Finalized Draft From Technical Committee

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NEPAL STANDARD

COPPER ALLOY SINGLE TAPS, COMBINATION TAP ASSEMBLIES, STOP VALVES AND SINGLE LEVER MIXERS FOR WATER SERVICES - SPECIFICATION

Government of Nepal

Ministry of Industry, Commerce and Supplies

Nepal Bureau of Standards and Metrology (NBSM)

Kathmandu, Nepal

www.nbsm.gov.np

1 SCOPE

This standard lays down the requirements regarding materials, manufacture, workmanship, construction, dimensions, finish and testing of nickel-chromium plated copper alloy non-rising spindle type single pillar and bib taps, combination tap assemblies, stop valves and single lever mixers suitable for operation from 0.05 MPa to 0.5 MPa pressure at maximum temperature of 65 °C.

2 REFERENCES

The standards given in Annex A contain provisions, which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in **Annex A.**

3 TERMINOLOGY

For the purpose of this standard, the definitions given in NS *** (Glossary of terms relating to water supply and sanitation) shall apply, in addition to the following.

3.1 Combination Tap Assembly

3.1.1 Pillar Mounted Combination — The tap assembly with a vertical inlet and a nozzle arranged to discharge in a downward direction (such as single hole and three- hole combination tap assemblies for wash basin),suitable for mounting on a horizontal surface.

3.1.2 Wall Mounted Combination — The tap assembly with a horizontal inlet and a nozzle arranged to discharge in a downward direction (such as bath and sink combination tap assemblies), suitable for mounting on vertical surface.

3.2 Angle Stop Valve — A valve with the inlet and outlet at right angles to each other and is intended to facilitate servicing of water fittings or appliances.

3.3 Single Lever Mixer — Mixing valve which mixes hot and cold water and which, by means of a control device, allows the user to adjust between ‘all cold water’ and ‘all hot water’, which implies the flow rate of the mixture obtained may be adjusted between ‘no flow’ and ‘maximum flow’ using the same control/operational device (lever/handle).

4 CLASSIFICATION AND NOMINAL SIZES

The nominal size shall be designated by the nominal bore of the pipe outlet to which the taps and valves are normally fitted. The nominal size shall be as follows for each of the type of the product as per this standard:

Sl No.	*Types of Tap*	*Nominal Size*
(1)	(2)	(3)
i)	Pillar tap	15 mm
ii)	Bib tap	15 mm
iii)	Combination tap assembly a) Wall mounted combination tap assembly b) Pillar mounted combination tap assembly	15 mm
iv)	Stop valve	15 mm and 20 mm
v)	Angle stop valve	15 mm and 20 mm
vi)	Single lever mixer a) Single lever concealed bath and shower mixer with diverter b) Single lever pillar mounted sink mixer with swivel spout c) Single lever pillar mounted basin mixer d) Single lever wall mounted sink mixer with swivel spout e) Single lever bath and shower mixer	15 mm

5 MATERIAL

Material, used for different components/parts of taps, stop valves and mixers shall be in accordance with Table 1, except for cartridges for single lever mixers.

Table 1 Material for Components/Parts of Single Taps, Combination Tap Assemblies, Stop Valves and Mixers

(Clauses 5, 6.11.1, 6.11.2 and 7.1.3.4)

All dimensions in millimetres.

Sl No.	Component	Material	Conforming to
(1)	(2)	(3)	(4)
i)	Body, body components, inlet tubes, nozzle, bonnet and back nuts	a) Cast brass	ANNEX G
		b) Die cast brass[1)]	ANNEX H
		c) Forged brass	ANNEX I
		d) Brass rods	ANNEX J
		e) Brass tubes	ANNEX K
		f) Copper Tubes	ANNEX L
ii)	Flanges, diverter and diverter components	a) Cast brass	ANNEX G
		b) Die cast brass[1)]	ANNEX H
		c) Forged brass	ANNEX I
		d) Brass rods	ANNEX J
		e) Brass sheet	ANNEX M
		f) Stainless steel sheet	ANNEX N
		g) Acrylonitrile butadiene styrene (ABS)	–
iii)	Spindle, glands, washer plate, nuts, screws and pin	a) Brass rods (Extruded or rolled)	ANNEX J
		b) Forged brass	ANNEX I
iv)	Circlip, wire locks	a) Phosphor bronze sheet	ANNEX O
		b) Phosphor bronze wire	ANNEX P
		c) Stainless steel	ANNEX Q
v)	'O' ring, gasket and seat washer	a) Synthetic rubber	ISO 3601-1
		b) Neoprene rubber	–
		c) Acrylonitrille butadiene rubber (NBR)	–
		d) Synthetic butadiene rubber (SBR)	–
vi)	Knob, knob components	a) Cast brass	ANNEX G
		b) Die cast brass[1)]	ANNEX H
		c) Forged brass	ANNEX I
		d) Brass rods	ANNEX J
		e) Zinc base alloys	ANNEX R
		f) Plastic [Polyacetal, Polypropylene, Acrylonitrile butadiene styrene (ABS), Arcylics-Polymethyl-Methacrylates, Nylon- Polymides]	–

[1)] Conformity only with chemical composition to be complied with.

6 MANUFACTURE, WORKMANSHIP AND CONSTRUCTION

6.1 General

Figures appearing in this standard are illustrative and do not specify design features. However, dimensions as specified shall be complied with.

6.2 Casting shall in all respects be sound and free from defects like laps, blowholes and pitting. External and internal surfaces shall be clean, smooth and free from sand. They shall be neatly dressed and no casting shall be burned, plugged stopped and patched.

6.3 Forging shall be sound without lamination, smooth and well finished.

6.4 Knobs shall be sound and free from cracks, spots and blow holes. However, shrinkage marks appearing due to processing are permissible on internal surface so as to not affect the appearance and performances of the knobs.

6.5 Machining

The body, bonnet, spindle and other parts shall be machined true, so that when assembled, the parts shall be axial parallel and cylindrical, with surface smoothly finished within the limits of dimensions specified for various components.

6.6 Screw Threads

6.6.1 The inlets and outlet connection threads whether internal or external, shall be a pipe thread conforming to either ISO 7-1 or ISO 228-1. This requirement does not apply to single hole combination tap assembly and single lever mixer.

6.6.2 The length of spindle threads shall be such that when the washer plate is resting on the seating without any washer, a length of thread equal to not less than 50 percent of the external diameter of the threaded portion of the spindle shall be in full engagement with the internal thread of the washer plate.

6.7 Waterway

6.7.1 Except where otherwise specified in this standard, the area of waterway throughout the body of a tap or valve shall not be less than the area of a circle of diameter equal to the minimum bore of seating specified in Table 2.

6.7.2 In any single outlet combination tap assembly the area of waterway through the individual tap shall be as specified in 6.7.1 up to the junction of the two tap outlet with the combined outlet. The internal diameter of a combined outlet shall not be less than 15 mm. If the combined outlet is not circular it shall have an area of waterway not less than the area of a circle of diameter equal to 15 mm.

6.7.3 In a combination tap assembly with diverter for bath and shower, the area of waterway may be reduced below the bore specified in 6.7.1.

6.7.4 In case of a single lever mixer, the minimum waterway in the whole product shall be have an area not less than the area of a circle of diameter equal to 6.5 mm.

6.8 Flow Straightening and Aerating Device

Taps may be fitted with flow straightening and aerating devices at manufacturer's option.

NOTES

1 Flow straightening of the corrugated sleeve or moulded plastic may be incorporated at the outlet within the nozzle of the tap. It may be noted that straighteners usually reduce the area of waterway.

2 Flow straightening and aerating device which incorporate a multiplicity of small orifices, that is those containing wire gauge or perforated plates, shall be screwed type and be easily removable for cleaning purpose. It should be noted that when aerators are fitted there is usually a reduction in flow.

6.9 Body Seats

6.9.1 The seat may be integral with the body or may be separate renewable seat rings, screwed into body and shall have serations or slots or any other not less efficient device to facilitate renewal. The area through the renewable seat ring shall be at least equal to a circle of diameter equal to the minimum bore of seating specified in Table 2. Seat ring faces shall be finished smooth and edges shall be deburred.

6.9.2 The body shall be machined so that when the body and seat are assembled and secured in position they are co-axial and the faces of seat and body are parallel.

6.10 Bonnet Assembly

The surface forming the body to bonnet joint shall be machined smooth. The joint may be with a gasket or an 'O' ring.

NOTE — For single lever mixers, the term 'operating mechanism' is used in place of 'bonnet assembly'.

6.11 Gland Packing

6.11.1 Except as specified in **6.11.2,** the gland or stuffing box shall be packed with, gland packing as per Sl No. (v) of Table 1, suitable for both cold and hot water. A suitable washer as per Sl No. (v) of Table 1 may also be fitted in the bottom of stuffing box but this may be omitted if the packing is in the form of a moulded composition packing ring.

6.11.2 When 'O' rings are to be employed for the gland seal, a minimum of two 'O' rings as per Sl No. (v) of Table 1 shall be fitted in spindle. They shall be capable of being renewed.

6.12 Flanges

Taps designed for mounting on to flat surfaces may have integral or separate flanges.

6.13 Knob

All knobs shall be close fit on a squared or serrated spindle. The knob may be secured by a screw or using any other efficient device, provided that the minimum cross-sectional area of attachment is not less than the equivalent square for that size of spindle. The knob shall not have any threads so as to screw it directly to the spindle. A non-metallic insert may be provided between knob and the spindle to restrict the heat transfer, when hot water is flowing.

7 DIMENSIONS

7.1 Single Pillar and Bib Tap, Combination Tap Assembly, Stop Valve and Angle Stop Valve

7.1.1 Minimum Thickness

Except where a lesser thickness is specified, no point of body subjected to direct water pressure shall have a thickness less than 2.0 mm. However, in the case of single tap and combination tap

assemblies, the open outlet nozzle portion may be reduced to 1.6 mm in case of castings and forging and to 0.6 mm when drawn tubes are used.

7.1.2 Body

7.1.2.1 The dimensions of body to bonnet connection and seat shall conform to the dimensions specified in Table 2, read with Fig. 1.

7.1.2.2 The seat edges shall be rounded off to avoid cutting edges.

7.1.2.3 Square or lugs on the shank under the flange of pillar tap known as locating feature is an optional feature. Where provided, it shall not exceed the following dimensions:

a) Circumscribed diameter of locating feature: 29 mm

b) Depth of locating feature under flange: 5 mm

7.1.2.4 Dimensions of bodies of pillar taps and bib taps shall conform to those specified in Table 3 read with Fig. 2, and Table 4 read with Fig. 3, respectively.

7.1.2.5 Dimensions of bodies for stop valves including angle stop valves shall conform to those specified in Table 5 read with Fig. 4.

7.1.2.6 Dimensions of bodies for wall mounted combination tap assembly shall conform to those specified in Table 6 read with Fig. 5. Dimensions of bodies of one-hole and three-hole pillar mounted combination tap assemblies shall conform to those specified in Table 7 read with Fig. 6 and Table 8 read with Fig. 7, respectively.

7.1.3 Bonnet Assembly

7.1.3.1 Spindle, bonnet, washer plate and other parts shall be machined true, so that when assembled, the parts shall be axial, parallel and cylindrical with surface smoothly finished.

7.1.3.2 The dimensions of bonnet assembly shall conform to those specified in Table 9 read with Fig. 8.

7.1.3.3 Washer plate

7.1.3.3.1 The washer plate shall be shrouded or flat type, made from one piece and shall be machined all over.

7.1.3.3.2 The part of washer plate that prevents turning shall be either two flats, a square, a hexagon or any other shape that prevents turning.

7.1.3.3.3 The seat washer shall be affixed to the washer plate. The connection between the seat washer and its housing shall be ensured by a screw, a nut or any other means that ensures the firm seating of the washer in its place.

7.1.3.3.4 The minimum lift of washer plate with washer in position shall be 3.5 mm and 5.0 mm, respectively for 15 mm and 20 mm nominal bore taps and valves.

7.1.3.4 The seat washer shall be as per Sl No. (v) of Table 1 and should be suitable for heat resistant applications.

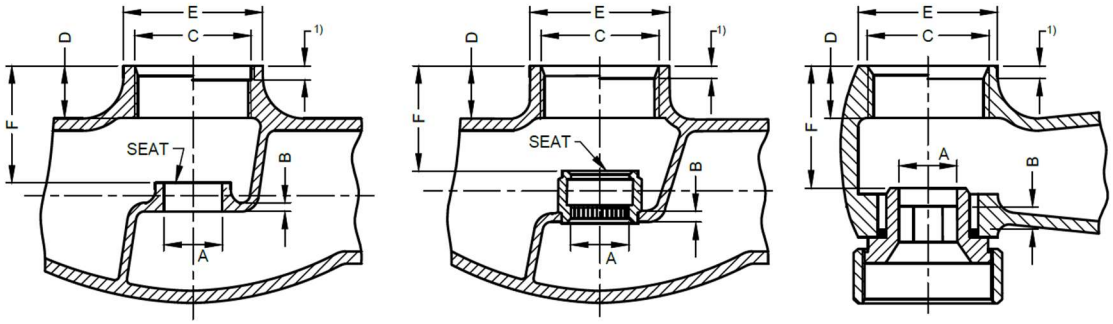
7.2 Single Lever Mixer

7.2.1 Dimensions of bodies for concealed diverter for bath and shower mixer shall conform to those specified in Table 10 read with Fig. 9. Dimensions of bodies for single lever sink mixer with swivel spout shall conform to those specified in Table 11 read with Fig. 10. Dimensions of bodies for single lever pillar mounted basin mixer shall conform to those specified in Table 12 read with Fig. 11. Dimensions of bodies for wall mounted single lever sink mixer with swivel spout shall conform to those specified in Table 13 read with Fig. 12. Dimensions of bodies for single lever bath and shower mixer shall conform to those specified in Table 14 read with Fig. 13.

7.2.2 Diameter of Single Lever Cartridge

The minimum nominal diameter of the single lever mixer cartridge shall be 35 mm.

7.2.3 Wherever the nuts are used for connecting the mixers with the braided pipe, the minimum thickness of the nuts shall be 2 mm.



1) OPTIONAL RECESSED TO A DEPTH NOT EXCEEDING 2½ THREADS

NOTE — The design shown are typical/illustrative. However, the dimensional details are for compliance.

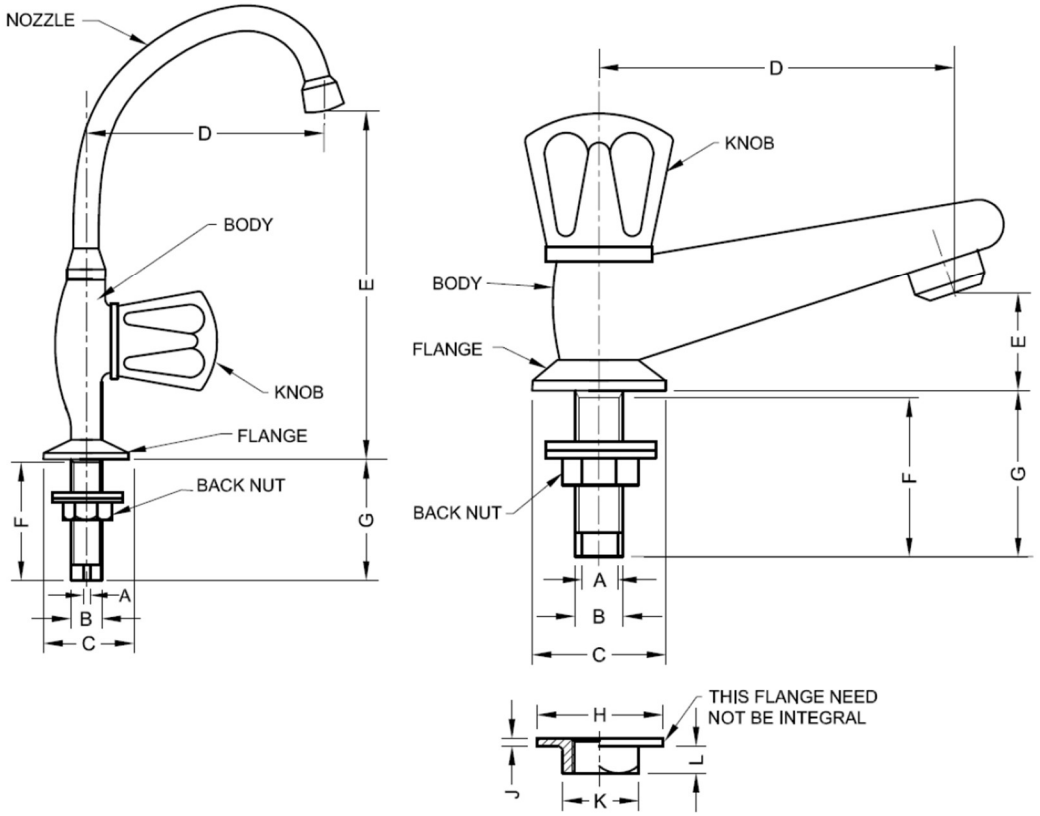
Fig. 1 TYPICAL DETAILS OF BODY TO BONNET CONNECTION

Table 2 Dimension of Body to Bonnet Connection

(Clauses 6.7.1, 6.9.1 and 7.1.2.1)

All dimensions in millimetres.

