

- **Designed primarily for Aerial Work Platforms**
- **Single- or dual-axis**
- **Ergonomic grips**
- **Top switch and person-present lever options**
- **Rocker grip with proportional output and detent**
- **Hall-effect sensor technology**
- **Choice of voltage outputs**
- **Dual outputs on each axis including rocker grip**
- **Center-reference signal**
- **Rated for 6 million cycles**
- **Under- or above-panel mounting**
- **Enclosure sealing to IP67**
- **EMC performance to 100V/m**
- **Integrated Connector or Flying-Lead termination**



The JC4000 joystick base and accompanying range of grips have been designed for use in Aerial Work Platform (AWP) applications, with options for single- or dual-axis operation making the product suitable for both scissor lifts and booms. Three, dual-axis gates are available – round, square or plus – while the ergonomically-designed grip offers the choice of one or two top switches, as well as a person-present lever, meaning the unit can be used across a wide variety of machines. These carefully chosen configuration options offer an optimal combination of performance and cost.

Non-contacting, Hall-effect sensing technology ensures smooth operation and a long life – in excess of 6 million operating cycles – while dual electrical outputs on each axis, plus a center-reference signal, enhance overall system safety. The range of the

electrical outputs can be set to either 10-90%, 20-80% or 25-75% of a 5V regulated supply, with the polarity of each adjustable to suit the host electronics.

The joystick can be fitted to an enclosure in both under-panel and above-panel configurations and provides sealing of the enclosure to IP67. In addition to a robust mechanical design that is resilient to high shaft load, shock and vibration, the operational integrity of the unit is assured in electrical fields of up to 100V/m.

The joystick is also available either with an integrated connector or with 300mm long flying leads.

Alternative grip options to those described above are available.



**CONTENTS**

**Configuration & Ordering Codes ..... 3**

- Mounting ..... 3
- Axes ..... 3
- Output ..... 4
- Output Sense ..... 4
- Spring..... 5
- Gate ..... 5
- Seat ..... 5
- Grip ..... 6
- Termination ..... 6

**Installation..... 7**

- Mechanical ..... 7
  - Dimensions – Above Panel Mounting ..... 7
  - Dimensions – Below Panel Mounting..... 7
  - Panel Cut-out and fixing details ..... 9
  - Dimensions – NH00 and NHF0 grip option ..... 10
  - Dimensions – B000 grip option ..... 11
  - Dimensions – B001 grip option ..... 11
  - Dimensions – B002 grip option ..... 13
  - Dimensions – HG\*\* grip option ..... 14
  - Dimensions – HJ\*\* grip option ..... 15
- Electrical Connections..... 17

**Specifications ..... 18**

- Electrical - Joystick..... 18
- Electrical – Grip switches ..... 18
- Electrical – HJ Grip functions ..... 19
- Mechanical - Joystick ..... 21
- Mechanical – Grips - HJ ..... 22
- EMC and Magnetic field ..... 22
- Environmental and Legislative..... 23



## CONFIGURATION & ORDERING CODES

JC4000-GEN-X-XX-X-XX-X-X-XXXX-X

Type	Mounting	Axes	Output	Output Sense	Spring	Gate	Seat	Grip	Termination
JC4000-GEN	X	XX	X	XX	X	X	X	XXXX	X
	T	XY	M	PN	M	S	A	NH00	A
	M	NY	L	PP		R		NHF0	B
						P		B000	
						N		B001	
								B002	
								HG00	
								HG01	
								HG02	
								HG03	
								HG04	
								HG05	
								HJ0*	
							HJ1*		
							HJ2*		
							HJ3*		
							HJ*A		
							HJ*B		

### MOUNTING

JC4000-GEN-X-XX-X-XX-X-X-XXXX-X

Code	Description
T	Above panel
M	Below panel

### AXES

JC4000-GEN-X-XX-X-XX-X-X-XXXX-X

Code	Description
XY	Dual axis
NY	Single axis – forward and reverse



### OUTPUT

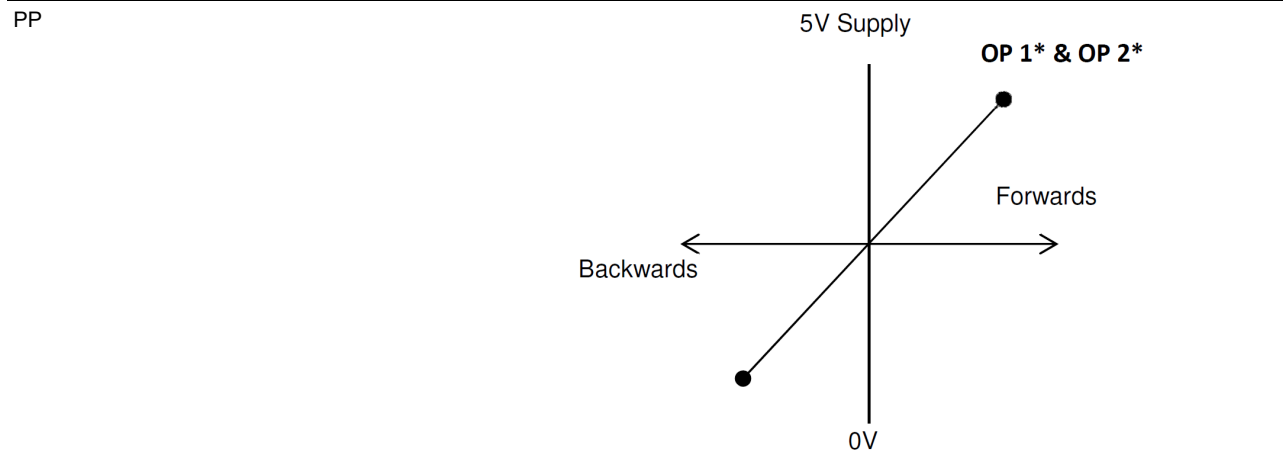
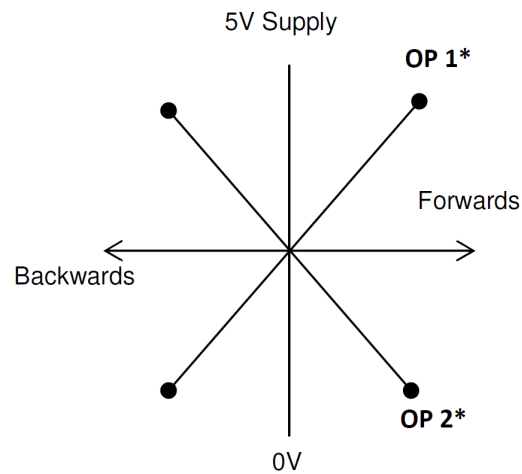
JC4000-GEN-X-XX-X-XX-X-X-XXXX-X

Code	Description
M	10-90% of 5V supply (0.5-4.5V nominal)
L	20-80% of 5V supply (1.0-4.0V nominal)
K	25-75% of 5V supply (1.25-3.75V nominal)

