BRITISH STANDARD

BS 6323-3: 1982

Reprinted, incorporating Amendments No. 1 and No. 2

Specification for

Seamless and welded steel tubes for automobile, mechanical and general engineering purposes —

Part 3: Specific requirements for hot finished seamless steel tubes

UDC 669.14-462.3:621.774.3

Cooperating organizations

The Iron and Steel Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following:

British Constructional Steelwork Association
British Internal Combustion Engine Manufacturers' Association
British Ironfounders' Association
British Railways Board
British Steel Industry*
British Steel Industry — Wire Section
Concrete Society Ltd
Council of Ironfoundry Associations
Department of Industry (National Physical Laboratory)
Electricity Supply Industry in England and Wales
Engineering Equipment Users' Association
Federation of Civil Engineering Contractors
Institute of Quality Assurance
Institution of Production Engineers
Institution of Structural Engineers
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Oil Companies' Materials Association
Process Plant Association
Royal Institute of British Architects
Society of Motor Manufacturers and Traders Ltd*
Steel Casting Research and Trade Association
Water-tube Boilermakers' Association

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the Technical Committee entrusted with the preparation of this British Standard:

Association of Hydraulic Equipment Manufacturers
British Steel Corporation
British Welded Steel Tube Manufacturers' Association
Chartered Institution of Building Services
Confederation of British Industry
Mechanical Handling Engineers' Association
Ministry of Defence
Motor Cycle Association of Great Britain
Coopted members

This British Standard, having been prepared under the direction of the Iron and Steel Standards Committee, was published under the authority of the Board of BSI and comes into effect on
31 December 1982

The following BSI references relate to the work on this standard:
Committee reference PSE/8 (formerly ISE/50)
Draft for comment 78/74961 DC

ISBN 0 580 12971 3

Amendments issued since publication

Amd. No.	Date of issue	Comments
5139	June 1986	
6022	June 1989	Indicated by a sideline in the margin

Contents

Foreword

This British Standard has been prepared under the direction of the Iron and Steel Standards Committee. It is a combined standard superseding BS 980:1950, BS 1775:1964 and BS 3014:1958 which are withdrawn.

In BS 6323, manufacturing processes have been aligned with current procedures, and processes no longer used, i.e. oxyacetylene welding and hydraulic lap welding, have been deleted. Terminology relating to the designation of certain manufacturing processes has been updated, i.e. SAW replaces EFW, and CFS replaces CDS. Additionally, in combining the standards, steel grades have been rationalized and aligned, with delivery conditions now being clearly designated by letter codes.

This standard is published in eight separate Parts as follows:

— *Part 1: General requirements;*

— *Part 2: Specific requirements for hot finished welded steel tubes;*

— *Part 3: Specific requirements for hot finished seamless steel tubes;*

— *Part 4: Specific requirements for cold finished seamless steel tubes;*

— *Part 5: Specific requirements for electric resistance welded (including induction welded) steel tubes;*

— *Part 6: Specific requirements for cold finished electric resistance welded (including induction welded) steel tubes;*

— *Part 7: Specific requirements for submerged arc welded steel tubes;*

— *Part 8: Specific requirements for longitudinally welded stainless steel tubes.*

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 4, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of BS 6323, which is used in conjunction with Part 1 of the same standard, covers the specific requirements for hot finished seamless steel tubes for use in the automobile, mechanical and general engineering industries. It specifies the chemical composition, mechanical properties, dimensions, dimensional tolerances and technical delivery condition of the tubes.

NOTE 1 For tubes for pressure purposes, attention is drawn to BS 3601 to BS 3605 and for hollow sections for structural purposes to BS 4360 and BS 4848-2.

NOTE 2 The titles of the publications referred to in this Part of this standard are listed on the inside back cover.

2 General

The tubes shall comply with the general requirements of BS 6323-1 and the specific requirements of this Part of the same standard, which covers tubes up to and including 610 mm outside diameter.

The tubes shall be of steel grades 3, 4, 5, or 8. The grade required shall be specified in the enquiry and order, together with other details as specified in clause **5** of BS 6323-1:1982, as appropriate.

3 Method of manufacture

The tubes shall be manufactured by a seamless process.

4 Delivery condition

The tubes shall be supplied in the hot finished condition.

NOTE At the option of the manufacturer a normalizing or other heat treatment may be carried out.

5 Chemical composition

The steel shall show on ladle analysis the composition given in Table 1 appropriate to the steel grade specified.

6 Mechanical properties

The tensile properties of the tubes, appropriate to their steel grade, determined in accordance with 15.2 of BS 6323-1:1982 shall be as given in Table 1.

For other mechanical properties, see clause **9**.

Table 1 — Chemical composition and mechanical properties (see note)

Designation	Chemical composition (ladle analysis)					Mechanical properties		
	C	Si max.	Mn	P max.	S max.	R_e min.	R_m min.	A min.
	%	%	%	%	%	N/mm^2	N/mm^2	%
HFS 3	0.20 max.	0.35	0.90 max.	0.050	0.050	215	360	24
HFS 4	0.25 max.	0.35	1.20 max.	0.050	0.050	235	410	22
HFS 5[ab]	0.23 max.	0.50	1.50 max.	0.050	0.050	340	490	20
HFS 8	0.40 to 0.55	0.35	0.50 to 0.90	0.050	0.050	340	540	18

NOTE Except for grade 8, welding of tubes of these grades does not require special techniques but care should be taken and welding should be carried out in accordance with the guidance given in the appropriate British Standards for welding, e.g. BS 5135. Welding of grade 8 may require special techniques.

