Penny+Giles

A Curtiss-Wright Company

JC3000 FINGER OPERATED JOYSTICK CONTROLLER

Innovation In Motion

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INNOVATION IN MOTION

The JC3000 joystick controller is designed for demanding applications in remote control chestpacks or auxiliary functions on industrial vehicles and other man-machine interfaces, where precise control, signal reliability, and compact size are important. The joystick is available with single or dual axis control, and can be specified with a choice of either long life potentiometer tracks, or switched output signals.

Innovative design

With a choice of potentiometer tracks that provide the analog signals proportional to lever movement or 3, 4 or 5 switched outputs per joystick half axis, the JC3000 can be configured to provide a range of output signals and directional/center switching functions. The JC3000's low profile below the mounting panel and short lever height above, allows a number of joysticks to be mounted side by side without lever interference. All electrical signals terminate in a 12-way Hirose connector on each joystick axis, reducing installation time.

Total reliability

The JC3000 is manufactured using mainly cast metal components and includes lever mechanics designed to give smooth proportional control. The lever will withstand a 900N downward static load, with up to 20Nm maximum overload to the lever at full deflection. Long life potentiometer tracks featuring multi-fingered precious metal wipers give low electrical noise and a working life greater than 5 million operations with zero maintenance during this period. The high quality printed switch tracks are also designed to provide a working life greater than 5 million operations.

Features

- **Potentiometric or switched sensing**
- **Single or dual axis control**
- **High strength lever with precise proportional control**
- **Sealed above the panel to IP66**
- **Choice of outputs and switches**
- **Choice of handles with or without switches**
- **Hirose series multi-lock connector**

Benefits

- **Long life and maintenance-free operation**
- **Suited to a wide range of operator control functions**
- **Rugged and smooth lever movement**
- **Operation in demanding environments**
- **Enables user configuration for system safety**
- **Additional operator control functions**
- **Simple, error free installation**

Quality Assurance
Penny+Giles are accredited to BS EN ISO9001:2008 Quality is at the heart of all our systems ensuring the reliability of our products from initial design to final despatch.

Certificate No.LRQ 0924881

EMC Directive 2004/108/EC
The products detailed in this document are supplied as components for installation into an electrical apparatus or system. They are outside the scope of the EEC directive and will not be CE marked.

Compliance Statement
All specification data in this document has been tested and documented by Penny+Giles unless otherwise stated. The qualification and suitability of this product in any customer specific application is the responsibility of the customer unless otherwise agreed with Penny+Giles.

JC3000 FINGER OPERATED JOYSTICK CONTROLLER

Potentiometric sensing

Designed to interface with an electronic controller, the long-life potentiometer track generates analog outputs with switched reference signals that are proportional to the distance and direction over which the handle is moved. The analog output can be configured to provide signals for fault detection circuits, and a center tap provides an accurate voltage reference for the center position or a zero point for a bipolar supply voltage. The electrically independent switch operates with separate contacts each side of the joystick center position, in each available axis.

The key advantages of this technology are its proportional output and the versatility it derives from its simplicity; it consists of a carbon-based potentiometer track with no complex circuitry or electronics, so it is not susceptible to electromagnetic interference or magnetic fields. However, as a contacting device it does have a long, but finite life and due consideration should be given to applications subject to high intensity use or where high dither or vibration may be encountered.

Please ask for details on our contactless Hall-effect joystick range if you have an application which may encounter dither or vibration.

Switched output

The JC3000 can also be supplied with switched tracks on each axis, with options for 3, 4 or 5 switches either side of the center position, in addition to a center off switch. An option for mechanical detents is also available, where the switching positions coincide with the detents, allowing the operator to determine the angular position of the joystick lever easily. The switches operate sequentially as the joystick lever is moved from center to the end stop in each axis.

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. We can also 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 JC3000 joystick is designed to provide the user with a wide choice of options, but allows rapid build and despatch. Contact your nearest sales office for the latest information on availability.

