

BRITISH STANDARD

**BS QC 410400 :
1992
IEC 393-3 :
1992**

**Harmonized system of quality assessment
for electronic components**

**Potentiometers for use in
electronic equipment.**

**Sectional specification for
rotary precision
potentiometers**

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Electronic Components Standards Policy Committee (ECL/-) to Technical Committee ECL/4, upon which the following bodies were represented:

- EEA (the Association of the Electronics, Telecommunications and Business Equipment Industries)
- Electronic Components Industry Federation
- Ministry of Defence
- National Supervising Inspectorate

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- BEAMA Ltd.
- ERA Technology Ltd.

This British Standard, having been prepared under the direction of the Electronic Components Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 July 1992

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National foreword

This British Standard has been prepared under the direction of the Electronic Components Standards Policy Committee. It is identical with IEC 393-3 : 1992 (QC 410400) *Potentiometers for use in electronic equipment Part 3 : Sectional specification: Rotary precision potentiometers*, published by the International Electrotechnical Commission (IEC) and is a harmonized specification within the IECQ system of quality assessment for electronic components.

The standard is to be used in conjunction with BS QC 410000 : 1990 *Harmonized system of quality assessment for electronic components: potentiometers for use in electronic equipment*.

Cross-references

International standard	Corresponding British Standard
IEC 63 : 1963	BS 2488 : 1966 <i>Schedule of preferred numbers for the resistance of resistors and the capacitance of capacitors for telecommunication equipment</i> (Technically equivalent)
IEC 68	BS 2011 <i>Environmental testing</i> (All Parts identical or technically equivalent)
IEC 393-1 : 1988	BS QC 410000 : 1990 <i>Harmonized system of quality assessment for electronic components: potentiometers for use in electronic equipment</i> (Identical)
QC 001002 : 1986	BS QC 001002 : 1991 <i>Rules of Procedure of the IEC Quality Assessment System for Electronic Components (IECQ)</i> (Identical)

The Technical Committee has reviewed the provisions of IEC 410 and QC 001001 to which reference is made in the text and has decided that they are acceptable for use in conjunction with this standard.

The British Standard which implements the IECQ Rules of Procedure is BS 9000 *General requirements for a system for electronic components of assessed quality Part 3 : 1991 Specification for the national implementation of the IECQ system*.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

POTENTIOMETERS FOR USE IN ELECTRONIC EQUIPMENT
PART 3: SECTIONAL SPECIFICATION:
ROTARY PRECISION POTENTIOMETERS

SECTION ONE - GENERAL

1. General

1.1 Scope

This standard is applicable to rotary precision potentiometers. These potentiometers are primarily intended for use in electronic equipment.

1.2 Object

The object of this standard is to prescribe preferred ratings and characteristics and to select from IEC Publication 393-1, appropriate Quality Assessment procedures, tests and measuring methods and to give general performance requirements for this type of potentiometer.

Test severities and requirements prescribed in detail specifications referring to this sectional specification shall be of equal or higher performance level, lower performance levels are not permitted.

1.3 Related documents

IEC Publications:

Publication 63 (1963):	Preferred Number Series for Resistors and Capacitors. Amendment No. 1 (1967) Amendment No. 2 (1977)
Publication 68:	Basic Environmental Testing Procedures.
Publication 393-1 (1988):	Potentiometers for Use in Electronic Equipment. Part 1: Generic Specification.
Publication 410 (1973):	Sampling Plans and Procedures for Inspection by Attributes.
Publication QC 001001 (1986):	Basic Rules of the IEC Quality Assessment System for Electronic Component (IECQ).
Publication QC 001002 (1986):	Rules of Procedure of the IEC Quality Assessment System for Electronic Components (IECQ).

Note. -The above references apply to the current editions except for IEC Publication 68, for which the referenced edition in the applicable test clauses of the generic specification shall be used.

1.4 Information to be given in a detail specification

Detail specifications shall be derived from the relevant blank detail specification.

