



## Fully Sealed Container Cermet Potentiometer Professional Grade



### LINKS TO ADDITIONAL RESOURCES



Their excellent performances are due to the use of a cermet-track sealed in a large case.

P13 interchangeability with RV6, combined with the excellent stability of its rated characteristics make it fully acceptable for military and professional uses.

### FEATURES

- High power rating 1.5 W at 70 °C
- Product qualification:  
According to CECC 41 301-001 (A, B, C)
- Test according to CECC 41000 or IEC 60393-1
- GAM T1
- Cermet element
- Fully sealed case
- Tight temperature coefficient ( $\pm 75$  ppm/°C typical)
- Mechanical strength
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



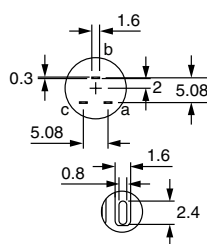
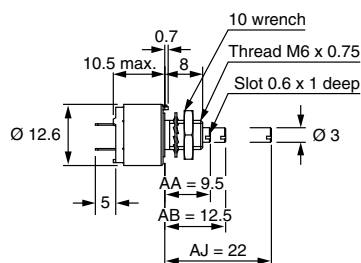
RoHS  
COMPLIANT

### QUICK REFERENCE DATA

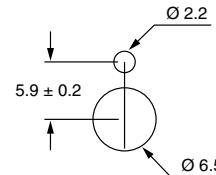
|                         |                                                      |
|-------------------------|------------------------------------------------------|
| Multiple module         | No                                                   |
| Switch module           | n/a                                                  |
| Detent module           | n/a                                                  |
| Special electrical laws | A: linear, L: logarithmic,<br>F: reverse logarithmic |
| Sealing level           | IP 67                                                |
| Lifespan                | 25K cycles                                           |

### DIMENSIONS in millimeters ( $\pm 0.5$ )

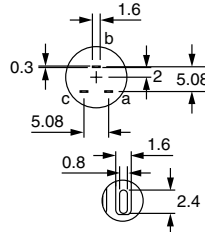
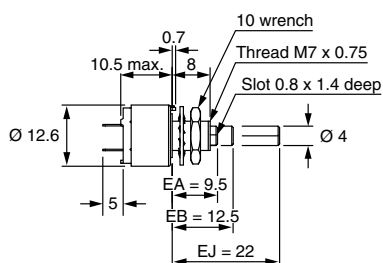
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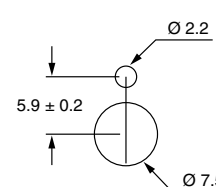
#### Panel Cutout



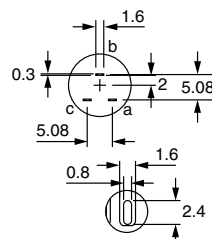
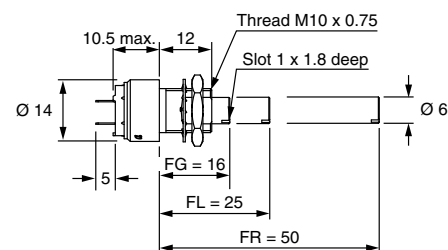
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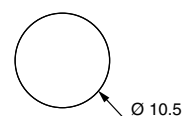
#### Panel Cutout



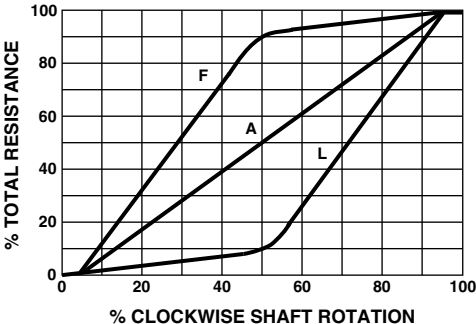
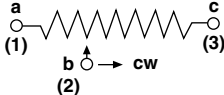
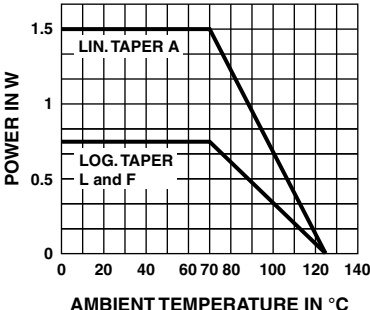
#### P13L-(PC33) C



