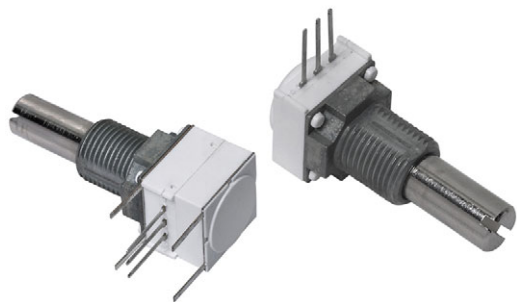


# 1/2" (12.7 mm) Conductive Plastic and Cermet Potentiometer



## LINKS TO ADDITIONAL RESOURCES



### QUICK REFERENCE DATA

|                         |                                                   |
|-------------------------|---------------------------------------------------|
| Multiple module         | Up to 3 modules                                   |
| Switch module           | Yes                                               |
| Detent module           | Yes                                               |
| Special electrical laws | A: linear, L: logarithmic, F: reverse logarithmic |
| Sealing level           | IP 64                                             |
| Lifespan                | 50K cycles                                        |

## FEATURES

- Robust construction
- High rotational life (50 000 cycles)
- Up to three sections PC support plates
- Rotary switches, tactile feedback, and solder lug terminals available
- Tests according to CECC 41000 or IEC 60393-1
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS  
COMPLIANT

## 148 FEATURES

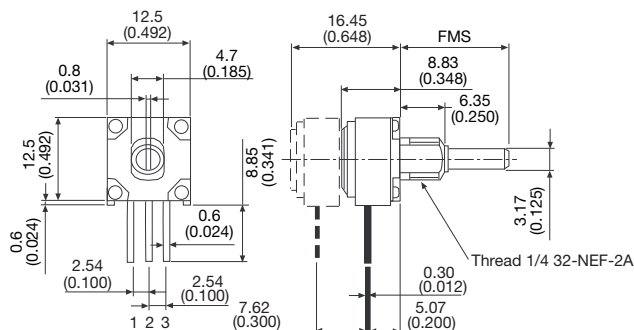
- Conductive plastic element
- Quiet electrical output

## 149 FEATURES

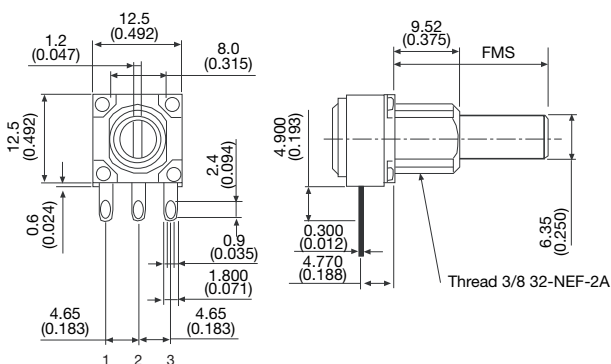
- Cermet element
- Low temperature coefficient ( $\pm 150$  ppm/ $^{\circ}$ C)

