TS series

Proportional Hall effect thumbsticks

The TS series Thumbstick is a proportional two axes joystick in a miniature package. Featuring non-contacting Hall effect technology for long life performance, the TS series Thumbstick is available with multiple linear output options including single and dual (redundant) outputs. It is similar in size and operation to "gamepad" controls, but in a rugged industrial package. Typical applications include pendant and remote controls as well as joystick handle and arm rest integration.

KEY FEATURES

- ❑ **1 or 2 axes**
- ❑ **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**

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OPTION SELECTION

TS [ ] [ ] [ ] [ ] [ ] [ ]

SERIES

HANDLE

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

TERMINATION[1]

1	22AWG 25cm PTFE
2	28AWG 25cm PTFE
3	Customer specified
4	2.54mm (0.100") Pitch TE Connector

OUTPUT OPTIONS

00	0V to 5V (Rail to Rail)
01	0.25V to 4.75V
02	0.5V to 4.5V
03	1V to 4V
04	0V to 5V - Sensor 1 0V to 5V - Sensor 2
05	0.25V to 4.75V - Sensor 1 0.25V to 4.75V - Sensor 2
06	0.5V to 4.5V - Sensor 1 0.5V to 4.5V - Sensor 2
07	1V to 4V - Sensor 1 1V to 4V - Sensor 2
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[2]
14	USB (Game Controller)
15	Joyball (Cursor emulation)

POWER SUPPLY OPTIONS

A	Single
B	Independent[3]

MOUNTING HARDWARE

N	None
D	Drop-in
R	Rear mount
A	Drop-in and Rear Mount
T	Threaded bushing

LIMITER

U	Single axis
S	Square
G	Guided feel
P	Plus

SPECIFICATIONS

MECHANICAL (FOR X, Y AXES)		
Operating Force	–	3.1N±0.5N (0.70lbf±0.11lbf)[4]
Maximum Vertical Load	–	200N (45lbf)[4]
Maximum Horizontal Load	–	150N (33.7lbf)[4]
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[5]
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

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.

1-1 - 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).

4 Force applied to the top of the castle cap.

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

- All values are nominal

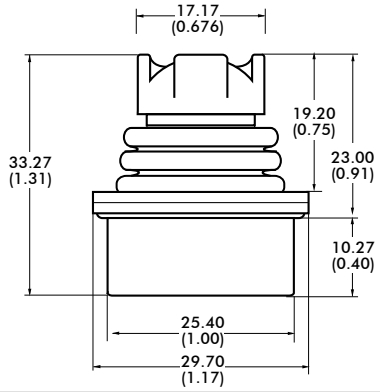
SPECIFICATIONS - continued

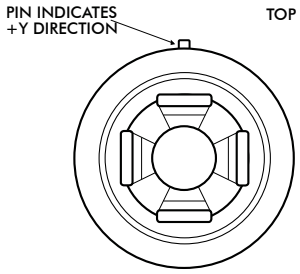
PUSHBUTTON SWITCH (Option 6 Handle)		
Electrical life	–	100,000 cycles
Rating	–	50mA,12VDC.
Terminal	–	Brass with silver plating
Contact resistance	–	100mΩ max.
Insulation resistance	–	100MΩ min. 500VDC.
Dielectric strength	–	250VAC /1 minute.
Contact arrangement	–	1 pole 1 throw.
Operation force	–	1.5lbf
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	–	Silicon
Handles	–	1, 2, 3 - Glass filled nylon 4, 5, 6, 7, 8 - silicon

