

Stainless steel tubes and fittings for the food industry and other hygienic applications —

Part 2: Specification for bends and tees

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Piping Systems Components Standards Policy Committee (PSE/-) to Technical Committee PSE/8, upon which the following bodies were represented:

- Adhesive Tape Manufacturers' Association
- British Compressed Air Society
- British Gas plc
- British Malleable Tube Fittings Association
- British Steel Industry
- British Valve and Actuator Manufacturers' Association
- British Welded Steel Tube Association
- Engineering Equipment and Materials Users' Association
- Food and Drink Federation
- Institution of Civil Engineers
- Institution of Gas Engineers
- Institution of Water and Environmental Management
- Large Diameter Steel Tube Association
- Mechanical Handling Engineers' Association
- Stainless Steel Fabricators' Association of Great Britain
- Steel Tube Fittings Manufacturers' Technical Association
- Water Companies Association
- Water Research Centre
- Water Services Association of England and Wales
- Coopted member

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Brewers Society
- Dairy Trade Federation
- Institution of Production Engineers
- Milking Machine Manufacturers' Association

This British Standard, having been prepared under the direction of the Piping Systems Components Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 31 January 1992

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Foreword

This Part of BS 4825 has been prepared under the direction of the Piping Systems Components Standards Policy Committee. It is a revision of BS 4825-2:1973, which is withdrawn.

BS 4825 is published in five Parts:

- *Part 1: Specification for tubes;*
- *Part 2: Specification for bends and tees;*
- *Part 3: Specification for clamp type couplings;*
- *Part 4: Specification for threaded (IDF type) couplings;*
- *Part 5: Specification for recessed ring joint type couplings.*

This Part of BS 4825 provides a range of bends and tees to complement tubes specified in BS 4825-1.

The essential differences between this Part of BS 4825 and BS 4825-2:1973 are as follows.

- a) A greater selection of materials is given.
- b) Sizes less than 101.6 mm outside diameter are exact metric equivalents of imperial sizes of tube.
- c) Alternative dimensions of lengths of bends and tees have been included.
- d) Tolerances of perpendicularity have been changed.
- e) Marking requirements are given in greater detail.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 7 and a back cover.

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1 Scope

This Part of BS 4825 specifies requirements for stainless steel bends and tees for the food industry and other industries where there are hygienic requirements. It specifies dimensions, tolerances, surface finish and materials.

The bends and tees specified are for use with tubes specified in BS 4825-1 and are intended for welding to tube ends or fitting to expanded or welded type couplings. The bends and tees specified are for use with tubes of outside diameters 12.7 mm to 219.1 mm.

This standard does not cover ERW tube.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Information to be supplied by the purchaser

2.1 The purchaser is to provide to the supplier the information given in Appendix A to enable products to be supplied in accordance with this standard.

2.2 A number of options are permitted by this standard as given in Appendix B.

Both the definitive requirements specified throughout this standard and the options selected by the purchaser shall be satisfied by the manufacturer before a claim of compliance with this standard can be made and verified. In the event that the purchaser does not indicate his requirements at the time of enquiry and order the manufacturer shall select the option where appropriate.

3 Symbols

For the purposes of this Part of BS 4825, the following symbols apply.

D_0	outside diameter
T	thickness
R	bend radius
L_1	face to centre-line length (including fittings where appropriate)
L_2	straight length
P	perpendicularity tolerance of end-to-straight length
P_1	perpendicularity tolerance of end-to-end

4 Designation

4.1 Bends

Bends shall be specified by the type, tube outside diameter and thickness, and face to centre-line length (see Clause 6).

4.2 Tees

Tees shall be specified by the type, tube outside diameter and thickness, and face to centre-line length (see Clause 6).

5 Materials

5.1 The grade of stainless steel shall be selected from the grades of material given in Table 1.

NOTE 1 The grades of stainless steel given in Table 1 are the same as those given in BS 4825-1.

NOTE 2 Bends and tees manufactured from the materials given in Table 1 are capable of use at pressures up to 20 bar¹⁾ at 150 °C. In most instances bends and tees will withstand higher pressures and temperatures but the purchaser is advised to inform the manufacturer if bends and tees will be subjected to such higher pressures and/or temperatures (see Appendix A).

¹⁾ 1 bar = 10⁵ N/m² = 100 kPa.

