



JC6000 MULTI AXIS JOYSTICK CONTROLLER

INNOVATION IN MOTION

The JC6000 rugged joystick controller is designed for demanding operator control applications in off-highway vehicles and other man-machine interfaces, where strength, reliability, and handle functionality are important. Available in one or two axis configurations, this joystick can be supplied with non-contact Hall effect sensors or long life potentiometer tracks. The JC6000's compact size, high lever strength and superb proportional control are ideal for applications which include operator controls on a wide range of off-highway vehicles, including cranes, loaders, excavators, access platforms, tractors and harvesters.

Handles and grips

The JC6000 can be specified with a choice of handles and grips to increase the functionality of the operator controls. With a choice of push buttons, trigger grips, proportional and switched rockers in a variety of different configurations, users can match their handle selection to suit their unique application.



Innovative design

With a choice of Hall effect sensors or potentiometer tracks to provide the analogue signals proportional to lever movement, the JC6000 can be configured to provide a range of output signals, directional and center switching functions, lever forces, and handle styles. CAN output can also be specified on the Hall sensor version for digital communication with vehicle systems.

Features

- Hall effect or potentiometric sensing
 - Single or dual axis control
- High strength lever with superb proportional control
 - Sealed above the panel to IP66
 - Choice of outputs and switches
- Choice of handles/grips with or without switches
 - AMP 040 series multi-lock connectors
- Interchangeable with Penny + Giles' JC600 model

Benefits

- Long life and maintenance-free operation
- Suited to a range of operator control functions
- Rugged and smooth lever movement
- Operation in hostile environments
- Enables user configuration for system safety
- Additional operator control functions
- Simple installation
- Improved performance within the same footprint



Quality Assurance

Penny + Giles are accredited to BS EN ISO9001:2000. Quality is at the heart of all our systems ensuring the reliability of our products from initial design to final despatch.

Certificate No.LRO 0924881

JC6000

MULTI-AXIS JOYSTICK CONTROLLER

Total reliability

The JC6000 includes lever mechanics designed to give smooth proportional control, with Hall effect sensors that provide contactless, long life operation up to 15 million operations. Alternative potentiometer tracks featuring multi-fingered precious metal wipers give low electrical noise and a long life of greater than 5 million operations.



Safety

The JC6000 with the Hall sensors option has dual outputs fitted as standard, allowing the signals to be monitored and compared for failure detection in safety critical applications. Additional independent switch functions can be specified for directional and center position indication - vital for vehicle system start-up safety. These switch functions are also available with the potentiometer tracks, which can also be specified with padding resistors to limit the output signals to 10-90% or 25-75%, allowing comparison and error detection.



Custom design

Penny+Giles offer an extensive range of fingertip and hand operated joysticks in standard modular configurations, designed to meet the majority of individual customer needs, but we can customise our designs for OEMs who require something more specialised to their application. Please talk to our technical sales team about your requirements.

Cell manufactured

The modular design of the JC6000 joystick is designed to provide the user with a wide choice of options, but allows efficient build and despatch using cell manufacturing principles. Contact your nearest sales office for the latest information on availability.



JC6000 JOYSTICK CONTROLLER

PERFORMANCE

MECHANICAL

Lever operating force breakout*		7 or 16
operating*	N	19 or 39 (full deflection)
maximum allowable**	N	390 (490 overload)
Lever mechanical angle single axis only	°	±20 forward/reverse
square gate	°	±20 in X and Y directions
Seat		preferred bias on axis
Expected life		15 million operations (5 million for potentiometer track version)
Weight	g	750 without handle fitted

* Measured at 55mm above upper flange face ** Measured 130mm above upper flange face

ENVIRONMENTAL

Operating temperature	°C	-25 to +80 (-25 to +80 with microswitches)
Storage temperature	°C	-25 to +85 (-25 to +85 with microswitches)
Environmental protection (above the flange)		IP66 IEC 60529 (fitted with HKN handle)
Vibration		Level±3g, 10Hz to 200Hz (random) @ 3.6g(rms)
Shock		20g, 6ms, half sine profile
EMC immunity level		100V/m, 30MHz to 1GHz, 1KHz 80% sine wave modulation, EN50082-2 (1995)
EMC emissions level		Complies with EN50081-2 (1993), 150kHz to 30MHz, level B
ESD immunity level		IEC61000-4-2 level 4 8kV contact discharge, 15kV air discharge

ELECTRICAL - HALL EFFECT SENSOR

Resolution		Infinite
Supply voltage range	Vdc	5 ±0.5 regulated transient free
Over voltage (maximum)	Vdc	15 continuous
Reverse polarity (maximum)	Vdc	14.5
Output voltage span - options	Vdc	±25% span - nominal 1.1 to 3.9 ±30% span - nominal 1.0 to 4.0 ±40% span - nominal 0.5 to 4.5
Load impedance (minimum)	k	5
Center voltage (no load)	%	48 - 52 of supply voltage
Current consumption	mA	13 per axis (6.5 per sensor)
Insulation resistance		Greater than 50M at 50Vdc
Output sense		The dual outputs rise together in the same direction, increasing with lever forward (and right), decreasing with lever backward (and left)
Output matching		See maximum output difference diagram below

