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: EN61000-4-2

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

PATENT PENDING

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
- 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	-	6 mA
2 – User controlled	5 V	6 mA

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⚫⚫⚫ NEW OPTIONS AVAILABLE
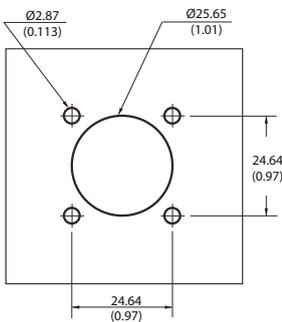
PLASTIC THREADED HOUSING

LED ILLUMINATION OPTION H HANDLE

PATENT PENDING

🪛 MOUNTING

PLASTIC HOUSING - DROP-IN CUTOUT

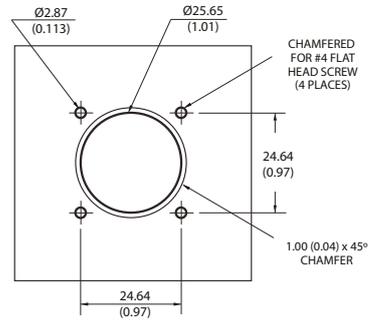Ø2.87 (0.113) Ø25.65 (1.01) 24.64 (0.97) 24.64 (0.97)

4 x PUSH IN CONNECTORS

DROP-IN BEZEL

O-RING

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

PLASTIC HOUSING - REAR MOUNT OPTION CUTOUT

Ø2.87 (0.113) Ø25.65 (1.01)

CHAMFERED FOR #4 FLAT HEAD SCREW (4 PLACES)

24.64 (0.97) 24.64 (0.97)

1.00 (0.04) x 45° CHAMFER

4 x 1/2 FH SS PHIL SCREW

REAR MOUNT BEZEL

- 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

2X R1.6 [.063] 11.94 [.470] Ø25.02 [.985]

SS LOCK WASHER

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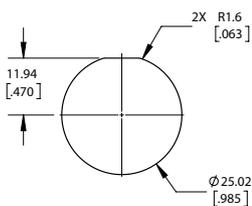
- The under panel depth for the Metal Threaded Housing configuration is 14.55 mm (0.573 in).
- Mounting nut can be tightened to a recommended torque of 10 lbf.

PLASTIC THREADED HOUSING - DROP-IN CUTOUT

2X R1.6 [.063] 11.94 [.470] Ø25.02 [.985]

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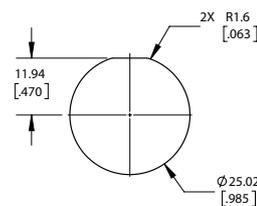
- The under panel depth for the Plastic Threaded Housing configuration is 14.55 mm (0.573 in).
- Mounting nut can be tightened to a recommended torque of 10 lbf.

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BUILD YOUR PART NUMBER

TS

SERIES

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 25 cm PTFE [2-1]
2	28 AWG 25 cm PTFE [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	✛

HANDLE[1]

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

OUTPUT OPTIONS [4]

00	0 V to 5 V	**06**	0.5 V to 4.5 V - Sensor 1 / 0.5 V to 4.5 V - Sensor 2	**11**	1 V to 4 V - Sensor 1 / 4 V to 1 V - Sensor 2
01	0.25 V to 4.75 V	**07**	1 V to 4 V - Sensor 1 / 1 V to 4 V - Sensor 2	**12**	Customer specified
02	0.5 V to 4.5 V	**08**	0 V to 5 V - Sensor 1 / 5 V to 0 V - Sensor 2	**13**	PWM [3]
03	1 V to 4 V	**09**	0.5 V to 4.5 V - Sensor 1 / 4.5 V to 0.5 V - Sensor 2	**14**	USB (Game Controller)
04	0 V to 5 V - Sensor 1 / 0 V to 5 V - Sensor 2	**10**	0.25 V to 4.75 V - Sensor 1 / 4.75 V to 0.25 V - Sensor 2	**15**	Joyball (Cursor emulation)
05	0.25 V to 4.75 V - Sensor 1 / 0.25 V to 4.75 V - Sensor 2				

LED CONTROL

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

POWER SUPPLY OPTIONS

A	Single
B	Independent [5]

LED COLOR

BLANK	No illumination
BB	Blue
RR	Red

[1] Pushbutton, Mushroom and Low profile handle not available with T (threaded housing, metal) or P (threaded housing, plastic),

[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

17.17
(0.676)

