

JIS

JAPANESE INDUSTRIAL STANDARD

Fixed ceramic capacitors class 2 for use in electronic equipment

 JIS C 6422—1991

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by

Japanese Standards Association

Printed in Japan

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



1. Scope

This Japanese Industrial Standard specifies fixed ceramic capacitors class 2 employing barium titanate ceramics as the dielectrics and metal film as the electrodes mainly used for electronic equipment, based on JIS C 5130.

- Remarks 1. The fixed ceramic capacitors class 2 (hereafter referred to as the "capacitors") mean capacitors for such services as bypass and coupling of circuit where the value of tangent of loss angle and the stability of capacitance is not strictly required.
2. The following Standards are cited in this Standard:
- JIS C 0805-Packaging of Electronic Components on Continuous Tapes
(Components with Axial Type and Radial Wire Lead Terminals)
 - JIS C 5101-General Rules of Fixed Capacitors for Electronic Equipment
 - JIS C 5102-Test Methods of Fixed Capacitors for Electronic Equipment
 - JIS C 5130-General Rules of Fixed Ceramic Capacitors for Use in Electronic Equipment
 - JIS C 5700-General Rules for Reliability Assured Electronic Components
 - JIS Z 9015-Sampling Inspection Procedures and Tables by Attributes with Severity Adjustment (Receiving Inspection Where a Consumer Can Select Suppliers)
3. The corresponding International Standards are given below.
- IEC 384-9 (1988) Fixed capacitors for use in electronic equipment
Part 9 : Sectional specification :
Fixed capacitors of ceramic dielectric, class 2
 - IEC 384-9-1 (1988) Fixed capacitors for use in electronic equipment
Part 9 : Blank detail specification :
Fixed capacitors of ceramic dielectric, class 2.
Assessment level E

2. Definitions

For the purpose of this Standard the definitions specified in JIS C 5130 shall apply.

3. Type designation

3.1 Structure of type designation The type designation shall be structured by arranging the symbols as given below.

Symbol denoting kind of capacitor	Symbol denoting style	Symbol denoting characteristics	Symbol denoting rated voltage	Symbol denoting nominal capacitance	Symbol denoting tolerance on capacitance	Symbol denoting grade	Symbol denoting failure rate level	Symbol denoting external dimensions	Symbol denoting processing of lead wire termination
3.2.1	3.2.2	3.2.3	3.2.4	3.2.5	3.2.6	3.2.7	3.2.8	3.2.9	3.2.10

Example: CK 45 BJ 1H 472 K C R 04 T

3.2 Symbols

3.2.1 Kind of capacitor The symbol denoting kind of capacitor shall be CK.

3.2.2 Style The symbol denoting style shall be 45, and the details shall be as given in Table 1.

Table 1. Style

Symbol	Outline	Enclosure	Termination	
			Kind	Direction
45	Round	Non-metallic enclosure	Lead wire	Same direction

3.2.3 Characteristics The symbol denoting characteristics shall consist of a combination of two English capital letters as shown in Table 2. The first letter denotes the relative capacitance change and the second letter denotes the category temperature range.

Table 2. Characteristics

Characteristic symbol	Relative capacitance change %			Category temperature range	
	Symbol	Without voltage application	With rated voltage application	Symbol	Temperature °C
BD	B	+ 10	+ 10 - 20	D	- 55 to + 85
BJ				J	- 25 to + 85
DD	D	+ 20 - 30	+ 20 - 40	D	- 55 to + 85
DJ				J	- 25 to + 85
ED	E	+ 20 - 55	+ 20 - 80	D	- 55 to + 85
EJ				J	- 25 to + 85
FJ	F	+ 30 - 80	+ 30 - 95	J	- 25 to + 85

Remarks: The relative capacitance change expresses the relative change caused over the category temperature range to the capacitance at 20°C without voltage application.

3.2.4 Rated voltage The rated voltage is a d.c. voltage, and the symbol denoting the rated voltage shall be as given in Table 3.

Table 3. Rated voltage

Symbol	Rated voltage V
1 H	50
2 H	500
3 A	1000
3 D	2000
3 F	3150
3 G	4000
3 J	6300

3.2.5 Nominal capacitance The symbol denoting nominal capacitance shall consist of three numerals, picofard (pF) being the unit. The first and second numerals shall represent the significant figures of nominal capacitance and the third numeral shall represent the number of zeros following the significant figures.

Example: 471 470 pF

472 4700 pF

473 47000 pF

3.2.6 Tolerance on capacitance The symbol denoting tolerance on capacitance shall consist of one English capital letter as shown in Table 4.

Table 4. Tolerance on capacitance

Symbol	K	M	P	Z
Tolerance %	± 10	± 20	+ 100 0	+ 80 - 20

3.2.7 Grade The symbol denoting grade shall consist of one English capital letter as shown in Table 5.

The combination of grade and characteristic classified by rated voltage shall be as given in Table 6.

