12.5 mm Modular Panel Potentiometer
High Dielectric Strength

FEATURES

- High dielectric strength potentiometer up to 5000 V_{RMS}
- 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 41000 or IEC 60393-1
- Shaft and panel sealed version
- Up to twenty-one indent positions
- Rotary switch options
- Custom designs on request
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

LINKS TO ADDITIONAL RESOURCES

3D Models

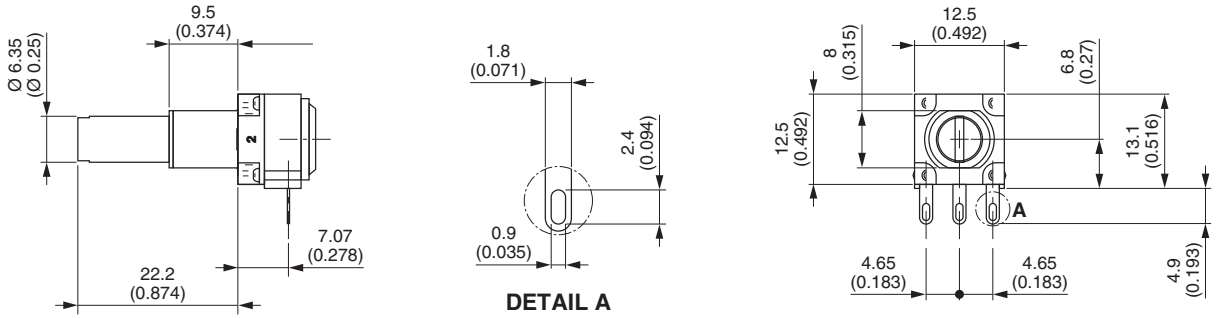
Capabilities and Custom Options

QUICK REFERENCE DATA	
Multiple module	Up to 7 modules
Switch module	Yes
Detent module	Yes
Special electrical laws	A: linear, L: logarithmic, F: reverse logarithmic and others see specification
Sealing level	IP 64
Lifespan	50K cycles

VERSATILE	MODULAR	COMPACT	ROBUST

CONFIGURATION EXAMPLE - Dimensions in millimeters (inches) ± 0.5 mm (± 0.02")

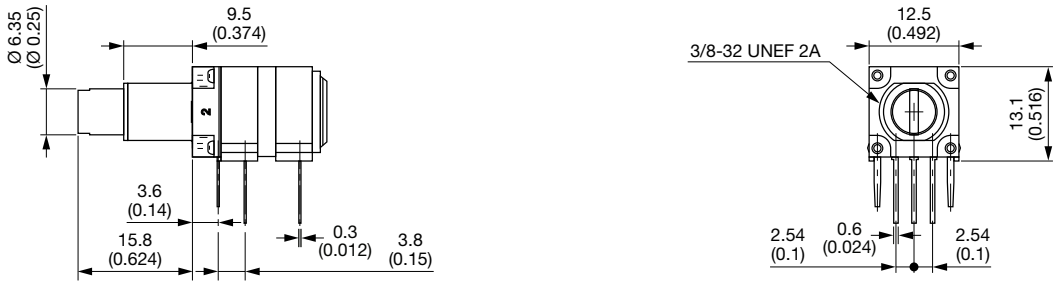
Single module, single shaft, solder lugs, metric bushing and shaft



