

- **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

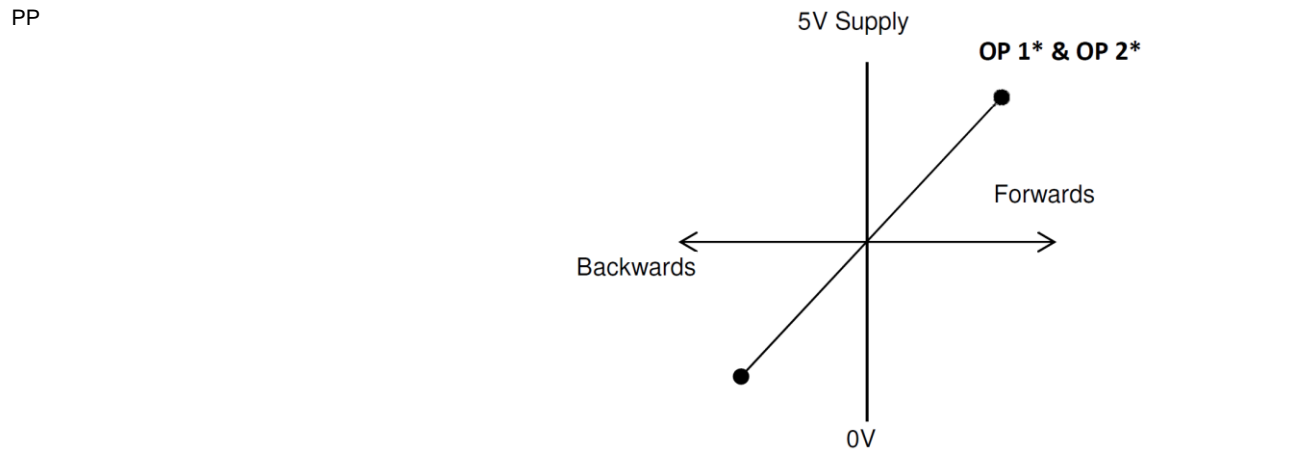
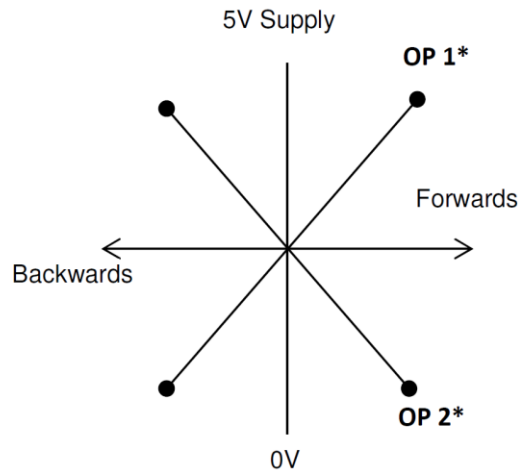
JC4000-GEN-X-XX-X-XX-X-X-XXXX-X

| 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

| Code | Description |
|-------------|--------------------|
| M | Medium |

GATE

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

| Code | Description |
|-------------|--------------------|
| S | Square |
| R | Round |
| P | Plus |
| N | Single axis |

SEAT

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

| Code | Description |
|-------------|--|
| A | Fitted with a biased seat to provide additional force when the operator moves the joystick towards the corners |

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 positons.



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 switches 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

