

## 12.5 mm Modular Panel Potentiometers High Dielectric Strength



### FEATURES

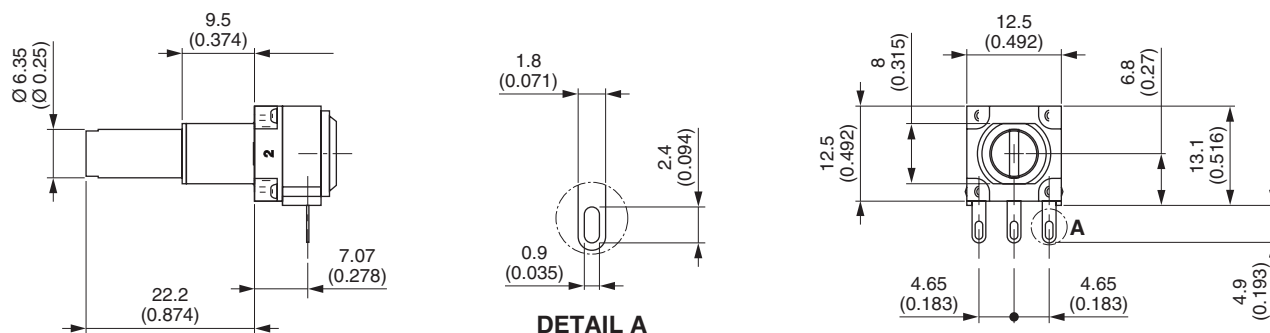
- High dielectric strength potentiometer up to 5000 V<sub>rms</sub>
- 12.5 mm square single turn panel control
- Plastic shaft and bushing
- Two shaft lengths and 29 terminal styles
- P11P: Cermet element
- P11D: Conductive plastic element
- Multiple assemblies - up to seven modules
- Test according to CECC 41 000
- Shaft and panel sealed version
- Up to twenty-one indent positions
- Rotary switch options
- Custom designs



VERSATILE	MODULAR	COMPACT	ROBUST
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### CONFIGURATION EXAMPLE - Dimensions in mm (Inches)/Tolerance $\pm 0.5$ mm ( $\pm 0.02$ "

Single module, single shaft, solder lugs, imperial bushing and shaft



Single module, single shaft, vertical mounting, PC pins with support plate, imperial bushing and shaft



Single module, single shaft, solder lugs, imperial bushing and shaft





## 12.5 mm Modular Panel Potentiometers High Dielectric Strength

# P11P, P11D

## Vishay Sfernice

### GENERAL SPECIFICATIONS

ELECTRICAL (INITIAL)		
	P11D	P11P
Resistive Element	Conductive plastic	Cermet
Electrical Travel	270° ± 10°	270° ± 10°
Resistance Range <sup>(1)</sup>	linear law 1 kΩ to 1 MΩ	20 Ω to 10 MΩ
	non linear law 470 Ω to 500 kΩ	100 Ω to 2.2 MΩ
Tolerance	standard ± 20 %	± 20 %
	on request -	± 5 % or ± 10 %
Power Rating at 70 °C	linear law 0.5 W at + 70 °C	1 W at + 70 °C
	non linear law 0.25 W at + 70 °C	0.5 W at + 70 °C
	multiple assemblies 0.25 W at + 70 °C per module	0.5 W at + 70 °C per module
Temperature Coefficient (Typical)	± 500 ppm	± 150 ppm
Limiting Element Voltage	350 V	350 V
End Resistance (Typical)	2 Ω	2 Ω
Contact Resistance Variation	linear law 1 %	2 % or 3 Ω
Independent Linearity (Typical)	linear law ± 5 %	± 5 %
Insulation Resistance	10 <sup>6</sup> MΩ min.	10 <sup>6</sup> MΩ min.
Dielectric Strength	leads to support plate 3000 V <sub>RMS</sub> min.	3000 V <sub>RMS</sub> min.
	leads to shaft and bushing 5000 V <sub>RMS</sub> min.	5000 V <sub>RMS</sub> min.
Mechanical Rotation Life	50 000 cycles	50 000 cycles