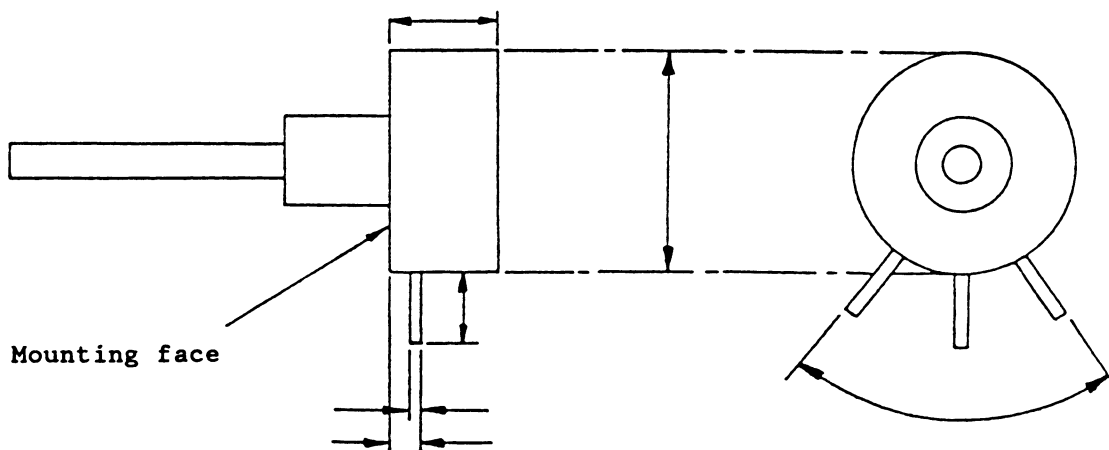
Detail specifications shall not specify requirements inferior to those of the generic, sectional or blank detail specification. When more severe requirements are included, they shall be listed in Sub-clause 1.9 of the detail specification and indicated in the test-schedules, for example by an asterisk.

Note. -The information given in Sub-clauses 1.4.1 and 1.4.3 may, for convenience, be presented in tabular form.

The following information shall be given in each detail specification and the values quoted shall preferably be selected from those given in the appropriate clause of this sectional specification.

1.4.1 Outline drawing and dimensions

The detail specification shall incorporate an illustration of the potentiometer being specified. Where space is insufficient to show the detail dimensions required for inspection purposes, such dimensions shall appear on a drawing forming an appendix to the detail specification.



The drawing shall give the following details:

- the dimensions of the spindle and bush. These may be given either on the outline drawing or by reference to IEC Publication 915;
- any locating devices;
- the total mechanical travel;
- the effective electrical travel;
- the angle of ineffective mechanical travel;
- the dimensions and the location of terminations;
- the dimensions which shall be measured in accordance with 4.4.2 of IEC Publication 393-1;
- any other dimensional information which will adequately describe the potentiometer.

All dimensions shall preferably be stated in mm, however when the original dimensions are given in inches, the converted metric dimensions in mm shall be added.

When the potentiometer is not designed for use on printed boards, this shall be clearly indicated in the detail specification.

1.4.2 Mounting

The detail specification shall specify the method of mounting to be applied for the voltage proof and the insulation resistance tests and for the application of the vibration and bump or shock tests. The potentiometers shall be mounted by their normal means, but the design may be such that special mounting fixtures are required. In this case the detail specification shall describe the mounting fixtures and they shall be used for the voltage proof and the insulation resistance tests and for the application of the vibration and bump or shock tests. -For the latter tests the mounting shall be such that there shall be no parasitic vibration.

1.4.3 Style (IEC Publication 393-1, Sub-clause 2.2.3)

The style shall be presented by a double-letter code e.g. AB, which is arbitrarily chosen for each detail specification.

The style designation, therefore, has no meaning unless the number of the detail specification is also given.

1.4.4 Resistance law

See Sub-clause 2.1.5.

1.4.5 Ratings and characteristics

The ratings and characteristics shall be in accordance with the relevant clauses of this specification together with the following:

1.4.5.1 Rated resistance range

See Sub-clause 2.2.1

The preferred values are those of the E-series of IEC Publication 63.

