

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 49

MALLEABLE CAST IRON PIPE FITTINGS
SCREWED IN ACCORDANCE WITH ISO RECOMMENDATION R 7

1st EDITION

July 1957

COPYRIGHT RESERVED

The copyright of ISO Recommendations and ISO Standards belongs to ISO Member Bodies. Reproduction of these documents, in any country, may be authorized therefore only by the national standards organization of that country, being a member of ISO.

For each individual country the only valid standard is the national standard of that country.

Printed in Switzerland

Also issued in French and Russian. Copies to be obtained through the national standards organizations.

BRIEF HISTORY

This ISO Recommendation R 49, *Malleable Cast Iron Pipe Fittings, Screwed in accordance with ISO Recommendation R 7*, was prepared by Technical Committee ISO/TC 5, *Pipes and Fittings*, the Secretariat of which is held by the Association Suisse de Normalisation (SNV).

At its plenary meeting held in Milan, in April 1952, the Technical Committee assigned the study of the standardization of these fittings to its Sub-Committee ISO/TC 5/SC 5, *Fittings (other than Cast Iron)*.

It was a question, in the first place, of making a choice among more than two thousand types and sizes of fittings covered by national standards, the proposals of the Member Bodies and the drafts of the former International Federation of the National Standardizing Associations (ISA) and of retaining those required for ordinary needs and manufactured in large quantity. During its meetings of 1952, in London, and 1953, in Paris, the Sub-Committee drew up a list of 638 types and sizes of fittings.

The Sub-Committee thereafter studied the "centre-to-face", "face-to-face" and "centre-to-centre" dimensions, comparing these with the dimensions specified by the national standards of various countries and by the ISA drafts. During its 1954 meetings, in Brussels and Zurich, it defined these dimensions and their tolerances.

On the basis of the proposals of the Sub-Committee, the ISO/TC 5 Secretariat put forward a first draft proposal which the Technical Committee examined during its 1955 plenary meeting, in Stockholm. After having decided upon the principle of corresponding and equally acceptable values for the inch and metric systems, provided that these values, in each case, permit practicable interchangeability, the Technical Committee adopted the draft proposal as a Draft ISO Recommendation.

The sizes of threads of Union nuts (see last column of table 4.21, page 31) have been included because the dimensions of the gaskets are dependent on those threads. As these threads are not intended to make pressure-tight joints on the threads and have not yet been standardized, they have therefore been included, for the time being, for guidance only.

Submitted on 31 December 1955 to all the ISO Member Bodies, this Draft ISO Recommendation was approved, subject to some amendments, by the following 27 Member Bodies (out of a total of 37):

*Austria	*Greece	Portugal
Belgium	Hungary	Romania
Bulgaria	*Ireland	Spain
Chile	Israel	Sweden
Czechoslovakia	Italy	Switzerland
Denmark	Japan	Turkey
Finland	Mexico	United Kingdom
France	Netherlands	U.S.S.R.
Germany	Poland	Yugoslavia

No Member Body opposed the approval of the Draft.

At its meeting in July 1957, the ISO Council decided to accept the Draft ISO Recommendation as an ISO RECOMMENDATION.

* These Member Bodies stated that they had no objection to the Draft being approved.

MALLEABLE CAST IRON PIPE FITTINGS

SCREWED IN ACCORDANCE WITH ISO RECOMMENDATION R 7

1. SCOPE

This Recommendation covers 638 malleable cast iron pipe fittings which are considered necessary for general use and which are being mass produced. It defines the types of fittings covered and specifies the dimensions which are necessary for interchangeability (centre-to-face, face-to-face and centre-to-centre dimensions) as well as their tolerances.

2. GENERAL

2.1 ILLUSTRATIONS

Illustrations used throughout this document are diagrammatical, e.g. the form of reinforcement and the design of the female ends shown have been arbitrarily chosen without prejudice.

2.2 REINFORCEMENT

The fittings may be either plain or reinforced.

Two typical forms of reinforcement are shown in figure 1.

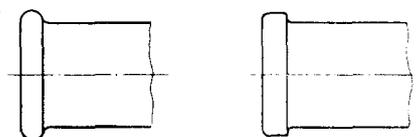


FIGURE 1

2.3 FEMALES ENDS

Two typical forms of female ends are shown in figure 2. Either form may be used for fitting code numbers D1, D4, E1, E2, G1, G1/45°, G4, G4/45° and Kb1.

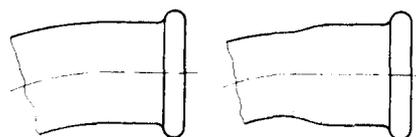


FIGURE 2

2.4 THREADS

The outlets are threaded to the dimensions specified in ISO Recommendation R 7, *Pipe Threads for Gas List Tubes and Screwed Fittings, where Pressure-Tight Joints are made on the Threads (1/8 inch to 6 inches)*.

2.5 DIMENSIONS

All the dimensions recommended enable the fittings to be assembled with tubes screwed in accordance with ISO Recommendation R 7.

The dimensions in inches and in millimetres given in the tables are considered to be "Corresponding values", although some of them are not exact equivalents. In all cases, however, the dimensions ensure practicable interchangeability.

The differences between these corresponding values do not exceed:

- 0.04 inch (corresponding value: 1 millimetre)
- or 50 per cent of the tolerances indicated in clause 2.6.1.

2.6 TOLERANCES

2.6.1 Where maximum or minimum dimensions are not specified, the tolerances for *centre-to-face**, *face-to-face*** and *centre-to-centre**** dimensions are as follows:

above		Dimensions up to and including		Tolerances	
mm	in	mm	in	mm	in
—	—	30	1 ¹ / ₄	± 1.5	± 0.06
30	1 ¹ / ₄	50	2	± 2.0	± 0.08
50	2	75	3	± 2.5	± 0.10
75	3	100	4	± 3.0	± 0.12
100	4	150	6	± 3.5	± 0.14
150	6	200	8	± 4.0	± 0.16
200	8	—	—	± 5.0	± 0.20

* *Centre-to-face* dimensions apply to elbows, bends, tees, crosses, etc.
 ** *Face-to-face* dimensions apply to sockets, nipples, etc.
 *** *Centre-to-centre* dimensions apply to return bends.

2.6.2 As regards the tolerance for the alignment of threads, the axes of the screw threads are coincident with the theoretical axes of the fittings within $\frac{1}{2}^\circ$ on the run and on the branches.

2.6.3 Thread tolerances are in accordance with those specified in ISO Recommendation R 7.

2.7 DESIGNATION OF FITTINGS

To facilitate easy translations into the languages of the various countries, the fittings covered by this Recommendation are designated by the following particulars and in the sequence shown:

- (a) Type of fitting see clause 2.7.1
 (b) Size see clause 2.7.2
 (c) Right- and left-hand thread, where applicable see clause 2.7.3
 (d) Code number see clause 2.7.4

2.7.1 Type of fitting (elbow, bend, tee, cross, etc.).

It should be noted that the following terms are omitted when reference is made to type of fitting:

- the indication "90°" for elbows, bends and tees of 90°;
- the word "equal" for fittings with all outlets of the same size;
- the word "female" for fittings with female-threaded outlets only;
- the word "male", where it is obvious that the fittings have only male thread.

The type of fitting is therefore denoted by "elbow", "bend", "tee", "cross", etc.

2.7.2 **Size.** This is determined by the nominal sizes of the pipe thread at the outlets.

EQUAL FITTINGS, where all outlets are of the same size, are referred to by that one size, irrespective of the number of outlets.

