
INTERNATIONAL STANDARD



2229

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Equipment for the petroleum and natural gas industries — Steel pipe flanges, nominal sizes 1/2 to 24 in — Metric dimensions

First edition — 1973-12-01

STANDARDSISO.COM : Click to view the full PDF of ISO 2229:1973

UDC 621.643.4 : 622.323/4

Ref. No. ISO 2229-1973 (E)

Descriptors : petroleum industry, equipment, metal pipe, steels, pipe flanges, pressure, temperature, ratings, specifications, dimensions, marking.

Price based on 54 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 2229 was drawn up by Technical Committee ISO/TC 67, *Materials and equipment for petroleum and natural gas industries*.

It was approved in August 1971 by the Member Bodies of the following countries :

Australia	Hungary	Spain
Austria	Japan	Turkey
Canada	Netherlands	United Kingdom
Czechoslovakia	New Zealand	U.S.A.
Egypt, Arab Rep. of	Romania	U.S.S.R.
Germany		

The Member Body of the following country expressed disapproval of the document on technical grounds :

France

CONTENTS

	Page
1 General	1
1.1 Scope and field of application	1
1.2 Pressure ratings	1
1.3 Flange facings and gaskets	1
1.4 Nominal sizes	1
1.5 Definitions	2
2 Materials	2
2.1 Flange materials	2
2.2 Bolting materials	2
3 dimensions	3
3.1 Flange sizes	3
3.2 Flange dimensions	3
3.3 Facing dimensions for other than lapped-type joints	3
3.4 Facing dimensions for lapped-type joints	3
3.5 Tolerances on flange facings	4
3.6 Flange bolting	4
3.7 Spot-facing and back-facing of flanges	4
3.8 Screwed flanges	4
3.9 Slip-on welding, socket-welding and lapped-type flanges	4
3.10 Welding-neck flanges	5
3.11 Concentric reducing screwed flanges	5
3.12 Concentric reducing slip-on welding and socket-welding flanges	5
3.13 Concentric reducing welding-neck flanges	5
3.14 Blank (blind) flanges	6
4 Tests	6

	Page
5 Inspection	6
5.1 Inspection arrangements	6
5.2 Repair of defects	6
6 Marking	6
7 Preparation and despatch	6
7.1 Preparation	6
7.2 Despatch	6

ANNEXES

A Pressure-temperature ratings	32
B Requirements for marking of steel pipe flanges	39
C Dimensions of seamless and welded steel pipe	41
D Threading of pipe for standard steel flanges	42
E Determination of bolt lengths for lapped joints	43
F Recommendations for the choice of gaskets, for flanged joints employing raised, male/female and tongue/groove flange facings	44
G Flange facings	51
H Welding techniques	54

TABLES

1 Steel specifications	2
2 Reducing screwed flanges, Classes 150 to 2 500	7
3 Facing dimensions for flanges other than ring-joint, Classes 150 to 2 500	8
4 Dimensions of ring-joint facings, Class 150	9
5 Dimensions of ring-joint facings, Class 300	10
6 Dimensions of ring-joint facings, Class 400	11
7 Dimensions of ring-joint facings, Class 600	12
8 Dimensions of ring-joint facings, Class 900	13
9 Dimensions of ring-joint facings, Class 1 500	14
10 Dimensions of ring-joint facings, Class 2 500	15
11 Numbers and dimensions of ring-joint gaskets	17
12 Dimensions of flanges, Class 150	18
13 Drilling and bolting for flanges, Class 150	19
14 Dimensions of flanges, Class 300	20
15 Drilling and bolting for flanges, Class 300	21
16 Dimensions of flanges, Class 400	22

	Page
17 Drilling and bolting for flanges, Class 400	23
18 Dimensions of flanges, Class 600	24
19 Drilling and bolting for flanges, Class 600	25
20 Dimensions of flanges, Class 900	26
21 Drilling and bolting for flanges, Class 900	27
22 Dimensions of flanges, Class 1 500	28
23 Drilling and bolting for flanges, Class 1 500	29
24 Dimensions of flanges, Class 2 500	30
25 Drilling and bolting for flanges, Class 2 500	31
26 Pressure-temperature ratings for flanges in carbon steel	33
27 Pressure-temperature ratings for flanges in carbon-molybdenum steel	33
28 Pressure-temperature ratings for flanges in 1 % chromium 1/2 % molybdenum steel	34
29 Pressure-temperature ratings for flanges in 1 1/4 % chromium 1/2 % molybdenum steel	34
30 Pressure-temperature ratings for flanges in 2 1/4 % chromium 1 % molybdenum steel	35
31 Pressure-temperature ratings for flanges in 5 % chromium 1/2 % molybdenum steel	35
32 Pressure-temperature ratings for flanges in 9 % chromium 1 % molybdenum steel	36
33 Pressure-temperature ratings for flanges in austenitic chromium-nickel steel	36
34 Pressure-temperature ratings for flanges in austenitic chromium-nickel (low carbon) steel	37
35 Pressure-temperature ratings for flanges in austenitic chromium-nickel (titanium and niobium stabilized) steel	37
36 Pressure-temperature ratings for flanges in austenitic chromium-nickel-molybdenum steel	38
37 Pressure-temperature ratings for flanges in austenitic chromium-nickel-molybdenum (low carbon) steel	38
38 Alloy steels designation	40
39 Dimensions of seamless and welded steel pipe	41
40 Additional length of effective thread on pipe	42
41 Group 1 gaskets — Dimensions of gaskets for raised and large male/female facings	46
42 Group 2 gaskets — Dimensions of gaskets for raised facings	47
43 Group 2 gaskets — Dimensions of gaskets for raised, large tongue/groove and large male/female facings	48
44 Group 3 gaskets — Dimensions of gaskets for raised facings	49
45 Group 3 gaskets — Dimensions of gaskets for raised, large tongue/groove and large male/female facings	50

FIGURES

	Page
1 Flange facings for other lapped type joints	51
2 Facings for lapped type joints	53
3 Details of welding ends of welding-neck flanges	54
4 Acceptable design for unequal wall thicknesses for welded neck flanges	54

STANDARDSISO.COM : Click to view the full PDF of ISO 2229:1973

Equipment for the petroleum and natural gas industries – Steel pipe flanges, nominal sizes 1/2 to 24 in – Metric dimensions

1 GENERAL

1.1 Scope and field of application

This International Standard gives specifications for cast and forged steel pipe flanges of the screwed, slip-on welding, socket-welding, lapped, blind and welding neck types for use in the petroleum and natural gas industries for oil, water, steam, air, gas and chemical services. The flange dimensions are also applicable to integral flanges, for example end flanges of valves.

The various types of flange are not necessarily applicable to all pressure and size ranges. Reference should be made to the appropriate tables for details.

Seven classes are provided for, namely :

Classes 150, 300, 400, 600, 900, 1 500 and 2 500.

These numerals represent the respective primary service pressure ratings in pounds-force per square inch.

NOTE – This International Standard does not specify limitations on the use of various methods of attachment of flanges to pipe or other equipment. The adequacy for operating conditions of any method of attachment specified should be determined by the designer of the piping or equipment, who should consult the appropriate standards or codes.

1.2 Pressure ratings

The maximum service temperature at which it is permissible to use a flange of a given class, when subjected to its primary service pressure, depends on the type of steel from which it is made.

Tables 26 to 37 in Annex A give the service pressures permissible, at various service temperatures, for each of the seven classes of flanges made from the different types of steel specified in 2.1.

Primary service pressures are shown underlined in the tables, the corresponding temperatures in the left-hand column of any table being the maximum service temperatures permissible at these pressures.

It will be observed that a flange complying with this International Standard may be used at a service pressure higher than its primary service pressure, but at a lower corresponding service temperature; conversely, it may be used at a pressure lower than its primary service pressure

and at a higher corresponding service temperature. In this context service temperature refers to the temperature of the fluid on the inside of the pressure-retaining components.

Where it is required to use the flanges specified in this International Standard at temperature below -29°C , reference should be made to the appropriate standards or codes. Ratings for carbon steel welding neck flanges in this International Standard are based upon the welding ends having a thickness at least equal to that calculated for pipe having a minimum specified yield strength of 280 N/mm². The ratings also apply to carbon steel welding neck flanges used with piping components of unequal strength and unequal wall thickness when the welded joint is made in accordance with Figure 4.

1.3 Flange facings and gaskets

The types of flange facings specified in this International Standard are defined in 3.3 and illustrated in Figures 1 and 2.

The satisfactory operation, under the pressure-temperature ratings referred to in 1.2, of flanged joints employing any of these facings depends on the use of gaskets of appropriate materials and dimensions.

For the facings defined, the gaskets indicated in 1.3.1 to 1.3.4 are recommended. The user is, however, responsible in all cases for the choice of gaskets suitable for the service required.

1.3.1 Ring-joint facings

Ring-joint gaskets to ANSI Standard B 16.20¹⁾. Dimensions of gaskets to this standard are given in Table 11.

1.3.2 Raised facings

1.3.3 Large and small male/female facings

1.3.4 Large and small tongue/groove facings

Group 1, Group 2 or Group 3 gaskets as defined in Annex F

1.4 Nominal sizes

The nominal size of a flange shown in the tables is the same as the corresponding nominal pipe size. (See Annex C.)

1) American National Standards Institute specification B 16.20, *Ring joint gaskets and grooves for steel pipe flanges*.

1.5 Definitions

For the purposes of this International Standard, the following definitions apply (see Figure 1 and, where appropriate, Figure 2) :

1.5.1 flange edge : The reference plane, coincident with the front of a flange, from which the height of any type of flange facing and also the minimum flange thickness is measured.

1.5.2 flange thickness : The distance from the flange edge to the back face of a flange or, if the bolt holes are spot-faced, from the flange edge to the spot facing.

1.5.3 flange facing : The profile of the connecting end of a flange. It is beyond the flange edge, except for a flange of Class 150 or 300 having a 1,6 mm high raised facing, in which case the raised facing is formed by cutting into the minimum flange thickness.

1.5.4 contact surface : That part of a flange facing upon which the gasket is actually compressed. In the case of flanges of Classes 150 and 300 having 1,6 mm high raised facings, and in all classes having female and groove facings, the contact surface is coincident with the flange edge as defined in 1.5.1. "Contact surface" is not applicable to ring-joint facings.

1.5.5 full-faced : Applies only to female, groove, and ring-joint facings and defines the resultant profile when the raised portion of such facings is extended to the full diameter of the flange.

NOTE — In such cases, the "flange edge", as defined in 1.5.1, remains unchanged, being coincident with the "contact surface" of female and groove type facings and with the bottom of the groove of ring-joint facings.

2 MATERIALS

2.1 Flange materials

The flanges specified in this International Standard shall be either steel forgings or steel castings, made to one of the steel specifications given in Table 1.

The reference to ASTM Standards are included until such time as Technical Committee ISO/TC 17 has formulated proposals for forgings and castings.

2.2 Bolting materials

All bolting materials shall comply with appropriate specifications.

TABLE 1 — Steel specifications

Material	ASTM Standards ¹⁾	
	Forgings	Castings
Carbon steel	{ A105 Grade I A105 Grade II A1812 ²⁾ Grades I and II	A216 Grade WCB — —
Carbon-molybdenum steel	A182 Grade F1	A217 Grade WC1
1 % chromium 1/2 % molybdenum steel	A182 Grade F12	—
1 1/4 % chromium 1/2 % molybdenum steel	A182 Grade F11	A217 Grade WC6
2 1/4 % chromium 1 % molybdenum steel	A182 Grade F22	A217 Grade WC9
5 % chromium 1/2 % molybdenum steel	A182 Grade F5a	A217 Grade C5
9 % chromium 1 % molybdenum steel	A182 Grade F9	A217 Grade C12
Austenitic chromium-nickel steel	{ A182 Grade F304 A182 Grade F304H	A351 Grade CF8 —
Austenitic chromium-nickel (low carbon) steel	A182 Grade F304L	—
Austenitic chromium-nickel (titanium stabilized) steel	{ A182 Grade F321 A182 Grade F321H	— —
Austenitic chromium-nickel (niobium stabilized) steel	{ A182 Grade F347 A182 Grade F347H	A351 Grade CF8C —
Austenitic chromium-nickel-molybdenum steel	{ A182 Grade F316 A182 Grade F316H	A351 Grade CF8M —
Austenitic chromium-nickel-molybdenum (low carbon) steel	A182 Grade F316L	—

1) American Society for Testing and Material Standards, Part 1, *Steel piping, tubing and fittings*.
2) Classes 150 and 300 only.

3 DIMENSIONS

3.1 Flange sizes

Pipe flanges of the following nominal sizes are specified :

1/2 3/4 1 (1 1/4 1 1/2 2 (2 1/2 3 (3 1/2 4 (5) 6 8 10
12 14 16 18 20 and 24 inches.

NOTES

1 The 3 1/2 in size is not specified for Classes 900, 1 500 and 2 500.

2 Sizes over 12 in are not specified for Class 2 500.

The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.

3.2 Flange dimensions

The dimensions of flanges of the various types and pressure classes included in this International Standard, other than the flange facing dimensions referred to in 3.3, shall be as specified in Tables 12, 14, 16, 18, 20, 22 and 24.

3.3 Facing dimensions for other than lapped-type joints

This International Standard applies to flange facings of the 1,6 mm and 6,4 mm high raised types, the large and small male/female and large and small tongue/groove types and the ring-joint type. (See Figure 1.) The 1,6 mm high raised facing is the regular type of facing for flanges of Classes 150 and 300, and the 6,4 mm high raised facing is the regular type of facing for flanges of Classes 400, 600, 900, 1 500 and 2 500.

When ordering flanges complying with this International Standard, the purchaser shall specify the type of facing to be provided.

Flange facings shall be machine finished overall and shall comply with the following requirements :

3.3.1 Raised facings

Raised facings shall be machined to the outside diameters specified in Table 3.

Gasket contact surfaces shall be finished as follows :

3.3.1.1 For nominal sizes 12 in and smaller

A continuous spiral groove generated by a 1,6 mm radius round-nosed tool at a feed of approximately 0,8 mm per revolution.

3.3.1.2 For nominal sizes above 12 in

A continuous spiral groove generated by a 3,2 mm radius round-nosed tool at a feed of approximately 1,2 mm per revolution.

If another type of finish is required, this shall be specified by the purchaser in his order. For example a concentrically grooved finish is a permissible alternative.

3.3.2 Male/female and tongue/groove facings

The dimensions of large and small male/female and large and small tongue/groove facings shall be as given in Table 3.

All contact surfaces shall be finished smooth except that large male facings may, as an alternative, be finished as described in 3.3.1.1 and 3.3.1.2.

Female and groove facings may be full-faced at the option of the manufacturer unless otherwise specified by the purchaser. (See Table 3, Note 4.)

3.3.3 Ring-joint facings

The dimensions of ring-joint facings shall be as given in Tables 4 to 10. Dimensions of ring-joint gaskets, correlated by ring numbers, shall be as given in Table 11.

Ring grooves shall be machined true and concentric with the flanges. They shall be finished smooth and shall be free from ridges and chatter marks.

Ring-joint facings may be full-faced at the option of the manufacturer unless otherwise specified by the purchaser. (See relevant Note in Tables 4 to 10.)

3.3.4 Minimum flange thickness

3.3.4.1 In no case, regardless of the type of facing and the tolerances permitted, shall the minimum thickness of a flange, as specified in this International Standard, be reduced at any point in order to provide adequate height for the facing or adequate depth for the groove, except for Classes 150 and 300 flanges with 1,6 mm raised facings, in which case this 1,6 mm shall be included in the specified minimum thickness of the flanges.

3.3.4.2 When a steel flange is required for bolting to a cast iron flange, the steel flange shall be plain (flat) faced. The thickness of such a flange shall be equal to the minimum thickness specified in the appropriate table or, if a 1,6 mm raised face has to be removed to obtain the plain (flat) face, equal to the minimum thickness specified less 1,6 mm.

NOTE — Where a 1,6 mm raised face has to be removed to obtain a plain (flat) face, the length through the hub of a flange will be non-standard.

3.4 Facing dimensions for lapped-type joints

Facings for lapped joints shall be one of the following types as specified by the purchaser (see Figure 2) :

3.4.1 Raised face.

3.4.2 Large male/female.

3.4.3 Large or small tongue/groove.

3.4.4 Ring-joint.

The facings shall comply with the requirements of 3.3. The dimensions t , as indicated in Figure 2, shall be not less than

the minimum thickness of the barrel of the stub-end, except that in the case of a large male facing the dimension t shall be not less than 6,4 mm.

3.5 Tolerances on flange facings

The tolerance on the inside and outside diameters of all facings other than the ring-joint type is $\pm 0,4$ mm.

The tolerances on ring-joint facings are given in Tables 4 to 10.

3.6 Flange bolting

For each class and size of flange included in this International Standard, the number of bolts, their size and the bolt circle diameter shall be as given in Tables 13, 15, 17, 19, 21, 23 and 25.

Bolt holes shall be evenly pitched around the bolt circle, and where flanges constitute the end connections of fabricated fittings, or pipe bends, or the permanent connections of other pieces of equipment, the holes shall be pitched evenly off the centre lines.

All bolt holes shall be drilled with either metric or inch standard drills as listed in Tables 13, 15, 17, 19, 21, 23 and 25.

3.7 Spot-facing and back-facing of flanges

All cast and forged steel flanges need not be spot-faced or back-faced, provided that the bearing surfaces for the nuts are parallel to the flange face within 1° . Any back-facing or spot-facing required to accomplish this shall not reduce the flange thickness to less than the minimum specified in this International Standard. The finished thickness may exceed the specified minimum by not more than 3,2 mm for any flange up to and including 18 in nominal size and by not more than 4,8 mm for any flange above 18 in nominal size.

The diameter of a spot-facing shall be not less than the dimension across the corners of the appropriate nut plus 3,2 mm. When a spot-facing cuts into the fillet of a flange, its diameter shall not exceed the dimension across the corners of the nut by more than 4,8 mm.

When a flange is back-faced, the fillet may be reduced but shall not be eliminated entirely. A sharp corner at the junction of a flange and its hub shall not be permitted.

3.8 Screwed flanges

Screwed flanges shall have dimensions in accordance with Tables 12, 14, 16, 18, 20, 22 and 24. The threads of screwed flanges shall conform to API Standard 5B¹⁾ or ANSI Standard B2.1²⁾ to mate with pipe to API Standard 5L¹⁾. Threads shall extend to the flange face in order to provide for the length of pipe thread specified in Annex D.

Threads shall be concentric with the axis of the flange. Variations in alignment shall not exceed 5 mm/m.

The hubs of the flanges shall be cylindrical or, alternatively, shall have a draft of not more than 7° on the outside surface for forging purposes.

Class 150 flanges shall be made without a counter-bore but, to ensure easy entrance when making a joint and to protect the threads, the latter shall be chamfered, at the back of the flange, to an angle of approximately 45° . The chamfer shall be concentric with the thread, shall have a major diameter approximately equal to the major diameter of the thread, and shall be included in the measurement of the thread length.

Class 300, 400, 600, 900 and 2 500 flanges shall be provided with a counter-bore as indicated in the tables and, to ensure easy entrance when making a joint, the thread shall be chamfered to an angle of approximately 45° at the bottom of the counter-bore. The chamfer shall be concentric with the thread and shall have a major diameter equal to that of the counter-bore.

For reducing screwed flanges see 3.11.

The following are the tolerances on screwed flanges :

3.8.1 On the counter-bore diameter (dimension Q)

Nominal sizes 10 in and smaller : $\begin{matrix} + 0,8 \text{ mm} \\ 0 \end{matrix}$

Nominal sizes 12 in and larger : $\begin{matrix} + 1,6 \text{ mm} \\ 0 \end{matrix}$

3.8.2 On the flange thickness (dimension C)

Nominal sizes 18 in and smaller : $\begin{matrix} + 3,2 \text{ mm} \\ 0 \end{matrix}$

Nominal sizes 20 in and larger : $\begin{matrix} + 4,8 \text{ mm} \\ 0 \end{matrix}$

3.9 Slip-on welding, socket-welding and lapped-type flanges

Slip-on welding, socket-welding and lapped-type flanges shall have dimensions in accordance with Tables 12, 14, 16, 18, 20, 22 and 24.

The hubs of the flanges shall be cylindrical or, alternatively, shall have a draft of not more than 7° on the outside surface for forging purposes.

The following are the tolerances on slip-on welding, socket-welding and lapped-type flanges :

3.9.1 On the flange bore and socket diameter (dimension B)

Nominal sizes 10 in and smaller : $\begin{matrix} + 0,8 \text{ mm} \\ 0 \end{matrix}$

Nominal sizes 12 in and larger : $\begin{matrix} + 1,6 \text{ mm} \\ 0 \end{matrix}$

1) American Petroleum Institute Standards 5B, *Threading, gauging and thread inspection of casing, tubing and line pipe threads*, and 5L, *Line pipe*.

2) American National Standards Institute specification B2.1, *Pipe threads (except Dryseal)*.

3.9.2 On the flange thickness (dimension C)

Nominal sizes 18 in and smaller : $\begin{matrix} + 3,2 \text{ mm} \\ 0 \end{matrix}$

Nominal sizes 20 in and larger : $\begin{matrix} + 4,8 \text{ mm} \\ 0 \end{matrix}$

3.10 Welding-neck flanges

Welding-neck flanges shall have dimensions in accordance with Tables 12, 14, 16, 18, 20, 22 and 24. The welding ends of the hubs shall conform to the contours given in Figure 3 and shall be cylindrical or, alternatively, shall have a draft of not more than 7° on the outside surface for forging purposes.

The following are the tolerances on welding-neck flanges :

3.10.1 On the flange bore (dimensions B)

Nominal sizes 10 in and smaller : $\pm 0,8 \text{ mm}$

Nominal sizes 12 to 18 in inclusive : $\pm 1,6 \text{ mm}$

Nominal sizes 20 in and larger : $\begin{matrix} + 3,2 \\ - 1,6 \end{matrix} \text{ mm}$

3.10.2 On the flange thickness (dimension C)

Nominal sizes 18 in and smaller : $\begin{matrix} + 3,2 \text{ mm} \\ 0 \end{matrix}$

Nominal sizes 20 in and larger : $\begin{matrix} + 4,8 \text{ mm} \\ 0 \end{matrix}$

3.10.3 On the outside diameter of the welding end of the hub (dimension A)

Nominal sizes 5 in and smaller : $\begin{matrix} + 2,4 \\ - 0,8 \end{matrix} \text{ mm}$

Nominal sizes 6 in and larger : $\begin{matrix} + 4,0 \\ - 0,8 \end{matrix} \text{ mm}$

3.10.4 On the overall length through the hub (dimension Y)

Nominal sizes 10 in and smaller : $\pm 1,6 \text{ mm}$

Nominal sizes 12 in and larger : $\pm 3,2 \text{ mm}$

Regardless of the tolerances specified in 3.10.1 and 3.10.3 above, the thickness of the welding end of a hub shall be not less than 87,5 % of the nominal thickness of the pipe to which the flange is to be attached.

