BRITISH STANDARD

BS EN
10242 : 1995

Threaded pipe fittings in malleable cast iron

The European Standard EN 10242 : 1994 has the status of a British Standard

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PSE/9, Pipe fittings other than cast iron, upon which the following bodies were represented:

British Compressed Air Society
British Fluid Power Association
British Gas plc
British Malleable Tube Fittings Association
British Plumbing Fittings Manufacturers' Association
British Valve and Actuator Manufacturers' Association
Energy Industries Council
Engineering Equipment and Materials Users' Association
Galvanizers' Association
Institution of Civil Engineers
Institution of Water and Environmental Management
Ministry of Defence
Steel Tube Fittings Manufacturers' Technical Association

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on
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The following BSI references relate to the work on this standard:
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Draft for comment 91/84067 DC

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Contents

National foreword

This British Standard has been prepared under the direction of Technical Committee PSE/9, Pipe fittings other than cast iron, and is the English language version of EN 10242 : 1994 *Threaded pipe fittings in malleable cast iron* published by the European Committee for Standardization (CEN).

This standard partially supersedes BS 143 & BS 1256 : 1986, which is being amended.

Cross-references

Publication referred to	Corresponding British Standard
EN 10204 : 1991	BS EN 10204 : 1991 *Specification for metallic products — Types of inspection documents*
EN 29001 : 1987[1)]	BS 5750 *Quality systems* Part 1 : 1987 *Specification for design/development, production, installation and servicing*
EN 29002 : 1987[1)]	Part 2 : 1987 *Specification for production and installation*
EN 45012 : 1989	BS 7514 : 1989 *General criteria for suppliers' declaration of conformity*

Compliance with a British Standard does not of itself confer immunity from legal obligations.

1) EN 29001 : 1987 and EN 29002 : 1987 have been superseded by EN ISO 9001 : 1994 and EN ISO 9002 : 1994, which are identical with BS EN ISO 9001 : 1994 and BS EN ISO 9002 : 1994 respectively.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 10242

November 1994

ICS 23.040.40

Descriptors: Pipe fittings, threaded fittings, cast iron, malleable cast iron, designation, design, dimensions, dimensional tolerances, screw thread, characteristics, tests, inspection, marking

English version

Threaded pipe fittings in malleable cast iron

Raccords de tuyauterie filetés en fonte malléable

Gewindefittings aus Temperguß

This European Standard was approved by CEN on 1994-11-10. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard has been prepared by ECISS/TC 29 of which the secretariat is held by UNSIDER.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 1995, and conflicting national standards shall be withdrawn at the latest by May 1995.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

Contents

1 Scope

This standard specifies the requirements for the design and performance of threaded pipe fittings in malleable cast iron.

These fittings are for general purposes for the transmission of fluids and gases up to the limits of pressure and temperature specified in this standard. They are intended for the connection of elements threaded in accordance with ISO 7-1, sizes $^1/_8$ to 6.

For use in conditions outside the pressure and temperature limits specified, reference shall be made to the manufacturer.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications.

These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 10204	*Metallic products. Types of inspection documents*
EN 29001	*Quality systems — Model for quality assurance in design/development, production, installation and servicing*
EN 29002	*Quality systems — Model for quality assurance in production and installation*
EN 45012	*General criteria for certification bodies operating quality system certification*
prEN 1562	*Malleable cast iron*
ISO 7–1	*Pipe threads where pressure tight joints are made on the threads* Part 1. *Designation, dimensions and tolerances*
ISO 228–1	*Pipe threads where pressure tight joints are not made on the threads* Part 1. *Designation, dimensions and tolerances*
ISO 6708	*Pipe components — Definition of nominal size*

3 Types of fitting

Table 1 gives an index to the fitting types, and patterns and symbols. The symbols relate to the identification of fittings and may be used for designation (see **13.1**).

Table 1. Index of fitting types, symbols and index to tables and patterns

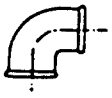
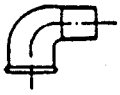
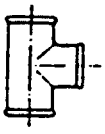
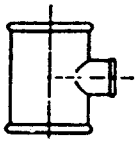
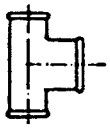
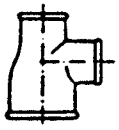
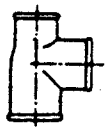
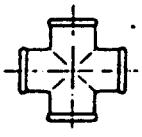
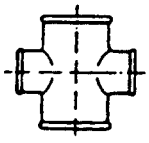
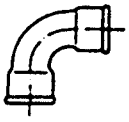
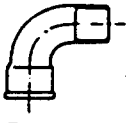
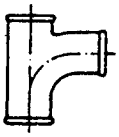
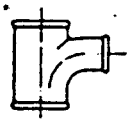
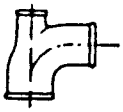
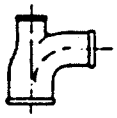
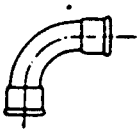
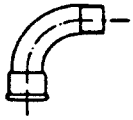
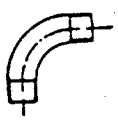
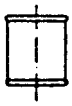
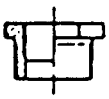
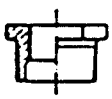
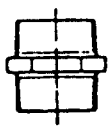
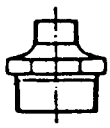
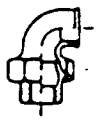
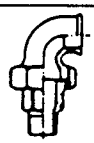
Types	Patterns					
Symbols	A1		A1/45°	A4		A4/45°
A Elbows	 Table 8	 Table 9	 Table 10	 Table 8	 Table 9	 Table 10
Symbols	B1					
B Tees	 Table 8	 Table 11	 Table 11	 Table 12	 Table 12	
Symbols	C1					
C Crosses	 Table 8	 Table 13				
Symbols	D1	D4				
D Short bends	 Table 14	 Table 14				
Symbols	E1				E2	
E Pitcher tees Twin elbows	 Table 14	 Table 15	 Table 15	 Table 15	 Table 14	 Table 16
Symbols	G1	G1/45°	G4	G4/45°	G8	
G Long sweep bends	 Table 17	 Table 18	 Table 17	 Table 18	 Table 17	

Table 1. Index of fitting types, symbols and index to tables and patterns *(concluded)*

Types	**Patterns**					
Symbols	M2			M4		
M Sockets	 Table 19	 Table 19		 Table 20	 Table 20	
Symbols	N4			N8		
N Bushings Hexagon nipples	 Table 21	 Table 21	 Table 21	 Table 22	 Table 22	
Symbols	P4					
P Backnuts	 Table 23					
Symbols	T1		T8	T9	T11	
T Caps Plugs	 Table 24		 Table 24	 Table 24	 Table 24	
Symbols	U1	U2	U11	U12		
U Union	 Table 25	 Table 25	 Table 25	 Table 25		
Symbols	UA1	UA2	UA11	UA12		
UA Union elbows	 Table 26	 Table 26	 Table 26	 Table 26		
Symbols	Za1	Za2				
Za Side outlet elbows and tees	 Table 8	 Table 8				

4 Terminology

For the purposes of this standard, the following terms and definitions apply:

4.1 fitting

Connecting piece, of one or more parts.

4.2 jointing thread

Thread complying with ISO 7-1.

4.3 fastening thread

Thread complying with ISO 228-1.

4.4 fitting size

Size designation of the threads of the threaded outlets as derived from ISO 7-1 (see also clause **13**).

4.5 designation of thread size

Same definition as for fitting size (see **4.4**).

4.6 nominal size; DN

For definition see ISO 6708.

NOTE 1. Nominal size is designated by the letters DN followed by the appropriate number.

NOTE 2. The relationship between fitting size and nominal size (DN) is given in annex D for guidance only.

NOTE 3. Nominal size (DN) should not be used for the designation of fitting size.

4.7 reinforcement

Additional material on the outside diameter of an internally threaded fitting in the form of a band or bead.

4.8 rib

Local and axially aligned additional material on the outside or inside of a fitting for assistance in assembly or manufacturing.

4.9 outlet

Internally or externally threaded end of a fitting, which connects with a tube, fitting or other component, which is threaded in accordance with ISO 7-1.

4.10 run

Two principal axially aligned outlets of a tee or cross.

4.11 branch

Side outlet(s) of a tee, pitcher tee, or cross.

4.12 chamfer

Removal of a conical portion at the entrance of a thread to assist assembly and prevent damage to the start of the thread.

4.13 face-to-face dimension

Distance between the two parallel faces of axially aligned outlets of a fitting.

4.14 face-to-centre dimension

Distance between the face of an outlet and the central axis of an angularly disposed outlet.

4.15 laying length

Average distance from the assembled pipe end to the axis of the fitting, or between the ends of two assembled pipes (see **7.2**).

