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**Specification for
Steel pipe fittings,
screwed and socket-welding
for the petroleum industry**

British Standards Institution

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The Petroleum Equipment Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government department and scientific and industrial organizations:

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British Mechanical Engineering Confederation	Department of Trade and Industry, Oil
British Rubber Manufacturers' Association Ltd	*Oil Companies Materials Association
*British Steel Industry	

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British Steel Corporation	Engineering Equipment Users' Association
British Valve Manufacturers' Association	National Association of Drop Forgers and Stampers

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Foreword

This British Standard has been prepared under the authority of the Petroleum Equipment Industry Standards Committee.

It is the metric version of BS 3799 which has also been revised so as to include welding bosses and round and swaged nipples, for which there is a general requirement. Flush bushings, bull plugs and all 2000 lb fittings have been deleted as there is now negligible usage of these types. Non-preferred sizes of all items, and hexagonal nipples over 2 in. nominal size have also been omitted.

A wider range of materials has been introduced and the material references have been revised in line with the current materials standards.

The bore diameter of sockets has also been modified to enable pipe with dimensions in accordance with ISO/R 64 (BS 3600) to be used in addition to pipe with the dimensions given in BS 1600 (API).

Certain measurements, notably nominal sizes, have not been converted into metric units since the use of imperial units in such cases follows established international practice in the petroleum industry; for this reason and also to retain identification, the designations 3000 lb and 6000 lb have been maintained.

In order to ensure interchangeability requirements, ANSI B16.11, ASTM 234 and ASTM A403 have been taken into account in the preparation of this document.

Acknowledgment is made to the American National Standards Institute (ANSI), the American Society for Testing Materials (ASTM), and the American Petroleum Institute (API) for data used in this standard.

British Standard Specification for

Steel pipe fittings, screwed and socket-welding for the petroleum industry

1. General

1.1 Scope

This British Standard specifies requirements for forged carbon and alloy steel screwed and socket-welding fittings for use in the petroleum and petrochemical industry.

Screwed fittings specified in this standard are intended for assembly with pipe threaded in accordance with API Std. 5B or ANSI B2.1. (N.P.T.)

Socket-welding fittings specified in this standard are primarily intended for assembly with plain end pipe dimensioned in accordance with BS 1600 and API Std. 5L. It should be noted, however, that with the exception of nominal size $2\frac{1}{2}$ in (65 mm) the socket dimensions are also suitable for use with plain end pipe dimensions in accordance with BS 3600 (ISO/R 64). See Notes to Purchaser (Appendix A) and Tables 13 and 16.

This standard provides for the following:

(1) Screwed fittings:

- Elbows, 90° and 45°
- Crosses
- Tees
- Couplings and half-couplings
- Caps
- Square, hexagonal and round head plugs
- Hexagonal head bushings
- Hexagonal and round nipples
- Unions
- Welding bosses
- Swage nipples*

(2) Socket-welding fittings:

- Elbows, 90° and 45°
- Crosses
- Tees
- Couplings and half-couplings
- Caps
- Unions
- Welding bosses
- Swage nipples*

NOTE. The Standards referred to in this standard are listed on the inside back cover.

1.2 Sizes and size identification

The size of a fitting is identified by the nominal size of the pipe with which it is to be used.

For reducing fittings, the openings are given in the alphabetical sequence shown in Fig. 1, the run openings being stated first, followed by the outlet opening(s). In each case, the larger opening is specified first.

* These fittings may be ordered in any combination of end preparation (see Table 12 with footnote).

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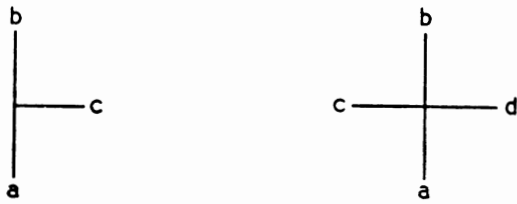


Fig. 1. Designation of outlets

Fittings of the following nominal sizes are included:

- (1) Screwed: $\frac{1}{8}$ in (6 mm) up to and including 4 in (100 mm).
- (2) Socket-welding: $\frac{1}{8}$ in (6 mm) up to and including 3 in (80 mm).

1.3 Designation

Fittings to this standard shall be designated as 3000 lb and 6000 lb. These designations represent the maximum cold non-shock working pressures of the fittings in pounds force per square inch. For convenient reference, schedule numbers of pipe normally used with these fittings are as follows:

Designation	Screwed fittings	Socket-welding fittings
3000 lb	Schedule 80	Schedule 80
6000 lb	Double extra strong	Schedule 160

Bore dimensions given in the relative tables for 3000 lb socket-welding fittings correspond to Schedule 40 pipe.

1.4 Pressure/temperature ratings

Pressure/temperature ratings are listed in Table 1.

Solid plugs and bushings do not carry specific ratings and are intended for use with screwed fittings of any of the designations shown in 1.3.

1.5 Manufacture

Fittings may be produced by any of the following recognized processes:

- (1) Forging: elbows, crosses, tees.
- (2) Forging or machining from bar stock: caps, bushings, hexagonal nipples, pipe plugs, unions.
- (3) Forging, or machining from bar stock or seamless pipe: couplings, half-couplings, welding bosses, round and swage nipples.

This standard does not cover fittings which have been fabricated by welding.

1.6 Certification

By agreement between the purchaser and the manufacturer, the basis of acceptance by the purchaser of the fittings covered by his order may be a certificate stating that such fittings comply with the requirements of this standard, and that the material from which they are made has the chemical and physical characteristics specified in the appropriate standards listed in Table 3.

2. Design

2.1 Screwed fittings

Screwed fittings shall be designed to withstand the stresses resulting from assembly.

For this purpose, elbows, tees and crosses shall be designed with wide reinforcing bands of heavy section connecting at the crotch of the fitting, resulting in additional wall thickness over the full length of the tapped ends. Screwed couplings, caps and similar fittings may have this additional wall thickness provided over their full length.

2.2 Screwed and socket-welding unions

These unions shall have integral steel-to-steel seats of the ball-to-cone seat type providing a concentric line contact. Cone-to-cone seat type may be supplied subject to agreement by the purchaser.

CAUTION. Unions should only be used as complete assemblies because component parts of unions made by different manufacturers, or component parts of different types of unions made by the same manufacturer, are not necessarily interchangeable.

2.3 Threading

Screwed fittings shall be taper threaded in accordance with API Std. 5B or ANSI B2.1. (N.P.T.)

Female and male entering threads shall be chamfered in accordance with the requirements of the relevant standard.

All fittings shall be threaded concentrically except that the actual and theoretical axes of the threads may diverge by not more than 1 in 200.

2.4 Dimensions of screwed fittings

The dimensions of screwed fittings shall be in accordance with Tables 4 to 12; except where minimum dimensions are given, these dimensions are nominal and are subject to normal manufacturing tolerances.

Except for hexagon nipples, all reducing fittings shall have the same centre-to-end and end-to-end dimensions and band diameters as an equal fitting corresponding in size to the largest opening in the reducing fitting.

2.5 Dimensions of socket-welding fittings

The dimensions of socket-welding fittings shall be in accordance with Tables 13 to 16.

One of the principles of this standard is the maintenance of a fixed position for the bottom of the socket with reference to the centre line of the fitting.

Reducing fittings shall have the same centre-to-bottom of socket dimensions as an equal fitting corresponding in size to the largest opening in the reducing fitting.

2.6 Tolerances for socket-welding fittings

The dimensions of fittings specified in Tables 13 to 16 shall be subject to the tolerances given in Table 2.

2.7 Workmanship and finish

Fittings complying with this standard shall be free from harmful defects and shall have a workmanlike finish.

Socket-welding fittings shall be faced at the ends at right angles to the axes.

The seats of unions shall be effectively protected against rust, during transit and storage.

3. Materials

Fittings to this standard shall be made of materials complying with one of the standards listed in Table 3, unless the use of other materials is agreed between purchaser and manufacturer.

4. Marking

4.1 Method of marking

The method of marking used shall not be harmful to the fittings.

Hard stamping is permissible only by roller stamping. Stamping shall be done lightly and carefully so as to minimize the notch effect and not so deep as to cause cracks or reduce the wall thickness of fittings below the minimum allowed. Stamping shall be applied prior to any final heat treatment when appropriate.

