



A Furukawa Company

**Optical Gain Fiber**  
Double Clad and Glass Clad



## **OPTICAL GAIN FIBER**

for Fiber Lasers and Amplifiers

Ytterbium

Ytterbium Polarization-Maintaining

Erbium-Ytterbium Polarization-Maintaining

Erbium-Ytterbium

## Cladding Pumped Optical Fibers

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

These fibers enable fiber lasers and amplifiers with good beam profile characteristics, high wallplug efficiencies, compact foot-prints, 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  $\mu\text{m}$  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

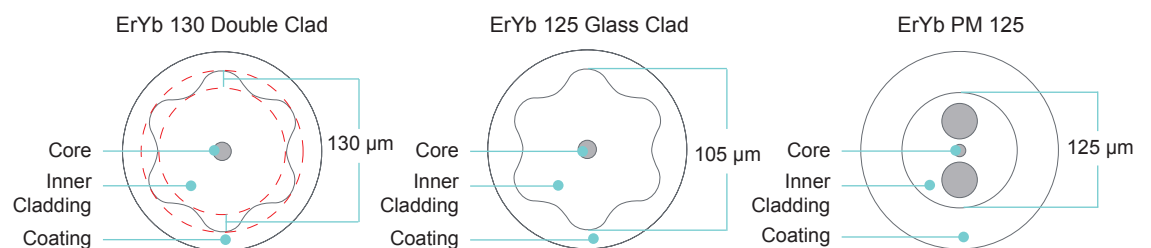
#### Features and Benefits (EY Double and Glass Clad)

- 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  $\mu\text{m}$  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  $\mu\text{m}$  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

	ErYb 130 (Double Clad)	ErYb 125 (Glass Clad)	ErYb PM 125
<b>Properties</b>			
Core numerical aperture	0.17	>0.20	0.17
Cladding numerical aperture	0.45	>0.24	0.45
Mode field diameter @ 1550 nm	7 $\mu\text{m}$	7 $\mu\text{m}$	7 $\mu\text{m}$
Ytterbium clad absorption @ 915 nm	>1.2 dB/m	>1.5 dB/m	>0.5 dB/m
Star cladding diameter	130 $\mu\text{m}$	105 $\mu\text{m}$	Not specified
Beat length @ 1060 nm	N/A	N/A	<4.0 mm
Beat length @ 1550 nm	N/A	N/A	<6.0 mm
Circular cladding diameter	N/A	125 $\mu\text{m}$	125 $\mu\text{m}$
Coating outer diameter	250 $\mu\text{m}$	250 $\mu\text{m}$	250 $\mu\text{m}$
<b>Mechanical and Testing Data</b>			
Proof test level	100 kpsi	100 kpsi	100 kpsi
Order by Part Number	552 HPWR 510	552 HPWR 065	300 380 334



## 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

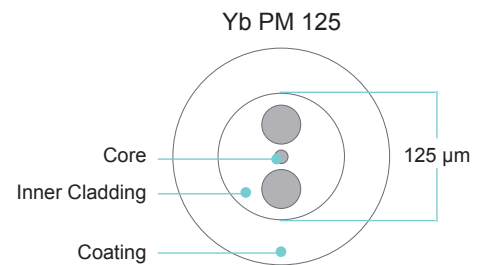
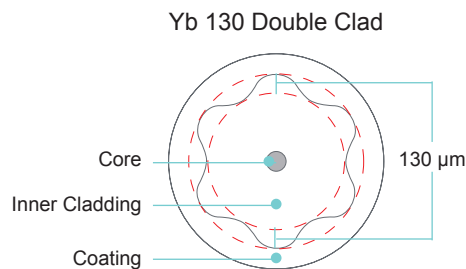
#### Ytterbium PM

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

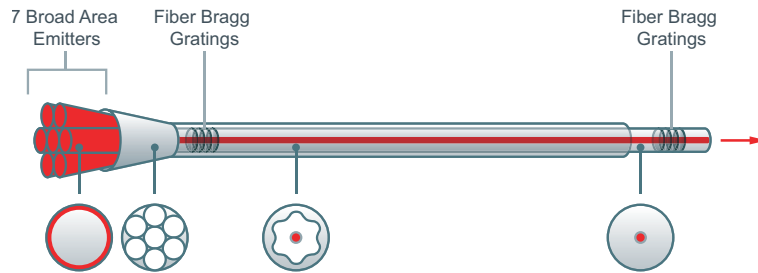
- Ytterbium concentrations optimized for efficiency
- Low-splice-loss achieved to conventional single-mode fiber and most commercially available passive double-clad fibers

	Yb 130	Yb PM 125
<b>Properties</b>		
Core numerical aperture	0.12	0.12
Cladding numerical aperture	0.45	0.45
Mode field diameter @ 1550 nm	6 μm	6 μm
Ytterbium clad absorption @ 915 nm	>0.5 dB/m	>0.5 dB/m
Beat length @ 1060 nm	Not Specified	<4.0 mm
Beat length @ 1550 nm	Not Specified	<6.0 mm
Circular cladding diameter	Not Specified	125 μm
Coating outer diameter	250 μm	250 μm
<b>Mechanical and Testing Data</b>		
Proof test level	100 kpsi	100 kpsi
<b>Order by Part Number</b>	<b>107 986 820</b>	<b>552 HPWR 004</b>



Cladding Pumped Fiber  
**Laser and Amplifier**

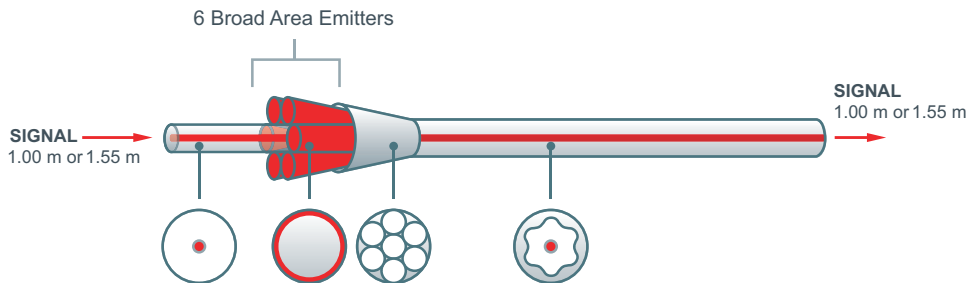
Cladding Pumped Fiber **LASER (CPFL)**



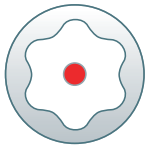
**Output Wavelength:**

- 1064 nm
- 1083 nm
- 1100 nm
- 1117 nm

Cladding Pumped Fiber **AMPLIFIER (CPFA)**

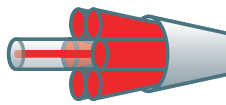


Cladding Pumped Fibers



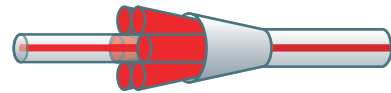
Also Available Separately

Combiners for CPF Lasers



Multimode Input (105/125  $\mu\text{m}$ )  
 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](http://www.ofsoptics.com)  
 or call 1-888-FIBER-HELP (1-888-342-3743) from inside the USA  
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