Note. -When products approved to the detail specification have different ranges, the following statement should be added:

"The range of values available in each style is given in the Qualified Products List".

1.4.5.2 Bump and shock

The bump and shock tests are considered to be alternatives. The detail specification shall indicate which test has been selected.

1.4.6 Marking

The detail specification shall specify the content of the marking on the potentiometer and on the package. Deviations from Sub-clause 1.5 of this sectional specification shall be specifically stated.

1.4.7 Ordering information

The detail specification shall indicate that the following information, in clear or in coded form, is required when ordering:

- 1) Rated resistance and tolerance on rated resistance.
- 2) Resistance law (if other than linear) and degree of conformity.
- 3) Number and issue reference of the detail specification and style reference.
- 4) Spindle and bush dimensions, if not implicit in the style reference.

1.4.8 Additional information (not for inspection purposes)

The detail specification may include information (which is not required to be verified by the inspection procedure), such as circuit diagrams, curves, drawings and notes needed for the clarification of the detail specification.

1.5 Marking1.5.1 General

The information given in the marking is normally selected from the following list; the relative importance of each item is indicated by its position in the list:

- a) rated resistance;
- b) tolerance on rated resistance;
- c) resistance law (if other than linear) and degree of conformity;
- d) detail specification and style reference;
- e) year and month (or week) of manufacture;
- f) details of spindle and bush (if not implicit in d) above). This may be in code form;
- g) manufacturer's name and trademark.

1.5.2 The potentiometer shall be clearly marked with a), and b) and c) above and with as many of the remaining items as is practicable. Any duplication of information in the marking of the potentiometer should be avoided.

1.5.3 The package containing the potentiometer(s) shall be clearly marked with all the information listed above.

1.5.4 Any additional marking shall be so applied that no confusion can arise.

SECTION TWO - PREFERRED RATINGS, CHARACTERISTICS AND TEST SEVERITIES

2. Preferred ratings, characteristics and test severities

2.1 Preferred characteristics

The values given in the detail specification shall preferably be selected from the following:

2.1.1 Preferred climatic categories

The potentiometers covered by this specification are classified into climatic categories according to the general rules given in IEC Publication 68-1.

The lower and upper category temperature and the duration of the damp heat, steady state test shall be chosen from the following:

Lower category temperature: -65 °C, -55 °C, -40 °C, -25 °C and -10 °C.

Upper category temperature: +70 °C, +85 °C, +100 °C
and +125 °C.

Duration of the damp heat, steady state test: 4, 10, 21 and 56 days.

The severities for the cold and dry heat tests are the lower and upper category temperatures respectively. Because of the construction of some potentiometers these temperatures will occur between two of the preferred temperatures given in IEC Publication 68-2. In this case the nearest preferred temperature within the actual temperature range of the potentiometer shall be chosen for this severity.

2.1.2 Temperature coefficients and temperature characteristics of resistance

The limits of change in resistance for the temperature characteristic of resistance test are given in Table I.

Each line in table gives the preferred temperature coefficient and corresponding temperature characteristic for 20 °C to 70 °C and limits of change in resistance for the measurement of the temperature characteristics of resistance (see IEC Publication 393-1, Sub-clause 4.14) on the basis of the category temperature ranges of Sub-clause 2.1.1 of this sectional specification.

Different portions of the resistance range may be covered by different temperature characteristics (or coefficients) of resistance although they appear in a single detail specification.

If measurements at additional temperatures are required, they shall be specified in the detail specification.