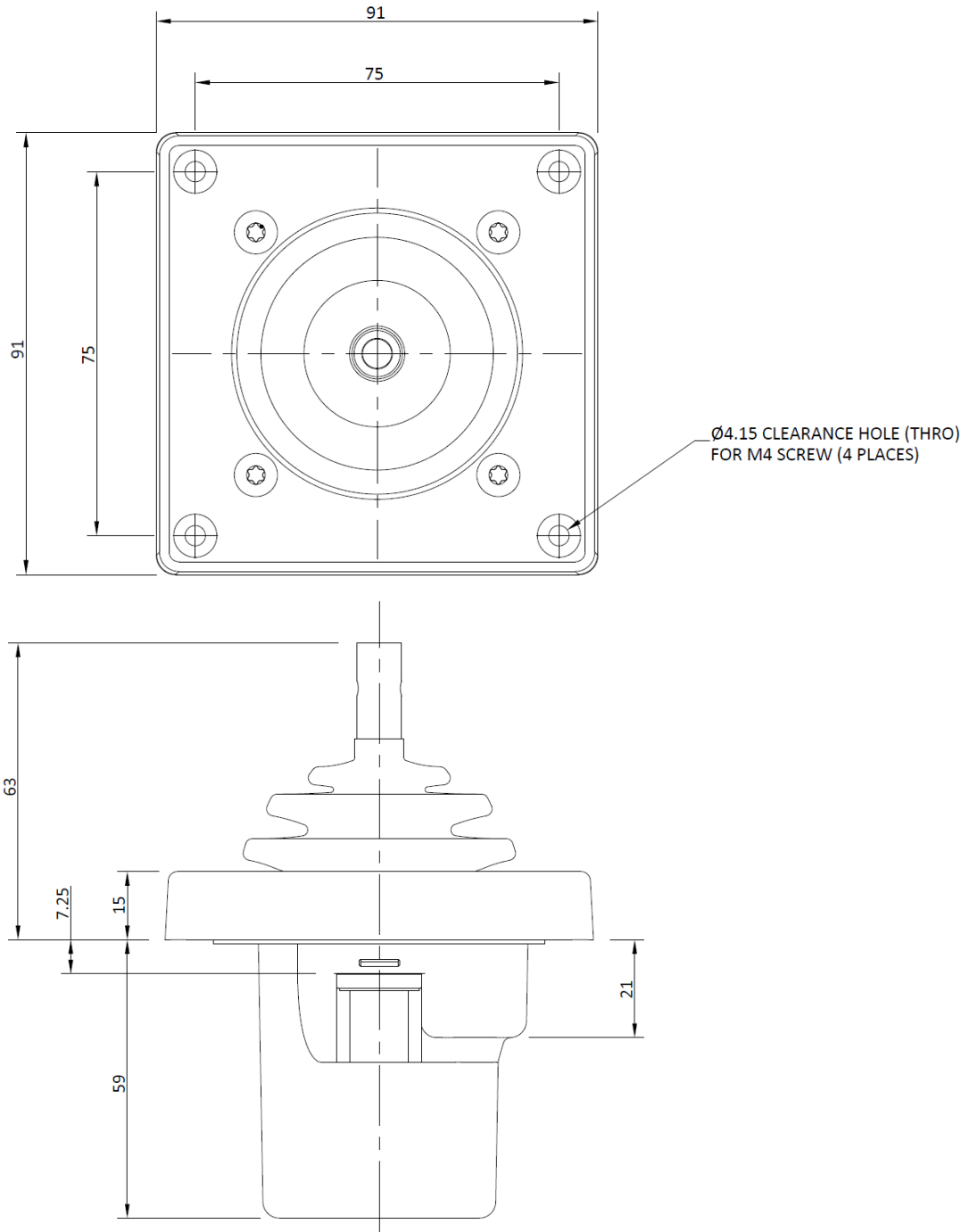
| Code | Description |
|------|--|
| A | Integrated MOLEX 12-way connector 53047-1210 |
| B | 22 AWG PTFE insulated 19/0.15 wires, 300 mm long |



