JAPANESE INDUSTRIAL STANDARD

JIS C 5102-1994

Test methods of fixed capacitors for use in electronic equipment

September, 1996

ERRATA

Page 72

Subclause 8.11.1

First paragraph, the heading and line 2, replace "Resistance of board to bending" with "Resistance to board bending" .

Remarks:This errata is for correcting the first edition of this Standard.

Japanese Standards Association

UDC 621.319.4.001.4:621.37/.39-772.2

JIS

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Test methods of fixed capacitors for use in electronic equipment

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

Contents

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JAPANESE INDUSTRIAL STANDARD J I S

Test methods of fixed capacitors for use in electronic equipment

C 5102-1994

1. Scope This Japanese Industrial Standard specifies the test methods of fixed capacitors (hereafter referred to as "capacitors") used mainly for electronic equipment. If any difference in the specifications between this Standard and the detail specification arises, the detail specification applies.

Remarks: The cited standards and the corresponding International standards are listed in Attached Table 1.

2. Definitions For the purpose of this Standard, in addition to the definitions given in JIS C 0010, JIS C 5101 and JIS C 5602, the following principal definitions apply:

(1) test (wide sense) This is a series of procedures to examine the performance of specimens, and consists of the following items. Each item is applied in the case of being specified.

(a) preconditioning

(b) initial measurement

(c) test (narrow sense) or measurement (including intermediate measurement)

(d) recovery

(e) final measurement

(2) preconditioning This is the treatment applied to specimens for increasing accuracy of tests, to avoid questions in the test results, as shown in the following:

(a) To eliminate the influence of past history.

(b) To stabilize the characteristics under test conditions.

(c) To eliminate partially the past history.

(3) test (narrow sense) or measurement This means to locate specimens under the specified conditions and/or to examine the appearance, electrical and mechanical performances, for the purpose of examining the influence of test conditions to the specimens.

There is a case of including intermediate measurements.

(4) recovery This means to carry out such treatment that is to allow the specimen to stand as it is or to dry the specimen before the final measurement, for the purpose of stabilizing the characteristics of specimens. The standing time in this recovery is sometimes called the recovery time.

(5) temperature stability (thermal equilibrium) The conditions that the capacitances of specimen measured twice consecutively at intervals of 5 min on the specimen kept at a specified temperature, become nearly equal.

(6) insulated type capacitor A capacitor in which the specified voltage can be applied between all the terminations and the enclosure.

Remarks: The enclosure dealt with here includes a metal case on which insulation treatment is applied such as covering of insulation sleeve.

(7) non-insulated type capacitor A capacitor in which the specified voltage can not be applied between all the terminations and the enclosure.

(8) ambient temperature The temperature of air in the free space at the position which is far enough from the specimen and where the effect of heat radiation is negligible.

(9) rated temperature (upper category temperature at rated voltage) The maximum ambient temperature at which the rated voltage can be applied continuously to the capacitor.

Remarks: In capacitors for which temperature derated voltage is not applicable, the rated temperature is equal to the upper category temperature.

(10) rated voltage (symbol: U_R) The maximum value of peak voltage (the sum of d.c. voltage and permissible a.c. peak voltage) which can be applied continuously to a capacitor at the rated temperature.

Remarks 1. In capacitors for a.c., the rated voltage is the r.m.s. value of continuously applicable a.c. voltage of a specified frequency.

2. In capacitors for pulse, the rated voltage is the maximum value of continuously applicable a.c. voltage of a specified frequency and waveform.

(11) temperature derated voltage The maximum voltage which can be applied continuously to a capacitor at a temperature exceeding its rated temperature (within its upper category temperature).

(12) category voltage (symbol: U_C) The maximum voltage which can be applied continuously to a capacitor at its upper category temperature.

(13) variation of capacitance due to temperature This is expressed by any of the following:

(a) Temperature characteristic of capacitance

(b) Temperature coefficient of capacitance and temperature cycle drift of capacitance

(14) temperature characteristic of capacitance The relative variation of capacitance at a temperature in category temperature range from that at reference temperature (20°C). It is expressed in percent (%).

Remarks: The above is applicable to a capacitor the capacitance of which changes nonlinearly to the temperature.

(15) temperature coefficient of capacitance The relative capacitance change per 1°C between the reference temperature (20°C) and a specified temperature within the category temperature range of a capacitor.

Remarks 1. The above is applied to a capacitor in which the capacitance change due to temperature is linear or almost linear.

2. The temperature coefficient of capacitance is expressed in the unit of ppm/°C (10^{-6}/°C).

(16) temperature cyclic drift of capacitance The difference between the capacitances at 20°C in the steps 1, 3 and 5 each other, when a capacitor is subjected once to the temperature cycle specified in the following table.

Remarks 1. The difference in capacitance is expressed as a rate (%) of drift or an amount of drift.

2. When it is expressed as an amount of drift, the amount is the difference between the maximum and minimum values of capacitances in the steps 1, 3 and 5.

