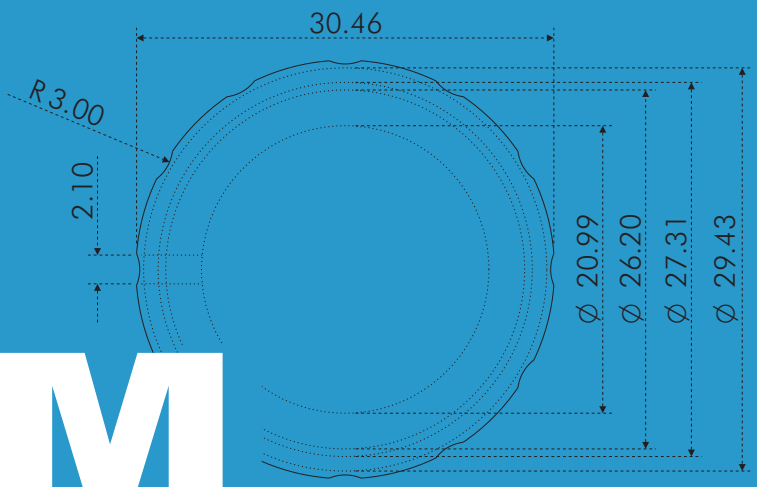




APEM

9000 SERIES - CONTACTLESS JOYSTICKS

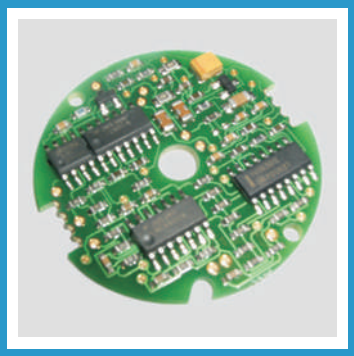
ULTRA LOW PROFILE ONE, TWO, THREE AXIS WIDE VARIETY OF HANDLES

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







www.apem.com

9000 SERIES - CONTACTLESS JOYSTICKS

PRODUCT DESCRIPTION

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

PRODUCT CONFIGURATION

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.

9000 SERIES - CONTACTLESS JOYSTICKS

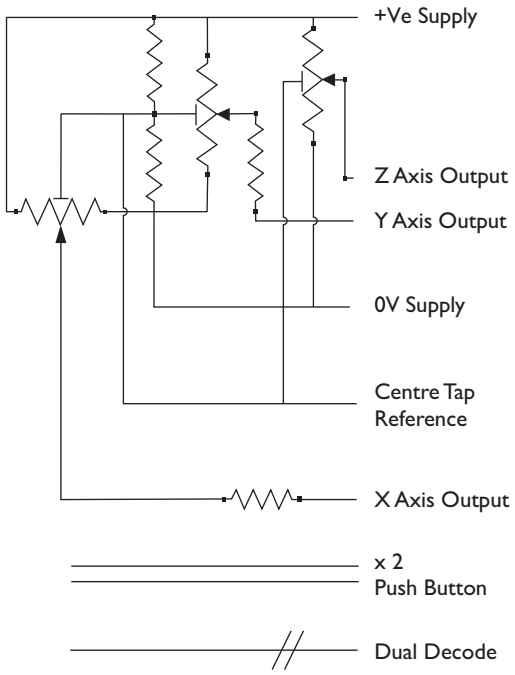
PRODUCT SPECIFICATION

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

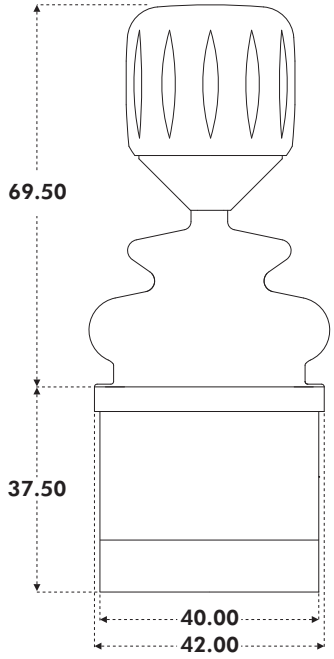
Cable information may be subject to specification, please refer to Apem for details.

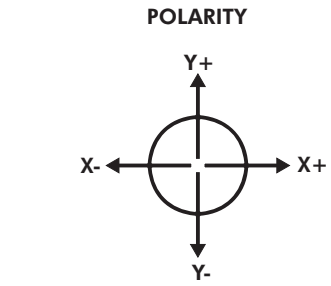
14/0.12 - Fourteen strands of 0.12mm diameter tinned annealed copper wire PVC insulated to a nominal OD of 1mm.			
Red	: +Vcc	Black	: 0V
Blue	: X Axis Wiper	Yellow	: Y Axis Wiper
Green	: Centre Tap Reference	Purple	: Z Axis Wiper
Orange	: Centre Detect, or Combined Fault & Centre Detect	White	: Fault 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.			

