BRITISH STANDARD

BS 3064:1978

Specification for

# Metric sine bars and sine tables (excluding compound tables)

Confirmed
February 2012

UDC 621.753:531.745

# Cooperating organizations

The Mechanical Engineering Standards Committee, under whose direction 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 Hydraulic Equipment Manufacturers
Association of Mining Electrical and Mechanical Engineers
British Compressed Air Society
British Electrical and Allied Manufacturers' Association (BEAMA)
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British Internal Combustion Engine Manufacturers' Association
British Pump Manufacturers' Association
British Steel Corporation
Chartered Institution of Building Services
Crown Agents for Oversea Governments and Administrations
Department of the Environment
Department of Industry (Mechanical Engineering)
Department of Industry (National Engineering Laboratory)
Department of Trade (Marine Division)
Department of Transport
Electricity Supply Industry in England and Wales
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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:

Department of Industry (National Physical Laboratory)
Department of Prices and Consumer Protection (British Calibration Service)
Gauge and Tool Makers' Association

This British Standard, having been prepared under the direction of the Mechanical Engineering Standards Committee, was published under the authority of the Executive Board on 31 January 1978



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The following BSI references relate to the work on this standard:
Committee reference MEE/59
Draft for comment 73/30909 DC

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**Amendments issued since publication**

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# Contents

# Foreword

This British Standard has been prepared under the direction of the Mechanical Engineering Standards Committee and was first published in 1959 in response to requests from the National Physical Laboratory and from users.

The original edition showed both metric and imperial dimensions but, as part of the BSI policy of producing purely metric standards, this new edition of the standard has been published.

It provides for sine bars and for sine tables inclinable about a single axis; design requirements are confined to essentials, but the desired accuracy of manufacture is fully specified in order to ensure the suitability of the sine bars and tables for use as precision measuring equipment.

Inspection and certification of sine bars may be undertaken by laboratories approved by the British Calibration Service; addresses can be obtained on application to the Superintendent, British Calibration Service, National Physical Laboratory, Teddington, Middlesex, TW11 0LW.

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 6, 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.

# Section 1. General

## 1 Scope

This British Standard specifies requirements for metric sine bars and sine tables, excluding compound tables.

Section 2 provides for four types of sine bar, illustrated in Figure 1, made in sizes of 100 mm, 200 mm and 300 mm.

NOTE Bars of 50 mm width and over are often referred to as sine plates.

Section 3 provides for sine tables inclinable about a single axis in sizes of 100 mm, 200 mm, 300 mm and 500 mm.

## 2 References

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

## 3 Nomenclature and definitions

For the purposes of this British Standard the nomenclature given in Figure 1 and Figure 2 has been adopted and the following definitions apply.

**3.1**
**designating size**

the center distances between the rollers

**3.2**
**flatness tolerance**

the maximum distance between two parallel planes within which the surface under consideration shall lie

**3.3**
**squareness tolerance of surfaces**

the distance between two parallel planes that are perpendicular to the plane in contact with the datum surface and within which the surface under consideration shall lie

**3.4**
**parallelism tolerance of surfaces**

the distance between two planes that are parallel to the plane in contact with the datum surface and within which the surface under consideration shall lie

# Section 2. Sine bars

## 4 General design

**4.1** The general form of the sine bars shall be basically in accordance with that shown for any one of the four types illustrated in Figure 1.

**4.2** Precautions should be taken in the design to ensure that the method of attachment of the rollers does not distort the sine bar or rollers in any way.

NOTE When sine bars are provided with tapped holes, it is recommended that they be of M6 size.

## 5 Material and manufacture

Sine bars, including rollers and hinge blocks, shall be made of high quality steel. Their surfaces shall have a hardness of not less than 750HV, when tested in accordance with BS 427-1. The various items shall be given an adequate stabilizing treatment.

## 6 Finish

All working surfaces of the items of the sine bar shall have a finely ground, or preferably lapped, finish in keeping with the tolerances specified in clause **7**. Non-working surfaces shall be clearly and permanently distinguishable by their type of finish. The rollers should be ground on centres to ensure freedom from lobbing.

