

JIS

JAPANESE INDUSTRIAL STANDARD

Fixed wire wound resistors — Power type

Ⓒ JIS C 6401—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 wire wound resistors - Power type

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1. Scope

This Japanese Industrial Standard specifies fixed wire wound resistors - power type (hereafter referred to as "resistors") which are mainly used in electronic equipment, based on JIS C 5201.

Remarks 1. This resistor is produced in such a way that the resistance wire is wound on a heat resistant core such as hollow ceramics and the assembly is covered with a heat resistant covering of vitreous enamel or others.

2. Applicable Standards are given below.

JIS C 5201-General Rules of Resistors for Use in Electronic Equipment

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

JIS C 5602-Glossary of Passive Components for Electronic Equipment

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

3. Corresponding International Standard is given below.

IEC 115-4 (1982) Fixed resistors for use in electronic equipment. Part 4 : Sectional specification : Fixed power resistors

4. The units and numerical values given in { } in this Standard are based on the traditional units and are appended for informative reference.

2. Definitions

For the purpose of this Standard, the definitions specified in JIS C 5201 and JIS C 5602 shall apply.

3. Type Designation

3.1 Structure of Type Designation The type designation shall be arranged as shown in the following example:

Symbol denoting kind of resistor	Symbol denoting form	Symbol denoting characteristic	Symbol denoting nominal resistance	Symbol denoting tolerances on resistance	Symbol denoting grade	Symbol denoting failure rate level
3.2.1	3.2.2	3.2.3	3.2.4	3.2.5	3.2.6	3.2.7

Example:

RW H 120 V 103 J C



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3.2 Symbols

3.2.1 Kind of Resistor The symbol denoting kind of resistor shall be RW based on 4.2.1 (kind of resistor) of JIS C 5201.

3.2.2 Form The form shall be expressed according to the construction and dimensions as shown in Table 1.

Table 1. Form

Symbol of form	Form	Remarks
F 20	Rectangular, non-metallic enclosure, lug terminals on one end, with mounting mechanism	Fig. 2
F 21		
F 22		
M 55	Cylindrical, non-metallic case, lead wire terminations on both ends	Fig. 3
M 56		
M 67		
M 68		
M 69		
M 70	Cylindrical, non-metallic enclosure, lead wire terminations on both ends	Fig. 4
M 74		
M 78		
M 79		
H 5	Cylindrical, non-metallic enclosure, lug terminations on one end	Fig. 5
H 10		
H 20		
H 30		
H 40		
H 60		
H 80		
H 120		

Table 1 (Continued)

Symbol of form	Form	Remarks
H 10 A	Cylindrical, non-metallic enclosure, lug terminations on one end, with intermediate terminations	Fig. 5 Fig. 6
H 20 A		
H 30 T		
H 30 A		
H 40 T		
H 40 A		
H 60 T		
H 60 A		
H 80 T		
H 80 A		
H 120 T		
H 120 A		

3.2.3 Characteristics The characteristics shall be denoted by one English capital letter as given in Table 2, according to the differences in category temperature range, maximum surface temperature, derating factor of dissipation.

Table 2. Characteristics

Item	Symbol	
	V	G
Category temperature range °C	-55 to +200	-40 to +200
Maximum surface temperature °C	350	275
Dissipation derating	V in Fig. 1	G in Fig. 1

3.2.4 Nominal Resistance The symbol denoting nominal resistance shall consist of three numerals based on 4.2.5 (nominal resistance) of JIS C 5201. The first and second numerals shall represent the significant figures of nominal resistance in the unit of ohm (Ω) and the third numeral shall represent the number of zeros following the significant figures. However, the decimal point shall be expressed by R and in this expression all the numerals shall be significant figures.

Examples: R 15 0.15 Ω 1 R 0 1.0 Ω 1 R 5 1.5 Ω
 150 15 Ω 152 1.5 k Ω

The nominal resistance of a resistor with a center termination shall be expressed by the total resistance (resistance between fixed terminations on both ends), and the nominal resistance of a resistor with an adjustable termination shall be expressed by the resistance between fixed terminations on both ends with the adjustable termination removed.

3.2.5 Tolerance on Resistance The symbol denoting tolerance on resistance shall be as given in Table 3, based on 4.2.6 (tolerance on resistance) of JIS C 5201.

Table 3. Tolerance on Resistance

Symbol	J	K
Tolerance on resistance %	± 5	± 10

3.2.6 Grade The symbol denoting grade shall consist of one English capital letter based on 4.2.7 (grade) of JIS C 5201, and the letter shall be C (simplified level) or X (no quality assessment is specified).

3.2.7 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 5201, and the letter shall be X (no failure rate level is specified).

4. Ratings

4.1 Rated Dissipation The rated dissipation shall be as specified in Table 4.

The rated ambient temperature shall be 20°C.

