TS series

Proportional miniature thumb controls • non-contacting Hall effect technology



DISTINCTIVE FEATURES

One or two axis
Analog, PWM or USB outputs
IP67 Above panel sealing mounting
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, IP69K[1] (subject to mounting style & final specifications)
- EMC Immunity Level: EN61000-4-3
- EMC Emissions Level: EN61000-6-3:2001
- ESD: EN61000-4-3 Level 2 (± 4 kv contact, ± 6 kv air)

SENSOR SPECIFICATIONS

- Technology: Hall effect sensors, single or dual
- Supply Voltage Range: 5.00 V ± 0.01 VDC
- Supply Current: 11 mA max
- Ratiometric Output Options: See options
- Reverse Polarity max: -10 V
- Transient overvoltage max: 16 V
- Start-up time: 15 ms max
- Output Impedance: 2Ω
- Return to Center Voltage Tolerance: ± 200 mV initial

U.S. Patent #D816,169 S
U.S. Patent #D732,047 S
U.S. Patent #D816,169 S
U.S. Patent #D734,138 S

The company reserves the right to change specifications without notice.

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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.

MATERIALS

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

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

CONNECTIONS

WIRING SPECIFICATION (Termination options 1 & 2)	
Black	Ground & button common, or LED common
Red	Power (5 V)[1]
Blue	X axis output (alpha)
Yellow	Y axis output (alpha)
Orange	Pushbutton switch (option 6 handle) or LED supply (option H handle) [2] [2]
Blue/White Stripe	X axis output (beta)
Yellow/Black Stripe	Y axis output (beta)
Red/White Stripe	Power (5 V) (beta)
Black/White Stripe	Ground (beta)

[1] Hall sensor and LED supply (LED control option 1)
[2] User controllable (LED control option 2)

PUSHBUTTON SWITCH SPECIFICATIONS (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

LED SPECIFICATIONS (OPTION H HANDLE)

LED CONTROL	OPERATING VOLTAGE	OPERATING CURRENT
1 – ON, driven by joystick supply voltage	-	25-30 mA
2 – User controlled	5 V	25-30 mA

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NEW OPTIONS AVAILABLE

PLASTIC THREADED HOUSING

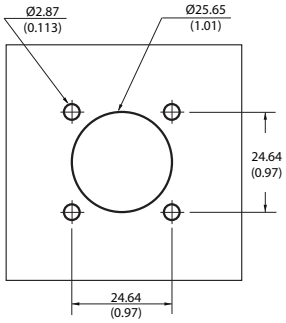


LED ILLUMINATION OPTION H HANDLE



MOUNTING

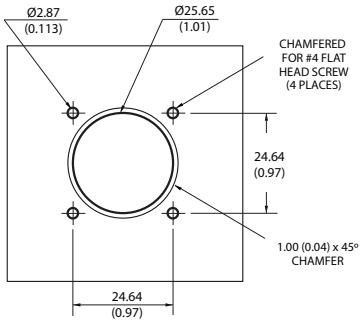
PLASTIC HOUSING - DROP-IN CUTOUT





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

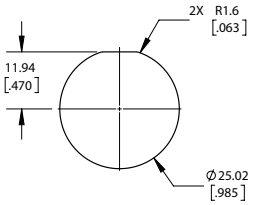
PLASTIC HOUSING - REAR MOUNT OPTION CUTOUT





- 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.

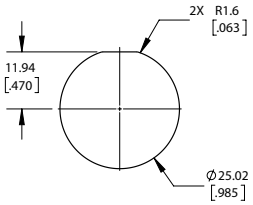
METAL THREADED HOUSING - DROP-IN CUTOUT

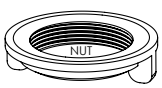




- The under panel depth for the Metal Threaded Housing configuration is 14.55 mm (0.573 in).
- Mounting nut can be tightened to a recommended torque of 10 in-lb.

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 in-lb.

