

# OZ Optics Limited

## Fiber Optic Attenuators

May 2016

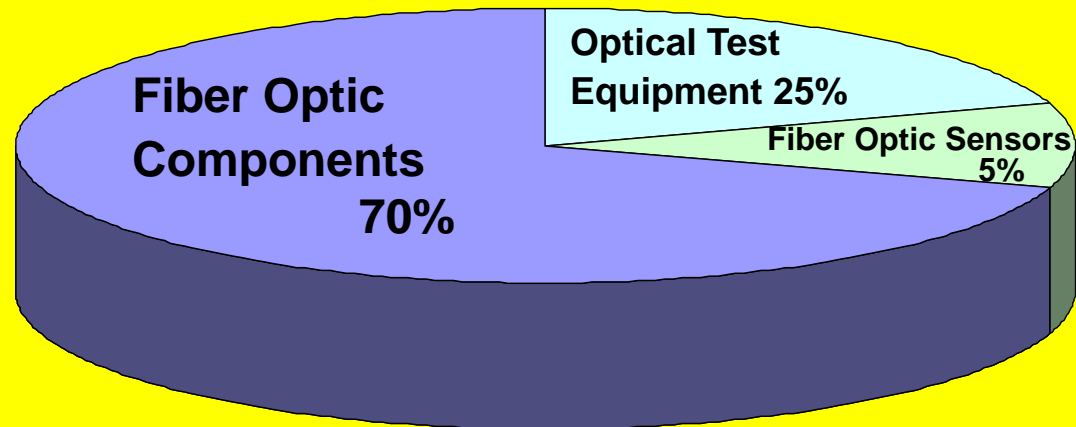
# Company Profile

- Company founded in 1985;
- Corporate headquarters located in Ottawa, Canada;
- Manufacturing facility in Ottawa/Canada, Izmir/Turkey, and Jiaxing/China
- Seven Product Groups: **Laser-to-Fiber Delivery Systems, High Power Fiber Optic Components, Polarization Maintaining Products, Attenuators, Opto-Electronic Packaging, Test Equipment, Fiber Optic Sensor Systems**
- Sales offices in Canada, USA, Turkey and China



# Company Profile

## ➤ Three Product Groups:



- Over 1,000 products
- Leading Edge R&D

# OZ Optics Products



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Global Leader in Fiber Optic Products since 1985

## Polarization Maintaining Fiber Optic Components

Patent Numbers: USA 7058275, 7095931, 7295731, China 1672073



Polarization Maintaining  
Connectors / Patchcords

Polarization Maintaining and Polarizing Splitters /  
Combiners / Fused Couplers / Switches

All Fiber Manual and Electrically Driven  
Polarization Controllers / Scramblers

PM Fiber Directional Taps /  
Power Monitors

Manual / Electrically Controlled  
PM Fiber Pigtailed Variable Attenuators

Fiber Pigtailed Polarizers

PLC Splitters

PM Fiber Pigtailed Circulators



OZ Optics Ltd.  
Headquarters, Canada  
Tel: +1-800-361-5415  
Tel: +1-613-831-0981  
Fax: +1-613-836-5059  
sales@ozoptics.com

OZ Optics USA  
California Division  
Tel: +1-510-770-1268  
Tel: +1-510-770-1726  
qxu@ozoptics.com



OZ Optics Turkey  
Tel: +90-232-252-3531  
Tel: +90-232-252-3498  
ysezerman@ozoptics.com.tr



OZ Optics China Ltd.  
Tel: +86-573-8222-3078  
Tel: +86-573-8222-3012  
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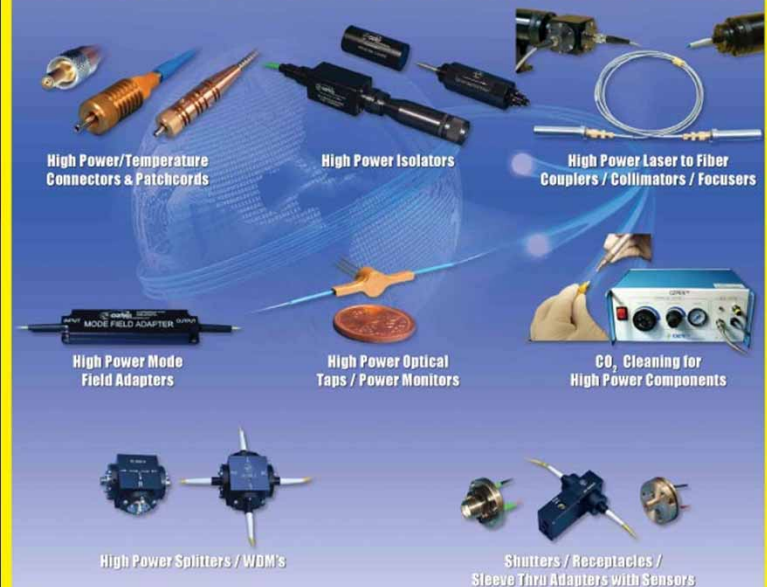
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## High Power Fiber Optic Components

Patent Numbers: Canada 2494133, USA 7058275, 7095931, 7295731, China 1672073



High Power/Temperature  
Connectors & Patchcords

High Power Isolators

High Power Laser to Fiber  
Couplers / Collimators / Focusors

High Power Mode  
Field Adapters

High Power Optical  
Taps / Power Monitors

CO<sub>2</sub> Cleaning for  
High Power Components

High Power Splitters / WDM's

Shutters / Receptacles /  
Sleeve Thru Adapters with Sensors



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sales@ozoptics.com

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California Division  
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qxu@ozoptics.com



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## Fiber Optic Attenuators for SM, PM, and MM Fibers

