PS: 4846

PAKISTAN STANDARD

SPECIFICATION FOR SANITARY TAPS

PAKISTAN STANDARDS AND QUALITY CONTROL AUTHORITY,
STANDARDS DEVELOPMENT CENTRE,
PSQCA COMPLEX, PLOT NO. ST – 7/A, BLOCK NO. 3,
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KARACHI.

PAKISTAN STANDARDS SPECIFICATION

FOR

SANITARY TAPS

General Technical Specification for single taps and mixing taps (nominal size 1½), PN 10, with a minimum flow pressure of 0.05 MPa (0.5 bar)

0. **FOREWORD**

0.1 This Standard was adopted by the Pakistan Standards & Quality Control Authority (PSQCA) for Standards Development Centre, after the draft Standard prepared by Technical Committee for "Builder's Hardware and Sanitary Fitting (BDC-6)" had been approved and endorsed by the Civil Engineering Divisional Council on 05-07-2007.

0.2 This Standard has been prepared after taking into consideration the views and suggestions of the manufacturers, technologists, suppliers and utilizing agencies.

0.3 In preparation of this standard the Technical Committee has derived assistance from the following foreign publication:

DIN-EN-200

0.4 This Standard is subject to periodical review in order to keep pace with development in industry. Any suggestions for improvement will be recorded and placed before the committee in due course.

1 SCOPE

The aim of this European Standard is to specify:

- The dimensional, watertightness, pressure resistance, hydraulic, mechanical strength, mechanical endurance and acoustic characteristics with which the single taps and mixer taps shall comply.

- The test methods to verify these characteristics.

2 FIELD OF APPLICATION

This European Standard applies to draw off taps to be fitted to sanitary appliances installed in rooms used for bodily hygiene (WC"s bathrooms, etc…….) and in kitchens.

It applies to sanitary draw off taps of nominal size ½ and PN 10 operating at the following pressure and temperature conditions:

TABLE 1: CONDITIONS OF USE OF TAPWARE

	Limits of use	**Recommended limits for correct operation**
Pressure	0,05 MPa to 1 MPa (0,5 to 10 bar)	0,1 MPa < P < 0,5 MPa (1 bar < P < 5 bar)
Temperature	Max. 90 °C	MAX. 65 °C Lower limit: as for installation

The scope of this standard excludes the following: single control mixers, thermostatic mixers, jet regulators, shower accessories, waste taps, and all taps adapted for special use.

4. DESIGNATION

The draw-off taps covered by this draft standard are designated as follows :

- Its type.
- It nominal size ½
- The reference to this standard: EN 200

Example: Combination tap with combined visible body, ½, for mounting on horizontal surfaces, EN 200.

5 MARKING - IDENTIFICATION

5.1 Marking

Tapware to this standard shall be marked in a permanent and indelible fashion as follows:

- on the head, with the manufacturer's name or identification;
- on the body, with the manufacturer's name or identification, its acoustic group and flow resistance class.

5.2 Identification

The control devices for the taps shall be identified by :

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

In the case of 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 requirements

All materials coming into contact with water intended for human consumption shall not present any health risk up to a temperature of 90 ^{o}C. They shall not cause any change to the drinking water either in terms of quality, appearance, smell or taste.

In the recommended limits for correct operation in clause 2 the materials shall not undergo any change which would impair the performance of the tap. Parts subjected to pressure shall withstand the maximum operating pressures given in table 1. Materials without adequate resistance to corrosion shall be protected against corrosion.

6.2 **Exposed surface condition**

Exposed surfaces shall comply with the requirements of EN 248, for electrodeposited Ni Cr coatings.

6.3 **Coating quality**

The coating shall comply with the requirements of EN 248, for electrodeposited Ni Cr coatings.

7. DIMENSIONAL CHARACTERISTICS

The design and production of the parts without dimensions in no way pre-judge the various solutions applied by the manufacturers when producing the corresponding parts.

