

## ■ Checklist Before Inquiry

When you specify Potentiometers, please take advantages of our standard products for better price and delivery. Please provide the following items before ordering.

				Checklist	
				Item	Information (Requirements)
Common	C-1	Inquiry purpose		New use, Modification, Others ( )	
	C-2	Modification	Previous supplier		
			Conventional part No.		
	C-3	Application	Purpose		
			Equipment		
			Environment	Indoor/Outdoor use, Stationary/Portable set, High humidity, SO <sub>2</sub> , NaCl	
			Temperature	( °C) to ( °C)	
	C-4	Adjustment	Operation	General use, Edge drive, Low torque	
			Method	Manual, Automatic	
			Direction	Top, Bottom, Vertical, Horizontal	
	C-5	Mounting	Driver shape	Plus/Minus screw slot, Hexagonal driver, Knob (Shape; )	
			Method	Manual, Automatic	
Mounter			Panaset (Model: ), Other mounter (Maker/Model: / ), Parts feeder		
C-6	Soldering	Method	Manual soldering, Flow soldering, Reflow soldering		
		Conditions	Temp. ( °C), Time ( s), Dipping times( )		
		Washing	Machine, Soaking, Applied solvent ( )		
Electrical	E-1	Application	Circuit	Volume, Tone, Balance, Circuit regulation, Others ( )	
			Stereo tone use	General tone, High-cut tone, Bass, Treble	
	E-2	Conditions	Current	ac, dc	
			Rating	Max. operating power ( W), Operating voltage ( V)	
	E-3	Resistance	Applied current	Small current use, Applying current ( mA)	
			Total value/Tolerance	( Ω) / ±20 %, ±30 %, Others (± %)	
	E-4	Taper	A, B, C, D, G, BH, 15A, 1B, 15C, 10A, 4B, H, Others ( )		
	E-5	Tracking error	Range	( dB) to ( dB)	
Specifications			±( dB)		
E-6	Tap	Necessity/Position	Necessary, Unnecessary / 40 %, 50 %, 60 %, Others ( )		
E-7	Other requirements				
Shapes/Dimensions	M-1	Shape	Size	φ9, φ12, φ14, φ16, φ18	
			Structure	Units	Single, 1-shaft 2 gang, 1-shaft 3 gang, 1-shaft 4 gang, 2-shaft 2 gang, 2-shaft 3 gang, 2-shaft 4 gang, 2-shaft 5 gang, Others ( )
	M-2	Shaft/Lever	Shape	Side Adjustment type, Top Adjustment type	
			Type	F type (flat), S type (slotted), P type (18 teeth serrations)	
	M-3	Mounting	Type	Bushing, Soldering, Screw mounting, Others ( )	
			(Type with bushing)	Screw dia.: M6, M7, M9, M10, 3/8" Screw pitch: 0.75 mm, 1.0 mm, 32NEF Bushing length: 5 mm, 7 mm, 10 mm, 15 mm, 17.5 mm, 20 mm, 22.5 mm, 25 mm, 27.5 mm, 30 mm, 32.5 mm, 35 mm, 37 mm, 39 mm, 42.5 mm	
	M-4	Terminals	Type	Solder lug, PWB	
			(PWB terminals)	Length from mounting surface: ( mm), Layout pattern: ( )	
	Additional functions				
	M-5	Switch	Type	Rotary, Pull-Push, Push-ON, Others ( )	
Function			SPST, SPDT, DPST, DPDT		
Rating			Voltage: ( V), Current: ( A), Inrush current: ( A)		
Terminal type			Solder lug, PWB (Height from PWB to shaft center: mm)		
M-6	Detents	Detents	1 point, 11 points, 41 points, Others ( points)		
		Position	Midpoint, at 180 °, at 200 °, Others (at )		
Others	L-1	Special requirements for endurance			
	L-2	Other questionnaires			

Notes:

- When you specify custom types (custom-made), new tooling and jigs, and/or equipment may be required. It will be necessary to confirm your estimates of quantity and development schedule as accurately as possible.
- Please inform us if you designate your own part number.

