

JIS

JAPANESE INDUSTRIAL STANDARD

Fixed metal film resistors for
use in electronic equipment
— form 05, grade B

JIS C 5722—1991

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

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Fixed metal film resistors for use in electronic equipment – form 05, grade B C 5722-1991

1. Scope

This Japanese Industrial Standard specifies fixed metal film resistors – form 05 Grade B mainly used in electronic equipment (hereafter referred to as the "resistors"), based on JIS C 5720.

Remarks 1. This resistor is a resistor produced in such a way that the metal film closely fixed on a ceramic bar is employed as the resistor element, terminations are attached thereto, and an insulating enclosure (mold) is applied to this assembly.

2. The cited Standards are given below.

JIS C 3102-Annealed Copper Wires for Electrical Purposes

JIS C 5202-Test Methods of Fixed Resistors for Electronic Equipment

JIS C 5720-General Rules of Fixed Metal Film Resistors for Use in Electronic Equipment

JIS Z 9015-Sampling Inspection Procedures and Tables by Attributes with Severity Adjustment (Receiving Inspection where a Consumer Can Select Suppliers)

2. Definitions

For the purpose of this Standard, the definitions specified in and JIS C 5720 shall apply.

3. Type Designation

3.1 Structure of Type Designation The type designation shall be arranged as follows:

Symbol denoting kind of resistor 3.2.1	Symbol denoting form 3.2.2	Symbol denoting character- istics 3.2.3	Symbol denoting rated dissi- pation 3.2.4	Symbol denoting nominal resistance 3.2.5
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Example: RN 05 G 2E 1002

Symbol denoting tolerances on re- sistance 3.2.6	Symbol denoting grade 3.2.7	Symbol denoting failure rate level 3.2.8
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Example: F B X

3.2 Symbols

3.2.1 Kind of Resistor The symbol denoting kind of resistor shall be RN based on 4.2.1 (kind of resistor) of JIS C 5720.

3.2.2 Form The symbol denoting form shall be 05 based on 4.2.2 (form) of JIS C 5720.

3.2.3 Characteristics The symbol denoting characteristics shall consist of one English capital letter based on 4.2.3 (characteristics) of JIS C 5720, and shall be as given in Table 1.

Table 1. Characteristics

Characteristic symbol			F	G
Rated dissipation and maximum working voltage (see 4.1 and 4.6)	Rated dissipation		Maximum working voltage V	
	Symbol	Power W		
	2 A	0.1		
	2 B	0.125		
	2 E	0.25		
	2 H	0.5		
	3 A	1		
Rated ambient temperature (see 4.1)			125°C	
Category temperature range (see 4.3)			- 55 to + 175°C	
Temperature coefficient of resistance (see No.2 of Table 7) ppm/°C			± 25	± 50
Maximum allowable change in resistance	Short-time overload (see No. 3 of Table 7)		± (0.25 % + 0.05 Ω)	
	Voltage proof (see No. 5 of Table 7)			
	Robustness of termination (see No. 1 of Table 8)		± (0.2 % + 0.01Ω)	
	Resistance to vibration (see No. 2 of Table 8)		± (0.25 % + 0.05 Ω)	
	Resistance to soldering heat (see No. 3 of Table 8)		± (0.1 % + 0.01 Ω)	
	Shock (see No. 5 of Table 8)		± (0.25 % + 0.05 Ω)	
	Cold operation (see No. 1 of Table 9)			
	Change of temperature (cyclic) (see No. 2 of Table 9)			
	Resistance to damp, heat (cyclic) (see No. 3 of Table 9)		± (0.5 % + 0.05 Ω) After voltage proof test ± (0.25 % + 0.05 Ω)	
	Endurance (rated load) (see No. 4 of Table 9)		± (0.5 % + 0.05 Ω)	

Table 1 (Cont'd)

Characterisitic symbol	F	G
Tolerance on resistance (see 3.2.6) %	± 0.1 ± 0.25	± 0.5 ± 1
Nominal resistance range ⁽¹⁾ (see 4.4)	24.9 Ω to 2.00 M Ω	

Note ⁽¹⁾ This range varies according to combination of rated dissipation and temperature coefficient within the range given in this Table (see Table 4).

