

TS series

Proportional miniature thumb controls •
non-contacting Hall effect technology



DISTINCTIVE FEATURES

- One or two axis
- Analog, PWM or USB outputs
- Submersible up to 1 m (3.28 ft)
- Rear or drop-in mounting
- Pushbutton option



ENVIRONMENTAL SPECIFICATIONS

- Operating Temperature: -40 °C to +85 °C (-40 °F to +185 °F)
- Storage Temperature: -40 °C to +85 °C (-40 °F to +185 °F)
- Above Panel Sealing: IP67, IP69K¹ (subject to mounting style & final specifications)
- EMC Immunity Level: EN61000-4-3
- EMC Emissions Level: EN61000-6-3:2001
- ESD: EN61000-4-2



ELECTRICAL SPECIFICATIONS

- Supply Voltage Range: 5.00 V ± 0.250 VDC
- Reverse Polarity max: -10 V
- Transient overvoltage max: 16 V
- Output Impedance: 2Ω
- Return to Center Voltage Tolerance: ± 200 mV initial



MECHANICAL SPECIFICATIONS

- Operating Force: 3.1 N ± 0.5 N (0.70 lbf ± 0.11 lbf)²
- Maximum Vertical Load: 200 N (45 lbf)²
- Maximum Horizontal Load: 150 N (33.7 lbf)²
- Mechanical Angle of Movement: 50° X & Y axis (subject to limiter plate)
- Expected Life: 1 million cycles
- Mass/Weight: 18.25 g ± 5.0 g (0.64 oz ± 0.18 oz)
- Lever Action (centering): Spring

¹ All options are IP68 and IP69K rated, however drop-in mounting does not prevent panel ingress.

² Force applied to the top of the castle cap.

The company reserves the right to change specifications without notice.



**PATENT
PENDING**



TS series

Proportional miniature thumb controls • non-contacting Hall effect technology



MATERIALS

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

APEM products may be recycled at end-of-life for the re-claiming of valuable metal components.



PUSHBUTTON SWITCH (OPTION 6 HANDLE)

- Electrical Life: 100,000 cycles
- Rating: 50 mA, 12 VDC.
- Terminal: Brass with silver plating
- Contact Resistance: 100 mΩ max
- Insulation Resistance: 100 MΩ min. 500 VDC
- Dielectric Strength: 250 VAC /1 minute
- Contact Arrangement: 1 pole 1 throw
- Stop Strength: Max 3 kgf vertical static load for 15 seconds
- Operating Temperature: -25 °C to +70 °C (-4 °F to +158 °F)
- Storage Temperature: -30 °C to +85 °C (-22 °F to +158 °F)
- Vibration Resistance: MIL-STD-202F METHOD 201A
- Shock Resistance: MIL-STD-202F METHOD 213B



CONNECTIONS

WIRING SPECIFICATION
(Termination options 1 & 2)

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)



NEW OPTION AVAILABLE

PLASTIC THREADED HOUSING



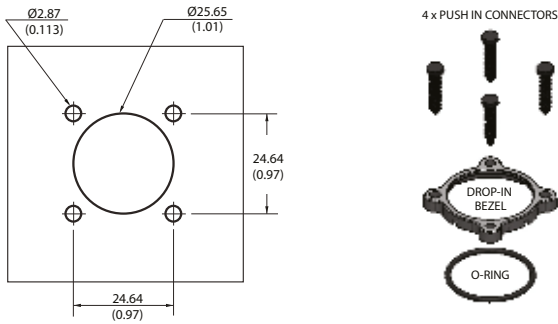
**PATENT
PENDING**

Proportional miniature thumb controls • non-contacting Hall effect technology



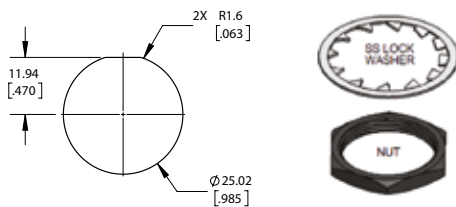
MOUNTING

PLASTIC HOUSING - DROP-IN CUTOUT



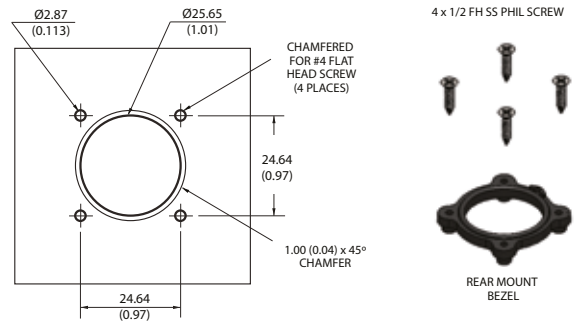
- The under panel depth for the Drop-in configuration is 16.02 mm (0.631 in).