INSTALLATION

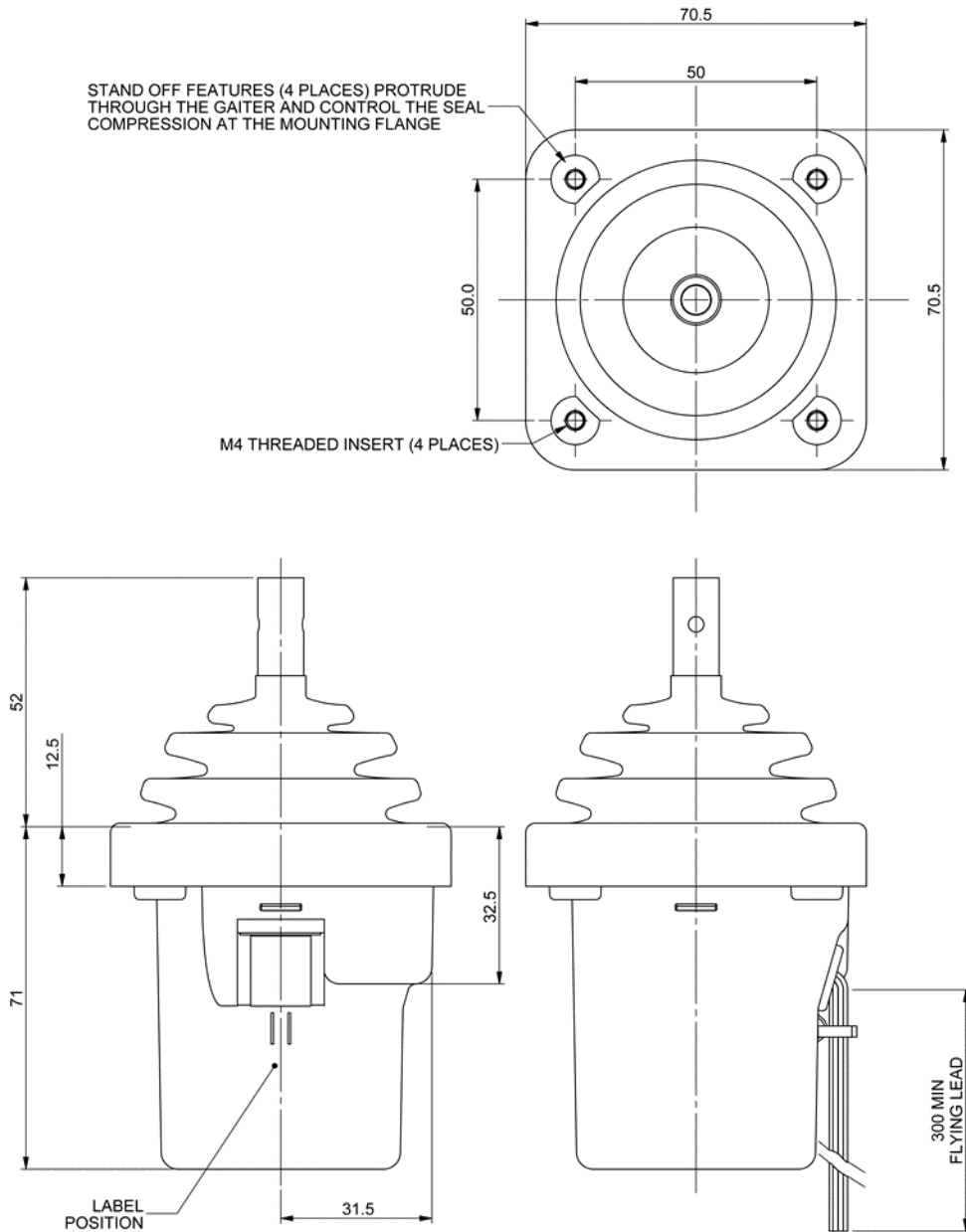
MECHANICAL

Dimensions – Above Panel Mounting





Dimensions – Below Panel Mounting



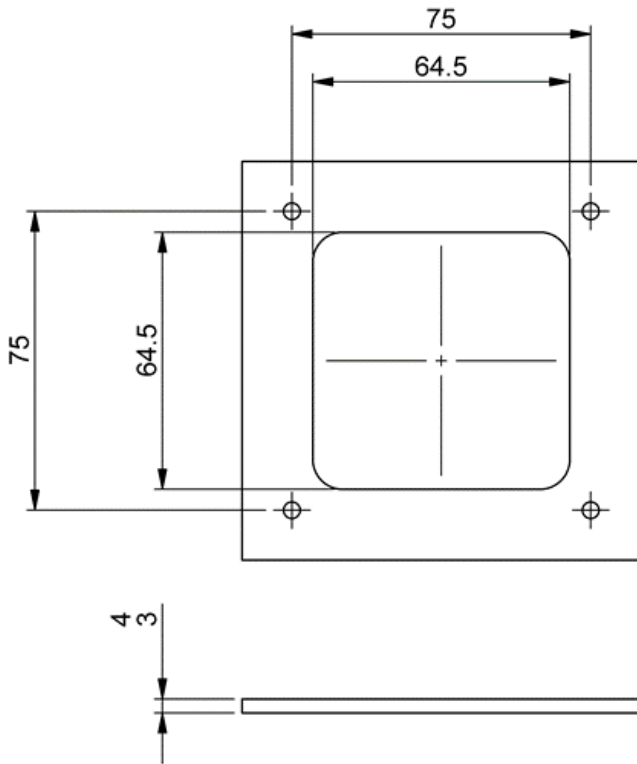
Integrated Connector Option

Flying Lead Option

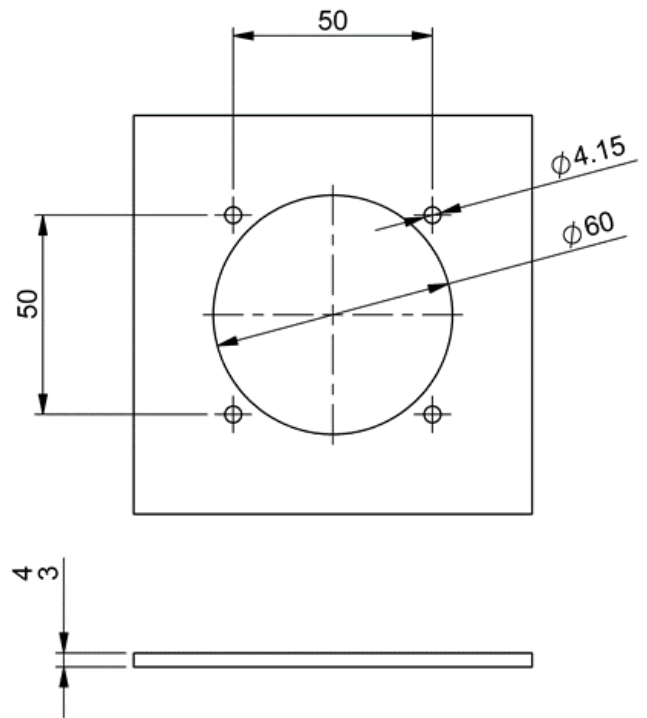


Panel Cut-out and fixing details

| | |
|---|---|
