



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_{RMS}
- 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
- Material categorization: for definitions of compliance please see 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>P16NP</p> <p>Thickness nut 2 mm washer 1.5 mm</p>	<p>P16NM</p> <p>Thickness nut 2 mm washer 1.5 mm</p>	<p>Panel Cutout</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 _{DC})	10 ⁶ MΩ	10 ⁶ 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"> • Ohmic value code, tolerance code and taper • Manufacturing date code

PACKAGING
<ul style="list-style-type: none"> • Carton box of 20 pieces
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		
<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						
STAN- DARD RESIS- TANCE 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						
STAN- DARD RESIS- TANCE 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 ⁴ MΩ Contact res. variation: < 2 % Rn
Damp heat, steady state	56 days 40 °C, 93 % HR	± 2 %	± 1 %	Insulation resistance: > 10 ⁴ 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							
P16 = cermet PA16 = conductive plastic	NM = metallic black NP = plastic black WM = metallic white WP = plastic white BP = plastic blue RP = plastic red YP = plastic yellow	223 = 22 kΩ for ohmic value range see electrical specification	M = ± 20 % On request: K = ± 10 %	A = linear L = clockwise logarithmic F = inverse clockwise logarithmic	B15 = box of 20 pieces	(If applicable) Given by Vishay for custom design											
										SPECIAL NUMBER FOR KNOB MARKING							
										F1 = line marking F2 = 10 graduations marking F3 = 5 graduations marking F4 = gradient marking F5 = light marking F6 = fan F7 = temperature F8 = volume On request: CV1D = detent in CCW position CV1F = detent in CW position CVDF = detent in CW and CCW position							















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



KNOB STYLES	
STYLE	EXAMPLE IMAGES
YP = yellow plastic	 
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



SPECIAL NUMBER	MARKING	EXAMPLE IMAGES		AVAILABILITY FOR PLASTIC KNOB	AVAILABILITY FOR METALLIC KNOB
F7	Temperature			Yes	Yes
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)	www.vishay.com/doc?51051

RELATED DOCUMENTS	
APPLICATION NOTES	
Potentiometers and Trimmers	www.vishay.com/doc?51001
Guidelines for Vishay Sfernice Resistive and Inductive Components	www.vishay.com/doc?52029
Capabilities and Custom Options	www.vishay.com/doc?48493



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.