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 temperatures 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

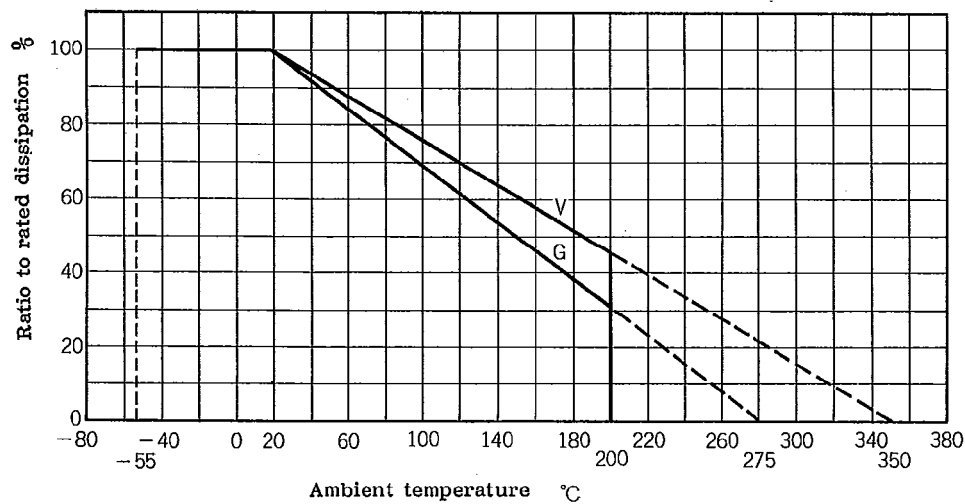


Table 4. Ratings

Symbol of form	Rated dissipation W		Nominal resistance range			Maximum overload voltage V
			Minimum value Ω	Maximum value k Ω		
	Characteristic V	Characteristic G	Single-layer winding	Single-layer winding	Multi-layer winding	
F 20	21	15	0.27	6.8	—	500
F 21	31	22	0.56	15	—	1250
F 22	53	37	1.0	30	—	2700
M 55	7	5	0.56	5.1	9.1	—
M 56	14	10	1.0	9.1	16	—
M 67	6.5	5	0.33	3.6	3.9	—
M 68	11	8	0.82	8.2	9.1	—
M 69	3	2.5	0.22	0.91	1.0	—
M 70	—	1	0.22	1.2	—	300
M 74	—	5	0.51	12	—	700
M 78	—	10	1.0	39	—	1500
M 79	—	3	0.22	3.6	—	300
M 5	6.3	5	0.12	3.3	—	—

Table 4 (Continued)

Symbol of form	Rated dissipation W		Nominal resistance range			Maximum overload voltage V
			Minimum value Ω	Maximum value kΩ		
	Charac- teristic V	Charac- teristic G	Single- layer winding	Single- layer winding	Multi- layer winding	
H 10	10	8	0.22	6.2	—	—
H 20	20	16	0.47	12	—	1400
H 30	30	25	0.68	20	—	2400
H 40	40	35	1.0	27	—	2800
H 60	60	45	1.6	43	—	2800
H 80	80	60	2.0	56	—	3600
H 120	120	90	3.0	82	—	5600
H 10 A	10	8	0.22	0.51	—	—
H 20 A	20	16	0.47	1.0	—	1400
H 30 T	27	22	0.68	18	—	2400
H 30 A	30	25		1.6		
H 40 T	36	31	1.0	24	—	2800
H 40 A	40	35		2.2		
H 60 T	54	40	1.6	39	—	2800
H 60 A	60	45		3.6		
H 80 T	72	54	2.0	51	—	3600
H 80 A	80	60		4.7		
H 120 T	108	81	3.0	75	—	5600
H 120 A	120	90		6.8		

4.3 Category Temperature Range The category temperature ranges shall be as given in Table 2.

4.4 Nominal Resistance Value The nominal resistance shall be expressed in the unit of ohm (Ω), and shall have the values equal to the numerical values of Table 5 multiplied by 10^n (n is an integer). The E 12 series is applicable to resistors with tolerance on resistance of $\pm 5\%$ (J) or $\pm 10\%$ (K) and E 24 series is applicable to resistors with tolerance on resistance of $\pm 5\%$ (J).

The nominal resistance range in correlation with the form and construction shall be as given in Table 4.

Table 5. Standard Values of Nominal Resistance

E12			E24						
1.0	1.2	1.5	1.0	1.1	1.2	1.3	1.5	1.6	
1.8	2.2	2.7	1.8	2.0	2.2	2.4	2.7	3.0	
3.3	3.9	4.7	3.3	3.6	3.9	4.3	4.7	5.1	
5.6	6.8	8.2	5.6	6.2	6.8	7.5	8.2	9.1	

Remarks: E12 series is recommended.

