BRITISH STANDARD

BS 3731:1987

Specification for

Vee blocks

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Committees responsible for this British Standard

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City of Birmingham Polytechnic

Department of Trade and Industry (National Engineering Laboratory)

Department of Trade and Industry (National Measurement Accreditation Service)

Department of Trade and Industry (National Physical Laboratory)

Gauge and Tool Makers' Association

Institution of Production Engineers

Ministry of Defence

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Contents

Foreword

This revision of BS 3731 has been prepared under the direction of the General Mechanical Engineering Standards Committee. It supersedes BS 3731:1977 which is withdrawn.

In this revision the requirements relating to matched pairs of blocks have been altered to take account of production difficulties, and the opportunity has been taken to make certain other requirements more specific.

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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.

1 Scope

This British Standard specifies requirements for hollow or solid, single or double vee blocks made from cast iron or steel and solid vee blocks made from granite, normally with a 90° included vee angle though the provisions of this standard are applicable to vee blocks with included vee angles other than 90°.

Two grades of accuracy, 1 and 2, are specified, and provision is made for matched pairs.

NOTE 1 Appendix A and Appendix B respectively deal with recommended dimensions for vee blocks with a maximum capacity of 200 mm diameter and with methods of test.
NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Nomenclature and definitions

For the purposes of this British Standard the nomenclature shown in Figure 1 and the following definitions apply.

2.1
designating size

the diameter of the maximum cylinder that the block will accommodate leaving 1 mm beyond the lines of contact

2.2
deviation from flatness

the minimum distance separating two parallel planes between which the surface can just be contained

2.3
deviation from parallelism of two surfaces

the variation in distance between one of the surfaces and a datum plane when the other surface is in contact with the datum plane

2.4 deviation from squareness of two surfaces

the minimum distance between two parallel planes which just enclose one surface and are perpendicular to a datum plane in contact with the other surface

2.5 working faces

the vee flanks, base, top, end, and side faces

2.6 vee axis

the axis of a cylinder in contact with the length of the vee flanks

3 Classification

Vee blocks are classified as grade 1 or 2 according to their accuracy as specified in clause **8**.

4 Materials

4.1 Steel vee blocks

The steel shall be sound and free from defects. The surface hardness shall be not less than 700 HV and the block shall be stabilized.

4.2 Cast iron vee blocks

Close-grained cast iron not inferior to grade 180 of BS 1452 shall be used. The castings shall be free from blowholes or porous patches. The plugging of minor defects with a material of a similar composition is permitted provided that such a repair does not affect stability or accuracy.

Grade 1 vee blocks shall be heat treated to have a hardness value of not less than 500 HV.

NOTE Grade 2 vee blocks may be hardened or left unhardened.

4.3 Granite vee blocks

The granite shall be close-grained and of uniform texture and colour, sound and free from flaws and fissures and from inclusions of softer materials.

5 General features

5.1 There shall be a minimum length of vee flank of 1 mm beyond the lines of contact with the maximum diameter cylinder.

NOTE An undercut at the bottom of the vee is permissible providing there is a minimum length of flank of 1 mm below the line of contact of a 5 mm diameter cylinder.

5.2 When threaded holes or threaded inserts are provided they shall be M6 × 1 – 6H complying with the requirements of BS 3643-2.

NOTE The positions of threaded holes or threaded inserts may be specified by the manufacturer or be as requested by the purchaser.

6 Finish

6.1 Grade 1 vee blocks shall have a ground and/or lapped finish on all working faces. Grade 2 vee blocks shall be finished by a similar process or by planing, shaping or milling.

6.2 There shall be no sharp edges.

7 Clamps

When clamps are supplied they shall be sufficiently robust to secure cylinders within the capacity of the vee block.

NOTE In order to facilitate the use of vee blocks when located on their side faces, it is recommended that clamps be designed so that the clamp body does not extend beyond the side faces of the block.

