

Specification for

# Micrometer heads

Confirmed  
February 2012

## 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:—

Admiralty  
 Air Ministry  
 Associated Offices Technical Committee  
 Association of Consulting Engineers Incorporated  
 British Chemical Plant Manufacturers' Association  
 British Compressed Air Society  
 British Electrical and Allied Manufacturers' Association  
 British Engineers' Association  
 British Internal Combustion Engine Manufacturers' Association  
 British Iron and Steel Federation  
 British Railways, The Railway Executive  
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 Locomotive Manufacturers' Association  
 Machine Tool Trades' Association  
 Ministry of Labour and National Service  
 Ministry of Supply  
 Ministry of Transport  
 Ministry of Works  
 Office of the High Commissioner for India  
 War Office

This British Standard, having been approved by the Mechanical Industry Standards Committee and endorsed by the chairman of the Engineering Divisional Council, was published under the authority of the General Council on 16 April 1951

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### Amendments issued since publication

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## Foreword

Other British Standards for engineers' precision tools are as follows:—

BS 817, *Cast iron surface plates and tables.*

BS 818, *Cast iron straightedges.*

BS 852, *Toolmakers' straightedges.*

BS 863, *Steel straightedges of rectangular section.*

BS 869, *Toolmakers' flats and high precision surface plates.*

BS 887, *Vernier callipers.*

BS 888, *Slip (or block) gauges and their accessories.*

BS 906, *Engineers' parallels (steel).*

BS 907, *Dial gauges for linear measurements.*

BS 939, *Engineers' squares.*

BS 957, *Feeler gauges.*

BS 958, *Precision levels.*

BS 959, *Internal micrometers.*

BS 1054, *Engineers' comparators.*

BS 1643, *Vernier height gauges.*

BS 1685, *Bevel protractors.*

BS 1790, *Combination length bars.*

This British Standard for micrometer heads has been prepared under the authority of the Mechanical Engineering Industry Standards Committee in response to a request received from the Institution of Production Engineers and is a further development of work which was done in connection with the revision of BS 870, "*External micrometers.*" The standard relates to micrometer heads supplied independently for assembly with measuring tools or machine tools. It forms one of a series of specifications for engineers' precision tools which has been prepared with the co-operation of the manufacturers and in close collaboration with the National Physical Laboratory.

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.

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### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 5 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

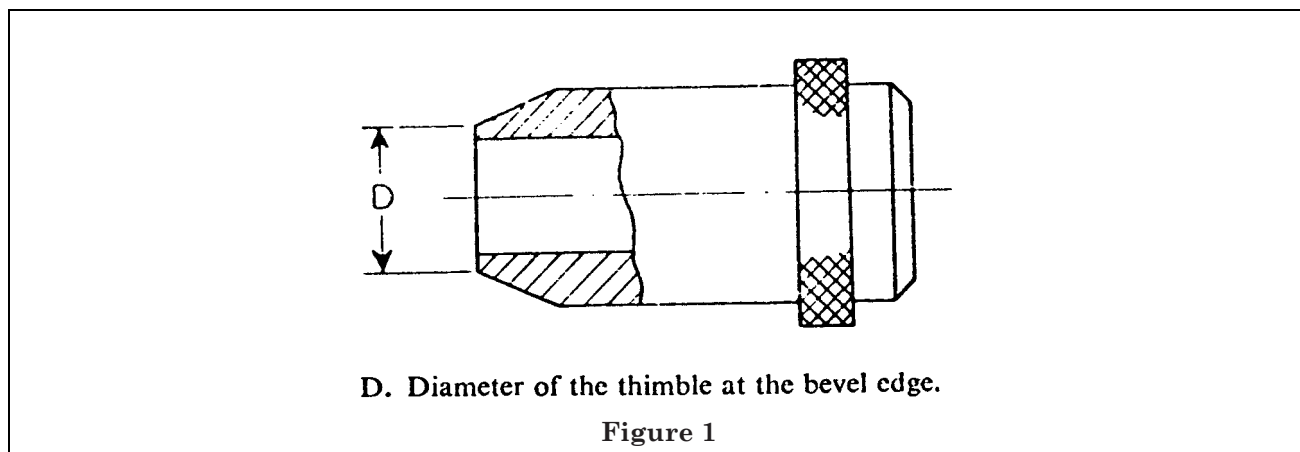
This British Standard relates to micrometer heads having measuring ranges of:

- a)  $\frac{1}{2}$  in.
- b) 1 in.
- c) 13 mm.
- d) 25 mm.

