APEM

Robust Industrial Joysticks

High Quality

Metal Mechanisms

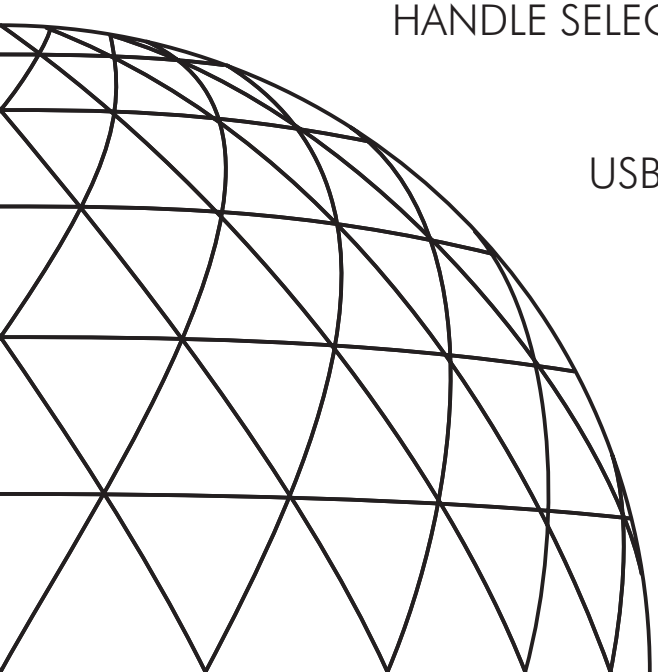
Versatile

Cost Effective

ROHS Compliant

APEM

CONTENTS



APEM

ERMEC
www.ermec.com

INDUSTRIAL JOYSTICKS

Apem is one of the world's largest manufacturers of professional switches and switch panels. Apem designs, develops, manufactures and sells professional products to customers in such dynamic markets as electronics, security, telecommunications, automotive, instrumentation, medical electronics, the computer industry and military electronics.

During 2005, Apem acquired Oliver Control Systems. This acquisition brought industrial joystick controls to the Apem product portfolio, allowing Apem to become a complete solution provider for all of your front panel requirements.

Originally formed in 1980, Oliver Control Systems has been responsible for the manufacture of over one million joysticks for service in a variety of industries In all parts of the world.

The engineering lead heritage continues to this day, and all Apem joysticks are designed for extremely long service lives with the highest levels of reliability and product quality. With a project orientated design team we specialise in ensuring our products are tailored to meet your exact needs. We guarantee your project requirements are as important to us as they are to you.

All Apem joysticks are designed for maximum robustness at the most cost effective prices.

In addition Apem joysticks are developed to be highly configurable and are offered with a wide range of options, including an array of possible handles, gaiters and electrical outputs. This modular approach to design allows customers to specifythe joystick that is ideally suited for their application, at the best possible cost.

All Apem joysticks are designed for ease of use, and offer an ergonomic solution that blends in with the control panel. To ensure the joystick not only feels great to use, but also looks right on the panel, Apem joysticks are available in differing colours and finishes to match the industrial designs and colour schemes of the panel.

Apem also offers a bespoke design service for those applications that require something a little different. If you do not see the exact product you need within these pages please pass your requirements to our techincal sales team, who will be happy to propose a solution to meet your needs.

For more information about Apem, please visit www.apem.com

INDUSTRIAL JOYSTICKS

The Apem portfolio of panel mount joysticks comprises :-

1000 Series - A family of switch joysticks for single step switching.

4000 Series - A family of robust, high quality potentiometer joysticks.

5000 Series - A family of lighter duty, cost optimised potentiometer joysticks.

9000 Series - A family of contactless sensing, robust joysticks for proportional control.

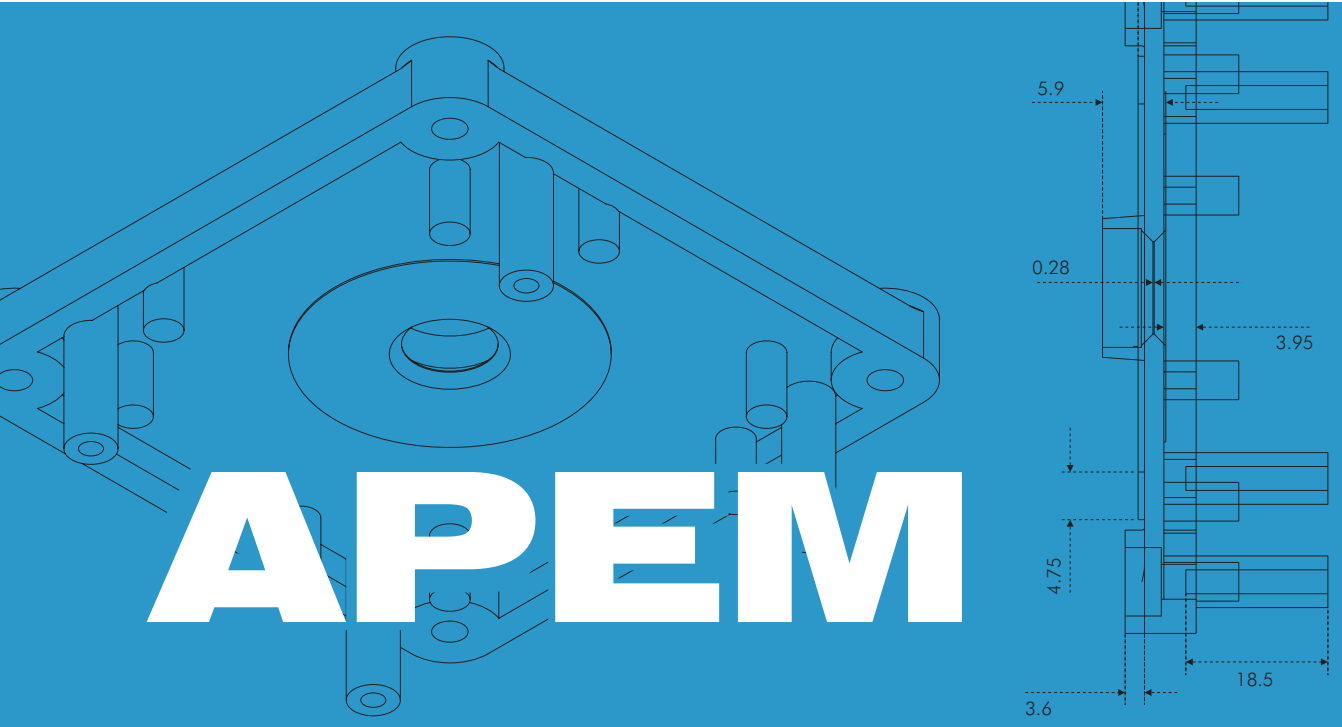
1000 Series.
The 1000 Series are robust, switch joysticks. Based on industry standard V3 and V4 microswitches, they can switch 6A, 10A or up to 16A. Available as either single or dual pole, the 1000 Series are ideal for general machine control type applications where the user is directing equipment at a predetermined speed. Supplied with user-changeable limiter plates, the 1000 Series can be configured to operate in either single or dual axes mode. The range is designed to mount in either screw or bush style configurations and is offered as a low cost solution for non-proportional control. The above-panel appearance of the 1000 Series may be customised by selecting either of the mounting styles and also choosing from the range of fully interchangeable handles and accessories.

4000 Series.
The 4000 Series is a range of highly versatile, single, dual or tri-axial, proportional joysticks. Unlike many other potentiometer based joysticks, the 4000 Series has an all-metal mechanism for maximum possible robustness and performance over life. The range employs high quality, plastic conductive film potentiometers as standard, and is designed as a sub-panel mount unit. Available with many different above-panel options, the 4000 Series is ideally suited to medium duty applications such as electric vehicle control. This series remains the preferred choice for applications which require a life greater than five million cycles and absolute immunity to RFI.

5000 Series.
The 5000 Series is a family of cost optimised, potentiometer joysticks. With particular attention paid to the style of the unit and a low installed depth these joysticks are ideal for lighter duty applications such as CCTV keyboard control. Configurable in two or three axes for pan, tilt and zoom control, these joysticks are also offered with a range of handles, gaiters and bezels to ensure they blend seamlessly into the control panel.

9000 Series.
The 9000 Series offers a range of single, dual or tri-axial products, utilising contactless sensing to give highly repeatable proportional signals that do not degrade with use. The 9000 Series builds on the well proven traditions of the earlier 7000 Series, yet introduces significantly improved mechanics to deliver a shallow installed depth without compromising functionality. The 9000 Series can be mounted as a drop-in or sub-panel fixing product and offers a range of electronic features including dual decode technology providing for electronic “at-centre” or “internal fault” detect, which makes it the ideal user interface for complex and safety critical applications such as materials handling or power chair control.

All Apem joysticks are supplied as ROHS compliant, and are designed and produced in our ISO9001:2000 assured facility.



APEM

1000 SERIES - MICROSWITCH JOYSTICKS

COMPACT SIZE ROBUST CONSTRUCTION SINGLE OR DUAL AXIS

VERSATILE SINGLE OR DUAL POLE ALTERNATIVE KNOB SELECTION

IP65 ABOVE PANEL BUSH OR SCREW MOUNT V4 SWITCHES

V3 SWITCHES CROSS OR DIAGONAL OPERATION LOW PROFILE

1000 SERIES - MICROSWITCH JOYSTICKS

GENERAL DESCRIPTION

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.

