

HITACHI METALS

GOURD  BRAND **MALLEABLE IRON PIPE FITTINGS**

日本葫蘆牌鉛水配件



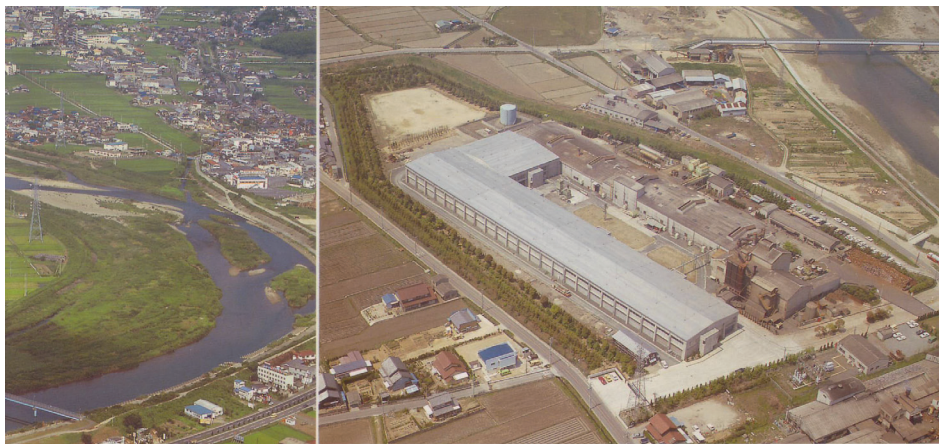
 Hitachi Metals, Ltd.

DISTRIBUTOR:



中華五金有限公司
CHUNG WAH METAL CO., LTD.

The Kuwabe Branch Works



The Kuwana Works

Ordering Information

- (1) The Gourd ∪ Brand Malleable Iron Pipe Fittings conform to the requirements provided in JIS B 2301 (JAPANESE authoritative INDUSTRIAL STANDARD). Unless otherwise specified, your order will be executed according to the Hitachi Gourd ∪ Brand specifications. These specifications conform to the following ratings. JIS B 2301 Screwed Type Malleable Iron Pipe Fittings.

(For the threads)

B.S. No. 21-1973 Pipe Threads.

ANSI B1.20.1-1983 Pipe Threads

DIN 2999-1960 Pipe Threads

Please refer to the appendix G, H and I of this catalogue for the standards of the above pipe threads.

- (2) When ordering the Gourd ∪ Brand Pipe Fittings, please specify the requirements:

* Type of thread—British, American or German

* Black or Galvanized.

* Fig. No.

* Name, nominal size and quantity.

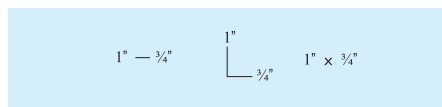
- (3) To minimize handling costs, the order for the Gourd ∪ Brand Pipe Fittings shall call for quantities covered by multiple numbers of shipping cartons.

- (4) To avoid confusion, the order for pipe fittings with different diameters should be described as follows:

a. Two Ways Fittings

Larger diameter comes first, and smaller second.

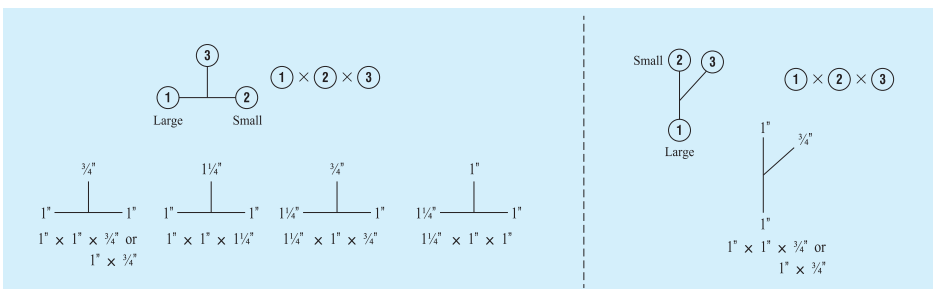
(Example)



b. Three Ways Fittings

Larger diameter of the two on the same line comes first and smaller second, and the remaining third.

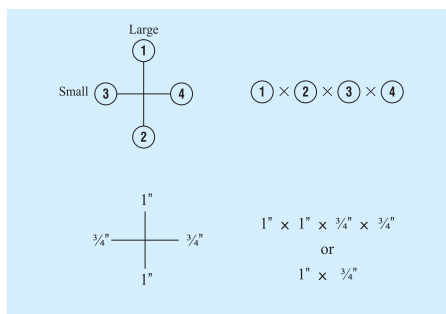
(Example)



c. Four Ways Fittings

The largest diameter comes first, and the one on the same line with the largest diameter second. The larger one of the remaining two is the third and the last one fourth.

(Example)



- (5) All items of the Gourd ∪ Brand Malleable Iron Pipe Fittings described in this catalogue are always ready for delivery in any quantity. Those not given in this catalogue may be manufactured on order. When making inquiry concerning those non-standard items please inform the followings:

a. Application and method of usage.

b. Quantity required, and prospect of the demand if possible.

c. Specifications in detail.

Materials, dimensions, dimensional tolerances, etc.

Please furnish us with a sample piece, draft, etc.

d. Standards or regulations on which the manufacture of the ordered items should be based.

1. Technical Information on the Gourd Brand Malleable Iron Pipe Fittings

(1) Introduction

Pipe fittings are normally used in places where they are hidden from sight and often overlooked. Any leak that occurs as a result of inferior pipe fittings can develop into a costly accident before the personnel may notice it. Careful selection of fittings beforehand can assure users of the Gourd  Brand pipe fittings years of maintenance-free service.

For over 60 years the Gourd  Brand has lived up to its reputation for excellence which is known the world over. As a result of its strict adherence to quality standards, the Gourd  Brand pipe fittings bear the Japanese Industrial Standard (JIS) mark as that organization's official seal of certified quality.

(2) Pressure-Temperature Ratings

The Gourd  Brand pipe fittings are used extensively for steam, air, water, gas, oil, and many other fluids, and are proved to withstand the pressure shown in the following table.

Pressure-Temperature Ratings		(JIS B 2301)	
Fluids and Temperature		Maximum Working Pressure	
Steam, Air, Gas and Oil under 300°C (570°F)		10 kg/cm ²	150 lbs/in ²
Steam, Air, Gas, Oil and Water under 200°C (400°F)		14	200
Water, Non-shock under 120°C (250°F)		20	300

(3) Types and Sizes

Standard types and sizes of the Gourd  Brand pipe fittings are shown in tables on pages 16 to 35. Non-standard types and sizes are also available on a special made-to-order basis.

The nominal size of a pipe fitting is shown by the one size of a pipe with which it is engaged. In the case of pipe fittings with more than two ends of different diameters, the nominal sizes are represented as follows:
In the case of those with two outlets, larger bore is called

① and smaller one ②. In the case of those with three outlets, the two bores on the same or parallel center line are ① and ② according to size and the rest one ③. In the four outlets type, the largest bore is ①, the one on the same or parallel center line with ① is ②, and the other two are ③ and ④ according to size. (Refer to the paragraph “Ordering Information.”)