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

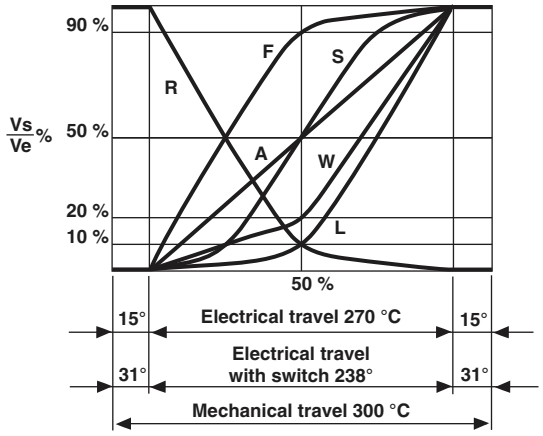
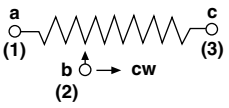
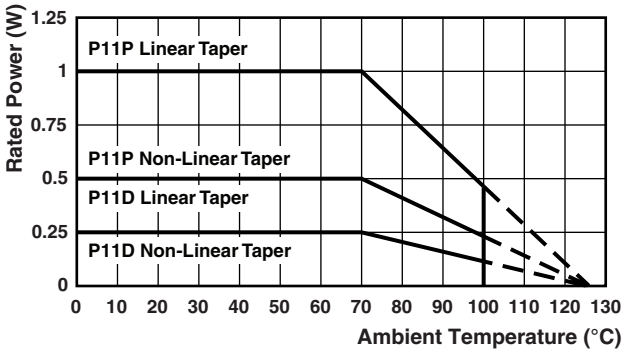
CONFIGURATION EXAMPLE - Dimensions in millimeters (inches) ± 0.5 mm (± 0.02")

Dual modules, single shaft, PC pins with front support plates, imperial bushing and shaft



GENERAL SPECIFICATIONS

ELECTRICAL (initial)

		P11D	P11P
Resistive element		Conductive plastic	Cermet
Electrical travel		270° ± 10°	270° ± 10°
Resistance range [1]	**linear taper**	1 kΩ to 500 kΩ	20 Ω to 10 MΩ
	non-linear taper	470 Ω to 250 kΩ	100 Ω to 2.2 MΩ
Tolerance	**standard**	± 20 %	± 20 %
	on request	± 10 %	± 5 % or ± 10 %
Taper			
Circuit diagram			
Power rating at 70 °C	**linear taper**	0.5 W at +70 °C	1 W at +70 °C
	non-linear taper	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
			

ELECTRICAL (initial)		P11D	P11P
Temperature coefficient, -40 °C to +100 °C (typical)		± 500 ppm	± 150 ppm
Limiting element voltage		350 V	350 V
End resistance (typical)		2 Ω	2 Ω
Contact resistance variation (typical)	linear taper	1 %	2 % or 3 Ω
Independent linearity (typical)	linear taper	± 5 %	± 5 %
Insulation resistance		10^6 MΩ min.	10^6 MΩ min.
Dielectric strength	leads to support plate	3000 V_{RMS} min.	3000 V_{RMS} min.
	leads to shaft and bushing	5000 V_{RMS} min.	5000 V_{RMS} min.
Mechanical endurance		50 000 cycles	50 000 cycles

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

(1) Consult Vishay Sfernice for other ohmic values

MECHANICAL (initial)	
Mechanical travel	300° ± 5°
Operating torque (typical)	
single and dual assemblies	0.2 Ncm to 1 Ncm max. (0.3 oz.-inch to 1.4 oz.-inch max.)
three to seven modules (per module)	0.2 Ncm to 0.3 Ncm max. (0.3 oz.-inch 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	3.5 g
two to seven modules (per module)	1.5 g to 2 g (0.25 oz. to 0.32 oz.)

ENVIRONMENTAL SPECIFICATIONS	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

- Potentiometer module
  Vishay logo, SAP code of ohmic value, tolerance in %, variation law, manufacturing date (four digits), “3” for the lead 3, product series (P11D, P11P)
- Switch module
  Version, manufacturing date (four digits), “c” for common lead
- Indent module
  Version, manufacturing date (four digits)

