BRITISH STANDARD

BS 4429:1987
Incorporating Amendment No. 1

Specification for

Rigging screws and turnbuckles for general engineering, lifting purposes and pipe hanger applications

UDC 621.889.2

Committees responsible for this British Standard

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 Coal
British Forging Industry Association
British Ports Association and the National Association of Ports Employers
British Railways Board
Chain Testers' Association of Great Britain
Corporation of Trinity House
Department of Trade and Industry (National Physical Laboratory)
Federation of Manufacturers of Construction Equipment and Cranes
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
British Steel Industry
Drop Forging Research Association
Electricity Supply Industry in England and Wales
Engineering Equipment and Materials Users' Association

This British Standard, having been prepared under the direction of the Mechanical Handling Standards Committee, was published under the direction of the Board of BSI and comes into effect on 30 April 1987

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The following BSI references relate to the work on this standard:
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Amendments issued since publication

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5875	June 1989	Indicated by a sideline in the margin

Contents

Foreword

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

BS 4429 was first issued in 1969 as a revision of BS 716 "*Rigging screws and stretching screws for general engineering purposes*" and BS 4013 "*Rigging screws for shipping purposes and for guyed masts*". This revision of BS 4429 supersedes BS 4429:1969 which is withdrawn. It takes account of commercially accepted items and introduces a new range of hexagon-ended turnbuckles specifically for general engineering, lifting purposes and for pipe hanger applications. The safe working load (SWL) ratings for rigging screws and turnbuckles have been uprated by 25 %. SWL values for pipe hanger turnbuckles take cognizance of work currently being undertaken in ISO/TC 5/SC 1.

Rigging screws are specified with combinations of screwed elongated eyes and screwed forks. Turnbuckles are specified with combinations of screwed elongated eyes, screwed forks or screwed hooks (hitherto the term "stretching screw" was used). Reference should be made to BS 3974-1 for fittings for pipe hanger turnbuckles.

Rigging screws are normally supplied in the ungalvanized condition (i.e. self-coloured) but the purchaser has the option of ordering rigging screws in the hot dip galvanized condition, provided this is stated on his enquiry and order. The reverse applies to turnbuckles, which are normally supplied in the hot dip galvanized condition, with the purchaser having the option to order self-coloured turnbuckles (see Appendix A).

It is sometimes desirable to fit the threaded shanks of rigging screws and turnbuckles with lock-nuts to prevent possible slacking back, particularly where vibration occurs. It is pointed out that, if lock-nuts are fitted, dimension H (closed) will be increased by twice the thickness of one nut.

Details of the information that should be supplied with any enquiry and order are given in Appendix A.

This standard is based on a design study carried out at the National Physical Laboratory and funded by the Health and Safety Executive.

Two reports covering this design study are available from the Natural Physical Laboratory, Teddington, Middlesex TW 11 0LW entitled:

"NPL Report DMA (A) 108 The technical background to the revision of BS 4429:1969 *Rigging screws and turnbuckles*", by T.A.E. Gorley; and

"NPL Report DMA (A) 125 The effects of tolerances on the technical background of rigging screws, turnbuckles and associated components in the revision of BS 4429:1969", by T.A.E. Gorley.

This design study was supplemented by actual testing of components at the laboratories of the Health and Safety Executive. A report by the Health and Safety Executive, reference IR/L/ME/86/23, entitled "*Tests to failure of rigging screw and turnbuckle components — revision of BS 4429*" gives the results of proving tests carried out on components made to this British Standard.

The Secretary of State for Industry accepts no responsibility for loss or damage arising from the use of the recommendations made in the report except to the extent that such loss or damage arises from the negligence of the Secretary or his servants or agents.

In this standard, attachments having screwed ends are geometrically similar throughout their respective ranges, taking account of commercial considerations. The screwed elongated eyes of these rigging screws have been proportioned to accept higher tensile steel shackles.

The terms "British Standard rigging screw" or "British Standard turnbuckle" should be taken as applying only to those rigging screws, turnbuckles and attachments which comply with this British Standard.

A new Appendix B entitled “Notes on design” has been added giving recommendations on the geometric formulae to be applied when sizes not covered by this standard are required.

A new Appendix C has also been added in this revision covering the selection, application and use of rigging screws and turnbuckles.

Whilst this standard is for general engineering, lifting and pipe hanger purposes it is recognized that the items covered may also be specified for other uses such as rigging of masts, etc. Whilst the information given in this standard applies, particular precautions should be taken in respect of exterior environmental conditions, oscillation/vibration caused by high winds, etc.

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 requirements

1.1 Scope

This British Standard specifies materials, components, dimensions, finishes and tests for rigging screws and turnbuckles of the following types and nominal sizes for both lifting and non-lifting applications.

Rigging screws: 8 mm to 100 mm, size of screw thread

Turnbuckles : 8 mm to 72 mm, size of screw thread

series no. 1, series no. 2 and pipe hanger applications

Lock-nuts are also covered (see section 4).

Attachments for turnbuckles for use in pipe hanger applications are excluded from this British Standard (see BS 3974-1).

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
rigging screw

a tubular body internally threaded at each end, with one right-hand and one left-hand thread, having attachments of required form, i.e. screwed eyes or screwed forks

1.2.2
turnbuckle

an open body consisting of reins, with bosses at each end and internally threaded at each end, with one right-hand and one left-hand thread, having attachments of required form, e.g. screwed eyes, screwed forks, screwed hooks, or for use, without attachments, for pipe hanger applications

1.3 Lifting applications

Only rigging screws and turnbuckles that are marked with the appropriate safe working load (see **1.11**) after proof loading (see **1.10**) shall be used for lifting applications.

1.4 Size

The size of the rigging screw or turnbuckle shall be the diameter *A*, in millimetres, of the screwed shank in accordance with Table 2 to Table 8 inclusive.

1.5 Tolerance on dimensions

When components are manufactured by the drop forging process, the tolerances on dimensions, etc. shall be quality F as specified in BS 4114.

When hand forged, the variation from any of the dimensions given in the tables of this standard shall not exceed $^{+7.5}_{-0}$ %.

When swaging is involved in the forming of a rigging screw body, the dimensions shall comply with **2.3**. Tolerances on screw threads are given in **1.8**.

1.6 Heat treatment

After completion of all forging operations and before machining, all components shall be hardened and tempered with the exception of screwed elongated eyes and screwed forks of size M64 and over (see **4.2.1** and **4.3.1**).

1.7 Hot dip galvanizing

1.7.1 Rigging screws

All components of all rigging screws shall normally be supplied in the self-coloured condition.

NOTE If rigging screws are required in the hot dip galvanized condition, this should be stated on the enquiry and order (see Appendix A) and should be in accordance with BS 729.

1.7.2 Turnbuckles

All components of all turnbuckles, with the exception of the screw threads, shall normally be supplied in the hot dip galvanized condition in accordance with BS 729.