3.11 Concentric reducing screwed flanges

A concentric reducing screwed flange shall be designated by the two nominal pipe sizes and the pressure class, for example 2 in X 1 in — Class 300.

The facing and flange dimensions and the bolting of such a flange shall be the same as those applicable to a normal standard flange of the same outside diameter and pressure class.

The minimum effective thread length (T in the drawings above Table 2) shall be at least equal to that of a normal standard flange of the same bore and pressure class, but the thread need not necessarily extend to the face of the flange as is required for a standard flange.

The hub dimensions shall be the same as those of a normal standard flange of the next size smaller in outside diameter in the same pressure class.

A hub need not be supplied where the reduced bore is small relative to the outside diameter of the flange, and Table 2 gives for each nominal size of standard flange the smallest nominal size of reduced bore for which a hub is required. Where reduced bores smaller than those given in Table 2 are required, blank (blind) flanges, with or without hub and suitably tapped, may be used.

Class 150 reducing screwed flanges need not be counter-bored but shall be chamfered as provided for in 3.8. Flanges of class 300 and higher, whether of the hub type or blank (blind) type, shall be counter-bored as specified in 3.8 for corresponding normal standard flanges, except that the depth of counter-bore shall be 6,4 mm for a tapping of 2 in nominal size or smaller and 9,5 mm for a tapping of 2 1/2 in nominal size or larger. The tolerances applicable to normal standard flanges apply also to the reducing flanges.

3.12 Concentric reducing slip-on welding and socket-welding flanges

A concentric reducing slip-on welding flange or a concentric reducing socket-welding flange shall be designated by the two nominal pipe sizes and the pressure class.

The facing and flange dimensions and the bolting of a flange of either of these types shall be the same as those of a normal standard flange of the same outside diameter and pressure class. The hub dimensions shall be the same as those applicable to a normal standard flange of the next size smaller in outside diameter in the same pressure class. The dimensions of the reduced bore shall correspond in all respects with those of a normal standard flange of the same bore and pressure class.

The tolerances applicable to normal standard flanges also apply to the reducing flanges referred to in this clause.

3.13 Concentric reducing welding-neck flanges

A concentric reducing welding-neck flange shall be designated by the nominal size of the reduced bore, the outside diameter of the flange and the pressure class.

The facing and flange dimensions and the bolting of such a flange shall be the same as those of a normal standard flange of the same outside diameter and pressure class. The hub dimensions and bore shall correspond in all respects with those applicable to a normal standard welding-neck flange of the same (reduced) bore and pressure class.

The tolerances applicable to normal standard welding-neck flanges also apply to the reducing flanges referred to in this clause.

3.14 Blank (blind) flanges

Blank flanges shall have dimensions in accordance with Tables 12, 14, 16, 18, 20, 22 and 24. They may be supplied with or without hubs at the manufacturer's option.

When the centre part of the face of a blank flange is recessed, at no point shall the recess reduce the thickness of the flange below the minimum given in Tables 16, 18, 20, 22 and 24. The bottom of the recess need not be machined.

When the centre part of the face of a blank flange is raised, the raised part shall have a diameter at least 25 mm smaller than the diameter specified for the recess in Tables 12, 14, 16, 18, 20, 22 and 24.

4 TESTS

This International Standard does not make provision for the pressure testing of loose flanges. These may be tested after attachment to pipe or equipment. The test pressure will then depend on the requirements of the appropriate standard or code in accordance with which the equipment has been fabricated.

Test pressures for integral flanges, for example end flanges of valves, shall be in accordance with those specified in the relevant specifications.

5 INSPECTION

5.1 Inspection arrangements

The purchaser or his representative shall have free access, at all reasonable times, to those parts of the manufacturer's works actually engaged upon his contract and shall be at liberty to inspect, at any stage of manufacture, the materials covered by such contract. He shall be at liberty to reject any material which does not comply with the requirements of this International Standard.

When the purchaser or his representative desires to witness the specified tests on the materials covered by the contract, the manufacturer shall notify him sufficiently in advance of the tests to enable him to be present.

5.2 Repair of defects

Defects which do not impair the strength of the flanges may be welded by a procedure approved by the purchaser. They shall be cleaned out to sound metal before welding, and shall be submitted to the purchaser's inspector for approval in this condition, after which they may be welded if the purchaser so agrees. After welding, flanges shall be heat-treated, except that welds required only for finish and appearance need not be heat-treated, if this is approved by the purchaser. When the welding of defects is permitted, the welding rod shall be such as to produce a weld having characteristics similar to the parent metal.

6 MARKING

Each steel flange produced in conformity with this International Standard shall be marked in accordance with the requirements of Annex B.

7 PREPARATION AND DESPATCH

7.1 Preparation

After inspection and before despatch, flanges shall, if necessary, be dried and cleaned. Painting of finished flanges shall be optional to the manufacturer, unless otherwise specified by the purchaser.

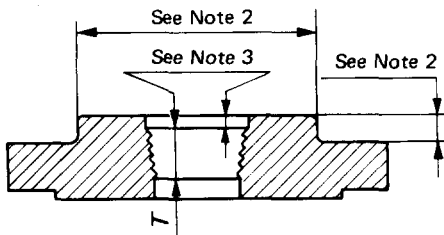
Threaded and machined surfaces shall be well covered with an approved rust-inhibiting product.

Exposed faces of flanges shall be protected over their entire surface with a suitable close-fitting protector securely attached at not less than four points. The type of protector and method of attachment shall be approved by the purchaser.

7.2 Despatch

Flanges shall be bundled by bolting them together or securing them with wire of suitable strength passed through the bolt holes in such a manner that the flanges are paired and no flange facings remain exposed.

Other methods of preparation for despatch shall be subject to agreement between purchaser and manufacturer.



Hub type flange

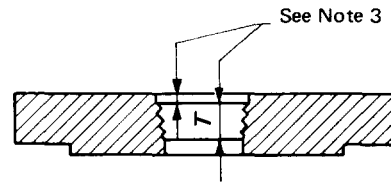
Blank (blind) flange
(Screwed as allowed by Note 2)

TABLE 2 — Reducing screwed flanges, Classes 150 to 2 500

Nominal pipe size appropriate to the diameter of the flange	Smallest nominal size of reduced bore requiring hub (see Note 2)
1	1/2
(1 1/4)	1/2
1 1/2	1/2
2	1
(2 1/2)	1 1/4
3	1 1/4
(3 1/2)	1 1/2
4	1 1/2
(5)	1 1/2
6	2 1/2
8	3
10	3 1/2
12	3 1/2
14	3 1/2
16	4
18	4
20	4
24	4

NOTES

1 This table shall be read in conjunction with clause 3.11.

2 A hub is required if the nominal size of the reduced bore is equal to or greater than the size given in the above table against the nominal pipe size appropriate to the outside diameter of the flange. Otherwise a blank (blind) flange, suitably tapped, may be used.

The nominal pipe size appropriate to a flange of a given outside diameter and pressure class may be found by reference to the table of standard flanges of the same pressure class. (See Tables 12, 14, 16, 18, 20, 22 and 24.)

Hub dimensions shall conform to the provisions of clause 3.11.

3 The threading and counter-bore, etc., shall conform to the provisions of clauses 3.8 and 3.11.

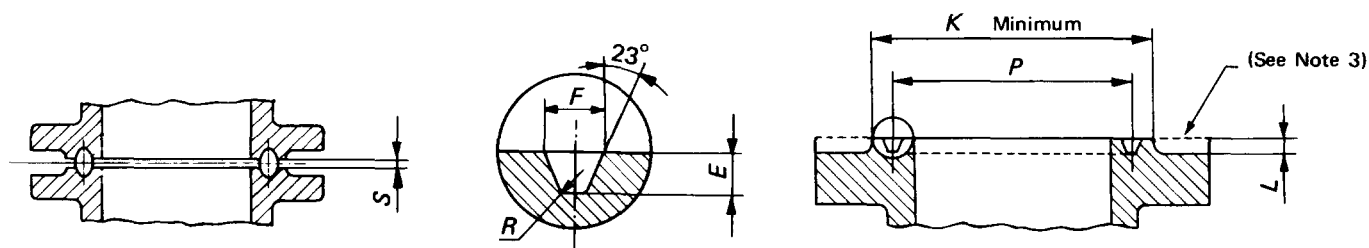
4 The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.

TABLE 3 — Facing dimensions for flanges other than ring-joint, Classes 150 to 2 500
(See Notes 1 and 2)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nominal pipe size	Outside diameter (see Note 3)			Inside diameter of large and small tongue (see Note 3)	Outside diameter of recess or groove (see Note 3)			Inside diameter of large and small groove (see Note 3)	Height		Depth of female or groove	Minimum outside diameter of raised portion (See Note 4)	
	Raised face, large male and large tongue (see Note 5)	Small male	Small tongue		Large female and large groove (see Note 5)	Small female	Small groove		Raised face Classes 150 and 300	Raised face Classes 400 to 2 500 Large and small male and tongue, all classes (see Note 5)		Small female and small groove	Large female and large groove (see Note 5)
	R	S	T		W	X	Y		Z			K	L
in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2	35	18,3	34,9	25,4	36,5	19,8	36,5	23,8	1,6	6,4	4,8	45	46
3/4	43	23,8	42,9	33,3	44,4	25,4	44,4	31,7	1,6	6,4	4,8	52	54
1	51	30,2	47,6	38,1	52,4	31,7	49,2	36,5	1,6	6,4	4,8	57	62
(1 1/4)	64	38,1	57,1	47,6	65,1	39,7	58,7	46,0	1,6	6,4	4,8	67	75
1 1/2	73	44,4	63,5	54,0	74,6	46,0	65,1	52,4	1,6	6,4	4,8	73	84
2	92	57,1	82,5	73,0	93,7	58,7	84,1	71,4	1,6	6,4	4,8	92	103
(2 1/2)	105	68,3	95,2	85,7	106,4	69,8	96,8	84,1	1,6	6,4	4,8	105	116
3	127	84,1	117,5	107,9	128,6	85,7	119,1	106,4	1,6	6,4	4,8	127	138
(3 1/2)	140	96,8	130,2	120,6	141,3	98,4	131,8	119,1	1,6	6,4	4,8	140	151
4	157	109,5	144,5	131,8	158,8	111,1	146,0	130,2	1,6	6,4	4,8	157	168
(5)	186	136,5	173,0	160,3	187,3	138,1	174,6	158,7	1,6	6,4	4,8	186	197
6	216	161,9	203,2	190,5	217,5	163,5	204,8	188,9	1,6	6,4	4,8	216	227
8	270	212,7	254,0	238,1	271,5	214,3	255,6	236,5	1,6	6,4	4,8	270	281
10	324	266,7	304,8	285,7	325,4	268,3	306,4	284,1	1,6	6,4	4,8	324	335
12	381	317,5	361,9	342,9	382,6	319,1	363,5	341,3	1,6	6,4	4,8	381	392
14	413	349,2	393,7	374,6	414,3	350,8	395,3	373,1	1,6	6,4	4,8	413	424
16	470	400,0	447,7	425,4	471,5	401,6	449,2	423,9	1,6	6,4	4,8	470	481
18	533	450,8	511,2	488,9	535,0	452,4	512,8	487,4	1,6	6,4	4,8	533	545
20	584	501,6	558,8	533,4	585,8	503,2	560,4	531,8	1,6	6,4	4,8	584	595
24	692	603,2	666,8	641,3	693,7	604,8	668,3	639,8	1,6	6,4	4,8	692	703

NOTES

- 1 This table shall read in conjunction with clauses 3.3, 3.4 and 3.5 and Figures 1 and 2.
- 2 For ring-joint facing dimensions see Tables 4 to 10.
- 3 For tolerances see clause 3.5.
- 4 A flange with large or small female or a large or small groove facing may be supplied with the outside diameter of the raised portion to dimension *K* or *L* in Column 13 or 14 above as appropriate, or full-faced, i.e. with the raised portion extending to the flange, at the option of the manufacturer unless otherwise specified by the purchaser.
- 5 Large male and female faces are not applicable to Class 150 because of potential dimensional conflicts.
- 6 The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.



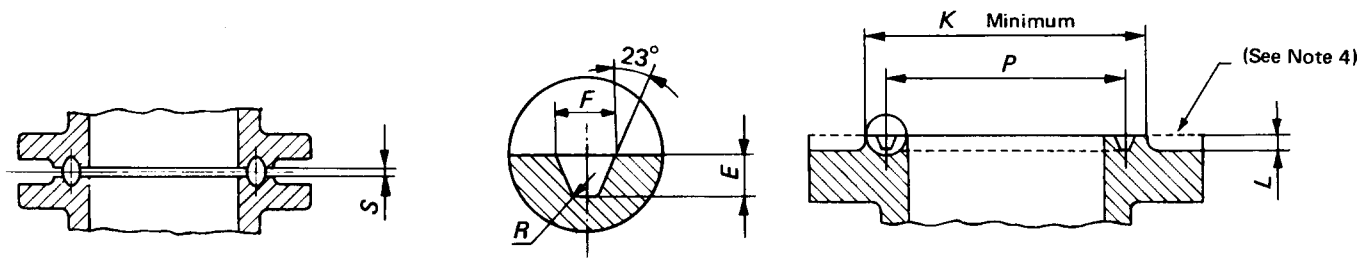
TOLERANCES

On E (depth) $+0,4$ mm
0On F (width) $\pm 0,2$ mmOn P (pitch diameter) $\pm 0,13$ mmOn R (radius at bottom) max.On 23° (angle) $\pm 30'$ TABLE 4 — Dimensions of ring-joint facings, Class 150
(See Note 1)

1	2	3	4	5	6	7	8
Nominal pipe size	Pitch diameter of groove P	Width of groove F	Depth of groove E Height of raised portion L (See Note 4) E and L	Diameter of raised portion (See Note 3) K	Radius at bottom of groove R	Ring number (See Table 11)	Approximate distance between flanges when ring is compressed (See Note 2) S
in	mm	mm	mm	mm	mm		mm
1	47,6	8,7	6,4	63,5	1,0	R. 15	4,0
(1 1/4)	57,2	8,7	6,4	73,0	1,0	R. 17	4,0
1 1/2	65,1	8,7	6,4	82,6	1,0	R. 19	4,0
2	82,6	8,7	6,4	101,6	1,0	R. 22	4,0
(2 1/2)	101,6	8,7	6,4	120,6	1,0	R. 25	4,0
3	114,3	8,7	6,4	133,4	1,0	R. 29	4,0
(3 1/2)	131,8	8,7	6,4	154,0	1,0	R. 33	4,0
4	149,2	8,7	6,4	171,4	1,0	R. 36	4,0
(5)	171,4	8,7	6,4	193,7	1,0	R. 40	4,0
6	193,7	8,7	6,4	219,1	1,0	R. 43	4,0
8	247,6	8,7	6,4	273,0	1,0	R. 48	4,0
10	304,8	8,7	6,4	330,2	1,0	R. 52	4,0
12	381,0	8,7	6,4	406,4	1,0	R. 56	4,0
14	396,9	8,7	6,4	425,4	1,0	R. 59	3,0
16	454,0	8,7	6,4	482,6	1,0	R. 64	3,0
18	517,5	8,7	6,4	546,1	1,0	R. 68	3,0
20	558,8	8,7	6,4	596,9	1,0	R. 72	3,0
24	673,1	8,7	6,4	711,2	1,0	R. 76	3,0

NOTES

- This table shall be read in conjunction with clauses 3.3 and 3.4 and Figures 1 and 2.
- When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.
- Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.
- Height L is equal to depth E but not subject to the tolerance on E .
- The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.



TOLERANCES

- On *E* (depth) $+ 0,4 \text{ mm}$
 0
- On *R* (radius at bottom) max.
- On *F* (width) $\pm 0,2 \text{ mm}$
- On 23° (angle) $\pm 30'$
- On *P* (pitch diameter) $\pm 0,13 \text{ mm}$

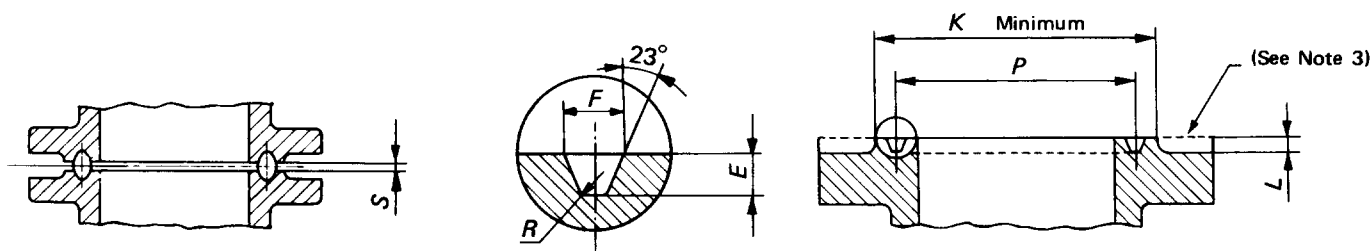
TABLE 5 — Dimensions of ring-joint facings, Class 300
(See Note 1)

1	2	3	4	5	6	7	8
Nominal pipe size	Pitch diameter of groove <i>P</i>	Width of groove <i>F</i>	Depth of groove <i>E</i> Height of raised portion <i>L</i> (See Note 5) <i>E</i> and <i>L</i>	Diameter of raised portion (See Note 4) <i>K</i>	Radius at bottom of groove <i>R</i>	Ring number (See Note 2 and Table 11)	Approximate distance between flanges when ring is compressed (See Note 3) <i>S</i>
in	mm	mm	mm	mm	mm		mm
1/2	34,1	7,1	5,6	50,8	1,0	R. 11	3,2
3/4	42,9	8,7	6,4	63,5	1,0	R. 13	4,0
1	50,8	8,7	6,4	69,8	1,0	R. 16	4,0
(1 1/4)	60,3	8,7	6,4	79,4	1,0	R. 18	4,0
1 1/2	68,3	8,7	6,4	90,5	1,0	R. 20	4,0
2	82,6	11,9	7,9	108,0	1,0	R. 23	5,6
(2 1/2)	101,6	11,9	7,9	127,0	1,0	R. 26	5,6
3	123,8	11,9	7,9	146,0	1,0	R. 31*	5,6
(3 1/2)	131,8	11,9	7,9	158,8	1,0	R. 34	5,6
4	149,2	11,9	7,9	174,6	1,0	R. 37	5,6
(5)	181,0	11,9	7,9	209,6	1,0	R. 41	5,6
6	211,1	11,9	7,9	241,3	1,0	R. 45	5,6
8	269,9	11,9	7,9	301,6	1,0	R. 49	5,6
10	323,8	11,9	7,9	355,6	1,0	R. 53	5,6
12	381,0	11,9	7,9	412,8	1,0	R. 57	5,6
14	419,1	11,9	7,9	457,2	1,0	R. 61	5,6
16	469,9	11,9	7,9	508,0	1,0	R. 65	5,6
18	533,4	11,9	7,9	574,7	1,0	R. 69	5,6
20	584,2	13,5	9,5	635,0	2,0	R. 73	5,6
24	692,2	16,7	11,1	749,3	2,0	R. 77	6,3

• See Note 2.

NOTES

- This table shall be read in conjunction with clauses 3.3 and 3.4 and Figures 1 and 2.
- In the 3 in nominal pipe size, for ring-joints with lapped flanges, the pitch diameter of the ring shall be 117,5 mm instead of 123,8 mm and the ring number shall be R. 30 instead of R. 31.
- When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.
- Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.
- Height *L* is equal to depth *E* but not subject to the tolerance on *E*.
- The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.



TOLERANCES

On E (depth) $+0,4$ mm
0On R (radius at bottom) max.On E (width) $\pm 0,2$ mmOn 23° (angle) $\pm 30'$ On P (pitch diameter) $\pm 0,13$ mm

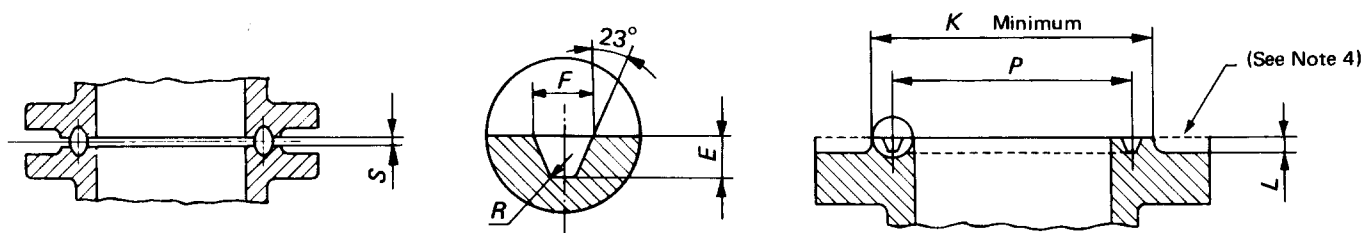
TABLE 6 – Dimensions of ring-joint facings, Class 400

(See Note 1)

1	2	3	4	5	6	7	8
Nominal pipe size	Pitch diameter of groove P	Width of groove F	Depth of groove E Height of raised portion L (See Note 4) E and L	Diameter of raised portion (See Note 3) K	Radius at bottom of groove R	Ring number (See Table 11)	Approximate distance between flanges when ring is compressed (See Note 2) S
in	mm	mm	mm	mm	mm		mm
1/2 3/4 1 (1 1/4) 1 1/2 2 (2 1/2) 3 (3 1/2)			For these sizes Class 600 flanges are used				
4 (5) 6 8 10 12 14 16 18 20 24	149,2 181,0 211,1 269,9 323,8 381,0 419,9 469,9 533,4 584,2 692,2	11,9 11,9 11,9 11,9 11,9 11,9 11,9 11,9 11,9 13,5 16,7	7,9 7,9 7,9 7,9 7,9 7,9 7,9 7,9 7,9 9,5 11,1	174,6 209,6 241,3 301,6 355,6 412,8 457,2 508,0 574,7 635,0 749,3	1,0 1,0 1,0 1,0 1,0 1,0 1,0 1,0 1,0 2,0 2,0	R. 37 R. 41 R. 45 R. 49 R. 53 R. 57 R. 61 R. 65 R. 69 R. 73 R. 77	5,6 5,6 5,6 5,6 5,6 5,6 5,6 5,6 5,6 5,6 6,3

NOTES

- 1 This table shall be read in conjunction with clauses 3.3 and 3.4 and Figures 1 and 2.
- 2 When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.
- 3 Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.
- 4 Height L is equal to depth E but not subject to the tolerance on E .
- 5 The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.



