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(JPFA/JSA)

**Screwed type malleable cast iron
pipe fittings**

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Pipe Fittings Association (JPFA)/ Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently, **JIS B 2301:2004** is replaced with this Standard.

However, **JIS B 2301:2004** may be applied in the **JIS** mark certification based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law until November 19, 2014.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, applications for a patent after opening to the public or utility model rights. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying any of such patent rights, applications for a patent after opening to the public or utility model rights.

Screwed type malleable cast iron pipe fittings

Introduction

This Japanese Industrial Standard has been prepared based on the second edition of **ISO 49** published in 1994 for adding types and dealing with the issues that remain unresolved since the previous revision.

The portions with continuous sidelines or dotted underlines are the matters in which the contents of the corresponding International Standard have been modified. A list of modifications with the explanations is given in Annex JC.

1 Scope

This Standard specifies screwed type malleable cast iron pipe fittings³⁾ (hereafter referred to as “fittings”) used for ordinary piping²⁾ for water¹⁾, oil, steam, air, gas, etc.

NOTE : The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows.

ISO 49:1994 *Malleable cast iron fittings threaded to ISO 7-1* (MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

- Notes
- ¹⁾ It refers to general service water, water for fire-fighting, water for industrial use, cold and hot water for air-conditioning, cooling water, etc. except drinking water.
 - ²⁾ It refers to piping mainly using carbon steel pipes for ordinary piping except that for high-pressure, for conduits and for other specific purposes.
 - ³⁾ It refers to those whose surface conditions are unmachined, galvanized, internally resin-coated and externally resin-covered.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 0151 *Iron and steel pipe fittings—Vocabulary*

JIS B 0202 *Parallel pipe threads*

NOTE : Corresponding International Standard: ISO 228-1:1994 *Pipe threads where pressure-tight joints are not made on the threads—Part 1: Dimensions, tolerances and designation* (MOD)

JIS B 0203 *Taper pipe threads*

NOTE : Corresponding International Standard: ISO 7-1:1994 *Pipe threads where pressure-tight joints are made on the threads—Part 1: Dimensions, tolerances and designation* (MOD)

JIS B 0205-4 *ISO general purpose metric screw threads—Part 4: Basic dimensions*

JIS B 0253 *Gauges for taper pipe threads*

JIS B 0254 *Limit Gauges for Parallel Pipe Threads*

JIS B 7502 *Micrometer callipers*

JIS G 5501 *Grey iron castings*

JIS G 5705 *Malleable iron castings*

NOTE : Corresponding International Standard: ISO 5922:2005 *Malleable cast iron (MOD)*

JIS H 0401 *Test methods for hot dip galvanized coatings*

JIS K 5600-1-4 *Testing methods for paints—Part 1: General rule—Section 4: Standard panels for testing*

JIS K 5600-5-2 *Testing methods for paints—Part 5: Mechanical properties of film—Section 2: Cupping test*

JIS K 6911 *Testing methods for thermosetting plastics*

JIS K 7161 *Plastics—Determination of tensile properties—Part 1: General principles*

JIS K 7206 *Plastics—Thermoplastic materials—Determination of Vicat softening temperature (VST)*

JIS S 3200-1 *Equipment for water supply service—Test methods of hydrostatic pressure*

JIS Z 1522 *Pressure sensitive adhesive cellophane tapes*

ISO 6708 *Pipework components—Definition and selection of DN (nominal size)*

3 Terms and definitions

For the purposes of this Standard, the terms and definitions given in **JIS B 0151** and the following apply.

3.1 fitting

joint composed of one or more parts

3.2 jointing thread

thread on outlet of fitting according to **JIS B 0203**

3.3 fastening thread

threads other than jointing thread, including those specified in **JIS B 0202** or others

3.4 fitting size

designation of thread size of outlet threaded according to **JIS B 0203**

The size of fitting is designated by this designation of thread size.

3.5 nominal size (DN)

nominal size according to **ISO 6708**

NOTE 1 The nominal size (DN) is designated by the letters “DN” followed by the appropriate number.

NOTE 2 The relation between the fitting size and the nominal size (DN) is given in table 3.

3.6 reinforcement

reinforced part added on the major diameter of an internally threaded fitting in the form of a band or bead (see figure 1)

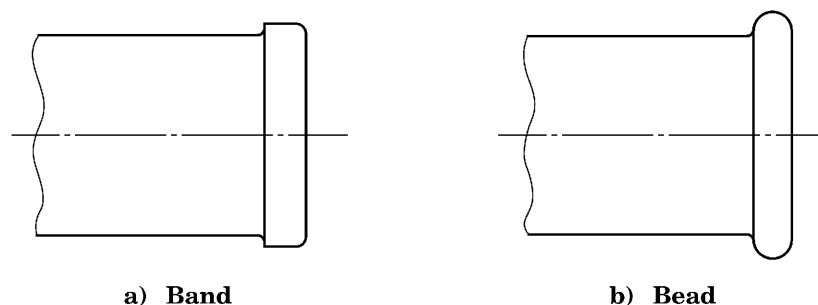


Figure 1 Forms of reinforcement

3.7 rib

axially aligned part added on the outside or inside of a fitting locally for assistance in assembling or manufacturing

3.8 outlet

internally or externally threaded end of a fitting for jointing piping components which are threaded as specified in **JIS B 0203**

3.9 run

two axially aligned outlets of a tee or cross

3.10 branch(es)

side outlet(s) of a tee for branching

3.11 chamfer

conical portion where end of a thread is removed to assist jointing and prevent damage to thread end

3.12 face-to-face dimension

distance between the two parallel faces of axially aligned outlets of a fitting

3.13 face-to-centre dimension

distance between the centre of a face of outlet and the central axis of an angularly disposed outlet of fitting

3.14 laying length

average distance from the assembled pipe end to the axis of the fitting, or between the ends of two assembled pipes

4 Classification

Fittings shall be classified as follows.

- a) The classification by format shall be as given in table 1.

Table 1 Classification by format

Classification by format	Application
Class I	Fittings conventionally produced/used in Japan.
Class II	Fittings of shapes specified in ISO 49 .

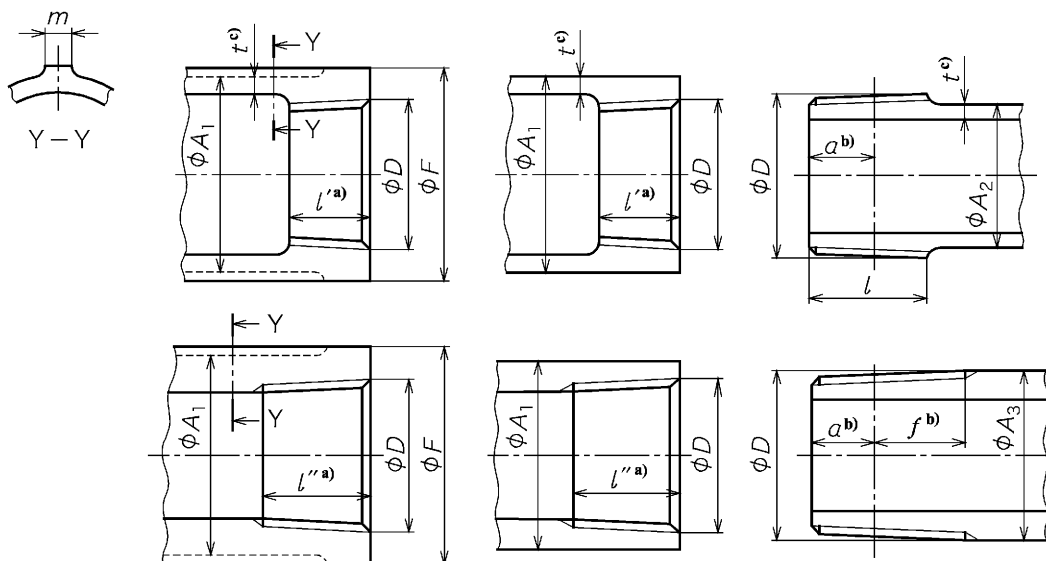
- b) The classification by shape shall be as given in table A.1.

The ends of fittings of Class I shall be as given in table 2.

- c) Surface conditions are classified into four types: unmachined, galvanized, internally resin-coated and externally resin-covered⁴⁾. However, the internal resin-coating and the external resin-covering are applicable only to Class I fittings.

Note ⁴⁾ It refers to fittings used underground, of which the outer surfaces are covered with relatively thick resin.

Table 2 Ends of fittings of Class I



Unit: mm

Fitting size	Threaded portion				Major diameter (informative)			Thickness (informative)	Outside diameter of reinforcement (informative)	Rib (informative)		
	Gauge diameter of thread	Number of threads (per 25.4 mm)	Length of internally threaded portion l' (informative)	Length of externally threaded portion l (informative)	Internally threaded side	Externally threaded side		t		F	Width m	Number Socket cap
					D							
$\frac{1}{8}$	9.728	28	6	8	15	9	11	2	18	3	2	
$\frac{1}{4}$	13.157	19	8	11	19	12	14	2.5	22	3	2	
$\frac{3}{8}$	16.662	19	9	12	23	14	17	2.5	26	3	2	
$\frac{1}{2}$	20.955	14	11	15	27	18	22	2.5	30	4	2	
$\frac{3}{4}$	26.441	14	13	17	33	24	27	3	36	4	2	
1	33.249	11	15	19	41	30	34	3	44	5	2	
$1\frac{1}{4}$	41.910	11	17	22	50	39	43	3.5	53	5	2	
$1\frac{1}{2}$	47.803	11	18	22	56	44	49	3.5	60	5	2	
2	59.614	11	20	26	69	56	61	4	73	5	2	
$2\frac{1}{2}$	75.184	11	23	30	86	72	76	4.5	91	6	2	
3	87.884	11	25	34	99	84	89	5	105	7	2	
4	113.030	11	28	40	127	110	114	6	133	8	4	
5	138.430	11	30	44	154	136	140	6.5	161	8	4	
6	163.830	11	33	44	182	160	165	7.5	189	8	4	

Notes a) Minimum values of length of internally threaded portion l' shall be according to **JIS B 0203**. An incomplete thread on the end of internal thread is permissible. The useful thread length l'' (min.) of tapered internal thread where the incomplete thread is included shall be according to **JIS B 0203**.

b) The dimension a in diagram indicates the position of gauge diameter from the externally threaded pipe end indicated in **JIS B 0203**. An incomplete thread on the end of external thread is permissible. In this case, the useful thread length over the position of gauge diameter f (min.) shall be according to **JIS B 0203**.

c) The thickness t shall be that prior to galvanizing or resin-coating.

