

Variable capacitors —

Part 1: Methods of test

UDC 621.318.43

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
Documents

AVA

Document Sharing Hub

Cooperating organizations

The Electronic Components Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following scientific and industrial organizations:

- British Electrical and Allied Manufacturers' Association
- Electricity Supply Industry in England and Wales*
- Electronic Components Industry Federation*
- Electronic Engineering Association*
- Institution of Electronic and Radio Engineers
- National Supervising Inspectorate*
- Post Office*
- Society of British Aerospace Companies*
- 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 committee entrusted with the preparation of this British Standard:

- British Broadcasting Corporation
- Electrical Research Association

This British Standard, having been prepared under the direction of the Electronic Components Committee, was published under the authority of the Executive Board and comes into effect on 31 October 1979

© BSI 01-2000

The following BSI references relate to the work on this standard:
Committee reference ECL/4
Draft for comment 79/21700 DC

ISBN 0 580 10933 X

Amendments issued since publication

Amd. No.	Date of issue	Comments
4030	September 1982	Indicated by a sideline in the margin

Contents

	Page
Cooperating organizations	Inside front cover
National foreword	ii
Section 1. General	
1 Scope	1
2 Object	1
3 Terminology	1
Section 2. General requirements for tests	
4 Test conditions	5
Section 3. Methods of test	
5 Visual examination	5
6 Dimensions and effective angle of rotation	6
7 Capacitance	6
8 Backlash	8
9 Tangent of the loss angle	8
10 Insulation resistance	8
11 Voltage proof	9
12 Rotor contact resistance	9
13 Temperature coefficient	9
14 Capacitance drift	10
15 Operating torque	11
16 Locking	11
17 Locking torque proof	11
18 End stop torque	11
19 Thrust and pull (axial)	12
20 Side thrust	12
21 Robustness of terminations	13
22 Rapid change of temperature	13
23 Soldering	13
24 Impact	14
25 Vibration	15
26 Climatic sequence	15
27 Damp heat (steady state)	16
28 Corrosion	17
29 Endurance	17
30 Sealing (normal conditioning)	18
31 Sealing (extended conditioning)	18
32 Capacitance drift after adjustment	19
Figure 1 — Illustration of capacitance measuring positions	7
Publications referred to	Inside back cover

National foreword

This British Standard has been prepared under the direction of the Electronic Components Standards Committee. It is identical with International Electrotechnical Commission Publication IEC 418-1:1974 “*Variable capacitors. Part 1. Terms and methods of test*”. Amendment No. 1 (1976) to IEC 418-1:1974 has been incorporated in the text of this standard.

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

Wherever the word “recommendation” appears, referring to this standard, it should be read as “British Standard”.

Cross-references

International Standard	Corresponding British Standard
ISO 3:1973	BS 2045:1965 <i>Preferred numbers</i> (Technically equivalent)
IEC 68-1:1968	BS 2011 <i>Basic environmental testing procedures</i> Part 1.1:1977 <i>General</i> (Identical)
IEC 68-2-1:1974	BS 2011 <i>Basic environmental testing procedures</i> Part 2.1A:1977 <i>Test A. Cold</i> (Identical)
IEC 68-2-2:1974	BS 2011 <i>Basic environmental testing procedures</i> Part 2.1B:1977 <i>Test B. Dry heat</i> (Identical)
IEC 68-2-3:1969	BS 2011 <i>Basic environmental testing procedures</i> Part 2.1Ca:1977 <i>Test Ca. Damp heat, steady state</i> (Identical)
IEC 68-2-4:1960	BS 2011 <i>Basic environmental testing procedures</i> Part 2.1Da:1977 <i>Test Da. Accelerated damp heat</i> (Identical)
IEC 68-2-6:1970	BS 2011 <i>Basic environmental testing procedures</i> Part 2.1Fc:1977 <i>Test Fc. Vibration (sinusoidal)</i> (Identical)
IEC 68-2-13:1966	BS 2011 <i>Basic environmental testing procedures</i> Part 2.1M:1977 <i>Test M. Low air pressure</i> (Identical)
IEC 68-2-14:1974	BS 2011 <i>Basic environmental testing procedures</i> Part 2.1N:1977 <i>Test N. Change of temperature</i> (Identical)
IEC 68-2-17:1968	BS 2011 <i>Basic environmental testing procedures</i> Part 2.1Q:1977 <i>Test Q. Sealing</i> (Identical)
IEC 68-2-20:1968 & IEC 68-2-20C:1973	BS 2011 <i>Basic environmental testing procedures</i> Part 2.1Ta:1977 <i>Test Ta. Solderability</i> (Identical)
IEC 68-2-21:1975	BS 2011 <i>Basic environmental testing procedures</i> Part 2.1U:1977 <i>Test U. Robustness of terminations and integral mounting devices</i> (Identical)

International Standard	Corresponding British Standard
IEC 68-2-27:1972	BS 2011 <i>Basic environmental testing procedures</i> Part 2.1Ea:1977 <i>Test Ea. Shock</i> (Identical)
IEC 68-2-29:1968	BS 2011 <i>Basic environmental testing procedures</i> Part 2.1Eb:1977 <i>Test Eb. Bump</i> (Identical)

NOTE *Textual error.* In 7.3 the symbols “N” and “Q” should read as if printed in italic (sloping) type, i.e. “*N*” and “*Q*”.

