INTERNATIONAL STANDARD ISO 3587

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

Glass plant, pipeline and fittings — Pipeline and fittings of nominal bore 15 to 150 mm — Compatibility and interchangeability

Appareillage, tuyauterie et raccords en verre — Tuyauterie et raccords de diamètres nominaux 15 à 150 mm — Compatibilité et interchangeabilité

First edition — 1976-04-01
Corrected and reprinted — 1981-07-30

UDC 621.64 : 666.11/28 **Ref. No. ISO 3587-1976 (E)**

Descriptors : glassware, piping, pipes (tubes), glass tubes, pipe fittings, glass fittings, equipment, specifications, dimensions, compatibility, interchangeability.

Price based on 17 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 3587 was drawn up by Technical Committee ISO/TC 128, *Glass plant, pipeline and fittings,* and circulated to the Member Bodies in November 1974.

It has been approved by the Member Bodies of the following countries :

Austria	Italy	Turkey
Bulgaria	Romania	United Kingdom
Czechoslovakia	South Africa, Rep. of	U.S.A.
France	Spain	U.S.S.R.
Germany	Switzerland	

No Member Body expressed disapproval of the document.

Printed in Switzerland

Glass plant, pipeline and fittings – Pipeline and fittings of nominal bore 15 to 150 mm – Compatibility and interchangeability

0 INTRODUCTION

Standardization of glass plant, pipeline and fittings has as its objective the provision of compatibility and interchangeability of the widest practicable range of current and future production.

This International Standard deals with glass pipeline and fittings from 15 to 150 mm nominal bore (for glass plant components of nominal bore 80 to 1 400 mm, see ISO 4704). The limitations in nominal bore and types of fittings have been made in order to achieve the maximum possible standardization at the earliest possible time so as to obviate proliferation of different commercial and national standards. It avoids the exclusion of any existing buttress end forms and any restriction on the technical development of products. Requirements of flange couplings have only been included to the extent necessary to ensure compatibility of the glass components.

In deciding the technical content of this International Standard, account has been taken of the existence of the various national and commercial standards which are already established.

The requirements of this International Standard are governed largely by the properties of the "borosilicate glass 3.3" specified in ISO 3585.

The requirements for compatibility and interchangeability specified in this International Standard can also be met by other materials of different physical properties, provided they are satisfactory in other respects.

Drawings in this International Standard are only to be considered as examples.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the essential requirements for compatibility and interchangeability of borosilicate glass pipeline and fittings in sizes from 15 up to 150 mm nominal bore (DN).

2 REFERENCES

ISO 2084, *Pipeline flanges for general use – Metric series – Mating dimensions.*

ISO 3585, *Glass plant, pipeline and fittings – Properties of borosilicate glass 3.3.*

ISO 3586, *Glass plant, pipeline and fittings – General rules for testing, handling and use.*

ISO 4704, *Glass plant, pipeline and fittings – Glass plant components.* 1)

3 DEFINITIONS

For the purposes of this International Standard the following definitions apply.

3.1 pipeline : A complete assembly consisting of pipe sections and fittings which are connected by flange couplings.

3.2 pipe section : A straight length of pipe fitted with buttress ends.

3.3 buttress end : The specially shaped end of a pipe section or fitting, the joint face being either flat or spherical, convex (male) or concave (female).

3.4 fittings : Items such as spacers, reducers, bends, tees, crosses, and valves used in conjunction with pipe sections within the pipeline.

3.5 flange coupling : The complete assembly of backing flanges, inserts, gaskets, and the appropriate nuts and bolts for connecting two buttress ends. (See figure 1.)

3.6 backing flange : The ring which transfers the clamping pressure of the bolts through an insert to the joint face of the buttress end. (See figure 1.)

1) In preparation.

3.7 adaptor flange : A special backing flange for coupling buttress ends of different design. (See 6.2.)

3.8 insert : The sleeve or ring between the buttress end and the backing flange. (See figure 1.)