NOTE If turnbuckles are required in the self-coloured condition this should be stated on the enquiry and order (see Appendix A).

1.8 Screw threads

The screw threads of the bodies of rigging screws and turnbuckles and their attachments shall comply with BS 3643-2, coarse pitch series, class 7H/8g (free fit).

For sizes M72 and over, a constant pitch series of 6 mm shall be used.

1.9 Freedom from defects

Each component of the completed rigging screw/turnbuckle shall be carefully examined before assembly and shall be free from any visible flaw or defect.

1.10 Proof loading

The testing machine used for proof loading shall have been verified in accordance with BS 1610-2 and maintained within grade 2.0 as specified in BS 1610-1.

Each complete rigging screw or turnbuckle to be used for lifting purposes shall, after manufacture, heat treatment and assembly, be subjected to a proof load equal to twice the safe working load (see Table 3 and Table 5) which it shall withstand without showing signs of permanent deformation. Each item to be tested shall be in the fully extended (open) position, in the manner in which the working load is applied in service.

After removal of the proof load, each rigging screw or turnbuckle shall be dismantled and thoroughly examined by a competent person and shall be accepted only if found to be free from visible flaws or defects.

NOTE In the cases of rigging screws or turnbuckles that are not to be used for lifting purposes the proof loading is optional and is to be carried out only if specified by the purchaser on his enquiry and order (see Appendix A).

1.11 Marking

1.11.1 All rigging screws and turnbuckles shall be marked with such symbols and marks as will permit identification with the manufacturer's test certificate (see **1.12**) in the following locations:

a) for tubular bodies of rigging screws, in the area indicated in Figure 1;

b) for open bodies of turnbuckles, on the centre of the length of one of the reins.

1.11.2 Additionally, after a rigging screw or turnbuckle to be used for lifting purposes has been proof loaded in accordance with **1.10**, the relevant area of the body shall be permanently and legibly stamped with the appropriate safe working load, SWL, as given in Table 3 or Table 5.

1.11.3 Care shall be taken that the marking stamps used have a concave surface, when applicable.

In all cases marking shall be carried out on the bodies of rigging screws and turnbuckles in the closed position with the body adequately supported, so that the resultant identification is neither too sharp nor excessive in depth.

NOTE The recommended maximum sizes of marking stamps to be used on the bodies of rigging screws and turnbuckles are indicated in Table 1.

Table 1 — Recommended maximum sizes of marking stamps

Size of screw, *A*	Max. size of marking stamp
mm	mm
Up to and including 12	3.5
Over 12, up to and including 24	5.0
Over 24	6.5

1.12 Test certificate

When proof loading, in accordance with **1.10**, has been satisfactorily carried out on each rigging screw and/or turnbuckle the manufacturer shall provide a test certificate with each consignment giving at least the following information for each:

a) the number and date of this British Standard, i.e. BS 4429:1987[1)];

b) a distinguishing mark to enable the particular rigging screw or turnbuckle to be identified with the test certificate;

c) the proof load applied (see **1.10**);

d) the safe working load (SWL);

e) the date of test;

f) the quantity tested and covered by one certificate.

The test certificate shall state that each rigging screw or turnbuckle was proof loaded in accordance with **1.10** and was subsequently examined by a competent person and that it complies with the requirements of this British Standard.

The test certificate shall state the name and address of the testing establishment, and the status of the signatory.

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

[1)] Marking BS 4429:1987 on or in relation to a product is a claim by the manufacturer that the product has been manufactured to the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility.

Section 2. Specific requirements for rigging screws

2.1 General

All rigging screws shall comply with the general requirements of section 1 and the specific requirements of this section.

2.2 Tubular body

2.2.1 Material

The material and dimensional tolerances for the tubular body shall be welded or seamless steel tube in accordance with BS 6323-1 and BS 6323-2 (HFW 4) or BS 6323-3 (HFS 4). It shall have a minimum yield strength R_e of 235 N/mm^2, a minimum tensile strength R_m of 410 N/mm^2 and a minimum elongation of 22 %.

2.2.2 Form and dimensions

The form and dimensions of the tubular body shall be in accordance with Figure 1 and Table 2.

The full length of the thread in the tapped holes at the ends of the body shall not be less than 1.5 times the diameter *A* of the screwed shank. A tommy-bar hole shall be drilled through both walls of the body at the centre of its length, central to and at right angles to the axis.

A hole of maximum diameter 6 mm shall be drilled through one side of the unthreaded portion at each end of the body, clear of the swaged portions by at least one hole diameter, in order that a probe can be used to check the required thread engagement of the attachments (see Figure 1).

2.3 Workmanship

The tubular body shall be neatly and cleanly made and finished. The ends of the body shall be swaged hot, externally, to cylindrical form. Dimension *F* (see Figure 1) shall be maintained after swaging.

2.4 Attachments

Attachments for use with the tubular body shall be in accordance with section 4.

Screwed attachments shall be screwed into the body of the rigging screw to the full depth of the female threaded portions.

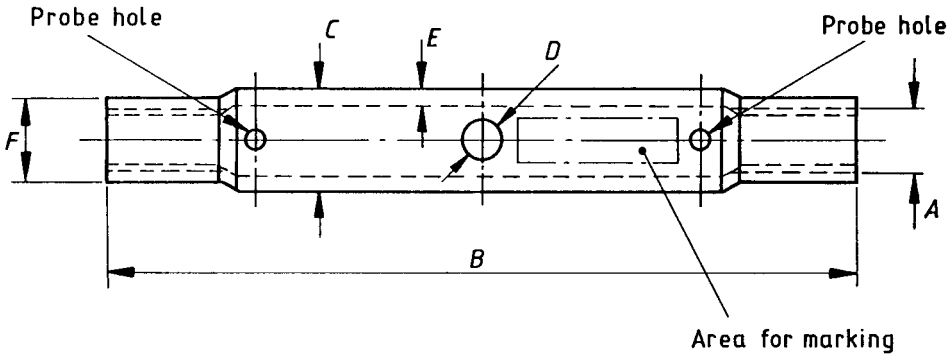


Figure 1 — Tubular body for rigging screws

Table 2 — Tubular bodies for rigging screws

Size of screw *A*	Overall length *B*	Body o.d. tube *C*	Tommy-bar hole diameter *D*	Body thickness *E*	Threaded end o.d. (min.) *F*
mm	mm	mm	mm	mm	mm
8	130	17.4	6	2.9	11
10	150	21.4	8	3.25	13
12	230	27	10	3.65	16.5
16	230	27	10	3.65	20
20	230	34.1	10	4.55	25
22	300	42.4	12	5.7	29
27	360	44.5	14	6.3	34.5
30	380	51.0	14	6.3	37
33	380	51.0	16	6.3	42
39	410	60.3	16	7.9	49
42	410	76.1	20	8	52
48	410	76.1	20	9.5	59
56	410	95.0	22	10	72
64	410	100.0	25	12.5	82
72	460	120.6	25	12.5	92
76	460	127.0	30	16	96
85	510	132.0	30	19	110
100	510	152.0	30	19	126

2.5 Types of rigging screw

Rigging screws fitted with attachments shall be supplied in one of the following forms.

