X50 Series – 50mm Optical Trackball, Panel Mount, Quadrature Output

1. DESCRIPTION

Utilizing the latest and most advanced infrared optical tracking technology, the X50 Series optical Trackerball™ is an extremely high specification, contact-less device, ideal for the most demanding of cursor control applications.
The optical tracking engine provides accurate cursor motion at all speeds and on virtually any ball, combining the benefits of solid-state sensing (no moving parts except the ball) with the aesthetics, functionality and performance associated with the Cursor Controls product range.
The design incorporates a removable top ring as standard to allow for easy cleaning, decontamination, sterilisation and maintenance - ensuring continued optimum performance and operation under the harshest of conditions.
The X50 series trackballs are available with a variety of electrical outputs, tracking force options, and sealing capabilities up to IP68.
The trackball has been designed to be back of panel mounted as part of OEM keyboards and consoles.

2. FEATURES

- Solid state sensing technology – infrared optical tracking engine (Generation II)
- Sealing up to IP68
- Outputs: TTL Quadrature
- Smooth operation in rugged environments
- Various top plate configurations
- Custom connector options available
- Various ball colours available

3. APPLICATIONS

- Medical systems
- Marine systems
- Custom keyboard applications
- Industrial consoles
- OEM custom solutions available

4. SPECIFICATIONS

4.1 MECHANICAL		
4.1.1	Weight	~150 grams
4.1.2	Ball size	Ø50.8mm (2")
4.1.3	Ball material	PROX resin
4.1.4	Tracking force options	20 grams nominal – damper ring (see section 8 for ordering code details)
		30-80 grams – PTFE seal (see section 8 for ordering code details)
4.1.5	Ball load	200N (20Kg) maximum downward pressure for 2 minutes @20°C
4.1.6	Resolvable ball speed	30 IPS (inches per second)
4.1.7	Mounting position	All angles
4.1.8	Tracking engine	Infrared optical navigation technology (Generation II) - solid state sensing
4.1.9	Housing material / colour	PC / ABS / Black
4.1.10	Sealing gasket	Cellular silicone (supplied)

4.2 ELECTRICAL		
4.2.1	Protocol	TTL Quadrature (Minimum of 4KHz sampling rate required)
4.2.2	Supply voltage	4.4V to 5.25V D.C.
4.2.3	Supply current	25mA typical, 30mA maximum
4.2.4	Resolution	1200 counts per ball revolution @ 1 IPS (inches per second) +/- 10%
4.2.5	Output connector	10 Way JST, right-angled header, part no. S10B-PH-SM4-TB (or equivalent)
4.2.6	Mating output connector	10 Way JST connector, part no. PH, CR or KR types (e.g. PHR-10)

4.3 ENVIRONMENTAL		
4.3.1	Operating temperature	0°C to +55°C (IEC 60068-2-1, IEC60068-2-2)
4.3.2	Storage temperature	-40°C to + 85 °C (IEC 60068-2-1, IEC60068-2-2)
4.3.3	Operating humidity	93% RH @ 40°C, non-condensing (IEC 60068-2-78)
4.3.4	Storage humidity	10%-95% non-condensing (IEC 60068-2-78)
4.3.5	Vibration	2g, 10-500Hz, 1 octave/min, 10 sweep cycles (IEC 60068-2-6)
4.3.6	Operating Shock	15g/11ms, ½ sine, 3 shocks in +ve and –ve direction, all 3 axes (IEC 60068-2-27)
4.3.7	Mechanical lifetime	1 million ball revolutions
4.3.8	MTBF	In excess of 250,000 hrs @ 25°C, Ground, Benign (MIL-HDBK-217F2)
4.3.9	ESD	15kV air-discharge and 8kV contact discharge (IEC 61000-4-2)
4.3.10	EMC	Radiated immunity - limits according to level 3 of IEC 61000-4-3 Radiated emissions to EN55022 class B
4.3.11	Sealing capability	IP68 (BS EN 60529)*