ELECTRICAL CONNECTIONS

Mating 12 way connector and pins	SA48061 (AMP 040 12 way connector 174045-2; pins 175062-1)
Mating 12 way harness	P49779 (connector, pins and 380mm long cable)

All Hall sensor connections terminate in a 12-way AMP 040 series multi-lock connector in the joystick base. See page 8 for pin identities

ELECTRICAL - POTENTIOMETER TRACK

Resolution		Virtually infinite
Track resistance ±20%	k	1.8, 2, 2.9, 5
Track operating angle	°	±18
Output voltage range	%	0-100, 10-90, 25-75 of input
Center tap voltage	%	48 - 52 of applied voltage
Center tap angle	°	±2.5
Center tap to switch alignment	°	Within 0.5
Supply voltage maximum	Vdc	32
Wiper circuit impedance	M	1 minimum recommended*
Power dissipation @ 25°C	W	0.25
Insulation resistance		Greater than 15M at 50Vdc

* The long life resistive elements require a high impedance load in the wiper circuit to minimise the current flowing through the wiper for optimum life conditions

ELECTRICAL - DIRECTIONAL OR CENTER SWITCH (LOW CURRENT)

		Not available with CANbus output
Switch operating angle	°	1.5 or 5 either side of center
Supply voltage maximum	Vdc	35
Load current maximum	mA	200 resistive

ELECTRICAL CONNECTIONS

Mating 16 way connector and pins
Mating 16 way harness
Mating 8 way connector and pins
Mating 8 way harness

All primary potentiometer track and directional/center switch connections terminate in a 16-way AMP 040 series multi-lock connector in the joystick base. Secondary potentiometer track connections terminate in an 8-way AMP 040 series multi-lock connector. See page 8 for pin identities

SA47931 (AMP 040 16 way connector 174046-2; Pins 175062-1)
P49780 (connector, pins and 380mm long cable)
SA304522 (AMP 040 8 way connector 174044-2; pins 175062-1)
P303083 (connector, pins and 380mm long cable)

ELECTRICAL - MICROSWITCH

		Not available with CANbus output
Switch configuration		Two switches per axis. Normally open at lever center position
Switch operating angle	°	2 to 5 either side of center
Contact rating		3A @125Vac, 2A @ 30Vdc
Switch life minimum		100,000 cycles, cycled at 1Hz, 1A and 12Vdc
Operating temperature	°C	-25 to +85

ELECTRICAL CONNECTIONS

Microswitch connections in the potentiometer joystick will replace the low current directional/center switches in the 16-way AMP 040 series multi-lock connector in the joystick base. In the Hall sensor joystick, switches terminate in the 8-way connector. See Electrical Connections on page 8 for pin identities

CAN OUTPUT VERSION

Supply voltage range	Vdc	9 to 36
CAN version		CAN 2.0b
Protocol		J1939
Under-panel sealing		IP66 IEC60529

JC6000 with Hall sensing option can also be supplied with an integrated CANBUS output offering the J1939 protocol. This CANBUS interface meets the requirements of IEC61508 SIL level 1

ELECTRICAL CONNECTIONS

Mating connector and pins

All connections terminate in the 6-way Deutsch DTM04-6P integrated connector P304844 (includes 390mm flying leads)

JC6000

JOYSTICK CONTROLLER HOW TO SPECIFY

PERFORMANCE OPTIONS

CODE

AXES

Single
Dual

NY
XY

SENSING

Output

Potentiometer Px or **Pxx** selected from below

5k 0-100%, $\pm 5^\circ$ directional switch
1.8k 0-100%, $\pm 5^\circ$ directional switch
2.9k 25-75%, $\pm 1.5^\circ$ directional switch
2k 10-90%, $\pm 1.5^\circ$ directional switch
2k 10-90%, $\pm 5^\circ$ directional switch
2.9k 25-75%, $\pm 5^\circ$ directional switch
Dual outputs per axis, 2k 10-90%, $\pm 1.5^\circ$ directional switch

P
E
N
Q
R
S
T
U

Output

Dual Hall Effect sensors each axis **Hxx** with output selected from below

Dual Hall Effect sensors each axis and $\pm 1.5^\circ$ directional switch **Bxx** with output selected from below
1.1Vdc to 3.9Vdc
1.0Vdc to 4.0Vdc
0.5Vdc to 4.5Vdc

H
B
K
L
M

CANbus Output

Single Axis/Dual Axis

Note: Directional track switches not currently available with CANbus output.

