

JIS

JAPANESE INDUSTRIAL STANDARD

**General rules of potentiometers
for use in electronic equipment**

JIS C 5260—1996

Translated and Published

by

Japanese Standards Association

Printed in Japan

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

Errata for JIS (English edition) are printed in *Standardization Journal*, published monthly by the Japanese Standards Association.

Errata will be provided upon request, please contact:

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Errata are also provided to subscribers of JIS (English edition) in *Monthly Information*.

Contents

	Page
1. Scope	1
2. Definitions	2
3. System of standard and order of precedence	6
4. Type designation	6
4.1 Structure of type designation	6
4.2 Symbols	7
4.2.1 Kind of resistor	7
4.2.2 Size	7
4.2.3 Characteristics	8
4.2.4 Style	8
4.2.5 Operating part	9
4.2.6 Resistance law	10
4.2.7 Nominal total resistance	16
4.2.8 Tolerance on total resistance	16
4.2.9 Assessment level	16
4.2.10 Failure rate level	17
4.2.11 Stability class	17
4.2.12 Other necessary symbols	18
5. Ratings	18
5.1 Rated power	18
5.2 Operating temperature range	19
5.3 Nominal total resistance	19
5.4 Resistance law	20
5.5 Tolerance on total resistance	20
6. Performances and test methods	20
6.1 Performances	20

	Page
6.2 Test methods	20
7. Assessment and assurance of quality	20
8. Principal dimentions	21
8.1 External dimentions	21
8.2 Screw thread	21
8.3 Size of mountig round hole of resistor	21
8.4 Dimensions of termination	21
8.5 Spacing between terminations	21
8.6 Diameter of operating part	21
9. Materials	22
10. Marking	22
10.1 Marking on prodcut	22
10.1.1 Items to be marked	22
10.1.2 Method of marking	22
10.1.3 Marking of nominal total resistance on small-sized resistors	25
10.2 Marking on package	26
11. Packaging	26
12. Taping	26
Annex 1. Quality assurance program	27
Annex 2. Procedure of quality assurance	30
Annex 3. Qualification approval test	31
Annex 4. Failure rate approval test	33
Annex 5. Quality conformance inspection	34
Annex 6. Periodic approval maintenance test	36

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J I S

General rules of potentiometers
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C 5260-1996

1. Scope This Japanese Industrial Standard is the generic specification of potentiometers used mainly for electronic equipment (hereafter referred to as "resistors") and specifies the matters common to resistors, basis of items to be specified in the sectional specification of resistors (hereafter referred to as "sectional specification") and in the detail specification of resistors (hereafter referred to as "detail specification").

Remarks 1. In this Standard, expression is done mainly for rotary type resistors, therefore the following words shall be read as stated below for application to slide type and linear travelling shaft type ones.

- (1) Operating part The operating part shall be read as shaft or lever.
- (2) Angle of revolution The angle of revolution as operation distance or travelling distance.
- (3) Rotation The rotation as operation or travelling.

2. The following Standards are cited in this Standard :

JIS B 0205	Metric coarse screw threads
JIS B 0207	Metric fine screw threads
JIS B 1001	Diameter of clearance holes and counterbores for bolts and screws
JIS C 0805	Packaging of electronic components on continuous tapes (components with axial type and radial wire lead terminals)
JIS C 0806	Packaging of electronic components on continuous tapes (surface mounting devices)
JIS C 5001	General rules for electronic components
JIS C 5002	Environmental requirements for electronic components
JIS C 5003	General test procedure of failure rate for electronic components
JIS C 5010	General rules for printed wiring boards
JIS C 5201	General rules of fixed resistors for use in electronic equipment
JIS C 5261	Test methods of potentiometers for use in electronic equipment
JIS C 5602	Glossary of passive components for electronic equipment
JIS C 5700	General rules for reliability assured electronic components
JIS Z 8601	Preferred numbers
JIS Z 9015	Sampling inspection procedures and tables by attributes with severity adjustment (receiving inspection where a consumer can select suppliers)

