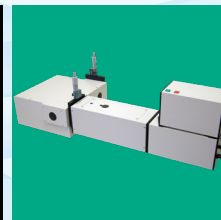
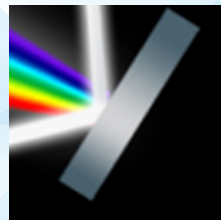
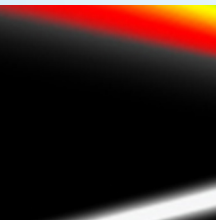
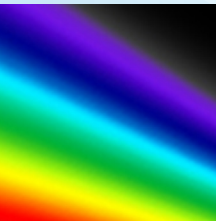


What makes the Tunable PowerArc a better Illuminator



The brightest 75W Xe continuously tunable light source from 180 nm to 2400 nm

Consisting of a unique arc lamp housing tightly coupled to a 0.2 meter monochromator, the Tunable PowerArc™ Illuminator is a self aligned illuminator that generates milliwatts of intensity and offers the versatility of continuous wavelength and bandwidth selection. The wavelength can be set manually or, for ultimate flexibility, it can be scanned under computer control. The Tunable PowerArc™ Illuminator could not be easier to operate. The system requires no ozone venting, and with the 75 watt xenon lamp no cooling is required. Simply push the start button and dial the wavelength and bandpass of output that you require. It's that easy!

Hardware Arc Lamp Housing

At the heart of the PowerArc™ lamp housing is a proprietary on-axis ellipsoidal reflector. Our reflectors collect up to 70% of the radiant energy from the arc lamp, versus only 12% for typical condenser systems in vertical lamp housings. The ellipse literally wraps around the arc lamp, collecting 5 to 6 times more output power than a conventional system.

The arc source is located at one focal point of the ellipse, and the radiation is reflected by the ellipse to the secondary focus which is actually outside of the lamp housing. Since the light is brought to a focus by reflection rather than refraction (through a lens), there are less losses from absorption or lens-surface back-reflection. This design is so efficient that a PowerArc™ lamp housing can deliver up to 11 times more optical power into a given smaller area than a conventional lamp housing. This is critical when illuminating light guides, monochromator slits, pinholes or other small areas.

What this means is simply that you get the same output with a 75 W system as with a conventional 450 W system. You obviously will save money and space.

While conventional lamp housings resemble chimneys emitting ozone and requiring cumbersome venting, the PowerArc™ has a sealed lamp housing that requires no ozone venting.

Ozone-Free Arc Lamp Housing

We call the PowerArc compact arc lamp housing design an ozone free lamp housing regardless of the lamp selected, even in the case of UV enhanced lamps. It is ozone free primarily because it is a sealed lamp housing that is air tight and not air cooled, unlike most arc lamp housings which use air cooling.

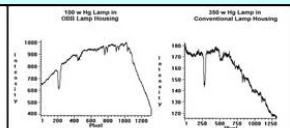
The PowerArc lamp housing with UV enhanced lamps has been tested following OSHA safety standards. While some ozone was detected outside the lamp housing, the ozone levels in the test room were well below the safe guidelines. Of course some UV light is delivered outside the lamp housing and into the air in the test room, and you can even detect this by smell, but not enough ozone is created to pose a health risk or require a chimney for venting.

Comparative field-test results:
"High Efficiency lamp housing yields 20x better sensitivity...lower operating cost."

In an independent comparison of OBB lamp housing with elliptical reflector vs. a competitor's condenser (lens reflector) housing, a 100 watt Hg lamp was mounted in the OBB lamp housing and a 350 watt Hg lamp was mounted in the competitor's conventional lamp housing. Both lamps were focused through the same monochromator then imaged onto a capillary flow cell "sample". The flow cell emission was then imaged onto a line scan camera, with each pixel representing 1 mm of sample length.

As the attached graphs indicate the smaller OBB lamp housing produced 5.5 times more emission signal with the less expensive 100 watt lamp than the larger, conventional lamp housing produced with the more expensive 350 watt lamp; approximately a 20 fold improvement.

Test and data courtesy of
 Dr. Heinrich Roder, Fox Chase Cancer Institute, Phila. PA.



