OPTICAL GAIN FIBER
For Fiber Lasers and Amplifiers

Ytterbium
Ytterbium Polarization-Maintaining
Erbium-Ytterbium Polarization-Maintaining
Erbium-Ytterbium

www.ofsoptics.com
Cladding Pumped Optical Fibers

Erbium-Ytterbium Double and Glass Clad, Erbium-Ytterbium PM Double Clad

These fibers enable fiber lasers and amplifiers with good beam profile characteristics, high wallplug efficiencies, compact footprints, superior reliability, and maintenance-free operation. They also accommodate high energies during pulsed operation and at high repetition rates.

Erbium-Ytterbium (Double Clad)
The single-mode core of this fiber is co-doped with both erbium and ytterbium. It is then surrounded by a silica cladding and covered with a low-index protective coating. The resulting double-clad fiber is used for single-mode fiber lasers and amplifiers operating in the 1530 to 1565 nm range.

Erbium-Ytterbium (Glass Clad)
The core of this fiber is identical to that of the erbium-ytterbium double-clad fiber described above. It is surrounded by a shaped glass inner cladding, which in turn is surrounded by a circular outer glass cladding. This glass-clad fiber is used for single-mode fiber lasers and amplifiers operating in the 1530 to 1565 nm range.

Erbium-Ytterbium PM (Double Clad)
TrueMode-kW cavities are designed to support one of two delivery options. For stand-alone use, single-mode output is efficiently coupled to common 20/400 μm delivery fiber. This provides a cladding-stripped and speckle-free clean output beam, ready for splicing to cabling. For combined use, a compatible output fiber is provided.

Typical Applications
- Construction of multi-watt amplifiers around 1550 nm
- LIDAR, CATV, FTTx, FSOC

Features and Benefits (EY Double and Glass Clad)
- Core recipe optimized for high optical efficiency and shortest device lengths
- Pump wavelength 910 - 980 nm
- Low-splice-loss achieved to conventional single-mode fiber and most commercially available passive double-clad fibers
- High conversion efficiency
- Patented cladding designs result in efficient mode mixing while maintaining good splice-ability
- Robust against 1 μm parasitics

Additional Features and Benefits (EY Glass Clad)
- Higher reliability: no optical power in contact with polymer coating, hence no coating degradation concerns
- Ease of assembly: Circular 125 μm outer cladding means that conventional telecom-grade splicers, cleavers, recoaters can be used
- Improves spliceability with conventional SM and MM passive fibers
- No low-index recoating necessary: even heat-shrink splice protector works well

<table>
<thead>
<tr>
<th>Properties</th>
<th>ErYb 130 (Double Clad)</th>
<th>ErYb 125 (Glass Clad)</th>
<th>ErYb PM 125</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core numerical aperture</td>
<td>0.17</td>
<td>&gt;0.20</td>
<td>0.17</td>
</tr>
<tr>
<td>Cladding numerical aperture</td>
<td>0.45</td>
<td>&gt;0.24</td>
<td>0.45</td>
</tr>
<tr>
<td>Mode field diameter @ 1550 nm</td>
<td>7 μm</td>
<td>7 μm</td>
<td>7 μm</td>
</tr>
<tr>
<td>Ytterbium clad absorption @ 915 nm</td>
<td>&gt;1.2 dB/m</td>
<td>1.5 dB/m</td>
<td>&gt;0.5 dB/m</td>
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<tr>
<td>Star cladding diameter</td>
<td>130 μm</td>
<td>105 μm</td>
<td>Not specified</td>
</tr>
<tr>
<td>Beat length @ 1060 nm</td>
<td>N/A</td>
<td>N/A</td>
<td>&lt;4.0 mm</td>
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<tr>
<td>Beat length @ 1550 nm</td>
<td>N/A</td>
<td>N/A</td>
<td>&lt;6.0 mm</td>
</tr>
<tr>
<td>Circular cladding diameter</td>
<td>N/A</td>
<td>125 μm</td>
<td>125 μm</td>
</tr>
<tr>
<td>Coating outer diameter</td>
<td>250 μm</td>
<td>250 μm</td>
<td>250 μm</td>
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</tbody>
</table>

Mechanical and Testing Data

<table>
<thead>
<tr>
<th>Proof test level</th>
<th>100 kpsi</th>
<th>100 kpsi</th>
<th>100 kpsi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order by Part Number</td>
<td>552 HPWR 510</td>
<td>552 HPWR 065</td>
<td>300 380 334</td>
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</table>

<table>
<thead>
<tr>
<th>ErYb 130 Double Clad</th>
<th>ErYb 125 Glass Clad</th>
<th>ErYb PM 125</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td>Core</td>
<td>Core</td>
</tr>
<tr>
<td>Inner Cladding</td>
<td>Inner Cladding</td>
<td>Inner Cladding</td>
</tr>
<tr>
<td>Coating</td>
<td>Coating</td>
<td>Coating</td>
</tr>
</tbody>
</table>
Cladding Pumped Optical Fibers

**Ytterbium, Ytterbium PM Double Clad**

The single-mode core of this optical fiber is doped with ytterbium. It is then surrounded by a silica cladding and covered with a low-index protective coating. These fibers enable fiber lasers and amplifiers with good beam profile characteristics, high wallplug efficiencies, compact footprints, superior reliability, and maintenance-free operation. They also accommodate high energies during pulsed operation and at high repetition rates.

