General Photonics

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Pigtailed Polarisation Controller

Polarite 1

- Low Loss
- Low backreflection
- Compact
- Easy to connect
- Low cost
- Insensitive to wavelength variations
- Works with fibres of any size

Applications:
- High speed telecommunication systems
- WDM systems
- CATV systems
- Fibre lasers
- Fibre sensor systems
- PM fibre systems
- Antenna remoting systems

This version of PolaRITE™ is conveniently pigtailed with or without connectors. It can be spliced to other components with a minimum loss and is ideal for controlling the polarisation state of light in any single mode fibre optic systems.

Specifications

| Intrinsic Insertion Loss | < 0.05 dB |
| Return Loss | > 65 dB |
| Operating Wavelength | 480 nm, 633 nm, 780 nm, 820 nm, 980 nm, 1060 nm, 1260 ~ 1650 nm |
| Extinction Ratio | > 40 dB |
| Operating Temperature | -40 ~ 85 °C |
| Storage Temperature | -40 ~ 85 °C |
| Dimensions | 1.00" x 1.09" x 4.00" (W x H x L) |

Dimensions (Inch)

Ordering Information

PLC - 00 - [Connector Type] [Fibre Core Size]
1 = 250µm jacket
2 = 900µm jacket
PC-PC, PC/APC 1 = 3.7µm
SC-PC, SC/APC 2 = 4.6µm
OM Ni = No Connectors
Others Specify
4 = 6.0µm
5 = 7.0µm
6 = 7.7µm
7 = 9.0µm

Applications:
- High speed telecommunication systems
- WDM systems
- CATV systems
- Fibre lasers
- Fibre sensor systems
- PM fibre systems
- Antenna remoting systems

Drop in Polarisation Controller

Polarite 1

- Low Loss
- Low backreflection
- Compact
- Easy to connect
- Low cost
- Insensitive to wavelength variations
- Works with fibres of any size

Applications:
- High speed telecommunication systems
- WDM systems
- CATV systems
- Fibre lasers
- Fibre sensor systems
- PM fibre systems
- Antenna remoting systems

This is the in-line version of PolaRITE™. It can be inserted into a fibre optic system to control the polarisation state of light without having to disconnect any part of the system. It can be used by simply inserting a length of fibre into the slot located on top of the device. The miniature version can be inserted in even tighter spaces in a fibre optical module.

Specifications

| Intrinsic Insertion Loss | < 0.05 dB |
| Return Loss | > 65 dB |
| Operating Wavelength | 480 nm, 633 nm, 780 nm, 820 nm, 980 nm, 1060 nm, 1260 ~ 1650 nm |
| Extinction Ratio | > 40 dB |
| Operating Temperature | -40 ~ 85 °C |
| Storage Temperature | -40 ~ 85 °C |
| Dimensions | 1.00" x 1.09" x 3.00" (W x H x L) |

Dimensions (Inch)

Ordering Information

PLC - 00 - [Connector Type] [Fibre Core Size]
1 = 250µm jacket
2 = 900µm jacket
PC-PC, PC/APC 1 = 3.7µm
SC-PC, SC/APC 2 = 4.6µm
OM Ni = No Connectors
Others Specify
3 = Lab. Version
S = Fibre Clamp with Screws
6 = Miniature Version
M = Fibre Clamp with Magnets
90 = 900µm jacket
* PLC-006 has no 900µm jacket option

Applications:
- High speed telecommunication systems
- WDM systems
- CATV systems
- Fibre lasers
- Fibre sensor systems
- PM fibre systems
- Antenna remoting systems

Dimensions (Inch)
**Connectorised Polarisation Controller**

**Polarite 1**

- Low Loss
- Low backreflection
- Compact
- Easy to connect
- Low cost
- Insensitive to wavelength variations
- Works with fibres of any size

This is a fully connectorised polarisation controller that comes with either male (PLC-005) or female (PLC-004) connectors, thus eliminating the headaches of fibre pigtails. Customers can use the bulkhead connectors of their own choice. Although the unit comes with FC type connectors, it can interface with ST and SC type connectors with industry standard FC/ST or FC/SC adaptors. The device is especially suitable for inter-connecting polarisation maintaining (PM) fibres using standard connectors without having to align the birefringent axes of the PM fibres. The improved design includes scales for easy replication of earlier settings, a feature highly desirable in laboratories for repeating polarisation adjustments.

**Dimensions (Inch)**

- **Ordering Information**
  - **PLC - 00 - XX -**
    - **Connector Type:**
      - Female Connectors: FC/PC, FC/APC
      - Male Connectors: FC/PC, FC/APC
    - **Fibre Core Size:**
      - 1 = 3.7µm
      - 2 = 4.8µm
      - 3 = 5.6µm
      - 4 = 6.0µm
      - 5 = 7.0µm
      - 6 = 7.7µm
      - 7 = 9.0µm

**Specifications**

- **Insertion Loss:** < 0.5dB with connectors
- **Return Loss:** > 55dB for APC connectors, > 45dB for FC connectors
- **Operating Wavelength:** 480nm, 633nm, 780nm, 820nm, 980nm, 1060nm, 1260 ~ 1650nm
- **Extinction Ratio:** > 40dB
- **Operating Temperature:** -40 ~ 85°C
- **Storage Temperature:** -40 ~ 85°C
- **Dimensions:** 1.00” x 1.09” x 4.00” (W x H x L)

**Dynamic Polarisation Controller / Scrambler, No Tail**

**Polarite 2**

- No intrinsic insertion loss
- No intrinsic back reflection
- Works with any wavelengths
- Works with any single mode optic fibres
- Compact, ideal for integration in modules
- Fast response time

**Applications:**

- PMD (polarisation mode dispersion) compensation
- PMD emulation
- PDL (polarisation dependent loss) measurement
- Automatic polarisation stabilisation for E/O modulator & interferometers
- Reduction of EDFA’s polarisation dependent gain
- Improvement of signal-to-noise ratio in long haul transmission systems
- Output stabilisation in fibre laser systems

General Photonics’ all fibre dynamic polarisation controller is specially designed for original equipment manufacturers (OEM) for integration into their fibre optic network modules and test equipment. The all fibre construction practically eliminates all insertion loss and back reflection. The device can be used as a fast electronic-driven polarisation controller to convert any input polarisation into any desired polarisation or as a polarisation scrambler to randomise the output polarisation state. The low insertion loss, low back reflection, low cost, compact size, and fast response time are just few desirable features the device has. The NoTail Polarite™ has two FC/PC or FC/APC male connectors directly mounted on the package. This attractive feature allows direct connection with PM fibres to eliminate polarisation fluctuations. Although the unit comes with FC type connectors, it can interface with ST and SC type connectors with industry standard FC/ST or FC/SC adaptors.

**Dimensions (Inch)**

- **Ordering Information**
  - **PCS - 3XN**
  - **Connector Type:**
    - 4 = 4 Actuators: FC/PC, FC/APC
  - **Fibre Core Size:**
    - 1 = 3.7µm
    - 2 = 4.8µm
    - 3 = 5.6µm
    - 4 = 6.0µm
    - 5 = 7.0µm
    - 6 = 7.7µm
    - 7 = 9.0µm
  - **Controller Type:**
    - a = Controller
    - s = Scrambler

**Specifications**

- **Intrinsic Insertion Loss:** 0.05dB
- **Return Loss:** > 65dB
- **Wavelength:** 1260 ~ 1650nm standard, others specify
- **Rise and Fall Time:** Rise time: 30µs max. Fall time: 30µs max.
- **3dB Bandwidth:** 20kHz min.
- **Rise and Fall Time:** Rise time: 30µs max. Fall time: 30µs max.
- **Max. Activation Loss (3 axes together):**
  - 0.01dB (P grade), 0.03dB (A grade) with 0~150VDC applied to all axes
  - 0.05ps
  - 25 ~ 80°C
- **Connector Type:** FC / PC or FC / APC
- **Electrical Interface:** 8 pin (25 mil. square) with 100 mil pitch connector
- **Dimensions:** 0.91” x 0.88” x 3.02” (3 axes), 0.91” x 0.75” x 3.12” (4 axes)
- **Maximum Applied Voltage:** 150 volts

(Values are referenced without connectors)
Dynamic Polarisation Controller / Scrambler, Standard

Polarite 2

- No intrinsic insertion loss
- No intrinsic back reflection
- Works with any wavelengths
- Works with any single mode optical fibres
- Compact, ideal for integration in modules
- Fast response time

Applications:
- PMD (polarisation mode dispersion) compensation:
- Polarisation stabilisation:
- Polarisation demultiplexing:
- Coherent communications:
- PMD emulation
- PDL (polarisation dependent loss) measurement
- PDL elimination in optical instruments, such as optical spectrum analysers
- Automatic polarisation stabilisation for E/O modulator & interferometers
- Reduction of EDFA’s polarisation dependent gain
- Improvement of signal-to-noise ratio in long haul transmission systems
- Output stabilisation in fibre laser systems

General Photonics’ all fibre dynamic polarisation controller (patented) is specially designed for original equipment manufacturers (OEM) for integration into their fibre optic network modules and test equipment. The all fibre construction practically eliminates all insertion loss and back reflection. The device can be used as a fast electronic-driven polarisation controller to convert any input polarisation into any desired polarisation or as a polarisation scrambler to randomise the output polarisation state. Low insertion loss, low back reflection, low cost, compact size, and fast response time are just a few desirable features the device has.

