

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

Part 1: Specification for tubes

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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The following BSI references relate to the work on this standard:
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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 It is a revision of BS 4825-1:1972, which is withdrawn.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 incorporates the range of sizes greater than 101.6 mm as specified in ISO 2037, published by the International Organization for Standardization. Sizes up to and including 101.6 mm are direct metric equivalents of the range of imperial sizes and wall thicknesses preferred by United Kingdom industry.

The essential differences between this Part of BS 4825 and BS 4825-1:1972 are as follows.

- a) A greater selection of materials is given.
- b) Sizes up to and including 101.6 mm outside diameter are exact metric equivalents of imperial sizes of tube.
- c) Alternative thicknesses of tube of 1.6 mm and 1.2 mm have been included in the range from 25.4 mm to 50.8 mm outside diameter.
- d) The tolerance band for exact lengths has been reduced.
- 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 tubes in straight lengths for the food industry and other industries where hygienic requirements are necessary. This standard covers seamless and longitudinally welded austenitic stainless steel tube from 12.7 mm to 406.4 mm outside diameter, and specifies dimensions, tolerances, surface finish and materials.

The standard does not cover ERW tube.

NOTE 1 The suitability of a tube for a hygienic application is determined mainly by its material, finish and the condition of the longitudinal weld (see Clause 7).

NOTE 2 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 Materials and manufacture

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

NOTE The grade should be specified by the purchaser in his enquiry and/or order (see Appendix A).

If tubes are to be used at a pressure greater than 20 bar¹⁾ or a temperature greater than 150 °C, this shall be stated in the enquiry and/or order (see Appendix A).

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 terms “seamless” and “welded” refer to the tube from which bends and tees are manufactured.		

¹⁾ 1 bar = 10⁵ N/m² = 100 kPa.

3.2 Tubes shall be made by either the cold finished seamless, or welded and bead rolled process.

NOTE Electric resistance welding is not considered suitable for stainless steel tube for the food industry and electric resistance welded tubes are excluded from this standard (see 3.4).

3.3 All tubes shall be fully annealed and free from scale (see note 4 to Table 3).

3.4 Welded tubes shall be manufactured from flat rolled strip, longitudinally welded across the abutting edges by a continuous automatic welding process, with or without the addition of filler metal. If filler wire is used, it shall comply with BS 2901-2.

3.5 For welded tubes, welds joining lengths of strip shall be cut out of the finished tube.

3.6 The tube shall comply with test category 2 of BS 3605.

4 Dimensions

The dimensions of tubes shall be as given in Table 2.

NOTE The required dimensions in terms of outside diameter and thickness should be specified by the purchaser in his enquiry and/or order (see Appendix A).

Table 2 — Dimensions of tubes

Outside diameter mm	Wall thickness mm
12.7	1.2
15.88	1.2
19.05	1.2
25.4	1.6 or 1.2 ^a
38.1	1.6 or 1.2 ^a
50.8	1.6 or 1.2 ^a
63.5	1.6
76.2	1.6
101.6	2.0
114.3	2.0
139.7	2.0
168.3	2.6
219.1	2.6
273.0	2.6
323.9	2.6
355.6	2.6
406.4	3.2

^a The 1.2 mm thicknesses are intended for use with expanded fittings.

5 Tolerances

5.1 Outside diameter

The tolerance on the outside diameter shall be as follows:

- a) up to and including 101.6 mm diameter:
 $\pm 0.5\%$ or ± 0.1 mm whichever is the greater;
- b) over 101.6 mm diameter:
 $\pm 0.75\%$.

The tolerance on the outside diameter shall include ovality.

5.2 Thickness

The tolerance on thickness shall be $\pm 12.5\%$.

5.3 Length

If exact length is specified the permissible variation in length shall be as follows:

- a) for lengths up to and including 6 m:
 $+3, -0$ mm;
- b) for lengths over 6 m:
 $+6, -0$ mm.

NOTE The purchaser should specify in his enquiry and/or order whether random or exact lengths are required (see Appendix B).

6 Surface finish

The internal and external surfaces of the tube shall be as given in Table 3.

Table 3 — Surface finish of tubes

Finish	R_a maximum μm	Typical types of finish
Internal External	1.0 2.5	Cold working and bright annealing, 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 tubes (see Appendix B).		
NOTE 3 No deposit of any material which might prove harmful during subsequent use and/or fabrication shall remain on the tube.		
NOTE 4 Tubes should be clean and free from surface defects or inclusions.		

7 Manufacturer's certificate

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

8 Marking

8.1 Individual tubes

Each tube shall be legibly and indelibly marked, either on the tube or on a label or wrapping which shall be securely attached with the following information:

- a) the manufacturer's name or identification mark;
- b) the number of this British Standard, i.e. BS 4825-1²⁾;
- c) the outside diameter and thickness;
- d) material grade;
- e) cast or batch reference to identify the source of the material.

EXAMPLE

XYZ BS 4825/1 25.4 × 1.6 304S14 A1234

NOTE The purchaser should specify in his enquiry and/or order whether permanent continuous marking is required (see Appendix B).

8.2 Bundled tubes

Tubes supplied in bundles shall have the information specified in 8.1a) and 8.1b) stamped on one or more metal or otherwise durable tags, or printed on banding clips or straps, which shall be securely attached to each bundle. Not more than one grade of steel shall be included in any one bundle.

NOTE If carbon steel strapping is used, then the strapping and/or tube should be protected so that the carbon steel strapping does not come into direct contact with the surfaces of the stainless steel tubes.

²⁾ Marking BS 4825-1 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.

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 4825-1:1991;
- b) the grade of stainless steel (see Clause 3);
- c) the method of tube manufacture (see 3.2);
- d) the tube outside diameter and thickness (see Table 2);
- e) the nominal working pressure and temperature of the pipe system if greater than 20 bar and/or greater than 150 °C (see 3.1).

Appendix B

Purchaser options

This standard lists certain options. The purchaser should state in the enquiry and/or order whether the following are required. If no such statement is made, supply is at the option of the manufacturer.

- a) whether random or exact lengths are required (see 5.3);
- b) the type of surface finish required on internal and external surfaces (see Clause 6);
- c) any particular requirements regarding surface finish (see Clause 6);
- d) whether a manufacturer's certificate is required (see Clause 7);
- e) whether permanent continuous marking is required (see 8.1).

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 3605, *Austenitic stainless steel pipes and tubes for pressure purposes*

BS 3605-1, *Specification for seamless tubes*

ISO 2037, *Metal pipes and fittings — Stainless steel tubes for the food industry*

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