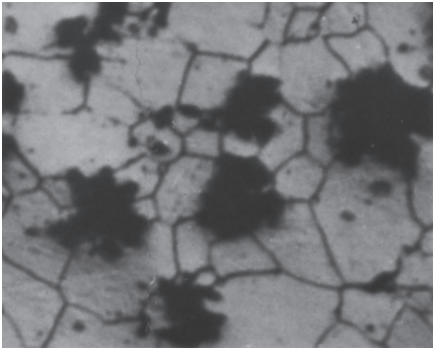
(4) Material

The Gourd  Brand pipe fittings are manufactured exclusively of black heart malleable iron. Compared with white heart malleable iron, one distinctive feature is that its uniformity of metal structure is far superior to white heart malleable iron. This uniformity is ensured even in the inner

part of thick castings and results in greater strength of the fitting. The following table shows a comparison between various standards for material used in malleable pipe fittings and also lists the properties of the Gourd  Brand pipe fittings

	Material	Tensile Strength kg/mm ²	Elongation in 2 in. %
Gourd  Brand	Black Heart Malleable Iron	36	12
Japanese Industrial Standard (min.)	Black Heart Malleable Iron	28	5
British Standard (min.)	Black Heart Malleable Iron	28.4	6
	White Heart Malleable Iron	34.7	4
American Standard (min.)	Cupola Malleable Iron	28.1	5

Microstructure of the Gourd Ⓜ Brand Black Heart
Malleable Iron after Annealing (x200)



(5) End Shapes

The shapes of the ends of the Gourd Ⓜ Brand pipe fittings are illustrated on the following page. These pipe fittings are patterned after British Standards. American Standard pipe fittings, however, are almost identical in shape and dimension to those of the Gourd Ⓜ Brand except for gauge diameter and the number of threads.

(6) Distance between Ends and Tolerances

The distance between ends of the Gourd Ⓜ Brand pipe fittings is shown in the tables on page 16 to 35. The tolerance is shown below.

Lengths in Millimeters	below 30	30 to 50	50 to 75	75 to 100	100 to 150	150 to 200	200 to 300	300 to 400
Tolerances in Millimeters (plus or minus)	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0

Nominal Size (in.)	Threads			
	Gauge Diam. D (mm)	Number of Threads per inch	Min. Length of Threads	
			Female l' (mm)	Male l' (mm)
1/8	9,728	28	6	8
1/4	13,157	19	8	11
3/8	16,662	19	9	12
1/2	20,955	14	11	15
3/4	26,441	14	13	17
1	33,249	11	15	19
1 1/4	41,910	11	17	22
1 1/2	47,803	11	18	22
2	59,614	11	20	26
2 1/2	75,184	11	23	30
3	87,884	11	25	34
3 1/2	100,330	11	26	35
4	113,030	11	28	40
5	138,430	11	30	44
6	163,830	11	33	44
8	214,630	10	42	57
10	265,430	10	50	60

* Those with nominal size smaller than 2 in. are also available in the non-banded type (plain type)

** Ribs are attached to socket and cap only.

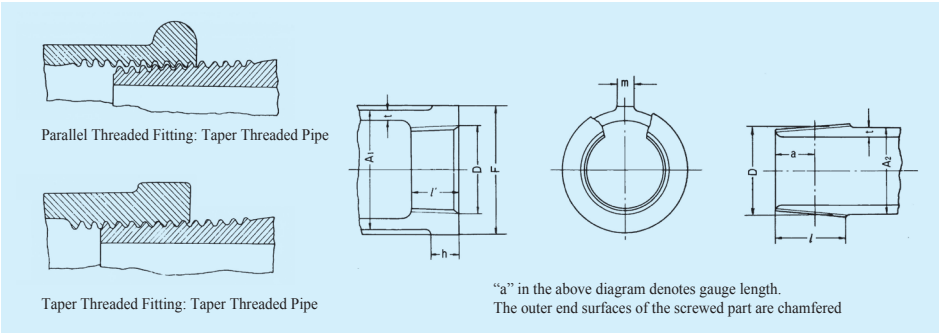
(7) Threads

The Gourd ∩ Brand pipe fittings' taper threads are machined according to the highly accurate American or British standards. As the following cross-section diagrams show, taper female threads engage taper male threads more closely than do parallel female threads. However, because of distinctive requirements in the uses of these fittings, it is difficult to label either type thread for fittings as more desirable in practice. The Gourd ∩ Brand can deliver fittings with either parallel or taper threading upon client specifications or requirements.

Parallel threading is tapped on the locknuts, or backnuts, sockets, plain, without ribs.

A unique machine threads the Gourd ∩ Brand pipe fittings simultaneously at all outlets. In two, three or four-outlet types, or in 45°, 90°, or 180° angle types, the axis angle error is almost entirely eliminated.

The elaborate chamfering of the threaded end allows the pipe fitting to be attached to the pipe easily and smoothly. Breakage around the joint is exceedingly rare.



"a" in the above diagram denotes gauge length.
The outer end surfaces of the screwed part are chamfered

Min. Outside Diam. of Body behind Thread		Wall Thickness t (mm)	*Bands		**Ribs	
Female A ₁ (mm)	Male A ₂ (mm)		Outside Diam. F (mm)	Width h (mm)	Width m (mm)	Number of Ribs
						Socket & Cap
15	9	2	18	5	3	2
19	12	2.5	22	5	3	2
23	14	2.5	26	5	3	2
27	18	2.5	30	6	4	2
33	24	3	36	6	4	2
41	30	3	44	7	5	2
50	39	3.5	53	8	5	2
56	44	3.5	60	9	5	2
69	56	4	73	11	5	2
86	72	4.5	91	12	6	2
99	84	5	105	13	7	2
113	97	5.5	119	14	8	2
127	110	6	133	16	8	4
154	136	6.5	161	18	8	4
182	160	7.5	189	20	8	4
234	210	8	244	24	9	4
288	260	9	300	28	11	6

(8) Coating

The Gourd ∪ Brand pipe fittings are of the so-called black, or galvanized type. Galvanized fittings are practically corrosion-free. Life test results have shown that under ordinary conditions the Gourd ∪ Brand pipe fittings remain corrosion-free for 40 years, and even under highly unfavorable conditions, are free from corrosion for at least ten years.

This corrosion-resistance is largely the result of the Gourd ∪ Brand's galvanizing process. All the Gourd ∪ Brand fittings are dipped in melted zinc before threading. This hot

zinc dipping process has proven—in countless experiments—to be superior to various other galvanizing methods, including electroplating, metal spraying, and sherardizing.

One problem encountered in galvanizing malleable iron by the hot dipping method is that of the brittleness of the zinc coating. In the Gourd ∪ Brand pipe fittings this problem has been overcome by special melting, annealing, and galvanizing treatments.

2. Manufacturing Process of the Gourd ∪ Brand Malleable Iron Pipe Fittings

The Gourd ∪ Brand pipe fittings are manufactured by a fully mechanized mass production system. Strict quality control governs every stage of the manufacturing process. The manufacturing facilities include patented casting equipment, a belt conveyor system, tunneltype continuous annealing furnaces kept at proper temperature by precision thermal measuring instruments, and automatic screw cutting machines. The Gourd ∪ Brand pipe fittings are turned out in rapid rhythmical succession. The Gourd ∪ Brand factories have been awarded the Deming Prize, as well as the Industrial

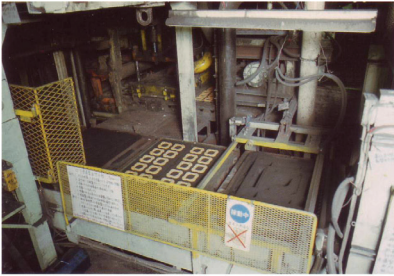
Engineering Standardization Prize by the Japanese Government. The latter prize is considered Japan's Grand Prix in the field of technical achievement. The Gourd ∪ Brand factories—where strict quality control and strict adherence to most exacting industrial standards are closely observed—stand as ample endorsement to the high quality of the Gourd ∪ Brand products. The company's motto "No Breakage, No Leakage, No Deformation in Service" stands behind every product.



