12.5 mm Modular Panel Potentiometers
High Dielectric Strength

FEATURES

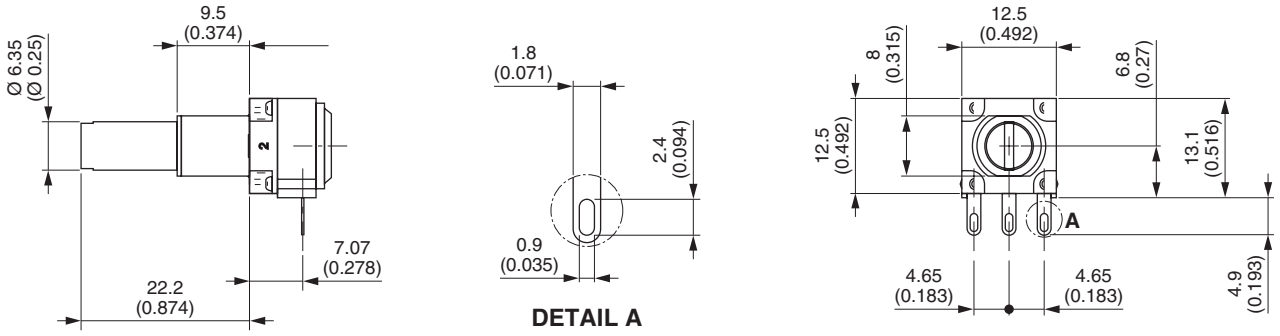
- High dielectric strength potentiometer up to 5000 V_{rms}
- 12.5 mm square single turn panel control
- Plastic shaft and bushing
- Two shaft lengths and 29 terminal styles
- P11P: Cermet element
- P11D: Conductive plastic element
- Multiple assemblies - up to seven modules
- Test according to CECC 41 000
- Shaft and panel sealed version
- Up to twenty-one indent positions
- Rotary switch options
- Custom designs on request
- Compliant to RoHS directive 2002/95/EC

RoHS COMPLIANT

VERSATILE	MODULAR	COMPACT	ROBUST

CONFIGURATION EXAMPLE - Dimensions in mm (Inches)/Tolerance ± 0.5 mm (± 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

GENERAL SPECIFICATIONS

ELECTRICAL (INITIAL)

		P11D	P11P
Resistive Element		Conductive plastic	Cermet
Electrical Travel		270° ± 10°	270° ± 10°
Resistance Range (1)	**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		10^6 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 Rotation Life		50 000 cycles	50 000 cycles

Note

(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

	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, nominal ohmic value (Ω, kΩ, MΩ), two stars identify P11D version, tolerance in % - variation law, manufacturing date (four digits), “3” for the lead 3
- **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
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 %	± 0.2 %
Moisture	+ 40 °C, 93 % relative humidity P11D: 21 days, P11P: 56 days	$\Delta R_T/R_T$ (%) insulation resistance	± 5 % > 10 MΩ	± 2 % > 1000 MΩ
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 %
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 %	± 0.2 % ± 0.5 %

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							
	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	P11P	P11D
Ω	W	V	mA	W	V	mA	W	V	mA	ppm/°C	
22	1	4.69	213								
47		6.85	146								
50		7.07	141								
100		10	100								
200		14.8	67.4	0.5							
470		21.6	46.1		15.3	32.7					
500		22.4	44.7		15.8	31.6					
1K		31.6	31.6		22.4	22.4	0.5	22.4	22.4		
2.2K		46.9	21.3		33.2	15.1		33.2	15.1		
4.7K		63.5	14.5		48.5	10.3		48.5	10.3		
5K		70.7	14.1		50.0	10.0		50.0	10.0		
10K		100	10		79.7	7.07		79.7	7.07	± 150	± 500
22K		148	6.7		105	4.77		105	4.77		
47K		217	4.6		153	3.26		153	3.26		
50K		224	4.47		158	3.16		158	3.16		
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								

