

## Fiber Collimator series 60FC-Q

Fiber Collimator for collimating large beam diameters and with integrated quarter-wave plate

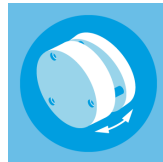


### FEATURES

The fiber collimators series 60FC-Q are designed for collimating radiation exiting from an optical fiber cable. An integrated adjustable quarter-wave plate is used to generate left-handed or right-handed circularly polarized radiation.

- Large beam diameters: Focal lengths up to 200 mm
- Choice of monochromats or achromats
- Various AR coatings for UV - IR
- Low-order retardation optics with minimal angular dependency
- Choice of fiber receptacals: FC PC or FC APC (standard), many others available
- Integrated TILT adjustment to prevent aberrations from vignetting or clipping
- Front connector accepts attachment optics

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- With integrated TILT adjustment
  - Components for quantum optics



## DESCRIPTION

The fiber collimators series 60FC-Q have an integrated quarter-wave plate and is designed for collimating radiation exiting optical fiber cables with high pointing stability and adjustable right-handed or left-handed circular polarization. They are suitable for single-mode and polarization-maintaining fiber cables leading to collimated beams with a Gaussian intensity profile.

### An optics for each application

A large variety of collimating optics allows that the optimum focal length and the best lens type for a single wavelength ([monochromat](#)) or a wavelength range ([achromat](#)) can be selected for each application. All lenses are AR-coated.

### Adjustment of focus and TILT, and state of polarization

The distance between fiber end-face and collimating optics is adjusted by means of an eccentric key. The lens does not rotate when adjusting the focus. The final focus setting is locked by means of two radially arranged clamping screws. Additionally attachment optics can be mounted to the front of the collimator.

Additionally, the collimator has an integrated TILT adjustment for aligning the beam axis to the mechanical axis. This prevents vignetting of the collimated beam as well as diffraction arising from the clipped beam.

The integrated low-order retardation optics with minimal angular dependency allows the adjustment of the state of polarization in the assembled state between right-handed and left-handed circular polarization. This is done using a cogged tool [60Z-2803](#) and can be monitored using the polarization analyzers series [SK010PA](#). Retardation optics are available for typical wavelengths between 389 nm and 1084 nm.

### Optimum lens performance

The angled polish of connectors of type APC is considered by a [pre-angled mechanical coupling axis](#) that compensates the beam deflection and you can use the lens centrally. This minimizes aberrations simply resulting from a non-ideal beam path through the lens.

### Connector Type

The fiber collimator can be equipped with FC PC (wide key\*), FC APC (wide key\*), ST or LSA (compatible with fiber connectors type DIN, AVIO and AVIM) [receptacles](#). In case of FC or LSA with a spring loaded ferrule the fiber coupler has an additional grub screw to increase pointing stability. \*Even though the fiber coupler has a wide key receptacle it still can be used with both narrow key and wide key fibers. More information can be found [here](#).

### Material

The fiber collimators are made of nickel silver and black anodized aluminum.

### Mounting

All Fiber Collimators 60FC-Q with diameter Ø 25 mm can be placed in a standard mirror mount. 60FC-Q with a larger diameter posses a flange for low-strain mounting e.g. using the clamp collars series [CC](#).

## TECHNOTES

- [Lens Types](#)  
[Differences between aspheres, achromats and apochromats](#)
- [Fiber Connector Options](#)  
[FC PC, FC APC etc.](#)
- [Pre-angled coupling axis](#)  
[Reasons for a pre-angled coupling axis](#)
- [Grub screw for fiber ferrule](#)  
[Why you should tighten the grub screw for the fiber ferrule.](#)

- [Collimating single-mode fibers \(6\)](#)  
[Collimated beam diameter, beam divergence, pilot beam](#)
- [Collimated beam diameter of a singlemode fiber](#)  
[Selection of focal length or determination of the resulting beam diameter](#)
- [Practical collimation](#)  
[Practical collimation tips for single-mode, polarization-maintaining and multimode fibers](#)
- [Beam divergence](#)  
[Beam divergence of a collimated beam exiting a single-mode fiber](#)
- [Pilot beam](#)  
[Approximate constant beam diameter across a certain working range](#)
- [Article - Fiber Coupling to Polarization-Maintaining Fibers and Collimation](#)  
[How measured fiber parameters help to choose the best coupling and collimation optics.](#)
- [Article - Specialized fiber collimators](#)  
[Cooling and trapping atoms using specially developed fiber collimators](#)
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## FAQ

### General Questions

#### **Why do you use low-order wave plates for the 60FC-Q collimators instead of zero-order?**

The fiber collimators of series 60FC-Q typically are used in quantum optical systems with narrow line width lasers.