### Digital Variable Attenuators



- 0.01dB Resolution, Fast Response
- 0.001 to 100dB Attenuation Range
- 100mW Max

### Electrically Controlled Variable Attenuators



- 0.01dB to 100dB Attenuation Range
- Up to 2 Watts Power Handling
- PC Based, Analog and Digital Control

### MEMS Variable Attenuators



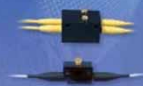
- 0.01dB to 40dB Attenuation Range
- Small Size, Low Cost, Low Power Consumption
- Low Wavelength Resonance, Low Crosstalk

### SM / PM / MM Fiber Pigtailed Inline Variable Attenuators



- 0.01dB to 100dB Attenuation Range
- 500mW Power, 200ns Wavelength Response
- 0.01dB/PC, 0.01dB/PC/20 Specifications

### Single/Multi Channel Miniature Variable Attenuators



- Compact, Less Than 5mm Spacing Between Fibers
- Designed for Multiple Fiber Arrays
- PC Based, Monolithic

### Reflective Style Variable Attenuators



- 0.01dB to 60dB Attenuation Range
- 0.1dB Resolution
- 40dB, 50dB, 60dB Backreflection

### Air Gap Variable Attenuators



- 0.1dB Resolution
- 100mW Power Handling
- 0.01dB/PC, 0.01dB/PC/20 Specifications

### Plug Type Fixed Attenuators



- Low Insertion Loss
- High Reliability
- Available in Various Fiber Types
- Available in Various Power Levels

### Attenuating Fiber Patchcords



- Available in Various Fiber Types
- Available in Various Power Levels
- Available in Various Wavelengths
- High Reliability and Long Lifetime



OZ Optics Ltd.  
Headquarters, Canada  
Tel: +1-800-361-5415  
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Fax: +1-613-836-5069  
sales@ozoptics.com

OZ Optics USA  
California Division  
Tel: +1-510-770-1268  
Tel: +1-510-770-1726  
Fax: +1-510-770-1726  
qu@ozoptics.com



OZ Optics Turkey  
Tel: +90-232-252-3531  
Fax: +90-232-252-3498  
yzezerman@ozoptics.com.tr



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## Laser & Laser Diode to Fiber Delivery Systems



Laser to Fiber Couplers



Bare Fiber Adaptors with Magnetic Clips



Bulkhead Receptacles



Pigtail/Receptacle Style High/Low Power Collimators/Focusers



High/Low Power Patchcords



WDM/RGB Combiners



OCT Modules and 2 micron Components



OEM Laser Diode to Fiber Couplers



Turnkey, Ultra Stable Laser Modules



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Tel: +1-510-770-1726  
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qu@ozoptics.com



OZ Optics Turkey  
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# OZ Optics Products



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### Fiber Optic Components for Optoelectronic Packaging


Hermetically Sealable Patchcords with Glass or Metal Solder



Single Channel



Multi Channel



Metalized Fibers




PM/SM/MM Fiber Pigtailed V-Groove Arrays




Polarization Measurement System for V-Grooves




Tapered / Lensed Fiber Polished / Laser Shaped




Glass Solder Preforms



Fiber Optic Ferrules




OZ Optics Ltd.  
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sales@ozoptics.com



OZ Optics USA  
California Division  
Tel: +1-800-361-5415  
Tel: +1-510-770-1268  
Fax: +1-510-770-1726  
qsu@ozoptics.com



OZ Optics Turkey  
Tel: +90-232-252-3531  
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ysezerman@ozoptics.com.tr



OZ Optics China Ltd.  
Tel: +86-573-8222-3076  
Fax: +86-573-8222-3012  
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### Fiber Optic Test Equipment



Polarization Extinction Ratio Measurement Systems



Power Meters with Smart Detector Heads



Broadband Digital Variable Attenuators



Optical Fiber Length Meters



High Power Visual Fault Locators Fiber Optic Stable Sources



Inline Optical Power Monitors/Meters



Laser Diode Sources Single/Multiwavelength



Fiber Optic Smart Patchcords



Fiber Optic Fault Finders



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# Product Innovation



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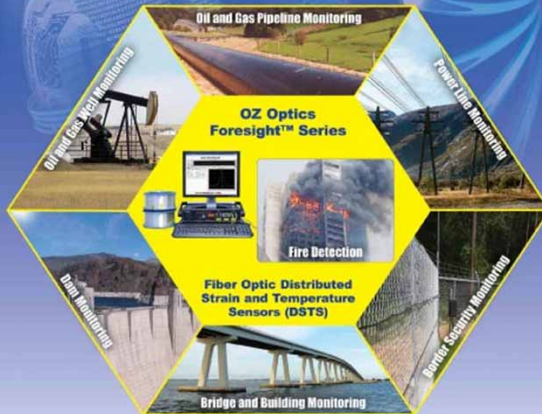


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## Fiber Optic Distributed Strain and Temperature Sensors

USA Patent Numbers: 7499151, 7599047

- BOTDA only, BOTDR only, or both BOTDA and BOTDR modules in one unit
- Simultaneous measurement of strain and temperature
- Fast, dynamic measurement of strain and/or temperature up to 100 km sensing range
- Uses standard telecommunication fiber to minimize costs



OZ Optics Ltd.  
Headquarters, Canada  
Tel: +1-800-361-5415  
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Tel: +1-510-770-1268  
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Tel: +1-613-831-0981  
Fax: +1-613-836-5089  
qru@ozoptics.com



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Tel: +90-232-252-3498  
Fax: +90-232-252-3498  
yzezerman@ozoptics.com.tr



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## Fiber Optic Fault Finder for Optical Network Safeguard™

