
fiberware
optical fibers - our passion

FIBERWARE
PRECISION IN OPTICAL FIBERS

fiberware is one of the world's leading manufactures of optical specialty fibers and fiber optic technologies. For more then three decates, the name fiberware has stood for highest precision, outstanding quality and customized solutions - from individual fibers to complete assemblies.

Our extensive manufacturing depth allows us to respond flexibly to individual customer requirements and to deliver tailored solutions for a wide range of industries - including high-power-laser applications, the semiconductor industry, laser and optics systems, sensor technology, spectroscopy, aerospace, automation technology and many more.

Our products meet the highest quality standards and are certified accoording to EN ISO 13485. Over 50% of our production is exported worldwide and is highly regarded in international markets.

fiberware -
Innovation meets experience.

Board of Directors (CEOs): Prof. Dr. G. Kuka, Sven Bonitz
Sales Director: Naim Ashraf

DEVELOPMENT OF THE CORPORATE GROUP

A success story in the light of innovation

1990 fiberware

The roots of our group go back to 1990, when physicist and fiber optics expert Dr. Georg Kuka founded fiberware in Berlin. His vision: to turn light technology at the cutting edge of science into market-ready applications.

1996 Headquarters Mittweida

A significant step followed in 1996: the company relocated its headquarters to Mittweida - a renowned hub for research and development in laser and optical technologies. This move laid the foundation for a close integration of science, engineering and industrial application.

2003 advanced fiber tools

In the year 2003 we expanded our portfolio by founding advanced fiber tools, with a clear focus on the production of certified medical assemblies, including medical laser probes. As a result, we successfully entered the field of medical technology and established ourselves as a reliable partner for customized solutions.

2022 Harnessing Light Holding

The next milestone came in 2022: the two companies were integrated into the newly established Harnessing Light Holding. This step united years of collaboration under one strategic umbrella - with the goal of sustainably strengthening the group's shared expertise, innovative power and synergies.

QUALITY
OUR FIRST PRIORITY!

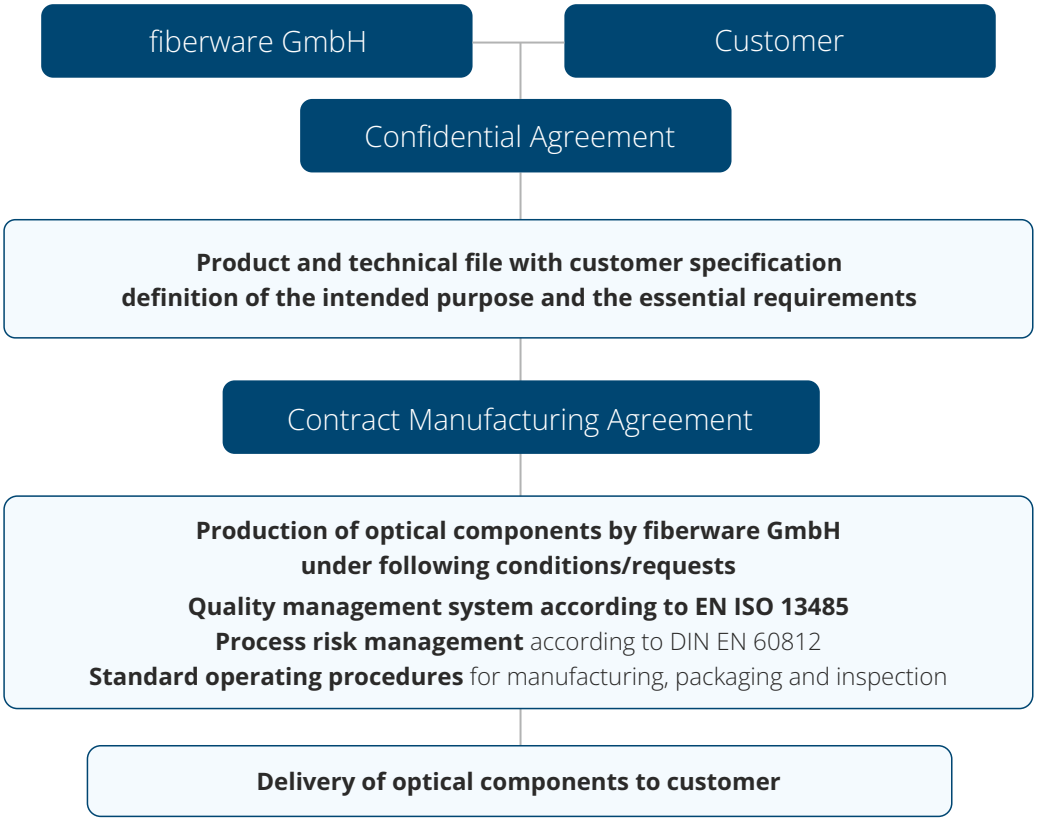
With our process-oriented
quality management system

QUALITY STATEMENT

The company fiberware GmbH has a process-oriented quality management system according to EN ISO 13485 and a quality assurance system.

The products we manufacture and deliver are subject to the strictest quality assurance criteria.

CONTRACT MANUFACTURING CHART



CUSTOMIZED SOLUTIONS

With our in-house team, we design and manufacture innovative products across the entire value chain - from optical fiber production to laser probe assembly and application-specific integration.

