

The Electroswitch 500 Series Magnetic Encoders are built upon a contact free integrated circuit design. This encoder integrates Hall Effect sensing and digital signal processing to provide high-resolution angular measurement solutions.

An important advantage of the 500 Series is the dramatic reduction in package size to 1/2 inch, while still incorporating the performance and output options required to support the widest range of industrial and motion sensing applications.

The 500 Series design leverages its reduced part count and simplified construction to provide extremely robust, high shock and vibration resistant performance, excelling in harsh and dirty environments.

FEATURES

- Compact, Robust, 1/2" package
- High Resolution Encoding up to 1024 PPR
- Widest Temperature Range
- Absolute and Incremental Outputs
- Zero Reference Positioning
- Tachometer with Direction Sensing
- Quadrature Code Output
- RoHS Compliant
- Contact Free Magnetic Design
- 3.3 or 5.0 VDC Options

BENEFITS

- Compact Size
- Multiple Output Codes Allowing Simpler Integration With a Wider Variety of Receiving Devices
- Best Encoder Reliability
 - Longest Life
 - Excellent Performance in Harsh Environments
- Low Power Consumption

APPLICATIONS

MOTOR CONTROL DEVICES

Control of motor circuits is accomplished by linking encoder to motor shaft

- Material Handling Equipment
- Machine Tools
- Conveyor Belts
- Printing Equipment
- Elevators
- Factory Automation

FLOW CONTROL DEVICES

Fluid flow can be metered by the encoder attached to displacement turbine and other styles of meters and pumps

- Manufacturing Process Controls
- Valve and Flow controls
- Fuel Pumps

AUDIO/ENTERTAINMENT

Frequency Select for Professional and High End Audio Applications

- Mixing Consoles
- High End Amplifiers
- Lighting Controls (intensity select)

AVIONICS

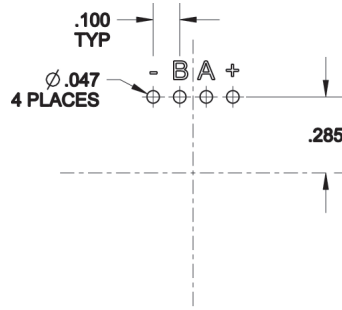
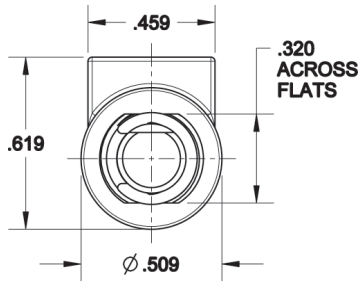
- Altitude Positioning
- Missile Firing and Guidance
- In-flight Refueling
- Auto Pilot Controls

MEDICAL

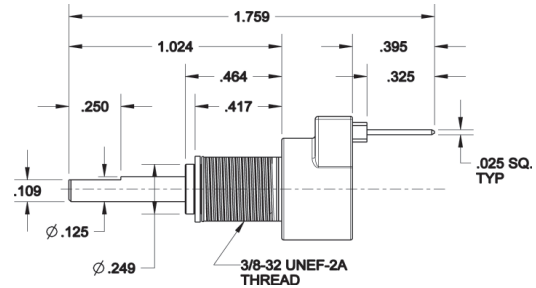
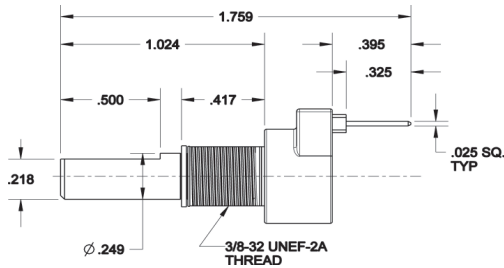
- Infusion Pump Flow
- Dispensing Equipment
- Automated Vial Sampling Equipment
- Dialysis Machines
- Ventilators

INDUSTRIAL POSITION SENSING AND POSITION CONTROL

- Off Road / Construction Equipment
- Lift Trucks
- Welding Machines



MOUNT FOOTPRINT
Quadrature Pinout Shown.
(Consult factory for Additional Pinouts)



Specifications

Electrical Specifications

Operating Voltage 4.7 to 5.7 VDC or 3.3 to 3.8 VDC
Supply Current [30 mA Max]
Logic output VCC High; 0.4 Low
Power Consumption 165mW max.