Sl No.	**Particular** (*see* Fig. 1)	**Dimensions for Nominal Size**	
		15	20
(1)	(2)	(3)	(4)
i)	Bore of seating, *A*	10.0 to 12.0	12.7 to 16.5
ii)	Thickness of metal supporting seat, *B*	2.0, *Min*	2.0, *Min*
iii)	Connection thread, *C*	G 1/2[1)]	G 3/4[1)]
iv)	Length of internal thread on body, *D*	9.0, *Min*	9.0, *Min*
v)	Outer diameter of body, *E*	24.0, *Min*	31.0, *Min*
vi)	Face of body to face of seating, *F*	21.0, *Min*	24.0, *Min*
[1)] Conforming to ISO 228-1.			



NOTE — The designs shown are typical/illustrative. However, the dimensional details are for compliance.

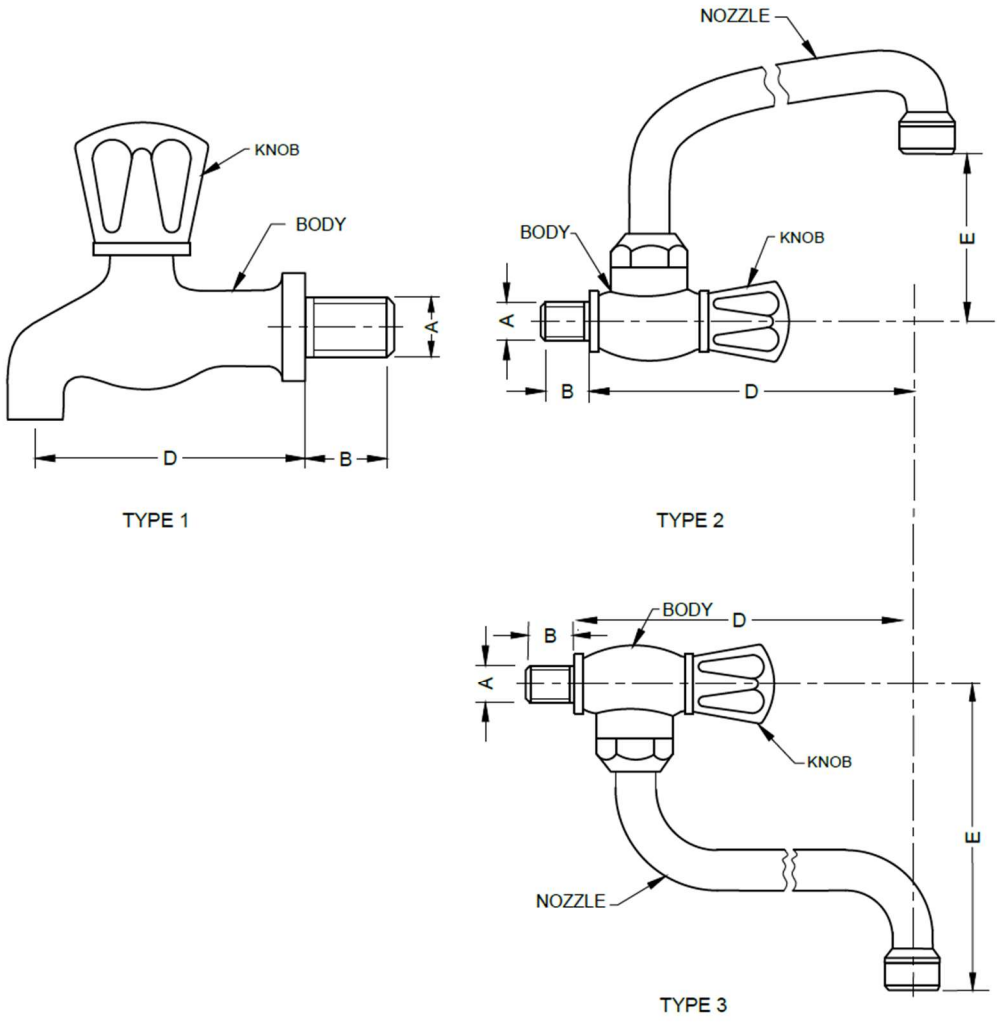
Fig. 2 TYPICAL DETAILS OF BODIES FOR PILLAR TAPS

Table 3 Dimensions of Bodies for Pillar Tap, Nominal Size 15 mm

(Clause 7.1.2.4)

All dimensions in millimetres.

Sl No.	Particulars (*see* Fig. 2)	Dimensions
(1)	(2)	(3)
i)	Bore of inlet shank, *A*	14.5, *Max*
ii)	Thread of inlet shank, *B*	G1/2 B[1)]
iii)	Diameter of base of flange, *C*	42, *Min*
iv)	Horizontal length from centre of body to centre of outlet, *D*	80, *Min*
v)	Height from flange to centre of outlet, *E*	25, *Min*
vi)	Length of thread, *F*	42, *Min*
vii)	Length of shank, *G*	50, *Min*
viii)	Diameter of flange, *H*	38, *Min*
ix)	Thickness of flange, *J*	2, *Min*
x)	Size across flats, *K*	25, *Min*
xi)	Heights of flats, *L*	7, *Min*
[1)] Conforming to ISO 228-1.		



NOTE — The designs shown are typical/illustrative. However, the dimensional details are for compliance.

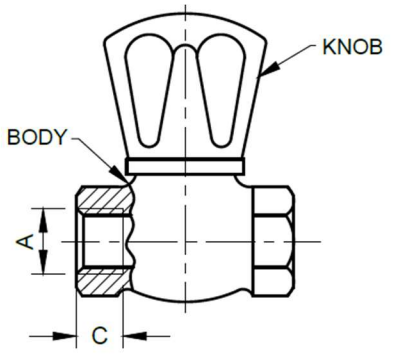
Fig 3 TYPICAL DETAILS OF BODIES FOR BIB TAPS

Table 4 Dimensions of Bodies for Bib Tap, Nominal Size 15 mm

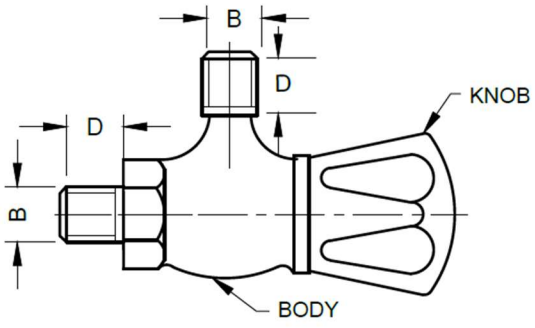
(Clause 7.1.2.4)

All dimensions in millimetres.

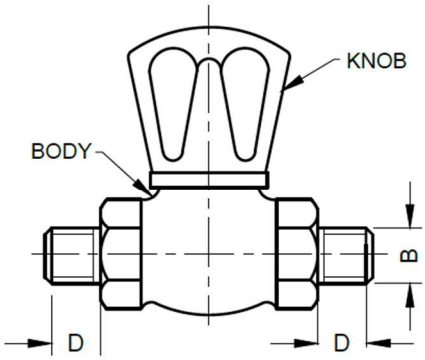
Sl No.	**Particular** (*see* Fig 3)	**Dimensions**
		Min
(1)	(2)	(3)
i)	Thread of Inlet shank, *A*	G 1/2 B[1] / R 1/2[1]
ii)	Length of shank, *B*	11, *Min*
iii)	Length from flange to centre of spout, *D*	70, *Min* for Type 1 150, *Min* for Type 2 and Type 3
iv)	Height between centre of the body and centre of spout, *E*	20, *Min*
[1] Conforming to ISO 228-1 or ISO 7-1		



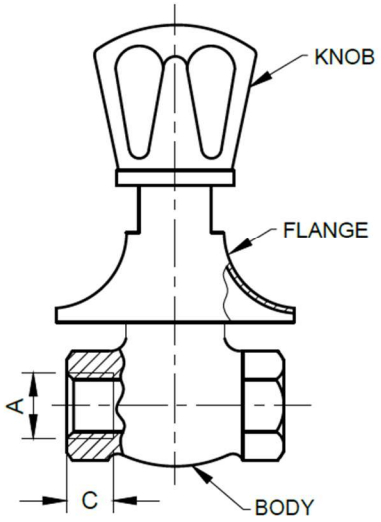
4A STOP VALVE WITH INTERNAL THREAD



4B ANGLE STOP VALVE



4C STOP VALVE WITH EXTERNAL THREAD



4D CONCEALED STOP VALVE

NOTE — The designs shown are typical/illustrative. However, the dimensional details are for compliance.

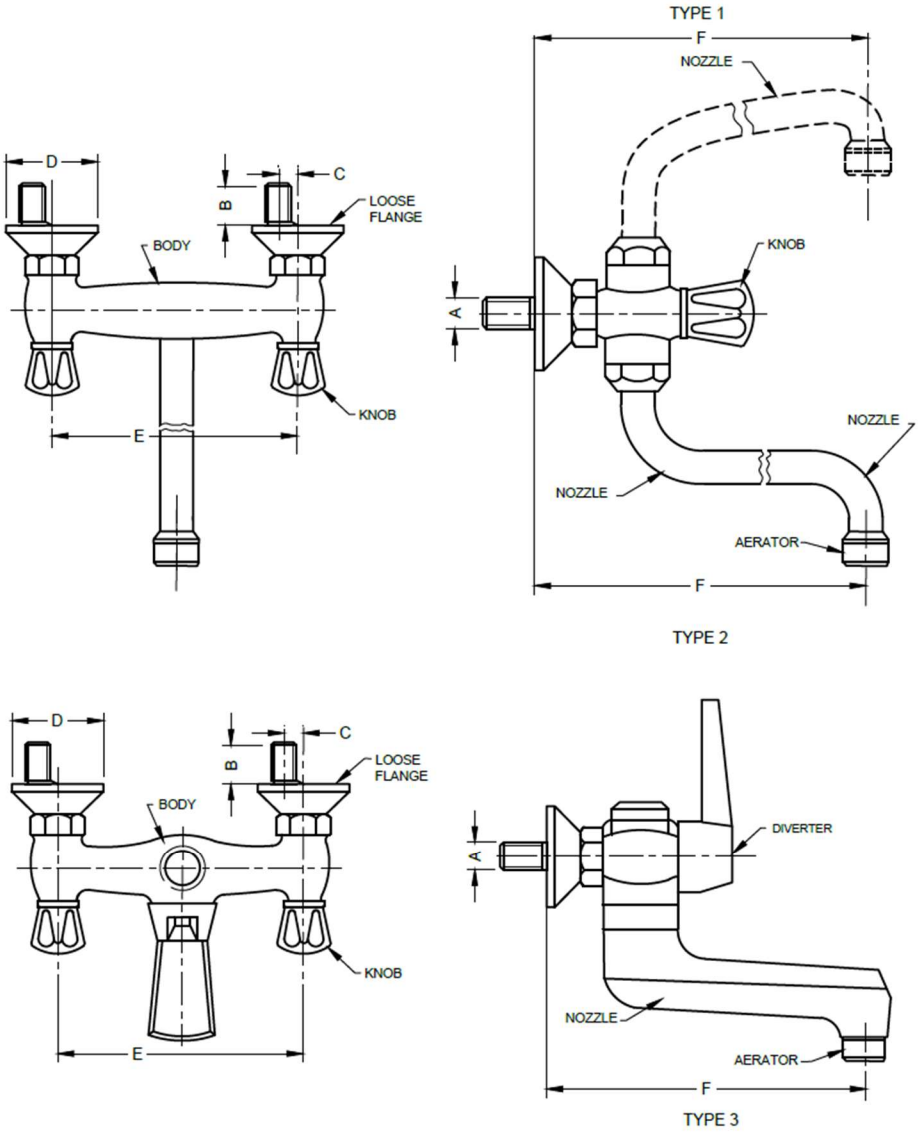
FIG. 4 TYPICAL DETAILS OF BODIES FOR STOP VALVES AND ANGLE STOP VALVES

Table 5 Dimensions of Bodies for Stop Valves and Angle Stop Valves

(Clause 7.1.2.5)

All dimensions in millimetres.

Sl No.	**Particulars** (*see* Fig. 4)	**Dimensions for Nominal Size**	
		15	20
(1)	(2)	(3)	(4)
i)	Thread of inlet shank, *A* (*see* Fig. 4A and Fig. 4D)	G 1/2[1)]/Rp 1/2[1)]	G 3/4[1)]/Rp 3/4[1)]
ii)	Thread of inlet shank, *B* (*see* Fig. 4B and Fig. 4C)	G 1/2 B[1)]/R 1/2[1)]	G 3/4 B[1)]/R 3/4[1)]
iii)	Length of shank, *C* (*see* Fig. 4A and Fig. 4D)	9, *Min*	10.5, *Min*
iv)	Length of shank, *D* (*see* Fig. 4B and Fig. 4C)	11, *Min*	12, *Min*
[1)] Conforming to ISO 228-1 or ISO 7-1.			



NOTE — The designs shown are typical/illustrative. However, the dimensional details are for compliance.

FIG. 5 TYPICAL DETAILS OF BODIES FOR WALL MOUNTED COMBINATION TAP ASSEMBLY

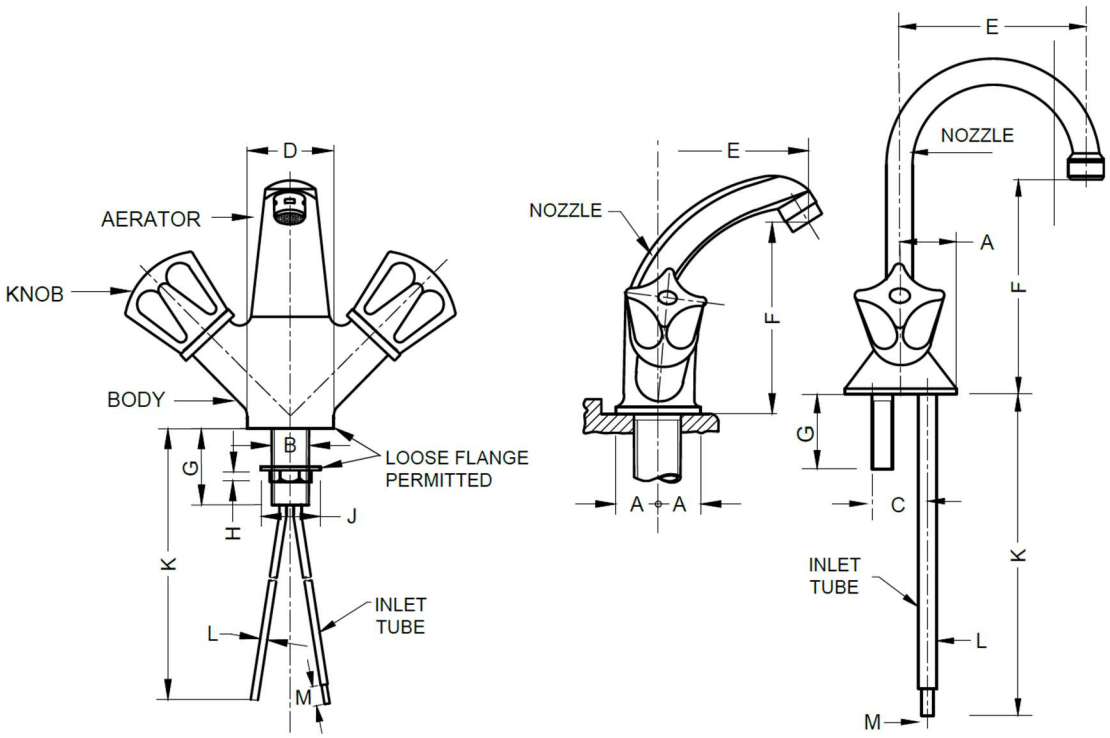
Table 6 Dimensions of Bodies for Wall Mounted Combination Tap Assembly, Nominal Size 15 mm

(Clause 7.1.2.6)

All dimensions in millimetres.

Sl No.	Particulars (*see* Fig. 5)	Dimensions
(1)	(2)	(3)
i)	Thread of inlet shank, *A*	G 1/2 B[1)]
ii)	Length of inlet shank, *B*	25, *Min*
iii)	Adjustment range of S-union, *C*	5, *Min*
iv)	Diameter of flange, *D*	50, *Min*
v)	Distance between centres of inlets, *E*	148, *Min*
vi)	Length from flange to centre of spout, *F*	200, *Min* for Type 1 and Type 2 135, *Min* for Type 3

[1)] Conforming to ISO 228-1 or ISO 7-1.