3.9 gasket : The jointing material placed between the faces of the buttress ends. (See figure 1.)

4 MATERIAL AND WORKING CONDITIONS

4.1 Basic properties

The glass parts referred to in this specification shall be manufactured from borosilicate glass 3.3, which is both heat and chemically resistant. Its properties are specified in ISO 3585.

4.2 Working temperatures

The maximum working temperatures of installed systems should not exceed those recommended by the manufacturer. There may be further limits, including temperature differences and rates of heating and cooling, where reference should be made to the manufacturer's recommendations and to the general rules given in ISO 3586.

Although borosilicate glass 3.3 retains its mechanical strength and will not deform at temperatures approaching the strain point (approximately 510 °C), the practical upper limit of operating temperatures for a pipeline is considerably lower and is controlled by the temperature differentials which can be permitted in the component. Pipeline should not be subjected to rapid temperature changes or to fluid temperature differences exceeding 120 °C (see ISO 3586) except where otherwise recommended by the manufacturer.

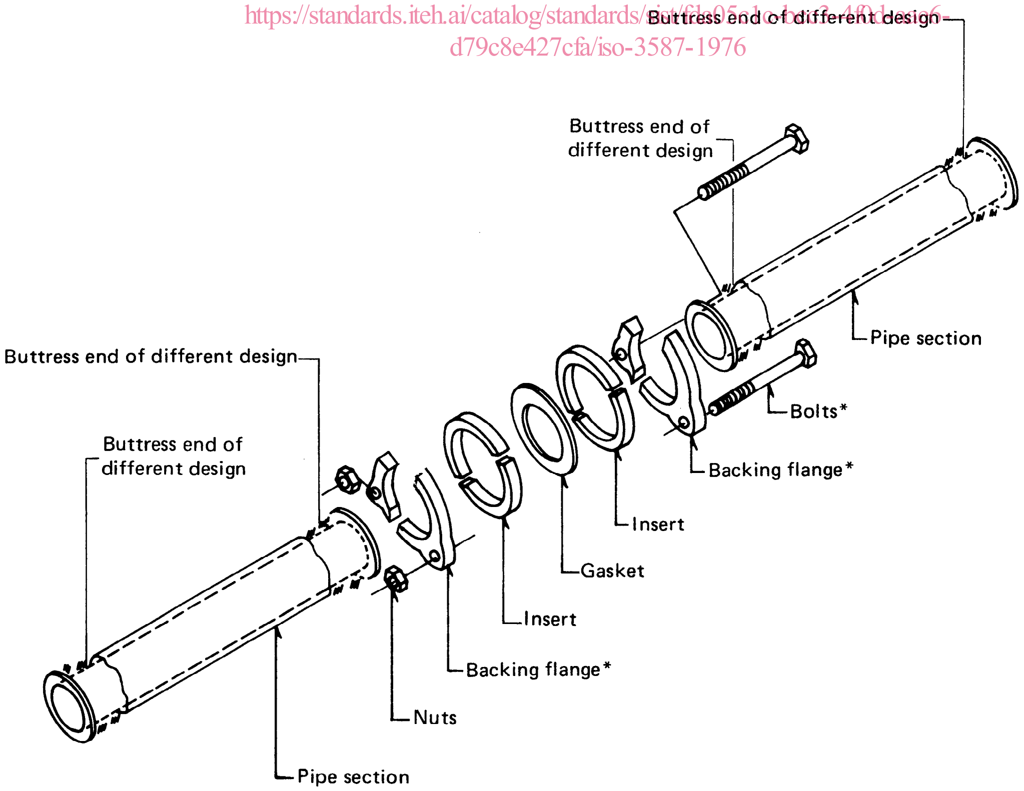
4.3 Maximum working pressures

Maximum working pressures for glass pipeline and fittings are given in table 1.

