INTERNATIONAL STANDARD 13

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

Grey iron pipes, special castings and grey iron parts for pressure main lines

Tuyaux, raccords et pièces en fonte grise pour canalisations sous pression

First edition – 1978-06-15

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Descriptors : pressure pipes, pipes (tubes), pipe fittings, pipe joints, pipe flanges, metal gaskets, metal tubes, castings, cast iron, grey iron, dimensions, dimensional tolerances, specifications, tests, mechanical tests, hardness tests, hydraulic tests.

Price based on 33 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 13 was developed by Technical Committee ISO/TC 5, *Metal pipes and fittings.*

It was submitted directly to the ISO Council, in accordance with clause 6.13.1 of the Directives for the technical work of ISO. It cancels and replaces ISO Recommendation R 13-1955, which had been approved by the member bodies of the following countries :

Austria	Hungary	Portugal
Chile	Italy	Spain
Denmark	Japan	Sweden
France	Mexico	Switzerland
Germany	Netherlands	United Kingdom
Ireland	New Zealand	Yugoslavia
Israel	Pakistan	

No member body had expressed disapproval of the document.

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CONTENTS

SECTION FOUR : SPECIAL CASTINGS Page

Grey iron pipes, special castings and grey iron parts for pressure main lines

SECTION ONE : GENERAL SPECIFICATION

0 INTRODUCTION

This International Standard applies generally to grey iron pipes, special castings and grey iron parts of all kinds for pressure mains, and chiefly to pipes and specials with sockets for lead joints.[1)]

It also applies to pipes and specials with other types of joints, particularly rubber joints. However, the characteristics of these joints, many of which are patented, are not detailed : they remain the subject of private agreement between manufacturers and users.

Castings with such joints may keep the overall measurements of castings with lead joints, which will facilitate the use by the manufacturer of interchangeable patterns allowing accurate and speedy manufacture.

With regard to socket joints (see clause 3), two different types have been included, in which the centring bead is part of the interior of the socket or formed on the outside of the pipe spigot.

Centrifugal casting in a metallic mould does not allow a bead to be cast on the spigot of the pipe. The two types of joint, however, have been included because the alternative method is still used; the respective dimensions of the two types of joint are such that interchangeability is always possible.

The flanges normally have a machined facing strip and drilled holes; this does not exclude the possibility, in certain cases, of having rough-cast flanges where particularly accurate moulding processes are used.

In general, the specials (see clause 4) have a sufficiently great resistance to internal pressure for all the current uses. Different methods of reinforcement have been allowed, however, particularly in cases where high working pressures must be applied to specials with large branches in which the stresses in the metal are important.

The socket tolerances (see clause 8) have been fixed in relation to the normal caulking space.

It is logical to provide for equality between the plus and minus tolerances. Similarly, the socket tolerances are smaller than the barrel tolerances : in fact, the socket of the castings has a greater thickness than the barrel and, therefore, greater rigidity.

The value adopted for the mass density of the cast iron (see clause 12) is 7 150 kg/m^3 : it lies between the values fixed formerly in different countries, which vary between 7 000 and 7 250. The value of 7 150 ensures good practical agreement between the calculated and real masses.

The cast iron pipes, specials and castings for mains of different diameters are generally made in thicknesses suited to the highest working pressures generally used.[2)]

In some cases, it may happen that these castings are intended to be submitted to working pressures giving an insufficient margin of safety as compared with the works test pressures (see clause 16). In such cases it will be for the users to state this and for the manufacturers to provide for a suitable increase in thickness and in test pressure.

1) Although spun pipes at present comprise the greater part of world production, sand cast pipes have been included, as they are still made by some manufacturers or in certain diameters.

2) Water distribution pipelines follow the contours of the ground and the working pressure varies from one point to another along their route. In practice it would be very difficult to vary the thickness and consequently the resistance of the castings according to their position in the pipeline and the pressure they have to withstand. The resulting increase in the number of patterns would complicate both stocking and distribution, besides increasing the risk of errors on the construction site.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the properties of the following products :

a) Grey iron pipes manufactured by any one of the three following processes :

1) centrifugal casting in metal moulds;

2) centrifugal casting in sand moulds;

3) vertical casting in sand moulds.

b) Grey iron special castings and parts.

It is applicable to pipes and all special castings with sockets, spigots or flanges defined by this International Standard and to pipes and special castings with other types of joints, the general dimensions of which, except those relating to the joints, conform to the requirements of this International Standard. It is not applicable to the down pipes and their specials used in the building industry.

2 REFERENCE

ISO/R 79, *Brinell hardness test for steel,* Amendment 1.

3 TYPES OF JOINTS

Socket pipes and special castings for lead joints may be provided with a centring ring in the socket, and in this case, are supplied with a plain spigot end. Alternatively, the sockets may be without centring ring, in which case the spigot ends could be plain or have a bead integrally cast or formed by means of a permanent hoop shrunk on hot.

Unless otherwise specified, flanges are machined on boss and their dimensions are in accordance with the relevant tables in this International Standard. Bolt holes may be drilled or cored.

When pipes and special castings are ordered with a joint of a type other than those mentioned in this International Standard, the dimensions and other characteristics of the joint are those applicable to that joint.

4 SPECIAL CASTINGS

The special castings are of the thickness shown in the relevant tables, except when the working conditions necessitate some strengthening. Such strengthening may be in the form of additional thickness, ribs, bolts, or other means proposed by the manufacturer and finally approved by the purchaser.

If necessary, the reinforcement of the thickness may be obtained by reducing the internal diameter.

5 MARKING

Each pipe and special casting has cast or painted on it the mark of the manufacturer, the nominal diameter and, if necessary, its principal characteristics.

The marks are placed :

a) on the socket faces of pipes centrifugally cast in metal moulds;

b) on the outsides of the sockets or on the barrels of pipes centrifugally cast in sand moulds;

c) on the outsides of the sockets or towards the ends of the barrels of pipes vertically cast in sand moulds;

d) on the barrels of special castings.

The class or any other marks required by the purchaser may be painted on.

6 MANUFACTURE OF GREY IRON USED

The grey iron used for the manufacture of pipes and special castings should be of good quality. It is prepared at the discretion of the manufacturer in a cupola, an active mixer, or other suitable furnace, and is made from pig iron, or molten iron, or good iron and steel scrap with additions of good quality materials suited to the production method, excluding any raw material of inferior quality. Upon fracture, the iron should show a grey, close and uniform grain.

7 QUALITY OF PIPES AND SPECIAL CASTINGS

Pipes and special castings are stripped with all precautions necessary to avoid warping or shrinking defects detrimental to their good quality.

The pipes and special castings should be sound and free from surface or other defects.

Repairing of defects by soldering or by the application of mastic may not be done without previously securing the consent of the purchaser or his representative. This stipulation also applies to the plugging of leaks by caulking.

Pipes and special castings showing small imperfections inseparable from the method of manufacture and not affecting their use, are not rejected.

The pipes and special castings should be such that they can be cut, drilled or machined; in case of dispute, the castings are considered as acceptable, provided that the Brinell harness, measured at the centre of the thickness, does not exceed 215 HB. The superficial Brinell hardness of pipes centrifugally cast in metal moulds does not exceed 230 HB (for the hardness test, see clause 15).

8 TOLERANCES ON THE EXTERNAL DIAMETER OF THE BARREL, THE INTERNAL DIAMETER OF THE SOCKET, AND THE DEPTH OF THE SOCKET

The socket tolerances are given in table 1, where

DN is the nominal diameter of the pipes and special castings in millimetres;

f is the caulking space of the joint in millimetres ($f = 9 + 0{,}003$ DN).

TABLE 1

Dimension	Nominal diameter	Tolerance mm
External diameter of barrel *DE*	All diameters	$\pm 1/2\,f = \pm (4{,}5 + 0{,}001\,5$ DN)
Internal diameter of socket *DI*	All diameters	$\pm 1/3\,f = \pm (3 + 0{,}001$ DN)
Depth of socket *P*	Up to and including DN 600	± 5
	Over DN 600 and up to and including DN 1 000	± 10

The maximum or minimum jointing space resulting from these tolerances is such that the jointing of the pipes and special castings is not adversely affected.

9 TOLERANCES ON THICKNESS

The tolerances on the wall thickness and flange thickness are given in table 2, where

e is the standard thickness of the wall in millimetres;

b is the standard thickness of the flange in millimetres.

TABLE 2

Type of casting	Dimension	Tolerance mm
Pipes	Wall thickness	$-(1 + 0{,}05\,e)$ [1]
	Flange thickness	$\pm (2 + 0{,}05\,b)$
Special castings	Wall thickness	$-(2 + 0{,}05\,e)$ [1]
	Flange thickness	$\pm (3 + 0{,}05\,b)$

1) No limit for the plus tolerances has been set (see clause 12, note).

The thickness of special castings may exceptionally be reduced to not less than the minimum thickness of class B pipes of the same diameter, provided that the area of the affected part is not more than 1/10 of the cross-sectional area of the bore.

10 TOLERANCES ON LENGTH

The tolerances on normally manufactured lengths of pipes and special castings are given in table 3.

TABLE 3

Type of casting	Nominal diameter	Tolerance mm
Socket and spigot and plain ended pipes	All diameters	± 20
Socket special castings, flange and socket and flange and spigot pieces	Up to and including DN 450	± 20
	Over DN 450	+ 20 − 30
Flanged pipes and flanged special castings	All diameters	± 10

Should smaller tolerances be demanded, for example in the case of flanged closing pieces, they are specially fixed, but the minimum tolerance may not be less than ± 1 mm.

Of the total number of socket and spigot pipes to be supplied in each diameter, the manufacturer may supply up to 10 % in lengths shorter than specified as shown in table 4.

TABLE 4

Specified length	Decrease in length m			
4 m	0,5	1	–	–
Over 4 m	0,5	1	1,5	2

11 PERMISSIBLE DEVIATION FROM A STRAIGHT LINE

The pipes should be straight. When rolled along two gantries separated by approximately two-thirds the length of the pipe to be checked, the maximum deviation f_m, in millimetres, should not be greater than 1,25 times the length l in metres of this pipe, thus

$$f_m \leqslant 1{,}25\,l$$

12 TOLERANCES ON MASSES

The standard masses are those shown in the attached tables or, for reinforced or non-standard special castings, those calculated by taking the mass density of cast iron as 7 150 kg/m³.

The tolerances on standard masses are given in table 5.

TABLE 5

Type of casting	Tolerance %
Pipes	± 5
Special castings except as stated below	± 8
Bends, special castings with more than one branch and non-standard special castings	± 12

NOTE – Castings of a greater mass than the maximum are accepted, provided they comply in every other respect with the requirements of this International Standard.

13 MECHANICAL TESTS

13.1 For pipes centrifugally cast in metal moulds

Test are made :

a) on rings for pipes up to and including the nominal diameter DN 300;

b) on tensile bars for pipes over the nominal diameter DN 300.

The rings and bars are cut from the spigot end of the pipes.

13.2 For pipes centrifugally cast in sand moulds

Tensile tests are made on bars for pipes of all nominal diameters. The bars are cut from the spigot end of the pipes.

13.3 For pipes vertically cast in sand moulds and special castings

Tensile tests are made, for pipes and special castings of all nominal diameters, on bars cast from the same metal as is used in the castings.

13.4 Ring tests for pipes centrifugally cast in metal moulds (figure 1)

Rings of approximately 25 mm width are tested on a suitable machine. The rings are supported on two knife edges diametrically opposed and the load is applied from the inside at these points.