Note:

<sup>(1)</sup> Consult Vishay Sfernice for other ohmic values

MECHANICAL (INITIAL)	
Mechanical Travel	300° ± 5°
Operating Torque (Typical):  single and dual assemblies three to seven modules (per module)	0.2 to 1 Ncm max. (0.3 to 1.4 oz.-inch max.) 0.2 to 0.3 Ncm max. (0.3 to 0.45 oz.-inch max.)
End Stop Torque	80 Ncm max. (6.8 lb.-inch max.)
Tightening Torque	150 Ncm max. (13 lb.-inch max.)
Weight:  single assemblies two to seven modules (per module)	3.5 g 1.5 g to 2 g (0.25 oz. to 0.32 oz.)

ENVIRONMENTAL		
	P11D	P11P
Operating Temperature Range	- 40 °C to + 100 °C	- 40 °C to + 100 °C
Climatic Category	40/100/21	40/100/56
Sealing	IP64	IP64
Storage Temperature	- 40 °C to + 100 °C	- 40 °C to + 100 °C

MARKING
• <b>Potentiometer Module</b> VISHAY logo, nominal ohmic value (Ω, kΩ, MΩ), two stars identify P11D version, tolerance in % - variation law, manufacturing date (four digits), "3" for the lead 3
• <b>Switch Module</b> Version, manufacturing date (four digits), "c" for common lead
• <b>Indent Module</b> Version, manufacturing date (four digits)

PACKAGING
• Box

**PERFORMANCES**

TESTS	CONDITIONS	TYPICAL VALUE AND DRIFTS		
			P11D	P11P
Load Life	1000 h at + 70 °C (90°/30')	$\Delta R_T/R_T$ (%) contact resistance variation	± 10 % ± 5 %	± 2 % ± 4 %
Temperature Cycle	- 40 °C to + 100 °C, 5 cycles	$\Delta R_T/R_T$ (%)	± 0.5 % typical	± 0.2 %
Moisture	+ 40 °C, 93 % relative humidity	$\Delta R_T/R_T$ (%) insulation resistance	21 days ± 5 % > 10 M $\Omega$	56 days ± 2 % > 1000 M $\Omega$
Rotational Life	P11P/P11D: 50 000 cycles	$\Delta R_T/R_T$ (%) contact resistance variation	± 6 % ± 4 %	± 5 % ± 5 %
Climatic Sequence	Dry heat at + 100 °C/damp heat cold - 40 °C/damp heat 5 cycles	$\Delta R_T/R_T$ (%)	-	± 1 %
Shock	50 g, 11 ms 3 shocks - 3 directions	$\Delta R_T/R_T$ (%) resistance setting change	± 0.2 % ± 0.5 %	± 0.2 % ± 0.5 % typical
Vibration	10 Hz to 55 Hz 0.75 mm or 10 g, 6 h	$\Delta R_T/R_T$ (%) voltage setting change	± 0.2 % ± 0.5 % typical	± 0.2 % ± 0.5 % typical

**SAP ORDERING INFORMATION** (Part Number 18 digits)

P	1	1	P	2	F	0	G	G	S	Y	0	0	1	0	3	M	A
MODEL	STYLE		NUMBER OF MODULES	BUSHING	OPTION	SHAFT	SHAFT STYLE	LEADS	RESISTANCE CODE/ TOLERANCE/ TAPER OR SPECIAL								
P11	P = CERMET ELEMENT  D = CONDUCTIVE PLASTIC (AUDIO)		1 2 3 4 5 6 7														