TABLE 1 — **Maximum working pressures for glass pipeline and fittings**

Nominal bore DN	Pipeline without valves	Pipeline including valves
mm	bar*	bar*
15	4	3
25	4	3
40	4	3
50	4	2
80	3	1,5
100	2	1
150	2	1

* 1 bar = 10^5 Pa



* Number of bolt holes varies according to diameter and design.

FIGURE 1 — **Designation of the components in a flange coupling assembly**

5 BASIC DIMENSIONS

5.1 Nominal bores (DN)

The nominal bores are 15 – 25 – 40 – 50 – 80 – 100 – 150 mm.

5.2 Length

All lengths of pipe sections and fittings shall be dimensioned in multiples of 25 mm. For the method of measurement of length, see annex A.

The length L

– of pipe sections and straight fittings with spherical buttress ends is the distance between the diameters d_0 (see figure 2);

– of pipe sections and straight fittings with flat buttress ends is the distance between the joint faces (see figure 3).

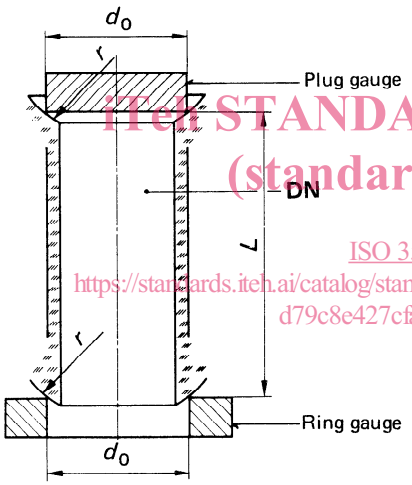


FIGURE 2 – **Length of pipe section with spherical buttress ends with reference to diameter d_0**

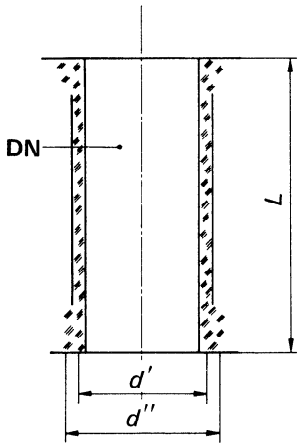


FIGURE 3 – **Length of pipe section with flat buttress ends and annular zone required for mating flat buttress ends with reference to diameters d' and d''**

5.3 Wall thickness

Wall thickness s between the buttress ends shall fall within the maximum and minimum limits given in table 2.

TABLE 2 – **Limits of wall thickness**

Dimensions in millimetres

DN	Thickness	
	min.	max.
15	2,2	3,8
25	3	5
40	3	6
50	3	6
80	3,5	7
100	4	7
150	4	8

6 MATING REQUIREMENTS

6.1 Pipeline and fittings with flat and spherical buttress ends (see figures 2 and 3)

In order to ensure the compatibility of pipeline and fittings with flat or spherical buttress ends, the dimensions given in table 3 should be adhered to.

TABLE 3 – **Dimensions for compatibility of spherical and flat buttress ends**

Dimensions in millimetres

DN	15	25	40	50	80	100	150
Radius of spherical buttress ends, r	18	25	40	50	80	100	150
Reference diameter of spherical buttress ends, d_0	21	34	50	62	90	118	170
Diameter of annular mating zone for flat buttress ends							
d' max.	21	31	46	58	87	111	163
d'' min.	23	37	52	64	93	117	169

6.2 Adaptor flanges

Because of the availability of different buttress end forms, the backing flanges usually supplied by the manufacturers of glass plant, pipeline and fittings are different in their shape, pitch circle diameter and the number and diameter of their bolt holes.

In order to ensure compatibility between the various types of glass buttress ends, and between them and pipe ends and flanges supplied in materials other than glass, an adaptor flange shall be used which is appropriate to the buttress

ends in use, having the pitch circle diameter and the number of bolts for NP 10 specified in ISO 2084, but with holes of reduced diameter (see table 4).

Examples of the use of adaptor flanges in conjunction with buttress ends in current manufacture are given in annex C.