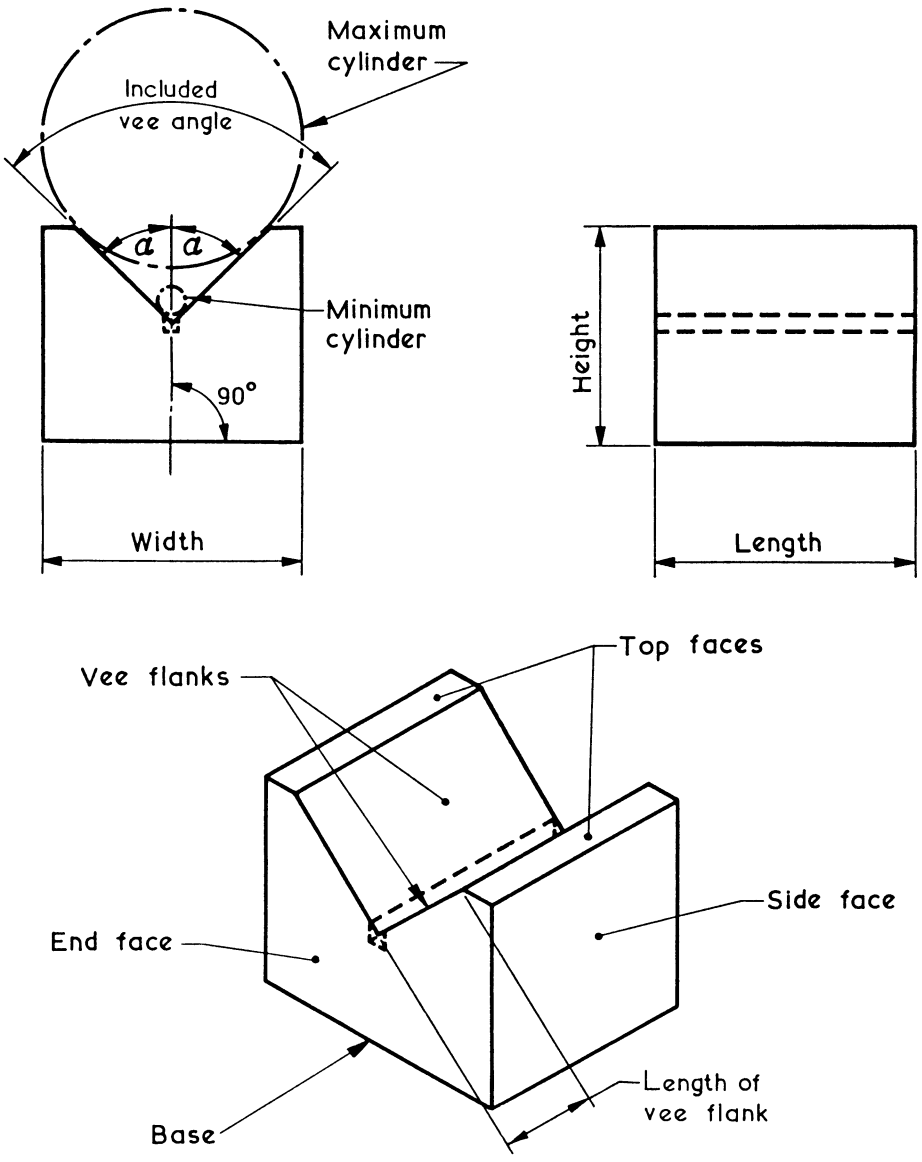

Figure 1 — Nomenclature

8 Accuracy

8.1 Grade 1 vee blocks

Grade 1 vee blocks shall be geometrically accurate within the permitted deviations given in Table 1.

Deviation of working faces from flatness shall not be such that they are convex.

8.2 Grade 2 vee blocks

Grade 2 vee blocks shall be geometrically accurate within the permitted deviations given in Table 2.

Deviations of working faces from flatness shall not be such that they are convex.

8.3 Matched pairs

The tolerances in columns 2 to 8 of Table 1 and Table 2 apply to each individual block in the pair, appropriate to the grade. In addition, the variations in the pair shall not exceed the values given in column 9 of the respective tables for the following features:

a) heights of the vee axes above the bases;

b) widths between the vee axes and the preferred side faces;

c) widths between the vee axes and the non-preferred side faces.

