

Specification for

Screwed studs for general purposes — Metric series

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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:

Association of Hydraulic Equipment Manufacturers	Institute of Iron and Steel Wire Manufacturers
Black Bolt and Nut Association of Great Britain	Ministry of Defence, Navy Department
Bright Steel Bar Association	Post Office
British Bolt, Nut, Screw and Rivet Federation	Precision Bolt and Nut Institute
British Railways Board	Rolled Thread Screw Association
British Constructional Steelwork Association	Scientific Instrument Manufacturers' Association
British Cycle and Motor Cycle Industries Association Ltd.	Society of Motor Manufacturers and Traders Limited
Council of British Manufacturers of Petroleum Equipment	Washer Manufacturers' Association of Great Britain
Electronic Engineering Association	Individual manufacturers
Fasteners and Turned Parts Institute	

This British Standard, having been approved by the Mechanical Engineering Industry Standards Committee, was published under the authority of the Executive Board on 28 February 1969

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The following BSI references relate to the work on this standard:
Committee references MEE/60 and MEE/60/8
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Foreword

A complete list of British Standards, numbering over 9,000, fully indexed and with a note of the contents of each, will be found in the BSI Catalogue which may be purchased from BSI Sales Department. The catalogue may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards, and to those listed in Appendix E:

BS 18, *Methods for tensile testing of metals*.

BS 21, *Pipe threads*.

BS 131, *Methods for notched bar tests. Part 3: The Charpy U-notch impact test on metals*.

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 1580, *Unified screw threads*.

BS 2693, *Screwed studs. Part 1: General purpose studs*.

BS 3382, *Electroplated coatings on threaded components*.

BS 3580, *Guide to design considerations on the strength of screw threads*.

BS 3643, *ISO metric screw threads — Part 1: Thread data and standard thread series — Part 2: Limits and tolerances for coarse pitch series threads*.

This British Standard has been prepared under the authority of the Mechanical Engineering Industry Standards Committee as a result of the decision taken in November, 1965, to adopt the ISO metric screw thread system in the UK (see Appendix C).

This standard has been drawn up to cover screwed studs for general purpose applications and as such it is a parallel metric standard to BS 2693-1¹⁾, which relates to inch series screwed studs and makes provision for what are generally termed “transition fit” threads.

BSI have for some time been liaising with several standards authorities in Europe since there are no ISO recommendations or proposals in existence dealing with the complex problem of the screw thread limits and tolerances at the metal end of screwed studs. Account has been taken of current European practice in drawing up this specification and a choice of classes of thread on the metal end is given to satisfy the requirements of those who require an oversize thread. Pending any international agreement in this respect, limits and tolerances for an optional alternative oversize thread for the metal end of the stud have been specified, for which the pitch (effective) and minor diameters have been increased by an amount equal to the tolerance on the pitch (effective) diameter, which when used with a “4H” hole gives a maximum interference similar to that of a BS Fine thread to BS 2693-1 when used with a BS 84²⁾ “close fit” hole; the maximum clearance is however slightly greater.

The more complex problem of “interference fit” threads is referred to at some length in the Foreword of BS 2693-2¹⁾. Research on this problem in respect of metric screwed studs is currently being carried out in Eastern Europe and should the necessity for a specification for fully interference fit threaded screwed studs be established, a second part of this standard could be prepared.

¹⁾ BS 2693, “Screwed studs”, Part 1: “General purpose studs”, Part 2: “Recommendations for high grade studs”.

²⁾ BS 84, “Parallel screw threads of Whitworth form”.

Although there are no ISO recommendations relating exclusively to screwed studs account has been taken of the following publications prepared by Technical Committee ISO/TC 2 “Bolts, nuts and accessories”:

ISO Recommendation R 225, “*Bolts, screws and studs. Dimensioning*”.

Draft ISO Recommendation DR 911, “*Mechanical properties of fasteners*”, Part 1: “*Bolts, screws and studs*”.

Draft ISO Recommendation DR 950, “*Nominal lengths for bolts, screws and studs, thread lengths for general purpose bolts*”.

It is to be emphasized that although the draft recommendations listed above have yet to be finally ratified, they have been provisionally agreed and are being progressively incorporated into the national standards of ISO member countries.

Attention is particularly drawn to Clauses 2 and 3 of this standard as these are affected by ISO Recommendation R 225. It will be seen in Figure 1 that the nominal length for metric studs is the “projecting length”, whereas in BS 2693 the overall length is denoted as the nominal length. Although the provisions of ISO/R 225 are contrary to current British and American practice, it is felt that they will need to be adopted in this metric standard in line with the general policy of changing over to metric system in the UK and taking account of current Continental practice.

