Knob Potentiometer

LINKS TO ADDITIONAL RESOURCES

3D Models

Capabilities and Custom Options

The P16F 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

RoHS COMPLIANT

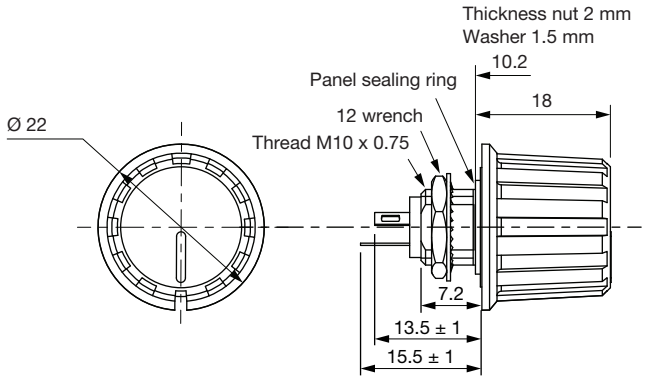
- Test according to CECC 41000 or IEC 60393-1
- **P16F** - version for professional and industrial applications (cermet)

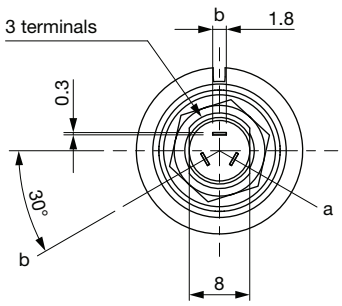
  1 W at 40 °C
- **PA16F** - version for professional audio applications (conductive plastic)

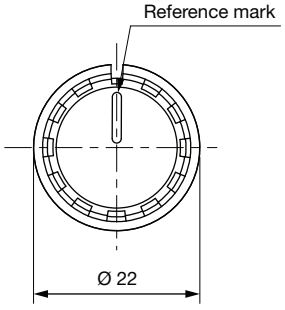
  0.5 W at 40 °C
- Compact (integrated)
- High dielectric strength: 5000 V_{AC}
- Fully sealed and panel sealed
- Metallic knob, special marking, or custom knob on request
- Custom knob and marking on request
- Detent option on request (haptic technology)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

QUICK REFERENCE DATA	
Multiple module	No
Switch module	Yes
Detent module	Yes
Special electrical laws	A: linear, L: logarithmic, F: reverse logarithmic
Sealing level	IP 67
Lifespan	10K cycles (switch), 50 cycles (track)

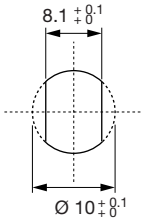
DIMENSIONS in millimeters (± 0.5 mm)





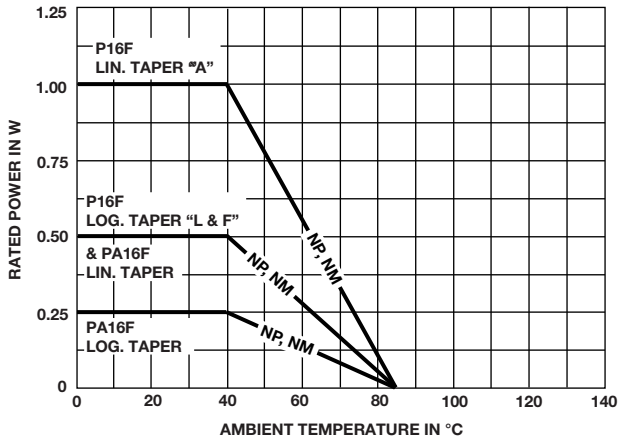
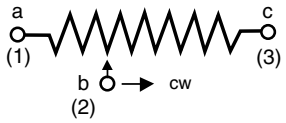
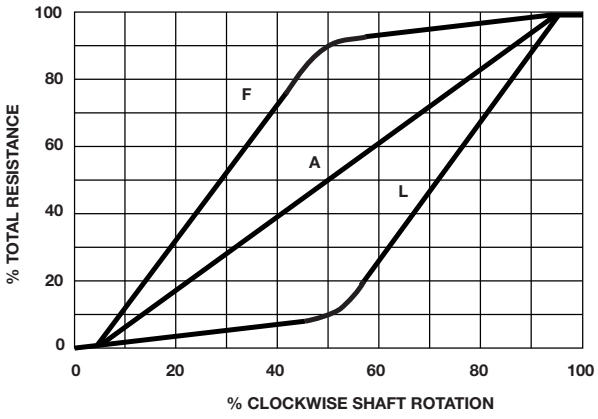