#### Panel Cutout





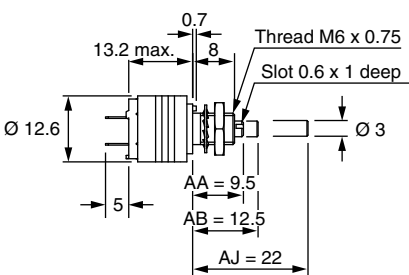
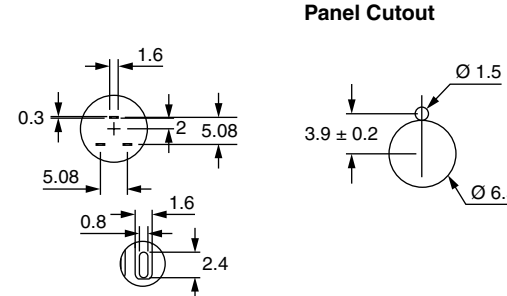
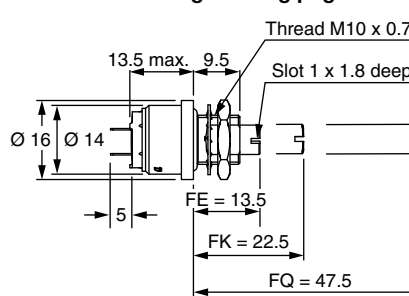
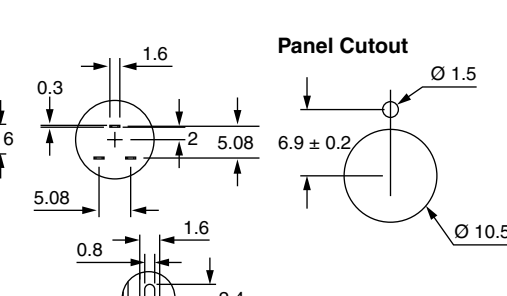
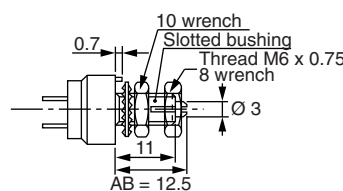
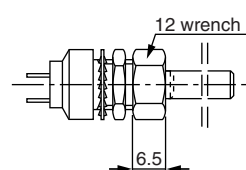
| ELECTRICAL SPECIFICATIONS                    |                                                                                                                                                    |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Resistive element                            | Cermet                                                                                                                                             |
| Electrical travel                            | 270° ± 10°                                                                                                                                         |
| Resistance range                             | Linear taper<br>22 Ω to 10 MΩ<br>Logarithmic taper<br>1 kΩ to 2.2 MΩ                                                                               |
| Standard series e3                           | 1, 2.2, 4.7 and on request 1, 2, 5                                                                                                                 |
| Tolerance                                    | Standard<br>± 20 %<br>On request<br>± 10 % to ± 5 %                                                                                                |
| Taper                                        |                                                                  |
| Circuit diagram                              |                                                                  |
| Power rating                                 | Linear<br>1.5 W at 70 °C<br>Logarithmic<br>0.75 W at 70 °C<br> |
| Temperature coefficient (typical)            | ± 150 ppm/°C<br>For values ≥ 100 Ω and in temperature range +20 °C to +70 °C,<br>the typical temperature coefficient is ± 75 ppm/°C                |
| Limiting element voltage (linear law)        | 350 V                                                                                                                                              |
| Contact resistance variation                 | 3 % Rn or 3 Ω                                                                                                                                      |
| End resistance (typical)                     | 1 Ω                                                                                                                                                |
| Dielectric strength (RMS)                    | 2000 V                                                                                                                                             |
| Insulation resistance (300 V <sub>DC</sub> ) | 10 <sup>6</sup> MΩ                                                                                                                                 |
| Independent linearity (typical)              | ± 5 %                                                                                                                                              |



