XP series

Mid-size flexible proportional joystick • non-contacting Hall effect technology

DISTINCTIVE FEATURES

One or two axis
Dual and dual inverse analogue and PWM outputs
CAN J1939 & CANopen
All metal mechanism construction

ENVIRONMENTAL SPECIFICATIONS

- Operating Temperature: -30 °C to +70 °C (-22 °F to 158 °F)
- Storage Temperature: -40 °C to +85 °C (-40 °F to 185 °F)
- Sealing: IP67 (above panel subject to handle and final specification)
- EMC Immunity Level: EN61000-4-3 (exceeds)
- EMC Emissions Level: EN61000-6-3:2001, CPSPR 32:2015, Class B 30 MHz-1GHz
- ESD: EN61000-4-2 (exceeds)

ELECTRICAL SPECIFICATIONS

- Analog output Voltage Range: ±10% x V to ±50% x V
- Output at Center: V/2 ±(5% x gain)
- Power Supply: 5 V ±0.5 V transient free; 3.3 V ±0.1 V
- Output impedance: 10 Ω
- Overvoltage max: +20 V

MECHANICAL SPECIFICATIONS

- Break out force: 3-5 N (subject to handle)
- Operating Force: up to 12 N (subject to handle
- Maximum Load: 400 N (90 lbf) (subject to handle)
- Mechanical Angle of Movement: +/- 17.5° X & Y axis (subject to limiter)
- Expected Mechanical Life: 10 million lifecycles
- Mass/weight: 500 g (17.64 oz) nominal
- Lever Action (centering): Spring

The company reserves the right to change specifications without notice.

*Non CAN options only

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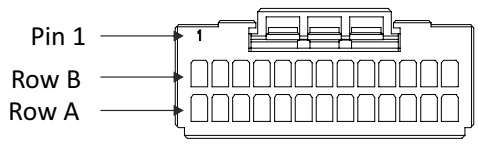
CONNECTIONS

The analogue and PWM joysticks are fitted as standard with 180mm(+/- 20mm) harnesses. Terminated to a 26 way housing TE 1-1827863-3.
Non standard connectors can be fitted upon request.

WIRING TABLE		
TE CONNECTIVITY 1-1827863-3 PINOUT		
PIN	COLOUR	FUNCTION
A1	RED	+VA
B1	BLACK	0VA
A2	RED	+VB
B2	BLACK	0VB
A3	BLUE	X Axis A
B3	YELLOW	Y Axis A
A4	BROWN	X Axis B
B4	WHITE	Y Axis B
A5	GREEN	Z Axis A
B5	ORANGE	Z Axis B
A6	GREEN	Centre Tap
B6	ORANGE	Centre Detect
A7	ORANGE	Switch Common
B7	BLUE	Front Switch
A8	RED	Enable Switch Common
B8	RED	Enable Switch Normally Open
A9	RED	Enable Switch Normally Closed
B9	GREEN	Handle Function 1
A10	BLUE	Handle Function 2
B10	ORANGE	Handle Function 3
A11	GREEN	Handle Function 4
B11	BLUE	Handle Function 5
A12		
B12		
A13		
B13		

CONNECTOR DETAIL
26 way housing TE 1-1827863-3



WIRE SIDE

MATERIALS

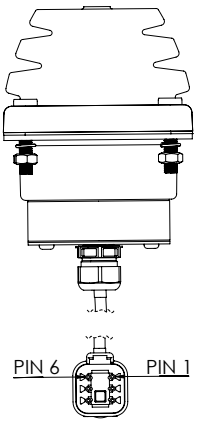
- Shaft: Stainless steel
- Boot: Neoprene
- Body: Zinc
- Handles:
  AR & AQ - Aluminum
  UR: Reinforced Nylon

TERMINATION (CAN OUTPUTS ONLY)

- The XP series CAN options are supplied with 200mm harness terminated with an industrial connector.
- Corrector detail: DT04-6P (Fig 1)

Fig. 1

Deutsch DT04-6P



PIN	Connection	Color
1	CAN LO	White
2	CAN HI	Green
3	ID LSB	Blue
4	ID MSB	Yellow
5	0V	Black
6	+12V	Red

