

- **Extremely robust design for arduous applications**
- **Integrated sealed connectors**
- **Center detent for enhanced return-to-center performance**
- **Under panel depth has been minimized to 83mm**
- **Pivot-point position minimizes grip cable flex**
- **Rated for 5 million cycles**
- **Hall-effect sensor technology**
- **CAN output options – J1939 and CANopen**
- **Dual Analogue outputs with sense options**
- **Electronics sealed to IP66 and IP69k**
- **Can be supplied as ‘base-only’ for custom grip fitting**
- **Multiple generic grip options with additional axes of control**



The JC8100 offers high mechanical strength for very heavy-duty applications and features a center detent that provides guaranteed return-to-center, as well as a positive feel to the operator, throughout 5 million cycles.

While maintaining an overall minimum under-panel depth of the joystick body, the shaft pivot-point position has been designed to be as low as possible so as to ensure a high strength capability in the small body space envelope. This reduction in angular deflection reduces wear on base-to-grip wiring, so enhancing overall reliability.

Hall-effect sensing eliminates contact wear and provides safety functionality via dual analogue outputs per axis or CAN. Electronic robustness is assured with sealing of the internal PCB to a rating of IP66 and IP69k.

Simplified connector detailing through the use of industry standard sealed connectors to ensure product integrity over the product lifetime.

A choice of multi-function grips are available, including grips with up to 4 axis of additional proportional control, plus the option of ‘base-only’ enabling custom grips to be fitted.



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CONFIGURATION & ORDERING CODES

The ordering configuration is made up of the product name, followed by a multi digit code. The code is generated by the configuration required for each aspect of the joystick.

JC8100-XX-X-XX-X-X-XXXX-X-XXXX-X-X-X-X

Type	Axes	Outputs	Output Sense	Operation	Spring	Features	Gate	Grip	Rocker Output	Rocker Profile	Boot	Termination
JC8100	XX	X	XX	X	X	XXXX	X	XXXX	X	X	X	X
	XY	M	PP	S	M	0000	S	NH00	E	S	F	A
	NY	L	PN				1	NHA0	N	V	N	B
	XN	K	NP					NHFL	Q	X		
		O	33					NHAF	R			
		P	34					AXXX	X			
		V	35					MGXX				
		C	36					HKNO				
								HE00				
								H100				

AXES

JC8100-~~XX~~-X-XX-X-X-XXXX-X-XXXX-X-X-X-X

Code	Description
XY	Dual
NY	Single axis movement in the Forward/Backward direction
XN	Single axis movement in the Left/Right direction

OUTPUTS

JC8100-XX-~~X~~-XX-X-X-XXXX-X-XXXX-X-X-X-X

Code	Supply Voltage	Min Output	Center Output	Max Output
M	5V Regulated ⁽¹⁾	10%Vs	50%Vs	90%Vs
L	5V Regulated ⁽¹⁾	20%Vs	50%Vs	80%Vs
K	5V Regulated ⁽¹⁾	25%Vs	50%Vs	75%Vs
O	8-54V	1.25V	2.50V	3.75V
P	8-54V	1.00V	2.50V	4.00V
V	8-54V	0.50V	2.50V	4.50V
C (CANBUS J1939)	9-32V	1000 counts	0 counts	1000 counts

NOTES

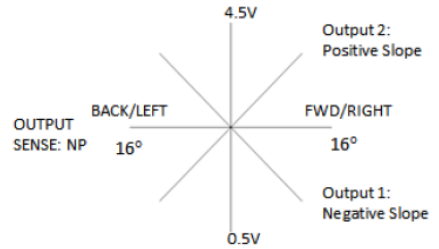
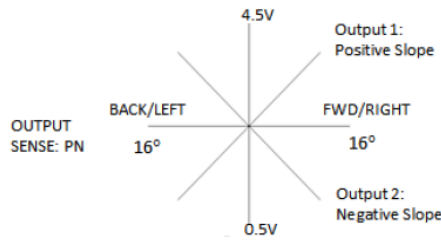
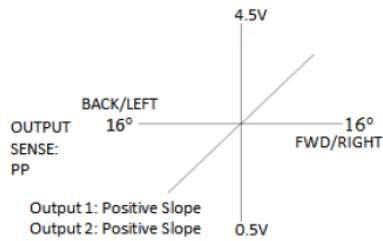
(1) 5V Regulated equates to 4.5–5.5V.