| 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

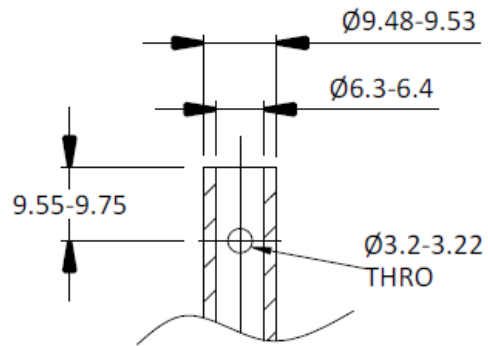


Below Panel Mounting Detail



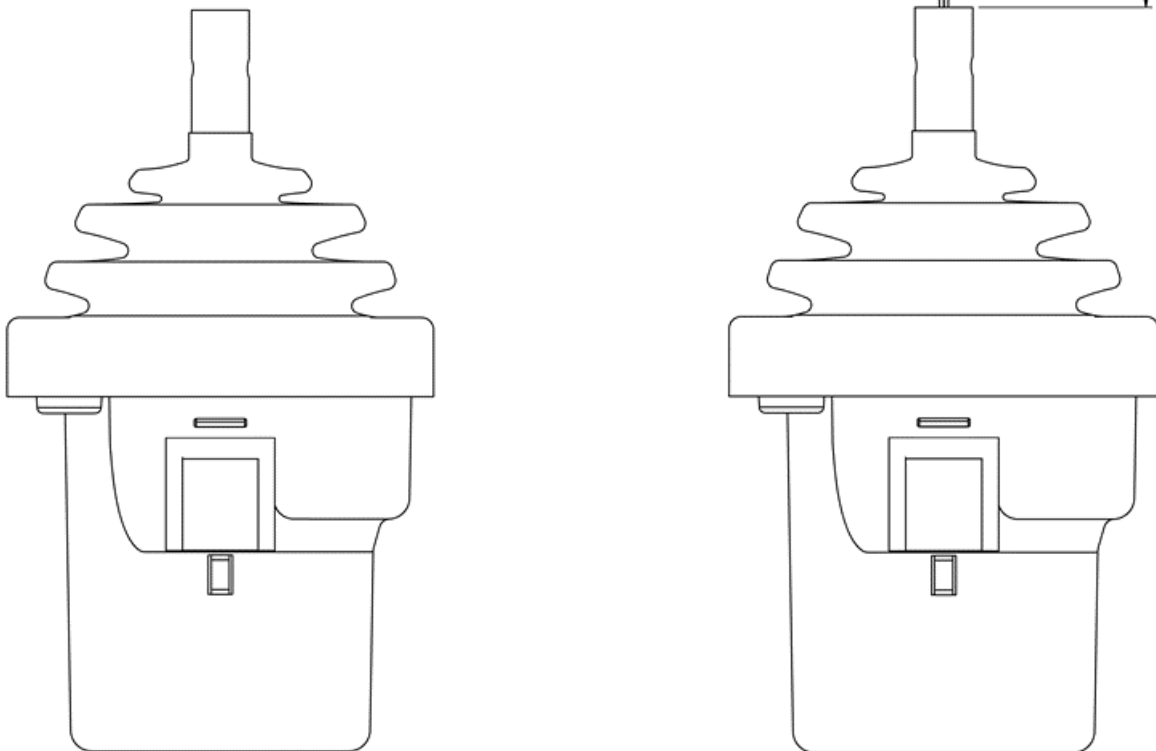
Dimensions – NH00 and NHF0 grip option

Operating rod details for customer fitted grips



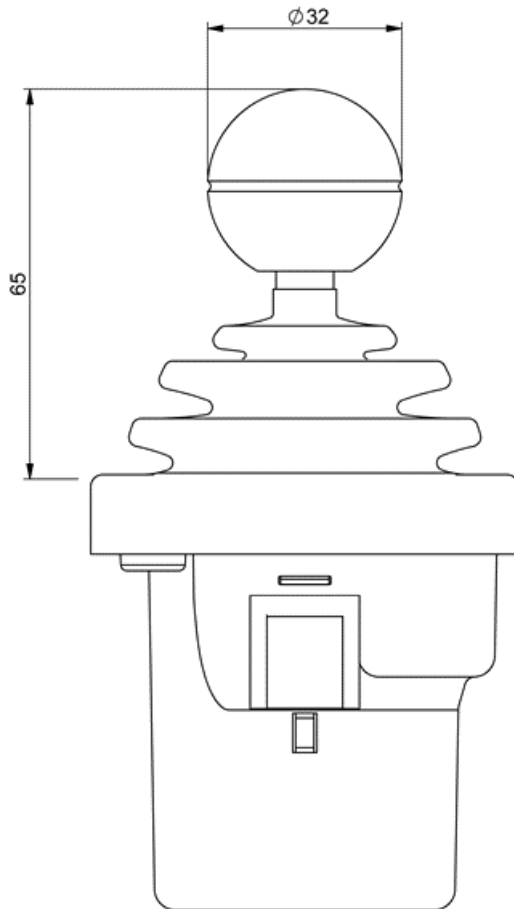
Cable size: 30 AWG (19/0.06)

