

## Knob Potentiometer



### 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
- Blue, white, yellow, red, and black knob
- Several marking: dot, line, gradient, 5 graduations, 10 graduations, fan, light, volume, temperature
- Metallic or plastic knob options
- Custom knob and marking on request
- Detent option on request (haptic technology)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS  
COMPLIANT

### LINKS TO ADDITIONAL RESOURCES



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.

QUICK REFERENCE DATA	
Multiple module	No
Switch module	Upgrade for switch version with P16S
Detent module	Yes
Special electrical laws	A: linear, L: logarithmic, F: reverse logarithmic
Sealing level	IP 67
Lifespan	50K cycles

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>



ELECTRICAL SPECIFICATIONS		
	P16	PA16
Resistive element	Cermet	Conductive plastic
Electrical travel	270° ± 10°	270° ± 10°
Power rating chart		
Circuit diagram		
Taper		
Resistance range	Linear taper 22 Ω to 10 MΩ Logarithmic taper 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 ± 20 % On request ± 10 %	± 20 % ± 10 % (1 kΩ to 100 kΩ)
Power rating	Linear 1 W at +40 °C Logarithmic 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	180 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>

PACKAGING
<ul style="list-style-type: none"> <li>• Carton box of 20 pieces</li> </ul>
Hardware: nuts, washer, and O-ring are separately supplied (not mounted on the potentiometer), in a small bag placed in the packaging.

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

DETENT OPTION (haptic technology)		
<p>Detent option is a positive tactile feedback.</p> <p>On request: the detent mechanism is housed in the P16</p> <p>Mechanical endurance: 10 000 cycles</p> <p>One detent in CCW position (CV1D)</p> <p>One detent in CW position (CV1F)</p> <p>One detent in CW position and CCW position (CVDF)</p>	<p>Ordering information (special code):</p> <p><u>CV1D</u> One detent in CCW position</p> <p><u>CV1F</u> Detent in CW position</p> <p><u>CVDF</u> Detent in CW position and CCW position</p>	



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

PA16 STANDARD RESISTANCE ELEMENT DATA						
STANDARD RESISTANCE VALUES	LINEAR TAPER			LOG TAPER		
	MAX. POWER AT 40 °C	MAX. VOLTAGE	MAX. CUR. THROUGH WIPER	MAX. POWER AT 40 °C	MAX. VOLTAGE	MAX. CUR. THROUGH WIPER
	W	V	mA	W	V	mA
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>RP</b> = plastic red <b>YP</b> = plastic yellow	<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											
										SPECIAL NUMBER FOR OPTION							
										<b>F1</b> = line marking <b>F2</b> = 10 graduations marking <b>F3</b> = 5 graduations marking <b>F4</b> = gradient marking <b>F5</b> = light marking <b>F6</b> = fan <b>F7</b> = temperature <b>F8</b> = volume <b>CV1D</b> = detent in CCW position <b>CV1F</b> = detent in CW position <b>CVDF</b> = detent in CW and CCW position							

KNOB STYLES	
STYLE	EXAMPLE IMAGES
NP = black plastic	 
WP = white plastic	 
BP = blue plastic	 
RP = red plastic	 
YP = yellow plastic	 



KNOB STYLES		
STYLE	EXAMPLE IMAGES	
NM = black metal		
WM = white metal		

**KNOB MARKING OPTIONS**

Several marking options on the top face of the knob are available.

SPECIAL NUMBER	MARKING	EXAMPLE IMAGES		AVAILABILITY FOR PLASTIC KNOB	AVAILABILITY FOR METALLIC KNOB
-	Dot (standard)			Yes	Yes
F1	Line			Yes	Yes
F2	10 graduations			Yes	Yes
F3	5 graduations			Yes	Yes
F4	Gradient			Yes	Yes
F5	Light			Yes	Yes
F6	Fan			Yes	Yes
F7	Temperature			Yes	Yes



SPECIAL NUMBER	MARKING	EXAMPLE IMAGES		AVAILABILITY FOR PLASTIC KNOB	AVAILABILITY FOR METALLIC KNOB
F8	Volume			Yes	Yes
(Special code)	Other on demand			On request	On request

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

ACCESSORIES	
Additional Accessories (to order separately)	<a href="http://www.vishay.com/doc?51051">www.vishay.com/doc?51051</a>

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>
Capabilities and Custom Options	<a href="http://www.vishay.com/doc?48493">www.vishay.com/doc?48493</a>



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