TOLERANCES

On E (depth) $+0,4$ mm
0On R (radius at bottom) max.On 23° (angle) $\pm 30'$ On F (width) $\pm 0,2$ mmOn P (pitch diameter) $\pm 0,13$ mm

TABLE 7 — Dimensions of ring-joint facings, Class 600

(See Note 1)

1	2	3	4	5	6	7	8
Nominal pipe size	Pitch diameter of groove	Width of groove	Depth of groove E Height of raised portion L (See Note 5)	Diameter of raised portion (See Note 4)	Radius at bottom of groove	Ring number (See Note 2 and Table 11)	Approximate distance between flanges when ring is compressed (See Note 3)
P	F	E and L	K	R	S		
in	mm	mm	mm	mm	mm		mm
1/2	34,1	7,1	5,6	50,8	1,0	R. 11	3,2
3/4	42,9	8,7	6,4	63,5	1,0	R. 13	4,0
1	50,8	8,7	6,4	69,8	1,0	R. 16	4,0
(1 1/4)	60,3	8,7	6,4	79,4	1,0	R. 18	4,0
1 1/2	68,3	8,7	6,4	90,5	1,0	R. 20	4,0
2	82,6	11,9	7,9	108,0	1,0	R. 23	4,8
(2 1/2)	101,6	11,9	7,9	127,0	1,0	R. 26	4,8
3	123,8	11,9	7,9	146,0	1,0	R. 31*	4,8
(3 1/2)	131,8	11,9	7,9	158,8	1,0	R. 34	4,8
4	149,2	11,9	7,9	174,6	1,0	R. 37	4,8
(5)	181,0	11,9	7,9	209,6	1,0	R. 41	4,8
6	211,1	11,9	7,9	241,3	1,0	R. 45	4,8
8	269,9	11,9	7,9	301,6	1,0	R. 49	4,8
10	323,8	11,9	7,9	355,6	1,0	R. 53	4,8
12	381,0	11,9	7,9	412,8	1,0	R. 57	4,8
14	419,1	11,9	7,9	457,2	1,0	R. 61	4,8
16	469,9	11,9	7,9	508,0	1,0	R. 65	4,8
18	533,4	11,9	7,9	574,7	1,0	R. 69	4,8
20	584,2	13,5	9,5	635,0	2,0	R. 73	4,8
24	692,2	16,7	11,1	749,3	2,0	R. 77	5,6

* See Note 2.

NOTES

1 This table shall be read in conjunction with clauses 3.3 and 3.4 and Figures 1 and 2.

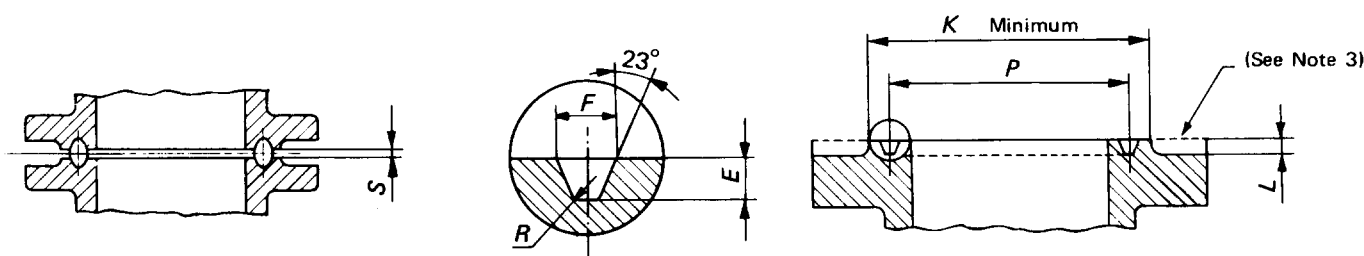
2 In the 3 in nominal pipe size, for ring-joints with lapped flanges, the pitch diameter of the ring shall be 117,5 mm instead 123,8 mm and the ring number shall be R. 30 instead of R. 31.

3 When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.

4 Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.

5 Height L is equal to depth E but not subject to the tolerance on E .

6 The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.



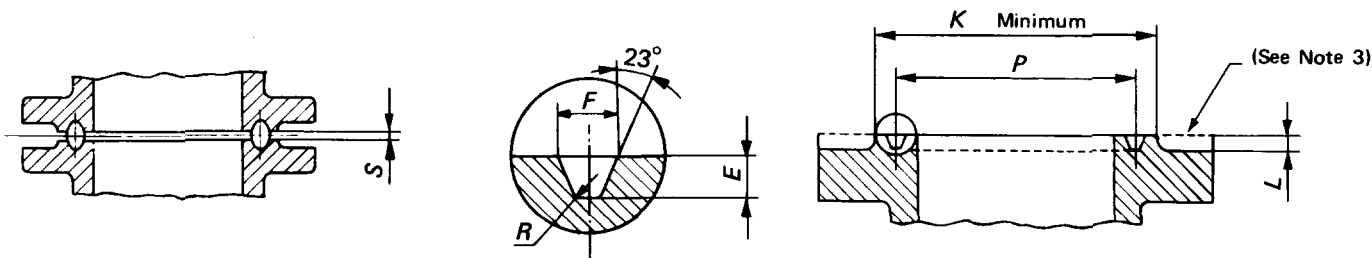
TOLERANCES

On E (depth) $+0,4$ mm
0On F (width) $\pm 0,2$ mmOn P (pitch diameter) $\pm 0,13$ mmOn R (radius at bottom) max.On 23° (angle) $\pm 30'$ TABLE 8 – Dimensions of ring-joint facings, Class 900
(See Note 1)

1	2	3	4	5	6	7	8
Nominal pipe size	Pitch diameter of groove P	Width of groove F	Depth of groove E Height of raised portion L (See Note 4) E and L	Diameter of raised portion (See Note 3) K	Radius at bottom of groove R	Ring number (See Table 11)	Approximate distance between flanges when ring is compressed (See Note 2) S
in	mm	mm	mm	mm	mm		mm
1/2 3/4 1 (1 1/4) 1 1/2 2 (2 1/2)			For these sizes Class 1 500 flanges are used				
3	123,8	11,9	7,9	155,6	1,0	R. 31	4,0
4	149,2	11,9	7,9	181,0	1,0	R. 37	4,0
(5)	181,0	11,9	7,9	215,9	1,0	R. 41	4,0
6	211,1	11,9	7,9	241,3	1,0	R. 45	4,0
8	269,9	11,9	7,9	308,0	1,0	R. 49	4,0
10	323,8	11,9	7,9	362,0	1,0	R. 53	4,0
12	381,0	11,9	7,9	419,1	1,0	R. 57	4,0
14	419,1	16,7	11,1	466,7	2,0	R. 62	4,0
16	469,9	16,7	11,1	523,9	2,0	R. 66	4,0
18	533,4	19,8	12,7	593,7	2,0	R. 70	4,8
20	584,2	19,8	12,7	647,7	2,0	R. 74	4,8
24	692,2	27,0	15,9	771,5	2,0	R. 78	5,6

NOTES

- 1 This table shall be read in conjunction with clauses 3.3 and 3.4 and Figures 1 and 2.
- 2 When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.
- 3 Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.
- 4 Height L is equal to depth E but not subject to the tolerance on E .
- 5 The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.



TOLERANCES

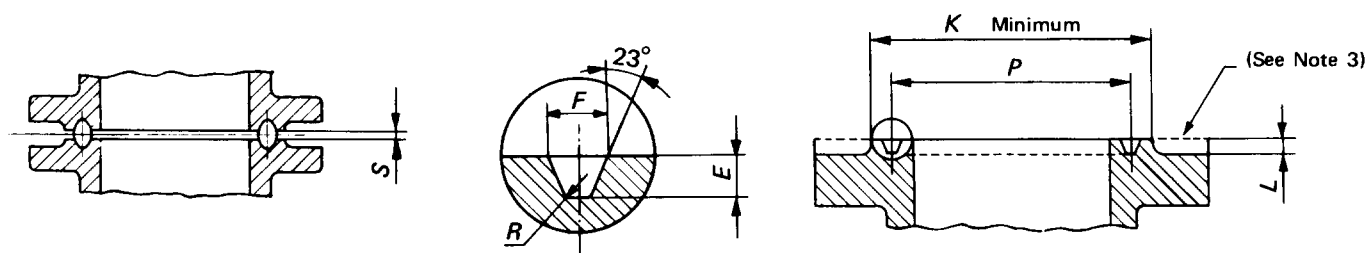
- On *E* (depth) $+ 0,4 \text{ mm}$
 0
- On *F* (width) $\pm 0,2 \text{ mm}$
- On *P* (pitch diameter) $\pm 0,13 \text{ mm}$
- On *R* (radius at bottom) max.
- On 23° (angle) $\pm 30'$

TABLE 9 — Dimensions of ring-joint facings, Class 1 500
(See Note 1)

1	2	3	4	5	6	7	8
Nominal pipe size	Pitch diameter of groove <i>P</i>	Width of groove <i>F</i>	Depth of groove <i>E</i> Height of raised portion <i>L</i> (See Note 4) <i>E</i> and <i>L</i>	Diameter of raised portion (See Note 3) <i>K</i>	Radius at bottom of groove <i>R</i>	Ring number (See Table 11)	Approximate distance between flanges when ring is compressed (See Note 2) <i>S</i>
in	mm	mm	mm	mm	mm		mm
1/2	39,7	8,7	6,4	60,3	1,0	R. 12	4,0
3/4	44,4	8,7	6,4	66,7	1,0	R. 14	4,0
1	50,8	8,7	6,4	71,4	1,0	R. 16	4,0
(1 1/4)	60,3	8,7	6,4	81,0	1,0	R. 18	4,0
1 1/2	68,3	8,7	6,4	92,1	1,0	R. 20	4,0
2	95,2	11,9	7,9	123,8	1,0	R. 24	3,2
(2 1/2)	108,0	11,9	7,9	136,5	1,0	R. 27	3,2
3	136,5	11,9	7,9	168,3	1,0	R. 35	3,2
4	161,9	11,9	7,9	193,7	1,0	R. 39	3,2
(5)	193,7	11,9	7,9	228,6	1,0	R. 44	3,2
6	211,1	13,5	9,5	247,6	2,0	R. 46	3,2
8	269,9	16,7	11,1	317,5	2,0	R. 50	4,0
10	323,8	16,7	11,1	371,5	2,0	R. 54	4,0
12	381,0	23,0	14,3	438,1	2,0	R. 58	4,0
14	419,1	27,0	15,9	488,9	2,0	R. 63	5,6
16	469,9	30,2	17,5	546,1	2,0	R. 67	7,9
18	533,4	30,2	17,5	612,8	2,0	R. 71	7,9
20	584,2	33,3	17,5	673,1	2,0	R. 75	9,5
24	692,2	36,5	20,6	793,7	2,0	R. 79	11,1

NOTES

- 1 This table shall be read in conjunction with clauses 3.3 and 3.4 and Figures 1 and 2.
- 2 When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.
- 3 Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.
- 4 Height *L* is equal to depth *E* but not subject to the tolerance on *E*.
- 5 The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.



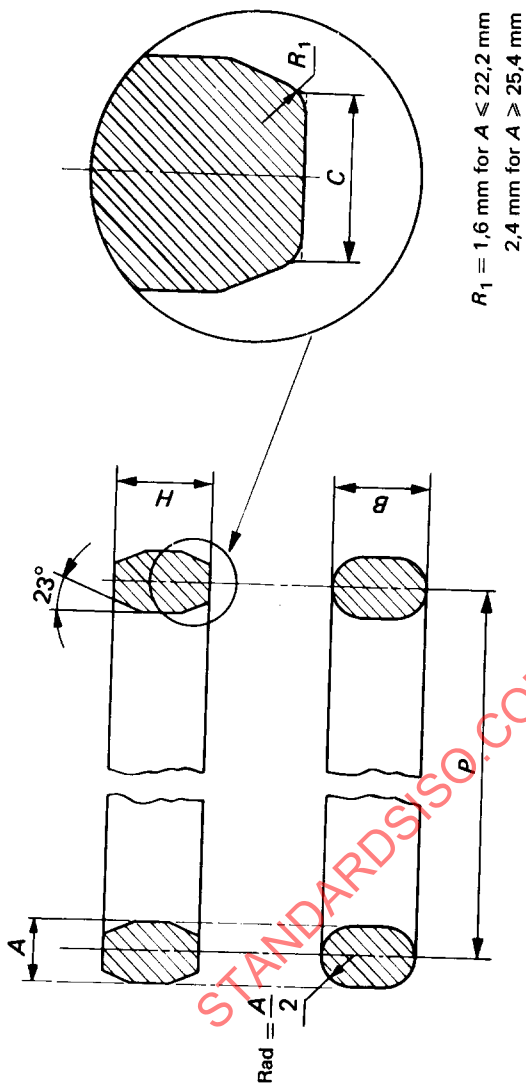
TOLERANCES

On E (depth) $+0,4 \text{ mm}$
 0 On F (width) $\pm 0,2 \text{ mm}$ On P (pitch diameter) $\pm 0,13 \text{ mm}$ On R (radius at bottom) max.On 23° (angle) $\pm 30'$ TABLE 10 — Dimensions of ring-joint facings, Class 2 500.
(See Note 1)

1	2	3	4	5	6	7	8
Nominal pipe size	Pitch diameter of groove P	Width of groove F	Depth of groove E Height of raised portion L (See Note 4) E and L	Diameter of raised portion (See Note 3) K	Radius at bottom of groove R	Ring number (See Table 11)	Approximate distance between flanges when ring is compressed (See Note 2) S
in	mm	mm	mm	mm	mm		mm
1/2	42,9	8,7	6,4	65,1	1,0	R. 13	4,0
3/4	50,8	8,7	6,4	73,0	1,0	R. 16	4,0
1	60,3	8,7	6,4	82,6	1,0	R. 18	4,0
(1 1/4)	72,2	11,9	7,9	101,6	1,0	R. 21	3,2
1 1/2	82,6	11,9	7,9	114,3	1,0	R. 23	3,2
2	101,6	11,9	7,9	133,4	1,0	R. 26	3,2
(2 1/2)	111,1	13,5	9,5	149,2	2,0	R. 28	3,2
3	127,0	13,5	9,5	168,3	2,0	R. 32	3,2
4	157,2	16,7	11,1	203,2	2,0	R. 38	4,0
(5)	190,5	19,8	12,7	241,3	2,0	R. 42	4,0
6	228,6	19,8	12,7	279,4	2,0	R. 47	4,0
8	279,4	23,0	14,3	339,7	2,0	R. 51	4,8
10	342,9	30,2	17,5	425,4	2,0	R. 55	6,3
12	406,4	33,3	17,5	495,3	2,0	R. 60	7,9

NOTES

- This table shall be read in conjunction with clauses 3.3 and 3.4 and Figures 1 and 2.
- When calculating the laying length of a pipe provided with ring-joints the appropriate dimension in Column 8 should be added to the overall length of the pipe.
- Raised portion or full-face may be supplied unless specified in the order. This does not apply to lapped joints.
- Height L is equal to depth E but not subject to the tolerance on E .
- The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.



$R_1 = 1,6 \text{ mm}$ for $A \leq 22,2 \text{ mm}$
 $2,4 \text{ mm}$ for $A \geq 25,4 \text{ mm}$

The presence of a small forging fin, located so that it does not prevent the ring from seating properly in the groove, is not objectionable.

TOLERANCES

P	(average pitch diameter of ring)	$\pm 0,18 \text{ mm}$
A	(width of ring section)	$\pm 0,2 \text{ mm}$
C	(width of flat of octagonal ring)	$\pm 0,2 \text{ mm}$
B and H	(height of ring section) (See Note 1)	$\pm 0,4 \text{ mm}$
23°	(angle)	$\pm 30'$
R_1	(edge radius of octagonal ring)	$\pm 0,4 \text{ mm}$

NOTES

- 1 A plus tolerance of 1,2 mm for heights B and H is permitted provided that the variation in the height of any given ring does not exceed 0,4 mm throughout its entire circumference.
- 2 When ordering ring-joint gaskets, the purchaser should specify octagonal or oval rings as desired. Either type of ring is suitable for use with flat-bottom grooves, which are standard in this International Standard. Oval rings are required for round-bottom grooves, which are now discontinued.
- 3 The dimensions incorporated in Table 11 are identical with those for corresponding ring numbers in ANSI Standard B 16.20, *Ring-joint gaskets and grooves for steel pipe flanges*.

TABLE 11 — Numbers and dimensions of ring-joint gaskets

1	2	3	4		5	6
			Oval B	Height of ring section H		
Ring Number	Pitch diameter P	Width of ring section A	Height of ring section		Width on flat of octagonal rings C	mm
			Oval B	Octagonal H		
R. 11	34,1	6,4	11,1	9,5	4,3	
R. 12	39,7	7,9	14,3	12,7	5,2	
R. 13	42,9	7,9	14,3	12,7	5,2	
R. 14	44,4	7,9	14,3	12,7	5,2	
R. 15	47,6	7,9	14,3	12,7	5,2	
R. 16	50,8	7,9	14,3	12,7	5,2	
R. 17	57,2	7,9	14,3	12,7	5,2	
R. 18	60,3	7,9	14,3	12,7	5,2	
R. 19	65,1	7,9	14,3	12,7	5,2	
R. 20	68,3	7,9	14,3	12,7	5,2	
R. 21	72,2	11,1	17,5	15,9	7,7	
R. 22	82,6	7,9	14,3	12,7	5,2	
R. 23	82,6	11,1	17,5	15,9	7,7	
R. 24	95,2	11,1	17,5	15,9	7,7	
R. 25	101,6	7,9	14,3	12,7	5,2	
R. 26	101,6	11,1	17,5	15,9	7,7	
R. 27	108,0	11,1	17,5	15,9	7,7	
R. 28	111,1	12,7	19,0	17,5	8,7	
R. 29	114,3	7,9	14,3	12,7	5,2	
R. 30	117,5	11,1	17,5	15,9	7,7	
R. 31	123,8	11,1	17,5	15,9	7,7	
R. 32	127,0	12,7	19,0	17,5	8,7	
R. 33	131,8	7,9	14,3	12,7	5,2	
R. 34	131,8	11,1	17,5	15,9	7,7	
R. 35	136,5	11,1	17,5	15,9	7,7	
R. 36	149,2	7,9	14,3	12,7	5,2	
R. 37	149,2	11,1	17,5	15,9	7,7	
R. 38	157,2	15,9	22,2	20,6	10,5	
R. 39	161,9	11,1	17,5	15,9	7,7	
R. 40	171,4	7,9	14,3	12,7	5,2	
R. 41	181,0	11,1	17,5	15,9	7,7	
R. 42	190,5	19,0	25,4	23,8	12,3	
R. 43	193,7	7,9	14,3	12,7	5,2	
R. 44	193,7	11,1	17,5	15,9	7,7	
R. 45	211,1	11,1	17,5	15,9	7,7	
R. 46	211,1	12,7	19,0	17,5	8,7	
R. 47	228,6	19,0	25,4	23,8	12,3	
R. 48	247,6	7,9	14,3	12,7	5,2	
R. 49	269,9	11,1	17,5	15,9	7,7	
R. 50	269,9	15,9	22,2	20,6	10,5	
R. 51	279,4	22,2	28,6	27,0	14,8	
R. 52	304,8	7,9	14,3	12,7	5,2	
R. 53	323,8	11,1	17,5	15,9	7,7	
R. 54	323,8	15,9	22,2	20,6	10,5	
R. 55	342,9	28,6	36,5	34,9	19,8	
R. 56	381,0	7,9	14,3	12,7	5,2	
R. 57	381,0	11,1	17,5	15,9	7,7	
R. 58	381,0	22,2	28,6	27,0	14,8	
R. 59	369,9	7,9	14,3	12,7	5,2	
R. 60	406,4	31,8	39,7	38,1	22,3	
R. 61	419,1	11,1	17,5	15,9	7,7	
R. 62	419,1	15,9	22,2	20,6	10,5	
R. 63	419,1	25,4	33,3	31,8	17,3	
R. 64	454,0	7,9	14,3	12,7	5,2	
R. 65	469,9	11,1	17,5	15,9	7,7	
R. 66	469,9	15,9	22,2	20,6	10,5	
R. 67	469,9	28,6	36,5	34,9	19,8	
R. 68	517,5	7,9	14,3	12,7	5,2	
R. 69	533,4	11,1	17,5	15,9	7,7	
R. 70	533,4	19,0	25,4	23,8	12,3	
R. 71	533,4	28,6	36,5	34,9	19,8	
R. 72	558,8	7,9	14,3	12,7	5,2	
R. 73	584,2	12,7	19,0	17,5	8,7	
R. 74	584,2	19,1	25,4	23,8	12,3	
R. 75	584,2	31,8	39,7	38,1	22,3	
R. 76	673,1	7,9	14,3	12,7	5,2	
R. 77	692,2	15,9	22,2	20,6	10,5	
R. 78	692,2	25,4	33,3	31,8	17,3	
R. 79	692,2	34,9	44,4	41,3	24,8	