The joystick construction is determined by the switches employed. There are two possible 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.

SWITCHES

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

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.
V4 - 10A/240V AC should be specified where the joystick will be switching larger current levels.
V3 - 16A/240V AC should be specified where the joystick will be switching even greater current levels.

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. The Apem sales team will be happy to provide 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 limiter set, that allows the customer to retro-fit limiters to reduce the travel to single axis(-), cross (+) or diagonal (X) operation. 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 gaiter options are offered as standard to provide an IP65 above-panel seal. When specifying a bush mount joystick please select gaiter option 5. Alternatively gaiter option 1 should be selected for 4 point screw mount joysticks. 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.

DUAL POLE OPERATION

The construction of the joystick is designed such that both switches nominally trigger simultaneously. Such simultaneous triggering is subject to a +/-3 degree tolerance (between switches) owing to the mechanical tolerances and hysterisis 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.

LEVERS

Lever option 5 provides for a low profile above the panel (41mm), this option is very popular for those applications requiring a compact, stubby design. Lever option 1 is an additional 5mm taller. Lever option 6 should be specified for a push button handle, and lever option 7 is designed for V4 di-pole, or V3 constructions.

1000 SERIES - MICROSWITCH JOYSTICKS

STANDARD OPTIONS

The 1000 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.

1	D	1	5	F	1	5	00
SERIES	MOUNTING	POLES	LEVER	HANDLE	LIMITER SET	GAITER	MODIFIER
6A - V4* (1)	22mm Bush* (D)	Single Pole (1)	Long* (1)	Round (C)	Not Supplied (0)	Screw Mount (1)	None (00)
16A - V3 (2)	4 Point Screw (V)	Di-pole* (2)	Standard V4* (5)	Cylindrical (D)	Standard (1)	Bush Mount* (5)	+ Limiter Fitted (34)
10A - V4* (3)			For Push Button V4* (6)	Conical (F)			Slot Limiter Fitted (39)
			For Di-pole V4/V3 (7)	Tall Conical (H)			
				Push Button* (M)			

* Denotes unavailable with V3 construction.

EXAMPLE CONFIGURATIONS

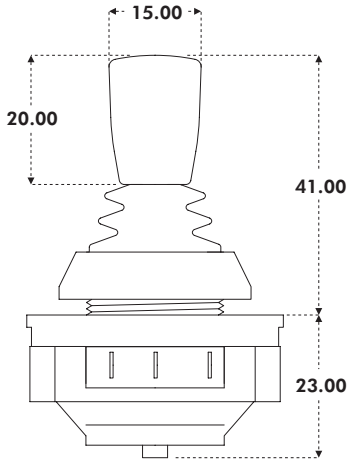
TECHNICAL SPECIFICATION

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

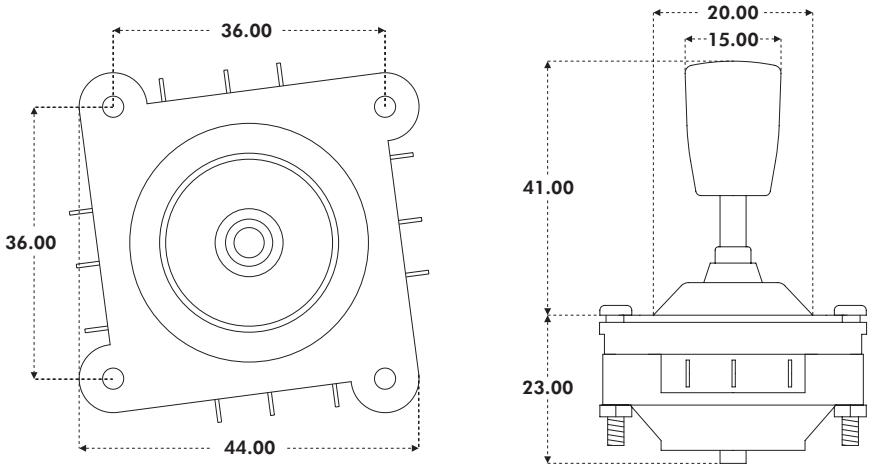
Mechanical Life	: >5 Million Operations	Lever Travel	: +/-12 Degrees from Centre
Lever Material	: Stainless Steel	Body Material	: Mineral Filled Nylon-6
Handle Material	: Nylon or Aluminium	Gaiter Material	: Neoprene
Mounting - Screw	: 4 x M2.5 Stainless (Slotted)	Mounting - Bush	: Single Point 22mm Diameter
No. of Switches	: 2, 4, or 8	Nominal Current	: 6A, 10A or 16A
Maximum Voltage	: 250V AC	Contacts 6A - V4	: Gold
Contacts 10A - V4	: Silver	Contacts 16A - V3	: Silver
Switch Contacts	: Changeover	Termination	: Solder (V4) - Faston (V3)
Contact Life	: Load Dependent	Temperature Range	: -20C to+50C
Weight	: 40 grams	Above Panel Seal	: IP65

1000 SERIES - MICROSWITCH JOYSTICKS

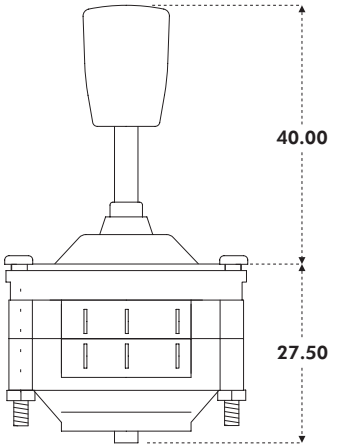
V4 BUSH MOUNT



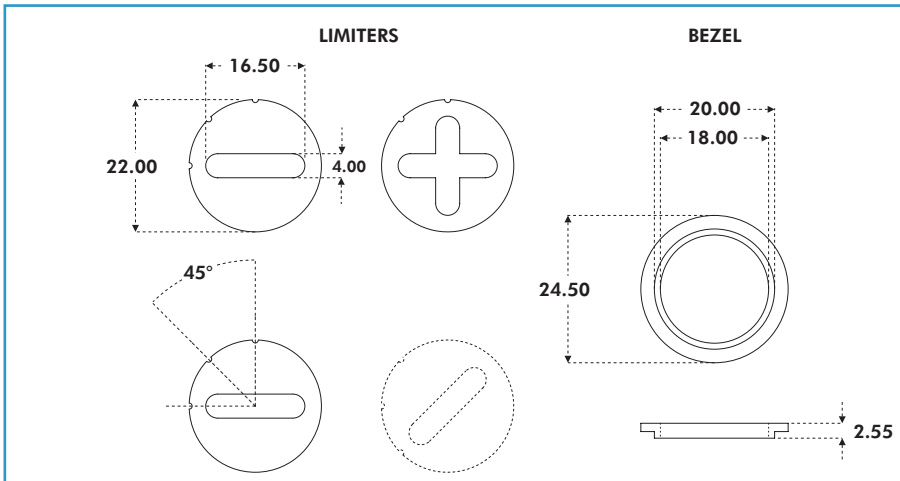
V4 SCREW MOUNT



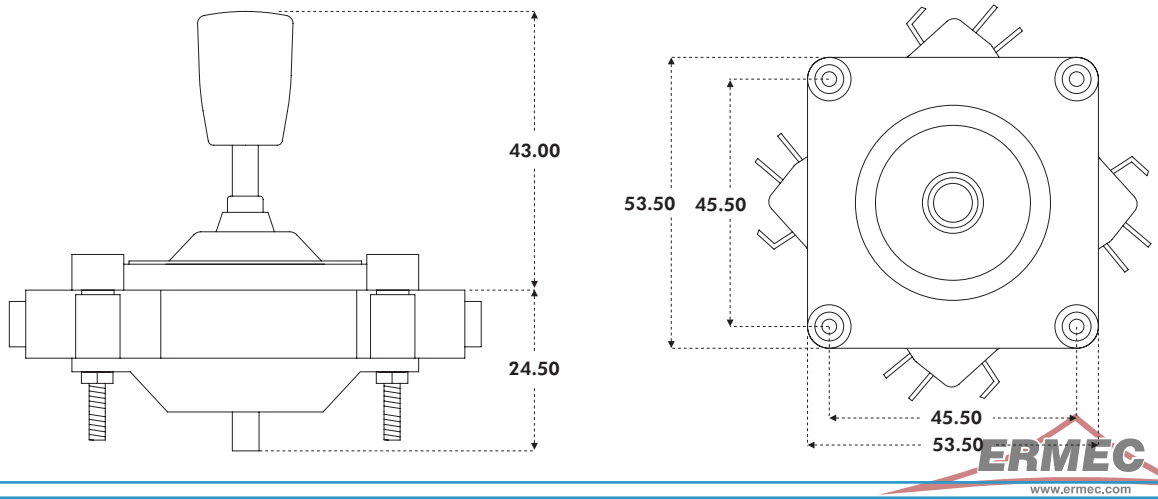
V4 DI-POLE



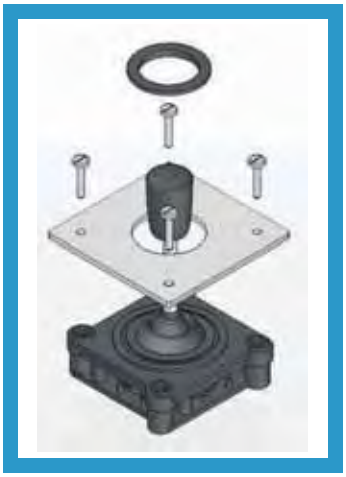
LIMITERS AND BEZEL SET



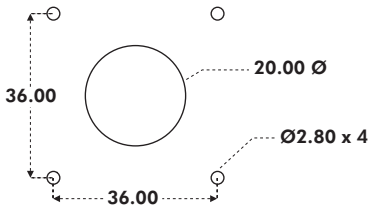
V3 SCREW MOUNT



V4 SCREW MOUNT - PANEL CUT-OUT & MOUNTING INSTALLATION



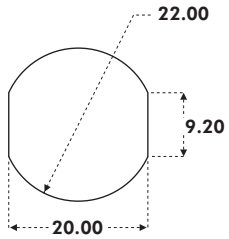
MOUNTING CUT-OUT



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.