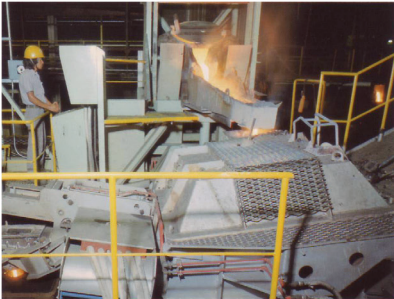
Mechanized and Automatic Foundry Shop



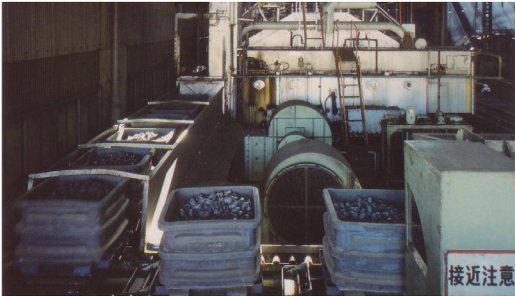
Mechanized and Automatic Foundry Shop



Mechanized and Automatic Foundry Shop



Mechanized and Automatic Foundry Shop

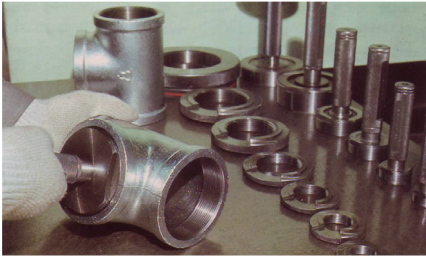


Tunnel Type Continuous Annealing Furnaces

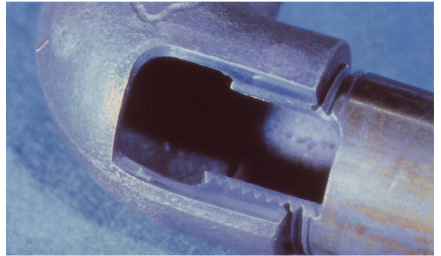


Modernized Tapping Shop

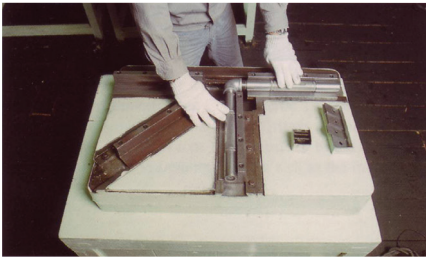
All the Gourd  Brand Malleable Iron Pipe Fittings are individually air-tested under water.



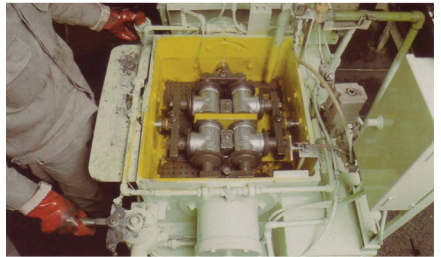
Gauge Inspection



Engagement Inspection



Angle Inspection of Thread Axle Line



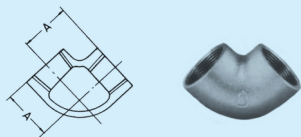
Air Testing



The Gourd  Brand Malleable Iron Pipe Fittings packed in carton boxes for export.

Fig. No. 1

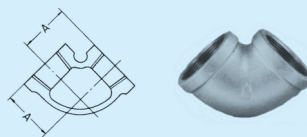
Elbows, 90°, equal, plain (L)



Nominal size (in.)	A (mm)
½ *₁	27
¾ *₁	32
1 *₁	38
1¼ *₁	46
1½ *₁	48
2 *₁	57

Fig. No. 2

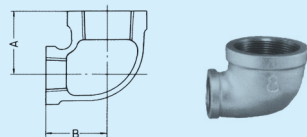
Elbows, 90°, equal, banded (BL)



Nominal size (in.)	A (mm)
⅛	17
¼	19
⅜	23
½	27
¾	32
1	38
1¼	46
1½	48
2	57
2½	69
3	78
3½	87
4	98
5	113
6	132
8	162

Fig. No. 2

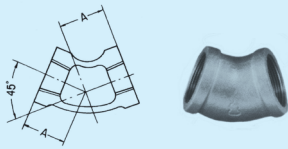
Elbows, 90°, reducing, banded (BRL)



Nominal size (in.)	A (mm)	B (mm)	Nominal size (in.)	A (mm)	B (mm)	Nominal size (in.)	A (mm)	B (mm)
¼ × ⅛	18	18	1½ × ¾	38	43	3 × 1½	58	72
¾ × ⅛	19	21	1½ × 1	41	45	3 × 2	62	72
¾ × ¼	20	22	1½ × 1¼	45	48	3 × 2½	72	75
½ × ⅛	22	23	2 × ½	38	48	4 × 1	57	83
½ × ¼	24	24	2 × ¾	41	49	4 × 1¼	62	85
½ × ⅜	26	25	2 × 1	44	51	4 × 1½	63	86
¾ × ⅛	24	26	2 × 1¼	48	54	4 × 2	69	87
¾ × ¼	25	28	2 × 1½	52	55	4 × 2½ *₁	78	90
¾ × ⅜	28	28	2½ × ½ *₁	41	57	4 × 3	83	91
¾ × ½	29	30	2½ × ¾ *₁	44	59	5 × 2	72	103
1 × ¼	27	31	2½ × 1 *₁	48	61	5 × 2½ *₁	81	105
1 × ⅜	30	31	2½ × 1¼ *₁	53	63	5 × 3	87	107
1 × ½	32	33	2½ × 1½ *₁	55	62	5 × 4	100	111
1 × ¾	34	35	2½ × 2	60	65	6 × 3	92	120
1¼ × ½	34	38	3 × ½	44	64	6 × 4	102	125
1¼ × ¾	38	40	3 × ¾	47	63	6 × 5	116	128
1¼ × 1	40	42	3 × 1	51	68			
1½ × ½	35	42	3 × 1¼	55	69			

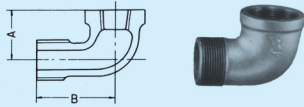
*₁ : Available in British and German threads only.

Fig. No. 4
Elbows, 45°, banded (BL 45)



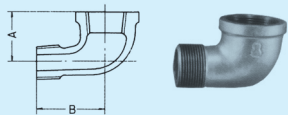
Nominal size (in.)	A (mm)
1/8	16
1/4	17
3/8	19
1/2	21
3/4	25
1	29
1 1/4	34
1 1/2	37
2	42
2 1/2	49
3	54
4	65
5	74
6	82

Fig. No. 6
Street Elbows, 90°, equal, banded (SL)



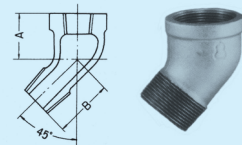
Nominal size (in.)	A (mm)	B (mm)
1/8	17	26
1/4	19	30
3/8	23	35
1/2	27	40
3/4	32	47
1	38	54
1 1/4	46	62
1 1/2	48	68
2	57	79
2 1/2	69	92
3	78	104
4	97	126

Fig. No. 6
Street Elbows, 90°, reducing, banded (RSL)



Nominal size (in.)	A (mm)	B (mm)
1/2 x 3/8	26	36
3/4 x 1/2	29	44
1 x 3/4	34	51
1 1/4 x 1	40	61
1 1/2 x 1 1/4	45	68
2 x 1 1/2	52	75

