professional grade horticulture lamps

•Commercial horticulture for year-round production of plants and vegetables.
•Research plant growth for Biotechnology and Pharmaceutical purposes.

Hi-LUX GRO™ by USHIO ✷ made in Germany

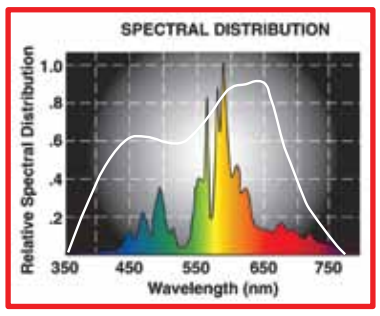
Opti-Red

Super HPS - AHS 1000 - Opti-Red - #5001671

Wattage: 1000	Burn Position: Any	Base: E39	Ignition Voltage: 4KV - 5KV
Initial Lumens: 146,000	Bulb Type: T23	Lamp Voltage: 200v - 280v	Warm-up Time: 7 minutes
Color Temp: 2,100k	MOL (mm): 390	Operating Current: 4.7a	Reignition Time: 2 minutes
Life: 24,000 hours	DIA (mm): 65	MAX Starting Current: 7.0a	Ballast: HPS S52

Super HPS - AHS 600 - Opti-Red - #5001670

Wattage: 600	Burn Position: Any	Base: E39	Ignition Voltage: 4KV - 5KV
Initial Lumens: 97,000	Bulb Type: T15	Lamp Voltage: 95v - 125v	Warm-up Time: 5 minutes
Color Temp: 2,100k	MOL (mm): 265	Operating Current: 6.2a	Reignition Time: 2 minutes
Life: 19,000 hours	DIA (mm): 46	MAX Starting Current: 8.1a	Ballast: HPS S106



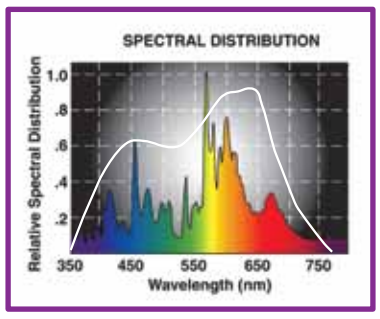
Super HPS - AHS 400 - Opti-Red - #5001669

Wattage: 400	Burn Position: Any	Base: E39	Ignition Voltage: 4KV - 5KV
Initial Lumens: 56,000	Bulb Type: T15	Lamp Voltage: 90v - 120v	Warm-up Time: 4 minutes
Color Temp: 2,100k	MOL (mm): 271	Operating Current: 4.45a	Reignition Time: 2 minutes
Life: 24,000 hours	DIA (mm): 46	MAX Starting Current: 6.0a	Ballast: HPS S51

Dual Core

HPS / MH - AMX-1000 - Dual Core - #5002114

Wattage: 1000	Burn Position: Horizontal 45	Base: E39	Ignition Voltage: 4KV - 5KV
Initial Lumens: 117,000	Bulb Type: T21	Lamp Voltage: 210v - 275v	Warm-up Time: 3 minutes
Color Temp: 2,800k	MOL (mm): 385	Operating Current: 4.7a	Reignition Time: 10 minutes
Life: 9,000 hours	DIA (mm): 66	MAX Starting Current: 8.0a	Ballast: HPS S52



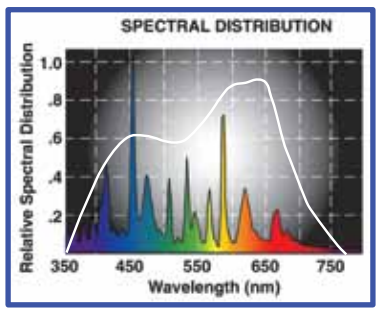
Opti-Blue

Super MH / Conversion - AMH-1000 - Opti-Blue - #5001673

Wattage: 1000	Burn Position: Any	Base: E39	Ignition Voltage: 4KV - 5KV
Initial Lumens: 109,000	Bulb Type: T25	Lamp Voltage: 230v - 280v	Warm-up Time: 3 minutes
Color Temp: 7,000k	MOL (mm): 284	Operating Current: 4.2a	Reignition Time: 10 minutes
Life: 12,000 hours	DIA (mm): 76	MAX Starting Current: 5.6a	Ballast: HPS S52

