

Dimensions of electronic tubes and valves —

Part 2: Specification for dimensions of United Kingdom electronic tubes

UDC 621.38 – 181

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- British Electrical and Allied Manufacturers' Association (BEAMA)
- Electricity Supply Industry in England and Wales
- Electronic Components Industry Federation*
- Electronic Engineering Association
- Institution of Electronic and Radio Engineers*
- Ministry of Defence*
- National Supervising Inspectorate*
- Post Office
- Society of British Aerospace Companies Limited
- Telecommunication Engineering and Manufacturing Association (TEMA)

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the Technical Committee entrusted with the preparation of this British Standard:

- Scientific Instrument Manufacturers' Association
- Services' Electronic Parts Committee
- United Kingdom Atomic Energy Authority

This British Standard, having been prepared under the direction of the Electronic Components Standards Committee, was published under the authority of the Executive Board and comes into effect on 31 July 1981

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Foreword

This revision of this British Standard has been prepared under the direction of the Electronic Components Standards Committee and comprises two Parts. BS 448-1:1981 specifies IEC¹⁾ dimensions of electronic tubes and valves; this Part of BS 448 specifies dimensions of electronic tubes registered in the United Kingdom and not covered in Part 1. These two Parts together complete the revision of BS 448:1953, which is hereby withdrawn.

As international work proceeds, it is anticipated that the data sheets given in this Part of this standard will gradually either be transferred to Part 1 or else withdrawn, and that this Part will itself eventually be withdrawn.

This Part comprises four sections. Section 1 gives general requirements and information applicable to all types of electronic tube base, gauge, etc. Sections 2 to 4 contain data sheets giving drawings and dimensions of electronic tube caps, reference line gauges and bases, respectively. Sections 2 to 4 should be read in conjunction with section 1.

The system of classifying electronic tube components is as follows. Caps and reference line gauges are designated "CT" and "RL", respectively. They are further subdivided into particular types by use of numerals, e.g. "CT4". Bases are designated "B", followed by a numeral indicating the number of pins per base, e.g. "B7" for a 7 pin base. Different types of bases with a given number of pins are identified by letter suffixes, e.g. "B7D" or "B7G/F" for 7 pin bases types D or G/F. An additional numerical suffix is used to convey the following information:

- /1.1 Base
- /1.2 Base pin (and spigot, wafer slot or tubulation) position gauge
- /1.3 Pin straightening tool
- /1.5 Base contact ring gauge
- /1.6 Base contact spigot gauge
- /2.1 Tube outline, without top cap

Alternative forms of particular items are distinguished from each other by the suffixes "a" and "b", e.g. "B8F/1.6a".

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 to iv, pages 1 to 62, 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⁾ International Electrotechnical Commission.

Section 1. General

1 Scope

This Part of this British Standard covers such physical requirements of the bases, caps and outlines of electronic tubes as are necessary to ensure mechanical compatibility and satisfactory electrical contact. Associated gauges and pin straightening tools are also covered. This standard deals only with electronic tubes registered in the United Kingdom and not covered in BS 448-1.

Owing to the many variables involved, including tolerances on pin diameters and permissible pitch circle eccentricity, it is not practical or economical to ensure complete compatibility in isolated cases where many component parts are on extreme opposing limits.

The standard is divided into four sections. Section 1 specifies general requirements for bases and associated gauges and pin straightening tools. Sections 2, 3 and 4 contain data sheets specifying the dimensions of caps, bases, outlines and associated gauges and pin straightening tools.

Appendix A, Appendix B and Appendix C identify which Part of BS 448 deals with which particular component.

2 References

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

3 Definitions

For the purposes of this British Standard the following definitions apply.

3.1

base

that portion of an electronic tube which carries the majority of the pins or contacts used for connection between the electrodes and the external circuit

NOTE One or more isolated connectors are sometimes fitted remote from the main group of pins or side contacts. It is not usual to regard these as forming part of the base (see 3.3).

3.2

spigot

a projection from the base extending beyond the pins and, in cooperation with a hole or recess in the tube socket, providing an axis of rotation to facilitate the insertion of the tube. The spigot may carry a longitudinal key to ensure the desired orientation of the tube in its holder

3.3

cap

an external fitting on an electronic tube distinct from the base and serving as an electrical connection

3.4

seated height

the overall height from the seating plane of the base, including any protrusion such as a tip or top cap

3.5

datum line

a radial line used as a reference for numbering base pins or contacts

4 Drawings and dimensions

The drawings in this standard are not to scale. Linear dimensions are stated in inches and millimetres; in each case the original system is indicated. The drawings and the inch/millimetre conversions and roundings are aligned with current IEC practice.

Third angle projection is used on all drawings.

