



Optical Encoders

SERIES 60AD

Optical Encoder with integrated Joystick and Pushbutton

FEATURES

- Dome contacts provide excellent tactile feedback in all directions
- Choices of actuation force, cable length and termination
- Customized solutions available

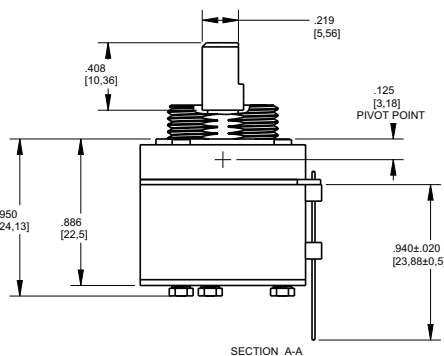
APPLICATIONS

- Aerospace
- Automotive
- Medical devices

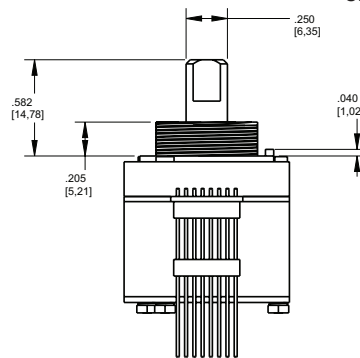
DIMENSIONS in inches (and millimeters)



Pin Version

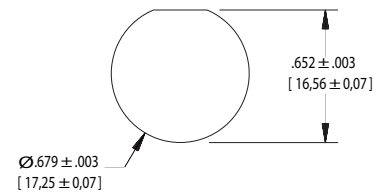


SECTION A-A

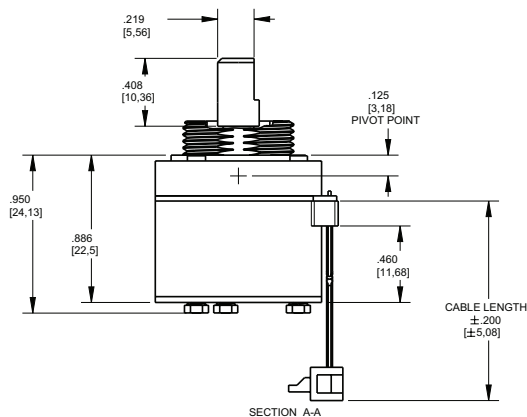


Unless otherwise specified, standard tolerance are:
Linear $\pm .025$
Diameter $\pm .010$
Angle $\pm 2.0^\circ$

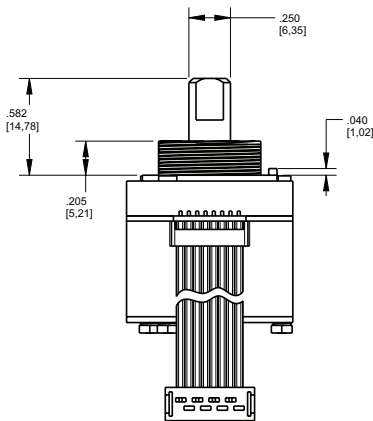
Recommended Panel Cut Out



Cable Connector Version



SECTION A-A



Connector: Amp 215083-8
Mating Connector: Amp 215079-8

ORDERING INFORMATION

Angle of Throw: 18= 18° or 20 positions
Joystick: 4= Four contacts & directions;
8= Four contacts & eight directions