7.1 Combination taps with concealed body for mounting on horizontal surfaces.

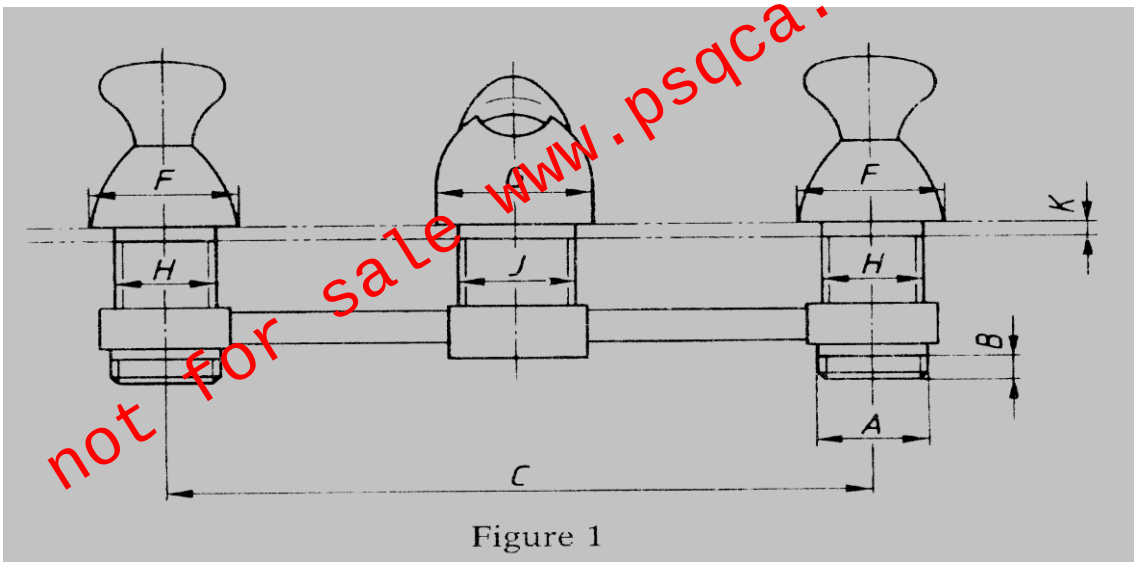


Figure 1

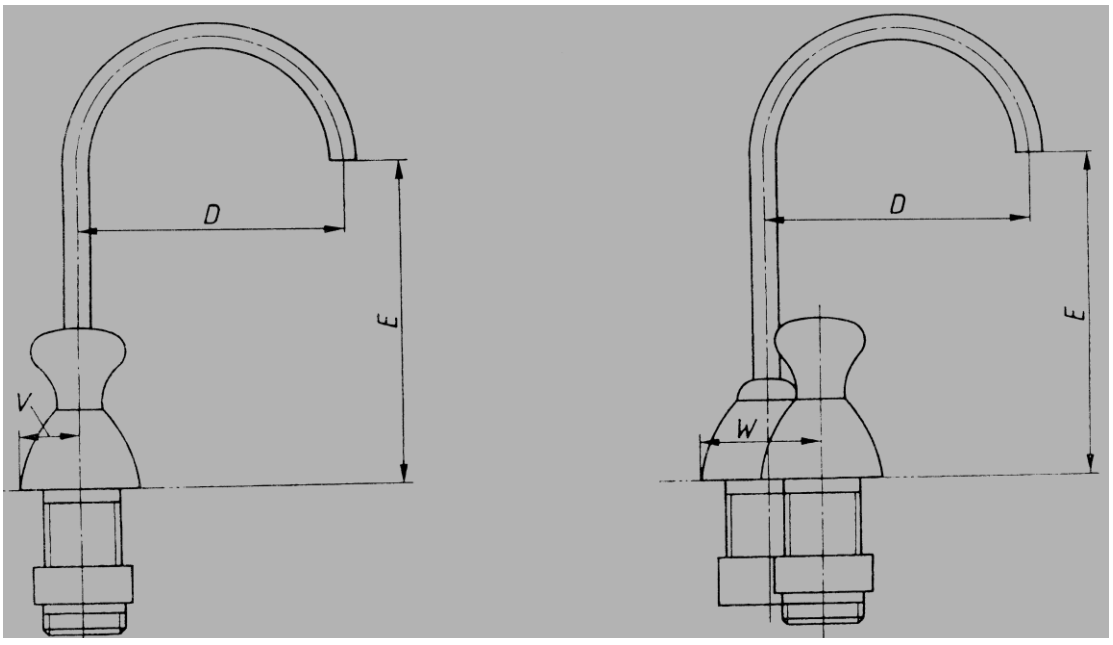


Figure 2

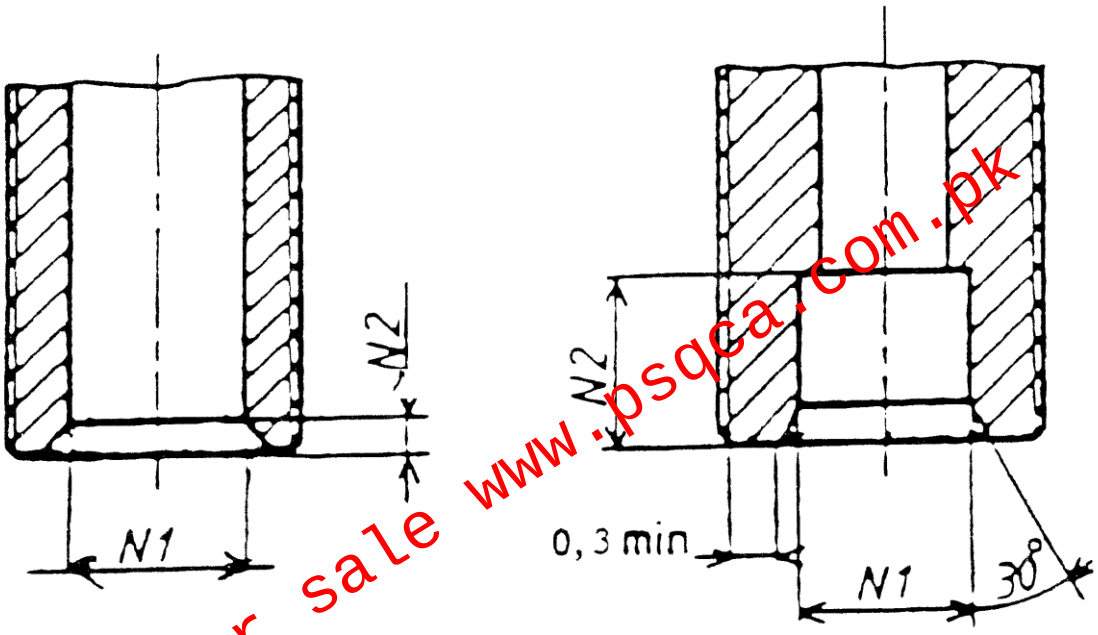
Figure 3

TABLE 2: DIMENSIONS OF COMBINATION TAPS WITH CONCEALED BODY FOR MOUNTING ON HORIZONTAL SURFACES.

Dimension reference	Values (mm)	Comments
A	G½B	ISO 228/1
B	8 min	
C (see NOTE)	200 ± 1 200 $^{+10}_{-5}$	In the case of fixed taps In the case of adjustable taps
D	- Fixed nozzle : 90 min - Movable nozzle : 100 min	Dimensions measured from the centre of the outlet orifice, the tap being of a type that may be fitted with or without an aerator, as appropriate
E	- Fixed nozzle : 90 min - Movable nozzle : low outlet: 25 min high outlet: 125 min	
F	42 min	Smallest dimension of the base
G	45 min	Smallest dimension of the base
G_1	External diameter 50 max	Backnut (not shown)
H	29 max 24 max for taps with fixed centres	
J	33,5 max	
K	Value such that it allows the tap to be fixed to the appliance - with a minimum thickness of 5 mm for ceramic ware - with a minimum thickness of 1 mm for other materials	This value shall also allow for a maximum thickness of support below the body of the tap of 18 mm
V	32 max	Maximum rear projection of the base of the tap
W	47 max	
NOTE : The value of 200 mm does not apply to bidets.		

Bore for connecting joints

The connections of certain types of taps may be provided with a bors. If a bore is provided, the dimensions shall be chosen exclusively from those given for dimension N_1 and N_2.



Type 1 **Type 2**

Figure 4: Inlet connections

TABLE 3: INLET CONNECTIONS, WITH BORE

Dimensions	**Values (mm)**	
N_1	Type 1	Type 2
	12,3 + 0,2 0	15,2 ± 0,05
N_0	5 min	13 min With a chamfer of 30° and a face of 0,3 min at the entrance to the bore

7.2 Single hole combination tap assemblies with combined visible body for mounting on horizontal surfaces

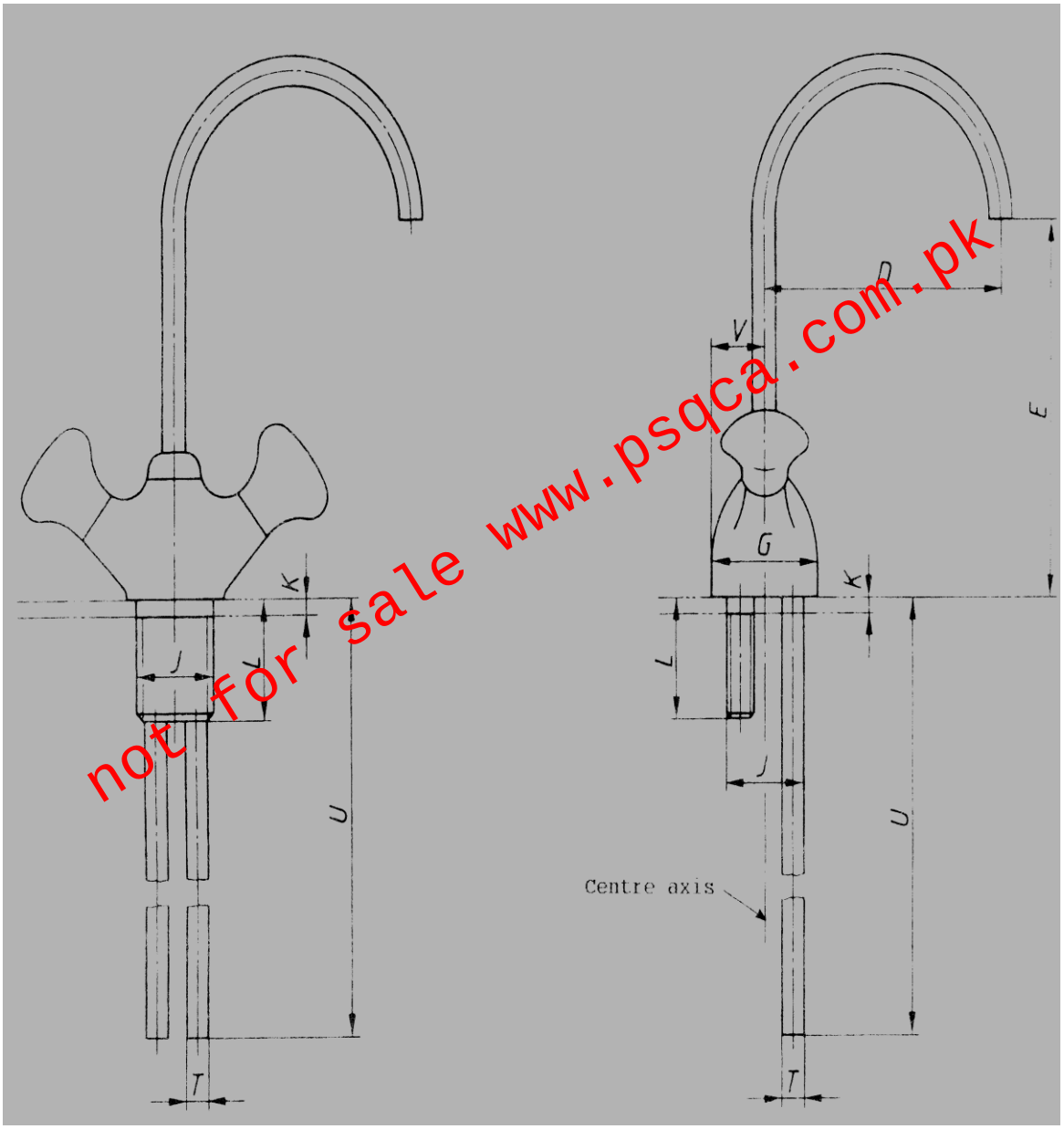


Figure 5

Figure 6

TABLE 4 : DIMENSIONS OF SINGLE HOLE COMBINATION TAPS ASSEMBLIES FOR MOUNTING ON HORIZONTAL SURFACES.

Dimension reference	Values (mm)	Comments
D	- Fixed nozzle : 90 min - Movable nozzle : 100 min	Dimensions measured from the centre of the outlet orifice, the tap being of a type that may be fitted with or without an aerator, as appropriate
E	- Fixed nozzle : 25 min - Movable nozzle : low outlet: 25 min high outlet: 125 min	
G	45 min	Smallest dimension of the base
G_1	External diameter 50 max	Backnut (not shown)
J	33,5 max	
K	Value such that it allows the tightening of the tap on to a support: - with a minimum thickness of 5 mm for ceramic ware - with a minimum thickness of 1 mm for other materials	This value shall also allow for a maximum thickness of support below the body of the tap of 18 mm
L	40 min	It should be noted that the minimum value adopted for this dimension allows taps conforming with this standard to be mounted on supports having a max. thickness of 18 mm.
T	10	External diameter
U	350 min. However the value of 250 min. may be accepted after agreement between the manufacturer and purchaser	
V	32 max	Maximum projection of the base of the taps