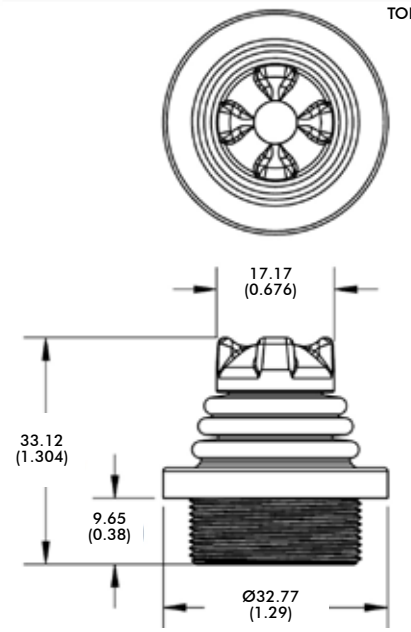
DIMENSIONAL DRAWINGS

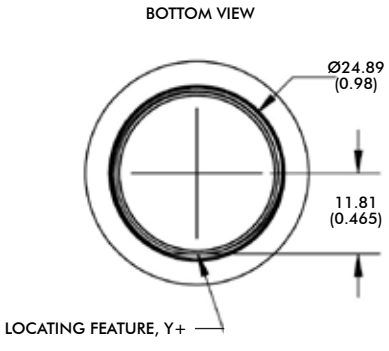
PLASTIC HOUSING





METAL THREADED HOUSING





Notes: Dimensions are in mm/(inch).
The company reserves the right to change specifications without notice.

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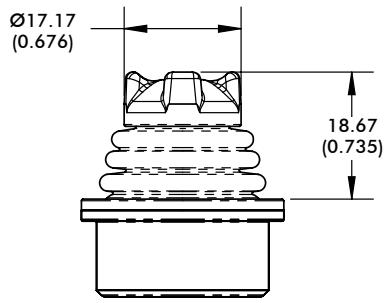
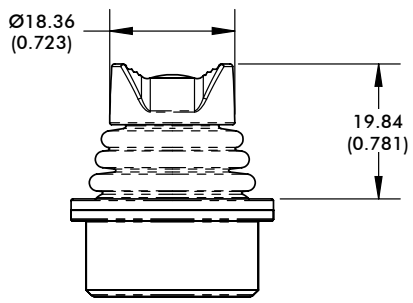
DIMENSIONAL DRAWINGS - continued

HANDLE OPTIONS

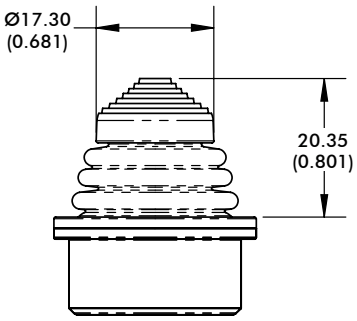
1. CASTLE



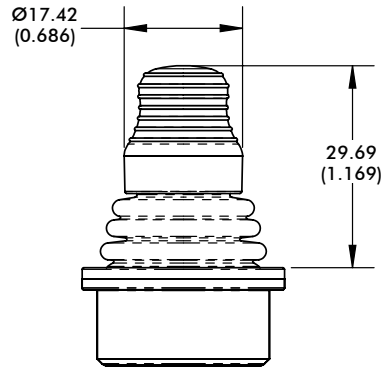
2. WINGED HAT



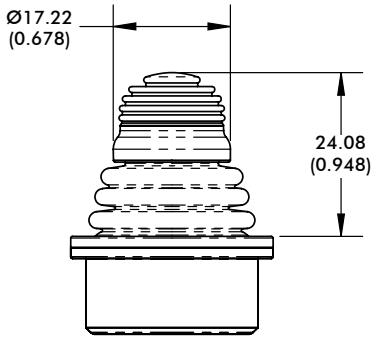
3. CONICAL



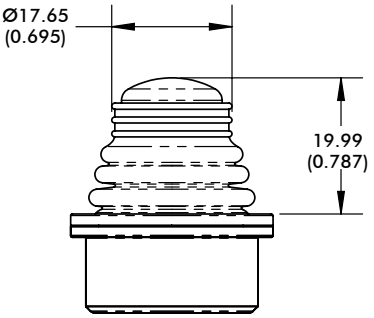
4. FINGER TIP



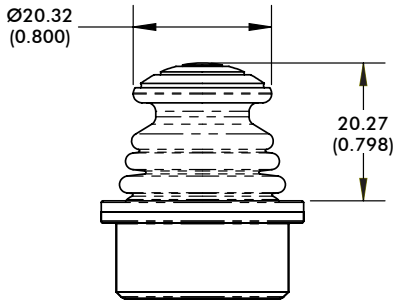
5. ROUND JOG



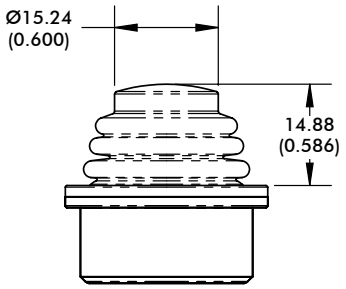
6. PUSHBUTTON



7. MUSHROOM



8. LOW PROFILE



Note: Option 7 and 8 handles not available with the "T" threaded housing mounting style.

