Prizmatix

Fiber Optic Low Friction*
Rotary Joint for Optogenetics

Ver. 11

*Patent Pending

Introduction

The fiber optic Rotary Joint enables optogenetics experiments with live animals, allowing for the free movement of animal and fiber optic cables with a minimum of torque while maintaining excellent light transmission.

High NA, large core polymer (POF) fibers of 1500um - 500um are coupled to Ultra High Power (UHP) LEDs at one end and attached to the Rotary Joint at the other end.

Small core fibers of 500um - 200um are coupled to the other side of the Rotary Joint, while connected to the free-moving animal during optogentics experiments.

The concept of Ultra High Power LED light delivery from thick to thin core fibers enables the use of several thin fibers simultaneously, for example to deliver light to both brain hemispheres simultaneously without loss of power at cannula tip.

Key Features

- Extremely low rotation torque (see http://www.youtube.com/watch?v=q5RE14fove0)
- Efficiently connects large core to small core fibers
- Lightweight with small footprint
- Ideal for coupling Prizmatix OG-LEDs to optogenetics fibers
- Fiber types: FC to FC.
- Stainless steel housing

Applications

- In-vivo Optogenetics: single or dual / multiple fiber outputs

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Specifications

Wavelength range	nm	350 – 1100
Connector for Optical fiber		FC - FC
Diameter	mm	18
Weight	g	10
Connection to other systems / supports		M2 thread
Rotational torque (static)	µN·m	<10
Typical additional optical loss (*)	dB	<0.5
Variation during rotation	dB	<0.2

* Measured in 1000um to 500um setup with rotary joint relative to fixed adaptor.

Additional Information

The Prizmatix Rotary Joint was especially designed for working with high NA fibers and LED light sources. Unlike Lasers, Prizmatix Ultra High Power LEDs have a high brightness and large light emitting area. This characteristic is used to couple the LED's light efficiently into a high numerical aperture (NA ≥ 0.5), large core fiber such as 1000um – 1500um core.

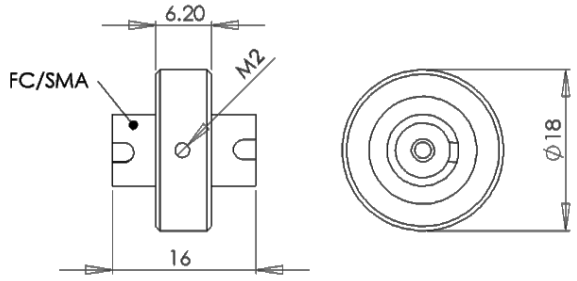
Due to the wide aperture of this fiber, coupling a secondary fiber (NA ≥ 0.5) with smaller core, such as 500um, does not require precise axial alignment. Placing the small core in front of the larger core fiber enables efficient light coupling. The primary fiber is connected to the top port of the fiber optic Rotary Joint and the secondary fiber is connected to the lower half. The Rotary Joint contains special low-friction ball bearings which enables the two fibers to rotate freely upon each other.

Although the core diameter of the fiber optic components are reduced, If the high NA is maintained the LED's brightness (usually measured in mW/mm^2), is conserved along the fiber optic path from the LED to the Rotary Joint, and eventually into the cannula.

The large to small core coupling method allows for more than one secondary fiber to be attached using a single LED light source and without compromising the brightness. This is very useful for comprehensive research such as optogenetically manipulating two brain hemispheres or several locations simultaneously as shown on the first page.

Prizmatix Rotary Joint is a one element of Prizmatix's Optogenetics Toolbox, which offers accessories for Optogenetics research see Optional Accessories section below:

Mechanical Drawing



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Optional Accessories

Ultra High Power LEDs for in-vivo optogenetics:

The Optogenetics-LED and Optogenetics-LED-Dual is a light source for in-vivo Optogenetics experiments The LED driver electronics supports CW or external TTL modulation with user-controlled frequency and duty cycle. For more details please see our website:
http://www.prizmatix.com/optogenetics/Prizmatix-in-vivo-Optogenetics-Toolbox.htm

Single Dual Optogenetics Fibers:

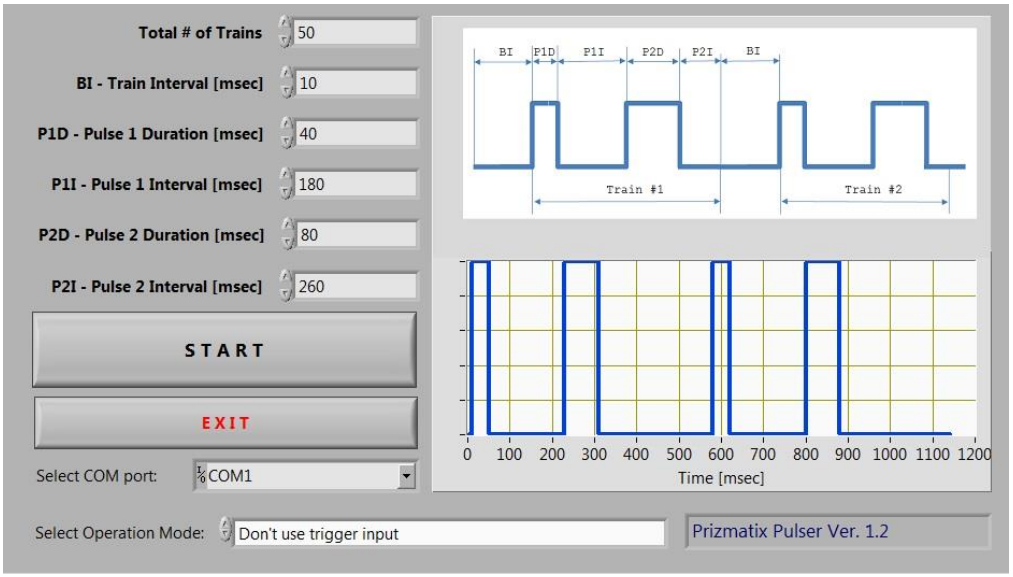
Prizmatix provides diverse fiber optics solutions for optogenetics in-vivo. Made of silica or polymer, these high NA fibers can be constructed to fit any research set-up with various combinations of connectors, ferrules, core diameters and lengths.
Examples include single stainless steel coverings of bare tipped fibers, or Y-shaped fibers for simultaneous stimulation of two hemispheres. For more details please see our website:
http://www.prizmatix.com/optogenetics/Fiberoptics-for-Optogenetics.htm

Optogenetics Implantable Cannulae:

Prizmatix Implantable Fiberoptic Cannulae / Ferrules allow direct light stimulation of certain deep brain regions in living animals. Each Cannula consists of a zirconia ferrule accommodating a high NA Silica/POF fiber, protruding from the zirconia ferrule at the specified length:
http://www.prizmatix.com/pdf/optogenetics/Optogenetics-Cannula.pdf

Pulser:

The Pulser device is an easy and inexpensive way to create trains of TTL pulses for Optogenetics activation directly from your computer via USB:
http://www.prizmatix.com/pdf/optogenetics/Pulser.pdf



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