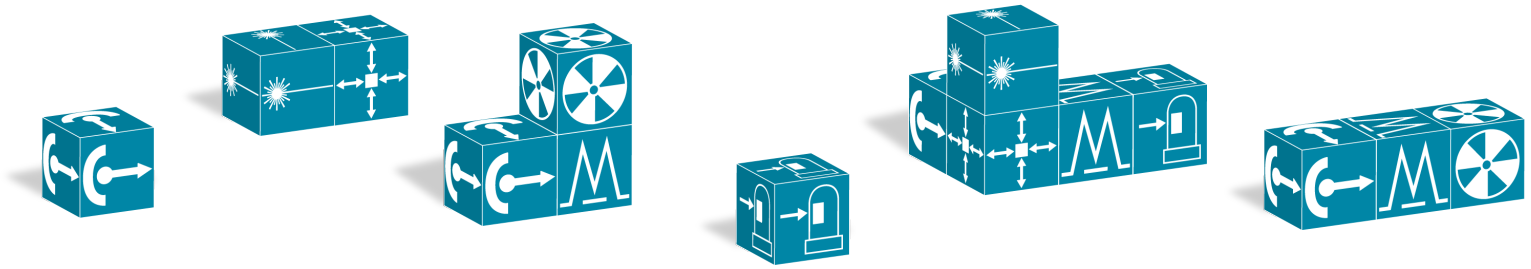
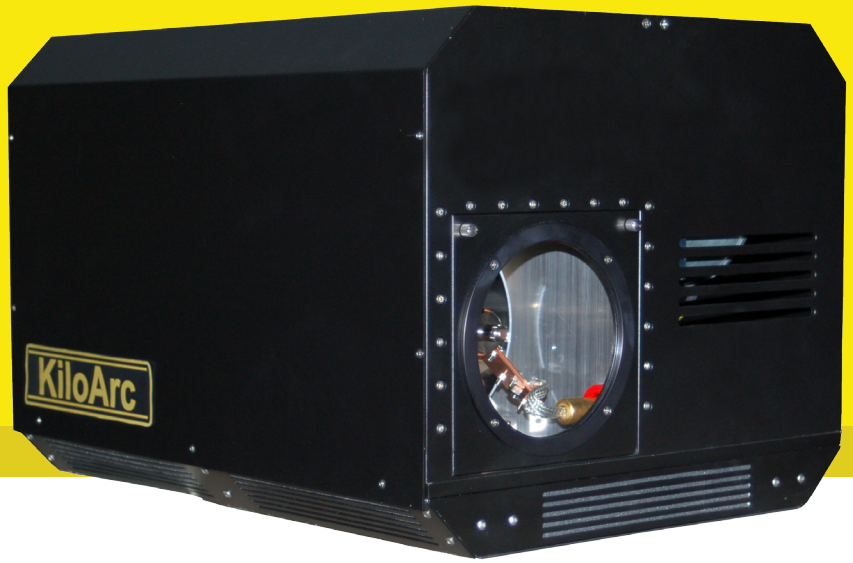