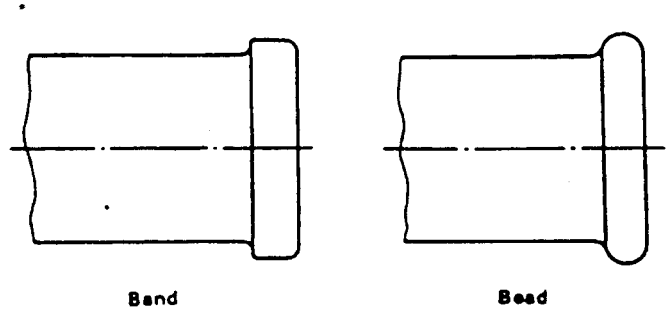


Figure 1. Forms of reinforcements

5 Materials

5.1 Material of the fitting

5.1.1 *Malleable cast iron*

The material used shall be malleable cast iron conforming to prEN 1562. The grade of material used shall be selected from the following grades depending on the design symbol chosen (see **6.1**):

Grades W400-005 or W350-04 for fittings in whiteheart malleable iron

Grades B350-10 or B300-06 for fittings in blackheart malleable iron.

5.1.2 *Other ferrous materials*

Notwithstanding this requirement, any other ferrous materials which give mechanical properties at least equivalent to those malleable cast irons specified above will be allowed for straight fittings not larger than $^3/_8$, but excluding unions.

5.2 Hot dip zinc coating

Where a protection by zinc coating is required, the zinc coating shall be applied by the hot dip process and shall meet the following requirements.

NOTE. For fittings supplied in other ferrous materials (see **5.1.2**) alternative zinc coating may be provided by agreement with the purchaser.

5.2.1 *Chemical composition of the zinc coating*

The content by mass of the accompanying elements in the finish zinc coating shall not exceed the following maximum values:

aluminium	(Al)	0,1 %
antimony	(Sb)	0,01 %
arsenic	(As)	0,02 %
bismuth	(Bi)	0,01 %
cadmium	(Cd)	0,01 %
copper	(Cu)	0,1 %
lead	(Pb)	1,6 %, in individual cases 1,8 %
tin	(Sn)	0,1 %

5.2.2 *Coating mass per surface unit*

The surface related mass of the zinc coating shall be not less than 500 g/m^2, as an average of 5 fittings. This corresponds to a medium layer thickness of 70 µm. It shall be not less than 450 g/m^2 (63 µm) when it is measured on an individual sample.

The medium layer thickness $\bar{s}$ of the zinc coating in µm may be calculated by using the approximation formula

$$\bar{s} = \frac{m_A}{7,2}$$

where m_A is the surface related mass of the zinc coating in g/m^2.

5.2.3 *Surface condition of the zinc coating*

The zinc coating on the internal surface of the fitting shall be continuous, with the exception of machined black surfaces. In the special case of larger material cross-sections the iron–zinc alloy phases may grow through. The internal zinc coating shall be free from zinc blisters, zinc burrs, non-metallic remainders.

5.3 Despatch conditions of finished fittings

The surfaces of the fittings shall be free of aromatic hydrocarbons.

6 Design

6.1 Fittings shall be identified by design symbols according to the selected material (see **5.1.1**) and the choice of thread (see **8.1.1**) as given in table 2.

NOTE. See also annex A.

Table 2. Design symbols

Design symbol	Thread type		Material grade
	external	internal	
A	R	Rp	W400-05 or B350-10
B	R	Rp	W350-04 or B300-06

6.2 The drawings are diagrammatic, without prejudice to the manufactured form.

6.3 The types and sizes dimensionally standardized are shown in tables 8 to 26.

6.4 Fittings shall be reinforced at the internally threaded ends by a band or bead, except where they are polygonal in shape to allow for spanner flats, or where fittings have side outlets (type Za1 and Za2).

6.5 Manufacturers may incorporate ribs at their discretion. Ribs should not project higher than the band or bead.

6.6 Backnuts may be plain or recessed and one face may be machined.

6.7 Tables 25 and 26 show two typical types of seats of unions and their designation. Other types of seat design and seat material shall be considered as complying with this standard provided the dimensions in tables 25 and 26 and other requirements of this standard are observed. Such unions do not have a specific designation.

7 Dimensions and tolerances

7.1 Fittings shall have the appropriate dimensions given in tables 8 to 26. Where maximum or minimum dimensions are not specified, the tolerances for face-to-face and face-to-centre dimensions shall be as given in table 3.

NOTE 1. Fitting sizes shown in brackets are optional sizes and which may have a limited availability.

NOTE 2. The face-to-face and face-to-centre dimensions of unions may not always comply with the tolerance given due to the compound effect of piece tolerances and design upon the final assembly.

Table 3. Tolerance on length

Values in millimetres

Dimension	Tolerance
≤ 30	± 1,5
> 30 ≤ 50	± 2,0
> 50 ≤ 75	± 2,5
> 75 ≤ 100	± 3,0
> 100 ≤ 150	± 3,5
> 150 ≤ 200	± 4,0
> 200	± 5,0

7.2 Laying lengths are given for assistance and guidance during installation. Their accuracy is dependent upon the tolerances given in **7.1** and on the tolerance of the threads specified in ISO 7-1. The dimensions *z* given in tables 8 to 26 are the average distance from the pipe end to the axis of the fitting (see figure 2) or the distance from pipe end to pipe end (see figure 3).

These assembly dimensions are calculated by deducting average lengths of engagement from the fact-to-face or face-to-centre dimensions given in the tables. The average lengths of engagement are rounded from the dimensions given in ISO 7-1 and are given in table 4.

7.3 The dimensions of widths across flats depend on the design of the fittings and are left to the discretion of the manufacturer.

7.3.1 Flats on plugs shall be square. Flats on other fittings up to and including size 3/4 should be hexagonal. Flats on other fittings above size 3/4 may be hexagonal or octagonal. Flats on union parts, excluding the union nut, may be hexagonal, octagonal or decagonal.

7.3.2 The minimum depth of the spanner flats measured at the corners shall be as given in table 5. For backnuts any chamfering shall not reduce the depth of spanner flat below the minimum dimension given in table 5.

Table 4. Lengths of engagement

Designation of thread size	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
Length of engagement, mm	7	10	10	13	15	17	19	19	24	27	30	36	40	40

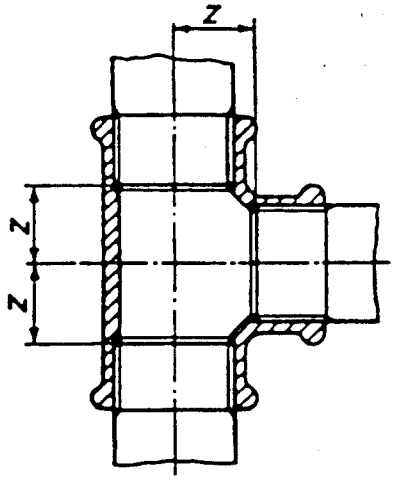


Figure 2. Laying lengths *z* in the case of an angularly disposed fitting

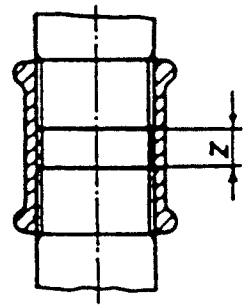


Figure 3. Laying length *z* in the case of an axially aligned fitting

Table 5. Minimum depth of spanner flats												
Designation of thread size	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
Min. depth of spanner flats, mm	4	4	5	5	5,5	6	6,5	6,5	7	7	7,5	8

8 Threads

8.1 Choice of thread

8.1.1 *Jointing thread*

Fittings shall be threaded in accordance with ISO 7-1. External threads shall be taper (R); internal threads shall be parallel (Rp).

8.1.2 *Fastening threads*

The threads of backnuts, union nuts and their mating threads shall be in accordance with ISO 228-1.

8.2 Alignment of threads

The axes of the screw threads shall be accurate to within ± 1/2° of the specified angle.

8.3 Chamfering

The outlets of the fittings shall have a chamfer.

On internal threads, the chamfer should have a minimum included angle of 90°, and the diameter at the face should exceed the major diameter of the thread.

On external threads, the chamfer should be a minimum included angle of 60° and the diameter at the face should not exceed the minor diameter of the thread at that face.

9 Manufacture

Fittings shall not contain material detrimental to their usage. They should be smooth, free from sand, blow holes, cracks and other injurious defects. They shall not be impregnated to cover such defects.

10 Required characteristics

10.1 Permissible working pressure and temperature

The fittings of all sizes shall be suitable for the maximum permissible working pressures within the temperature ranges given in table 6. Intermediate pressure ratings at temperatures between 120 °C and 300 °C shall be obtained by linear interpolation. For normal applications the lowest service temperature for fittings is –20 °C.

For special applications at temperatures below –20 °C the manufacturer shall be consulted.

10.2 Design strength

Pressure-containing fittings including the component parts of unions shall be designed to withstand the design test pressures given in table 7. Each size of fitting shall be type tested in accordance with table 7.

Table 6. Pressure/temperature ratings	
Service temperature °C	**Maximum permissible working pressure** bar[1)]
–20 to 120	25
between 120 and 300	interpolated values
300	20

[1)] 1 bar = 10^5 N/m² = 100 kPa.

