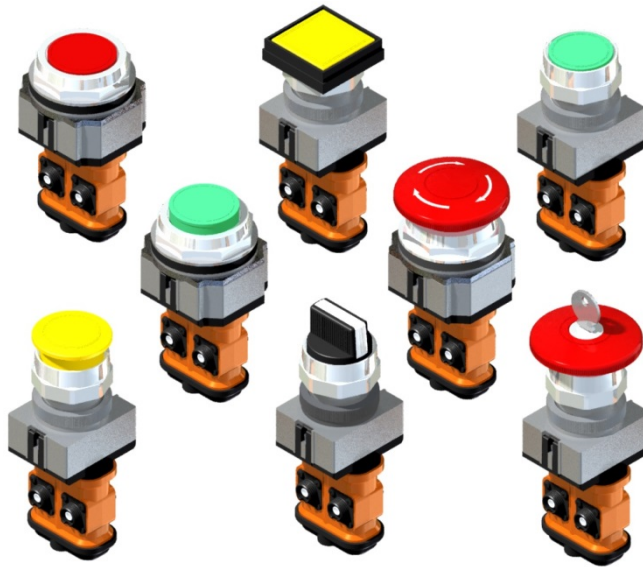


# Operation Manual

## Fiber Optic Switch (FiberSwitch™)

### Model: FOS-01



SIGMA RESEARCH Inc.  
259 Edgeley Blvd, Unit #2  
Vaughan, Ontario, Canada L4K 3Y5  
Tel: +1 (905) 669-6888  
Fax: +1 (905) 669-6444  
[info@sigmaresearch.ca](mailto:info@sigmaresearch.ca)  
[www.sigmaresearch.ca](http://www.sigmaresearch.ca)

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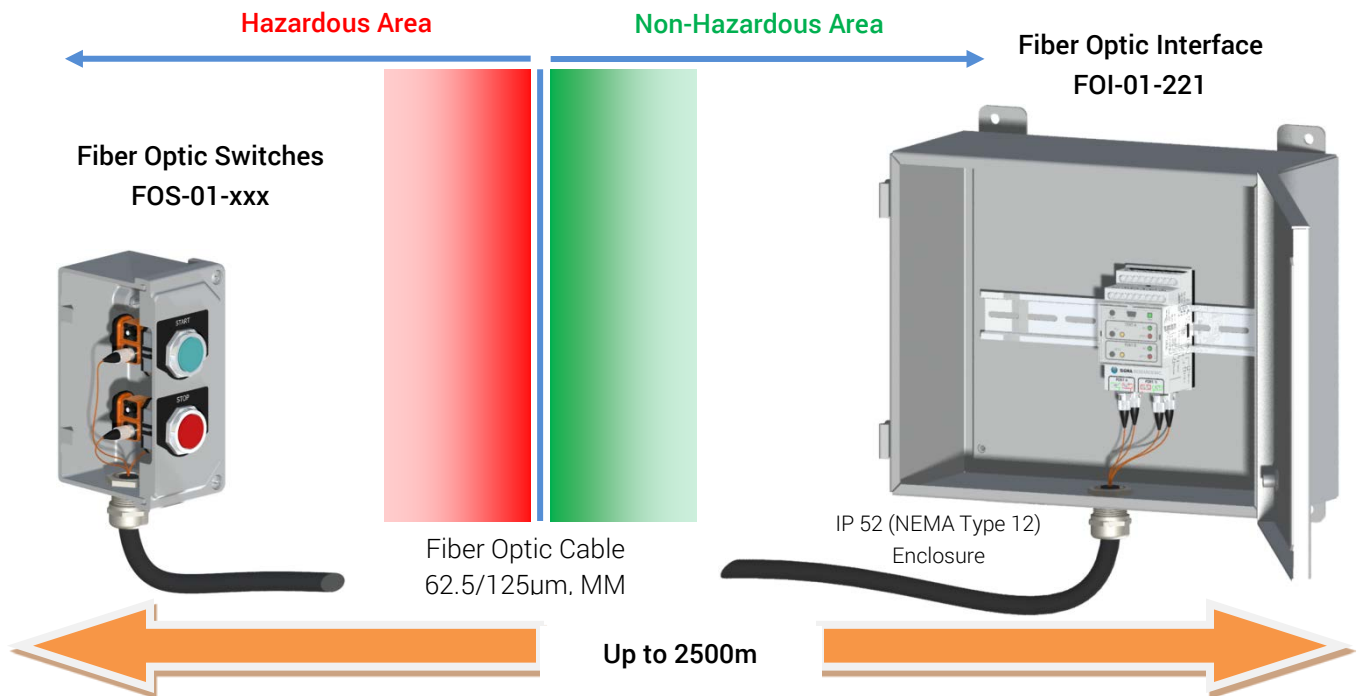
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## 1.0 Overview

The Fiber Optic Switch (FiberSwitch™) is a revolutionary device that opens new fields of application for fiber optics as well as introducing a new method of controlling electrical devices. It outperforms electrical switches in many applications such as hazardous locations and remote control over long distances. It acts as a switch which interrupts a fiber optic signal to indicate a button press or selection. The Fiber Optic Switch is essentially an optical contact block which connects to a variety of existing operators, making it a perfectly safe switch for hazardous areas.



The system provides a safe optical signal (rated inherently safe **Ex op is**), which can be used in any type of hazardous environment or explosive atmosphere.

### Features:

- ✓ Absolutely safe for installation in hazardous areas, as it eliminates the ignition source.
- ✓ Immune to EMI/RFI and high voltage power lines.
- ✓ Eliminates electrocution and fire hazards
- ✓ Can be installed up to 2.5Km away from equipment it controls.
- ✓ Uses Standard Multimode 62.5/125µm fiber optic cable with FC connectors.
- ✓ Low overall installation cost as fiber optic cable is less costly than copper cable.
- ✓ Unique fail safe feature that opens its NC contacts if the optical contact block comes off the operator
- ✓ Stackable optical contact blocks up to two tiers.
- ✓ Allows for multiple Fiber Optic Switches to be daisy chained.

