



# Measurement and Test Methods

## Electrical performance

### 1.Total Resistance

With the shaft(level) placed at the end of terminal 1 or 3, shall be determined by measuring the resistance between the resistor terminals 1 and 3 unless otherwise specified

### 2.Rated Power

The maximum value of electric power that can be applied continuously to the whole area of a resistor (between terminals 1 and 3) at the rated ambient temperature.

Meanwhile, assuming that the rated ambient temperature of a carbon film resistor is 50°C, then the maximum power at an ambient temperature of 50 to 70°C can be obtained by multiplying the rated power by the rated power ratio determined from the derating curve shown below.

### 3.Rated Voltage

Corresponding to the rated power shall be determined by the following equation. When the resulting rated voltage exceeds the maximum operating voltage of a specific resistor, the maximum operating voltage shall be taken as the rated voltage

### 4.Tap Resistance

Determined by measuring the resistance between a tapped terminal and a specified terminal (terminal 1 or terminal 3).

### 5.Residual Resistance

With the shaft(lever) placed at the end of terminal 1, shall be measured between the terminals 1 and 2.

Next, with the shaft(lever) placed at the end of terminal 3, the resistance shall be measured between the terminal 2 and 3.

If there are tapped terminals, the shaft(lever) shall be turned(moved) and the resulting minimum resistance between the tapped terminal and the terminal 2 shall be measured.

### 6.Resistance Taper

With the shaft(lever) placed in the specified position, shall be determined by measuring the voltage between the specified terminals (between terminals 1 and 2 or between terminals 2 and 3) and calculating the percentage in reference to the voltage between terminals 1 and 3.

Reference: standard resistance tapers in reference to rotational angles (travels) are as shown below.

### 7.Maximum Attenuation Level

With the shaft placed at the end of terminal 1, shall be determined by measuring the voltage applied between the terminals 1 and 2, and calculating the ratio to the voltage applied between the terminals 1 and 3.

Meanwhile, unless otherwise specified, the value obtained shall be used in place of the residual resistance of a rotary potentiometer for volume control.

### 8.Insertion Loss

With the shaft placed at the end of terminal 3, shall be determined by measuring the voltage applied between the terminals 1 and 2, and calculating the ratio to the voltage applied between the terminals 1 and 3.

Meanwhile, unless otherwise specified, the value obtained shall be used in place of the residual resistance of a rotary potentiometer for volume control.

### 9.Sliding Noise

Measured by connecting the resistor to the amplifier having frequency characteristics specified in JIS C 6443, applying DC voltage of 20v between the terminals 1 and 3. (if rated voltage is 20v or less, this voltage shall be applied) and by rotating (moving) the shaft(lever) at a speed of about 20 cycles per minute

### 10.Voltage Proof

Measured by applying AC voltage to the specified spot for a minute to check for arc, burning, dielectric breakdown and other abnormalities. Respective terminals may be tested in group. The locations described below shall be tested unless otherwise specified. However, if the section concerned is so constructed as to conduct, that particular part shall not be tested.



## 11. Insulation Resistance

Measured with a megger by applying specified voltage to the specified locations.

The undermentioned spots shall be tested unless otherwise specified. However, if the section concerned is so constructed as to conduct, that particular part shall not be tested.

## 12. Testing spots for Voltage proof and Insulation Resistance

- A. Between terminal and shaft(lever)
- B. Between terminal and metal cover(lever)
- C. Between terminal of multi-ganged-unit
- D. Between switch terminal and shaft
- E. Between switch terminal and resistance terminal
- F. Between switch terminal and metal cover

## 13. Gang Error

With the shaft (lever) placed in the specified position, shall be determined by applying test voltage of 2 to 15v (since-wave RMS value) between the terminals 1 and 3 at  $1,000\pm 200\text{Hz}$  and measuring the voltage between the resistor terminal 2 and the specified terminal (terminal 1 or 3), and shall be calculated by the following equation. Meanwhile, unless otherwise specified, DC test voltage may be applied

# Mechanical performance

### 1. Total Rotational Angle (Travel)

Determined by measuring the rotational angle (travel) when the shaft (lever) is turned (moved) from the end position of terminal 1 to the end position of terminal 3.

### 2. Rotational Torque (Operating Force)

Determined by measuring the torque (operating force) necessary to turn (move) the shaft (lever).

Unless otherwise specified, measurement shall be made at ambient temperature of 5 to 35°C, and the shaft rotational speed shall be 60° per second and the lever traveling speed 20mm per second.

### 3. Starting Torque (Starting Force)

Determined by measuring a torque (operating force) necessary to turn (move) the shaft (lever) for the first time after allowing the test piece to stand for a long period of time.

Unless otherwise specified, measurement shall be made at an ambient temperature of 5 to 35°C, and the shaft rotational speed shall be 60° per second and the lever traveling speed 20mm per second.

Remarks: To be specified when required in particular

### 4. Shaft Wobble

Determined by measuring the amount of deflection at a position of 30mm from the reference surface with a bending moment of 0.1N.m (50mN.m for insulated shaft) applied perpendicularly to the shaft from 180° deferent directions at a point within 3mm from the place where a smooth cylindrical surface of the shaft ceases to exist. However, if the length of the shaft is less than 30mm, proportional calculation shall be used.

### 5. Shaft Stopper Strength (Lever Stopper Strength)

With the shaft (lever) placed at the end of terminal 1, a specified torsional moment (force) shall be applied in that direction for 10 seconds. Next, the shaft (lever) shall be placed at the end of terminal 3 and a specified torsional moment (force) shall be applied similarly, to check the operating part and other related sections for deformation, breakage, etc.

### 6. Push-pull Strength (Lever push-pull Strength)

A specified force shall be applied in the axial direction of the shaft (lever) for 10 seconds to check the operating part and other sections for deformation, breakage, operating condition, etc.