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Specification for

Machine tool components —

Part 10: Trapezoidal threads for lead and feed screw assemblies

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The 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:

Ball and Roller Bearing Manufacturers' Association	University of Aston in Birmingham
Machine Tool Industry Research Association	University of Manchester Institute of Science and Technology
National Federation of Engineers' Tool Manufacturers	Individual experts

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Foreword

This British Standard has been prepared under the authority of the Mechanical Engineering Standards Committee. It is based on a draft submitted by the Machine Tool Trades Association.

The objective of this standard is to specify criteria for metric trapezoidal thread screw and nut assemblies that will meet the requirements of the vast majority of machine tools. Therefore, in the final assessment of a screw and nut assembly made to this standard, the criteria by which the assembly is judged shall only be those that relate to assemblies.

This standard was derived from BS 5346 “*ISO metric trapezoidal screw threads*”, which is based on ISO/DIS 2901 “*ISO metric trapezoidal screw threads — Basic profile and maximum material profile*” and ISO/DIS 2902 “*ISO metric trapezoidal screw threads — General plan*”, but certain dimensions and ranges have been altered in order to fulfil the specific requirements of machine tool lead and feed screws. Complementary to ISO/DIS 2901 and ISO/DIS 2902 is ISO/DIS 2903 “*ISO metric trapezoidal screw threads — Tolerances*”, which specifically excludes high accuracy applications such as those required by machine tools, hence the necessity for this standard which also includes a 12 mm pitch that is not in BS 5346.

Because of the need to attain the requirements of this standard for an assembled screw and nut, it is difficult to completely standardize the screw and nut as individual components. This is due to the high accuracies required in machine tool applications and also to the fact that different manufacturing techniques available (thread turning, whirling, grinding, milling, etc.) can produce slight variations on the profile of the mating component.

When thread profile modification occurs as a direct result of the chosen manufacturing process, this is generally acceptable provided that the appropriate specifications in Table 2 and Table 3 are adhered to. However, if the customer demands strict compliance with the thread profile, it is the customer’s responsibility to ensure that a statement to that effect is made when placing the order.

Appendix A of this standard gives information that may provide useful guidance when selecting nominal dimensions and accuracy classes, and it may serve to indicate where extra information could be added to the specification if considered necessary.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, 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

This British Standard specifies a range of nominal diameters (10 mm to 100 mm), nominal pitches (2 mm to 20 mm) and tolerances for machine tool lead and feed screws and nuts.

This standard does not make any recommendations concerning features such as material, length or mounting criteria for lead and feed screws.

2 References

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

3 Definitions

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

3.1

basic profile

the basic profile is the theoretical profile associated with the basic sizes of the major, pitch and minor diameters of the thread. The deviations are applied to these basic sizes

NOTE See Figure 1.

3.2

basic size

the theoretical size to which the deviations are applied in order to obtain the limits of size

3.3

nominal size

the size that is used for general identification. It is generally the basic major diameter of the thread

3.4

feed screw and lead screw

a threaded spindle imparting accurate displacement or motion to a machine tool element with respect to another element

3.5

lead

the distance measured parallel to the axis between corresponding points on consecutive contours of the same thread helix in the same axial plane section and on the same side of the helix

3.6

pitch

the distance measured parallel to the axis between corresponding points on adjacent profiles lying in the same axial plane and on the same side of the axis

NOTE For a single-start screw, the lead and pitch are the same. For a 2-start screw, the lead is twice the pitch.

3.7

accumulated effective pitch deviation

the accumulated effective pitch minus the accumulated nominal pitch for the same angle of rotation

4 Maximum material profile

Dimensions shall comply with those given in Table 1. This profile has prescribed clearances on the major, minor and pitch diameters referring to the basic profile (see Figure 2).

5 Nominal values of pitch, lead and thread diameter

The nominal values of pitch, lead and thread diameter and their permissible combinations shall comply with the requirements of Table 2. All multi-start threads shall use multiples of the pitches specified in Table 2 and the helix angle shall not exceed 25°.

6 Accuracy class designations and requirements for assembled screws and nuts

6.1 General. Accuracy class designations and requirements shall comply with Table 3.

Clearances are expressed axially or diametrically in order to enable different measuring methods to be used, neither the nut nor the screw being permitted to rotate during measurement.

Where anti-backlash devices are used, the axial clearance is the criterion and diametral clearances greater than those stated may be used. Where half or split nuts are used, as on lathe lead screws, neither clearance applies.

6.2 Thread tolerances. In order to achieve the requirements of the various classes of accuracy, different procedures have to be adopted depending on the required accuracy.

It is unlikely that nuts and screws for assemblies to classes 4 and 10 will be made to any recognized thread tolerancing system, since the magnitude of the accumulated effective pitch deviation is the overriding factor. Nut and screw specifications will therefore need to be selected accordingly.

Certain tolerance classes derived from the basic system that is described in BS 5346 may be used as a basis for specifying the components for assemblies to classes 25, 40, 60, 100 and 160.

6.3 Nut base system. For this system the nut shall be manufactured to the tolerances given in Table 4 (i.e. tolerance class 4H on the pitch diameter); the screw is then made to suit the nut and the class of accuracy chosen.