

MS series

Proportional compact hand grip controllers •
non-contacting Hall effect technology



DISTINCTIVE FEATURES

One, two or three axis

Analog output

10 million lifecycles

CAN bus J1939 and CANopen outputs available

Redundant outputs available



ENVIRONMENTAL SPECIFICATIONS

- Operating Temperature: -25 °C to +70 °C (-13 °F to +158 °F)
- Storage Temperature: -40 °C to +70 °C (-40 °F to +158 °F)
- Sealing: IP67 Above panel (subject to final specifications)
- EMC Immunity Level: EN61000-4-3:2006
- EMC Emissions Level: EN61000-4-8: 2009
- ESD: EN61000-4-2:2008



ELECTRICAL SPECIFICATIONS

- Supply Voltage Range: 5.00VDC \pm 0.250VDC
- Reverse Polarity Max: -10VDC
- Transient Overvoltage Max: 18VDC
- Output Impedance: 6 Ω
- Current Consumption Max: 10mA max per axis
- Return to Center Voltage (no load): \pm 200mV



MECHANICAL SPECIFICATIONS (X & Y AXIS)

- Operating Force: 7.5N (1.70lbf)
- Maximum Vertical Load: 444.8N (100lbf)
- Maximum Horizontal Load: 667N (150lbf)
- Mechanical Angle of Movement: 40° X & Y axis (subject to limiter plate)
- Expected Life: 10 million lifecycles
- Lever Action (centering): Spring

The company reserves the right to change specifications without notice.



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MECHANICAL SPECIFICATIONS (Z AXIS)

- Operating Torque: 0.25Nm (2.21lbf in)
- Break out Torque: 0.15Nm (1.33lbf in)
- Maximum Allowable Torque: 4.50Nm (39.83lbf in)
- Mechanical Angle of Movement: 68°
- Expected Life: 1 million lifecycles



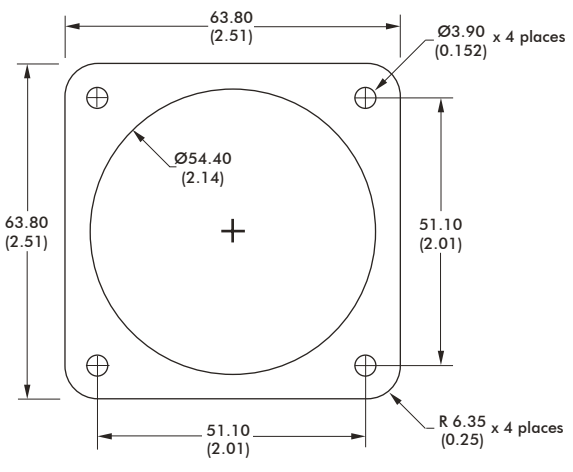
MATERIALS

- Body: Glass Filled Nylon
- Boot: Silicone
- Handles: Glass Filled Nylon

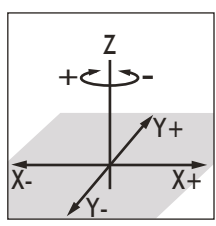


MOUNTING

PANEL CUT-OUT



AXIS ORIENTATION



- Standard configurations feature a rubber grommet as indicated in the above drawings
- An optional plastic strain relief is available and will increase under panel mounting depth by 19.05 (0.75).
- Actual strain relief position may vary.



OUTPUTS

POTENTIOMETER OPTIONS

POTENTIOMETER	P	M	R
Electrical Element	CONDUCTIVE PLASTIC		
Track Resistance	5K		
Linearity	±1.0%	±5.0%	±1.0%
Track Operating Angle	220°	56°	50°
CRV	±1.5%	±1.5%	±1.0%
Power Dissipation	0.25W@40°C	0.5W@70°C	1W
Rotational Life	1,000,000	1,000,000	10,000,000



CAN J1939 INTERFACE SPECIFICATION

The MS Series utilizes redundant Hall effect sensors to measure the primary X and Y axis. The CAN controller support various button configurations as well as proportional thumbwheels and mini-joysticks for additional axis data. All axis and button data are delivered on a CAN 2.0B compliant physical interface. Two additional signals allow configuration of the controller Source Address. Controller messages are delivered per the SAE J1939-71 message protocol.

