

BRITISH STANDARD 2136 : 1965

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SPECIFICATION FOR FIXED METALLIZED-PAPER DIELECTRIC CAPACITORS FOR DIRECT CURRENT

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FIXED METALLIZED-PAPER
DIELECTRIC CAPACITORS
FOR DIRECT CURRENT

B.S. 2136 : 1965

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THIS BRITISH STANDARD, having been approved by the Telecommunication Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 8th September, 1965.

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The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

This standard makes reference to the following British Standards:

B.S. 2011. Basic methods for the climatic and durability testing of components for telecommunication and allied electronic equipment.

B.S. 2045. Preferred numbers.

B.S. 2131. Fixed capacitors for direct current using impregnated paper or paper/plastics film dielectric.

B.S. 2488. Preferred values and associated tolerances for resistors and capacitors for telecommunication equipment.

B.S. * Capacitors for radio interference suppression.

*In course of preparation.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

CO-OPERATING ORGANIZATIONS

The Telecommunication Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

*British Broadcasting Corporation	Electronic Valve and Semiconductor
*British Electrical and Allied Manufacturers' Association	Manufacturers' Association
*British Radio Equipment Manufacturers' Association	*Institution of Electrical Engineers
British Radio Valve Manufacturers' Association	*Institution of Electronic and Radio Engineers
British Railways Board	*Ministry of Aviation
Cable and Wireless Ltd.	*Ministry of Defence, Navy Department
*Crown Agents for Oversea Governments and Administrations	Ministry of Labour (H.M. Factory Inspectorate)
Electrical Contractors' Association (Incorporated)	*Post Office
*Electrical Research Association	*Radio and Electronic Component Manufacturers' Federation
*Electricity Council, the Generating Board and the Area Boards in England and Wales	Relay Services Association of Great Britain
*Electronic Engineering Association	*Science Research Council—Radio and Space Research Station
	*Telecommunication Engineering and Manufacturing Association

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

Radio Society of Great Britain Society of British Aerospace Companies Ltd.

The following B.S.I. references relate to the work on this standard:
Committee references TLE/4 and TLE/4/4 Draft for comment D 63/9565

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BRITISH STANDARD SPECIFICATION FOR FIXED METALLIZED-PAPER DIELECTRIC CAPACITORS FOR DIRECT CURRENT

FOREWORD*

This British Standard has been prepared under the authority of the Telecommunication Industry Standards Committee and is one of a series dealing with components intended primarily for use in telecommunication and allied electronic equipment. It is a revision of B.S. 2136 published in 1961, and is identical with the corresponding IEC publication (IEC Publication 166) unless otherwise indicated by a footnote.

The use of this standard, as of others in the series, requires reference to B.S. 2011, 'Basic methods for the climatic and durability testing of components for telecommunication and allied electronic equipment', which fully describes a range of tests to which components may be subjected in accordance with the requirements of the standard specifications for the individual components.

The object of the tests on components is to establish, as far as is possible under laboratory conditions:

- a.* their suitability for use over stated ranges of temperature and humidity;
- b.* their ability to withstand specified conditions of mechanical shock such as are to be expected in transit or under operational conditions;
- c.* their ability to withstand normal assembly processes (e.g. soldering) attendant on their incorporation in equipment, without detriment to *a* and *b* above.

* The Foreword does not appear in IEC Publication 166.

SPECIFICATION

SECTION ONE : GENERAL

1. Scope

This British Standard relates to fixed capacitors with self-healing properties, for direct current, with a rated voltage not exceeding 6300 V, containing a dielectric of impregnated paper and thin deposited metal electrodes, intended for use in equipment for telecommunication and in electronic equipment employing similar techniques.

NOTE. Capacitors for radio interference suppression are not included in the present specification, but are covered by B.S.*, 'Capacitors for radio interference suppression'.

Certain types of metallized-paper capacitors will fulfil the requirements of B.S. 2131, 'Fixed capacitors for direct current using impregnated paper or paper/plastics film dielectric'.

2. Object

The object of this standard is to establish uniform requirements for judging the electrical, mechanical and climatic properties of capacitors, to describe test methods and to give recommendations for standard dimensions and classification into categories according to their ability to withstand conditions as specified in B.S. 2011.

3. Terminology

3.1. D.C. capacitor. A d.c. capacitor is a capacitor designed essentially for application with a direct voltage.

3.2. Self-healing. Self-healing is a process by which the electrical properties of a capacitor after a local breakdown of its dielectric are instantaneously and essentially restored to their values before the breakdown.

3.3. Metallized paper dielectric capacitor Type 1. Metallized paper dielectric capacitors Type 1 are capacitors, which may be protected by self-healing properties. The rate of such self-healing operations during service shall be negligible.

3.4. Metallized paper dielectric capacitor Type 2. Metallized paper dielectric capacitors Type 2 are capacitors for which the self-healing of the metallized dielectric at voltages both below and above the rated voltage is relied upon to provide protection for a capacitor in normal use.

NOTE. The criteria for the classification of both types are given in the Clauses 13.4, 20.2, 20.7, 21 and 22.

3.5. Rated voltage (U_R). The rated voltage is the direct operating voltage which may be applied continuously to the terminations of a capacitor at an ambient temperature of 40°C.

NOTE. Where alternating voltages are present, whether or not in addition to direct voltage, the working voltage of the capacitor shall be taken as the sum of the direct voltage and the peak alternating voltages. This sum shall not exceed the value of the rated voltage, and the value of the peak alternating voltage should not exceed the following percentages of the rated direct voltage at the frequencies stated:

50 c/s: 20 per cent	} only 10 per cent is allowed where the rated voltage exceeds 1500 V.
100 c/s: 15 per cent	
1 000 c/s: 3 per cent	
10 000 c/s: 1 per cent	

3.6. Category voltage (U_C). The category voltage (U_C) is the voltage which may be applied continuously to a capacitor in use at its maximum category temperature.