HC
1 or 2

LEVER SPRING FORCE

Heavy duty, 16N breakout, 39N full deflection
Medium duty, 7N breakout, 19N full deflection

H
M

GATE

Square $\pm 20^\circ$ mechanical angle in X and Y directions

S

MECHANICAL FEATURES

No lock or detents fitted

NL

MICROSWITCH

No switch fitted
High current microswitches, 2A @ 30Vdc (Not available with CANbus output)

N
Y

INTERFACE

Standard interface (no electronics)
CANbus output, SAE J1939 protocol, Source Address 33 (HEX)
1000 CAN counts Source Address 34
Source Address 35
Source Address 36

STN
JR1
JL1
JC1
JA1

HANDLE/GRIP STYLE See pages 9-15

Standard knob, no functions
Hand grip with options for buttons or rocker
Ergonomic grip with multiple buttons and proportional rockers
Trigger grip with optional rocker switching
No handle
No handle, flying leads fitted (allows customer to fit own handle.)

HKN
HB
A
MG
NH
NHF

EXAMPLE ORDER CODE

JC6000 - XY - PRR - H - S - NL - N - STN - HKN

JC6000 JOYSTICK CONTROLLER

DIMENSIONS

Note: drawings not to scale

INSTALLATION

The joystick is designed to be fitted from below the mounting panel, through a 70mm diameter hole. The effectiveness of the joystick flange sealing is dependent on the panel mounting surface being sufficiently rigid to compress the sealing gaiter. The surface finish of the mounting panel is critical to achieving an adequate seal and rough surface finishes, paint chips, deep scratches, etc. should be avoided.

Recommended panel thickness

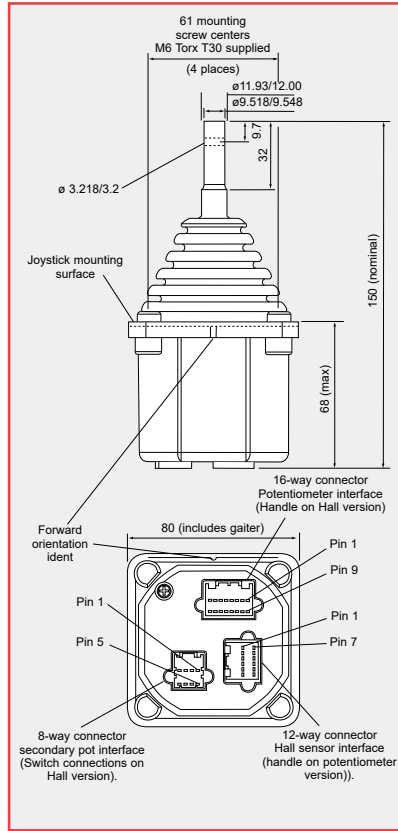
3.5 to 6mm

Recommended screw torque

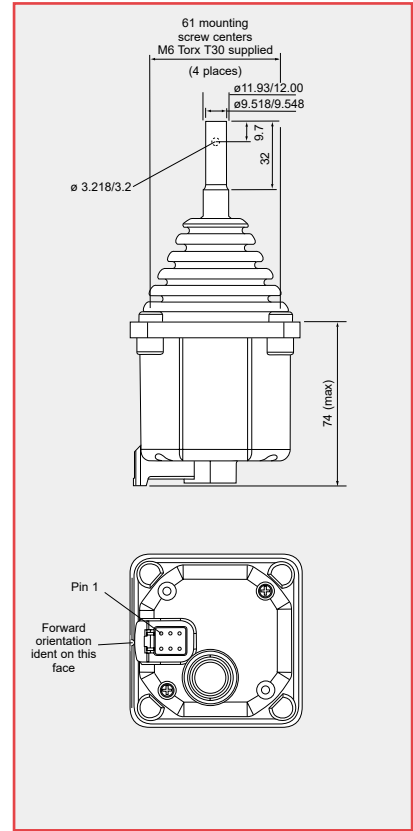
Fixing screws can be driven to a maximum torque of 5Nm when clamped against a 3.5mm thick panel.

The mounting hole depth is 12.6mm. For through-hole installation, the screws can be driven at a torque of 3.5Nm directly through the blind cast holes to remove the cast covers. The joystick mounting flange should be connected to the vehicle chassis or reference plane (normally zero volts).

POTENTIOMETER AND HALL EFFECT CONTROLLER



CAN OUTPUT CONTROLLER



CAN OUTPUT OPTIONS

The sealing of the lower cover meets the requirements of IP66 (IEC 60529) and uses an integrated Deutsch DTMO4-6P 6 pin connector with the cover. The use of a suitable sealed mating connector will enable a full IP66 connection to be made. The cover also includes an integrated breather system to ensure pressure regulation under all barometric pressure and temperature conditions without moisture ingress into the joystick.