NOTE — The designs shown are typical/illustrative. However, the dimensional details are for compliance.

FIG. 6 TYPICAL DETAILS OF BODIES FOR ONE-HOLE PILLAR MOUNTED COMBINATION TAP ASSEMBLY

Table 7 Dimensions of Bodies for One-hole Pillar Mounted Combination Tap Assembly, Nominal Size 15 mm

(Clause 7.1.2.6)

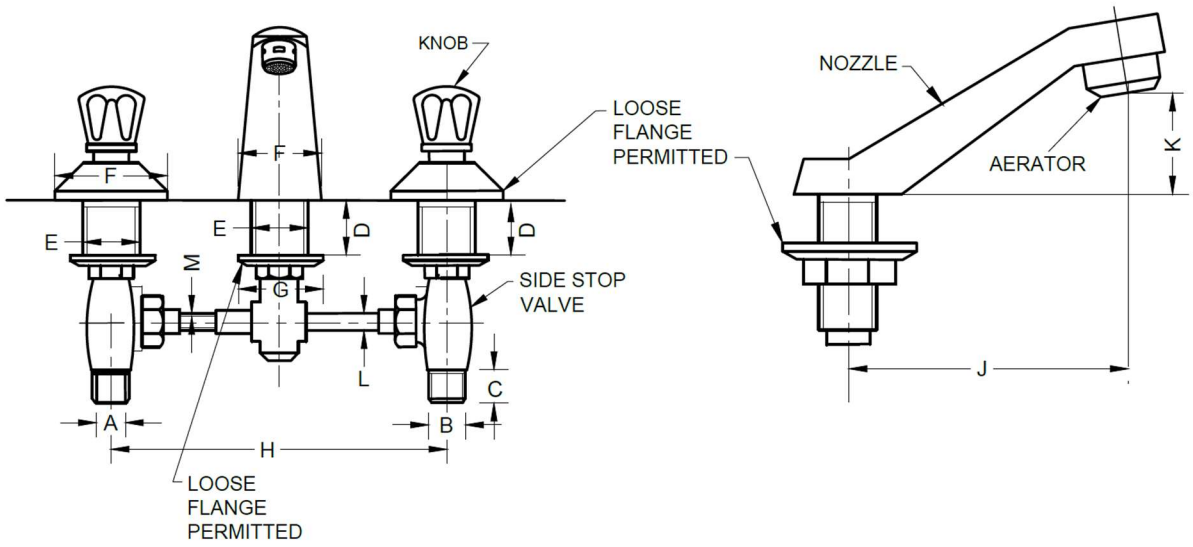
All dimensions in millimetres.

Sl No.	**Particulars** (*see* Fig. 6)	Dimensions
(1)	(2)	(3)
i)	Dimension of base form centre of body, *A*	21, *Min*
ii)	Diameter of shank, *B*	33, *Max*
iii)	Outlet dimension, *C*	33.5, *Max*
iv)	Smallest dimension of flange, *D*	42, *Min*
v)	Horizontal length from centre of body to centre of outlet, *E*	80, *Min*
vi)	Height from flange to centre of spout, *F*	40, *Min*
vii)	Length of threaded shank, *G*	25, *Min*
viii)	Depth of hexagon, *H*	7, *Min*
ix)	Diameter of flange, *J*	42, *Min*
x)	Length of connection, *K*	350, *Min*
xi)	Mean outside diameter of copper tube, *L*	9.5, *Min*
xii)	Mean thickness of tube, *M*	0.6, *Min*

NOTES

1 The inlet tubes made of soft annealed copper tubes.

2 Braided hoses may be used, however, it should withstand minimum static pressure of 1 N/mm^2.



NOTE — The design shown is typical/illustrative. However, the dimensional details are for compliance.

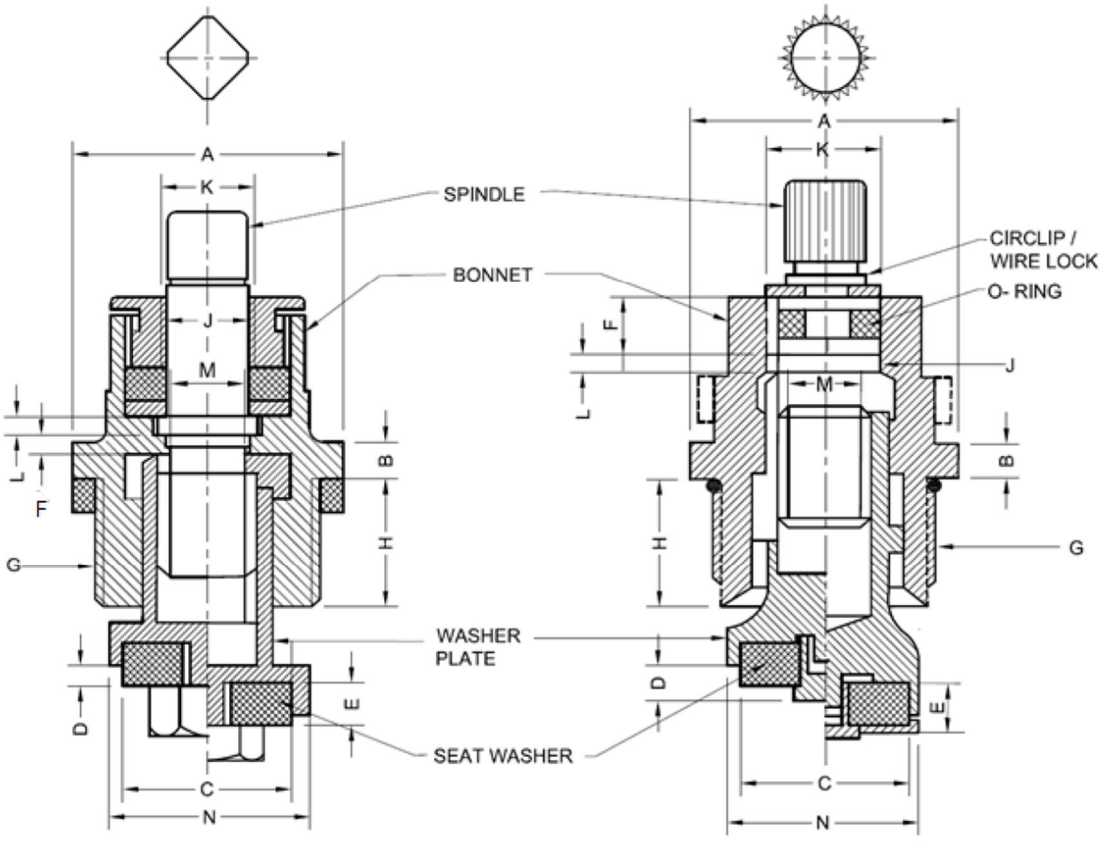
Fig. 7 TYPICAL DETAILS OF BODIES FOR THREE-HOLE PILLAR MOUNTED COMBINATION TAP ASSEMBLY

Table 8 Dimensions of Bodies for Three-hole Pillar Mounted Combination Tap Assembly, Nominal Size 15 mm

(Clause 7.1.2.6)

All dimensions in millimetres.

Sl No.	**Particulars** (*see* Fig. 7)	**Dimensions**
(1)	(2)	(3)
i)	Bore of inlet shank, *A*	14.5, *Max*
ii)	Thread of inlet shank, *B*	G1/2 B[1)]
iii)	Length of external threaded shank, *C*	8, *Min*
iv)	Height for tightening (adjustable), *D*	5, *Min*
v)	Diameter of shank, *E*	29, *Min*
vi)	Smallest dimension of flange, *F*	42 to 62
vii)	Diameter of flange, *G*	42, *Min*
viii)	Distance between centres of inlet, *H*	195, *Min*
ix)	Horizontal length from centre of body to centre of outlet, *J*	90, *Min*
x)	Height from base of the body to centre of outlet, *K*	25 to 125
xi)	Mean outside diameter of copper tube, *L*	9.5, *Min*
xii)	Mean thickness of tube, *M*	0.6, *Min*
[1)] Conforming to ISO 228-1.		



NOTE — The design shown is typical/illustrative. However, the dimensional details are for compliance.

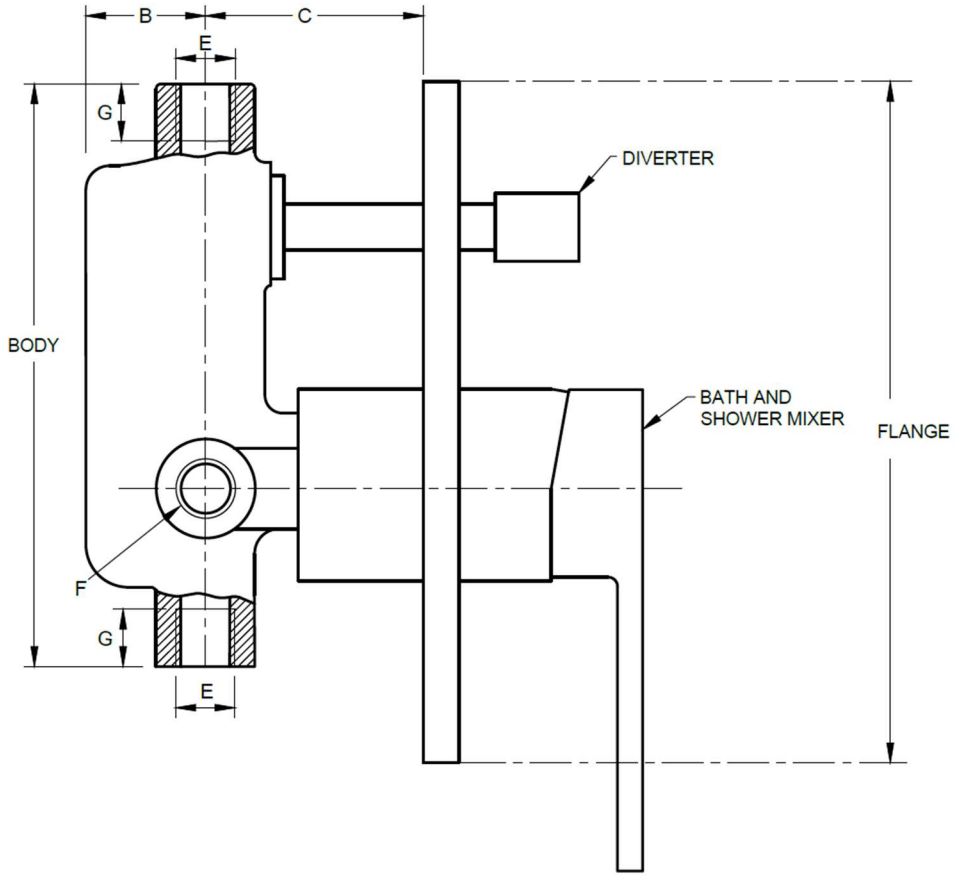
FIG. 8 TYPICAL DETAILS OF BODIES OF BONNET ASSEMBLY

Table 9 Dimensions of Bodies of Bonnet Assembly

(Clause 7.1.3.2)

All dimensions in millimetres.

Sl No.	**Particulars** (*see* Fig 8)	**Dimensions for Nominal Size**	
		15	20
(1)	(2)	(3)	(4)
i)	Diameter, *A*	24, *Min*	30, *Min*
ii)	Thickness, *B*	2.0, *Min*	2.5, *Min*
iii)	Diameter of seat washer, *C*	15.6, *Min*	20.6, *Min*
iv)	Projection from edge of washer plate, *D* (applicable for shrouded type only)	1, *Min*	1, *Min*
v)	Thickness of seat washer, *E*	4, *Min*	4, *Min*
vi)	Length of closing thrust collar of bonnet, *F*	2.0, *Min*	2.5, *Min*
vii)	Thread, *G*	G 1/2 B[1)]	G 3/4 B[1)]
viii)	Length, *H*	8, *Min*	9, *Min*
ix)	Diameter of spindle, *J*	6.5, *Min*	9, *Min*
x)	Diameter of thrust collar, *K*	11.8, *Min*	13.8, *Min*
xi)	Thickness of thrust collar, *L*	1.5, *Min*	1.5, *Min*
xii)	Core diameter of spindle actuating, *M*	6.0, *Min*	8.0, *Min*
xiii)	Outside diameter of washer plate, *N*	17.6, *Max*	24, *Max*
[1)] Conforming to ISO 228-1.			



NOTE — The design shown is typical/illustrative. However, the dimensional details are for compliance.

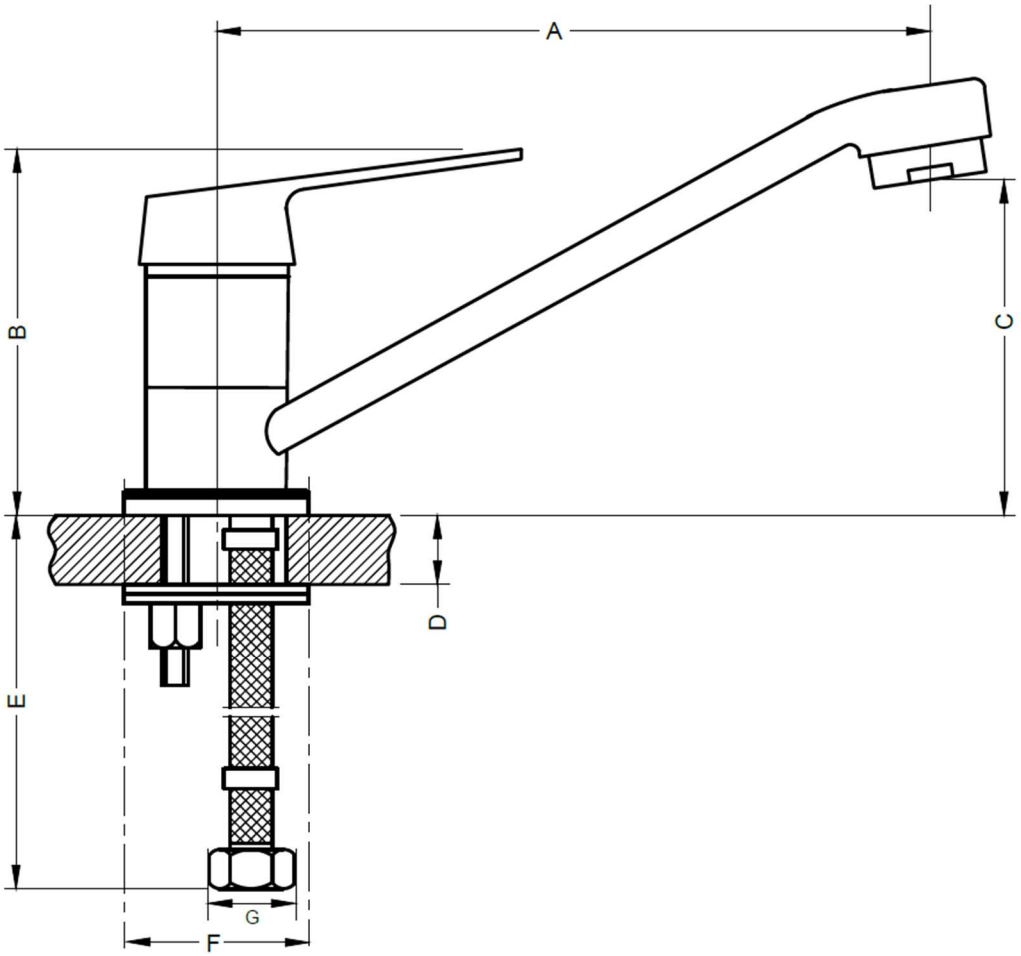
FIG. 9 TYPICAL DETAILS OF BODY OF SINGLE LEVER CONCEALED BATH AND SHOWER MIXER WITH DIVERTER

Table 10 Dimensions of Body for Single Lever Concealed Bath and Shower Mixer with Diverter

(Clause 7.2.1)

All dimensions in millimetres.

Sl No.	**Particular** (*see* Fig. 9)	**Dimensions**
(1)	(2)	(3)
i)	Dimension of flange, *A*	a) Round flange – ϕ140, *Min* b) Rectangular shape – 100 (W) × 140 (L), *Min* c) Square shape – 140 × 140, *Min*
ii)	Distance between the centre of the thread to the back edge of the flange, *B*	25, *Min*
iii)	Distance between the centre of the thread to the back of the body, *C*	45, *Max*
iv)	Dimensions of the flange	125 (L) × 50 (W), *Min*
v)	Thread of inlet/outlet, E	G 1/2 B[1)] for inlet G 1/2 B[1)] or G 3/4 B[1)] for outlet
vi)	Length of the inlet/outlet thread, *F*	12, *Min* (for both inlet and outlet)
[1)] Conforming to ISO 228-1 or ISO 7-1.		