| STANDARD RESISTANCE ELEMENT DATA |                           |                            |                               |                           |                            |                               |                                     |
|----------------------------------|---------------------------|----------------------------|-------------------------------|---------------------------|----------------------------|-------------------------------|-------------------------------------|
| STANDARD<br>RESISTANCE<br>VALUES | LINEAR TAPER              |                            |                               | LOG. TAPER                |                            |                               | TYPICAL<br>TCR<br>-55 °C<br>+125 °C |
|                                  | MAX.<br>POWER<br>AT 70 °C | MAX.<br>WORKING<br>VOLTAGE | MAX. CUR.<br>THROUGH<br>WIPER | MAX.<br>POWER<br>AT 70 °C | MAX.<br>WORKING<br>VOLTAGE | MAX. CUR.<br>THROUGH<br>WIPER |                                     |
| Ω                                | W                         | V                          | mA                            | W                         | V                          | mA                            | ppm/°C                              |
| 22                               | 1.5                       | 5.74                       | 261                           |                           |                            |                               | ± 150                               |
| 47                               | 1.5                       | 8.4                        | 177                           |                           |                            |                               |                                     |
| 100                              | 1.5                       | 12.2                       | 122                           |                           |                            |                               |                                     |
| 220                              | 1.5                       | 18.2                       | 82.6                          |                           |                            |                               |                                     |
| 470                              | 1.5                       | 26.5                       | 56.5                          |                           |                            |                               |                                     |
| 1K                               | 1.5                       | 38.7                       | 38.7                          | 0.75                      | 27                         | 27                            |                                     |
| 2.2K                             | 1.5                       | 57.5                       | 26.1                          | 0.75                      | 40                         | 18                            |                                     |
| 4.7K                             | 1.5                       | 84                         | 17.9                          | 0.75                      | 59                         | 12                            |                                     |
| 10K                              | 1.5                       | 122.5                      | 12.2                          | 0.75                      | 87                         | 8.7                           |                                     |
| 22K                              | 1.5                       | 182                        | 8.26                          | 0.75                      | 128                        | 5.8                           |                                     |
| 47K                              | 1.5                       | 265                        | 5.65                          | 0.75                      | 187                        | 3.9                           |                                     |
| 100K                             | 1.22                      | 350                        | 3.5                           | 0.75                      | 273                        | 2.7                           |                                     |
| 220K                             | 0.56                      | 350                        | 1.6                           | 0.56                      | 350                        | 1.6                           |                                     |
| 470K                             | 0.26                      | 350                        | 0.74                          | 0.26                      | 350                        | 0.74                          |                                     |
| 1M                               | 0.12                      | 350                        | 0.35                          | 0.12                      | 350                        | 0.35                          |                                     |
| 2.2M                             | 0.05                      | 350                        | 0.16                          | 0.05                      | 350                        | 0.16                          |                                     |
| 4.7M                             | 0.026                     | 350                        | 0.074                         |                           |                            |                               |                                     |
| 10M                              | 0.012                     | 350                        | 0.035                         |                           |                            |                               |                                     |

| MECHANICAL SPECIFICATIONS         |              |                      |
|-----------------------------------|--------------|----------------------|
| Mechanical travel                 | 300° ± 5°    |                      |
| Operating torque (typical)        | 2 Ncm        | 2.85 oz. inch        |
| End stop torque                   |              |                      |
| Style T, Q                        | 35 Ncm max.  | 3.1 lb inch max.     |
| Style L                           | 80 Ncm max.  | 7.1 lb inch max.     |
| Tightening torque of mounting nut |              |                      |
| Style T, Q                        | 150 Ncm max. | 13.3 lb inch max.    |
| Style L                           | 250 Ncm max. | 22.1 lb inch max.    |
| Unit weight                       | 6 g to 18 g  | 0.22 oz. to 0.64 oz. |
| Terminals                         | e3: pure Sn  |                      |

| ENVIRONMENTAL SPECIFICATIONS |                               |
|------------------------------|-------------------------------|
| Temperature range            | -55 °C to +125 °C             |
| Climatic category            | 55 / 125 / 56                 |
| Sealing                      | Fully sealed - container IP67 |

| OPTIONS                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Special feature command shaft | Length is measured from the mounting surface to the free end of the shaft. The screwdriver slot is aligned with the wiper within $\pm 10^\circ$ . Special shafts are available, in accordance to drawings supplied by customers. We recommend that customers should not machine tool shafts, in order to avoid damage. Bending or torsion of terminals should also be avoided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Panel sealing                 | <p>Potentiometers P13T and P13L can be fitted with a device providing sealing between the threaded bushing and the front panel. Their designation is P13P and P13N respectively or with a locating peg P13P...E and P13N...E.</p> <p><b>Panel sealed version</b><br/> <b>P13P</b><br/> <b>P13P...E: Including locating peg</b></p>  <p><b>Panel Cutout</b></p>  <p><b>Panel sealed version</b><br/> <b>P13N</b><br/> <b>P13N...E: Including locating peg</b></p>  <p><b>Panel Cutout</b></p>                                                                                                                  |
| Shaft locking                 | <p>On potentiometers equipped with a 3 mm Ø shaft, shaft locking can be obtained:</p> <ul style="list-style-type: none"> <li>• Either by a taper nut tightening a slotted bushing. Ask for P13O type. These devices are normally equipped with an AB type shaft (12.5 mm with a slot).</li> </ul> <p><b>P13O</b></p>  <ul style="list-style-type: none"> <li>• Or by a tightening nut locked by a screw. Ask for ES1 type. On potentiometers equipped with a Ø 6 mm shaft, locking can be obtained by a taper nut applying pressure on a slotted notched washer. This device is supplied in a box as an accessory. Ask for DBAN. These devices are ordered separately. Please consult Vishay Sfernice.</li> </ul> <p><b>P13L DBAN</b></p>  <p>No locking on shaft Ø 4 mm.</p> |