Air cooled lamp housings have a real problem because they blow oxygen at the UV source, and, like blowing oxygen on a fire, this creates problems. One way to get around this problem with an air cooled lamp housing is to select a lamp that has an envelope that does not emit wavelengths below 250 nm. As such even an air cooled lamp housing will not create an ozone problem since there is no UV output outside the lamp itself. The problem with this solution is that many applications require deeper UV wavelengths.

If you require deep UV output for your application then you necessarily require a lamp that emits deep UV wavelengths. For these applications we recommend a UV enhanced lamp and a suprasil front window for the PowerArc lamp housing to get the most UV output you can. Even in this configuration, the sealed PowerArc lamp housing is still considered to be an ozone free lamp housing.

Since oxygen is the principle absorber of light in the 150 to 200 nm range, some applications, such as CD spectroscopy, require nitrogen purging to access the lowest UV wavelengths emitted from UV enhanced xenon lamps (down to about 180 nm). For output in the 180 to 200 nm range you will need to nitrogen purge your optical environment, and also to use no front face window on the lamp housing. The housing is now no longer air tight, but the nitrogen purging negates the concern for ozone creation.

The unique PowerArc design allows you to choose whatever lamp, reflector and front face window is best for your particular optical needs. And the Ozone free design means that your choice is always safe and requires no venting or chimney to deal with.

Lamp



You have a choice of lamps depending on the spectral output that you require. Of course you may order different types of lamps for the housing, they are interchangeable.

There are two types of arc lamps available—xenon and mercury. The xenon gas used in the lamp provides continuous spectra from 180 nm to 2,500 nm of course at varying intensity (refer to spectral output graph). The mercury provides a line spectra (refer to spectral graph). The spectral curves for xenon and mercury are normalized (relative intensities) therefore it is not obvious that the mercury lamps, intensity—where it emits, exceeds that of the xenon lamp. Because of the smaller arc size, the mercury lamp can also provide greater intensity in a smaller area (greater brightness) than the xenon lamp.

We also have an optional tungsten-halogen filament lamp for NIR applications.

Arc lamps come with a quartz or suprasil envelope depending on the application. Quartz lamps do not transmit the deep UV below 240 nm. Suprasil lamps do transmit the deepest UV output from the arc down to about 180 nm. For either type of lamp envelope our unique lamp housing design does not create ozone and therefore requires no ozone venting.

Arc Lamp Specifications

Lamp Wattage	Lamp Type	Nominal Arc Gap
75 watt	Compact Arc Xenon	0.8 mm
100 watt	Tungsten Halogen Filament	4 x 2 mm
100 watt	Mercury	0.25 mm
75 watt	Suprasil Compact Arc Xenon	1.3 mm
150 watt	Compact Arc Xenon Ozone free	2.1 mm
150 watt	Compact Arc Xenon	2.1 mm

The 75 watt xenon lamp and 100 watt tungsten-halogen lamps require no cooling whatsoever. The larger wattages of lamps require water cooling.

You can either get your water directly from the cold-water tap (can be a problem if the water is hard or when water is not available) or from an inexpensive circulating water bath option that we provide.

We have selected water-cooling over air: because it allows us to make a more compact housing; seal in the ozone and eliminates the need for venting.

Reflector

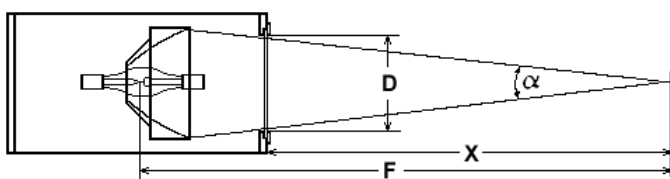
Our ellipsoidal reflectors are proprietary in design and the coating used. They are NOT electro-formed reflectors, which can distort with heat, and can degrade within months. Our proprietary design ensures that distortion of the critical ellipsoid can not occur as the lamp reaches its operating temperature. This ensures thermal stability of focus. The coating ensures reasonably long operating life—typically 3-5 years.

