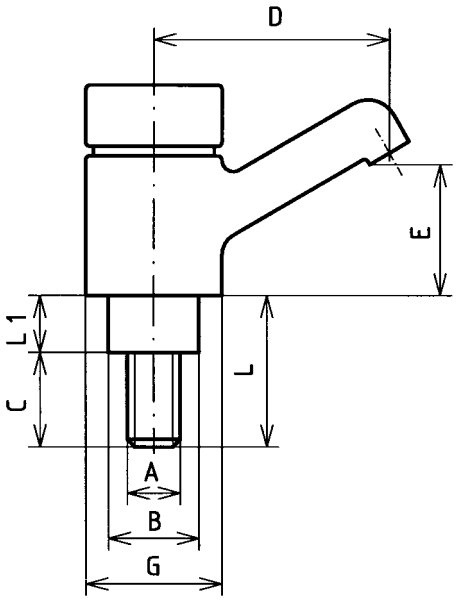

Figure 1. Tap with visible body for horizontal surface

Table 2. Dimensions		
		Values in millimetres
Dimension	**Values**	**Comments**
A	G 1/2 B	
B	29 max.	May be threaded
C	11 min.	
D	100 min.	Dimension from the centre of the outlet orifice with or without flow rate regulator as supplied
E	25 min.	Vertical distance from lowest point of the outlet orifice to the mounting surface of the tap
G	45 min.	Smallest dimension of the tap base
L and L1	Value which enables the tapware to be mounted on a support 1 mm to 18 mm in thickness and connection to the water supply	

NOTE. Supply by flexible hose is permitted (see **8.5.2**)

8.2 Taps with visible body for mounting on vertical surfaces (see figure 2 and table 3)

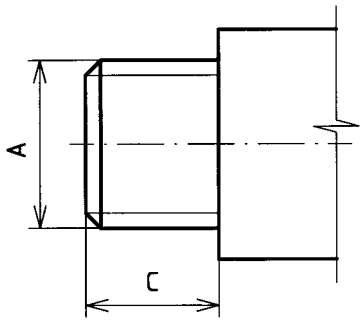

Figure 2. Threaded inlets of taps with visible body for mounting on vertical surfaces

Table 3. Dimensions of threaded inlets		
		Values in millimetres
Dimension	**Values**	
A	G 1/2 B	G 3/4 B
C	11 min.	13 min.

8.3 In-line tapware with threaded inlet and outlet

8.3.1 *Inlets and outlets aligned (see figure 3 and table 4)*

8.3.2 *Inlets and outlets at right angles (see figure 4 and table 4)*

8.4 Concealed tapware for vertical surfaces

The dimensions of this type of tapware are left to the discretion of the manufacturer.

8.5 Mixer for horizontal surface (see figures 5, 6 and 7 and table 5)

The standardized dimensions of self-closing mixers:

– firstly, guarantee their mounting and interchangeability on sanitary appliances complying with the standards EN 31, EN 32 and EN 111;

– secondly, give the various options for connecting with the water supply.

8.5.1 *Supply copper by tube*

8.5.2 *Supply by flexible hose*

NOTE. Supply hoses should conform with the requirements of *Flexible hoses for water supply — Specifications and test methods* (WI No.: 00164121), currently under preparation.

NOTE. Figures 5 and 6 and table 5 are also applicable to tapware equipped with flexible hoses. **The examples shown are not exhaustive.**

8.6 Mixer with visible body for mounting on vertical surfaces

8.6.1 *Mixers with parallel inlets*

8.6.1.1 *Mixers with straight unions (see figure 8 and table 6)*

8.6.1.2 *Mixers with eccentric unions (see figure 9 and table 6)*

8.6.1.3 *Mixers with captive nuts (see figure 10 and table 6)*

8.6.2 *Mixer with opposed inlets (see figure 11 and table 4)*

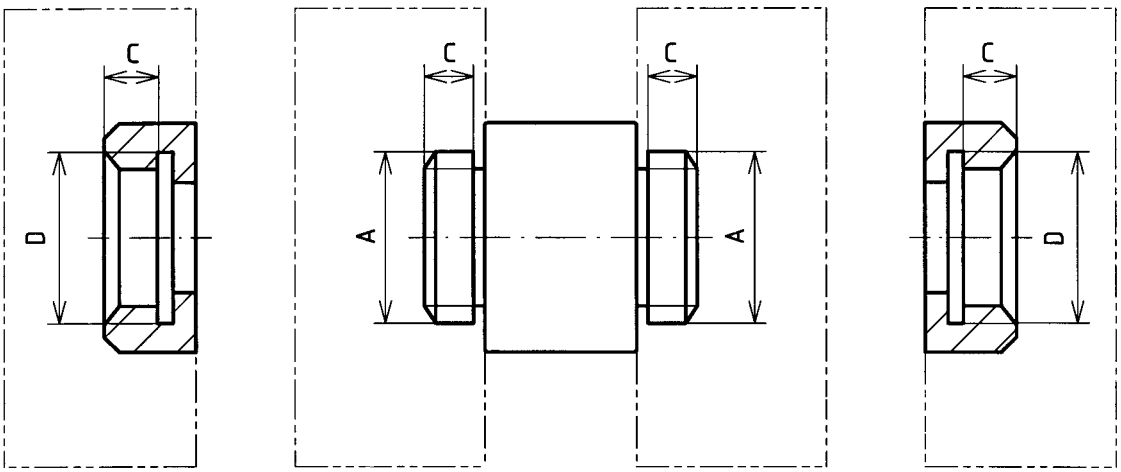

Figure 3. Tapware with inlets and outlets aligned

Table 4. Dimensions of threads

Values in millimetres

Dimension	**Values**	
A	G 1/2 B	G 3/4 B
D	G 1/2	G 3/4
C	8 min.	10 min.

NOTE. In the event of a different inlet and outlet size, the nominal size is that of the inlet and the outlet size shall be stated (e.g. in-line tapware G 1/2 B male with female outlet G 3/4 with inlet and outlet aligned).

