

Anti-Resonant Hollow Core Fibers

The IXF-ARF family are anti-resonant hollow-core fibers. ARF fibers exhibit a large mode effective area, ultra low dispersion within the transmission band and extremely low overlap of guided power with the surrounding silica (less than $2 \cdot 10^{-5}$). ARF fibers are particularly suited as delivery fiber for ultrafast laser operating in the visible and NIR wavelengths, for low latency applications at 1550 nm, and for gas sensing in the 2 and 3 μm wavelength ranges.



IXF-ARF fibers can be connectorized into patchcords or fiber assemblies for easier integration, handling and improved robustness.

Benefits & Features

- Low loss for fiber delivery applications
- High damage threshold
- Ultra low dispersion in the transmission bands
- Nearly single mode guidance
- Connectorization into patchcords possible
- Other wavelengths available upon request

Applications

- Delivery fiber for ultrafast lasers
- Low latency data transmission
- Gas-filled AR hollow core fiber laser
- Molecular tracing, gas detection

Related Publications

- [Jason Kapit and Anna P. M. Michel, «Dissolved gas sensing using an anti-resonant hollow core optical fiber.» Appl. Opt. 60, 10354-10358 \(2021\)](#)
- [R. Nagase, H. Kamitsuna, R. Sasaki, and T. Maejima, «Hollow-Core Fiber Connector,» in 26th Optoelectronics and Communications Conference, P. Alexander Wai, H. Tam, and C. Yu, eds., OSA Technical Digest \(Optica Publishing Group, 2021\), paper S4E.3.](#)
- 28th International Conference on Optical Fiber Sensors, Hamamatsu, Japan, November 2023, Paper Tu3.10 (2023), «A High Sensitivity, Fast Response Optical Fiber Gas Sensor using Micro-drilled Anti-Resonant Fiber»

IXF-ARF-	40-240	41-240	33-160-V1	45-240-V1
Optical parameters				
Design wavelength (nm)	750	920	1064	1550
Attenuation (dB/km) ⁽²⁾	≤ 50	≤ 75	≤ 55	≤ 35
Bandwidth < 100 dB/km (nm)	700 – 915	820 – 990	1000 – 1260	1450 – 1750
Mode Field Diameter (μm) ^{(1), (2)}	29	34	26	37
Dispersion (ps/nm/km) ^{(1), (2)}	1	1	2	1
Numerical aperture ⁽¹⁾	0.02	0.02	0.03	0.03
3 dB bend loss radius (cm) ^{(2), (3)}	≤ 5	≤ 5	≤ 5	≤ 7
Physical and Material parameters				
Material	Air core surrounded by Pure Silica			
Core diameter (μm)	38 ± 3	40 ± 3	33 ± 3	46 ± 3
Silica diameter (μm)	242 ± 5	240 ± 5	160 ± 5	239 ± 5
Coating diameter (μm)	398 ± 10	398 ± 10	325 ± 10	395 ± 10
Coating type	Dual coat high index acrylate			
Proof-testing (kpsi)	≥ 20			

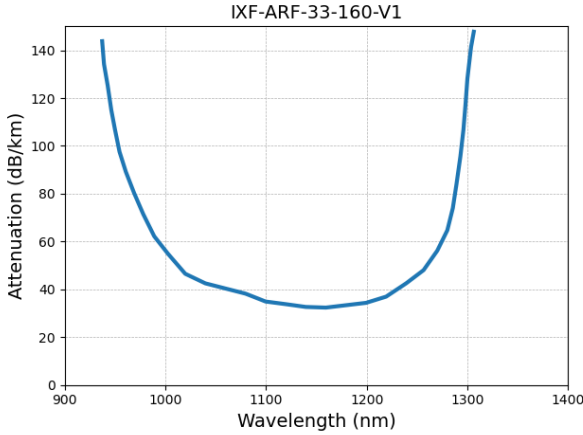
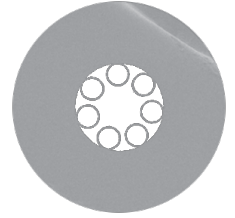
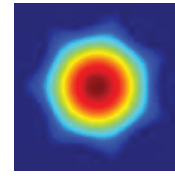
(1) Calculated typical value from simulation

(2) At design wavelength

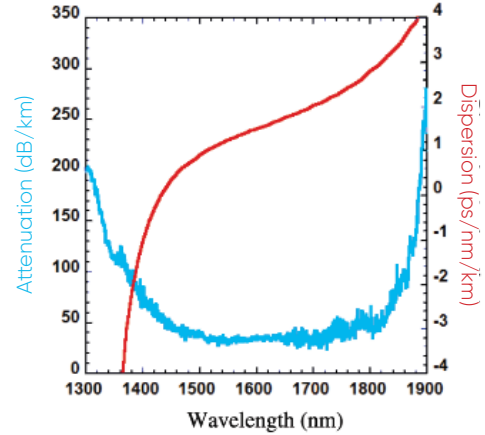
(3) Per turn

IXF-ARF Series

ARF fibers exhibit a gaussian profile and nearly-singlemode behavior. Their wide transmission window and moderate loss make them an appealing option for many applications, including the delivery of high power ultrafast lasers. The large mode field diameter and very low numerical aperture require special care when coupling optical signal into ARF fibers.



Typical attenuation of IXF-ARF-33-160-V1 fiber optimized for operation around 1 μm .



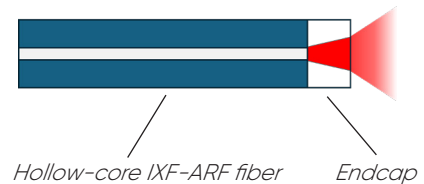
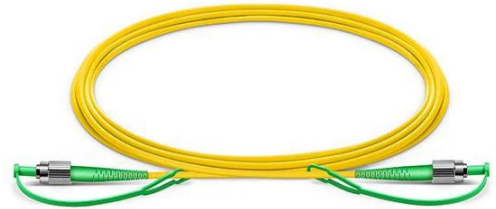
Typical attenuation and dispersion of IXF-ARF-45-240-V1 fiber optimized for operation around 1550 nm

PATCHCORDS & FIBER ASSEMBLIES

ARF fibers can be connectorized into patchcords or pigtailed for easier integration, handling and improved robustness. When connectorized, fiber end-faces are terminated with thin endcaps to seal and protect the hollow microstructure while maintaining the optical beam quality.

Patchcord

Length (m)	Up to 12, longer lengths upon request
Connectors	FC (APC or PC) SC (APC or PC) SMA Other upon request
Jacket	No jacket (bare fiber) \varnothing 900 μm hytrel \varnothing 3 mm PVC Stainless steel
Endcap length (μm), typical	100, other lengths upon request
Endcap material	Fused silica



Hollow-core IXF-ARF fiber

Endcap

Exail reserves the right to change, at any time and without notice, the specifications, design, function or form of its products described herein.

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