KiloArc™

Broadband High Intensity Light Source



OPTICAL BUILDING BLOCKS CORPORATION

KiloArc™

General Information

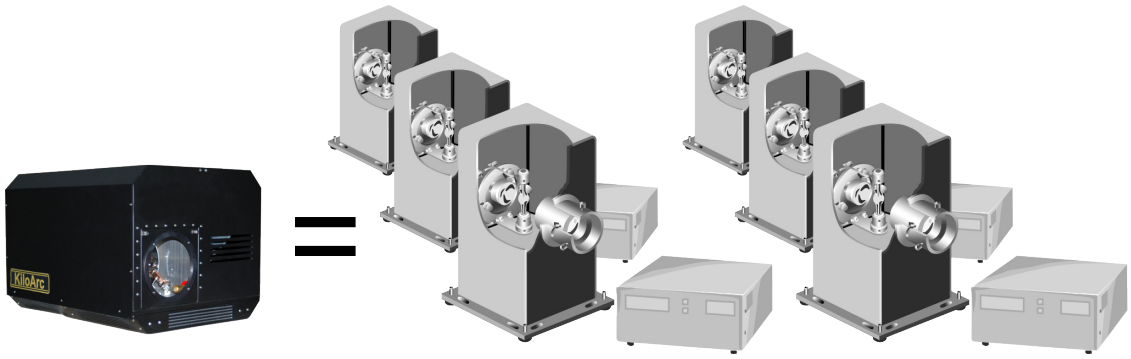
If you need a broadband light source in the UV/Vis/NIR portion of the spectrum, an arc lamp has no peer. And if you are looking for the most intense broadband light source you can get, then the KiloArc™ has no peer. The intensity of an arc lamp is extremely high and, depending on the lamp, reasonably continuous throughout the region from 240 to 1,200 nanometers. Usable intensities are even available in the deep UV down to 180 nm and in the near infrared out to 2,500 nm.

While arc lamps themselves are very similar from manufacturer to manufacturer, the arc lamp housings and power supplies that operate these lamps are very different from manufacturer to manufacturer. As such the arc lamp housing can have a dramatic affect on how an arc lamp illuminator performs. We believe that our long experience in light source design is what allows us to give you a unique light source that truly is a better illuminator.

Key Benefits of the OBB KiloArc™ Illuminator

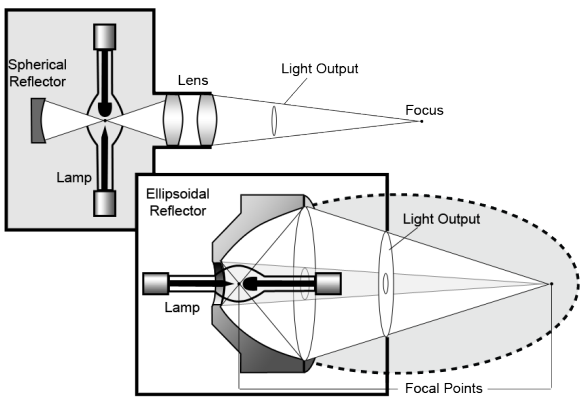
- Delivers over 100 watts of optical power to an 8 mm spot.
- Compact Integrated design includes everything, housing, power supply, igniter.
- No tools required to change lamps.
- Delivers the brilliance of 1,000 suns.
- Ozone free operation, venting is not a necessity, but an option.
- Economical, the most watts for your dollar.

You would have to buy 6 old style vertical lamp housings to deliver the same number of photons that a KiloArc™ delivers to a single point!



OBB Arc Lamp Housing Design; A Better Approach

Users of old style vertical arc lamp housings are throwing away as much as 90% of the lamps output, due to poor collection efficiency. These old style vertical lamp housings have a collection lens in front of the arc lamp and sometimes, but not always, a back reflector behind them. The problem with this old design is that only the light that actually strikes these optical elements is delivered outside of the lamp housing. All other photons emitted by the lamp are wasted, simply heating the inside of the lamp housing. Conversely the unique OBB KiloArc™ lamp housing has an enveloping ellipsoidal reflector that collects virtually all of the light emitted by the lamp arc, delivering those photons to a secondary focal point outside of the lamp housing, and it does so without any lenses.



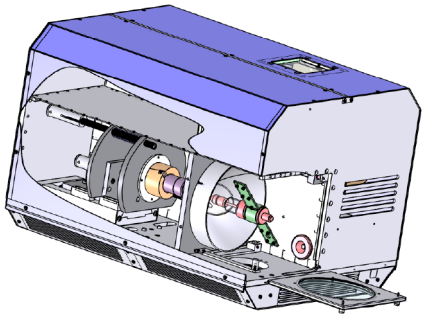
For an equivalent wattage of bulb, the OBB KiloArc™ delivers 5 to 6 times more light emitted by the same bulb, to the secondary focus which is outside the lamp housing! Our design just simply collects a larger solid angle of light than does the old style. That means that an OBB KiloArc™ lamp housing with a 1,000 watt xenon lamp provides the equivalent optical power of a 6,000 watt xenon lamp in an old style vertical lamp housing. And it does so with much greater power density due to a smaller focal spot, and at a small fraction of the cost.

