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

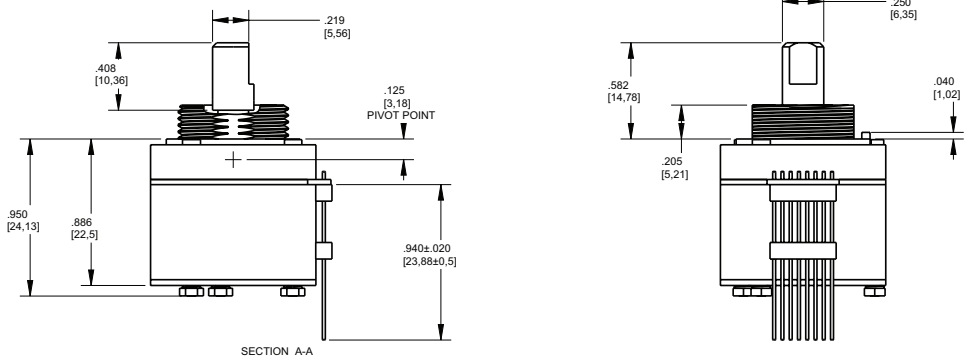
APPLICATIONS

- Aerospace
- Automotive
- Medical devices

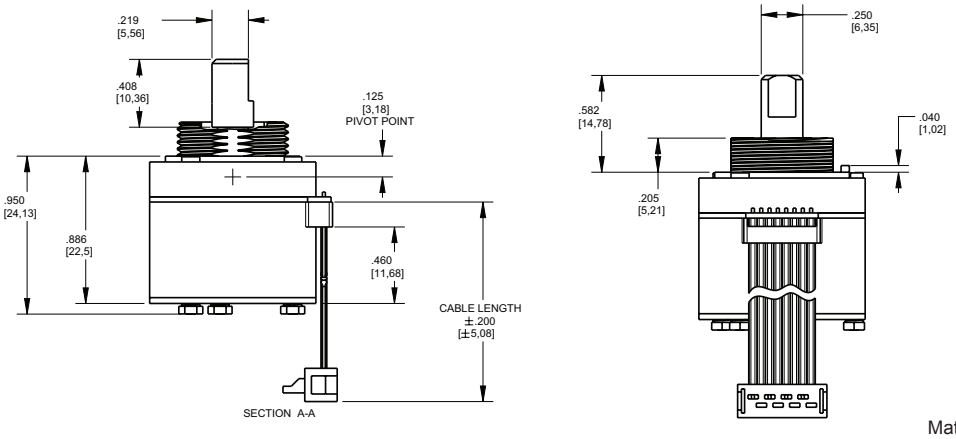
DIMENSIONS in inches (and millimeters)

Unless otherwise specified, standard tolerance are:
Linear ± .025
Diameter ± .010
Angle ± 2.0°

Pin Version



Cable Connector Version



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

ORDERING INFORMATION

60AD18-4-M-060S

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

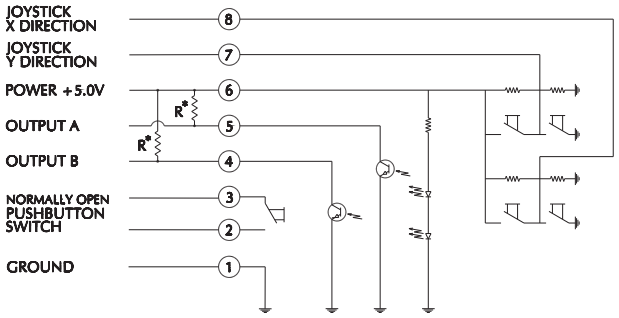
Termination: 0.050" center P= pin header; C= connector; S= stripped cable
Cable Length: 020 thru 250 in 1/2 inch increments, 060= 6.0 inch cable
Force Option: (see table) L=low, M=medium, H=high

		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

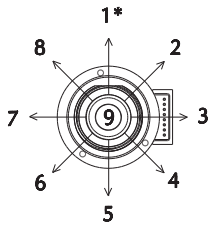
SWITCH SCHEMATIC



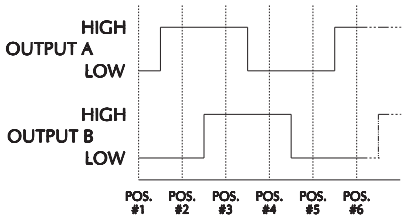
*EXTERNAL PULL-UP RESISTORS REQUIRED FOR OPERATION (2.2kΩ).

JOYSTICK POSITION DIAGRAM

* INDICATES DIRECTION OF D-FLAT ON BUSHING



ENCODER WAVEFORM (C.W. ROTATION)



ENCODER TRUTH TABLE (C.W. ROTATION)

POSITION	OUTPUT A	OUTPUT B
#1	○	○
#2	◯	○
#3	◯	◯
#4	○	◯

◯ INDICATES LOGIC-HIGH
○ INDICATES LOGIC-LOW
CODE REPEATS EVERY FOUR POSITIONS

JOYSTICK TRUTH TABLE

POSITION	X OUTPUT	Y OUTPUT
1	NEUTRAL	HIGH
2	HIGH	HIGH
3	HIGH	NEUTRAL
4	HIGH	LOW
5	NEUTRAL	LOW
6	LOW	LOW
7	LOW	NEUTRAL
8	LOW	HIGH
9	NEUTRAL	NEUTRAL

SPECIFICATIONS

Rotary Specifications

Operating Voltage: 5.00 ± 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 ± .010 in.

Joystick Specifications

Supply Current: 5mA max
Output Code: 2-Bit
Logic Output Characteristics:
Neutral Position: 2.5 ± 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

Detent Housing: Nylon 6/10
Shaft: Nylon 6/10
Shaft Insert: 303 stainless steel
Joystick Housing: Nylon 6,10
Centering Plate: Nylon 6,10
Detent Balls: Carbon steel
Detent Springs: Music wire
Dome Contacts: Stainless steel
Dome Housings: Polycarbonate over brass-lead frame
Dome Retainers: Nylon 6,0; 30% glass-filled
Joystick Actuators: Polyphthalamide; 50% glass filled
Pushbutton Dome Retainer: Polycarbonate
Printed Circuit Board: NEMA grade FR-4. Glass-cloth epoxy, double clad with copper
Infrared Emitter: Gallium arsenide
Phototransistor: Planar silicon
Resistors: Metal oxide on ceramic substrate
Solder: 95.5% SN, 3% AG, 0.5% CU

OPTIONS

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

Unikeyic Electronics

Global Electronic Components Distributor

Click to view pricing, inventory, delivery, and lifecycle information:

grayhill:

05001-02N 12C1087-1 34BWSP52B4M7QT 87Z3004-8 94HAB16JT M3786/4-3868 11K5014-KCNB 56D30-01-1-AJS 78J01T 84BB-0005-A 76PSB02ST 84BB-0009-A 25LB18-Q 30B1012-9 44M45-01-1-04N 56SDP36-01-2-AJS 10C1015-1 76P02 4001 84BB-0303-B 56SDP30-01-2-AJS 71BDF30-04QAJN 76PSB04ST 50D60-01-1-AJN 50M60-01-1-05N 39-701 76HPSB08GWRT 30-100 68B-105-0 71B30-01-4-02N