The preferred orientation of each block in a pair shall be indicated by the manufacturer.

NOTE Attention is drawn to the fact that if these latter requirements are to be met, advantage cannot be taken of the whole of the tolerances for individual blocks.

9 Container

Grade 1 vee blocks shall be supplied in a container.

10 Protection against climatic conditions

During storage and transit steel and cast iron vee blocks shall be protected against climatic conditions.

Table 1 — Geometrical accuracy for grade 1 vee blocks

Designating size	Permitted deviations							
	Flatness of working faces	Squareness of end and side faces to the base (measured over height)	Parallelism of opposite faces	Parallelism of vee axis to base and to side faces over length of vee[a]	Squareness of vee axis to end faces over length of vee[a]	Equality of semi-angles of vee flanks[a]	Centrality of vee[b]	Matching tolerance over the lengths of vees (see 8.3)
mm	µm	µm	µm	µm	µm	minute	µm	µm
20	2	4	4	2	2	1	4	2
25	2	4	4	2	2	1	4	2
40	3	6	6	4	4	1	6	3
50	3	6	6	4	4	1	6	3
63	4	8	8	6	6	1	8	4
75	5	10	10	8	8	1	10	5
80	5	10	10	8	8	1	10	5
85	5	10	10	8	8	1	10	5
100	6	12	12	10	10	1	12	6
125	8	16	16	14	14	1	16	8
160	10	20	20	18	18	1	20	10
200	12	24	24	22	22	1	24	12

NOTE Intermediate sizes should be made to the accuracy specified for the next smaller designating size. Double vee blocks should be made to the accuracy specified for the larger designating size.

[a] For a recommended method of checking these features, see Appendix B.

[b] Displacement of the centre of the vee axis from the centre line between the two side faces.

Table 2 — Geometrical accuracy for grade 2 vee blocks

Designating size	Permitted deviations							
	Flatness of working faces	Squareness of end and side faces to the base (measured over height)	Parallelism of opposite faces	Parallelism of vee axis to base and to side faces over length of vee[a]	Squareness of vee axis to end faces over length of vee[a]	Equality of semi-angles of vee flanks[a]	Centrality of vee[b]	Matching tolerance over the lengths of vees (see 8.3)
mm	µm	µm	µm	µm	µm	minute	µm	µm
20	6	8	8	8	8	2	6	4
25	6	10	10	10	10	2	8	4
40	8	14	14	14	14	2	10	6
63	12	26	26	26	26	2	18	8
80	16	34	34	34	34	2	22	10
85	16	34	34	34	34	2	22	10
100	18	38	38	38	38	2	24	12
125	24	40	40	40	40	2	24	16
160	26	42	42	42	42	2	26	20
200	28	46	46	46	46	2	28	24

NOTE Intermediate sizes should be made to the accuracy specified for the next smaller designating size. Double vee blocks should be made to the accuracy specified for the larger designating size.

[a] For a recommended method of checking these features, see Appendix B.

[b] Displacement of the centre of the vee axis from the centre line between the two side faces.

11 Marking

Each vee block shall be legibly and permanently marked with the following information in a manner that does not affect the accuracy of the vee block:

a) the manufacturer's name or trade mark;

b) the number and date of this British Standard, i.e. BS 3731[1)];

c) the grade of accuracy (grade 1 or grade 2);

d) matched pairs of vee blocks shall bear a suitable pairing symbol, e.g. A and B.

NOTE 1 All vee blocks that are to be certified by a testing authority are required to bear a serial number.

NOTE 2 It is recommended that the designating size be marked on the block.

[1)] Marking BS 3731 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Appendix A Recommended general dimensions

Recommended general dimensions for steel and cast iron vee blocks are given in Table 3, Table 4 and Table 5. Because of the nature of the material, special consideration has been given to granite vee blocks and recommended general dimensions are given in Table 6.