3. The International Standards corresponding to this Standard are given below.

IEC 62 (1992)	Marking codes for resistors and capacitors
IEC 63 (1963)	Preferred number series for resistors and capacitors Amendment No.1 (1967) and Amendment No.2 (1977)
IEC 393-1 (1989)	Potentiometers for use in electronic equipment Part 1: Generic specification Amendment No.1 (1992)
IEC 393-2 (1989)	Potentiometers for use in electronic equipment Part 2: Sectional specification; Lead-screw actuated and rotary preset potentiometers
IEC 393-3 (1992)	Potentiometers for use in electronic equipment Part 3: Sectional specification; Rotary precision potentiometers
IEC 393-4 (1992)	Potentiometers for use in electronic equipment Part 4: Sectional specification; Single-turn rotary power potentiometers
IEC 393-5 (1992)	Potentiometers for use in electronic equipment Part 5: Sectional specification; Single-turn rotary low-power wirewound and non-wirewound potentiometers
ISO 8601 (1988)	Data elements and interchange formats – Information interchange – Representation of dates and times

2. Definitions For the main terms used in this Standard the definitions in JIS C 5001, JIS C 5602 and JIS C 5700 apply, and the rest of the terms shall be as follows:

- (1) kind of resistors This means a classification done mainly according to the material of resistor or the purpose of use.
- (2) nominal total resistance The resistance between both terminations of the resistive element by which the value in Standard is designated. In general, it is the resistance value marked on a resistor.

Informative reference: In IEC 393-1, this is called “rated resistance”.

- (3) operating temperature range The range of ambient temperature over which a resistor is able to operate continuously.

Informative reference: In IEC 393-1, this is called “category temperature range”.

- (4) highest ambient temperature The maximum ambient temperature at which a resistor is able to operate continuously.

Informative reference: In IEC 393-1, this is called “upper category temperature”.

- (5) lowest ambient temperature The minimum ambient temperature at which a resistor is able to operate continuously.

Informative reference: In IEC 393-1, this is called “lower category temperature”.

- (6) rated ambient temperature The maximum value of ambient temperature at which a resistor is able to operate continuously while a specified rated load (electric power) is being applied.
- (7) rated power The maximum value of electric power which can be continuously applied to all the area of a resistive element at the rated ambient temperature.
Informative reference: In IEC 393-1, this is called "rated dissipation".
- (8) maximum power The maximum value of electric power which can be continuously applied to all the area of a resistive element at a certain ambient temperature.

Remarks: The maximum power when the nominal total resistance value exceeds the critical resistance value is limited to a power corresponding to the maximum working voltage.

Informative reference: In IEC 393-1, this is called as "category dissipation".

- (9) derating curve The curve which shows the relationship between the ambient temperature and the maximum power. In general, it is expressed in percentage of the rated power.
- (10) rated voltage The maximum value of d.c. voltage or a.c. voltage (r.m.s.) which can be applied continuously across a resistor at the rated ambient temperature.
- (11) maximum working voltage or limiting element voltage The maximum value of d.c. voltage or a.c. voltage (r.m.s.) which can be applied across a resistor (or the resistive element).
- (12) critical resistance The maximum nominal total resistance value up to which the rated power is consumed by a resistor without exceeding the maximum working voltage.
- (13) resistance law or resistance taper The behavior of change in resistance value relative to the mechanical operation of a resistor. The characteristic in which behavior of change in the ratio of the voltage (or resistance) between terminations 1 and 2 (or 2 and 3) to the voltage (or resistance) between terminations 1 and 3 is expressed in correlation with the angle of rotation of the spindle (operating part). There are characteristics as stated below.

Informative reference: In IEC 393-1, this is called "resistance law".