**STANDARD RESISTANCE ELEMENT DATA**

STANDARD RESISTANCE VALUES	P11P CERMET						P11A CONDUCTIVE PLASTIC LINEAR LAW			TYPICAL TCR - 40 °C/+ 100 °C	
	LINEAR LAW			NON LINEAR LAW						P11P	P11D
	MAX. POWER AT 70 °C	MAX. WORKING VOLTAGE	MAX. CUR. THROUGH WIPER	MAX. POWER AT 70 °C	MAX. WORKING VOLTAGE	MAX. CUR. THROUGH WIPER	MAX. POWER AT 70 °C	MAX. WORKING VOLTAGE	MAX. CUR. THROUGH WIPER		
Ω	W	V	mA	W	V	mA	W	V	mA	ppm/°C	
22	1	4.69	213	0.5	15.3	32.7	0.5	22.4	22.4	± 150	± 500
47	↓	6.85	146								
50		7.07	141								
100		10	100								
200		14.8	67.4								
470		21.6	46.1								
500		22.4	44.7								
1K		31.6	31.6								
2.2K		46.9	21.3								
4.7K		63.5	14.5								
5K		70.7	14.1								
10K		100	10								
22K		148	6.7								
47K		217	4.6								
50K		224	4.47								
100K	1	316	3.16	0.5	224	2.24	0.5	224	2.24		
220K	0.56	350	1.59	0.26	332	1.51	0.5	332	1.51		
470K	0.26	350	0.75	0.12	350	0.74	0.26	350	0.74		
500K	0.25	350	0.70	0.25	350	0.70	0.25	350	0.70		
1M	0.12	350	0.35		350	0.35					
2.2M	0.05	350	0.16								
4.7M	0.02	350	0.07								



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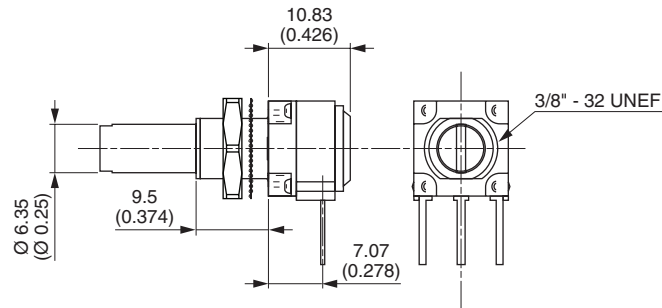
**P11P, P11D**

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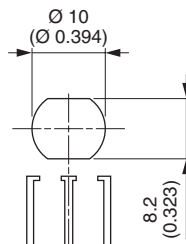
## SAP ORDERING INFORMATION (Part Number 18 digits)

P	1	1	P	2	F	0	G	G	S	Y	0	0	1	0	3	M	A								
MODEL	STYLE	NUMBER OF MODULES	BUSHING			OPTION	SHAFT	SHAFT STYLE	LEADS	RESISTANCE CODE/ TOLERANCE/ TAPER OR SPECIAL															
P11			<table><tr><td></td><td>Ø</td><td>L</td></tr><tr><td>F</td><td>3/8"</td><td>3/8"</td></tr></table>				Ø	L	F	3/8"	3/8"														
	Ø	L																							
F	3/8"	3/8"																							

## BUSHING DIMENSIONS - Dimensions in mm (Inches)/Tolerance $\pm 0.5$ mm ( $\pm 0.02$ " )



## PANEL CUT OUT - Dimensions in mm (Inches)/Tolerance $\pm 0.5$ mm ( $\pm 0.02$ " )



### Notes:

- Hardware supplied in separate bags

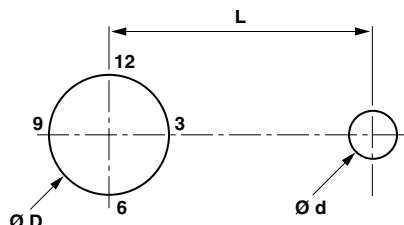
## SAP ORDERING INFORMATION (Part Number 18 digits)