## 7 Accuracy

### 7.1 Upper and lower surface

**7.1.1** The whole of the upper surface of the bar and its lower surface, if a working surface, shall be flat within

0.0015 mm for 100 mm bars

0.002 mm for 200 mm bars

0.003 mm for 300 mm bars

**7.1.2** The lower surface, if a working surface, shall be parallel to the upper surface to within

0.0015 mm for 100 mm bars

0.002 mm for 200 mm bars

0.003 mm for 300 mm bars

**7.2 Side faces.** The side faces of the bars shall be:

a) flat within

0.004 mm for 100 mm bars

0.005 mm for 200 mm bars

0.006 mm for 300 mm bars;

b) square to the upper surface of the bar within 0.0025 mm per 25 mm;

c) square to the axis of the hinge roller within 0.013 mm per 25 mm measured in the plane common to the axes of the rollers.

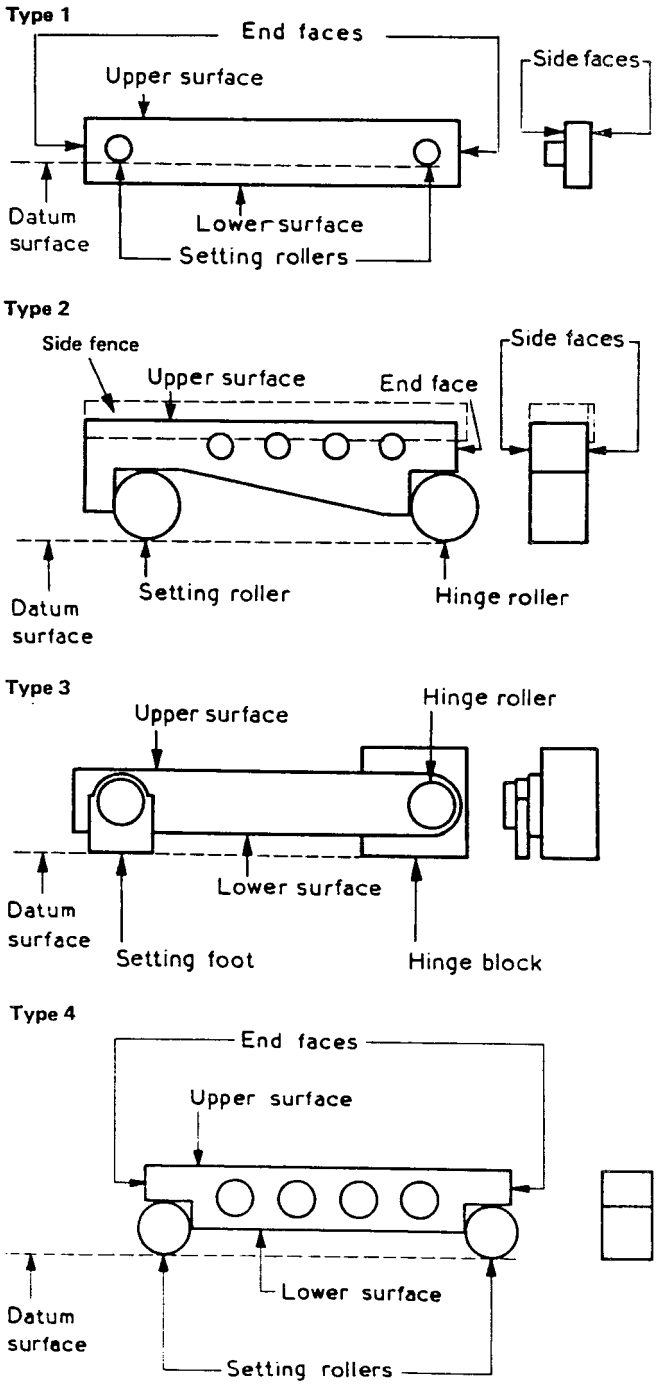
NOTE In the case of type 1 bars, requirement c) applies to both rollers.

**7.3 End faces.** The end faces, when intended as working surfaces, shall be:

a) flat within 0.0025 mm;

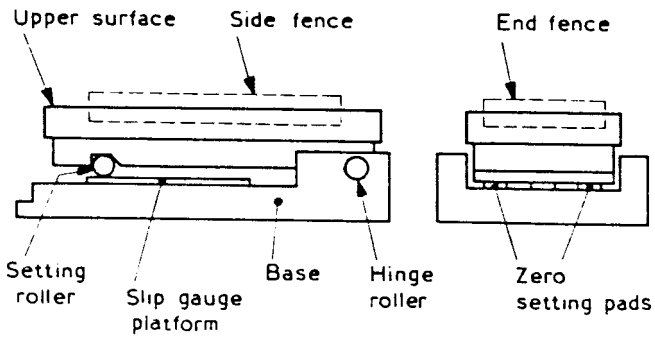
b) square to the upper surface of the bar within 0.0025 mm per 25 mm;

c) parallel to the axis of the hinge roller within 0.013 mm per 25 mm.




