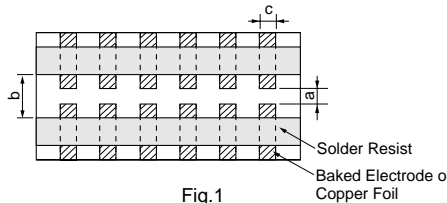



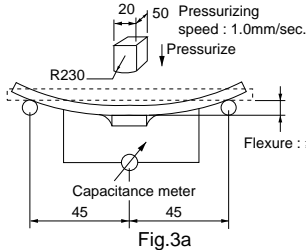
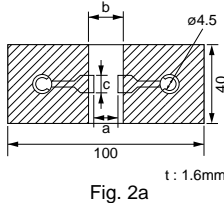
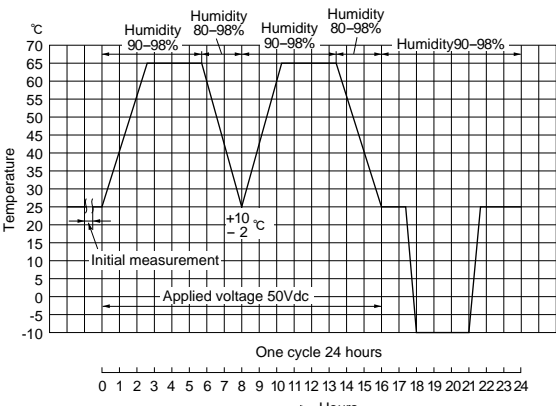
# ERB Series Specifications and Test Method (1)


No.	Item	Specifications	Test Method																
1	Operating Temperature Range	−55 to +125°C	Reference Temperature: 25°C																
2	Rated Voltage	See the previous pages.	The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, $V^{P-P}$ or $V^{O-P}$ , whichever is larger, should be maintained within the rated voltage range.																
3	Appearance	No defects or abnormalities	Visual inspection																
4	Dimensions	Within the specified dimension	Using calipers																
5	Dielectric Strength	No defects or abnormalities	No failure should be observed when 300%(*) of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. (*) 300V: 250%, 500V: 200%																
6	Insulation Resistance (I.R.)	1,000,000MΩ min. ( $C \leq 470\text{pF}$ ) 100,000MΩ min. ( $C > 470\text{pF}$ )	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25°C and standard humidity and within 2 minutes of charging.																
7	Capacitance	Within the specified tolerance	The capacitance/Q should be measured at 25°C at the frequency and voltage shown in the table.																
8	Q	$C \leq 220\text{pF}$ : $Q \geq 10,000$ $220\text{pF} < C \leq 470\text{pF}$ : $Q \geq 5,000$ $470\text{pF} < C \leq 1,000\text{pF}$ : $Q \geq 3,000$ C: Nominal Capacitance (pF)	<table><tr><td>Frequency</td><td>1±0.1MHz</td></tr><tr><td>Voltage</td><td>1±0.2Vrms</td></tr></table>	Frequency	1±0.1MHz	Voltage	1±0.2Vrms												
Frequency	1±0.1MHz																		
Voltage	1±0.2Vrms																		
9	Capacitance Temperature Characteristics	Capacitance Change	The temperature coefficient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5, the capacitance should be within the specified tolerance for the temperature coefficient and capacitance change as Table A. The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in steps 1, 3 and 5 by the capacitance value in step 3.																
		Temperature Coefficient																	
		Capacitance Drift																	
10	Adhesive Strength of Termination	No removal of the terminations or other defects should occur.	Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 1 using an eutectic solder. Then apply 10N* force in parallel with the test jig for 10±1sec. The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.																
		 <p>Fig.1</p>	<table><tr><th>Type</th><th>a</th><th>b</th><th>c</th></tr><tr><td>ERB18</td><td>1.0</td><td>3.0</td><td>1.2</td></tr><tr><td>ERB21</td><td>1.2</td><td>4.0</td><td>1.65</td></tr><tr><td>ERB32</td><td>2.2</td><td>5.0</td><td>2.9</td></tr></table> <p>(in mm) *5N (ERB188)</p>	Type	a	b	c	ERB18	1.0	3.0	1.2	ERB21	1.2	4.0	1.65	ERB32	2.2	5.0	2.9
Type	a	b	c																
ERB18	1.0	3.0	1.2																
ERB21	1.2	4.0	1.65																
ERB32	2.2	5.0	2.9																

Continued on the following page. 