4.2 Required markings

Solid plugs, bushings and hexagonal nipples shall be clearly and indelibly marked with the following:

- (1) Manufacturer's name or trademark.
- (2) Material identification symbol (not required for carbon steel WPB).

All other fittings shall be clearly and indelibly marked with the following:

- (1) Manufacturer's name or trademark.
- (2) Material identification symbol (not required for carbon steel WPB).
- (3) Designated pressure rating.
- (4) Nominal size in inches (this may be omitted from reducing fittings). Example of markings:

- a. A.B.Co.
- b. WP1
- c. 3000 lb
- d. 2

4.3 Permissible omission of markings

Where the size of fittings does not permit full markings, these may be omitted in the following sequence:

- (1) Nominal size
- (2) Designated pressure rating
- (3) Manufacturer's name or trademark.

5. Inspection and test

5.1 Impact testing

Fittings ordered for use in low temperature services shall be subject to the requirements specified in the relevant material specification and in accordance with the requirements of BS 131: Part 2 and if so specified by the purchaser.

5.2 Hydrostatic testing

Hydrostatic testing of fittings other than unions is not required by this standard, but all fittings shall be capable of withstanding a hydrostatic test pressure of 1.5 times their designated pressure rating (see 1.4). This test shall be applied only when specified in the purchaser's order.

All unions shall be subjected to a seat test by the application of an internal air pressure of 20 bar* whilst the fitting is completely immersed in water or light oil.

5.3 Inspection

The purchaser or his representative shall, for the purpose of inspection, have free access at all reasonable times to those parts of the manufacturer's works engaged on the purchaser's order. He shall be afforded all reasonable facilities for satisfying himself that the fittings are being manufactured in accordance with this standard.

5.4 Test facilities

The manufacturer shall supply the material required for testing, supply and prepare the necessary test pieces, and supply the labour and appliances for such testing as may be carried out on his premises in accordance with this standard. In the absence of facilities at his own works for making the prescribed tests, the manufacturer shall arrange for the tests to be carried out elsewhere.

* 1 bar = 10^5 N/m² = 10^5 Pa.

Table 1. Pressure/temperature ratings

Bar/°C

Material	WPA WPB		WPLO +		WP1		WP11		WP22		WP5		WPL3 +		WP304		WP304 H		WP304 L	
Temp. °C	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb
–100/–50													207	414	177	354			147	295
–50/–30			207	414									207	414	177	354			147	295
–30/+40	207	414	207	414	207	414	207	414	207	414	207	414	207	414	177	354	177	354	147	295
50	206	411	207	414	207	414	207	414	207	414	207	414	206	411	172	345	172	345	147	294
75	203	406	203	406	203	406	203	406	203	406	203	406	203	406	165	330	165	330	146	292
100	200	401	200	401	200	401	200	401	200	401	200	401	200	401	155	311	155	311	142	285
125	198	396	198	396	198	396	198	396	198	396	198	396	198	396	148	297	148	297	133	266
150	196	392	196	392	196	392	196	392	196	392	196	392	196	392	142	284	142	284	123	247
175	194	388	194	388	194	388	194	388	194	388	194	388	194	388	136	272	136	272	114	229
200	192	384	192	384	192	384	192	384	192	384	192	384	192	384	130	260	130	260	105	211
225	188	377	188	377	188	377	188	377	188	377	188	377	188	377	125	250	125	250	99.5	199
250	183	366	183	366	183	366	183	366	183	366	183	366	183	366	120	240	120	240	94	188
275	174	349	174	349	174	349	174	349	174	349	174	349	174	349	116	231	115	231	90	180
300	165	331	165	331	165	331	165	331	165	331	165	331	165	331	112	224	112	224	87.5	175
325	155	311	155	311	155	311	155	311	155	311	155	311	155	311	108	217	108	217	85	170
350	145	290	145	290	146	292	146	292	146	292	146	292	145	290	105	210	105	210	82.5	165
375	134	268	134	268	137	274	137	275	137	275	137	275			101	203	101	203	80.5	161
400	122	244	122	244	127	254	128	257	128	257	128	257			98	196	98	196	78.5	157
425	106	212	106	212	118	236	120	241	120	241	120	241			95	190	95	190	76.5	153
450	89	178	89	178	109	218	111	223	111	223	111	223			92	184	92	184		
475	70	140	70	140	99.5	199	103	206	103	206	103	206			89.5	179	89.5	179		
500	51.5	103	51.5	103	90	180	94.5	189	94.5	189	94.5	189			88	176	88	176		
525	33.6	67.2	33.6	67.2	79	158	86	172	86	172	86	172			87	174	87	174		
550							67	134	68.5	137	63	126			85.5	171	85.5	171		
575							49.2	98.4	51.5	103	44.8	89.6			80.5	161	80.5	161		
600							35.8	71.7	38.8	77.6	30	60			69.5	139	69.5	139		
625							22.8	45.6	28	56	20.8	41.7			55	110	55	110		
650							11.4	22.8	19.4	38.8	14.4	28.8			43.8	87.7	43.8	87.7		
675															32.9	65.8	32.9	65.8		
700															25.2	50.5	25.2	50.5		
725															19.3	38.7	19.3	38.7		
750															15.1	30.2	15.1	30.2		
775															11.7	23.5	11.7	23.5		
800															8.7	17.5	8.7	17.5		

Table 1. Pressure/temperature ratings

Bar/°C

WP321 H		WP347		WP347 H		WP316		WP316 H		WP316 L		WP317		WP309		WP310		Material
3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	Temp. °C
		207	414			207	414			147	295	207	414	207	414	207	414	–100/–50
		207	414			207	414			147	295	207	414	207	414	207	414	–50/–30
207	414	207	414	207	414	207	414	207	414	147	295	207	414	207	414	207	414	–30/+40
206	411	206	411	206	411	206	411	206	411	147	295	206	411	206	411	206	411	50
203	406	203	406	203	406	203	406	203	406	147	295	203	406	203	406	203	406	75
200	401	200	401	200	401	200	401	200	401	147	294	200	401	200	401	200	401	100
198	396	198	396	198	396	198	396	198	396	142	284	198	396	198	396	198	396	125
196	392	196	392	196	392	196	392	196	392	137	274	196	392	196	392	196	392	150
194	388	194	388	194	388	194	388	194	388	126	252	194	388	194	388	194	388	175
192	384	192	384	192	384	192	384	192	384	115	230	192	384	192	384	192	384	200
188	377	188	377	188	377	188	377	188	377	110	220	188	377	188	377	188	377	225
183	366	183	366	183	366	183	366	183	366	106	212	183	366	183	366	183	366	250
174	349	174	349	174	349	174	349	174	349	102	204	174	349	174	349	174	349	275
165	331	165	331	165	331	165	331	165	331	98.5	197	165	331	165	331	165	331	300
155	311	155	311	155	311	155	311	155	311	95	190	155	311	155	311	155	311	325
147	294	147	294	147	294	147	294	147	294	92	184	147	294	146	293	146	293	350
141	282	141	282	141	282	141	282	141	282	89	178	141	282	140	280	140	280	375
135	270	135	270	135	270	135	270	135	270	86	172	135	270	133	267	133	267	400
129	258	129	258	129	258	129	258	129	258	83.5	167	129	258	127	254	127	254	425
123	246	123	246	123	246	123	246	123	246	81	162	123	246	120	240	120	240	450
117	234	117	234	117	234	117	234	117	234			117	234	113	227	113	227	475
111	223	111	223	111	223	111	223	111	223			111	223	107	214	107	214	500
105	211	105	211	105	211	105	211	105	211			105	211	98	196	100	201	525
99.5	199	99.5	199	99.5	199	99.5	199	99.5	199			99.5	199	85.5	171	93.5	187	550
94	188	94	188	94	188	94	188	94	188			94	188	73	146	87.5	175	575
88	176	88	176	88	176	89	178	89	178			89	178	60	120	80.5	161	600
71	142	71	142	71	142	79	158	79	158			79	158	47.5	95	69.5	139	625
48.7	97.4	48.7	97.4	48.7	97.4	66.5	133	66.5	133			66.5	133	37	74	58.5	117	650
33.8	67.6	33.8	67.6	33.8	67.6	53	106	53	106			53	106	28.9	57.8	47.6	95.2	675
23.3	46.6	23.3	46.6	23.3	46.6	41.3	82.7	41.3	82.7			41.3	82.7	23.7	47.5	36.3	72.6	700
16.6	33.2	16.6	33.2	16.6	33.2	29.8	59.6	29.8	59.6			29.8	59.6	18.9	37.9	26	52	725
12.8	25.7	12.8	25.7	12.8	25.7	22	44.1	22	44.1			22	44.1	14.5	29	18.3	36.7	750
10.2	20.5	10.2	20.5	10.2	20.5	17	34	17	34			17	34	11.2	22.4	13.1	26.2	775
8.2	16.4	8.2	16.4	8.2	16.4	12.5	25.1	12.5	25.1			12.5	25.1	9.3	18.6	9.3	18.6	800

