NuMATCH™

INTRODUCING NuGEN9

Connecting High Performance
Fiber Laser & Amplifer Components

Optimize manufacturing of high performance fiber lasers & amplifiers

High precision, repeatable splicing of fiber components made with various specialty fibers is key to manufacturing high performance fiber lasers. NuMATCH fiber sets have carefully chosen specifications with tight geometric and optical tolerances that facilitate repeatable splicing in volume manufacturing environments. OEMs and high end users can easily specify that components for their laser product are made from Nufern's NuMATCH fibers, thus ensuring that all fibers and components going into the production line are spliced easily yielding the highest performance products. NuGEN9 Yb-fibers, the state-of-the-art fibers from Nufern, are available as precision matched fiber sets, for your most demanding applications.

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OPTICAL FIBERS — FIBER GYRO COILS — DEFENSE TECHNOLOGY — FIBER LASERS & AMPLIFIERS

NUMATCH™

Connecting High Performance
Fiber Laser & Amplifier Components

Precision Matched LMA Double Clad Fiber Family

- Maximize splice performance between fibers for high yield manufacturing of fiber lasers
- Precision matched sets available for LMA fibers spanning 10-25 µm core and 130-400 µm clad diameters
- NuGEN9 Yb-fibers are precision matched as standard

Precision Table 1

	Nufern 20/400 Precision Matched Fiber Set				
	Photosensitive	Active	Passive	PM Active	PM Passive
	PS-GDF-20/400-M	LMA-YDF-20/400-M	LMA-GDF-20/400-M	PLMA-YDF-20/400-M	PLMA-GDF-20/400-M
Core Diameter (µm)	20+/-1.5	20+/-1.5	20+/-1.5	20+/-1.5	20+/-1.5
Clad Diameter (µm)	400+/-5	400+/-10	395+/-5	405+/-10	395+/-10
Core NA	0.065+/-0.005	0.065+/-0.005	0.065+/-0.005	0.065+/-0.005	0.065+/-0.005
Clad NA	>0.46	>0.46	>0.46	>0.46	>0.46
Coating Diameter (µm)	550+/-15	550+/-15	550+/-15	550+/-15	550+/-15
Birefringence				0.0004	0.0004
Prooftest (kpsi)	>100	>100	>100	>100	>100

Complimentary Matched Fiber Family

- Complimentary fibers have core structure, size and composition that allow light to propagate efficiently from one type of fiber to the other after splicing
- Available in more than 40 different products covering Yb, Er:Yb, Tm and Ho doped fibers as well as passive fibers

Complimentary Table 2

	Nufern 20/130 Complimentary Fiber Set			
	Active	Passive	PM Active	PM Passive
	LMA-YDF-20/130-VIII	LMA-GDF-20/130	PLMA-YDF-20/130-VIII	PLMA-GDF-20/130
Core Diameter (um)	20+/-2	20+/-2	20+/-2	20+/-2
Clad Diameter (um)	130+/-2	130+/-1	130+/-1	130+/-1
Core NA	0.080+/-0.005	0.080+/-0.005	0.080+/-0.005	0.080+/-0.005
Clad NA	>0.46	>0.46	>0.46	>0.46
Coating Diameter (um)	245+/-10	245+/-10	245+/-10	245+/-10
Birefringence			0.0002	0.0002
Prooftest (kpsi)	>100	>100	>100	>100

Features & Benefits

- Matched fiber series — Ensures splice compatibility
- NuCOAT$_{FA}$ fluoroacrylate coating — Greater fiber durability in extreme environmental operating & storage conditions
- Available in NuGEN9 Yb-doped glass — Useful for generating high powers in the most demanding applications
- Precision matched set of fibers — Offer the most stringent specification and best performance in the industry
- All fiber proof tested to > 100 kpsi — Critical for ensuring long term reliability when coiling

Typical Applications

- Monolithic high power fiber lasers and amplifiers
- LMA fiber couplers, pump combiners and Bragg gratings
- High power pump and signal delivery pigtails
- Military, industrial and medical

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Toll Free: 866.466.0214 | Tel: 860.408.5000 | Fax: 860.844.0210 | **www.nufern.com**
Capabilities and typical design parameters are described above. Various standard and OEM designs are available.

