X38 Series – 38mm Optical Trackball, Panel Mount, USB & PS/2 Output

Figure 1: Cursor Controls X38 Trackerball

1. DESCRIPTION

Utilizing the latest and most advanced infrared optical tracking technology, the X38 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 X38 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: USB & PS2 (auto-select)
- Smooth operation in rugged environments
- Various top plate configurations
- Custom connector options available
- Various ball colours available
- VX3™ – integrated zoom feature for scroll wheel functionality

3. APPLICATIONS

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

4. SPECIFICATIONS

4.1 MECHANICAL		
4.1.1	Weight	~90 grams
4.1.2	Ball size	Ø38.1mm (1.5”)
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	100N (10Kg) 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	USB & PS/2 (auto-select)
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	900 counts per ball revolution @ 1 IPS (inches per second) +/- 10% 1800 counts per ball revolution @ 5 IPS (inches per second) +/- 10%
4.2.5	Output connector	8 Way JST, right-angled header, part no. S8B-PH-SM4-TB (or equivalent)
4.2.6	Mating output connector	8 Way JST connector, part no. PH, CR or KR types (e.g. PHR-8)
4.2.7	Switch Inputs	3 switches: left, middle, and right. Connection through 4-way JST, right-angled header, part no: S4B-PH-SM4-TB (or equivalent)
4.2.8	Mating switch connector	4 Way JST connector, part no: PH, CR or KR types (e.g. PHR-4)

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

4.4 ELECTRICAL OUTPUT COMPATIBILITY
Windows 7, 8 & 10
Redhat Linux
Fully compliant with USB 2.0 (Low Speed) framework (chapter 9) and HID specifications

5. CONNECTION DETAILS

Connection is made to the X38 Series trackball by means of two JST connectors (or equivalent). Tables 1 and 2 highlight the connection details. Custom connections are available (please contact your local sales office for further details).

5.1 Output Connector: P1

Description: 8 Way JST, right-angled header.
Manufacturer: JST (or equivalent)
Part No: S8B-PH-SM4-TB
Mating connector: PH, CR or KR types (e.g. PHR-8)

Pin Number	USB & PS/2
1	SEE NOTE 1
2	
3	EARTH
4	SEE NOTE 1
5	5V D.C
6	D- , PS/2 Data
7	D+ , PS/2 Clock
8	0V

Table 1: Output connections

NOTE 1: Pin to be left floating (unconnected)

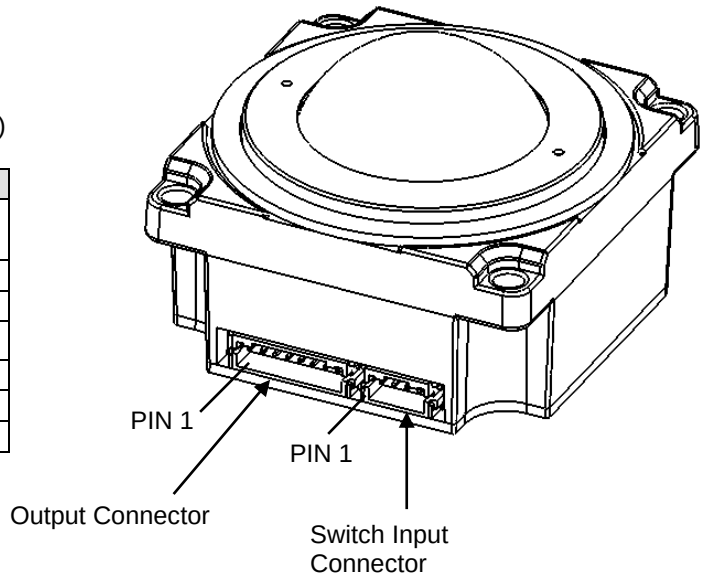


Figure 2: Connector Details

5.2 Switch Input Connector: P2

Description: 4-way JST, right-angled header.
Manufacturer: JST (or equivalent)
Part No: S4B-PH-SM4-TB
Mating connector: PH, CR or KR types (e.g. PHR-4)

Pin Number	Function
1	Left switch
2	Middle switch
3	Right switch
4	0V

Table 2: Switch connections

5.3 Switch Schematic

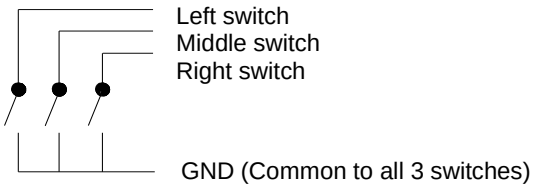


Figure 3: Switch Schematic

For alternative switch options and configurations please contact your local sales office.