NOTE 1 It is permissible to have a combination of any two end attachments specified in this standard, provided that these are called for in the enquiry and order. (See Appendix A.)

a) *Eye-to-eye type.* The eye-to-eye type shall be made up of a tubular body, as shown in Figure 1, fitted at each end with a screwed elongated eye, as shown in Figure 5.

NOTE 2 The resultant rigging screw of this type is shown in Figure 2(a).

b) *Eye-to-fork type.* The eye-to-fork type shall be made up of a tubular body, as shown in Figure 1, fitted at one end with a screwed elongated eye, as shown in Figure 5 and at the other end with a screwed fork, as shown in Figure 6.

NOTE 3 The resultant rigging screw of this type is shown in Figure 2(b).

c) *Fork-to-fork type.* The fork-to-fork type shall be made up of a tubular body, as shown in Figure 1, fitted at each end with a screwed fork, as shown in Figure 6.

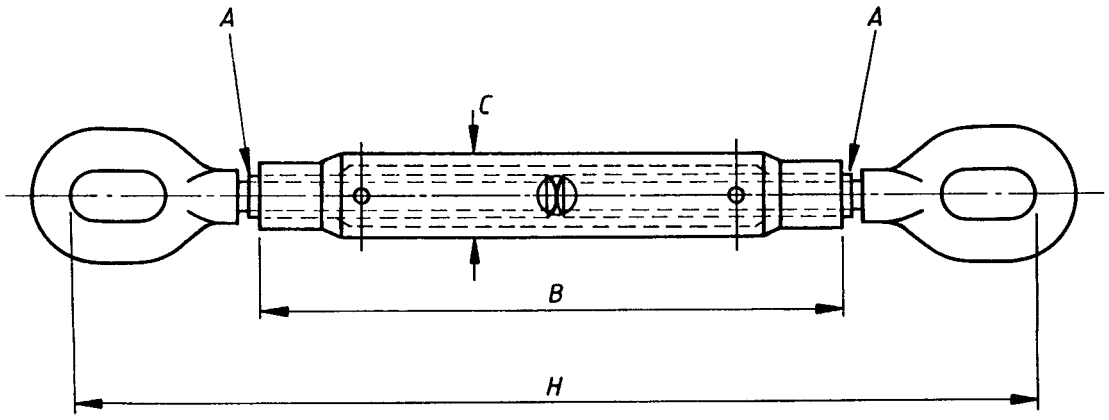
NOTE 4 The resultant rigging screw of this type is shown in Figure 2(c).

2.6 Open and closed dimensions

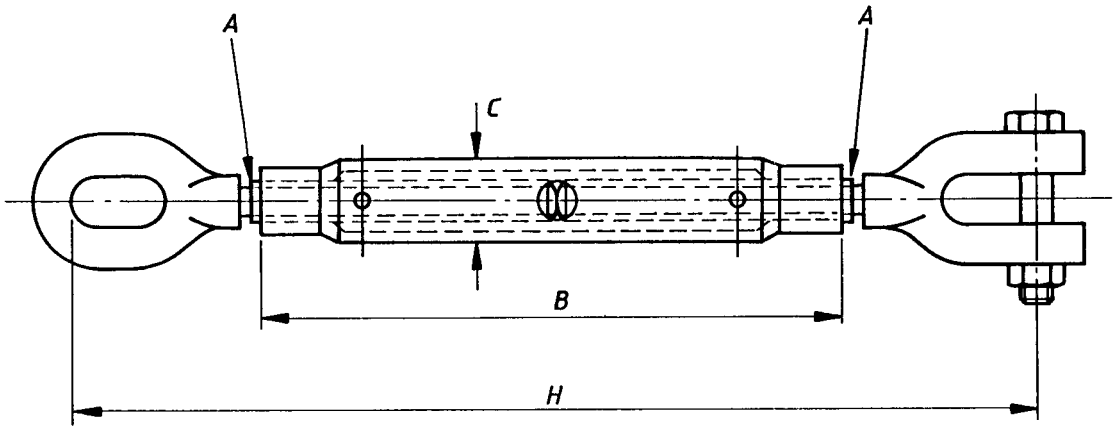
Open and closed dimensions *H* for rigging screws shall be in accordance with Table 3.

2.7 Safe working loads

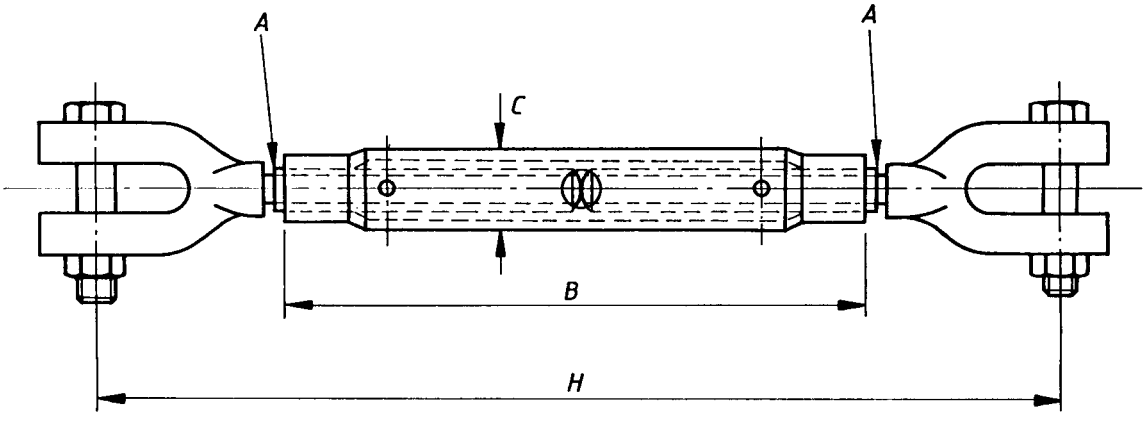
Safe working load (SWL) values for rigging screws shall be in accordance with Table 3.