See next page for electrical connections

JC6000 JOYSTICK CONTROLLER

ELECTRICAL CONNECTIONS

16-way primary connector

Pin number	Potentiometer tracks	Hall effect sensors
1	Y switch track N/O (lever forward +Y)	Pins 1 to 12 used for handle connections
2	X switch track center on	See chosen handle style for details
3	X pot track left	-
4	X pot track wiper signal	-
5	X pot track right	-
6	X pot track center tap	-
7	X switch track common	-
8	X switch track N/O (lever left -X)	-
9	Y pot track backward	-
10	Y pot track wiper signal	-
11	Y pot track forward	-
12	Y pot track center tap	-
13	Y switch track common	Not connected
14	Y switch track N/O (lever backward -Y)	Not connected
15	X switch track N/O (lever right +X)	Not connected
16	Y switch track center on	Not connected

8-way secondary connector (where fitted)

1	Secondary Y pot track backward	Forward (directional or micro) switch common
2	Secondary Y pot track center tap	Forward switch output
3	Secondary Y pot track wiper signal	Backward switch output
4	Secondary Y pot track forward	Backward switch common
5	Secondary X pot track right	Left switch common
6	Secondary X pot track wiper signal	Left switch output
7	Secondary X pot track center tap	Right switch output
8	Secondary X pot track left	Right switch common

12-way connector

1	Pins 1 to 12 used for handle connections	+5V supply - sensors 3 and 4
2	See chosen handle style for connection details	0V supply - sensors 3 and 4
3	-	-
4	-	0V supply - sensors 1 and 2
5	-	Forward / backward output - sensor 3
6	-	Left / right output - sensor 2
7	-	Left / right output - sensor 4
8	-	Forward / backward output - sensor 1
9	-	Not connected
10	-	Not connected
11	-	Not connected
12	-	Not connected

6 pin Deutsch connector CAN output

1	Not available	Not available
2	Not available	Not available
3	Not available	Not available
4	Not available	Not available
5	Not available	Not available
6	Not available	Not available

JC6000 JOYSTICK CONTROLLER HANDLE OPTIONS



HKN

The HKN handle is the simplest option available for the JC6000. This handle does not include any additional functionality, but is designed to allow the joystick to be controlled by the operator gripping the handle palm downwards.

NH or NHF

These options are selected when no handle is required to be fitted. NHF option has wires fitted to the joystick connector on the base, through the operating lever.

HB

Developed to replicate the functionality of the traditional mechanical handle, the HB range of hand grips can be specified with either a button or rocker switch, mounted into the top of the handle, within easy reach of the operator's thumb. These can be configured as a 'Person Present' feature or, for example, the steer signal for an access platform.



A RANGE

Designed to meet the demands for more complex control systems in off-highway applications, the 'A' range of ergonomic hand grips can be fitted with a combination of analogue outputs, push button and 'Person Present' switches. The handle can be specified with two independent analogue outputs generated by proportional rockers which, in turn, provide auxiliary directional switching in addition to the potentiometric output. When coupled with the two axis JC6000 base joystick this unit can provide a four-axis controller.

This handle can also be purchased separately, for fitting to customer levers or assemblies. Ask our sales team for more details on this option.

MG

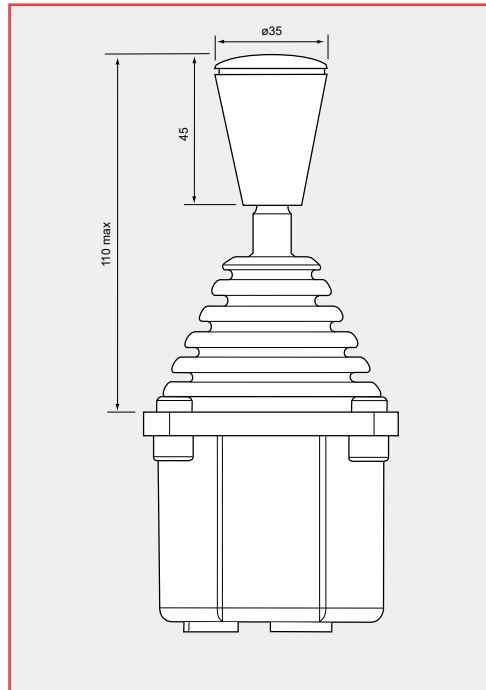
Designed to provide a simple approach to a 'Person Present' handle whilst offering the flexibility of switch options in the top of the handle. The profile of the MG handle ensures the operator's fingers are permanently close to the buttons, minimising operator fatigue and maximising functional control. The handle can be supplied with or without a hand rest and can be configured with a combination of trigger lever, single or dual switches.

This handle can also be purchased separately, for fitting to customer levers or assemblies. Ask our sales team for more details on this option.



