

## 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

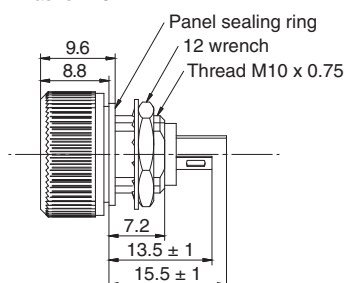
- Test according to CECC 41000 or IEC 60393-1
- **P16** - Version for professional and industrial applications (cermet)  
1 W at 40 °C
- **PA16** - Version for professional audio applications (conductive plastic)  
0.5 W at 40 °C
- Compact (integrated)
- High dielectric strength: 2500 V<sub>RMS</sub>
- Fully sealed and panel sealed
- Metallic or plastic knob options
- Custom knob on request
- Material categorization: for definitions of compliance please see [www.vishay.com/doc299912](http://www.vishay.com/doc299912)


**RoHS**  
COMPLIANT

### DIMENSIONS in millimeters (± 0.5 mm)

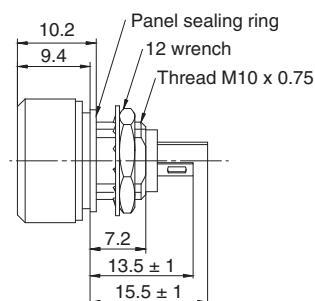
#### P16NP

Thickness nut 2 mm  
washer 1.5 mm

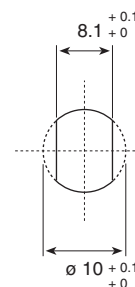


#### P16NM

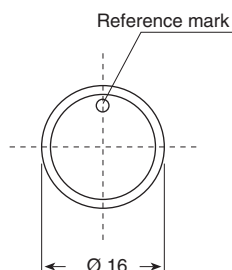
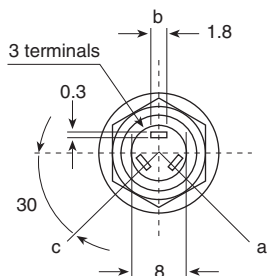
Thickness nut 2 mm  
washer 1.5 mm



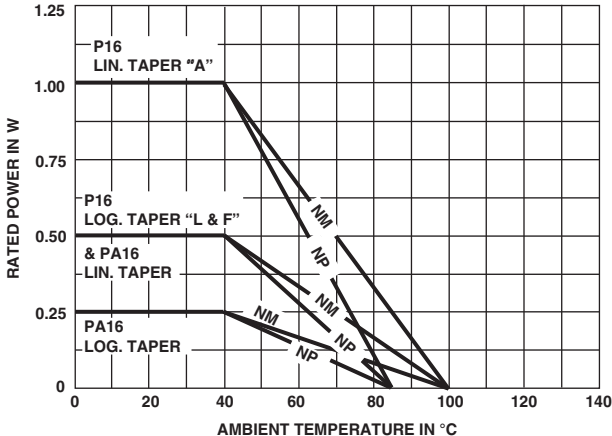
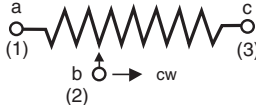
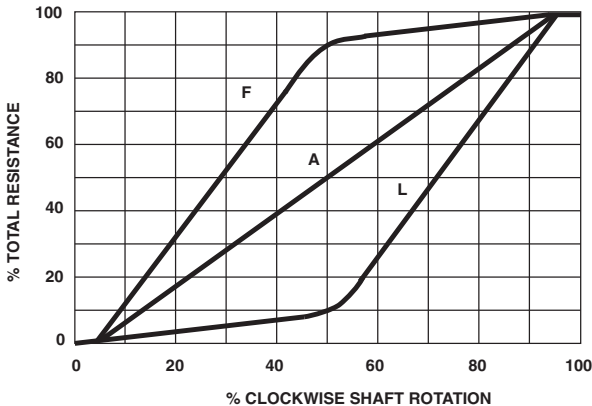
#### Panel Cutout



Panel thickness max.: 3 mm





| 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<br>Logarithmic Taper                                                   | 22 Ω to 10 MΩ<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                             | Standard<br>On Request                                                              | ± 20 %<br>± 10 %                 | ± 20 %<br>± 10 % (1 kΩ to 100 kΩ)   |
| Power Rating                          | Linear<br>Logarithmic                                                               | 1 W at +40 °C<br>0.5 W at +40 °C | 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 VDC)       | 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**