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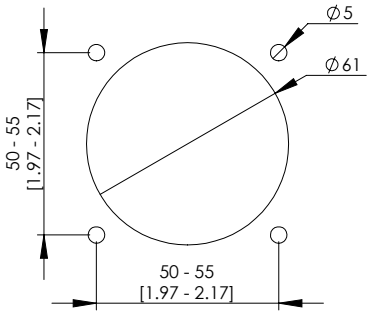
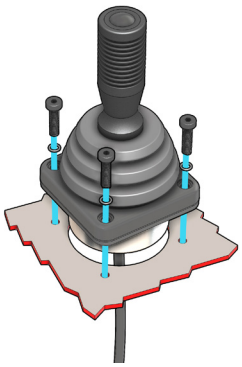
MOUNTING)

When mounting the joystick, consideration should be given to the position so that unnecessary risk of damage is minimised. If the joystick is intended for use in a mobile enclosure then care must be taken to protect the joystick from damage caused by dropping. Basic precautions such as mounting it at the lightest end of the enclosure so it doesn't hit the ground first or by protecting it with a guard should always be implemented for long term reliability. The body of the joystick, on the underside of the panel, must not be subject to water spray, excessive humidity or dust. Some handles may be larger than some panel cut-outs. This may restrict the choice of mounting and bezel options. Please refer to APEM for assistance.

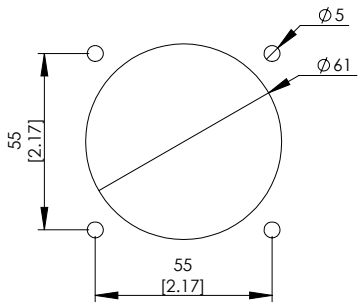
DROP-IN MOUNT CUT-OUT AND INSTALLATION
BEZEL OPTION 1

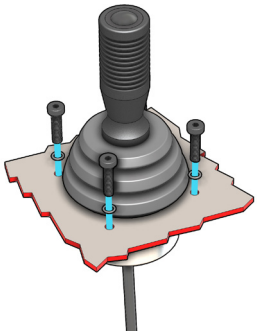




- The joystick is dropped into the panel cut-out.
- Supplied with M5 low profile cap head bolts, spring washers and nuts. Must be torqued to 0.7 Nm
- When mounted this way the gaiter forms part of the panel seal however an addition seal is provided to ensure good bezel to panel contact.

OPTION A SUB-MOUNT CUT-OUT AND INSTALLATION
BEZEL OPTION 0





- When mounted this way the panel acts as the bezel and no separate bezel is needed.
- M5 machined screws are recommended.
- When mounted this way the upper part of the gaiter forms part of the panel seal however an addition seal is provided to ensure good bezel to panel contact.

NOTES:
1. Dimensions are in mm/(inch).
2. The dimensions shown are for XP AR handle. For specific dimensions of this or any other configuration please refer to APEM.
3. When sub panel mounting, great care should be taken not to damage the boot, or any of the mechanism under the boot.

All panel cut-outs should be free from sharp edges and debris that may damage the boot.

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BUILD YOUR PART NUMBER

JOYSTICK BASE

XP — SERIES

CONFIGURATION

01	Standard
02	3.3V Operation
03	Dual Outputs
04	Inverse Dual Outputs
05	PWM
06	CAN
07	CANopen
08	CANopen **LSS**
09	PWM dual inverse
10	PWM dual

GAIN

10	±10%xV
25	±25%xV
30	±30%xV
40	±40%xV
50	±50%xV

LIMITER

A	Single Axis NS
B	Single Axis EW
C	Cross
R	Round
S	Square

SPRING FUNCTION

01	Standard sprung to center

BEZEL

0	Below
6	Drop square bezel

GUIDED FEEL

20	Guided feel

TERMINATION

01	Standard

HANDLE

AQ	Tall aluminium anodised
AR	Tall aluminium anodised with IA P/B
UR	Multifunction handle*
SM	Multifunction handle*