NHT handle option

K10 handle option

HL0 handle option

ZC1 handle option

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JC3000 JOYSTICK CONTROLLER ANALOG OUTPUT

PERFORMANCE MECHANICAL

Lever breakout torque XY	**Nm**	0.2
Lever operating torque XY	**Nm**	0.6 (full lever deflection at ±31°)
Lever detent torque XY	**Nm**	0.1 approx.
Maximum allowable torque XY	**Nm**	12.5 to 20 (full lever deflection, depending on gate and detent options selected)
Lever operating angle	**°**	±31 max. in X and Y directions (Actual angle will depend on gate selected)
Lever action		Self centering, aligned X and Y
Lever gate profiles		Single axis in X or Y, square or plus
Detent angles	**°**	

Nominal	Lever angle	Gate Code	Track Code
±5.5	-	-	-
±12	-	-	-
±18	±19	Φ 19	P_3
±24	±25	Φ 25	P_4
±30	±31	Φ 31	P_5

where Φ can be 1, S or P, & _ can be N, R, Q, E or L, see page 9

Maximum Z axis torque	**Nm**	5
Expected life		>5 million operations
Weight	**g**	205 nominal, without handle fitted

ENVIRONMENTAL

Operating temperature	**ºC**	-25 to +75
Storage temperature	**ºC**	-40 to +85
Environmental protection above the flange		IP66 (IP65 when ZC1 handle is fitted) IEC 60529 (The joystick is unprotected below the flange)

ELECTRICAL
Analog Track

Resolution		Virtually infinite
Track resistance (±20%)	**kΩ**	1.8, 2, 2.9, 5 or 10
Track electrical angle	**°**	±17, ±23 or ±28 (Depends on gate and track code selected)
Output voltage range	**%**	0-100, 10-90 or 25-75 of input (±2%) (Depends on analog potentiometer track selected see options page 9)
Center tap voltage (no load)	**%**	48 - 52 of applied voltage
Center tap angle	**°**	±2.5
Supply voltage - maximum	**Vdc**	32
Output current – maximum	**mA**	5†
Wiper circuit impedance	**MΩ**	>1† recommended
Insulation resistance		Greater than 50MΩ at 50Vdc

Switch-Directional or Center Off/Center On*

Switch operating angle	**°**	3.75 either side of center position
Supply voltage - maximum	**Vdc**	30
Load current - maximum	**mA**	5

* The JC3000 has an additional center switch in each axis. When the handle is moved, the center switch signal will become open circuit ('break before make') before the directional switch closes. This angle is typically less than 1º. The directional and center switches are provided to allow customers to integrate the joystick into their control system in a safe manner. It is recommended that these switches are utilised to ensure a safe condition exists at all times.

DIMENSIONS AND MOUNTING DETAILS

For dimensions, mounting details and installation recommendations see page 8.

† The long life resistive elements require a high impedance load in the wiper circuit to minimise the current flowing through the wiper for optimum conditions. Connecting the joystick output to a control circuit/controller with a Wiper Circuit Impedance that is lower than stated above can result in an offset of the output voltage through the travel of the joystick. This may be most noticeable when the joystick is at rest at the centre position. A lower than specified wiper circuit impedance can also result in a higher than stated output current and this in turn will result in a reduced electrical life of the potentiometer element. The potentiometer element must be connected as a Voltage Divider and should not be used as a variable resistor. Use as a variable resistor will result in incorrect operation of the control system.

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JC3000 JOYSTICK CONTROLLER ANALOG OUTPUT

ELECTRICAL CONNECTIONS

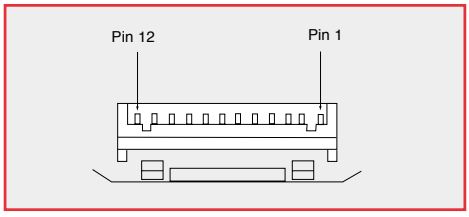
All potentiometer track and directional/center/handle switch connections terminate in a 12-way Hirose DF3-12P-2DS(01) series connector on each joystick axis – a mating connector and flylead is available (one is required for each axis). The connectors used on the JC3000 joystick are gold plated, therefore the mating connectors should also be gold plated.