TABLE I

Temperature coefficient $10^{-6}/^{\circ}\text{C}$	Temperature characteristic $20/70^{\circ}\text{C}$	Temperature characteristic of resistance (limits of percentage change in resistance)							
		Reference temperature/ Lower category temperature				Reference temperature/ Upper category temperature			
$10^{-6}/^{\circ}\text{C}$	$\%$	+20/-65	+20/-55	+20/-40	+20/-25	+20/-10	* +20/+85	+20/+100	+20/+125
$\pm 1\,000$	± 5	$\pm 8,5$	$\pm 7,5$	± 6	$\pm 4,5$	± 3	$\pm 6,5$	± 8	$\pm 10,5$
± 500	$\pm 2,5$	$\pm 4,3$	$\pm 3,75$	± 3	$\pm 2,25$	$\pm 1,5$	$\pm 3,25$	± 4	$\pm 5,25$
± 250	$\pm 1,25$	$\pm 2,15$	$\pm 1,88$	$\pm 1,5$	$\pm 1,13$	$\pm 0,75$	$\pm 1,62$	± 2	$\pm 2,62$
± 150	$\pm 0,75$	$\pm 1,3$	$\pm 1,15$	$\pm 0,9$	$\pm 0,68$	$\pm 0,45$	$\pm 0,98$	$\pm 1,2$	$\pm 1,6$
± 100	$\pm 0,5$	$\pm 0,85$	$\pm 0,75$	$\pm 0,6$	$\pm 0,45$	$\pm 0,3$	$\pm 0,65$	$\pm 0,8$	$\pm 1,05$
± 50	$\pm 0,25$	$\pm 0,43$	$\pm 0,375$	$\pm 0,3$	$\pm 0,23$	$\pm 0,15$	$\pm 0,325$	$\pm 0,4$	$\pm 0,525$
± 25	$\pm 0,125$	$\pm 0,215$	$\pm 0,188$	$\pm 0,15$	$\pm 0,113$	$\pm 0,075$	$\pm 0,162$	$\pm 0,2$	$\pm 0,262$
± 10	$\pm 0,05$	$\pm 0,085$	$\pm 0,075$	$\pm 0,06$	$\pm 0,045$	$\pm 0,03$	$\pm 0,065$	$\pm 0,08$	$\pm 0,105$

* Potentiometers having an upper category temperature of $+85^{\circ}\text{C}$ need not be measured between 20°C and 70°C .

2.1.3 Limits for change in resistance or output ratio

The preferred combinations of limits for change in resistance or output ratio in each of the tests listed in the heading of the following table are as indicated in the lines of the table.

Note. -The clause numbers in the heading of the table refer to IEC Publication 393-1.

TABLE II

Stability class in %	4.38 Climatic sequence 4.39 Damp heat, steady state 4.40 Mechanical endurance 4.43.2 Electrical endurance at 70°C 4.43.3 Electrical endurance at upper category temperature	4.34 Change of temperature	4.30 Robustness of terminations 4.33 Resistance to soldering heat 4.35 Vibration 4.36 Bump 4.37 Shock	4.22 Thrust and pull on spindle 4.34 Change of temperature	4.35 Vibration (if applicable)
$\Delta R/R$ between terminations <u>a</u> and <u>c</u>				$\Delta \frac{U_{ab}}{U_{ac}}$ (See Note 1)	$\Delta \frac{U_{ab}}{U_{ac}}$ (See Note 1)
5	$\pm(5\%+0,1\Omega)$	$\pm(2\%+0,1\Omega)$	$\pm(1\%+0,05\Omega)$	$\pm 1\%$	$\pm 1\%$
3	$\pm(3\%+0,1\Omega)$	$\pm(2\%+0,1\Omega)$	$\pm(1\%+0,05\Omega)$	$\pm 1\%$	$\pm 1\%$
2	$\pm(2\%+0,1\Omega)$	$\pm(1\%+0,1\Omega)$	$\pm(0,5\%+0,05\Omega)$	$\pm 0,5\%$	$\pm 0,5\%$
1	$\pm(1\%+0,1\Omega)$	$\pm(0,5\%+0,05\Omega)$	$\pm(0,25\%+0,01\Omega)$	$\pm 0,25\%$	$\pm 0,25\%$

Note 1. -The change in the output voltage ratio $\Delta \frac{U_{ab}}{U_{ac}}$ shall be expressed in percent of the total applied voltage.