

# 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)<sup>1</sup>
- Maximum Vertical Load: 200N (45lbf)<sup>1</sup>
- Maximum Horizontal Load: 150N (33.7lbf)<sup>1</sup>
- 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, IP69K<sup>2</sup>
- 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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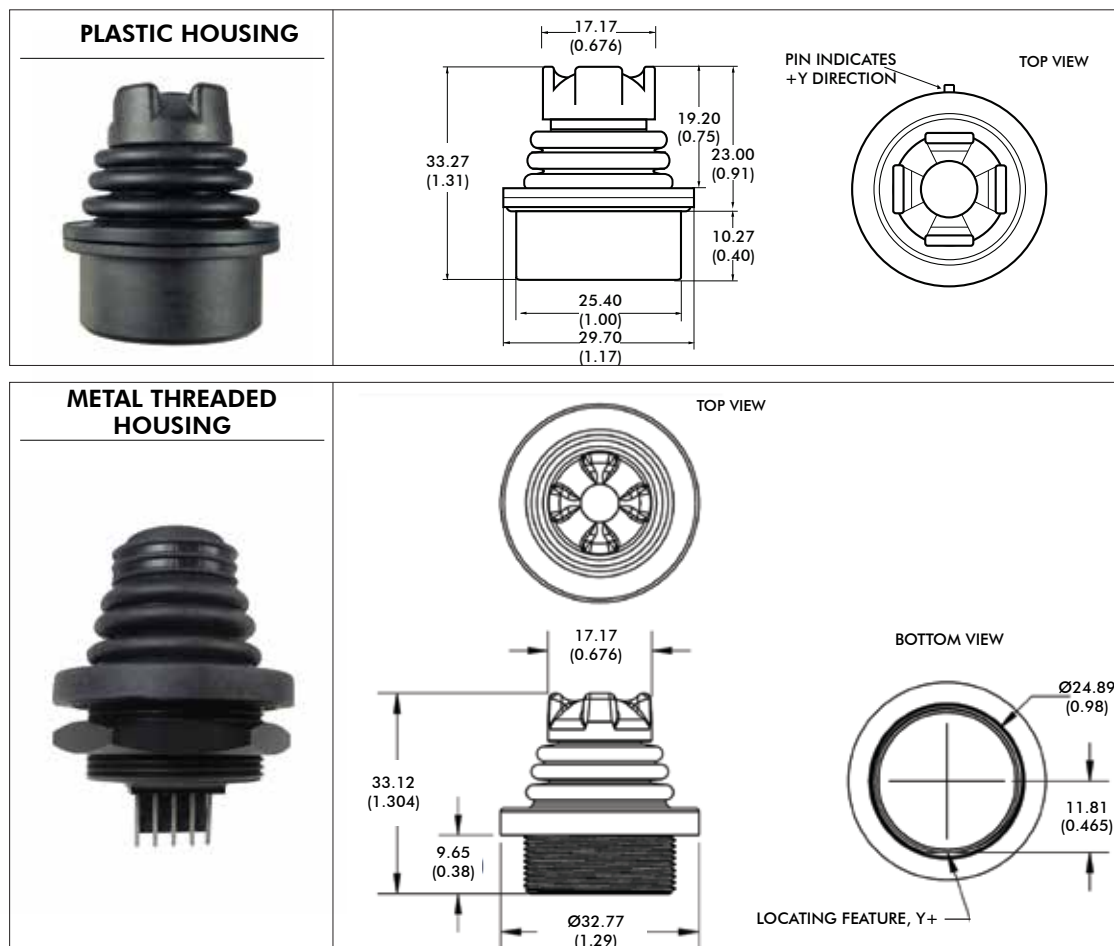
## Proportional Hall effect thumbsticks