Super MH / Conversion - AMH-600 - Opti-Blue - #5001675

Wattage: 600	Burn Position: Any	Base: E39	Ignition Voltage: 4KV - 5KV
Initial Lumens: 55,000	Bulb Type: T25	Lamp Voltage: 90v - 120v	Warm-up Time: 3 minutes
Color Temp: 7,000k	MOL (mm): 284	Operating Current: 6.2a	Reignition Time: 10 minutes
Life: 12,000 hours	DIA (mm): 76	MAX Starting Current: 8.0a	Ballast: HPS S106



Super MH / Conversion - AMH-400 - Opti-Blue - #5001674

Wattage: 400	Burn Position: Any	Base: E39	Ignition Voltage: 4KV - 5KV
Initial Lumens: 39,000	Bulb Type: T15	Lamp Voltage: 80v - 110v	Warm-up Time: 3 minutes
Color Temp: 7,000k	MOL (mm): 248	Operating Current: 4.6a	Reignition Time: 10 minutes
Life: 20,000 hours	DIA (mm): 46	MAX Starting Current: 6.0a	Ballast: HPS S51

WARRANTY

USHIO horticulture lamps are warranted for 1 year when used in conjunction with major brand, UL-Listed ballasts. USHIO horticulture lamps are said to be free from defects in materials and workmanship for the one year period beginning on the date of sale or if unknown, from date of production. If the lamps fail to operate for the warranty period, USHIO America, Inc. will provide a free replacement lamp (no labor allowance).

TERMS AND CONDITIONS

USHIO horticulture lamps must be installed and operated under suitable environmental conditions and in accordance with the latest National Electrical Code, Underwriters Laboratory Bulletins, and ANSI specifications. This warranty will not apply in the event of conditions demonstrating abnormal use or stress, such as operating temperatures in excess of maximum rated temperatures, under/over voltage conditions, excessive switching cycles or operating hours, dirty or cracked sockets, or improper lamp or ballast installation.

REPLACEMENT OF PRODUCT, LIMITS OF LIABILITY

The foregoing shall constitute the sole and exclusive remedy of the purchaser and the sole and exclusive liability of USHIO AMERICA. NO WARRANTY OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE IS MADE OR IS TO BE IMPLIED. USHIO AMERICA will not, under any circumstance, whether as a result of breach of contract or warranty, tort, or otherwise, be liable for any costs or damages, including lost profits or revenues, incidental, special or consequential damages.

USHIO America, Inc. reserves the right to examine all failed lamps and/or ballasts and reserves the right to be the sole judge as to whether any lamps and/or ballasts are defective and covered under this warranty.

USHIO

HPL+ COMPACT FILAMENT LAMPS

HPL+ SERIES
FOR ENTERTAINMENT LIGHTING

For ETC Fixtures: SOURCE FOUR™, SOURCE FOUR JR™, SOURCE FOUR PAR™

USHIO's high performance lamp HPL, has been redesigned to be the most powerful HPL ever. It's ultra-compact filament geometry now improves the optical efficiency of your ETC Source Four™ fixtures to produce up to 20% more fixture lumens. That's up to 20% more light from the same fixture as compared to the old lamp design.

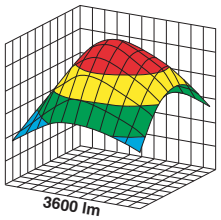
Previously, design of the HPL lamp was limited to larger filament dimensions than USHIO's HPL**+** geometry. Working in close cooperation with ETC's engineers, Ushio has matched the "innovation" of the Source Four™ fixture by making a more compact (6.0mm x 9.5mm) filament profile. This improvement partnered with the optics of the Source Four™, generate ultimate axial and radial light distribution and optical system efficiency.

The Source Four's™ precise optics demand precisely engineered lamps. USHIO has responded to the Source Four's™ need for a reduced geometry filament, and has done so with quality manufacturing standards. Performance you can measure, quality you can count on, variety of lamp types, and innovative design for your theatrical needs.

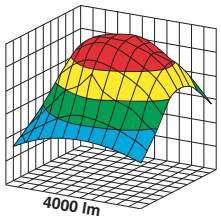
BENEFITS OF HPL+ LAMPS

- High efficiency (28.5 lumens per watt average)
- Increased fixture light output of up to 20%