NOTE — The design shown is typical/illustrative. However, the dimensional details are for compliance.

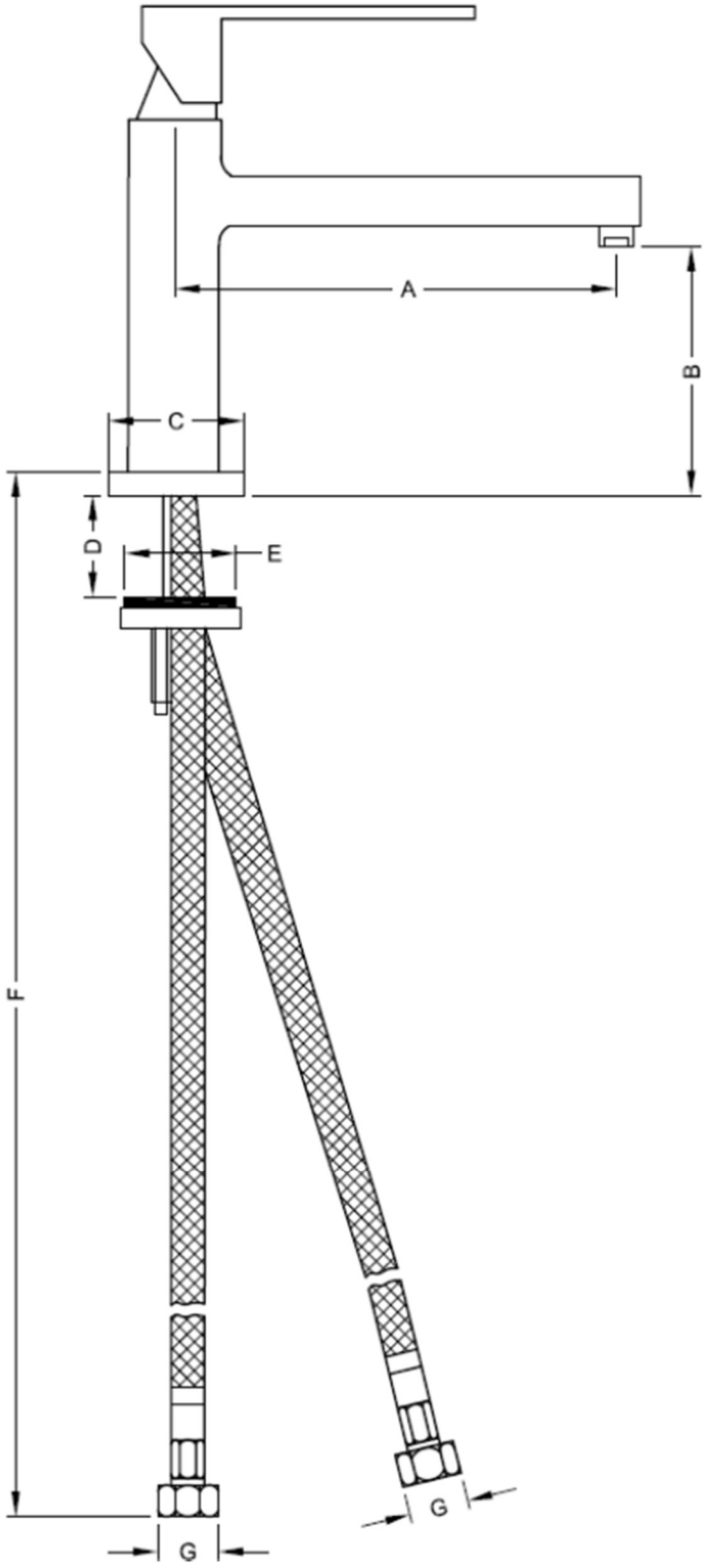
Fig. 10 TYPICAL DETAILS OF BODY OF SINGLE LEVER PILLAR MOUNTED SINK MIXER WITH SWIVEL SPOUT

Table 11 Dimensions of Body for Single Lever Pillar Mounted Sink Mixer with Swivel Spout

(Clause 7.2.1)

All dimensions in millimetres

Sl No.	**Particulars** (*see* Fig. 10)	**Dimensions**
(1)	(2)	(3)
i)	Horizontal length from the centre of the body to the centre of the outlet of the spout, *A*	200, *Min*
ii)	Height from the base to the top of the lever in off-position, *B*	115, *Min*
iii)	Height from the base of the flange to the centre of the outlet of the spout, *C*	130, *Min*
iv)	Length of thread shank, *D*	20, *Min*
v)	Length of the connecting pipe/ hose, E	350, *Min*
vi)	Diameter of the base of the flange, *F*	42, *Min*
vii)	Connecting nut, G	G 1/2 B[1)]
[1)] Conforming to ISO 228-1 or ISO 7-1		



NOTE — The design shown is typical/illustrative. However, the dimensional details are for compliance.

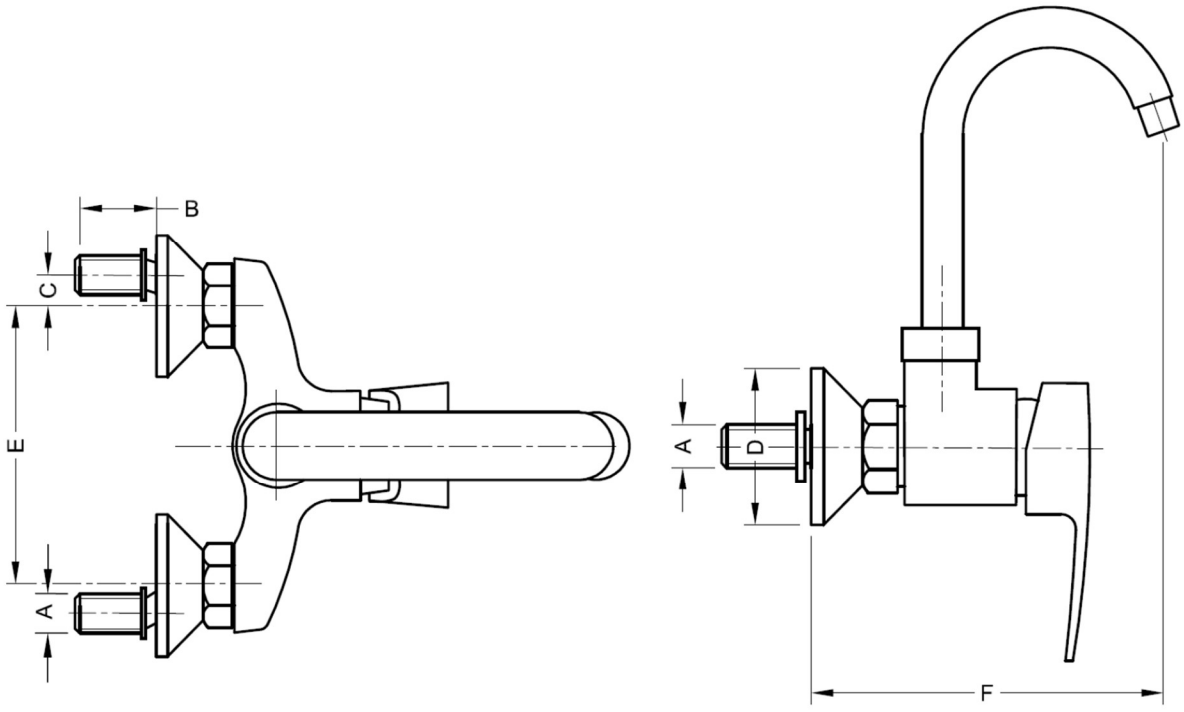
FIG. 11 TYPICAL DETAILS OF BODY OF SINGLE LEVER PILLAR MOUNTED BASIN MIXER

Table 12 Dimensions of Bodies for Single Lever Pillar Mounted Basin Mixer

(Clause 7.2.1)

All dimensions in millimetres.

Sl No.	Particulars (*see* Fig 11)	Dimensions
(1)	(2)	(3)
i)	Horizontal length from the centre of the body to the centre of the outlet of the spout, *A*	75, *Min*
ii)	Height from the base of the flange to the centre of the outlet of the spout, *B*	45, *Min*
iii)	Diameter of the base of the flange, *C*	45 to 52
iv)	Length of the anchoring stud, *D*	65, *Min*
v)	Diameter of the shank, *E*	33, *Min*
vi)	Length of the connecting pipe/hose, *F*	350, *Min*
vii)	Connecting nut, G	G 1/2 B[1)]
[1)] Conforming to ISO 228-1 or ISO 7-1.		



NOTE — The design shown are typical/illustrative. However, the dimensional details are for compliance.

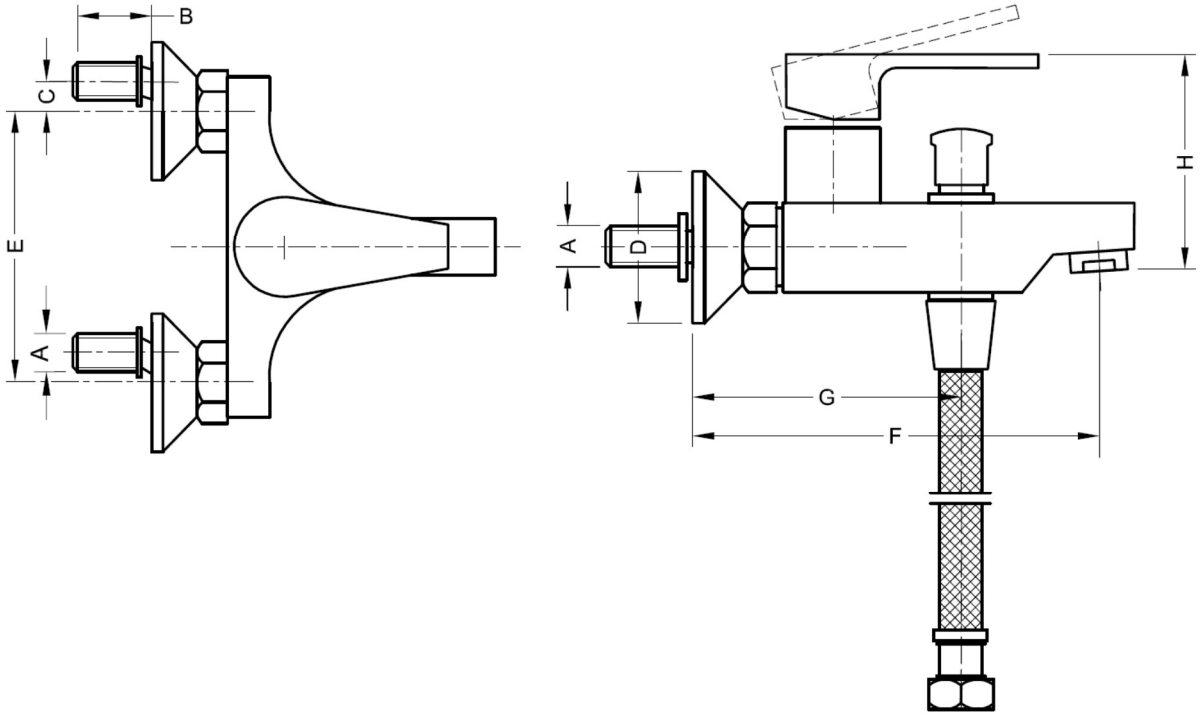
Fig. 12 TYPICAL DETAILS OF BODY FOR SINGLE LEVER WALL MOUNTED SINK MIXER WITH SWIVEL SPOUT

Table 13 Dimensions of Bodies for Single Lever Wall Mounted Sink Mixer with Swivel Spout

(*Clause* 7.2.1)

All dimensions in millimetres.

Sl No.	Particulars (see Fig. 12)	Dimensions
(1)	(2)	(3)
i)	Thread of inlet shank, A	G1/2 B1)
ii)	Length of shank, B	25, Min
iii)	Adjustment range of S-union, C	5.0, Min
iv)	Diameter of flange, D	50, Min
v)	Distance between centres of inlet, E	148, Min
vi)	Length from flange to centre of spout, F	200, Min
1) Conforming to IS 2643 or IS 554.		



NOTE — The design shown are typical/illustrative. However, the dimensional details are for compliance.

Fig. 13 TYPICAL DETAILS OF BODY OF SINGLE LEVER BATH AND SHOWER MIXER

Table 14 Dimensions of Body of Single Lever Bath and Shower Mixer

(Clause 7.2.1)

All dimensions in millimetres.

Sl No.	**Particulars** (*see* Fig. 13)	**Dimension**
(1)	(2)	(3)
i)	Thread of inlet shank, *A*	G 1/2 B[1)]
ii)	Length of shank, *B*	25, *Min*
iii)	Adjustment range of S-union, *C*	10, *Min*
iv)	Diameter of flange, *D*	50, *Min*
v)	Distance between centres of inlet, *E*	148, *Min*
vi)	Distance from flange to centre of spout, *F*	135, *Min*
vii)	Distance from flange to centre of outlet for hand shower, *G*	75, *Min*
viii)	Height from the bottom of the centre of the outlet of the spout to the top of the lever in off-position, *H*	80, *Min*
[1)] Conforming to ISO 228-1 or ISO 7-1.		

8 ADDITIONAL REQUIREMENTS FOR ACCESSIBLE TAPS

8.1 Accessible taps should be single lever mixer or combination tap assembly with lever handle (see Notes), complying with other requirements as given in **8.2** to **8.4**.

NOTES

1 Sensor operated accessible taps will be covered in a separate standard.

2 In order to ensure accessibility for persons with disabilities, the requirements relating to installation of sanitary appliances including water closets, will be covered in a separate standard.

8.2 The operating control (lever handles) shall be easily operable with one hand with an operating force of not more than 20 N.

8.3 Information, if any should be in raised tactile and Braille signage.

8.4 It is recommended that a thermostat be installed to limit the temperature of the hot water to maximum of 40 °C in order to prevent scalding. Hot and cold water taps should be identifiable by both colour and tactile marking.

9 FINISH

9.1 The significant surfaces of taps, combination tap assemblies, stop valves and single lever mixers shall be nickel-chromium plated. However, the body of concealed stop valve and side stop

valve of pillar mounted combination tap assembly may be polished bright or may be unpolished surface, as 'cast' finish.

9.1.1 Definition of Significant Surfaces

Significant surfaces are all parts of the article (taps, valves, combination tap assemblies and single lever mixers) covered or to be covered by the coating (plating/polishing) and for which the coating is essential for serviceability and/or appearance of the fitted article. For example, internal surfaces of hollow parts such as cross pieces, caps, knobs are not deemed significant.

9.2 The taps and valves of copper alloy shall be nickel-chromium plated complying with service condition No. 2 (Cu/Ni 10b Cr r) of ISO 1456. The knobs and knob components of plastic material may be used in as moulded finish, or nickel-chromium plated complying with service condition No. 2 of ISO 4525. The knobs and knob components of zinc base alloy shall be nickel-chromium plated complying with service condition No. 2 (Zn/Cu Ni 15b Cr r) of ISO 1456.

10 PERFORMANCE REQUIREMENTS

10.1 All taps, valves and mixers shall be capable of complying with the tests specified in **10.2** to **10.6** The test specified are laboratory tests and not quality control tests during production.

10.2 Water Tightness Characteristic

10.2.1 This test consists of checking under cold water pressure or under air pressure the water tightness of bonnet assembly/operating mechanism on seat, tap, valve and mixer upstream, tap, valve and mixer downstream and bath/shower diverters whether manual or automatically operated.

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

10.2.3 The test equipment, duration and procedure as specified in Annex B shall be followed.

10.2.4 Throughout the duration of test, there shall be no leakage of water or escape of air bubbles respectively, through the walls of the body, the bonnet/operating mechanism and the diverter

assembly. Combination tap assembly and single lever mixer when tested in accordance with B-6, shall have no leakage or seepage at the outlet or at the end of the unconnected inlet.

10.3 Pressure Resistance Characteristic

10.3.1 This test consists of revealing any deformation in the tap and valve that may result under the action of cold water at a relatively high pressure. The test shall be carried out upstream of the taps, valves and mixers.

10.3.2 Criteria for conformity shall be that no permanent deformation in the part of the taps, valves and mixers shall be produced.

10.3.3 The test equipment, procedure and duration as specified in Annex C shall be followed.

10.4 Hydraulic Characteristics (Flow Rate)

10.4.1 The value of flow rate shall not be less than 3 l/min at 0.05 MPa. If the tap/valve/mixer is fitted with flow straightening or aerating device, the same may be removed for the testing purpose. The measurement shall be carried out with taps and valves fully open.

10.4.2 The test circuit, apparatus and procedure as specified in Annex D shall be followed for a dynamic system.

10.4.3 In case of non-metred fittings, the average maximum difference between the highest and the lowest average flow rate shall not exceed 2.0 l/min.