Codes:

Quadrature 32, 64, 128 or 256 PPR
Tachometer 64, 128, 256, 512 PPR (w/ direction)
Absolute 10 bit PWM (1024 PPR) *
Quadrature 32, 64, 128 or 256 PPR w/ Z channel*

Frequency [fixed] 1 μ s

Environmental Specifications

Operation Temperature -40C to +105C
Storage Temperature -55 C to +125C
Humidity MIL STD 202G Method 103B Condition A or Higher

Mechanical Specifications

Mechanical Vibration

Harmonic motion with amplitude of 15g, varied from 10 to 2000 Hz for 12 hours, per MIL STD 202G Method 204D Condition B or Higher

Mechanical Shock

100g for 6 ms half sine wave with velocity change of 12.3 ft/s, per MIL STD 202G Method 213B Condition C or Higher

Life cycles: 10M w/ sleeve bearing
Operational speed: 200 rpm max w/ sleeve bearing
Weight: 0.5 oz.

Materials:

Housing: Zinc Die Cast Alloy
Shaft: Stainless Steel
Terminal: Tin Plated

NOTE: Mounting Hardware Included

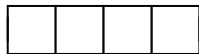
Standard Sealing: Limited Dust and Water Ingress Protection

Ordering Information

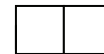
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Voltage:
5= 5 VDC

Output:
Q= Quadrature
T= Tachometer w/ direction

Resolution / PPR:
Quadrature: 0032, 0064,
0128, 0256
Tachometer 0064, 0128,
0256, 0512 (Tachometer)

Sealing:
S=Standard

Shaft Diam:
01 = .250
02 = .125

Termination:
0= Straight Pins

*Additional Options

Voltage:
3= 3.3VDC
Output:
A= Absolute (10 bit PWM)
Z= Quadrature w/ Z channel

Resolution / PPR:
Absolute: 1024
Quadrature w/ Z: 0032,
0064, 0128, 0256

Sealing:
P= Panel Seal
I=IP67

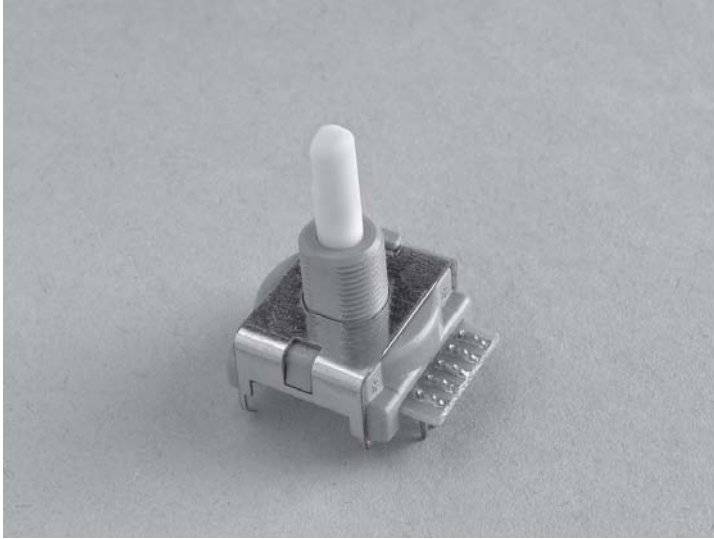
Termination:
4= 4" Cable & Connector

Example Part

505Q-0256-S010 = 500 Series Encoder, 5 volt, Quadrature, 256, no additional sealing, 1/4" diam. shaft, w/ straight pins

***Additional Options:** Contact Electroswitch for Lead-times and Minimum Order Requirements

Customization can include: Modified Shaft Lengths and Flats - Cabling Options



The Electroswitch 700 Series is the economical solution to virtually any digital encoder or potentiometer requirement. As the latest version in our new generation of rotary encoder products, the 700 Series has been freshly tooled to include resistive analog output for potentiometer applications, as well as the standard digital code for direct interface with a microprocessor. The .890" package enhances the original design concept, delivering high performance and quality levels in triple digit PPRs.

