



The 1000 Series is a versatile range of low cost switch joysticks and is ideal for light to medium duty environments where proportional control is not a necessity. Configurable with either single or double pole switching, the 1000 Series can also be specified as screw or bush mounted.

There are two construction options, based on the use of either V3 or V4 switches. V4 switches may be specified with 6A or 10A operation, yielding a smaller joystick than the construction employed for V3 switches which yields up to 16A operation.



KEY FEATURES

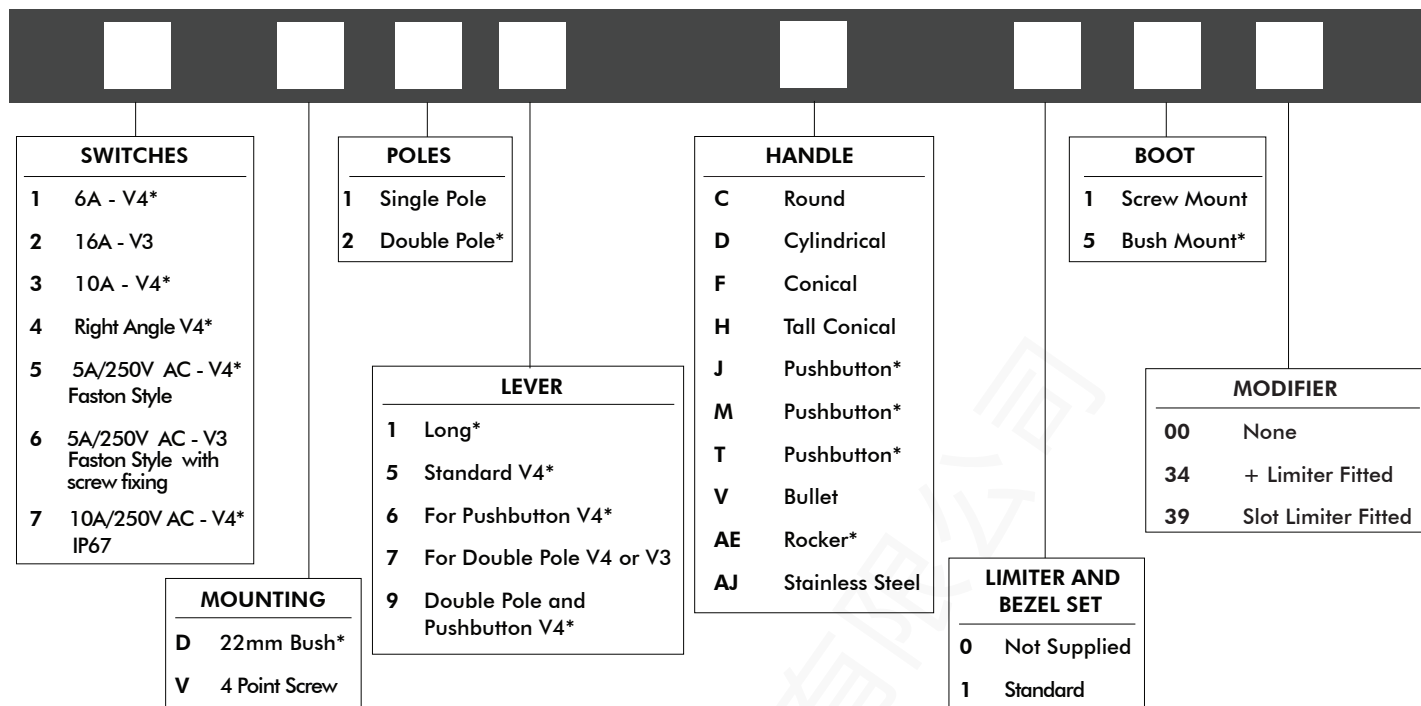
- Compact size
- Robust construction
- Single or dual axes
- Single or double pole
- Gold contacts
- Bushing or screw mount
- V4 switches
- V3 switches
- Alternative handle selection including pushbutton handles



1000 series

Compact switch joysticks

OPTION SELECTION



* Unavailable with V3 construction.

SPECIFICATIONS

MECHANICAL

Mechanical Life	-	>5 Million Operations
Lever Travel	-	24° (12° from center)
Lever Material	-	Stainless Steel or Brass
Mass/weight	-	40g
Body Material	-	Mineral Filled Nylon-6
Handle Material	-	See Handles Page
Boot Material	-	Neoprene
Mounting - Screw	-	4 x M2.5 Stainless (Slotted)
Mounting - Bush	-	Single Point 22mm Diameter

ELECTRICAL

Number of Switches	-	2, 4, or 8
Nominal Current	-	6A, 10A, or 16A
Maximum Voltage	-	250V AC
Contacts #1 6A - V4	-	Gold
Contacts #2 10A - V4	-	Silver
Contacts #3 16A - V3	-	Silver
Contacts #4 Right Angle	-	Silver
Contacts #5 Faston Style - V4	-	Silver
Contacts #6 Faston Style - V3	-	Silver
Contacts #7	-	Silver
Switch Contacts	-	Changeover
Contact Life	-	Load Dependent
Pushbutton Cable	-	Blue

ENVIRONMENTAL

Temperature Range	-	-20°C to 50°C ³
Above Panel Seal (IP)	-	To IP67 ¹

NOTES

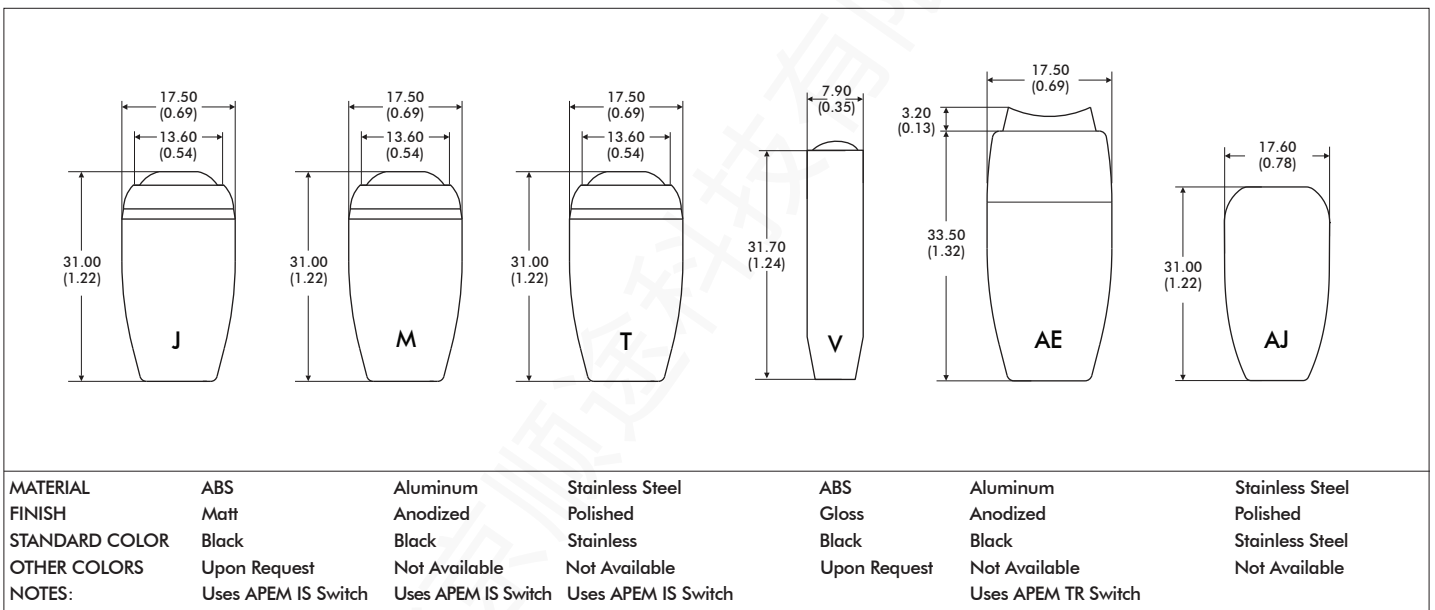
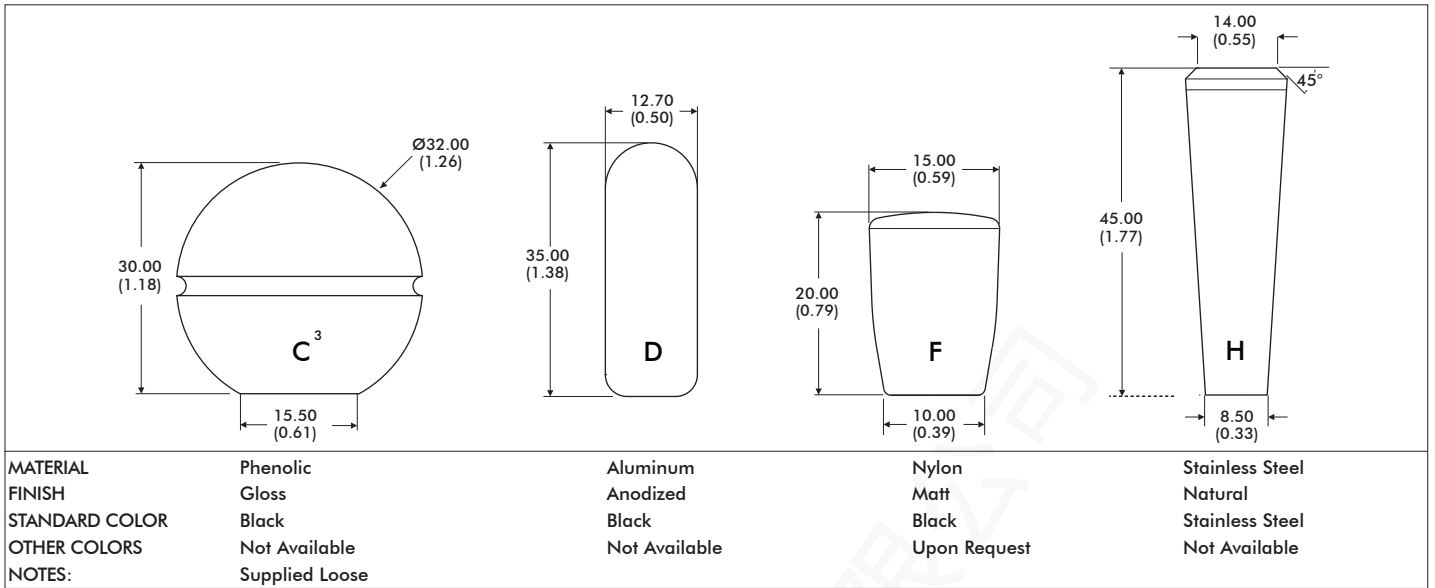
- All values are nominal
- 1. Excludes some handle options.
- 2. Exact specifications may be subject to configuration. Contact Technical Support for the performance of your specific configuration.
- 3. Temperature specification may be subject to the chosen switch option. Please refer to factory.

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

1000 series

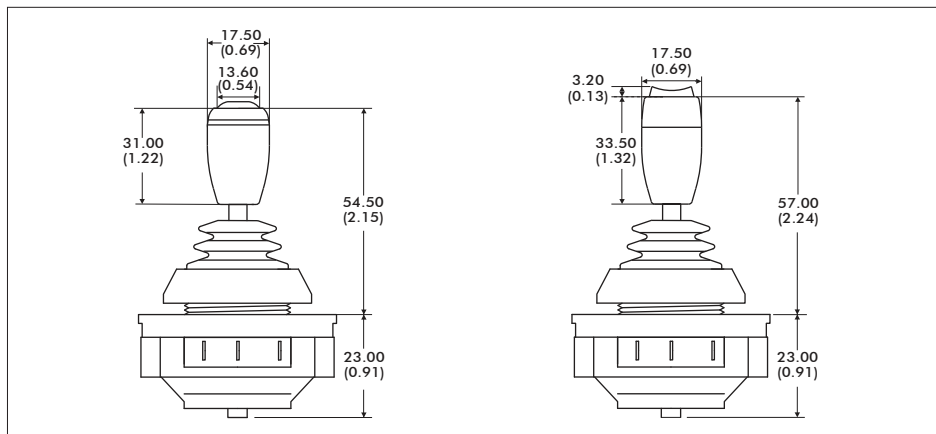
Compact switch joysticks

DIMENSIONAL DRAWINGS - HANDLES



NOTES:

1. Dimensions are in mm/(inch)
2. Pushbutton (J, M, T) and rocker switches (AE) are for bushmount configurations only. Dimensions are shown below.
3. Handle is supplied loose because it is larger than panel cutout. The handle should be press fitted to the joystick, once the joystick is installed in the panel



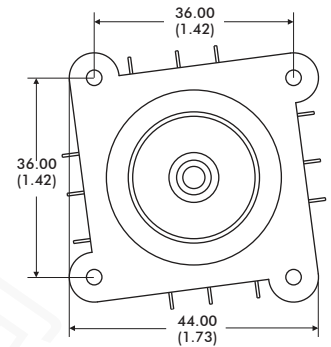
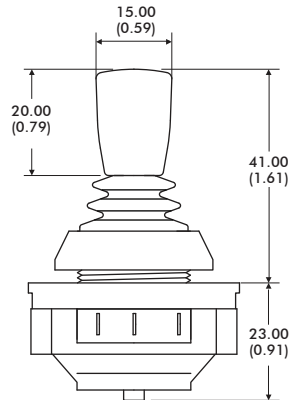
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1000 series

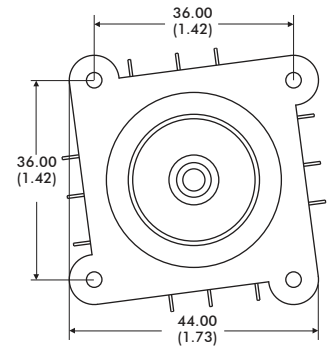
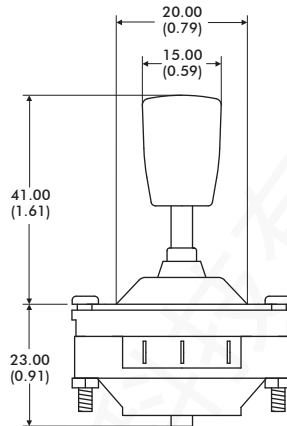
Compact switch joysticks

DIMENSIONAL DRAWINGS - continued

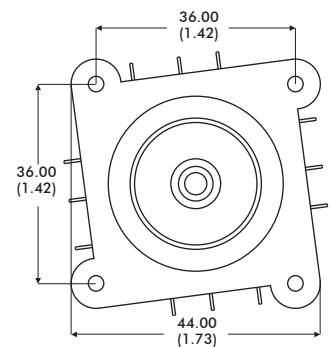
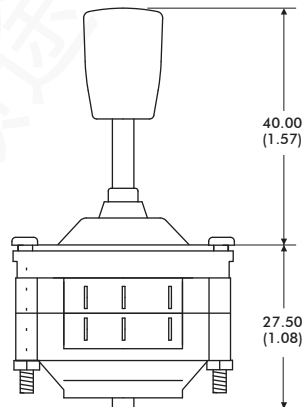
V4 BUSH MOUNT



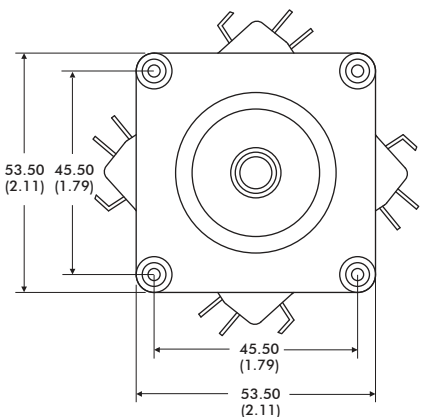
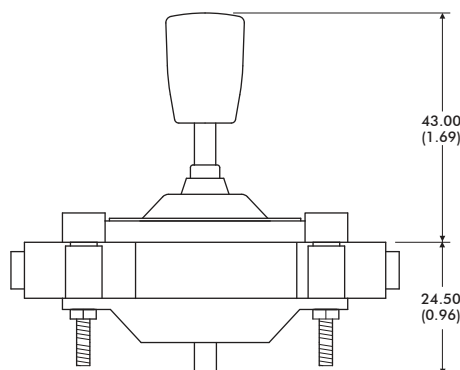
V4 SCREW MOUNT



V4 SCREW MOUNT DOUBLE POLE



V3 SCREW MOUNT



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

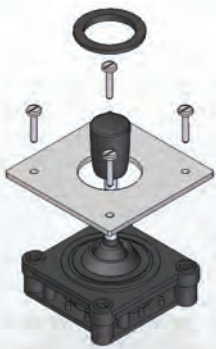
1000 series

Compact switch joysticks

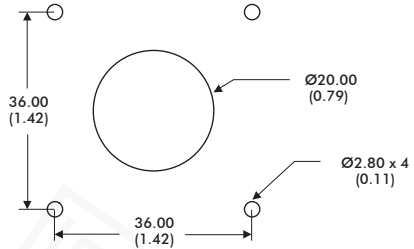
DIMENSIONAL DRAWINGS - continued

MOUNTING CUTOUT DIMENSIONS AND INSTALLATION

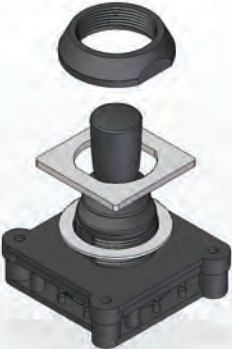
V4 SCREW MOUNT



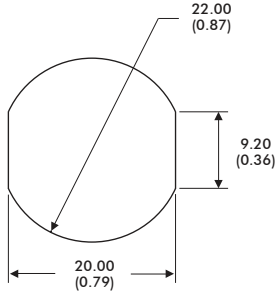
NOTE:
The joystick is mounted from beneath the panel using the 4 x M2.5 machine screws, supplied with the joystick.
Supplied as standard with the joystick is a round bezel which may be fitted (according to customer preference) to finish the front face of the panel. Fitting the bezel is optional, and is not necessary if the panel cut-out finishes the panel. If fitting the bezel is selected then the panel cut out should be toleranced such that the bezel is an interference fit. Additionally bonding the bezel is recommended.




V4 BUSH MOUNT



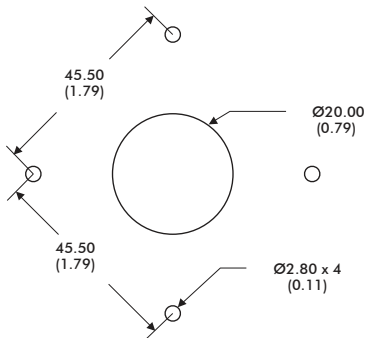
NOTE:
The joystick is mounted from beneath the panel. Supplied as standard with all bush mount joysticks is an adhesive P.V.C. sealing gasket. This should be fitted between the joystick and the panel, in applications where a good seal is needed.



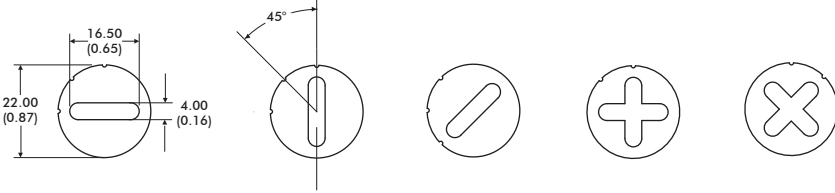
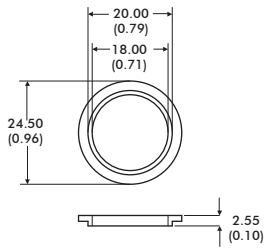
V3 SCREW MOUNT



NOTE:
The joystick is mounted from beneath the panel using the 4 x M2.5 machine screws, supplied with the joystick. Supplied as standard with the joystick is a round bezel which may be fitted (according to customer preference) to finish the front face of the panel. Fitting the bezel is optional, and is not necessary if the panel cut-out finishes the panel. If fitting the bezel is selected then the panel cut out should be toleranced such that the bezel is an interference fit. Additionally bonding the bezel is recommended.



LIMITERS AND BEZEL SET

NOTES:

1. Dimensions are in mm/(inch)

1000 series

Compact switch joysticks

CONFIGURATION OPTIONS

SWITCHES

Seven switch options are specified as standard. All are configured with change-over contacts, allowing the user flexibility of connection.

Option 1 - V4 - 6A/240V AC should be specified where the joystick will be switching smaller current levels. These switches are supplied with gold flash terminals to ensure reliable switching at very low current levels.

Option 2 - V3 - 16A/240V AC should be specified where the joystick will be switching up to 16A.

Option 3 - V4 - 10A/240V AC should be specified where the joystick may be switching up to 10A.

Option 4 - V4 - 5A/250V AC with right angle terminals, should be specified for PCB mounting or simpler termination.

Option 5 - V5 - 5A/250V AC with 2.8mm Faston style terminals.

Option 6 - V3 - 16A/250V AC with long terminals and screw fixing

Option 7 - V4 - 10A/250V AC sealed to IP67

Note: The construction of the joystick employing V3 switches is not available with as many configuration options.

Life and reliability of the switches is heavily determined by the type of application and parameters such as load. Contact the factory for further advice about the expected switch performance under differing loads or DC supplies.

MECHANICAL OPERATION

All 1000 Series are supplied with an open square gate. As a standard option the joystick may be supplied with an additional plastic limiter set, that allows the customer to retro-fit limiters to reduce the travel to single axis(-), cross (+) or diagonal (X) operation. For harsh environments metal limiters are also available.

Joysticks are supplied as standard without a cable harness, allowing the user flexibility of connection. Alternatively the joystick may be factory configured with fitted limiters or cable harnesses, upon customer request.

SEALING

Two boot options are offered as standard to provide an above-panel seal. When specifying a bush mount joystick select boot option 5 which yields an IP65 seal. Alternatively boot option 1 should be selected for 4 point screw mount joysticks which yields an IP67 seal. As standard, an adhesive P.V.C sealing gasket is supplied with all bush mount joysticks, to ensure a good seal between the joystick body and the panel. The sealing standards quoted are panel seals. It is assumed that the below panel area will be sealed. For applications where below panel seal can not be assured, switch option 7 should be selected.

DOUBLE POLE OPERATION

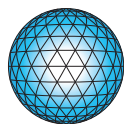
The construction of the joystick is designed such that both switches nominally trigger simultaneously. Such simultaneous triggering is subject to a +/-2 degree tolerance (between switches) owing to the mechanical tolerances and hysteresis of each switch.

MOUNTING

The 1000 Series is available in two mounting options, four point screw mount or bush mount. The V4 screw mount option is supplied with M2.5 x 20mm screws, whereas the larger construction of V3 screw mount joystick is supplied with M2.5 x 25mm screws. All screws supplied are slotted, pan head machine screws, although longer pan head screws, or countersunk heads are also available upon request.

LEVERS

Lever option 5 provides for a low profile above the panel (41mm/1.61inch), this option is very popular for those applications requiring a compact, stubby design. Lever option 1 is an additional 5mm/0.20inch taller. Lever option 6 should be specified for a push button handle, and lever option 7 is designed for V4 double-pole, or V3 constructions. Lever Option 9 is for double-pole and pushbutton joysticks. Additional custom levers are available upon request.



The 3000 Series is the very latest generation in high precision contactless joysticks. With a class leading installed depth of <math><20\text{mm}</math>, it is available in 1, 2 or 3 axes formats. Long trouble-free life is assured with the latest hall effect technology, providing a range of analog signals or custom PWM output options. The 3000 Series also delivers a radically improved mechanism construction that is specifically designed for increased robustness, strength and performance.



KEY FEATURES

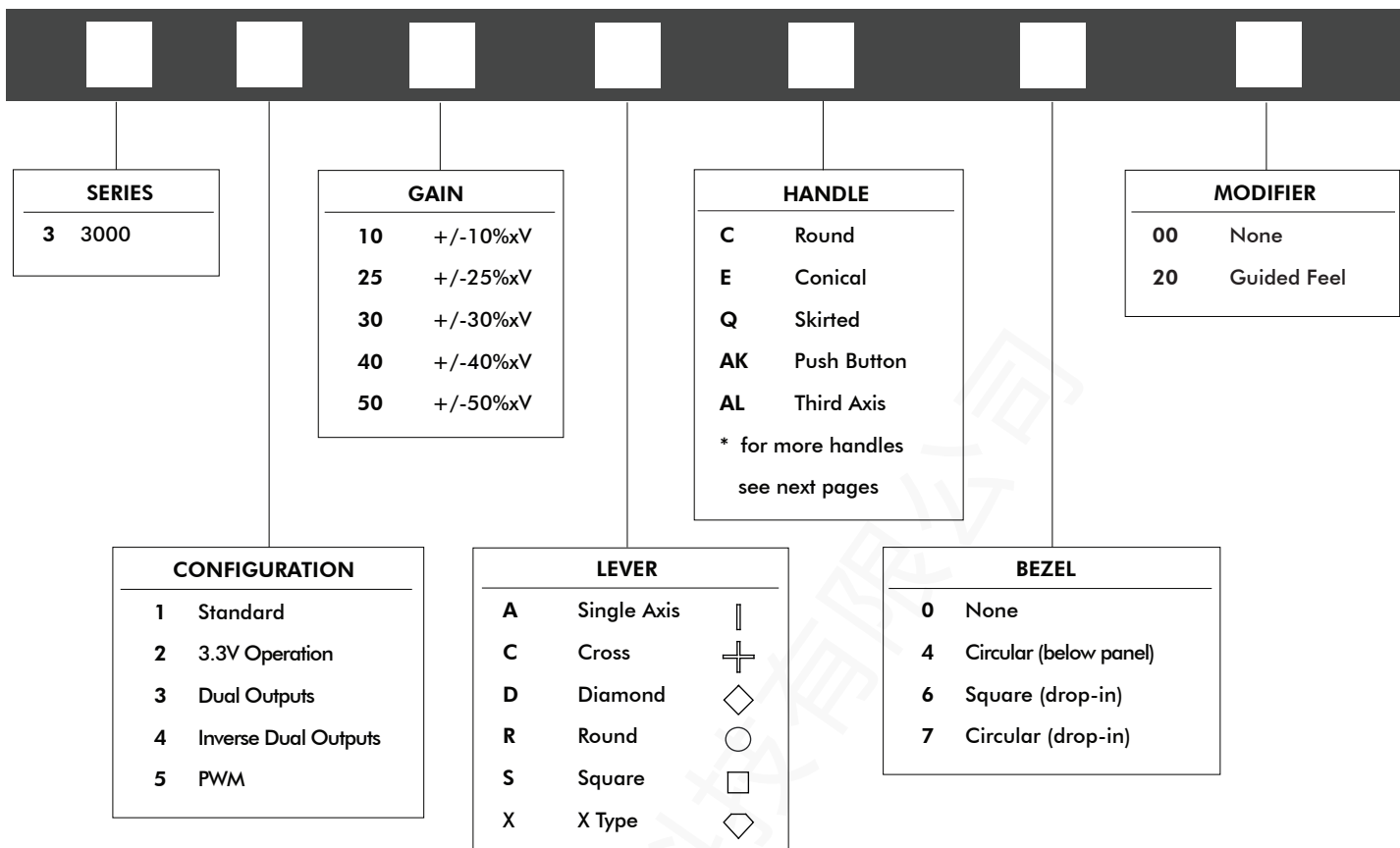
- Class leading installed depth <math><20\text{ mm}</math>
- Hall effect sensing
- 1, 2 or 3 axes
- 5V or 3.3V operation
- EMC shielded
- Analog or PWM outputs
- Next generation metal mechanisms
- Dual outputs available



3000 series

Premium Hall effect joysticks

OPTION SELECTION



- **CONFIGURATION 1** provides one proportional output per axis, a center tap reference and a separate center detect output.
- **CONFIGURATION 2** is offered as standard with +/-50% gain, yielding a voltage span from 0V (South) to 3.3V (North).
- **CONFIGURATION 3** joystick operates on 5V and provides two outputs per axis of the same polarity for example Y, Y & X, X. The second set of outputs are accurate to the first within +/-5% of the power supply. The power supply and center tap for the secondary outputs are also completely independent.
- **CONFIGURATION 4** The secondary outputs are of inverse polarity to the primary wipers for example X, -X & Y, -Y. The first and second outputs can be summed and compared to Center Tap to verify that the joystick is operating correctly.
- **CONFIGURATION 5** Operating on a 5V supply the 3000 Series may be selected with a variety of PWM output options. For more details on the type of outputs available please refer to Apem.

Note: The 3.3V supply is created by additional DC/DC conversion within the joystick and therefore the power consumption is greater than a 5V supplied product.

STANDARD OPTION AVAILABILITY

The following table shows which permutations of options are possible.

CONFIGURATION	CT	CD	AXES			SUPPLY		GAIN					LIMITERS						ALL HANDLES	ALL BEZELS			
			X	Y	Z	3.3	5V	10	25	30	40	50	A	C	D	R	S	X					
1	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	✗	✗	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	✗	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	✗	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	✗	✗	✓	✓	✓	✗	✓	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

HANDLE AND BEZEL OPTIONS

For drop in mounting, please specify bezel option 6 or 7. For sub-panel mounting, no bezel is necessary, unless the boot is required to seal to the face of the panel in which case bezel option 4 should be specified. Further mounting information including panel cutouts are shown on the following pages.

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

MECHANICAL

Materials Employed	-	Shaft - Stainless Steel Boot - Neoprene Others - Brass, Nylon, ABS
Weight	-	100g (0.20lb) nominal
Breakout Force	-	1.3N (2.86lbf)
Mechanical Angle of Movement	-	36° for X and Y axes (subject to limiter) 50° for Z axis (subject to handle)
Max Load to Mechanism	-	400N (881.85lbf)

ENVIRONMENTAL

Storage	-	-40C to +70C
Operating Temperature	-	-25C to +70C
Seal Above Panel	-	IP65 - Neoprene boot fitted as standard
EMC Emission	-	Complies with EN 61000-6-3:200, CISPR 22:2005 Class B 30MHz-11GHz
Life Cycles	-	10,000,000 cycles (5,000,000 for 3 axes joysticks)
ESD	-	Complies with EN61000-4-2 (extended) +/-8KV (20 contacts) & +/-15KV (20 air discharges)
EMC Immunity	-	100V/m, 80MHz-2.7GHz, 1KHz 80% sine wave modulation, EN 61000-4-3 (extended)
Vibration	-	100Hz - 200Hz @ 0.13g /Hz, total 3.6gRMS (1 Hour in each of the three mutually perpendicular axes)

ELECTRICAL

Gain (Output Voltage Span)	-	+/-10% x V to +/-50% x V
Output at Center	-	V/2 +/- (5% x Gain)
Power Supply	-	5V +/-0.5V Transient free (Configs 1, 2, 3, 4 & 5) or 3.3V +/-0.1V (Config 2)
Center Tap Impedance	-	1K1
Center Detect Output	-	Pulled high within joystick via 2K2 to +V, and smoothed to 0V with 100nF
Sensor Type	-	Hall effect
Current Consumption	-	5V - <13mA (Two axes) - <20mA (Three axes) 3.3V - <24mA (Two axes) - <40mA (Three axes)
Loads	-	Minimum 10K, preferred 100K+

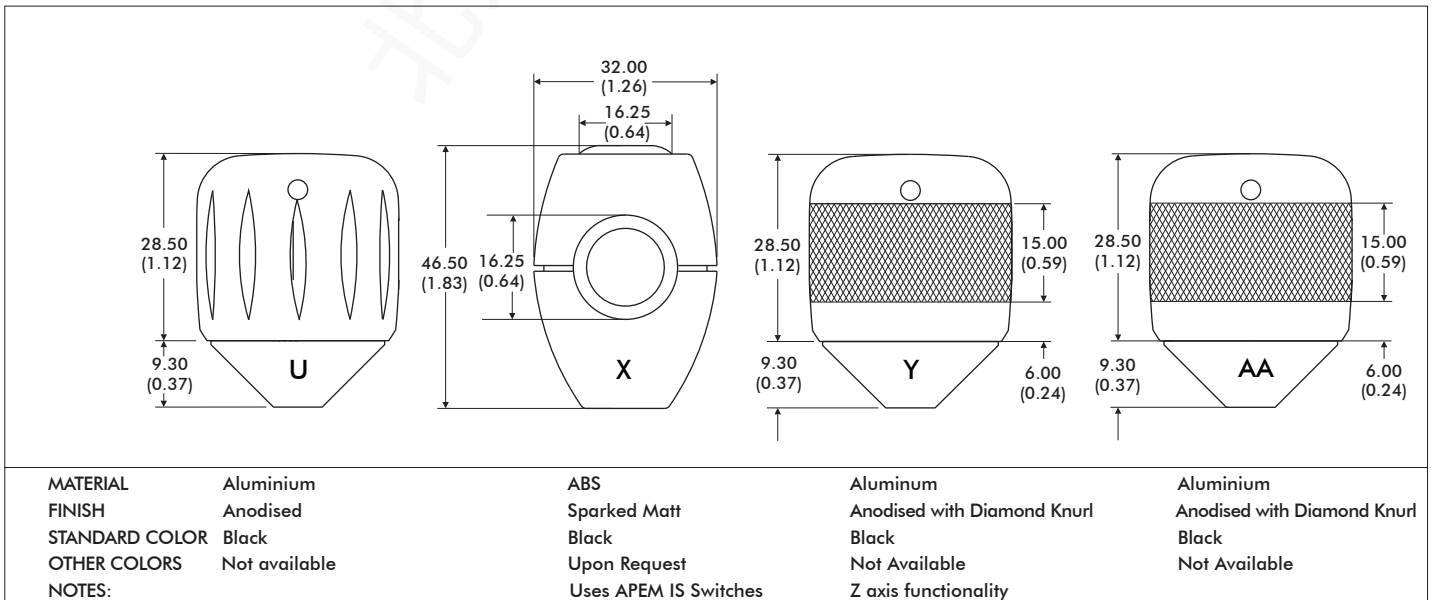
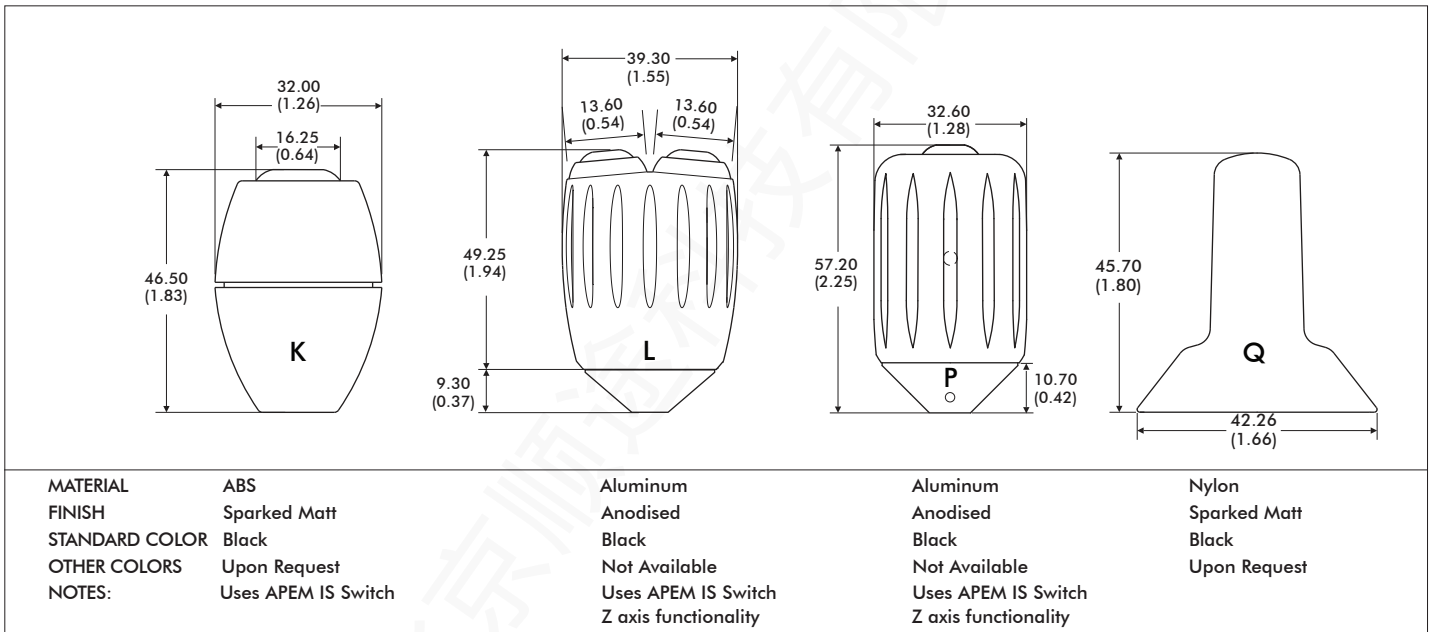
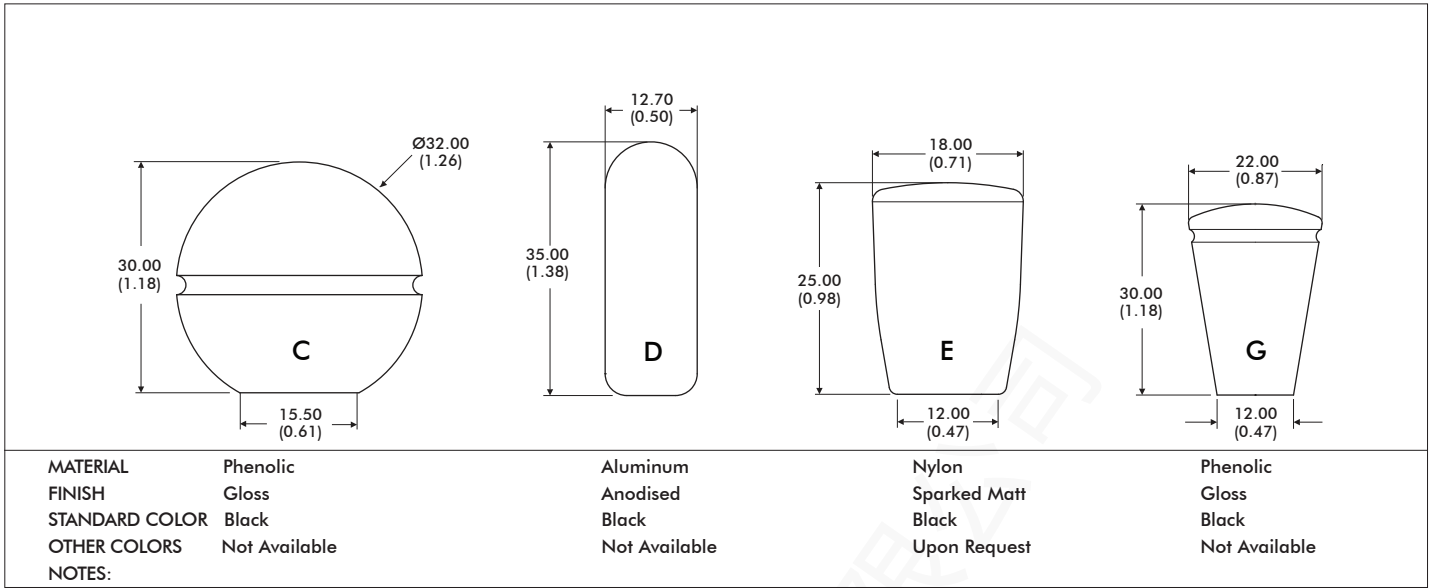
NOTES:

- All values are nominal
- All specifications shown are based on a standard configuration and are provided for guidance only.
- Please refer to Apem for assistance on how to achieve the best performance from your chosen configuration.
- Current consumption may be greater for dual output configurations.

3000 series

Premium Hall effect joysticks

DIMENSIONAL DRAWINGS - HANDLES

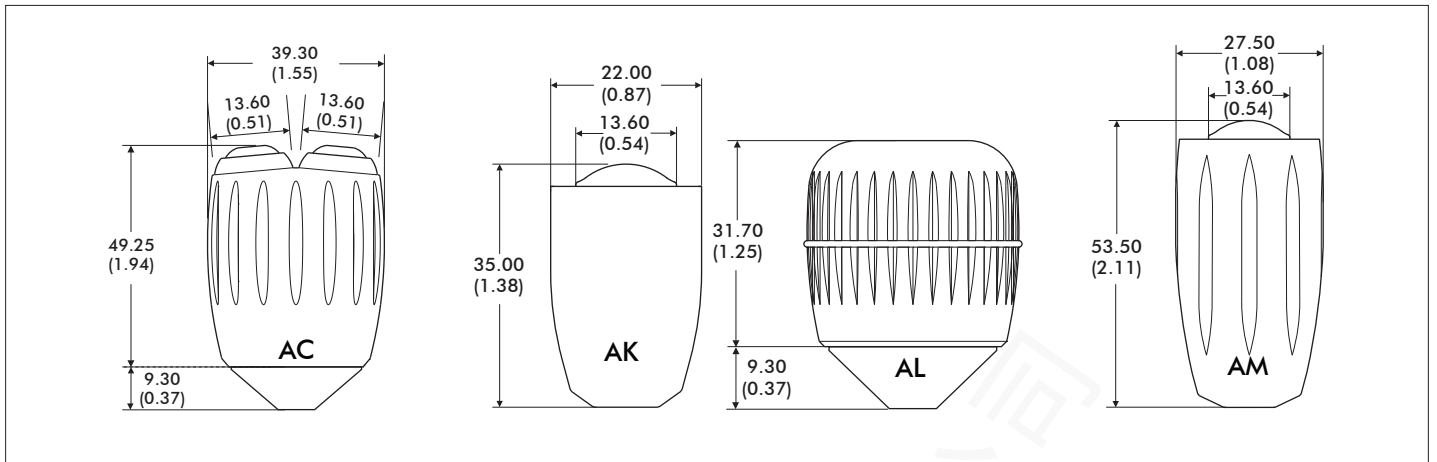


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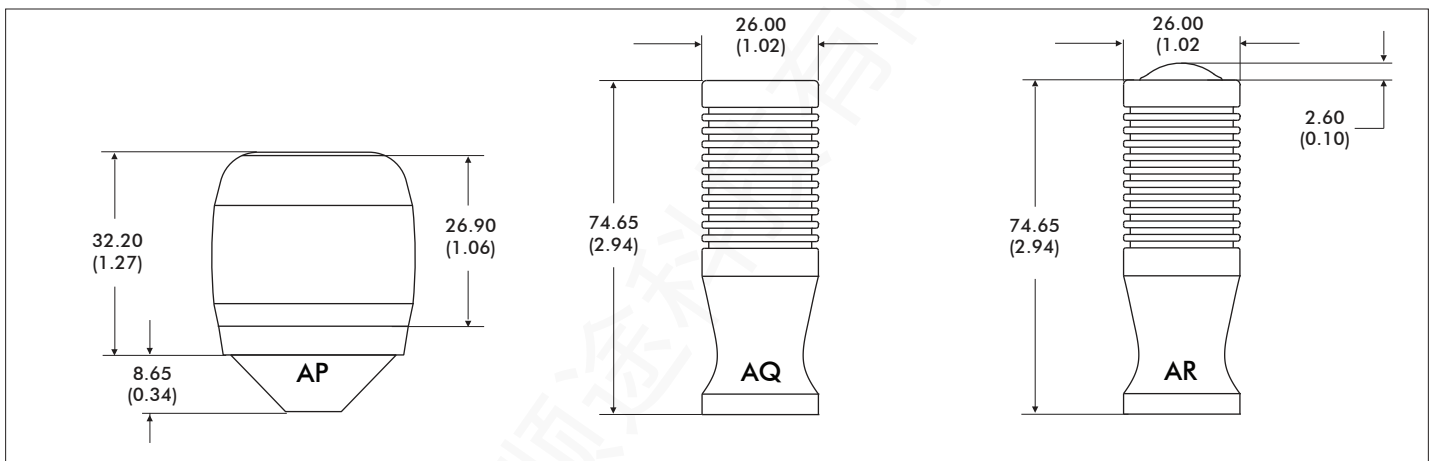
3000 series

Premium Hall effect joysticks

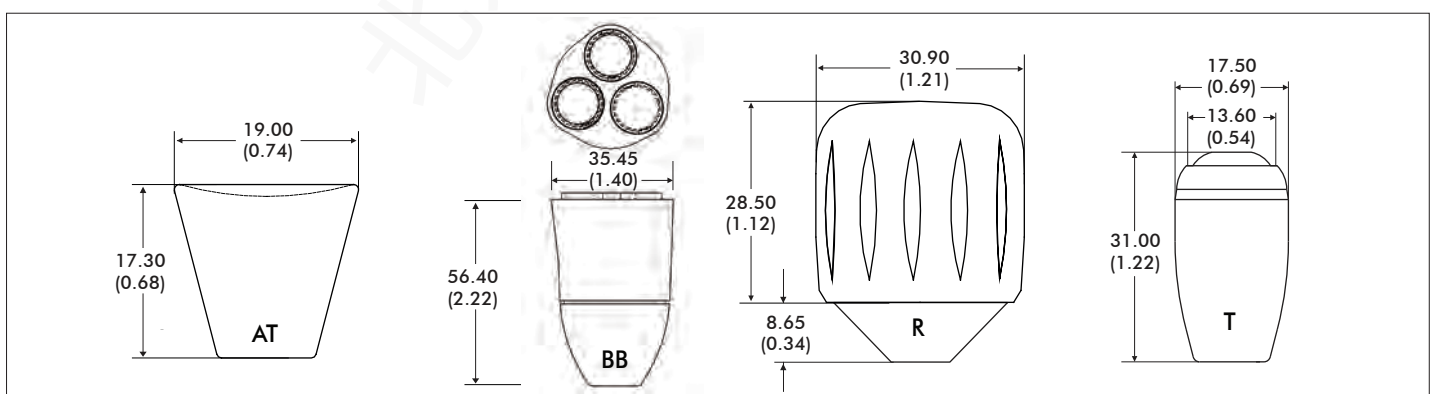
DIMENSIONAL DRAWINGS - HANDLES - continued



MATERIAL	Aluminum	Aluminum	Nylon	Aluminum
FINISH	Anodised	Anodised	Sparked Matt	Anodised
STANDARD COLOR	Black	Black	Black	Black
OTHER COLORS	Not Available	Not Available	Upon Request	Not Available
NOTES:	Uses APEM IS Switches	Uses APEM IA Switch	Z axis functionality	Uses APEM IA Switch



MATERIAL	Santoprene over Nylon	Aluminum	Aluminum
FINISH	Soft Touch	Anodised	Anodised
STANDARD COLOR	Black	Black	Black
OTHER COLORS	Upon Request	Not Available	Not Available
NOTES:	Z axis functionality		Uses APEM IA Switch



MATERIAL	Nylon	Nylon	Aluminum	Stainless Steel
FINISH	Sparked Matt	Sparked Matt	Anodised	Natural
STANDARD COLOR	Black	Black	Black	Stainless Steel
OTHER COLORS	Upon Request	Not Available	Not Available	Not Available
NOTES:		Uses APEM IL switch	Z axis functionality	Uses APEM IS switch

1. Dimensions are in mm/(inch)

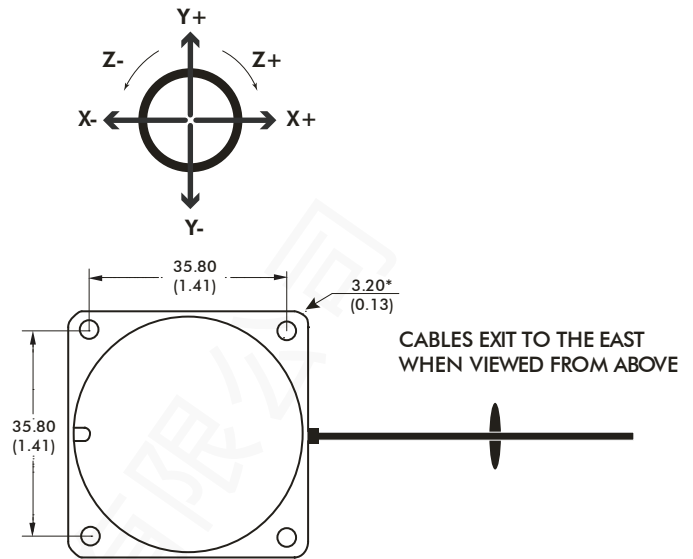
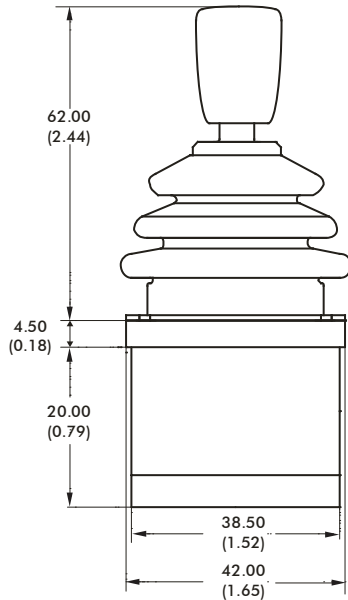
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3000 series

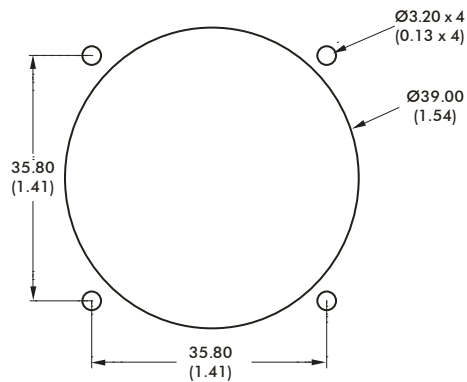
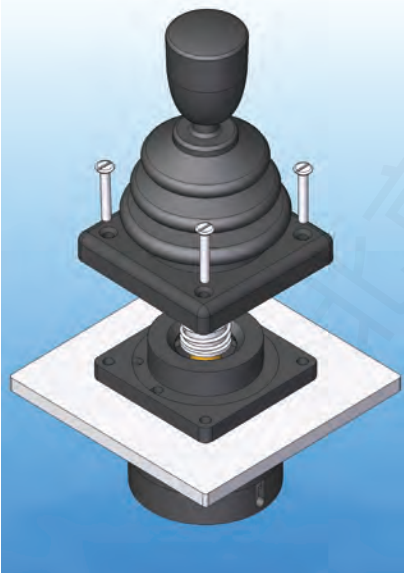
Premium Hall effect joysticks

DIMENSIONAL DRAWINGS - continued

GENERAL DIMENSIONS



DROP IN MOUNTING - PANEL CUT-OUT & MOUNTING INSTALLATION



The joystick is dropped into the panel cut-out. For panel thickness of <math>< 3\text{mm}</math>, M3 x 16 countersunk machine screws are recommended. Please note: Image (left) shows a square bezel, a circular bezel is also available for this option.

NOTES:

1. Dimensions are in mm/(inch)
2. The dimensions shown are for generic 3000 series with E type handle. For specific dimensions of this or any other configuration please refer to Apem.

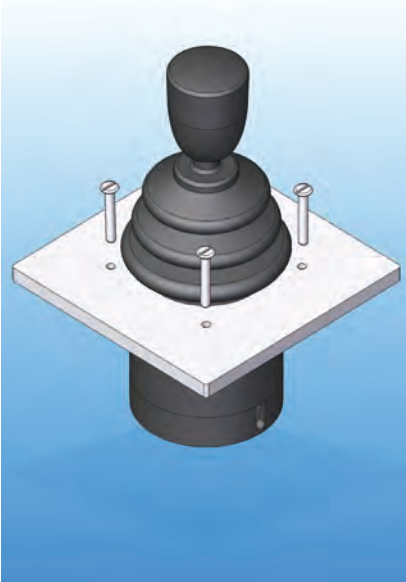
*3000 Series has slotted mounting holes - allows compatibility with mounting pitches of 32.25mm to 35.80mm

3000 series

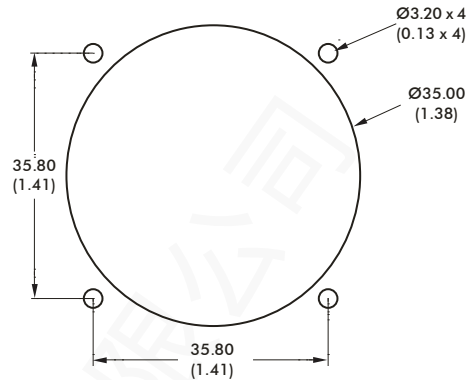
Premium Hall effect joysticks

MOUNTING INSTALLATION

SUB MOUNTING OPTION A - PANEL CUT-OUT & MOUNTING INSTALLATION

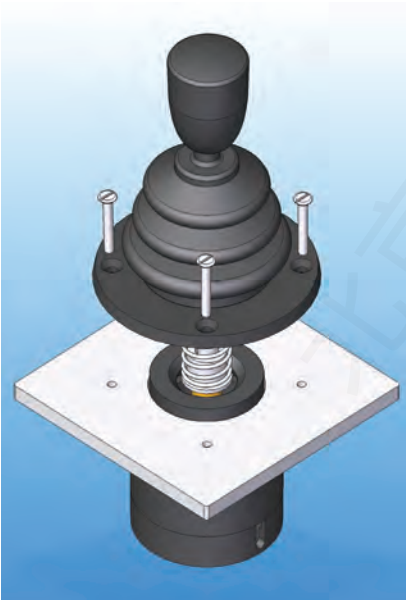


MOUNTING CUT-OUT

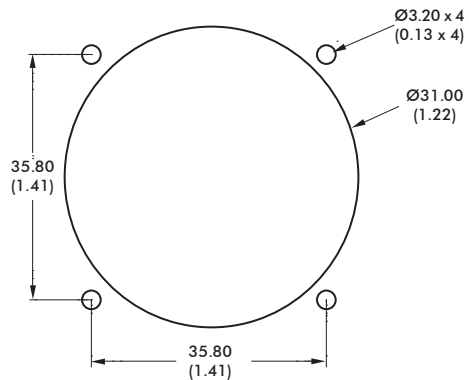


When mounted this way the panel acts as the bezel and no separate bezel is needed. M3 machine screws are recommended.

SUB MOUNTING OPTION B - PANEL CUT-OUT AND MOUNTING INSTALATION



MOUNTING CUT-OUT



The joystick is mounted beneath the panel and the base of the boot must be brought through the panel cut-out and held in place with the circular bezel. For panel thickness of <3mm, M3 x 16 countersunk machine screws are recommended.

NOTES:

1. Dimensions are in mm/(inch)
2. When sub panel mounting, great care should be taken not to damage the boot, or any of the mechanism under the boot. All panell cut-outs should be free from sharp edges and debris that may damage the boot.

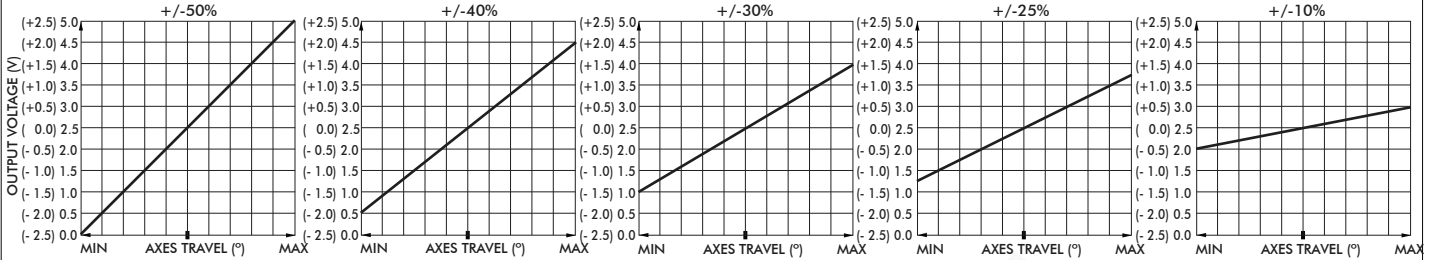
3000 series

Premium Hall effect joysticks

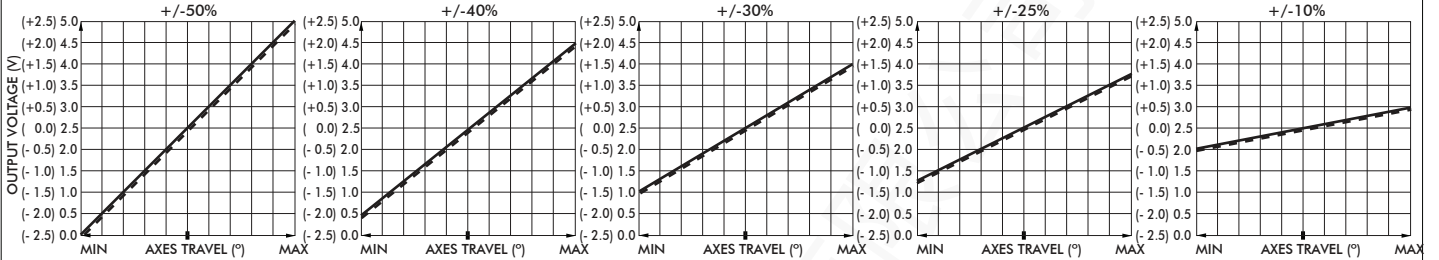
CONFIGURATION OPTIONS

LINEAR OUTPUT OPTIONS

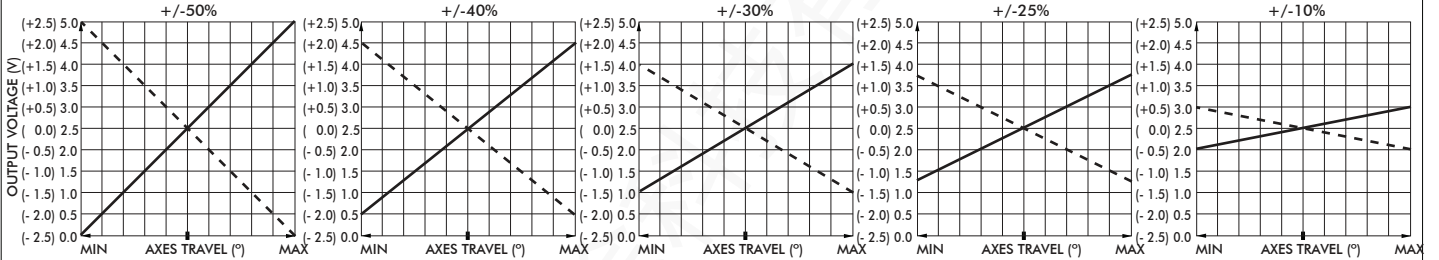
SINGLE OUTPUT - CONFIGURATION 1



DUAL OUTPUT - CONFIGURATION 3



DUAL OUTPUT - CONFIGURATION 4



POWER SUPPLY

The 3000 Series is designed to be powered by a regulated 5V +/- 0.5V power supply. The outputs are ratiometric, making a stable, noise free, power supply essential. The 3.3V version of the 3000 Series requires a power supply accurate to +/-0.1V. The outputs are not ratiometric, the voltage gain is set to 50% as standard, giving an output range from 0 to 3.3V regardless of supply voltage. The power supply to the joystick should be carefully regulated to be within tolerance. Should the power supply change outside of the specified tolerances, permanent damage may occur.

MAGNETIC IMMUNITY AND SYSTEM DESIGN

The 3000 Series incorporates internal magnetic screening to minimise the effect of external magnetic fields. Mounting or operating the joystick close to strong magnetic fields is not recommended. System designers should follow best practice when incorporating the 3000 Series joystick into their products. Care should be taken to decouple the power supply properly and to employ adequate EMC shielding.

MOUNTING

When mounting the joystick, care should be taken to site it in a position that does not make it vulnerable to damage when in use. If the joystick is intended for use in a handheld enclosure then care must be taken to protect the joystick from damage caused by dropping. Basic precautions such as mounting it at the lightest end of the enclosure so it doesn't hit the ground first or by protecting it with a guard should always be implemented for long term reliability. The body of the joystick, on the underside of the panel, must not be subject to water spray, excessive humidity or dust.

CENTER DETECT (CD)

Where selected, (configuration 1 types) the output on this additional cable will be 0V while the joystick is inactive. Should either the X or Y outputs change outside of the centre tolerance, indicating that the joystick has been operated, the center detect signal will switch to 5V. Within the joystick this output is pulled high by a 2K2 resistor and is decoupled by a 100nF capacitor to 0V. This output is designed for use in applications requiring an enable/disable signal that is separate from the main wipers. It is not recommended for use as a safety feature or a method of "person-present" detection.

CENTER TAP REFERENCE (CT)

Where selected, (configurations 1, 3 and 4) the joystick also outputs a centre reference voltage that is set at 50% (+/-1%) of the supply voltage. This output can be used to check the integrity of the power supply applied to the joystick. A reading on this output, outside of the specified tolerance suggests a problem with the power supply to the joystick. The other purpose of this output is to act as a reference equal to the voltage output when the lever is at center. Measuring the voltage outputs relative to CT rather than 0V eliminates inaccuracies created by variation in supply voltage.

GAIN OPTIONS

The voltage output on the wipers, at full scale deflection is determined by the gain. The gain is expressed as a percentage of the voltage supplied. Therefore (assuming a 5V supply) a joystick specified with +/- 25% gain would yield 1.25V at South, 2.5V at centre and 3.75V at North. A range of gain options are available as standard for configurations 1, 3 and 4. All joysticks are supplied pre-set and no further calibration is needed throughout the lifetime of operation.

OUTPUT IMPEDANCE

The voltage outputs at center and at each end of travel are specified across an infinite load, with no current flowing. The output impedance specified in the electrical specification should be taken into account when designing a system. Load resistance of less than 10K Ohms is not recommended.

MECHANISM

The omni-directional mechanism utilises an extremely robust ball-socket pivot. This construction yields an end product that is extremely resistant to vertical impact. Furthermore it constantly withstands high pull, push, rotational or horizontal forces that the product may be subject to, during life.

SPRINGING

All 3000 Series are offered sprung to center. The standard spring force requires 1.3N (nominally) to off-center the joystick. The 3000 Series may be specified with a lighter spring (1N), or a stronger spring (1.6N).

GUIDED FEEL

The 3000 Series may also be specified with guided feel. A joystick with guided feel moves more readily towards the poles (N, S, E and W) and whilst it can still move away from the poles, the force required to do so is greater. Unless specified otherwise, joysticks are supplied as standard without guiding. This standard configuration allows the user to move the joystick anywhere within the limiter with the same force and without any bias.

CONNECTIONS

The joystick is fitted, as standard, with 150mm long BS6360 rated cables and an industry standard 2.5mm pitch connector(s). Further non-standard connectors and cable options are available upon request.

CONFIGURATIONS 1 & 2

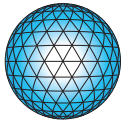
Joysticks are supplied with a seven way connector as standard. If the joystick is specified with a pushbutton handle, the connector will be nine way.

