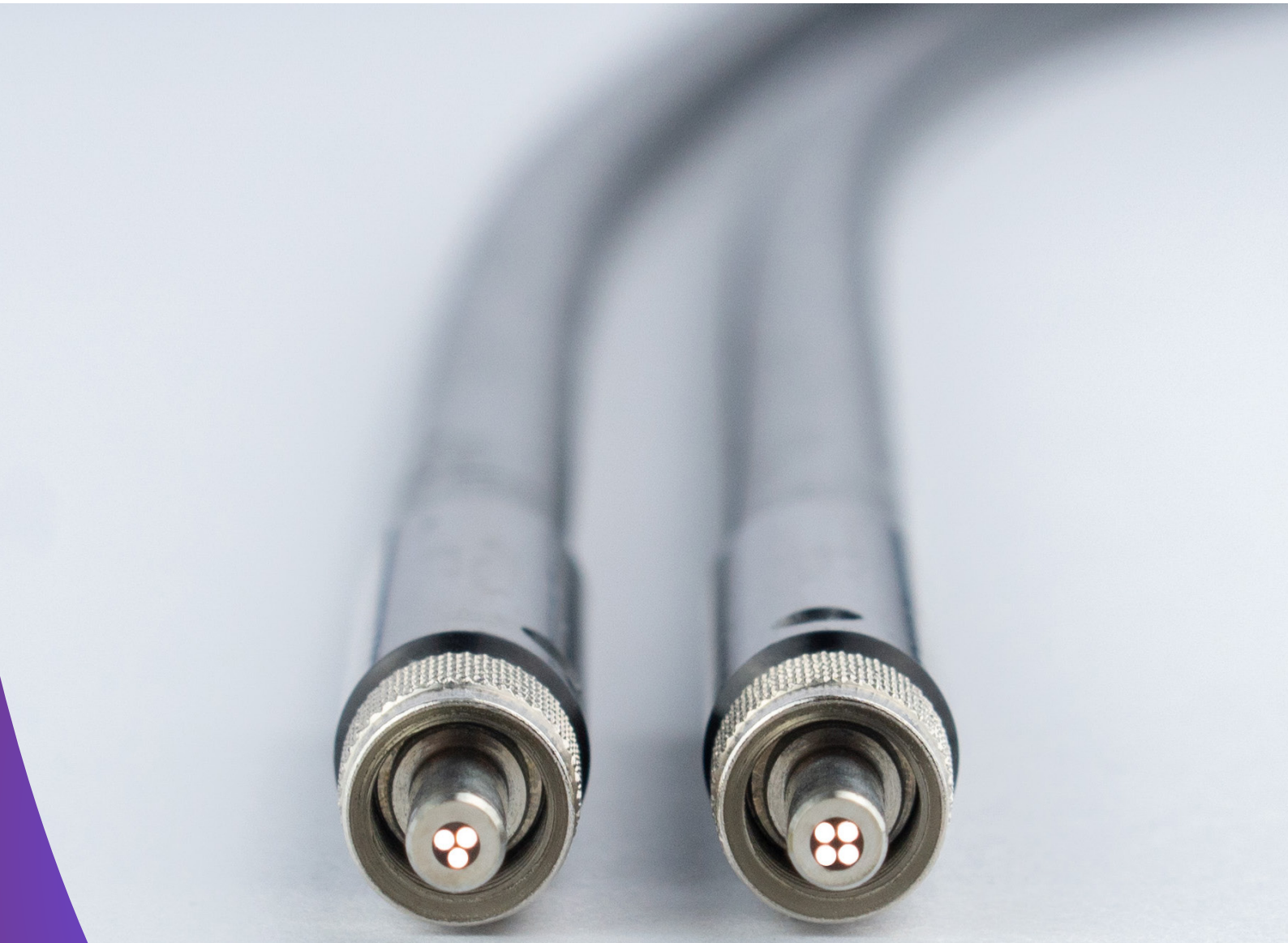
art photonics

25 Years Anniversary

Broad Spectra Fiber Solutions

FlexiRay® & FlexiSpec®



Made in Germany

Overview

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The United States of America
The United States of America
The Director of the United States Patent and Trademark Office
United States Patent

Broad Spectra Fiber Solutions –
Fiber Photonics for Life & Industry

art photonics GmbH was established in Berlin in 1998 with a focus on developing specialty fiber products for a wide range of applications in the UV-Vis-IR spectrum. Today, art photonics is a leading global provider of fiber cables, bundles, and spectroscopy probes for various uses, spanning from UV to Mid IR-range (0.2-18 µm). These applications include:

1) Laser technology and medical fields, where our flexible cables facilitate laser power delivery.
2) Remote reaction monitoring and in-line industrial process control, as well as medical diagnostics and environmental monitoring, which are enabled by our spectral fiber probes.
3) Endoscopy and 3D-IR-imaging systems benefit from our flexible IR-imaging solutions.

Among our specialty fiber offerings, the most unique type is our Polycrystalline InfraRed PIR-fibers. These PIR-fibers are exceptionally flexible and non-toxic, manufactured in-house through the extrusion of purified Silver Halide crystals. We also provide other fiber types, all categorized under two brand names: FlexiRay® - cables and bundles designed for laser technology, medicine, and more; and FlexiSpec® - fiber probes coupled with various spectrometers and sensors, designed for industrial process control and medical diagnostics.

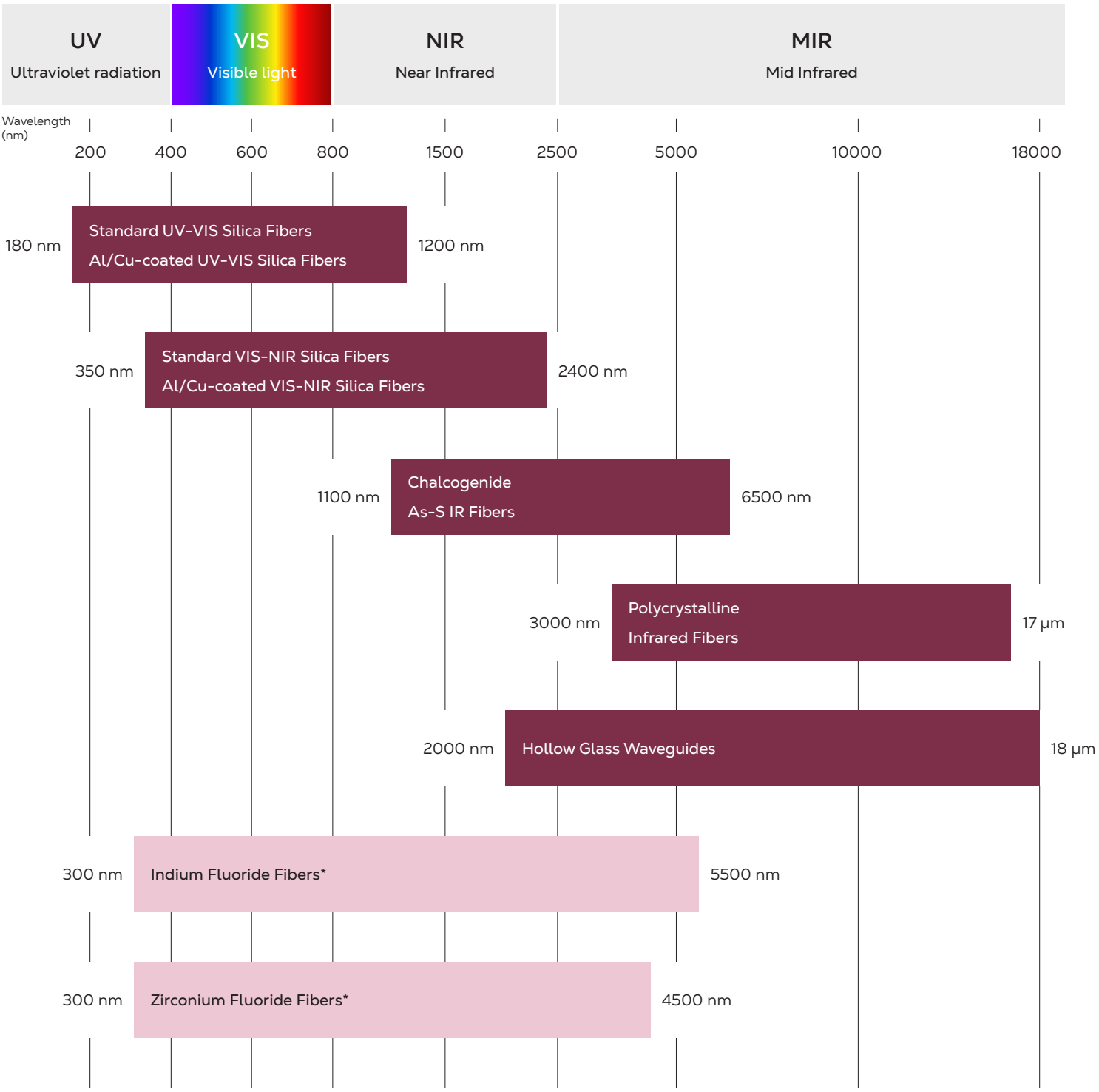
Our team of experts is committed to delivering the highest quality and most reliable products and services at competitive prices. We strive to find the best fiber solutions to address our customers' needs, working closely with our partners and customers.

