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.
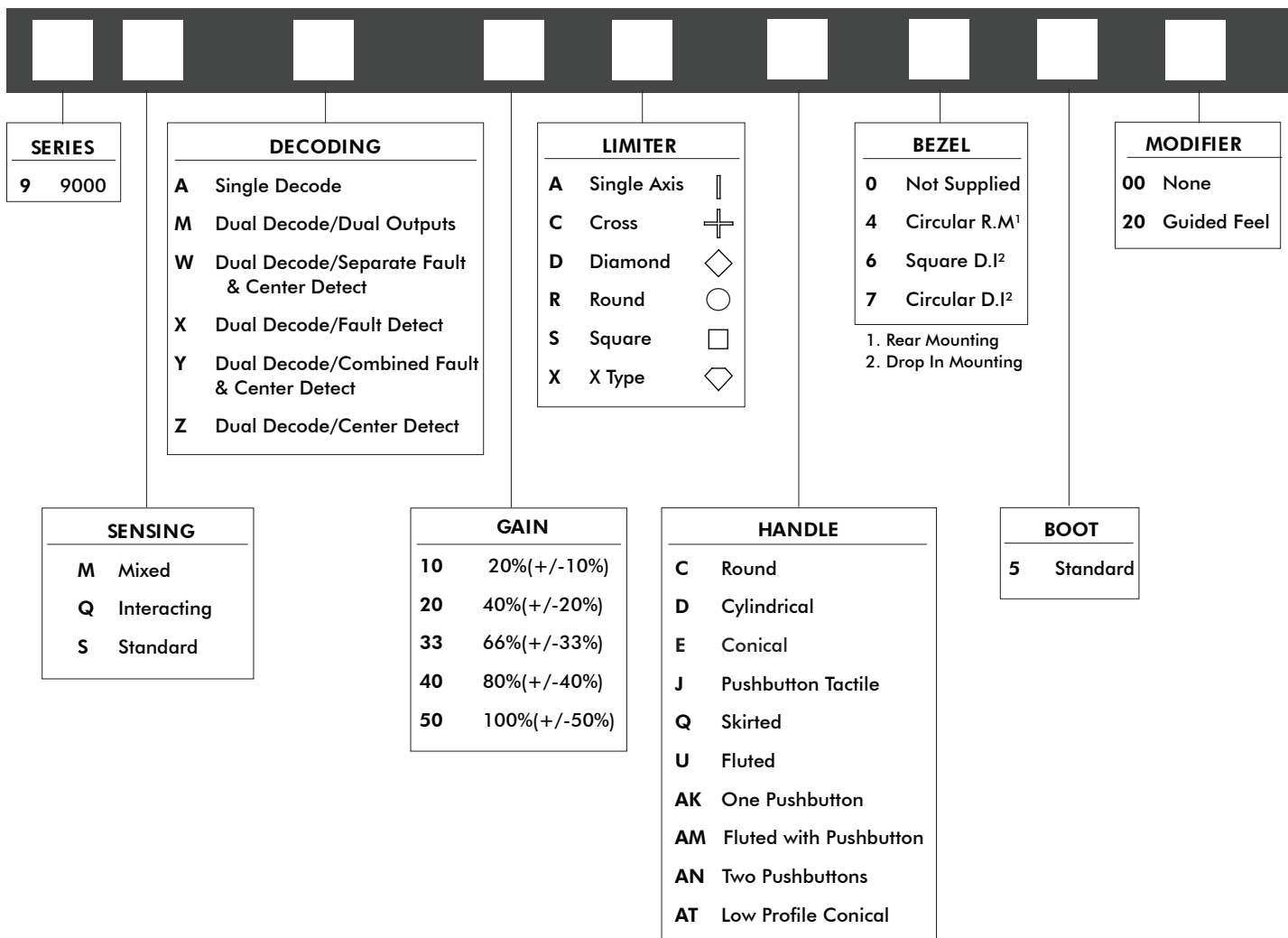
KEY FEATURES