UNEQUAL FITTINGS are referred to by the size of each outlet, the sequence of specifying being dependent upon the number of outlets as follows:

Unequal fittings having two outlets are specified by their outlets given in decreasing order (large outlet — small outlet). See figure 3:

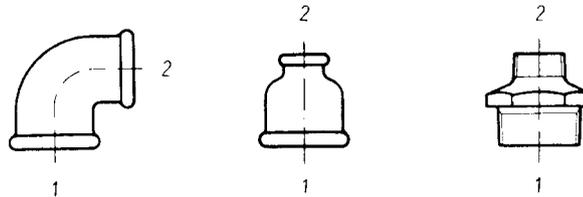


FIGURE 3

Unequal fittings (reducing or increasing) having more than two outlets are specified by either of the two methods shown respectively in figures 4 and 5:

Method "a" of specifying outlets

used in most countries where the **metric system** is applied

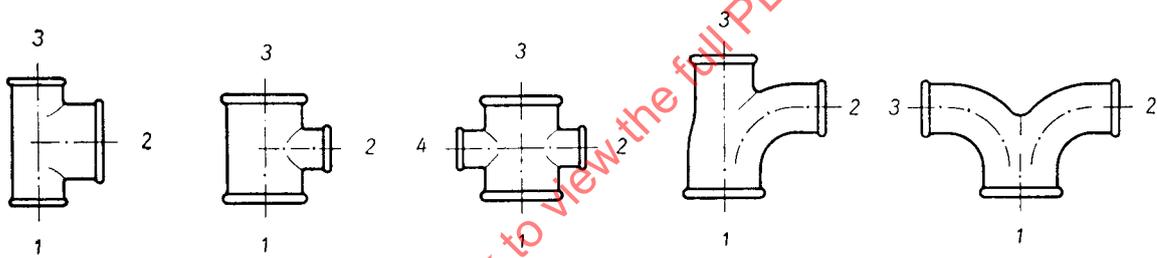


FIGURE 4

Method "b" of specifying outlets

used in most countries where the **inch system** is applied

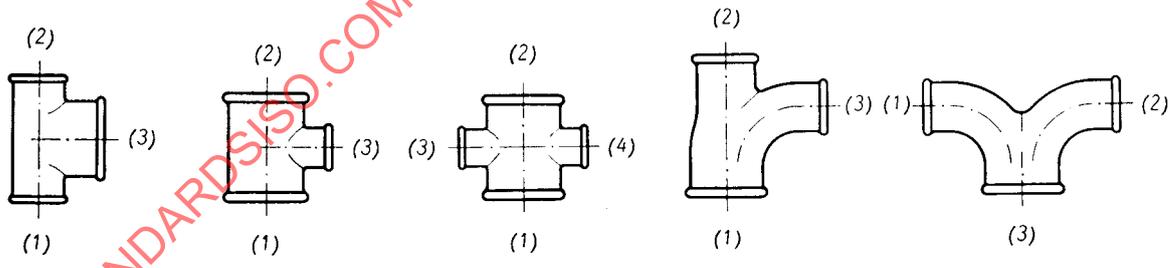


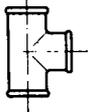
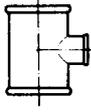
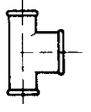
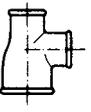
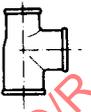
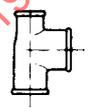
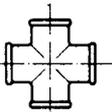
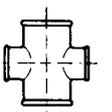
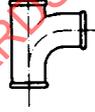
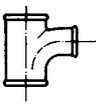
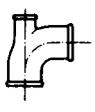
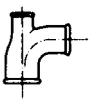
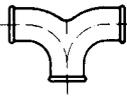
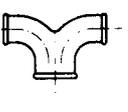
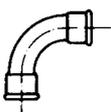
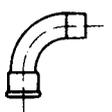
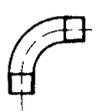
FIGURE 5

2.7.3 Right- and left-hand thread. For sockets and hexagon nipples, with right- and left-hand thread, the letters "R-L" (Right-Left) are added after the size of the fitting.

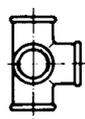
2.7.4 Code number. See Indexes, pages 6, 7 and 8.

2.7.5 Examples of designations :

- | | |
|--|---------------------|
| 2 inch equal female elbow | = Elbow 2, A1 |
| 1½ inch equal male and female bend | = Bend 1½, D4 |
| 1 inch equal socket, threaded right- and left-hand | = Socket 1 R-L, M2 |
| Reducing female tee, in which the sizes on the run are 1 inch and ½ inch and the outlet is ¾ inch: | |
| Method "a" of specifying outlets | = Tee 1 × ½ × ¾, B1 |
| Method "b" of specifying outlets | = Tee 1 × ½ × ¾, B1 |

3. INDEX OF CODE NUMBERS							
A Elbows	A1  Page 9		A1/45°  Page 11		A4  Page 9		A4/45°  Page 11
	 Page 10		 Page 10		 Page 10		 Page 11
B Tees	B1						
	 Page 9	 Page 12	 Page 12	 Page 14	 Page 14	 Page 14	
C Crosses	C1						
	 Page 9	 Page 16					
D Bends	D1  Page 17	D4  Page 17					
E Pitcher Tees Twin Elbows	E1				E2		
	 Page 17	 Page 18	 Page 18	 Page 18	 Page 17	 Page 19	
G Long Sweep Bends	G1  Page 20	G1/45°  Page 21	G4  Page 20	G4/45°  Page 21	G8  Page 20		
Kb Return Bends	Kb 1  Page 22						

3. INDEX OF CODE NUMBERS (concluded)

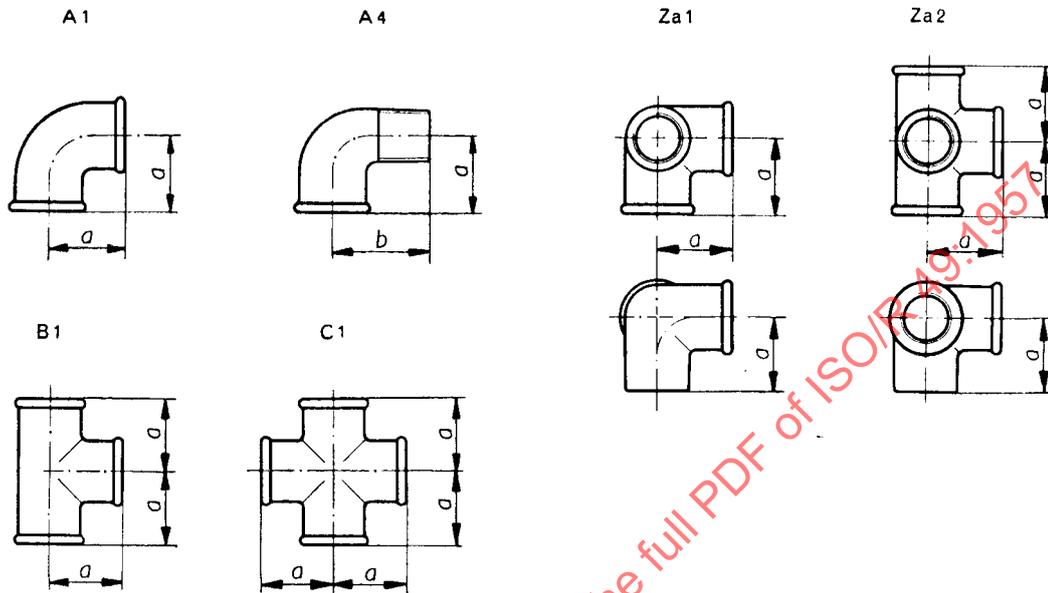
<p>M Sockets</p>	<p>M2</p>  <p>Page 23</p>  <p>Page 23</p>	<p>M3</p>  <p>Page 23</p>	<p>M4</p>  <p>Page 24</p>  <p>Page 24</p>			
<p>N Bushings Hexagon Nipples</p>	<p>N4</p>  <p>Page 25</p>  <p>Page 25</p>	 <p>Page 25</p>	<p>N8</p>  <p>Page 26</p>  <p>Page 26</p>			
<p>P Backnuts</p>	<p>P4</p>  <p>Page 27</p>					
<p>T Caps Plugs</p>	<p>T1</p>  <p>Page 28</p>	<p>T2</p>  <p>Page 28</p>	<p>T8</p>  <p>Page 28</p>	<p>T9</p>  <p>Page 28</p>	<p>T11</p>  <p>Page 28</p>	
<p>U Unions</p>	<p>U1</p>  <p>Page 29</p>	<p>U2</p>  <p>Page 29</p>	<p>U11</p>  <p>Page 29</p>	<p>U12</p>  <p>Page 29</p>		
<p>UA Union Elbows</p>	<p>UA1</p>  <p>Page 30</p>	<p>UA2</p>  <p>Page 30</p>	<p>UA11</p>  <p>Page 30</p>	<p>UA12</p>  <p>Page 30</p>		
<p>Za Side outlet Elbows and Tees</p>	<p>Za1</p>  <p>Page 9</p>	<p>Za2</p>  <p>Page 9</p>				