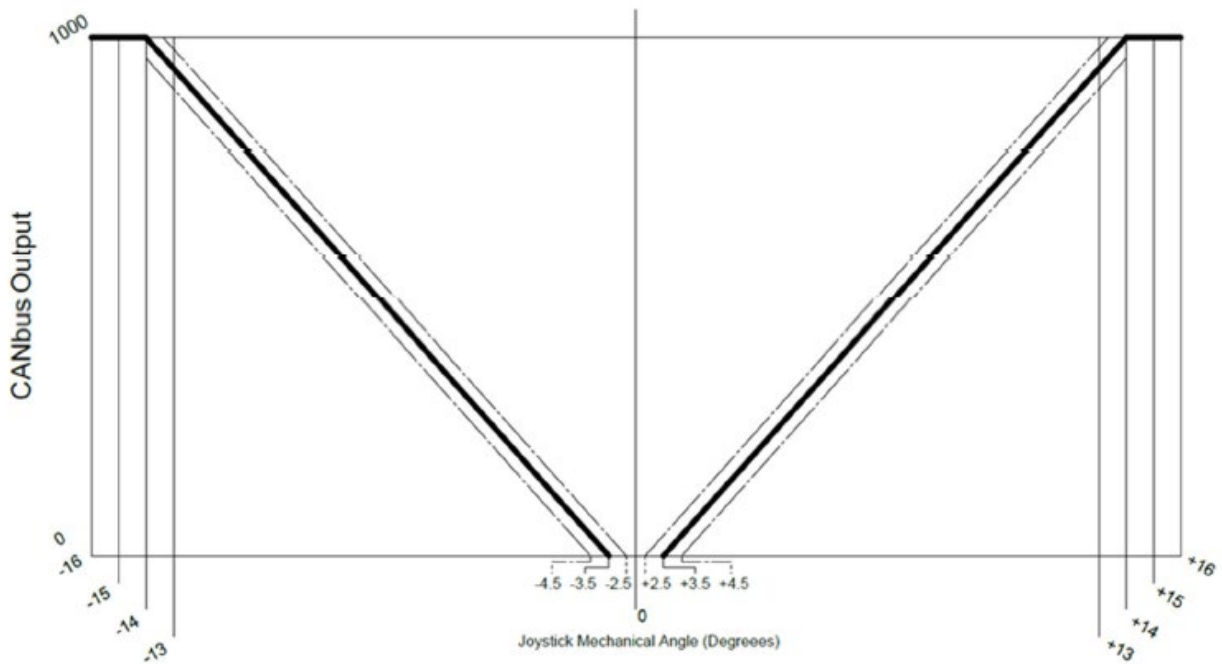
OUTPUT SENSE

JC8100-XX-X-XX-X-X-XXXX-X-XXXX-X-X-X-X

CODE	DESCRIPTION	
PP	Output 1: Positive Slope Output 2: Positive Slope	
PN	Output 1: Positive Slope Output 2: Negative Slope	
NP	Output 1: Negative Slope Output 2: Positive Slope	
33	CAN output: 51	Source Address = 0x 33
34	CAN output: 52	Source Address = 0x 34
35	CAN output: 53	Source Address = 0x 35
36	CAN output: 54	Source Address = 0x 36



CAN Output Profile





OPERATION

JC8100-XX-X-XX-X-X-XXXX-X-XXXX-X-X-X-X

Code	Description
S	Spring return-to-center

SPRING

JC8100-XX-X-XX-X-X-XXXX-X-XXXX-X-X-X-X

Code	Description
M	Standard

FEATURES

JC8100-XX-X-XX-X-X-XXXX-X-XXXX-X-X-X-X

Code	Description
0000	No mechanical features

GATE

JC8100-XX-X-XX-X-X-XXXX-X-XXXX-X-X-X-X

Code	Description
S	Square
1	Single axis



GRIP

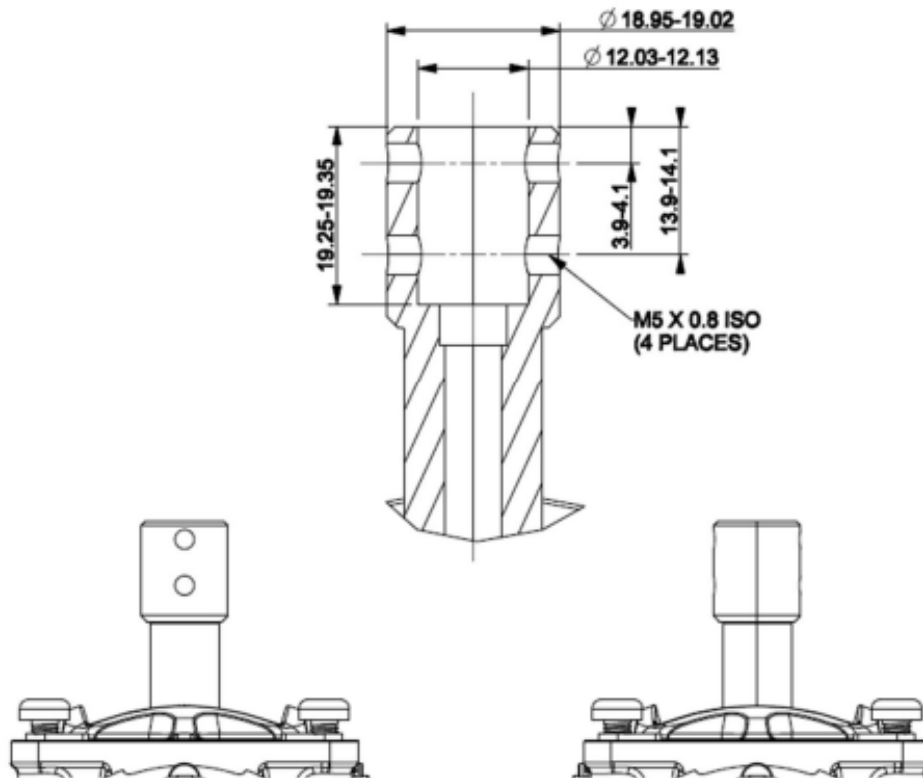
JC8100-XX-X-XX-X-X-XXXX-X-~~XXXX~~-X-X-X-X

Code	Description
NH00	No grip
NHA0	No grip, extended operating rod
NHFL	No grip, 13x flying leads (cable type 30AWG – 19/0.06, PTFE, Uni-Lay)
NHAF	No grip, extended operating rod, 13x flying leads (cable type 30AWG – 19/0.06, PTFE, Uni-Lay)
AXXX	AMF grip ⁽¹⁾
MGXX	MG grip ⁽¹⁾
HKN0	HKN grip ⁽¹⁾
HE00	HE grip ⁽¹⁾
HI00	HI grip ⁽¹⁾

NOTES

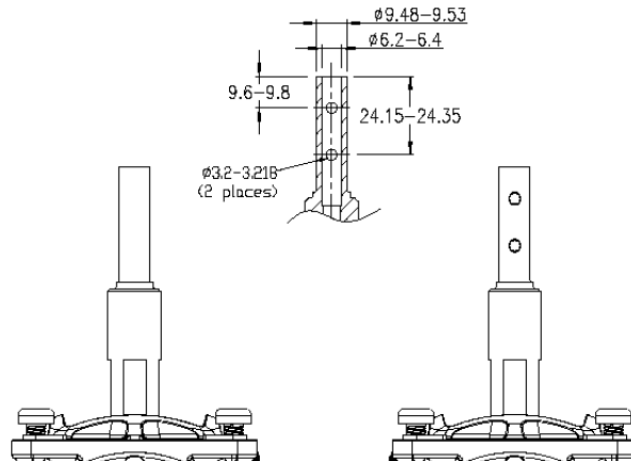
(1) Refer to the relevant grip specification for configuration details.
The overall performance of the joystick may be limited by the grip chosen (refer to grip specification).
It is the responsibility of the customer when fitting the grip to ensure wires are correctly terminated (flying lead version only).