\* Previous notations for potentiometer shape "Stand-up type" (Shaft is parallel to PWB.) and "Lay-down type" (Shaft is vertical to PWB.) – have been changed in this edition to "Horizontal type" or "Side-adjust type" (Shaft or knob is parallel to PWB.) and "Vertical type" or "Top-adjust type" (Shaft or knob is vertical to PWB.).

### ■ ⚠ Application Notes

When using our Rotary Potentiometers, please observe the following items to prevent dangerous accidents and deterioration of performance.

#### 1. Prohibited items and notes in design stage

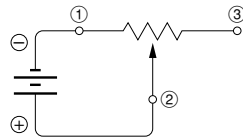
1. Use within the rating  
The Power Rating or Maximum Voltage varies with the size and type of a product. Also, the Power Rating must be reduced according to a Power Derating Curve. When a potentiometer is used with a current of less than a few micro-amperes, the influence of contact resistance increases because of the circuit diagram. Check the potentiometer under actual operating conditions.

#### 2. Migration

Some potentiometers cannot be used with dc voltage. If a potentiometer is to be used with dc voltage, specify this when ordering, or check the availability referring to the "Product Specifications for Information."

#### 3. Anodization

When a potentiometer is used with dc voltage under conditions of high humidity, the terminal at the side of the wiper (terminal 2) must be a positive electrode, as shown in the figure at right.



#### 4. Recommended Circuit Configuration

It is recommended that you use the variable resistor for voltage adjustments. If it is used for current adjustments, then it may be influenced by the contact resistance between the resistor body and the slide, depending on the target circuit conditions. Conducting a test under actual operating conditions is highly recommended.

#### 5. Soldering conditions

When performing solder dipping, check the soldering conditions according to the "Product Specifications for Information," because the conditions vary with the product.

Do not wash a potentiometer after solder dipping because flux may invade the potentiometer, resulting in contact failure. Avoid use of jumper cables near the potentiometers because flux may attach to them.

#### 6. Shaft rotation wobble

If the shaft is long, the rotation wobble increases in proportion to its length. To secure the quality of a set, we recommend use of the types with a bushing.

#### 7. Operating temperature conditions

Tactile feeling in operation is given serious consideration, and rotation torque increases under low temperatures (below  $-10\text{ }^{\circ}\text{C}$ ) depending on the product. If a potentiometer is expected to be used under low temperatures, specify this in advance.

#### 2. Prohibited items and notes on handling

##### 1. Terminal clinch

Bending and unbending of terminals after mounting to a PWB must be one cycle or less. More than one bending/unbending cycle may result in damage.

##### 2. Stress on the terminals

Do not apply excessive stress to terminals during handling. Set soldering conditions with consideration given to stress on the terminals.

##### 3. Chemical resistance

Polycarbonate is used for the shaft in the potentiometers with an insulated shaft. Check the reactivity of the polycarbonate material with any chemicals to be used.

##### 4. Potentiometers with a push lock type switch

Handle the potentiometer with the shaft locked. If a lateral pressure above  $0.4\text{ N}\cdot\text{m}$  ( $4\text{ kg}\cdot\text{cm}$ ) is applied to the shaft when it is unlocked, the shaft may be bent.

##### 5. Storage conditions

Do not store the potentiometers under high temperatures and/or high humidity, or in a location where corrosive gas may be generated. Store the potentiometers at room temperature and room humidity in a packed condition. Use them within a maximum of 6 months. Check the date of manufacture on the package box and apply the "first-in-first-out" rule.

If unpacked potentiometers must be stored as inventory, store them in a polyethylene bag to keep out air.

#### 3. Prohibited items on fire and smoking

1. Absolutely avoid use of a potentiometer beyond its rated range because doing so may cause a fire.

If misuse or abnormal use may result under conditions in which the potentiometer is used out of its rated range, take proper measures such as current interruption using a protective circuit.

2. The grade of nonflammability for resin used in potentiometers is "94HB," which is based on UL94 Standards (flammability test for plastic materials). Prohibit use in a location where a spreading fire may be generated or prepare against a spreading fire.