CAN 2.0B INTERFACE PARAMETERS

- Baud rate: 250 KHz
- Transmission repetition rate: 50ms
- BJMI/EJMI interval time: 20ms
- Terminating resistor: No (available by special request to factory)
- Connection to Deutsch DTM04-6P connector:

Pin	Color	Function
1	White	CAN Lo
2	Green	CAN Hi
3	Blue	Source Address SEL 1
4	Orange	Source Address SEL 0
5	Black	Ground
6	Red	6 - 35 VDC



CAN J1939 INTERFACE SPECIFICATION (CONTINUED)

CAN MESSAGE PROTOCOL

- Primary Axis and button data on Basic Joystick Message 1 (BJM1):
 - Priority: 3
 - Base PGN: 0xFDD6
 - Source address: 0x10¹
 - Data field: 8 bytes
- Redundant Axis data on Extended Joystick Message 1 (EJM1):
 - Priority: 3
 - Base PGN: 0xFDD7
 - Source address: 0x10¹
 - Data field: 8 bytes
- Additional thumbwheels and mini-joysticks data on Extended Joystick Message 2 (EJM2):
 - Priority: 3
 - Base PGN: 0xFDD9
 - Source address: 0x10¹
 - Data field : 8 bytes

Note 1: Alternate source addresses can be configured by grounding of the blue and/or orange wires.

- Source address= 0x10: ORANGE= floating , BLUE= floating (default)
- Source address= 0x20: ORANGE= floating, BLUE= grounded
- Source address= 0x30: ORANGE= grounded, BLUE= floating
- Source address= 0x40: ORANGE= grounded, BLUE= grounded

BJM1 DATA FIELD STRUCTURE:

START POSITION (BYTE/BIT)	LENGTH (BITS)	FUNCTION
1/1	2	Primary X-axis neutral position status
1/3	2	Primary X-axis left position status
1/5	2	Primary X-axis right position status
1/7 to 2/8	10	Primary X-axis position data
3/1	2	Primary Y-axis neutral position status
3/3	2	Primary Y-axis down position status
3/5	2	Primary Y-axis up position status
3/7 to 4/8	10	Primary Y-axis position data
6/1	2	Button 4 status
6/3	2	Button 3 status
6/5	2	Button 2 status
6/7	2	Button 1 status
7/1	2	Button 8 status (Paddle if 6 button configuration)2
7/3	2	Button 7 status (Trigger if 6 button configuration)2
7/5	2	Button 6 status
7/7	2	Button 5 status
8/5	2	Button 10 status (Paddle if 8 button configuration)2
8/7	2	Button 9 status (Trigger if 8 button configuration)2

Note 2: If configured with no buttons, trigger and/or paddle would be positioned in Button n+1 and Button n+2.

EJM1 DATA FIELD STRUCTURE:

START POSITION (BYTE/BIT)	LENGTH (BITS)	FUNCTION
1/1	2	Redundant X-axis neutral position status
1/3	2	Redundant X-axis left position status
1/5	2	Redundant X-axis right position status
1/7 to 2/8	10	Redundant X-axis position data
3/1	2	Redundant Y-axis neutral position status
3/3	2	Redundant Y-axis down position status
3/5	2	Redundant Y-axis up position status
3/7 to 4/8	10	Redundant Y-axis position data

EJM2 DATA FIELD STRUCTURE:

START POSITION (BYTE/BIT)	LENGTH (BITS)	FUNCTION
1/1	2	A-axis neutral position status
1/3	2	A-axis left position status
1/5	2	A-axis right position status
1/7 to 2/8	10	A-axis position data
3/1	2	B-axis neutral position status
3/3	2	B-axis left position status
3/5	2	B-axis right position status
3/7 to 4/8	10	B-axis position data
5/1	2	C-axis neutral position status
5/3	2	C-axis left position status
5/5	2	C-axis right position status
5/7 to 6/8	10	C-axis position data

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USB OPTIONS

USB: GAME CONTROLLER

Featuring a USB 2.0 HID compliant interface, APEM's USB joysticks are recognized as standard HID "game controller" devices. Adhering to the HID specification, APEM's USB joysticks are plug-and-play with most versions of Windows. Joystick button and axis assignments are dependent upon the controlled application.

Features

- USB 2.0 HID compliant "game controller" device
- Easy to install and operate
- Functions determined by controlled application

Supplied Wiring

USB: USB Male Type A connector with overmolded cable

VOLTAGE REGULATOR

The Voltage Regulator is a multi-wired analog option used to mate to a variety of industrial control voltages. The Voltage Regulator may be used when the supply or output voltage is greater than 5V or when bipolar output is required.