Specifications

<table>
<thead>
<tr>
<th>Intrinsic Insertion Loss</th>
<th>0.05dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return Loss</td>
<td>&gt; 65dB</td>
</tr>
<tr>
<td>Wavelength</td>
<td>1260 - 1650nm standard, others specify</td>
</tr>
<tr>
<td>Rise and Fall Time</td>
<td>Rise time: 30μs max. Fall time: 30μs max.</td>
</tr>
<tr>
<td>3dB Bandwidth</td>
<td>20kHz min.</td>
</tr>
<tr>
<td>Scrambling Frequencies (@23°C)</td>
<td>60, 100, 130kHz (Consult data sheet for the accurate scrambling frequencies of each unit)</td>
</tr>
<tr>
<td>Vns at Scrambling Frequencies (@23°C and 1500nm)</td>
<td>7 volts max. at 60kHz, 6 volts max. at 100kHz, 3.6 volts max. at 130kHz</td>
</tr>
<tr>
<td>Max. Activation Loss (3 axes together)</td>
<td>0.01dB (P grade), 0.02dB (A grade) with 0 ~ 150 VDC applied to all axes</td>
</tr>
<tr>
<td>Polarisation Mode Dispersion</td>
<td>0.05ps</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-25 ~ 80°C</td>
</tr>
<tr>
<td>Fibre Pigtail</td>
<td>9125μm singlemode fibre standard, others specify</td>
</tr>
<tr>
<td>Electrical Interface</td>
<td>8 pin (25 mil. square) with 100 mil. pitch connector</td>
</tr>
<tr>
<td>Dimensions</td>
<td></td>
</tr>
<tr>
<td>Maximum Applied Voltage</td>
<td>150 volts</td>
</tr>
</tbody>
</table>

Ordering Information

<table>
<thead>
<tr>
<th>PCS</th>
<th>X</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 = 3 Actuators</td>
<td>Connector Type:</td>
<td>Fibre Core Size:</td>
<td>C = Controller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 = 4 Actuators</td>
<td>FC/PC, SC/PC, SC/APC</td>
<td>1 = 3.7μm</td>
<td>S = Scrambler</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Or NC = No Connectors</td>
<td>2 = 4.6μm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others Specify</td>
<td>3 = 5.6μm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 = 6.0μm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 = 7.0μm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 = 7.7μm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7 = 9.0μm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Typical Performance Data

- Figure 1. Histogram of DC Vπ. In most cases DC Vπ is less than 30 Volts.
- Figure 2. Histogram of activation loss. In most cases, activation loss is less than 0.01dB.
- Figure 3. DC Vπ as function of operating temperature.
- Figure 4. Insertion loss vs. wavelength.
Polarisation Controllers & Drive Electronics

Dynamic Polarisation Controller / Scrambler, Mini

Polarite 3

- No intrinsic insertion loss
- No intrinsic back reflection
- Fast response
- Compact size

Applications:
- PMD compensation
- Polarisation stabilisation
- Polarisation demultiplexing
- Fibre sensor
- Fibre Laser
- Testing equipment

In response to customers' request of low profile polarisation controllers for system integration, General Photonics made a special effort in designing this third generation polarisation controller, PolaRITE III, with significantly reduced height and size. The height reduction is especially important for the device to be integrated in test equipment, fibre sensor, fibre laser and optical network modules. With a special athermal design, the temperature stability is also significantly improved over our early version PolaRITE II. Just like its siblings, PolaRITE III eliminates practically all insertion loss and backreflection with its unique all fibre construction. Combined with General Photonics’ miniature piezo driver card, it can be controlled either by a digital or analog signal to obtain any desired polarisation output from an arbitrary input polarisation state.

Intrinsic Insertion Loss | 0.05 dB
Return Loss | > 65 dB
Operation Wavelength | 1260 ~ 1650 nm standard, others specify
Rise and Fall Time | 30 µs max.
Activation Loss | 0.01 dB max.
Polarisation Mode Dispersion | 0.05 ps
Vx at DC (@23 °C) | 35 volts max. at 1550nm
Operation Temperature | -25 °C ~ 80 °C
Storage Temperature | -40°C to 85°C
Fibre Pigtail | 9/125 µm single mode fibre standard, others specify
Dimensions | 2.58” (L) x 0.80” (W) x 0.63” (H) (3 axes)
| 3.25” (L) x 0.80” (W) x 0.63” (H) (4 axes)
Electrical Interface | 8 pin 100 mil. pitch connector
Maximum Applied Voltage | 150 volts

Ordering Information

MPC - - - -

3X = 3 Channel FC/PC, FC/APC
4X = 4 Channel or NC = No Connectors
Fibre Core Size:

1 = 3.7µm
2 = 4.6µm
3 = 5.6µm
4 = 6.0µm
5 = 7.0µm
6 = 7.7µm
7 = 9.0µm
Miniature Multi-Channel Piezo Driver Card

**MPD-001**

- No high voltage supply needed
- Fast response & Low noise
- Both analog & digital control options
- 12-bit TTL control resolution
- Compact size

**Applications:**
- Piezo based polarisation controllers
- Piezo based phase shifters
- Piezo based actuators
- High resolution translation stage
- Remote positioning

General Photonics' miniature piezo driver card is a precision, low-noise, low-drift, high-voltage controller designed specifically for piezo actuators. It is capable of supporting 4-channel piezo driving voltages up to 140 volts each. No high voltage power supply is required, thanks to the on-board HV DC/DC converters. For conveniences, the card can be configured to accept a ±12 volt power supply or an optional external 160-volt power supply (PWR-002 recommended). The output voltage of each channel can be controlled either with an input analog signal or a 12-bit TTL signal. For the analog control, the board simply acts as a 4-channel voltage amplifier with 30V/V amplification.

### Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board Dimensions</td>
<td>100mm (W) x 100mm (L) x 20mm (H)</td>
</tr>
<tr>
<td>External Analog Input</td>
<td>10pin</td>
</tr>
<tr>
<td>External Digital Input</td>
<td>20pin</td>
</tr>
<tr>
<td>Number of Channels</td>
<td>Up to 4</td>
</tr>
<tr>
<td>Max. Output Voltage</td>
<td>140 V</td>
</tr>
<tr>
<td>Max. Output Current</td>
<td>60 mA/channel all channels (continuous)</td>
</tr>
<tr>
<td>Max. Analog Control Voltage</td>
<td>5 V</td>
</tr>
<tr>
<td>Analog Input Gain</td>
<td>30 V/V ± 1%</td>
</tr>
<tr>
<td>Digital Control Resolution</td>
<td>12-bit</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>&gt; 20 kΩ</td>
</tr>
<tr>
<td>Output Impedance</td>
<td>50 Ω</td>
</tr>
<tr>
<td>Noise</td>
<td>&lt; 40 mV (RMS)²</td>
</tr>
<tr>
<td>-3db Bandwidth</td>
<td>16 kHz²</td>
</tr>
<tr>
<td>Power Supply</td>
<td>+12 VDC/1.2A, -12 VDC/0.1A or external PWR-002²</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0°C to 40°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20°C to 60°C</td>
</tr>
</tbody>
</table>

Note: 1. When an external high voltage supply with sufficiently high power is used, 20 mA / channel can be increased to 60mA/channel. Contact General Photonics for details.
2. Measured with 0.1% loading and output voltage of 140 V
3. Measured at 140 V output without loading
4. If PWR-002 is selected, the on-board DC-DC converters will be removed.

### Ordering Information

#### Pigtail Model:

- **PCD - 002 - 1 X - - - - - -**

#### NoTail™ Model:

- **PCD - 002 - 4 X - - - - - -**

#### Ordering Information - Pigtail Model:

- **PCD-002**

General Photonics' all fibre dynamic polarisation controller module (patented) integrates a PCS-4X(3X) polarisation controller with a PCD-002 drive card. The drive card has 4 inputs to accept 4 control signals of 0 ~ 10V to drive the PCS-4X(3X) polarisation controller. To operate the polarisation controller to its maximum range, a power supply of 150V is required. However, lower voltage power supply may also be used. For example, a power supply of 72V can provide a maximum driving voltage of 67V (72V-5V). This 67V voltage can induce more than 2π retardation for each fibre squeezer and is sufficient for most polarisation control purposes. In general, the maximum driving voltage from the card is 5 volts lower than power supply voltage.

### Driver Card for Polarise 2

#### Specifications

- **Electrical Characteristics**
  - Number of PZT Channels: 4
  - EXT. Input Voltage Range: 0 ~ 10 volts
  - EXT. Input Resistance: 20kΩ
  - Output Impedance: 50Ω
  - Rise Time: 15µs @ 10 Vp-p
  - Output Voltage Range: 0 ~ 150 volts VDC ± 1%
  - EXT. Input Gain: 15 V/V ±1%
  - Noise: <40mV (rms)
  - -3db Bandwidth: 40kHz
  - Operating Temperature: 0 ~ 40°C
  - Storage Temperature: -20 ~ 60°C

- **Physical Features**
  - Dimensions: 4.5” (W) x 5.4” (D) x 1.0” (H)
  - EXT. Input Connectors: 8 pin (25 mil. square) with 100 mil. pitch connector
  - Input Power Supply: 160V, 250mA VDC and ± 15V, 200mA VDC

- **Maximum Ratings**
  - Max. Output Current: 60mA per Channel (Continuous)
  - 120mA per Channel (Peak)
  - Max. EXT. Input Voltage: 10 VDC

1. The noise was measured with the output set to 150V and an output capacitance of 0.18 µF (capacitance of PolaRITE II’s piezo actuator). It may decrease with higher output capacitance and increase with no output capacitance. Note: The bandwidth was measured at 150V output without load. Any piezo added to the output may decrease the bandwidth.