3. When it is expressed as a rate of drift (%), unless otherwise specified, the rate is the value of the drift specified in the above 2 divided by the capacitance in the step 3.

Step	Temperature °C
1	20
2	Lower category temperature
3	20
4	Upper category temperature
5	20

(17) test reverse voltage The value of reverse voltage used for reverse voltage test. This is applied to an electrolytic capacitor.

(18) rated reverse voltage The maximum value of reverse voltage which a capacitor can withstand in a specified temperature range. This is applied to an electrolytic capacitor.

(19) climatic category This definition indicates the conditions of climatic tests of capacitors in common terms throughout relevant standards. It means a combination of test temperature for cold-proof, test temperature for heat-proof and test days for damp-proof (steady state) which the capacitor can withstand.

Remarks: The category is expressed as follows:

XX/YYY/ZZ

where,

XX : test temperature for cold-proof, normally the lower category temperature (example: –40°C)

YYY : test temperature for heat-proof, normally the upper category temperature (example: 85°C)

ZZ : test days for damp-proof (steady state 40°C) (example: 10 days)

Example: 40/085/10

(20) chip capacitors Small capacitors of square or cylindrical shape which are suitable for surface mounting by providing capacitor elements with electrodes or terminals.

In this Standard, this may be sometimes called SMD (surface mounting devices).

(21) polarizing voltage D.C. voltage applied across a capacitor with its terminal as a positive pole and with its mounting fixture as a negative pole. The purpose is to examine whether electrolysis accelerates deterioration of insulation of insulators of capacitors.

Informative reference: The above words are the same as those in IEC.

3. Test conditions

3.1 Standard conditions The test shall, unless otherwise specified, be carried out under the standard conditions as shown in Table 1. If any doubt arises on the judgement based on the measured values under this standard conditions, or when especially required, the condition of 3.3 shall be applied.

If the specimens are large, or if the maintenance of temperature in the testing place is difficult, the test may be carried out under conditions other than the standard conditions in accordance with relevant detail specifications. In such case, the temperature shall be in the range of 5°C to 40°C.

Table 1. Standard conditions

Temperature	15 °C to 35°C
Relative humidity	45 % to 75 %
Air pressure	86 kPa to 106 kPa

Remarks 1. The relative humidity may be neglected if it does not affect the tests and measurement results.

2. The temperature in the standard conditions is occasionally called ordinary temperature.

3.2 Reference conditions The reference conditions shall be based on 5.1 of JIS C 0010 and given in Table 2. However, the reference conditions may be specified by temperature only.

Table 2. Reference conditions

Temperature	20°C
Air pressure	101.3 kPa

Remarks: It is generally impossible to correct the performance values against the relative humidity by means of calculation. Therefore, the relative humidity is not specified.

3.3 Referee conditions The referee conditions shall be based on 5.2 of JIS C 0010 and selected among Table 3 as specified by the relevant detail specification.

Unless otherwise specified, the grade 2 of symbol A in Table 3 shall apply.

Table 3. Referee conditions

Symbol	Grade 1		Grade 2	
	Temperature °C	Relative humidity %	Temperature °C	Relative humidity %
A	20 ± 1	63 to 67	20 ± 2	60 to 70
B	23 ± 1	48 to 52	23 ± 2	45 to 55
C	25 ± 1		25 ± 2	
D	27 ± 1	63 to 67	27 ± 2	60 to 70

Remarks: Air pressure is 86 kPa to 106 kPa.

3.4 Matters to be cared Sun light, heat radiation from other heat sources, and other factors which may affect the results of measurement on the specimens, shall be avoided throughout the test.

4. Treatment before and after test

4.1 Preconditioning At the test or measurement, the specimens shall be allowed to stand at the testing or measuring temperature for 30 min or more, and discharged completely.

4.2 Recovery Before the final measurement, the specimens shall be allowed to stand under the standard conditions for 1 h to 2 h.

4.3 Forced drying Before the initial or final measurement, the specimens shall be dried under the conditions specified in the detail specification.

The conditions specified in the detail specification shall be selected from Table 4.

After drying, the specimens shall be cooled in a desiccator with the activated alumina, silica-gel or other desiccants, or in the atmosphere of relative humidity 20 % or less.

Table 4. Conditions for forced drying

Condition	Condition 1	Condition 2
Temperature	55 ± 2°C	
Relative humidity	20 % max.	
Air pressure	86 kPa to 106 kPa	
Duration of standing	6 ± 0.5 h	96 ± 4 h

Informative reference: Condition 2 corresponds to the condition specified by IEC 384-1.

4.4 Voltage treatment Before the initial or final measurement, the protective resistor of about 1 kΩ shall be connected in series to the specimen. A d.c. voltage which is equal to the rated voltage is applied for 1 h. Next, the specimens shall be discharged through the resistor of about 1 Ω/V. Then, it shall be allowed to stand under the standard conditions for 12 h to 48 h.