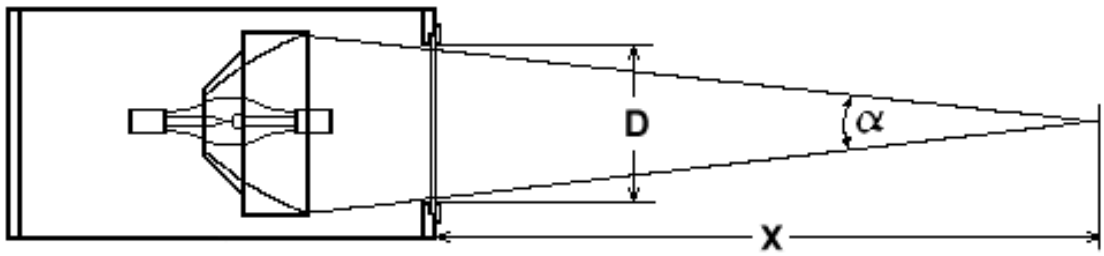
HORIBA Scientific

KiloArc™ Arc Lamp Illuminator Optical Performance Specifications



Optical Power	100 watts broadband
Spot Size	8 mm FWHM
Diameter (D) at exit opening	112 mm (4.4 inches)
Focal point from housing (X)	443.87 mm (17.475 inches)
Beam angle (full)	14.4 degrees
Numerical Aperture (N.A.)	0.12
Short Term Optical Noise*	from 0.15% to 0.2% RMS
Optical Stability	2%

*1,000 points/s, 1 s duration, 1.5 KHz detector bandwidth

KiloArc™ Arc Lamp Illuminator Other Specifications

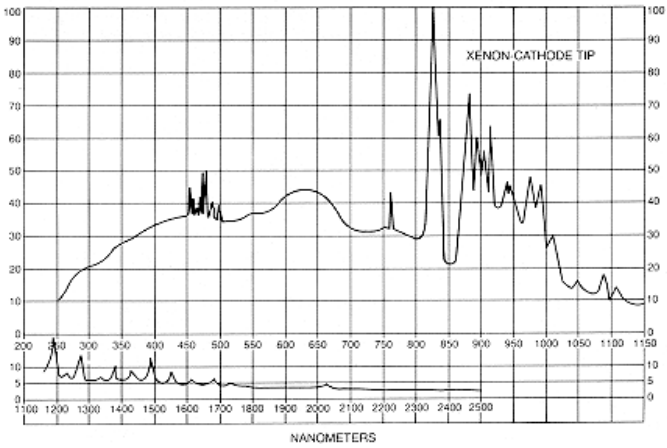
Input	210–240 V AC 50/60 Hz
Starting	45 kV starting pulse
Power Rating	800–1200 watts (adjustable) — recommended 800–1000 watts
Lamp Module Type	1000 W Xenon, 1000 W Mercury/Xenon (proprietary to HORIBA)
Lamp Life	Typically 1,500 hrs
Focusing Optics	High efficiency f/4 ellipsoid reflector
Power Precision	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)

Determining KiloArc™ Arc Lamp Illuminator Energy Output for a Given Wavelength

To determine how much light the KiloArc™ delivers in a specific wavelength region for a given lamp refer to the following spectral output curves for the xenon and mercury-xenon arc lamps. These curves provide an estimation of the percentage of the total optical output power for a given wavelength range of the emitted light from the lamp.

Arc Lamp Spectrum Band Pass Intensity Charts

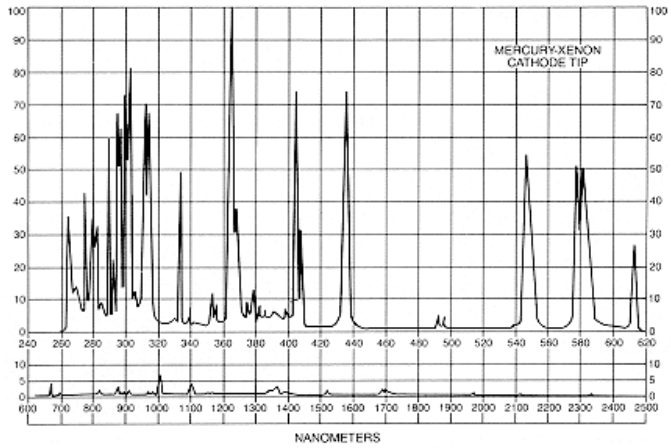
Xenon Arc Lamp Spectrum



Xenon Arc Lamp Intensity Chart

Wavelength	% output	Wavelength	% output	Wavelength	% output	Wavelength	% output
250-300	2.489	750-800	4.682	1250-1300	0.896	1750-1800	0.345
300-350	3.540	800-850	8.914	1300-1350	0.705	1800-1850	0.306
350-400	4.577	850-900	6.284	1350-1400	0.931	1850-1900	0.306
400-450	5.245	900-950	6.788	1400-1450	0.919	1900-1950	0.306
450-500	5.626	950-1000	5.848	1450-1500	1.118	1950-2000	0.268
500-550	5.214	1000-1050	2.871	1500-1550	0.701	2000-2050	0.345
550-600	5.729	1050-1100	1.953	1550-1600	0.513	2050-2100	0.230
600-650	6.472	1100-1150	1.402	1600-1650	0.515	2100-2150	0.230
650-700	5.649	1150-1200	1.593	1650-1700	0.552	2150-2200	0.230
700-750	4.862	1200-1250	0.846	1700-1750	0.428	TOTAL	100.000

Mercury/Xenon ArcLamp Spectrum



Mercury/Xenon Arc Lamp Intensity Chart

Wavelength	% output	Wavelength	% output	Wavelength	% output	Wavelength	% output
260-270	2.205	380-390	0.538	500-510	0.199	800-900	3.186
270-280	2.678	390-400	0.488	510-520	0.199	900-1000	2.947
280-290	2.877	400-410	2.862	520-530	0.199	1000-1100	3.942
290-300	4.231	410-420	0.304	530-540	0.249	1100-1200	3.544
300-310	3.883	420-430	0.319	540-550	3.325	1200-1300	2.190
310-320	5.730	430-440	5.207	550-560	1.563	1300-1400	4.580
320-330	0.538	440-450	0.498	560-570	0.249	1400-1500	2.091
330-340	1.572	450-460	0.199	570-580	3.463	1500-1600	2.449
340-350	0.448	460-470	0.199	580-590	4.908	1600-1700	2.051
350-360	0.886	470-480	0.199	590-600	0.521	1700-1800	2.190
360-370	8.403	480-490	0.229	600-700	3.467	1800-1900	1.990
370-380	1.473	490-500	0.483	700-800	2.041	1900-2000	1.990

Example

How much light does the KiloArc™ arc lamp illuminator deliver with a 1,000 watt xenon arc 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 power of the 1,000 watt xenon lamp is 100 watts broadband (100,000 mW). Referring to the Band Pass Intensity Chart, and graph, for the xenon lamp indicates that at 400 nm there is approximately 5% of the total lamp output in a 50 nm wide band. 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. HORIBA 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™ web page 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.