3000 series

Robust proportional fingertip controllers • non-contacting Hall effect technology

DISTINCTIVE FEATURES

One, two or three axis
Analog or PWM outputs
Low profile less than 20 mm below panel depth
5 V or 3.3 V operation
Metal mechanism

ENVIRONMENTAL SPECIFICATIONS

- Operating Temperature: -25 °C to +70 °C
- Storage Temperature: -40 °C to +70 °C
- Sealing: IP65 (above panel subject to handle and final specification)
- EMC Immunity Level: EN61000-4-3 (extended)
- EMC Emissions Level: EN61000-6-3:2001, CISPR 22:2005, Class B 30 MHz-11GHz
- ESD: EN61000-4-2 (extended)

ELECTRICAL SPECIFICATIONS

- Output Voltage Range: ±10% x V to ±50% x V
- Output at Center: V/2 ±(5% x gain)
- Power Supply: 5 V ±0.5 V transient free; 3.3 V ±0.1 V (configuration 2)
- Output impedance: 10 Ω
- Overvoltage max: +20 V

MECHANICAL SPECIFICATIONS

- Operating Force: 1.3 N (2.86 lbf) (Dependant on configuration)
- Maximum Load: 400 N (89.921 lbf) (subject to handle)
- Mechanical Angle of Movement: 36° X & Y axis (subject to limiter); 50° Z axis (subject to handle)
- Expected Mechanical Life: 10 million lifecycles
- Mass/weight: 100 g (3.53 oz) nominal
- Lever Action (centering): Spring

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MATERIALS

- Shaft: Stainless steel
- Boot: Neoprene
- Handles:
  BL, E, Q, AL - Nylon
  AR - Aluminum
  K - ABS
  T - Stainless steel

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

CONFIGURATIONS 3 & 4

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

PIN	FUNCTION	COLOR
1	0V	Black
2	Center Tap Reference	Green
3	No connection	
4	Y Axis Output	Yellow
5	X Axis Output- Where Specified	Blue
6	+V	Red
7	No connection	

For details on configuration 5 pinout, please contact Customer Support.

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. Some handles may be larger than some panel cut-outs. This may restrict the choice of mounting and bezel options. Please refer to APEM for assistance.

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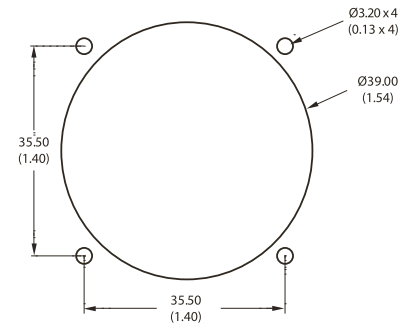
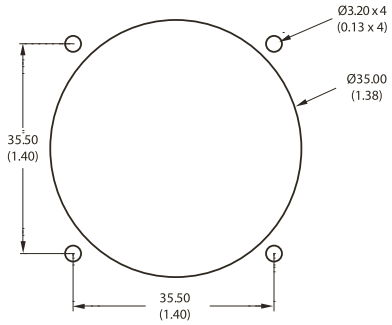
MONTING (CONTINUED)

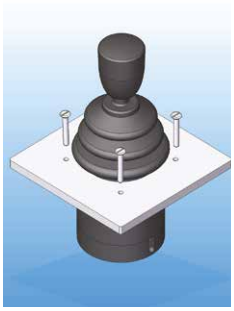
DROP-IN MOUNT CUT-OUT AND INSTALLATION



- The joystick is dropped into the panel cut-out.
- For panel thickness of <3 mm, m3 x 16 countersunk machine screws are recommended.
- Please note: Image shows a square bezel, a circular bezel is also available for this option..
- For IP65 panel sealed, a sealing gasket 310062 need to be ordered separately.