FEATURES

- Digital Codes Available: Incremental Quadrature, Absolute, Gray
- Analog Resistive Output For Use As A Potentiometer
- 5K And 10K Resistive Element Standard
- High Temperature Materials Meet 85°C Requirements
- Push button Feature
- Push to Turn Feature
- RoHs Compliant

BENEFITS

- Multiple Output Codes Allow Simpler Integration with a Wider Variety of Receiving Devices
- Encoder or Potentiometer function in same package
- Excellent Performance in Harsh Environments
- Push button Allows Dual Function with Single Shaft Input
- Low Profile Package

APPLICATIONS

Medical

- Rehab Treadmills
- X-Ray Equipment
- Cold Therapy/Compression Equipment

Audio/Music

- Volume Control
- Automotive
- Home
- Professional
- Electric Guitars

HVAC

- Temperature Control
- Fan Control

Appliance

- Electronic Range Control of Bake time
- Electronic Range Control of Temperature and Duration
- Dishwasher Control

Agriculture/Construction

- Bailer control for height and speed
- Electronic control interface

Test and Measurement

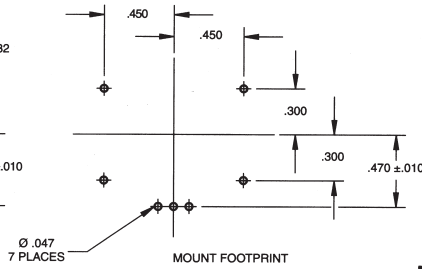
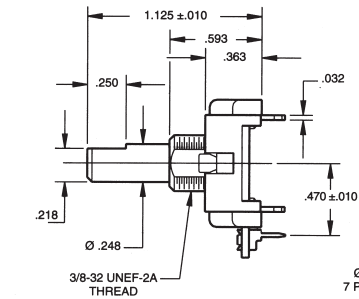
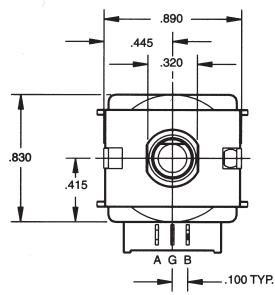
- Automotive Test Equipment

Panel Input Device

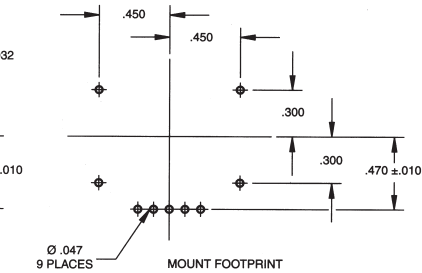
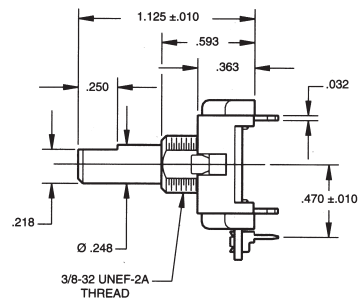
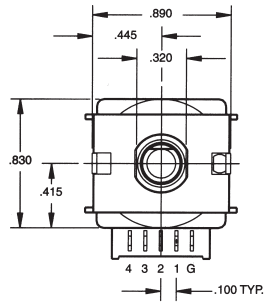
- Menu scroll and select via pushbutton

