



## **Knob Potentiometer With Switch**

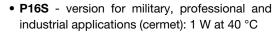


#### **LINKS TO ADDITIONAL RESOURCES**



The P16S 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.

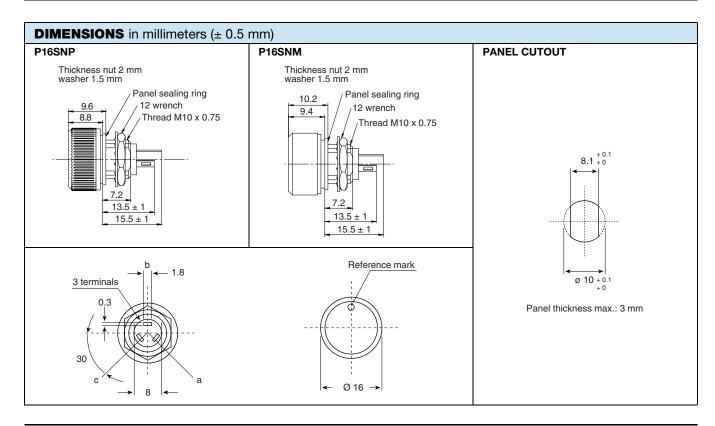
#### **FEATURES**





- PA16S version for professional audio applications (conductive plastic): 0.5 W at 40 °C
- Compact (integrated)
- Detent and electric cut off at beginning of travel
- Fully sealed and panel sealed
- · Metallic or plastic knob options
- · Custom knob on request
- Test according to CECC 41000 or IEC 60393-1
- Material categorization: for definitions of compliance please see <a href="https://www.vishay.com/doc?99912">www.vishay.com/doc?99912</a>

| QUICK REFERENCE DATA    |   |
|-------------------------|---|
| Multiple module         | No  |
| Switch module           | Yes   |
| Detent module           | Yes   |
| Special electrical laws | A: linear, L: logarithmic, F: reverse logarithmic |
| Sealing level           | IP 67   |
| Lifespan                | 10K cycles (switch), 50K cycles (track)           |





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|  |                             | P16S   | PA16S  |  |  |  |
|--|-----------------------------|--|--|--|--|--|
| Resistive element                            |                             | Cermet   | Conductive plastic   |  |  |  |
| Electrical travel                            |                             | 220° ± 10°   | 220° ± 10°   |  |  |  |
| Power rating chart                           |                             | PA16S<br>LOG. TAPER<br>0 0 20 40 60                            |  |  |  |  |
| Circuit diagram                              |                             | a<br>(1) b b → cw (3)  |  |  |  |  |
| Taper  |                             | 20 0 10 20 40  | 60 80 100<br>E KNOB ROTATION                                   |  |  |  |
| Resistance range                             | linear law logarithmic laws | 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  |  |  |  |
| standard                                     |                             | ± 20 %   | ± 20 %   |  |  |  |
| Tolerance                                    | on request                  | ± 10 %   | ± 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  | ± 500 ppm  |  |  |  |
| 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   |  |  |  |

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| MECHANICAL SPECIFICATIONS         |                 |  |  |
|-----------------------------------|-----------------|--|--|
| Mechanical travel                 | 300° ± 5°       |  |  |
| Operating torque                  | 2 Ncm typical   |  |  |
| End stop torque                   | 25 Ncm maximum  |  |  |
| 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                              |                  |  |  |

| SWITCH ELECTRICAL AND MECHANICAL SPECIFICATIONS |   |             |  |  |
|---|---|-------------|--|--|
| ON / OFF switch                                 | Actuation in counter clockwise position (between terminal a and terminal b) |             |  |  |
| Switching current                               | P16S  | 100 mA max. |  |  |
| Switching current                               | PA16S   | 1 mA max.   |  |  |
| Switch actuation torque                         | 3 Ncm typical   |             |  |  |
| Switch actuation travel                         | 30° ± 5°  |             |  |  |
| Dielectric strength terminal to terminal (RMS)  | 1000 V  |             |  |  |
| Insulation resistance between contacts          | 10 <sup>6</sup> MΩ  |             |  |  |
| Switch mechanical endurance                     | 10 000 cycles   |             |  |  |
| 1 cycle   | ON-OFF-ON   |             |  |  |

#### Note

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

#### **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).

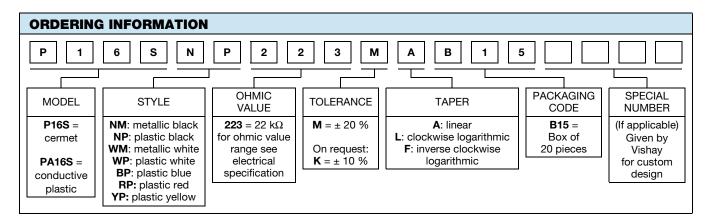
For white, blue, red, and yellow color see ordering information. Other dimensions, shape, marking, colors of control knobs are manufactured on request - please consult Vishay. Other reference marks (shapes, colors) and legends can be printed on plastic knob on request - please consult Vishay.