5 Fitting size

Fitting sizes shall be designated based on the nominal designations of thread of fitting according to **JIS B 0203**. For the purposes of designations, symbols R, Rc and Rp shall be omitted.

The relation between the fitting size and the nominal size (A) or the nominal size (DN) shall be as given in table 3.

Table 3 Relation between fitting sizes and nominal sizes

Fitting size	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4	5	6
Nominal size A	6	8	10	15	20	25	32	40	50	65	80	100	125	150
Nominal size DN	6	8	10	15	20	25	32	40	50	65	80	100	125	150
NOTE: The <u>nominal size (A)</u> and the nominal size (DN) should not be used to designate the fitting size.														

Designations specifying the sizes of unequal/reducing fittings shall be as follows.

- a) **In the case of those having two outlets** To be designated in numerical order, the larger diameter as ① and the smaller as ② (① × ②).
- b) **In the case of those having three outlets** To be designated in numerical order, diameters on the same axis as ①, ② followed by the rest as ③ (① × ② × ③). Where the sizes of ① and ② are different, these shall be designated by their sizes in decreasing order, from the larger size as ① to the smaller size as ②. If ① and ② are the same size and ③ is the smaller size, the designation of ② may be omitted (① × ③).
- c) **In the case of those having four outlets** To be designated in numerical order, the largest size as ①, one side outlet on the same axis as ②, the larger outlet size in the rests as ③ followed by one side outlet on the same axis as ④ (① × ② × ③ × ④). However, if those on the same axis are the same size, respectively, this may be designated in numerical order, the larger size as ① and the smaller as ② (① × ②).

6 Relation between fluid conditions and maximum permissible working pressures

The relation between the fluid conditions and the maximum permissible working pressures shall be as given in table 4.

Table 4 Relation between fluid conditions and maximum permissible working pressures

Unit: MPa

Fluid condition ^{a)}	Maximum permissible working pressure ^{b)}		
	Division of material		
	JMB/300-6, JMB/350-10, JMW/350-4 or JMW/400-5 of ISO 5922	FCMB27-05 or FCMW34-04 of JIS G 5705	FC200 of JIS G 5501 or ferrous material at least equal thereto
Steady flow ^{d)} at 120 °C or under ^{c)}	2.5	2.5	2.0
Steam, air, gas or oil at 300 °C or under ^{c)}	2.0	1.0	1.0
Notes ^{a)} Maximum permissible working pressures at an intermediate temperature between 120 °C and 300 °C shall be obtained by linear interpolation. For pulsating flows (water flows generated at a stationary condition, of which the pressure and the flow rate change almost periodically, but excluding transient fluctuations), the applications shall be at a temperature up to 220 °C. ^{b)} Applications of a pressure higher than the maximum permissible working pressure given here shall be upon agreement between the parties concerned with delivery. ^{c)} Fittings resin-coated shall be used within the temperature range appropriate to the resin. ^{d)} Steady flow is a water flow without pulsation or transient fluctuation. Fittings may be used for the steady flow at -20 °C or higher. The case where used at temperature below -20 °C shall be upon the agreement between the parties concerned with delivery.			

7 Shapes/dimensions and dimensional tolerances

7.1 Threads

Threads shall be as follows.

- Jointing threads of fittings shall be the taper pipe threads specified in **JIS B 0203**. The internal threads may either be taper or parallel.
- Fastening threads of fittings shall be threads specified in **JIS B 0202**, and the like.
- Useful threads of fittings shall be free from defects such as harmful thin threads and broken crests.

7.2 Alignment of thread axis lines

The alignment of thread axis lines shall be accurate to within $\pm 0.5^\circ$ of the specified angle.

7.3 Chamfering

The outlets of fittings shall be chamfered. The open angle of chamfer at internally threaded portion shall be at least 60° , and the diameter at the end face shall be greater than the minor diameter of external thread. The open angle of chamfer at externally threaded portion shall be at least 60° , and the diameter at the end face shall be not greater than the minor diameter of thread.

7.4 Reinforcement

The end part of internal jointing thread of fitting shall be equipped with a band or bead. However, fittings of Class I of the fitting size 2 or under, those having polygonal ends with spanner flats and those having side outlets need not be equipped with reinforcement.

7.5 Rib

Fittings may be provided with ribs; however, for those having reinforcements, ribs should not be projected beyond the reinforcements.

7.6 Width across flats

Dimensions of spanner flats are not specified as they depend on the design of fittings.

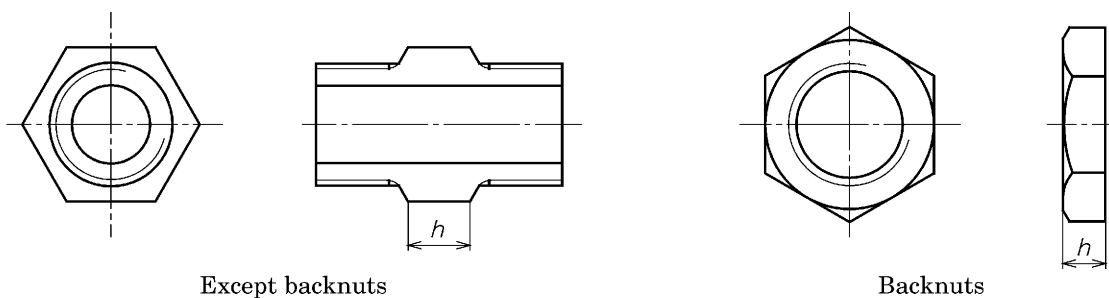
7.7 Polygonal shapes

Caps may be in hexagonal, round or other shapes. Flats on plugs shall be square. Flats on respective union parts may be hexagonal, octagonal or decagonal. Flats on other fittings of 3/4 or under in size should be hexagonal, and those over 3/4 in size may be hexagonal or octagonal.

7.8 Depth of spanner flats

Minimum depth of spanner flats measured at end corner shall be as given in table 5. For backnuts, any chamfering shall not reduce the depth of spanner flats below the minimum dimensions given in table 5.

Table 5 Minimum depth of spanner flats



Unit: mm

Fitting size	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4	5	6
Minimum depth of spanner flats h	3	3	3	3	4	4.5	5	6.5	7	7	7.5	8	9	10

7.9 Backnuts

A backnut may be plain or recessed, and one face thereof may be machined.

7.10 Main dimensions

Main dimensions of fittings shall be as given in table A.2 to table A.47. The tolerances on face-to-centre dimension and face-to-face dimension shall be as given in table 6. These tolerances given need not always apply to the face-to-centre dimension and the face-to-face dimension of unions. Furthermore, laying lengths shall be given in Annex B for assistance and guidance during piping installation.

Table 6 Tolerances on face-to-centre dimension and face-to-face dimension

Unit: mm

Face-to-centre dimension and face-to-face dimension	30 or under	Over 30 up to and incl. 50	Over 50 up to and incl. 75	Over 75 up to and incl. 100	Over 100 up to and incl. 150	Over 150 up to and incl. 200	Over 200 up to and incl. 300	Over 300 up to and incl. 400
Tolerances	± 1.5	± 2	± 2.5	± 3	± 3.5	± 4	± 5	± 6

8 Performances**8.1 Materials of fittings**

Materials of fittings shall be as follows.

- a) Materials for fittings shall be FCMB27-05 or blackheart malleable cast iron at least equivalent thereto, or FCMW34-04 or whiteheart malleable cast iron at least equivalent thereto specified in **JIS G 5705**. Any other ferrous materials at least equivalent to these malleable cast irons are allowed for the fittings, except unions, not larger than 3/8 in size of the straight type, and FC200 specified in **JIS G 5501** or others at least equivalent to the grade may be used for plugs.
- b) Inner and outer surfaces of fittings of malleable cast iron shall be smooth and free from sand, blow holes, cracks and other detrimental defects.

These defects shall not be impregnated to cover.

8.2 Galvanizing

Galvanizing shall be as follows.

- a) Where galvanizing is required for fittings, the hot-dip galvanized coating shall be applied before threading. For fittings of ferrous materials other than malleable cast iron, the surface treatment shall be provided upon the agreement between the parties concerned with delivery.
- b) The coating mass of hot-dip galvanized coating shall be obtained according to any method of **a)**, **b)** and **c)** of **10.2**, and the performance by each method shall be as follows.
 - 1) In the case of the method in **10.2 a)**, the coating masses shall be obtained for five samples. The coating mass shall be not less than 500 g/m² on average and not less than 450 g/m² on each individual sample.

The coating mass shall be obtained according to the following formula.

$$A = \frac{W_1 - W_2}{S} \times 10^6$$

where, A : coating mass (g/m²)
 W_1 : mass before removing coating of test piece (g)
 W_2 : mass after removing coating of test piece (g)
 S : surface area of coated part of test piece (mm²)

- 2) In the case of the method in **10.2 b)**, the thicknesses of coating shall be obtained for five samples. The thickness of coating shall be not less than 70 µm on average and not less than 63 µm on each individual sample.
- 3) In the case of the method in **10.2 c)**, the end point shall not be reached in the cupric sulphate test after immersions of five times.
- c) The galvanized coating on inner surface of fitting shall be continuous except the machined surface. The inner galvanized coating shall be free from zinc blister, burrs and non-metallic residues⁵⁾.

Note ⁵⁾ In the portion of thick-walled cross section, an iron–zinc alloy phase may grow through.

8.3 Internal resin coating

The internal resin coating shall be according to Annex JA.

8.4 External resin covering

The external resin covering shall be according to Annex JB.