**MARKING**

Printed:

- Vishay trademark
- Part number (including ohmic value code, tolerance code and taper)
- Manufacturing date
- Marking of terminals a

**PACKAGING**

- In box

Hardware: nuts, washer, and O-ring are separately supplied (not mounted on the potentiometer), in a small bag placed in the packaging.

**PERFORMANCE**

| TESTS                   | CONDITIONS                                                                                        | REQUIREMENTS            |                                 |                                                                     | TYPICAL VALUES AND DRIFTS |                                 |                                                                                  |
|-------------------------|---------------------------------------------------------------------------------------------------|-------------------------|---------------------------------|---------------------------------------------------------------------|---------------------------|---------------------------------|----------------------------------------------------------------------------------|
|                         |                                                                                                   | $\Delta R_T/R_T$<br>(%) | $\Delta R_{1-2}/R_{1-2}$<br>(%) | OTHER                                                               | $\Delta R_T/R_T$<br>(%)   | $\Delta R_{1-2}/R_{1-2}$<br>(%) | OTHER                                                                            |
| Electrical endurance    | 1000 h at rated power<br>90°/30° - ambient temp. 70 °C                                            | ± 10 %                  | -                               | Contact res. variation:<br>< 7 % Rn                                 | ± 1 %                     | -                               | Contact res. variation:<br>< 3 % Rn                                              |
| Climatic sequence       | Phase A dry heat 125 °C<br>Phase B damp heat<br>Phase C cold -55 °C<br>Phase D damp heat 5 cycles | ± 10 %                  | ± 10 %                          | -                                                                   | ± 0.5 %                   | ± 1 %                           | -                                                                                |
| Damp heat, steady state | 56 days<br>40 °C, 93 % HR                                                                         | ± 10 %                  | ± 10 %                          | Dielectric strength:<br>250 V<br>Insulation resistance:<br>> 100 MΩ | ± 0.5 %                   | ± 1 %                           | Dielectric strength:<br>1000 V<br>Insulation resistance:<br>> 10 <sup>4</sup> MΩ |
| Change of temperature   | 5 cycles<br>-55 °C at +125 °C                                                                     | ± 3 %                   | -                               | -                                                                   | ± 0.5 %                   | -                               | -                                                                                |
| Mechanical endurance    | 25 000 cycles                                                                                     | ± 10 %                  | -                               | Contact res. variation:<br>< 7 % Rn                                 | ± 3 %                     | -                               | Contact res. variation:<br>< 2 % Rn                                              |
| Shock                   | 50 g's at 11 ms<br>3 successive shocks<br>in 3 directions                                         | ± 2 %                   | -                               | -                                                                   | ± 0.1 %                   | ± 0.2 %                         | -                                                                                |
| Vibration               | 10 Hz to 55 Hz<br>0.75 mm or 10 g's<br>during 6 h                                                 | ± 2 %                   | -                               | -                                                                   | ± 0.1 %                   | -                               | $\Delta V_{1-2}/V_{1-3} < \pm 0.2 \%$                                            |

