

# Trimmer Potentiometers



## Angle Sensing Potentiometer SMD Dust-proof Type 12mm Size PVS1 Series

### ■ Features

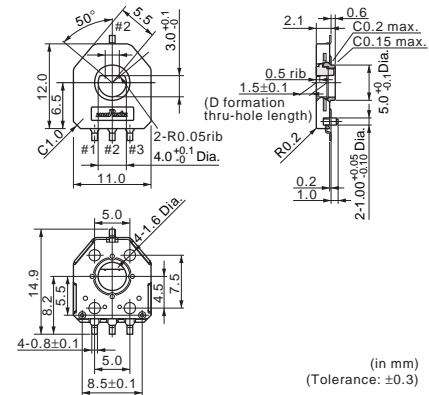
1. Dust-proof construction protects the interior from dust, which maintains stable characteristics.
2. Compliant to high peak temperature lead free soldering.
3. Excellent resistance materials and high reliability wiper achieves 1M cycles.
4. D formation thru-hole rotor enables selection of any kind of gear shape.
5. Leaded terminal type is available.
6. Ultra-thin size (2.1mm height)
7. Au plated terminals without Lead.

### ■ Applications

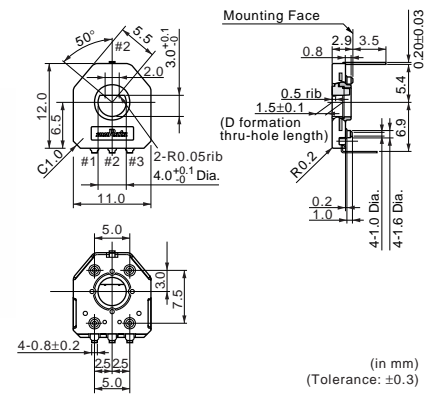
1. Animal robot
2. Switch for automotive
3. Motor drive unit
4. Radio control equipment
5. Electric motor-driven bicycle



PVS1A



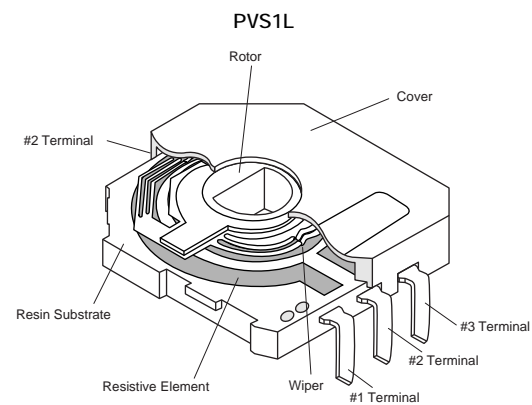
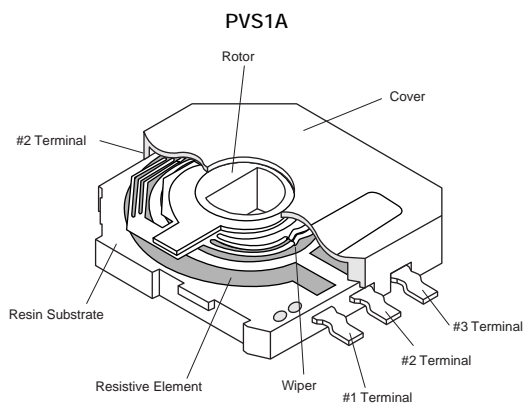
PVS1L



Part Number	Total Resistance Value (k ohm)	Linearity (%)	Effective Rotational Angle	TCR	Rotational Life
<b>PVS1A103A01 (SV01A103AEA01)</b>	10 ±30%	±2	333.3° (Ref.)	±500ppm/°C	1M cycles
<b>PVS1L103A03 (SV01L103AEA11)</b>	10 ±30%	±2	333.3° (Ref.)	±500ppm/°C	1M cycles

PVS1 series will be changed to new part number "SV01" since Oct. 1, 2004.