- Ohmic value code, tolerance code and taper
- Manufacturing date code

**PACKAGING**

- Carton box of 20 pieces

**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**

| STAN-<br>DARD<br>RESIS-<br>TANCE<br>VALUES | LINEAR TAPER                 |                                     |                                  | LOG TAPER                    |                                     |                                  |
|--------------------------------------------|------------------------------|-------------------------------------|----------------------------------|------------------------------|-------------------------------------|----------------------------------|
|                                            | MAX.<br>POWER<br>AT<br>40 °C | MAX.<br>VOLTAGE<br>THROUGH<br>WIPER | MAX.<br>CUR.<br>THROUGH<br>WIPER | MAX.<br>POWER<br>AT<br>40 °C | MAX.<br>VOLTAGE<br>THROUGH<br>WIPER | MAX.<br>CUR.<br>THROUGH<br>WIPER |
| 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**

| STAN-<br>DARD<br>RESIS-<br>TANCE<br>VALUES | LINEAR TAPER                 |                                     |                                  | LOG TAPER                    |                                     |                                  |
|--------------------------------------------|------------------------------|-------------------------------------|----------------------------------|------------------------------|-------------------------------------|----------------------------------|
|                                            | MAX.<br>POWER<br>AT<br>40 °C | MAX.<br>VOLTAGE<br>THROUGH<br>WIPER | MAX.<br>CUR.<br>THROUGH<br>WIPER | MAX.<br>POWER<br>AT<br>40 °C | MAX.<br>VOLTAGE<br>THROUGH<br>WIPER | MAX.<br>CUR.<br>THROUGH<br>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                          | 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<br>90°/30° cycle at +40 °C          | ± 5 %                     | -                            | Insulation resistance: > 10 <sup>4</sup> MΩ<br>Contact res. variation: < 2 % R <sub>n</sub> |
| 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 % R <sub>n</sub>                                                |
| 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 %                   | -                            | $\Delta V_{1-2}/\Delta V_{1-3} \leq \pm 0.5$ %                                              |

**Note**

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

**ORDERING INFORMATION**

|                                                                   |                                                                                                                                                |          |          |                                                                                   |          |          |                                                           |                                                                                                      |          |          |                                     |                                                               |  |  |  |  |  |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|-----------------------------------------------------------------------------------|----------|----------|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------|----------|-------------------------------------|---------------------------------------------------------------|--|--|--|--|--|
| <b>P</b>                                                          | <b>1</b>                                                                                                                                       | <b>6</b> | <b>N</b> | <b>P</b>                                                                          | <b>2</b> | <b>2</b> | <b>3</b>                                                  | <b>M</b>                                                                                             | <b>A</b> | <b>B</b> | <b>1</b>                            | <b>5</b>                                                      |  |  |  |  |  |
| <b>MODEL</b>                                                      | <b>STYLE</b>                                                                                                                                   |          |          | <b>OHMIC VALUE</b>                                                                |          |          | <b>TOLERANCE</b>                                          | <b>TAPER</b>                                                                                         |          |          | <b>PACKAGING CODE</b>               | <b>SPECIAL NUMBER</b>                                         |  |  |  |  |  |
| <b>P16</b> =<br>Cermet<br><br><b>PA16</b> =<br>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<br>range see<br>electrical<br>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<br>logarithmic |          |          | <b>B15</b> =<br>Box of<br>20 pieces | (If applicable)<br>Given by<br>Vishay<br>for custom<br>design |  |  |  |  |  |

**PART NUMBER DESCRIPTION** (for information only)

|            |           |              |             |          |         |           |         |                   |
|------------|-----------|--------------|-------------|----------|---------|-----------|---------|-------------------|
| <b>P16</b> | <b>NP</b> | <b>22 kΩ</b> | <b>20 %</b> | <b>A</b> |         | <b>BO</b> |         | <b>e3</b>         |
| MODEL      | STYLE     | VALUE        | TOLERANCE   | TAPER    | SPECIAL | PACKAGING | SPECIAL | LEAD<br>(Pb)-FREE |



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