

Fully Sealed Container Cermet Potentiometers Submarine Applications



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)
- Compliant to RoHS Directive 2002/95/EC


RoHS
COMPLIANT

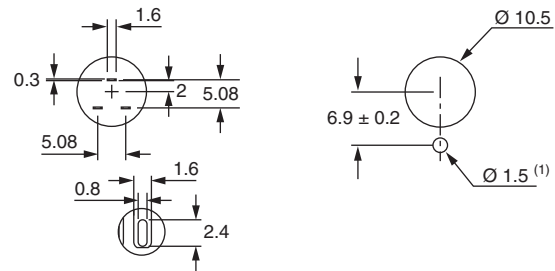
P13SM is designed for applications which need to set electrical parameters with an immersed potentiometer in deep water conditions up to 30 m (100 feet).

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

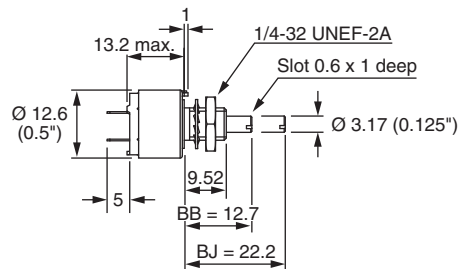
P13SM N



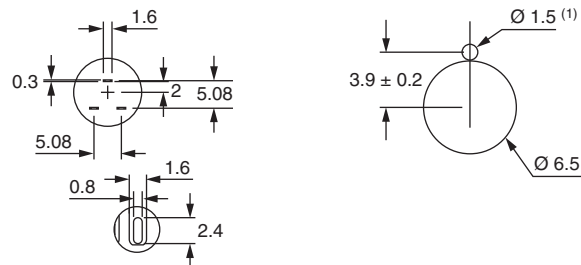
Panel Cutout



P13SM B



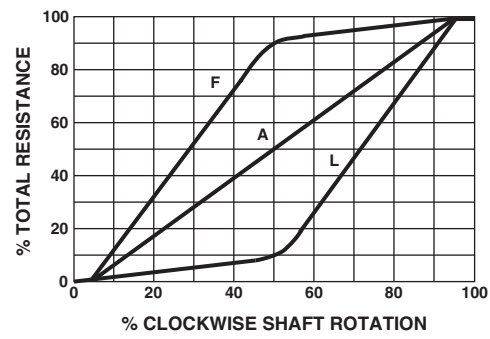
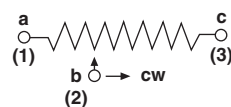
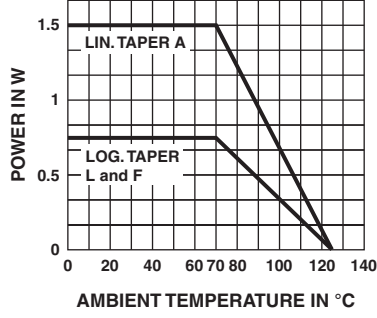
Panel Cutout



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 | <table border="0" style="width: 100%;"> <tr> <td style="text-align: center;">Linear Taper</td> <td style="text-align: center;">22 Ω to 10 MΩ</td> </tr> <tr> <td style="text-align: center;">Logarithmic Taper</td> <td style="text-align: center;">1 kΩ to 2.2 MΩ</td> </tr> </table> | Linear Taper | 22 Ω to 10 MΩ | Logarithmic Taper | 1 kΩ to 2.2 MΩ |
| 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 | <table border="0" style="width: 100%;"> <tr> <td style="text-align: center;">Standard</td> <td style="text-align: center;">± 20 %</td> </tr> <tr> <td style="text-align: center;">On Request</td> <td style="text-align: center;">± 10 % to ± 5 %</td> </tr> </table> | Standard | ± 20 % | On Request | ± 10 % to ± 5 % |
| Standard | ± 20 % | | | | |
| On Request | ± 10 % to ± 5 % | | | | |
| Taper |  | | | | |
| Circuit Diagram |  | | | | |
| Power Rating | <p>Linear 1.5 W at 70 °C</p> <p>Logarithmic 0.75 W at 70 °C</p>  | | | | |
| Temperature Coefficient (Typical) | <p>± 150 ppm/°C</p> <p>For values ≥ 100 Ω and in temperature range + 20 °C to + 70 °C, the typical temperature coefficient is ± 75 ppm/°C</p> | | | | |
| 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 % | | | | |



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Vishay Sfernice

| STANDARD RESISTANCE ELEMENT DATA | | | | | | | |
|----------------------------------|---------------------|----------------------|-------------------------|---------------------|----------------------|-------------------------|------------------------------------|
| STANDARD RESISTANCE VALUES | LINEAR TAPER | | | LOGS TAPER | | | 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 max. | 2.85 oz. inch max. |
| 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 max. | 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 8 pieces for shaft FR (code BO8) • 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) |

| 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 temp. 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 | $\pm 0.1 \%$ | - | $\Delta V_{1-2}/V_{1-3} < \pm 0.2 \%$ |



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| 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 STYL | VALUE | TOLERANCE | TAPER | SPECIAL | PACKAGING | SHAFT | SPECIAL | LEAD (Pb)-FREE |



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