

Harmonized system of quality assessment for electronic components — Fixed resistors for use in electronic equipment —

**Part 05.00: Sectional specification:
Fixed resistor networks in which not all
resistors are individually measurable**

[IEC Title. Fixed resistors for use in electronic equipment —
Part 7: Sectional specification: Fixed resistor networks in which
not all resistors are individually measurable]

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- British Telecommunications plc
- Electronic Components Industry Federation
- Electronic Engineering Association
- Ministry of Defence
- National Supervising Inspectorate
- Society of British Aerospace Companies Limited
- Telecommunication Engineering and Manufacturing Association (TEMA)

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National foreword

This Part of BS 9940 has been prepared under the direction of the Electronic Components Standards Committee. It is identical with IEC Publication 115-7 (QC 400500):1984 *Fixed resistors for use in electronic equipment. Part 7: Sectional specification: Fixed resistor networks in which not all resistors are individually measurable* published by the International Electrotechnical Commission (IEC).

This standard is a harmonized specification within the IECQ system of quality assessment for electronic components.

Terminology and conventions. The text of the International Standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

For the purposes of this Part of BS 9940 1.1 and 1.2 should be regarded as constituting the scope of the standard.

Cross-references. The British Standard harmonized with QC 001001 and QC 001002 is BS 9000 *General requirements for a system for electronic components of assessed quality — Part 1:1981 Specification of basic rules and procedures*.

International Standards	Corresponding British Standards
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>Basic environmental testing procedures</i>
IEC 68-1:1982	Part 1.1:1983 <i>General and guidance</i> (Identical)
IEC 115-1:1982 (QC 400000:1982)	BS 9940 <i>Fixed resistors for use in electronic equipment</i> Part 0:1983 <i>Generic specification</i> (Identical)
IEC 115-7-1:1984 (QC 400501:1984)	BS 9940 <i>Fixed resistors for use in electronic equipment</i> Part 05.01:1985 <i>Blank detail specification: Fixed resistor networks in which not all resistors are individually measurable. Assessment level E</i> (Identical)
IEC 410:1973	BS 6001:1972 <i>Sampling procedures and tables for inspection by attributes</i> (Technically equivalent)

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 18, 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

1.1 Scope

This standard applies to fixed resistor networks. The resistors may be individually isolated or interconnected in any circuit configuration.

1.2 Object

The object of this standard is to prescribe preferred ratings and characteristics and to select from IEC Publication 115-1:1982, the appropriate Quality Assessment procedures, tests and measuring methods and to give general performance requirements for this type of resistor network.

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

1.3 Related documents

IEC publications:

Publication 63:1963	<i>Preferred Number Series for Resistors and Capacitors.</i> Amendment No. 1 (1967) Amendment No. 2 (1977)
Publication 68:	<i>Basic Environmental Testing Procedures.</i>
Publication 115-1:1982	<i>Fixed Resistors for Use in Electronic Equipment. Part 1: Generic Specification.</i>
Publication 410:1973	<i>Sampling Plans and Procedures for Inspection by Attributes.</i>
Publication QC 001001:1981	<i>Basic Rules of the IEC Quality Assessment System for Electronic Components (IECQ).</i>
Publication QC 001002:1981	<i>Rules of Procedures of the IEC Quality Assessment System for Electronic Components (IECQ).</i>

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 or Sectional Specification.

When more severe requirements are included, they shall be listed in Sub-clause 1.8 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

There shall be an illustration of the network as an aid to easy recognition and for comparison of the network with others. Dimensions and their associated tolerances, which affect interchangeability and mounting, shall be given in the detail specification. All dimensions shall preferably be stated in millimetres, however when the original dimensions are given in inches, the converted metric dimensions in millimetres shall be added.

1.4.2 Mounting

The detail specification shall specify the method of mounting to be applied for normal use and for the application of the vibration and the bump or shock tests. The resistor networks shall be mounted by their normal means. The design of the resistor network may be such that special mounting fixtures are required in its use. In this case, the detail specification shall describe the mounting fixtures and they shall be used in the application of the vibration and bump or shock tests.

1.4.3 Style (IEC Publication 115-1, Sub-clause 2.2.3)

For the purpose of this standard the style is a combination of rated dissipation and temperature characteristic (or coefficient) of resistance.

It shall be represented by a double-letter code e.g. AB, BC, CD, etc., which is arbitrarily chosen for each dissipation/temperature characteristic combination covered by a detail specification. The style designation, therefore, has no meaning unless the number of the detail specification is also given.