(a) Eye-to-eye type



(b) Eye-to-fork type



(c) Fork-to-fork type

Figure 2 — Types of rigging screw

Table 3 — Open and closed dimensions *(H)* and safe working loads for rigging screws

Size of screw *A*	Dimension *H*						Safe working load, (SWL)
	Eye-to-eye [see Figure 2 (a)]		**Eye-to-fork** [see Figure 2 (b)]		**Fork-to-fork** [see Figure 2 (c)]		
	Closed	**Open**	**Closed**	**Open**	**Closed**	**Open**	
mm	mm	mm	mm	mm	mm	mm	
8	200	304	198	302	196	300	200 kg
10	252	370	241	359	230	348	300 kg
12	334	525	332	523	330	521	500 kg
16	372	550	371	549	370	548	750 kg
20	384	550	382	548	380	546	1.25 t
22	460	689	462	691	464	693	2 t
27	534	807	532	806	530	803	3 t
30	544	828	562	846	580	864	4 t
33	596	870	602	876	608	882	5 t
39	630	915	649	934	668	953	6 t
42	650	925	680	955	710	985	7.5 t
48	710	966	733	989	756	1 012	10 t
56	800	1 030	790	1 020	780	1 010	15 t
64	806	1 011	798	1 003	790	995	20 t
72	888	1 117	874	1 103	860	1 089	25 t
76	1 094	1 310	1 047	1 263	1 000	1 216	30 t
85	1 210	1 448	1 135	1 373	1 060	1 298	40 t
100	1 280	1 470	1 194	1 384	1 108	1 298	50 t

NOTE For dimensions of attachments, see Table 6 and Table 7.

Section 3. Specific requirements for turnbuckles

3.1 General

All turnbuckles shall comply with the general requirements of section 1 and the specific requirements of this section.

3.2 Designation

Turnbuckles for general lifting purposes are obtainable in two lengths which shall be designated series no. 1 and series no. 2 in accordance with **3.3.2** and Table 4.

3.3 Open body

3.3.1 Material

The open body shall be made from steel complying with the requirements of BS 970-1, grade 080A30 in the hardened and tempered condition.

3.3.2 Form and dimensions

The form and dimensions of the open body shall be in accordance with Figure 3 and Table 4 series no. 1 and no. 2, and pipe hanger applications, respectively.

The cross-sectional dimensions of the hexagonal ends of the turnbuckle body shall be in accordance with BS 3692.

3.4 Workmanship

The open body shall be a solid forging without any weld, neatly and cleanly made and finished. If lock-nuts are to be provided, the faces of each boss of the open body shall be machine faced.

3.5 Attachments

Attachments for use with the turnbuckle open body for lifting purposes shall be in accordance with section 4. Screwed attachments shall be screwed into the body of the turnbuckle to the full depth of the female threaded portions.

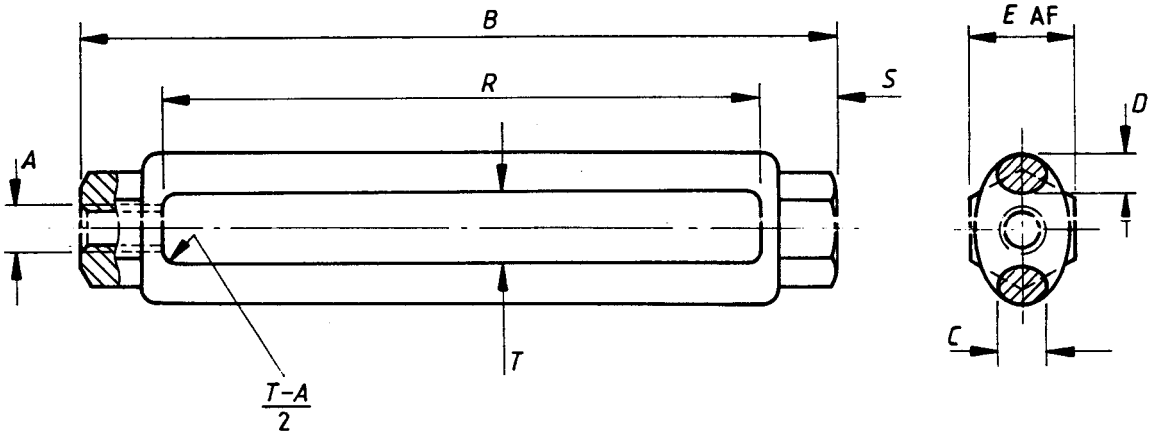


Figure 3 — Hexagon-ended open body for turnbuckles

Table 4 — Hexagon-ended open bodies for turnbuckles

Size of screw *A*	Nut size	*B* min.			*C* (min.)	*D* (min.)	*E* across flats (min.)	*R* (see note)			*S*	*T* (min.)
		Lifting purposes		Pipe hangers				Lifting purposes		Pipe hangers		
		Series no. 1	Series no. 2					Series no. 1	Series no. 2			
mm		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
8	M8	130	180	180	8	7	12.7	100	150	150	15	11
10	M10	150	184	184	10	8	16.7	116	150	150	17	12
12	M12	230	190	190	12	8	18.7	190	150	150	20	15
16	M16	230	202	202	16	11	23.7	178	150	150	26	19
20	M20	230	214	214	20	13	29.7	166	150	150	32	23
22	M22	300	222	—	22	14	31.6	228	150	—	36	26
24	M24	—	—	228	24	15	35.4	—	—	150	39	29
27	M27	360	238	—	27	15	40.4	276	150	—	44	29
30	M30	380	256	256	30	16	45.4	274	150	150	53	35
33	M33	380	258	—	36	18	49.4	274	150	—	53	42
36	M36	—	—	266	36	18	54.3	—	—	150	58	42
39	M39	410	276	—	39	20	59.3	284	150	—	63	45
42	M42	410	286	286	42	21	64.3	274	150	150	68	50
48	M48	410	310	310	54	28	74.3	250	150	150	80	62
56	M56	410	330	330	67	28	84.1	230	150	150	90	72
64	M64	410	354	354	67	32	94.1	206	150	150	102	72
72	M72	460	382	382	75	34	104.3	228	150	150	116	83

NOTE The design of turnbuckle can incorporate any length of opening provided *S*, *C* and *D* are maintained.

3.6 Types of turnbuckle

Turnbuckles fitted with attachments shall be supplied in one of the following forms.

NOTE 1 It is permissible to have a combination of any two end fittings specified in this standard, provided that these are called for in the enquiry or order. (See Appendix A.)

a) *Eye-to-eye type.* The eye-to-eye type shall be made up of an open body as shown in Figure 3 fitted at each end with a screwed elongated eye as shown in Figure 5.

NOTE 2 The resultant turnbuckle of this type is shown in Figure 4(a).

b) *Eye-to-fork type.*The eye-to-fork type shall be made up of an open body as shown in Figure 3 fitted at one end with a screwed elongated eye as shown in Figure 5 and at the other end with a screwed fork as shown in Figure 6.

NOTE 3 The resultant turnbuckle of this type is shown in Figure 4(b).

c) *Fork-to-fork type.* The fork-to-fork type shall be made up of an open body as shown in Figure 3 fitted at each end with a screwed fork as shown in Figure 6.

NOTE 4 The resultant turnbuckle of this type is shown in Figure 4(c).

d) *Hook-to-hook type.* The hook-to-hook type shall be made up of an open body as shown in Figure 3 fitted at each end with a screwed trapezoidal hook as shown in Figure 7.

NOTE 5 The resultant turnbuckle of this type is shown in Figure 4(d).