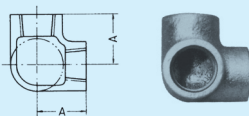
Fig. No. 7
Street Elbows, 45°, banded (SL45)



Nominal size (in.)	A (mm)	B (mm)
1/8	16	21
1/4	17	23
3/8	19	27
1/2	21	31
3/4	25	36
1	29	42
1 1/4	34	49
1 1/2	37	51
2	42	59

Fig. No. 9

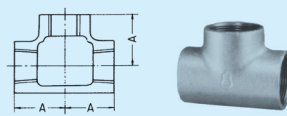
Side Outlet Elbows, plain (SOL)



Nominal size (in.)	A (mm)
$\frac{3}{8}$	23
$\frac{1}{2}$	27
$\frac{3}{4}$	32
1	38
$1\frac{1}{4}$	46
$1\frac{1}{2}$	48
2	57

Fig. No. 10

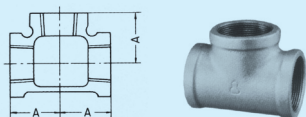
Tees, equal, plain (T)



Nominal size (in.)	A (mm)
$\frac{1}{2}$ * ₁	27
$\frac{3}{4}$ * ₁	32
1 * ₁	38
$1\frac{1}{4}$ * ₁	46
$1\frac{1}{2}$ * ₁	48
2 * ₁	57

Fig. No. 11

Tees, equal, banded (BT)

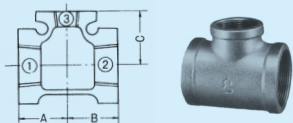


Nominal size (in.)	A (mm)
$\frac{1}{8}$	17
$\frac{1}{4}$	19
$\frac{3}{8}$	23
$\frac{1}{2}$	27
$\frac{3}{4}$	32
1	38
$1\frac{1}{4}$	46
$1\frac{1}{2}$	48
2	57
$2\frac{1}{2}$	69
3	78
$3\frac{1}{2}$	87
4	97
5	113
6	132

*1 : Available in British and German threads only.

Fig. No. 11

Tees, reducing, banded (① and ② on the same center line and branch ③ smaller) (BRT)

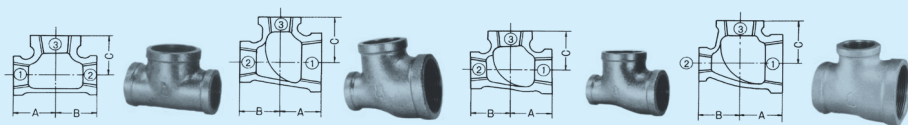


Nominal size (in.)	A (mm)	B (mm)	C (mm)	Nominal size (in.)	A (mm)	B (mm)	C (mm)	Nominal size (in.)	A (mm)	B (mm)	C (mm)
¼ × ¼ × ⅛	18	18	18	2 × 2 × 1¼	48	48	54	5 × 5 × 3	87	87	107
⅜ × ⅜ × ⅛	19	19	21	2 × 2 × 1½	52	52	55	5 × 5 × 4	100	100	111
⅜ × ⅜ × ¼	20	20	22	2½ × 2½ × ½	41	41	57	6 × 6 × ¾	60	60	108
½ × ½ × ⅛	22	22	23	2½ × 2½ × ¾	44	44	58	6 × 6 × 1	64	64	110
½ × ½ × ¼	24	24	24	2½ × 2½ × 1	48	48	60	6 × 6 × 1¼	67	67	113
½ × ½ × ⅜	26	26	25	2½ × 2½ × 1¼	52	52	62	6 × 6 × 1½	70	70	116
¾ × ¾ × ⅛	24	24	26	2½ × 2½ × 1½	55	55	62	6 × 6 × 2	75	75	115
¾ × ¾ × ¼	25	25	27	2½ × 2½ × 2	60	60	65	6 × 6 × 2½ * ₁	85	85	118
¾ × ¾ × ⅜	28	28	28	3 × 3 × ½	43	43	65	6 × 6 × 3	92	92	120
¾ × ¾ × ½	29	29	30	3 × 3 × ¾	46	46	66	6 × 6 × 4	102	102	125
1 × 1 × ⅛	26	26	30	3 × 3 × 1	50	50	68	6 × 6 × 5	116	116	128
1 × 1 × ¼	27	27	31	3 × 3 × 1¼	55	55	70	8 × 8 × 6 * ₃	139	139	155
1 × 1 × ⅜	30	30	31	3 × 3 × 1½	58	58	72				
1 × 1 × ½	32	32	33	3 × 3 × 2	62	62	72				
1 × 1 × ¾	34	34	35	3 × 3 × 2½	72	72	75				
1¼ × 1¼ × ⅜	33	33	36	4 × 4 × ½	50	50	79				
1¼ × 1¼ × ½	34	34	38	4 × 4 × ¾	54	54	80				
1¼ × 1¼ × ¾	38	38	40	4 × 4 × 1	57	57	83				
1¼ × 1¼ × 1	40	40	42	4 × 4 × 1¼	61	61	86				
1½ × 1½ × ¼	31	31	38	4 × 4 × 1½	63	63	86				
1½ × 1½ × ⅜	34	34	40	4 × 4 × 2	69	69	87				
1½ × 1½ × ½	35	35	42	4 × 4 × 2½	78	78	90				
1½ × 1½ × ¾	38	38	43	4 × 4 × 3	83	83	91				
1½ × 1½ × 1	41	41	45	5 × 5 × ¾	55	55	96				
1½ × 1½ × 1¼	45	45	48	5 × 5 × 1	60	60	97				
2 × 2 × ⅜	37	37	46	5 × 5 × 1¼	62	62	100				
2 × 2 × ½	38	38	48	5 × 5 × 1½	66	66	100				
2 × 2 × ¾	41	41	49	5 × 5 × 2	72	72	103				
2 × 2 × 1	44	44	51	5 × 5 × 2½ * ₁	81	81	105				

*₁ : Available in British and German threads only.*₃ : Available in British threads only.

Fig. No. 11

Tees, reducing, banded (BRT)



