

# CONDUCTIVE PLASTIC ROTARY POTENTIOMETERS



*Penny + Giles*

*rotary potentiometers are designed to give*

*reliable, precise control and feedback signals*



*Penny+Giles*  
in control

**PENNY AND GILES - FIRST IN MEASUREMENT AND CONTROL**

## PRECISION ROTARY POTENTIOMETERS - BY DESIGN

Precision bearings with low torque enable the use of low drive forces and ensure a long trouble-free life (normally over  $50 \times 10^6$  revolutions)

Corrosion resistant precision stainless steel shaft provides accurate drive location for improved accuracy

Multi-fingered precious metal wiper gives independent contact ensuring low noise and a long life.

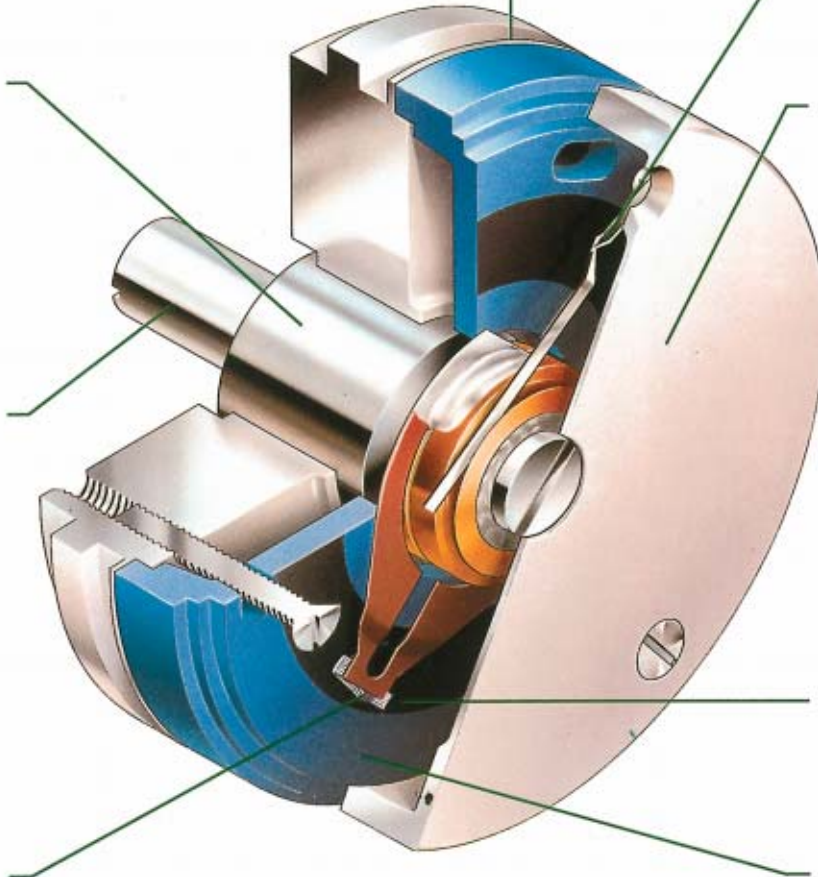
Synchro clamp mounting for easy installation

Precious metal brush wires ensure low noise and long life

Rugged construction facilitates use in industrial environments

Conductive plastic track with hard wearing carbon surface for stable output and long life

Conductive plastic track gives virtually infinite resolution with low electrical noise



PENNY AND GILES conductive plastic rotary potentiometers provide reliable precision outputs for control and feedback applications.

Since developing the conductive plastic track technology, Penny and Giles have over twenty five years experience of providing cost-effective reliable solutions to customers' technical problems.

Position feedback applications range from aircraft fly-by-wire systems to camera controls and coal cutting machinery.

Penny and Giles' technology combines a hard wear resistant conductive surface and multi-fingered precious metal contacts to give virtually infinite resolution, low noise

characteristics and a long operational life.

The flush bonded carbon track and precision ball bearing system enable continuous 360 degree operation without wiper fatigue.

The mechanical design of the rotary potentiometer range enables them to perform in severe environmental conditions.

Built to withstand extremes of temperature and high levels of mechanical vibration and shock Penny and Giles potentiometers are used extensively in civil and military aircraft, naval vessels, electricity generating plants and general process control applications where reliability considerations are of paramount importance.