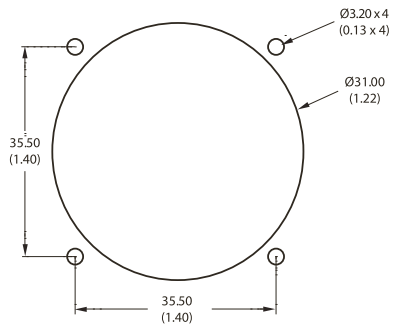
OPTION A SUB-MOUNT CUT-OUT AND INSTALLATION

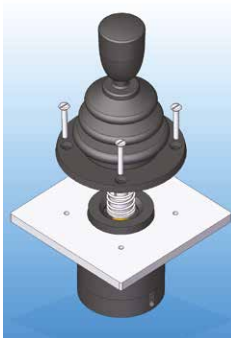




- When mounted this way the panel acts as the bezel and no separate bezel is needed.
- M3 machine screws are recommended..

OPTION B SUB-MOUNT CUT-OUT AND INSTALLATION





- 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 <3 mm, m3 x 16 countersunk machine screws are recommended.

NOTES:

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

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.
3. 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 debris that may damage the boot.

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BUILD YOUR PART NUMBER

SERIES	CONFIGURATION	GAIN	LIMITER
3	1 Standard	10 ±10%xV	A Single Axis
	2 3.3V Operation	25 ±25%xV	C Cross
	3 Dual Outputs	30 ±30%xV	D Diamond
	4 Inverse Dual Outputs	40 ±40%xV	R Round
	5 PWM	50 ±50%xV	S Square
			X X Type

HANDLE*	BEZEL	MODIFIER
BL Round	0 None	00 None
E Conical	4 Circular (below panel)	20 Guided Feel
Q Skirted	6 Square (drop-in)	
AK Pushbutton	7 Circular (drop-in)	
AL Third Axis		

*For more handles see next pages

NOTES :
Standard option availability : The following table shows which permutations of options are possible.