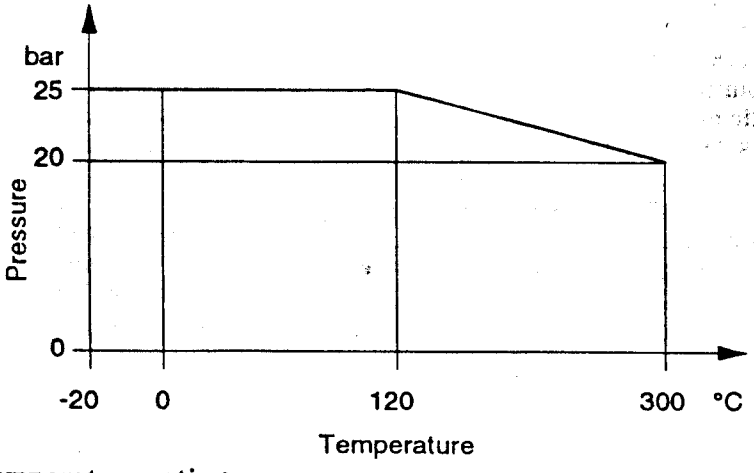


Figure 4. Pressure/temperature ratings

Table 7. Design test pressures	
Hydrostatic design test pressure (gauge)	
Sizes $^1/_8$ to 4	Sizes 5 and 6
100 bar	64 bar

It is permissible for there to be leakage from a union joint at a pressure below the pressure given in table 7 provided that the pressure is not less than 1,5 × maximum permissible working pressure at ambient temperature (see **10.1**).

10.3 Assembly

The fittings shall be capable of withstanding the forces normally involved during assembly when correctly assembled with threads in accordance with **8.1**.

11 Testing and inspection

11.1 Malleable cast iron

The manufacturer shall ensure by adequate tests that the malleable cast iron meets the requirements of the material grade specified in **5.1.1**.

In addition to the test requirements of prEN 1562, the manufacturer shall conduct appropriate tests, after annealing and before machining, to ensure that all fittings are satisfactorily malleabilized.

11.2 Hot dip zinc coating

Where protection by hot dip zinc coating is specified, the manufacturer shall ensure that the hot dip zinc coating meets the requirements of **5.2**. The elements specified in **5.2.1** shall be determined using a recognized test method, e.g. atomic absorption spectroscopy. The method of determination of the coating mass per surface unit area should be taken from ISO 1460. The thickness of the coating may be checked by using calibrated electronic or magnetic instruments (e.g. ISO 2178) or by microscopic examination. The measuring result for a fitting then follows as the arithmetic mean of at least 10 individual measurements at points distributed statistically across the fitting.

Hot dip zinc coated fittings shall be visually inspected for compactness and continuity of the zinc coating in accordance with sampling plans (e.g. ISO 2859).

11.3 Threads

11.3.1 *Jointing threads*

The manufacturer shall ensure by adequate control that the jointing threads meet the requirements of ISO 7-1.

NOTE. ISO 7-2 gives a recommended system of gauging but other systems of gauging can be used providing they ensure equivalent results are obtained and threads conform to ISO 7-1.

11.3.2 *Fastening threads*

Fastening threads shall meet the requirements of ISO 228-1.

NOTE. ISO 228-2 gives a recommended system of gauging but other systems of gauging can be used providing they ensure equivalent results are obtained and threads conform to ISO 228-1.

11.3.3 *Alignment*

The alignment of the threads shall meet the requirements specified in **8.2**.

11.4 Leak tightness test

All pressure containing fittings shall be tested after machining, but before protective coating other than zinc coating by one of the following methods. Each fitting, when so tested, shall show no sign of leakage.

a) by the application of an internal hydrostatic pressure of not less than 20 bar, or

b) by the application of an internal pneumatic pressure of not less than 5 bar, whilst the fitting is completely immersed in water or light oil, or

c) by other tests which ensure an equivalent quality.

Fittings which do not satisfy the chosen test shall be rejected.

11.5 Final visual inspection

The fittings shall be free from visible casting or threading defects. The verification regarding this shall be done by adequate visual inspection.

11.6 Acceptance tests for higher performances

11.6.1 If the customer requires acceptance tests for higher performances, these shall be stipulated and agreed at the enquiry or order stage. The purchaser shall bear the costs of acceptance tests. Acceptance tests should be carried out with suitable equipment and the manpower of the manufacturer.

11.6.2 *Hydrostatic pressure tests*

Acceptance hydrostatic pressure tests for working pressures above 25 bar shall be carried out by agreement at the order stage. The test pressure shall not exceed the limit beyond which permanent deformations and changes to the thread dimensions would occur.

11.7 Analysis of aromatic hydrocarbons

The verification of this requirement (see **5.3**) shall be performed by means of gas or thin-layer chromatography or other equivalent methods.

11.8 Inspection documents

When requested by the purchaser and agreed with the supplier, the supplier shall provide inspection documents in accordance with EN 10204 clauses **2.1** or **2.2**.

12 Quality assurance system

Manufacturers of fittings to this standard shall establish and maintain a documented quality system conforming to EN 29001 or EN 29002 and certified by a third party certification body operating to EN 45012, as a means of ensuring that the fittings conform to the specified requirements.

13 Designation of fittings

13.1 Elements of the designation

The fittings complying with this standard shall be designated as follows:

a) the type of fitting, see table 1;

b) EN 10242;

c) the symbol, see table 1;

d) fitting size, see **13.2** and tables 8 to 26;

e) surface condition whether black (symbol Fe) or hot dip zinc coated (symbol Zn);

f) design symbol, see **6.1**.

13.2 Additional notes on designation of size

Equal fittings, where all outlets are of the same size, are referred to by that one size, irrespective of the number of outlets.

Unequal fittings having two outlets are specified by their outlets in decreasing order (large outlet-small outlet).

Unequal fittings having more than two outlets but not reducing on the run are specified as follows.

a) Tees B1 and E1 with equal outlets on the run and an increasing or reducing outlet on the branch are specified by stating the size of the run followed by the size of the branch, for example, $1 \times 3/4$ (see tables 11 and 15).

b) Twin elbows reducing E2. The size of the large outlet is specified followed by the size of the two smaller outlets, for example, $1\,1/2 \times 1\,1/4$ (see table 16).

c) Reducing crosses C1. The size of the largest run is specified followed by the size of the two smaller (but equal) branches, for example, $1\,1/4 \times 1$ (see table 13).

Unequal fittings having more than two outlets and reducing on the run or with three different outlets may be specified by either method "a" or method "b" according to national practice as shown in figure 5.

NOTE. It is recommended that method "b" should be phased out by the year 2000. From this time all fittings should be designated using method "a".

13.3 Example of designation

i) Equal female elbow size 2, black finish, design symbol A:

Elbow EN 10242-A1-2-Fe-A

ii) Reducing tee with run 2 and branch 1, hot dip zinc coated, design symbol B:

Tee EN 10242-B1-2 × 1-Zn-B

iii) Reducing tee with run 1 and $3/4$ and branch $1/2$ black finish, design symbol A respectively B:

using method "a": Tee EN 10242-B1-1 × $1/2$ × $3/4$-Fe-A

using method "b": Tee EN 10242-B1-1 × $3/4$ × $1/2$-Fe-B

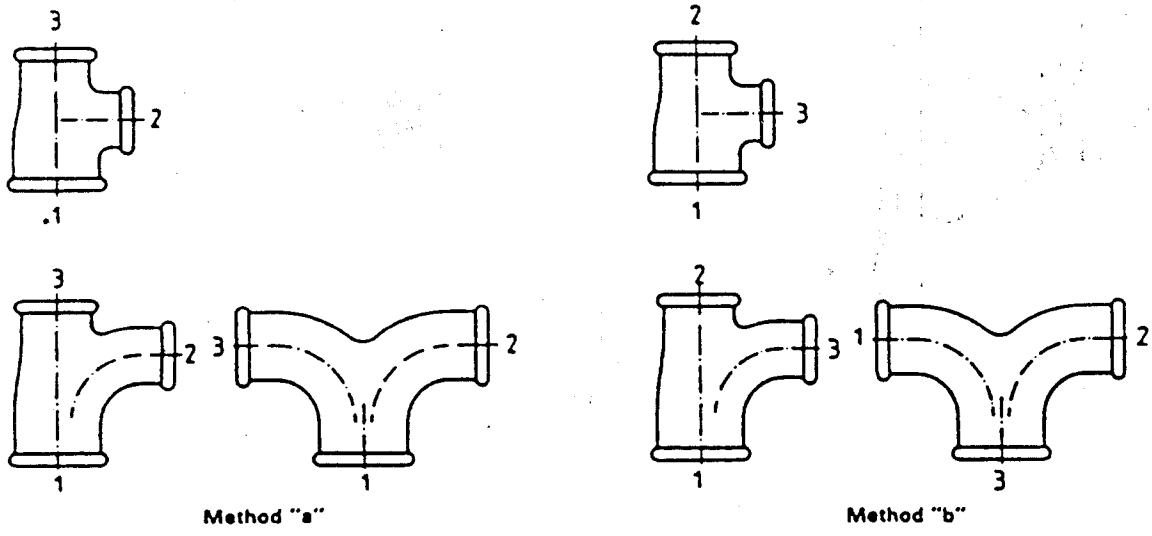


Figure 5. Sequence of specifying outlets when the above mentioned abbreviated method does not apply

14 Marking

Unless it is not practicable because of casting method space limitations, fittings shall be marked by casting at least with:

a) the manufacturer's name or trademark;

b) the fitting size (as defined in **4.4**).