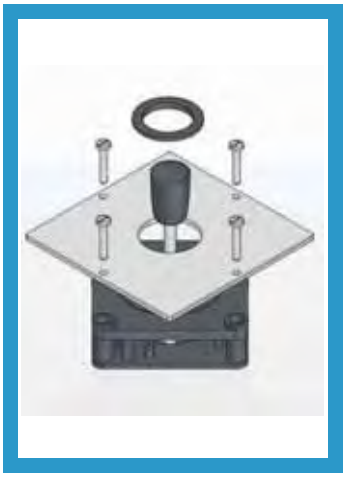
V4 BUSH MOUNT - PANEL CUT-OUT & MOUNTING INSTALLATION

MOUNTING CUT-OUT

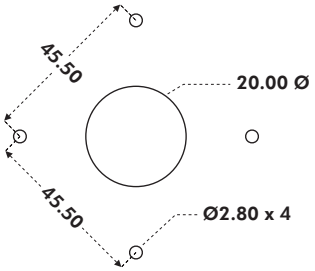


The joystick is mounted from beneath the panel. Supplied as standard with all bush mount joysticks is an adhesive P.V.C. sealing gasket. This should be fitted between the joystick and the panel, in applications where a good seal is needed.

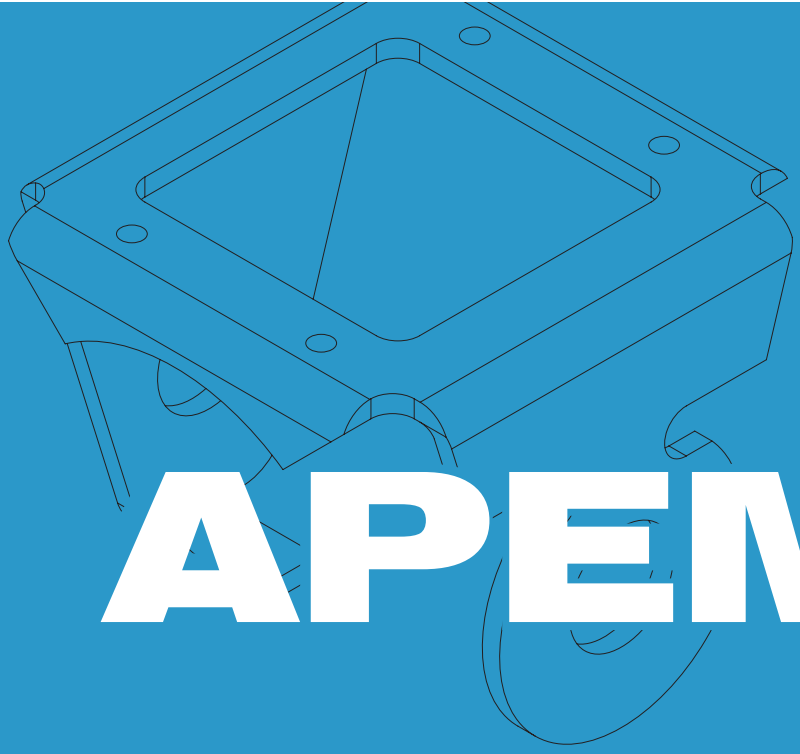
V3 SCREW MOUNT - PANEL CUT-OUT & MOUNTING INSTALLATION

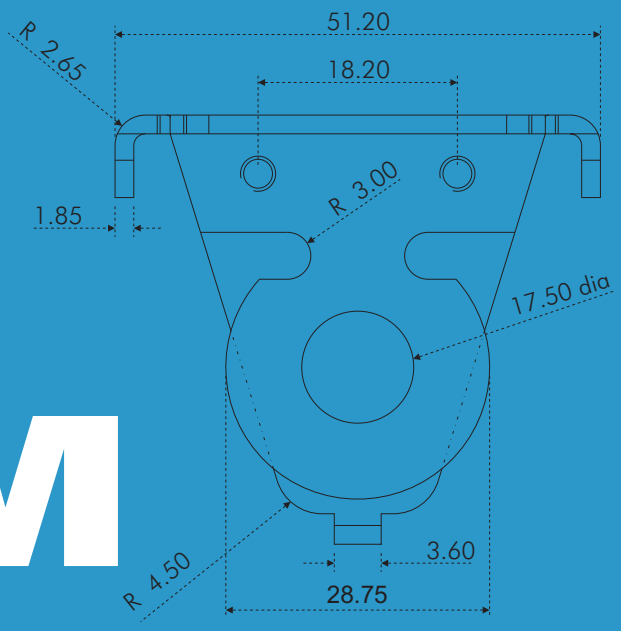


MOUNTING CUT-OUT



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.





APEM

4000 SERIES - POTENTIOMETER JOYSTICKS

TWO STANDARD MOUNTING OPTIONS LOW CURRENT DRAIN IP65 ABOVE PANEL

VARIETY OF POTENTIOMETER OPTIONS ROBUST, INDUSTRIAL, ALL METAL MECHANISM

AVAILABLE IN CLOSED & OPEN BODY VARIANTS INHERENTLY IMMUNE TO R.F.I.

OPTIONAL CENTRE-DETECT MICROSWITCHING HIGH QUALITY POTENTIOMETERS

4000 SERIES - POTENTIOMETER JOYSTICKS

GENERAL DESCRIPTION

The 4000 Series is a range of robust, industrial quality potentiometer joysticks. 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.

Whilst contactless joysticks such as the 9000 Series have replaced potentiometer joysticks in many applications, the 4000 Series continue to be popular owing to their ease of interfacing, wider operating voltage span, lower current drain and inherent immunity to RFI.

MECHANISM

Unlike most other products in it's class the 4000 Series employs an all-metal mechanism, providing the finest feel. It delivers consistent return to centre 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 gaiter option 5. The open frame variant may be specified for use with gaiter option 1, or in the case the joystick is specified with friction hold, or where space in the immediate vicinity of the joystick is very limited.

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 centre. 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.
Potentiometer option 2 is ideal for safety critical applications. Acting like two potentiometers in one, potentiometer option 2 provides two completely independent wiper signals, which may also be powered seperately and yield nominally rail to rail outputs.
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.

GATING

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 centre. The standard spring force requires 1.3N (nominally) to off-centre 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.

4000 SERIES - POTENTIOMETER JOYSTICKS

STANDARD OPTIONS

The 4000 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.

4	R	2	1	2	S	1	E	5	5	00
SERIES	BODY	AXES	POTS	- 2 -	SPRING	- 1 -	HANDLE	BEZEL	GAITER	MODIFIER
4000 (4)	Closed (R)	One (1)	10K 340° (1)		Friction Hold (F)		Round (C)	None (0)	Internal (1)	None (00)
	Open (P)	Two (2)	5K Dual Output (2)		Strong (H)		Cylindrical (D)	Square (3)	Standard (5)	
		Three (3)	5K 340° (5)		Standard (S)		Conical (E)	Circular (5)		
			5K 55° (8)		Weak (W)		Conical (G)			
			5K 55°+CT (9)				Push Button Tactile (M)			
							Push Button Soft Touch (N)			
							Skirted (Q)			
							Third Axis (R)			
							Third Axis - Knurled (Y)			

CABLE SPECIFICATION

Cable information may be subject to specification, please refer to Apem for details.

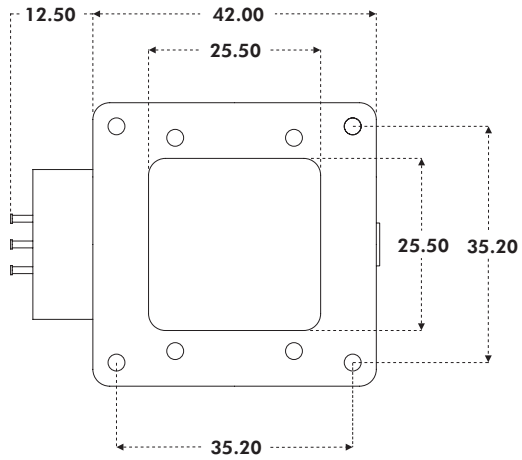
14/0.12 - Fourteen strands of 0.12mm diameter tinned annealed copper wire PVC insulated, to a nominal OD of 1mm			
Red	: +Vcc for X & Y Axes	Black	: 0V for X & Y Axes
Blue	: X Axis Wiper	Yellow	: Y Axis Wiper
Green	: Centre Tap		
7/0.127 - Seven strands of 0.127mm diameter tinned copper wire ETFE insulated, to a nominal OD of 0.7mm			
Orange	: Push Button		
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.			