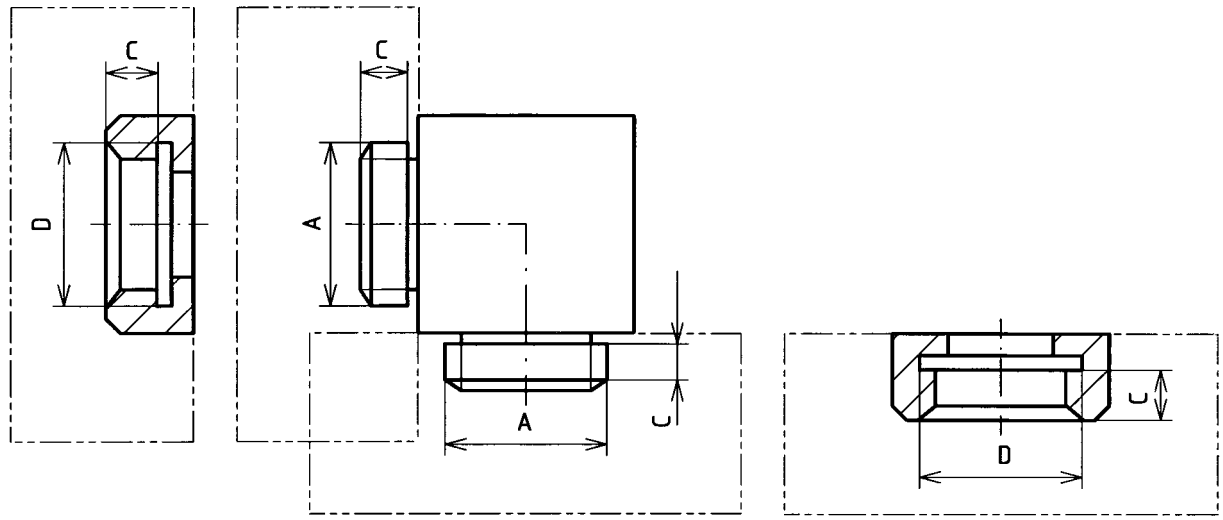

Figure 4. Tapware with inlets and outlets at right angles

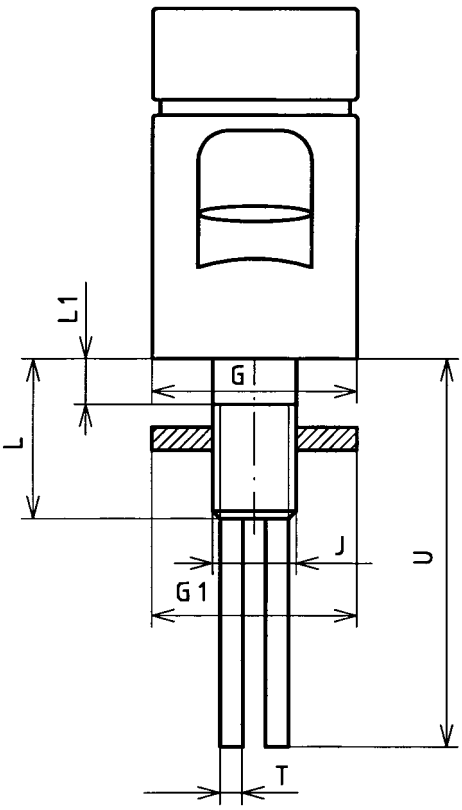

Figure 5. Mixer for mounting on horizontal surface supply by tube (Fixation a)

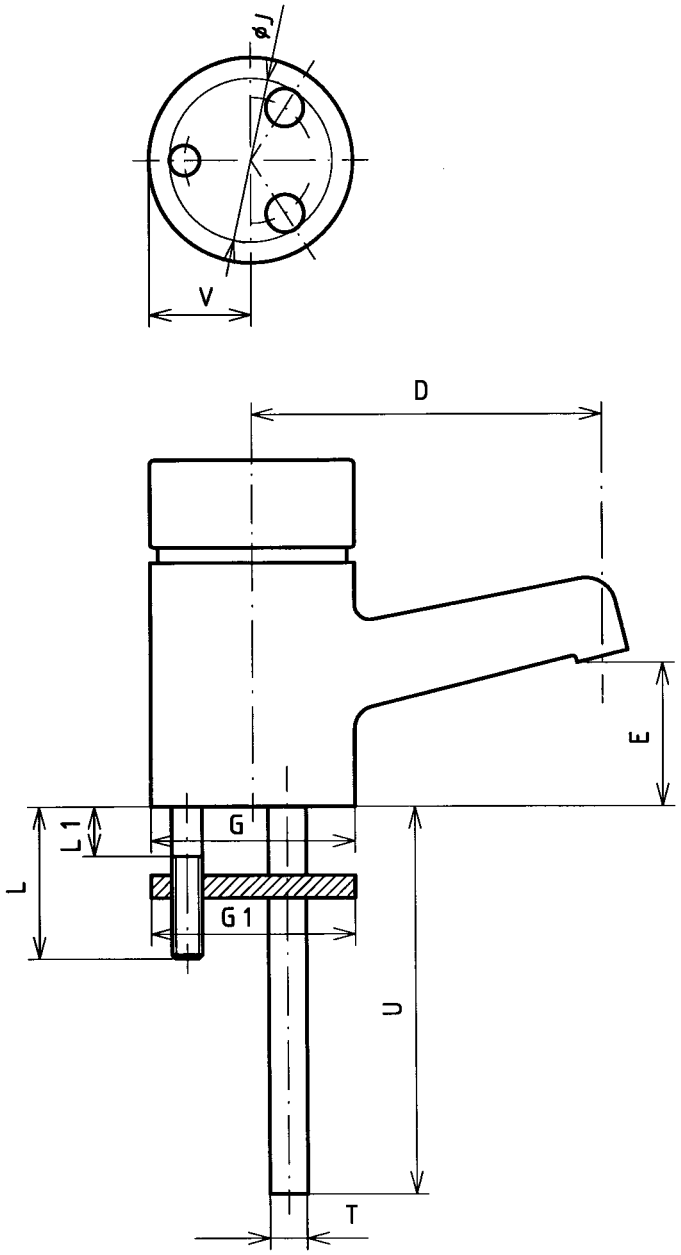

Figure 6. Mixer for mounting on horizontal surface supply by tube (Fixation b)

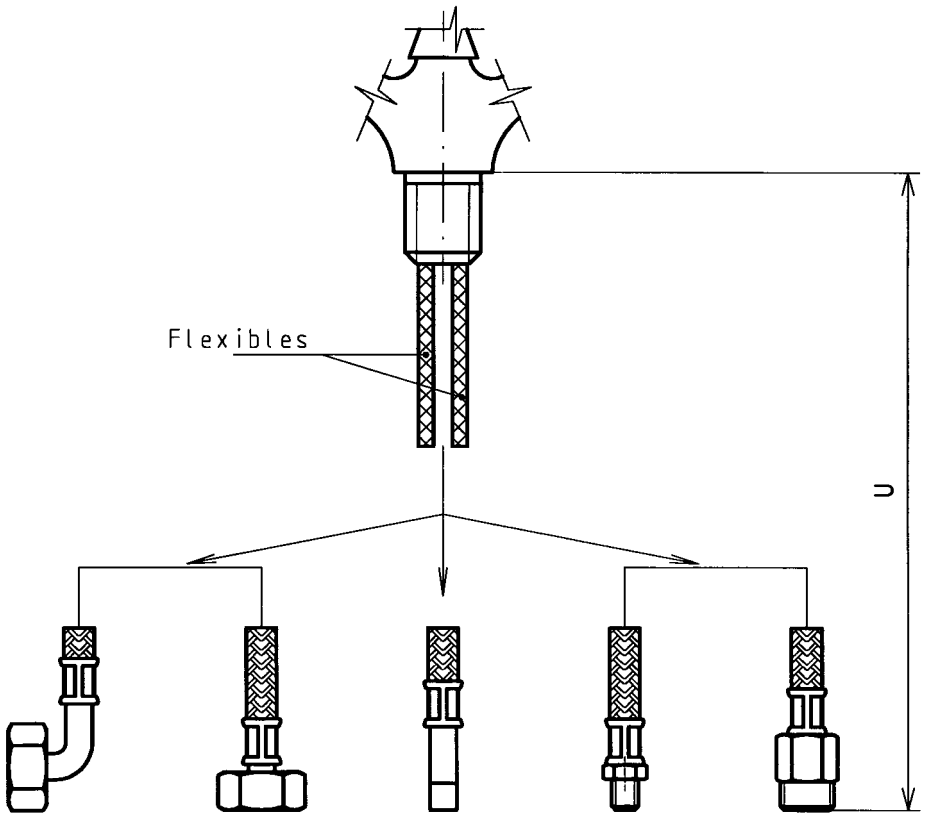

Figure 7. Examples of inlet connections for 'Flexible Hoses'

Table 5. Dimensions of mixers

Values in millimetres

Dimension	Values	Comments
D	100 min	Horizontal distance from axis of diameter J to centre of outlet orifice including jet regulator or flow straightener if fitted
E	25 min.	Vertical distance from the lowest point of the outlet orifice including jet regulator or flow straightener device if fitted, to the mounting surface of the tap
G	45 min.	Dimension of the base
G1	50 max.	Clamping washer, or backnut flange diameter
J	33,5 max.	The 2 supply pipes and the fixing device shall fit into a circle of diameter J
L and L1	Value which enables the tapware to be mounted on a support 1 mm to 18 mm in thickness	
T	Copper tube exterior ∅ 10 or hose	Plain external or G 3/8 male or female thread or G 1/2 male or female thread Plain end exterior ∅ 10 or with G 3/8 male or female thread or G 1/2 male or female thread
U	350 min.	May be reduced to 220 subject to agreement between the manufacturer and the customer
V	32 max.	Projection to rear from axis of diameter J