Notes: Dimensions are in mm/(inch).
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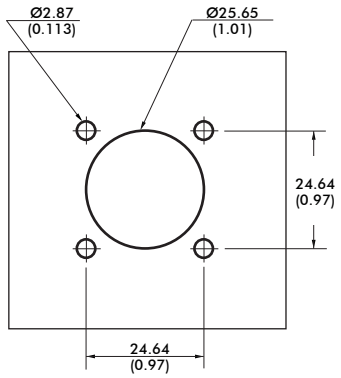
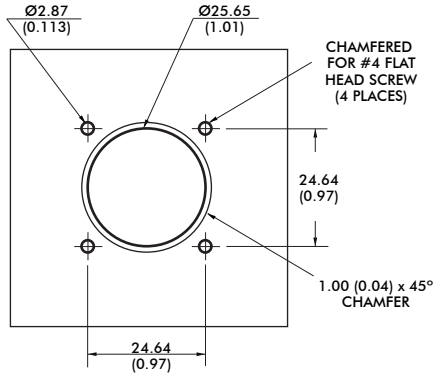
MOUNTING OPTIONS

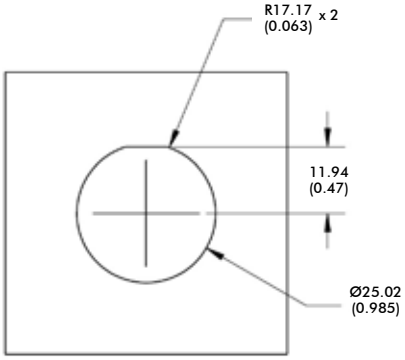
PLASTIC HOUSING - DROP-IN OPTION CUTOUT DIMENSIONS

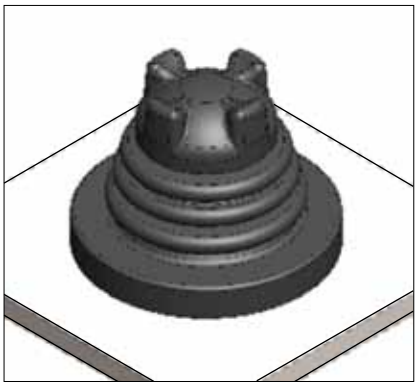


PLASTIC HOUSING - REAR MOUNT OPTION CUTOUT DIMENSIONS



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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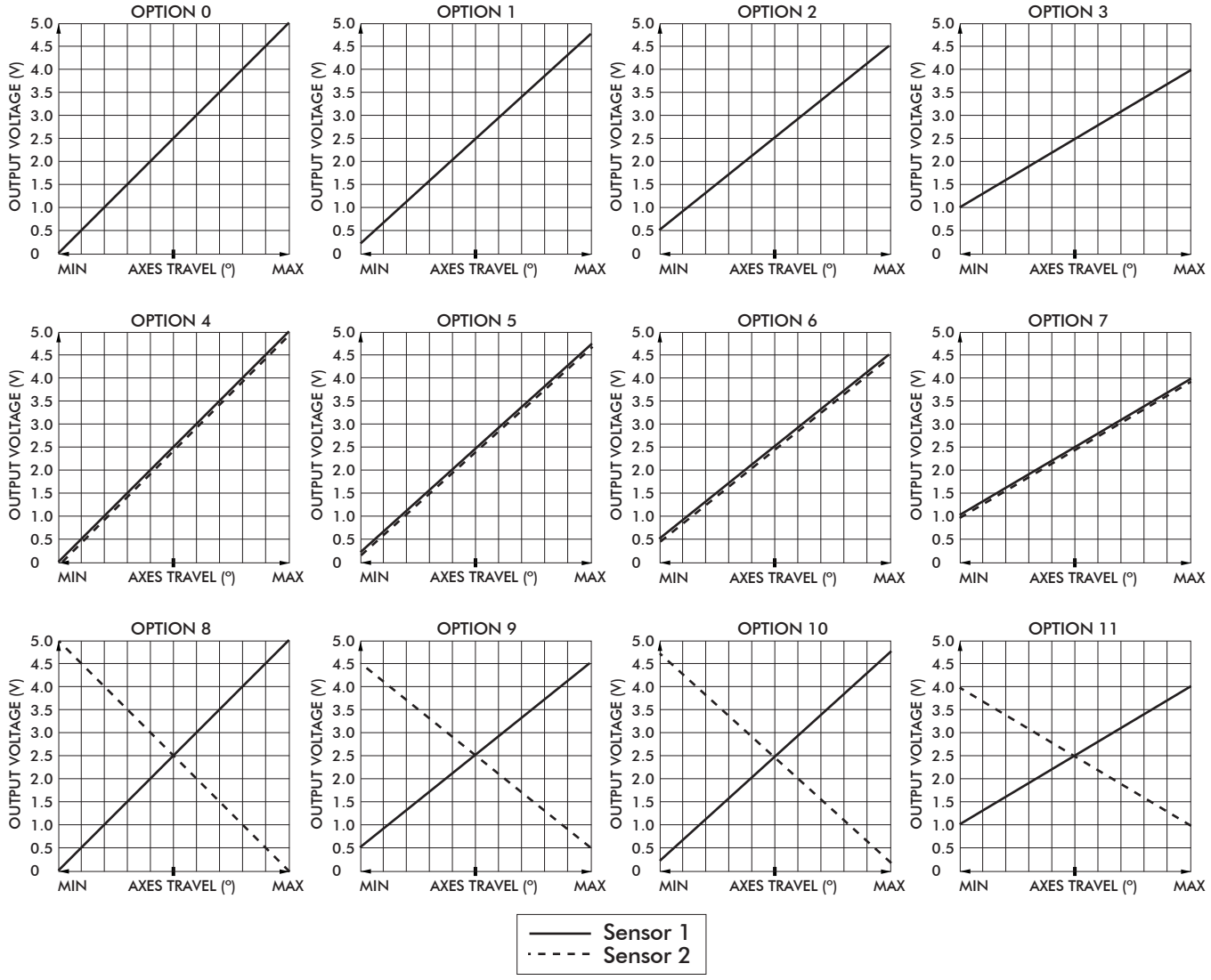
SPECIFICATIONS

LINEAR 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)
Red/White Stripe	-	X axis output (beta)
Yellow/Black Stripe	-	Y axis output (beta)
Red/White Stripe	-	Power (5V) (beta)
Black/White Stripe	-	Ground (beta)

CONNECTOR TERMINATION OPTION

The TS series Thumbstick may be specified with a TE 2.54mm (0.100") pitch header.
Both single and dual output Thumbstick configurations feature a 7 position TE 3-647166-7 connector.

PINOUT INFORMATION:

Pin 1: Switch	Pin 5: Y (alpha)
Pin 2: Not used	Pin 6: Y (beta)
Pin 3: GND	Pin 7: 5VDC
Pin 4: X (alpha)	Pin 8: X (beta)

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

ADDITIONAL OUTPUT OPTIONS

PLUG-AND-PLAY SOLUTIONS:

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 and Linux. Joystick button and axes 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 overmolded cable
(Optional ruggedized military connectors are available.)

USB Male Type A Connector

JOYBALL (CURSOR EMULATION)

The Joyball option converts multi-axis joystick ouput 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. Supported protocols: USB.

APPLICATIONS

The Joyball option is ideal for vehicle applications subjected to dirt and high vibration which make operating a traditional cursor control device difficult. The Joyball option is widely used in shipboard and military applications.

FEATURES

- HID compliant "pointing device"
- Plug-and-play with USB option
- Ideal for marine GPS and navigation

SUPPLIED WIRING

USB: USB Male Type A Connector with overmolded cable.