# PERFORMANCE SPECIFICATION

## Common to all instruments in the range

Operational temperature range	-65° to +130°C except RCP 09 (-55°C to +100°C)
Resistance temperature coefficient	Typically ±500 ppm - dependent on resistance value
Insulation resistance at 500V	Not less than 100 x 10 <sup>9</sup> ohms
Dielectric strength	750V rms
Resolution	Virtually infinite
Output smoothness	MIL-R-39023 grade C 0.1%
Mechanical angle	Continuous rotation
Warning	The wiper current must not exceed 10mA or permanent damage may result.

## Options linear and sine/cosine potentiometers

Conformity and resistance	A conformity or resistance value outside the standard range may be custom built
Switch track section	Available on synchro sizes 11, 15 and 18
Index point	An index point can be included
Shaft extensions	Available
Shaft sealing	O ring shaft sealing can be fitted to BS5490 1977 IP66 or to BS5490 1977 IP67
Electrical angle	Non-standard electrical angles can be supplied

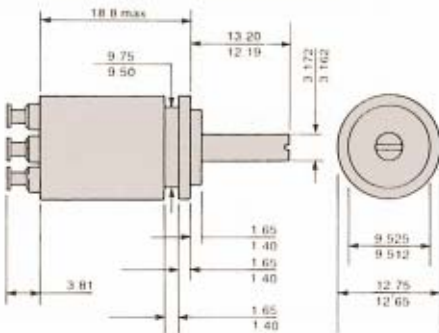
## Linear function potentiometers

Potentiometer model number	RCP 05	RCP 08	RCP 09	RCP 11
Body diameter	12.7mm	19.3mm	22.2mm	27.2mm
Resistance range ±10%	1-5K Ω	1-5K Ω	5K Ω	1-10K Ω
Linearity (% of applied voltage)	±1% to 0.5%	±1% to 0.1%	±1% to 0.5%	±1% to 0.075%
Electrical angle - standard	340°	340°	342°	345°
Power dissipation at 20°C	1 watt	1.2 watt	1.5 watt	1.5 watt
Number of cups up to	1	1	1	4
Number of taps per cup up to	-	-	-	4
Tap positional accuracy	-	-	-	±1.5°
Current tap width (voltage taps are zero width)	-	-	-	1.5°
Starting torque maximum at 20°C	- single cup - each additional cup	5gm cm -	6gm cm -	10gm cm 8gm cm
Moment of inertia per cup at 20°C		1.3gm cm <sup>2</sup>	1.5gm cm <sup>2</sup>	1.0gm cm <sup>2</sup>
Weight	- single cup - each additional cup	7gm -	12gm -	12gm 28gm 7gm
Standard terminations	End terminals	Flying leads or end terminals	Side flying	Side terminals

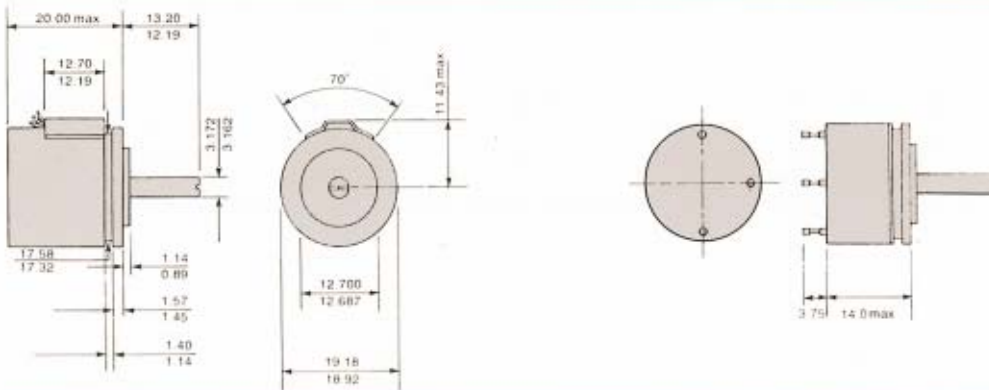
Potentiometer model number	RCP 15	RCP 18	RCP 30
Body diameter	36.7mm	44.7mm	76.2mm
Resistance range ±10%	1-10K Ω	1-10K Ω	2 - 20K Ω
Linearity (% of applied voltage)	±1% to 0.05%	±1% to 0.05%	±1% to 0.02%
Electrical angle - standard	350°	352°	354°
Power dissipation at 20°C	2.0 watt	3.0 watt	8.0 watt
Number of cups up to	6	6	6
Number of taps per cup up to	6	6	6
Tap positional accuracy	±1.2°	±1°	±1°
Current tap width (voltage taps are zero width)	1.2°	1°	1°
Starting torque maximum at 20°C	- single cup - each additional cup	10gm cm 10gm cm	12gm cm 12gm cm
Moment of inertia per cup		3.4gm cm <sup>2</sup>	3.6gm cm <sup>2</sup>
Weight	- single cup - each additional cup	51gm 10gm	64gm 11gm
Standard terminations	Side terminals	Side terminals	Side terminals