- Monitors and reports network health status in real time, 24 hours/day, 365 days/year
- Lowers network operating and maintenance expenses
- Reduces revenue loss due to fiber plant outages
- User friendly interface via various wireless interfaces (Wi-Fi, GPRS), USB, or RS-232
- Reports fault location, giving GPS coordinates with time stamp
- Early alert and outage reports via cellular phone, email, IM, SMS, or text messaging



OZ Guard Automated Test Solution



Remote Monitoring a WDM Network



Remotely Accessible/Wireless Fault Finders



GPS Locator



OZ Optics Ltd.  
Headquarters, Canada  
Tel: +1-800-361-5415  
Tel: +1-510-770-1268  
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Fax: +1-613-836-5089  
sales@ozoptics.com

OZ Optics USA  
California Division  
Tel: +1-510-770-1268  
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Tel: +1-613-831-0981  
Fax: +1-613-836-5089  
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OZ Optics Turkey  
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Tel: +90-232-252-3498  
Fax: +90-232-252-3498  
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OZ Optics China Ltd.  
Tel: +86-573-8222-3078  
Tel: +86-573-8222-3012  
Tel: +86-573-8222-3012  
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# Product Innovation



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## 2 micron Fiber Optic Components for PM and SM Fibers

Fiber Optic Patchcords

Fused Couplers / Taps /  
Beam Splitters / Combiners

Fiber Pigtailed  
Laser Diode Sources

Pigtail / Receptacle Style  
Collimators / Focusers

Polarizers

Manual / Electrically Controlled  
Variable Attenuators

Isolators



OZ Optics Ltd.  
Headquarters, Canada  
Tel: +1-800-361-5415  
Tel: +1-613-831-0981  
Fax: +1-613-836-5089  
sales@ozoptics.com

OZ Optics USA  
California Division  
Tel: +1-810-770-1268  
Tel: +1-810-770-1726  
qru@ozoptics.com



OZ Optics Turkey  
Tel: +90-232-252-3531  
Fax: +90-232-252-3498  
ysezerman@ozoptics.com.tr



OZ Optics China Ltd.  
Tel: +86-573-8222-3078  
Fax: +86-573-8222-3012  
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## Fiber Optic Products for OCT Applications

OCT Modules

Manual / Electrically Controlled  
Broadband Variable Attenuators

Manual / Electrically Controlled  
Fiber Optic Delay Lines

Manual / Electrically Controlled  
Polarization Controllers

Fiber Pigtailed  
Broadband SLED Sources

Fiber Collimators / Focusers

Broadband Fused Couplers



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Headquarters, Canada  
Tel: +1-800-361-5415  
Tel: +1-613-831-0981  
Fax: +1-613-836-5089  
sales@ozoptics.com

OZ Optics USA  
California Division  
Tel: +1-810-770-1268  
Tel: +1-810-770-1726  
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OZ Optics Turkey  
Tel: +90-232-252-3531  
Fax: +90-232-252-3498  
ysezerman@ozoptics.com.tr



OZ Optics China Ltd.  
Tel: +86-573-8222-3078  
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# Company Profile

Over 470 employees worldwide:

- 260 in Ottawa and US
- 50 in Turkey
- 160 in China

OZ Canada



OZ China



OZ Turkey

# Company Profile

*OZ Optics is lead by an experienced team:*

- **Ömür Sezerman, Chairman, President & CEO**
  - Founder and CEO since inception (31 years)
- **Zahide Sezerman, VP of Human Resources**
  - With OZ Optics since inception (31 years)
- **Garland Best, VP of Components Division**
  - 24 years at OZ Optics
- **Gordon Youle, VP of Test Equipment Division**
  - 17 years at OZ Optics
- **Martin Powell, Operation Manager**
  - 12 years at OZ Optics
- **Sarah Miller, Controller**
  - 3 years at OZ Optics
- **Metin Sezerman, General Manager of OZ Turkey**
  - 15 years at OZ Optics
- **Bing Li, General Manager of OZ Optics China**
  - 12 years at OZ Optics





# Company Profile

➤ *Using our strong direct sales and distributors, we address the following markets:*



# Company Profile

➤ *OZ Optics has resellers and distributors in over 30 Countries & Regions and over 10,000 customers globally:*



# In-House Production Capabilities

- Experienced and well-trained staff in following fields:
  - optical, mechanical, electronics & software