### Order Information

- **PCD-002**

Note: 1. The noise was measured with the output set to 150V and an output capacitance of 0.18 µF (capacitance of PolaRITE II’s piezo actuator). It may decrease with higher output capacitance and increase with no output capacitance. 2. The bandwidth was measured at 150V output without load. Any piezo added to the output may decrease the bandwidth.
Integrated Polarite 2/3 with Miniature Piezo Driver Card

**PCD-M02**

- **Unique Features:**
  - No insertion loss
  - Low activation loss
  - Compact size
  - Fast response
  - Digital and analog control

- **Applications:**
  - Polarisation control
  - Polarisation scrambling
  - PDL measurement
  - PMD compensation / emulation
  - Fibre sensor

This module integrates a General Photonics' all fibre dynamic polarisation controller module with a MPD-001 miniature piezo driver card so that the SOP of the signal can be directly controlled either by a 0 to 5V analog control signal or a 12-bit TTL digital control signal. No high voltage power supply is required, thanks to an on board HV DC/DC converter. For conveniences, the card can be configured to accept either a ±12 volt power supply or an optional external 160-volt power supply (PWR-002 recommended). When working as polarisation controller, the module can convert any input polarisation states to any desired output polarisation states. While as scrambler, it can randomise the output polarisation state. The low insertion loss, low back reflection, and low activation loss of the module are important features for test and measurement applications, while the compact size is ideal for the system integration or handheld devices.

### Preliminary Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board Dimensions</td>
<td>100mm x 100mm</td>
</tr>
<tr>
<td>External Analog Input</td>
<td>10pin</td>
</tr>
<tr>
<td>External Digital Input</td>
<td>20pin</td>
</tr>
<tr>
<td>Number of Channels</td>
<td>3 or 4</td>
</tr>
<tr>
<td>Max. Output Voltage</td>
<td>140V</td>
</tr>
<tr>
<td>Max. Output Current</td>
<td>20 mA/channel</td>
</tr>
<tr>
<td>Max. Analog Control Voltage</td>
<td>5V</td>
</tr>
<tr>
<td>Analog Input Gain</td>
<td>30 V/V ± 1%</td>
</tr>
<tr>
<td>Digital Control Resolution</td>
<td>12 Bits</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>&gt; 20kΩ</td>
</tr>
<tr>
<td>Output Impedance</td>
<td>50 Ω</td>
</tr>
<tr>
<td>Noise</td>
<td>&lt; 40 mV (RMS)2</td>
</tr>
<tr>
<td>Response Time</td>
<td>&lt; 40 µs rise and fall time with 15 V output</td>
</tr>
<tr>
<td>Power Supply</td>
<td>+12 VDC/12A, -12VDC/1A or external PWR-002</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0°C to 60°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20°C to 60°C</td>
</tr>
</tbody>
</table>

Note: 1. When an external high voltage supply with sufficiently high power is used, 20 mA/ channel can be increased to 60mA/Channel. Contact General Photonics for details. 2. Measured with PolarRTE 12/16 loading and output voltage of 140 V. 3. PWR-002 is selected to be used only with DC/DC converters will be removed. PWR-002 comes with ±12 VDC and 160 VDC. Other 160 VDC power supply may also be used. Contact General Photonics for details.

### Ordering Information

- **PCD - M02**
  - 3X = 3 Channel
  - 4X = 4 Channel
  - NC = No Connectors

- **PCD - M03**
  - 13 = 1310nm
  - 15 = 1550nm
  - 98 = 980nm
  - NC = No Connectors

### Polarisations Scrambler Module

**PolaMix**

- **No insertion loss**
- **No back reflection**
- **Low residual phase**
- **Low power consumption**
- **PDG (polarisation dependent gain) mitigation**
- **Polarisation sensitivity elimination**
- **Facilitating PMD emulation**
- **Facilitating PMD compensation**
- **Facilitating PDL measurement**

General Photonics' Polarisation Scrambler Module uses a breakthrough all fibre technology to effectively randomise polarisation states. Depolarising by polarisation scrambling has many important applications. Scrambling input polarisation can remove the measurement uncertainties caused by testing device polarisation sensitivity. The performance degradation due to polarisation-dependent-gain (PDG) induced in optical amplifiers can be suppressed by scrambling the State of Polarisation (SOP). Polarisation scrambling can also be used in systems to facilitate and simplify PMD monitoring. Based on a patented and awarding all fibre technology, PCD-003 delivers superior performance such as extremely low insertion loss and back reflection, extremely low residual phase and amplitude modulation. The total power consumption is less than 10W typical.

### Specifications:

- **Insertion Loss**: < 0.05 dB
- **Centre Operating Wavelength**: 980 nm, 1310 nm, 1550 nm, other specify
- **Operating Wavelength Range**: > 100 nm
- **Output Degree of Polarisation**: < 5%
- **Average PMD**: < 0.05 ps
- **Intrinsic PDL**: < 0.05 dB, 0.01 dB typical
- **Return Loss**: > 65 dB
- **Optical Power Handling**: > 1000 mW
- **Residual Amplitude Modulation**: < 0.01 dB
- **Residual Phase Modulation**: < 0.1 px
- **Power Supply**: ±12 VDC/1A to ±15 VDC/1A
- **Power Consumption**: 10 W typical
- **Scrambling Frequencies**: Factory set 4 fixed frequencies, distributed between DC to > 700 kHz
- **Operating Temperature**: -10 ~ 40 °C
- **Storage Temperature**: -10 ~ 50 °C
- **Board Dimensions**: 100 x 100 x 20 mm (L x W x H)

Note: 1. Centre Wavelength ± 50 nm 2. At 500 Hz detection bandwidth 3. Measured from a photodetector at PCD-003 output using a spectrum analyser. A polariser is placed in front of the photodetector to convert polarisation modulation to amplitude modulation.
Polarisation Scrambler Module with Microprocessor Controller

- No insertion loss and no back reflection
- Low residual phase and amplitude modulation
- Build in RS 232 port
- Remote operation wavelength control

Applications:
- PDG (polarisation dependent gain) mitigation
- Facilitating PMD compensation
- Facilitating PDL measurement
- Polarisation sensitivity elimination

General Photonics’ Polarisation Scrambler plug-in module uses a breakthrough all-fibre technology to effectively randomise polarisation states. The module is designed to be easily plugged into a network equipment or measurement instrument with a minimum development. PCD-004 integrates a microprocessor-based communication and control board on a PCD-003 scrambler board to allow the module to be remotely controlled via RS232. In particular, a control computer or microprocessor can be used to turn the module on/off, or change the operation wave-length of the module for optimum performance. There are also on-board buttons to locally change the operation wavelength or disable/enable the scrambler board. Otherwise, the performance of PCD-004 is identical to that of PCD-003. The module can be operated alone with required DC power supply, or be plugged into the PolaMAX™ polarisation management platform for easy evaluation or operation.

Ordering Information

PCD - 004 -

01 = 1260 - 1650 nm
02 = 970 - 1300 nm
SC/PC, SC/APC
Or NC = No Connectors

Accessories:
ADB-001 Communication Interface Board

Specifications

- Insertion Loss
- Centre Operating Wavelength
- Operating Wavelength Range
- Average PMD
- Intrinsic PDL
- Optical Power Handling
- Residual Amplitude Modulation
- Residual Phase Modulation
- Power Supply
- Power Consumption
- Scrambling Frequencies
- Operating Temperature
- Storage Temperature

Minimum Specifications

- 3” (L) x 4” (W) x 0.8” (H)
- FC/PC, FC/APC, SC/PC or SC/APC
- SC/PC, SC/APC
- Of NC = No Connectors

Note:
1. Centre Wavelength ± 150 nm.
2. Per 1000-point average.

• Polarisation sensitivity elimination
• Facilitating PDL measurement
• PMD monitoring for PMD compensation
• Facilitating PDL measurement

Miniature Polarisation Scrambler Card

PSM-001

- No insertion loss & No back reflection
- Low residual phase and amplitude
- Scrambling frequencies selectable
- Low power consumption
- Small size (3” x 4”)

Applications:
- Hand held and field instruments
- Polarisation sensitivity elimination
- Facilitating PMD emulation
- PMD monitoring for PMD compensation
- Facilitating PDL measurement

General Photonics’ miniature polarisation scrambler module is designed specifically for hand held and field instruments. It uses fibre squeezer technology to effectively randomise polarisation states. Unlike PCD-003 and PCD-004, the scrambling rate of this miniature scrambler is user selectable from a few hertz to tens of kilohertz via a push-button switch. Its low power consumption, as low as half watts, enables the module to be powered by batteries. Its miniature size (3”x4”x0.8”) makes it easy to be integrated in tight spaces typical in handheld instruments. Finally, the scrambler has a superb scrambling uniformity enabled by an on board microprocessor and proprietary codes.

