

TS series

Proportional Hall effect thumbsticks

Distinctive features and specifications



- ☐ 1 or 2 axis
- ☐ Pushbutton handle option
- ☐ Non-contact Hall effect technology
- ☐ Submersible to 1m (3.28ft) per IP68
- ☐ Threaded metal housing option
- ☐ Redundant outputs available
- ☐ USB outputs available

MECHANICAL (FOR X, Y AXIS)

- Operating Force: 3.1N±0.5N (0.70lbf±0.11lbf)¹
- Maximum Vertical Load: 200N (45lbf)¹
- Maximum Horizontal Load: 150N (33.7lbf)¹
- Mechanical Angle of Movement: 50°
- Expected Life: 1 million cycles
- Mass/weight: 18.25g ± 5.0g (0.64oz±0.18oz)
- Lever Action (Centering): Spring centering

ENVIRONMENTAL

- Operating Temperature: -40°C to +85°C (-40°F to +185°F)
- Storage Temperature: -40°C to +85°C (-40°F to +185°F)
- Sealing: IP68, IP69K²
- EMC Immunity Level: EN61000-4-3
- EMC Emissions Level: EN61000-6-3:2001
- ESD: EN61000-4-2

ELECTRICAL SENSOR

- Resolution: 1.22mV
- Supply Voltage Range: 5.00V±0.01V
- Reverse Polarity Max: -10V
- Overvoltage Max: 20V
- Output Impedance: 2Ω
- Return to Center Voltage Tolerance: ±200mV initial

PUSHBUTTON SWITCH (Option 6 Handle)

- Electrical life: 100,000 cycles
- Rating: 50mA, 12VDC.
- Terminal: Brass with silver plating
- Contact resistance: 100mΩ max
- Insulation resistance: 100MΩ min. 500VDC
- Dielectric strength: 250VAC /1 minute
- Contact arrangement: 1 pole 1 throw
- Operation force: 1.5lbf
- Stop strength: Max 3kgf vertical static load for 15 seconds
- Operating temperature: -25°C to +70°C (-13°F to +158°F)
- Storage temperature: -30°C to +85°C (-22°F to +185°F)
- Vibration resistance: MIL-STD-202F METHOD 201A
- Shock resistance: MIL-STD-202F METHOD 213B

MATERIALS

- Body: Glass filled nylon
- Threaded Body: Black oxide plated brass
- Boot: Silicone
- Handles: 1, 2, 3 - Glass filled nylon
4, 5, 6, 7, 8 - Silicone
B, C, D - Thermoplastic elastomer

NOTES:



Mounting accessories.

Standard hardware includes:

- For the Drop-in option – 4 push in connectors, drop-in bezel and an O-ring.
- For the Rear mount option: 4x1/2 FH SS Phil Screws and a rear mount bezel.

1 Force applied to the top of the castle cap.

2 All options are IP68 and IP69K rated, however Drop-in mounting does not prevent panel ingress.

– All values are nominal.



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Overview

TS						
SERIES	Handle	Termination ¹	Mounting Options	Limiter	Output Options	Power Supply Options
0 None	1 Castle	1 22AWG 25cm PTFE	N None	U Single axis	00 0V to 5V (Rail to Rail)	A Single
2 Winged Hat	3 Conical	2 28AWG 25cm PTFE	D Drop-in	S Square	01 0.25V to 4.75V	B Independent ³
4 Finger Tip	5 Round Jog	3 72" Overmold Cable with USB Male Type Connector	R Rear mount	G Guided feel	02 0.5V to 4.5V	
6 Pushbutton	7 Mushroom*	4 2.54mm (0.100") Pitch TE Connector	A Drop-in and Rear Mount	P Plus	03 1V to 4V	
8 Low Profile*	8 Low Profile*	5 2.54mm (0.100") Pitch TE Connector with 10" Mating Harness	T Threaded bushing		04 0V to 5V - Sensor 1 0V to 5V - Sensor 2	
A Handles 1, 2, 3					05 0.25V to 4.75V - Sensor 1 0.25V to 4.75V - Sensor 2	
B Castle, elastomer					06 0.5V to 4.5V - Sensor 1 0.5V to 4.5V - Sensor 2	
C Winged Hat, elastomer					07 1V to 4V - Sensor 1 1V to 4V - Sensor 2	
D Conical, elastomer					08 0V to 5V - Sensor 1 5V to 0V - Sensor 2	
					09 0.5V to 4.5V - Sensor 1 4.5V to 0.5V - Sensor 2	
					10 0.25V to 4.75V - Sensor 1 4.75V to 0.25V - Sensor 2	
					11 1V to 4V - Sensor 1 4V to 1V - Sensor 2	
					12 Customer specified	
					13 PWM ²	
					14 USB (Game Controller)	
					15 Joyball (Cursor emulation)	