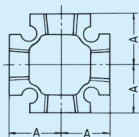
Nominal size (in.)	A (mm)	B (mm)	C (mm)	Nominal size (in.)	A (mm)	B (mm)	C (mm)	Nominal size (in.)	A (mm)	B (mm)	C (mm)
$\frac{3}{8} \times \frac{3}{8} \times \frac{1}{2}$	25	25	26	$1\frac{1}{4} \times 1 \times \frac{1}{2}$	34	32	38	$2 \times 1\frac{1}{4} \times 2$	57	54	57
$\frac{1}{2} \times \frac{3}{8} \times \frac{3}{8}$	26	23	25	$1\frac{1}{4} \times 1 \times \frac{3}{4}$	37	34	40	$2 \times 1\frac{1}{2} \times \frac{1}{2}$	38	35	48
$\frac{1}{2} \times \frac{3}{8} \times \frac{1}{2}$	27	25	27	$1\frac{1}{4} \times 1 \times 1$	40	38	42	$2 \times 1\frac{1}{2} \times \frac{3}{4}$	41	38	50
$\frac{1}{2} \times \frac{1}{2} \times \frac{3}{4}$	30	30	30	$1\frac{1}{4} \times 1 \times 1\frac{1}{4}$	46	42	46	$2 \times 1\frac{1}{2} \times 1$	45	42	52
$\frac{1}{2} \times \frac{1}{2} \times 1$	33	33	32	$1\frac{1}{4} \times 1\frac{1}{4} \times 1\frac{1}{2}$	48	48	45	$2 \times 1\frac{1}{2} \times 1\frac{1}{4}$	50	47	54
$\frac{3}{4} \times \frac{3}{8} \times \frac{3}{4}$	32	28	32	$1\frac{1}{4} \times 1\frac{1}{4} \times 2$	52	52	48	$2 \times 1\frac{1}{2} \times 1\frac{1}{2}$	52	48	55
$\frac{3}{4} \times \frac{1}{2} \times \frac{1}{2}$	30	27	30	$1\frac{1}{4} \times \frac{1}{2} \times 1\frac{1}{2}$	48	42	48	$2 \times 1\frac{1}{2} \times 2$	57	55	57
$\frac{3}{4} \times \frac{1}{2} \times \frac{3}{4}$	32	30	32	$1\frac{1}{4} \times \frac{3}{4} \times \frac{3}{4}$	38	32	43	$2 \times 2 \times 2\frac{1}{2}$	65	65	60
$\frac{3}{4} \times \frac{1}{2} \times 1$	35	33	34	$1\frac{1}{4} \times \frac{3}{4} \times 1\frac{1}{2}$	48	43	48	$2 \times 2 \times 3$	72	72	62
$\frac{3}{4} \times \frac{3}{4} \times 1$	35	35	34	$1\frac{1}{4} \times 1 \times \frac{3}{4}$	38	34	43	$2\frac{1}{2} \times 1\frac{1}{2} \times 2\frac{1}{2}$	69	62	69
$\frac{3}{4} \times \frac{3}{4} \times 1\frac{1}{4}$	40	40	38	$1\frac{1}{4} \times 1 \times 1$	41	37	45	$2\frac{1}{2} \times 2 \times 1\frac{1}{4}$	52	48	62
$1 \times \frac{1}{2} \times \frac{1}{2}$	32	27	33	$1\frac{1}{4} \times 1 \times 1\frac{1}{4}$	45	42	48	$2\frac{1}{2} \times 2 \times 1\frac{1}{2}$	55	52	62
$1 \times \frac{1}{2} \times \frac{3}{4}$	34	30	35	$1\frac{1}{4} \times 1 \times 1\frac{1}{2}$	48	45	48	$2\frac{1}{2} \times 2 \times 2$	60	57	65
$1 \times \frac{1}{2} \times 1$	38	34	38	$1\frac{1}{4} \times 1\frac{1}{4} \times \frac{1}{2}$	35	34	41	$2\frac{1}{2} \times 2 \times 2\frac{1}{2}$	69	65	69
$1 \times \frac{3}{4} \times \frac{1}{2}$	32	29	33	$1\frac{1}{4} \times 1\frac{1}{4} \times \frac{3}{4}$	38	37	43	$2\frac{1}{2} \times 2\frac{1}{2} \times 3^{*1}$	75	75	70
$1 \times \frac{3}{4} \times \frac{3}{4}$	34	32	35	$1\frac{1}{4} \times 1\frac{1}{4} \times 1$	41	40	45	$3 \times 2 \times 2$	62	57	72
$1 \times \frac{3}{4} \times 1$	38	35	38	$1\frac{1}{4} \times 1\frac{1}{4} \times 1\frac{1}{4}$	45	44	48	$3 \times 2 \times 3$	78	72	78
$1 \times 1 \times 1\frac{1}{4}$	42	42	40	$1\frac{1}{4} \times 1\frac{1}{4} \times 1\frac{1}{2}$	48	48	48	$3 \times 2\frac{1}{2} \times 72$	72	69	75
$1 \times 1 \times 1\frac{1}{2}$	45	45	42	$1\frac{1}{4} \times 1\frac{1}{4} \times 2$	55	54	52	$3 \times 3 \times 4$	92	92	85
$1 \times 1 \times 2$	51	51	44	$1\frac{1}{4} \times 1\frac{1}{2} \times 2$	54	54	52	$4 \times 3 \times 4$	97	91	97
$1\frac{1}{4} \times \frac{1}{2} \times \frac{1}{2}$	34	27	38	$2 \times \frac{1}{2} \times 2$	57	48	57				
$1\frac{1}{4} \times \frac{1}{2} \times \frac{3}{4}$	37	30	40	$2 \times \frac{3}{4} \times 2$	57	49	57				
$1\frac{1}{4} \times \frac{1}{2} \times 1$	40	33	42	$2 \times 1 \times 1\frac{1}{4}$	48	42	54				
$1\frac{1}{4} \times \frac{1}{2} \times 1\frac{1}{4}$	46	38	46	$2 \times 1 \times 1\frac{1}{2}$	52	45	55				
$1\frac{1}{4} \times \frac{3}{4} \times \frac{1}{2}$	34	29	38	$2 \times 1 \times 2$	57	52	57				
$1\frac{1}{4} \times \frac{3}{4} \times \frac{3}{4}$	37	32	40	$2 \times 1\frac{1}{4} \times 1$	45	41	52				
$1\frac{1}{4} \times \frac{3}{4} \times 1$	40	35	42	$2 \times 1\frac{1}{4} \times 1\frac{1}{4}$	48	46	54				
$1\frac{1}{4} \times \frac{3}{4} \times 1\frac{1}{4}$	46	40	46	$2 \times 1\frac{1}{4} \times 1\frac{1}{2}$	51	47	55				

*1 : Available in British and German threads only.

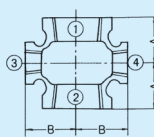
*4 : Available in American threads only.

Fig. No. 16

Crosses, equal, banded (BCr)

**Fig. No. 16**

Crosses, reducing, banded (BRCr)

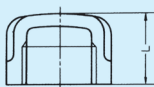


Nominal size (in.)	A (mm)
1/8	17
1/4	19
3/8	23
1/2	27
3/4	32
1	38
1 1/4	46
1 1/2	48
2	57
2 1/2	69
3	78
4	97
5	113
6	132

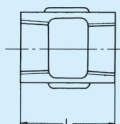
Nominal size (in.)	A (mm)	B (mm)
3/4 x 3/4 x 1/2 x 1/2	29	30
1 x 1 x 1/2 x 1/2	32	33
1 x 1 x 3/4 x 3/4	34	35
1 1/4 x 1 1/4 x 3/4 x 3/4	38	40
1 1/4 x 1 1/4 x 1 x 1	40	42
1 1/2 x 1 1/2 x 3/4 x 3/4	38	43
1 1/2 x 1 1/2 x 1 x 1	41	45
1 1/2 x 1 1/2 x 1 1/4 x 1 1/4	45	48
2 x 2 x 3/4 x 3/4	41	49
2 x 2 x 1 x 1	44	51
2 x 2 x 1 1/4 x 1 1/4	48	54
2 x 2 x 1 1/2 x 1 1/2	52	55
2 1/2 x 2 1/2 x 1 x 1 * ₁	48	60
2 1/2 x 2 1/2 x 2 x 2 * ₁	60	65
3 x 3 x 2 x 2	62	72

Fig. No. 18

Caps, banded (BCa)

**Fig. No. 19**

Sockets (Couplings), with ribs, plain (S)



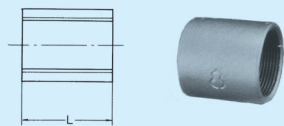
Nominal size (in.)	L (mm)
1/8	14
1/4	15
3/8	17
1/2	20
3/4	24
1	28
1 1/4	30
1 1/2	32
2	36
2 1/2	42
3	45
3 1/2	48
4	55
5	58
6	65

Nominal size (in.)	L (mm)
1/2 * ₂	35
3/4 * ₂	40
1 * ₂	45
1 1/4 * ₂	50
1 1/2 * ₂	55
2 * ₂	60

*₁ : Available in British and German threads only.
 *₂ : Available in British and American threads only.