6. TRACKBALL CONFIGURATION

The X38 Series trackball provides features that may be selected using the DIP switch located on the printed circuit board. Table 3 details the assigned function of each switch.

6.1 DIP Switch Functions

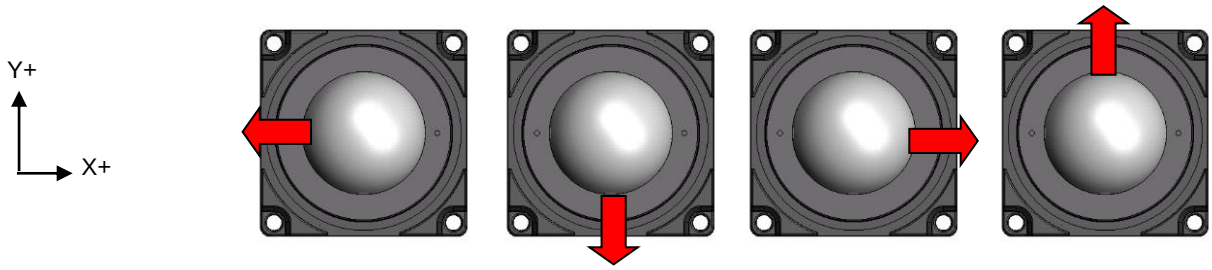
DIP Switch	Function	OFF	ON
1	Orientation 1 Setting	See Figure.1	See Figure.1
2	Orientation 2 Setting	See Figure.1	See Figure.1
3	VX3 - Virtual 3 Axis Function	Feature disabled	Feature enabled
4	Smart Feature	Feature disabled	Feature enabled
5	Tracking Mode	Ballistic tracking	Linear tracking
6	Factory Setting	Switch must be set in the OFF position	
7	Factory Setting	Switch must be set in the OFF position	
8	N/A	N/A	N/A

Table 3: DIP switch functions

Factory default setting: All switches OFF

6.2 Orientation

The orientation function allows the user to mount the X38 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 4: Mounting Orientations

6.3 VX3™

VX3 is patent protected facility that provides the same 2 modes of functionality as a scroll wheel on a 3-axis mouse.

Operation:

Press middle button once to latch scroll mode one (e.g. dynamic pan feature);
Press middle button again to latch scroll mode two (e.g. 3rd axis zoom feature);
Further middle button presses toggles between scroll mode one and scroll mode two;
Press either left or right buttons to cancel feature and resume normal X-Y cursor operation

6.4 Smart Switch

A patent protected button latch facility.

Operation:
Press right button for 3 seconds or more to enable;
Once enabled, pressing any button for approximately 1 second latches that button on;
Press any button momentarily to de-latch;
Disabled with a further press of the right button for 3 seconds or more;

6.5 Tracking Mode

Ballistic Tracking: Intuitive tracking algorithm to provide increased cursor resolution when tracking fast whilst retaining the original resolution for tracking accurately at slow speeds.

Linear Tracking: No tracking algorithm. 900 counts per ball revolution maintained at all tracking speeds.

6.6 Removable Ring Style

The X38 Trackerball can be supplied with two different removable ring styles as shown below:

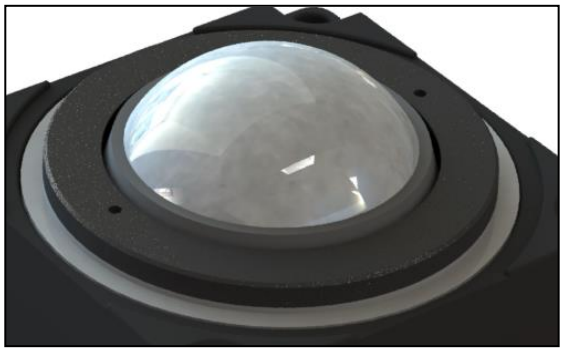


Figure 5: Removable Ring with Dimples

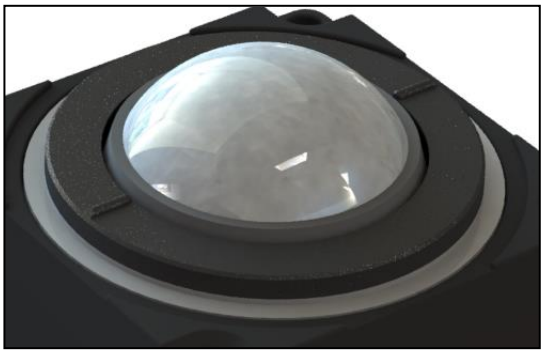
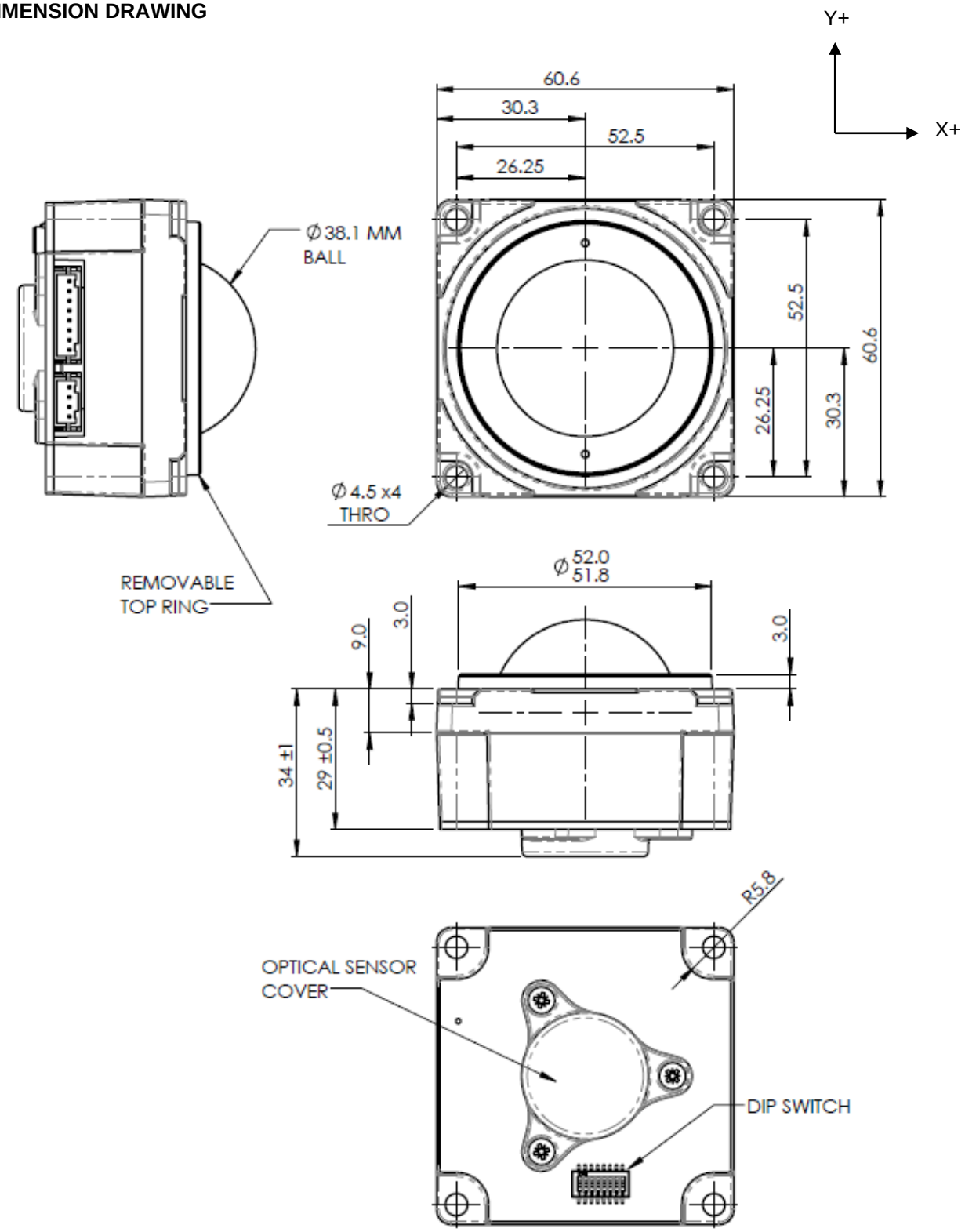


Figure 6: Removable Ring with Ribs

Please refer to section 8 for ordering code details.