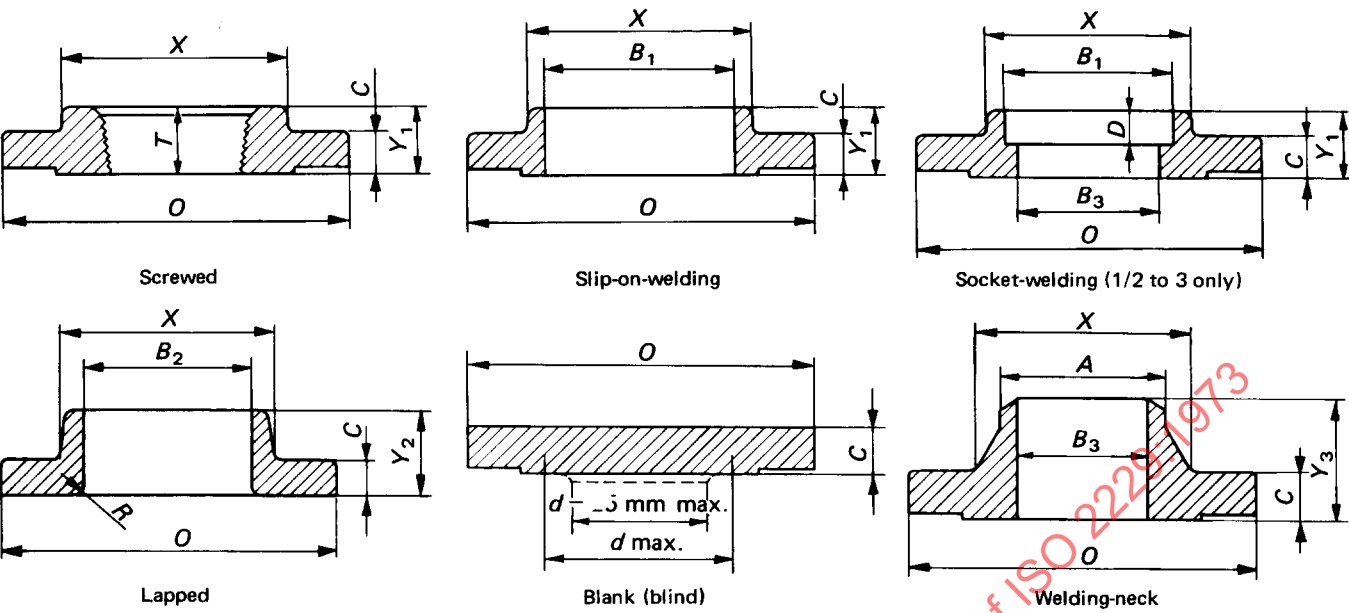


TABLE 12 — Dimensions of flanges, Class 150

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nominal pipe size	Outside diameter of flange	Thickness of flange (min.) (See Note 6)	Diameter of hub	Hub diameter beginning of chamfer welding- neck A	Length through hub			Thread length T	Bore			Corner radius of bore of lapped flange and pipe R	Depth of socket D	Diameter of recess blank (blind) flange (See Note 8) d (max.)
					Screwed slip-on and socket- welding Y ₁	Lapped Y ₂	Welding- neck Y ₃		Slip-on and socket- welding (min.) B ₁	Lapped (min.) B ₂	Welding- neck and socket- welding (See Note 7) B ₃			
in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2	89	11,1	30	21,3	16	16	48	16	22,4	23,0	15,8	3,0	9,5	12,7
3/4	98	12,7	38	26,7	16	16	52	16	27,7	28,0	21,0	3,0	11,0	19,1
1	108	14,3 (11,1)	49	33,4	17	17	56	17	34,5	35,0	26,2	3,0	12,5	25,4
(1 1/4)	117	15,9 (12,7)	59	42,2	21	21	57	21	43,2	43,5	35,1	5,0	14,5	31,8
1 1/2	127	17,5 (14,3)	65	48,3	22	22	62	22	49,5	50,0	40,9	6,5	16,0	38,1
2	152	19,0 (15,9)	78	60,3	25	25	64	25	62,0	62,5	52,5	8,0	17,5	50,8
(2 1/4)	178	22,2 (17,5)	90	73,0	29	29	70	29	74,7	75,5	63,7	8,0	19,0	63,5
3	190	23,8 (19,0)	108	88,9	30	30	70	30	90,7	91,5	77,9	9,5	20,5	76,2
(3 1/2)	216	23,8 (20,6)	122	101,6	32	32	71	32	103,4	104,0	90,1	9,5		88,9
4	229	23,8	135	114,3	33	33	76	33	116,1	117,0	102,3	11,0		101,6
(5)	254	23,8	164	141,3	37	37	89	37	143,8	145,0	128,2	11,0		127,0
6	279	25,4	192	168,3	40	40	89	40	170,7	171,0	154,1	12,5		152,4
8	343	28,6	246	219,1	44	44	102	44	221,5	222,0	202,7	12,5		203,2
10	406	30,2	305	273,0	49	49	102	49	276,4	277,0	254,5	12,5		254,0
12	483	31,8	365	323,9	56	56	114	56	327,2	328,0	304,9	12,5		304,8
14	533	34,9	400	365,6	57	79	127	57	359,2	360,0		12,5		336,6
16	597	36,5	457	406,4	64	87	127	64	410,5	411,0	To be specified by the purchaser	12,5		387,4
18	635	39,7	505	457,0	68	97	140	68	461,8	462,0		12,5		438,2
20	698	42,9	559	508,0	73	103	144	73	513,1	514,0		12,5		489,0
24	813	47,6	664	610,0	83	111	152	83	616,0	616,0		12,5		590,6

NOTES

- 1 This table shall be read in conjunction with section 3.
- 2 For flange facing dimensions see Tables 3 and 4.
- 3 For tolerances permitted on flange dimensions see clauses 3.8 to 3.13.
- 4 The drawings at the head of this table, for flanges other than the lapped type, depict Class 150 flanges with 1,6 mm raised facings. The dimensions C and Y therefore include the height of the 1,6 mm facing. See clause 3.3.
- 5 For particulars of reducing flanges see clauses 3.11, 3.12 and 3.13, and Table 2.
- 6 Values in parentheses apply to integral flanges only.
- 7 The dimensions in Column 12 correspond to the inside diameters of standard wall pipe which for sizes 10 in and smaller are the same as Schedule 40 pipe (see Annex C).
- 8 The centre part of the face of blank (blind) flanges may be recessed or raised (see clause 3.14).
- 9 The use of sizes in parentheses in Column 1 should be avoided; these sizes will be deleted in future editions.

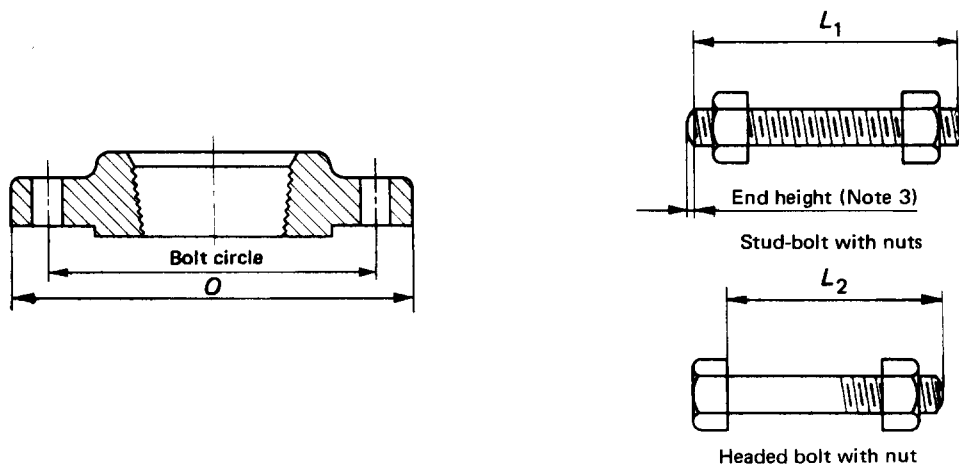


TABLE 13 – Drilling and bolting for flanges, Class 150

1	2	3	4	5	6	7	8	9	10
Nominal pipe size	Outside diameter of flange O	Drilling				Length of stud-bolts L_1 (See Note 3)			Length of headed bolts L_2 (See Note 2)
		Diameter of bolt circle	Number of bolts	Diameter of bolts	Standard drill sizes for bolt holes	1,6 mm raised face	Ring joint	Lapped joints (basic dimensions only) (See Note 2)	
in	mm	mm		in	in (mm)	mm	mm	mm	mm
1/2	89	60,3	4	1/2	5/8 (16,0)	57	—	57	44
3/4	98	69,8	4	1/2	5/8 (16,0)	57	—	57	51
1	108	79,4	4	1/2	5/8 (16,0)	64	76	64	51
(1 1/4)	117	88,9	4	1/2	5/8 (16,0)	64	76	64	57
1 1/2	127	98,4	4	1/2	5/8 (16,0)	70	83	70	57
2	152	120,6	4	5/8	3/4 (19,0)	76	89	76	70
(2 1/4)	178	139,7	4	5/8	3/4 (19,0)	83	95	83	76
3	190	152,4	4	5/8	3/4 (19,0)	89	102	89	76
(3 1/2)	216	177,8	8	5/8	3/4 (19,0)	89	102	89	76
4	229	190,5	8	5/8	3/4 (19,0)	89	102	89	76
(5)	254	215,9	8	3/4	7/8 (22,0)	95	108	95	83
6	279	241,3	8	3/4	7/8 (22,0)	95	108	95	83
8	343	298,4	8	3/4	7/8 (22,0)	102	114	102	89
10	406	362,0	12	7/8	1 (25,5)	114	127	114	95
12	483	431,8	12	7/8	1 (25,5)	114	127	114	102
14	533	476,2	12	1	1 1/8 (28,5)	127	140	127	108
16	597	539,8	16	1	1 1/8 (28,5)	133	146	133	114
18	635	577,8	16	1 1/8	1 1/4 (32,0)	146	159	146	121
20	698	635,0	20	1 1/8	1 1/4 (32,0)	152	165	152	133
24	813	749,3	20	1 1/4	1 3/8 (35,0)	171	184	171	146

NOTES

- 1 This table shall be read in conjunction with clause 3.6.
- 2 For determination of stud-bolt and headed bolt lengths for lapped type joints see Annex E.
- 3 The ends of all stud-bolts and headed bolts shall be rounded or chamfered. Stud-bolt lengths do not include the heights of these ends. Headed bolt lengths include end heights.
- 4 The use of sizes in parentheses in Column 1 should be avoided; these sizes will be deleted in future editions.

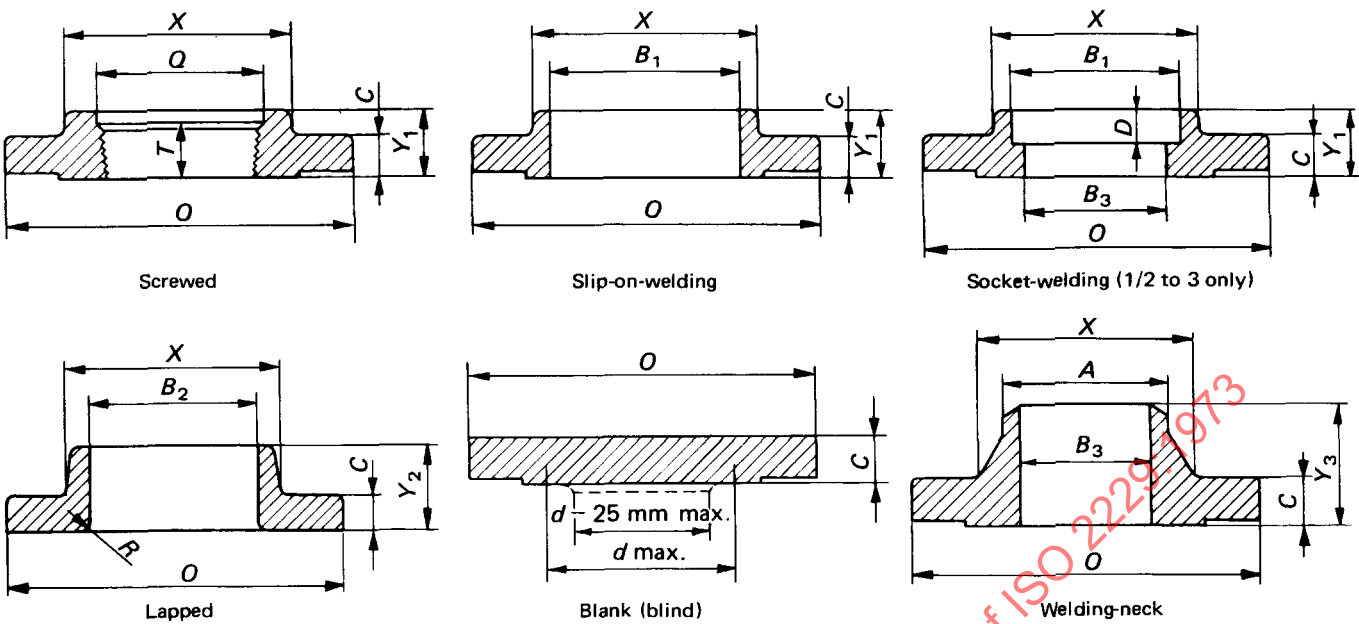


TABLE 14 – Dimensions of flanges, Class 300

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Diamètre nominal du tube	Diamètre extérieur de la bride	Epaisseur de la bride (min.)	Diamètre de la collerette à la base	Diamètre de la collerette à la soudure	Hauteur de la bride			Longueur du filetage	Alésage			Rayon de l'arrondi de la bride tournante et du tube	Diamètre du logement de fin de filetage (min.)	Profondeur du logement	Diamètre de l'évidement d'une bride pleine (voir Note 7)
					Filetée, emmanchée et soudée à logement à souder	Tournante sur collet	A souder en bout		Emmanchée et soudée à logement à souder (min.)	Tournante sur collet (min.)	A souder en bout et à logement à souder (voir Note 6)				
O	C	X	A	Y ₁	Y ₂	Y ₃	T	B ₁	B ₂	B ₃	R	Q	D	d (max.)	
in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2	95	14,3	38	21,3	22	22	52	16	22,4	23,0	15,8	3,0	23,5	9,5	
3/4	117	15,9	48	26,7	25	25	57	16	27,7	28,0	21,0	3,0	29,0	11,0	
1	124	17,5	54	33,4	27	27	62	17	34,5	35,0	26,2	3,0	36,0	12,5	
(1 1/4)	133	19,0	64	42,2	27	27	66	21	43,2	43,5	35,1	5,0	44,5	14,5	31,8
1 1/2	156	20,6	70	48,3	30	30	68	22	49,5	50,0	40,9	6,5	50,5	16,0	38,1
2	165	22,2	84	60,3	33	33	70	29	62,0	62,5	62,5	8,0	63,5	17,5	50,8
(2 1/2)	190	25,4	100	73,0	38	38	76	32	74,7	75,5	62,7	8,0	76,0	19,0	63,5
3	210	28,6	117	88,9	43	43	79	32	90,7	91,5	77,9	9,5	92,0	20,5	76,2
(3 1/2)	229	30,2	133	101,6	44	44	81	37	103,4	104,0	90,1	9,5	105,0		88,9
4	254	31,8	146	114,3	48	48	86	37	116,1	117,0	102,3	11,0	118,0		101,6
(5)	279	34,9	178	141,3	51	51	98	43	143,8	145,0	128,2	11,0	145,0		127,0
6	318	36,5	206	168,3	52	52	98	46	170,7	171,0	154,1	12,5	171,0		152,4
8	381	41,3	260	219,1	62	62	111	51	221,5	222,0	202,7	12,5	222,0		203,2
10	444	47,6	321	273,0	67	95	117	56	276,4	277,0	254,5	12,5	276,0		254,0
12	521	50,8	375	323,9	73	102	130	60	327,2	328,0	304,9	12,5	329,0		304,8
14	584	54,0	425	356,6	76	111	143	64	359,2	360,0		12,5	260,0		336,6
16	648	57,2	483	406,4	83	121	146	68	410,5	411,0	A spécifier par l'acheteur	12,5	411,0		387,4
18	711	60,3	533	457,0	89	130	159	70	461,8	462,0		12,5	462,0		431,8
20	775	63,5	587	508,0	95	150	162	73	513,1	514,0		12,5	513,0		482,6
24	914	69,8	702	610,0	106	152	168	83	616,0	616,0		12,5	614,0		584,2

NOTES

- 1 This table shall be read in conjunction with section 3.
- 2 For flange facing dimensions see Tables 3 and 5.
- 3 For tolerances permitted on flange dimensions see clauses 3.8 to 3.13.
- 4 The drawings at the head of this table, for flanges other than the lapped type, depict Class 300 flanges with 1,6 mm raised facings. The dimensions C and Y therefore include the height of the 1,6 mm facing. See clause 3.3.
- 5 For particulars of reducing flanges see clauses 3.11, 3.12 and 3.13, and Table 2.
- 6 The dimensions in Column 12 correspond to the inside diameters of standard wall pipe which for sizes 10 in and smaller are the same as Schedule 40 pipe (see Annex C).
- 7 The centre part of the face of blank (blind) flanges may be recessed or raised (see clause 3.14).
- 8 The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.

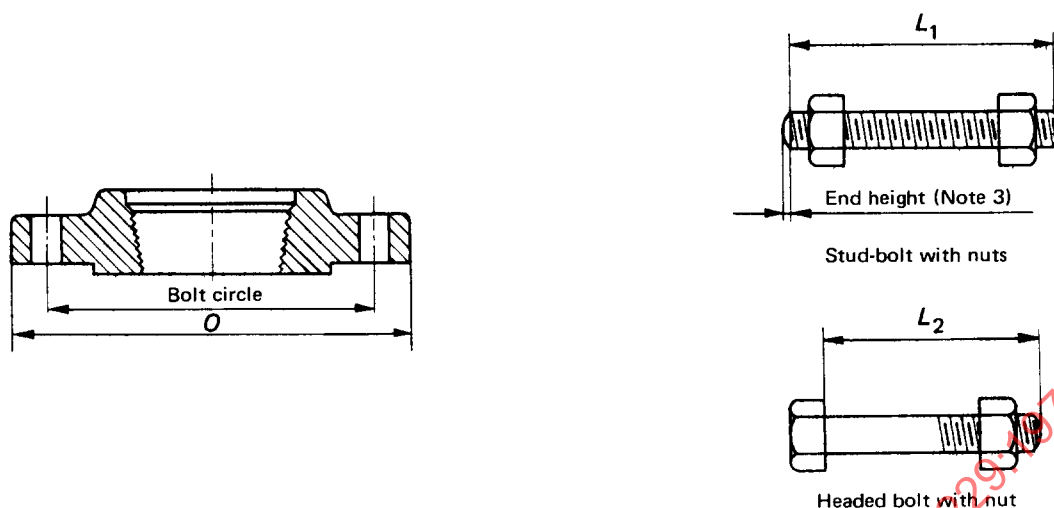


TABLE 15 – Drilling and bolting for flanges, Class 300

1	2	3	4	5	6	7	8	9	10
Nominal pipe size	Outside diameter of flange O	Drilling				Length of stud-bolts L_1 (See Note 3)			Length of headed bolts L_2 (See Note 2)
		Diameter of bolt circle	Number of bolts	Diameter of bolts	Standard drill sizes for bolt holes	1,6 mm raised face	Ring joint	Lapped joints (basic dimensions only) (See Note 2)	1,6 mm raised face
in	mm	mm		in	in (mm)	mm	mm	mm	mm
1/2	95	66,7	4	1/2	5/8 (16,0)	64	76	64	51
3/4	117	82,6	4	5/8	3/4 (19,0)	70	83	70	64
1	124	88,9	4	5/8	3/4 (19,0)	76	89	76	64
(1 1/4)	133	98,4	4	5/8	3/4 (19,0)	76	89	76	70
1 1/2	156	114,3	4	3/4	7/8 (22,0)	89	102	89	76
2	165	127,0	8	5/8	3/4 (19,0)	83	102	83	76
(2 1/2)	190	149,2	8	3/4	7/8 (22,0)	95	114	95	83
3	210	168,3	8	3/4	7/8 (22,0)	102	121	102	89
(3 1/2)	229	184,2	8	3/4	7/8 (22,0)	108	127	108	95
4	254	200,0	8	3/4	7/8 (22,0)	108	127	108	95
(5)	279	235,0	8	3/4	7/8 (22,0)	114	133	114	102
6	318	269,9	12	3/4	7/8 (22,0)	121	140	121	108
8	381	330,2	12	7/8	1 (25,5)	133	152	133	121
10	444	387,4	16	1	1 1/8 (28,5)	152	171	152	133
12	521	450,8	16	1 1/8	1 1/4 (32,0)	165	184	165	146
14	584	514,4	20	1 1/8	1 1/4 (32,0)	171	190	171	152
16	648	571,5	20	1 1/4	1 3/8 (35,0)	184	203	184	165
18	711	628,6	24	1 1/4	1 3/8 (35,0)	190	210	190	171
20	775	685,8	24	1 1/4	1 3/8 (35,0)	203	222	203	178
24	914	812,8	24	1 1/4	1 5/8 (41,5)	229	254	229	197

NOTES

- 1 This table shall be read in conjunction with clause 3.6.
- 2 For determination of stud-bolt and headed bolt lengths for lapped type joints see Annex E.
- 3 The ends of all stud-bolts and headed bolts shall be rounded or chamfered. Stud-bolt lengths do not include the heights of these ends.
- 4 The use of sizes in parentheses in Column 1 should be avoided; these sizes will be deleted in future editions.

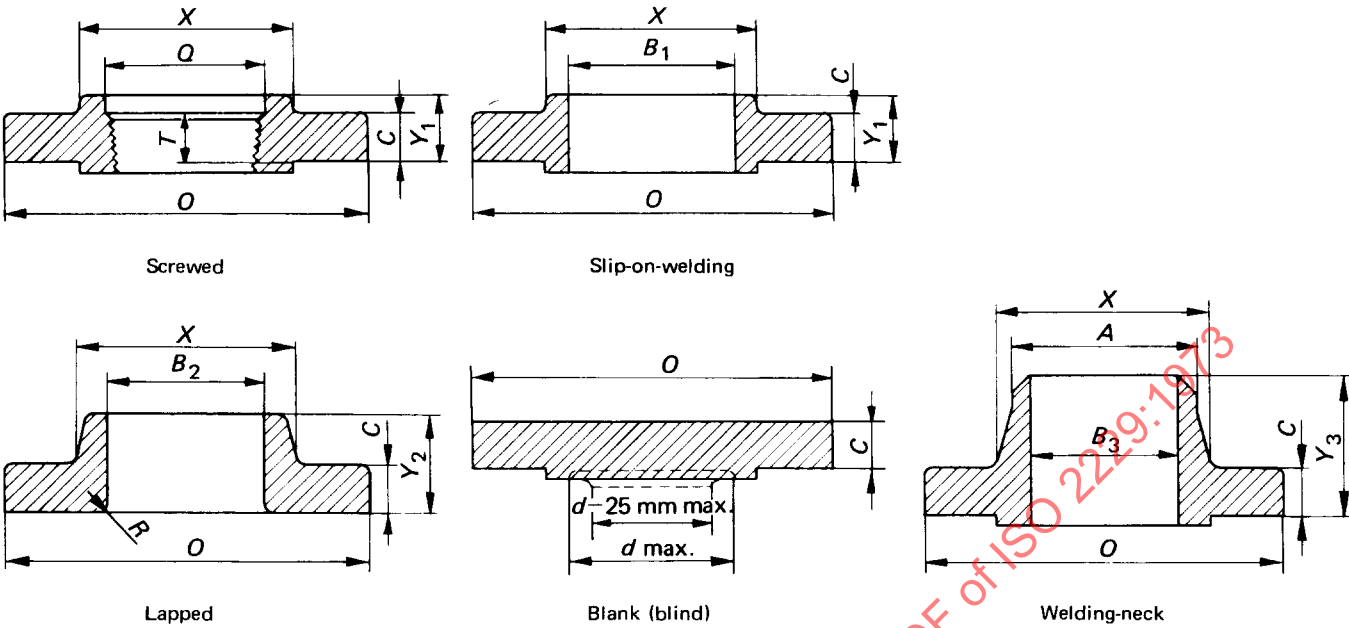


TABLE 16 – Dimensions of flanges, Class 400

1 Nominal pipe size	2 Outside diameter of flange O	3 Thickness of flange (min.) C	4 Diameter of hub X	5 Hub diameter beginning of chamfer welding- neck A	Length through hub			9 Thread length T	Bore			13 Corner radius of bore of lapped flange and pipe R	14 Counter- bore screwed (min.) Q	15 Diameter of recess blank (blind) flange d (max.) (See Note 3)
					6 Screwed and slip-on Y ₁	7 Lapped Y ₂	8 Welding- neck Y ₃		10 Slip-on (min.) B ₁	11 Lapped (min.) B ₂	12 Welding-neck B ₃			
in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2 3/4 1 (1 1/4) 1 1/2 2 (2 1/2) 3 (3 1/2)	For these sizes Class 600 flanges are used													
4 (5) 6 8 10 12 14 16 18 20 24	254 279 318 381 444 521 584 648 711 775 914	34,9 38,1 41,3 47,6 54,0 57,2 60,3 63,5 66,7 69,8 76,2	146 178 206 260 321 375 425 483 533 587 702	114,3 141,3 168,3 219,1 273,0 323,9 355,6 406,4 457,0 508,0 610,0	51 54 57 68 73 79 84 94 98 102 114	51 54 57 68 102 108 117 127 137 146 159	89 102 103 117 124 137 149 152 165 168 175	37 43 46 51 56 60 64 68 70 73 83	116,1 143,8 170,7 221,5 276,4 327,2 359,2 410,5 461,8 513,1 616,0	117 145 171 222 277 328 360 411 462 514 616	To be specified by the purchaser	11,0 11,0 12,5 12,5 12,5 12,5 12,5 12,5 12,5 12,5 12,5	118 145 171 222 276 329 360 411 462 513 614	101,6 127,0 152,4 203,2 245,0 304,8 333,4 381,0 431,8 479,4 574,7

NOTES

- 1 This table shall be read in conjunction with section 3.
- 2 For flange facing dimensions see Tables 3 and 6.
- 3 For tolerances permitted on flange dimensions see clauses 3.8 to 3.13.
- 4 For particulars of reducing flanges see clauses 3.11, 3.12 and 3.13.
- 5 The centre part of the face of blank (blind) flanges may be recessed or raised (see clause 3.14).
- 6 The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.