Drawing facility

Extrusion

Assembling

Industrial and scientific applications

INDUSTRIAL APPLICATIONS*

Astronomy

- bare fibers / shaped fibers
- cables
- bundles
- beam delivery
- measurement
- assembly

Laser

- bare fibers / shaped fibers
- cables
- bundles
- beam delivery
- process control
- monitoring
- assembly

Mining

- bare fibers
- cables
- process control
- monitoring
- assembly

Optics

- bare fibers / shaped fibers
- cables
- bundles
- beam delivery
- process control
- monitoring
- measurement
- assembly

Scientific

- bare fibers / shaped fibers
- cables
- bundles
- beam delivery
- process control
- monitoring
- measurement
- assembly

Semiconductor

- fibers
- cables
- bundles
- process control
- monitoring
- measurement
- assembly

Sensing

- bare fibers / shaped fibers
- cables
- bundles
- beam delivery
- process control
- monitoring
- assembly

Spectroscopy

- bare fibers / shaped fibers
- cables
- bundles
- beam delivery
- detection
- monitoring
- assembly

* *The applications listed above represent possible areas of applications and can be realized in cooperation with the customer.*

LASERGUIDE

Overview of Laser Types and their Wavelengths – Technical Importance of the Optical Fiber

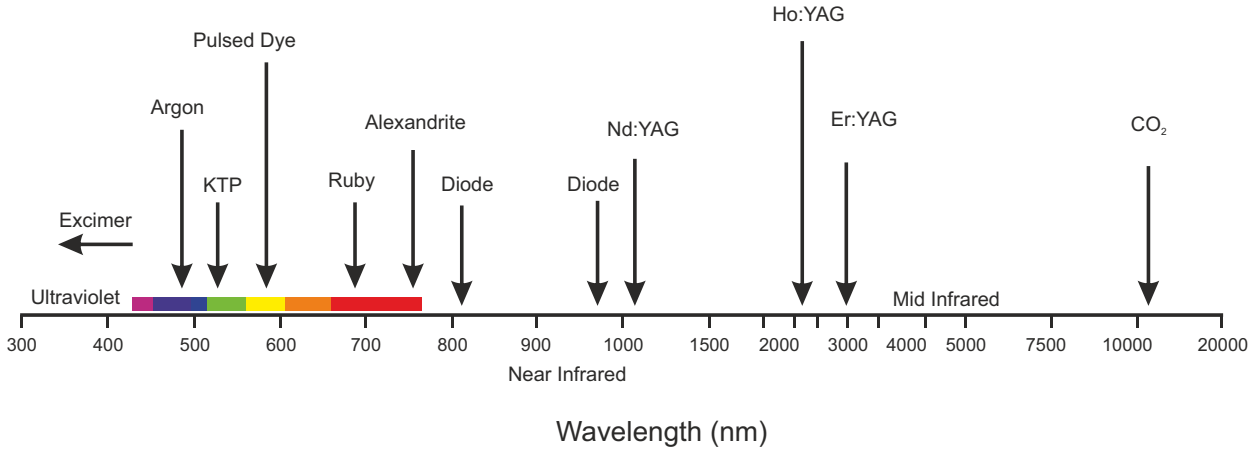
Lasers emit coherent radiation of a defined wavelength, determined by the specific laser medium, such as CO_2, argon, ruby or semiconductors.

To transmit this radiation reliably to the point of application, the use of suitable optical fibers is essential.

The fiber is responsible for transporting the laser energy with minimal losses and high beam stability. Depending on wavelength, power level and application, fibers with specific core materials, numerical apertures and structural designs are selected.

The appropriate optical fiber is therefore a critical factor in the efficiency, safety and precision of laser-based systems.

Laser	Laser Type	Wavelength
FAR INFRARED		
Er:YAG	Solid State	2,9 mic
HO:YAG	Solid State	2,1 mic
CO_2	Gas	10,6 mic
CO_2 pulsed / gepulst	Gas	10,6 mic
NEAR INFRARED		
Nd:YAP	Solid State	1080 nm
Nd:YAG	Solid State	1064 nm
Diode	Semiconductor	810-980 nm
Diode	Semiconductor	630-750 nm
Krypton	Gas-Ion	799.3 nm
Alexandrit	Solid State	700-800 nm
Diode	Semiconductor	780-905 nm
Krypton	Gas-Ion	752.5 nm
VISIBLE		
Ruby	Solid State	694 nm
Krypton	Gas-Ion	676.4 nm
HeNe	Gas	633 nm
Ruby	Solid State	628 nm
Frequency dubb. Nd:YAG / KTP	Gas-Ion	350 nm
Krypton	Gas-Ion	350 nm
Argon	Gas-Ion	514,5 nm
KTP / Frequency dubb. Nd:YAG	Solid State	532 nm
NEAR ULTRAVIOLET		
Excimer	Gas (excimer)	308 nm (UV-B)
FAR ULTRAVIOLET		
ArF	Gas (excimer)	193 nm (UV-C)

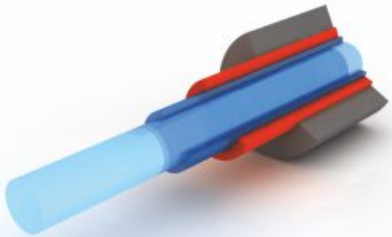

Ho:YAG
Pulsed Dye
Argon
Alexandrite
Nd:YAG
Er:YAG
CO2
KTP
Ruby
Diode
Diode
Excimer
Ultraviolet
Mid Infrared
300
400
500
600
700
800
900
1000
1500
2000
3000
4000
5000
7500
10000
20000
Near Infrared
Wavelength (nm)