Fig. No. 19a

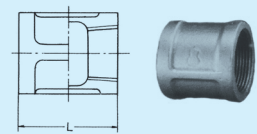
Sockets (Couplings), with full parallel threads, plain (PS)



Nominal size (in.)	L (mm)
1/2	35
3/4	40
1	45
1 1/4	50
1 1/2	55
2	60

Fig. No. 20

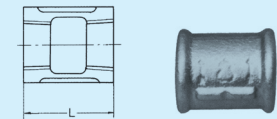
Sockets (Couplings), with ribs, banded (BS)



Nominal size (in.)	L (mm)
1/8	22
1/4	25
3/8	30
1/2	35
3/4	40
1	45
1 1/4	50
1 1/2	55
2	60
2 1/2	70
3	75
3 1/2	80
4	85
5	95
6	105
8	125

Fig. No. 20a

Sockets, with right and left hand threads, banded (EBS)

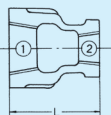


Nominal size (in.)	L (mm)
3/8 * ₁	30
1/2 * ₁	35
3/4 * ₁	40
1 * ₁	45
1 1/4 * ₁	50
1 1/2 * ₁	55
2 * ₁	60

*₁ : Available in British and German threads only.

Fig. No. 22

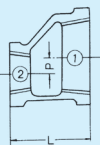
Reducing Sockets (Reducers), with ribs, banded (BRS)



Nominal size (in.)	L (mm)	Nominal size (in.)	L (mm)	Nominal size (in.)	L (mm)	Nominal size (in.)	L (mm)
$\frac{1}{4} \times \frac{1}{8}$	25	$1\frac{1}{4} \times \frac{3}{4}$	48	$2\frac{1}{2} \times 1\frac{1}{4}$	65	$4 \times 2\frac{1}{2}$	85
$\frac{3}{8} \times \frac{1}{8}$	28	$1\frac{1}{4} \times 1$	48	$2\frac{1}{2} \times 1\frac{1}{2}$	65	4×3	85
$\frac{3}{8} \times \frac{1}{4}$	28	$1\frac{1}{2} \times \frac{3}{8}$	52	$2\frac{1}{2} \times 2$	65	$5 \times 1\frac{1}{4}$	95
$\frac{1}{2} \times \frac{1}{8}$	34	$1\frac{1}{2} \times \frac{1}{2}$	52	$3 \times \frac{1}{2}$	72	$5 \times 1\frac{1}{2}$	95
$\frac{1}{2} \times \frac{1}{4}$	34	$1\frac{1}{2} \times \frac{3}{4}$	52	$3 \times \frac{3}{4}$	72	5×2	95
$\frac{1}{2} \times \frac{3}{8}$	34	$1\frac{1}{2} \times 1$	52	3×1	72	5×3	95
$\frac{3}{4} \times \frac{1}{8}$	38	$1\frac{1}{2} \times 1\frac{1}{4}$	52	$3 \times 1\frac{1}{4}$	72	5×4	95
$\frac{3}{4} \times \frac{1}{4}$	38	$2 \times \frac{3}{8}$	58	$3 \times 1\frac{1}{2}$	72	$6 \times 1\frac{1}{2}$	105
$\frac{3}{4} \times \frac{3}{8}$	38	$2 \times \frac{1}{2}$	58	3×2	72	6×2	105
$\frac{3}{4} \times \frac{1}{2}$	38	$2 \times \frac{3}{4}$	58	$3 \times 2\frac{1}{2}$	72	$6 \times 2\frac{1}{2}^{*1}$	105
$1 \times \frac{1}{4}$	42	2×1	58	$4 \times \frac{1}{2}$	85	6×3	105
$1 \times \frac{3}{8}$	42	$2 \times 1\frac{1}{4}$	58	$4 \times \frac{3}{4}$	85	6×4	105
$1 \times \frac{1}{2}$	42	$2 \times 1\frac{1}{2}$	58	4×1	85	6×5	105
$1 \times \frac{3}{4}$	42	$2\frac{1}{2} \times \frac{1}{2}^{*1}$	65	$4 \times 1\frac{1}{4}$	85		
$1\frac{1}{4} \times \frac{3}{8}$	48	$2\frac{1}{2} \times \frac{3}{4}$	65	$4 \times 1\frac{1}{2}$	85		
$1\frac{1}{4} \times \frac{1}{2}$	48	$2\frac{1}{2} \times 1$	65	4×2	85		

Fig. No. 22a

Reducing Sockets (Reducers),eccentric, banded (BExRS)



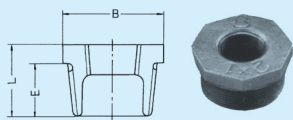
Nominal size (in.)	L (mm)	P (mm)	Nominal size (in.)	L (mm)	P (mm)
$\frac{3}{4} \times \frac{1}{2}$	38	3	$2 \times 1\frac{1}{2}$	58	6
$1 \times \frac{1}{2}$	42	6	$2\frac{1}{2} \times 1^{*1}$	65	20
$1 \times \frac{3}{4}$	42	3	$2\frac{1}{2} \times 1\frac{1}{4}^{*1}$	65	16
$1\frac{1}{4} \times \frac{1}{2}$	48	10.5	$2\frac{1}{2} \times 1\frac{1}{2}^{*1}$	65	14
$1\frac{1}{4} \times \frac{3}{4}$	48	8	$2\frac{1}{2} \times 2^{*1}$	65	8
$1\frac{1}{4} \times 1$	48	4	$3 \times 1\frac{1}{2}$	72	19.5
$1\frac{1}{2} \times \frac{1}{2}$	52	13	3×2	72	14
$1\frac{1}{2} \times \frac{3}{4}$	52	10	$3 \times 2\frac{1}{2}^{*1}$	72	6.5
$1\frac{1}{2} \times 1$	52	7	4×2	85	26.5
$1\frac{1}{2} \times 1\frac{1}{4}$	52	3	$4 \times 2\frac{1}{2}^{*1}$	85	19
$2 \times \frac{1}{2}$	58	18.5	4×3	85	12.5
$2 \times \frac{3}{4}$	58	16	$5 \times 4^{*3}$	95	13
2×1	58	13			
$2 \times 1\frac{1}{4}$	58	9			

*1 : Available in British and German threads only.

*3 : Available in British threads only.

Fig. No. 26

Bushings (Bushes) (Bu)