The limits for acceptance are those given in the original system. The limits shown in a derived system are calculated from those in the original system and rounded appropriately within the true calculated limits. Thus the tolerances in a derived system may be narrower than those in the original system. In case of disagreement arising from a difference between gauges the article shall be accepted if it passes any gauge which is made within the tolerances defined in the original system.

5 Pin (or contact) numbering

Pin positions are numbered in succession in a clockwise direction from the datum line beginning with the first pin position, the centre of which is past the datum line as viewed from the free end of the pins. Each pin is identified by the number of its position.

When a contact pin is located in the centre of the base, this may either be numbered or designated as the centre pin. If numbered, it is the highest numbered pin.

When there is a short or index pin, that pin is not to be counted in the numbering of the pins.

When a base has concentric pin circles of decreasing diameters, the pin positions on the pin circles are numbered sequentially, continuing from the highest numbered pin position in the outer circle, always numbering in a clockwise direction along a decreasing spiral. The datum line is the reference used for the outer pin circle only.

6 Pin soldering

Where applicable, the soldering of the connecting wire to the pin shall be so finished that the free end of the pin is smooth. With pins other than resilient pins (see clause 7), any increase in pin diameter due to solder shall not exceed 0.010 in (0.254 mm) and the solder shall not extend more than 0.120 in (3.048 mm) up from the free end of the finished pin.

7 Resilient pins

Maximum and minimum diameters of resilient pins are not defined, but the dimensions of gauges for ensuring adequate resilience of the pins are specified below.

7.1 Dimensions of resilient pins

7.1.1 The length of the pins, measured from the sole of the base and including the collar (if any) and solder, shall be 15.5 ± 0.5 mm (0.610 ± 0.019 in).

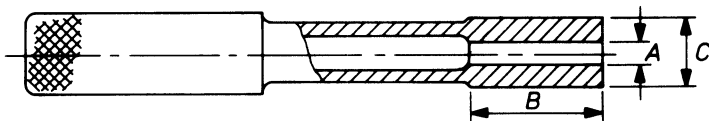
7.1.2 The maximum diameter of the pin shall be situated at a point 7.5 ± 1.5 mm (0.295 ± 0.055 in) from its free end. The contour of the sides of the pins shall be convex for the whole distance between the collar and the end of the pin. The curvature shall be least for a distance of 3 mm (0.118 in) on both sides of the position of the maximum diameter.

7.1.3 Pins shall be resilient radially and rigid axially and shall be of such design that after insertion in the minimum gauge they shall require a force of not less than 0.5 lb (0.226 kg) for extraction from the maximum gauge.

7.2 Gauge for resilient pins. The maximum and minimum gauges shall have the dimensions specified in the following table. An example of a convenient form of gauge is shown below.

The inch dimensions are derived from the original millimetre dimensions.

Ref.	Dimensions					
	Inches			Millimetres		
	Min.	Nom.	Max.	Min.	Nom.	Max.
Maximum gauge						
A	0.125 6	0.125 9	0.125 9	3.19	3.20	3.20
B	—	0.65	—	—	16.5	—
C	0.315	0.355	0.390	8.00	9.00	10.00
Minimum gauge						
A	0.123 1	0.123 1	0.123 4	3.125	3.125	3.135
B	—	0.65	—	—	16.5	—
C	0.315	0.355	0.390	8.00	9.00	10.00



Gauge for resilient pins

8 Tolerances on pin position

8.1 Geometrical tolerances. Geometrical tolerances have been used in this standard to specify variations in the positions of the contact pins in bases and permissible variations in the position, concentricity or squareness of gauge features. The methods of expression used are similar to those recommended in BS 308.

8.2 Maximum material condition (MMC). The use of the term “Maximum material condition” (MMC) in the notes means that the positional tolerances of the pins are specified in relation to their maximum material limits of size. In other words, each group of pins shall be capable of accepting a position gauge which has holes of diameters equal to the maximum material limits of the pins plus the positional tolerance. If any pin is finished to a size below its maximum material limit this allows it a positional tolerance greater than that specified for its maximum material condition, the increase of positional tolerance being equal to the difference between the specified maximum material limit of size and its actual finished size.

9 Gauging

In the section of the standard dealing with individual tube bases the positional requirements are defined, with a few exceptions, by means of gauges. Where gauges are specified, the procedure indicated in the notes accompanying each drawing refers to the following standard procedures for using gauges.

- a) *Gauging procedure 1.* The entire length of the pins shall, without undue force, pass into and disengage from the prescribed gauge.
- b) *Gauging procedure 2.* The gauge shall be attached to such an accessory weight as will give the total weight prescribed in the notes accompanying each gauge drawing. The entire length of the pins shall pass into the gauge and, on withdrawal, shall become disengaged without lifting the total weight of the assembled gauge and accessory weight.

Solder shall be removed from the sides of the pins prior to gauging.

NOTE Before inserting tubes in equipment or before gauging, bent pins should be straightened by using the pin straightening tool described in the appropriate data sheet.