### ■ Construction



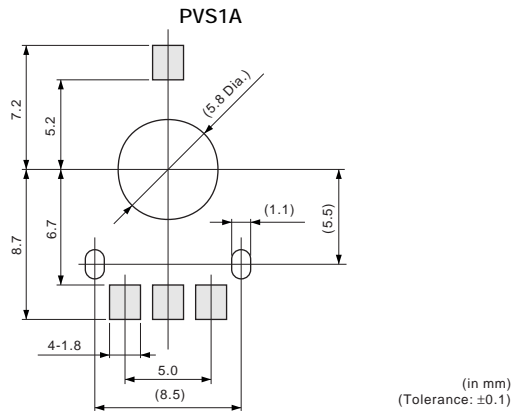
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⚠Note Please read rating and ⚠CAUTION (for storage, operating, rating, soldering, mounting and handling) in this PDF catalog to prevent smoking and/or burning, etc.  
This catalog has only typical specifications. Therefore, you are requested to approve our product specifications or to transact the approval sheet for product specifications before ordering.

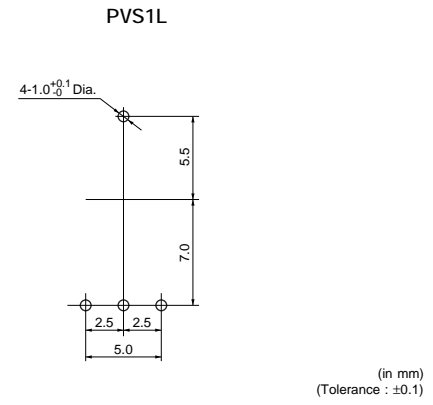
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■ Standard Land Pattern



■ Standard Mounting Holes



■ Characteristics

Temperature Cycle (Thermal Shock)	ΔTR	±20%
	Linearity	±3%
Humidity	ΔTR	±20%
	Linearity	±3%
Vibration	ΔTR	±10%
	Linearity	±3%
Shock (20G)	ΔTR	±10%
	Linearity	±3%
Humidity Load Life	ΔTR	±20%
	Linearity	±3%
High Temperature Exposure	ΔTR	+5/-30%
	Linearity	±3%
Low Temperature Exposure	ΔTR	±20%
	Linearity	±3%
Rotational Life (1M cycles)	ΔTR	±20%
	Linearity	±3%

ΔTR: Total Resistance Change

## PVS1 Series Notice

### ■ Notice (Operating and Storage Conditions)

1. Store in temperatures of -10 to +40deg. C and relative humidity of 30-85%RH.
2. Do not store in or near corrosive gases.
3. Use within six months after delivery.
4. Open the package just before using.
5. Do not store under direct sunlight.
6. Do not use the rotary position sensor under the following environmental conditions. If you use the rotary position sensor in an environment other than these listed below, please consult with Murata factory representative prior to using.

- (1) Corrosive gasses atmosphere  
(Ex. Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.)
- (2) In liquid  
(Ex. Water, Oil, Medical liquid, Organic solvent, etc.)
- (3) Dusty / dirty atmosphere
- (4) Direct sunlight
- (5) Static voltage nor electric/magnetic fields
- (6) Direct sea breeze
- (7) Other variations of the above

### ■ Notice (Soldering and Mounting)-PVS1A Type

#### 1. Soldering

- (1) PVS1A series can be soldered by reflow soldering method and soldering iron. Do not use flow soldering method (dipping).
  - (2) The dimension of land pattern used should be Murata's standard land pattern at reflow soldering. Excessive land area may cause displacement due to the effect of the surface tension of the solder. Insufficient land area may cause insufficient soldering strength on PCB.
  - (3) Standard soldering condition
    - (a) Reflow soldering : Refer to the standard temperature profile.
    - (b) Soldering iron:
      - >Temperature of tip 360 deg. C max.
      - >Soldering time 3 sec. max./1 terminal
      - >Diameter 3mm max.
      - >Wattage of iron 30W max.
- Before using other soldering conditions than those listed above, please consult with Murata factory representative prior to using. If the

soldering conditions are not suitable, e.g., excessive time and/or excessive temperature, the rotary position sensor may deviate from the specified characteristics.

- (4) The amount of solder is critical. Insufficient amounts of solder can lead to insufficient soldering strength on PCB. Excessive amounts of solder may cause bridging between the terminals.
  - (5) The soldering iron should not come in contact with the cover of the rotary position sensor. If such contact does occur, the rotary position sensor may be damaged.
- #### 2. Mounting
- (1) Do not apply excessive force (preferable 9.8N (Ref.; 1kgf) max.), when the rotary position sensor is mounted to the PCB.
  - (2) Do not warp and/or bend PCB to prevent the rotary position sensor from breakage.
- #### 3. Cleaning
- Cannot be cleaned because of open construction.