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Table 2. Tolerances for socket-welding fittings

Dimension	Nominal size in	Tolerance mm
Centre to bottom of socket elbows, crosses and tees (dimensions <i>A</i> and <i>E</i> , Table 13)	$\frac{1}{8}$ and $\frac{1}{4}$	± 0.8
Bottom of socket to opposite end in half-couplings and welding bosses (dimensions <i>F</i> , Tables 14 and 16)	$\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$	± 1.5
	1, $1\frac{1}{4}$, $1\frac{1}{2}$ and 2	± 2.0
	$2\frac{1}{2}$ and 3	± 2.5
Bottom to bottom of sockets in couplings (dimension <i>E</i> , Table 14)	$\frac{1}{8}$ and $\frac{1}{4}$	± 1.5
	$\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$	± 3.0
	1, $1\frac{1}{4}$, $1\frac{1}{2}$ and 2	± 4.0
	$2\frac{1}{2}$ and 3	± 5.0
Bore diameter of sockets (dimension <i>B</i> , Tables 13, 14, 15 and 16)	2 and smaller	+0.3 -0.0
	$2\frac{1}{2}$ and 3	+0.4 -0.0
Bore diameter of fittings (dimension <i>d</i> , Tables 13, 14, 15 and 16)	2 and smaller	± 0.4
	$2\frac{1}{2}$ and 3	± 0.8
Concentricity of bore	all sizes	± 0.8
Alignment of axes	all sizes	1 in 200

Notes to Table 3

NOTE 1. Reference to BS 3602 to BS 3605 materials is given for manufacturing purposes only. For conditions of assembly of socket-welding fittings, reference should be made to 1.1 of this standard.

NOTE 2. Material shall be silicon killed.

NOTE 3. Except that minimum yield stress shall not be less than 242 N/mm², carbon content shall not exceed 0.25% and Bessemer steel is not permitted. To be made from killed steel and if required for high temperature shall be silicon killed.

NOTE 4. These grades are subject to impact testing at sub-zero temperature (see 5.1).

NOTE 5. In order to meet the impact test requirements specified in 5.1 of this standard, the chemical composition may be suitably modified.

NOTE 6. Except that the carbon content shall not exceed 0.15% and the specified mechanical properties shall be:

Tensile strength (min.)	414 N/mm ²
Yield stress (min.)	207 N/mm ²
Elongation (min. on $5.65 \sqrt{S_0}$)	24% longitudinal 20% transverse

where S_0 is the original cross sectional area.

NOTE 7. If specified elevated temperature properties are required this shall be so stated in the order and suffix (B) added to identification symbol.

NOTE 8. All BS 970 and ASTM bar to be supplied in softened condition.

Table 3. Materials and material identification symbols

For Notes to Table 3 see page 9.

Steel	Identification symbol	Steel standards					
		Seamless pipes		Bars ^(a)		Forgings	
		British Standard ⁽¹⁾	Comparable* ASTM	British Standard	Comparable* ASTM	British Standard	Comparable* ASTM
<i>Carbon and carbon alloy</i>							
Carbon	WPA WPB	— 3602 HFS27 CDS27	— A106 Gr B	1502-161 Gr 28 —	A576 and A400 ^(a)	1503-161 Gr 32	A181 Gr II ⁽²⁾
Carbon-molybdenum	WP1	—	A335 Gr P1	—	—	—	A182 Gr F1
1½ % Chromium-½ % molybdenum	WP11	3604 HF621 CD621	A335 Gr P11	—	—	1503-621	A182 Gr F11
5 % Chromium-½ % molybdenum	WP5	3604 HF625 CD625	A335 Gr P5	—	—	1503-625 ⁽⁶⁾	A182 Gr F5
2½ % Chromium-1 % molybdenum	WP22	3604 HF622 Gr 27 CD622 Gr 27	A335 Gr P22	—	—	1503-622	A182 Gr F22
<i>Carbon and carbon alloy for low temperature service</i>							
Carbon	WPL0 ⁽⁴⁾	3603 HFS27 LT50 CDS27 LT50	A333 Gr 6 ⁽⁶⁾ A334 Gr 6	1502-224 Gr 28 LT50	—	1503-224 Gr 28 LT50	A350 Gr LF1 ⁽⁶⁾
3½ % Nickel steel	WPL3 ⁽⁴⁾	3603 HFS503 LT100 CDS503 LT100	A333 Gr 3 ⁽⁶⁾ A334 Gr 4	—	—	1503-503 LT100V	A350 Gr LF2 A350 Gr LF3
9 % Nickel steel	WPL8 ⁽⁴⁾	—	A333 Gr 8 A334 Gr 8	—	—	1503-509 LT196V	A522
<i>Austenitic stainless</i>							
Austenitic chromium nickel	WP304	3605 304S18 ⁽⁷⁾	A312 Gr TP304	970 Pr 4 304S15	A276 Type 304	1503 304S40	A182 Gr F304
Extra low carbon	WP304L	3605 304S14	A312 Gr TP304C	970 Pr 4 304S12	A276 Type 304L	1503 304S30	A182 Gr F304L
Titanium stabilized	WP321	3605 321S18 ⁽⁷⁾	A312 Gr TP321	970 Pr 4 321S12	A276 Type 321	1503 321S40	A182 Gr F321
Molybdenum	WP316	3605 316S18 ⁽⁷⁾	A312 Gr TP316	970 Pr 4 316S16	A276 Type 316	1503 316S40 or S41	A182 Gr F316
Molybdenum-extra low carbon	WP316L	3605 316S14	A312 Gr TP316C	970 Pr 4 316S12	A276 Type 316L	1503 316S30 or S31	A182 Gr F316L

* Attention is drawn to the approximate nature of the comparison between the BS and ASTM specifications and in the case of ASTM it is necessary to ensure in all cases the material specified is suitable in every respect for the particular application.

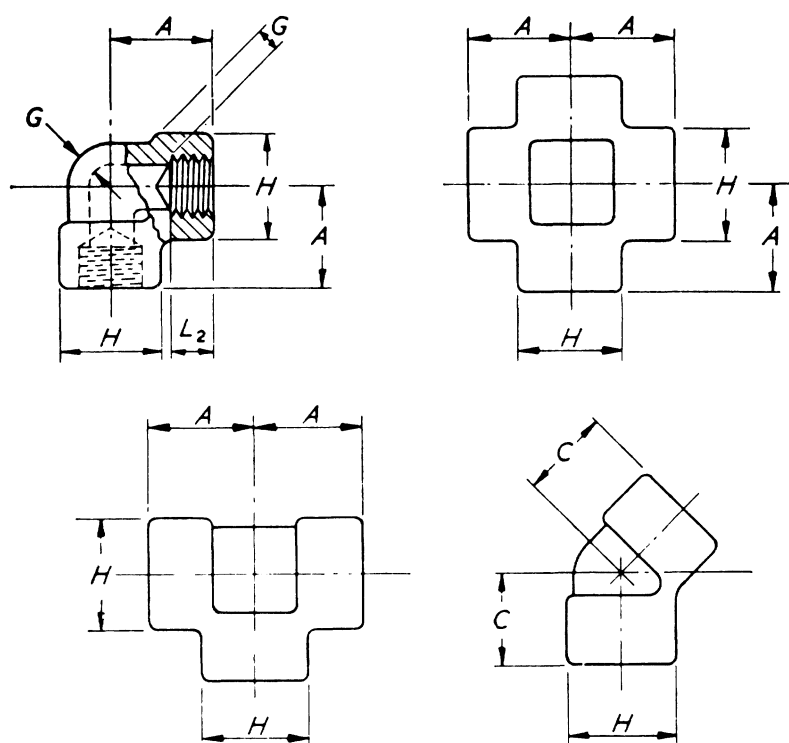


Table 4. Screwed fittings. Dimensions of 90° elbows, crosses, tees and 45° elbows