PACKAGING

- Box

PERFORMANCES				
TESTS	CONDITIONS	TYPICAL VALUE AND DRIFTS		
			P11D	P11P
Electrical endurance	1000 h at rated power 90’/30’ - ambient temp. 70 °C	$\Delta R_T/R_T$ Contact resistance variation	± 10 % ± 5 %	± 2 % ± 4 %
Change of temperature	-40 °C to +100 °C, 5 cycles	$\Delta R_T/R_T$	± 0.5 %	± 0.2 %
Damp heat, steady state	+40 °C, 93 % relative humidity P11P: 56 days, P11D: 21 days	$\Delta R_T/R_T$ Insulation resistance	± 5 % > 10 MΩ	± 2 % > 1000 MΩ
Mechanical endurance	50 000 cycles	$\Delta R_T/R_T$ Contact resistance variation	± 6 % ± 4 %	± 5 % ± 5 %
Climatic sequence	Dry heat at +125 °C/damp heat cold -55 °C/damp heat, 5 cycles	$\Delta R_T/R_T$	-	± 1 %
Shock	50 *g*’s, 11 ms 3 shocks - 3 directions	$\Delta R_T/R_T$ $\Delta R_{1\text{-}2}/R_{1\text{-}2}$	± 0.2 % ± 0.5 %	± 0.2 % ± 0.5 %
Vibration	10 Hz to 55 Hz 0.75 mm or 10 *g*’s, 6 h	$\Delta R_T/R_T$ $\Delta V_{1\text{-}2}/V_{1\text{-}3}$	± 0.2 % ± 0.5 %	± 0.2 % ± 0.5 %

ORDERING INFORMATION (part number)

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						P11D CONDUCTIVE PLASTIC					
	LINEAR TAPER			NON LINEAR TAPER			LINEAR TAPER			NON LINEAR TAPER		
	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	MAX. POWER AT 70 °C	MAX. WORKING VOLTAGE	MAX. CUR. THROUGH WIPER
Ω	W	V	mA	W	V	mA	W	V	mA	W	V	mA
22	1	4.69	213									
47	1	6.86	146									
50	1	7.07	141									
100	1	10.0	100	0.5	7.07	70.7						
220	1	14.8	67.4	0.5	10.0	47.7						
470	1	21.7	46.1	0.5	15.3	32.6						
500	1	22.4	44.7	0.5	15.8	31.6				0.25	11.2	22.4
1K	1	31.6	31.6	0.5	22.4	22.4	0.5	22.4	22.4	0.25	15.8	15.8
2.2K	1	46.9	21.3	0.5	33.2	15.1	0.5	33.2	15.1	0.25	23.5	10.7
4.7K	1	63.6	14.5	0.5	48.5	10.3	0.5	48.5	10.3	0.25	34.3	7.29
5K	1	70.7	14.1	0.5	50.0	10.0	0.5	50.0	10.0	0.25	35.4	7.07
10K	1	100	10.0	0.5	70.7	7.07	0.5	70.7	7.07	0.25	50.0	5.00
22K	1	148	6.74	0.5	105	4.77	0.5	105	4.77	0.25	74.2	3.37
47K	1	217	4.61	0.5	153	3.26	0.5	153	3.26	0.25	108	2.31
50K	1	224	4.47	0.5	158	3.16	0.5	158	3.16	0.25	112	2.24
100K	1	316	3.16	0.5	224	2.24	0.5	224	2.24	0.25	158	1.58
220K	0.56	350	1.59	0.5	332	1.51	0.5	332	1.51	0.25	235	1.07
470K	0.26	350	0.75	0.26	349	0.74	0.26	350	0.74	0.25	343	0.73
500K	0.25	350	0.70	0.25	350	0.70	0.25	350	0.70	0.25	350	0.70
1M	0.12	350	0.35	0.12	350	0.35	0.12	350	0.35			
2.2M	0.56	350	0.16	0.056	350	0.16						
4.7M	0.26	350	0.074									
5M	0.25	350	0.070									
10M	0.12	350	0.035									