4. DIMENSIONS OF FITTINGS

INDEX

	Page		Page
4.1 Elbows A1		4.12 Return bends Kb1	22
Male and female elbows A4		4.13 Sockets M2	
Tees B1		Sockets, right- and left-hand threads	
Crosses C1		M2 R-L	
Side outlet elbows Za1		Sockets, reducing M2	
Side outlet tees Za2	9	Eccentric sockets, reducing M3	23
4.2 Elbows, reducing A1		4.14 Male and female sockets M4	
Male and female elbows, reducing A4	10	Male and female sockets, reducing M4	24
4.3 45° elbows A1/45°		4.15 Bushings N4	25
45° male and female elbows A4/45°	11	4.16 Hexagon nipples N8	
4.4 Tees, reducing or increasing on the		Hexagon nipples, right- and left-hand	
branch B1	12-13	threads N8 R-L	
4.5 Tees, reducing on the run:		Hexagon nipples, reducing N8	26
reducing on the branch B1		4.17 Backnuts P4	27
equal on the branch B1		4.18 Hexagon caps T1	
increasing on the branch B1	14-15	Round caps T2	
4.6 Crosses, reducing C1	16	Plain plugs T8	
4.7 Bends D1		Beaded plugs T9	
Male and female bends D4		Countersunk plugs T11	28
Pitcher tees E1		4.19 Unions, flat seat U1	
Twin elbows E2	17	Male and female Unions, flat seat U2	
4.8 Pitcher tees:		Unions, taper seat U11	
reducing on the branch E1		Male and female Unions, taper	
reducing on the run E1		seat U12	29
reducing on branch and run E1	18	4.20 Union elbows, flat seat UA1	
4.9 Twin elbows, reducing E2	19	Male and female Union elbows, flat	
4.10 Long sweep bends G1		seat UA2	
Male and female long sweep bends G4		Union elbows, taper seat UA11	
Male long sweep bends G8	20	Male and female Union elbows, taper	
4.11 45° long sweep bends G1/45°		seat UA12	30
45° male and female long sweep bends		4.21 Gaskets for Unions and Union elbows,	
G4/45°	21	flat seat U1, U2, UA1 and UA2	31

4.1 ELBOWS **A1** MALE AND FEMALE ELBOWS **A4** SIDE OUTLET ELBOWS **Za1**
 TEES **B1** CROSSES **C1** SIDE OUTLET TEES **Za2**



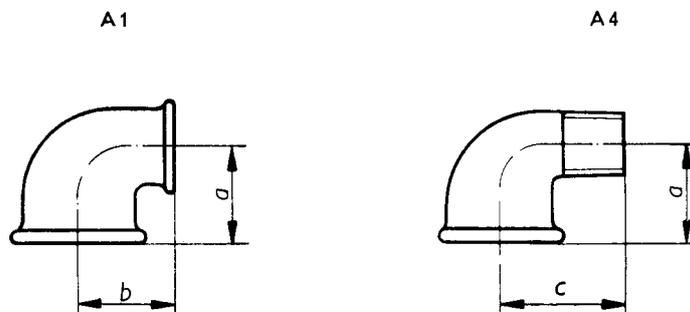
Sizes inches						Dimensions (Corresponding values)			
A1	A4	B1	C1	Za1	Za2	millimetres		inches	
						a	b	a	b
1/8	1/8	1/8	—	—	—	19	25	0.75	1.00
1/4	1/4	1/4	1/4	—	—	21	28	0.81	1.14
3/8	3/8	3/8	3/8	3/8	3/8	25	32	0.95	1.30
1/2	1/2	1/2	1/2	1/2	1/2	28	37	1.12	1.50
3/4	3/4	3/4	3/4	3/4	3/4	33	43	1.31	1.73
1	1	1	1	1	1	38	52	1.50	2.10
1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	45	60	1.75	2.41
1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	50	65	1.94	2.61
2	2	2	2	2	2	58	74	2.25	2.96
2 1/2	2 1/2	2 1/2	2 1/2	—	—	69	88	2.70	3.52
3	3	3	3	—	—	78	98	3.08	3.92
3 1/2	3 1/2	3 1/2	—	—	—	87	108	3.42	4.32
4	4	4	4	—	—	96	118	3.79	4.72
5	—	5	—	—	—	115	—	4.50	—
6	—	6	—	—	—	131	—	5.13	—

Dimensions which are not specified are left to the discretion of the manufacturer.
 Tolerances: see clause 2.6.

Thread: in accordance with ISO Recommendation R 7.

4.2

ELBOWS, REDUCING A1
MALE AND FEMALE ELBOWS, REDUCING A4



Sizes Inches		Dimensions (Corresponding values)					
		millimetres			inches		
A1	A4	a	b	c	a	b	c
$\frac{3}{8} \times \frac{1}{4}$	—	23	23	—	0.88	0.90	—
$\frac{1}{2} \times \frac{3}{8}$	$\frac{1}{2} \times \frac{3}{8}$	26	26	33	1.04	1.03	1.34
$\frac{3}{4} \times \frac{3}{8}$	—	28	28	—	1.12	1.13	—
$\frac{3}{4} \times \frac{1}{2}$	$\frac{3}{4} \times \frac{1}{2}$	30	31	40	1.20	1.22	1.61
$1 \times \frac{1}{2}$	—	32	34	—	1.26	1.36	—
$1 \times \frac{3}{4}$	$1 \times \frac{3}{4}$	35	36	46	1.37	1.45	1.85
$1 \frac{1}{4} \times \frac{3}{4}$	—	36	41	—	1.45	1.62	—
$1 \frac{1}{4} \times 1$	$1 \frac{1}{4} \times 1$	40	42	56	1.58	1.67	2.25
$1 \frac{1}{2} \times 1$	—	42	46	—	1.65	1.80	—
$1 \frac{1}{2} \times 1 \frac{1}{4}$	—	46	48	—	1.82	1.88	—
$2 \times 1 \frac{1}{2}$	—	52	55	—	2.02	2.16	—
$2 \frac{1}{2} \times 2$	—	61	66	—	2.39	2.60	—

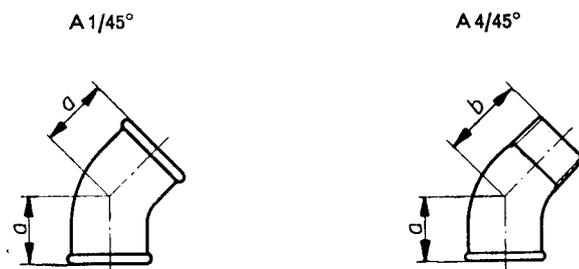
Dimensions which are not specified are left to the discretion of the manufacturer.

Tolerances: see clause 2.6.

Thread: in accordance with ISO Recommendation R 7.

4.3

45° ELBOWS A1/45°
45° MALE AND FEMALE ELBOWS A4/45°



Sizes inches		Dimensions (Corresponding values)			
		millimetres		inches	
A 1 / 45°	A 4 / 45°	a	b	a	b
$\frac{3}{8}$	$\frac{3}{8}$	20	25	0.80	1.00
$\frac{1}{2}$	$\frac{1}{2}$	22	28	0.88	1.12
$\frac{3}{4}$	$\frac{3}{4}$	25	32	0.98	1.26
1	1	28	37	1.12	1.45
$1 \frac{1}{4}$	$1 \frac{1}{4}$	33	43	1.29	1.67
$1 \frac{1}{2}$	$1 \frac{1}{2}$	36	46	1.43	1.81
2	2	43	55	1.68	2.14

Dimensions which are not specified are left to the discretion of the manufacturer.