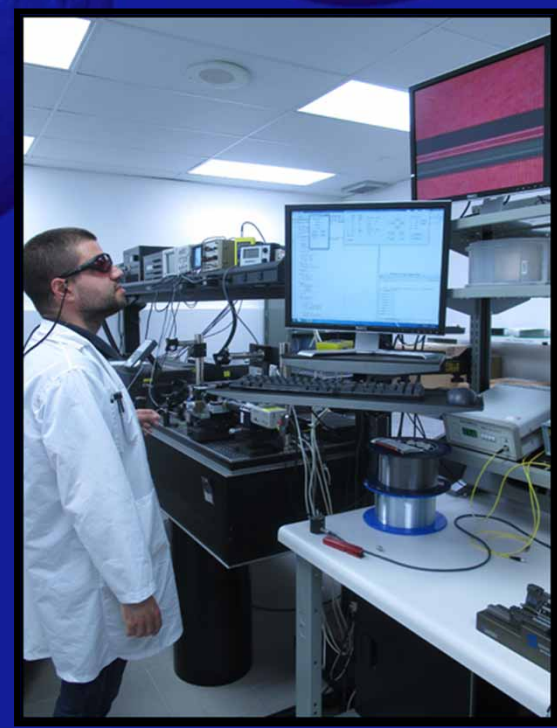
CNC Machine Shop



AR Coating



Femtosecond Laser Lab



Clean Room



Laser Conditioning/Cleaving





# Branch Network

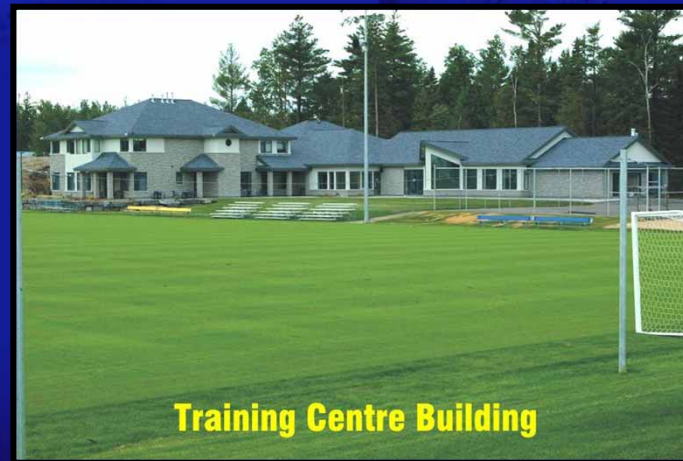


# Facility – Ottawa Headquarters

- 60,000 sq ft. – Manufacturing and R&D Facilities
- 15,000 sq ft. – Admin, Sales and Marketing
- 15,000 sq ft. – Training and Fitness Facility
- R&D, Product Design, Engineering, Final Assembly & QA



# Facility – Ottawa Headquarters





# OZ Optics – Turkey Factory

- Operational since 2000
- 33,000 sq ft. Manufacturing Facility
- Located in Free Trade Zone
- Low Tax Rates
- Sub Component Parts Manufacturing
- Cost Effective Manufacturing
- High Quality Labor



# OZ Optics China

- Operational since 2009
- Wholly Foreign Owned Enterprise
- Subcomponent Parts Manufacturing
- Cost Effective Manufacturing
- High Quality Labor
- Extensive Training  
( 3-6 months in OZ Canada)



# OZ China Facility

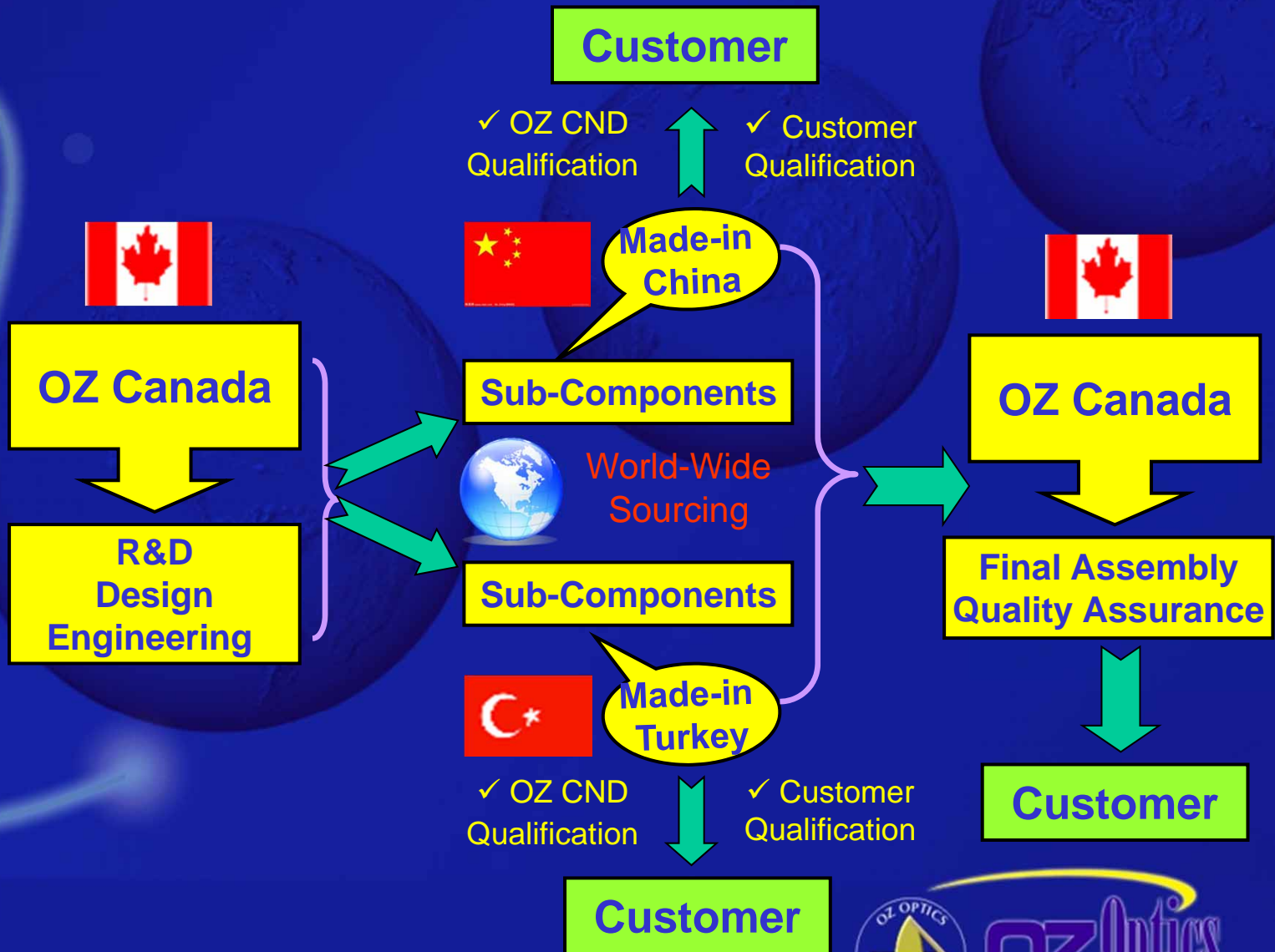
## Jiaxing, China

- Located in Economic Development Zone
- 500 sq meters – Admin, Sales and Marketing
- 1500 sq meters – Manufacturing Area
  - 100 sq meters – Class 10,000 Clean Room
  - 100 sq meters – ESD Working Area