## 2.0 Technical Specifications

**Max. Distance:** 2.5Km@850nm, 7Km@1310nm

**Attenuation:** <4dB\* for 62.5/125µm MM fiber

**Wavelength:** 850nm, 1310nm

**MM Graded Fiber:** 62.5/125µm, OM1

**Connector:** FC

**Operating Temperature Range:** -25 - 60°C (-13 - 140°F)

**Storage Temperature Range:** -40 - 70°C (-40 - 158°F)

**Humidity:** 20-80% RH (non-condensing)

**Enclosure:** IP52 / NEMA Type 12

**Operators:** NEMA 30.5mm, IEC 22.5mm

**Number of Optical Ports per Optical Contact Block:** 2

**Max. # of Stackable Optic Contact Blocks:** 2

\* Attenuation may be higher due to size tolerances of the FC connector

### Optical Contact Blocks

- NC
- NO
- NC-LB Late Break,
- NO-EM Early Make

### Explosive Atmosphere ATEX\*

- I/II 1G
- II 1D
- I M1

\* When used in conjunction with the Fiber Optic Interface FOI-01-221

### Explosive Atmosphere IECEx\*

- Ex op is IIC T6 Ga
- Ex op is IIIC T60°C Da

\* When used in conjunction with the Fiber Optic Interface FOI-01-221

### Hazardous Area NEC 500, 505, 506 (CEC)\*

#### **Divisions:**

- Class I,II,III, Div. 1,2, Group A, B, C, D, E, F, G,

Temp. Code T6

#### **Zones:**

- Class 1, Zone 0, AEx op is IIC T6 Ga
- Class II, Zone 20, AEx op is IIIC T60°C Da

\* When used in conjunction with the Fiber Optic Interface FOI-01-221

### Weight

One optical contact block with no operator: 29g (1oz)

Two stacked optical contact blocks with no operator: 52g (1.8oz)

### Standards, Codes & Directives

IEC 61010-1, IEC 60825-1, 2

IEC 60079-0, IEC 60079-28, UL1203,

NEC, CEC, RoHS, ATEX

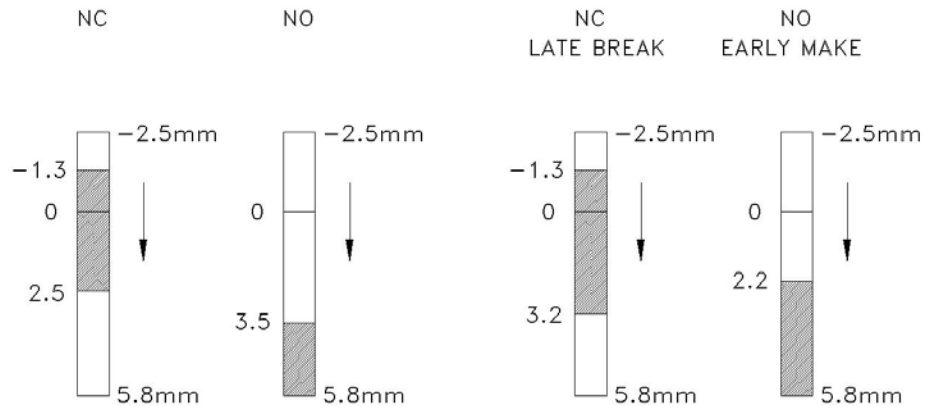
### Patents

US 7,786,428                      Aug 31/2010

CANADA 2,614,920              Feb 14/2012

### 3.0 Contact Travel

#### CONTACT TRAVEL DIAGRAMS



Tolerance:  $\pm 0.2\text{mm}$

Shaded area denotes contact closed (light goes through the switch)

NC – Normally Closed

NO – Normally Open

0 – Indicates the rest position of the switch

-2.5mm – Indicates the rest position of the switch when the operator is not installed

If the operator comes off the switch, the NC and NC Late Break will open.

A combination of a NC and a NO contacts will result in a "Break Before Make" operation while a combination of a NC-LB Late Break and NO-EM Early Make will result in a "Make Before Break" operation.

## 4.0 Hazardous Locations

The Fiber Optic Switch meets the requirements of European Parliament Directive 94/9/EC, *Equipment and protective systems Intended for use in potentially explosive atmospheres (ATEX Directive)* and IEC 60079-28 (Explosive atmosphere - Protection of equipment and transmission systems using optical radiation) when used in conjunction with the Fiber Optic Interface FOI-01-221.

**According to ATEX Directive, the Fiber Optic Switch is classified as Simple Apparatus "Ex op is" for the following reasons:**

- The device is entirely passive and non-electrical.
- Light energy produced by the Fiber Optic Interface meets the requirements for Ex Op is (inherently safe optical radiation) per IEC 60079-28 and ANSI/ISA 60079-28.

The device being a "Simple Apparatus" shall not bear the CE mark according to the ATEX directive.

Therefore, the Fiber Optic Switch can be safely installed and operated in any type of hazardous area:

- ATEX Equipment Group I (Mines); All Categories (M1 and M2); All Gas and Dust Environments
- ATEX Equipment Group II; All Categories (1, 2 and 3); All Gas and Dust Environments

**According to NEC 504.2, the Fiber Optic Switch is classified as Simple Apparatus for the following reasons:**

- The device is entirely passive and non-electrical.
- The device does not dissipate any power that can increase its surface temperature over ambient.
- NEC 500 Class I (Gas and Vapor), Divisions 1 and 2, Group. A, B, C, D, Temp. T6
- NEC 500 Class II (Dust), Divisions 1 and 2, Group E, F, G Temp. T6
- NEC 500 Class III (Fibers or Flyings), Divisions 1 and 2
- NEC 505 Zones (Gas and Vapor): Zones 0, 1, 2, 20, 21, 22

According to NEC 504.4 the Fiber Optic Switch being a "Simple Apparatus" does not have to be listed.

## 5.0 Installation and Environmental Considerations

Fiber Optic Switches shall always be installed in a protective metallic or non-metallic enclosure with a min. rating of min. IP 54 (NEMA Type 3R or 4x) for outdoor locations and IP52(NEMA Type 12) for indoor locations.