It applies to micrometer heads with rotatable spindles and with non-rotatable spindles, classed according to the following ranges of thimble diameter (dia. D, Figure 1):—

- Type 1 Below 1 in. thimble diameter.  
 Type 2 1 in. and below 2 in. thimble diameter.  
 Type 3 2 in. thimble diameter and over.

NOTE Micrometer heads of the larger types with non-rotatable spindles may be supplied to special orders with dimensions approximately similar to those given in Table 2 and to an accuracy similar to that shown in Table 4



## 2 Nomenclature

For the purpose of this standard the nomenclature given in Figure 2 has been adopted.

## 3 Material

The barrels and thimbles, if of Type 1, shall be of a suitable quality steel; if they are of larger diameter they may be made of a suitable light alloy.

The spindle shall be of high grade tool steel. Its measuring face shall be hardened to not less than 800 D.P.N.<sup>1)</sup> The measuring face may be tipped with tungsten carbide or other suitable hard material.

## 4 Micrometer screw

The micrometer screw shall have a pitch of  $\frac{1}{40}$  of an inch, or of 0.5 mm.

NOTE It is recommended that the threads of the screw and nut be truncated so as to confine contact to the flanks of the thread.

## 5 Spindle

The front parallel portion of the spindle of micrometer heads with rotatable spindles shall be a good free turning fit in its bush without appreciable shake. There shall be at least one turn over-run at each end of the screw beyond the graduated range. The micrometer head shall be supplied with the spindle and screw lubricated with a thin light non-corrosive oil, and in this condition the spindle shall run freely and smoothly throughout the length of its travel. There shall be no perceptible backlash between the spindle screw and nut.

When the micrometer head is at its maximum reading there shall still be full engagement of the nut and micrometer screw.

<sup>1)</sup> The approximate equivalent hardness number on the Rockwell C scale is 62.

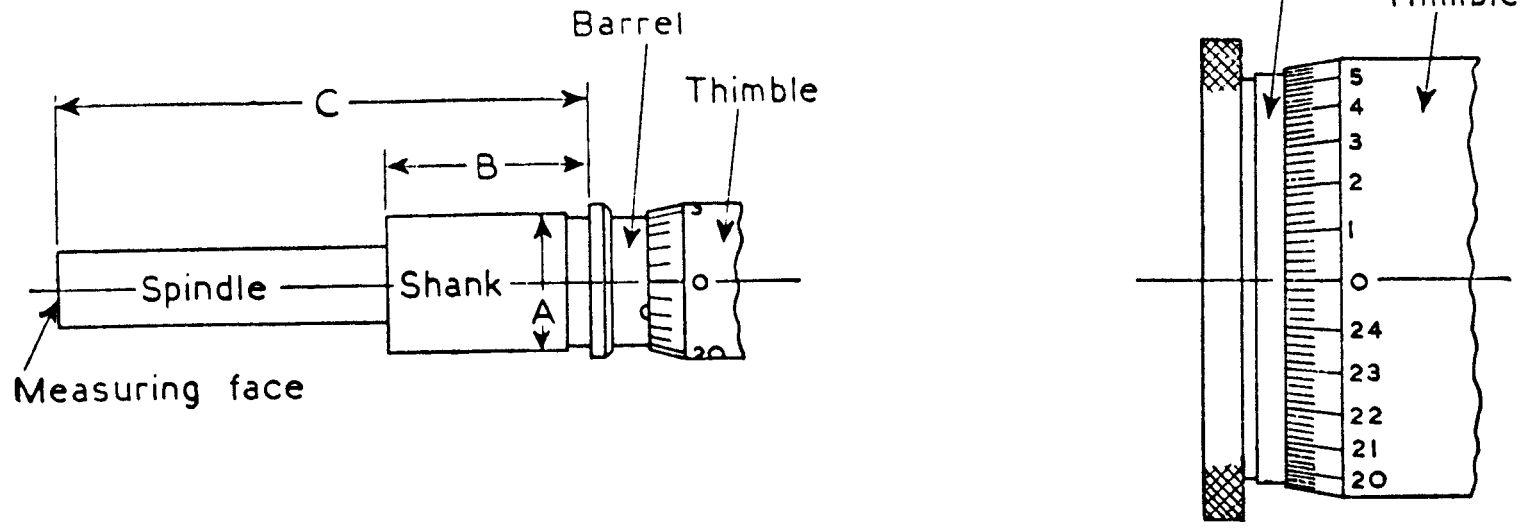


Figure 2 — Nomenclature for micrometer heads

If a spindle clamp is provided on Type 1 micrometer heads, the design shall be such that it effectively locks the spindle without resulting in an alteration of measurement greater than 0.0001 in., or 0.003 mm.