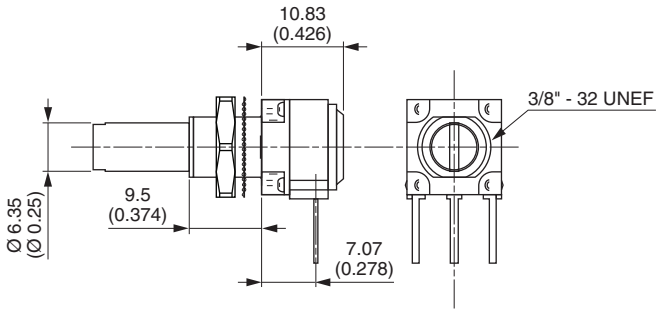
ORDERING INFORMATION (part number)

P	1	1	P	2	F	0	G	G	S	Y	0	0	1	0	3	M	A

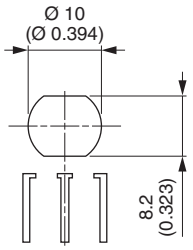
MODEL	STYLE	NUMBER OF MODULES	BUSHING	OPTION	SHAFT	SHAFT STYLE	LEADS	RESISTANCE CODE/ TOLERANCE/ TAPER OR SPECIAL
P11								

	Ø	L
F	3/8"	3/8"

BUSHING DIMENSIONS - Dimensions in mm (inches) ± 0.5 mm (± 0.02")



PANEL CUT OUT - Dimensions in mm (inches) ± 0.5 mm (± 0.02")



Note

- Hardware supplied in separate bags

ORDERING INFORMATION (part number)

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

Location pegs:

mm	Ø	L
A	2	6.2
B	2	7.75
C	3.5	13.5
0	Without peg	

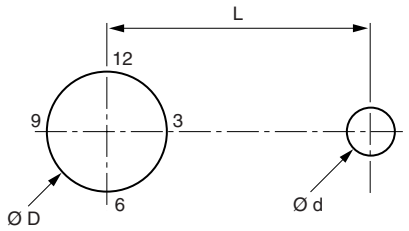
Sealed version:

P	Panel and shaft sealed

LOCATING PEGS (anti-rotation lug)

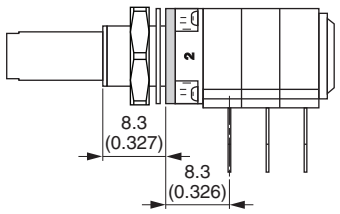
The locating peg is provided by a plate mounted on the bushing and positioned by the module sides. Four set positions are available, clock face orientation: 12, 3, 6, 9.

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

ORDERING INFORMATION (part number)

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

SHAFT

CODE	L (inch)	L (mm)
GG	5/8	15.8
GJ	7/8	22.2

SHAFT STYLE

S = Slotted

SHAFTS - Dimensions in mm (inches) ± 0.5 mm (± 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 ± 10° of the wiper position.

ORDERING INFORMATION (part number)

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		

LEADS

Available leads

A00	W00	X00	Y00	Z00
A10	W10	X03	Y03	Z03
A13	W20	X04	Y04	Z04
A14		X10		Z10
A20		X13		Z13
A23		X14		Z14
A24		X20		Z20
		X23		Z23
		X24		Z24

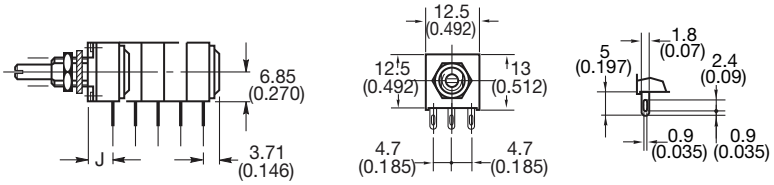
FIRST DIGIT	
Y	Soldering lugs
X	PCB pins
Z	PCB pins with front support plate
A	PCB pins with front and back support plates
W	PCB pins - vertical mounting with 2 extra pins - 1 module only (more modules on request)