# ERB Series Specifications and Test Method (1)

Continued from the preceding page.

No.	Item	Specifications	Test Method									
11	Vibration Resistance	Appearance	No defects or abnormalities									
		Capacitance	Within the specified tolerance									
		Q	Satisfies the initial value. $C \leq 220\text{pF} : Q \geq 10,000$ $220\text{pF} < C \leq 470\text{pF} : Q \geq 5,000$ $470\text{pF} < C \leq 1,000\text{pF} : Q \geq 3,000$ C: Nominal Capacitance (pF)									
12	Deflection	No crack or marked defect should occur.	Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 2a using an eutectic solder. Then apply a force in the direction shown in Fig. 3a. The soldering should be done by the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.									
		 										
13	Solderability of Termination	95% of the terminations are to be soldered evenly and continuously.	Immerse the capacitor in a solution of isopropyl alcohol and rosin (25% rosin in weight proportion). Preheat at 80 to 120°C for 10 to 30 seconds. After preheating, immerse in an eutectic solder or Sn-3.0Ag-0.5Cu solder solution for 5±0.5 seconds at 245±5°C.									
14	Resistance to Soldering Heat	The measured and observed characteristics should satisfy the specifications in the following table.	Preheat according to the conditions listed in the table below. Immerse the capacitor in an eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5°C for 10±0.5 seconds. Let sit at room temperature for 24±2 hours.									
		<table><tr><th>Item</th><th>Specifications</th></tr><tr><td>Appearance</td><td>No marked defect</td></tr><tr><td>Capacitance Change</td><td>Within ±2.5% or ±0.25pF (Whichever is larger)</td></tr><tr><td>Q</td><td><math>C \leq 220\text{pF} : Q \geq 10,000</math> <math>220\text{pF} &lt; C \leq 470\text{pF} : Q \geq 5,000</math> <math>470\text{pF} &lt; C \leq 1,000\text{pF} : Q \geq 3,000</math></td></tr><tr><td>Dielectric Strength</td><td>No failure</td></tr></table> C: Nominal Capacitance (pF)		Item	Specifications	Appearance	No marked defect	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	Q	$C \leq 220\text{pF} : Q \geq 10,000$ $220\text{pF} < C \leq 470\text{pF} : Q \geq 5,000$ $470\text{pF} < C \leq 1,000\text{pF} : Q \geq 3,000$	Dielectric Strength
Item	Specifications											
Appearance	No marked defect											
Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)											
Q	$C \leq 220\text{pF} : Q \geq 10,000$ $220\text{pF} < C \leq 470\text{pF} : Q \geq 5,000$ $470\text{pF} < C \leq 1,000\text{pF} : Q \geq 3,000$											
Dielectric Strength	No failure											
15	Temperature Cycle	The measured and observed characteristics should satisfy the specifications in the following table.	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours at room temperature, then measure.									
		<table><tr><th>Item</th><th>Specifications</th></tr><tr><td>Appearance</td><td>No marked defect</td></tr><tr><td>Capacitance Change</td><td>Within ±5% or ±0.5pF (Whichever is larger)</td></tr><tr><td>Q</td><td><math>C \geq 30\text{pF} : Q \geq 350</math> <math>10\text{pF} \leq C &lt; 30\text{pF} : Q \geq 275 + \frac{C}{10}</math> <math>C &lt; 10\text{pF} : Q \geq 200 + 10C</math></td></tr><tr><td>I.R.</td><td>1,000MΩ min.</td></tr><tr><td>Dielectric Strength</td><td>No failure</td></tr></table> C: Nominal Capacitance (pF)		Item	Specifications	Appearance	No marked defect	Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	Q	$C \geq 30\text{pF} : Q \geq 350$ $10\text{pF} \leq C < 30\text{pF} : Q \geq 275 + \frac{C}{10}$ $C < 10\text{pF} : Q \geq 200 + 10C$	I.R.
Item	Specifications											
Appearance	No marked defect											
Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)											
Q	$C \geq 30\text{pF} : Q \geq 350$ $10\text{pF} \leq C < 30\text{pF} : Q \geq 275 + \frac{C}{10}$ $C < 10\text{pF} : Q \geq 200 + 10C$											
I.R.	1,000MΩ min.											
Dielectric Strength	No failure											
16	Humidity	The measured and observed characteristics should satisfy the specifications in the following table.	Apply the 24-hour heat (-10 to +65°C) and humidity (80 to 100%) treatment shown below, 10 consecutive times. Remove, let sit for 24±2 hours at room temperature, and measure.									
		<table><tr><th>Item</th><th>Specifications</th></tr><tr><td>Appearance</td><td>No marked defect</td></tr><tr><td>Capacitance Change</td><td>Within ±5% or ±0.5pF (Whichever is larger)</td></tr><tr><td>Q</td><td><math>C \geq 30\text{pF} : Q \geq 350</math> <math>10\text{pF} \leq C &lt; 30\text{pF} : Q \geq 275 + \frac{C}{10}</math> <math>C &lt; 10\text{pF} : Q \geq 200 + 10C</math></td></tr><tr><td>I.R.</td><td>1,000MΩ min.</td></tr></table> C: Nominal Capacitance (pF)		Item	Specifications	Appearance	No marked defect	Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	Q	$C \geq 30\text{pF} : Q \geq 350$ $10\text{pF} \leq C < 30\text{pF} : Q \geq 275 + \frac{C}{10}$ $C < 10\text{pF} : Q \geq 200 + 10C$	I.R.
Item	Specifications											
Appearance	No marked defect											
Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)											
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I.R.	1,000MΩ min.											
												