HKN HANDLE OPTION

DIMENSIONS

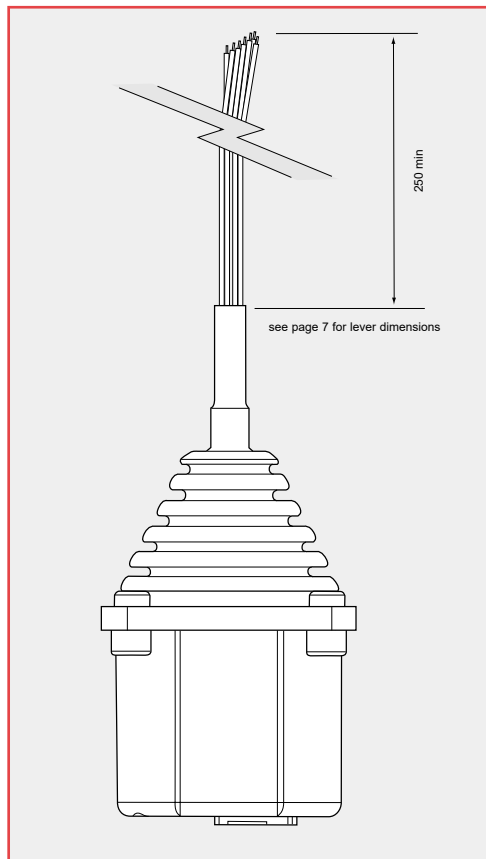


NH OR NHF HANDLE OPTIONS

ELECTRICAL CONNECTIONS

Wire size
Wire current

28AWG
1.4A



NH option has no wires fitted.

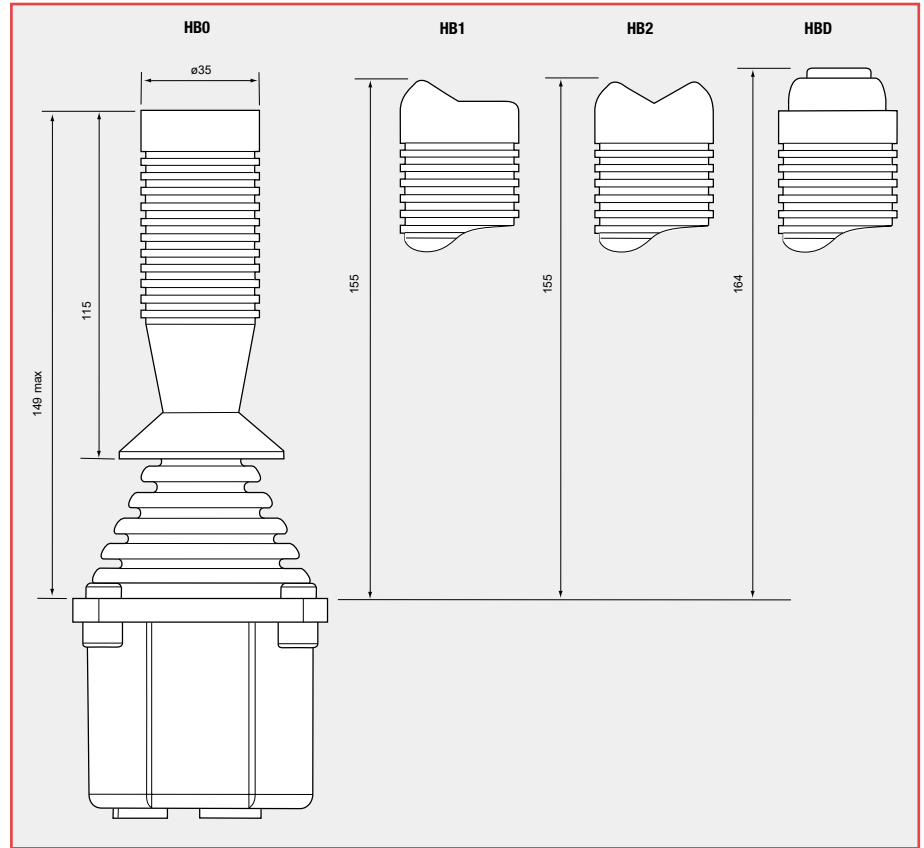
NHF option allows customer to fit own handle style to joystick operating lever.

Pin	Wire color
1	Grey
2	Yellow
3	Red
4	Orange
5	Brown
6	Black
7	Green
8	White
9	Blue
10	Violet
11	Pink
12	Red/Yellow
13	Not connected
14	Not connected
15	Not connected
16	Not connected

NHF handle option note: Wires terminate on the 12-way connector (Potentiometer version), or the 16-way connector (Hall sensor version).