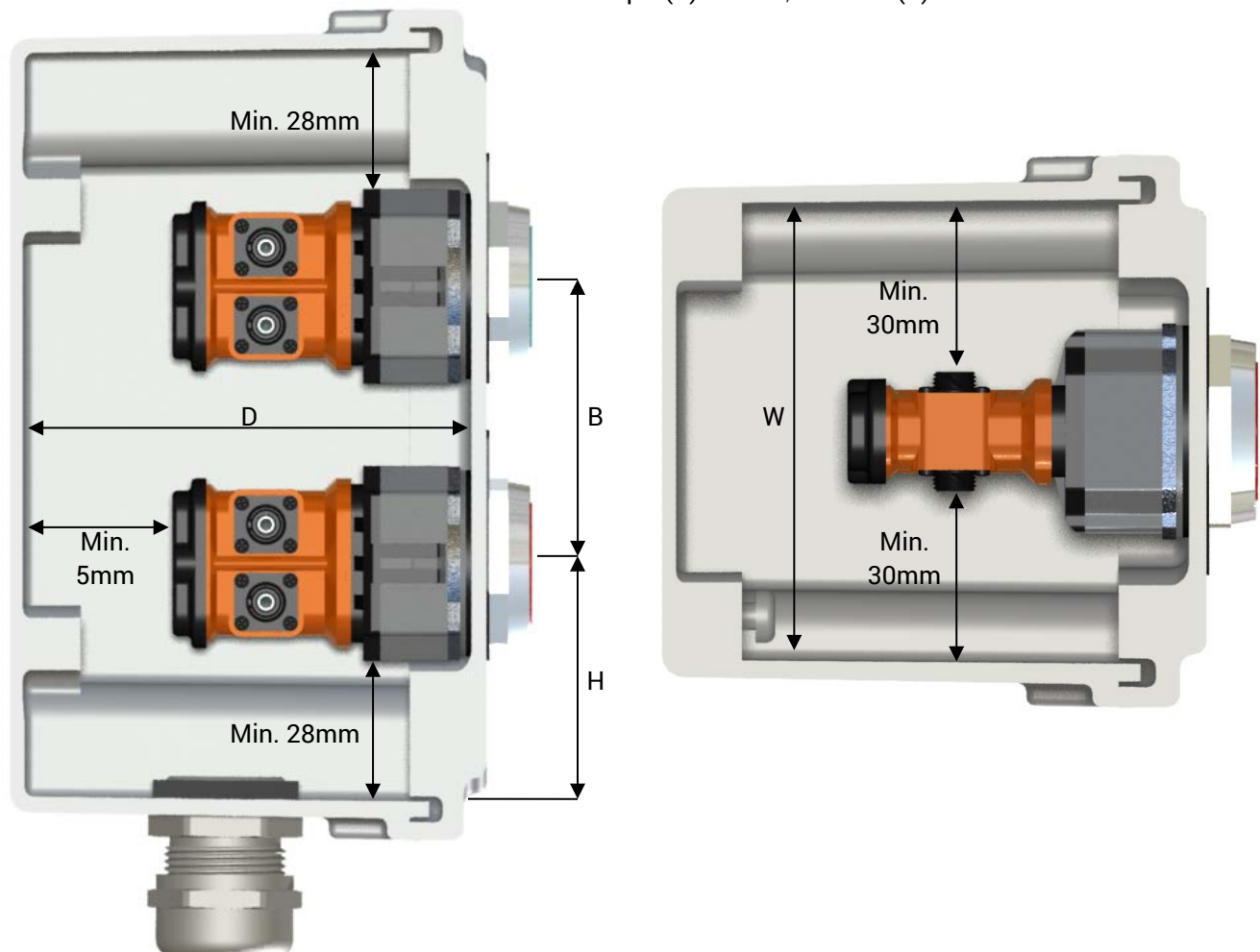
When Fiber Optic Switches are installed in a non-metallic enclosure in hazardous locations, the enclosure must be made of antistatic material\* or it should be covered with a bonded durable conductive coating\*. The enclosure must be grounded or as a minimum must be in direct contact with a metallic structure that is grounded.

The FOS protective enclosure as described above should also provide mechanical protection as required by IEC 61010-1 (energy protection level greater than 5J).

\*surface resistance  $<10^9$  ohm@50% relative humidity (Ref. IEC 60079-0 section 7.4.2, UL1203 section 33.4)

### Single Optical Contact Block Clearance Details:

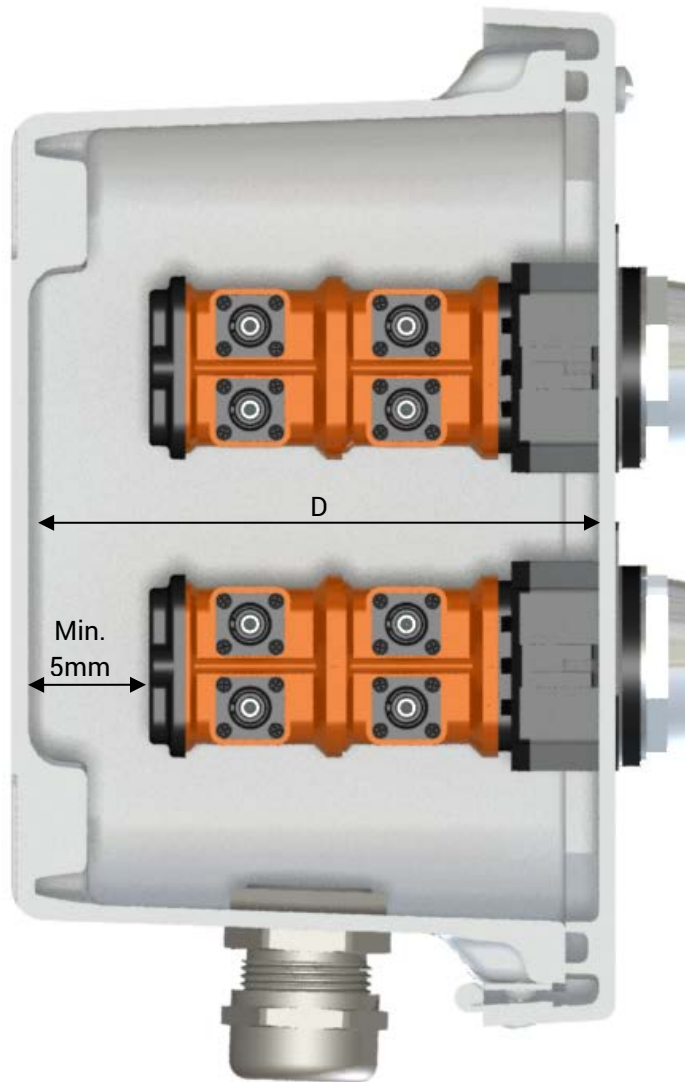
Enclosure dimensions should be a minimum of: **Height(H): 57mm, Width(W): 82mm, Depth(D): 70mm, Between(B): 57mm**



**Double Optical Contact Block Clearance Details:**

Enclosure should be a minimum of **Depth(D)**: 100mm.