*Handle part number build up continues on the next page

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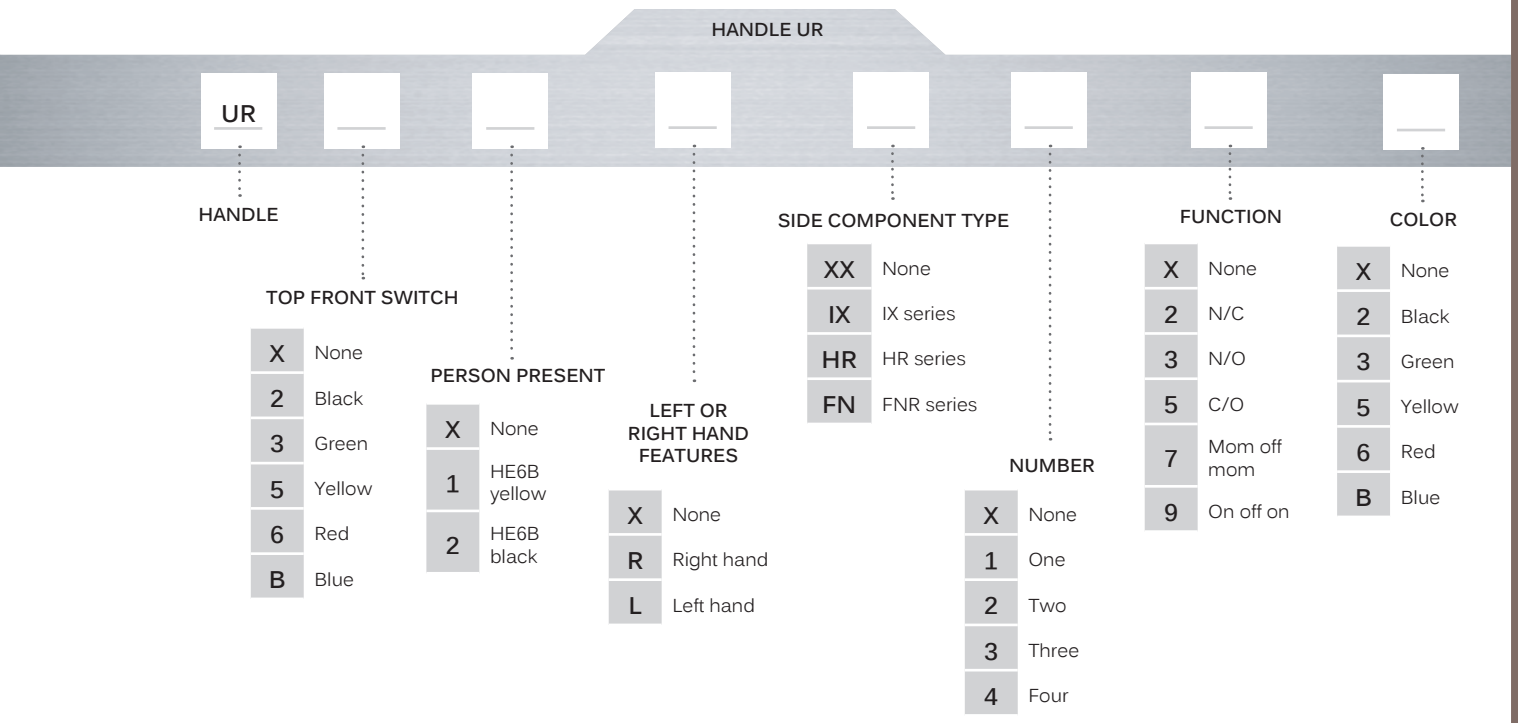
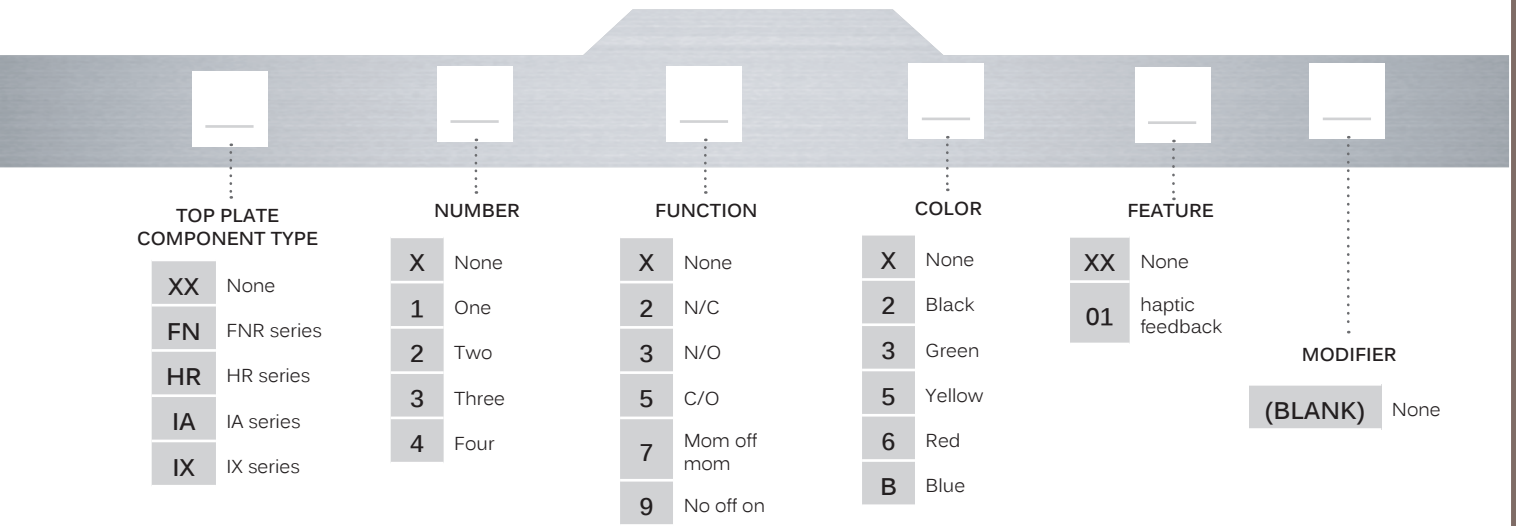
BUILD YOUR PART NUMBER (continued)





