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Specification for

Unified screw threads —

Part 3: Diameters below $\frac{1}{4}$ in

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Agricultural Engineers' Association	Scientific Instrument Manufacturers' Association
British Bolt, Nut, Screw and Rivet Federation	Screw Thread Tool Manufacturers' Association
Electronic Engineering Association	Society of British Aerospace Companies Ltd.
Fasteners and Turned Parts Institute	Telecommunication Engineering and Manufacturing Association
Ministry of Aviation	
National Association of Marine Engine Builders	

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Foreword

This standard makes reference to the following British Standards:

BS 919, *Screw gauge limits and tolerances — Part 1: Gauges for screw threads of Unified form.*

BS 1580, *Unified screw threads — Parts 1 and 2. Diameters ¼ in and larger.*

BS 3382, *Electroplated coatings on threaded components.*

BS 4084, *Unified screw threads of “UNJ” basic profile.*

This British Standard has been prepared under the authority of the Mechanical Engineering Industry Standards Committee to complete the British Standards for Unified screw threads covering a range of diameters from 0.060 in (No. 0) to 6 in and should therefore be read in conjunction with Parts 1 and 2 of BS 1580.

The Unified screw thread system, including the sizes covered in this standard, has been recommended by the International Organization for Standardization as the international system of screw threads in inch units. The recommendations are embodied in documents ISO R 68 for the basic and design thread profiles and ISO R 263 for the diameter/pitch combinations.

Although this Part 3 of BS 1580 refers to Parts 1 and 2 for the basic details of Unified screw threads, including thread profile and tolerancing methods, etc., sufficient information has been included herein to enable this part to be used independently of the other parts for general purposes. However, since Part 3 is regarded as an extension to Parts 1 and 2, its table numbers have been made to run sequentially from these parts.

It will be noted that the range of diameters covered by this Part of BS 1580 falls within the range of B.A. screw thread sizes, BS 93¹⁾. The various pitches for the same diameter in the Unified system, however, offer a somewhat wider selection of pitch/diameter combinations for a specific application than in the B.A. system. The UNF series will be found to present the closest approximation to the B.A. pitch/diameter ratios.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 13 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⁾ BS 93, “British Association (B.A.) screw thread with tolerances for sizes 0 B.A. to 16 B.A.”.

1 Scope

This standard relates to Unified screw threads from Number 0 (0.060 in diameter) to Number 12 (0.216 in diameter), commonly referred to as the “numbered sizes”.

It specifies the basic, tolerances, allowances and limiting sizes for the coarse (UNC) and the fine (UNF) thread series and for the Number 12-32 UNEF extra-fine diameter pitch combination.

NOTE Attention is drawn to the fact that with the different screw thread forms available there is the possibility of mismatch. It is the responsibility of the designer of the end product to ensure that this possibility is reduced to a minimum.

2 ISO/Unified thread form

a) The basic form and design forms of the threads covered by this part are the same as those specified in Part 1, Clause 2.

Data relating to the various standard proportions of Unified threads from 24 to 80 threads per inch are given in Table 54. Particulars of the symbols used in this table will be found in Appendix G of Parts 1 and 2.

b) *Screw threads for Aerospace purposes which are specified to comply with BS 1580.*

i) *External threads.* It is permitted for these to have the enlarged root radius specified for the UNJ profile in BS 4084²⁾. The minor diameter limits of size will accordingly be modified to suit the enlarged root radius. The major and effective diameter limits of size are not modified and shall be in accordance with those given in BS 1580 for the specified thread tolerance class.

ii) *Internal threads.* Internal threads produced after 18 January, 1974 shall conform with the minor diameter limits of size specified in BS 4084²⁾. The effective diameter limits of size are not modified and shall be in accordance with those given in BS 1580 for the specified thread tolerance class.

The major diameter is not affected as the dimensions are the same in BS 1580 and BS 4084²⁾.

3 Standard thread series

The standard diameter/pitch combinations for Unified threads below $\frac{1}{4}$ in diameter are given in Table 39. Where possible, the use of No. 1, No. 3 and No. 12 sizes should be avoided and preference should be given to the sizes in Column 1. Columns 1 and 2 list the first and second choices as detailed in ISO Recommendation R 263.

4 Basic sizes

The basic sizes are given in Table 51 for the UNC series, Table 52 for the UNF series and Table 53 for the No. 12-32 UNEF thread.

5 Screw thread classes

For general information on the classes of Unified screw threads see BS 1580-1.3. The classes applicable to the screw threads covered by this part are Classes 2A and 3A for external screw threads and Classes 2B and 3B for internal screw threads. Classes 1A and 1B are not considered suitable for these sizes of Unified screw threads.