- 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

SERIES		DECODING		LIMITER		BEZEL		MODIFIER	
9	9000	A	Single Decode	A	Single Axis ‖	0	Not Supplied	00	None
		M	Dual Decode/Dual Outputs	C	Cross ✛	4	Circular R.M[1]	20	Guided Feel
		W	Dual Decode/Separate Fault & Center Detect	D	Diamond ◇	6	Square D.I[2]		
		X	Dual Decode/Fault Detect	R	Round ◯	7	Circular D.I[2]		
		Y	Dual Decode/Combined Fault & Center Detect	S	Square ☐				
		Z	Dual Decode/Center Detect	X	X Type ◇				

1. Rear Mounting
2. Drop In Mounting

SENSING		GAIN		HANDLE		BOOT	
M	Mixed	10	20%(+/-10%)	C	Round	5	Standard
Q	Interacting	20	40%(+/-20%)	D	Cylindrical		
S	Standard	33	66%(+/-33%)	E	Conical		
		40	80%(+/-40%)	J	Pushbutton Tactile		
		50	100%(+/-50%)	Q	Skirted		
				U	Fluted		
				AK	One Pushbutton		
				AM	Fluted with Pushbutton		
				AN	Two Pushbuttons		
				AT	Low Profile Conical		

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.

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

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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

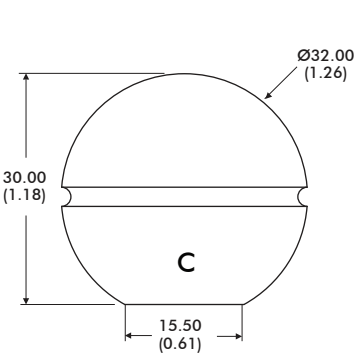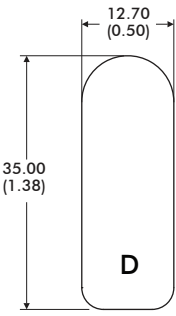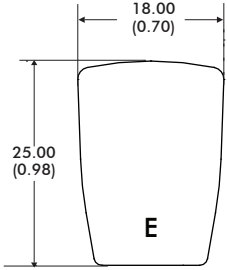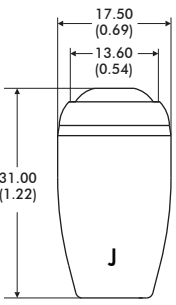|			
14/0.12 - Fourteen strands of 0.12mm diameter tinned annealed copper wire PVC insulated to a nominal OD of 1mm			
Red	: +Vcc	Black	: 0V
Blue	: X Axis Wiper	Yellow	: Y Axis Wiper
Green	: Center Tap Reference		
Orange	: Center Detect, or Combined Fault & Center Detect	White	: Fault Detect
Brown	: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