Old HPL Design

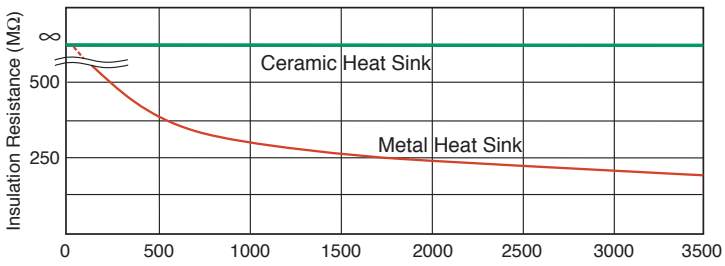


New USHIO HPL+



Illumination distribution measured with: HPL 750 watt

Insulation Resistance for Ceramic & Metal Bases



Condition (DC/1kV) Temperature: 40ºC / Humidity: 90%

FEATURES

- New ceramic heat sink base maintains its resistance to electric conductivity over the life of the lamp
- Unique compact four & six filament design for more efficient light collection
- Standard and Long Life versions provide increased light output
- USHIO has the largest selection of voltages and wattages

Source Four™ PAR EA: rated up to 750W
Source Four™ PAR MCM: rated up to 575W
Source Four™ PAR Nel: rated up to 750W

Source Four™ jr
& Source Four™ jr Zoom
rated up to 575W

Source Four™
& Source Four™ Zoom
rated up to 750W

USHIO

CHARACTERISTICS & SPECIFICATIONS

APPLICATIONS

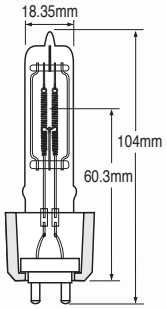
Voltage: 115V, 120V, 230V and 240V

- ETC Source Four™ rated up to 750W
- ETC Source Four™ jr & Source Four™ jr Zoom rated up to 575W
- ETC Source Four™: PAR EA - up to 750W, PAR MCM - up to 575W, PARNel - up to 750W

Low Voltage: 77V

- ETC Source Four™ fixture family using ETC Dimmer Doubling

"Licensed under U.S. Patent #RE36316 claims 9-12 and 16-17 only; Canadian Patent #2,103,358; European Patent #592589 & #969496. No other licenses expressed or implied."



Watts (W)	Ushio Ordering Code	Ushio Lamp Description	Description	Filament Type	Color Temp (K)	Initial Lumens (lm)	Average Life (h)
	77 Volt for Dimmer Doubling						
550	1000668	HPL-550/77V+	JS77V-550WC	4-C8	3250	16170	300
550	1000669	HPL-550/77X+	JS77V-550WX	4-C8	3050	12160	2000
750	1000676	HPL-750/77V	JS77V-750WC	4-C8	3250	22950	300
	115 Volt						
375	1000666	HPL-375/115V+	JS115V-375WC	4-C8	3250	10540	300
375	1000667	HPL-375/115X+	JS115V-375WX	4-C8	3050	8000	1000
575	1000670	HPL-575/115V+	JS115V-575WC	4-C8	3250	16520	300
575	1000671	HPL-575/115X+	JS115V-575WX	4-C8	3050	12360	2000
750	1000675	HPL-750/115V+	JS115V-750WC	4-C8	3250	21900	300
750	1003153	HPL-750/115X+	JS115V-750WX	4-C8	3050	16400	1500
	120 Volt						
575	1000672	HPL-575/120V+	JS120V-575WC	4-C8	3250	16520	300
575	1002283	HPL-575/120X+	JS120V-575WX	4-C8	3050	12360	2000
750	1003144	HPL-750/120V+	JS120V-750WC	4-C8	3250	21900	300
750	1003178	HPL-750/120X+	JS120V-750WX	4-C8	3050	16400	1500
	230 Volt						
375	1003182	HPL-375/230X+	JS230V-375WXN	6-C8	3000	7250	1000
575	1000673	HPL-575/230V+	JS230V-575WCN	6-C8	3200	14900	400
575	1002233	HPL-575/230X+	JS230V-575WXN	6-C8	3050	11780	1500
750	1002289	HPL-750/230V+	JS230V-750WCN	6-C8	3200	19750	300
750	1003179	HPL-750/230X+	JS230V-750WXN	6-C8	3050	15600	1500
	240 Volt						
375	1003183	HPL-375/240X+	JS240V-375WXN	6-C8	3000	7250	1000
575	1000674	HPL-575/240V+	JS240V-575WCN	6-C8	3200	14900	400
575	1002234	HPL-575/240X+	JS240V-575WXN	6-C8	3050	11780	1500
750	1003184	HPL-750/240V+	JS240V-750WCN	6-C8	3200	19750	300
750	1003180	HPL-750/240X+	JS240V-750WXN	6-C8	3050	15600	1500

Scan with a smartphone to view this product online.

