# High-Speed Polarization Scrambler/Depolarizer

## 0.05 to 5MHz, 450 to 2200nm, <1dB optical loss, turn-key module

DATASHEET

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The NOPS Series High-Speed Polarization Scrambler is a non-mechanical, electro-optic device designed for ultra-fast polarization randomization with low optical loss and outstanding long-term reliability. It utilizes multiple electro-optic crystal rotators oriented at 45° intervals, each driven at a unique fixed frequency to achieve rapid, full-coverage scrambling across the Poincaré sphere. While a minimum of three rotators is theoretically sufficient, the use of four significantly enhances performance, extending the operating temperature range, wavelength coverage, and minimizing residual degree of polarization. Housed in a compact aluminum enclosure, the plug-and-play module requires no calibration—simply connect the fibers and apply 12 VDC using the included power adapter. The bidirectional design is thermally stabilized after a 10-minute warm-up and features integrated heat dissipation for consistent operation. The NOPS Series provides a robust, maintenance-free solution for applications demanding high-speed, reliable polarization scrambling.

## Features

- No Moving Parts
- Ultra-High Speed
- Low Loss
- High Reliability
- Bidirectional
- Space/Mill Qualification

## Applications

- Polarization Elimination
- Instruments

## Specifications

| Parameter | | Min | Typical | Max | Unit |
|---|---|---|---|---|---|
| Center Wavelength | | 780 | | 2400 | nm |
| Operating Wavelength Range | 3 Rotators | | 40 | | nm |
| | 4 Rotators | | 140 | | |
| | 6 Rotators | | 300 | | |
| Insertion Loss [1] | | | 0.8 | 1.8 | dB |
| Return Loss | | 45 | 50 | 55 | dB |
| Degree of Polarization [2] | 300kHz | | 3 | 4 | % |
| | 2MHz | | 4 | 5 | |
| | 5MHz | | 8 | 12 | |
| Three Rotator Frequencies | 300kHz | 70 | 210 | 300 | kHz |
| | 2MHz | 230 | 1100 | 2000 | |
| | 5MHz | 270 | 2200 | 5000 | |
| Optical Power Handling [3] | | 100 | | 500 | mW |
| Polarization Dependent Loss | | | 0.25 | 0.5 | dB |
| Operating Temperature[4] | | -5 | | 50 | ˚C |
| Storage Temperature | | -40 | | 85 | ˚C |
| Power Supply (DC) | | | 12 | | V |
| Power Consumption | | | 4 | | W |

**Notes**:

[1]. Without connectors. Each Connector adds 0.3dB. 0.8 dB is typical for 1550nm. 1.5dB is typical for 780nm

[2]. Tested using Agilent Polarimeter N7781 series with data rate 1MHz

[3]. 500mW for fiber Core >9 μm. 100mW for 750nm. High power version is available for special order

[4]. 3 plates version has temperature operation range from 10 to 35 °C. 4 plates version has the full operation range

**Note:** The specifications provided are for general applications with a cost-effective approach. If you need to narrow or expand the tolerance, coverage, limit, or qualifications, please [click this link]:



Rev 12/05/25

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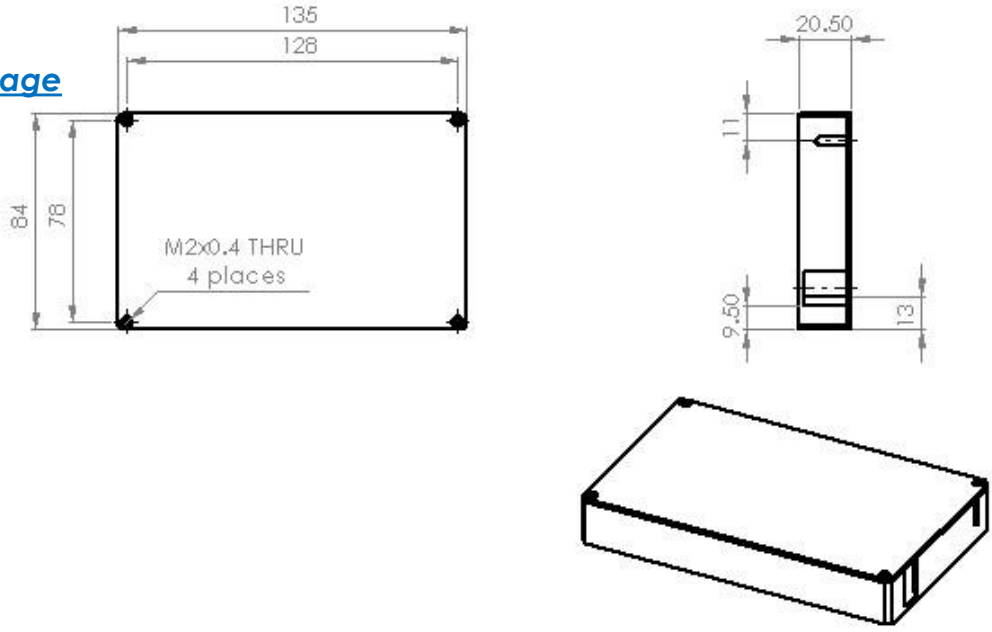
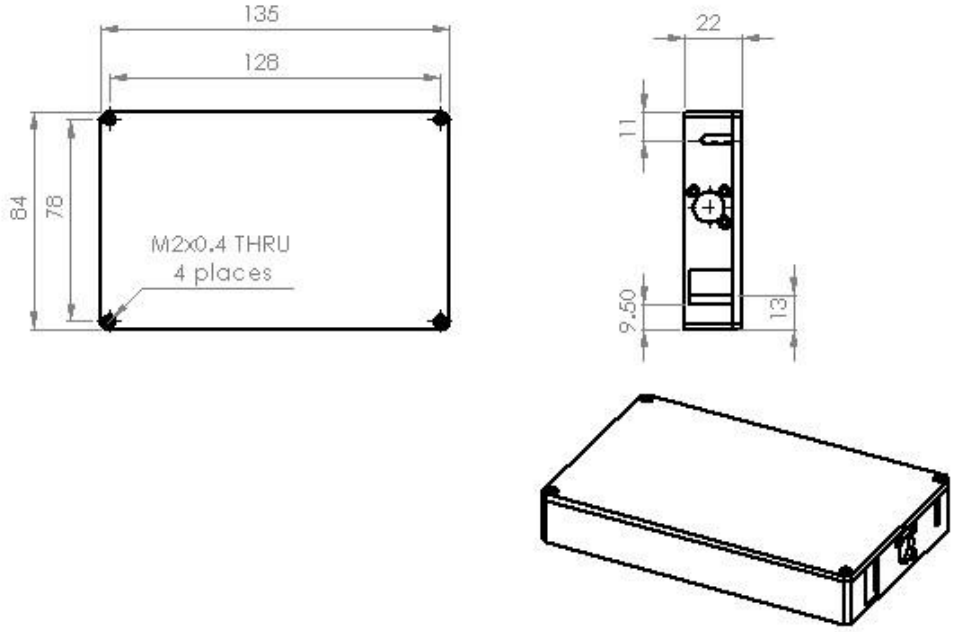
## Mechanical Dimensions (mm)

### < 3 Element 2MHz Package




### > 3 Eelment 2MHz Package

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## Ordering Information

| | ☐☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
|---|---|---|---|---|---|---|---|---|
| **Prefix** | **# Rotator** | **Wavelength** | **Max Frequency** | **Package** | **Fiber Type** | **Fiber Cover** | **Fiber Length** | **Connector** |
| **NOPS-** | 3 = 1N<br>4 = 4N<br>6 = 6N | 1550nm = 5<br>1310nm = 3<br>1060nm = 1<br>850nm = 8<br>750nm = 7<br>2000nm = 2<br>Special = 0 | 300kHz = 3<br>2MHz = 2<br>5MHz = 5<br>1kHz = A<br>500Hz = B | < 2MHz Package = 3<br>≥ 2MHz Package = 5<br>300kHz on PCB = P<br>300kHz 1W = A<br>2MHz 1W = B<br>5MHz 1W = C | SMF-28 = 1<br>H1060 = 2<br>Special = 0 | 0.9mm tube = 3<br>Bare = 1<br>Special = 0 | 0.25m = 1<br>0.5m = 2<br>1.0m = 3<br>Special = 0 | FC/PC = 2<br>FC/APC = 3<br>LC/PC = 7<br>LC/APC = 9<br>LC/UPC = U<br>Special = 0 |

Red color for special order

**Fiber Core Alignment**
Note that the minimum attenuation for these devices depends on excellent core-to-core alignment when the connectors are mated. This is crucial for shorter wavelengths with smaller fiber core diameters that can increase the loss of many decibels above the specification if they are not perfectly aligned. Different vendors' connectors may not mate well with each other, especially for angled APC.