TABLE 4 — **Adaptor flanges, mating dimensions**

Dimensions in millimetres

DN	15	25	40	50	80	100	150
Pitch circle diameter, d	65	85	110	125	160	180	240
Number of holes, n	4	4	4	4	8	8	8
Diameter of holes, d_1	7	9,5	9,5	9,5	9,5	9,5	10,5

6.3 Gaskets

For sealing between spherical buttress ends of different shapes, the gasket for the female spherical buttress end should be used, and for flat buttress ends a gasket with a diameter within the annular mating zone (see figures 2 and 3, table 3 and annex C).

6.4 Alignment of coupled spherical pipeline and fittings

The spherical end pipes and fittings shall allow a deviation between the axes of two components fitted together, of not less than the angular values given in table 5.

TABLE 5 — **Minimum possible deviation of alignment**

DN	15	25	40	50	80	100	150
Angle	3°	3°	3°	3°	3°	3°	2°

7 ESSENTIAL DIMENSIONS FOR INTERCHANGEABILITY

7.1 Pipe sections (see figures 4 and 5).

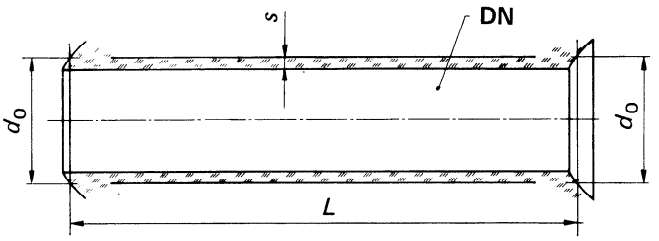


FIGURE 4 — **Pipe section with spherical buttress ends (male/female)**

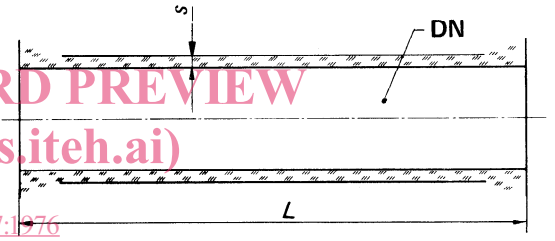


FIGURE 5 — **Pipe section with flat buttress ends**

7.1.1 *Lengths of pipe sections*

The lengths and tolerances of pipe sections are given in table 6.

TABLE 6 — **Lengths and tolerances of pipe sections**

Dimensions in millimetres

DN	100	125	150	175	200	300	400	500	700	1 000	1 500	2 000	3 000
15	± 2										± 3		
25	± 2										± 3		± 4
40	± 2										± 3		± 4
50	± 3										± 3		± 4
80	± 3										± 4		± 5
100	± 3										± 4		± 5
150	± 3										± 4		± 5

7.1.2 *Permissible bow of pipe sections*

Bow is the longitudinal curvature of a pipe section expressed as the maximum deviation from a straight line connecting two points at the extremities of its length within the buttress ends. The recommended method for the measurement of bow is given in annex B. The limits of permissible bow are given in table 7.

TABLE 7 – **Permissible bow of pipe sections**

Dimensions in millimetres

DN	Bow for length of straight pipe section					
	500	700	1 000	1 500	2 000	3 000
15	2	2	3	4	5	–
25	2	2	3	4	5	7
40	2	2	3	4	5	7
50	2	2	3	5	6	8
80	2	2	3	5	6	8
100	2	2	3	5	6	8
150	2	3	4	6	7	10

7.1.3 *Maximum outside diameter of pipe*

The maximum outside diameter of pipe between the welds of the buttress ends shall not exceed the dimensions given in table 8.

TABLE 8 – **Maximum outside diameter of pipe**

Dimensions in millimetres

DN	15	25	40	50	80	100	150
Maximum outside diameter	23	35	51	62	92	120	170

7.2 Spacers and adaptors

The lengths and tolerances of spacers and adaptors are given in figures 6 to 9 and table 9.