10 Gauges and pin straightening tools

10.1 Tolerances. The dimensions specified for these items do not define manufacturing tolerances but are limiting dimensions which shall not be exceeded throughout the working life of the item.

10.2 Construction. The relevant drawings in this standard show, in general, only the essential features of the gauges and pin straightening tools. Their detailed construction shall follow normal gauging practice, as follows.

- a) The material shall be steel except where otherwise specified. The steel used for insertion and withdrawal force gauge pins shall comply with the requirements of BS 1407, hardened and tempered. All gauging surfaces shall be hardened. Suitable limits for hardness are as follows (see BS 427-1).
 - 1) *Hardened.* Gauges and pin straightening tools:
 - i) for pins of diameter less than 0.090 in (2.286 mm): 650–750 HV;
 - ii) for other surfaces: 750–850 HV.
 - 2) *Unhardened:* not less than 230 HV.
- b) Gauge surfaces shall be suitably finished for the class of tolerance indicated and shall have ground finish or better.
- c) Unless otherwise stated, the sharp edges shall be removed: the maximum radius or chamfer shall be 0.005 in (0.12 mm).

NOTE 1 Hardened bushes may be used where plain holes are shown, provided that they are secure and the gauge is not unduly weakened.

NOTE 2 It is recommended that the gauges are suitably shaped to prevent them rolling.

10.3 Application of gauges. The gauges specified in this standard are intended to be used on bases and caps after assembly on the tubes.

10.4 Climatic conditions for gauging. The gauges shall be used at a temperature of 20 ± 5 °C and at a relative humidity not greater than 75 per cent.

10.5 Storage. To prevent oxidation during storage, gauges and pin straightening tools shall be protected by covering the surfaces with a 10 per cent solution of petroleum jelly in white spirit. This protective coat shall be removed by a suitable solution before the articles are used.

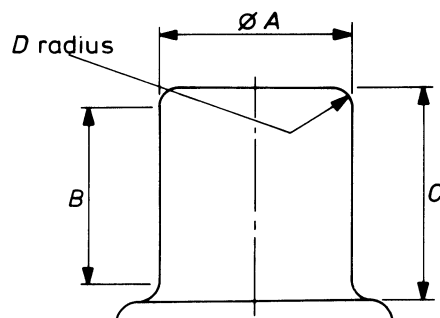
11 Function of spigot and key

Gauges for testing bases fitted with spigots and keys have been designed on the assumption that all such spigots have keys to ensure that no pin can be inserted into other than its corresponding contact. Exceptions to this general rule are referred to in the relevant data sheets.

Section 2. Drawings and dimensions of electronic tube caps

The dimensions of electronic tube caps registered in the United Kingdom and not covered in BS 448-1:1981 shall be as given in the following data sheets.

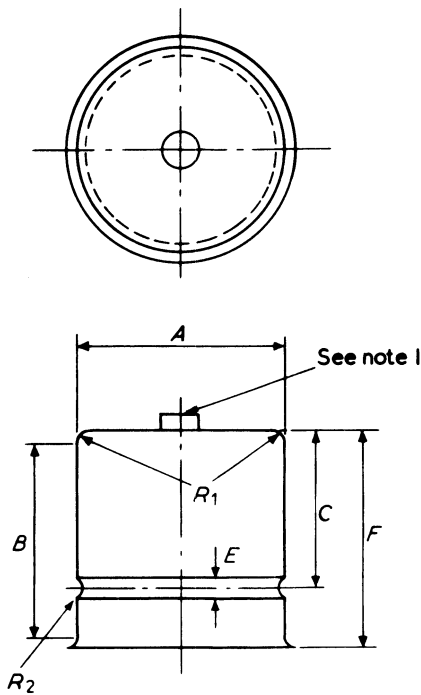
CAP CT4



The millimetre dimensions are derived from the original inch dimensions.

Ref.	Dimensions							Notes
	Millimetres			Degrees	Inches			
	Min.	Nom.	Max.	Nom.	Min.	Nom.	Max.	
A	18.80	19.05	19.30		0.740	0.750	0.760	—
B	16.1	—	—		0.63	—	—	1
C	—	—	22.0		—	—	0.87	2
D	—	—	2.0		—	—	0.08	—
NOTE 1 Dimension <i>B</i> represents the length of the contact surface of the cap.								
NOTE 2 Dimension <i>C</i> may be increased by 1.5 mm (0.06 in) to allow for solder.								
NOTE 3 Connectors should not exert more than 31 N (7 lbf) radial compression at any point around the circumference.								