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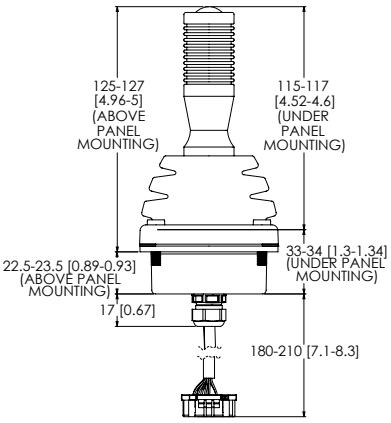
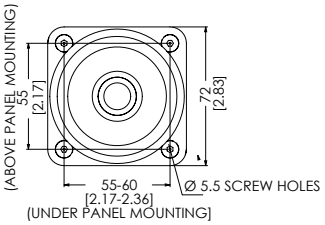
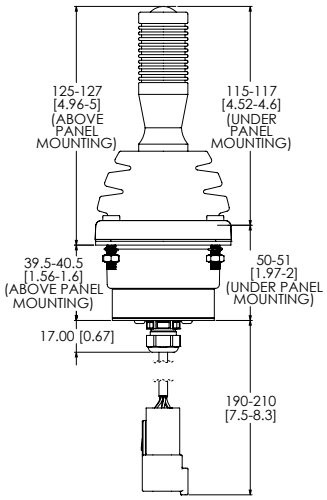
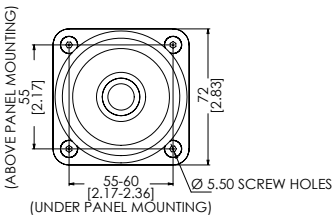
WITH HANDLE OPTION AR





WITH CAN CONFIGURATION





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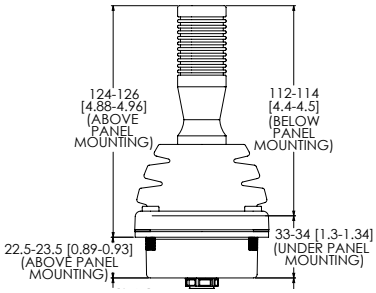
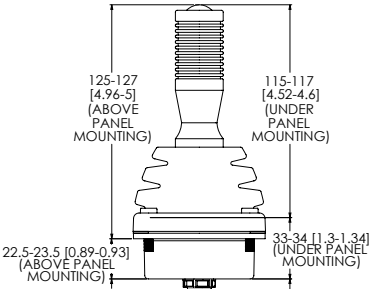
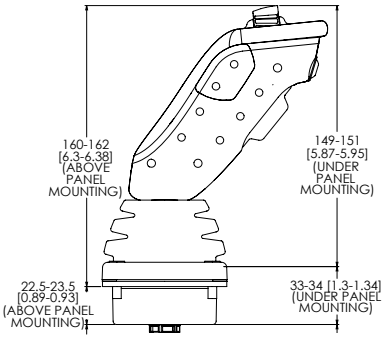
HANDLE OPTIONS