[a] Grain refining elements may be added to this grade at the option of the manufacturer.

[b] For thicknesses in excess of 30 mm it is permissible for the minimum yield strength to be reduced by 5 N/mm^2.

7 Dimensions and sectional properties

The dimensions of tubes shall be designated by either:

a) the outside diameter and thickness; or

b) the outside diameter and the inside diameter.

A list of the sizes most commonly used is given in Table 3 and the sectional properties are given in appendix B of BS 6323-1:1982.

8 Tolerances

8.1 Outside diameter. Where tubes are specified by outside diameter and thickness, the tolerance on the outside diameter, including ovality, shall be ± 1 % with a minimum of ± 0.5 mm.

NOTE Tolerances on diameters are not given in this part of BS 6323 for tubes specified by outside diameter and inside diameter. The tolerances to be applied should be agreed between the purchaser and the manufacturer at the time of enquiry and order.

8.2 Thickness. Where tubes are specified by outside diameter and thickness, the tolerance on thickness, including eccentricity, shall be:

up to and including 3 % of outside diameter: ± 15 %

over 3 % of outside diameter: $^{+\ 15}_{-\ 12.5}$ %

8.3 Length. All tubes shall be supplied in either:

a) random lengths, as agreed between purchaser and manufacturer, or

b) specified cut lengths to the following tolerances:

up to and including 6 000 mm: $^{+\ 10}_{-\ \ 0}$ mm

over 6 000 mm: $^{+\ 15}_{-\ \ 0}$ mm

NOTE Closer tolerances on length may be obtained by agreement between the purchaser and the manufacturer.

9 Tests

9.1 General. In addition to the tensile test specified in clause **6**, at the option of the manufacturer and dependent upon the dimensions, the tubes shall be subjected to either a flattening test as given in **9.2** or a bend test (strip) as given in **9.3**. The tests shall be carried out in accordance with **15.3** and **15.4** respectively of BS 6323-1:1982.

9.2 Flattening test. The distance between the platens, or in the case of flattening by hammer blows the distance between the outside surfaces, shall be no greater than the value calculated from the formula:

$$H = \frac{(1 + C)a}{C + a/D}$$

where the symbols are as defined in clause **3** of BS 6323-1:1982. Values of C are given in Table 2.

Table 2 — Values for deformation factor C

Designation	C
HFS 3	0.09
HFS 4	0.07
HFS 5	0.06
HFS 8	0.06

9.3 Bend test (strip). The strip shall be bent round a bar of the following diameter:

Designation	Bar diameter
HFS 3	4a
HFS 4	5a
HFS 5	5a
HFS 8	6a

Table 3 — Dimensions of hot finished seamless tubes

Outside diameter	Thicknesses							
	Minimum thickness	Thicknesses in common usage						Maximum thickness
mm	mm	mm	mm	mm	mm	mm	mm	mm
33.7	3.2	3.2	4.0	5.0				6.3
38.0	3.2	3.2	4.0	5.0	5.6			6.3
42.4	3.2	3.2	4.0	5.6				7.1
48.3	3.2	3.2	4.0	5.0	5.6			7.1
60.3	3.2	4.5	5.0	5.6	6.3			11
76.1	3.2	4.5	5.6	6.3				12.5
88.9	4.0	4.5	5.0	5.6	6.3			16
101.6	4.5	5.0	5.6	6.3				16
114.3	4.5	5.0	5.6	6.3	8.0			28
127.0	4.5	5.0	5.6	6.3	8.0			28
139.7	4.5	5.0	5.6	6.3	8.0	10.0		32
168.3	5.0	5.0	5.6	6.3	7.1	8.0	10.0	40
193.7	5.0	5.6	6.3	8.0	10.0	12.5		45
219.1	5.0	5.6	6.3	8.0	10.0	12.5		55
244.5	6.3	6.3	7.1	8.0	10.0	12.5		60
273	6.3	6.3	7.1	8.0	10.0	12.5		70
323.9	6.3	6.3	7.1	8.0	10.0	12.5		80
355.6	8.0	8.0	10.0	12.5				90
406.4	8.0	10.0	12.5					100
457	9.5	10.0	12.5					100

NOTE Outside diameters and thicknesses other than those listed are available by agreement between purchaser and manufacturer. For sectional properties including mass per unit length, see appendix B of BS 6323-1:1982.

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Publications referred to

BS 3601, *Steel pipes and tubes for pressure purposes: carbon steel with specified room temperature properties.*

BS 3602, *Specification for steel pipes and tubes for pressure purposes: carbon and carbon manganese steel with specified elevated temperature properties.*

BS 3603, *Specification for steel pipes and tubes for pressure purposes: carbon and alloy steel with specified low temperature properties.*

BS 3604, *Specification for steel pipes and tubes for pressure purposes: ferritic alloy steel with specified elevated temperature properties.*

BS 3605, *Seamless and welded austenitic stainless steel pipes and tubes for pressure purposes.*

BS 4360, *Specification for weldable structural steels.*

BS 4848, *Hot-rolled structural steel sections.*

BS 4848-2, *Hollow sections.*

BS 5135, *Metal-arc welding of carbon and carbon manganese steels.*

BS 6323, *Specification for seamless and welded steel tubes for automobile, mechanical and general engineering purposes.*

BS 6323-1, *General requirements.*

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