

Laser Beam Couplers series 60SMF

with fine threaded adjustment screws - for coupling into single-mode and polarization-maintaining fiber cables



FEATURES

The fiber couplers series 60SMF with fine threaded adjustment screws are an improved, advanced version of the fiber couplers [60SMS](#). They are high precision fiber couplers optimized for high coupling efficiency, high pointing stability and long-term stability and provide efficient coupling of collimated laser radiation into single-mode and PM fiber cables.

- All appreciated benefits of the well-established 60SMS laser beam coupler including its very high pointing stability and as well as the proven long-term stability.
- Ceramic bearings and adjustment screws with fine thread to ensure an even more precise and easy adjustment.
- For single-mode or PM fiber cables
- System mount Ø 19.5 mm
- Integrated TILT and focusing adjustment
- Focal lengths up to 18 mm
- Choice of aspheres, monochromats, achromats and apochromats
- Various AR coatings for UV - IR
- LSA type receptacle (PC or APC): compatible with fiber connectors type DIN, AVIO and AVIM
- Eco brass ® (standard) or amagnetic titanium

- With integrated TILT adjustment



DESCRIPTION

The fiber couplers series 60SMF with fine threaded adjustment screws are an improved, advanced version of the fiber couplers series [60SMS](#). They are designed for compact and long-term stable coupling of single-mode laser radiation into a single-mode or polarization-maintaining fiber. For multimode applications please use the series [60FC-A19.5](#) fiber couplers.

An optics for each application

A large variety of coupling optics allows that the optimum focal length and the best lens type for a single wavelength ([asphere](#), [monochromat](#)) or a wavelength range ([achromat](#) or apochromat) can be selected for each application. All lenses are AR-coated. For an ideal Gaussian beam and standard fibers you can reach coupling efficiencies up to 80%.

High long-term stability

It's compact size as well as the high-resolution alignment mechanisms allow for a straight-forward, intuitive coupling procedure. The result is a fiber coupling with high thermal stability, pointing stability, that is vibration and shock-insensitive. [Long-term stability tests](#) (see figure on the right) have shown a power stability better than 3% for a temperature range of 15-35°C.

6 Degrees of freedom*

In order to achieve optimum coupling efficiency the fiber coupler needs to provide certain degrees of freedom. You need to adjust

- the angle between laser beam and lens/fiber end-face
- the z-position of the lens
- adjust the polarization axis of the fiber to that of the laser source
- center the lens with respect to the laser beam

The fiber coupler provides all degrees of freedom necessary. It has a TILT adjustment, an independent focus adjustment, can be rotated 360°, and allows for lateral adjustment* using e.g. the adapter [60A19.5-F](#).

The TILT adjustment is used to maximize the lateral overlap between the mode field of the fiber and the focussed laser spot using 3 adjustment screws. It has ceramic bearings and the adjustment screws have a super-fine thread to ensure an even more precise and easy adjustment. 3 locking screws are used for fine-adjustment and to lock the position for an optimum mechanical stability.

Independent to the TILT adjustment, the distance between fiber end-face and coupling optics is adjusted by means of an eccentric key. The final focus setting is locked by means of two radially arranged clamping screws. Since the focus adjustment is independent, the z-position of the mode field diameter can be placed much more precisely.

The polarization alignment of the fiber to the polarization axis of the laser source is performed by rotating the laser beam coupler. The separation of the fiber coupler and the adapter necessary for centering is essential to allow for a full 360° freedom of rotation. The coupler has a tight-fit cylinder that can be placed into a Ø 19.5 mm receptacle of a corresponding adapter.

The beam can be centered with respect to the aperture of the coupling optics using e.g. the adapter [60A19.5-F](#).

Optimum lens performance

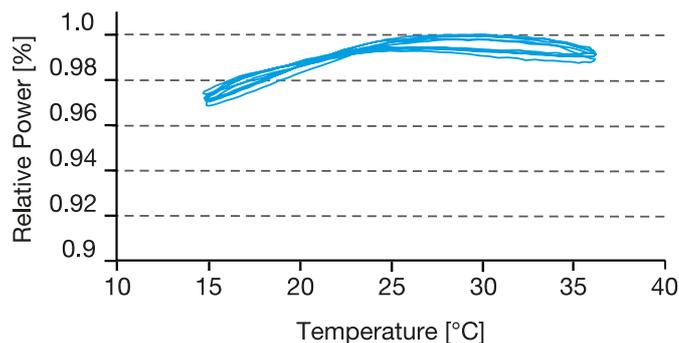
The angled polish of connectors of type APC causes the beam to exit in an angle and not parallel to the optical axis of the fiber. This is corrected by the [pre-angled mechanical coupling axis](#) of the coupler that compensates the beam deflection and you can use the lens centrally. This minimizes aberrations simply resulting from a non-ideal beam path through the lens.