HB HANDLE OPTIONS

DIMENSIONS



SPECIFICATION

		H B 0	H B 1	H B 2	H B D
Maximum height above flange	mm	149	155	155	164
Maximum grip diameter	mm	35	35	35	35
Environmental sealing (IEC 60529)		IP65	IP65	IP65	IP65
Number of switches		0	1	2	1
Action			Momentary rocker	Momentary rocker	Momentary button
Switch operating force	N	-	-	-	7
Maximum current @ 30Vdc	A	-	2.5	2.5	5
Expected life (operations)		100,000	100,000	100,000	100,000

ELECTRICAL CONNECTIONS

Common terminal		11		11	11
N/O contact switch 1			1		
N/C contact switch 1					
N/O contact switch 2				1	

Note: Signals terminate on the 12 way connector (potentiometer version) or the 16 way connector (Hall sensor version)

A RANGE HANDLE OPTIONS

SPECIFICATION

Maximum height above flange	mm	166
Maximum grip diameter	mm	61
Environmental sealing (IEC 60529)		IP65
Number of switches		1 to 6 in the top plate
Action		Momentary button
Switch operating force	N	3
Maximum current @ 50Vdc	mA	200
Expected life (operations)		1 million
Weight	g	170 - A2LD option
Operating temperature	°C	-40 to +70
Storage temperature	°C	-40 to +80

ROCKER

Rocker profile		Standard (S) or V profile (V)
Breakout force	N	5 at the end of the rocker
Operating force	N	15 at the end of the rocker
Mechanical movement	°	±10 (±1°)
Electrical movement	°	±9 (±1°)
Expected life (operations)		5 million
Load current (maximum)	mA	200 (see note on page 5)
Power dissipation @ 25°C	W	0.25
Track resistance		Will match JC6000 Y axis resistance †
Output voltage		Will match JC6000 Y axis output †
Center tap angle	°	±1.5
Directional or center off switch		Standard
Switch gap	°	2.5 either side of center
Switch supply voltage	Vdc	35