Table 5. Grade

Symbol	Grade is defined as
B	A grade that requires quality assessment of general level I.
C	A grade that requires quality assessment of simplified level.
E	A grade that requires quality assessment of general level II.
X	A grade for which quality assessment is not specified.

Remarks: The general level I and simplified level are based on the general level and simplified level in 3. (classification of reliability assurance level) of JIS C 5700.

Informative reference: The general level II corresponds to Assessment level E given in IEC 384-9-1.

Table 6. Combination of grade and characteristic classified by rated voltage

Grade symbol	Rated voltage V	Characteristic symbol						
		BD	BJ	DD	DJ	ED	EJ	FJ
B, C	50	○	○	○	○	○	○	—
	500	○	○	○	○	○	○	—
E	50	○	○	○	○	○	○	○
	500	○	○	○	○	○	○	—
X	50	—	○	—	○	—	—	○
	500	—	○	—	—	—	○	—
	1000 or over	—	○	—	—	—	○	—

Remarks: The mark ○ shows that the combination is applicable.

3.2.8 Failure rate level The symbol denoting failure rate level shall consist of one English capital letter as shown in Table 7.

Table 7. Failure rate level

Symbol	Failure rate level %/1000 h	Applicable grade
M	1.0	B, C, E
P	0.1	
R	0.01	
S	0.001	
X	Not specified.	B, C, E, X

3.2.9 External dimensions The symbol denoting external dimensions (hereafter referred to as "size symbol") is applicable for capacitors of grades E and X with rated voltages 50 V and 500 V, and shall consist of two English capital letters as shown in Table 8.

The size symbols for each characteristic, rated voltage, and nominal capacitance shall be selected from those in Table 8 by agreement between the parties concerned with acceptance.

Table 8. External dimensions

Symbol	External dimension mm
04	4.0
05	5.0
06	6.3
08	8.0
10	10.0
11	11.2
12	12.5
14	14.0
16	16.0
18	18.0
20	20.0

Remarks: The external dimension means the dimension D given in Attached Tables 2 and 3.

3.2.10 Processing of lead wire termination The symbol denoting processing of lead wire termination is used to express lead wire processed ones and taped ones, and shall consist of one English capital letter as shown in Table 9.

Table 9. Processing of lead wire termination

Symbol	Classification of lead wire termination processing
F	Product with processed lead wire termination
T	Taped product

4. Ratings

4.1 Category temperature range The category temperature range shall be as given in Table 2.

4.2 Rated voltage The rated voltage shall be as given in Table 3.

4.3 Nominal capacitance and tolerance on capacitance The combinations of nominal capacitance and tolerance on capacitance are classified according to the characteristics, and shall be as shown in Table 10.

The combinations of dimension and nominal capacitance shall be as given in Attached Tables 1 to 4. However, in the grades E and X, the combinations of dimension and nominal capacitance of capacitors with rated voltage 50 V or 500 V are subjected to agreement between the parties concerned with acceptance.

Table 10. Combination of nominal capacitance,
characteristic and tolerance on capacitance

Nominal capacitance pF	Tolerance on capacitance %				
	± 10	± 20	+100 0	+80 -20	
	Applicable characteristic				
	BD, BJ	DD, DJ	ED, EJ	ED, EJ	FJ
100	○	—	—	—	—
120	○	—	—	—	—
150	○	—	—	—	—
180	○	—	—	—	—
220	○	—	—	—	—
270	○	—	—	—	—
330	○	—	—	—	—
390	○	—	—	—	—
470	○	—	○	○	—
560	○	—	—	—	—
680	○	○	—	—	—
820	○	—	—	—	—
1000	○	○	○	○	○
1200	○	—	—	—	—
1500	○	○	—	—	—
1800	○	—	—	—	—
2200	○	○	○	○	○
2700	○	—	—	—	—
3300	○	○	—	—	—
3900	○	—	—	—	—
4700	○	○	○	○	○
5600	○	—	—	—	—
6800	○	○	—	—	—
8200	○	—	—	—	—
10000	○	○	○	○	○
15000	—	○	—	—	—
22000	—	—	—	—	○
47000	—	—	—	—	○

Remarks: The mark ○ shows that the combination is applicable.

5. Performances and test methods

5.1 Test methods The test methods shall be as specified in JIS C 5102. However, the test method of taping shall be as specified in JIS C 0805.

The test method when JIS C 0805 is not applicable and that for processed lead wire termination are subjected to agreement between the parties concerned with acceptance.

5.2 Preconditioning If the preconditioning is specified in the test method stated in Table 11, the heat treatment stated below shall be carried out before the test.