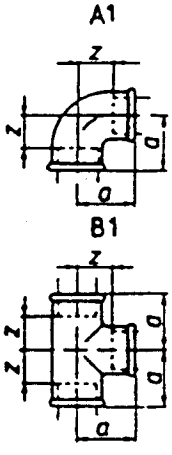
Other markings shall not conflict with the markings detailed in a) and b).

When it is not practicable to mark fittings because of casting method space limitations, it is permissible to omit either or both of the markings detailed in a) and b) providing the omitted markings are given on the packaging material, but in this case the fitting shall not be marked with any other marking.

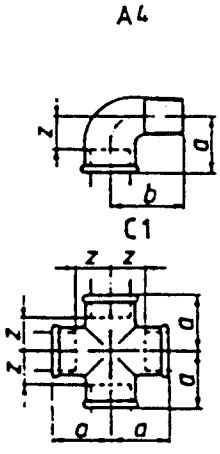
The CE mark and eventually other marks shall be put on the accompanying commercial documents or on the packaging material or on the fitting itself.

Table 8

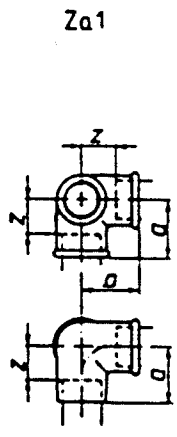
Elbows A1
Tees B1



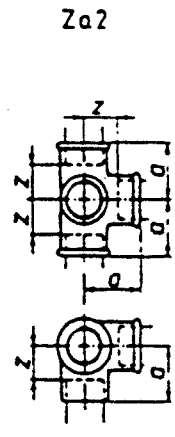
Male and female A4
Crosses C1



Side outlet
elbows Za1



Side outlet
tees Za2

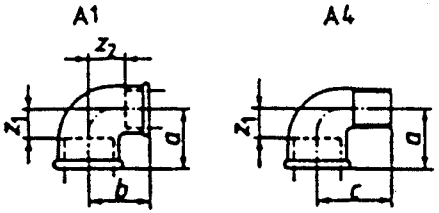


Fitting sizes						Dimensions mm		Laying length mm
A1	**A4**	**B1**	**C1**	**Za1**	**Za2**	*a*	*b*	*z*
1/8	1/8	1/8	—	—	—	19	25	12
1/4	1/4	1/4	(1/4)	—	—	21	28	11
3/8	3/8	3/8	3/8	(3/8)	(3/8)	25	32	15
1/2	1/2	1/2	1/2	1/2	(1/2)	28	37	15
3/4	3/4	3/4	3/4	3/4	(3/4)	33	43	18
1	1	1	1	(1)	(1)	38	52	21
1 1/4	1 1/4	1 1/4	1 1/4	—	—	45	60	26
1 1/2	1 1/2	1 1/2	1 1/2	—	—	50	65	31
2	2	2	2	—	—	58	74	34
2 1/2	2 1/2	2 1/2	(2 1/2)	—	—	69	88	42
3	3	3	(3)	—	—	78	98	48
4	4	4	(4)	—	—	96	118	60
(5)	—	(5)	—	—	—	115	—	75
(6)	—	(6)	—	—	—	131	—	91

Dimensions which are not specified are left to the discretion of the manufacturer
( ): see **7.1**.
Tolerances: see table 3.
Threads: in accordance with ISO 7-1.

Table 9

Elbows, reducing A1
Male and female elbows, reducing A4

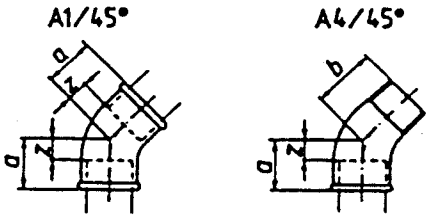


Fitting sizes		**Dimensions** mm			**Laying lengths** mm	
A1	**A4**	*a*	*b*	*c*	z_1	z_2
($^3/_8 \times {}^1/_4$)	—	23	23	—	13	13
$^1/_2 \times {}^3/_8$	$^1/_2 \times {}^3/_8$	26	26	33	13	16
($^3/_4 \times {}^3/_8$)	—	28	28	—	13	18
$^3/_4 \times {}^1/_2$	$^3/_4 \times {}^1/_2$	30	31	40	15	18
$1 \times {}^1/_2$	—	32	34	—	15	21
$1 \times {}^3/_4$	$1 \times {}^3/_4$	35	36	46	18	21
$1^1/_4 \times {}^3/_4$	—	36	41	—	17	26
$1^1/_4 \times 1$	$1^1/_4 \times 1$	40	42	56	21	25
($1^1/_2 \times 1$)	—	42	46	—	23	29
$1^1/_2 \times 1^1/_4$	—	46	48	—	27	29
$2 \times 1^1/_2$	—	52	55	—	28	36
($2^1/_2 \times 2$)	—	61	66	—	34	42

Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see 7.1
Tolerances: see table 3
Threads: in accordance with ISO 7.1.

Table 10

45° elbows A1/45°
45° male and female elbows A4/45°



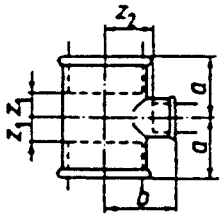
Fitting sizes		Dimensions mm		Laying lengths mm
A1/45°	A4/45°	*a*	*b*	*z*
3/8	3/8	20	25	10
1/2	1/2	22	28	9
3/4	3/4	25	32	10
1	1	28	37	11
1 1/4	1 1/4	33	43	14
1 1/2	1 1/2	36	46	17
2	2	43	55	19

Dimensions which are not specified are left to the discretion of the manufacturer.
Tolerances: see table 3
Threads: in accordance with ISO 7-1.

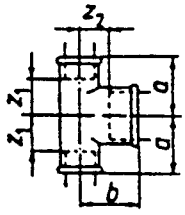
Table 11

Tees reducing on the branch B1
Tees increasing on the branch B1

B1



Tees reducing on the branch B1



Tees increasing on the branch B1

Tees reducing on the branch

Fitting sizes	Dimensions mm		Laying lengths mm	
	a	b	z_1	z_2
$^3/_8 \times ^1/_4$	23	23	13	13
$^1/_2 \times ^1/_4$	24	24	11	14
$^1/_2 \times ^3/_8$	26	26	13	16
$(^3/_4 \times ^1/_4)$	26	27	11	17
$^3/_4 \times ^3/_8$	28	28	13	18
$^3/_4 \times ^1/_2$	30	31	15	18
$(1 \times ^1/_4)$	28	31	11	21
$1 \times ^3/_8$	30	32	13	22
$1 \times ^1/_2$	32	34	15	21
$1 \times ^3/_4$	35	36	18	21
$(^1/_4 \times ^3/_8)$	32	36	13	26
$1^1/_4 \times ^1/_2$	34	38	15	25
$1^1/_4 \times ^3/_4$	36	41	17	26
$1^1/_4 \times 1$	40	42	21	25
$1^1/_2 \times ^1/_2$	36	42	17	29
$1^1/_2 \times ^3/_4$	38	44	19	29
$1^1/_2 \times 1$	42	46	23	29
$1^1/_2 \times 1^1/_4$	46	48	27	29
$2 \times ^1/_2$	38	48	14	35
$2 \times ^3/_4$	40	50	16	35
2×1	44	52	20	35
$2 \times 1^1/_4$	48	54	24	35
$2 \times 1^1/_2$	52	55	28	36
$2^1/_2 \times 1$	47	60	20	43
$2^1/_2 \times 1^1/_4$	52	62	25	43
$2^1/_2 \times 1^1/_2$	55	63	28	44
$2^1/_2 \times 2$	61	66	34	42

Fitting sizes	Dimensions mm		Laying lengths mm	
	a	b	z_1	z_2
3×1	51	67	21	50
$(3 \times 1^1/_4)$	55	70	25	51
$3 \times 1^1/_2$	58	71	28	52
3×2	64	73	34	49
$3 \times 2^1/_2$	72	76	42	49
4×2	70	86	34	62
4×3	84	92	48	62

Tees increasing on the branch

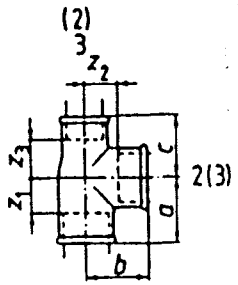
Fitting sizes	Dimensions mm		Laying lengths mm	
	a	b	z_1	z_2
$^3/_8 \times ^1/_2$	26	26	16	13
$^1/_2 \times ^3/_4$	31	30	18	15
$(^1/_2 \times 1)$	34	32	21	15
$^3/_4 \times 1$	36	35	21	18
$(^3/_4 \times 1^1/_4)$	41	36	26	17
$1 \times 1^1/_4$	42	40	25	21
$(1 \times 1^1/_2)$	46	42	29	23
$1^1/_4 \times 1^1/_2$	48	46	29	27
$(1^1/_4 \times 2)$	54	48	35	24
$1^1/_2 \times 2$	55	52	36	28

Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see **7.1**.
Tolerances: see table 3
Threads: in accordance with ISO 7-1.
Method of designation of fitting sizes: see **13.2a**.