NOTES:

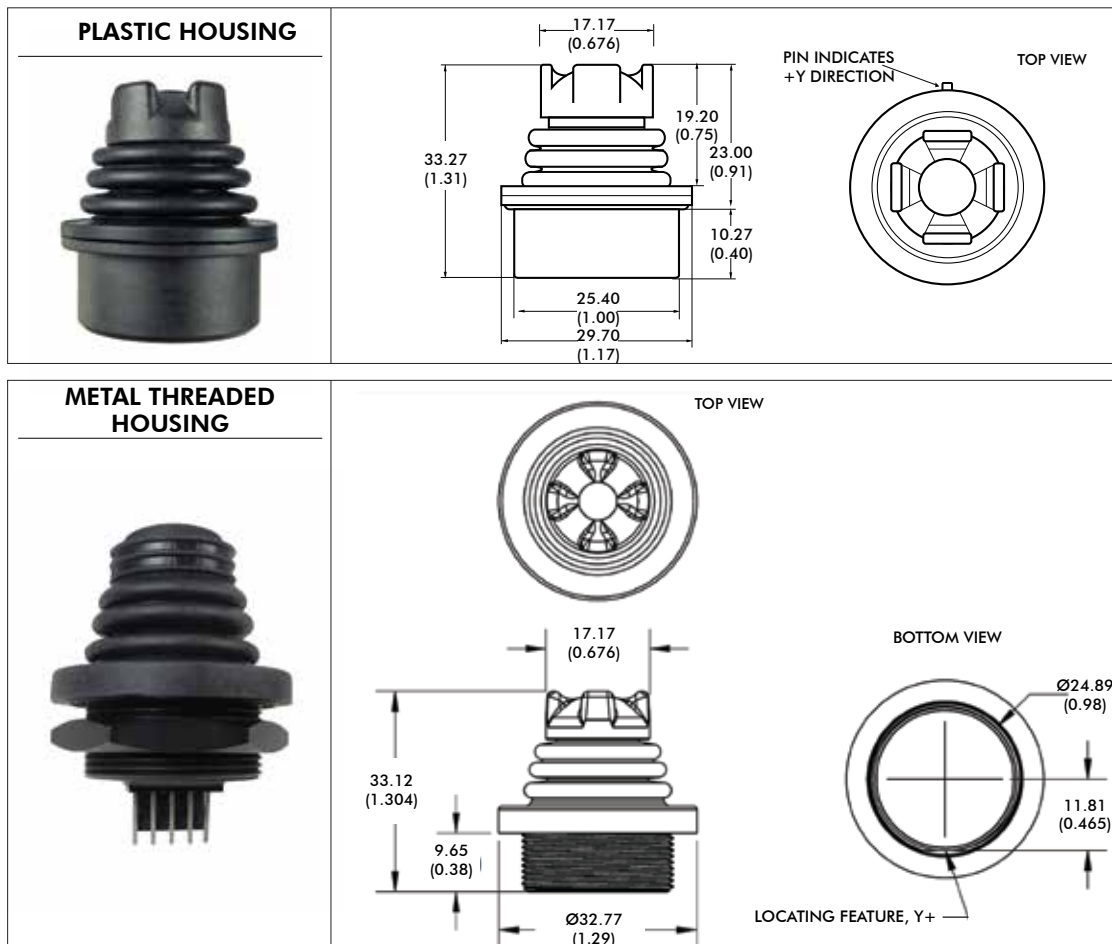
* = Not available with Threaded Housing (Mounting Style Option "T").