### OUTPUT SENSE

JC4000-GEN-X-XX-X-XX-X-X-XXXX-X

Code	Description
PN	Output 1: Positive slope      Output 2: Negative slope
PP	Output 1: Positive slope      Output 2: Positive slope
PN	



\* 10-90%, 20-80% or 25-75% of 5V supply



**SPRING**

JC4000-GEN-X-XX-X-XX-X-X-XXXX-X

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<b>Code</b>	<b>Description</b>
M	Medium

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**GATE**

JC4000-GEN-X-XX-X-XX-X-X-X-XXXX-X

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<b>Code</b>	<b>Description</b>
S	Square
R	Round
P	Plus
N	Single axis

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**SEAT**

JC4000-GEN-X-XX-X-XX-X-X-X-XXXX-X

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<b>Code</b>	<b>Description</b>
A	Fitted with a biased seat to provide additional force when the operator moves the joystick towards the corners

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**Note:**

The biased seat is fitted to all joysticks, but its function can only be felt in Square and Round gate joysticks. The biased seat enables the operating rod to move more easily along the X and Y axes of the joystick, but it does not prevent movement into the corner positions.



**GRIP**

JC4000-GEN-X-XX-X-XX-X-X-X-XXXX-X

Code	Grip Type	Grip Function
NH00	NH	No grip
NHF0	NH	No grip, Flying leads to enable customer to fit their own grip
B000	Ball	Plain ball – no electrical functions
B001	Extended Ball	Extended ball - no electrical functions
B002	Extended Ball	Extended ball - no electrical functions
HG00	HG	Full grip – no electrical functions
HG01	HG	Full grip – with a single top switch
HG02	HG	Full grip – with two top switches
HG03	HG	Full grip – with two top switches and an operator present switch
HG04	HG	Full grip – with one top switch and an operator present switch
HG05	HG	Full grip – with an operator present switch
HJ0*	HJ	Rocker Grip – Without overpress at ends of travel
HJ1*	HJ	Rocker Grip – With Right overpress at end of travel
HJ2*	HJ	Rocker Grip – With Left overpress at end of travel
HJ3*	HJ	Rocker Grip – With Left and Right overpress at ends of travel
HJ*A	HJ	Rocker Grip – Both outputs Positive ramp to Right; Output Span 0.5 to 4.5V d.c.
HJ*B	HJ	Rocker Grip – First output Positive, second output Negative ramp to Right; Output Span 0.5 to 4.5V d.c.

**TERMINATION**

JC4000-GEN-X-XX-X-XX-X-X-X-XXXX-X

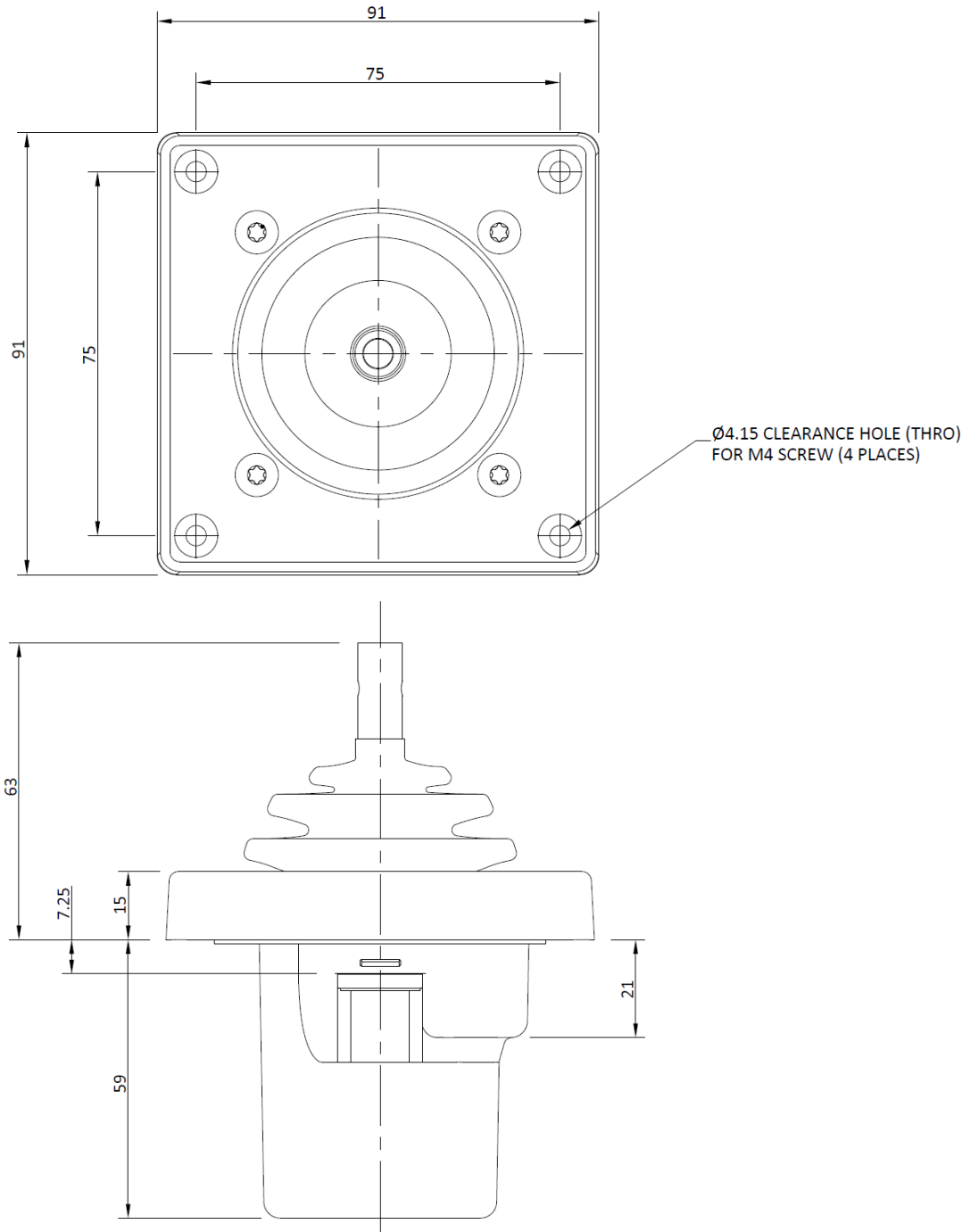
Code	Description
A	Integrated MOLEX 12-way connector 53047-1210
B	22 AWG PTFE insulated 19/0.15 wires, 300 mm long