† unless requested otherwise

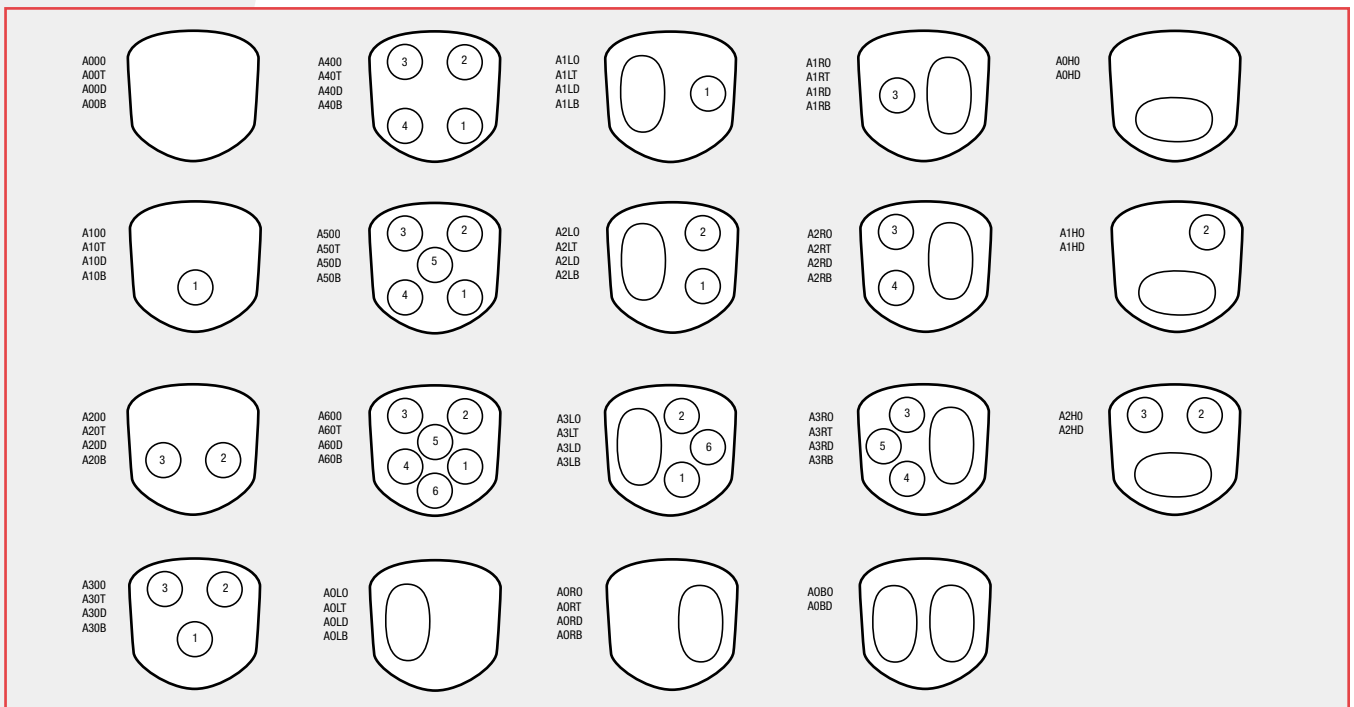
FUNCTIONALITY

SWITCHES

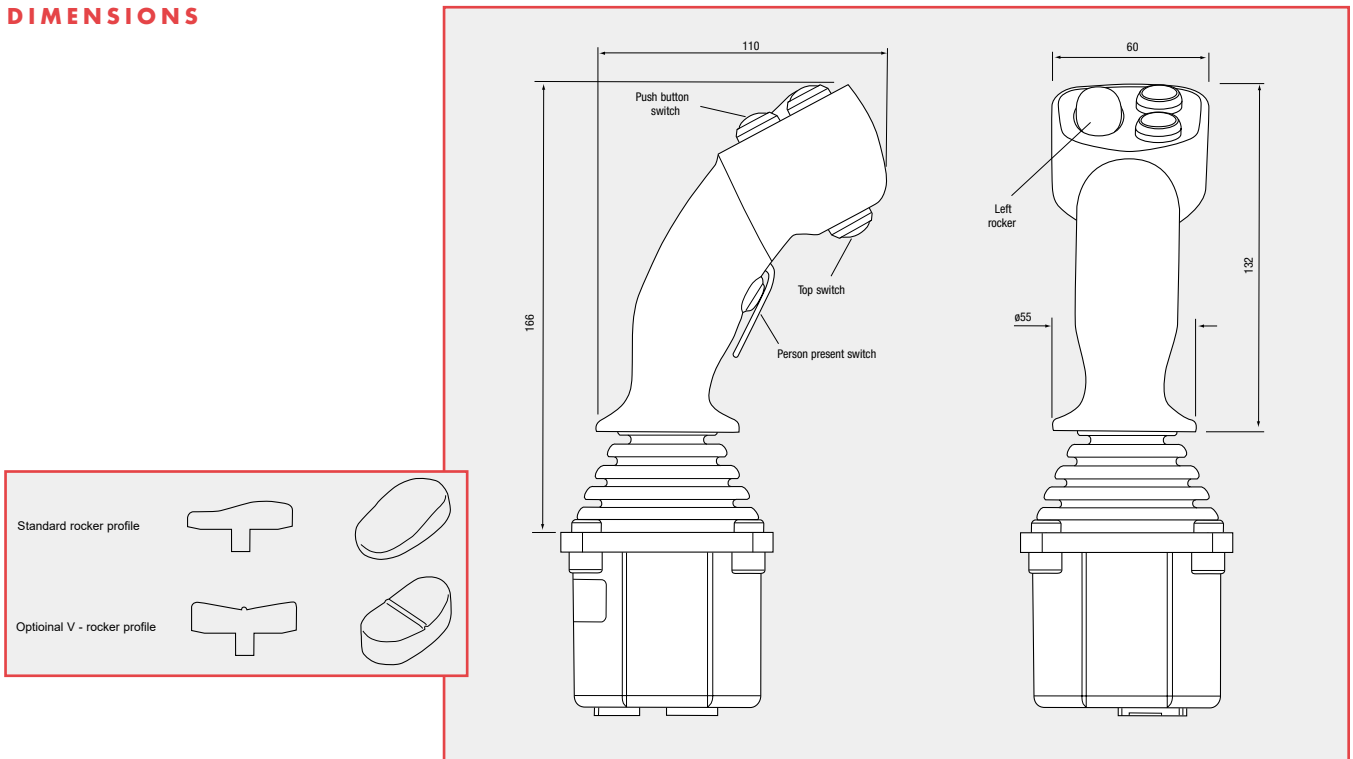
ROCKERS

	1	2	3	4	5	6	TOP	Person Present	LEFT	RIGHT	HORIZONTAL
SWITCH 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SWITCH 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SWITCH 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SWITCH 4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SWITCH 5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SWITCH 6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TOP SWITCH	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PERSON PRESENT	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
LEFT ROCKER	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
RIGHT ROCKER	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HORIZONTAL	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

SWITCH AND ROCKER OPTIONS



DIMENSIONS



ELECTRICAL CONNECTIONS

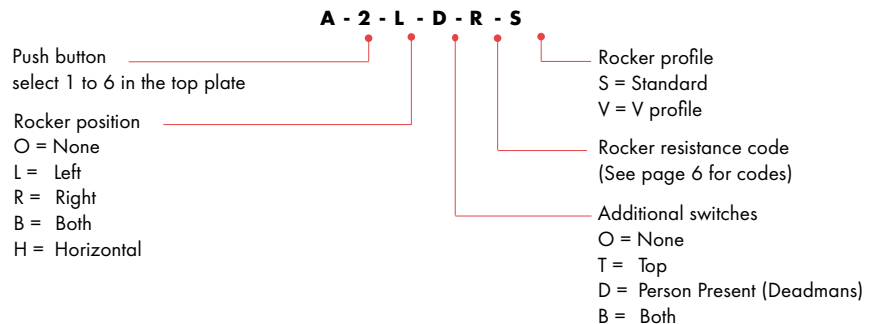
	Pin	Wire color		Pin	Wire color
Common terminal (for all switches)	11	Black	Rocker center tap	6	Yellow/Red*
Switch 1	4	Blue	Rocker zero or negative supply (L, R or H)	10	Pink/Grey
Switch 2	3	Yellow	Rocker output signal (L or H only)	5	Pink
Switch 3	2	Blue/White	Rocker output signal (R)	9	White
Switch 4	1	White/Green	Rocker switch common	11	Black
Switch 5	†	Red	Rocker switch (L forward)	2	Blue/Orange
Switch 6	†	Violet	Rocker switch (L backward)	1	Green
Top switch	†	Pink with marker	Rocker switch (R forward)	3	Yellow
Person present switch	12	Red/Green	Rocker switch (R backward)	4	Blue
Person present switch	8	Black/White	Rocker switch (H left)	4	Blue/Orange
Rocker positive supply (L, R or H)	7	White/Red	Rocker switch (H right)	1	Green