Table 3 — Dimensions of cast iron hollow type vee blocks (see Figure 2)

Designating size *D*	Width *A*	Height *B*	Length *C*
mm	mm	mm	mm
63	80	60	35
80	100	75	40
100	130	90	45
125	150	100	50
160	180	130	60
200	220	160	70

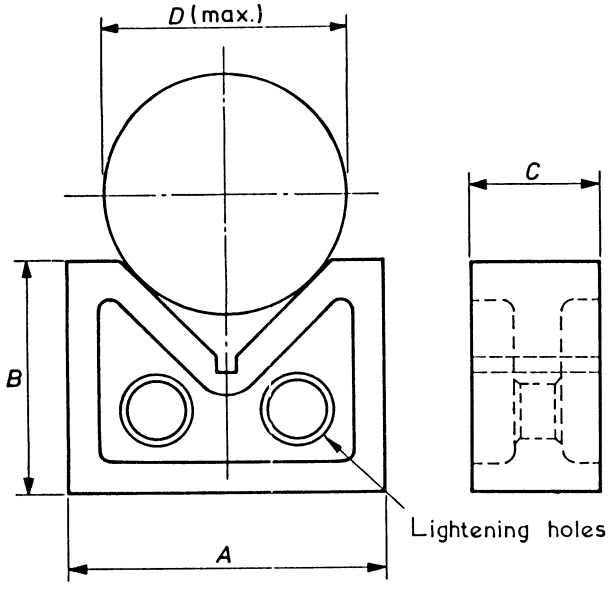

Figure 2 — Hollow type vee blocks

Table 4 — Dimensions of steel or cast iron solid type vee blocks (see Figure 3)

Designating size *D*	Width *A*	Height *B*	Length *C*
mm	mm	mm	mm
40	50	40	25
85	100	70	50

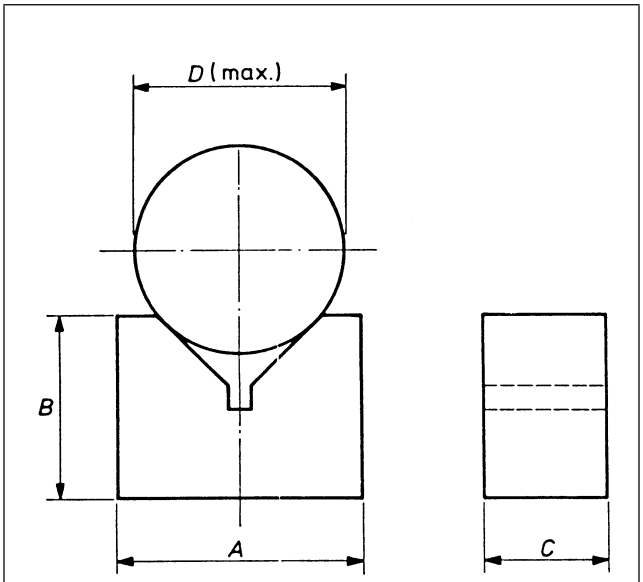

Figure 3 — Solid type vee blocks

Table 5 — Dimensions of steel or cast iron double type vee blocks (see Figure 4)

Designating sizes *D*	Width *A*	Height *B*	Length *C*
mm	mm	mm	mm
20 and 25	32	32	42
20 and 40	40	40	50

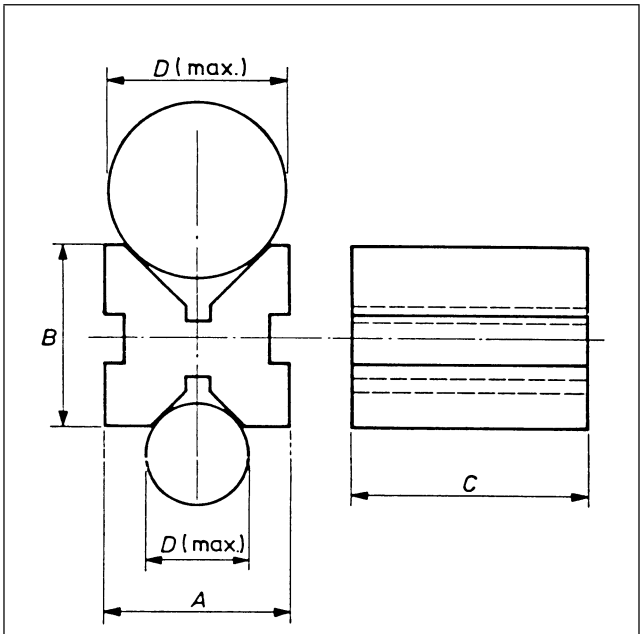

Figure 4 — Double type vee blocks

Table 6 — Dimensions of granite vee blocks
(see Figure 3)