SECOND DIGIT	
0	Y = 4.65 (0.183") A, X, Z, W = 5.08 (0.200") pin spacing pins section 0.9 x 0.3 (0.035" x 0.012")
1	2.54 (0.100") pin spacing pin section 0.6 x 0.3 (0.024" x 0.012")
2	5.08 (0.200") pin spacing pins section 0.6 x 0.3 (0.024" x 0.012")

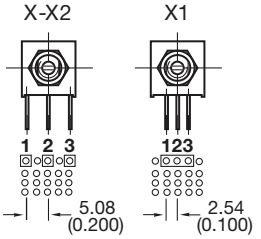
THIRD DIGIT	
0	5.08 (0.200") space between modules
3	7.62 (0.300") space between modules
4	10.16 (0.400") space between modules

DIMENSIONS in millimeters (inches) ± 0.5 mm (± 0.02")

SOLDER LUGS Y

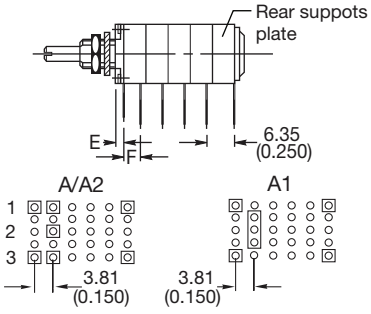


PCB PIN OUT

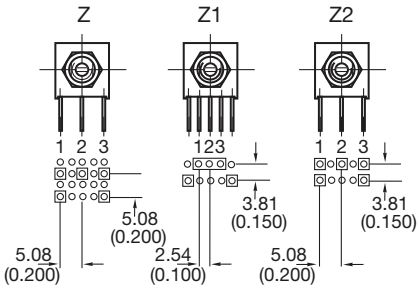


HORIZONTAL MOUNTING

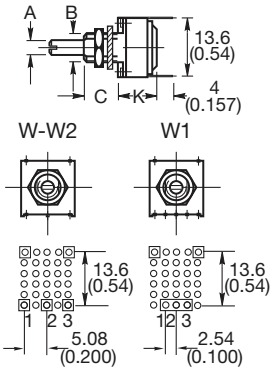
FRONT AND REAR SUPPORT PLATES



FRONT SUPPORT PLATE



VERTICAL MOUNTING



THE POSITION OF EACH MODULE IS FREE

	LEADS			
	X../Y..	**A../Z1./Z2.**	**Z0.** (except with rotary switch)	**Z0.** (with rotary switch)
E	-	3.63 (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)	-	-	-

ORDERING INFORMATION (part number)

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/ TOLERANCE/ TAPER OR SPECIAL

From 20 Ω to 10 MΩ
see instructions on
electrical specifications

Resistance code:
200 = 20 Ω to
106 = 10 MΩ

Tolerance code:
standard:
M = ± 20 %
on request:
K = ± 10 %,
J = ± 5 % (cermet only)

Taper: A, L, W, F, S, R
or
special code
given by Vishay

SPECIAL CODES GIVEN BY VISHAY

Option available:

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

P11 OPTION: ROTARY SWITCH MODULES

- Rotary switch
- Current up to 2 A
- Actuation CW or CCW position
- 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 P11 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
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 modules is 238° ± 10°.

Leads finish: gold plated

RSD 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

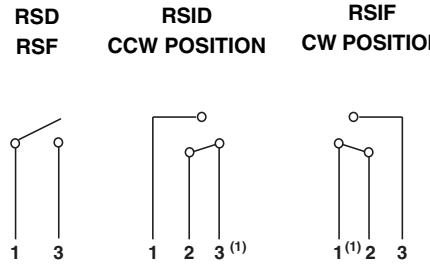
In full CCW position, the contact is made between 3 and 2 and open between 3 and 1. Switch actuation (CW direction) reverses these positions.

