New: PM PCF Broadband Fiber Cables

Polarization-maintaining, endlessly single-mode, photonic crystal fibers series PCF-P with Gaussian intensity profile

FEATURES

Polarization-maintaining, endlessly single-mode, photonic crystal fiber cables series PCF-P with Gaussian intensity profile and low-stress fiber connectors with end caps.

- Broadband fiber with wavelength range 370 nm - 1550 nm
- PCF fiber with 5 µm core, pure silica
- End caps for a smaller power density at the fiber end-faces and a sealed microstructure
- Measured values for fiber NA: NAe^2
- Mode-field diameter almost independent of wavelength
- Fiber patch cable with Ø 900 µm buffer or as Ø 3 mm cable with Kevlar strain-relief
- Connectors type FC with 0°-polish or 8°-polish
- Polarization axis is indicated by connector index key (slow axis)
- Optionally: Amagnetic titanium connectors for connectors of type FC PC or FC APC

- Polarization-maintaining PCF Fiber
- RGBV fiber optic components

DESCRIPTION

Polarization-maintaining, endlessly single-mode, photonic crystal fiber cables series PCF-P with Gaussian intensity profile and low-stress fiber connectors with end caps.

Fiber
The fiber is a polarization-maintaining, endlessly single-mode PCF fiber, they have a core diameter of 5 µm. The mode-field diameter MFD is almost independent of wavelength. The effective numerical NAe2 is wavelength dependent and is measured for each connectorized fiber and various wavelengths by Schäfter+Kirchhoff. The special broadband fiber has an operational wavelength range of 370 nm - 1550 nm.

Fiber Connectors
For each fiber end the fiber connector type can be chosen (FC PC with 0°-polish or FC APC with 8°-polish).

End Caps
The fiber connectors of all PCF fiber cables are equipped with an end cap. This means that a short piece of coreless fiber (< 300 µm) is spliced onto the polarization-maintaining PCF fiber. The end cap seals the microstructure of the fiber and allows for an easy cleaning of the end-face. Additionally it also reduced the power density at the fiber end-face.

Amagnetic fiber connectors
For FC PC or FC APC type connectors amagnetic versions completely made of titanium can be selected. Those connectors have a ceramic ferrule.

New! Contact us for more information and availability!

ORDER OPTIONS

Order Code	Core diameter	Wavelength range	Features
PCF-P-5	5 µm	370 - 1550 nm	polarization-maintaining

TECHNOTES

- Photonic crystal fiber cables PCF
  Details about the specific features of PCF fibers.
- Numerical Aperture / Effective Numerical Aperture
  Why is it best to define an effective numerical aperture NAe^2?
- Typical effective Numerical Apertures
  Typical values for the effective numerical aperture
- Mismatch / NA Mismatch and Overlap
  Overlap and coupling efficiency when using fibers of different NA, different Mode field or different focal lengths
- Polarization-maintaining Fibers (PM Fibers)
  Why are some fibers polarization-maintaining?

Characterizing Polarization-maintaining Fibers (PM Fibers)
How to characterize PM fibers.

- High Power Phenomena
  Stimulated Brillouin Scattering and fiber end-face effects
- End cap fibers
  What are end caps and why should I use them?
- Fiber Patch Cable Types
  Details on the structure of 3 mm and 900 µm fiber cables.
- Fiber Connector Options
  FC, AVIM and E2000
- Amagnetic fiber connectors
  Special features of titanium connectors
- Connecting single-mode and PM fibers to a fiber coupler
  How to correctly insert a fiber into the receptacle of a fiber coupler

FAQ

What are PCF fibers? What is the difference to a standard fiber?

What is a large mode area PCF fiber?

For single-mode fibers, there is a change in refractive indices between core and cladding.
In large mode area PCF fibers the single-mode transport is introduced by microstructuring the fiber cladding. In our case the PCF fibers have a hexagonal structure of periodic holes that lead to a single-mode transport within the fiber. The fibers are categorized by their core diameter (e.g. 5 µm or 10 µm). Detailed calculations reveal that for this type of fibers the mode field diameter MFD is almost wavelength-independent. It is larger than the MFD of comparable standard fibers. In contrast, the numerical aperture has a significant wavelength-dependency. This is important to consider when collimating a beam for a large wavelength range.

When should I use a PCF fiber instead of a standard single-mode fiber?

Our PCF fibers are endlessly single-mode, (polarization-maintaining, only type PCF-P), specialized photonic crystal fiber cables with Gaussian intensity profile and low-stress fiber connectors with end caps. They have an operational wavelength range of 300 - 1200 nm and can be used for example for very broadband applications or with supercontinuum lasers.
Standard (PM) fibers have a much more limited operational wavelength range and are no longer single-mode below the cut-off wavelength.

If you need a broadband fiber, there are also special RGB fibers that are broadband and do cover a range of 400 - 680 nm.

For standard applications standard fibers should be preferred over specialized PCF fibers.

I want to couple a lot of power? Should I prefer a PCF over a standard fiber?

The power that can be coupled into a fiber depends on two things. First on how much power the end-face can handle and second how much power the bulk fiber can handle. This is described in full detail here.

As described for our standard fibers. End caps reduce the risk or torching the fiber end-face when coupling in high powers. These are also used in PCF fibers. In conclusion when considering the end-face alone, PCF fibers cannot handle more power.