Table 12

Tees reducing on the run and the branch B1
Tees reducing on the run and equal on the branch B1

B1



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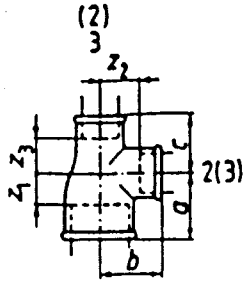
(1)

Tees reducing on the run and the branch B1

Tees reducing on the run and the branch

Fitting sizes			Dimensions mm			Laying lengths mm		
Method "a" 1 2 3	Method "b" 1 2 3		a	b	c	z_1	z_2	z_3
$1/2 \times 3/8 \times 3/8$	$1/2 \times 3/8 \times 3/8$		26	26	25	13	16	15
$3/4 \times 3/8 \times 1/2$	$3/4 \times 1/2 \times 3/8$		28	28	26	13	18	13
$3/4 \times 1/2 \times 3/8$	$3/4 \times 3/8 \times 1/2$		30	31	26	15	18	16
$3/4 \times 1/2 \times 1/2$	$3/4 \times 1/2 \times 1/2$		30	31	28	15	18	15
$1 \times 1/2 \times 1/2$	$1 \times 1/2 \times 1/2$		32	34	28	15	21	15
$1 \times 1/2 \times 3/4$	$1 \times 3/4 \times 1/2$		32	34	30	15	21	15
$1 \times 3/4 \times 1/2$	$1 \times 1/2 \times 3/4$		35	36	31	18	21	18
$1 \times 3/4 \times 3/4$	$1 \times 3/4 \times 3/4$		35	36	33	18	21	18
$1\,1/4 \times 1/2 \times 1$	$1\,1/4 \times 1 \times 1/2$		34	38	32	15	25	15
$1\,1/4 \times 3/4 \times 3/4$	$1\,1/4 \times 3/4 \times 3/4$		36	41	33	17	26	18
$1\,1/4 \times 3/4 \times 1$	$1\,1/4 \times 1 \times 3/4$		36	41	35	17	26	18
$1\,1/4 \times 1 \times 3/4$	$1\,1/4 \times 3/4 \times 1$		40	42	36	21	25	21
$1\,1/4 \times 1 \times 1$	$1\,1/4 \times 1 \times 1$		40	42	38	21	25	21
$1\,1/2 \times 1/2 \times 1\,1/4$	$1\,1/2 \times 1\,1/4 \times 1/2$		36	42	34	17	29	15
$1\,1/2 \times 3/4 \times 1\,1/4$	$1\,1/2 \times 1\,1/4 \times 3/4$		38	44	36	19	29	17
$1\,1/2 \times 1 \times 1$	$1\,1/2 \times 1 \times 1$		42	46	38	23	29	21
$1\,1/2 \times 1 \times 1\,1/4$	$1\,1/2 \times 1\,1/4 \times 1$		42	46	40	23	29	21
$(1\,1/2 \times 1\,1/4 \times 1)$	$(1\,1/2 \times 1 \times 1\,1/4)$		46	48	42	27	29	25
$1\,1/2 \times 1\,1/4 \times 1\,1/4$	$1\,1/2 \times 1\,1/4 \times 1\,1/4$		46	48	45	27	29	26
$2 \times 3/4 \times 1\,1/2$	$2 \times 1\,1/2 \times 3/4$		40	50	38	16	35	19
$2 \times 1 \times 1\,1/2$	$2 \times 1\,1/2 \times 1$		44	52	42	20	35	23
$2 \times 1\,1/4 \times 1\,1/4$	$2 \times 1\,1/4 \times 1\,1/4$		48	54	45	24	35	26
$2 \times 1\,1/4 \times 1\,1/2$	$2 \times 1\,1/2 \times 1\,1/4$		48	54	46	24	35	27
$(2 \times 1\,1/2 \times 1\,1/4)$	$(2 \times 1\,1/4 \times 1\,1/2)$		52	55	48	28	36	29
$2 \times 1\,1/2 \times 1\,1/2$	$2 \times 1\,1/2 \times 1\,1/2$		52	55	50	28	36	31



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Tees reducing on the run and equal on the branch B1

Tees reducing on the run and equal on the branch

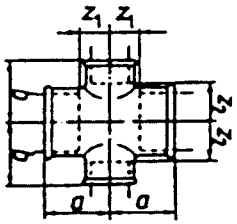
Fitting sizes			Dimensions mm			Laying lengths mm		
Method "a" 1 2 3	Method "b" 1 2 3		a	b	c	z_1	z_2	z_3
$1/2 \times 1/2 \times 3/8$	$1/2 \times 3/8 \times 1/2$		28	28	26	15	15	16
$3/4 \times 3/4 \times 3/8$	$3/4 \times 3/8 \times 3/4$		33	33	28	18	18	18
$3/4 \times 3/4 \times 1/2$	$3/4 \times 1/2 \times 3/4$		33	33	31	18	18	18
$(1 \times 1 \times 3/8)$	$(1 \times 3/8 \times 1)$		38	38	32	21	21	22
$1 \times 1 \times 1/2$	$1 \times 1/2 \times 1$		38	38	34	21	21	21
$1 \times 1 \times 3/4$	$1 \times 3/4 \times 1$		38	38	36	21	21	21
$1\,1/4 \times 1\,1/4 \times 1/2$	$1\,1/4 \times 1/2 \times 1\,1/4$		45	45	38	26	26	25
$1\,1/4 \times 1\,1/4 \times 3/4$	$1\,1/4 \times 3/4 \times 1\,1/4$		45	45	41	26	26	26
$1\,1/4 \times 1\,1/4 \times 1$	$1\,1/4 \times 1 \times 1\,1/4$		45	45	42	26	26	25
$1\,1/2 \times 1\,1/2 \times 1/2$	$1\,1/2 \times 1/2 \times 1\,1/2$		50	50	42	31	31	29
$1\,1/2 \times 1\,1/2 \times 3/4$	$1\,1/2 \times 3/4 \times 1\,1/2$		50	50	44	31	31	29
$1\,1/2 \times 1\,1/2 \times 1$	$1\,1/2 \times 1 \times 1\,1/2$		50	50	46	31	31	29
$1\,1/2 \times 1\,1/2 \times 1\,1/4$	$1\,1/2 \times 1\,1/4 \times 1\,1/2$		50	50	48	31	31	29
$2 \times 2 \times 3/4$	$2 \times 3/4 \times 2$		58	58	50	34	34	35
$2 \times 2 \times 1$	$2 \times 1 \times 2$		58	58	52	34	34	35
$2 \times 2 \times 1\,1/4$	$2 \times 1\,1/4 \times 2$		58	58	54	34	34	35
$2 \times 2 \times 1\,1/2$	$2 \times 1\,1/2 \times 2$		58	58	55	34	34	36

Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see 7.1.
Tolerances: see table 3.
Threads: in accordance with ISO 7-1.
Method of designation of fitting: see 13.2.

Table 13

Crosses, reducing C1

C1

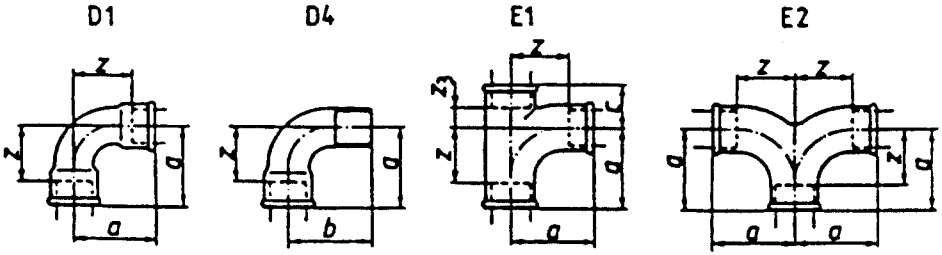


Fitting sizes	Dimensions mm		Laying lengths mm	
	a	b	z_1	z_2
($^1/_2 \times {}^3/_8$)	26	26	13	16
$^3/_4 \times {}^1/_2$	30	31	15	18
$1 \times {}^1/_2$	32	34	15	21
$1 \times {}^3/_4$	35	36	18	21
($1^1/_4 \times {}^3/_4$)	36	41	17	26
$1^1/_4 \times 1$	40	42	21	25
($1^1/_2 \times 1$)	42	46	23	29

Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see 7.1.
Tolerances: see table 3.
Threads: in accordance with ISO 7-1.
Method of designation of fitting sizes: see **13.2c**.