Timer Setting

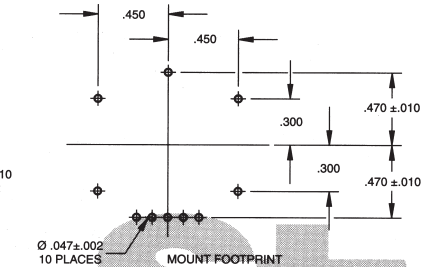
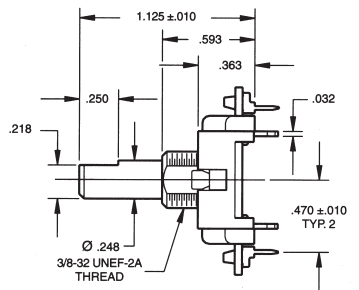
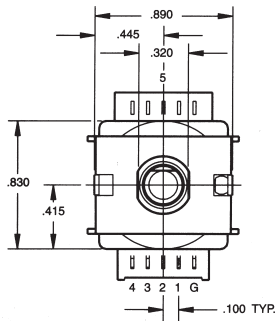
- Irrigation controls



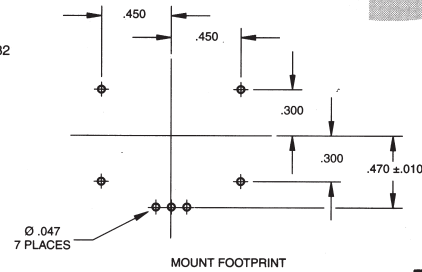
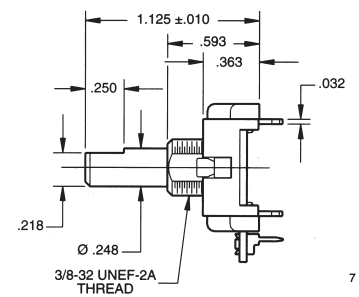
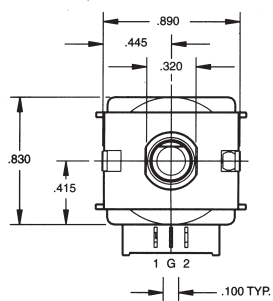
700 Series



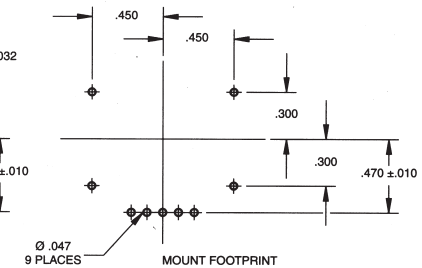
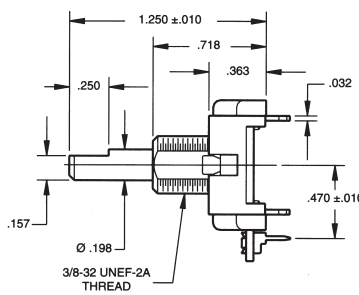
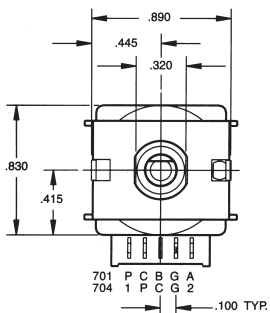
12 or 16 position 702 Series



24 or 32 position 702 Series

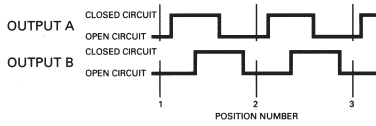


703 Series

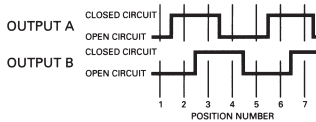


701 Series or 704 Series

QUADRATURE CODE FULL CYCLE PER DETENT (12, 16, 24 POSITION)



QUADRATURE CODE 1/4 CYCLE PER DETENT (12, 16, 24, 32, OR 36 POSITION)