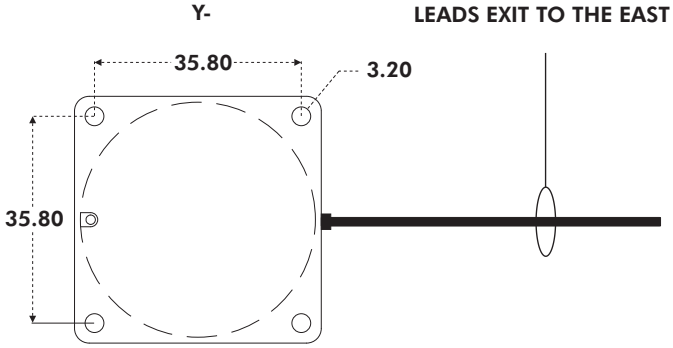
9000 SERIES - CONTACTLESS JOYSTICKS

USEFUL DIMENSIONS

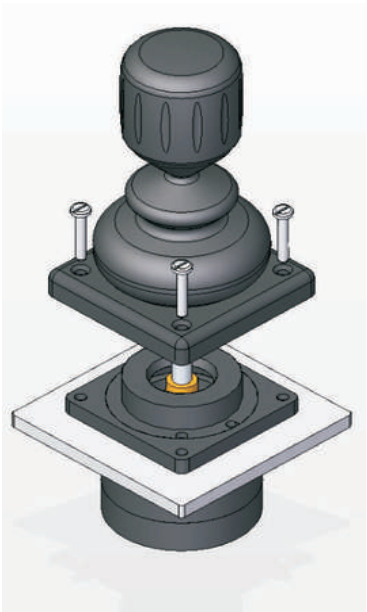
GENERAL DIMENSIONS



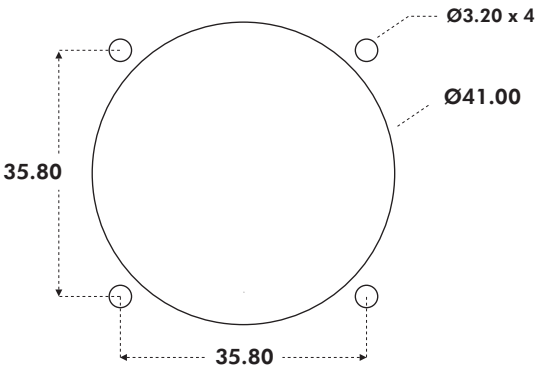




DROP IN MOUNTING - PANEL CUT-OUT & MOUNTING INSTALLATION



MOUNTING CUT-OUT



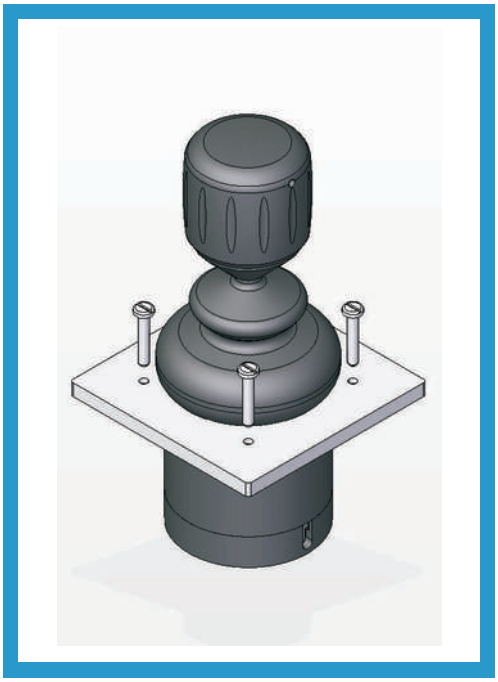
The joystick is dropped into the panel cut-out. For panel thickness of <3mm, M3 x 16 countersunk machine screws are recommended.

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.

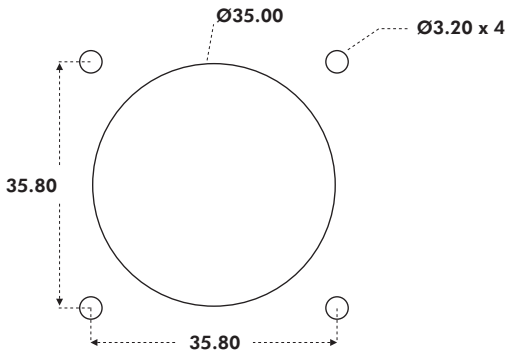
9000 SERIES - CONTACTLESS JOYSTICKS

USEFUL DIMENSIONS

MOUNTING OPTION A - PANEL CUT-OUT & MOUNTING INSTALLATION

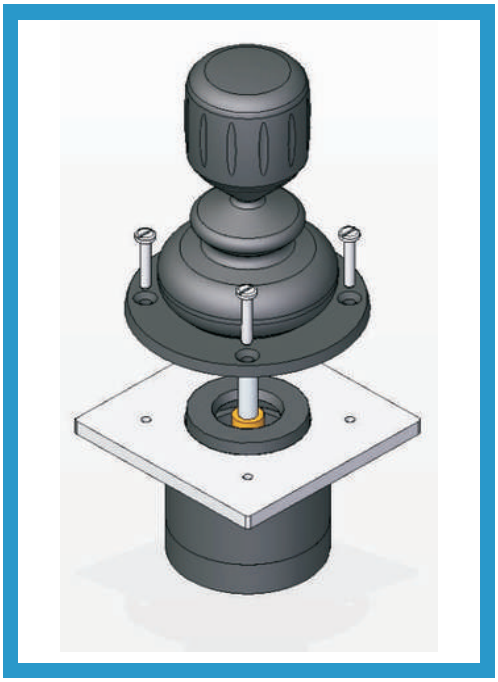


MOUNTING CUT-OUT

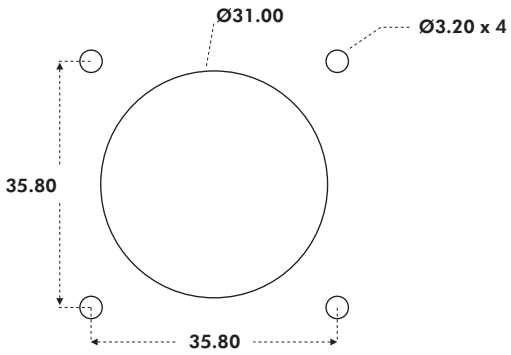


When mounted this way the panel acts as the bezel and no separate bezel is needed. M3 machine screws are recommended.

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.