Nominal size		Centre-to-end 90° elbows, tees, crosses A		Centre-to-end 45° elbows C		Outside diameter of band (min.) H		Wall thickness (min.) G		Length of thread (min.) L ₁ *
		3000	6000	3000	6000	3000	6000	3000	6000	L ₁ *
in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
$\frac{1}{8}$	(6)	21	—	17	—	22	—	3.2	—	6.70
$\frac{1}{4}$	(8)	25	—	19	—	25	—	3.3	—	10.21
$\frac{3}{8}$	(10)	29	—	22	—	33	—	3.5	—	10.36
$\frac{1}{2}$	(15)	33	38	25	29	38	46	4.1	8.2	13.56
$\frac{3}{4}$	(20)	38	44	29	33	46	56	4.3	8.5	13.86
1	(25)	44	51	33	35	56	62	5.0	9.9	17.34
$1\frac{1}{2}$	(32)	51	60	35	43	62	75	5.3	10.6	17.95
$1\frac{1}{2}$	(40)	60	64	43	44	75	84	5.5	11.1	18.38
2	(50)	64	83	44	52	84	102	6.0	12.0	19.22
$2\frac{1}{2}$	(65)	83	95	52	—	102	121	7.6	15.3	28.89
3	(80)	95	114	64	—	121	146	8.3	16.6	30.48
4	(100)	114	—	79	—	152	—	9.3	—	33.02

* See 2.3.

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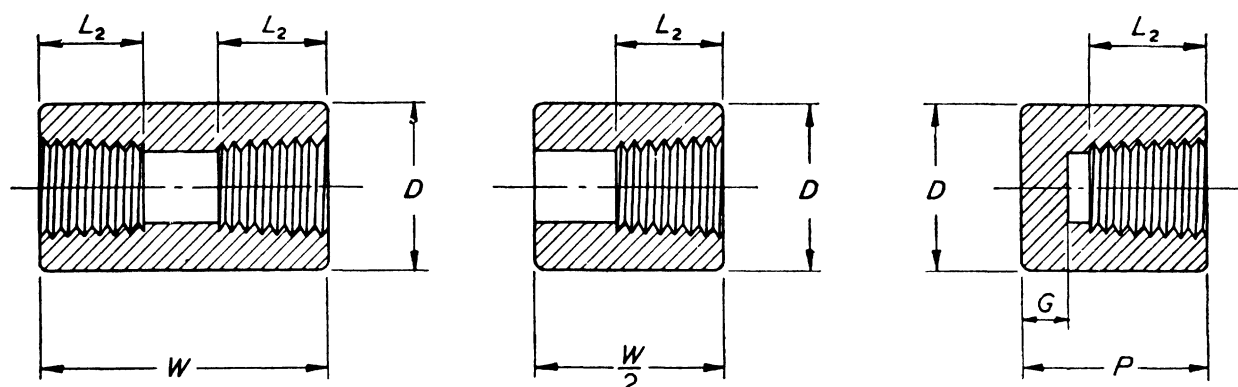
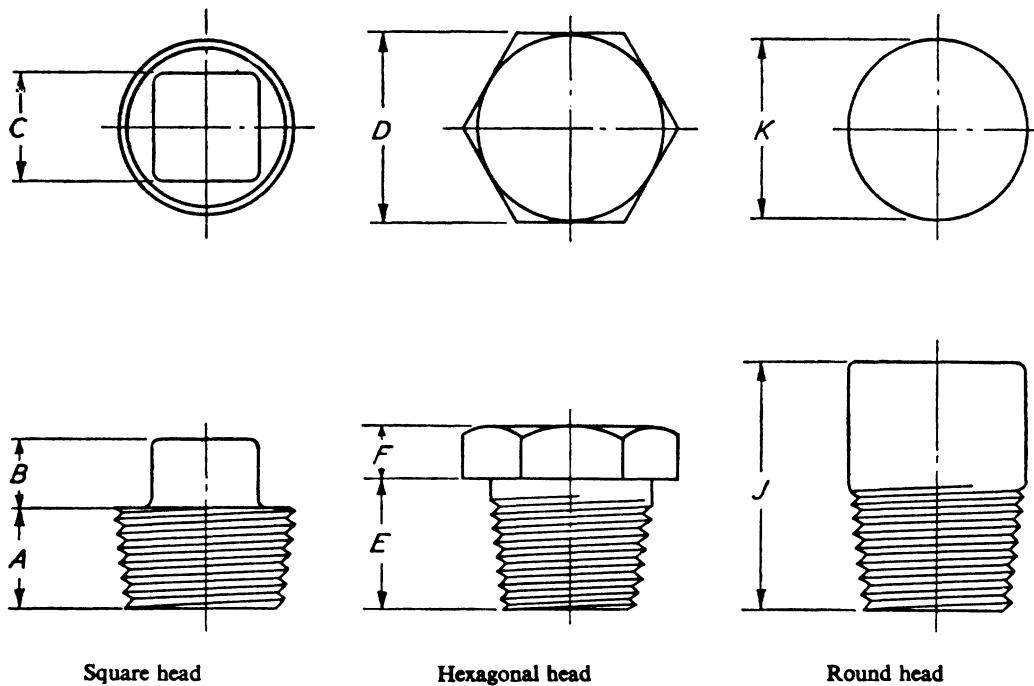


Table 5. Screwed fittings. Dimensions of couplings, half-couplings and caps

Nominal size		End to end couplings W	End to end caps P		Outside diameter (min.) D		Cap end wall thickness (min.) G		Length of thread (min.) L_1^*
		3000 and 6000	3000	6000	3000	6000	3000	6000	L_1^*
in	mm	mm	mm	mm	mm	mm	mm	mm	mm
$\frac{1}{8}$	(6)	32	19	—	16	22	5	—	6.70
$\frac{1}{4}$	(8)	35	25	27	19	25	5	6	10.21
$\frac{3}{8}$	(10)	38	25	27	22	32	5	6	10.36
$\frac{1}{2}$	(15)	48	32	33	29	38	6	8	13.56
$\frac{3}{4}$	(20)	51	37	38	35	45	6	8	13.86
1	(25)	60	41	43	45	57	10	11	17.34
$1\frac{1}{4}$	(32)	67	45	46	57	64	10	11	17.95
$1\frac{1}{2}$	(40)	79	45	48	64	76	11	13	18.38
2	(50)	86	48	51	76	92	13	16	19.22
$2\frac{1}{2}$	(65)	92	60	—	92	—	16	—	28.89
3	(80)	108	65	—	108	—	19	—	30.48
4	(100)	121	68	—	140	—	22	—	33.02

* See 2.3.

**Table 6. Screwed fittings. Minimum dimensions of pipe plugs**

Nominal size		Square head			Hexagonal head			Round head	
		A	B	C	D	E	F	J	K
in	mm	mm	mm	mm	mm	mm	mm	mm	mm
$\frac{1}{8}$	(6)	10	6	7	11	10	6	35	10
$\frac{1}{4}$	(8)	11	6	10	16	15	6	41	14
$\frac{3}{8}$	(10)	13	8	11	18	16	8	41	18
$\frac{1}{2}$	(15)	14	10	14	22	20	8	45	21
$\frac{3}{4}$	(20)	16	11	16	27	21	10	45	27
1	(25)	19	13	21	35	25	10	51	33
$1\frac{1}{4}$	(32)	21	14	24	45	26	14	51	43
$1\frac{1}{2}$	(40)	21	16	29	51	26	16	51	48
2	(50)	22	18	33	64	27	18	64	60
$2\frac{1}{2}$	(65)	27	19	38	76	41	19	70	73
3	(80)	29	21	43	89	42	21	70	90
4	(100)	32	32	64	118	45	32	76	114

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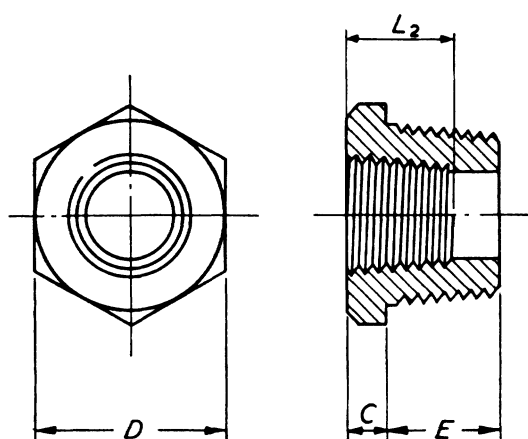


Table 7. Screwed fittings. Minimum dimensions of bushings

Nominal size		C	D	E
in	mm	mm	mm	mm
$\frac{1}{8}$	(8)	3	16	15
$\frac{3}{8}$	(10)	4	18	16
$\frac{1}{2}$	(15)	5	22	20
$\frac{3}{4}$	(20)	6	27	21
1	(25)	6	35	25
$1\frac{1}{4}$	(32)	7	45	26
$1\frac{1}{2}$	(40)	8	51	26
2	(50)	9	64	27
$2\frac{1}{2}$	(65)	10	76	41
3	(80)	10	90	42
4	(100)	13	118	45

NOTE. The internal thread size shall be specified by the purchaser (see Appendix A, item (6)) and corresponding L_2 shall be as in Table 4.

