

JAPANESE INDUSTRIAL STANDARD  
JIS C 5201-1994  
General rules of fixed resistors  
for use in electronic equipment

March, 1996

## ERRATA

| Page | Position                                                               | Wrong | Correct |
|------|------------------------------------------------------------------------|-------|---------|
| 13   | Table 15, in column of<br><u>E96</u> , and in line of <u>Symbol 94</u> | 981   | 931     |

Remarks: This errata is for correcting the first edition of this Standard.  
Japanese Standards Association

# JIS

**JAPANESE INDUSTRIAL STANDARD**

**General rules of fixed resistors for  
use in electronic equipment**

**JIS C 5201—1994**

**Translated and Published**

**by**

**Japanese Standards Association**

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

## JAPANESE INDUSTRIAL STANDARD

J I S

General rules of fixed resistors for  
use in electronic equipment

C 5201-1994

1. **Scope** This Japanese Industrial Standard is the generic specification of fixed resistor used mainly for electronic equipment (hereafter referred to as "resistors") and specifies 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. The following Standards are cited in this Standards:

- 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 0802 Color code for fixed resistors for electronic equipment
- 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 5202 Test methods of fixed resistors for electronic equipment
- JIS C 5602 Glossary of passive components for electronic equipment
- JIS C 5700 General rules for reliability assured electronic components
- JIS C 5720 General rules of fixed metal film resistors for use in electronic equipment
- 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)

2. The International standards corresponding to this Standard are as follows:

IEC 62 (1992) Marking codes for resistors and capacitors

IEC 63 (1963) Preferred number series for resistors and capacitors

IEC 115-1 (1982) Fixed resistors for use in electronic equipment Part 1: Generic specification

IEC 301 (1971) Preferred diameters of wire terminations of capacitors and resistors

ISO 8601 (1988) Data elements and interchange formats—information interchange—Representation of dates and times

2. **Definitions** For the purpose of this standard, the definitions given in JIS C 5001, JIS C 5602 and JIS C 5700 apply.

The main terms are as follows:

- (1) kind of resistors A resistor classified by resistance materials, or by purpose of its use.

- (2) nominal resistance value A resistance value which denotes the specified value and is usually indicated on the resistor.

Informative reference: In IEC 115-1, it is called "rated resistance".

- (3) critical resistance value The maximum nominal resistance value at which the rated power can be loaded without exceeding the maximum working voltage.

- (4) working temperature range The range of ambient temperature within which a resistor is capable of operating continuously.

Informative reference: In IEC 115-1, it is called "category temperature range".

- (5) highest ambient temperature The maximum ambient temperature at which a resistor is capable of operating continuously.

Informative reference: In IEC 115-1, it is called "upper category temperature".

- (6) lowest ambient temperature The minimum ambient temperature at which a resistor is capable of operating continuously.

Informative reference: In IEC 115-1, it is called "lower category temperature".

- (7) rated ambient temperature The maximum ambient temperature at which a resistor is capable of being used continuously with the rated load (power) applied.

- (8) rated power The maximum value of power which can be continuously loaded to a resistor at rated ambient temperature.

Informative reference: In IEC 115-1, it is called "rated dissipation".

- (9) maximum power The maximum value of power which can be continuously loaded to a resistor at a certain ambient temperature.

Remarks: When the nominal resistance value exceeds the critical resistance value, the maximum dissipation is limited to the power that corresponds to the maximum working voltage.

Informative reference: In IEC 115-1, the maximum power at highest ambient temperature is called "category dissipation" which is normally zero.

- (10) derating curve A curve that expresses the relation between ambient temperature and the maximum power, the latter generally expressed in percentage.
- (11) rated voltage The maximum value of d.c. voltage or a.c. voltage (effective value) capable of being applied continuously to a resistor at the rated ambient temperature.

- (12) maximum working voltage (or limiting element voltage) The maximum value of d.c. voltage or a.c. voltage (effective value) capable of being applied continuously to a resistor (or to the resistor element).

Informative reference: In IEC 115-1, it is called "limiting element voltage".

