

# Knob Potentiometer



The P16 is a revolutionary concept in panel mounted potentiometers. This unique design consists of a knob driving and incorporating a cermet potentiometer. Only the mounting hardware and terminals are situated on the back side of the panel reducing to a minimum the required clearance.

## FEATURES

- Test according to CECC 41000 or IEC 60393-1
- **P16** - Version for professional and industrial applications (cermet)  
1 W at 40 °C
- **PA16** - Version for professional audio applications (conductive plastic)  
0.5 W at 40 °C
- Compact (integrated)
- High dielectric strength: 2500 V<sub>RMS</sub>
- Fully sealed and panel sealed
- Metallic or plastic knob options
- Custom knob on request
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

DIMENSIONS in millimeters (± 0.5 mm)		
<p><b>P16NP</b></p> <p>Thickness nut 2 mm washer 1.5 mm</p>	<p><b>P16NM</b></p> <p>Thickness nut 2 mm washer 1.5 mm</p>	<p><b>Panel Cutout</b></p> <p>Panel thickness max.: 3 mm</p>

ELECTRICAL SPECIFICATIONS			
	P16	PA16	
Resistive element	Cermet	Conductive plastic	
Electrical travel	270° ± 10°	270° ± 10°	
Power rating chart	<p>The power rating chart plots Rated Power in W (0 to 1.25) against Ambient Temperature in °C (0 to 140). It shows four curves: P16 LIN. TAPER 'A' (highest power), P16 LOG. TAPER 'L &amp; F', &amp; PA16 LIN. TAPER, and PA16 LOG. TAPER (lowest power). Each curve has a vertical segment at 40°C and a diagonal segment decreasing to 0W at 100°C. Labels NM, NP, and NF indicate different taper types.</p>		
Circuit diagram	<p>The circuit diagram shows a potentiometer with three terminals: a (1) on the left, b (2) in the center, and c (3) on the right. A clockwise rotation arrow is shown below terminal b.</p>		
Taper	<p>The taper chart plots % Total Resistance (0 to 100) against % Clockwise Shaft Rotation (0 to 100). It shows three curves: F (logarithmic), A (linear), and L (logarithmic).</p>		
Resistance range	Linear taper Logarithmic taper	22 Ω to 10 MΩ 100 Ω to 2.2 MΩ	1 kΩ to 1 MΩ 470 Ω to 500 kΩ
Standard series E3		1 - 2.2 - 4.7 and on request 1 - 2 - 5	1 - 2.2 - 4.7
Tolerance	Standard On request	± 20 % ± 10 %	± 20 % ± 10 % (1 kΩ to 100 kΩ)
Power rating	Linear Logarithmic	1 W at +40 °C 0.5 W at +40 °C	0.5 W at +40 °C 0.25 W at +40 °C
Temperature coefficient (typical)		± 150 ppm/°C	± 500 ppm/°C
Dielectric strength (RMS)		2500 V	2500 V
Limiting element voltage (linear law)		350 V	350 V
Contact resistance variation		3 % Rn or 3 Ω	2 % Rn or 3 Ω
End resistance (typical)		1 Ω	1 Ω
Insulation resistance (500 V <sub>DC</sub> )		10 <sup>6</sup> MΩ	10 <sup>6</sup> MΩ



MECHANICAL SPECIFICATIONS	
Mechanical travel	300° ± 5°
Operating torque	2 Ncm typical
End stop torque	25 Ncm maximum
Max. tightening torque of mounting nut	250 Ncm maximum
Unit Weight	4.5 g typical

ENVIRONMENTAL SPECIFICATIONS		
	METALLIC KNOB	PLASTIC KNOB
Temperature range	-40 °C to +125 °C	-40 °C to +85 °C
Climatic category	40/100/56	40/85/56
Sealing	Sealed container and panel sealed	
Protection grades	IP67	

MARKING
<ul style="list-style-type: none"> <li>Ohmic value code, tolerance code and taper</li> <li>Manufacturing date code</li> </ul>

CONTROL KNOB
<p>Black metallic knob (NM).            Black plastic knob (NP).            For white and blue color see ordering information.            Other dimensions, shapes, colors of control knobs are manufactured on request - please consult Vishay.            Other reference marks (shapes, colors) and legends can be printed on plastic knob on request - please consult Vishay.</p>

PACKAGING
<ul style="list-style-type: none"> <li>Carton box of 20 pieces</li> </ul>

