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

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FOREWORD

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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

Printed in Switzerland

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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/mm^2. 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 16.20[1]. 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	A216 Grade WCB
	A105 Grade II	–
	A181[2] Grades I and II	–
Carbon-molybdenum steel	A182 Grade F1	A217 Grade WCI
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	A351 Grade CF8
	A182 Grade F304H	–
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	A351 Grade CF8C
	A182 Grade F347H	–
Austenitic chromium-nickel-molybdenum steel	A182 Grade F316	A351 Grade CF8M
	A182 Grade F316H	–
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 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 ± 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 5B[1] or ANSI Standard B2.1[2] to mate with pipe to API Standard 5L[1]. 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 : $^{+\ 0,8\ mm}_{0}$

Nominal sizes 12 in and larger : $^{+\ 1,6\ mm}_{0}$

3.8.2 *On the flange thickness (dimension C)*

Nominal sizes 18 in and smaller : $^{+\ 3,2\ mm}_{0}$

Nominal sizes 20 in and larger : $^{+\ 4,8\ mm}_{0}$

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 : $^{+\ 0,8\ mm}_{0}$

Nominal sizes 12 in and larger : $^{+\ 1,6\ mm}_{0}$

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 : $^{+3,2}_{\ \ 0}$ mm

Nominal sizes 20 in and larger : $^{+4,8}_{\ \ 0}$ mm

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 : ± 0,8 mm

Nominal sizes 12 to 18 in inclusive : ± 1,6 mm

Nominal sizes 20 in and larger : $^{+3,2}_{-1,6}$ mm

3.10.2 *On the flange thickness (dimension C)*

Nominal sizes 18 in and smaller : $^{+3,2}_{\ \ 0}$ mm

Nominal sizes 20 in and larger : $^{+4,8}_{\ \ 0}$ mm

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

Nominal sizes 5 in and smaller : $^{+2,4}_{-0,8}$ mm

Nominal sizes 6 in and larger : $^{+4,0}_{-0,8}$ mm

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

Nominal sizes 10 in and smaller : ± 1,6 mm

Nominal sizes 12 in and larger : ± 3,2 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 neccessarily 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.

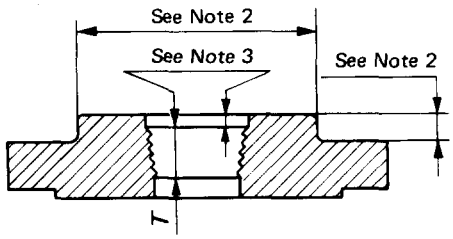
Threaded and machined surfaces shall be well covered with an approved rust-inhibiting product.

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.

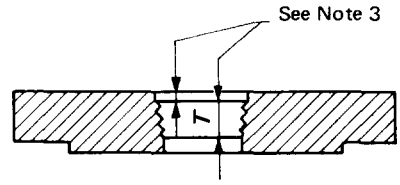
7.2 Despatch

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 manufactuer.



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
	Outside diameter (see Note 3)				**Outside diameter of recess or groove** (see Note 3)				**Height**			**Minimum outside diameter of raised portion** (See Note 4)	
Nominal pipe size	**Raised face, large male and large tongue** (see Note 5)	**Small male**	**Small tongue**	**Inside diameter of large and small tongue** (see Note 3)	**Large female and large groove** (see Note 5)	**Small female**	**Small groove**	**Inside diameter of large and small groove** (see Note 3)	**Raised face Classes 150 and 300**	**Raised face Classes 400 to 2 500 Large and small male and tongue, all classes** (see Note 5)	**Depth of female or groove**	**Small female and small groove**	**Large female and large groove** (see Note 5)
	R	*S*	*T*	*U*	*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.

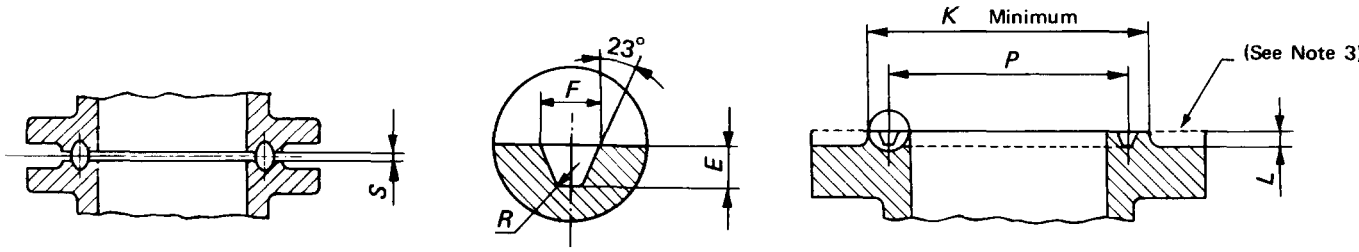
2 For ring-joint facing dimensions see Tables 4 to 10.

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) $^{+0,4}_{0}$ mm
On F (width) ± 0,2 mm
On P (pitch diameter) ± 0,13 mm
On R (radius at bottom) max.
On 23° (angle) ± 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

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.