P	1	1	P	2	F	0	G	G	S	Y	0	0	1	0	3	M	A
MODEL	STYLE	NUMBER OF MODULES	BUSHING	OPTION			SHAFT	SHAFT STYLE	LEADS	RESISTANCE CODE/ TOLERANCE/ TAPER OR SPECIAL							
				<u>Location Pegs:</u> A = $\varnothing = 2$ L = 6.2 B = $\varnothing = 2$ L = 7.75 C = $\varnothing = 3.5$ L = 13.5 0 = Without peg  <u>Sealed Version:</u> P = Panel and shaft sealed													

## LOCATING PEGS (Anti-Rotation Lug)

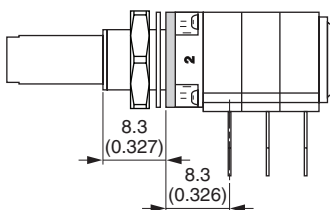
The locating peg is provided by a plate mounted on the bushing and positioned by the module sides. Four set positions are available, clock face orientation: 12, 3, 6, 9.

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



CODE	Ø d (mm)	L (mm)	EFFECTIVE HIGH PEG
A	2	6.2	0.7
B	2	7.75	0.7
C	3.5	13.5	1.1

## PANEL AND SHAFT SEALED



O ring plate can not be used with locating pegs

### Note

- Locating pegs and panel o ring are supplied in separate bags with nuts and washers



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## P11P, P11D

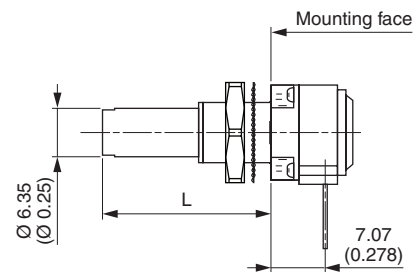
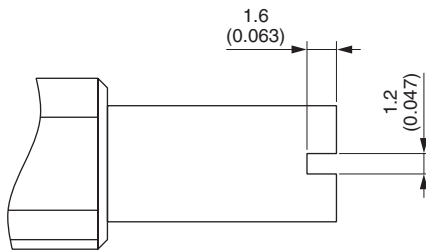
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### SAP ORDERING INFORMATION (Part Number 18 digits)

P	1	1	P	2	F	0	G	G	S	Y	0	0	1	0	3	M	A												
MODEL	STYLE	NUMBER OF MODULES	BUSHING	OPTION	SHAFT			SHAFT STYLE	LEADS	RESISTANCE CODE/ TOLERANCE/ TAPER OR SPECIAL																			
					<table border="1"><thead><tr><th>CODE</th><th>L (inch)</th><th>L (mm)</th></tr></thead><tbody><tr><td>GG</td><td>5/8</td><td>15.8</td></tr><tr><td>GJ</td><td>7/8</td><td>22.2</td></tr></tbody></table>			CODE	L (inch)	L (mm)	GG	5/8	15.8	GJ	7/8	22.2	S = Slotted												
CODE	L (inch)	L (mm)																											
GG	5/8	15.8																											
GJ	7/8	22.2																											

### SHAFTS - Dimensions in mm (Inches)/Tolerance $\pm 0.5$ mm ( $\pm 0.02$ " )

The shaft length are always measured from the mounting face.  
Shafts are designed by a 3 letter code (3 digits). Shafts are slotted and aligned to  $\pm 10^\circ$  of the wiper position.