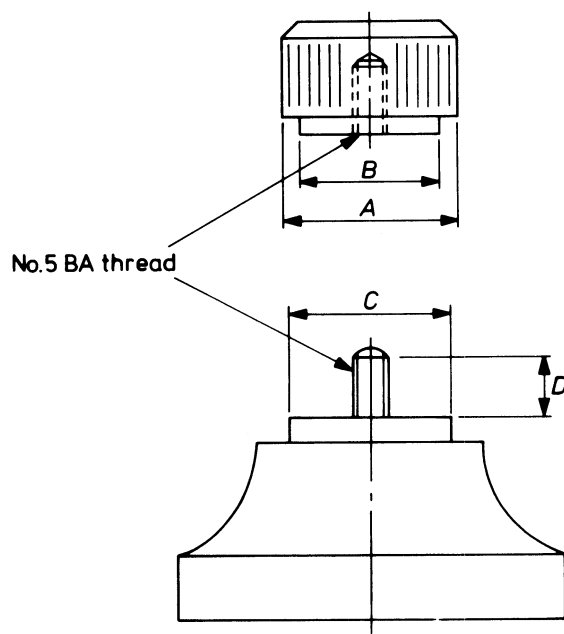
CAP CT5



The millimetre dimensions are derived from the original inch dimensions.

Ref.	Dimensions						Notes
	Millimetres			Inches			
	Min.	Nom.	Max.	Min.	Nom.	Max.	
A	14.86	14.99	15.11	0.585	0.59	0.595	—
B	12.0	—	—	0.47	—	—	2
C	10.04	10.24	10.43	0.395	0.403	0.411	—
E	—	0.91	—	—	0.036	—	—
F	14.74	14.99	15.24	0.58	0.59	0.60	—
R ₁	—	—	1.77	—	—	0.070	—
R ₂	—	0.46	—	—	0.018	—	—
NOTE 1	The length of the connecting tag shall be not greater than 6.35 mm (0.25 in).						
NOTE 2	Dimension B represents the length of the contact surface of the cap.						

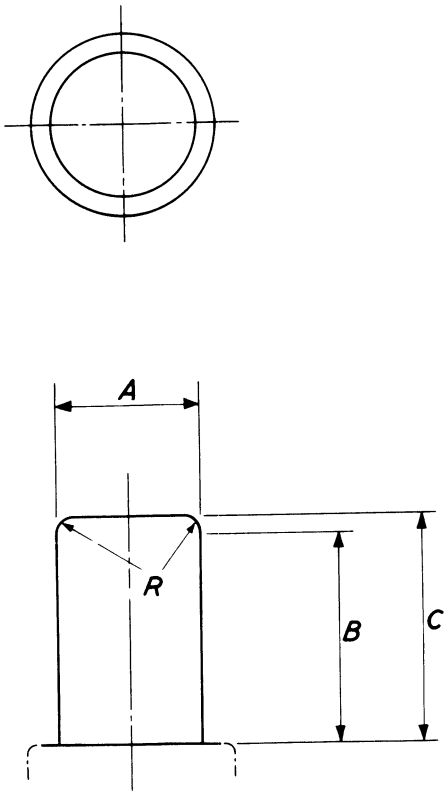
CAP CT6 (SCREW TYPE)



The millimetre dimensions are derived from the original inch dimensions.

Ref.	Dimensions						
	Millimetres			Degrees	Inches		
	Min.	Nom.	Max.	Nom.	Min.	Nom.	Max.
<i>A</i>	—	—	11.9		—	—	0.47
<i>B</i>	7.62	—	9.39		0.30	—	0.37
<i>C</i>	9.4	—	—		0.37	—	—
<i>D</i>	3.43	—	—		0.135	—	—
NOTE 1 The two parts shall be capable of full engagement, i.e. until the two opposite faces meet.							
NOTE 2 A 6BA thread should be used for new developments where this type of cap is employed.							

CAP CT9



The millimetre dimensions are derived from the original inch dimensions.