Continued on the following page. 

# ERB Series Specifications and Test Method (1)

 Continued from the preceding page.

No.	Item	Specifications	Test Method										
17	High Temperature Load	The measured and observed characteristics should satisfy the specifications in the following table.	Apply 200% (500V only 150%) of the rated voltage for 1,000±12 hours at 125±3°C. Remove and let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.										
		<table><tr><th>Item</th><th>Specifications</th></tr><tr><td>Appearance</td><td>No marked defect</td></tr><tr><td>Capacitance Change</td><td>Within ±3% or ±0.3pF (Whichever is larger)</td></tr><tr><td>Q</td><td>C≥30pF : Q≥350 10pF≤C&lt;30pF : Q≥275+ <math>\frac{5}{C}</math> C C&lt;10pF : Q≥200+10C</td></tr><tr><td>I.R.</td><td>1,000MΩ min.</td></tr></table>		Item	Specifications	Appearance	No marked defect	Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	Q	C≥30pF : Q≥350 10pF≤C<30pF : Q≥275+ $\frac{5}{C}$ C C<10pF : Q≥200+10C	I.R.	1,000MΩ min.
		Item		Specifications									
		Appearance		No marked defect									
		Capacitance Change		Within ±3% or ±0.3pF (Whichever is larger)									
Q	C≥30pF : Q≥350 10pF≤C<30pF : Q≥275+ $\frac{5}{C}$ C C<10pF : Q≥200+10C												
I.R.	1,000MΩ min.												
C: Nominal Capacitance (pF)													

Table A-6

Char.	Nominal Values (ppm/ $^{\circ}\text{C}$ ) Note 1	Capacitance Change from 25 $^{\circ}\text{C}$ (%)					
		-55		-30		-10	
		Max.	Min.	Max.	Min.	Max.	Min.
5C	0 $\pm$ 30	0.58	-0.24	0.40	-0.17	0.25	-0.11

Note 1: Nominal values denote the temperature coefficient within a range of 25 to 125 $^{\circ}\text{C}$  (for 5C)