In these fiber collimators, the quarter-wave plate is placed directly after the fiber receptacle in the diverging beam.

Thus, we use low-order waveplates for this application because they have a ten times smaller angular dependence compared to zero-order waveplates.

It may be better to use zero-order plates only if the parts are used in a non-temperature-stabilized environment or if they are used with a broadband source.

Series 60FC-Q fiber collimators with zero-order plates are available upon request.

### Adjustment

#### **How much can I change the focus setting?**

You can change the focus setting  $\pm 2.0$  mm.

**I do not have a collimating telescope to collimate. Can you give me practical advice?**

Of course, a collimating telescope is the best way to collimate. But there are other methods depending on the type of fiber (single-mode and PM vs. multimode) you can use. Please refer to our practical collimating tips [here](#).

**My collimator is shipped "prealigned". What does this mean?**

Schäfter+ Kirchhoff ships all collimators prealigned and collimated for either a specific wavelength defined by the customer or a typical wavelength. The collimation is performed using professional collimating telescopes.

**Please note:** The fibers used in the standard adjustment procedure are all equipped with an [end cap](#) when aligning for wavelengths  $\leq 520$  nm. The adjustment wavelength is given on the label for each collimator/coupler. If a fiber with end cap was used it is marked by "EC".

**I am unsure how to correctly adjust my coupler/collimator. Where do I find details about the adjustment procedure?**

Please refer to the manual in the Downloads section for a detailed adjustment procedure.

## Fiber Receptacle

### FC PC and FC APC

**What type of receptacle does my collimator with receptacle type FC have? Narrow key or wide key?**

All our fiber collimators and couplers with a receptacle type FC have a so called wide key receptacle (2.14 mm).

These are suitable for connecting fibers with connector type FC (wide key) but also with those of type narrow key! You can find the details in the FAQs below.

**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 receptacle 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.

## Troubleshooting

**I can't collimate the radiation out of a coupler. Why?****Have you loosened the grub screws?**

The clamp screws have to be loosened before changing the focus setting, Please refer to the adjustment instructions of the individual couplers for more details.

**Have you checked, if the fiber is correctly placed within the fiber receptacle of the coupler?**

The fiber connector might not be placed correctly within the receptacle of the coupler/collimator. In particular, please check the small grub screw holding the connector's ferrule (e.g. for FC PC and FC APC type couplers). It might be in the way. Please refer to the adjustment instructions of the individual couplers/collimators for more details.

**Have you checked the eccentric key for damage?**

The eccentric key might be damaged or broken. If that is the case, try another eccentric key of the same type and (or) contact Schäfter+Kirchhoff for replacement.

**Are you using a fiber with an end cap?**

Collimating/coupling with an end cap fiber cable is no different than with a standard fiber cable. However, the focus position might vary a little ( $<200\text{ }\mu\text{m}$ ) when swapping a standard fiber cable for a fiber cable with end cap.

The eccentric key 55EX-5 is used to adjust the focus position. In some cases the stroke is not large enough.

This includes working with very small wavelegths or very large wavelengths. Please try using a different groove instead.

**Are you using the optimum groove for adjusting the focus setting with the eccentric key?**

The distance lens to fiber end face is changed by means of an eccentric key. This key has a pin. The lens tube has one (or more) circumferential groove(s). The lens tube is shifted axially by rotating the eccentric.

In order to cover the entire adjustment range, it might be necessary to switch from one to the next circumferential groove.

Sometimes it is easier to do a coarse alignment by shifting the rear part manually (instead of using the eccentric key). Then, the right groove for a proper fine adjustment with the eccentric will appear in the aperture of the fiber collimator for the eccentric and you can finish the fine adjustment using the eccentric key.

## DOWNLOADS



[Adjustment\\_60FC-Q.pdf \(Manual\)](#)



[Article\\_FiberCollimators.pdf \(Technote\)](#)

**This downloads section only includes general downloads for the complete series.**

Please access the individual product pages (using the product configurator, the product list, order options or the search button if you have a complete order code). Here you will find specific downloads including technical drawings or stepfiles.

## ACCESSORIES

### ADJUSTMENT TOOLS

### FIBER OPTICS

**CLAMP COLLARS  
SERIES CC**

for all collimators with flange, different sizes

## RELATED PRODUCTS

**POLARIZATION  
ANALYZER SK010PA**

Measurement tool for coupling into polarization-maintaining fiber cables

**FIBER CABLES PMC**

Polarization-maintaining fiber cables

This is a printout of the page <https://sukhamburg.com/products/fiberoptics/fibercoupler/series/60fc-q.html> from 4/19/2024

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