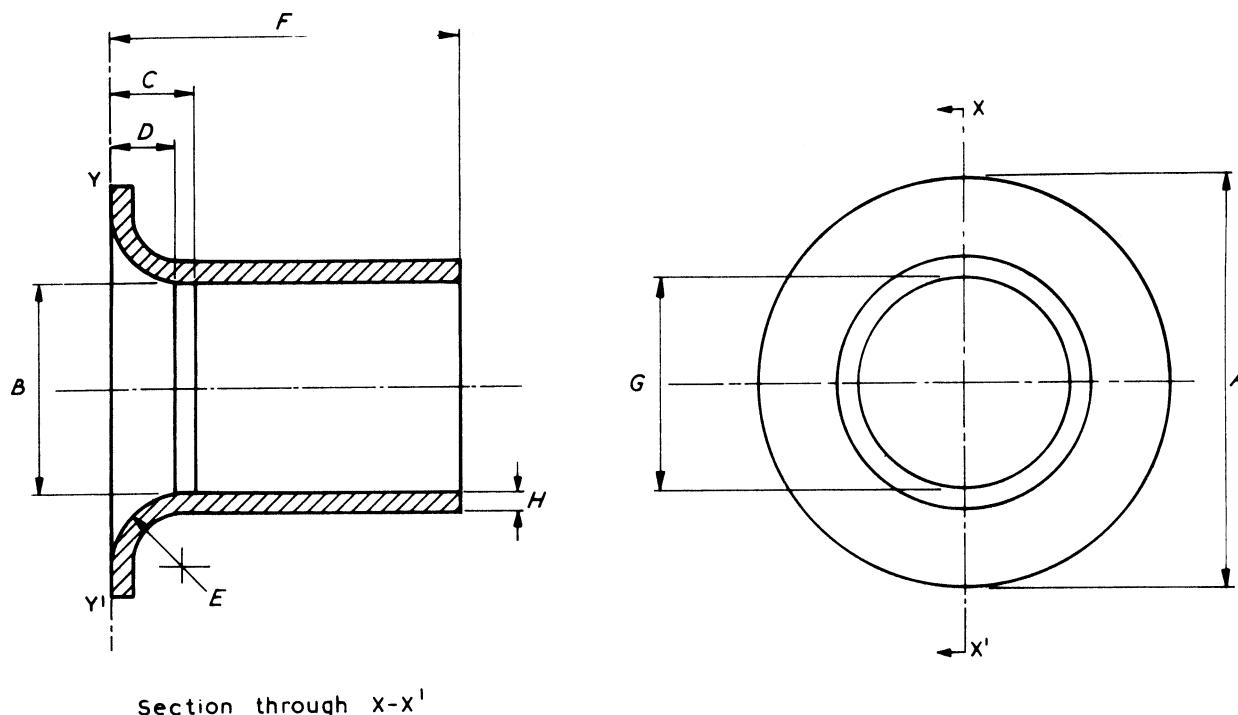
Ref.	Dimensions							Notes
	Millimetres			Degrees	Inches			
	Min.	Nom.	Max.	Nom.	Min.	Nom.	Max.	
A	9.475	9.525	9.575		0.373	0.375	0.377	1
B	12.70	—	—		0.500	—	—	
C	—	—	15.01		—	—	0.591	
R	—	—	1.270		—	—	0.050	
NOTE 1 Dimension B represents the length of the contact surface of the cap.								

Section 3. Drawings and dimensions of electronic tube reference line gauges for CRTs

The dimensions of electronic tube reference line gauges registered in the United Kingdom and not covered in BS 448-1:1981 shall be as given in the following data sheets.

REFERENCE LINE GAUGE RL1

[for C.R. Tubes having a nominal neck diameter of 35 mm (see note 4)]



The inch dimensions are derived from the original millimetre dimensions.