+Ve Supply

Y Axis Output

0V Supply

Center Tap Reference
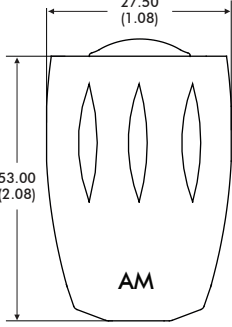
X Axis Output

x 2 Pushbutton

Dual Decode
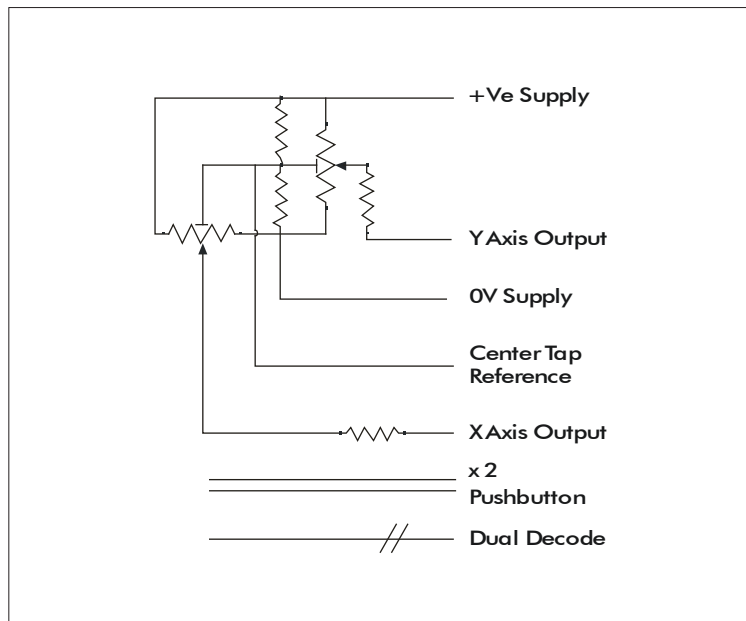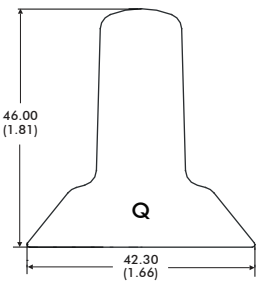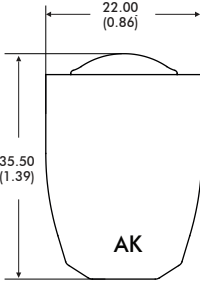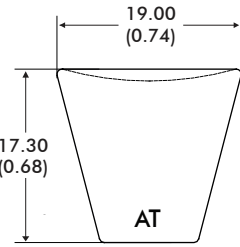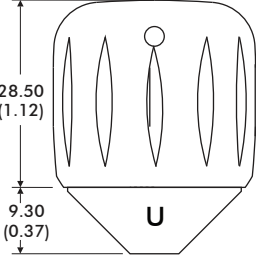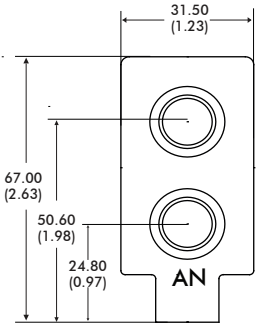
9000 series
Inductive sensing joysticks
DIMENSIONAL DRAWINGS - HANDLES

Ø32.00 (1.26)

30.00 (1.18)

15.50 (0.61)

C

12.70 (0.50)

35.00 (1.38)

D

18.00 (0.70)

25.00 (0.98)

E

17.50 (0.69)

13.60 (0.54)

31.00 (1.22)

J

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

46.00 (1.81)

42.30 (1.66)

Q

22.00 (0.86)

35.50 (1.39)

AK

27.50 (1.08)

53.00 (2.08)

AM

MATERIAL	Nylon	Aluminum	Aluminium
FINISH	Sparked Matt	Anodised	Anodised
STANDARD COLOR	Black	Black	Black
OTHER COLORS	Upon Request	Not Available	Upon Request
NOTES:		Uses APEM IA Switch	Uses APEM IA Switch

19.00 (0.74)

17.30 (0.68)

AT

28.50 (1.12)

9.30 (0.37)

U

31.50 (1.23)

67.00 (2.63)

50.60 (1.98)

24.80 (0.97)

AN

MATERIAL	Nylon	Aluminum	Delrin
FINISH	Sparked Matt	Anodised	Gloss
STANDARD COLOR	Black	Black	Black
OTHER COLORS	Upon Request	Not Available	Not Available
NOTES:			Uses APEM IS Switch

1. Dimensions are in mm/(inch)

9000 series
Inductive sensing joysticks
DIMENSIONAL DRAWINGS - continued

GENERAL DIMENSIONS

62.00
(2.44)

4.50
(0.18)

31.00
(1.22)

40.00
(1.57)

42.00
(1.65)

POLARITY

North

West ← → East

South

35.80
(1.41)

3.20*

35.80
(1.41)

