

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
- Detent option on request (haptic technology)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



LINKS TO ADDITIONAL RESOURCES



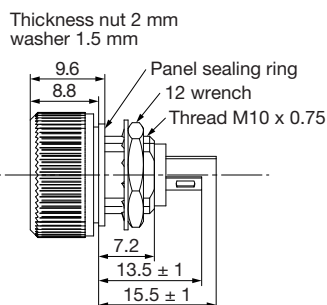
The P16 is a revolutionary concept in panel mounted potentiometers. This unique design consists of a knob driving and incorporating a cermet potentiometer. Only the mounting hardware and terminals are situated on the back side of the panel reducing to a minimum the required clearance.

QUICK REFERENCE DATA

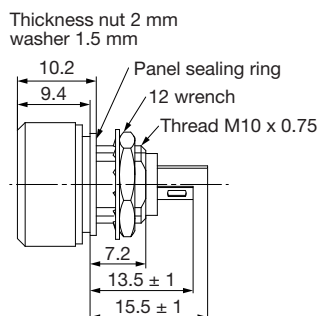
Multiple module	No
Switch module	Upgrade for switch version with P16S
Detent module	Yes
Special electrical laws	A: linear, L: logarithmic, F: reverse logarithmic
Sealing level	IP 67
Lifespan	50K cycles

DIMENSIONS in millimeters (± 0.5 mm)

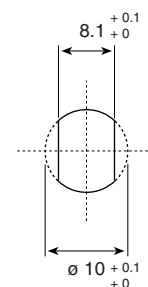
P16NP



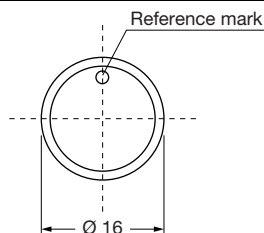
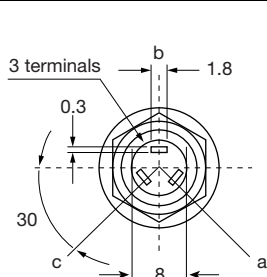
P16NM



Panel Cutout



Panel thickness max.: 3 mm





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

- Ohmic value code, tolerance code and taper
- Manufacturing date code

PACKAGING

- 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

Black metallic knob (NM).

Black plastic knob (NP).

For white, blue, red, and yellow color see "Ordering Information".

Other dimensions, shape, marking, 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.

DETENT OPTION (haptic technology)

Detent option is a positive tactile feedback.

On request:

the detent mechanism is housed in the P16

Mechanical endurance: 10 000 cycles

One detent in CCW position (CV1D)

One detent in CW position (CV1F)

One detent in CW position and CCW position (CVDF)

Ordering information (special code):

CV1D

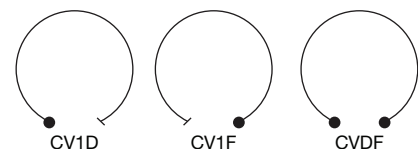
One detent in CCW position

CV1F

Detent in CW position

CVDF

Detent in CW position and CCW position





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
	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 THROUGH WIPER	MAX. CUR. THROUGH WIPER	MAX. POWER AT 40 °C	MAX. VOLTAGE THROUGH WIPER	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	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					
PA16 = conductive plastic												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.