- (a) potential percentage The percentage given by the formula below, when the voltage between terminations 1 and 3 is denoted by U_{13} , that between 1 and 2 by U_{12} and that between 2 and 3 by U_{23} .

$$\frac{U_{12}}{U_{13}} \times 100 (\%), \text{ or } \frac{U_{23}}{U_{13}} \times 100 (\%)$$

- (b) resistance percentage The percentage given by the formula below, when the resistance between terminations 1 and 3 is denoted by R_{13} , that between 1 and 2 by R_{12} and that between 2 and 3 by R_{23} .

$$\frac{R_{12}}{R_{13}} \times 100 (\%), \text{ or } \frac{R_{23}}{R_{13}} \times 100 (\%)$$

- (c) attenuation percentage Generic name of potential percentage and resistance percentage.

Remarks: Unless otherwise specified, this is expressed in potential percentage.

- (d) resistance law A Such a characteristic that the attenuation percentage between terminations 1 and 2 increases according to almost exponential function curve when the operating part is rotated clockwise.
- (e) resistance law B Such a characteristic that the attenuation percentage is almost linear in the middle part of angle of effective rotation and symmetrical as regards the center point.
- (f) resistance law C Such a characteristic that the attenuation percentage between terminations 2 and 3 increases according to almost exponential function curve when the operating part is rotated counterclockwise.
- (g) resistance law H Resistance laws other than those of A, B and C.
- (h) resistance law of tapped resistor Resistance law of resistors equipped with intermediate taps.

- (14) direction of rotation (or direction of travel) of operating part The direction of rotation of an operating part viewed from end of the operating part.

Remarks: The direction of rotation is distinguished by calling it clockwise or counterclockwise.

- (15) center tap termination The termination which is connected to intermediate portion of a resistive material. It is also called an intermediate tap.

The position of intermediate tap is expressed by the angle of rotation in percent (%) of total mechanical rotation.

- (16) total mechanical rotation or total mechanical travel The angle of mechanical rotation from one end position to another end position of an operating part.

Remarks: For a resistor in which some play angle is provided on the operating part due to structural reason such as a resistor with a push-pull switch, the play angle is included.

- (17) switch angle The angle necessary for operating the rotary switch.

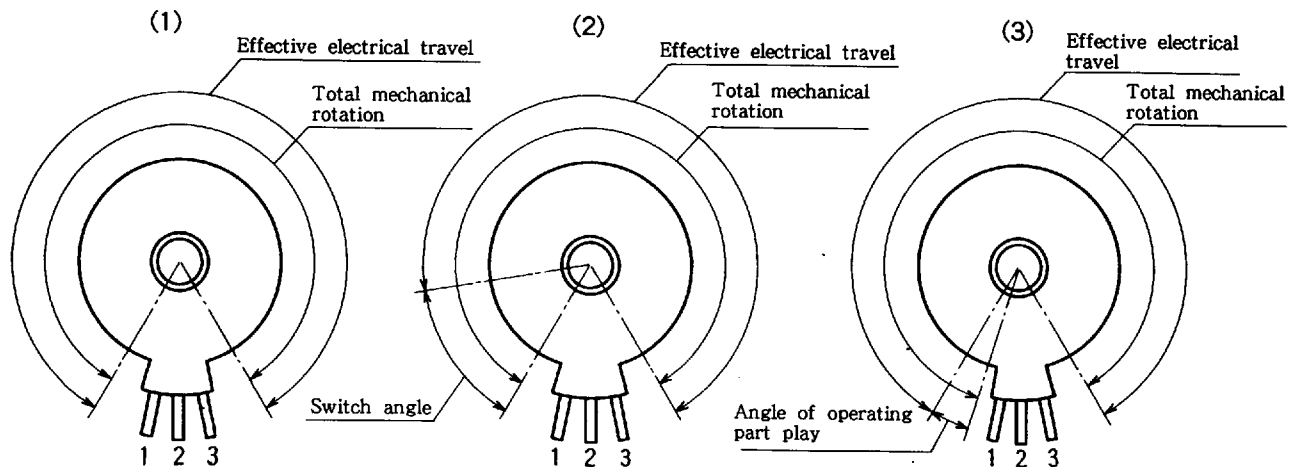
- (18) effective electrical travel or angle of effective electrical rotation

- (18.1) For resistors without play on operating part

- (a) The total mechanical rotation for a resistor without switch [see Fig. 1 (1)].
- (b) The total mechanical rotation subtracted by the switching angle, for a resistor with rotary switch [see Fig. 1 (2)].