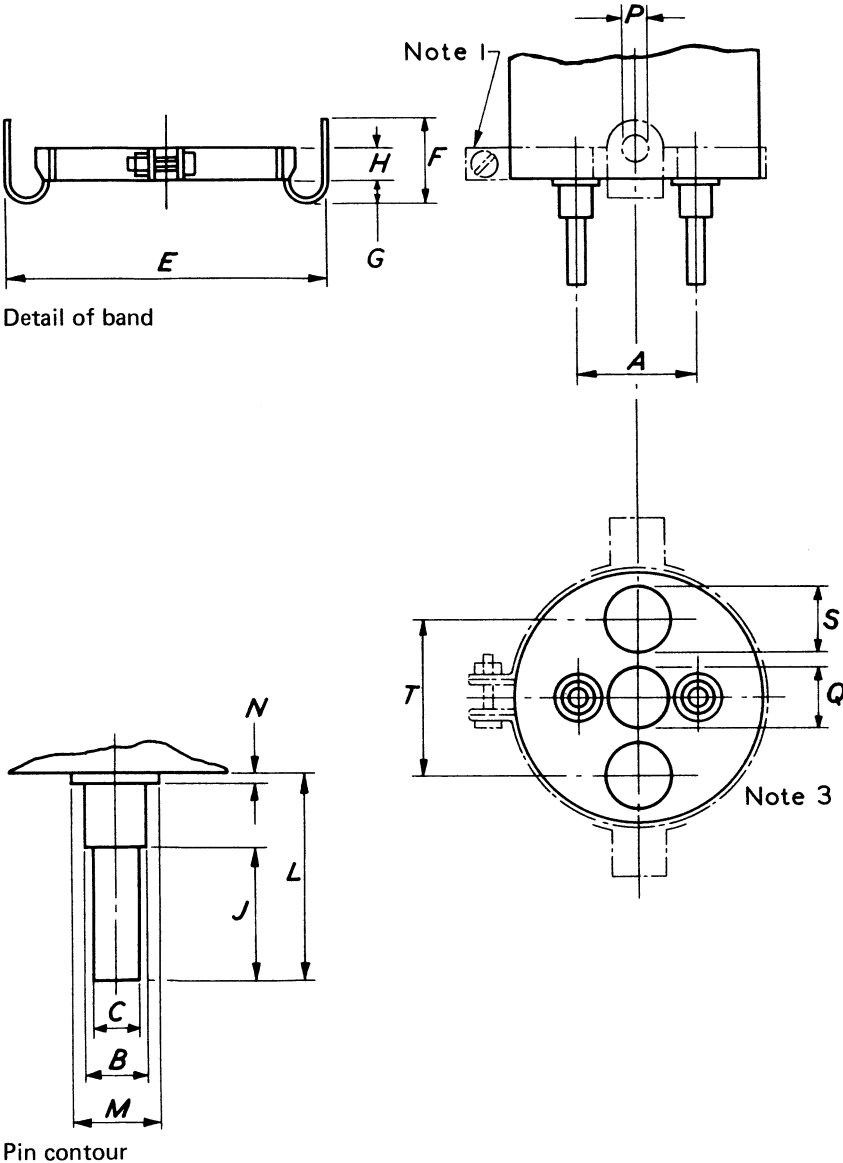
Ref.	Dimensions						Notes
	Millimetres			Inches			
	Min.	Nom.	Max.	Min.	Nom.	Max.	
<i>A</i>	74.75	75.00	75.25	2.943	2.953	2.962	—
<i>B</i>	35.725	35.750	35.825	1.4065	1.4075	1.4104	4
<i>C</i>	16.475	16.500	16.525	0.6487	0.6496	0.6505	4
<i>D</i>	11.355	11.380	11.405	0.4471	0.4480	0.4490	4
<i>E</i>	12.57	12.70	12.83	0.495	0.500	0.505	—
<i>F</i>	—	63.0	—	—	2.48	—	—
<i>G</i>	35.237	35.250	35.309	1.3873	1.3878	1.3901	4
<i>H</i>	—	7.0	—	—	0.276	—	—
NOTE 1	Reference line determined by position where gauge rests on the bulb cone (Y – Y ¹).						
NOTE 2	The gauge shall pass over the base and entire length of the neck without undue force.						
NOTE 3	The radii of corners, if rounded, shall not exceed 0.4 mm (0.016 in).						
NOTE 4	The gauge is uniformly tapered between planes <i>C</i> and <i>D</i> .						
NOTE 5	The gauge will only apply when specified in data for approval or in published data.						

Section 4. Drawings and dimensions of electronic tube bases

The dimensions of electronic tube bases registered in the United Kingdom and not covered in BS 448-1:1981 shall be as given in the following data sheets.

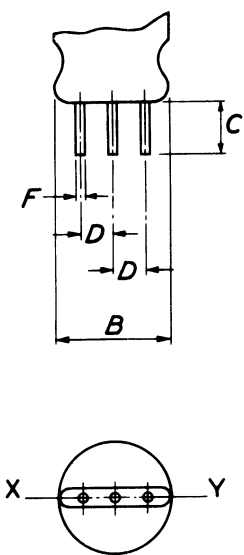
B2D/1.1: B2D BASE

The millimetre dimensions are derived from the original inch dimensions



Ref.	Dimensions							Notes
	Inches			Degrees	Millimetres			
	Min.	Nom.	Max.	Nom.	Min.	Nom.	Max.	
A	1.312	1.375	1.437		33.3	34.9	36.5	
B	—	0.375	—		—	9.52	—	
C	0.276	0.281	0.286		7.01	7.14	7.26	
E	—	4.125	—		—	104.78	—	
F	—	1.000	—		—	25.4	—	
G	—	0.250	—		—	6.35	—	
H	—	0.375	—		—	9.52	—	
J	—	0.750	—		—	19.05	—	2
L	—	1.187	—		—	30.15	—	2
M	—	0.500	—		—	12.70	—	
N	—	—	0.125		—	—	3.17	
P	—	0.250	—		—	6.35	—	
Q	—	0.625	—		—	15.88	—	3
S	—	0.750	—		—	19.05	—	3
T	—	1.750	—		—	44.45	—	
NOTE 1	The band may, or may not, be present.							
NOTE 2	An additional 0.060 in. (1.525 mm.) shall be allowed for solder on the finished valve.							
NOTE 3	Holes S and Q are placed as shown to permit forced air cooling.							