**Typical Applications**
- Fiber lasers
- Fiber amplifiers
- High-energy, pulsed operation

**Ytterbium**
The single-mode core of this fiber is doped with ytterbium. It is then surrounded by a silica cladding and covered with a low-index protective coating. The resulting double-clad fiber is used for single-mode fiber lasers and amplifiers operating in the 1040 to 1200 nm range.

**Typical Applications**
- Construction of single-mode fiber lasers emitting at 1040 to 1200 nm

**Features and Benefits**
- Star-shaped cladding gives efficient mode mixing and improves spliceability
- Low-index polymer coating maintains strength and gives high cladding NA

**Ytterbium PM (Double Clad)**
Ytterbium double-clad PM optical fibers are used for single-mode optical fiber lasers and amplifiers operating in the 1040 to 1200 nm range with polarized outputs.

**Features and Benefits**
- Ytterbium concentrations optimized for efficiency
- Low-splice-loss achieved to conventional single-mode fiber and most commercially available passive double-clad fibers

<table>
<thead>
<tr>
<th>Properties</th>
<th>Yb 130</th>
<th>Yb PM 125</th>
<th>YB10-130</th>
<th>YB12-250</th>
<th>YB16-250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core numerical aperture</td>
<td>0.12</td>
<td>0.12</td>
<td>0.075 ± 0.005</td>
<td>0.070 ± 0.005</td>
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<tr>
<td>Cladding numerical aperture</td>
<td>0.45</td>
<td>0.45</td>
<td>≥0.45</td>
<td>≥0.46</td>
<td>≥0.45</td>
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<tr>
<td>Mode field diameter @ 1070 nm</td>
<td>6 µm</td>
<td>6 µm</td>
<td>11 ± 0.8 µm</td>
<td>12 ± 0.8 µm</td>
<td>15 µm</td>
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<tr>
<td>Ytterbium clad absorption @ 915 nm</td>
<td>&gt;0.5 dB/m</td>
<td>&gt;0.5 dB/m</td>
<td>1.6 ± 0.2 dB/m</td>
<td>0.65 ± 0.15 dB/m</td>
<td>0.9 ± 0.1 dB/m</td>
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<tr>
<td>Beat length @ 1060 nm</td>
<td>Not Specified</td>
<td>&lt;4.0 mm</td>
<td>Not Specified</td>
<td>Not Specified</td>
<td>Not Specified</td>
</tr>
<tr>
<td>Beat length @ 1550 nm</td>
<td>Not Specified</td>
<td>&lt;6.0 mm</td>
<td>Not Specified</td>
<td>Not Specified</td>
<td>Not Specified</td>
</tr>
<tr>
<td>Cladding diameter (Peak to Peak)</td>
<td>130 ± 2 µm</td>
<td>125 µm</td>
<td>130 ± 3 µm</td>
<td>250 ± 3 µm</td>
<td>253 ± 4 µm</td>
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<tr>
<td>Coating outer diameter</td>
<td>250 ± 15 µm</td>
<td>250 µm</td>
<td>250 ± 15 µm</td>
<td>400 ± 15 µm</td>
<td>400 ± 15 µm</td>
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</tbody>
</table>

**Mechanical and Testing Data**

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<th>Proof test level</th>
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<th>100 kpsi</th>
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<tbody>
<tr>
<td>Order by Part Number</td>
<td>78756</td>
<td>552 HPWR 004</td>
<td>79541</td>
<td>79539</td>
<td>85720</td>
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</table>

![Yb 130 Double Clad](image1)

![Yb PM 125](image2)

![Yb10-130 Double Clad](image3)

![Yb12-250 Double Clad](image4)

![Yb16-250 Double Clad](image5)
Cladding Pumped Optical Fibers

Cladding Pumped Fiber LASER (CPFL)

- 7 Broad Area Emitters
- Fiber Bragg Gratings
- Output Wavelength:
  - 1064 nm
  - 1083 nm
  - 1100 nm
  - 1117 nm

Cladding Pumped Fiber AMPLIFIER (CPFA)

- 6 Broad Area Emitters
- Signal: 1.00 m or 1.55 m

Cladding Pumped Fibers

- Also Available Separately

Combiners for CPF Lasers

- Multimode Input (105/125 µm)
- CPF Output (0.45 NA)

Cladding Pumped Fiber Gain Module Configurations

- Includes Combiner and Cladding Pumped Fiber
- Models of Gain Modules Available: Yb, PM Yb, ErYb Double & Glass Clad, PM ErYb

For additional information please contact your sales representative. You can also visit our website at www.ofsoptics.com or call 1-888-FIBER-HELP (1-888-342-3743) from inside the USA or 1-770-798-5555 from outside the USA.

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