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

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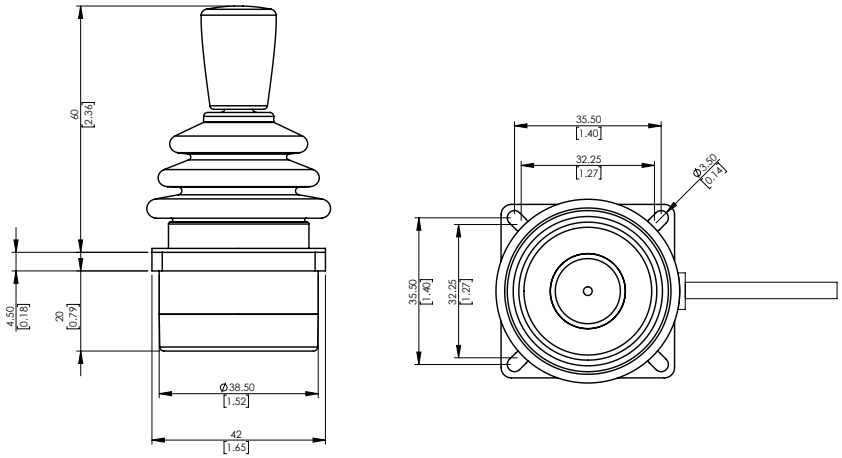
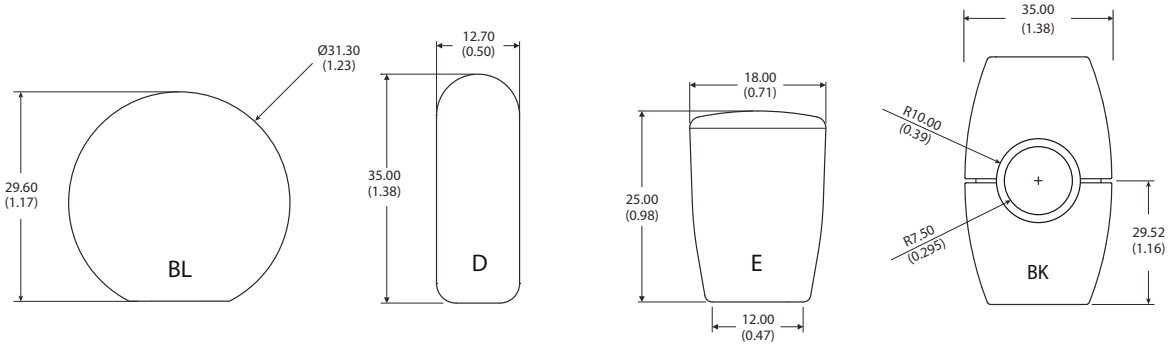
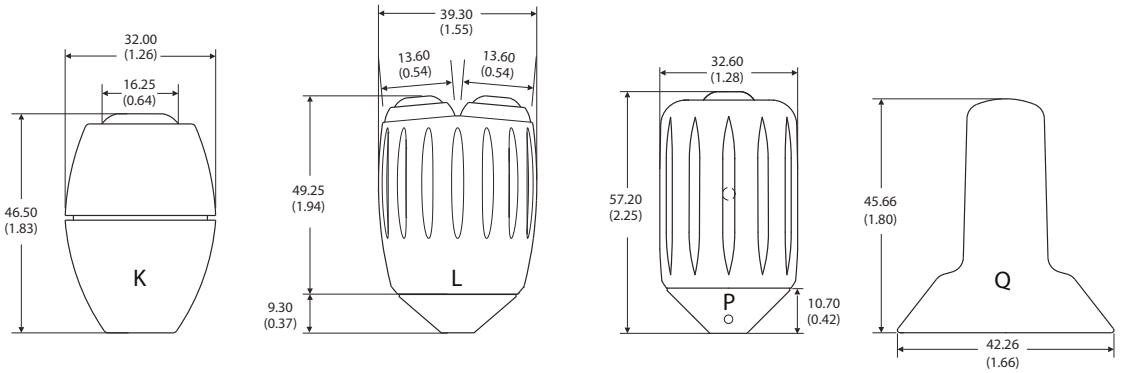
WITH HANDLE OPTION E



HANDLE OPTIONS



MATERIAL	Nylon	Aluminum	Nylon	ABS
FINISH	Sparked Matt	Anodized	Sparked Matt	Sparked Matt
STANDARD COLOR	Black	Black	Black	Black
NOTES				Uses APEM IA Switch



MATERIAL	ABS	Aluminum	Aluminum	Nylon
FINISH	Sparked Matt	Anodized	Anodized	Sparked Matt
STANDARD COLOR	Black	Black	Black	Black
NOTES	Uses APEM IS Switch	Uses APEM IS Switch Z axis functionality	Uses APEM IS Switch Z axis functionality	