## DIMENSIONS in millimeters (inches) $\pm 0.5$ mm ( $\pm 0.02$ " )

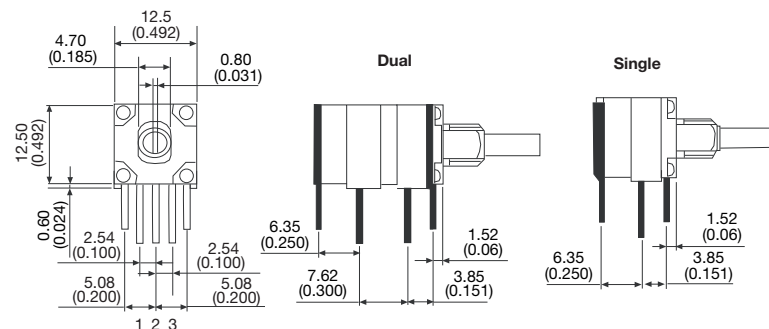
### Single, dual or triple

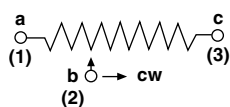


### Solder lug terminals



### Front and rear support plates E = flush with board surface



| <b>ELECTRICAL SPECIFICATIONS</b>       |                                                                                    |                                |
|----------------------------------------|------------------------------------------------------------------------------------|--------------------------------|
| PARAMETER                              | 148                                                                                | 149                            |
| Resistance range                       | linear                                                                             | 1 k $\Omega$ to 500 k $\Omega$ |
|                                        | non-linear                                                                         | 500 $\Omega$ to 250 k $\Omega$ |
| Tolerance                              | linear                                                                             | 10 %                           |
|                                        | non-linear                                                                         | 20 % on request 10 %           |
| Linearity (typical)                    | $\pm 5$ % independent                                                              |                                |
| End resistance                         | 4 $\Omega$ maximum each end                                                        |                                |
| Power rating                           | 0.5 W at 70 °C<br>0 W at 120 °C                                                    | 1 W at 70 °C<br>0 W at 150 °C  |
|                                        | Non-linear or PC mount, derate 50 %                                                |                                |
| Circuit diagram                        |  |                                |
| Effective rotation                     | 270° $\pm$ 10° without rotary switch<br>240° $\pm$ 10° with rotary switch          |                                |
| Contact resistance variation (typical) | 1.5 % of total resistance                                                          | 3 % of total resistance        |
| Maximum continuous working voltage     | 350 V <sub>AC</sub> across end terminals, but within power rating                  |                                |
| Dielectric withstanding voltage        | Sea level -750 V <sub>AC</sub>                                                     |                                |

| <b>MECHANICAL SPECIFICATIONS</b> |                                                                                            |                  |
|----------------------------------|--------------------------------------------------------------------------------------------|------------------|
| Mechanical travel                | 300° $\pm$ 5°                                                                              |                  |
| Operating torque (typical)       | Single section 0.2 oz. to 3.0 oz. - in dual or triple section 0.3 oz.-inch to 4.5 oz.-inch |                  |
| End stop torque                  | bushing A and B                                                                            | 2.1 lb-inch max. |
|                                  | bushing F                                                                                  | 6.8 lb-inch max. |
| Weight (approx.)                 | single                                                                                     | 0.19 oz.         |
|                                  | dual                                                                                       | 0.27 oz.         |
|                                  | triple                                                                                     | 0.35 oz.         |
| Terminals                        | electrical elements                                                                        | e3: pure Sn      |
|                                  | switch elements                                                                            | e4: gold plated  |

| <b>ENVIRONMENTAL SPECIFICATIONS</b>    |                                       |                                       |
|----------------------------------------|---------------------------------------|---------------------------------------|
|                                        | 148                                   | 149                                   |
| Operating temperature                  | -40 °C to +125 °C                     | -40 °C to +125 °C                     |
| Storage temperature                    | -55 °C to +125 °C                     | -55 °C to +125 °C                     |
| Temperature cycling (5 cycles)         | -40 °C to +125 °C (4 % $\Delta R_T$ ) | -40 °C to +125 °C (3 % $\Delta R_T$ ) |
| Load life (1000 h rated load at 70 °C) | 10 % $\Delta R_T$                     | 5 % $\Delta R_T$                      |
| Mechanical endurance                   | 50 000 cycles                         |                                       |
| TCR (typical)                          | $\pm 500$ ppm/°C                      | $\pm 150$ ppm/°C                      |
| Sealing                                | IP64                                  |                                       |

**Note**

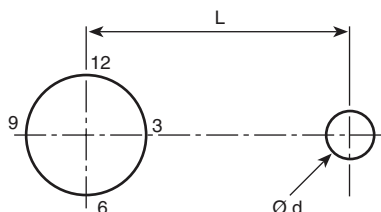
- Nothing stated herein shall be construed as a guarantee of quality or durability

| <b>MARKING</b>                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vishay logo, SAP code of ohmic value, tolerance in %, variation law, manufacturing date (four digits), "3" for the lead 3, product series (148, 149) |

### LOCATING PEGS (anti-rotation lug)

The locating peg is provided by a plate mounted on the bushing and positioned by the module sides. Four set positions are available, clock face orientation: 12, 3, 6, 9.

