BS 4311-2:2009

BSI British Standards

Gauge blocks manufactured to imperial specification –

Part 2: Accessories

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Contents

Summary of pages
This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 12, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 4311-2 is published by BSI and came into effect on 30 June 2009. It was prepared by Technical Committee TDW/4, *Technical product realization*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

BS 4311-2:2009 supersedes BS 4311-2:1994, which was withdrawn with the publication of BS 4311-1:2007+C1:2009.

Relationship with other documents

BS 4311-2:2009 is associated with BS EN ISO 3650:1999, which specifies the most important design and metrological characteristics of gauge blocks with a rectangular cross-section and a nominal length l_n ranging from 0,5 mm to 1 000 mm. BS 4311-2:2009 is also associated with BS 4311-1:2007+C1:2009, which addresses the requirements for the ongoing support for gauge blocks manufactured to the imperial system.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

A comma, rather than a full point, has been used as the decimal indicator throughout this British Standard in order to align it with the Geometrical Product Specifications referenced in Clause **2**. Care should be taken when using this publication in conjunction with other British Standards.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

0 Introduction

The use of gauge blocks for measuring and for calibrating measuring instruments can be extended by accessories of the types specified in this standard. For instance pairs of Type A and Type B jaws are specified which, when combined with gauge blocks, form an external or an internal calliper.

Other accessories specified in this standard are a robust base that can be used to convert a stack of wrung gauge blocks into a height gauge; and a centre point and an edged tool for scribing arcs of precise radius. The various items are provided with wringing surfaces suitable for wringing to gauge blocks, and holders are available for supporting the wrung gauge block stacks when in use.

The accuracy of measurements obtained when using the accessories is influenced by the manner of their use, e.g. reduction of flexure in calliper jaws, better flatness of the datum surface on which the base is located, and avoidance of local wear, particularly on the scribing tool and the Type A jaws, are all ways of improving the accuracy which can be achieved.

1 Scope

This British Standard specifies requirements for accessories intended for use with metric and inch gauge blocks conforming to BS EN ISO 3650 and BS 4311-1:2007+C1:2009, and includes two types of measuring jaw (Type A and Type B), scriber points and centre points, bases and holders. Requirements for general dimensions and the form, material, surface finish and accuracy of various features are specified.

Examples of typical assemblies of accessories are shown in Figure 1 and notes on their use are given in Annex A.

Annex B gives details of other items which may be used with gauge blocks and accessories.

NOTE Type B jaws, scriber points, centre points and holders specified for metric gauge blocks are fully compatible with gauge blocks in inch units.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 4311-1:2007+C1:2009*, Gauge blocks manufactured to imperial specification – Part 1: Specification and validation*