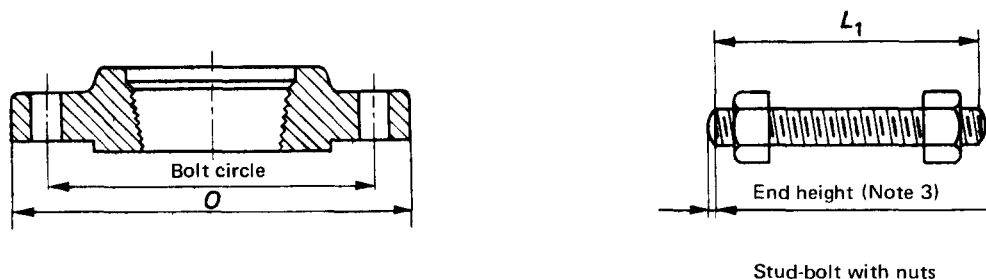


TABLE 17 – Drilling and bolting for flanges, Class 400

1	2	3	4	5	6		7	8	9	10
Nominal pipe size	Outside diameter of flange O	Drilling				Length of stud-bolts L_1 (See Note 3)				
		Diameter of bolt circle	Number of bolts	Diameter of bolts	Standard drill sizes for bolt holes		6,4 mm raised face	Male and female; Tongue and groove	Ring joint	Lapped joints (basic dimensions only) (See Note 2)
					in	(mm)				
1/2 3/4 1 (1 1/4) 1 1/2 2 (2 1/2) 3 (3 1/2)										
For these sizes Class 600 flanges are used										
4 (5) 6 8 10 12 14 16 18 20 24	254 279 318 381 444 521 584 648 711 775 914	200,0 235,0 269,9 330,2 387,4 450,8 514,4 571,5 628,6 685,8 812,8	8 8 12 12 16 16 20 20 24 24 24	7/8 7/8 7/8 1 1 1/8 1 1/4 1 1/4 1 3/8 1 3/8 1 3/8 1 1/2 1 1/2 1 3/4	1 1 1 1 1/8 1 1/4 1 3/8 1 3/8 1 1/2 1 1/2 1 5/8 1 7/8	(25,5) (25,5) (25,5) (28,5) (32,0) (35,0) (35,0) (38,0) (38,0) (41,5) (47,5)	133 140 146 165 184 197 203 216 222 241 267	127 133 140 159 178 190 197 210 216 235 260	140 146 152 171 190 203 210 222 229 248 280	121 127 133 152 171 184 190 203 210 229 254

NOTES

- 1 This table shall be read in conjunction with clause 3.6.
- 2 For determination of stud-bolt lengths for lapped type joints see Annex E.
- 3 The ends of all stud-bolts shall be rounded or chamfered. Stud-bolt lengths do not include the heights of these ends.
- 4 The use of sizes in parentheses in Column 1 should be avoided; these sizes will be deleted in future editions.

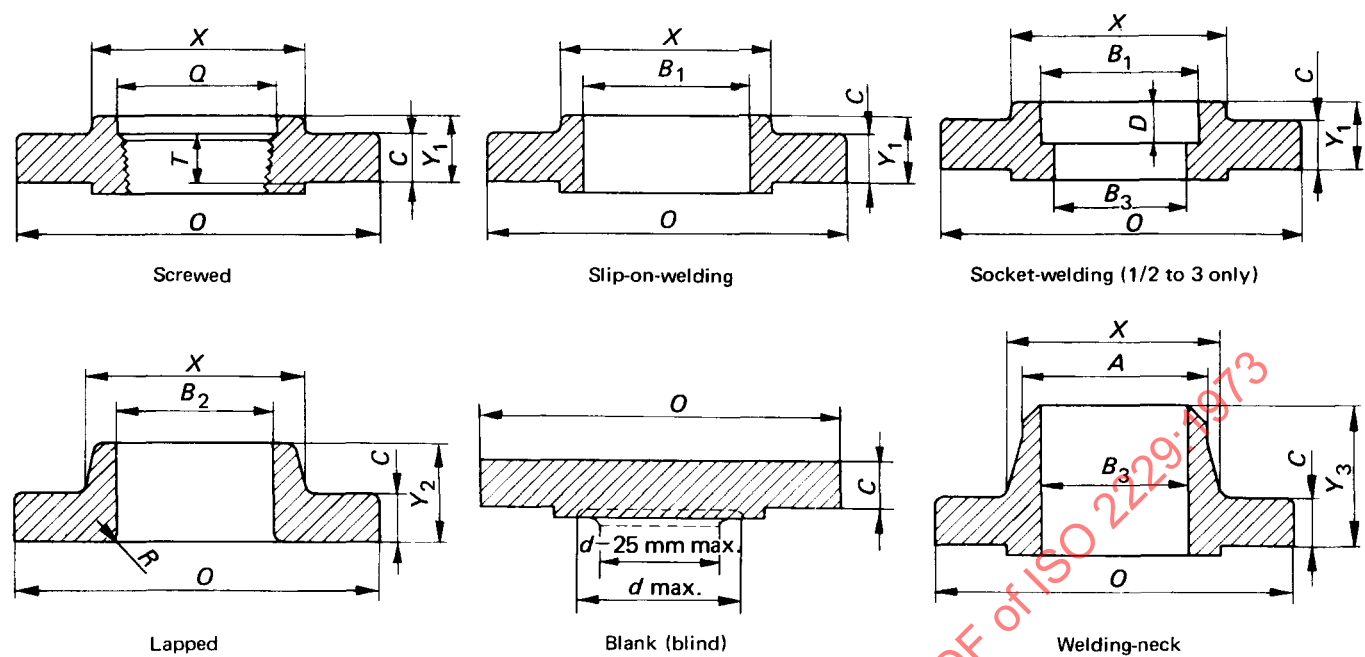
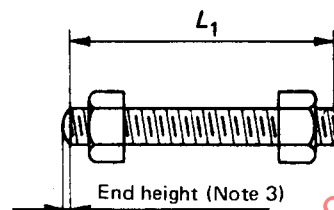
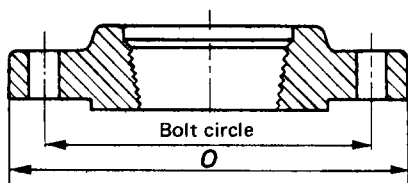


TABLE 18 — Dimensions of flanges, Class 600

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nominal pipe size	Outside diameter of flange <i>O</i>	Thickness of flange (min.) <i>C</i>	Diameter of hub <i>X</i>	Hub diameter beginning of chamfer welding- neck <i>A</i>	Length through hub			Thread length <i>T</i>	Bore			Corner radius of bore of lapped flange and pipe <i>T</i>	Counter- bore screwed flange (min.) <i>Q</i>	Depth of socket <i>D</i>	Diameter of recess blank (blind) flange (See Note 5) <i>d</i> (max.)
					Screwed slip-on and socket- welding <i>Y₁</i>	Lapped <i>Y₂</i>	Welding- neck <i>Y₃</i>		Slip-on and socket- welding (min.) <i>B₁</i>	Lapped (min.) <i>B₂</i>	Welding- neck and socket- welding <i>B₃</i>				
in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2	95	14,3	38	21,3	22	22	52	16	22,4	23,0	To be specified by the purchaser	3,0	23,5	9,5	12,7
3/4	117	15,9	48	26,7	25	25	57	16	27,7	28,0		3,0	29,0	11,0	19,1
1	124	17,5	54	33,4	27	27	62	17	34,5	35,0		3,0	36,0	12,5	25,4
(1 1/4)	133	20,6	64	42,2	29	29	67	21	43,2	43,5		5,0	44,5	14,5	31,8
1 1/2	156	22,2	70	48,3	32	32	70	22	49,5	50,0		6,5	50,5	16,0	38,1
2	165	25,4	84	60,3	37	37	73	29	62,0	62,5		8,0	63,5	17,5	50,8
(2 1/2)	190	28,6	100	73,0	41	41	79	32	74,7	75,5		8,0	76,0	19,0	63,5
3	210	31,8	117	88,9	46	46	83	35	90,7	91,5		9,5	92,0	20,5	76,2
(3 1/2)	229	34,9	133	101,6	49	49	86	40	103,4	104,0		9,5	105,0		88,9
4	273	38,1	152	114,3	54	54	102	41	116,1	117,0		11,0	118,0		101,6
(5)	330	44,4	189	141,3	60	60	114	48	143,8	145,0		11,0	145,0		127,0
6	356	47,6	222	168,3	67	67	117	51	170,7	171,0		12,5	171,0		162,4
8	419	55,6	273	219,1	76	76	133	57	221,5	222,0		12,5	222,0		200,0
10	508	63,5	343	273,0	86	111	152	65	276,4	277,0		12,5	276,0		247,7
12	559	66,7	400	323,9	92	117	156	70	327,2	328,0		12,5	329,0		298,5
14	603	69,8	432	355,6	94	127	165	73	359,2	360,0		12,5	360,0		327,0
16	686	76,2	495	406,4	106	140	178	78	410,5	411,0		12,5	411,0		374,7
18	743	82,6	546	457,0	117	152	184	79	461,8	462,0		12,5	462,0		419,1
20	813	88,9	610	508,0	127	165	190	83	513,1	514,0		12,5	513,0		463,6
24	940	101,6	718	610,0	140	184	203	92	616,0	616,0		12,5	614,0		558,8

NOTES

- 1 This table shall be read in conjunction with section 3.
- 2 For flange facing dimensions see Tables 3 and 7.
- 3 For tolerances permitted on flange dimensions see clauses 3.8 to 3.13.
- 4 For particulars of reducing flanges see clauses 3.11, 3.12 and 3.13, and Table 2.
- 5 The centre part of the face of blank (blind) flanges may be recessed or raised (see clause 3.14).
- 6 The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.



Stud-bolt with nuts

TABLE 19 – Drilling and bolting for flanges, Class 600

1	2	3	4	5	6	7	8	9	10
Nominal pipe size	Outside diameter of flange <i>O</i>	Drilling				Length of stud-bolts <i>L</i> ₁ (See Note 3)			
		Diameter of bolt circle	Number of bolts	Diameter of bolts	Standard drill sizes for bolt holes	6,4 mm raised face	Male and female; Tongue and groove	Ring joint	Lapped joints (basic dimensions only) (See Note 2)
in	mm	mm		in	in (mm)	mm	mm	mm	mm
1/2	95	66,7	4	1/2	5/8 (16,0)	76	70	76	64
3/4	117	82,6	4	5/8	3/4 (19,0)	83	76	83	70
1	124	88,9	4	5/8	3/4 (19,0)	89	83	89	76
(1 1/4)	133	98,4	4	5/8	3/4 (19,0)	95	89	95	83
1 1/2	156	114,3	4	3/4	7/8 (22,0)	102	95	102	89
2	165	127,0	8	5/8	3/4 (19,0)	102	95	108	89
(2 1/2)	190	149,2	8	3/4	7/8 (22,0)	114	108	121	102
3	210	168,3	8	3/4	7/8 (22,0)	121	114	127	108
(3 1/2)	229	184,2	8	7/8	1 (25,5)	133	127	140	121
4	273	215,9	8	7/8	1 (25,5)	140	133	146	127
(5)	330	266,7	8	1	1 1/8 (28,5)	159	152	165	146
6	356	292,1	12	1	1 1/8 (28,5)	165	159	171	152
8	419	349,2	12	1 1/8	1 1/4 (32,0)	190	184	197	178
10	508	431,8	16	1 1/4	1 3/8 (35,0)	210	203	216	197
12	559	489,0	20	1 1/4	1 3/8 (35,0)	216	210	222	203
14	603	527,0	20	1 3/8	1 1/2 (38,0)	229	222	235	216
16	686	603,2	20	1 1/2	1 5/8 (41,5)	248	241	254	235
18	743	654,0	20	1 5/8	1 3/4 (44,5)	267	260	273	254
20	813	723,9	24	1 5/8	1 3/4 (44,5)	286	279	292	273
24	940	838,2	24	1 7/8	2 (51,0)	324	318	337	311

NOTES

- 1 This table shall be read in conjunction with clause 3.6.
- 2 For determination of stud-bolt lengths for lapped type joints see Annex E.
- 3 The ends of all stud-bolts shall be rounded or chamfered. Stud-bolt lengths do not include the heights of these ends.
- 4 The use of sizes in parentheses in Column 1 should be avoided; these sizes will be deleted in future editions.

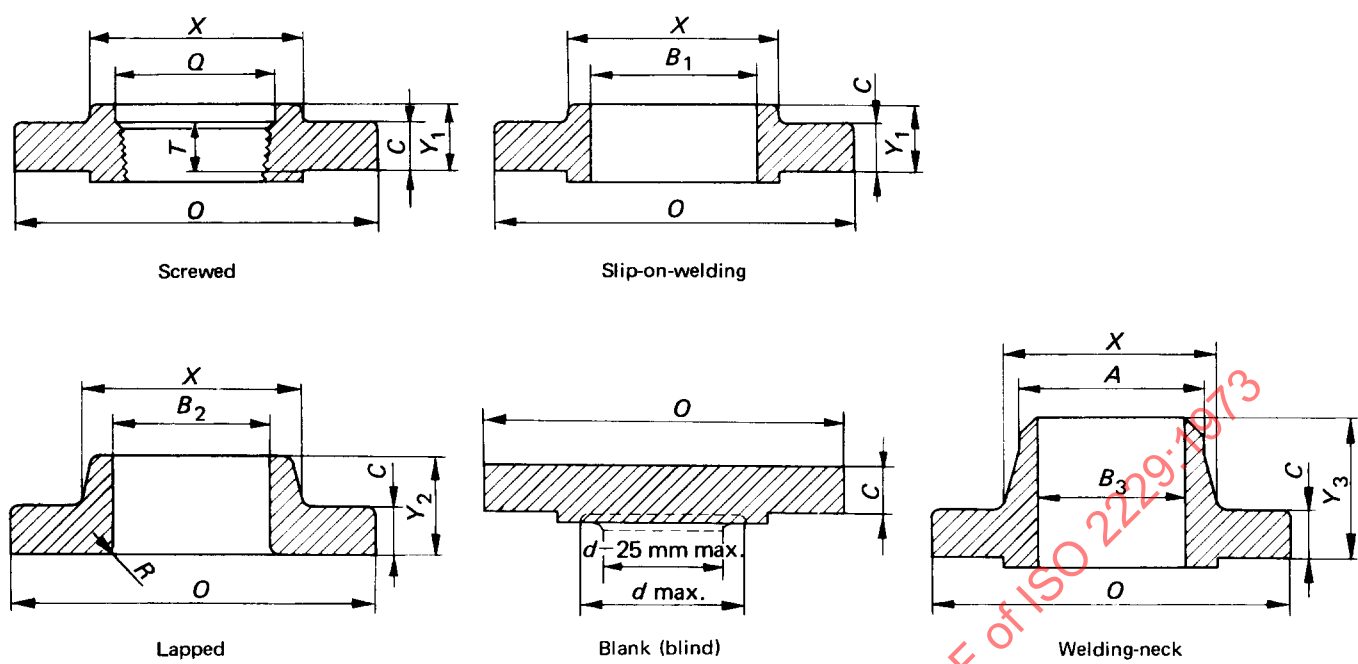


TABLE 20 – Dimensions of flanges, Class 900

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nominal pipe size	Outside diameter of flange	Thickness of flange (min.)	Diameter of hub	Hub diameter beginning of chamfer welding- neck A	Length through hub			Thread length T	Bore			Corner radius of bore of lapped flange and pipe R	Counter- bore screwed flange (min.) Q	Diameter of recess blank (blind) flange (See Note 5) d (max.)
					Screwed and slip-on Y ₁	Lapped Y ₂	Welding- neck Y ₃		Slip-on (min.) B ₁	Lapped (min.) B ₂	Welding- neck B ₃			
in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2														
3/4														
1														
(1 1/4)														
1 1/2														
2														
(2 1/2)														
For these sizes Class 1 500 flanges are used														
3	241	38,1	127	88,9	54	54	102	41	90,7	91,5	To be specified by the purchaser	9,5	92	73,0
4	292	44,4	159	114,3	70	70	114	48	116,1	117,0		11,0	118	98,4
(5)	349	50,8	190	141,3	79	79	127	54	143,8	145,0		11,0	145	120,7
6	381	55,6	235	168,3	86	86	140	57	170,7	171,0		12,5	171	146,1
8	470	63,5	298	219,1	102	114	162	64	221,5	222,0		12,5	222	190,5
10	546	69,8	368	273,0	108	127	184	71	276,4	277,0		12,5	276	238,1
12	610	79,4	419	323,9	117	143	200	76	327,2	328,0		12,5	329	282,6
14	641	85,7	451	355,6	130	156	213	83	359,2	360,0		12,5	360	311,2
16	705	88,9	508	406,4	133	165	216	86	410,5	411,0		12,5	411	355,6
18	787	101,6	565	457,0	152	190	229	89	461,8	462,0		12,5	462	400,1
20	857	108,0	622	508,0	159	210	248	92	513,1	514,0	12,5	513	444,5	
24	1 041	139,7	749	610,0	203	267	292	102	616,0	616,0	12,5	614	533,4	

NOTES

- 1 This table shall be read in conjunction with section 3.
- 2 For flange facing dimensions see Tables 3 and 8.
- 3 For tolerances permitted on flange dimensions see clauses 3.8 to 3.13.
- 4 For particulars of reducing flanges see clauses 3.11, 3.12 and 3.13, and Table 2.
- 5 The centre part of the face of blank (blind) flanges may be recessed or raised (see clause 3.14).
- 6 The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.

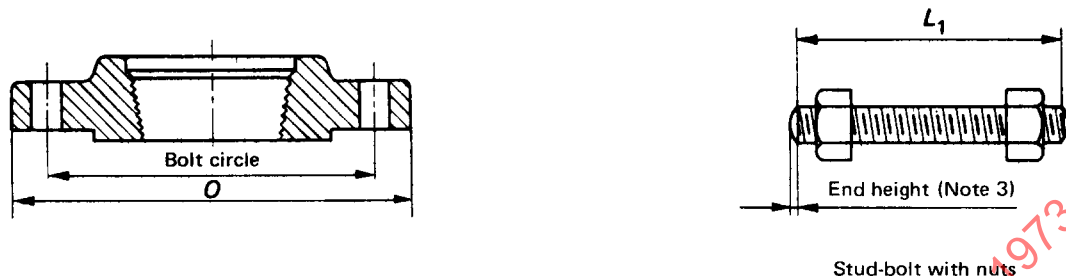


TABLE 21 — Drilling and bolting for flanges, Class 900

1	2	3	4	5	6	7	8	9	10
Nominal pipe size	Outside diameter of flange O	Drilling				Length of stud-bolts L_1 (See Note 3)			
		Diameter of bolt circle	Number of bolts	Diameter of bolts	Standard drill sizes for bolt holes		6,4 mm raised face	Male and female; Tongue and groove	Lapped joints (basic dimensions only) (See Note 2)
in	mm	mm		in	in	(mm)	mm	mm	mm
1/2 3/4 (1 1/4) 1 1/2 2 (2 1/2)									
For these sizes Class 1 500 flanges are used									
3	241	190,5	8	7/8	1	(25,5)	140	133	146
4	292	235,0	8	1 1/8	1 1/4	(32,0)	165	159	171
(5)	349	279,4	8	1 1/4	1 3/8	(35,0)	184	178	190
6	381	317,5	12	1 1/8	1 1/4	(32,0)	190	184	190
8	470	393,7	12	1 3/8	1 1/2	(38,0)	216	210	222
10	546	469,9	16	1 3/8	1 1/2	(38,0)	229	222	235
12	610	533,4	20	1 3/8	1 1/2	(38,0)	248	241	254
14	641	558,8	20	1 1/2	1 5/8	(41,5)	267	260	279
16	705	616,0	20	1 5/8	1 3/4	(44,5)	279	273	292
18	787	685,8	20	1 7/8	2	(51,0)	324	318	337
20	857	749,3	20	2	2 1/8	(54,0)	343	337	356
24	1 041	901,7	20	2 1/2	2 5/8	(67,0)	432	425	457

NOTES

- 1 This table shall be read in conjunction with clause 3.6.
- 2 For determination of stud-bolt lengths for lapped type joints see Annex E.
- 3 The ends of all stud-bolts shall be rounded or chamfered. Stud-bolt lengths do not include the heights of these ends.
- 4 The use of sizes in parentheses in Column 1 should be avoided; these sizes will be deleted in future editions.