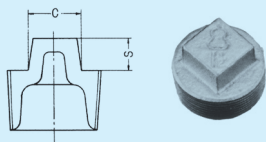


Nominal size (in.)	Width across flats B (mm)		L (mm)	E (mm)	Nominal size (in.)	Width across flats B (mm)		L (mm)	E (mm)
	Hex.	Oct.				Hex.	Oct.		
1/4 x 1/8	17		17	12	2 1/2 x 1		80	39	28
3/8 x 1/8	21		18	13	2 1/2 x 1 1/4		80	39	28
3/8 x 1/4	21		18	13	2 1/2 x 1 1/2		80	39	28
1/2 x 1/8	26		21	16	2 1/2 x 2		80	39	28
1/2 x 1/4	26		21	16	3 x 1/2		95	44	32
1/2 x 3/8	26		21	16	3 x 3/4		95	44	32
3/4 x 1/8	32		24	18	3 x 1		95	44	32
3/4 x 1/4	32		24	18	3 x 1 1/4		95	44	32
3/4 x 3/8	32		24	18	3 x 1 1/2		95	44	32
3/4 x 1/2	32		24	18	3 x 2		95	44	32
1 x 1/8	38		27	20	3 x 2 1/2		95	44	32
1 x 1/4	38		27	20	3 1/2 x 3		105	47	34
1 x 3/8	38		27	20	4 x 1/2		120	51	37
1 x 1/2	38		27	20	4 x 3/4		120	51	37
1 x 3/4	38		27	20	4 x 1		120	51	37
1 1/4 x 1/8	46		30	22	4 x 1 1/4		120	51	37
1 1/4 x 1/4	46		30	22	4 x 1 1/2		120	51	37
1 1/4 x 3/8	46		30	22	4 x 2		120	51	37
1 1/4 x 1/2	46		30	22	4 x 2 1/2		120	51	37
1 1/4 x 3/4	46		30	22	4 x 3		120	51	37
1 1/4 x 1	46		30	22	4 x 3 1/2		120	51	37
1 1/2 x 1/8	54		32	23	5 x 1		145	57	42
1 1/2 x 1/4	54		32	23	5 x 1 1/4		145	57	42
1 1/2 x 3/8	54		32	23	5 x 1 1/2		145	57	42
1 1/2 x 1/2	54		32	23	5 x 2		145	57	42
1 1/2 x 3/4	54		32	23	5 x 3		145	57	42
1 1/2 x 1	54		32	23	5 x 4		145	57	42
1 1/2 x 1 1/4	54		32	23	6 x 1		170	64	46
2 x 1/8		63	36	25	6 x 1 1/4		170	64	46
2 x 1/4		63	36	25	6 x 1 1/2		170	64	46
2 x 3/8		63	36	25	6 x 2		170	64	46
2 x 1/2		63	36	25	6 x 2 1/2 *1		170	64	46
2 x 3/4		63	36	25	6 x 3		170	64	46
2 x 1		63	36	25	6 x 4		170	64	46
2 x 1 1/4		63	36	25	6 x 5		170	64	46
2 x 1 1/2		63	36	25	8 x 6		220	80	57
2 1/2 x 1/2 *1		80	39	28					
2 1/2 x 3/4		80	39	28					

*1 : Available in British and German threads only.

Fig. No. 28

Plugs (P)

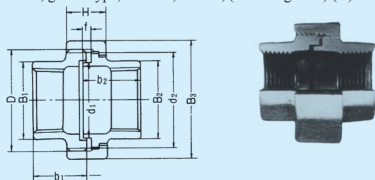


Nominal size (in.)	Width across flats C (mm)	Height S (mm)
1/8	7	7
1/4	9	8
3/8	12	9
1/2	14	10
3/4	17	11
1	19	12
1 1/4	23	13
1 1/2	26	14
2	32	15
2 1/2	41	18
3	46	19
3 1/2	54	21
4	58	22
5	67	25
6	77	28

Plugs under nominal size 3/8 may be made of mild steel.

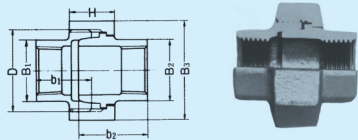
Fig. No. 31

Unions, gasket type, flat seat, female, (without gasket) (U)



Nominal size (in.)	Union bush			Union end						Union nut		
	D	b ₁	Width across flats B ₁	d ₁	d ₂	b ₂	f	Width across flats B ₂	H	Width across flats B ₃		
	(mm)	(mm)	Oct. Dec.	(mm)	(mm)	(mm)	(mm)	Oct. Dec.	(mm)	Oct.	Dec.	
1/8	M21	15	15	12.5	18.7	16.5	3	15	13	25		
1/4	M26	17	19	16.5	23.5	18	3	19	13.5	31		
3/8	M31	19	23	20	28	20.5	3.5	23	16	37		
1/2	M35	21	27	24	32	21.5	3.5	27	17	42		
3/4	M42	24.5	33	30	39	26	4	33	18.5	49		
1	M51	27	41	33	47.5	29	4	41	20	59		
1 1/4	M60	30		46	56.5	32	4		50	22		69
1 1/2	M68	33	50	53	64.5	35.5	4.5		56	24.5		78
2	M82	37	69	65	78.5	39.5	5		69	27		93
2 1/2	M100	42	86	81	96.5	45.5	6.5		86	29.5		112
3	M115	47	99	95	111.5	50	7		99	32.5		127
3 1/2	M130	52	113	108	126.5	55	8		113	35.5		143
4	M145	58	127	121	141.5	60.5	8.5		127	39		158
5	M175	66	154	150	171.5	66.5	8.5		154	43		188
6	M205	73	182	177	201.5	73	10		182	49		219

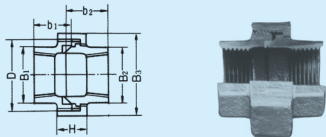
Fig. No. 31a
Unions, taper seat, iron to iron, female (US)



Nominal size (in.)	Union bush					Union end				Union nut			
	D (mm)	b ₁ (mm)	Width across flats B ₁ (mm)			b ₂ (mm)	Width across flats B ₂ (mm)			H (mm)	Width across flats B ₃ (mm)		
			Hex.	Oct.	Dec.		Hex.	Oct.	Dec.		Hex.	Oct.	Dec.
⅛	M21	15		15		16.5		15		13		25	
¼	M26	21	19			23.5	19			16	31		
⅜	M31	22	23			25.5	23			17	37		
½	M35	25	26			28	26			19	42		
¾	M42	26.5	32			30.5	32			20	49		
1	M51	30	39			34.5	39			23.5	59		
1¼	M60	33	48			38.5	48			24.5	69		
1½	M68	36	55			42	55			28	78		
2	M82	39	68			47	68			29	93		
2½ * ₁	M100	44	84			51.5	84			33	112		
3	M115	49	98			58	98			36	127		
4	M145	58			127	60.5			127	39			158
5	M175	66			154	66.5			154	43			188
6	M205	73			182	73			182	49			219

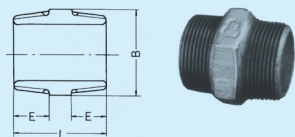
*₁ : Available in British and German threads only.

Fig. No. 31b
Unions, conical joint, brass to iron seat, female (US)



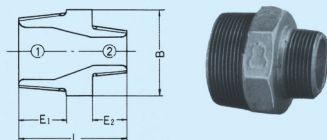
Nominal size (in.)	Union bush					Union end				Union nut		
	D (mm)	b ₁ (mm)	Width across flats B ₁ (mm)		b ₂ (mm)	Width across flats B ₂ (mm)		H (mm)		Width across flats B ₃ (mm)		
			Oct.	Dec.		Oct.	Dec.			Oct.	Dec.	
⅛	M21	15	15		16.5	15		13		25		
¼	M26	17	19		18	19		13.5		31		
⅜	M31	19	23		20.5	23		16		37		
½	M35	21	27		21.5	27		17		42		
¾	M42	24.5	33		26	33		18.5		49		
1	M51	27	41		29	41		20		59		
1¼	M60	30		50	32		50	22			69	
1½	M68	33		56	35.5		56	24.5			78	
2	M82	37		69	39.5		69	27			93	
2½	M100	42		86	45.5		86	29.5			112	
3	M115	47		99	50		99	32.5			127	
4	M145	58		127	60.5		127	39			158	
5	M175	66		154	66.5		154	43			188	
6	M205	73		182	73		182	49			219	

Fig. No. 32
Nipples, equal (Ni)



Nominal size (in.)	Width across flats B (mm)		L (mm)	E (mm)
	Hex.	Oct.		
1/8	14		32	11
1/4	17		34	12
3/8	21		36	13
1/2	26		42	16
3/4	32		47	18
1	38		52	20
1 1/4	46		56	22
1 1/2	54		60	23
2		63	66	25
2 1/2 *1		80	73	28
3		95	81	32
3 1/2		105	85	34
4		120	92	37
5 *1		145	104	42
6 *1		170	116	46