Brillouin scattering is a phenomenon of the bulk fiber. The Brillouin threshhold depends on the mode field diameter. PCF fibers have a higher Brioullin threshhold and can carry larger powers **if** their mode field is larger compared to the MFD of a standard fiber. This is true e.g. for a PCF-5 with 5µm core when used with wavelengths < 600 nm.

What is the difference between a PCF fiber and a standard fiber?

Single-mode fibers are primarily characterized by their numerical aperture (NA) and their cut-off wavelength λc_0. The mode field diameter MFD changes with wavelength and in first approximation the NA is considered to be constant. Detailed measurements however reveal that the NA is also wavelength dependent.

In large mode area PCF fibers, the single-mode transport is introduced by microstructuring the fiber cladding. The fibers are categorized by their core diameter (e.g. 5 µm or 10 µm). Detailed calculations reveal that for this type of fibers the mode field diameter MFD is almost wavelength-independent. It is larger than the MFD of comparable standard fibers. In contrast, the numerical aperture has a significant wavelength-dependency. This is important to consider when collimating a beam for a large wavelength range.

Why do all PCF fibers have an end cap?

The fiber connectors of all PCF fiber cables are equipped with an end cap. This means that a short piece of coreless fiber (< 300 µm) is spliced onto the PCF fiber.

The end cap seals the microstructre of the fiber and allows for an easy cleaning of the end-face. Additionally it also reduced the power density at the fiber end-face.

How do the fiber end faces look like? Do you seal the microstructure?

Yes, the microstructure is sealed.

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Can I use PCF fibers with a mating sleeve?

Since the radiation has already started to diverge within the end cap, a simple mating is no longer possible. Please use a fiber-to-fiber coupler in this case.

Connector Type FC PC and FC APC

How do I attach a fiber cable?

To prevent damage to the sensitive fiber end-face, always insert the fiber connector`s ferrule at an angle, with the connector key properly aligned to the receptacle notch.
When the ferrule tip is safely located in the inner cylinder of the receptacle, align the connector to the receptacle axis and carefully introduce the connector into the fiber coupler.
Then, orient the connector key in a way that it is pressed gently onto the right-hand side of the receptacle notch ("right-hand orientation rule").
Gently screw on the connector cap nut onto the receptacle until it is finger-tight.
Gently tighten the fiber grub screw to reduce the free play of the ferrule in the receptacle.

What is the "right-hand orientation rule"?

When the ferrule tip is safely located in the inner cylinder of the receptacle, align the connector to the receptacle axis and carefully introduce the connector into the fiber coupler.

Then, orient the connector key in a way that it is pressed gently onto the right-hand side of the receptacle notch.

The tightened grub screw and the "right-hand orientation rule" for the connector, ensure a high reproducibility in mode field position and angle, which is especially important for attaching and reattaching polarization-maintaining fibers reproducibly.

Can I attach a narrow key fiber cable to a fiber coupler with a wide key receptacle?

Yes, you can- without any problem. Simply adhere to the "right-hand orientation rule".

Generally, with any FC PC or FC APC type connector there is a freeplay when inserting the fiber into the fiber coupler. The free play in between the connector ferrule and receptacle is only a few microns, but necessary for inserting the ferrule without force. There is a difference between the receptable and key width for wide key (2.14 mm) and narrow key (2.0 mm) fibers. If you follow the so-called "right-hand orientation rule" you can reproducibly attach and reattach even PM fibers with narrow key receptacle to fiber couplers with wide key receptacle without difficulty.

"Right-hand orientation rule":

When the ferrule tip is safely located in the inner cylinder of the receptacle, align the connector to the receptacle axis and carefully introduce the connector into the fiber coupler. Then, orient the connector key in a way that it is pressed gently onto the right-hand side of the receptacle notch. The tightened grub screw and the "right-hand orientation rule" for the connector, ensure a high reproducibility in mode field position and angle, which is especially important for attaching and reattaching polarization-maintaining fibers reproducibly.

Can I use an end cap fiber with a mating sleeve?

Since the radiation has already started to diverge within the end cap, a simple mating is no longer possible. Please use a fiber-to-fiber coupler in this case.

PM fibers

I look at my fiber end face and do not see a Panda structure? Why is that?
Chances are, that the fiber is equipped with end caps, that do not have a Panda structure themselves. The Panda structure within the actual fiber cable is visble with special microscopes only.

ACCESSORIES

RGB LASER BEAM COUPLERS SERIES 60SMS	for coupling into single-mode and polarization-maintaining fiber cables
RGB FIBER COLLIMATOR SERIES 60FC	for collimating radiation exiting an optical fiber or as an incoupler
POLARIZATION ANALYZER SK010PA	Measurement tool for coupling into polarization-maintaining fiber cables
BULKHEAD FIBER ADAPTERS	Fiber Adapters without Optics

RELATED PRODUCTS

NEW: FIBER CABLES PCF-S	Endlessly single-mode, photonic crystal fibers series PCF-S with Gaussian intensity profile
FIBER CABLES PMC-RGB	Polarization-maintaining fiber cables, broadband, 400 nm - 680 nm
FIBER CABLES PMC	Polarization-maintaining fiber cables

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CONTACT

For more information please contact:
Schäfter + Kirchhoff GmbH
Kieler Str. 212
22525 Hamburg
Germany
Tel: +49 40 85 39 97-0
Fax: +49 40 85 39 97-79

info@sukhamburg.de
www.sukhamburg.com

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