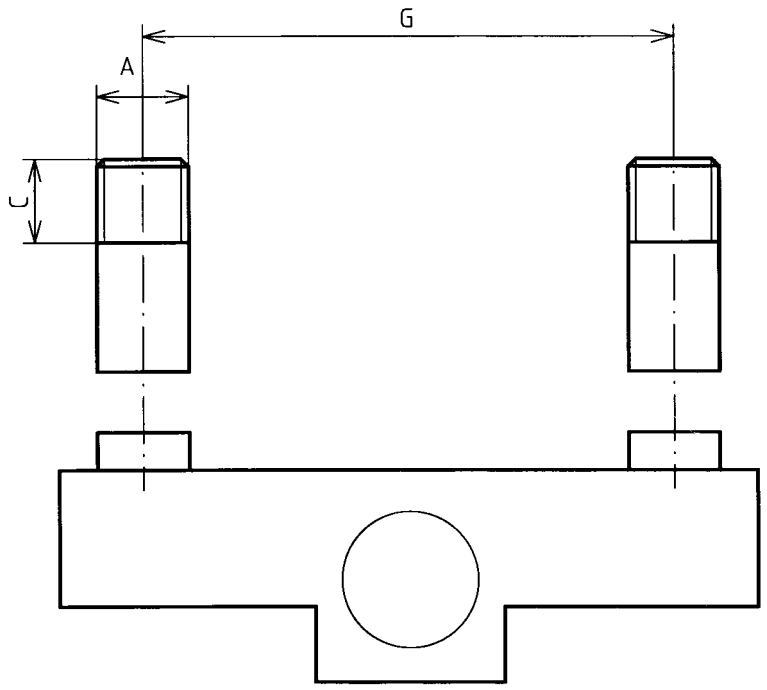

Figure 8. Mixer with straight unions

Table 6. Dimensions

Dimensions in mm

Dimensions	Values	Comments
A*)	G 1/2 B	ISO 228-1
A1	G 3/4	ISO 228-1
B	9 min.	Useful length of thread (excluding washer)
C	15 min.	Useful length of thread
F	140 to 160	Extension of this range is permitted
G	150 ± 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 permissible.

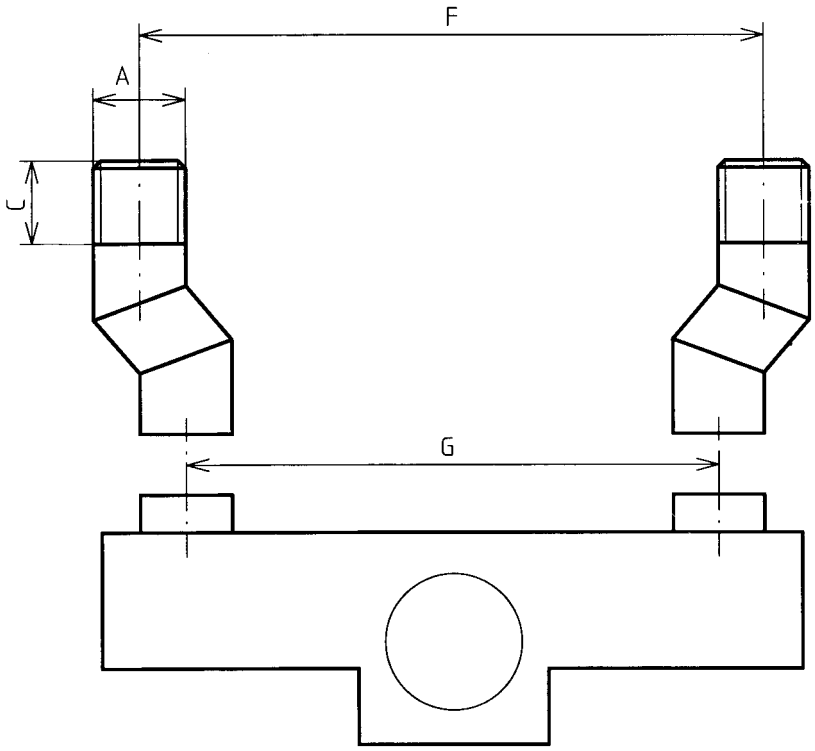

Figure 9. Mixer with eccentric unions

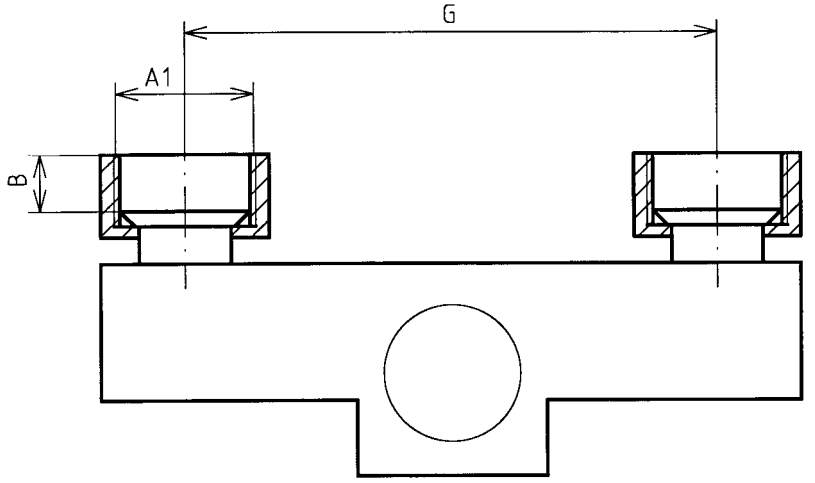

Figure 10. Mixer with captive nuts

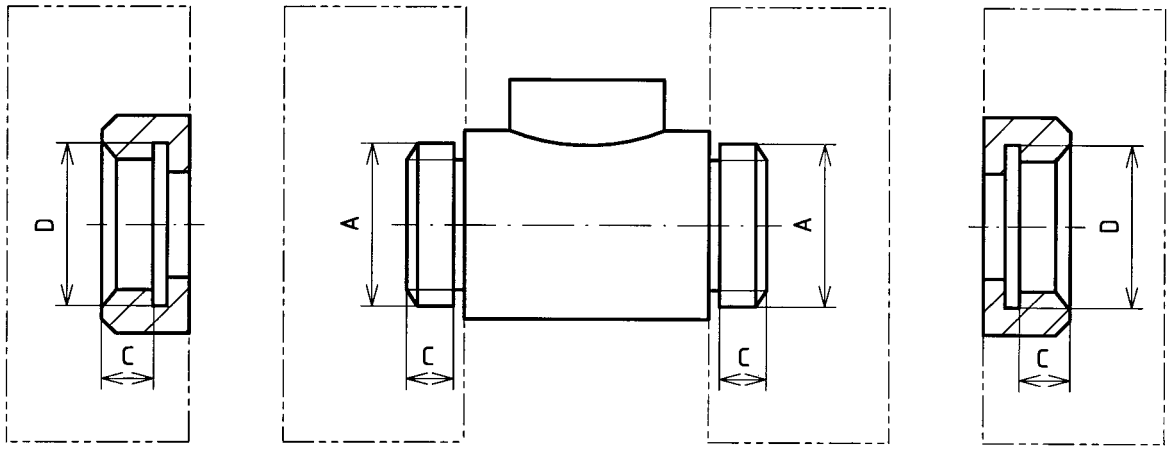

Figure 11. Mixer with opposed inlets

8.7 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 7 and 8;

b) not conforming with EN 246, these self closing taps are covered by clause **8.8**.

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

8.7.1 *Nozzle outlet for flow rate regulator with internal thread (see figure 12 and table 7)*

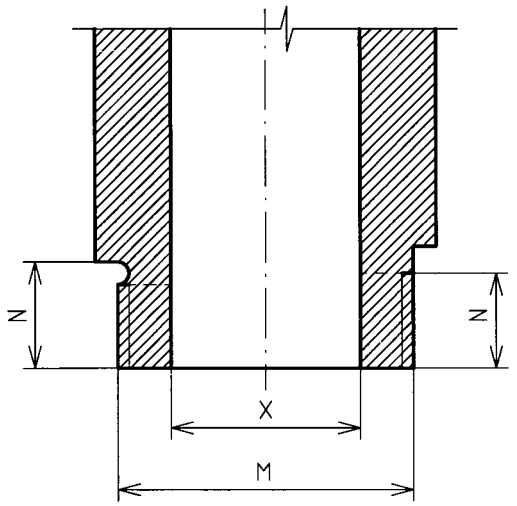

Figure 12. Nozzle outlet for flow rate regulator with internal thread

Table 7	
	Dimensions in mm
M	M 22 × 1-6 g
X	14 min. — 17 max.
N	4,5 min.