1-1 – Wires are thick, robust, and best suited for stand alone applications.

1-2 – Wires are thin and best suited for tightly constrained wire routing.

2 Contact factory for PWM configuration.

3 Only available on dual output. Not available with Handle 6 (Pushbutton). Not available with Termination Options 4 or 5.



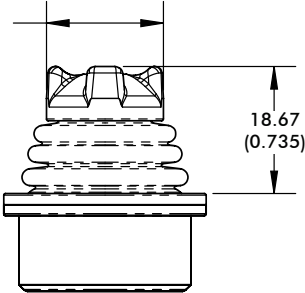
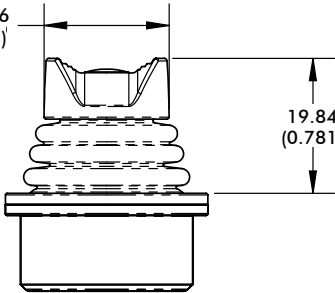
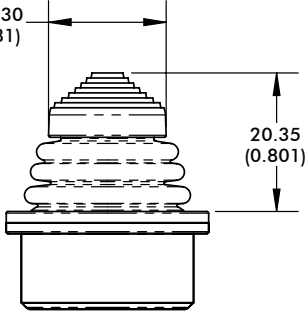
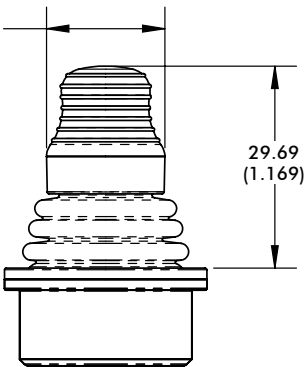
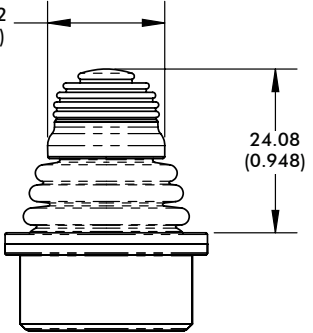
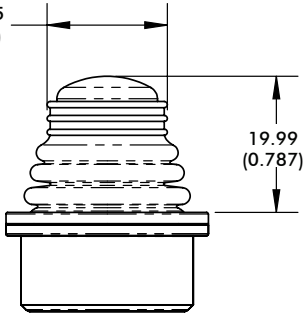
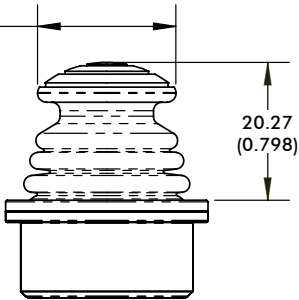
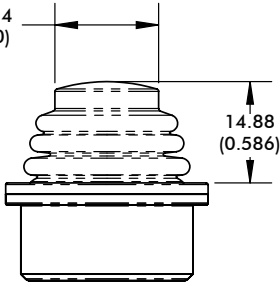
NOTE: Dimensions are in mm/(inch).

Note: The company reserves the right to change specifications without notice.

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Models and dimensions

HANDLE OPTIONS		
1. CASTLE B. CASTLE (ELASTOMER) Ø17.17 (0.676) 18.67 (0.735) 	2. WINGED HAT C. WINGED HAT (ELASTOMER) Ø18.36 (0.723) 19.84 (0.781) 	3. CONICAL D. CONICAL (ELASTOMER) Ø17.30 (0.681) 20.35 (0.801) 
4. FINGER TIP Ø17.42 (0.686) 29.69 (1.169) 	5. ROUND JOG Ø17.22 (0.678) 24.08 (0.948) 	6. PUSHBUTTON Ø17.65 (0.695) 19.99 (0.787) 
7. MUSHROOM Ø20.32 (0.800) 20.27 (0.798) 	8. LOW PROFILE Ø15.24 (0.600) 14.88 (0.586) 	