Looking forward to our collaboration,

Dr. Viacheslav Artyushenko
President

Overview of transmission ranges

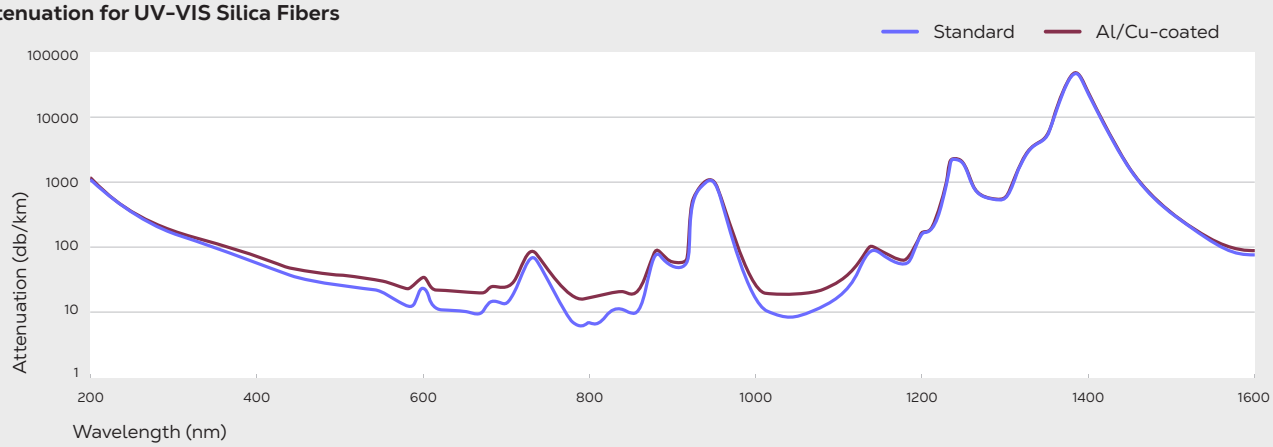
Find fibers to match your application



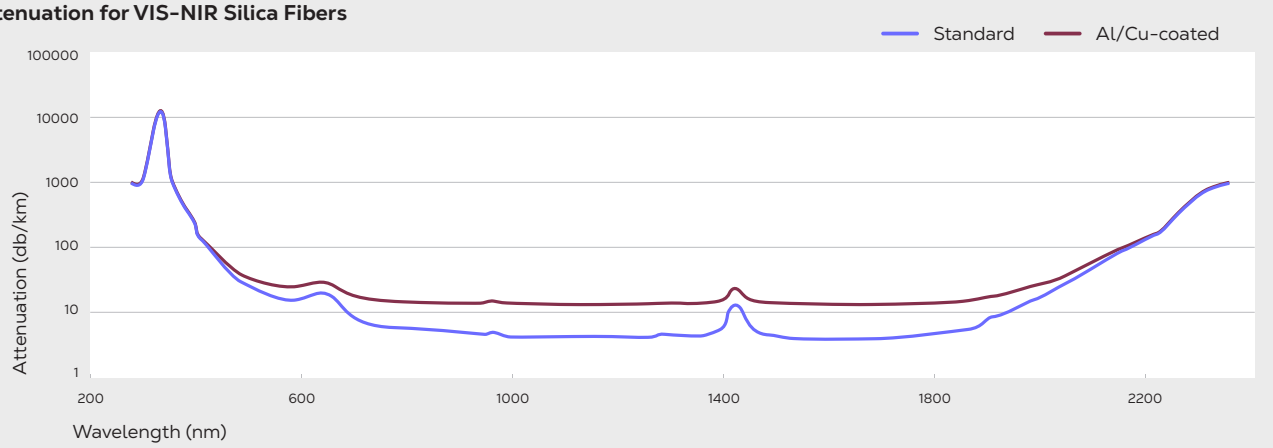
* in partnership with Le Verre Fluoré
www.leverrefluore.com