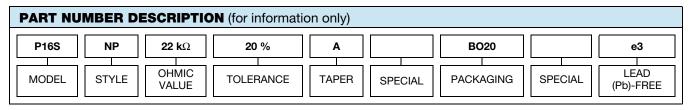
| STANDA               | STANDARD RESISTANCE ELEMENT DATA |                 |                               |                           |                 |                               |                           |                 |                               |                           |                 |                               |
|----------------------|----------------------------------|-----------------|-------------------------------|---------------------------|-----------------|-------------------------------|---------------------------|-----------------|-------------------------------|---------------------------|-----------------|-------------------------------|
|                      | P16S CERMET                      |                 |                               |                           |                 | PA16S CONDUCTIVE PLASTIC      |                           |                 |                               |                           |                 |                               |
| STANDARD             | L                                | INEAR TAP       | PER                           | LOG                       | ARITHMIC        | TAPER                         | LINEAR TAPER              |                 |                               | LOGARITHMIC TAPER         |                 |                               |
| RESISTANCE<br>VALUES | MAX.<br>POWER<br>AT 40 °C        | MAX.<br>VOLTAGE | MAX. CUR.<br>THROUGH<br>WIPER | MAX.<br>POWER<br>AT 40 °C | MAX.<br>VOLTAGE | MAX. CUR.<br>THROUGH<br>WIPER | MAX.<br>POWER<br>AT 40 °C | MAX.<br>VOLTAGE | MAX. CUR.<br>THROUGH<br>WIPER | MAX.<br>POWER<br>AT 40 °C | MAX.<br>VOLTAGE | MAX. CUR.<br>THROUGH<br>WIPER |
| Ω                    | W                                | ٧               | mA                            | W                         | ٧               | mA                            | W                         | ٧               | mA                            | W                         | ٧               | 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                          |                           |                 |                               | 0.25                      | 10.8            | 23.1                          |
| 1K                   | 1                                | 31.6            | 31.6                          | 0.5                       | 22.4            | 22.4                          | 0.5                       | 22.4            | 22.4                          | 0.25                      | 15.8            | 16                            |
| 2.2K                 | 1                                | 46.9            | 21.3                          | 0.5                       | 33.2            | 15.1                          | 0.5                       | 33.2            | 15.1                          | 0.25                      | 23.5            | 11                            |
| 4.7K                 | 1                                | 68.5            | 14.6                          | 0.5                       | 48.5            | 10.3                          | 0.5                       | 48.5            | 10.3                          | 0.25                      | 34.3            | 7                             |
| 10K                  | 1                                | 100             | 10                            | 0.5                       | 70.7            | 7.07                          | 0.5                       | 70.7            | 7.07                          | 0.25                      | 50              | 5                             |
| 22K                  | 1                                | 148             | 6.74                          | 0.5                       | 105             | 4.77                          | 0.5                       | 105             | 4.77                          | 0.25                      | 74              | 3.4                           |
| 47K                  | 1                                | 217             | 4.61                          | 0.5                       | 153             | 3.26                          | 0.5                       | 153             | 3.26                          | 0.25                      | 108             | 2.3                           |
| 100K                 | 1                                | 316             | 3.16                          | 0.5                       | 224             | 2.24                          | 0.5                       | 224             | 2.24                          | 0.25                      | 158             | 1.6                           |
| 220K                 | 0.56                             | 350             | 1.59                          | 0.5                       | 332             | 1.51                          | 0.5                       | 332             | 1.51                          | 0.25                      | 235             | 1.1                           |
| 470K                 | 0.26                             | 350             | 0.75                          | 0.26                      | 350             | 0.74                          | 0.26                      | 350             | 0.74                          | 0.25                      | 343             | 0.7                           |
| 1M                   | 0.12                             | 350             | 0.35                          | 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                         |                           |                 |                               |                           |                 |                               |                           |                 |                               |



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| PERFORMANCE             |   |                                     |                              |   |  |  |
|-------------------------|---|-------------------------------------|------------------------------|---|--|--|
| TESTS                   | CONDITIONS  | TYPICAL VALUES AND DRIFTS           |                              |   |  |  |
| 12313                   | OONDITIONS  | ∆R <sub>T</sub> /R <sub>T</sub> (%) | $\Delta R_{1-2}/R_{1-2}$ (%) | OTHER   |  |  |
| Electrical endurance    | 1000 h at rated power<br>90'/30' cycle at +40 °C          | ± 5 %                               | -                            | Insulation resistance: > $10^4$ M $\Omega$ Contact res. variation: < $2$ % Rn |  |  |
| Damp heat, steady state | 56 days<br>40 °C, 93 % HR                                 | ± 2 %                               | ± 1 %                        | Insulation resistance: $> 10^4 \text{ M}\Omega$                               |  |  |
| 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 dimensions | ± 0.2 %                             | ± 0.5 %                      | -   |  |  |
| Vibration               | 10 Hz to 55 Hz<br>0.75 mm or 10 <i>g</i> 's<br>during 6 h | ± 0.2 %                             | -                            | $\Delta V_{1-2}/\Delta V_{1-3} \le \pm \ 0.5 \%$                              |  |  |





| 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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