#### 4. For use in equipment for which safety is requested

Although care is taken to ensure potentiometer quality, inferior characteristics, short circuits, and open circuits are some problems that might be generated. To design a set which places maximum emphasis on safety, review the affect of any single fault of a potentiometer in advance and perform virtually fail-safe design to ensure maximum safety by:

1. preparing a protective circuit or a protective device to improve system safety, and
2. preparing a redundant circuit to improve system safety so that the single fault of a potentiometer does not cause a dangerous situation.

For notes on use, the following sources were referred:

Technical report EIAJ RCR-2191A "Guideline of Notabilia for potentiometers for Use in Electronic Equipment" issued by the Japan Electronics and Information Technology Industries Association  
(Issued by March 2002)

Refer to this Technical Report for additional details.

#### 5. For actual use, be sure to refer to "Product Specifications for Information."

### ■ Common Specifications

#### ● Electrical Specifications

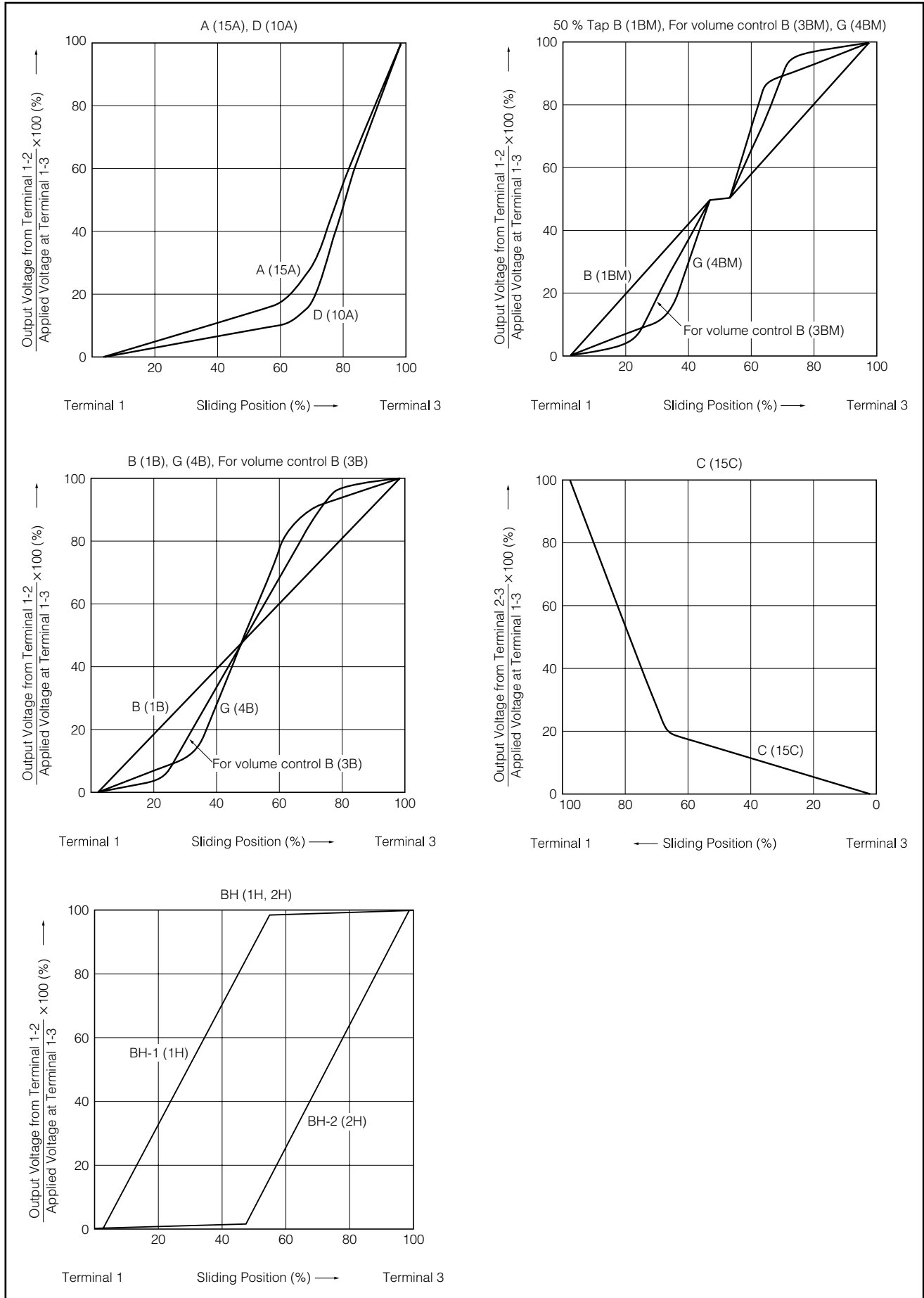
##### 1. Taper

Measuring Method		$\frac{\text{Out-put Voltage between Terminal 1 \& 2}}{\text{Operating Voltage between Terminal 1 \& 3}} \times 100(\%)$	$\frac{\text{Out-put Voltage between Terminal 2 \& 3}}{\text{Operating Voltage between Terminal 1 \& 3}} \times 100(\%)$
Taper		Effective Rotation Angle	
EIAJ	Panasonic	50 %	50 % *
15A	A	10 to 25	—
1B	B	40 to 60	—
15C	C	—	10 to 25
10A	D	6 to 15	—
4B	G	40 to 60	—
H	BH	Linear taper	

Notes:

1. \* Angle from terminal 3 side.
2. ( ) is per JIS (Japanese Industrial Standard). Unless otherwise specified, we consider it at 50 % rotation, however, upon request above JIS can be applied.