## INSTALLATION

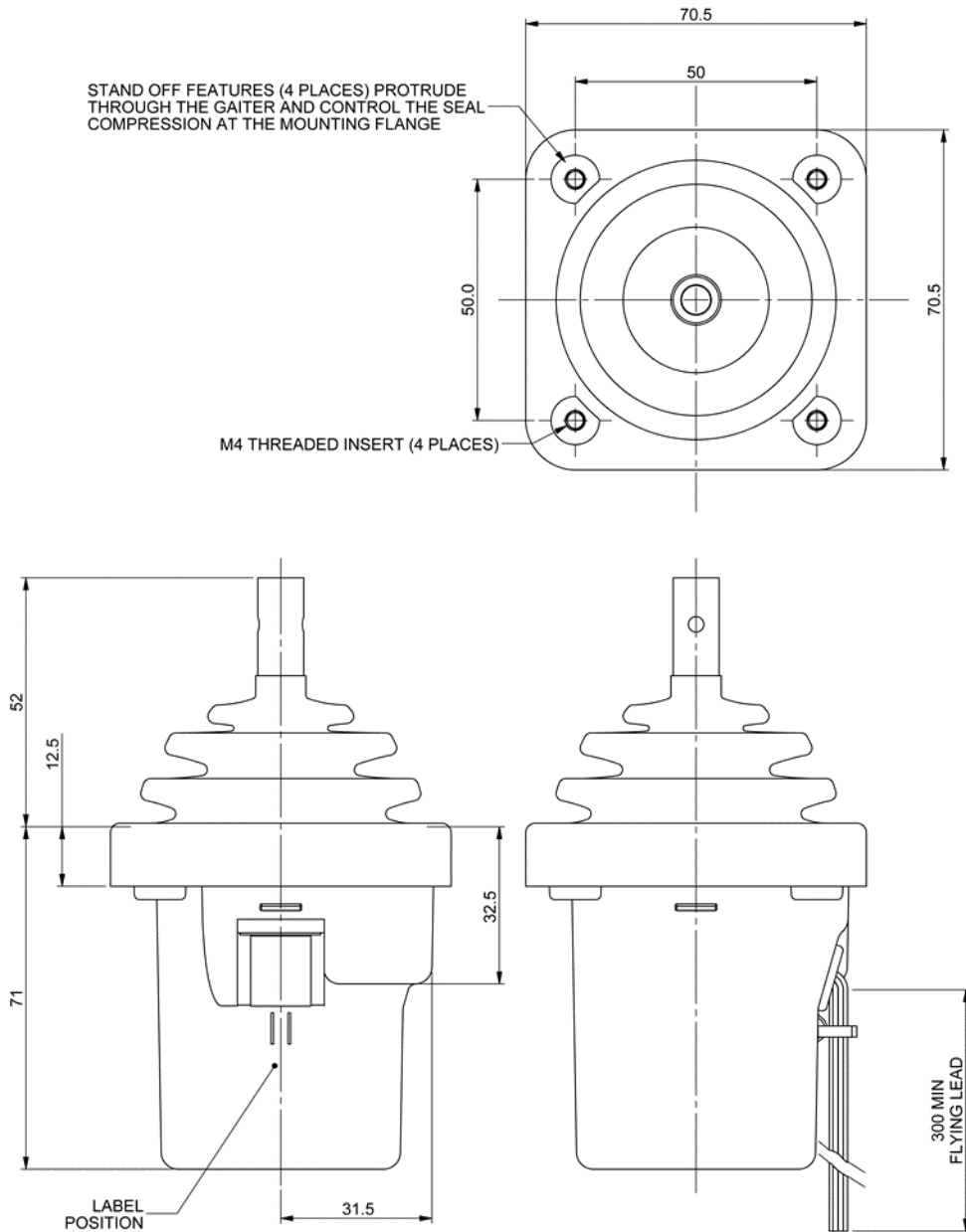
### MECHANICAL

#### Dimensions – Above Panel Mounting





**Dimensions – Below Panel Mounting**



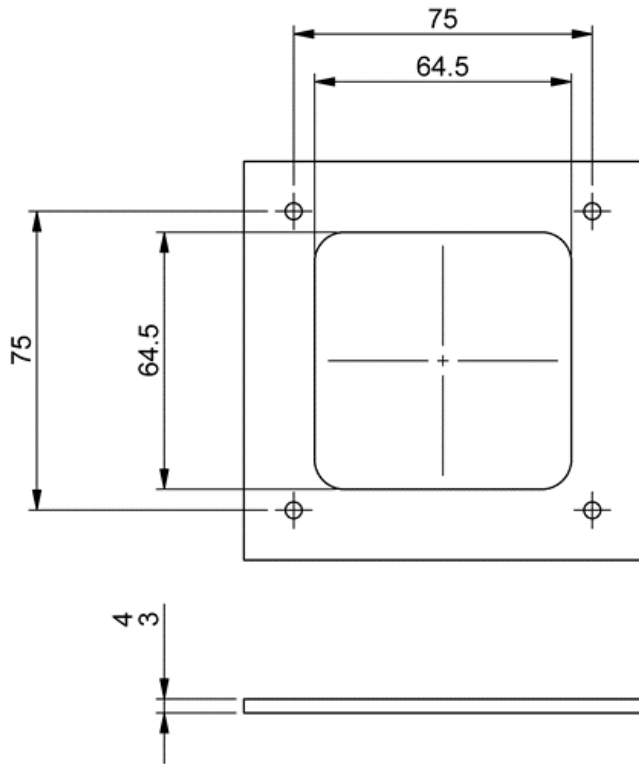
Integrated Connector Option

Flying Lead Option

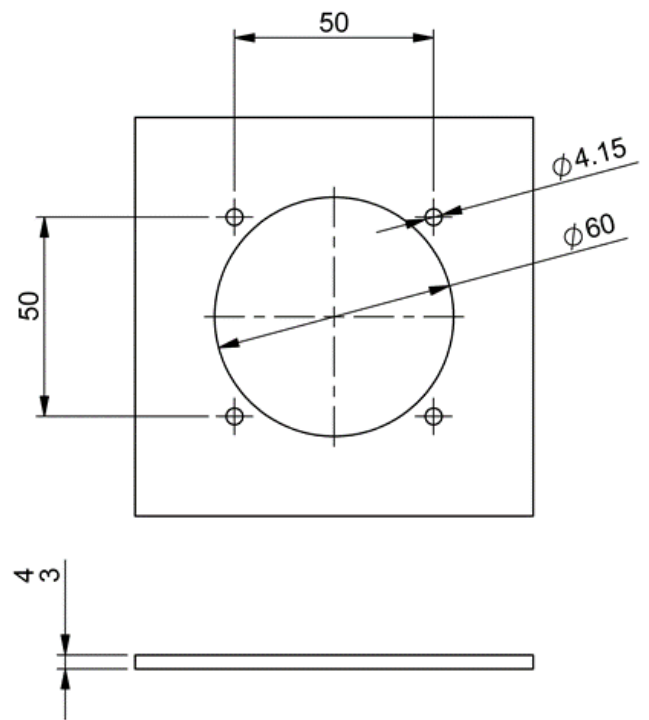


**Panel Cut-out and fixing details**

PANEL CUT-OUT DETAILS – BELOW-PANEL MOUNT	64.5 mm square profile with 7.5mm maximum radius in each corner and 4 additional holes for the mounting screws
PANEL CUT-OUT DETAILS – ABOVE-PANEL MOUNT	60 mm diameter hole with 4 additional holes for the mounting screws
RECOMMENDED PANEL THICKNESS	3 to 4 mm
FIXING HARDWARE	M4 screws – it is recommended that self-locking nuts are used when using the above panel mounting The below panel mounting has integrated M4 x 0.7 Brass inserts
RECOMMENDED SCREW TIGHTENING TORQUE TO ACHIEVE OPTIMUM PANEL SEAL PERFORMANCE	1.5 Nm



