



## ファイバーレーザーの共振器に用いる FBG (Fiber Bragg Grating) 用 フォトセンシティブファイバー (Photosensitive Fiber)

Nufern ではファイバーレーザーの共振器ミラー (高反射率 FBG, 出力カップラー用 FBG) を作成する為のフォトセンシティブファイバーを提供しています。種類としてはシングルモードファイバー、ダブルクラッドファイバー等 種々のフォトセンシティブファイバーが、用意されています。

代表例を下記表に記載します。記載していないファイバーやカスタム品のご用命も承ります。ご購入の際は、ファイバーレーザーで用いられているアクティブファイバーの型番などの仕様をご連絡下さい。Nufern で最適なフォトセンシティブファイバーを推薦致します。

Nufern社製デリバリファイバ (GDF) は基本的に全てFBG作製用ファイバ (Photosensitive Fiber) として使用できます。

| Model                              | Core Dia/Core NA<br>[μm]/ | inner clad dia/Inner Clad NA<br>[μm]/         | Coating Dia<br>[μm] | Birefringence        |
|------------------------------------|---------------------------|---|---------------------|----------------------|
| <b>PS-GDF-7/210 FUD-3386</b>       | 7/0.1                     | 210-220/0.46                                  | 335-385             | NA                   |
| <b>PS-GSF-8/130 FUD-3599</b>       | (8.6)/0.10                | 129-131/                                      | 230-260             | N/A                  |
| <b>PS-GDF-10/400 FUD-3204</b>      | 10/0.07-0.09              | 385-415/0.46                                  | 530-570             | N/A                  |
| <b>PS-GDF-15/130 FUD-15/130</b>    | 13-17/0.08                | 128-132/0.46                                  | 230-260             | N/A                  |
| <b>PS-PM-GDF-15/130 FUD-3343</b>   | 13-17/0.075-0.085         | 128-132/0.46                                  | 230-260             | $1.5 \times 10^{-4}$ |
| <b>PS-GDF-20/400 FUD-3186</b>      | 17-23/0.05-0.07           | 375-425/0.46                                  | 525-575             | N/A                  |
| <b>PS-GDF-20/400-10FA FUD-3589</b> | 18-22/0.10                | 385-415/0.46                                  | 530-570             | N/A                  |
| <b>PM-PS-GDF-20/400 FUD-3304</b>   | 18-22/0.05-0.07           | 385-415/0.46                                  | 525-575             | $3 \times 10^{-4}$   |
| <b>PS-GDF-25/250-22 FUD-3416</b>   | 23-27/0.22                | 240-260/0.46                                  | 380-420             | N/A                  |
| <b>PS-GDF-30/400 FUD-3203</b>      | 27-33/0.05-0.07           | 385-415/0.46                                  | 530-570             | N/A                  |
| <b>PS-GTF-20/400/480 FUD-3355</b>  | 20-22/0.055-0.065         | 380-420/0.21-0.25<br>465-495/0.46(Outer Clad) | 615-665             | N/A                  |

PS: Photo-sensitive Fiber “( )”の値は Mode Field Diameter(MFD 値)です。

PM: Polarization Maintaining

GDF: Guide 用 Double Clad Fiber

GSF: Guide 用 SingleMode Fiber

GTF: Guide 用 Triple Clad Fiber

ご用命、ご質問は (株)オプトサイエンス までご連絡下さい。 Tel: 03-3356-1064 info@optoscience.com



# Photosensitive 980 nm Polarization Maintaining Fiber



Nufern photosensitive 980 nm polarization maintaining fiber is designed to perform all functions of a 980 nm PM fiber but with enhanced photosensitivity for fabrication of gratings. This fiber is designed for use in pump diodes, couplers and multiplexers. PS-PM980 allows component manufacturers to make low cost fibertails for 980 nm pumps. Using one fiber that provides excellent photosensitivity, as well as polarization maintaining attributes, substantially reduces writing time thus lowering costs.