250 MIN.



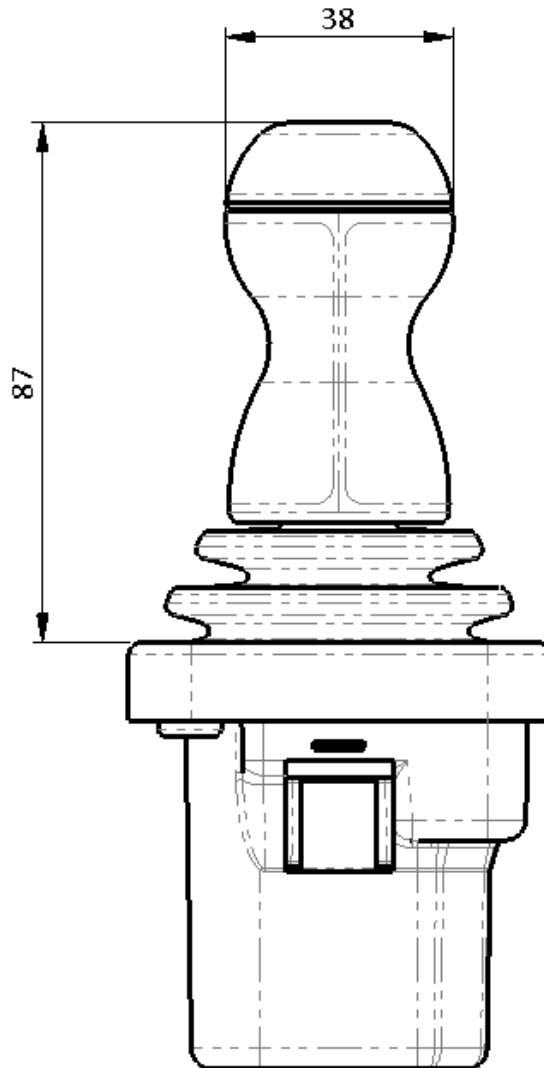


Dimensions – B000 grip option



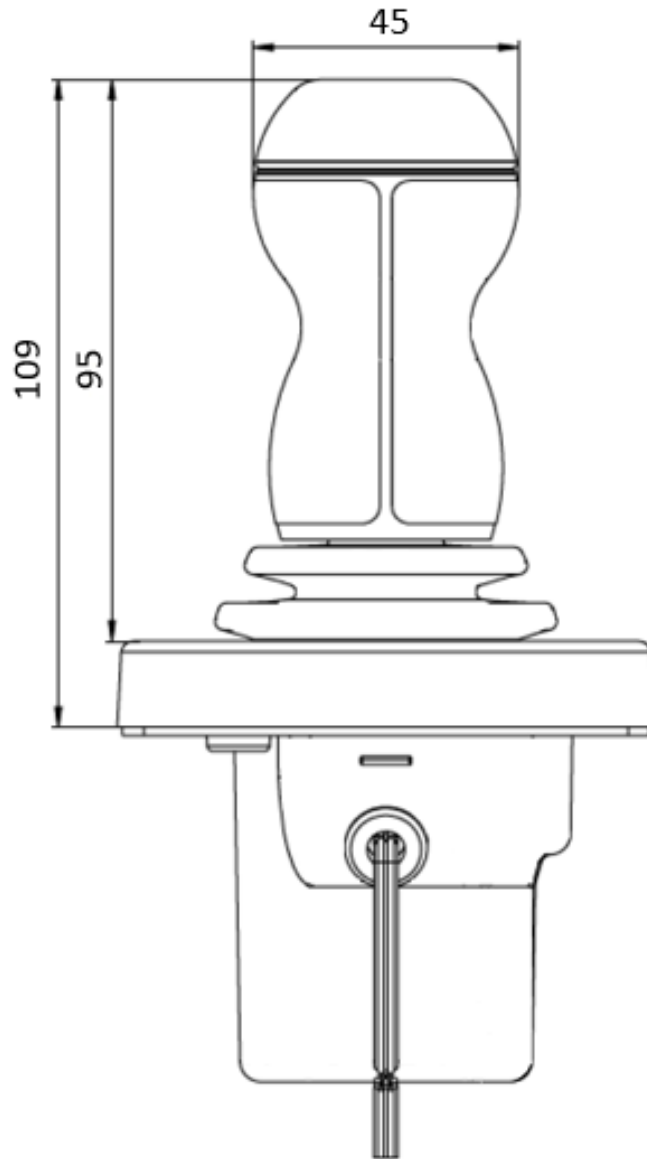


Dimensions – B001 grip option



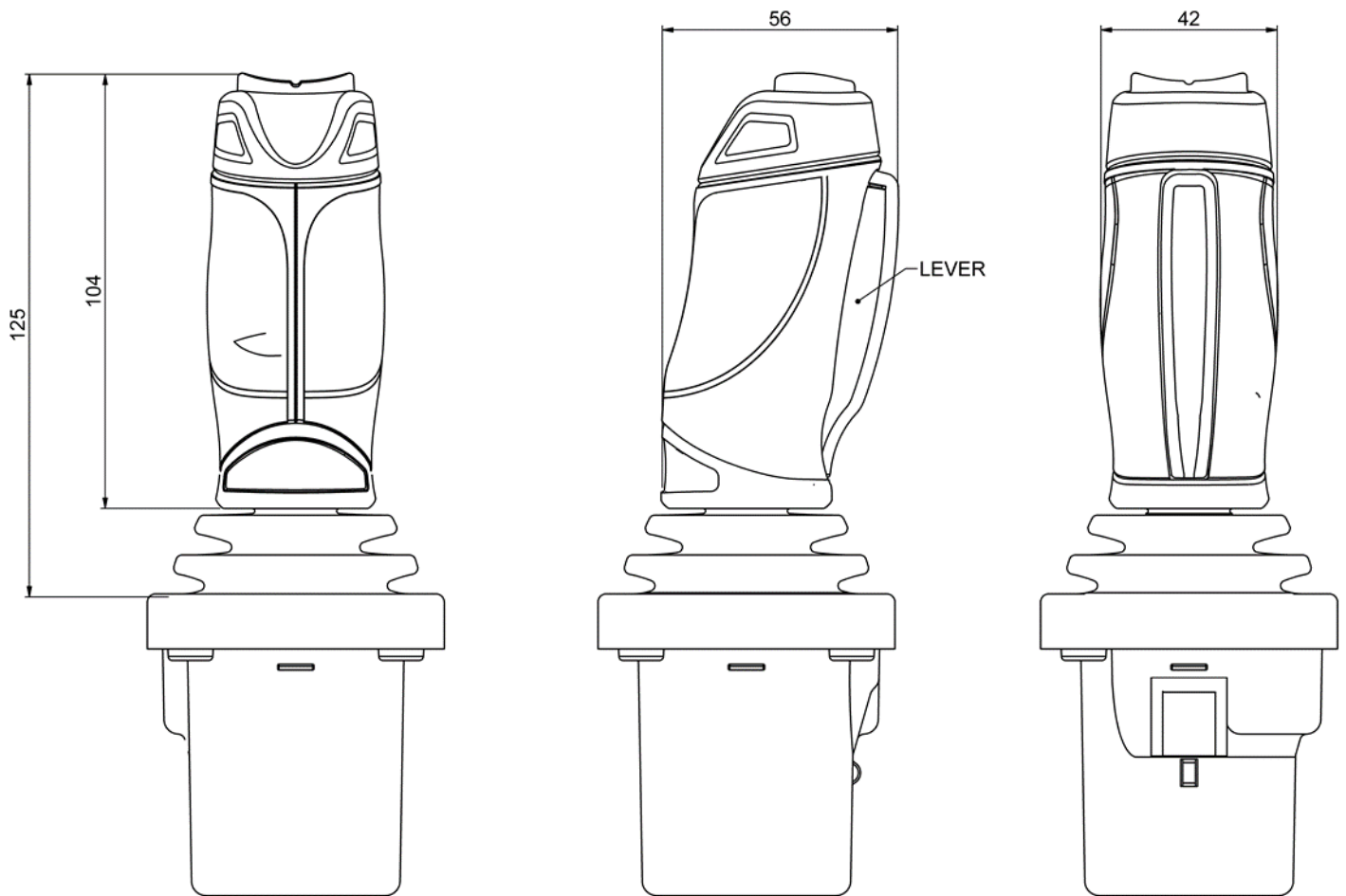


Dimensions – B002 grip option



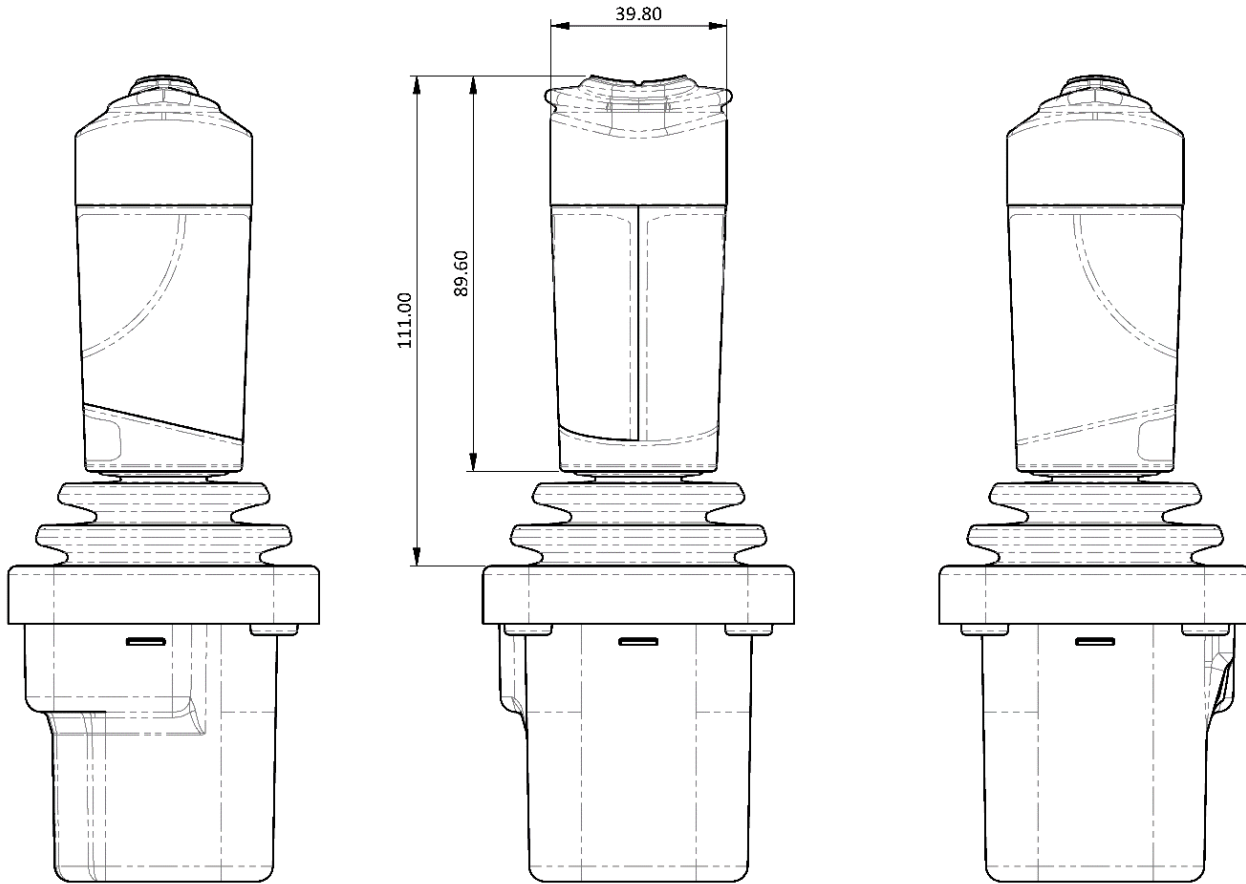


Dimensions – HG** grip option



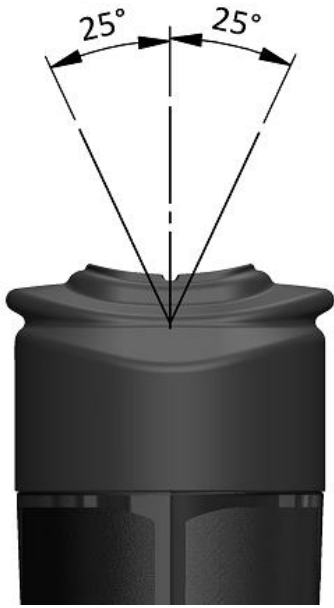


Dimensions – HJ grip option**

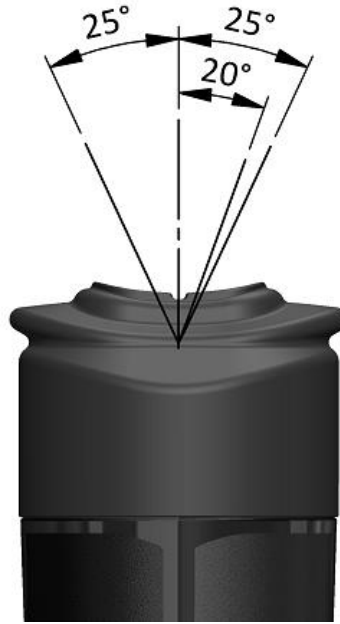


Overpress/detent coding

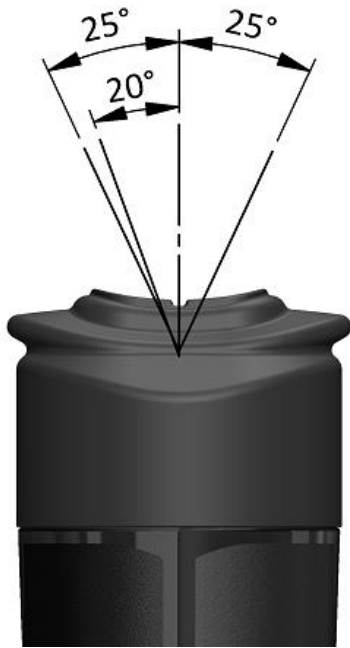
| Ordering Code | Description |
|---------------|----------------------------|