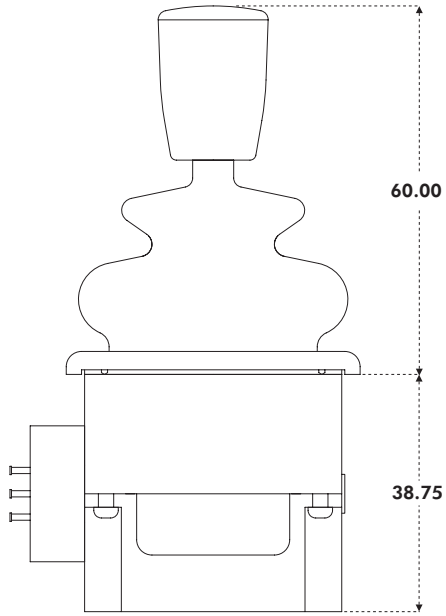
TECHNICAL SPECIFICATION

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

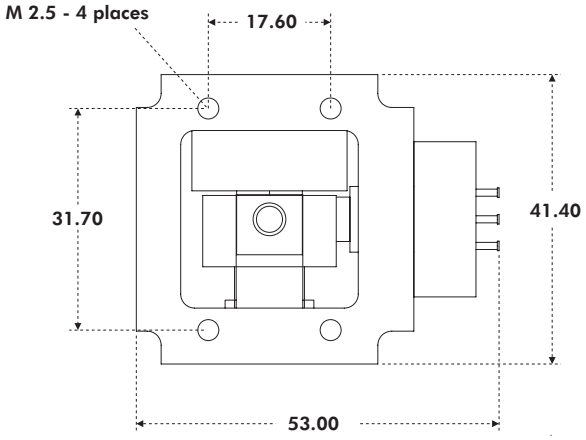
Life Cycles	: >5 Million Operations	Lever Travel	: +/-27.5 Degrees
Lever Material	: Stainless Steel	Body Material	: Glass Filled ABS or Steel
Knob Material	: Nylon or Aluminium	Gaiter Material	: Neoprene
Pivot Blocks	: HE30 Alloy	Other Materials	: Brass
Temperature Range	: -20°C to +55°C	Resistance Tolerance	:+/-20%
Linearity	: +/-2%	Output Smoothness	: 0.1% max
Power Rating	: 1W at 70°C - Derate to 0W at 125°C	Insulation Resistance	:1000M Ohms, 500V DC
Preferred Load	: >100K	Potentiometer Alignment	: To Centre of Track (+/-1%)
Weight	: 110 Grams	Above Panel Seal	: IP65

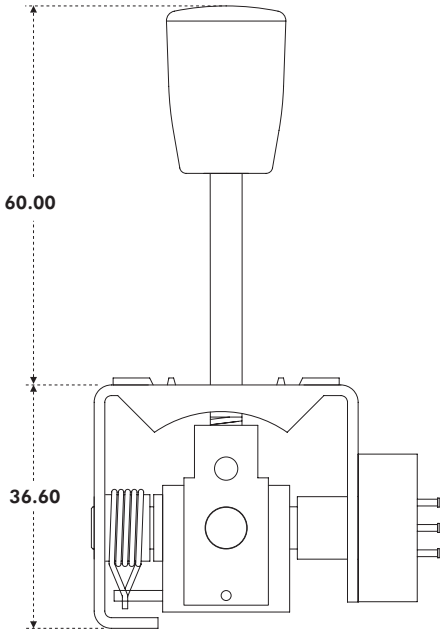
CLOSED FRAME





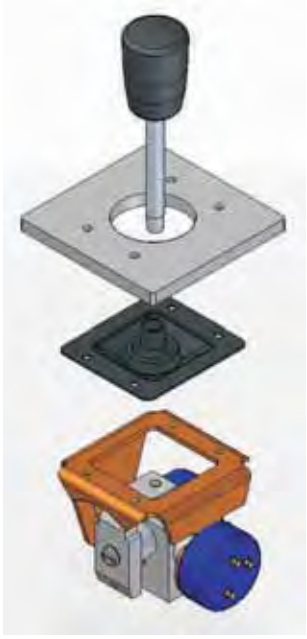
OPEN FRAME



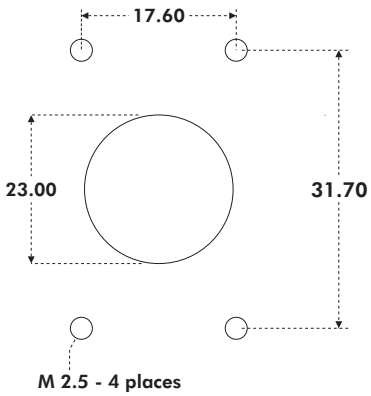


Note: The dimensions shown are for a generic two axes 4000 Series open frame with the E type handle, and a generic two axes 4000 Series closed frame also with the two axes E type handle.
For specific dimensions of this or any other configuration please refer to Apem.

OPEN FRAME - PANEL CUT-OUT AND MOUNTING INSTALLATION

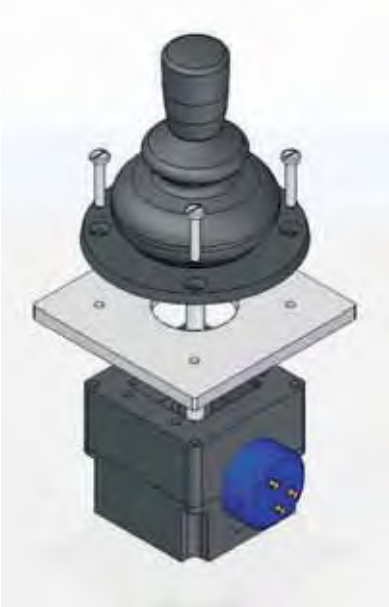


MOUNTING CUT-OUT

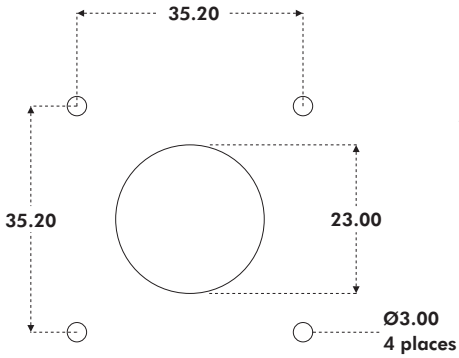


The joystick mounts from beneath the panel and the gaiter is trapped between the joystick and the panel. No bezel is necessary for this installation, since the panel acts as the bezel. The frame has M2.5 tapped holes and as such M2.5 machine screws are recommended for this mounting.

CLOSED FRAME - PANEL CUT-OUT AND MOUNTING INSTALLATION

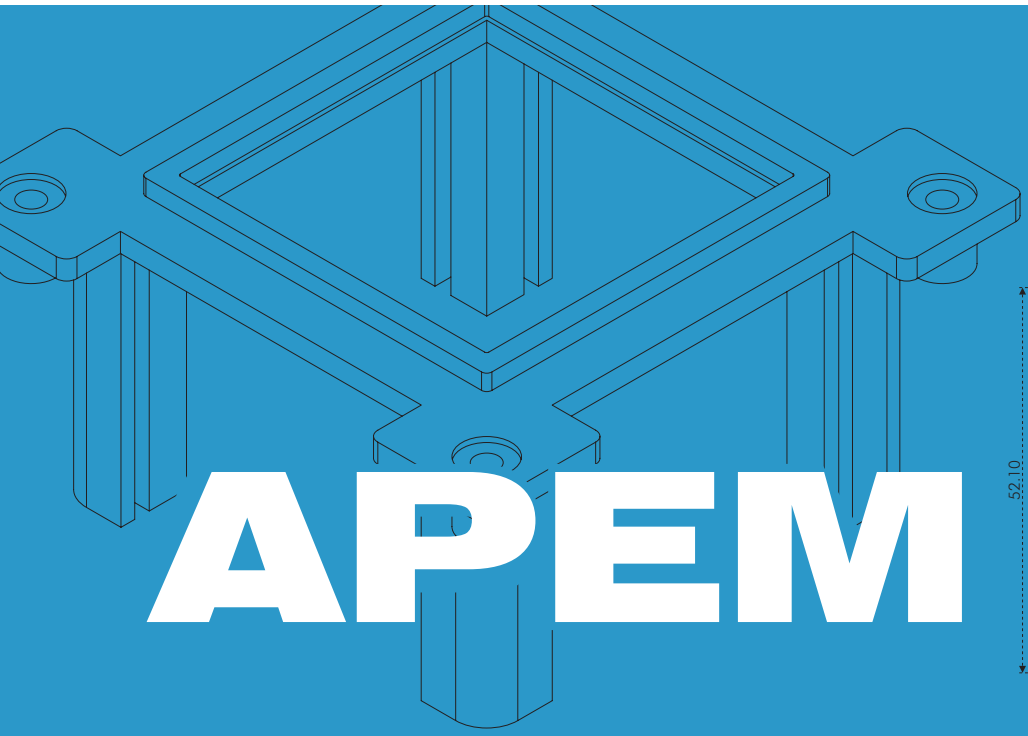


MOUNTING CUT-OUT



The body of the joystick is mounted from beneath the panel. The gaiter 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.