The bending strength modulus of the ring is calculated from the breaking load by the following formula :

$$R = \frac{3P(D-e)}{\pi b e^2}$$

where

R is the bending strength modulus of the ring, in newtons per square millimetre;

P is the breaking load, in newtons;

D is the external diameter of the ring, in millimetres;

e is the thickness of the wall of the ring, in millimetres;

b is the width of the ring, in millimetres.

13.5 Tests on bars for pipes centrifugally cast in metal or sand moulds (figure 2)

The tensile test bars cut from the pipes are about 90 mm long, and have a diameter of about 6 mm, which dimension may vary with the thickness of the pipe. The ends are prepared so as to fit the testing machine. Figure 2 shows one suitable design.

13.6 Tests on bars for pipes vertically cast in sand moulds and special castings (figure 3)

The tensile test bars are correctly moulded and free from defects and are either unmachined, or machined to give a diameter of about 20 mm to 25 mm. The ends are selected by the manufacturer to fit the testing machine; figure 3 shows one suitable design.

14 TESTING RESULTS

The mechanical tests are carried out during manufacture and at the most twice per day of casting. The results obtained are representative of all pipes and special castings of all diameters made during the day.

The manufacturer is allowed to take three test pieces from the same pipe or during the same run of metal, of which test pieces at least two should satisfy the requirements of table 6.

NOTE – The manufacturer and the purchaser may agree to replace the tensile test on machined test bar by a quicker test on ring. They determine the test conditions.

All pipes from which the rings or bars have been cut are accepted by the purchaser as complete lengths.

15 BRINELL HARDNESS TEST

For the checking of the hardness limits, specified in clause 7, Brinell tests are carried out, in accordance with the requirements of ISO/R 79, on the test rings or bars cut from the pipes and used for the previous tests.

The test consists of applying either a load of 3 000 kg to a ball of 10 mm diameter for 15 s, or a load of 750 kg to a ball of 5 mm diameter for 10 s.

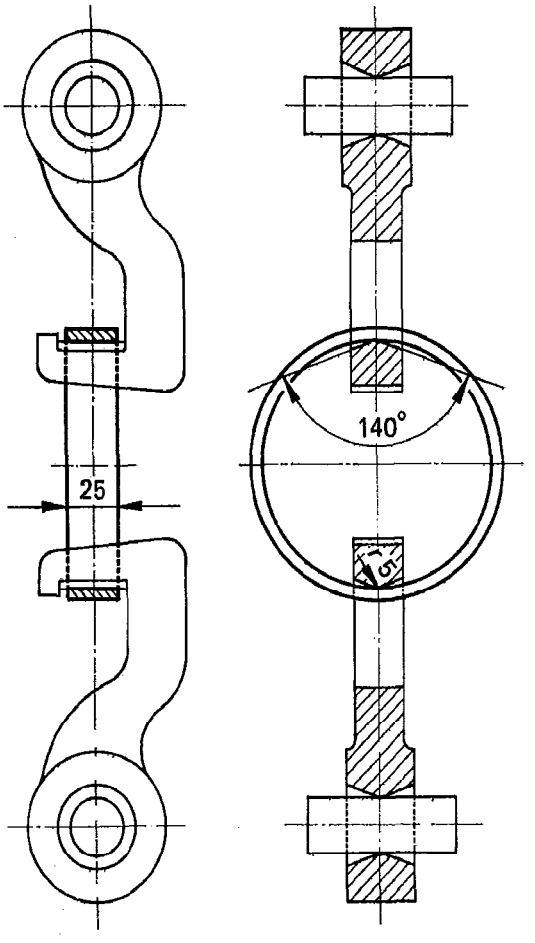


FIGURE 1

Dimensions in millimetres

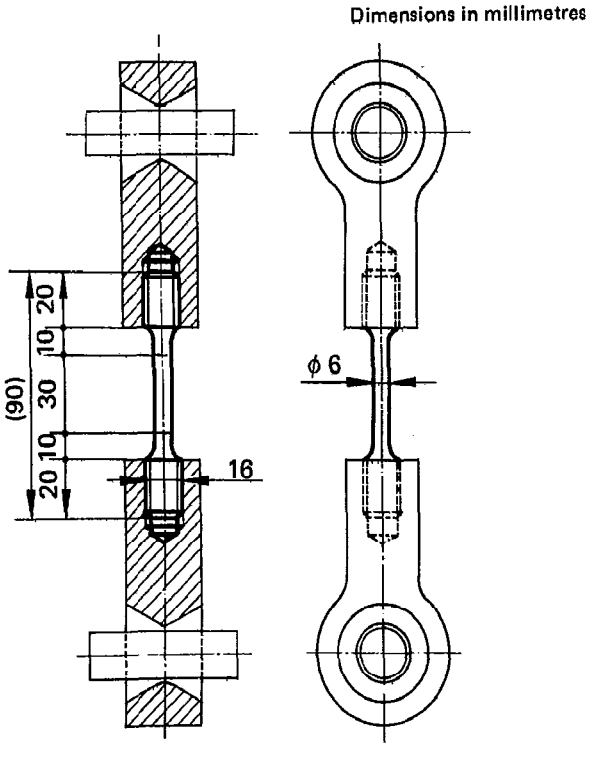


FIGURE 2

Dimensions in millimetres

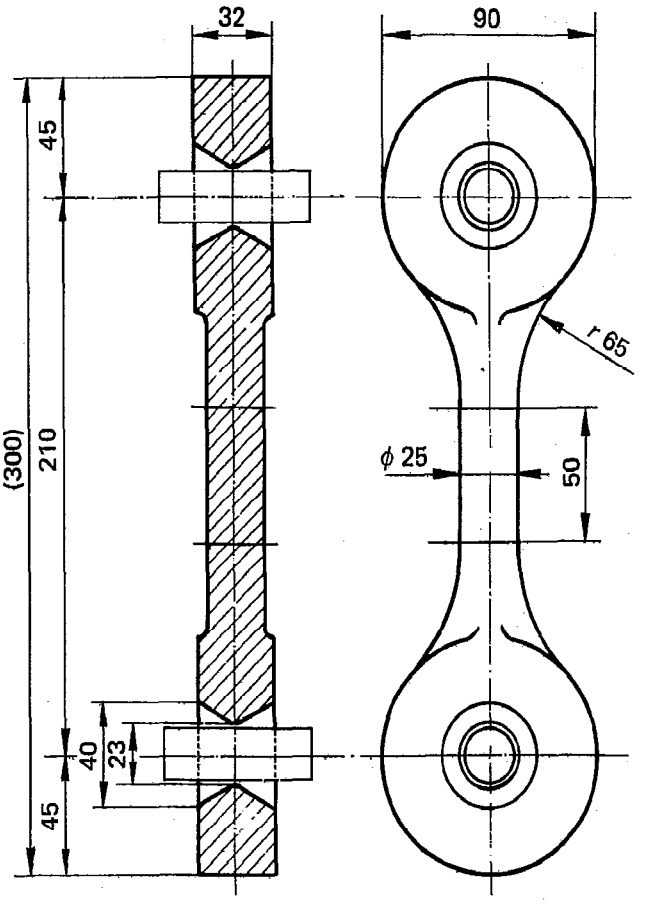


FIGURE 3

TABLE 6

Type of casting	Nominal diameter	Type of test	Minimum resistance N/mm²
Pipes centrifugally cast in metal moulds	Up to and including DN 300	Deflection on ring	(modulus) 400
	Over DN 300 and up to and including DN 600	Tensile on machined test bar	200
	Over DN 600	Tensile on machined test bar	180
Pipes centrifugally cast in sand moulds	Up to and including DN 600	Tensile on machined test bar	180
	Over DN 600	Tensile on machined test bar	180
Pipes vertically cast in sand moulds and special castings	All diameters	Tensile on cast test bar	140

16 HYDRAULIC TESTS

Hydraulic tests are carried out in accordance with tables 7, 8 and 9.

16.1 For centrifugally cast socket and spigot pipes

TABLE 7

Nominal diameter	Test pressure bar*		
	Class LA	Class A	Class B
Up to and including DN 600	35	35	35
Over DN 600	15	20	25

16.2 For vertically cast pipes

TABLE 8

Nominal diameter	Test pressure bar*	
	Class A	Class B
Up to and including DN 600	20	25
Over DN 600	15	20

16.3 For other pipes and special castings

TABLE 9

Type of casting	Nominal diameter	Test pressure bar*
Flanged pipes Special castings	Up to and including DN 300	25
	Over DN 300 and up to and including DN 600	20
Flanged pipes, special castings, without branches or with branches not greater than half the principal diameter	Over DN 600 and up to and including DN 1 000	15
Special castings with branches greater than half the principal diameter	Over DN 600 and up to and including DN 1 000	10

NOTE – Where pipes or special castings are required for higher test pressures, they are specially considered (see clause 4).

To perform the hydraulic test, the pipes are kept under pressure for 15 s; they may be struck moderately with a 700 g hammer, and they must withstand the pressure test without showing any leakage, sweating or other defect of any kind.

Wherever manufacturing practice permits, the hydraulic test is applied before coating.

17 COATING

Except when otherwise specified, all pipes and special castings are coated inside and outside.

The coating must set rapidly with good adherence and not scale off.

The inside coating must not contain any constituent soluble in water or any ingredient liable to impart any taste or smell whatsoever to the water, after suitable washing out of the main.

18 INSPECTION

If the purchaser wishes to inspect the pipes and special castings, such inspection is undertaken at the works of the manufacturer. The equipment and labour necessary for the carrying out of the inspection are provided by the manufacturer.

The inspector appointed by the purchaser and accredited to the manufacturer is previously advised of the time at which the operations of manufacture and inspection will normally take place.

The inspector may witness the casting, the sampling, the preparation and testing of the test pieces, the checking of dimensions and masses and the hydraulic tests.

The inspection and weighing of pipes and special castings may be carried out after coating.

Should the purchaser or his representative not be present for the carrying out of these operations at the time agreed upon, the manufacturer is entitled to proceed with the manufacture and inspection without the purchaser or his representative being present.

* 1 bar = 10^5 Pa = 10^5 N/m^2

SECTION TWO : JOINTS

19 GENERAL

Grey iron pipes, specials and castings for mains may be manufactured in the range of nominal diameters from DN 20 to DN 2 000[1)].

For the time being, it has been decided to retain the recommended range of the previous edition of this International Standard (ISO/R 13-1955), i.e. nominal diameters ranging from DN 80 to DN 1 000, which does not preclude in any way the possible extension of this International Standard to other nominal diameters at a later date.

For the flanges, it is to be noted that the diameter of the holes is greater by 1 mm than that provided for surface mains. This increase facilitates the installation of the castings, which is always difficult in the case of underground mains, and permits the use of bolts of increased diameter whenever this is thought necessary in order to resist corrosion.

It has been decided to delete the values of the bolt diameters expressed in inches, as has been done in ISO 2531. Moreover it has been decided to modify the number of bolt holes for flanges of the nominal diameter DN 80, in accordance with ISO 2531, although the former drilling can be obtained at the purchaser's request.

1) In the tables, nominal diameter (DN) is only a number designating and classifying the dimensions of pipes, specials and line parts.

