

## Knob Potentiometer



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.

### FEATURES

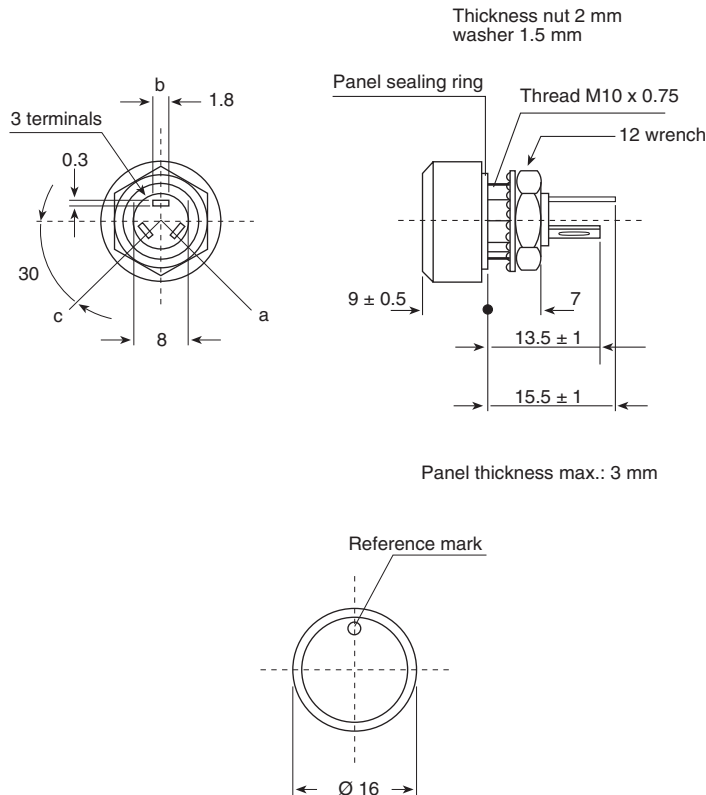
- Test according to CECC 41000 or IEC 60393-1
- **P16** - Version for professional and industrial applications (cermet)  
1 W at 40 °C
- **PA16** - Version for professional audio applications (conductive plastic)  
0.5 W at 40 °C
- Compact (integrated)
- High dielectric strength: 2500 V<sub>RMS</sub>
- Fully sealed and panel sealed
- Metallic or plastic knob options
- Custom knob on request
- Compliant to RoHS Directive 2002/95/EC



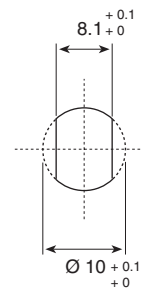
**RoHS**  
COMPLIANT

### DIMENSIONS in millimeters (± 0.5 mm)

**P16, PA16**



**PANEL CUTOUT**



| ELECTRICAL SPECIFICATIONS                    |   |                                       |
|--|---|---------------------------------------|
|  | P16   | PA16                                  |
| Resistive Element                            | Cermet  | Conductive plastic                    |
| Electrical Travel                            | 270° ± 10°  | 270° ± 10°                            |
| Power Rating Chart                           |   |                                       |
| Circuit Diagram                              |   |                                       |
| Taper  |   |                                       |
| Resistance Range                             | <b>Linear Taper</b><br>22 Ω to 10 MΩ<br><b>Logarithmic Taper</b><br>100 Ω to 2.2 MΩ | 1 kΩ to 1 MΩ<br>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                                    | <b>Standard</b><br>± 20 %<br><b>On Request</b><br>± 10 %                            | ± 20 %<br>± 10 % (1 kΩ to 100 kΩ)     |
| Power Rating                                 | <b>Linear</b><br>1 W at + 40 °C<br>0.5 W at + 40 °C<br><b>Logarithmic</b>           | 0.5 W at + 40 °C<br>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 <sub>DC</sub> ) | 10 <sup>6</sup> MΩ  | 10 <sup>6</sup> MΩ                    |



| MECHANICAL SPECIFICATIONS              |                 |
|--|-----------------|
| Mechanical Travel                      | 300° ± 5°       |
| Operating Torque                       | 2 Ncm typical   |
| End Stop Torque                        | 25 Ncm maximum  |
| Max. Tightening Torque of Mounting Nut | 250 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"> <li>Ohmic value code, tolerance code and taper</li> <li>Manufacturing date code</li> </ul> |

| PACKAGING   |
|---|
| <ul style="list-style-type: none"> <li>Carton box of 20 pieces</li> </ul> |

| CONTROL KNOB  |
|---|
| Black metallic knob (NM).   |
| Black plastic knob (NP).  |
| For white and blue color see ordering information.  |
| Other dimensions, shapes, 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 | 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                   |                     |              |                         |

| PA16 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 70 °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                 | 79.7         | 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<br>90°/30° cycle at + 40 °C         | ± 5 %                     | -                            | Insulation resistance: > 10 <sup>4</sup> MΩ<br>Contact res. variation: < 2 % Rn |
| Damp Heat, Steady State | 56 days<br>40 °C, 93 % HR                                 | ± 2 %                     | ± 1 %                        | Insulation resistance: > 10 <sup>4</sup> MΩ                                     |
| Mechanical Endurance    | 50 000 cycles   | ± 5 %                     | -                            | Contact res. variation: < 2 % Rn  |
| Shock                   | 50 g's at 11 ms<br>3 successive shocks<br>in 3 directions | ± 0.2 %                   | ± 0.5 %                      | -   |
| Vibration               | 10 Hz to 55 Hz<br>0.75 mm or 10 g's<br>during 6 h         | ± 0.2 %                   | -                            | $\Delta V_{1-2}/\Delta V_{1-3} \leq \pm 0.5 \%$                                 |

| 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                                       |  |  |  |  |  |
| <b>P16</b> = Cermet<br><br><b>PA16</b> = Conductive plastic | <b>NM</b> : Metallic black<br><b>NP</b> : Plastic black<br><b>WM</b> : Metallic white<br><b>WP</b> : Plastic white<br><b>BP</b> : Plastic blue |   |   | <b>223</b> = 22 kΩ<br>for ohmic value range see electrical specification |   |   | <b>M</b> = ± 20 %<br><br>On request:<br><b>K</b> = ± 10 % | <b>A</b> : Linear<br><b>L</b> : Clockwise logarithmic<br><b>F</b> : Inverse clockwise logarithmic |   |   | <b>B15</b> = Box of 20 pieces | (If applicable)<br>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 |



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