### Overview

|                         |  |                                                              |  |                               |  |                            |  |
|-------------------------|--|--------------------------------------------------------------|--|-------------------------------|--|----------------------------|--|
| TS                      |  |                                                              |  |                               |  |                            |  |
| SERIES                  |  |                                                              |  |                               |  |                            |  |
| Handle                  |  | Termination <sup>1</sup>                                     |  | Output Options                |  | Power Supply Options       |  |
| 0 None                  |  | 1 22AWG 25cm PTFE                                            |  | 00 0V to 5V (Rail to Rail)    |  | A Single                   |  |
| 1 Castle                |  | 2 28AWG 25cm PTFE                                            |  | 01 0.25V to 4.75V             |  | B Independent <sup>3</sup> |  |
| 2 Winged Hat            |  | 3 72" Overmold Cable with USB Male Type Connector            |  | 02 0.5V to 4.5V               |  |                            |  |
| 3 Conical               |  | 4 2.54mm (0.100") Pitch TE Connector                         |  | 03 1V to 4V                   |  |                            |  |
| 4 Finger Tip            |  | 5 2.54mm (0.100") Pitch TE Connector with 10" Mating Harness |  | 04 0V to 5V - Sensor 1        |  |                            |  |
| 5 Round Jog             |  |                                                              |  | 0V to 5V - Sensor 2           |  |                            |  |
| 6 Pushbutton            |  |                                                              |  | 05 0.25V to 4.75V - Sensor 1  |  |                            |  |
| 7 Mushroom*             |  |                                                              |  | 0.25V to 4.75V - Sensor 2     |  |                            |  |
| 8 Low Profile*          |  |                                                              |  | 06 0.5V to 4.5V - Sensor 1    |  |                            |  |
| A Handles 1, 2, 3       |  |                                                              |  | 0.5V to 4.5V - Sensor 2       |  |                            |  |
| B Castle, elastomer     |  |                                                              |  | 07 1V to 4V - Sensor 1        |  |                            |  |
| C Winged Hat, elastomer |  |                                                              |  | 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 <sup>2</sup>           |  |                            |  |
|                         |  |                                                              |  | 14 USB (Game Controller)      |  |                            |  |
|                         |  |                                                              |  | 15 Joyball (Cursor emulation) |  |                            |  |
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#### 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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## Proportional Hall effect thumbsticks

Models and dimensions

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

### NOTES:

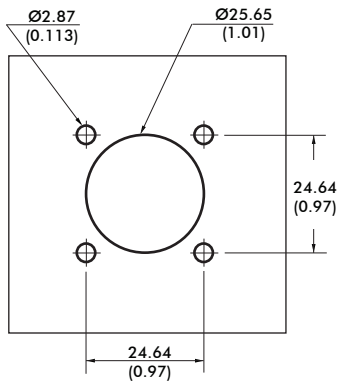
- Option 7 and 8 handles not available with the "T" threaded housing mounting style.
- Dimensions are in mm/(inch).

# TS series

## Proportional Hall effect thumbsticks

Models and dimensions – continued

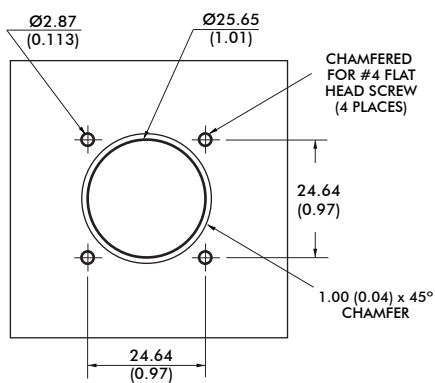
### PLASTIC HOUSING - DROP-IN OPTION CUTOUT DIMENSIONS



4 x PUSH IN CONNECTORS



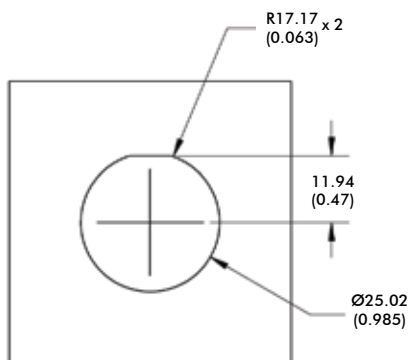
### PLASTIC HOUSING - REAR MOUNT OPTION CUTOUT DIMENSIONS



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).

