

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
- Metallic or plastic knob options
- Custom knob on request
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

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 | n/a |
| Detent module | n/a |
| Special electrical laws | A: linear, L: logarithmic, F: reverse logarithmic |
| Sealing level | IP 67 |
| Lifespan | 50K cycles |

| DIMENSIONS in millimeters (± 0.5 mm) | | |
|---|---|----------------------------|
| <p>P16NP</p> <p>Thickness nut 2 mm washer 1.5 mm</p> | <p>P16NM</p> <p>Thickness nut 2 mm washer 1.5 mm</p> | <p>Panel Cutout</p> |
| | | |

| 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 |
|---|
| <ul style="list-style-type: none"> Ohmic value code, tolerance code and taper Manufacturing date code |

| PACKAGING |
|--|
| <ul style="list-style-type: none"> 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. |

| P16 STANDARD RESISTANCE ELEMENT DATA | | | | | | |
|--------------------------------------|---------------------|----------------------------|-----------|---------------------|----------------------------|-----------|
| STANDARD RESISTANCE VALUES | LINEAR TAPER | | | LOG TAPER | | |
| | MAX. POWER AT 40 °C | MAX. VOLTAGE THROUGH WIPER | MAX. CUR. | MAX. POWER AT 40 °C | MAX. VOLTAGE THROUGH WIPER | MAX. CUR. |
| | W | V | mA | W | V | mA |
| Ω | W | V | mA | W | V | mA |
| 22 | 1 | 4.69 | 213 | | | |
| 47 | 1 | 6.85 | 146 | | | |
| 100 | 1 | 10 | 100 | | | |
| 220 | 1 | 14.8 | 67.4 | 0.5 | 7.1 | 71 |
| 470 | 1 | 21.7 | 46.1 | 0.5 | 10.5 | 48 |
| 1K | 1 | 31.6 | 31.6 | 0.5 | 15.3 | 32.6 |
| 2.2K | 1 | 46.9 | 21.3 | 0.5 | 22.4 | 22.4 |
| 4.7K | 1 | 68.5 | 14.6 | 0.5 | 33.2 | 15.1 |
| 10K | 1 | 100 | 10 | 0.5 | 48.5 | 10.3 |
| 22K | 1 | 148 | 6.74 | 0.5 | 70.7 | 7.07 |
| 47K | 1 | 217 | 4.61 | 0.5 | 105 | 4.77 |
| 100K | 1 | 316 | 3.16 | 0.5 | 153 | 3.26 |
| 220K | 0.56 | 350 | 1.59 | 0.5 | 224 | 2.24 |
| 470K | 0.26 | 350 | 0.75 | 0.5 | 332 | 1.51 |
| 1M | 0.12 | 350 | 0.35 | 0.26 | 350 | 0.74 |
| 2.2M | 0.05 | 350 | 0.16 | 0.12 | 350 | 0.35 |
| 4.7M | 0.02 | 350 | 0.07 | 0.056 | 350 | 0.16 |
| 10M | 0.01 | 350 | 0.012 | | | |

| PA16 STANDARD RESISTANCE ELEMENT DATA | | | | | | |
|---------------------------------------|---------------------|----------------------------|-----------|---------------------|----------------------------|-----------|
| STANDARD RESISTANCE VALUES | LINEAR TAPER | | | LOG TAPER | | |
| | MAX. POWER AT 40 °C | MAX. VOLTAGE THROUGH WIPER | MAX. CUR. | MAX. POWER AT 40 °C | MAX. VOLTAGE THROUGH WIPER | MAX. CUR. |
| | W | V | mA | W | V | mA |
| 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 | | | |



| 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 PA16 = conductive plastic | 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 | | | | | | |

| 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 |

| 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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