8.7.2 ***Nozzle outlet for flow rate regulator with external thread (see figure 13 and table 8)***

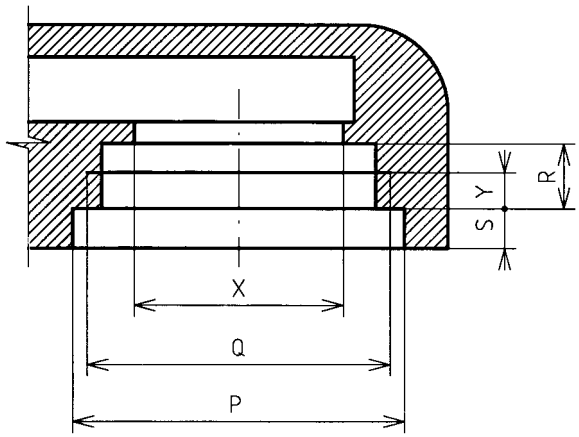

Figure 13. Nozzle outlet for flow rate regulator with external thread

Table 8

Dimensions in mm

Q	M 24 × 1-6 H	M 28 × 1-6 H
P	min. ∅ 24,2	min. ∅ 28,3
R	4,5 ± 0,2	6 ± 0,2
S	1,5 to 4,5	3,5 to 9,5
X	14 min. − 17 max.	15 min. − 19 max.
Y	3 min.	4,5 min.

8.8 Special cases

8.8.1 ***Special taps and mixers for installation on horizontal surfaces***

Taps and mixers intended for special applications e.g. for installation on sanitary appliances not conforming with European Standards, where dimensional interchangeability is not a requirement etc. etc., can 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 dimension E ≥ 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 tapware, shall indicate clearly that this tapware is a special case.

8.8.2 ***Special taps and mixers for installation on vertical surfaces***

Taps and mixers with a visible body intended for special applications when 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. 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 tapware, shall indicate clearly that this tapware 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 tapware and gives the corresponding requirements.

9.2 Leaktightness tests

9.2.1 ***Test methods***

9.2.1.1 *Principle*

The principle of the test is to check, under cold water pressure or under air pressure:

a) the leaktightness of the obturator;

b) the leaktightness of the tapware (body, head-body assembly, spout-body assembly, etc.).

The test under cold water pressure and the test under air pressure are regarded as equivalent. The choice between one or other of the methods is at the discretion of the test laboratory (except for the test at (0,1 ± 0,01) MPa (1 ± 0,1) bar in **9.2.2.1**).

NOTE. The control and shut-off devices shall be designed in such a way that there is no likelihood of inadvertent opening occurring under normal service conditions.

9.2.1.2 *Apparatus*

9.2.1.2.1 *Water test*

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

9.2.1.2.2 *Air test under water*

– A tank complete with accessories for conducting the test, filled with water.

– A pneumatic circuit capable of supplying the required pressure and of maintaining it throughout the duration of the test.

9.2.2 *Test for leaktightness of the obturator on the seat and leaktightness of the tap upstream of the obturator*

9.2.2.1 *Water test*

9.2.2.1.1 *Procedure*

– Connect the tapware to the test circuit.

– Apply a water pressure of (1,6 ± 0,05) MPa (16 ± 0,5) bar to the tap for (60 ± 5) s.

– Apply a water pressure of (0,1 ± 0,01) MPa (1 ± 0,1) bar for (60 ± 5) s.

9.2.2.1.2 *Requirements*

a) Verification of leaktightness of the obturator.

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

b) Verification of leaktightness upstream of the obturator.

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

9.2.2.2 *Air test under water*

9.2.2.2.1 *Procedure*

– Connect the tapware to the test circuit.

– Completely immerse the tapware in the tank.

– Apply an air pressure of (0,6 ± 0,03) MPa (6 ± 0,3) bar for (20 ± 2) s.

9.2.2.2.2 *Requirement*

For the duration of the test there shall be no release of air bubbles.

9.2.3 *Test of leaktightness of the tap downstream of the obturator*

9.2.3.1 *Water test*

9.2.3.1.1 *Procedure*

– Connect the tapware to the test circuit.

– With the outlet orifice closed and generally directed downwards, open the obturator.

NOTE. For tapware which normally closes automatically on release of the operating member, continue to hold the obturator mechanically in the open position during testing.

– Apply a water pressure of (0,4 ± 0,02) MPa (4 ± 0,2) bar for (60 ± 5) s.

– Apply a water pressure of (0,02 ± 0,005) MPa (0,2 ± 0,05) bar for (60 ± 5) s.

NOTE. For tapware with hydraulic opening, the 0,02 MPa (0,2 bar) test is not mandatory.

9.2.3.1.2 *Requirements*

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

9.2.3.2 *Air test under water*

9.2.3.2.1 *Procedure*

– Connect the tapware to the test circuit.

– With the outlet orifice closed and generally directed upwards, open the obturator.

NOTE 1. For tapware which normally closes automatically on release of the operating member, continue to hold the obturator mechanically in the open position during testing.

– Immerse the tapware in the tank.

– Apply an air pressure of (0,2 ± 0,01) MPa (2 ± 0,1) bar for (20 ± 2) s.

– Apply an air pressure of (0,02 ± 0,005) MPa (0,2 ± 0,05) bar for (20 ± 2) s.

NOTE 2. For tapware with hydraulic opening, the 0,02 MPa (0,2 bar) test is not mandatory.

9.2.3.2.2 *Requirements*

For the duration of the test, there shall be no escape of air bubbles at the joints or through the walls.

9.3 Summary of the leaktightness tests

See table 9.

10 Pressure resistance characteristics

10.1 General

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

This clause specifies a method for testing mechanical behaviour of the body of the valve using cold water and specifies the corresponding requirements.

10.2 Test of mechanical behaviour

10.2.1 *Test method*

10.2.1.1 *Principle*

The principle of the test consists of identifying any deformation of the tapware occurring under the action of a high cold water pressure.

The test is carried out upstream and downstream of the obturator.

10.2.1.2 *Apparatus*

A hydraulic test circuit capable of providing the static and dynamic pressures required and of maintaining them for the duration of the test.

10.2.2 *Test of the mechanical behaviour upstream of the obturator, with the obturator in the closed position*

10.2.2.1 *Procedure*

– Connect the tapware to the test circuit.

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

10.2.2.2 *Requirement*

There shall be no permanent deformation of any part of the tapware located upstream of the seat.

Seepage around the gaskets is tolerated.

10.2.3 *Test of mechanical behaviour downstream of the obturator, with the obturator in the open position*

10.2.3.1 *Procedure*

Apply a dynamic water pressure of (0,4 ± 0,02) MPa (4 ± 0,2) bar for (60 ± 5) s, this pressure being measured at the point of connection of the tapware to the pipework.

The test is carried out on the tapware as equipped.

Table 9. Summary of leaktightness tests

			Cold water test			or	Air test under cold water		
Leaktightness of	**Position of obturator**	**Outlet orifice**	**Test conditions**		**Requirements**		**Test conditions**		**Requirements**
			Pressure	**Duration**			**Pressure**	**Duration**	
Obturator	Closed	Open	(0,1 ± 0,01) MPa (1 ± 0,1) bar	(60 ± 5) s	No leakage				Test with air not acceptable
	Closed	Open	(1,6 ± 0,05) MPa (16 ± 0,5) bar	(60 ± 5) s			(0,6 ± 0,03) MPa (6 ± 0,3) bar	(20 ± 2) s	No escape of air bubbles
Tap assembly	Open	Closed	(0,4 ± 0,02) MPa (4 ± 0,2) bar	(60 ± 5) s			(0,2 ± 0,01) MPa (2 ± 0,1) bar	(20 ± 2) s	No escape of air bubbles
			(0,02 ± 0,005) MPa (0,2 ± 0,05) bar	(60 ± 5) s			(0,02 ± 0,005) MPa (0,2 ± 0,05) bar	(20 ± 2) s	
	For tapware which normally closes automatically on release of the operating member, continue to hold the obturator mechanically in the open position during testing. For tapware with hydraulic opening, the 0,02 MPa (0,2 bar) test is not mandatory.								