These illustrations show basic types of sine bars. They are diagrammatic only and are not intended to illustrate detail of design.

**Figure 1 — Sine bars: types and nomenclature**




The illustration is diagrammatic only and is not intended to illustrate details of design.

**Figure 2 — Sine table: nomenclature**

**7.4 Setting and hinge rollers**

**7.4.1** Individual rollers shall be uniform in radius within 0.002 mm and straight over their length to the same accuracy.

**7.4.2** The mean diameters of the rollers on bars of types 1, 2 and 4 shall be equal to each other within 0.0025 min.

**7.5 Roller axes**

**7.5.1** The distance between the roller axes shall everywhere agree with the designating size of the bars within

0.0025 mm for 100 mm bars

0.005 mm for 200 mm bars

0.008 mm for 300 mm bars

**7.5.2** For all sizes of bars, the roller axes shall lie in a common plane within 0.002 mm over the length of either roller.

**7.5.3** The upper surface, and the lower, if a working surface, shall be parallel to the plane tangent to the lower surface of the rollers within 0.002 mm.

**7.5.4** In addition to complying with the foregoing requirements, a type 3 sine bar shall also comply with the following requirements.

a) The bearing surface of the setting foot and the hinge block shall be flat within 0.0025 mm.

b) When a type 3 bar is placed on a flat datum surface, it shall be free from rock and its upper surface, and lower surface, if a working surface, shall be parallel to the datum surface within

0.0015 mm for 100 mm bars

0.0020 mm for 200 mm bars

0.0030 mm for 300 mm bars

**7.6 End and side fences.** Sine bars may be supplied with end and side fences. The working surfaces of end and side fences shall be flat within 0.005 mm, when attached.

## 8 Protection

**8.1** Each sine bar shall be supplied in a suitable case, strongly constructed and designed to protect the working surface and prevent the ingress of dust.

**8.2** All surfaces of the sine bar shall be protected against climatic conditions by being covered with a suitable corrosion preventive preparation.

## 9 Marking

Each bar shall have legibly and permanently marked upon it the following particulars:

a) designating size of bar;

b) the number of this British Standard (i.e. BS 3064);

c) an identification number;

d) the manufacturer's name or trade mark.

NOTE The mark BS 3064 on the product is an indication by the manufacturer that the goods purport to comply with the requirements of this British Standard.

## Section 3. Sine tables inclinable about a single axis

## 10 General design

**10.1** The essential features of a sine table inclinable about a single axis, as illustrated in Figure 2, are a base, provided with a slip gauge platform, and a work table having a setting roller at one end and a hinge roller at the other. At least one end and one side fence shall be provided.

**10.2** The height of the slip gauge platform shall be such as to require the insertion of a setting slip gauge in order to bring the upper surface of the work table parallel with the base. The size of the setting slip gauge shall be indicated and shall be not less than 3 mm.

**10.3** The provision of tapped holes or tee slots in the work table for clamping purposes is an optional requirement.

**10.4** When tapped holes are provided it is recommended that they be M6 for tables up to and including 300 mm and M10 for the 500 mm table. The drilling and tapping operations should be carried out before the surface of the table is finished and the holes should be countersunk.

**10.5** Where tee slots are provided, these should be in accordance with BS 2485 to take M6 bolt sizes for tables up to 300 mm and M10 bolt sizes for 500 mm tables.

## 11 Material and manufacture

**11.1 General.** The base, work table and fences shall be of close-grained plain, or alloy cast iron, in accordance with BS 1452, grade 180 or higher, or of steel. The material shall be sound and free from defects and the parts in question shall be given a suitable heat treatment to relieve internal stresses, or to harden and stabilize them, as appropriate.

**11.2 Cast iron.** Good quality close-grained plain, or alloy cast iron shall be used, sound and free from blow holes and porous patches. Minor defects in the top surface should be repaired by plugging with material of composition similar to the plate.