10.4.4 For water efficiency rating, this test is performed to determine the value of the flow rate corresponding to a maximum pressure of 0.42 MPa.

10.5 Mechanical Strength Characteristics

10.5.1 This test is performed to verify the torsional strength of operating mechanism/bonnet assembly to a torque of 6 Nm, in both opening and closing positions.

10.5.2 The required torque of 6 Nm shall be applied and maintained for a period of 5 min either with a torque wrench, having an accuracy of 10 percent, fitted to operating member or a lever arm and device for measuring the force applied. It shall be assured that shear force does not affect the measurement.

10.5.3 The tap, valve and mixer with its operating mechanism (bonnet assembly) shall not be supplied with water during the test.

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

10.6 Mechanical Endurance Characteristics

10.6.1 The mechanical endurance test of the operating mechanisms (head and handle) of taps, valves and mixers shall satisfy the leak tightness test requirement as described in B-3.

10.6.2 The test equipment, duration and procedure as specified in Annex E shall be followed.

11 ADDITIONAL REQUIREMENTS FOR WATER EFFICIENCY

For water efficiency rating and labelling of taps, valves, combination tap assemblies, single lever mixers, the requirements given in NS *** (Water Efficient Plumbing Products (Sanitary Fittings) — Requirements) shall be complied with.

12 SAMPLING AND CRITERIA FOR CONFORMITY

The sampling procedure to be adopted and criteria for conformity shall be as given in Annex F.

13 MARKING

13.1 Each pillar tap, bib tap, combination tap assembly, stop valve and angle stop valve and single lever mixer shall be legibly marked with the following information:

a) Manufacturer's name or trade-mark.
b) Letter 'H' or 'C' or alternatively fire red or blue colour for taps meant for hot water or cold water applications. In the case of combination tap assembly and single lever mixer, the hot water supply and marking for the same shall be on the left, and those for cold water on the right.
c) Direction of flow in case of stop valves.

13.2 The packing of the product shall be marked legibly and indelibly with the following:

a) Manufacture's name or trade mark;
b) Nominal size of valve; and
c) Batch number and date of manufacture.

13.3 Accessible taps shall be marked with the international sign of accessibility on the carton/packing.

13.4 NS Certification Marking

Each pillar tap, bib tap, combination tap assembly, stop valve and angle stop valve, single lever mixer conforming to the requirements of this standard may be certified as per the provisions of the Nepal Standard (Certification Mark) Act, 2037 and the Rules and Regulations framed thereunder, and the tap may be marked with the Standard Mark.

ANNEX A

(Clause 2)

LIST OF REFERRED NEPAL STANDARDS

NS No.	*Title*
ISO 7-1	Pipe threads where pressure — Tight joints are made on the threads — Dimensions, tolerances and designation
ISO 1456	Metallic and other inorganic coatings — Electrodeposited coatings of nickel, nickel plus chromium, copper plus nickel and of copper plus nickel plus chromium
ISO 228-1	Pipe threads where pressure- tight joints are not made on the threads — Dimensions, tolerances and designation
ISO 4525	Metallic coatings — Electroplated coatings of nickel plus chromium on
ISO 3601 (Part 1) : 2012 (Part 2) : 2025	Fluid power systems — O-rings Part 1: Inside diameters, cross-sections, tolerances and designation codes Part 2: Housing dimensions for general applications acceptance criteria
NS ***	Glossary of terms relating to water supply and sanitation
NS ***	Water efficient plumbing products (Sanitary Fittings)— Requirements
NS 145	Random Sampling Method

ANNEX B

(Clauses 10.2.4 and 10.6.1)

WATER TIGHTNESS CHARACTERISTICS TEST

B-1 GENERAL

This test is carried out to verify the water tightness of the complete tap, valve and mixer specimen.

B-2 TEST EQUIPMENT

B-2.1 For 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.

B-2.2 For Air Test under Water

The test set-up shall include a tank filled with water and its accessories, and a pneumatic circuit that can deliver the required pressure and maintain it for the duration of the test.

B-2.3 For Flow Diverter

The test set-up shall include a flow diverter (automatic/manually lockable) having a nominal flow of minimum 5.0 litre per minute at a dynamic pressure of 0.3 MPa.

B-2.4 Test Duration

The duration given in B-3 to B-5 are minimum time periods.

B-3 PROCEDURE FOR CHECKING THE WATERTIGHTNESS OF THE OPERATING MECHANISM/BONNET ASSEMBLY ON THE SEAT, AND THE WATERTIGHTNESS OF THE TAPS, VALVES AND MIXERS UPSTREAM

B-3.1 Water Test

a) Connect the tap/valve/mixers specimen to the test circuit;
b) With the outlet orifice open generally turned downwards, close the seat (bonnet assembly) using a torque of 1.5 Nm; and
c) Apply water pressure of 1.2 MPa for 60 s.

NOTE — When the water tightness of the spindle is ensured by a stuffing box, the packing gland is loosened.

B-3.2 Air Test under Water

a) Connect the tap/valve/mixers specimen to the test circuit.

b) With the outlet orifice open and generally turned upwards, close the seat (bonnet assembly) using a torque of 1.5 Nm.

c) Completely immerse the tap/valve/mixers specimen in water contained in tank.

d) Apply an air pressure of 0.6 MPa to the tap/valve specimen for 20 s.

NOTE — If the water tightness of the spindle is ensured by a stuffing box, the packing gland is loosened.

B-4 PROCEDURE FOR CHECKING THE WATERTIGHTNESS OF THE TAPS, VALVES AND MIXERS DOWNSTREAM

B-4.1 Water Test

a) Connect the valve specimen to the test circuit.

b) With the outlet orifice closed and generally turned downwards, open the seat (bonnet assembly).

c) Apply to the valve specimen, a water pressure of 0.4 MPa for 60 s.

d) In addition, for taps, valves and mixers where the water tightness of the spindle is ensured by one or more ‘O’ rings, apply a water pressure of 0.02 MPa for 60 s.

e) In the latter case, begin by applying 0.4 MPa gradually reducing down to the test pressure of 0.02 MPa.

B-4.2 Air Test under Water

a) Connect the valve specimen to the circuit with the outlet orifice closed;

b) Immerse the valve specimen in water contained in the tank;

c) Apply an air pressure of 0.2 MPa for 20 s;

d) In addition, for valves where the water tightness of the spindle is ensured by one or more ‘O’ rings, apply an air pressure of 0.2 MPa for 20 s; and

e) In the latter case, begin by applying 0.2 MPa gradually reducing down to the test pressure of 0.02 MPa.

B-5 PROCEDURE FOR CHECKING THE WATERTIGHTNESS OF MANUALLY OPERATED DIVERTERS

B-5.1 Water Test Procedure

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

b) Put the diverter in the bath position, the bath outlet being artificially closed and shower outlet being open and generally turned downwards ensuring that there is no water leakage.

c) Apply a static water pressure of 0.4 MPa for 60 s. Check that the water tightness is maintained on the shower side.

d) In addition, when the water tightness of diverter is ensured by one or more 'O' rings, apply a static water pressure of 0.02 MPa 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. Check that the water tightness is maintained on the shower side.

e) Put the diverter in the shower position, the shower outlet being artificially closed and the bath outlet being open and generally turned downwards ensuring that there is no water leakage.

f) Apply a static water pressure of 0.4 MPa for 60 s. Check that water tightness is maintained on the bath side.

g) In addition, if the water tightness of the diverter is ensured by one or more 'O' rings, apply a static water pressure of 0.02 MPa 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. Check that water tightness is maintained on the bath side.

B-5.2 Air Test Procedure under Water

a) Connect the tap in its normal positions of use to the test circuit.

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

c) Immerse the tap in the water contained in the tank.

d) Apply a static air pressure of 0.2 MPa for 20 s. Check that water tightness is maintained on the shower side, and there is no air leakage.

e) In addition, if the water tightness of the diverter is ensured by one or more 'O' rings, apply a static air pressure of 0.02 MPa for 20 s. In the latter case begin by applying the highest pressure of 0.02 MPa. Check that water tightness is maintained on the shower side.

f) 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.

g) Immerse the tap in the water contained in the tank.

h) Apply a static air pressure of 0.2 MPa for 20 s. Check that water tightness is maintained on the bath side, and there is no air leakage.

i) In addition, if the water tightness of the diverter is ensured by one or more 'O' rings, apply a static air pressure of 0.02 MPa 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. Check that water tightness is maintained on the bath side.

B-5.3 Procedure for Checking the Water Tightness of Flow Diverters (Automatic/Manually Lockable)

The test shall be carried out with water only as per the procedure described below:

a) Connect the tap, in its normal position of use, to the test circuit with outlet orifices open and generally turned downwards. Connect the flow regulator (see B-2.3), to the shower outlet.

b) Put the diverter in the bath position, and apply a dynamic water pressure of 0.4 MPa for 60 s. Check that water tightness is maintained on the shower side.

c) Put the diverter in shower position, check that water tightness is maintained on the bath side.

d) With the diverter still in shower position, reduce the dynamic pressure to 0.05 MPa. Check that the diverter has not disengaged. Maintain this pressure for 60 s and check that water tightness is maintained on the bath side.

e) Stop the water, check that the diverter returns to the bath position.

f) Re-apply the dynamic pressure of 0.05 MPa for 60 s. Check that the water tightness is maintained on the shower side.

B-6 PROCEDURE FOR CHECKING THE WATER TIGHTNESS OF THE OPERATING MECHANISM/BONNET ASSEMBLY FOR NO CROSS FLOW BETWEEN HOT WATER AND COLD WATER

a) Connect one end of the combination tap assembly/single lever mixer to the test circuit.

b) With the outlet orifice open and the bonnet assembly/operating mechanism open, apply a water pressure of 0.4 MPa for 60 s. In this period, move the temperature control device over its full operating range.

c) Repeat the text, reversing the water supply connection to the other inlet.

d) Check that the water tightness is maintained at the outlet or at the end of the unconnected inlet.

ANNEX C

(Clause 10.3.3)

PRESSURE RESISTANCE CHARACTERISTICS

C-1 GENERAL

This test is the carried out for checking the mechanical behaviour of the body of the tap, valves and mixers under cold water pressure.

C-2 TEST EQUIPMENT

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

C-3 PROCEDURE FOR CHECKING THE MECHANICAL BEHAVIOUR UPSTREAM OF THE OPERATING MECHANISM/BONNET ASSEMBLY IN SHUT POSITION

Apply a static water pressure of 2.5 MPa for a duration of 60 s. There should not be any deformation or leakage.

C-4 PROCEDURE FOR CHECKING THE MECHANICAL BEHAVIOUR DOWNSTREAM OF THE BONNET ASSEMBLY/OPERATING MECHNAISM IN OPEN POSITION

Connect the tap/valve/mixer to the test circuit and open the same fully. For taps/valves/mixers with a flow rate regulator fitted, apply at the inlet a dynamic water pressure of 0.4 MPa for a duration of 60 s. For taps/valves/mixers without flow rate regulator and 15 mm nominal size, apply at the inlets, for 60 s, the water pressure needed to give a flow rate of 0.4 l/s through the specimen. For valves without flow rate regulator and 20 mm nominal size, apply at the inlets, for 60 s, the water pressure needed to give a flow rate of 0.8 l/s through the specimen. Check whether there is permanent deformation in any part of the specimen downstream of the bonnet assembly/operating mechanism. For taps/valves/mixers with removable flow rate regulator, the test shall be carried out both with and without this regulator. There should not be any deformation or leakage.

C-5 PROCEDURE FOR CHECKING THE MECHANICAL BEHAVIOUR OF BODY OF TAPS, VALVES AND MIXERS

Remove the bonnet assembly and close the bonnet/cartridge end and the outlet with a plug. Apply a static water pressure of 2.5 MPa for a duration of 60 s, this pressure being measured at the junction of the valve and the pipe. There should not be any deformation or leakage in the body.

ANNEX D

(Clause 10.4.2)

HYDRAULIC CHARACTERISTICS

D-1 GENERAL

This test is carried out to measure the flow rate of single and combination taps, valves and single lever mixers together with their standard accessories for a given pressure.

D-2 APPARATUS

The apparatus consists of a supply circuit and a test circuit (see Fig. 14).

D-2.1 Supply Circuit

D-2.1.1 The supply circuit assembly consists of,

a) device (A) enabling the required pressure to be achieved;
b) piping (B) with a cross-section such that the test circuit without the tap and valve to be tested, enables a flow rate of 50 percent greater than the flow rate to be measured to be achieved.
c) device (C) to measure the flow rate.

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

D-2.2 Test Circuit (see Fig. 15)

D-2.2.1 The circuit shown in Fig. 15 is suitable whatever be the type of the tap, valve and mixer to be tested. It consists of:

a) a straight portion of tube, having a minimum internal diameter of 13 mm and 19 mm for 15 mm and 20 mm nominal size of taps and valves respectively, with a pressure tapping, as shown in Fig. 15.
b) tap/valve/mixer connecting nut or socket of suitable size; and
c) a pressure circuit, connected to the pressure take-off tee and to the pressure measuring device.

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

a) at the connection level, for all taps [see (a) and (c) in Fig. 15] except for tap with combined visible bodies and all mixers with copper inlet pipe of 250 mm minimum length [see (b) in Fig. 15]; and
b) 200 mm above the connection level for all types of tap.

Example of the fitting of the tap and valve to the test circuit are shown in Fig. 15.

D-2.2.2 Pipes

The pipes shall be of brass/SS 304 and their internal surface shall be smooth.

D-2.2.3 Pressure Take-off Tee

The pressure take-off tees shall be made of brass and machined to the dimension as specified in Table 15 read along with Fig. 16.

D-3 TEST CONDITIONS

D-3.1 Precision of the Measurements

The precision of the device for measuring the flow rates and pressures shall be ± 2 percent.

D-3.2 Procedure

a) Connect the tap/valve/mixer specimen to the test circuit.
b) For combination taps with two inlets, the test shall be carried out on each of these inlets separately.
c) For combination taps with combined visible body, reduce, if necessary, the length of the supply tubes to a value of 250 mm.
d) For the taps, valves and mixers, which cannot be connected directly to the test circuit connector, use intermediate connecting device which have minimum head loss.
e) With the outlet orifice closed and generally turned downward, open the seal. Open the tap/valve/mixer to its maximum.
f) Measure the flow rate three times at three different dynamic pressures of 0.1 MPa, 0.3 MPa and 0.5 MPa, and calculate the average flow rate at each pressure. Apply the pressure to the fixture for a duration of (60 ± 5) s and measure the flow rate when a continuous flow has been established.

g) Using logarithmic coordinates, plot the curve of the flow rate (Q) as a function of the pressure (P).

h) Determine on this curve the value of the flow rate corresponding to the pressure of 0.05 MPa and 0.42 MPa.