## Typical Applications

- Grating-based pump diode pigtails
- Couplers
- Multiplexers

## Features & Benefits

- PANDA-style stress structure for increased birefringence — Superior optical performance and uniformity
- High photosensitivity — Enables low cost, high yield grating fabrication
- Tightly controlled specifications — Excellent uniformity

## Optical Specifications

|                                |                               |
|--------------------------------|-------------------------------|
| Operating Wavelength (nominal) | 980 nm                        |
| Core NA                        | 0.120                         |
| Mode Field Diameter            | 6.6 ± 1.0 μm @ 980 nm         |
| Cutoff                         | 900 ± 70 nm                   |
| Core Attenuation               | ≤ 3.0 dB/km @ 980 nm          |
| Beat Length                    | ≤ 3.3 mm @ 980 nm             |
| Normalized Cross Talk          | ≤ - 40.0 dB at 2 m @ 980 nm   |
|                                | ≤ - 25.0 dB at 100 m @ 980 nm |

## PS-PM980

## Geometrical & Mechanical Specifications

|                             |                                     |
|-----------------------------|-------------------------------------|
| Cladding Diameter           | 125.0 ± 1.0 μm                      |
| Core Diameter               | 6.0 μm                              |
| Coating Diameter            | 245.0 ± 15.0 μm                     |
| Coating Concentricity       | < 5.0 μm                            |
| Core/Clad Offset            | ≤ 0.50 μm                           |
| Coating Material            | UV Cured, Dual Acrylate             |
| Operating Temperature Range | -40 to 85 °C                        |
| Prooftest Level             | ≥ 100 kpsi (0.7 GN/m <sup>2</sup> ) |



Standard specifications and design parameters are listed above. Specifications are subject to change without notice. Other configurations such as alternative form factors, optimized cut-off and UV cured color coating may be available. Let us know how Nufern can assist with your requirements.



光技術をサポートする  
株式会社オプトサイエンス

<http://www.optoscience.com>

東京本社 〒160-0014 東京都新宿区内藤町1番地 内藤町ビルディング  
TEL: 03 (3356) 1064 FAX: 03 (3356) 3466 E-mail: info@optoscience.com  
大阪支店 〒532-0011 大阪市淀川区西中島7-7-2 新大阪ビル西館  
TEL: 06 (6305) 2064 FAX: 06 (6305) 1030 E-mail: osk@optoscience.com  
名古屋営業所 〒450-0002 名古屋市中村区名駅2-37-21 東海ソフトビル  
TEL: 052 (569) 6064 FAX: 052 (569) 8064 E-mail: ngo@optoscience.com

# Photosensitive Select Cut-Off Single-Mode Fiber



Nuferm PS1060 photosensitive fiber is designed for use in writing fiber Bragg gratings for pump stabilizers or diode output wavelengths in the 980 to 1060 nm range. PS1060 is also used in coupler applications. This photosensitive fiber provides a cost-savings for grating-writing because customers can write highly repeatable, quality gratings in a short time.

## Typical Applications

- Pump stabilizers
- Diode pigtailling
- Couplers

## Features & Benefits

- High photosensitivity — Enables low cost, high yield grating fabrication
- Mode matched to standard transmission fiber — Low splice loss

## Optical Specifications

|                      |                        |
|----------------------|------------------------|
| Operating Wavelength | 980 – 1060 nm          |
| Core NA              | 0.130                  |
| Mode Field Diameter  | 6.2 ± 0.8 μm @ 1060 nm |
| Cutoff               | 920 ± 50 nm            |
| Core Attenuation     | ≤ 20.0 dB/km @ 1060 nm |

## PS1060

## Geometrical & Mechanical Specifications

|                             |                                     |
|-----------------------------|-------------------------------------|
| Cladding Diameter           | 125.0 ± 1.5 μm                      |
| Core Diameter               | 5.0 μm                              |
| Coating Diameter            | 245.0 ± 15.0 μm                     |
| Coating Concentricity       | < 5.0 μm                            |
| Core/Clad Offset            | ≤ 0.50 μm                           |
| Coating Material            | UV Cured, Dual Acrylate             |
| Operating Temperature Range | -55 to 85 °C                        |
| Short Term Bend Radius      | ≥ 12 mm                             |
| Long Term Bend Radius       | ≥ 25 mm                             |
| Proof test Level            | ≥ 100 kpsi (0.7 GN/m <sup>2</sup> ) |



Standard specifications and design parameters are listed above. Specifications are subject to change without notice. Other configurations such as alternative form factors, optimized cut-off and UV cured color coating may be available. Let us know how Nuferm can assist with your requirements.