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.



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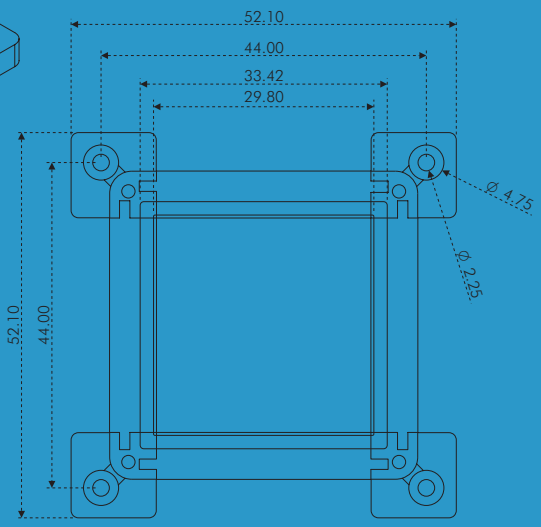


5000 SERIES - POTENTIOMETER JOYSTICKS

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

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 details of these or any other 5000 Series enquiries please contact your local Apem representative.

5000 SERIES - POTENTIOMETER JOYSTICKS

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)

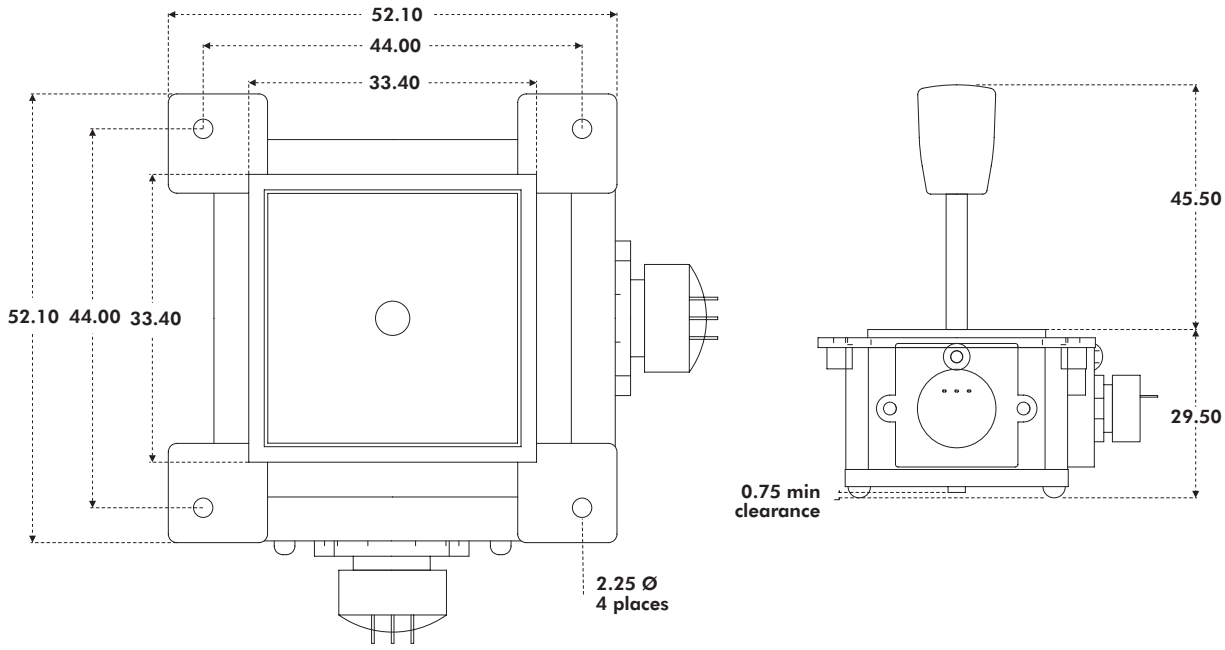
EXAMPLE CONFIGURATIONS

TECHNICAL SPECIFICATION

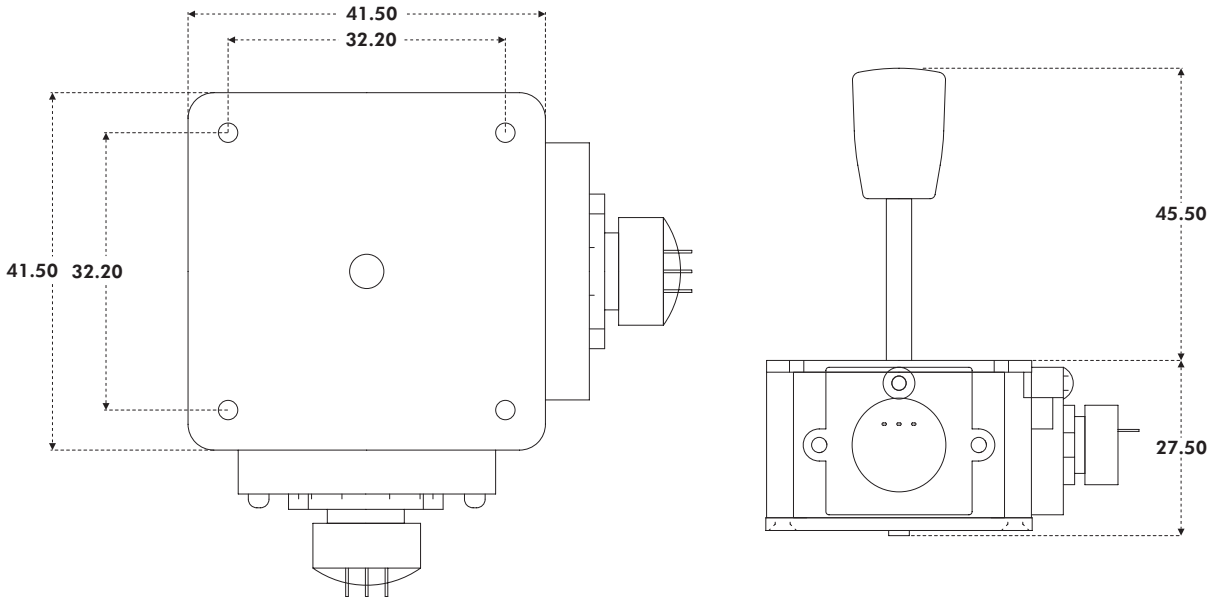
All parameters and dimensions shown maybe subject to specification, please refer to Apem for details.

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)

MOUNTING OPTION A

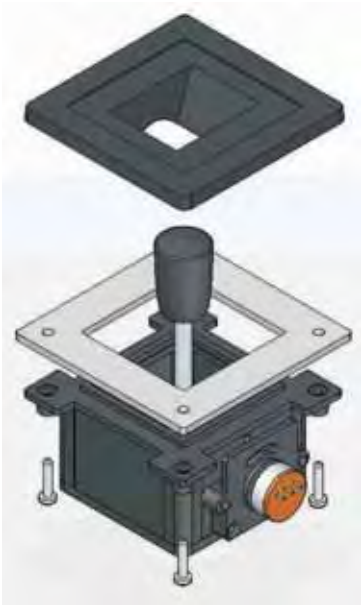


MOUNTING OPTION B

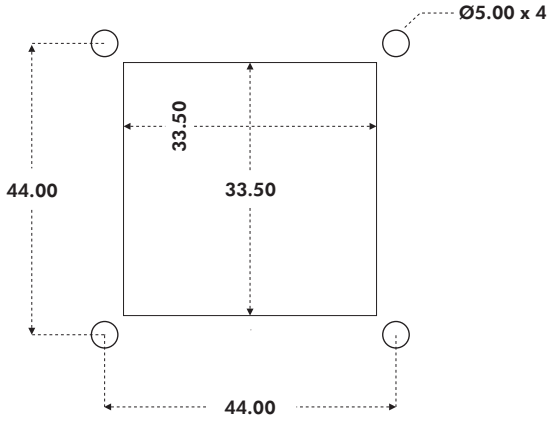


Note: The dimensions shown are for a generic two axes 5000 Series with the F type handle. For specific dimensions of this or any other configuration please refer to Apem.