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BUILD YOUR PART NUMBER

TS

SERIES

HANDLE[1]

0	None
1	Castle
2	Winged Hat
3	Conical
4	Finger Tip
5	Round Jog
6	Pushbutton
7	Mushroom[1]
8	Low Profile[1]
A	Handles 1, 2, 3
B	Castle, elastomer
C	Winged Hat, elastomer
D	Conical, elastomer
E	Quadcave
F	Puck
G	Roller
H	Castle, LED illumination[1-2]

MOUNTING OPTIONS

N	None
D	Drop-in
R	Rear mount
A	Drop-in and Rear Mount
T	Threaded housing, Metal
P	Threaded housing, Plastic

TERMINATION[2]

1	22 AWG PTFE, 25 cm ± 1.27 cm [2-1]
2	28 AWG PTFE, 25 cm ± 1.27 cm [2-2]
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

LIMITER

U	Single axis
S	Square
G	Guided feel
P	Plus

OUTPUT OPTIONS [4]

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
14	USB (Game Controller)
15	Joyball (Cursor emulation)

POWER SUPPLY OPTIONS

A	Single
B	Independent [5]

LED CONTROL

BLANK	No illumination
1	ON, driven by joystick supply voltage [6]
2	User controlled [7]

LED COLOR

BLANK	No illumination
BB	Blue
RR	Red

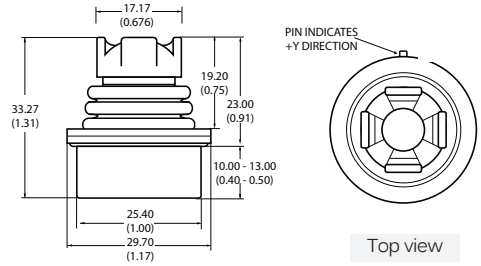
[1] Mushroom and Low Profile handles not available with P (threaded housing, plastic) or T (threaded housing, metal) housing options.
[1-2] Contact factory if USB output is needed with illuminated castle actuator.
[2-1] Wires are thick, robust, and best suited for stand alone applications.
[2-2] Wires are thin and best suited for tightly constrained wire routing.
[3] Contact factory for PWM configuration.
[4] Output voltage is ratiometric to supply voltage.
[5] Only available on dual output. Not available with Handle 6 (Pushbutton). Not available with termination options 4 or 5.
[6] LED control is driven by joystick supply voltage. Illumination is constantly on
[7] LED requires independent 5V supply. Illumination is user controlled.

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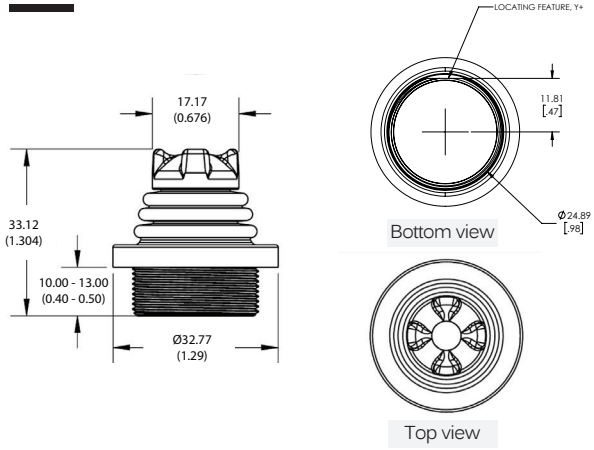
PLASTIC HOUSING