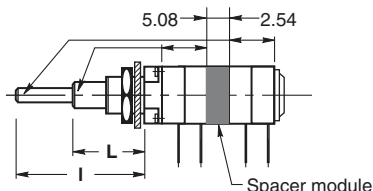
All 148, 149 bushings have a double flat. When panel mounting holes have been punched accordingly, an anti-rotation lug is not necessary.



| CODE | VERSION | BUSHING A, B | BUSHING F | EFFECTIVE HIGH PEG |
|------|---------|--------------|-----------|--------------------|
| A    | Ø d mm  | 2            | 2         | 0.7                |
|      | L mm    | 6.2          | 6.2       | -                  |
| B    | Ø d mm  | 2            | 2         | 0.7                |
|      | L mm    | 7.75         | 7.75      | -                  |
| C    | Ø d mm  | -            | 3.5       | 1.1                |
|      | L mm    | -            | 13.5      | -                  |

Locating pegs are supplied in separate bags with nuts and washers

### RSID OPTION: ROTARY SWITCH MODULES



- Rotary switches
- Current up to 2 A
- SPDT: single pole, changeover switch in CCW position - 3 pins
- Sealing IP60

#### MODULES: RS ON/OFF SWITCH RSI CHANGEOVER SWITCH

The position of each module is free.

RS and RSI rotary switches are housed in a standard 148, 149 module size 12.7 mm x 12.7 mm x 5.08 mm (0.5" x 0.5" x 0.2"). They have the same terminal styles as the assembled electrical modules.

An assembly can comprise 1 or more switch modules.

Switch actuation is described as seen from the shaft end.  
D: means actuation in maximum CCW position

The switch actuation travel is 25° with a total mechanical travel of 300° ± 5° and electrical travel of electrical modules is 238° ± 10°.

#### RSID Single Pole CHANGEOVER

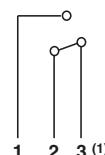
In full CCW position, the contact is made between 3 and 2 and open between 3 and 1. Switch actuation (CW direction) reverses these positions.

#### SWITCH SPECIFICATIONS

|                                        |                      |                                |
|----------------------------------------|----------------------|--------------------------------|
| Switching power maximum                |                      | 62.5 VA v<br>15 VA =           |
| Switching current maximum              |                      | 0.25 A 250 V v<br>0.5 A 30 V = |
| Maximum current through element        |                      | 2 A                            |
| Contact resistance                     |                      | 100 mΩ                         |
| Dielectric strength                    | Terminal to terminal | 1000 V <sub>RMS</sub>          |
|                                        | Terminal to bushing  | 2000 V <sub>RMS</sub>          |
| Maximum voltage operation              |                      | 250 V v<br>30 V =              |
| Insulation resistance between contacts |                      | 10 <sup>6</sup> MΩ             |
| Life at P <sub>max.</sub>              |                      | 10 000 actuations              |
| Minimal travel                         |                      | 25°                            |
| Operating temperature                  |                      | -40 °C to +85 °C               |

#### ELECTRICAL DIAGRAM

##### RSID CCW POSITION



#### Note

(1) Common

**ORDERING INFORMATION** (part number)

|                                                  |                          |          |                                                        |          |                     |          |                            |          |                   |                                                          |                   |          |                                                                                                                                                               |          |          |          |          |
|--------------------------------------------------|--------------------------|----------|--------------------------------------------------------|----------|---------------------|----------|----------------------------|----------|-------------------|----------------------------------------------------------|-------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>1</b>                                         | <b>4</b>                 | <b>8</b> | <b>1</b>                                               | <b>0</b> | <b>F</b>            | <b>0</b> | <b>G</b>                   | <b>J</b> | <b>S</b>          | <b>X</b>                                                 | <b>1</b>          | <b>0</b> | <b>1</b>                                                                                                                                                      | <b>0</b> | <b>3</b> | <b>K</b> | <b>A</b> |
| <b>MODEL</b>                                     | <b>NUMBER OF MODULES</b> |          | <b>SWITCH / DETENT</b>                                 |          | <b>BUSHING</b>      |          | <b>LOCATING PEG</b>        |          | <b>SHAFT</b>      | <b>SHAFT END</b>                                         | <b>LEADS</b>      |          | <b>RESISTANCE CODE / TOLERANCE / TAPER OR SPECIAL</b>                                                                                                         |          |          |          |          |
| 148 = plastic conductive<br>149 = cermet element | 1<br>2<br>3              |          | 1 = RSID<br>2 = CV1M<br>3 = CV21<br>0 = without switch |          | See table "Bushing" |          | 0 = without<br>A<br>B<br>C |          | See table "Shaft" | S = slotted<br>On request:<br>R = round<br>F = flattened | See table "Leads" |          | Resistance code:<br>101 = 100 Ω to<br>105 = 1 MΩ<br>Tolerance code:<br>M = 20 %; K = 10 %<br>Taper: A (S); L (Z); F (R)<br>or<br>Special code given by Vishay |          |          |          |          |