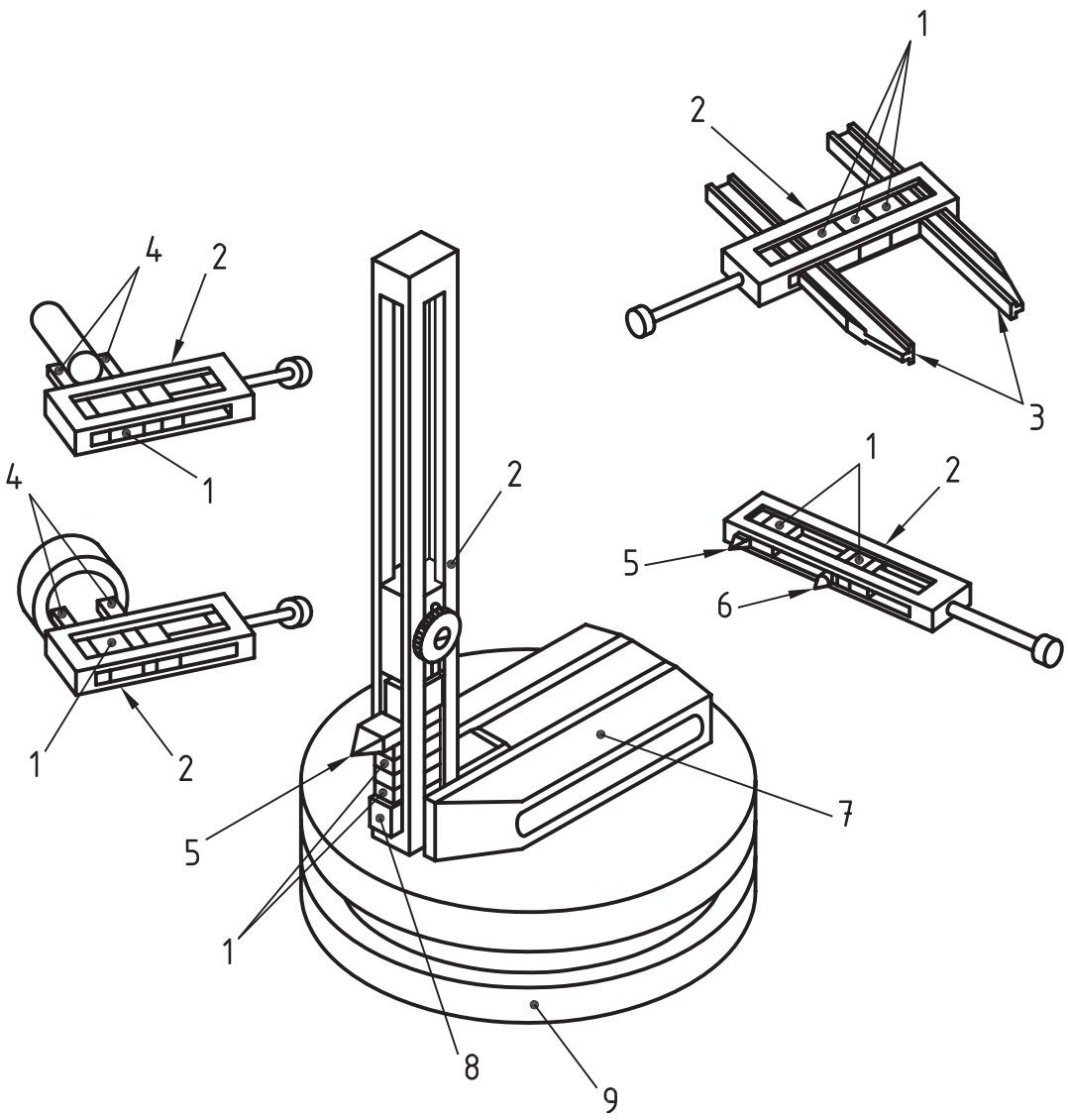
BS EN ISO 3650*, Geometrical product specifications (GPS) – Length standards – Gauge blocks*

BS EN ISO 6507-1*, Metallic materials – Vickers hardness test – Part 1: Test method*

3 Terms and definitions

For the purposes of this part of BS 4311, the terms and definitions given in BS EN ISO 3650 and BS 4311-1 apply.

Figure 1 **Examples of assemblies of gauge block accessories**



Key

1	Gauge block(s)	6	Centre point
2	Holder	7	Base
3	Measuring jaws (Type B)	8	Platform
4	Measuring jaws (Type A)	9	Toolmaker's flat or surface plate (not an accessory)
5	Scriber point		

4 Material for accessories, other than the guide plates of holders

Accessories shall be of high grade steel or other wear-resistant material equivalent to that of steel, having a hardness of not less than 750 HV. When steel is used the accessories shall be hardened to not less than 750 HV when tested in accordance with BS EN ISO 6507-1.

The accessories shall be heat-treated to stabilize the material.

NOTE 1 The guide plates of holders can be of steel or other wear-resistant material equivalent to that of steel having a hardness of not less than 250 HV.

NOTE 2 Approximate equivalent hardness values for other hardness scales are specified in BS EN ISO 18265.