Mating 12-way connector and flyleads

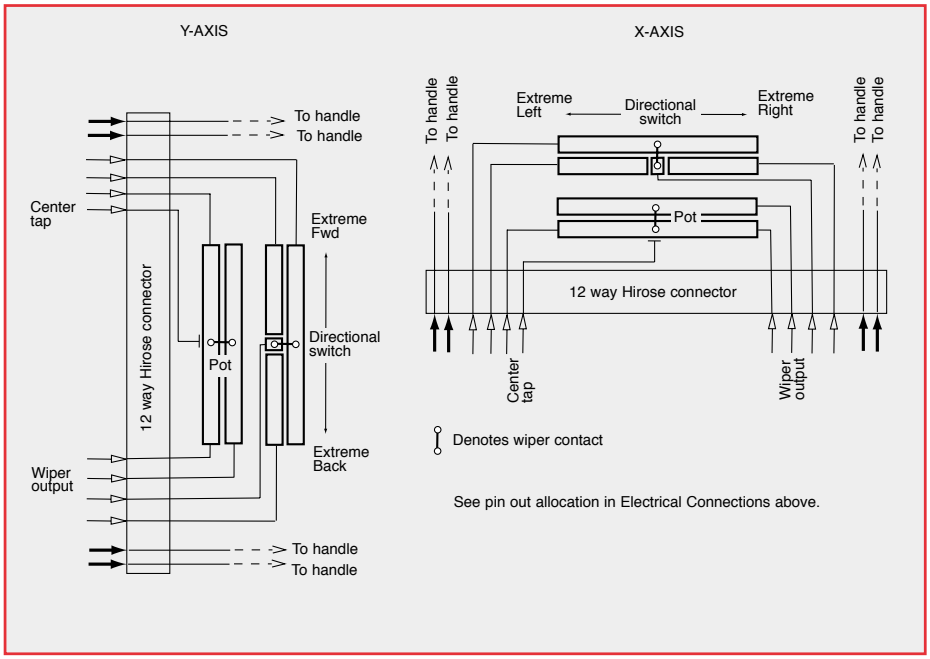
SA310621 MK1 – Connector, terminals and **100mm long** UL1007 wires – 28AWG (7/0.127mm)
SA310621 MK2 – Connector, terminals and **300mm long** UL1007 wires – 28AWG (7/0.127mm)

Y-Axis Allocation	X-Axis Allocation	Connector Pin Number	12-way Harness Wire Colour
Output voltage signal	Output voltage signal	1	Black
Switch track N/O (lever forward +Y)	Switch track N/O (lever right +X)	2	Red
Not connected	Normally not connected unless ZC1/ZCS handle is fitted (XN code only)	3	Blue
Potentiometer center tap	Potentiometer center tap	4	White
Switch track center on	Switch track center on	5	Green
Not connected	Normally not connected unless ZC1/ZCS handle is fitted (XN code only)	6	Yellow
Switch track N/O (lever backward -Y)	Switch track N/O (lever left –X)	7	Brown
Switch track common	Switch track common	8	Orange
Normally not connected unless ZC1/ZCS handle is fitted (NY and XY code only)	Not connected	9	Grey
Potentiometer backward (-V or zero supply)	Potentiometer left (-V or zero supply)	10	Violet
Potentiometer forward (+V supply)	Potentiometer right (+V supply)	11	Black/White
Normally not connected unless ZC1/ZCS handle is fitted (NY and XY code only)	Not connected	12	Black/Red

MULTI PIN CONNECTOR DIAGRAM



ANALOG TRACK DIAGRAM



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JC3000 JOYSTICK CONTROLLER SWITCHED OUTPUT

PERFORMANCE
MECHANICAL

Lever breakout torque XY	**Nm**	0.2
Lever operating torque XY	**Nm**	0.6 (full lever deflection at ±31°)
Lever detent torque XY	**Nm**	0.1 approx.
Maximum allowable torque XY	**Nm**	12.5 to 20 (full lever deflection, depending on gate and detent options selected)
Lever operating angle	**°**	±31 max. in X and Y directions (Actual angle will depend on gate selected)
Lever action		Self centering, aligned X and Y
Lever gate profiles		Single axis in X or Y, Square or Plus