QUADRATURE CODE FULL CYCLE 12, 16, 24 POSITION

SWITCH POSITIONS	OUTPUT	
	A	B
1	•	•
2	•	•
3	•	•
4	•	•
5	•	•
6	•	•
7	•	•
8	•	•
9	•	•
10	•	•
11	•	•
12	•	•
13	•	•
14	•	•
15	•	•
16	•	•
17	•	•
18	•	•
19	•	•
20	•	•
21	•	•
22	•	•
23	•	•
24	•	•

QUADRATURE CODE 1/4 CYCLE ALL POSITION

SWITCH POSITIONS	OUTPUT	
	A	B
1	•	•
2	•	•
3	•	•
4	•	•
5	•	•
6	•	•
7	•	•
8	•	•
9	•	•
10	•	•
11	•	•
12	•	•
13	•	•
14	•	•
15	•	•
16	•	•
17	•	•
18	•	•
19	•	•
20	•	•
21	•	•
22	•	•
23	•	•
24	•	•
25	•	•
26	•	•
27	•	•
28	•	•
29	•	•
30	•	•
31	•	•
32	•	•
33	•	•
34	•	•
35	•	•
36	•	•

GRAY CODE 16 POSITION (*)

SWITCH POSITIONS	OUTPUT			
	1	2	4	8
1	•	•	•	•
2	•	•	•	•
3	•	•	•	•
4	•	•	•	•
5	•	•	•	•
6	•	•	•	•
7	•	•	•	•
8	•	•	•	•
9	•	•	•	•
10	•	•	•	•
11	•	•	•	•
12	•	•	•	•
13	•	•	•	•
14	•	•	•	•
15	•	•	•	•
16	•	•	•	•

GRAY CODE 32 POSITION (**)

SWITCH POSITIONS	OUTPUT			
	1	2	4	8
17	•	•	•	•
18	•	•	•	•
19	•	•	•	•
20	•	•	•	•
21	•	•	•	•
22	•	•	•	•
23	•	•	•	•
24	•	•	•	•
25	•	•	•	•
26	•	•	•	•
27	•	•	•	•
28	•	•	•	•
29	•	•	•	•
30	•	•	•	•
31	•	•	•	•
32	•	•	•	•

• INDICATES LOGIC HIGH

* - 12 position gray code is the same as a 16 position without positions 11 through 14.

** - 24 position gray code is the same as a 32 position without positions 21 through 28.

Specifications

Current Carrying Capacity	Resistive 0.5 watt
Switching Load	1mA at 115 VAC, 15mA at 14 VDC
Shock Humidity	MIL-STD 202E
Dielectric Strength	750 volts
Contact Resistance	1 ohm typical
Contact Bounce	5 ms @ 15 RPM
Contacts	Phosphor-bronze gold interface with program board
Codes	Resistive, Quadrature, A/B, Binary, Gray
Code Program	Non-shorting typical
Operating Forces	16 position = 7.5 in.-oz. ±20%, 36 position = 4.5 in.-oz. ±20%
Life	50,000 cycles (50% loss in torque over life. High temperature operation will reduce detent life.)
Operating Temperature	-40°C to +85°C
Shaft Material	Molded plastic
Anti-Rotation Device	Flatted mounting bushing .375" dia. x .320", double "D"

Detent Angles	36°, 30°, 22.5°, 15°, 11.25°, 10°; others upon request
Molded Construction	Valox plastic rated 94 V-0 or better
Board Material	FR-4 with 1 oz. copper clad, plated
Push-Button Characteristics	Stroke: .065 ±.015
	Push-Button Force: 15 oz. max.
	Push-Button Resistance: 80 ohms max.
	Torque: 12, 24 position = 1.6 ±.3 in.-oz.
	Torque: 16 position = 2 ±.3 in.-oz.
	Torque: 32, 36 position = 1.2 ±.3 in.-oz.
	Contact Resistance: 5 ohms max.
	Contact Bounces: 5 ms max. @ 15 RPM
	Push-Button Life: minimum 250,000 operations