**Note**

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

**ORDERING INFORMATION** (part number)

|       |         |    |     |           |    |   |      |                   |                 |                                     |                                  |                                                                              |                                                                                                                                                                                                                    |   |         |                                                  |  |
|-------|---------|----|-----|-----------|----|---|------|-------------------|-----------------|-------------------------------------|----------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---------|--------------------------------------------------|--|
| P     | 1       | 3  | P   | A         | B  | 1 | 0    | 3                 | M               | L                                   | B                                | 1                                                                            | 7                                                                                                                                                                                                                  | E |         |                                                  |  |
| MODEL | BUSHING |    |     | SHAFT     |    |   |      | OHMIC VALUE       |                 | TOLERANCE                           | TAPER                            | PACKAGING                                                                    |                                                                                                                                                                                                                    |   | SPECIAL |                                                  |  |
| P13   |         | Ø  | L   | Old codes |    | Ø | L    | Only with bushing | Old Shaft codes | Linear law from 22 Ω to 10 MΩ       | M = 20 %<br>On request: K = 10 % | A = linear<br>L = clockwise logarithmic<br>F = inverse clockwise logarithmic | Bushings L or N:<br>shaft < 45 mm<br>B10 = box of 10 pieces<br>shaft > 45 mm<br>B08 = box of 8 pieces<br><br>Other bushings:<br>shaft < 20 mm<br>B17 = box of 25 pieces<br>shaft > 20 mm<br>B12 = box of 15 pieces |   |         | E = locating peg or special code given by Vishay |  |
|       | T       | 6  | 8   | T         | AA | 3 | 9.5  | T, P              | K               | Logarithmic law from 1 kΩ to 2.2 MΩ |                                  |                                                                              |                                                                                                                                                                                                                    |   |         |                                                  |  |
|       | Q       | 7  | 8   | Q         | AB | 3 | 12.5 | T, P, O           | L, M            | 103 = 10 kΩ                         |                                  |                                                                              |                                                                                                                                                                                                                    |   |         |                                                  |  |
|       | L       | 10 | 12  | V         | AJ | 3 | 22   | T, P              | R               |                                     |                                  |                                                                              |                                                                                                                                                                                                                    |   |         |                                                  |  |
|       | O       | 6  | 11  | H         | EA | 4 | 9.5  | Q                 | E               |                                     |                                  |                                                                              |                                                                                                                                                                                                                    |   |         |                                                  |  |
|       | P       | 6  | 8   | TP        | EB | 4 | 12.5 | Q                 | F               |                                     |                                  |                                                                              |                                                                                                                                                                                                                    |   |         |                                                  |  |
|       | N       | 10 | 9.5 | VP        | EJ | 4 | 22   | Q                 | G               |                                     |                                  |                                                                              |                                                                                                                                                                                                                    |   |         |                                                  |  |
|       |         |    |     |           | FG | 6 | 16   | L                 | AC              |                                     |                                  |                                                                              |                                                                                                                                                                                                                    |   |         |                                                  |  |
|       |         |    |     |           | FL | 6 | 25   | L                 | AM              |                                     |                                  |                                                                              |                                                                                                                                                                                                                    |   |         |                                                  |  |
|       |         |    |     |           | FR | 6 | 50   | L                 | AL              |                                     |                                  |                                                                              |                                                                                                                                                                                                                    |   |         |                                                  |  |
|       |         |    |     |           | FE | 6 | 13   | N                 | AC              |                                     |                                  |                                                                              |                                                                                                                                                                                                                    |   |         |                                                  |  |
|       |         |    |     |           | FK | 6 | 22   | N                 | AM              |                                     |                                  |                                                                              |                                                                                                                                                                                                                    |   |         |                                                  |  |
|       |         |    |     |           | FQ | 6 | 47.5 | N                 | AL              |                                     |                                  |                                                                              |                                                                                                                                                                                                                    |   |         |                                                  |  |

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

|       |         |         |       |             |      |       |         |           |         |       |         |                |
|-------|---------|---------|-------|-------------|------|-------|---------|-----------|---------|-------|---------|----------------|
| P13   | T       | PE      | M     | 10K         | 20 % | L     |         | BO        |         |       |         | e3             |
| MODEL | BUSHING | SPECIAL | SHAFT | OHMIC VALUE | TOL. | TAPER | SPECIAL | PACKAGING | SPECIAL | SHAFT | SPECIAL | LEAD (Pb)-FREE |

**ACCESSORIES**

|                                              |                                                                        |
|----------------------------------------------|------------------------------------------------------------------------|
| Additional Accessories (to order separately) | <a href="http://www.vishay.com/doc?51051">www.vishay.com/doc?51051</a> |
| Control knobs                                | <a href="http://www.vishay.com/doc?51101">www.vishay.com/doc?51101</a> |

**RELATED DOCUMENTS****APPLICATION NOTES**

|                                                                   |                                                                        |
|-------------------------------------------------------------------|------------------------------------------------------------------------|
| Potentiometers and Trimmers                                       | <a href="http://www.vishay.com/doc?51001">www.vishay.com/doc?51001</a> |
| Guidelines for Vishay Sfernice Resistive and Inductive Components | <a href="http://www.vishay.com/doc?52029">www.vishay.com/doc?52029</a> |



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