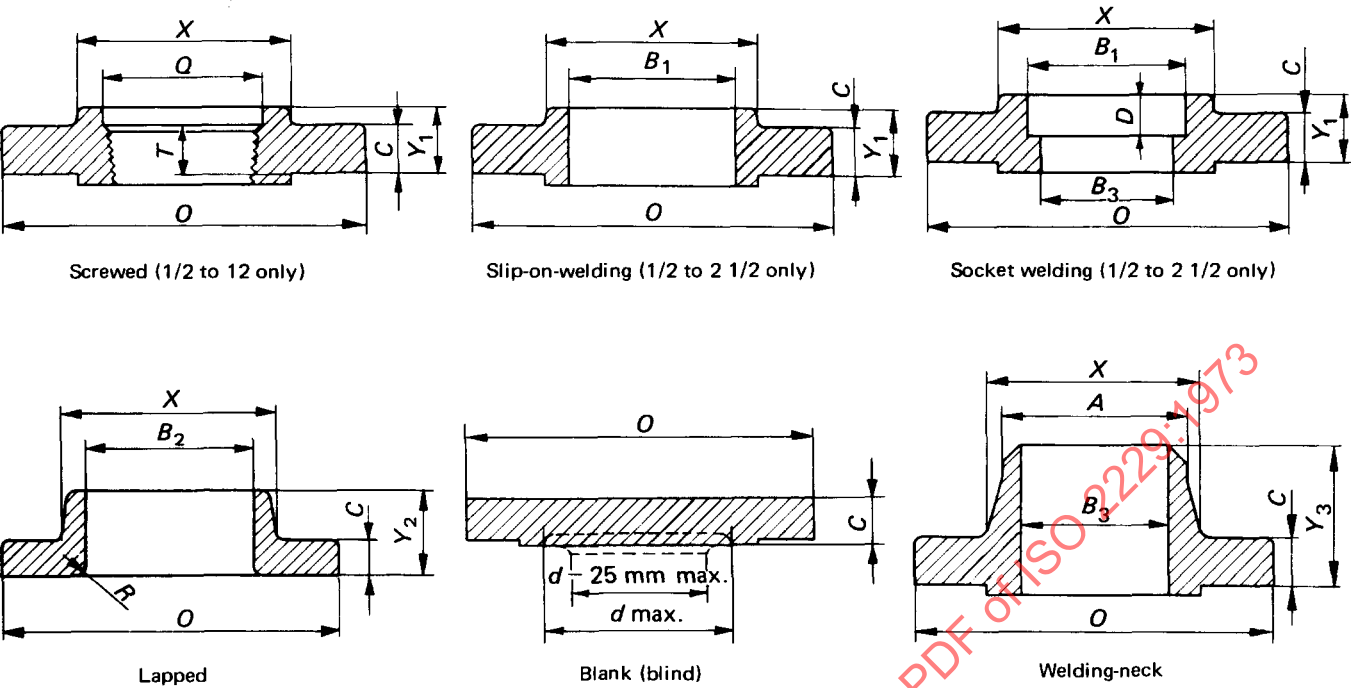


TABLE 22 – Dimensions of flanges, Class 1 500

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nominal pipe size	Outside diameter of flange	Thickness of flange, (min.)	Diameter of hub	Hub diameter beginning of chamfer welding- neck	Length through hub				Bore			Corner radius of bore of lapped flange and pipe	Counter- bore screwed flange (min.)	Depth of socket	Diameter of recess blank (blind) flange (See Note 5)
					Screwed slip-on and socket- welding	Lapped	Welding- neck	Thread length	Slip-on and socket- welding (min.)	Lapped (min.)	Welding- neck and socket welding				
	<i>O</i>	<i>C</i>	<i>X</i>	<i>A</i>	<i>Y</i> ₁	<i>Y</i> ₂	<i>Y</i> ₃	<i>T</i>	<i>B</i> ₁	<i>B</i> ₂	<i>B</i> ₃	<i>R</i>	<i>Q</i>	<i>D</i>	<i>d</i> (max.)
in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2	121	22,2	38	21,3	32	32	60	22	22,4	23,0		3,0	23,5	9,5	12,7
3/4	130	25,4	44	26,7	35	35	70	25	27,7	28,0		3,0	29,0	11,0	17,5
1	149	28,6	52	33,4	41	41	73	29	34,5	35,0		3,0	36,0	12,5	22,2
(1 1/4)	159	28,6	64	42,2	41	41	73	30	43,2	43,5		5,0	44,5	14,5	28,6
1 1/2	178	31,8	70	48,3	44	44	83	32	49,5	50,0		6,5	50,5	16,0	34,9
2	216	38,1	105	60,3	57	57	102	38	62,0	62,5		8,0	63,5	17,5	47,6
(2 1/2)	244	41,3	124	73,0	64	64	105	48	74,7	75,0		8,0	76,0	19,0	57,2
3	267	47,6	133	88,9	73	73	117	51		91,5		9,5	92,0		69,9
4	311	54,0	162	114,3	91	91	124	57		117,0		11,0	118,0		92,1
(5)	375	73,0	197	141,3	105	105	156	64		145,0		11,0	145,0		111,1
6	394	82,6	229	168,3	119	119	171	70		171,0		12,5	171,0		136,5
8	483	92,1	292	219,1	143	143	213	76		222,0		12,5	222,0		177,8
10	584	108,0	368	273,0	159	178	254	84		277,0		12,5	276,0		222,3
12	673	123,8	451	323,9	181	219	283	92		328,0		12,5	329,0		263,5
14	749	133,4	495	355,6		241	298			360,0		12,5			288,9
16	826	146,1	552	406,4		260	311			411,0		12,5			330,2
18	914	161,9	597	457,0		276	327			462,0		12,5			371,5
20	984	178,0	641	508,0		292	356			514,0		12,5			415,9
24	1 168	203,0	762	610,0		330	406			616,0		12,5			498,5

NOTES

- 1 This table shall be read in conjunction with section 3.
- 2 For flange facing dimensions see Tables 3 and 9.
- 3 For tolerances permitted on flange dimensions see clauses 3.8 to 3.13.
- 4 For particulars of reducing flanges see clauses 3.11, 3.12 and 3.13, and Table 2.
- 5 The centre part of the face of blank (blind) flanges may be recessed or raised (see clause 3.14).
- 6 The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.

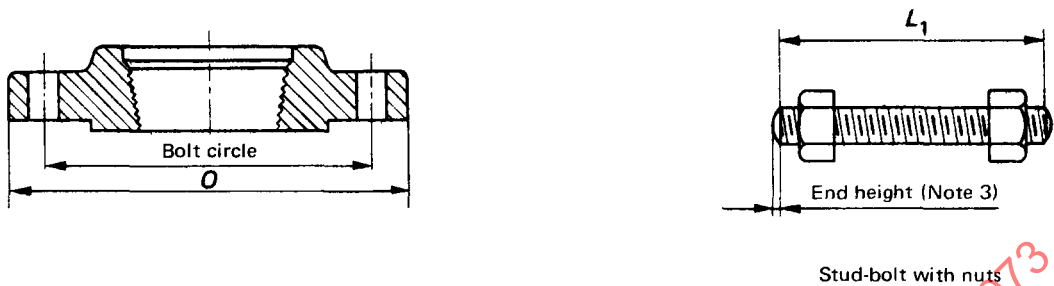


TABLE 23 – Drilling and bolting for flanges, Class 1 500

1	2	3	4	5	6	7	8	9	10
Nominal pipe size	Outside diameter of flange <i>O</i>	Drilling				Length of stud-bolts <i>L</i> ₁ (See Note 3)			
		Diameter of bolt circle	Number of bolts	Diameter of bolts	Standard drill sizes for bolt holes	6,4 mm raised face	Male and female; Tongue and groove	Ring joint	Lapped joints (basic dimensions only) (See Note 2)
in	mm	mm		in	in (mm)	mm	mm	mm	mm
1/2	121	82,6	4	3/4	7/8 (22,0)	102	95	102	89
3/4	130	88,9	4	3/4	7/8 (22,0)	108	102	108	95
1	149	101,6	4	7/8	1 (25,5)	121	114	121	108
(1 1/4)	159	111,1	4	7/8	1 (25,5)	121	114	121	108
1 1/2	178	123,8	4	1	1 1/8 (28,5)	133	127	133	121
2	216	165,1	8	7/8	1 (25,5)	140	133	146	127
(2 1/2)	244	190,5	8	1	1 1/8 (28,5)	152	146	159	140
3	267	203,2	8	1 1/8	1 1/4 (32,0)	171	165	178	159
4	311	241,3	8	1 1/4	1 3/8 (35,0)	190	184	197	178
(5)	375	292,1	8	1 1/2	1 5/8 (41,5)	241	235	248	229
6	394	317,5	12	1 3/8	1 1/2 (38,0)	254	248	260	241
8	483	393,7	12	1 5/8	1 3/4 (44,5)	286	279	298	273
10	584	482,6	12	1 7/8	2 (51,0)	337	330	343	324
12	673	571,5	16	2	2 1/8 (54,0)	375	368	387	362
14	749	635,0	16	2 1/4	2 3/8 (60,0)	406	400	425	394
16	826	704,8	16	2 1/2	2 5/8 (67,0)	444	438	470	432
18	914	774,7	16	2 3/4	2 7/8 (73,0)	489	483	514	476
20	984	831,8	16	3	3 1/8 (80,0)	533	527	565	521
24	1 168	990,6	16	3 1/2	3 5/8 (92,0)	610	603	648	597

NOTES

- 1 This table shall be read in conjunction with clause 3.6.
- 2 For determination of stud-bolt lengths for lapped type joints see Annex E.
- 3 The ends of all stud-bolts shall be rounded or chamfered. Stud-bolt lengths do not include the heights of these ends.
- 4 The use of sizes in parentheses in Column 1 should be avoided; these sizes will be deleted in future editions.

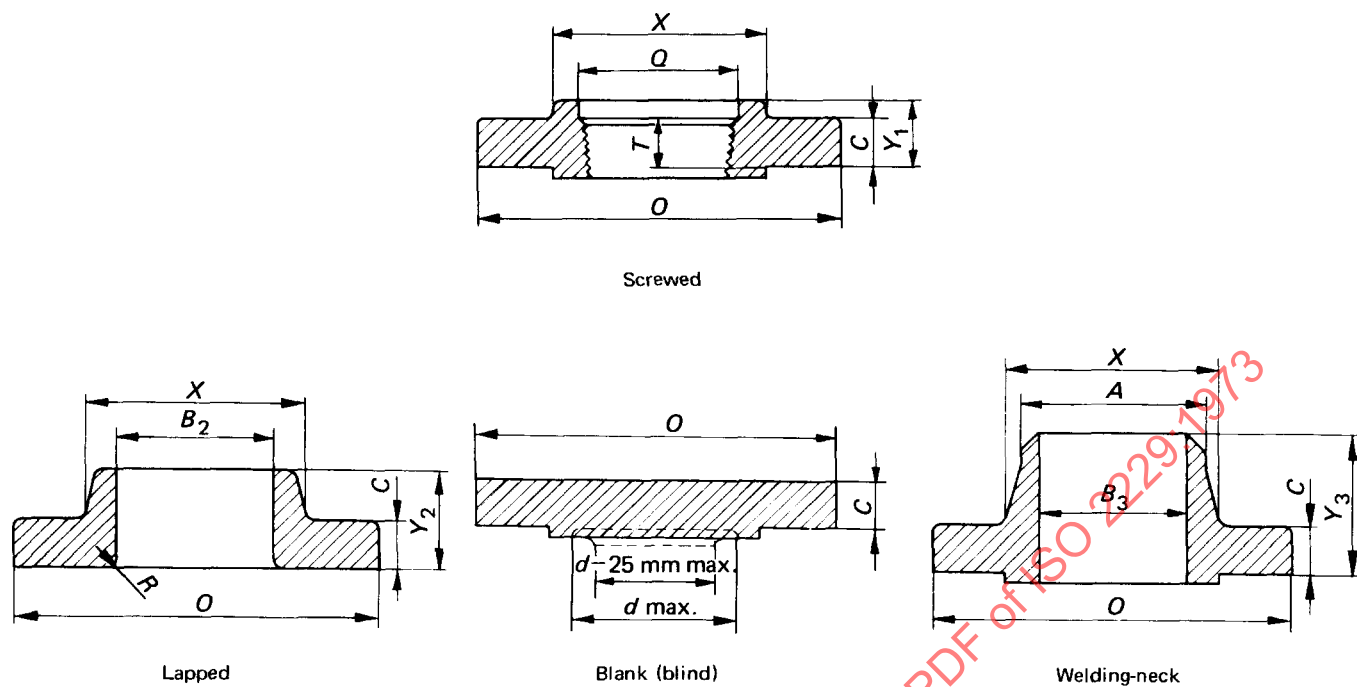


TABLE 24 – Dimensions of flanges, Class 2 500

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nominal pipe size	Outside diameter of flange	Thickness of flange (min.)	Diameter of hub	Hub diameter beginning of chamfer welding- neck A	Length through hub			Thread length	Bore		Corner radius of bore of lapped flange and pipe	Counter- bore screwed flange (min.)	Diameter of recess blank (blind) flange (See Note 5)
					Screwed	Lapped	Welding- neck		Lapped (min.)	Welding- neck			
	O	C	X	A	Y ₁	Y ₂	Y ₃	T	B ₂	B ₃	R	Q	d (max.)
in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1/2	133	30,2	43	21,3	40	40	73	29	23,0	To be specified by the purchaser	3,0	23,5	11,1
3/4	140	31,7	51	26,7	43	43	79	32	28,0		3,0	29,0	14,3
1	159	34,9	57	33,4	48	48	89	35	35,0		3,0	35,0	19,1
(1 1/4)	184	38,1	73	42,2	52	52	95	38	43,5		5,0	44,5	25,4
1 1/2	203	44,4	79	48,3	60	60	111	44	50,0		6,5	50,5	28,6
2	235	50,8	95	60,3	70	70	127	51	62,5		8,0	63,5	38,1
(2 1/2)	267	57,1	114	73,0	79	79	143	57	75,5		8,0	76,0	47,6
3	305	66,7	133	88,9	92	92	168	64	91,5		9,5	92,0	57,2
4	356	76,2	165	114,3	108	108	190	70	117,0		11,0	118,0	73,0
(5)	419	92,1	203	141,3	130	130	229	76	145,0		11,0	145,0	92,1
6	483	108,0	235	168,3	152	152	273	83	171,0		12,5	171,0	111,1
8	552	127,0	305	219,1	178	178	318	95	222,0		12,5	222,0	146,1
10	673	165,1	375	273,0	229	229	419	108	277,0		12,5	276,0	184,2
12	762	184,1	441	323,9	254	254	464	121	328,0		12,5	329,0	219,1

NOTES

- 1 This table shall be read in conjunction with section 3.
- 2 For flange facing dimensions see Tables 3 and 10.
- 3 For tolerances permitted on flange dimensions see clauses 3.8 to 3.13.
- 4 For particulars of reducing flanges see clauses 3.11, 3.12 and 3.13, and Table 2.
- 5 The centre part of the face of blank (blind) flanges may be recessed or raised (see clause 3.14).
- 6 The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.

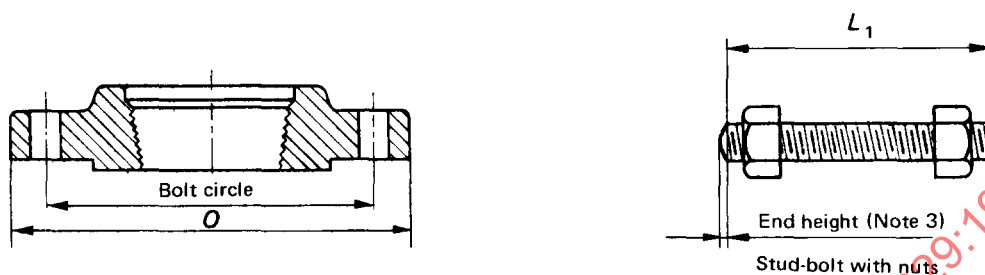


TABLE 25 -- Drilling and bolting for flanges, Class 2 500

1	2	3	4	5	6	7	8	9	10
Nominal pipe size	Outside diameter of flange <i>O</i>	Drilling				Length of stud-bolts L_1 (See Note 3)			
		Diameter of bolt circle	Number of bolts	Diameter of bolts	Standard drill sizes for bolt holes	6,4 mm raised face	Male and female; Tongue and groove	Ring joint	Lapped joints (basic dimensions only) (See Note 2)
in	mm	mm		in	in (mm)	mm	mm	mm	mm
1/2	133	88,9	4	3/4	7/8 (22,0)	121	114	121	108
3/4	140	95,2	4	3/4	7/8 (22,0)	121	114	121	108
1	159	107,9	4	7/8	1 (25,5)	133	127	133	121
(1 1/4)	184	130,2	4	1	1 1/8 (28,5)	146	140	152	133
1 1/2	203	146,0	4	1 1/8	1 1/4 (32,0)	165	159	171	152
2	235	171,4	8	1	1 1/8 (28,5)	171	165	178	159
(2 1/2)	267	196,8	8	1 1/8	1 1/4 (32,0)	190	184	197	178
3	305	228,6	8	1 1/4	1 3/8 (35,0)	216	210	222	203
4	356	273,0	8	1 1/2	1 5/8 (41,5)	248	241	260	235
(5)	419	323,8	8	1 3/4	1 7/8 (47,5)	292	286	311	279
6	483	368,3	8	2	2 1/8 (54,0)	343	337	356	330
8	552	438,1	12	2	2 1/8 (54,0)	381	375	394	368
10	673	539,7	12	2 1/2	2 5/8 (67,0)	483	476	508	470
12	762	619,1	12	2 3/4	2 7/8 (73,0)	533	527	559	521

NOTES

- 1 This table shall be read in conjunction with clause 3.6.
- 2 For determination of stud-bolt lengths for lapped type joints see Annex E.
- 3 The ends of all stud-bolts shall be rounded or chamfered. Stud-bolt lengths do not include the heights of these ends.
- 4 The use of sizes in parentheses in Column 1 should be avoided; these sizes will be deleted in future editions.

ANNEX A

PRESSURE-TEMPERATURE RATINGS

NOTES ON TABLES 26 to 37

1 General

In the tables all pressures are in bars¹⁾. Temperatures and pressures listed are maximum internal fluid temperatures and pressures. Primary service pressures are underlined.

For applications of these ratings see clause 1.2.

2 Effects of elevated temperatures on certain steels

Consideration should be given to the possibility of excessive oxidation (scaling) of the steels in the following tables :

- Table 28 – 1 % chromium 1/2 % molybdenum steel

Table 29 – 1 1/4 % chromium 1/2 % molybdenum steel

Table 30 – 2 1/4 % chromium 1 % molybdenum steel

Table 31 – 5 % chromium 1/2 % molybdenum steel at temperatures above 593 °C
- }
- at temperatures
above 566 °C.

The effects of carbide precipitation should be considered in the case of welded construction or use at temperatures above 482 °C of the steel in Table 33 – austenitic chromium-nickel steel.

The effects of sigma formation should be considered when using the steel in Table 36 – austenitic chromium-nickel-molybdenum steel – at temperatures above 538 °C.

1) 1 bar = 10⁵ N/m².

TABLE 26 -- Pressure-temperature ratings
for flanges in carbon steel
(Forgings : ASTM A.105
and A.181¹⁾ Grades I and II.
Castings : ASTM A.216 Grade WCB)

1	2	3	4	5	6	7	8
Service temperature °C	Maximum non-shock service pressure ratings, bar						
	Class						
	150	300	400	600	900	1 500	2 500
– 29 ²⁾ to 38	19,0	49,6	66,1	99,2	149,0	248,3	413,8
50	18,3	49,4	65,6	98,5	148,4	246,7	411,3
75	17,3	48,7	64,8	97,4	146,3	243,5	406,1
100	16,3	48,0	64,0	96,0	144,5	240,2	400,6
125	15,4	47,5	63,3	94,9	142,6	237,8	396,2
150	14,5	46,8	62,6	94,0	141,3	235,0	392,0
175	13,5	46,5	62,1	93,1	140,0	233,1	388,4
200	12,6	46,0	61,5	91,9	138,5	230,6	383,8
225	11,7	45,1	60,5	90,4	135,9	226,0	377,1
250	10,7	43,7	58,5	87,8	131,7	219,2	366,0
260	<u>10,3</u>	—	—	—	—	—	—
275	10,0	41,8	56,0	83,5	125,5	209,3	349,1
300	9,4	39,6	53,0	79,0	119,0	198,1	330,6
325	8,7	37,4	49,8	74,5	112,0	186,8	310,9
350	8,1	34,8	46,7	69,3	104,9	174,4	290,0
375	7,5	32,1	43,4	63,8	96,6	158,0	267,7
400	6,9	29,1	39,4	58,2	87,8	145,8	243,6
425	6,4	25,5	34,4	51,0	77,3	128,2	212,5
450	5,8	21,4	28,6	42,7	64,6	107,6	178,2
454	—	<u>20,7</u>	<u>27,6</u>	<u>41,3</u>	<u>62,1</u>	<u>103,4</u>	<u>172,4</u>
475	5,1	16,8	22,4	33,4	50,7	84,2	140,3
500	4,0	12,4	16,2	24,6	37,2	61,7	103,3
525	3,4	8,1	10,8	16,0	24,1	40,3	67,2
538	2,6	5,5	7,6	11,0	16,5	28,2	45,9

TABLE 27 -- Pressure-temperature ratings for
flanges in carbon-molybdenum steel
(Forgings : ASTM A182 Grade F1.
Castings : ASTM A217 Grade WC1)

1	2	3	4	5	6	7	8
Service temperature °C	Maximum non-shock service pressure ratings, bar						
	Class						
	150	300	400	600	900	1 500	2 500
– 29 ²⁾ to 38	19,0	49,6	66,1	99,2	149,0	248,3	413,8
50	18,3	49,4	65,6	98,5	148,4	246,7	411,3
75	17,3	48,7	64,8	97,4	146,3	243,5	406,1
100	16,3	48,0	64,0	96,0	144,5	240,2	400,6
125	15,4	47,5	63,3	94,9	142,6	237,8	396,2
150	14,5	46,8	62,6	94,0	141,3	235,0	392,0
175	13,5	46,5	62,1	93,1	140,0	233,1	388,4
200	12,6	46,0	61,5	91,9	138,5	230,6	383,8
225	11,7	45,1	60,5	90,4	135,9	226,0	377,1
250	10,7	43,7	58,5	87,8	131,7	219,2	366,0
260	<u>10,3</u>	—	—	—	—	—	—
275	10,0	41,8	56,0	83,5	125,5	209,3	349,1
300	9,4	39,6	53,0	79,0	119,0	198,1	330,6
325	8,7	37,4	49,8	74,5	112,0	186,8	310,9
350	8,1	34,9	46,7	69,6	105,2	174,9	291,8
375	7,5	32,8	43,8	65,5	98,4	164,0	274,0
400	6,9	30,7	40,6	61,2	91,4	154,2	254,0
425	6,4	28,4	37,8	56,5	85,0	141,5	236,0
450	5,8	26,0	34,8	52,0	78,2	130,5	217,6
475	5,1	23,8	31,7	47,8	71,9	119,3	199,0
500	4,0	21,6	28,7	43,1	64,7	107,8	179,6
510	—	<u>20,7</u>	<u>27,6</u>	<u>41,3</u>	<u>62,1</u>	<u>103,4</u>	<u>172,4</u>
525	3,4	19,0	25,3	38,0	57,4	94,8	158,1

1) Classes 150 and 300 only.

