

Specification for

Steel shackles for lifting and general engineering purposes: grade M(4)

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The preparation of this British Standard was entrusted by the Mechanical Handling Standards Committee (MHE/-) to Technical Committee MHE/1, upon which the following bodies were represented:

- Associated Offices Technical Committee
- British Chain Manufacturers' Association
- British Forging Industry Association
- British Ports Association and the National Association of Ports Employers
- British Railways Board
- British Steel Industry
- Chain Testers Association of Great Britain
- Corporation of Trinity House
- Department of Trade and Industry (National Physical Laboratory)
- Federation of Wire Rope Manufacturers of Great Britain
- Health and Safety Executive
- Lloyds Register of Shipping
- Ministry of Defence

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

- Association of Supervisory and Executive Engineers
- Drop Forging Research Association
- Electricity Supply Industry in England and Wales
- Engineering Equipment and Materials Users' Association
- Federation of Manufacturers of Construction Equipment and Cranes

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Foreword

This British Standard has been prepared under the direction of the Mechanical Handling Standards Committee.

This standard basically forms a revision of BS 3032 based on metric units. It was decided that a new British Standard number should be allocated to it, i.e. BS 6994, and that it should coexist with BS 3032 which is based on imperial units. BS 3032 will be reviewed in five years to decide whether it should then be withdrawn.

The long term aim is to have a rationalized list of shackles, taking account of parallel ISO¹⁾ work published as ISO 2415-1987, but not aligning with the ISO Working Load Limits.

Comparing the content of this British Standard with that of ISO 2415 it is evident that the large dee and large bow shackles comply with the ISO dimensional requirements. The small dee only complies in two instances (1.0 t and 2.5 t), and the remainder are outside the requirements for jaw width (w). None of the small bow shackles complies with ISO requirements. Some have working load limits that do not comply and the remainder do not align with the bow radius (r) requirements. The 1.0 t does not comply with the jaw width requirements. These differences are due to a degree of compromise in the ISO committee and the realism and development of the UK market.

The other major differences between this British Standard and BS 3032 are that:

- a) the scope of this standard covers shackles for lifting purposes;
- b) the designation of each type of shackle is based on the working load limit (WLL) which is equivalent to the maximum safe working load (SWL).

In this British Standard the clause covering materials indicates two British Standards with associated designation or group. If the purchaser has a preference for one or the other he should indicate this on his enquiry and order (see 2.1).

In this British Standard it is stated that, normally, shackles will be supplied in the self-colour condition. However should the purchaser require a special corrosion-resistant finish he has a choice of either:

- hot-dip galvanizing to BS 729
- electroplated coatings of cadmium and zinc to BS 1706, or
- phosphate treatment to BS 3189.

Appendix B of this standard gives guidance on the selection and use of shackles covered by this standard (not including those covered in Appendix D) and suitable for both lifting and general engineering purposes.

Appendix C of this standard covers design notes and dimensions of shackles that comply with the requirements of this British Standard.

It is recognized that for some purposes, shackles outside the dimensional range of this standard may have to be specially designed.

Appendix D of this standard gives guidance on the design criteria for such shackles. However in such cases it is **not permissible** for such shackles to be marked or certified as being "in accordance with this British Standard".

Appendix E of this standard gives guidance on the safe use of those shackles which comply with all the requirements of this standard.

¹⁾ International Organization for Standardization.

In the development of this British Standard, account was taken of the Report Ref. IR/L/ME/84/9 of the Health and Safety Executive (HSE) entitled “Deformation tests on shackles” by Mr T Wall (April 1984) in which it is stated in the findings that the width of the jaw of a shackle (w) reduces before the internal length (s) increases.

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 to iv, pages 1 to 16, 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.

Section 1. General

1.1 Scope

This British Standard specifies requirements for performance (section 2) and dimensions (section 3) for four types of higher tensile steel shackles of grade M(4) for lifting and general engineering purposes as follows.

Shackle type	Range of sizes (<i>d</i>)	Range of working load limits	
	mm	t	
Large dee	10 to 100	0.8 to 80	} See (a)
Small dee	10.5 to 71.5	1.0 to 50	
Large bow	10.5 to 105	0.8 to 80	} See (b)
Small bow	10.5 to 78	1.0 to 50	

This specification also covers the requirements for shackle pins of the following types with which shackles are fitted as appropriate:

- Type G — Screwed pin with eye and collar
- Type H — Countersunk screwed pin with slotted head
- Type K — Countersunk screwed pin with sunk square socket head
- Type L — Pin with hexagon head, hexagon nut and split cotter pin

Appendix A gives information to be supplied by the purchaser on his enquiry and order.