Lamp Housing

At the heart of every OBB KiloArc™ 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 from a conventional system.

The arc source is located at one focus points of the ellipse, and the radiation is reflected by the ellipse to the secondary focus which is actually outside of the KiloArc™. 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 an OBB Lamp housing can deliver up to 11 times more optical power into a given smaller area than a conventional lamp housing.

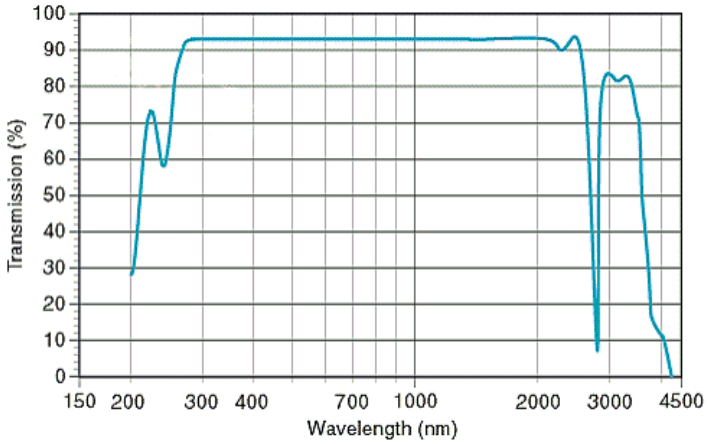
Our ellipsoidal reflectors are proprietary in design and the coating used. They are NOT electro-formed reflectors, which can distort with heat, and can degrade within months. Our proprietary design ensures that distortion of the critical ellipsoid cannot occur as the lamp reaches its operating temperature. This ensures thermal stability of focus. The coating ensures reasonably long operating life, typically 2–3 years.



The KiloArc™ ellipsoidal reflector is an f/4 reflector. The f/# is important when considering matching the KiloArc™ source to some other components like, fiber optics, liquid light guides or monochromators. However f/# for an ellipsoidal reflector is not an indicator of light collection as it is in a simple lens design. The shape and size of the ellipsoidal reflector determines how much light is collected from the lamp arc. The f/# only determines the focal cone angle.

The KiloArc™ is air cooled. However since the system uses ozone free lamps, there is no ozone or venting requirements, although there is an exhaust hose adapter if you want to vent the warm air out of a lab.

The OBB KiloArc™ is a sealed arc lamp housing with a quartz window through which the focused light is delivered. Below is the spectral transmission curve for the quartz window.



Quartz Spectral Transmission Curve

Lamp

You have a choice of two lamps depending on the spectral output that you require; xenon or mercury-xenon. The lamps are provided as a complete pre-aligned assembly which includes a cooling fin and a quick release self aligning connector. Of course you may order both types of lamps as they are interchangeable.

The xenon gas used in the lamp provides continuous spectra from 180 nm to 2,500 nm at varying intensities. The mercury-xenon provides more of a line spectra. The spectral curves for xenon and mercury-xenon are normalized (relative intensities) therefore, although you cannot tell from the curves, the mercury-xenon lamp actually has greater intensities than the xenon lamp at it's various peaks. Refer to specifications web page for detailed spectral characteristics of these two lamps.

The KiloArc™ uses ozone free quartz lamps which cut off the deep UV below 240 nm.

Typical lamp lifetime is 1,500 hrs. The lamp lifetime is highly dependent on operating conditions. Lamps should not be operated above their rated wattage (1,000 W).