Panel Cutout



Panel thickness max.: 3 mm

ELECTRICAL SPECIFICATIONS

		P16F	PA16F: VERSION FOR AUDIO PROFESSIONAL APPLICATION
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	1 kΩ to 1 MΩ
	Logarithmic taper	100 Ω to 2.2 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 %	± 20 %
	On request	± 10 %	± 10 % (1 kΩ to 100 kΩ)
Power rating	Linear	1 W at +40 °C	0.5 W at +40 °C
	Logarithmic	0.5 W at +40 °C	0.25 W at +40 °C
Temperature coefficient (typical)		± 150 ppm/°C	± 500 ppm/°C
Dielectric strength (RMS)		5000 V_{AC}	5000 V_{AC}
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	3 Ncm typical
End stop torque	25 Ncm maximum
Max. tightening torque of mounting nut	180 Ncm maximum
Unit weight	10 g typical

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

MARKING

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

CONTROL KNOB

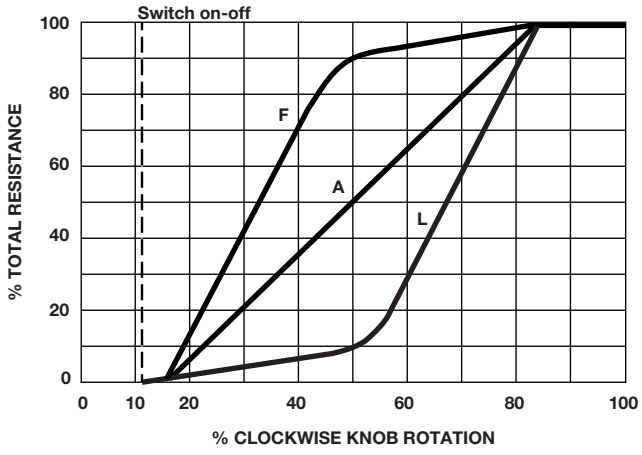
Black metallic knob (NM). On request, please consult Vishay.
Black plastic knob (NP).

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.

SWITCH OPTION		
ON / OFF switch	Actuation in counter clockwise between terminal a and terminal b	
Switching current	P16F	100 mA max.
	P16AF, version for audio professional application	1 mA max.
Switching actuation torque	3 Ncm typical	
Switching actuation travel	30° ± 5°	
Dielectric strength terminal to terminal (RMS)	1000 V	
Insulation resistance between contacts	10^6 MΩ	
Switch mechanical endurance	10 000 cycles	
1 cycle	ON - OFF - ON	
Ordering information (special code)	RSD	



KNOB MARKING OPTIONS

SPECIAL NUMBER	MARKING	EXAMPLE IMAGES
On request: several marking options on the top face of the knob		
F2	10 graduations	
F3	5 graduations	
F4	Gradient	
F5	Light	
F6	Fan	
F7	Temperature	
F8	Volume	
(Special code)	Other on demand	

P16F 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
Ω	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			

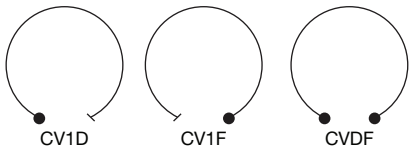
PA16F STANDARD RESISTANCE ELEMENT

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
Ω	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			

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



PERFORMANCE

TESTS	CONDITIONS	TYPICAL VALUES AND DRIFTS		
		$\Delta R_T/R_T$ (%)	$\Delta R_{1\text{-}2}/R_{1\text{-}2}$ (%)	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 %	-	$\Delta V_{1\text{-}2}/\Delta V_{1\text{-}3} \leq$ ± 0.5 %

Note

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

ORDERING INFORMATION

P	1	6	F	N	P	2	2	3	M	A					

MODEL	STYLE	OHMIC VALUE	TOLERANCE	TAPER	SPECIAL NUMBER
P16F = cermet **PA16F** = conductive plastic	**NP** = plastic black **NM** = metallic black or other color on request	**223** = 22 kΩ for ohmic value range see Electrical Specifications	**M** = ± 20 % On request: **K** = ± 10 %	**A** = linear **L** = clockwise logarithmic **F** = inverse clockwise logarithmic	(If applicable) Given by Vishay for custom design

SPECIAL NUMBER FOR OPTION
RSD: switch **CV1D** = detent in CCW position **CV1F** = detent in CW position **CVDF** = detent in CW and CCW position **F2** = 10 graduations marking **F3** = 5 graduations marking **F4** = gradient marking **F5** = light marking **F6** = fan **F7** = temperature **F8** = volume

PART NUMBER DESCRIPTION (for information only)

P16F	NP	22 kΩ	20 %	A	
MODEL	STYLE	VALUE	TOLERANCE	TAPER	SPECIAL

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

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