4.5 Tolerance on Resistance The tolerance on resistance shall be expressed in percent (%) and shall be as given in Table 3. However, for a resistor equipped with central termination, tolerance on resistance between the central termination and each end termination is twice the tolerance on resistance shown in Table 3.

4.6 Rated Voltage The rated voltage means the d.c. or a.c. (r.m.s at power frequency) voltage which corresponds the rated dissipation and the value of which is calculated from the formula below.

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

where, E : rated voltage (V)
 P : rated dissipation (W)
 R : nominal resistance (Ω)

5. Performances and Test Procedures

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

5.2 Electrical Performances The electrical performances shall comply with Table 6.

Table 6. Electrical Performances

No.	Item	Performances	Test method (JIS C 5202)	
			As specified in 5.1 (resistance) Use class A for voltage application.	Maximum applied voltage V
1	Resistance	Within specified tolerance on resistance. Provided that, for a resistor with central termination, terminations on both ends, resistance between fixed terminations on both ends, and for a resistor with adjustable termination, resistance between fixed terminations on both ends are taken as the resistance.	Nominal resistance range	
			Less than 10 Ω	0.1
			10 Ω and over up to but not including 100 Ω	0.3
			100 Ω and over up to but not including 1 k Ω	1
			1 k Ω and over up to but not including 10 k Ω	3
			10 k Ω and over up to but not including 100 k Ω	10
			100 k Ω and over up to but not including 1 M Ω	25
	Maximum adjustable range of resistor with adjustable termination	Not less than 75 % for resistors of form H 10 A or H 20 A, not less than 80 % for other resistors.	Carry out the maximum adjustable range test as given below. Fix adjustable termination as close as possible to one of fixed terminations measure the resistance between adjustable termination and fixed termination close thereto and call it R_1 . Measure the resistance between the adjustable termination and the other fixed termination in the similar way and call it R_2 . Call the resistance between fixed terminations on both ends R . Calculate maximum adjustable range R_a from the following formula:	
			$R_a (\%) = \frac{R - (R_1 + R_2)}{R} \times 100 (\%)$	

Table 6. (Continued)

Performances		Test method (JIS C 5202)																													
2	Temperature characteristic of resistance	As specified in 5.2 (temperature characteristic of resistance and deviation in resistance).																													
		(1) Employ condition A																													
		Unit: °C																													
<table><tr><th rowspan="2">Nominal resistance</th><th colspan="2">Temperature coefficient of resistance</th></tr><tr><th>Not less than 20 Ω</th><th>Less than 20 Ω</th></tr><tr><td></td><td>± 260 ppm/°C</td><td>± 400 ppm/°C</td></tr></table>		Nominal resistance	Temperature coefficient of resistance		Not less than 20 Ω	Less than 20 Ω		± 260 ppm/°C	± 400 ppm/°C	<table><tr><th rowspan="2">Step</th><th colspan="2">Characteristics</th></tr><tr><th>V</th><th>G</th></tr><tr><td>1</td><td>20⁺⁵₋₁ (room temperature is allowed)</td><td>20⁺⁵₋₁ (room temperature is allowed)</td></tr><tr><td>3</td><td>-55±3</td><td>-40±3</td></tr><tr><td>4</td><td>20⁺⁵₋₁ (room temperature is allowed)</td><td>20⁺⁵₋₁ (room temperature is allowed)</td></tr><tr><td>7</td><td>350±3</td><td>275±3</td></tr><tr><td>8</td><td>20⁺⁵₋₁ (room temperature is allowed)</td><td>20⁺⁵₋₁ (room temperature is allowed)</td></tr></table>		Step	Characteristics		V	G	1	20 ⁺⁵ ₋₁ (room temperature is allowed)	20 ⁺⁵ ₋₁ (room temperature is allowed)	3	-55±3	-40±3	4	20 ⁺⁵ ₋₁ (room temperature is allowed)	20 ⁺⁵ ₋₁ (room temperature is allowed)	7	350±3	275±3	8	20 ⁺⁵ ₋₁ (room temperature is allowed)	20 ⁺⁵ ₋₁ (room temperature is allowed)
Nominal resistance	Temperature coefficient of resistance																														
	Not less than 20 Ω	Less than 20 Ω																													
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Step	Characteristics																														
	V	G																													
1	20 ⁺⁵ ₋₁ (room temperature is allowed)	20 ⁺⁵ ₋₁ (room temperature is allowed)																													
3	-55±3	-40±3																													
4	20 ⁺⁵ ₋₁ (room temperature is allowed)	20 ⁺⁵ ₋₁ (room temperature is allowed)																													
7	350±3	275±3																													
8	20 ⁺⁵ ₋₁ (room temperature is allowed)	20 ⁺⁵ ₋₁ (room temperature is allowed)																													
		(2) Calculate temperature coefficient of resistance as specified in 5.2.3 (a).																													