Power Supply

The KiloArc™ illuminator has a dedicated 1,000 watt power supply and igniter built into it. The power supply is a high efficiency switch-mode type supply. It is rated at 1,200 watts to ensure that it is not operated at the limit of its range. This provides better stability and longer lifetime when operated at 1,000 W. The KiloArc™ has triple shielding and electronic filtering to ensure that there is no RF transmitted or radiated out of the illuminator to interfere with sensitive equipment, like computers.

Igniter

The internal igniter provides a 45 KV pulse for reliable lamp ignition. 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. OBB Engineers carefully designed and tested the KiloArc's triple shielding housing and electronic filtering to ensure that there is no RF transmitted or radiated out of the illuminator

KiloArc™ Power Supply and Igniter Specifications

Input	210–240 V AC 50/60 Hz
Starting	45 kV starting pulse
Power Rating	800–1200 watts (adjustable) — recommended 800–1000 watts
Output Volts Compliance	17–23 VDC
Output Current Limit	70 A rms

Smart Features

There are two LED indicators on the back, one called the "STATUS" which shows the modes of operation: cool down, stand by, or error. The other is an ERROR indication. It senses problems and displays error codes when they occur.

Particular considerations were paid to safety. The lamp chamber and power supply are constantly monitored for heat, as well as the airflow for cooling. If there are problems the lamp will shut down automatically and you will receive an appropriate error message. If the access door to the lamp is loose or open the lamp will turn off, or not ignite..

We tried to make the operation as fool proof, safe and reliable as possible, making the KiloArc™ ideal for commercial applications.

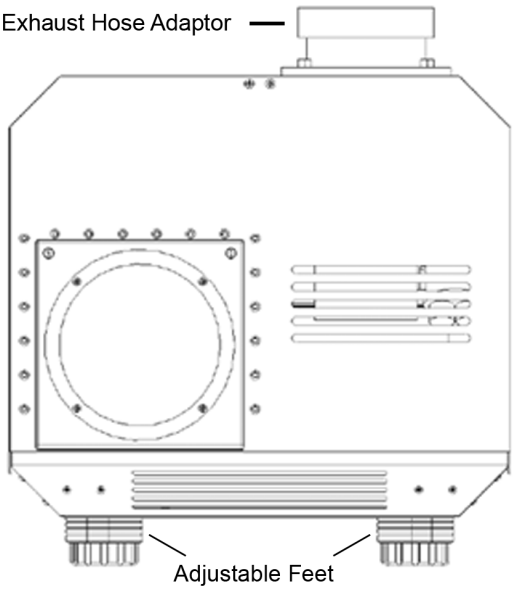
Options

Set of Feet

The KiloArc™ comes without feet on a level plate. In case you want to operate it on a surface that requires leveling, we can provide you with a set of four adjustable feet.

4-Inch Exhaust Hose Adaptor

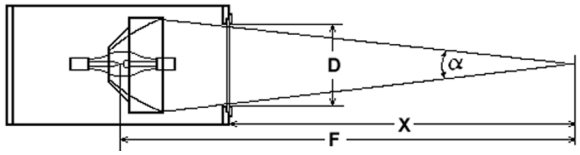
The KiloArc™ does not generate harmful levels of ozone (less than a typical copier). It does generate some heat. Therefore venting is not a requirement, but if you do desire to vent the exhaust from the KiloArc™, select this option.



Specifications

Optical Performance Specifications

Optical Power	100 watts broadband
Spot Size	8 mm FWHM
Diameter (D)	112 mm (4.4 inches)
Focal point from housing (X)	112 mm (4.4 inches)
Beam angle (full)	14.4 degrees
Numerical Aperture (N.A.)	0.12
Optical Noise	0.07% RMS
Optical Stability	0.2%