Receptacle Type LSA

The fiber coupler has a [receptacle](#) of type LSA and is available as PC (for fibers with 0°-polish) and APC (for fibers with 8°-polish). The receptacle type LSA is compatible with fiber connectors type DIN, AVIO and AVIM. Since fibers with this connector type have a spring loaded ferrule, the fiber coupler has an additional grub screw to increase pointing stability. Compatible fibers can be found on www.diamond-fo.com.

Material Options

The fiber couplers are available in eco brass ® (standard) or in amagnetic titanium. In case of titanium, the relative permeability is near 1 ($\mu_r=1.00005$) 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.



TECHNOTES

- [Lens Types](#)
[Differences between aspheres, achromats and apochromats](#)
- [Pre-angled coupling axis](#)
[Reasons for a pre-angled coupling axis](#)
- [Single-mode and PM fiber Coupling \(6\)](#)
[Selection of focal length, estimated coupling efficiency](#)
- [Single-mode and PM fiber Coupling](#)
[Selection of focal length, estimated coupling efficiency](#)
- [Selection of coupling focal length for an elliptical beam](#)
[Selection of focal length and effective coupling diameter](#)
- [Coupling efficiency](#)
[Sources of loss when fiber-coupling](#)

- [Industry-grade fiber coupling](#)
[Industry-grade fiber coupling for different well-established laser systems](#)
- [Article - Fiber Coupling to Polarization-Maintaining Fibers and Collimation](#)
[How measured fiber parameters help to choose the best coupling and collimation optics.](#)
- [Article - Perfectly Coupled](#)
[Making single-mode fiber coupling smooth and permanent](#)
- [Stability and coupling efficiency of the laser beam couplers type 60SMS](#)
[Stability measurements during temperature cycling and how incorrect adjustment affects the coupling efficiency.](#)

FAQ

Adjustment

How much can I change the focus setting?

For couplers and collimators with a focal length < 12 mm you can change the focus setting ± 0.5 mm. For couplers and collimators with a focal length ≥ 12 mm you can change the focus setting ± 1.0 mm.

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.

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. 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 for more details.

Have you tried another eccentric key?

Please check, if the eccentric key is damaged or broken.

Please also check, if you are using the appropriate eccentric key. The eccentric key type 60EX-5 has a larger stroke compared to the key type 60EX-4. The 60EX-5 is used for couplers with focal length ≥ 12 mm. The 60EX-4 is used for focal lengths < 12 mm.

In some very, very rare cases the stroke of the original eccentric key may be too small for the coupler in your application. (See FAQ "Difference between 60EX-4 and 60EX-5"). Try using the 60EX-5 in this case.

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.

DOWNLOADS



[Adjustment_60SMF-LSA.pdf \(Manual\)](#)



[010821190700.pdf \(Dimensional drawing\)](#)

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

ADAPTERS FOR 60SMS with system mount $\varnothing 19.5$ mm

RELATED PRODUCTS

**LASER BEAM
COUPLERS SERIES
60SMF** with fine threaded adjustment screws - for coupling into single-mode and polarization-maintaining fiber cables

**LASER BEAM
COUPLERS SERIES
60SMF-MAV** with mini AVIM type receptacle and with fine threaded adjustment screws - for coupling into single-mode and polarization-maintaining fiber cables

**FIBER COLLIMATOR
SERIES 60FC**

for collimating radiation exiting an optical fiber or as
an incoupler

**FIBER COLLIMATOR
SERIES 60FC-SF**

Fiber Collimator/Fiber Coupler with super-fine thread

This is a printout of the page https://sukhamburg.com/products/fiberoptics/fibercoupler/rtype/lisa/60smf_lisa.html from 6/25/2022

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