*When mounted in an IP68 enclosure

5. CONNECTION DETAILS

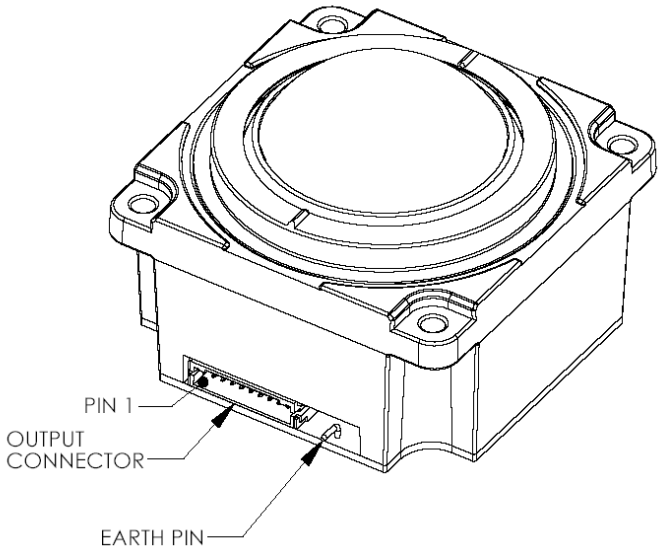
Connection is made to the X50 Series trackball by means of a single JST connector (or equivalent). Table 1 highlights the connection details. Custom connections are available (please contact your local sales office for further details).

5.1 Output Connector: P1

Description: 10 Way JST, right-angled header.
Manufacturer: JST (or equivalent)
Part No: S10B-PH-SM4-TB
Mating connector: PH, CR or KR types (e.g. PHR-10)

Pin Number	Quadrature
1	X1
2	X2
3	Y1
4	Y2
5	EARTH
6	EARTH
7	5V D.C
8	SEE NOTE 1
9	
10	0V

Table 1 Output connections



6. TRACKBALL CONFIGURATION

The X50 Series trackball provides features that may be selected using the DIP switch located on the printed circuit board. Table 2 details the assigned function of each switch.

6.1 DIP Switch Functions

DIP Switch	Function	OFF	ON
1	Orientation 1 Setting	See Figure.1	See Figure.1
2	Orientation 2 Setting	See Figure.1	See Figure.1
3	Not used	N/A	N/A
4	Tracking Resolution	*CPR = 1200	*CPR = 600
5	Not used	N/A	N/A
6	Factory Setting	Switch must be set in the OFF position	
7	Not used	N/A	N/A
8	Not used	N/A	N/A

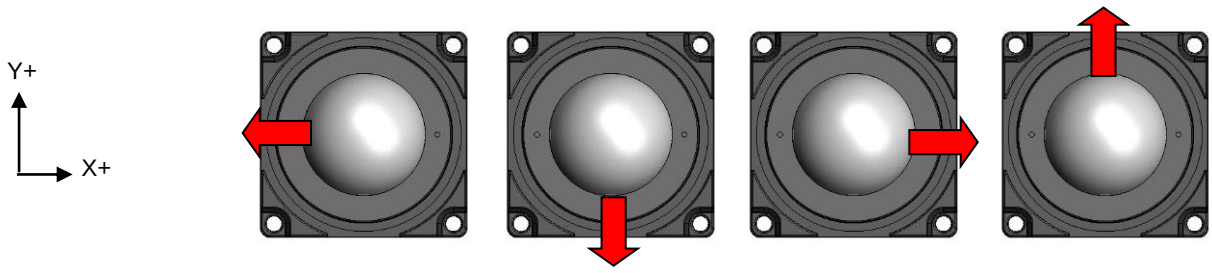
Table 2 DIP Switch Functions

***C**ounts **P**er Ball **R**evolution

Factory default setting: All DIP switches OFF

6.2 Orientation

The orientation function allows the user to mount the X50 Series trackball device in one of four positions (see figure. 1 below). The orientation of the device is determined by the direction in which the output connector is facing (when viewed from the top of Trackerball device). The direction of the output connector is denoted by the red arrow.
The track ball orientation can be selected to accommodate customer requirements for connector location and wiring.