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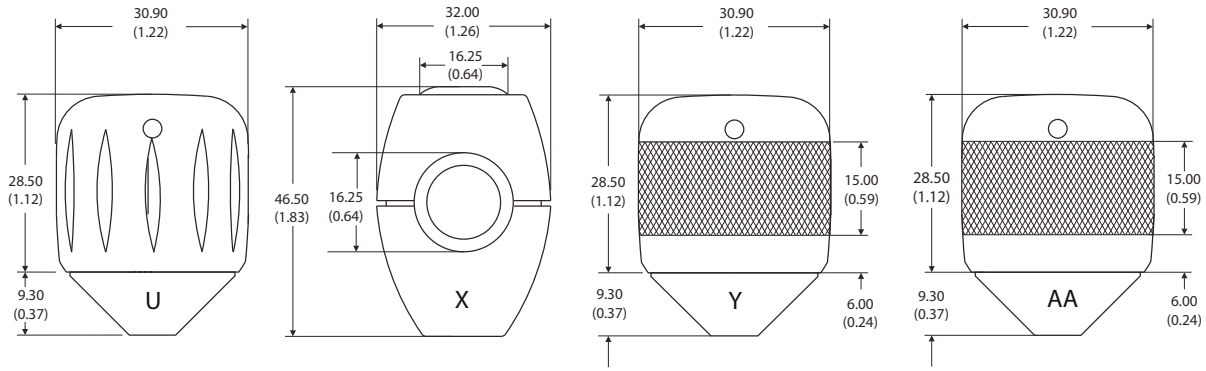
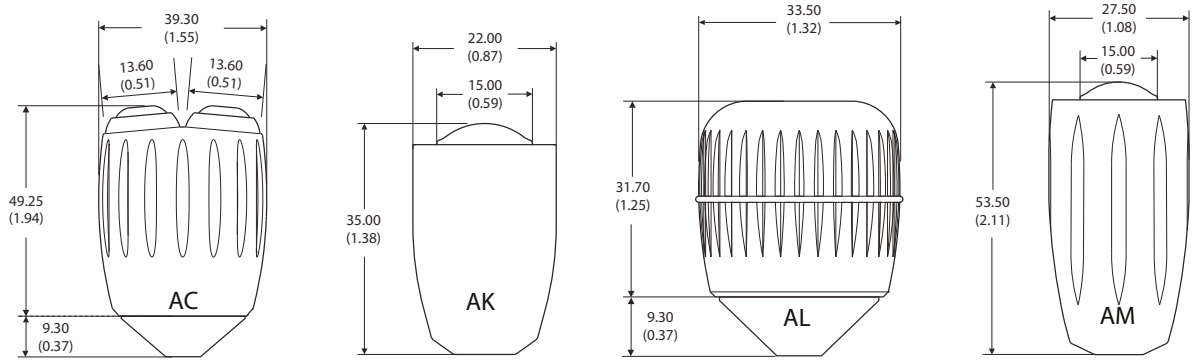
HANDLE OPTIONS (CONTINUED)



MATERIAL	Aluminum	ABS	Aluminum	Aluminum
FINISH	Anodized	Sparked Matt	Anodized with Diamond Knurl	Anodized with Diamond Knurl
STANDARD COLOR	Black	Black	Black	Black
NOTES		Uses APEM IS Switch	Z axis functionality	



MATERIAL	Aluminum	Aluminum	Nylon	Aluminum
FINISH	Anodized	Anodized	Sparked Matt	Anodized
STANDARD COLOR	Black	Black	Black	Black
NOTES	Uses APEM IS Switch	Uses APEM IA Switch	Z axis functionality	Uses APEM IA Switch

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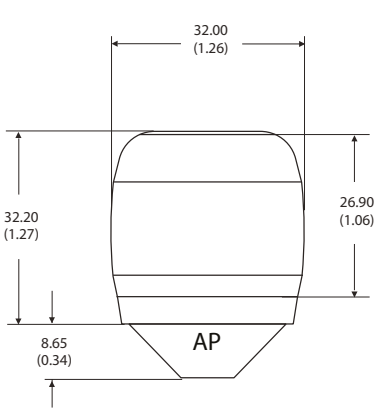
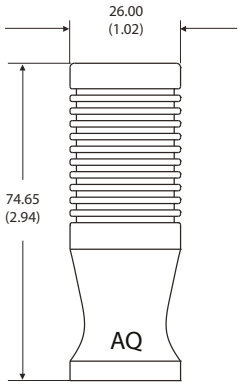
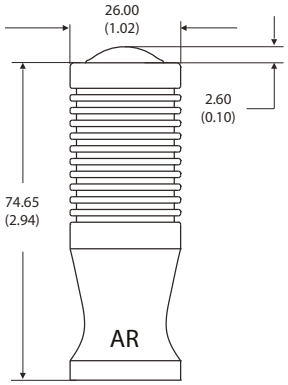
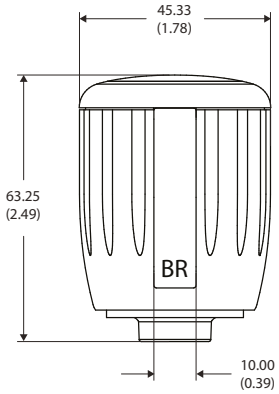
HANDLE OPTIONS (CONTINUED)

