
British Standard Specification for

Eyebolts for lifting purposes

Boulons à œil pour systèmes de levage — Spécifications

Transportösen für Hebezeuge

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Foreword

This British Standard has been prepared under the direction of the Mechanical Engineering Standards Committee and is the first full revision of the metric edition which was published in 1968; this revision supersedes BS 4278 : 1968, which is now withdrawn. Previously steel eyebolts were covered in BS 529 : Parts 1 and 2 (withdrawn).

The standard specifies three types of eyebolt: namely the collar eyebolt, the eyebolt with link and the dynamo eyebolt. Eyebolts without collars for lift suspension purposes are specified in BS 5655 : Part 8, which replaced BS 529 : Part 2. For all three types, metric dimensions and threads are specified but, in addition, full details of imperial threaded shanks are given in appendix A. These imperial threaded eyebolts are intended for replacement purposes only for assembly into imperial threaded equipment already in existence. In the previous edition of this standard only brief details concerning imperial threads were given and only collar and dynamo eyebolts were covered. More importantly, no advice was given on the selection of suitable forgings for imperial threading; this is now fully covered.

It will be noted that eyebolts with a shank thread smaller than M12 are not specified in view of their susceptibility to damage due to over-tightening. Exceptions to this are the 3/8 in diameter collar and dynamo eyebolts which have been retained in order to preserve the safe working load (SWL) relationship with BS 529 : Part 1 (see below).

Collar eyebolts and eyebolts with link have been uprated by 25 % in this revision as a result of work undertaken by the National Physical Laboratory and the Research and Laboratories Services Division of the Health and Safety Executive (HSE). This uprating has also enabled the SWLs of imperial threaded collar eyebolts given in table 4, to be made equivalent to those given in BS 529 : Part 1 so that they may be used for replacement purposes. Collar eyebolts are generally used with shackles and are suitable for reduced SWLs when used for inclined loading in the plane of the eye. (See appendix B.) When used at 90 ° loading to the

eyebolt axis (i.e. trunnions) the SWL for each eyebolt should not be more than 25 % of the SWL in axial loading marked on the eyebolt (see appendix B).

Eyebolts with link are now specified with both metric and imperial threads. These eyebolts are generally used in pairs without the need for shackles and are suitable for inclined loading in any plane at reduced SWLs (see table 8). It should be emphasized that a collar eyebolt to table 1 fitted with a link cannot be considered as an 'eyebolt with link' to table 2. In addition, the collar eyebolt requires a deeper tapped hole and therefore care is necessary if eyebolts with link are replaced by collar eyebolts.

Dynamo eyebolts are intended for axial lifting only and, if used in pairs a spreader beam should always be used. Loading out of axial by even 5 ° imposes undue stress on the screw thread run-out. For this reason collar eyebolts or eyebolts with link should be a first preference and dynamo eyebolts should be used only if axial loading can be ensured.

The dangers of the mismatch arising from eyebolts being inadvertently screwed into holes with a different thread form are explained and recommendations are made in HSE Guidance Note PM 16, 'Eyebolts', and in PD 6494. In this revision of this standard certain non-preferred metric sizes which were likely to be incorrectly assembled with other metric threaded holes have been deleted. Some other metric thread sizes have been changed to give as far as possible, first choice metric threads complying with BS 3643 : Part 2.

Recommendations for the selection, care and use of eyebolts are given in appendix B. Some of the material in appendix B is based on Section 3 of the 'Code of Practice for the safe use of lifting equipment', published by the Chain Testers' Association of Great Britain to whom acknowledgement is made. Users wishing to obtain more detailed information are recommended to refer to this Code.*

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

*Obtainable from the Chain Testers' Association of Great Britain (see B.5 for address).

British Standard Specification for

Eyebolts for lifting purposes

1. Scope

This British Standard covers three types of eyebolt as follows:

- (a) collar eyebolt, in the range 0.25 tonnes to 30 tonnes SWL;
- (b) eyebolt with link, in the range 1.0 tonnes to 6.3 tonnes SWL;
- (c) dynamo eyebolt, in the range 0.25 tonnes to 10.0 tonnes SWL.