Ordering Information

PSM - 001 -

01 = 1260 - 1650 nm
02 = 970 - 1300 nm
FC/PC, FC/APC, SC/PC, SC/APC
Or NC = No Connectors

Preliminary Specifications

- Board Dimensions: 3” (L) x 4” (W) x 0.8” (H)
- Fibre Input Connector: FC/PC, FC/APC, SC/PC or SC/APC
- Fibre Output Connector: FC/PC, FC/APC, SC/PC or SC/APC
- Insertion Loss: < 0.05 dB (without connectors)
- < 0.6 dB (with connectors)
- Operating Wavelengths: 1260 to 1650 nm and 970-1300 nm standard
- Operating Wavelength Range: > 300 nm
- Average PMD: < 0.05 ps
- Intrinsic PDL: < 0.05 dB
- Optical Return Loss: > 65 dB (without connectors)
- Optical Power Handling: > 1000 mW
- Power Supply: 5.0 to 5.5 V/3W max.
- Power Consumption: 0.5 to 3 watts, depending on the scrambling rate
- Scrambling Frequencies: User selectable: 10, 20, 50, 100, 200, 500, 1k, 3k, 5k, 10k, 12k, and 12.5 kHz
- Operating Temperature: 10 °C to 65 °C
- Storage Temperature: +10 °C to 65 °C

Note: 1. Centre wavelength ± 50 nm.
2. Per 1000-point average.
Fibre Phase Shifter

Specifications:
- Insertion Loss: < 0.1dB
- Return Loss: > 65dB
- Total Phase Shifter (0 ~ 20kHz): 8π ~ 15π
- Half-wave Voltage (0 ~ 20kHz): 10 volts ~ 20 volts
- Operating Wavelength: 970 ~ 1650nm
- PDL: < 0.05dB
- Residual Amplitude Modulation: ± 0.01dB
- Operating Temperature: 0 ~ 50°C
- Storage Temperature: -40 ~ 85°C
- Max. Applied Voltage: 150 volts

Dimensions (in mm):
- 35.00 x 13.87 x 12.00
- 85.50 x 17.50

Dynamic Polarisation Switch

Specifications:
- Fast speed
- No moving parts
- Low insertion loss
- Compact size

Applications:
- Polarisation diversified detectors and sensors
- Polarisation multiplexing
- Polarisation metrology
- Polarisation modulator
- Coherent communication
- PMD monitoring

General Photonics’ all solid-state polarisation switch can quickly and repeatably rotate the incoming SOP via a fixed angle, either at 45 or 90 degrees. Both single mode and PM fibre pigtailed versions are available. With the PM option, the device functions as a TE to TM converter to switch the SOP between being aligned with the slow and the fast axes of the PM fibre, or between the slow axis and 45 degrees from the slow axis. With SM option, the device simply rotates the polarisation ellipse either 45 or 90 degrees. The device can be used for PMD monitoring, polarisation modulation, polarisation detection, and polarisation metrology.

Preliminary Specifications:
- Operating Wavelength: 1550 ± 30 nm
- Polarisation Rotation (at 1550nm, 23°C): 45° ± 0.5° or 90° ± 0.5°
- Polarisation Rotation (all wavelength, all temp.): 45° ± 5° or 90° ± 5°
- Insertion Loss: < 0.5 dB
- Return Loss: > 55 dB
- Switching Current: < 130 mA
- Switching Voltage: 3.5 ~ 5 V
- Latching Current: ~ 80 mA
- Latching Voltage: 2 ~ 3 V
- Switching Time: 100 µs typical
- Extinction Ratio: > 18 dB for PM model
- Dimensions: 35.0 (L) x 17.5 (W) x 13.5 (H) mm
- Operation Temperature: 0°C to 50°C
- Storage Temperature: -40°C to 85°C
- Fibre Type: Fujikura PM Panda, Corning SMF-28 or compatible

Ordering Information:
- FPS - 001 - [Connector Type] - [Fibre Type] - [Polarisation Rotation]
- PSW - 001 - [Polarisation Rotation] - [Fibre Type] - [Connectors]

(values are referenced without connectors)

For more information on Laser 2000 products visit our website at: www.laser2000.co.uk

Telephone: 01933 461 666 • Fax: 01933 461 699 • e-mail: sales@laser2000.co.uk • website: www.laser2000.co.uk
Endless Polarisation Stabiliser

PolaStay

- Reset free operation
- 2ms recovery time
- 16 /s tracking speed
- Plug and play

Applications:
- Elimination of polarisation fading
- Coherent communication
- Optical amplifier noise reduction
- Polarisation demultiplexing

PolaStay TM polarisation stabiliser actively maintains a stable output state of polarisation (SOP) against a rapid input SOP fluctuation as fast as 2ms and tracks against an endless rotating input SOP up to 16 /s without reset. This unique product is a complete system consisting of General Photonics’ polarisation controller, in-line polarisation monitor, and proprietary algorithm. The output of the product can either be of single mode fibre or PM fibre with output polarisation aligned to its slow axis. With a polariser placed at the output end, the maximum power fluctuation caused by the input polarisation fluctuation is less than 0.1dB. The module can be used to suppress noise figure in optical amplifiers, reduce PDL effects, demultiplex polarisation division multiplexed channels, and eliminate polarisation fading in coherent communication and fibre sensor systems.

Ordering Information:
POS-103

Typical Performance Data:
(Ch 1 is EXT. input, Ch 2 is output)

PCD-001

PCD-001 is a precision, low noise, low drift, high-voltage 3-channel driver for piezo actuators. The instrument provides both manual and electronic control of the piezo drive voltages, and is an ideal driver for use with General Photonics’ polarisation controllers and scramblers. Other applications include remote alignment of single-mode fibre couplers, high-resolution translation, microscopy, remote positioning, etc. Each of the three piezo drive voltages can be controlled independently. Precision 10-turn potentiometers on the front panel allow for precise manual setting of the outputs over the full operating range. This allows hands-off control of the piezo translators to take full advantage of the inherently high resolution of the piezo element. The driver voltage can also be controlled externally by applying an analog voltage (from 0 to 10V) to the front panel BNC inputs or to rear panel male DB9 connector, or remotely controlled by a computer RS-232 interface. This voltage is multiplied by a gain of 15V and summed with the manual control voltage.

Ordering Information:
PCD - 001
(Please specify the power supply type: 115 VAC 50 ~ 60 Hz or 230 VAC 50 ~ 60 Hz)

Specifications

Electrical Characteristics

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of PZT Channels</td>
<td>3</td>
</tr>
<tr>
<td>EXT. Input Voltage Range</td>
<td>0 ~ 10 volts</td>
</tr>
<tr>
<td>EXT. Input Resistance</td>
<td>20kΩ</td>
</tr>
<tr>
<td>Rise Time</td>
<td>15μs @ 10 Vp-p</td>
</tr>
<tr>
<td>Output Voltage Range</td>
<td>0 ~ 150 volts VDC ± 1%</td>
</tr>
<tr>
<td>EXT. Input Gain</td>
<td>15 V/V ± 1%</td>
</tr>
<tr>
<td>Noise²</td>
<td>&lt;40mV (rms)</td>
</tr>
<tr>
<td>-3dB Bandwidth²</td>
<td>40kHz</td>
</tr>
<tr>
<td>Stability</td>
<td>&lt;0.01% per 5 hours</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 ~ 40°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20 ~ 60°C</td>
</tr>
</tbody>
</table>

Physical Features

Dimensions 6.75" (W) x 6.25" (D) x 2.5" (H)

BNC (front panel) and male DB9 (rear panel)

Manual Control

10-turn potentiometers

RS-232 Interface

Male DB9

Number of Channels | 3

Number of Displays | 3

Display Type | 3.5 digit LCD

Power Supply | 100 ~ 120VAC 50 ~ 60Hz, or 200 ~ 240 VAC 50 ~ 60Hz

Max. Output Current | 600mA per channel (continuous)

Max. EXT. Input Voltage | 120mA per channel (peak)

Fuse Rating | 10VDC 1000mA @ 115 VAC or 500mA @ 230 VAC

Note 1: The noise was measured with the output set to 150V and an output capacitance of 0.18 μF (capacitance of PolaRITE II’s piezo actuator). It may decrease with higher output capacitance and increase with no output capacitance. 2. The bandwidth was measured at 150V output without load. Any piezo added to the output may decrease the bandwidth.
Polarisation Management Platform

**PolaMax**

Applications:
- High speed PMD emulation
- Polarisation stabilisation
- Polarisation scrambling
- SOP & DOP monitoring
- PMD compensation
- Polarisation analysis
- PDL/IL/RL measurement

Individual Modules Include:
- PolaRITE™ II Dynamic Polarisation Controller (page 3,4)
- PolaMIX™ Polarisation Scrambler (page 7,8)
- DynaDelay™ Dynamic Differential Group Delay (page 14)
- PolaDetect™ High Speed In-line Polarimeter (page 12)
- PolaCHEX™ PDL/IL/RL meter
- PolaStay™ Polarisation Stabiliser

**PolaMAX™** is a multi-function turnkey platform dedicated to dynamic polarisation management in fibre optic systems and in R&D laboratories. The Euro-standard 3U frame can hold up to five individual modules for polarisation control, monitoring, measurement, or scrambling. Many modules are first of its kind or only its kind on the market, and are based on General Photonics’ patented cutting edge technologies. These modules include DynaDelay™ differential group delay line, PolaDetect™ high speed in-line polarimeter, PolaRITE™ II polarisation controller, PolaStay™ polarisation stabiliser, PolaMIX™ polarisation scrambler, PolaCHEX™ PDL/IL/RL meter, and high-speed PMD emulator. PolaMAX™ therefore provides a convenient platform for customers to evaluate and use these cutting-edge modules.

An external PC can be used to control the modules individually or collectively via a RS232 port to achieve desired functions. For example, DynaDelay™, PolaDetect™, and a PolaRITE™ II can be controlled collectively to form an optical polarisation mode dispersion (PMD) compensator.