Detent angles **°**

Nominal	Lever angle	Gate Code	Track Code
±5.5	-	-	-
±12	-	-	-
±18	±19	Φ 19	SW3
±24	±25	Φ 25	SW4
±30	±31	Φ 31	SW5

where Φ can be 1, S or P, see page 9

Maximum Z axis torque	**Nm**	5
Expected life		>5 million operations
Weight	**g**	205 nominal, without handle fitted

ENVIRONMENTAL

Operating temperature	**°C**	-25 to +75
Storage temperature	**°C**	-40 to +85
Environmental protection above the flange		IP66 (IP65 when ZC1 handle is fitted) IEC 60529 (The joystick is unprotected below the flange)

ELECTRICAL
Switch Track

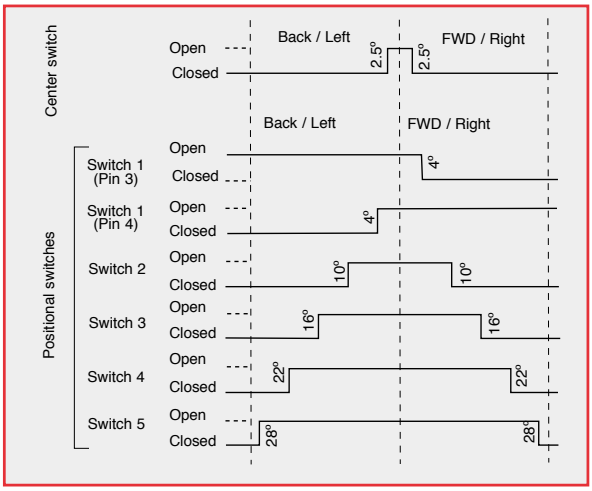
Number of switch positions		3, 4 or 5 either side of center
Number of detents		3, 4 or 5 either side of center (Also option for no detents)
Switch angles	**°**	(SW1) ±4, (SW2)±10, (SW3)±16, (SW4)±22, (SW5)±28
Supply voltage - maximum	**Vdc**	32
Load current – maximum	**mA**	5
Insulation resistance		Greater than 50MΩ at 50Vdc

Switch-
Center Off

Switch operating angle	**°**	2.5 either side of center position
Supply voltage - maximum	**Vdc**	30
Load current - maximum	**mA**	5

SWITCH ACTIVATION DIAGRAM

Switch track output and center switch signals on both X and Y axes are Normally Open at lever center position. Switch sequences close depending on the direction of lever movement and the detent position.
See the diagram for the switch activation profile.



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JC3000 JOYSTICK CONTROLLER SWITCHED OUTPUT

ELECTRICAL CONNECTIONS

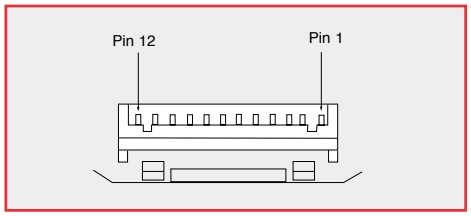
All switch track/center/handle switch connections terminate in a 12-way Hirose DF3-12P-2DS(01) series connector on each joystick axis – a mating connector & flylead is available (one is required for each axis). The connectors used on the JC3000 joystick are gold plated, therefore the mating connectors should also be gold plated.

