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

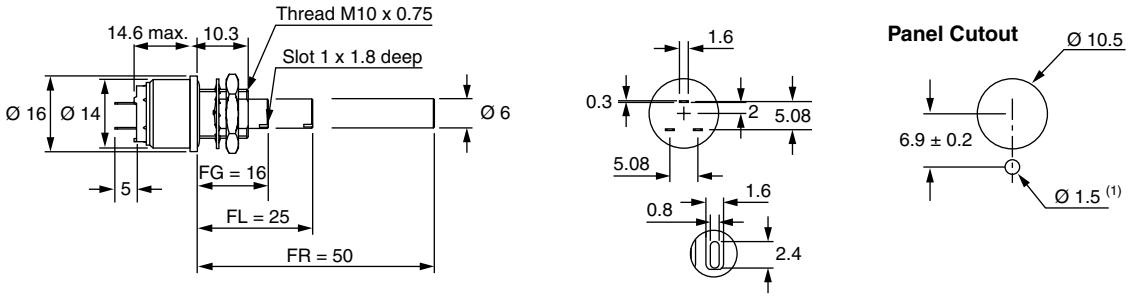
- High power rating 1.5 W at 70 °C
- Stainless steel shaft and bushing to endure sea salt water immersion
- Fully sealed IP68 on panel
- Tight temperature coefficient (± 75 ppm/°C typical)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

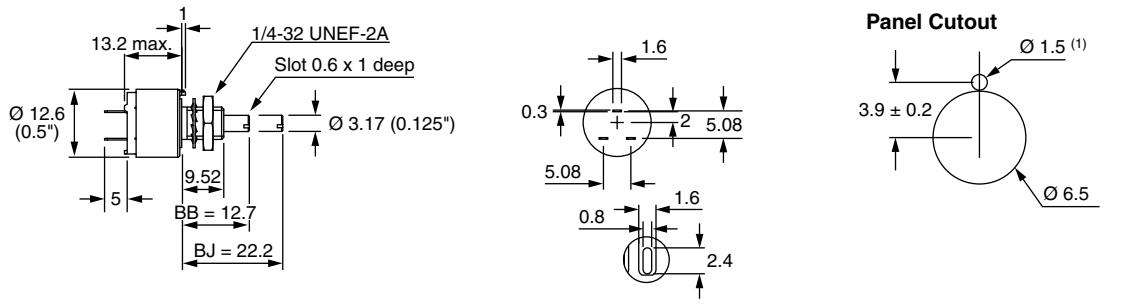
QUICK REFERENCE DATA	
Multiple module	No
Switch module	n/a
Detent module	n/a
Special electrical laws	A: linear, L: logarithmic, F: reverse logarithmic
Sealing level	IP 68
Lifespan	25K cycles

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

P13SM N



P13SM B



Note

(1) CAUTION: Ø 1.5 of panel cut out must not be fully through-hole

Undergoes European Quality Insurance System

For technical questions, contact: sferpottrimmers@vishay.com

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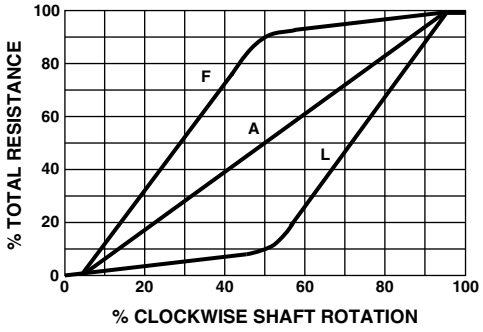
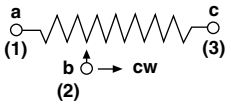
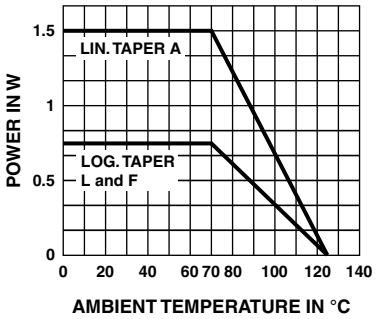
ELECTRICAL SPECIFICATIONS		
Resistive element		Cermet
Electrical travel		270° ± 10°
Resistance range	Linear taper	22 Ω to 10 MΩ
	Logarithmic taper	1 kΩ to 2.2 MΩ
Standard series E3		1, 2.2, 4.7, and on request 1, 2, 5
Tolerance	Standard	± 20 %
	On request	± 10 % to ± 5 %
Taper		
Circuit diagram		
Power 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 % Rn 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 %

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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

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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 ± 10°. 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:

- 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:

- 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		
		$\Delta R_T/R_T$ (%)	$\Delta R_{1\text{-}2}/R_{1\text{-}2}$ (%)	OTHER
Electrical endurance	1000 h at rated power 90'/30' - ambient temperature 70 °C	± 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	± 0.5 %	± 1 %	-
Damp heat, steady state	56 days 40 °C, 93 % HR	± 0.5 %	± 1 %	Dielectric strength: 1000 V Insulation resistance: > 10^4 MΩ
Change of temperature	5 cycles -55 °C at +125 °C	± 0.5 %	-	-
Mechanical endurance	25 000 cycles	± 3 %	-	Contact res. variation: < 2 % Rn
Shock	50 *g*'s at 11 ms 3 successive shocks in 3 directions	± 0.1 %	± 0.2 %	-
Vibration	10 Hz to 55 Hz 0.75 mm or 10 *g*'s during 6 h	± 0.1 %	-	$\Delta V_{1\text{-}2}/V_{1\text{-}3}$ < ± 0.2 %

Note

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

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ORDERING INFORMATION (Part Number)

P	1	3	S	M	N	F	L	S	1	0	3	M	A	E			

MODEL

P13SM

BUSHING

	Ø	L	Shaft Ø
N	10	10.3	6
B	6.35	9.52	3.17

SHAFT

	Ø	L
BB	3.17	12.7
BJ	3.17	22.2
FG	6	16
FL	6	25
FR	6	50
AP	Custom	

SHAFT STYLE

S = slotted

On request:
R = round
F = flat
D = custom

OHMIC VALUE

Linear law from 22 Ω to 10 MΩ

Logarithmic law from 1 kΩ to 2.2 MΩ

103 = 10 kΩ

TOLERANCE

M = 20 %

On request:
K = 10 %
J = 5 %

TAPER

A = linear
L = clockwise logarithmic
F = inverse clockwise logarithmic

SPECIAL

E = locating peg or special code given by Vishay

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

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