**11.3 Steel.** If made of steel, the base, work table and fences shall be hardened and stabilized; when finished, the working surfaces shall have a hardness of not less than 750HV, when tested in accordance with BS 427-1.

**11.4 Hinge and setting rollers.** The hinge and setting rollers shall be of high quality steel. They shall be hardened and, when finished, shall have a hardness of not less than 750HV, when tested in accordance with BS 427-1.

## 12 Finish

The quality of the workmanship and finish shall conform to that customary for precision instruments of this class and shall conform to the tolerances shown in Table 1, Table 2 and Table 3. All working surfaces shall be finely ground or scraped; the hinge and setting rollers, after hardening, shall have a finely ground, or preferably lapped, finish. Non-working surfaces shall be clearly and permanently distinguishable by their type of finish.

## 13 Rigidity

In the horizontal position, the construction of the table shall be such that the deflection of the upper surface shall be not greater than the amount shown in Table 1 when the load shown is carried.

**Table 1 — Angular deflection**

| Designating size | Load | Angular deflection |
|---|---|---|
| mm | kg | ″ |
| 100 | 5 | 4 |
| 200 | 10 | 4 |
| 300 | 15 | 4 |
| 500 | 25 | 4 |

## 14 Base

The under surface of the base shall have not less than 20 % bearing area, evenly distributed, as shown by a rubbing test. When the base is placed on a grade A surface plate, the sine table shall not rock.

## 15 Accuracy

**15.1 Gauge block platforms.** The flatness of the gauge block platform and its parallelism to the under surface of the base shall lie within two parallel planes, as shown in Table 2.

**Table 2 — Parallelism of gauge block platform**

| Designating size | Tolerance on parallelism |
|---|---|
| mm | mm |
| 100 | 0.001 |
| 200 | 0.002 |
| 300 | 0.003 |
| 500 | 0.005 |

When two gauge platforms are provided they shall be co-planar within 0.001 mm.

**15.2 Upper surface of the work table.** The tolerances on flatness of the upper surface and its parallelism to the plane on which the sine table rests are given in Table 3.

**Table 3 — Parallelism of upper surface**

| Designating size | Tolerance on flatness and parallelism |
|---|---|
| mm | mm |
| 100 | 0.004 |
| 200 | 0.004 |
| 300 | 0.005 |
| 400 | 0.006 |

**15.3 End and side faces.** At least two adjacent faces of the table shall be:

a) flat within 0.005 mm for 100, 200 and 300 mm tables; 0.006 mm for 500 mm tables;

b) mutually square and square to the upper surface of the work table within 0.0025 mm per 25 mm;

c) square or parallel to the axis of the hinge roller within 0.013 mm over the length of the roller.

**15.4 Setting and hinge rollers.** Individual rollers shall be uniform in radius within 0.002 mm and straight over their length to the same accuracy.

**15.5 Roller axes**

**15.5.1** The distance between the roller axes shall everywhere agree with the designating size of the tables within

0.0025 mm for 100 mm tables

0.005 mm for 200 mm tables

0.006 mm for 300 mm tables

0.013 mm for 500 mm tables

**15.5.2** The roller axes shall be in a common plane within 0.001 mm per 25 mm length over the length of either roller.

**15.5.3** The roller axes shall be parallel to, and equidistant from, the upper surface of the work table to within 0.001 mm per 25 mm length of roller.

**15.6 End and side fences.** The working surfaces of end and side fences, when attached, shall be flat within 0.005 mm.

## 16 Protection

**16.1** A suitable case or protective cover shall be provided.

**16.2** All surfaces of the sine table shall be protected against climatic conditions by being covered with a suitable corrosion preventive preparation.

## 17 Marking

Each sine table shall have legibly and permanently marked upon it the following particulars:

a) designating size of table;

b) the number of this British Standard (i.e. BS 3064);

c) an identification number;

d) the manufacturer's name or trade mark.

NOTE The mark BS 3064 on the product is an indication by the manufacturer that the goods purport to comply with the requirements of this British Standard.

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# Publications referred to

BS 427, *Method for Vickers hardness test.*
BS 427-1, *Testing of metals.*
BS 1452, *Grey iron castings.*
BS 2485, *Tee slots, tee bolts, tee nuts and tenons.*

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