Table 1 — Material grades

Grade	Maximum carbon content %	Description
304S11	0.03	Seamless
304S31	0.07	Seamless
316S11	0.03	Seamless
316S13	0.03	Seamless
316S31	0.07	Seamless
316S33	0.07	Seamless
304S22	0.03	Welded
304S25	0.06	Welded
316S22	0.03	Welded
316S26	0.07	Welded

^a The term “seamless” and “welded” refer to the tube from which bends and tees are manufactured.

5.2 If filler wire is used in the manufacture of tees, it shall comply with BS 2901-2.

6 Dimensions

The dimensions of bends and tees, shown in Figure 1, shall be as given in Table 2.

NOTE 1 For all bends the radius of bend should be:

$$R \approx 1.5 D_0$$

NOTE 2 The purchaser should specify the type and dimensions of bends and tees in his enquiry and/or order (see Appendix A).

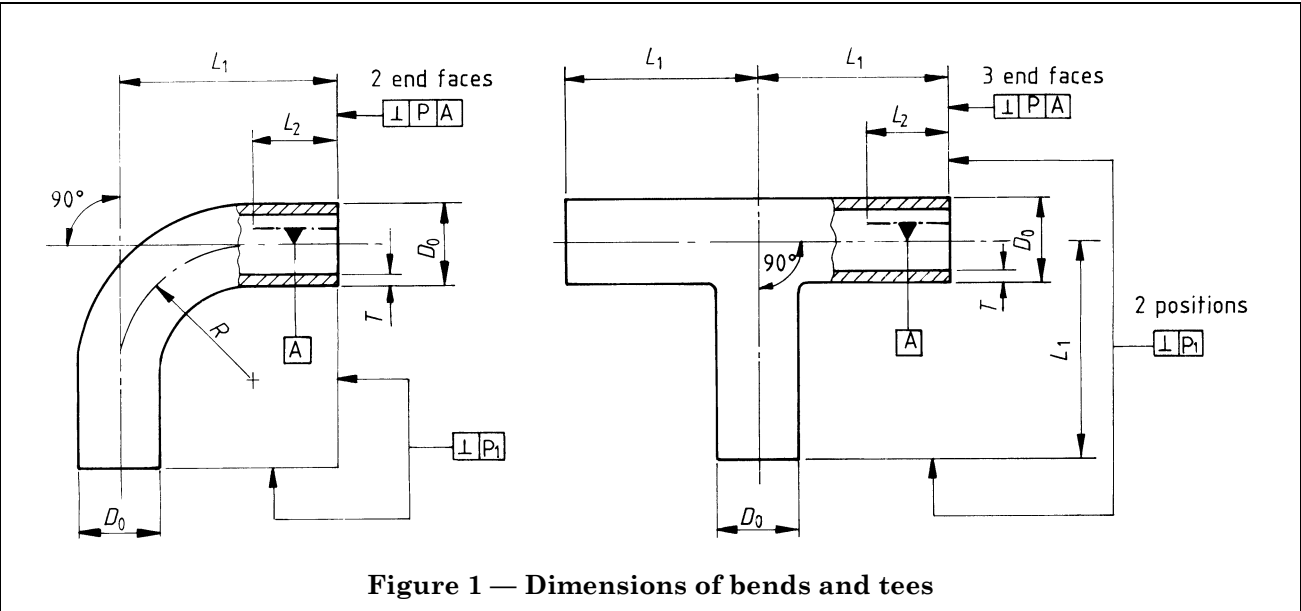


Figure 1 — Dimensions of bends and tees

Table 2 — Dimensions of bends and tees

Outside diameter, D_o mm	Long type				Short type		Maximum deviations	
	L_1 mm	L_2 minimum mm	T		L_1 mm	T mm	P mm	P_1 mm
			Expansion mm	Weld mm				
12.7	45	25	—	1.2	—	—	0.1	0.2
15.88	55	25	—	1.2	—	—	0.2	0.4
19.05	60	25	—	1.2	—	—	0.2	0.4
25.4	65	25	1.2	1.6	43.5	1.6	0.25	0.5
38.1	85	25	1.2	1.6	63.5	1.6	0.3	0.6
50.8	110	30	1.2	1.6	88.5	1.6	0.4	0.8
63.5	135	35	1.6	1.6	113.5	1.6	0.5	1.0
76.2	155	38	1.6	1.6	133.5	1.6	0.5	1.0
101.6	195	38	—	2.0	173.5	2.0	0.7	1.4
114.3	210	38	—	2.0	—	—	0.8	1.6
139.7	250	38	—	2.0	—	—	0.9	1.8
168.3	295	38	—	2.6	—	—	1.1	2.2
219.1	370	38	—	2.6	—	—	1.4	2.8
NOTE 1 Long bends and tees are to be used for subsequent expansion of couplings or direct welding into a pipework system.								
NOTE 2 Short bends and tees are to be used for subsequent attachment of couplings by welding or direct welding into a pipework system.								
NOTE 3 The purchaser should specify the type of bend or tee in his enquiry and/or order (see Appendix A).								

7 Tolerances

7.1 Outside diameter

The tolerance on the outside diameter, D_o , in straight length, L_2 , shall be as follows:

a) up to and including 101.6 mm diameter:

± 0.5 % with a minimum of ± 0.1 mm;

b) over 101.6 mm diameter:

± 0.75 %.

7.2 Thickness

The tolerance on thickness, T , in straight length, L_2 , shall be ± 12.5 % of the specified value.

7.3 Face to centre-line length

The tolerance on face to centre-line length, L_1 , shall be as follows:

a) up to and including 101.6 mm diameter:

+0.5, -0 mm;

b) over 101.6 mm diameter:

+1.0, -0 mm.

7.4 Perpendicularity

The tolerance on perpendicularity shall be as follows.

a) **Maximum deviation, P .** The maximum deviation, P , shall be as given in Table 2.

b) **Maximum deviation, P_1 .** The maximum deviation, P_1 , shall be as given in Table 2.

8 Surface finish