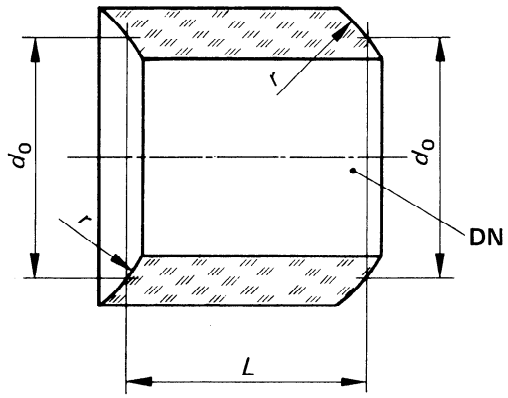


FIGURE 6 – **Spacer, spherical (female)/spherical (male)**

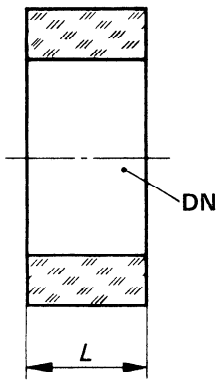


FIGURE 7 – **Spacer, flat/flat**

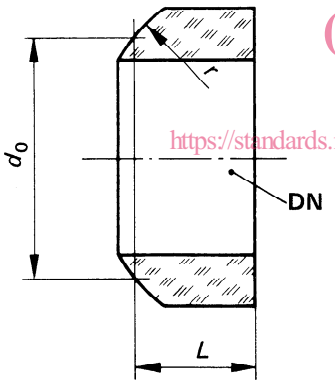


FIGURE 8 – **Adaptor, spherical (male)/flat**

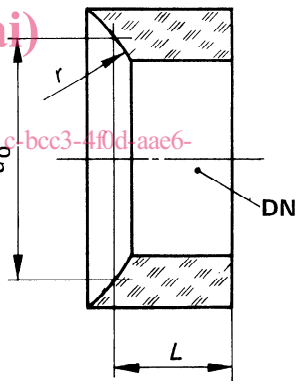


FIGURE 9 – **Adaptor, spherical (female)/flat**

TABLE 9 – **Lengths and tolerances of spacers and adaptors**

Dimensions in millimetres

DN	Spacers length L		Adaptors length L
15	25 ± 1	50 ± 1,5	25 ± 1
25	25 ± 1	50 ± 1,5	25 ± 1
40	25 ± 1	50 ± 1,5	25 ± 1
50	25 ± 1	50 ± 1,5	25 ± 1
80		50 ± 1,5	50 ± 1,5
100		50 ± 1,5	50 ± 1,5
150		50 ± 1,5	50 ± 1,5

7.3 Reducers

The lengths and tolerances of reducers are given in figures 10 to 13 and table 10.