2) See clause 1.2.

TABLE 28 – Pressure-temperature ratings for
flanges in 1 % chromium 1/2 % molybdenum steel
(Forgings : ASTM A182 Grade F12)

1	2	3	4	5	6	7	8
Service temperature °C	Maximum non-shock service pressure ratings, bar						
	Class						
	150	300	400	600	900	1 500	2 500
– 29 ¹⁾ to 38	19,0	49,6	66,1	99,2	149,0	248,3	413,8
50	18,3	49,4	65,6	98,5	148,4	246,7	411,3
75	17,3	48,7	64,8	97,4	146,3	243,5	406,1
100	16,3	48,0	64,0	96,0	144,5	240,2	400,6
125	15,4	47,5	63,3	94,9	142,6	237,8	396,2
150	14,5	46,8	62,6	94,0	141,3	235,0	392,0
175	13,5	46,5	62,1	93,1	140,0	233,1	388,4
200	12,6	46,0	61,5	91,9	138,5	230,6	383,8
225	11,7	45,1	60,5	90,4	135,9	226,0	377,1
250	10,7	43,7	58,5	87,8	131,7	219,2	366,0
260	10,3	—	—	—	—	—	—
275	10,0	41,8	56,0	83,5	125,5	209,3	349,1
300	9,4	39,6	53,0	79,0	119,0	198,1	330,6
325	8,7	37,4	49,8	74,5	112,0	186,8	310,9
350	8,1	35,0	46,8	70,0	105,1	175,9	292,1
375	7,5	33,2	44,0	65,9	99,1	165,0	275,2
400	6,9	30,9	41,2	61,8	92,8	155,0	257,2
425	6,4	28,8	38,4	57,8	86,6	144,4	240,7
450	5,8	26,9	35,7	53,5	80,4	134,1	223,2
475	5,1	24,7	33,0	49,5	74,1	123,7	206,4
500	4,0	22,8	30,2	45,2	67,9	113,4	189,2
525	3,4	20,7	27,6	41,3	62,1	103,4	172,4
538	2,7	17,6	23,8	35,5	53,1	88,6	147,9
550	—	15,2	20,2	30,5	45,7	75,9	126,6
575	—	10,0	13,5	20,0	30,0	50,1	81,6
600	—	5,9	7,9	11,7	17,8	29,5	49,0
615	—	4,4	5,7	8,6	13,0	21,5	35,8
630	—	3,3	4,4	6,4	9,7	16,3	27,1
645	—	2,6	3,4	5,1	7,7	12,7	21,2

TABLE 29 – Pressure-temperature ratings for
flanges in 1 1/4 % chromium 1/2 % molybdenum steel
(Forgings : ASTM A182 Grade F11.
Castings : ASTM A217 Grade WC6)

1	2	3	4	5	6	7	8
Service temperature °C	Maximum non-shock service pressure ratings, bar						
	Class						
	150	300	400	600	900	1 500	2 500
– 29 ¹⁾ to 38	19,0	49,6	66,1	99,2	149,0	248,3	413,8
50	18,3	49,4	65,6	98,5	148,4	246,7	411,3
75	17,3	48,7	64,8	97,4	146,3	243,5	406,1
100	16,3	48,0	64,0	96,0	144,5	240,2	400,6
125	15,4	47,5	63,3	94,9	142,6	237,8	396,2
150	14,5	46,8	62,6	94,0	141,3	235,0	392,0
175	13,5	46,5	62,1	93,1	140,0	233,1	388,4
200	12,6	46,0	61,5	91,9	138,5	230,6	383,8
225	11,7	45,1	60,5	90,4	135,9	226,0	377,1
250	10,7	43,7	58,5	87,8	131,7	219,2	366,0
260	10,3	—	—	—	—	—	—
275	10,0	41,8	56,0	83,5	125,5	209,3	349,1
300	9,4	39,6	53,0	79,0	119,0	198,1	330,6
325	8,7	37,4	49,8	74,5	112,0	186,8	310,9
350	8,1	35,0	46,8	70,0	105,1	175,9	292,1
375	7,5	33,2	44,0	65,9	99,1	165,0	275,2
400	6,9	30,9	41,2	61,8	92,8	155,0	257,2
425	6,4	28,8	38,4	57,8	86,6	144,4	240,7
450	5,8	26,9	35,7	53,5	80,4	134,1	223,2
475	5,1	24,7	33,0	49,5	74,1	123,7	206,4
500	4,0	22,8	30,2	45,2	67,9	113,4	189,2
525	3,4	20,7	27,6	41,3	62,1	103,4	172,4
538	2,7	18,3	24,5	36,9	55,1	92,0	153,7
550	—	16,2	21,4	31,7	48,2	80,2	133,7
575	—	11,8	15,5	23,4	35,3	59,0	98,4
600	—	8,4	11,6	17,2	25,8	43,1	71,7
615	—	6,5	9,0	13,4	20,3	33,8	55,6
630	—	5,0	6,5	9,6	14,6	24,6	41,1
645	—	3,3	4,3	6,3	10,0	16,6	27,6

1) See clause 1.2.

**TABLE 30 — Pressure-temperature ratings for
flanges in 2 1/4 % chromium 1 % molybdenum steel**
(Forgings : ASTM A182 Grade F22.
Castings : ASTM A217 Grade WC9)

1	2	3	4	5	6	7	8
Service temperature °C	Maximum non-shock service pressure ratings, bar						
	Class						
	150	300	400	600	900	1 500	2 500
– 29 ¹⁾ to 38	19,0	49,6	66,1	99,2	149,0	248,3	413,8
50	18,3	49,4	65,6	98,5	148,4	246,7	411,3
75	17,3	48,7	64,8	97,4	146,3	243,5	406,1
100	16,3	48,0	64,0	96,0	144,5	240,2	400,6
125	15,4	47,5	63,3	94,9	142,6	237,8	396,2
150	14,5	46,8	62,6	94,0	141,3	235,0	392,0
175	13,5	46,5	62,1	93,1	140,0	233,1	388,4
200	12,6	46,0	61,5	91,9	138,5	230,6	383,8
225	11,7	45,1	60,5	90,4	135,9	226,0	377,1
250	10,7	43,7	58,5	87,8	131,7	219,2	366,0
260	<u>10,3</u>	—	—	—	—	—	—
275	10,0	41,8	56,0	83,5	125,5	209,3	349,1
300	9,4	39,6	53,0	79,0	119,0	198,1	330,6
325	8,7	37,4	49,8	74,5	112,0	186,8	310,9
350	8,1	35,0	46,8	70,0	105,1	175,9	292,1
375	7,5	33,2	44,0	65,9	99,1	165,0	275,2
400	6,9	30,9	41,2	61,8	92,8	155,0	257,2
425	6,4	28,8	38,4	57,8	86,6	144,4	240,7
450	5,8	26,9	35,7	53,5	80,4	134,1	223,2
475	5,1	24,7	33,0	49,5	74,1	123,7	206,4
500	4,0	22,8	30,2	45,2	67,9	113,4	189,2
525	3,4	<u>20,7</u>	<u>27,6</u>	<u>41,3</u>	<u>62,1</u>	<u>103,4</u>	<u>172,4</u>
538	2,7	18,3	24,5	36,9	55,1	92,0	153,8
550	—	16,4	21,7	32,6	48,9	81,8	136,6
575	—	12,3	16,5	25,0	37,2	61,9	103,4
600	—	9,3	12,3	18,4	27,6	46,2	77,6
615	—	7,9	10,2	15,2	23,2	38,4	63,9
630	—	6,2	8,3	12,6	19,0	31,0	52,7
645	—	4,3	6,7	10,0	15,2	25,8	42,2

**TABLE 31 — Pressure-temperature ratings for
flanges in 5 % chromium 1/2 % molybdenum steel**
(Forgings : ASTM A182 Grade F5a.
Castings : ASTM A217 Grade C5)

1	2	3	4	5	6	7	8
Service temperature °C	Maximum non-shock service pressure ratings, bar						
	Class						
	150	300	400	600	900	1 500	2 500
– 29 ¹⁾ to 38	19,0	49,6	66,1	99,2	149,0	248,3	413,8
50	18,3	49,4	65,6	98,5	148,4	246,7	411,3
75	17,3	48,7	64,8	97,4	146,3	243,5	406,1
100	16,3	48,0	64,0	96,0	144,5	240,2	400,6
125	15,4	47,5	63,3	94,9	142,6	237,8	396,2
150	14,5	46,8	62,6	94,0	141,3	235,0	392,0
175	13,5	46,5	62,1	93,1	140,0	233,1	388,4
200	12,6	46,0	61,5	91,9	138,5	230,6	383,8
225	11,7	45,1	60,5	90,4	135,9	226,0	377,1
250	10,7	43,7	58,5	87,8	131,7	219,2	366,0
260	<u>10,3</u>	—	—	—	—	—	—
275	10,0	41,8	56,0	83,5	125,5	209,3	349,1
300	9,4	39,6	53,0	79,0	119,0	198,1	330,6
325	8,7	37,4	49,8	74,5	112,0	186,8	310,9
350	8,1	35,0	46,8	70,0	105,1	175,9	292,1
375	7,5	33,2	44,0	65,9	99,1	165,0	275,2
400	6,9	30,9	41,2	61,8	92,8	155,0	257,2
425	6,4	28,8	38,4	57,8	86,6	144,4	240,7
450	5,8	26,9	35,7	53,5	80,4	134,1	223,2
475	5,1	24,7	33,0	49,5	74,1	123,7	206,4
500	4,0	22,8	30,2	45,2	67,9	113,4	189,2
525	3,4	<u>20,7</u>	<u>27,6</u>	<u>41,3</u>	<u>62,1</u>	<u>103,4</u>	<u>172,4</u>
538	2,7	17,2	23,1	34,5	51,7	86,2	143,7
550	—	14,9	20,0	30,2	45,5	75,5	125,6
575	—	10,7	14,5	22,0	32,8	54,1	89,6
600	—	7,4	9,5	15,0	21,5	35,9	60,0
615	—	5,6	7,6	10,7	17,2	28,2	47,6
630	—	4,7	6,2	9,1	14,0	23,1	39,0
645	—	3,8	5,2	7,6	11,5	19,0	31,6

1) See clause 1.2.

TABLE 32 – Pressure-temperature ratings for
flanges in 9 % chromium 1 % molybdenum steel
(Forgings : ASTM A182 Grade F9.
Castings : ASTM A217 Grade C12)

1	2	3	4	5	6	7	8
Service temperature °C	Maximum non-shock service pressure ratings, bar						
	Class						
	150	300	400	600	900	1 500	2 500
– 29 ¹⁾ to 38	19,0	49,6	66,1	99,2	149,0	248,3	413,8
50	18,3	49,4	65,6	98,5	148,4	246,7	411,3
75	17,3	48,7	64,8	97,4	146,3	243,5	406,1
100	16,3	48,0	64,0	96,0	144,5	240,2	400,6
125	15,4	47,5	63,3	94,9	142,6	237,8	396,2
150	14,5	46,8	62,6	94,0	141,3	235,0	392,0
175	13,5	46,5	62,1	93,1	140,0	233,1	388,4
200	12,6	46,0	61,5	91,9	138,5	230,6	383,8
225	11,7	45,1	60,5	90,4	135,9	226,0	377,1
250	10,7	43,7	58,5	87,8	131,7	219,2	366,0
260	<u>10,3</u>	–	–	–	–	–	–
275	10,0	41,8	56,0	83,5	125,5	209,3	349,1
300	9,4	39,6	53,0	79,0	119,0	198,1	330,6
325	8,7	37,4	49,8	74,5	112,0	186,8	310,9
350	8,1	35,0	46,8	70,0	105,1	175,9	292,1
375	7,5	33,2	44,0	65,9	99,1	165,0	275,2
400	6,9	30,9	41,2	61,8	92,8	155,0	257,2
425	6,4	28,8	38,4	57,8	86,6	144,4	240,7
450	5,8	26,9	35,7	53,5	80,4	134,1	223,2
475	5,1	24,7	33,0	49,5	74,1	123,7	206,4
500	4,0	22,8	30,2	45,2	67,9	113,4	189,2
510	3,8	21,7	29,0	43,8	65,5	109,3	182,0
525	3,4	<u>20,7</u>	<u>27,6</u>	<u>41,3</u>	<u>62,1</u>	<u>103,4</u>	<u>172,4</u>
538	2,6	20	26,9	40,3	60,3	<u>100,3</u>	167,5
550	–	17,1	22,8	33,8	51,0	85,4	141,1
575	–	11,2	14,8	22,4	33,3	55,5	92,8
600	–	7,2	9,5	14,2	21,9	36,0	59,9
615	–	5,8	7,6	11,6	17,5	28,6	47,4
630	–	4,8	6,2	9,2	14,1	23,2	38,8
645	–	3,8	5,1	7,6	11,6	18,8	31,5

TABLE 33 – Pressure-temperature ratings for
flanges in austenitic chromium-nickel steel
(Forgings : ASTM A182 Grades F304 and F304H.
Castings : ASTM A351 Grade CF8)

1	2	3	4	5	6	7	8
Service temperature °C	Maximum non-shock service pressure ratings, bar						
	Class						
	150	300	400	600	900	1 500	2 500
– 29 ¹⁾ to 38	19,0	42,4	56,8	85,1	127,6	212,8	354,8
50	18,3	41,3	55,3	83,0	124,4	207,8	346,4
75	17,3	39,6	52,4	78,8	118,1	196,5	328,0
100	16,3	37,6	49,8	74,6	111,8	186,6	311,2
125	15,4	35,8	47,5	71,1	106,9	178,6	296,8
150	14,5	34,1	45,5	67,9	102,0	170,4	283,0
175	13,5	32,6	43,6	65,2	97,7	163,5	272,5
200	12,6	31,2	41,7	62,6	93,9	156,3	260,0
225	11,7	30,0	40,1	60,4	90,0	150,0	250,3
250	10,7	29,1	38,5	58,0	86,6	144,1	240,6
260	<u>10,3</u>	–	–	–	–	–	–
275	10,0	27,8	37,2	55,8	83,6	139,2	232,1
300	9,4	26,6	35,9	53,9	80,7	134,9	224,1
325	8,7	25,8	34,6	52,0	78,2	130,0	216,8
350	8,1	25,2	33,4	50,3	75,6	126,0	210,0
375	7,5	24,4	32,4	49,4	72,8	122,0	203,5
400	6,9	23,4	31,4	47,2	70,4	117,8	196,2
425	6,4	22,8	30,4	46,2	68,3	113,9	189,8
450	5,8	22,2	29,5	44,3	66,8	110,7	185,0
475	5,1	21,5	28,8	43,1	64,5	107,2	179,1
500	4,0	21,0	28,2	42,6	63,5	105,9	176,0
525	3,4	20,7	27,9	41,7	62,4	104,3	173,4
538	2,7	<u>20,7</u>	<u>27,6</u>	<u>41,3</u>	<u>62,1</u>	<u>103,4</u>	<u>172,4</u>
550	–	20,4	27,5	41,0	61,4	102,8	170,5
575	–	19,3	26,8	39,0	58,3	96,3	160,9
600	–	16,5	22,6	33,4	50,3	84,5	140,3
615	–	14,3	19,5	28,8	43,3	72,8	120,4
630	–	12,5	17,0	25,4	37,5	63,5	105,1
645	–	11,0	14,7	21,9	33,1	55,5	92,2
660	–	9,6	12,5	18,6	28,6	47,2	78,6
675	–	7,9	10,7	15,9	23,8	39,3	65,2
690	–	6,9	9,0	13,4	20,3	33,8	56,5
705	–	5,9	7,6	11,7	17,2	28,4	48,1
715	–	5,3	6,9	10,3	15,5	26,2	43,1
725	–	4,7	6,2	9,3	14,1	23,4	38,4
735	–	4,1	5,6	8,5	12,7	21,1	34,8
745	–	3,8	5,2	7,7	11,6	19,3	31,9
755	–	3,4	4,7	7,0	10,4	17,6	29,0
765	–	3,1	4,3	6,2	9,7	15,6	26,3
775	–	2,8	3,8	5,5	8,6	13,9	23,2
785	–	2,5	3,3	5,0	8,0	12,1	20,7
795	–	2,3	3,0	4,5	6,7	10,9	18,5
805	–	2,0	2,8	3,9	5,8	10,0	16,7
815	–	1,7	2,4	3,4	5,2	9,0	14,8

1) See clause 1.2.

TABLE 34 — Pressure-temperature ratings for
flanges in austenitic chromium-nickel
(low carbon) steel
(Forgings : ASTM A182 Grade F304L)

1	2	3	4	5	6	7	8
Service temperature °C	Maximum non-shock service pressure ratings, bar						
	Class						
	150	300	400	600	900	1 500	2 500
– 29 ¹⁾ to 38	19,0	35,5	47,2	71,0	106,5	177,2	295,5
50	18,3	35,4	47,1	70,7	106,0	176,2	294,0
75	17,3	35,0	46,7	70,1	105,0	174,2	291,5
100	16,3	34,4	45,7	68,4	103,4	172,1	285,5
125	15,4	31,7	42,6	63,7	95,2	159,0	265,5
150	14,5	29,5	39,6	59,1	89,0	148,0	247,0
175	13,5	27,4	36,8	55,0	82,5	137,4	229,0
200	12,6	25,3	34,0	50,8	75,9	126,9	211,0
225	11,7	23,7	31,8	47,5	71,5	119,1	198,0
250	10,7	22,6	30,1	45,0	67,7	113,0	188,5
260	10,3	—	—	—	—	—	—
275	10,0	21,6	28,6	43,1	64,6	108,0	179,0
300	9,4	21,0	28,0	42,0	63,0	105,0	174,7
316	—	20,7	27,6	41,3	62,1	103,4	172,4
325	8,7	20,4	23,3	41,6	61,4	102,2	170,1
350	8,1	19,7	26,4	39,4	59,1	98,6	164,5
375	7,5	19,2	25,8	38,5	57,8	96,2	160,8
400	6,8	19,0	25,2	37,5	56,5	94,0	157,1
425	6,4	18,3	24,5	36,9	55,6	92,2	153,7

Primary service pressures are shown in bold type.

TABLE 35 — Pressure-temperature ratings for
flanges in austenitic chromium-nickel
(titanium stabilized) steel
(Forgings : ASTM A182 Grades F321 and F321H)
and in austenitic chromium-nickel
(niobium stabilized) steel
(Forgings : ASTM A182 Grades F347 and F347H.
Castings : ASTM A351 Grade CF8C)

1	2	3	4	5	6	7	8
Service temperature °C	Maximum non-shock service pressure ratings, bar						
	Class						
	150	300	400	600	900	1 500	2 500
– 29 ¹⁾ to 38	19,0	49,6	66,1	99,2	149,0	248,3	413,8
50	18,3	49,4	65,6	98,5	148,4	246,7	411,3
75	17,3	48,7	64,8	97,4	146,3	243,5	406,1
100	16,3	48,0	64,0	96,0	144,5	240,2	400,6
125	15,4	47,5	63,3	94,9	142,0	237,8	396,2
150	14,5	46,8	62,6	94,0	141,3	235,0	392,0
175	13,5	46,5	62,1	93,1	140,0	233,1	388,4
200	12,6	46,0	61,5	91,9	138,5	230,6	383,8
225	11,7	45,1	60,5	90,4	135,9	226,0	377,1
250	10,7	43,7	58,5	87,8	131,7	219,2	366,0
260	10,3	—	—	—	—	—	—
275	10,0	41,8	56,0	83,5	125,5	209,3	349,1
300	9,4	39,6	53,0	79,0	119,0	198,1	330,6
325	8,7	37,4	49,8	74,5	112,0	186,8	310,9
350	8,1	35,2	47,0	70,0	106,0	176,0	294,0
375	7,5	33,9	45,2	67,5	102,1	169,0	282,0
400	6,9	32,3	43,0	64,5	97,5	162,3	269,8
425	6,4	31,2	41,2	62,0	92,8	155,1	258,1
450	5,8	29,6	39,3	59,0	88,6	148,0	246,0
475	5,1	28,2	37,4	56,3	84,5	141,0	234,0
500	4,0	26,7	35,6	53,5	80,5	133,4	223,2
525	3,4	25,4	33,8	50,6	76,4	126,4	211,0
538	2,7	24,5	32,7	49,3	73,8	123,1	205,1
550	—	23,9	31,8	47,9	72,0	119,7	199,5
575	—	22,6	30,0	43,0	67,5	112,6	187,6
600	—	21,0	28,2	42,3	63,5	105,8	175,6
607	—	20,7	27,6	41,3	62,1	103,4	172,4
615	—	19,6	25,5	39,5	58,0	96,3	159,7
630	—	16,3	21,6	32,2	48,3	80,2	132,6
645	—	12,7	17,2	25,5	37,9	62,9	105,1
660	—	10,0	13,4	20,1	30,3	50,7	84,3
675	—	8,3	10,7	16,1	23,8	40,1	63,1
690	—	6,4	8,6	13,1	19,4	32,1	54,1
705	—	5,2	6,9	10,3	15,2	25,6	43,6
715	—	4,5	6,1	9,0	13,4	22,6	37,6
725	—	4,0	5,4	7,9	12,1	19,7	32,9
735	—	3,4	4,7	6,9	10,9	17,4	29,1
745	—	3,2	4,2	6,5	9,9	16,2	26,7
755	—	2,9	3,9	5,9	9,1	14,8	24,6
765	—	2,6	3,6	5,2	8,3	13,6	22,4
775	—	2,4	3,4	4,8	7,5	12,4	20,3
785	—	2,2	2,9	4,3	6,8	11,2	18,3
795	—	2,1	2,9	4,0	6,2	10,3	16,8
805	—	1,9	2,7	3,7	5,9	9,7	15,9
815	—	1,7	2,4	3,4	5,2	9,0	14,8

1) See clause 1.2

TABLE 36 – Pressure-temperature ratings for
flanges in austenitic chromium-nickel-molybdenum steel
(Forgings : ASTM A182 Grades F316 and F316H.
Castings : ASTM A351 Grade CF8M)