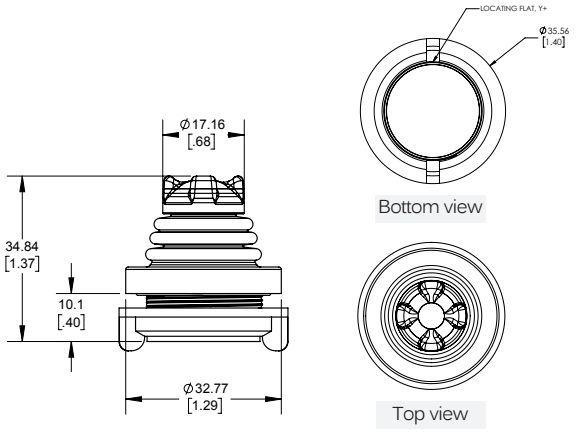
METAL THREADED HOUSING





PLASTIC THREADED HOUSING

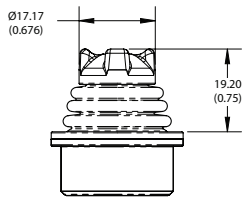




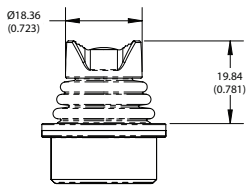
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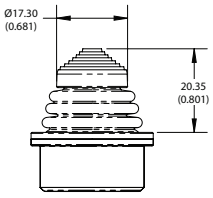
HANDLE OPTIONS



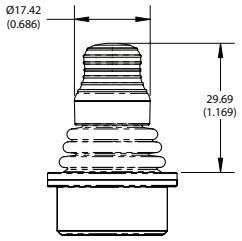
1 Castle
B Castle (elastomer)



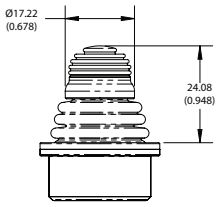
2 Winged hat
C Winged hat (elastomer)



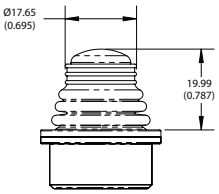
3 Conical
D Conical (elastomer)



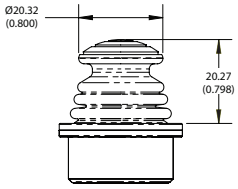
4 Fingertip



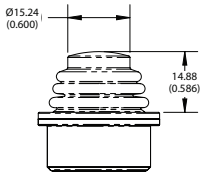
5 Round jog



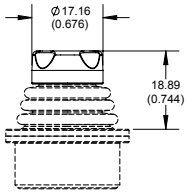
6 Pushbutton



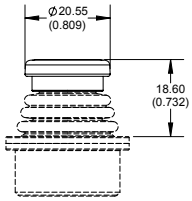
7 Mushroom



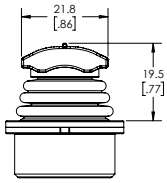
8 Low profile



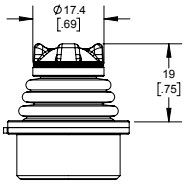
E Quadcave



F Puck



G Roller



H Castle, LED illumination

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)