NOTE *Stainless steel bolts and nuts.* Owing to the tendency for close-fitting bolts and nuts of stainless steel to seize when tightened together, it is recommended that stainless steel uncoated fasteners should not be made to Class 3 limits but rather to Class 2 limits.

6 Tolerances, allowances and limits of size

a) *Uncoated threads.* The tolerances and allowances for Unified screw threads below $\frac{1}{4}$ inch diameter, of Classes 2A, 2B, 3A and 3B are based on the same formulae as those for the larger diameters (given in Appendix A of Parts 1 and 2) with the single exception of the tolerances for the minor diameters of Class 2B internal threads which are the same as those for Class 3B internal threads. These tolerances are calculated from the formula $0.05 \sqrt[3]{p^2} + 0.03p/D - 0.002$ except that they shall not exceed $0.394p$.

The tolerances and limits of size for finished uncoated threads of Classes 2A, 2B, 3A and 3B are given in Table 40 to Table 50 inclusive.

²⁾ BS 4084, “Unified screw threads of “UNJ” basic profile”.

The effective diameter tolerances are based on a length of engagement between $\frac{2}{3}$ and $1\frac{1}{2}$ times the nominal major diameter. For adjustment of these tolerances for shorter lengths see Part 1, Clauses 19 and 20.

The values given for the minimum major diameters of internal threads are not realized in practice as the roots of the threads are always cleared above the minimum major diameter.

b) *Coated threads*. For information on the coating of bulk-produced threads reference should be made to BS 3382³⁾. The appropriate system of gauging coated threads is given in BS 919-1⁴⁾, Appendix C. For threads where the mean thickness of coating are of the order of 0.0002 inch, their limits before and after coating shall comply with the following requirements. For heavier coatings, special provisions are necessary. see BS 3382-7⁵⁾.

i) *Class 2A, external threads*. Normally, it is permissible for Class 2A coated threads to exceed the maximum limits shown in Table 40, Table 41, Table 45 and Table 49 provided they can be accepted by a GO screw gauge of basic size.

ii) *Class 2AG, external threads*. For such applications of Class 2A coated threads where the allowance must be maintained after coating (designated as Class 2AG) it is recommended that, before coating, both the maximum and minimum limits given in Table 40, Table 41, Table 45 and Table 49 be reduced by the amount of the Class 2A allowance shown in Table 40. After coating the maximum tabulated limits shall not be exceeded.

iii) *Class 3A, external threads*. Class 3A coated threads shall not exceed the maximum limits given in Table 40, Table 43, Table 47 and Table 49, and are to be accepted by a GO screw gauge of basic size. Before coating, it is recommended that both the maximum and minimum tabulated limits be reduced by the amount of the Class 2A allowances shown in Table 40.

iv) *Class 2B, internal threads*. Class 2B coated threads shall not be smaller than the minimum limits shown in Table 40, Table 42, Table 46 and Table 50 and are to be accepted by a GO screw gauge of basic size. Although small internal threads are difficult to coat, a thin deposit is achieved and it is recommended that before coating the above minimum limits be increased not more than the following amounts:

No. 2, 0.0003 in; No. 3, 0.0004 in; No. 4, 0.0005 in;

No. 5, 0.0006 in; No. 6, 0.0007 in; No. 8, 0.0008 in;

Nos. 10 and 12, 0.001 in. No amount is recommended for internal threads smaller than No. 2.

The maximum limits, however, shall remain unchanged. The tolerances resulting from these recommended amounts are substantially as Class 3B, and are considered to be a practical minimum. It is, therefore, strongly recommended that coated Class 2B threads be used instead of coated Class 3B threads.

v) *Class 3B, internal threads*. Class 3B coated threads shall not be smaller than the minimum limits given in Table 40, Table 44, Table 48 and Table 50 and are to be accepted by a GO screw gauge of basic size. It before coating the above minimum limits are increased by the amounts recommended for Class 2B threads and the maximum limits remain unchanged, the resulting working tolerances may be too small to be practical. To remedy this, it may then be necessary to increase the maximum limits by the same amounts as those recommended for the minimum limits. The resulting maximum limits would then be substantially the same as the Class 2B maximum limits. It is for this reason that it is strongly recommended that coated Class 2B threads be used instead of coated Class 3B threads.

³⁾ BS 3382 "Electroplated coatings on threaded components".

⁴⁾ BS 919, "Screw gauge limits and tolerances", Part 1: "Gauges for screw threads of Unified form"

⁵⁾ In course of preparation.