1	2	3	4	5	6	7	8
Service temperature °C	Maximum non-shock service pressure ratings, bar						
	Class						
	150	300	400	600	900	1 500	2 500
– 29 ¹⁾ to 38	19,0	49,6	66,1	99,2	149,0	248,3	413,8
50	18,3	49,4	65,6	98,5	148,4	246,7	411,3
75	17,3	48,7	64,8	97,4	146,3	243,5	406,1
100	16,3	48,0	64,0	96,0	144,5	240,2	400,6
125	15,4	47,5	63,3	94,9	144,0	237,8	396,2
150	14,5	46,8	62,6	94,0	141,3	235,0	392,0
175	13,5	46,5	62,1	93,1	140,0	233,1	388,4
200	12,6	46,0	61,5	91,9	138,5	230,6	383,8
225	11,7	45,1	60,5	90,4	135,9	226,0	377,1
250	10,7	43,7	58,5	87,8	131,7	219,2	366,0
260	10,3	—	—	—	—	—	—
275	10,0	41,8	56,0	83,5	125,5	209,3	349,1
300	9,4	39,6	53,0	79,0	119,0	198,1	330,6
325	8,7	37,4	49,8	74,5	112,0	186,8	310,9
350	8,1	35,2	47,0	70,0	106,0	176,0	294,0
375	7,5	33,9	45,2	67,5	102,1	169,0	282,0
400	6,9	32,3	43,0	64,5	97,5	162,3	269,8
425	6,4	31,2	41,2	62,0	92,8	155,1	258,1
450	5,8	29,6	39,3	59,0	88,6	148,0	246,0
475	5,1	28,2	37,4	56,3	84,5	141,0	234,0
500	4,0	26,7	35,6	53,5	80,5	133,4	223,2
525	3,4	25,4	33,8	50,6	76,4	126,4	211,0
538	2,7	24,5	32,7	49,3	73,8	123,1	205,1
550	—	23,9	31,8	47,9	72,0	119,7	199,5
575	—	22,6	30,0	43,0	67,5	112,6	187,6
600	—	21,0	28,2	42,3	63,5	105,8	175,6
607	—	20,7	27,6	41,3	62,1	103,4	172,4
615	—	20,3	27,2	40,7	61,0	102,0	170,0
630	—	19,0	25,2	38,6	56,2	94,2	156,9
645	—	16,7	22,2	32,7	49,6	83,2	138,5
660	—	14,8	19,4	29,3	43,8	73,2	122,0
675	—	12,7	16,8	25,5	38,3	64,0	106,0
690	—	11,2	14,8	21,4	33,2	55,2	91,0
705	—	9,3	12,7	18,9	28,4	46,9	78,0
715	—	8,2	11,2	16,9	24,8	41,0	69,0
725	—	7,3	9,6	14,3	21,5	35,5	59,4
735	—	6,5	8,5	12,6	18,6	31,2	52,1
745	—	5,5	7,2	11,2	16,8	28,2	46,6
755	—	5,1	6,9	10,0	15,0	25,2	41,8
765	—	4,5	5,9	9,0	13,7	22,6	37,5
775	—	4,0	5,4	8,3	12,4	20,4	34,1
785	—	3,6	5,0	7,4	11,2	18,1	30,7
795	—	3,3	4,3	6,5	10,0	16,1	27,2
805	—	3,0	3,6	5,6	8,8	14,2	23,4
815	—	2,4	3,1	4,8	7,2	11,7	19,7

TABLE 37 – Pressure-temperature ratings for
flanges in austenitic chromium-nickel-molybdenum
(low carbon) steel
(Forgings : ASTM A182 Grade F316L)

1	2	3	4	5	6	7	8
Service temperature °C	Maximum non-shock service pressure ratings, bar						
	Class						
	150	300	400	600	900	1 500	2 500
– 29 ¹⁾ to 38	19,0	35,5	47,2	71,0	106,5	177,2	295,5
50	18,3	35,5	47,2	71,0	106,5	177,2	295,5
75	17,3	35,5	47,2	71,0	106,5	177,2	295,5
100	16,3	35,2	46,8	70,3	105,9	176,2	293,6
125	15,4	34,0	45,3	67,9	102,2	170,1	284,0
150	14,5	32,7	44,6	65,7	98,4	164,0	273,5
175	13,5	30,2	40,3	60,5	91,0	151,2	252,2
200	12,6	27,6	36,7	55,1	82,6	138,1	230,0
225	11,7	26,5	35,1	52,6	79,0	131,9	219,5
250	10,7	25,4	34,1	50,8	76,2	127,1	211,6
260	10,3	—	—	—	—	—	—
275	10,0	24,4	32,6	49,0	73,5	122,0	203,5
300	9,4	23,8	31,4	47,2	71,0	117,9	196,5
325	8,7	22,9	30,4	45,6	68,5	113,8	189,6
350	8,1	22,2	29,4	44,1	66,3	110,2	184,0
375	7,5	21,2	28,6	42,6	64,1	106,7	177,9
400	6,9	20,7	27,6	41,3	62,1	103,4	172,4
425	6,4	20,0	26,6	40,6	60,1	100,3	166,8
450	5,8	19,4	26,0	38,9	58,2	97,1	161,8

1) See clause 1.2.

ANNEX B

REQUIREMENTS FOR MARKING OF STEEL PIPE FLANGES

B.1 Manufacturer's name or trade mark

All flanges shall be marked with the manufacturer's name or trade mark.

B.2 Class rating

Every flange shall be marked with the numerals denoting its class (primary service pressure rating in pounds-force per square inch).

Cold working and test pressure markings are prohibited unless specifically requested by the purchaser.

B.3 Material identification

B.3.1 Carbon steel flanges shall be marked with the word "steel".

B.3.2 Alloy steel flanges shall be marked with the word "steel" and with the appropriate standard symbol as indicated in Table 38.

The manufacturer may supplement the standard symbols with any desired trade designation provided that such markings cannot be confused with the standard symbols.

B.4 Melt identification

All cast steel flanges shall be marked with a melt number or melt identification except in the case of carbon steel castings, when this marking may be omitted unless specially required by the purchaser.

B.5 Thread identification

When flanges are not screwed to API Standard 5B¹⁾ or ANSI Standard B2.1²⁾, they shall be marked to indicate the type of thread used. The marking shall be made during manufacture of the flanges, or by stamping.

B.6 Size designation

The size marking shall consist of numerals denoting the nominal pipe size in inches. Size markings may be omitted from reducing flanges.

B.7 Ring number

Flanges grooved for standard ring-joints and the rings to be used with them shall be marked with the letter "R" and the corresponding ring numbers. These markings shall be placed on the edges of the flanges and on the outside surfaces of the rings. For ring numbers refer to Tables 4 to 11.

B.8 Omission of markings

On flanges of such size as will not permit of full markings, the markings may be omitted, with the approval of the purchaser, to the degree which conditions require in the following sequence :

1) American Petroleum Institute Standard 5B, *Threading, gauging and thread inspection of casing, tubing and line pipe threads*.

2) American National Standards Institute specification B2.1, *Pipe threads (except Dryseal)*.

- 1) size
- 2) material :
 - a) steel
 - b) alloy steel symbol
- 3) class rating
- 4) manufacturer's name or trade mark.

B.9 Stamping

Where steel stamps are used for marking, care shall be taken to see that the marking is not deep enough to cause cracks.

TABLE 38 – Alloy steels designation

Type of steel	Forgings		Castings	
	Specification	Standard symbol	Specification	Standard symbol
Carbon-molybdenum	ASTM A182 Grade F1	F1	ASTM A217 Grade WC1	WC1
1 % chromium 1/2 % molybdenum	ASTM A182 Grade F12	F12	—	—
1 1/4 % chromium 1/2 % molybdenum	ASTM A182 Grade F11	F11	ASTM A217 Grade WC6	WC6
2 1/4 % chromium 1 % molybdenum	ASTM A182 Grade F22	F22	ASTM A217 Grade WC9	WC9
5 % chromium 1/2 % molybdenum	ASTM A182 Grade F5a	F5a	ASTM A217 Grade C5	C5
9 % chromium 1 % molybdenum	ASTM A182 Grade F9	F9	ASTM A217 Grade C12	C12
Austenitic chromium-nickel	ASTM A182 Grade F304	F304	ASTM A351 Grade CF8	CF8
	ASTM A182 Grade F304H	F304H	—	—
Austenitic chromium-nickel (low carbon)	ASTM A182 Grade F304L	F304L	—	—
Austenitic chromium-nickel (titanium stabilized)	ASTM A182 Grade F321	F321	—	—
	ASTM A182 Grade F321H	F321H	—	—
Austenitic chromium-nickel (niobium stabilized)	ASTM A182 Grade F347	F347	ASTM A351 Grade CF8C	CF8C
	ASTM A182 Grade F347H	F347H	—	—
Austenitic chromium-nickel-molybdenum	ASTM A182 Grade F316	F316	ASTM A351 Grade CF8M	CF8M
	ASTM A182 Grade F316H	F316H	—	—
Austenitic chromium-nickel-molybdenum (low carbon)	ASTM A182 Grade F316L	F316L	—	—

ANNEX C

DIMENSIONS OF SEAMLESS AND WELDED STEEL PIPE

TABLE 39 — Dimensions of seamless and welded steel pipe

Dimensions in millimetres

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Nominal pipe size in	Outside diameter	Nominal wall thickness																
		Schedule 5S	Schedule 10S	Schedule 10	Schedule 20	Schedule 30	Schedule 40S	Standard wall	Schedule 40	Schedule 60	Schedule 80S	Extra strong	Schedule 80	Schedule 100	Schedule 120	Schedule 140	Schedule 160	Double extra strong
1/8	10,3	—	1,24	—	—	—	1,73	1,73	1,73	—	2,41	2,41	2,41	—	—	—	—	—
1/4	13,7	—	1,65	—	—	—	2,24	2,24	2,24	—	3,02	3,02	3,02	—	—	—	—	—
3/4	17,1	—	1,65	—	—	—	2,31	2,31	2,31	—	3,20	3,20	3,20	—	—	—	—	—
1/2	21,3	1,65	2,11	—	—	—	2,77	2,77	2,77	—	3,73	3,73	3,73	—	—	—	4,78	7,47*
3/4	26,7	1,65	2,11	—	—	—	2,87	2,87	2,87	—	3,91	3,91	3,91	—	—	—	5,56	7,82*
1	33,4	1,65	2,77	—	—	—	3,38	3,38	3,38	—	4,55	4,55	4,55	—	—	—	6,35	9,09*
(1 1/4)	42,2	1,65	2,77	—	—	—	3,56	2,56	3,56	—	4,85	4,85	4,85	—	—	—	6,35	9,70*
1 1/2	48,3	1,65	2,77	—	—	—	3,68	3,68	3,68	—	5,08	5,08	5,08	—	—	—	7,14	10,16*
2	60,3	1,65	2,77	—	—	—	3,91	3,91	3,91	—	5,54	5,54	5,54	—	—	—	8,74	11,07*
(2 1/2)	73,0	2,11	3,05	—	—	—	5,16	5,16	5,16	—	7,01	7,01	7,01	—	—	—	9,52	14,02*
3	88,9	2,11	3,05	—	—	—	5,49	5,49	5,49	—	7,62	7,62	7,62	—	—	—	11,13	15,24*
(3 1/2)	101,6	2,11	3,05	—	—	—	5,74	5,74	5,74	—	8,08	8,08	8,08	—	—	—	—	—
4	114,3	2,11	3,05	—	—	—	6,02	6,02	6,02	—	8,56	8,56	8,56	—	11,13	—	13,49	17,12*
(5)	141,3	2,77	3,40	—	—	—	6,55	6,55	6,55	—	9,52	9,52	9,52	—	12,70	—	15,88	19,05*
6	168,3	2,77	3,40	—	—	—	7,11	7,11	7,11	—	10,97	10,97	10,97	—	14,27	—	18,26	21,95*
8	219,1	2,77	3,76	—	6,35	7,04	8,18	8,18	8,18	10,31	12,70	12,70	12,70	15,09	18,26	20,62	23,01	22,22*
10	273,0	3,40	4,19	—	6,35	7,80	9,27	9,27	9,27	12,70	12,70	12,70	12,70	15,09	18,26	21,44	25,40	25,40
12	323,9	3,96	4,57	—	6,35	8,38	9,52	9,52	9,52	10,31	14,27	12,70	12,70*	17,47	21,44	25,40	28,58	33,34
14	365,6	3,96	4,78	6,35	7,92	9,52	—	9,52	11,13	15,09	—	12,70*	19,05	23,82	27,79	31,75	35,71	—
16	406,4	4,19	4,78	6,35	7,92	9,52	—	9,52	12,70	16,64	—	12,70	21,44	26,19	30,96	36,52	40,49	—
18	457,0	4,19	4,78	6,35	7,92	11,13	—	9,52*	14,27	19,05	—	12,70*	23,82	29,36	34,92	39,69	45,24	—
20	508,0	4,78	5,54	6,35	9,52	12,70	—	9,52	15,09	20,62	—	12,70	26,19	32,54	38,10	44,45	50,01	—
22	559,0	4,78	5,54	6,35	9,52	12,70	—	9,52	15,88	22,22	—	12,70	28,58	34,92	41,28	47,62	53,98	—
24	610,0	5,54	6,35	6,35	9,52	14,27	—	9,52	17,48	24,61	—	12,70*	30,96	38,89	46,02	52,39	59,54	—
26	660,0	—	—	7,92	12,70	—	—	9,52*	—	—	—	12,70	—	—	—	—	—	—
28	711,0	—	—	7,92	12,70	15,88	—	9,52*	—	—	—	12,70	—	—	—	—	—	—
30	762,0	6,35	7,92	7,92	12,70	15,88	—	9,52*	—	—	—	12,70	—	—	—	—	—	—
32	813,0	—	—	7,92	12,70	15,88	—	9,52*	17,48	—	—	12,70	—	—	—	—	—	—
34	864,0	—	—	7,92	12,70	15,88	—	9,52*	17,48	—	—	12,70	—	—	—	—	—	—
36	914,0	—	—	7,92	12,70	15,88	—	9,52*	19,05	—	—	12,70	—	—	—	—	—	—

* Except when marked with an asterisk, Standard, Extra Strong and Double Extra Strong wall thickness have pipe of corresponding wall thickness listed under one of the schedule numbers.

Dimensions in this table are based on ANSI Standard B36.10 and ANSI Standard B36.19.

For tolerance on outside diameter and wall thickness see appropriate specifications.

Schedule 5S, 10S, 40S and 80S apply to austenitic chromium-nickel steel pipe only.

The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.

For nominal pipe sizes greater than 36 in, see API Standard 5LS, *Spiral weld line pipe*.

ANNEX D

THREADING OF PIPE FOR STANDARD STEEL FLANGES

(See clause 3.8)

This International Standard calls for thread lengths in the flanges in proportion to the thickness of the flange. This means that the thread lengths in the flanges intended for the higher pressure classes in a given size are longer than the thread lengths in the flanges intended for the lower pressure classes.

The length of the effective external taper thread specified in API Standard 5B and ANSI Standard B2.1 provides a sufficient number of threads on the pipe to ensure a satisfactory joint with certain of these lower pressure classes and sizes of flanges (denoted in Table 40 by an asterisk).

Table 40 gives the additional length of effective thread required on pipe for those sizes and pressure classes of flanges where the standard effective pipe thread length is too short to bring the end of the pipe reasonably close to the face of the flange when both parts are assembled by power.

As the threads in the flanges and on the pipe are gauged with a tolerance of one thread large and one thread small, there will naturally be some difference in distance between the end of the pipe and the face of the flange in the various assemblies for the different sizes and classes of flanges.

The additional lengths given in Table 40 are added to the small end of the standard pipe threads; the pitch diameter at the end of the external thread is therefore smaller than that of the standard pipe. In other words, the small end of the ring gauge will pass over the end of the pipe, the number of threads or length in millimetres equal to the values given.

TABLE 40 – Additional length of effective thread on pipe

Nominal pipe size	Classes 150 300	Class 400	Class 600		Class 900		Class 1 500		Class 2 500	
	Number of threads	Number of threads	Number of threads	Additional length	Number of threads	Additional length	Number of threads	Additional length	Number of threads	Additional length
				mm		mm		mm		mm
1/2	*	—	*	*	—	—	3 1/2	6,4	7	12,7
3/4	*	—	*	*	—	—	5	6,4	7	12,7
1	*	—	*	*	—	—	5	11,0	7 1/2	16,5
(1 1/4)	*	—	*	*	—	—	5	11,0	7 1/2	16,5
1 1/2	*	—	*	*	—	—	5	11,0	7 1/2	16,5
2	*	—	*	*	—	—	5	11,0	7 1/2	16,5
(2 1/2)	*	—	*	*	—	—	5	15,9	8	25,4
3	*	—	1	3,2	3	9,5	6	19,0	10	31,8
(3 1/2)	*	—	1	3,2	—	—	—	—	—	—
4	*	*	1 1/2	4,8	3 1/2	11,1	6 1/2	20,6	10 1/2	33,3
(5)	*	*	1 1/2	4,8	3 1/2	11,1	6 1/2	20,6	10 1/2	33,3
6	*	*	1 1/2	4,8	3 1/2	11,1	7 1/2	23,8	11 1/2	36,5
8	*	*	2	6,4	4	12,7	8	25,4	14	44,4
10	*	*	3	9,5	5	15,9	9	28,6	16	50,8
12	*	*	3	9,5	5	15,9	10	31,8	19	60,3
14	*	*	3	9,5	6	19,0	—	—	—	—
16	*	*	3	9,5	6	19,0	—	—	—	—
18	*	*	3	9,5	6	19,0	—	—	—	—
20	*	*	3	9,5	6	19,0	—	—	—	—
24	*	*	3	9,5	6	19,0	—	—	—	—

* Standard pipe thread is used for this size.

NOTE — The use of sizes in parentheses should be avoided; these sizes will be deleted in future editions.

ANNEX E

DETERMINATION OF BOLT LENGTHS FOR LAPPED JOINTS

E.1 DETERMINATION OF STUD-BOLT LENGTHS FOR LAPPED JOINTS OF OTHER THAN RING-JOINT TYPE, ALL CLASSES

To determine the lengths of stud-bolts required for various types of lapped joints, the following additions should be made to the appropriate basic dimensions given in Column 9 of Tables 13 and 15 and Column 10 of Tables 17, 19, 21, 23 and 25 :

Type of lapped joint	Addition to basic dimension
i) Lapped raised face to lapped raised face	Add thickness t , in Figure 2, of both laps.
ii) Lapped male to lapped female	Add thickness t , in Figure 2, of male lap or 6,4 mm, whichever is the greater, plus thickness t , in Figure 2, of female lap.
iii) Lapped tongue to lapped groove	Add thickness t , in Figure 2, of tongue lap plus thickness t , in Figure 2, of groove lap plus 6,4 mm.
iv) Lapped raised face to 1,6 mm raised face on flange (Classes 150 and 300)	Add thickness t , in Figure 2, of one lap.
v) Lapped raised face to 6,4 mm raised face on flange (all classes)	Add thickness t , in Figure 2, of one lap plus 6,4 mm.
vi) Lapped male to female on flange	Add thickness t , in Figure 2, of male lap or 6,4 mm, whichever is the greater.
vii) Lapped female to male on flange	Add thickness t , in Figure 2, of female lap plus 6,4 mm.
viii) Lapped tongue to groove on flange	Add thickness t , in Figure 2, of tongue lap plus 6,4 mm.
ix) Lapped groove to tongue on flange	Add thickness t , in Figure 2, of groove lap plus 6,4 mm.

E.2 DETERMINATION OF STUD-BOLT LENGTHS FOR LAPPED JOINTS OF THE RING-JOINT TYPE**E.2.1 Classes 150 and 300**

Add the thickness t , in Figure 2, of each lap included in the joints to the appropriate stud-bolt dimensions obtained from Column 8 of Tables 13 and 15.

E.2.2 Classes 400, upwards

Add the thickness t , in Figure 2, of each lap included in the joints to the appropriate stud bolt dimensions obtained from Column 9 of Tables 17, 19, 21, 23 and 25.

E.3 DETERMINATION OF HEADED BOLT LENGTHS FOR ALL TYPES AND CLASSES OF LAPPED JOINTS

The length of a headed bolt for any of the facing combinations in i) and ii) above is equal to the length of the appropriate stud-bolt plus 3,2 mm minus the nominal bolt size.

ANNEX F

RECOMMENDATIONS FOR THE CHOICE OF GASKETS FOR FLANGED JOINTS
EMPLOYING RAISED, MALE/FEMALE AND TONGUE/GROOVE FLANGE FACINGS

F.1 GASKET TYPES

The satisfactory operation, under the pressure-temperature ratings given in Tables 26 to 37, of a flanged joint employing raised, male/female or tongue/groove facings is dependent on the choice of a gasket which will be suitably stable under the bolt load applied to the joint.

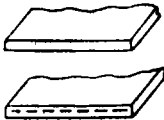
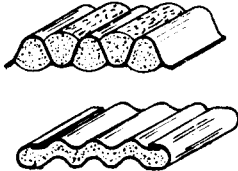
The raised, male/female and tongue/groove facings specified in this International Standard cover together, for each nominal size of flange, three different contact widths, namely :

- a) the raised face and the large male face width, both of which are the same;
- b) the large tongue face width;
- c) the small tongue face width.

Accordingly, under these recommendations, the range of suitable gasket types has been divided into Groups 1, 2 and 3, Group 1 containing the gasket types applicable when given a contact width not greater than that defined in a), Group 2 the gaskets applicable when given a contact width not greater than that defined in b), and Group 3 the gaskets applicable when given a contact width not greater than that defined in c). The groups are as follows :

Group 1 gaskets

Gasket contact width for each nominal size to be made not greater than the width of the raised facing of the relevant slip-on welding flange, the inside diameter being taken as the outside diameter of the relevant pipe.

Material	Typical sections
Non-metallic gaskets except those of compressed asbestos fibre less than 1,6 mm thick	
Edge (spiral)-wound, asbestos-filled gaskets made of carbon or stainless steel or nickel-copper alloy	
Corrugated metal gaskets, asbestos-inserted or jacketed and asbestos-filled, made of soft aluminium, soft copper or brass, iron or soft steel	
Corrugated metal gaskets made of soft aluminium, soft copper or brass	

Group 2 gaskets

Gasket contact width for each nominal size to be made not greater than the width of the relevant large tongue facing.

Material	Typical sections
Compressed asbestos fibre gaskets 0,8 mm thick	
Corrugated metal, asbestos-inserted or jacketed and asbestos-filled gaskets made of 5 % chromium steel, stainless steel or nickel-copper alloy	
Corrugated metal gaskets made of iron or soft steel, 5 % chromium steel, stainless steel or nickel-copper alloy	
Flat metal jacketed and asbestos-filled gaskets made of soft aluminium, soft copper or brass, iron or soft steel, 5 % chromium steel, stainless steel or nickel-copper alloy	
Grooved metal gaskets made of soft aluminium, soft copper or brass, iron or soft steel, 5 % chromium steel, stainless steel or nickel-copper alloy	

Group 3 gaskets

Gasket contact width for each nominal size to be made not greater than the width of the relevant small tongue facing minus 0,8 mm but not less than 4,8 mm.

Material	Typical sections
Solid flat metal gaskets made of soft aluminium, soft copper or brass, iron or soft steel, 5 % chromium steel, stainless steel or nickel-copper alloy	

F.2 GASKET DIMENSIONS

For the convenience of users the limiting dimensions of gaskets in Groups 1, 2 and 3 are given in Tables 41 to 45.