Refer to "Single Optical Contact Block Clearance Details" for rest of dimension restrictions.

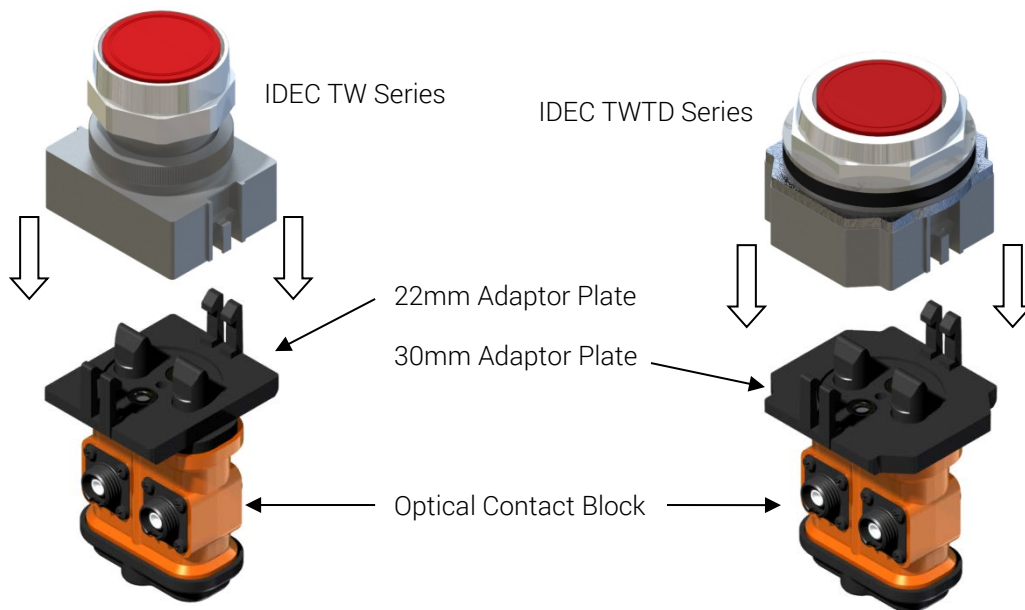




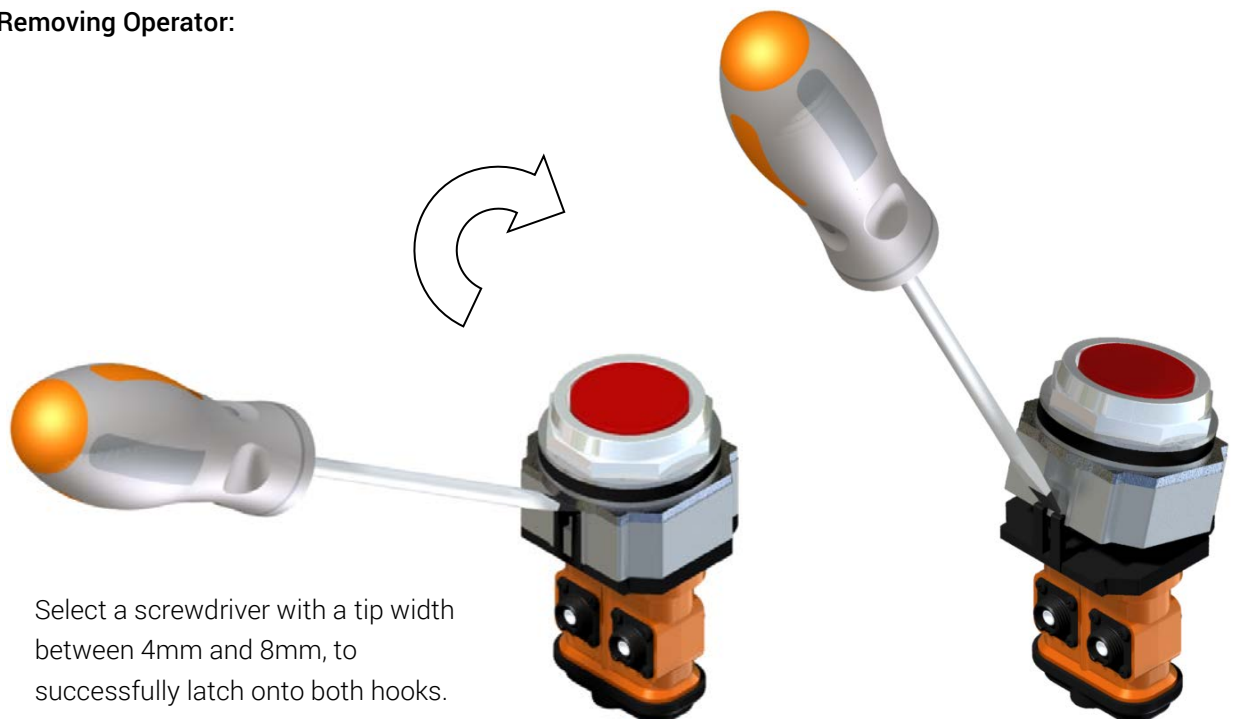
## 5.1 Operators

The Fiber Optic Switch is compatible with IDEC Corp. operators TW series and TWTD series. Refer to IDEC catalog for operator specifications.

Operators snap onto the hooks of the adaptor plate to complete a fully assembled switch. Fiber Optic Switches are available in 22mm and 30mm options.



### Removing Operator:



Select a screwdriver with a tip width between 4mm and 8mm, to successfully latch onto both hooks.