Attenuation spectra of fibers & waveguides

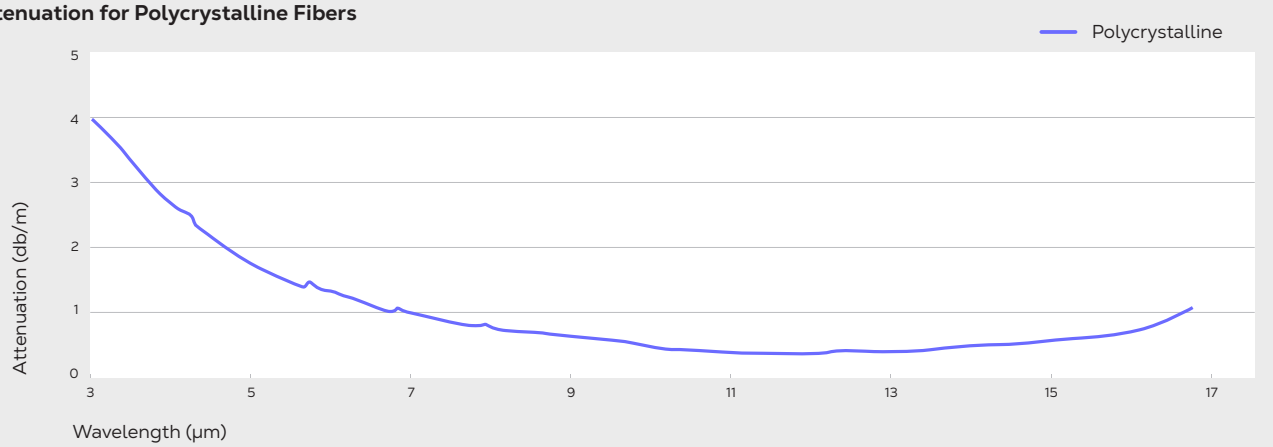
Attenuation for UV-VIS Silica Fibers



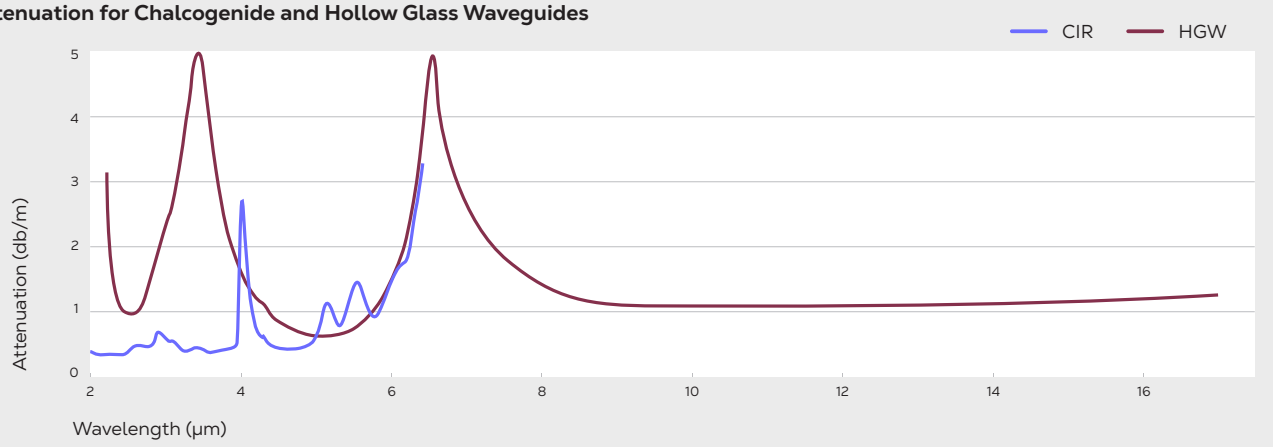
Attenuation for VIS-NIR Silica Fibers



Attenuation for Polycrystalline Fibers

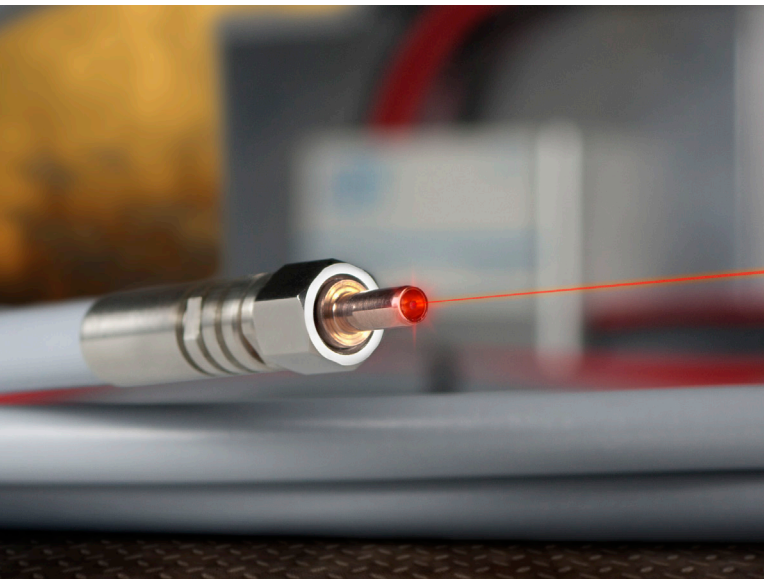


Attenuation for Chalcogenide and Hollow Glass Waveguides



FlexiRay® Silica Fiber Cables

For laser power delivery



Durable FlexiRay® laser cables ensure long-term use in industrial and medical fields. We offer high-temperature assemblies (up to 600°C) suitable for high-power and vacuum applications. These assemblies utilize FlexiRay® metal-coated silica fibers and feature high-power connectors HP-SMA and D80. Prior to shipment, each cable undergoes testing with a 100W diode laser to ensure quality for our customers.

Silica cables for UV, VIS, NIR range

art photonics offers Silica Fiber cables for two spectral ranges, UV-VIS and VIS-NIR. These cables come with various cable jackets and connectors based on customer requirements. With ultra-low OH content, they allow for excellent transmission up to 300 m. You can choose from a wide selection of fibers, connectors, and protective jackets, while their standardization enable fast delivery times.

Custom Silica Fiber cables produced by art photonics feature a reinforced cladding stabilized by nylon thread, offering maximum protection against stretching damage, and fully sealed from input to output connector.

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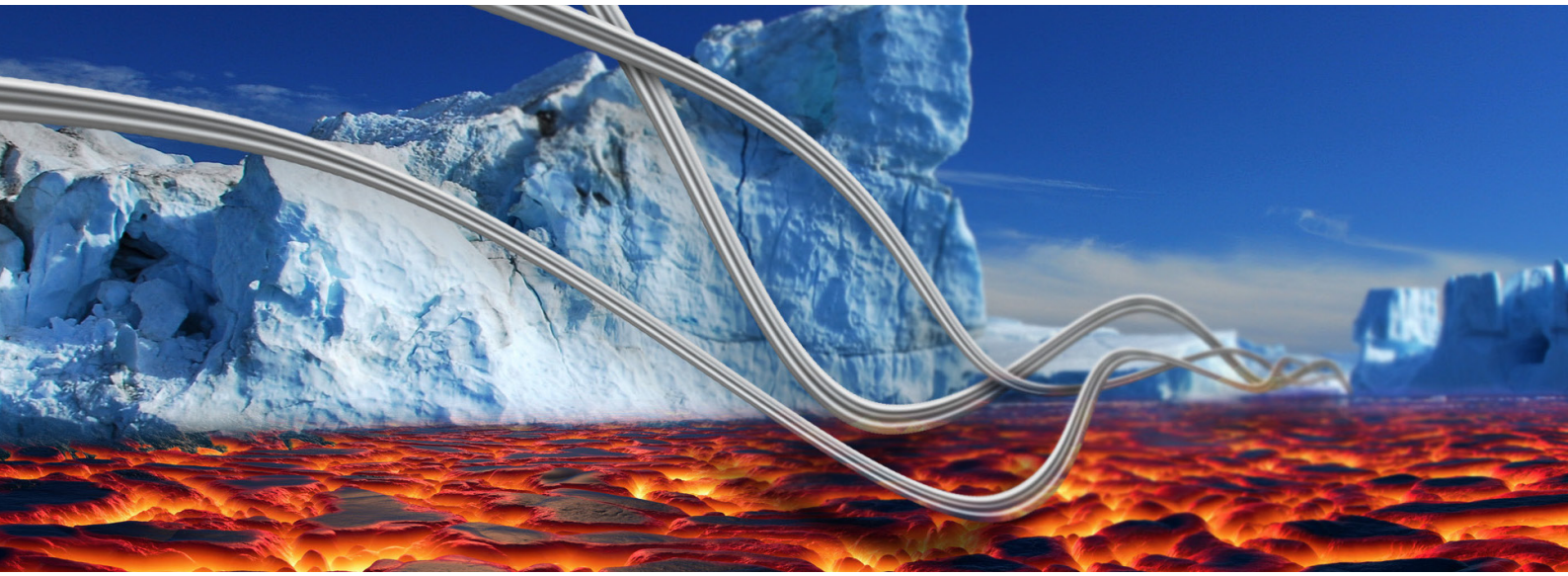
FlexiRay® Al- and Cu-alloy coated fibers

Silica fibers for UV-VIS-Near Infrared range



Aluminum- and Copper-alloy coated Silica Fibers are the optimal solution for applications in high temperature, vacuum and harsh environment conditions.
Laser cables and bundles of metal can be used in vacuum and at **temperatures up to 400°C** for Al-coated fibers and **›600°C** for Cu-alloy coated fibers.