光技術をサポートする  
株式会社オプトサイエンス

<http://www.optoscience.com>

東京本社 〒160-0014 東京都新宿区内藤町1番地 内藤町ビルディング  
TEL: 03 (3356) 1064 FAX: 03 (3356) 3466 E-mail: info@optoscience.com  
大阪支店 〒532-0011 大阪市淀川区西中島7-7-2 新大阪ビル西館  
TEL: 06 (6305) 2064 FAX: 06 (6305) 1030 E-mail: osk@optoscience.com  
名古屋営業所 〒450-0002 名古屋市中村区名駅2-37-21 東海ソフトビル  
TEL: 052 (569) 6064 FAX: 052 (569) 8064 E-mail: ngo@optoscience.com

# 20/400 Precision Matched Photosensitive Double Clad Fiber



Nufern's PS-GDF-20/400-M photosensitive fiber is precision matched to the active and passive 20/400-M fibers and is designed for use in writing fiber Bragg gratings for fiber laser applications. Nufern's matched series of Large Mode Area (LMA) double clad fibers are ideal for high power monolithic fiber lasers and amplifiers. Featuring a matching set of LMA fibers, this series of fibers ensure splice compatibility across the entire chain of 20/400 fiber components, such as fiber Bragg gratings and couplers, required to make monolithic fiber lasers. This matched fiber series is based on a 20 micron diameter core and 400 micron diameter clad size with a low NA (0.06) core and consists of Yb-doped fiber, photosensitive fiber and passive beam delivery fibers all made to highest tolerances in the industry. All fibers utilize the latest glass composition and NuCOAT coating technology for long life and excellent beam quality.

## Typical Applications

- Monolithic high power lasers & amplifiers
- Ideal for Bragg gratings in laser applications
- Military, industrial and medical

## Features & Benefits

- Matched fiber series — Ensures splice compatibility across the 20/400 matched series of fibers
- High photosensitivity — Enables low cost, high yield grating fabrication
- NuCOAT™ fluoroacrylate coating — Greater fiber durability in extreme environmental operating & storage conditions
- All fiber proof tested to > 100 kpsi — Critical for ensuring long term reliability when coiling

## Optical Specifications

|                                |  |
|--------------------------------|--|
| Operating Wavelength (nominal) | 1060 nm  |
| Core NA                        | 0.065 ± 0.005                                    |
| First Cladding NA (5%)         | ≥ 0.46   |
| Core Attenuation               | ≤ 15.0 dB/km @ 1200 nm<br>≤ 30.0 dB/km @ 1300 nm |
| Cladding Attenuation           | ≤ 15.0 dB/km @ 1095 nm                           |

## PS-GDF-20/400-M

## Geometrical & Mechanical Specifications

|                         |                                     |
|-------------------------|-------------------------------------|
| Cladding Diameter       | 400.0 ± 5.0 μm                      |
| Core Diameter           | 20.0 ± 1.5 μm                       |
| Coating Diameter        | 550.0 ± 15.0 μm                     |
| Core/Clad Offset        | ≤ 2.00 μm                           |
| Clad Non-Circularity    | ≤ 0.5 %                             |
| First Cladding Material | Low Index Polymer                   |
| Proof test Level        | ≥ 100 kpsi (0.7 GN/m <sup>2</sup> ) |

The precision matched active and passive fibers are also available - see LMA-YDF-20/400-M and LMA GDF-20/400-M



Standard specifications and design parameters are listed above. Specifications are subject to change without notice. Other configurations such as alternative form factors, optimized cut-off and UV cured color coating may be available. Let us know how Nufern can assist with your requirements.



光技術をサポートする  
株式会社オプトサイエンス

<http://www.optoscience.com>

東京本社 〒160-0014 東京都新宿区内藤町1番地 内藤町ビルディング  
TEL: 03 (3356) 1064 FAX: 03 (3356) 3466 E-mail: info@optoscience.com  
大阪支店 〒532-0011 大阪市淀川区西中島7-7-2 新大阪ビル西館  
TEL: 06 (6305) 2064 FAX: 06 (6305) 1030 E-mail: osk@optoscience.com  
名古屋営業所 〒450-0002 名古屋市中村区名駅2-37-21 東海ソフトビル  
TEL: 052 (569) 6064 FAX: 052 (569) 8064 E-mail: ngo@optoscience.com