LEADS EXIT TO THE EAST
VIEWED FROM ABOVE
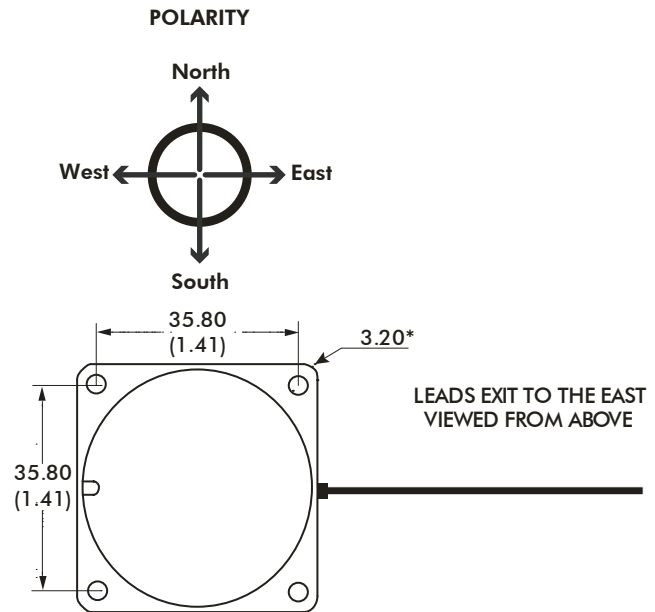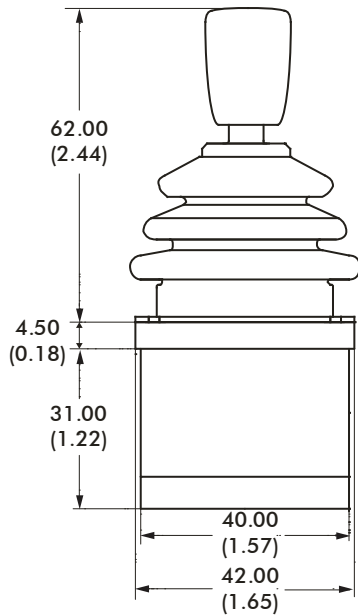
DROP IN MOUNTING - PANEL CUT-OUT & MOUNTING INSTALLATION

Ø3.20 x 4
(0.13)

Ø41.00
(1.61)

35.80
(1.41)

35.80
(1.41)
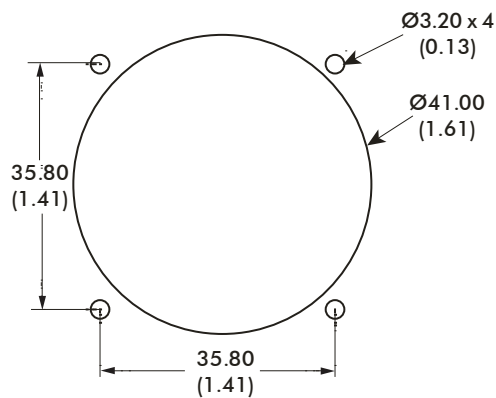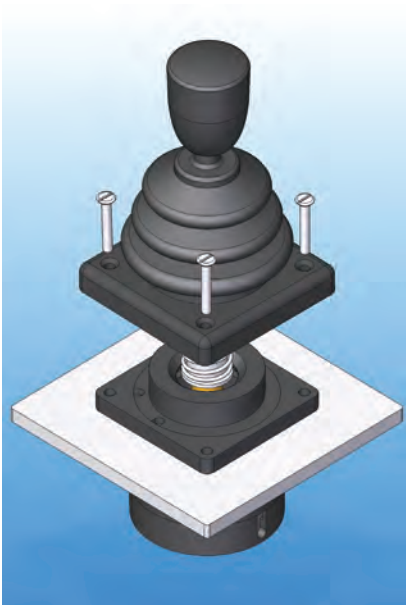
The joystick is dropped into the panel cut-out. The joystick and boot must be kept in place by bezel (option 6 & 7). For panel thickness of <3mm, M3 x 16 countersunk machine screws are recommended.


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.
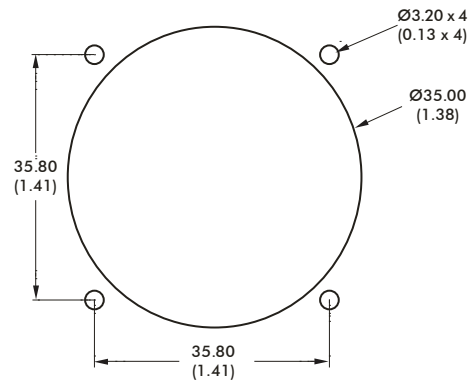
9000 series
Inductive based joysticks
MOUNTING OPTIONS

