

Fully Sealed Container Cermet Potentiometers Submarine Applications



P13SM is designed for applications which need to set electrical parameters with an immersed potentiometer in deep water conditions up to 30 m (100 feet).

FEATURES

- High power rating 1.5 W at 70 °C
- Stainless steel shaft and bushing to endure sea salt water immersion
- Fully sealed IP68 on panel
- Tight temperature coefficient (± 75 ppm/°C typical)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

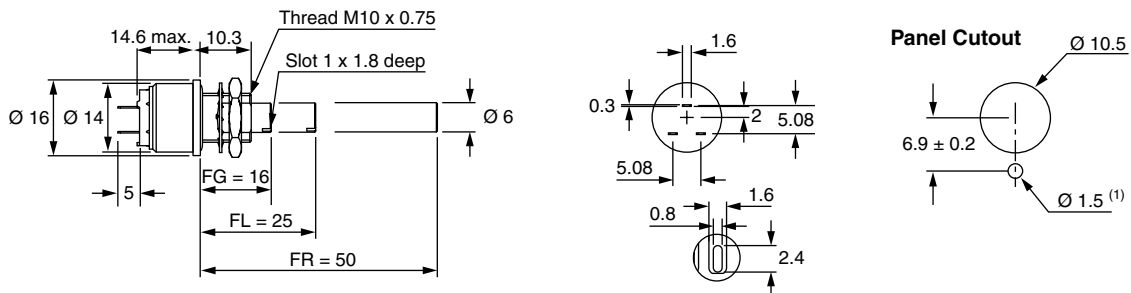


RoHS
COMPLIANT

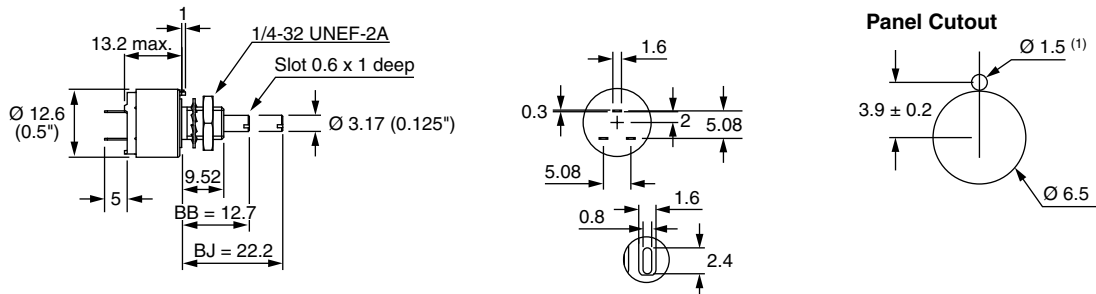
QUICK REFERENCE DATA	
Multiple module	No
Switch module	n/a
Detent module	n/a
Special electrical laws	A: linear, L: logarithmic, F: reverse logarithmic
Sealing level	IP 68
Lifespan	25K cycles

DIMENSIONS in millimeters (inches) ± 0.5 mm (± 0.02 ")

P13SM N



P13SM B



Note

(1) CAUTION: $\text{Ø } 1.5$ of panel cut out must not be fully through-hole

Undergoes European Quality Insurance System

ELECTRICAL SPECIFICATIONS	
Resistive element	Cermet
Electrical travel	270° ± 10°
Resistance range	Linear taper 22 Ω to 10 MΩ Logarithmic taper 1 kΩ to 2.2 MΩ
Standard series E3	1, 2.2, 4.7, and on request 1, 2, 5
Tolerance	Standard ± 20 % On request ± 10 % to ± 5 %
Taper	
Circuit diagram	
Power rating	Linear 1.5 W at 70 °C Logarithmic 0.75 W at 70 °C
Temperature coefficient (typical)	± 150 ppm/°C For values ≥ 100 Ω and in temperature range +20 °C to +70 °C, the typical temperature coefficient is ± 75 ppm/°C
Limiting element voltage (linear law)	350 V
Contact resistance variation	3 % R _n or 3 Ω
End resistance (typical)	1 Ω
Dielectric strength (RMS)	2000 V
Insulation resistance (300 V _{DC})	10 ⁶ MΩ
Independent linearity (typical)	± 5 %



STANDARD RESISTANCE ELEMENT DATA							
STANDARD RESISTANCE VALUES	LINEAR TAPER			LOGS TAPED			TYPICAL TCR -55 °C +125 °C
	MAX. POWER AT 70 °C	MAX. WORKING VOLTAGE	MAX. CUR. THROUGH WIPER	MAX. POWER AT 70 °C	MAX. WORKING VOLTAGE	MAX. CUR. THROUGH WIPER	
Ω	W	V	mA	W	V	mA	ppm/°C
22	1.5	5.74	261	-	-	-	± 150
47	1.5	8.4	177	-	-	-	
100	1.5	12.2	122	-	-	-	
220	1.5	18.2	82.6	-	-	-	
470	1.5	26.5	56.5	-	-	-	
1K	1.5	38.7	38.7	0.75	27	27	
2.2K	1.5	57.5	26.1	0.75	40	18	
4.7K	1.5	84	17.9	0.75	59	12	
10K	1.5	122.5	12.2	0.75	87	8.7	
22K	1.5	182	8.26	0.75	128	5.8	
47K	1.5	265	5.65	0.75	187	3.9	
100K	1.22	350	3.5	0.75	273	2.7	
220K	0.56	350	1.6	0.56	350	1.6	
470K	0.26	350	0.74	0.26	350	0.74	
1M	0.12	350	0.35	0.12	350	0.35	
2.2M	0.05	350	0.16	0.05	350	0.16	
4.7M	0.026	350	0.074	-	-	-	
10M	0.012	350	0.035	-	-	-	