AS... UV / VIS QUARTZ / QUARTZ FIBERS

All Silica... UltraViolet

Features

- Higher transmission than PCS-Fibers between 180 nm and 300 nm
- High core-to-clad ratio available for high-efficiency bundles
- Specialty coatings available for high temperatures, high vacuum and harsh chemicals environments
- Biocompatible materials
- Sterilizable by ETO, steam, e-beam, gamma radiation
- Radiation resistant
- Laser damage resistant



Fiber-Design

- Pure fused silica core (high OH-)
- Fluorine doped fused silica cladding
- Acrylate coating (-40°C to 85°C)
- Silicone resin coating (-40°C to 180°C)
- Polyimide coating (-190°C to 385°C)

Properties

- Core/clad ratio: 1.1
- Numerical aperture: 0.22 ± 0.02
- Operation wavelength range: 180 nm to 1100 nm
- Proof test level (bend method): 70 kpsi
- Bend radius: momentary 100 times the fiber radius long term 600 times the fiber radius
- Laser damage threshold:
  > 50 mJ/mm^2 (XeCl, 25 ns pulse at 248 nm)
  >150 mJ/mm^2 (XeCl, 30 ns pulse at 308 nm)
- Radiation induced attenuation:
  < 10 dB/km at dose values above 1 Mrad

Optional

- Core/clad ratios: 1.05, 1.07, 1.15, 1.20, 1.30, 1.40
- Numerical apertures: 0.07 to 0.28
- Metal coating
- Fiber bundles
- Tapered fibers
- Connectors (SMA, FC/PC, ST, DIN)
- AS-Fiber cables

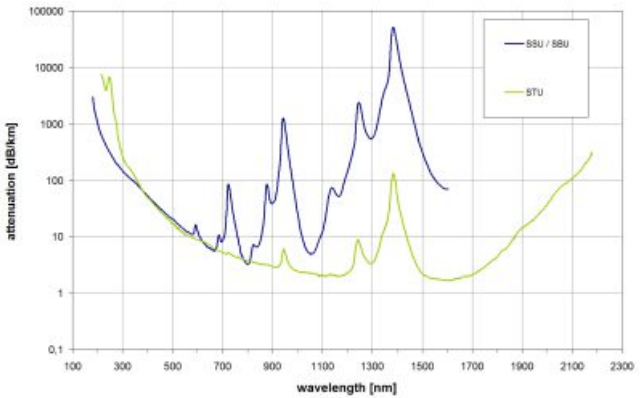
Coating/Buffer

- Nylon (-40°C to 100°C)
- ETFE (-200°C to 150°C)
- Acrylate (-40°C to 85°C)
- Polyimide (-190°C to 385°C)

Other specifications upon request

Low Attenuation:

- α (λ = 313nm) = 99dB/km
- α (λ = 400nm) = 36dB/km
- α (λ = 660nm) = 5,4dB/km

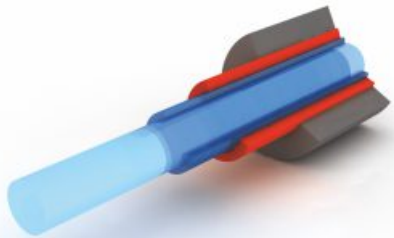


AS... IR QUARTZ/QUARTZ FIBERS

All Silica ... Infrared

Features

- Higher transmission than PCS-Fibers between 1500 nm and 2600 nm
- Broad useful spectral transmission range
- Specialty coatings available for high temperatures, high vacuum and harsh chemicals environments
- Biocompatible materials
- Sterilizable by ETO, steam, e-beam, gamma radiation
- Radiation resistant
- Laser damage resistant



Fiber-Design

- Pure fused silica core (low OH-)
- Fluorine doped fused silica cladding
- Acrylate coating (-40°C to 85°C)
- Silicone resin coating (-40°C to 180°C)
- Polyimide coating (-190°C to 385°C)

Properties

- Core/clad ratio: 1.1, 1.2, 1.4
- Numerical aperture: 0.22 ± 0.02
- Operation wavelength range: 350 nm to 2600 nm
- Proof test level (bend method): 70 kpsi
- Bend radius: momentary 100 times the fiber radius long term 600 times the fiber radius
- Laser damage threshold:
  > 5 J/mm^2 (Nd:YAG, 1ms pulse at 1060 nm)
  >1.3 kW/mm^2 (Nd:YAG, cw at 1060 nm)

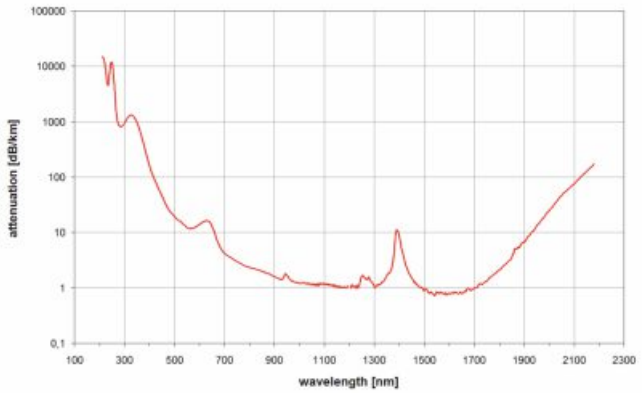
Optional

- Core/clad ratios: 1.15,1.30, 1,4 ... 2,5
- Numerical apertures: 0.07 to 0.28
- Metal coating (Al or Cu)
- Fiber bundles
- Tapered fibers
- Connectors (SMA, FC/PC, ST, DIN)
- AS-Fiber cables
- High temperature acrylate -40°C to 200°C

Other specifications upon request.