**Ordering Information**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMP - 000</td>
<td>3U 42HP chassis or 3U 63HP chassis</td>
</tr>
</tbody>
</table>

*Please specify the power supply type: 115 VAC 50 ~ 60Hz or 230VAC 50 ~ 60Hz*

**Specifications**

<table>
<thead>
<tr>
<th>Chassis</th>
<th>Dimensions</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3U height, 42HP width</td>
<td>3 or 5 single-slot modules</td>
</tr>
</tbody>
</table>

| Power Supply | 100 ~ 120 VAC 50 ~ 60Hz or 200 ~ 240 VAC 50 ~ 60Hz, 150W max. |

| Remote Interface | RS 232, and digital I/O |

<table>
<thead>
<tr>
<th>Environment</th>
<th>Operating Temperature</th>
<th>Storage Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 ~ 50°C</td>
<td>-20 ~ 60°C</td>
</tr>
</tbody>
</table>
High Speed Polarimeter

PolaDetect

- High speed and low loss
- Compact size
- No moving parts

Applications:
- Polarisation stabilisation
- PMD compensation/measurement
- Sample/Tissue birefrigence analysis (Con-focal arrangement)
- Remote sensing (remote stress analysis)
- Polarisation analysis/monitoring
- Polarisation division multiplexing

General Photonics’ in-line polarimeter is specially designed for low cost and high-speed polarisation characterisation without interrupting data traffic. It outputs four voltage signals for calculating both the degree of polarisation (DOP) and the state of polarisation (SOP) of the light passing through the device in microseconds. PolaDetect is ideal for integrating into polarisation monitoring and polarisation stabilisation modules, or in polarisation characterisation instruments. It comes with a pre-amplification board to provide analog signals for SOP/DOP calculation, feedback control, and computer interface. A calibration matrix is provided with every device for the calculation. Devices without preamplification board and calibration matrix are also available for OEM. The output fibre can be either a single mode fibre or a PM fibre.

Specifications

- Insertion Loss: 0.8dB typical, 1.2dB max.
- Return Loss: 55dB
- PDL: < 0.25dB
- PMD: < 0.1ps
- Wavelength Dependent Loss: 0.15dB over C band
- Optical Power Sensitivity: 5µW
- Optical Damage Power: 300mW min.
- Measurement Bandwidth: 700kHz
- SOP Accuracy (at calibration wavelength): ± 1% max
- DOP Accuracy (at calibration wavelength): ± 2% max
- Wavelength Range: 1550 ± 50nm or 1310 ± 50nm
- Operating Temperature: 0 ~ 40°C
- Storage Temperature: -40 ~ 85°C
- Optical Module Dimension: 39.1 x 20.3 x 18.0mm
- Fibre Type: SMF-28 to SMF-28, or SMF-28 to PM Panda Fibre
- Electrical Interface: 16 pin w/o preamplifier board, 20 pin w/o preamplifier board
- Electrical Power Supply: ±5V ~ ±10V w/o preamplifier board, ±12V w/o preamplifier board
- Preamplifier Board Dimension: 125 x 50mm

(Values are referenced without connectors) 1. Compared with Agilent 8509C polarisation analyser

Ordering Information

- POD -
- 15 = 1550nm SS = SM in / SM out 01 = w/o preamplifier Connector type: FC/PC, FC/APC
- 13 = 1310nm SP = SM in / PM out 02 = w/ preamplifier SC/PC, SC/ APC
- Or NC = No Connectors Others Specify

For more information on Laser 2000 products visit our website at: www.laser2000.co.uk
Telephone: 01933 461 666 • Fax: 01933 461 699 • e-mail: sales@laser2000.co.uk • website: www.laser2000.co.uk
**DOP Meter**

**DOP-101**

- Fast measurement speed
- No calibration needed
- High accuracy and reliability
- Front panel real time display

**Applications:**
- DOP Measurement
- DOP monitoring
- ASE & SLED source characterisation
- Raman amplifier block manufacturing
- PMD monitoring
- Amplifier noise figure measurement

Using patented max.& min. search technique, this DOP meter can measure and display the Degree of Polarisation (DOP) of a light source in real time with high accuracy and wide dynamic range. Other expensive polarimeters measure the DOP less accurately for low DOP sources, while the polarisation scrambler-based instruments are less accurate for high DOP sources. Surprisingly, our low cost DOP meter provides simple and accurate DOP measurement for both low and high DOP sources. It is ideal for DOP characterisation of depolarisers and depolarised light sources, such as ASE, SLED, and the pumps for Raman amplifiers. It can also be used to monitor OSNR and PMD of optical signals, and measure the noise figure of optical amplifiers. Another attractive feature is that no calibration is needed for a wide operating wavelength range, including S, C and L band.

**Preliminary Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Wavelength Range</td>
<td>1260 to 1650 nm</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.2%</td>
</tr>
<tr>
<td>DOP Accuracy</td>
<td>± 0.5%</td>
</tr>
<tr>
<td>Repeatability</td>
<td>± 0.5%</td>
</tr>
<tr>
<td>Measurement Speed</td>
<td>0.5 second</td>
</tr>
<tr>
<td>DOP Range</td>
<td>0 ~ 100%</td>
</tr>
<tr>
<td>Optical Power Handling</td>
<td>20dBm max. and higher power with fixed attenuator</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>10°C to 50°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20°C to 60°C</td>
</tr>
<tr>
<td>Front Panel Display</td>
<td>4 digits LCD display</td>
</tr>
<tr>
<td>Wavelength Calibration</td>
<td>Not required</td>
</tr>
<tr>
<td>Power Supply</td>
<td>100 ~ 120 VAC, 50 ~ 60 Hz, or 200 ~ 240 VAC, 50 ~ 60 Hz</td>
</tr>
<tr>
<td>Dimensions</td>
<td>3.48&quot; (H) x 8.69&quot; (W) x 14.44&quot; (L), 19&quot; half rack</td>
</tr>
</tbody>
</table>

**Fixed Differential Group Delay**

**PolaDelay**

- Large 1st order PMD up to 100 ps
- Customised PMD up to µs
- Compact size
- Low insertion loss
- Rugged design

**Applications:**
- PMD emulation
- PMD compensation
- TDM bit alignment

No more large spools of PM fibre are needed for generating a large amount of differential group delay (DGD) between two orthogonal polarisation states. General Photonics’ compact device can provide pure first-order PMD with values up to 100 ps with the standard package. DGD values up to microseconds can be custom made with minimum charges. PolaDelay™ can be used to simulate the PMD effect in the fibre link, check the performance of testing equipment, or replace hundreds of meters of PM fibre to equalise DGD accumulated in a transmission fibre link for a PMD compensator. The compact and rugged package provides high performance and superb environmental stability.

**Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Wavelength</td>
<td>1550 ± 50 nm</td>
</tr>
<tr>
<td>Insertion Loss</td>
<td>0.9 dB typical, 1.2 dB max.</td>
</tr>
<tr>
<td>DGD Value</td>
<td>0 ps to 100 ps standard</td>
</tr>
<tr>
<td>2nd Order PMD</td>
<td>&lt; 90 ps²</td>
</tr>
<tr>
<td>Return Loss</td>
<td>55 dB</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 ~ 70 °C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40 ~ 85 °C</td>
</tr>
<tr>
<td>Optical Power Handling</td>
<td>300 mW min.</td>
</tr>
<tr>
<td>Fibre Type</td>
<td>Corning SMF-28</td>
</tr>
<tr>
<td>Dimensions</td>
<td>28 x 18 x 10 mm</td>
</tr>
</tbody>
</table>

(Values are referenced without connectors)
Dynamic Differential Group Delay Module

DynaDelay

• Digitally switched DGD
• 500 µs or less delay switching speed
• ±45 ps or 0-90 ps total DGD
• 6 bit (1.36 ps) delay resolution
• Compact size

General Photonics’ high-speed dynamic differential group delay (DGD) line provides a variable amount of group delay difference between two linear orthogonal polarisation states. DGD is a key component for PMD emulation and compensation. DynaDelay can digitally switch the amount of DGD from -45 ps to 45 ps with a resolution of 1.36 ps (6-bit resolution) in less than 500 µs. With an integrated circuit board and a software package, the device can easily be controlled with a computer or a microprocessor. In addition to PMD emulation and compensation, this patented device can also be used for precision TDM bit alignment. The module can be operated alone with required DC power supply, or be plugged into the PolaMAX™ polarisation management platform for easy evaluation or operation.

Applications:
• PMD compensation
• PMD emulation
• TDM bit alignment
• True time delay for RF signal processing

Insertion Loss 1.5 dB max.
Return Loss 55 dB
PDL 0.2 dB over all DGD values
PDL Variation ±0.15 dB over all DGD values
0.25 dB over C band
Wavelength Dependent Loss 0.15 dB over all DGD values
1st order PMD -45 ~ +45 ps, 0 ~ 90 ps optional, others specify
2nd order PMD 90 ps2 max.
Transient DGD 1.36 ps max.
1.36 ps total
0.7 dB total
Number of Control Bits 6
Delay Variation Speed 500 µs
Operating Wavelength 1550 ± 50 nm, or 1310 ± 50 nm
Optical Power Handling 300 mW min.
Electrical Interface RS-232, digital I/O
Electrical Power Supply 12 VDC / 0.5A, 5 VDC / 1.2A
Software DGDPro-111 LabVIEW™ testing program (included)
DGDPro-IV LabVIEW™ PMD emulation (optional)
Operating Temperature 0 ~ 50°C
Dimensions 220 x 100 x 32 mm (L x W x H)

Figure 1. Maxwellian distribution of DGD generated by PMD emulation software. The solid line is fitted by Maxwellian distribution

Figure 2. PMD emulation software interface.