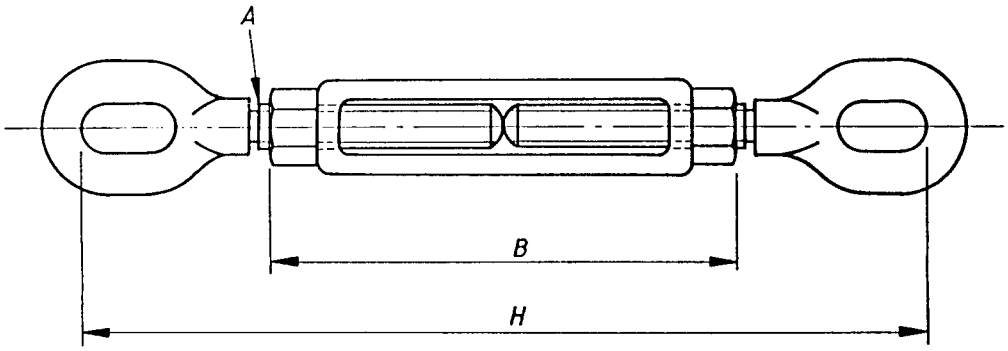
e) *Pipe hanger type.* The pipe hanger type shall be made up of an open body as shown in Figure 3 fitted at each end with a screwed pipe hanger sling rod as shown in BS 3974-1.

3.7 Open and closed dimensions

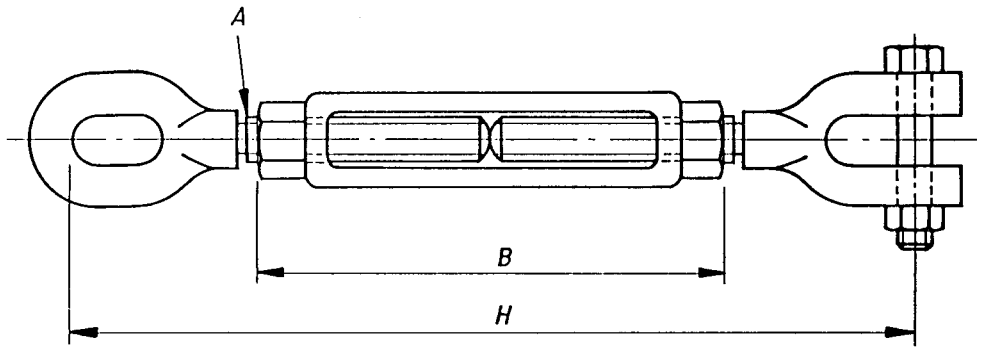
Open and closed dimensions *H* for a) eye-to-eye, b) eye-to-fork, c) fork-to-fork and d) hook-to-hook turnbuckles shall be in accordance with Table 5.

3.8 Safe working loads

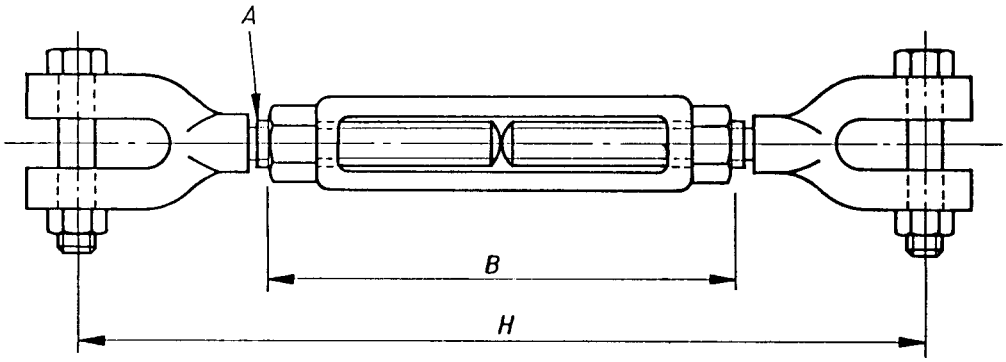
Safe working load (SWL) values for turnbuckles shall be in accordance with Table 5.



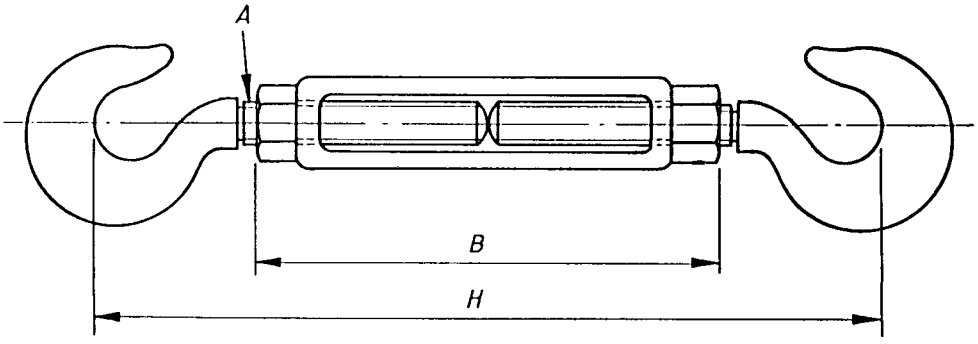
(a) Eye-to-eye type



(b) Eye-to-fork type



(c) Fork-to-fork type



(d) Hook-to-hook type

Figure 4 — Types of turnbuckle

Table 5 — Open and closed dimensions (H) and safe working loads for turnbuckles

Size of screw A	Dimension H																Safe working load SWL (see note 2)	
	Eye-to-eye [see Figure 4 (a)]				Eye-to-fork [see Figure 4 (b)]				Fork-to-fork [see Figure 4 (c)]				Hook-to-hook [see Figure 4 (d)]					
	Series no. 1		Series no. 2		Series no. 1		Series no. 2		Series no. 1		Series no. 2		Series no. 1		Series no. 2		Lifting purposes	Pipe hanger purposes
	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open		
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm		
8	Not available																—	240 kg
10	252	370	284	434	241	359	273	423	230	348	262	412	242	358	274	424	300 kg	365 kg
12	334	525	298	448	332	523	296	446	330	521	294	444	330	520	295	445	500 kg	530 kg
16	372	550	342	492	371	549	341	491	370	548	340	490	354	532	336	486	750 kg	1 t
20	384	550	366	516	382	548	364	514	380	546	362	512	392	558	366	516	1.25 t	1.56 t
22	460	689	384	534	462	691	386	536	464	693	388	538	500	728	420	570	2 t	—
24	Not available																—	2.24 t
27	534	807	412	562	532	806	410	560	530	803	408	558	Not available				3 t	—
30	544	828	420	570	562	846	438	588	580	864	456	606	Not available				4 t	3.58 t
33	596	870	472	622	602	876	478	628	608	882	484	634	Not available				5 t	—
36	Not available																—	5.22 t
39	630	915	496	646	649	934	515	665	668	953	534	684	Not available				6 t	—
42	650	925	524	674	680	955	554	704	710	985	584	734	Not available				7.5 t	7.18 t
48	710	966	602	752	733	989	625	775	756	1 012	648	798	Not available				10 t	9.44 t
56	800	1 030	728	878	790	1 020	718	868	780	1 010	708	858	Not available				15 t	13 t
64	806	1 011	734	884	798	1 003	742	892	790	995	748	900	Not available				20 t	17.2 t
72	888	1 117	810	960	874	1 103	824	974	860	1 089	838	988	Not available				—	22.3 t

NOTE 1 For details of hangers and attachments for pipe hanger applications, refer to BS 3974-1.
NOTE 2 The SWL values for pipe hanger applications relate to their usage in association with pipe hangers in accordance with BS 3974-1.