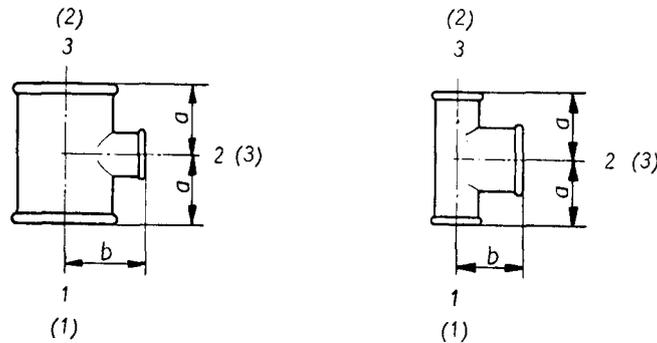
Tolerances: see clause 2.6.

Thread: in accordance with ISO Recommendation R 7.

4.4

TEES, REDUCING OR INCREASING ON THE BRANCH B1

B1



Sizes Inches						Dimensions (Corresponding values) millimetres inches				
Method "a"			Method "b"			a	b	a	b	
1	2	3	(1)	(2)	(3)					
3/8	×	1/4	×	3/8	×	1/4	23	23	0.88	0.90
3/8	×	1/2	×	3/8	×	1/2	26	26	1.03	1.04
1/2	×	1/4	×	1/2	×	1/4	24	24	0.97	0.98
1/2	×	3/8	×	1/2	×	3/8	26	26	1.04	1.03
1/2	×	3/4	×	1/2	×	3/4	31	30	1.22	1.20
1/2	×	1	×	1/2	×	1	34	32	1.36	1.26
3/4	×	1/4	×	3/4	×	1/4	26	27	1.05	1.08
3/4	×	3/8	×	3/4	×	3/8	28	28	1.12	1.13
3/4	×	1/2	×	3/4	×	1/2	30	31	1.20	1.22
3/4	×	1	×	3/4	×	1	36	35	1.45	1.37
3/4	×	1 1/4	×	3/4	×	1 1/4	41	36	1.62	1.45
1	×	1/4	×	1	×	1/4	28	31	1.11	1.22
1	×	3/8	×	1	×	3/8	30	32	1.18	1.27
1	×	1/2	×	1	×	1/2	32	34	1.26	1.36
1	×	3/4	×	1	×	3/4	35	36	1.37	1.45
1	×	1 1/4	×	1	×	1 1/4	42	40	1.67	1.58
1	×	1 1/2	×	1	×	1 1/2	46	42	1.80	1.65

Dimensions which are not specified are left to the discretion of the manufacturer.
 Tolerances: see clause 2.6.
 Thread: in accordance with ISO Recommendation R 7.
 Method of specifying outlets: see clause 2.7.2.

4.4 TEES, REDUCING OR INCREASING ON THE BRANCH B1 (concluded)

Sizes inches						Dimensions (Corresponding values)			
Method "a"			Method "b"			millimetres		inches	
1	2	3	(1)	(2)	(3)	a	b	a	b
1 1/4	× 3/8	× 1 1/4	1 1/4	× 1 1/4	× 3/8	32	36	1.26	1.44
1 1/4	× 1/2	× 1 1/4	1 1/4	× 1 1/4	× 1/2	34	38	1.34	1.53
1 1/4	× 3/4	× 1 1/4	1 1/4	× 1 1/4	× 3/4	36	41	1.45	1.62
1 1/4	× 1	× 1 1/4	1 1/4	× 1 1/4	× 1	40	42	1.58	1.67
1 1/4	× 1 1/2	× 1 1/4	1 1/4	× 1 1/4	× 1 1/2	48	46	1.88	1.82
1 1/4	× 2	× 1 1/4	1 1/4	× 1 1/4	× 2	54	48	2.10	1.90
1 1/2	× 1/2	× 1 1/2	1 1/2	× 1 1/2	× 1/2	36	42	1.41	1.66
1 1/2	× 3/4	× 1 1/2	1 1/2	× 1 1/2	× 3/4	38	44	1.52	1.75
1 1/2	× 1	× 1 1/2	1 1/2	× 1 1/2	× 1	42	46	1.65	1.80
1 1/2	× 1 1/4	× 1 1/2	1 1/2	× 1 1/2	× 1 1/4	46	48	1.82	1.88
1 1/2	× 2	× 1 1/2	1 1/2	× 1 1/2	× 2	55	52	2.16	2.02
2	× 1/2	× 2	2	× 2	× 1/2	38	48	1.49	1.88
2	× 3/4	× 2	2	× 2	× 3/4	40	50	1.60	1.97
2	× 1	× 2	2	× 2	× 1	44	52	1.73	2.02
2	× 1 1/4	× 2	2	× 2	× 1 1/4	48	54	1.90	2.10
2	× 1 1/2	× 2	2	× 2	× 1 1/2	52	55	2.02	2.16
2 1/2	× 1	× 2 1/2	2 1/2	× 2 1/2	× 1	47	60	1.87	2.37
2 1/2	× 1 1/4	× 2 1/2	2 1/2	× 2 1/2	× 1 1/4	52	62	2.04	2.45
2 1/2	× 1 1/2	× 2 1/2	2 1/2	× 2 1/2	× 1 1/2	55	63	2.16	2.51
2 1/2	× 2	× 2 1/2	2 1/2	× 2 1/2	× 2	61	66	2.39	2.60
3	× 1	× 3	3	× 3	× 1	51	67	2.00	2.66
3	× 1 1/4	× 3	3	× 3	× 1 1/4	55	70	2.17	2.74
3	× 1 1/2	× 3	3	× 3	× 1 1/2	58	71	2.29	2.80
3	× 2	× 3	3	× 3	× 2	64	73	2.52	2.89
3	× 2 1/2	× 3	3	× 3	× 2 1/2	72	76	2.83	2.99
4	× 2	× 4	4	× 4	× 2	70	86	2.74	3.41
4	× 3	× 4	4	× 4	× 3	84	92	3.30	3.60

Dimensions which are not specified are left to the discretion of the manufacturer.

Tolerances: see clause 2.6.

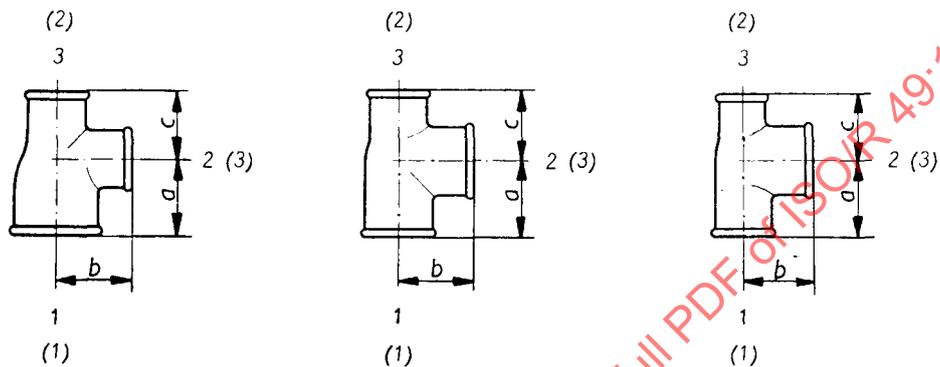
Thread: in accordance with ISO Recommendation R 7.

Method of specifying outlets: see clause 2.7.2.