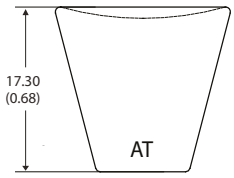


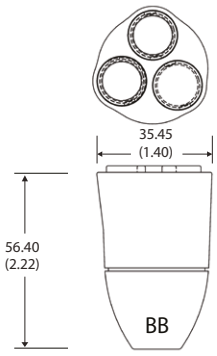


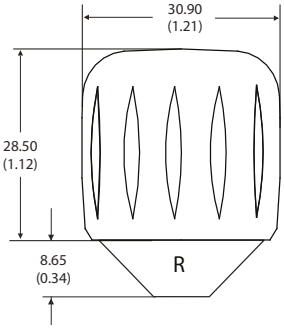


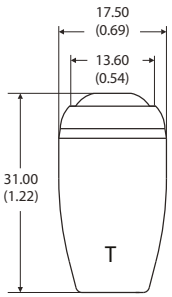


MATERIAL	Santoprene over Nylon	Aluminum	Aluminum	Black Mineral Filled Nylon
FINISH	Soft Touch	Anodized	Anodized	Light Sparked Finish
STANDARD COLOR	Black	Black	Black	Black
NOTES	Z axis functionality		Uses APEM IA Switch	Mec sealed Switch on Deadman









MATERIAL	Nylon	Nylon	Aluminum	Stainless Steel
FINISH	Sparked Matt	Sparked Matt	Anodized	Natural
STANDARD COLOR	Black	Black	Black	Stainless Steel
NOTES		Uses APEM IL switch	Z axis functionality	Uses APEM IS Switch

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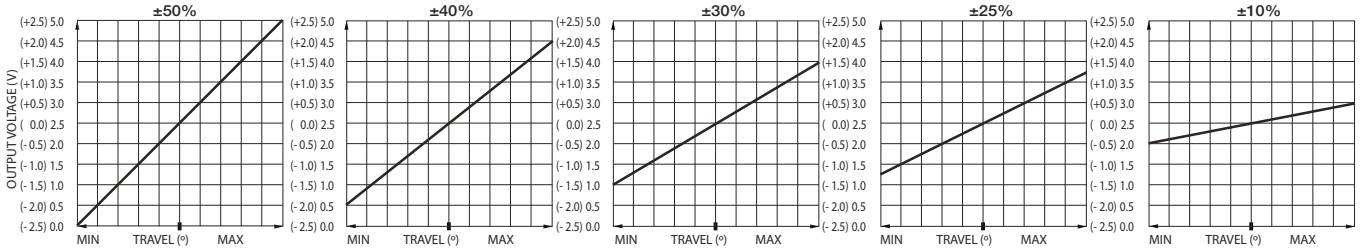
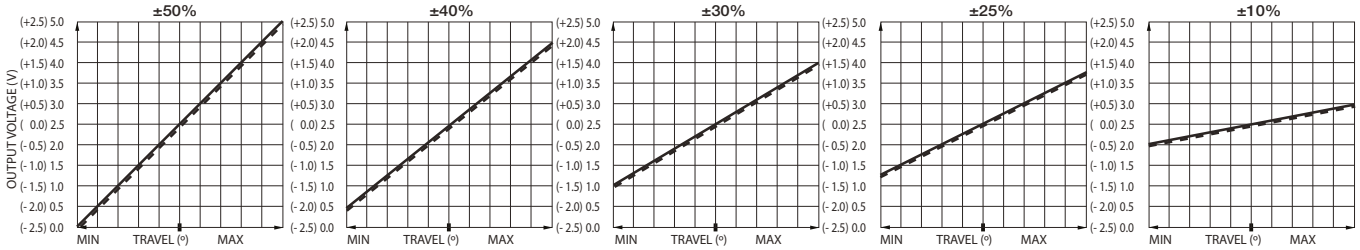
VOLTAGE OUTPUT OPTIONS