# DIMENSIONS - ALL MODELS

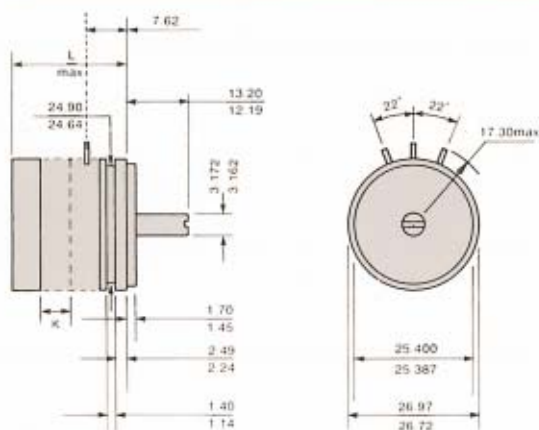
## Potentiometer model number RCP 05



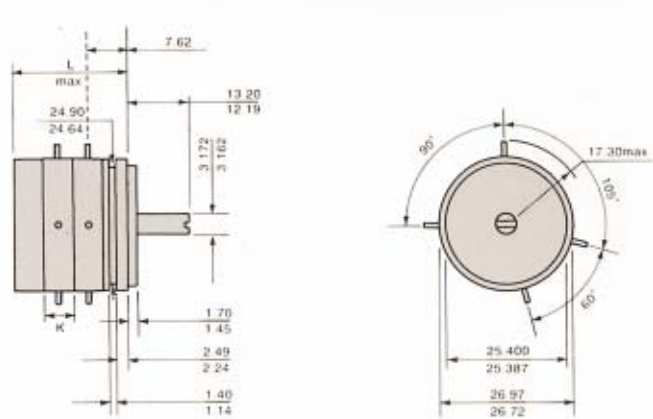
## Potentiometer model number RCP 08



## Potentiometer model number RCP 11



## Potentiometer model number RCP 11SC



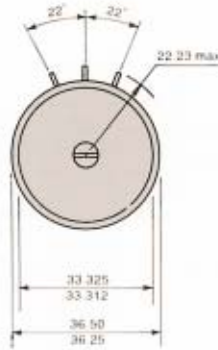
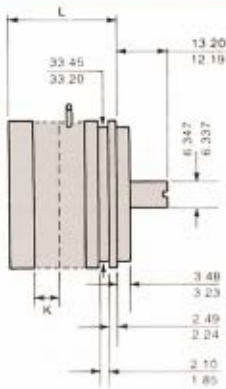
For potentiometer model number RCP 09 see page 7

	Linear function	Sine function	*Sine/cosine function	Each addition cup K-any function
Dimension L	16.5	16.5	22.2	add 6.3

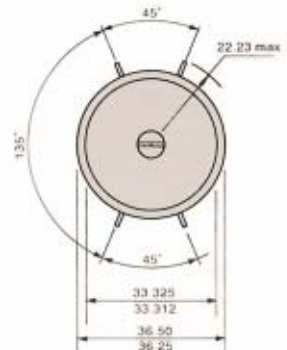
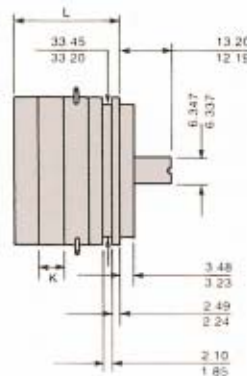
All dimensions in millimetres  
 \* Sine/cosine requires two cups