Coating/Buffer

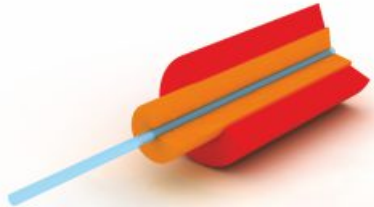
- Nylon (-40°C to 100°C)
- ETFE (-200°C to 150°C)
- Acrylate (-40°C to 85°C)
- Polyimide (-190°C to 385°C)



SINGLE-MODE FIBERS

Features

- Single mode transmission at a range of standard wavelength between 350 nm and 1550 nm
- All fibers available with 125 µm diameter to allow the use of standard connectors
- High NA fibers available
- Specialty coatings available for high temperatures, high vacuum and harsh chemicals environments
- Radiation resistant type available
- Standard communication fibers available



Fiber-Design

- Doped fused silica core
- Pure fused silica cladding
- Dual layer Acrylate coating (-40°C to 85°C)
- Polyimide coating (- 190°C to 385°C)

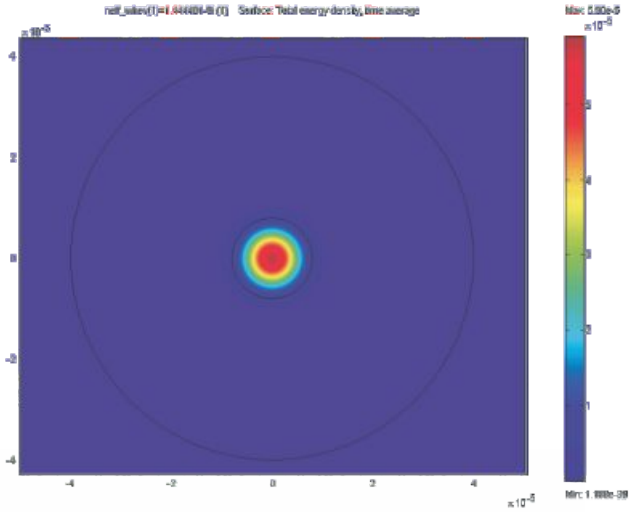
Coating/Buffer optional

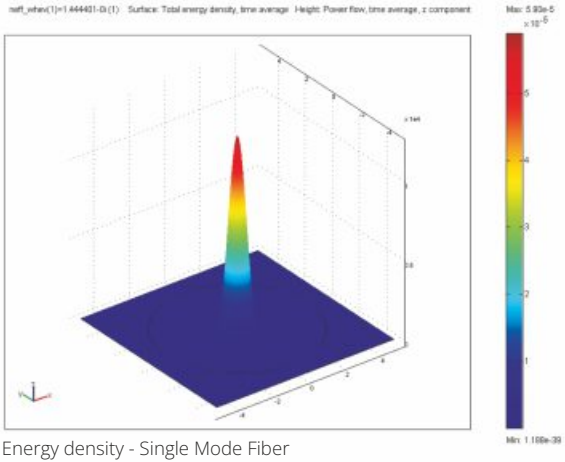
- Silicone
- Acrylat
- Hard Clad
- Polyimde

Other specifications upon request.

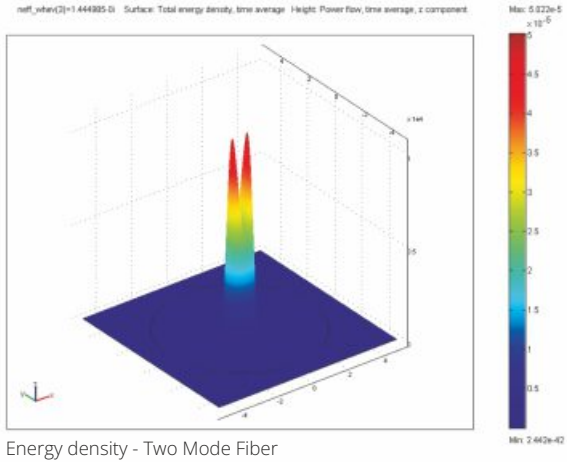
Optional

- Numerical apertures: 0.10 to 0.35
- Metal coating (-190°C to 750°C)
- Connectors (DIN, FC/PC, ST, SMA)
- Single-mode fiber cables
- 80µm cladding
- High NA = 0,2
- High temperature acrylate (-40°C to 200°C)