Ordering Information

DGD - 6B2 - X X - - X -

15 = 1550 nm
13 = 1310 nm
20 = 20 mm
X = Connector Type:
SC/PC, SC/APC
or NC = No Connectors

Software Accessories:
DGD Pro-III (Included. LabVIEW™ program including: single DGD, 2 state jogging, 64 state scan, and arbitrary state scan)
DGDPro-IV (Optional. PMD emulation LabVIEW™ program)

Preliminary Specifications

Insertion Loss 1.5 dB max.
Return Loss > 55 dB
PDL ±0.2 dB
PDL Variation ±0.15 dB over all DGD values
Wavelength Dependent Loss 0.25 dB over C band
1st order PMD -45 ~ +45 ps, 0 ~ 90 ps optional, others specify
2nd order PMD 90 ps2 max.
Number of Control Bits 6
Delay Resolution 0.36 ps
1.36 ps
Number of Bits 6
Delay Switching Speed 500 µs
Operating Wavelength 1550 ± 50 nm standard, others specify
Optical Power Handling 300 mW min.
Electrical Interface RS-232, digital I/O, +12V/0.5A, +5V/1.2A power supply
Software An executable program for selecting various combinations of DGD switching.
Optional PMD emulation software.
Max. Optical Power 300 mW min.
Dimensions 220 mm (L) x 100 mm (W) x 32 mm (H)

Note: 1.Other DGD and resolution values are available, call for details.
Programmable Differential Delay Module

**ProDelay**

- Digitally switched DGD
- 250 µs or less delay switching speed
- ±45 ps or 0-90 ps total DGD
- 6 bit (1.36 ps) delay resolution
- Compact size

**Applications:**
- PMD compensation
- PMD emulation
- TDM bit alignment
- True time delay for RF signal processing

General Photonics’ high-speed variable differential group delay (DGD) line provides a variable amount of group delay difference between two linear orthogonal polarisation states. DGD is a key component for PMD emulation and compensation. ProDelay™ can digitally vary the amount of 1st order PMD from -45ps to 45ps with a resolution of 1.36 ps (6-bit resolution) in less than 250 µs. With an integrated circuit board and a software package, the device can be easily controlled with a computer or a microprocessor. The circuit board has a 10-pin TTL digital I/O port to interface with any digital control signal, either from a control circuit board or a computer. An optional Labview PMD emulation software is also available to generate Maxwellian DGD distribution of any average value. In addition to PMD compensation and emulation, this patented device can also be used for precision TDM bit alignment.

**Typical Performance Data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion Loss (dB)</td>
<td>&lt;0.3</td>
</tr>
<tr>
<td>Return Loss (dB)</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td>Cosmic Jitter (ps)</td>
<td>±0.2</td>
</tr>
<tr>
<td>1st Order PMD</td>
<td>1.36 ps</td>
</tr>
<tr>
<td>2nd Order PMD</td>
<td>90 ps</td>
</tr>
<tr>
<td>Transient DGD</td>
<td>1.36 ps</td>
</tr>
<tr>
<td>Delay Variation Speed (µs)</td>
<td>250</td>
</tr>
<tr>
<td>Operating Wavelength (nm)</td>
<td>1550±20</td>
</tr>
<tr>
<td>Optical Power Handling</td>
<td>300mW min.</td>
</tr>
<tr>
<td>Electrical Interface</td>
<td>10 µA</td>
</tr>
<tr>
<td>Electrical Power Supply</td>
<td>9 VDC / 0.6A</td>
</tr>
<tr>
<td>Software</td>
<td>DGDPro-I for computer printer port (optional)</td>
</tr>
<tr>
<td></td>
<td>DGDPro-II for digital I/O card &amp; PMD emulation (optional)</td>
</tr>
</tbody>
</table>

**Ordering Information**

- **DGD - 6B1**
  - 15 = 1550nm
  - 45 = +45ps DGD
  - Connector Type: FC/PC, SC/PC, SC/APC
  - Others Specify: SC/PC, SC/APC

**Software Accessories:**

- DGDPro-I (Included: Basic testing program in C++, including: manual input, DGD, 2 state jogging, 64 state scan and arbitrary state scan)
- DGDPro-II (Optional: LabVIEW™ program including: single DGD, multi DGD scan, 64 state scan, and PMD emulation)

**Compact Time Delay Coil**

**TDC**

- Compact for easy integration into modules
- Low insertion loss
- Customised delay length
- Rugged construction
- Variety of fibre types
- Wide spectral response range
- Plug ‘n’ play for easy use

**Applications:**
- Optical buffer for optical networks
- Gyroscope, sensor, and signal processing
- Radar calibration and instrument calibration
- Laser spectroscopic measurement
- Time delay for opto-electronics oscillators
- Nonlinear fibre loop
- Optical network testing and analysing
- Optical packet switching, buffering, routing and input/output synchronisation

Winding a large fibre spool is easy; but making compact and low loss fibre coils demands attention, precision, and skills. With specially designed & computerised machinery and proprietary manufacturing process, we can produce extremely low insertion loss fibre coils that fit your budget and tight space. No more large fibre spools to occupy your precious space and no more high loss associated with the small size! Our optical fibre coil fills a long overdue vacuum in the photonics market, where large time delay and small size are essential. Each coil is ruggedly packaged to withstand various environments in field applications. Bare coils are available for OEM applications.

**Ordering Information**

- **CIR**
  - Connector Type: FC/PC, SC/PC, PM: Fujikura Panda
  - Fibre Type: Others Specify
  - Core/Clad: 12.7/125µm
  - CIR = No Connectors

**Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion Loss</td>
<td>&lt;0.3 dB/km typical, &lt;0.5 dB/km max. (above intrinsic loss)</td>
</tr>
<tr>
<td>Fibre Length (m)</td>
<td>10m up to 4km</td>
</tr>
<tr>
<td>Optical Delay</td>
<td>Nanosecond to microsecond depending on fibre length and type</td>
</tr>
<tr>
<td>Operating Wavelength (nm)</td>
<td>1260~1650nm standard, others specify</td>
</tr>
<tr>
<td>Storage Temp.</td>
<td>-40 ~ 85°C</td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>3.0 x 1.5 x 0.3”</td>
</tr>
</tbody>
</table>

**DGD Controllers / Delay Lines - Compact**

Telephone: 01933 461 666 • Fax: 01933 461 699 • e-mail: sales@laser2000.co.uk • website: www.laser2000.co.uk
Delay Lines - Manually Adjustable / Motorised

Manually Variable Optical Delay Line

VariDelay 1

- Space Efficient
- Highest delay to length ratio
- Long delay: more than 600 ps
- Low insertion loss variation
- Free space model available
- Rugged design

General Photonics’ manually variable optical delay line provides precision optical path variation of more than 18 cm (600 ps). The compact and rugged design makes the device ideal to be integrated in network equipment and test instrument for precision optical path length or timing alignment. Free space version is available with plug-in pinhole accessories for simple and easy beam alignment.

Ordering Information

VDL - 001 - - - - - - - -
15=1550nm 33=330ps Connector Type: SS=SMF-28
35=1310 & 1550nm 60=600ps FC/PC, FC/APC PP=PM Panda
or NC=No Connectors
Others Specify

VariDelay 2

- Space Efficient
- Highest delay to length ratio
- Long delay: more than 600 ps
- Free space model available
- Rugged design

General Photonics’ motorised variable optical delay line provides precision optical path length adjustment of more than 18 cm (600 ps). Driven by a DC motor with an integrated encoder, the motorised delay line has a micrometer delay resolution. Its low insertion loss and high reliability make the device ideal for integrating in networks equipment and test instrument for precision optical path length control or timing alignment. It can also be used as a bench-top instrument for laboratory applications. The motorised delay line can be remotely controlled by a PC through RS 232 interface or locally controlled using a case-top keypad. Free space version is available with plug-in pinhole accessories for simple and easy beam alignment.

Ordering Information

MDL - 001 - - - - - - - -
15=1550nm 33=330ps Connector Type: SS=SMF-28
35=1310 & 1550nm 60=600ps FC/PC, FC/APC PP=PM Panda
or NC=No Connectors
Others Specify

Applications:
- Passive time division multiplexing
- TDM bit alignment
- Fibre interferometers

Typical Performance Data

Varidelay 1 & Varidelay 2

Figure 1. Insertion Loss vs. Optical Delay

Specifications

Operating Wavelength Range: 1260 ~ 1550 nm
Optical Delay Range: 0 ~ 330 ps continuous for 330 ps model
Optical Delay Accuracy: ± 0.02 ps over entire delay range
Optical Delay Repeatability: ± 0.02 ps over entire delay range
Delay Varying Speed: 10 speed settings, from 0.01 ps/sec to 256 ps/sec
Insertion Loss: 1.0 dB (nominal)
Insertion Loss Variation: ± 0.3 dB over entire range for 330 ps model
Return Loss: 50 dB
Extinction Ratio: > 18 dB for PM model
Power Supply: 12 VDC/1A max.
Control Mode: Panel and RS 232 interface
Display Type: 2 x 16 characters LCD
Optical Power Handling: 300 mW min.
Operating Temperature: 0 ~ 40 °C
Storage Temperature: -40 ~ 60 °C
Fibre Type: Corning SMF-28, or Fujikura PM Panda fibre
Dimensions: 1.6” x 4.0” x 7.0”

(Values are referenced without connectors)
**Faraday Rotator Mirror**

**FRM-001**

- Compact size
- Low insertion loss
- High stability
- Rugged design
- NoTail™ model available

FRM-001 is a fibre optic polarisation rotation mirror designed for fibre optic networks and measurement applications. Upon reflection, the state of polarisation (SOP) rotates 90 degrees from that of the input light. A unique property of Faraday rotator mirror is that at any point along the fibre, the SOPs of the forward going and reflected light are always orthogonal to each other, regardless of the birefringence of the fibre. Therefore, when properly used, the device can help to eliminate polarisation sensitivity of an optical fibre system. Applications include eliminating polarisation-induced fluctuations in fibre interferometers, Brillouin amplifier systems, fibre laser systems, and fibre optic antenna remoting systems. FRM – 001 is optical path epoxy free and thus offers low insertion loss and high temperature stability. We also offer the NoTail™ version to eliminate the dreadful headaches of pigtail handling and unwanted optical path delay.