- PIN 1:** 0V (Black)
- PIN 2:** Center Tap Reference (Green)
- PIN 3:** Z Axis Output (Purple) - Where Specified
- PIN 4:** Y Axis Output (Yellow)
- PIN 5:** X Axis Output (Blue) - Where Specified
- PIN 6:** +V (Red)
- PIN 7:** Center Detect (Orange)
- PIN 8:** Pushbutton (Orange)
- PIN 9:** Pushbutton (Orange)

CONFIGURATIONS 3 & 4

Joysticks are supplied with two completely independent cable assemblies, for a truly dual system.

- PIN 1:** 0V (Black)
 - PIN 2:** Center Tap Reference (Green)
 - PIN 3:** No connection
 - PIN 4:** Y Axis Output (Yellow)
 - PIN 5:** X Axis Output (Blue) - Where Specified
 - PIN 6:** +V (Red)
 - PIN 7:** No connection
- For details on configuration 5 pin out, please refer to Customer Support.



The 4000 Series is a range of robust, industrial quality potentiometer joysticks for internal and external applications. All 4000 Series share the same, all metal mechanism to provide the finest performance and service life over a wide range of temperatures and loads. All 4000 Series employ high quality plastic film potentiometers, yielding a service life of many millions of cycles.



KEY FEATURES

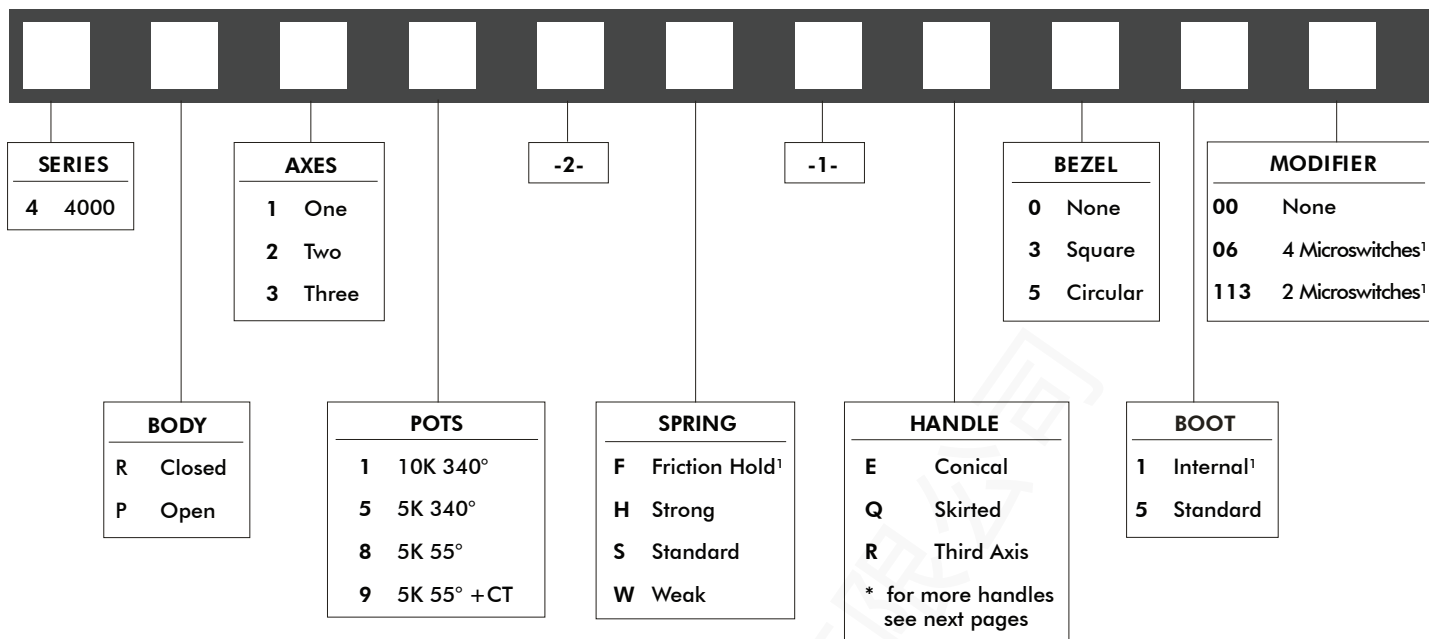
- Two standard mounting options
- Low current drain
- Variety of potentiometer options
- Robust
- All metal mechanism
- IP65 above panel
- Inherently immune to RFI
- Optional centre-detect micro-switching
- Available in two body variants



4000 series

Industrial resistive joysticks

OPTION SELECTION



Note:

1 Only available on 4P types

CABLE SPECIFICATIONS

14/0.12 - Fourteen strands of 0.12mm diameter tinned annealed copper wire PVC insulated, to a nominal OD of 1mm	
Red : +Vcc for X & Y Axes	Black : 0V for X & Y Axes
Blue : X Axis Wiper	Yellow : Y Axis Wiper
Green : Center Tap	
7/0.127 - Seven strands of 0.127mm diameter tinned copper wire ETFE insulated, to a nominal OD of 0.7mm	
Orange : Pushbutton	
Red : +Vcc for Z Axis	Blue : 0V for Z Axis
Green : Z Axis Wiper	
All 4000 Series are supplied with 150mm of twisted cable harness, with tinned ends.	
Connectors fitted upon request.	
If supplied, microswitches are rated for up to 5A and are not wired, allowing the user flexibility of connection.	

TECHNICAL SPECIFICATION

Life Cycles : >5 Million Operations	Lever Travel : +/-27.50 Degrees
Lever Material : Stainless Steel	Body Material : Glass Filled ABS or Steel
Handle Material : See guide	Boot Material : Neoprene or Santoprene
Pivot Blocks : HE30 Alloy	Other Materials : Brass
Temperature Range : -20°C to +55°C	Resistance Tolerance : +/-20%
Linearity : +/-2%	Output Smoothness : 0.1% max
Power Rating : 1W at 70°C - Derate to 0W at 125°C	Insulation Resistance : 1000MOhms, 500VDC
Preferred Load : >100K	Potentiometer Alignment : To Center of Track (+/-1%)
Weight : 110 Grams	Above Panel Seal : IP65 (subject to handle)

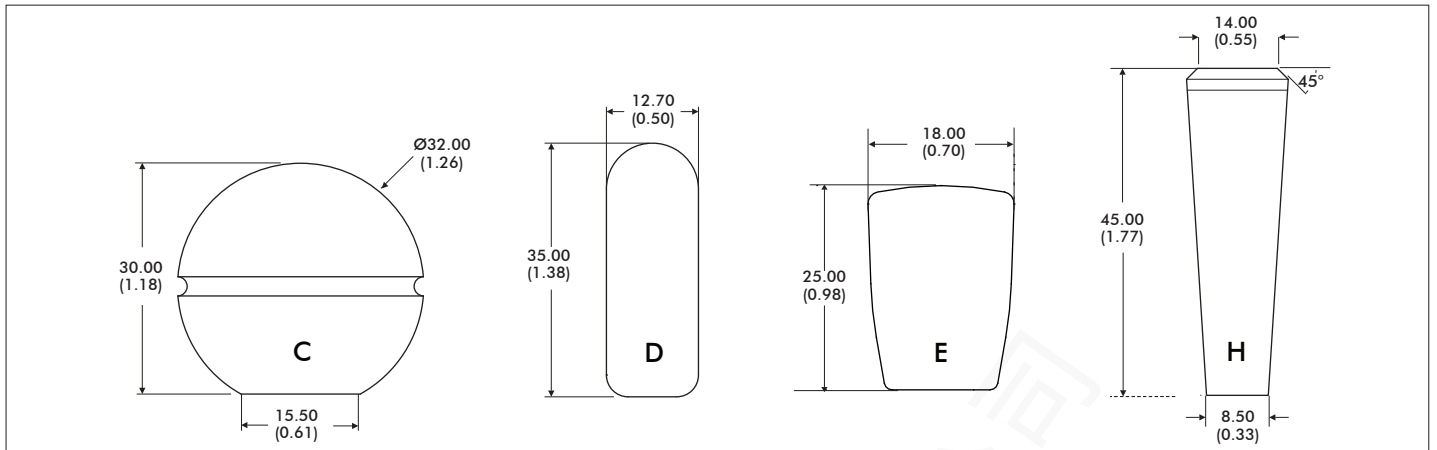
NOTES:

- All values are nominal
- All specifications shown are based on a standard configuration and are provided for guidance only.
- Please refer to Apem for assistance on how to achieve the best performance from your chosen configuration.

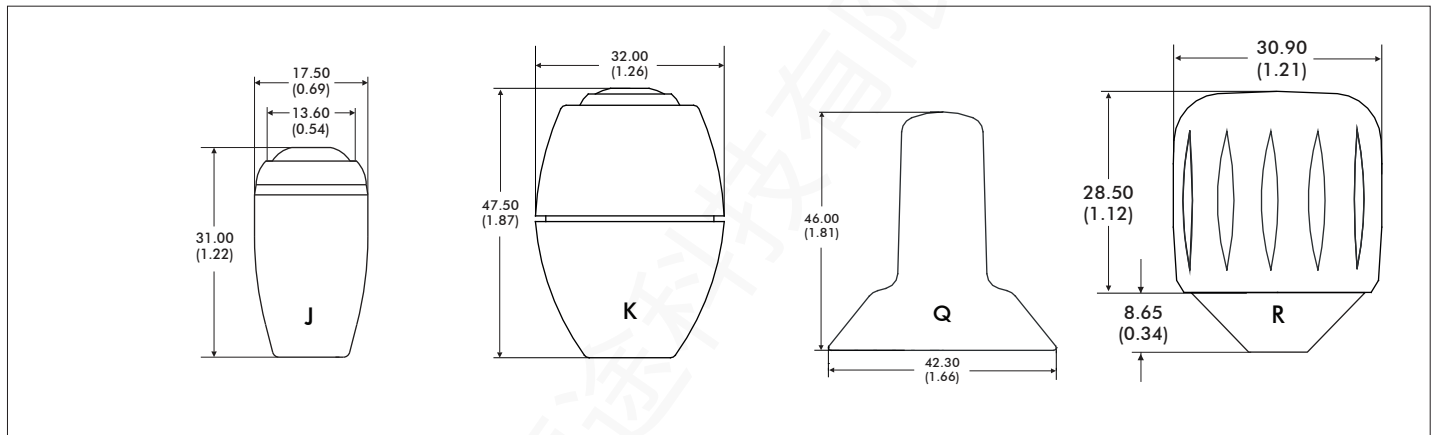
4000 series

Industrial resistive joysticks

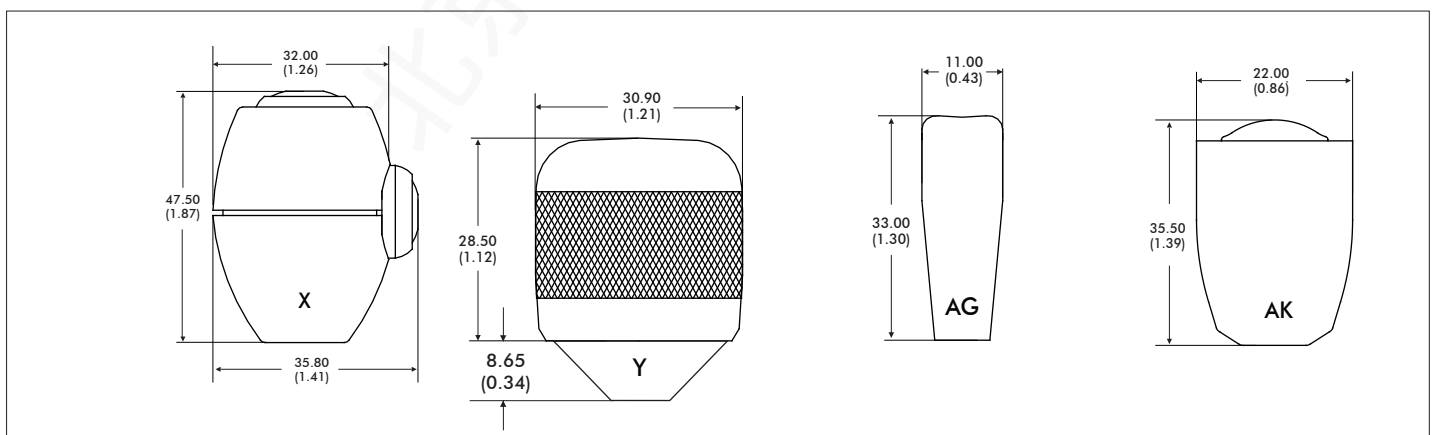
DIMENSIONAL DRAWINGS - HANDLES



MATERIAL	Phenolic	Aluminium	Nylon	Stainless Steel
FINISH	Gloss	Anodised	Sparkled Matt	Natural
STANDARD COLOR	Black	Black	Black	Stainless Steel
OTHER COLORS	Not Available	Not Available	Upon Request	Not Available
NOTES:				



MATERIAL	ABS	ABS	Nylon	Aluminium
FINISH	Sparkled Matt	Sparkled Matt	Sparkled Matt	Anodised
STANDARD COLOR	Black	Black	Black	Black
OTHER COLORS	Upon Request	Not Available	Not Available	Not Available
NOTES:	Uses APEM IS Switch	Uses APEM IS Switch		Third Axis function



MATERIAL	ABS	Aluminium	Stainless Steel	Aluminium
FINISH	Sparkled Matt	Anodised	Polished	Anodised
STANDARD COLOR	Black	Black	Stainless	Black
OTHER COLORS	Upon Request	Not Available	Not Available	Not Available
NOTES:	Uses APEM IS Switches	Third Axis function		Uses APEM IA Switch

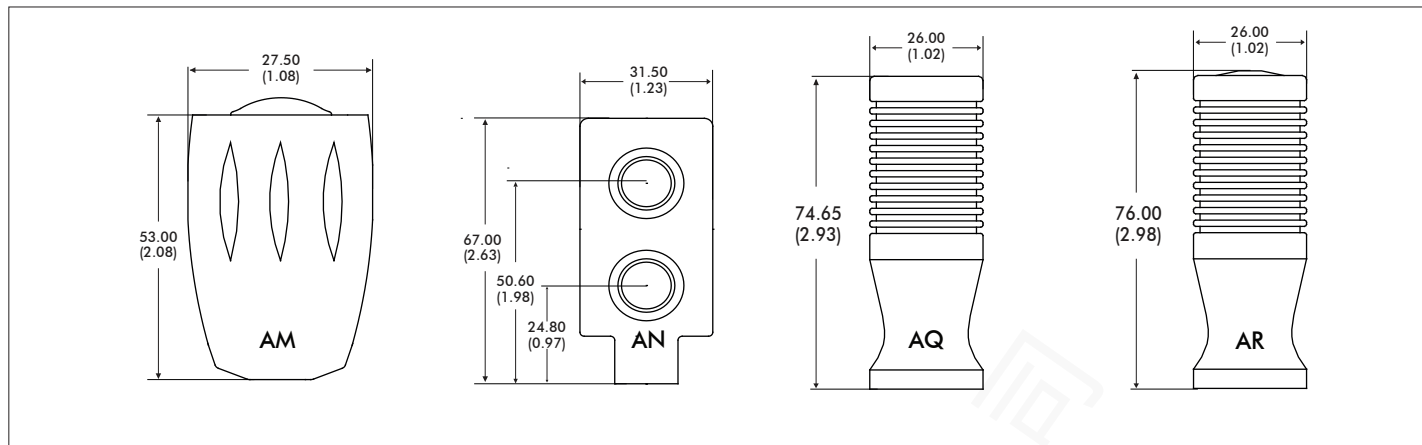
1. Dimensions are in mm/(inch)

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

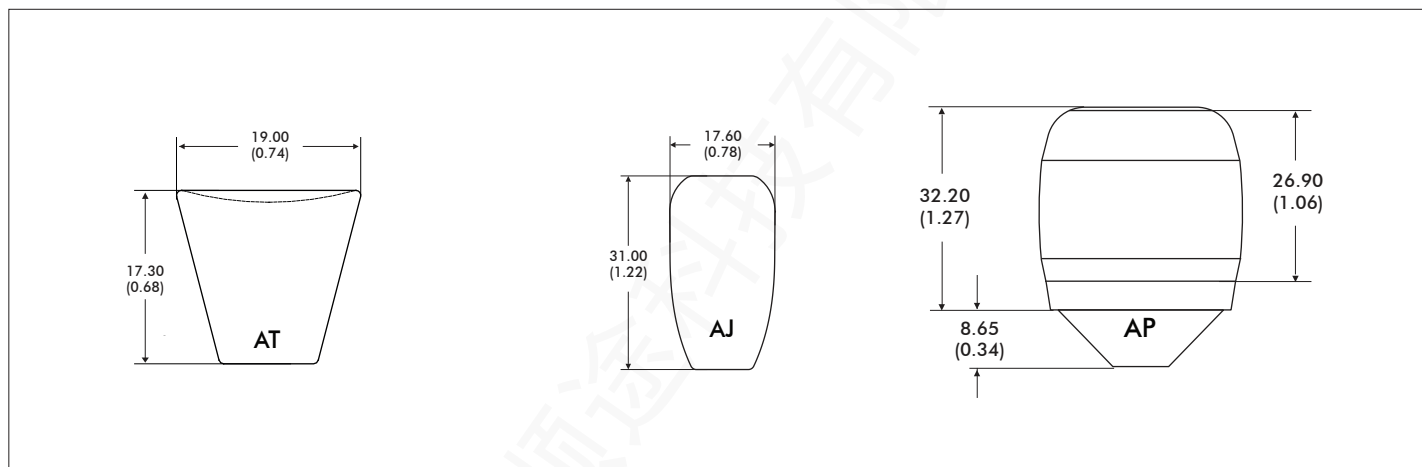
4000 series

Industrial resistive joysticks

DIMENSIONAL DRAWINGS - HANDLES - continued



MATERIAL	Aluminium	Delrin	Aluminium	Aluminium
FINISH	Anodised	Gloss	Anodised	Anodised
STANDARD COLOR	Black	Black	Black	Black
OTHER COLORS	Upon Request	Not Available	Not Available	Not Available
NOTES:	Uses APEM IA switch	Uses APEM IS switch		Uses Apem IA Switch



MATERIAL	Nylon	Stainless Steel	Santoprene over Nylon
FINISH	Sparked Matt	Polished	Soft Touch
STANDARD COLOR	Black	Stainless Steel	Black
OTHER COLORS	Upon Request	Not Available	Upon Request
NOTES:			Z Axis functionality

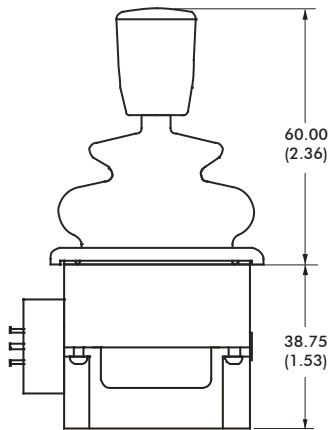
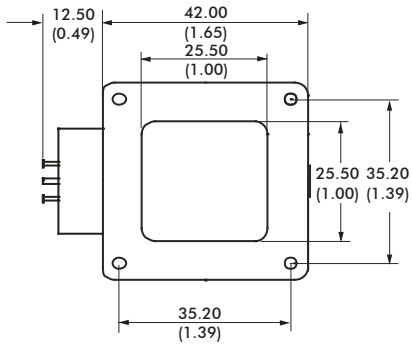
1. Dimensions are in mm/(inch)

4000 series

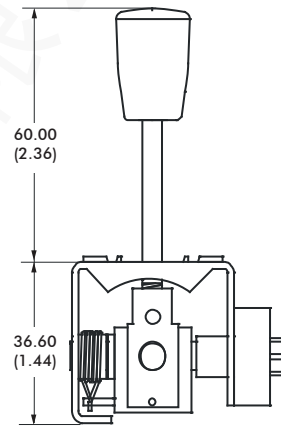
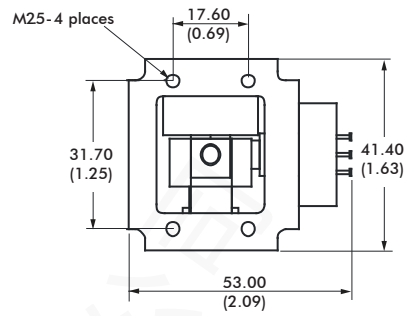
Industrial resistive joysticks

DIMENSIONAL DRAWINGS - continued

CLOSED BODY

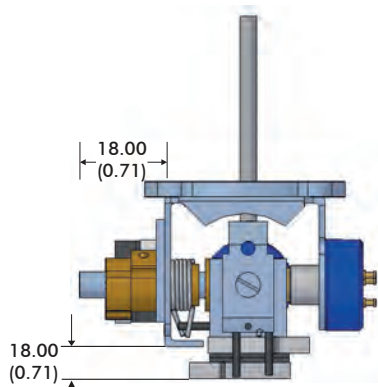


OPEN BODY

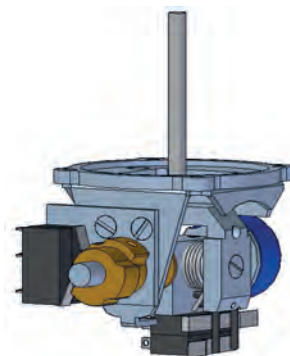


NOTE: The dimensions shown are for a generic two axes 4000 Series open body with the E type handle, and a generic two axes 4000 Series closed body also with the two axes E type handle. For specific dimensions of this or any other configuration please refer to Apem.

MICROSWITCHES



MICROSWITCHES



NOTE:

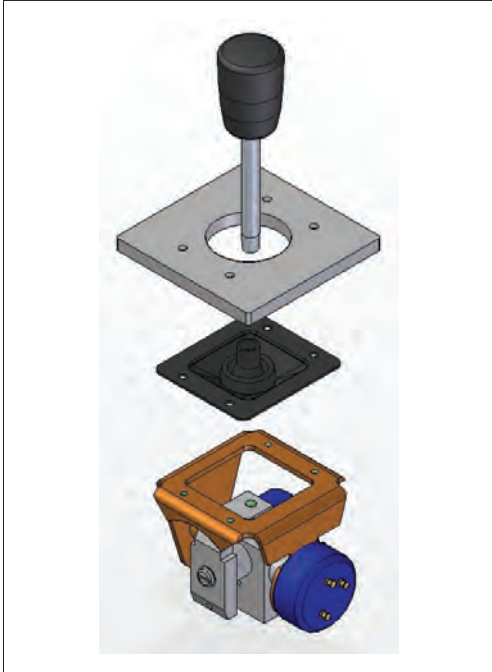
1. Dimensions are in mm/(inch)

4000 series

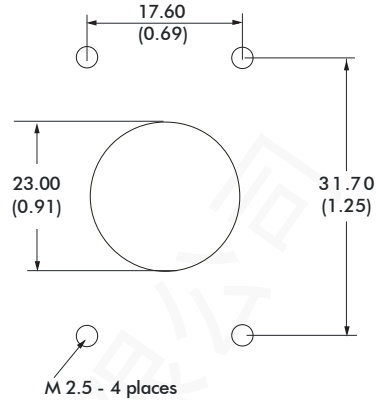
Industrial resistive joysticks

MOUNTING INSTALLATION

OPEN FRAME - PANEL CUT-OUT AND MOUNTING INSTALLATION

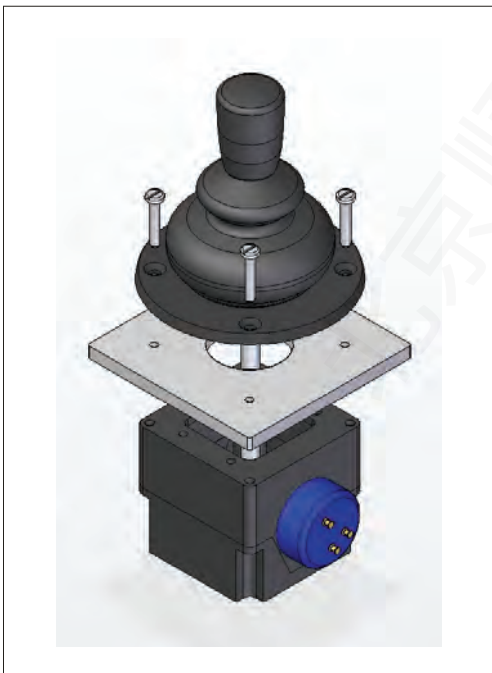


MOUNTING CUT-OUT

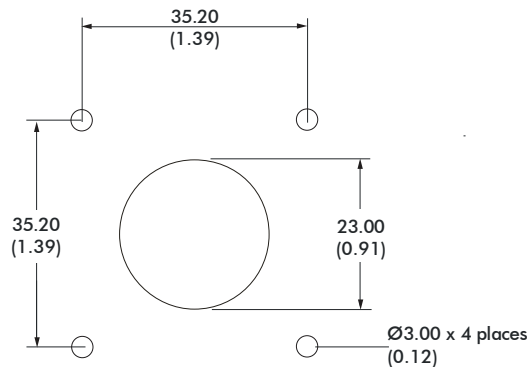


The joystick mounts from beneath the panel and the boot is trapped between the joystick and the panel. No bezel is necessary for this installation, since the panel acts as the bezel. The frame has M2.5 tapped holes and as such M2.5 machine screws are recommended for this mounting.

CLOSED FRAME - PANEL CUT-OUT AND MOUNTING INSTALLATION



MOUNTING CUT-OUT



The body of the joystick is mounted from beneath the panel. The boot is passed through the panel cut-out and is held onto the front face of the panel by the mounting bezel. The square bezel has a gloss finish and is designed for use with No.4 x 3/8" pan head self tapping screws whereas the circular bezel has a matt finish and is designed for countersunk screws.

NOTES: Dimensions are in mm/(inch)

During the mounting process, great care should be taken not to damage the boot. All panel cut-outs should be free from sharp edges and swarf that may damage the boot.

4000 series

Industrial resistive joysticks

CONFIGURATION OPTIONS

MECHANISM

Unlike most other products in its class the 4000 Series employs an all-metal mechanism, providing the finest feel. It delivers consistent return to center performance over life, across a broad range of applications and operating environments. The 4000 Series is offered in two body styles; the more standard closed body type should be selected for those applications requiring standard single or dual axes functionality. The open frame variant may be specified for those applications requiring friction hold functionality, additional centre detect microswitches or where the above the panel height must be kept to a minimum. Both body styles employ the same mechanism and therefore provide the same performance and feel.

POTENTIOMETERS

The high quality plastic film potentiometers employed as standard in the 4000 Series have 340° tracks. With a shaft deflection angle of 55° (+/-27.5°), a typical 12V supply would therefore result in a full-scale nominal deflection from 5V to 7V, operating about a nominal 6V center. The 4000 Series is available with alternative potentiometers, including the option of the 5K-55° track variant, providing rail-to-rail signal swings for applications where these are necessary and additional amplification is not practical. The potentiometers on the 4000 Series are designed for use as a variable potential divider rather than a two pin variable resistor. Noise generated by the contact resistance of the wiper to the track dictates that for optimum performance the output signals should be fed into a load of greater than 100K. Potentiometer option 9 is to special order only, and may be subject to longer than standard lead times.

PANEL CUTOUT

Being a sub-panel mount joystick the panel cut-out may be used to limit the deflection of the joystick. The maximum allowable panel cutout dimensions are shown on the following page. Where some handles may be larger than the specified panel cut-out please refer to the Apem sales team. Subsequently the joystick may be supplied without the handle fitted, or with an additional mounting plate.

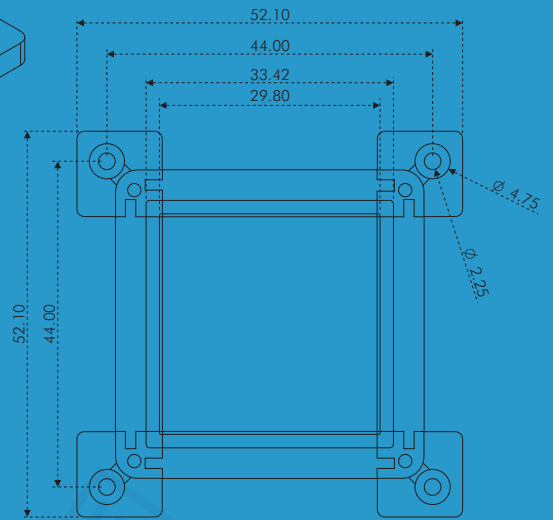
SPRINGING

As standard 4000 Series are offered sprung to center. The standard spring force requires 1.3N (nominally) to off-center the joystick. The 4000 Series may be specified with a lighter spring (1N), or a stronger spring (1.6N). N.B. Forces quoted are subject to exact joystick configuration and are provided as a guide only. The 4000 Series also offers a friction hold configuration, whereby the handle will remain in the position it is left when no operator is present. The amount of friction may be varied prior to installation by adjusting the torque setting of the friction clutches.

SEALING

As standard, the 4000 Series is sealed to IP65 above the panel. This may be subject to exact configuration selected. Some configurations will yield an IP67 seal. Please refer to Apem for details of your chosen mounting, handle and boot options and for guidance as to the best level of panel seal achievable.

APEM



5000 SERIES - POTENTIOMETER JOYSTICKS

- COST EFFECTIVE
- LOW PROFILE INSTALLATION
- ROHS COMPLIANT
- SIMPLE INTERFACE
- ERGONOMIC DESIGN
- LOW CURRENT DRAIN
- TWO OR THREE AXES
- SPECIFICALLY DESIGNED FOR KEYBOARDS



5000 SERIES - POTENTIOMETER JOYSTICKS

仅供产品选型使用

PRODUCT DESCRIPTION

GENERAL DESCRIPTION

The 5000 Series is a range of low profile, cost optimised potentiometer joysticks. These joysticks are designed specifically for applications such as keyboards where installed depth and cost are critical. Configurable in up to three axes, for pan, tilt and zoom control of such applications as CCTV cameras the 5000 Series is offered with a range of handles, bezels and mounting styles.

MOUNTING

The 5000 Series is a sub-panel mounting joystick. It is offered with two mounting options; option B allows the user to screw down from the front face of the panel, through the bezel and into the joystick. Option A has four additional screwing points on the body of the joystick, allowing the user to screw from the underside of the panel, up through the joystick and into the panel, and in so doing the screw heads are concealed. Option B is designed for use with gaiter option 1 and bezel option 2, where as option A is designed for use with bezel option 1.

POTENTIOMETERS

The 5000 Series is offered as standard with 5K potentiometers which have 220° tracks. With a shaft deflection angle of nominally 40°, a typical 5V supply would therefore result in a full scale nominal deflection from 2V to 3V, operating about a nominal 2.5V centre. The potentiometers used on the 5000 Series are designed for use as a variable potential divider, rather than a two pin variable resistor. Noise generated by the contact resistance of the wiper to the track dictates that for optimum performance the output signals should be fed into a load of greater than 100K.

OPERATING MODE

The operating mode of the joystick may be specified as either sprung to centre, or alternatively with a "ratchet" position, allowing a positive detented feel in three positions either side of centre (available on X & Y axes only).

USER FLEXIBILITY

The 5000 Series is designed to be as flexible as possible whilst keeping cost optimal. As standard the unit is offered without a wiring harness, allowing customers to wire the unit according to the needs of the individual application. The joystick may be factory configured with cable harnesses upon request. The 5000 Series is offered with an open square gate as standard, again allowing the customer the flexibility of determining in software how the precise control is configured.

LEVERS

Lever option 1 should be specified for any two axes configuration. Lever option 8 is for three axes operation. Apem offers a range of non standard lever options, including custom and lower profile options, for more detailed of these or any other 5000 Series enquiries please contact your local Apem representative.

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

5000 SERIES - POTENTIOMETER JOYSTICKS

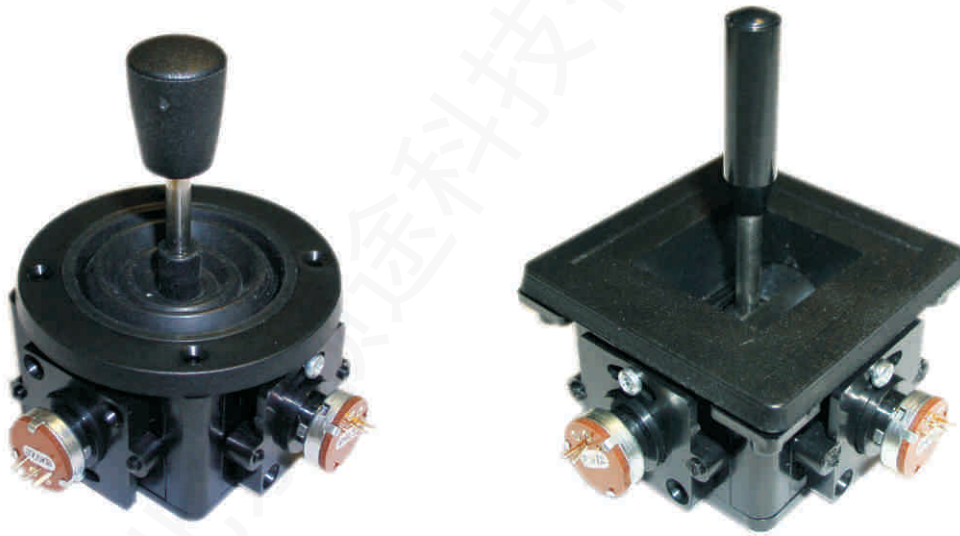
PRODUCT CONFIGURATION

STANDARD OPTIONS

The 5000 Series is available with a range of standard options, to specify your joystick, simply choose one option from each column. An example is shown below.

5	S	2	5	1	S	0	F	2	1	00
SERIES	MOUNTING	AXES	POTS	LEVER	SPRING	WIRED	HANDLE	BEZEL	GAITER	MODIFIER
5000 (5)	Sub Mount A (S) Sub Mount B (T)	Two (2) Three (3)	5 K 220° (5)	Standard (1) For 3 Axes (8)	Ratchet (R) Standard (S)	None (0) 200mm (1)	Conical (F) Tall Conical (H) Tall Slimline (V) Third Axis (W)	Not supplied (0) Square (1) Circular (2)	Not supplied (0) Standard (1)	None (00)

EXAMPLE CONFIGURATIONS



TECHNICAL SPECIFICATION

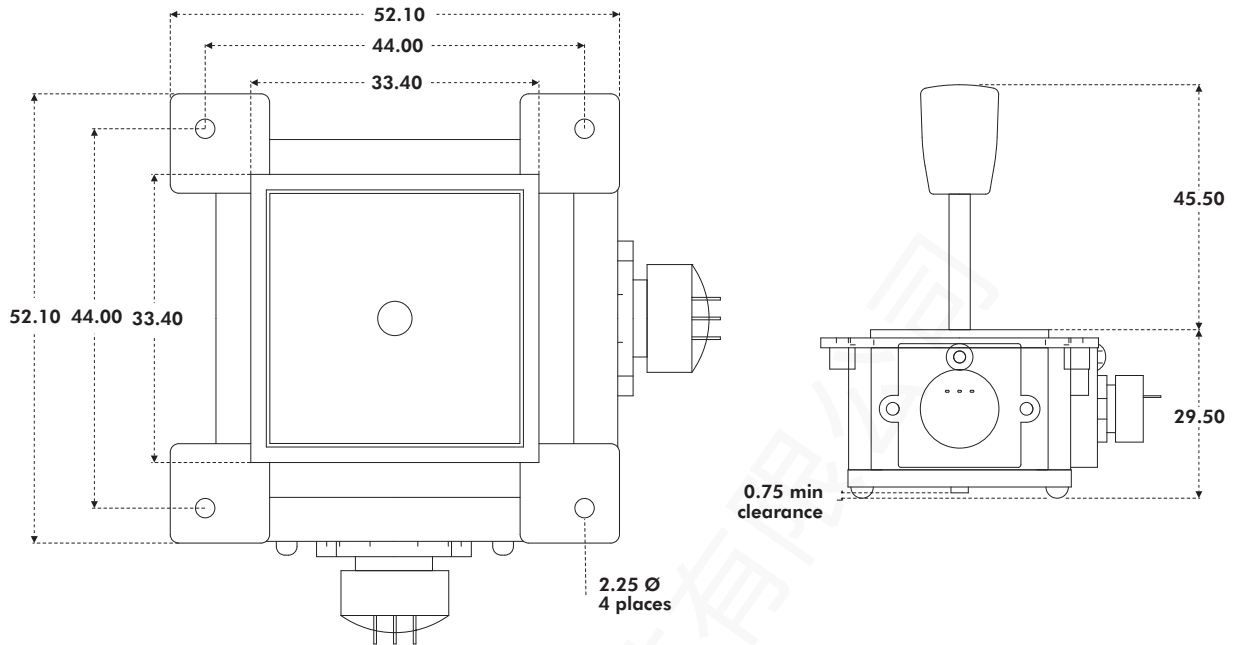
All parameters and dimensions shown maybe subject to specification, please refer to Apem for details.

Life Cycles	: >1 Million Mechanical Operations	Lever Travel	: +/-20 Degrees from Centre
Lever Material	: Stainless Steel	Body Material	: ABS
Handle Material	: Nylon or Aluminium	Gaiter Material	: Neoprene
Temperature Range	: -10°C to +55°C	Resistance Tolerance	: +/-20%
Maximum Voltage	: 10V	Rated Power	: 0.125W per Potentiometer
Weight	: 50 Grams	Potentiometer Alignment	: To Centre of Track (+/-50mV)

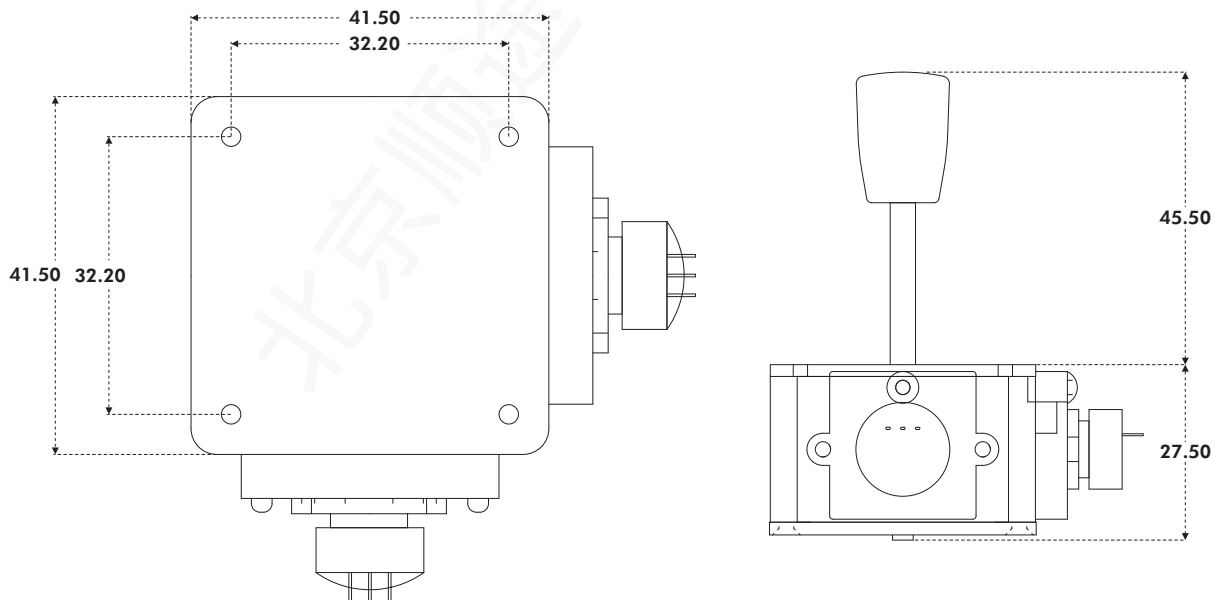
仅供产品选型使用
5000 SERIES - POTENTIOMETER JOYSTICKS

USEFUL DIMENSIONS

MOUNTING OPTION A

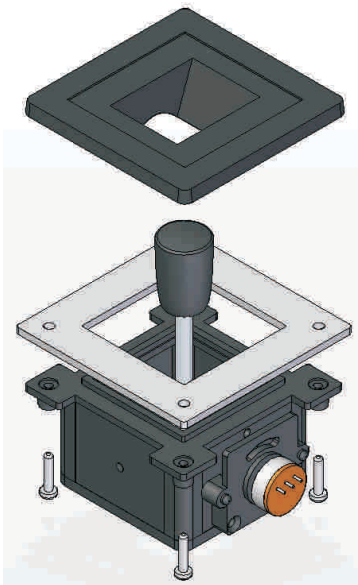


MOUNTING OPTION B

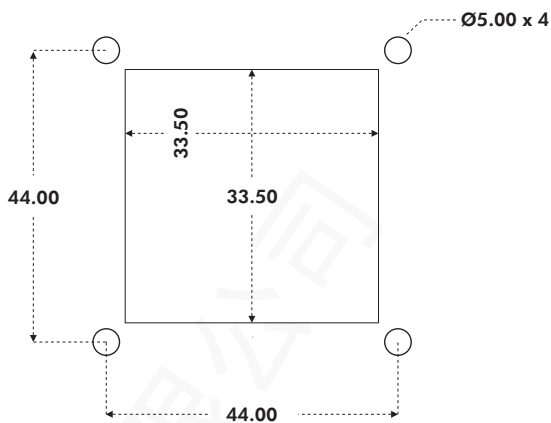


Note: The dimensions shown are for a generic two axes 5000 Series with the F type handle. For specific dimensions of this or any other configuration please refer to Apem.

MOUNTING OPTION A - PANEL CUT-OUT AND MOUNTING INSTALLATION

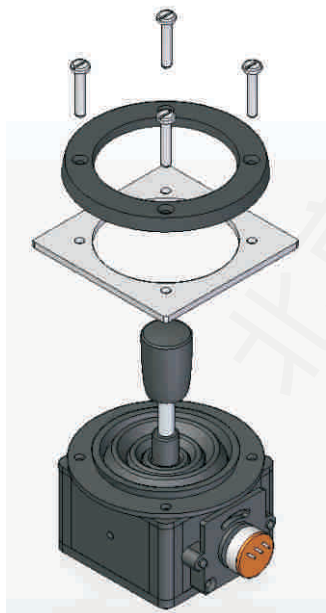


MOUNTING CUT-OUT

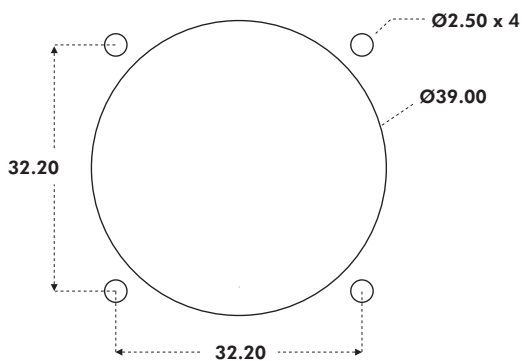


The joystick is mounted from beneath the panel, with the bezel fitted onto the front face of the panel. It is recommended to use No. 2 self tapping, pan head screws, the length of which must be determined subject to the thickness of the panel.

MOUNTING OPTION B - PANEL CUT-OUT AND MOUNTING INSTALLATION



MOUNTING CUT-OUT



The joystick is mounted from beneath the panel. The gaiter must be passed through the panel cut-out and held in place with the mounting bezel. It is recommended to use No. 2 self tapping countersunk screws, the length of which must be determined subject to the thickness of the panel.

Note: During the mounting process, great care should be taken not to damage the gaiter. All panel cut-outs should be free from sharp edges and swarf that may damage the gaiter.

8000 series

Ruggedized switch joysticks

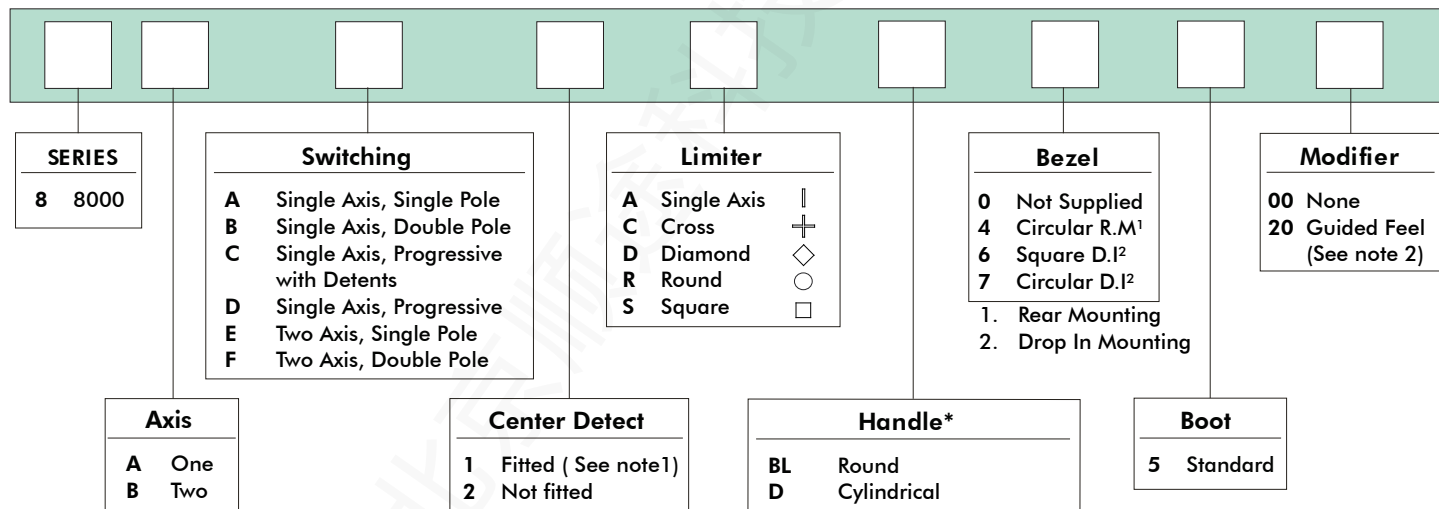
Distinctive features and specifications



- One or two axis
- Optional center detect microswitch
- Wide range of handle options
- Up to 1AMP operation
- Gold plated contacts
- Single step or progressive switching

TECHNICAL SPECIFICATIONS

- Mechanical Life Cycles: > 1 Million Operations
- Current Rating: To 1A
- Weight: 98 Grams (0.20lb)
- Operating Deflection: ±18°
- Shaft Diameter: 5mm (0.20in)
- Shaft Material: Stainless Steel
- Boot: Neoprene
- Maximum Voltage: 125VAC
- Switch Contacts: Gold Plated
- Above Panel Seal: IP65
- Body Material: Glass Reinforced ABS
- Gimbal Pivot: Acetal & Hardened Steel
- Other Materials: Brass, Acetal, Nylon
- Temperature Range: -25°C to +80°C (-13°F to +76°F)



NOTES:

1. The additional center detect switch is not available on joysticks with progressive switching.
2. Guided feel is only available on two axis joysticks. Further non-standard options including custom handles, special limiters and detents are available. Please refer to APEM.
3. Only a square limiter will allow sufficient travel in a diagonal direction to activate both speed and steer switches.

BEZEL OPTIONS

For drop-in mounting, please specify bezel option 6 or 7. For sub-panel mounting, no bezel is necessary, unless the boot is required to seal to the front face of the panel in which case option 4 should be specified. Bezels 6 & 7 clamp the boot and top face of the joystick body to the panel when bezel 4 clamps only the boot. Some handles may be larger than some panel cut-outs. This may restrict the choice for mounting and bezel options. Please refer to APEM for assistance.

SPRINGING

As standard 8000 series are offered sprung to center. The standard spring force requires 1.6N (nominally) to off-center the joystick. The 8000 series may be specified with a lighter spring (1N).

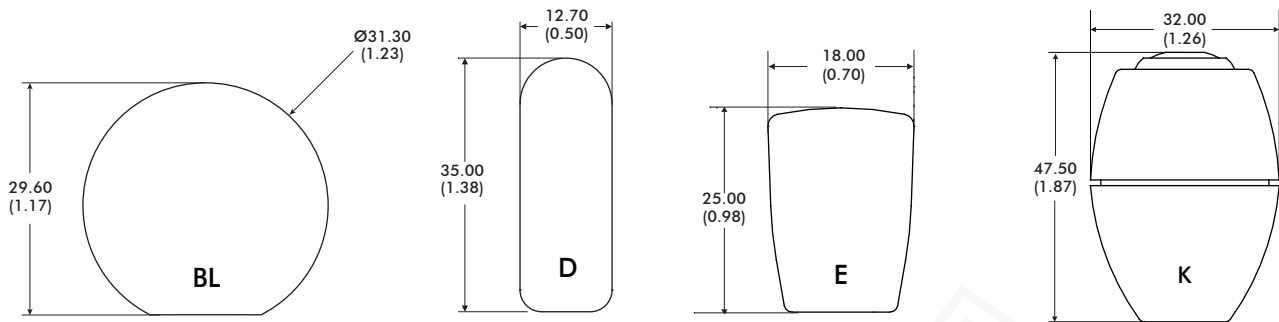
NOTE: Forces quoted are subject to exact joystick configuration and are provided as a guide only.

* For more handles see next page

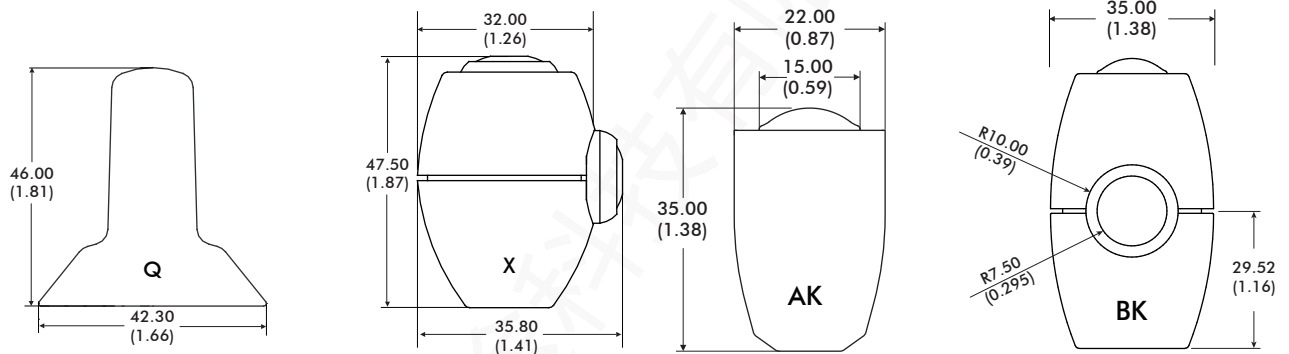
8000 series

Ruggedized switch joysticks

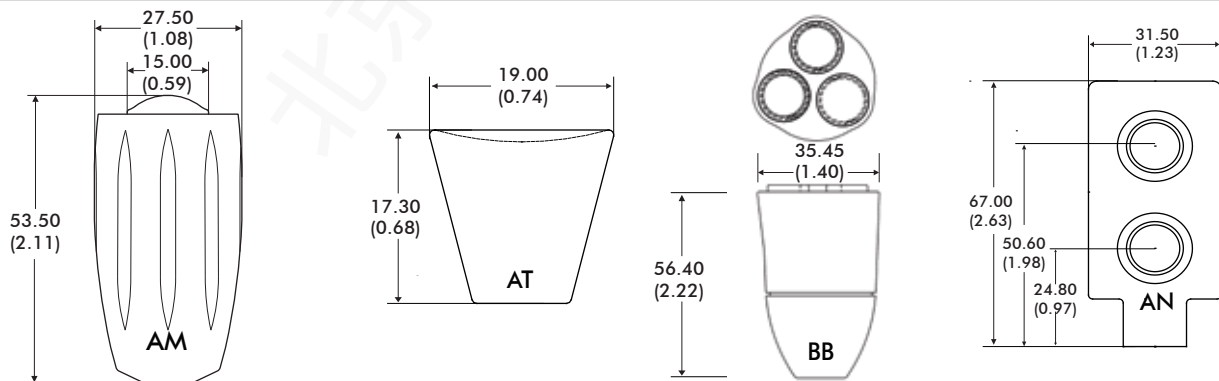
Overview



MATERIAL	Nylon	Aluminum	Nylon	ABS
FINISH	Sparkled Matt	Anodised	Sparkled Matt	Sparkled Matt
STANDARD COLOR	Black	Black	Black	Black
OTHER COLORS	Not Available	Not Available	Upon Request	Not Available
NOTES:				Uses APEM IS Switches



MATERIAL	Nylon	ABS	Aluminum	ABS
FINISH	Sparkled Matt	Sparkled Matt	Anodised	Sparkled Matt
STANDARD COLOR	Black	Black	Black	Black
OTHER COLORS	Not Available	Not Available	Not Available	Upon Request
NOTES:		Uses APEM IS Switches Requires drop-in mounting	Uses APEM IA Switches	Uses APEM IA Switches



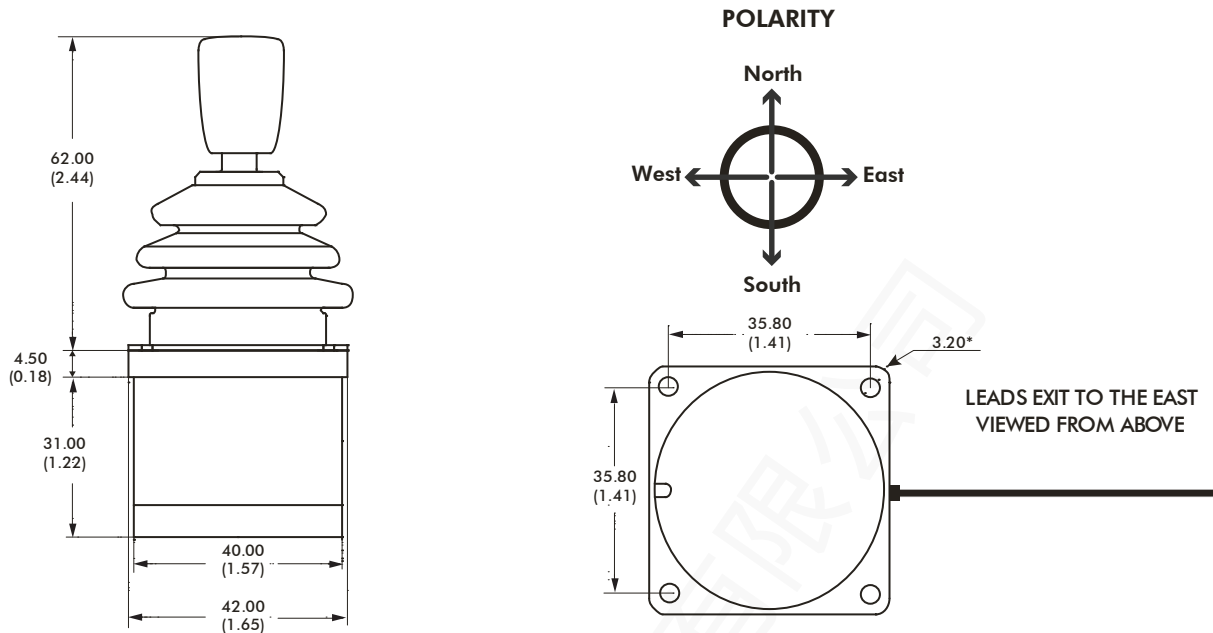
MATERIAL	Aluminum	Nylon	Nylon	Delrin
FINISH	Anodised	Sparkled Matt	Sparkled Matt	Gloss
STANDARD COLOR	Black	Black	Black	Black
OTHER COLORS	Not Available	Upon Request	Not Available	Not Available
NOTES:	Uses APEM IA Switches		Uses APEM IL Switches Requires drop-in mounting	Uses APEM IL Switches

NOTES:

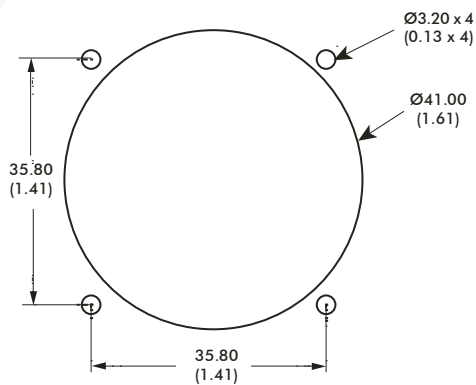
1. Dimensions are in mm/(inch).
2. Unless otherwise specified, all joysticks are supplied with black switches in the handles.

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

GENERAL DIMENSIONS



DROP IN MOUNTING - PANEL CUT-OUT & MOUNTING INSTALLATION



The joystick is dropped into the panel cut-out. The joystick and boot must be kept in place by bezel (option 6 & 7). For panel thickness of <3mm, M3 x 16 countersunk machine screws are recommended. To ensure a good panel seal, gaskets are available as an optional extra.

NOTES:

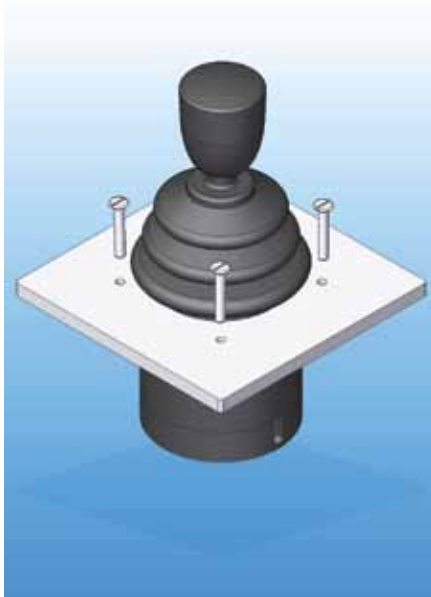
1. Dimensions are in mm/(inch).
2. The dimensions shown are for a generic 8000 series with the conical E type handle. For specific dimensions of this or any other configuration please refer to APEM.

8000 series

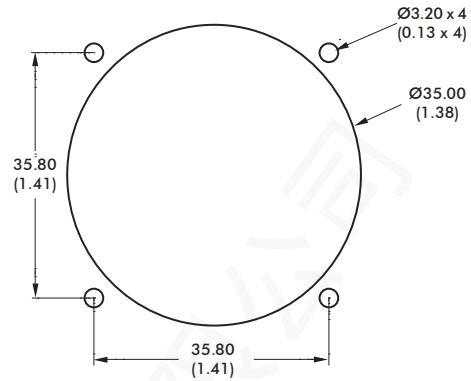
Ruggedized switch joysticks

Overview

MOUNTING OPTION A - PANEL CUT-OUT & MOUNTING INSTALLATION

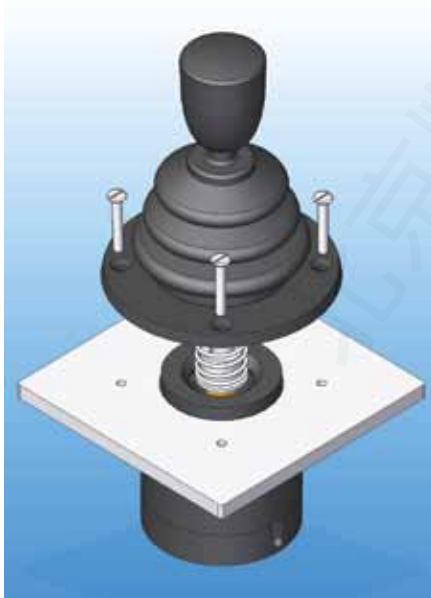


MOUNTING CUT-OUT

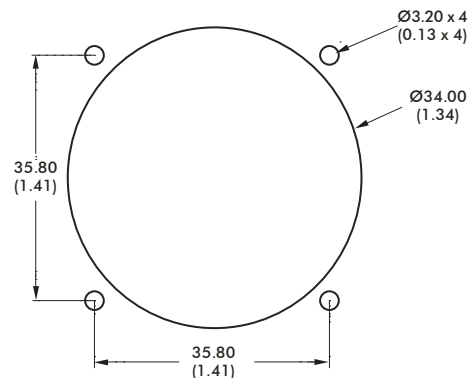


When mounted this way the panel acts as the bezel and no separate bezel is needed. M3 machine screws are recommended.

MOUNTING OPTION B - PANEL CUT-OUT & MOUNTING INSTALLATION



MOUNTING CUT-OUT



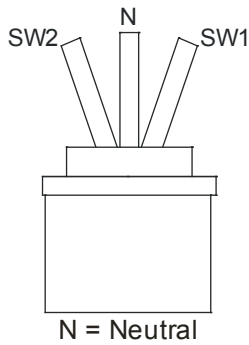
The joystick flange is mounted beneath the panel and the base of the boot must be brought through the panel cut-out and held in place with the circular bezel (option 4). For panel thicknesses of 3mm, M3 x 16 countersunk machine screws are recommended.

NOTES:

- When sub panel mounting, great care should be taken not to damage the boot, or any of the mechanism under the boot. All panel cut-outs should be free from sharp edges and swarf that may damage the boot.
- Some handles are larger than the recommended panel cut-out, in which case drop-in mounting must be specified.

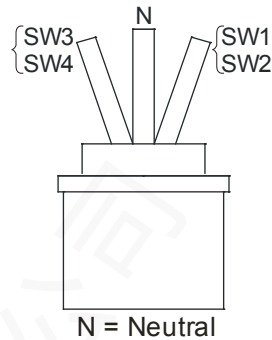
SINGLE AXIS CONFIGURATIONS

SWITCHING OPTION A



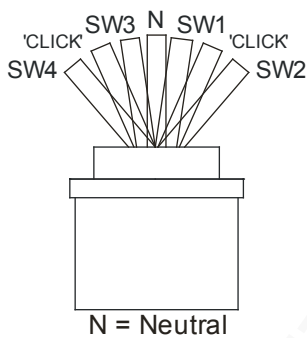
One switch will actuate as the joystick moves away from center in either direction.

SWITCHING OPTION B



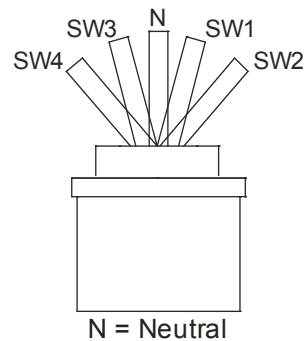
Two switches will actuate as the joystick moves away from center, in either direction.

SWITCHING OPTION C



As per option D, but with a mechanical detent between actuation of the first and second switch.

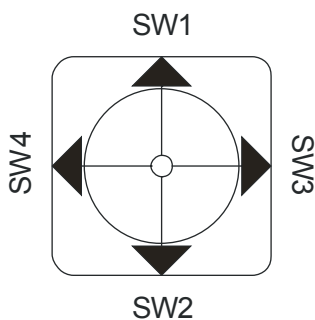
SWITCHING OPTION D



One switch will actuate after 50% of travel, with a further switch at the end of travel, in either direction.