Section 4. Specific requirements for attachments

4.1 General

All attachments shall comply with the general requirements of section 1 and the specific requirements of this section.

4.2 Screwed elongated eyes

4.2.1 Material and workmanship

Screwed elongated eyes shall not contain any weld and shall be made from steel in accordance with the requirements of BS 970-1, grade 080A30 in the hardened and tempered condition, up to and including the M56 size and normalized for the M64 size and above. The eye shall be forged integrally in one piece and cleanly finished.

4.2.2 Form and dimensions

The form and dimensions of screwed elongated eyes shall be in accordance with Figure 5 and Table 6.

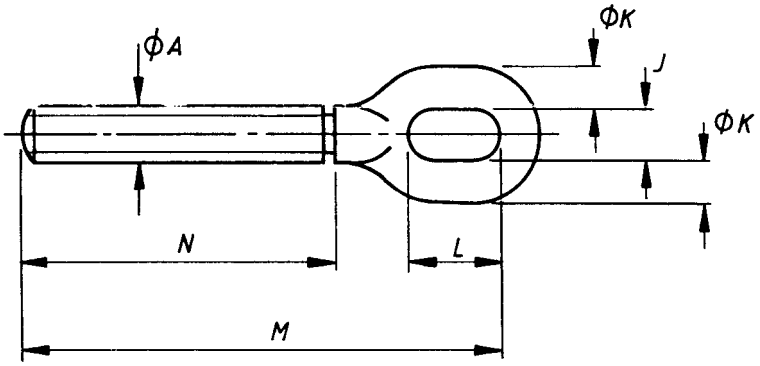


Figure 5 — Screwed elongated eye

Table 6 — Screwed elongated eyes

Size of screw *A*	Inside width of eye *J*	Eye thickness *K*	Inside length of eye *L*	Effective length *M*			Length of screwed *N*		
				Rigging screw	Turnbuckle		Rigging screw	Turnbuckle	
					Series no. 1	Series no. 2		Series no. 1	Series no. 2
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
8	9	7	20	100	100	126	65	65	90
10	11	8	24	126	126	143	75	75	92
12	14	10	35	167	167	150	115	115	95
16	18	14	40	186	186	172	115	115	101
20	22	16	50	192	192	184	115	115	107
22	22	18	50	230	230	193	150	150	111
27	24	20	52	267	267	204	180	180	113
30	28	22	57	272	272	211	190	190	123
33	34	25	64	298	298	237	190	190	129
39	38	28	75	315	315	249	205	205	138
42	40	30	85	325	325	263	205	205	143
48	44	35	92	355	355	302	205	205	155
56	58	43	115	400	400	365	205	205	165
64	60	53	120	403	403	368	205	205	177
72	75	61	150	444	444	406	230	230	191
76	88	68	195	547	—	—	230	—	—
85	100	78	240	605	—	—	255	—	—
100	110	88	250	640	—	—	255	—	—

4.3 Screwed forks

4.3.1 Material and workmanship

Screwed forks shall not contain any weld and shall be made from steel in accordance with BS 970-1, grade 080A30 in the hardened and tempered condition, up to and including the M56 size and normalized for the M64 size and above. The fork shall be forged integrally in one piece and cleanly finished.

4.3.2 Form and dimensions

The form and dimensions of screwed forks shall be in accordance with Figure 6 and Table 7. The screwed fork shall be supplied, complete with bolt and nut, in accordance with the general requirements of BS 3692
(grade 8.8 bolt/grade 8 nut), except that the length of the plain portion of the bolt shall be such that when the nut is screwed onto the bolt it seats onto the shoulder and not on the fork body. The nut shall be a thin type and shall be secured by a split cotter pin positioned outside the nut.

The hole for the bolt shall be accurately drilled or bored at right angles to the axis of the screwed shank.

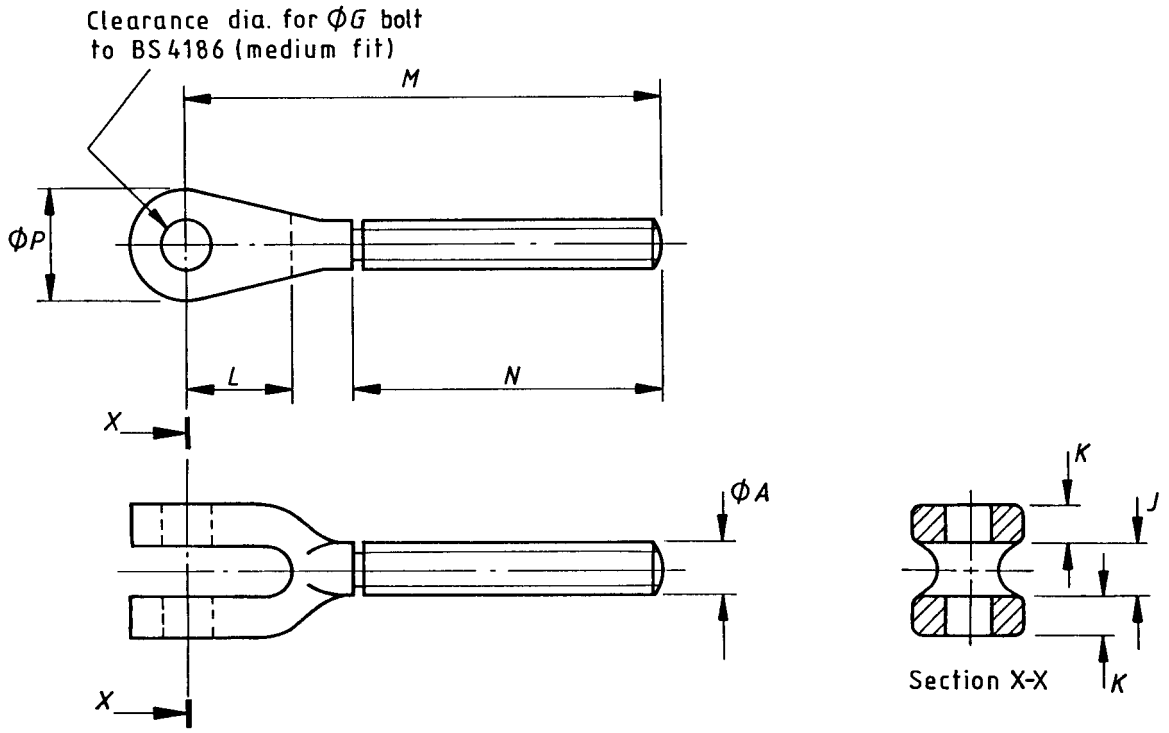


Figure 6 — Screwed fork

Table 7 — Screwed forks (supplied complete with bolt and nut)