Table 14

Short bends D1
Male and female short bends D4
Pitcher tees E1
Twin elbows E2

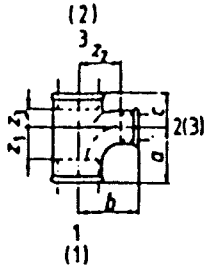


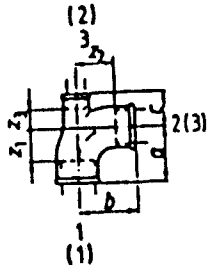
Fitting sizes				**Dimensions** mm		**Laying lengths** mm	
D1	**D4**	**E1**	**E2**	$a = b$	c	z	z_3
1/4	1/4	—	—	30	—	20	—
3/8	3/8	3/8	3/8	36	19	26	9
1/2	1/2	1/2	1/2	45	24	32	11
3/4	3/4	3/4	3/4	50	28	35	13
1	1	1	1	63	33	46	16
1 1/4	1 1/4	1 1/4	1 1/4	76	40	57	21
1 1/2	1 1/2	1 1/2	1 1/2	85	43	66	24
2	2	2	2	102	53	78	29

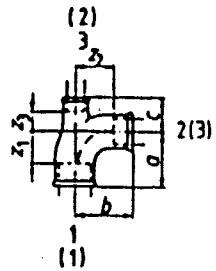
Dimensions which are not specified are left to the discretion of the manufacturer.
Tolerances: see table 3.
Threads: in accordance with ISO 7-1.

Table 15

Pitcher tees reducing on the branch E1
Pitcher tees reducing on the run E1
Pitcher tees reducing on the branch and run E1







Pitcher tees reducing on the branch E1
Pitcher tees reducing on the branch

Fitting sizes	Dimensions mm			Laying lengths mm		
	a	*b*	*c*	z_1	z_2	z_3
$^3/_4 \times ^1/_2$	47	48	25	32	35	10
$1 \times ^1/_2$	49	51	28	32	38	11
$1 \times ^3/_4$	53	54	30	36	39	13
$1^1/_4 \times ^1/_2$	51	56	30	32	43	11
$1^1/_4 \times ^3/_4$	55	58	33	36	43	14
$1^1/_4 \times 1$	66	68	36	47	51	17
$(1^1/_2 \times ^3/_4)$	55	61	33	36	46	14
$(1^1/_2 \times 1)$	66	71	36	47	54	17
$(1^1/_2 \times 1^1/_4)$	77	79	41	58	60	22
(2×1)	70	77	40	46	60	16
$(2 \times 1^1/_4)$	80	85	45	56	66	21
$(2 \times 1^1/_2)$	91	94	48	67	75	24

Pitcher tees reducing on the run E1

Pitcher tees reducing on the branch and run E1
Pitcher tees reducing on the run

Fitting sizes		Dimensions mm			Laying lengths mm		
Method "a" 1 2 3	Method "b" (1) (2) (3)	*a*	*b*	*c*	z_1	z_2	z_3
$^3/_4 \times ^3/_4 \times ^1/_2$	$^3/_4 \times ^1/_2 \times ^3/_4$	50	50	27	35	35	14

Pitcher tees reducing on branch and run

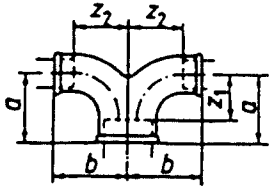
Fitting sizes		Dimensions mm			Laying lengths mm		
Method "a" 1 2 3	Method "b" (1) (2) (3)	*a*	*b*	*c*	z_1	z_2	z_3
$^3/_4 \times ^1/_2 \times ^1/_2$	$^3/_4 \times ^1/_2 \times ^1/_2$	47	48	24	32	35	11
$1 \times ^1/_2 \times ^3/_4$	$1 \times ^3/_4 \times ^1/_2$	49	51	25	32	38	10
$1 \times ^3/_4 \times ^3/_4$	$1 \times ^3/_4 \times ^3/_4$	53	54	28	36	39	13

Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see **7.1**.
Tolerances: see table 3.
Threads: in accordance with ISO 7-1.
Method of designation of fitting sizes: see **13.2**.

Table 16

Twin elbows, reducing E2

E2



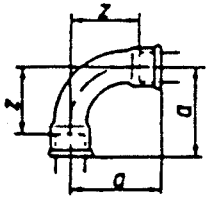
Fitting sizes	Dimensions mm		Laying lengths mm	
	a	b	z_1	z_2
(3/4 × 1/2)	47	48	32	35
(1 × 3/4)	53	54	36	39
(1 1/4 × 1)	66	68	47	51
(1 1/2 × 1 1/4)	77	79	58	60
(2 × 1 1/2)	91	94	67	75

Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see **7.1**.
Tolerances: see table 3.
Threads: in accordance with ISO 7-1.
Method of designation of fitting sizes: see **13.2b**.

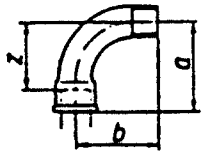
Table 17

Long sweep bends G1
Male and female long sweep bends G4
Male long sweep bends G8

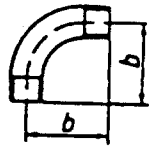
G1



G4



G8



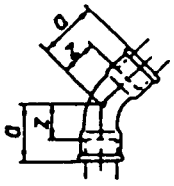
Fitting sizes			Dimensions mm		Laying lengths mm
G1	G4	G8	*a*	*b*	*z*
—	(1/8)	—	35	32	28
1/4	1/4	—	40	36	30
3/8	3/8	(3/8)	48	42	38
1/2	1/2	1/2	55	48	42
3/4	3/4	3/4	69	60	54
1	1	1	85	75	68
1 1/4	1 1/4	(1 1/4)	105	95	86
1 1/2	1 1/2	(1 1/2)	116	105	97
2	2	(2)	140	130	116
2 1/2	(2 1/2)	—	176	165	149
3	(3)	—	205	190	175
4	(4)	—	260	245	224

Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see 7.1.
Tolerances: see table 3.
Threads: in accordance with ISO 7-1.

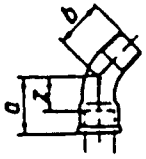
Table 18

45° long sweep bends G1/45°
45° male and female long sweep bends G4/45°

G1/45°



G4/45°

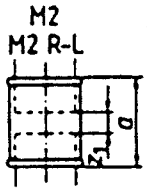


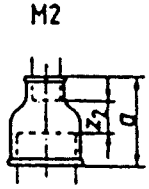
Fitting sizes		Dimensions mm		Laying lengths mm
G1/45°	**G4/45°**	*a*	*b*	*z*
—	(1/4)	26	21	16
(3/8)	3/8	30	24	20
1/2	1/2	36	30	23
3/4	3/4	43	36	28
1	1	51	42	34
1 1/4	1 1/4	64	54	45
1 1/2	1 1/2	68	58	49
2	2	81	70	57
(2 1/2)	(2 1/2)	99	86	72
(3)	(3)	113	100	83

Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see 7.1.
Tolerances: see table 3.
Threads: in accordance with ISO 7-1.

Table 19

Sockets M2
Sockets, right- and left-hand thread M2 R-L
Sockets, reducing M2





Fitting sizes			Dimensions mm	Laying lengths mm	
M2	**M2 R-L**	**M2 reducing**	*a*	z_1	z_2
1/8	—	—	25	11	—
1/4	—	1/4 × 1/8	27	7	10
3/8	3/8	(3/4 × 1/8)	30	10	13
		3/8 × 1/4			10
1/2	1/2	1/2 × 1/4	36	10	13
		1/2 × 3/8			13
		(3/4 × 1/4)			14
3/4	3/4	3/4 × 3/8	39	9	14
		3/4 × 1/2			11
		1 × 3/8			18
1	1	1 × 1/2	45	11	15
		1 × 3/4			13
		1 1/4 × 1/2			18
1 1/4	1 1/4	1 1/4 × 3/4	50	12	16
		1 1/4 × 1			14
		(1 1/2 × 1/2)			23
1 1/2	1 1/2	1 1/2 × 3/4	55	17	21
		1 1/2 × 1			19
		1 1/2 × 1 1/4			17

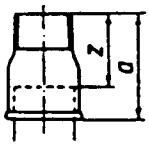
Fitting sizes			Dimensions mm	Laying lengths mm	
M2	**M2 R-L**	**M2 reducing**	*a*	z_1	z_2
		(2 × 1/2)			28
		(2 × 3/4)			26
2	2	2 × 1	65	17	24
		2 × 1 1/4			22
		2 × 1 1/2			22
	—	(2 1/2 × 1 1/4)			28
2 1/2		(2 1/2 × 1 1/2)	74	20	28
		(2 1/2 × 2)			23
		(3 × 1 1/2)			31
3	—	(3 × 2)	80	20	26
		(3 × 2 1/2)			23
		(4 × 2)			34
4	—	(4 × 2 1/2)	94	22	31
		(4 × 3)			28
(5)	—	—	109	29	—
(6)	—	—	120	40	—

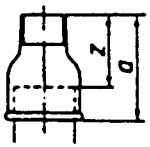
Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see 7.1.
Tolerances: see table 3.
Threads: in accordance with ISO 7-1.