20 DIMENSIONS OF SOCKETS AND SPIGOTS

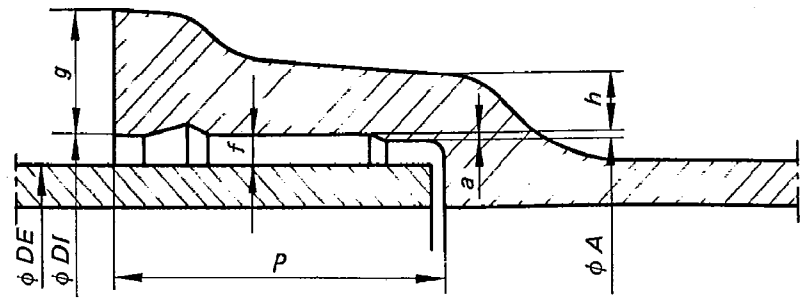
$a = 3 + 0{,}001\ DN$

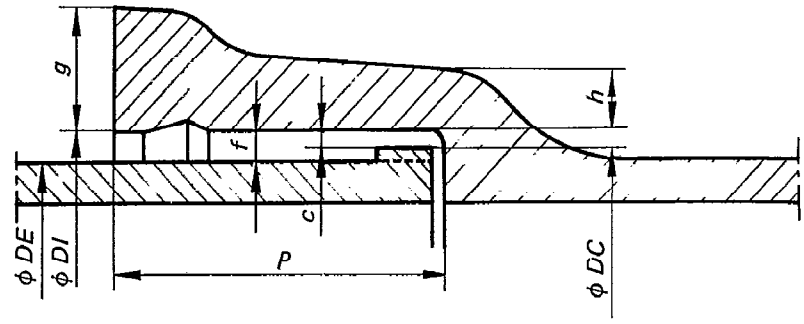
$g = 20 + 0{,}03\ DN$

$h = 8 + 0{,}025\ DN$

$c = 3 + 0{,}001\ DN$

$f = 9 + 0{,}003\ DN$





Dimensions in millimetres

Nominal diameter DN	Barrel	Socket						Bead		Joint thickness
	DE	*DI*	*P*	*A*	*a*	*g*[1]	*h*[1]	*DC*	*c*	*f*
80	98	116	84	110	3	22,5	10	104	3	9
100	118	137	88	131	3	23	10,5	124	3	9,5
125	144	163	91	157	3	24	11	150	3	9,5
150	170	189	94	183	3	24,5	12	176	3	9,5
200	222	241	100	235	3	26	13	228	3	9,5
250	274	294	103	287	3,5	27,5	14,5	281	3,5	10
300	326	346	105	339	3,5	29	15,5	333	3,5	10
350	378	398	107	391	3,5	30,5	17	385	3,5	10
400	429	449	110	442	3,5	32	18	436	3,5	10
500	532	553	115	546	3,5	35	20,5	539	3,5	10,5
600	635	657	120	650	3,5	38	23	642	3,5	11
700	738	760	122	753	3,5	41	25,5	745	3,5	11
800	842	865	125	857	4	44	28	850	4	11,5
900	945	968	128	960	4	47	30,5	953	4	11,5
1 000	1 048	1 072	130	1 064	4	50	33	1 056	4	12

1) Dimensions *g* and *h* do not affect interchangeability; they only indicate minimum permissble thicknesses.

21 SPECIAL CASTINGS – DIMENSIONS OF SOCKETS AND SPIGOTS

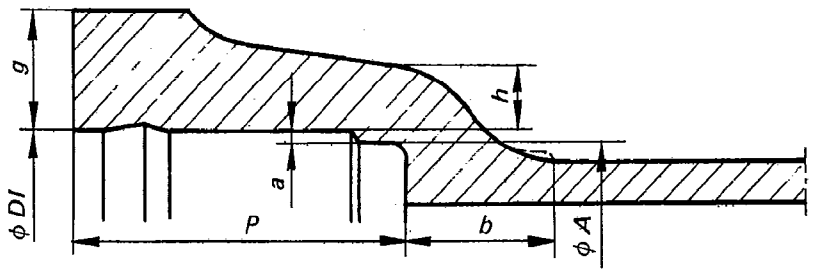
$a = 3 + 0{,}001\ DN$

$b = 35 + 0{,}1\ DN$

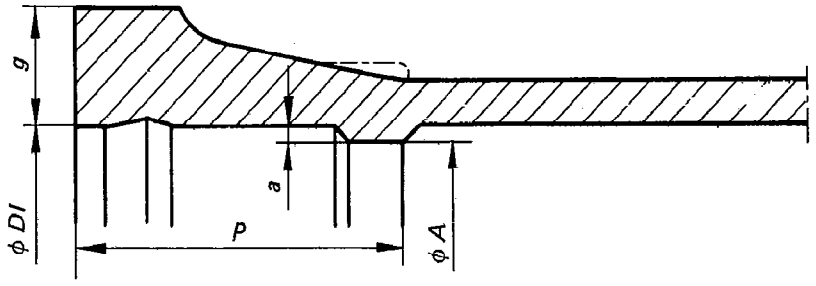
$g = 20 + 0{,}035\ DN$

$h = 10 + 0{,}025\ DN$

Specials, collars excepted



Collars



Dimensions in millimetres

Nominal diameter DN	Socket						
	DI	*P*	*A*	*a*	*b*	*g*[1]	*h*[1]
80	116	84	110	3	43	23	12
100	137	88	131	3	45	23,5	12,5
125	163	91	157	3	47,5	24,5	13
150	189	94	183	3	50	25,5	14
200	241	100	235	3	55	27	15
250	294	103	287	3,5	60	29	16,5
300	346	105	339	3,5	65	30,5	17,5
350	398	107	391	3,5	70	32,5	19
400	449	110	442	3,5	75	34	20
500	553	115	546	3,5	85	37,5	22,5
600	657	120	650	3,5	95	41	25
700	760	122	753	3,5	105	44,5	27,5
800	865	125	857	4	115	48	30
900	968	128	960	4	125	51,5	32,5
1 000	1 072	130	1 064	4	135	55	35

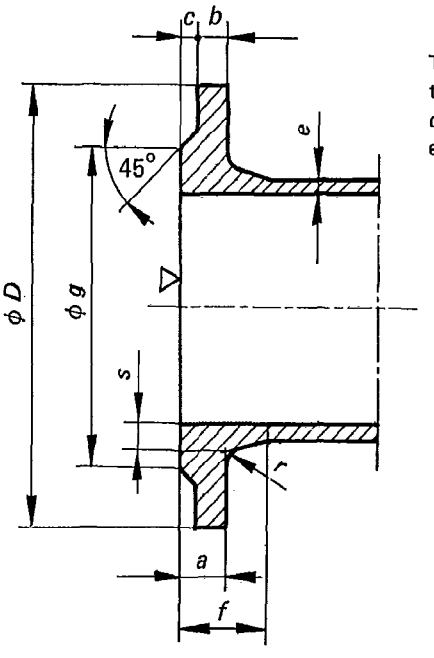
1) Dimensions *g* and *h* do not affect interchangeability; they only indicate minimum permissible thicknesses.

22 DIMENSIONS OF FLANGES PN 10

$b = 19 + 0{,}028\ DN$

$f = 35 + 0{,}1\ DN$

$s = 10{,}5 + 0{,}03\ DN$



Thickness *e* is equal to the thickness of pipe or special comprising the flange. Not to exceed *s* value.

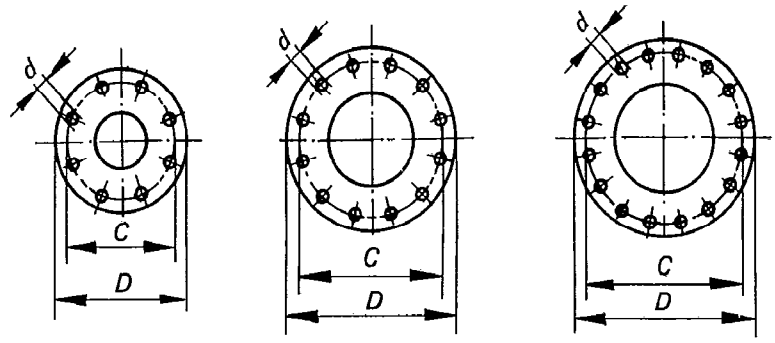
Dimensions in millimetres

Nominal diameter DN	*D*	*g*	*a*	*b*	*c*	*f*	*s*	*r*
80	200	133	24	21	3	43	13	6
100	220	153	25	22	3	45	13,5	6
125	250	183	25,5	22,5	3	47,5	14,5	6
150	285	209	26	23	3	50	15	6
200	340	264	27,5	24,5	3	55	16,5	8
250	395	319	29	26	3	60	18	8
300	445	367	31,5	27,5	4	65	19,5	8
350	505	427	33	29	4	70	21	8
400	565	477	34	30	4	75	22,5	10
500	670	582	37	33	4	85	25,5	10
600	780	682	41	36	5	95	28,5	10
700	895	797	43,5	38,5	5	105	31,5	10
800	1 015	904	46,5	41,5	5	115	34,5	12
900	1 115	1 004	49	44	5	125	37,5	12
1 000	1 230	1 111	52	47	5	135	40,5	12

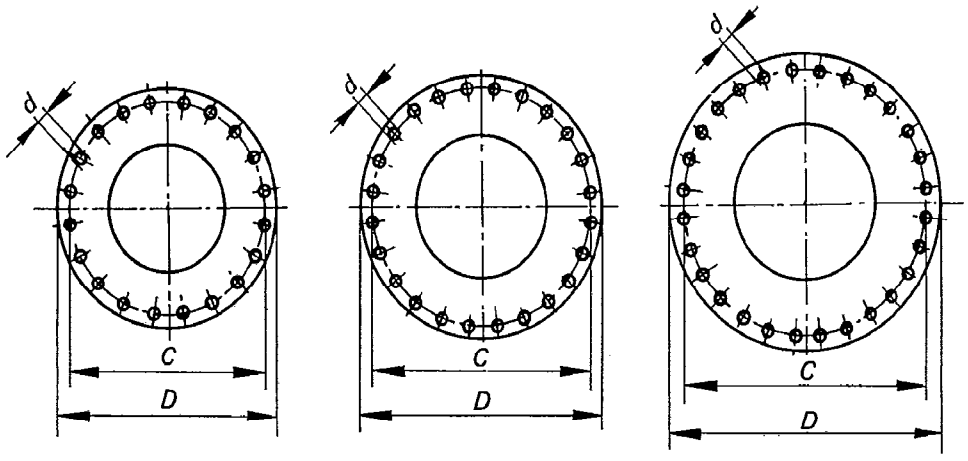
NOTE – Details of flanges are in practical accordance with the various existing standards belonging to the metric system, taking into account the thickness tolerances.

23 STANDARD FLANGE DRILLING PN 10

DN 80 to 200 250 and 300 350 and 400



DN 500 and 600 700 and 800 900 and 1 000



Dimensions in millimetres

Nominal diameter DN	D	C	Holes		Bolts
			Number	Diameter d	Diameter
80	200	160	8[1)]	19	16
100	220	180	8	19	16
125	250	210	8	19	16
150	285	240	8	23	20
200	340	295	8	23	20
250	395	350	12	23	20
300	445	400	12	23	20
350	505	460	16	23	20
400	565	515	16	28	24
500	670	620	20	28	24
600	780	725	20	31	27
700	895	840	24	31	27
800	1 015	950	24	34	30
900	1 115	1 050	28	34	30
1 000	1 230	1 160	28	37	33

1) For flanges with nominal diameter 80 and nominal pressure PN 10, the number of holes may be reduced to 4 at the purchaser's request, in order to permit coupling with an existing flange of an old pipe-line.

SECTION THREE : **PIPES**

24 GENERAL

The three thickness classes of the previous edition have been retained.

Class LA has been taken as a basis and its thicknesses have been determined in a systematically mathematical manner as a linear function of the nominal diameter.

Class A allows a 10 % increase in thickness over class LA for all nominal diameters.