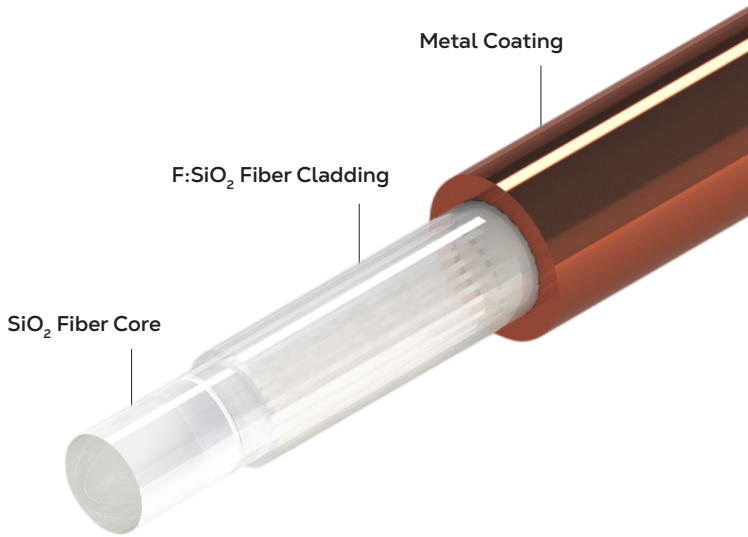
* Working temperatures range is valid for using in non-oxidizing atmospheres

Wavelength

180 to 2400 nm

Numerical aperture (NA)

0.13 - 0.22



Main features:

- Working temperatures up to 400°C
- Excellent mechanical strength and flexibility
- No outgassing under high vacuum conditions
- Solderable into connectors (epoxy-free option)
- Effective heat rejection along metal coating
- Steaming, ETO, steam, e-beam or gamma-sterilizable

FlexiRay® Mid-IR fiber products

Complete production cycle in Berlin

Pioneering extrusion technology was developed for fabrication of polycrystalline fibers from TlHal and AgHal solid solution crystals by Dr. Artyushenko >40 year ago and since 1998 it was developed by art photonics for a volume production of Core / Clad Polycrystalline Infra-Red (PIR-) fibers transparent over a broad spectral range 3–17µm.
Complete technology vertical starting from salts preparation and crystal growth provides a stable superior quality of the optical fiber.

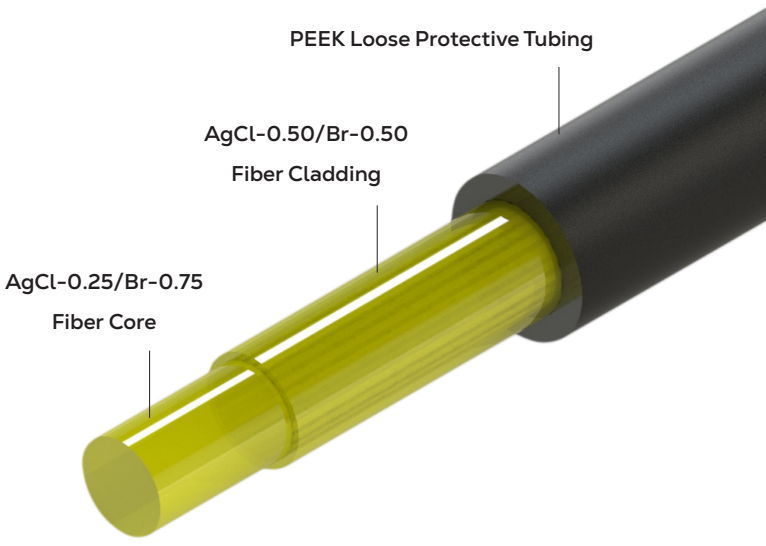
Highest performance PIR core/clad fiber are extruded with core diameters span from 240µm to 860µm.
Low optical losses without absorption peaks over the mentioned spectral range ensure a successful use of PIR- fiber for a broad range of applications.

Wavelength

3 µm to 17 µm

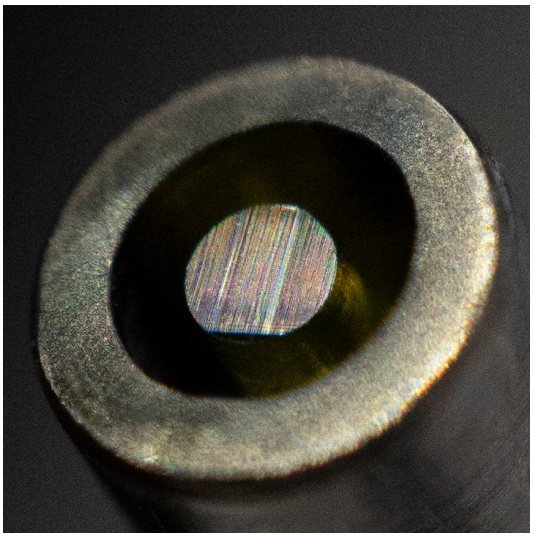
Numerical aperture (NA)

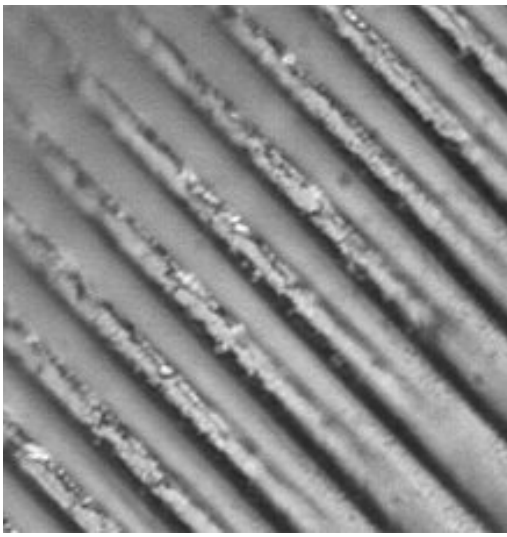
0.30



FlexiRay® Mid-IR fiber cables and bundles

For spectroscopy, pyrometry and more





Fiber Cables based on **Polycrystalline Infra-Red (PIR-) fibers** (3 – 17 μm) are used in a wide range of applications including Mid-IR light delivery, spectroscopy, remote temperature sensing, etc. PIR-fiber cables are available with a variety of standard fiber diameters, with different connectors (SMA-905, FC/PC, and FC/APC), and several types of protective sheathing. Special treatment is developed for PIR-fiber laser cables to modify their end surface with SMART microstructure - to suppress Fresnel reflection losses for >2 times.