4.5

TEES, REDUCING ON THE RUN:
 REDUCING ON THE BRANCH **B1**
 EQUAL ON THE BRANCH **B1**
 INCREASING ON THE BRANCH **B1**

B1



Sizes inches						Dimensions (Corresponding values)					
Method "a"			Method "b"			millimetres			inches		
1	2	3	(1)	(2)	(3)	a	b	c	a	b	c
1/2	×	3/8	×	3/8	×	26	26	25	1.04	1.03	0.95
1/2	×	1/2	×	3/8	×	28	28	26	1.12	1.12	1.03
3/4	×	3/8	×	3/8	×	28	28	25	1.12	1.13	0.95
3/4	×	3/8	×	1/2	×	28	28	26	1.12	1.13	1.04
3/4	×	1/2	×	3/8	×	30	31	26	1.20	1.22	1.03
3/4	×	1/2	×	1/2	×	30	31	28	1.20	1.22	1.12
3/4	×	3/4	×	3/8	×	33	33	28	1.31	1.31	1.13
3/4	×	3/4	×	1/2	×	33	33	31	1.31	1.31	1.22
3/4	×	1	×	1/2	×	36	35	34	1.45	1.37	1.36
1	×	3/8	×	3/4	×	30	32	28	1.18	1.27	1.12
1	×	1/2	×	1/2	×	32	34	28	1.26	1.36	1.12
1	×	1/2	×	3/4	×	32	34	30	1.26	1.36	1.20
1	×	3/4	×	3/8	×	35	36	28	1.37	1.45	1.13
1	×	3/4	×	1/2	×	35	36	31	1.37	1.45	1.22
1	×	3/4	×	3/4	×	35	36	33	1.37	1.45	1.31

Dimensions which are not specified are left to the discretion of the manufacturer.
 Tolerances: see clause 2.6.
 Thread: in accordance with ISO Recommendation R 7.
 Method of specifying outlets: see clause 2.7.2.

4.5

TEES, REDUCING ON THE RUN:
 REDUCING ON THE BRANCH **B1**
 EQUAL ON THE BRANCH **B1**
 INCREASING ON THE BRANCH **B1** (concluded)

Sizes inches						Dimensions (Corresponding values)						
Method "a"			Method "b"			millimetres			inches			
1	2	3	(1)	(2)	(3)	a	b	c	a	b	c	
1	×	1	×	$\frac{3}{8}$	×	1	38	38	32	1.50	1.50	1.27
1	×	1	×	$\frac{1}{2}$	×	1	38	38	34	1.50	1.50	1.36
1	×	1	×	$\frac{3}{4}$	×	1	38	38	36	1.50	1.50	1.45
1	×	$1\frac{1}{4}$	×	$\frac{3}{4}$	×	$1\frac{1}{4}$	42	40	41	1.67	1.58	1.62
$1\frac{1}{4}$	×	$\frac{1}{2}$	×	1	×	$1\frac{1}{4}$	34	38	32	1.34	1.53	1.26
$1\frac{1}{4}$	×	$\frac{3}{4}$	×	$\frac{3}{4}$	×	$\frac{3}{4}$	36	41	33	1.45	1.62	1.31
$1\frac{1}{4}$	×	$\frac{3}{4}$	×	1	×	$\frac{3}{4}$	36	41	35	1.45	1.62	1.37
$1\frac{1}{4}$	×	1	×	$\frac{1}{2}$	×	1	40	42	34	1.58	1.67	1.36
$1\frac{1}{4}$	×	1	×	$\frac{3}{4}$	×	1	40	42	36	1.58	1.67	1.45
$1\frac{1}{4}$	×	1	×	1	×	1	40	42	38	1.58	1.67	1.50
$1\frac{1}{4}$	×	$1\frac{1}{4}$	×	$\frac{1}{2}$	×	$1\frac{1}{4}$	45	45	38	1.75	1.75	1.53
$1\frac{1}{4}$	×	$1\frac{1}{4}$	×	$\frac{3}{4}$	×	$1\frac{1}{4}$	45	45	41	1.75	1.75	1.62
$1\frac{1}{4}$	×	$1\frac{1}{4}$	×	1	×	$1\frac{1}{4}$	45	45	42	1.75	1.75	1.67
$1\frac{1}{4}$	×	$1\frac{1}{2}$	×	1	×	$1\frac{1}{2}$	48	46	46	1.88	1.82	1.80
$1\frac{1}{2}$	×	$\frac{1}{2}$	×	$1\frac{1}{4}$	×	$1\frac{1}{2}$	36	42	34	1.41	1.66	1.34
$1\frac{1}{2}$	×	$\frac{3}{4}$	×	$1\frac{1}{4}$	×	$\frac{3}{4}$	38	44	36	1.52	1.75	1.45
$1\frac{1}{2}$	×	1	×	1	×	1	42	46	38	1.65	1.80	1.50
$1\frac{1}{2}$	×	1	×	$1\frac{1}{4}$	×	1	42	46	40	1.65	1.80	1.58
$1\frac{1}{2}$	×	$1\frac{1}{4}$	×	$\frac{3}{4}$	×	$1\frac{1}{4}$	46	48	41	1.82	1.88	1.62
$1\frac{1}{2}$	×	$1\frac{1}{4}$	×	1	×	$1\frac{1}{4}$	46	48	42	1.82	1.88	1.67
$1\frac{1}{2}$	×	$1\frac{1}{4}$	×	$1\frac{1}{4}$	×	$1\frac{1}{4}$	46	48	45	1.82	1.88	1.75
$1\frac{1}{2}$	×	$1\frac{1}{2}$	×	$\frac{1}{2}$	×	$1\frac{1}{2}$	50	50	42	1.94	1.94	1.66
$1\frac{1}{2}$	×	$1\frac{1}{2}$	×	$\frac{3}{4}$	×	$1\frac{1}{2}$	50	50	44	1.94	1.94	1.75
$1\frac{1}{2}$	×	$1\frac{1}{2}$	×	1	×	$1\frac{1}{2}$	50	50	46	1.94	1.94	1.80
$1\frac{1}{2}$	×	$1\frac{1}{2}$	×	$1\frac{1}{4}$	×	$1\frac{1}{2}$	50	50	48	1.94	1.94	1.88
2	×	$\frac{3}{4}$	×	$1\frac{1}{2}$	×	$\frac{3}{4}$	40	50	38	1.60	1.97	1.52
2	×	1	×	$1\frac{1}{2}$	×	1	44	52	42	1.73	2.02	1.65
2	×	$1\frac{1}{4}$	×	$1\frac{1}{4}$	×	$1\frac{1}{4}$	48	54	45	1.90	2.10	1.75
2	×	$1\frac{1}{4}$	×	$1\frac{1}{2}$	×	$1\frac{1}{4}$	48	54	46	1.90	2.10	1.82
2	×	$1\frac{1}{2}$	×	$1\frac{1}{4}$	×	$1\frac{1}{2}$	52	55	48	2.02	2.16	1.88
2	×	$1\frac{1}{2}$	×	$1\frac{1}{2}$	×	$1\frac{1}{2}$	52	55	50	2.02	2.16	1.94
2	×	2	×	$\frac{3}{4}$	×	2	58	58	50	2.25	2.25	1.97
2	×	2	×	1	×	2	58	58	52	2.25	2.25	2.02
2	×	2	×	$1\frac{1}{4}$	×	2	58	58	54	2.25	2.25	2.10
2	×	2	×	$1\frac{1}{2}$	×	2	58	58	55	2.25	2.25	2.16

Dimensions which are not specified are left to the discretion of the manufacturer.

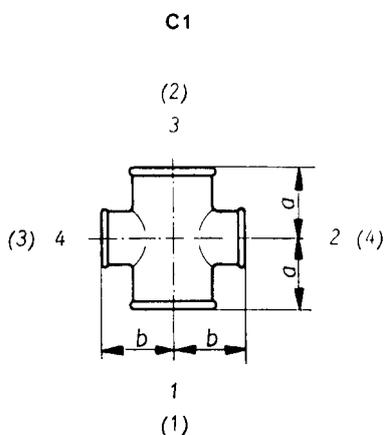
Tolerances: see clause 2.6.

Thread: in accordance with ISO Recommendation R 7.

Method of specifying outlets: see clause 2.7.2.