Class B allows a 20 % increase in thickness over class LA for all nominal diameters.

For special uses, classes C, D, E, etc., may be considered, allowing respective increases in thicknesses of 30 %, 40 %, 50 %, etc., over class LA.

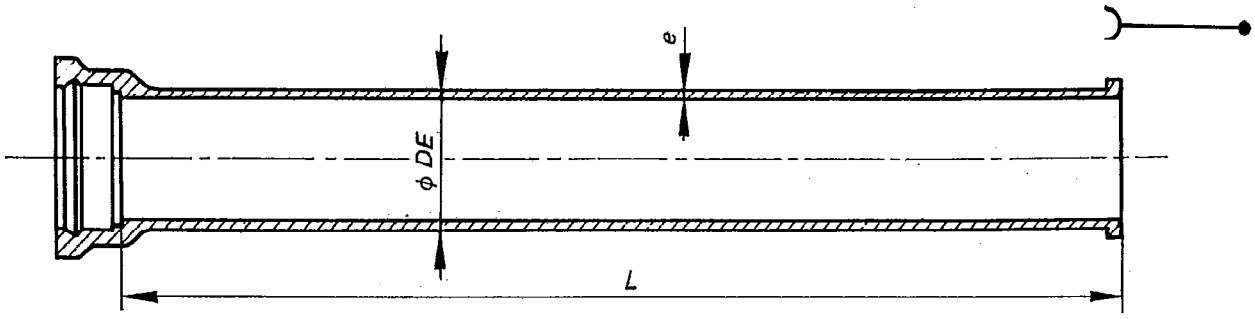
The masses have been calculated for each of the lengths generally used, by taking into account in each case a socket mass, fixed arbitrarily as a proportion of the mass of the pipe barrel.

For flanged pipes, only class B pipes with moulded flanges or screwed flanges have been covered. In the latter case the method of screwing and the exact form of the thread are left to the discretion of the manufacturer, in view of the fact that the flanges are never removed after screwing on the barrels of the pipes.

25 SOCKET AND SPIGOT PIPES – CLASS LA

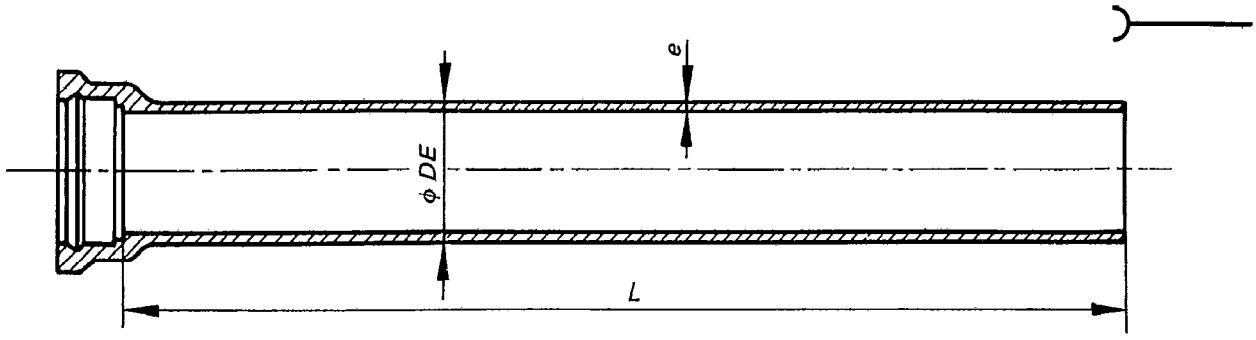
$e = \frac{10}{12}(7 + 0{,}02\ DN)$

Symbol :



$e = \frac{10}{12}(7 + 0{,}02\ DN)$

Symbol :



Dimensions in millimetres

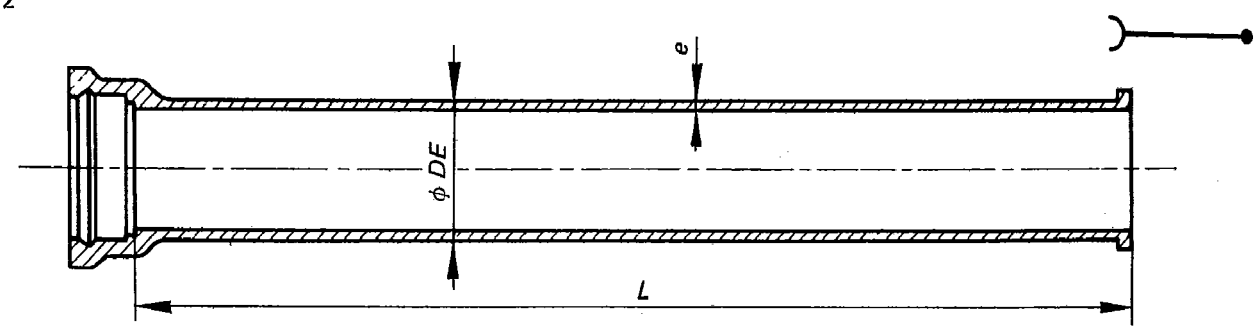
Masses in kilograms

Nominal diameter DN	Barrel			Socket mass ≈	Total mass for one working length, L						
	DE	e	Mass per unit length ≈		4 m	4,88 m	5 m	5,5 m	6 m	6,5 m	7 m
80	98	7,2	14,7	5,5	64		79		93,5		
100	118	7,5	18,6	7,1	81,5		100	109	119		
125	144	7,9	24,2	9,2	106		130	142	154		
150	170	8,3	30,1	11,5	132		162	177	192		
200	222	9,2	44,0	16,8	193	231	237	259	281		
250	274	10,0	59,3	22,9	260	312	319	349	379	408	
300	326	10,8	76,5	29,8	336	403	412	450	489	527	
350	378	11,7	96,3	37,5	423	507	519	567	615		
400	429	12,5	116,9	46,3	514	617	631	690	748		
500	532	14,2	165,2	66,0	727	872	892	974	1 057		
600	635	15,8	219,8	89,3	968	1 162	1 188	1 298	1 408		
700	738	17,5	283,2	116,8	1 250		1 533	1 675	1 816		
800	842	19,2	354,9	147,8	1 567		1 922	2 100	2 277		2 632
900	945	20,8	431,8	182,6	1 910		2 342	2 558	2 773		3 205
1 000	1 048	22,5	518,3	222,3	2 295		2 814	3 073	3 332		3 850

26 SOCKET AND SPIGOT PIPES – CLASS A

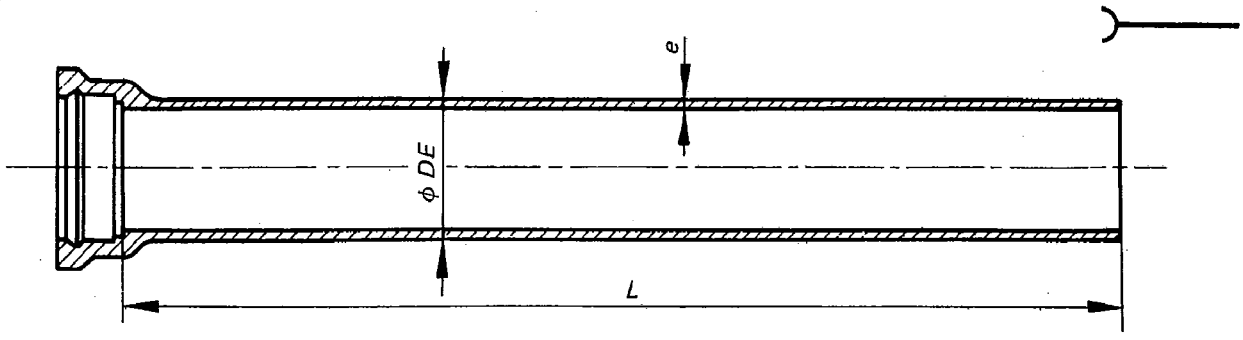
$e = \frac{11}{12}(7 + 0{,}02\ DN)$

Symbol :



$e = \frac{11}{12}(7 + 0{,}02\ DN)$

Symbol :



Dimensions in millimetres

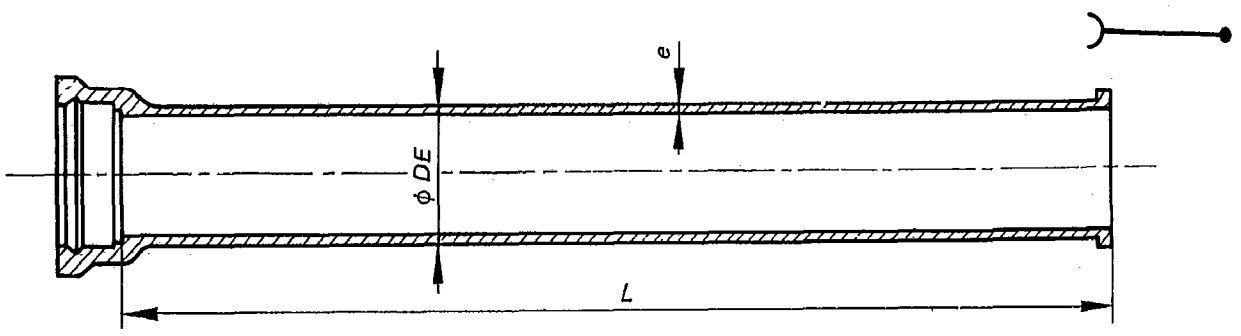
Masses in kilograms

Nominal diameter DN	Barrel			Socket mass ≈	Total mass for one working length, *L*						
	DE	*e*	Mass per unit length ≈		4 m	4,88 m	5 m	5,5 m	6 m	6,5 m	7 m
80	98	7,9	16,0	5,5	69,5		85,5		101		
100	118	8,3	20,5	7,1	89		109	120	130		
125	144	8,7	26,4	9,2	115		141	155	168		
150	170	9,2	33,2	11,5	144		178	194	211		
200	222	10,1	48,1	16,8	209	251	257	281	305		
250	274	11,0	65,0	22,9	283	340	348	380	413	445	
300	326	11,9	84,0	29,8	366	440	450	492	534	576	
350	378	12,8	105,0	37,5	458	550	563	615	668		
400	429	13,8	128,7	46,3	561	674	690	754	819		
500	532	15,6	181,0	66,0	790	949	971	1 061	1 152		
600	635	17,4	241,4	89,3	1 055	1 267	1 296	1 417	1 538		
700	738	19,3	311,6	116,8	1 363		1 675	1 830	1 986		
800	842	21,1	389,1	147,8	1 704		2 093	2 288	2 482		2 871
900	945	22,9	474,3	182,6	2 080		2 554	2 791	3 029		3 503
1 000	1 048	24,8	570,0	222,3	2 502		3 072	3 357	3 642		4 212

27 SOCKET AND SPIGOT PIPES – CLASS B

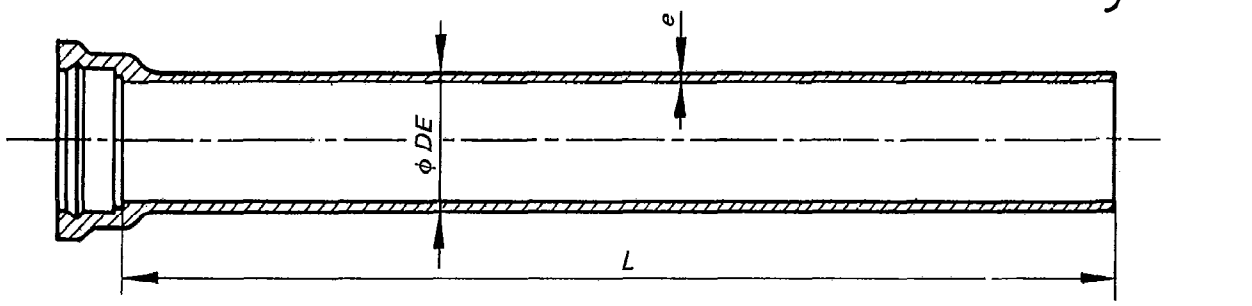
$e = 7 + 0{,}02\ DN$

Symbol :