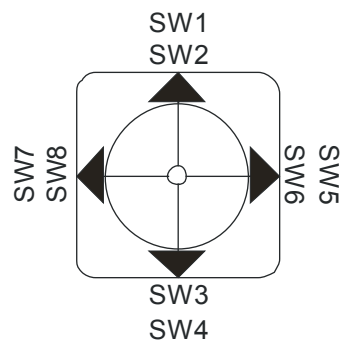
TWO AXIS CONFIGURATIONS

SWITCHING OPTION E



One switch will actuate in each of the four directions: North, South, East & West.

SWITCHING OPTION F



Two switches will actuate in each of the four directions: North, South, East & West.

8000 series

Ruggedized switch joysticks

Overview

SWITCHING OPTIONS

The following configurations are available as standard :

Single Axis - Single Pole : One switch in each of the the two directions; North & South.

Single Axis - Double Pole : Two switches in each of the the two directions; North & South.

Single Axis - Progressive : One switch will actuate after 8 degrees of movement, with a further switch actuating after another 10 degrees of movement, in either direction.

Single Axis - Progressive with detents : As above, but with a mechanical detent at the point of the first switch actuation in each direction.

Dual Axis - Single Pole : One switch in each of the four positions; North, South, East and West.

Dual Axis - Double Pole : Two switches in each of the four positions; North, South, East and West.

Note : Double Pole switching is designed such that both switches in any given position trigger nominally together.

Many configurations are also available with a further microswitch actuating when the joystick is at center, for center detection purposes.

MICROSWITCHES

The 8000 series utilizes industrial quality microswitches with changeover contacts. As standard, the switches are rated to a maximum of 1 Amp, and have gold plated contacts for reliable switching at low current levels. Please note when specifying a joystick with a pushbutton handle the characteristics of the pushbutton will be different from the microswitches. Please refer to APEM for full details and characteristics of your chosen configuration.

GUIDED FEEL

8000 series joysticks may also be specified with guided feel. A joystick with guided feel moves more readily towards the poles (North, South, East and West) and whilst it can still move away from the poles, the force required to do so is greater. Unless specified otherwise, joysticks are supplied as standard without guiding. This standard configuration allows the user to move the joystick anywhere within the limiter with the same force and without any bias.

CABLE SPECIFICATION

As standard the joysticks are supplied utilizing the normally open contacts of the microswitches.

For connection to the normally closed contacts, please specify this as part of your special modification.

Cable information may be subject to specification, please refer to APEM for details. Connectors and custom looms may be factory fitted upon request.

14/0.12 – Fourteen strands of 0.12mm diameter tinned annealed copper wire PVC insulated, to a nominal OD of 1mm

Red – Common

Blue – Second Switch West

Green – First Switch West

Orange – Second Switch North

Brown – First Switch North

Black – First Switch East

Yellow – Second Switch East

Purple – First Switch South

White – Second Switch South

Gray – Center Detect Switch

7/0.127 – Seven strands of 0.127mm diameter tinned copper wire ETFE insulated, to a nominal OD of 0.7mm

Orange – First Pushbutton (Top of Handle)

Green – Second Pushbutton

NOTE: All 8000 series are supplied with 150mm of twisted cable harness, with tinned ends.

9000 series

Inductive sensing joysticks



The 9000 Series is ideal for those applications that demand proportional control with a low profile below the panel. Developed from the proven 7000 Series, the 9000 Series employs the same, highly proven, contactless, inductive sensing and circuitry. This joystick offers self-centering, omni-directional functionality, and utilizes the exclusive 'locking cam' system to rigidly secure the highly repeatable mechanism around the precision groundsteel operating shaft. High precision air wound coils are mounted directly onto the SMT circuitry, delivering enviable accuracy while further minimizing the installed depth of the joystick.



KEY FEATURES

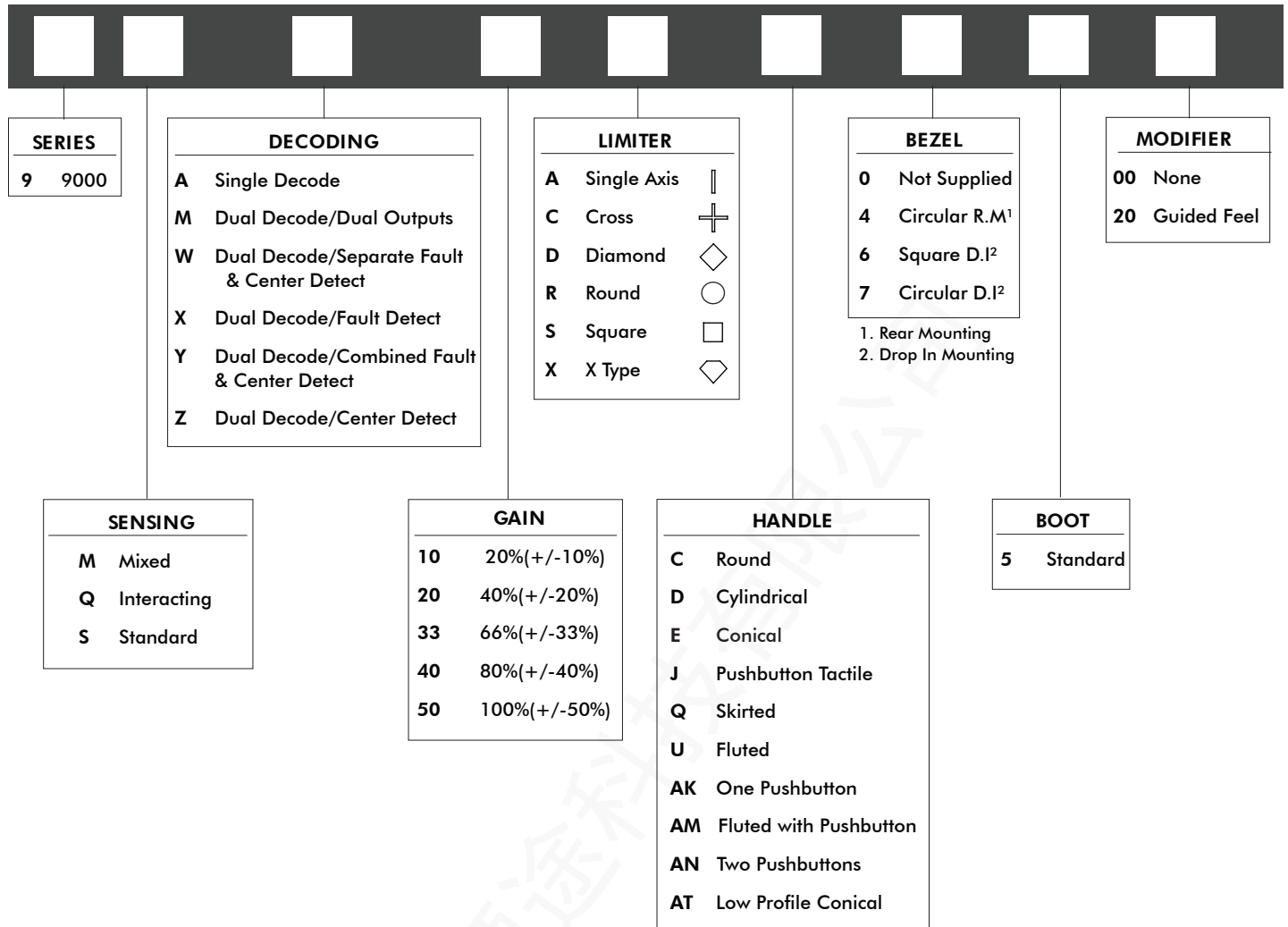
- One or two axes
- Signal mixing options
- 5 - 15V operation
- Optional "at center" and "internal fault" detection
- Dual redundant outputs.
- Infinite resolution
- Inductive sensing
- Consistent performance
- IP65 above panel
- Long service life
- Wide range of handles



9000 series

Inductive sensing joysticks

OPTION SELECTION



NOTES

1. BEZEL OPTIONS

For drop in mounting, please specify bezel option 6 or 7. For sub-panel mounting, no bezel is necessary, unless the boot is required to seal to the front face of the panel in which case bezel option 4 should be specified. Bezels 6 & 7 clamp the boot and top face of the joystick body to the panel whereas bezel 4 clamps only the boot.

2. SPRINGING

As standard 9000 Series are offered sprung to centre. The standard spring force requires 1.3N (nominally) to off-center the joystick. The 9000 Series may be specified with a lighter spring (1N), or a stronger spring (1.6N)

Note: Forces quoted are subject to exact joystick configuration and are provided as a guide only.

3. DUAL DECODE INTERFACE

For optimum performance of the center detect and fault detect signals, Apem recommends the signals are "pulled high" via an input resistor of typically 22k, on the controller circuitry.

4. CENTER TAP REFERENCE

All 9000 Series output a center tap reference as standard. This reference is set within the joystick at 50% of Vcc (+/-1%). For optimum accuracy the outputs should be read relative to the center tap.

5. NON STANDARD

Further non standard options including custom handles or special limiters are available. Please refer to the factory for further details.

9000 series

Inductive sensing joysticks

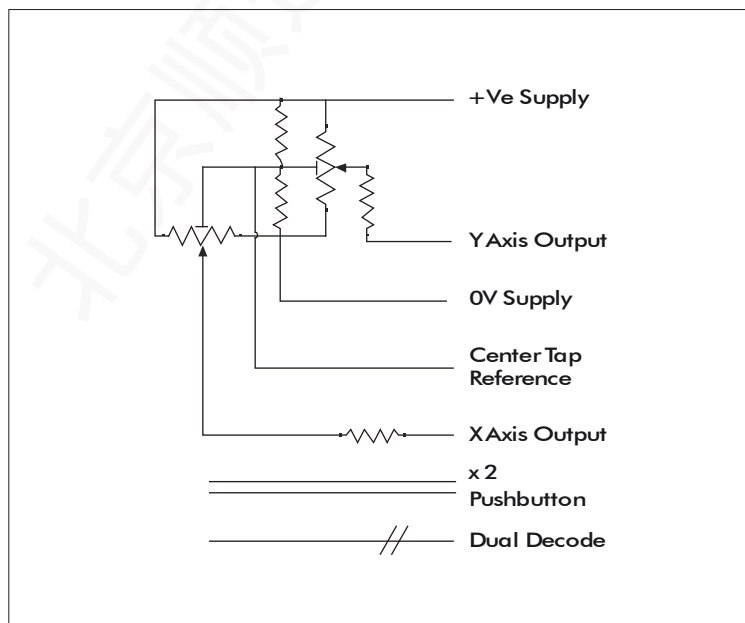
TECHNICAL SPECIFICATIONS

Life Cycles	: > 10 Million Operations	Supply Voltage	: 4.75V Min to 15V Max
Signal Swing	: +/-10% of Vcc to +/-50% of Vcc	Output Signal Tolerance	: +/-10% of Output
Output at Center	: +/-1%	Output Impedance	: 1.8k +/-1%
Signal Ripple	: <1% of Output	Supply Current	: Typically 10mA
ESD Immunity	: >12KV - Correctly Installed	RFI Rejection	: >20V/m - Bare Joystick
RFI Rejection	: >40V/m - Correctly Installed	Preferred Load	: >10K
Body Material	: Glass Reinforced ABS	Shaft Material	: Stainless Steel
Shaft Diameter	: 5 mm	Other Materials	: Brass, Acetal, Nylon
Gimbal Pivot	: Acetal & Hardened Steel	Boot	: Neoprene
Weight	: 90 grams (0.20lb)	Above Panel Seal	: IP65
Temperature Range	: -20°C to +55°C (-4°F to +131°F)	Operating Lever Deflection	: +/-18°

CABLE SPECIFICATIONS

14/0.12 - Fourteen strands of 0.12mm diameter tinned annealed copper wire PVC insulated to a nominal OD of 1mm			
Red	: +Vcc	Black	: 0V
Blue	: X Axis Wiper	Yellow	: Y Axis Wiper
Green	: Center Tap Reference		
Orange	: Center Detect, or Combined Fault & Center Detect	White	: Fault Detect
Brown	: Mirror of X Axis Wiper	Grey	: Mirror of Y Axis Wiper
7/0.127 - Seven strands of 0.127mm diameter tinned copper wire ETFE insulated, to a nominal OD of 0.7mm			
Orange	: Pushbutton		
All 9000 Series are supplied with 150mm of twisted cable harness, with tinned ends.			
Connectors may be fitted upon request.			

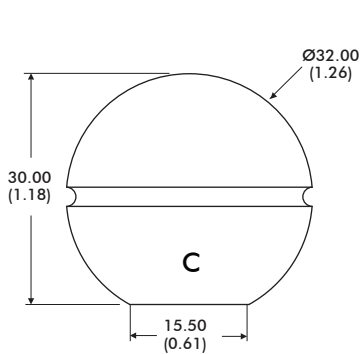
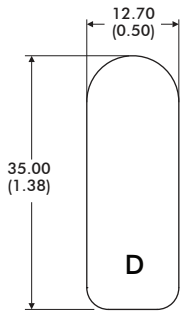
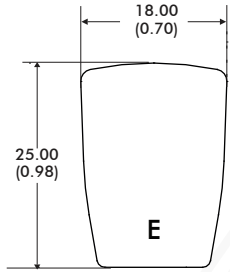
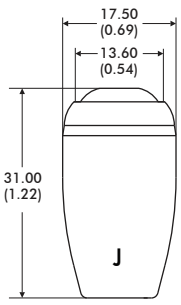
NEAR EQUIVALENT CIRCUIT

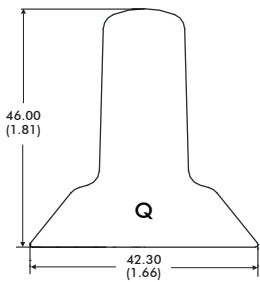
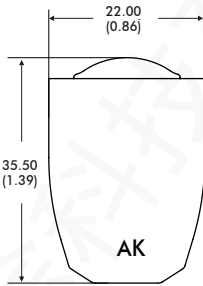
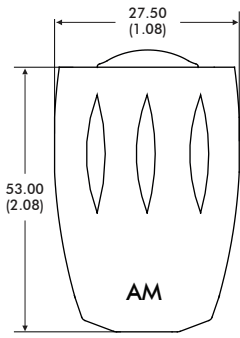


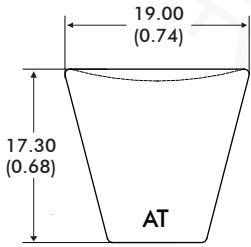
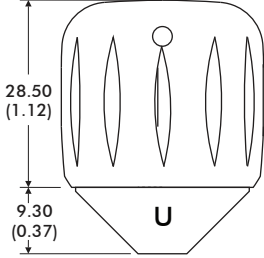
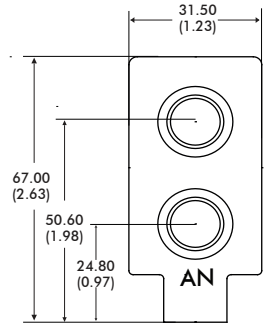
9000 series

Inductive sensing joysticks

DIMENSIONAL DRAWINGS - HANDLES

			
<p>MATERIAL Phenolic FINISH Gloss STANDARD COLOR Black OTHER COLORS Not Available NOTES:</p>	<p>Aluminium Anodised Black Not available</p>	<p>Nylon Sparkled Matt Black Upon Request</p>	<p>ABS Sparkled Matt Black Upon Request Uses APEM IS Switch</p>

		
<p>MATERIAL Nylon FINISH Sparkled Matt STANDARD COLOR Black OTHER COLORS Upon Request NOTES:</p>	<p>Aluminium Anodised Black Not Available Uses APEM IA Switch</p>	<p>Aluminium Anodised Black Upon Request Uses APEM IA Switch</p>

		
<p>MATERIAL Nylon FINISH Sparkled Matt STANDARD COLOR Black OTHER COLORS Upon Request NOTES:</p>	<p>Aluminium Anodised Black Not Available</p>	<p>Delrin Gloss Black Not Available Uses APEM IS Switch</p>

1. Dimensions are in mm/(inch)

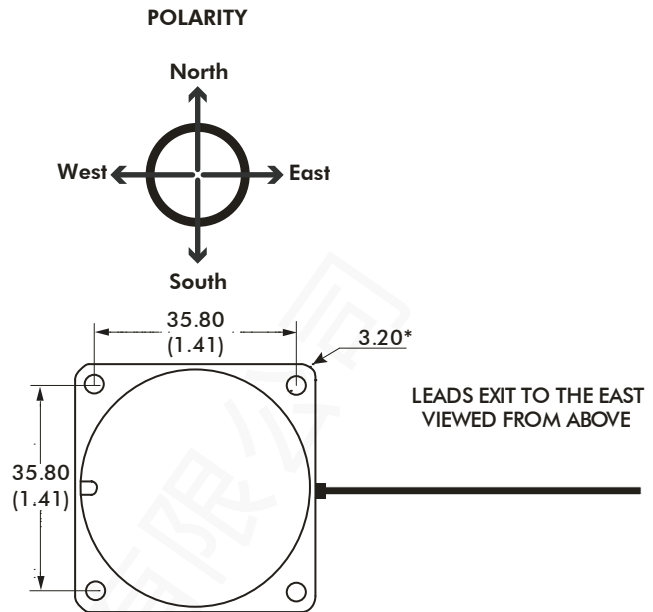
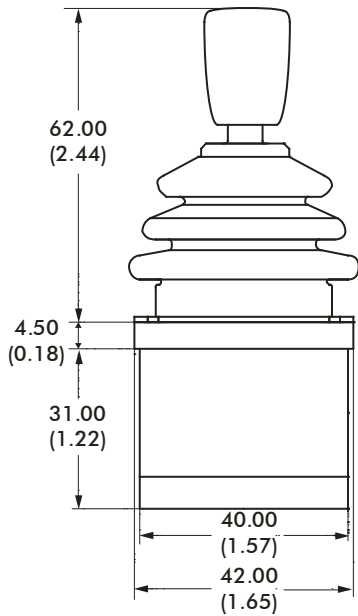
Note: The company reserves the right to change specifications without notice.

9000 series

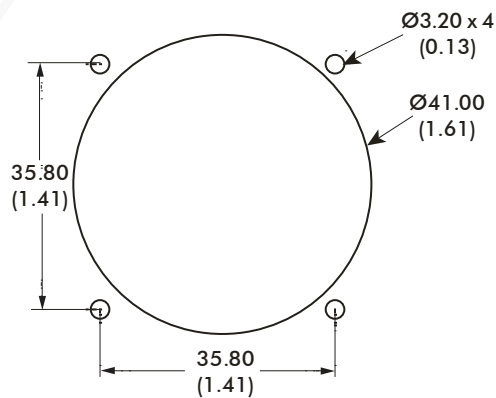
Inductive sensing joysticks

DIMENSIONAL DRAWINGS - continued

GENERAL DIMENSIONS



DROP IN MOUNTING - PANEL CUT-OUT & MOUNTING INSTALLATION



The joystick is dropped into the panel cut-out. The joystick and boot must be kept in place by bezel (option 6 & 7). For panel thickness of <3mm, M3 x 16 countersunk machine screws are recommended.

NOTES:

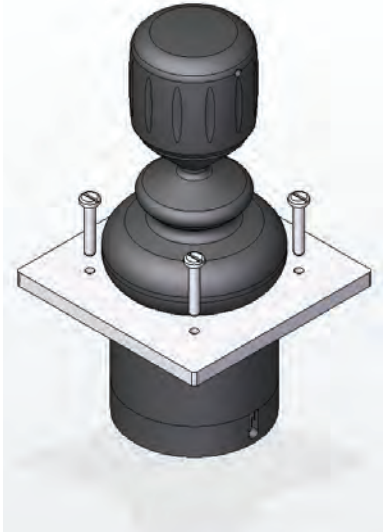
1. Dimensions are in mm/(inch)
2. The dimensions shown are for a generic 9000 Series with the conical E type handle. For specific dimensions of this or any other configuration please refer to the Factory.

9000 series

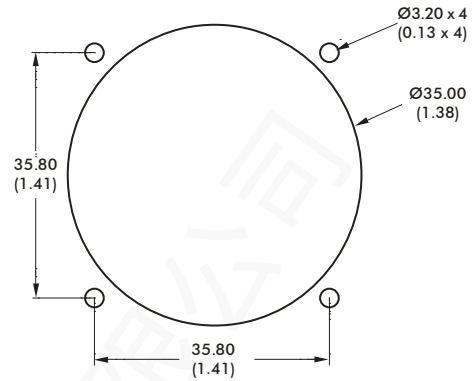
Inductive based joysticks

MOUNTING OPTIONS

MOUNTING OPTION A - PANEL CUT-OUT & MOUNTING INSTALLATION

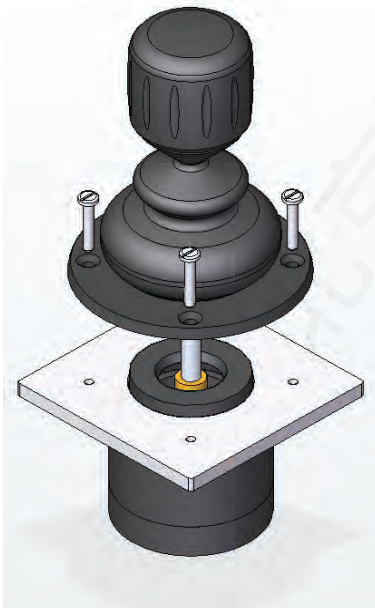


MOUNTING CUT-OUT

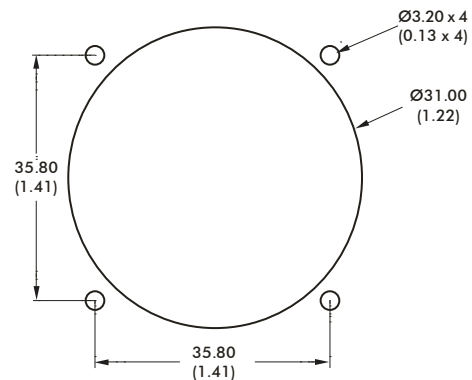


When mounted this way the panel acts as the bezel and no separate bezel is needed. M3 machine screws are recommended.

MOUNTING OPTION B - PANEL CUT-OUT & MOUNTING INSTALLATION



MOUNTING CUT-OUT



The joystick flange is mounted beneath the panel and the base of the boot must be brought through the panel cut-out and held in place with the circular bezel (option 4). For panel thicknesses of 3mm, M3 x 16 countersunk machine screws are recommended.

NOTES: Dimensions are in mm/(inch)

When sub panel mounting, great care should be taken not to damage the boot, or any of the mechanism under the boot. All panel cut-outs should be free from sharp edges and swarf that may damage the boot.

CIRCUITRY

The 9000 Series joystick operates by passing an oscillating current through a drive coil, directly mounted at the lower end of the operating lever, and immediately above the four sensing coils. When the shaft and drive coil moves away from the centre, the signals detected in each opposing pair of coils increase nominally in proportion to deflection. The phase of those signals determine the direction. Synchronous electronic switches followed by integrating amplifiers provide DC signals directly equivalent to those of potentiometer joysticks, but with fixed output impedance and free of wiper noise and track wear.

DUAL DECODE

Designed for use in the most safety-critical applications, the 9000 Series incorporates comprehensive internal monitoring circuitry whereby output signals are continually compared with separately generated 'mirror signals'. In the unlikely event of an internal fault, the dual decode system will generate a separate fault signal, enabling the controller to fail-to-safe. The dual decode system is a complete internal self-monitoring system, providing a far higher standard of protection. An additional, 'away from center' signal is also available whenever required. Although the monitoring of the joystick is fully internal, the inverse 'mirror signals' can be available as external outputs where the monitor function is incorporated within the controller circuitry.

GUIDED FEEL

The 9000 Series may also be specified with guided feel. A joystick with guided feel moves more readily towards the poles (N, S, E and W) and while it can still move away from the poles, the force required to do so is greater. Unless specified otherwise, joysticks are supplied as standard without guiding. This standard configuration allows the user to move the joystick anywhere within the limiter with the same force and without any bias.

FUNCTIONAL OPTIONS

The 9000 Series can be configured in three different modes:

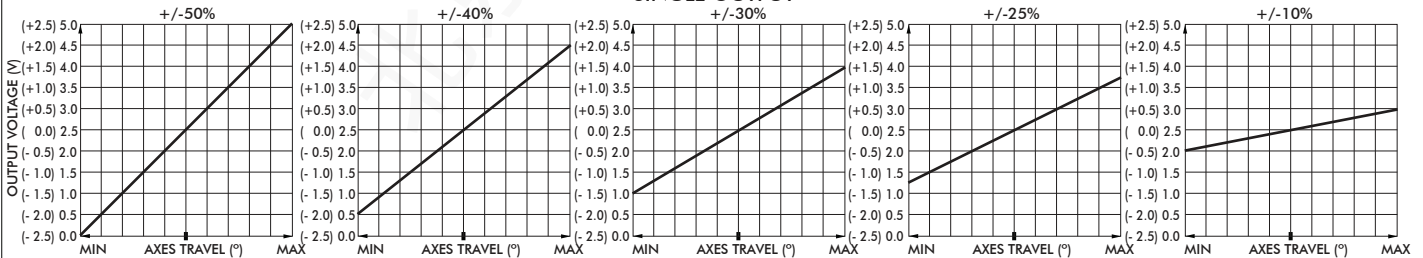
Orthogonal, standard signals - Replicating that of a potentiometer.

Deliberate signal mixing - Ideal for those applications whereby the method of steering is by controlling two motors. For example one motor uses X+Y signals and the other uses X-Y signals. This mixing is achieved by internally orientating the signals at 45 degrees to normal. Typical applications may be twin propeller boats, tracked vehicles, or wheelchairs.

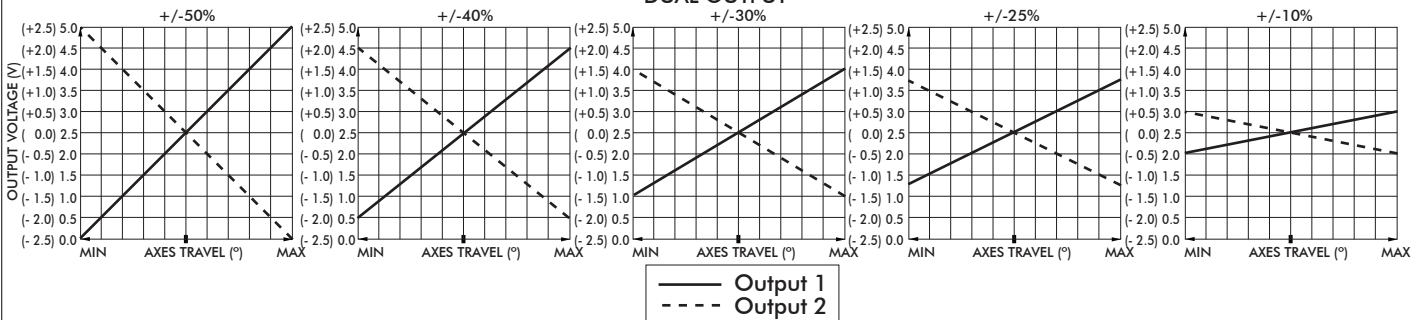
Deliberate signal interaction - Enables reduction in one signal as the other increases. This option is particularly beneficial where it is undesirable to maintain full forward speed while turning and vice versa.

LINEAR OUTPUT OPTIONS

SINGLE OUTPUT



DUAL OUTPUT



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



- Hall effect joystick and switch function
- Sculpted ergonomic design
- Next generation Hall effect technology
- 5V operation - dual redundant outputs as standard
- Two lever height variants
- Industry standard connector
- IP67 sealed
- Sprung and detent lever options
- Available with color-coded inserts
- EMC & Magnetically shielded - analog or PWM outputs
- Effectively zero below panel depth
- End stackable mounting

MECHANICAL

- Materials Employed: Polyetherimide, Polycarbonate, Stainless Steel
- Weight: 50g
- Mechanical Operating Angle: ± 25 Degrees
- Max Load to Mechanism:
 - Vertical: IK08 (BSEN62262:2002)
 - Horizontal: 75N (16.86lbf)

ELECTRICAL

- Gain (Output Voltage Span): $\pm 10\% \times V$ to $\pm 50\% \times V$
- Output at Center: $V/2 \pm (5\% \times \text{Gain})$
- Power Supply: 5V $\pm 0.5V$ Transient free
- Switch Outputs: Open Drain, pulled high within control via 1K5 to 5V, and smoothed to 0V with 100nF
- Sensor Type: Hall effect
- Current Consumption: $< 20\text{mA}$
- Loads: Minimum 10K, preferred 100K+

ENVIRONMENTAL

- Storage: -40°C to 70°C (-40°F to 158°F)
- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Seal Above Panel: IP67 (Gasket fitted as standard)
- EMC Emissions: Complies with EN 61000-6-3:2001 CISPR 22:2005 Class B 30MHz - 11GHz
- Life Cycles: 5 million cycles sprung version only. Detents rated to 2 million cycles
- ESD: Complies with EN61000-4-2 (extended) $\pm 8\text{KV}$ (20 contacts) & $\pm 15\text{KV}$ (20 air discharges)
- EMC Immunity: 100V/m, 80MHz-2.7GHz, 1KHz 80% sine wave modulation, EN 61000-4-3 (extended)
- Vibration: 100Hz - 200Hz @ $0.13\text{g}^2/\text{Hz}$, total 3.6gRMS (1 Hour in each of the three mutually perpendicular axis)

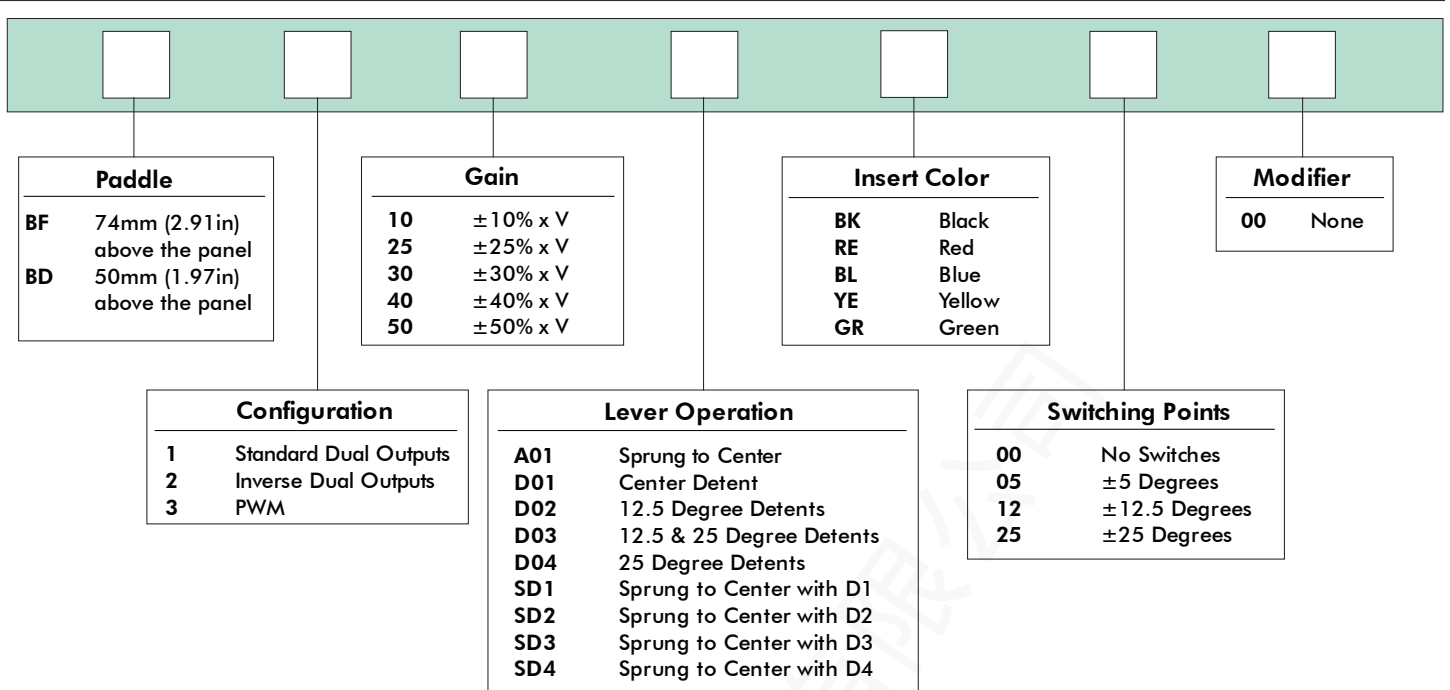
NOTES:

1. All parameters shown are based on a standard configuration and are provided for guidance only.
2. Please refer to APEM for assistance on how to achieve the best performance from your chosen configuration.

BF series

Paddle controllers

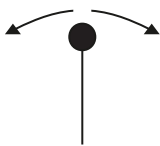
Overview



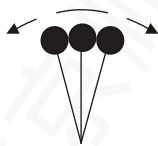
LEVER OPERATION

DETENT OPTIONS

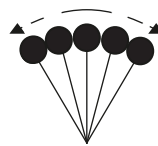
D01 = CENTER DETENT



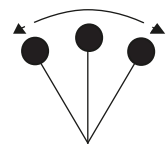
D02 = +/-12.5 DEGREES



D03 = +/- 12.5 & 25 DEGREES

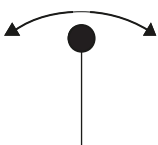


D04 = +/-25 DEGREES

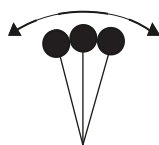


SPRUNG TO CENTER WITH DETENT OPTIONS

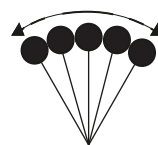
SD1 = CENTER DETENT



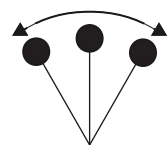
SD2 = +/-12.5 DEGREES



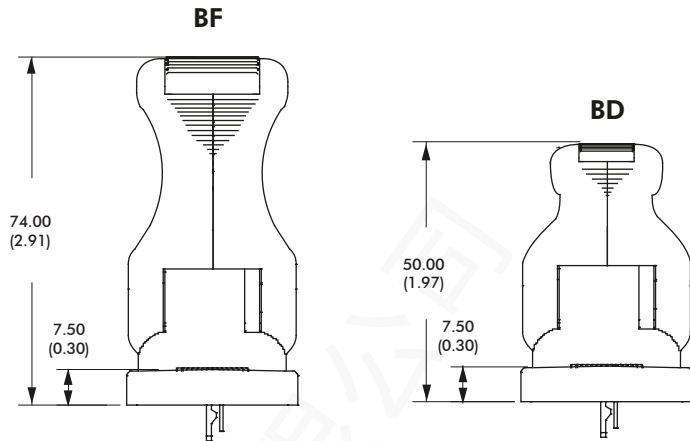
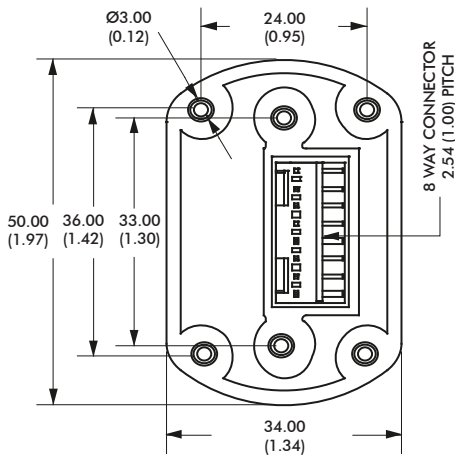
SD3 = +/- 12.5 & 25 DEGREES



SD4 = +/- 25 DEGREES



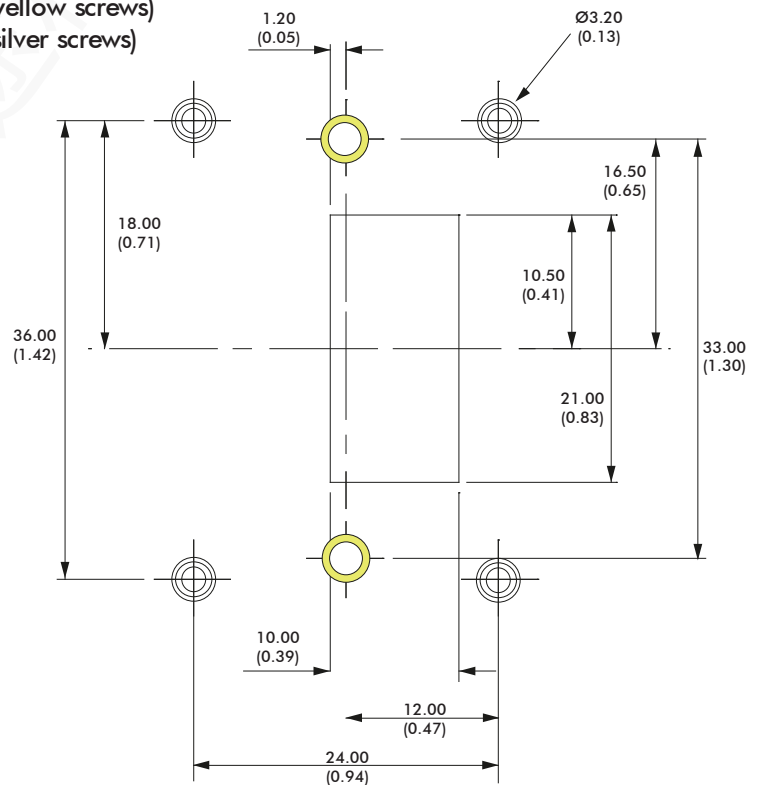
GENERAL DIMENSIONS



DROP IN MOUNTING - PANEL CUT-OUT & MOUNTING INSTALLATION

The Paddle may be mounted with two different hole patterns:

- Two screws – in line on the Y axis (shown as yellow screws)
- Four screws – one in each corner (shown as silver screws)



The Paddle is fitted with M3 bushes in all six positions, as standard.
Fasteners are not supplied as standard. The appropriate length of fastener is dependent on panel thickness.

NOTE: All dimensions in mm/(inch).

BF series

Paddle controllers

Overview

MECHANISM

The brand new mechanism design has been developed for strength and long life while retaining a superb feel.

SPRUNG TO CENTER

The lever springs back to the center position when released.

DETENT POSITIONS

The lever 'clicks' into a number of preset positions. The internal switches can be configured to trigger at two of these points.

DETENT POSITIONS WITH SPRUNG TO CENTER

The lever 'clicks' into a number of preset positions and springs back to its center position when released.

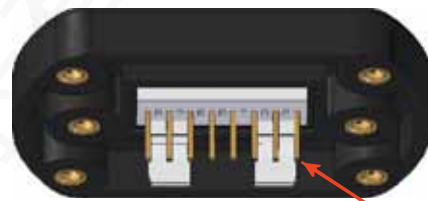
CONNECTIONS

The Paddle is fitted, as standard, with an industry standard 2.54mm pitch 8 way connector.

CONNECTIONS

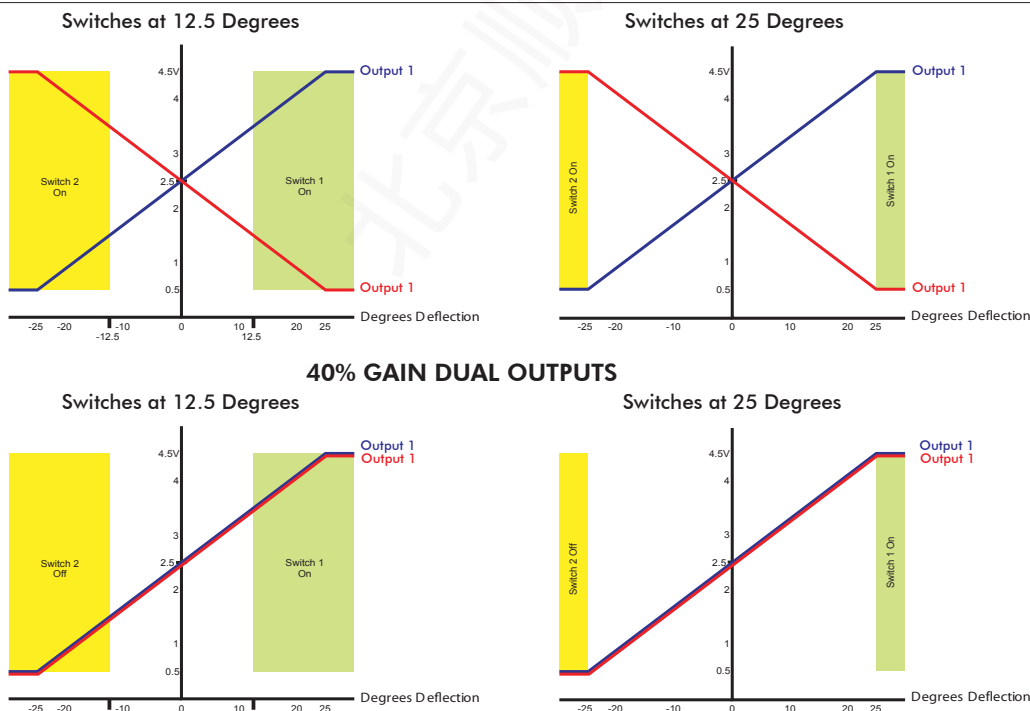
Paddles are supplied with an eight way connector as standard.

- PIN 1: 5V
- PIN 2: Switch 1(+)
- PIN 3: 0V
- PIN 4: Analog/PWM output 1
- PIN 5: Analog/PWM output 2
- PIN 6: 0V
- PIN 7: Switch 2 (-)
- PIN 8: 5V

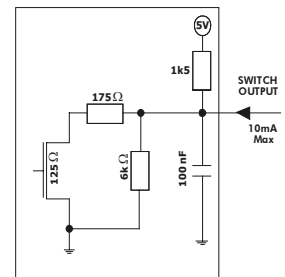


PIN 1

BF SERIES OUTPUT CHARACTERISTICS - 40% GAIN DUAL INVERSE OUTPUTS



Equivalent circuit for the switch output



Note: When Dual Output (non-inverted) option is selected the polarity of Switch 2 is inverted

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

OUTPUT OPTIONS

The BF series Paddle is configured as two “electrical” controls in one mechanical package. The Paddle operates from 5V and provides two proportional outputs. The second output is accurate to the first within $\pm 3\%$ of the power supply. The power supply for the secondary output is also completely independent. Customers may choose their preference of voltage outputs (gains).

The secondary output can be of the same or inverse polarity to the primary wiper. For example, with a secondary inverse output, the first and second outputs can be summed and compared to zero to verify that the joystick is operating correctly. Paddles having two identical outputs of the same polarity may be used to drive two identical dual redundant circuits.

There are also two Hall effect switches that trigger at pre-determined lever positions.

The BF series Paddle may be specified with a variety of PWM output options. For more details on available PWM options please refer to APEM.

ADDITIONAL OUTPUT INFORMATION**SELECTABLE SWITCHING POINTS**

The Paddle incorporates two Hall effect switches. The angle of the lever at the switch trigger point can be selected when ordering.

If no switches are specified then the output on pins 2 and 7 will be unused.

The outputs are configured as ‘open drain’ type with a 1K5 pull up resistor to 5V.

GAIN OPTIONS

The voltage output on the wiper, at full scale deflection is determined by the gain. The gain is expressed as a percentage of the voltage supplied. Therefore (assuming a 5V supply) a Paddle specified with $\pm 25\%$ gain would yield 1.25V at South, 2.5V at center and 3.75V at North. A range of gain options are available as standard. All controls are supplied pre-set and no further calibration is needed throughout the lifetime of operation.

OUTPUT IMPEDANCE

The voltage outputs at center and at each end of travel are specified across an infinite load, with no current flowing. The output impedance specified in the electrical specification should be taken into account when designing a system. Load resistance of less than 10K Ohms is not recommended.

HANDLE OPTIONS

The BF series offers two standard handle options. The taller (74mm) handle provides the most ergonomic solution while the shorter (50mm) is best suited to hand held applications where a minimized height is preferred. The taller lever is supplied with the top insert prefitted, however the shorter lever may be specified with no insert fitted and the snap in inserts supplied loose for ease of customer integration.

Note: All snap in inserts may only be fitted once, and are not removable once fitted.

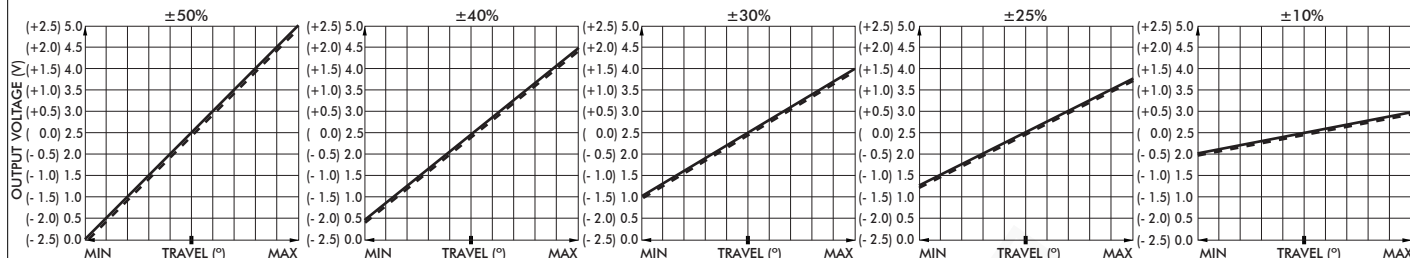
BF series

Paddle controllers

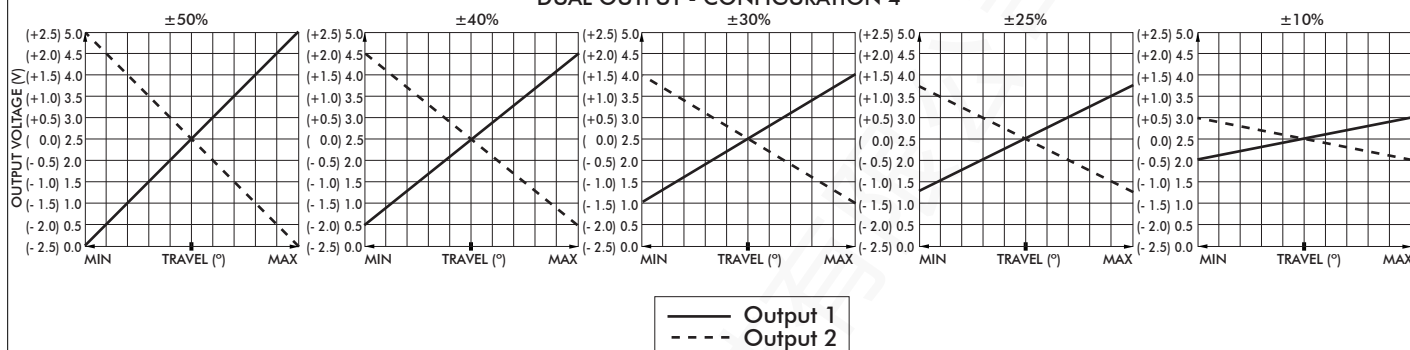
Overview

VOLTAGE OUTPUT OPTIONS

DUAL OUTPUT - CONFIGURATION 3



DUAL OUTPUT - CONFIGURATION 4



POWER SUPPLY

The BF Series is designed to be powered by a regulated $5V \pm 0.5V$ power supply. The outputs are ratiometric, making a stable, noise free, power supply essential. The power supply to the joystick should be carefully regulated to be within tolerance. Should the power supply change outside of the specified tolerances, permanent damage may occur.

MAGNETIC IMMUNITY AND SYSTEM DESIGN

The BF Series incorporates internal magnetic screening to minimize the effect of external magnetic fields. Mounting or operating the Paddle close to strong magnetic fields is not recommended. System designers should follow best practice when incorporating the BF Series Paddle into their products. Care should be taken to decouple the power supply properly and to employ adequate EMC shielding.

MOUNTING

When mounting the Paddle, care should be taken to site it in a position that does not make it vulnerable to damage when in use. If the Paddle is intended for use in a handheld enclosure then care must be taken to protect the Paddle from damage caused by dropping. Basic precautions such as mounting it at the lightest end of the enclosure so it doesn't hit the ground first or by protecting it with a guard should always be implemented for long term reliability. The body of the Paddle, on the underside of the panel, must not be subject to water spray, excessive humidity or dust.



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

M series

Miniature resistive joysticks

Distinctive features and specifications



- World's #1 selling joystick for CCTV applications
- Potentiometric sensing
- One, two or three axis
- Low profile design with 17 handle options
- RoHS

MECHANICAL (FOR X AND Y AXIS)

- Break Out Force: 0.7N (0.16lbf)
- Operating Force: 1.3N (0.29lbf)
- Maximum Applied Force: 100N (22.48lbf)
- Mechanical Angle of Movement: 56°
- Expected Life: See potentiometer options
- Mass/weight: Varies
- Package Size (mm) (L x W x H) or (Dia x H): Varies
- Lever Action (Centering): Spring or Friction

MECHANICAL (FOR Z AXIS)

- Break Out Torque: 0.022N·m (0.19lbf-in)
- Operating Torque: 0.040N·m (0.35lbf-in)
- Maximum Allowable Torque: 0.049N·m (0.43lbf-in)
- Mechanical Angle: 90°
- Handle Action: Spring

ENVIRONMENTAL

- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Storage Temperature: -40°C to 70°C (-40°F to 158°F)

POTENTIOMETER OPTIONS

Potentiometer	P	M	R
Electrical Element	Conductive Plastic	Conductive Plastic	Conductive Plastic
Track Resistance	5K	5K	5K
Linearity	±1.0%	±5.0%	±1.0%
Track Operating Angle	220°	56°	50°
CRV	±1.5%	±1.5%	±1.0%
Power Dissipation	0.25W@40°C	0.5W@70°C	1W
Rotational Life	1,000,000	1,000,000	10,000,000

CENTERING OPTIONS

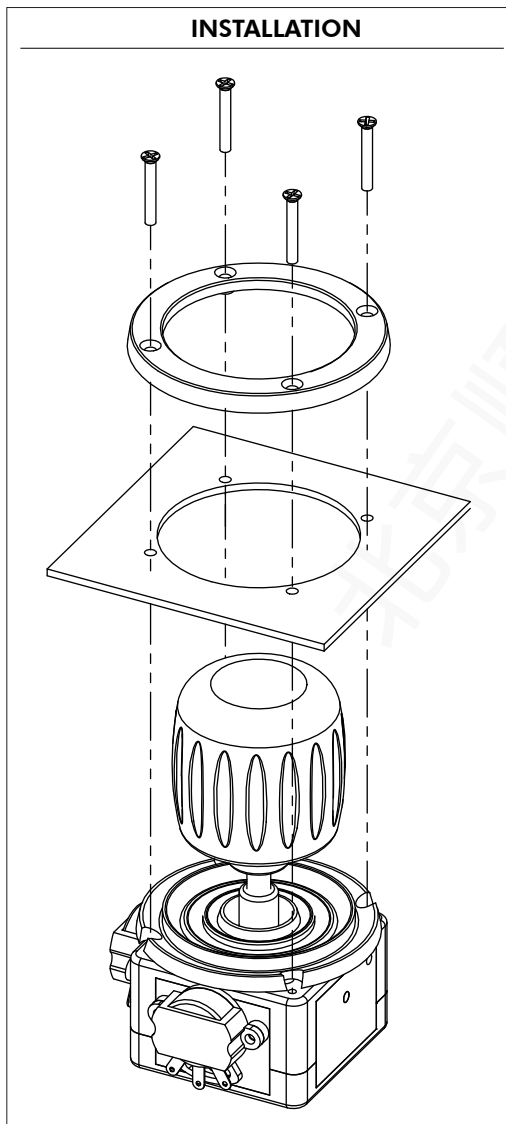
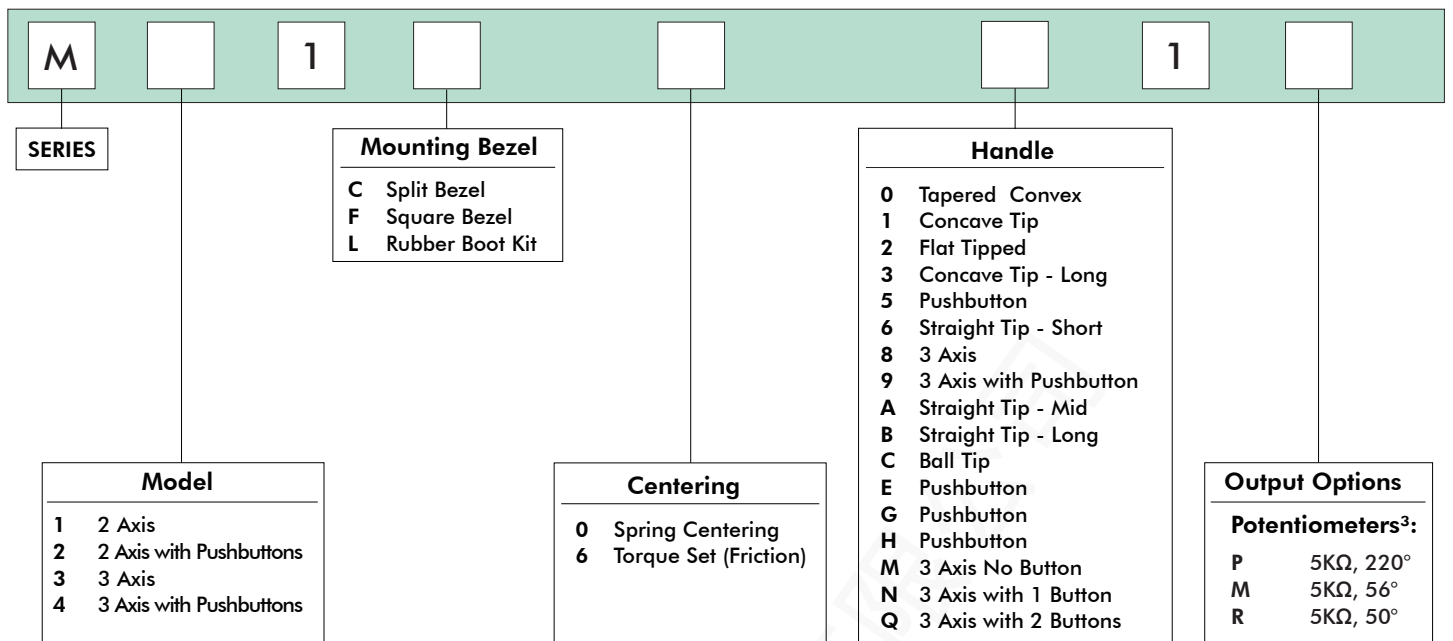
- **SPRING CENTERING:** The joystick returns to center when the handle is released.
- **TORQUE SET:** Torque set provides absolute positioning with uniform friction applied to "X" and "Y" axis.

- NOTES:
- All values are nominal.
 - Specifications are subject to the joystick configuration.
Contact Technical Support for the performance of your specific configuration.
 - The M Series is intended for internal applications.

M series

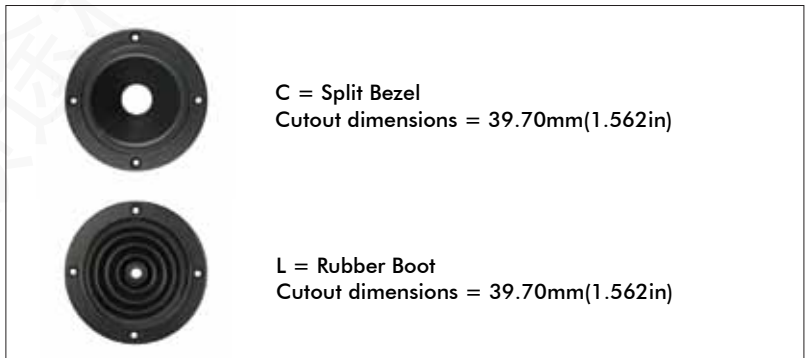
Miniature resistive joysticks

Overview

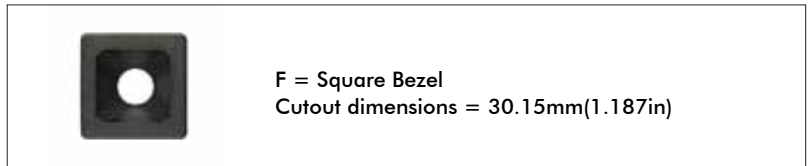


NOTES:

1. Front Mounting Bezels (FM)



2. Rear mounting bezels (RM)



3. Potentiometer specifications are located on the previous page.



Mounting accessories.

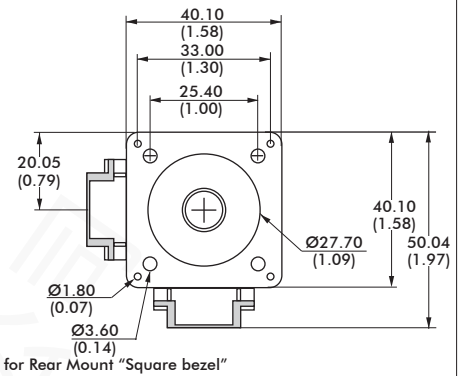
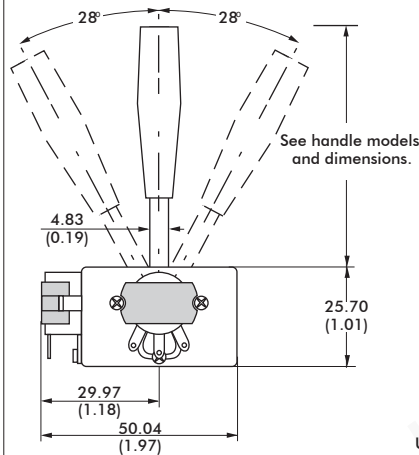
Standard hardware includes:

C= Ring, cup, and 4 black Phl screws 2-56x1/2in

L= Ring and 4 black Phl screws 2-56x1/2in

F= Square bezel, 4 screws 2-56x1/2in Phl, and 4 screws 2-56x1/4in Phl

2 AXIS WITH OPTION A HANDLE

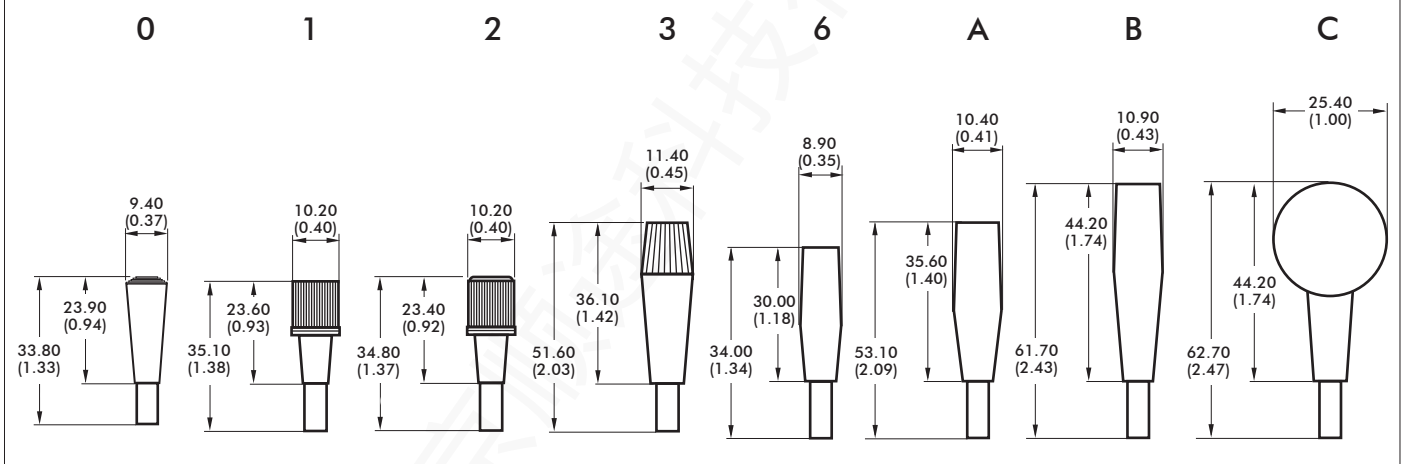


NOTES:

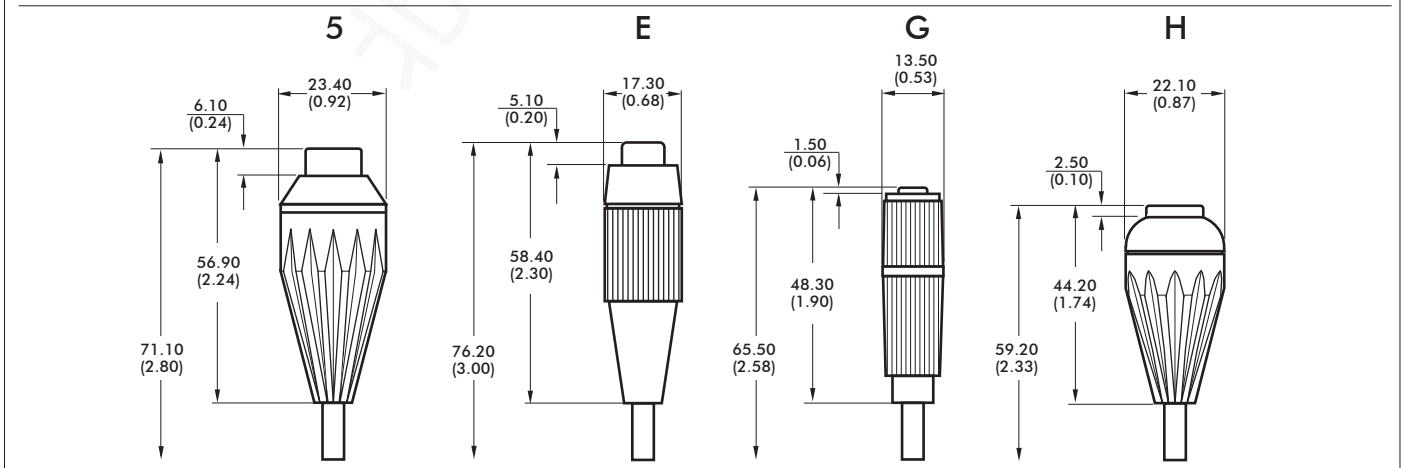
1. Mechanical dimensions represent a joystick with the largest potentiometer option.
2. Potentiometer size will vary according to selected option.