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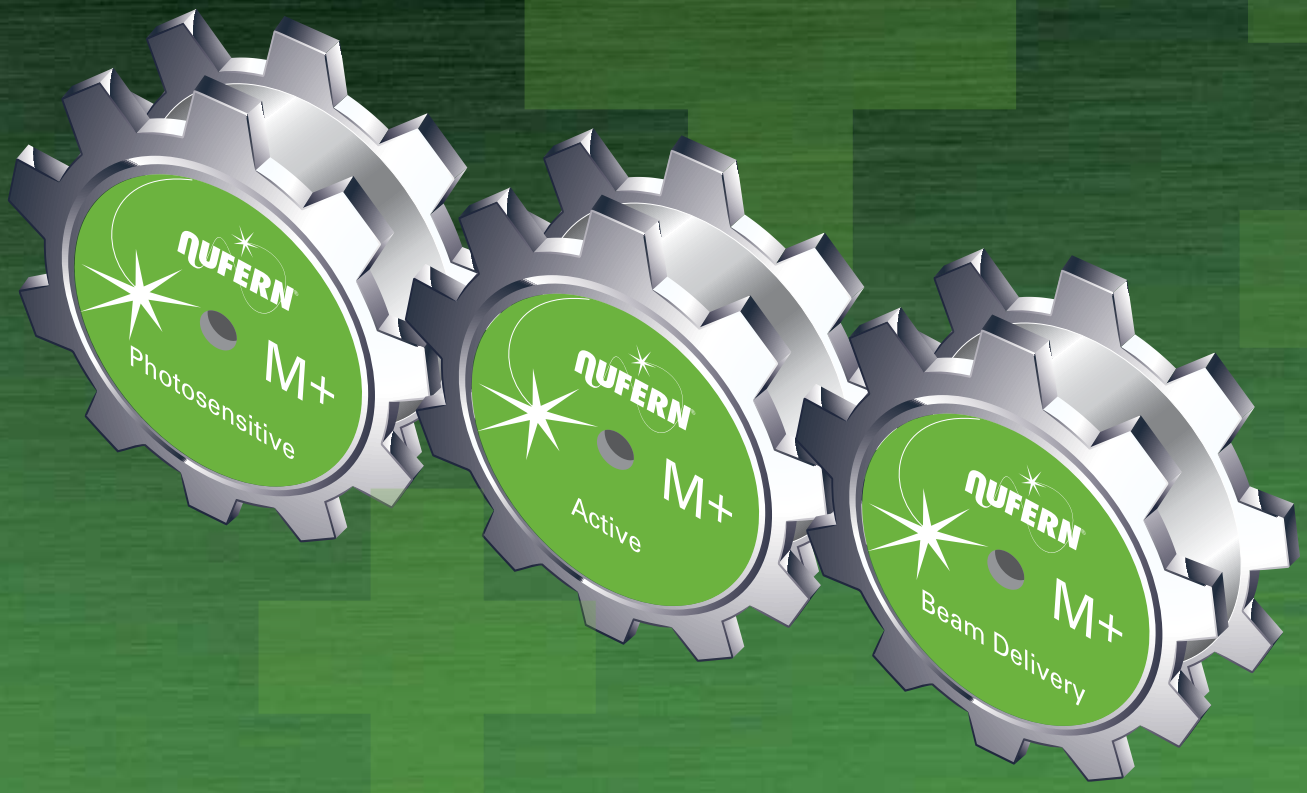
NuMatch™ M+



Tighter Tolerance Fibers for Optimized Splicing

Uncompromising Performance

Nufern has developed a new line of matched fibers called M+ that are specifically designed to provide the best beam quality at the highest output powers needed for today's industrial applications. These fibers offer the tightest tolerance geometry specifications enabling the lowest possible splice loss between active and passive fibers, resulting in lower thermal load. In addition, the attenuation and the NA tolerance have been improved allowing the lowest overall fiber path loss. These improved features increase splice repeatability reducing laser build cost. Use Nufern NuMatch M+ fibers to improve laser performance by reducing overall loss and minimizing thermal load.