For tapware which normally closes automatically on release of the operating member, continue to hold the obturator mechanically in the open position during testing.

10.2.3.2 *Requirements*

There shall be no permanent deformation of any part of the tapware located downstream of the seat.

10.3 Summary of the pressure tests

See table 10.

11 Hydraulic characteristics

11.1 General

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

This clause gives a test method for measuring, for a given pressure:

– flow rate;

– shape of the flow curve;

– flow duration;

– sensitivity of mixers.

11.2 Test method

11.2.1 ***Principle***

The tests for verifying the characteristics in **11.1** are carried out on the basis of plotting the flow curve as function of time (figure 17 flow time graph) and (for mixers) temperature of mixed water as a function of the movement of the temperature control device.

11.2.2 ***Test apparatus***

This comprises:

– two supply circuits (hot water and cold water) (figure 14) (use cold water only when testing single taps);

– a test circuit (figure 15);

– a pressure/flow/time recording device (range 200 Hz) for verifying the stated requirements (figure 15).

11.2.2.1 *Supply circuits (see figure 14)*

Each circuit comprises:

a) a temperature regulation device (not shown) for adjusting:

– the cold water temperature at a value between 10 °C and 15 °C;

– the hot water temperature at a value between 60 °C and 65 °C.

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

c) piping (2) of a suitable cross section to achieve the required flow rate.

11.2.2.2 *Test circuit (see figure 15)*

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

a) piping made from a rigid metal tube, of diameter and length in accordance with the dimensions in table 11 and figure 15 including:

– a device to connect this piping to the supply circuit;

– a device for measuring flow rate;

– a pressure take off tee;

– a temperature probe;

– a connection to the reinforced flexible hose.

b) reinforced flexible hose, 500 mm long minimum internal diameter equal to that of the rigid metal tube, with, at its end, a device for connection to the tapware.

c) a water temperature probe at the outlet of mixers.

Equipment for measuring the:

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

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

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

– movement (G) of the temperature regulating device.

Table 10. Mechanical behaviour — pressure resistance

				Cold water test		
Pressure resistance of		**Position of the obturator**	**Outlet orifice**	**Test conditions**		**Requirements**
				Pressure	**Duration**	
Tap assembly	Upstream of seat	Closed	Open	Static (2,5 ± 0,05) MPa (25 ±0,5 bar)	(60 ± 5) s	No permanent deformation upstream of the seat
	Downstream of seat	Open	Open	Flow (0,4 ± 0,02) MPa (4 ± 0,2 bar)	(60 ± 5) s	No permanent deformation downstream of the seat

NOTE. For tapware which normally closes automatically on release of the operating member, continue to hold the obturator mechanically in the open position during testing.

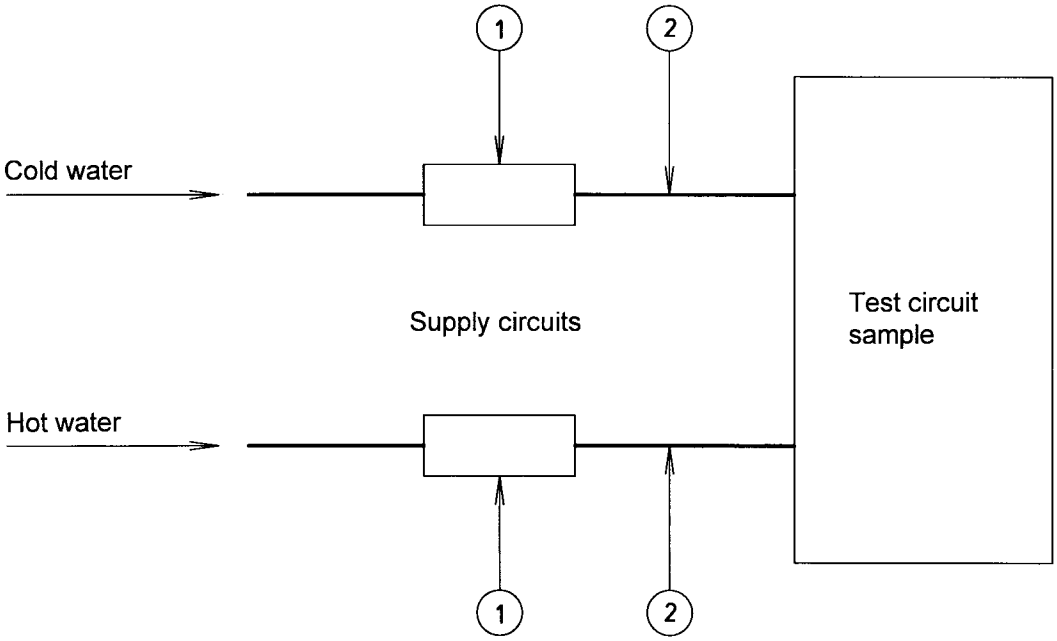

Figure 14. Supply circuits

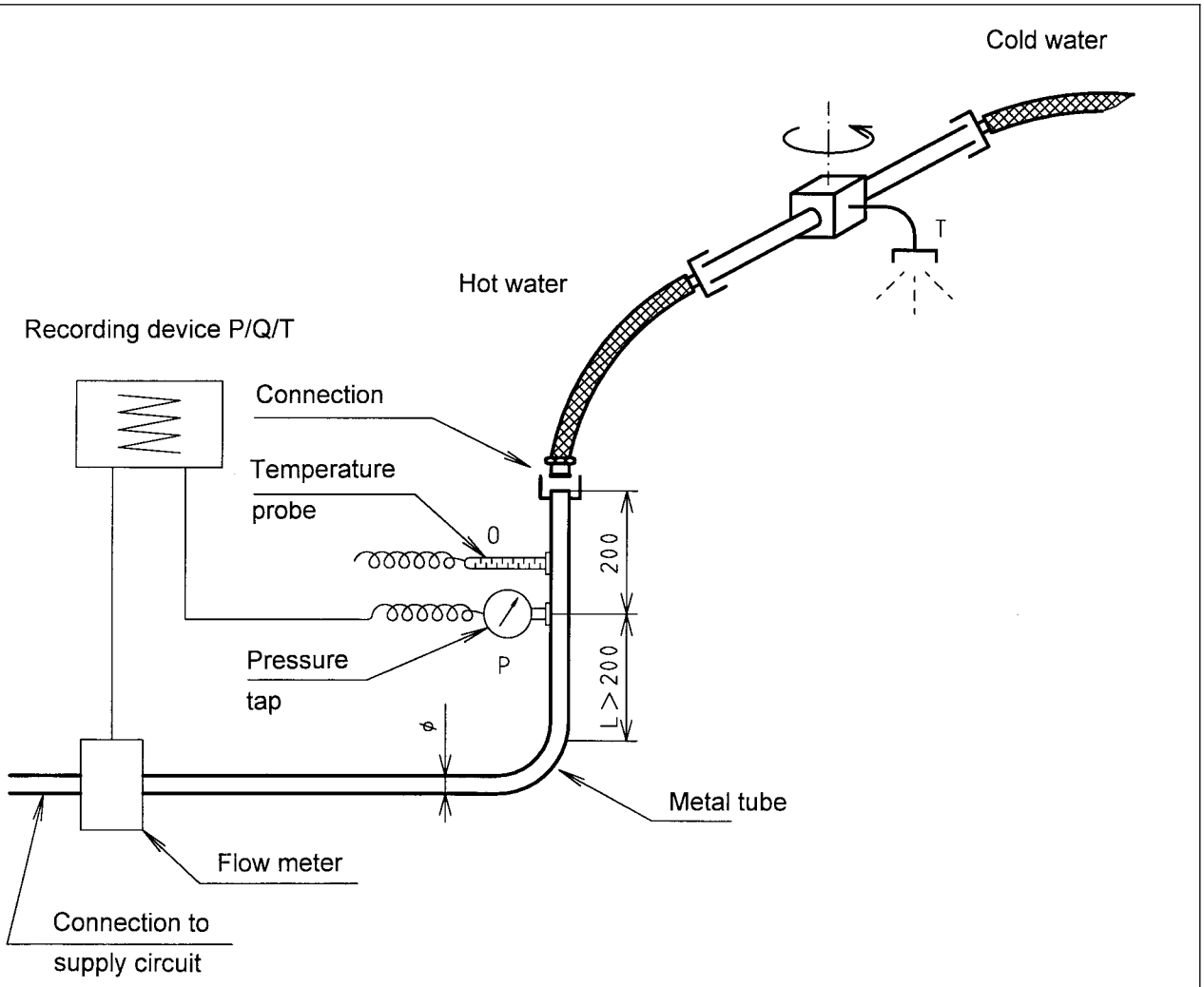

Figure 15. Test circuit

11.2.2.3 *Piping (see table 11)*

– Material: rigid metallic tube with smooth internal surface.