5 Type A measuring jaws

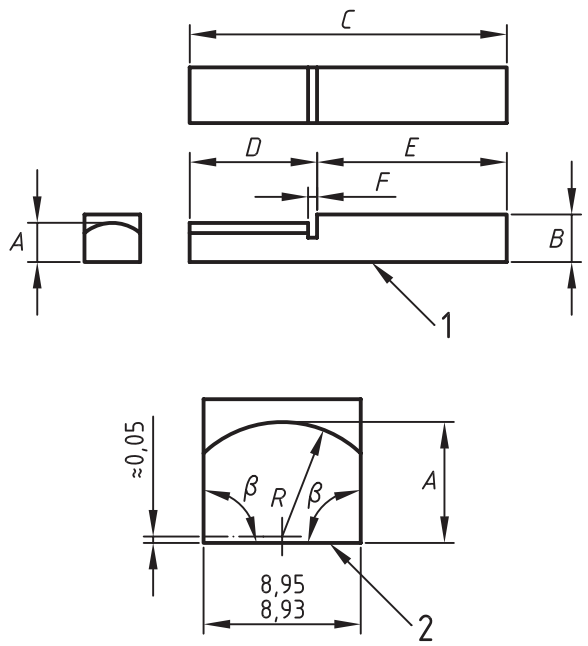
5.1 General

The form and dimensions of Type A measuring jaws shall be as specified in Figure 2 and Table 1.

NOTE These jaws are usually supplied in pairs for internal or external measurements.

Figure 2 **Type A jaws**

Dimensions in millimetres



Key

1 Wringing face

2 End elevation enlarged

Table 1 **Dimensions of Type A jaws**

Recommended nominal dimension (unit of length)		**Approximate dimensions**				
inch	mm	mm				
A	***A***	***B***	***C***	***D***	***E***	***F***
0,1	2	7,5	40	6	34	1,0 (rad. or undercut)
0,2	5	7,5	45	15	30	1,5
0,25	—	7,5	50	20	30	1,5
—	8	12,5	50	20	30	1,5
—	12,5	12,5	75	45	30	20

5.2 Finish and accuracy

The wringing faces shall be finished by high grade lapping and shall have a deviation from flatness not greater than 0,000 3 mm within any 35 mm length.

For each jaw, dimension *A* (Table 1) shall be a nominal length $^{+0,001}_{0}$ mm. Angle *ß* (Figure 2) shall be 90° $^{0'}_{-10'}$.

Additionally, when the pair of jaws is wrung over an interposed gauge block having a nominal length approximately equal to dimension *A* and aligned along one side, the maximum error in the overall length shall be not greater than + 0,001 mm.

NOTE 1 In manufacture this tolerance may be achieved by positioning the centre for the radius R midway between the side faces to within 0,025 mm.

NOTE 2 These jaws should not be used for the accurate measurement of internal diameters less than 3A.

6 Type B measuring jaws

6.1 General

The form and dimensions of Type B measuring jaws shall be as specified in Figure 3.

