

# TH series

Proportional single axis throttle controllers •  
non-contacting Hall effect technology



## DISTINCTIVE FEATURES

- Spring or friction control options
- Two lever heights available
- Inserts available in black, red, blue, yellow & green
- Analog or PWN outputs
- Redundant output 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)
- Above Panel Sealing: Up to IP63 (subject to handle configuration)
- EMC Immunity Level: EN61000-4-3: 2006
- EMC Emissions Level: EN61000-4-8: 2009
- ESD: EN61000-4-2: 2008



## ELECTRICAL SPECIFICATIONS

- Supply Voltage range: 5.00 VDC  $\pm$ 0.01 VDC
- Reverse Polarity Max: -14.5 VDC
- Ratiometric Output Voltage: See options
- Transient Overvoltage max: 18 V
- Output Impedance: 6  $\Omega$
- Return to Center Voltage Tolerance:  $\pm$ 200 mV initial
- Current Consumption Max: 10 mA



## MECHANICAL SPECIFICATIONS

- Operating Force: 7.7 N (1.70 lbf)
- Break Out Force: 6.6 N (1.50 lbf)
- Mechanical Angle of Movement: 70°
- Expected Life: 10 million lifecycles
- Mass /weight: Varies
- Lever Action (centering): Friction

The company reserves the right to change specifications without notice.



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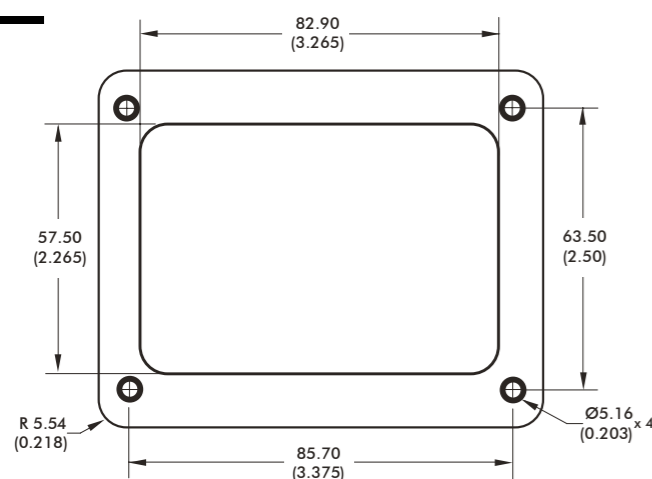
## MATERIALS

- Body: Glass Filled Nylon
- Handles: Glass Filled Nylon

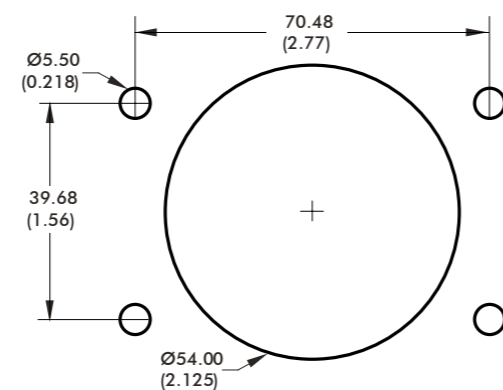
## ELECTRICAL MICROSWITCH

- Electrical rating: 0.1A at 30VDC (resistive load)
- Insulation resistance: 100 MΩ min (at 500VDC)
- Contact resistance: 100 MΩ max
- Dielectric strength: 600VAC, 50/60 Hz for 1 min between terminals of the same polarity; 1,000VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground and between each terminal and non current-carrying metal parts
- Vibration resistance: Malfunction 10 to 55Hz, 1.5mm double amplitude
- Stock resistance: Destruction 1,000 m/s<sup>2</sup> (approx.100G) max  
Malfunction 200 m/s<sup>2</sup> (approx. 20G) max
- Durability: Mechanical 1,000,000 operations min. (60 operations/min)  
Electrical 100,000 operations min. (30 operations/min)