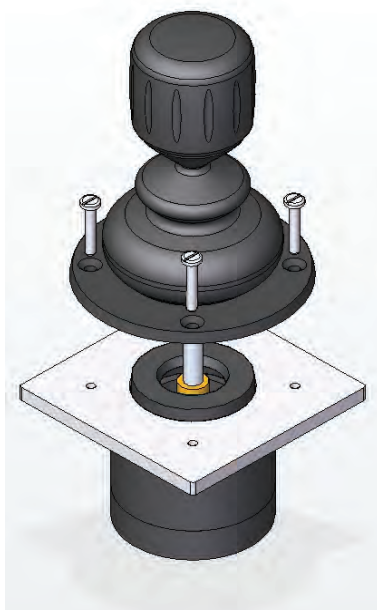### MOUNTING OPTION A - PANEL CUT-OUT & MOUNTING INSTALLATION

MOUNTING CUT-OUT

Ø3.20 x 4
(0.13 x 4)
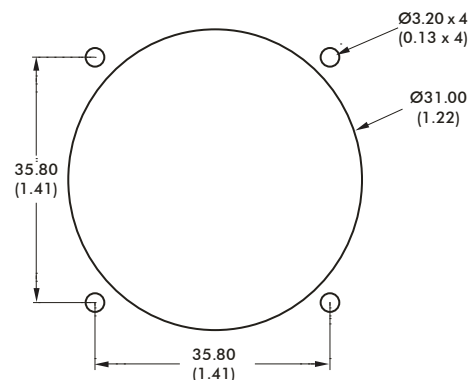
Ø35.00
(1.38)

35.80
(1.41)

35.80
(1.41)
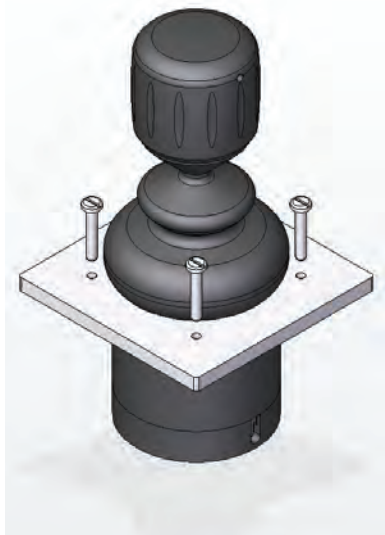
When mounted this way the panel acts as the bezel and no separate bezel is needed. M3 machine screws are recommended.

MOUNTING OPTION B - PANEL CUT-OUT & MOUNTING INSTALLATION

MOUNTING CUT-OUT

Ø3.20 x 4
(0.13 x 4)

Ø31.00
(1.22)

35.80
(1.41)

35.80
(1.41)

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.

9000 series
Inductive sensing joysticks
CONFIGURATION OPTIONS

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

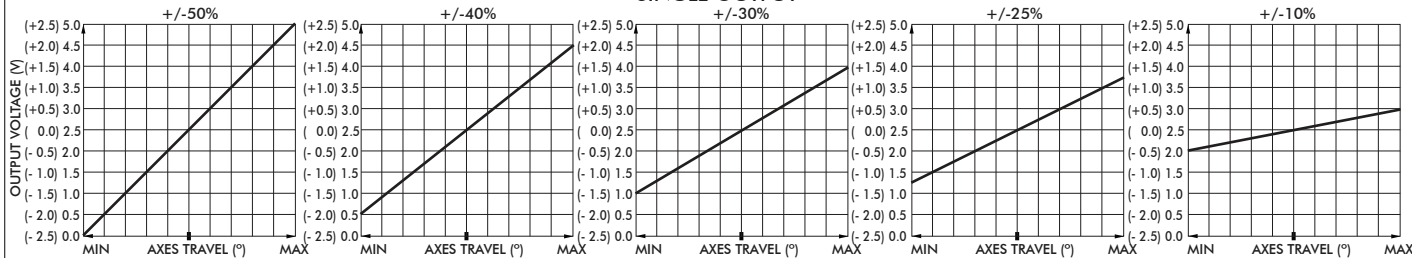The 9000 Series can be configured in three different modes:

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.

LINEAR OUTPUT OPTIONS

SINGLE OUTPUT

DUAL OUTPUT

Output 1
Output 2

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