Switch 1(Orientation 1)	OFF	ON	OFF	ON
Switch 2 (Orientation 2)	OFF	OFF	ON	ON

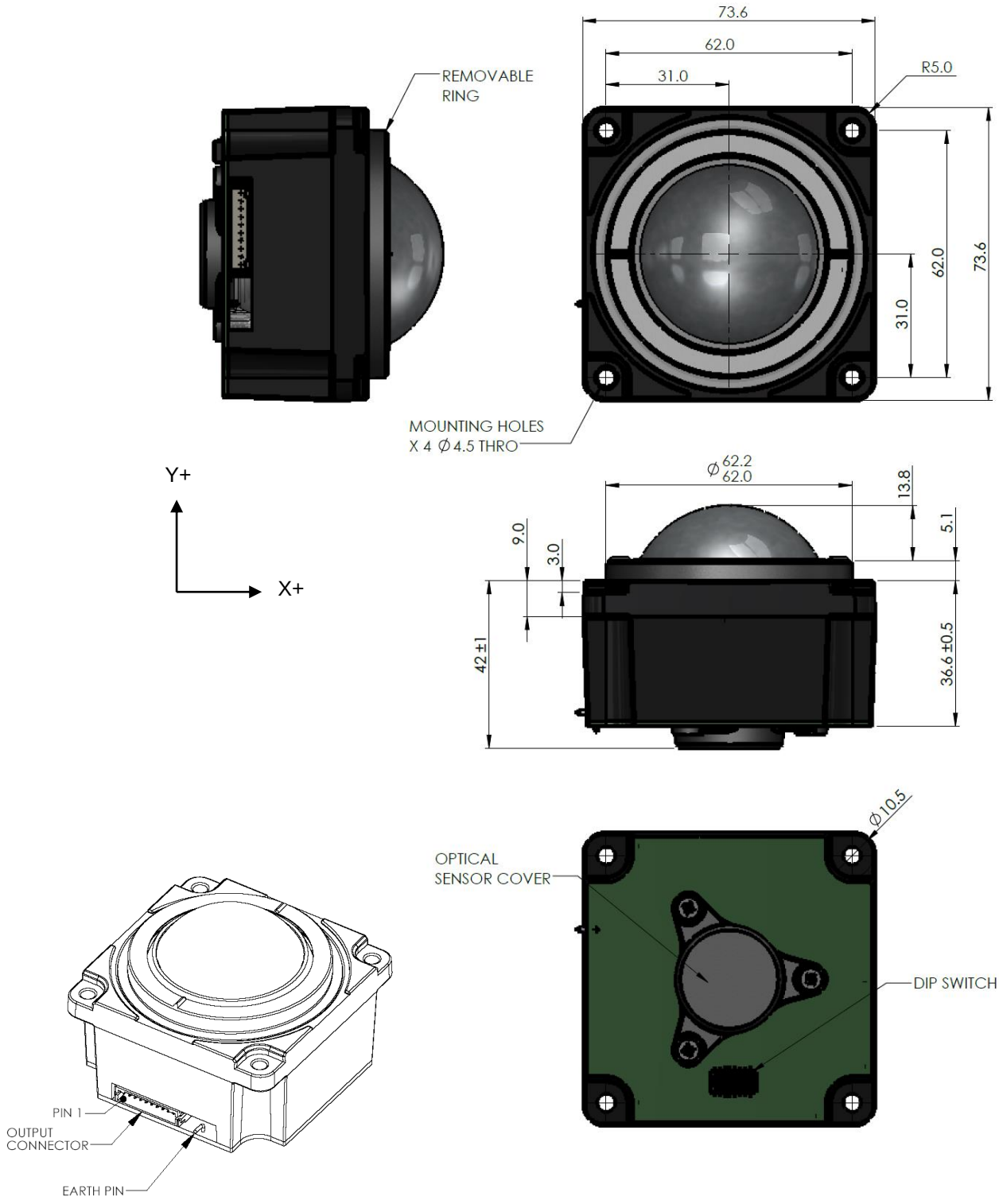
Figure 1 Mounting Orientations

6.3 Tracking Resolution

DIP switch 4 allows the user to choose between two trackball resolution settings. The trackball resolution is a measurement of how far the ball moves on the monitor/screen for one revolution of the ball.

- DIP switch 4 OFF provides the default resolution of 1200 counts (pixels) per ball revolution.
- DIP switch 4 ON provides the user with a resolution of 600 counts (pixels) per ball revolution.