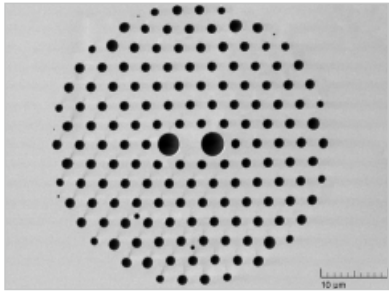


Energy density - Single Mode Fiber

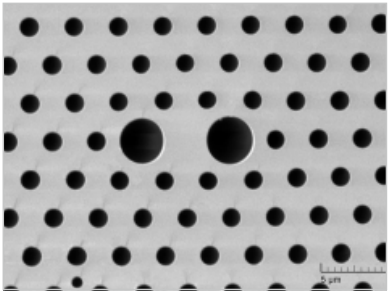


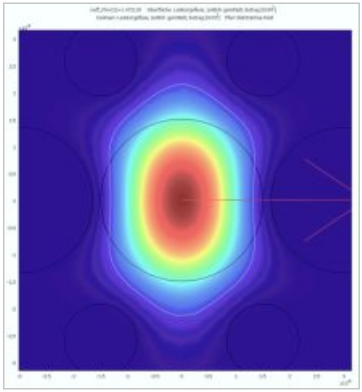
Energy density - Two Mode Fiber

POLARISATION MAINTAINING LARGE MODE AREA UV FIBER

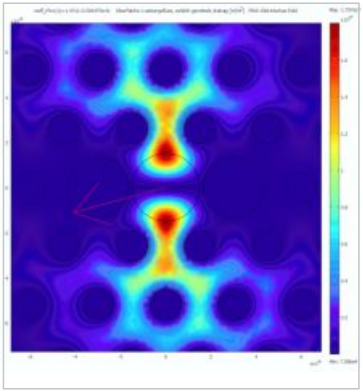


magnified
microstructured fiber
(scanning electron microscope)



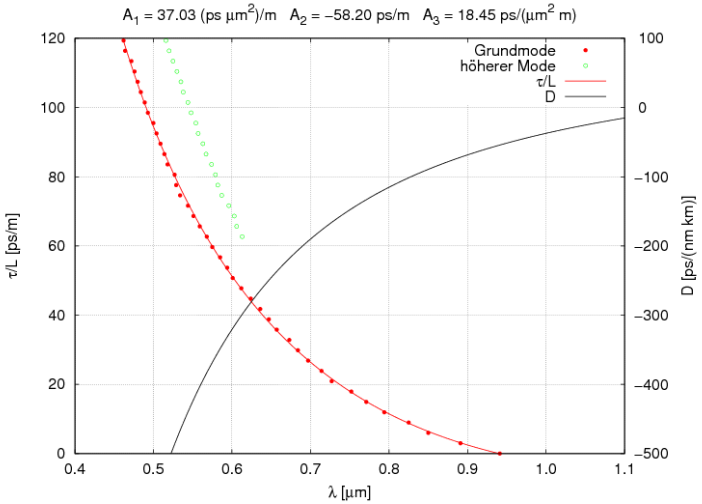


simulated fundamental mode



simulated higher order mode
Confinement Loss >400dB/km

Diameter	= 125µm
MFDx	= 2,6µm
MFDy	= 4,3µm
MFA	= 8,9µm^2
LB	=18,7mm (beat length)



DISPERSION DER PM-LMA 375/125 UV
measured by Prof. Peter Hartmann, Westsächsische Hochschule

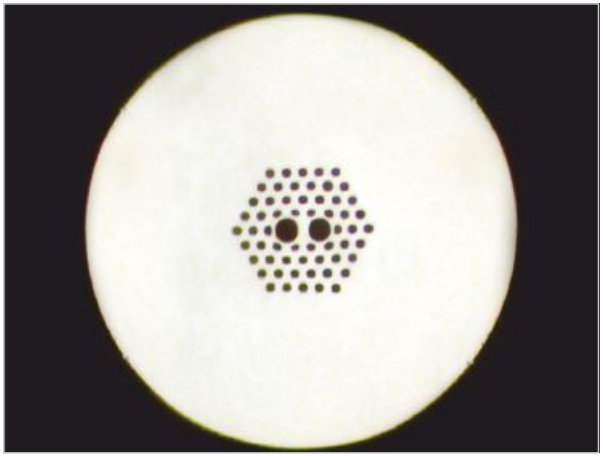
POLARISATION MAINTAINING FIBER PM 500
PM-LMA 500|125 VIS ACAC

Advantages

- Endlessly single-mode in the visible range (500nm - 750nm)
- Pure silica fiber
- Polarisation maintaining
- Mode field diameter independent of wavelength

Applications

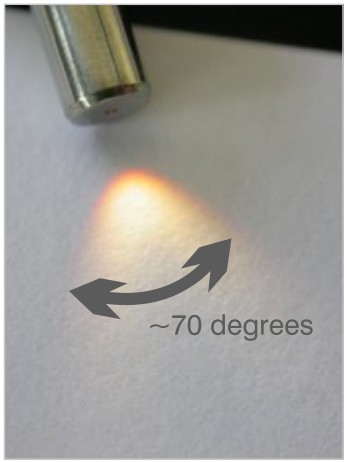
- Single-mode polarized light delivery
- Polarisation and mode filtering
- Doping free, therefore good candidate for radiation resistance fibers (RRF)
- Endlessy single-mode in the visible range (500nm - 750nm)



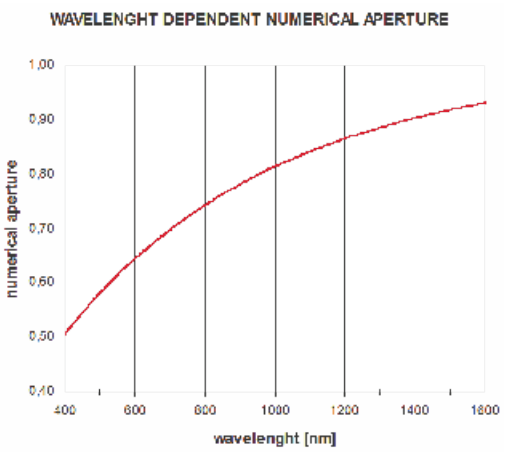
Fiber cross-section

HIGH NUMERICAL APERTURE
MICROSTRUCTURED FIBER | HINAMS-FIBER

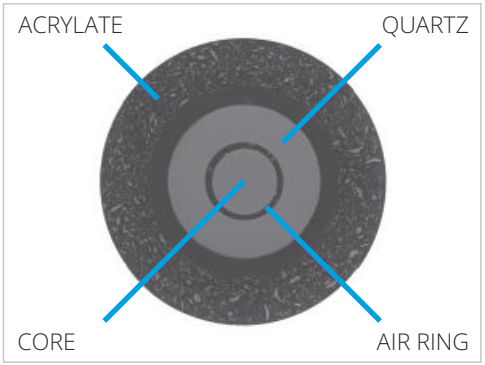
- All silica fiber (coating independent)
- Selectable but strong wavelength dependent Numerical Aperture up to NA=0,9
- Multimode core sizes selectable up to 500µm