User specified Output Voltage

- 0-5 VDC
- 0-10 VDC
- ± 5 VDC
- ± 10 VDC

Electrical Specifications

- Supply Voltage: (Output Voltage + 1 VDC) to 30 VDC
- Supply Current: 90mA max

USB: CURSOR EMULATION

The Cursor Emulation option converts a multi-axis joystick output into a mouse, trackball or cursor control device. The joystick's internal microprocessor converts absolute axis position into a cursor velocity, which is translated as a relative trackball or mouse position.

Applications

The Cursor Emulation option is ideal for vehicle applications subjected to dirt and high vibration which makes operating a traditional cursor control device difficult. The Cursor Emulation option is widely used in shipboard and military applications.

Features

- HID compliant "pointing device"
- Plug-and-play with USB option

Supplied Wiring










USB: USB Male Type A connector with overmolded cable

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BUILD YOUR PART NUMBER

					
SERIES	HANDLE	FRONT BUTTONS	TOP BUTTONS	SIDE BUTTONS	LIMITER PLATE
	<div>10Ball tip</div> <div>42Stock grip</div> <div>31Short stock grip</div> <div>23Low profile¹ (2 axis)</div> <div>24Low profile¹ (3 axis)</div> <div>54Low profile¹ square front (2 axis)</div> <div>55Low profile¹ square front (3 axis)</div>	<div>NNone</div> <div>OOne</div> <div>WTwo</div>	<div>0None</div> <div>1One</div> <div>2Two</div> <div>RRocker</div>	<div>0None</div> <div>UOne upper position</div> <div>LOne lower position</div> <div>FTwo</div> <div>DOperator Presence Paddle</div>	<div>S Square</div> <div>R Round</div> <div>X Slotted horizontal</div> <div>Y Slotted vertical</div> <div>P Plus</div> <div>D Diamond</div> <div>G Guided feel - square</div> <div>H Guided feel - round</div>
					
SPRING TENSION	OUTPUT OPTIONS			ADDITIONAL OPTIONS	
<div>00Standard</div>	<div>00V to 5V (rail to rail)</div> <div>10.5V to 4.5V</div> <div>20.25V to 4.75V</div> <div>31V to 4V</div> <div>40V to 5V Sensor 1 0V to 5V Sensor 2</div> <div>50.5V to 4.5V Sensor 1 0.5V to 4.5V Sensor 2</div>	<div>60.25V to 4.75V Sensor 1 0.25V to 4.75V Sensor 2</div> <div>71V to 4V Sensor 1 1V to 4V Sensor 2</div> <div>80V to 5V Sensor 1 5V to 0V Sensor 2</div> <div>90.5V to 4.5V Sensor 1 4.5V to 0.5V Sensor 2</div> <div>100.25V to 4.75V Sensor 1 4.75V to 0.25V Sensor 2</div>	<div>111V to 4V Sensor 1 4V to 1V Sensor 2</div> <div>0-UUSB</div> <div>1-JCursor emulation</div> <div>2-CAN bus J1939</div> <div>3-CANopen</div> <div>VVoltage regulator</div> <div>EEnvironmental sealing *</div>		

* Above panel sealing up to IP67 (dependant upon handle configuration)



ABOUT THIS SERIES

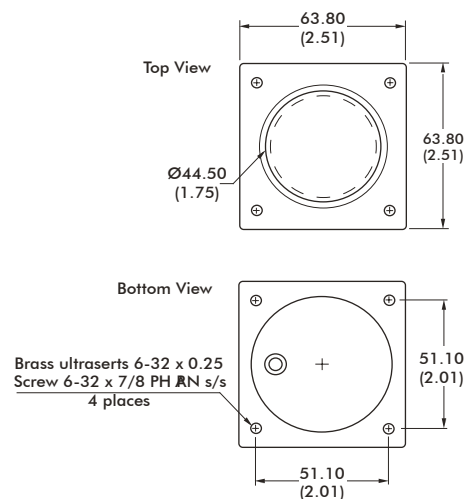
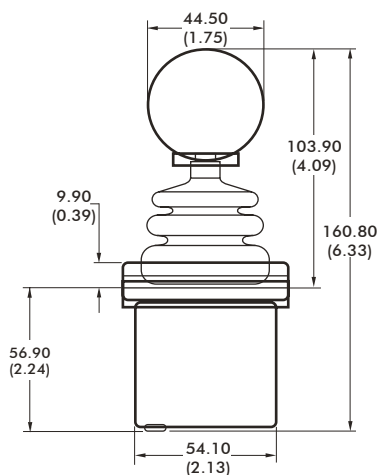


Mounting accessories : Standard hardware includes: 4 screws (6-32x7/8) Phil.