MOUNTING OPTION A - PANEL CUT-OUT AND MOUNTING INSTALLATION

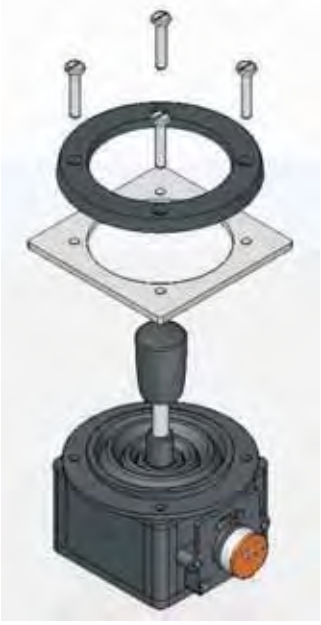


MOUNTING CUT-OUT

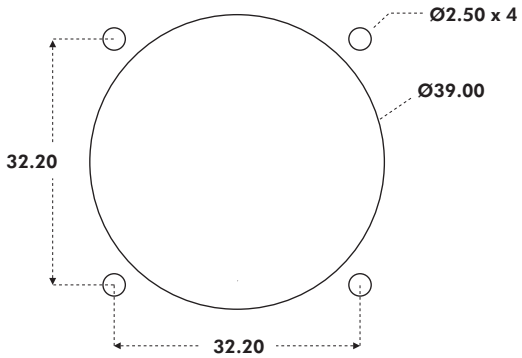


The joystick is mounted from beneath the panel, with the bezel fitted onto the front face of the panel. It is recommended to use No. 2 self tapping, pan head screws, the length of which must be determined subject to the thickness of the panel.

MOUNTING OPTION B - PANEL CUT-OUT AND MOUNTING INSTALLATION

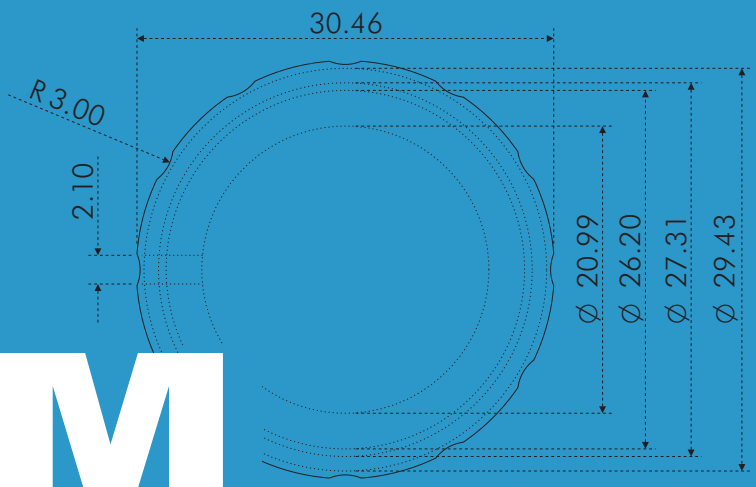


MOUNTING CUT-OUT



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.



APEM

9000 SERIES - CONTACTLESS JOYSTICKS

ULTRA LOW PROFILE ONE, TWO, THREE AXIS WIDE VARIETY OF HANDLES

HIGH EMC IMMUNITY 18 MONTH WARRANTY INFINITE RESOLUTION

CONTACTLESS SENSING CONSISTENT PERFORMANCE IP65 ABOVE PANEL

OPTIONAL 'AT CENTRE' AND 'INTERNAL FAULT' DETECTION LONG SERVICE LIFE

9000 SERIES - CONTACTLESS JOYSTICKS

GENERAL DESCRIPTION

The 9000 Series is ideal for those applications that demand proportional control with the lowest possible profile below the panel. Developed from the proven 7000 Series, the 9000 Series employs the same, highly proven, contactless, inductive sensing and circuitry. The mechanics have been radically improved to reduce the below-panel depth to a world class 35mm sub-panel or 31mm drop-through. This joystick offers self-centering, omni-directional functionality, and utilises the exclusive 'locking cam' system to rigidly secure the highly repeatable mechanism around the precision ground steel operating shaft. High precision air wound coils are mounted directly onto the SMT circuitry, delivering enviable accuracy whilst further minimising the installed depth of the joystick.

CIRCUITRY

The 9000 Series joystick operates by passing a 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 centre' 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 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.

FUNCTIONAL OPTIONS

The 9000 Series can be configured in three different modes -

Orthoganol, 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.

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

9000 SERIES - CONTACTLESS JOYSTICKS

STANDARD OPTIONS

The 9000 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.

9	S	A	20	R	C	6	2	00

SERIES	SENSING	DECODING	GAIN	LIMITER	HANDLE	BEZEL	GAITER	MODIFIER
9000 (9)	Mixed (M)	Single Decode (A)	20% (+/- 10%) (10)	Single Axis (A)	Round (C)	Not supplied (0)	Gloss Finish (2)	None (00)
	Interacting (Q)	Dual Decode Dual Outputs (M)	40% (+/- 20%) (20)	Cross (C)	Cylindrical (D)	Circular (4)	Standard (5)	Guided Feel (20)
	Standard (S)	Dual Decode Separate Fault & Centre Detect (W)	66% (+/- 33%) (33)	Diamond (D)	Conical (E)	Square (6)		
		Dual Decode Fault Detect (X)	80% (+/- 40%) (40)	Round (R)	Conical (G)			
		Dual Decode Combined Fault & Centre Detect (Y)	100% (+/- 50%) (50)	Square (S)	Push Button Tactile (J)			
		Dual Decode Centre Detect (Z)		X Type (X)	Push Button Tactile (M)			
					Push Button Soft Touch (N)			
					Third Axis + Push Button (P)			
					Skirted (Q)			
					Third Axis (R)			
					Third Axis - Knurled (Y)			

BEZEL OPTIONS

For drop in mounting, please specify bezel option 6. For sub-panel mounting, no bezel is necessary, unless the gaiter is required to seal to the face of the panel in which case bezel option 4 should be specified.

SPRINGING

As standard 9000 Series are offered sprung to centre. The standard spring force requires 1.3N (nominally) to off-centre 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. Owing to the size and weight of handle type P it is supplied as standard with a strong spring.

DUAL DECODE INTERFACE

For optimum performance of the centre detect and fault detect signals, Apem recommend the signals are “pulled high” via an input resistor of typically 22k, on the controller circuitry.

CENTRE TAP REFERENCE

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

NON STANDARD

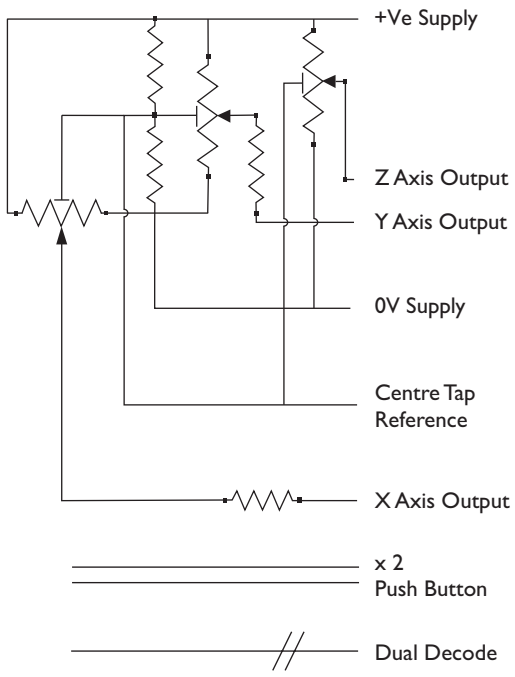
Further non standard options including custom handles or special limiters are available. Please refer to Apem for further details.

TECHNICAL SPECIFICATION

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

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 Centre	: +/-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	: 5mm	Other Materials	: Brass, Acetal, Nylon
Gimbal Pivot	: Acetal and Hardened Steel	Gaiter	: Neoprene
Weight	: 90 Grams	Above Panel Seal	: IP65
Temperature Range	: -20°C to +55°C	Max Load to Shaft - Horizontal	: 25Kg (Momentary)
Max Load to Shaft - Vertical	: 75Kg (Momentary)	Operating Lever Deflection	: +/-18°

NEAR EQUIVALENT CIRCUIT

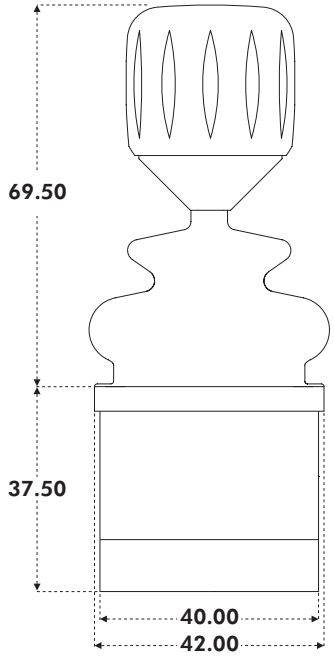


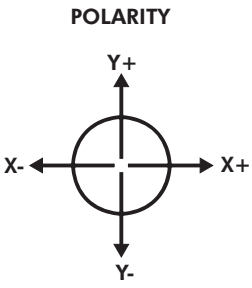
CABLE SPECIFICATION

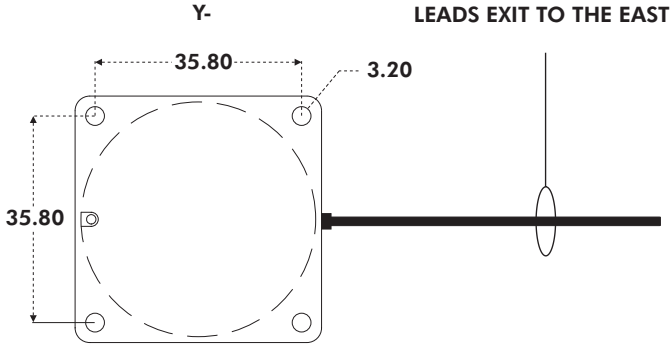
Cable information may be subject to specification, please refer to Apem for details.