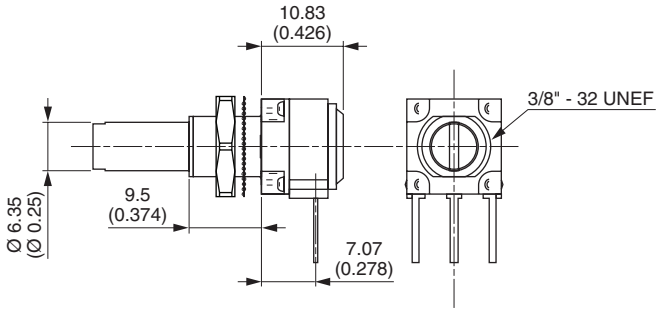
ORDERING INFORMATION (Part Number 18 digits)

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

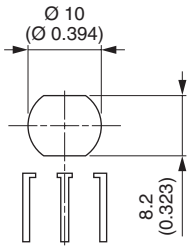
MODEL	STYLE	NUMBER OF MODULES	BUSHING	OPTION	SHAFT	SHAFT STYLE	LEADS	RESISTANCE CODE/ TOLERANCE/ TAPER OR SPECIAL
P11								

	Ø	L
F	3/8"	3/8"

BUSHING DIMENSIONS - Dimensions in mm (Inches)/Tolerance ± 0.5 mm (± 0.02")



PANEL CUT OUT - Dimensions in mm (Inches)/Tolerance ± 0.5 mm (± 0.02")



Notes
- Hardware supplied in separate bags

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

OPTION

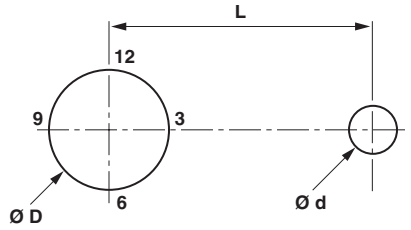
Location Pegs:
A = Ø = 2 L = 6.2
B = Ø = 2 L = 7.75
C = Ø = 3.5 L = 13.5
0 = Without peg

Sealed Version:
P = Panel and shaft sealed

LOCATING PEGS (Anti-Rotation Lug)

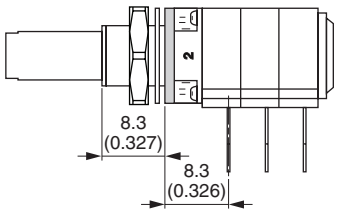
The locating peg is provided by a plate mounted on the bushing and positioned by the module sides. Four set positions are available, clock face orientation: 12, 3, 6, 9.

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 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		

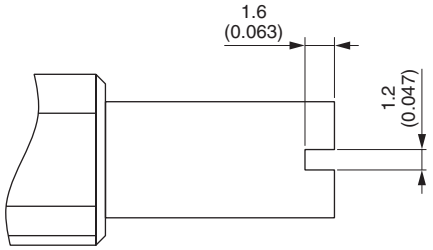
CODE	L (inch)	L (mm)
GG	5/8	15.8
GJ	7/8	22.2

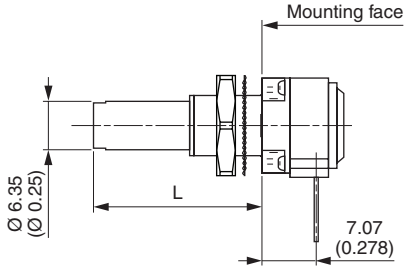
S = Slotted

SHAFTS - Dimensions in mm (Inches)/Tolerance ± 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 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

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

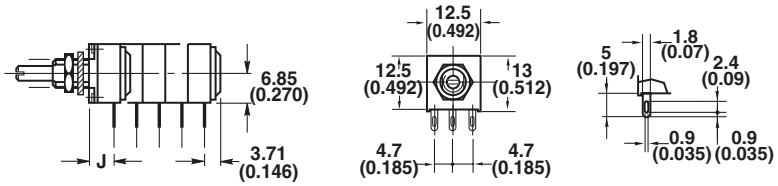
FIRST DIGIT	
Y	Soldering lugs
X	PCB pins
Z	PCB pins with front support plate
A	PCB pins with front and back support plates
W	PCB pins - vertical mounting with 2 extra pins - 1 module only