Mating 12-way connector and flyleads

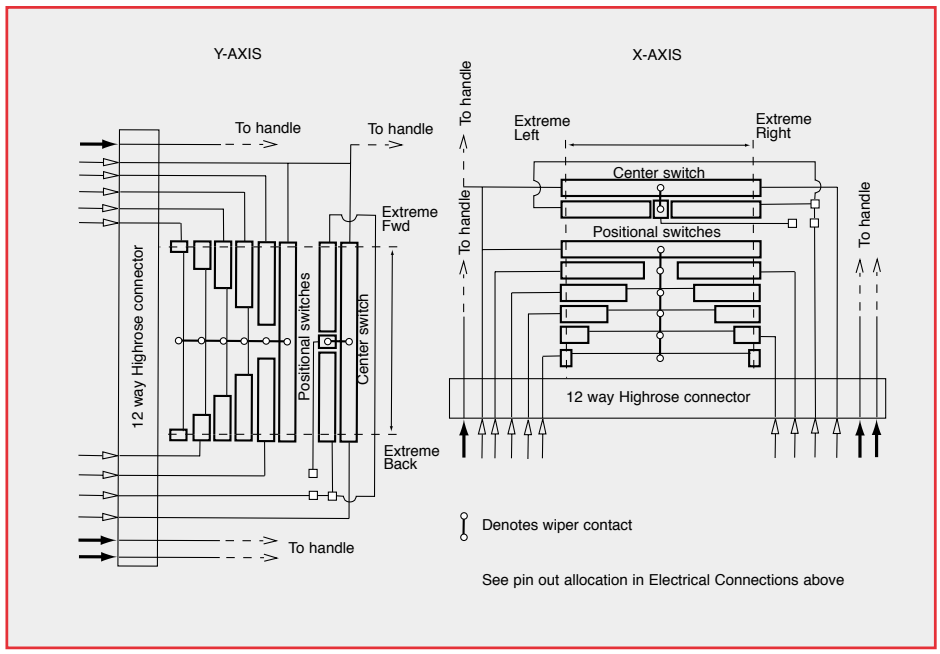
SA310621 MK1 – Connector, terminals and **100mm long** UL1007 wires – 28AWG (7/0.127mm)
SA310621 MK2 – Connector, terminals and **300mm long** UL1007 wires – 28AWG (7/0.127mm)

Y-Axis Allocation	X-Axis Allocation	Connector Pin Number	12-way Harness Wire Colour
Switch track common	Switch track common	1	Black
Center off switch	Center off switch	2	Red
Switch 1 (lever forward +Y)	Switch 1 (lever right +X)	3	Blue
Switch 1 (lever backward -Y)	Switch 1 (lever left -X)	4	White
Switch 2 (forward & backward)	Switch 2 (right & left)	5	Green
Switch 3 (forward & backward)	Switch 3 (right & left)	6	Yellow
Switch 4 (forward & backward)	Switch 4 (right & left)	7	Brown
Switch 5 (forward & backward)	Switch 5 (right & left)	8	Orange
Not connected	Not connected	9	Grey
Normally not connected unless ZC1/ZCS handle is fitted (NY and XY code only)	Normally not connected unless ZC1/ZCS handle is fitted (XN code only)	10	Violet
Normally not connected unless ZC1/ZCS handle is fitted (NY and XY code only)	Normally not connected unless ZC1/ZCS handle is fitted (XN code only)	11	Black/White
Switch track common	Switch track common	12	Black/Red