- (18.2) For resistors with play on operating part The total mechanical rotation subtracted by the angle of operating part play [see Fig. 1 (3)].

Fig. 1. Effective electrical travel



Remarks: The case that the spindle is rotated counterclockwise to the end is shown.

- (19) residual resistance or end resistance This is the resistance between the end termination and the termination of the moving contact when the operating part is positioned at the relevant end of rotation.
- (20) characteristic Especially picked up performances of a resistor which can be expressed quantitatively or qualitatively under certain conditions.
- (21) assessment level This means the classification of resistors according to the degree of ensurance of the performances under certain conditions.
- (22) stability class This means the classification of resistors according to the limit of change (or change rate) in the total resistance when they are subjected to the test items of short period and long period.
- (23) basic specification A general rule which specifies common matters relating with the field such as electronic components and reliability assurance thereof.
Examples: JIS C 5001 and JIS C 5700
- (24) generic specification A general rule which specifies common matters relating with each family of component such as potentiometers and fixed resistors.
Informative reference: IEC 393-1 is a generic specification of potentiometers.
- (25) sectional specification A general rule which specifies common matters relating with each sub-family of component such as screw driven type and rotary pre-set type potentiometers, precision potentiometers, rotary low power wound and non-wound types potentiometers.
- (26) detail specification A standard which specifies size, style, characteristics, assessment level and stability class of a component manufactured in accordance with the relevant sectional specification, and clearly states the requirements.
- (27) primary stage of manufacture The primary stage of manufacturing process which shall be managed by the manufacturer who receives approval as his manufacturing process of resistors.

3. System of standard and order of precedence Standards of resistors are composed of the groups of specifications given below, and if there is contradiction in the specifications, the order of precedences is as given below.

- (1) Detail specification
- (2) Sectional specification
- (3) Generic specification (JIS C 5260)
- (4) Basic specification (JIS C 5001 and JIS C 5700)

Remarks: Hereafter the sectional specification and detail specification are called resistor Standard as a generic name.

4. Type designation

4.1 Structure of type designation The type designation shall be formed by arranging the symbols as given below, and specified by the resistor specification.

	Symbol denoting kind of resistor 4.2.1	Symbol denoting size 4.2.2	Symbol denoting charac- teristics 4.2.3	Symbol denoting style 4.2.4	Symbol denoting operating part 4.2.5	Symbol denoting resistance law 4.2.6
Example 1.	RV	24	Y	N	20S	0B
Example 2.	RV	24	Y	D	30R	0B501 +
	Symbol denoting nominal total resistance 4.2.7	Symbol denoting tolerance on total resistance 4.2.8	Symbol denoting assessment level 4.2.9	Symbol denoting failure rate level or stability class 4.2.10 or 4.2.11	Symbol denoting other necessary items 4.2.12	
	103	K	E	J	SE	
	15A502	M	X	K	—	

Remarks: Expression of resistance law and nominal total resistance for a resistor of single spindle multi sections (gauged) and double spindle molt sections (dual) shall be as follows :

Example :

For gauged ones

- (1) 0B103 × 2

One in which two resistors with resistance law 0B and nominal total resistance 10 kΩ are connected.

- (2) 0B102 × 15A103

One in which a resistor with resistance law 0B and nominal total resistance 1 kΩ is connected on operating part side and a resistor with resistance law 15 A and nominal total resistance 10 kΩ is connected on opposite side of operating part.

For dual ones

- (1) 0B102 + 0B102 One in which two resistors with resistance law 0B and nominal total resistance 1 k Ω are connected.
- (2) 0B103 + 15A103 One in which a resistor with resistance law 0B and nominal total resistance 10 k Ω is connected on operating part side and a resistor with resistance law 15 A and nominal total resistance 10 k Ω is connected on opposite side of operating part.