- (13) maximum overload voltage The maximum value of d.c. voltage or a.c. voltage (effective value) capable of being applied to a resistor for a short period of time.
- (14) characteristic Performances of a resistor which are specially taken up and capable of being expressed quantitatively or qualitatively under certain conditions.
- (15) grade Classification of resistors according to the degree of guarantee of their performance.

Informative reference: In the sectional specifications associated with IEC 115-1, it is called "assessment level"

- (16) stability class Classification according to the limit of resistance change in short-term and long-term test items.
- (17) basic specification The general rule which specifies common matters for electronic components and for extension of reliability assurance and so on of electronic components.

Example: JIS C 5001, JIS C 5700, etc.

- (18) generic specification The general rule which specifies common matters for each family of resistor such as fixed resistor or variable resistor.

Informative reference: IEC 115-1 is general rules for fixed resistors and called "generic specification" in IEC.

- (19) sectional specification The general rule which specifies common matters for each sub-family such as metal film fixed resistor, carbon film fixed resistor or wirewound fixed resistor.

- (20) detail specification The standard or specification in which the provisions are specified for each style, characteristic, grade safety and level prepared based on the sectional specification, and the requirements are clearly stated.

- (21) primary stage of manufacture The primary stage of process which shall be controlled by the manufacturer who intends to be approved for his resistor.

3. System and priority of standards The entire specification system of resistor shall consist of the following groups of specifications, and if there is any conflict among the specifications, priority shall be given in the following order:

- (1) Detail specification
- (2) Sectional specification (JIS C 5720)
- (3) Generic specification (JIS C 5201)
- (4) Basic specification (JIS C 5001 and JIS C 5700)

Remarks: Detail specifications and sectional specifications are hereafter referred to as "resistor Standard" as the generic expression.

#### 4. Type designation

4.1 Structure of type designation Type designation shall be formed as shown in the following arrangement and specified in the resistor standard.

The example given is based on a metallic film fixed resistor for electronic equipment.

|                                  |                       |                                 |                             |                                          |                                                |                       |                                                       |                                      |
|----------------------------------|-----------------------|---------------------------------|-----------------------------|------------------------------------------|------------------------------------------------|-----------------------|-------------------------------------------------------|--------------------------------------|
| Symbol denoting kind of resistor | Symbol denoting style | Symbol denoting characteristics | Symbol denoting rated power | Symbol denoting nominal resistance value | Symbol denoting tolerances on resistance value | Symbol denoting grade | Symbol denoting failure rate level or stability class | Symbol denoting other necessary item |
| 4.2.1                            | 4.2.2                 | 4.2.3                           | 4.2.4                       | 4.2.5                                    | 4.2.6                                          | 4.2.7                 | 4.2.8 or 4.2.9                                        | 4.2.10                               |

Example:

RN      05      C      2E      1002      D      A      M      H

#### 4.2 Symbols

4.2.1 Kind of resistor The symbol denoting kind of resistor shall be represented by two English capital letters. The first letter shall be the English capital letter R indicating "Resistor". The second letter shall be an English capital letter other than I, O and Z, determined by main resistance material used. The combination of the first and the second letters shall be as given in Table 1.

Table 1. Symbol denoting kind of resistor

| Symbol | Main resistance material             |
|--------|--------------------------------------|
| RB     | Resistance wire (precision type)     |
| RC     | Carbon family mixture                |
| RD     | Carbon film                          |
| RK     | Metallic family mixture (thick film) |
| RN     | Metallic film (thin film)            |
| RS     | Metallic oxide film                  |
| RW     | Resistance wire (power type)         |

**4.2.2 Style** The symbol denoting style shall be primarily presented by two numerals as given in Attached Table 1. However, a third numeral or an English capital letter may be added as specified in the detail specification. So that the symbol would be composed of three numerals, or two numerals and one English capital letter.

**4.2.3 Characteristics** The symbol denoting characteristics shall be presented by two or three English capital letters other than I and O, and shall be specified in the resistor Standard.

**4.2.4 Rated power** The symbol denoting rated power shall be presented by the combination of two alphanumerical characters: the first one is a numerical, and the second one is an English capital letter as given in Table 2.