MECHANICAL SPECIFICATIONS			
Mechanical travel	Style B	300° ± 5°	
	Style N	310° ± 5°	
Operating torque (typical)		2 Ncm	2.85 oz. inch
End stop torque	Style B	35 Ncm max.	3.1 lb inch max.
	Style N	80 Ncm max.	7.1 lb inch max.
Tightening torque of mounting nut	Style B	80 Ncm min., 150 Ncm max.	7 lb inch min., 13.3 lb inch max.
	Style N	80 Ncm min., 250 Ncm max.	7 lb inch min., 22.1 lb inch max.
Unit weight		8 g to 27 g	0.3 oz. to 1 oz.
Terminals		e3: pure Sn	

ENVIRONMENTAL SPECIFICATIONS	
Temperature range	-55 °C to +125 °C
Climatic category	55 / 125 / 56
Sealing	Fully sealed - container IP68
Panel sealing	Immersion at 30 m (100 feet) in sea salt water or clear water



OPTIONS	
Special feature command shaft	Length is measured from the mounting surface to the free end of the shaft. The screwdriver slot is aligned with the wiper within $\pm 10^\circ$. Special shafts are available, in accordance to drawings supplied by customers. We recommend that customers should not machine tool shafts, in order to avoid damage. Bending or torsion of terminals should also be avoided.

MARKING
Printed: <ul style="list-style-type: none"> • Vishay trademark • Part number (including ohmic value code, tolerance code and resistance law) • Manufacturing date • Marking of terminals a

PACKAGING
In box Packaging quantity depending on shafts: <ul style="list-style-type: none"> • Box of 5 pieces for shaft FR (code BO5) • Box of 10 pieces for shaft FG or FL (code BO10) • Box of 15 pieces for shaft BJ (code BO15) • Box of 25 pieces for shaft BB (code BO25)
Hardware: nuts, washer, and O-ring are separately supplied (not mounted on the potentiometer), in a small bag placed in the packaging.

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' - ambient temperature 70 °C	$\pm 1 \%$	-	Contact res. variation: < 3 % Rn
Climatic sequence	Phase A dry heat 125 °C Phase B damp heat Phase C cold -55 °C Phase D damp heat 5 cycles	$\pm 0.5 \%$	$\pm 1 \%$	-
Damp heat, steady state	56 days 40 °C, 93 % HR	$\pm 0.5 \%$	$\pm 1 \%$	Dielectric strength: 1000 V Insulation resistance: > 10 ⁴ MΩ
Change of temperature	5 cycles -55 °C at +125 °C	$\pm 0.5 \%$	-	-
Mechanical endurance	25 000 cycles	$\pm 3 \%$	-	Contact res. variation: < 2 % Rn
Shock	50 g's at 11 ms 3 successive shocks in 3 directions	$\pm 0.1 \%$	$\pm 0.2 \%$	-
Vibration	10 Hz to 55 Hz 0.75 mm or 10 g's during 6 h	$\pm 0.1 \%$	-	$\Delta V_{1-2}/V_{1-3} < \pm 0.2 \%$

Note

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



ORDERING INFORMATION (Part Number)																	
P	1	3	S	M	N	F	L	S	1	0	3	M	A	E			
MODEL	BUSHING			SHAFT			SHAFT STYLE	OHMIC VALUE			TOLERANCE	TAPER		SPECIAL			
P13SM	∅	L	Shaft ∅		∅	L	S = slotted On request: R = round F = flat D = custom	Linear law from 22 Ω to 10 MΩ Logarithmic law from 1 kΩ to 2.2 MΩ 103 = 10 kΩ			M = 20 % On request: K = 10 % J = 5 %	A = linear L = clockwise logarithmic F = inverse clockwise logarithmic		E = locating peg or special code given by Vishay			
	N	10	10.3	6	BB	3.17	12.7										
	B	6.35	9.52	3.17	BJ	3.17	22.2										
					FG	6	16										
					FL	6	25										
					FR	6	50										
					AP	Custom											

PART NUMBER DESCRIPTION (for information only)													
P13SM	N	E	FL	S	10K	20 %	A			BO10			e3
MODEL	BUSHING	SPECIAL	SHAFT	SHAFT STYLE	VALUE	TOLERANCE	TAPER	SPECIAL	PACKAGING	SHAFT	SPECIAL		LEAD (Pb)-FREE

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



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.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. 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.