

ERRATA

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Table 5

The value of resistance for temperature 150 °C and nominal resistance 0.55 k Ω

Error: 1.510

Correct: 1.610

The value of resistance for temperature 155 °C and nominal resistance 30 k Ω

Error: 229.5

Correct: 299.5

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

Japanese Standards Association

JIS

JAPANESE INDUSTRIAL STANDARD

**Thermistor for temperature
measurement**

JIS C 1611—1995

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by

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Printed in Japan

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

JAPANESE INDUSTRIAL STANDARD

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Thermistor for temperature measurement

C 1611-1995

1. Scope This Japanese Industrial Standard specifies thermistor for temperature measurement.

Remarks 1. The following standards are cited in this Standard:

JIS B 7507 Vernier, dial and digital callipers

JIS B 7516 Metal rules

JIS C 0911 Vibration testing procedure for electric machines and equipment

JIS C 0912 Shock testing procedure for electric machines and equipment

JIS C 1302 Insulation resistance testers

JIS C 1303 High insulation resistance meters

JIS C 1604 Resistance thermometer sensors

JIS Z 8703 Standard atmospheric conditions for testing

JIS Z 8704 Temperature measurement — Electrical methods

JIS Z 8710 Temperature measurement — General requirement

2. In this Standard, the units and numerical values in { } are based on traditional unit system, and are appended for informative reference.

2. Definitions For the purpose of this standard the following definitions apply.

- (1) thermistor for temperature measurement The temperature measuring probe which is composed of thermistor, inside conductor, insulator and protective tube. In the case of using terminal, outside conductor and resistance for interchange, there is the case where all of them are included.
- (2) thermistor The thermistor is composed of metal oxide. It is a resistance element having negative temperature coefficient with its surface covered by glass.
- (3) inside conductor The inside conductor is the part of conductor connected to the thermistor, and located in the protective tube.
- (4) insulator The insulator to be used for protection of short circuit between inside conductors, and between inside conductor and protective tube.
- (5) protective tube The tube to be used for such protection that the thermistor and the inside conductor do not contact directly with the substances of temperature measurement, or atmosphere.
- (6) outside conductor The part of conductor which is outside of protective tube.

- (7) resistance for interchange The added resistance, when the thermistor for temperature measurement is able to be interchanged by adding that resistance.
- (8) interchangeable element type thermistor for temperature measurement The thermistor for temperature measurement that is able to be interchanged without adding the resistance for interchange.
- (9) combined resistance type thermistor for temperature measurement The thermistor to which the resistance for interchange is added and the combined resistance thereof shows certain temperature characteristics.
- (10) ratio type thermistor for temperature measurement The thermistor for temperature measurement with 3 terminals whose circuit is composed of thermistor and resistor, and the ratio thereof has certain relationship.
- (11) standard temperature characteristics Standard value of resistance (combined) or ratio corresponding to the temperature, for each class of thermistor for temperature measurement.
- (12) nominal resistance value of interchangeable element type thermistor for temperature measurement Nominal value of resistance at the specified temperature.
- (13) resistance deviation Deviation of the resistance per 1 K{1°C} at the specified temperature.
- (14) ratio deviation Deviation of the ratio per 1 K{1°C} at the specified temperature.
- (15) thermistor constant B The constant used for calculation of the resistance at an optional temperature between two temperatures whose resistances are given.

3. Classification Thermistors are classified as follows, according to the grade, circuit configuration, range of working temperature, and nominal resistance value (only interchangeable element type thermistor).

- (1) Grade Grade shall conform to Table 1.

Table 1. Classification

Symbol	Grade
0.3	Grade 0.3
0.5	Grade 0.5
1.0	Grade 1.0
1.5	Grade 1.5

- (2) Circuit configuration Circuit configuration shall be as shown in Table 2.