3.2.4 Rated Dissipation The symbol denoting rated dissipation shall be as given in Table 2, based on 4.2.4 (rated dissipation) of JIS C 5720.

Table 2. Rated Dissipation

Symbol	Rated dissipation W
2 A	0.1
2 B	0.125
2 E	0.25
2 H	0.5
3 A	1

3.2.5 Nominal Resistance The symbol denoting nominal resistance shall consist of four numerals based on 4.2.5 (nominal resistance) of JIS C 5720. The first, second and third numerals shall represent the significant figures in the unit of ohm (Ω) and the fourth numeral shall represent the number of zeros following to the significant figures. However, if there is a decimal point, the decimal point shall be represented by English capital letter R, and all the numerals are significant figures in this expression.

Example: 24R9.....24.9 Ω 47R5..... 47.5 Ω
 1000.....100 Ω 4750..... 475 Ω
 1001..... 1 k Ω 4751.....4.75 k Ω
 1003.....100 k Ω 4753..... 475 k Ω

3.2.6 Tolerance on Resistance The symbol denoting tolerance on resistance shall consist of one English capital letter based on 4.2.6 (tolerance on resistance) of JIS C 5720, and shall be as given in Table 3.

Table 3. Tolerance on Resistance

Symbol	B	C	D	F
Tolerance on resistance %	± 0.1	± 0.25	± 0.5	± 1

3.2.7 Grade The symbol denoting grade shall consist of one English capital letter based on 4.2.7 (grade) of JIS C 5720, and the letter shall be B (general level I).

3.2.8 Failure Rate Level The symbol denoting failure rate level shall consist of one English capital letter based on 4.2.8 (failure rate level) of JIS C 5720, and the letter shall be X (no failure rate is specified).

4. Ratings

4.1 Rated Dissipation The rated dissipation shall be as given in Table 4. However, for a resistor with a resistance exceeding its critical resistance, this means the dissipation corresponding to its maximum working voltage.

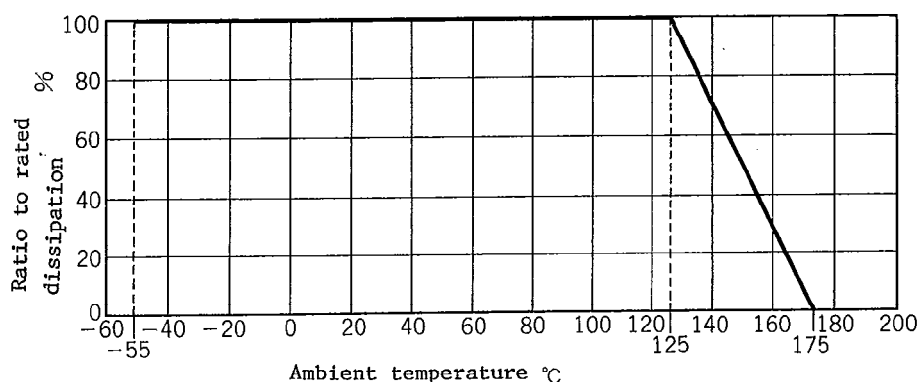
The rated ambient temperature shall be 125°C.

Table 4. Ratings

Rated dissipation		Maximum working voltage V	Maximum overload voltage V	Voltage proof V		Nominal resistance range
Symbol	Power W			Normal pressure	Low air pressure	
2 A	0.1	200	400	450	200	49.9 Ω to 200 kΩ
2 B	0.125	250	500			49.9 Ω to 499 kΩ
2 E	0.25	300	600	900	350	49.9 Ω to 1 MΩ
2 H	0.5	350	700			24.9 Ω to 1 MΩ
3 A	1	500	1 000			49.9 Ω to 2 MΩ

4.2 Maximum Dissipation The maximum dissipation shall have the same value as that of rated dissipation at temperatures not exceeding the rated ambient temperature. The maximum dissipation at temperature exceeding the rated ambient temperature shall have the values obtained by reducing the rated dissipation by means of the derating curve of Fig. 1.