**Fiber Cleanliness**
Fibers with smaller core diameters (<5 μm) must be kept extremely clean, contamination at fiber-fiber interfaces, combined with the high optical power density, can lead to significant optical damage. This type of damage usually requires re-polishing or replacement of the connector.

**Maximum Optical Input Power**
Due to their small fiber core diameters for short wavelength and high photon energies, the damage thresholds for device is substantially reduced than the common 1550nm fiber. To avoid damage to the exposed fiber end faces and internal components, the optical input power should never exceed 20 mW for wavelengths shorter 650nm. We produce a special version to increase the how handling by expanding the core side at the fiber ends.

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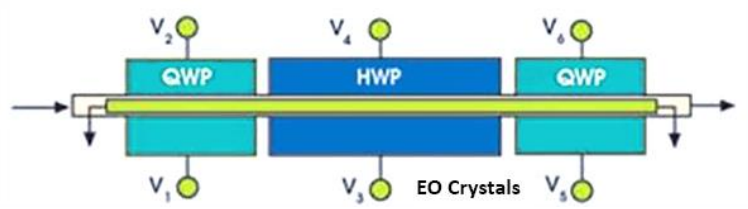
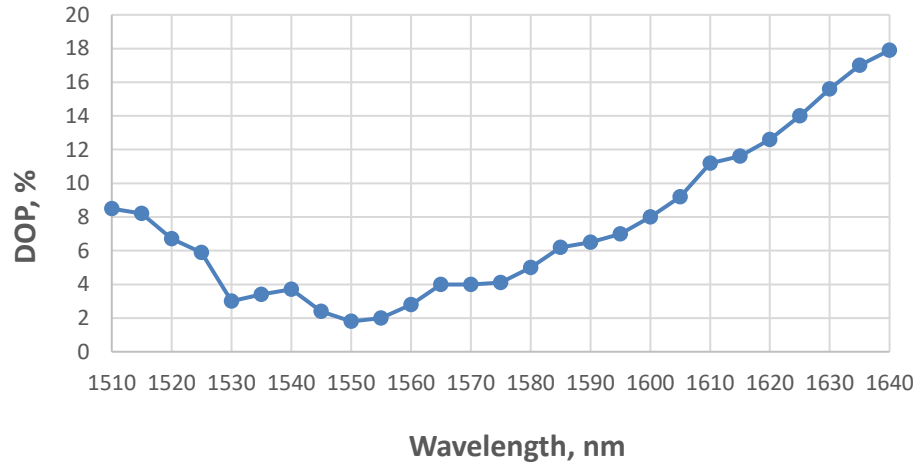
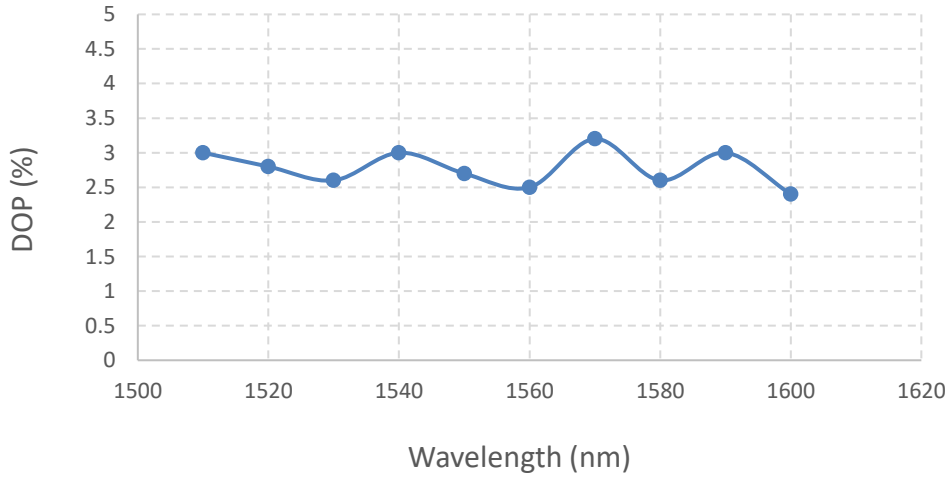
## Function Diagram




## Typical DOP vs Wavelength (3 element 300K scrambler set at 1550nm)




## Typical DOP vs Wavelength (4 element 300K scrambler set at 1550nm)

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