Size of screw *A*	Size of bolt *G*	Width between forks *J*	Fork thickness *K*	Length of fork *L*	Overall effective length *M*			Length of screwed shank *N*			Fork width *P*
					Rigging screw	Turnbuckle		Rigging screw	Turnbuckle		
						Series no. 1	Series no. 2		Series no. 1	Series no. 2	
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
8	M8	10	6	18	98	98	128	65	65	90	15
10	M8	12	6	20	115	115	132	75	75	92	18
12	M10	15	9	34	165	165	148	115	115	95	23
16	M16	22	10	50	185	185	171	115	115	101	32
20	M16	23	12	55	190	190	182	115	115	107	36
22	M20	28	13	60	232	232	195	150	150	111	40
27	M22	30	14	68	267	267	204	180	180	119	50
30	M27	34	17	70	290	290	229	190	190	123	58
33	M30	38	19	75	304	304	243	190	190	129	64
39	M33	50	20	90	334	334	268	205	205	138	68
42	M36	50	23	110	355	355	293	205	205	143	80
48	M42	56	26	130	378	378	325	205	205	155	92
56	M48	67	30	135	390	390	355	205	205	165	108
64	M56	70	32	135	395	395	376	205	205	177	120
72	M64	88	42	150	430	430	420	230	230	191	140
76	M72	110	50	185	500	—	—	230	—	—	152
85	M80	110	50	185	530	—	—	255	—	—	170
100	M90	115	58	220	554	—	—	255	—	—	200

4.4 Screwed trapezoidal hooks

4.4.1 Material

The material for screwed trapezoidal hooks shall be in accordance with BS 2903.

4.4.2 Form and dimensions

The form and dimensions of screwed trapezoidal hooks shall be based on BS 2903 as shown in Figure 7 and Table 8.

4.5 Lock-nuts

If specified on the enquiry and order lock-nuts shall comply with BS 3692, grade 4, thin series.

NOTE Where lock-nuts are fitted, dimension *H* (closed) will be increased by twice the thickness of one nut.

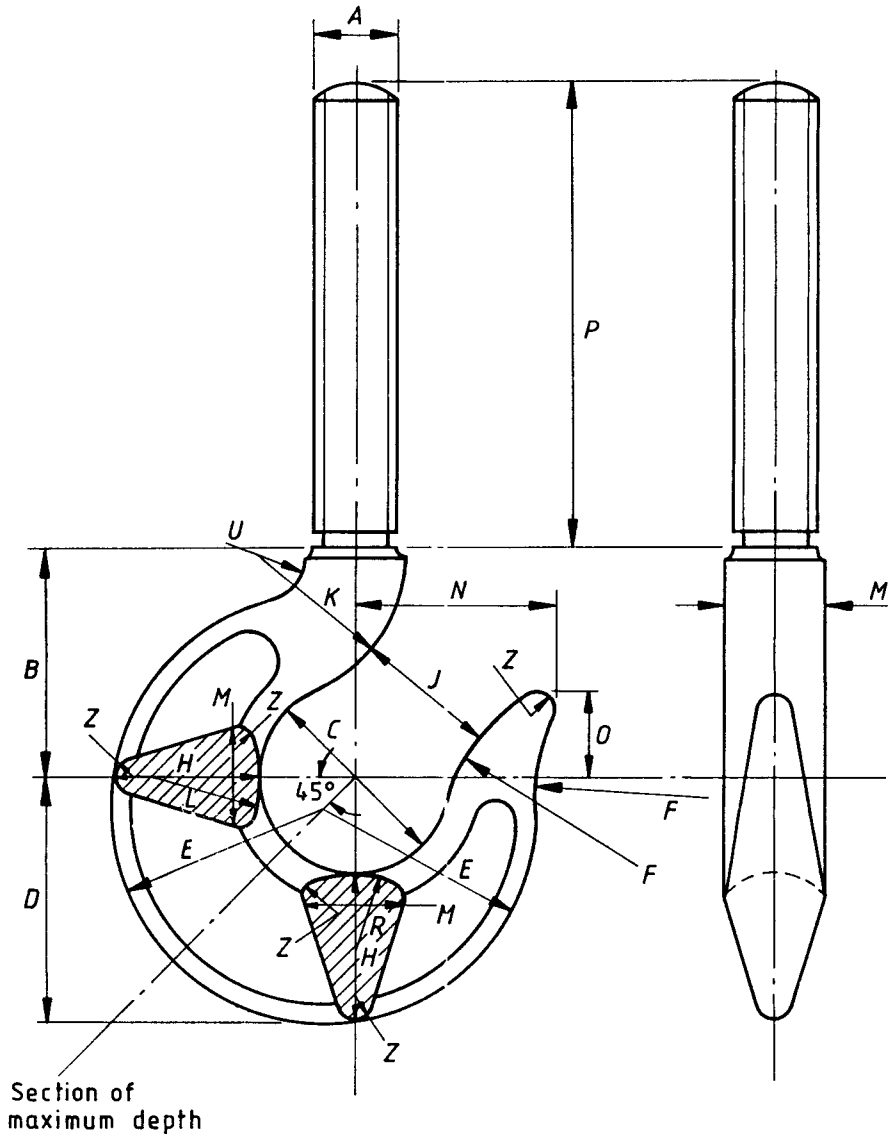


Figure 7 — Screwed trapezoidal hook for turnbuckles

Table 8 — Screwed trapezoidal hooks for turnbuckles

Size of screw *A*	Ratio *C*/*H*	*B*	*C*	*D*	*E*	*F*	*H*	*J*	*K*	*L*	*M*	*N*	*O*	*P*		*R*	*U*	*Z*
														Series no. 1	Series no. 2			
mm		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
8	1.28	21	18	23	20	18	14	13	14	10	9	19	8	65	90	7	4	2
10	1.28	27	23	30	26	23	18	17	18	13	12	24	10	75	92	9	6	2
12	1.28	29	25	33	28	25	20	19	20	14	13	26	10	115	95	10	6	3
16	1.28	38	32	41	36	32	25	24	26	19	16	33	13	115	101	12	8	3
20	1.28	47	40	51	45	40	31	30	32	23	21	41	17	115	107	16	10	4
22	1.28	60	51	66	58	51	40	38	41	30	26	53	21	150	111	20	13	4

NOTE Based on Table 2 of BS 2903:1980, except for shank dimensions.