7.3 **Bib taps for mounting on vertical surfaces**

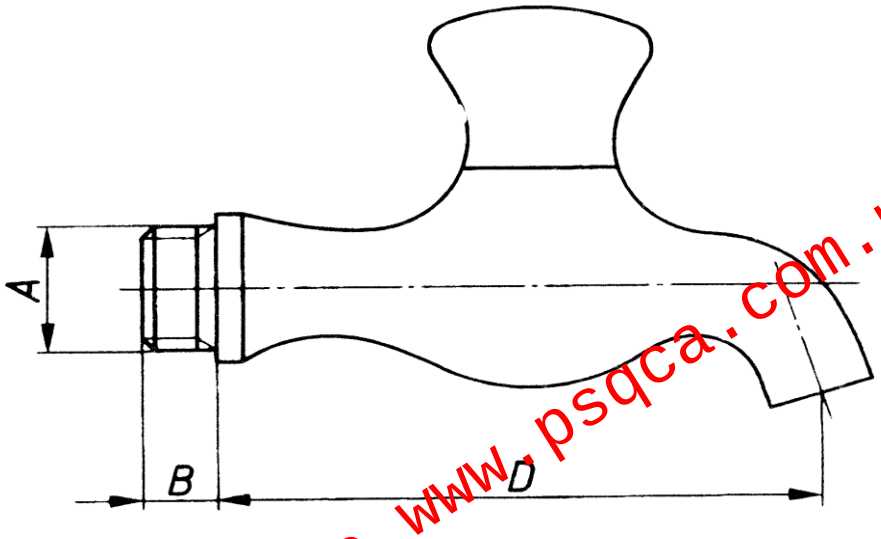


Figure 7

TABLE 5: DIMENSIONS OF BIB TAPS FOR MOUNTING ON VERTICAL SURCFACES

DIMENSION REFERENCE	VALUES (mm)	COMMENTS
A	G½B	ISO 228/1
B	11 min	Not including thickness of any cover plate.
C	80 min	Dimensions measured from the centre of the outlet orifice. The tap may be fitted with or without an aerator.

7.4 Combination taps with visible cross connected body for mounting on vertical surfaces

7.4.1 ***General***

These taps require unions for connecting to the pipe work.

The connections between the tap and the unions shall be arranged in one of the different ways shown in figure 8 and 9.

Method 1: captive nut on the pipe connector (cases 1, 2 and 3 of table 8)

Method 2: captive nut on the tap (cases 4, 5, and 6 of table 8).

The dimensions of the internal connections are not specified; the threads shall conform with ISO Recommendations or Standards.

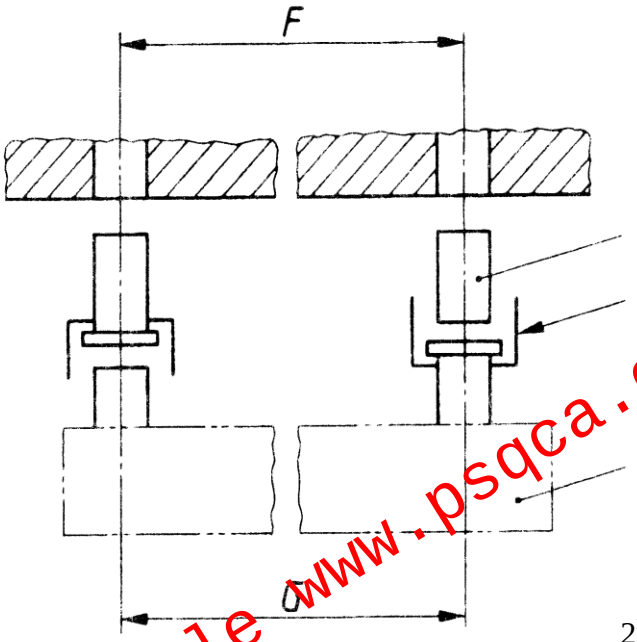
Combination taps with a visible cross-connected body for mounting on vertical surfaces shall be designed so that they may be used with straight connectors or eccentric connectors whatever the shape of the body.

The nominal dimensions between centres are given : 150 mm and 153 mm.

At a later date a nominal dimension between centres of 150 mm only shall be adopted.

7.4.2 **Connecting dimensions**

7.4.2.1 **Taps fitted with straight unions**



1st Method
(capnut on the union)

2nd Method
(capnut on the tap)

Figure 8 : Straight union

TABLE 6 : STRAIGHT UNIONS

Dimensions	**Values (mm)**	**Comments**
F (See NOTE)	Dimension between the centres of the union for pipes with centres of 150 ± 1 or 153 ± 1	These combination mixing taps with straight unions shall be mounted on pipes having corresponded centre lines
G	Distance between centres of the body inlets: 150 or 153	The manufacturing dimensions shall allow mounting on pipes having corresponding nominal centre lines with an installation tolerance of ± 1 mm
NOTE: National standards are allowed to have explanatory comments.		

7.4.2.2 **Taps fitted with eccentric unions**

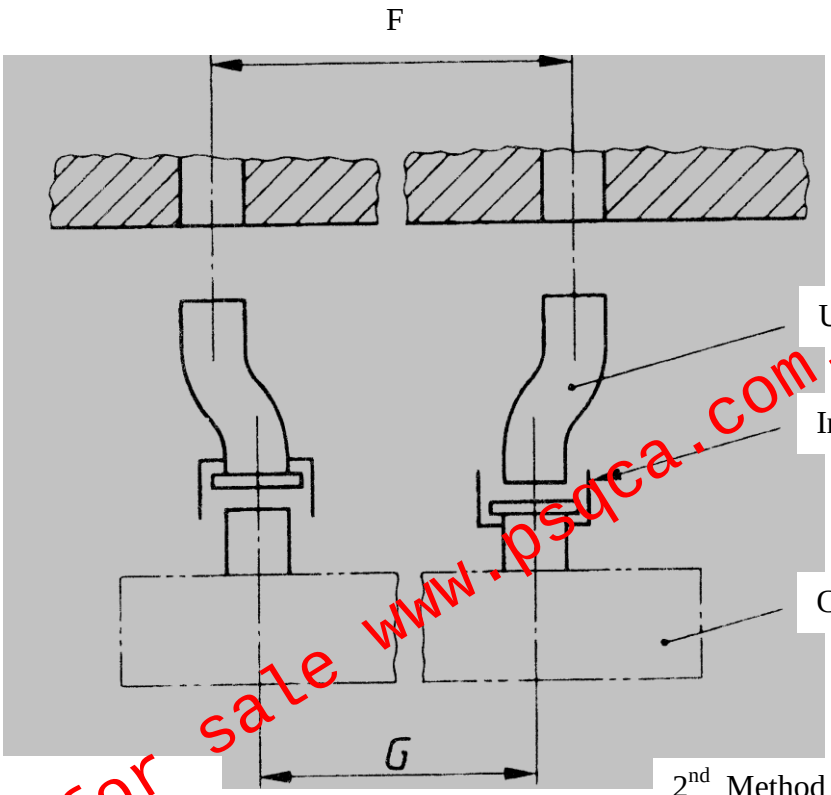


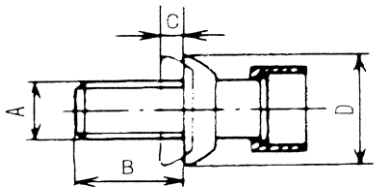
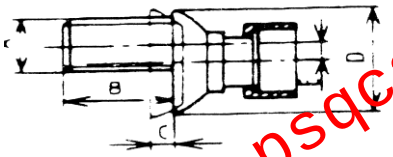
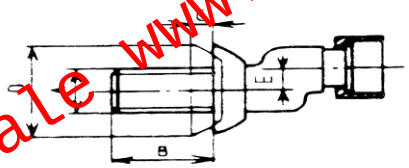
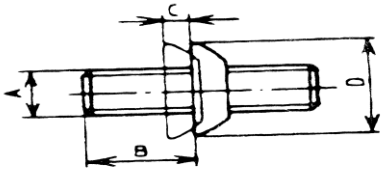
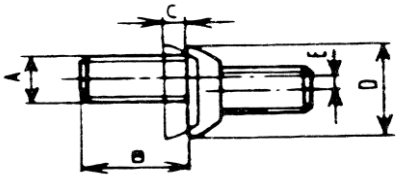
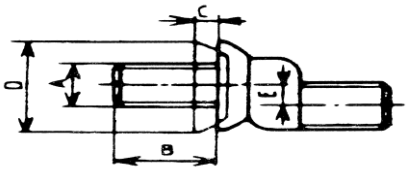
Figure 9 : Eccentric unions

TABLE 7: ECCENTRIC UNIONS

DIMENSIONS	VALUES (mm)
F (See Note)	Dimension between the centre lines of the unions for pipes with centre lines varying respectively from: 140 to 160, or from: 143 to 163
G	Distance between centres of the body inlets: 150 or 153
NOTE: National standards are allowed to have explanatory comments.	

7.4.2.3 **Dimensions of union**

Table 8 : Dimensions of union

Case	Type	Figure	Sizes	
1	Straight union with capnut and cover plate		A	Thread ISO 228/1 G1/2B
			B*	25 min
			C	5 min
			D	Diameter 50 min
			E	
2	Concealed eccentric union with capnut and cover plate		A	Thread ISO 228/1 G1/2B
			B*	25 min
			C	5 min
			D	Diameter 60 min
			E	5 min
3	Visible eccentric union with capnut and cover plate		A	Thread ISO 228/1 G½B
			B*	25 min
			C	5 min
			D	Diameter 50 min
			E	5 min
4	Straight union with cover plate		A	Thread ISO 228/1 G½B
			B*	25 min
			C	5 min
			D	Diameter 50 min
			E	
5	Concealed eccentric union and cover plate		A	Thread ISO 228/1 G½B
			B*	25 min
			C	5 min
			D	Diameter 60 min
			E	5 min
6	Visible eccentric union and cover plate		A	Thread ISO 228/1 G½B
			B*	25 min
			C	5 min
			D	Diameter 50 min
			E	5 min
NOTE: Dimensions B represents the distance between the free end of the thread and the rear face of the cover plate. This dimension is not the useful length of thread.				