8.5 Hydrostatic pressure resistance

For the hydrostatic pressure resistance, the test is conducted on fittings before the internal resin is coated and the external resin is covered. When the hydrostatic pressure of 2.5 MPa is applied, fittings shall be free from abnormalities such as breakage and leakage. Furthermore, except gray cast iron plugs, when the hydrostatic pressure of 10 MPa is applied to fittings of 1/8 to 4 in size and the hydrostatic pressure of 6.4 MPa is applied to fittings of 5 and 6 in size, the fittings shall be free from breakage.

8.6 Leakage tightness

For the leakage tightness, the test is conducted on fittings before the internal resin is coated and the external resin is covered, and fittings shall be free from leakage.

9 Appearance

For the appearance of fittings, there shall be no defects detrimental to practical usage.

10 Test methods

10.1 Materials of fittings

- a) The materials of fittings shall be according to respective material specifications.
- b) The appearance of inner and outer surfaces of cast iron products shall be visually observed.

10.2 Galvanized coating test

For the galvanized coating test, the amount of galvanized coating shall be tested according to any of the following. For the appearance, the inner surface of fittings shall be visually observed.

- a) According to **5.2** of **JIS H 0401**.
- b) The thickness of galvanized coating of products shall be measured according to **5.3** of **JIS H 0401** using electromagnetic measuring apparatus⁶⁾ or microscope inspection.

In addition, the thickness of galvanized coating shall be obtained by averaging the measured values of thickness of galvanized coating at 10 points or more in the circumferential direction of fitting cross section.

- c) According to clause **6** of **JIS H 0401**.

Note ⁶⁾ See **ISO 2178**, clause **12** of **JIS H 8501**, etc.

10.3 Test on internal resin coating

The test on internal resin coating shall be according to **JA.5**.

10.4 Test on external resin covering

The test on external resin covering shall be according to **JB.6**.

10.5 Hydrostatic pressure resistance test

The hydrostatic pressure resistance test shall be according to the text of **JIS S 3200-1**.

10.6 Leakage tightness test

The leakage tightness test shall be any of the following.

- a) Applying a hydrostatic pressure of 2.0 MPa.
- b) According to Annex 2 of JIS S 3200-1; however, the pneumatic pressure shall be 0.5 MPa. Fittings may be immersed in light oil.
- c) According to Annex 3 of JIS S 3200-1; however, the pneumatic pressure shall be 0.5 MPa.
- d) By other methods capable of ensuring a test quality equivalent to **a)**, **b)** or **c)**.

11 Inspections

11.1 Classification of inspections and inspection items

The inspections of fittings shall be divided into the type inspection⁷⁾ and the delivery inspection⁸⁾, and respective inspection items shall be as follows.

The sampling plan of delivery inspection shall be upon the agreement between parties concerned with delivery.

Notes ⁷⁾ The inspection for determining whether all the characteristics of quality of fitting indicated in design are satisfied.

- 8) The inspection for determining whether the characteristics recognized to be required are satisfied when products obtained by the same design and manufacture as those which have passed the type inspection are delivered.

a) **Type inspection items**

- 1) Material inspection
- 2) Galvanized coating inspection
- 3) Inspection on internal resin coating
- 4) Inspection on external resin covering
- 5) Thread inspection
- 6) Thread alignment inspection
- 7) Shapes/dimensions inspection
- 8) Hydrostatic pressure resistance inspection
- 9) Leakage tightness inspection
- 10) Appearance inspection

b) **Delivery inspection items**

- 1) Material inspection
- 2) Galvanized coating inspection
- 3) Internal resin coating inspection (except resin material inspection)
- 4) External resin covering inspection (except resin material inspection)
- 5) Thread inspection
- 6) Alignment of thread axis lines inspection
- 7) Shapes/dimensions inspection
- 8) Leakage tightness inspection
- 9) Appearance inspection

11.2 Material inspection

The material, when tested according to **10.1**, shall comply with the requirements of **8.1**.

11.3 Galvanized coating inspection

The galvanized coating, when tested according to **10.2**, shall comply with the requirements of **8.2**.

11.4 Internal resin coating inspection

The internal resin coating inspection shall be according to **JA.6**.

11.5 External resin covering inspection

The external resin covering inspection shall be according to **JB.7**.

11.6 Thread inspection

The thread inspection shall be as follows.

- a) The inspection on jointing threads of fittings shall conform to the requirements of **7.1 a)** and **b)** when inspected according to **JIS B 0253**. Other methods are permissible when it is ensured that equivalent results conforming to **JIS B 0203** are obtained.

In addition, useful threads of fittings shall conform to the requirements of **7.1 c)** when visually inspected.

- b) The fastening threads of fittings shall conform to the requirements in respective standards when inspected according to **JIS B 0254** or other methods.

11.7 Alignment of thread axis lines inspection

The alignment of thread axis lines shall conform to the requirements of **7.2** when the standard jig is screwed in, then the axis line angle is actually measured or calculated.

11.8 Shapes/dimensions inspection

The shapes/dimensions shall conform to the requirements of **7.3** to **7.10** when inspected according to the methods of direct measurement, use of limit gauges, etc.

11.9 Hydrostatic pressure resistance inspection

The hydrostatic pressure resistance shall conform to the requirements of **8.5** when inspected according to **10.5**.

11.10 Leakage tightness inspection

The leakage tightness shall conform to requirements of **8.6** when inspected according to **10.6**.

11.11 Appearance inspection

The appearance shall conform to requirements of clause **9** when visually inspected.

12 Designation of products

The designation of fitting shall consist of the number of this Standard or the title of this Standard, format ⁹⁾, surface condition and fitting size. For the surface condition, unmachined may be called black and galvanized white.

Example 1	JIS B 2301	Class I	Reducing male and female elbow	Black	2 × ³ / ₄
Example 2	Screwed type malleable cast iron pipe fitting	Class I	45° elbow	Galvanized	1 ¹ / ₂
	(Number or title of this Standard)	(Format)	(Shape)	(Surface condition)	(Fitting size)

Note ⁹⁾ For fittings of Class I, the format may be omitted.

13 Marking

13.1 Marking on products

Products shall be marked with the following items indelibly by means of casting or stamping. For the product of which the surface area is small, some of marking items may be omitted. Examples of omissions are as given in table 7.

- a) Manufacturer's name or abbreviation thereof
- b) Fitting size

Table 7 Examples when marking is impractical

Shape	Impractical in marking of manufacturer's name or abbreviation thereof and fitting size	Impractical in marking of fitting size
Reducing elbows	—	$\frac{3}{8} \times \frac{1}{8}$, $\frac{3}{8} \times \frac{1}{4}$
Unequal tees	—	$\frac{1}{4} \times \frac{1}{4} \times \frac{3}{8}$, $\frac{3}{8} \times \frac{3}{8} \times \frac{1}{8}$, $\frac{3}{8} \times \frac{3}{8} \times \frac{1}{4}$
Reducing sockets	—	$\frac{1}{4} \times \frac{1}{8}$, $\frac{3}{8} \times \frac{1}{8}$, $\frac{3}{8} \times \frac{1}{4}$
Bushings	$\frac{1}{4} \times \frac{1}{8}$, $\frac{3}{8} \times \frac{1}{8}$, $\frac{3}{8} \times \frac{1}{4}$	$\frac{1}{2} \times \frac{1}{8}$, $\frac{1}{2} \times \frac{1}{4}$, $\frac{1}{2} \times \frac{3}{8}$
Backnuts	$\frac{1}{4}$	$\frac{3}{8}$
Plugs	$\frac{1}{8}$	$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1
Unions	$\frac{1}{8}$, $\frac{1}{4}$	$\frac{3}{8}$
Male and female unions	$\frac{1}{4}$	$\frac{3}{8}$

13.2 Marking on packaging

The following items may be marked on packaging. When the marking items on product are omitted according to **13.1** and materials other than FCMB27-05 or FCMW34-04 specified in **JIS G 5705** are used, material standards and symbols shall be marked on the package.

- a) Number or title of this Standard
- b) Classification ¹⁰⁾
- c) Material standards and symbols
- d) Fitting size
- e) Quantity
- f) Manufacturer's name or abbreviation thereof

Note ¹⁰⁾ For the surface condition, unmachined may be called black and galvanized white.

Annex A (normative)

Classification by shapes and main dimensions of fittings

A.1 Scope

This Annex specifies the classification by shapes of fittings and the main dimensions thereof.

