

Specification for

Screw thread measuring cylinders

Co-operating organizations

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

- Associated Offices' Technical Committee
- Association of Consulting Engineers
- Association of Mining Electrical and Mechanical Engineers
- British Chemical Plant Manufacturers' Association
- British Compressed Air Society
- British Electrical and Allied Manufacturers' Association
- British Gear Manufacturers' Association
- British Internal Combustion Engine Manufacturers' Association
- British Iron and Steel Federation
- British Mechanical Engineering Federation
- British Railways Board
- Crown Agents for Oversea Governments and Administrations
- D.S.I.R.-National Engineering Laboratory
- Electricity Council, the Generating Board and the Area Boards in England and Wales
- Engineering Equipment Users' Association
- Gas Council
- High Commission of India
- Institute of Marine Engineers
- Institute of Petroleum
- Institution of Civil Engineers
- Institution of Gas Engineers
- Institution of Heating and Ventilating Engineers
- Institution of Mechanical Engineers
- Institution of Mechanical Engineers (Automobile Division)
- Institution of Production Engineers
- Locomotive and Allied Manufacturers' Association of Great Britain
- London Transport Board
- Machine Tool Trades Association
- Ministry of Defence, Army Department
- Ministry of Defence, Navy Department
- Ministry of Labour (H.M. Factory Inspectorate)
- Ministry of Power
- Ministry of Transport
- Ministry of Public Building and Works
- National Coal Board
- National Physical Laboratory (D.S.I.R.)
- Radio Industry Council
- Royal Institute of British Architects

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Foreword

This standard makes reference to the following British Standards:

BS 84, *Parallel screw threads of Whitworth form.*

BS 93, *British Association (B.A.) screw threads.*

BS 427, *Vickers hardness test — Part 1:1961 Testing of metals.*

BS 1580, *Unified screw threads.*

BS 3643, *Metric screw threads.*

This British Standard which relates to screw thread measuring cylinders, used in the determination of the effective diameter E of external screw threads, has been prepared under the authority of the Mechanical Engineering Industry Standards Committee in response to requests from the National Physical Laboratory and from user sources.

Thread measuring cylinders have been employed in the measurement of external screw threads for many years and their use for this purpose has long been familiar. During World War I the National Physical Laboratory established a recommended series of so-called “Best-size” cylinders for use in the measurement of screw threads of Whitworth, ISO Metric and B.A. thread forms. This series, amended and enlarged to include Unified threads, has been used extensively ever since and is still in use in this country at the present time.

In issuing this first British Standard for screw thread measuring cylinders opportunity has been taken to draw on the considerable experience gained in screw thread measurement over the years. Two grades of measuring cylinders are provided for in the standard, viz., Grade A (pitch-line) cylinders and Grade B (grouped) cylinders. Grade B cylinders are the same as the N.P.L. “Best-size” cylinders referred to above; Grade A cylinders are new and are chosen to make contact with the flanks of the screw thread under measurement very close to the pitch-line. This entails a particular size of Grade A cylinder for each form and pitch of screw thread.

SPECIAL NOTE. The introduction of Grade A (pitch-line) cylinders with their finer diametral tolerances renders the term “Best-size” (as applied to the series originally covered by the N.P.L. Schedule) anomalous, and the designation “Best-size” is therefore not recognized in this standard. 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 and ii, pages 1 to 10, 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 relates to two grades of screw thread measuring cylinders intended for use in checking external screw threads by means of pitch diameter measuring machines.

NOTE For a full description of this well established method of measuring the effective diameter of an external screw thread when using thread measuring cylinders, and also for an explanation of the P value used in this measurement, see “Notes on Applied Science No.1” issued by the Department of Scientific and Industrial Research and entitled “Gauging and Measuring Screw Threads”, published by Her Majesty’s Stationery Office.

The standard comprises two parts:

Part 1 gives the bases for the diametral tolerances of Grade A and Grade B screw thread measuring cylinders and the relative merits of the two grades.

Part 2 gives the complete specification for both grades of cylinders suitable for the forms and pitches of screw threads shown in Table 1.

2 Terminology

“Pairs” and “sets” of screw thread measuring cylinders. When two cylinders are used for measuring the effective diameter of a screw thread they are referred to in this standard as a “pair” and when three cylinders are used they are referred to as a “set”.

Part 1. Grades of cylinders

3 Tolerances and P values

a) *Grade A (pitch-line) screw thread measuring cylinders.* Grade A cylinders nominally make contact with the flanks of the screw thread on the pitch line; it follows that a pair (or a set) will be required for each pitch and form of screw thread to be measured. A diametral tolerance of $\pm 0.000\ 02$ in from nominal size is allowed. It is intended that the P value associated with Grade A cylinders should be calculated on the nominal diameter of the cylinders used, regardless of where their actual diameters lie within the $\pm 0.000\ 02$ in tolerance zone.

NOTE Should the actual diameters of a pair or set of Grade A cylinders all happen to fall on the upper or on the lower limit of the $\pm 0.000\ 02$ in tolerance zone, then the basing of the P value on the nominal diameter of the thread measuring cylinder could give rise to an error of $0.000\ 02$ inches in the measured effective diameter of Whitworth, Unified and ISO Metric threads, and $0.000\ 03$ inches in the case of B.A. threads. These small inaccuracies of measurement, which only occur in extreme cases, are considered to be insignificant; they could of course be entirely eliminated, if desired, by calculating the P value using the actual mean diameter of the thread measuring cylinders instead of the nominal diameter.

b) *Grade B (grouped) screw thread measuring cylinders (original N.P.I. “Best-size” cylinders).* Grade B cylinders have larger diametral tolerances than those of Grade A to enable an individual pair or set to be used for measuring a specified range of screws of different form and pitch.

Their diametral tolerances are controlled, so as to allow them to make contact with the flanks of the thread anywhere within a distance on each side of the pitch-line equal to one-twentieth of the length of the straight portion of the flank. (This requirement is modified slightly for screw threads of Unified and ISO Metric form; for these threads the cylinders make contact with the flanks anywhere within a distance on each side of the pitch line equal to one-tenth of the length of the straight portion *above the pitch-line*.)

Calculating the diametral tolerance zones on the above basis for cylinders to be used on threads of Whitworth, Unified, ISO Metric and B.A. forms, reveals that the zones for some thread forms overlap. Thus it is possible to select a restricted tolerance zone which is common for threads of different form which can be served by a single pair (or set) of cylinders. The details relating to Grade B cylinders given in Table 7 have been worked out on this basis.

Sometimes a pair or set of Grade B cylinders is purchased for the measurement of a screw thread of one form only. In this case the permitted diametral tolerance band for the cylinders is calculated for the particular form of screw thread in question, using the appropriate formula given in Table 8.

The P value to be associated with a pair or set of Grade B cylinders is calculated on the *mean* of the measured diameters of the two or three cylinders concerned.

When Grade B cylinders are used to measure a screw thread whose flank angles are in error by as much as the full equivalent of the tolerance allowed on the effective diameter of the thread, the error which could arise in measuring the effective diameter (on the assumption that the flank angles were correct) could, in the extreme case, be about one-tenth of the tolerance allowed on that diameter.