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	: Centre Tap Reference	Purple	: Z Axis Wiper
Orange	: Centre Detect, or Combined Fault & Centre Detect	White	: Fault Detect
Brown	: Mirror of X Axis Wiper	Grey	: Mirror of Y Axis
7/0.127 - Seven strands of 0.127mm diameter tinned copper wire ETFE insulated, to a nominal OD of 0.7mm			
Orange	: Push Button		
All 9000 Series are supplied with 150mm of twisted cable harness, with tinned ends.			
Connectors may be fitted upon request.			

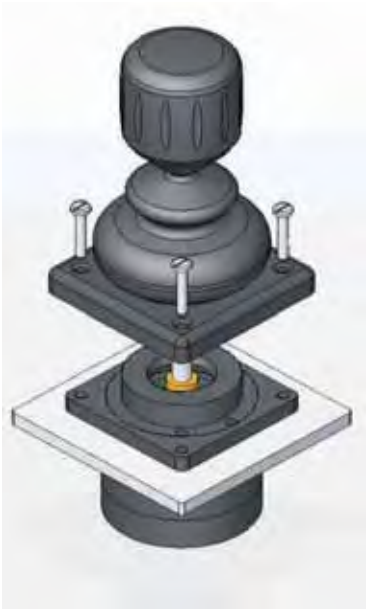
GENERAL DIMENSIONS



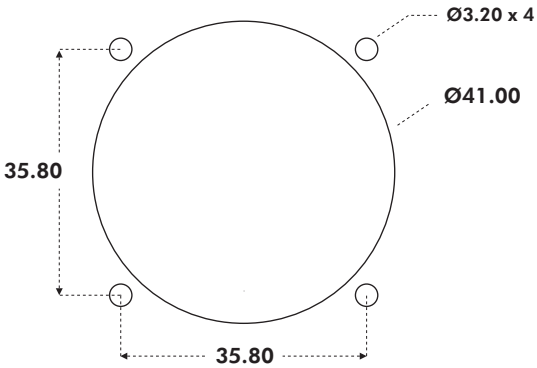




DROP IN MOUNTING - PANEL CUT-OUT & MOUNTING INSTALLATION



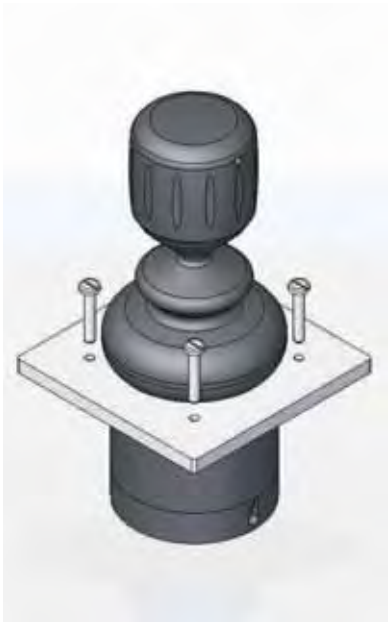
MOUNTING CUT-OUT



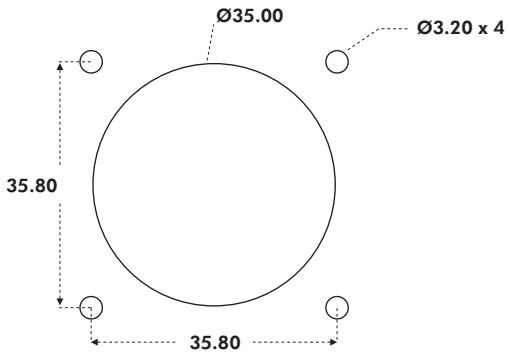
The joystick is dropped into the panel cut-out. For panel thickness of <3mm, M3 x 16 countersunk machine screws are recommended.

Note: The dimensions shown are for a generic 9000 Series with the third axis R type handle. For specific dimensions of this or any other configuration please refer to Apem.

MOUNTING OPTION A - PANEL CUT-OUT & MOUNTING INSTALLATION

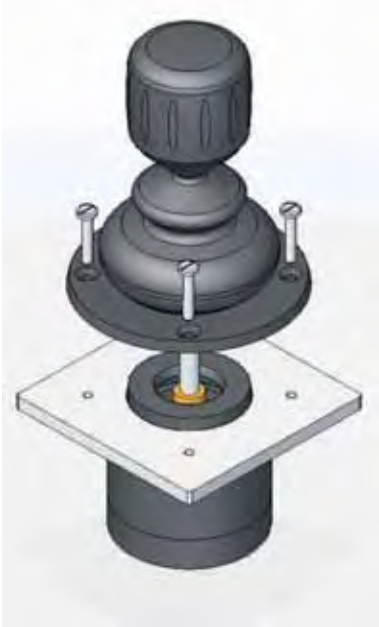


MOUNTING CUT-OUT

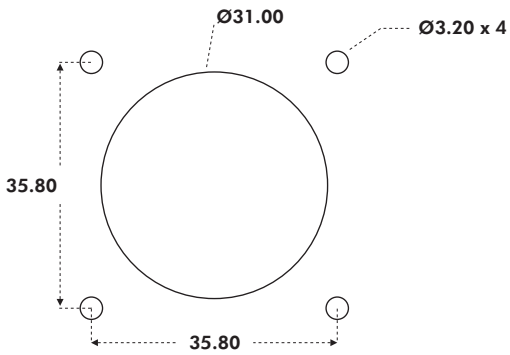


When mounted this way the panel acts as the bezel and no separate bezel is needed. M3 machine screws are recommended.

MOUNTING OPTION B - PANEL CUT-OUT & MOUNTING INSTALLATION



MOUNTING CUT-OUT

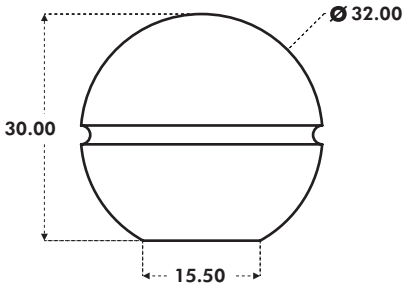


The joystick flange is mounted beneath the panel and the base of the gaiter must be brought through the panel cut-out and held in place with the circular bezel. For panel thicknesses of 3mm, M3 x 16 countersunk machine screws are recommended.

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

HANDLE SELECTION GUIDE

HANDLE C



The conventional choice for power chairs.

MATERIAL: Phenolic

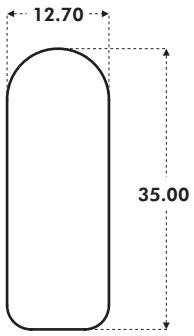
FINISH: Gloss

STANDARD COLOUR: Black

OTHER COLOURS: Upon request

AVAILABLE: 1000, 4000 and 9000 Series

HANDLE D



A tall cylindrical handle, with an anodised aluminium finish.

MATERIAL: Aluminium

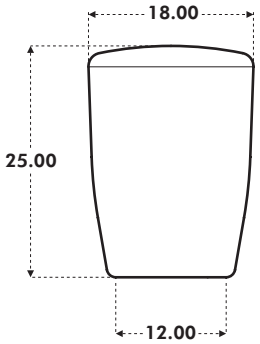
FINISH: Anodised

STANDARD COLOUR: Black

OTHER COLOURS: Not available

AVAILABLE: 1000, 4000 and 9000 Series

HANDLE E



A mid-size conical handle with a modern look and feel.

MATERIAL: Nylon

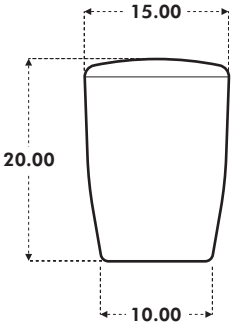
FINISH: Matt

STANDARD COLOUR: Black

OTHER COLOURS: Upon request

AVAILABLE: 4000 and 9000 Series

HANDLE F



The smallest conical handle for that feel of precision.

MATERIAL: Nylon

FINISH: Matt

STANDARD COLOUR: Black

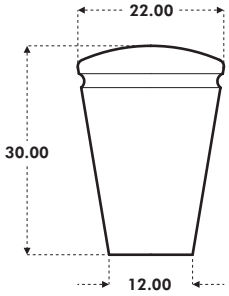
OTHER COLOURS: Upon request

AVAILABLE: 1000 and 5000 Series

Note: The drawings above are not to scale and all dimensions shown are in millimeters.
Note: Different colour variants may be subject to minimum order quantities.

HANDLE SELECTION GUIDE

HANDLE G



A larger conical handle with a gloss finish.

MATERIAL: Phenolic

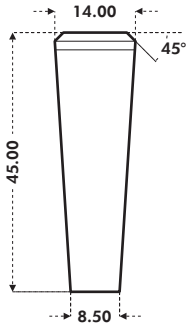
FINISH: Gloss

STANDARD COLOUR: Black

OTHER COLOURS: Not available

AVAILABLE: 4000 and 9000 Series

HANDLE H



The tallest conical handle with a premium look.