1.4.4 Ratings and characteristics

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

1.4.4.1 *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 Marking

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

1.5 Marking

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

- 1) Network identification which enables reference back to the detail specification for identification of each element.
- 2) The identification of terminations as given in the detail specification.
- 3) Date of manufacture.
- 4) Detail specification and style.
- 5) Manufacturer's name or trade mark.

1.5.2 The network shall be clearly marked with 1) and 2) above and with as many of the remaining items as practicable.

Any duplication of information in the marking should be avoided.

1.5.3 The package containing the networks shall be clearly marked with the information listed in 1), 3), 4) and 5) above.

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

1.6 Terminology

In addition to the definitions given in the Generic Specification for Fixed Resistors, IEC Publication 115-1, the following definitions apply:

1.6.1

fixed resistor network

a network in which a number of resistive elements are physically inseparably associated, so that, in terms of specifications, tests, trade and maintenance, it is considered as indivisible

1.6.2

rated resistance

the value of each element of the resistor network which is marked on the network or indicated in the detail specification

1.6.3a

differential resistance/temperature characteristic

the difference at a given temperature, between the resistance/temperature characteristics of any two specified resistors of the same network over a given temperature range

Example of calculation:

$$\Delta (\text{R.T.C.}) = \left(100 \frac{\Delta R1}{R1} - 100 \frac{\Delta R2}{R2} \right) (\%)$$

where:

- $\Delta (\text{R.T.C.})$ = The differential resistance/temperature characteristic between the two specified resistors expressed in %.
- $R1$ and $R2$ = The resistance values of each of the two resistors at the reference ambient temperature (normally 20 °C).
- $\Delta R1$ and $\Delta R2$ = The change in resistance between a given ambient temperature and the reference ambient temperature. This given ambient temperature shall be within the category temperature range.

1.6.3b differential temperature coefficient

the difference between the temperature coefficients at a given ambient temperature of any two specified resistors in the same network over a given temperature range:

Example of calculation:

$$\Delta (\alpha) = \frac{10^6}{\Delta \theta} \left(\frac{\Delta R1}{R1} - \frac{\Delta R2}{R2} \right)$$

where:

- $\Delta (\alpha)$ = The differential coefficient temperature between the two specified resistors expressed in $10^{-6}/^{\circ}\text{C}$.
- $R1$ and $R2$ = The resistance value of each of the two resistors at the reference ambient temperature (normally 20 °C).
- $\Delta R1$ and $\Delta R2$ = The change in resistance value, between a given ambient temperature and the reference ambient temperature. This given ambient temperature must be within a specified range included in the category temperature range.
- $\Delta \theta$ = The algebraic difference, in degrees Celsius, between the reference and the given ambient temperature.

1.6.4 differential resistance change

the difference between the resistance change of any two specified resistors of the same network at the end of a test

NOTE It is normally expressed in per cent.

1.6.5 rated resistor element dissipation

the maximum allowable dissipation which a resistor element is capable of dissipating in continuous operation at the rated temperature of 70 °C

1.6.6 rated network dissipation

The maximum allowable dissipation which the resistor network is capable of dissipating in continuous operation at the rated temperature of 70 °C

1.6.7 resistance ratio

the ratio of the resistance values of any two specified resistors of the same network

when called for the rated value and the tolerance of this rated value of the ratio are given by the detail specification

1.6.8 functional characteristics

the functions for which the networks have been designed. These functions shall be defined when necessary by the detail specification which will state the methods of measurement, the performance requirements and the tests before, during and after which these functions shall be measured

1.6.9

qualifying test network

a style of network representative of a family of networks which is used to check that the design rules used and manufacturing processes applied by a manufacturer of fixed resistor networks enable him to produce networks capable of meeting specified electrical characteristics and performance requirements

NOTE This qualifying test networks might either be an actual fixed resistor network manufactured for customer's use or one designed for the purpose of qualification and/or quality conformance inspection only, provided that the National Supervising Inspectorate considers it to be representative of the family.

1.6.10

limiting element voltage

the maximum d.c. or a.c. r.m.s. voltage that may be continuously applied to the terminations of each resistor in the network (it is generally dependent upon size and manufacturing technology of the resistor network)

where the term a.c. r.m.s. voltage is used in this standard, the peak voltage shall not exceed 1.42 times the r.m.s. value

NOTE This voltage shall only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.