

## 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

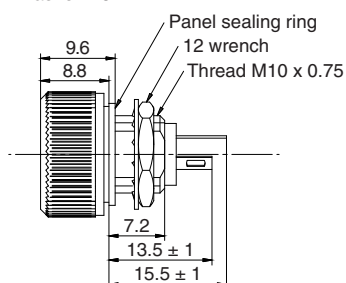
- Test according to CECC 41000 or IEC 60393-1
- **P16** - Version for professional and industrial applications (cermet)  
1 W at 40 °C
- **PA16** - Version for professional audio applications (conductive plastic)  
0.5 W at 40 °C
- Compact (integrated)
- High dielectric strength: 2500 V<sub>RMS</sub>
- 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/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### DIMENSIONS in millimeters (± 0.5 mm)

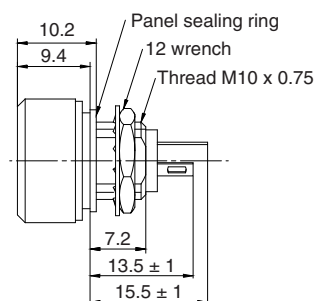
#### P16NP

Thickness nut 2 mm  
washer 1.5 mm

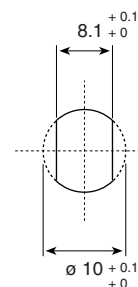


#### P16NM

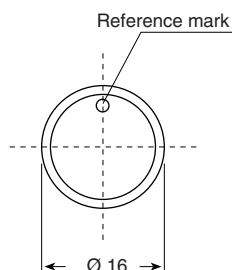
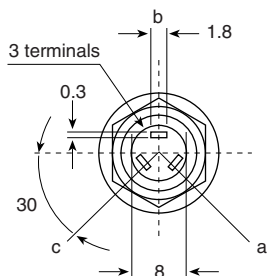
Thickness nut 2 mm  
washer 1.5 mm



#### Panel Cutout



Panel thickness max.: 3 mm



**ELECTRICAL SPECIFICATIONS**

|                                              |                                   | <b>P16</b>                                                     | <b>PA16</b>                                                       |
|----------------------------------------------|-----------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------|
| Resistive Element                            |                                   | Cermet                                                         | Conductive plastic                                                |
| Electrical Travel                            |                                   | $270^\circ \pm 10^\circ$                                       | $270^\circ \pm 10^\circ$                                          |
| Power Rating Chart                           |                                   |                                                                |                                                                   |
| Circuit Diagram                              |                                   |                                                                |                                                                   |
| Taper                                        |                                   |                                                                |                                                                   |
| Resistance Range                             | Linear Taper<br>Logarithmic Taper | 22 $\Omega$ to 10 M $\Omega$<br>100 $\Omega$ to 2.2 M $\Omega$ | 1 k $\Omega$ to 1 M $\Omega$<br>470 $\Omega$ to 500 k $\Omega$    |
| Standard Series E3                           |                                   | 1 - 2.2 - 4.7 and on request 1 - 2 - 5                         | 1 - 2.2 - 4.7                                                     |
| Tolerance                                    | Standard<br>On Request            | $\pm 20\%$<br>$\pm 10\%$                                       | $\pm 20\%$<br>$\pm 10\%$ (1 k $\Omega$ to 100 k $\Omega$ )        |
| Power Rating                                 | Linear<br>Logarithmic             | 1 W at + 40 $^\circ\text{C}$<br>0.5 W at + 40 $^\circ\text{C}$ | 0.5 W at + 40 $^\circ\text{C}$<br>0.25 W at + 40 $^\circ\text{C}$ |
| Temperature Coefficient (Typical)            |                                   | $\pm 150$ ppm/ $^\circ\text{C}$                                | $\pm 500$ ppm/ $^\circ\text{C}$                                   |
| Dielectric Strength (RMS)                    |                                   | 2500 V                                                         | 2500 V                                                            |
| Limiting Element Voltage (Linear Law)        |                                   | 350 V                                                          | 350 V                                                             |
| Contact Resistance Variation                 |                                   | 3 % R <sub>n</sub> or 3 $\Omega$                               | 2 % R <sub>n</sub> or 3 $\Omega$                                  |
| End Resistance (Typical)                     |                                   | 1 $\Omega$                                                     | 1 $\Omega$                                                        |
| Insulation Resistance (500 V <sub>DC</sub> ) |                                   | 10 <sup>6</sup> M $\Omega$                                     | 10 <sup>6</sup> M $\Omega$                                        |

**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 | MAX.<br>CUR.<br>THROUGH<br>WIPER | MAX.<br>POWER<br>AT<br>40 °C | MAX.<br>VOLTAGE | 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 | MAX.<br>CUR.<br>THROUGH<br>WIPER | MAX.<br>POWER<br>AT<br>40 °C | MAX.<br>VOLTAGE | 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 % 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> =<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) |       |       |           |       |         |           |         |                   |
|------------------------------------------------|-------|-------|-----------|-------|---------|-----------|---------|-------------------|
| P16                                            | NP    | 22 kΩ | 20 %      | A     |         | BO        |         | e3                |
| MODEL                                          | STYLE | VALUE | TOLERANCE | TAPER | SPECIAL | PACKAGING | SPECIAL | LEAD<br>(Pb)-FREE |



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