![Figure 1. Insertion loss vs. wavelength.](image)

**Specifications**

- Insertion Loss: 0.3dB typical, 0.5dB max.
- Faraday Rotation Angle: 90 degrees
- Rotation Angle Tolerance: ±1 degree max. at Centre Wavelength
- Rotation Angle Temperature Dependence: ±0.12 degree/°C
- Reflection Polarisation Dependence: ±0.5% max.
- Operating Wavelength: 1550nm, 1310nm
- Operating Bandwidth: ±15nm
- Optical Power Handling: 500mW min.
- Operating Temperature: 0 °C to 70 °C
- Storage Temperature: -40 °C to 85 °C
- Fibre Type: Corning SMF-28
- Dimensions: Ø5.5 x 32mm (w/pigtail), Ø9.5 x 50mm (NoTail™)

**Ordering Information**

<table>
<thead>
<tr>
<th>FRM-001</th>
<th>13 = 1310nm</th>
<th>15 = 1550nm</th>
<th>25 = 250µm jacket</th>
<th>Connector Type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>S=Single Stage</td>
<td>13=1310nm</td>
<td>Pigtailed:</td>
<td>Connector Type:</td>
<td></td>
</tr>
<tr>
<td>T=Double Stage</td>
<td>15=1550nm</td>
<td>FB/FC, FC/PC</td>
<td>SC/PC, SC/APC</td>
<td></td>
</tr>
<tr>
<td>N=NoTail™</td>
<td>or NC=No Connectors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NT=NTPP=PM to PM</td>
<td>Others Specify</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Isolator**

**ISO**

- Polarisation insensitive
- NoTail™ model available
- Low loss and low reflection
- Compact size
- Environmentally stable
- High quality

Applications:
- Fibre optics amplifier
- WDM systems
- Transmitters and fibre lasers
- R&D laboratories

These isolators are the smallest in size but the highest in quality in the market. They are ruggedly built to function reliably in a wide variety of environments. The small size, polarisation insensitivity, low loss, and low reflection combine to make these isolators ideal for integration in many fibre optic systems. We also offer the NoTail™ version to eliminate the dreadful headaches of pigtail handling. The short optical path (~7 cm) of the NoTail™ isolator is most desirable for ultra-short pulse and interferometric applications.

**Specifications**

- Stage: Single Stage, Double Stage
- Peak Isolation: > 40dB, > 52dB
- Min. Isolation: > 32dB, > 45dB
- Insertion Loss (Typical): 0.4dB, 0.5dB
- Insertion Loss (Max.): 0.5dB, 0.6dB
- Return Loss (Input / Output): > 60 / 55dB, > 60 / 55dB
- Operating Bandwidth: ±15nm, ±30nm
- PMD (SMF-28 model): < 0.1ps, < 0.05ps
- PDL (SMF-28 model): < 0.1dB, < 0.1dB
- Extinction Ratio (PM model): > 18dB, > 18dB
- Operating Centre Wavelength: 1550, 1310nm
- Optical Power Handling: 500mW min.
- Operating Temperature: 0 °C to 70 °C
- Storage Temperature: -40 °C to 85 °C
- Fibre Type: SM: Corning SMF-28
- Dimensions: Ø5.5 x 32mm (w/pigtail), Ø9.5 x 65mm (NoTail™)

For more information on Laser 2000 products visit our website at: www.laser2000.co.uk

Telephone: 01933 461 666 • Fax: 01933 461 699 • e-mail: sales@laser2000.co.uk • website: www.laser2000.co.uk
Polarisation Insensitive Optical Circulator

CIR

- High quality and attractively priced
- Compact
- Exceptional environmental stability
- Low excess loss

Applications:
- Add-drop filter
- Digital, hybrid and AM-video system
- Dispersion compensator
- fibre sensors
- Bi-directional communication

General Photonics’ polarisation insensitive optical circulator features low insertion loss, high isolation, and low PDL. It is an ideal candidate in add/drop filter, EDFA, dispersion compensation, bi-directional communication and other applications.

Dimensions

<table>
<thead>
<tr>
<th>1</th>
<th>60mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø 5.5mm</td>
<td></td>
</tr>
</tbody>
</table>

Ordering Information

CIR - - - - - - - -
P = Grade P 13 = 1310nm Connector type: 25 = 250µm jacket
A = Grade A 15 = 1550nm FC/PC, FC/APC 90 = 900µm jacket

or NC = No Connectors

Others Specify

Specifications

<table>
<thead>
<tr>
<th>Grade</th>
<th>Premium</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typcal Insertion Loss (±15nm, 23°C)</td>
<td>0.6dB</td>
<td>0.8dB</td>
</tr>
<tr>
<td>Insertion Loss (±20nm, all SOP, 0 ~ 70°C)</td>
<td>0.8dB</td>
<td>1.0dB</td>
</tr>
<tr>
<td>PDL</td>
<td>&lt;0.15dB</td>
<td>&lt;0.2dB</td>
</tr>
</tbody>
</table>

Operating Centre Wavelength

1550nm, 1310nm

Isolation (1530~1565nm, 23°C, 2 - 1)

50dB typical, 40dB min.

Isolation (1530~1565nm, 23°C, 3 - 2)

50dB typical, 40dB min.

Cross Talk (1 - 3)

50dB

Return Loss

50dB

Polarisation Mode Dispersion (PMD)

0.1ps

Optical Power Handling

300mW min.

Operating Temperature

-40 ~ 85°C

Fibre Type

Corning SMF-28

Dimensions

Ø5.5 x 60mm

Drop-in Coupler / WDM, No Tail

NoTail

- Wide band operating
- Short optical path delay
- Compact and rugged design
- Easy to integrate into fibre optical systems
- Low excess loss
- High temperature stability

Applications:
- Power monitoring and sharing
- CATV
- Local area networks

These connectorised couplers and WDMs are free of fibre pigtails and ready to be inserted in optical systems without the headaches of tinkering with fragile and messy fibre pigtails. Another main feature of these devices is their short optical path delay (~30 cm) between the input and the output, desirable in many systems where the optical path balance is important, such as interferometric systems, ultra-short pulse systems, and fibre laser systems. Additionally, these devices have four strong magnets mounted on the back for temporary and yet secure placement on standard optical tables.

Ordering Information

NTC - - - - - - - -
13 = 1310nm Coupling Ratio: Connector Type: Port Config: Connector Type:
15 = 1550nm xx = xx% FC/PC, FC/APC 12 = 1 x 2
35 = 1310 & 1550nm SC/PC, SC/APC 22 = 2 x 2

Specifications

<table>
<thead>
<tr>
<th>Coupler</th>
<th>NTW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Centre Wavelength</td>
<td>1310, 1550, or 1310 / 1550</td>
</tr>
<tr>
<td>Operating Bandwidth</td>
<td>±50nm</td>
</tr>
<tr>
<td>Wavelength Isolation</td>
<td>N/A</td>
</tr>
<tr>
<td>Insertion Loss</td>
<td>See table below</td>
</tr>
<tr>
<td>Excess Loss</td>
<td>0.1dB typical, 0.2dB max.</td>
</tr>
<tr>
<td>Return Loss</td>
<td>1 x 2: &gt;55dB, 2 x 2: &gt;65dB</td>
</tr>
<tr>
<td>PDL</td>
<td>0.1dB typical</td>
</tr>
<tr>
<td>Thermal Stability</td>
<td>0.1dB typical</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 ~ 70°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40 ~ 85°C</td>
</tr>
<tr>
<td>Fibre Type</td>
<td>Corning SMF-28</td>
</tr>
<tr>
<td>Port Configuration</td>
<td>1 x 2 or 2 x 2</td>
</tr>
<tr>
<td>Dimensions</td>
<td>3.5” x 1.5” x 5 / 8” (L x W x H)</td>
</tr>
</tbody>
</table>

Insertion Loss (IL) Table

<table>
<thead>
<tr>
<th>Coupling Ratio</th>
<th>IL (Single Window)</th>
<th>IL (Dual Windows)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 / 90</td>
<td>&lt; 5.4 / 5.3</td>
<td>&lt; 5.4 / 5.3</td>
</tr>
<tr>
<td>20 / 80</td>
<td>&lt; 6.2 / 6.1</td>
<td>&lt; 6.2 / 6.1</td>
</tr>
<tr>
<td>30 / 70</td>
<td>&lt; 6.9 / 6.8</td>
<td>&lt; 6.9 / 6.8</td>
</tr>
<tr>
<td>40 / 60</td>
<td>&lt; 7.5 / 7.4</td>
<td>&lt; 7.5 / 7.4</td>
</tr>
<tr>
<td>50 / 50</td>
<td>&lt; 8.5 / 8.4</td>
<td>&lt; 8.5 / 8.4</td>
</tr>
</tbody>
</table>

(Values are referenced without connectors)
Polarisation Beam Splitter / Combiner

**PBC**

- Compact size
- Low insertion loss
- High power handling
- Rugged design

**Applications:**
- Polarisation division Mux/DeMux
- EDFA and Raman amplifiers
- Instrument and R&D

PBC-001 can be used either as a polarisation beam combiner to combine two light beams from two PM fibres into a single fibre, or as polarisation beamsplitter to split light from an input fibre into two output fibres of orthogonal polarisation states. An important application of the device is for polarisation division multiplexing or demultiplexing in optical systems to increase their transmission capacity. In addition, as a pump combiner in optical amplifiers, the device efficiently combines two pump lasers into a single fibre to increase the optical amplifier’s saturation power and to reduce its polarisation sensitivity. The wide operation bandwidth and high power handling capability (2000 mW) make the device very attractive for next-generation amplifier systems. Finally, with a rugged stainless package designed for high optical performance and stability, this compact device offers low excess insertion loss, low back reflection, high extinction ratio that meet or surpass competitor’s specifications.