– Dimensions: in addition to the dimensions shown in figure 15, the following dimensions shall be observed.

Table 11. Dimensions

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

11.2.2.4 *Pressure take off tees*

The pressure take off tee shall be the individual type or the annular slit type (see annex A).

11.2.3 ***Mounting of single self closing taps***

Only the cold water supply shown in figure 15 is used for the tests.

11.2.4 ***Mounting of mixers (see figures 16a, 16b and 16c)***

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

11.3 Principle of the flow test

The measurements are carried out on the tapware as supplied for, e.g. with any accessory fitted.

The test is carried out with water at a temperature less than 25 °C.

The tapware shall firstly be run-in with 500 operations with cold water as specified above using the method described in **13.3** for single taps and 166 operations using the method described in **13.4** for mixer taps.

Before each test, the tapware shall be operated 5 times before the measurements are taken (air purge).

Mixers are tested in the hot, cold and mid blend positions with cold water. The least favourable values are recorded.

The opening device is operated for 1 second.

The measurements are made by recording the variation of flow as a function of time.

The results are plotted on a graph with time in seconds on the x-axis and flow in litres/minutes on the y-axis.

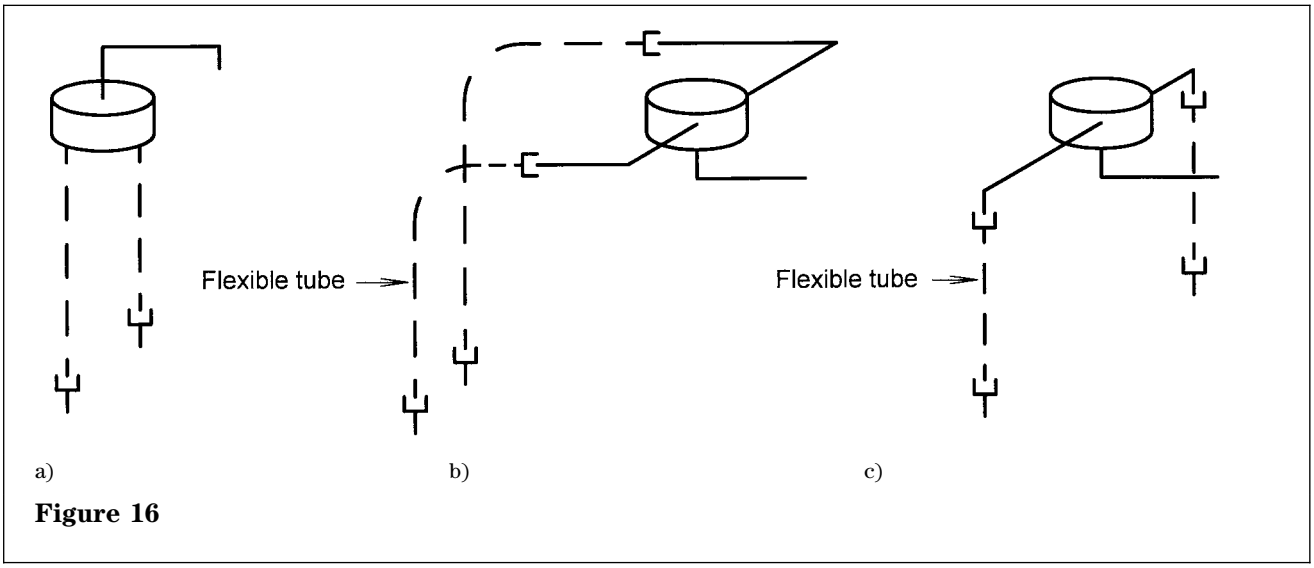

Figure 16

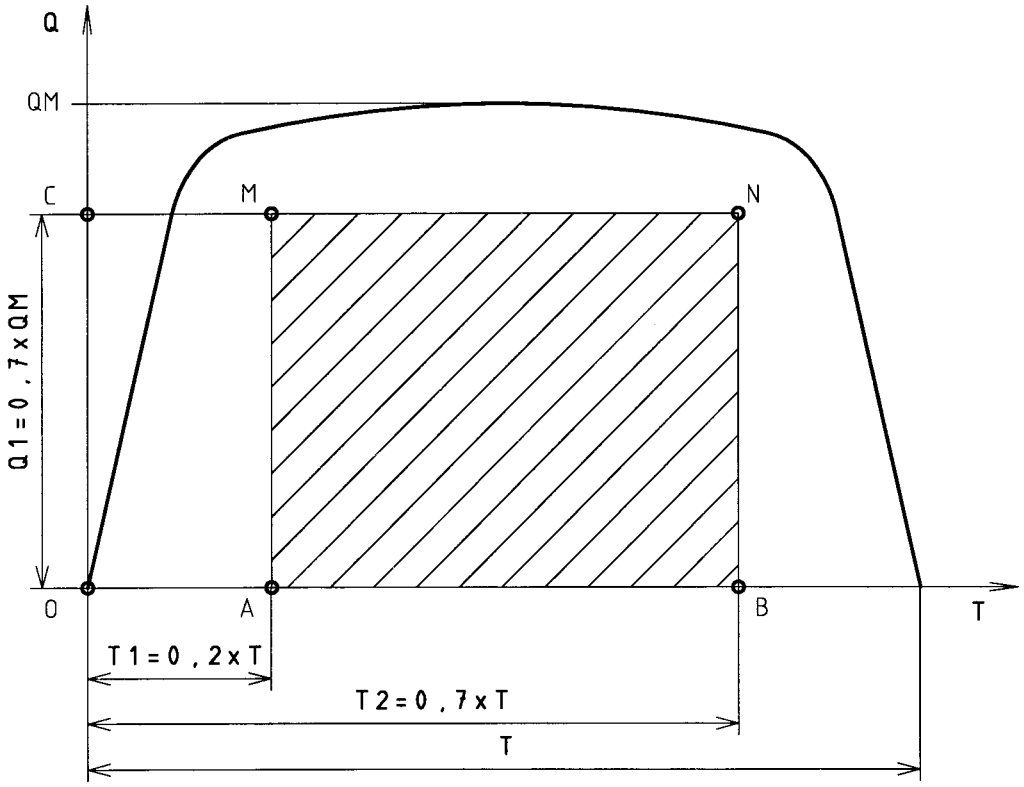

Figure 17. Flow-time graph

The following are defined:

T	Time between the start and end of flow shown on the graph
T1	= 0,2 × T
T2	= 0,7 × T
QM	Maximum flow reached by the tapware starting from time 0
Q1	= 0,7 × QM

The following points are defined:

O	Origin of the graph corresponding to the opening of the tapware
A	Located on the x-axis at time T1 = 0,2 × T
B	Located on the x-axis at time T2 = 0,7 × T
C	Located on the y-axis at Q1 = 0,7 × QM
M	Intersection of a vertical line through A and a horizontal line through C
N	Intersection of a vertical line through B and a horizontal line through C

11.4 Requirements

11.4.1 *Flow rate*

Under the test conditions set out below, the flow rate measured when fully open corresponding to the value QM from the graph described in **11.3** shall, depending on the type of appliance for which the tapware is intended, comply with the requirements of table 12.