Chalcogenide Infra-Red Fiber

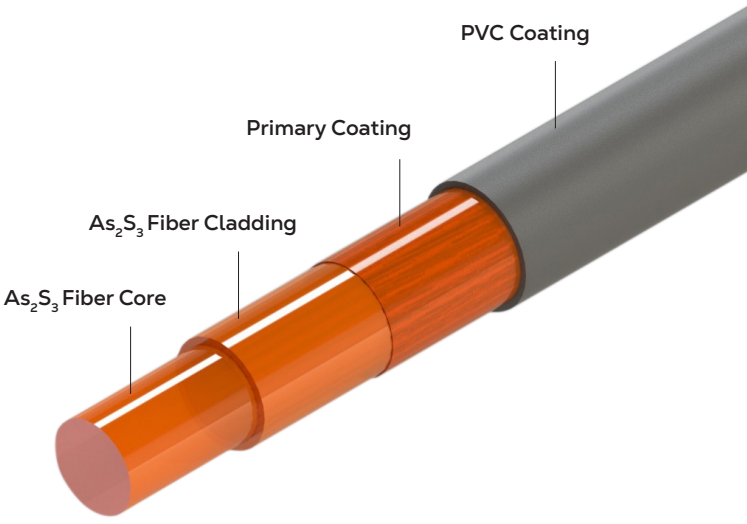
Chalcogenide Infra-Red (CIR-) fiber cables (1.1 – 6.5 μm) have diverse applications including power delivery of QCL, spectroscopy, Flexible IR-imaging systems, etc. CIR- fiber cables are available with a variety of standard fiber diameters, SMA-905, FC/PC, FC/APC connectors, and several types of protective tubing.

Wavelength

1.1 μm to 6.5 μm

Numerical aperture (NA)

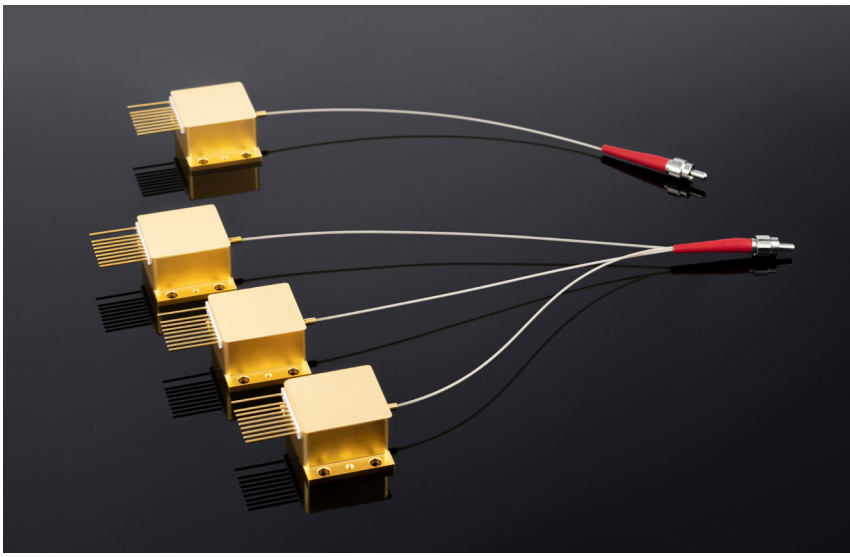
0.13 to 0.30



FlexiRay® Radiation delivery for Lasers

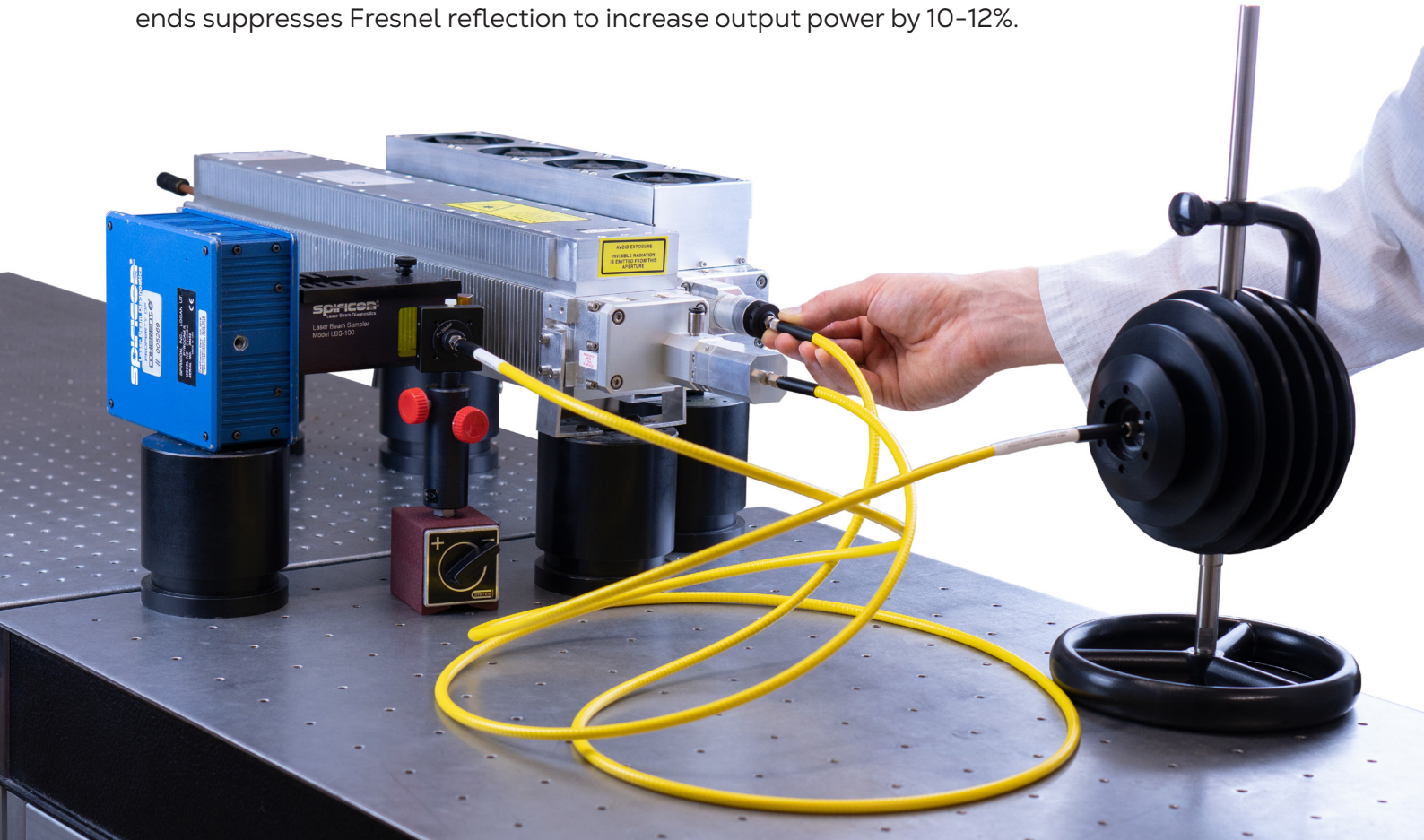
PIR and CIR fiber cables and combiners

PIR and CIR fibers enable efficient coupling of QC-Lasers with flexible cables and probes for stable transmission under bending, while IR-fiber bundles allow to combine radiation from many QCL into one fiber – to make customized multi-spectral systems.