Appendix B gives guidance on selection and usage of shackles and Appendix E gives guidance on their safe use.

Appendix C includes design notes and dimensions of shackles which comply with this standard.

Appendix D, **for information only**, gives guidance on design criteria for special shackles outside the dimensional range of this standard. These special shackles cannot be marked or certified as being in accordance with this British Standard.

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

1.2 Definitions

For the purposes of this British Standard the following definitions apply.

1.2.1

shackle

a component consisting of two readily separable parts, the body and the pin

1.2.2

body

one of the two parts of the shackle, consisting of a bar of suitable section formed through an appropriate angle and terminating in coaxial eyes

1.2.3

eyes

bosses on the ends of the body, with coaxial holes through which the pin passes

1.2.4

pin

a straight bar of circular section which passes through the eyes, arranged so as to be secure when in position and which can be readily disassembled (see , , and)

1.2.5

competent person

a designated person qualified by knowledge and practical experience which would:

- a) enable the testing and examination of shackles as specified in **2.6.2** and **E.3** to be carried out and any defect to be located and evaluated in terms of possible detrimental effect;
- b) enable the safe working load to be determined in relation to the working load limit taking into account the particular service conditions.

1.2.6

safe working load (SWL)

the maximum mass (as certified by a competent person) which a shackle may raise, lower or suspend in the particular service conditions. The safe working load will normally be the same as the working load limit, but it may be less

1.2.7

working load limit (WLL) (=maximum SWL)

the maximum mass which the shackle is designed to raise, lower or suspend

1.2.8

proof force

the force applied to a finished shackle in a static tensile test

1.2.9

breaking (or failure) force

the specified force below which the shackle will not release the load during the course of a tensile test to destruction

1.3 Designation

The designation of the shackle including the pin shall include the following:

- the number of this British Standard, i.e. BS 6994
- the word “shackle”
- grade M
- the type of shackle
- the type of pin
- the working load limit (WLL) as specified in Table 1 to Table 4

Example: BS 6994, shackle, M, large dee, type G, 10 t WLL.

1.4 General

All shackles shall comply with the relevant requirements of **1.5** and **1.6** of this section, the performance requirements of section 2 and the dimensional requirements of section 3.

1.5 Marking

1.5.1 Grade marking

Each shackle body and pin shall be marked in the positions shown in , with the symbol “M” enclosed in a circle to indicate grade M(4).

No marks shall be positioned on the crown of the shackle, i.e. in the area cross-hatched in (a) and (b).

1.5.2 Other marking

Each shackle body shall be permanently and legibly marked with:

- a) the safe working load (SWL) in tonnes or, if below 1 tonne, in kilograms;

NOTE 1 If no SWL is specified, the marking on the shackle will be the SWL equal to the WLL.

NOTE 2 It is permissible for an SWL lower than the working load limit (see **1.2.7**) to be marked if so stated by the purchaser in his enquiry and order, e.g. for hazardous conditions.

- b) markings and symbols which indicate the following:

- 1) the manufacturer of the shackle;
- 2) the material and heat treatment batch;
- 3) means of identifying the shackle with the manufacturer’s certificate of test and examination (see and **1.6**).

1.5.3 Care in marking

The marking shall be neither too sharp nor so deep that any mechanical property is impaired.

1.5.4 Maximum size of marks

The maximum size of marks shall be as follows.

Diameter of material in shackle body <i>d</i>	Maximum size of marks
mm	mm
Up to and including 12.5	3
Over 12.5 up to and including 25	4.5
Over 25	6

1.6 Certificate of test and examination

The manufacturer or supplier shall provide a certificate of test and examination with each consignment of shackles giving the following information:

- a) distinguishing mark [to enable any particular shackle or batch of shackles in the consignment to be identified to the same degree as specified in **1.5.2 b**)];
- b) designation of shackle and pin (see **1.3**);
- c) the proof force applied (see Table 1 to Table 4);
- d) the safe working load (see Table 1 to Table 4) marked on shackle;
- e) number of shackles supplied;
- f) the finish applied if other than self colour.

The certificate of test and examination shall state that the shackles comply in all respects with this standard. It shall also state the name and address of the testing establishment and the status of the signatory.

NOTE The certificate of test and examination may be the appropriate statutory form, available from HSE, provided the required information is given (see also **E.3**).