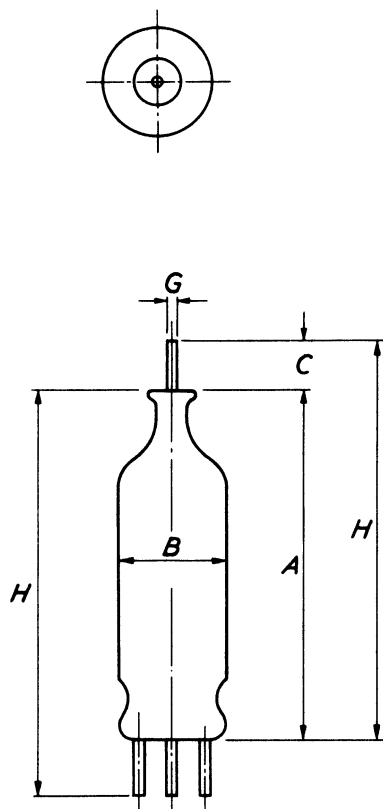
B3G/1.1: B3G BASE



The inch dimensions are derived from the original millimetre dimensions.

Ref.	Dimensions						Notes
	Inches			Millimetres			
	Min.	Nom.	Max.	Min.	Nom.	Max.	
<i>B</i>	—	—	0.472	—	—	12.0	1
<i>C</i>	0.205	0.226	0.255	5.1	5.75	6.5	
<i>D</i>	0.109	0.118	0.127	2.75	3.0	3.25	
<i>F</i>	0.035 5	0.039 5	0.043 0	0.9	1.0	1.1	
NOTE 1 The dimensions on the drawing fixing the positions of the pins refer to the fixed ends of the pins.							
NOTE 2 The centre-pin shall not deviate more than 0.5 mm. (0.019 in.) from the straight line X–Y connecting the other two.							

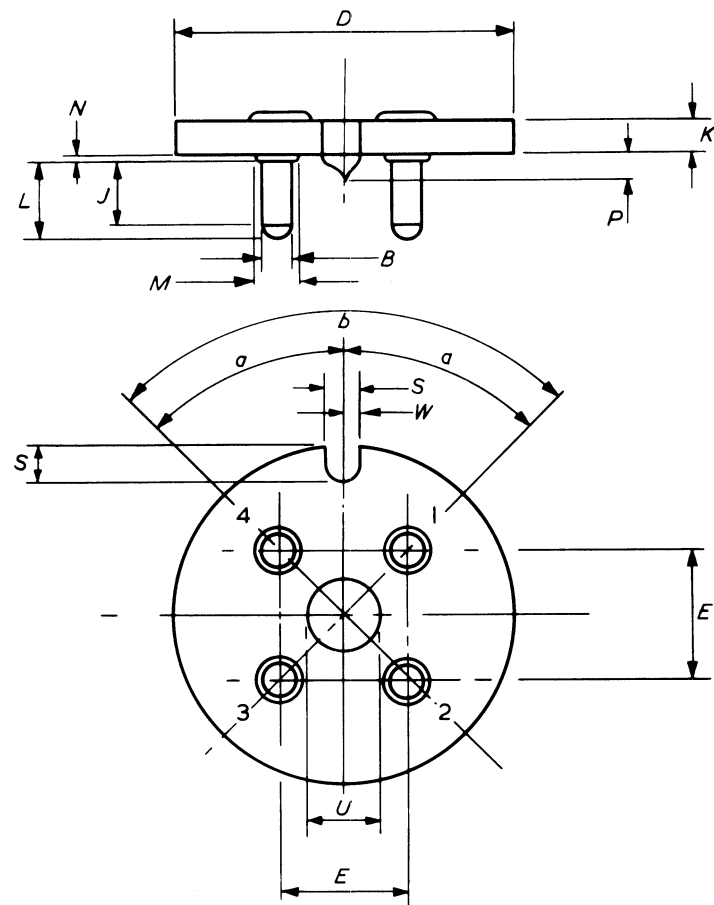
B3G/2.1: B3G OUTLINE, WITHOUT TOP CAP



The inch dimensions are derived from the original millimetre dimensions.

Ref.	Dimensions						Notes
	Inches			Millimetres			
	Min.	Nom.	Max.	Min.	Nom.	Max.	
<i>A</i>	—	—	1.496	—	—	38.0	
<i>B</i>	—	—	0.472	—	—	12.0	
<i>C</i>	0.205	0.226	0.255	5.1	5.75	6.5	
<i>G</i>	0.028	0.031 5	0.035	0.7	0.8	0.9	
<i>H</i>	1.516	—	—	38.5	—	—	