# Manufacturing Strategy



# Industry Standards

All products manufactured are in strict accordance with international industry standards:

➤ *Telecordia Compliance*



➤ *CE Compliance*



➤ *RoHS Compliance*



➤ *ISO 9001:2008 Certified (China, Turkey and Canada)*

➤ *Controlled Goods Directorate Registered*

# Core Competencies

- Pioneer in Polarization Maintaining (PM) Components
- Leader in Wavelength Flattened, High Power & Low PDL Components
- Leader in High Power Fiber Optic Delivery Systems
- Custom Test Equipment, Including Polarization Test Equipment and FTTH Equipment
- Widest Range in Attenuator Product Offering
- Fiber Optic Distributed Strain and Temperature Sensors
- Complete product line for OCT applications & 2 Micron



# Leading Technology

- **High Power Isolators**
  - power handling > 50W
  - low loss, low cost turnkey solution



High Power Free Space and Pigtailed Isolators

- **Pioneer in Polarization Maintaining (PM) Components**
  - wavelength flattened
  - high power & low PDL
  - PM test equipment



Polarization Maintaining Patchcords

Distributed Strain and Temperature Sensors



- **Fiber Optic Sensor**
  - fast and simultaneous measurement of strain & temp
  - large structure health monitoring

High Power Collimators/Focusers



- **Leader in High Power Fiber Optic Delivery Systems**
  - specializes in custom design



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## OUR VISION

- Be the preferred Supplier of choice
- Capture and expand market share
- Maximize shareholder value

## OUR MISSION

- To become the leading provider of innovative optical products to telecom and non-telecom sectors

## OUR CORE VALUES

- Leadership
- Teamwork
- Boldness
- Commitment
- Innovation
- Rewards

## OUR QUALITY POLICY

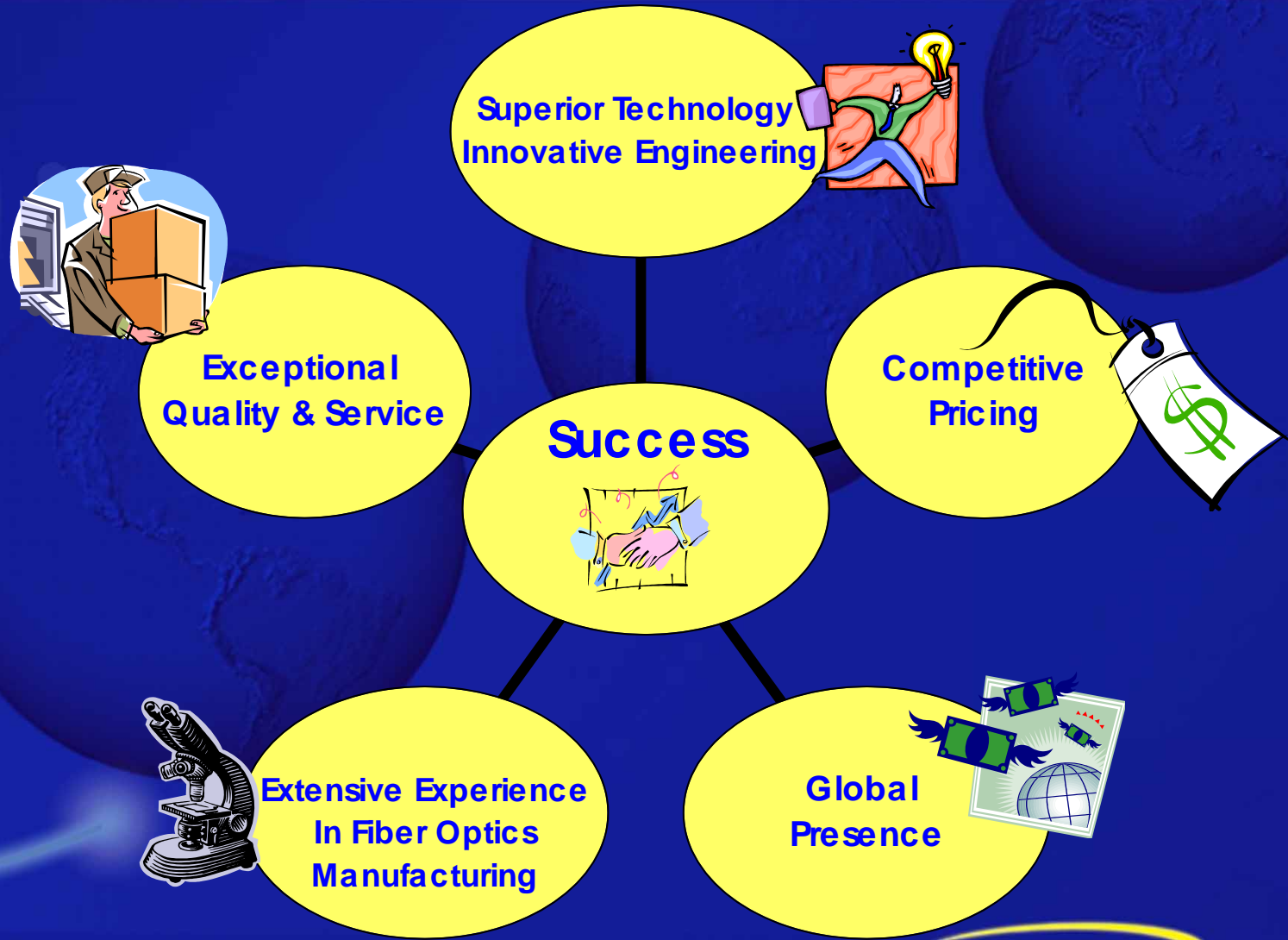
- Provide our Customers with a competitive advantage, leveraging performance, price and delivery, through a continuous process of Quality advancement in all areas of our Company
- Communicate effectively to our Customers, Suppliers and Shareholders our commitment to Quality and continuous improvement
- Promote opportunities of professional development for all members of our Company through education, training and personal challenge