Fig. 1. Derating Curve



4.3 Category Temperature Range The category temperature range shall be - 55 to + 175°C.

4.4 Nominal Resistance The nominal resistance shall be expressed in the unit of ohm (Ω), and the values shall be the numerical values given in Table 5 (E 96 series) and Table 6 (E 192 series) multiplied by 10^n (n is an integer). Table 5 is applicable for resistors with tolerance on resistance of $\pm 1\%$ (F), and Table 6 is applicable for resistors with tolerance on resistance of $\pm 0.1\%$ (B), $\pm 0.25\%$ (C) or $\pm 0.5\%$ (D).

The lowest resistance value and the highest resistance value in correlation with the rated dissipation shall be as given in Table 4.

Table 5. Preferred Numbers of Nominal Resistance (E 96 Series)

1.00	1.33	1.78	2.37	3.16	4.22	5.62	7.50
1.02	1.37	1.82	2.43	3.24	4.32	5.76	7.68
1.05	1.40	1.87	2.49	3.32	4.42	5.90	7.87
1.07	1.43	1.91	2.55	3.40	4.53	6.04	8.06
1.10	1.47	1.96	2.61	3.48	4.64	6.19	8.25
1.13	1.50	2.00	2.67	3.57	4.75	6.34	8.45
1.15	1.54	2.05	2.74	3.65	4.87	6.49	8.66
1.18	1.58	2.10	2.80	3.74	4.99	6.65	8.87
1.21	1.62	2.15	2.87	3.83	5.11	6.81	9.09
1.24	1.65	2.21	2.94	3.92	5.23	6.98	9.31
1.27	1.69	2.26	3.01	4.02	5.36	7.15	9.53
1.30	1.74	2.32	3.09	4.12	5.49	7.32	9.76

Table 6. Preferred Numbers of Nominal Resistance (E 192 Series)

1.00	1.21	1.47	1.78	2.15	2.61	3.16	3.83	4.64	5.62	6.81	8.25
1.01	1.23	1.49	1.80	2.18	2.64	3.20	3.88	4.70	5.69	6.90	8.35
1.02	1.24	1.50	1.82	2.21	2.67	3.24	3.92	4.75	5.76	6.98	8.45
1.04	1.26	1.52	1.84	2.23	2.71	3.28	3.97	4.81	5.83	7.06	8.56
1.05	1.27	1.54	1.87	2.26	2.74	3.32	4.02	4.87	5.90	7.15	8.66
1.06	1.29	1.56	1.89	2.29	2.77	3.36	4.07	4.93	5.97	7.23	8.76
1.07	1.30	1.58	1.91	2.32	2.80	3.40	4.12	4.99	6.04	7.32	8.87
1.09	1.32	1.60	1.93	2.34	2.84	3.44	4.17	5.05	6.12	7.41	8.98
1.10	1.33	1.62	1.96	2.37	2.87	3.48	4.22	5.11	6.19	7.50	9.09
1.11	1.35	1.64	1.98	2.40	2.91	3.52	4.27	5.17	6.26	7.59	9.20
1.13	1.37	1.65	2.00	2.43	2.94	3.57	4.32	5.23	6.34	7.68	9.31
1.14	1.38	1.67	2.03	2.46	2.98	3.61	4.37	5.30	6.42	7.77	9.42
1.15	1.40	1.69	2.05	2.49	3.01	3.65	4.42	5.36	6.49	7.87	9.53
1.17	1.42	1.72	2.08	2.52	3.05	3.70	4.48	5.42	6.57	7.96	9.65
1.18	1.43	1.74	2.10	2.55	3.09	3.74	4.53	5.49	6.65	8.06	9.76
1.20	1.45	1.76	2.13	2.58	3.12	3.79	4.59	5.56	6.73	8.16	9.88

4.5 Tolerance on Resistance The tolerance on resistance shall be expressed in percent (%) and shall be as given in Table 3.