| HJ0* | No Overpress |
| HJ1* | Overpress – right only |
| HJ2* | Overpress – left only |
| HJ3* | Overpress – left and right |



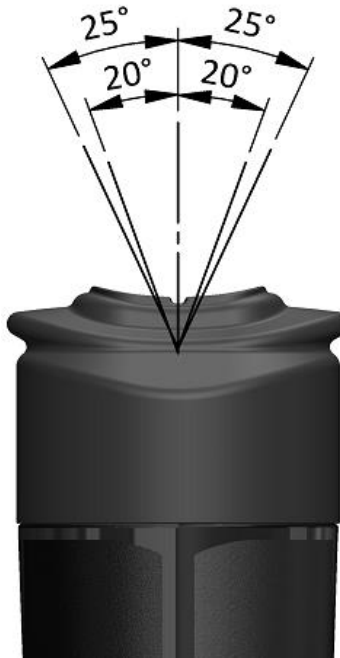
No overpress



Overpress - Right



Overpress - Left



Overpress - Left and Right



ELECTRICAL CONNECTIONS

Termination: CODE A



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

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

Note: the mating connector must be fitted with gold-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 | |
| Orange | Y-axis Output 2 | | |
| White | Center Reference Voltage | | |
| Purple | X-axis Output 2 | | |
| Brown | X-axis Output 1 | | |
| Grey | 0V supply | | |
| Pink | Y-axis Output 1 | | |
| Red | 5V supply | | |



SPECIFICATIONS

ELECTRICAL - JOYSTICK

| | |
|------------------------------------|---|
| 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 Ω (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 Ω |
| POWER-ON SETTLEMENT TIME | Up to 15ms |
| SUPPLY REVERSE POLARITY PROTECTION | -10Vdc (continuous) |
| CURRENT CONSUMPTION | < 30mA |
| INSULATION RESISTANCE @ 10VDC | >10M Ω |