HANDLES

2 AXIS



2 AXIS WITH PUSHBUTTON¹



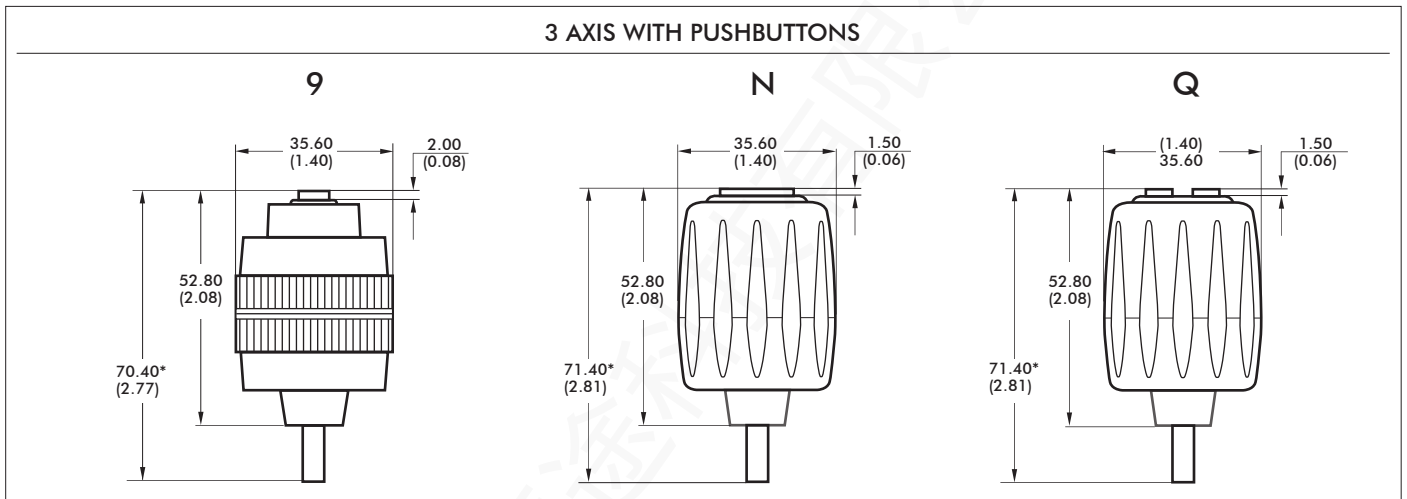
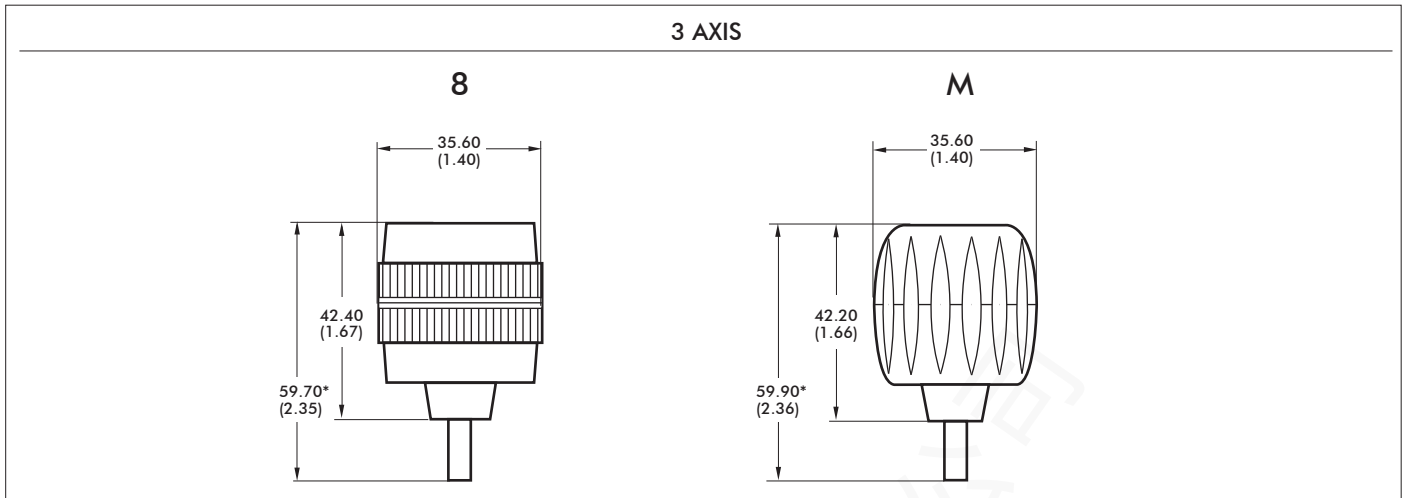
NOTES:

1. Pushbuttons are not sealed. Joysticks are intended for internal applications only.
2. Dimensions are in mm/(inch).

M series

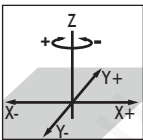
Miniature resistive joysticks

Overview



NOTES:

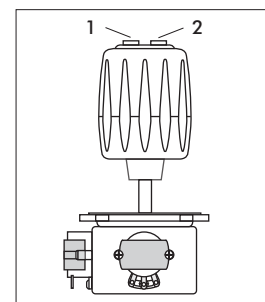
1. Dimensions are in mm/(inch).
2. Pushbuttons are not sealed. Joysticks are intended for internal applications only.
3. Axis orientation:


4. Wiring information:
 - Cables are provided for pushbuttons and the Z axis.
 - Cables are not supplied for the potentiometers (axis X and Y).

DEFAULT WIRE COLOR CODE*		
COLOR	FUNCTION	AWG
2 OR 3 AXIS JOYSTICK WITH 1 PUSHBUTTON - OPTIONS 5,E,G,H,9,N		
ORANGE	Switch 1	28
ORANGE	Switch Common	
3 AXIS JOYSTICK WITH 2 PUSHBUTTONS - Option Q**		
ORANGE	Switch 1	28
BROWN	Switch 2	
GREEN	Switch Common	
Z AXIS IN A 3 AXIS JOYSTICK - OPTIONS 8,9,M,N,Q		
RED	Supply	28
WHITE	Signal	
BLUE	Return	

NOTES: * Wires for the Z axis and for the pushbuttons are 292mm (11.5in) and stripped.

** Handle "Q" pushbuttons are shown in the following drawing:





- Hall effect joystick and switch function
- Sculpted ergonomic rubber grip
- 5V operation - standard dual redundant outputs
- Analog or PWM outputs
- Custom lever colors & designs available
- IP67 sealed
- EMC shielded
- 60mm above panel height

ELECTRICAL SPECIFICATIONS

- Gain (Output Voltage Span): $\pm 10\% \times V$ to $\pm 50\% \times V$
- Output at Center: $V/2 \pm (5\% \times \text{Gain})$
- Power Supply: 5V $\pm 0.5V$ Transient free
- Switch Outputs: Open Drain, pulled high within paddle control via 1K5 to 5V, and smoothed to 0V with 100nF
- Sensor Type: Hall effect
- Current Consumption: <20mA
- Loads: Minimum 10K, preferred 100K+
- PWM frequency range: 100Hz to 1KHz

MATERIALS

- Body: PA
- Actuator: PA & PC
- Rubber Grip: TPE

GENERAL SPECIFICATIONS

- Operating Angle: ± 30 Degrees
- Life Cycles: 10 million cycles
- Soft touch lever with color options

ENVIRONMENTAL SPECIFICATIONS

- Storage: -40°C to 85°C (-40°F to 185°F)
- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Seal Above Panel: IP67 Dust & Water Ingress - to BS EN60529:1992+A2:2013
- Damp Heat – BS EN 60068-2-78:2002 Test Cab 21 days exposure @ +85°C 85%RH
- Salt Spray – BS EN 60068-2-11:1999 Test Ka 48 hours exposure @ +35°C with 5% NaCl
- Conducted Emissions: CISPR 25:2008 Ed. 3.0
- Radiated Emissions: CISPR 25:2008 Ed. 3.0, EN61000-6-4: 2011
- Radiated Immunity: ISO 11452-2: 2004 (150V/m), EN61000-6-2: 2005
- Conducted Immunity: ISO 11452-4: 2011
- Signal Cable Transients: EN 61000-6-2: 2005
- AC Magnetic Field Immunity: MIL-STD-461F
- Electrostatic Discharge: ISO 10605: 2008 inc A1: 2014 (8KV contact / 15KV air discharge) EN61000-4-2
- Random vibration according to ISO15003 level 1 in 3 axes 10...350Hz, Level 2, 8 hours/axis
- Bump - BS EN 60068-2-27:2009 40g 6ms half sine, 50 shock in each sense of each axis, total 300 shocks
- Freefall drop - BS EN 60068-2-31:2008 1000mm drop onto all faces and edges
- Shock - BS EN 60068-2-27:2009 50g 6ms half sine, 3 shocks in each sense of each axis, total 18 shocks

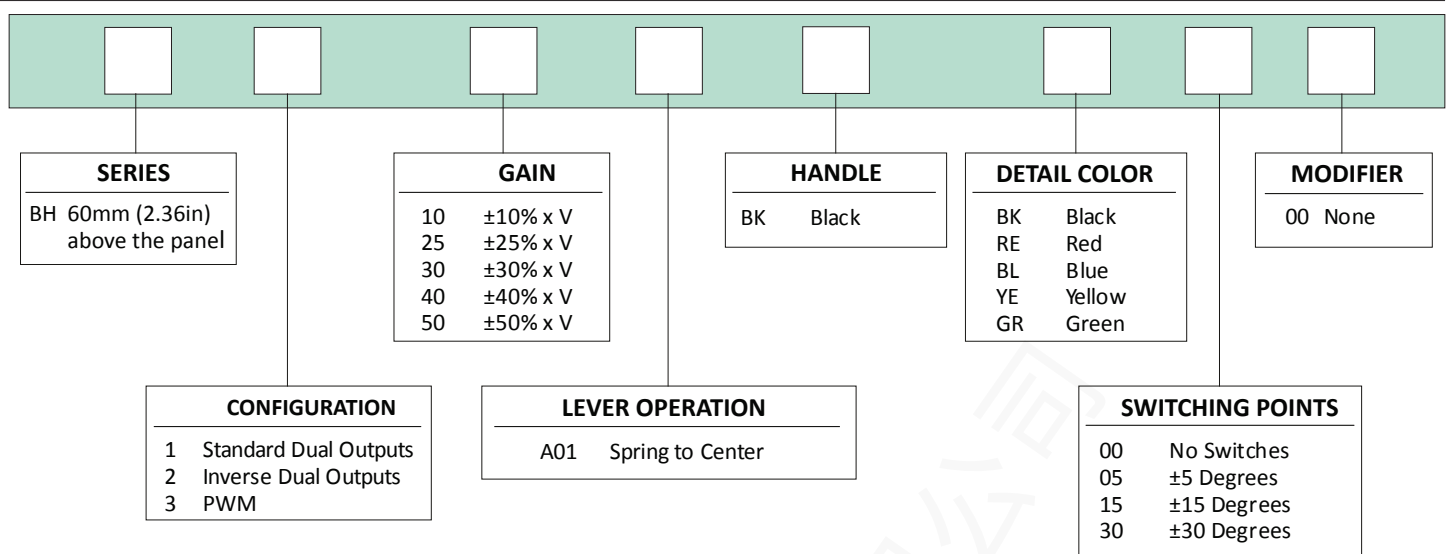


All parameters shown are based on a standard configuration and are provided for guidance only. Please contact APEM for assistance on how to achieve the best performance from your chosen configuration.

BH series

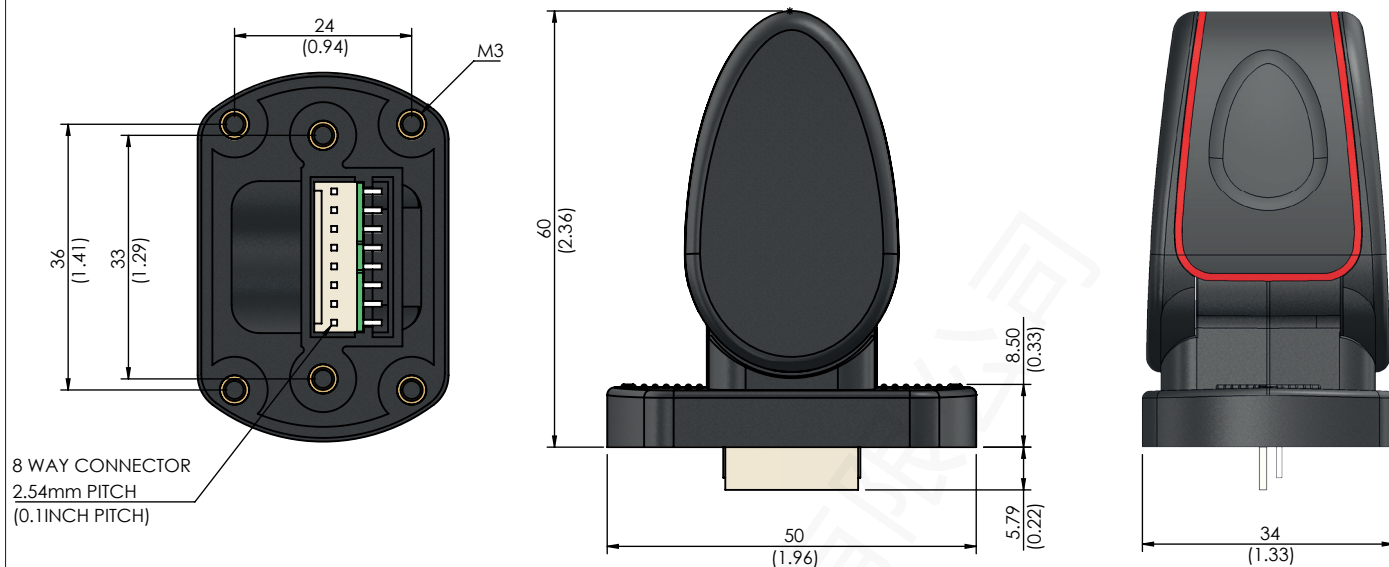
Paddle joystick controllers

Overview



Intentionally
left blank

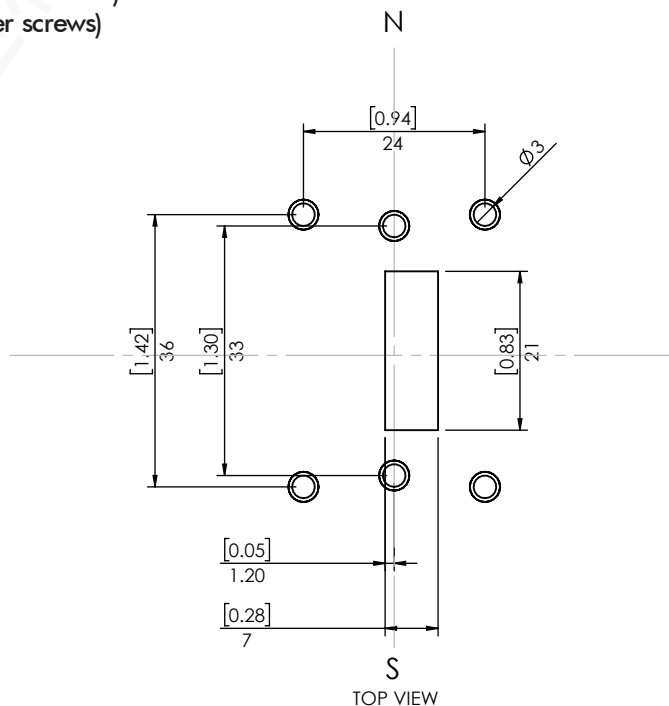
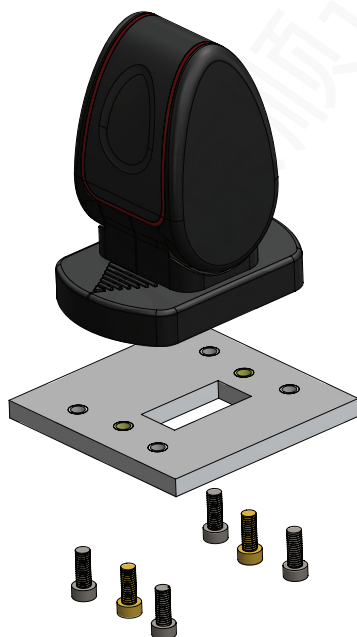
GENERAL DIMENSIONS



DROP IN MOUNTING - PANEL CUT-OUT & MOUNTING INSTALLATION

The Paddle may be mounted with two different hole patterns:

- Two screws – in line on the Y axis (shown as yellow screws)
- Four screws – one in each corner (shown as silver screws)



The Paddle is fitted with M3 bushes in all six positions, as standard.
Fasteners are not supplied as standard. The appropriate length of fastener is dependent on panel thickness.

NOTE: All dimensions in mm/(inch).

BH series

Paddle joystick controllers

Overview

MECHANISM

The brand new mechanism design has been developed for strength and long life while retaining a superb feel.

SPRING TO CENTER

The lever springs back to the center position when released.

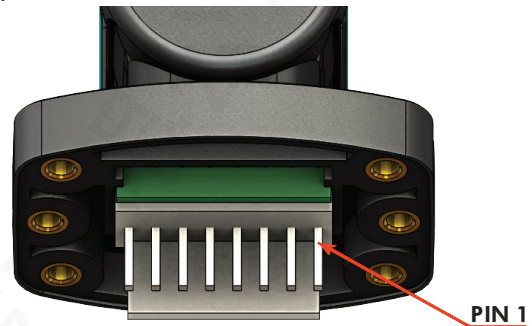
CONNECTIONS

The paddle is fitted, as standard, with an industry standard 2.54mm pitch 8 way connector.

CONNECTIONS

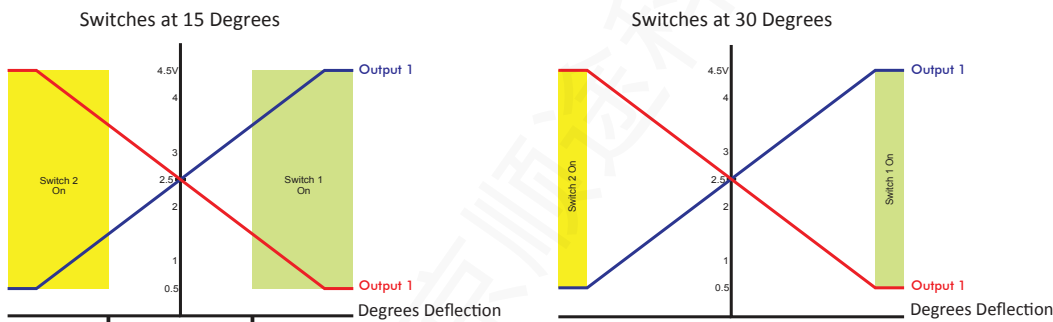
Paddles are supplied with an eight way connector as standard.

- PIN 1: 5V
- PIN 2: Switch 1(+)
- PIN 3: 0V
- PIN 4: Analog/PWM output 1
- PIN 5: Analog/PWM output 2
- PIN 6: 0V
- PIN 7: Switch 2 (-)
- PIN 8: 5V

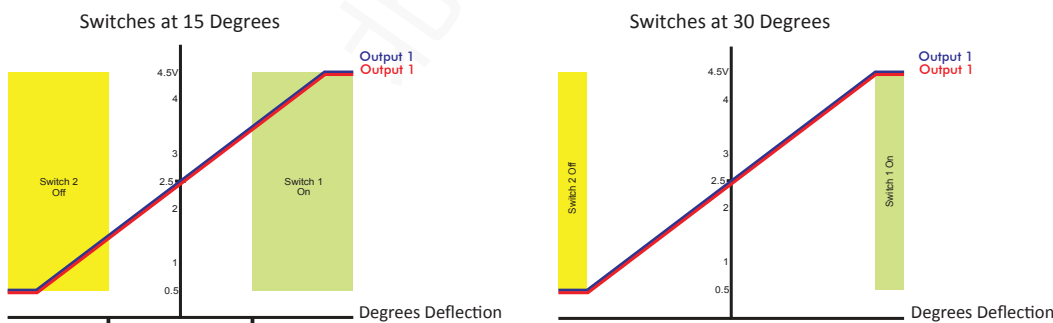


BH SERIES DUAL OUTPUT CHARACTERISTICS

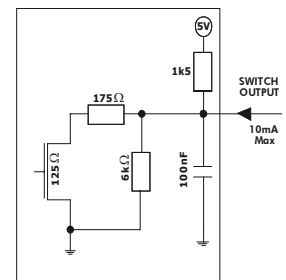
40% GAIN INVERSE



40% GAIN



Equivalent circuit for the switch output



Note: When Dual Output (non-inverted) option is selected the polarity of Switch 2 is inverted

OUTPUT OPTIONS

The BH series paddle joystick is configured as two “electrical” controls in one mechanical package. The Paddle operates from 5V and provides two proportional outputs. The second output is accurate to the first within $\pm 3\%$ of the power supply. The power supply for the secondary output is also completely independent. Customers may choose their preference of voltage outputs (gains).

The secondary output can be of the same or inverse polarity to the primary wiper. For example, with a secondary inverse output, the first and second outputs can be summed and compared to zero to verify that the joystick is operating correctly. Paddles having two identical outputs of the same polarity may be used to drive two identical dual redundant circuits.

There are also two Hall effect switches that trigger at pre-determined lever positions.

The BH series paddle joystick may be specified with a variety of PWM output options. For more details on available PWM options please refer to APEM.

ADDITIONAL OUTPUT INFORMATION

SELECTABLE SWITCHING POINTS

The Paddle incorporates two Hall effect switches. The angle of the lever at the switch trigger point can be selected when ordering. If no switches are specified then the output on pins 2 and 7 will be unused. The outputs are configured as ‘open drain’ type with a 1K5 pull up resistor to 5V.

GAIN OPTIONS

The voltage output on the wiper, at full scale deflection is determined by the gain. The gain is expressed as a percentage of the voltage supplied. Therefore (assuming a 5V supply) a Paddle specified with $\pm 25\%$ gain would yield 1.25V at South, 2.5V at center and 3.75V at North. A range of gain options are available as standard. All controls are supplied pre-set and no further calibration is needed throughout the lifetime of operation.

OUTPUT IMPEDANCE

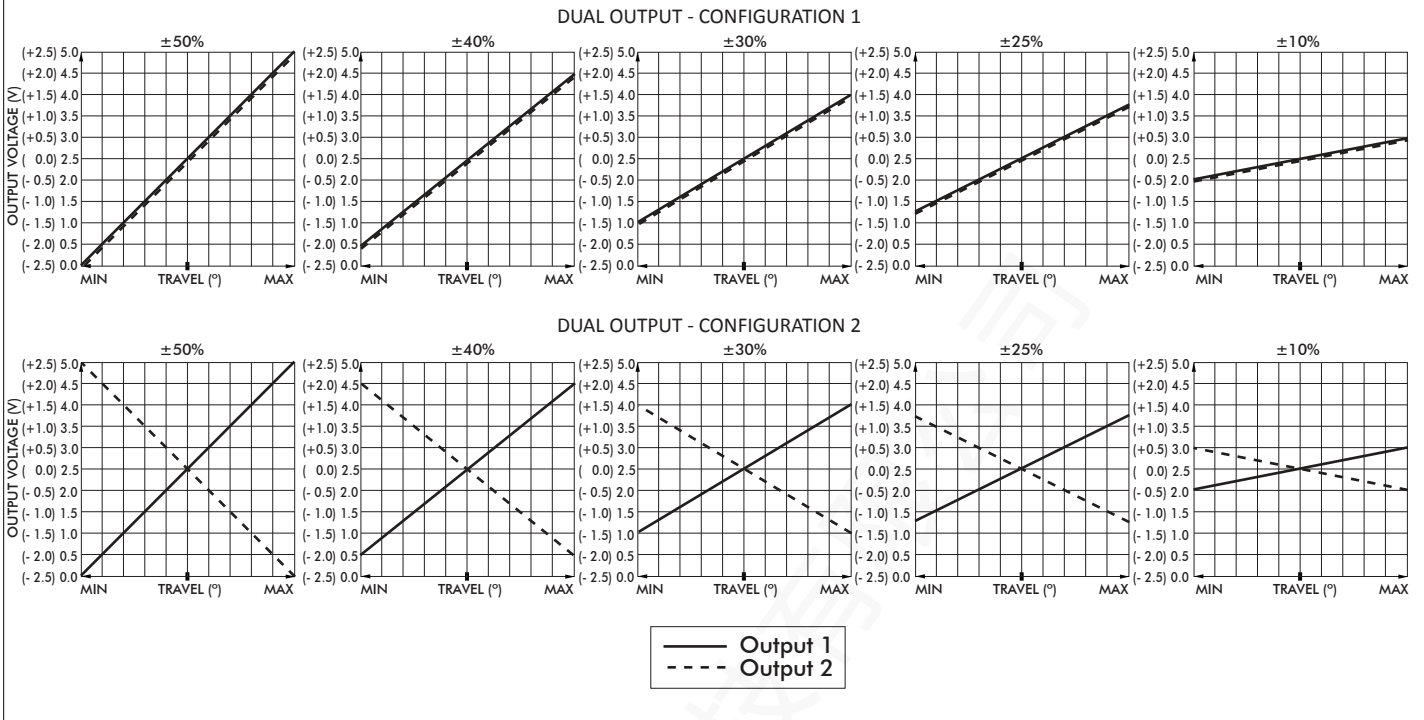
The voltage outputs at center and at each end of travel are specified across an infinite load, with no current flowing. The output impedance specified in the electrical specification should be taken into account when designing a system. Load resistance of less than 10K Ohms is not recommended.

BH series

Paddle joystick controllers

Overview

VOLTAGE OUTPUT OPTIONS



POWER SUPPLY

The BL is designed to be powered by a regulated $5V \pm 0.5V$ power supply. The outputs are ratiometric, making a stable, noise free, power supply essential. The power supply to the joystick should be carefully regulated to be within tolerance. Should the power supply change outside of the specified tolerances, permanent damage may occur.

MAGNETIC IMMUNITY AND SYSTEM DESIGN

The BH Series incorporates internal magnetic screening to minimize the effect of external magnetic fields. Mounting or operating the Paddle close to strong magnetic fields is not recommended. System designers should follow best practice when incorporating the BH Series Paddle into their products. Care should be taken to decouple the power supply properly and to employ adequate EMC shielding.

MOUNTING

When mounting the Paddle, care should be taken to site it in a position that does not make vulnerable to damage when in use. If the Paddle is intended for use in a handheld enclosure then care must be taken to protect the Paddle from damage caused by dropping. For long term reliability, basic precautions should be implemented, such as mounting it at the lightest end of the enclosure or by protecting it with a guard. The body of the Paddle, on the underside of the panel, must not be subject to water spray, excessive humidity or dust.



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



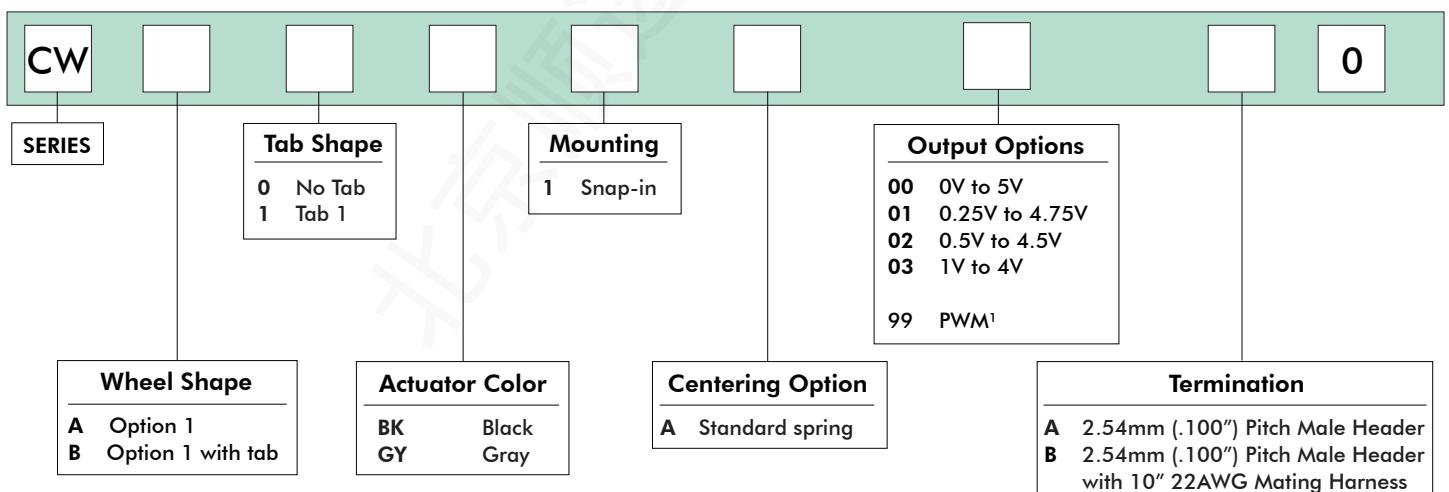
- Miniature design
- Ideal for joystick, armrest and panel mounting
- Proportional output
- Self-centering, single axis actuator
- Snap-in mounting

MECHANICAL
<ul style="list-style-type: none"> • Mechanical Angle of Movement: $\pm 45^\circ$ • Expected Life: 3 million cycles • Mass / weight: $18.25g \pm 5.0g$ ($0.64oz \pm 0.18oz$) • Lever Action (centering): Spring centering • Actuation Force: .151bf.

ENVIRONMENTAL
<ul style="list-style-type: none"> • Operating Temperature: $-40^\circ C$ to $+85^\circ C$ ($-40^\circ F$ to $+185^\circ F$) • Storage Temperature: $-40^\circ C$ to $+85^\circ C$ ($-40^\circ F$ to $+185^\circ F$) • EMC Immunity Level: EN61000-4-3 • EMC Emissions Level: EN61000-6-3:2001 • ESD: EN61000-4-2

ELECTRICAL
<ul style="list-style-type: none"> • Resolution: 1.22mV • Supply Voltage Range: $5.00V \pm 0.01V$ • Reverse Polarity Max: -10V • Overvoltage Max: 20V • Output Impedance: 2Ω • Return to Center Voltage Tolerance: $\pm 200mV$ initial

NOTES:
Exact specifications are subject to configuration.
All values are nominal.

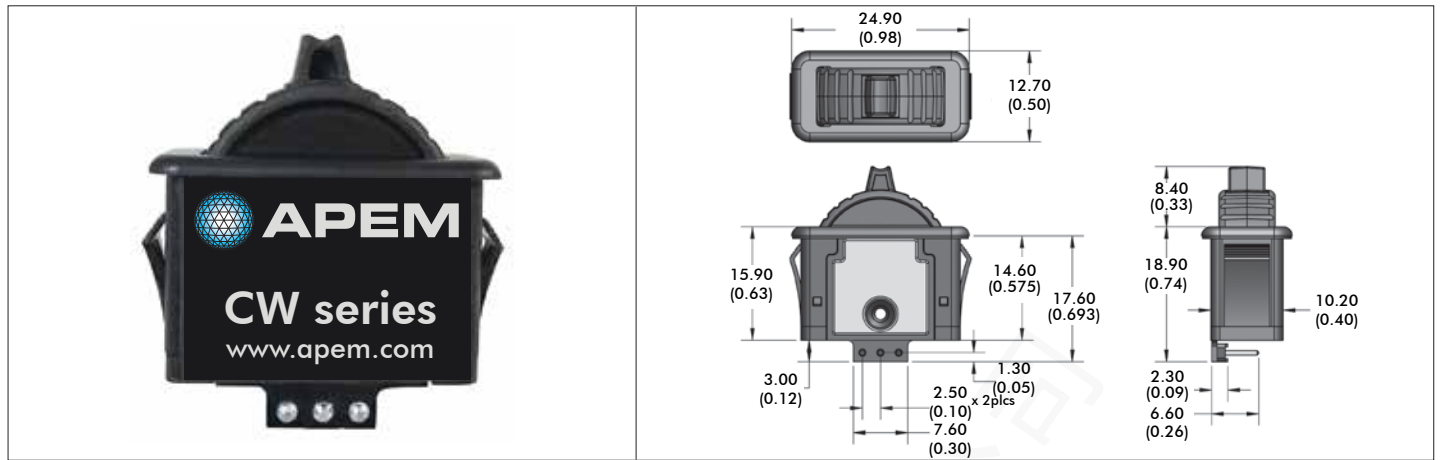


NOTE:
1 - Contact factory for PWM configuration.

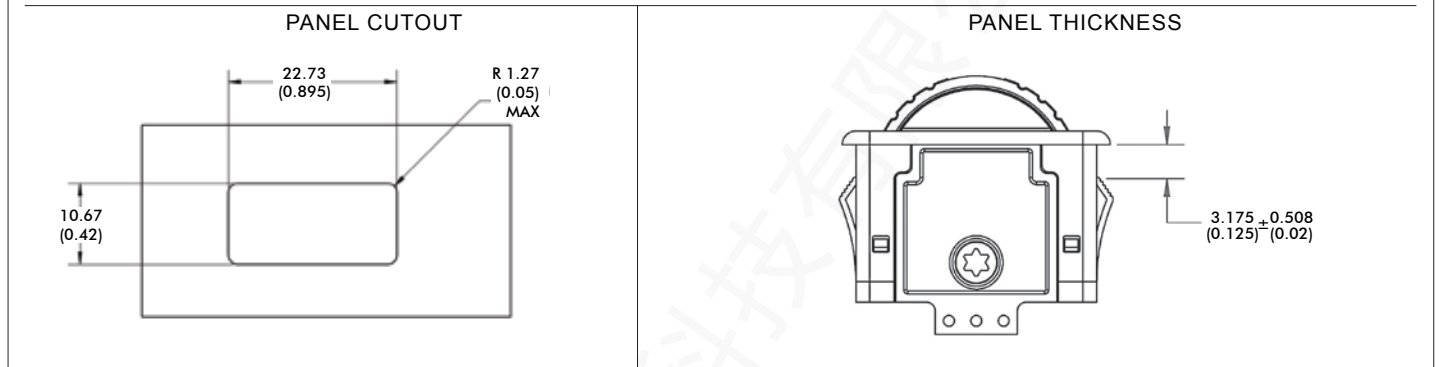
CW series

Proportional miniature control wheel

Overview

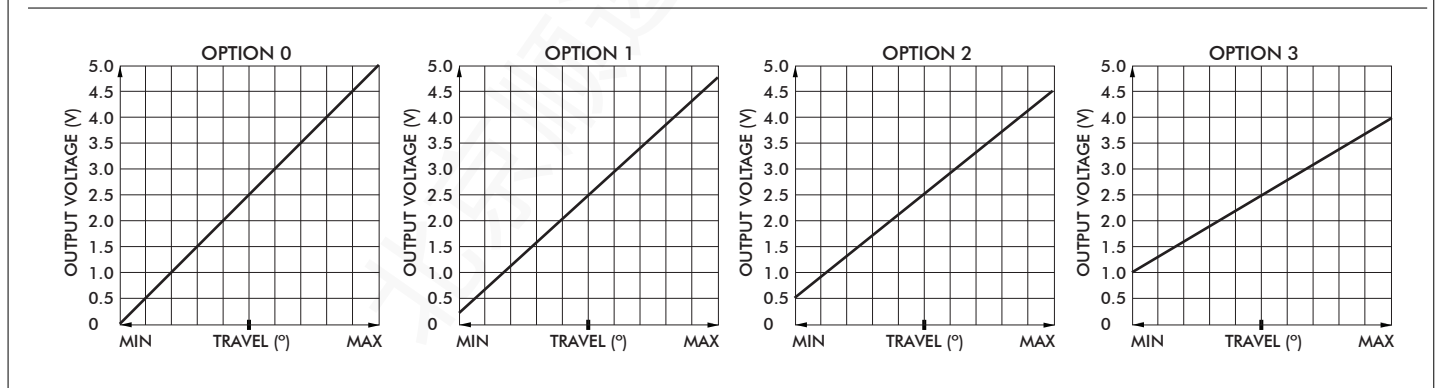


MOUNTING OPTIONS

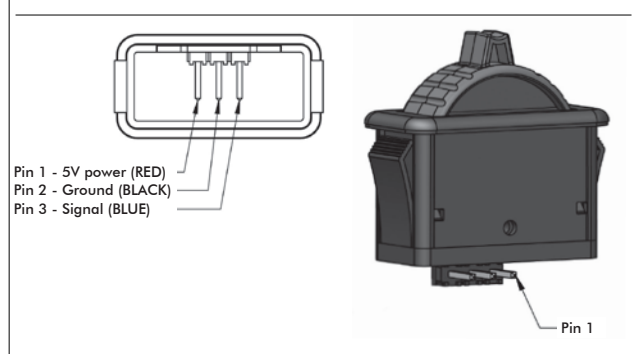


NOTE: Dimensions are in mm/(inch).

VOLTAGE OUTPUT OPTIONS



TERMINALS



OPTIONAL MATING HARNESS¹

- Wire type: 22AWG 25cm PTFE
- Connector: Molex 0050579503

WIRING SPECIFICATION

- Red: Power (5V)
- Black: Ground
- Blue: Signal

NOTES:

1. The CW Series is fitted with a three terminal SAMTEC (TLW-103-05-T-S) 2.54mm header. An optional 22AWG Mating Harness may be specified from the "Terminal" category of the Option Selection Guide.
- Images shown are for illustration purposes only.

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

HF series

Hall effect joysticks

Distinctive features and specifications



- Connectorized housing
- Voltage regulator, 24V supply option
- Shallow mounting depth <1.00"
- USB 1.1 HID interface option
- 1, 2 and 3 axis configurations

MECHANICAL (FOR X, Y AXIS)

- Break Out Force: 1.3N (0.3lbf)
- Operating Force: 2.8N (0.63lbf)
- Maximum Applied Force: 200N (45.00lbf)
- Mechanical Angle of Movement: 36° (18° from center)
- Expected Life: 5 million
- Material: Glass filled nylon
- Package Size: 5.75" x 4.50" x 3.25"
- Lever Action: Single spring, omnidirectional

ENVIRONMENTAL

- Operating Temperature: -40°C to 70°C (-40°F to 158°F)
- Storage Temperature: -40°C to 70°C (-40°F to 158°F)
- Sealing (IP): Up to IP68*
- EMC Immunity Level (V/M): EN61000-4-3
- EMC Emissions Level: EN61000-6-3:2001
- ESD: EN61000-4-2

MECHANICAL (FOR Z AXIS)

- Break Out Torque: 0.09N·m (0.80lbf-in)
- Operating Torque: 0.121N·m(1.07lbf-in)
- Maximum Allowable Torque: 2.50N·m(22.13lbf-in)
- Hand Mechanical Angle: 60° (30° from center)
- Handle Action: Spring centering, rotational
- Expected Life: 5 million

ELECTRICAL

- Sensor: Hall effect
- Resolution: 1.22mV
- Supply Voltage Operating: 5VDC±0.01VDC
- Reverse Polarity Max: -10VDC
- Overvoltage Max: 20VDC
- Output Voltage: See options
- Output Impedance: 2Ω
- Return to Center Voltage (No Load): ±200mV
- Error signal: 1.0%

NOTES:

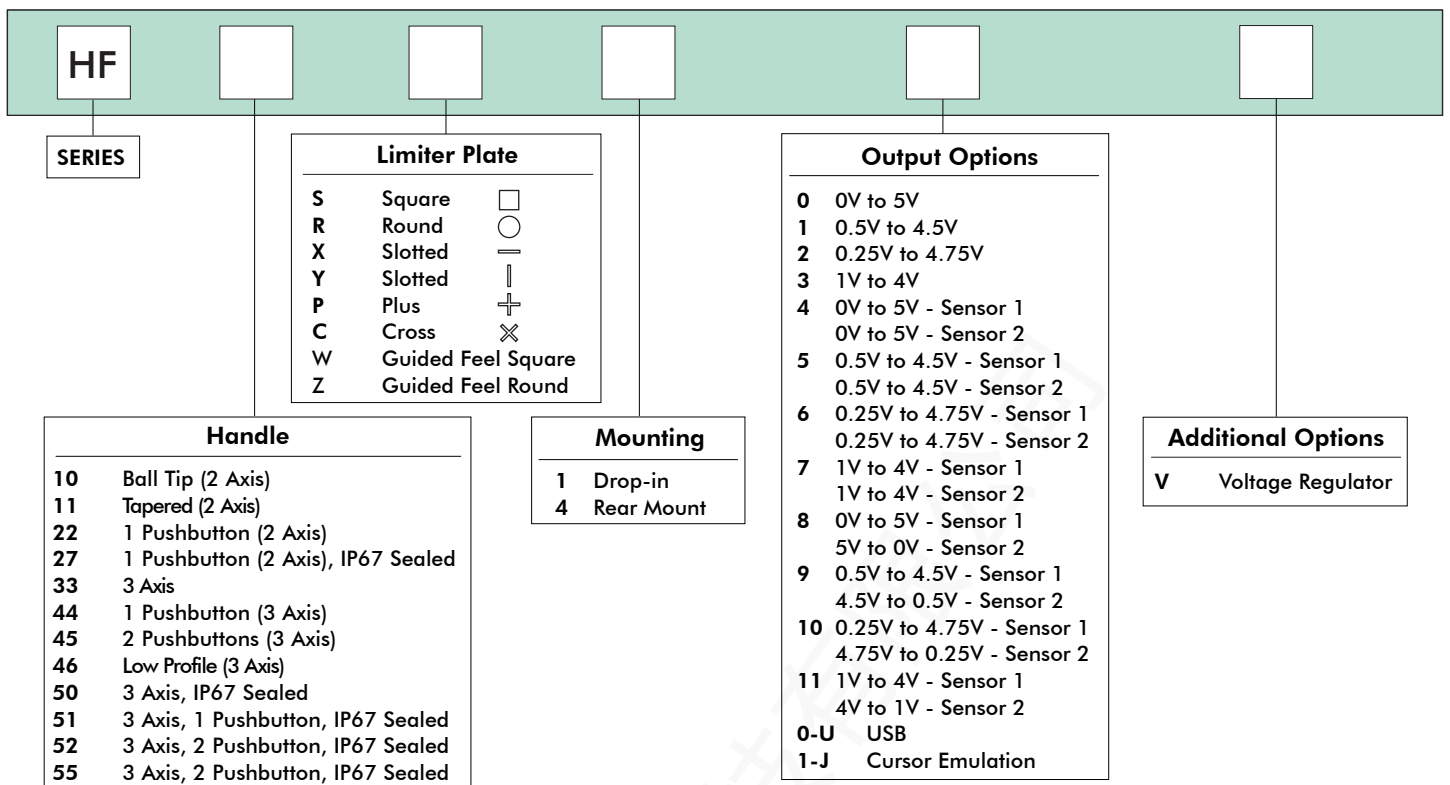
- All values are nominal.
- Exact specifications may be subject to configuration. Contact Technical Support for the performance of your specific configuration.
- * Excludes some handle options.



HF series

Hall effect joysticks

Overview



NOTES

- The HF Series joysticks are supplied with a Hirose DF11-12DP-2DS9(24) connector (male receptacle). (Fig 1)
Cable not included. Please request at order entry. Cable connector (female socket) is Hirose DF11-12DS-2C. (Fig 2)
Connector specifications: 12 position 2mm pitch dual row (2x6) pin header.

Wire Color	Description
Black	Ground
Red	Power
Blue/White	X-Axis (Dual Output)
Blue	X-Axis
Yellow/Black	Y-Axis (Dual Output)
Yellow	Y-Axis
Green/Black	Z-Axis (Dual Output)
Green	Z-Axis
Orange	Button 1
White	Button Common
Violet	Button 2




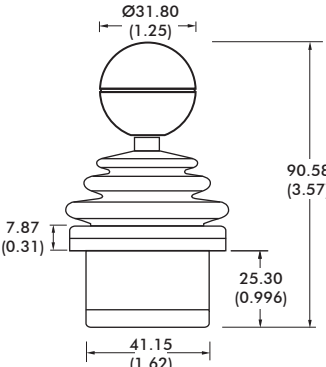
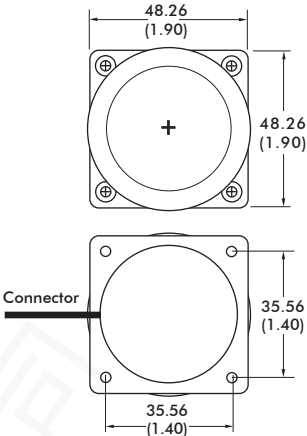

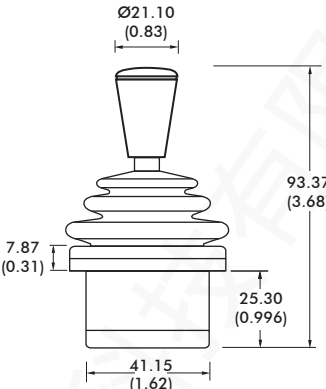
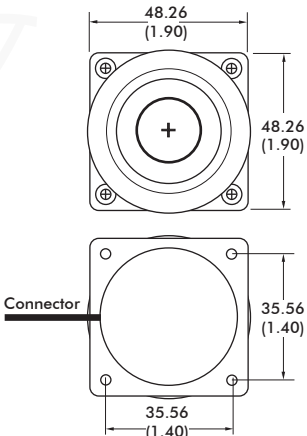

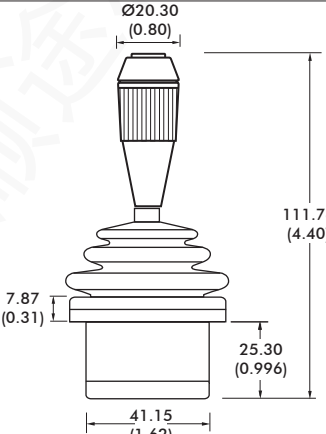
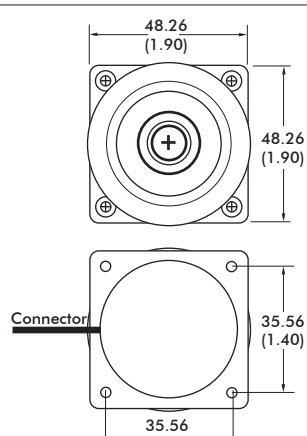

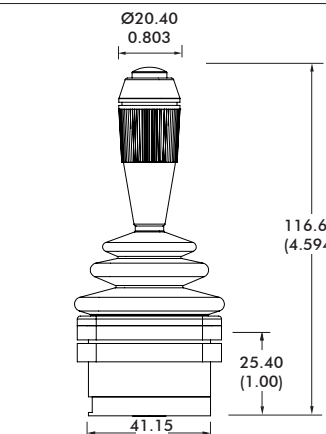
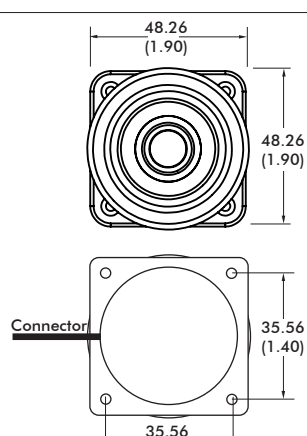
Up to IP68 available.



Mounting accessories. Standard hardware includes: gasket, clamping ring, and four #4-40x3/4 Phil Ph MS SS screws.



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


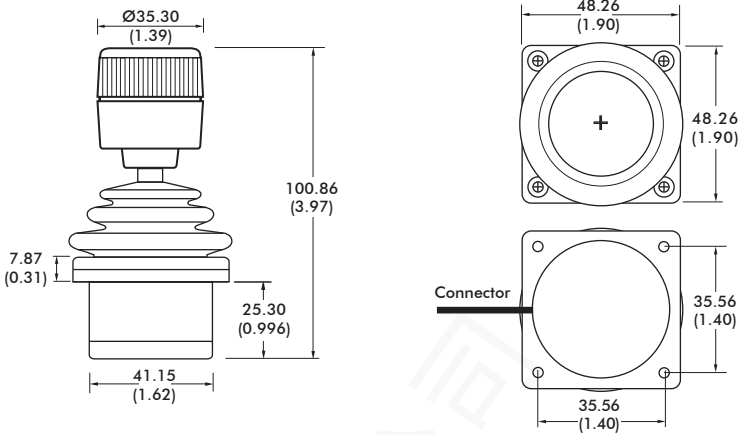

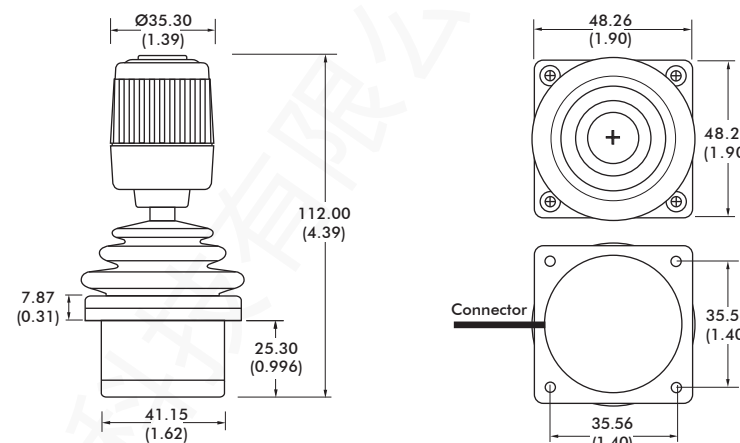

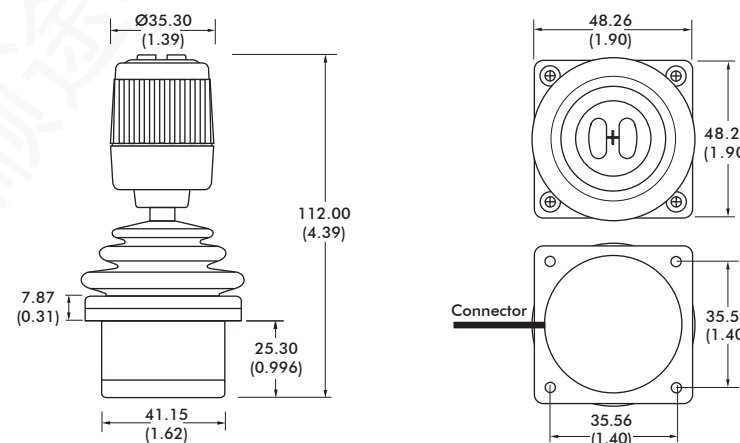

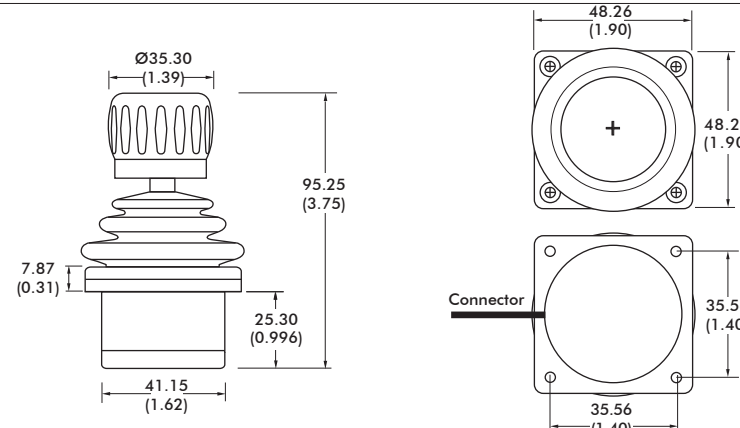
<p>10</p> 	 <p> $\varnothing 31.80$ (1.25) 90.58 (3.57) 7.87 (0.31) 25.30 (0.996) 41.15 (1.62) </p>	 <p> 48.26 (1.90) 48.26 (1.90) Connector 35.56 (1.40) 35.56 (1.40) </p>
<p>11</p> 	 <p> $\varnothing 21.10$ (0.83) 93.37 (3.68) 7.87 (0.31) 25.30 (0.996) 41.15 (1.62) </p>	 <p> 48.26 (1.90) 48.26 (1.90) Connector 35.56 (1.40) 35.56 (1.40) </p>
<p>22</p> 	 <p> $\varnothing 20.30$ (0.80) 111.76 (4.40) 7.87 (0.31) 25.30 (0.996) 41.15 (1.62) </p>	 <p> 48.26 (1.90) 48.26 (1.90) Connector 35.56 (1.40) 35.56 (1.40) </p>
<p>27</p> 	 <p> $\varnothing 20.40$ 0.803 116.69 (4.594) 25.40 (1.00) 41.15 (1.62) </p>	 <p> 48.26 (1.90) 48.26 (1.90) Connector 35.56 (1.40) 35.56 (1.40) </p>

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

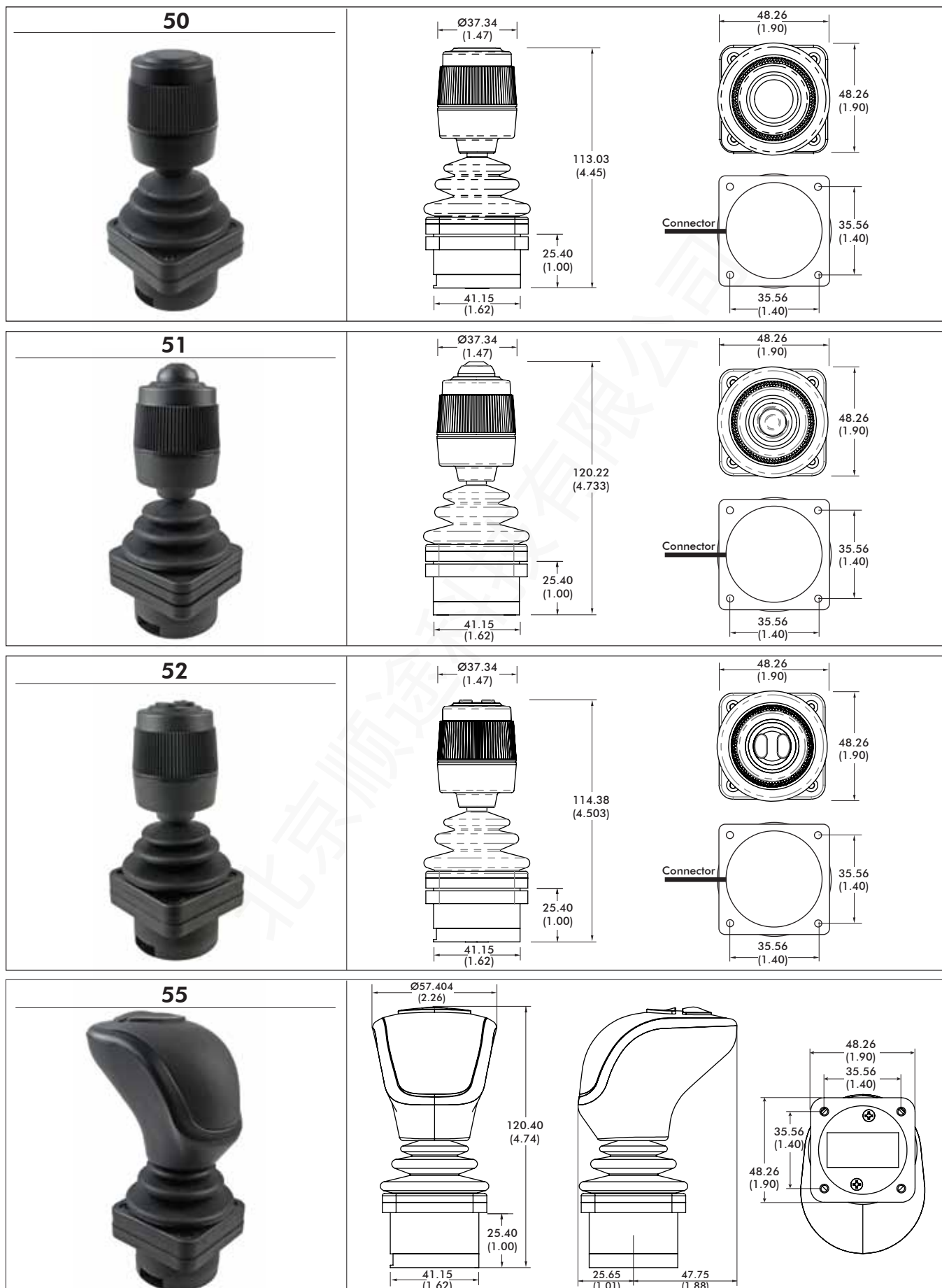
HF series

Hall effect joysticks

Overview

<p style="text-align: center;">33</p> 	
<p style="text-align: center;">44</p> 	
<p style="text-align: center;">45</p> 	
<p style="text-align: center;">46</p> 	

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



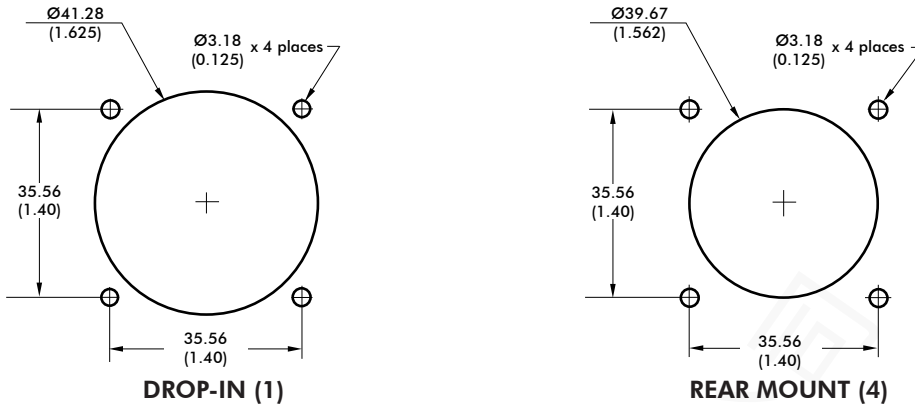
Note: The company reserves the right to change specifications without notice.

HF series

Hall effect joysticks

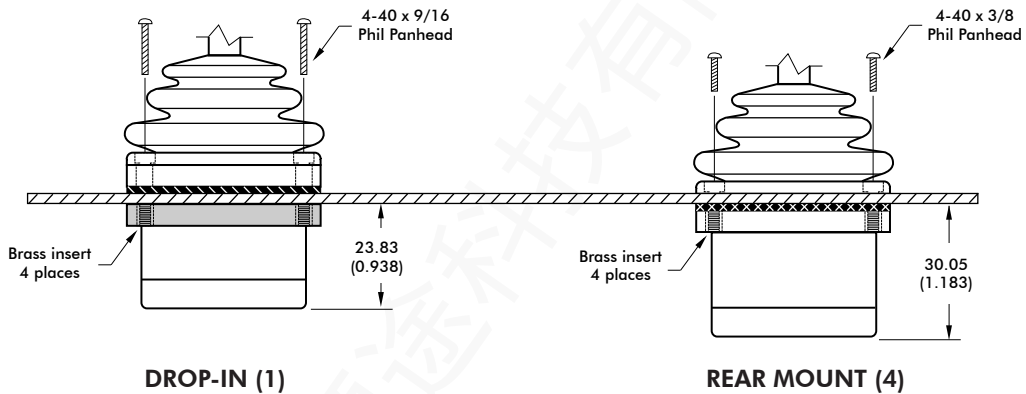
Overview

PANEL CUT-OUT DIMENSIONS

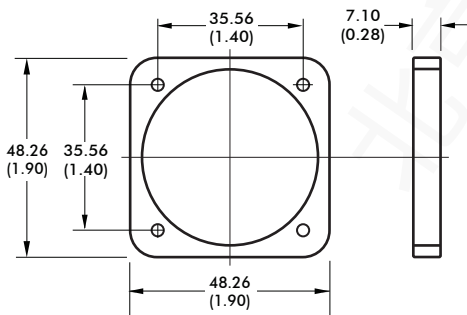


* Not available for Option 11 and 55 Handles

MOUNTING OPTIONS



CLAMPING RING



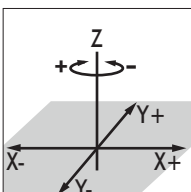
NOTES:

- For DROP-IN mounting, the panel thickness can be 1.17mm to 3.17mm (0.046in to 0.125in).
- For REAR MOUNT the maximum panel thickness is 1.6mm (0.063in).
- A panel thickness of 1/16" (1.6mm/0.063in) was considered for all the below-panel depth values.
- The below-panel depth is extended by 7.11 mm (0.28in) with the USB, Cursor Emulation, Voltage Regulator options.

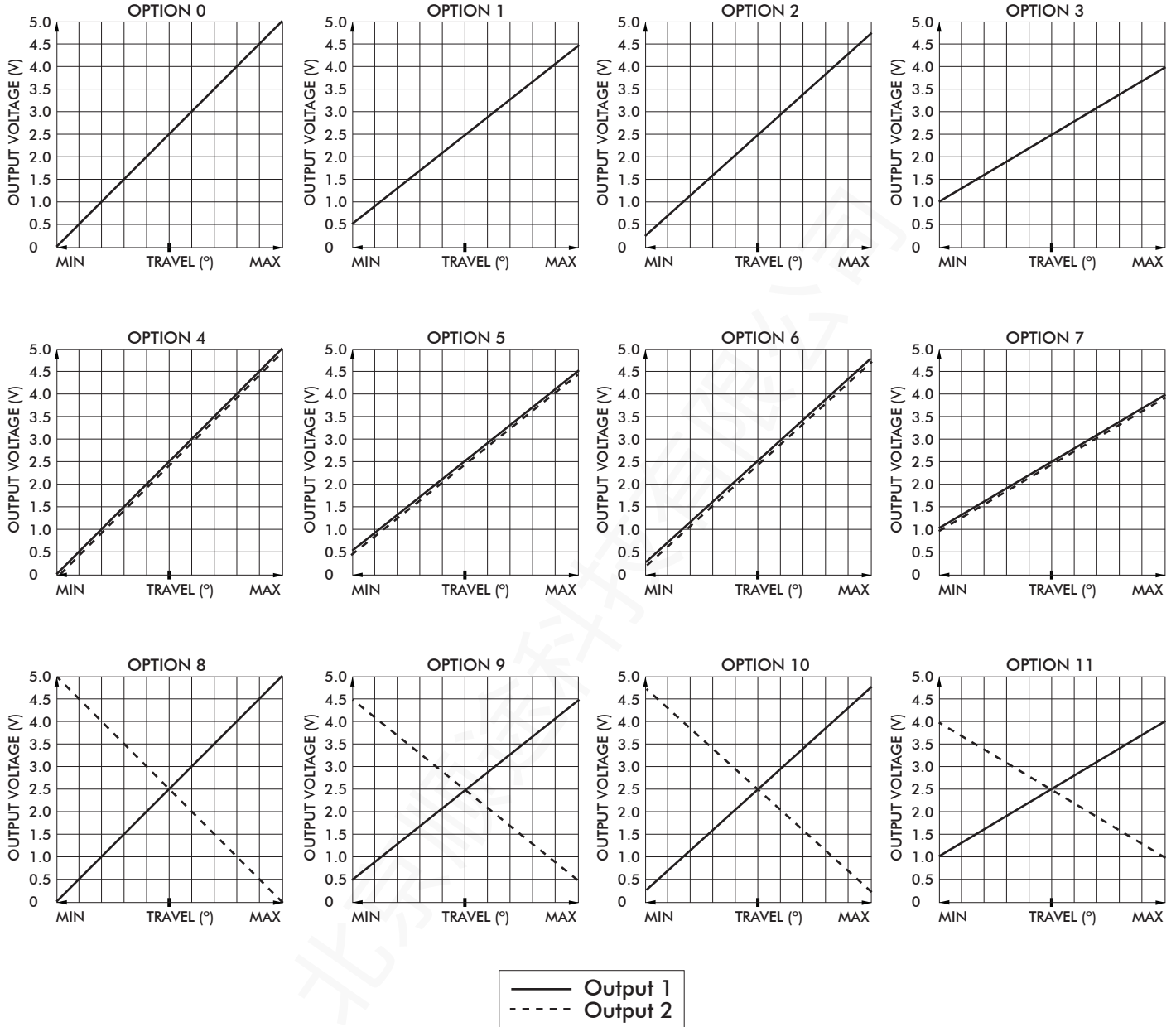
- Panel
- Gasket
- Rear Mount Gasket

NOTES:

1. Dimensions are in mm/(inch).
2. Axis orientation:



VOLTAGE OUTPUT OPTIONS



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

HF series

Hall effect joysticks

Overview

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 and Linux. 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
- Standard Male Type A Connector

SUPPLIED WIRING

USB: USB Male Type A Connector with 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 marine 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 to mini B

I/O COMPLEMENT/ USER SPECIFIED PARAMETERS:

- USB 2 pushbuttons 2 or 3 axes (X, Y, and Z "scroll")

ADDITIONAL OUTPUT OPTIONS

VOLTAGE REGULATOR

The Voltage Regulator option may be used when the voltage is greater than 5V or when bipolar output is required.