Ordering Information

Code

700: Quadrature
701: Quadrature with Push-button
702: Absolute
703: Resistive
704: Resistive with Push-button

Electrical Cycles or Resistive Value

700: 06, 08, 09, 12, 16, 24, 32 or 36
701: 06, 08, 09, 12, 16, 24, 32 or 36
702: 01
703: 05K or 10K
704: 05K or 10K

Number of Detent Positions

700: 12, 16, 24, 32, 36 or 00: No Detents
701: 12, 16, 24, 32, 36 or 00: No Detents
702: 12, 16, 24, or 32
703: 00: No Detents
704: 00: No Detents

701

08

32

700 Series Standard Offerings

700-09-36	701-08-32	702-01-12	703-05-00	704-05-00
700-16-16	701-04-16	702-01-16	703-10-00	704-10-00
700-24-24	701-06-24	702-01-24		

Features:

- Robust .865" Square Package
- Strong Electron Welded PC Terminations
- Dual and Tri-Concentric Shaft Option
- Enclosed High Temperature Design
- Push Button Feature Option
- Precious Metal Contacts
- Contacts Insert Molded

Benefits:

- Compact Size
- Easy Insertion into PCB
- Multiple Functions Save Panel Space
- Wave Solder Applications
- Addition of Push button allows Scroll and Select Function
- Long Service Life of over 50,000 cycles with Low Contact Resistance
- Maximum Switch Position Accuracy

MM Series Applications

Avionics:

- Radio Channel Select
- Auto Pilot Select
- Fuel / Air data systems
- Flight Simulators

Communication Equipment:

- GPS—Co-ordinates Input
- Military and Commercial Radio Channel Select

Medical:

- Defibrillators — Voltage Control
- X-Ray Equipment—Intensity Input

Construction / Agricultural Equipment

- Combine Platform Height Select
- HVAC Cab Controls

Test Equipment

- Oscilloscopes—Scale Input Control



Front facing PC terminals option

Electroswitch MM Series

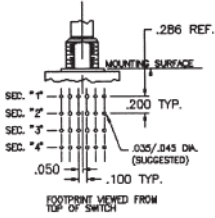
Dual Concentric with optional Pushbutton



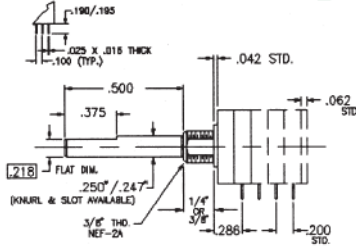
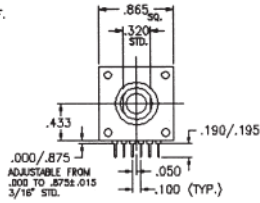
The MM Series represents the best in contemporary rotary technology and reflects the high standards of reliability that have made Electroswitch rotary devices known worldwide. At only .86" square, these compact switches have up to 36 positions and adapt to numerous design requirements.

Durable construction and an enclosed, high temperature resistant design make the MM Series ideal for wave solder applications. Contacts are insert molded in place for lifetime performance and switching accuracy.

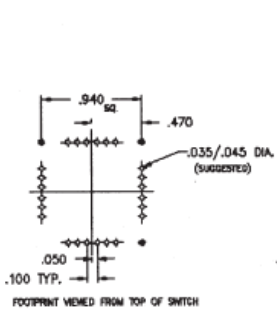
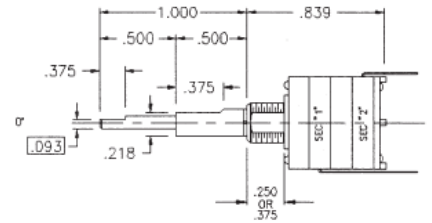
Available options include concentric shafts as well as shaft and panel seals. These switches are highly versatile and economically customized. These options help make the MM Series a cost effective solution for a wide range of applications.