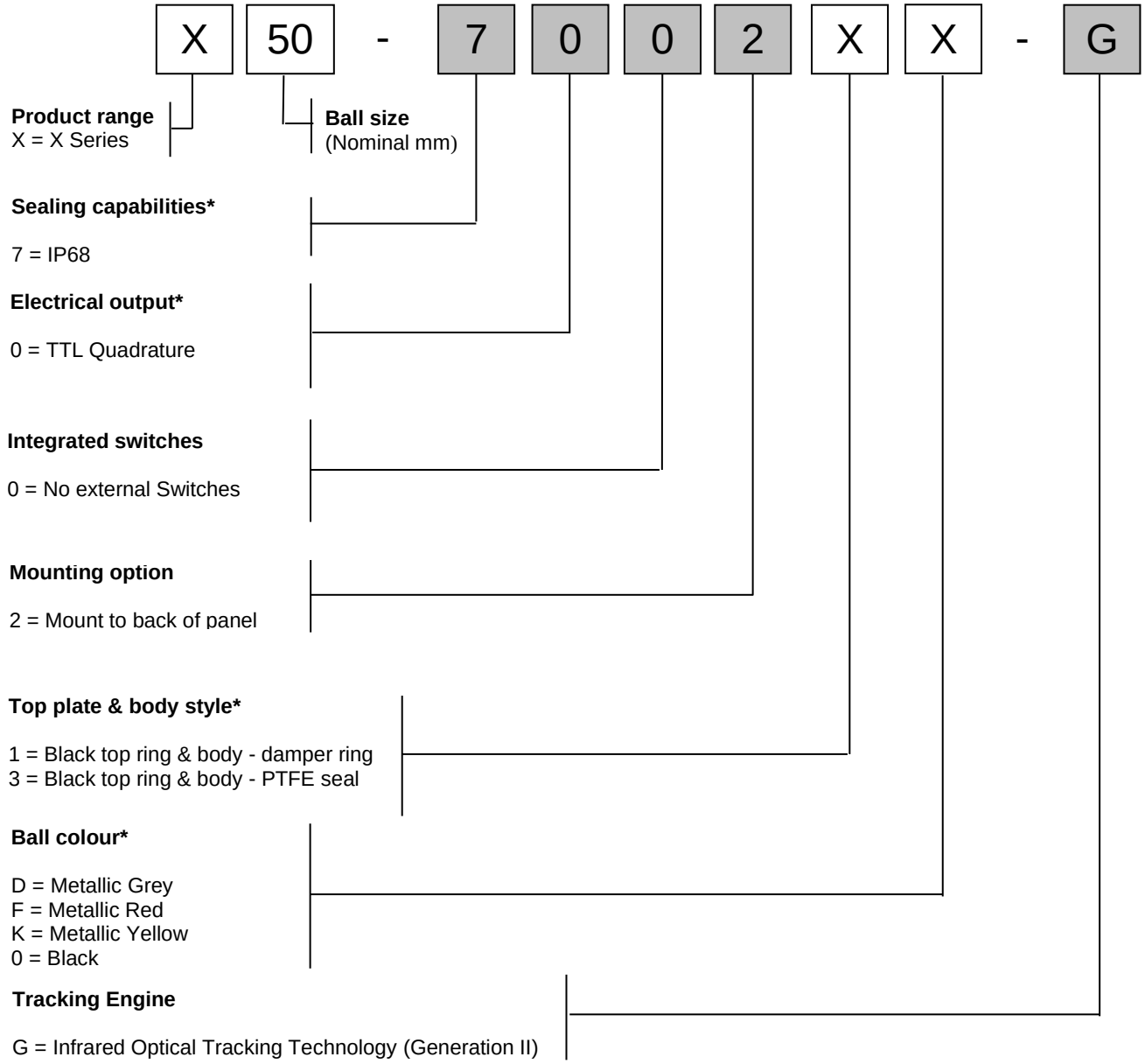
7. DIMENSION DRAWING



Dimensional drawing specifies factory default orientation.
All dimensions are in mm unless otherwise stated.
Tolerances +/- 0.25mm unless otherwise stated
Please note that an IGES model is available on request. Please contact your local sales office for more information.

8. PRODUCT ORDERING CODE SYSTEM

Please construct your standard product ordering code by selecting the numbers and letters to suit your specification:



*For further options please contact your local sales representative

8.1 Ordering Example

X50-70021D-G: X50, IP68, TTL Quadrature, no external switches integrated, mount to back of panel, black top ring & body - damper ring, metallic grey ball, infrared optical tracking technology (Generation II).

X50-700230-G: X50, IP68, TTL Quadrature, no external switches integrated, mount to back of panel, black top ring & body – PTFE seal, black ball, infrared optical tracking technology (Generation II).

9. DOCUMENT HISTORY

Issue	Date	Author	Remarks
A	05.01.19	N.S	NP1189: Document released
B	28.05.20	N.S	Ordering code section updated