$e = 7 + 0{,}02\ DN$

Symbol :



Dimensions in millimetres

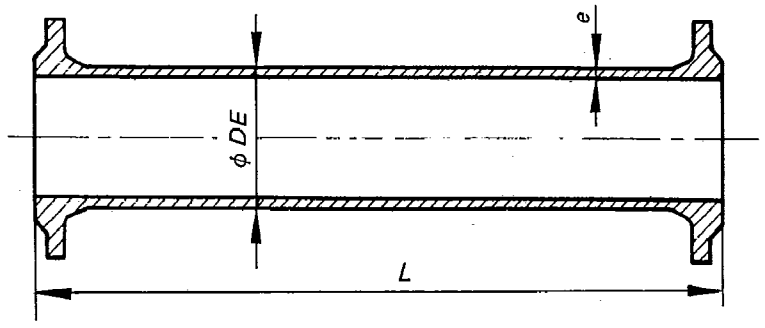
Masses in kilograms

Nominal diameter DN	Barrel			Socket mass ≈	Total mass for one working length, *L*						
	DE	*e*	Mass per unit length ≈		4 m	4,88 m	5 m	5,5 m	6 m	6,5 m	7 m
80	98	8,6	17,3	5,5	74,5		92		109		
100	118	9,0	22,0	7,1	95		117	128	139		
125	144	9,5	28,7	9,2	124		153	167	181		
150	170	10,0	35,9	11,5	155		191	209	227		
200	222	11,0	52,1	16,8	225	271	278	304	330		
250	274	12,0	70,6	22,9	305	368	376	411	447	482	
300	326	13,0	91,4	29,8	395	476	487	533	578	624	
350	378	14,0	114,5	37,5	495	596	610	667	724		
400	429	15,0	139,5	46,3	604	727	744	814	883		
500	532	17,0	196,7	66,0	853	1 026	1 049	1 148	1 246		
600	635	19,0	262,9	89,3	1 141	1 372	1 404	1 535	1 667		
700	738	21,0	338,2	116,8	1 470		1 808	1 977	2 146		
800	842	23,0	423,1	147,8	1 840		2 263	2 475	2 687		3 110
900	945	25,0	516,6	182,6	2 249		2 766	3 024	3 282		3 799
1 000	1 048	27,0	619,2	222,3	2 699		3 318	3 628	3 938		4 557

28 FLANGED PIPES – SAND CAST – CLASS B

$e = 7 + 0{,}02\ DN$

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	Barrel			Bride	Working length in metres[1] L
	DE	e	Mass per unit length ≈	Mass for one flange ≈	
80	98	8,6	17,3	3,7	1 to 3
100	118	9,0	22,0	4,2	1 to 4
125	144	9,5	28,7	5,3	1 to 4
150	170	10,0	35,9	6,7	1 to 4
200	222	11,0	52,1	9,3	1 to 4
250	274	12,0	70,6	12,0	1 to 4
300	326	13,0	91,4	14,8	1 to 4
350	378	14,0	114,5	19,0	1 to 4
400	429	15,0	139,5	23,4	1 to 4
500	532	17,0	196,7	32,1	1 to 4
600	635	19,0	262,9	44,0	1 to 4
700	738	21,0	338,2	59,9	1 to 4
800	842	23,0	423,1	80,8	1 to 4
900	945	25,0	516,6	94,6	1 to 4
1 000	1 048	27,0	619,2	120,0	1 to 4

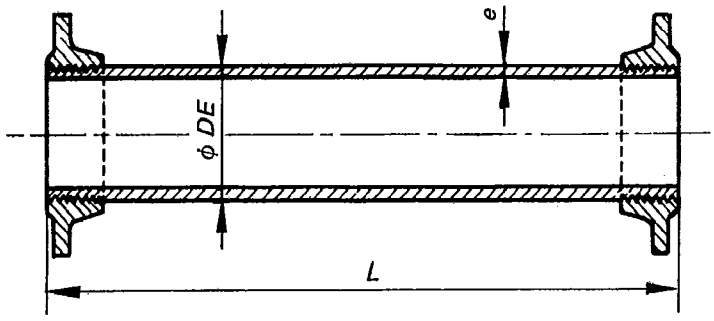
1) Depending on manufacturer's facilities.

NOTE – Flanged pipes horizontally cast may be manufactured with increase of thickness up to the thickness of corresponding specials.

29 FLANGED PIPES CENTRIFUGALLY CAST WITH SCREWED FLANGES – CLASS B

$e = 7 + 0{,}02\ DN$

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	Barrel			Bride	Working length in metres[1] L
	DE	e	Mass per unit length ≈	Mass for one flange ≈	
80	98	8,6	17,3	4,3	
100	118	9,0	22,0	5,0	
125	144	9,5	28,7	6,6	
150	170	10,0	35,9	8,2	2 - 3 - 4 - 4,88 - 5 - 5,5 - 6
200	222	11,0	52,1	11,4	
250	274	12,0	70,6	14,7	
300	326	13,0	91,4	18,6	

1) Depending on manufacturer's facilities.

SECTION FOUR : SPECIAL CASTINGS

30 GENERAL

As a rule, the specials have been designed with the smallest possible dimensions. Their ends are flanged or socketed.[1)]

As specials with spigot ends have less strength and precision, this International Standard provides only for flange and spigot pieces and plugs.

The flange and socket and the flange and spigot specials (see clauses 31 and 32) are as short as possible so as to reduce the space required in underground chambers, in which they are often placed.

The 1/4 bends (see clauses 34, 44 and 45) have been designed with the radius of curvature adopted by the majority of countries.

The 1/8, 1/16 and 1/32 bends (see clauses 35, 36, 37 and 46) have been designed with the same radius for the central part, allowing the machining in series of the corresponding curved part of the different patterns.

Only the 1/8 flanged bends, up to a nominal diameter DN 300 (see clause 46), have a different radius; this is dependent on the length prescribed for the tangents and is in conformity with the practice in many countries.

The tees (see clauses 38, 39 and 47) of a nominal diameter smaller than DN 350 have been provided with a full range of branches, as they are used chiefly in distribution mains for which branches down to a minimum nominal diameter DN 80 may be taken off the main piping.

Mains of a nominal diameter greater than DN 300, however, are usually trunk mains, either conducting or delivering, and are not generally used for taking off branches for distribution pipes of small diameter. That is why, beyond DN 300, only tees with branches of a nominal diameter equal to, or greater than, half the nominal diameter of the body have been provided for.

Tees with very small branches of reduced lengths may be adopted subsequently, after study of their statistics of use.

It is important to note that two different types have been retained for each tee measurement, namely :

- double socket tees with flanged branch (see clause 38);
- double socket tees with socket branch (see clause 39).

The coexistence of these two types constitutes a regrettable situation, as the number of tee patterns is much greater than that of the other specials, on account of the variations in the diameter of the branches.

The necessity for the two types is imposed by the methods of fitting valves practised in different countries :

- in certain countries flanged valves, and consequently tees with flanged branches, are used;
- in other countries, and particularly in American countries, socket valves, and consequently tees with socket branches, are preferred.

It is, therefore, desirable, in order to achieve a reduction in the number of types, that an international unification should take place by degrees for the types of valves as well as of the tees.

Crosses (see clauses 40 and 48) are provided for up to a nominal diameter DN 300, with equal branches on the body : the adoption of castings allowing reduced branches would be very disadvantageous, on account of the many possible combinations of branches and of the very small number of crosses used.

The double socket and double flanged tapers (see clauses 41 and 49) are as short as possible, so as to allow the use of several successive tapers, if necessary.

The caps, plugs and blank flanges (see clauses 42, 43 and 50) have been shown unreinforced; they can also be quite suitably manufactured with domed ends, and they can have facing strips necessary for mounting standpipes and gauges.

As a rule, all the measurements have been fixed, not arbitrarily, but as a linear function of the diameter.

This arrangement allows the range of dimensions, as well as the outlines of the castings, to be harmonized.

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1) This preference for specials with sockets is justified by many advantages.

In a main, the position of the specials : bends, tees, etc., is nearly always governed by the layout of the route and rarely coincides with the end of a pipe.

It is, therefore, necessary to interpose between the last whole pipe and the special, a section of reduced length obtained by cutting a whole pipe into two lengths. The first portion is used before the special and the second immediately afterwards, one of these portions being without a socket. The all-socket specials provide the missing socket, and, therefore, the construction of the pipe-line proceeds without any need of leaving out lengths on the site.

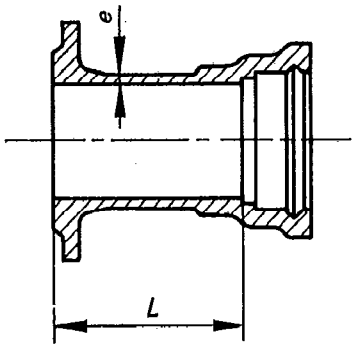
Specials with two sockets, as compared with the other specials, have the following advantages :

- mechanical resistance increased by the presence at each of their ends of a very strong socket;
- excellent stability on anchorages, which can extend over the whole length of the specials;
- complete accessibility of joints which are clear of anchorages;
- simplification of orders and of the supply of spares by the elimination of superfluous specials, many of which have the same use;
- facility of moulding on symmetrical plate patterns, in conditions favouring precision and production.

31 FLANGED SOCKETS

$$e = \frac{14}{12}(7 + 0{,}02\ DN)$$

Symbol :



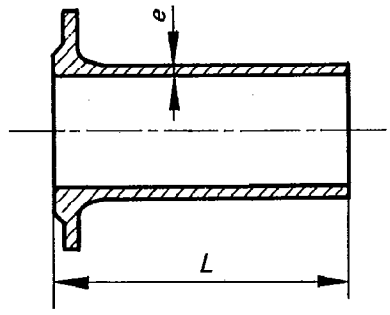
Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	e	L	Mass ≈
80	10,0	150	13
100	10,5	150	16
125	11,1	150	20
150	11,7	150	26
200	12,8	150	37
250	14,0	300	62
300	15,2	300	79
350	16,3	300	100
400	17,5	300	123
500	19,8	300	173
600	22,2	300	234
700	24,5	300	306
800	26,8	300	391
900	29,2	300	476
1 000	31,5	300	580

32 FLANGED SPIGOTS

$$e = \frac{14}{12}(7 + 0{,}02\ DN)$$

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	e	L	Mass ≈
80	10,0	400	12
100	10,5	400	14
125	11,1	400	19
150	11,7	400	23
200	12,8	500	39
250	14,0	500	53
300	15,2	500	68
350	16,3	500	85
400	17,5	500	104
500	19,8	500	146
600	22,2	600	227
700	24,5	600	295
800	26,8	600	375
900	29,2	600	455
1 000	31,5	600	552

NOTE — For adjusting a flanged spigot to a pipe or to a socket, see clauses 20 and 21.

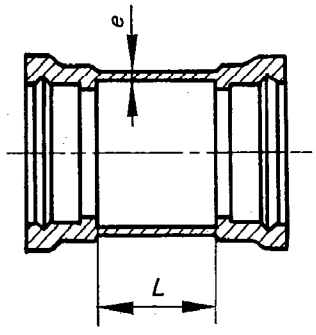
33 COLLARS

$e = \frac{14}{12}(7 + 0{,}02\ DI)$[1)]

$L = 150 + 0{,}1\ DN$

1) For *DI* values, see clause 21.