The specimen shall be allowed to stand at the upper category temperature $\pm 2^{\circ}\text{C}$ for approximately 1 h, then allowed to stand under the standard conditions for 24 ± 2 h, and then subjected to the initial measurement.

5.3 Performances Performances shall be as specified in Table 11. However, performances relating to taping of taped products shall be as specified in JIS C 0805.

The performances when JIS C 0805 is not applicable and relating to processing of lead wire termination are subjected to agreement between the parties concerned with acceptance.

Table 11. Performances and test methods

No.	Item	Performances	Test method (JIS C 5102)	Informative reference (essential points of JIS C 5102)									
1	Between terminations	No abnormality.	As specified in 7.1. Test voltage: <table><tr><th>Rated voltage</th><th>Grades B, C, X</th><th>Grade E</th></tr><tr><td>50 V</td><td>125 V</td><td></td></tr><tr><td>500 V</td><td>1250 V</td><td></td></tr></table> 1 kV or over 200 % of rated voltage + 500 V Duration of application: grades B, C, X 1 to 5 s grade E qualification approval test 1 min periodic quality inspection 1 min lot quality inspection 1 s Charge and discharge current: 50 mA max.	Rated voltage	Grades B, C, X	Grade E	50 V	125 V		500 V	1250 V		
Rated voltage	Grades B, C, X	Grade E											
50 V	125 V												
500 V	1250 V												
Voltage proof		Between terminations and enclosure	As specified in 7.1. Test voltage: <table><tr><th>Rated voltage</th><th>Grades B, C, X</th><th>Grade E</th></tr><tr><td>Not exceeding 500 V</td><td>250 % of rated voltage or 1.3 kV whichever is the lower</td><td>250 % of rated voltage</td></tr><tr><td>Exceeding 500 V</td><td></td><td>150 % of rated voltage + 500 V</td></tr></table> Duration of application: grades B, C, X 1 to 5 s grade E qualification approval test 1 min periodic quality inspection 1 min lot quality inspection 1 s Charge and discharge current: 50 mA max. Test method: grades B, C, X 7.1.3 (3.3) metal small ball method grade E 7.1.3 (3.1) V block method, 7.1.3 (3.2) metal foil method or 7.1.3 (3.4) metal plate method	Rated voltage	Grades B, C, X	Grade E	Not exceeding 500 V	250 % of rated voltage or 1.3 kV whichever is the lower	250 % of rated voltage	Exceeding 500 V		150 % of rated voltage + 500 V	
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Not exceeding 500 V	250 % of rated voltage or 1.3 kV whichever is the lower	250 % of rated voltage											
Exceeding 500 V		150 % of rated voltage + 500 V											

Voltage proof

Table 11 (Continued)

Remarks: The C_k in this table expresses the numerical value of nominal capacitance in the unit of microfarad (μF).

Table 11 (Continued)

No.	Item	Performances	Test method (JIS C 5102)	Informative reference (essential points of JIS C 5102)												
6	Tensile strength	No abnormalities such as breaking and loosening of termination.	As specified in 8.1.	Apply the tension gradually in the direction of emergence of termination.												
	Bending strength															
	Robustness of termination		As specified in 8.1.	Number of bends: 2												
7	Appearance	No remarkable abnormality and marking shall be easily legible.	As specified in 8.2. Class of vibration: Class C for grade B Peak-to-peak amplitude 1.5 mm Provided, acceleration does not exceed 196 m/S ² . Class A for grades C, E and X Peak-to-peak amplitude 1.5 mm	Class A: 10-55-10 Hz (1 min) Class C: 10-2000-10 Hz (20 min)												
	Capacitance (applicable to grades B, C and X)	To satisfy No. 3.														
	Resistance to vibration		Tangent of loss angle (tan δ) (applicable to grades B, C and X)	To satisfy No. 4.												
		Direction and duration of vibration: Directions of X, Y and Z axes 2 h in one direction 6 h in total. However, for grade X in one direction (X axis) 2 h only. Refer to Fig. 1 of this Standard (JIS C 6422) for directions of vibration.														
		<table><thead><tr><th>Nominal sectional area a mm²</th><th>Nominal wire diameter (when section is circular) d mm</th><th>Tensile force N</th><th>Duration S</th></tr></thead><tbody><tr><td>0.07 < a ≤ 0.2</td><td>0.3 < d ≤ 0.5</td><td>5</td><td>10 ± 1</td></tr><tr><td>0.2 < a ≤ 0.5</td><td>0.5 < d ≤ 0.8</td><td>10</td><td></td></tr></tbody></table>			Nominal sectional area a mm ²	Nominal wire diameter (when section is circular) d mm	Tensile force N	Duration S	0.07 < a ≤ 0.2	0.3 < d ≤ 0.5	5	10 ± 1	0.2 < a ≤ 0.5	0.5 < d ≤ 0.8	10	
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