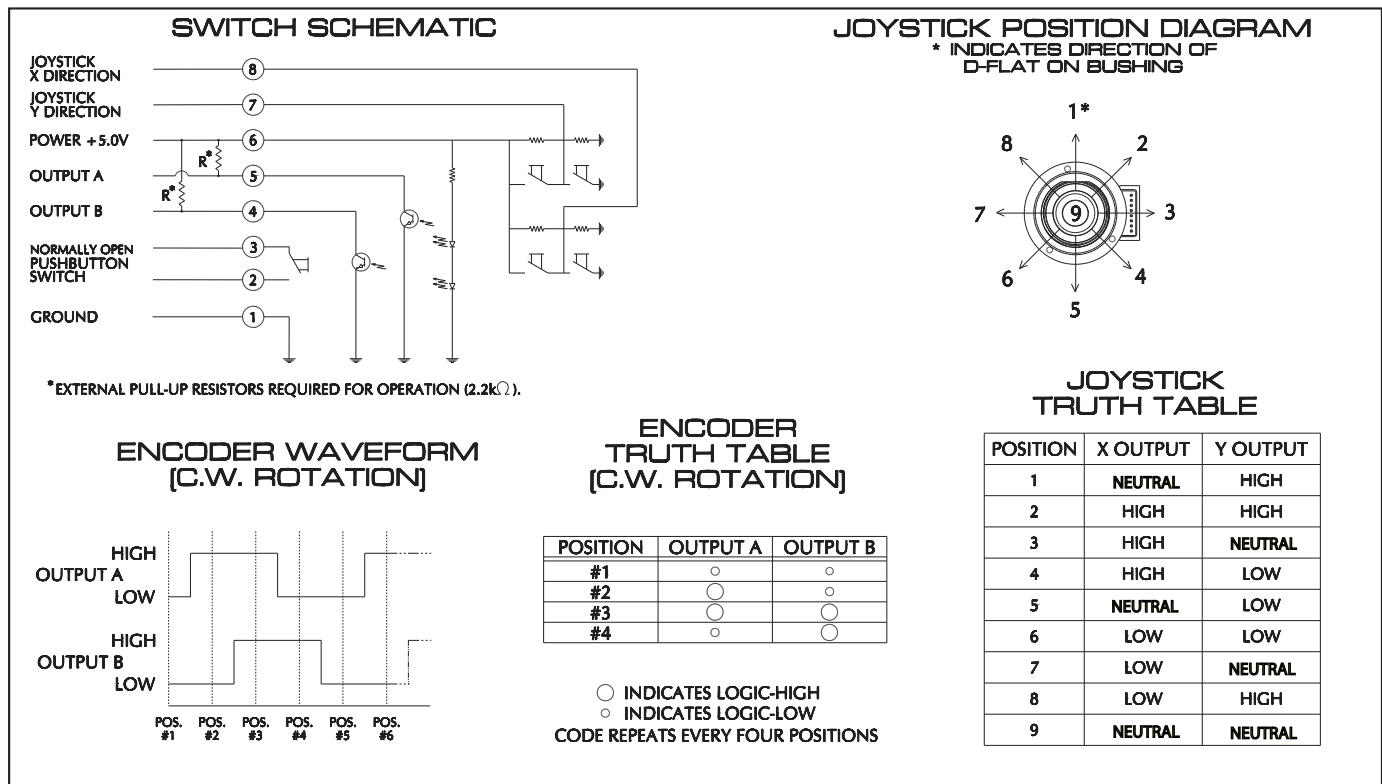
60AD18-4-M-060S

Termination: 0.050" center P= pin header; C= connector; S= stripped cable
Cable Length: 020 thru 250 in 1/2 inch increments, 060= 6.0 inch cable
Force Option: (see table) L=low, M=medium, H=high

	OPTION		
	L	M	H
1 ACTUATION FORCE (JOYSTICK) [g]	550±200	725±200	1050±250
2 ACTUATION FORCE (PUSHBUTTON) [g]	625±200	800±200	1100±250
3 AVERAGE ROTATIONAL TORQUE [in-oz]	1.50±0.75	3.50±1.75	5.00±2.00

For prices and custom configurations, contact a local sales office, an authorized distributor, or Grayhill's sales department.

JOYSTICK OPERATION + ENCODER WAVEFORM AND TRUTH TABLE Standard Quadrature 2-Bit Code



SPECIFICATIONS

Rotary Specifications

Operating Voltage: 5.00 \pm 0.25 Vdc**Supply Current:** 20mA max at 5 Vdc**Minimum Sink Current:** 2.0mA at 5 Vdc**Power Consumption:** 100 mW max at 5 Vdc**Output:** Open collector phototransistor, 2.2k Ω external pull-up resistors are required**Output Code:** 2-Bit quadrature, channel A leads channel B by 90° in clockwise rotation**Logic Output Characteristics:**

High: No less than 3.5 Vdc

Low: No greater than 1.0 Vdc

Mechanical Life: 1 million rotational cycles (through all positions and a full return)**Rotational Torque:** see table**Maximum Rotational Speed:** 100 RPM**Mounting Torque:** 15 in-lbs. maximum**Shaft Push/Pull Out Force:** 45 lbs min.**Shaft Side-Load Force:** 20 lbs. max.**Terminal Strength:** 15 lbs pull-out force min.

Pushbutton Specifications

Rating: 10 mA at 5 Vdc resistive**Contact Resistance:** less than 10 ohms**Contact Bounce:** < 4ms make, <10 ms break**Mechanical Life:** 1 million actuations min.**Actuation Force:** see table**Pushbutton Travel:** .027 \pm .010 in.

Joystick Specifications

Supply Current: 5mA max**Output Code:** 2-Bit**Logic Output Characteristics:**Neutral Position: 2.5 \pm 0.5 Vdc

High-State Position: >4.5 Vdc

Low-State Position: <0.5 Vdc

Mechanical Life: 500k cycles min.**Actuation Force:** see table**Angle of Throw:** 3.5° +2°/-1°

Environmental Ratings

Operating Temp. Range: -40°C to 85°C**Storage Temp. Range:** -55°C to 100°C**Relative Humidity:** 96 hours at 90-95% humidity at 40°C**Vibration:** Harmonic motion with amplitude of 15g, within 10 to 2000 Hz for 12 hours**Mechanical Shock:**

Test 1: 100g for 6ms half-sine wave with a velocity change of 12.3 ft/s

Test 2: 100g for 6ms sawtooth wave with a velocity change of 9.7 ft/s

Materials and Finishes

Shaft: Nylon 6/10**Solder:** 95.5% SN, 3% AG, 0.5% CU

This product series is ROHS Compliant.

OPTIONS

Contact Grayhill for custom terminations, rotational torque, number of positions, shaft configurations, and resolutions.