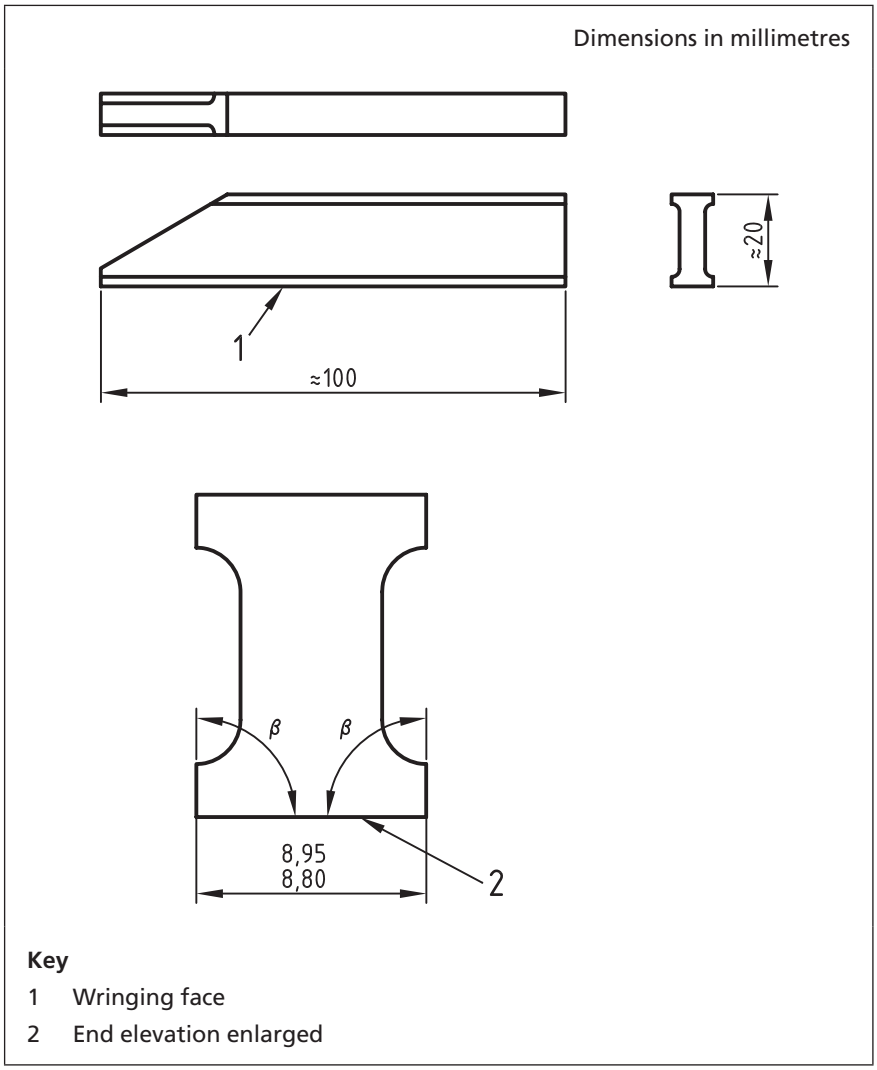
NOTE These jaws are usually supplied in pairs for external measurements.

6.2 Finish and accuracy

The wringing faces shall be finished by high grade lapping and shall have a deviation from flatness not greater than 0,000 3 mm within any 35 mm length.

Angle β shall be $90° \, {}^{0'}_{-10'}$.