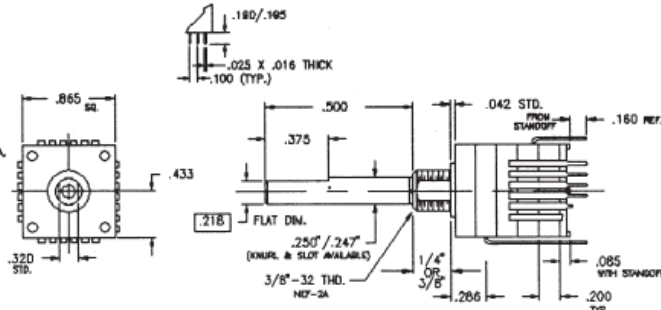
Parallel Shaft Mounting (relative to PC Board)



Perpendicular Shaft Mounting (relative to PC Board)



Perpendicular Shaft Mounting (relative to PC Board)



Shaft and Bushing Options			
Suffix	Shaft Diam	Shaft Lgh. From End of Bushing	Bush Lgh
01	.125"	.375"	.250"
02	.125"	.375"	.375"
03	.125"	.500"	.250"
04	.125"	.500"	.375"
05	.125"	.750"	.250"
06	.125"	.750"	.375"
07	.125"	1.00"	.250"
08	.125"	1.00"	.375"
09	.250"	.375"	.250"
10	.250"	.375"	.375"
11	.250"	.500"	.250"
12	.250"	.500"	.375"
13	.250"	.750"	.250"
14	.250"	.750"	.375"
15	.250"	1.00"	.250"
16	.250"	1.00"	.375"

Ordering Information

MM	—								
Number of Decks	Number of Positions	Code Output: G = Gray Q = Quadrature H = Hexidecimal * B = BCD * * = optional	Termination: F = Front PC R = Rear PC P = Perpendicular PC L = Solder Lug	Index Angle: 90°, 60°, 45° 36°, 30° 22.5°, 20° 18°, 15° 12.8°, 11.25° 10°	Stop Type: F = Fixed C = Continuous	Sealing: S = Standard (No Seals) P = Shaft and Panel	See chart Above for Suffix	Consult Factory for Additional Available Options	

Electrical / Mechanical Specifications

Electrical Specifications

Current Carrying Capacity: Resistive Load 250 mA at 28 VDC
Switching Loads 1.5 mA at 115VAC
150 mA at 14 VDC

Contact Design: Shorting or Non-shorting (non-shorting version up to 16 positions only)

Dielectric Strength: From pole to shaft 1,000 volts minimum

Contact Resistance: 75 milliohms maximum over lifetime.

Codes: Gray, Quadrature, BCD and Hexidecimal
Others available for special order

Environmental Specifications

Operation Temperature: -55°C to +85°C (105°C optional)

Shock / Humidity: MIL STD 202E Method

Mechanical Specifications

Operational Forces: (Torque over detents): 7 to 20in/oz. ±25%

Stop Strength: 15 in/lb. minimum

Sealing: Terminals are insert molded into housing. Front and rear molded sections of module are Interlock construction and ideally suited for wave soldering.

Anti-Rotation Device: Flatted bushing .375" dia. X .320", double "D"

Concentric Shafts: Available

Life: 50,000 minimum cycles at rated load

Detent Angles: 90°, 60°, 45°, 36°, 30°, 22.5°, 20°, 18°, 15°, 12.8°, 11.25°, 10°

Materials (RoHS Compliant)

Shaft and Hardware: Shafts and Hardware are steel, zinc and chromate treated.

Molded Construction: Molded parts are Ryton R4 and Polyester PBT, chosen for heat resistance and electrical characteristics. Rated UL 94 V-O or better

Disc Construction: Program Disc is glass epoxy, copper clad with silver plating standard. Gold upon request.

Contacts: Phosphor-bronze with silver inlay at interface with program disc. Gold inlays available upon request. External terminals are tin plated except on die cut edges.