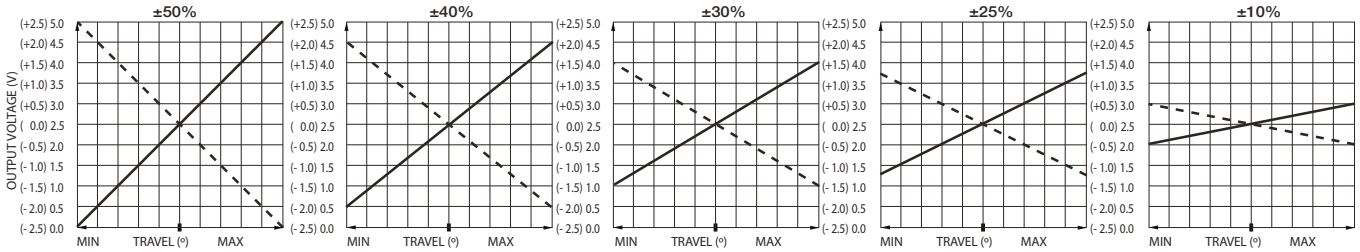
SINGLE OUTPUT - CONFIGURATION 1



DUAL OUTPUT - CONFIGURATION 3



DUAL OUTPUT - CONFIGURATION 4



Output 1

Output 2

APEM Joystick models

300002	3112SALZ153	300141	3140SAK600	300662	3150CAP400
300007	3140RAL600	300170	3140SAK400	300852	3150SX600
300129	3150RAL600	300171	3140SAL400	3130CAK400	3140SK600
300197	3140SAL649	300192	3140SQ600	3130CAK600	3140SZ6254
300202	3150RAK600	300194	3125CAK400	3140AAK000	3150AP600
300204	3140SE600	300194	3125CAK400	3140AP400	3150CAK700
300244	3140RAK6125	300238	3125SZ6101	3140CE600	3150CAR600
300362	3140CAK600	300249	3140SAL600	3140CK600	3150CE400
300451	3112SAL0503	300290	3150CAK600	3140CL700	3150CQ700
300451	3250RAL700	300317	3150SP700	3140CP400	3150RE600
300865	3150RE620	300543	3250SE400	3140CP600	3150RR700
300904	3150CU400	300548	3150RP600	3140RAL6764	3250SAL700
300133	3150SBL692	300553	3140RAP400	3140RE600	3250SE400

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CONFIGURATION

POWER SUPPLY

The 3000 series is designed to be powered by a regulated 5 V ± 0.5 V power supply. The outputs are ratiometric, making a stable, noise free, power supply essential. The 3.3 V version of the 3000 series requires a power supply accurate to ± 0.1 V.

The outputs are not ratiometric, the voltage gain is set to 50 % as standard, giving an output range from 0 to 3.3 V 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.

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 center tolerance, indicating that the joystick has been operated, the center detect signal will switch to 5 V.

Within the joystick this output is pulled high by a 2K2 resistor and is decoupled by a 100 nF capacitor to 0 V.

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 center 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 0 V 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 5 V supply) a joystick specified with ±2 5 % gain would yield 1.25 V at South, 2.5 V at center and 3.75 V 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 10 K Ohms is not recommended.

MECHANISM

The omni-directional mechanism utilizes 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 1.3 N (nominally) to off-center the joystick. The 3000 series may be specified with a lighter spring (1 N), or a stronger spring (1.6 N).

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.