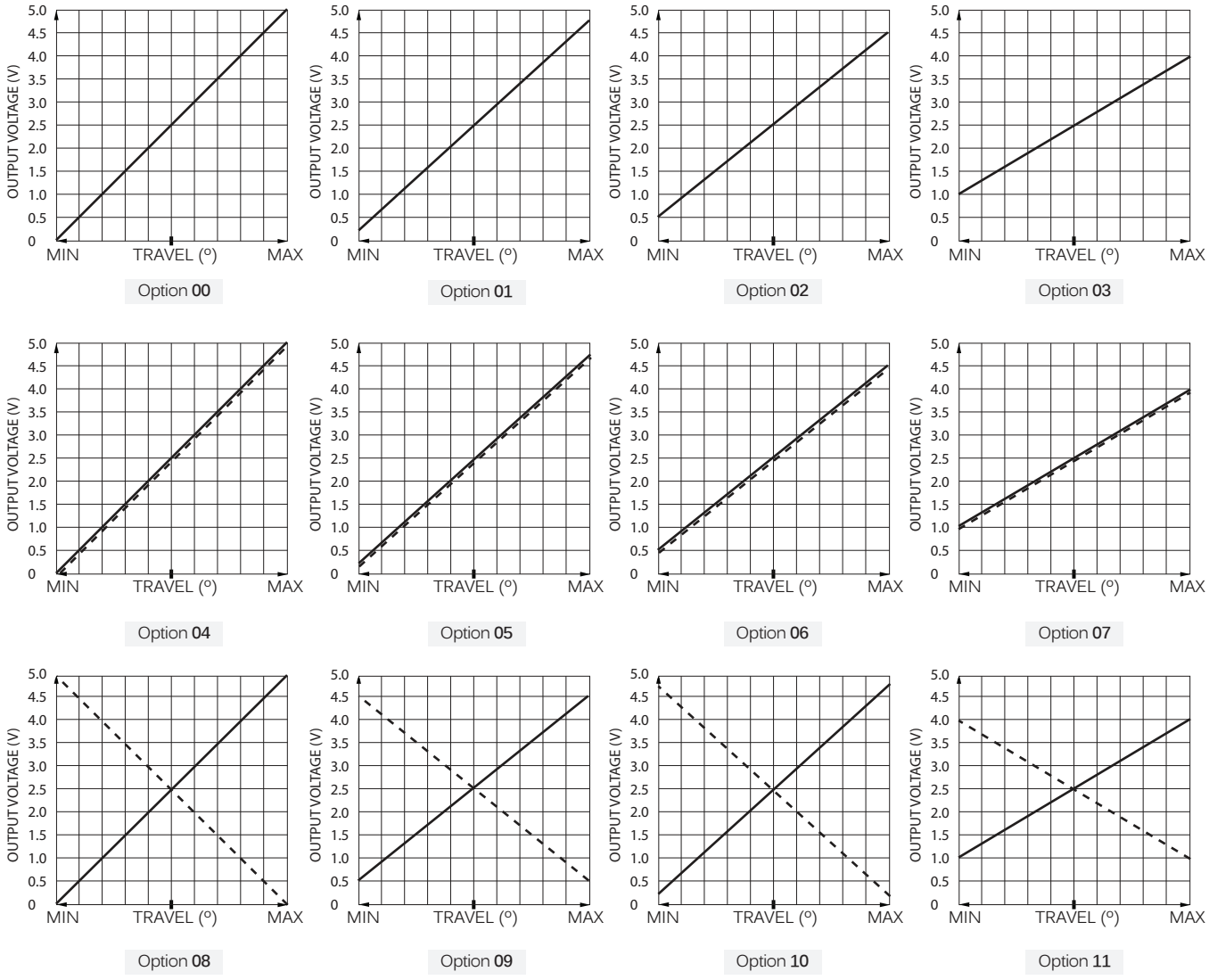
The cursor emulation option converts a multi-axis joystick into a mouse or cursor control device

- 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

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VOLTAGE OUTPUT OPTIONS [1]



CONNECTOR TERMINATION OPTION

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

[1] Voltage outputs are ratiometric to supply voltage

- 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.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Apem:

TSAA1P00A TS4A1S00A TSAA1S00A TS1A1S00A TSAA1G00A TS1A1U00A TSEA1S00A TSFA1S00A TSBP1S00A TSGP1U00A TSHA1S00A1RR TSHA1S00A1BB TS1A1S01A TS1A1U01A TS1R1S00A TS1D1S00A TSAA3S14A TSAD1P00A TSAA1S01A TSAA2S00A TS4R2S00A TSAA1P01A TS4R1S08A TS4R2G00A TS4R1G00A TS4R1S00A TS4A2S02A TS2R1U02A TS1R1G04A TS1R2S02A TS1R3S14A TS1R2P00A TS1R2S00A TS1R1S02A TS1D1U02A TS1D1S02A TSDA2S02A TSBA2S02A TSAT1S02A TSCA2S02A TSBT2S02A TSAT1G02A TS6T1G02A TS6T1S02A