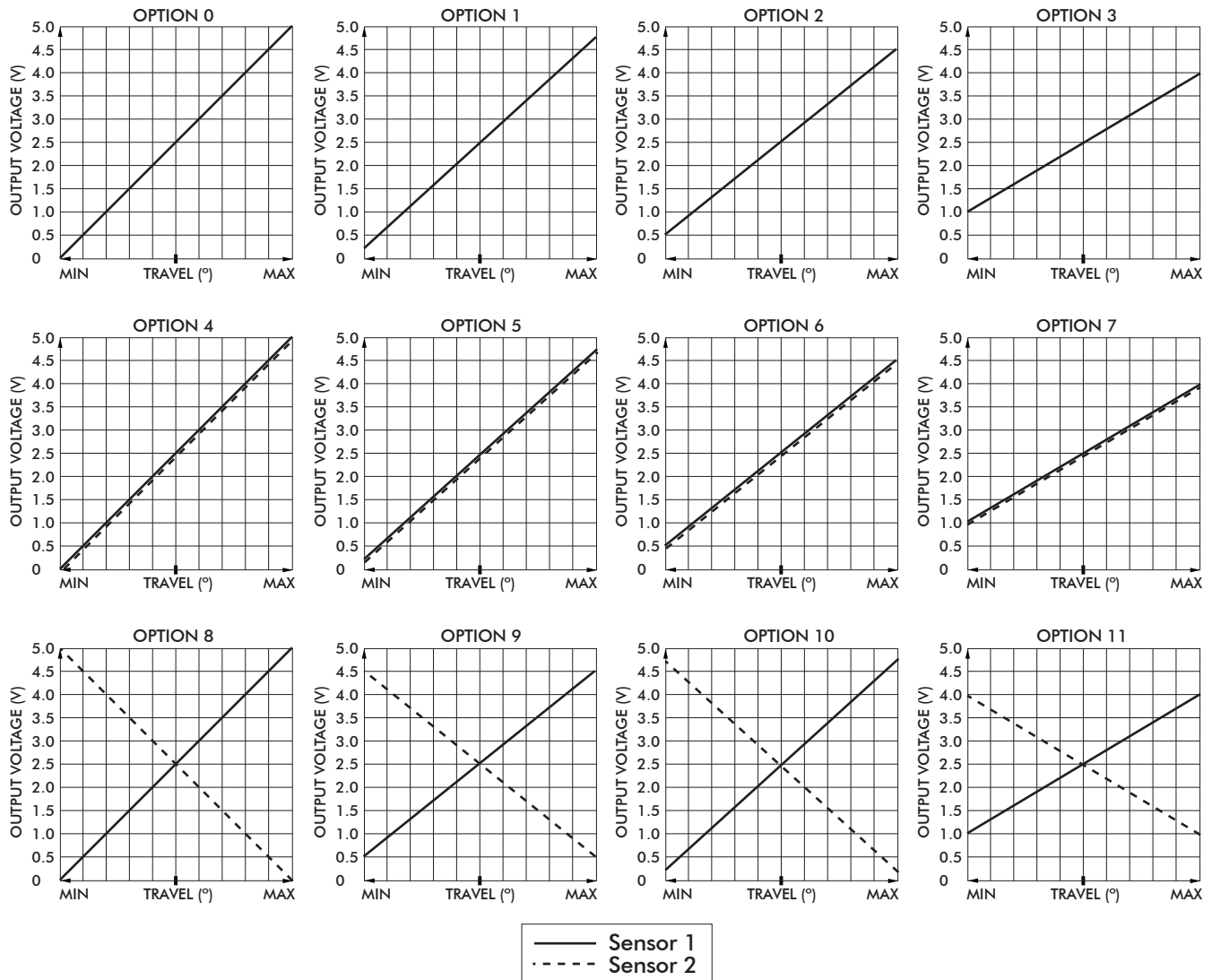
Note: The company reserves the right to change specifications without notice.

# TS series

## Proportional Hall effect thumbsticks

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)

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

# TS series

## Proportional Hall effect thumbsticks

### 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

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