NH00

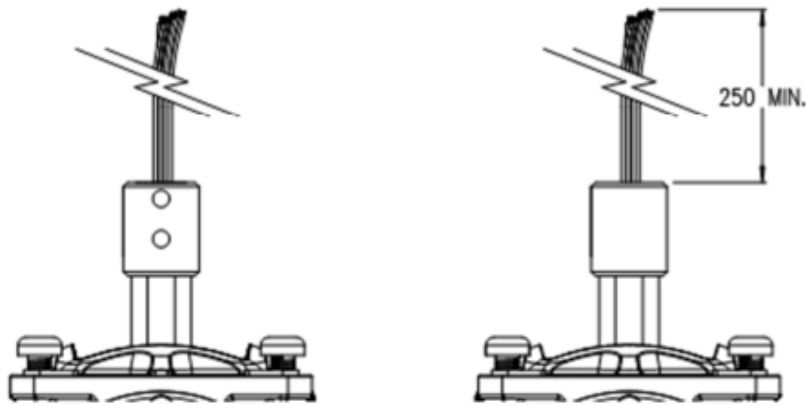




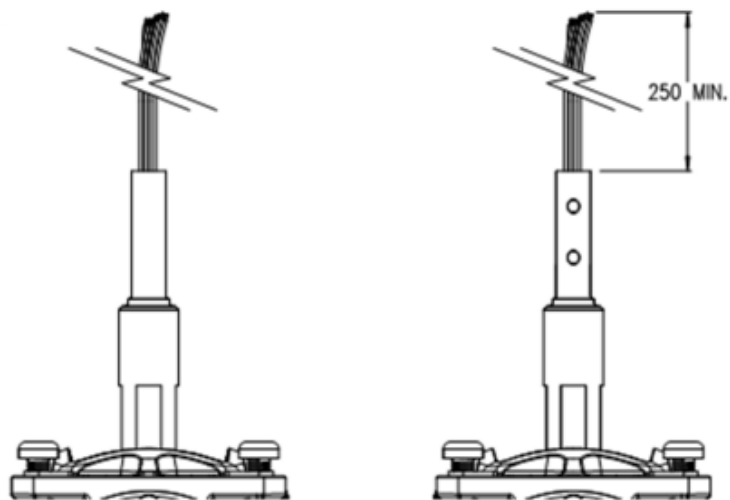
NHA0



NHFL



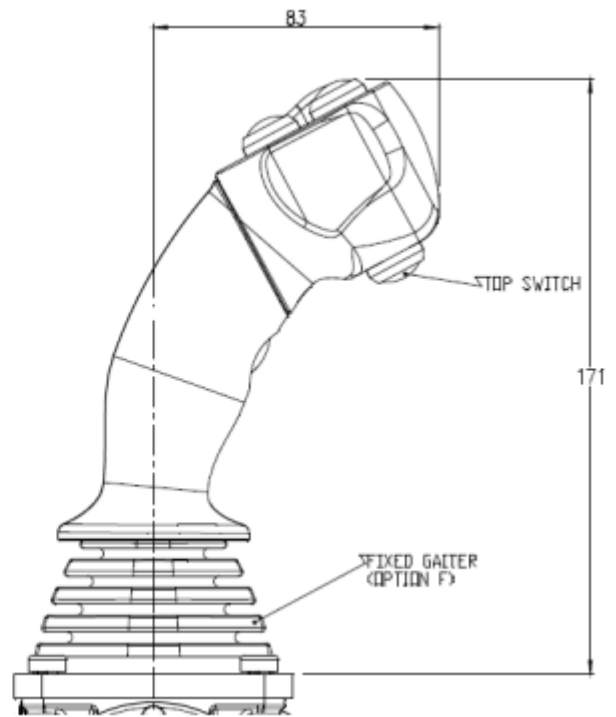
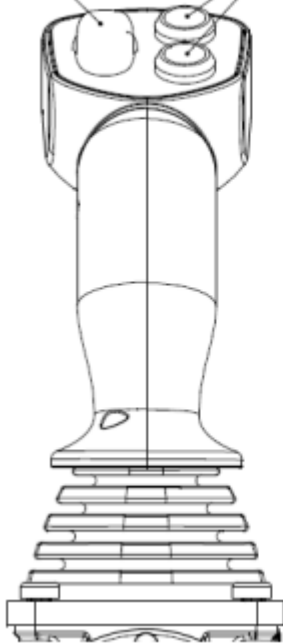
NHAF





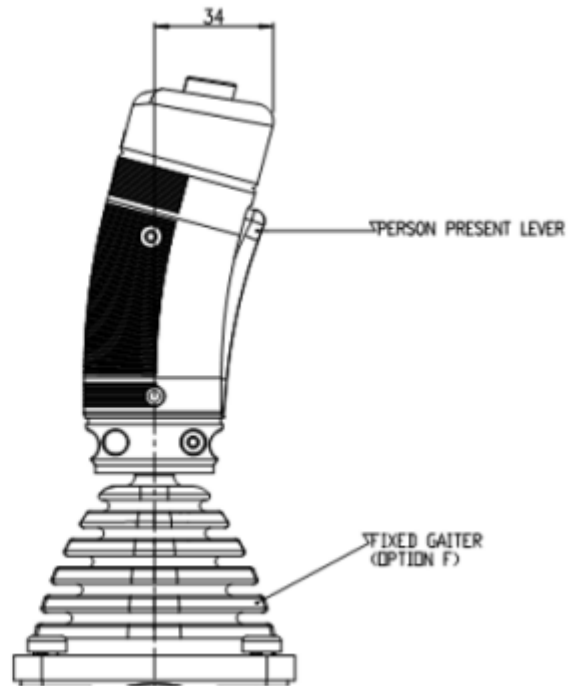
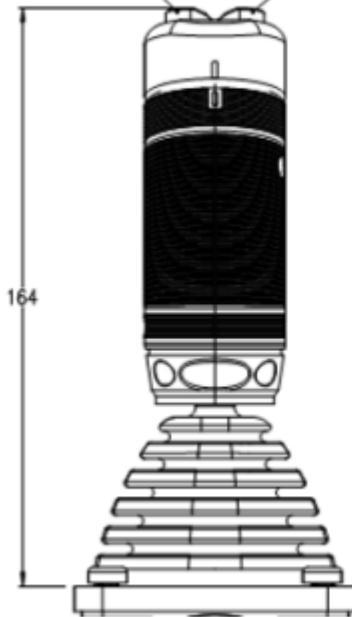
AXXX