CO and CO_2 Laser Power Delivery

Polycrystalline Mid-InfraRed (PIR-) fiber cables provide stable power transmittance under the bending that is an important advantage as compared to hollow waveguides. Special SMART treatment of PIR-fiber ends suppresses Fresnel reflection to increase output power by 10-12%.



Specialty fiber cables and pigtails,
cables for vacuum applications

art photonics' optical fiber vacuum feedthroughs provide a flexible optical path into a vacuum or high pressure chamber.

For silica fibers the vacuum feedthrough can be delivered for all fiber diameters, from single mode fiber up to 1000 µm core fiber in a UV/VIS/NIR spectral range. All feedthroughs are proved to work up to 10^{-9} Torr.

We develop and manufacture any cable design from a pigtail to 300m length from space to underwater application.

Multispectral Bundles

- Fiber bundles contain up to a thousand optical fibers
- Custom fiber arrangement
- High and Low temperature special design
- Standard or custom connectors and ferrules
- Splitting light from light source into several channels
- Combining light from several sources
- Reshaping of light beam cross section

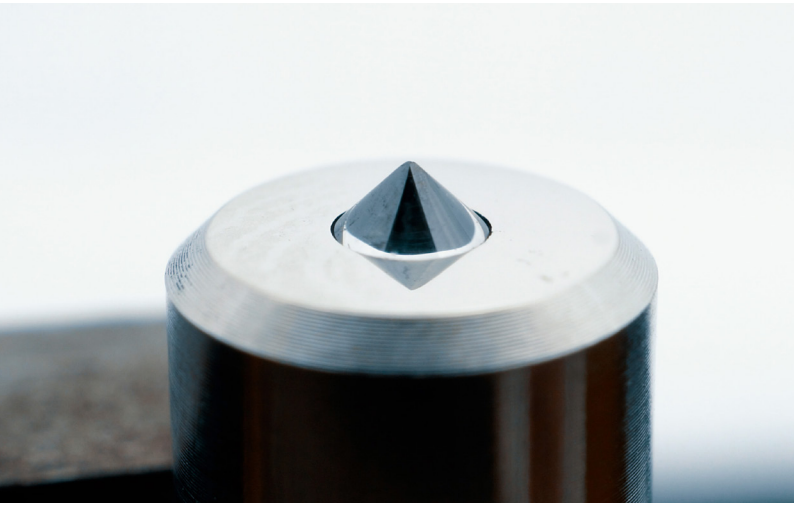
UNIQUE FIBER PROBES

FOR PROCESS SPECTROSCOPY

IN A BROAD 0.3-16 µm RANGE

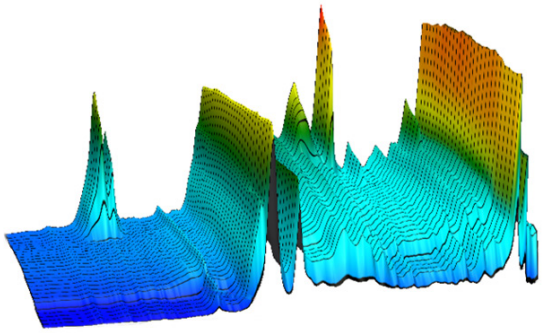
FlexiSpec® ATR Probes

Attenuated Total Reflection Probes



Our FlexiSpec® product line includes the latest generation of Attenuated Total Reflection UV-VIS-NIR & Mid IR-fiber ATR-Probes produced for any type of FT-NIR, FT-IR and other IR-spectrometers, photometers and IR-LED or QCL spectral sensors. Standard and High Temperature (HT) ATR immersion fiber optic probes with patented design are suitable for reaction monitoring in lab, pilot plant and for full automated process control.

Our ATR fiber Probes can be used for process-spectroscopy to monitor reactions in-line in a broad temperature range of -150 to 250°C. They can resist high pressures up to 200 bar and can be used with any FTIR or spectral sensors in automated process control and process interfaces.



FlexiSpec® ATR Probes

Attenuated Total Reflection Probes

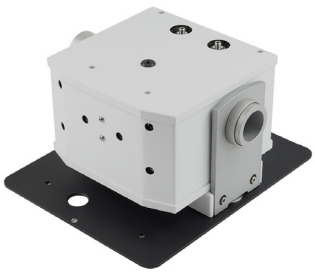
Our Lab ATR Probes with PEEK shaft were specially designed to offer cost-effective solutions for analyzing samples in small lab reactors and open vessels, without compromising sensitivity, when our ATR-Loop PIR-fiber probes were the first in the FlexiSpec® product line, historically designed for use with FTIR or any other mid-IR spectrometer. Both Lab and Loop ATR Probes are ideal for remote analysis of liquids, pastes, or soft surfaces, with no requirement for sample preparation, making them a cost-effective option.

The ATR Loop Probe, while being a cost-effective and highly sensitive alternative to standard ATR Probes, also features easily replaceable loop tips, allowing for convenient customization or disposal of the loop when needed.

FlexiSpec® Couplers

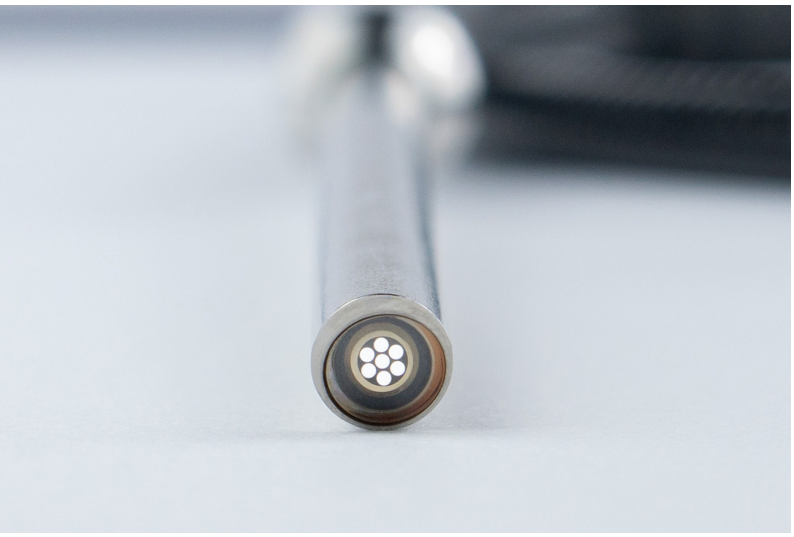
Couplers for FTIR Spectrometers

Our Fiber Probe Couplers are the ideal solution for connecting Fiber Optic Probes to FTIR spectrometers, enabling remote analysis and reaction monitoring. With a mirror design that provides high coupling efficiency for any probe, the couplers cover a broad spectral range of 0.2-18µm. The in/out ports are compatible with SMA-terminated fiber probes and the adjustable mirrors ensure maximum coupling efficiency. The couplers are easy to install in the sample chamber, making them a convenient option for any laboratory. They allow for easy in-line process spectroscopy and reaction monitoring, eliminating the need for time-consuming sample collection and preparation.