NOTE 1 Although the mechanical requirements specified in this standard are in metric technical units (i.e. kgf/mm²), in accordance with present ISO agreements (ISO/DR 911), comparable SI units have been included in anticipation of future international agreement in this respect. 1 kgf = 9.806 65 newtons. For further information about SI units see BS 3763, “International System (SI) units”, BS 350, “Conversion factors and tables”, Supplement No. 1, “Additional tables for SI conversions” and PD 5686, “The use of SI units”.

NOTE 2 See Appendix E for related British Standards.

NOTE 3 The products referred to in this specification — “screwed nuts”, should not be confused with products used on pipe flanges which are commonly referred to as “stud bolts”.

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 20, 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

1.1 This British Standard specifies the dimensions and tolerances for screwed studs with ISO metric threads in diameters from 3 mm to 39 mm inclusive, intended for general purposes.

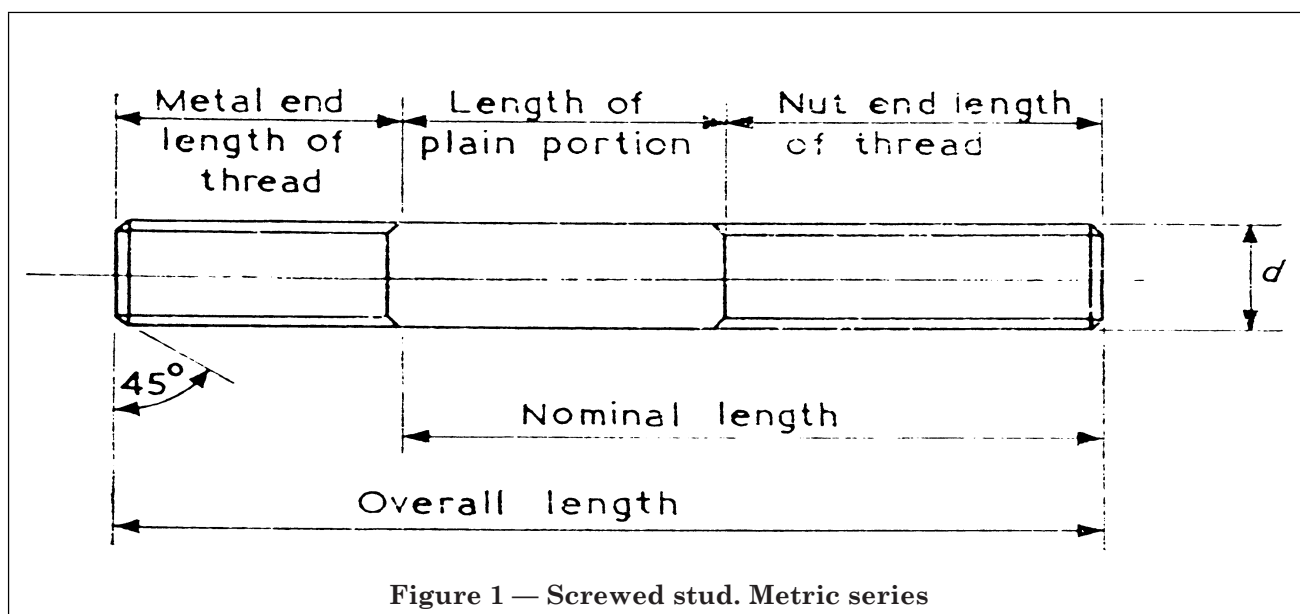
1.2 Mechanical properties are given only in respect of carbon or alloy steel screwed studs which are not to be used for special applications, such as those requiring weldability or corrosion resistance.

1.3 The dimensional requirements of this standard also apply to non-ferrous and stainless steel screwed studs.

2 Nomenclature

For the purposes of this standard the nomenclature given below and the terms illustrated in Figure 1 apply:

- 1) *Metal end*. The end of the stud which is screwed into the component.
- 2) *Nut end*. The end of the stud which is not screwed into the component.
- 3) *Plain portion*. The unthreaded length of stud.



3 Nominal length

The nominal length of the stud shall be measured from the nut end including the chamfer, to the extreme end of the runout of the thread on the metal end (see Figure 1).

NOTE Clause 3 is based on ISO/R 225 and is different from the definition in Clause 4 of BS 2693, "Screwed studs", Part 1:1956, "General purpose studs".

3.1 The standard nominal lengths are given in Table 1.

3.2 The tolerances on the standard nominal lengths shall be as given in Table 1.

NOTE See Appendix D for preferred standard sizes.

4 Ends of studs

The ends of the studs shall be finished with a straight chamfer with a 90° included angle to a depth slightly exceeding the depth of thread.