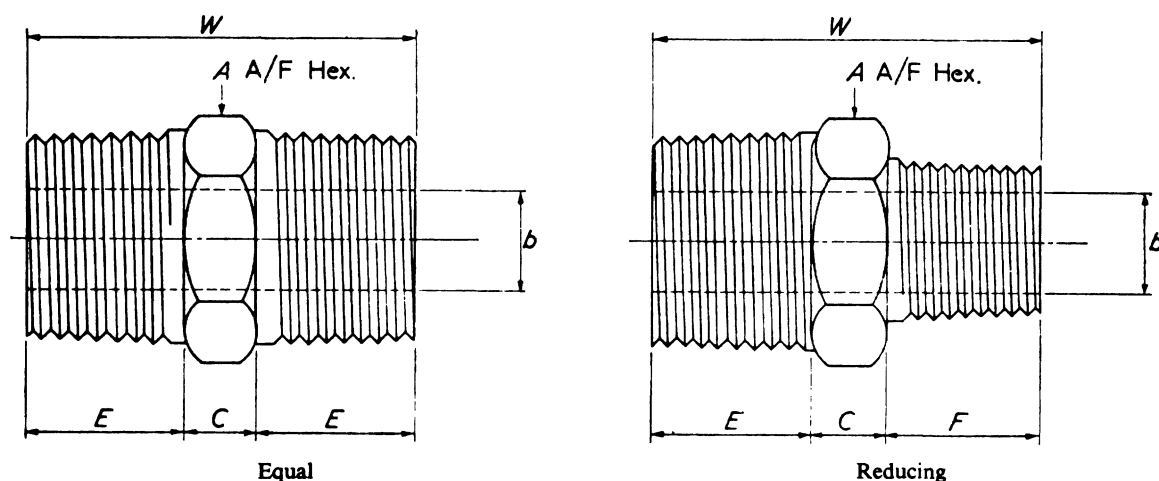


Table 8. Screwed fittings. Dimensions of hexagonal nipples

Nominal size				A	W	E	b		C	F
Equal		Reducing		(min.)	(min.)	(min.)	3000	6000	(min.)	(min.)
in $\frac{1}{8}$	mm (6)	in —	mm —	mm 11	mm 26	mm 10	mm 5	mm 2	mm 6	mm —
$\frac{1}{4}$	(8)	—	—	15	36	15	8	6	6	—
—	—	$\frac{1}{4} \times \frac{1}{8}$	(8 × 6)	15	31	15	5	2	6	10
$\frac{3}{8}$	(10)	—	—	18	40	16	11	8	8	—
—	—	$\frac{3}{8} \times \frac{1}{4}$	(10 × 8)	18	39	16	8	6	8	15
$\frac{1}{2}$	(15)	—	—	22	48	20	14	11	8	—
—	—	$\frac{1}{2} \times \frac{3}{8}$	(15 × 10)	22	44	20	11	8	8	16
—	—	$\frac{1}{2} \times \frac{1}{4}$	(15 × 8)	22	43	20	8	6	8	15
$\frac{3}{4}$	(20)	—	—	27	52	21	19	13	10	—
—	—	$\frac{3}{4} \times \frac{1}{2}$	(20 × 15)	27	50	21	14	11	9	20
—	—	$\frac{3}{4} \times \frac{3}{8}$	(20 × 10)	27	46	21	11	8	9	16
1	(25)	—	—	35	60	25	24	17	10	—
—	—	$1 \times \frac{3}{4}$	(25 × 20)	35	56	25	19	13	10	21
—	—	$1 \times \frac{1}{2}$	(25 × 15)	35	55	25	14	11	10	20
$1\frac{1}{2}$	(40)	—	—	50	68	26	38	30	16	—
—	—	$1\frac{1}{2} \times 1$	(40 × 25)	50	67	26	24	17	16	25
—	—	$1\frac{1}{2} \times \frac{3}{4}$	(40 × 20)	50	63	26	19	13	16	21
—	—	$1\frac{1}{2} \times \frac{1}{2}$	(40 × 15)	50	62	26	14	11	16	20
2	(50)	—	—	62	71	27	49	39	17	—
—	—	$2 \times 1\frac{1}{2}$	(50 × 40)	62	70	27	38	30	17	26
—	—	2×1	(50 × 25)	62	70	27	24	17	18	25
—	—	$2 \times \frac{3}{4}$	(50 × 20)	62	65	27	19	13	17	21
—	—	$2 \times \frac{1}{2}$	(50 × 15)	62	65	27	14	11	18	20

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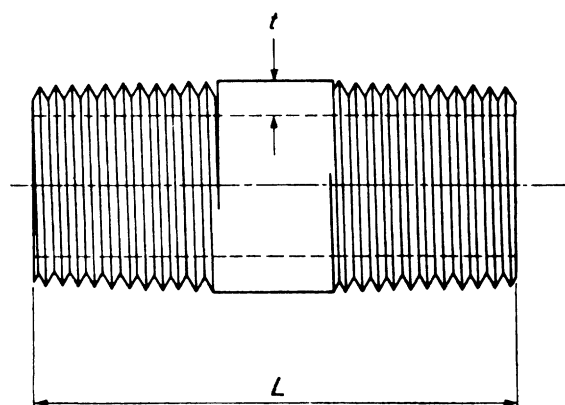


Table 9. Screwed fittings. Dimensions of round nipples

Nominal size		Std. lengths L^*				Wall thickness t	
						3000	6000
in	mm	mm				Schedule 80	XXS
$\frac{1}{8}$	(6)	50	75	100	150		
$\frac{1}{4}$	(8)	50	75	100	150		
$\frac{3}{8}$	(10)	50	75	100	150		
$\frac{1}{2}$	(15)	—	75	100	150		
$\frac{3}{4}$	(20)	—	75	100	150		
1	(25)	—	75	100	150		
$1\frac{1}{2}$	(40)	—	75	100	150		
2	(50)	—	75	100	150		
$2\frac{1}{2}$	(65)	—	—	100	150		
3	(80)	—	—	100	150		
4	(100)	—	—	—	150		

* Other lengths are available when specified.