Other Specifications

Input	210–240 V AC 50/60 Hz
Starting	45 kV starting pulse
Power Rating	800–1200 watts (adjustable) — recommended 800–1000 watts
Lamp Module Type	1000 W Xenon, 1000 W Mercury/Xenon (proprietary to OBB)
Lamp Life	Typically 1,500 hrs
Focusing Optics	High efficiency f/4 ellipsoid reflector
Power Precision	0.04% (0.4 watts)
Output Volts Compliance	17–23 VDC
Output Current Limit	70 A rms
Height	329 mm (12.9inches)
Width	375 mm (14.8 inches)
Length	489 mm (19.3 inches)
Weight	31 kg (68 pounds)
Window Diameter (D)	127 mm (5.0 inches)
Center Beam Line Height (without feet)	128 mm (5.0 inches)

OBB has a policy of continuous product development and reserves the right to amend part numbers, descriptions and specifications without prior notice.

Example

How much light does the KiloArc™ provide with a 1,000 watt xenon lamp in a 5 nm bandwidth at 400 nm?

The answer is an astounding 500 mW!

Here is how we get that answer as well as a cautionary note about this number.

Calculation:
The total optical power collected out from the 1,000 watt xenon lamp is 100 watts broadband (100,000 mW). The OBB xenon lamp uses approximately 5% of the total lamp output at 400 nm in a 50 nm wide band (refer to OBB's web site for a chart of the integrated lamp output in different wavelength ranges). Therefore in a 5 nm bandwidth at 400 nm there will be approximately 0.5% (1/10th of 50 nm) of the total lamp output. This corresponds to 500 mW.

Caution about available energy:
Remember that not all of this light may be available to you for your application. In the first place the KiloArc™ is so powerful that we would recommend using an IR heat filter to prevent damage to secondary optical elements. Although this primarily cuts out the IR there will be some loss at other wavelengths through the water jacketed, water filled, IR filter.

Filter for wavelength selection:
If you wanted to use a 5 nm bandpass filter for wavelength selection, then there will also be losses through the filter combinations you would use to filter out the unwanted wavelengths without photo-damaging your filters, as well as coupling losses for any optics you incorporate. Therefore you will end up with less than 500 mW, but you will still have a severely intense beam of light.

Monochromator for wavelength selection:
If you are going to use a monochromator to filter and select the 5 nm output at 400 nm, then there are a number of factors to consider before determining exactly how much light will be available through the monochromator. Specifically the slit size required for a 5 nm bandpass, the grating efficiency curve for the grating used, the f/# matching of the monochromator, and the throughput loss of the monochromator coupling. OBB happens to provide a tunable KiloArc™ illuminator that consists of the KiloArc™ lamp housing coupled to a 200 mm focal length monochromator. When using the 1,000 watt xenon lamp a considerable amount of light in the original 8 mm focused spot doesn't even get through the narrow 1.25 mm slits required to obtain a 5 nm bandpass with a standard 1,200 l/mm grating. Firstly we have to remember that the 8 mm spot is actually the FWHM of the total light focused. This means that approximately half of the total power is outside an 8 mm diameter. So, less than 5% of the total focused light gets into the monochromators narrow 1.25 mm slit in the first place. Additionally, depending on the grating used, its wavelength angle, its efficiency curve as well as the coupling loses of the monochromator you will have a total throughput for the monochromator of roughly 30%. This results in about 10 mw of energy delivered through the monochromator at 400 nm in a 5 nm bandpass. This number is in good agreement with our empirical results for the Tunable KiloArc™. Refer to the Tunable KiloArc™ brochure for the corresponding output curve. Also remember that other monochromators, and certainly different gratings will have affects that will have an impact of the total throughput.

Applications

Applications for 1,000 watt arc lamp housings cover a broad range of scientific, OEM and research applications. Arc lamp systems are the light sources of choice for a variety of spectroscopy systems. Such as:

- Fluorometers,
- UV /Vis Spectrometers
- CD Spectrometers
- Stopped-Flow Spectrometers
- Tunable Illuminators

Arc lamp systems are also used for a broad a range of applications almost as diverse as the wavelength range across which they emit.