7.4.2.4 **Dimensions of combination taps**

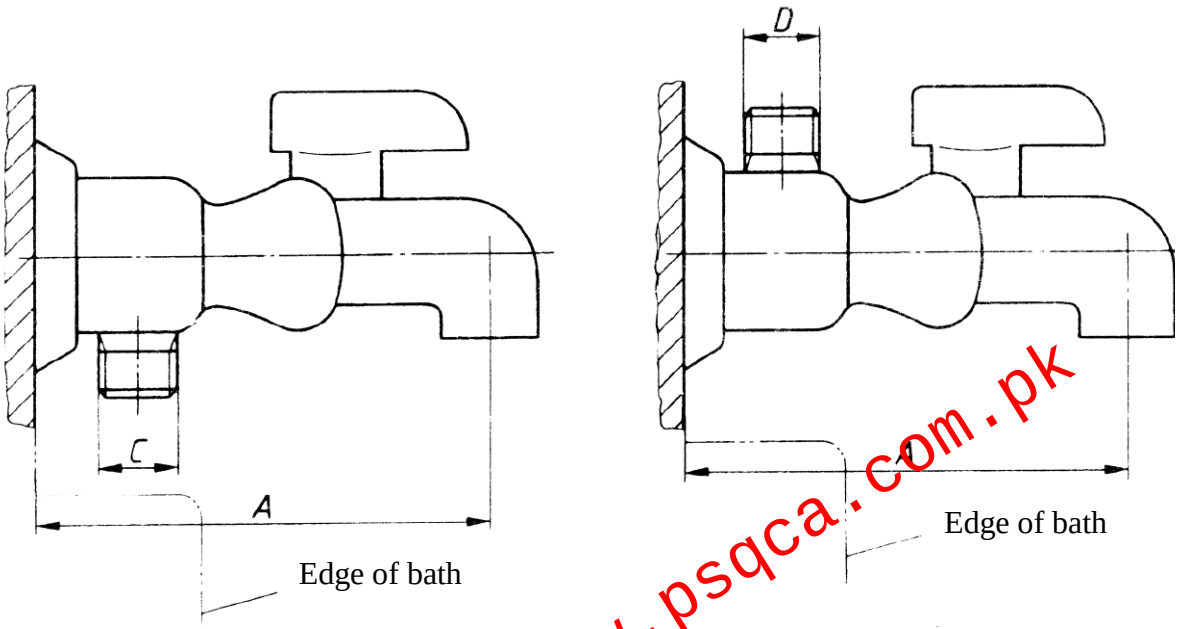


Figure 10: Example of a combination tap with visible cross-connected body mounted on a vertical surface for baths and showers, with diverter

TABLE 9: DIMENSIONS OF TAPS WITH CROSS-CONNECTED BODY MOUNTED ON VERTICAL SURFACES

DIMENSIONS REFERENE	VALUES	COMMENTS
A	115 mm min	The actual manufactured dimension shall permit the combination tap to fulfil its function when installed with the associated sanitary appliance for which it is intended.
C	G½B	Connecting thread to the flexible tube.
D	G½B G¾B	Connecting thread to the flexible tube, shower holder or similar. The choice of the value is left to the manufacturer.
NOTE: A sufficient clearance between the wall and the shower connection shall be provided to enable tightening, and loosening of the shower connection.		

7.5 DIMENSIONS OF NOZZLE OUTLETS TO ACCEPT AERATORS

The dimensions of the nozzle outlets designed to accept the flow rate regulators of EN 246 are given in the following tables 10 and 11.

7.5.1 Nozzle outlets designed to accept female threaded aerators

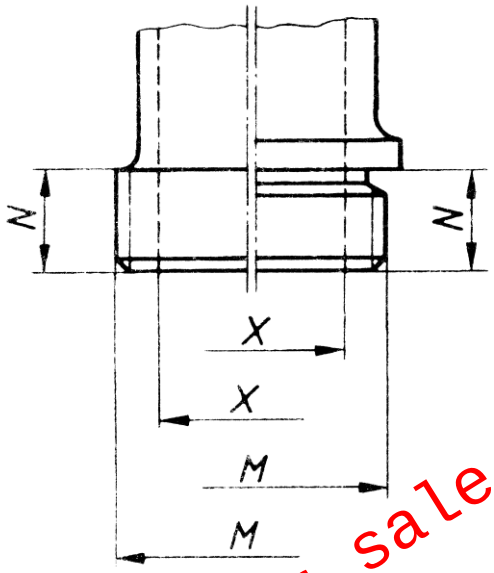


Figure 11

TABLE 10: FEMALE THREADED AERATOR DIMENSIONS

Dimensions in mm	
M (See note)	M 22 x 1 – 6 g
X	14 min – 17 max
N	4.5 min
NOTE: In order to ensure the interchangeability of aerators of flow regulating devices, the manufacturing tolerance chosen for the connecting threads of the outlet shall be compatible with the standardized thread of the aerator of flow regulating device.	

7.5.2 *Nozzle outlets designed to accept male threaded aerators*

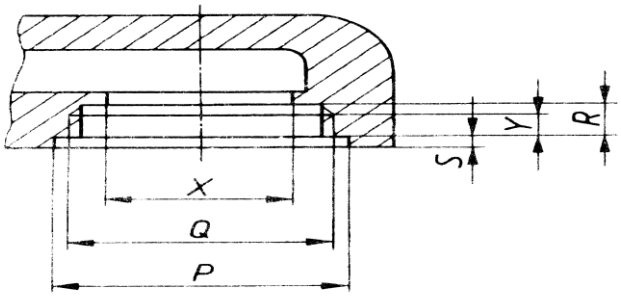


Figure 12

TABLE 11: MALE THREADED AERATOR DIMENSIONS

Dimensions in mm		
Q (See note)	M 24 x 1-6H	M28 x 1-6H
P	Min θ 24,2	Min θ 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
NOTE: In order to ensure the interchangeability of aerators of flow regulating devices, the manufacturing tolerance chosen for the connecting threads of the outlet shall be compatible with the standardized thread of the aerator of flow regulating device.		

8 WATERTIGHTNESS CHARACTERISTICS

8.1 General

The test defined below is a type test (laboratory test) and not a quality control test during production.

This clause specified test methods to verify the watertightness of the complete tap and lays down the corresponding requirements.

8.2 Watertightness tests

8.2.1 *Test methods*

8.2.1.1 ***Principle.*** The principle of the test consists of checking under cold water pressure or under air pressure:

a) the watertightness of the obturator;

b) the watertightness of the tap (body, head-body assembly, jet body assembly);

c) the watertightness of the bath/shower diverters, manual or automatically operated.

The tests under cold water pressure and air pressure are considered to be equivalent. The choice between one or the other method should be agreed between purchaser and test laboratory.

In the case where automatic diverters are considered to have an anti-pollution function, they shall comply with special specification to be defined later.

The construction of the obturator mechanism shall be such that there shall be no risk of accidental opening during normal service conditions.

8.2.1.2 ***Test equipment***

8.2.1.2.1 ***Water test.*** The hydraulic test circuit shall be capable of producing the static and dynamic pressures required and maintaining them for the duration of the test.

8.2.1.2.2 ***Air test under water.*** Tank filled with water and its accessories.

Pneumatic circuit that can deliver the required pressure and maintain it for the duration of the test.

8.2.1.2.3 ***Test duration.*** The periods given are minimum periods.

8.2.2 ***Checking the watertightness of the obturator on the seat, and the watertightness of the tap unstream.***

8.2.2.1 ***Water test***

8.2.2.1.1 ***Procedure***

Connect the tap to the test circuit.

With the outlet orifice open and generally turned downwards, close the obturator using a torque of 1,5 Nm.

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

NOTE: When the watertightness of the spindle is ensured by a stuffing box, the packing gland is loosened.

8.2.2.1.2 ***Test criteria***

a) Checking the watertightness of the obturator

Throughout the duration of the test, there shall be no leakage past the obturator.

b) Checking the watertightness upstream

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

8.2.2.2 ***Air test under water***

8.2.2.2.1 ***Procedure***

Connect the tap to the test circuit.

With the outlet orifice open and generally turned upwards, close the obturator using a torque of 1,5 Nm.

Completely immerse the tap in the water contained in the tank.

Apply an air pressure of 0,6 MPa (6 bar) to the tap for 20 s.

If the watertightness of the spindle is ensured by a stuffing box, the packing gland is loosened.

8.2.2.2.2 ***Test criteria***

Throughout the duration of the test there shall be no escape of air bubbles.

8.2.3 ***Checking the watertightness of the tap downstream***

8.2.3.1 ***Water test***

8.2.3.1.1 ***Procedure***

Connect the tap to the test circuit.

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

Apply to the tap a water pressure of 0,4 MPa (4 bar) for 60 s.