## DROP-IN MOUNTING CUT-OUT DIMENSIONS



## REAR MOUNT CUT-OUT DIMENSIONS



## CAN J1939 INTERFACE SPECIFICATION

The TH 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: 0x10<sup>1</sup>
  - Data field: 8 bytes
- Redundant Axis data on Extended Joystick Message 1 (EJMI):
  - Priority: 3
  - Base PGN: 0xFDD7
  - Source address: 0x10<sup>1</sup>
  - Data field: 8 bytes
- Additional thumbwheels and mini-joysticks data on Extended Joystick Message 2 (EJM2):
  - Priority: 3
  - Base PGN: 0xFDD9
  - Source address: 0x10<sup>1</sup>
  - 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) <sup>2</sup>
7/3	2	Button 7 status (Trigger if 6 button configuration) <sup>2</sup>
7/5	2	Button 6 status
7/7	2	Button 5 status
8/5	2	Button 10 status (Paddle if 8 button configuration) <sup>2</sup>
8/7	2	Button 9 status (Trigger if 8 button configuration) <sup>2</sup>

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

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### 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

\* Operating force: configuration option «L»

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## BUILD YOUR PART NUMBER

SERIES	HANDLE <sup>1</sup>	FRONT BUTTONS	TOP BUTTONS	SIDE BUTTONS	MICROSWITCHES
TH					
0	Ball Tip	0 None	0 None	0 None	0 None
1	Stock Grip	1 One	1 One	U One - upper position	1 -35°
2	Short Stock Grip		2 Two	L One - lower position	2 0°
5	Palm Grip <sup>2</sup>			T Two	3 +35°
				D Operator presence paddle	4 -35° and 0°
				P Palm Grip (with 3 side buttons)	5 -35° and +35°
					6 0° and +35°
					7 -35°, 0 and +35°

MECHANICAL DETENTS	MOUNTING OPTIONS	OUTPUT OPTIONS	ADDITIONAL OPTIONS
0 None	R Rear mount	0 0V to 5V	E Environmental sealing <sup>3</sup>
1 -35°	D Drop-in	1 0.5V to 4.5V	
2 0°		2 0.25V to 4.75V	
3 +35°		3 0V to 5V Sensor 1 0V to 5V Sensor 2	
4 -35° and 0°		4 0.5V to 4.5V Sensor 1 0.5V to 4.5V Sensor 2	
5 -35° and +35°		5 0.25V to 4.75V Sensor 1 0.25V to 4.75V Sensor 2	
6 0° and +35°		6 0V to 5V Sensor 1 5V to 0V Sensor 2	
7 -35°, 0 and +35°		7 0.5V to 4.5V Sensor 1 4.5V to 0.5V Sensor 2	
		8 0.25V to 4.75V Sensor 1 4.75V to 0.25V Sensor 2	

### NOTES

<sup>1</sup> See information on standard configurations for throttle handles

<sup>2</sup> Palm Grip handle requires drop-in mounting

<sup>3</sup> Environmental sealing level available up to IP63 and dependant on handle configuration

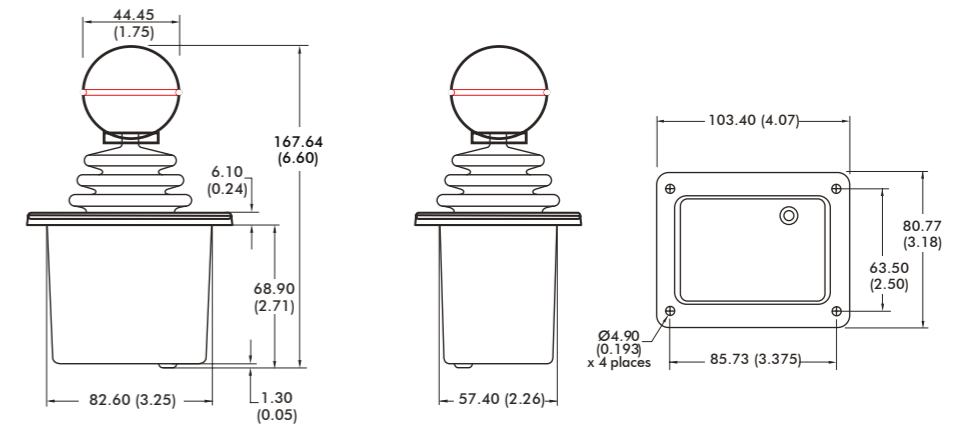
## ABOUT THIS SERIES

**Mounting accessories** : standard hardware includes: 1 gasket, 4 screws (10-32x3/4 Phillips flat head), 4 washers (#10 split lock), 4 nuts (10-322 hex). The gasket and mounting hardware are shipped off the throttle, in a separate bag.