With an PowerArc™ lamp housing you have a choice of three different ellipsoidal reflectors depending on your requirements. The proprietary reflectors HORIBA uses allows for the great 70% collection efficiency. In addition to collection of light the reflectors are used as focusing elements. Hence the selection of a reflector determines the focal length. The different focal lengths correspond to the different “focal cones” of light coming from your lamp housing. This “focal cone” is variously referred to as f/#, Numerical Aperture, and/or acceptance, convergence, or divergence angle.

The f/# is important when considering matching a light source to some other component, for example: fiber optics, liquid light guides or monochromators. However the f/# does not affect the light collection as it does in a simple lens design. The shape and size of the ellipsoidal reflector determines how much light is collected from the lamp arc, and the amount of delivered light is the same for all of HORIBA's reflectors. Selection of your reflector f/# is primarily based on matching the focal cone of the converging beam with any secondary optical elements you will be using. However the f/# also determines the focal distance and the focal spot size with lower f/#'s having shorter focal lengths and smaller spot sizes.

The spot size at the focus is directly related to the original arc gap size of the lamp and the focal length of the reflector. The larger the arc, or the longer the focal length, the larger the spot size at the focus. Hence if you want to have the maximum power in the smallest spot select the fastest focal length (f/1) and the smallest arc size lamp (100 W Mercury). This is another unique benefit of the HORIBA's system; we give you the most power in the smallest spot. No one using an arc lamp can match us in this regardless of their systems size or cost.

Reflector Selection Guide (dimensions are in millimeters)



Arc Lamp Ellipsoidal Reflector Specifications

	f/4.5 reflector	f/2.5 reflector	f/1 reflector
Focal length (F)	379 mm	240.5 mm	112 mm
Focal point from housing (X)	284.35 mm	151.46 mm	22.25 mm
Beam angle (α)	14.5 degrees	28 degrees	45 degrees
Numerical Aperture N.A.	0.12	0.24	0.45

Window

The PowerArc™ is a sealed arc lamp housing. You have a choice of the optical front windows, depending on the spectral output that you require. Please refer to the transmission spectra of the three types of windows available. If you plan to use different types of lamps in your lamp housing, you may want to order different windows or select Suprasil since it will transmit all spectra.

Window	Wavelength
Pyrex	Above 350 nm
Quartz	Above 250 nm
Suprasil	Above 180 nm

Power Supply

The PowerArc™ lamp housing comes with one of two choices for the power supply and igniter.

Dedicated 75 or 100 Watt Arc Lamp Power Supply:

If you are only ever going to use the 75 watt xenon lamp or 100 watt mercury lamp with your PowerArc™ lamp housing, then we offer two dedicated compact power supplies and igniter units that are integrated onto the lamp housing. They are specially designed switch mode power supplies offering outstanding stability with a simple push button, electronically safe, ignition. In fact, although they are not DC regulated power supplies, HORIBA carefully designed them to offer virtually identical stability specifications to our linear power supply. When used with the PowerArc™ lamp housing this illuminator offers a very small form at a very affordable price.



Universal 75 to 150 Watt Arc Lamp Power Supply:

If you need to use a lamp other than 75 or 100 watts, then we offer a universal highly-regulated, constant current, linear, DC power supply. This universal power supply provides very stable power for arc lamps. It can also be used with a 100 watt tungsten-halogen filament lamp for enhanced IR output. Designed for use with various lamp housings, it may be used with lamp housings from other manufacturers. When used with an arc lamp in HORIBA's PowerArc™ lamp housing, this stand alone power supply is connected to a compact igniter that is integrated onto the lamp housing for electronically safe ignition.

The DC regulated power supply pictured below has a current adjust for different operating wattages and can display operating voltage, wattage or current.



Ignition Safe Arc Lamp Igniter

Ignition noise can disrupt, or even destroy, sensitive equipment in the vicinity of an arc lamp during start-up. This can be quite a concern in a crowded lab environment. HORIBA Engineers introduced an igniter that is integrated onto the lamp housing. This design provides an effective EMI shield which contains the EMI pulse, providing a safer and more convenient environment in which to do your research.