### ■ Notice (Soldering and Mounting)-PVS1L Type

#### 1. Soldering

- (1) PVS1L series can be soldered by flow soldering method and soldering iron. Do not use reflow soldering method.
  - (2) Standard soldering condition
    - (a) Flow soldering
      - >Pre-heating temp.: 80-100 deg. C
      - >Soldering temp. : 260 deg. C max.
      - >Soldering time : 3 sec. max.
    - (b) Soldering iron
      - >Temperature of tip: 360 deg. C max.
      - >Soldering time : 3 sec. max./1 terminal
      - >Diameter : 3mm max.
      - >Wattage of iron : 30W max.
- Before using other soldering conditions than those listed above, please consult with Murata factory representative prior to using. If the

soldering conditions are not suitable, e.g., excessive time and/or excessive temperature, the rotary position sensor may deviate from the specified characteristics.

- (3) The amount of solder is critical.
  - (4) The soldering iron should not come in contact with the cover of the rotary position sensor. If such contact does occur, the rotary position sensor may be damaged.
- #### 2. Mounting
- (1) Use PCB hole to meet the pin of the rotary position sensor. If the rotary position sensor is installed into insufficient PCB hole, the rotary position sensor may be damaged by mechanical stress.
  - (2) Do not apply excessive force (preferably 9.8N (Ref.; 1kgf) max.), when the rotary position

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## PVS1 Series Notice

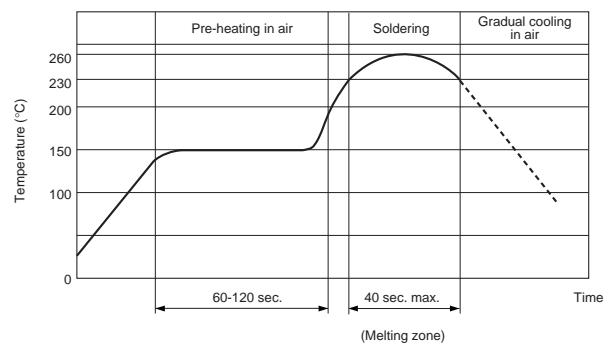
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sensor is mounted to the PCB.

Cannot be cleaned because of open construction.

### 3. Cleaning

#### ■ Reflow Soldering Standard Profile



#### ■ Notice (Handling)

Uncontrolled mechanical force except usual rotation on the hollow rotor of product, may cause big change of electrical characteristic, big increase of rotational torque or mechanical damage of product.

Therefore, please pay your attention on the following points for your design.

1. The fixing method of product must be soldering by the terminals of product. And please don't fix by screw cramping of supporting board which might cause mechanical deformation of product.
2. Your connecting shaft must be sustained by your bearing and any uncontrolled force should not apply on the hollow rotor of product.

#### ■ Notice (Other)

1. Please make sure the connecting impedance is not to be less than 10M ohm. The rotary position sensor is designed to connect the output terminal and A/D port of the microprocessor directly. Therefore, connecting impedance presupposes certain M ohm and the contact resistance is set high.
2. To minimize the processing error and noise influence which occur in rare cases, when data is installed through the product, please note the following items and program your software.
  - (1) Data install should be done plural times and

applied the mean value.

- (2) Data considered as error should be invalid.
- (3) If suspicious data is found, the data should be re-installed.
3. Before using rotary position sensor, please test after assembly in your particular mass production system.
4. MURATA cannot guarantee rotary position sensor integrity when used under conditions other than those specified in this document.