Guidance on the selection of appropriate forgings and of SWL ratings when screwing eyebolts with imperial threads (see 4.1(b) and 4.1(c)) is given in appendix A.

Recommendations on the correct selection and safe use of eyebolts are given in the foreword and appendix B.

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

2. Material

The material used in the manufacture of both the eyebolts and the links shall comply with one of the following steel specifications of BS 970 : Part 1:

080A27*
080A30
080M30
070M26

3. Form and dimensions

The form and dimensions of eyebolts shall be in accordance with the following:

- (a) collar eyebolts shall be as shown in figure 1 and as given in table 1 for metric threads, or table 4 for imperial threads;
- (b) eyebolts with links shall be as shown in figure 2 and as given in table 2 for metric threads, or table 5 for imperial threads;
- (c) dynamo eyebolts shall be as shown in figure 3 and as given in table 3 for metric threads, or table 6 for imperial threads.

NOTE. For special applications the length of the shank (dimension *H*) may be increased provided that the eyebolt and shank are drop forged in one piece.

4. Screw threads

4.1 The screw threads of the shanks of the eyebolts shall comply with the following British Standards:

- (a) Metric threads complying with BS 3643 : Part 2, coarse pitch series, tolerance class 6g, in accordance with the sizes specified in tables 1, 2 and 3 of this standard, i.e. BS 4278. For metric thread diameter 72 mm, in table 1 of this standard, a pitch of 6 mm, and a tolerance class 6g shall be used.
- (b) Whitworth threads in accordance with table 4 of BS 84 : 1956, coarse thread series, BSW, medium class.
- (c) Unified threads in accordance with table 5 of BS 1580 : Part 1 : 1962, coarse series, UNC, class 2A.

NOTE. It is expected that newly designed equipment will have tapped holes to receive eyebolts screwed in accordance with (a) above. Eyebolts threaded to (b) and (c) are intended for use with imperial threaded equipment which is already in existence.

4.2 The portion of the shank at the end of the screw thread shall have a run-out and, in the case of collar eyebolts and eyebolts with link, the collar shall be recessed in accordance with dimensions *J* and *K* of tables 1 to 6.

5. Workmanship

5.1 **All eyebolts.** The whole of each eyebolt, including the shank, shall be cleanly drop forged in one piece and shall be free from patent defects. The underside of the collar shall be machined in true alignment at right-angles to the axis of the shank. The shank shall be screwed concentrically with the outside diameter of the collar. The thread run-out and recess if any shall be smoothly radiused and free from surface irregularities.

5.2 **Eyebolts with link.** The link of the eyebolt with link (see figure 2, tables 2 and 5) shall be welded by one of the following methods:

- (a) electric resistance butt welding;
- (b) flash-butt welding;
- (c) atomic hydrogen welding;
- (d) inert gas shielded-arc welding.

The weld shall be smoothly finished all round and care shall be taken to avoid porosity and to ensure penetration and fusion throughout.

* As specified in the 1972 edition. Steel 080A27 is not included in the 1983 edition of BS 970 : Part 1.

6. Tolerances

6.1 General. The tolerances given in **6.2** and **6.3** shall apply.

6.2 Drop forgings. The tolerances on dimensions of drop forgings shall comply with quality F of BS 4114.

6.3 Links. The size of the material of the link shall not differ from the nominal size (see dimension d , tables 2 and 5) by more than $\pm 5\%$.

7. Heat treatment

All eyebolts, after forging, and links, after welding, shall be heated to a temperature between 860°C and 890°C and then quenched in oil or water and tempered at a suitable temperature between 550°C and 660°C .

8. Hardness test

8.1 General. Eyebolts shall have a Brinell hardness between 163 and 217. Either the test shall be made in accordance with BS 240 : Part 1 using a 10 mm ball and a load of 3000 kg, or if another method is employed the conversion shall be made in accordance with BS 860.