11.4.2 *Flow rate curve*

The flow rate curve shall not impinge on the rectangle AMNB defined in figure 17. This test is not applied if T1 ≤ 6 s.

11.4.3 *Flow duration*

The flow duration corresponding to time T defined in **11.3** shall conform with the values in table 13 at a water temperature of (20 ± 5) °C.

If the time delay is adjustable, the adjustment range shall include the values given, and the endurance tests shall be carried out on the basis of these values.

NOTE. For tapware intended for 'special applications', the manufacturer shall specify the flow rate and flow duration for the tapware.

Table 12. Flow rate		
Type of appliance	**Dynamic pressure**	**Minimum flow rate** (l/min)
Washbasins	(0,3 ± 0,02) MPa (3 ± 0,2) bar	6
	For tapware fitted flow regulators, the flow rate at (0,3 ± 0,02) MPa (3 ± 0,2) bar may be less than 6 l/min provided that the flow rate at (0,1 ± 0,01) MPa (1 ± 0,1) bar is at least 3 l/min.	
Showers	(0,3 ± 0,02) MPa (3 ± 0,2) bar	9
Other, special applications	(0,3 ± 0,02) MPa (3 ± 0,2) bar	To suit application

Table 13. Duration of flow		
Type of appliance	**Flow pressure**	**Duration T**
Washbasins	(0,3 ± 0,02) MPa (3 ± 0,2) bar	(15 ± 5) s
Showers	(0,3 ± 0,02) MPa (3 ± 0,2) bar	30^{+5}_{-10} s
Other, special applications	(0,3 ± 0,02) MPa (3 ± 0,2) bar	To suit application

11.4.4 ***Specific characteristics of mixers***

In addition to the requirements stated in **11.4.1** to **11.4.3**, self-closing mixers shall also meet the requirements of:

11.4.4.1 *Sensitivity*

11.4.4.1.1 *Definition*

Sensitivity is characterized by the minimum displacement of the temperature adjustment device necessary for a limited temperature variation, within a given blend water temperature range.

11.4.4.1.2 *Principle*

This consists of verifying that, within the reference range 34 °C to 42 °C, the temperature difference of 8 K corresponds to a displacement G of the temperature adjustment device of a value greater than the values given in **11.4.4.1.4**.

11.4.4.1.3 *Procedure*

– Connect both supplies of the mixer to the test circuit.

– Fit the drive mechanism to the temperature adjustment device.

– Supply the mixer, on the cold water side, with water at a temperature of T between 10 °C and 15 °C adjusted to ± 1 °C, with the hot water inlet isolated.

– Adjust the pressure P to (0,3 ± 0,02) MPa (3 ± 0,2) bar, with the mixer open.

– Do the same with the hot water inlet, with water at a temperature of T between 60 °C and 65 °C, adjusted to ± 1 °C, so that ΔT = 50 K (± 1K).

– Adjust the pressure P to (0,3 ± 0,02) MPa (3 ± 0,2) bar, with the mixer open.

Once these adjustments have been made, return the temperature control device to the cold water position.

– Slowly operate the temperature control device at a rate of 0,5° angular/s or 0,8 mm/s, maintaining a pressure of (0,3 ± 0,02) MPa (3 ± 0,2) bar and record the curve of blend temperature as a function of the position of the temperature control device. The measurement shall be taken in both directions of operation. The least favourable measurement is recorded.

– The mixer should be opened to maintain maximum flow rate.

For mixers which normally close automatically on release of the operating member, continue to hold the obturator mechanically in the open position during testing.

On the basis of the measurements carried out in **11.4.4.1.3** plot the curves of mean temperature T as a function of the movement G of the temperature control device.

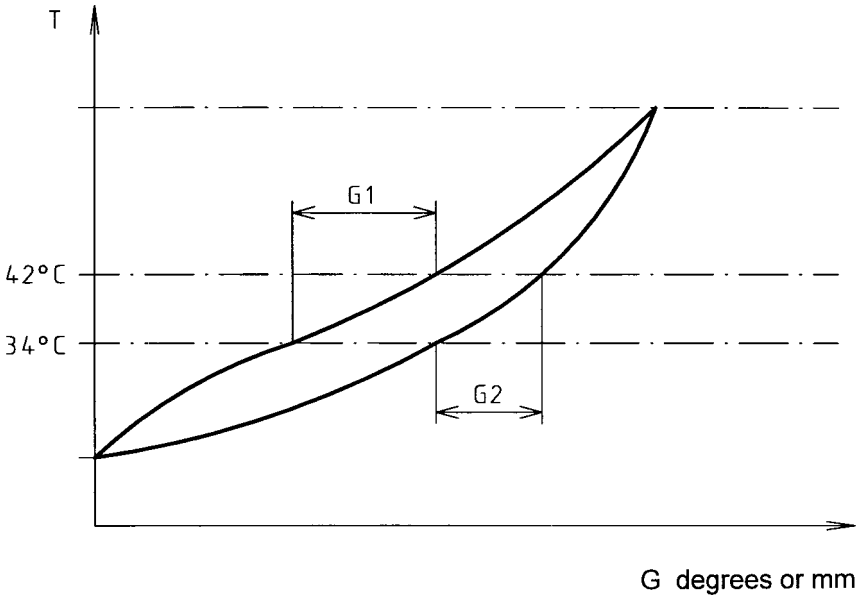

Figure 18. Sensitivity curve

11.4.4.1.4 *Requirement*

Between the mixed water temperatures of 34 °C and 42 °C, the movement of the control lever shall be a minimum of 12 mm measured at the end of the lever.

If mixing is controlled by a cylindrical device, movement shall be at least 12° angular for a mixed water temperature variation from 34 °C to 42 °C.

If the control system is not clearly defined, the most favourable method of measurement shall be used.

Mixers of special design not corresponding to the angular or linear movement values, may be accepted as complying with this standard if their sensitivity is deemed equivalent to this standard.

11.4.4.2 *Cross flow between hot and cold water*

11.4.4.2.1 *Principle*

For mixers where total shut-off of the hot and cold water supplies is effected when the control device is in the closed position, devices ensuring non inter-communication between the hot and cold water are not mandatory.

For mixers incorporating a temperature adjustment device with total shut-off placed on the blend water delivery, non inter-communication devices between the hot and cold water are mandatory.

If non-return valves are used (type EB for example), they shall conform with prEN 1717.

These devices may either be incorporated into the mixer itself, or supplied with the mixer and installed in the supply pipes.

11.4.4.2.2 *Procedure*

Connect only one inlet of the mixer 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 mixer for (60 ± 5) s for the full operating range of the temperature adjustment device.

Repeat the test with the other water inlet of the mixer connected to the test circuit.

11.4.4.2.3 *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.

12 Mechanical properties — operating force

12.1 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 before the mechanical endurance test.

12.2 Procedure

The opening force, with the tapware supplied under a static pressure of (0,3 ± 0,02) MPa (3 ± 0,2) bar, is exerted via a dynamometer, (measurement accuracy ± 2 % of the values measured) preferably with recording facilities, in accordance with the method of operation of the tapware.

The force is applied to the operating member until the tapware is fully open, this being verified by the delivery of the maximum flow rate measured in **11.4.1**.

12.3 Requirement

The measured force shall be less than 65 N.

13 Mechanical endurance or wear resistance characteristics

13.1 General

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

This clause specifies a method of test for mechanical endurance or wear resistance of the moving parts of the tapware and specifies the corresponding requirements.

13.2 Procedure

The principle of the test is to subject the tapware to a specified number of operations in order to ensure its behaviour over an extended period of time.

The test is carried out using an automatic machine for operating the tapware. The machine shall be adapted to the type of tapware under test.

The tapware is tested as supplied.

After 5 purging operations, 5 operations of the valve are carried out recording its flow time, before the endurance test is carried out.

The mean of these 5 operations is taken as the reference time.