MULTI PIN CONNECTOR DIAGRAM



SWITCH TRACK DIAGRAM



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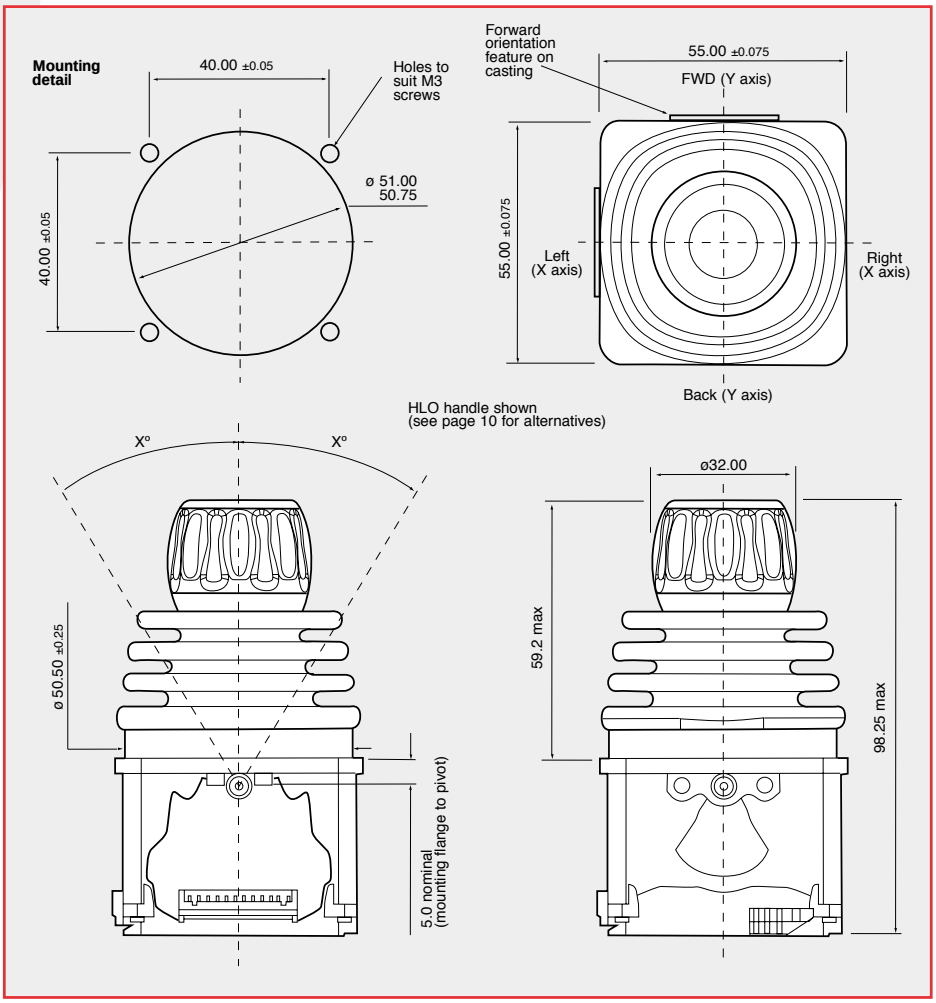
JC3000 JOYSTICK CONTROLLER

DIMENSIONS

Note: drawings not to scale



Lever angle (X°) depends on gate selected.

INSTALLATION

The joystick is designed to be fitted from below the mounting panel, through a 50.75/51.00mm 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

The JC3000 joystick requires 4 x M3 screws (not supplied) to attach the flange to the mounting panel. To maintain an effective seal between the joystick flange and the mounting panel, the mounting screws should be tightened to a recommended fixing torque of 1Nm.

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JC3000 JOYSTICK CONTROLLER
HOW TO SPECIFY

PERFORMANCE OPTIONS	FEATURE		CODE
AXES	Single axis in Y direction only - Forward/Backward		**NY**
	Single axis in X direction only - Right/Left		**XN**
	Dual axis		**XY**
GATE Selecting the gate style and angle determines the track code for switched output and 2/3 of the final track code for analog output versions.	Single axis with ±31º lever range	(Track code = P_5 or SW5)	**131**
	Single axis with ±25º lever range	(Track code = P_4 or SW4)	**125**
	Single axis with ±19º lever range	(Track code = P_3 or SW3)	**119**
	Square with ±31º lever range in X and Y	(Track code = P_5 or SW5)	**S31**
	Square with ±25º lever range in X and Y	(Track code = P_4 or SW4)	**S25**
	Square with ±19º lever range in X and Y	(Track code = P_3 or SW3)	**S19**
	Plus with ±31º lever range	(Track code = P_5 or SW5)	**P31**
	Plus with ±25º lever range	(Track code = P_4 or SW4)	**P25**
	Plus axis with ±19º lever range	(Track code = P_3 or SW3)	**P19**
TRACKS - Analog output Final track code element * is determined by the gate/angle previously selected.	Analog potentiometer - 1.8k 0-100% ±3.75º directional switch		**PN***
	Analog potentiometer - 2k 10-90% ±3.75º directional switch		**PR***
	Analog potentiometer - 2.9k 25-75% ±3.75º directional switch		**PQ***
	Analog potentiometer - 5k 0-100% ±3.75º directional switch		**PE***
	Analog potentiometer - 10k 0-100% ±3.75º directional switch		**PL***
TRACKS - Switched output	Switched track - 5 switches either side of center		**SW5**
	Switched track - 4 switches either side of center		**SW4**
	Switched track - 3 switches either side of center		**SW3**
LEVER SPRING FORCE	Medium duty 0.2Nm breakout, 0.6Nm full deflection		**M**
SEAT	Aligned with axis		**A**
DETENTS	No detent feature - **available for all gate code options**		**D00**
	5 each side of center position - **option for gate codes 131; S31; P31**		**D5H**
	4 each side of center position - **option for gate codes 125; S25; P25**		**D4H**
	3 each side of center position - **option for gate codes 119; S19; P19**		**D3H**
INTERFACE	Standard interface - no electronics		**STN**
HANDLE STYLE **See pages 10-11**	No handle, plain lever		**NHP**
	No handle, M5 threaded lever		**NHT**
	Tapered handle, no functions		**K10**
	Ball handle, no functions		**B00**
	Low profile, fluted handle, no functions		**HL0**
	Handle with momentary push button		**ZC1**
	Handle with momentary switch action		**ZCS**