MATERIAL: Aluminium

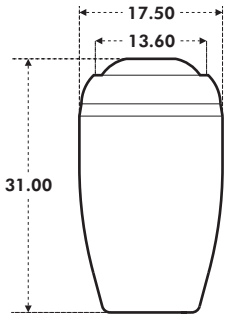
FINISH: Anodised

STANDARD COLOUR: Silver

OTHER COLOURS: Upon request

AVAILABLE: 1000 and 5000 Series

HANDLE J



A tactile push button handle using the Apem IP67 sealed, momentary IS Series push button.

MATERIAL: ABS

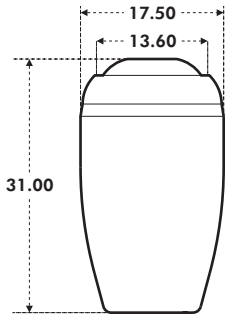
FINISH: Matt

STANDARD COLOUR: Black

OTHER COLOURS: Not available

AVAILABLE: 9000 Series

HANDLE M



A tactile push button handle using the Apem IP67 sealed, momentary IS Series push button.

MATERIAL: Aluminium

FINISH: Anodised

STANDARD COLOUR: Black

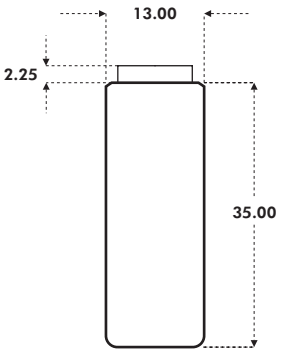
OTHER COLOURS: Upon request

AVAILABLE: 1000, 4000 and 9000 Series

Note: The drawings above are not to scale and all dimensions shown are in millimeters.
Note: Different colour variants may be subject to minimum order quantities.

HANDLE SELECTION GUIDE

HANDLE N



A soft touch push button handle, using the Apem 9633 Series switch.

MATERIAL: Aluminium

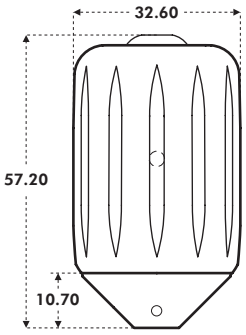
FINISH: Anodised

STANDARD COLOUR: Black

OTHER COLOURS: Upon request

AVAILABLE: 4000 and 9000 Series

HANDLE P



A premium, all metal, third axis handle with the IP67 sealed, IS Series push button switch.

MATERIAL: Aluminium

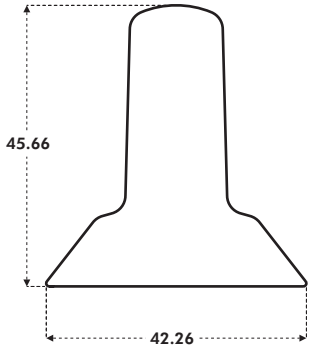
FINISH: Hard Anodised

STANDARD COLOUR: Black

OTHER COLOURS: Upon request

AVAILABLE: 9000 Series

HANDLE Q



An ideal choice in external environments where mechanical protection of the gaiter is desirable.

MATERIAL: Nylon

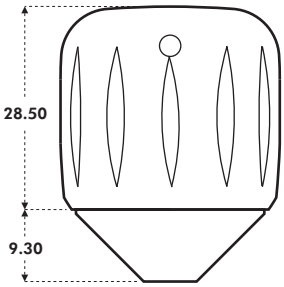
FINISH: Matt

STANDARD COLOUR: Black

OTHER COLOURS: Upon request

AVAILABLE: 4000 and 9000 Series

HANDLE R



The standard, all metal, third axis handle for supreme robustness with a great look and feel.

MATERIAL: Aluminium

FINISH: Hard Anodised

STANDARD COLOUR: Black

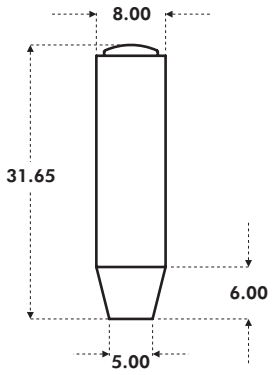
OTHER COLOURS: Upon request

AVAILABLE: 4000 and 9000 Series

Note: The drawings above are not to scale and all dimensions shown are in millimeters.
Note: Different colour variants may be subject to minimum order quantities.

HANDLE SELECTION GUIDE

HANDLE V



A tall slimline handle for the 5000 Series

MATERIAL: ABS

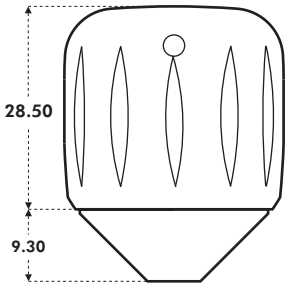
FINISH: Gloss

STANDARD COLOUR: Black

OTHER COLOURS: Not available

AVAILABLE: 5000 Series

HANDLE W



The standard third axis handle for the 5000 Series.

MATERIAL: Nylon

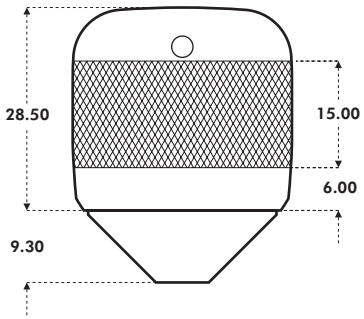
FINISH: Matt

STANDARD COLOUR: Black

OTHER COLOURS: Not available

AVAILABLE: 5000 Series

HANDLE Y



An all metal third axis handle, with a knurled finish, ideal for more industrial environments.

MATERIAL: Aluminium

FINISH: Anodised with diamond knurl

STANDARD COLOUR: Black

OTHER COLOURS: Not available

AVAILABLE: 4000 and 9000 Series

The total throw of all third axis handles is 55° (+/- 27.5 degrees). As standard the polarity of all the handles is incrementing when turned clockwise.

All third axis handles employ 5K potentiometers as standard regardless of the product series to which they are fitted.
The electrical outputs are tailored during manufacture to match the required specification of joystick to which they are fitted.

For further detail on any of the Apem handles, or for technical data on the Apem switches employed, please refer to your local Apem sales representative.

Note: The drawings above are not to scale and all dimensions shown are in millimeters.
Note: Different colour variants may be subject to minimum order quantities.

USB JOYSTICK INTERFACE MODULE

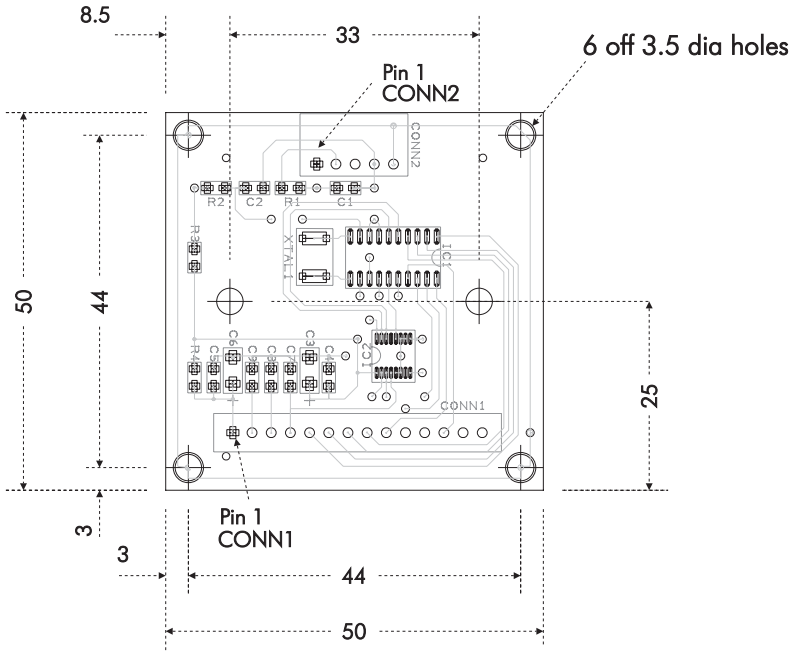
GENERAL DESCRIPTION

The Apem USB joystick interface is designed to connect an Apem 9000 Series joystick with up-to 3 axes and 8 buttons to a USB port on a PC or Mac®. It is compatible with *Windows*® 98 / *Windows* 2000 and newer operating systems on the PC, as well as Mac OS® 9.0 / Mac OS X and newer on the Mac.

The interface is fully USB V1.1/2.0 and HID 1.1 compliant. It is compatible with standard system drivers, so no special drivers are required. There are 3 analogue inputs for X, Y and Z axes with 10 bit resolution and connections for up-to 8 push buttons.

MOUNTING

The interface board measurements and mounting points are shown below:



CONNECTIONS

USB connection is made to a 5 way Molex KK style header. A USB cable (1.5m long) is available seperately.
The joystick connects to a 14 way Molex KK style header.

USING THE JOYSTICK TO CONTROL THE MOUSE POINTER

A software utility can be downloaded from the internet that allows a joystick connected to the USB interface to control the mouse pointer. Please refer to the Virtual Projects Website http://www.vp-soft.com/software/joymouse.php for details on their 'Joymouse' software.

DATASHEET

For further details and a full USB interface datasheet, please refer to your local Apem sales representative.

CONTACT US

For more information on Apem or other Apem products,
please visit www.apem.com

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