P16 STANDARD RESISTANCE ELEMENT DATA						
STAN- DARD RESIS- TANCE VALUES	LINEAR TAPER			LOG TAPER		
	MAX. POWER AT 40 °C	MAX. VOLTAGE THROUGH WIPER	MAX. CUR. THROUGH WIPER	MAX. POWER AT 40 °C	MAX. VOLTAGE THROUGH WIPER	MAX. CUR. THROUGH WIPER
	Ω	W	V	mA	W	V
22	1	4.69	213			
47	1	6.85	146			
100	1	10	100			
220	1	14.8	67.4	0.5	7.1	71
470	1	21.7	46.1	0.5	10.5	48
1K	1	31.6	31.6	0.5	15.3	32.6
2.2K	1	46.9	21.3	0.5	22.4	22.4
4.7K	1	68.5	14.6	0.5	33.2	15.1
10K	1	100	10	0.5	48.5	10.3
22K	1	148	6.74	0.5	70.7	7.07
47K	1	217	4.61	0.5	105	4.77
100K	1	316	3.16	0.5	153	3.26
220K	0.56	350	1.59	0.5	224	2.24
470K	0.26	350	0.75	0.5	332	1.51
1M	0.12	350	0.35	0.26	350	0.74
2.2M	0.05	350	0.16	0.12	350	0.35
4.7M	0.02	350	0.07	0.056	350	0.16
10M	0.01	350	0.012			

PA16 STANDARD RESISTANCE ELEMENT DATA						
STAN- DARD RESIS- TANCE VALUES	LINEAR TAPER			LOG TAPER		
	MAX. POWER AT 40 °C	MAX. VOLTAGE THROUGH WIPER	MAX. CUR. THROUGH WIPER	MAX. POWER AT 40 °C	MAX. VOLTAGE THROUGH WIPER	MAX. CUR. THROUGH WIPER
	Ω	W	V	mA	W	V
470				0.25	10.8	23.1
1K	0.5	22.4	22.4	0.25	15.8	16
2.2K	0.5	33.2	15.1	0.25	23.5	11
4.7K	0.5	48.5	10.3	0.25	34.3	7
10K	0.5	70.7	7.07	0.25	50.0	5.0
22K	0.5	105	4.77	0.25	74	3.4
47K	0.5	153	3.26	0.25	108	2.3
100K	0.5	224	2.24	0.25	158	1.6
220K	0.5	332	1.51	0.25	235	1.1
470K	0.26	350	0.74	0.25	343	0.7
1M	0.12	350	0.35			



PERFORMANCE				
TESTS	CONDITIONS	TYPICAL VALUES AND DRIFTS		
		$\Delta R_T/R_T$ (%)	$\Delta R_{1-2}/R_{1-2}$ (%)	OTHER
Electrical endurance	1000 h at rated power 90°/30° cycle at +40 °C	± 5 %	-	Insulation resistance: > 10 <sup>4</sup> MΩ Contact res. variation: < 2 % Rn
Damp heat, steady state	56 days 40 °C, 93 % HR	± 2 %	± 1 %	Insulation resistance: > 10 <sup>4</sup> MΩ
Mechanical endurance	50 000 cycles	± 5 %	-	Contact res. variation: < 2 % Rn
Shock	50 g's at 11 ms 3 successive shocks in 3 directions	± 0.2 %	± 0.5 %	-
Vibration	10 Hz to 55 Hz 0.75 mm or 10 g's during 6 h	± 0.2 %	-	$\Delta V_{1-2}/\Delta V_{1-3} \leq \pm 0.5 \%$

**Note**

- Nothing stated herein shall be construed as a guarantee of quality or durability.

ORDERING INFORMATION																		
P	1	6	N	P	2	2	3	M	A	B	1	5						
MODEL	STYLE		OHMIC VALUE		TOLERANCE		TAPER		PACKAGING CODE		SPECIAL NUMBER							
<b>P16</b> = cermet <b>PA16</b> = conductive plastic	<b>NM</b> : metallic black <b>NP</b> : plastic black <b>WM</b> : metallic white <b>WP</b> : plastic white <b>BP</b> : plastic blue		<b>223</b> = 22 kΩ for ohmic value range see electrical specification		<b>M</b> = ± 20 %  On request: <b>K</b> = ± 10 %		<b>A</b> : linear <b>L</b> : clockwise logarithmic <b>F</b> : inverse clockwise logarithmic		<b>B15</b> = box of 20 pieces		(If applicable) Given by Vishay for custom design							

PART NUMBER DESCRIPTION (for information only)								
P16	NP	22 kΩ	20 %	A		B0		e3
MODEL	STYLE	VALUE	TOLERANCE	TAPER	SPECIAL	PACKAGING	SPECIAL	LEAD (Pb)-FREE

RELATED DOCUMENTS	
<b>APPLICATION NOTES</b>	
Potentiometers and Trimmers	<a href="http://www.vishay.com/doc?51001">www.vishay.com/doc?51001</a>
Guidelines for Vishay Sfernice Resistive and Inductive Components	<a href="http://www.vishay.com/doc?52029">www.vishay.com/doc?52029</a>



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