

# Monochromatic light sources

## Guidelines

The best monochromatic light source of course is a laser. But tunable lasers are expensive. More economical is to combine a light source with one or more optical filters or with a monochromator. There are advantages and disadvantages.

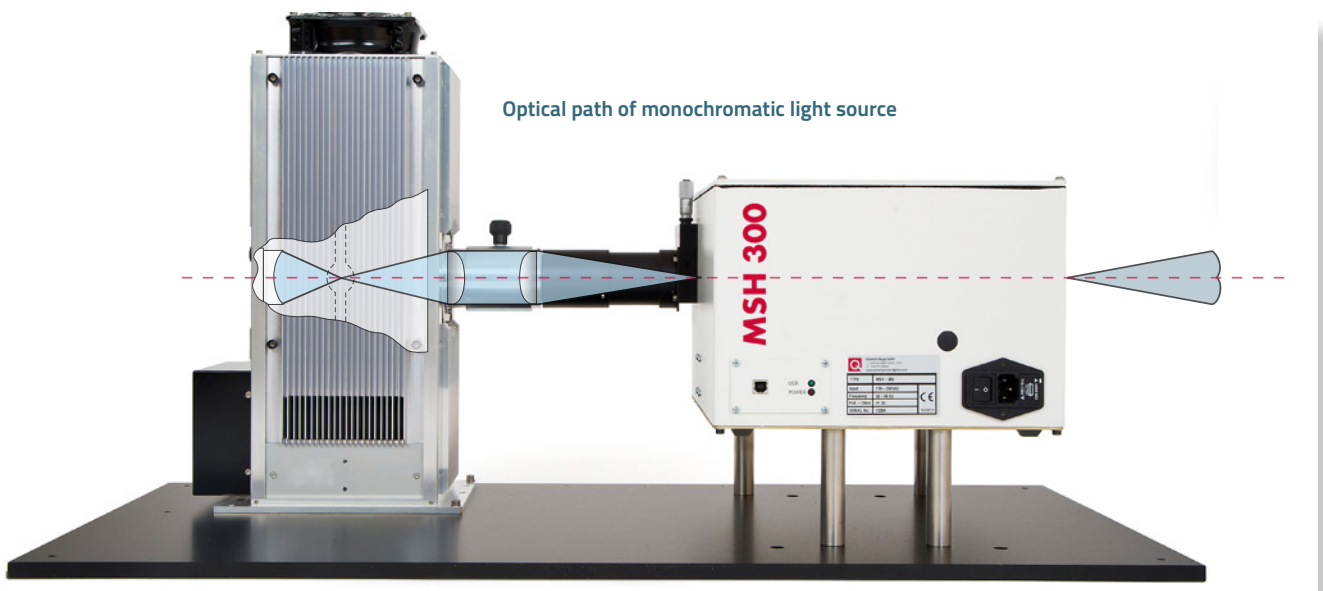
### Light sources and monochromators

Combine one of our condenser lens lamp housings and a monochromator for a versatile, bright source of narrowband radiation. Deuterium, xenon and quartz tungsten halogen lamps provide output which varies slowly with wavelength over wide spectral regions. Mercury lamps provide intense ultraviolet lines which the monochromator selects for luminescence or photochemical studies. Computer control of the monochromators makes these programmable wavelength sources.

For imaging the source on an entrance slit the geometric conditions have to be considered and the F/numbers have to be matched accordingly. For higher power or highly monochromatic illumination (band widths below 0.5 nm in the visible, 1 nm in the near IR), choose a 300 mm monochromator. For moderate band widths and power requirements choose a monochromator with lower focal length for its efficiency and price.

### Guidelines

Monochromator throughput is dependent upon various factors. One of the important factors is coupling efficiency. To maximize monochromator throughput, your source must be focused precisely on the monochromator slit. One simple way to do this is to use fiber optics, but you lose some throughput and you are limited by the usable wavelength range of the fiber.



1 kW lamp housing with 300 mm monochromator and accessories mounted on a common base plate

### Advantages

This solution is best for applications where source versatility is important. You can change condensers easily and have a wide selection of secondary focusing lenses to match any monochromator. The collimated beam path gives flexibility in where you locate the hardware. Accessories are available for prefiltering or spatial manipulation of the beam from the lamp housing. In the IR, where glass lenses do not transmit, an IR element is used with an Al reflector.

### Which lamp, which monochromator?

The choice of the lamp depends on the spectral range and the desired resolution resp. bandwidth of the monochromator.

The better method is to align the optical axes of the light source and the monochromator, and ensure that the input slit is at the image of the source. Filling the acceptance cone of the monochromator means to choose a lens which focuses the beam on the slit at the correct F/number. (See: "Choosing the right focusing lens")

We offer mounting kits that mount lamp housing and monochromator to a common baseplate. Therewith the height of the optical axes and the light source-monochromator distance is fixed.

The figure above gives an idea of this set-up.

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### Introduction

Configuring a complete monochromatic light source with its various options can be a difficult task.

Questions to be answered are:

- Which source type (arc or halogen)?
- Which condenser type (glass or quartz) and which F/number?
- Which monochromator (focal length 150 mm or 300 mm)?
- Which gratings are necessary to cover the desired wavelength range?
- Which slit assembly for the best repeatability or flexibility?
- What components are needed to build a complete (ready-to-operate) source?
- Are accessories required?

With more than 50 years in the light source business, QD has built up an extensive technical know-how to help you answer these questions. We also offer one of the broadest selection of components to provide you with an individual solution for your specific application.

### Standard monochromatic light source packages

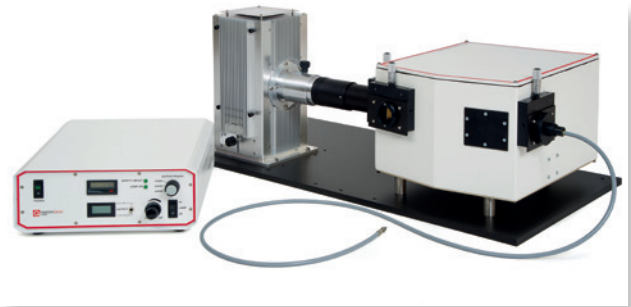
For your ordering convenience we also offer complete "standard monochromatic light source packages" with just one part number.

All these systems include:

- Light source optimized for slit illumination
- Monochromator
- Gratings
- Variable slit assemblies
- Order sorting filter wheel with suitable longpass filters
- Focusing lens
- Control software
- All cables and hardware needed to start
- All components mounted on a common base plate

They do **not** include a lamp which needs to be ordered separately.

This kind of simplification naturally has its limitations. Some of the flexibility you have when configuring a monochromatic light source based on our modular components needs to be given up. We would therefore like you to understand the configurations listed below as a summary of our most popular monochromatic light sources. As always, we will be happy to receive your call, talk about your application and help you make your final selection of the best source with the necessary accessories.



Sample configuration with accessories

### Monochromator features

- Fully automated
- USB 2.0 interface
- 230 - 2400 nm (monochromator and lamp dependent)
- Two variable slit assemblies, 10  $\mu$ m - 10 mm
- Control software
- Software development kit incl. Lab View VI's

### Xe arc lamps features

- High UV and VIS output
- Continuous spectrum from 200 to 700 nm
- Produce high irradiance on small targets
- Small, high radiance arc