## 5.2 Optical Contact Blocks

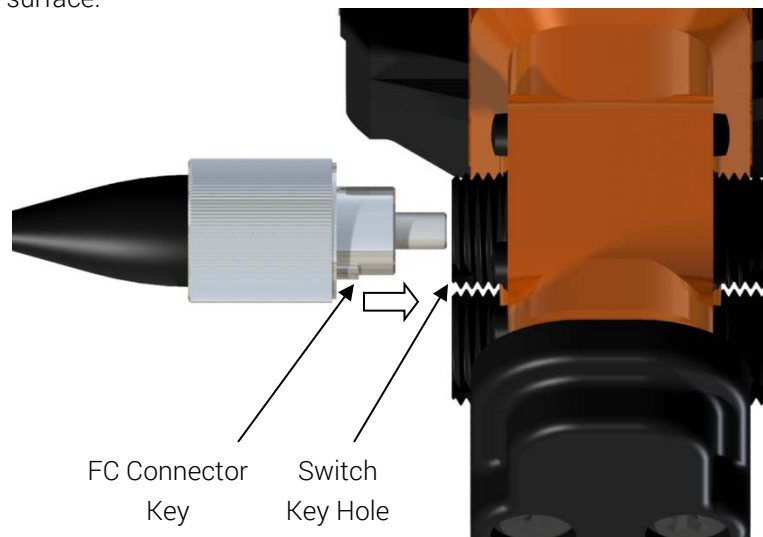
Fiber Optic Switches are available with one or two optical contact blocks. The second contact block is attached to the bottom of the first, to provide two additional optical ports. Each optical contact block contains two optical ports, with each port having the option of a Normally Open (NO) or Normally Closed (NC) contact.



*! Do not disassemble or unscrew any parts of the optical contact block, as this will affect the optical alignment of the Fiber Optic Switch causing higher signal losses.*

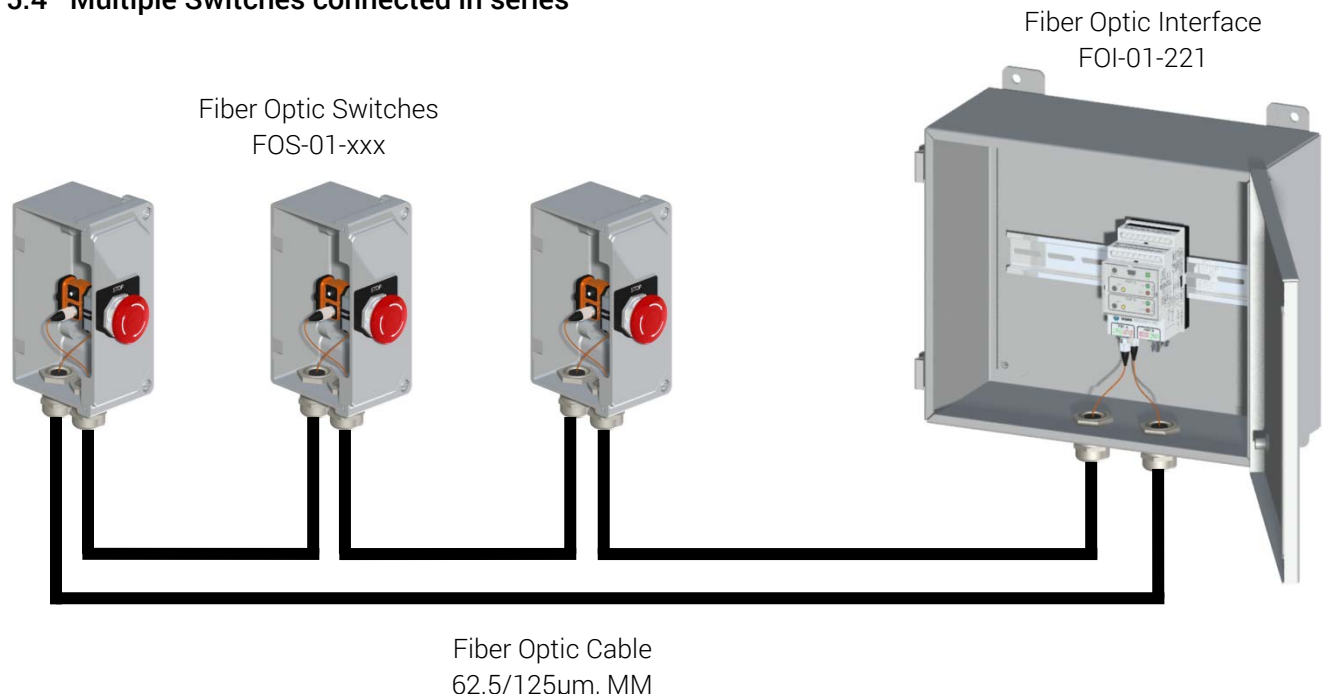
## 5.3 Inserting FC Connector

Line up the FC Connector key with the key hole in the Fiber Optic Switch. Insert all the way until it cannot be pushed any further. Once inserted, begin to screw the connector on the thread to the end until the FC connector touches the flat surface.



*! Make sure key is inserted and connector is fully screwed in. Fiber optic signal losses will significantly increase if not connected properly.*

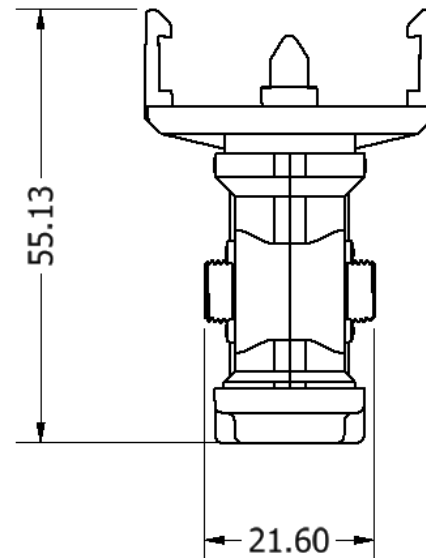
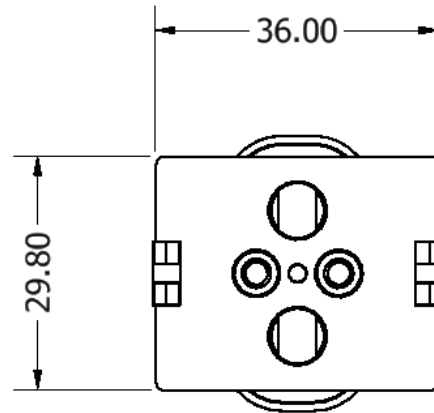
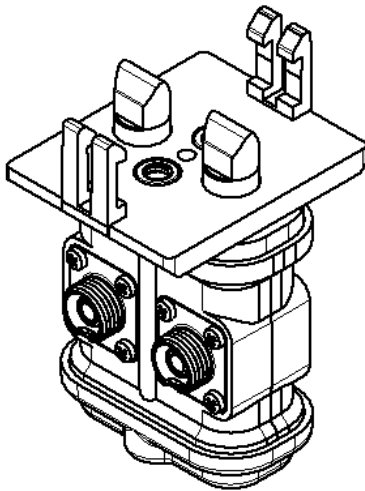
#### 5.4 Multiple Switches connected in series



Fiber Optic Switches can be connected in series as shown above. This however leads to additional optical losses occurring in the system due to multiple switches. Each Fiber Optic Switch adds <4dB (typical 3dB) loss. When using the switches with a Fiber Optic Interface, refer to FOI Operation Manual (ANNEX A) for a detailed optical power margin calculation and the maximum number of switches that can be connected in series.