4.6

CROSSES, REDUCING C1



Sizes inches								Dimensions (Corresponding values)				
								millimetres		inches		
Method "a"		Method "b"		a	b	a	b					
1	2	3	4					(1)	(2)	(3)	(4)	
$1/2$	\times	$3/8$	\times	$1/2$	\times	$3/8$	\times	$3/8$	26	26	1.04	1.03
$3/4$	\times	$3/8$	\times	$3/4$	\times	$3/8$	\times	$3/8$	28	28	1.12	1.13
$3/4$	\times	$1/2$	\times	$3/4$	\times	$1/2$	\times	$1/2$	30	31	1.20	1.22
1	\times	$3/8$	\times	1	\times	$3/8$	\times	$3/8$	30	32	1.18	1.27
1	\times	$1/2$	\times	1	\times	$1/2$	\times	$1/2$	32	34	1.26	1.36
1	\times	$3/4$	\times	1	\times	$3/4$	\times	$3/4$	35	36	1.37	1.45
$1\ 1/4$	\times	$1/2$	\times	$1\ 1/4$	\times	$1/2$	\times	$1/2$	34	38	1.34	1.53
$1\ 1/4$	\times	$3/4$	\times	$1\ 1/4$	\times	$3/4$	\times	$3/4$	36	41	1.45	1.62
$1\ 1/4$	\times	1	\times	$1\ 1/4$	\times	1	\times	1	40	42	1.58	1.67
$1\ 1/2$	\times	$3/4$	\times	$1\ 1/2$	\times	$3/4$	\times	$3/4$	38	44	1.52	1.75
$1\ 1/2$	\times	1	\times	$1\ 1/2$	\times	1	\times	1	42	46	1.65	1.80
$1\ 1/2$	\times	$1\ 1/4$	\times	$1\ 1/2$	\times	$1\ 1/4$	\times	$1\ 1/4$	46	48	1.82	1.88
2	\times	1	\times	2	\times	1	\times	1	44	52	1.73	2.02
2	\times	$1\ 1/4$	\times	2	\times	$1\ 1/4$	\times	$1\ 1/4$	48	54	1.90	2.10
2	\times	$1\ 1/2$	\times	2	\times	$1\ 1/2$	\times	$1\ 1/2$	52	55	2.02	2.16

Dimensions which are not specified are left to the discretion of the manufacturer.

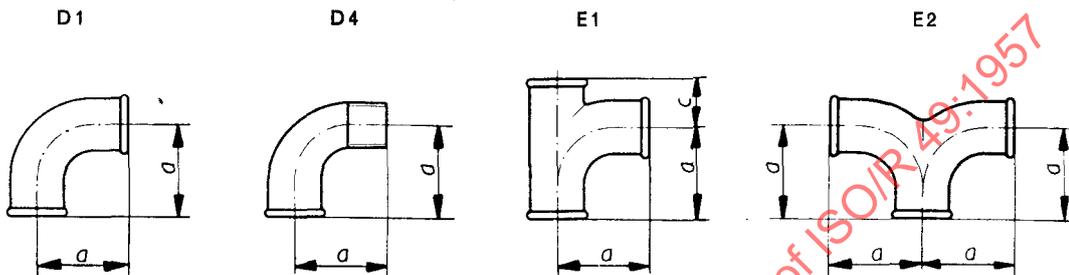
Tolerances: see clause 2.6.

Thread: in accordance with ISO Recommendation R 7.

Method of specifying outlets: see clause 2.7.2.

4.7

BENDS **D1**
 MALE AND FEMALE BENDS **D4**
 PITCHER TEES **E1**
 TWIN ELBOWS **E2**



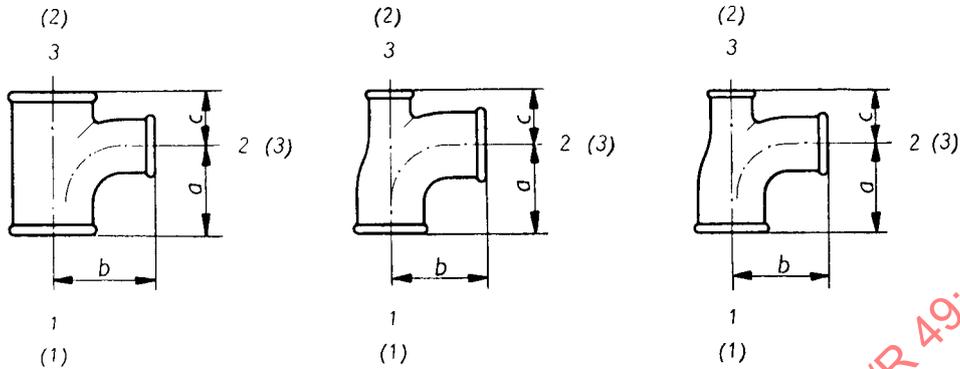
Sizes inches				Dimensions (Corresponding values) millimetres inches			
D1	D4	E1	E2	a	c	a	c
1/4	1/4	—	—	30	—	1.19	—
3/8	3/8	3/8	3/8	36	19	1.44	0.71
1/2	1/2	1/2	1/2	45	24	1.75	0.90
3/4	3/4	3/4	3/4	50	28	2.00	1.08
1	1	1	1	63	33	2.50	1.26
1 1/4	1 1/4	1 1/4	1 1/4	76	40	3.00	1.53
1 1/2	1 1/2	1 1/2	1 1/2	85	43	3.35	1.69
2	2	2	2	102	53	4.00	2.04

Dimensions which are not specified are left to the discretion of the manufacturer.
 Tolerances: see clause 2.6.
 Thread: in accordance with ISO Recommendation R 7.

4.8

PITCHER TEES:
 REDUCING ON THE BRANCH **E1**
 REDUCING ON THE RUN **E1**
 REDUCING ON BRANCH AND RUN **E1**

E1

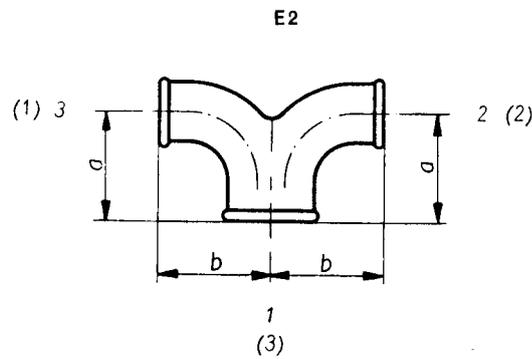


Sizes Inches						Dimensions (Corresponding values) millimetres inches					
Method "a"			Method "b"			a	b	c	a	b	c
1	2	3	(1)	(2)	(3)						
3/4	1/2	1/2	3/4	1/2	1/2	47	48	24	1.84	1.86	0.90
3/4	1/2	3/4	3/4	3/4	1/2	47	48	25	1.84	1.86	0.97
3/4	3/4	1/2	3/4	1/2	3/4	50	50	27	2.00	2.00	1.02
1	1/2	3/4	1	3/4	1/2	49	51	25	1.89	1.99	0.97
1	1/2	1	1	1	1/2	49	51	28	1.89	1.99	1.06
1	3/4	1/2	1	1/2	3/4	53	54	27	2.05	2.13	1.02
1	3/4	3/4	1	3/4	3/4	53	54	28	2.05	2.13	1.08
1	3/4	1	1	1	3/4	53	54	30	2.05	2.13	1.14
1	1	3/4	1	3/4	1	63	63	31	2.50	2.50	1.21
1 1/4	1/2	1 1/4	1 1/4	1 1/4	1/2	51	56	30	1.97	2.16	1.14
1 1/4	3/4	1	1 1/4	1	3/4	55	58	30	2.13	2.30	1.14
1 1/4	3/4	1 1/4	1 1/4	1 1/4	3/4	55	58	33	2.13	2.30	1.26
1 1/4	1	3/4	1 1/4	3/4	1	66	68	31	2.58	2.67	1.21
1 1/4	1	1	1 1/4	1	1	66	68	33	2.58	2.67	1.26
1 1/4	1	1 1/4	1 1/4	1 1/4	1	66	68	36	2.58	2.67	1.38
1 1/4	1 1/4	1	1 1/4	1	1 1/4	76	76	38	3.00	3.00	1.46
1 1/2	3/4	1 1/2	1 1/2	1 1/2	3/4	55	61	33	2.19	2.42	1.27
1 1/2	1	1 1/4	1 1/2	1 1/4	1	66	71	36	2.64	2.79	1.38
1 1/2	1	1 1/2	1 1/2	1 1/2	1	66	71	36	2.64	2.79	1.40
1 1/2	1 1/4	1	1 1/2	1	1 1/4	77	79	38	3.06	3.12	1.46
1 1/2	1 1/4	1 1/4	1 1/2	1 1/4	1 1/4	77	79	40	3.06	3.12	1.53
1 1/2	1 1/4	1 1/2	1 1/2	1 1/2	1 1/4	77	79	41	3.06	3.12	1.57
2	1	2	2	2	1	70	77	40	2.73	3.02	1.53
2	1 1/4	1 1/2	2	1 1/2	1 1/4	80	85	41	3.15	3.35	1.57
2	1 1/4	2	2	2	1 1/4	80	85	45	3.15	3.35	1.73
2	1 1/2	1 1/4	2	1 1/4	1 1/2	91	94	43	3.59	3.73	1.65
2	1 1/2	1 1/2	2	1 1/2	1 1/2	91	94	43	3.59	3.73	1.69
2	1 1/2	2	2	2	1 1/2	91	94	48	3.59	3.73	1.85