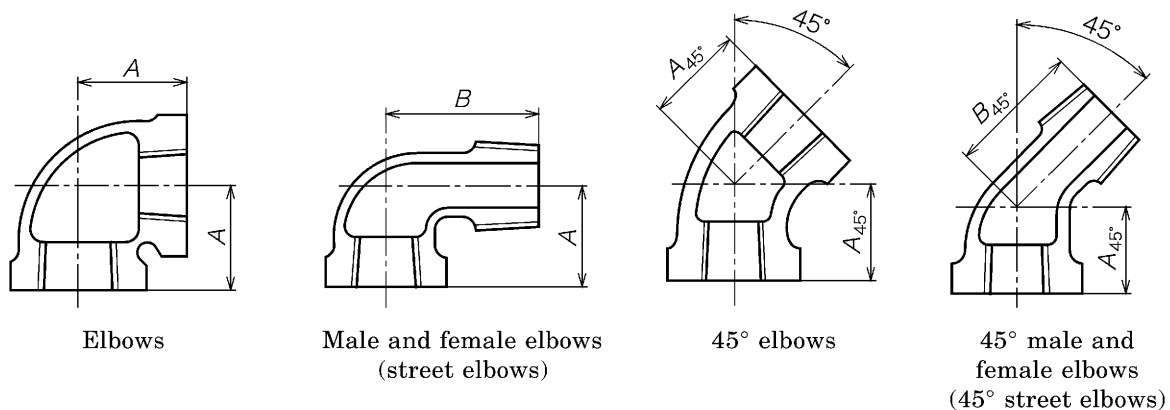
Table A.1 Classification by shapes

Classification by shapes	Class I	Class II
Elbows	Table A.2	Table A.24
Male and female elbows (street elbows)	Table A.2	Table A.24
45° elbows	Table A.2	Table A.24
45° male and female elbows (45° street elbows)	Table A.2	Table A.24
Reducing elbows	Table A.3	Table A.25
Reducing male and female elbows (reducing street elbows)	Table A.3	Table A.25
Tees	Table A.4	Table A.26
Male and female tees (service tees)	Table A.4	—
Unequal tees (unequal on the branch)	Table A.5	Table A.27
Reducing tees (reducing on the run)	Table A.6	Table A.28
Reducing male and female tees (reducing service tees)	Table A.6	—
Crosses	Table A.7	Table A.29
Reducing crosses	Table A.7	Table A.29
Side outlet elbows	Table A.8	Table A.30
Side outlet tees	Table A.8	Table A.30
Short bends	Table A.9	Table A.31
Male and female short bends	Table A.9	Table A.31
Pitcher tees	—	Table A.31
Twin elbows	—	Table A.31
Reducing pitcher tees	—	Table A.32
Reducing twin elbows	—	Table A.33
Long sweep bends	Table A.10	Table A.34
Male and female long sweep bends	Table A.10	Table A.34
Male long sweep bends	Table A.10	Table A.34
45° long sweep bends	Table A.10	Table A.35
45° male and female long bends	Table A.10	Table A.35
45° male long sweep bends	Table A.10	—
45° laterals	Table A.11	—
90° laterals	Table A.11	—
Return bends	Table A.11	—
Sockets	Table A.12	Table A.36
Male and female sockets	Table A.12	Table A.36
Reducing sockets	Table A.13	Table A.37
Reducing male and female sockets	Table A.13	Table A.37
Eccentric reducing sockets	Table A.13	—
Bushings	Table A.14	Table A.38
Nipples	Table A.15	Table A.39
Reducing nipples	Table A.15	Table A.39
Backnuts (locknuts)	Table A.16	Table A.40
Caps	Table A.17	Table A.41
Plugs	Table A.18	Table A.42

Table A.1 (concluded)

Classification by shapes	Class I	Class II
Unions	Table A.19	Table A.43
Male and female unions	Table A.20	Table A.44
Union elbows	Table A.21	Table A.45
Male and female union elbows	Table A.22	Table A.46
Gaskets for unions	—	Table A.47
Flange unions	Table A.23	—
NOTE : Any elbow or bend of 90° type shall be designated without angles for the classification by shapes.		

**Table A.2 Class I elbows, male and female elbows (street elbows),
45° elbows and 45° male and female elbows (45° street elbows)**

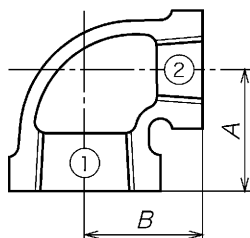


Unit: mm

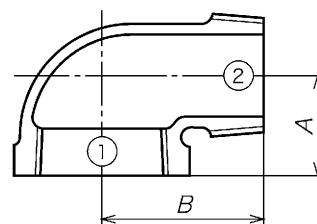
Fitting size	Face-to-centre dimension			
	A	A _{45°}	B	B _{45°}
1/8	17	16	26	21
1/4	19	17	30	23
3/8	23	19	35	27
1/2	27	21	40	31
3/4	32	25	47	36
1	38	29	54	42
1 1/4	46	34	62	49
1 1/2	48	37	68	51
2	57	42	79	59
2 1/2	69	49	92	71
3	78	54	104	79
4	97	65	126	96
5	113	74	148	110
6	132	82	170	127

Shapes/dimensions of ends of fittings are as given in table 2.

Table A.3 Class I reducing elbows and reducing male and female elbows (reducing street elbows)



Reducing elbows



Reducing male and female elbows
(reducing street elbows)

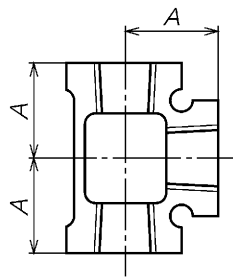
Unit: mm

Fitting size ① × ②	Reducing elbow		Fitting size ① × ②	Reducing elbow	
	Face-to-centre dimension			Face-to-centre dimension	
	A	B		A	B
$\frac{3}{8} \times \frac{1}{8}$	19	21	$2\frac{1}{2} \times 1\frac{1}{4}$	52	62
$\frac{3}{8} \times \frac{1}{4}$	20	22	$2\frac{1}{2} \times 1\frac{1}{2}$	55	62
$\frac{1}{2} \times \frac{1}{4}$	24	24	$2\frac{1}{2} \times 2$	60	65
$\frac{1}{2} \times \frac{3}{8}$	26	25	$3 \times \frac{1}{2}$	44	64
$\frac{3}{4} \times \frac{3}{8}$	28	28	$3 \times \frac{3}{4}$	46	66
$\frac{3}{4} \times \frac{1}{2}$	29	30	3×1	50	68
$1 \times \frac{3}{8}$	30	31	$3 \times 1\frac{1}{4}$	55	70
$1 \times \frac{1}{2}$	32	33	$3 \times 1\frac{1}{2}$	58	72
$1 \times \frac{3}{4}$	34	35	3×2	62	72
$1\frac{1}{4} \times \frac{1}{2}$	34	38	$3 \times 2\frac{1}{2}$	72	75
$1\frac{1}{4} \times \frac{3}{4}$	38	40	4×1	57	83
$1\frac{1}{4} \times 1$	40	42	$4 \times 1\frac{1}{4}$	61	86
$1\frac{1}{2} \times \frac{1}{2}$	35	42	$4 \times 1\frac{1}{2}$	63	86
$1\frac{1}{2} \times \frac{3}{4}$	38	43	4×2	69	87
$1\frac{1}{2} \times 1$	41	45	$4 \times 2\frac{1}{2}$	78	90
$1\frac{1}{2} \times 1\frac{1}{4}$	45	48	4×3	83	91
$2 \times \frac{1}{2}$	38	48	5×3	87	107
$2 \times \frac{3}{4}$	41	49	5×4	100	111
2×1	44	51	6×3	92	120
$2 \times 1\frac{1}{4}$	48	54	6×4	102	125
$2 \times 1\frac{1}{2}$	52	55	6×5	116	128
$2\frac{1}{2} \times \frac{1}{2}$	41	57	—	—	—
$2\frac{1}{2} \times \frac{3}{4}$	44	58	—	—	—
$2\frac{1}{2} \times 1$	48	60	—	—	—
Shapes/dimensions of ends of fittings are as given in table 2.					

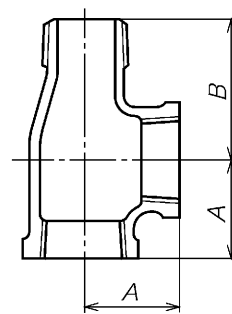
Unit: mm

Fitting size ① × ②	Reducing male and female elbow (reducing street elbow)	
	Face-to-centre dimension	
	A	B
$\frac{1}{2} \times \frac{3}{8}$	26	37
$\frac{3}{4} \times \frac{1}{2}$	29	44
$1 \times \frac{1}{2}$	32	47
$1 \times \frac{3}{4}$	34	51
$1\frac{1}{4} \times 1$	40	61
$1\frac{1}{2} \times 1$	41	65
$1\frac{1}{2} \times 1\frac{1}{4}$	45	68
$2 \times \frac{3}{4}$	41	65
$2 \times 1\frac{1}{4}$	48	75
$2 \times 1\frac{1}{2}$	52	75
$2\frac{1}{2} \times 1$	48	79
$2\frac{1}{2} \times 2$	60	88
3×2	62	98
Shapes/dimensions of ends of fittings are as given in table 2.		

Table A.4 Class I tees and male and female tees (service tees)



Tees

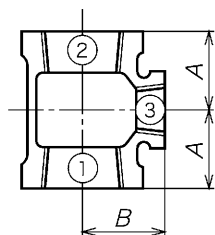


Male and female tees (service tees)

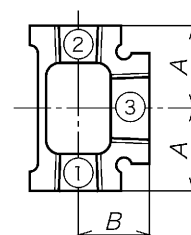
Unit: mm

Fitting size	Face-to-centre dimension	
	<i>A</i>	<i>B</i>
$\frac{1}{8}$	17	26
$\frac{1}{4}$	19	30
$\frac{3}{8}$	23	35
$\frac{1}{2}$	27	40
$\frac{3}{4}$	32	47
1	38	54
$1\frac{1}{4}$	46	62
$1\frac{1}{2}$	48	68
2	57	79
$2\frac{1}{2}$	69	92
3	78	104
4	97	126
5	113	148
6	132	170
Shapes/dimensions of ends of fittings are as given in table 2.		

Table A.5 Class I unequal tees (unequal on the branch)



(Reducing on the branch)



(Increasing on the branch)