ROCKER SWITCH MOMENTARY SWITCH



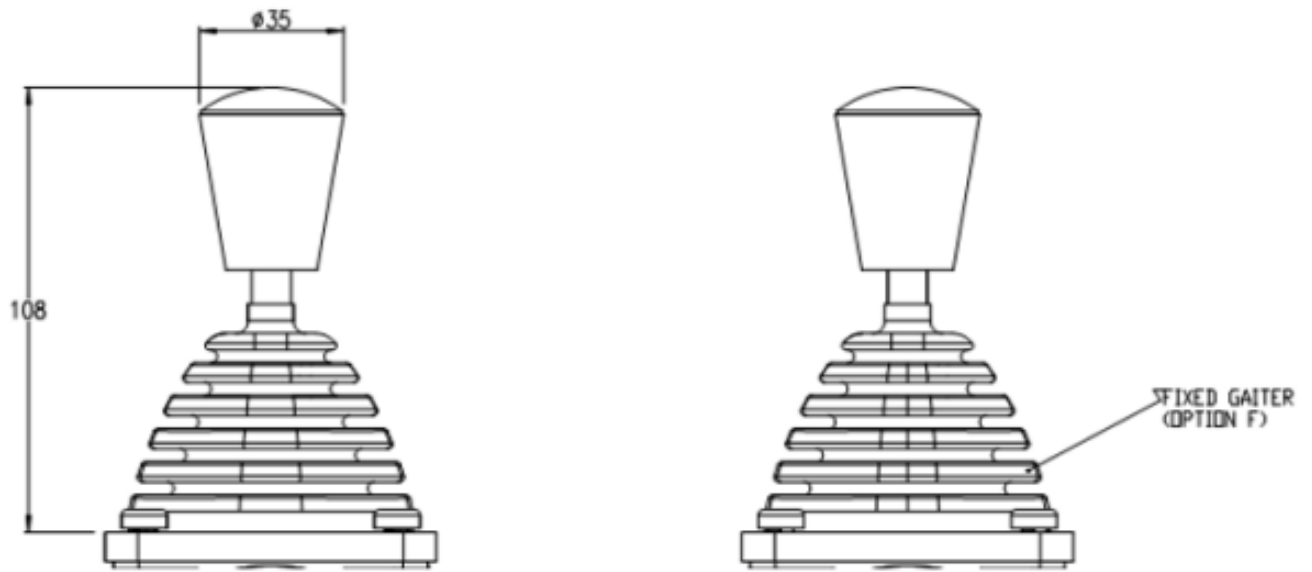
MGXX

SWITCH 1 SWITCH 2

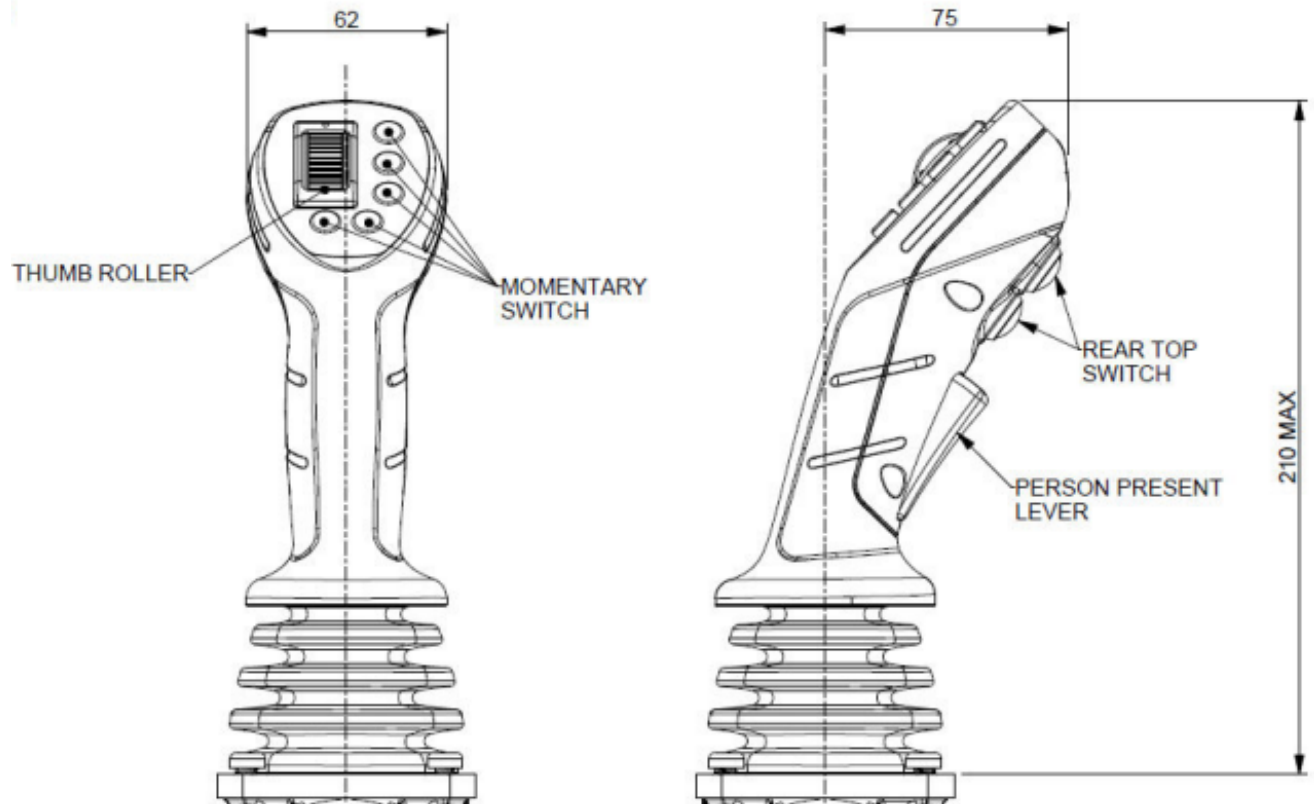




HKNO

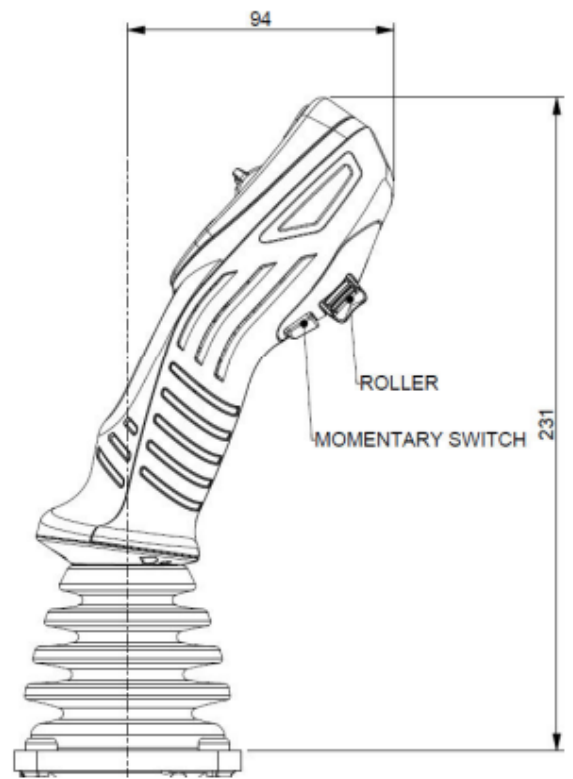
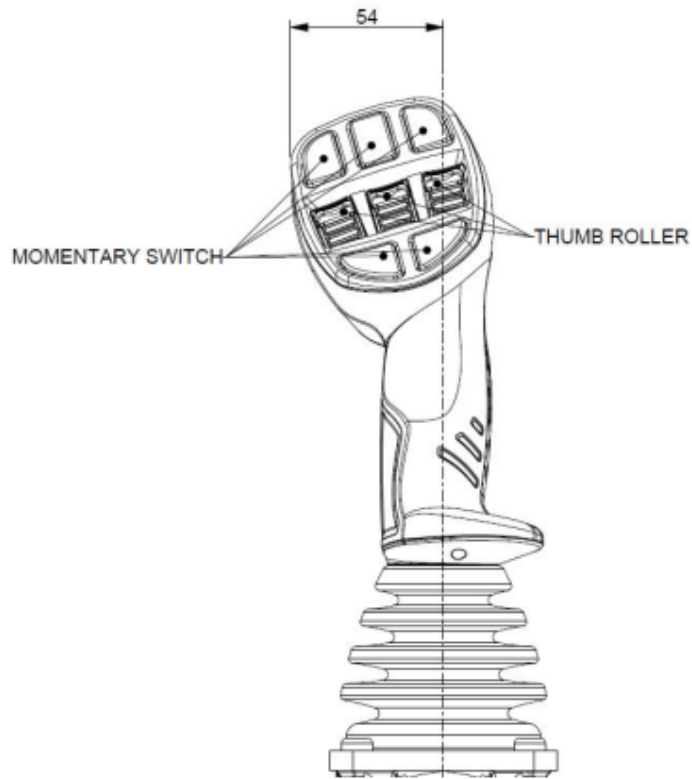


HE00





H100





ROCKER OUTPUT

JC8100-XX-X-XX-X-X-XXXX-X-XXXX-~~X~~-X-X-X

Code	Description
E ⁽²⁾	0–100% Output (4.0–6.0kΩ)
N ⁽²⁾	0–100% Output (1.4–2.2kΩ)
Q ⁽²⁾	25–75% Output (2.2–3.6kΩ)
R ⁽²⁾	10–90% Output (1.6–2.4kΩ)
X	No rocker fitted

NOTES

(2) AMF grip only.

ROCKER PROFILE

JC8100-XX-X-XX-X-X-XXXX-X-XXXX-X-~~X~~-X-X

Code	Description
S ⁽²⁾	Standard
V ⁽²⁾	V-profile
X	No rocker fitted

NOTES

(2) AMF grip only.

BOOT

JC8100-XX-X-XX-X-X-XXXX-X-XXXX-X-X-~~X~~-X

Code	Description
F	Fixed
N ⁽³⁾	No boot fitted

NOTES

(3) The 'N' option is only available with the NH00, NHAF, NHA0 and NHFL grip options

TERMINATION

JC8100-XX-X-XX-X-X-XXXX-X-XXXX-X-X-X-~~X~~

Code	Description	Mating Connector
A	AMPseal 23-way connector	770680-1 Plug assembly
B	Deutsch DT04-6M	DTM06-6S

NOTES

The joystick is fitted with gold plated pins so the mating connector must be fitted with gold plated contacts