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	*e*	*L*	Mass ≈
80	10,9	158	14
100	11,4	160	17
125	12,0	163	22
150	12,6	165	28
200	13,8	170	40
250	15,0	175	55
300	16,2	180	71
350	17,5	185	90
400	18,6	190	110
500	21,1	200	159
600	23,5	210	216
700	25,9	220	283
800	28,4	230	360
900	30,8	240	448
1 000	33,2	250	547

34 DOUBLE SOCKET 1/4 BENDS

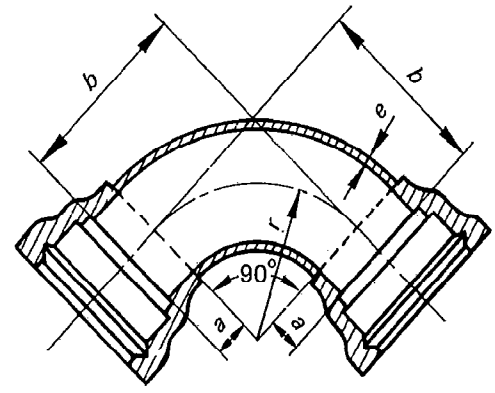
$e = \frac{14}{12}(7 + 0{,}02\ DN)$

$r = 65 + 0{,}9\ DN$

$a = 35 + 0{,}1\ DN$

$b = 100 + DN$

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	*e*	*r*	*a*	*b*	Mass ≈
80	10,0	137	43	180	18
100	10,5	155	45	200	24
125	11,1	177,5	47,5	225	33
150	11,7	200	50	250	43
200	12,8	245	55	300	67
250	14,0	290	60	350	98
300	15,2	335	65	400	135

35 DOUBLE SOCKET 1/8 BENDS

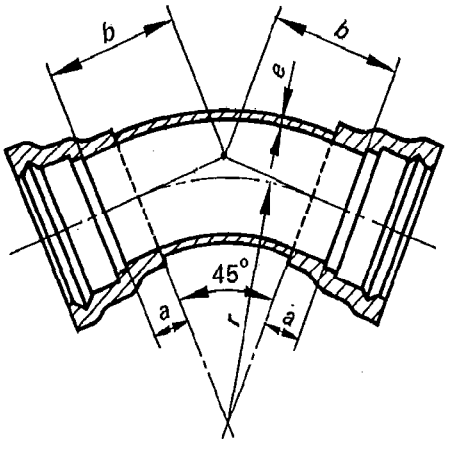
$e \approx \frac{14}{12}(7 + 0{,}02\ DN)$

$r \approx 200 + DN$

$a \approx 35 + 0{,}1\ DN$

$b \approx 117{,}8\ldots + 0{,}514\ldots DN$

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	e	r	a	b	Mass ≈
80	10,0	280	43	159	18
100	10,5	300	45	169	24
125	11,1	325	47,5	182	32
150	11,7	350	50	195	41
200	12,8	400	55	221	62
250	14,0	450	60	246	89
300	15,2	500	65	272	121
350	16,3	550	70	298	159
400	17,5	600	75	324	202
500	19,8	700	85	375	310
600	22,2	800	95	426	448
700	24,5	900	105	478	619
800	26,8	1 000	115	529	827
900	29,2	1 100	125	581	1 077
1 000	31,5	1 200	135	632	1 368

36 DOUBLE SOCKET 1/16 BENDS

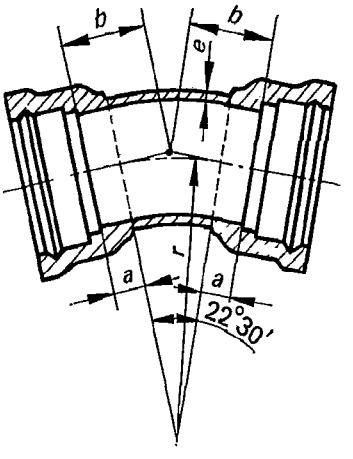
$e \approx \frac{14}{12}(7 + 0{,}02\ DN)$

$r \approx 200 + DN$

$a \approx 35 + 0{,}1\ DN$

$b \approx 74{,}78\ldots + 0{,}298\,9\ldots DN$

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	e	r	a	b	Mass ≈
80	10,0	280	43	99	16
100	10,5	300	45	105	21
125	11,1	325	47,5	112	27
150	11,7	350	50	120	35
200	12,8	400	55	135	53
250	14,0	450	60	150	75
300	15,2	500	65	164	100
350	16,3	550	70	179	130
400	17,5	600	75	194	164
500	19,8	700	85	224	246
600	22,2	800	95	254	351
700	24,5	900	105	284	478
800	26,8	1 000	115	314	632
900	29,2	1 100	125	344	813
1 000	31,5	1 200	135	374	1 024

37 DOUBLE SOCKET 1/32 BENDS

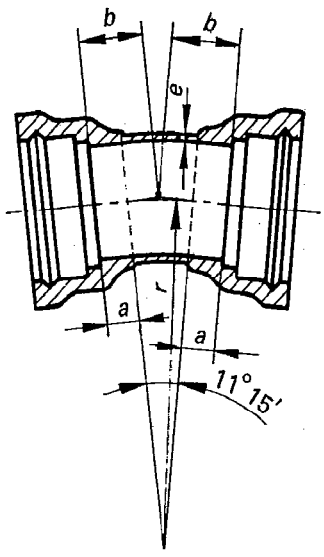
$e = \frac{14}{12}(7 + 0{,}02\ DN)$

$r = 200 + DN$

$a = 35 + 0{,}1\ DN$

$b = 54{,}69\ldots + 0{,}198\ldots DN$

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	*e*	*r*	*a*	*b*	Mass ≈
80	10,0	280	43	71	15
100	10,5	300	45	75	19
125	11,1	325	47,5	80	25
150	11,7	350	50	84	32
200	12,8	400	55	94	48
250	14,0	450	60	104	67
300	15,2	500	65	114	89
350	16,3	550	70	124	115
400	17,5	600	75	134	144
500	19,8	700	85	154	215
600	22,2	800	95	174	302
700	24,5	900	105	194	408
800	26,8	1 000	115	213	534
900	29,2	1 100	125	233	682
1 000	31,5	1 200	135	253	852

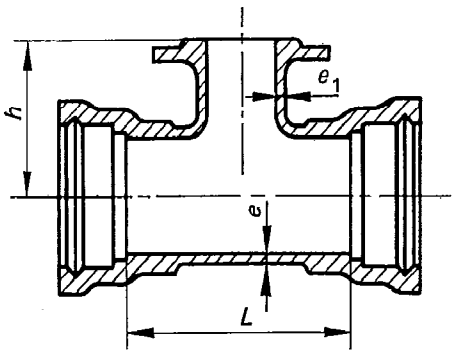
38 DOUBLE SOCKET TEES WITH FLANGED BRANCH

$$e = \frac{14}{12}(7 + 0{,}02\ DN)$$

$$L = 100 + 1{,}4\ DN$$

$$h \begin{cases} 80 \ldots\ldots = 100 + DN \\ 100 \text{ to } 250 \ldots\ldots = 150 + 0{,}5\ DN \\ 300 \text{ to } 1\,000 \begin{cases} dn \leqslant 250 = 150 + 0{,}5\ DN \\ dn \geqslant 300 = 250 + 0{,}5\ DN \end{cases} \end{cases}$$

Symbol :



Dimensions in millimetres — Masses in kilograms

Body			Branch			Mass ≈
Nominal diameter DN	e	L	Nominal diameter dn	e_1	h	
80	10,0	212	80	10,0	180	22
100	10,5	240	80	10,5	200	28
	10,5	240	100	10,5	200	29
125	11,1	275	80	11,1	212,5	36
	11,1	275	100	11,1	212,5	37
	11,1	275	125	11,1	212,5	39
150	11,7	310	80	11,7	225	45
	11,7	310	100	11,7	225	46
	11,7	310	125	11,7	225	48
	11,7	310	150	11,7	225	50
200	12,8	380	80	12,8	250	67
	12,8	380	100	12,8	250	68
	12,8	380	125	12,8	250	70
	12,8	380	150	12,8	250	72
	12,8	380	200	12,8	250	76
250	14,0	450	80	13,0	275	94
	14,0	450	100	13,5	275	95
	14,0	450	125	14,0	275	97
	14,0	450	150	14,0	275	99
	14,0	450	200	14,0	275	103
	14,0	450	250	14,0	275	107
300	15,2	520	80	13,0	300	128
	15,2	520	100	13,5	300	129
	15,2	520	125	14,5	300	131
	15,2	520	150	15,0	300	133
	15,2	520	200	15,2	300	137
	15,2	520	250	15,2	300	141
	15,2	520	300	15,2	400	156
350	16,3	590	200	16,3	325	178
	16,3	590	250	16,3	325	182
	16,3	590	300	16,3	425	197
	16,3	590	350	16,3	425	204

Dimensions in millimetres — Masses in kilograms

Body			Branch			Mass ≈
Nominal diameter DN	e	L	Nominal diameter dn	e_1	h	
400	17,5	660	200	16,5	350	225
	17,5	660	250	17,5	350	230
	17,5	660	300	17,5	450	246
	17,5	660	350	17,5	450	253
	17,5	660	400	17,5	450	261
500	19,8	800	250	18,0	400	348
	19,8	800	300	19,5	500	367
	19,8	800	350	19,8	500	375
	19,8	800	400	19,8	500	382
	19,8	800	500	19,8	500	397
600	22,2	940	300	19,5	550	523
	22,2	940	350	21,0	550	532
	22,2	940	400	22,2	550	542
	22,2	940	500	22,2	550	556
	22,2	940	600	22,2	550	573
700	24,5	1 080	350	21,0	600	728
	24,5	1 080	400	22,5	600	737
	24,5	1 080	500	24,5	600	755
	24,5	1 080	600	24,5	600	772
	24,5	1 080	700	24,5	600	793
800	26,8	1 220	400	22,5	650	978
	26,8	1 220	500	25,5	650	997
	26,8	1 220	600	26,8	650	1 017
	26,8	1 220	700	26,8	650	1 036
	26,8	1 220	800	26,8	650	1 062
900	29,2	1 360	500	25,5	700	1 290
	29,2	1 360	600	28,5	700	1 313
	29,2	1 360	700	29,2	700	1 334
	29,2	1 360	800	29,2	700	1 357
	29,2	1 360	900	29,2	700	1 374
1 000	31,5	1 500	500	25,5	750	1 639
	31,5	1 500	600	28,5	750	1 660
	31,5	1 500	700	31,5	750	1 689
	31,5	1 500	800	31,5	750	1 711
	31,5	1 500	900	31,5	750	1 727
	31,5	1 500	1 000	31,5	750	1 756

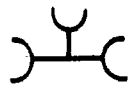
39 TEES : ALL SOCKETS

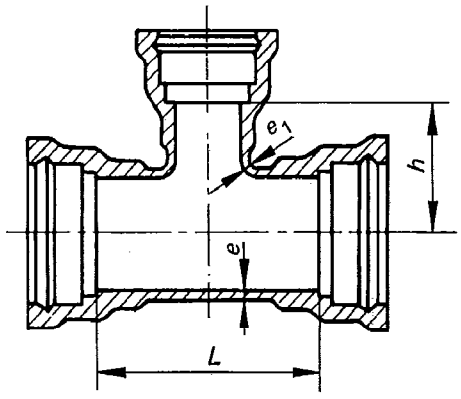
$e = \frac{14}{12}(7 + 0{,}02\ DN)$

$L = 100 + 1{,}4\ DN$

$h = 50 + 0{,}5\ DN + 0{,}2\ dn$

Symbol :