Appendix A Information to be supplied by the purchaser with the enquiry and order

The enquiry and order should state the following:

a) the number of this British Standard, i.e. BS 4429;

b) application, i.e.:

lifting purposes

non-lifting purposes

pipe hanger applications;

c) the type of rigging screw (see Figure 2) or turnbuckle (see Figure 4) complete with attachments. In the case of turnbuckles state whether series no. 1 or series no. 2 or whether for pipe hanger applications;

d) size of screw diameter A, in millimetres;

e) in the case of rigging screws or turnbuckles for non-lifting applications including pipe hanger applications, whether proof loading is to be carried out (see **1.10**);

f) whether rigging screws and attachments are required in the hot dip galvanized condition (see **1.7.1**);

g) whether turnbuckles and attachments are required in the self-coloured condition (see **1.7.2**);

h) whether lock-nuts (see **4.5**) are required;

i) whether inspection is required by an outside authority.

Appendix B Notes on design

NOTE This appendix is for information only and does not form part of this standard.

This appendix gives a recommended basis for design of rigging screws or turnbuckles outside the range specified in this standard, where A is the diameter of screw.

These formulae have been obtained by averaging the tabulated values, thus in many instances the tabulated values vary from those obtained from the formulae. The tabulated values account for availability of material sections, usage and other criteria.

a) Tubular body for rigging screws (see Figure 1)

$C = 1.7\ A$

$E = 0.23\ A$

$F = 1.28\ A$

SWL = $0.004\ A^2$ tonnes

b) Hexagon-ended open body for turnbuckles (see Figure 3)

$C = A$

$D = 0.6\ A$

$E = 1.7\ A$

$S = 1.65\ A$

$T = 1.2\ A$

Nut diameter = A

SWL = $0.004\ A^2$ tonnes

Internal radius in body = $(T - A/2)$

c) Screwed elongated eyes (see Figure 5)

$J = A$

$K = 0.8\ A$

$L = 2.25\ A$

SWL = $0.004\ A^2$ tonnes

d) Screwed forks (see Figure 6)

$J = 1.2\ A$

$K = 0.6\ A$

$L = 2.45\ A$

$P = 1.9\ A$

$G = 0.9\ A$

SWL = $0.004\ A^2$ tonnes

e) Screwed trapezoidal hooks for turnbuckles (see Figure 7). Proportions in accordance with Table 2 of BS 2903:1980, except for shank.

Appendix C Selection, application and use of rigging screws and turnbuckles for lifting applications

C.1 Selection

C.1.1 *Selection of body*

The use of a turnbuckle is preferred particularly as it is easier to observe that the attachment is screwed fully into the female thread.

C.1.2 *Selection of attachments*

The following applications are suitable for the attachments indicated.

a) Screwed elongated eyes: suitable for general usage, but designed to be compatible with higher tensile small dee shackles.

b) Screwed forks: suitable for use with a solid thimble eye termination for wire rope.

c) Screwed trapezoidal hooks: suitable for hooking into attachments or anchorages provided that they fit freely into the seat of the hook and do not load the hook on the point or exert any side thrust upon the hook.

C.1.3 *Provision of lock-nuts*

Where vibration may occur, lock-nuts should be fitted. If lock-nuts are used, the closed dimension overall will be increased by twice the thickness of one lock-nut and the specified length on the order should take account of this fact.

C.1.4 *Galvanizing*

Where rigging screws and turnbuckles are to be used in a hostile corrosive environment, consideration should be given to the addition of a galvanized coating.

It should be noted that hot dip galvanized threads wear easily and are unsuitable for parts used for frequent adjustment.

C.2 Storage and handling

C.2.1 *Screw threads*

All screw threads should be lubricated, protected and handled with care. Threads that are self-coloured should be heavily greased and exposed threads hessian- or canvas-wrapped as a protection against outside elements.

C.2.2 *Inspection hole on rigging screw*

The inspection/viewing hole in the rigging screw body should be kept clear of grease, etc. so that the position of the screw on the attachment relative to the body can be observed.

C.2.3 *Body and attachments*

The body and attachments should be treated as one complete item and kept together at all times.

C.3 Assembly and adjustment

C.3.1 *Adjustment*

The average or normal torque should be applied via the tommy-bar and/or spanner when adjusting the screws. The tommy-bar arm should not be extended, e.g. with a length of pipe, to increase leverage.

The adjustment of hexagon-ended turnbuckles should be achieved by the use of a spanner on the hexagonal end.

C.3.2 *Location of attachments*

At least 1.6 *A* of the length of the thread of the attachment should be maintained in the body end (where *A* is the diameter of thread).

In the case of rigging screws, the probe or inspection hole should always be obscured by the screwed end attachment.

C.4 Application

C.4.1 *Prevention of unscrewing*

Rigging screws and turnbuckles should not be used in situations where they are liable to be unscrewed, e.g. by rotation of a wire rope, load, etc.

C.4.2 *Bending of rigging screws*

Rigging screws should not be used in slinging operations where they are likely to become bent, e.g. round corners of a load.

C.4.3 *Examination and in-service inspection*

Rigging screws and turnbuckles used for lifting purposes should be examined by a competent person at intervals not exceeding 6 months and a report of the examinations kept on file.

Actions which should be taken in the event of defects found during in-service inspection are given in Table 9.

Table 9 — Types of defect found in in-service inspections and actions to be taken in the event of a defect

Defect	Action
Safe working load marking either missing or unrecognizable. Identification missing or unreadable.	Competent person to check test certificates and restamp. If not possible, retest and restamp.
Damaged screw thread.	Competent person to decide whether to scrap the component.
Rusty or tight screw thread.	Arrange for necessary lubrication but if tightness persists, refer to a competent person.
Distorted body or fittings.	Competent person to decide whether to scrap or repair.
Nicks, gouges, cracks or corrosion.	Refer to competent person.

Publications referred to

BS 729, *Hot dip galvanized coatings on iron and steel articles.*

BS 970, *Specification for wrought steels for mechanical and allied engineering purposes.*

BS 970-1, *General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels.*

BS 1610, *Materials testing machines and force verification equipment.*

BS 1610-1, *Specification for the grading of the forces applied by materials testing machines.*

BS 1610-2, *Specification for the grading of equipment used for the verification of the forces applied by materials testing machines.*

BS 2903, *Specification for higher tensile steel hooks for chains, slings, blocks and general engineering purposes.*

BS 3643, *ISO metric screw threads.*

BS 3643-2, *Specification for selected limits of size.*

BS 3692, *ISO metric precision hexagon bolts, screws and nuts. Metric units.*

BS 3974, *Pipe supports.*

BS 3974-1, *Pipe hangers, slider and roller type supports.*

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

BS 4186, *Specification for clearance holes for metric bolts and screws.*

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

BS 6323-1, *General requirements.*

BS 6323-2, *Specific requirements for hot finished welded steel tubes.*

BS 6323-3, *Specific requirements for hot finished seamless steel tubes.*

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