B4A/1.1: B4A BASE

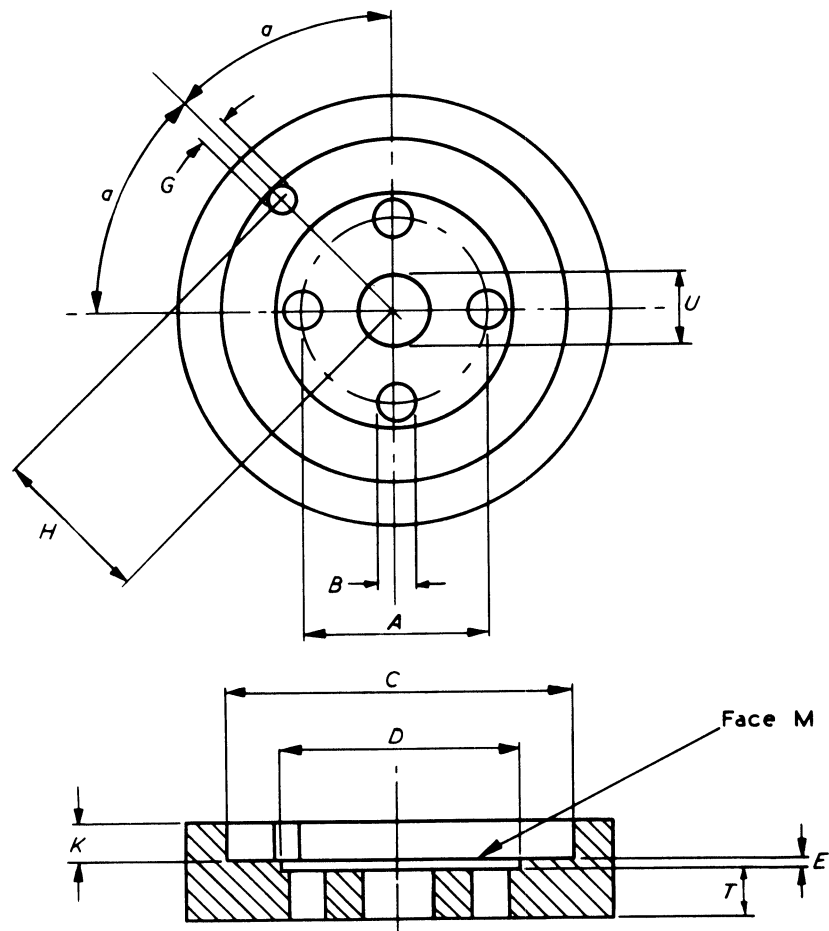


The millimetre dimensions are derived from the original inch dimensions.

Ref.	Dimensions							Notes
	Inches			Degrees	Millimetres			
	Min.	Nom.	Max.	Nom.	Min.	Nom.	Max.	
<i>B</i>	0.183	0.187	0.191	—	4.65	4.75	4.85	1
<i>D</i>	1.781	1.797	1.813	—	45.24	45.64	46.05	
<i>E</i>	—	0.688	—	—	—	17.475	—	
<i>J</i>	0.328	—	—	—	8.331	—	—	
<i>K</i>	—	0.19	—	—	—	4.83	—	
<i>L</i>	0.328	0.414	0.500	—	8.3	10.5	12.7	
<i>M</i>	—	—	0.26	—	—	—	6.60	2
<i>N</i>	—	—	0.04	—	—	—	1.02	
<i>P</i>	—	—	0.125	—	—	—	3.175	
<i>S</i>	0.171	0.187	0.203	—	4.34	4.75	5.16	
<i>U</i>	—	—	0.38	—	—	—	9.65	
<i>W</i>	0.086	—	0.101	—	2.17	—	2.58	
<i>a</i>	—	—	—	45	—	—	—	
<i>b</i>	—	—	—	90	—	—	—	

NOTE 1 Solder shall not extend laterally beyond the cylindrical surface of the pins.
NOTE 2 P represents the maximum length of the tip-off projecting below the ceramic.
NOTE 3 The pin deposition shall be checked by the gauge shown in B4A/1.2.

B4A/1.2: B4A BASE PIN AND WAFER SLOT POSITION GAUGE



The millimetre dimensions are derived from the original inch dimensions.

Ref.	Dimensions							Notes
	Inches			Degrees	Millimetres			
	Min.	Nom.	Max.	Nom.	Min.	Nom.	Max.	
<i>A</i>	—	0.971	—	—	—	24.663	—	1
<i>B</i>	0.204	—	0.205	—	5.182	—	5.207	
<i>C</i>	1.815	—	1.816	—	46.101	—	46.126	
<i>D</i>	1.251	—	1.253	—	31.775	—	31.826	2
<i>E</i>	0.045	—	0.050	—	1.143	—	1.270	
<i>G</i>	0.153	—	0.154	—	3.886	—	3.912	
<i>H</i>	—	0.814	—	—	—	20.676	—	
<i>K</i>	—	0.20	—	—	—	5.08	—	
<i>T</i>	—	0.250	—	—	—	6.35	—	
<i>U</i>	0.40	—	—	—	10.16	—	—	
<i>a</i>	—	—	—	45	—	—	—	

NOTE 1 Holes *B* have positional tolerance zones 0.001 in. (0.025 mm) diameter. Datum — face *M* and cylinder *C*.

NOTE 2 Pin *G* has a positional tolerance zone 0.001 in. (0.025 mm.) diameter. Datum — holes *B* and cylinder *C*.