Unit: mm

Fitting size ① × ② × ③	Reducing on the branch		Fitting size ① × ② × ③	Reducing on the branch	
	Face-to-centre dimension			Face-to-centre dimension	
	<i>A</i>	<i>B</i>		<i>A</i>	<i>B</i>
$\frac{3}{8} \times \frac{3}{8} \times \frac{1}{8}$	19	21	$3 \times 3 \times \frac{3}{4}$	46	66
$\frac{3}{8} \times \frac{3}{8} \times \frac{1}{4}$	20	22	$3 \times 3 \times 1$	50	68
$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{4}$	24	24	$3 \times 3 \times 1\frac{1}{4}$	55	70
$\frac{1}{2} \times \frac{1}{2} \times \frac{3}{8}$	26	25	$3 \times 3 \times 1\frac{1}{2}$	58	72
$\frac{3}{4} \times \frac{3}{4} \times \frac{1}{4}$	25	27	$3 \times 3 \times 2$	62	72
$\frac{3}{4} \times \frac{3}{4} \times \frac{3}{8}$	28	28	$3 \times 3 \times 2\frac{1}{2}$	72	75
$\frac{3}{4} \times \frac{3}{4} \times \frac{1}{2}$	29	30	$4 \times 4 \times \frac{1}{2}$	51	79
$1 \times 1 \times \frac{1}{4}$	28	31	$4 \times 4 \times \frac{3}{4}$	54	80
$1 \times 1 \times \frac{3}{8}$	30	31	$4 \times 4 \times 1$	57	83
$1 \times 1 \times \frac{1}{2}$	32	33	$4 \times 4 \times 1\frac{1}{4}$	61	86
$1 \times 1 \times \frac{3}{4}$	34	35	$4 \times 4 \times 1\frac{1}{2}$	63	86
$1\frac{1}{4} \times 1\frac{1}{4} \times \frac{3}{8}$	33	36	$4 \times 4 \times 2$	69	87
$1\frac{1}{4} \times 1\frac{1}{4} \times \frac{1}{2}$	34	38	$4 \times 4 \times 2\frac{1}{2}$	78	90
$1\frac{1}{4} \times 1\frac{1}{4} \times \frac{3}{4}$	38	40	$4 \times 4 \times 3$	83	91
$1\frac{1}{4} \times 1\frac{1}{4} \times 1$	40	42	$5 \times 5 \times \frac{3}{4}$	55	96
$1\frac{1}{2} \times 1\frac{1}{2} \times \frac{3}{8}$	34	40	$5 \times 5 \times 1$	60	97
$1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{2}$	35	42	$5 \times 5 \times 1\frac{1}{4}$	62	100
$1\frac{1}{2} \times 1\frac{1}{2} \times \frac{3}{4}$	38	43	$5 \times 5 \times 1\frac{1}{2}$	66	100
$1\frac{1}{2} \times 1\frac{1}{2} \times 1$	41	45	$5 \times 5 \times 2$	72	103
$1\frac{1}{2} \times 1\frac{1}{2} \times 1\frac{1}{4}$	45	48	$5 \times 5 \times 2\frac{1}{2}$	81	105
$2 \times 2 \times \frac{3}{8}$	37	46	$5 \times 5 \times 3$	87	107
$2 \times 2 \times \frac{1}{2}$	38	48	$5 \times 5 \times 4$	100	111
$2 \times 2 \times \frac{3}{4}$	41	49	$6 \times 6 \times \frac{3}{4}$	60	108
$2 \times 2 \times 1$	44	51	$6 \times 6 \times 1$	64	110
$2 \times 2 \times 1\frac{1}{4}$	48	54	$6 \times 6 \times 1\frac{1}{4}$	67	113
$2 \times 2 \times 1\frac{1}{2}$	52	55	$6 \times 6 \times 1\frac{1}{2}$	70	115
$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{2}$	41	57	$6 \times 6 \times 2$	75	116
$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{3}{4}$	44	58	$6 \times 6 \times 2\frac{1}{2}$	85	118
$2\frac{1}{2} \times 2\frac{1}{2} \times 1$	48	60	$6 \times 6 \times 3$	92	120
$2\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{4}$	52	62	$6 \times 6 \times 4$	102	125
$2\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{2}$	55	62	$6 \times 6 \times 5$	116	128
$2\frac{1}{2} \times 2\frac{1}{2} \times 2$	60	65	—	—	—
$3 \times 3 \times \frac{1}{2}$	43	65	—	—	—
Shapes/dimensions of ends of fittings are as given in table 2.					

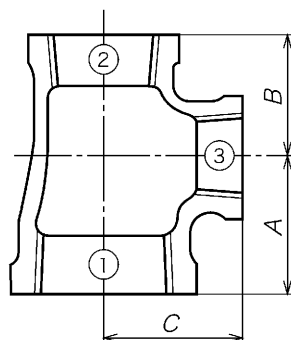
Shapes/dimensions of ends of fittings are as given in table 2.

Unit: mm

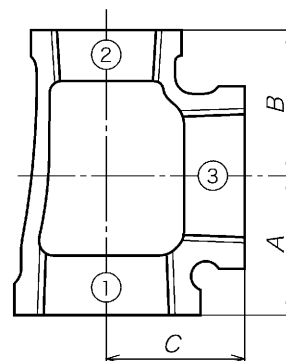
Fitting size ① × ② × ③	Increasing on the branch	
	Face-to-centre dimension	
	A	B
$\frac{1}{4} \times \frac{1}{4} \times \frac{3}{8}$	22	20
$\frac{3}{8} \times \frac{3}{8} \times \frac{1}{2}$	25	26
$\frac{1}{2} \times \frac{1}{2} \times \frac{3}{4}$	30	30
$\frac{1}{2} \times \frac{1}{2} \times 1$	33	32
$\frac{3}{4} \times \frac{3}{4} \times 1$	35	34
$\frac{3}{4} \times \frac{3}{4} \times 1\frac{1}{4}$	40	38
$1 \times 1 \times 1\frac{1}{4}$	42	40
$1 \times 1 \times 1\frac{1}{2}$	45	42
$1 \times 1 \times 2$	51	44
$1\frac{1}{4} \times 1\frac{1}{4} \times 1\frac{1}{2}$	48	45
$1\frac{1}{4} \times 1\frac{1}{4} \times 2$	52	48
$1\frac{1}{2} \times 1\frac{1}{2} \times 2$	54	52
$1\frac{1}{2} \times 1\frac{1}{2} \times 2\frac{1}{2}$	62	55
$2 \times 2 \times 2\frac{1}{2}$	65	60
$2 \times 2 \times 3$	72	62
$2\frac{1}{2} \times 2\frac{1}{2} \times 3$	75	70
$3 \times 3 \times 4$	92	85

Shapes/dimensions of ends of fittings are as given in table 2.

Table A.6 Class I reducing tees (reducing on the run) and reducing male and female tees (reducing service tees)



Reducing tees
(reducing on the branch and the run)



Reducing tees
(reducing on the run and
equal on the branch)

Unit: mm

Fitting size ① × ② × ③	Reducing on the run and the branch			Fitting size ① × ② × ③	Reducing on the run and the branch		
	Face-to-centre dimension				Face-to-centre dimension		
	A	B	C		A	B	C
$1/2 \times 3/8 \times 3/8$	26	23	25	$1/2 \times 1/4 \times 1$	41	40	45
$3/4 \times 3/8 \times 1/2$	29	25	30	$1/2 \times 1/4 \times 1/4$	45	44	48
$3/4 \times 1/2 \times 3/8$	28	26	28	$1/2 \times 1/4 \times 2$	55	54	52
$3/4 \times 1/2 \times 1/2$	30	27	30	$2 \times 1 \times 1$	44	38	51
$3/4 \times 1/2 \times 1$	35	33	34	$2 \times 1 \times 1/4$	48	42	54
$1 \times 1/2 \times 1/2$	32	27	33	$2 \times 1 \times 1/2$	52	45	55
$1 \times 1/2 \times 3/4$	34	30	35	$2 \times 1/4 \times 1$	44	40	51
$1 \times 3/4 \times 1/2$	32	29	33	$2 \times 1/4 \times 1/4$	48	46	54
$1 \times 3/4 \times 3/4$	34	32	35	$2 \times 1/4 \times 1/2$	52	48	55
$1/4 \times 1/2 \times 3/4$	37	30	40	$2 \times 1/4 \times 2/2$	65	62	60
$1/4 \times 1/2 \times 1$	40	33	42	$2 \times 1/2 \times 1/2$	38	35	48
$1/4 \times 3/4 \times 1/2$	34	29	38	$2 \times 1/2 \times 3/4$	41	38	50
$1/4 \times 3/4 \times 3/4$	37	32	40	$2 \times 1/2 \times 1$	45	42	52
$1/4 \times 3/4 \times 1$	40	35	42	$2 \times 1/2 \times 1/4$	49	46	54
$1/4 \times 1 \times 1/2$	34	32	38	$2 \times 1/2 \times 1/2$	52	48	55
$1/4 \times 1 \times 3/4$	37	34	40	$2 \times 1/2 \times 2/2$	65	62	60
$1/4 \times 1 \times 1$	40	38	42	$2/2 \times 1/2 \times 1/2$	55	48	62
$1/4 \times 1 \times 1/2$	48	45	45	$2/2 \times 1/2 \times 2$	60	55	65
$1/4 \times 1 \times 2$	54	51	48	$2/2 \times 2 \times 1$	48	44	60
$1/2 \times 3/4 \times 3/4$	38	32	43	$2/2 \times 2 \times 1/4$	52	48	62
$1/2 \times 3/4 \times 1$	41	35	45	$2/2 \times 2 \times 1/2$	55	52	62
$1/2 \times 1 \times 3/4$	38	34	43	$2/2 \times 2 \times 2$	60	57	65
$1/2 \times 1 \times 1$	41	37	45	$3 \times 2 \times 2$	62	57	72
$1/2 \times 1 \times 1/4$	45	42	48	$3 \times 2/2 \times 1/2$	58	55	72
$1/2 \times 1 \times 2$	55	51	52	$3 \times 2/2 \times 2$	62	60	72
$1/2 \times 1/4 \times 1/2$	35	34	42	$3 \times 2/2 \times 2/2$	72	69	75
$1/2 \times 1/4 \times 3/4$	38	38	43	—	—	—	—

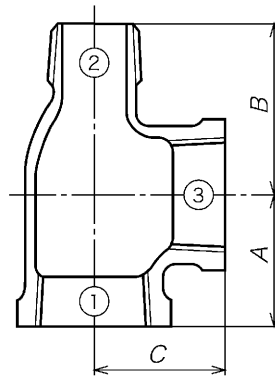
Shapes/dimensions of ends of fittings are as given in table 2.

Unit: mm

Fitting size ① × ② × ③	Reducing on the run and equal on the branch		
	Face-to-centre dimension		
	A	B	C
$1/2 \times 3/8 \times 1/2$	27	25	27
$3/4 \times 3/8 \times 3/4$	32	28	32
$3/4 \times 1/2 \times 3/4$	32	30	32
$1 \times 3/8 \times 1$	38	32	38
$1 \times 1/2 \times 1$	38	34	38
$1 \times 3/4 \times 1$	38	35	38
$1/4 \times 1/2 \times 1/4$	46	38	46
$1/4 \times 3/4 \times 1/4$	46	40	46
$1/4 \times 1 \times 1/4$	46	42	46
$1/2 \times 1/2 \times 1/2$	48	42	48
$1/2 \times 3/4 \times 1/2$	48	43	48
$1/2 \times 1 \times 1/2$	48	45	48
$1/2 \times 1/4 \times 1/2$	48	48	48
$2 \times 1/2 \times 2$	57	48	57
$2 \times 3/4 \times 2$	57	49	57
$2 \times 1 \times 2$	57	52	57
$2 \times 1/4 \times 2$	57	54	57
$2 \times 1/2 \times 2$	57	55	57
$2/2 \times 1/2 \times 2/2$	69	62	69
$2/2 \times 2 \times 2/2$	69	65	69
$3 \times 2 \times 3$	78	72	78
$4 \times 3 \times 4$	97	91	97

Shapes/dimensions of ends of fittings are as given in table 2.