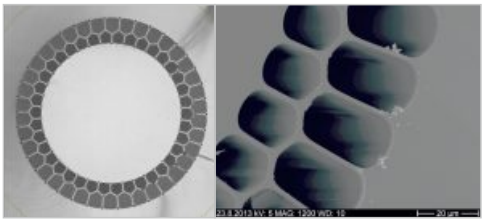
White light radiation from HiNAMS-Fiber



Example of wavelength dependence for a 500µm core diameter fiber



Raster electron microscope picture from HINAMS-fiber endsurface

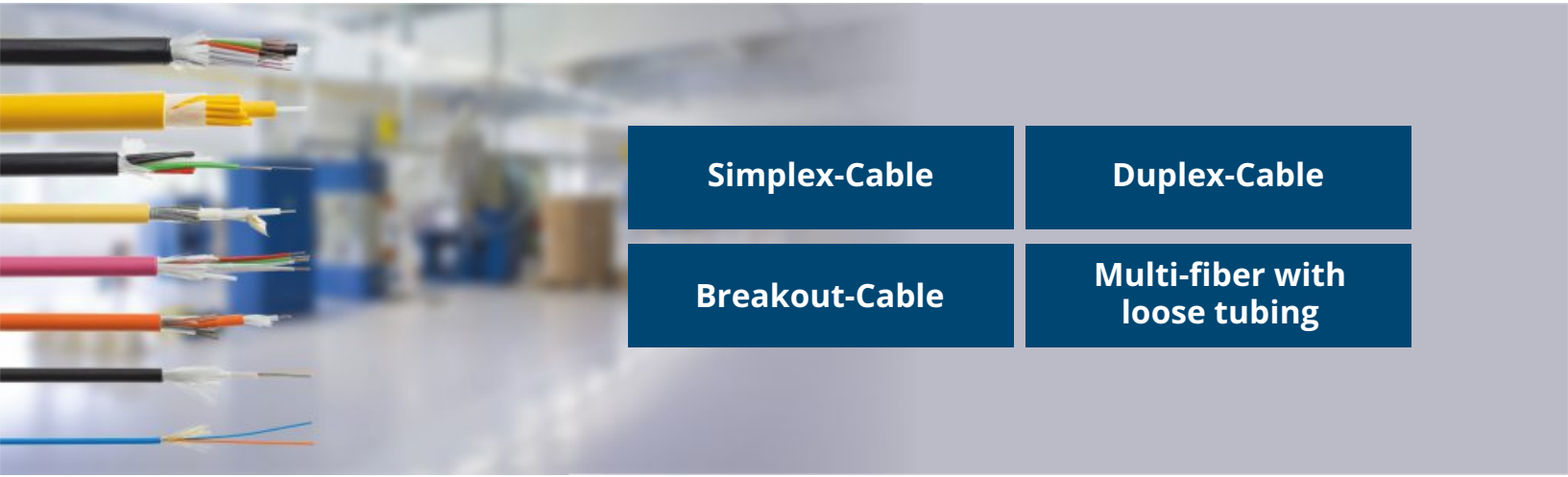


SPECIALTY CABLES

Cable Design and Options

Cable assemblies can be made with various fibers and designs.

- Wavelenght range 190nm - 2300nm
- Single and Multi cable design
- Temperature range between -40°C to 350°C