ELECTRICAL – GRIP SWITCHES

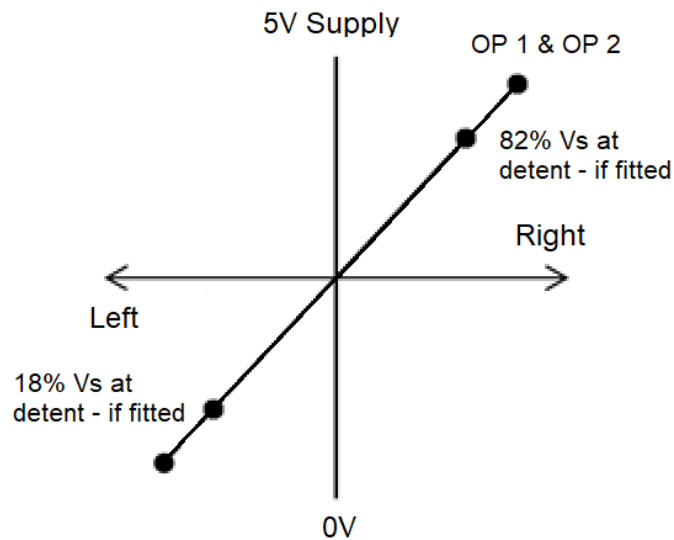
| | |
|-----------------------|---------------------------------------|
| CONTACT RATING | 100mA, 30V dc maximum (0.5mA minimum) |
| CONTACT RESISTANCE | 30 m Ω maximum |
| INSULATION RESISTANCE | >10 M Ω |
| MECHANICAL LIFE | 4,000,000 cycles |
| OPERATING FORCE | 3.5N \pm 0.7N |
| CONTACT BOUNCE |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



ELECTRICAL – HJ GRIP FUNCTIONS

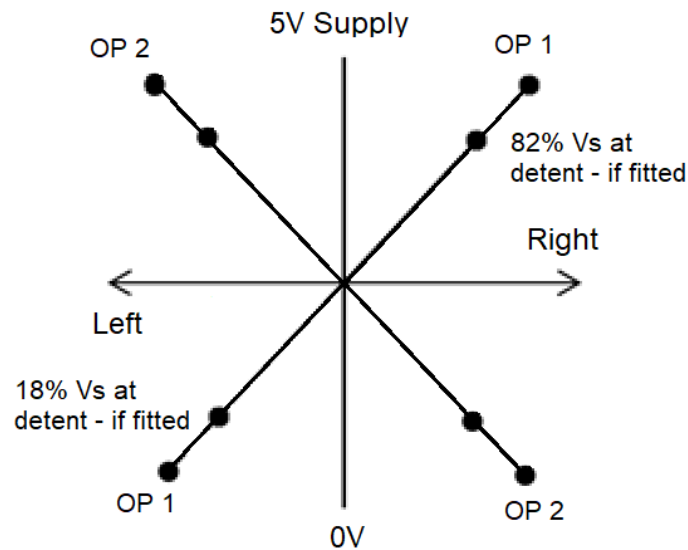
HJ*A Output Sense

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



| | |
|---|--|
| 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% |

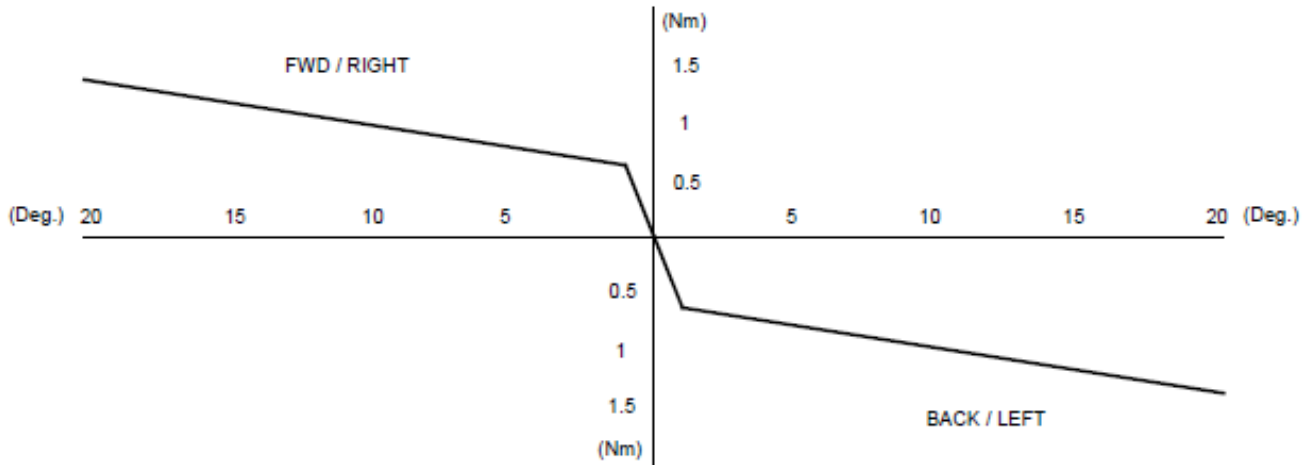
Note: The HG and HJ grips have a “Flow in, Flow out” design and the internal components are sealed to meet IP66 and IP67



MECHANICAL - JOYSTICK

| | | |
|----------------------------------|--|--|
| 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 | |

Note: Typical operating force profile shown below:





MECHANICAL – GRIPS - HJ

| | | |
|---|--|--------|
| Mechanical angle (centre return) | 25° nominal | |
| Detents | Detent feel position 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 IP20 below panel, including connector and flying lead option | 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 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.

All trademarks acknowledged.