If a friction or ratchet drive is fitted to the spindle, the force it exerts shall lie between  $1\frac{1}{2}$  lb. and  $2\frac{1}{4}$  lb.

NOTE It is not customary to fit friction or ratchet drives to Types 2 and 3 micrometer heads as these are generally used in conjunction with a fiducial indicator.

The projection of the spindle (dimension C, Figure 2) shall be in accordance with Column 5 of Table 1 and Table 2.

## 6 Thimble and barrel

The thimble and barrel may be of Type 1 diameter or may be of the larger type (see Figure 2). In the case of micrometer heads having  $\frac{1}{2}$  in. or 13 mm. range of measurement the diameter of the graduated edge of the thimble (dimension D, Figure 1) shall be not less than  $\frac{3}{8}$  in. and in the case of micrometer heads having 1 in. or 25 mm. range of measurement this diameter shall be not less than  $\frac{7}{16}$  in.

It is recommended that, for ease of reading, the angle of the bevel (angle  $\alpha$  Figure 3) should be  $15^\circ$  but in no case shall this angle be more than  $20^\circ$ . The distance from the outside of the barrel to the reading end of the graduation on the thimble (dimension B, Figure 3) shall not exceed 0.015 in.

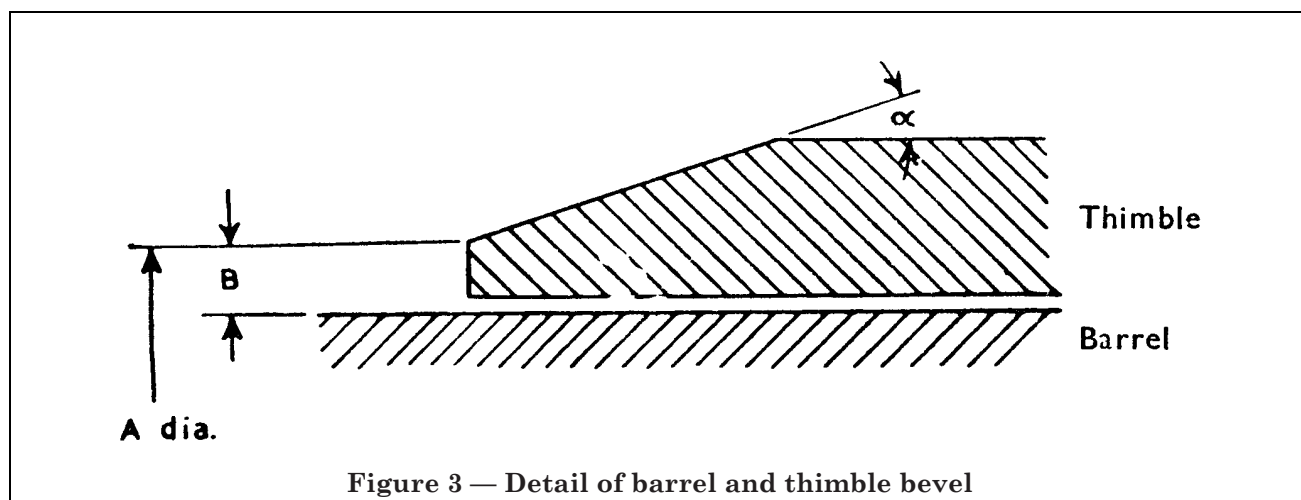


Figure 3 — Detail of barrel and thimble bevel

## 7 Graduations

The thimble shall be graduated to read in the units shown in Columns 6 and 7 of Table 1 and Table 2.

NOTE A vernier enabling readings to be taken to 0.0001 in. may be incorporated in Type 1 micrometer heads if required.

All graduation lines shall be clearly cut. In the case of Type 1 micrometer heads the graduation lines on the thimble and the fiducial line, and vernier lines when applicable, on the barrel shall have a width of not less than 0.006 in. and not more than 0.008 in. For larger heads the thickness of the graduation lines on the thimble and the fiducial line on the barrel shall be approximately one-fifth of the distance between the adjacent lines with a minimum thickness of 0.004 in.

Whilst the thickness of the remaining graduations on the barrel for all types is not of prime importance, it is recommended that these graduations should not vary in thickness from the others by an obvious amount.

NOTE It is recommended that, for ease of reading, the surfaces of the thimble and barrel should have a dull finish and that the graduation lines should be blackened in.

## 8 Adjustments

Each micrometer head shall be provided with means for adjusting the zero setting and for compensating for wear between the screw and nut.

On Types 2 and 3 micrometer heads provision shall be made for adjusting the zero setting by turning the barrel, which shall be a stiff friction fit.

