



Optical Encoders

SERIES 60A Joystick

FEATURES

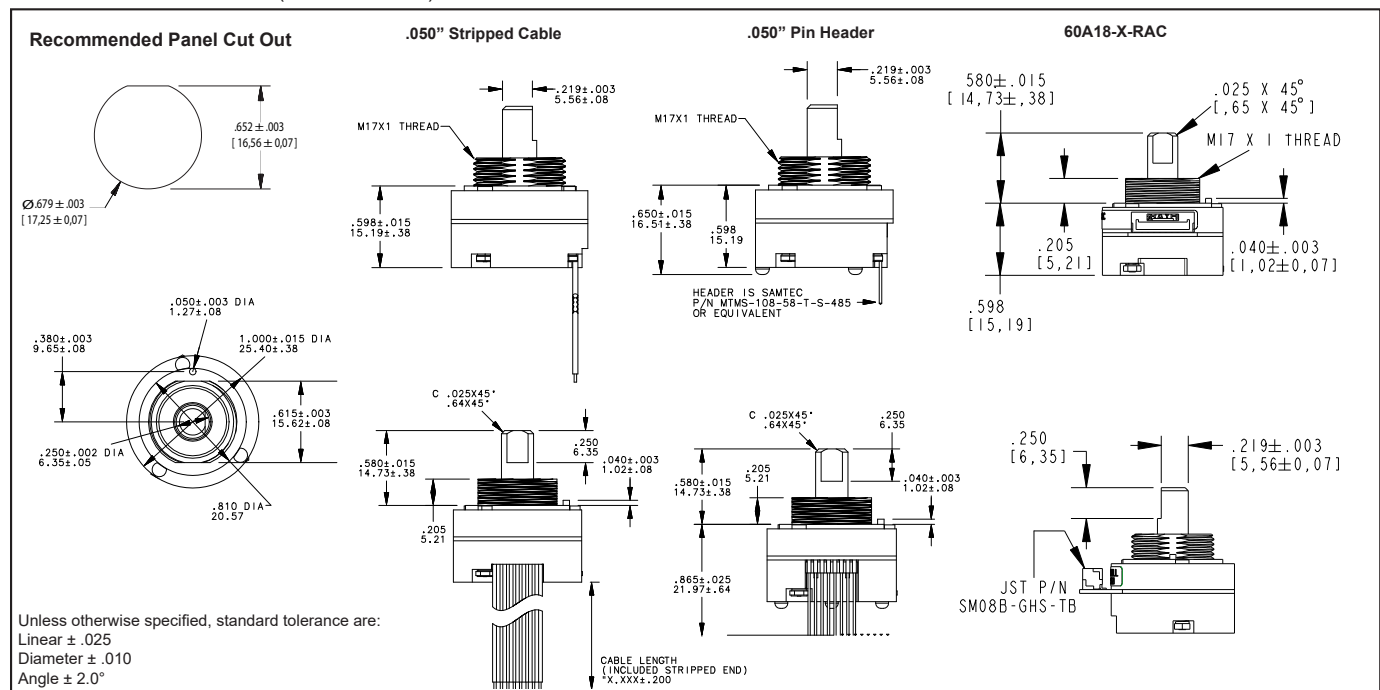
- Optical Encoder, Pushbutton, and Joystick in One Shaft
- Long Life, High Reliability
- Compatible with CMOS, HCMOS, and TTL Logic
- Choices of Cable Length and Termination
- Customized Solutions Available

APPLICATIONS

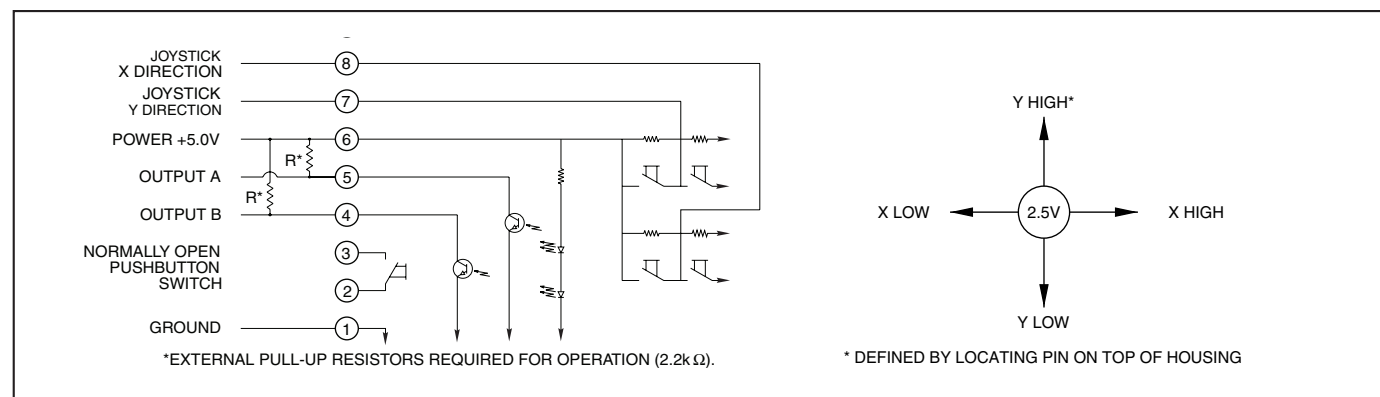
- Global Positioning/Driver Information Systems
- Medical Equipment Control
- Radio Control
- Robotics
- Commercial Appliances