In addition, for taps where the watertightness of the spindle is ensured by one or more O-rings, apply a water pressure of 0.02 MPa (0,2 bar) for 60 s.

In the latter case, begin by applying 0,4 MPa (4 bar) gradually reducing down to the test pressure of 0,02 MPa (0,2 bar).

8.2.3.1.2 ***Test criteria***

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

8.2.3.2 ***Air test under water***

8.2.3.2.1 ***Procedure***

Connect the tap to the test circuit.

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

Immerse the tap in the water contained in the tank.

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

In addition, for taps where the watertightness of the spindle is ensured by one or more O-rings, apply an air pressure of 0,02 MPa (0,2 bar) for 20 s.

In the latter case, begin by applying 0,4 MPa (4 bar) gradually reducing down to the test pressure of 0,02 MPa (0,2 bar).

8.2.3.2.2 ***Test criteria***

Throughout the duration of the test there shall be no escape of air bubbles.

8.2.4 **Checking the watertightness of manually operated diverters**

8.2.4.1 ***Water test***

8.2.4.1.1 ***Procedure***

Connect the tap in its normal position of use, to the test circuit.

Put the diverter in the bath position, the bath outlet being artificially closed and the shower outlet being open and generally turned downwards.

Apply a static water pressure of 0,4 MPa (4 bar) for 60 s. Check that watertighhtness is maintained on the shower side.

In addition, when the watertightness of the diverter is ensured by one or more O-rings, apply a static water pressure of 0,02 MPa (0,2 bar) for 20 s. In the latter case, being by applying the highest pressure, then gradually reducing down to the lowest pressure of 0,02 MPa (0,2 bar). Check that watertightness is maintained on the shower side.

Put the diverter in the shower position, the shower outlet being artificially closed and the bath outlet being open and generally turned downwards.

Apply a static water pressure of 0,4 MPa (4 bar) for 60 s. Check that watertightness is maintained on the bath side.

In addition, if the watertighhtness of the diverter is ensured by one or more O-rings, apply a static water pressure of 0,02 MPa (0,2 bar) for 20 s. In the latter case, begin by applying the lowest pressure, then gradually reducing down to the lowest pressure of 0,02 MPa (0,2 bar). Check that watertightness is maintained on the bath side.

8.2.4.1.2 **Test criteria**

Watertightness is achieved when no leakage occurs.

8.2.4.2 ***Air test under water***

8.2.4.2.1 ***Procedure***

Connect the tap in its normal position of use to the test circuit.

Place the diverter in the bath position, with the bath outlet being artificially closed and the shower outlet being open generally turned upwards.

Immerse the tap in the water contained in the tank.

Apply a static air pressure of 0,2 MPa (2 bar) for 20 s. Check that watertightness is maintained on the shower side.

In addition, if the watertightness of the diverter is ensured by one or more O-rings, apply a static air pressure of 0,02 MPa (0,2 bar) for 20 s. In the latter case, begin by applying the highest pressure, then gradually reducing down to the lowest pressure of 0,02 MPa (0,2 bar). Check that watertightness is maintained on the shower side.

Put the diverter in the shower position with the shower side outlet being artificially closed and the bath side outlet being opened and generally turned upwards.

Immerse the tap in the water contained in the tank.

Apply a static air pressure of 0,2 MPa (2 bar) for 20 s. Check that watertightness is maintained on the bath side.

In addition, if the watertightness of the diverter is ensured by one or more O-rings, apply a static air pressure of 0,02 MPa (0,2 bar) for 20 s. In the latter case, begin by applying the highest pressure, then gradually reducing down to the lowest pressure of 0,02 MPa (0,2 bar). Check that watertightness is maintained on the bath side.

8.2.4.2.2 **Test criteria**

Watertightness is achieved when there is no production of air bubbles.

8.2.5 ***Checking the watertightness of automatic diverters***

The test is carried out with water only.

8.2.5.1 ***Procedure and test criteria***

Connect the tap, in its normal position of use, to the test circuit with the outlet orifices open and generally turned downwards. Connect the hydraulic standardized resistance A (see 13.3.3) to the shower outlet. (Resistance which when tested alone at a pressure of 0,3 MPa gives a flow rate of 0,25 l/s).

Put the diverter in the bath position, and apply a dynamic water pressure of 0,4 MPa (4 bar) for 60 s. Check that watertightness is maintained on the shower side.

Put the diverter in the shower position, check that watertightness is maintained on the bath side.

With the diverter still in the shower position, reduce the dynamic pressure to 0,05 MPa (0,5 bar). Check that the diverter has not disengaged. Maintain this pressure for 60 s and check that watertightness is maintained on the bath side.

With the diverter still in the shower position, reduce the dynamic pressure to 0,05 MPa (0,5 bar). Check that the diverter has not disengaged. Maintain this pressure for 60 s and check that watertightness is maintained on the bath side.

Stop the water; check that the diverter returns to the bath position.
Re-apply the dynamic pressure of 0,05 MPa (0,5 bar) for 60 s. Check that watertightness is maintained on the shower side.

8.2.5.2 **Test criteria**

Watertightness is achieved when there is no leakage.

TABLE 12: SUMMARY OF WATERTIGHTNESS TEST

Tightness of:		Position of obturator	Outlet orifice (g)	Cold water test			Air test with cold water		
				Test conditions		Characteristics required	Test conditions		Characteristics required
				Pressure (bar)	Duration (s)		Pressure (bar)	Duration (s)	
Obturator (See Note 1)		Closed- Dosing torque 1,5 N.m	Open	16 bar	60 s	No leakage	6 bar	20 s	No escape of air bubbles
Tap assembly	Upstream (See Note 1)	Closed- Dosing torque 1,5 N.m	Open	16 bar	60 s	No leakage	6 bar	20 s	No escape of air bubbles
	Downstream	Open	Closed	4 bar 0,2 bar (See Note 2)	60 s 60 s (See Note 2)	- Static pressure test - No leakage	2 bar 0,2 bar (See Note 2)	20 s 20 s (See Note 2)	- Static pressure test - No escape of air bubbles
Manually Operated Directing device	Diverter in Shower position	Closed on bath side	- Artificially close shower side - Open on bath side	4 bar 0,2 bar (See Note 2)	60 s 60 s (See Note 2)	- Static pressure test - No leakage on bath side	2 bar 0,2 bar (See Note 2)	20 s 20 s (See Note 2)	- Static pressure test - No escape of air bubbles on bath side
	Diverter to bath position	Closed on shower side	- Artificially close bath side - Open on shower side	4 bar 0,2 bar (See Note 2)	60 s 60 s (See Note 2)	- Static pressure test - No leakage on shower side	2 bar 0,2 bar (See Note 2)	20 s 20 s (See Note 2)	- Static pressure test - No escape of air bubbles on shower side
Automatic return diverting device (follow the chronological order)	Diverter to bath position - 1 -	Closed on shower side	The 2 outlets open	4 bar	60 s	- Dynamic pressure test - No leakage on shower side			
	Diverter in Shower position - 2 -	Closed on bath side	The 2 outlets open	4 bar	60 s	- Dynamic pressure test - No leakage on bath side			
	Diverter in Shower position - 3 -	Closed on bath side	The 2 outlets open	0,5 bar	60 s	- Dynamic pressure test - No leakage on bath side	1) No disengaging of diverter 2) Shutting off of water 3) Automatic return of diverter to bath position		
	Diverter in bath position - 4 -	Closed on shower side	The 2 outlets open	0,5 bar	60 s	- Dynamic pressure test - No leakage on shower side			

Note 1. If the watertightness of the spindle is ensured by a stuffing box, loosen the packing gland. In the case of one or more O-rings, these are placed normally.
Note 2. Supplementary test carried out in the case where watertightness is ensured by one or more O-rings.

9 PRESSURE RESISTANCE CHARACTERISTICS

9.1 General

The test defined below is a type test (laboratory test) and not a quality control test during production.

This clause specifies a test method for checking the mechanical behaviour with cold water of the body of the tap and lays down the test criteria.

9.2 Checking of mechanical behaviour under pressure

9.2.1 *Test method*

9.2.1.1 *Principle*

The principle of the test consists of revealing any deformation in the tap that may result under the action of cold water at a relatively high pressure. The test is carried out upstream and downstream of the tap.

9.2.1.2 *Equipment*

Use a hydraulic test circuit capable of producing the static and dynamic pressures required and of maintaining them for the test duration.

9.2.2 *Checking of mechanical behaviour upstream – Obturator in shut position*

9.2.2.1 *Procedure*

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

9.2.2.2 *Test criteria*

No permanent deformation in the part of the tap situated upstream shall be produced.

9.2.3 *Checking of mechanical behaviour downstream – Obturator in the open position*

9.2.3.1 *Procedure*

Apply for 60 s a dynamic water pressure of 0,4 MPa (4 bar), this pressure being measured at the junction of the tap and the pipe. Carry out the test on the tap as supplied. For taps containing a removable hydraulic resistance in the nozzle carry out an additional test with the resistance removed.

9.2.3.2 ***Test criteria***

No permanent deformation in the part of the tap situated downstream shall be produced.