Table A.6 (concluded)

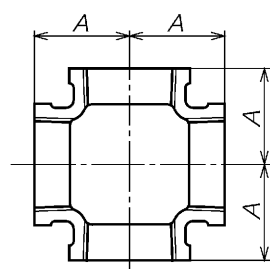


Reducing male and female tees
(reducing service tees)

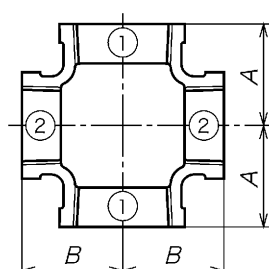
Unit: mm

Fitting size ① × ② × ③	Reducing male and female tees (reducing service tees)		
	Face-to-centre dimension		
	A	B	C
$\frac{3}{4} \times \frac{1}{2} \times \frac{3}{4}$	32	44	32
$1 \times \frac{1}{2} \times 1$	38	47	38
$1 \times \frac{3}{4} \times 1$	38	51	38
$1\frac{1}{4} \times \frac{3}{4} \times 1\frac{1}{4}$	46	55	46
$1\frac{1}{4} \times 1 \times 1\frac{1}{4}$	46	61	46
$1\frac{1}{2} \times 1 \times 1\frac{1}{2}$	48	65	48
$1\frac{1}{2} \times 1\frac{1}{4} \times 1\frac{1}{2}$	48	68	48
$2 \times \frac{3}{4} \times 2$	57	65	57
$2 \times 1\frac{1}{4} \times 2$	57	75	57
$2 \times 1\frac{1}{2} \times 2$	57	75	57
$2\frac{1}{2} \times 1 \times 2\frac{1}{2}$	69	79	69
$2\frac{1}{2} \times 2 \times 2\frac{1}{2}$	69	88	69
$3 \times 2 \times 3$	78	98	78
Shapes/dimensions of ends of fittings are as given in table 2.			

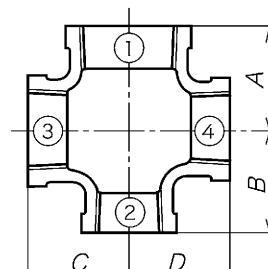
Table A.7 Class I crosses and reducing crosses



Crosses



Reducing crosses
(runs are same)



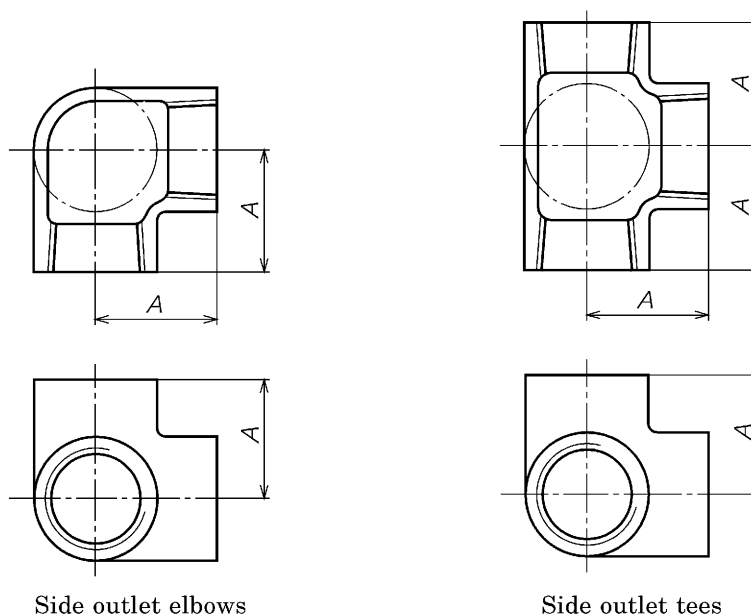
Reducing crosses
(runs are different)

Unit: mm	
Fitting size	Crosses
	Face-to-centre dimension
	A
1/8	17
1/4	19
3/8	23
1/2	27
3/4	32
1	38
1 1/4	46
1 1/2	48
2	57
2 1/2	69
3	78
4	97
5	113
6	132
Shapes/dimensions of ends of fittings are as given in table 2.	

Unit: mm			
Fitting size ① × ②	Reducing crosses (runs are same)		
	Face-to-centre dimension		
	A	B	
3/4 × 1/2	29	30	
1 × 1/2	32	33	
1 × 3/4	34	35	
1 1/4 × 3/4	38	40	
1 1/4 × 1	40	42	
1 1/2 × 3/4	38	43	
1 1/2 × 1	41	45	
1 1/2 × 1 1/4	45	48	
2 × 3/4	41	49	
2 × 1	44	51	
2 × 1 1/4	48	54	
2 × 1 1/2	52	55	
2 1/2 × 1	48	60	
2 1/2 × 2	60	65	
3 × 1	50	68	
3 × 2	62	72	
3 × 2 1/2	72	75	
Shapes/dimensions of ends of fittings are as given in table 2.			

Unit: mm				
Fitting size ① × ② × ③ × ④	Reducing crosses (runs are different)			
	Face-to-centre dimension			
	A	B	C	D
1 × 3/4 × 3/4 × 3/4	34	32	35	35
1 1/4 × 1 × 3/4 × 3/4	38	34	40	40
1 1/4 × 1 × 1 × 3/4	40	38	42	40
1 1/4 × 1 × 1 × 1	40	38	42	42
1 1/2 × 1 × 3/4 × 3/4	38	34	43	43
1 1/2 × 1 × 1 × 3/4	41	38	45	43
1 1/2 × 1 × 1 × 1	41	38	45	45
1 1/2 × 1 1/4 × 3/4 × 3/4	38	38	43	43
1 1/2 × 1 1/4 × 1 × 3/4	41	40	45	43
1 1/2 × 1 1/4 × 1 × 1	41	40	45	45
2 × 1 1/4 × 1 × 1	44	40	51	51
2 × 1 1/2 × 3/4 × 3/4	41	38	49	49
2 × 1 1/2 × 1 × 1	44	41	51	51
2 × 1 1/2 × 1 1/4 × 1	48	45	54	51
2 × 2 × 1 1/4 × 1	48	48	54	51
2 1/2 × 2 × 1 × 1	48	44	60	60
Shapes/dimensions of ends of fittings are as given in table 2.				

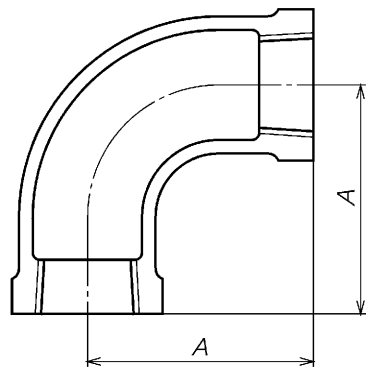
Table A.8 Class I side outlet elbows and side outlet tees



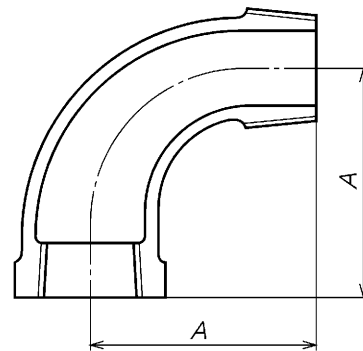
Unit: mm

Fitting size	Face-to-centre dimension
	<i>A</i>
$\frac{3}{8}$	23
$\frac{1}{2}$	27
$\frac{3}{4}$	32
1	38
$1\frac{1}{4}$	46
$1\frac{1}{2}$	48
2	57
Shapes/dimensions of ends of fittings are as given in table 2.	

Table A.9 Class I short bends and male and female short bends



Short bends

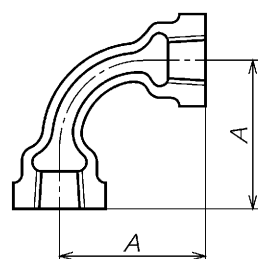


Male and female short bends

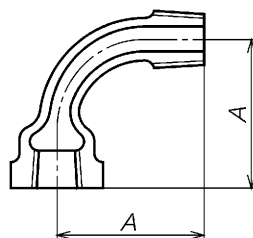
Unit: mm

Fitting size	Face-to-centre dimension
	A
$\frac{1}{2}$	45
$\frac{3}{4}$	50
1	63
$1\frac{1}{4}$	76
$1\frac{1}{2}$	85
2	102
Shapes/dimensions of ends of fittings are as given in table 2.	