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 20, 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 Scope

This recommendation relates to variable capacitors intended for use in electronic equipment and gives the terms and methods of test which may be applied.

The capacitors are divided according to their type (function), dielectric, style and application as defined in Sub-clauses 3.8, 3.9 and 3.10.

Separate "Type specifications" will give the specific test and requirements which are applicable to each type and grade of capacitor and detail specifications for a particular range of capacitors will be prepared in accordance with the relevant "Type specification".

2 Object

The object of the tests on capacitors described herein is to establish as far as possible under laboratory conditions:

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

Some tests in this recommendation are accelerated tests or tests under conditions which may represent or even exceed the most severe conditions of use. Such tests establish arbitrary standards of quality and they cannot be held to give positive information of any performance beyond or outside the test periods and test conditions. Where the required operating conditions differ materially from the test conditions specified herein, reference should be made to the manufacturers regarding the suitability of a component for a particular purpose. In general, longer periods of life for a given performance limit may be expected where the environment or loading imposes a less severe stress on the component.

The tests described in this recommendation are applicable to each section of multi-section capacitors, unless otherwise specified in the relevant specification.

3 Terminology

For the purposes of this recommendation the following definitions shall apply:

3.1

variable capacitor

a capacitor which is designed to enable the capacitance to be varied continuously over its complete range

3.2

differential capacitor

a capacitor comprising two isolated stators which are operated with one rotor, arranged so that as the capacitance between the rotor and one stator increases, the capacitance between the rotor and the other stator decreases, but the sum of the two capacitance values remains substantially constant at all settings

3.3

split stator capacitor

a capacitor comprising two isolated stators which function in series with a common rotor

3.4

section

a stator and its corresponding rotor

3.5

multi-section capacitor

a capacitor which has several sections, the capacitance values of which are varied simultaneously by a common actuating device

3.6

reference section

that section to which other sections are matched

3.7

matching section

a section matched to a reference section

3.8 Type

Is determined by the function and is governed by the ability of the capacitor to withstand various severities of mechanical endurance (see Sub-clause **29.1**).

3.8.1

type A

a capacitor which is intended to be operated frequently throughout its life. When used for tuning purposes, this capacitor may be provided with a control spindle to which a knob or drive may be fitted

3.8.2

type B

a capacitor used for trimming or for other similar purposes, where the amount and duration of movement of the rotatable electrode is considerably less than that of Type A

3.8.3

type C

a capacitor used specifically as a pre-set capacitor where a comparatively small number of movements are required during its life

3.9 Style

The method of varying the capacitance.

3.9.1

style 1 — concentric

an air dielectric capacitor where the capacitance can be varied by the axial movement of a rotor in a stator

3.9.2

style 2 — vane

a capacitor where the capacitance can be varied by rotating the rotor vanes between the stator vanes

3.9.3

style 3 — tubular

a solid dielectric capacitor where the capacitance can be varied by the axial movement of an electrode within a tube

3.9.4

style 4 — compression

a capacitor where the capacitance can be varied by compressing a stack of electrode and dielectric layers

3.9.5

style 5 — disk

a solid dielectric capacitor where the capacitance can be varied by rotating a metal or metallized disk

3.10**descriptive code**

the description of the type (function), dielectric, style and application of a capacitor may be in the form of a four character code as follows:

Descriptive code	C	2	3	1
Type (function)	C ————— } A = Tuning capacitor B = Trimmer capacitor C = Pre-set capacitor			
Dielectric	2 ————— } 1 = Air 2 = Solid			
Style	3 ————— } 1 = Concentric 2 = Value 3 = Tubular 4 = Compression 5 = Disk			
Application	1 — } 1 = Grade 1 — professional 2 = Grade 2 — domestic			

Example: For a pre-set capacitor, solid dielectric, tubular style, for professional application, the descriptive code is C231.

3.11**maximum capacitance**

the value which is obtained with the actuating device adjusted in the manner prescribed in the relevant specification

3.12**minimum capacitance**

the value which is obtained with the actuating device adjusted in the manner prescribed in the relevant specification

3.13**capacitance swing**

the difference between maximum and minimum capacitance values

3.14**capacitance law**

the relationship between capacitance and the position of the actuating device

3.15**effective angle of rotation**

the angle (or number of turns) through which the rotor moves between the positions of maximum and minimum capacitance

3.16**total angle of rotation**

the angle (or number of turns) through which the rotor moves between the end stops. If there are no end stops, then the total angle of rotation is the effective angle of rotation

3.17**nominal angle of rotation**

the angle used for determining the measuring points when capacitance law measurements are made

3.18**backlash**

the difference in capacitance (expressed as a ratio) obtained at a specified measuring angle when the actuating device is moved to approach this measuring angle from a clockwise and then from an anti-clockwise direction