User Specified Output Voltage:

- 0-5VDC
- ±10VDC

ELECTRICAL SPECIFICATIONS

- Supply Voltage: (Output Voltage + 1V) to 35V
- Supply Current: 90mA max

WIRING SPECIFICATION

- Red wire: Supply (+35V max.)
- Black wire: Ground
- Blue wire: X axis output
- Yellow wire: Y axis output
- Green wire: Z axis output
- White wire: Pushbutton common wire
- Orange, violet, grey, brown, pink, bl/wt/y/bk, gn/bk, gy/w wire: Pushbutton outputs

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

HG series

Hand grip Hall effect joysticks

Distinctive features and specifications



- Rugged, hand operation
- Hall effect sensing
- Sealed up to IP68
- 10 million life cycles
- Redundant outputs available
- Analog, USB and custom outputs
- CANbus J1939 and CANopen options available

MECHANICAL (FOR X AND Y AXIS)

- Break Out Force: 7.7N (1.70lbf)
- Operating Force: 14.0N (3.10lbf)
- Maximum Applied Force: 1000.0N (225.00lbf)
- Mechanical Angle of Movement: 38°
- Expected Life: 10 million cycles
- Lever Action (Centering): Spring centering
- Material: Glass reinforced nylon

ELECTRICAL

- Sensor: Hall effect
- Supply Voltage Operating: 5.00VDC
- Reverse Polarity Max: -14.5VDC
- Overvoltage Max: 18VDC
- Output Impedance: 6Ω
- Current Consumption Max: 10mA max per axis
- Return to Center Voltage (No Load): ±200mV

MECHANICAL (FOR Z AXIS)

- Break Out Torque: 0.6N·m (5.31lbf-in)
- Operating Torque: 1.1N·m (9.74lbf-in)
- Maximum Allowable Torque: 24.5N·m (216.84lbf-in)
- Hand Mechanical Angle: 42°
- Expected Life: 10 million cycles

STANDARD SWITCH CHARACTERISTICS/RATINGS

- Electrical Resistive Load: 5A (depending on the chosen switch)
- Electrical Inductive Load: 3A (depending on the chosen switch)
- Low Level: 10mA @ 30mV (depending on the chosen switch)
- Electrical Life: 1 million cycles 5A @ 28 VDC resistive snap-action (depending on the chosen switch)
- Mechanical Life: 1million cycles
- Environmental Seal: IP67
- Action: Momentary, snap-action
- Operating Force: 7.5N±2.0N (1.69lbf±0.45lbf)
- Total Travel: 0.080 inches max

ENVIRONMENTAL¹

- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Storage Temperature: -40°C to 70°C (-40°F to 158°F)
- Sealing: To IP65²
- EMC Immunity Level (V/M): IEC 61000-4-8:2009
- EMC Emissions Level: IEC 61000-4-3:2006
- ESD: IEC 61000-4-2:2008

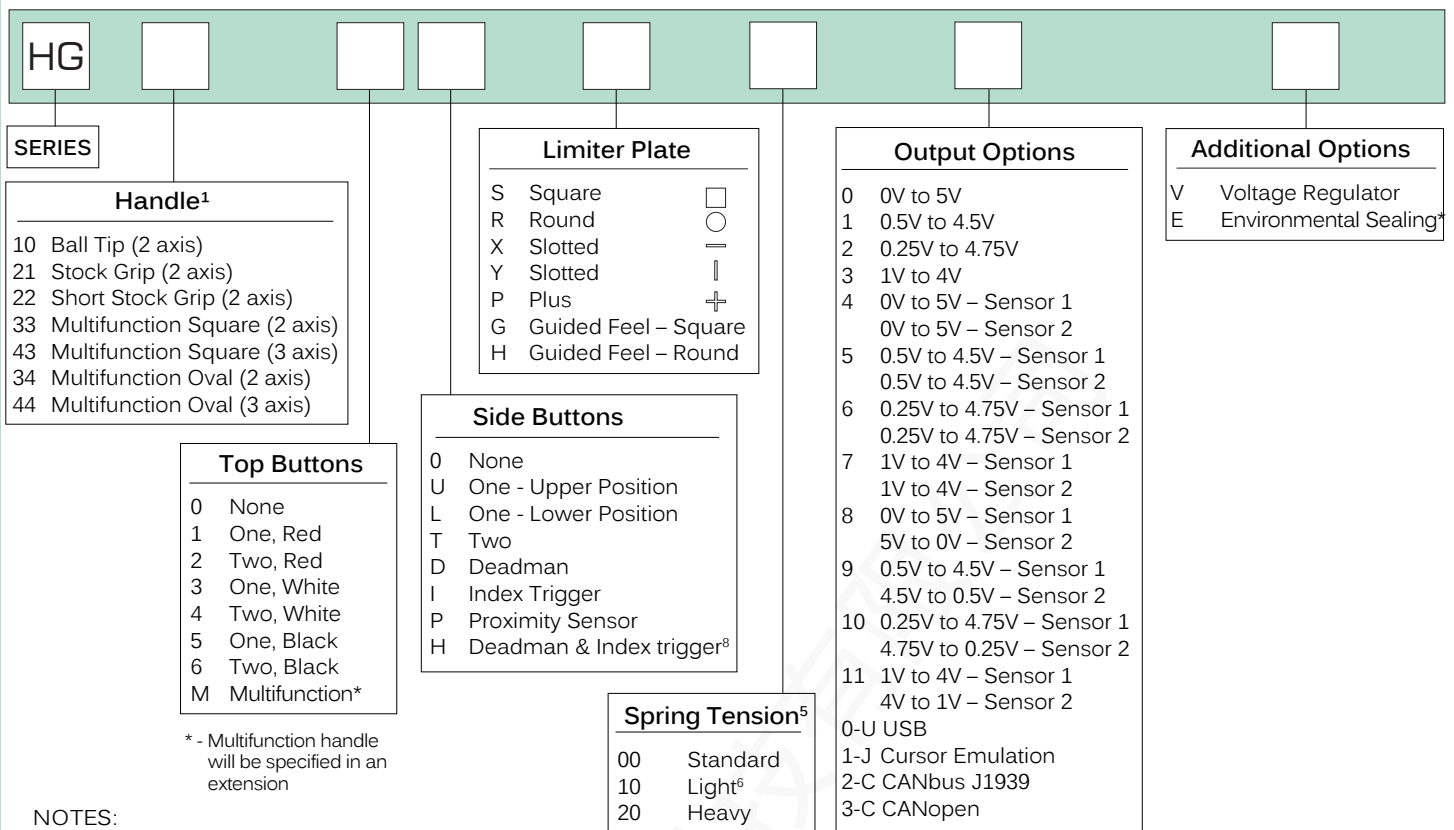
NOTES:

- All values are nominal.
- Exact specifications may be subject to configuration.
- Contact Technical Support for the performance of your specific configuration.
- 1 Environmental specifications are for joysticks configured with analog output voltage. Specifications may vary for other outputs.
- 2 Excludes some handle options.

HG series

Hand grip Hall effect joysticks

Overview



NOTES:

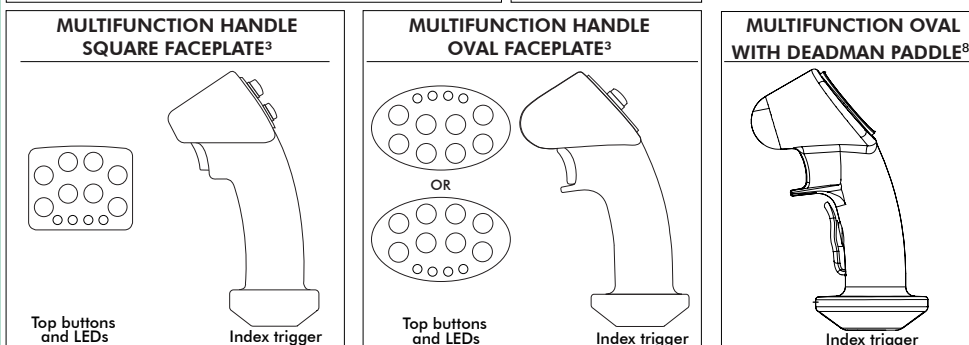
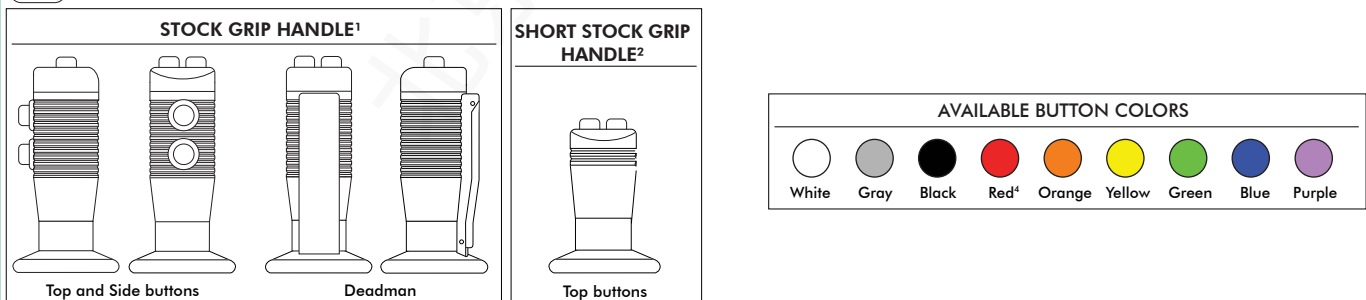
1. Refer to previous page for information on standard configurations for joysticks with Stock Grip, Short Stock Grip, and Multifunction handles.
2. Multifunction Oval may be configured with an index trigger and/or deadman paddle.
3. Multifunction handle orders should be accompanied by drawing of button/component placement.
4. Multifunction handle requires Drop-in mounting.
5. X/Y axis spring tension. Contact Technical Support for information on best possible spring for your chosen configuration.
6. Not recommended for use with multifunction handles.
7. CANbus, USB and Voltage Regulator are mutually exclusive.
8. Multifunction Oval only.



*Environmental sealing level available up to IP68. Dependent upon handle configuration.



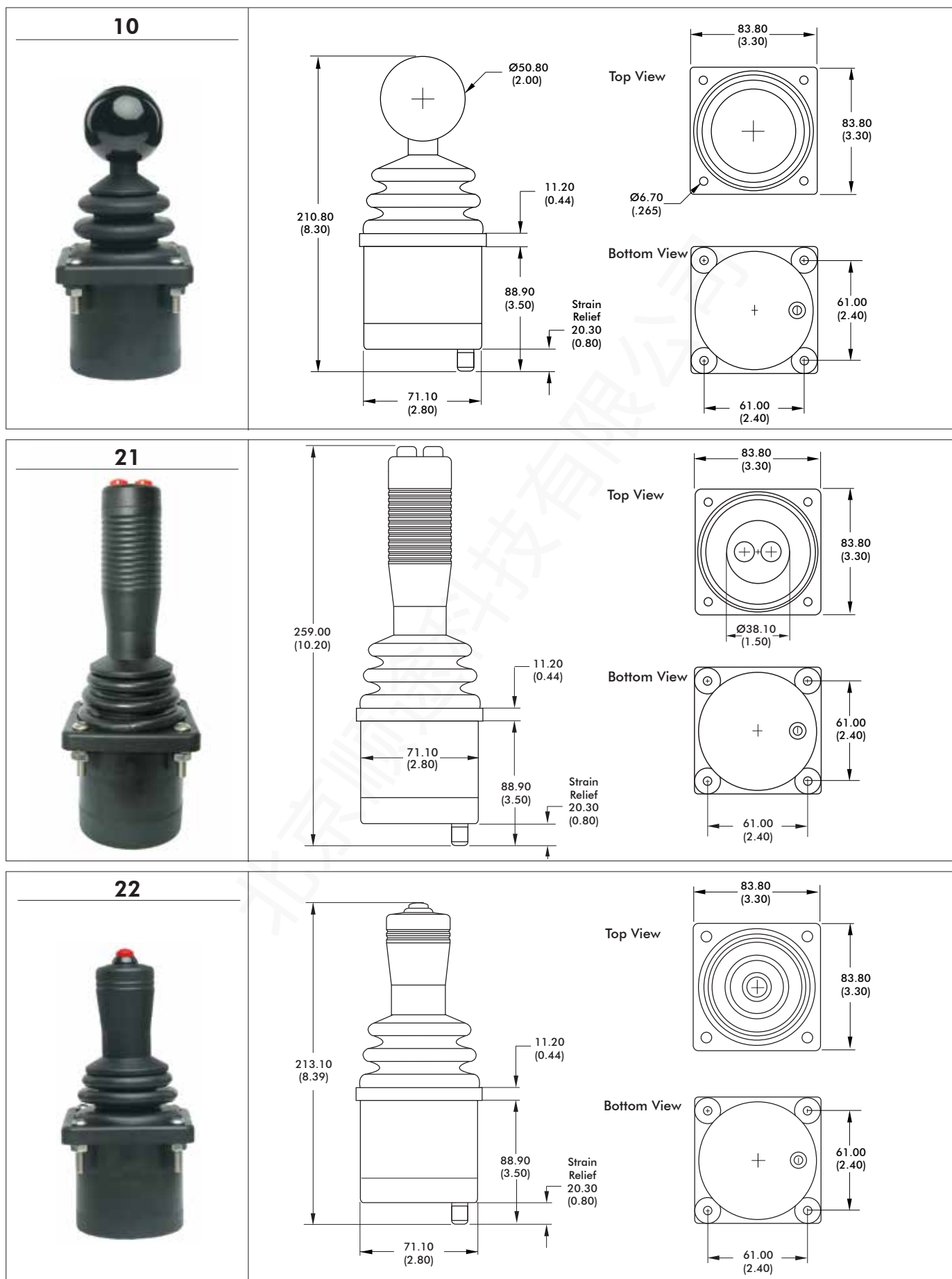
Mounting accessories. Standard hardware includes: 1 gasket, 4 nuts (1/4-20), 4 washers (1/4), 4 hex head screws (1/4-20x1 1/4).



NOTES:

1. The maximum possible configuration for the Stock Grip handle is up to 2 Top Buttons and 2 Side Buttons. A handle with a Deadman can have 2 Top Buttons, but no Side Buttons.
2. The maximum possible configuration for the Short Stock Grip handle is up to 2 Top Buttons.
3. For non-standard configurations contact Technical Support. We can customize the faceplate according to your exact needs.
4. If unspecified, the pushbuttons will have snap action momentary switches with red button caps.
5. Starting from the strain relief, the cable is 406mm (16in) long.

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

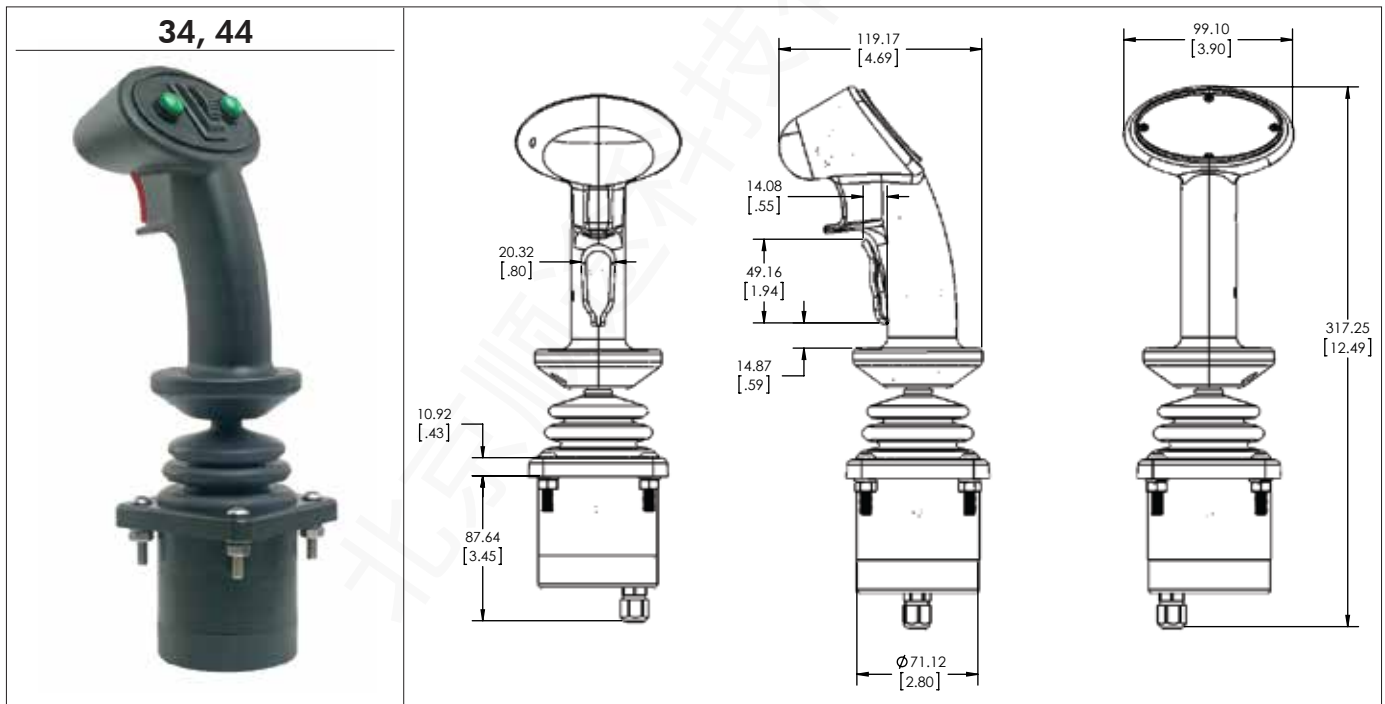
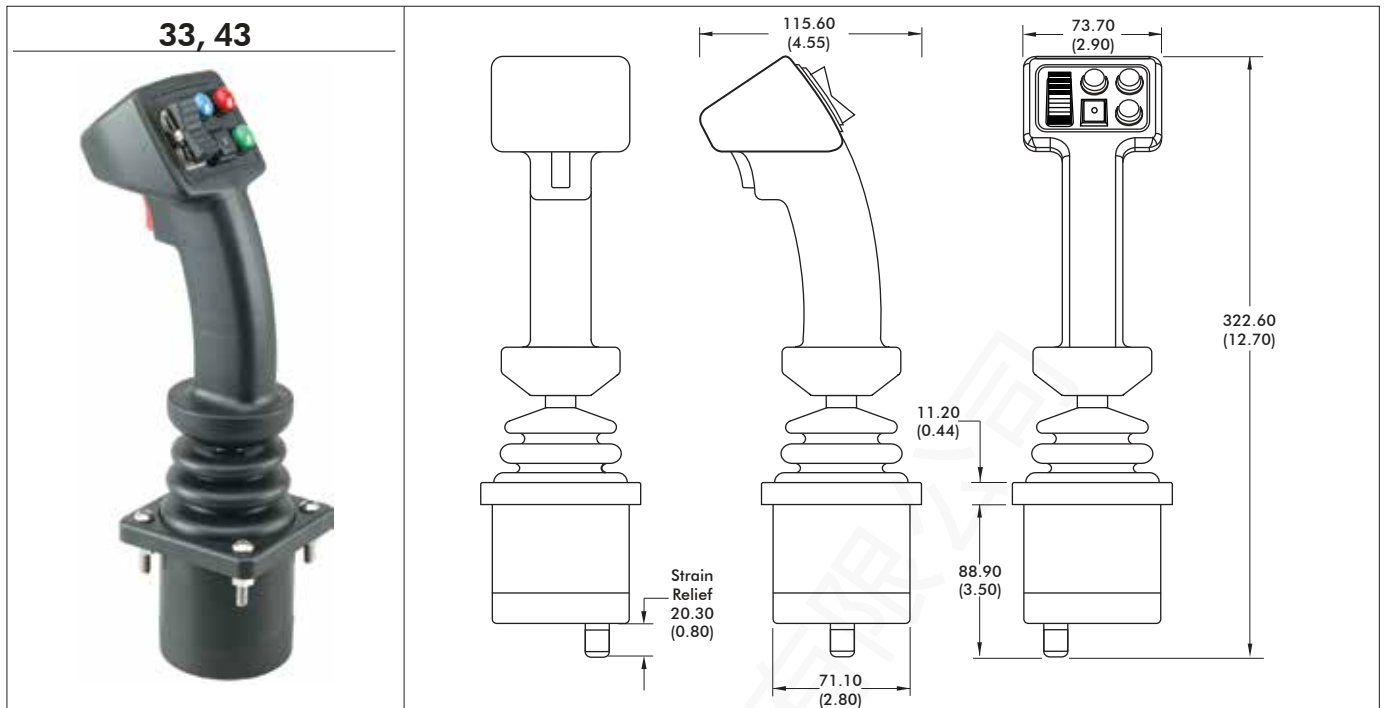


Note: The company reserves the right to change specifications without notice.

HG series

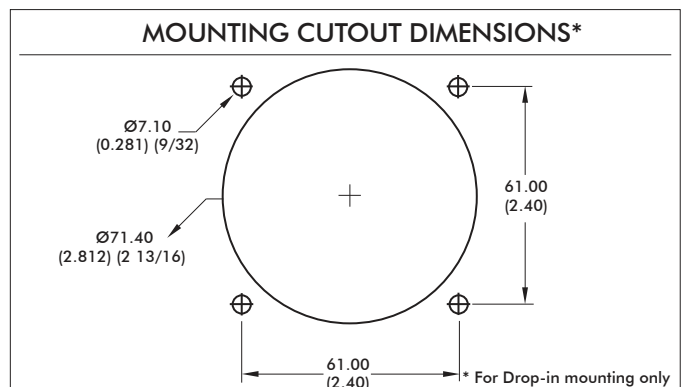
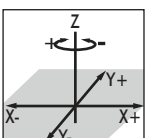
Hand grip Hall effect joysticks

Overview

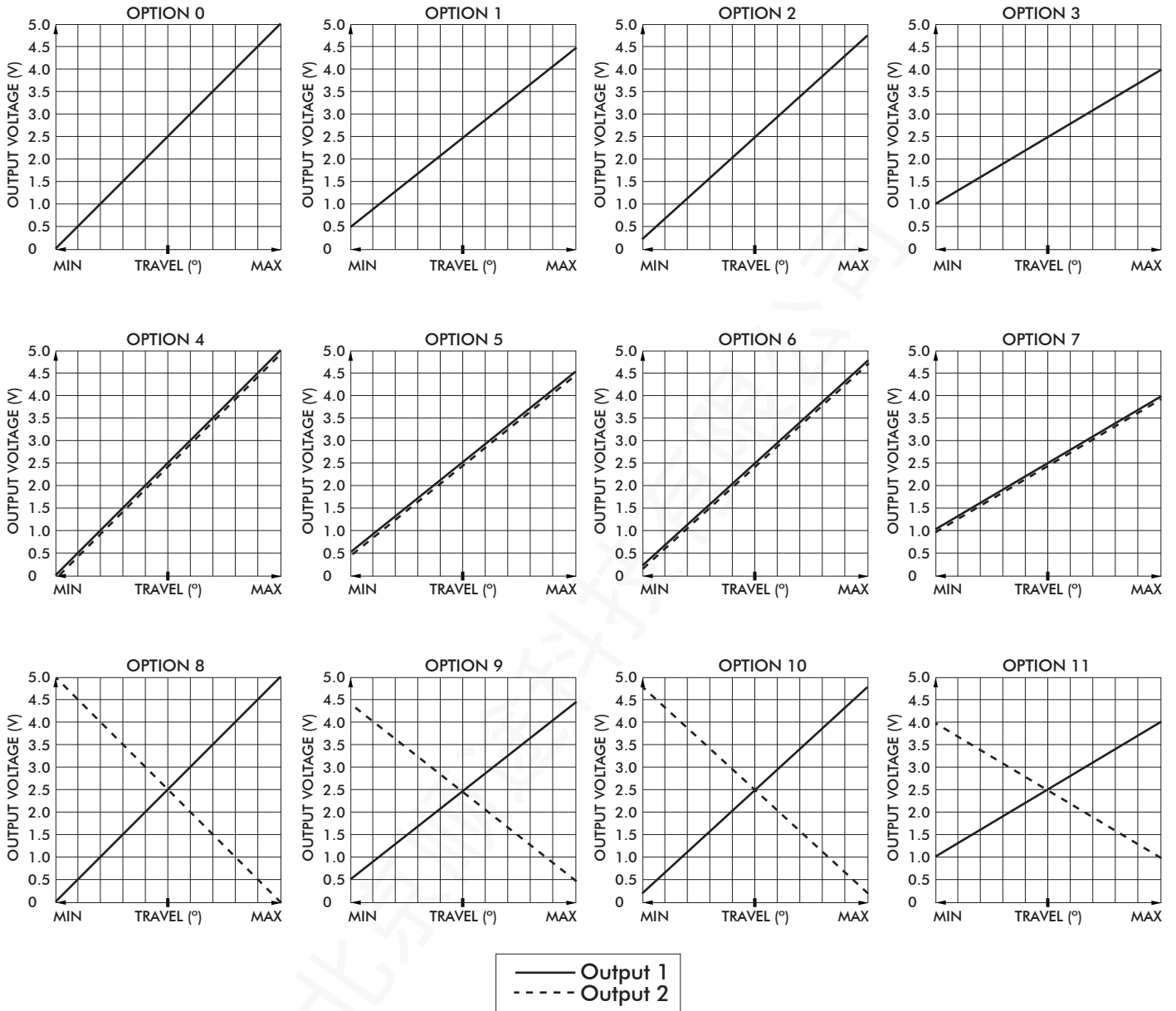


NOTES:

1. Dimensions are in mm/(inch).
2. Actual strain relief position may vary.
3. For below panel lower profile housings, the strain relief [20.30/(0.80)] can be replaced with a rubber grommet [1.27/(0.05)], and the standard housing cap [18.54/(0.73)] can be replaced with a short cap [11.94/(0.47)]. These options are available only for joysticks without additional boards, except USB.
4. Axis orientation:



VOLTAGE OUTPUT OPTIONS



HG series

Hand grip Hall effect joysticks

Overview

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 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 ship-board 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



CANBUS

CANbus J1939

APEM's HG CANbus joysticks conform to the SAE J1939 serial bus specification used for communications between electronic control units and vehicle components. The HG CANbus option provides I/O extension for up to 24 digital and 11 analog inputs.

ELECTRICAL SPECIFICATIONS

- Supply Voltage: 6VDC to 35 VDC
- Supply Current: 15mA min, +5mA per LED, +10mA per axis

WIRING SPECIFICATION

- Red Wire: Supply Power
- Black Wire: Ground
- Green Wire: CAN high data
- White Wire: CAN low data
- Blue Wire: Identifier Select LSB
- Orange Wire: Identifier Select MSB

ENVIRONMENTAL

- Operating temperature: -25°C to +70°C (-13°F to +158°F)
- Storage temperature: -40°C to +70°C (-40°F to +158°F)

CONNECTOR OPTIONS:

- Cable assembly with Deutsch DT04 style plugs

CANbus CONFIGURATION:

- Contact Technical Support for assistance

CANopen

- Contact Technical Support for assistance with CANopen configuration.

HG series

Hand grip Hall effect joysticks

Overview

ADDITIONAL OUTPUT OPTIONS

VOLTAGE REGULATOR

The Voltage Regulator is a multi-wired analog option used to mate to a variety of industrial control voltages. The Voltage Regulator may be used when the supply or output voltage is greater than 5V or when bipolar output is required.

User Specified Output Voltage:

- 0-5VDC
- 0-10VDC
- ±5VDC
- ±10VDC

ELECTRICAL SPECIFICATIONS

- Supply Voltage: (Output Voltage + 1VDC) to 30VDC
- Supply Current: 90mA max

北京顺途科技有限公司

NEW!

HR series

Proportional output thumbwheels - friction hold

Distinctive features and specifications



- Friction hold - 2 versions:
11 detents along the travel or 1 detent at center
- Sealed to IP68
- Backlighting option
- EMI/RFI shielding
- Patented solution

ENVIRONMENTAL SPECIFICATIONS

- Electronics sealed to IP68 according to IEC 60529
- Shock resistance : 50 g during 11ms (version with 11 detents)
- Salt spray : IEC 512-6, test 11f
- Operating temperature : -30°C to +70°C
- Storage temperature : -40°C to +85°C
- EMI/RFI shielding : IEC 61000-4-3 and ISO 11452-2 (100V/m)
- ESD discharges : 16KV according to EN 61000-4-2

GENERAL SPECIFICATIONS

- APEM SAS patented design
- Mechanical operating angle :
+/- 35°
- Detent operating force :
1,75N ± 0,5 (version w. 11 detents)
2,5N ± 0,5 (version with 1 detent)
- Mechanical life : 100.000 cycles

ELECTRICAL SPECIFICATIONS

- Hall effect sensor
- Supply voltage : 5VDC +/- 0,5V
- Reverse polarity : -10V max.
- Overvoltage : +20V max.
- Center voltage (no load) : 2,5V +/- 0,2V
- Consumption : 11mA max. (single output)
22mA max. (dual output)
- LED supply : 6VDC 10mA

MATERIALS

- Wheel : polyamide with colouring
- Support : polyamide, black
- Electronics sealing : epoxy
- Connector : polyester (Molex 0510210700)
- Multiwire lead AWG28

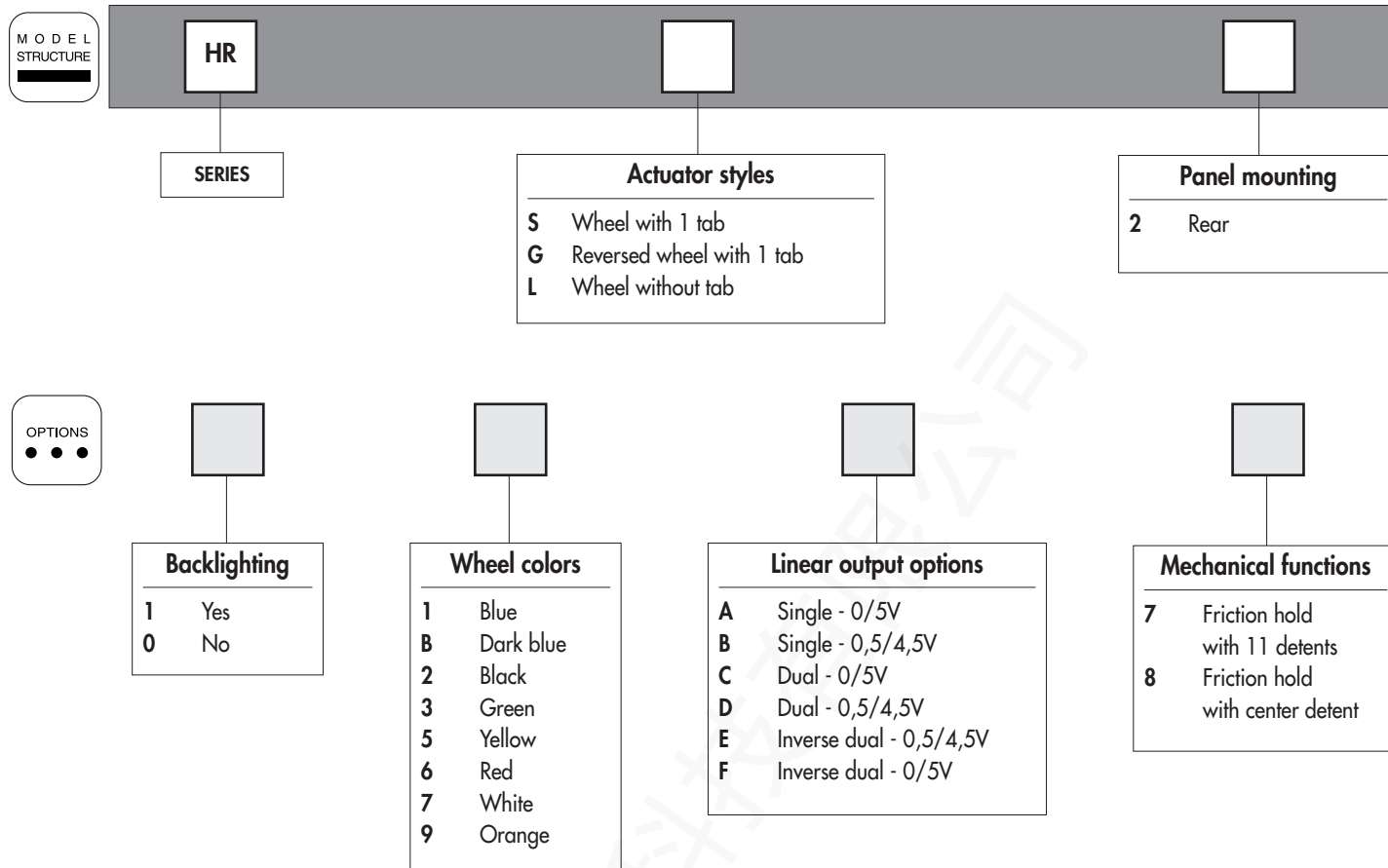
Tolerance : The general tolerance for dimensions in this brochure is $\pm 0,3$ (.012).
The company reserves the right to change specifications without notice.

HR series

NEW!

Proportional output thumbwheels - friction hold

Overview



ABOUT THIS SERIES

On the following pages, you will find successively :

- model structure of switches
- options in the same order as in above chart

Dimensions : first dimensions are in mm while inches are shown as bracketed numbers.



NOTICE : please note that not all combinations of above numbers are available. Refer to the following pages for further information.



Mounting accessories : standard hardware supplied : 2 self-tapping screws DELTA PT® 22x08 for plastic.



Packaging unit : 20 pieces

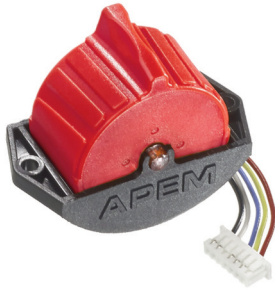
NEW!

HR series

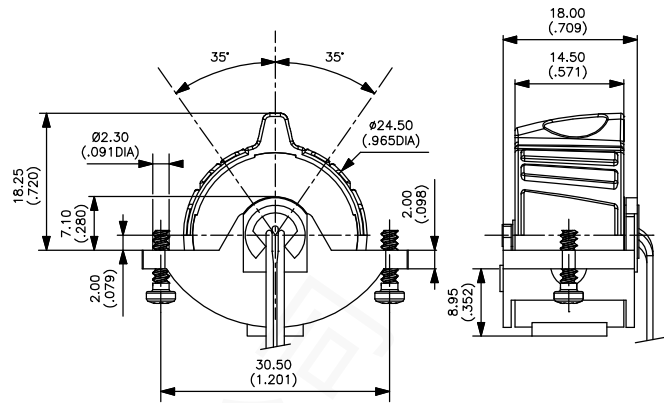
Proportional output thumbwheels - friction hold

Actuator styles

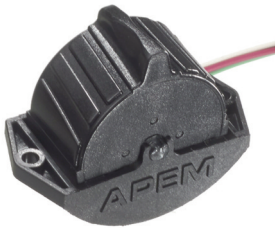
Wheel with 1 tab - version S



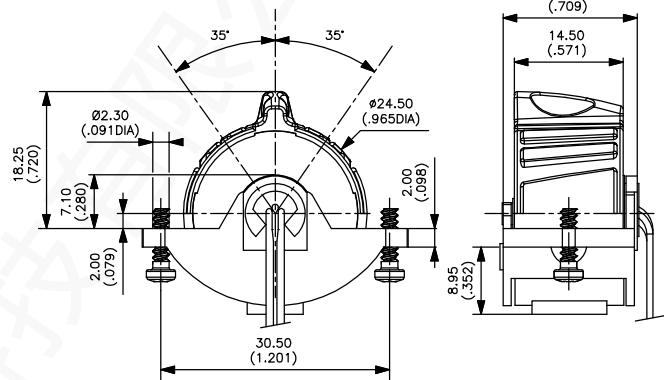
HRS2



Reversed wheel with 1 tab - version G



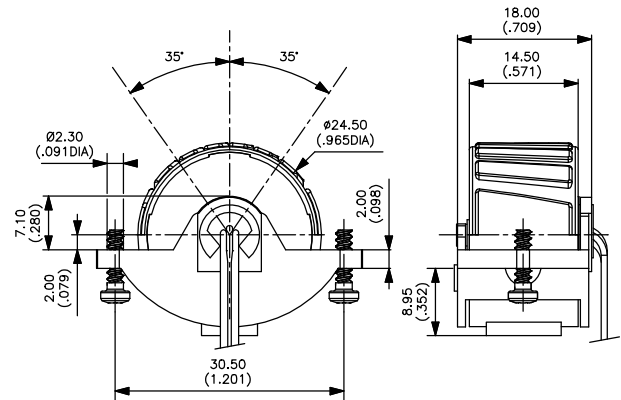
HRG2



Wheel without tab - version L



HRL2



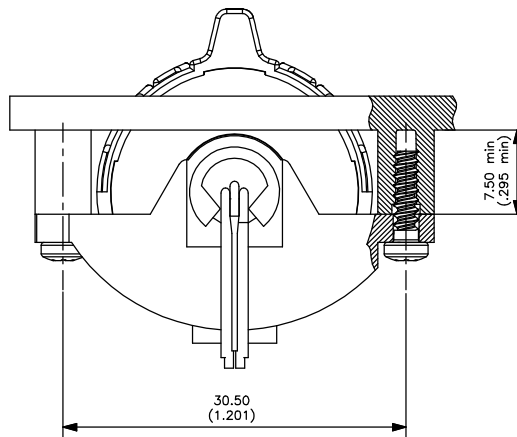
HR series

NEW!

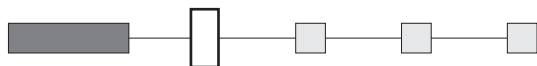
Proportional output thumbwheels - friction hold

Options

EXAMPLE OF MOUNTING



BACKLIGHTING



- 1 Yes
- 0 No

WHEEL COLORS



- 1 : Blue - B : Dark blue - 2 : Black - 3 : Green - 4 : Grey - 5 : Yellow - 6 : Red - 7 : White - 9 : Orange

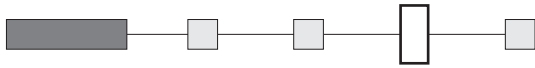
NEW!

HR series

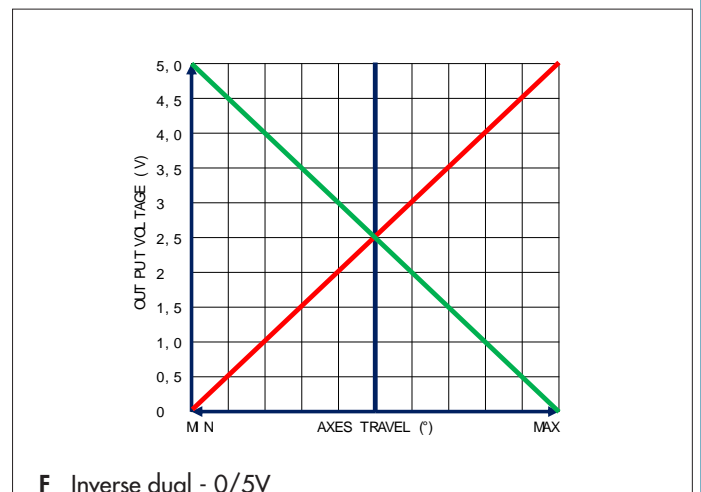
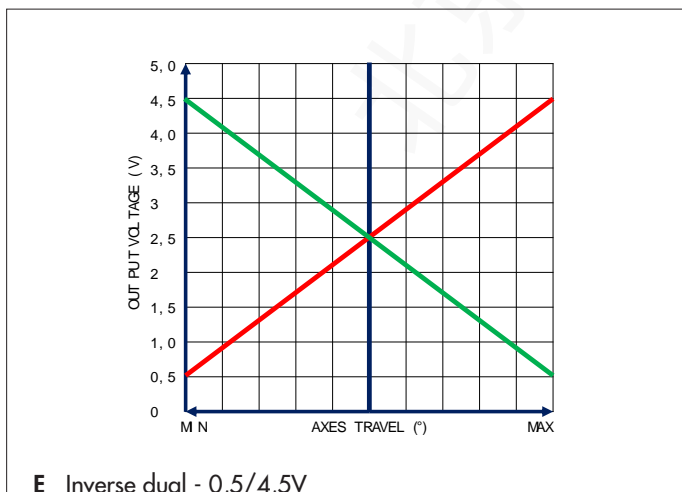
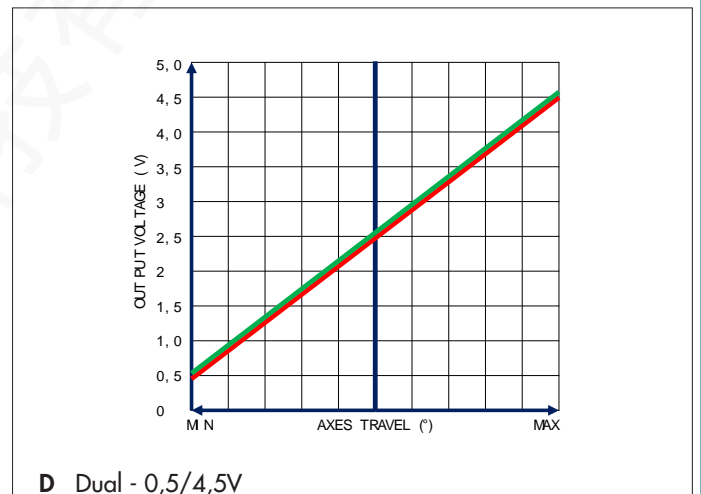
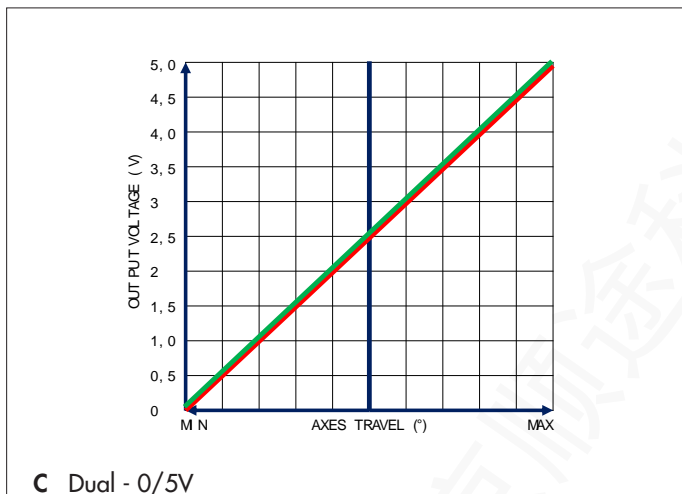
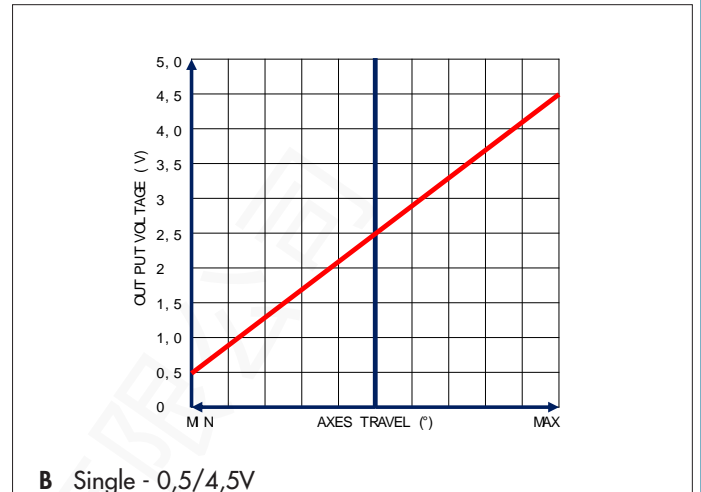
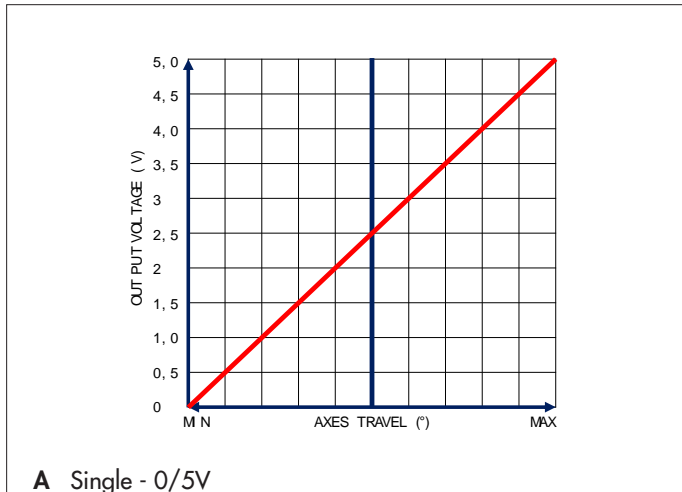
Proportional output thumbwheels - friction hold

Options

LINEAR OUTPUT OPTIONS



— output 1
— output 2



Note: The output voltage cannot be superior to the power supply voltage.
For 0/5V versions, the power supply should not be lower than 5V.

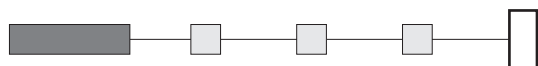
HR series

NEW!

Proportional output thumbwheels - friction hold

Options - Connections

MECHANICAL FUNCTIONS



- 7 Friction hold with 11 detents along the travel
- 8 Friction hold with center detent

CONNECTIONS

Single output without backlighting

Pin	Function	Color
1		
2	Power supply: +VDC 5V	Red
3		
4		
5		
6	Output	
7	Ground 0V	Black

Single output with backlighting

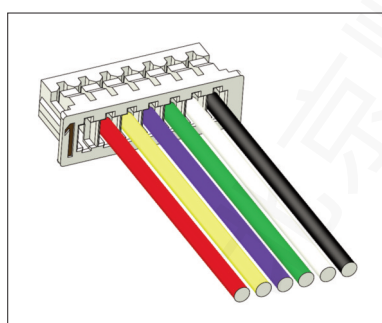
Pin	Function	Color		
1				
2	Power supply: +VDC 5V	Red		
3			LED +	Yellow
4			LED -	Blue
5				
6	Output	White		
7	Ground 0V	Black		

Dual output without backlighting

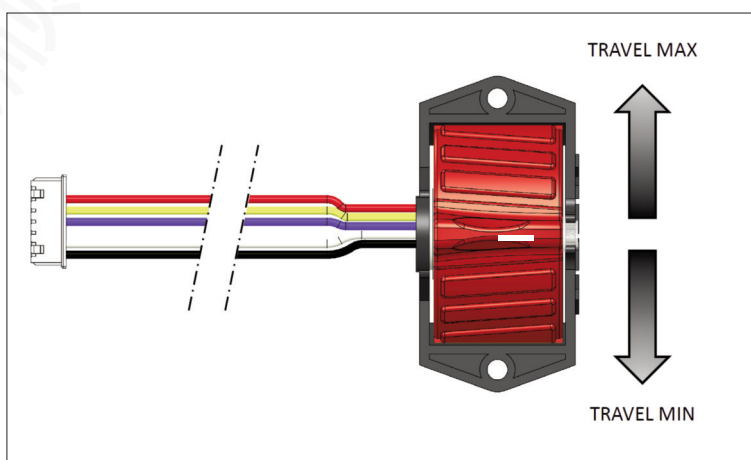
Pin	Function	Color
1		
2	Power supply: +VDC 5V	Red
3		
4		
5	Output 2	Green
6	Output 1	White
7	Ground 0V	Black

Dual output with backlighting

Pin	Function	Color		
1				
2	Power supply: +VDC 5V	Red		
3			LED+	Yellow
4			LED-	Blue
5	Output 2	Green		
6	Output 1	White		
7	Ground 0V	Black		



Wiring harness with multiwire lead AWG28. Length 140 mm



HRFRICITION1512-A

HR1504-A-R1



- High reliability, long life
- Sealed to IP68
- Backlighting option
- EMI/RFI shielding
- Other detent options on request
- Patented solution

ENVIRONMENTAL SPECIFICATIONS

- Electronics sealed to IP68 according to IEC 60529
- Shock resistance : 50 g during 11ms
- Vibration resistance : 10-500Hz - 5g according to IEC 512-4, test 6d
- Salt spray : IEC 512-6, test 11f
- Operating temperature : -30°C to +70°C
- Storage temperature : -40°C to +85°C
- EMI/RFI shielding : IEC 61000-4-3 and ISO 11452-2 (100V/m)
- ESD discharges : 16KV according to EN 61000-4-2

GENERAL SPECIFICATIONS

- APEM SAS patented design
- Mechanical operating angle :
+/- 35° (versions S/G/L)
+/- 20° (version K)
- Sprung to center
- Operating force at center:
2N +/- 0,5N (without detent position)
4N +/- 0,5N (with detent position)
- Mechanical life : 5 million cycles (without detent)

ELECTRICAL SPECIFICATIONS

- Hall effect sensor
- Supply voltage : 5VDC +/- 0,5V
- Reverse polarity : -10V max.
- Overvoltage : +20V max.
- Return to center voltage (no load) : +/- 0,2V
- Consumption : 11mA max. (single output)
22mA max. (dual output)
- LED supply : 6VDC 10mA

MATERIALS

- Wheel : polyamide with colouring
- Support : polyamide, black
- Electronics sealing : epoxy
- Connector : polyester (Molex 0510210700)
- Multiwire lead AWG28

Tolerance : The general tolerance for dimensions in this brochure is $\pm 0,3$ (.012).

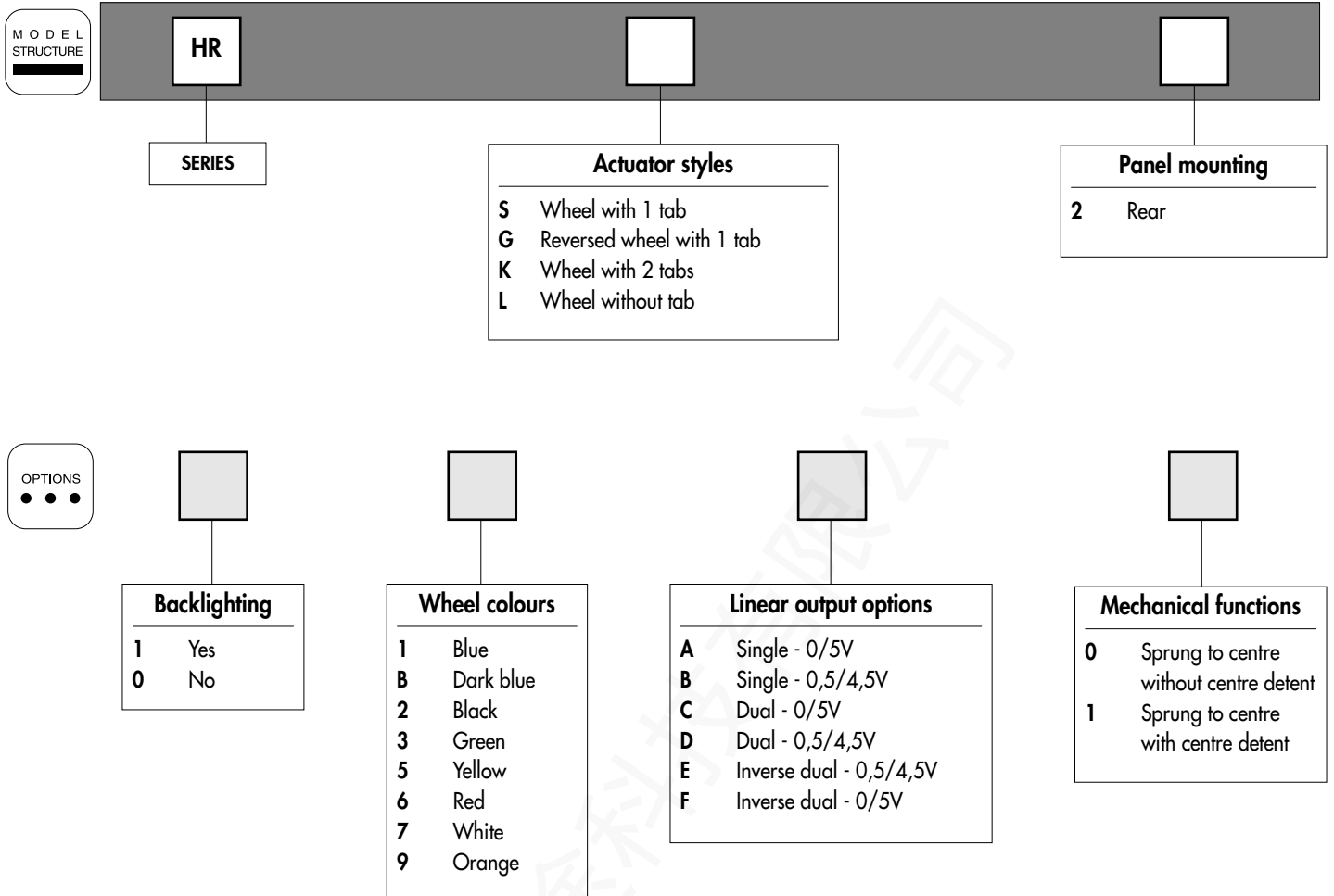
Dimensions, specifications and data shown in this brochure are subject to change without notice.

HR series

New!

Proportional output thumbwheels - sprung to centre

Overview



Other detent options: on request.

ABOUT THIS SERIES

On the following pages, you will find successively :
 - model structure of switches
 - options in the same order as in above chart

Dimensions : first dimensions are in mm while inches are shown as bracketed numbers.

NOTICE : please note that not all combinations of above numbers are available. Refer to the following pages for further information.

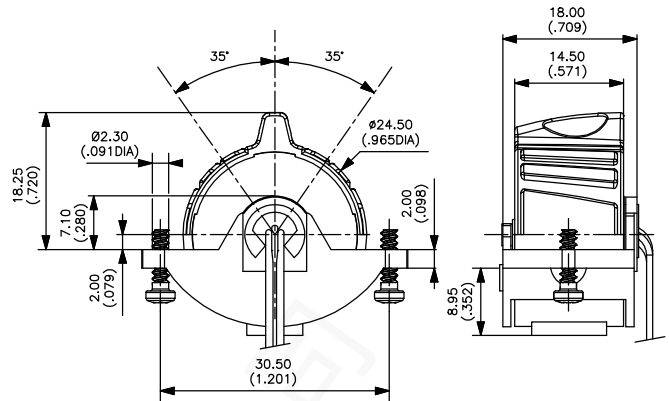
Mounting accessories : standard hardware supplied : 2 self-tapping screws DELTA PT® 22x08 for plastic.

Packaging unit : 20 pieces

Wheel with 1 tab - version S



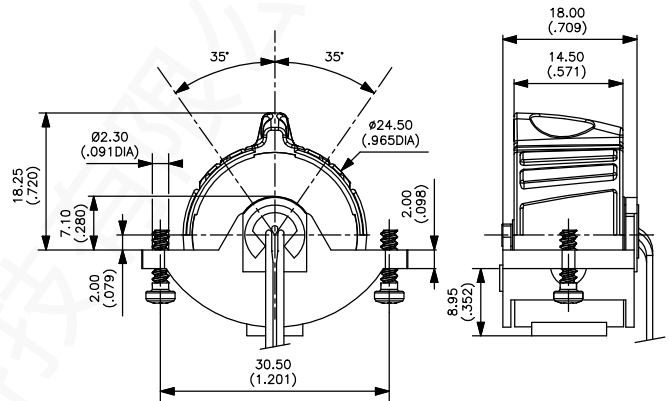
HRS2



Reversed wheel with 1 tab - version G



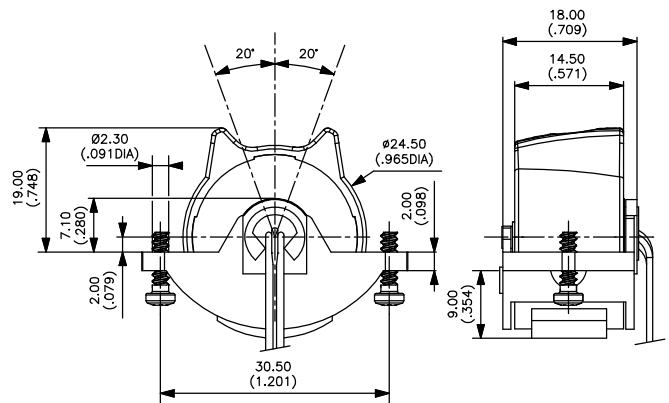
HRG2



Wheel with 2 tabs - version K



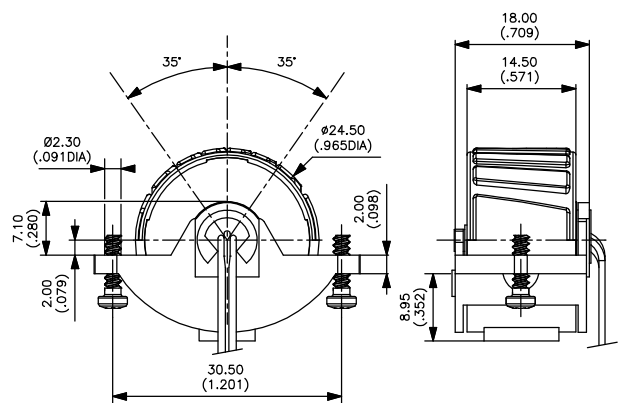
HRK2



Wheel without tab - version L



HRL2

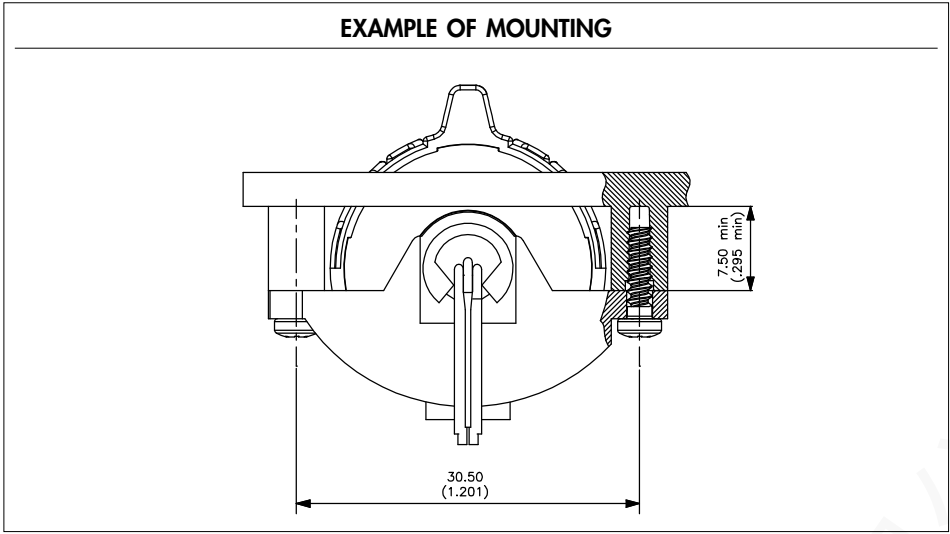


HR series

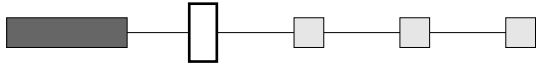
New!