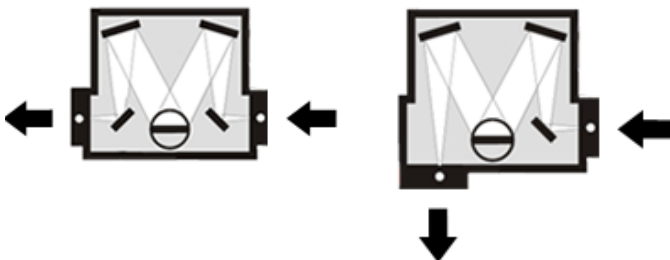
Monochromator Hardware

Optional Ports

This extremely rugged monochromator is built from a single solid metal casting that includes the base plate, optical mounts and all four sides of the unit. Inside the monochromator has extensive baffles to reduce stray light. There is an entrance and exit baffle box at the entrance and exit slits, as well as a center baffle that separates the input side from the exit side of the monochromator.

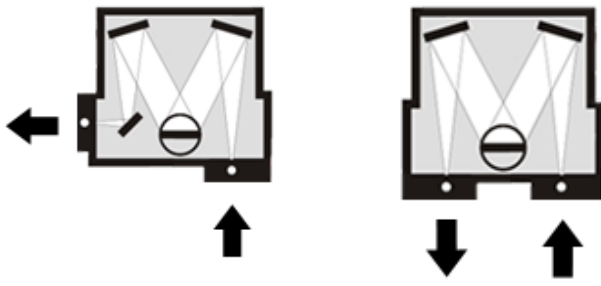
The monochromator has four optional ports that can be utilized for two inputs and two outputs. In the standard configuration it comes with one entrance and one exit port. This gives you a choice of four different input/output geometries:

- 180° Straight Line – with folding mirrors on entrance and exit
- 90° Right Angle – with folding mirror on the exit side
- 90° Left Angle – with folding mirror on the entrance side
- 360° – with no folding mirrors



180° Straight Line

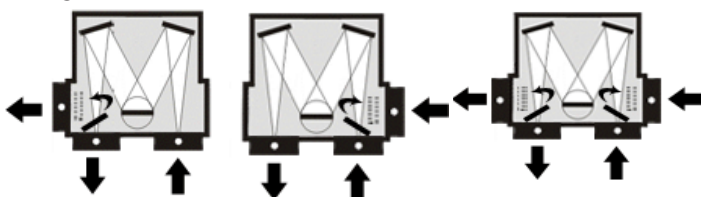
90° Right Angle



90° Left Angle

360°

You can also elect as an option to have two entrance ports or two exit ports. This option adds an appropriate flipping mirror(s) and slit assemblies. The flipping mirror is manually switched to receive light from either entrance port, or to deliver light to either exit port depending on the configuration.



Dual Exit Ports

Dual Entrance Ports

Dual Entrance and Exit Ports

Slits

The monochromator slits are continuously adjustable manual slits with micrometers for adjustment from 0 to 6 mm. The micrometers have a digital readout of the physical slit size selected. The slit housing also has a manually sliding shutter to quickly shut off or open the light path. This manual slider also has a wedge height adjustment to allow you to select a slit height anywhere from 0 to 21 mm.

Wavelength Control

The monochromator wavelength is controlled with a manual dial and readout. The readout is designed to be in true wavelength in nanometers for the 1,200 g/mm grating. For other gratings you have to multiply the dial readout by a factor depending on the actual grating resolution. For example with the 600 g/mm grating you multiply the digital readout by 2 to arrive at the true wavelength position of the monochromator.

Programmable Computer Control

An optional computer control accessory is available. It includes a stepper motor assembly, an MD-2000 USB motor controller interface box and a LabVIEW* driver for computer control of the monochromator wavelength with LabVIEW software from National Instruments.

A very simple software package is also provided by HORIBA to remotely select the wavelength and control the shutter. Requires Windows 2000 or Windows XP operating system.

Software Screen Shots



*LabVIEW is a trade mark of National Instruments

Tunable PowerArc™ Illuminator Hardware

Coupled together with a rigid adapter tube, the Tunable PowerArc™ Illuminator is a single portable self aligned light source. Below is the schematic for the complete illuminator.