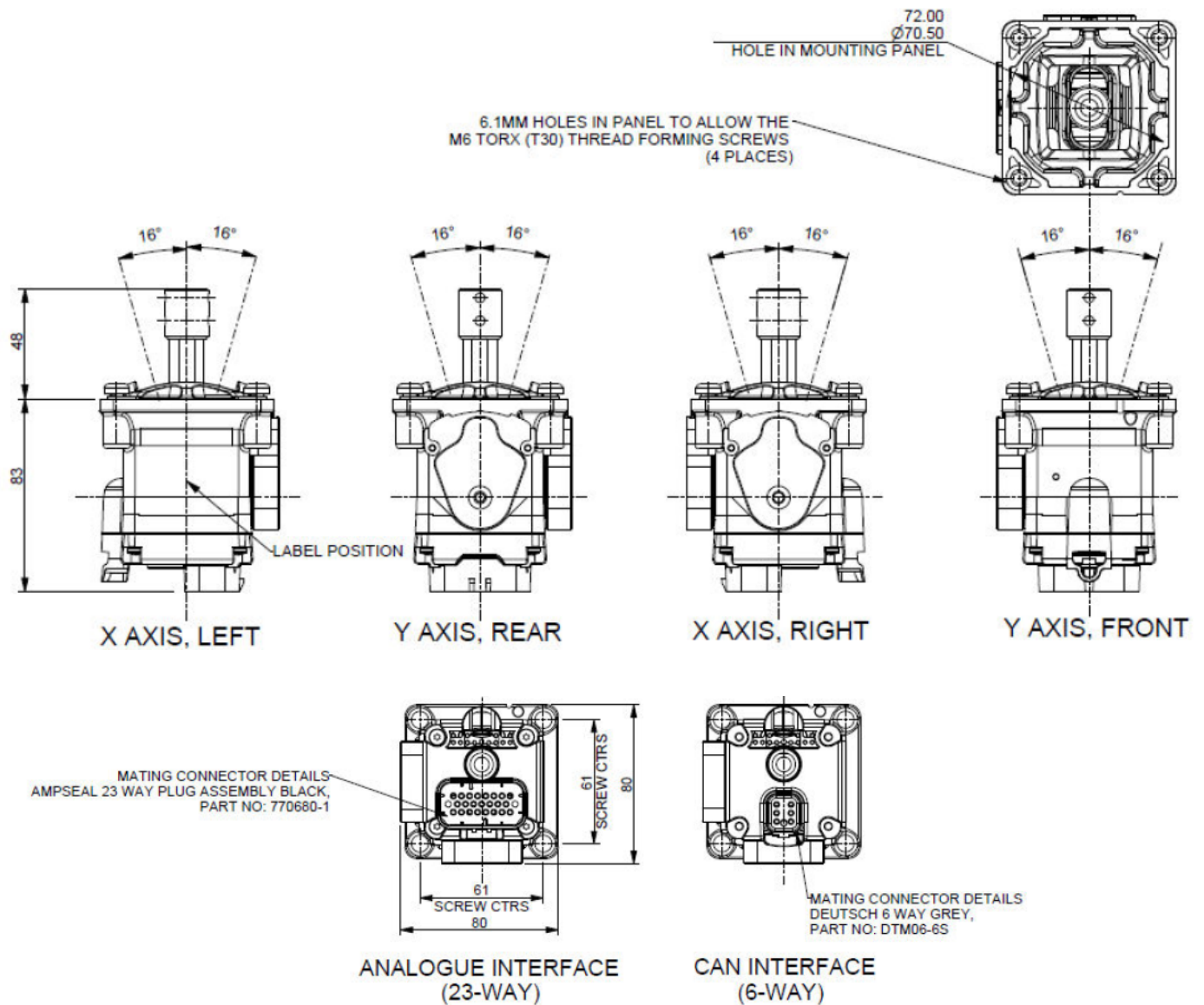
INSTALLATION

MECHANICAL

The joystick is designed to be fitted from below the mounting panel through a 72mm diameter hole. The effectiveness of the joystick flange sealing is dependent on the panel mounting surface being sufficiently rigid to compress the sealing boot. The surface finish of the mounting panel is critical to achieve an adequate seal and rough surface finishes, paint chips, deep scratches, etc. should be avoided.

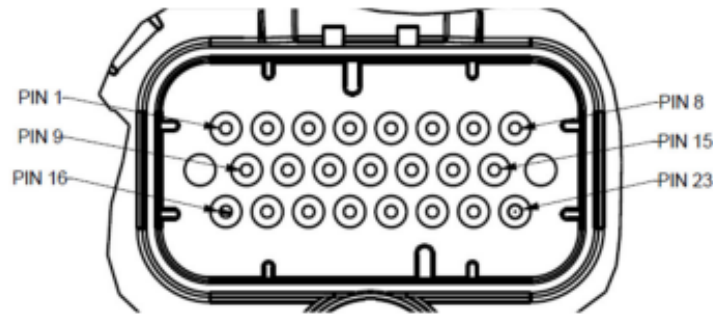
Panel thickness: 3.5–4.5mm

Screw torque (using supplied screws): 5Nm



ELECTRICAL CONNECTIONS

23-Way Analogue Joystick Connector



AMPseal 23-way

Pin	Function	Pin	Function
1	0V	13	X-axis Output 1
2	X-axis Output 2	14	Y-axis Output 1
3	Y-axis Output 2	15	See chosen grip specification
4	Center tap	16	See chosen grip specification
5	See chosen grip specification	17	8-54V supply to joystick
6	0V	18	See chosen grip specification
7	See chosen grip specification	19	See chosen grip specification
8	See chosen grip specification	20	See chosen grip specification
9	See chosen grip specification	21	See chosen grip specification
10	See chosen grip specification	22	See chosen grip specification
11	See chosen grip specification	23	Do not Connect – Curtiss-Wright programming pin
12	5V supply to joystick		

NOTES

The joystick is fitted with gold plated pins so the mating connector must be fitted with gold plated contacts

The maximum pull force allowed on the mating connector/wiring loom is 100N – damage may occur to the joystick or mating connector if a higher force is applied