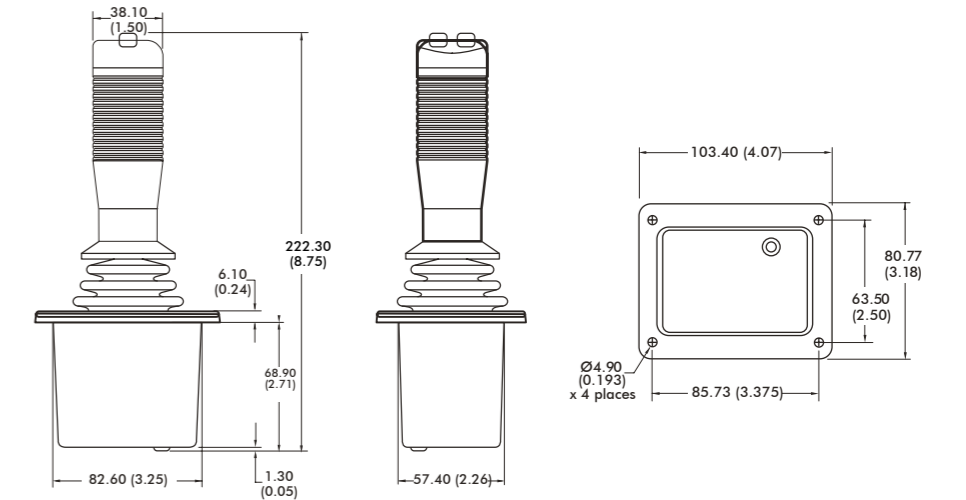
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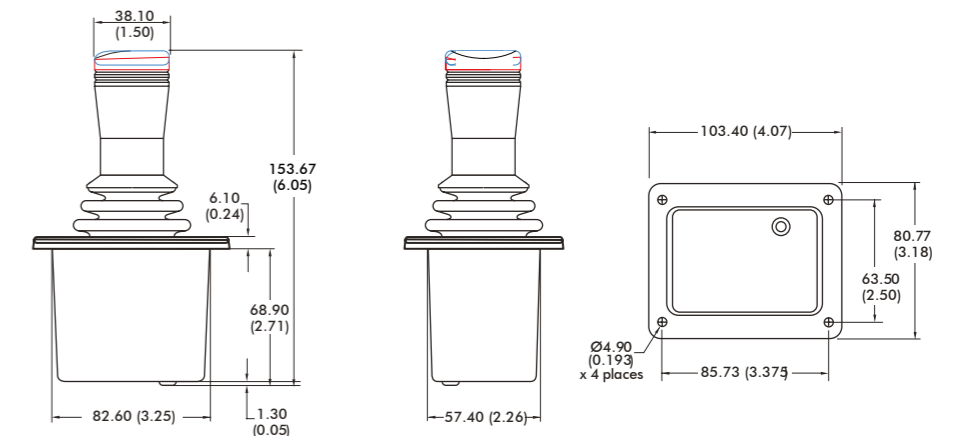
## HANDLE 0 - BALL TIP