NOTES:

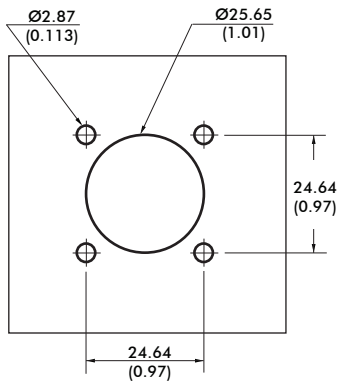
- Option 7 and 8 handles not available with the "T" threaded housing mounting style.
- Dimensions are in mm/(inch).

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Models and dimensions – continued

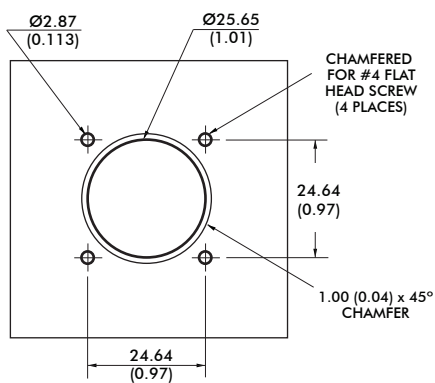
PLASTIC HOUSING - DROP-IN OPTION CUTOUT DIMENSIONS



4 x PUSH IN CONNECTORS



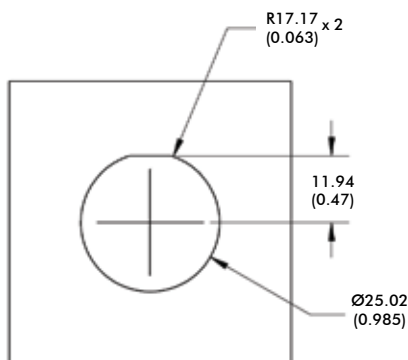
PLASTIC HOUSING - REAR MOUNT OPTION CUTOUT DIMENSIONS



4 x 1/2 FH SS PHIL SCREW



METAL THREADED HOUSING - DROP-IN OPTION CUTOUT DIMENSIONS



NOTES:

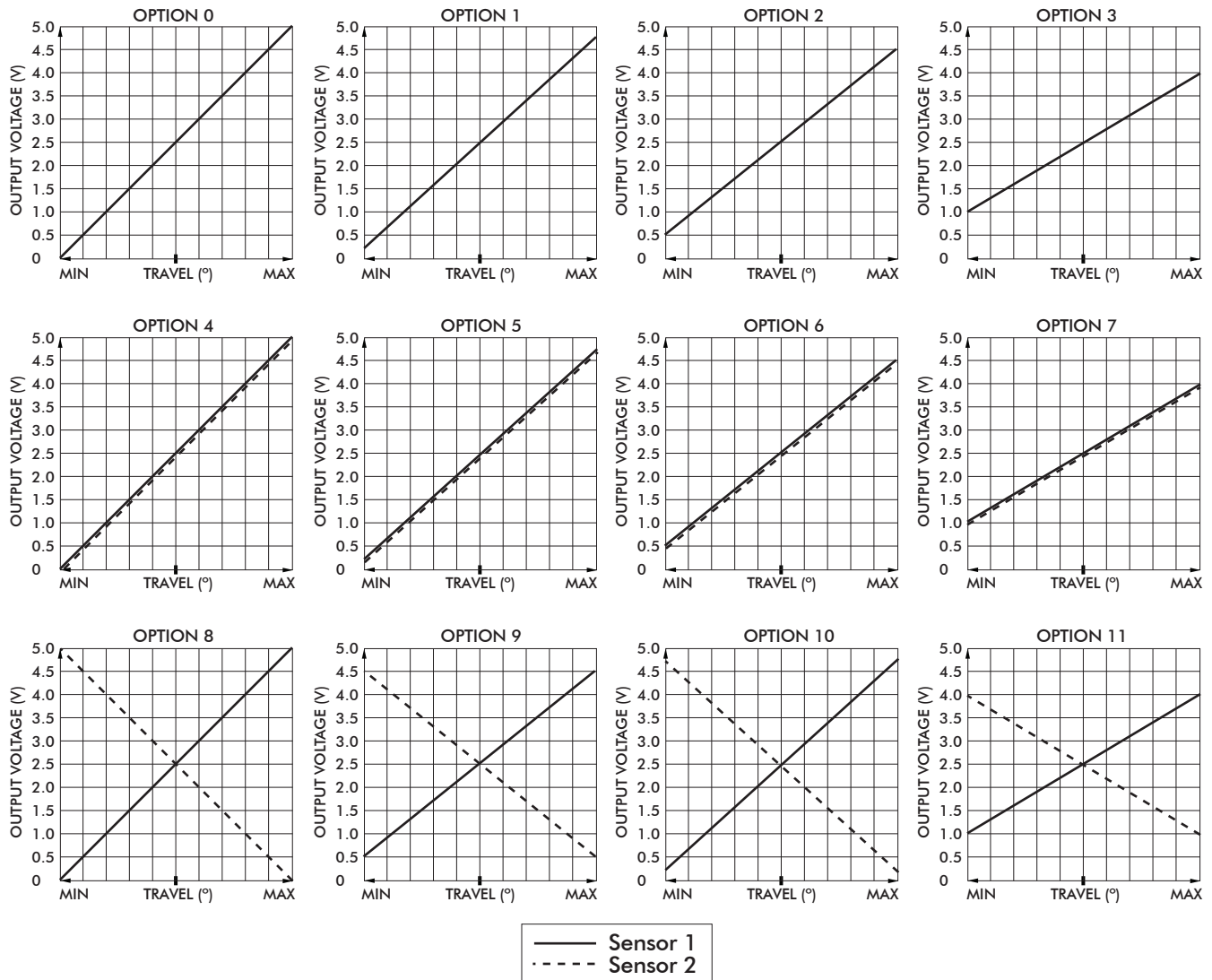
- 1 The maximum panel thickness for the Rear Mount configuration is 2.032mm (0.08in)
- 2 The under panel depth for the Drop-in configuration is 16.02mm/(0.631in).
- 2 The under panel depth for the Metal Threaded Housing configuration is 14.55mm/(0.573in).
- 3 Dimensions are in mm/(inch).

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Models and dimensions – continued

VOLTAGE OUTPUT OPTIONS



WIRING SPECIFICATION

- Black: Ground & button common
- Red: Power (5V)
- Blue: X axis output (alpha)
- Yellow: Y axis output (alpha)
- Orange: Pushbutton switch (option 6 handle)
- Blue/White Stripe: X axis output (beta)
- Yellow/Black Stripe: Y axis output (beta)
- Red/White Stripe: Power (5V) (beta)
- Black/White Stripe: Ground (beta)

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Overview

CONNECTOR TERMINATION OPTION

Single output configurations feature a five position TE 3-647166-5 connector. Dual output configurations feature a seven position TE 3-647166-7 connector. A mating harness is not included, but may be specified for single output configurations at the time of order for an additional charge. The five function harness is part number 505-499. The seven function harness is part number 505-500.

PINOUT SPECIFICATION		
	TE 3-647166-5	TE 3-647166-7
PIN 1	Y (alpha)	Pushbutton
PIN 2	5VDC	GND/ Pushbutton common
PIN 3	X (alpha)	X (alpha)
PIN 4	GND/ Pushbutton common	Y (beta)
PIN 5	Pushbutton	Y (alpha)
PIN 6	–	5VDC
PIN 7	–	X (beta)

USB

USB

Featuring USB 1.1 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 1.1 HID compliant "game controller" device
- Easy to install and operate
- Functions determined by controlled application

SUPPLIED WIRING

USB: USB Male Type A Connector with 72" overmolded cable

CURSOR EMULATION

The Cursor Emulation option converts 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