Above Panel Mounting Detail

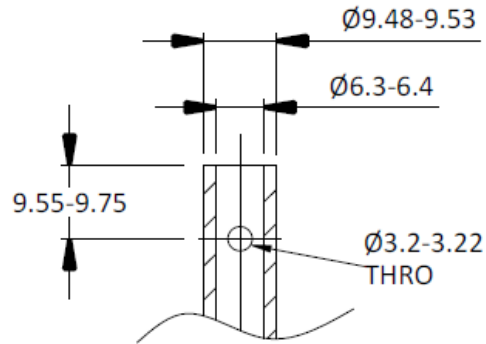


Below Panel Mounting Detail



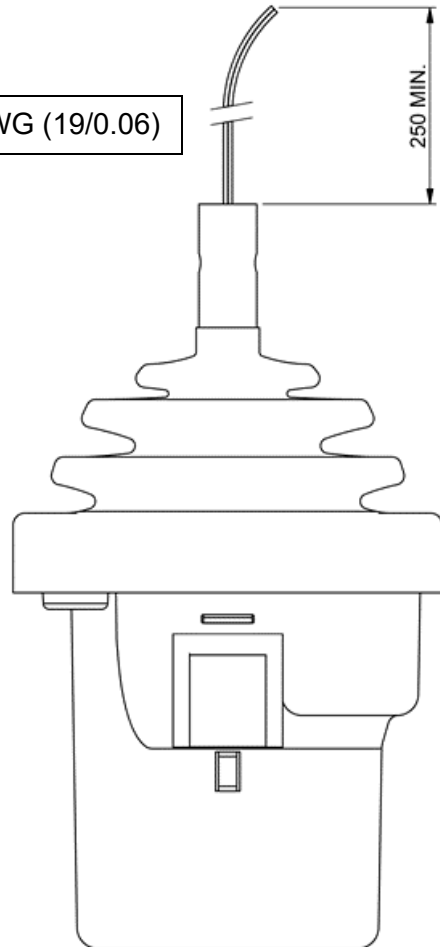
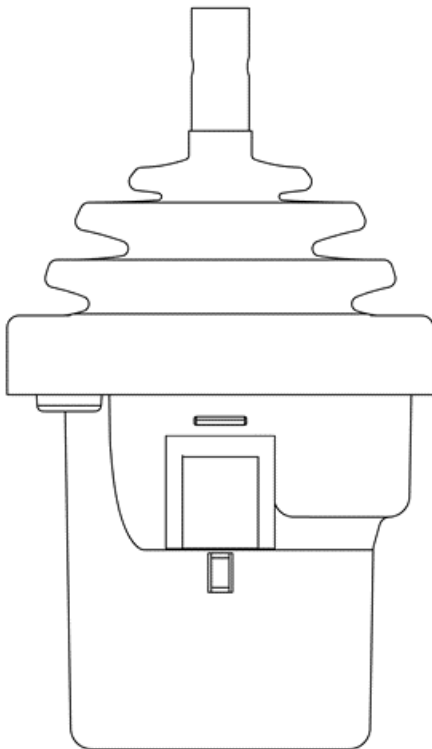
Dimensions – NH00 and NHF0 grip option

Operating rod details for customer fitted grips



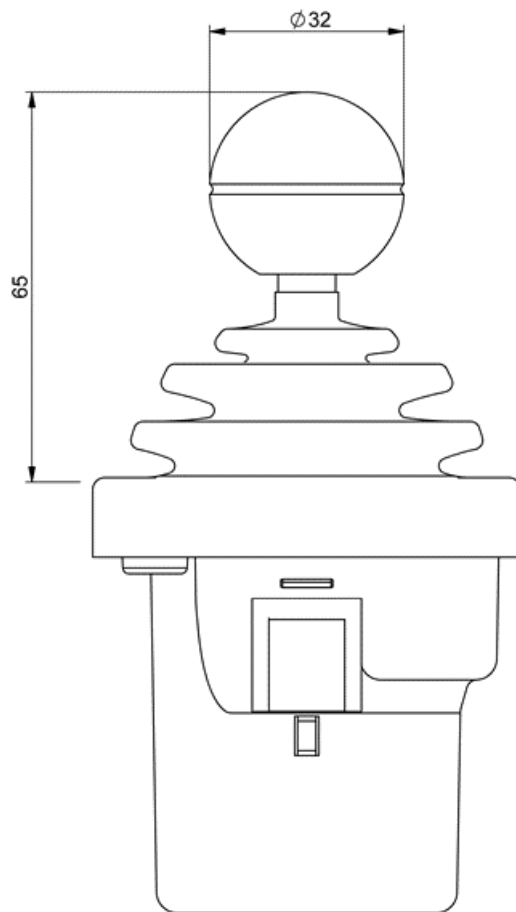
Cable size: 30 AWG (19/0.06)