Table 2. Circuit configuration

Symbol	Circuit configuration	Connection
THE	Element interchangeable type	As given in Fig. 1
THR	Combined resistance type	As given in Figs. 2 (A), (B)
THP	Ratio type	As given in Fig. 3

Fig. 1. Element interchangeable type

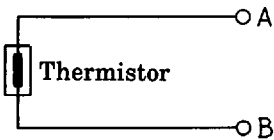
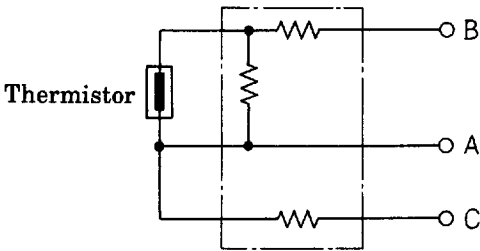


Fig. 2

(A) Combined resistance type (B) Combined resistance type



Fig. 3. Ratio type



Remarks: A, B and C show the terminal symbols.

- (3) Working temperature range Working temperature range shall be as follows:
- (a) In the case of interchangeable element type, the working temperature ranges and the nominal resistances shall be as given in Table 3.

Table 3. Working temperature ranges and nominal resistances

Working temperature range	Nominal resistance
0 to 20°C ⁽¹⁾	6 kΩ(0°C) 30 kΩ(0°C)
10 to 30°C ⁽¹⁾	6 kΩ(0°C) 30 kΩ(0°C)
20 to 40°C ⁽¹⁾	6 kΩ(0°C) 30 kΩ(0°C)
30 to 50°C ⁽¹⁾	6 kΩ(0°C) 30 kΩ(0°C)
40 to 60°C ⁽¹⁾	6 kΩ(0°C) 30 kΩ(0°C)
50 to 70°C ⁽¹⁾	6 kΩ(0°C) 30 kΩ(0°C) 3 kΩ(100°C)
60 to 80°C ⁽¹⁾	6 kΩ(0°C) 30 kΩ(0°C) 3 kΩ(100°C)
70 to 90°C ⁽¹⁾	6 kΩ(0°C) 30 kΩ(0°C) 3 kΩ(100°C)
80 to 100°C ⁽¹⁾	6 kΩ(0°C) 30 kΩ(0°C) 3 kΩ(100°C)
-50 to +100°C	6 kΩ (0°C)
0 to 150°C	30 kΩ (0°C)
50 to 200°C	3 kΩ (100°C)
100 to 250°C	0.55 kΩ (200°C)
150 to 300°C	4 kΩ (200°C)
200 to 350°C	8 kΩ (200°C)

Note ⁽¹⁾ For Grade 0.3, this temperature range shall be applied.

- (b) In the case of combined resistance type and ratio type, the working temperature ranges shall be as given in Table 4.

Table 4. Working temperature ranges

Working temperature range
-50 to +50°C
0 to 100°C
50 to 150°C
100 to 250°C
150 to 300°C
200 to 350°C

4. Characteristics

4.1 Temperature characteristics

4.1.1 Standard temperature characteristics Standard temperature characteristics of the thermistor for temperature measurement shall be as follows.

- (1) Standard temperature characteristics of the interchangeable element type thermistor for temperature measurement shall be as given in Table 5.

Table 5. Standard temperature characteristics of interchangeable element type thermistor for temperature measurement

Tem- perature °C	Nominal resistance		6 kΩ (0 °C)		30 kΩ (0 °C)		3 kΩ (100 °C)		0.55 kΩ (200 °C)		4 kΩ (200 °C)		8 kΩ (200 °C)	
	Working tem- perature range		-50 to +100 °C		0 to 150 °C		50 to 200 °C		100 to 250 °C		150 to 300 °C		200 to 350 °C	
	Characteristic, resistance deviation		Resistance	Resistance deviation	Resistance	Resistance deviation	Resistance	Resistance deviation	Resistance	Resistance deviation	Resistance	Resistance deviation	Resistance	Resistance deviation
-50			75.36 kΩ	± 4.28										
-45			56.59	± 3.11										
-40			42.90	± 2.28										
-35			32.80	± 1.69										
-30			25.23	± 1.26										
-25			19.53	± 0.95										
-20			15.21	± 0.72	77.07 kΩ									
-15			11.92	± 0.55	60.23									
-10			9.414	± 0.422	47.41									
- 5			7.489	± 0.327	37.59									
0			6.000	± 0.261	30.00	± 1.35 kΩ								
5			4.843	± 0.200	24.10	± 1.01								
10			3.934	± 0.158	19.49	± 0.80								
15			3.209	± 0.125	15.85	± 0.63								
20			2.637	± 0.100	12.97	± 0.50								
25			2.179	± 0.080	10.67	± 0.40								