13.3 Cycle for a single tap

Mount the tap on the automatic test machine and connect the cold water supply circuit which shall deliver water at a temperature below 30 °C and at a static pressure of (0,3 ± 0,02) MPa (3 ± 0,2) bar.

Open to maximum flow, then release.

Wait 5 s after flow has ceased.

The cycle is repeated 210 000 times.

13.4 Cycle for a mixer

Mount the mixer on the automatic test machine and connect the cold water supply circuit with water at a temperature less 30 °C and the hot water supply circuit with water at a temperature of (65 ± 2) °C.

With the mixer closed, adjust the hot and cold water pressures upstream of the mixer to (0,3 ± 0,02) MPa (3,0 ± 0,2) bar.

Carry out the following cycle 70 000 times:

Start: Temperature device in the mid blend position, mixer closed.

Opening operation, then release.

Move the temperature control towards cold water position in approximately 1,5 s.

Await end of flow.

Wait for 5 s.

Opening operation, then release.

Move the temperature control towards hot water position in approximately 3 s.

Await end of flow.

Wait for 5 s.

Opening operation, then release.

Move the temperature control towards mid-blend position in approximately 1,5 s.

Await end of flow.

Wait for 5 s.

Following this procedure for 70 000 cycles of temperature adjustment device results in 210 000 opening/closing cycles of the operating device.

13.5 Minimum requirements

During the test, no rupture of components, separation from the seat or failure to operate of the tapware shall be observed.

After 210 000 cycles verify that:

– when measured in accordance with **12.3** the force to operate is less than 65 N;

– when checked under the conditions set out in **9.2.2** that leaktightness is maintained;

– when measured in accordance with **11.3**, the flow rate QM is greater than the minimum requirement specified in **11.4.1**;

For special valves, that the specified flow rate is maintained.

– When measured in accordance with **11.4.3**, the flow duration shall not vary by more than ± 40 % of the reference time recorded before the endurance test (see **13.2**).

EXAMPLE:

Shower valve/mean time: 30 s.

After the endurance test, its time should be between:

30 − (0,4 × 30) = 18 s and 30 + (0,4 × 30) = 42 s.

The time considered is the mean of 5 operations.

NOTE. For adjustable valves, the adjustment should not be reset.

14 Acoustic characteristics

14.1 General

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

This clause specifies the test method for classifying self closing tapware 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 *Fitting and operating conditions for tapware*

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 prEN 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 acoustics group.

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 the results*

The results of the measurements taken in accordance with EN ISO 3822-2 are expressed by the acoustic level of the tapware Lap in dB(A).

NOTE. Reminder: Lap = 45 dB(A) − Ds.

14.3.2 *Determination of the acoustic group*

Depending on the values of Lap obtained at (0,3 ± 0,02) MPa (3 ± 0,2) bar, tapware is classified in the following acoustic groups.

Table 14. Acoustic groups

Group	**Lap** (dB(A))
I	Lap < 20
II	20 ≤ Lap ≤ 30
Not classified	Lap > 30

The acoustic test is not obligatory. Tapware not tested can be certified under the designation 'not classified' and will be considered to have an Lap of greater than 30 dB(A).

14.3.3 *Flow class*

If the tapware has a flow rate regulator conforming with EN 246 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 prEN ISO 3822-4 : 1995 and when necessary with adaptors in accordance with annexes B and C of prEN ISO 3822-4 : 1995.

Hydraulic resistances tested alone are defined in 5 classes as a function of their calibrated flow rate at 0,3 MPa (3 bar):

Table 15. Class of flow rate

Classes	**Flow rate in l/s**
A	0,25
S	0,33
B	0,42
C	0,50
D	0,63

Tapware 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.

Tapware 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.

Annex A (normative)
Pressure take off tees
EXAMPLES

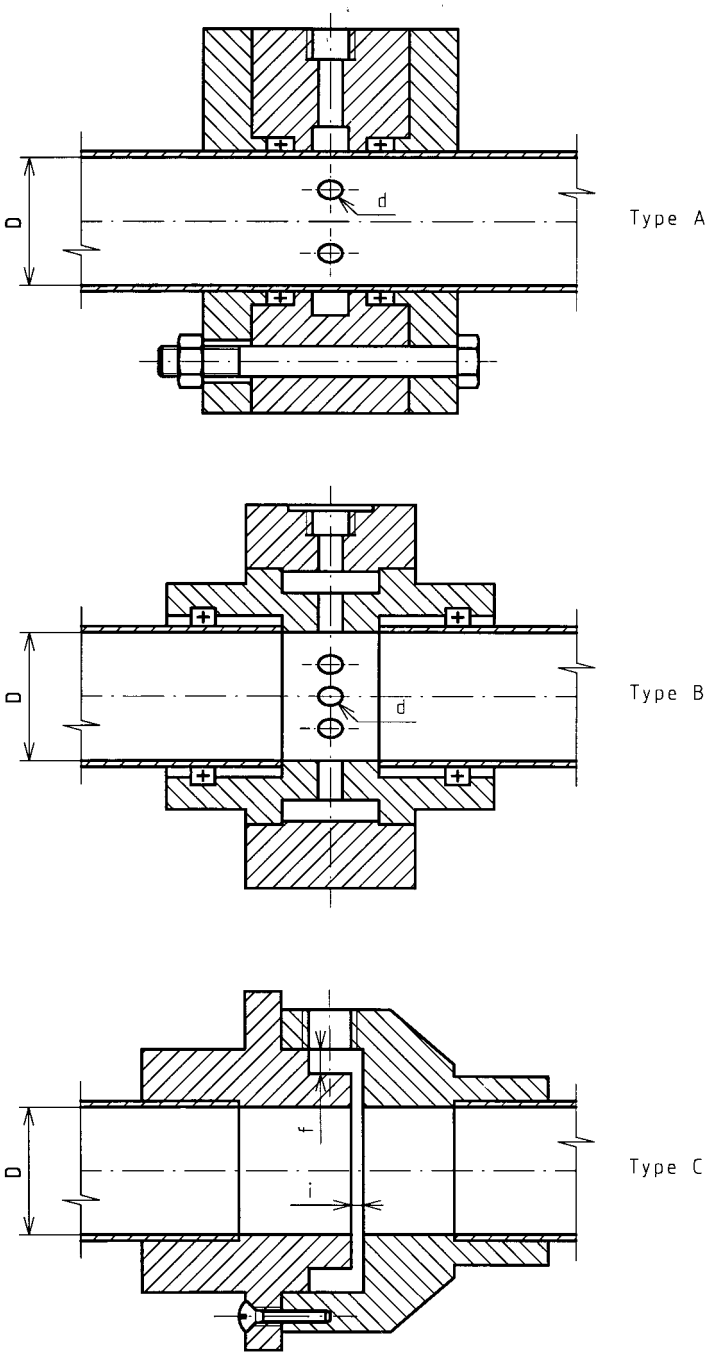

Figure A.1

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 : 1991.

The main principles are:

a) 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 4) 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 casings shall be greater than or equal to half the total area of the orifices connecting the chamber to the piping.

b) annular slit:

– the thickness f of the annular slit 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 machined;

– the width i of the annular slit should be nominally 1 mm.

Annex B (informative)
Acoustic classification (example)

B.1 Tapware with nozzle

If the nozzle is fitted with a flow rate regulator, the tapware is classed:

— as a function of acoustic group I or II;

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

– D, C or B for bath mixers;

– D to A for other tapware. However, unless otherwise requested by the manufacturer, the test will generally start with resistance A.

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

B.2 Tapware with shower head outlet

The tapware 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 Tapware with nozzle and shower or shower head outlet

If the nozzle is fitted with a flow rate regulator, the tapware 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 heads D, C, B, S or A.

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

EXAMPLES:

A mixer, 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 mixer, 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 tapware is classified solely on the basis of the most unfavourable acoustic group.

Tapware of a given class can not be fitted with a fitting (flow rate regulator, shower fitting) of a higher flow class.

Tapware of a given class may be fitted with a fitting of a lower flow class, on condition that it satisfies the requirements of clause **14.3.3**. In this case, acoustic class of the tapware will be reduced automatically.

List of references

See national foreword.

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