SECOND DIGIT	
0	Y = 4.65 mm (0.183") A, X, Z, W = 5.08 mm (0.200") pin spacing pins section 0.9 x 0.3 mm² (0.035" x 0.012")
1	2.54 mm (0.100") pin spacing pin section 0.6 x 0.3 mm² (0.024" x 0.012")
2	5.08 mm (0.200") pin spacing pins section 0.6 x 0.3 mm² (0.024" x 0.012")

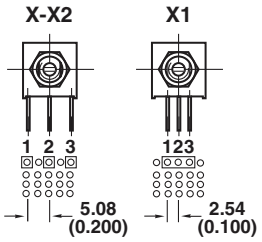
THIRD DIGIT	
0	5.08 mm (0.200") space between modules
3	7.62 mm (0.300") space between modules
4	10.16 mm (0.400") space between modules

DIMENSIONS in mm (Inches)/Tolerance ± 0.5 (0.02)

SOLDER LUGS Y

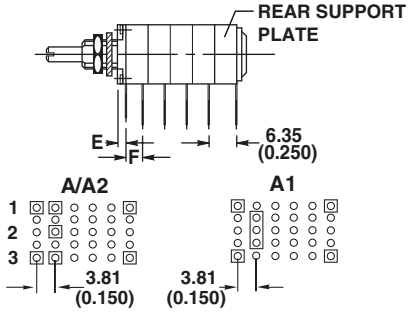


PCB PIN OUT

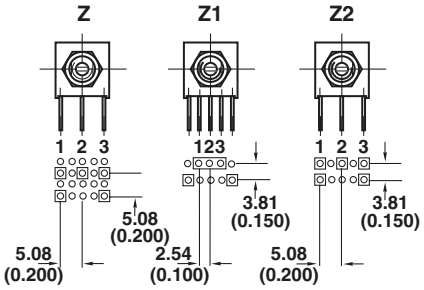


HORIZONTAL MOUNTING

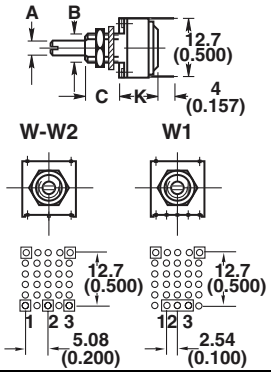
FRONT AND REAR SUPPORT PLATES



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	-	3.6 (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)	-	-	-