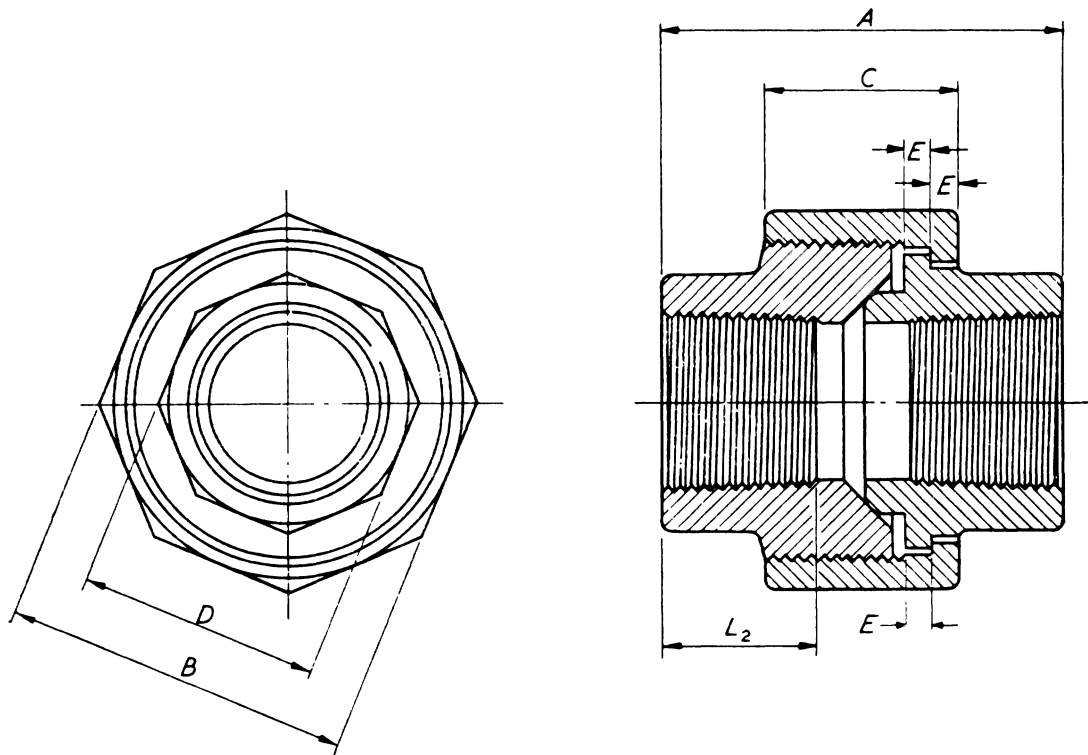


Table 10. Screwed fittings. Dimensions of unions

Nominal size		3000					
		End to end A	Width A/F union nut (min.) B	Height of union nut (min.) C	Width A/F of ends (min.) D	Thickness of shoulder (min.) E	Length of thread (min.) L ₁
in	mm	mm	mm	mm	mm	mm	mm
$\frac{1}{8}$	(6)	40	32	16	17	3.2	6.70
$\frac{1}{4}$	(8)	43	32	18	19	3.2	10.21
$\frac{3}{8}$	(10)	48	36	19	22	3.2	10.36
$\frac{1}{2}$	(15)	51	43	21	30	4.0	13.56
$\frac{3}{4}$	(20)	57	50	24	36	4.8	13.86
1	(25)	64	60	25	41	4.8	17.34
$1\frac{1}{4}$	(32)	70	70	29	50	5.6	17.93
$1\frac{1}{2}$	(40)	79	78	30	60	5.6	18.38
2	(50)	89	95	37	70	6.4	19.22
$2\frac{1}{2}$	(65)	118	125	48	85	9.6	28.89
3	(80)	121	140	51	100	12.7	30.48

NOTE. Other external forms of nut and ends are permissible provided the minimum dimensions shown in this table are maintained.

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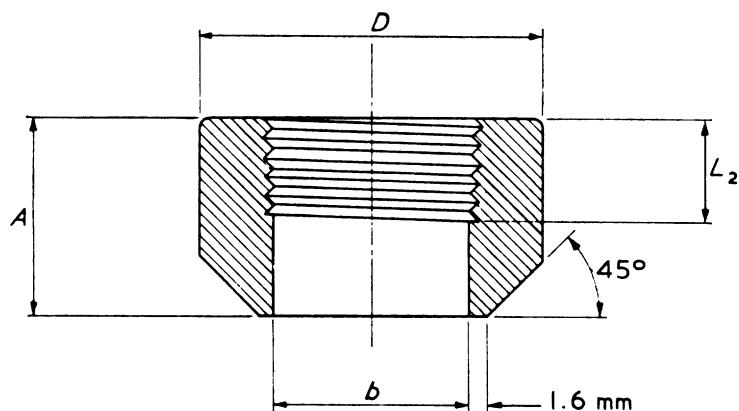


Table 11. Screwed fittings. Minimum dimensions of welding bosses

Nominal size		Length of thread L_2	Length A	Bore dia. b	Outside dia. D	
					3000	6000
in	mm	mm	mm	mm	mm	mm
$\frac{1}{8}$	(6)	6.70	38	8.4	16	22
$\frac{1}{4}$	(8)	10.21	41	11.1	19	26
$\frac{3}{8}$	(10)	10.36	45	14.2	22	32
$\frac{1}{2}$	(15)	13.56	51	18.0	29	38
$\frac{3}{4}$	(20)	13.86	51	23.0	35	45
1	(25)	17.34	51	29.0	45	60
$1\frac{1}{2}$	(40)	18.38	51	44.0	64	76
2	(50)	19.22	51	56.0	76	95
$2\frac{1}{2}$	(65)	28.89	51	67.0	95	—
3	(80)	30.48	57	82.0	110	—
4	(100)	33.02	64	95.0	140	—

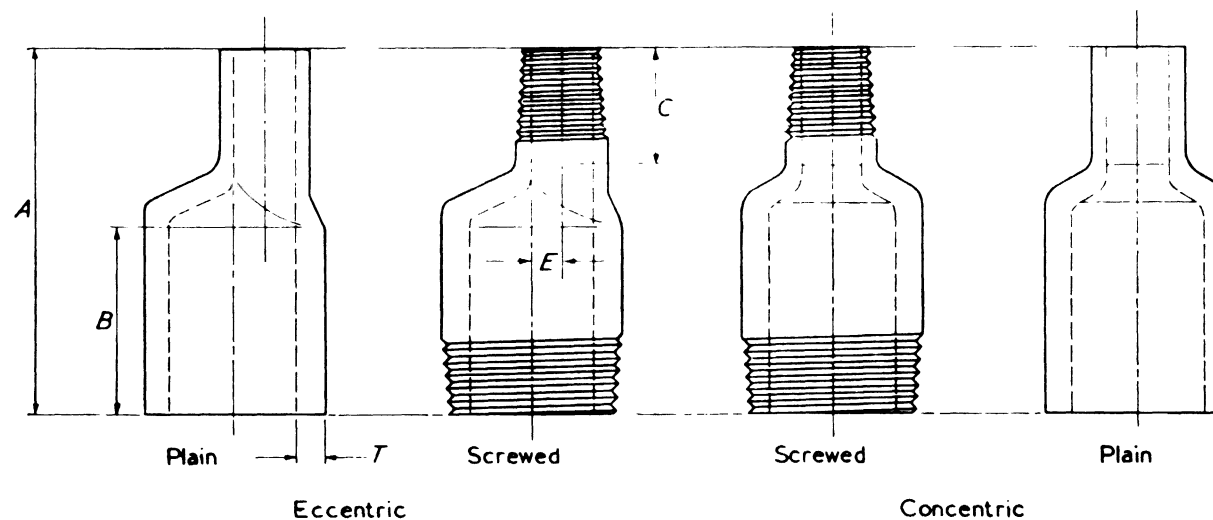


Table 12. Fittings. Dimensions of swage nipples

Nominal size		Parallel length			Eccentricity <i>E</i>		Thickness <i>T</i> and <i>t</i> *		
		(min.) <i>A</i>	(min.) <i>B</i>	(min.) <i>C</i>	3000	6000	Screwed/Plain 3000	Plain 6000	Screwed 6000
in	mm	mm	mm	mm	mm	mm	Schedule 80	Schedule 160	Double extra strong
$\frac{1}{8} \times \frac{1}{8}$	(10 × 8)	76	48	16	1.6	—			
$\frac{1}{8} \times \frac{1}{4}$	(15 × 10)	89	56	19	1.6	—			
$\frac{1}{8} \times \frac{1}{2}$	(15 × 8)	89	56	19	3.2	—			
$\frac{1}{4} \times \frac{1}{4}$	(20 × 15)	95	57	22	2.4	2.4		Schedule 160	XXS
$\frac{1}{4} \times \frac{1}{2}$	(20 × 10)	95	57	22	4.0	—			
$\frac{1}{2} \times \frac{1}{4}$	(25 × 20)	102	64	22	2.8	2.0		Schedule 160	Double extra strong
$\frac{1}{2} \times \frac{1}{2}$	(25 × 15)	102	64	22	5.2	4.4			
$1 \frac{1}{8} \times 1$	(40 × 25)	114	70	25	6.7	6.4			
$1 \frac{1}{8} \times \frac{3}{4}$	(40 × 20)	114	70	25	9.5	8.3			
$1 \frac{1}{8} \times \frac{1}{2}$	(40 × 15)	114	70	25	11.9	10.7			
$2 \times 1 \frac{1}{8}$	(50 × 40)	165	108	29	5.6	5.2			
2×1	(50 × 25)	165	108	29	12.7	11.5			
$2 \times \frac{3}{4}$	(50 × 20)	165	108	29	15.5	13.5			
$2 \times \frac{1}{2}$	(50 × 15)	165	108	29	17.5	15.9			
$2 \frac{1}{2} \times 2$	(65 × 50)	178	114	32	4.8	3.2			
$2 \frac{1}{2} \times 1 \frac{1}{2}$	(65 × 40)	178	114	32	10.3	8.3			
$3 \times 2 \frac{1}{2}$	(80 × 65)	203	133	41	7.1	6.7			
3×2	(80 × 50)	203	133	41	11.9	9.9			
$3 \times 1 \frac{1}{2}$	(80 × 40)	203	133	41	17.5	15.5			
4×3	(100 × 80)	229	140	48	11.9	10.7			
$4 \times 2 \frac{1}{2}$	(100 × 65)	229	140	48	19.1	17.5			

