700 SERIES
MECHANICAL ENCODERS

FEATURES

- Digital Codes Available:
  Incremental: A/B or Quadrature
  Absolute: Binary or Gray
- Up to 98 pulses per revolution (PPR)
- Analog resistive output for use as a potentiometer
- High temperature materials meet 85° requirements
- Push button feature allows dual function with single shaft input

The 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 the triple digit PPMs.

Electroswitch leads the market in rotational torque management for encoders. Our process includes digital maps to ensure repeatable and quantitative measurement.

Newly introduced in the 700 Series in an integrated push-button, which permits two functions in a single shaft. This feature provides system cost savings and user-friendly interface for input selection. The push-button feature is offered in the same package size as the standard 700, with a complete interface for scrolling through a menu and making a selection.

The 700 Series features a wide range of standard configurations to fulfill most needs. As with standard product, customized versions for volume applications also benefit from Electroswitch's cost-effective, automated production processes to build in quality performance.

APPLICATIONS



TIMER AND TEMPERATURE SELECTION
Incremental output codes are ideal for scroll functions required for input devices. Resistive output for temperature input selection.



HVAC TEMPERATURE AND FAN CONTROL
Digital or analog output for temperature with direct drive to display and fan control for automotive use.



ELECTRONIC RANGE CONTROL
Control of bake time, temperature and duration in residential and commercial applications.



PANEL INPUT DEVICE
Used to scroll through menu via shaft rotation; for selecting menu item via push-button.



AUDIO INPUT
Volume control for all amplifier applications; automotive, musical, home, and professional.

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700 Series Application Notes

With the introduction of the 700 Series Mechanical Encoder and Potentiometer, Electroswitch delivers a low cost, multifunctional rotary interface with repeatable torque and 'feel' to match the user's needs.

New to the 700 Series is the addition of resistive (analog) output. Therefore, users have the unprecedented option of choosing between two types of outputs; digital or resistive. The digital outputs are available in absolute or incremental code, and reflect Electroswitch's many years of technological expertise in this area. The resistive outputs are available in 5K or 10K linear tapers; custom outputs can be developed upon request. All of these variations are offered in the same package size and may be used in any combination. The typical absolute code is either gray or binary. The four or five bit output gray code provides the benefit of only one bit change per change of state.

The incremental output code is known as an A/B counting code. As the shaft is rotated, two wave forms are generated and the A/B code 'counts' these pulses, sending them to the microprocessor to determine a 'relative' position. The counts or pulses continue with the rotation of the shaft, which allows the position to change infinitely, or as the microprocessor allows. Direction may be determined by analyzing the phase difference between the two channels.

The A/B code is also known as a quadrature. In full quadrature, each change of state in the two waveforms is counted, providing the highest form of resolution at 4 counts per cycle. In half quadrature, only the changes of state in one wave form are counted, providing 2 counts per cycle. While in quarter quadrature, only the rise in one wave form is counted, providing 1 count per cycle.

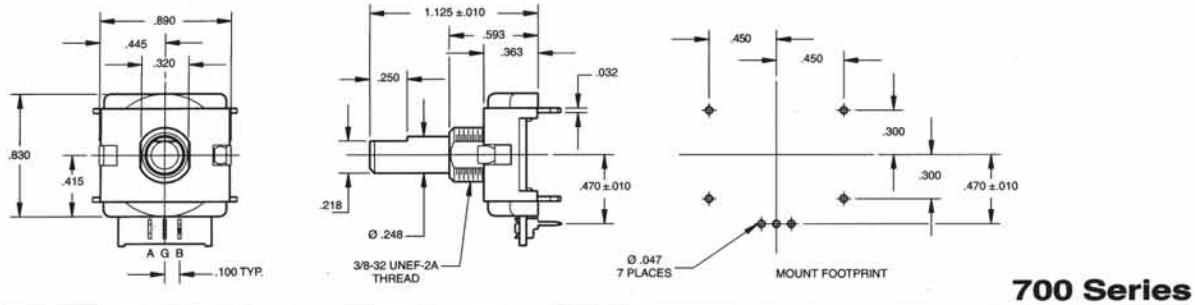
The 700 Series features 12, 16, 24, 32 or 36 mechanical detent positions that provide up to 36 electrical outputs per revolution in standard offering. Without mechanical detents, the resolution per rotation can be much higher. Electroswitch offers up to 96 electrical outputs per revolution in this non-detented method in custom applications.

Several options within the 700 Series make it unique and a valuable choice for any user. Our push-button feature allows two functions to be controlled by one shaft. By integrating the push-button function into its standard design, Electroswitch has been able to keep the package size the same for all of the 700 Series products. This push-button feature is ideal for scrolling and select functions, or to incorporate an on-off option in one rotary package size.

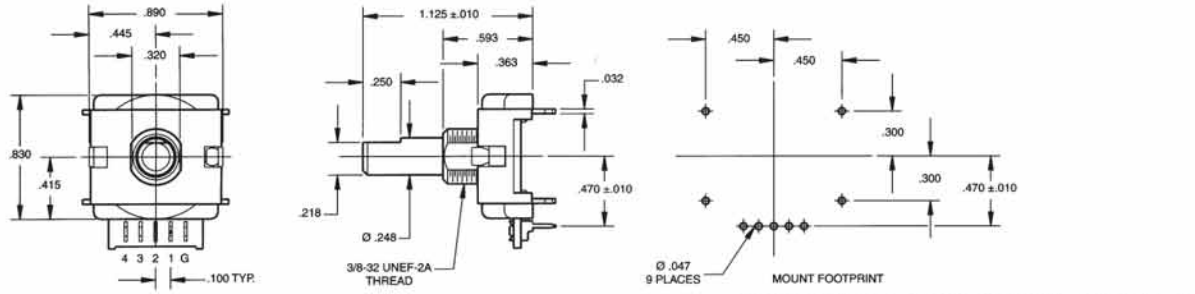
Standard mounting configuration is shaft perpendicular to the mounting board, with a bracket for additional mounting strength.