Table 2. Symbol denoting rated power

Unit: W

| First character | Second character |       |     |     |      |                 |    |     |       |    |
|-----------------|------------------|-------|-----|-----|------|-----------------|----|-----|-------|----|
|                 | A                | B     | C   | D   | E    | F               | G  | H   | J     | K  |
| 0               | —                | —     | —   | —   | —    | —               | —  | —   | —     | —  |
| 1               | —                | —     | —   | —   | —    | 0.035<br>[0.03] | —  | —   | 0.063 | —  |
| 2               | 0.1              | 0.125 | —   | —   | 0.25 | —               | —  | 0.5 | —     | —  |
| 3               | 1                | —     | —   | 2   | 2.5  | 3.15<br>[3]     | 4  | 5   | 6.3   | 8  |
| 4               | 10               | 12.5  | 16  | 20  | 25   | 31.5            | 40 | 50  | 63    | 80 |
| 5               | 100              | 125   | 160 | 200 | —    | —               | —  | —   | —     | —  |

Remarks: Values in parentheses may be specified in the resistor standard and used.

Informative reference: The first character represents power of 10 by which the number indicated by the second character is multiplied, and the second character represents the basic numeral (R 10 preferred number of JIS Z 8601).

The numerical values indicated by the second character have an unit of milliwatt (mW).

Example: 2 A ..... 0.1 W = 1.0 mW  $\times 10^2$

**4.2.5 Nominal resistance value** The symbol denoting nominal resistance value shall be presented by three numerals (in the case of E 3, E 6, E 12 and E 24 series numbers) or four numerals (in the case of E 48, E 96 and E 192 series numbers).

When the symbol is presented by three numerals, the first and the second numerals shall represent the significant figures of nominal resistance value in ohms ( $\Omega$ ), and the third numeral shall represent the number of zeros following the significant figures.

When the symbol is represented by four numerals, the first, second and third numerals shall be the significant figures, and the fourth numeral shall represent the number of zeros following the significant figures. If there is a decimal point, it shall be expressed by an English capital letter R, and in this case, all the numerals shall be significant figures.

**Examples:** Examples of symbols denoting nominal resistance value in three numerals and in four numerals are given below.

| (Three numerals)      |                        |  | (Four numerals)         |                          |  |
|-----------------------|------------------------|--|-------------------------|--------------------------|--|
| R10.....0.10 $\Omega$ | 150.....15 $\Omega$    |  | R100.....0.100 $\Omega$ | 15R2.....15.2 $\Omega$   |  |
| R47.....0.47 $\Omega$ | 101.....100 $\Omega$   |  | R475.....0.475 $\Omega$ | 1000.....100 $\Omega$    |  |
| 1R0.....1.0 $\Omega$  | 151.....150 $\Omega$   |  | 1R00.....1.00 $\Omega$  | 1001.....1.00 k $\Omega$ |  |
| 1R5.....1.5 $\Omega$  | 102.....1.0 k $\Omega$ |  | 4R75.....4.75 $\Omega$  | 1003.....100 k $\Omega$  |  |
| 100.....10 $\Omega$   | 154.....150 k $\Omega$ |  | 10R0.....10.0 $\Omega$  | 1523.....152 k $\Omega$  |  |

**4.2.6 Tolerances on resistance value** The symbol denoting tolerances on resistance value shall be presented by one English capital letter, as shown in Table 3.

Table 3. Symbol denoting tolerances on resistance value

| Symbol                           | E           | L          | P          | W          | B         | C          | D         | F       | G       | J       | K        | M        | N        |
|----------------------------------|-------------|------------|------------|------------|-----------|------------|-----------|---------|---------|---------|----------|----------|----------|
| Tolerances on resistance value % | $\pm 0.005$ | $\pm 0.01$ | $\pm 0.02$ | $\pm 0.05$ | $\pm 0.1$ | $\pm 0.25$ | $\pm 0.5$ | $\pm 1$ | $\pm 2$ | $\pm 5$ | $\pm 10$ | $\pm 20$ | $\pm 30$ |

**Informative reference:** The symbol W was expressed as the symbol A in JIS C 5201-1988, but the symbol is changed to W because such symbols as E, L, P, W are added in IEC 62 (1992).