D-4 CALIBRATION

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

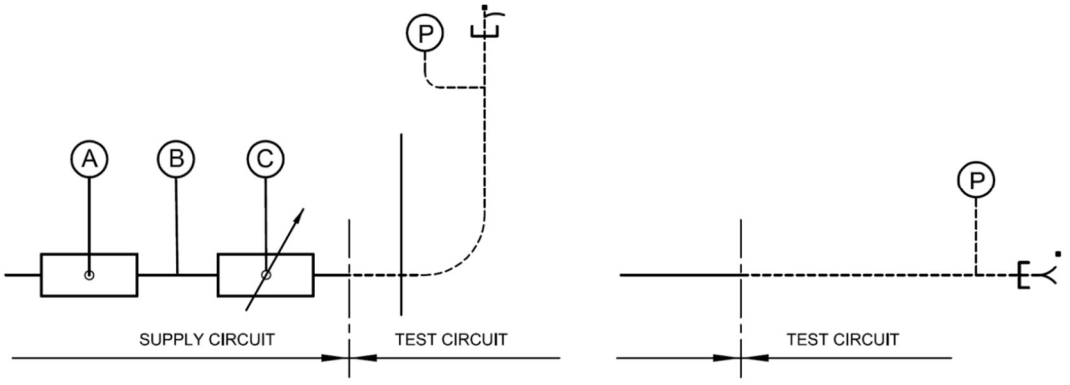
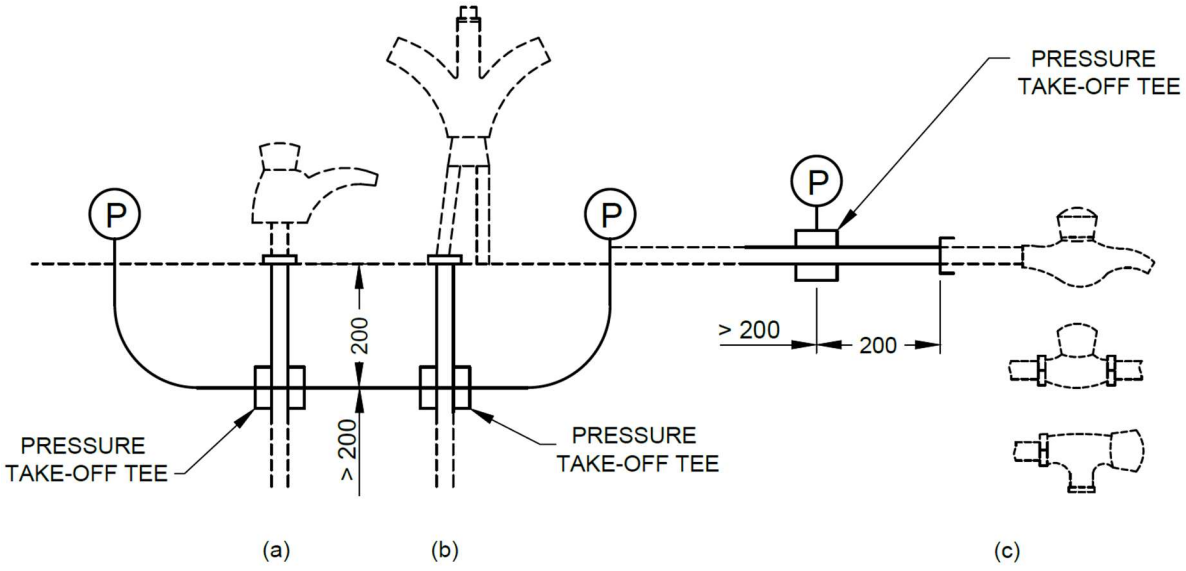
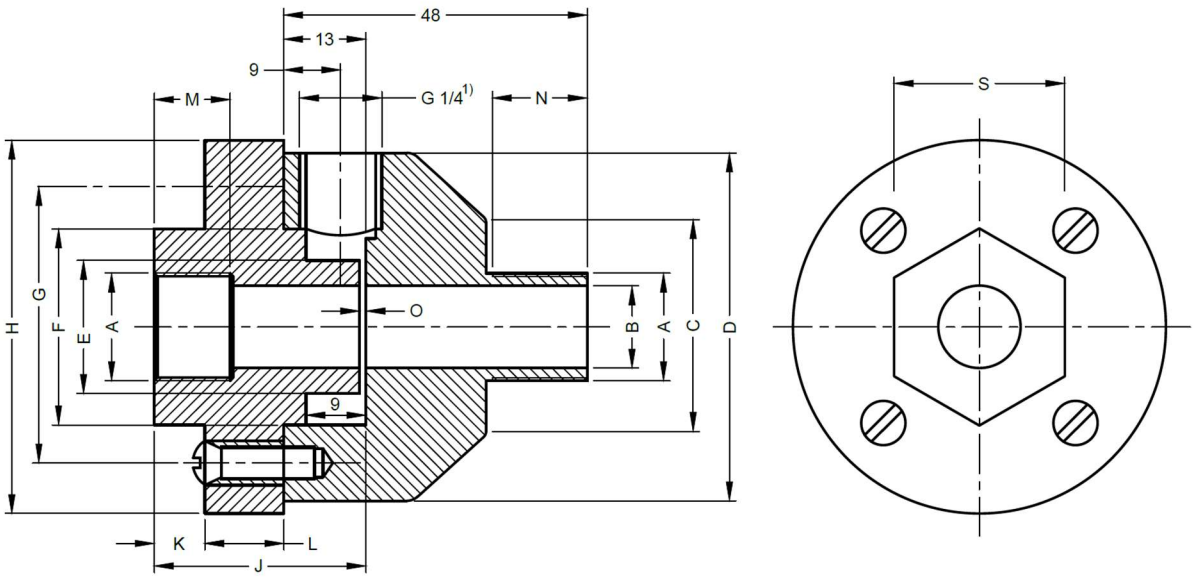


Fig. 14 Supply and Test Circuit



All dimensions in millimetres

Fig. 15 Test Circuit



1) CONFORMING TO ISO 228-1.

All dimensions in millimetres.

FIG. 16 DIMENSION OF PRESSURE TAKE-OFF TEE

Table 15 Dimensions of Pressure Take-Off Tee

(Clause D-2.2.3)

All dimensions in millimetres.

Sl No.	Nominal Size	Thread Size	Particulars (*see* Fig. 16)													Width Across Flats	Bolts	
		A[1)]	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*J*	*K*	*L*	*M*	*N*	*O*	S	Number	Size
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
i)	15	G 1/2	13	34	55	21	31	43	59	27	8	12.5	12	15	0.5	27	4	M4 × 16
ii)	20	G 3/4	19	41	62	26	38	50	66	29	10	12.4	14	17	0.6	32	4	M5 × 16
[1)] Conforming to ISO 228-1.																		

ANNEX E

(Clause 10.6.2)

MECHANICAL ENDURANCE CHARACTERISTICS

E-1 MECHANICAL ENDURANCE CHARACTERISTICS OF THE OPERATING MECHANISM – ROTARY HEADWORKS OF SINGLE TAPS AND COMBINATION TAP ASSEMBLIES

E-1.1 General

This test shall be carried out to verify the mechanical endurance of the operating mechanisms (head and handle) of single taps and combination taps of nominal sizes 15 mm and 20 mm. Taps shall first satisfy the leak tightness tests described in B-3 and B-4.

E-1.2 Test Method E-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 with water at specified pressure/temperature and with a specified dwell time (see Table 16).

E-1.2.2 Apparatus

E-1.2.2.1 An automatic test rig, which rotates in both directions, such that the closing torque shall remain constant irrespective of wear of the test piece. The set closing torque shall not be affected by the momentum of the equipment during the test.

E-1.2.2.2 A supply circuit with a pump or a similar device, capable of producing the required pressure at a temperature ≤ 30 °C for the cold water and (65 ± 2) °C for the hot water. 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 (for example, ingress of grease or other contaminants).

E-1.2.2.3 A device to actuate the operating mechanism of the tap. This shall not impose, by virtue of misalignment or otherwise, any axial or radial forces that would not occur in normal use.

NOTE — The test sample can show abnormal wear due to loads imposed by the test equipment resulting from eccentricity of the two axes. This results in pick-up on one side only due to lateral

forces which do not occur in normal use. The tolerance on concentricity should therefore be as small as possible.

Table 16 Endurance Test Conditions for Rotary Headworks of Single Taps and Combination Tap Assemblies

(Clause E-1.2.1)

Sl No.	Conditions	Field of Application Supply System
(1)	(2)	(3)
i)	Water temperature, in °C	
	a) Cold water	≤ 30
	b) Hot water	(65 ± 2)
ii)	Flow rate adjusted by throttling outlet, in *l*/min	6 ± 1
iii)	Static pressure, in MPa	0.4 ± 0.05
iv)	Rotations per minute, in rpm	
	a) for elastomeric seal	30 ± 0.1
	b) for ceramic valves	10 ± 0.1
v)	Dwell time in open position, in s	1 to 2
vi)	Dwell time in closed position with applied torque, in s	≤ 0.4
vii)	Total dwell time in closed position, in s	2 to 3
viii)	Closing torque, in Nm	
	a) elastomeric washer	2.5 ± 0.25
	b) ceramic discs	1.5 ± 0.25
ix)	Number of cycles	200 000

E-1.3 Procedure

a) Fit the tap to be tested complete with its handle onto the test rig and connect to the water supply circuit;

b) for taps with elastomeric washer, adjust the closing torque to a constant value of (2.5 ± 0.25) Nm; for ceramic disc valves, adjust the closing torque to a constant value of (1.5 ± 0.25) Nm;

c) with the tap closed, adjust the static water pressure, to (0.4 ± 0.05) MPa;

d) with the tap open, adjust the flow rate, by throttling the outlet of the tap to (6 ± 1) l/min;

e) where leak tightness of the spindle is ensured by a stuffing box the gland nut is loosened as follows:

1) loosen the gland nut;

2) with the outlet orifice closed, open the obturator; apply a water pressure of 0.1 MPa; and
3) tighten the gland nut until a watertight seal is just obtained.

E-1.4 Requirement

After testing, the tap shall again satisfy the leak tightness criteria given in B-3 and B-4, and there shall be no failure of any component part.

E-2 MECHANICAL ENDURANCE CHARACTERISTICS OF THE OPERATING MECHANISM – SINGLE LEVER MIXER

E-2.1 General

This test shall be carried out to verify the mechanical endurance of the control device of a mechanical mixing valve. They shall first satisfy the leak tightness test specified in B-3 and B-4.

E-2.2 Test Method

E-2.2.1 Principle

This consists of subjecting the control device to a specific number of movements with a dwell time at specified cold water and hot water pressures and temperatures (see Table 17). For mixing valves with separate controls for flow rate and temperature, the test shall be carried out on each of these devices. For mixing valves with single lever control for flow rate and temperature, the test is carried out according to E-2.2.4.

E-2.2.2 Apparatus

This comprises circuits (hot water, cold water) and an automatic machine. Each circuit comprising a pump or similar device, capable of supplying the required pressure at a temperature ≤ 30 °C for the cold water and (65 + 2) °C for the hot water.

E-2.2.3 Automatic Machine

The machine's mechanism shall carry out one of the cycles defined, according to the movement of the mixing valve.

Table 17 Endurance Test Conditions for Cartridges for Single Lever Mixer

(Clause E-2.2.1)

Sl No.	Conditions	Field of Application Supply System
(1)	(2)	(3)
i)	Water temperature, in ° C	
	a) Cold water	≤ 30
	b) Hot water	(65 ± 2)
ii)	Flow rate adjusted by downstream resistance, in *l*/min	6 ± 1
iii)	Static pressure, in MPa	0.4 ± 0.05 MPa
iv)	Speed, in angular/s	(60 ± 5) ° angular/s
v)	Dwell time, in s	5 ± 0.5
vi)	Reversal time on each direction change, in s	0.5 ± 0.5
vii)	*p*H	8 ± 1
viii)	Water hardness	Indication of the measured value in the test report
ix)	Number of cycles	70 000 (rectangular or triangular or separate control movements)

E-2.2.4 Procedure

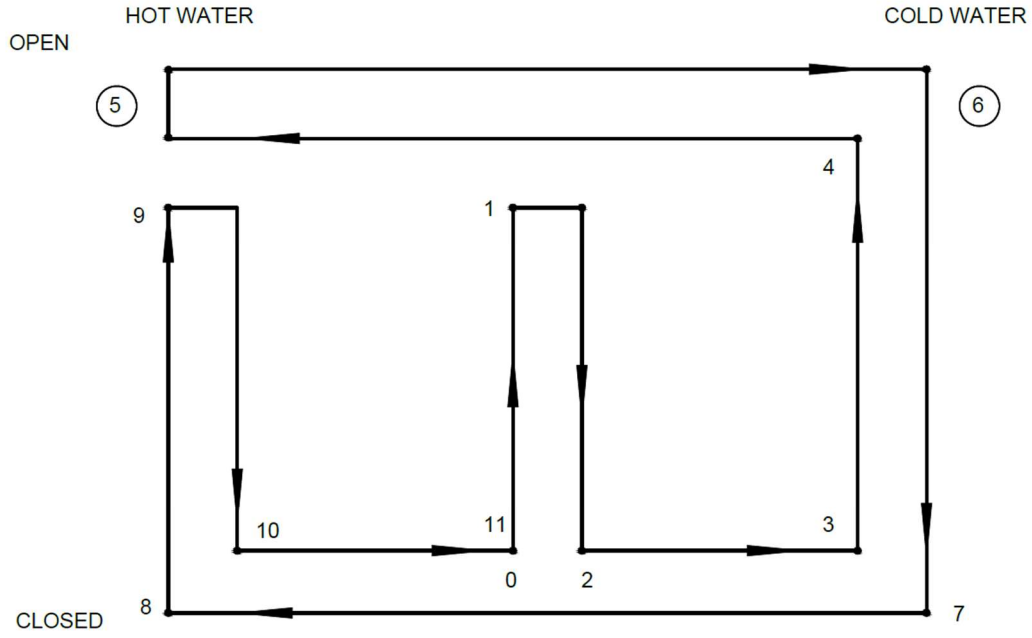
a) Install the mixing valv

b) e in its normal position of use on the machine and connect it to both the cold water supply circuit and the hot water supply circuit.

b) Set the maximum force transmitted by the machine to open and close the flow control to a maximum moment, M of 3 Nm, and to move the temperature control to a maximum moment M1 of 3 Nm. The machine shall stop if this torsional resistance value is reached on the mechanism (see Fig. 17, Fig. 18, Fig. 19 and Fig. 20).

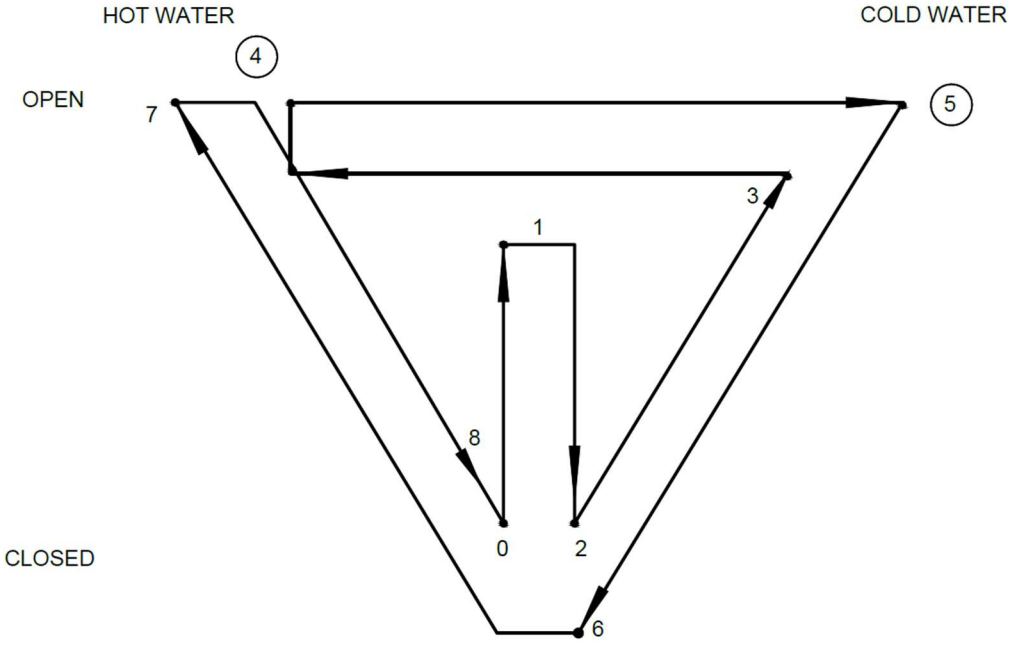
c) With the mixing valve closed, set the hot water and cold water static pressures at the values given in position 0.