PIN INDICATES
+Y DIRECTION

33.27
(1.31)

19.20
(0.75)

23.00
(0.91)

10.00 - 13.00
(0.40 - 0.50)

25.40
(1.00)

29.70
(1.17)

Top view

METAL THREADED HOUSING

17.17
(0.676)

Ø24.89
(0.98)

11.81
(0.465)

33.12
(1.304)

LOCATING FEATURE, Y+

10.00 - 13.00
(0.40 - 0.50)

Bottom view

Ø32.77
(1.29)

Top view

PLASTIC THREADED HOUSING

Ø35.56
[1.40]

LOCATING FLAT, Y+

Ø17.16
[.68]

34.84
[1.37]

10.1
[.40]

Bottom view

Ø32.77
[1.29]

Top view
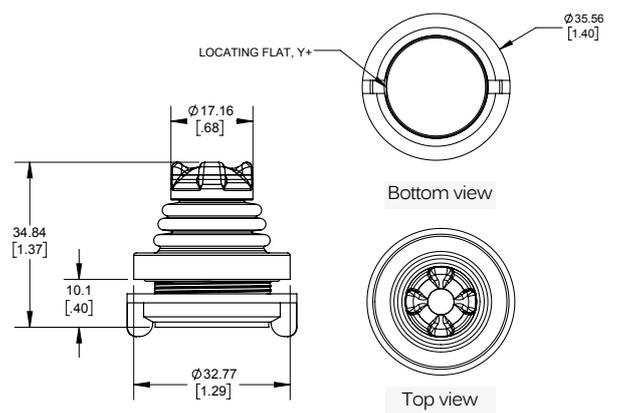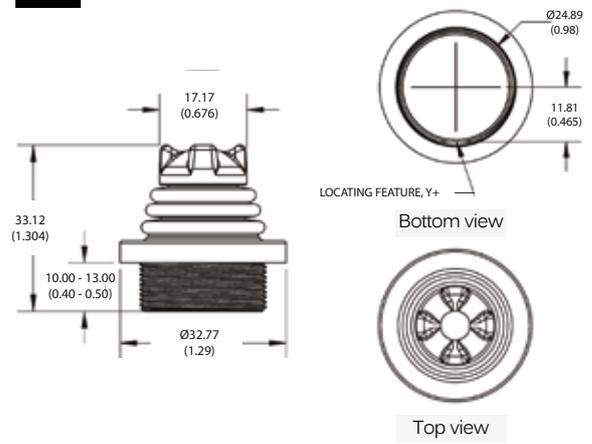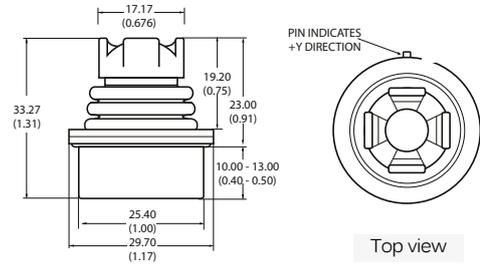
TS series

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HANDLE OPTIONS

Ø17.17
(0.676)
19.20
(0.75)

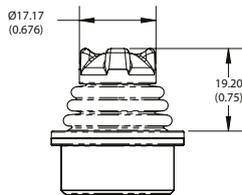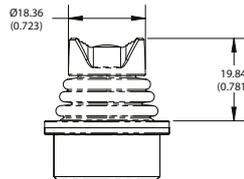**1** Castle
B Castle (elastomer)

Ø18.36
(0.723)
19.84
(0.781)

2 Winged hat
C Winged hat (elastomer)

Ø17.30
(0.681)
20.35
(0.801)
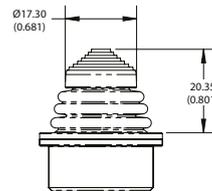
3 Conical
D Conical (elastomer)
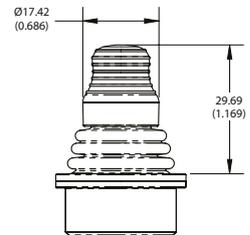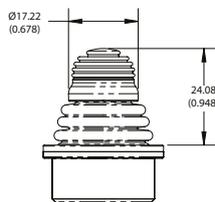
Ø17.42
(0.686)
29.69
(1.169)

4 Fingertip

Ø17.22
(0.678)
24.08
(0.948)

5 Round jog

Ø17.65
(0.695)
19.99
(0.787)

6 Pushbutton

Ø20.32
(0.800)
20.27
(0.798)