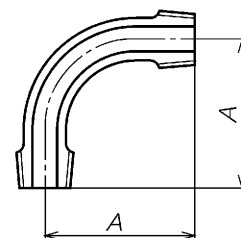
Table A.10 Class I long sweep bends, male and female long sweep bends, male long sweep bends, 45° long sweep bends, 45° male and female long sweep bends and 45° male long sweep bends



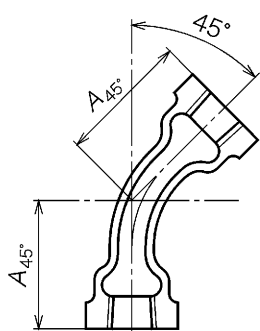
Long sweep bends



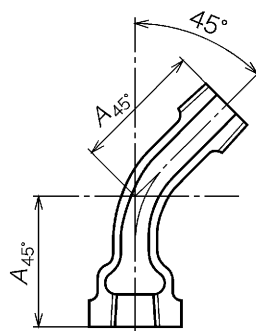
Male and female long sweep bends



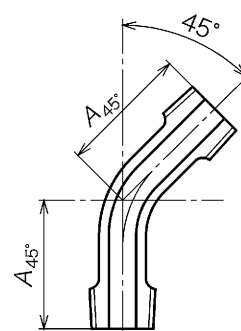
Male long sweep bends



45° long sweep bends



45° male and female long sweep bends



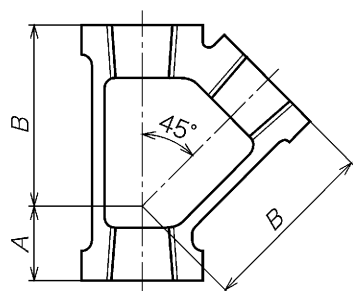
45° male long sweep bends

Unit: mm

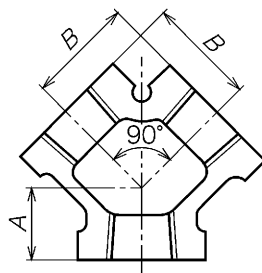
Fitting size	Face-to-centre dimension	
	A	A _{45°}
1/8	32	25
1/4	38	29
3/8	44	35
1/2	52	38
3/4	65	45
1	82	55
1 1/4	100	63
1 1/2	115	70
2	140	85
2 1/2	175	100
3	205	115
4	260	145
5	318	170
6	375	195

Shapes/dimensions of ends of fittings are as given in table 2.

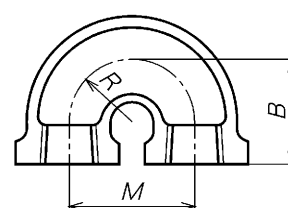
Table A.11 Class I 45° laterals, 90° laterals and return bends



45° laterals



90° laterals



Return bends

$$R = \frac{M}{2}$$

Unit: mm

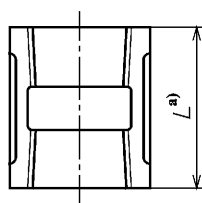
Fitting size	45° laterals		90° laterals	
	Face-to-centre dimension		Face-to-centre dimension	
	A	B	A	B
$\frac{1}{8}$	10	25	10	17
$\frac{1}{4}$	13	31	13	19
$\frac{3}{8}$	14	35	14	23
$\frac{1}{2}$	18	42	18	28
$\frac{3}{4}$	20	50	20	32
1	23	62	23	38
$1\frac{1}{4}$	28	75	28	46
$1\frac{1}{2}$	30	82	30	48
2	34	99	34	57
$2\frac{1}{2}$	40	124	40	68
3	45	140	45	78
4	57	178	52	97
5	65	215	60	114
6	74	255	67	132
Shapes/dimensions of ends of fittings are as given in table 2.				

Unit: mm

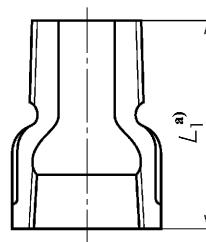
Unit: mm

Fitting size	Return bend		
	Centre distance		B
	M		
	Basic size	Tolerance	
$\frac{1}{8}$	23	± 0.8	21
$\frac{1}{4}$	28	± 0.8	23
$\frac{3}{8}$	32	± 0.8	28
$\frac{1}{2}$	38	± 0.8	33
$\frac{3}{4}$	50	± 0.8	41
1	62	± 0.8	50
$1\frac{1}{4}$	75	± 1	60
$1\frac{1}{2}$	82	± 1	62
2	98	± 1.2	72
$2\frac{1}{2}$	115	± 1.2	82
3	130	± 1.5	93
4	160	± 1.8	115
Shapes/dimensions of ends of fittings are as given in table 2.			

Table A.12 Class I sockets and male and female sockets



Sockets



Male and female sockets

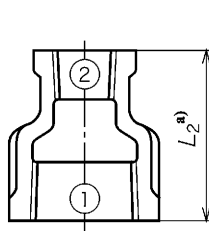
Unit: mm

Fitting size	Socket	Male and female socket
	L	L_1
$\frac{1}{8}$	22	25
$\frac{1}{4}$	25	28
$\frac{3}{8}$	30	32
$\frac{1}{2}$	35	40
$\frac{3}{4}$	40	48
1	45	55
$1\frac{1}{4}$	50	60
$1\frac{1}{2}$	55	65
2	60	70
$2\frac{1}{2}$	70	80
3	75	90
4	85	100
5	95	110
6	105	125

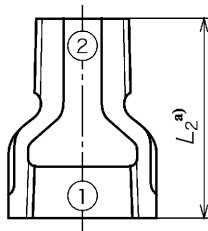
Shapes/dimensions of ends of fittings are as given in table 2.

Note ^{a)} Tolerances on the dimensions L and L_1 shall be twice the values given in table 6.

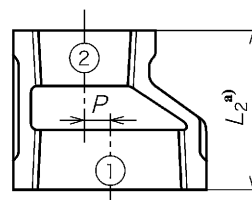
Table A.13 Class I reducing sockets, reducing male and female sockets and eccentric reducing sockets



Reducing sockets



Reducing male and female sockets



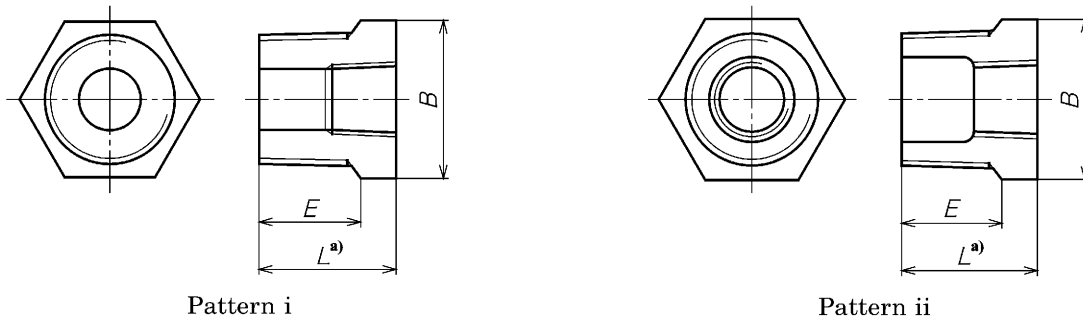
Eccentric reducing sockets

Unit: mm			
Fitting size ① × ②	Reducing sockets	Fitting size ① × ②	Reducing sockets
	L_2		L_2
$1/4 \times 1/8$	25	$3 \times 1/2$	72
$3/8 \times 1/8$	28	$3 \times 3/4$	72
$3/8 \times 1/4$	28	3×1	72
$1/2 \times 1/8$	34	$3 \times 1 1/4$	72
$1/2 \times 1/4$	34	$3 \times 1 1/2$	72
$1/2 \times 3/8$	34	3×2	72
$3/4 \times 1/4$	38	$3 \times 2 1/2$	72
$3/4 \times 3/8$	38	$4 \times 1/2$	85
$3/4 \times 1/2$	38	$4 \times 3/4$	85
$1 \times 3/8$	42	4×1	85
$1 \times 1/2$	42	$4 \times 1 1/4$	85
$1 \times 3/4$	42	$4 \times 1 1/2$	85
$1 1/4 \times 1/2$	48	4×2	85
$1 1/4 \times 3/4$	48	$4 \times 2 1/2$	85
$1 1/4 \times 1$	48	4×3	85
$1 1/2 \times 1/2$	52	$5 \times 1 1/2$	95
$1 1/2 \times 3/4$	52	5×2	95
$1 1/2 \times 1$	52	$5 \times 2 1/2$	95
$1 1/2 \times 1 1/4$	52	5×3	95
$2 \times 1/2$	58	5×4	95
$2 \times 3/4$	58	$6 \times 1 1/2$	105
2×1	58	6×2	105
$2 \times 1 1/4$	58	$6 \times 2 1/2$	105
$2 \times 1 1/2$	58	6×3	105
$2 1/2 \times 1/2$	65	6×4	105
$2 1/2 \times 3/4$	65	6×5	105
$2 1/2 \times 1$	65	—	—
$2 1/2 \times 1 1/4$	65	—	—
$2 1/2 \times 1 1/2$	65	—	—
$2 1/2 \times 2$	65	—	—
Shapes/dimensions of ends of fittings are as given in table 2.			
Note ^{a)} Tolerances on the dimension L_2 shall be twice the values given in table 6.			

Unit: mm	
Fitting size ① × ②	Reducing male and female sockets
	L_2
$1/2 \times 3/8$	43
$3/4 \times 1/2$	48
$1 \times 3/4$	55
$1 1/4 \times 1$	60
$1 1/2 \times 1 1/4$	63
$2 \times 1 1/2$	70
Shapes/dimensions of ends of fittings are as given in table 2.	
Note ^{a)} Tolerances on the dimension L_2 shall be twice the values given in table 6.	

Unit: mm		
Fitting size ① × ②	Eccentric reducing sockets	
	L_2	P (info.)
$2 \times 1/2$	58	18.5
$2 \times 3/4$	58	16
2×1	58	13
$2 \times 1 1/4$	58	9
$2 \times 1 1/2$	58	6
$2 1/2 \times 1 1/2$	65	14
$2 1/2 \times 2$	65	8
3×2	72	14
$3 \times 2 1/2$	72	6.5
4×2	85	26.5
$4 \times 2 1/2$	85	19
4×3	85	12.5
5×3	95	25.5
5×4	95	13
6×4	105	25
6×5	105	12.5
Shapes/dimensions of ends of fittings are as given in table 2.		
Note ^{a)} Tolerances on the dimension L_2 shall be twice the values given in table 6.		