FlexiSpec® Reflection Probes

for Industrial and Lab Applications




art photonics' FlexiSpec® Reflection Probes were designed with special angled optics to provide exceptional sensitivity and reduce unwanted signal interference. These probes are available in customized designs for various industrial applications and enable fast and precise measurements of different media, delivering reliable and accurate results every time. With a range of applications including measuring diffuse and specular reflectance, backscatter and fluorescence measurements, quality control and process monitoring in manufacturing, and non-destructive testing and inspection in materials science, Reflection Probes are an ideal choice for any laboratory or industry.

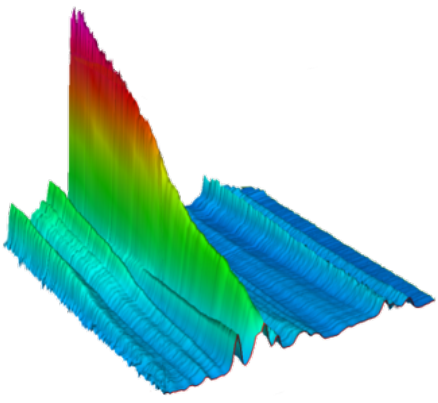
FlexiSpec® Transflection Probes

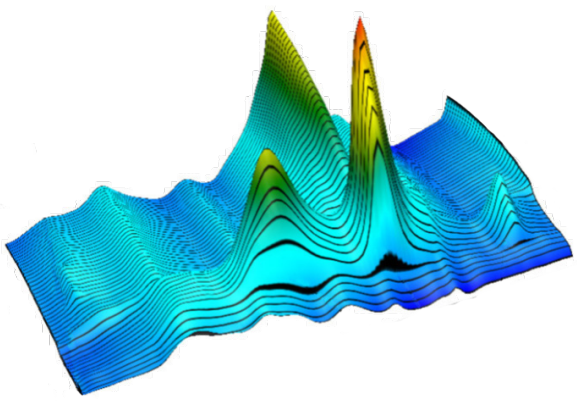
for Remote Liquid Sensing

FlexiSpec® product line includes the latest generation of Transflection Dual Pass fiber optic probes to be used with any spectrometer or photometer in any part of UV - VIS or VIS - NIR spectra.

Hastelloy C22 shaft is suitable for industrial applications and for work in harsh environment. Sapphire windows and a number of removable heads with variable optical path length allow to use Transflection probe in wide range of liquids and concentrations. Upon request, more than one removable head can be included per order. Possible slit sizes range from 0.5 - 20mm.

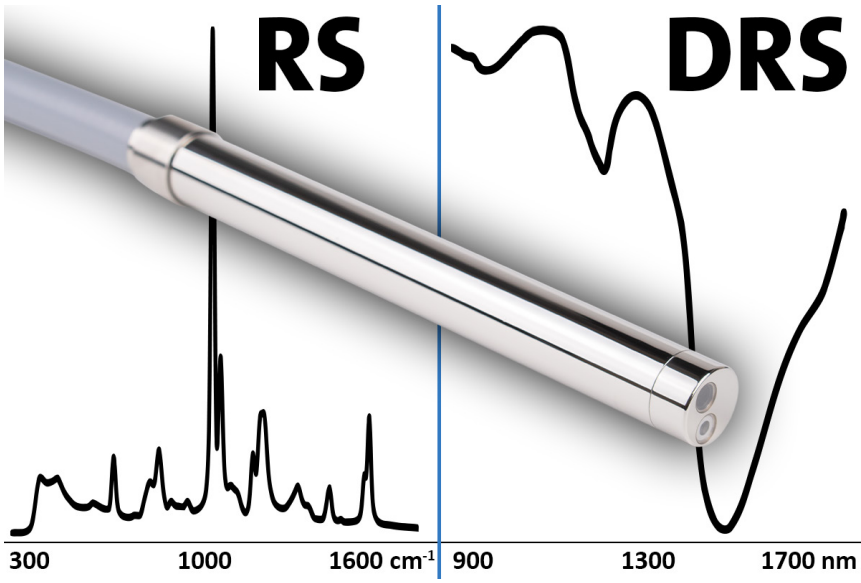
Compatible with all spectrometers, Transflection Fiber probe with Sapphire optics provides On-line transmission spectroscopy at long distance in wide range of liquids (from transparent to poorly transparent). High throughput in any part of UV - VIS or VIS - NIR spectra allows flexible and robust applications for industrial in harsh environments.





FlexiSpec® Combi Probes

NIR-Raman Combined Probes

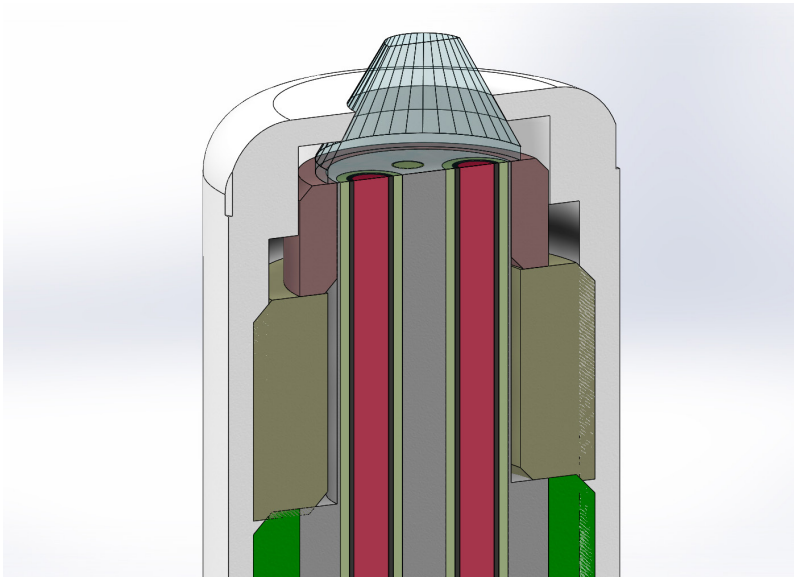


FlexiSpec® product line includes innovating NIRaman Combi probes. Raman and NIR spectra contain qualitative and quantitative information on the chemical composition and physical properties of the substance. Both are able to provide critical product and process information during production.

Multispectral Fiber System offers a great possibility to monitor chemical reaction by key spectroscopy methods: ATR-absorption in Mid-Infrared, Near-IR Reflection, Raman scattering and Fluorescence. MSF-System helps to select the best method or their combination to enable remote analysis of media in reactor with high accuracy and to run process-control in-line.