## HANDLE 1 - STOCK GRIP



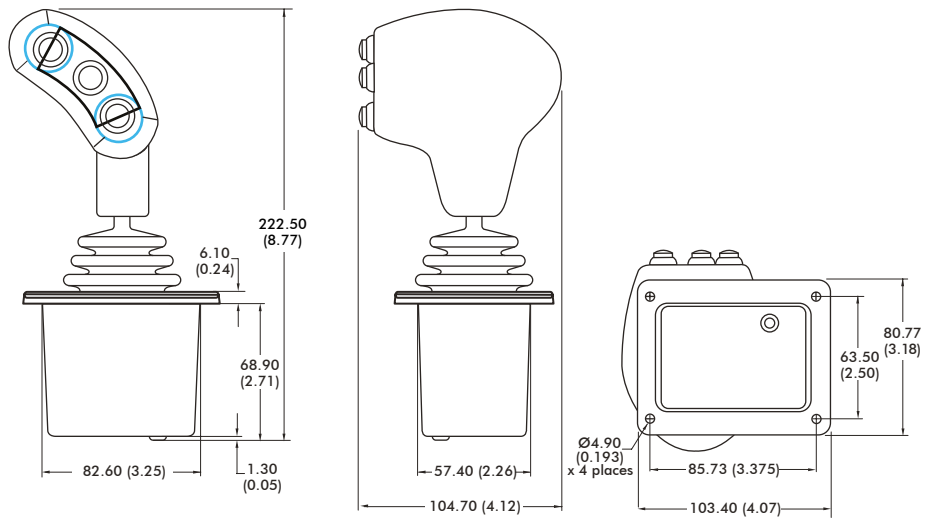
## HANDLE 2 - SHORT STOCK GRIP



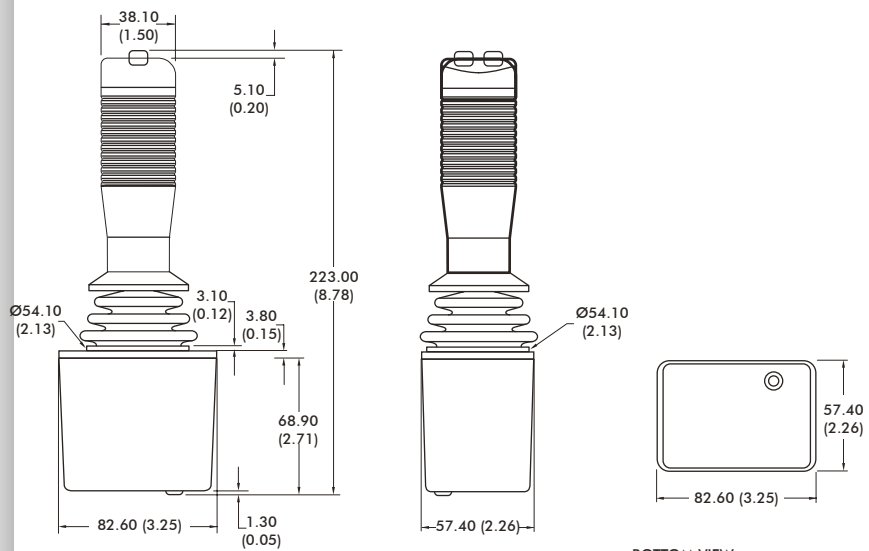
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## HANDLE 5 - PALM GRIP



## REAR MOUNT

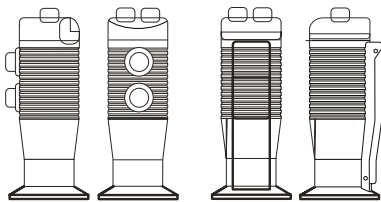


BOTTOM VIEW



## HANDLE OPTIONS

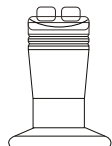
### STOCK GRIP HANDLE (1)



Top & Side Buttons

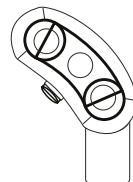
Operator Presence Paddle

### SHORT STOCK GRIP HANDLE (2)



Top Buttons

### PALM GRIP HANDLE



Front Button and Side 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.
- 2 The maximum possible configuration for the Short Stock Grip handle is up to 2 Top Buttons. Operator Presence Paddle, Index Trigger & Side buttons not available with this handle.
- 3 For non-standard configurations, contact APEM's Product Support Team
- 4 If unspecified, the pushbuttons will have snap action momentary switches with red button caps.