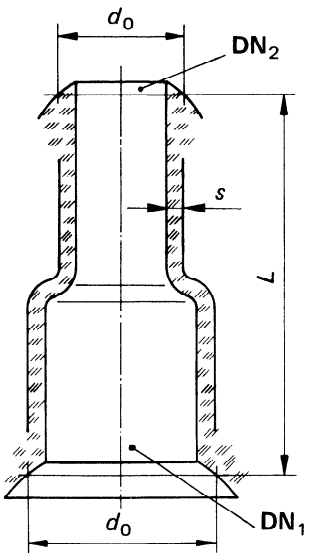


FIGURE 10 – **Reducer, spherical (female)/ spherical (male)**

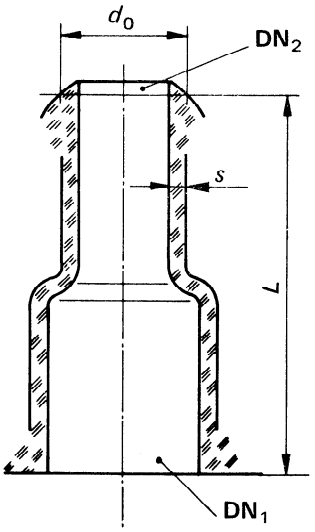


FIGURE 11 – **Reducer, flat/spherical (male)**

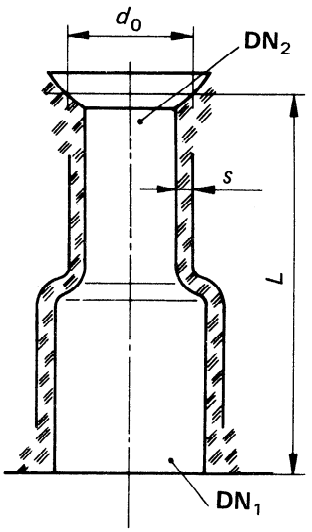


FIGURE 12 – **Reducer, flat/spherical (female)**

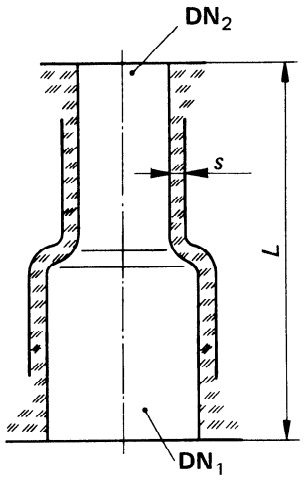


FIGURE 13 – **Reducer, flat/flat**

TABLE 10 – **Lengths and tolerances of reducers**

Dimensions in millimetres

DN_1	DN_2	L
25	15	100 ± 2
40	15	100 ± 2
40	25	100 ± 2
50	15	100 ± 3
50	25	100 ± 3
50	40	100 ± 3
80	25	125 ± 3
80	40	125 ± 3
80	50	125 ± 3
100	25	150 ± 3
100	40	150 ± 3
100	50	150 ± 3
100	80	150 ± 3
150	25	200 ± 3
150	40	200 ± 3
150	50	200 ± 3
150	80	200 ± 3
150	100	200 ± 3

7.4 Elbows

The lengths and tolerances of elbows are given in figures 14 and 15 and table 11.

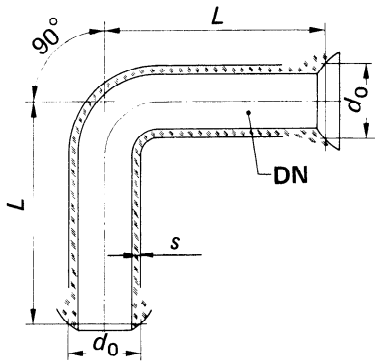


FIGURE 14 — **Elbow with spherical buttress ends, male/female**

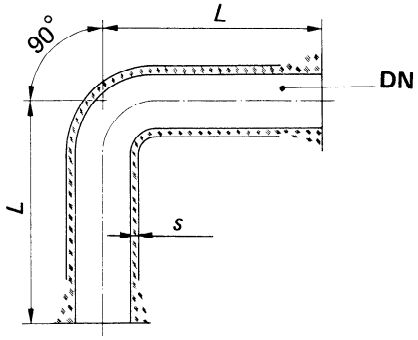


FIGURE 15 — **Elbow with flat buttress ends**

TABLE 11 — **Lengths and tolerances of elbows**

Dimensions in millimetres

DN	*L*
15	50 ± 2
25	100 ± 2
40	100 ± 2
50	125 ± 3
80	150 ± 3
100	200 ± 3
150	250 ± 3

7.5 45° Bends

The lengths and tolerances of 45° bends are given in figures 16 and 17 and table 12.