Dimensions which are not specified are left to the discretion of the manufacturer.
 Tolerances: see clause 2.6. Thread: in accordance with ISO Recommendation R 7.
 Method of specifying outlets: see clause 2.7.2.

4.9

TWIN ELBOWS, REDUCING E2



Sizes inches						Dimensions (Corresponding values)			
Method "a"			Method "b"			millimetres		inches	
1	2	3	(1)	(2)	(3)	a	b	a	b
3/4	× 1/2	× 1/2	1/2	× 1/2	× 3/4	47	48	1.84	1.86
1	× 1/2	× 1/2	1/2	× 1/2	× 1	49	51	1.89	1.99
1	× 3/4	× 3/4	3/4	× 3/4	× 1	53	54	2.05	2.13
1 1/4	× 3/4	× 3/4	3/4	× 3/4	× 1 1/4	55	58	2.13	2.30
1 1/4	× 1	× 1	1	× 1	× 1 1/4	66	68	2.58	2.67
1 1/2	× 1	× 1	1	× 1	× 1 1/2	66	71	2.64	2.79
1 1/2	× 1 1/4	× 1 1/4	1 1/4	× 1 1/4	× 1 1/2	77	79	3.06	3.12
2	× 1 1/4	× 1 1/4	1 1/4	× 1 1/4	× 2	80	85	3.15	3.35
2	× 1 1/2	× 1 1/2	1 1/2	× 1 1/2	× 2	91	94	3.59	3.73

Dimensions which are not specified are left to the discretion of the manufacturer.

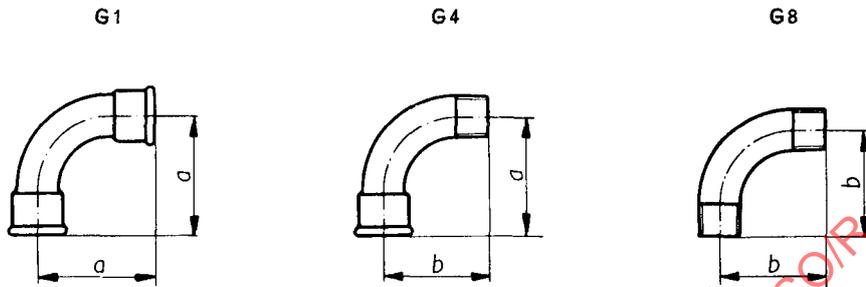
Tolerances: see clause 2.6.

Thread: in accordance with ISO Recommendation R 7.

Method of specifying outlets: see clause 2.7.2.

4.10

LONG SWEEP BENDS **G1**
 MALE AND FEMALE LONG SWEEP BENDS **G4**
 MALE LONG SWEEP BENDS **G8**



Sizes			Dimensions (Corresponding values)			
Inches			millimetres		inches	
G1	G4	G8	a	b	a	b
1/8	1/8	—	35	32	1.38	1.26
1/4	1/4	—	40	36	1.57	1.42
3/8	3/8	3/8	48	42	1.89	1.65
1/2	1/2	1/2	55	48	2.17	1.89
3/4	3/4	3/4	69	60	2.70	2.40
1	1	1	85	75	3.32	2.97
1 1/4	1 1/4	1 1/4	105	95	4.15	3.75
1 1/2	1 1/2	1 1/2	116	105	4.56	4.14
2	2	2	140	130	5.51	5.12
2 1/2	2 1/2	—	176	165	6.95	6.50
3	3	—	205	190	8.06	7.48
3 1/2	3 1/2	—	234	217	9.15	8.55
4	4	—	260	245	10.25	9.65

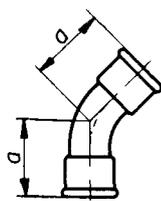
Dimensions which are not specified are left to the discretion of the manufacturer.
 Tolerances: see clause 2.6.
 Thread: in accordance with ISO Recommendation R 7.

4.11

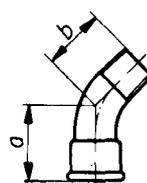
45° LONG SWEEP BENDS G1/45°

45° MALE AND FEMALE LONG SWEEP BENDS G4/45°

G1/45°



G4/45°



Sizes inches		Dimensions (Corresponding values)			
G1/45°	G4/45°	millimetres		inches	
		a	b	a	b
1/4	1/4	26	21	1.00	0.85
3/8	3/8	30	24	1.18	0.94
1/2	1/2	36	30	1.44	1.16
3/4	3/4	43	36	1.67	1.40
1	1	51	42	2.00	1.65
1 1/4	1 1/4	64	54	2.53	2.13
1 1/2	1 1/2	68	58	2.70	2.28
2	2	81	70	3.16	2.71
2 1/2	2 1/2	99	86	3.85	3.40
3	3	113	100	4.48	3.90

Dimensions which are not specified are left to the discretion of the manufacturer.

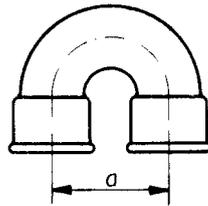
Tolerances: see clause 2.6.

Thread: in accordance with ISO Recommendation R 7.

4.12

RETURN BENDS Kb1

Kb1



Sizes inches	Dimensions (Corresponding values)	
	millimetres	inches
	<i>a</i>	<i>a</i>
1/2	38	1.50
3/4	50	2.00
1	64	2.50
1 1/4	76	3.00
1 1/2	89	3.50
2	102	4.00

Dimensions which are not specified are left to the discretion of the manufacturer.

Tolerances: see clause 2.6.

Thread: in accordance with ISO Recommendation R 7.