Table 20

Male and female sockets M4
Male and female sockets, reducing M4

M4





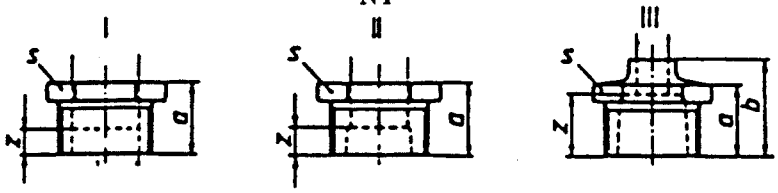
Fitting sizes		Dimensions mm	Laying lengths mm
M4	**M4 reducing**	*a*	*z*
$^3/_8$	$^3/_8 \times ^1/_4$	35	25
$^1/_2$	$^1/_2 \times ^1/_4$ $^1/_2 \times ^3/_8$	43	30
$^3/_4$	$(^3/_4 \times ^3/_8)$ $^3/_4 \times ^1/_2$	48	33
1	$1 \times ^1/_2$ $1 \times ^3/_4$	55	38
$1^1/_4$	$1^1/_4 \times ^3/_4$ $1^1/_4 \times 1$	60	41
—	$1^1/_2 \times 1$ $1^1/_2 \times 1^1/_4$	63	44
— —	$(2 \times 1^1/_4)$ $(2 \times 1^1/_2)$	70	46

Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see 7.1.
Tolerances: see table 3.
Threads: in accordance with ISO 7-1.

Table 21

Bushings N4

N4



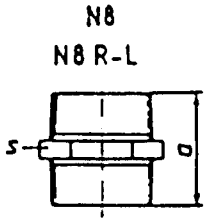
Fitting sizes	Patterns	Dimensions mm		Laying lengths mm
		a	*b*	*z*
1/4 × 1/8	I	20	—	13
3/8 × 1/8	II	20	—	13
3/8 × 1/4	I	20	—	10
1/2 × 1/8	II	24	—	17
1/2 × 1/4	II	24	—	14
1/2 × 3/8	I	24	—	14
3/4 × 1/4	II	26	—	16
3/4 × 3/8	II	26	—	16
3/4 × 1/2	I	26	—	13
1 × 1/4	II	29	—	19
1 × 3/8	II	29	—	19
1 × 1/2	II	29	—	16
1 × 3/4	I	29	—	14
1 1/4 × 3/8	II	31	—	21
1 1/4 × 1/2	II	31	—	18
1 1/4 × 3/4	II	31	—	16
1 1/4 × 1	I	31	—	14
(1 1/2 × 3/8)	II	31	—	21
1 1/2 × 1/2	II	31	—	18
1 1/2 × 3/4	II	31	—	16
1 1/2 × 1	II	31	—	14
1 1/2 × 1 1/4	I	31	—	12

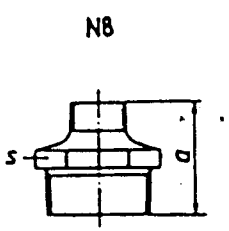
Fitting sizes	Patterns	Dimensions mm		Laying lengths mm
		a	*b*	*z*
2 × 1/2	III	35	48	35
2 × 3/4	III	35	48	33
2 × 1	II	35	—	18
2 × 1 1/4	II	35	—	16
2 × 1 1/2	II	35	—	16
2 1/2 × 1	III	40	54	37
2 1/2 × 1 1/4	III	40	54	35
2 1/2 × 1 1/2	II	40	—	21
2 1/2 × 2	II	40	—	16
3 × 1	III	44	59	42
3 × 1 1/4	III	44	59	40
3 × 1 1/2	III	44	59	40
3 × 2	II	44	—	20
3 × 2 1/2	II	44	—	17
4 × 2	III	51	69	45
4 × 2 1/2	III	51	69	42
4 × 3	II	51	—	21

Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see **7.1**.
Dimension *s*: see **7.3**.
Tolerances: see table 3.
Threads: in accordance with ISO 7-1.

Table 22

Hexagon nipples N8
Hexagon nipples, right- and left-hand thread N8 R-L
Hexagon nipples, reducing N8





Fitting sizes			Dimensions mm
N8	N8 R-L	N8 reducing	*a*
1/8	—	—	29
1/4	—	—	36
3/8	—	3/8 × 1/4	38
1/2	1/2	1/2 × 1/4	44
3/4	3/4	3/4 × 3/8 3/4 × 1/2	47
1	(1)	1 × 1/2 1 × 3/4	53
1 1/4	—	(1 1/4 × 1/2) 1 1/4 × 3/4 1 1/4 × 1	57
1 1/2	—	(1 1/2 × 3/4) 1 1/2 × 1 1 1/2 × 1 1/4	59

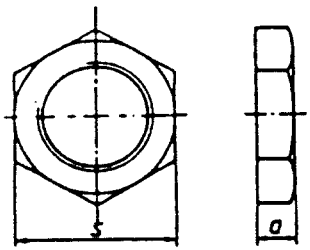
Fitting sizes			Dimensi mm
N8	N8 R-L	N8 reducing	*a*
2	—	(2 × 1) 2 × 1 1/4 2 × 1 1/2	68
2 1/2	—	(2 1/2 × 2)	75
3	—	(3 × 2) (3 × 2 1/2)	83
4	—	—	95

Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see 7.1.
Dimension *s*: see 7.3.
Tolerances: see table 3.
Threads: in accordance with ISO 7-1.

Table 23

Backnuts P4

P4[1)]



Fitting sizes	**Dimensions** mm
	a min.
1/4	6
3/8	7
1/2	8
3/4	9
1	10
1 1/4	11
1 1/2	12
2	13
2 1/2	16
3	19

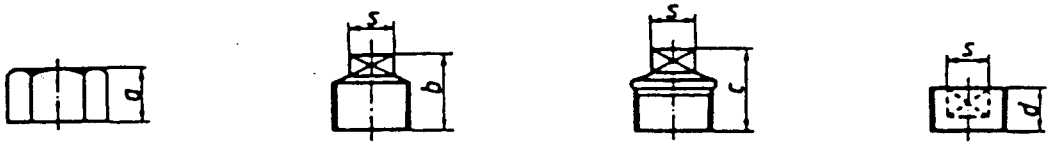
Dimensions which are not specified are left to the discretion of the manufacturer.
Dimension *s*: see **7.3**.
Threads: in accordance with ISO 228-1.

[1)] Backnuts may be plain or recessed, and one face may be machined.

Table 24

Caps T1
Plain plugs T8
Beaded plugs T9
Countersunk plugs T11

T1 T8 T9 T11

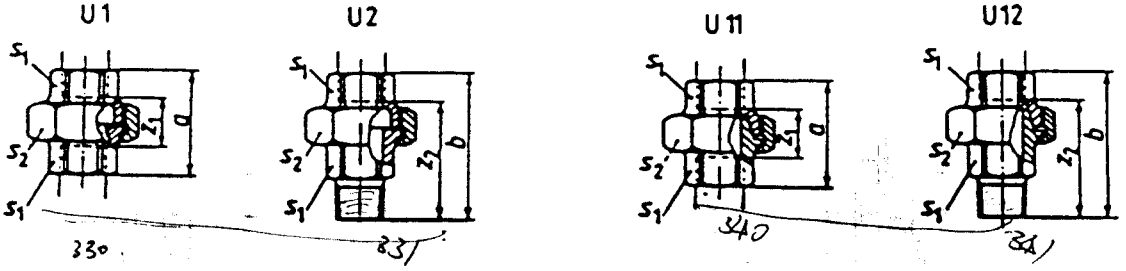


Fitting sizes				**Dimensions** mm			
T1	**T8**	**T9**	**T11**	*a* min.	*b* min.	*c* min.	*d* min.
(1/8)	1/8	1/8	—	13	11	20	—
1/4	1/4	1/4	—	15	14	22	—
3/8	3/8	3/8	(3/8)	17	15	24	11
1/2	1/2	1/2	(1/2)	19	18	26	15
3/4	3/4	3/4	(3/4)	22	20	32	16
1	1	1	(1)	24	23	36	19
1 1/4	1 1/4	1 1/4	—	27	29	39	—
1 1/2	1 1/2	1 1/2	—	27	30	41	—
2	2	2	—	32	36	48	—
2 1/2	2 1/2	2 1/2	—	35	39	54	—
3	3	3	—	38	44	60	—
4	4	4	—	45	58	70	—

Caps may have hexagon, round or other profiles at the manufacturer's discretion.
Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see **7.1**.
Dimension *s*: see **7.3**.
Threads: in accordance with ISO 7-1.