The internal and external surfaces of bends and tees shall be as given in Table 3.

Table 3 — Surface finish of bends and tees

Finish	R_a maximum μm	Typical types of finish
Internal External	1.0 2.5	Polishing, abrasive cleaning, acid descaling
NOTE 1 R_a is defined in BS 1134.		
NOTE 2 The purchaser should specify on his enquiry and/or order the type(s) of finish required for the internal and external surfaces of bends and tees (see Appendix A).		
NOTE 3 Care should be taken that no deposit of any material which might prove harmful during subsequent use and/or fabrication shall remain on the bends or tees.		
NOTE 4 Bends and tees should be clean and free from surface defects or inclusions.		

9 Manufacturer’s certificate

The manufacturer shall supply, when requested by the purchaser in the enquiry and/or order, a certificate stating that the bends and tees comply with the requirements of this standard for the appropriate type of bend and tee (see Appendix B).

Appendix A

Essential information to be supplied by the purchaser in the enquiry and/or order

The purchaser should provide the following information in the enquiry and/or order:

- a) the number and date of this British Standard i.e. BS 4825-2:1991 (see also Appendix C);
- b) the grade of stainless steel (see Clause 5);
- c) the nominal working pressure and temperature of the pipe system if greater than 20 bar and/or greater than 150 °C (see note 2 to Clause 5);
- d) the size, thickness and length (long or short);
- e) the type of surface finish required on internal and external surfaces.

Appendix B

Purchaser options

This standard lists certain options. The purchaser should state in the enquiry and/or order whether a manufacturer's certificate is required (see Clause 9). If no such statement is made, supply is at the option of the manufacturer.

Appendix C

Marking

It is recommended that each bend or tee is legibly and indelibly marked with the following:

- a) the manufacturer's name or identification mark;
- b) the number of this British Standard, i.e. BS 4825-2²⁾;
- c) the outside diameter and thickness;
- d) material grade;
- e) cast or batch reference to identify the source of material.

EXAMPLE

XYZ BS 4825/2 50.8 1.6 304S14 A1234

²⁾ Marking BS 4825-2 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Publication(s) referred to

BS 1134, *Assessment of surface texture*

BS 1134-1, *Methods and instrumentation*

BS 2901, *Specification for filler rods and wires for gas-shielded arc welding*

BS 2901-2, *Austenitic stainless steels*

BS 4825, *Stainless steel tubes and fittings for the food industry and other hygienic applications*

BS 4825-1, *Specification for tubes*

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