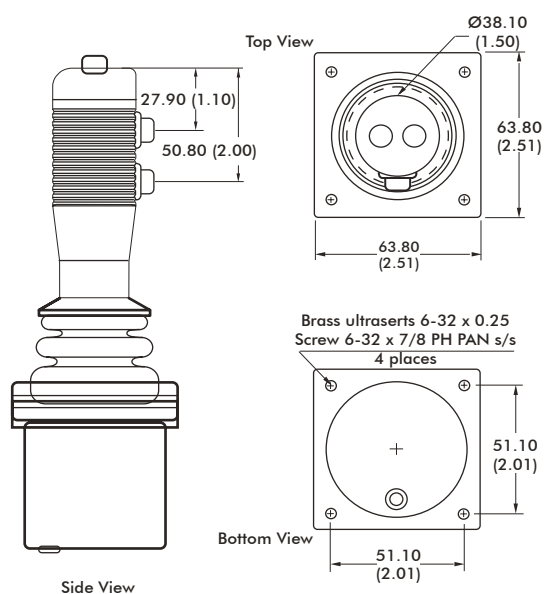
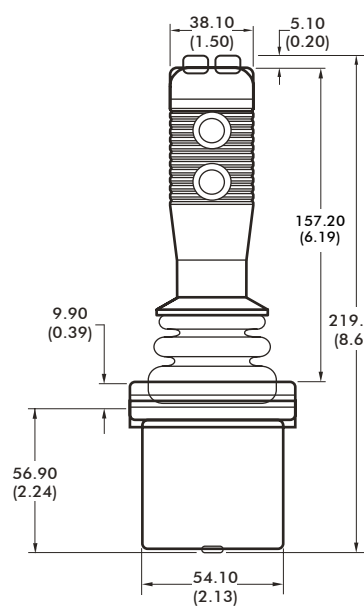
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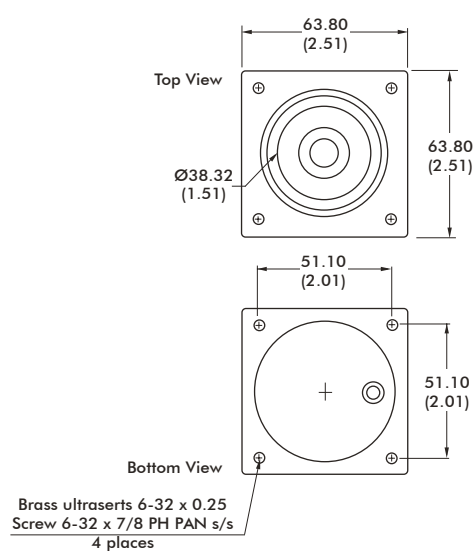
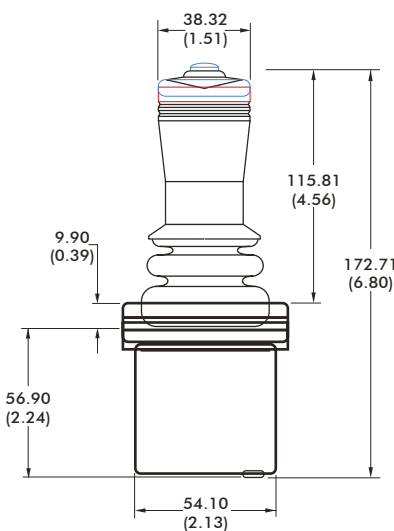
HANDLE 10 - BALL TIP