Ömür Sezerman  
President



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# Competitive Advantage





# Fiber Optic Attenuators

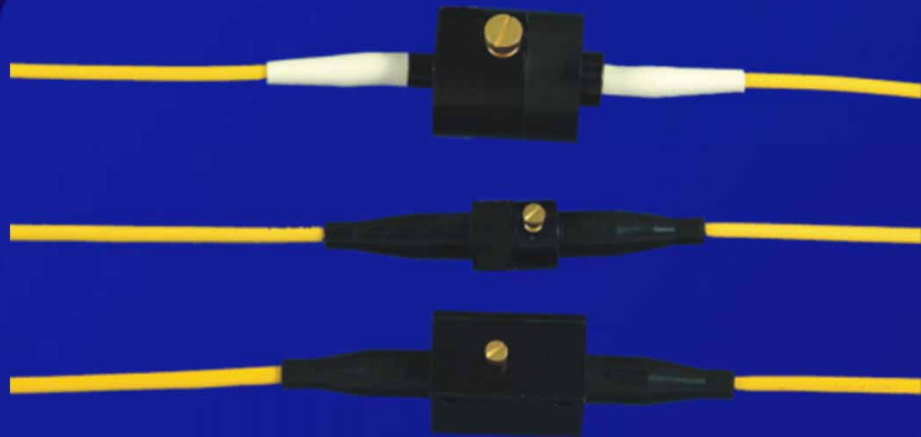
## OZ Optics Offers the Broadest Range of Attenuator Products on the Market.

### Competitive Advantages:

- High Power Handling Capability: Up to 10 Watts CW at 1550nm
- Wavelength Flattened Response Over the S, C & L Bands (1470-1620nm)
- Available from 350 nm – 2000 nm wavelengths
- Very Low Polarization Dependent Loss (PDL): As low loss 0.01dB
- High Volume Manufacturing Capability
- Exceptional Quality
- Superior Service
- Low Cost

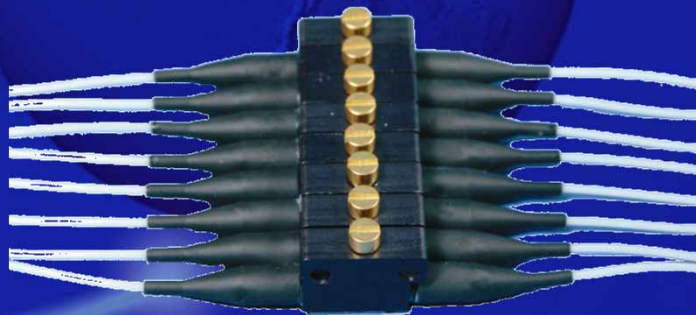
# Inline Variable Attenuators

- **0.6dB to 80dB Attenuation Range SMF, PMF & MMF**
- **Available from 350 nm – 2000 nm wavelengths**
- **Up to 10W Power, Flat Wavelength Response**
- **As low as 0.01dB PDL**
- **High Power Version up to 10 Watts at 1550nm**
- **Meets Telcordia Specifications**



# Miniature Inline Variable Attenuators

- **0.6dB to 80dB Attenuation Range SMF, PMF & MMF**
- **Available from 350 nm – 2000 nm wavelengths**
- **Up to 2W Power, Flat Wavelength Response**
- **As low as 0.01dB PDL, Meets Telcordia Specifications**
- **Ideal for patch panels, DWDM Systems**





# Inline Neutral Density Variable Attenuators

- **Mode Independent Attenuation (Ideal for MMF)**
- **0.6dB to >40 dB Attenuation Range**
- **SMF, PMF & MMF Versions**



# Reflective Style Variable Attenuators

- **0.8dB to 60dB Attenuation Range**
- **Available from 350 nm – 2000 nm wavelengths**
- **0.01dB Resolution, SMF & MMF Versions**
- **-40dB, -50dB, -60dB Backreflection**



# Receptacle Style Variable Attenuators

- **2dB to 80dB Attenuation Range**
- **Available from 350 nm – 2000 nm wavelengths**
- **0.01dB Resolution, SMF & MMF Versions**
- **Wide Variety of Receptacles Available**





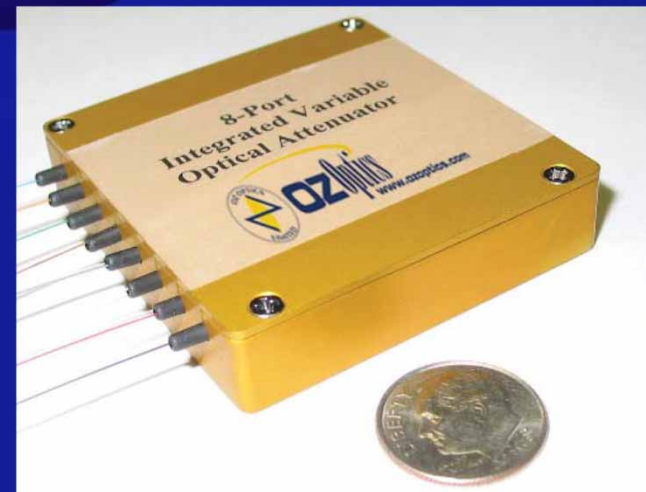
# Air Gap Variable Attenuators

- **Very Compact Size**
- **Patch Panel Mountable**
- **FC/PC, SC & ST Connector Styles**



# MEMS Based Variable Attenuators

- 0.8 – 40 dB Attenuation Range, Low Cost
- Multi Channel Variable Attenuators
- Power Monitors at Input and/or Output End
- SM and PM fiber versions.