Potentiometer model number RCP 15

Potentiometer model number RCP 15SC



Linear function



\*Sine/cosine function

Each addition cup K-any function

Dimension L—single gang

17.8

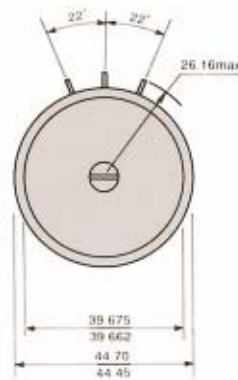
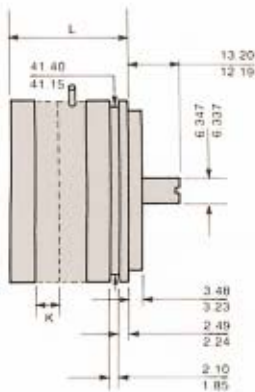
17.8

22.2

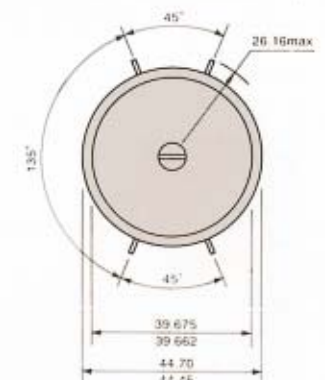
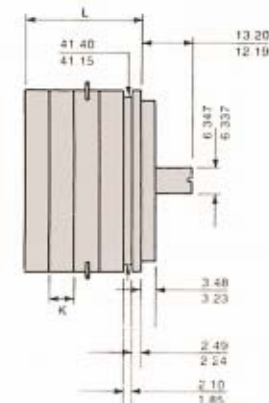
add 6.3

Potentiometer model number RCP 18

Potentiometer model number RCP 18SC



Linear function



\*Sine/cosine function

Each addition cup K-any function

Dimension L—single gang

17.8

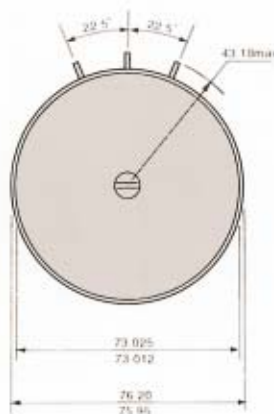
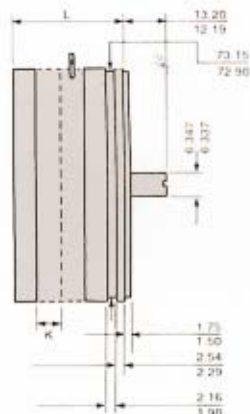
17.8

22.2

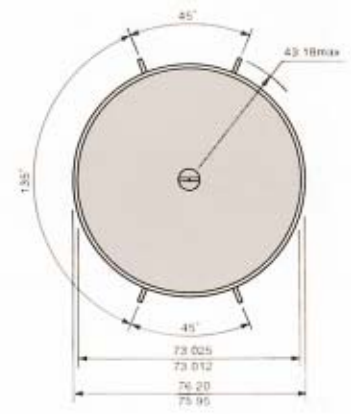
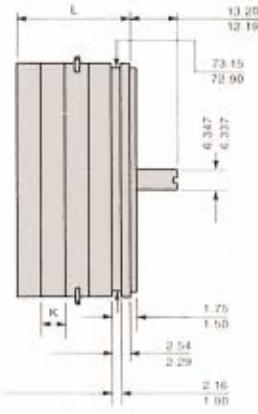
add 6.3

Potentiometer model number RCP 30

Potentiometer model number RCP 30SC



Linear function



\*Sine/cosine function

Each addition cup K-any function

Dimension L—single gang

31

31

37.3

add 6.3

All dimensions in millimetres  
\* Sine/cosine requires two cups

# PERFORMANCE SPECIFICATIONS

## Sine/cosine function potentiometers

Potentiometer model number	RCP 11SC	RCP 15SC
Body diameter	27.2mm	36.7mm
Resistance values per quadrant $\pm 20\%$	1k, 2k, 3k or 5k $\Omega$	1k, 2k, 3k, 5k or 10k $\Omega$
Conformity – % peak to peak volts	1 – 0.25%	1 – 0.2%
Power dissipation at 20°C	1.5 watt	2.0 watt
Starting torque maximum at 20°C	– sine – sine/cosine	10gm cm 20gm cm
Moment of inertia at 20°C	– sine – sine/cosine	3.4gm cm <sup>2</sup> 6.2gm cm <sup>2</sup>
Weight	– sine – sine/cosine	51gm 61gm