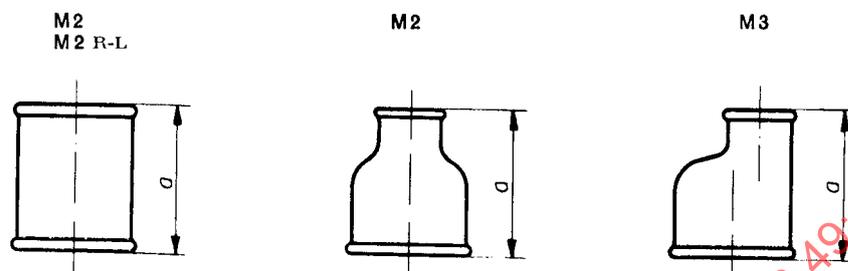
4.13

SOCKETS M2

SOCKETS, RIGHT- AND LEFT-HAND THREAD M2 R-L

SOCKETS, REDUCING M2

ECCENTRIC SOCKETS, REDUCING M3



Sizes				Dimensions (Corresponding values)		Sizes				Dimensions (Corresponding values)	
inches				mm	in	inches				mm	in
M2	M2 R-L	M2 reducing	M3	a	a	M2	M2 R-L	M2 reducing	M3	a	a
1/8	—	—	—	25	0.96	—	—	2 × 1/2	—	—	—
1/4	1/4	1/4 × 1/8	—	27	1.06	2	2	2 × 3/4	2 × 3/4	65	2.53
3/8	3/8	3/8 × 1/8	—	30	1.16	—	—	2 × 1	2 × 1	—	—
—	—	3/8 × 1/4	—	—	—	—	—	2 × 1 1/4	2 × 1 1/4	—	—
—	—	—	—	—	—	—	—	2 × 1 1/2	2 × 1 1/2	—	—
1/2	1/2	1/2 × 1/4	—	36	1.42	2 1/2	2 1/2	2 1/2 × 1 1/4	—	74	2.88
—	—	1/2 × 3/8	—	—	—	—	—	2 1/2 × 1 1/2	—	—	—
—	—	—	—	—	—	—	—	2 1/2 × 2	—	—	—
3/4	3/4	3/4 × 1/4	—	39	1.52	3	3	3 × 1 1/2	—	80	3.18
—	—	3/4 × 3/8	—	—	—	—	—	3 × 2	—	—	—
—	—	3/4 × 1/2	3/4 × 1/2	—	—	—	—	3 × 2 1/2	—	—	—
1	1	1 × 3/8	—	45	1.77	3 1/2	—	—	—	87	3.43
—	—	1 × 1/2	1 × 1/2	—	—	—	—	—	—	—	—
—	—	1 × 3/4	1 × 3/4	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	4 × 2	—	94	3.69
1 1/4	1 1/4	1 1/4 × 3/8	—	50	1.93	4	—	4 × 2 1/2	—	—	—
—	—	1 1/4 × 1/2	1 1/4 × 1/2	—	—	—	—	4 × 3	—	—	—
—	—	1 1/4 × 3/4	1 1/4 × 3/4	—	—	—	—	—	—	—	—
—	—	1 1/4 × 1	1 1/4 × 1	—	—	5	—	—	—	109	4.22
1 1/2	1 1/2	1 1/2 × 1/2	1 1/2 × 1/2	55	2.15	6	—	—	—	120	4.75
—	—	1 1/2 × 3/4	1 1/2 × 3/4	—	—	—	—	—	—	—	—
—	—	1 1/2 × 1	1 1/2 × 1	—	—	—	—	—	—	—	—
—	—	1 1/2 × 1 1/4	1 1/2 × 1 1/4	—	—	—	—	—	—	—	—

Dimensions which are not specified are left to the discretion of the manufacturer.

Tolerances: see clause 2.6.

Thread: in accordance with ISO Recommendation R 7.

4.14

MALE AND FEMALE SOCKETS M4
 MALE AND FEMALE SOCKETS, REDUCING M4

M4



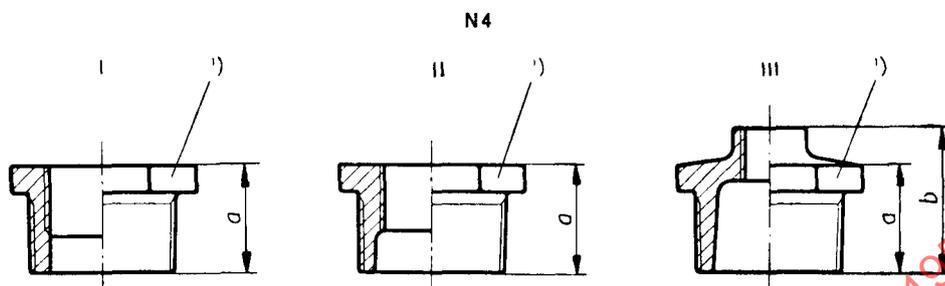
Sizes inches		Dimensions (Corresponding values) mm in	
M4	M4 reducing	a	a
$\frac{3}{8}$	$\frac{3}{8} \times \frac{1}{4}$	35	1.38
$\frac{1}{2}$	$\frac{1}{2} \times \frac{1}{4}$ $\frac{1}{2} \times \frac{3}{8}$	43	1.69
$\frac{3}{4}$	$\frac{3}{4} \times \frac{3}{8}$ $\frac{3}{4} \times \frac{1}{2}$	48	1.89
1	$1 \times \frac{1}{2}$ $1 \times \frac{3}{4}$	55	2.17
$1 \frac{1}{4}$	$1 \frac{1}{4} \times \frac{3}{4}$ $1 \frac{1}{4} \times 1$	60	2.36
—	$1 \frac{1}{2} \times 1$ $1 \frac{1}{2} \times 1 \frac{1}{4}$	63	2.48
—	$2 \times 1 \frac{1}{4}$ $2 \times 1 \frac{1}{2}$	70	2.76

STANDARDSISO.COM · Click to view the full PDF of ISO/R 49:1957

Dimensions which are not specified are left to the discretion of the manufacturer.
 Tolerances: see clause 2.6.
 Thread: in accordance with ISO Recommendation R 7.

4.15

BUSHINGS N4



Sizes inches	Pat- terns	Dimensions (Corresponding values)				Sizes inches	Pat- terns	Dimensions (Corresponding values)			
		millimetres		inches				millimetres		inches	
	N4	a	b	a	b		N4	a	b	a	b
$1/4 \times 1/8$	I	20	—	0.79	—	$2 \times 1/2$	III	35	48	1.38	1.89
$3/8 \times 1/8$	II	20	—	0.79	—	$2 \times 3/4$	III	35	48	1.38	1.89
$3/8 \times 1/4$	I	20	—	0.79	—	2×1	II	35	—	1.38	—
$1/2 \times 1/8$	II	24	—	0.94	—	$2 \times 1 1/4$	II	35	—	1.38	—
$1/2 \times 1/4$	II	24	—	0.94	—	$2 \times 1 1/2$	II	35	—	1.38	—
$1/2 \times 3/8$	I	24	—	0.94	—	$2 1/2 \times 1$	III	40	54	1.57	2.13
$3/4 \times 1/4$	II	26	—	1.02	—	$2 1/2 \times 1 1/4$	III	40	54	1.57	2.13
$3/4 \times 3/8$	II	26	—	1.02	—	$2 1/2 \times 1 1/2$	II	40	—	1.57	—
$3/4 \times 1/2$	I	26	—	1.02	—	$2 1/2 \times 2$	II	40	—	1.57	—
$1 \times 1/4$	II	29	—	1.14	—	3×1	III	44	59	1.73	2.32
$1 \times 3/8$	II	29	—	1.14	—	$3 \times 1 1/4$	III	44	59	1.73	2.32
$1 \times 1/2$	II	29	—	1.14	—	$3 \times 1 1/2$	III	44	59	1.73	2.32
$1 \times 3/4$	I	29	—	1.14	—	3×2	II	44	—	1.73	—
$1 1/4 \times 1/8$	II	31	—	1.22	—	$3 \times 2 1/2$	II	44	—	1.73	—
$1 1/4 \times 1/2$	II	31	—	1.22	—	$3 1/2 \times 3$	II	46	—	1.81	—
$1 1/4 \times 3/4$	II	31	—	1.22	—	4×2	III	51	69	2.01	2.72
$1 1/4 \times 1$	I	31	—	1.22	—	$4 \times 2 1/2$	III	51	69	2.01	2.72
$1 1/2 \times 3/8$	II	31	—	1.22	—	4×3	II	51	—	2.01	—
$1 1/2 \times 1/2$	II	31	—	1.22	—	$4 \times 3 1/2$	II	51	—	2.01	—
$1 1/2 \times 3/4$	II	31	—	1.22	—						
$1 1/2 \times 1$	II	31	—	1.22	—						
$1 1/2 \times 1 1/4$	I	31	—	1.22	—						

Dimensions which are not specified are left to the discretion of the manufacturer.

Tolerances: see clause 2.6.

Thread: in accordance with ISO Recommendation R 7.

1) Widths across flats to be chosen by the manufacturer in conformity with the relevant ISO Recommendations.