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



ONE CYCLE 0 TO 11

17A RECTANGULAR MOVEMENT



ONE CYCLE 0 TO 8

17B TRIANGULAR MOVEMENT

FIG. 17 RECTANGULAR AND TRIANGULAR MOVEMENT

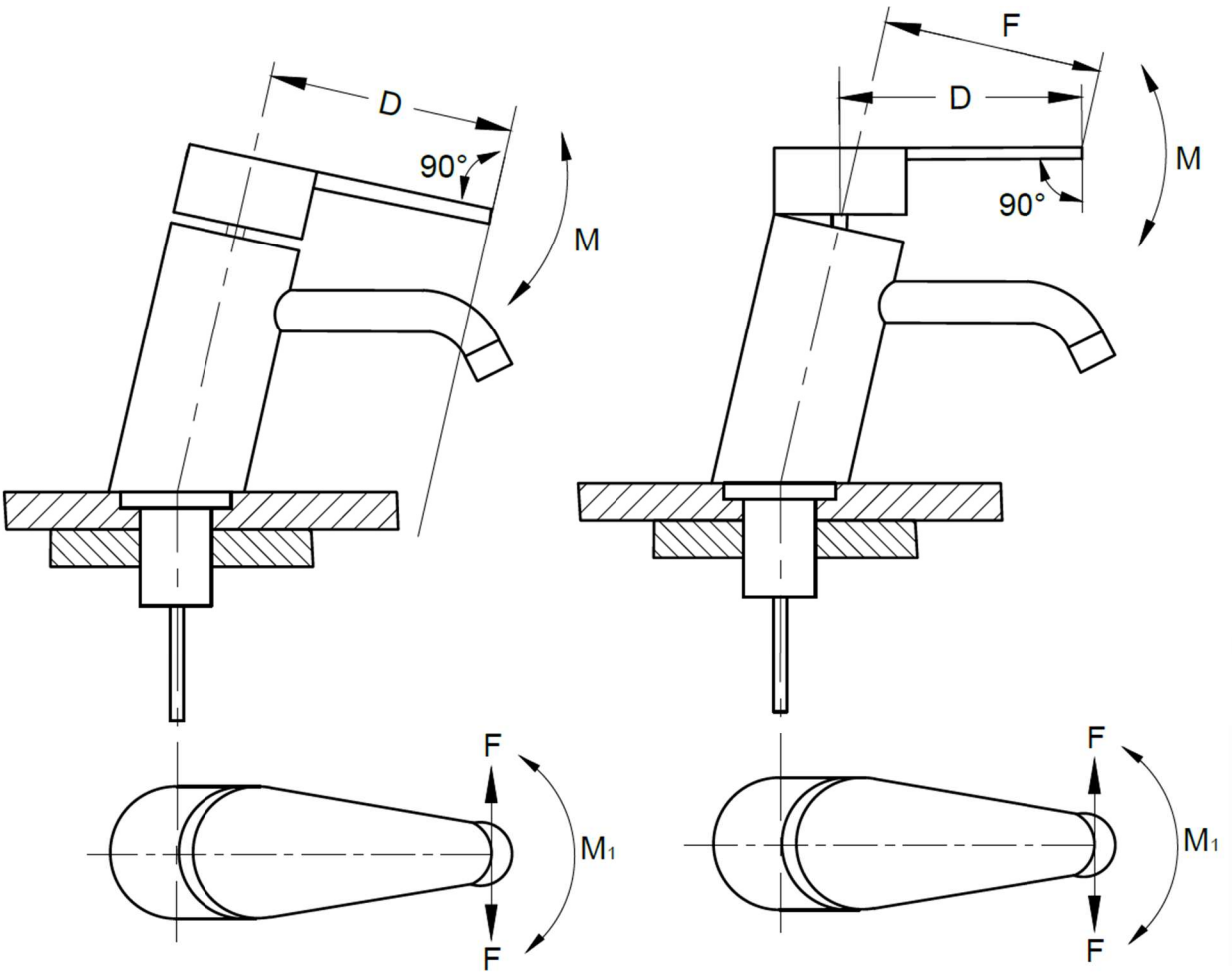


Fig. 18 TEST BENCH FOR JOYSTICK MIXING VALVE SEQUENTIAL CONVENTIONAL MIXING VALVE

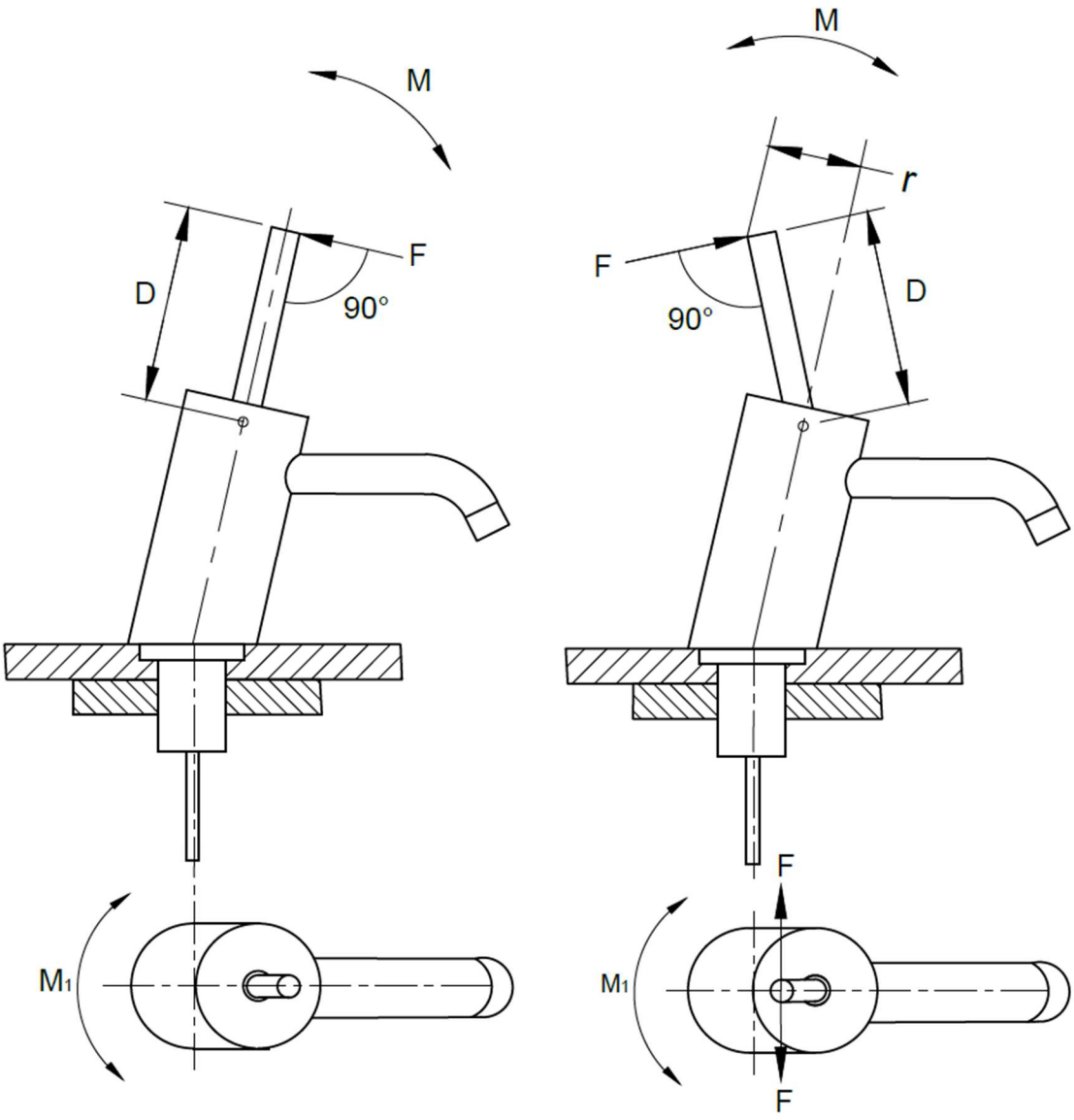


FIG. 19 TEST BENCH ADJUSTMENT TORQUE FOR JOYSTICK MIXING VALVE

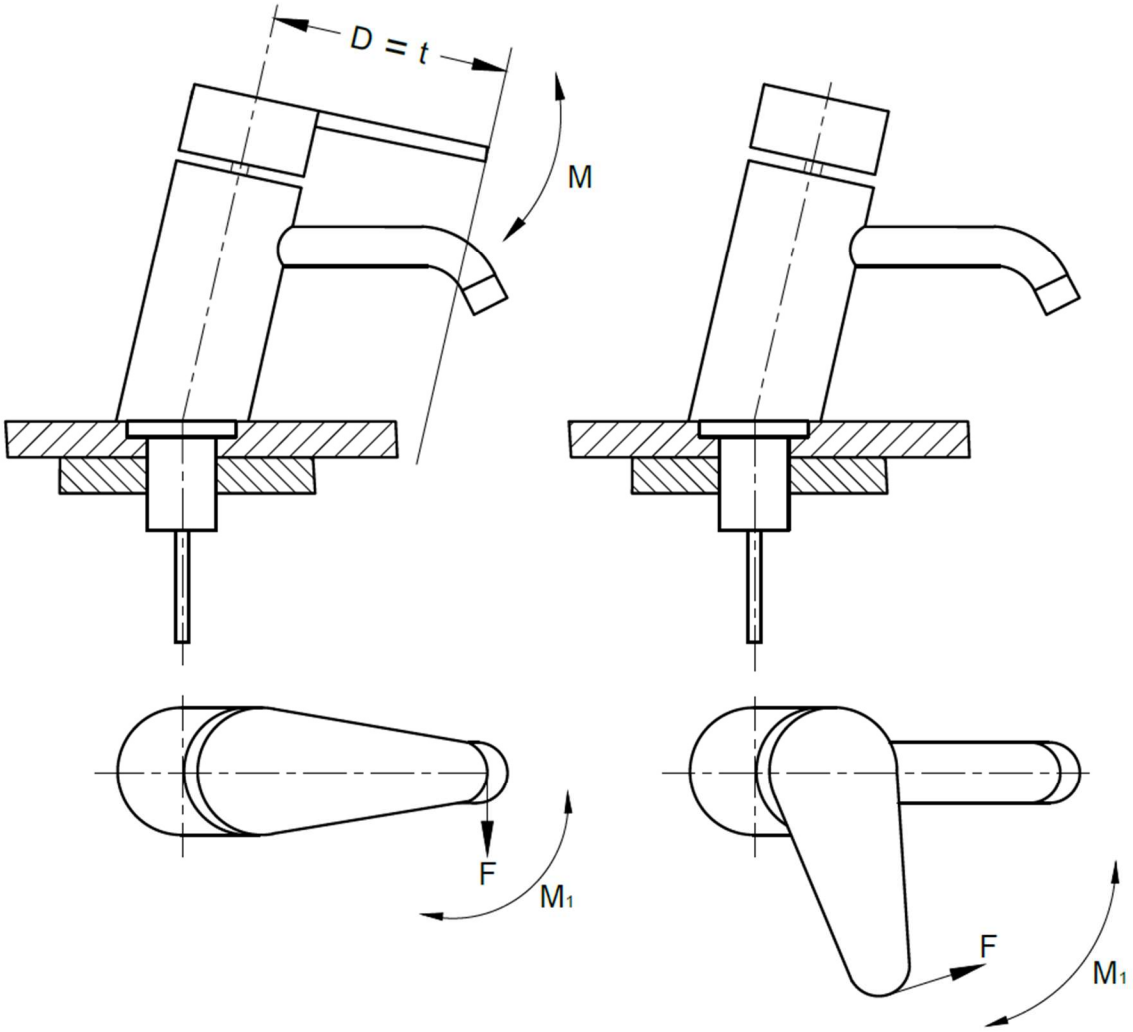


Fig. 20 TEST ADJUSTMENT TORQUE FOR MIXING VALVE

e) Subject the mixing valve to 70 000 cycles of opening and closing, each cycle comprising opening and closing movements as described below and illustrated in Fig. 17 to Fig. 20:

1) For rectangular movements:

i) start in mean mixed closed position;

ii) open in mean mixed position;

iii) return to closed position;

iv) move to cold water position (position 3);

v) open in cold water position (position 4);

vi) move to full open hot water position (position 5), then dwell for 5 s.;

vii) move to cold water position (position 6), then dwell for 5 s.;

viii) close in cold water position (position 7);

ix) move to closed hot water position (position 8);

x) open in hot water position (position 9), then close (position10); and

xi) return to position 0.

2) For triangular movements:

i) start in mean mixed closed position;

ii) open in mean mixed position;

iii) return to closed position;

iv) open in full cold water position;

v) move to full hot water position, then dwell for 5 s.;

where,

vi) move to full cold water position, then dwell for 5 s.;

vii) return to mixed closed position (position 6);

viii) open in full hot water position; and

ix) close, return to position 0.

3) For dual control, subject each control device to the relevant part of the rectangular movement series of tests.

Where,

F = applied force, in N;

D = radius of control lever, in mm;

r = effective radius of control lever, in mm;

M = moment, in Nm

(M = F • D/1 000 < 3 Nm) ; and

M1 = moment, in Nm

(M1= F • r/1 000 < 3 Nm).

for example,

a) If D = 100 mm, then F has to be 30 N.

b) If D = 50 mm, then F has to be 60 N.

E-2.3 Requirements

During the test, no component fracture, sticking or leakage shall occur. The operating torque for flow rate adjustment and temperature adjustment shall not exceed 3 Nm during the test. Verify that, after 70 000 cycles, the leak tightness requirements of B-3 and B-4 are still satisfied.

During the test, record any incident, such as, failure of leak tightness, leakage in the assembly, fracture of components, stoppage of machine due to control difficulties, etc.

E-3 MECHANICAL ENDURANCE OF DIVERTER FOR BATH AND SHOWER MIXERS

E-3.1 General

These two methods, one for manual diverters and the other for diverters with automatic return, shall be carried out to evaluate the mechanical endurance of diverters of combination taps, and specifies the test criteria. The diverter assembly should hold at a minimum water pressure of 0.05 MPa.

E-3.2 Test Method

E-3.2.1 Principle

The diverter is subjected to a specified number of operations whilst being supplied alternately with cold water and with hot water to test its behavior over a period of time, taking into account the effect of water temperature (see Table 18).

E-3.2.2 Apparatus

E-3.2.2.1 Manual diverter

An automatic machine that ensures alternate operations at the rate of (15 ± 1) cycles per minute and supply circuits with a pump or similar device to supply the required cold water static pressure at a temperature of ≤ 30 °C and the required hot water static pressure at a temperature of (65 ± 2) °C.

E-3.2.2.2 Diverter with automatic return

A mechanism for moving the diverter to the shower position under the conditions specified in B-5 and supply circuits identical to those specified above with, in addition, an automatic quick-acting valve to cut off the supply to the combination tap/mixer under test.

Table 18 Summary of Endurance Test Conditions for Diverters

(Clause E-3.2.1)

Sl No.	Conditions	Field of Application Supply System
(1)	(2)	(3)
i)	Pressure of cold or hot water, in MPa	(0.4 + 0.05)
ii)	Water temperature, in °C	
	a) Cold water	≤ 30
	b) Hot water	(65 ± 2)
iii)	Timing of supply of cold or hot water, in min	15 ± 1
iv)	Time of flow to bath or to shower outlet, in s	5 ± 0.5
v)	Flow rate to bath and to shower outlet, in *l*/min	(6 ± 1)
vi)	Operation rate for manual diverters (cycles), in min^{-1}	15 ± 1
vii)	Number of cycles	30 000

E-3.2.3 Procedure

E-3.2.3.1 Manual diverter

a) Install the tap, as supplied, onto the test rig and connect both inlets to both supply circuits;

b) connect the drive device to the diverter operating member by means of a flexible component;

c) adjust the static water pressure of both hot and cold circuits for taps to (0.4 ± 0.05) MPa;

d) in the flow-to-bath and flow-to-shower mode, adjust the flow rate to (6 ± 1) l/min by restricting the outlet; and

e) subject the diverter to a test of 30 000 cycles, each comprising a return movement between the extreme positions; throughout the test, supply the tap alternately at both inlets with cold water for (15 ± 1) min then hot water for (15 ± 1) min.

E-3.2.3.2 Diverter with automatic return

a) Install the tap, as supplied, on the test rig and connect both inlets to both supply circuits;

b) Connect the drive device to the diverter operating member by means of a flexible component;

c) Adjust the static pressure of both hot and cold circuits for taps to (0.4 ± 0.05) MPa;

d) In the flow-to-bath and flow-to-shower mode, adjust the flow rate to (6 ± 1) l/min by restricting the outlet; and

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

1) with the diverter in the “flow to bath” position, allow water to flow through the bath outlet for (5 ± 0.5) s;
2) move the diverter to the shower position;
3) allow water to flow through the shower outlet for (5 ± 0.5) s; and
4) use the quick-acting valve to cut off the supply to the tap, allowing the diverter to return to the “flow to bath” position, and then reopen the supply.

Throughout the test, supply the tap alternately at both inlets with cold water for (15 ± 1) min and then hot water for (15 ± 1) min.

E-3.2.4 Requirement

Throughout the test, there shall be no incidents of leaks, failure of diverter to reset, blockage, etc. On completion of 30 000 cycles the assembly shall be leak tight when tested according to B-5 for manual diverters or B-5.3 for diverters with automatic return.

ANNEX F

(Clause 12)

SAMPLING AND CRITERIA FOR CONFORMITY

F-1 SCALE OF SAMPLING

F-1.1 Lot

In any consignment, all the items (pillar taps, bib taps, combination tap assemblies, stop valves and angle stop valves and single lever mixers) made of the same material, of the same nominal size and from the same batch of manufacture shall be grouped together to constitute a lot.

F-1.2 For ascertaining the conformity of material in the lot to the requirements of this standard, sample shall be tested from each lot separately.

F-1.3 The number of items to be selected from the lot shall depend on the size of the lot and shall be according to Table 19.

Table 19 Scale of Sampling and Criteria for Conformity

(Clause F-1.3)

Sl No.	No. of Taps and Valves in the Lot	Sample Size	Acceptance Number	Sub-Sample
(1)	(2)	(3)	(4)	(5)
i)	Up to 150	8	0	8
ii)	151 to 300	13	0	13
iii)	301 to 500	20	1	13
iv)	501 to 1 000	32	2	20
v)	1 001 to 3 000	50	3	32
vi)	3 001 and above	80	5	32

F-1.3.1 These items shall be selected at random from the lot, in order to ensure randomness of selection, procedures given in NS 145 may be followed.

F-2 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

F-2.1 All the taps and valves selected according to F-1.3 shall be examined for material (5.1), manufacture, workmanship and construction (6), dimensions (7), and finish (9). For accessible

taps, the requirements given in 8 shall also be examined. A sample item failing to satisfy one or more of these requirements shall be considered as defective.