7 Mushroom

Ø15.24
(0.600)
14.88
(0.586)

8 Low profile

Ø17.16
(0.676)
18.89
(0.744)

E Quadcave

Ø20.55
(0.809)
18.60
(0.732)

F Puck

21.8
[.86]
19.5
[.77]

G Roller

Ø17.4
[.69]
19
[.75]
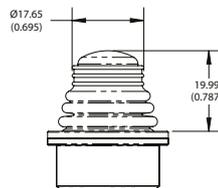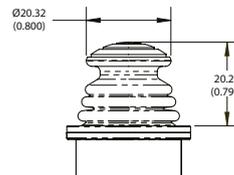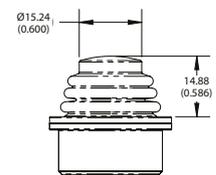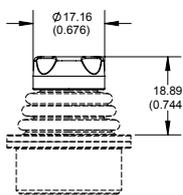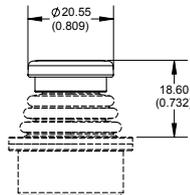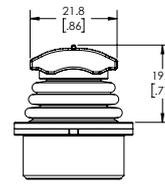
H Castle, LED illumination

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
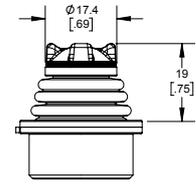
- Applications: The cursor emulation option is ideal for vehicle applications subjected to dirt and high vibration which makes operating a traditional cursor control device difficult. The Cursor Emulation option is widely used in shipboard and military applications.
- Features:
    - HID compliant "pointing device"
    - Plug-and-play with USB option
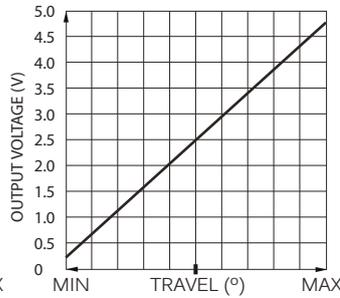- Supplied wiring: USB Male Type A Connector with overmolded cable

PATENT PENDING

TS series

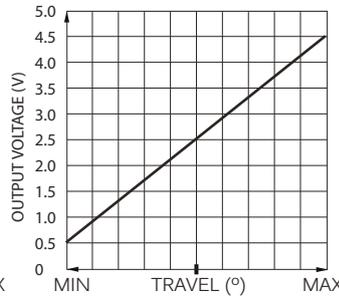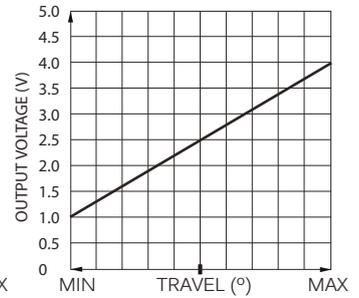## Proportional miniature thumb controls • non-contacting Hall effect technology
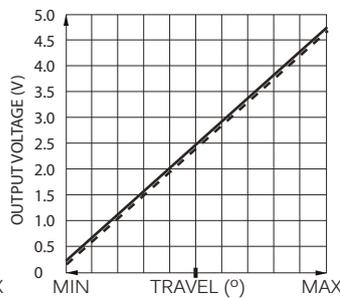
⚡ VOLTAGE OUTPUT OPTIONS [1]
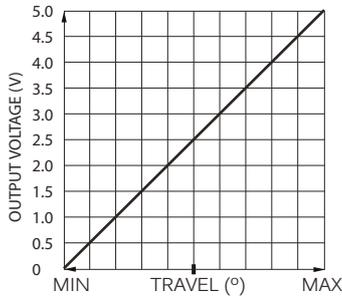
Option **00**