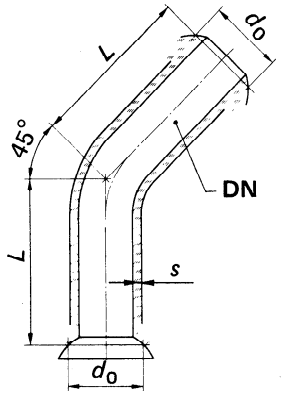


FIGURE 16 — **45° Bend with spherical buttress ends, male/female**

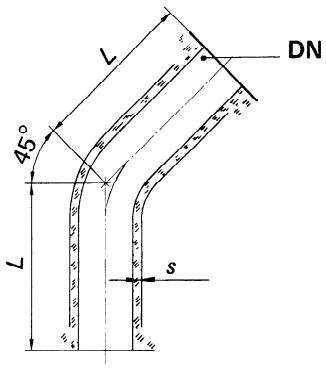


FIGURE 17 — **45° Bend with flat buttress ends**

TABLE 12 — **Lengths and tolerances of 45° bends**

Dimensions in millimetres

DN	*L*
15	50 ± 2
25	75 ± 2
40	100 ± 2
50	100 ± 3
80	125 ± 3
100	175 ± 3
150	200 ± 3

7.6 90° Bends

The lengths and tolerances of 90° bends are given in figures 18 and 19 and table 13 (see note below).

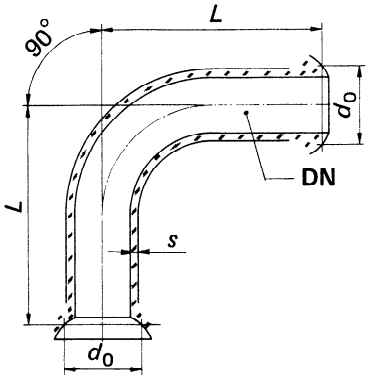


FIGURE 18 — **90° Bend with spherical buttress ends, male/female**

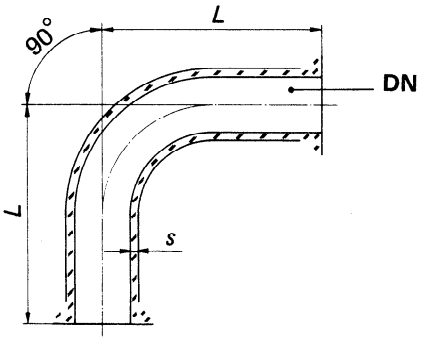


FIGURE 19 — **90° Bend with flat buttress ends**

TABLE 13 — **Lengths and tolerances of 90° bends**

Dimensions in millimetres

DN	L
15	50 ± 2
25	100 ± 2
40	150 ± 2
50	150 ± 3
80	200 ± 3
100	250 ± 3
150	250 ± 3

NOTE — 90° bends, equal tees, crosses and angle valves are interchangeable with each other as shown in figure 20. Some sizes of elbows are also interchangeable with these fittings.

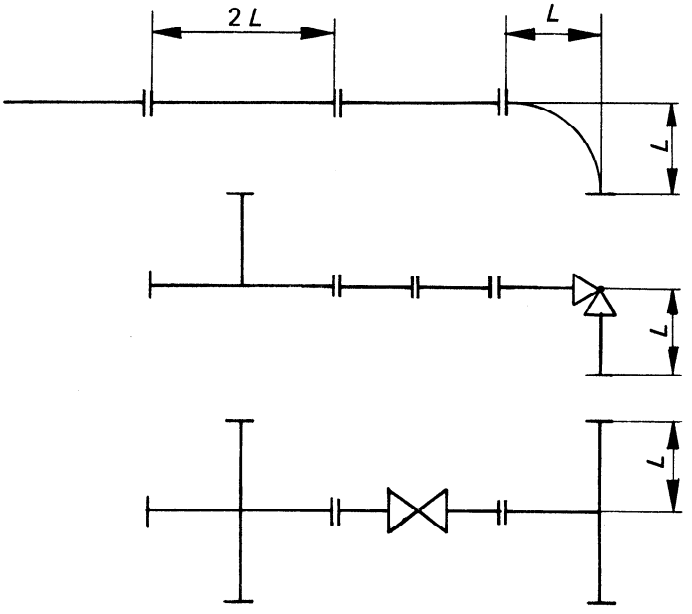


FIGURE 20 — **Schematic drawing of interchangeability**