**Specifications**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Insertion Loss</th>
<th>Extinction Ratio (ER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium A</td>
<td>0.30dB, 0.45dB</td>
<td>23dB, 20dB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Centre Wavelength</th>
<th>Operating Bandwidth</th>
<th>Return Loss</th>
<th>Optical Power Handling</th>
<th>Operating Temperature</th>
<th>Storage Temperature</th>
<th>Fibre Type</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1460nm, 1480nm, 1550nm</td>
<td>±30nm</td>
<td>55dB</td>
<td>2000mW</td>
<td>0 ~ 70°C</td>
<td>-40 ~ 85°C</td>
<td>Port 2 and Port 3: PM Panda Fibre</td>
<td>Ø5.5 x 30mm</td>
</tr>
</tbody>
</table>

**Ordering Information**

<table>
<thead>
<tr>
<th>Grade</th>
<th>P</th>
<th>01</th>
<th>1460nm</th>
<th>Port 1 Fibre Type</th>
<th>Connector Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium A</td>
<td>P</td>
<td>01</td>
<td>1460nm</td>
<td>SM = SMF-28</td>
<td>FC/PC, FC/APC</td>
</tr>
<tr>
<td>A</td>
<td>02</td>
<td>1480nm</td>
<td>PM = Panda PM</td>
<td>SC/PC, SC/APC</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>1550nm</td>
<td>Or NC = No Connectors</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(P = Grade P 01 = 1460nm Port 1 Fibre Type: Connector Type: A = Grade A 02 = 1480nm SM = SMF-28 FC/PC, FC/APC 03 = 1550nm PM = Panda PM SC/PC, SC/APC Or NC = No Connectors)

Polarisation Maintaining Coupler

**PMC**

- Compact size
- Low insertion loss
- Low back reflection
- Rugged design

**Applications:**
- Power sharing in PM fibre systems
- Power monitoring in PM systems
- PM fibre interferometers

PMC-001 is a polarisation maintaining coupler which either splits the light from the input PM fibre into two output PM fibres, or combines light signals from two PM fibres into a single PM fibre. The state of polarisation can either be aligned with the slow axis of the PM fibres or the fast axis. The device can be used to split a high power linearly polarised light into multiple paths without perturbing the linear state of polarisation (SOP). It can also be used as a power tap to monitor signal power in a PM fibre system without disturbing the linear SOP of light propagating in the PM fibre. The application includes PM fibre interferometers, power sharing in polarisation sensitive systems, and signal monitoring in PM fibre systems. The rugged stainless steel package is designed for high optical performance and stability. This compact device offers low excess insertion loss, low back reflection, high extinction ratio. Splitting ratios from 1 to 50% are available.

**Specifications**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Excess Loss</th>
<th>Split Ratio Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium A</td>
<td>&lt;0.40dB</td>
<td>&lt;±2.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating Centre Wavelength</th>
<th>Operating Bandwidth</th>
<th>Return Loss</th>
<th>Extinction Ratio</th>
<th>Split Ratio</th>
<th>Optical Power Handling</th>
<th>Operating Temperature</th>
<th>Storage Temperature</th>
<th>Fibre Type</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1550nm, 1310nm</td>
<td>±25nm</td>
<td>50dB</td>
<td>&gt; 18dB</td>
<td>1 ~ 50%</td>
<td>300mW min.</td>
<td>0 ~ 70°C</td>
<td>-40 ~ 85°C</td>
<td>Fujikura PM Panda Fibre</td>
<td>Ø5.5 x 32mm</td>
</tr>
</tbody>
</table>

**Ordering Information**

<table>
<thead>
<tr>
<th>Grade</th>
<th>P</th>
<th>13</th>
<th>1310nm</th>
<th>Split Ratio</th>
<th>Connector Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium A</td>
<td>P</td>
<td>13</td>
<td>1310nm</td>
<td>xx%</td>
<td>FC/PC, FC/APC</td>
</tr>
<tr>
<td>A</td>
<td>15</td>
<td>1550nm</td>
<td>xx%</td>
<td>SC/PC, SC/APC</td>
<td></td>
</tr>
<tr>
<td>Or NC = No Connectors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Ordering Information)

For more information on Laser 2000 products visit our website at: www.laser2000.co.uk

Telephone: 01933 461 666 • Fax: 01933 461 699 • e-mail: sales@laser2000.co.uk • website: www.laser2000.co.uk
In Line Polariser

POL

• Compact size
• Low insertion loss
• High extinction ratio
• Low back reflection
• Rugged design
• NoTail™ model available

Applications:
• Eliminating unwanted polarisation state
• PMD monitoring
• Polarisation interferometer

POL-001 is an in-line polariser designed for fibre optic networks and measurement applications. Applications include polarisation analysing, polarisation monitoring and control, SNR monitoring, PMD monitoring, spectrum filtering and control, polarisation extinction ratio improvement, fibre laser mode-locking, and polarisation interferometer. When combined with a polarisation controller, POL-001 may function as a variable optical attenuator to adjust the optical power in the fibre. POL-001 is based on integrating a high ER micro-polariser in a rugged stainless steel package for high optical performance and stability. This compact device offers low insertion loss, low back reflection, and high extinction ratio. Both pigtailed version and NoTail™ version are available. The unique NoTail package has the advantage of eliminating the polarisation disturbances caused by fibre pigtails.

Specifications

- Operating Wavelength: 1550 ± 50 nm, 1310 ± 50 nm
- Insertion Loss: 0.3 dB typical, 0.5 dB max.
- Return Loss: 55 dB
- SM Output: 40 dB typical, 30 dB min.
- PM Output, P Grade: > 25 dB Extinction
- PM Output, A Grade: > 22 dB
- Optical Power Handling: 300 mW min.
- Operating Temperature: 0 ~ 70°C
- Storage Temperature: -40 ~ 85°C
- Fibre Type: SM: Corning SMF-28, PM: Fujikura PM Panda fibre
- Dimensions: Ø 5.5 x 32 mm (w/pigtail), Ø 9.5 x 65 mm (NoTail™)

Ordering Information

POL - 001 - - - - - - -

P-Grade P 13-1310nm Pigtailed: Connector Type:
A-Grade A 15-1550mm SS = SM to SM FC/PC, FC/APC
PP = PM to PM SC/PC, SC/APC
Of NC = No Connectors
NoTail™:
NTSS = SM to SM
NTSP = SM to PM
NTPP = PM to PM
Others Specify

Fibre Optic Depolariser

PolaZero

• For lasers with coherence length to and beyond 10m
• Low degree of polarisation
• Wide operating wavelength range
• Low insertion loss

Applications:
• Minimise polarisation sensitivity of fibre sensors
• Remove polarisation sensitivity of Raman amplifiers
• Eliminate polarisation sensitivity of optical instruments
• Reduce PDL effects of optical components

Capable of depolarising lasers with coherence length larger than kilometres, General Photonics’ passive depolariser is miles ahead of competition! This patent pending device surprisingly comes with a small package of 85 X 60 X 10mm for lasers with coherence length up to 10 meters. Devices for coherence length larger than kilometres can be custom made with minimum charges. The device is ideal for eliminating the effects of PDL or polarisation sensitivity of optical components and instruments. Equally important, it can be used for depolarising the pump lasers to eliminate the polarisation sensitivity of Raman amplifiers. The rugged package provides high performance and superb environmental stability.

Specifications

- Centre Operating Wavelength: 1420nm, 1480nm, 1550nm, 1600nm
- Operating Wavelength Range: ±50nm
- Coherence Length of Light Source: 10m standard, others specify
- Output Degree of Polarisation: <5%
- Insertion Loss: 1.0dB typical, 1.4dB max.
- Residual Extinction Ratio: <0.5dB
- Return Loss: 55dB
- Optical Power Handling: 300mW min.
- Operating Temperature: 0 ~ 70°C
- Storage Temperature: -40 ~ 85°C
- Fibre Type: Input: PM Panda Fibre, Output: Corning SMF-28
- Dimensions: 85 x 60 x 10mm

Ordering Information

DEP - 001 - - - - - - -

01 = 1550nm Coherent Length Connector Type:
02 = 1600nm 10 = 10m others specify
03 = 1480nm others specify
04 = 1420nm or NC = No Connectors
Others Specify