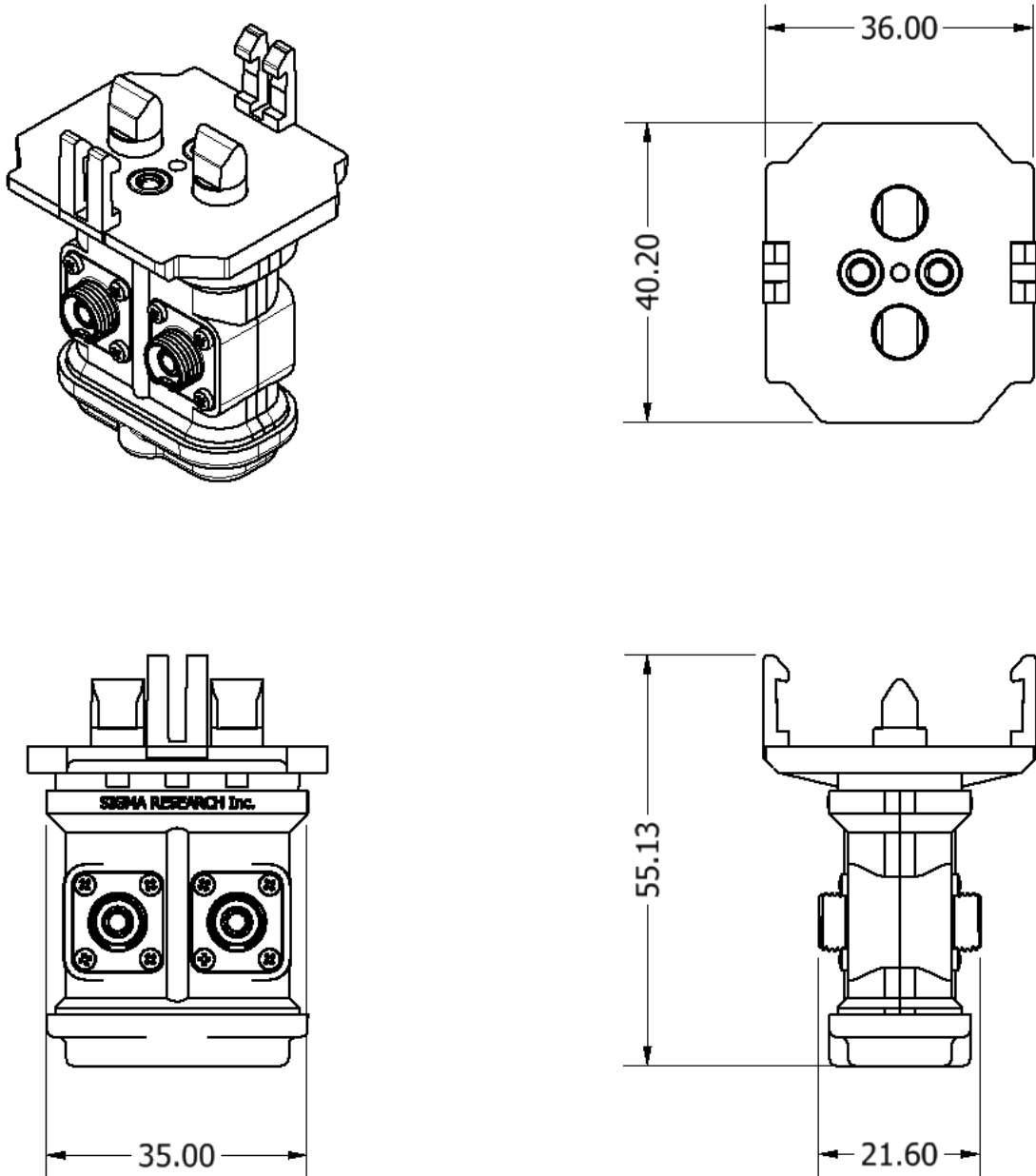
## 6.0 Dimensions

### 22mm Fiber Optic Switch (no operator)



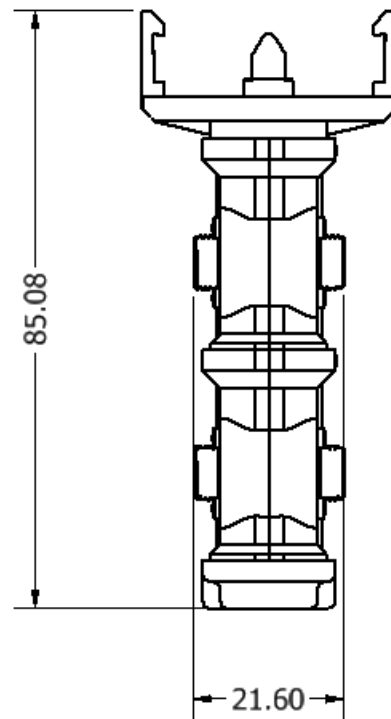
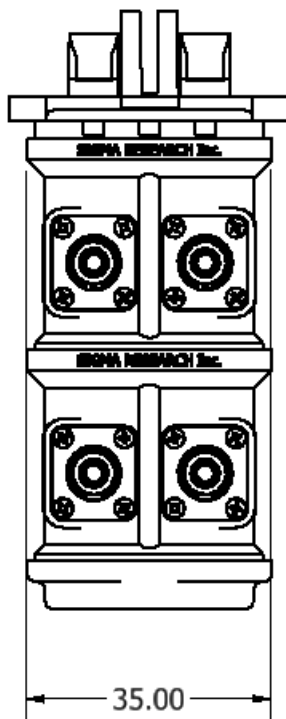
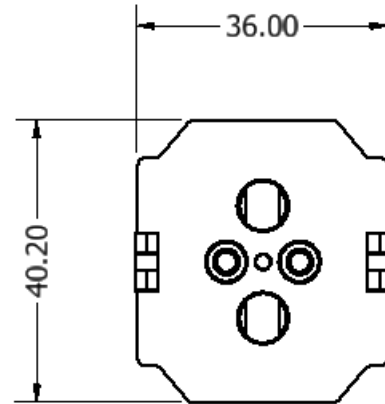
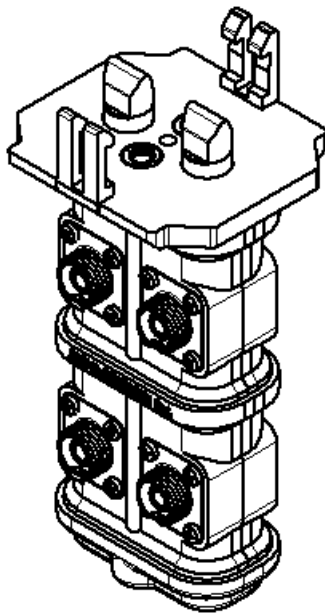
All dimensions in mm