Fig. No. 32a
Nipples, reducing (RNi)

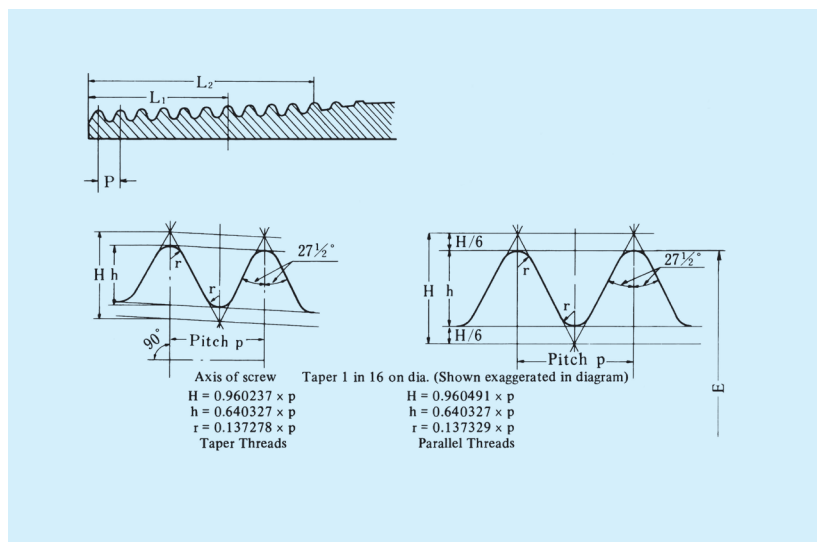


Nominal size (in.)	Width across flats B (mm)		L (mm)	E ₁ (mm)	E ₂ (mm)	Nominal size (in.)	Width across flats B (mm)		L (mm)	E ₁ (mm)	E ₂ (mm)
	Hex.	Oct.					Hex.	Oct.			
3/8 x 1/4	21		35	13	12	1 1/2 x 1 1/4	54		59	23	22
1/2 x 1/4	26		38	16	12	2 x 3/4		63	59	25	18
1/2 x 3/8	26		39	16	13	2 x 1		63	61	25	20
3/4 x 3/8	32		42	18	13	2 x 1 1/4		63	63	25	22
3/4 x 1/2	32		45	18	16	2 x 1 1/2		63	64	25	23
1 x 1/2	38		48	20	16	2 1/2 x 1 1/2 *1		80	68	28	23
1 x 3/4	38		50	20	18	2 1/2 x 2		80	70	28	25
1 1/4 x 3/4	46		52	22	18	3 x 2		95	74	32	25
1 1/4 x 1	46		54	22	20	3 x 2 1/2 *1		95	77	32	28
1 1/2 x 1/2	54		53	23	16	4 x 2		120	80	37	25
1 1/2 x 3/4	54		55	23	18	4 x 2 1/2 *1		120	83	37	28
1 1/2 x 1	54		57	23	20	4 x 3		120	87	37	32

*1 : Available in British and German threads only.

Appendix. F. Basic Dimensions for British Standard Pipe Threads

This information is selected from the British Standard Specification Pipe Threads B.S. No. 21: 1973 Table 1.

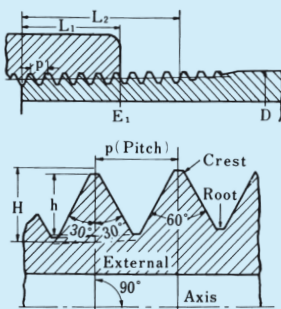


(Unit: inch)

Nominal	E Diameter at Gauge Plane (Gauge Diameter)	L_1 Distance of Gauge Diameter from End (Gauge Length)	L_2 Length of Effective Thread	P Pitch	h Depth of Thread	Number of Threads per Inch
$\frac{1}{8}$	0.383	0.1563	0.2545	0.03571	0.0229	28
$\frac{1}{4}$	0.518	0.2367	0.3814	0.05263	0.0337	19
$\frac{3}{8}$	0.656	0.2500	0.3947	0.05263	0.0337	19
$\frac{1}{2}$	0.825	0.3214	0.5178	0.07143	0.0457	14
$\frac{3}{4}$	1.041	0.3750	0.5714	0.07143	0.0457	14
1	1.309	0.4091	0.6591	0.09091	0.0582	11
$1\frac{1}{4}$	1.650	0.5000	0.7500	0.09091	0.0582	11
$1\frac{1}{2}$	1.882	0.5000	0.7500	0.09091	0.0582	11
2	2.347	0.6250	0.9204	0.09091	0.0582	11
$2\frac{1}{2}$	2.960	0.6875	1.0511	0.09091	0.0582	11
3	3.460	0.8125	1.1761	0.09091	0.0582	11
4	4.450	1.0000	1.4091	0.09091	0.0582	11
5	5.450	1.1250	1.5795	0.09091	0.0582	11
6	6.450	1.1250	1.5795	0.09091	0.0582	11

Appendix. G. Basic Dimensions for American Standard Pipe Threads

This information is selected from the American Standard for Pipe Threads, ANSI B1.20.1-1983 Table 2.



The taper of the thread is 1 in 16 or 0.75 in. per ft measured on the diameter and along the axis.
The crest and root of pipe threads are truncated a minimum of 0.033 p.

Taper Threads

$$H = 0.8660 \times p$$

$$h = 0.800 \times p$$

(Unit: inch)

Nominal Pipe Size	D Outside Diameter of Pipe	E ₁ Pitch Diameter at End of Internal Thread	L ₁ Normal Engagement by Hand between External and Internal Thread	L ₂ Length of Effective Thread	P Pitch of Thread	h Depth of Thread	Number of Threads per Inch
1/8	0.405	0.37360	0.1615	0.2639	0.03704	0.02963	27
1/4	0.540	0.49163	0.2278	0.4018	0.05556	0.04444	18
3/8	0.675	0.62701	0.240	0.4078	0.05556	0.04444	18
1/2	0.840	0.77843	0.320	0.5337	0.07143	0.05714	14
3/4	1.050	0.98887	0.339	0.5457	0.07143	0.05714	14
1	1.315	1.23863	0.400	0.6828	0.08696	0.06957	11.5
1 1/4	1.660	1.58338	0.420	0.7068	0.08696	0.06957	11.5
1 1/2	1.900	1.82234	0.420	0.7235	0.08696	0.06957	11.5
2	2.375	2.29627	0.436	0.7565	0.08696	0.06957	11.5
2 1/2	2.875	2.76216	0.682	1.1375	0.12500	0.10000	8
3	3.500	3.38850	0.766	1.2000	0.12500	0.10000	8
3 1/2	4.000	3.88881	0.821	1.2500	0.12500	0.10000	8
4	4.500	4.38712	0.844	1.3000	0.12500	0.10000	8
5	5.563	5.44929	0.937	1.4063	0.12500	0.10000	8
6	6.625	6.50597	0.958	1.5125	0.12500	0.10000	8
7	8.625	8.50003	1.063	1.7125	0.12500	0.10000	8
10	10.750	10.62094	1.210	1.9250	0.12500	0.10000	8
12	12.750	12.61781	1.360	2.1250	0.12500	0.10000	8

Straight Threads: The pitch, angle and depth of thread are the same as the corresponding dimensions of the taper pipe thread. The basic pitch diameter for both the external and internal straight thread is equal to the pitch diameter of taper pipe thread at the gauging notch (dimension E₁).

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