Option **01**

Option **02**

Option **03**
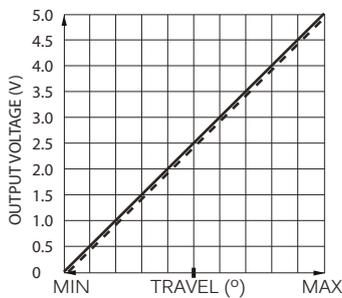
Option **04**

Option **05**
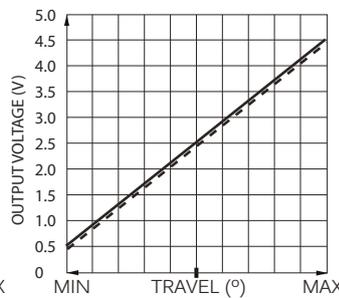
Option **06**
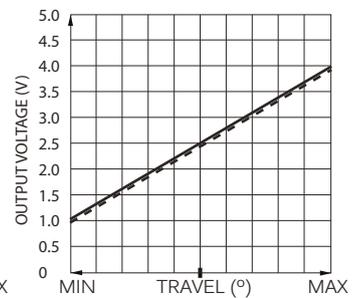
Option **07**
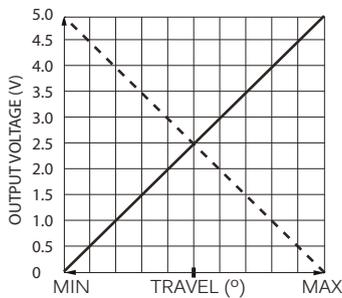
Option **08**
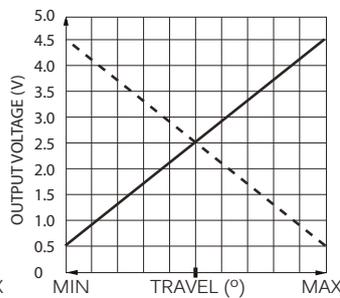
Option **09**
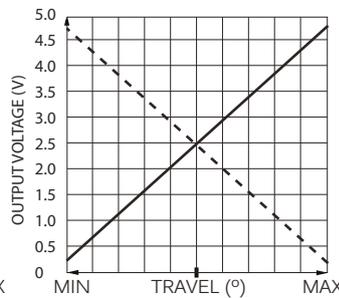
Option **10**
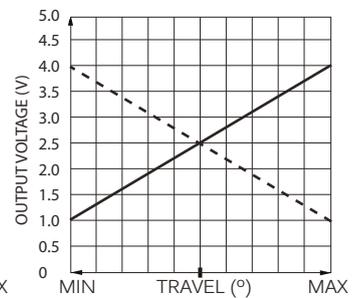
Option **11**

——————— Sensor 1
- - - - - - - Sensor 2

⤬ 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)

- 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.

[1] Voltage outputs are ratiometric to supply voltage

Mouser Electronics

Authorized Distributor

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

Apem:

  TS-6A1S02A   TS-AA1S08A   TS-7A1S00A   TS-AA1S02A   TS-7A1P00A   TS-6A1S00A   TS-6A1P00A   TS-3A1P00A
TS-AA1U00A   TS-6A1U00A   TS-AA1U02A   TS-4A1S02A   TS-AA1S09A   TS-3A1G00A   TS-7A1U00A   TS-6A1S08A
TS-5A1S00A   TS-1R1P00A   TS-1R1G00A   TSAA1P00A   TS4A1S00A   TSAA1S00A   TS1A1S00A   TS1R1S14A
TS1D1U14A   TSAA1G00A   TS1A1U00A   TS1A1G02A   TS1A1S01A   TS1A1S02A   TS1A1S04A   TS1A1U01A
TS1A2G06A   TS1R1S00A   TS1D1S00A   TSAD3P14A   TSAR1G05A   TSAR1P01A   TSAR1S00A   TSAR1U00A
TSAR2G09A   TSAA2S04A   TSAA3S14A   TSAD1G09A   TSAD1P00A   TSAD1S00A   TSAD2S09A   TSAA1S01A
TSAA1S14A   TSAA2G01A   TSAA2G02A   TSAA2G09A   TSAA2S00A   TS4R2S00A   TS4R2U00A   TS5A1S09A
TS6D2S02A   TSAA1G01A   TSAA1P01A   TS4R1S01A   TS4R1S08A   TS4R1S14A   TS4R1U00A   TS4R2G00A
TS4R2G09A   TS4D2S15A   TS4R1G00A   TS4R1G09A   TS4R1P01A   TS4R1P04A   TS4R1S00A   TS4D1S04B
TS4D1S06A   TS4D1U00A   TS4D1U02A   TS4D2S01A   TS4D2S04A   TS3R2U00A   TS3R2U02A   TS4A2G00A
TS4A2S02A   TS4D1G06A   TS4D1S00A   TS3R1S05A   TS3R1S05B   TS3R1S14A   TS3R2S00A   TS3R2S02A
TS3R2S04A   TS3D2S00A   TS3D2U09A   TS3N1S01A   TS3N2S00A   TS3N2S02A   TS3R1S04A   TS1R1G06A
TS1R1G14A   TS2R2U02A   TS2R2U03A   TS3D1S00A