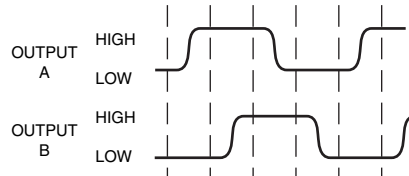
DIMENSIONS in inches (and millimeters)



CIRCUITRY AND JOYSTICK OPERATION Standard Quadrature 2-Bit Code



WAVEFORM AND TRUTH TABLE Standard Quadrature 2-Bit Code



Clockwise Rotation		
Position	Output A	Output B
1		
2	•	
3	•	•
4		•

• Indicates logic high; blank indicates logic low. Code repeats every 4 positions.

SPECIFICATIONS

Rotary Electrical and Mechanical Ratings

Operating Voltage: 5.00 ± 0.25 Vdc

Supply Current: 20 mA maximum at 5 Vdc

Output: Open collector phototransistor.

External pull up resistors are required

Output Code: 2-Bit quadrature, channel A leads channel B by 90° electrically during clockwise rotation of the shaft

Logic Output Characteristics:

High: No less than 3.5 Vdc

Low: No greater than 1.0 Vdc

Minimum Sink Current: 2.0 mA

Power Consumption: 100 mW maximum

Mechanical Life: 1 million rotational cycles of operation (1 cycle is a rotation through all positions and a full return)

Average Rotational Torque: 2.0 ± 1.0 in-oz initially, torque shall be within 50% of initial value throughout life

Mounting Torque: 15 in-lbs. maximum

Shaft Push-Out Force: 45 lbs minimum

Shaft Pull-Out Force: 45 lbs minimum

Shaft Side-Load Force: 20 lbs max.

Terminal Strength: 15 lbs terminal pull-out force minimum for cabled and header termination

Solderability: 95% free of pin holes and voids

Actuation Force: 400 ± 150 grams force

Shaft Travel: 0.020 ± 0.010 inches

Joystick Electrical and Mechanical Ratings

Supply Current: 5 mA maximum

Output Code: 2-Bit

Logic Output Characteristics:

Neutral: 2.5 ± 0.5 Vdc

High: > 4.5 Vdc

Low: < 0.5 Vdc

Angle of Throw: $8^\circ \pm 2^\circ$ in all directions

Life: 500,000 actuations in each direction

Environmental Ratings

Operating Temperature Range: -40°C to 85°C

Storage Temperature 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 a varied 10 to 2000 Hz frequency 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: Polyamide polymer (nylon 6/10 alloy) with stainless steel insert

Cable: Copper stranded with plating in PVC insulation

Connector: PA 4.6 with tin over nickel plated phosphor bronze

Lockwashers: Stainless steel with passivate finish

Hex Nuts: 303 Stainless steel

Solder: Sn/Ag/Cu, Lead-Free, No Clean

Mounting Nut: Polyurethane

This product series is ROHS Compliant.

OPTIONS

Contact Grayhill for custom terminations, rotational torque, number of positions, shaft configurations, and resolutions. Control knobs are also available.

Pushbutton Electrical and Mechanical Ratings

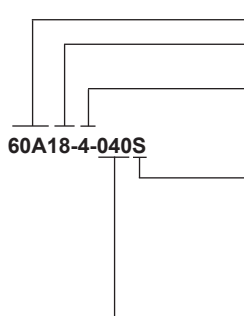
Rating: 10 mA at 5 Vdc resistive

Contact Resistance: less than 10 ohms

Life: 1 million actuations minimum

Contact Bounce: < 4 mS make, 10 mS break

ORDERING INFORMATION

	Series	
	Angle of Throw:	Detent: 18 = 18° or 20 positions; Non-detent: 08 = 18° or 20 positions; Non-Turn: 00 = Joystick and Pushbutton only
	Joystick Contacts:	2 = 2 Discrete Contacts 4 = 4 Discrete Contacts 8 = 4 Contacts in 8 possible directions
	Termination:	S = 4.0in Stripped cable; .050" centers; C = 4.0in Cable with Amp Connector P/N 215083-8; .050" centers; (See Amp Mateability Guide for mating connector details) P = Pins; .050" centers RAC = Right Angle Connector: JST SM08B-GHS-TB(LF)(SN); .050" centers (See JST Connector Guide for mating connector details)
	Cable Length:	020 = 2in. 030 = 3in. 040 = 4in. 050 = 5in. 060 = 6in. 080 = 8in. 100 = 10in. 120 = 12.5in. *Eliminate cable length if ordering "P" or "RAC" termination option

*60A18-4-RAC available as standard P/N, for additional options, please contact Grayhill



60A18-X-RAC