**BUSHING**

|   | <b>Ø</b> | <b>L</b> | <b>OLD CODES</b> |
|---|----------|----------|------------------|
| A | 1/4"     | 1/4"     | N                |
| B | 1/4"     | 3/8"     | J                |
| F | 3/8"     | 3/8"     | G                |

**LEADS**

|     | <b>TYPE</b>                 | <b>PIN SPACING</b> | <b>SPACE BETWEEN MODULES</b> | <b>OLD CODES</b> |
|-----|-----------------------------|--------------------|------------------------------|------------------|
| X10 | PCB pins                    | 2.54 mm (0.100")   | n/a                          | P                |
| X13 |                             |                    | 7.62 mm (0.300")             |                  |
| A10 | PCB pins and support plates | 2.54 mm (0.100")   | n/a                          | E                |
| A13 |                             |                    | 7.62 mm (0.300")             |                  |
| Y00 | Sold, lugs                  | 4.65 mm (0.183")   | n/a                          | S                |
| Y03 |                             |                    | 7.62 mm (0.300")             |                  |

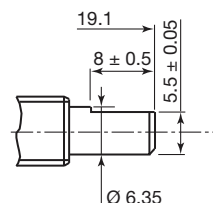
**SHAFT**

|    | <b>Ø</b> | <b>FMS</b> | <b>OLD CODES</b> |
|----|----------|------------|------------------|
| BB | 1/8"     | 1/2"       | 32               |
| BG | 1/8"     | 5/8"       | 40               |
| BH | 1/8"     | 3/4"       | 48               |
| BJ | 1/8"     | 7/8"       | 56               |
| GB | 1/4"     | 1/2"       | 32               |
| GG | 1/4"     | 5/8"       | 40               |
| GH | 1/4"     | 3/4"       | 48               |
| GJ | 1/4"     | 7/8"       | 56               |
| GL | 1/4"     | 1"         | 64               |
| GN | 1/4"     | 1 1/4"     | 80               |

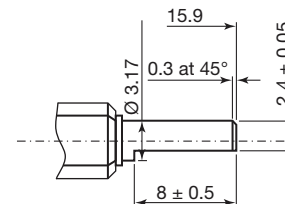
The shaft length is always measured from the mounting face. Standard shafts are designed by a 3 letters code (3 digits). Shafts slots are aligned to  $\pm 10^\circ$  of the wiper position. All standard shafts are slotted except flattened and splined, see exceptions for bushing.

**FLATTED SHAFT**

Bushing: F  
Shaft: GHF



Bushing: A  
Shaft: BGF

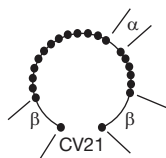
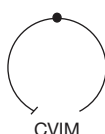


## DETENT OPTION (haptic technology)

Detent option is a positive tactile feedback.  
The detents mechanism is housed in a standard P11 module.  
Up to 21 detent positions available.

Available: CV1M  
CV21

Mechanical endurance: 10 000 cycles



$$\alpha = \frac{270^\circ}{n-1}$$

$$\beta = \alpha + 15^\circ$$

## ORDERING INFORMATION (first order only for special code creation)

**CV1M**

**CV1M** 1 detent at half travel  
**CV21** 21 detents

## PART NUMBER DESCRIPTION (for information only)

|       |         |        |         |              |       |       |       |       |       |      |       |         |         |             |
|-------|---------|--------|---------|--------------|-------|-------|-------|-------|-------|------|-------|---------|---------|-------------|
| 148   | 1       | 0      | F       | 0            | GJ    | S     | X10   | BO50  | 10K   | 10 % | A     |         |         | e3          |
| MODEL | MODULES | SWITCH | BUSHING | LOCATING PEG | SHAFT | SHAFT | LEADS | PACK. | VALUE | TOL. | TAPER | SPECIAL | SPECIAL | LEAD FINISH |

## 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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