# Electrically Controlled Attenuators

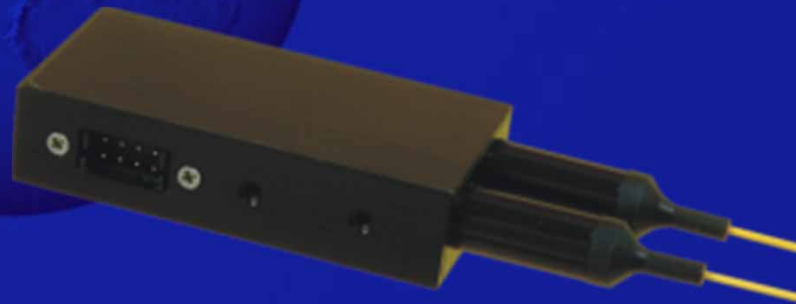
- **0.6dB to 60dB Attenuation Range SMF, PMF & MMF**
- **Available from 350 nm – 2000 nm wavelengths**
- **Maintains Attenuation with Power Off, Up to 2W Power**
- **Low Cost, High Speed, Rugged & Compact Size**





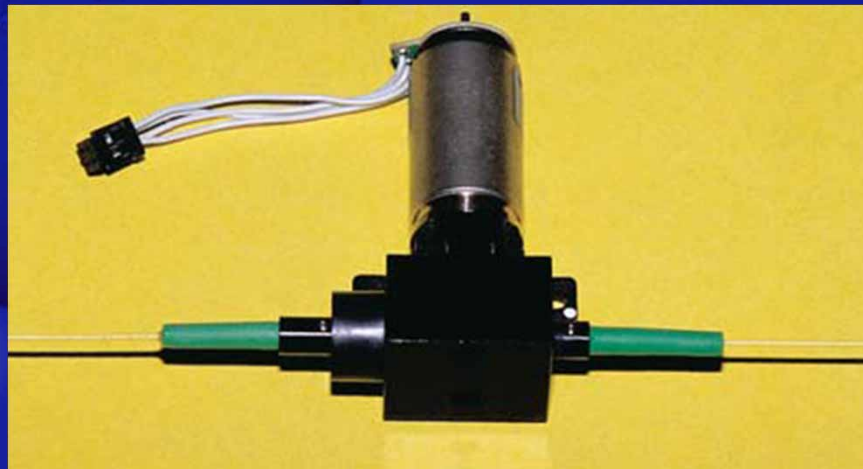
# Reflective Style Motor Driven Attenuators

- **0.8dB - 60dB Attenuation Range**
- **Available from 350 nm – 2000 nm wavelengths**
- **Up to 2W Power Handling SMF, PMF & MMF**
- **High Speed, Rugged & Compact Size**



# OEM Motor Driven Variable Attenuators

- **0.6dB to 60dB Attenuation Range SMF, PMF & MMF**
- **Available from 350 nm – 2000 nm wavelengths**
- **Maintains Attenuation with Power Off, Up to 2W**
- **Low Cost, High Speed, Rugged & Compact Size**



# Digital Variable Attenuators

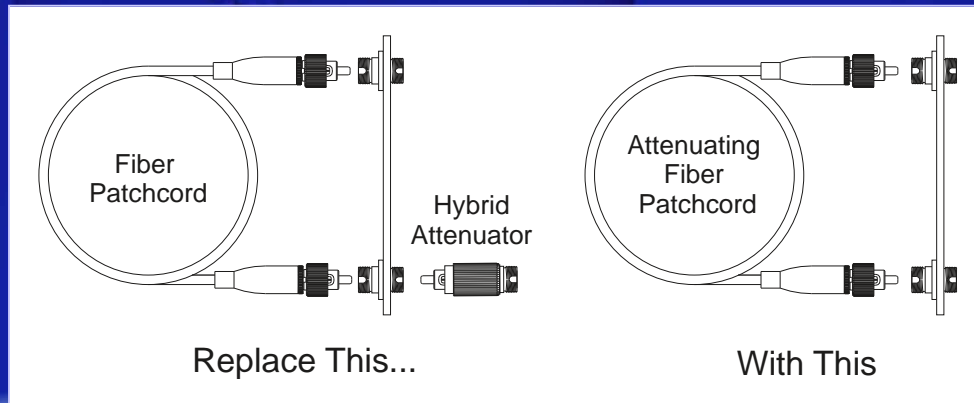
- **0.01dB Resolution, Fast Response Time**
- **0.6dB to 60dB Attenuation Range**
- **Available from 350 nm – 2000 nm wavelengths for SM, PM and MM fibers.**
- **USB Interface**
- **Up to four calibrated wavelengths**