Dimensions in millimetres — Masses in kilograms

Body			Branch			Mass ≈
Nominal diameter DN	e	L	Nominal diameter dn	e_1	h	
80	10,0	212	80	10,0	106	23
100	10,5	240	80	10,5	116	28
	10,5	240	100	10,5	120	30
125	11,1	275	80	11,1	128,5	36
	11,1	275	100	11,1	132,5	38
	11,1	275	125	11,1	137,5	41
150	11,7	310	80	11,7	141	45
	11,7	310	100	11,7	145	47
	11,7	310	125	11,7	150	50
	11,7	310	150	11,7	155	53
200	12,8	380	80	12,8	166	67
	12,8	380	100	12,8	170	69
	12,8	380	125	12,8	175	71
	12,8	380	150	12,8	180	74
	12,8	380	200	12,8	190	81
250	14,0	450	80	13,0	191	94
	14,0	450	100	13,5	195	96
	14,0	450	125	14,0	200	99
	14,0	450	150	14,0	205	102
	14,0	450	200	14,0	215	108
	14,0	450	250	14,0	225	116

Dimensions in millimetres — Masses in kilograms

Body			Branch			Mass ≈
Nominal diameter DN	e	L	Nominal diameter dn	e_1	h	
300	15,2	520	80	13,0	216	128
	15,2	520	100	13,5	220	129
	15,2	520	125	14,5	225	132
	15,2	520	150	15,0	230	134
	15,2	520	200	15,2	240	142
	15,2	520	250	15,2	250	150
	15,2	520	300	15,2	260	159
350	16,3	590	200	16,3	265	182
	16,3	590	250	16,3	275	190
	16,3	590	300	16,3	285	199
	16,3	590	350	16,3	295	209
400	17,5	660	200	16,5	290	229
	17,5	660	250	17,5	300	237
	17,5	660	300	17,5	310	246
	17,5	660	350	17,5	320	256
	17,5	660	400	17,5	330	268
500	19,8	800	250	18,0	350	356
	19,8	800	300	19,5	360	365
	19,8	800	350	19,8	370	375
	19,8	800	400	19,8	380	386
	19,8	800	500	19,8	400	413
600	22,2	940	300	19,5	410	521
	22,2	940	350	21,0	420	531
	22,2	940	400	22,2	430	543
	22,2	940	500	22,2	450	569
	22,2	940	600	22,2	470	602

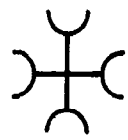
40 CROSSES : ALL SOCKETS

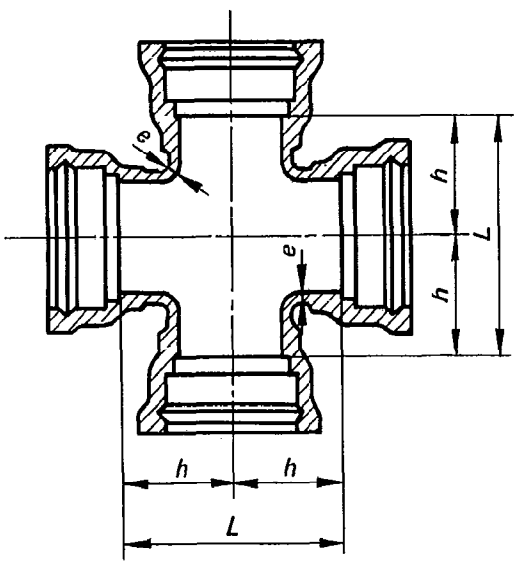
$e = \frac{14}{12}(7 + 0{,}02\ DN)$

$L = 100 + 1{,}4\ DN$

$h = 50 + 0{,}7\ DN$

Symbol :





Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	e	L	h	Mass ≈
80	10,0	212	106	30
100	10,5	240	120	39
125	11,1	275	137,5	52
150	11,7	310	155	67
200	12,8	380	190	102
250	14,0	450	225	145
300	15,2	520	260	197

41 DOUBLE SOCKET TAPERS

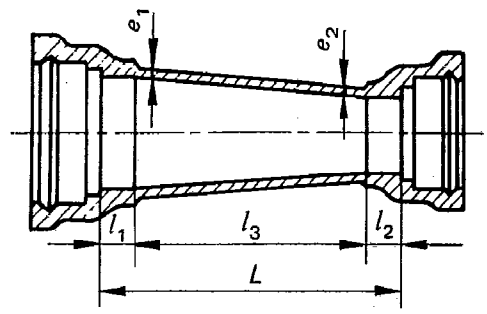
Symbol :

$$e_1 = \frac{14}{12}(7 + 0{,}02\ DN)$$

$$e_2 = \frac{14}{12}(7 + 0{,}02\ dn)$$

$$l_1 = 35 + 0{,}1\ DN$$

$$l_2 = 35 + 0{,}1\ dn$$



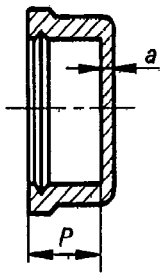
Dimensions in millimetres — Masses in kilograms

Large diameter			Small diameter					
Nominal diameter DN	e_1	l_1	Nominal diameter dn	e_2	l_2	l_3	L	Mass ≈
100	10,5	45	80	10,0	43	112	200	18
125	11,1	47,5	80	10,0	43	309,5	400	27
	11,1	47,5	100	10,5	45	307,5	400	30
150	11,7	50	80	10,0	43	307	400	31
	11,7	50	100	10,5	45	305	400	34
	11,7	50	125	11,1	47,5	302,5	400	38
200	12,8	55	100	10,5	45	300	400	43
	12,8	55	125	11,1	47,5	297,5	400	47
	12,8	55	150	11,7	50	295	400	51
250	14,0	60	125	11,1	47,5	292,5	400	58
	14,0	60	150	11,7	50	290	400	62
	14,0	60	200	12,8	55	285	400	72
300	15,2	65	150	11,7	50	285	400	75
	15,2	65	200	12,8	55	280	400	84
	15,2	65	250	14,0	60	275	400	95
350	16,3	70	200	12,8	55	475	600	117
	16,3	70	250	14,0	60	470	600	131
	16,3	70	300	15,2	65	465	600	146
400	17,5	75	250	14,0	60	465	600	149
	17,5	75	300	15,2	65	460	600	164
	17,5	75	350	16,3	70	455	600	181
500	19,8	85	350	16,3	70	445	600	222
	19,8	85	400	17,5	75	440	600	241
600	22,2	95	400	17,5	75	430	600	290
	22,2	95	500	19,8	85	420	600	332
700	24,5	105	500	19,8	85	410	600	388
	24,5	105	600	22,2	95	400	600	437
800	26,8	115	600	22,2	95	390	600	501
	26,8	115	700	24,5	105	380	600	557
900	29,2	125	700	24,5	105	370	600	629
	29,2	125	800	26,8	115	360	600	692
1 000	31,5	135	800	26,8	115	350	600	772
	31,5	135	900	29,2	125	340	600	843

42 CAPS

$a = 19 + 0{,}028\ DN$

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	a	P	Mass ≈
80	21	84	7
100	22	88	9
125	22,5	91	12
150	23	94	15
200	24,5	100	24
250	26	103	34
300	27,5	105	46
350	29	107	61
400	30	110	77
500	33	115	118
600	36	120	171
700	38,5	122	235
800	41,5	125	314
900	44	128	405
1 000	47	130	514

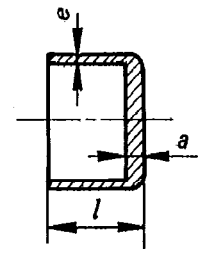
NOTE – Beyond the nominal diameter DN 300, the bottom of caps may be domed.

43 PLUGS

$e = \frac{14}{12}(7 + 0{,}02\ DN)$

$a = 19 + 0{,}028\ DN$

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	e	a	l	Mass ≈
80	10,0	21	125	3
100	10,5	22	130	4
125	11,1	22,5	135	6
150	11,7	23	140	9
200	12,8	24,5	150	14
250	14,0	26	155	22
300	15,2	27,5	160	30

44 DOUBLE FLANGED 1/4 BENDS

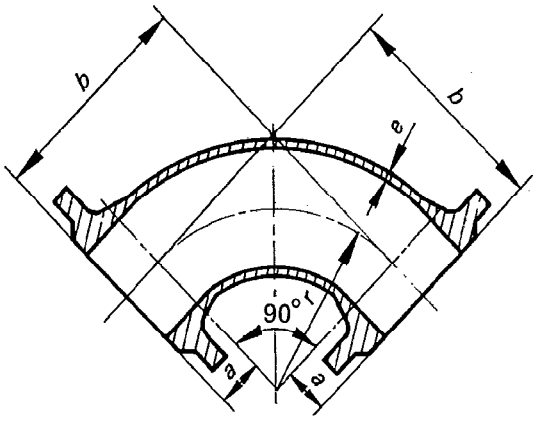
$e = \frac{14}{12}(7 + 0{,}02\ DN)$

$r = 65 + 0{,}9\ DN$

$a = 35 + 0{,}1\ DN$

$b = 100 + DN$

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	e	r	a	b	Mass ≈
80	10,0	137	43	180	13
100	10,5	155	45	200	17
125	11,1	177,5	47,5	225	23
150	11,7	200	50	250	31
200	12,8	245	55	300	49
250	14,0	290	60	350	72
300	15,2	335	65	400	100
350	16,3	380	70	450	137
400	17,5	425	75	500	181
500	19,8	515	85	600	290
600	22,2	605	95	700	442
700	24,5	695	105	800	639
800	26,8	785	115	900	890
900	29,2	875	125	1 000	1 179
1 000	31,5	965	135	1 100	1 544

45 DOUBLE FLANGED 1/4 DUCKFOOT BENDS

$e = \frac{14}{12}(7 + 0{,}02\ DN)$

$r = 65 + 0{,}9\ DN$

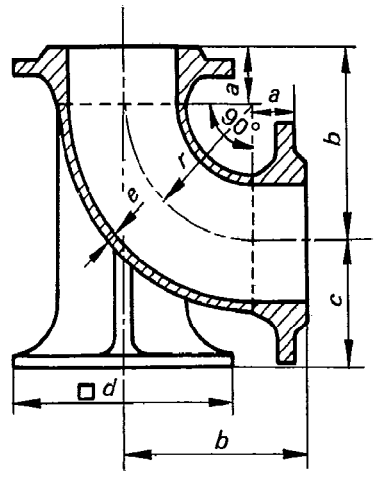
$a = 35 + 0{,}1\ DN$

$b = 100 + DN$

$c = 60 + 0{,}6\ DN$

$d = 100 + DN$

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	e	r	a	b	c	d	Mass ≈
80	10,0	137	43	180	108	180	21
100	10,5	155	45	200	120	200	26
125	11,1	177,5	47,5	225	135	225	36
150	11,7	200	50	250	150	250	47
200	12,8	245	55	300	180	300	74
250	14,0	290	60	350	210	350	111
300	15,2	335	65	400	240	400	156
350	16,3	380	70	450	270	450	214
400	17,5	425	75	500	300	500	281
500	19,8	515	85	600	360	600	446
600	22,2	605	95	700	420	700	677