Figure 3 **Type B jaws**



Key

1 Wringing face

2 End elevation enlarged

7 Scriber point and centre point

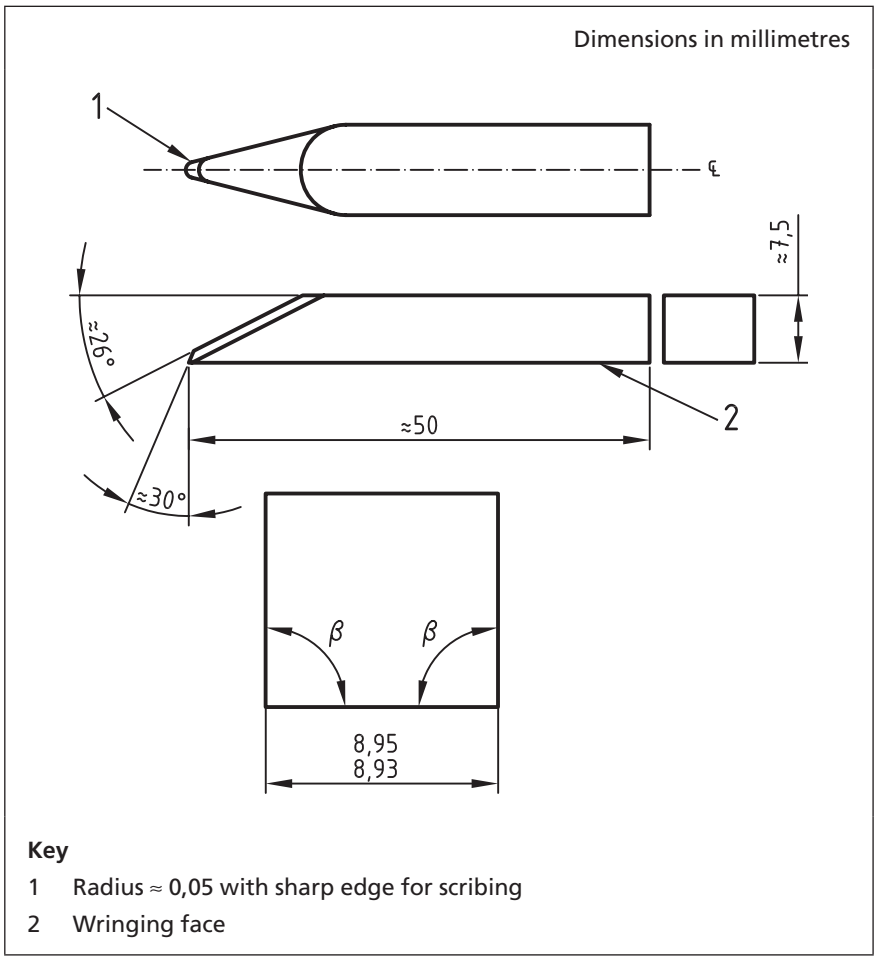
7.1 General

The form and dimensions of the scriber point shall be as specified in Figure 4.

The form and dimensions of the centre point shall be as specified in Figure 5.

NOTE These items are usually supplied together for the scribing of arcs.

Figure 4 **Scriber point**



7.2 Finish and accuracy

The wringing faces shall be finished by high grade lapping and their deviation from flatness shall be not greater than 0,000 3 mm within any 35 mm length.

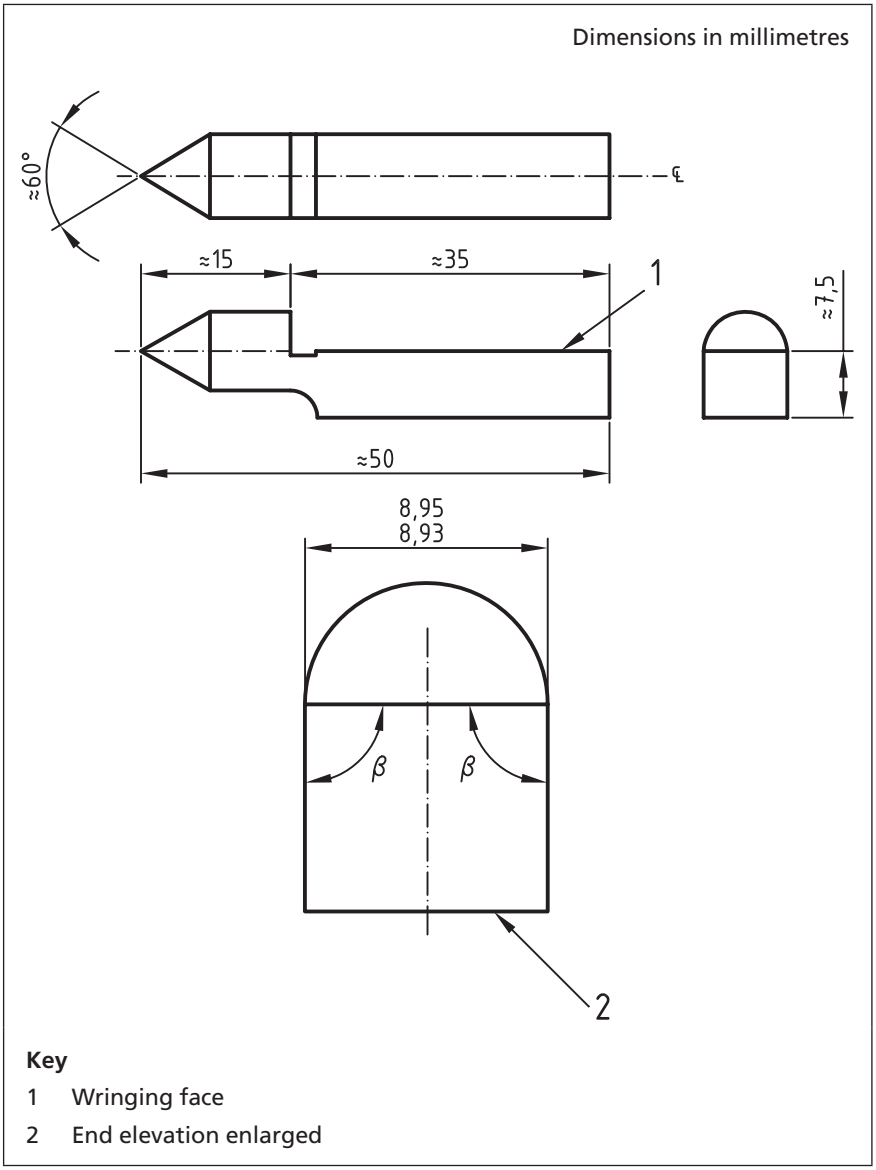
Angle β shall be $90° \, {}^{0'}_{-10'}$.