INQUIRY

Fibertype

- Spectrale dependence
- Numerical aperture
- Diameters

Buffer

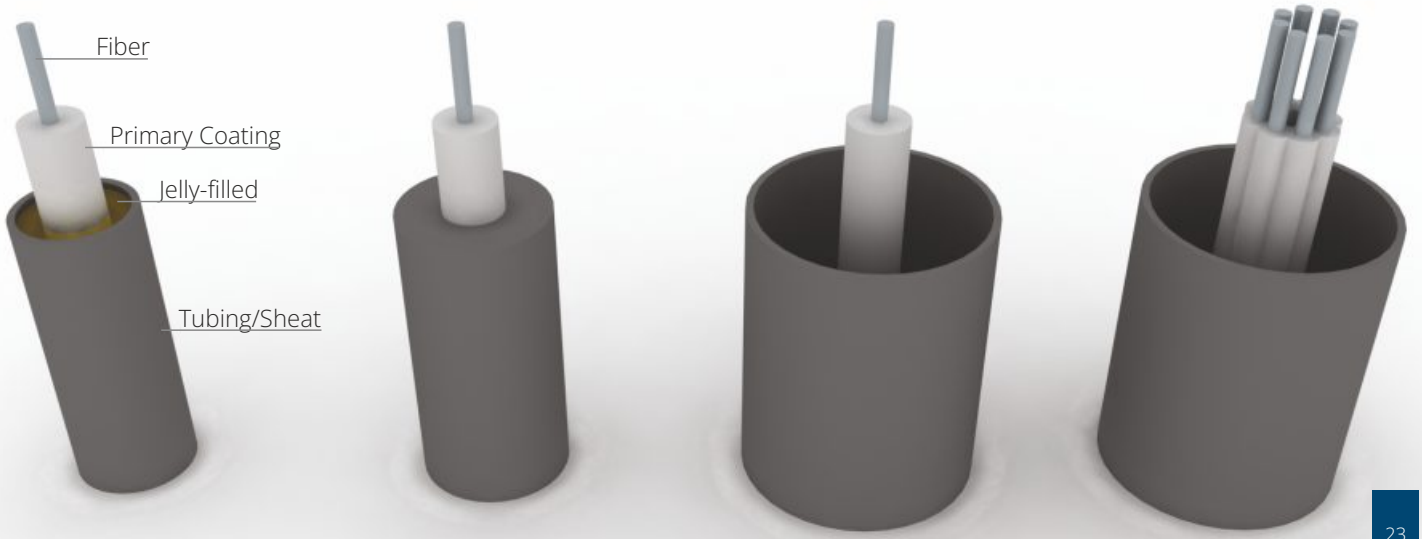
- Temperature range
- Diameter
- Colour

Cable

- Indoor
- Outdoor
- Environment specs

Assembling

- Optics
- High power
- Connectors
- Medical or other specs

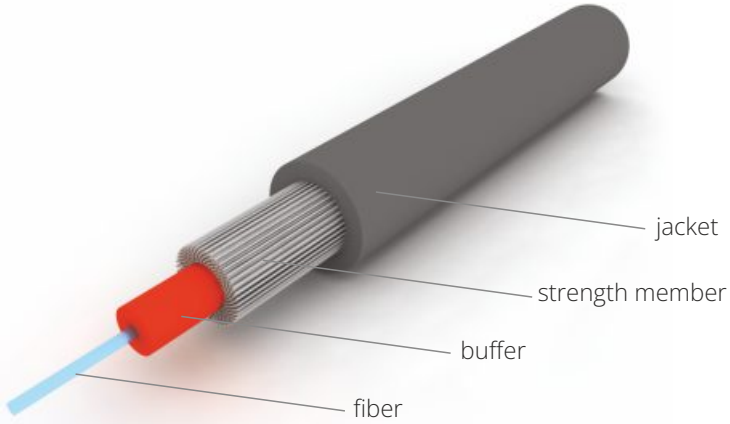


SIMPLEX-CABLE

Features

Cable assemblies can be made with various fiber

- Wavelenght range 190 nm - 2300 nm
- Single and multi cable design
- Temperature range between -40 °C to 350 °C
- Customer designed available



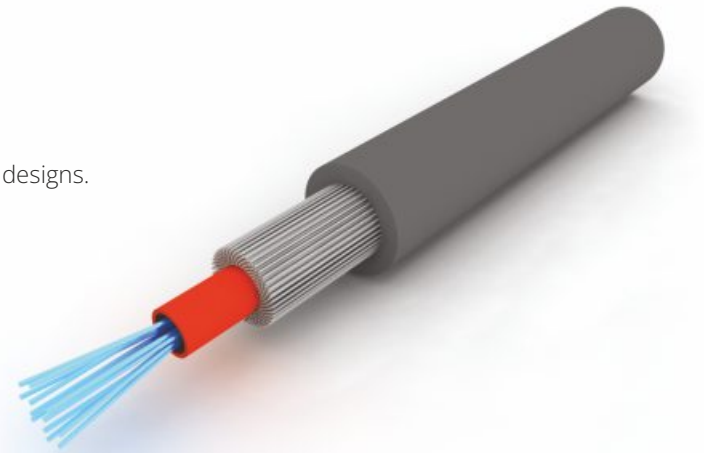
Cable-Design

- Tight or semi-tight buffer
- Aramidiance as strength member
- Outer sheat PVC or flameretardant
- Zero halogenfree compound (LSZH)
- Colour: grey, orange or upon customer request
- Flexible but rugged cable for use inhouse application
- Customer request

Optional

- Buffer, tube or sheat materials for higher temperatures (FEP)
- Fibertypes: upon customer request
- Individual sheat marking and sheat colours upon customer request

MULTI-FIBER WITH LOOSE TUBING



Features

Cable assemblies can be made with various fibers and designs.

- Wavelenght range 190 nm - 2300 nm
- Single and multi cable design
- Temperature range between -40 °C to 350 °C
- Customer designed available

Cable-Design

- Up to 6 fibers
- Aramidiance as strength member
- Outer sheat PVC or flameretardant zero halogenfree compound (LSZH)
- Colour: grey, orange or upon customer request
- Rugged cable for use inhouse application
- Customer request

Optional

- Buffer, tube or sheat materials for higher temperatures (FEP)
- Fibertypes: upon customer request
- Individual sheat marking and sheat colours upon customer request
- Preassembled lengths
- Jelly-filled
- With central strenght member
- Hybrid-cable

CAPILLARIES

Features

- High strength capillaries
- Pressure resistant
- Specialty coating for high temperature and harsh chemicals
- Sterilizable by ETO, steam, e-beam, gamma radiation
- UV and IR optical quality available