250 MIN.



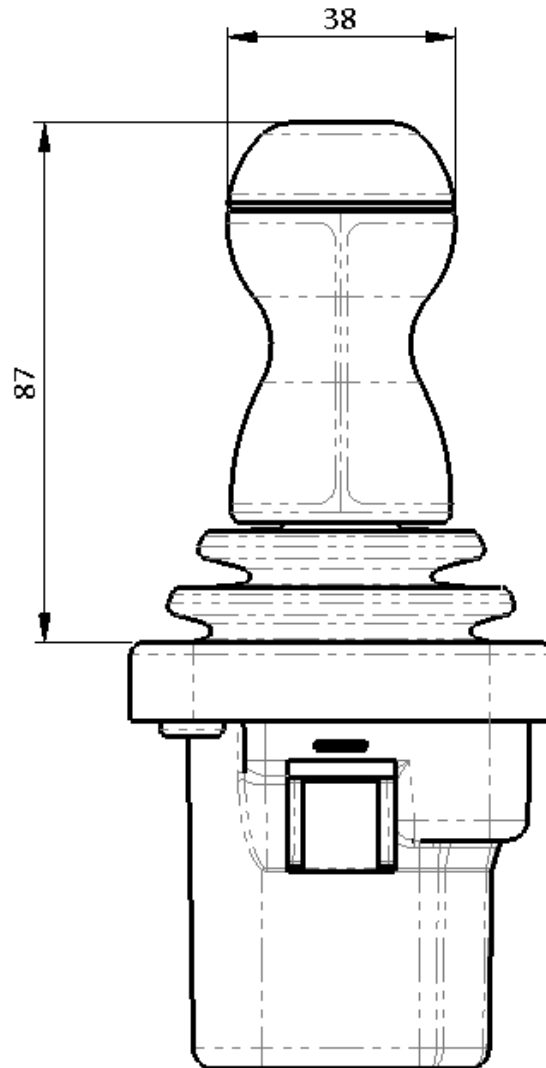


Dimensions – B000 grip option



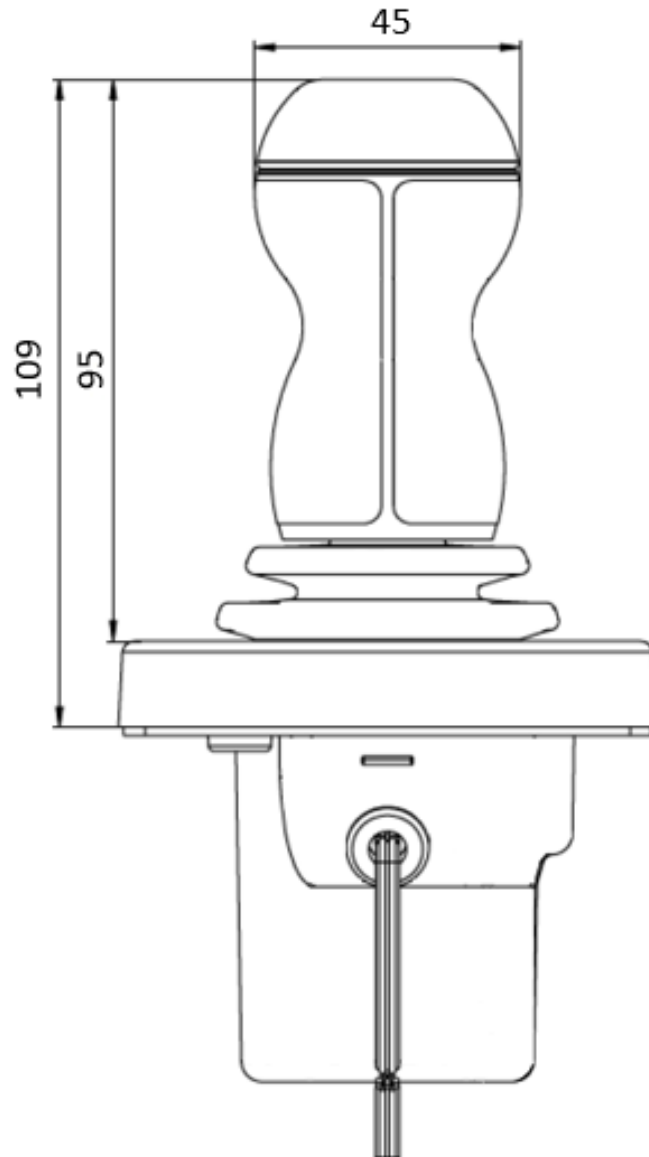


Dimensions – B001 grip option



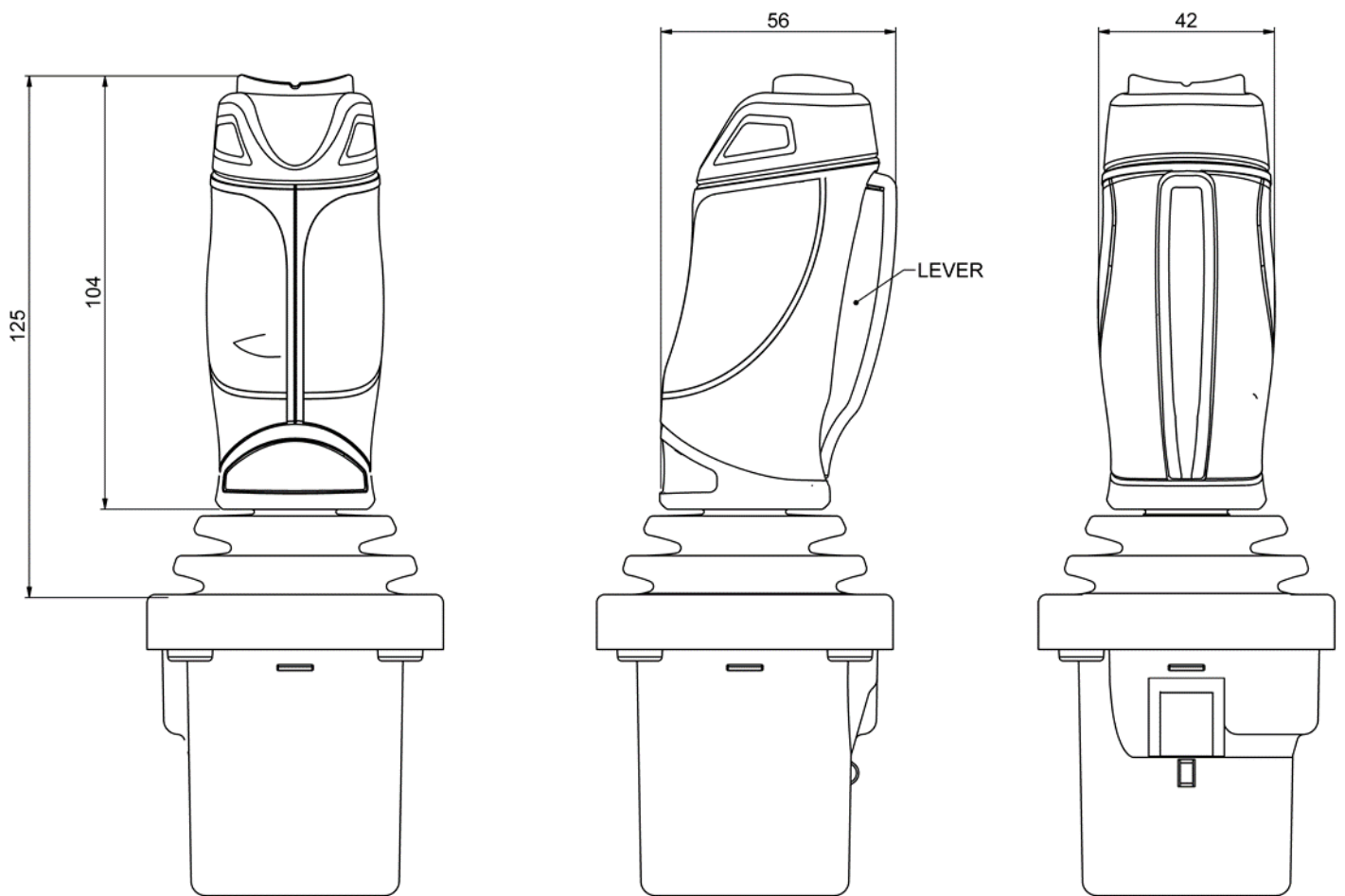


Dimensions – B002 grip option



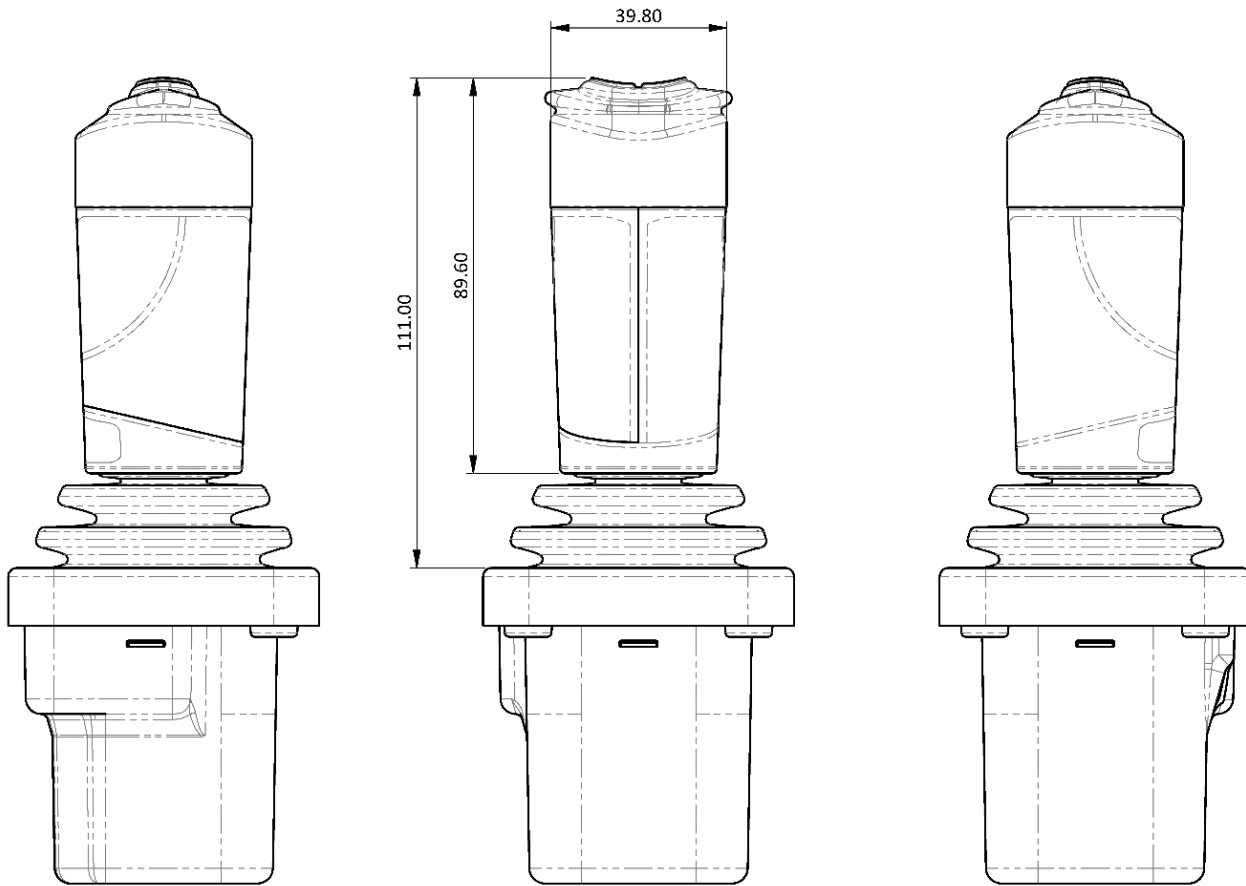


Dimensions – HG\*\* grip option



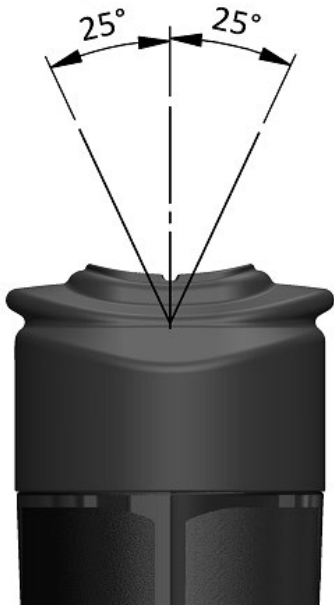


**Dimensions – HJ\*\* grip option**

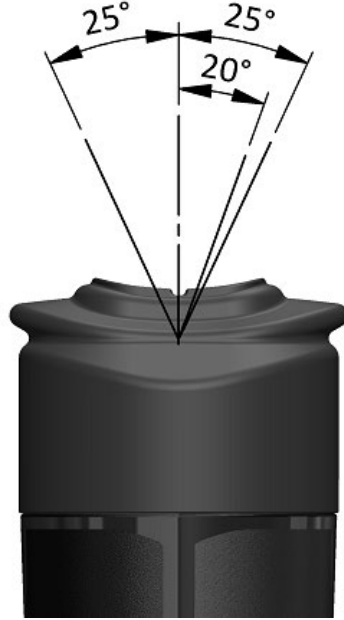


**Overpress/detent coding**

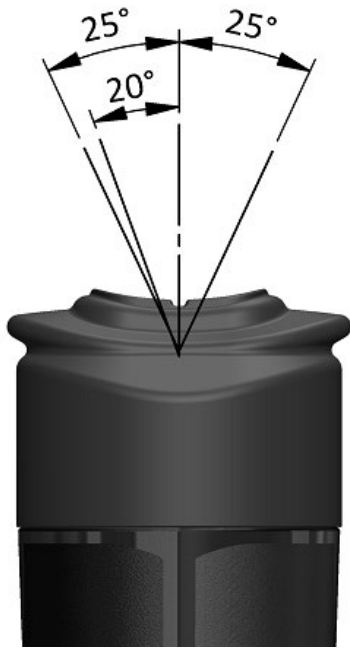
Ordering Code	Description
HJ0*	No Overpress
HJ1*	Overpress – right only
HJ2*	Overpress – left only
HJ3*	Overpress – left and right



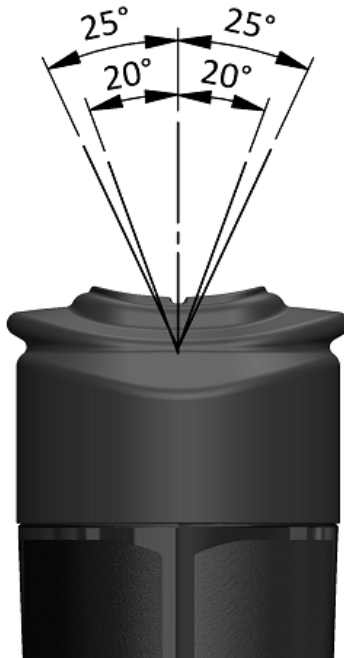
No overpress



Overpress - Right



Overpress - Left



Overpress - Left and Right





**ELECTRICAL CONNECTIONS**

**Termination: CODE A**



Molex 12-way 53047-1210 with Tin-plated pins

**Recommended mating Molex connector:**  
**Housing – 510211200**  
**Crimp pins - 500798000**

**Note:** the mating connector must be fitted with Tin-plated pins to ensure stable output from the joystick

Pin	Function		
1	NHF0 = Blue wire	HG** grip = Top switch left or single	HJ** grip = Primary Output
2	NHF0 = Green wire	HG** grip = Top switch right	HJ** grip = Secondary Output
3	NHF0 = Yellow Wire	HG** grip = Lever switch	
4	NHF0 = Black Wire	HG** grip = Common for all grip switches	
5	Not connected		
6	Y-axis Output 2		
7	Center Reference Voltage		
8	X-axis Output 2		
9	X-axis Output 1		
10	0V supply		
11	Y-axis Output 1		
12	5V supply		