† depends on other options selected

*Center tap not connected on A3LB and A3RB handles

Note: Signals terminate on the 12-way connector (Potentiometer version), or the 16-way connector (Hall sensor version)

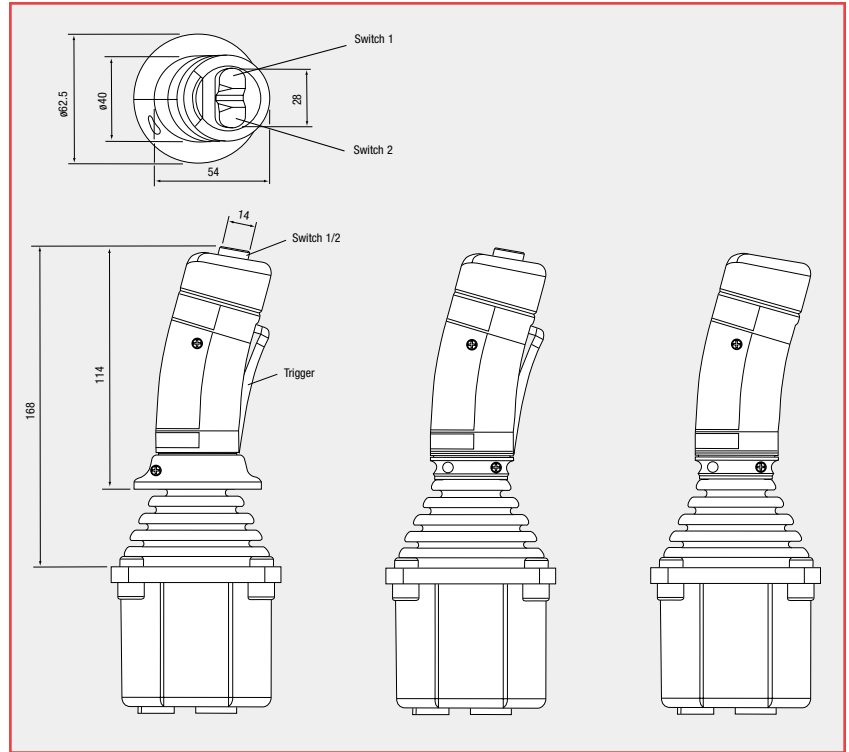
ORDERING CODES



Note: When ordering a handle fitted with a rocker, two profiles can be supplied (S = standard profile; V = v profile) please specify style when ordering.

MG HANDLE OPTIONS

DIMENSIONS



SPECIFICATION

Maximum height above flange	mm	168
Maximum grip diameter	mm	40
Environmental sealing (IEC 60529)		IP67 (IP66 with trigger switch)
Number of switches		0 to 3
Action		Momentary Button, Rocker or Trigger
Switch operating force		
Trigger	N	5
Switch 1 or 2	N	7
Maximum current @ 30Vdc	mA	100
Expected life (operations)		1 million
Operating temperature	°C	-25 to +75
Storage temperature	°C	-30 to +80

HANDLE CODE**MG00****MG01****MG02****MG03****MG04****MG05****MG06****MG07****MG08****MG09****MG10****MG11****Top switch position**

None

1

1 & 2

1 & 2

1 & 2

1

1 & 2

1

1

None

None

None

See Electrical Connections for wire color codes.

Trigger switch

No

No

No

Yes

Yes

Yes

No

No

Yes

Yes

None

Yes

Hand rest

No

No

No

No

Yes

Yes

Yes

Yes

No

Yes

Yes

No

ELECTRICAL CONNECTIONS**Common terminal (for top switches)****Switch 1 - Left****Switch 2 - Right****Trigger switch****Trigger switch****Pin number**

12

6

3

4

5

Wire color

Black

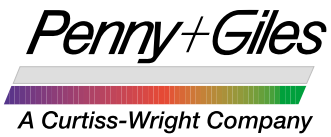
Blue

Green

Blue/Orange

Yellow

Note: Signals terminate on the 12-way connector (Potentiometer version), or the 16-way connector (Hall sensor version)



www.pennyandgiles.com

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Innovation In Motion