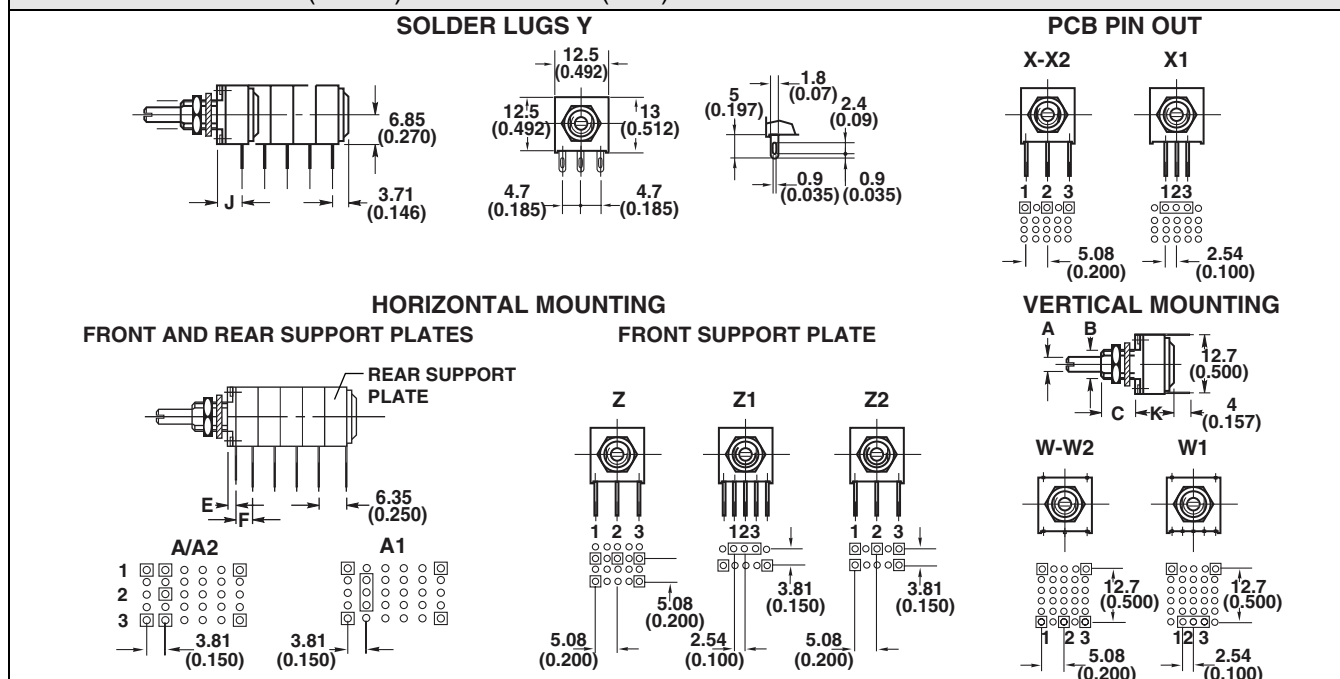
**SAP ORDERING INFORMATION** (Part Number 18 digits)

P	1	1	P	2	F	0	G	G	S	Y	0	0	1	0	3	M	A
MODEL	STYLE	NUMBER OF MODULES	BUSHING	OPTION	SHAFT	SHAFT STYLE	LEADS				RESISTANCE CODE/ TOLERANCE/ TAPER OR SPECIAL						
							Available leads										
							A00	W00	X00	Y00	Z00						
							A10	W10	X03		Z03						
							A13	W20	X04		Z04						
							A14		X10		Z10						
							A20		X13		Z13						
							A23		X14		Z14						
							A24		X20		Z20						
									X23		Z23						
									X24		Z24						

FIRST DIGIT	
Y	Soldering lugs - 4.70 mm (0.185") pin spacing
X	PCB pins
Z	PCB pins with front support plate
A	PCB pins with front and back support plates
W	PCB pins - vertical mounting with 2 extra pins - 1 module only

SECOND DIGIT	
0	5.08 mm (0.200") pin spacing for X, Z, W pins section 0.9 x 0.3 mm <sup>2</sup> (0.035" x 0.012")
1	2.54 mm (0.100") pin spacing for X, Z, W pins section 0.6 x 0.3 mm <sup>2</sup> (0.024" x 0.012")
2	5.08 mm (0.200") pin spacing for X, Z, W pins section 0.6 x 0.3 mm <sup>2</sup> (0.024" x 0.012")

THIRD DIGIT	
0	5.08 mm (0.200") space between modules
3	7.62 mm (0.300") space between modules
4	10.16 mm (0.400") space between modules