Both adjustments shall be such that they remain secure after setting and do not impair the original accuracy of the instrument. Suitable spanners or keys shall be supplied for these adjustments.

**Table 1 — Dimensions for Type 1 micrometer heads with rotatable spindles**

1	2	3	4	5	6	7
Diameter of thimble	Measuring range	Diameter of shank A	Length of shank B	Projection of spindle C	Unit of thimble graduations	
		Tolerance +0.0000 -0.0004		Tolerance +0.000 -0.005	English	Metric
Type 1 Below 1 in.	1/2 in. or 13 mm.	0.375	3/8	1	in.	mm.
Type 1 Below 1 in.	1 in. or 25 mm.	0.500	3/4	2	in.	mm.

<sup>a</sup> 0.0001 by vernier if required.

**Table 2 — Dimensions for Types 2 and 3 micrometer heads with rotatable spindles**

1	2	3	4	5	6	7
Diameter of thimble	Measuring range	Diameter of shank A	Recommended length of shank B	Recommended projection of spindle C	Unit of thimble graduations	
		Tolerance +0.0000 -0.0002		Tolerance +0.000 -0.005	English	Metric
Type 2 1 in. and below 2 in.	1 in. or 25 mm.	0.500 or 0.5625	in. 3/4 or 1 3/8	in. 2 <sup>a</sup>	in.	mm.
Type 3 2 in. and over	1 in. or 25 mm.	0.500 or 0.5625	3/4 or 1 3/8	2 <sup>a</sup>	in.	mm.

<sup>a</sup> 2<sup>5</sup>/<sub>8</sub> in. where length of shank is increased to 1 3/8 in.

## 9 Measuring face

In the case of 1/2 in. and 13 mm. range micrometer heads the measuring face of the spindle shall be not less than 3/16 in. in diameter. In the case of 1 in. and 25 mm. range micrometer heads the measuring face of the spindle shall be not less than 1/4 in. in diameter.

The measuring face shall be finished by lapping and shall be flat to within the tolerances given in Column 2 of Table 3 and Table 4 and square to within the tolerances given in Columns 3 and 4 of Table 3 and Table 4.

## 10 Accuracy

When tested at the standard reference temperature of 68 °F. each micrometer head shall comply with the tolerances given in Table 3 and Table 4.

*Repetition of reading.* Micrometer heads of Types 1 and 2 shall be capable of repetition of reading over any portion of the scale to 0.000 05 in. (0.001 mm.). Type 3 micrometer heads shall be capable of repetition of reading over any portion of the scale to 0.000 02 in. (0.0005 mm.).



Table 3 — Maximum permissible errors for Type 1 micrometer heads

1	2	3	4	5
Diameter of thimble	Flatness of measuring face	Squareness of measuring face to axis of spindle (measured over diameter of face)	Squareness of measuring face to outside diameter of shank (measured over diameter of face)	Maximum error of traverse of measuring face at any position
Type 1 Below 1 in.	0.000 05 in. (0.001 mm.)	0.000 05 in. (0.001 mm.)	0.0003 in. (0.008 mm.)	0.0001 in. (0.003 mm.)

Table 4 — Maximum permissible errors for Types 2 and 3 micrometer heads

1	2	3	4	5
Diameter of thimble	Flatness of measuring face	Squareness of measuring face to axis of spindle (measured over diameter of face)	Squareness of measuring face to outside diameter of shank (measured over diameter of face)	Maximum error of traverse of measuring face at any position
Type 2 1 in. and below 2 in.	0.000 03 in. (0.0008 mm.)	0.000 03 in. (0.0008 mm.)	0.0001 in. (0.003 mm.)	0.0001 in. <sup>a</sup> (0.003 mm.) <sup>a</sup>
Type 3 2 in. and over	0.000 02 in. (0.0005 mm.)	0.000 03 in. (0.0008 mm.)	0.000 03 in. (0.0008 mm.)	0.0001 in. <sup>a</sup> (0.003 mm.) <sup>a</sup>

<sup>a</sup> The periodic error shall not exceed  $\pm 0.000 05$  in. ( $\pm 0.001$  mm.) for Type 2 micrometer heads and  $\pm 0.000 02$  in. ( $\pm 0.0005$  mm.) for Type 3 micrometer heads.

## 11 Case

Each micrometer head shall be supplied in a suitable protective case or box.

## 12 Packing

As a protection against climatic conditions each micrometer head shall be coated with a suitable thin non-corrosive light oil and shall be securely wrapped in suitable wrapping material.

## 13 Marking

Each micrometer head shall have legibly and permanently marked upon it, in characters not less than 0.025 in. high, the manufacturer's name or trade mark.

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