Proportional output thumbwheels - sprung to centre

Options

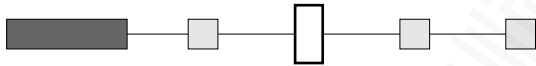


BACKLIGHTING



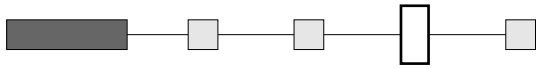
- 1 Yes
- 0 No

WHEEL COLOURS

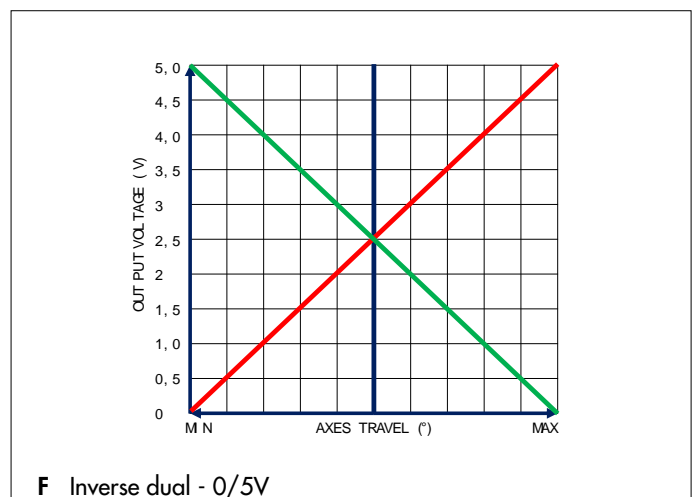
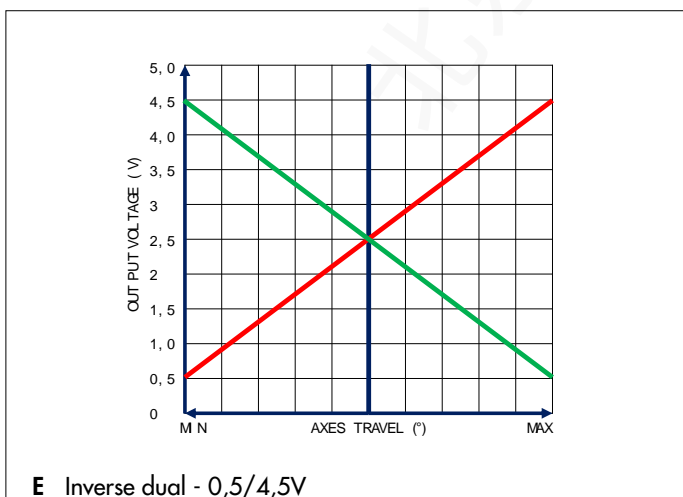
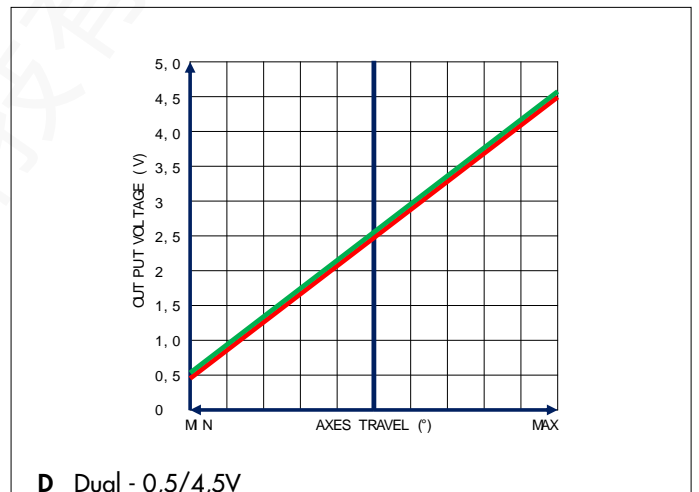
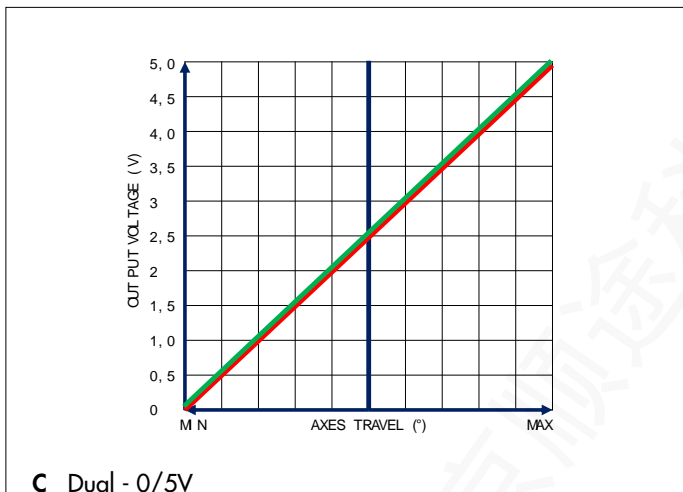
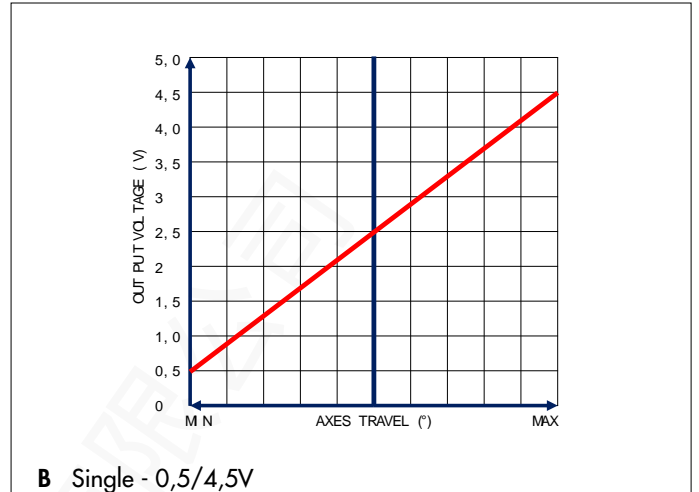
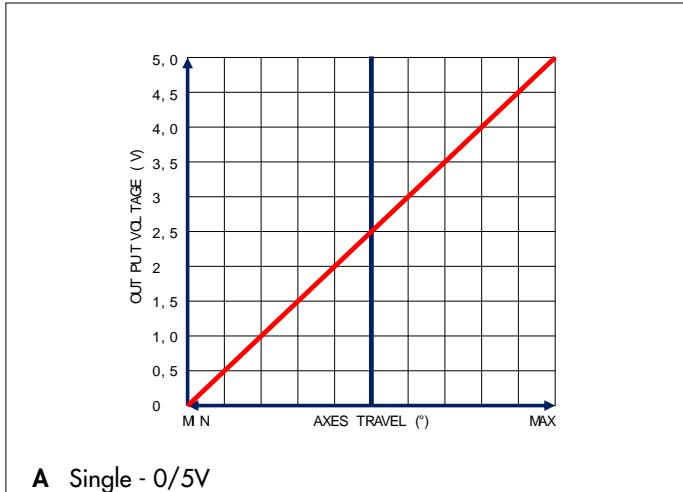


- 1 : Blue - B : Dark blue - 2 : Black - 3 : Green - 4 : Grey - 5 : Yellow - 6 : Red - 7 : White - 9 : Orange

LINEAR OUTPUT OPTIONS



— output 1
— output 2



Note: The output voltage cannot be superior to the power supply voltage.
For 0/5V versions, the power supply should not be lower than 5V.

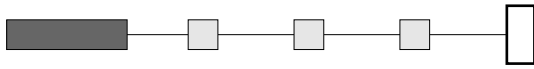
HR series

New!

Proportional output thumbwheels - sprung to centre

Options - Connections

MECHANICAL FUNCTIONS



- 0 Sprung to centre without centre detent
- 1 Sprung to centre with centre detent

Other : on request.

CONNECTIONS

Single output without backlighting

Pin	Function	Colour
1		
2	Power supply: +VDC 5V	Red
3		
4		
5		
6	Output	
7	Ground 0V	Black

Single output with backlighting

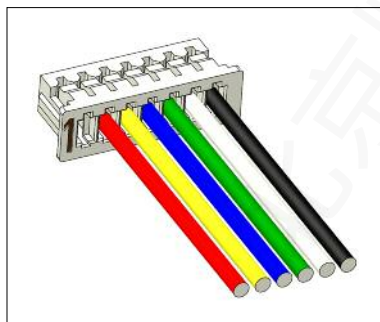
Pin	Function	Colour
1		
2	Power supply: +VDC 5V	Red
3	LED +	Yellow
4	LED -	Blue
5		
6	Output	White
7	Ground 0V	Black

Dual output without backlighting

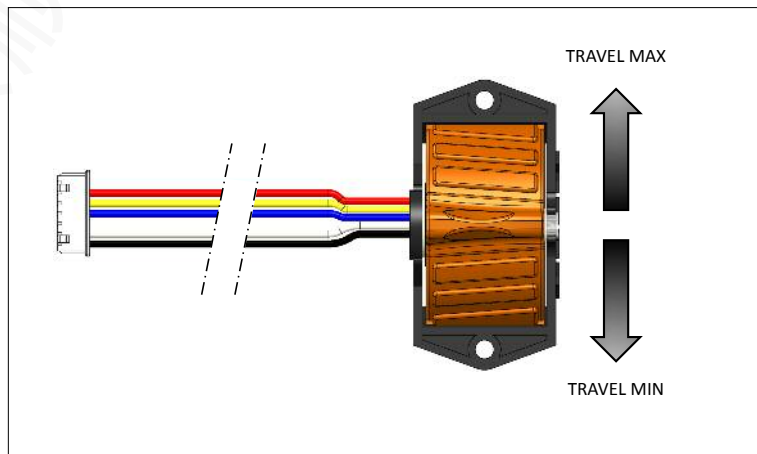
Pin	Function	Colour
1		
2	Power supply: +VDC 5V	Red
3		
4		
5	Output 2	Green
6	Output 1	White
7	Ground 0V	Black

Dual output with backlighting

Pin	Function	Colour
1		
2	Power supply: +VDC 5V	Red
3	LED+	Yellow
4	LED-	Blue
5	Output 2	Green
6	Output 1	White
7	Ground 0V	Black



Wiring harness with multiwire lead AWG28. Length 140 mm





- Rugged finger positioning control
- Available with CANbus J1939
- Available with USB 1.1 HID compliant interface
- 1, 2 and 3 axis configurations
- 10 million life cycles
- Sealing up to IP68

MECHANICAL (FOR X, Y AXIS)

- Break Out Force: 1.8N (0.4lbf)
- Operating Force: 3.5N (0.75lbf)
- Maximum Applied Force: 450N (100lbf)
- Mechanical Angle of Movement: 40°
- Expected Life: 10 million cycles
- Material: Glass filled nylon
- Lever Action: Spring centering

MECHANICAL (FOR Z AXIS)

- Break Out Torque: 0.09N·m (0.80lbf-in)
- Operating Torque: 0.121N·m (1.07lbf-in)
- Maximum Allowable Torque: 0.150N·m (1.33lbf-in)
- Hand Mechanical Angle: 60°
- Handle Action: Spring centering
- Expected Life: 10 million cycles

CANbus OUTPUT VERSION

- Supply Voltage Range: 6V to 30V
- CANbus Version: J1939

- NOTES:
- All values are nominal.
 - Exact specifications may be subject to configuration.
 - Contact Technical Support for the performance of your specific configuration.
 - * Excludes some handle options.

ENVIRONMENTAL

- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Storage Temperature: -40°C to 70°C (-40°F to 158°F)
- Sealing (IP): IP65 to IP68*
- EMC Immunity Level (V/M): IEC 61000-4-3: 2006
- EMC Emissions Level: IEC 61000-4-8: 1993/A1: 2000
- ESD: IEC 61000-4-2: 2008
- Vibration Crash (non operational): IAW MIL-STD-810F Method 516.5 Procedure V, Table 516.5-8 SRS (75G)
- Vibration Shock (non operational): IAW MIL-STD-810F, Method 516.5, Procedure 1, 40G peak sine wave pulse with 11ms duration
- Vibration Shock (operational): IAW MIL-STD-810F, Method 516.5, Procedure, 20G peak half sine wave pulse with 11ms duration









ELECTRICAL

- Sensor: Hall effect
- Supply Voltage Operating: 5.00VDC
- Reverse Polarity Max: -14.5VDC
- Overvoltage Max: 18VDC
- Output Voltage: See options
- Output Impedance: 6Ω
- Current Consumption Max: 10mA per axis
- Return to Center Voltage (No Load): ±200mV

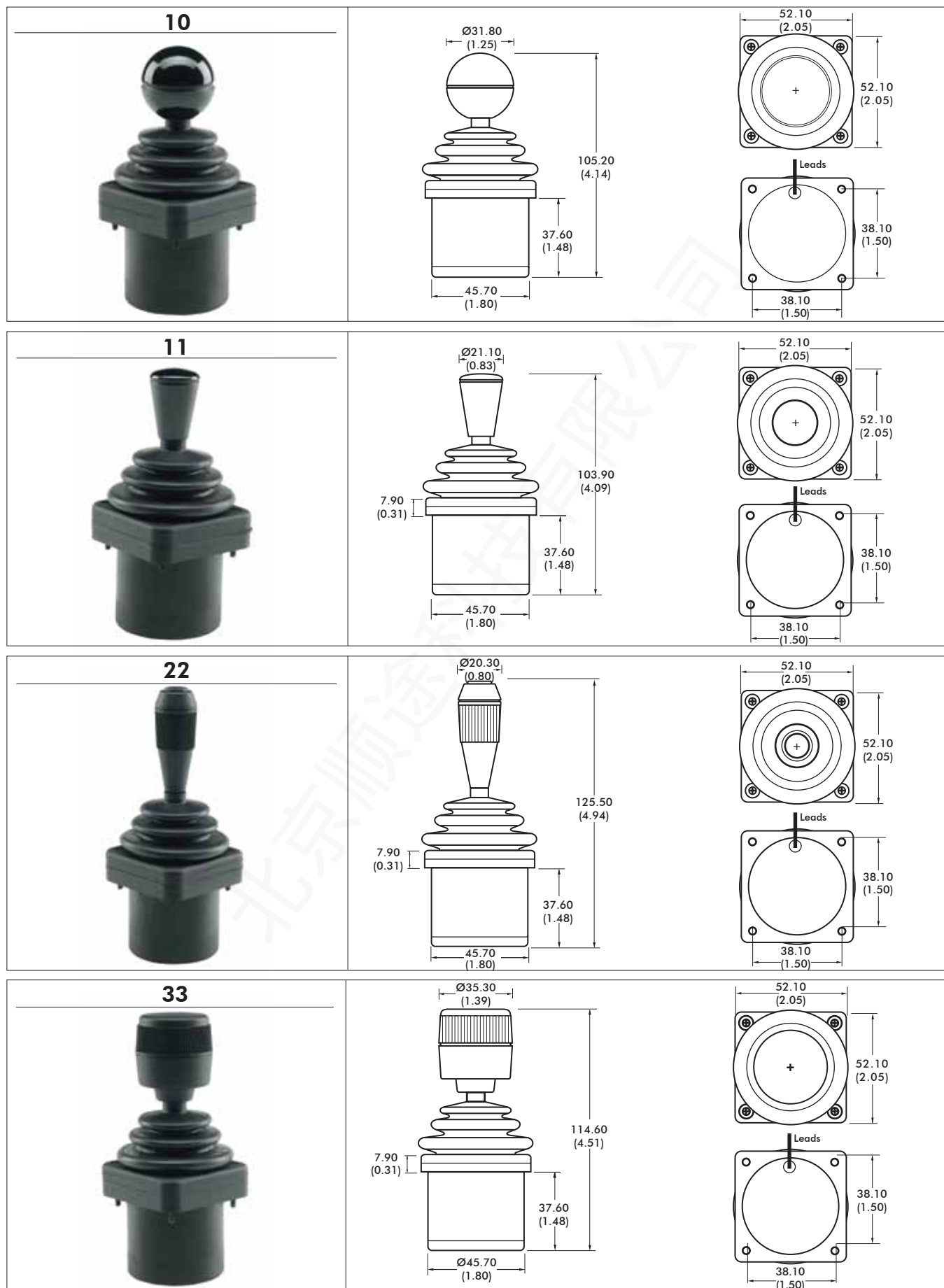
HT series

Ruggedized Hall effect joysticks

Overview

HT				
SERIES	Handle	Limiter Plate	Mounting	Output Options
	<ul style="list-style-type: none"> 10 Ball Tip (2 Axis) 11 Tapered (2 Axis) 22 1 Pushbutton (2 Axis) 33 3 Axis 44 1 Pushbutton (3 Axis) 45 2 Pushbuttons (3 Axis) 46 Low Profile (3 Axis) 	<ul style="list-style-type: none"> S Square  R Round  X Slotted  Y Slotted  P Plus  C Cross  	<ul style="list-style-type: none"> 1 Drop-in 4 Rear Mount 	<ul style="list-style-type: none"> 0 0V to 5V (Rail to Rail) 1 0.5V to 4.5V 2 0.25V to 4.75V 3 1V to 4V 4 0V to 5V – Sensor 1 0V to 5V – Sensor 2 5 0.5V to 4.5V – Sensor 1 0.5V to 4.5V – Sensor 2 6 0.25V to 4.75V – Sensor 1 0.25V to 4.75V – Sensor 2 7 1V to 4V – Sensor 1 1V to 4V – Sensor 2 8 0V to 5V – Sensor 1 5V to 0V – Sensor 2 9 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 0-U USB 1-J Cursor Emulation 2-C CANbus
<p>NOTES:</p> <ul style="list-style-type: none">  Up to IP68 available.  Mounting accessories. Standard hardware includes: gasket, clamping ring, and four #4-40x3/4 Phil Ph MS SS screws. 				



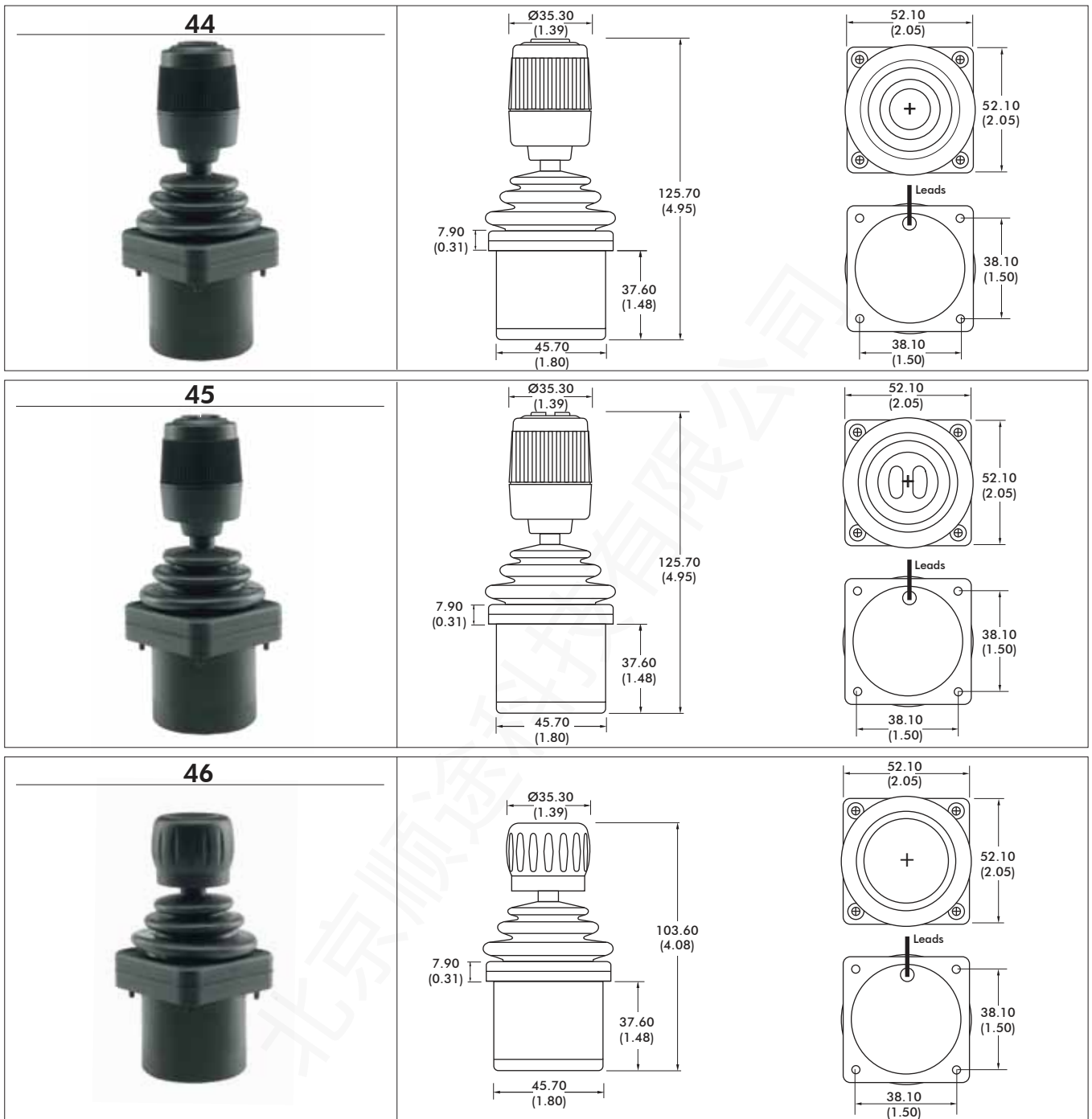


Note: The company reserves the right to change specifications without notice.

HT series

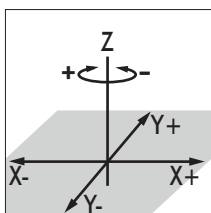
Ruggedized Hall effect joysticks

Overview



NOTES:

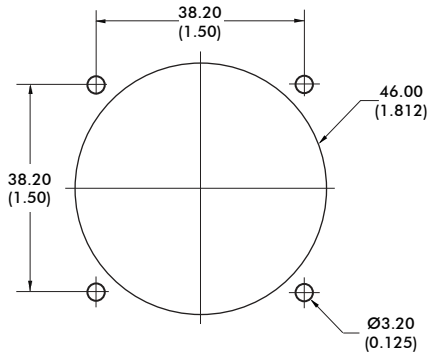
1. Dimensions are in mm/(inch).
2. Axis orientation:



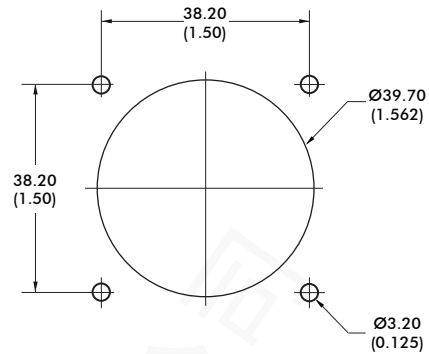
DEFAULT WIRE COLOR CODE*		
COLOR	FUNCTION	AWG
RED	Vcc or Vdd	28
BLACK	Ground	
BLUE	X Axis	
YELLOW	Y Axis	
GREEN	Z Axis	22
WHITE	Switch Common (optional)	
ORANGE	Switch 1 (optional)	
VIOLET	Switch 2 (optional)	

NOTE: * Starting from the strain relief, the leads are 178mm (7in) long, 3.18mm (0.125in) stripped.

PANEL CUTOUT DIMENSIONS

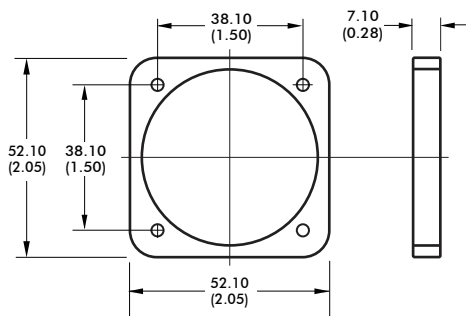


DROP-IN

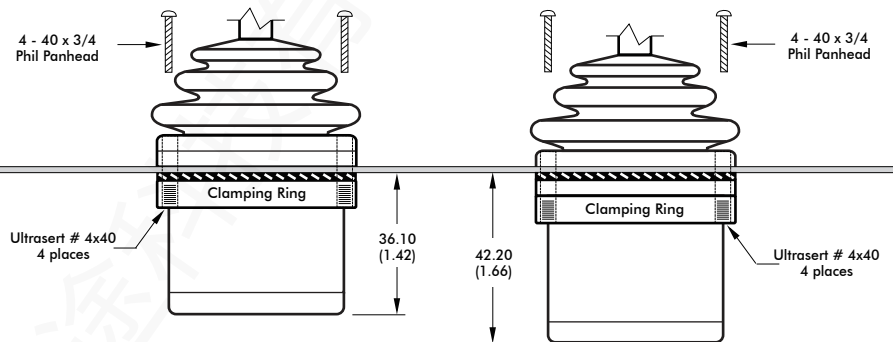


REAR MOUNT

CLAMPING RING



MOUNTING OPTIONS



DROP-IN

REAR MOUNT

- Panel
- Gasket = $\frac{0.50}{(0.02)}$

NOTES:

- For DROP-IN mounting, the panel thickness can be 1.17mm to 3.17mm (0.046in to 0.125in).
- For REAR MOUNT the maximum panel thickness is 1.6mm (0.063in).
- A panel thickness of 1/16" (1.6mm/0.063in) was considered for all the below-panel depth values.
- The below-panel depth is extended by 7.11mm (0.28in) with the Mouse Emulation, USB, CANbus, and Dual Sensor options.

NOTE:

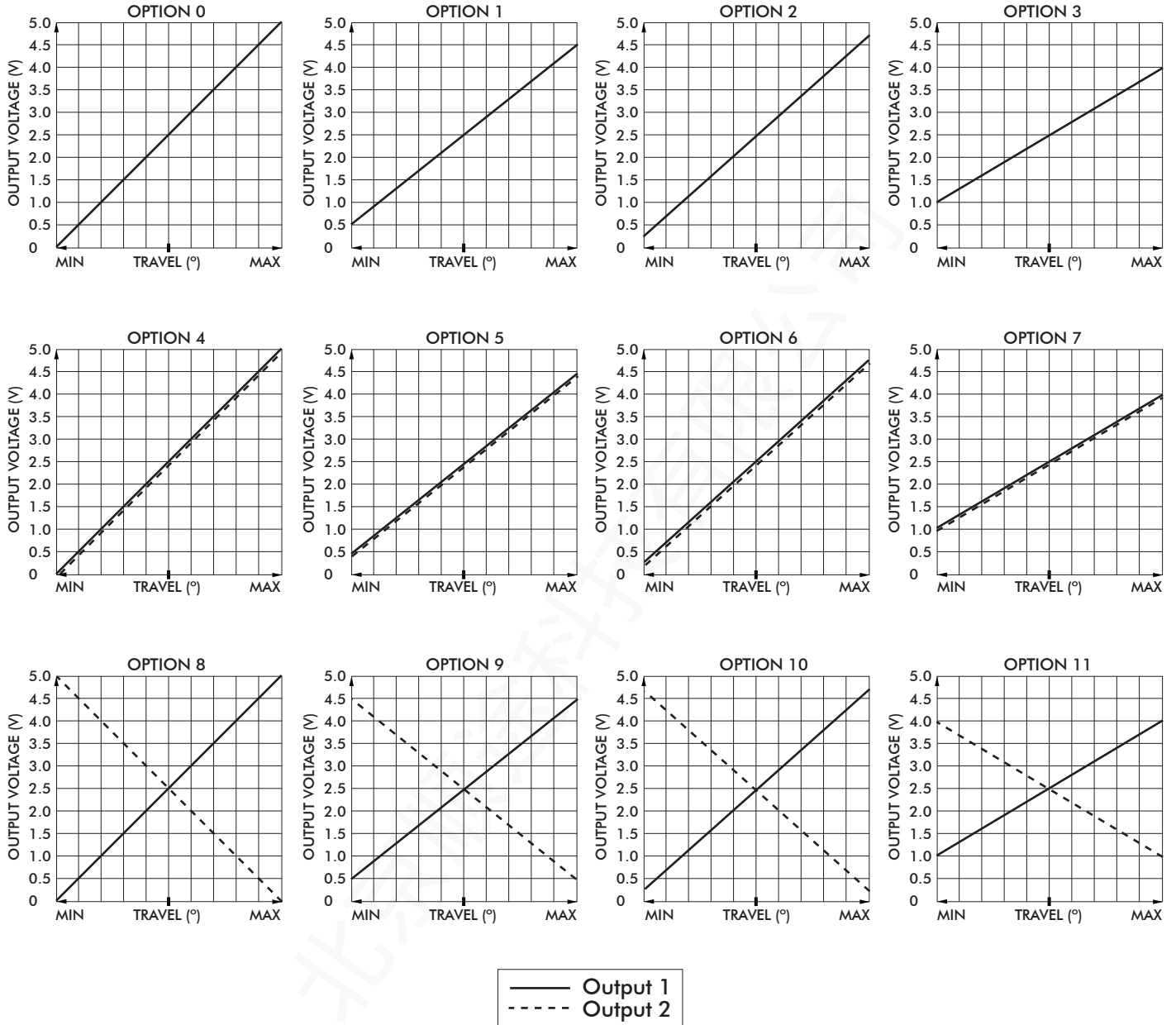
1. Dimensions are in mm/(inch).

HT series

Ruggedized Hall effect joysticks

Overview

VOLTAGE OUTPUT OPTIONS



ADDITIONAL OUTPUT OPTIONS

CANbus J1939

APEM's HT CANbus joysticks conform to the J1939 serial bus specification used for communications between electronic control units and vehicle components.

ELECTRICAL SPECIFICATIONS	
• Supply Voltage:	6VDC to 35 VDC
• Supply Current:	15mA min, +5mA per LED, +10mA per axis

WIRING SPECIFICATION	
• Red Wire:	Supply Power
• Black Wire:	Ground
• Green Wire:	CAN high data
• White Wire:	CAN low data
• Blue Wire:	Identifier Select LSB
• Orange Wire:	Identifier Select MSB

ENVIRONMENTAL	
• Operating temperature:	-25°C to +70°C (-13°F to +158°F)
• Storage temperature:	-40°C to +70°C (-40°F to +158°F)

CONNECTOR OPTIONS:

- Cable assembly with Deutsch DT04 style plugs

CANbus CONFIGURATION:

- Contact Technical Support for assistance

CANopen

- Contact Technical Support for assistance with CANopen configuration.

HT series

Ruggedized Hall effect joysticks

Overview

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 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
- Standard Male Type A Connector

SUPPLIED WIRING

USB: USB Male Type A Connector with overmolded cable
(Optional ruggedized military connectors are available.)

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 Joyball 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
- Ideal for marine GPS and navigation
- Environmental sealing up to IP68*

SUPPLIED WIRING

USB: USB Male Type A Connector with overmolded cable

I/O COMPLEMENT/ USER SPECIFIED PARAMETERS:

- USB 2 pushbuttons 2 or 3 axis (X, Y, and Z "scroll")

NOTE: *Excludes some handle options.

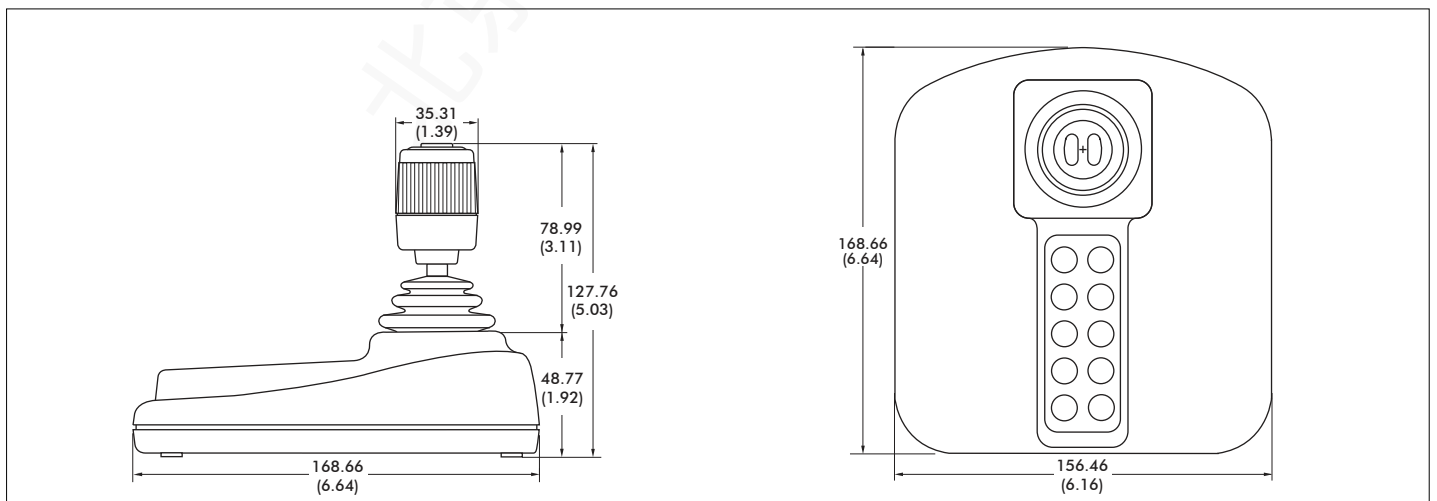


- ❑ 3 axis joysticks for PTZ control
- ❑ USB 1.1 HID compliant “game controller”
- ❑ Programmable pushbutton switches
- ❑ Easy to use and operate

- Joystick performance:
 - Hall effect three axis joystick
 - X/Y/Z for positioning control
- Joystick travel:
 - 36° for X and Y axis
 - 60° for Z axis
- Centering: Single spring, omni-directional
- Joystick shaft: Stainless steel
- Joystick boot: Neoprene
- Joystick handle: Glass filled nylon
- Pushbutton performance:
 - 10 tactile pushbuttons on housing
 - Two tactile pushbuttons on joystick
 - 3,000,000 cycles
- Desktop: High impact ABS housing
- Power:
 - Via USB interface (5V DC)
 - Consumption 32mA
- Operating conditions:
 - -25°C to +85°C (-13°F to +185°F)

- Approvals
 - EN 55024:1998, EN 55022, CE
 - FCC Part 15 Subpart B Class B
 - RoHs compliant
- Weight: 440 g (0.97lb)
- Interface: USB port
- Connectors
 - USB Type A Male
 - Cable Length: 2m; 6ft. 6.8in
- Systems support integration: Windows 7, Vista, XP, 2000, Window 8, OSX, Linux
- Supported protocols:
 - USB HID 1.1 game controller
 - Direct X (Gaming Control)
 - Joystick: Three HID axes
 - Pushbuttons: 12 HID buttons
 - Uses standard DirectX HID drivers
 - Connects directly to workstation PC
- Environmental: For indoor use only

NOTE: All values are nominal.



NOTES:

Dimensions are in mm/(inch).

To order the IP Desktop please refer to Part Number 100-550 (Gray or Black).

IPD Launch

USB desktop controllers

Distinctive features and specifications

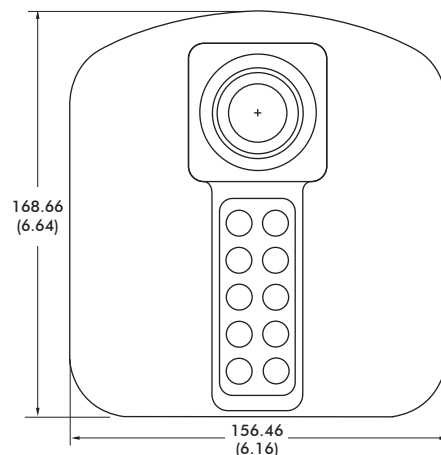
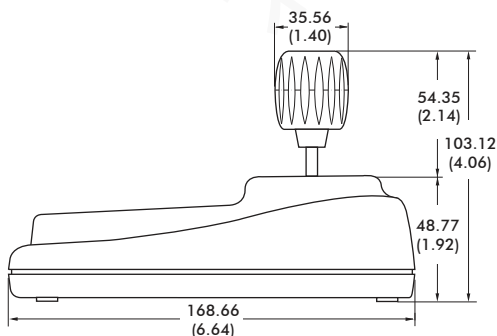


- 3 axis joystick for PTZ control
- USB 1.1 HID compliant “game controller”
- Ten pushbutton switches
- Easy to use and operate

- Joystick performance:
 - Resistive three axis joystick
 - X/Y/Z for positioning control
- Joystick travel:
 - 36° for X and Y axis
 - 56° for Z axis
- Centering: Dual spring, omni-directional
- Joystick shaft: Nickel plated brass
- Joystick boot: Thermostatic elastomer
- Joystick handle: Glass filled nylon
- Pushbutton performance: 10 tactile pushbuttons on housing rated for 3,000,000 life cycles
- Desktop housing: High impact ABS
- Power:
 - Via USB interface (5V DC)
 - Consumption 32mA
- Operating conditions: -25 to +85°C (-13 to +185°F)

NOTE: All values are nominal.

- Approvals:
 - EN 55024:1998, EN 55022, CE
 - FCC Part 15 Subpart B Class B
 - RoHs compliant
- Weight: 435 g (0.96lb)
- Interface: USB port
- Connectors:
 - USB Type A Male
 - Cable Length: 2m; 6ft. 6.8in.
- Systems support integration: Windows 7, Vista, XP, 2000, Windows 8, OSX, Linux
- Supported protocols:
 - USB HID 1.1 game controller
 - Direct X (Gaming Control)
 - Joystick: Three HID axis
 - Pushbuttons: 10 HID buttons
 - Uses standard DirectX HID drivers
 - Connects directly to workstation PC
- Environmental: For indoor use only



NOTES:

Dimensions are in mm/(inch).

To order the IP Desktop please refer to Part Number 100-450.

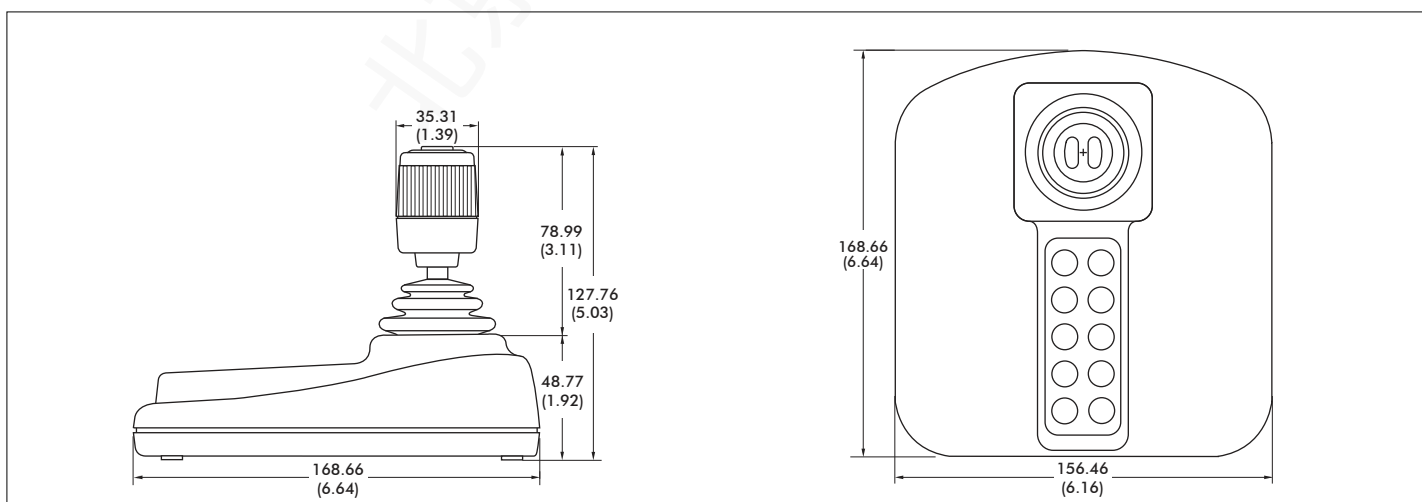


- 3 axis joystick for PTZ control
- LED pushbutton switches
- USB 1.1 HID compliant “game controller”
- Soft touch Business Blue coating

- Joystick performance:
 - Hall effect three axis joystick
 - X/Y/Z for positioning control
- Joystick travel:
 - 36° for X and Y axis
 - 60° for Z axis
- Centering: Single spring, omni-directional
- Joystick shaft: Stainless steel
- Joystick boot: Neoprene
- Joystick handle: Glass filled nylon
- Pushbutton performance:
 - 10 vibrant, high efficiency back lit LED pushbuttons rated for 10,000,000 life cycles
 - Two tactile pushbuttons on joystick rated for 3,000,000 life cycles
- Desktop housing:
 - High impact ABS
 - Soft touch Business Blue coating
- Power:
 - Via USB interface (5V DC)
 - Consumption 300mA

- Operating conditions: -25° to +85° C (-13 to +185° F)
- Approvals:
 - EN 55024:1998, EN 55022, CE
 - FCC Part 15 Subpart B Class B
 - RoHs compliant
- Weight: 455 g (1.00lb)
- Interface: USB port
- Connectors:
 - USB Type A Male
 - Cable Length: 2m; 6ft. 6.8in.
- Systems support integration: Windows 7, Vista, XP, 2000, Windows 8, OSX, Linux
- Supported protocols:
 - USB HID 1.1 game controller
 - Direct X (Gaming Control)
 - Joystick: Three HID axis
 - Pushbuttons: 12 HID buttons
 - Uses standard DirectX HID drivers
 - Connects directly to workstation PC
- Environmental: For indoor use only

NOTE: All values are nominal.



NOTES:

Dimensions are in mm/(inch).

To order the IP Desktop please refer to Part Number 100-650.

M series

Miniature resistive joysticks

Distinctive features and specifications



- World's #1 selling joystick for CCTV applications
- Potentiometric sensing
- One, two or three axis
- Low profile design with 17 handle options
- RoHS

MECHANICAL (FOR X AND Y AXIS)

- Break Out Force: 0.7N (0.16lbf)
- Operating Force: 1.3N (0.29lbf)
- Maximum Applied Force: 100N (22.48lbf)
- Mechanical Angle of Movement: 56°
- Expected Life: See potentiometer options
- Mass/weight: Varies
- Package Size (mm) (L x W x H) or (Dia x H): Varies
- Lever Action (Centering): Spring or Friction

MECHANICAL (FOR Z AXIS)

- Break Out Torque: 0.022N·m (0.19lbf-in)
- Operating Torque: 0.040N·m (0.35lbf-in)
- Maximum Allowable Torque: 0.049N·m (0.43lbf-in)
- Mechanical Angle: 90°
- Handle Action: Spring

ENVIRONMENTAL

- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Storage Temperature: -40°C to 70°C (-40°F to 158°F)

POTENTIOMETER OPTIONS

Potentiometer	P	M	R
Electrical Element	Conductive Plastic	Conductive Plastic	Conductive Plastic
Track Resistance	5K	5K	5K
Linearity	±1.0%	±5.0%	±1.0%
Track Operating Angle	220°	56°	50°
CRV	±1.5%	±1.5%	±1.0%
Power Dissipation	0.25W@40°C	0.5W@70°C	1W
Rotational Life	1,000,000	1,000,000	10,000,000

CENTERING OPTIONS

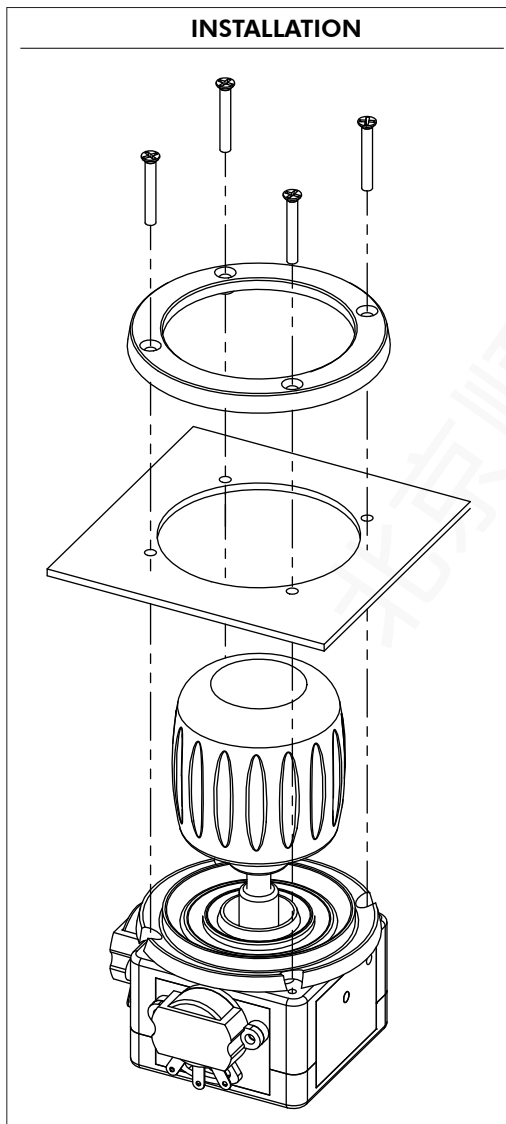
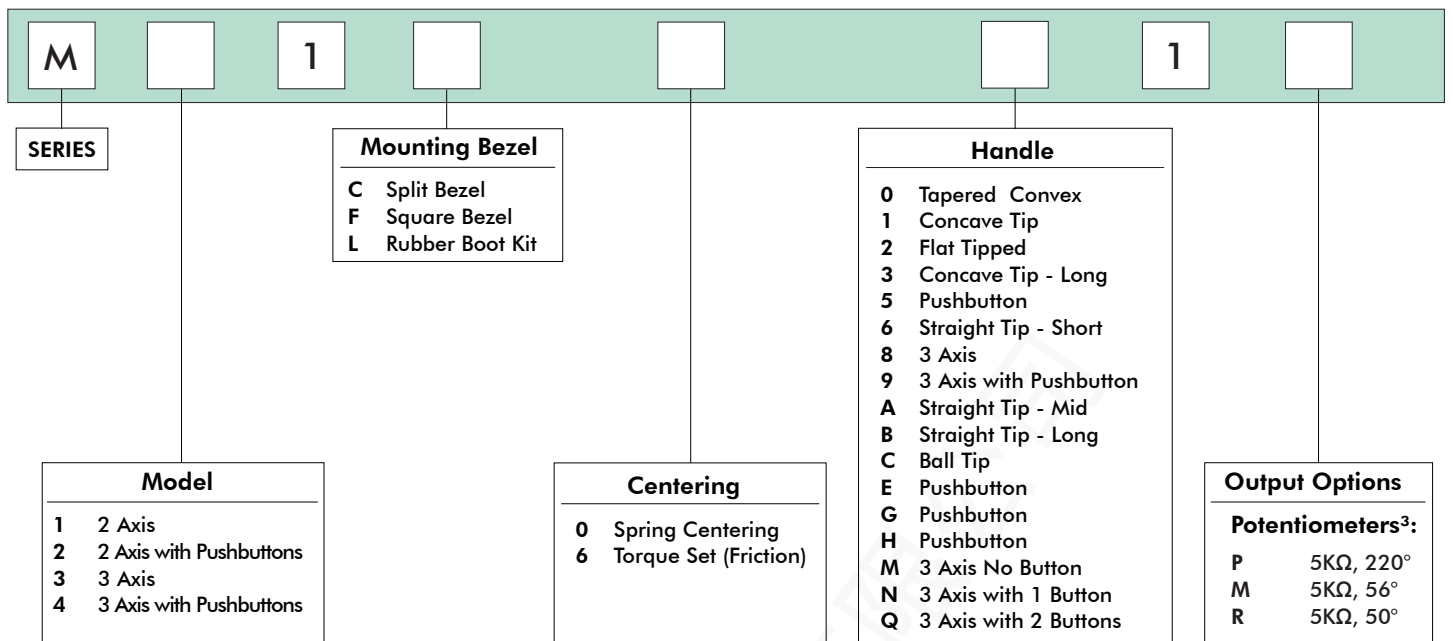
- **SPRING CENTERING:** The joystick returns to center when the handle is released.
- **TORQUE SET:** Torque set provides absolute positioning with uniform friction applied to "X" and "Y" axis.

- NOTES:
- All values are nominal.
 - Specifications are subject to the joystick configuration.
Contact Technical Support for the performance of your specific configuration.
 - The M Series is intended for internal applications.

M series

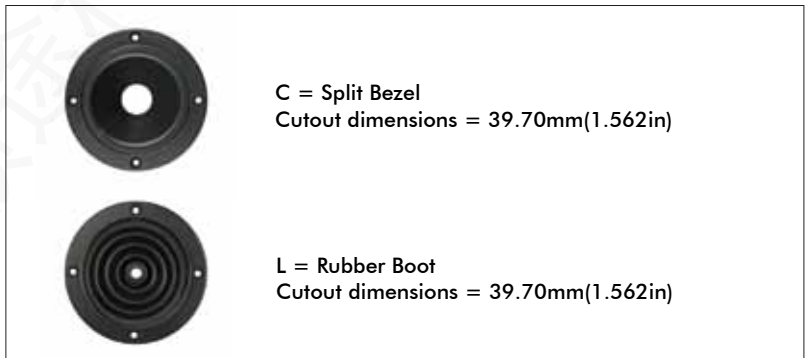
Miniature resistive joysticks

Overview

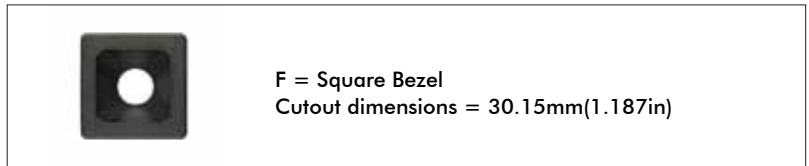


NOTES:

1. Front Mounting Bezels (FM)



2. Rear mounting bezels (RM)



3. Potentiometer specifications are located on the previous page.



Mounting accessories.

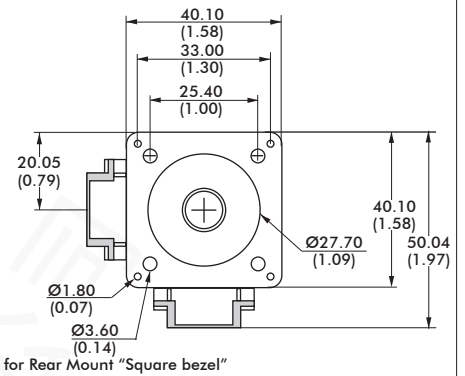
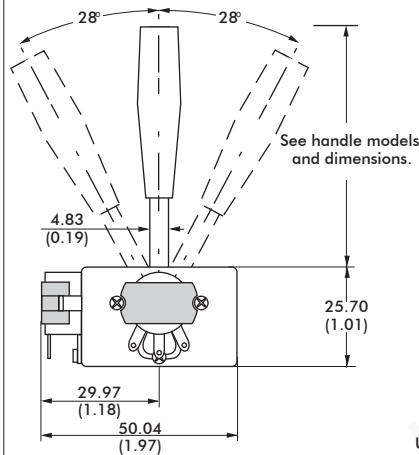
Standard hardware includes:

C= Ring, cup, and 4 black Phl screws 2-56x1/2in

L= Ring and 4 black Phl screws 2-56x1/2in

F= Square bezel, 4 screws 2-56x1/2in Phl, and 4 screws 2-56x1/4in Phl

2 AXIS WITH OPTION A HANDLE

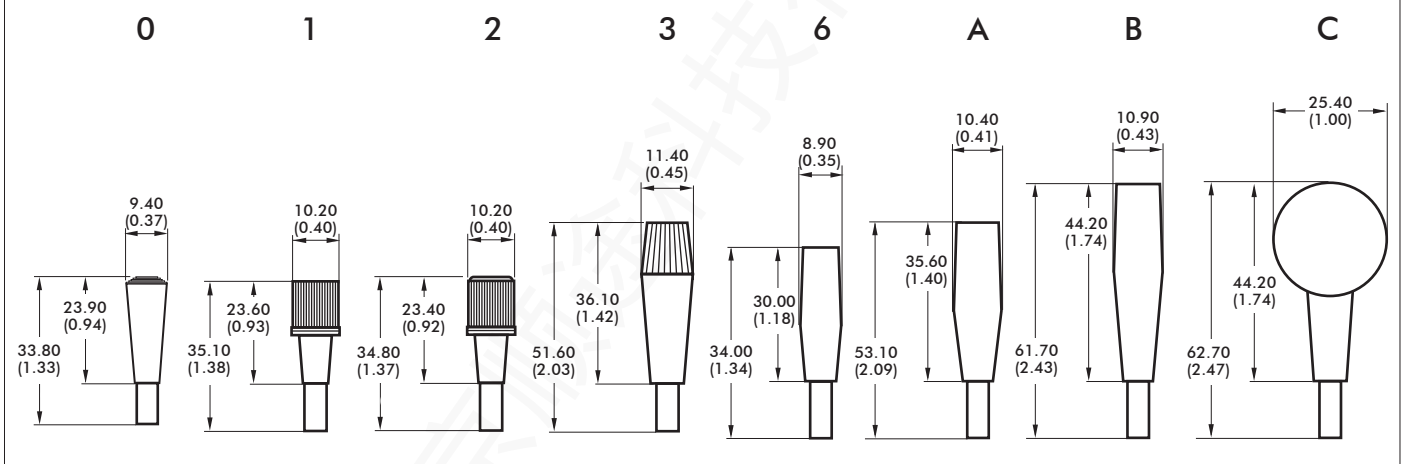


NOTES:

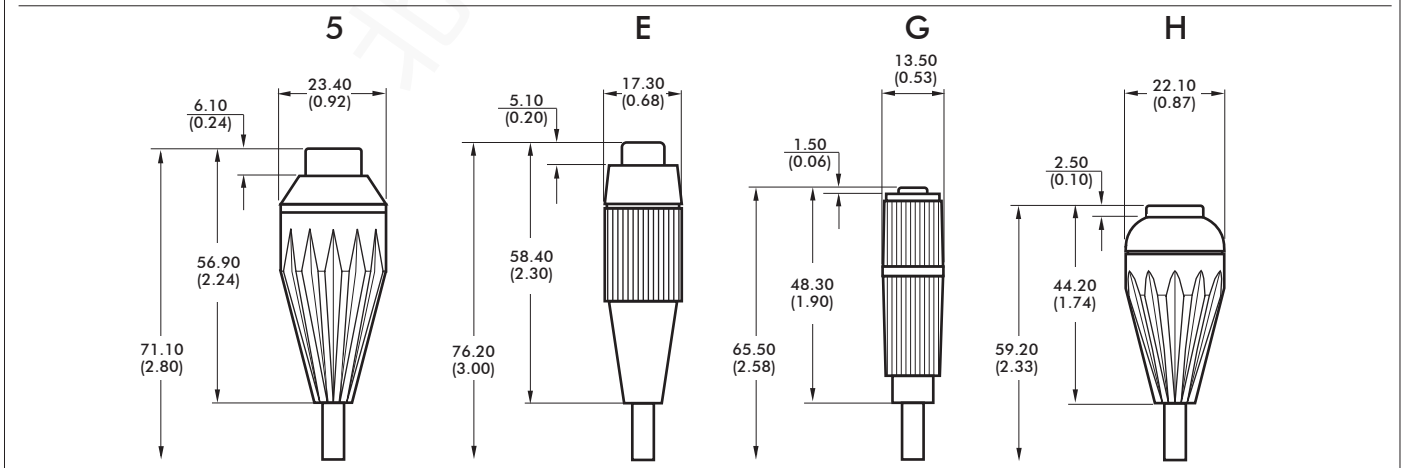
1. Mechanical dimensions represent a joystick with the largest potentiometer option.
2. Potentiometer size will vary according to selected option.

HANDLES

2 AXIS



2 AXIS WITH PUSHBUTTON¹



NOTES:

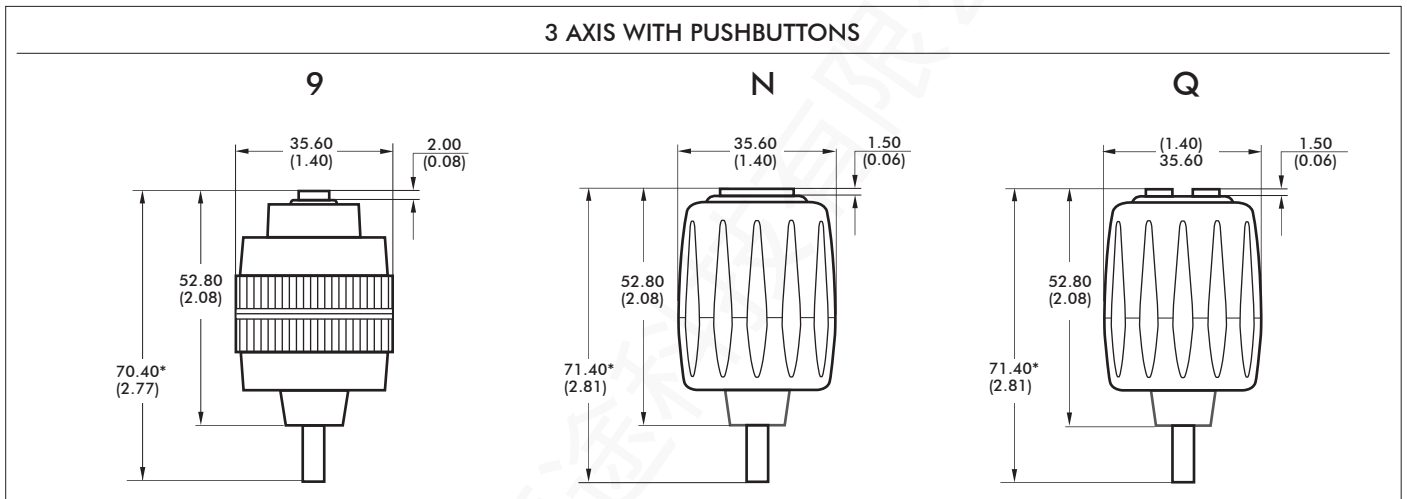
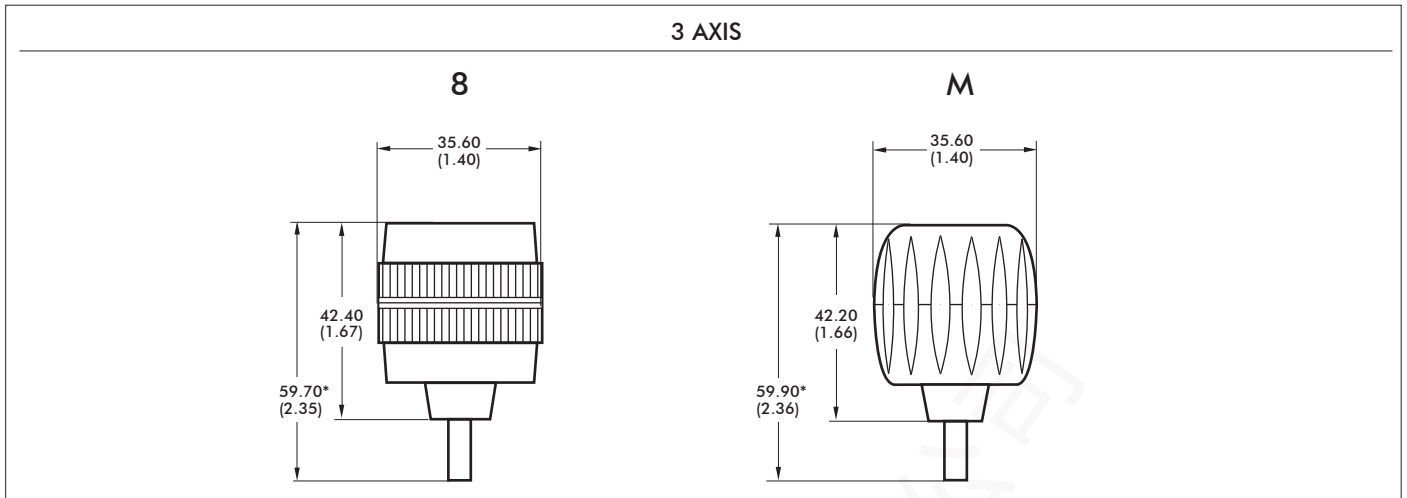
1. Pushbuttons are not sealed. Joysticks are intended for internal applications only.
2. Dimensions are in mm/(inch).

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

M series

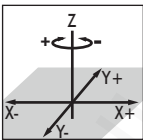
Miniature resistive joysticks

Overview



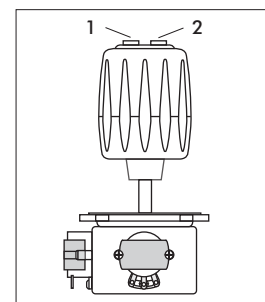
NOTES:

1. Dimensions are in mm/(inch).
2. Pushbuttons are not sealed. Joysticks are intended for internal applications only.
3. Axis orientation:


4. Wiring information:
 - Cables are provided for pushbuttons and the Z axis.
 - Cables are not supplied for the potentiometers (axis X and Y).

DEFAULT WIRE COLOR CODE*		
COLOR	FUNCTION	AWG
2 OR 3 AXIS JOYSTICK WITH 1 PUSHBUTTON - OPTIONS 5,E,G,H,9,N		
ORANGE	Switch 1	28
ORANGE	Switch Common	
3 AXIS JOYSTICK WITH 2 PUSHBUTTONS - Option Q**		
ORANGE	Switch 1	28
BROWN	Switch 2	
GREEN	Switch Common	
Z AXIS IN A 3 AXIS JOYSTICK - OPTIONS 8,9,M,N,Q		
RED	Supply	28
WHITE	Signal	
BLUE	Return	

- NOTES:**
- * Wires for the Z axis and for the pushbuttons are 292mm (11.5in) and stripped.
 - ** Handle "Q" pushbuttons are shown in the following drawing:



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

MS series

Mid-size Hall effect joysticks

Distinctive features and specifications



- Compact size
- 1, 2 and 3 axis configurations
- Sealed up to IP68
- Available with USB
- Redundant outputs available
- 10 million life cycles
- Available with J1939 CANbus and CANopen

MECHANICAL (FOR X AND Y AXIS)

- Break Out Force: 5.6N (1.25lbf)
- Operating Force: 7.5N (1.70lbf)
- Maximum Applied Force: 650N (145lbf)
- Mechanical Angle of Movement: 40°
- Expected Life: 10 million cycles
- Material: Glass reinforced nylon
- Lever Action (Centering): Spring centering

ELECTRICAL

- Sensor: Hall effect
- Supply Voltage Operating: 5.00VDC
- Reverse Polarity Max: -14.5VDC
- Overvoltage Max : 18VDC
- Output Impedance: 6Ω
- Current Consumption Max: 10mA max per axis
- Return to Center Voltage (No Load): ±200mV

MECHANICAL (FOR Z AXIS)

- Break Out Force: 0.15N·m (1.33lbf-in)
- Operating Force: 0.25N·m (2.21lbf-in)
- Maximum Allowable Force: 4.50N·m (39.83lbf-in)
- Hand Mechanical Angle: 68°
- Handle Action: Spring return
- Expected Life: 1 million cycles

STANDARD SWITCH CHARACTERISTICS/RATINGS

- Electrical Resistive Load: 5A (depending on the chosen switch)
- Electrical Inductive Load: 3A (depending on the chosen switch)
- Low Level: 10mA @ 30mV (depending on the chosen switch)
- Electrical Life: 1 million cycles 5A @ 28 VDC resistive snap-action (depending on the chosen switch)
- Mechanical Life: 1 million cycles
- Environmental Seal: IP68
- Action: Momentary, snap-action
- Operating Force: 7.5N±2.0N (1.69lbf±0.45lbf)
- Total Travel: 0.080 inches max
- Over Travel: 0.010 inches min

ENVIRONMENTAL

- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Storage Temperature: -40°C to 70°C (-40°F to 158°F)
- Sealing (IP): Up to IP68
- EMC Immunity Level (V/M): IEC 61000-4-3:2006
- EMC Emissions Level: IEC 61000-4-8:2009
- ESD: IEC 61000-4-2:2008







NOTES:

- All values are nominal.
- Exact specifications may be subject to configuration.
- Contact Technical Support for the performance of your specific configuration.