4.2 Symbols

4.2.1 Kind of resistor The symbol denoting kind of resistor shall consist of two English capital letters. The first letter shall be an English capital letter R which expresses resistor. The second letter shall be an English capital letter, excluding I, O and Z, which represents the resistive material. The combination of the first letter and the second letter shall be as given in Table 1.

Table 1. Symbol denoting kind of resistor

Symbol	Principal resistive material
RA	Resistance wire (low power type)
RG	Metal mixture (thick film)
RJ	Non-wire-wound (pre-set type)
RM	Metal film (thin film)
RP	Resistance wire (power type)
RQ	Non-wire-wound (precision type)
RR	Resistance wire (precision type)
RT	Resistance wire (pre-set type)
RV	Carbon mixture

4.2.2 Size The symbol denoting size shall consist of one to three numerals as shown in Table 2.

For rotary type and pre-set type, the size means the outside diameter, and for sliding type it means the total mechanically operated distance.

For resistors of other operating systems, the size shall be as specified in the resistor Standard.

Table 2. Symbol denoting size

Unit : mm					
Symbol	Size	Symbol	Size	Symbol	Size
2	2.5	14	14.5	50	50
3	3.2	16	16	60	60
4	4.0	20	20	80	80
5	5.0	22	22	100	100
6	6.3	24	24	125	125
8	8.0	25	25	160	160
9	9.5	28	28	200	200
10	10	30	31.5	250	250
12	12.5	40	40		

4.2.3 Characteristics The symbol denoting characteristics shall be one to two English capital letters excluding I and O, and shall be as specified in the resistor Standard.

4.2.4 Style The symbol denoting style shall, as a rule, consist of one English capital letter as shown in Table 3.

If necessary, it may be denoted by two English capital letters or one English capital letter and one numeral by adding one English capital letter or one numeral to the said symbol as specified in the resistor Standard.

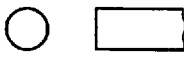
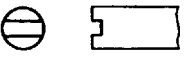
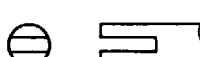
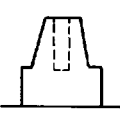
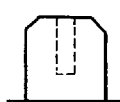
Table 3. Symbol denoting style

For pre-set type		For rotary potentiometers	
Symbol	Structural classification and mounting method	Symbol	Structural classification and mounting method
A	Surface mount type, Adjustment at top, Internally bent metal termination	D	Dual, Central screw mounting, Lug termination
B	Surface mount type, Adjustment at top, Externally bent metal termination	G	Ganged, Central screw mounting, Lug termination
C	Surface mount type, Adjustment at side, Internally bent metal termination	L	Single, Central screw mounting, Lug termination, With operating part blocking
D	Surface mount type, Adjustment at side, Externally bent metal termination		
E	Surface mount type, Adjustment at bottom, Externally bent metal termination	N	Single, Central screw mounting, Lug termination
F	Surface mount type, Adjustment at top, Electrode termination	P	Single, Termination mounting, Printed termination
G	Surface mount type, Adjustment at side, Electrode termination	S	Single, Central screw mounting, Waterproof lug termination
P	Rotary type, Adjustment at top, Printed termination, Screw driven type, Adjustment at side, Printed termination		
X	Rotary type, Adjustment at side, Printed termination, Screw driven type, Adjustment at side, Printed termination		

4.2.5 Operating part The symbol denoting operating part shall be formed by writing the symbol of length and the symbol of shape side by side. The symbol of length shall be expressed in the unit of mm and the symbol of shape shall be as given in Table 4.

The length of operating part of dual type resistor means the length from the mounting surface to the tip of internal operating part.

Table 4. Symbol denoting shape of operating part

Symbol	Shape		Operating means (Informative reference)
R		Round type	Operating part of single-spindle, multi-spindle and push-pull spindle
S		Groove type	
F		Flat type	
K		Serration type with 18 ridges	
H		Slit type	
T		Internal screw type	
U		External screw type	
A		Type A	Sliding type operating part
B		Type B	