30mm Fiber Optic Switch (no operator)



All dimensions in mm

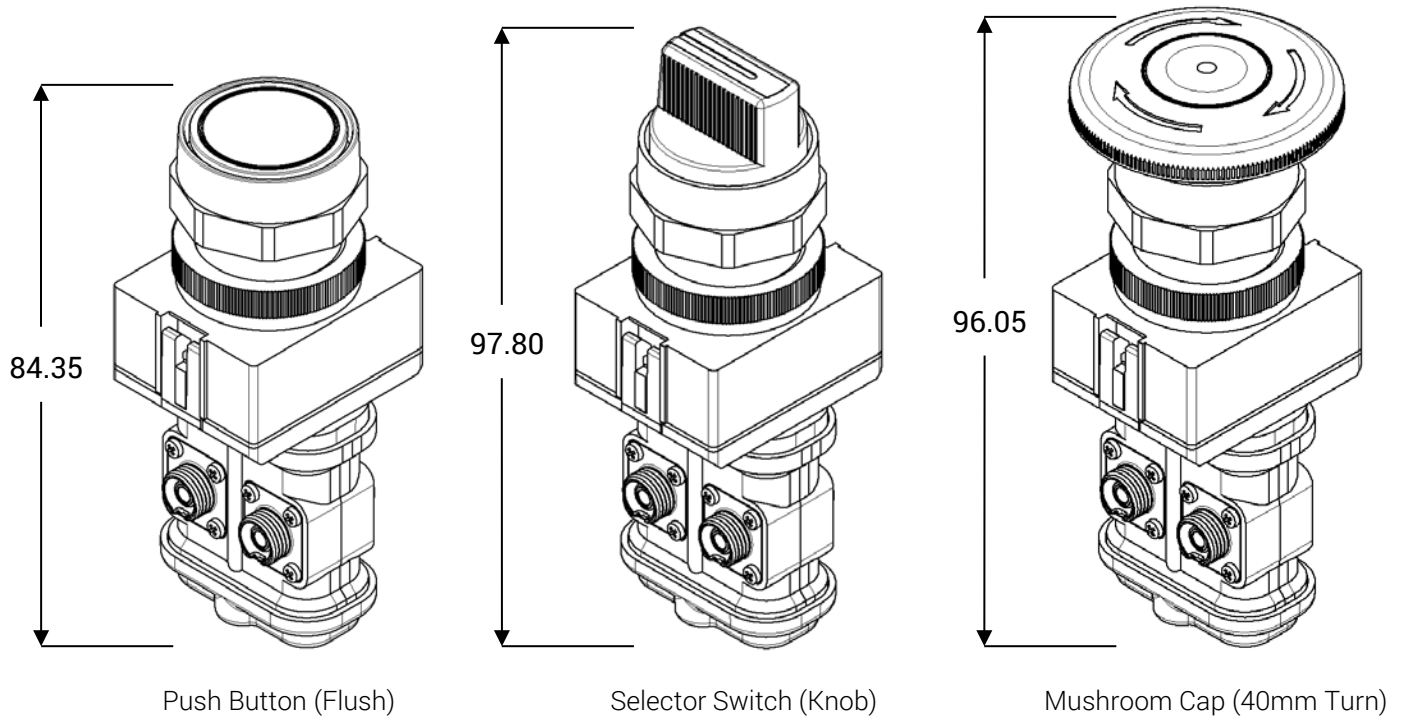
30mm Fiber Optic Switch (double optical contact block, no operator)



All dimensions in mm

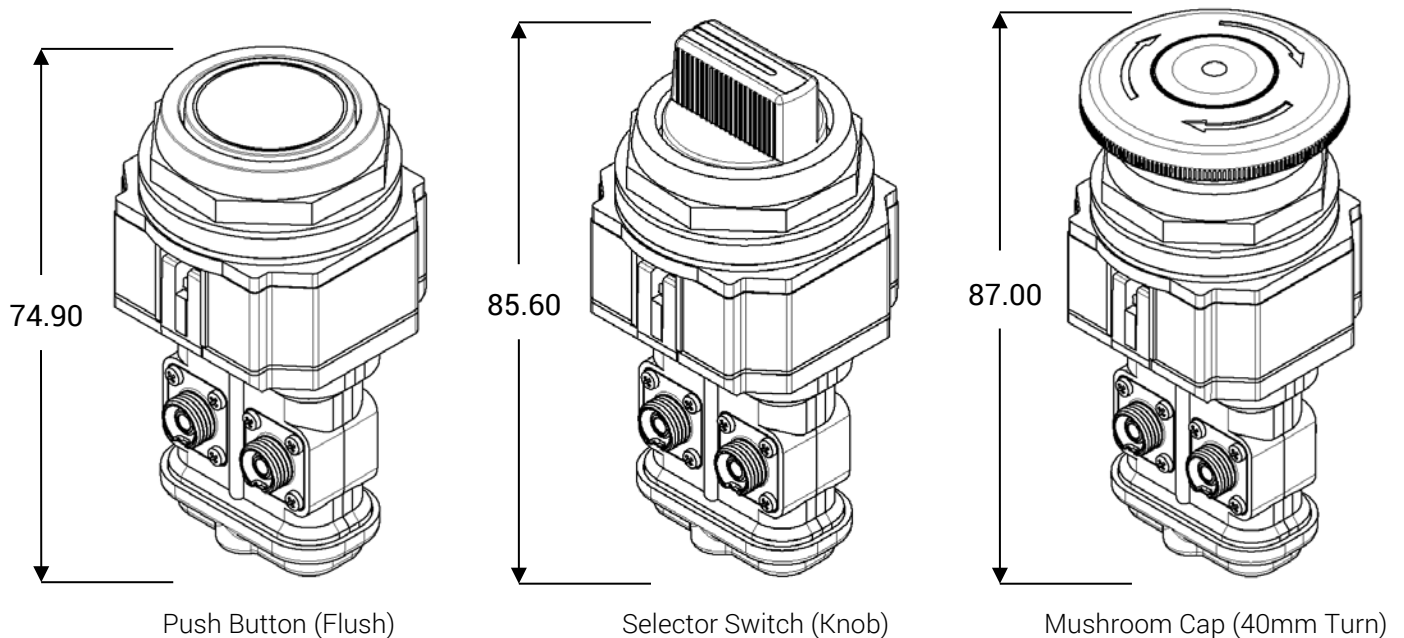
### 22mm Fiber Optic Switch (with IDEC operators)