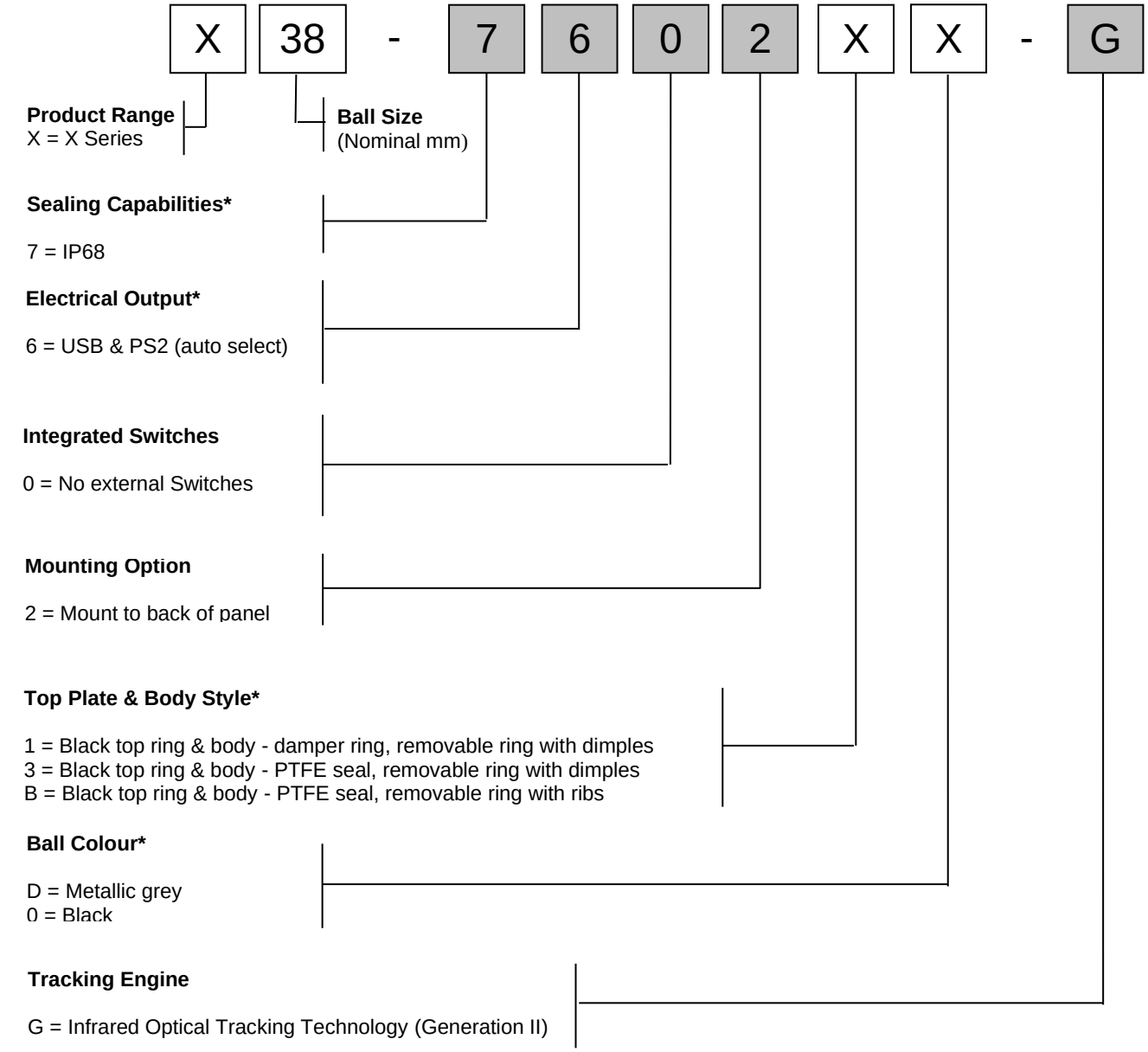
7. DIMENSION DRAWING



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

X38-76021D-G: X38, IP68, USB & PS/2, no external switches integrated, mount to back of panel, black top ring & body - damper ring, metallic grey ball, infrared optical tracking technology (Generation II).

X38-760230-G: X38, IP68, USB & PS/2, 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	10.01.19	N.S	NP1189: Document released
B	11/04/22	C.E.	NP1354 – Type “B” body style added