The deviation of the centre point from the plane of the wringing face shall be not greater than 0,01 mm.

A circle of a desired nominal diameter can be scribed when the scriber point and centre point are used together with a stack of gauge blocks wrung between these two accessories. The nominal diameter of the circle shall be equal to twice the sum of the nominal lengths

of the gauge blocks. The deviation of the scribed diameter from its nominal value shall be not greater than 0,025 mm, with the diameter measured between the inside edges of the scribed lines.

Figure 5 **Centre point**



8 Base

8.1 General

The base shall be designed for use in combination with wrung gauge blocks to provide a nominal length over a datum surface, designated a platform, in contact with the underside of the base.

The base, including the platform to which the gauge blocks are wrung, shall be designed to remain stable when used with a holder capable of supporting a wrung combination of gauge blocks up to a nominal length of 300 mm.

Means shall be provided for attaching the holder so that the combination of gauge blocks is perpendicular to the datum surface.

The underside of the base shall be relieved and an air vent provided. The sides shall be relieved to form convenient finger grips.

The platform shall have a length of not less than 35 mm.

The platform shall have a width of $9\ ^{-0,5}_{-0,07}$ mm.

8.2 Finish and accuracy

The underside of the base and the platform upon which gauge block combinations are to be wrung shall be finished by high grade lapping to within the following tolerances.

a) The deviation from flatness of the underside of the base shall be not greater than 0,001 mm and the base shall not rock.

b) The deviation from flatness of the platform shall be not greater than 0,000 3 mm.

c) The deviation from parallel of the platform shall be not greater than 0,000 3 mm with the underside of the base as the datum plane.

d) The deviation from the nominal height of the measured length to the platform from the underside of the base shall be not greater than 0,000 8 mm.

9 Holders

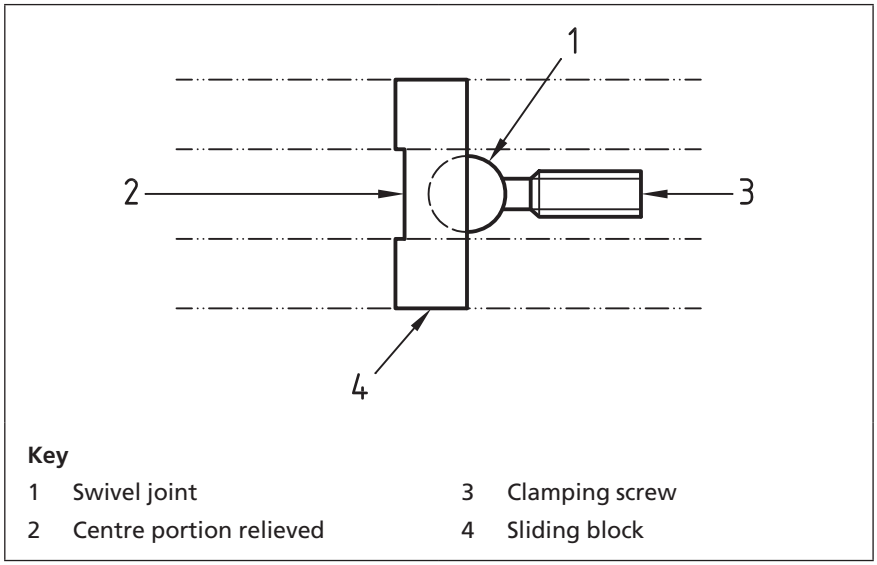
The holders shall be capable of accommodating wrung combinations of gauge blocks and accessories, and of preventing relative movements of items while they are in use.