F-2.1.1 The lot shall be considered to have satisfied these requirements if the number of defective items found in the sample is less than or equal to the corresponding acceptance number given in col 4 of Table 19.

F-2.2 The lot having been found satisfactory according to F-2.1 shall be further tested for performance test specified under 9.2. For this purpose, a sub-sample of taps and valves given in col 5 of Table 19 shall be taken and subjected to these tests. The number of items required in the sub-sample may be taken from those already examined and found satisfactory according to F-2.1.

F-2.2.1 The lot shall be considered to have satisfied the requirements for these tests if none of tap and valves in the sub-sample fails in any of these tests.

ANNEX G

CHEMICAL PROPERTIES OF CAST BRASS, LCB 2

Constituent	Percentage	
	Designation of LCB 2	
	Ingots	Castings
Copper Plus incidental Nickel	63.0-67.0	63.0-70.0
Lead	1.0-3.0	1.0-3.0
Tin	1.50 Max	1.50 Max
Iron, Max	0.50	0.75
*Aluminium, Max	0.01	0.01
Zinc	Remainder	Remainder

*The chemical analysis for aluminium is not required if the supplier undertakes and certifies the material doesn't contain this impurity in excess of the limits stated in the table.

ANNEX H

CHEMICAL COMPOSITIONS OF DIE CAST BRASS

Constituent	Percentage	
	Grade DCB-2	
	Min	Max
Copper	58.0	63.0
Tin	-	1.0
Lead	0.5	2.5
Nickel	-	1.0
Iron	-	0.5
Aluminium	0.2	0.8
Manganese	-	0.5
Silicon	-	0.05
Total Impurities (excluding Ni+ Pb+ Al)	-	2.00
Zinc	Remainder	

Note: Other impurities do not preclude alloying the possible presence of other unnamed elements. However, analysis shall be regularly made only for the alloying elements listed in the table. By agreement between the manufacture and the purchaser. Limits may be established for elements not specified and analysis done.

ANNEX I

CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES OF BRASSES

S. No.	Material	Designation	Chemical Composition Constituent, Percent												Mechanical Properties for Forging Stock and Forgings					Density[a] g/cm^3
			Cu	Pb	Sn	Fe	Al	Mn	Ni	Si	Cr	Co	Zn	Total Impurities Percent Max	Tensile Strength MPa Min	0.2 Percent Proof Stress MPa Min	Percent Elongation at Gauge Length $5.65\sqrt{S_0}$ Min	Hardness HRB Min	Izod on J Min	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
i)	Leaded brass	FLB	56.5 to 60.0	0.6 to 2.0	–	0.30	–	–	–	–	–	–	Rem.[b]	0.75 (excl Fe)	310	–	25	–	–	8.4
NOTE — All single limits are maximum unless otherwise stated.																				

[a] For information only.

[b] Rem. is to be read as remainder.

ANNEX J

BRASS ROD - SPECIFICATION

Table J1 Chemical Compositions

S.No	Constituent	Percentage (Grade 1)
1	Copper	56.0-59.0
2	Lead	2.0-3.5
3	Iron, Max	0.35
4	Total other impurities (excluding iron), Max	0.7
5	Zinc	Remainder

NOTES

1. if required antimony may be restricted to 0.02 percent in Grade 1 alloy.

2. Any nickel or silver present is to be counted as copper.

3. Other impurities do not preclude the possible presence of other unnamed elements. However, analysis shall be regularly made only for the alloying elements listed in the table, plus either copper or zinc. The major elements that is not analyzed shall be determined by difference between the sum of those elements analyzed and 100 percent. By agreement between the manufacturer and the purchaser, the limits may be established for elements not specified and analysis done.

Table J2 Tensile Properties

SI No.	Condition	Size, mm		Tensile Strength Min, MPa	Elongation on Gauge Length 5.65√A, Percent, Min
		Min	Max		
1	Half hard (HB)	6	12	405	4
		12	25	395	6
		25	50	355	12
		50	-	325	17

ANNEX K

BRASS TUBES - SPECIFICATIONS

Table K1 Chemical Compositions

S.No	Constituent	Percentage	
		Grade CuZn30As	**Grade CuZn37**
1	Copper plus incidental nickel	68.5-71.5	62.0-65.0
2	Lead, max	0.07	0.30
3	Iron, Max	0.06	0.1
4	Arsenic	0.02-0.06	0.06 max
5	Total Impurities, Max	0.30	0.60
6	Zinc	Remainder	Remainder

Note - The chemical analysis for total impurities is not required if the supplier undertakes and certifies that the material doesn't contain impurities in the excess of the limits specified.

Table K2. Tensile Strength and Hardness requirements of Tubes

Grades	Temper	Tensile Strength MPa	Hardness Vickers HV
CuZn30As	Annealed (O)	285 Min	75 Max
	Temper Annealed (TA)	300 Min	80-110
	Hard (HD)	400 Min	135 Min
CuZn37	Annealed (O)	285 Min	80 Max
	Temper Annealed (TA)	320 Min	80-110
	Hard (HD)	400 Min	130 Min

ANNEX L

COPPER TUBES - SPECIFICATIONS

Table L1 Chemical Composition

Sl No.	Grade	Cu + Ag *Min*	P	O
i)	Cu-OF	99.95	-	10 ppm
ii)	Cu-DLP	99.90	0.004 to 0.015	-
iii)	Cu-DHP	99.90	0.015 to 0.040	-

Table L2 Tensile Properties

SI No.	Condition	Tensile Strength, MPa		Percentage Elongation on Gauge Length 50 mm Min
		Min	Max	
1	Soft Annealed	210	-	40

Table L3. Microscopic Examination

Condition	Grain Size
Soft annealed	0.040 mm, Min

ANNEX M

BRASS SHEET - SPECIFICATIONS

Table M1 Chemical Composition

Alloy Designation	Percentage				
	Cu	Pb Max	Fe Max	Total Impurities (Including Iron Max)	Zn
CuZn 37	61.5 to 64.5	0.30	0.075	0.6	Remainder

Table M2 Mechanical Properties

Alloy Designation	Condition	Thickness		Tensile Strength		Elongation on gauge length of 50 mm percent Min	Vickers Hardness (HV)				Bend Test			
		Over	Upto and Including	N/mm^2 Up to and Including 450 mm Wide	kgf/mm^2 Over 450 mm Wide		Upto and Including 450 mm Wide		Over 450 mm Wide		Transverse Bend		Longitudinal Bend	
		mm	mm	Min	Max		Min	Max	Min	Max	Angle Deg	Radius	Angle Deg	Radius
CuZn 37	O	-	10	275	275	40	-	80	-	80	180	Close	180	Close
	HA	-	10	335	320	30	75	-	75	-	180	Close	180	Close
	HB	-	3.5	380	345	15	110	-	100	-	180	Close	180	Close
		3.5	10								180	T	180	T

T= thickness of material, HA= Quarter Hard

ANNEX N

STAINLESS STEEL SHEET (GRADE 304) - SPECIFICATIONS

Table N1 Chemical Composition, Percent

Sl No.	Grade Designation	Numerical Symbol ISS	C	Si	Mn	Ni	Cr	Mo	S	P	N	Cu	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1)	X06Cr19Ni9	304	0.070	0.75	2.00	8.00 to 10.50	17.50 to 19.50	–	0.030	0.045	0.10	–	–
2)	X02Cr19Ni10	304 L	0.030	0.75	2.00	8.00 to 12.00	17.50 to 19.50	–	0.030	0.045	0.10	–	–
3)	X07Cr19Ni9	304 H	0.040 to 0.100	0.75	2.00	8.00 to 10.50	18.00 to 20.00	–	0.030	0.045	–	–	–

High alloy steels (total alloying elements more than 10 percent) - The designation shall consist of:

I) Letter 'X'.

2) Figure indicating 100 times the percentage carbon content.

3) Chemical symbol for alloying elements each followed by the figure for its average percentage content rounded off to the nearest integer (Note : Symbol ‘Mn' for manganese shall be included in case manganese content is equal to or greater than 1 percent,).

4) Chemical symbol to indicate specially added element to attain the desired properties.

Examples: X10Cr18Ni9S3 Steel in pickled condition with average carbon 0.10 percent, chromium 18 percent and nickel 9 percent.

XI5Cr25Nil2 Steel with 0.15 percent carbon, 25 percent chromium and 12 percent nickel

Table N2 Recommended Heat Treatment for Stainless Steels

Sl No.	Grade Designation		Symbols*	Annealing or Softening Temperature °C	Quenching Media for Annealing or Softening[1)]	Symbols[2)]	Hardening Temperature °C	Quenching Media for Hardening	Tempering Temperature °C
		Numerical Symbol ISS							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1)	X06Cr19Ni9	304	SA	1 000 to I 120	w, a	–	–	–	–
2)	X02Cr19Ni10	304 L	SA	1 000 to 1 120	w, a	–	–	–	–
3)	X07Cr19Ni9	304 H	SA	1 000 to 1 120	w, a	–	–	–	–

[1)]f = furnace, a = air, O =oil, and w = water.

SA = Solution Annealing,

Table N3 Mechanical Properties in Annealed Condition

Sl No.	Grade Designation		Hardness, *Max*			Yield Strength Min, MPa 0.2 Percent Proof Stress	Tensile Strength Min, MPa	Elongation Percent Min 50 mm	Bend Test Dma
		Numerical Symbol ISS	Brinell HBS/HBW	Rockwell HRB	Vickers Load (1 kg to 30 kg)				
(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)
1)	X06Cr19Ni9	304	201	92	205	205	515	40	Not required
2)	X02Cr19Ni10	304 L	201	92	205	170	485	40	Not required
3)	X 07Cr19Ni9	304 H	201	92	205	205	515	40	Not required

ANNEX O

PHOSPHOR BRONZE SHEET, STRIP AND FOIL - SPECIFICATIONS

Table O1 Chemical Composition of Phosphor Bronze Sheet, Strip and Foil

Grade	Percent					
	Tin	**Phosphorous**	**Lead** Max	**Iron** Max	**Zinc** Max	**Cu + Sn + P** Min
(1)	(2)	(3)	(4)	(5)	(6)	(7)
III	5.5-7.0	0.03-0.35	0.02	0.10	0.30	99.5

Note - Copper may be taken as the difference between the sum of all the elements analyzed and 100 percent

Table O2 Mechanical Properties of Phosphor Bronze Sheet, Strip and Foil

Grade	Condition	Thickness	Tensile Strength, MPa		Elongation Percent on 50 mm G.L, Min	Vickers Hardness (HV)			
		Upto and Including	Up to and Including 450 mm Wide	Over 450 mm Wide		Upto and Including 450 mm Wide		Over 450 mm Wide	
			Min	Max		Min	Max	Min	Max
III	**O**	10	315	315	50	-	90	-	90
	HA	10	385	385	40	115	-	115	-
	HB	10	495	460	12	170	-	150	-
	HD	6	590	540	6	200	-	165	-
	HE	6	650	-	-	215	-	-	-
	HS	0.9	-	-	-	220	-	-	-
	HES	0.6	-	-	-	240	-	-	-

HE : Extra hard

HS : Spring hard

HES : Extra spring hard

ANNEX P

PHOSPHOR BRONZE WIRES - SPECIFICATIONS

TABLE P1 CHEMICAL COMPOSITION OF PHOSPHOR BRONZE WIRES

Grade	Percent				
	Tin	**Phosphorous**	**Lead** Max	**Total Impurities** Max	**Copper**
(1)	(2)	(3)	(4)	(5)	(6)
I	4.2-5.5	0.02-0.40	0.05	0.20	Remainder
II	5.5-7.5	0.02-0.40	0.05	0.20	Remainder

TABLE P2 MECHANICAL PROPERTIES OF PHOSPHOR BRONZE WIRES

Grade	**Condition**	**Thickness**		**Tensile Strength, MPa**		**Elongation Percent on 50 mm G.L, Min**
		Over	**Upto and Including**	Up to and Including 450 mm Wide	Over 450 mm Wide	
		mm	**mm**	**Min**	**Max**	
I	**O**	0.45	6.0	340	-	40
	HB	0.45	6.0	540	700	-
	HD	0.45	6.0	700	850	-
	HE	0.45	2.5	850	-	-
		2.5	6.0	800	-	-
II	**O**	0.45	6.0	370	-	50
	HB	0.45	6.0	590	740	-
	HD	0.45	6.0	740	900	-
	HE	0.45	2.5	900*	-	
		2.5	6.0	850	-	

For special requirements, the purchaser may specify a minimum of 925 MPa for wires of 0.45 to 0.50 mm diameter.

ANNEX Q

STAINLESS STEEL GRADE I – (SPRING WIRE) - SPECIFICATIONS

Table Q1 Chemical Composition

Grade	Designation	Constituent, Percent							
		C Max	Si Max	Mn Max	S Max	P Max	Cr	Ni	Mo
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1)	X07Cr18Ni9	0.15	1.00	2.00	0.030	0.045	17.0 to 19.0	8.0 to 10.0	-

Table Q2 Permissible Variations for Product Analysis

Constituent	Permissible Variations Over and Under Specified Limit Percent, Max
(1)	(2)
Carbon	0.01
Manganese	0.03
Silicon	0.05
Sulphur	0.005
Phosphorus	0.005
Chromium	0.20
Nickel	0.10
Molybdenum	0.10

Table Q3 Tensile Strength for Stainless Steel Spring Wire

Wire Diameter (Nominal), mm		Tensile Strength, MPa, Min	Reduction of Area after Fracture Percentage, Min
Over	Up to and Including	Grade I	
-	0.20	2200	-
0.20	0.30	2150	-
0.30	0.40	2150	-
0.40	0.50	2050	-
0.50	0.65	2000	-
0.65	0.80	1950	-
0.80	1.00	1900	-
1.00	1.25	1850	40
1.25	1.50	1800	40
1.50	1.75	1750	40
1.75	2.00	1700	40
2.00	2.50	1650	40
2.50	3.00	1600	40
3.00	3.50	1550	40
3.50	4.25	1500	40
4.25	5.00	1450	40
5.00	6.00	1400	40
6.00	7.00	1350	40
7.00	8.50	1300	40
8.50	10.00	1250	40

Table Q4 Reference Data for Modulus of Elasticity and Rigidity

Steel Grade	Modulus of Elasticity, MPa		Modulus of Elasticity, MPa	
	Untempered	Tempered	Untempered	Tempered
1	19500	18500	73000	70000

ANNEX R

Table R1 Chemical Composition of Zinc Alloy Ingots

Sl No.	Common Name	Traditional Name	Colour Code	Alloy Symbol	Alloy Number	Short Designations	Elements								
							Al	Cu	Mg	Pb, *Max*	Cd, *Max*	Sn, *Max*	Fe, *Max*	Ni	Zn
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	Alloy 3	Zamak 3	white/ yellow	ZnAl4	ZL0400 A	ZL3	3.9 to 4.3	0.1, *Max*	0.03 to 0.06	0.004 0	0.003 0	0.001 5	0.035	–	Remainder
ii)	Alloy 7	Zamak 7	white/ brown	ZnAl4LM	ZL0400 B	ZL7	3.9 to 4.3	0.1, *Max*	0.010 to 0.020	0.003 0	0.002 0	0.001 0	0.035	0.005 to 0.020	Remainder
iii)	Alloy 5	Zamak 5	white/ black	ZnAl4Cu1	ZL0410	ZL5	3.9 to 4.3	0.7 to 1.1	0.03 to 0.06	0.004 0	0.003 0	0.001 5	0.035	–	Remainder
iv)	Alloy 2	Zamak 2	white/ green	ZnAl4Cu3	ZL0430	ZL2	3.9 to 4.3	2.7 to 3.3	0.025 to 0.05	0.004 0	0.003 0	0.001 5	0.035	–	Remainder
v)	ZA-8	ZA-8	white/ blue	ZnAl8Cu1	ZL0810	ZL8	8.2 to 8.8	0.9 to 1.3	0.02 to 0.03	0.005	0.005	0.002	0.035	–	Remainder
vi)	ZA-12	ZA-12	white/ orange	ZnAl11Cu1	ZL1110	ZL12	10.8 to 11.5	0.5 to 1.2	0.02 to 0.03	0.005	0.005	0.002	0.05	–	Remainder
vii)	ZA-27	ZA-27	white/ purple	ZnAl27Cu2	ZL2720	ZL27	25.5 to 28.0	2.0 to 2.5	0.012 to 0.020	0.005	0.005	0.002	0.07	–	Remainder
viii)	HF Alloy	–	white/ red or brown	ZnAl4HF	ZL0400 C	–	4.4 to 4.7	0.035, *Max*	0.007 to 0.012	0.003	0.002	0.001	0.03	–	Remainder
ix)	–	ACuZinc / ACuZinc 5	white/ Red	ZnAl3Cu6	ZL0360	–	2.8 to 3.3	5.2 to 6.0	0.035 to 0.050	0.004	0.003	0.002	0.05	–	Remainder