Mating connector – 23-Way

The suggested mating connector is an AMPseal 770680-1 Plug assembly



Analogue Joystick Base-to-Grip Connections

23-way AMPseal to flying leads

Pin	Description	Pin	Description
1	n/a	13	n/a
2	n/a	14	n/a
3	n/a	15	Blue
4	n/a	16	Violet
5	Yellow	17	n/a
6	n/a	18	White/Violet
7	Blue/Orange	19	White/Yellow
8	Brown	20	Pink
9	White	21	Pink/Grey
10	White/Red	22	Green/Yellow
11	Black/Red	23	Do not Connect – Curtiss-Wright programming pin n/a
12	n/a		

NOTES

Cable type 30AWG – 19/0.06, PTFE, Uni-Lay



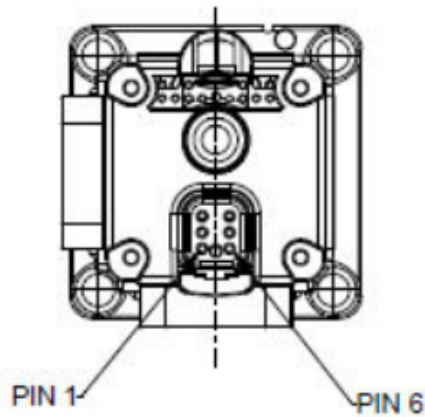
6-Way CAN Joystick Connector

Deutsch DTM04-6P 6-way

Pin	Function
1	Ground
2	Power
3	CAN high
4	CAN low
5	CAN shield
6	No connection

NOTES

The joystick is fitted with gold plated pins so the mating connector must be fitted with gold plated contacts



CAN Joystick Base-to-Grip Connections

CAN joystick with flying leads.

Color	Function	Color	Function
Blue	Digital input from grip	Pink/Grey	Ground 0V to grip
Yellow	Digital input from grip	White/Red	5V supply to grip
Brown	Digital input from grip	Pink	Analogue input from grip
Violet	Digital input from grip	White	Analogue input from grip
Blue/Orange	Digital input from grip	Green/Yellow	Analogue input from grip
White/Violet	Digital input from grip	White/Yellow	Analogue input from grip
Black/Red	Ground 0V to grip		

NOTES

Cable type 30AWG – 19/0.06, PTFE, Uni-Lay

The maximum pull force allowed on the mating connector/wiring loom is 100N – damage may occur to the joystick or mating connector if a higher force is applied

Mating connector – 6-Way

The suggested mating connector is a Deutsch DTM06-6S

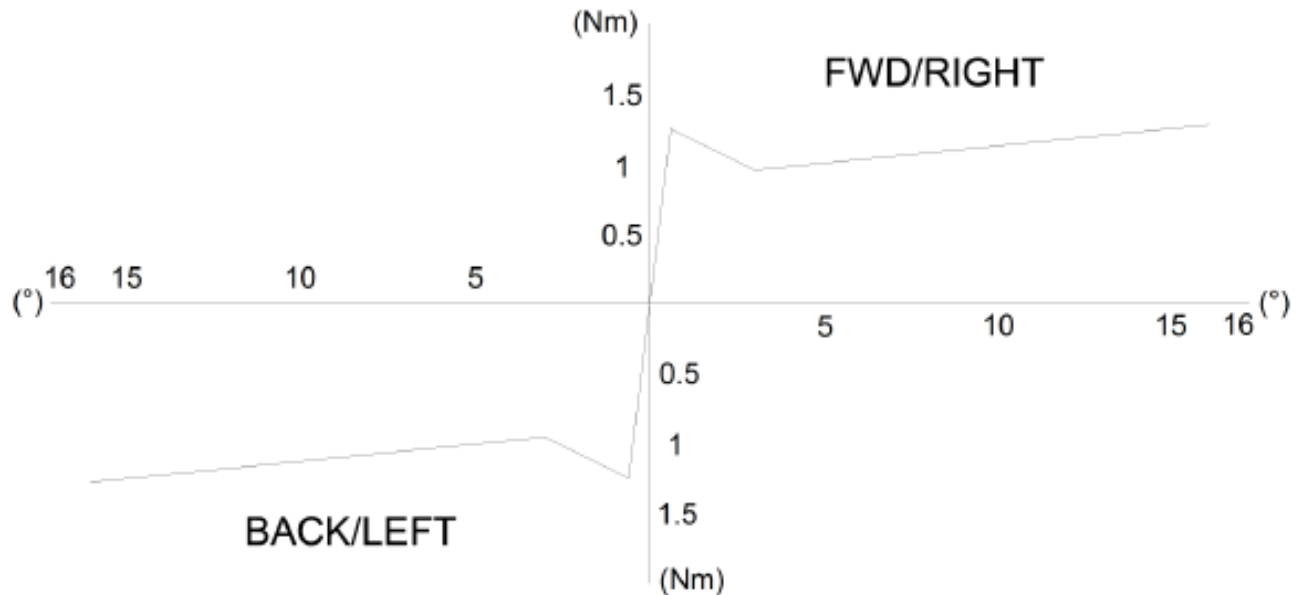


SPECIFICATIONS

MECHANICAL

OPERATING TORQUE⁽⁴⁾

BREAKOUT	1.3Nm
MAXIMUM	1.3Nm



LOADS⁽⁵⁾

HORIZONTAL	240Nm
VERTICAL	5000N
ROTATIONAL	50Nm

IMPACT

HORIZONTAL	20J (on operating rod)
VERTICAL	20J (on operating rod)

MISCELLANEOUS

LEVER MECHANICAL ANGLE	±16° in X- or Y-axes
EXPECTED LIFE	5,000,000 cycles ^(6 and 7) (20,000,000 operations) ⁽⁸⁾
MASS	0.9kg (without grip fitted)

NOTES

(4) The operating torque values are measured on-axis.

(5) Loads are based on NH00 and NHFL grip options. The strength of other grip options will be limited by the grip/adaptor fitted to the joystick. NHA0 and NHAF are limited to 25Nm horizontal static loading

(6) 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. Joystick is cycled at a speed of 2Hz at an ambient temperature of 25°C.

(7) The 5 million operations apply to the mechanical and electrical life of the joystick. Boot life will depend on the type of use, operating speed and frequency that the joystick is operated at the extremes of travel

(8) One operation is defined as one movement (e.g. from center to the end of travel).