5 Plain portion

5.1 The length of the plain portion shall not be less than half the nominal diameter (d) of the thread and shall be taken to include the runout threads on the nut end of the studs.

Table 1 — Standard nominal lengths and tolerances on the standard nominal lengths of screwed studs

Dimensions in millimetres

Nominal length	Tolerance	Nominal length	Tolerance
12	± 0.35	120	± 0.70
14	± 0.35	(125)	± 0.80
16	± 0.35	130	± 0.80
(18)	± 0.50	140	± 0.80
20	± 0.50	150	± 0.80
(22)	± 0.50	160	± 0.80
25	± 0.50	170	± 0.80
(28)	± 0.50	180	± 0.80
30	± 0.50	190	± 1.0
(32)	± 0.50	200	± 1.0
35	± 0.50	220	± 1.0
(38)	± 0.50	240	± 1.0
40	± 0.50	260	± 1.0
45	± 0.50	280	± 1.0
50	± 0.50	300	± 1.0
55	± 0.60	325	± 1.2
60	± 0.60	350	± 1.2
65	± 0.60	375	± 1.2
70	± 0.60	400	± 1.2
75	± 0.60	425	± 1.3
80	± 0.60	450	± 1.3
85	± 0.70	475	± 1.3
90	± 0.70	500	± 1.3
(95)	± 0.70		
100	± 0.70		
(105)	± 0.70		
110	± 0.70		
(115)	± 0.70		

NOTE 1 Lengths shown in brackets are non-preferred.
NOTE 2 See Appendix D for preferred standard sizes.

5.2 The nominal diameter of the plain portion shall be equal to the maximum (basic) major diameter of the threaded ends and subject to the tolerances in the following table:

Nominal diameter <i>d</i>	Tolerance
mm	mm
3	+ 0 – 0.09
over 3 up to 6	+ 0 – 0.12
over 6 up to 10	+ 0 – 0.15
over 10 up to 18	+ 0 – 0.18
over 18 up to 30	+ 0 – 0.21
over 30 up to 39	+ 0 – 0.25

6 Length of thread

6.1 Metal end

6.1.1 The length of the thread on the metal end of the stud shall include the runout threads and shall be equal to the nominal diameter of the thread or to one and a half times the nominal diameter of the thread, as specified by the purchaser.

6.1.2 The length of thread runout shall be not less than 2 pitches or more than $2\frac{1}{2}$ pitches.

6.1.3 The tolerance on the length of thread shall be as given in the following table:

Length of thread	Tolerance
mm	mm
3	± 0.40
over 3 up to 6	± 0.50
over 6 up to 10	± 0.60
over 10 up to 18	± 0.70
over 18 up to 30	± 0.80
over 30 up to 39	± 1.00

6.2 Nut end

6.2.1 The length of thread on the nut end of the stud shall not include the runout threads and shall be in accordance with the table given below, except in the cases of short studs where this would result in a length of plain portion less than $\frac{1}{2}d$. In such cases a length of plain portion equal to $\frac{1}{2}d$ should be allowed for before threading the remainder for the nut end.

Nominal length of stud	Length of thread
Up to and including 125 mm	$2d + 6$ mm
Over 125 mm up to and including 200 mm	$2d + 12$ mm
Over 200 mm	$2d + 25$ mm

Thread lengths based on these formulae are given in Table 2.

6.2.2 The length of thread runout shall not exceed $2\frac{1}{2}$ pitches.

6.2.3 The tolerance on the length of thread shall be plus two pitches on all diameters, as given in Table 2.

7 Screw threads

7.1 General. The form of the thread, diameters and associated pitches of standard screwed studs, metric series, shall be in accordance with BS 3643-1³⁾.

7.2 Metal end. The screw thread on the metal end shall be either to the standard limits of tolerance class 4h (close fit) as specified in BS 3643-2³⁾, or alternatively may be oversize on the effective and minor diameter. Oversize threads shall conform to the limits and tolerances given in Table 3.

The purchaser shall specify which of the alternatives is required in any enquiry or order.

7.3 Nut end. The screw thread on the nut end shall be to the tolerances for class 6g (medium fit) as specified in BS 3643-2³⁾.

7.4 Tapped holes for metal end. It is recommended that tapped holes for the metal end of screwed studs be in accordance with tolerance class 4H as specified in BS 3643-1³⁾.

However, where the class of fit is not critical, holes may be tapped to tolerance class 6H (medium fit).

7.5 If the purchaser requires other classes of fit or fine pitch threads then this shall be the subject of agreement with the manufacturer.

³⁾ BS 3643, "ISO metric screw threads" — Part 1: "Thread data and standard thread series" — Part 2: "Limits and tolerances for coarse pitch series threads".