

# 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:  $3.1\text{N} \pm 0.5\text{N}$  ( $0.70\text{lbf} \pm 0.11\text{lbf}$ )<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:  $18.25\text{g} \pm 5.0\text{g}$  ( $0.64\text{oz} \pm 0.18\text{oz}$ )
- 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:  $5.00\text{V} \pm 0.01\text{V}$
- Reverse Polarity Max: -10V
- Overvoltage Max: 20V
- Output Impedance: 2Ω
- Return to Center Voltage Tolerance:  $\pm 200\text{mV}$  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

### 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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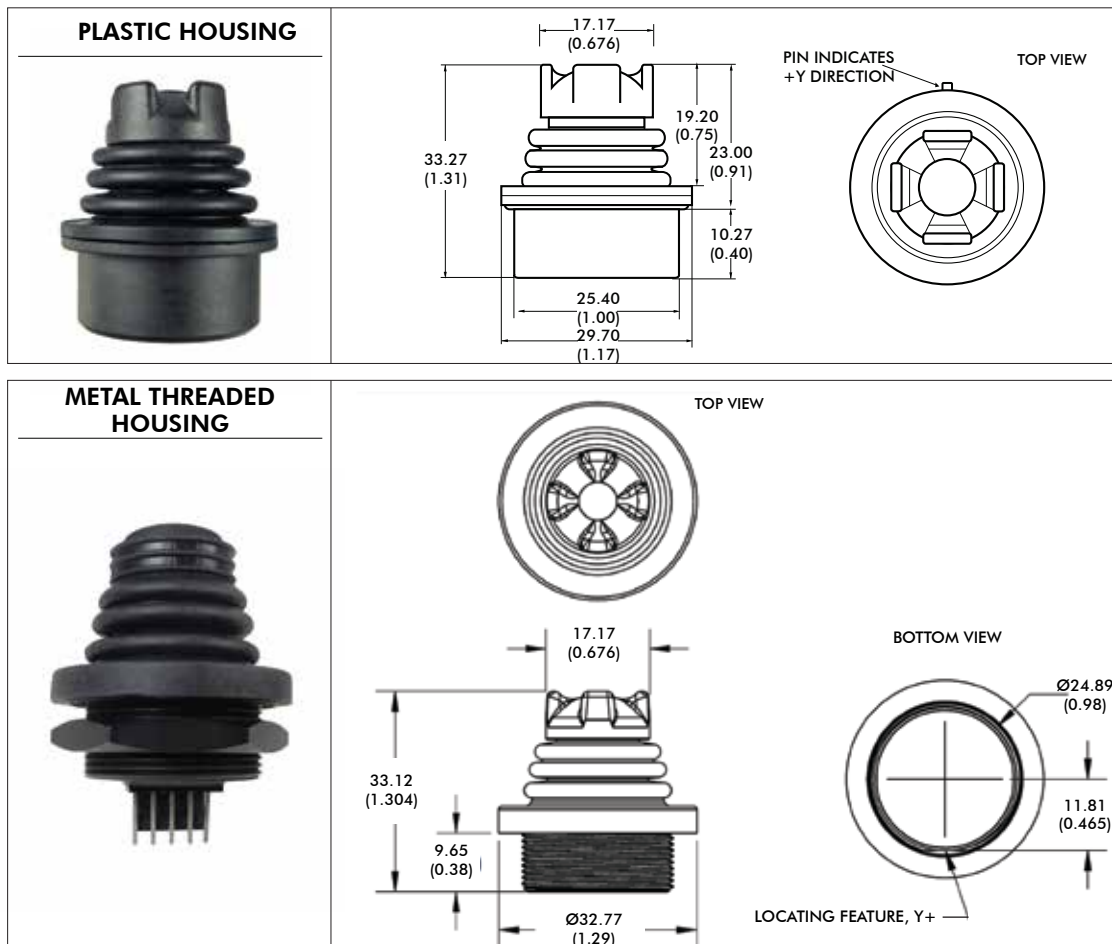
## Proportional Hall effect thumbsticks

### Overview

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

#### 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       |                       |                      |
|----------------------|-----------------------|----------------------|
| <b>1. CASTLE</b>     | <b>2. WINGED HAT</b>  | <b>3. CONICAL</b>    |
| <b>4. FINGER TIP</b> | <b>5. ROUND JOG</b>   | <b>6. PUSHBUTTON</b> |
| <b>7. MUSHROOM</b>   | <b>8. LOW PROFILE</b> |                      |

### NOTES:

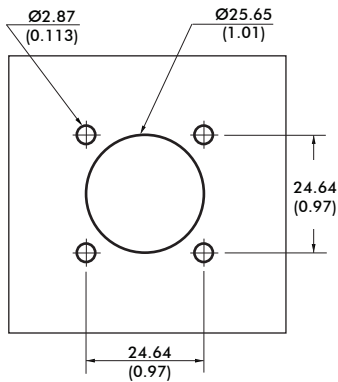
- Option 7 and 8 handles not available with the "T" threaded housing mounting style.
- Dimensions are in mm/(inch).