MS series

Mid-size Hall effect joysticks

Overview

MS					
SERIES	Front Buttons	Side Buttons	Spring Tension	Output Options	Additional Options
	N None O One W Two	0 None U One Upper Position L One Lower Position F Two D Deadman	00 Standard	0 0V to 5V (Rail to Rail) 1 0.5V to 4.5V 2 0.25V to 4.75V 3 1V to 4V 4 0V to 5V – Sensor 1 0V to 5V – Sensor 2 5 0.5V to 4.5V – Sensor 1 0.5V to 4.5V – Sensor 2 6 0.25V to 4.75V – Sensor 1 0.25V to 4.75V – Sensor 2 7 1V to 4V – Sensor 1 1V to 4V – Sensor 2 8 0V to 5V – Sensor 1 5V to 0V – Sensor 2 9 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 0-U USB 1-J Cursor Emulation 2-C CANbus J1939 3-C CANopen	V Voltage Regulator E Environmental Sealing
Handle	Top Buttons	Limiter Plate			
10 Ball Tip 42 Stock Grip 31 Short Stock Grip 23 Low Profile ¹ (2 Axis) 24 Low Profile ¹ (3 Axis) 54 Low Profile ¹ Square Front (2 Axis) 55 Low Profile ¹ Square Front (3 Axis)	0 None 1 One 2 Two R Rocker	S Square  R Round  X Slotted  Y Slotted  P Plus  D Diamond  G Guided Feel – Square H Guided Feel – Round			

NOTES:

1. Low Profile handles are offered in two options:



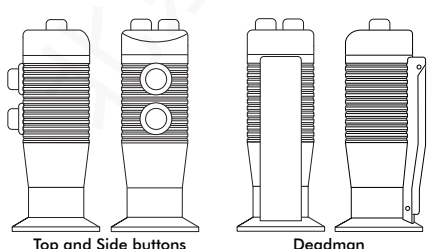
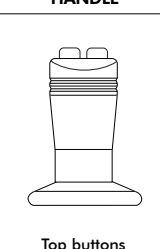
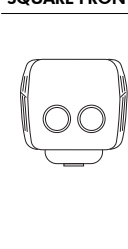

2. CANbus, USB or Voltage Regulator are mutually exclusive.



*Environmental sealing level available up to IP68. Dependent upon handle configuration.



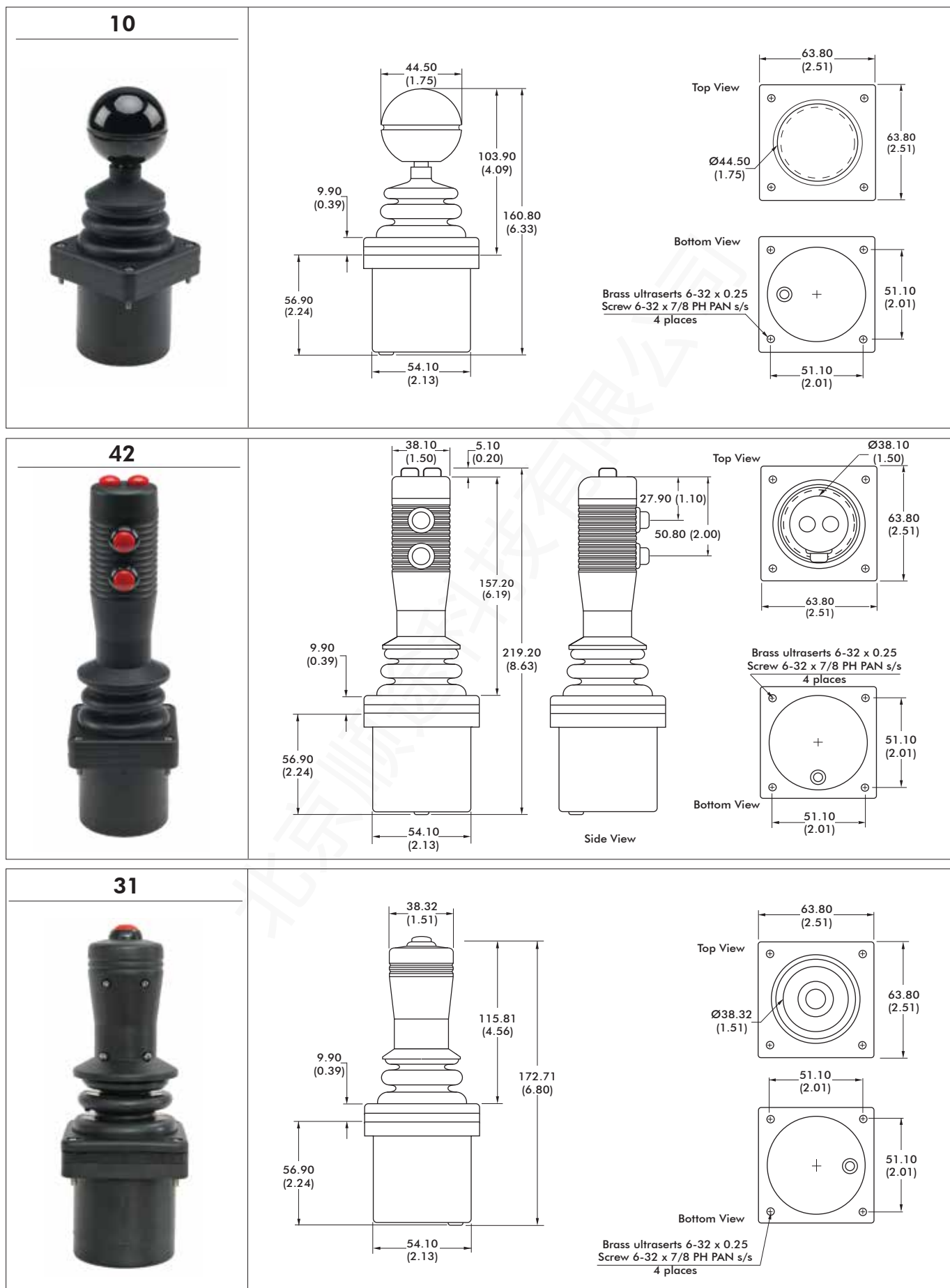
Mounting accessories. Standard hardware includes: 4 screws (6-32x7/8) Phil.

STOCK GRIP HANDLE¹	SHORT STOCK GRIP HANDLE²	LOW PROFILE SQUARE FRONT³
 <p>Top and Side buttons Deadman</p>	 <p>Top buttons</p>	
AVAILABLE BUTTON COLORS  <p>White Gray Black Red⁴ Orange Yellow Green Blue Purple</p>		

NOTES:

- The maximum possible configuration for the Stock Grip handle is up to 2 Top Buttons and 2 Side Buttons. A handle with a Deadman can have 2 Top Buttons, but no Side Buttons.
- The maximum possible configuration for the Short Stock Grip handle is up to 2 Top Buttons. It is not possible with Deadman, Index Trigger, or Side Buttons.
- The maximum possible configuration for the Low Profile Square Front handle is up to 2 Front Buttons. It is not possible with Deadman, Index Trigger, or Top Buttons.
- If unspecified, the pushbuttons will have snap action momentary switches with red button caps.
- Starting from the strain relief, the cable is 406mm (16in) long, 6.40mm (0.25in) stripped with plug, covered with an expandable cable sleeve.

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

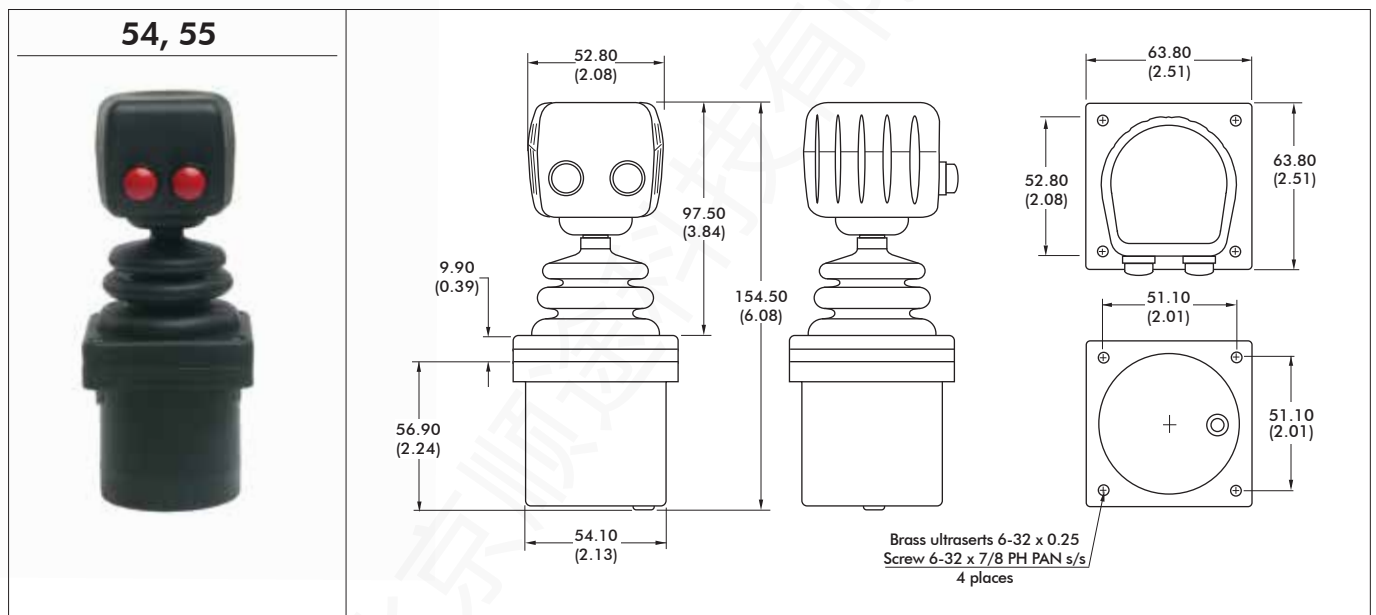
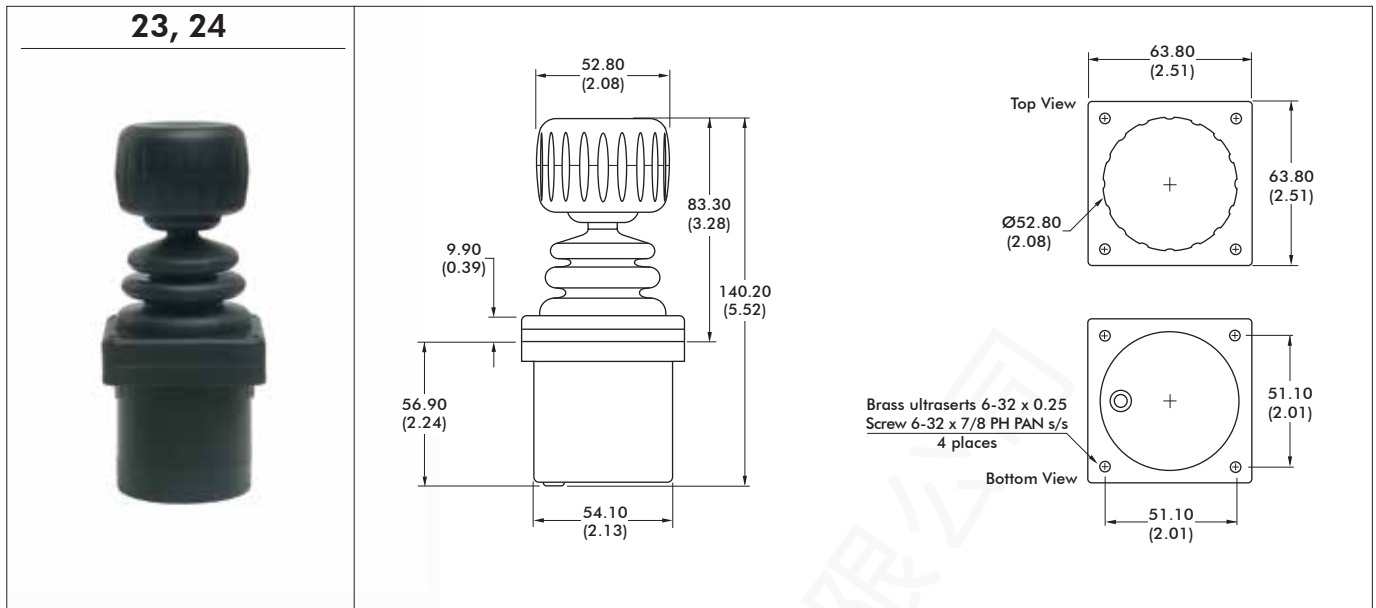


Note: The company reserves the right to change specifications without notice.

MS series

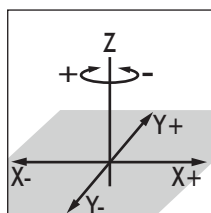
Mid-size Hall effect joysticks

Overview

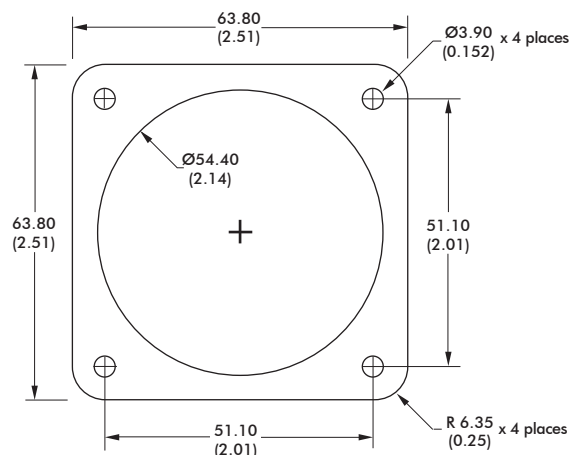


NOTES

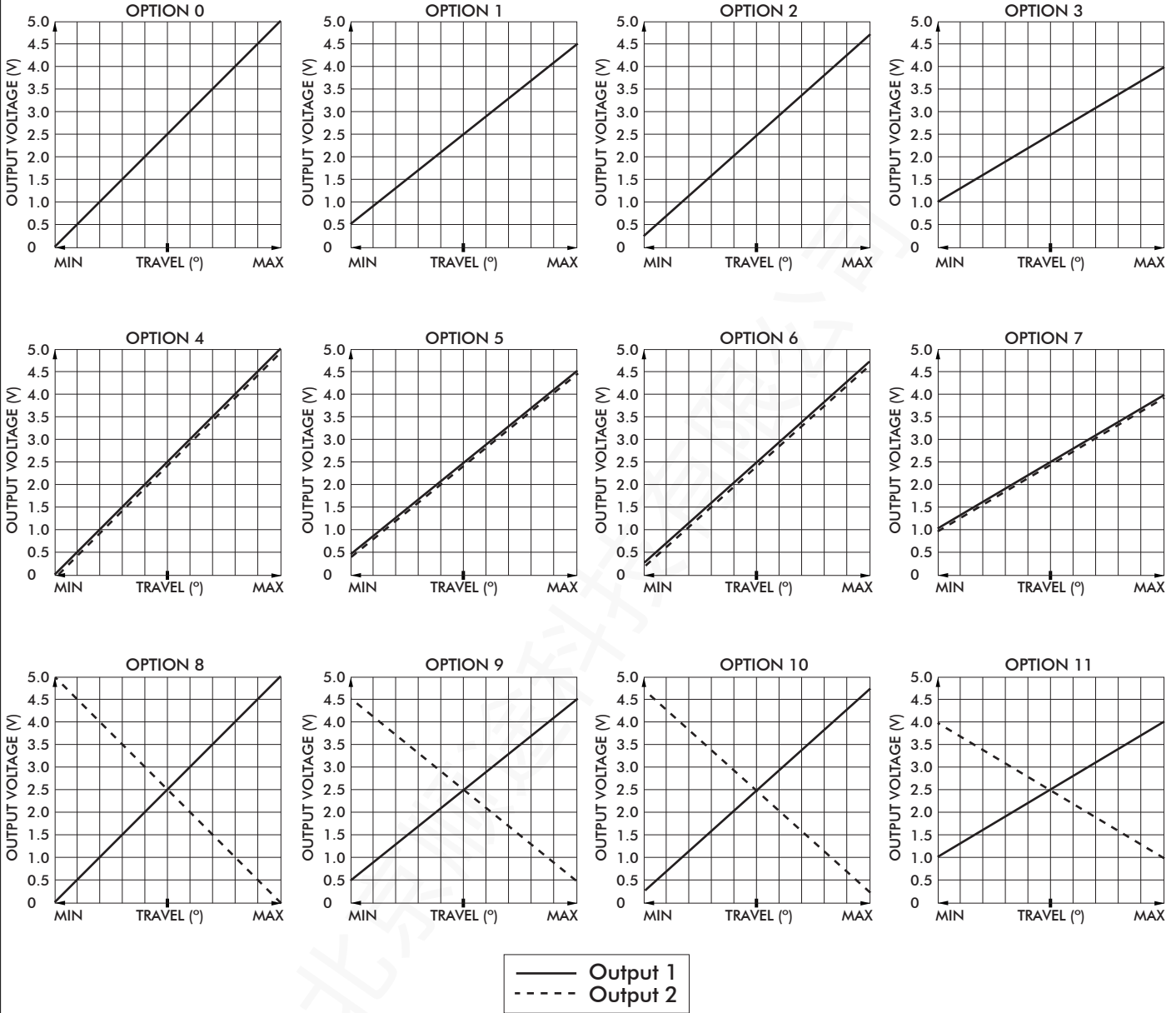
1. Dimensions are in mm/(inch).
2. Standard configurations feature a rubber grommet as indicated in the above drawings. An optional plastic strain relief is available and will increase under panel mounting depth by 19.05 (0.75).
3. Actual strain relief position may vary.
4. Axis orientation:



MOUNTING CUTOUT DIMENSIONS



VOLTAGE OUTPUT OPTIONS



MS series

Mid-size Hall effect joysticks

Overview

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 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

ADDITIONAL OUTPUT OPTIONS

VOLTAGE REGULATOR

The Voltage Regulator is a multi-wired analog option used to mate to a variety of industrial control voltages. The Voltage Regulator may be used when the supply or output voltage is greater than 5V or when bipolar output is required.

User Specified Output Voltage:

- 0-5 VDC
- 0-10 VDC
- ± 5 VDC
- ± 10 VDC

ELECTRICAL SPECIFICATIONS

- Supply Voltage: (Output Voltage + 1VDC) to 30VDC
- Supply Current: 90mA max

CANBUS

CANbus J1939

APEM's MS CANbus joysticks conform to the SAE J1939 serial bus specification used for communications between electronic control units and vehicle components. The MS CANbus option provides extension for up to 24 digital I/O and 11 analog inputs.

ELECTRICAL SPECIFICATIONS

- Supply Voltage: 6VDC to 35 VDC
- Supply Current: 15mA min, +5mA per LED, +10mA per axis

WIRING SPECIFICATION

- Red Wire: Supply Power
- Black Wire: Ground
- Green Wire: CAN high data
- White Wire: CAN low data
- Blue Wire: Identifier Select LSB
- Orange Wire: Identifier Select MSB

ENVIRONMENTAL

- Operating temperature: -25°C to +70°C (-13°F to +158°F)
- Storage temperature: -40°C to +70°C (-40°F to +158°F)

CONNECTOR OPTIONS:

- Cable assembly with Deutsch DT04 style plugs

CANbus CONFIGURATION:

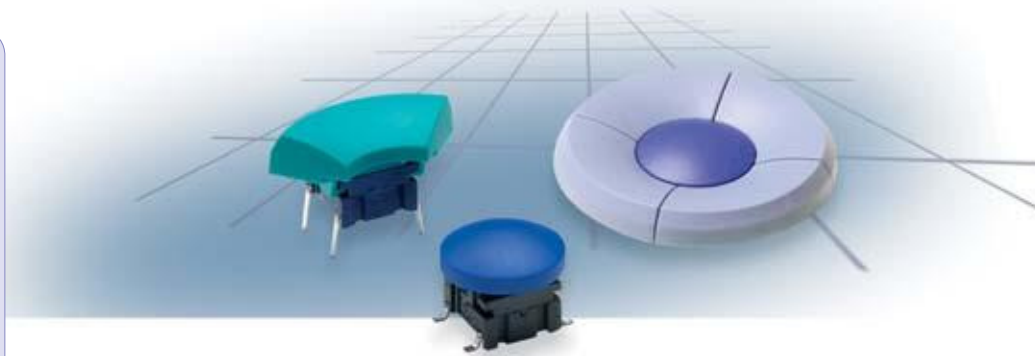
- Contact Technical Support for assistance

CANopen

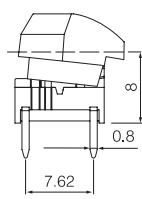
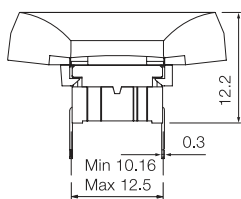
- Contact Technical Support for assistance with CANopen configuration.

Technical Data

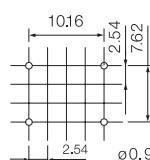
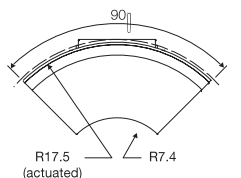
- through-hole or SMD
- 50mA/24VDC
- single pole/momentary
- 10.000.000 operations life time
- IP67 sealing
- temperature range:
low temp: -40/+115°C
high temp: -40/+160°C



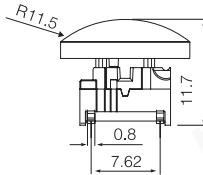
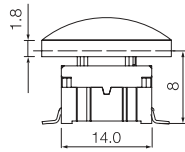
Dimensions 1ZB (through-hole)



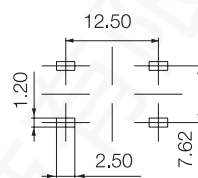
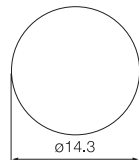
PCB layout



Dimensions 1ZC (SMD)



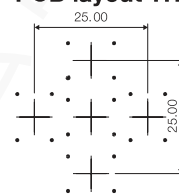
PCB layout



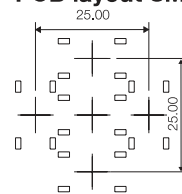
Recommended panel cut-out:

ø35.0-35.5 Depending on application

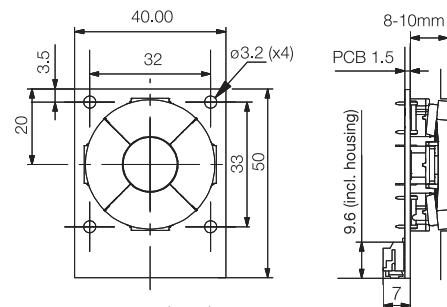
PCB layout TH



PCB layout SMD



Dimensions Navimec[™] Module



Dimensions (mm)

How to order

3 A

Switch



Mounting

T through-hole
S surface mount



L 6 low temp.
H 9 high temp.



Cap 1ZB



03 grey

06 white

09 black

30 ultra blue

40 dusty blue

42 aqua blue

50 metal dark blue

53 metal light grey

57 metal dark grey

58 metal bordeaux

3 F

Switch



Mounting

T through-hole
S surface mount



L 6 low temp.
H 9 high temp.



Cap 1ZC



Navimec[™] Module

Part No. 9508000

Navimec[™] Module excl. keycaps

Part No. 950XXYY

Navimec[™] Module incl. keycaps

Part No. 9509XXXYYY

Navimec[™] Module incl. keycaps with legends

The module can be delivered with keycaps (4 x 1ZB and 1 x 1ZC) in solid colours or black keycaps with white legends.

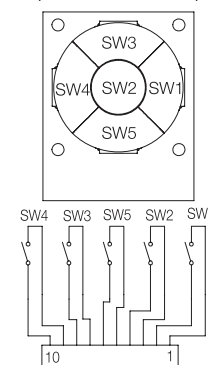
For module incl. keycaps in solid colours (950XXYY) please indicate colour code for 1ZBXX and colour code for 1ZCYY.

For module incl. keycaps with legends (9509XXXYYY) please indicate legends for 1ZBXXX and legends for 1ZCYYY. All Caps are black with white legends. Please see legends available on page 23.

Examples: Module with 5 switches (4x3ATL6+1x3FTL6) mounted with 4x1ZB30 ultra blue and 1x1ZC42 aqua blue = 9503042.

Module with 5 switches (4x3ATL6+1x3FTL6) mounted with 4x1ZB09XD136 (legend arrow) and 1x1ZC09118 (legend OK) = 9509136118.

Circuit Diagram Navimec[™] Module (Front side View)



The plug on the Navimec[™] module is JST SMT S10B-PH-SM3-TB or similar.
We recommend using
Cable socket: JST PHR-10 or similar
Contact: JST SPH-002T-PO.5S or similar.

Ordering example: 4x3ATL6+1ZB53 and 1x3FTL6+1ZC58 or Navimec[™] Module 9505358

For updates of products and/or changes of specifications please see www.mec.dk

New!

NV series

Compact 4- or 5-way switch based miniature joysticks

Distinctive features and specifications



- Positive tactile feedback in all directions
- Sealed to IP69K
- Compact and low profile
- Robust : shock, vibration and salt spray resistant

ELECTRICAL SPECIFICATIONS

- Electrical function : 4 or 5 momentary NO
- Max. current/voltage rating with resistive load : 50mA
12VDC
- Electrical life at full load :
1.000.000 cycles per direction
1.000.000 cycles for pushbutton
- Output : MOLEX 6 pin connector (Ref: 53398-0671)
Mating connector Molex 51021-0600

MATERIALS

- Sealing gasket : elastomer
- Case : brass, black chrome plated
- Actuator : ABS
- Lever : steel
- Nut : brass, black chrome plated

ENVIRONMENTAL SPECIFICATIONS

- Front panel sealing :
IP69K according to DIN 40050-9
IP67 according to IEC 60529
- Shock resistance per IEC 60068-2-27 :
3 sinusoidal impulse 300m/s² 18ms on 3 axis
- Vibrations (random, 3 axis) per IEC 60068-2-64 : 10-350Hz
Vibrations (sinus) per IEC 60068-2-6 : 10-200Hz / 20m/s² ; dwell period
30 minutes
- Salt Spray : 96 h per IEC 60068-2-11/KA
- Damp heat per IEC 68-2-78 : 40°C 93% HR 10 days
- Cold and dry heat, temperature shock per IEC 68-2-14/Na :
-40°C to +85°C - 10 cycles
- Operating temperature: -40°C / +65°C

MECHANICAL SPECIFICATIONS

- Life : 1 million cycles per direction
- Angular travel : 12°
- Pushbutton travel : 1,5 mm
- Operating force :
Directions : 4 N ± 1 N
Pushbutton: 11 N ± 2 N
- Panel thickness : 1 to 10 mm (.039 to .393)
- Torque : 2 Nm min. applied to nut
- Mechanical strength : the switch can withstand a force of 100 N applied
in any directions

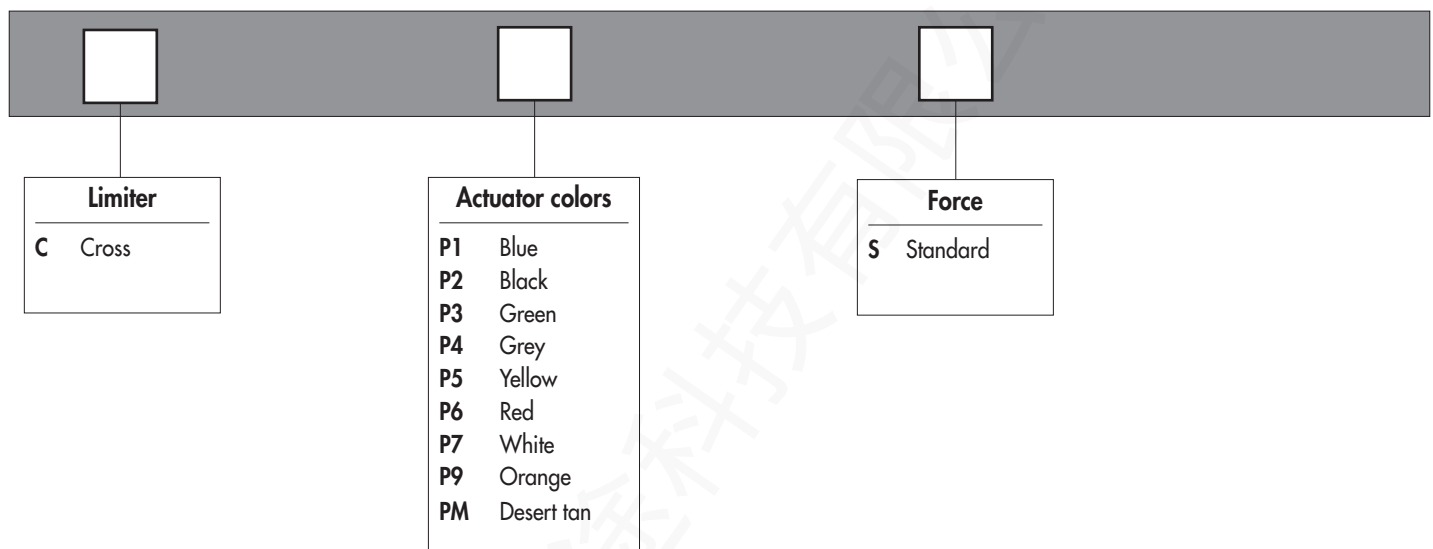
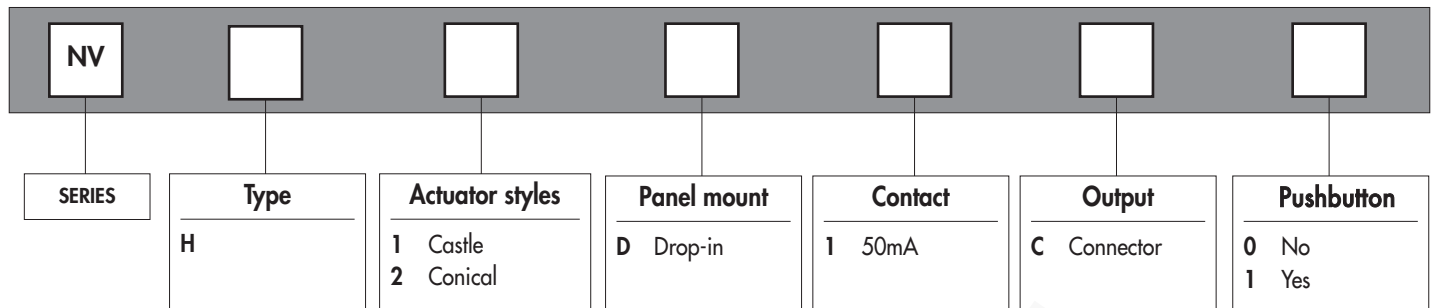
The company reserves the right to change specifications without notice.

NV series

New!

Compact 4- or 5-way switch based miniature joysticks

Overview



Dimensions : First dimensions are in mm while inches are shown as bracketed numbers.

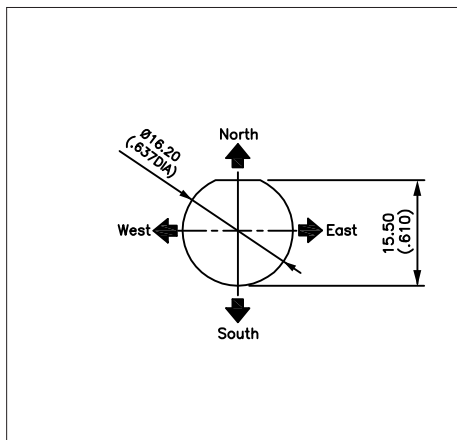


Mounting accessories : Standard hardware supplied : 1 hex nut 19 mm across flats

New!

NV series

Compact 4- or 5-way switch based miniature joysticks

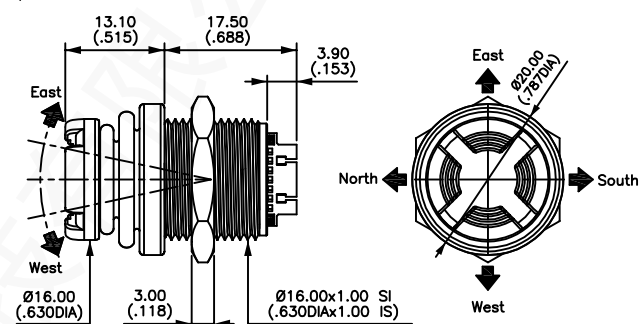


4 directions



NVH1D1C0....

➔ For direction available

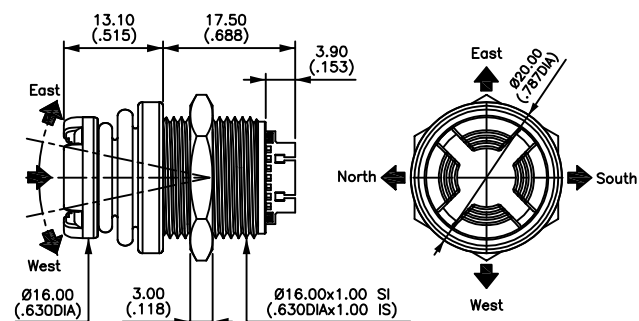


4 directions + pushbutton



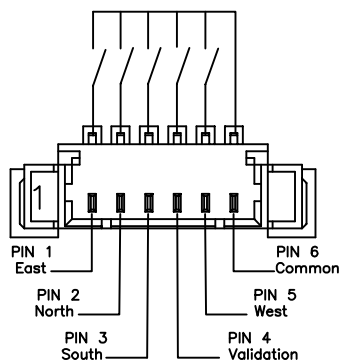
NVH1D1C1....

➔ For direction available



WIRING (REAR VIEW)

PIN 4 for pushbutton version only



NZ series

Compact switch joysticks

Distinctive features and specifications



- Compact Size
- 11.9mm Bush Mount
- Alternate Handle Selection
- Polyimide Flexi Tail Option
- Silicone Rubber Sealing Boots
- V5 switches up to 2A

MECHANICAL

- Mechanical Life: 1 Million Operations (maximum)
- Lever Travel: 15° ($\pm 7.5^\circ$ from center)
- Lever Material: Stainless Steel
- Weight: 35 to 45 grams (subject to configuration type)
- Body Material: Mineral Filled Nylon-6
- Boot Material: Silicone rubber
- Mounting - Bush: Single Point 11.9mm Diameter
- Recommended Panel Thickness (for half boot): 1-4 mm – suggested 3mm
- Recommended Panel Thickness (for full boot): 1-4 mm – suggested 2mm
- Impact Test Rating: IK09 (Lever / Boot options A and B)

ELECTRICAL

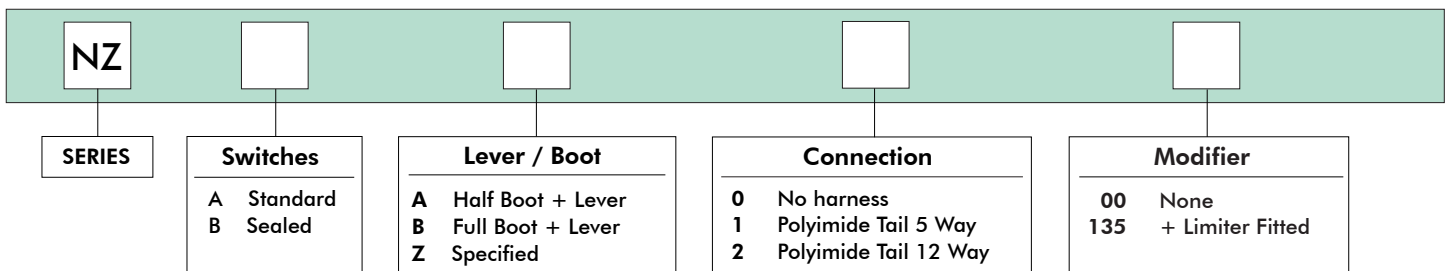
- Nominal Current Switch Option A: Up to 2A
- Nominal Current Switch Option B: Up to 100mA
- Maximum Voltage: 125VAC
- Switch Contacts: Changeover gold plated silver alloy
- Contact Life: Load Dependent (Please refer to factory)

ENVIRONMENTAL

- Temperature Range Switch Option A: -25°C to +50°C (-13°F to +122°F)¹
- Temperature Range Switch Option B: -40°C to +85°C (-40°F to +185°F)¹
- Above Panel Seal-Lever / Boot options A and B: To IP67
(IP Ratings quoted refer to assembled joysticks with boots fitted, and are above panel seals only).

NOTES:

- All values are nominal.
- Specifications are subject to the joystick configuration.
Contact Technical Support for the performance of your specific configuration.
- 1. Temperature specifications may be subject to the chosen switch option.
Please refer to factory.



NZ series

Compact switch joysticks

Overview

JOYSTICK MOUNTING (ALL VERSIONS)

NOTE: Both full and half boots to be tightened to 1.5Nm to ensure the optional panel gasket is fully compressed. If extra security is required, use an appropriate bond to secure the nut to the bush. Take care when fitting boots over levers, ensuring they are not twisted, once installed.

NZ WITH FULL BOOT	NZ WITH HALF BOOT

CONFIGURATION

Connection Option 0
No Harness
Switches suitable for 125VAC @ 2A (Resistive load)

PANEL CUT-OUT

Connection Option 1
5 Way Polyimide tail
Tail and connector suitable for 36VDC @ 2A max.

- 1 North Normally Open
- 2 West Normally Open
- 3 South Normally Open
- 4 East Normally Open
- 5 Switch Common

Connection Option 2
12 Way Polyimide Tail
Tail and connector suitable for Small Control Signals only (12VDC @ 100mA max.)

1 South Normally Closed	7 South Normally Open
2 West Normally Closed	8 East Normally Open
3 West Normally Open	9 North Normally Open
4 West Common	10 South Common
5 East Normally Closed	11 East Common
6 North Normally Closed	12 North Common

TOP VIEW
Options 1 and 2

Viewed from above

NOTE: Images shown are for illustration purposes only. Dimensions are in mm/(inch).

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

SWITCHES

The NZ series is supplied with two switch options. Both options have a gold plated silver alloy contact, providing reliable switching at low current levels. Switch option A being suitable for up to 2A operation and switch option B being suitable for 100mA operation. The anticipated life of the switches is heavily determined by the application and parameters such as load type. Please contact the factory for further advice about the expected switch performance under different loads of DC power supplies.

MECHANICAL OPERATION

All NZ series are supplied with an open square gate, allowing the user to move freely in all directions. This configuration allows the user to move in a diagonal direction which will provide a contact on two switches simultaneously. As a standard option the joystick may be factory fitted with an anodized aluminum limiter plate, limiting the travel to a "+" shape e.g. North, South, East and West only, with no diagonal travel, or a slot shape for North, South movement only.

LEVERS AND SEALING

The NZ series is offered with two panel sealing options:

- The silicone half boot option offers a product that closely mimics the look of a toggle switch. Lever Option A also mimics the look of a toggle lever. Additional levers to suit the half boot construction are available upon request.
- The silicone full boot option offers a product that more closely resembles a traditional joystick. Lever Option B is designed to work with a full boot. This option provides for the best possible panel seat, and has the tallest construction offered.

The half boot is supplied as standard with an additional sealing washer to seal the underside of the mounting nut. All boots are supplied as standard in black. The half boot is also available in red and green.

In all cases the NZ series is also supplied with an additional sealing gasket which may be optionally fitted to seal the body of the joystick to the underside of the panel.

NOTES: All seats offered are above panel seals. The NZ series is not sealed under panel. Switch option A are unsealed switches. Switch Option B are sealed switches.

CONNECTION DETAILS

Joysticks are supplied as standard without a cable harness, allowing the user flexibility of connection. Alternatively, joysticks specified with option A switches may be supplied with a polyimide ribbon tail, available in two configurations:

- The 5-way tail provides a connection to the four normally open contacts (North, South, East and West) and one common line. The 5-way tail is suitable for use with loads up to 2A @ 36VDC.
- The 12-way tail provides a connection to all twelve contacts i.e. normally open, normally closed and common on each of the four switches. The 12-way tail is suitable for use with small control signals up to 100mA 12VDC.

Both tails are terminated with a 0.1 inch pitch female connector housing. Male connectors are available upon request.



PC series

Ergonomic pendant controllers

Distinctive features and specifications



- Analog voltage or USB interface
- Readily available with TS series Thumbstick
- Optional sealing up to IP67
- Designed for optimal ergonomics
- Custom configurations available

TYPICAL MECHANICAL SPECIFICATIONS

TS SERIES THUMBSTICK (PN TS1R2S00A)

- Operating Force: 3.1N±0.5N
- Maximum Vertical Load: 200N (45lbf)
- Maximum Horizontal Load: 150N
- Travel Angle: ± 25°
- Expected Life: 1 million cycles
- Lever Action (centering): Spring centering

IP SERIES PUSHBUTTON (PN IPP3SAD2LOG)

- Total Travel: 1.7mm (0.067)
- Operating Force: 6N ± 2N
- Mechanical Life: 1 million cycles

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)
- Optional sealing up to IP67 & IP69K

MATERIALS

- Case: Thermoplastic, black

ELECTRICAL - USB OPTIONS

- Power (via the USB interface): 5VDC, Consumption 100mA
- Cable: USB Type A male connector
- Cable length: 7'

SUPPORTED PROTOCOLS

- USB HID 1.1 game controller
- DirectX (Gaming Control)
- Uses standard Direct X HID drivers

NOTES:


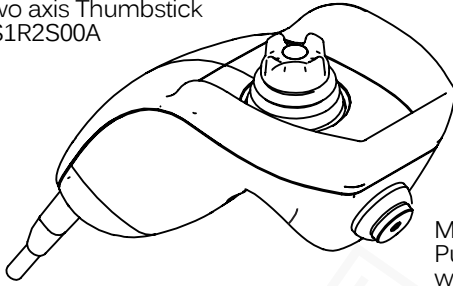

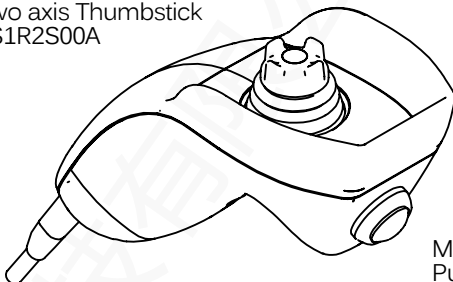

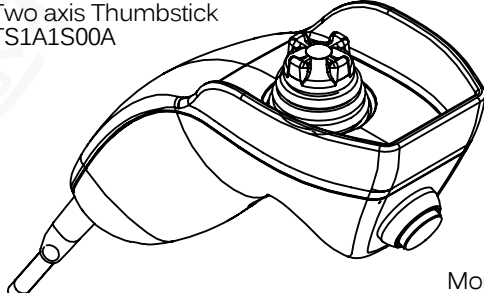


Notice: Exact specifications may be subject to configuration. Contact Technical Support for the performance of your specific configuration.

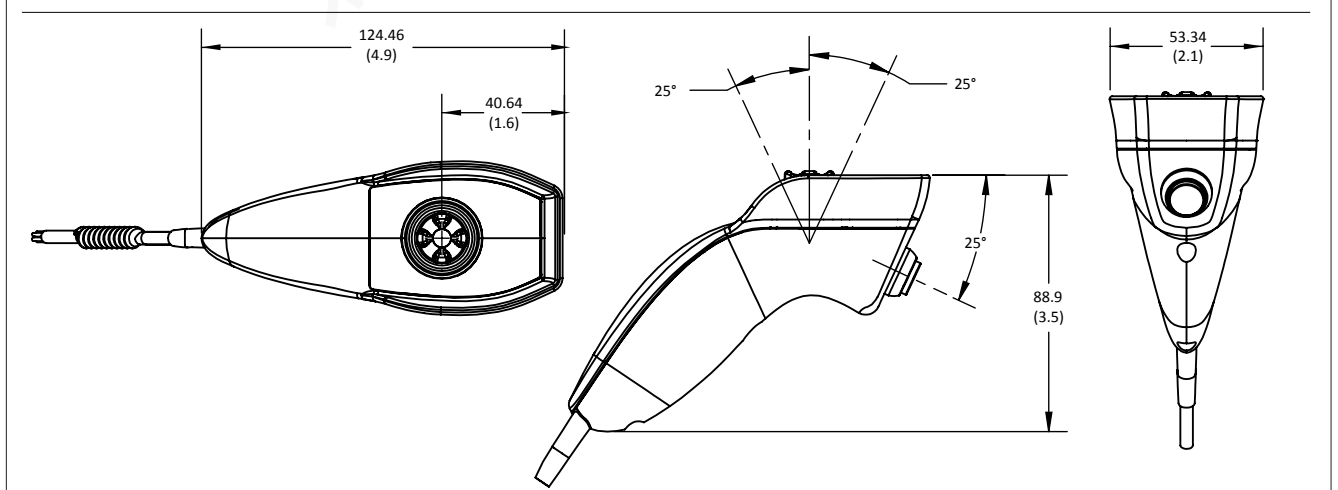
PC series

Ergonomic pendant controllers

Overview

<p>Two axis TS and momentary pushbutton with LED</p> 	<p>Part number PC2430</p> <p>Two axis Thumbstick TS1R2S00A</p>  <p>Momentary Pushbutton with Green LED IPP3SAD2LOG</p> <p>OUTPUT - USB "Game Controller"</p>
<p>Two axis TS and momentary pushbutton</p> 	<p>Part number PC2441</p> <p>Two axis Thumbstick TS1R2S00A</p>  <p>Momentary Pushbutton ISR3SAD100</p> <p>OUTPUT - USB "Game Controller"</p>
<p>Two axis TS with momentary pushbutton, coiled cable</p> 	<p>Part number PC3566</p> <p>Two axis Thumbstick TS1A1S00A</p>  <p>Momentary pushbutton ISR3SAD600</p> <p>OUTPUT - 0V to 5V</p>

HANDLE DIMENSIONS



RS series USB desktop joystick

Distinctive features and specifications



- Three axis Hall effect joystick
- 12 bit resolution
- USB interface
- Ergonomic design for left or right hand use
- Six tactile pushbuttons

SPECIFICATIONS

JOYSTICK PERFORMANCE:

- Hall effect three axis joystick
- X/Y/Z for positioning control
- Joystick travel: X/Y axis +/-18°, Z axis +/-40°
- Centering: single spring, omni-directional
- Joystick shaft: stainless steel
- Joystick boot: silicone
- Joystick handle: glass filled nylon

PUSHBUTTON PERFORMANCE:

- Six long life tactile switches

DESKTOP HOUSING:

- High impact ABS

POWER:

- Via the USB interface (5V DC)
- Consumption 100mA

APPROVALS:

- EN 55024:1998, EN 55022, CE
- FCC Part 15 Subpart B Class B
- RoHS compliant

INTERFACE:

- USB port

CONNECTORS:

- USB Type A Male
- Cable Length: 2m; 6ft. 6.8in

SYSTEM SUPPORT INTEGRATION:

- Windows 7, Vista, XP, 2000, Windows 8, OSX, Linux

SUPPORTED PROTOCOLS:

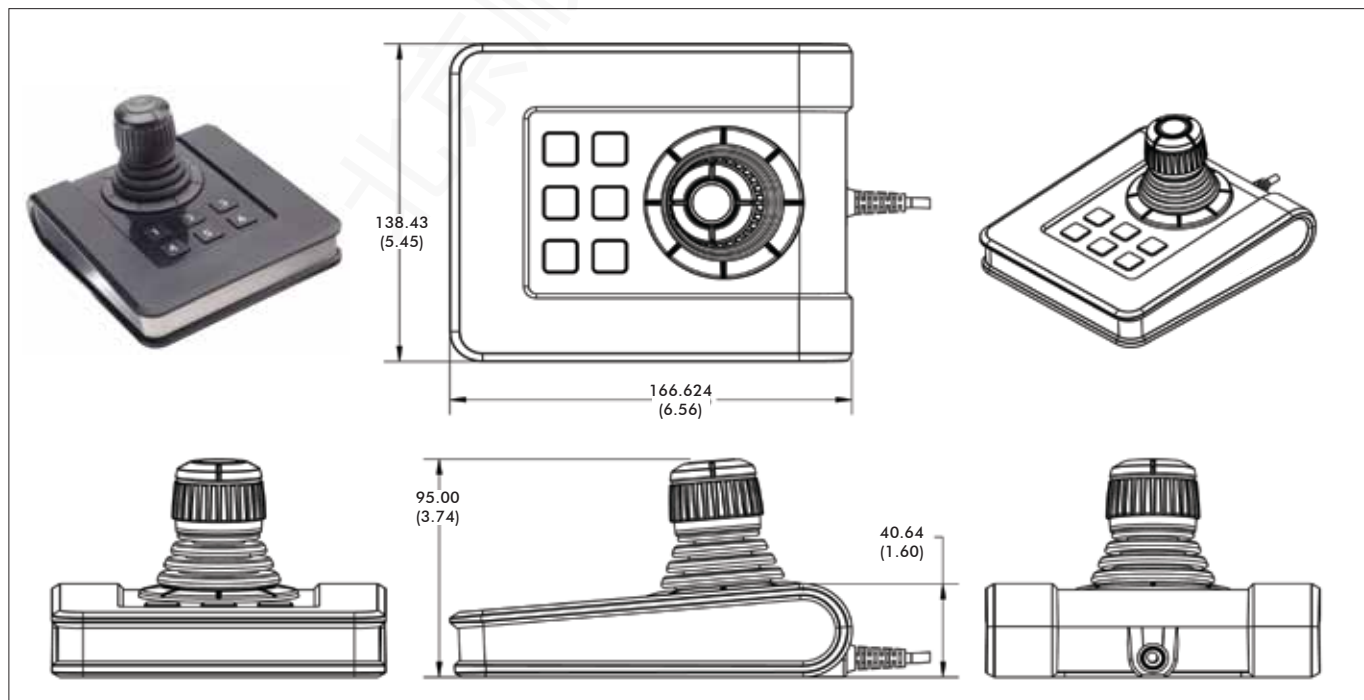
- USB HID 1.1 game controller
- Direct X (Gaming Control)
- Joystick: Three HID axis
- Pushbuttons: 6 HID buttons
- Uses standard DirectX HID drivers
- Connects directly to workstation PC

ENVIRONMENTAL:

- For indoor use only

OPERATING CONDITIONS:

- - 25°C to +70°C (-13°F to +158°F)



NOTE: All dimensions are in mm/(inch)

SN series

Hall effect T-bar fader

Distinctive features and specifications



- Consistent smooth feel
- Precision ball race bearings & PTFE guides
- Latest generation Hall effect sensor
- 12 bit resolution
- "Barrel" or "Bullet" aluminum handles
- Analog voltage or PWM output options
- Absolute positioning
- Industry standard mounting

MECHANICAL

- Operating Force: 0.5N
- Mechanical Angle of Movement: 63° (±31.5° from center)
- Expected Life: 1 Million Operations
- Mass/Weight: 65g
- Package Size (mm) (L x W x H) or (Dia x H): 75 x 96 x 42mm
- Lever Action (Centering): Friction Clutch

MATERIALS

- Body: Mineral filled nylon - Black
- Lever: Acetyl - Black
- Handle: Aluminum - Silver anodized
- Screening Plates: Mild Steel - Zinc plated

ENVIRONMENTAL

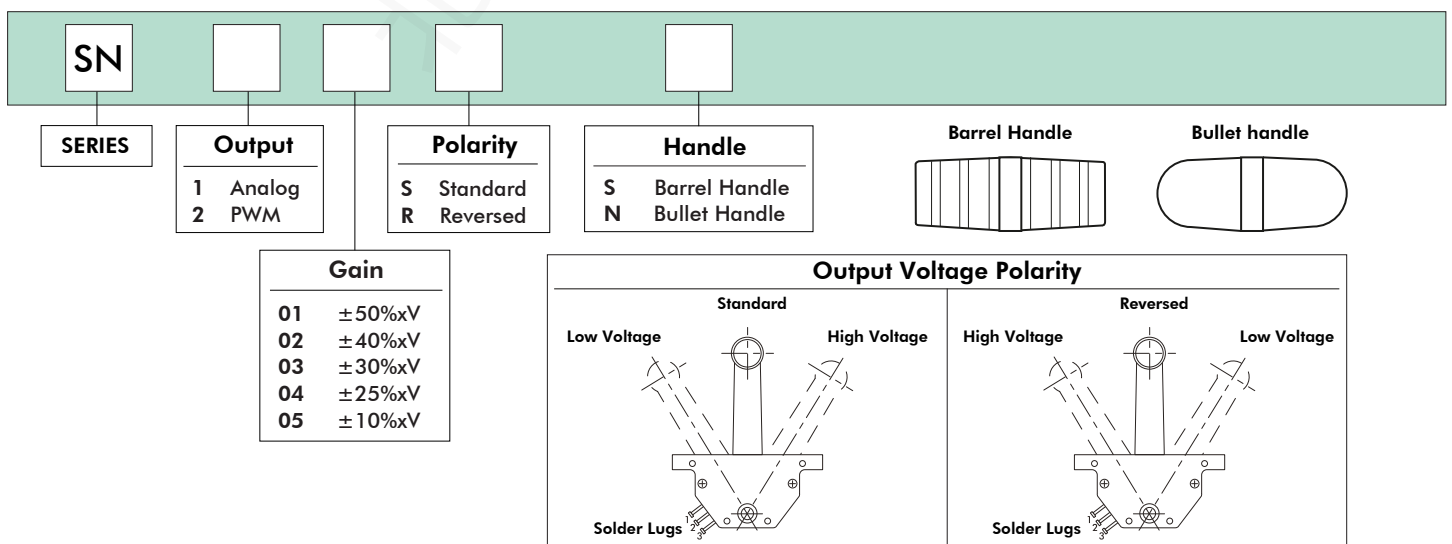
- Operating Temperature: -20°C to +70°C (-4°F to +158°F)
- Storage Temperature: -40°C to +70°C (-40°F to +158°F)
- Sealing (IP): Not sealed. For internal applications only.

ELECTRICAL SENSOR

- Sensor: Hall effect
- Output at Center: $V/2 \pm (5\% \times \text{Gain})$
- Power Supply: $5V \pm 0.5V$ Transient free
- Reverse Polarity Max: -10VDC
- Overvoltage Max: 20VDC
- Output Voltage: 0V to 5V (See gain options)
- Output Impedance: 10Ω
- Current Consumption Typ: 13mA
- Load: Minimum 10K, preferred 100K+

NOTES:

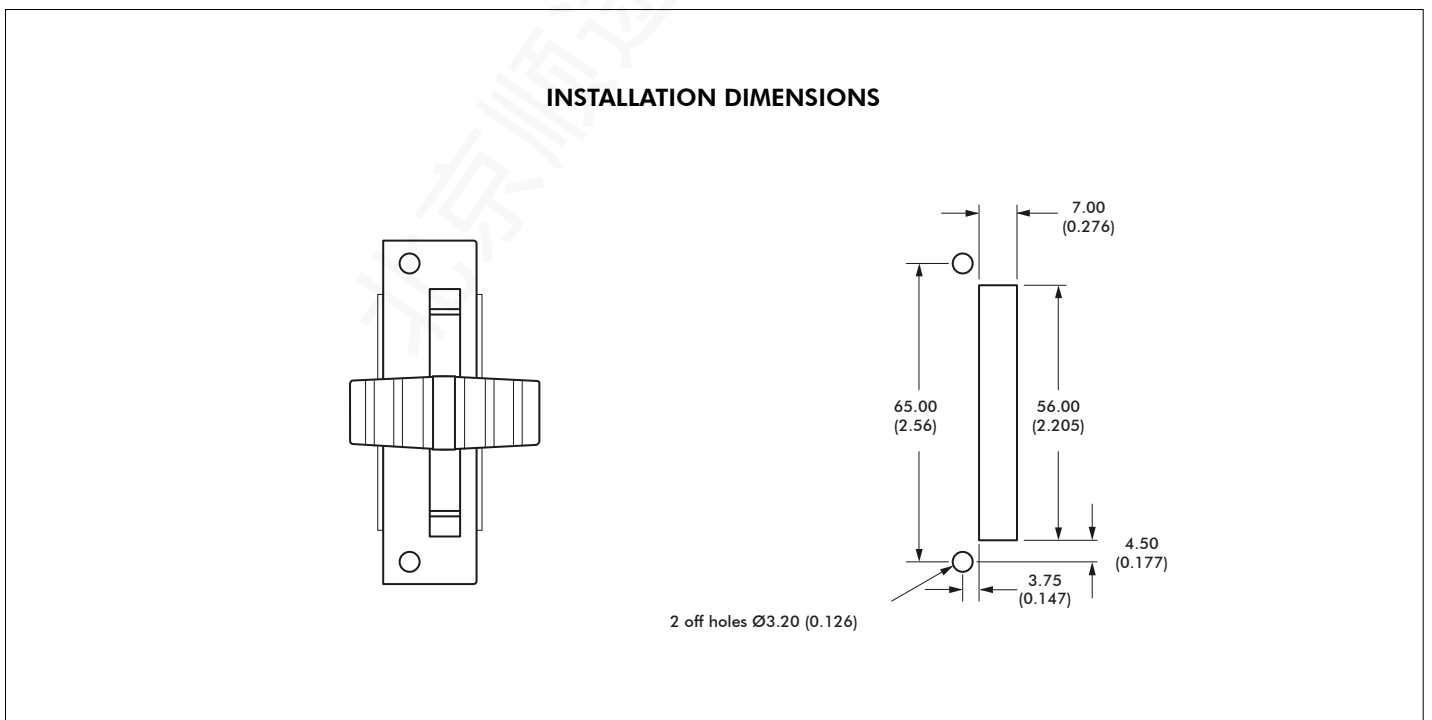
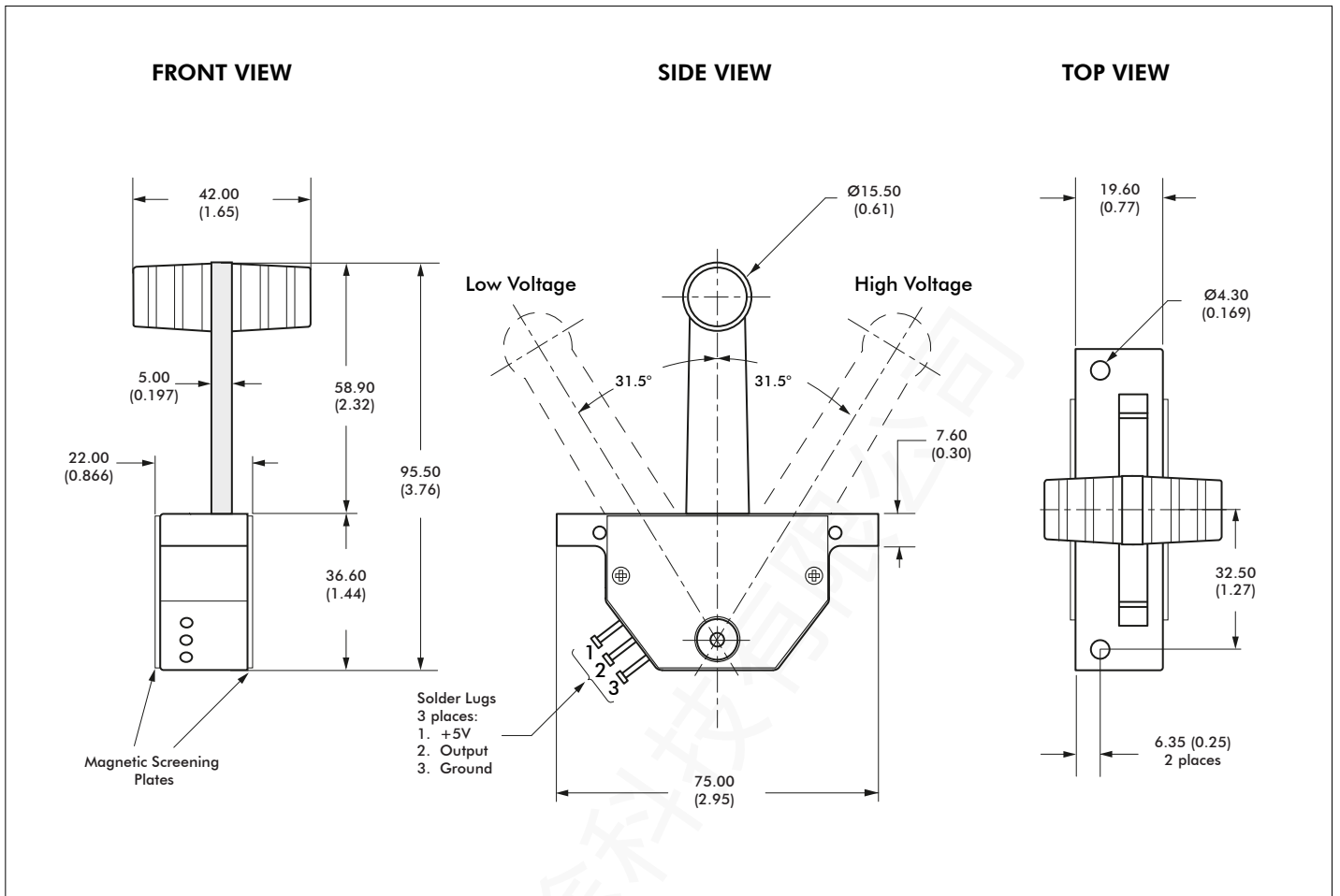
- All values are nominal.
- All specifications shown are based on a standard configuration and are provided for guidance only.
- Please contact factory for assistance on how to achieve the best performance from your chosen configuration.



SN series

Hall effect T-bar fader

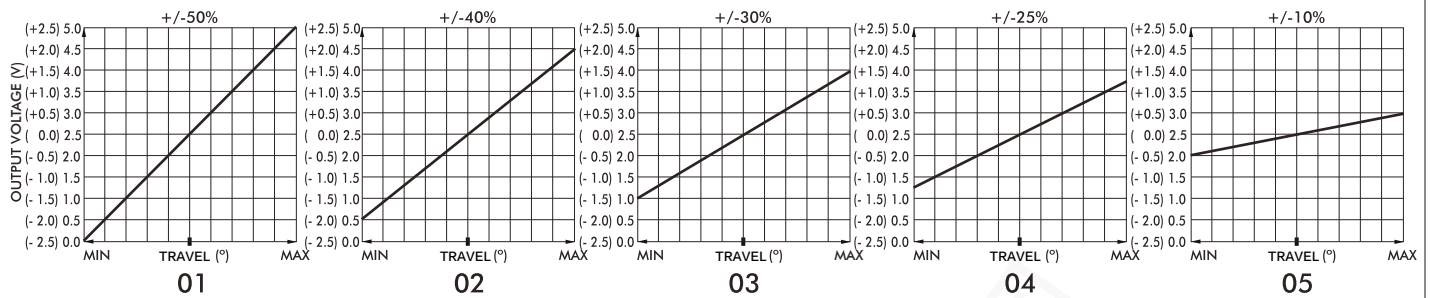
Overview



NOTES:

Dimensions in mm/(inch).
 Images shown are for illustration purposes only.

GAIN OPTIONS



MECHANISM

The SN series utilizes high quality ball bearings at the pivot point of its lever and uses a PTFE friction clutch assembly to create a smooth, damped, put and stay feel of the lever to ensure a consistent feel over the life of the product.