46 DOUBLE FLANGED 1/8 BENDS

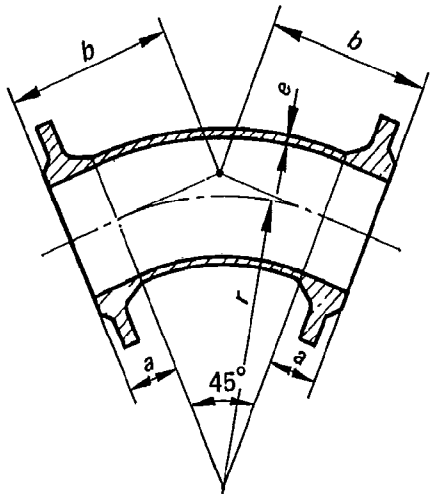
$e = \frac{14}{12}(7 + 0{,}02\ DN)$

r { 80 to 300 = 156,9... + 2,172 8...DN
350 to 1 000 = 200 + DN

$a = 35 + 0{,}1\ DN$

b { 80 to 300 = 100 + DN
350 to 1 000 = 117,8... + 0,514... DN

Symbol :



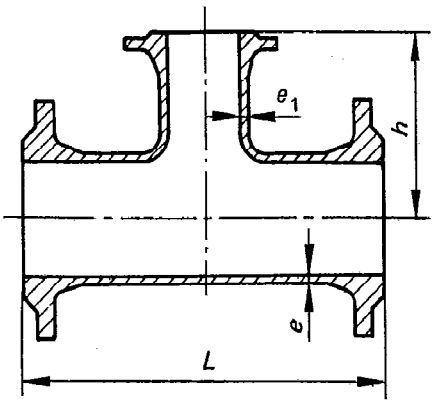
Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	*e*	*r*	*a*	*b*	Mass ≈
80	10,0	331	43	180	14
100	10,5	374	45	200	18
125	11,1	429	47,5	225	25
150	11,7	483	50	250	34
200	12,8	591	55	300	54
250	14,0	700	60	350	80
300	15,2	809	65	400	112
350	16,3	550	70	298	115
400	17,5	600	75	324	149
500	19,8	700	85	375	231
600	22,2	800	95	426	342
700	24,5	900	105	478	485
800	26,8	1 000	115	529	667
900	29,2	1 100	125	581	868
1 000	31,5	1 200	135	632	1 125

47 ALL FLANGED TEES

$$e = \frac{14}{12}(7 + 0{,}02\ DN) \qquad L \begin{cases} 80 \text{ to } 300 = 200 + 2\ DN \\ 350 \text{ to } 1\,000 = 500 + DN \end{cases}$$

$$h \begin{cases} DN\ 80 \text{ to } 300 \begin{cases} dn = DN \\ dn < DN \end{cases} = \begin{matrix} 100 + DN \\ 100 + 0{,}5\ DN + 0{,}5\ dn \end{matrix} \\ DN\ 350 \text{ to } 1\,000 \begin{cases} dn \leqslant 250 \\ dn \geqslant 300 \end{cases} = \begin{matrix} 150 + 0{,}5\ DN \\ 250 + 0{,}5\ DN \end{matrix} \end{cases}$$



Symbol :

Dimensions in millimetres — Masses in kilograms

Body			Branch			Mass ≈
Nominal diameter DN	e	L	Nominal diameter dn	e_1	h	
80	10,0	360	80	10,0	180	21
100	10,5	400	80	10,5	190	25
	10,5	400	100	10,5	200	26
125	11,1	450	80	11,1	202,5	32
	11,1	450	100	11,1	212,5	34
	11,1	450	125	11,1	225	36
150	11,7	500	80	11,7	215	41
	11,7	500	100	11,7	225	42
	11,7	500	125	11,7	237,5	45
	11,7	500	150	11,7	250	47
200	12,8	600	80	12,8	240	62
	12,8	600	100	12,8	250	63
	12,8	600	125	12,8	262,5	66
	12,8	600	150	12,8	275	68
	12,8	600	200	12,8	300	74
250	14,0	700	80	13,0	265	89
	14,0	700	100	13,5	275	90
	14,0	700	125	14,0	287,5	93
	14,0	700	150	14,0	300	96
	14,0	700	200	14,0	325	102
	14,0	700	250	14,0	350	109
300	15,2	800	80	13,0	290	122
	15,2	800	100	13,5	300	124
	15,2	800	125	14,5	312,5	126
	15,2	800	150	15,0	325	129
	15,2	800	200	15,2	350	136
	15,2	800	250	15,2	375	143
	15,2	800	300	15,2	400	151
350	16,3	850	200	16,3	325	169
	16,3	850	250	16,3	325	173
	16,3	850	300	16,3	425	188
	16,3	850	350	16,3	425	195

Dimensions in millimetres — Masses in kilograms

Body			Branch			Mass ≈
Nominal diameter DN	e	L	Nominal diameter dn	e_1	h	
400	17,5	900	200	16,5	350	211
	17,5	900	250	17,5	350	215
	17,5	900	300	17,5	450	232
	17,5	900	350	17,5	450	239
	17,5	900	400	17,5	450	246
500	19,8	1 000	250	18,0	400	315
	19,8	1 000	300	19,5	500	334
	19,8	1 000	350	19,8	500	342
	19,8	1 000	400	19,8	500	349
	19,8	1 000	500	19,8	500	363
600	22,2	1 100	300	19,5	550	466
	22,2	1 100	350	21,0	550	475
	22,2	1 100	400	22,2	550	485
	22,2	1 100	500	22,2	550	499
	22,2	1 100	600	22,2	550	516
700	24,5	1 200	350	21,0	600	642
	24,5	1 200	400	22,5	600	651
	24,5	1 200	500	24,5	600	669
	24,5	1 200	600	24,5	600	686
	24,5	1 200	700	24,5	600	707
800	26,8	1 300	400	22,5	650	858
	26,8	1 300	500	25,5	650	877
	26,8	1 300	600	26,8	650	897
	26,8	1 300	700	26,8	650	916
	26,8	1 300	800	26,8	650	941
900	29,2	1 400	500	25,5	700	1 106
	29,2	1 400	600	28,5	700	1 128
	29,2	1 400	700	29,2	700	1 149
	29,2	1 400	800	29,2	700	1 173
	29,2	1 400	900	29,2	700	1 190
1 000	31,5	1 500	500	25,5	750	1 396
	31,5	1 500	600	28,5	750	1 418
	31,5	1 500	700	31,5	750	1 446
	31,5	1 500	800	31,5	750	1 468
	31,5	1 500	900	31,5	750	1 484
	31,5	1 500	1 000	31,5	750	1 513

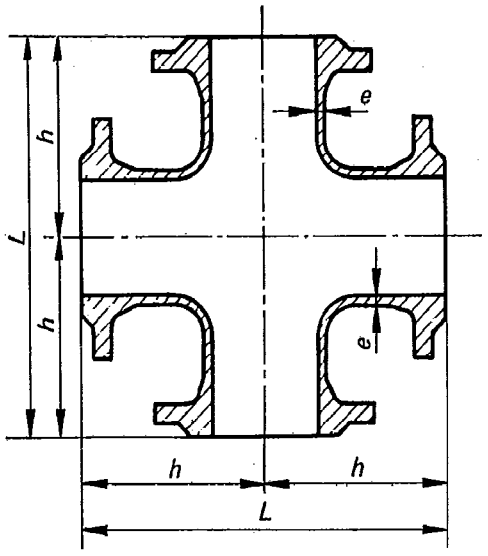
48 ALL FLANGED CROSSES

$e = \frac{14}{12}(7 + 0{,}02\ DN)$

$L = 200 + 2\ DN$

$h = 100 + DN$

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	e	L	h	Mass ≈
80	10,0	360	180	27
100	10,5	400	200	34
125	11,1	450	225	46
150	11,7	500	250	60
200	12,8	600	300	93
250	14,0	700	350	135
300	15,2	800	400	186

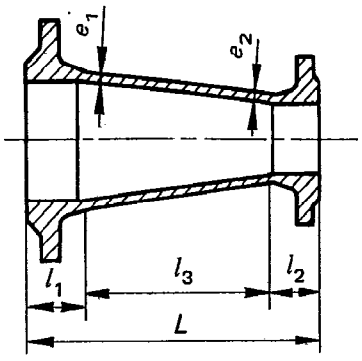
49 DOUBLE FLANGED TAPERS

$e_1 = \frac{14}{12}(7 + 0{,}02\ DN)$

$e_2 = \frac{14}{12}(7 + 0{,}02\ dn)$

$l_1 = 35 + 0{,}1\ DN$

$l_2 = 35 + 0{,}1\ dn$



Symbol :

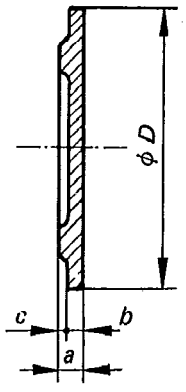
Dimensions in millimetres — Masses in kilograms

Large diameter			Small diameter					
Nominal diameter DN	e_1	l_1	Nominal diameter dn	e_2	l_2	l_3	L	Mass ≈
100	10,5	45	80	10,0	43	112	200	12
125	11,1	47,5	80	10,0	43	309,5	400	20
	11,1	47,5	100	10,5	45	307,5	400	22
150	11,7	50	80	10,0	43	307	400	23
	11,7	50	100	10,5	45	305	400	25
	11,7	50	125	11,1	47,5	302,5	400	27
200	12,8	55	100	10,5	45	300	400	31
	12,8	55	125	11,1	47,5	297,5	400	34
	12,8	55	150	11,7	50	295	400	37
250	14,0	60	125	11,1	47,5	292,5	400	41
	14,0	60	150	11,7	50	290	400	44
	14,0	60	200	12,8	55	285	400	50
300	15,2	65	150	11,7	50	285	400	51
	15,2	65	200	12,8	55	280	400	58
	15,2	65	250	14,0	60	275	400	65
350	16,3	70	200	12,8	55	475	600	87
	16,3	70	250	14,0	60	470	600	96
	16,3	70	300	15,2	65	465	600	106
400	17,5	75	250	14,0	60	465	600	109
	17,5	75	300	15,2	65	460	600	120
	17,5	75	350	16,3	70	455	600	132
500	19,8	85	350	16,3	70	445	600	160
	19,8	85	400	17,5	75	440	600	174
600	22,2	95	400	17,5	75	430	600	210
	22,2	95	500	19,8	85	420	600	239
700	24,5	105	500	19,8	85	410	600	281
	24,5	105	600	22,2	95	400	600	317
800	26,8	115	600	22,2	95	390	600	368
	26,8	115	700	24,5	105	380	600	410
900	29,2	125	700	24,5	105	370	600	458
	29,2	125	800	26,8	115	360	600	508
1 000	31,5	135	800	26,8	115	350	600	570
	31,5	135	900	29,2	125	340	600	617

50 BLANK FLANGES

$b = 19 + 0{,}028\ DN$

Symbol :



Dimensions in millimetres — Masses in kilograms

Nominal diameter DN	D	a	b	c	Mass ≈
80	200	24	21	3	5
100	220	25	22	3	6
125	250	25,5	22,5	3	8
150	285	26	23	3	11
200	340	27,5	24,5	3	16
250	395	29	26	3	23
300	445	31,5	27,5	4	32
350	505	33	29	4	43
400	565	34	30	4	55
500	670	37	33	4	85
600	780	41	36	5	126
700	895	43,5	38,5	5	177
800	1 015	46,5	41,5	5	245
900	1 115	49	44	5	313
1 000	1 230	52	47	5	406

NOTE – Beyond the nominal diameter DN 300, the bottoms of the blank flanges may be domed.