**DIMENSIONS** in mm (Inches)/Tolerance  $\pm 0.5$  (0.02)**THE POSITION OF EACH MODULE IS FREE**

LEADS				
	X../Y..	A../Z1./Z2.	Z0. (except with rotary switch)	Z0. (with rotary switch)
E	-	3.6 (0.14)	3.81 (0.15)	2.15 (0.085)
F	-	3.81 (0.15)	5.08 (0.20)	5.08 (0.20)
J	7.06 (0.278)	-	-	-



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## P11P, P11D

Vishay Sfernice

### SAP ORDERING INFORMATION (Part Number 18 digits)

P	1	1	P	2	F	0	G	G	S	Y	0	0	1	0	3	M	A
MODEL	STYLE	NUMBER OF MODULES	BUSHING	LOCATING PEG	SHAFT	SHAFT STYLE	LEADS	RESISTANCE CODE/ TOLERANCE/ TAPER OR SPECIAL									
								Resistance Code: 102 = 1 k $\Omega$ to 105 = 1 M $\Omega$  Tolerance Code: M = 20 %, K = 10 %, J = 5 %  Taper: A, L, W, F, S, R or special code given by Vishay									

### RESISTANCE CODE

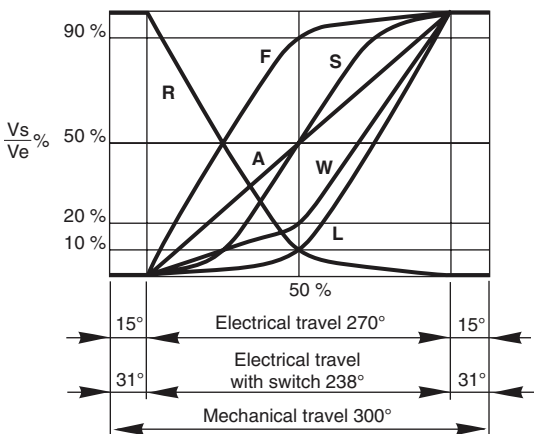
See Conversion Table for ohmic value

### TOLERANCE

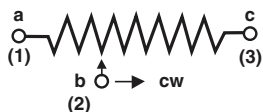
Standard: M =  $\pm 20\%$

On request: K =  $\pm 10\%$ , J =  $\pm 5\%$  (cermet only)

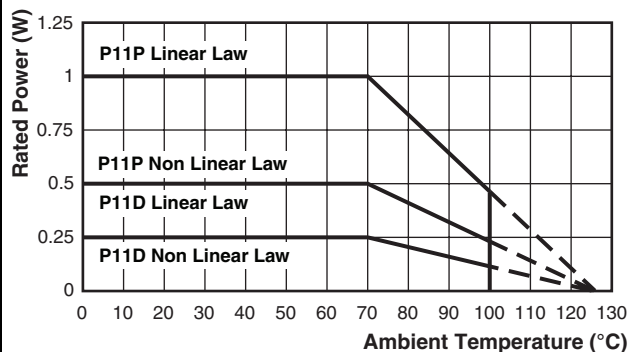
### VARIATION LAWS



### CIRCUIT DIAGRAM



### POWER RATING CHART



### SPECIAL CODES GIVEN BY VISHAY

#### OPTION AVAILABLE

- Custom design on request
- Specific linearity
- Specific interlinearity
- Specific variation law
- Multiple assemblies with various modules

**P11 OPTION: ROTARY SWITCH MODULES**

- Rotary switches
- Current up to 2 A
- Actuation CW or CCW position

**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 P11 module size 12.7 x 12.7 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

F: means actuation in maximum CW position

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

**RDS SINGLE POLE SWITCH, NORMALLY OPEN**

In full CCW position, the contact between 1 and 3 is open. It is made at the beginning of the travel in CW direction.

**RSF SINGLE POLE SWITCH, NORMALLY OPEN**

In full CW position, the contact between 1 and 3 is open. It is made at the beginning of the travel in CCW direction.