MATERIAL	Aluminum	Aluminum	Reinforced nylon
FINISH	Anodized	Anodized	Textured
STANDARD COLOR	Black	Black	Black
NOTES		**Uses APEM IA switch**	
IP66 (with option 8 bezel)	X	X	IP67

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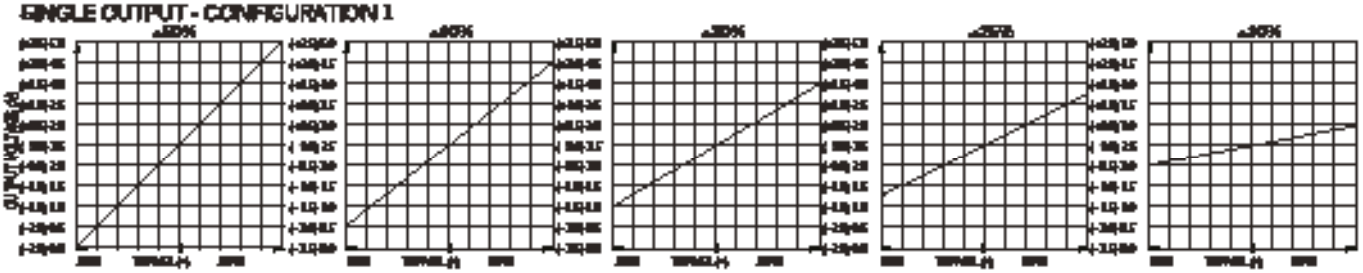
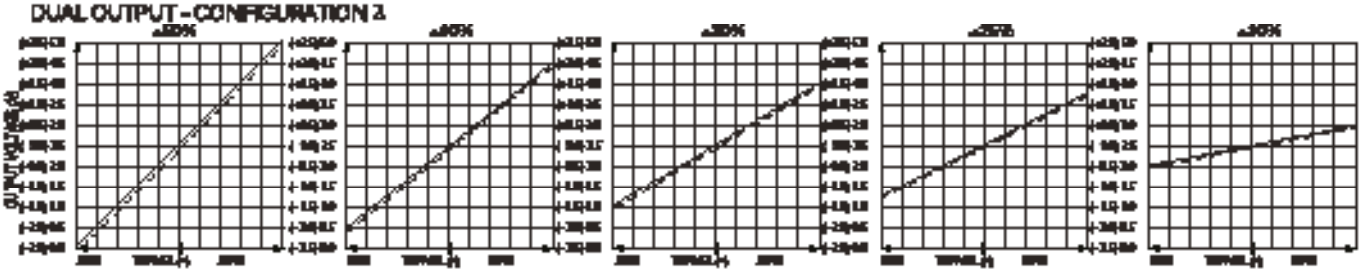
VOLTAGE OUTPUT OPTIONS

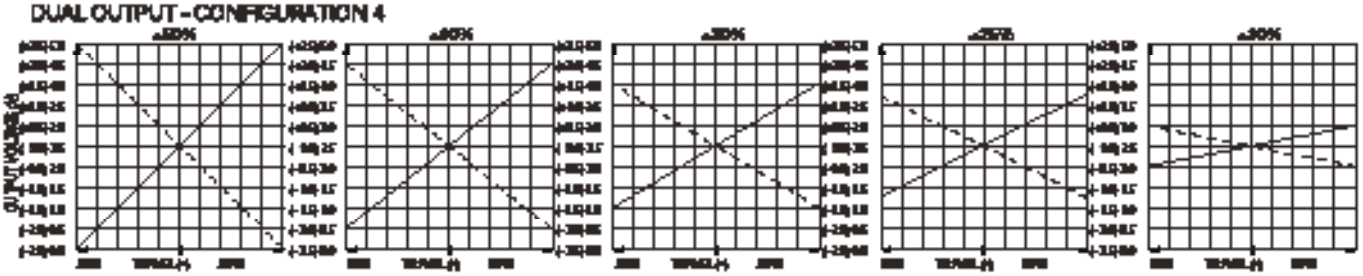
SINGLE OUTPUT - CONFIGURATION 1



DUAL OUTPUT - CONFIGURATION 3



DUAL OUTPUT - CONFIGURATION 4



Output 1

Output 2

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CAN J1939 INTERFACE SPECIFICATION

The XP Series CAN options data is delivered on a CAN 2.0B compliant physical interface. Two additional signals allow configuration of the controller Source Address.
Controller messages are delivered per the SAE J1939-71 message protocol.