Potentiometer model number	RCP 18SC	RCP 30SC
Body diameter	44.56mm	76.44mm
Resistance values per quadrant $\pm 20\%$	1k, 2k, 3k, 5k or 10k $\Omega$	1k, 2k, 3k, 5k or 10k $\Omega$
Conformity – % peak to peak volts	1 – 0.2%	1 – 0.2%
Power dissipation at 20°C	3.0 watt	8.0 watt
Starting torque maximum at 20°C	– sine – sine/cosine	30gm cm 60gm cm
Moment of inertia at 20°C	– sine – sine/cosine	7.0gm cm <sup>2</sup> 14.0gm cm <sup>2</sup>
Weight	– sine – sine/cosine	150gm 170gm

### Note:

**Conformity – % peak to peak volts** is the fidelity of the relationship between the actual function and the theoretical function characteristic. It is expressed as a ratio of the difference between the measured output voltage and the theoretical output voltage at a given angle divided by the supply voltage applied across the potentiometer (pins 1 and 2) i.e.

$$\frac{V_0 - V_1}{V}$$

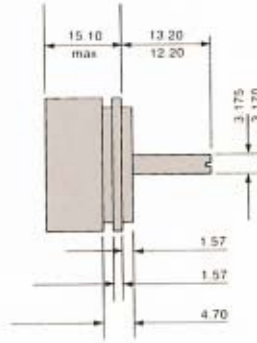
V across the potentiometer (pins 1 and 2)

**Resistance, ohms per quadrant** is measured on a standard 360° sine or sine/cosine potentiometer by measuring the resistance across the potentiometer (pins 1 and 2) as this corresponds to the quadrant resistance.

# THE MIDPOT POTENTIOMETER

## Potentiometer model number RCP 09

Resistance	±20%	5K Ω
Linearity independent		±0.35%
Electrical angle	±2°	342°
Insulation resistance at 500vd.c.		100M Ω minimum
Resistance temperature coefficient		±500 ppm
Power dissipation	at 20°C at 100°C	1.5W maximum 0.3W maximum
Dielectric strength		750V rms
Output smoothness		MIL-R-39023 Grade CO.1%
Resolution		Virtually infinite
Maximum wiper current		10mA
Mechanical angle		Continuous rotation
Starting torque		10gm cm maximum
Weight		12gm maximum
Life		>50 x 10 <sup>6</sup> rotations
Operational temperature range		-55 to +100 degrees C



Materials	Shaft	Stainless steel
	Bearing housing	Aluminium 6082 TF
	Rear cap	Nylon 66
	Bearings	Stainless steel

## SPECIAL APPLICATIONS



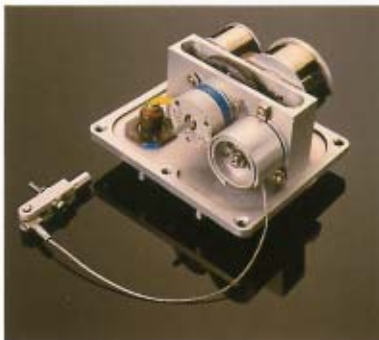
Quadruplex flight control unit



Special housings/shafts



Precision switching unit



Constant force contents transmitter



Aircraft flap and position feedback potentiometers



Special conductive plastic tracks

# ROTARY POTENTIOMETER APPLICATIONS

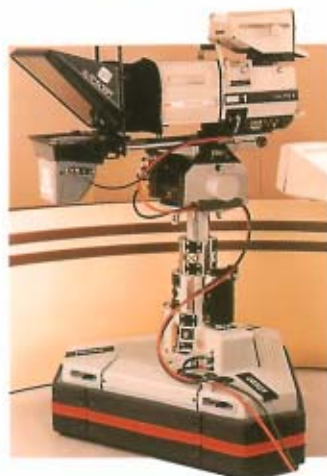
*Control and feedback*



*Position  
feedback*



*Position  
feedback*



*Position feedback*

**Whatever your application**

**- land, sea or air -**

**there is a Penny + Giles**



*Position feedback*

Distributed by:

Our engineers are always available for consultation

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