POWER SUPPLY

The SN series is designed to be powered by a regulated $5V \pm 0.5V$ power supply. The output is ratiometric, making a stable, noise free, power supply essential. The power supply to the SN series should be carefully regulated to be within tolerance. Should the power supply change outside specified tolerances, permanent damage may occur.

MAGNETIC IMMUNITY AND SYSTEM DESIGN

The SN series faders incorporate magnetic shielding, however, mounting or operating the SN series close to strong magnetic fields is not recommended. System designers should follow best practice when incorporating the SN series into their products. Care should be taken to disconnect the power supply properly and to employ adequate EMC shielding.

MOUNTING

When mounting the SN series, care should be taken to site it in a position that does not make it vulnerable to damage when in use. The SN series must not be subject to water spray, excessive humidity or dust. The handle is supplied separately, in two halves that must be screwed together after the SN series has been mounted to the panel.

GAIN OPTIONS

The voltage output on the wiper, at full scale deflection is determined by the gain. The gain is expressed as a percentage of the voltage supplied. Therefore (assuming a 5V supply), a SN series specified with $\pm 25\%$ gain would yield 1.25V at South and 3.75V at North. A range of gain options are available as standard. All SN series are supplied pre-set and no further calibration is needed throughout the lifetime of operation.

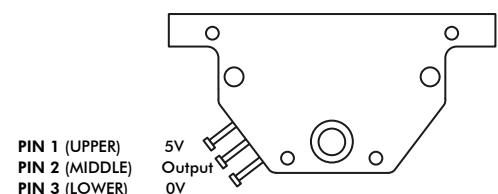
OUTPUT IMPEDANCE

The voltage output at the center and at each end of travel are specified across an infinite load, with no current flowing. The output impedance specified in the electrical specification should be taken into account when designing a system. Load resistance of less than 10K Ohms is not recommended.

CONNECTIONS

The SN series are supplied with three solder post connections.

Additional cable outputs and customer specific connectors are available on request.



TH series

Single-axis throttle joysticks

Distinctive features and specifications



- Rugged, hand operation
- Hall effect sensing
- Single axis friction clutch operation
- Optional mechanical detents and/or microswitches
- Redundant outputs available
- Sealed up to IP68

MECHANICAL

- Break Out Force : 6.6N (1.50lbf)
- Operating Force: 7.7N (1.70lbf)
- Mechanical Angle of Movement: 70°
- Expected Life: 10 million cycles
- Mass/weight: Varies
- Material: Glass reinforced nylon
- Lever Action (Centering): Friction

ELECTRICAL

- Sensor: Hall effect
- Resolution: Infinite
- Supply Voltage Operating: 5.00VDC
- Reverse Polarity Max: -14.5VDC
- Overvoltage Max: 18VDC
- Output Impedance: 6Ω
- Current Consumption Max: 10mA

ENVIRONMENTAL

- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Storage Temperature: -40°C to 70°C (-40°F to 158°F)
- Sealing (IP): IP65 to IP68*
- EMC Immunity Level (V/M): IEC 61000-4-8:2009
- EMC Emissions Level: IEC 61000-4-3:2006
- ESD: IEC 61000-4-2:2008

ELECTRICAL MICROSWITCH

- Electrical rating: 0.1 A at 30 VDC (resistive load)
- Insulation resistance: 100 MΩ min. (at 500 VDC)
- Contact resistance: 100 mΩ max.
- Dielectric strength: 600 VAC, 50/60 Hz for 1 min between terminals of the same polarity 1,000 VAC, 50/60 Hz for 1 minute between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal parts
- Vibration resistance: Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
- Shock resistance: Destruction: 1,000 m/s² (approx. 100G) max. Malfunction: 200 m/s² (approx. 20G) max.
- Durability: Mechanical: 1,000,000 operations min. (60 operations/min) Electrical: 100,000 operations min. (30 operations/min)
- Sealing: IP67 (excluding solder terminals)

STANDARD SWITCH CHARACTERISTICS/RATINGS

- Electrical Resistive Load: 5A (depending on the chosen switch)
- Electrical Inductive Load: 3A (depending on the chosen switch)
- Low Level: 10mA @ 30mV (depending on the chosen switch)
- Electrical Life: 1 million cycles 5A @ 28 VDC resistive snap-action (depending on the chosen switch)
- Mechanical Life: 1 million cycles
- Environmental Seal: IP67
- Action: Momentary, snap-action
- Operating Force: 1.7 lbs ± 0.5 lb
- Total Travel: 0.080 inches max
- Over Travel: 0.010 inches min

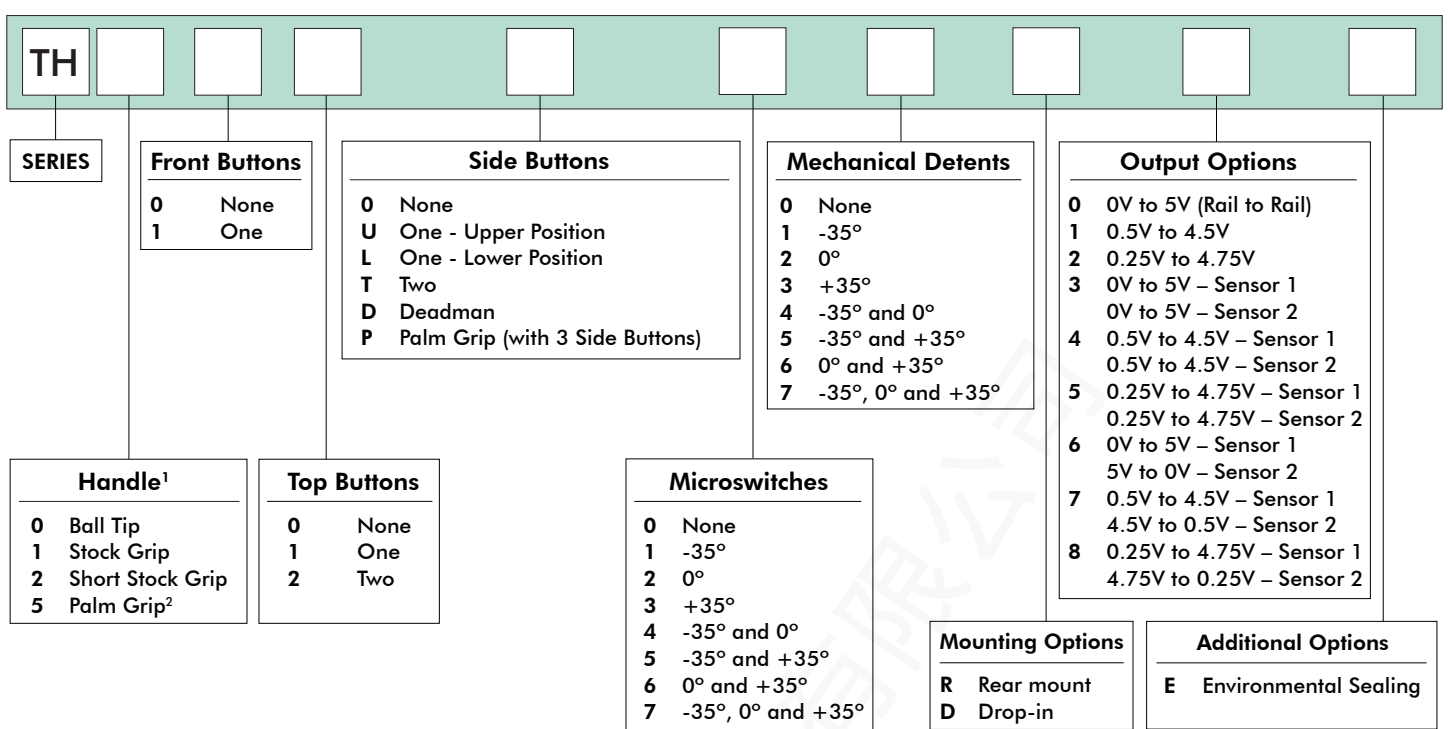
NOTES:

- All values are nominal.
- Exact specifications may be subject to configuration.
- Contact Technical Support for the performance of your specific configuration.
- * Excludes some handle options.

TH series

Single-axis throttle joysticks

Overview



NOTES:

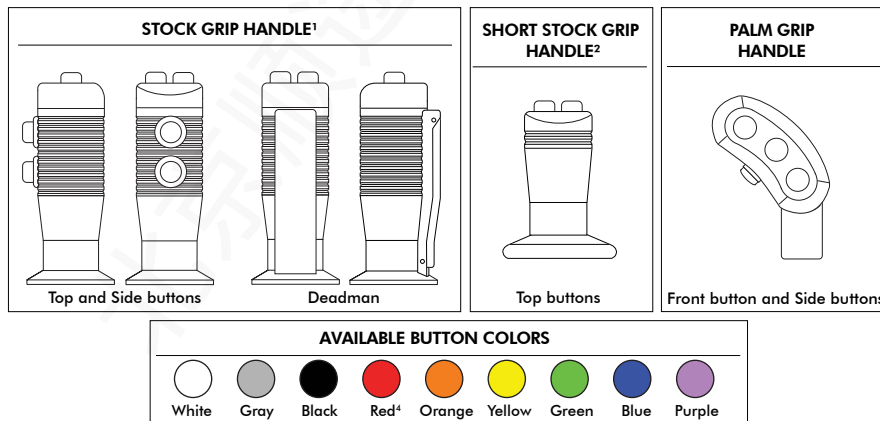
1. See information on standard configurations for throttle handles.
2. Palm Grip handle requires Drop-in mounting.



Up to IP68 available.

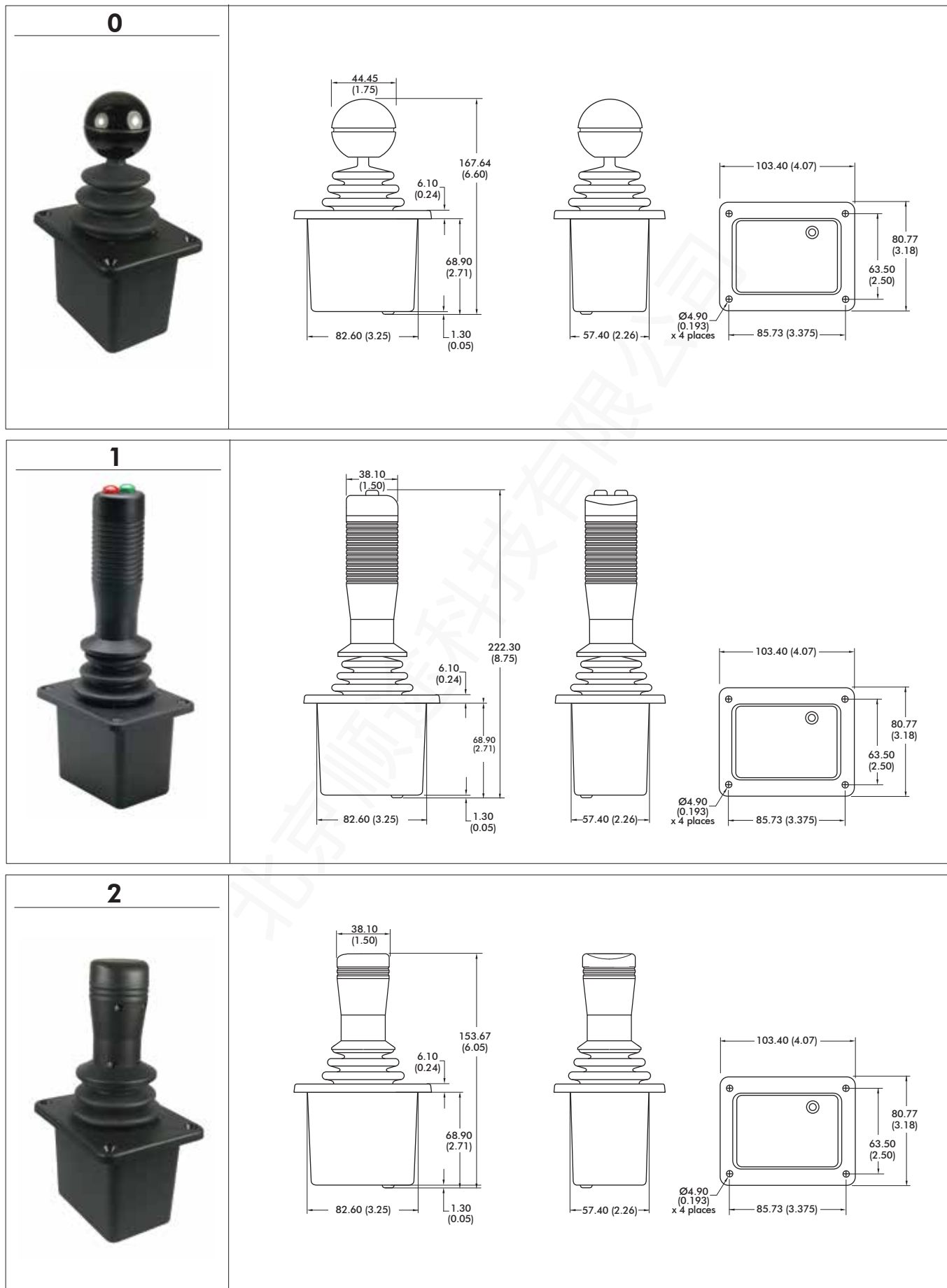


Mounting accessories. Standard hardware includes: 1 gasket, 4 screws (10-32x3/4 Phillips Flat Head), 4 washers (#10 Split Lock), 4 nuts (10-32 Hex). The gasket and the mounting hardware are shipped off the throttle, in a separate bag.



NOTES:

1. The maximum possible configuration for the Stock Grip handle is up to 2 Top Buttons and 2 Side Buttons.
2. The maximum possible configuration for the Short Stock Grip handle is up to 2 Top Buttons. It is not possible with Deadman, Index Trigger, or Side Buttons.
3. For non-standard configurations contact Technical Support.
4. If unspecified, the pushbuttons will have snap action momentary switches with red button caps.

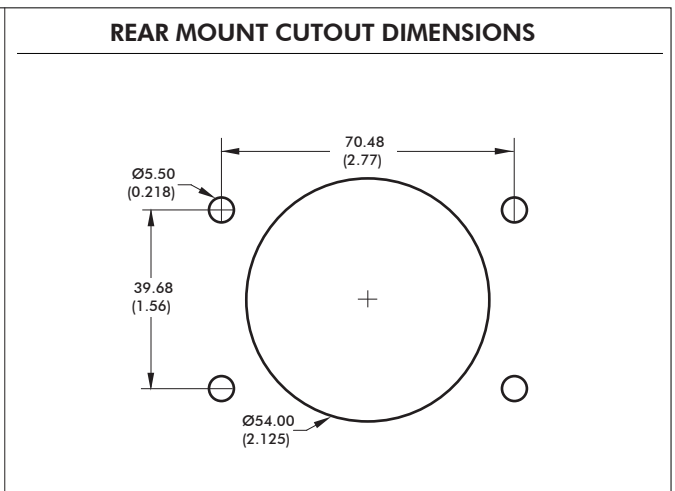
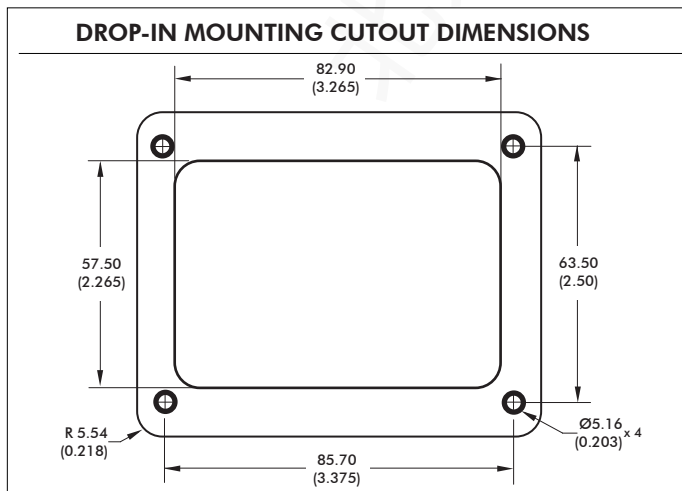
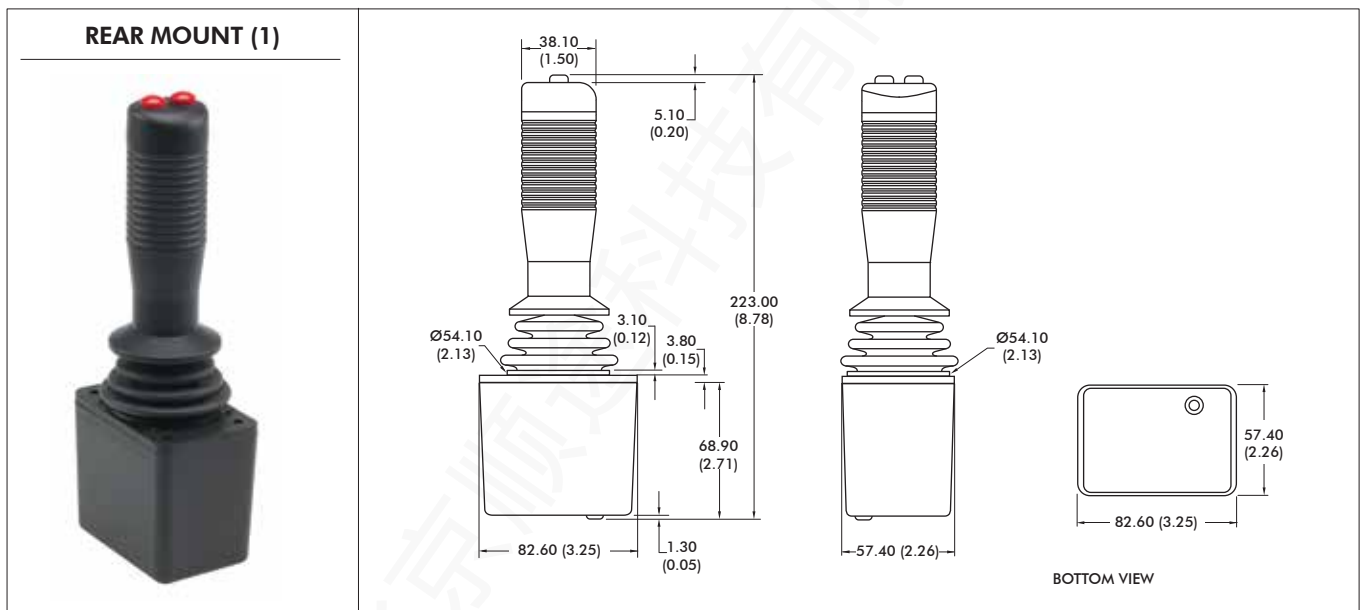
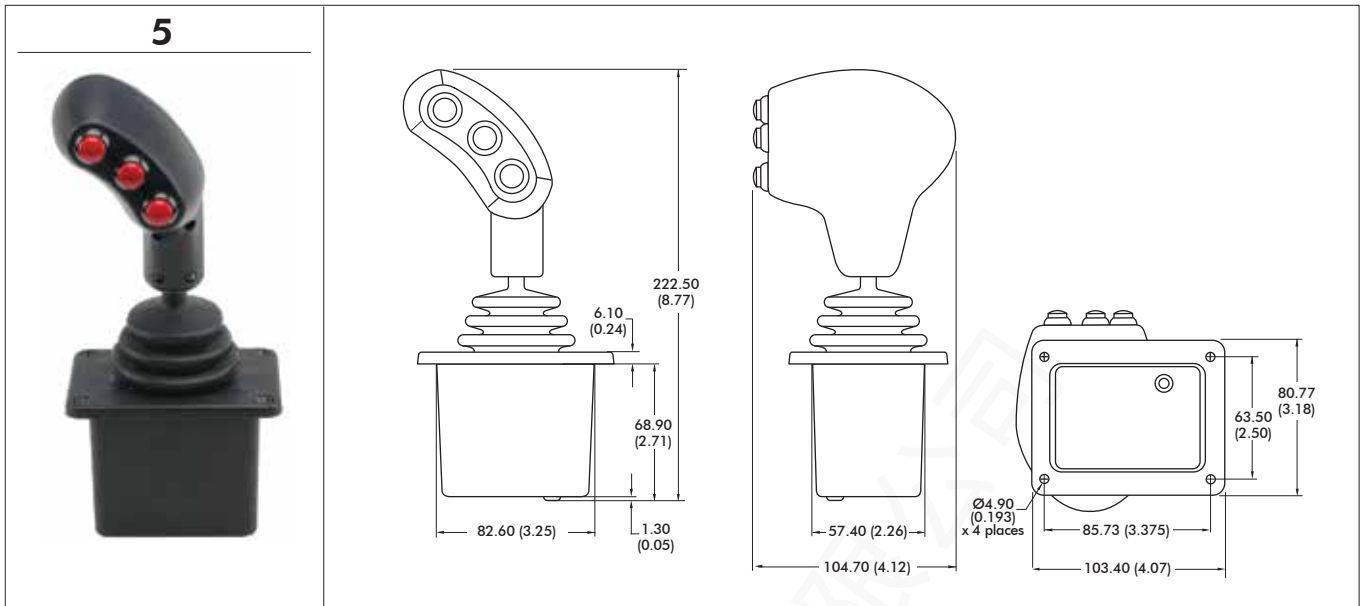


Note: The company reserves the right to change specifications without notice.

TH series

Single-axis throttle joysticks

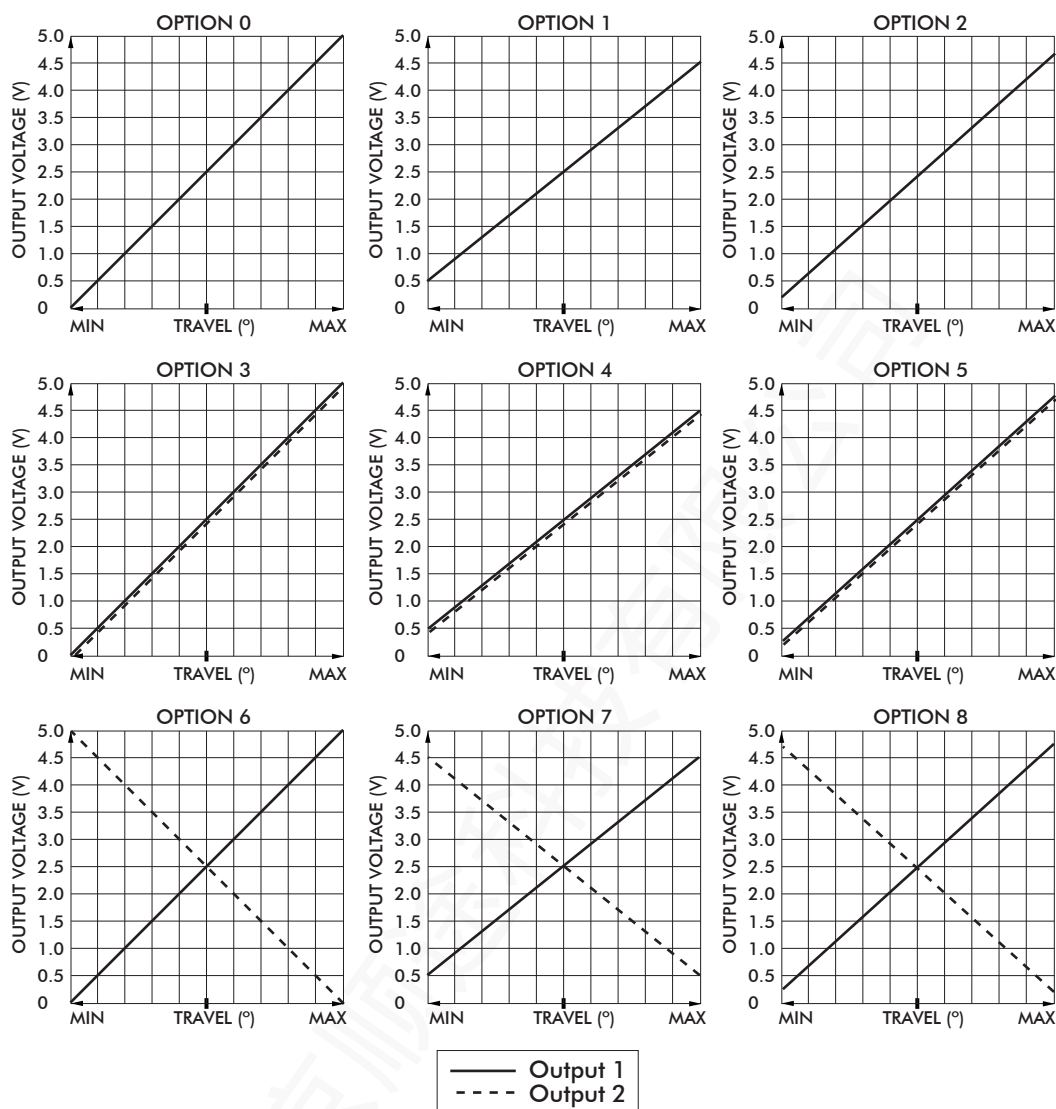
Overview



NOTE:

1. Dimensions are in mm/(inch).

VOLTAGE OUTPUT OPTIONS



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)¹
- Maximum Vertical Load: 200N (45lbf)¹
- Maximum Horizontal Load: 150N (33.7lbf)¹
- 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, IP69K²
- 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.

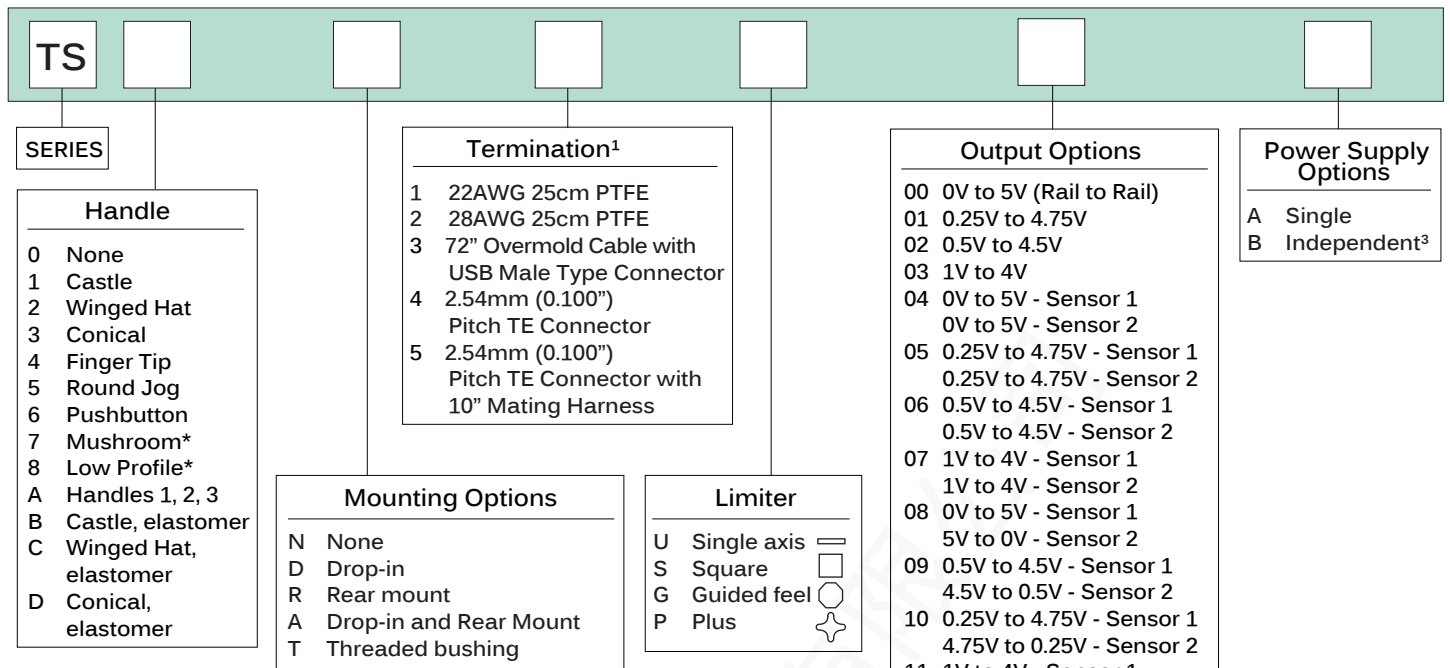
- 1 Force applied to the top of the castle cap.
 - 2 All options are IP68 and IP69K rated, however Drop-in mounting does not prevent panel ingress.
- All values are nominal.



TS series

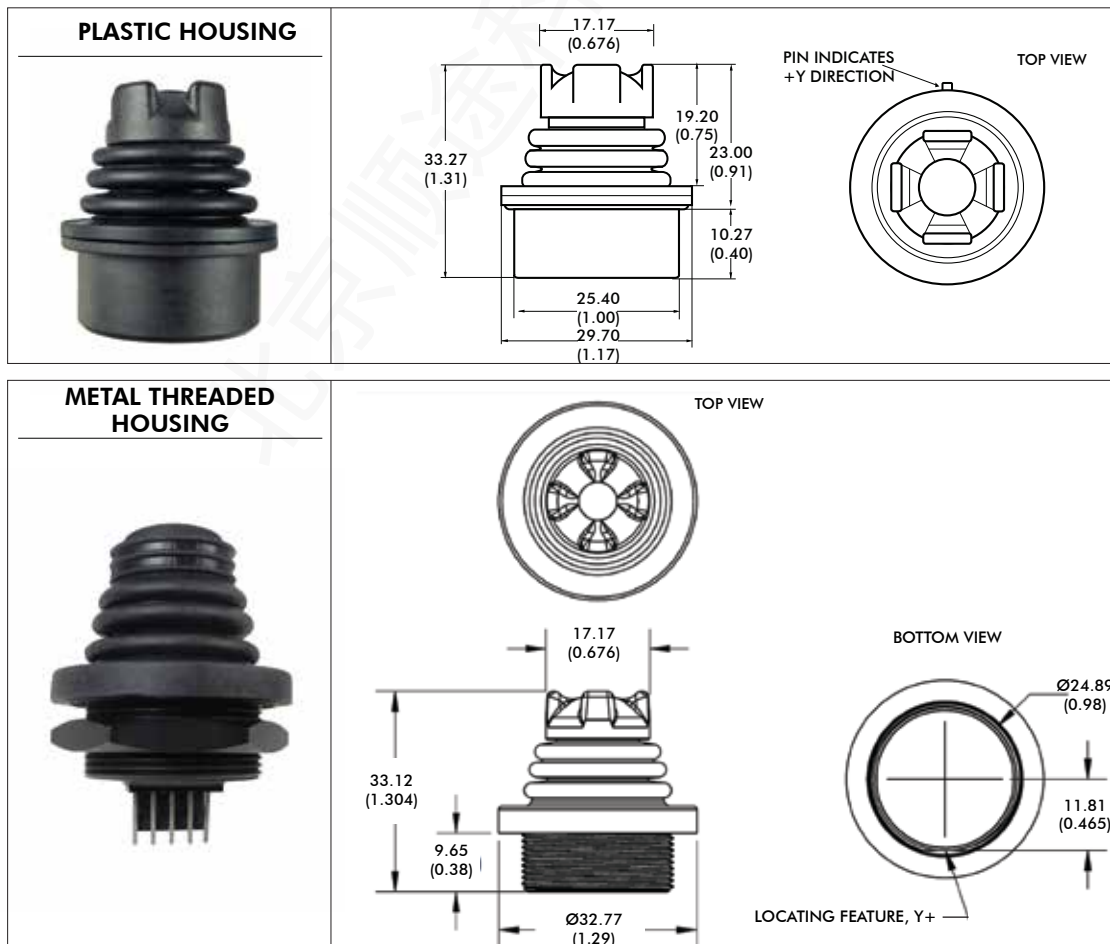
Proportional Hall effect thumbsticks

Overview



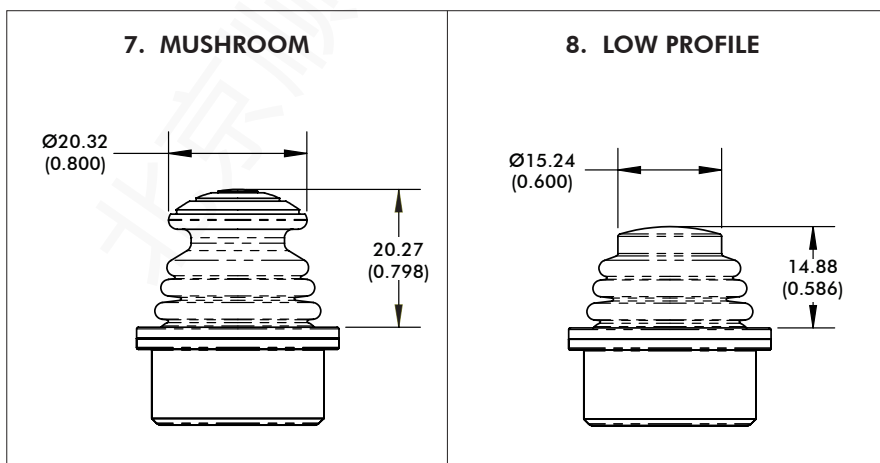
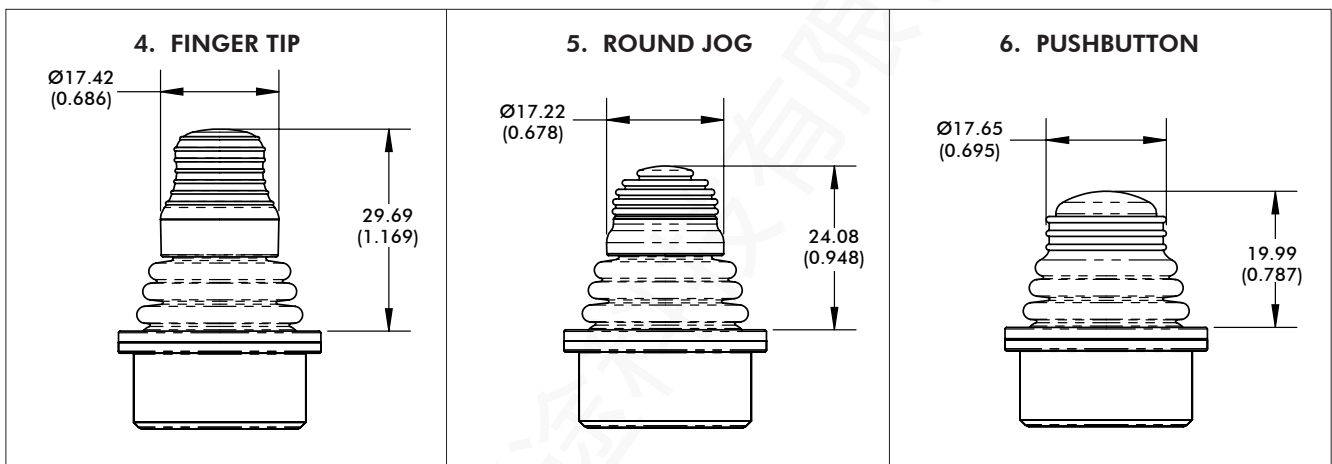
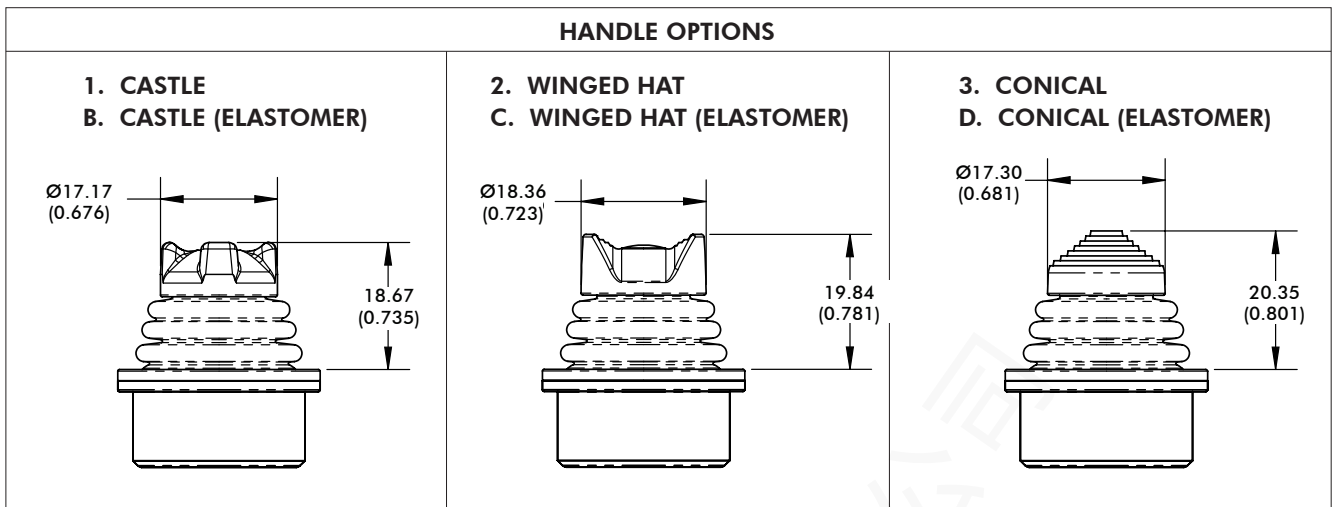
NOTES:

- * = 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.



NOTES:

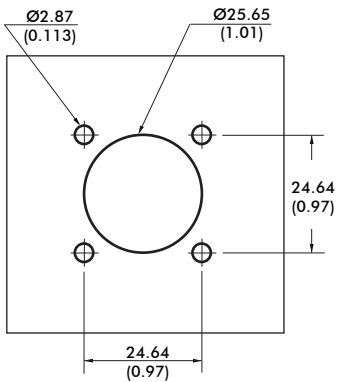
- Option 7 and 8 handles not available with the "T" threaded housing mounting style.
- Dimensions are in mm/(inch).

TS series

Proportional Hall effect thumbsticks

Models and dimensions – continued

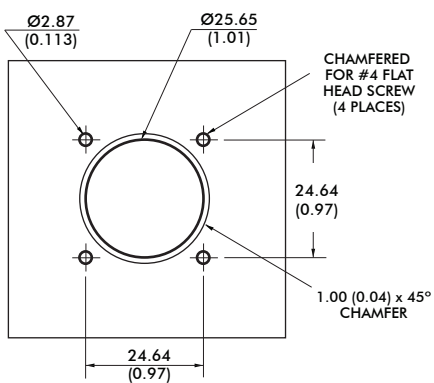
PLASTIC HOUSING - DROP-IN OPTION CUTOUT DIMENSIONS



4 x PUSH IN CONNECTORS



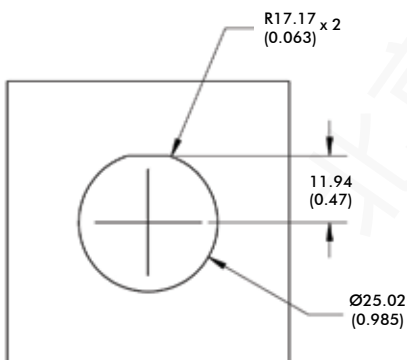
PLASTIC HOUSING - REAR MOUNT OPTION CUTOUT DIMENSIONS



4 x 1/2 FH SS PHIL SCREW



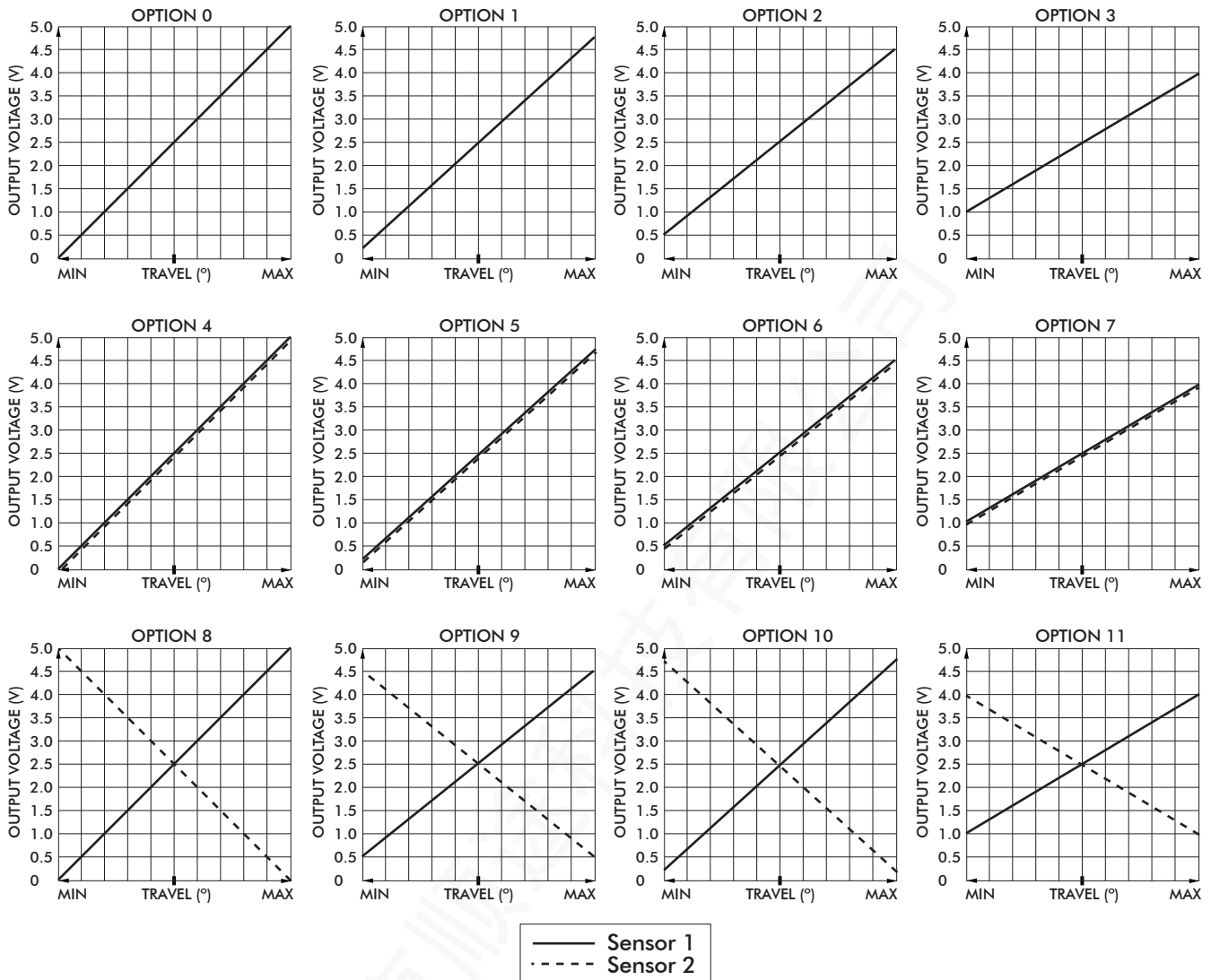
METAL THREADED HOUSING - DROP-IN OPTION CUTOUT DIMENSIONS



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).

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)

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

TW series

Hall effect thumbwheels

Distinctive features and specifications



- 5 million cycles
- Hall effect technology
- Proportional control
- Self-centering single axis design
- Redundant outputs available
- Choice of wheel colors: black, red, blue, or gray

MECHANICAL (FOR X, Y AXIS)
<ul style="list-style-type: none"> • Break Out Force: 0.7N (0.15lbf) • Mechanical Angle of Movement: 80° (±40° from center) • Expected Life: 5 million cycles • Lever Action (Centering): Spring centering

ENVIRONMENTAL
<ul style="list-style-type: none"> • 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: IP67* • EMC Immunity Level: EN61000-4-3 (extended) • EMC Emissions Level: EN61000-6-3:2001 • ESD: EN61000-4-2 (extended)

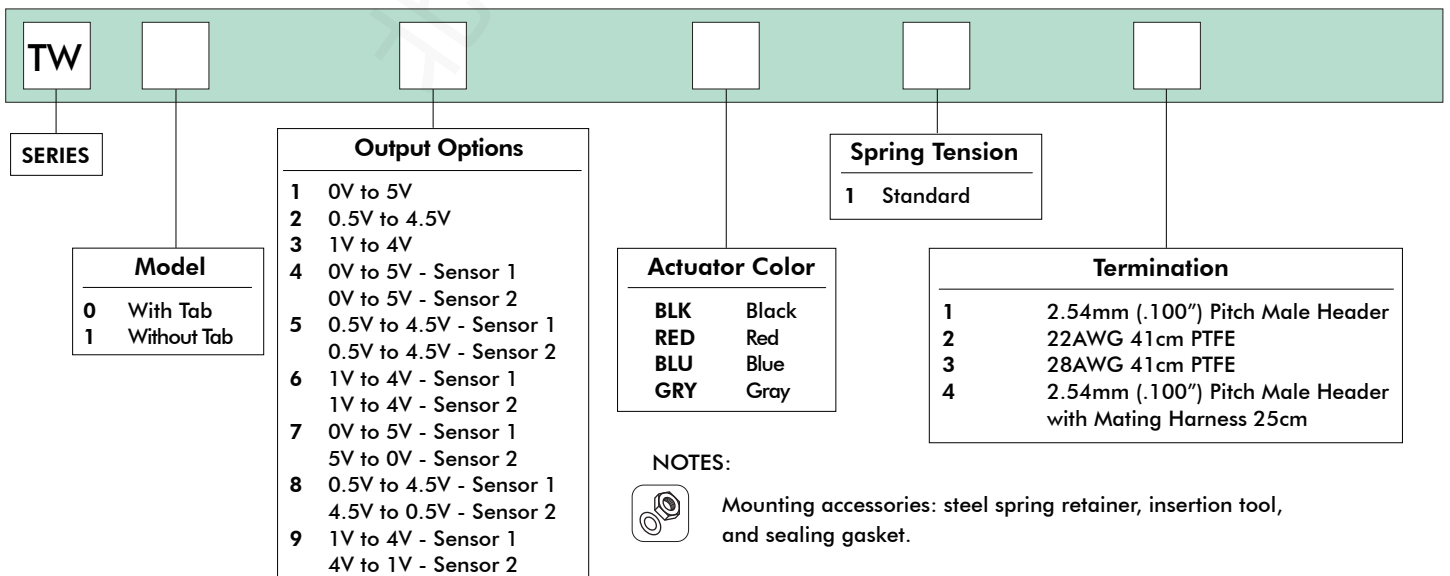
ELECTRICAL
<ul style="list-style-type: none"> • Sensor: Hall effect • Resolution: 1.22mV • Supply Voltage Range: 5V ± 0.01V • Reverse Polarity Max: -10V • Overvoltage Max: 20V • Output Impedance: 2Ω • Return to Center Voltage (No Load): ±200mV • Error Signal: 1.0%

NOTES:

* Electronics sealed to IP67.

Exact specifications are subject to configuration.

All values are nominal.

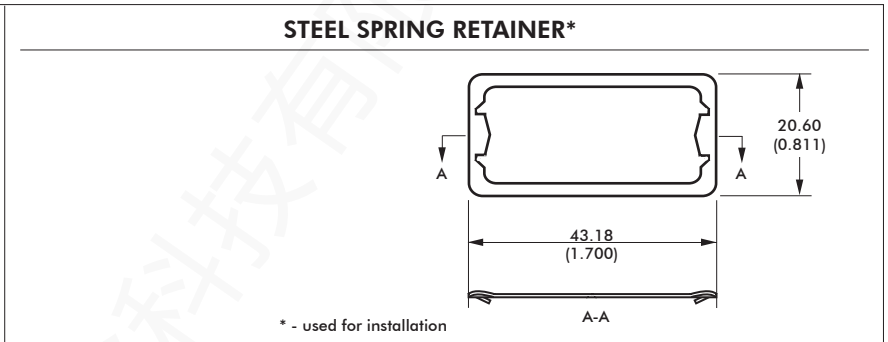
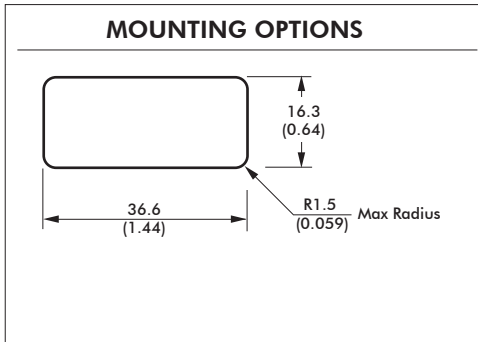
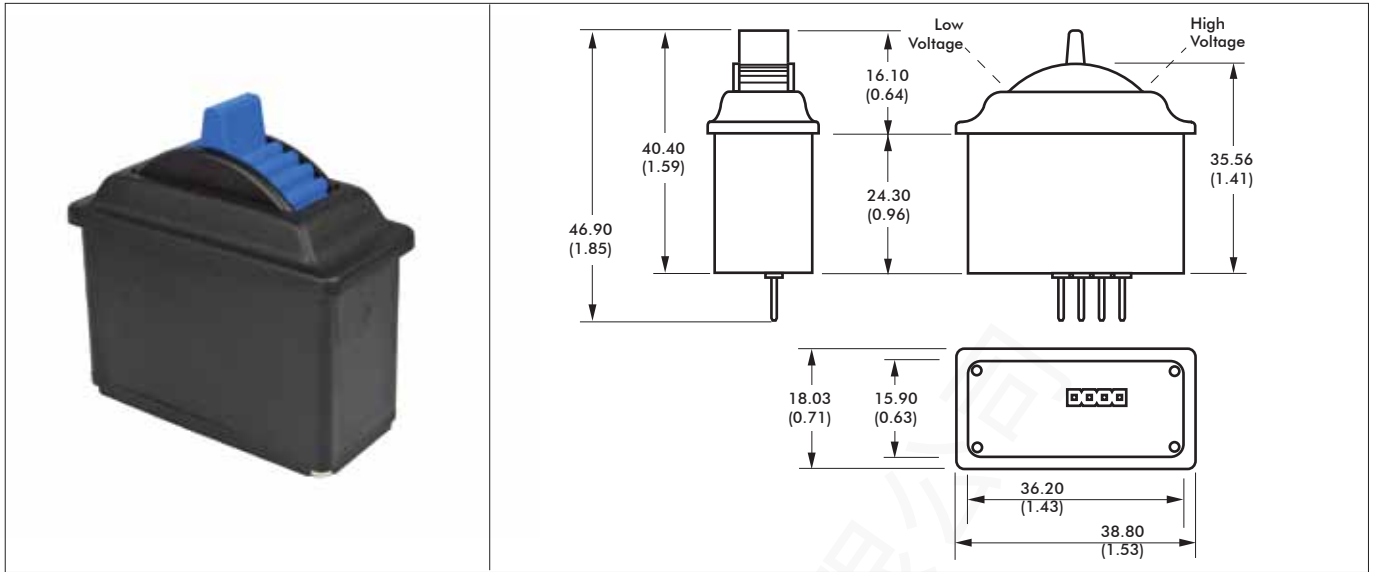


Note: The company reserves the right to change specifications without notice.

TW series

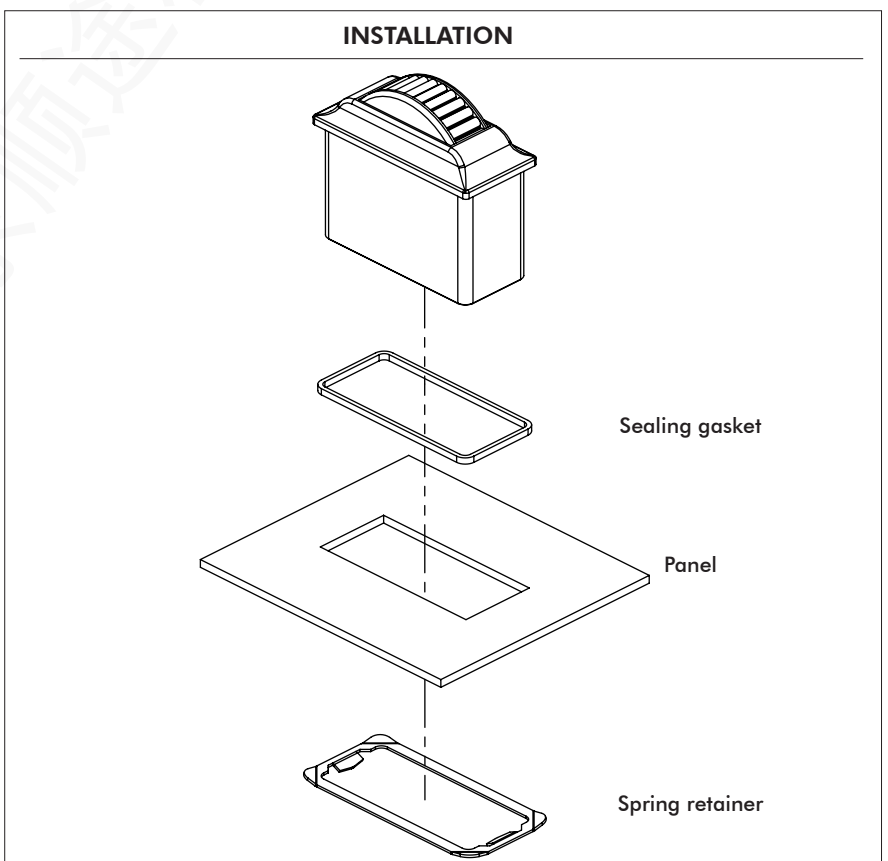
Hall effect thumbwheels

Overview

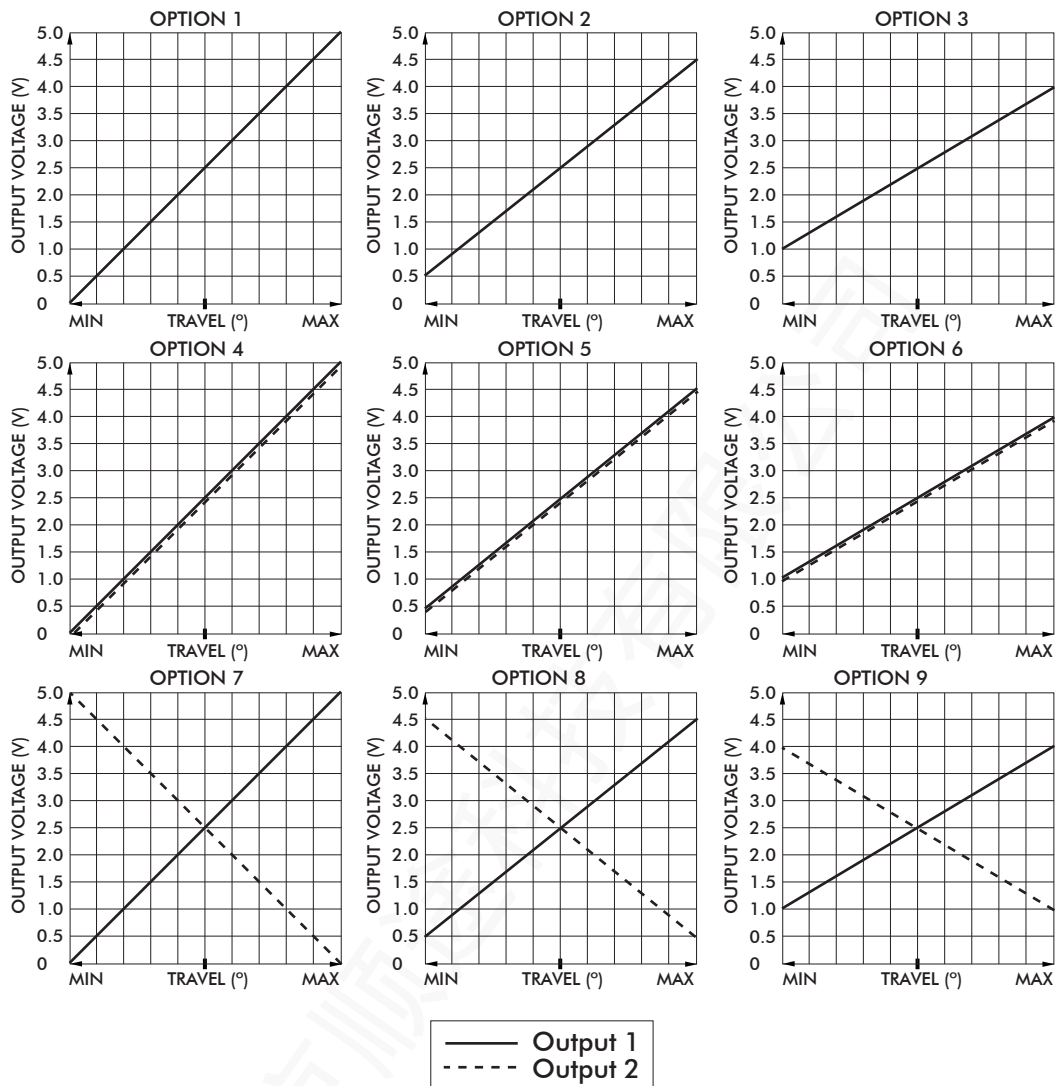


NOTE:

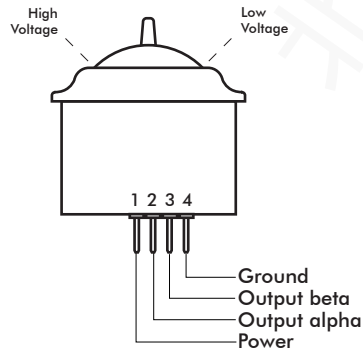
1. Dimensions are in mm/(inch).



VOLTAGE OUTPUT OPTIONS



CONNECTOR PINOUT



CONNECTOR TERMINATION OPTION

The TW Series Thumbwheel may be specified with a TE Connectivity 2.54mm pitch male header. When selected from the "Option Selection" guide, both single and dual output configurations feature a four position TE 3-647166-4 connector.

OPTIONAL MATING HARNESS

The TW Series is available with an optional mating harness. The four function harness is part number 505-498.

Wire type: 22AWG 25cm PTFE
Connector: Molex 0050579504

DEFAULT WIRE COLOR CODE

COLOR	FUNCTION	AWG
RED	+5V	22
BLACK	Ground	
BLUE	Output alpha	
BLUE/WHITE	Output beta	

CIRCUIT	WIRE COLOR
PIN 1	BLACK
PIN 2	BLUE/WHITE
PIN 3	BLUE
PIN 4	RED

VM Desktop

USB multifunction controllers

Distinctive features and specifications

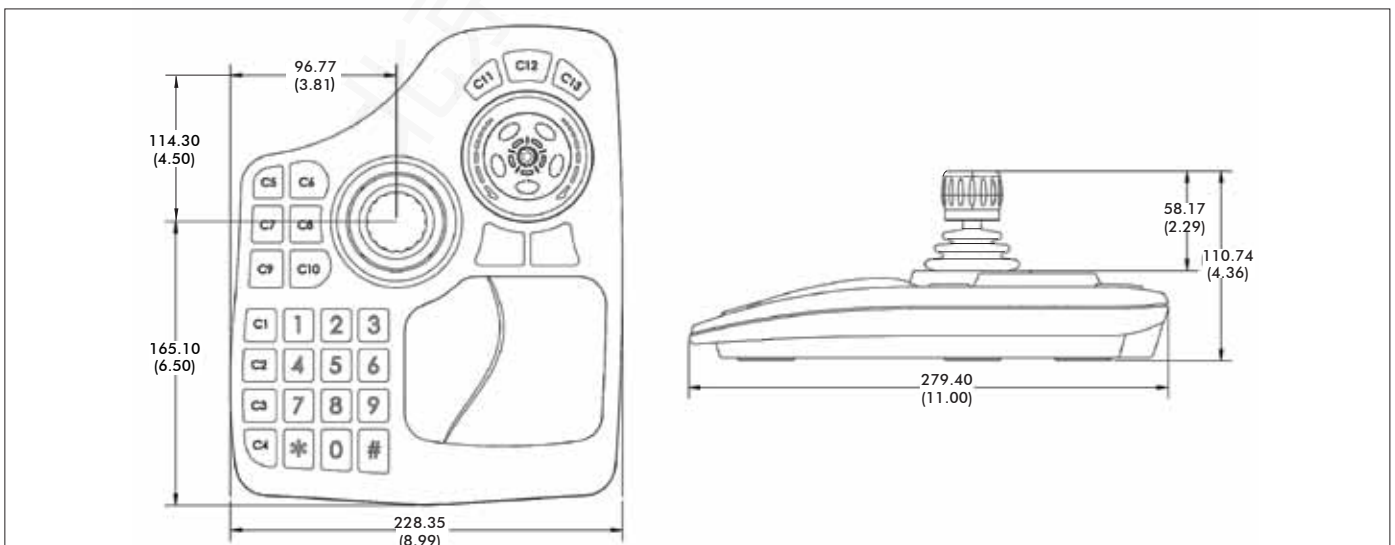


- ❑ 3 axis joystick for PTZ control
- ❑ 27 programmable pushbuttons
- ❑ USB 1.1 HID compliant “game controller”
- ❑ Jog/shuttle dial
- ❑ Easy to use and operate
- ❑ Functions determined by controlled application

- Joystick performance:
 - Hall effect three axis joystick
 - X/Y/Z for positioning control
- Joystick travel:
 - 36° for X and Y axis
 - 60° for Z axis
- Centering: Single spring, omni-directional
- Joystick shaft: Stainless steel
- Joystick boot: Neoprene
- Joystick handle: Glass filled nylon
- Jog/shuttle performance:
 - Spring loaded shuttle ring travel $\pm 40^\circ$
 - Smooth action knob rotates 360°
- Pushbutton performance:
 - 27 programmable pushbuttons rated for 500,000 life cycles
 - Lighting: high efficiency LED
 - Pushbutton material: silicon
 - “Mouse” pushbuttons are rated for 10 million life cycles
- Desktop housing: High impact ABS
- Power:
 - Via USB interface (5V DC)
 - Consumption 1A

- Operating conditions:
 - -25°C to +85°C (-13°F to +185°F)
- Approvals:
 - EN 55024:1998, EN 55022,
 - FCC Part 15 Subpart B Class B
 - RoHs compliant
- Interface:
 - USB port
 - Uses standard DirectX HID drivers
 - Connects directly to workstation PC
- Connectors:
 - USB Type A Male
 - Cable Length: 2m (6ft. 6.8in)
- Systems support integration: Windows 7, Vista, XP, 2000, Windows 8, OSX, Linux
- Supported protocols:
 - USB HID 1.1 game controller
 - Direct X (Gaming Control)
 - Joystick: Three HID axis
 - Pushbuttons: 12 HID buttons
 - Uses standard DirectX HID drivers
 - Connects directly to workstation PC
- Environmental: For indoor use only
- Boxed weight: 1.33kg (47oz)

NOTE: All values are nominal.



- NOTES:
- Dimensions are in mm/(inch).
 - Product is supplied individually boxed with instruction booklet.
 - To order the VM Desktop, please refer to Part Number 100-590.