

SERIES 60AR

Rugged and Sealed Joystick

FEATURES

- Three-in-One Joystick, Optical Encoder and Pushbutton
- Shaft and panel sealed to IP67 against liquids and particulates
- Choices of knobs, cable length and termination
- Customized solutions available

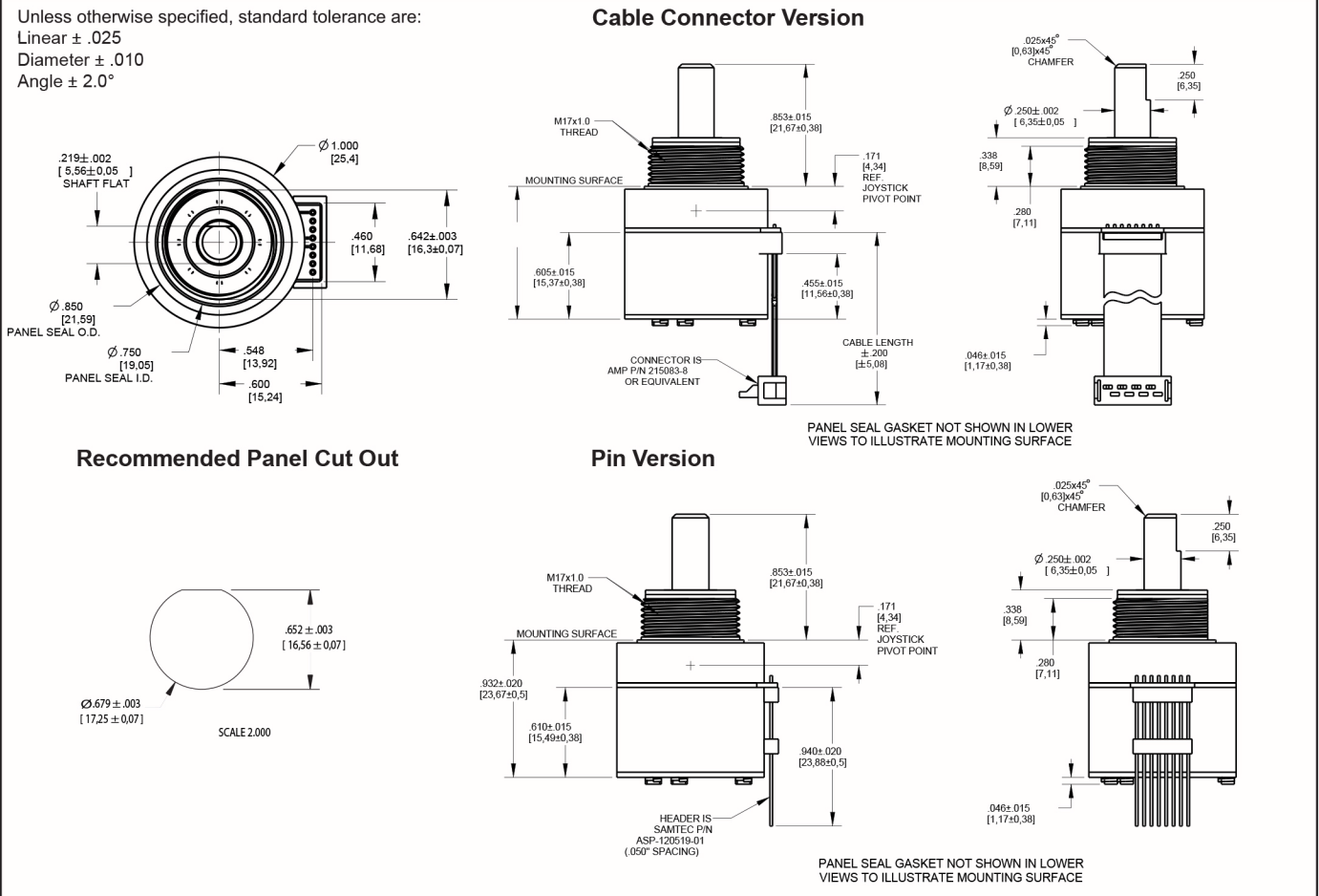
APPLICATIONS

- Aerospace
- Military vehicles and devices
- Mobile electronics for outdoor use



DIMENSIONS in inches (and millimeters)