Table A.14 Class I bushings



Unit: mm

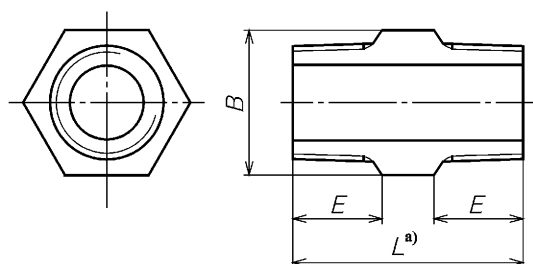
Fitting size	Pattern	L	E (Info.)	Width across flats B (info.)		Fitting size	Pattern	L	E (Info.)	Width across flats B (info.)	
				Hexagon	Octagon					Hexagon	Octagon
$\frac{1}{4} \times \frac{1}{8}$	i	17	12	17	—	$3 \times \frac{1}{2}$	ii	44	32	—	95
$\frac{3}{8} \times \frac{1}{8}$	i or ii	18	13	21	—	$3 \times \frac{3}{4}$	ii	44	32	—	95
$\frac{3}{8} \times \frac{1}{4}$	i	18	13	21	—	3×1	ii	44	32	—	95
$\frac{1}{2} \times \frac{1}{8}$	ii	21	16	26	—	$3 \times 1\frac{1}{4}$	ii	44	32	—	95
$\frac{1}{2} \times \frac{1}{4}$	i or ii	21	16	26	—	$3 \times 1\frac{1}{2}$	ii	44	32	—	95
$\frac{1}{2} \times \frac{3}{8}$	i	21	16	26	—	3×2	ii	44	32	—	95
$\frac{3}{4} \times \frac{1}{4}$	ii	24	18	32	—	$3 \times 2\frac{1}{2}$	i or ii	44	32	—	95
$\frac{3}{4} \times \frac{3}{8}$	i or ii	24	18	32	—	$4 \times \frac{1}{2}$	ii	51	37	—	120
$\frac{3}{4} \times \frac{1}{2}$	i	24	18	32	—	$4 \times \frac{3}{4}$	ii	51	37	—	120
$1 \times \frac{1}{4}$	ii	27	20	38	—	4×1	ii	51	37	—	120
$1 \times \frac{3}{8}$	ii	27	20	38	—	$4 \times 1\frac{1}{4}$	ii	51	37	—	120
$1 \times \frac{1}{2}$	i or ii	27	20	38	—	$4 \times 1\frac{1}{2}$	ii	51	37	—	120
$1 \times \frac{3}{4}$	i	27	20	38	—	4×2	ii	51	37	—	120
$1\frac{1}{4} \times \frac{3}{8}$	ii	30	22	46	—	$4 \times 2\frac{1}{2}$	ii	51	37	—	120
$1\frac{1}{4} \times \frac{1}{2}$	ii	30	22	46	—	4×3	i or ii	51	37	—	120
$1\frac{1}{4} \times \frac{3}{4}$	ii	30	22	46	—	$5 \times 1\frac{1}{2}$	ii	57	42	—	145
$1\frac{1}{4} \times 1$	i	30	22	46	—	5×2	ii	57	42	—	145
$1\frac{1}{2} \times \frac{3}{8}$	ii	32	23	54	—	$5 \times 2\frac{1}{2}$	ii	57	42	—	145
$1\frac{1}{2} \times \frac{1}{2}$	ii	32	23	54	—	5×3	ii	57	42	—	145
$1\frac{1}{2} \times \frac{3}{4}$	ii	32	23	54	—	5×4	ii	57	42	—	145
$1\frac{1}{2} \times 1$	ii	32	23	54	—	6×1	ii	64	46	—	170
$1\frac{1}{2} \times 1\frac{1}{4}$	i	32	23	54	—	$6 \times 1\frac{1}{4}$	ii	64	46	—	170
$2 \times \frac{1}{2}$	ii	36	25	—	63	$6 \times 1\frac{1}{2}$	ii	64	46	—	170
$2 \times \frac{3}{4}$	ii	36	25	—	63	6×2	ii	64	46	—	170
2×1	ii	36	25	—	63	$6 \times 2\frac{1}{2}$	ii	64	46	—	170
$2 \times 1\frac{1}{4}$	ii	36	25	—	63	6×3	ii	64	46	—	170
$2 \times 1\frac{1}{2}$	i or ii	36	25	—	63	6×4	ii	64	46	—	170
$2\frac{1}{2} \times \frac{1}{2}$	ii	39	28	—	80	6×5	ii	64	46	—	170
$2\frac{1}{2} \times \frac{3}{4}$	ii	39	28	—	80	—	—	—	—	—	—
$2\frac{1}{2} \times 1$	ii	39	28	—	80	—	—	—	—	—	—
$2\frac{1}{2} \times 1\frac{1}{4}$	ii	39	28	—	80	—	—	—	—	—	—
$2\frac{1}{2} \times 1\frac{1}{2}$	ii	39	28	—	80	—	—	—	—	—	—
$2\frac{1}{2} \times 2$	i or ii	39	28	—	80	—	—	—	—	—	—

Dimensions of internally threaded portions shall be as given in table 2.

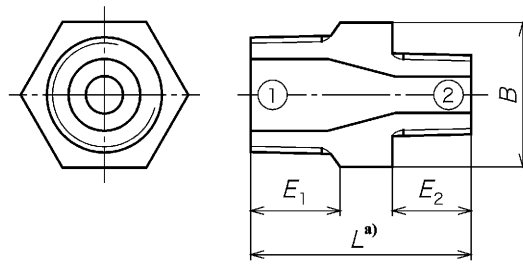
NOTE: The length from the fitting end face of taper external thread to the gauge diameter position may be shorter than the requirements in JIS B 0203 to keep allowance necessary for tightening.

Note ^{a)} Tolerances on the dimension L shall be twice the values given in table 6. However, plus side tolerances for $1 \times \frac{3}{4}$ or under shall be thrice.

Table A.15 Class I nipples and reducing nipples



Nipples



Reducing nipples

Unit: mm

Fitting size	Nipples			
	L	E	Width across flats B (info.)	
			Hexagon	Octagon
$\frac{1}{8}$	32	11	14	—
$\frac{1}{4}$	34	12	17	—
$\frac{3}{8}$	36	13	21	—
$\frac{1}{2}$	42	16	26	—
$\frac{3}{4}$	47	18	32	—
1	52	20	38	—
$1\frac{1}{4}$	56	22	46	—
$1\frac{1}{2}$	60	23	54	—
2	66	25	—	63
$2\frac{1}{2}$	73	28	—	80
3	81	32	—	95
4	92	37	—	120
5	104	42	—	145
6	116	46	—	170

NOTE 1 The length from the fitting end face of taper external thread to the gauge diameter position may be shorter than the requirements in **JIS B 0203** to keep allowance necessary for tightening.

NOTE 2 Inner surface of wall thickness (corner) may be recessed.

NOTE 3 End faces of inner diameter edges may be rounded.

Note ^{a)} Tolerances on the dimensions L shall be twice the values given in table 6. However, plus side tolerances for 1 or under of nipples and for $1 \times \frac{3}{4}$ or under of reducing nipples shall be thrice.

Unit: mm

Fitting size ① × ②	Reducing nipples				
	L	E_1	E_2	Width across flats B (info.)	
				Hexagon	Octagon
$\frac{3}{8} \times \frac{1}{4}$	35	13	12	21	—
$\frac{1}{2} \times \frac{1}{4}$	38	16	12	26	—
$\frac{1}{2} \times \frac{3}{8}$	39	16	13	26	—
$\frac{3}{4} \times \frac{1}{4}$	41	18	12	32	—
$\frac{3}{4} \times \frac{3}{8}$	42	18	13	32	—
$\frac{3}{4} \times \frac{1}{2}$	45	18	16	32	—
$1 \times \frac{3}{8}$	45	20	13	38	—
$1 \times \frac{1}{2}$	48	20	16	38	—
$1 \times \frac{3}{4}$	50	20	18	38	—
$1\frac{1}{4} \times \frac{1}{2}$	50	22	16	46	—
$1\frac{1}{4} \times \frac{3}{4}$	52	22	18	46	—
$1\frac{1}{4} \times 1$	54	22	20	46	—
$1\frac{1}{2} \times \frac{3}{4}$	55	23	18	54	—
$1\frac{1}{2} \times 1$	57	23	20	54	—
$1\frac{1}{2} \times 1\frac{1}{4}$	59	23	22	54	—
$2 \times \frac{3}{4}$	59	25	18	—	63
2×1	61	25	20	—	63
$2 \times 1\frac{1}{4}$	63	25	22	—	63
$2 \times 1\frac{1}{2}$	64	25	23	—	63
$2\frac{1}{2} \times 1\frac{1}{2}$	68	28	23	—	80
$2\frac{1}{2} \times 2$	70	28	25	—	80
3×2	74	32	25	—	95
$3 \times 2\frac{1}{2}$	77	32	28	—	95
4×2	80	37	25	—	120
4×3	87	37	32	—	120

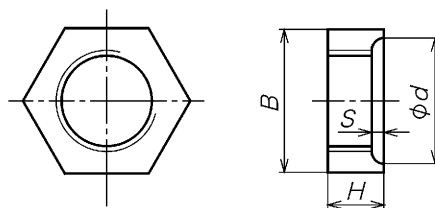
NOTE 1 The length from the fitting end face of taper external thread to the gauge diameter position may be shorter than the requirements in **JIS B 0203** to keep allowance necessary for tightening.

NOTE 2 Inner surface of wall thickness (corner) may be recessed.

NOTE 3 End faces of inner diameter edges may be rounded.

Note ^{a)} Tolerances on the dimensions L shall be twice the values given in table 6. However, plus side tolerances for 1 or under of nipples and for $1 \times \frac{3}{4}$ or under of reducing nipples shall be thrice.

Table A.16 Class I backnuts (locknuts)



Unit: mm

Fitting size	Height H	Diameter d	Depth S	Width across flats B	
				Hexagon	Octagon
$\frac{1}{4}$	8	18	1.2	21	—
$\frac{3}{8}$	9	22	1.2	26	—
$\frac{1}{2}$	9	28	1.2	32	—
$\frac{3}{4}$	10	34	1.5	38	—
1	11	40	1.5	46	—
$1\frac{1}{4}$	12	50	1.5	54	—
$1\frac{1}{2}$	13	55	2.5	—	63
2	15	68	2.5	—	77
$2\frac{1}{2}$	17	88	2.5	—	100
3	18	100	2.5	—	115
4	22	125	2.5	—	145
5	25	150	2.5	—	165
6	30	180	2.5	—	200

Threads shall be according to **JIS B 0202**; however, the tolerances shall be twice the values.

NOTE : All dimensions are for reference.