HANDLE 42 - STOCK GRIP

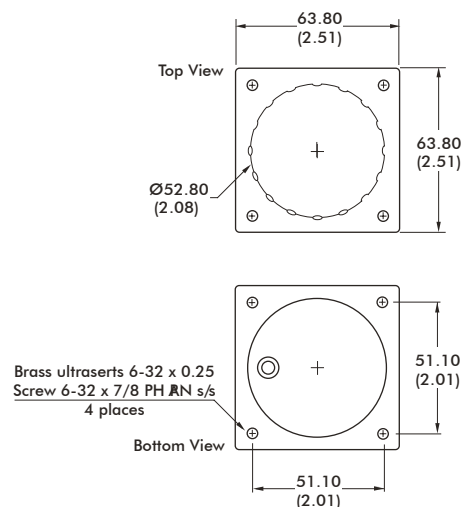
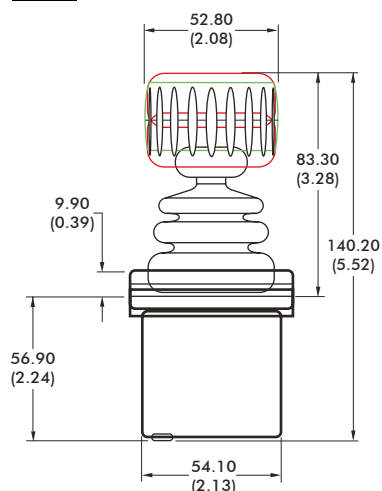


HANDLE 31 - SHORT STOCK GRIP

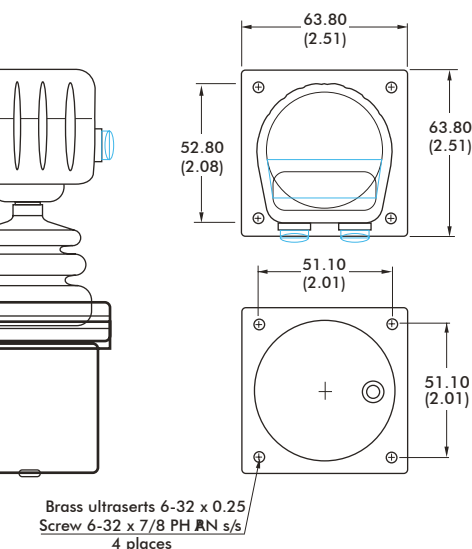
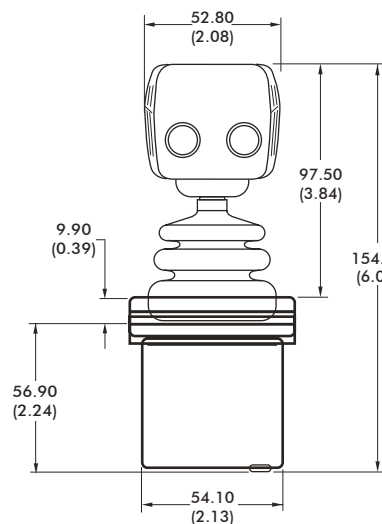


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HANDLE 23, 24 - LOW PROFILE (2 & 3 AXIS)

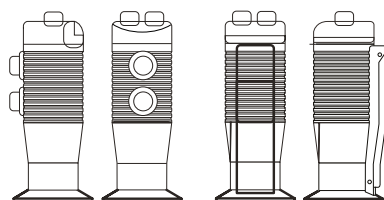


HANDLE 54, 55 - LOW PROFILE SQUARE FRONT (2 & 3 AXIS)



HANDLE OPTIONS

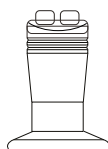
STOCK GRIP HANDLE (1)



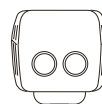
Top & Side Buttons

Operator Presence Paddle

SHORT STOCK GRIP HANDLE (2)



LOW PROFILE SQUARE FRONT (3)



Front Buttons

AVAILABLE BUTTON COLORS



White, Gray, Black, Red (4),
Orange, Yellow, Green, Blue,
Purple

1. The maximum possible configuration for the Stock Grip handle is up to 2 Top Buttons and 2 Side Buttons. A handle with an Operator Presence Paddle can have 2 Top Buttons, but no Side Buttons.
2. The maximum possible configuration for the Short Stock Grip handle is up to 2 Top Buttons. It is not possible with Operator Presence Paddle, Index Trigger, or Side Buttons.
3. The maximum possible configuration for the Low Profile Square Front handle is up to 2 Front Buttons. It is not possible with Operator Presence Paddle, Index Trigger, or Top Buttons.
4. If unspecified, the pushbuttons will have snap action momentary switches with red button caps.