The holder shall incorporate a swivel joint (see Figure 6) between the sliding block and the clamping screw to ensure an even pressure on the combination.

The surfaces of the sliding and fixed blocks against which the combination abuts shall be finished by lapping and the centres of these surfaces shall be relieved (see Figure 6).

The distance between the side plates shall be $9\ ^{+0,1}_{0}$ mm.

Figure 6 **Detail of holder**



Key

1 Swivel joint
2 Centre portion relieved
3 Clamping screw
4 Sliding block

10 Marking

Each accessory shall be marked with the manufacturer's name, initials or trademark.

Type A jaws and their bases shall be marked with the nominal size.

11 Case

Each set of accessories shall be supplied in a case, with a separate compartment for each accessory.

The case shall have a hinged lid and the means to retain the lid in its closed position.

The case shall be designed so that, when the lid is closed, the accessories cannot become displaced or their lapped faces become damaged by contact with the surfaces of the compartments.

The joint between the lid and the body of the case shall be close fitting and prevent the ingress of dust (e.g. opposed faces rebated or having a fillet and groove).

12 Protection against adverse climatic conditions

All surfaces of the accessories shall be protected against adverse climatic conditions with a suitable protective preparation to prevent corrosion.[1)]

[1)] Guidance on packaging is given in BS 1133-19.

Annex A (informative) Notes on the use of gauge block accessories

A.1 Type A and Type B jaws

When wringing the jaws with gauge blocks the combination should be aligned by bringing the corresponding side faces of the items into contact with a surface plate. The projection of the jaws beyond the gauge blocks should be minimized to avoid loss of accuracy through springing of the tips of the jaws.

A.2 Type A jaws

Type A jaws wear most at the leading end: a sign of wear is an abraded line along the cylindrical surface.

A.3 Scriber and centre points

In all manipulation, care should be taken to protect both points against burrs or blunting. When assembling points with a combination of gauge blocks, it is advisable to align the assembly along one side against a surface plate. Furthermore, the centre lines of scribers and centre points should be kept parallel with the axis of the gauge blocks.

The scribing of arcs is facilitated if the sample is polished beforehand and if it can be rotated beneath the scribing assembly. If thick lines result there is uncertainty as to the true location of the marks since the scratch could be asymmetrical, and the innermost edge, from which measurements should be taken, could be irregular in outline.

The scriber will wear with use and its scribing edge should be checked by inspection under optical magnification. Where a travelling microscope is available, the user may prefer to scribe arcs of nominal radius and measure the diameter of the scribed circle; the interposed gauge blocks may then be adjusted if necessary, and arcs rescribed.

Rectification of scriber and centre points is best entrusted to the manufacturer.

Annex B (informative) Accessories

The accessories specified in this standard can be supplied with a straight knife-edge conforming to BS 852. The base can be used with a surface plate conforming to BS 817 or a toolmakers' flat conforming to BS 869.

Bibliography

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 817, *Specification for surface plates*

BS 852, *Specification for toolmakers' straightedges*

BS 869, *Specification for toolmakers' flats and high precision surface plates*

BS 1133-19, *Packaging code – Section 19: Use of desiccants in packaging*

BS EN ISO 18265, *Metallic materials – Conversion of hardness values*

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