TABLE 13: MECHANICAL BEHAVIOUR – RESISTANCE TO PRESSURE

RESISTANCE TO PRESSURE	OBTURATOR	OUTLET ORIFICE	COLD WATER TEST TEST CONDITIONS		TEST CRITERIA
			PRESSURES (bar)	DURATION (s)	
Upstream of the tap	Closed	Open	(Static pressure) 25 bar	60 s	No permanent deformation upstream
Downstream of the tap (See NOTE)	Open	Open	(dynamic pressure) 4 bar	60 s	No permanent deformation downstream
NOTE: The test is carried out on the tap as supplied. For taps containing, in the nozzle, a removable hydraulic resistance, an additional test is carried out with the resistance removed.					

10 HYDRAULIC CHARACTERISTICS

10.1 General

The test defined below is a type test (laboratory test) and not a quality control test during production.

This clause specifies a test method which enables the flow rate of single and combination taps together with their standard accessories to be measured for a given pressure, and specifies the corresponding requirements.

10.2 Test criteria

In the test conditions defined below and according to the type of appliance for which the tap is intended, the value of flow rate measured under 0,3 MPa (3 bar) shall be not less than:

- 12 1/min, for wash basins, bidets, sinks and showers;

- 20 1/min, for baths.

10.3 Test method

10.3.1 *Principle*

The principle of the test is to determine, the value of the flow rate corresponding to a reference pressure equal to 0,3 MPa (3 bar). The measurement is carried out with the tap fully open. If it is fitted with standard accessories (jet regulator, connectors, etc…..) the measurement will be carried out by replacing these fittings with the standardized flow resistance as described in 13.3.3.

10.3.2 *Apparatus*

The apparatus consists of :

- a supply circuit;
- a test circuit

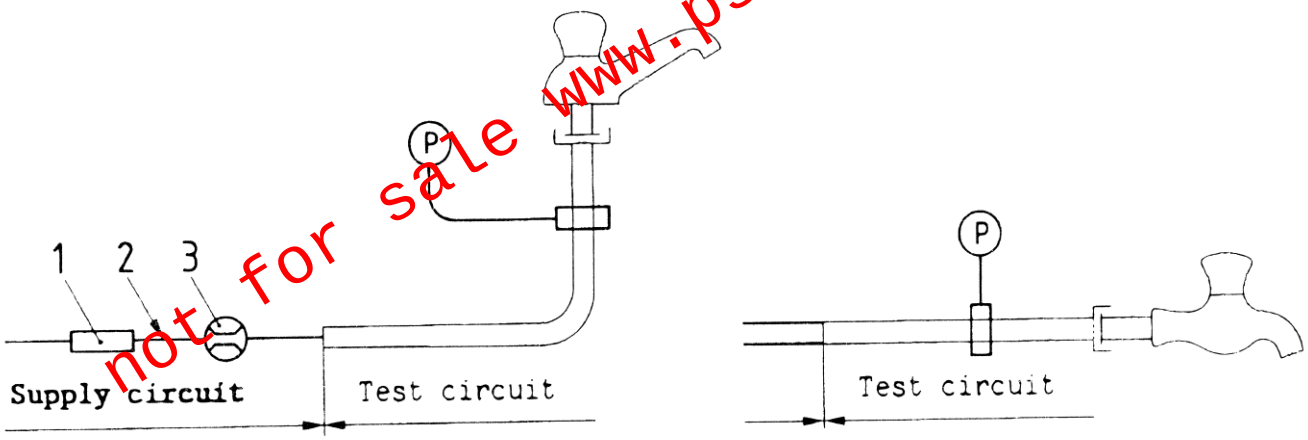


FIGURE 13 : SUPPLY CIRCUIT

10.3.2.1 The supply circuit assembly consists of :

- a device (1) enabling the required pressures to be achieved;
- piping (2) with a cross section such that the test circuit, without the tap to be tested, enables a flow rate of 50 % greater than the flow rate to be measured, to be achieved;
- a device (3) to measured the flow rate.

NOTE: This device may also be placed downstream of the test circuit, provided it is separate from the test circuit.

10.3.2.2 ***Test circuit*** **(Figure 14)**

The circuit shown in figure 14 is suitable whatever the type of the tap to be tested.

It consists of :

- a straight portion of tube, the dimensions of which are given in figure 14 with a pressure tapping;
- a tap connecting nut G½;
- a pressure circuit, connected to the pressure take off tee and to the pressure measuring device.

NOTE: The connection between the pressure circuit and the measuring apparatus is situated:

- at the connection level, for all taps (figures 14a and 14c) except for taps with combined visible bodies and all mixers with copper inlet pipe of 250 mm minimum length (figure 14b);

- 200 mm above the connection level for all these types of tap.

Examples of the fitting of the tap to the test circuit are shown in figure 14.

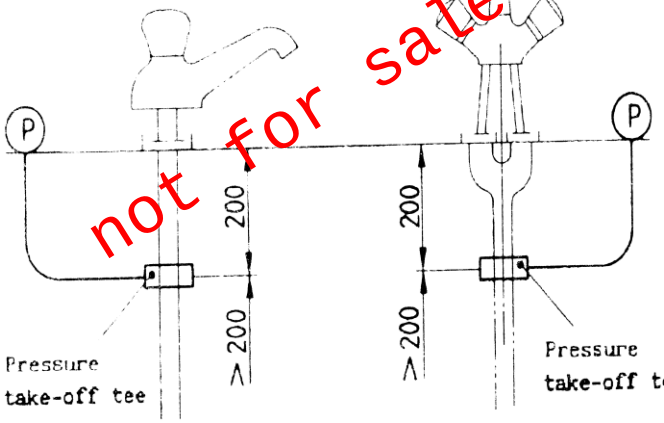


Figure 14a

Figure 14b

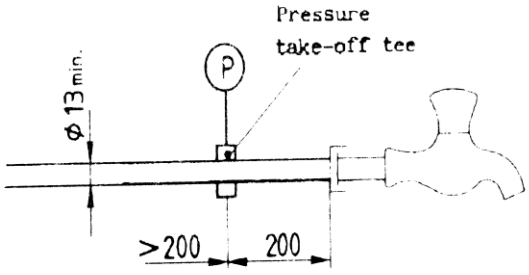


Figure 14c

10.3.2.3 ***Pipes.*** The pipes shall be of metal and their internal surface shall be smooth.

10.3.2.4 ***Pressure take-off tee.*** The pressure take off tees may be of the individual pressure tapping type or of the annular slit type. Examples of recommended pressure take off tees are given in the information appendix A, with recommendations concerning their manufacture.

10.3.3 ***Test conditions***

10.3.3.1 ***Temperature of the water***

The tests are carried out only in cold water. The temperature of this water shall be between 10 ^{o}C and 25 ^{o}C.

10.3.3.2 ***Precision of the measurements***

The precision of the devices for measuring the flow rates and pressures shall be ± 2 %.

10.3.4 ***Procedure***

Fit the tap to be tested onto the test circuit.

For combination taps with two inlets, the test shall be carried out on each of these inlets separately.

For combination taps with combined visible body, reduce, if necessary the length of the supply tubes to a value of 250 mm.

For the taps which cannot be connected directly to the test circuit connector, use intermediate connecting devices which have minimum head loss.

Open the valve to its maximum.

Supply the test circuit and adjust the dynamical pressure to 0,3 MPa (3 bar).

When a stable, continuous flow has been established, measure the corresponding flow rate.

For greater accuracy, the following procedure is recommended:

- carry out several measurements of the flow rate at different values of pressure (for example between 0,1 MPa and 0,5 MPa, (1 bar and 5 bar);

- using logarithmic coordinates, plot the curve of the flow rate (Q) as a function of the pressure (P);

- determine on this curve the value of the flow rate corresponding to the pressure of 0,3 MPa (3 bar).

10.3.5 ***Calibration***

It is recommended that the measuring appliances and the test circuit be calibrated at regular intervals.

11 MECHANICAL STRENGTH CHARACTERISTICS

Torsion test for operating mechanism of single taps and combination taps

11.1 General

The test defined below is a type test (laboratory test) and not a quality control test during production.

This test shall be carried out before the mechanical endurance test.

The clause specifies a test method to verify the torsional strength of the operating mechanisms of single taps and mixer taps and lays down the test criteria.

11.2 Test method

11.2.1 *Principle*

The principle of the test consists of submitting the operating mechanism to a given torque so as to verify its strength.

11.2.2 *Apparatus*

This consists of either a torque wrench having an accuracy of 10% fitted to the operating member or a lever arm and a device for measuring the force applied.

Ensure that shear force does not affect the measurement.

11.2.3 *Procedure*

- The tap, with its operating mechanism shall not be supplied with water during the test.

- The test is carried out at ambient temperature.

- Apply, over a period of 5 minutes, a torque of 6 Nm to the operating mechanism in both opening and closing positions.

11.2.4 *Test criteria*

Throughout the duration of the test and at the end of the test, there shall be no permanent deformation or loosening of any part of the valve.

12 MECHANICAL ENDURANCE CHARACTERISTICS

12.1 Mechanical endurance characteristics of the operating mechanism

12.1.1 *General*

The test defined below is a type test (laboratory test) and not a checking test during production.