EXAMPLE ORDER CODES **JC3000-XY-S31-PN5-M-A-D00-STN-K10**

JC3000-NY-131-SW5-M-A-D5H-STN-ZC1

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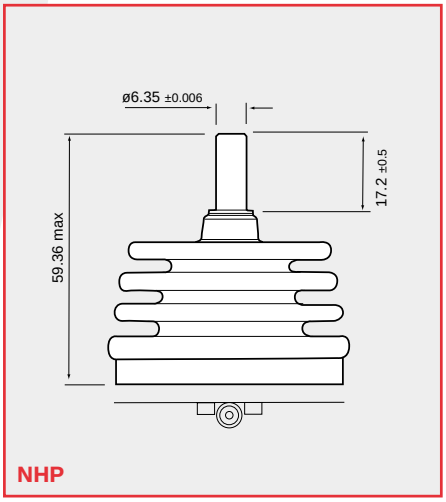
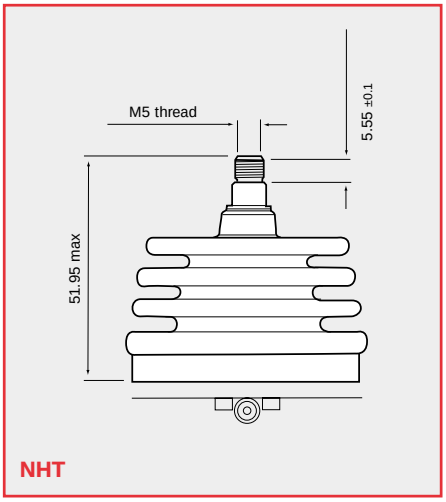
JC3000 JOYSTICK CONTROLLER HANDLE OPTIONS