# TS series

## Proportional Hall effect thumbsticks

Models and dimensions – continued

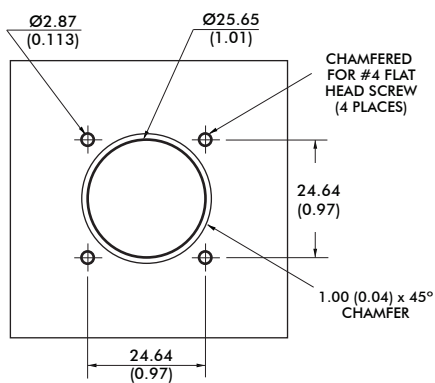
### PLASTIC HOUSING - DROP-IN OPTION CUTOUT DIMENSIONS



4 x PUSH IN CONNECTORS



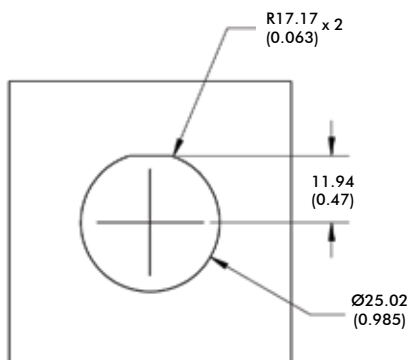
### PLASTIC HOUSING - REAR MOUNT OPTION CUTOUT DIMENSIONS



4 x 1/2 FH SS PHIL SCREW



### METAL THREADED HOUSING - DROP-IN OPTION CUTOUT DIMENSIONS



#### NOTES:

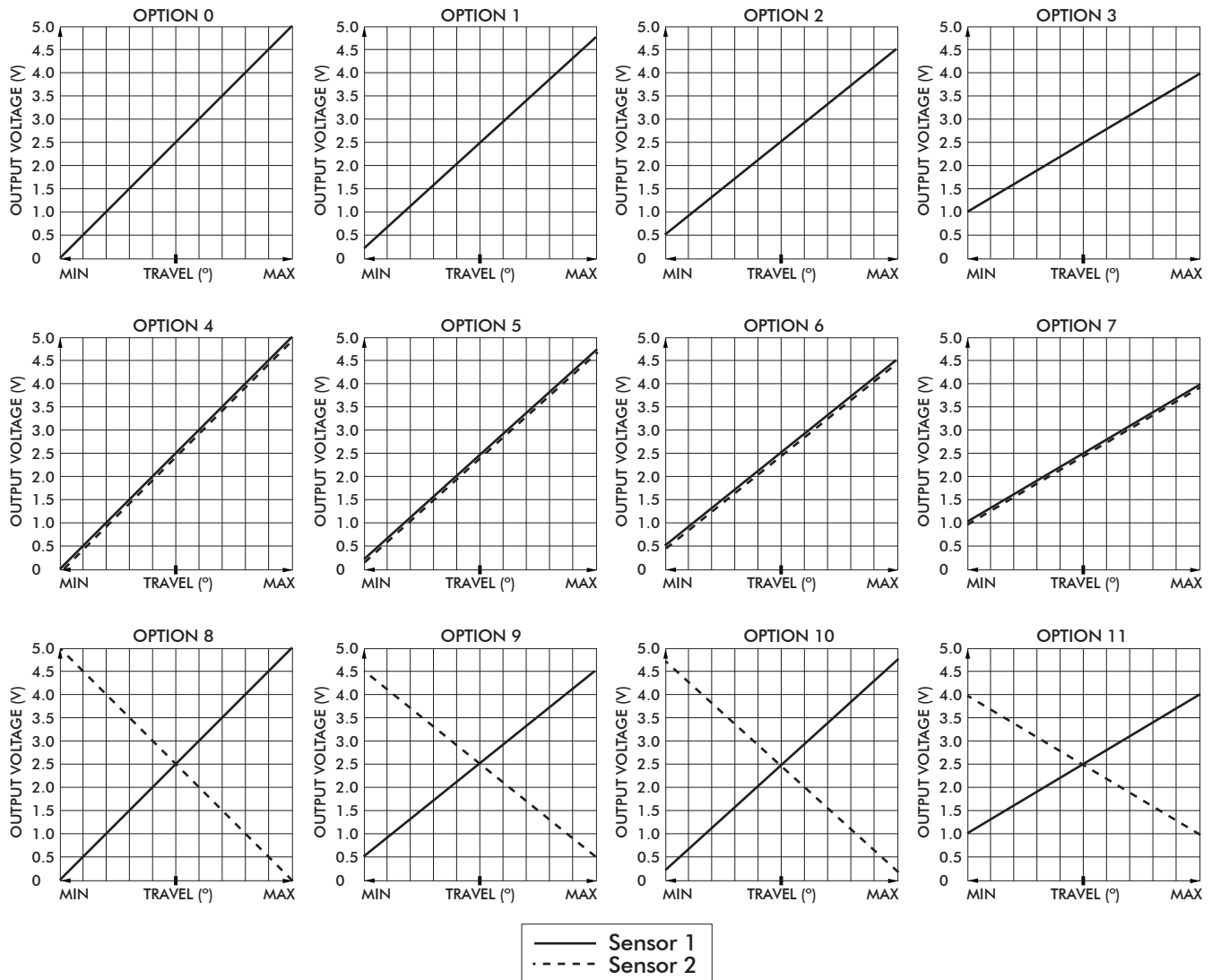
- 1 The maximum panel thickness for the Rear Mount configuration is 2.032mm (0.08in)
- 2 The under panel depth for the Drop-in configuration is 16.02mm/(0.631in).
- 2 The under panel depth for the Metal Threaded Housing configuration is 14.55mm/(0.573in).
- 3 Dimensions are in mm/(inch).

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## 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)

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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

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