

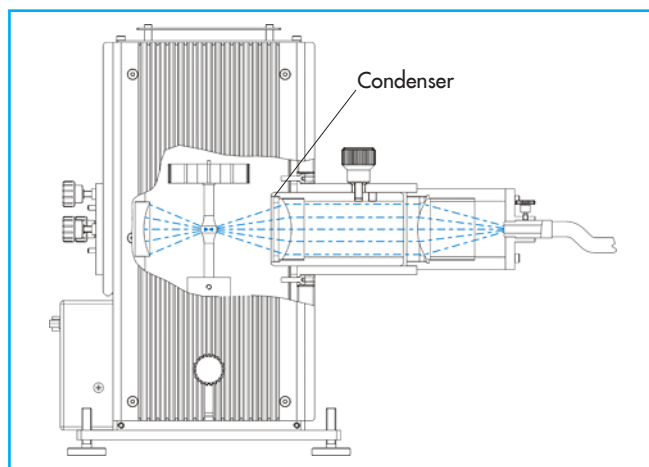


Fiber Optics and Light Sources

Introduction

- broadband UV to VIS-IR spectrum
- complete versatility for filtering fiber input

With appropriate accessories, our 150, 500 and even 1 KW lamp housings can easily be operated as fiber optic light sources. Hg and Xe arc lamps up to 200 W are preferred sources for UV and visible light, because the relatively small arcs of these lamps are very efficient for coupling light into optical fibers.



Which accessories?

The principle is shown in the above fig. Our housings with condensing optics produce a collimated beam. For coupling the light into the fiber the collimated beam has to be re-focused with a secondary lens. The lens has to be chosen in such a way that the F-number is matched to the acceptance cone of the fiber. We offer several fiber coupling devices, that are already equipped with the correct secondary focusing lens.

Advantage: flexible

We offer different fiber couplers: for glass fiber bundles, for quartz fiber bundles and a model optimized for fibers with diameter <math><800 \mu\text{m}</math>. All fiber couplers can be mounted directly to the lightsource condenser and accept the fiber bundle at the output.

(See www.lot-orient.com/lightsources, „Accessories“).

Lamp housings with condensing optics produce a parallel beam, so any accessory which fits between condenser and fiber optic coupler can be used. This is especially important when using filters, etc.

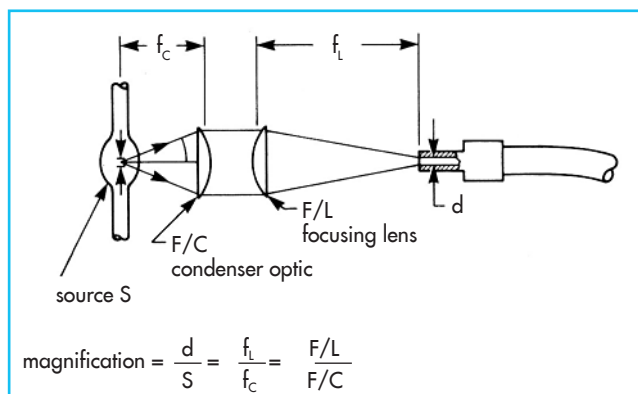
Which type of lamp?

There are two main criteria for choosing a lamp: wavelength range and optical diameter of the fiber resp. fiber bundle. It is for example not possible to couple more light into a 600 μm fiber when using a higher wattage lamp. This is because the radiance cannot be increased due to imaging these type of sources. The arc of arc lamps with higher power is relatively large. But the radiance of a 1000 W Xe arc lamp is not higher than that of a 75 W Xe arc lamp.

For most efficient fiber coupling you always have to consider the geometrical circumstances of the source and fiber diameter.

Choose the fiber diameter according to the source dimensions or vice versa. And take into account that you have to multiply the source dimensions by the magnification. The magnified dimensions should just fill the fiber.

The fig. below shows an approach being a useful simplification in order to select a source, the source optics and matching to the fiber geometry.





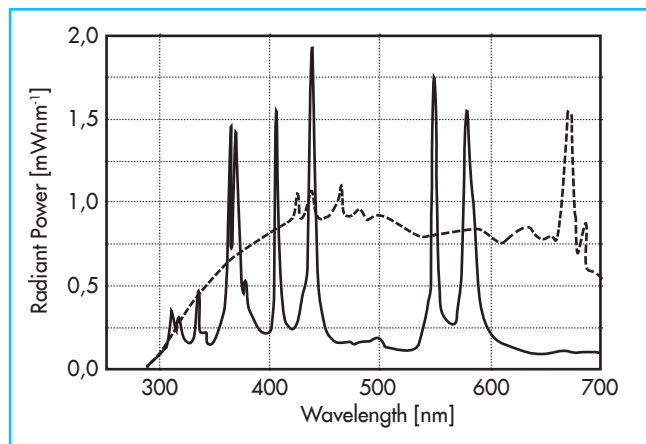
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Introduction

Large Core Fiber or Fiber Bundle?

You can choose between large core fibers and fiber bundles. The difference is in transmission and diameter. Large core fibers are available in diameters up to 1000 μm .

Fiber bundles are available with optical diameters of a few single fibers (typ. 100 μm) up to several centimeters.



The above figure shows the typical output through fiber optics.

top: 100 W Hg arc lamp with 600 μm large core fiber.
below: 150 W Xe lamp with 3,0 mm quartz fiber bundle (length 1 m).

Fiber Bundle Focusing Assemblies

These assemblies focus the collimated light of our light sources into a fiber or fiber bundle. The one end has a male flange to couple to the light source; the other end accepts fiber bundles with an 11 mm adapter.



Guidelines

Interference filters, fiber bundles and in particular liquid light guides should absorb as little radiation as possible, particularly IR.

- Turn the reflective side of the filter towards the incoming light.
- Use the fiber in as large a beam as possible. Never focus a beam on a filter.
- Use a beam turner with a dichroic mirror or the combination of water filter and infrared absorbing glass (see www.lot-oriel.com/lightsources, „Accessories“). Because of the non-reversible effects we recommend that the temperature of the filters not exceed 70° C and that the rise in temperature not exceed 5° C per minute.

For lamps with 200 W and more, we recommend a water filter or beam splitter with dichroic mirror in order to filter out the IR. For lamps with 300 W and more it is in any case necessary to remove the IR (water filter), otherwise the fiber bundles (and optical filters) could be destroyed.

	Condenser Size [mm]	Lens	To use with
LSZ153	35	F/0,9 Glass	Glass Fiber Bundles with bundle dia. ≥ 2 mm
LSZ152	35	F/2,0 Quartz	Quartz Fiber Bundles with bundle dia. ≥ 1 mm
LSZ155	35	F/2,0 Quartz	Quartz Fiber Bundles with bundle dia. ≤ 800 μm
LSZ151	35	F/0,9 Quartz	UV VIS Liquid Light Guide with bundle dia. ≥ 3 mm
LSZ250	50	F/1,3 Glass	Glass Fiber Bundles with bundle dia. ≥ 5 mm
LSZ251	50	F/2,5 Quartz	Quartz Fiber Bundles with bundle dia. ≥ 5 mm
LSZ252	50	F/1,3 Quartz	UV VIS Liquid Light Guide with bundle dia. ≥ 3 mm