Applications

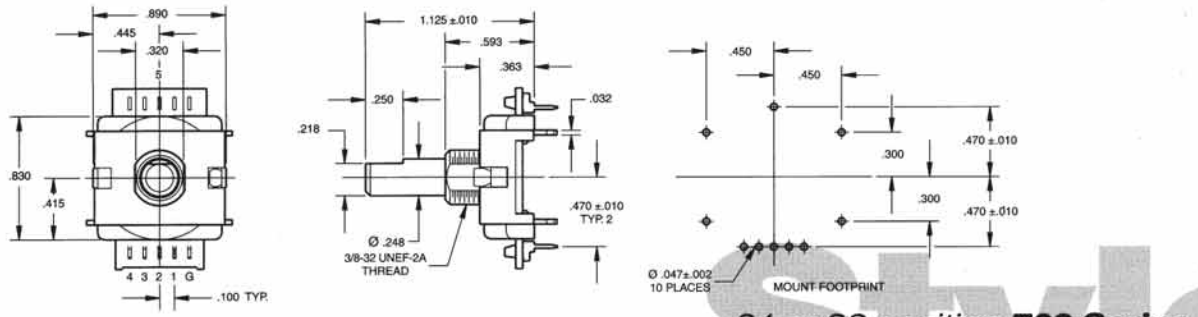
700 Series Encoder Configurations



700 Series

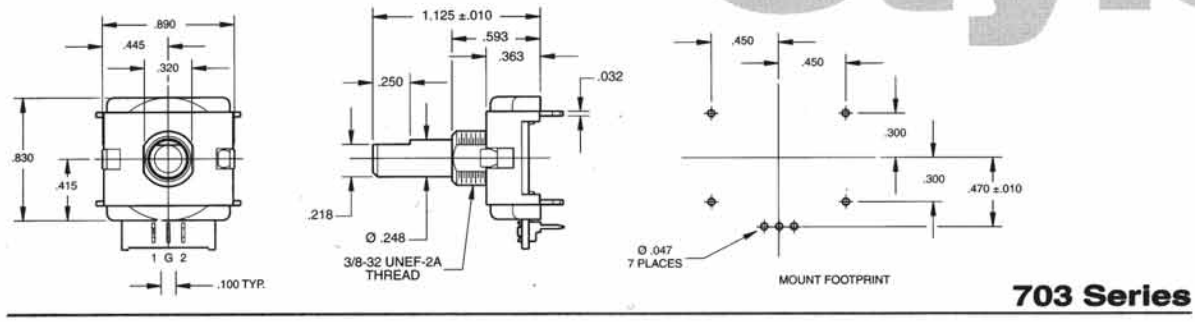


12 or 16 position **702 Series**

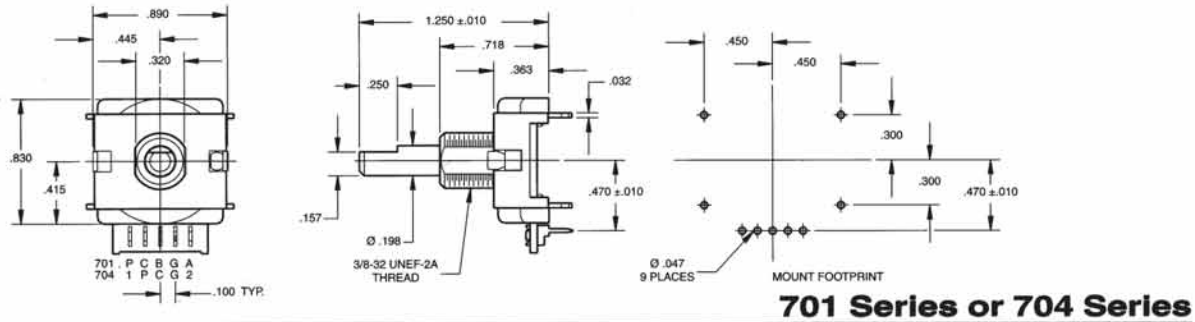


24 or 32 position **702 Series**

Styles



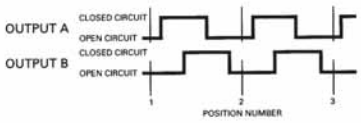
703 Series



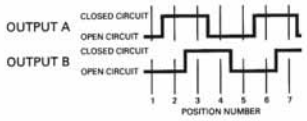
701 Series or 704 Series

Truth and Output Tables

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	OUTPUT B
1		•
	•	•
	•	
2		
	•	
	•	•
	•	
3		
	•	
	•	•
	•	
4		
24		•

QUADRATURE CODE
1/4 CYCLE
ALL POSITION

SWITCH POSITIONS	OUTPUT A	OUTPUT B
1		
2	•	
3	•	•
4		•
5		
6	•	
7	•	•
8		•
9		
10	•	
11	•	•
12		•
13		
XX	•	•
36		•

• INDICATES LOGIC LOW

GRAY CODE
16 POSITION (*)

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

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

GRAY CODE
32 POSITION (**)

SWITCH POSITIONS	OUTPUT 1	2	4	8	16
17				•	•
18	•			•	•
19	•	•		•	•
20		•		•	•
21		•	•	•	•
22	•	•	•	•	•
23	•		•	•	•
24			•	•	•
25			•		•
26	•		•		•
27	•	•	•		•
28		•	•		•
29		•			•
30	•	•			•
31	•				•
32					•

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

Ordering the 700 Series Encoder

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		

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

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