**Termination: CODE B**

22 AWG PTFE insulated 19/0.15 wires, 300 mm long

Wire Color	Function		
Blue	NHF0 = Blue wire	HG** grip = Top switch left or single	HJ** grip = Primary Output
Green	NHF0 = Green wire	HG** grip = Top switch right	HJ** grip = Secondary Output
Yellow	NHF0 = Yellow Wire	HG** grip = Lever switch	
Black	NHF0 = Black Wire	HG** grip = Common for all grip switches	
Purple	Y-axis Output 2		
White	Center Reference Voltage		
Orange	X-axis Output 2		
Pink	X-axis Output 1		
Grey	0V supply		
Brown	Y-axis Output 1		
Red	5V supply		



## SPECIFICATIONS

### ELECTRICAL - JOYSTICK

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SUPPLY VOLTAGE	5Vdc $\pm$ 0.5Vdc
OUTPUT VOLTAGE (FACTORY SET)	Two outputs of 10% to 90%, 20 to 80% or 25 to 75% of the Supply Voltage per axis
CENTERING ACCURACY	50% $\pm$ 2.5% of supply voltage (as supplied)
END ACCURACY	+2% to -3% at the high end of the output span i.e. 75%, 80% and 90% +3% to -2% at the low end of the output span i.e. 25%, 20% and 10%
LINEARITY ACCURACY	$\pm$ 2.8%
MATCHING ACCURACY OF DUAL OUTPUTS	$\pm$ 4%
OUTPUT IMPEDANCE	100 $\Omega$ (nominal)
OUTPUT SENSE	The dual outputs can be configured to have positive ramps or a combination of Positive and Negative ramps
CENTER REFERENCE OUTPUT	50% $\pm$ 0.7% of the supply voltage
CENTER REFERENCE OUTPUT IMPEDANCE	1100 $\Omega$
POWER-ON SETTLEMENT TIME	Up to 15ms
SUPPLY REVERSE POLARITY PROTECTION	-10Vdc (continuous)
CURRENT CONSUMPTION	< 30mA
INSULATION RESISTANCE @ 10VDC	>10M $\Omega$

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### ELECTRICAL – GRIP SWITCHES

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CONTACT RATING	100mA, 30V dc maximum (0.5mA minimum)
CONTACT RESISTANCE	30 m $\Omega$ maximum
INSULATION RESISTANCE	>10 M $\Omega$
MECHANICAL LIFE	4,000,000 cycles
OPERATING FORCE	3.5N $\pm$ 0.7N
CONTACT BOUNCE	2ms Maximum

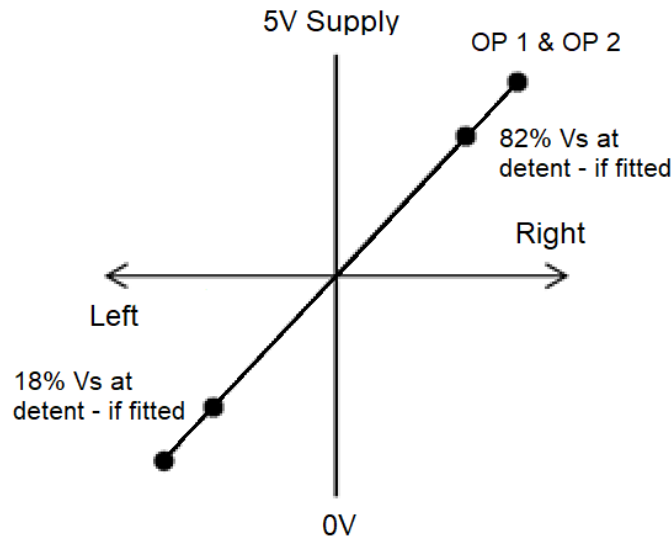
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## ELECTRICAL – HJ GRIP FUNCTIONS

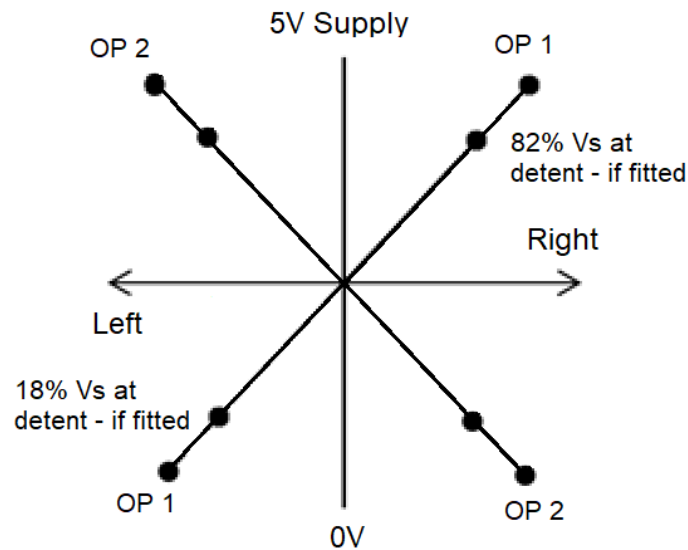
### HJ\*A Output Sense

Both output ramps positive – Actuate the rocker to the left for 0.5V output and right for the 4.5V output  
Output range 0.5 to 4.5V is the only option available



### HJ\*B Output Sense

Crossed output ramps – Actuate the rocker to the left for Primary Output 0.5V and Secondary output 4.5V. Actuate the rocker to the right for Primary output 0.5V and secondary output 0.5V  
Output range 0.5 to 4.5V is the only option available



### HJ\*B Output at detent

If the detent feature is fitted, then the output at the detent position will be 18%/ 82% of the 5V supply



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SUPPLY VOLTAGE	5Vdc $\pm$ 0.5Vdc Regulated
MAXIMUM SUPPLY CURRENT – GRIP ONLY	<44mA
SHORT CIRCUIT PROTECTION OUTPUT TO GROUND	Yes
Tracking Error	$\pm$ 2%
Output clamping	Yes - (2% below or above chosen end value targets)
Output type	Dual analogue ratiometric output (crossed or parallel)
Output range	10-90% at rated supply voltage (0.5-4.5V nominal)
Output range of over press (if fitted)	18-82% at rated supply voltage (0.9-4.1V nominal)
Tolerance of output voltage in centre	As supplied: $\pm$ 3% After-Life: Centre 1: $\pm$ 3% Centre 2: $\pm$ 3%
Tolerance of output voltage at ends of travel	As supplied: $\pm$ 2% After life (Including Temperature effects): Back: -3%/+2% Back Detent: -4%/+3% Forward Detent: -3%/+4% Forward: -2%/+3%

