

Specification for

Wrought steels in the form of blooms, billets, bars and forgings —

Part 4: Valve steels

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The Iron and Steel Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

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British Cast Iron Research Association	Institution of Mechanical Engineers
British Constructional Steelwork Association	(Automobile Division)
British Electrical and Allied Manufacturers' Association*	Institution of Production Engineers
British Ironfounders' Association	Institution of Structural Engineers
British Mechanical Engineering Federation	Joint Iron Council
British Railways Board*	Lloyd's Register of Shipping
British Steel Castings Research Association	Ministry of Defence, Army Department*
British Steel Industry*	Ministry of Defence, Navy Department*
Council of Iron Producers	National Association of Drop Forgers and Stampers*
Council of Ironfoundry Associations	National Physical Laboratory (Ministry of Technology)
Crown Agents for Oversea Governments and Administrations	Oil Companies Materials Association
Department of Employment and Productivity (H.M. Factory Inspectorate)	Royal Institute of British Architects
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Federation of Civil Engineering Contractors	Society of British Aerospace Companies
Institute of British Foundrymen	Society of Motor Manufacturers and Traders Ltd.*
Institute of Iron and Steel Wire Manufacturers	Stainless Steel Development Association*
Institute of Marine Engineers*	

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

This British Standard, having been approved by the Iron and Steel Industry Standards Committee, was published under the authority of the Executive Board on 12th February, 1970

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Committee references ISE/31, ISE/31/2, ISE/31/2/3
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Association of British Railway Carriage & Wagon Manufacturers	Spring Research Association
British Bolt, Nut, Screw & Rivet Federation	Stainless Steels Fabricators' Association of Great Britain
Ministry of Technology	Individual Companies
National Coal Board	

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Foreword

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

This standard makes reference to the following British Standards:

BS 240, *Method for Brinell hardness test. Part 1: Testing of metals.*

BS 427, *Method for Vickers hardness test. Part 1: Testing of metals.*

BS 891, *Method for Rockwell hardness test. Part 1: Testing of metals.*

BS 1837, *Method for the sampling of iron, steel, permanent magnet alloys and ferro-alloys.*

BS 4114, *Dimensional and quantity tolerances for steel drop and press forgings and for upset forgings made on horizontal forging machines.*

BS 5046, *Method for the estimation of equivalent diameters in the heat treatment of steel.*

Handbook No. 19, *Methods for the sampling and analysis of iron, steel and other ferrous metals.*

This Part of this British Standard has been prepared under the direction of the Iron and Steel Standards Committee and specifies requirements for valve steels. The requirements for stainless and heat resisting steels, previously included in this Part of this standard, are now included, in revised form, in BS 970-1:1983 which is a restructured and metricated revision of BS 970-1 to BS 970-4, published between 1970 and 1972 (excluding the valve steels of this Part 4). BS 970 now comprises the following Parts:

BS 970-1:1983 Specification for wrought steels for mechanical and allied engineering purposes. Part 1: General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels.

BS 970-4:1970 Specification for wrought steels in the form of blooms, billets, bars and forgings. Part 4: Valve steels.

BS 970-5:1972 Specification for wrought steels in the form of blooms, billets, bars and forgings. Part 5: Carbon and alloy spring steels for the manufacture of hot formed springs.

BS 970-6:1973 Specification for wrought steels in the form of blooms, billets, bars and forgings. Part 6: SI metric values (for use with BS 970-4 and BS 970-5).

Part 4 (as now amended) and Part 5 will be separately revised. Part 6 (as amended by AMD 4348) will be withdrawn when the revisions of Parts 4 and 5 are published.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their 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 8 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 General requirements

1.1 Scope

This Part of BS 970 applies to valve steels in the form of blooms, billets, bars and forgings.

1.2 General

The steel shall be supplied in accordance with the general requirements specified in this section and the specific requirements given in section 3.

1.3 Information to be supplied by the purchaser

The following information shall be stated on the enquiry and order; a drawing of the part to be made or information regarding manipulation or service conditions to which the material will be subjected may be useful in appropriate cases.

- 1) *a. Text deleted*
b. The material specification in section 3 of this Part of the standard.
- 2) The condition in which the material is to be supplied if different from 1.9.
- 3) *Text deleted*
- 4) *Text deleted*
- 5) *Text deleted*
- 6) *Text deleted*
- 7) If a statement giving the cast analysis is required, see 1.17.
- 8) If special identification of the steel is required, see 1.18.
- 9) If the material is to be inspected at the manufacturer's works and tested in the presence of the purchaser or his representative, see 1.15.

1.4 Steelmaking process

The steel shall be made by an electric process.

1.5 Chemical composition

1.5.1 Composition ranges. The specific ranges of chemical composition are based on cast analysis which shall comply with the relevant specification.

1.5.2 Residual elements. Elements not quoted in the relevant specification shall not be added to the steel without the agreement of the purchaser, other than for the purpose of finishing the heat. All reasonable precautions shall be taken to prevent the addition of such elements during manufacture. The percentages of elements up to the contents given below shall be considered as incidental.

Elements	Non-austenitic steels	Austenitic steels	
		Without specified molybdenum	With specified molybdenum
	%	%	%
Titanium	—	0.10	0.10
Niobium	—	0.20	0.20
Molybdenum	0.30	0.70	—
Copper	0.30	0.50	0.70

For special applications the purchaser may specify by agreement with the supplier a different limit to the content of one or more of these, or other residual elements, or combination of them in the steel and may require the amount of such elements to be stated.

1.6 Product analysis and permitted variations

1.6.1 Analysis of the product may vary from the cast analysis due to heterogeneity arising during the casting and solidification of the ingot. Table 1 shows the deviations permitted in product analysis in relation to cross sections not greater than 100 in².

The variations may occur in the individual elements either above or below the specified range but shall not be applied both above and below the range for any one element in any one cast of steel.

1.6.2 Any billet, bar or forging which on chemical analysis falls outside the limits of permissible deviation from the specified composition range for a significant element shall be deemed not to comply with this British Standard.

1.6.3 In the event of a single sample falling outside the permitted deviations on the product analysis further samples shall be selected for check analysis from the remainder of the consignment, as follows:

At least two samples from the same cast for delivered weights up to 5 tons, at least five samples from the same cast for delivered weights up to 20 tons, and at least eight samples from the same cast for delivered weights over 20 tons.

These samples shall fall within the permitted deviations. If any of these further samples are proved to be outside the permitted deviations for any significant element the consignment shall be deemed not to comply with this British Standard.

1.6.4 Samples for product analysis shall be taken in accordance with the requirements of BS 1837¹⁾ and, in the event of dispute, analysed in accordance with the appropriate methods of British Standard Handbook No. 19²⁾.

¹⁾ BS 1837, "Methods for the sampling of iron, steel, permanent magnet alloys and ferroalloys".

²⁾ Handbook No. 19. "Methods for the sampling and analysis of iron, steel and other ferrous alloys".