* Thickness and outside diameters of swage nipples shall correspond to those of the appropriate nominal pipe size.

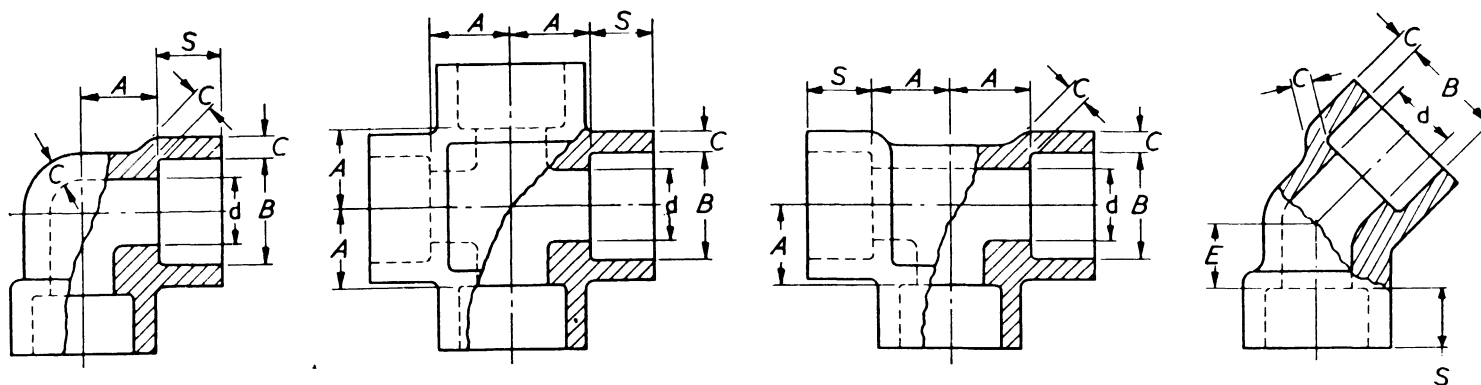


Table 13. Socket-welding fittings. Dimensions of 90 ° elbows, crosses, tees and 45 ° elbows

Nominal size		Depth of socket (min.) <i>S</i>	Centre to bottom of socket <i>A</i>		Bore diameter of socket (min.) <i>B</i>	Socket wall thickness (min.) <i>C</i>		Bore diameter of fitting <i>d</i> *		Centre to bottom of socket for 45 ° elbows <i>E</i>	
			3000	6000		3000	6000	3000	6000	3000	6000
in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
$\frac{1}{8}$	(6)	10	11	—	10.7	3.2	—	6.8	—	8	—
$\frac{1}{4}$	(8)	10	11	—	14.1	3.3	—	9.2	—	8	—
$\frac{3}{8}$	(10)	10	14	—	17.6	3.5	—	12.5	—	8	—
$\frac{1}{2}$	(15)	10	16	19	21.8	4.1	5.2	15.5	11.8	11	13
$\frac{3}{4}$	(20)	13	19	22	27.4	4.3	6.1	21.0	15.5	13	14
1	(25)	13	22	27	34.1	5.0	7.0	26.5	20.5	15	18
$1\frac{1}{4}$	(32)	13	27	32	42.9	5.3	7.0	35.0	29.5	18	21
$1\frac{1}{2}$	(40)	13	32	38	49.0	5.6	7.8	40.5	34.0	21	26
2	(50)	16	38	41	61.0	6.1	9.5	52.0	43.0	26	29
$2\frac{1}{2}$ †	(65)	16	41	57	73.8	7.7	10.4	62.0	54.0	29	32
3	(80)	16	57	64	89.7	8.3	12.2	78.0	67.0	32	41

* Bore diameter *d* corresponds to schedule 40 and schedule 160 pipe respectively. Subject to tolerances see 2.6.

† Outside diameter of pipe must be specified if dimensions are not in accordance with BS 1600.

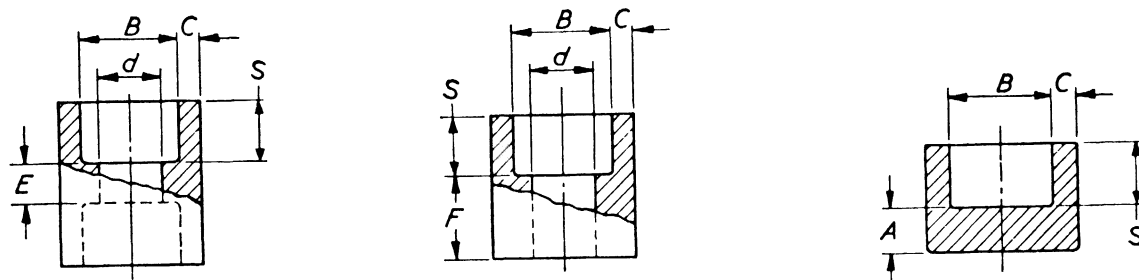


Table 14. Socket-welding fittings. Dimensions of couplings, half-couplings and caps

Nominal size		Depth of socket (min.) <i>S</i>	Couplings distance between bottoms of sockets <i>E</i>	Half couplings distance between bottom of socket and opposite end <i>F</i>	Caps; wall thickness (min.) <i>A</i>		Bore diameter of socket (min.) <i>B</i>	Socket wall thickness (min.) <i>C</i>		Bore diameter of fitting <i>d*</i>	
					3000	6000		3000	6000	3000	6000
in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/8	(6)	10	6	16	4	—	10.7	3.2	—	6.8	—
1/4	(8)	10	6	16	7	—	14.1	3.3	—	9.2	—
3/8	(10)	10	6	17	7	—	17.6	3.5	—	12.5	—
1/2	(15)	10	10	22	8	11	21.8	4.1	5.2	15.5	11.8
3/4	(20)	13	10	24	10	13	27.4	4.3	6.1	21.0	15.5
1	(25)	13	13	29	11	14	34.1	5.0	7.0	26.5	20.5
1 1/4	(32)	13	13	30	13	18	42.9	5.3	7.0	35.0	29.5
1 1/2	(40)	13	13	32	14	19	49.0	5.6	7.8	40.5	34.0
2	(50)	16	19	41	18	24	61.0	6.1	9.5	52.0	43.0
2 1/2†	(65)	16	19	43	21	29	73.8	7.7	10.4	62.0	54.0
3	(80)	16	19	44	24	34	89.7	8.3	12.2	78.0	67.0

* Bore *d* corresponds to schedule 40 and schedule 160 pipe respectively. Subject to tolerances see 2.6.

† Outside diameter of pipe must be specified if dimensions are not in accordance with BS 1600.