Table 25

Unions, flat seat U1
Male and female unions, flat seat U2
Unions, taper seat U11
Male and female unions, taper seat U12



Fitting sizes				Dimensions mm		Laying lengths mm	
U1	U2	U11	U12	a	b	z_1	z_2
—	—	(1/8)	—	38	—	24	—
1/4	1/4	1/4	1/4	42	55	22	45
3/8	3/8	3/8	3/8	45	58	25	48
1/2	1/2	1/2	1/2	48	66	22	53
3/4	3/4	3/4	3/4	52	72	22	57
1	1	1	1	58	80	24	63
1 1/4	1 1/4	1 1/4	1 1/4	65	90	27	71
1 1/2	1 1/2	1 1/2	1 1/2	70	95	32	76
2	2	2	2	78	106	30	82
2 1/2	—	2 1/2	2 1/2	85	118	31	91
3	—	3	3	95	130	35	100
—	—	4	—	110	—	38	—

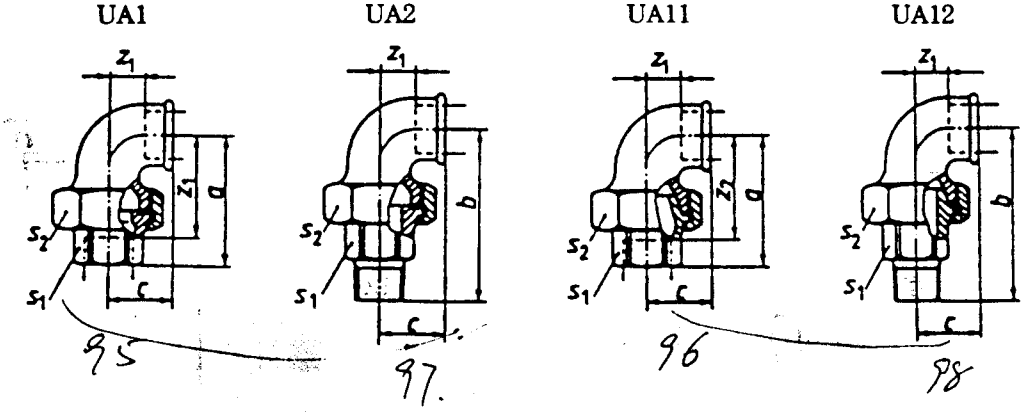
Dimensions which are not specified are left to the discretion of the manufacturer.
( ): see **7.1**.
Other types of seat design and seat materials shall be considered as standard providing dimensions a and b are observed.
Dimensions s_1 and s_2: see **7.3**.
Tolerances: see note 2 to **7.1**.
Threads: threads at outlets in accordance with ISO 7.1.
Gaskets: see table 27.

Caution: Unions (without or without gasket as appropriate to the seat design) should only be used as complete assemblies because component parts of unions made by different manufacturers, or component parts of different types of union made by the same manufacturer, are not necessarily interchangeable.

NOTE. Unions U1 and U2 may be supplied with or without spigot at the manufacturer's discretion.

Table 26

Union elbows, flat seat UA1
Male and female union elbows, flat seat UA2
Union elbows, taper seat UA11
Male and female union elbows, taper seat UA12



Fitting sizes				Dimensions mm			Laying lengths mm	
UA1	UA2	UA11	UA12	*a*	*b*	c	z_1	z_2
—	—	1/4	1/4	48	61	21	11	38
3/8	3/8	3/8	3/8	52	65	25	15	42
1/2	1/2	1/2	1/2	58	76	28	15	45
3/4	3/4	3/4	3/4	62	82	33	18	47
1	1	1	1	72	94	38	21	55
1 1/4	1 1/4	1 1/4	1 1/4	82	107	45	26	63
1 1/2	1 1/2	1 1/2	1 1/2	90	115	50	31	71
2	2	2	2	100	128	58	34	76

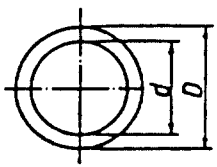
Dimensions which are not specified are left to the discretion of the manufacturer.
Other types of seat design and seat materials shall be considered as standard providing dimensions *a*, *b* and *c* are observed.
Dimensions s_1 and s_2: see **7.3**.
Tolerances: see note 2 to **7.1**.
Threads: threads at outlets in accordance with ISO 7-1.
Gaskets: see table 27.

Caution: Unions (with or without gasket as appropriate to the seat design) should only be used as complete assemblies because component parts of unions made by different manufacturers, or component parts of different types of union made by the same manufacturer, are not necessarily interchangeable.

NOTE. Union elbows UA1 and UA2 may be supplied with or without spigot at the manufacturer's discretion.

Table 27

Gaskets for unions and union elbows, flat seat U1, U2, UA1 and UA2



Fitting sizes of unions and union elbows	Diameters of gasket mm		Thread sizes of unions nuts (for guidance only)
	d	*D*	
1/8	—	—	G 1/2
1/4	13	20	G 5/8
	17	24	G 3/4
3/8	17	24	G 3/4
	19	27	G 7/8
1/2	21	30	G 1
	24	34	G 1 1/8
3/4	27	38	G 1 1/4
1	32	44	G 1 1/2
1 1/4	42	55	G 2
1 1/2	46	62	G 2 1/4
2	60	78	G 2 3/4
2 1/2	75	97	G 3 1/2
3	88	110	G 4
4	—	—	G 5
			G 5 1/2

Material and thickness of gasket: to be specified when ordering, depending on the application.
Thread sizes of union nuts: see 8.1.2.

Annex A (normative)

Malleable cast iron fittings threaded to ISO 7-1 but having internal threads type Rc

A.1 Design

In addition to the fitting designs identified by the design symbols A and B in **6.1** and table 2, the fittings described in table **A.1** are also used.

Table A.1 Design symbols

Design symbol	Thread type		Material grade
	External	Internal	
C	R	Rc	W400-05 or B350-10
D	R	Rc	W350-04 or B300-06

NOTE. These designs have been included at the request of the United Kingdom.

A.2 Jointing

Fittings of design symbols C and D shall be threaded in accordance with ISO 7-1. External threads shall be taper (R), internal threads shall be taper (Rc).

A.3 Requirements

Except as given in **A.1** and **A.2**, the requirements for fittings of design symbols C and D are as given in the main part of this standard.

Annex B (informative)

Assessment of conformity

In addition to the requirements of clause **12** it is recommended that the conformity of threaded pipe fittings in malleable cast iron to this standard should be assessed according to the Construction Products Directive (89/106/EEC) annex III clause **2**, item ii) third possibility, that is

1) initial type test by the manufacturer;
2) factory control of production.

Annex C (informative)

Relationship with the essential requirements of the Construction Products Directive (89/106/EEC)

Clarification of the reference numbers for the essential requirements as given in the Construction Products Directive.

1) requirement with regard to the mechanical aspect;
2) requirement with regard to the aspect of fire;
3) requirement with regard to hygiene, health and environment;
4) requirement with regard to safety in use;
5) requirement with regard to noise protection;
6) requirement with regard to energy economics.

Table C.1 Characteristics and corresponding clause in this standard for the essential requirements						
Characteristics	**Reference number of the essential requirements**					
	1	**2**	**3**	**4**	**5**	**6**
Hot dip zinc coating	—	—	Clauses **5.2.1** and **11.2**	—	—	—
Leak tightness	—	—	—	Clause **11.4**	—	—

Annex D (informative)
Relationship between fitting size and nominal size (DN)

The relationship between designation of thread size, which is the fitting size, and nominal size (DN) is given in table **D.1** for guidance only.

Table D.1 Thread designation and nominal size														
Designation of thread size/fitting size	1/8	1/4	3/8	1/2	3/4	**1**	1 1/4	1 1/2	**2**	2 1/2	**3**	**4**	**5**	**6**
Nominal size, DN	6	8	10	15	20	25	32	40	50	65	80	100	125	150

Annex E (informative)
Bibliography

The following standards are referenced in the text of this standard and are listed here for information only.

ISO 7-2 — *Pipe threads where pressure tight joints are made on the threads* Part 2. *Verification by means of limit gauges*

ISO 228-2 — *Pipe threads where pressure tight joints are not made on the threads* Part 2. *Verification by means of limit gauges*

ISO 1460 — *Metallic coatings — hot dip galvanised coatings on ferrous materials — Gravimetric determination of the mass per unit area*

ISO 2178 — *Non-magnetic coatings on magnetic substrates — Measurement of coating thickness — magnetic method*

ISO 2859 — *Sampling procedures for inspection by attributes*