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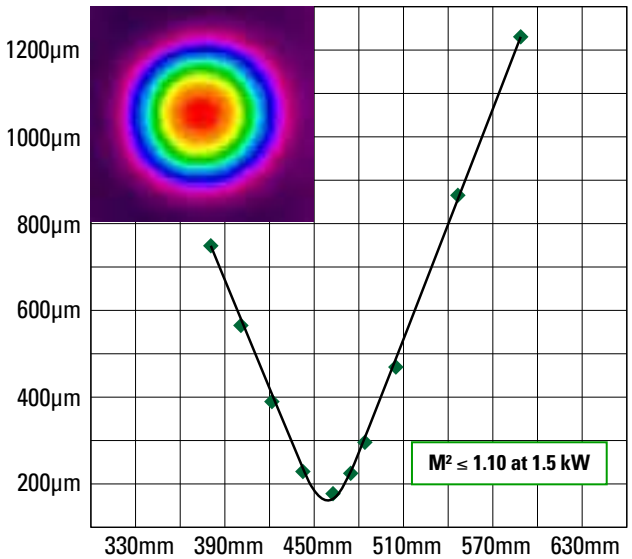
NUMATCH™ M+

Tighter Tolerance Fibers for
Optimized Splicing

Tighter Tolerances

Introducing M+ line of matched active and passive fibers for the most demanding fiber laser applications requiring the highest performance and greatest beam quality M+ fibers offer >25% tighter tolerances than any other fibers including Nufern's M class of matched fibers.

- Delivering best available splice loss
- Improved thermal load management
- Improved beam quality



Beam quality, M^2, achieved with a 0.06 NA, 25/400 µm, Yb-fiber with M+ specifications operating at an output power of 1500 watts.

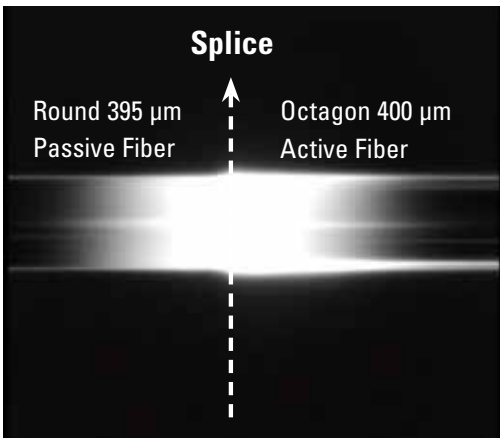
Ultra Matched M+ Fibers with Improved MFD Tolerence

Nufern M+ fibers are the first active fibers in the industry that specify the mode-field diameter. By optimizing and precisely matching the MFD of the active and passive M+ fibers, splice losses less than 0.05 dB are realized easier than with any other active/passive fiber pairing

Benefits

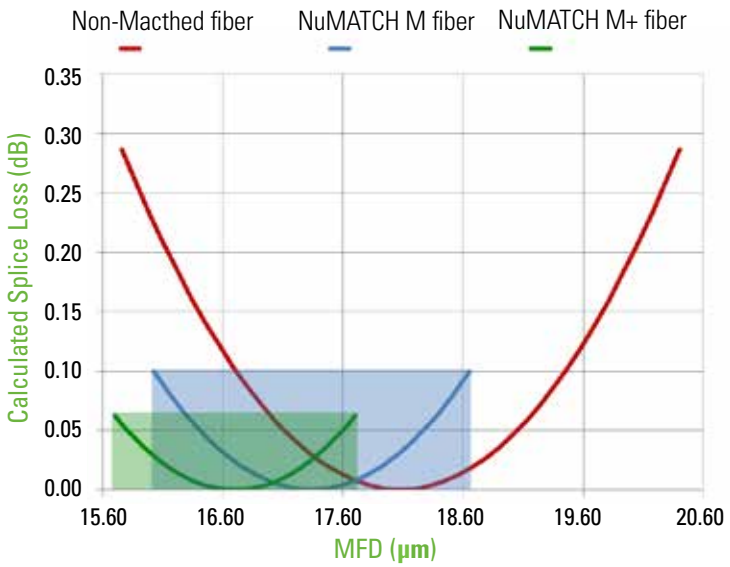
Nufern continues to offer the largest range of matched fibers for industrial production of fiber lasers for the widest range of applications including marking, micro-machining, cutting, welding, drilling and engraving.

- Tighter tolerance – Reduces the time and variability when splicing
- Repeatable splices – Reduces test and rework with lower splice loss
- High power – Reduces stray light and thermal load
- Performance – Improves beam quality and laser efficiency



By optimizing the core sizes and NA, and specifying the MFD, M+ fibers have better matched MFD's for improved splice performance.

Calculated Splice Loss vs MFD Specification



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