Fiber Collimator series 60FC-T

for collimating large beam diameters and with additional TILT adjustment

FEATURES

The fiber collimator series 60FC-T is designed for collimating radiation exiting from an optical fiber cable or used in reverse as a fiber coupler (fiber port) for coupling a beam into an optical fiber cable. It has an integrated TILT adjustment to prevent aberrations from vignetting or clipping.

- Large beam diameters: Focal lengths up to 200 mm
- Choice of monochromats or achromats
- Various AR coatings for UV - IR
- Choice of fiber receptacles: FC PC or FC APC (standard), SMA (0°,5°,8°), many others available
- Integrated TILT adjustment to prevent aberrations from vignetting or clipping
- Front connector accepts attachment optics

- With integrated TILT adjustment

DESCRIPTION

The fiber collimators series 60FC-T are designed for collimating radiation exiting optical fiber cables with high pointing stability. They can also be used in reverse-mode as fiber incouplers. They are suitable for single-mode and polarization-maintaining fiber. Please note that for multimode collimation the intensity profile is not Gaussian and depends on certain fiber and radiation properties.

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
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.

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 centrically. This minimizes aberrations simply resulting from a non-ideal beam path through the lens.

Connector Type
The fiber collimator can be equipped with receptacles of type FC PC (wide key*), FC APC (wide key*), ST or LSA (compatible with fiber connectors type DIN, AVIO and AVIM). 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 (standard) or in amagnetic titanium. In case of titanium, the relative permeability is near 1 (μr=1.00005) making it almost transparent to magnetic fields. The linear coefficient of thermal expansion is close to that of the optics so that a thermal stability over a larger temperature range can be expected.

Mounting
All Fiber Collimators 60FC-T with diameter Ø25 mm can be placed in a standard mirror mount. 60FC-T 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
- Producing spots (3)
  When can you produce a spot by simply refocusing the fiber collimator and when is a micro focus optics necessary?
  - Refocusing the collimator to produce a focus spot
    Beam divergence of a collimated beam exiting a single-mode fiber
  - Producing spots by using a fiber collimator and a micro focus optics
    Calculation of spot diameter for single-mode fibers
  - Rayleigh range
    What is the depth of focus of my spot?
- Article - Fiber Coupling to Polarization-Maintaining Fibers and Collimation
  How measured fiber parameters help to choose the best coupling and collimation optics.

FAQ

Order Code

How do I read the Order Code?

The Order Code of standard Fiber Couplers is fairly easy ro read.
Example: 60FC-xxx-T-M125-54
60FC-T denotes the series of the Fiber Coupler, in this case series 60FC-T. You can find an overview of available series here.
xxx stands for the receptacle type. Standard is FC and the xxx is left out. SMA stands for receptacle type F-SMA, LSA stands for a receptacle type LSA compatible with fiber connectors type DIN, AVIO and AVIM.
4 stands for the collimator coupling axis. It is either 4 (standard) for 8°-polished fibers or 0 for 0°-polished fibers. For SMA couplers there is als 23 which is for 5°-polished fibers.
M125 denotes the otics type and the focal length. M stands for monochromat or achromat, A for asphere and S for singlet lens. The focal length is given in mm, in this case 125 mm.
54 describes the AR-Coating of the lens. Specifics on the coatings can be downloaded on the individual product pages of the fiber couplers.

Adjustment

How much can I change the focus setting?

You can change the focus setting ± 2.0 mm.

How can I change the focus setting?

To check the collimation setting of the fiber collimator, couple a radiation source of appropriate wavelength into the fiber connected to the fiber collimator. (Always keep laser safety in mind!)

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 shiftet axially by rotating the eccentric.

First, loosen the clamp screws fixing the lens position by means of a screwdriver type 50HD-15. Insert the eccentric key type 55EX-5 into the large hole so that the pin of the key is placed in one of the circumferential grooves.
Now, adjust the focus setting by rotating the eccentric key. In order to cover the entire adjustment range, it might be necessary to switch from one to the next circumferential groove. Finally, fix the clamp screws in order to lock the collimation setting.

You can change the focus setting of these fiber collimators also by just shifting the rear part manually. It is an option to do this for a coarse alignment. Then, the right groove for a proper fine adjustment with the eccentric will appear in the aperture of the fiber collimator for the eccentric.

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

Of coarse, 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.

The fiber collimator has a TILT alignment. What does this mean?

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.

If you want to point the collimated laser beam to a certain point and need to tilt the beam axis, DO NOT do this using the TILT mechanism of the 60FC-T. You need to hold the fiber collimator in a adequate holder, e.g. a mirror mount with the respective amounts of freedom.

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 calles wide key receptacle (2.14 mm).

These are suitable for connecting fibers with connector type FC (wide key) but also with thos 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 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.

Fiber Collimators with receptacle type SMA

Why do we not offer fiber couplers without TILT alignment and a receptacle type F-SMA with an angled polish?

The fiber connectors of type SMA do not have a spring-loaded ferrule (such as FC type connectors do).

The receptacles do not have a limit stop.
Since the length of the ferrule is not defined precisely, the emitting point in the fiber coupler is not properly defined.

In case of a 0°-polish this is not a problem since you can adjust for this by adjusting the axial lens position.

However, in case of an SMA fiber connector with an angled polish, the emitting point additionally moves laterally with ferrule length.

In order to compensate for this lateral displacement, a TILT alignment is absoluetely necessary.

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 µm) 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.

It says my coupler/collimator was "precollimated" but the collimation setting seems to not be alright. What might be the problem?

Are you using the same wavelength as the adjustment wavelength?

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

The adjustment wavelength is given on the label for each collimator/coupler. If you are using another wavelength you need to change the focus setting. Please refer to the manual for more details.

Are you using the same fiber type as in the adjustment procedure?

The fibers used in the standard adjustment procedure are all equipped with an end cap when aligning for wavelengths ≤ 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".

If you are not using a fiber with an end cap but the preadjustment at Schäfter+Kirchhoff was done using an end cap ("EC") or you are using a fiber with an end cap and the preadjustment at Schäfter+Kirchhoff was done without, you might need to change the focus setting. Please refer to the manual for more details.

DOWNLOADS

Adjustment_60FC-T.pdf (Manual)

Article_FibercouplingNAe2.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
IRIS DIAPHRAGMS BL	for collimators
MICRO FOCUS OPTICS	Micro Focus Optics for Fiber Collimators of all series

POLARIZATION FILTERS

RETARDATION OPTICS	Retardation optics for fiber collimators

RELATED PRODUCTS

FIBER COLLIMATOR SERIES 60FC-L	for collimating large beam diameters
FIBER COLLIMATOR 60FC-Q	Fiber Collimator for collimating large beam diameters and with integrated quarter-wave plate
FIBER COLLIMATOR SERIES 60FC	for collimating radiation exiting an optical fiber or as an incoupler

This is a printout of the page https://sukhamburg.com/products/fiberoptics/fibercoupler/series/60fc-t.html from 4/25/2024

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

LEGAL NOTICE