This clause specifies a test method to verify the mechanical endurance of the operating mechanism (head and handle) of single taps and combination taps and lays down the test criteria.

12.1.2 *Combination*

12.1.2.1 *Principle*

The principle of the test consists of checking the behaviour of the operating mechanism by carrying out a number of opening and closing operations.

12.1.2.2 *Apparatus*

An automatic test rig, which provides a torque in the two directions of rotation; the closing torque shall remain constant irrespective of wear of the test piece.

It shall be ensured that the set closing torque is not affected by the moment of inertia of the equipment during the test.

A supply circuit with a pump or an equivalent device, capable of delivering the static pressure required, in cold water at temperature less than 30 ^{o}C.

If the water is supplied by a circulation system, it is necessary to ensure that the quality of the water does not change during the test, (ingress of grease, etc…….).

A device to actuate the operating mechanism of the tap. It shall be such that the clearance between the headwork and its handle does not cause lateral movement. The figures 15 and 16 show examples of actuating devices.

Equipment related forces that act horizontally or vertically on the test piece and might result in abnormal wear shall be eliminated. A frictionless vertical connection to the spindle shall be ensured.

NOTE: The test piece may show abnormal wear due to the test equipment caused by eccentricity of the two axes, which results in pick-up on one side only due to lateral forces which do not occur in normal use.

The tolerance on concentricity shall therefore be as small as possible.

The tolerances on concentricity of an axis in relation to a reference axis is the diameter of a cylinder coaxial with the reference axis, and all points of the tolerated axis shall be within that cylinder.

12.1.2.3 ***Procedure***

The head shall be tested with its handle.

Fit the tap to be tested onto the equipment and connect to the cold water supply circuit (< 30 ^{o}C).

Adjust the closing torque, in rotation, to a constant value of 2,5 Nm.

With the tap closed, adjust the static pressure, upstream, to a value between 0,2 MPa (2 bar) and 0,4 MPa (4 bar).

With the tap open, adjust the flow rate, upstream, to a value between 0,066 1/s and 0,100 1/s (4 1/min and 6 1/min).

Carry out 200 000 opening and closing cycles, with a rotation speed of the spindle of 30 minus 1 rpm. Each cycle comprises:

- opening to 75 % of the total opening;
- holding in open position, for 1 s to 2 s ;
- closing completely with a torque for 2,5 Nm;
- holding in closed position, for 1 s to 2 s.

Every 25 000 cycles, subject to the tap watertightness test (without removing the test piece from the test rig). Carry out this test under the conditions described in clause 7 employing a closing torque of 2,5 Nm.

Carry out the same test, using a torque of 2,5 Nm, after 200 000 cycles.

12.1.2.4 ***Test Criteria***

There shall be no leakage in closed and open position. If leakage occurs, the test shall be stopped.

12.1.3 *Test report*

The test report shall include the following:

Water temperature : …….. ^{o}C
Static pressure :……. MPa
Flow-rate :……. 1/s
Closing torque : ……. (Nm)
Watertightness test after : ……. Cycles
Rotational speed of spindle : …… rev/min
Duration of closure : …… s
Duration of opening : …… s
Headwork travel : …… % of the total opening

Test days:
Rest days:

Hardness of the water: mg/1 as $Ca\ CO_3$ [1]

Results of watertightness test:

- Total number of effective cycles carried out.
- Results.

(Note 1): An equivalence table of the water hardness values is given in the EEC Directive 80/778 of 80/07/15.

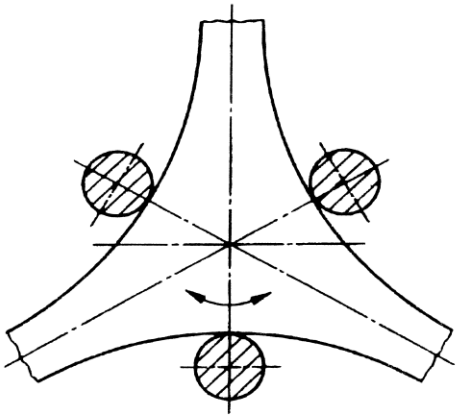


Figure 15: Examples of drive plates

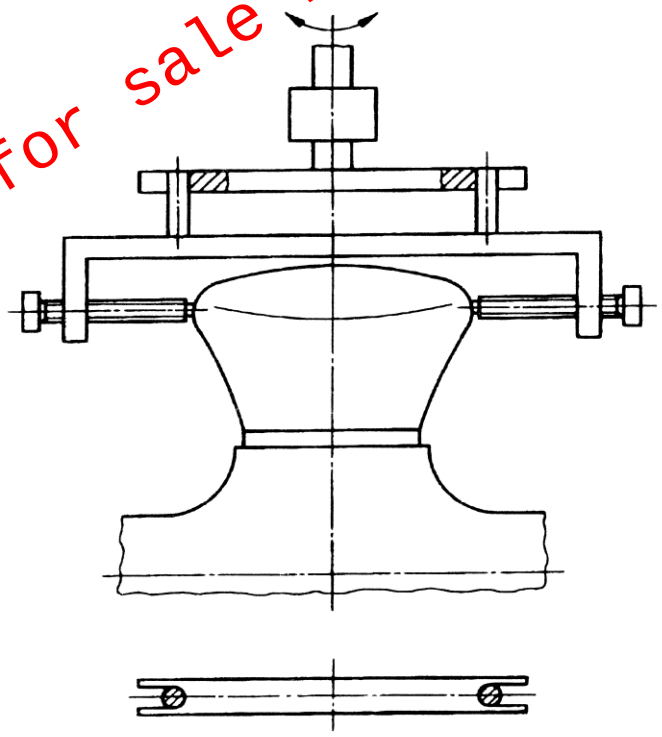


Figure 16

12.2 Mechanical endurance of diverters

12.2.1 *General*

This clause specifies two methods of test for the mechanical endurance of diverters of water fittings and waste fittings: one for manual diverters and one for automatic diverters, and specifies the test criteria.

This sub-clause applies to the combination taps with a diverter

12.2.2 *Test criteria*

During the test, there shall be no deformation, rupture of the elements, blockage of the mechanism, leaks on the nozzle side or shower side or at the diverter control joint.

At the end of the test, check the watertightness:

- under the conditions specified in 8.2.4 for manual diverters;
- under the conditions specified in 8.2.5 for automatic diverters.

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 system being fed alternately with cold water and hot water at 65^{o} ± 2 ^{o}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 alternate operations of the diverter at the rate of 15 cycles per minute.

Supply circuits comprising a pump or similar device to supply the cold water static pressure required at a temperature ≤ 30 ^{o}C and hot water static pressure at 65^{o} ± 2 ^{o}C.

12.2.3.2.2 ***Automatic diverter***

Mechanism for moving the diverter to the shower position under the conditions specified in 8.2.5.

Supply circuits identical to those specified in 12.2.3.2.1 with, in the common circuit, a quick-acting valve coupled to the diverter moving mechanism.

12.2.3.3 ***Procedure***

12.2.3.3.1 ***Manual diverter***

Assemble the fittings, as supplied, onto the test rig and connect to the supply circuit.

Connect the driver device to the diverter lever by means of a flexible hose.

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

Open the supply-side valve. Adjust the flow to a value between 0,066 1/s and 0,100 1/s (4 1/min and 6 1/min) by covering the nozzle outlet.

Subject the diverter to a fatigue test of 30 000 cycles, each cycle comprising a backwards and forwards movement between the end positions.

Throughout the test, supply the tap alternately with cold water for 15 minutes, then hot water for 15 minutes, and so on.

Throughout the test, record any incidents: leaks, deformations, ruptures etc.

After 30 000 cycles check the watertightness of the assembly (sub-clause 8.2.4).

12.2.3.3.2 ***Automatic diverter.*** Fit the hydraulic resistance A as described in 13.3.3 on the shower outlet.

Fit the assembly as equipped to a support and connect it to the supply circuit.

With the tap closed, adjust the water pressure of the two supply circuits to a value equal to 0,4 MPa (4 bar).

Open the tap on the supply side. Adjust the flow to the minimum value permitting proper functioning of the diverter.

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

- with the diverter in the bath position, allow a flow of water for 5 s through the nozzle;
- change the diverter (by pulling or pushing) to move it to the shower position;
- allow the flow of water for 5 s, though the shower outlet;
- cut off the supply, return the diverter to the bath position and reopen the supply:

Throughout the test, supply the tap alternately with cold water for 15 minutes and then hot water at 65 ± 2 ^{o}C for 15 minutes.

Throughout the test, record any incidents: leaks, non-resetting of the diverter, blockage, etc.

After 30 000 cycles, check the watertightness of the assembly and record any deterioration (sub-clause 8.2.5).

12.3 Mechanical endurance of the swivel nozzles

12.3.1 ***General***

This sub-clause specifies a method for testing the mechanical endurance of swivel nozzles of fittings and specifies the corresponding test criteria.

12.3.2 ***Test method***

12.3.2.1 ***Principle.*** The principle of the test is to move the nozzle of the tap fed with cold water backwards and forwards for a specified number of cycles in order to test its behaviour over a period of time.

12.3.2.2 ***Apparatus***

Automatic machine for moving the nozzle alternatively backwards and forwards at the rate of 15 cycles a minute.