4.6 Rated Voltage The rated voltage means the d.c. or a.c. (r.m.s. value at power frequency) voltage which corresponds to the rated dissipation and shall be calculated from the formula below. However, if the rated voltage so obtained exceeds the maximum working voltage given in Table 4, this maximum working voltage shall be taken as the rated voltage.

$$E = \sqrt{P \cdot R}$$

where, E : rated voltage (V)

P : rated dissipation (W)

R : nominal resistance (Ω)

5. Performances and Test Methods

5.1 Test Methods The test methods for electrical, mechanical and climatic performances shall be as specified in JIS C 5202.

5.2 Electrical Performances The electrical performances shall be as given in Table 7.

Table 7. Electrical Performances

No.	Item	Performances	Test methods (JIS C 5202)	
1	Resistance	Within specified tolerances on resistance	Comply with 5.1 (resistance). Classification of voltage application shall be A.	
			Nominal resistance range	Maximum voltage application V
			Under 100 Ω	0.3
			100 Ω or over to and excluding 1 k Ω	1
			1 k Ω or over to and excluding 10 k Ω	3
			10 k Ω or over to and excluding 100 k Ω	10
			100 k Ω or over to and excluding 1 M Ω	25
			1 M Ω or over	50

Table 7 (Cont'd)

No.	Item	Performances	Test methods (JIS C 5202)																													
2	Temperature characteristic of resistance	Temperature coefficient of resistance shall be within the values stated below. <table><tr><th>Character-istic symbol</th><th>Temperature coefficient of re-sistance ppm/°C</th></tr><tr><td>F</td><td>± 25</td></tr><tr><td>G</td><td>± 50</td></tr></table>	Character-istic symbol	Temperature coefficient of re-sistance ppm/°C	F	± 25	G	± 50	Comply with 5.2 (temperature character-istic of resistance and drift of resistance). (1) Test conditions shall be as given below. Condition B shall be employed for lot quality inspection and condition A for other cases. Unit: °C <table><tr><th rowspan="2">Step</th><th colspan="2">conditions</th></tr><tr><th>A</th><th>B</th></tr><tr><td>1</td><td>$20^{+5}_{-1}^{(2)}$</td><td>$20^{+5}_{-1}^{(2)}$ (room temperature is allowed)</td></tr><tr><td>2</td><td>-15 ± 2</td><td>—</td></tr><tr><td>3</td><td>-55 ± 3</td><td>-55 ± 3</td></tr><tr><td>4</td><td>$20^{+5}_{-1}^{(3)}$</td><td>$20^{+5}_{-1}^{(3)}$ (room temperature is allowed)</td></tr><tr><td>5</td><td>100 ± 2</td><td>—</td></tr><tr><td>6</td><td>175 ± 3</td><td>175 ± 3</td></tr></table> Notes (2) This is reference temper-ature of lower side only. (3) This is reference temper-ature of higher side only. (2) Calculate temperature coefficient of resistance (TCR) from following formula. $TCR \text{ (ppm/°C)} = \frac{R - R_0}{R_0} \times \frac{1}{t - t_0} \times 10^6$ where, R : measured value of re-sistance at t °C (Ω) R₀ : measured value of re-sistance at t₀ °C (Ω) t : measured value of testing temperature (°C) t₀ : measured value of refer-ence temperature (°C)	Step	conditions		A	B	1	$20^{+5}_{-1}^{(2)}$	$20^{+5}_{-1}^{(2)}$ (room temperature is allowed)	2	-15 ± 2	—	3	-55 ± 3	-55 ± 3	4	$20^{+5}_{-1}^{(3)}$	$20^{+5}_{-1}^{(3)}$ (room temperature is allowed)	5	100 ± 2	—	6	175 ± 3	175 ± 3
Character-istic symbol	Temperature coefficient of re-sistance ppm/°C																															
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3	-55 ± 3	-55 ± 3																														
4	$20^{+5}_{-1}^{(3)}$	$20^{+5}_{-1}^{(3)}$ (room temperature is allowed)																														
5	100 ± 2	—																														
6	175 ± 3	175 ± 3																														
3	Short-time overload	No remarkable ab-normalities on ap-pearance and marking shall be readable. Change of resistance: within ± (0.25 % + 0.05 Ω)	Comply with 5.5 (short-time overload). (1) Test condition shall be condition A. (2) Maximum overload voltage shall be as specified in Table 4 of this Standard (JIS C 5722).																													