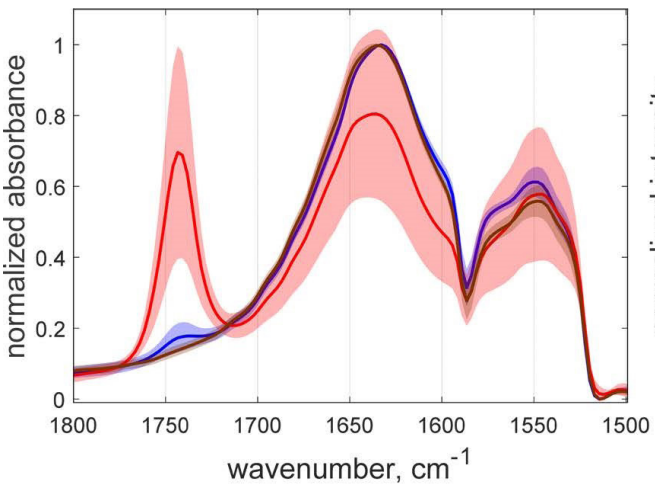
FlexiSpec® Combi Probes

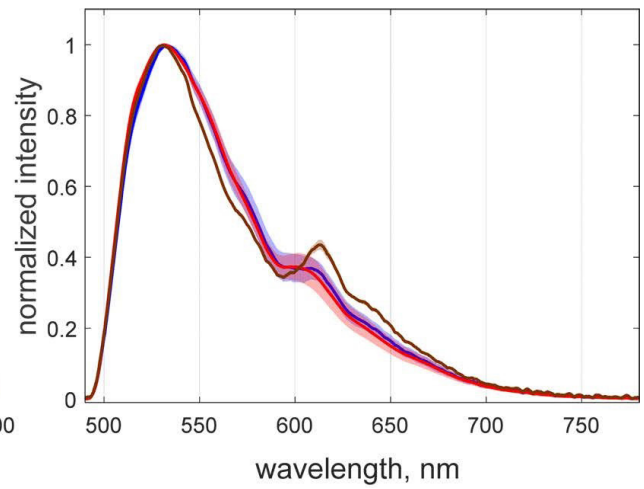
ATR + Fluorescence Probe



Introducing ATR+Fluorescence Fiber Optic Probe: its design allows for simultaneous examination of mid-infrared and fluorescence spectroscopy of diverse liquid and solid samples. The probe was designed to provide chemical information from a single measurement point in space and time – allowing for complementary post-processing of the spectroscopic data.

This probe is ideal for medical and industrial applications – were several examination methods are a must. Unleash the true potential of simultaneous mid-IR and Fluorescence sensing – with art photonics ATR+Fluorescence Combi Probe.



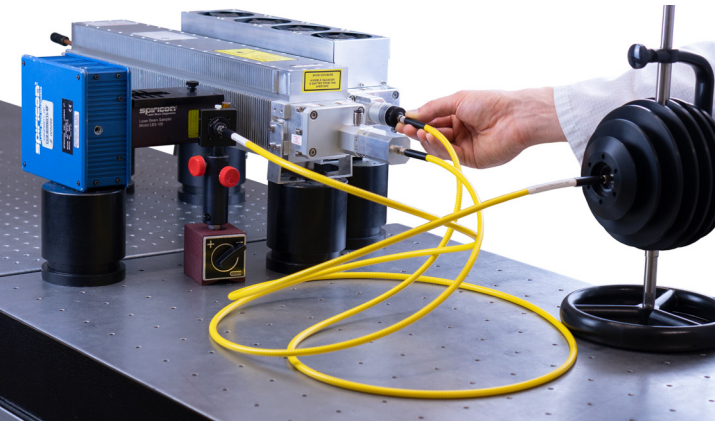


Applications

Where our technology is implemented

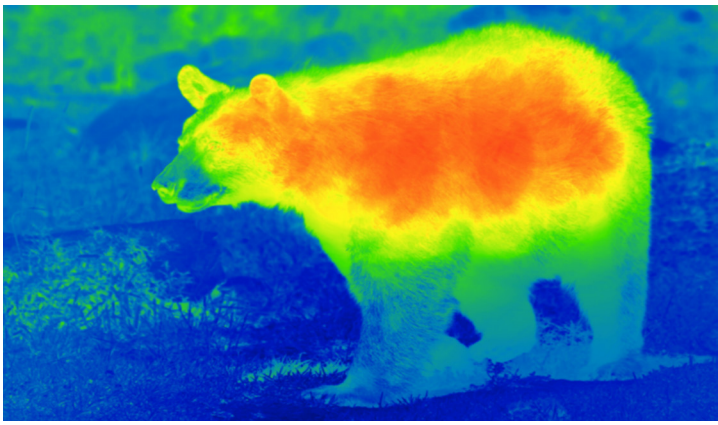
Spectroscopy in Industry: To simplify Reaction Analysis, we recommend using flexible light guides in your laboratory setup for spectroscopic measurements in-line without sampling. Real-time analysis of the process in lab reactors provides a continuous data flow, saving you time and revealing process details for perfect research results.

Spectroscopy in Lab: Modern chemical production requires process analytics that can be organized remotely. We at art photonics offer to equip your production site with flexible fiber optic probes for remote in-line process monitoring without sampling, thus saving time and optimizing workflow.



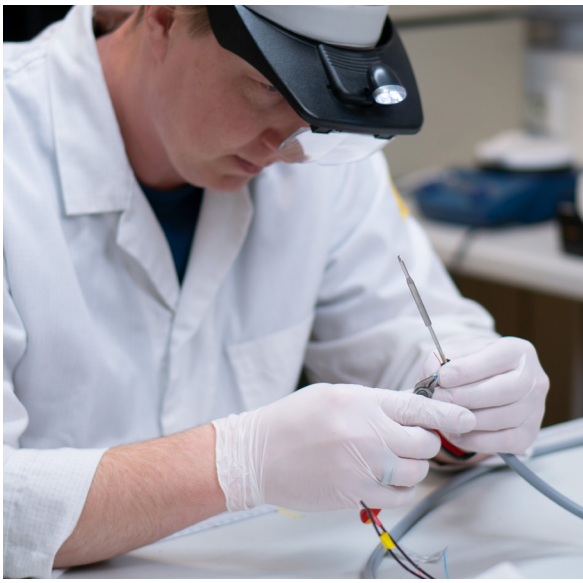
Laser beam delivery: Profit from our novel strategy based on flexible beam delivery for any laser (including QCL) to position sample and system as conveniently as possible and perform the desired research safely, avoiding open laser beams in the workspace.

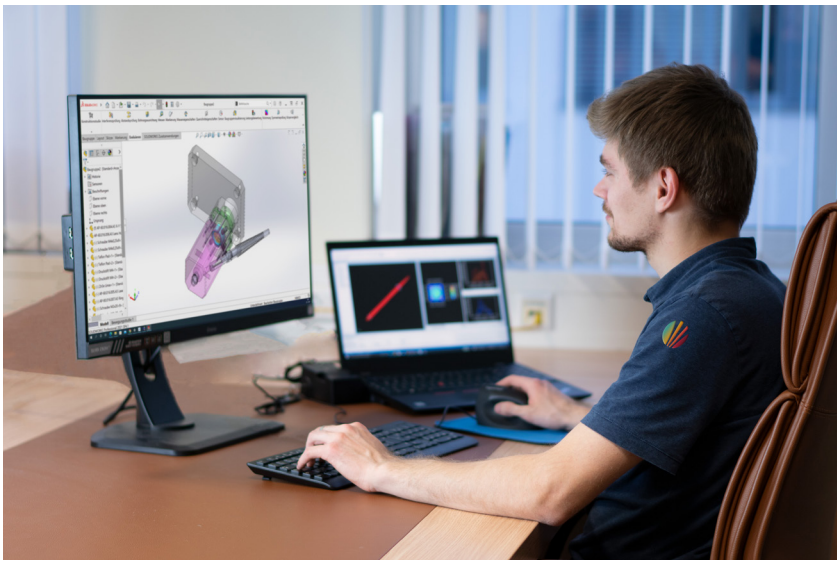
Imaging and Thermosensing: Remote temperature sensing is an important task for many research areas. Art photonics offers unique flexible fiber optic solutions for NIR and mid IR ranges.
IR imaging is still a challenging and developing task which can often be solved easier using flexible solutions such as fiber optics.



Our Services

Training, installation, development, repairs





We are right here
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