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 ν 15 VA =
Switching current maximum		0.25 A 250 V ν 0.5 A 30 V =
Maximum current through element		2 A
Contact Resistance		100 mΩ
Dielectric strength	Terminal to terminal	1000 V_{RMS}
	Terminal to bushing	5000 V_{RMS}
Maximum voltage operation		250 V ν 30 V =
Insulation resistance between contacts		10^6 MΩ
Life at $P_{max.}$		10 000 actuations
Minimal travel		25°
Operating temperature		-40 °C to +85 °C

ELECTRICAL DIAGRAM



Note
(1) Common

ORDERING INFORMATION (First order only)

RSID

RSD	SPST: single pole, open switch in CCW position - 2 pins
RSF	SPST: single pole, open switch in CW position - 2 pins
RSID	SPDT: single pole, changeover switch in CCW position - 3 pins
RSIF	SPDT: single pole, changeover switch in CW position - 3 pins

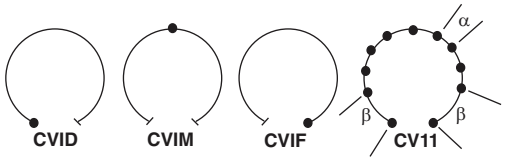
P11 OPTION: DETENT MODULES

The detents mechanism is housed in a standard P11 module.
Up to 21 detent positions 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: CVID - CVIF - CVIM
CV3 - CV11 - CV21

Mechanical endurance: 10 000 cycles



$\alpha = \frac{270°}{n - 1}$

$\beta = \alpha + 15°$

ORDERING INFORMATION (First order only for special code creation)

CV1M

CV1M	1 detent at half travel
CV1M J84	CV1M with accuracy of center point ± 2 % (all tapers 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)

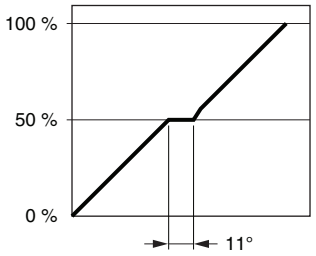
EN

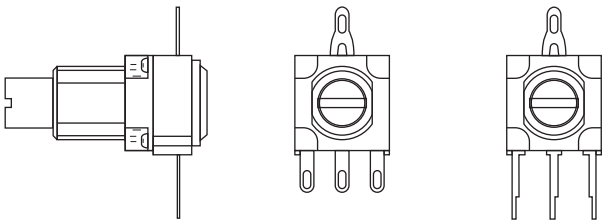
EN	Neutral module

P11 OPTION: CENTER CURRENT TAP "J"

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

Center tap presents a short circuit of 11° of travel.





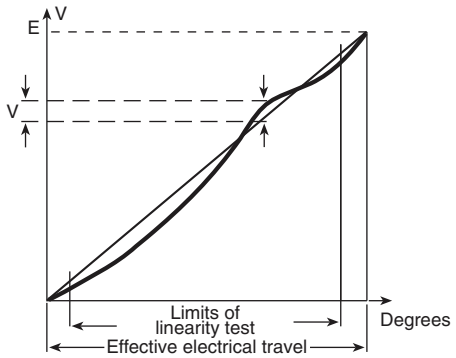
- Sealing IP60

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 ΔV 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.

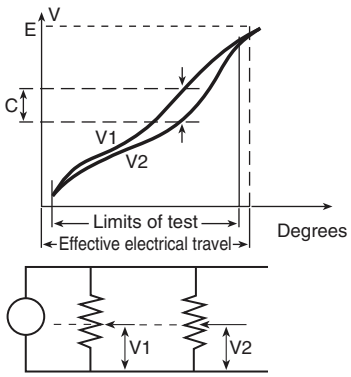
ORDERING INFORMATION (First order only)

J123

J123	Independent linearity ± 3 % (linear taper)
J145	Independent linearity ± 2 % (linear taper)

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 20 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 V1 and V2

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

ORDERING INFORMATION (First order only)

J44

J44	Interlinearity ± 2 % (linear taper)

For other request, contact us.

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

ACCESSORIES

Additional Accessories (to order separately)	www.vishay.com/doc?51051

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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