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



ORDERING INFORMATION

60AR18-4-060S

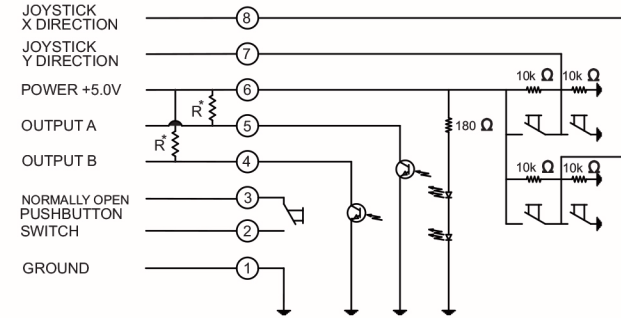
Angle of Throw: 18= 18° or 20 positions, 08= Non-detent or 20 positions, 00= Non-turn
Joystick: 4= Four contacts & four directions; 8= Four contacts & eight directions

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, leave blank if pinned

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

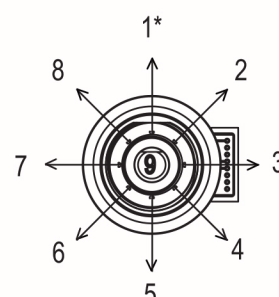
JOYSTICK OPERATION + ENCODER WAVEFORM AND TRUTH TABLE Standard Quadrature 2-Bit Code

SWITCH SCHEMATIC

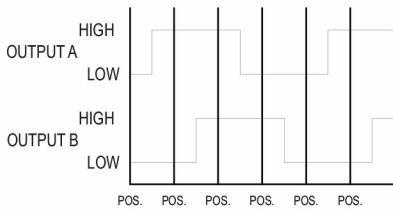


*EXTERNAL PULL-UP RESISTORS REQUIRED FOR OPERATION (2.2k Ω).

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	2.5	HIGH
2	HIGH	HIGH
3	HIGH	2.5
4	HIGH	LOW
5	2.5	LOW
6	LOW	LOW
7	LOW	2.5
8	LOW	HIGH
9	2.5	2.5

SPECIFICATIONS

Environmental Specifications

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

Storage Temperature Range: -40°C to 100°C

Humidity: 96 hours at 90-95% humidity at 40°C

Mechanical 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 velocity change of 12.3 ft/s.

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

Shaft and panel Seal: IP67, 1 meter submersion for 30 minutes

Joystick Electrical & Mechanical Specifications

Supply Current: 5 Ma, maximum

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 (Joystick): 500k actuations, minimum in each direction

Actuation Force (Joystick): 1320±660g (X&Y directions only)

Angle of Throw: 4.0°±1.5° (X&Y directions only, at electrical contact)

Pushbutton Electrical & Mechanical Specifications Rating:

10 Ma at 5 Vdc, resistive

Contact Resistance: Less than 10 Ω

Contact Bounce: <4 Ms make, <10 Ms break

Mechanical Life (Pushbutton): 1 million actuations, minimum

Actuation Force (Pushbutton): 1500±450g

Pushbutton Travel: .018±.005 in

Rotary Electrical & Mechanical Specifications

Operating Voltage: 5.00±25 Vdc

Supply Current: 20 Ma, maximum at 5 Vdc

Minimum Sink Current: 2.0 Ma for 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: Logic-high shall be no less than 3.5 Vdc, Logic-low shall be no greater than 1.0 Vdc

Optical Rise Time: 30 ms, maximum

Optical Fall Time: 30 ms, maximum

Mechanical Life (Rotational): 1 million cycles, minimum (1 cycle is a rotation through all positions and a full return)

Average Rotational Torque: 4.6±2.0 in-oz, initial

Shaft Push-out Force: 60 lbs, minimum before failure

Shaft Side-load Force: 25 lbs, maximum before failure

Terminal Strength: 15 lbs pull-out force, minimum for cable or header termination

Solderability: 95% free of pin holes or voids

Maximum Rotational Speed: 100 Rpm

Mounting Torque: 15 in-lbs maximum

Specifications are subject to change