3. [ ] is only reference value.

### Standard Taper



Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

### 2. Tracking

The tracking should be calculated as follows.

$$\text{Tracking (dB)} = 20 \log (VR_2/VR_1)$$

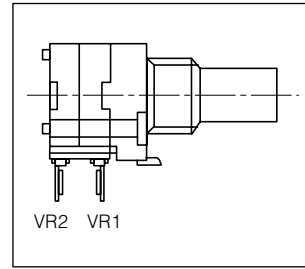
Where:

VR<sub>1</sub>= Voltage between terminal 1 & 2 of section R<sub>1</sub>

VR<sub>2</sub>= Voltage between terminal 1 & 2 of section R<sub>2</sub>

Test voltage between terminal 1 & 3

shall be 2 V to 5 V (1000±200 Hz).



In case of a potentiometer with a tap, the measurement should be made by connecting a fixed resistor between tap terminal and terminal 1. Unless otherwise specified, tolerance of the fixed resistor shall be ±10 %. If your requirements different, inform us of your specifications.

### ● Mechanical Specifications

#### 1. Shaft Angle

Shaft angle against mounting surface shall be 90°. Shaft bend and shaft wobble shall be  $a \times L/30$  (mm) max. when 50 mN·m moment applied to the measuring point of shaft.

Where:

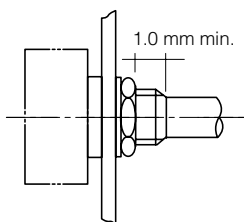
a= Constant Value as shown below

L= Distance between mounting surface and measuring point on the shaft

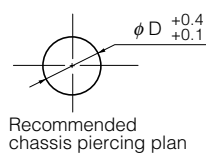
Size	Shaft material	Shape & Type		Shaft wobble (a)	Bending moment
9 mm square 12 mm square 14 mm square 18 mm square (Common)	Metal shaft	Without switch	1-shaft type	0.3 mm	50 mN·m
		With push switch		0.5 mm	
	Insulated shaft	With bushing	Single, Two-in-One	0.5 mm	
		Snap-in		0.7 mm	

#### 2. Nut Tightening Torque

When nut is tightened as specified below, unevenness of shaft rotation shall not occur.



Mounted State



Bushing Dia., etc.	Tightening Strength
M7 to M9	1.0 N·m