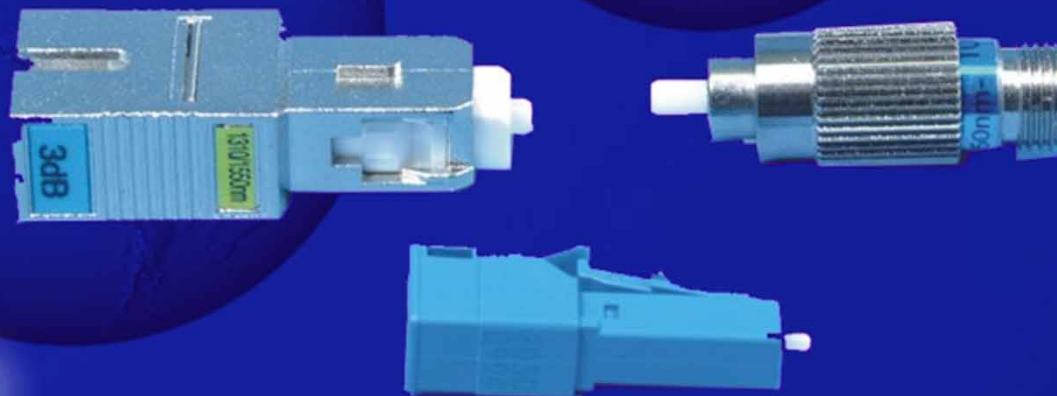
# Attenuating Fiber Patchcord

- Simplifies Your Layout
- 0.1dB to 20dB Attenuation in 0.1dB Increments
- Capable of Handling up to 2 Watts of Optical Power
- Available from 350 nm – 2000 nm wavelengths
- For SM and PM fibers only.



# Plug Type Fixed Attenuators

- **Low Cost, Rugged & Compact Size for SMF & MMF**
- **< -50dB Backreflection (for SMF)**
- **-1dB to -25dB Attenuation Levels,**
- **1300 & 1550nm for SMF, 850, 1300 & 1550nm for MMF**



# Loopback Style Fixed Attenuators

- **Mode Independent Attenuation**
- **Rugged, Compact Housing**
- **SMF & MMF Versions**





# Fixed and Removable Neutral Density Attenuators

- Mode Independent Attenuation
- Pigtail & Receptacle Styles
- SMF, MMF & PMF Versions



# Fiber Optic Terminators

- **Designed to Kill Backreflection in Unused Ends**
- **50dB Return Loss, 1300/1550 SM Fiber Only**
- **Ultra, FC/PC, LC/PC & SC Connectors**



# Hybrid Patchcords

- **Angled, Super, Ultra, FC/PC, ST, SC Connectors**
- **Male to Male, Male to Female Versions**
- **Low Cost, Rugged & Compact Size**





# Universal Connectors

- **Less than 0.5dB Insertion Loss**
- **Ultra, Super, Angled FC/PC, LC, SC, ST & SMA**
- **Low Cost, Rugged & Compact Size**



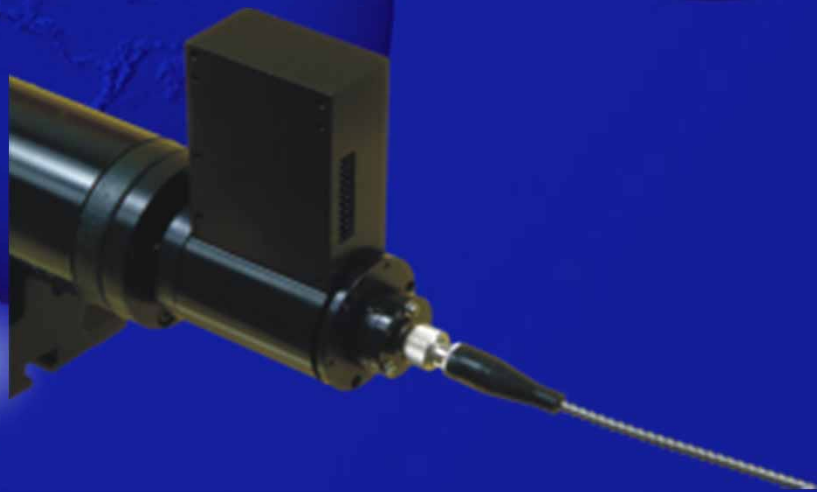
# Fiber Optic Shutters

- **Up to 100W Optical Power SMF, PMF & MMF**
- **Fast Response Time**
- **Ideal for Safety Interlocks**
- **Available from 350 nm – 2000 nm wavelengths**



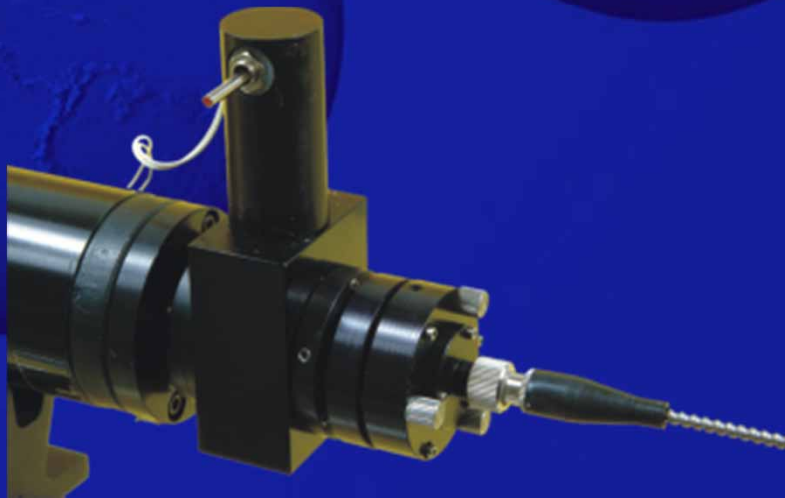
# Source to Fiber Couplers - with Electrically Controlled Attenuators

- **> 60% Coupling Efficiency for SM & PM Fiber**
- **60dB Attenuation Range**
- **Available from 350 nm – 2000 nm wavelengths**
- **0.5dB Accuracy. 0.01dB Resolution**



# Source to Fiber Couplers with Shutters

- **> 60% Coupling Efficiency for SM & PM Fiber**
- **Up to 3 Watts Optical Power**
- **Ideal for Safety Interlocks, Remote Control**
- **Available from 350 nm – 2000 nm wavelengths**





# OZ Optics

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*Please Contact Our Sales Dept:*

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Toll Free: 1-800-361-5415

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