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:
200 = 20 Ω to
106 = 10 MΩ

Tolerance Code:
M = 20 %, K = 10 %, J = 5 %

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

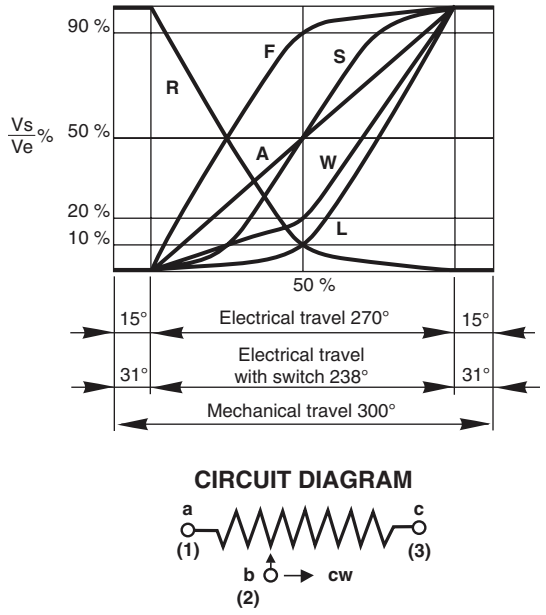
RESISTANCE CODE

See Conversion Table for ohmic value

TOLERANCE

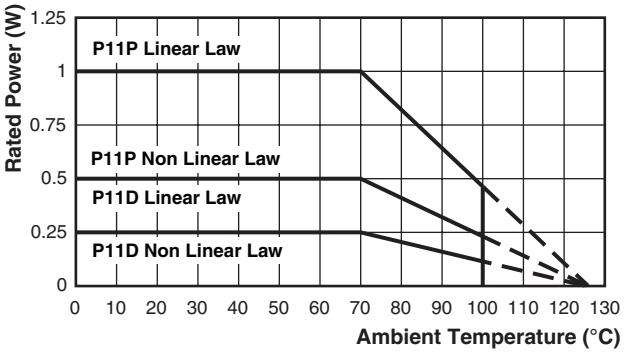
Standard: M = ± 20 %
On request: K = ± 10 %, J = ± 5 % (cermet only)

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 switchs
- 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 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 module is 238° ± 10°.

Leads finish: Gold plated.

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

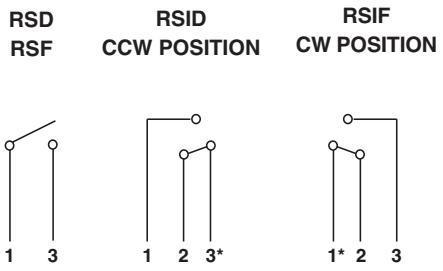
In full CCW position, the contact is made between 3 and 2 and open between 3 and 1. Switch actuation (CW direction) reverses these positions.

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 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		30 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
- Common

ORDERING INFORMATION (First order only)

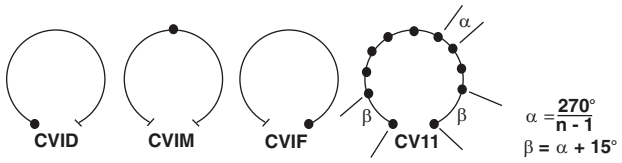
RSID

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 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

Rotational life: 10 000 cycles



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 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)

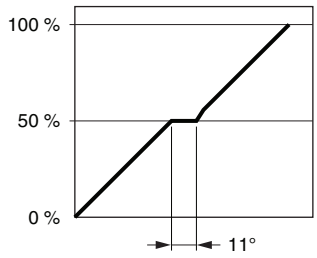
EN

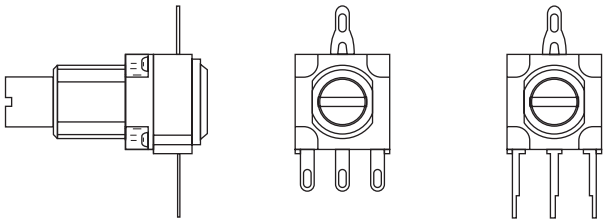
EN	Neutral module

P11 OPTION: CENTER CURRENT TAP "J"

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

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



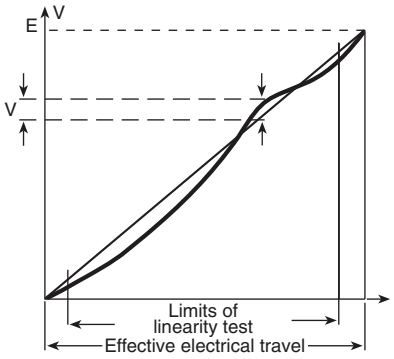


ORDERING INFORMATION (First order only)

J

J	Center tap

P11 OPTION: SPECIAL LINEARITY - CONFORMITY



The independent linearity (conformity for the non linear laws) is the maximum gap ΔV between the actual variation curve and the theorical 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.

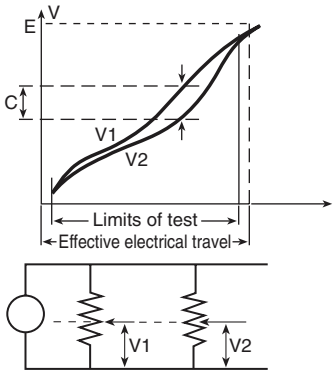
ORDERING INFORMATION (First order only)

J123

J123	Independent linearity ± 3 % (linear law)
J145	Independent linearity ± 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 V1 and V2

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

ORDERING INFORMATION (First order only)

J44

J44	Interlinearity ± 2 % (linear law)

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

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