CAN 2.0B INTERFACE PARAMETERS

- Baud rate: 250 kbps
- Transmission repetition rate: 50ms
- BJMI/EJMI interval time: 20ms
- Terminating resistor: No

CANOPEN INTERFACE SPECIFICATION

- Baud rate: 250 kbps
- Node ID: 20h
- Buttons: 1A0H (180H + NODE ID)
- Analog (axis) outputs: 2A0h (280h + Node ID)
- Heartbeat (500ms): 720h (700h + Node ID)
- Axis resolution: 8 bit
- Network Management: Auto start enabled

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CONFIGURATION

POWER SUPPLY

The analogue XP series is designed to be powered by a regulated 5 V ± 0.5 V power supply. The outputs are ratiometric, making a stable, noise free, power supply essential. The 3.3 V version of the XP series requires a power supply accurate to ± 0.1 V.

The outputs are not ratiometric, the voltage gain is set to 50 % as standard, giving an output range from 0 to 3.3 V regardless of supply voltage. The power supply to the joystick should be carefully regulated to be within tole¬rance. Should the power supply change outside of the specified tolerances, permanent damage may occur.

MAGNETIC IMMUNITY AND SYSTEM DESIGN

The XP series incorporates internal magnetic screening to minimise the effect of external magnetic fields. Mounting or operating the joystick close to strong magnetic fields is not recommended. System designers should follow best practice when incorporating the XP series joystick into their products.

Care should be taken to decouple the power supply properly and to employ adequate EMC shielding.

CENTER DETECT (CD)

Where selected, (configuration 1 types) the output on this additional cable will be 0V while the joystick is inactive. Should either the X or Y outputs change outside of the centre tolerance, indicating that the joystick has been operated, the centre detect signal will switch to 5 V.

Within the joystick this output is pulled high by a 2K2 resistor and is decoupled by a 100 nF capacitor to 0 V.

This output is designed for use in applications requiring an enable/disable signal that is separate from the main X , Y outputs. It is not recommended for use as a safety feature or a method of “person-present“ detection.

CENTER TAP REFERENCE (CT)

Where selected, (configurations 1, 3 and 4) the joystick also outputs a centre reference voltage that is set at 50% (±1%) of the supply voltage.

This output can be used to check the integrity of the power supply applied to the joystick. A reading on this output, outside of the specified tolerance suggests a problem with the power supply to the joystick.

The other purpose of this output is to act as a reference equal to the voltage output when the lever is at centre.

Measuring the voltage outputs relative to CT rather than 0 V eliminates inaccuracies created by variation in supply voltage.

GAIN OPTIONS

The voltage output on the HE outputs, at full scale deflection is determined by the gain. The gain is expressed as a percentage of the voltage supplied. Therefore (assuming a 5 V supply) a joystick specified with ±2 5 % gain would yield 1.25 V at South, 2.5 V at centre and 3.75 V at North.

A range of gain options are available as standard for configurations 1, 3 and 4.

All joysticks are supplied pre-set and no further calibration is needed throughout the lifetime of operation.

OUTPUT IMPEDANCE

The voltage outputs at centre and at each end of travel are specified across an infinite load, with no current flowing.

The output impedance specified in the electrical specification should be taken into account when designing a system. Load resistance of less than 10 K Ohms is not recommended.

MECHANISM

The omni-directional mechanism utilises an extremely robust ball-socket pivot. This construction yields an end product that is extremely resistant to vertical impact.

Furthermore, it constantly withstands high pull, push, rotational or horizontal forces that the product may be subject to, during life.

SPRINGING

All XP series are offered sprung to centre. The standard spring force requires 3 – 5N to off-centre the joystick.

GUIDED FEEL

The XP series is supplied as standard with guided feel. A joystick with guided feel moves more readily towards the poles (N, S, E and W) and whilst it can still move away from the poles, the force required to do so is greater. For non-guided feel please contract APEM for availability.

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CORRECTNESS PROCEDURE

New datasheet

This datasheet have been approved and can be officially released.

DATE AND SIGNATURE	DATE AND SIGNATURE
PRODUCT MANAGER	COMMUNICATION DEPARTMENT
DATE AND SIGNATURE	
QUALITY DEPARTMENT	

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