METAL THREADED HOUSING - DROP-IN CUTOUT



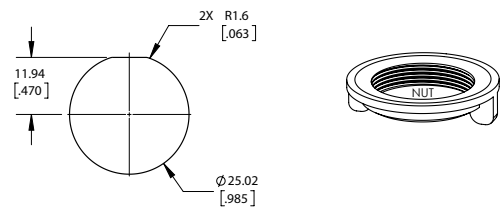
- The under panel depth for the Metal Threaded Housing configuration is 14.55 mm (0.573 in).
- Mounting nut can be tightened to a recommended torque of 10 lbf.

PLASTIC HOUSING - REAR MOUNT OPTION CUTOUT



- The maximum panel thickness for the Rear Mount configuration is 2.032 mm (0.08 in).
- Mounting screws can be driven to a recommended torque of 4 lbf.

PLASTIC THREADED HOUSING - DROP-IN CUTOUT







- The under panel depth for the Plastic Threaded Housing configuration is 14.55 mm (0.573 in).
- Mounting nut can be tightened to a recommended torque of 10 lbf.

TS series

Proportional miniature thumb controls •
non-contacting Hall effect technology



BUILD YOUR PART NUMBER

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

* = Not available with T (threaded housing, metal) or P (threaded housing, plastic)

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.

TS series

Proportional miniature thumb controls • non-contacting Hall effect technology

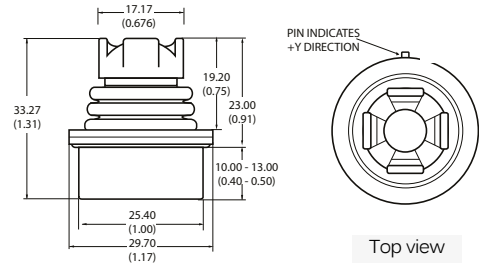
PLASTIC HOUSING



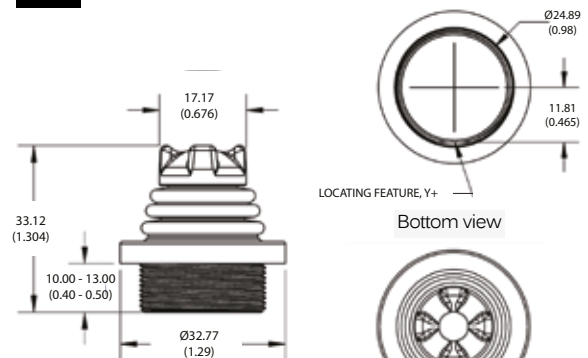
METAL THREADED HOUSING



PLASTIC THREADED HOUSING

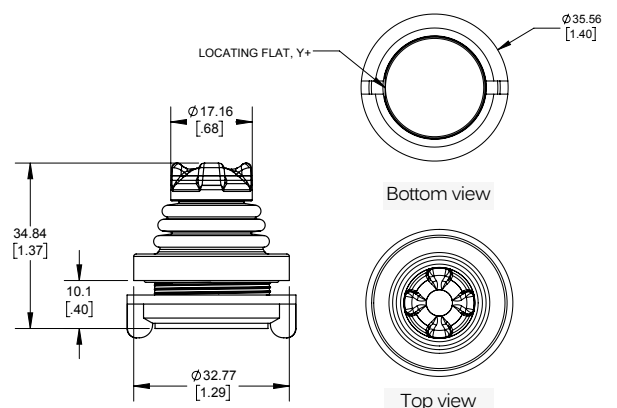


Top view



Bottom view

Top view



Bottom view

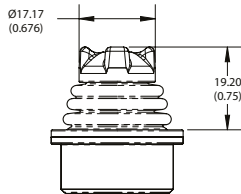
Top view

TS series

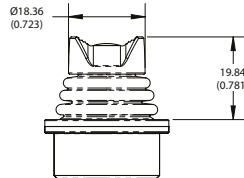
Proportional miniature thumb controls •
non-contacting Hall effect technology



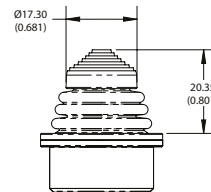
HANDLE OPTIONS



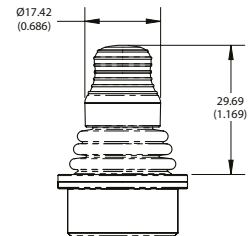
1 Castle
B Castle (elastomer)



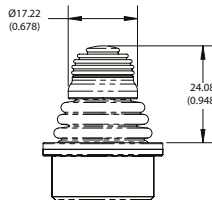
2 Winged hat
B Winged hat (elastomer)



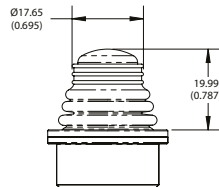
3 Conical
B Conical (elastomer)