All heights in mm. *Contact us for more operator dimensions*



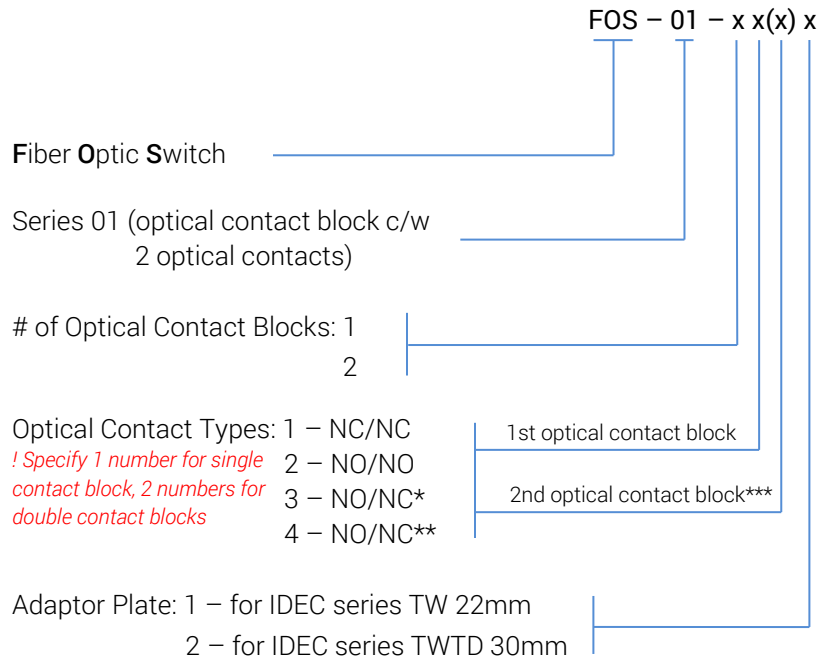
### 30mm Fiber Optic Switch (with IDEC operators)

All heights in mm. *Contact us for more operator dimensions*



## 7.0 Ordering Number & Contents

### Catalog Number



\* "Break-Before-Make" contacts. NC contact opens before NO contact closes.

\*\* "Make-Before-Break" contacts. NO contact closes before NC contact closes.

\*\*\* Leave blank if choosing single optical contact block (ex. 1 optical contact block: FOS-01-121, 2 optical contact blocks: FOS-01-2121)

*! Operator to be specified from IDEC catalog. The adaptor plate must match the operator (ex. 22mm for TW series, or 30mm for TWTD series)*

### Standard Contents

- Fiber Optic Switch FOS-01-xxx
- Hard copy of Datasheet

### Accessories & Additional Contents

- Fiber Optic Cable, MM Graded Fiber: 62.5/125µm.
- ST & FC connectors
- Cable glands



## 8.0 Warranty

This product has been manufactured and tested to the highest quality standards by SIGMA RESEARCH Inc. This warranty offered by SIGMA RESEARCH Inc. covers defects in material or workmanship in SIGMA RESEARCH Inc. products for a period of 1 year from the date of shipment. This warranty extends to the original purchaser only and is non-transferable.

During the warranty period SIGMA RESEARCH Inc. will replace at no charge for parts only or, at its option, replace any product or part of the product that proves defective because of improper workmanship and/or material, under normal installation, use, service and maintenance.

### Damage in Shipment

If a product is received damaged, e-mail or call SIGMA RESEARCH Inc. Please be as specific as possible in outlining all the details of the damage and include pictures if possible. You must also inform the shipper immediately, and retain all the shipping containers in case reshipment is required. Failure to follow these steps may affect our response time and your claim for compensation.

### Limitations of Warranty

This warranty does not cover any problem that is caused by:

- A. Conditions, malfunctions or damage not resulting from defects in material or workmanship.
- B. Conditions, malfunctions or damage resulting from normal wear and tear, improper installation, improper maintenance, misuse, abuse, negligence, accident or alteration.
- C. Accessories, connected materials and products, or related products not manufactured or sold by SIGMA RESEARCH Inc.

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability of fitness for a particular use. SIGMA RESEARCH Inc. shall not be liable for any direct, indirect, special, incidental or consequential damages, whether based on contract or any other legal theory.

### Contact Information:

To exercise this warranty, e-mail or call SIGMA RESEARCH Inc. You will be given specific instructions and assisted through the return process. This warranty requires the product to be delivered to the SIGMA RESEARCH Inc. service facility intact for examination with the serial number unremoved and all shipping charges prepaid. SIGMA RESEARCH Inc. will determine in its sole discretion if such defect exists and when repairs can be made. Once repaired, the product will be returned or replaced and the transportation prepaid, unless the shipment needs to be expedited in which case the customer will pay for return shipment. Repaired products are warranted for the remaining balance of the original warranty period, or at least 90 days.

#### Address:

259 Edgeley Blvd, Unit #2  
Vaughan, Ontario, Canada L4K 3Y5

#### Contact:

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