8.2 Procedure. The surface on which the impression is to be made shall be obtained by filing, grinding or smooth machining.

NOTE. Suitable precautions should be taken to ensure that the surface tested is representative of the material and that its hardness is not affected by decarburization, carburization, or by the method used for the preparation of the test surface.

9. Proof loading

Each eyebolt, and eyebolt with link, after manufacture and subsequent heat treatment, shall be subjected to an axial proof load equal to at least twice the safe working load specified in tables 1, 2 or 3 or, in the case of imperial threaded eyebolts, at least twice the safe working load specified in tables 4, 5 and 6, which it shall withstand without showing any visible permanent set.

After the removal of the proof load, each eyebolt and eyebolt with link shall be thoroughly examined by a competent person and shall be accepted only if found free from visible flaw or defect.

10. Marking

10.1 General. Each eyebolt shall be legibly and permanently marked in a manner that does not impair its mechanical strength. The symbols shall be as large as possible but in any case not less than 3 mm high. In the case of collar and dynamo eyebolts, the symbols shall be marked on raised flat areas positioned on both sides of the lower parts of the eye as shown in figures 1 and 3. In the case of eyebolts with links, the symbols shall be marked on the side of the link as shown in figure 2. •

NOTE. If (as for example in the case of smaller eyebolts) the areas mentioned above provide insufficient space for marking all the requisite information, marking can be carried out on low stressed areas such as the periphery of the collar of an eyebolt.

The information given in **10.2** to **10.5** shall be marked on each eyebolt.

10.2 Quality mark. Each eyebolt shall be marked with the symbol 'M' enclosed in a circle. The quality mark shall be kept remote from any metric thread identification.

NOTE 1. The quality mark may, if drop forged, be on the side of the crown of the eye.

NOTE 2. In the previous issue of this standard the symbol '04' was used as the quality mark. Eyebolts with this marking may still be available, complying with the requirements of this standard.

10.3 Safe working load (axial lift). The SWL as specified in tables 1, 2 and 3 or in the case of imperial threaded eyebolts the SWL as specified in tables 4, 5 and 6, or a lower value if required by the purchaser shall be marked on the eyebolt, e.g. 'SWL 1.6 t'.

10.4 Thread identification. Each eyebolt shall be marked with one of the following thread identifications as appropriate:

- (a) 'M' to denote ISO metric threads, coarse series, including the accepted metric thread diameter designation, e.g. M12;
- (b) 'BSW' to denote BS Whitworth threads, including the accepted BSW thread diameter designation, e.g. $\frac{1}{2}$ BSW;
- (c) 'UNC' to denote unified coarse threads, including the accepted UNC thread diameter designation, e.g. $\frac{1}{2}$ UNC.

10.5 Distinguishing mark. Each eyebolt shall be marked with such marks or symbols as will allow identification with the certificate of test.

11. Certificate of test

The manufacturer or supplier shall provide a certificate with each consignment of eyebolts giving at least the following information for each eyebolt:

- (a) distinguishing mark or symbol (see **10.5**);
- (b) form and size of screw thread (see clause **4** and **10.4**);
- (c) proof load applied (see clause **9**);
- (d) safe working load (see tables 1, 2, 3 or 4, 5, 6 and **10.3**).

The certificate shall declare that each eyebolt was proof loaded in accordance with clause **9** and was subsequently examined by a competent person and that it complies with this standard, i.e. BS 4278. It shall state the name and address of the testing establishment and the status of the signatory.

NOTE. The certificate may be the appropriate statutory form, provided the required information is given.