**ELECTRICAL**

SUPPLY VOLTAGE - ANALOGUE	5V \pm 10%
SUPPLY REVERSE POLARITY PROTECTION – 5V SUPPLY	-7Vdc
SUPPLY VOLTAGE - ANALOGUE	8 to 54V
SUPPLY REVERSE POLARITY PROTECTION – 8 TO 54V SUPPLY	-56Vdc
SUPPLY VOLTAGE – CAN	9 to 32V
SUPPLY REVERSE POLARITY PROTECTION - CAN	-36Vdc
OVERVOLTAGE - CAN	Supply line +60Vdc
CAN H AND L MAXIMUM VOLTAGE RATING	\pm 58Vdc
SHORT CIRCUIT PROTECTION - CAN	12Vd.c. power supply
MAXIMUM SUPPLY CURRENT	<30mA
RESOLUTION	12-bits (4096)
OUTPUT - ANALOGUE	Two outputs per axis
OUTPUT VOLTAGE RANGE (M)	10-90% of 5V supply
OUTPUT VOLTAGE RANGE (L)	20-80% of 5V supply
OUTPUT VOLTAGE RANGE (K)	25-75% of 5V supply
OUTPUT VOLTAGE RANGE (O)	1.25V – 3.75V with 8 to 54V supply
OUTPUT VOLTAGE RANGE (P)	1.00V – 4.00V with 8 to 54V supply
OUTPUT VOLTAGE RANGE (V)	0.50V – 4.50V with 8 to 54V supply
CENTER ACCURACY	\pm 4% supplied \pm 5.5% after life (including temperature effects)
END ACCURACY	+2.8%/-4.5% of upper voltage +4.5%/-2.8% of lower voltage
LINEARITY ACCURACY	\pm 2.8%
MATCHING ACCURACY	\pm 4%
OUTPUT IMPEDANCE	100 Ω (nominal)
CENTER REFERENCE OUTPUT	50% \pm 0.7% of Vsupply
CENTER REF. OUTPUT IMPEDANCE	1100 Ω
OUTPUT - CAN	J1939
POWER-ON SETTLEMENT TIME	Up to 15ms
INSULATION RESISTANCE @ 10VDC	>10M Ω
CLAMPING	During the programming of the joystick the output at the ends of travel correspond to the nominal. The outputs are clamped and therefore the output range will not exceed the range by \pm 2.8% (i.e. 7.2% - 92.8% of the supply voltage for the 10 to 90% span)

NOTES

Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolutely maximum rated conditions for extended periods may affect product reliability.

CAN DATA

CAN PROTOCOL	J1939
BAUD RATE	250 kbps
SAMPLING TIME	20mS



ENVIRONMENTAL

SEALING ⁽⁹⁾ – ABOVE PANEL	EN 60529 DIN 40 050 (Part 9)	IP6X / IPX7 / IPX9K - dependent on grip
SEALING – ELECTRONICS	EN 60529	IP67
DRY HEAT	EN 60068-2-2	+85°C
COLD	EN 60068-2-1	-50°C
OPERATING TEMPERATURE (CYCLING)	EN 60068-2-14	-40°C to +85°C
TEMPERATURE & HUMIDITY - ANALOGUE	EN 60068-2-38	Pt2.1 Z/AD, 65°C @95%RH /-10°C (10 cycles)
TEMPERATURE & HUMIDITY - CAN	EN 60068-2-78	85°C @75%RH/37.8°C @95%RH/-40°C (10 cycles)
SALT MIST	EN 60068-2-11	Severity 2 (96 hours)
SINUSOIDAL VIBRATION	EN 60068-2-6	10-200Hz; 3gn; 1hr per axis
RANDOM VIBRATION	EN 60068-2-64	10-200Hz; 3.6gn; 2hr per axis
SHOCK (BUMP)	EN 60068-2-27	50gn; 6mS ½ sine; 3 in each of 6 directions
RADIATED EMISSIONS	CISPR: 3 rd edition 2008 and corrigendum 1 2008	Test limits: EN 55016-2-3: 201 +A1: 2010 +A2; 2014
CONDUCTED DISTURBANCE IMMUNITY	ISO 11452-4: 2011	Test level 100mA 1KHz sine 80% 1MHz – 400MHz
RADIATED FIELD IMMUNITY (ABSORBER-LINED SHIELDED ENCLOSURE (ALSE))	ISO11452-2: 2005	Test levels: 100V/m CW/PM/AM 1KHz sine 80% 400MHz-1000MHz 100V/m CW/PM 1000MHz-2000MHz
ESD	EN 60605: 2008	Levels (maximum): Network 330pf / 330R Contact discharge ±8Kv, 330pf, 2KΩ (powered and unpowered) Air discharge ±15Kv, 330pf, 2KΩ (powered and unpowered)
CONDUCTED DISTURBANCE IMMUNITY	ISO 7627-2: 2004 / ISO 7637-2: 2011	12V test: Pulses: 1, 2a, 2b, 3a, 3b, 4 to 12V Standard; 5a (unclamped) to Vs +65V: 5b (clamped) to Vs +37V 24V test: Pulses: 1, 2a, 2b, 3a, 3b, 4 to 24V Standard; 5a (unclamped) to Vs +123V: 5b (clamped) to Vs +65V
POWER FREQUENCY IMMUNITY	EN 6100-4-8: 2010	30A/m 50Hz/60Hz

NOTES

(9) The overall sealing performance of the joystick is limited by the grip/boot fitted to the joystick.



LABELLING

Label to contain.

P&G CONTROLS LTD. UK	
SPECIFICATION TYPE	JC8100-GEN-XXXX
BATCH NO.:	XXXXXXX
ISSUE STATUS	X
REFERENCE	XXXXMMYYYY

IMPORTANT INFORMATION

In the event of the boot rupturing or being removed, it is recommended that immediate replacement of the boot is carried out to minimize the effects of particle and water ingress from the surrounding environment.

Whilst Curtiss-Wright Industrial Division - 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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