Table 5 (continued)

Nominal resistance Working temperature range Characteristic resistance deviation Temperature °C	6 kΩ (0 °C)		30 kΩ (0 °C)		3 kΩ (100 °C)		0.55 kΩ (200 °C)		4 kΩ (200 °C)		8 kΩ (200 °C)	
	-50 to +100 °C		0 to 150 °C		50 to 200 °C		100 to 250 °C		150 to 300 °C		200 to 350 °C	
	Resistance	Resistance deviation	Resistance	Resistance deviation	Resistance	Resistance deviation	Resistance	Resistance deviation	Resistance	Resistance deviation	Resistance	Resistance deviation
30	1.812 ^{kΩ}	± 0.065 ^{kΩ}	8.828 ^{kΩ}	± 0.323 ^{kΩ}	28.05 ^{kΩ}							
35	1.510	± 0.053	7.343	± 0.261	23.21							
40	1.266	± 0.043	6.140	± 0.212	19.31							
45	1.067	± 0.035	5.159	± 0.174	16.15							
50	904.2 ^Ω	± 29.0 ^Ω	4.356	± 0.144	13.57 ^{kΩ}	± 0.47						
55	769.6	± 24.0	3.696	± 0.118	11.46	± 0.38						
60	657.7	± 20.0	3.147	± 0.098	9.717	± 0.310						
65	564.8	± 16.7	2.695	± 0.081	8.278	± 0.257						
70	487.0	± 14.0	2.317	± 0.068	7.081	± 0.214						
75	421.2	± 11.8	2.000	± 0.057	6.081	± 0.180						
80	365.7	± 10.0	1.734	± 0.048	5.243	± 0.151	12.66 ^{kΩ}					
85	318.8	± 8.4	1.508	± 0.041	4.536	± 0.128	10.18					
90	278.9	± 7.2	1.318	± 0.035	3.939	± 0.108	8.626					
95	244.8	± 6.2	1.155	± 0.030	3.432	± 0.092	7.345					
100	215.6	± 5.5	1.017	± 0.026	3.000	± 0.080	6.281 ^{kΩ}	± 0.194				
105	190.3		897.0 ^Ω	± 21.8 ^Ω	2.631	± 0.067	5.393	± 0.159				
110	168.4		794.0	± 18.9	2.314	± 0.058	4.649	± 0.134				
115	149.6		704.9	± 16.3	2.041	± 0.050	4.023	± 0.113				
120	133.3		627.7	± 14.2	1.805	± 0.043	3.495	± 0.096				
125			560.4	± 12.4	1.601	± 0.037	3.046	± 0.081				
130			501.7	± 10.8	1.424	± 0.033	2.664	± 0.069	23.06 ^{kΩ}			
135			450.3	± 9.5	1.269	± 0.028	2.338	± 0.059	20.02			
140			405.2	± 8.3	1.134	± 0.025	2.056	± 0.051	17.44			
145			365.5	± 7.4	1.016	± 0.022	1.818	± 0.044	15.23			
150			330.5	± 5.6	912.1 ^Ω	± 19.5 ^Ω	1.510	± 0.039	13.33 ^{kΩ}	± 0.35		
155			229.5		818.0	± 17.5	1.430	± 0.033	11.70	± 0.30		
160			272.0		734.9	± 15.4	1.273	± 0.029	10.29	± 0.26		
165			247.6		661.3	± 13.7	1.137	± 0.025	9.082	± 0.223		