Cold water supply circuit (15 ^{o}C to 30 ^{o}C) with a pump or similar device for supplying the static pressure required.

Loading:

- 1 kg weight if the range of the nozzle is equal to or less than 200 mm;
- weight giving a bending moment of 2 Nm if the range of the nozzle is greater than 200 mm.

12.3.2.3 ***Procedure***

Mount the tap on the machine and connect it to the supply circuit. If the nozzle has an aerator, leave it on and ensure that it does not obstruct the test path.

At the end of the swivel nozzle, hang a weight as specified in 12.3.2.2.

Connect the driving device to the swivel nozzle.

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

Open the tap; adjust the flow rate to a value between 0,066 1/s and 0,10 1/s (1 1/min and 6 1/min) by covering the nozzle outlet.

Subject the swivel nozzle to a test of 80 000 cycles, each cycle comprising a backwards and forwards movement between the end positions; these are fixed so that the nozzle describes an arc of 110^{o} approximately or, if there is a stop, the swing is over 90 % of the theoretical travel.

During the test, move the nozzle smoothly at as steady a speed as possible at a rate of 15 backwards and forwards motions per minute.

12.3.3 ***Test criteria***

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

At the end, the watertightness shall be checked in accordance with the requirement of clause 8.2.3.

13 ACOUSTIC CHARACTERISTICS

13.1 General

This clause specifies the test method for classifying the water fittings by acoustic group (I or II), supplemented for the fittings including an aerator, by indication of the hydraulic resistance class (A,S,B,C or D) used for determining the group.

13.2 Procedure

13.2.1 ***Assembly of the fittings***

This is carried out in accordance with the requirements of ISO 3822: Part 2.

13.2.2 ***Test methods***

13.2.2.1 ***General specifications***

The tests are carried out in accordance with the requirements of (PS:…….) ISO 3822: Part 1 and 3822: Part 2.

13.2.2.2 ***Particular specifications***

Only the 0,3 MPa (3 bar) test is used for determining the acoustic group of the fittings.

NOTE: If necessary, tests at different pressures may be carried out in conformity with national regulations if they exist, and in accordance with the national criteria in force.

13.3 **Test criteria**

13.3.1 ***Expression of the results***

The results of the measurements carried out in accordance with (PS:…….) ISO 3822 shall be expressed in two ways:

13.3.1.1 ***Standardized level difference:***

D_s in dB (A)

This magnitude is defined by $D_s = L_s - L$

Where

L_s is the average sound level (A) or the average octave band sound pressure level in the test room, due to the noise produced by the installation noise standard at a water pressure of 0,3 MPa (3 bar).

L is the corresponding level of the noise produced by the appliance under test under specified conditions.

L_s and L are expressed in dB (A) or in decibels per bands.

The higher the magnitude D_s, the quieter the tap.

13.3.1.2 ***Acoustic level Lap in dB (A)***

This magnitude Lap is defined by the relationship:

$L_{ap} = L_{sr} - D_s$

Or

$L_{ap} = L_{sr} + L - L_s$

L_{sr} is a reference level (in sound level A or in octave bands), given by the standard generator supplied at a pressure of 0,3 MPa (3 bar).

The smaller the magnitude L_{ap} the quieter the tap.

13.3.2 ***Determination of the groups***

The fittings may be classified into the following groups in accordance with the D_s or L_{ap} values obtained at 0,3 MP a (3 bar).

Table 14 : acoustic groups

GROUP	D_s in dB (A)	L_{ap} in dB (A)
I	≥ 25	≤ 20
II	≥ 15	≤ 30
Not classified	< 15	> 30

13.3.3 ***Class of hydraulic resistance***

If the fittings include an aerator and/or outlet for shower accessory, the measurement is carried out without these accessories as they are the subject of special acoustic measurements. The tests are then carried out replacing these accessories with a hydraulic resistance, having calibrated flow in accordance with annex A of (PS:…….) ISO 3822/4 and , where applicable, with adaptors as in annexes B and C of (PS:…….) ISO 3822/4.

If they are tested on their own, the hydraulic resistances determine 5 classes as a function of their flow rate at 0,3 MPa (3 bar):

Class A q = 0,25 1/s
Class S q = 0,33 1/s
Class B q = 0,42 1/s
Class C q = 0,50 1/s
Class D q = 0,63 1/s

The tapware is connected to the class of hydraulic resistance with calibrated flow with which they were tested, without its flow necessarily being the one determining the class of the hydraulic resistance, however.

Fittings without any accessories are tested as they are, under 3 MPa (3 bar).

APPENDIX A
(informative)

Appendix given as a supplement to clause 10

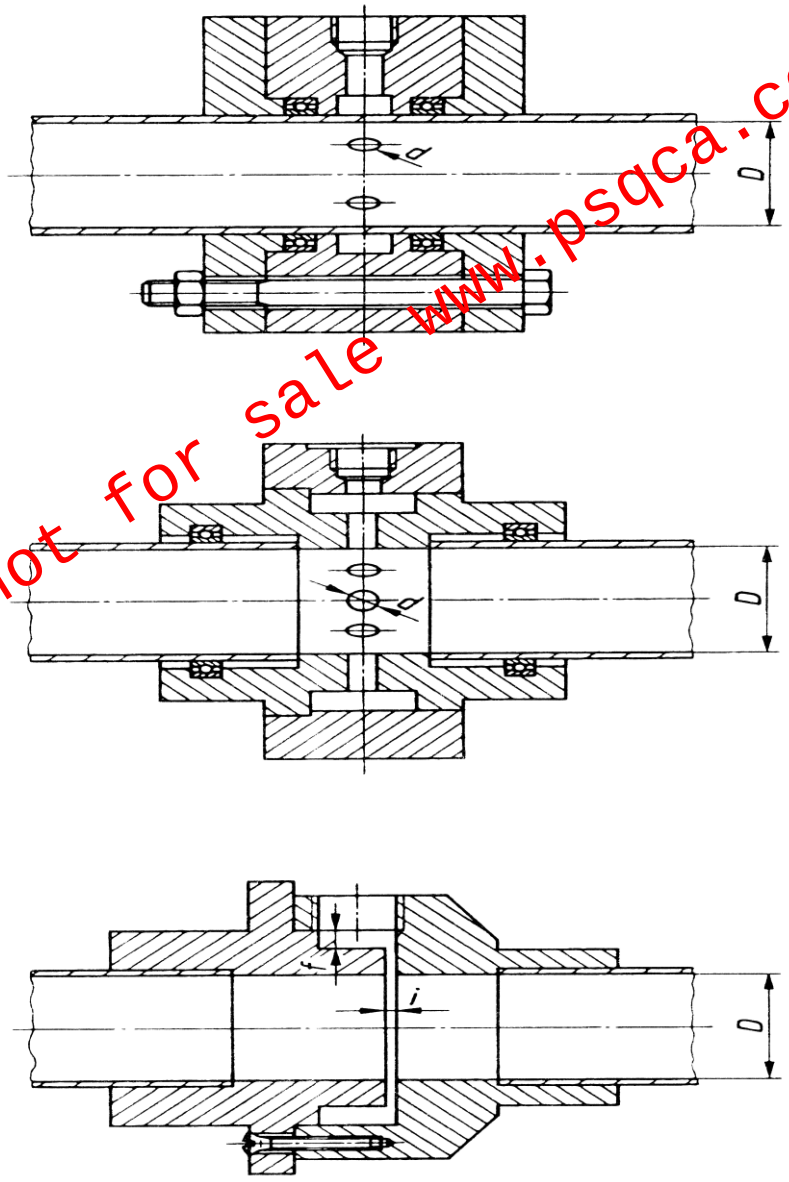


Figure 17 : Pressure gauge tappings (examples)

Appendix A
(informative)

RECOMMENDATIONS FOR THE CONSTRUCTION OF PRESSURE TAKE OFF TEES

Figure 17 gives three examples of pressure take off tees giving equivalent results:

a) with individual pressure orifices: Types A and B;

b) annular slit: Type C.

Specifications on the design and construction of pressure take off tees are given in (PS:……) ISO 5167 – 1980.

The main principles are given below :

INDIVIDUAL PRESSURE ORIFICE:

The axis of the pressure orifices should intersect the axis of the piping (or of the casing) and be perpendicular to it.

The mouth of the hole should be circular. The edges should be flush with the wall of the piping (or the casing) and as sharp as possible. Slight round-off is permitted (radius ≤ $1/10^{th}$ diameter of the pressure orifice).

The diameter of the pressure orifice should be less than 0,1 D (D: internal diameter of the tube or casing).

The pressure orifices should be even in number. There should be at least four of them. The angles formed by the arcs of the pressure orifices should be approximately equal.

The area of the free cross section of the annular chamber of the pressure orifices should be equal to or greater than half the total surface of the pressure orifice opening linking the chamber to the piping.

ANNULAR SLIT:

The thickness f of the annular slit should be equal to or greater than twice the width i of the slit.

The area of the free cross section of the annular chamber should be equal to or greater than half the total surface of the annular slit linking the chamber to the piping.

All surfaces coming into contact with the fluid measured should be clean and well finished.

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