**RSID SINGLE POLE CHANGEOVER**

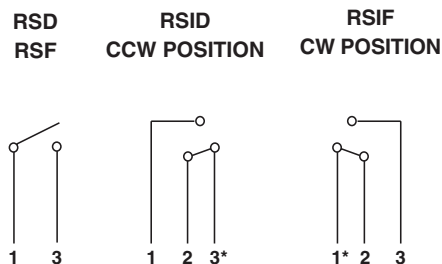
In full CCW position, the contact is made between 3 and 2 and open between 3 and 1. Switch actuation (CW direction) reverses these positions.

**RSIF SINGLE POLE CHANGEOVER**

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

**SWITCH SPECIFICATIONS**

Switching Power Maximum		62.5 VA $\vee$ 15 VA =
Switching Current Maximum		0.25 A 250 V $\vee$ 0.5 A 30 V =
Maximum Current Through Element		2 A
Contact Resistance		30 m $\Omega$
Dielectric Strength	Terminal to Terminal	1000 V <sub>RMS</sub>
	Terminal to Bushing	5000 V <sub>RMS</sub>
Maximum Voltage Operation		250 V $\vee$ 30 V =
Insulation Resistance Between Contacts		10 <sup>6</sup> M $\Omega$
Life at P <sub>max</sub> .		10 000 actuations
Minimal Travel		25°
Operating Temperature		- 40 °C to + 85 °C

**ELECTRICAL DIAGRAM**

**Note:**

- Common

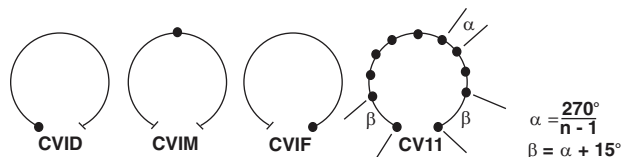
**ORDERING INFORMATION** (First order only)

RSID

<b>RSD</b>	SPST: Single pole, open switch in CCW position - 2 pins
<b>RSF</b>	SPST: Single pole, open switch in CW position - 2 pins
<b>RSID</b>	SPDT: Single pole, changeover switch in CCW position - 3 pins
<b>RSIF</b>	SPDT: Single pole, changeover switch in CW position - 3 pins

### P11 OPTION: DETENT MODULES

The valley detents mechanism is housed in a standard P11 module. Up to 21 detents position available.  
Count detents as follows: 1 for CCW position, 1 for full CW position, plus the other positions forming equal resistance increments (linear taper) - not equal angles.  
Available now: CVID - CVIF - CVIM  
CV3 - CV11 - CV21



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

#### CV1M

**CV1M** 1 detent at half travel  
**CV1M J84** CV1M with accuracy of center point  $\pm 2\%$  (all laws except S)  
**CV1D** 1 detent at CCW position  
**CV1F** 1 detent at CW position  
**CV3** 3 detents  
**CV11** 11 detents  
**CV21** 21 detents

### P11 OPTION: NEUTRAL MODULES "EN"

Neutral or screen module is housed in a standard P11 module.  
It is used as a screen between two electrical modules.

The leads can be connected to ground.

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

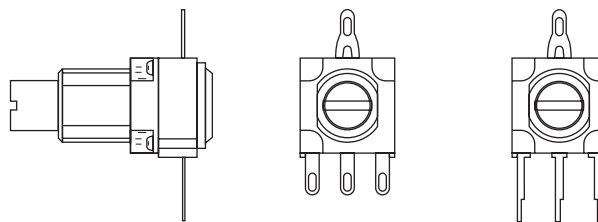
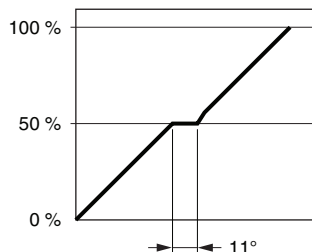
#### EN

**EN** Neutral module

### P11 OPTION: CENTER CURRENT TAP "J"

The extra terminal is a solder lug connected at 50 % of electrical travel and situated in the potentiometer module opposite the terminals.