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**Note:** The HG and HJ grips have a "Flow in, Flow out" design and the internal components are sealed to meet IP66 and IP67



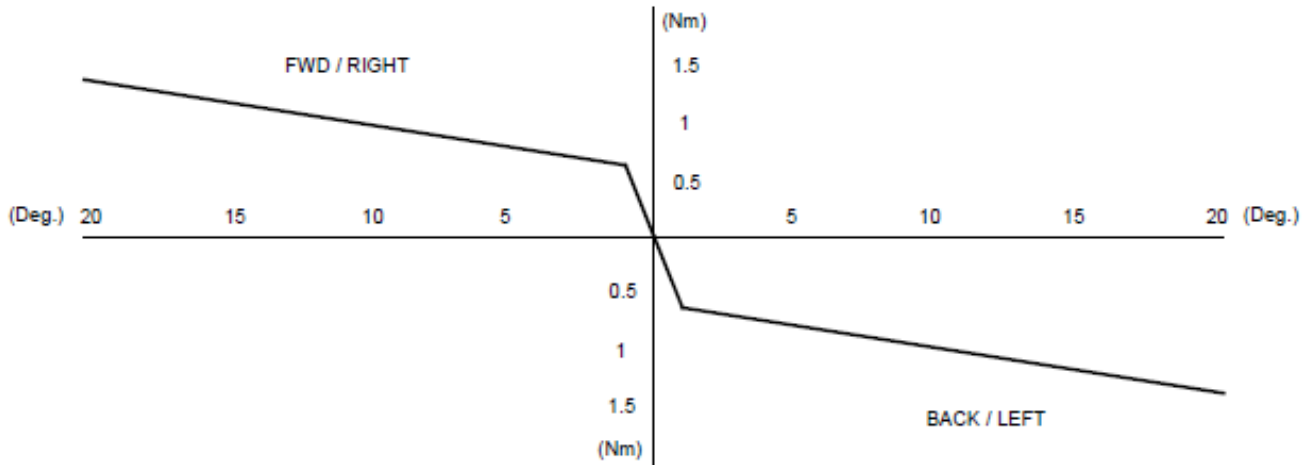
**MECHANICAL - JOYSTICK**

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BREAKOUT FORCE	0.7 Nm (nominal)	
OPERATING FORCE AT END OF TRAVEL	1.35 Nm (nominal)	
MAXIMUM STATIC HORIZONTAL LOAD	50 Nm	
MAXIMUM STATIC VERTICAL LOAD	1,100 N	
MAXIMUM STATIC ROTATIONAL LOAD	6 Nm	
MAXIMUM HORIZONTAL IMPACT LOAD	5J (on operating rod)	
MAXIMUM VERTICAL IMPACT LOAD	15J (on operating rod)	
MECHANICAL ANGLE	±20° in X- or Y-axes	
MECHANICAL LIFE	6 million cycles	One cycle is defined as moving from center to the end of travel, returning past the center to the other extreme and back to center
WEIGHT	220 g without a grip 245 g with ball handle 310 g with full grip	

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Note: Typical operating force profile shown below:





**MECHANICAL – GRIPS - HJ**

Mechanical angle (centre return)	25° nominal	
Detents	Detent feel positions are nominally ±20° relative to the centre position	
Breakout Force @	-40°C	4 Nm
	25/30°C	3 Nm
	+80°C	3.5 Nm
Maximum operative force before detent @	-40°C	6.5 Nm
	25/30°C	6 Nm
	+80°C	5.5 Nm
Maximum operating force at detent actuation	-40°C	20 Nm
	25/30°C	17 Nm
	+80°C	17 Nm
Life – not detent (see below)	>1,000,000 cycles at 2 Hz (cycle is centre to one end 20°, then to other end 20° then back to centre).	
Life of additional detent feature	>200,000 cycles at 2 Hz (cycle is centre to one end 25°, then to other end 25° then back to centre)	
NOTE: All values recorded at room temperature of 23°C, unless otherwise stated. Unit not to be used in iced conditions.		

**EMC AND MAGNETIC FIELD**

EMC IMMUNITY LEVEL	ISO 11452-2 (ALSE)	100V/m, 400MHz – 1GHz and Horizontal at Level 4 of standard
EMC EMISSIONS LEVEL	EN 61000-6-4: 2011 Clause 11, Table 1; 1.1, 1.4	Tested to Emission standard group 1, Class A (40dB, 47dB)
ESD IMMUNITY LEVEL	EN 61000-4-2, Level 2: 1995 Clause 8, Table 1; 1.5 EN61000-4-2: 2009	8kV contact (excluding connector pins or wires); 15kV air discharge
CONDUCTED DISTURBANCE IMMUNITY	ISO 11452-4 (BCI)	80MHz – 400MHz at 150mm, 450mm and 750mm Clamp Distances at Level 4 of standard (100mA)
POWER FIELD IMMUNITY	EN 61000-4-8: 2010	50Hz & 60 Hz X, Y and Z position at level of standard (30A/m)



**ENVIRONMENTAL AND LEGISLATIVE**

OPERATING TEMPERATURE	-40°C to 80°C	Temperature cycle per EN 60068-2-14: 1999
STORAGE TEMPERATURE	-40°C to 80°C	Cold test to EN 60068-2-1: 1993 Dry heat to EN 60068-2-2: 1993
TEMPERATURE & HUMIDITY	BS EN 60068-2-38: 2009	Pt 2.1 Z/AD; 65°C for 10 cycles
WATER AND DUST INGRESS	IP66 and IP67 above panel where a grip is fitted	Panel sealing performance is dependent on the stiffness and surface condition of the panel i.e. free of scratches. It is the responsibility of the customer to define the panel material and thickness to achieve the seal rating
	IP20 below panel, including connector and flying lead option	The electronics below the panel are protected such that the joystick will continue to function with a sufficient drying out Period after immersion
SALT MIST	EN 60068-2-52: 1996	Severity 2
VIBRATION (SINUSOIDAL)	EN 60068-2-6: 2008	3gn, 10-200Hz, 1 hour per axis
VIBRATION (RANDOM)	EN 60068-2-64: 2008	3.6gn, 10-200Hz, 2 hours per axis
BUMP	EN 60068-2-27: 2008	40gn, ½ sine 6ms, 1,350 bumps in each of 6 directions
SHOCK	EN 60068-2-27: 2008	25g, 10ms, 500 shocks in each of 6 directions

**IMPORTANT INFORMATION**

Whilst Curtiss-Wright Industrial Group - Penny & Giles has designed this joystick to meet a range of applications it is the responsibility of the customer to ensure it meets their specific requirement.

Penny & Giles Controls Ltd makes no warranty or representation in respect of product fitness or suitability for any particular design application, environment, or otherwise, except as may subsequently be agreed in contract for the sale and purchase of products. Customers should therefore satisfy themselves of the actual performance requirements and subsequently the product's suitability for any particular design application and the environment in which the product is to be used.

Continual research and development may require change to products and specification without prior notification.

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