NHP
No handle, plain lever

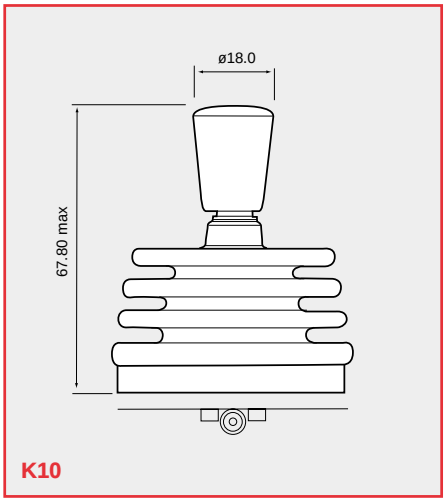
NHT
No handle, M5 threaded lever

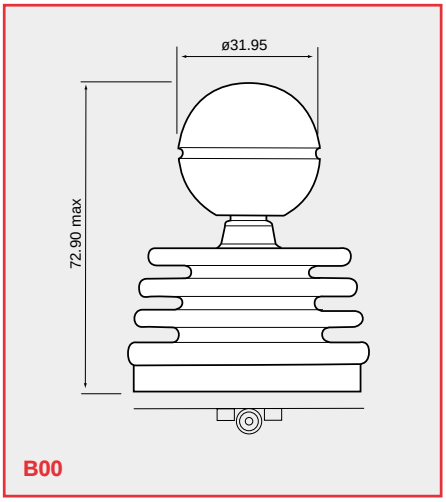




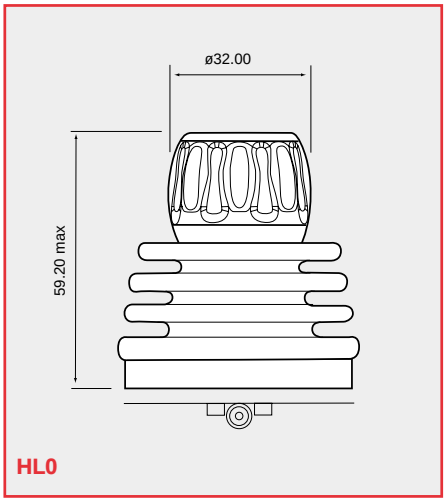
K10
This handle option is a simple tapered style with no switch functions, allowing simple fingertip control.

B00
This handle option is a spherical ball style with no switch functions, allowing simple 'finger and thumb' control The handle has a recessed diametral groove on the circumference to aid grip.





HL0
This handle option is a low profile, fluted style that has a maximum 59.2mm height above the mounting panel. This option allows closer spacing of multiple joysticks within a small surface area - typically in applications like remote control chest packs and robotics equipment.



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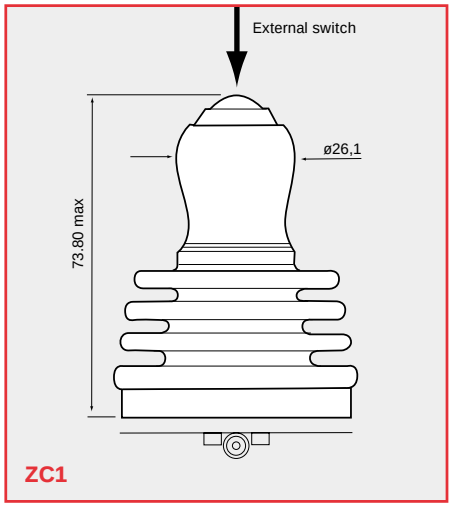
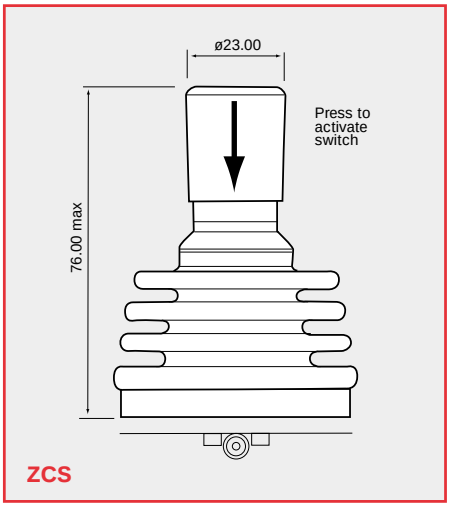
ZC1 or ZCS HANDLE OPTION

A switch function can be incorporated by using the ZC1 external button switch or the ZCS internal switch to verify the change in signals from the joystick.





PERFORMANCE		ZC1	ZCS
Maximum height above flange	mm	73.8	76
Maximum diameter	mm	26.1	23
Environmental sealing (IEC 60529)		IP65	IP66
Number of switches		1	1
Action		Momentary button	Momentary handle depress
Switch operating force	N	3	7
Maximum current	mA	200 @ 50Vdc	100 @ 30Vdc
Expected electrical life	operations	1 million	500,000

ZC1 or ZCS ELECTRICAL CONNECTIONS

Switch connections terminate on the Hirose DF3 series connector. Actual pin allocation depends on the joystick track type and gate selection.

See page 5 for Analog Output version connections.

See page 7 for Switched Output version connections.

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