Center tap short circuit 11° of travel.

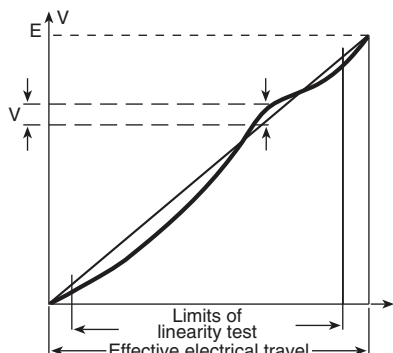


### ORDERING INFORMATION (First order only)

#### J

**J** Center tap

## P11 OPTION: SPECIAL LINEARITY - CONFORMITY



The independent linearity (conformity for the non linear laws) is the maximum gap  $\Delta V$  between the actual variation curve and the theoretical variation curve the nearest to it. The linearity and the conformity are expressed in percentage of the total applied voltage  $E$

$$\text{linearity conformity} = \frac{\pm \Delta V_{\max.}}{E}$$

They are measured over 90 % of actual electrical travel (centered).

On request linearity can be guaranteed in linear law.

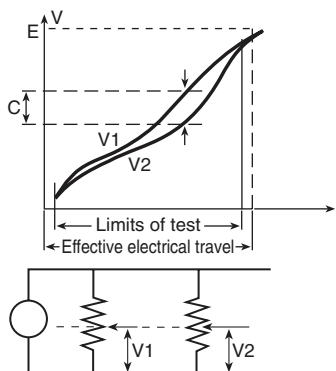
### ORDERING INFORMATION (First order only)

**J123**

**J123** Independent linearity  $\pm 3\%$  (linear law)  
**J145** Independent linearity  $\pm 2\%$  (linear law)

For other request, contact us.

## P11 OPTION: SPECIAL INTERLINEARITY - INTERCONFORMITY



It is the maximum deviation between the actual voltage outputs of 2 or more pot modules in the same assembly. It is expressed as a percentage of the total applied voltage, or in dB attenuation.

Interlinearity is measured between 2 pot modules, over 10 to 90 % of the attenuation.

The interlinearity or interconformity is expressed as a percentage of the total applied voltage:

$$I\% = \frac{|C|}{E}$$

Or in decibels by comparison between outputs  $V_1$  and  $V_2$

$$I \text{ dB} = 20 \log \frac{V_1}{V_2}$$

### ORDERING INFORMATION (First order only)

**J44**

**J44** Interlinearity  $\pm 2\%$  (linear law)

For other request, contact us.



12.5 mm Modular Panel Potentiometers  
High Dielectric Strength

P11P, P11D

Vishay Sfernice

**EXAMPLES OF FIRST ORDER INFORMATION**

**FIRST EXAMPLE:** Triple module (switch is counted as a module)

P	1	1	P	3	F	0	G	G	S	Y	0	0					
MODEL P11	STYLE P	3 MODULES	BUSHING F (Ø 3/8" / L 3/8")	WITHOUT LOCATING PEG		SHAFT SLOTTED (L 5/8")		SOLDER LUGS		SPECIAL TO BE DEFINED BY VISHAY							

**ORDERING INFORMATION:**

PART NUMBER	P11P3F0GGSY00.....		
SHAFT AND BUSHING	See drawing of special shaft attached		
MODULE NO. 1	RSID		
MODULE NO. 2	103 M A	J123	
MODULE NO. 3	503 M A	J	

**PART NUMBER DESCRIPTION** (used on some Vishay document or label, for information only)

P11P	3	F	0	GG	S	Y00	10K	20 %	A			e3
MODEL	MODULES	BUSHING	OPTION	SHAFT	SHAFT STYLE	LEADS	VALUE	TOL.	TAPER	SPECIAL	SPECIAL	LEAD (Pb)- FREE



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