## Angle Sensing Potentiometer Specifications and Test Methods

No.	Item	Test Methods															
1	Linearity	<p>Independent linearity should vary no more than <math>\pm 2\%</math> within <math>\pm 160^\circ</math> to 50% voltage ratio. Taper : linear, 100%/333.3° Measured with the circuit as below (Figure 1).</p> <p style="text-align: right;">Figure-1</p>															
2	Temperature Coefficient of Resistance	<p>The rotary position sensor should be subjected to each of the following temperatures (see Table 1) for 30-45 minutes. Temperature coefficient of resistance should be applied to the following formula.</p> $TCR = \frac{R_2 - R_1}{R_1 (t_2 - t_1)} \times 10^6 \text{ (ppm/}^\circ\text{C)}$ <p> <math>t_1</math> : Reference temperature in degrees celsius  <math>t_2</math> : Test temperature in degrees celsius  <math>R_1</math> : Resistance at reference temperature in ohm  <math>R_2</math> : Resistance at test temperature in ohm         </p> <table border="1"> <thead> <tr> <th>Sequence</th> <th>*1</th> <th>2</th> <th>*3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Temperature (<math>^\circ\text{C}</math>)</td> <td>+25</td> <td>-40</td> <td>+25</td> <td>+85</td> </tr> </tbody> </table> <p>Note * : Reference temperature</p> <p style="text-align: center;">Table-1 Test temperatures</p>	Sequence	*1	2	*3	4	Temperature ( $^\circ\text{C}$ )	+25	-40	+25	+85					
Sequence	*1	2	*3	4													
Temperature ( $^\circ\text{C}$ )	+25	-40	+25	+85													
3	Temperature Cycle (Thermal Shock)	<p>The rotary position sensor should be subjected to Table 2 temperature for 5 cycles. Then, the rotary position sensor should be kept in the dry box for 24 +8/-0 hrs.</p> <table border="1"> <thead> <tr> <th>Sequence</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Temperature (<math>^\circ\text{C}</math>)</td> <td>-40<math>\pm</math>3</td> <td>+25<math>\pm</math>2</td> <td>+85<math>\pm</math>3</td> <td>+25<math>\pm</math>2</td> </tr> <tr> <td>Time (min.)</td> <td>30</td> <td>5 max.</td> <td>30</td> <td>5 max.</td> </tr> </tbody> </table> <p style="text-align: center;">Table 2: One cycle of temperature cycle</p>	Sequence	1	2	3	4	Temperature ( $^\circ\text{C}$ )	-40 $\pm$ 3	+25 $\pm$ 2	+85 $\pm$ 3	+25 $\pm$ 2	Time (min.)	30	5 max.	30	5 max.
Sequence	1	2	3	4													
Temperature ( $^\circ\text{C}$ )	-40 $\pm$ 3	+25 $\pm$ 2	+85 $\pm$ 3	+25 $\pm$ 2													
Time (min.)	30	5 max.	30	5 max.													
4	Humidity	<p>The rotary position sensor should be stored in a chamber at temperature of <math>+60\pm 2^\circ\text{C}</math> and relative Humidity of 90-95% for 250<math>\pm</math>8 hrs. After removing from the chamber, the rotary position sensor should be kept in the dry box for 24 +8/-0 hours.</p>															
5	Vibration	<p>The rotary position sensor should be tested under the condition of the amplitude of 1.5mm, the frequency range from 10 to 55Hz (should be traversed in approximately one minute) and 2 hours in each of 3 mutually perpendicular directions (total 6 hours). Then, the rotary position sensor should be kept in the dry box for 1-2 hrs.</p>															
6	Shock	<p>The rotary position sensor should be tested under the condition of the peak acceleration 20G max. in half-sine wave and 5 shocks in each of 3 mutually perpendicular directions (total 15 shocks). Then, the rotary position sensor should be kept in the dry box for 1-2 hrs.</p>															
7	Humidity Load Life	<p>Full rated continuous working voltage not exceeding 5Vdc should be applied intermittently between terminal #1 and terminal #3 of the rotary position sensor, 1.5 hours on and 0.5 hours off, for 96<math>\pm</math>4 hours in total in a chamber at a temperature of <math>+40\pm 2^\circ\text{C}</math> and relative humidity of 90-95%. After removing from the chamber, the rotary position sensor should be kept in the dry box for 24 +8/-0 hours.</p>															
8	High Temp. Exposure	<p>The rotary position sensor should be stored in a chamber at the temperature of <math>+85\pm 3^\circ\text{C}</math> without loading for 250<math>\pm</math>8 hours. After removing from the chamber, the rotary position sensor should be kept in the dry box for 24 +8/-0 hours.</p>															
9	Low Temp. Exposure	<p>The rotary position sensor should be stored in a chamber at the temperature of <math>-40\pm 3^\circ\text{C}</math> without loading for 168<math>\pm</math>4 hours. After removing from the chamber, the rotary position sensor should be kept in the dry box for 24 +8/-0 hours.</p>															
10	Rotational Life	<p>The adjustment rotor should be continuously rotated within <math>\pm 160^\circ</math> of effective electrical rotational angle, at the rate of one cycle for 6 seconds for 1 Million cycles under the condition of <math>+25\pm 2^\circ\text{C}</math> of temperature without loading.</p>															