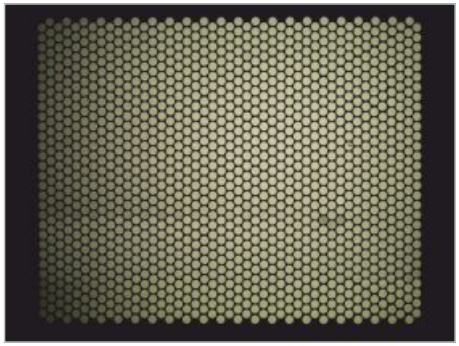
Capillary-Design

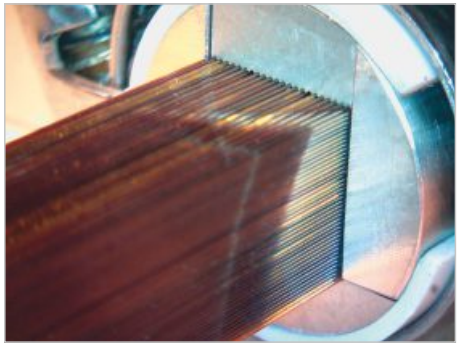
- Pure fused silica tube
- Polyimide coating (to 385°C)
- Uncoated (to 950°C)

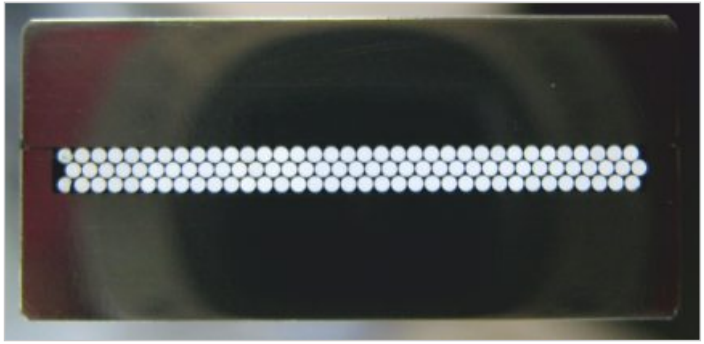
Properties

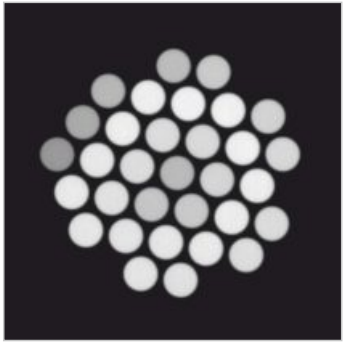
- Inner diameters: 2 µm to 2000 µm
- Wall thickness: 10 µm to 1000 µm
- Length: 1 m to 10 km (depends on diameter, lengths more than 1,5m only with coating)
- Standard tolerances: ± 1 % (Inner diameter)

TOTALLY ORDERED BUNDLE



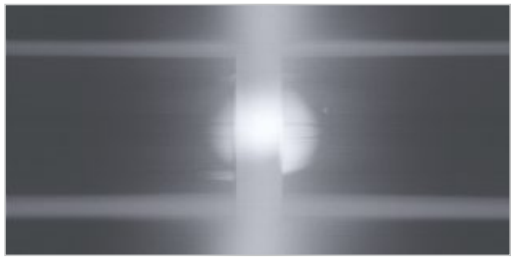




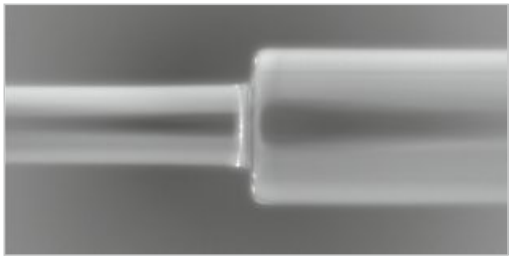


ALL-SILICA FIBER
PLASMA FUSION TECHNOLOGY AND SERVICE

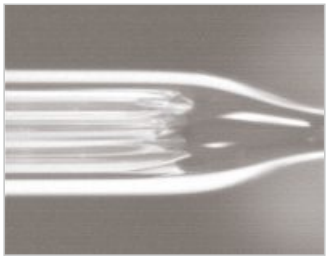
- Splicing of all-silica fibers up to 2mm of diameter (also different diameters)
- Fused all-silica fiber bundles up to 2mm of diameter
- Plasma fusion all-silica lens forming
- Tapering of all-silica fibers and bundles



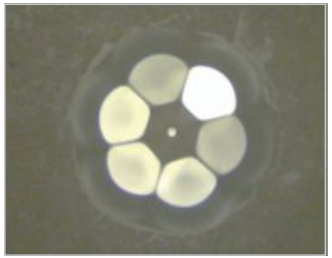
2mm fibers during splicing process



Splice of two different large diameter fibers



Tapered fiber bundle



Fused fiber bundle

METAL PROTECTIVE HOSE

Features

Protective hose for buffered optical fiber or cables

- High torsional strength
- Flexible
- High tensile strength
- High crush resistance
- Impermeable to splash – water

Properties

	Inner diameter in mm	Outer diameter in mm
DN 2	1,4	3
DN 3	3,0	4,6
DN 4	4,0	5,8
DN 5	5,0	6,8

To complete the range of medical components, fiberware offer a various medical protective tubing´s in biocompatible quality. A great variety of designs and technical know-how enable us to implement customer requests individually. Simplex, Duplex tubing's with and without strain relief, coating of metal protective tubing's and printing of logo and marking, complete the range of our customer service.

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FIBERWARE Catalog Version 1.0 | 2025