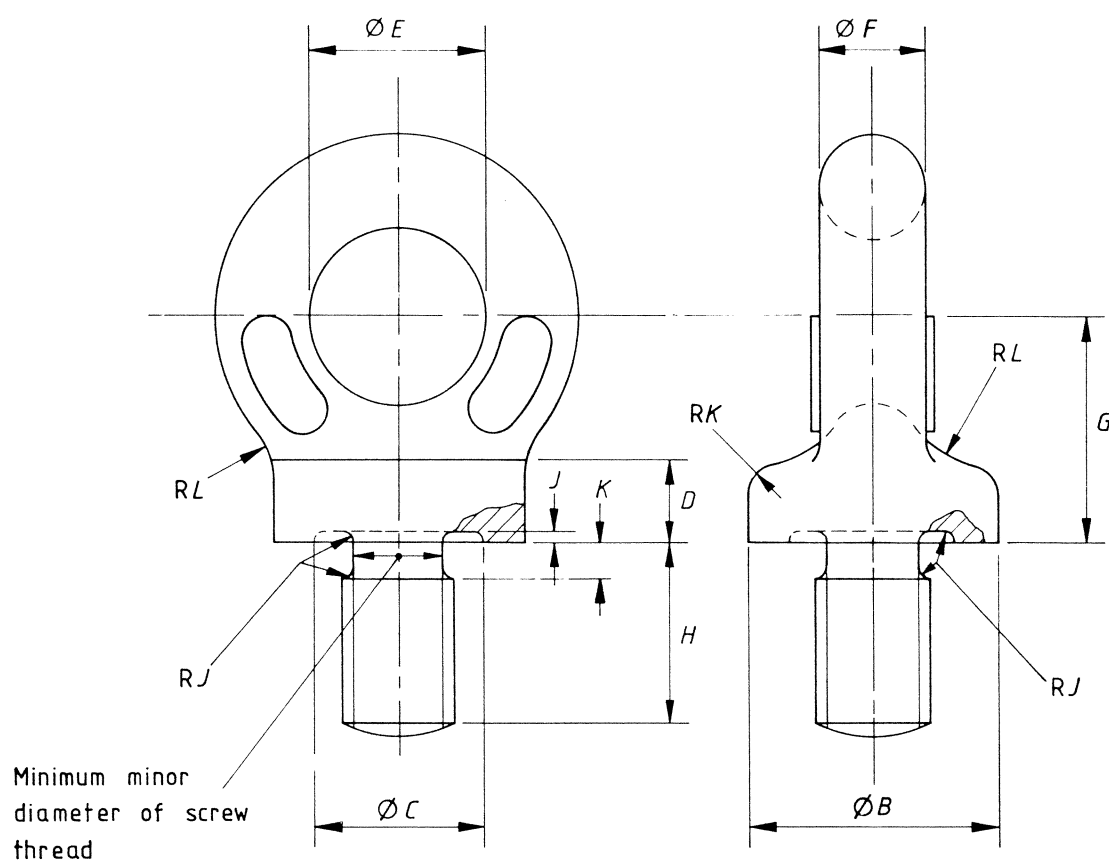


Figure 1. Collar eyebolt

Table 1. Collar eyebolt (see figure 1)

Safe working load (axial)	Metric thread dia.	$B = 1.5E$	$C = E$	$D = 0.5E$	E^*	$F = 0.6E$	$G = 1.33E$	$H = 1.17E$	J	$K = 0.17E$	$L = 0.6E$
tonnes	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
0.4	12	22	15	7	15	9	20	18	1	3	9
0.8	16	29	20	10	20	12	26	23	1	3	12
1.6	20	40	27	14	27	16	36	32	1	5	16
2.5	24	52	35	17	35	21	46	40	2	6	21
4.0	30	65	44	22	44	26	58	51	2	7	26
6.3	36	81	54	27	54	32	72	63	3	9	32
8.0	42	90	60	30	60	36	80	70	3	10	36
10.0	48	101	68	34	68	40	90	79	3	11	40
12.5	52	115	76	38	76	46	102	89	3	13	46
16.0	56	128	86	43	86	51	114	100	4	14	51
20.0	64	144	96	48	96	58	128	112	4	16	58
25.0	72	162	108	54	108	65	144	126	4	18	65

* $E \approx 21.6 \sqrt{\text{SWL}}$

NOTE. Dimension K is to be regarded as a minimum and may be increased to 2.5 times the thread pitch in order to facilitate die head screwing.