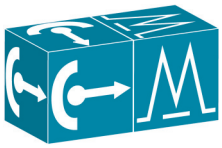
- Dermatology
- Optical Teaching Labs
- Photo-Activation
- Photobiology
- Photochemistry
- Photovoltaics
- Pump Probe
- Solar Simulators
- Spectroscopy

Compatible Optical Building Blocks

The PowerArc™ illuminator is one of many interconnectable optical components. Hence the name of our company, Optical Building Blocks Corporation. These Optical Building Blocks can be ordered together to form a complete subassembly or they can be subsequently added to an existing OBB component. In fact there are enough OBB components to choose from to build your own complete optical system for various spectroscopy requirements.

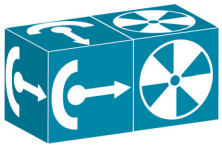
Monochromators

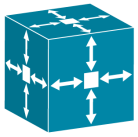
OBB has an excellent 200 mm focal length monochromator. If you would like to couple the KiloArc™ illuminator to our monochromator, then we have a light shield adapter tube to physically connect them and create a tunable illuminator. Inside the light shield is held an IR filter to remove the heat component of the beam. Refer to our Monochromator brochure learn more about our monochromators. Incidentally, if you are looking for such a tunable KiloArc™ illuminator we have a separate brochure describing them.



Optical Choppers

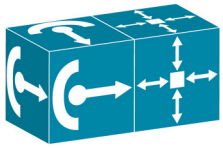
If you would like to convert the continuous illumination of the KiloArc™ into a pulsed light source then we have an optical chopper that can do the job. It can be used on a stand alone basis.





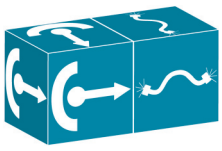
Sample Compartment

If you would like to couple your KiloArc™ lamp housing into a sample compartment, then we have an ideal solution. The OBB QuadraCentric sample compartment is an excellent unit that has various sample handling capabilities. There is also a light shield adapter tube that directly couples the KiloArc™ lamp housing to the sample compartment with matching optics to focus light into the sample. Inside the light shield is held an IR filter to remove the heat component of the beam. You can then have up to three other input or output optical channels to or from the central sample holder. So you could create a right angle fluorometer or scatter system or a straight through absorbance spectrometer with the appropriate detection components. For each optical channel in the sample compartment there is also a filter holder for wavelength selection.



Liquid Light Guides

Liquid light guides have become the flexible light guide of choice for non laser based light handling. OBB Corporation has a selection of liquid light guides to choose from. If you would like to use a liquid light guide with your KiloArc™ lamp housing then we have an adapter tube that will connect the lamp housing to the light guide. Inside the light shield adapter tube is held an IR filter to remove the heat component of the beam to protect the light guide from photo-damage.



Other Accessories

Collimating Lenses

If you need a collimated optical beam, then a collimating lens can be employed for the diverging beam after the light focal point. Be sure to match the collimating lens for your beam diameter requirements and for the f/# of the OBB light source you are considering. OBB offers a number of collimating lenses to choose from. Also if you need a uniform collimated beam of light be sure to consider an optical diffuser.

OEM

One of Optical Building Block Corporation's major markets is for O.E.M applications. Whether its supplying standard off the shelf products, modified products or completely custom designed new products, OBB Corp. has the development team of engineers and scientists to meet your specific needs. Subsequent to the development OBB Corp has the manufacturing capability to produce the product efficiently, reliably and economically in any quantity that you may need.

Our technical expertise resides in developing:

- Specialized light sources
- Monochromators
- Spectrographs
- Microscope accessories
- Low light or fast detection from UV to NIR
- Specific luminescence, fluorescence, phosphorescence systems for use with reagents
- Polarimeters
- Software related to instrumentation control and analysis

In general we specialize in equipment related to the application and uses of light.

OBB has a policy of continuous product development and reserves the right to amend part numbers, descriptions and specifications without prior notice.

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