NOTE. The information for the voltage at temperatures between 40°C and the maximum category temperature must be given by the manufacturer.

3.7. Rated capacitance. The rated capacitance of a metallized paper dielectric capacitor is the value which is indicated upon it.

3.8. Rated temperature range. The rated temperature range is the range of ambient temperatures for which the capacitor is designed for continuous operation; this corresponds with the temperature limits of its appropriate category.

3.9. Tangent of the loss angle. The tangent of the loss angle ($\tan \delta$) is the power loss of the capacitor divided by the reactive power of the capacitor at a sinusoidal voltage of specified frequency.

* In course of preparation.

- 3.10. *Maximum temperature of a capacitor*** (for information only). The maximum temperature of a capacitor is the temperature at the hottest point of its external surface.

NOTE. The terminations are considered to be part of the external surface.

- 3.11. *Minimum temperature of a capacitor*** (for information only). The minimum temperature of a capacitor is the temperature at the coldest point of its external surface.

NOTE. The terminations are considered to be part of the external surface.

- 3.12. *Type***. A type comprises products having similar design features manufactured by the same techniques and falling within the manufacturer's usual range of ratings for these products.

NOTE 1. Mounting accessories are ignored, provided they have no significant effect on the test results.

NOTE 2. Ratings cover the combination of:

- a. electrical ratings;
- b. sizes;
- c. environmental category.

NOTE 3. The limits of the range of ratings shall be agreed upon between customer and manufacturer.

- 3.13. *Type test***. The type test of a product is the complete series of tests to be carried out on a number of specimens representative of the type, with the object of determining whether a particular manufacturer can be considered to be able to produce products meeting the specification.

- 3.14. *Type approval****. Type approval is the decision by the proper authority (the customer himself or his nominee) that a particular manufacturer can be considered to be able to produce in reasonable quantities the type meeting the specification.

- 3.15. *Acceptance tests****. Acceptance tests are tests carried out to determine the acceptability of a consignment on a basis of an agreement between customer and manufacturer.

The agreement shall cover:

- a. the sample size;
- b. the selection of tests;
- c. the extent to which the test specimens shall conform to the requirements for the selected tests of the specification.

NOTE. In cases of divergent test results the appropriate British Standard test methods shall be used for acceptance tests.

- 3.16. *Factory tests****. Factory tests are those tests carried out by the manufacturer to verify that his products meet the specification.

4. Classification into categories

- 4.1.** The capacitors, covered by this British Standard, are classified into categories according to the general rules given in B.S. 2011.

- 4.2.** The table below gives the preferred categories with their temperature ranges and the durations of the long term damp heat test thus are:

Category	Temperature range	Damp heat, long term
55/125/56	– 55°C to + 125°C	56 days
55/085/56	– 55°C to + 85°C	56 days
40/100/56	– 40°C to + 100°C	56 days
40/100/21	– 40°C to + 100°C	21 days
25/085/21	– 25°C to + 85°C	21 days
10/070/21	– 10°C to + 70°C	21 days
10/070/04	– 10°C to + 70°C	4 days

* As this standard only covers type tests, these definitions are included solely for information.

5. Standard values of rated capacitance

The standard values of the rated capacitance shall be taken from the following series:

1; 1.5; 2.2; 3.3; 4.7; 6.8; 10 and their decimal multiples.

These values conform to the E6 series of preferred values given in B.S. 2488, 'Preferred values and associated tolerances for resistors and capacitors for telecommunication equipment'.

6. Tolerances on rated capacitance

The standard tolerances on the rated capacitance are:

± 5 per cent, ± 10 per cent and ± 20 per cent.

7. Standard values of rated voltage

The standard values of rated voltage at 40°C are:

63; 100; 125; 160; 200; 250; 400; 630; 1000; 1600; 2500; 4000 and 6300 V.

These values conform to the basic series of preferred values R5 given in B.S. 2045, 'Preferred numbers', with the addition of the values 125 V and 200 V, chosen from the R10 series of the same standard.

If other values are needed, they shall be chosen from the R10 series.

8. Marking

8.1. The following marking information, in the order given below is required:

- a. Rated capacitance in microfarads or picofarads;
- b. Rated voltage; direct voltage may be indicated by the symbol --- ;
- c. Category voltage and maximum category temperature;
- d. Indication as to which termination is connected to the outside foil (where applicable).

This indication shall be made by a heavy type arrowhead pointing towards the outside foil termination or by any other suitable means;

e. The symbol MP 1 or MP 2;

f. Tolerance on rated capacitance;

Tolerances may be indicated by letters if sufficient space is not available for figures and the following letters shall be used:

$J = \pm 5$ per cent; $K = \pm 10$ per cent and $M = \pm 20$ per cent;

g. Manufacturer's name or trade mark;

h. Indication of the appropriate category;

j. Manufacturer's type designation;

k. Week (or month) and year of manufacture. This may be in code form;

l. Reference to this British Standard.

8.2. The capacitor shall be clearly marked with *a*, *b*, *c* and *d* above and with as many as possible of the remaining items.

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

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

NOTE. The mark B.S. 2136 on or in relation to the product is a claim by the manufacturer that it complies with the requirements of the standard.

The British Standards Institution is the owner of a registered certification trade mark. This is shown below, enclosed in the words 'Approved to British Standard'. This mark can be used only by manufacturers licensed under the certification mark scheme operated by the B.S.I. The presence of this mark on or in relation to a product is an assurance that the goods have been produced to comply with the requirements of the British Standard under a system of supervision, control