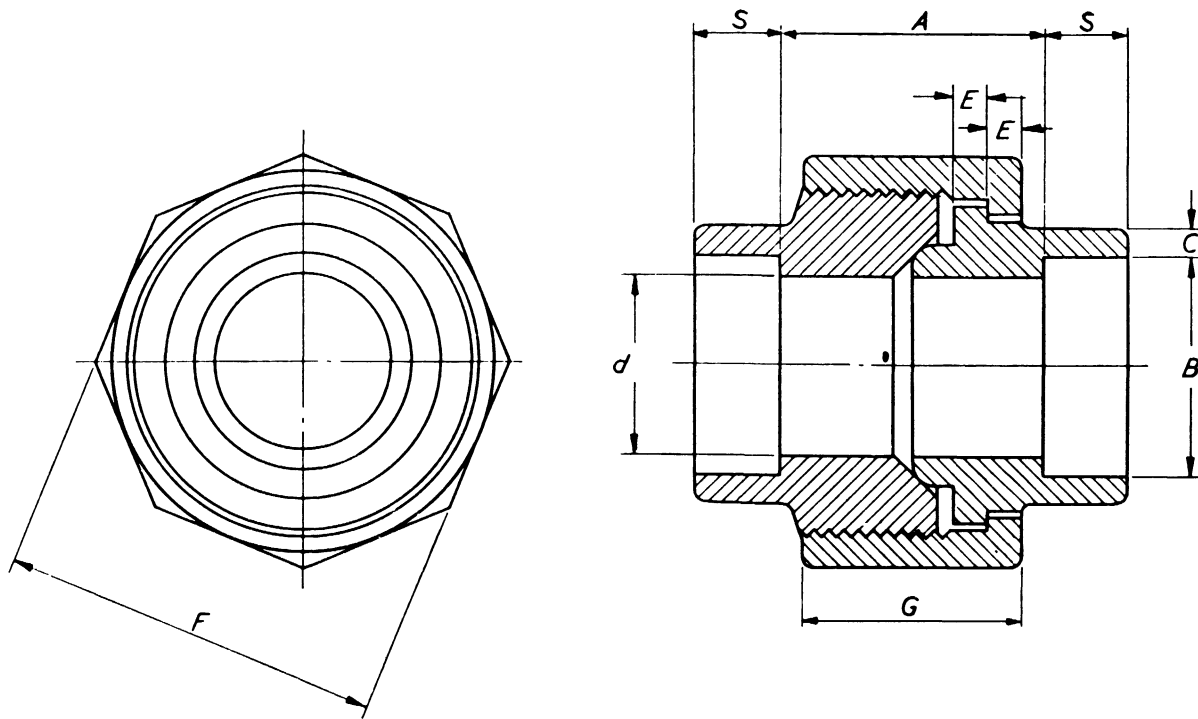


Table 15. Socket-welding fittings. Dimensions of unions

Nominal size		3000							
		Depth of socket (min.) <i>S</i>	Distance between bottoms of sockets (min.) <i>A</i>	Bore diameter of sockets (min.) <i>B</i>	Socket wall thickness (min.) <i>C</i>	Bore diameter of union <i>d</i> *	Thickness of shoulder (min.) <i>E</i>	Width A/F of nut (min.) <i>F</i>	Height of nut (min.) <i>G</i>
in	mm	mm	mm	mm	mm	mm	mm	mm	mm
$\frac{1}{8}$	(6)	10	17	10.7	3.2	6.8	3.2	32	16
$\frac{1}{4}$	(8)	10	17	14.1	3.3	9.2	3.2	32	18
$\frac{3}{8}$	(10)	10	17	17.6	3.5	12.5	3.2	36	19
$\frac{1}{2}$	(15)	10	18	21.8	4.1	15.5	4.0	41	21
$\frac{3}{4}$	(20)	13	20	27.4	4.3	21.0	4.8	50	24
1	(25)	13	26	34.1	5.0	26.5	4.8	60	25
$1\frac{1}{4}$	(32)	13	28	42.9	5.3	35.0	5.6	70	29
$1\frac{1}{2}$	(40)	13	30	49.0	5.6	40.5	5.6	78	30
2	(50)	16	36	61.0	6.1	52.0	6.4	95	37
$2\frac{1}{2}$	(65)	16	57	73.8	7.7	62.0	9.6	125	48
3	(80)	16	70	89.7	8.3	78.0	12.7	140	51

* Bore diameter *d* corresponds to schedule 40 pipe. Subject to tolerances see 2.6.

† Outside diameter of pipe must be specified if dimensions are not in accordance with BS 1600.

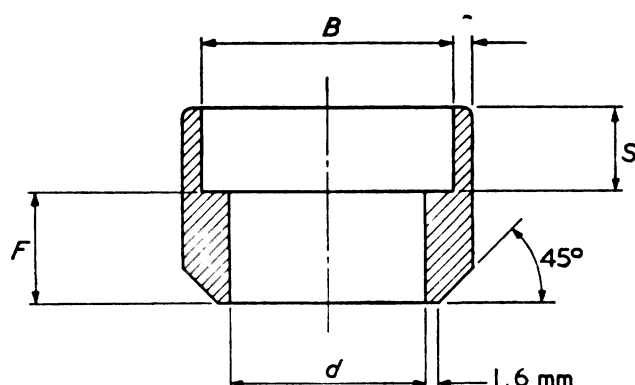


Table 16. Socket-welding fittings. Dimensions of welding bosses

Nominal size		Bore dia. of socket (min.) B	Socket wall thickness (min.) C		Bore diameter of fitting d^*		Length F	Depth of socket (min.) S
			3000	6000	3000	6000		
in	mm	mm	mm	mm	mm	mm	mm	mm
$\frac{1}{8}$	(6)	10.7	3.2	—	6.8	—	28	10
$\frac{1}{4}$	(8)	14.1	3.3	—	9.2	—	32	10
$\frac{3}{8}$	(10)	17.6	3.5	—	12.5	—	34	11
$\frac{1}{2}$	(15)	21.8	4.1	5.2	15.5	11.8	38	13
$\frac{3}{4}$	(20)	27.4	4.3	6.1	21.0	15.5	38	13
1	(25)	34.1	5.0	7.0	26.5	20.7	35	16
$1\frac{1}{2}$	(40)	49.0	5.6	7.8	40.5	34.0	32	19
2	(50)	61.0	6.1	9.5	52.0	43.0	29	22
$2\frac{1}{2}\dagger$	(65)	73.8	7.7	10.4	62.0	54.0	29	22
3	(80)	89.7	8.3	12.2	78.0	66.0	29	22

* Bore diameter d corresponds to schedule 40 and schedule 160 pipe respectively. Subject to tolerances see 2.6.

† Outside diameter of pipe must be specified if dimensions are not in accordance with BS 1600.

Appendix A

Notes to purchaser

Certain clauses of this standard permit alternatives. It is recommended that the following information be supplied by the purchaser in the enquiry or order. If the purchaser requires fittings which deviate from this standard, such deviating requirements shall be stated in the purchase order.

- (1) Type and quantity of fittings (1.1).
- (2) Nominal size(s) and designation (1.2 and 1.3).
- (3) Material identification symbol (Clause 3 and Table 3).
- (4) State if hydrostatic test is required (5.2).
- (5) State if socket-welding fittings are required for assembly with pipe to BS 3600 dimensions (1.1 and Table 2).
- (6) Specify internal thread size of bushings (Table 7).
- (7) Certification (1.6).
- (8) State if fittings are to be used at elevated temperatures (1.4).
- (9) State if cone-to-cone seal is an acceptable alternative (2.2).

BSI publications referred to in this standard

This standard makes reference to the following British Standards:

- BS 131 Methods for notched bar tests
Part 2 The Charpy V-notch impact test on metals
- BS 970 Wrought steels in the form of blooms, billets, bars and forgings
Part 4 Stainless, heat resisting and valve steels
- BS 1502 Steels for fired and unfired pressure vessels. Sections and bars
- BS 1503 Steels for fired and unfired pressure vessels. Forgings
- BS 1600 Dimensions of steel pipe for the petroleum industry
- BS 3600 Dimensions and masses per unit length of welded and seamless steel pipes and tubes for pressure purposes
- BS 3602 Steel pipes and tubes for pressure purposes. Carbon steel: high duties
- BS 3603 Steel pipes and tubes for pressure purposes. Carbon and alloy steel: low temperature duties
- BS 3604 Steel pipes and tubes for pressure purposes. Low and medium alloy steel
- BS 3605 Seamless and welded austenitic stainless steel pipes and tubes for pressure purposes
- API Std 5B Specification for threading, gauging and thread inspection of casing, tubing and line pipe threads
- API Std 5L Line pipe
- ANSI B2.1 Pipe threads (except dryseal)