**4.2.7 Grade** The symbol denoting grade shall be presented by one English capital letter as given in Table 4.

Table 4. Symbol denoting grade

| Symbol         | Grade                                                                              | Informative reference                                                                            |
|----------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| A              | A grade that needs quality assessment of "special level".                          | Special level specified in JIS C 5700 with set failure rate                                      |
| B              | A grade that needs quality assessment of "general level 1".                        | General level specified in JIS C 5700                                                            |
| C              | A grade that needs quality assessment of "simplified level".                       | Simplified level specified in JIS C 5700                                                         |
| E              | A grade that needs quality assessment of "general level 2".                        | Corresponding to Assessment level E specified in IEC 115-2, 115-4, 115-5, 115-6, 115-7 and 115-8 |
| E <sub>1</sub> | A grade that needs quality assessment of a level severer than level E              | No provision in IEC standard.                                                                    |
| E <sub>2</sub> | A grade that needs quality assessment of a level severer than level E <sub>1</sub> |                                                                                                  |
| F              | A grade that needs quality assessment of a level more lenient than level E         | Corresponding to assessment level F specified in IEC.                                            |
| X              | No quality assessment is specified.                                                | No quality assurance is applied.                                                                 |

**4.2.8 Failure rate level** The symbol denoting failure rate level shall be presented by one English capital letter as given in Table 5.

Table 5. Symbol denoting failure rate level

| Symbol | Failure rate level %/1000 h |
|--------|-----------------------------|
| M      | 1.0                         |
| P      | 0.1                         |
| R      | 0.01                        |
| S      | 0.001                       |

**4.2.9 Stability class** The symbol denoting stability class shall be presented by one English capital letter as shown in Table 6. In this index, the limits of change in resistance after long term and short term tests of resistors are classified and specified, and shall be specified in the detail specification. When the stability class is specified, the failure rate level shall not be specified overlapping the former.

Table 6. Symbol denoting stability class

| Symbol | Class % | Resistance change after short term test | Resistance change after long term test |
|--------|---------|-----------------------------------------|----------------------------------------|
| W      | 0.05    | $\pm(0.01 \% + 0.01 \Omega)$            | $\pm(0.05 \% + 0.01 \Omega)$           |
| B      | 0.1     | $\pm(0.02 \% + 0.01 \Omega)$            | $\pm(0.1 \% + 0.01 \Omega)$            |
| C      | 0.25    | $\pm(0.05 \% + 0.01 \Omega)$            | $\pm(0.25 \% + 0.05 \Omega)$           |
| D      | 0.5     | $\pm(0.1 \% + 0.01 \Omega)$             | $\pm(0.5 \% + 0.05 \Omega)$            |
| F      | 1.0     | $\pm(0.25 \% + 0.05 \Omega)$            | $\pm(1.0 \% + 0.05 \Omega)$            |
| G      | 2.0     | $\pm(0.5 \% + 0.05 \Omega)$             | $\pm(2.0 \% + 0.1 \Omega)$             |
| H      | 3.0     | $\pm(0.5 \% + 0.05 \Omega)$             | $\pm(3.0 \% + 0.1 \Omega)$             |
| J      | 5.0     | $\pm(1.0 \% + 0.05 \Omega)$             | $\pm(5.0 \% + 0.1 \Omega)$             |
| K      | 10.0    | $\pm(2.0 \% + 0.1 \Omega)$              | $\pm(10 \% + 0.5 \Omega)$              |
| L      | 15.0    | $\pm(2.0 \% + 0.1 \Omega)$              | $\pm(15 \% + 0.5 \Omega)$              |

**Informative reference:** The stability class is established based on the provisions of IEC 115-2, IEC 115-4, IEC 115-5, IEC 115-6, IEC 115-7 and IEC 115-8, and the symbols for tolerance on resistance value are employed.

**4.2.10 Other necessary item** Symbols denoting other necessary item are applicable in such case that performance, construction, materials and other matters that can not be expressed by the symbols given in 4.2.1 to 4.2.9 are expressed. Such symbols shall be specified in the resistor Standard. However, symbols specified in Tables 5 and 6 shall not be used.

## 5. Ratings

**5.1 Working temperature range** The working temperature range shall be the combination of any one of the highest ambient temperatures and any one of the lowest ambient temperatures indicated below.

However, the combinations shown in Table 7 are preferable.