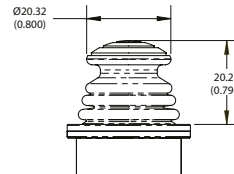
4 Fingertip



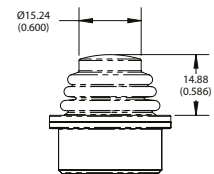
5 Round jog



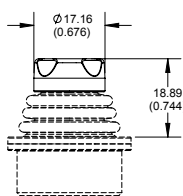
6 Pushbutton



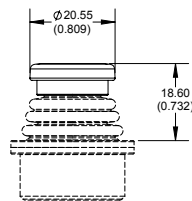
7 Mushroom



8 Low profile



E Quadcave



F Puck



USB OPTIONS

USB : GAME CONTROLLER

Featuring 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 Male Type A Connector with 72" overmolded cable

USB: JOYBALL (CURSOR EMULATION)

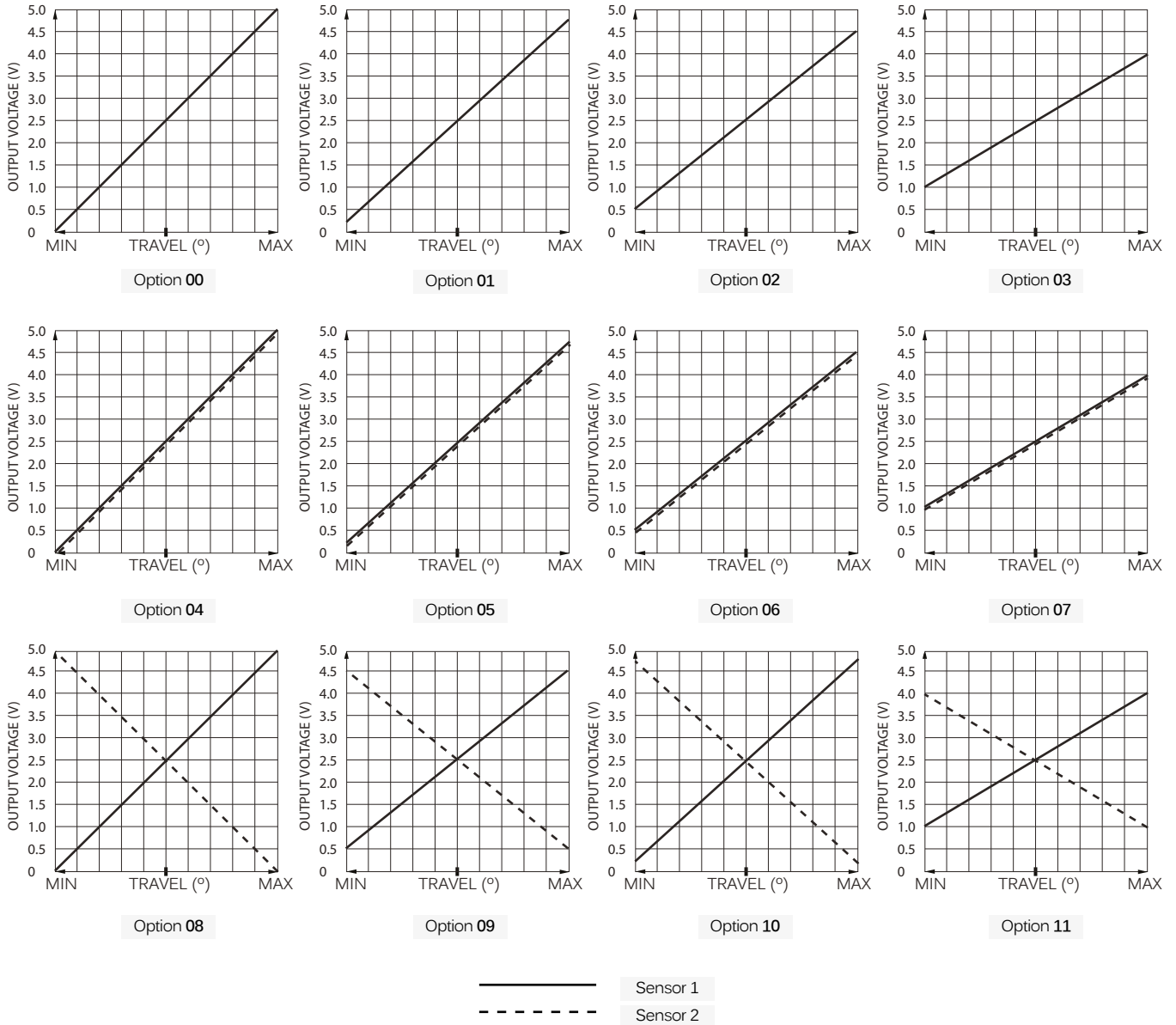
The cursor emulation option converts a multi-axis joystick into a mouse or cursor control device

- 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 Male Type A Connector with overmolded cable

**PATENT
PENDING**

Proportional miniature thumb controls • non-contacting Hall effect technology

VOLTAGE OUTPUT OPTIONS



CONNECTOR TERMINATION OPTION

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

- 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.