Designating size *D*	Width *A*	Height *B*	Length *C*
mm	mm	mm	mm
50	75	75	75
75	100	100	100
85	150	150	150
125	200	200	200

Appendix B Recommended methods of testing vee blocks

B.1 Vee axis

B.1.1 Parallelism of the vee axis to the base can be determined from indicator readings taken over the ends of a precision cylinder placed in the vee [see Figure 5 a)]. The cylinder should extend beyond the end faces of the block.

B.1.2 Parallelism of the vee axis to the side faces and its centrality can be determined in a similar manner, but using the side faces in turn as a datum [see Figure 5 b)].

B.1.3 Squareness of the vee axis to the end faces can be determined using a precision cylinder, with a flange or tee piece, using the end faces in turn as a datum [see Figure 5 c)]. Squareness should be determined in two planes at 90°, i.e. parallel to the base and parallel to the side faces.

NOTE Any error in squareness of the flange or tee piece to the precision cylinder can be determined by rotating the cylinder through 180°.

B.2 Equality of matched pairs

A method similar to that described in **B.1.1** is also recommended for checking the heights of the vee axes above the base in matched pairs of vee blocks (see **8.3**), but in this case height readings should be taken over the minimum and maximum cylinders that can be accommodated by the blocks in question. Measurement of the widths between the vee axes and side faces over the length of the vees can also be determined by means of these cylinders.

B.3 Equality of semi-angles

Equality of the semi-angles of the vee is conveniently checked by means of a sine table and test indicator.

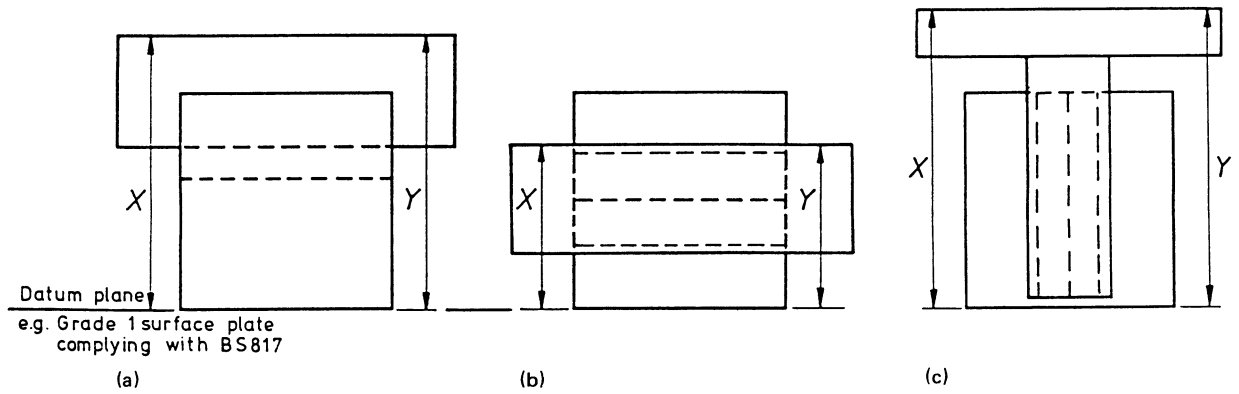

Figure 5 — Checking the vee axis

Publications referred to

BS 817, *Specification for surface plates.*
BS 1452, *Specification for grey iron castings.*
BS 3643, *ISO metric screw threads.*
BS 3643-2, *Specification for selected limits of size.*

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W4 4AL