Form No. S-HPL+/R-0411: The specification on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

HALOGEN LAMPS

JCS 120V-575W

TUNGSTEN HALOGEN LAMPS FOR ENTERTAINMENT LIGHTING

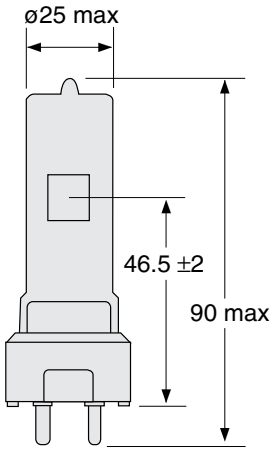
New 575 watt lamps from USHIO are designed as a medium wattage alternative to the FKW 300W and FRK 650W lamps used in theatrical fresnels. These medium wattage lamps allow for two instruments to be used on a 1200 watt capacity dimming channel while maximizing the light output. The Halogen capsule utilizes a bi-plane filament design, and incorporates a special gas mixture to prevent overheating and lamp darkening in smaller and hotter instrument designs.

Available in two versions: 300 hour life— 15,500 lumens
Long life 1500 hour— 12,000 lumens

FEATURES & BENEFITS

- Excellent color consistency from lamp to lamp
- High color stability over the entire lifetime
- 26 lumens per watt
- Permits 2 fixtures per circuit
- Bi-plane filament
- GY9.5 Base

Acclaim Fresnel
Selecon Performance Lighting



All dimensions are in millimeters

Watts (W)	USHIO Ordering Code	USHIO Lamp Code	Voltage (V)	Color Temp (K)	Approx Lumens (lm)	Filament Type	Average Life (h)
575	1003326	JCS120V-575WC	120	3200	15500	8-C-13D	300
575	1003327	JCS120V-575WX	120	3000	12000	8-C-13D	1500

Distributed by:

Form No. S-JCS575/R-0806
The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

HALOGEN LAMP

JDW - SAFETY QUARTZ LAMPS
DOUBLE JACKETED PROTECTION

SAFETY QUARTZ HALOGEN – FOR GENERAL LIGHTING

The Safety Quartz lamp structure consists of a low pressure, inner quartz bulb and a thick outer hard glass jacket. The outer jacket design realizes higher safety considerations to self contain any quartz in case of a lamp burst. Additional benefits of the outer hard glass shell is the reduction of harmful UV light and the ability to perform lamp installations with bare hands. The overall design allows for smaller open-fixture designs with easier lamp replacement and maintenance. The Halogen Safety Quartz lamp has a proprietary (EU11) base to be used with its matching socket. For safety considerations, the EU11 socket design will not accept standard mini-can (E-11) based halogen lamps.

FEATURES

- Safety Hard Glass outer jacket
- Low Halogen fill pressure
- UV Reduction
- Small size for compact fixtures
- Special (EU11) Base and Socket
- White Halogen light

BENEFITS

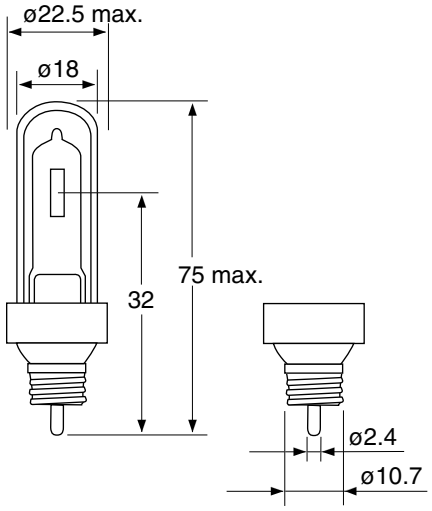
- High efficiency (28.5 lumens per watt average)
- Increased fixture light output of up to 20%
- Easier lamp replacement and maintenance
- A safer Halogen lamp design— integrated burst protection

Distributed by:

USHIO

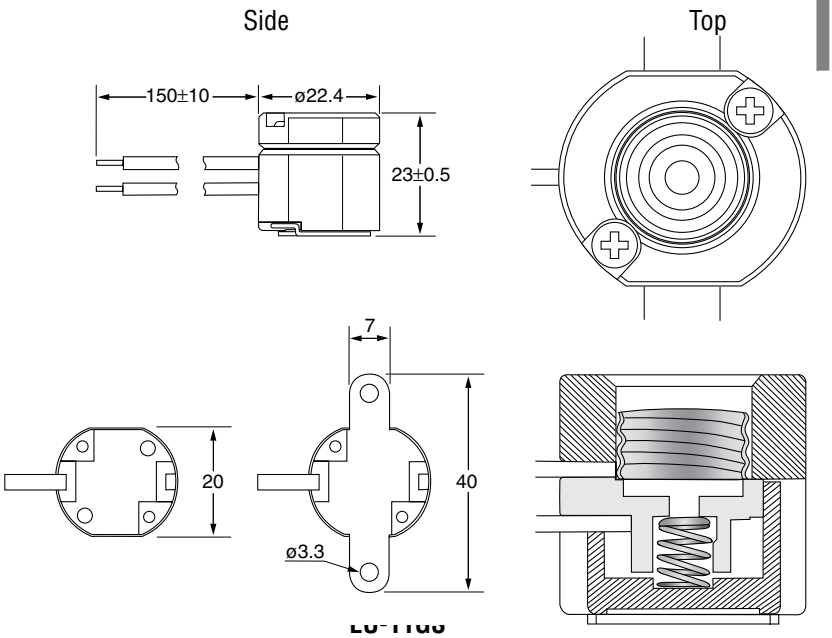
CHARACTERISTICS & SPECIFICATIONS

LAMP



EU-11 Base

SOCKET



All dimensions are in millimeters

Watts (W)	Ushio Ordering Code	Ushio Lamp Code	Voltage (V)	Initial Lumens (lm)	Color Temp (K)	Inner Capsule	Avg Life (h)	Base
SINGLE ENDED - EU11 Base								
85	1003230	JDW120V-85WGSK	120	1500	2850	Clear	2000	EU11
85	1003231	JDW120V-85WGSF/K	120	1500	2850	Frosted	2000	EU11

SOCKET - for EU11 Base

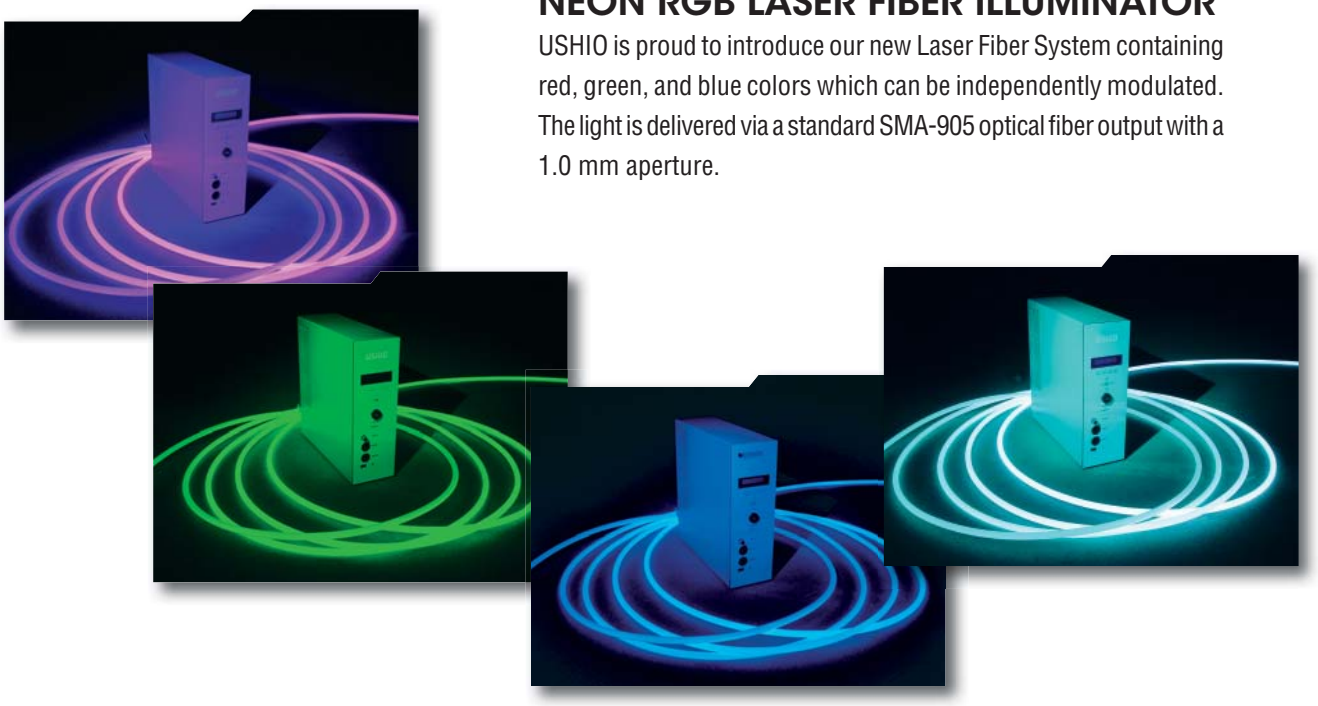
1003222	EU-11FS
1003223	EU-11GS w/ mounting feet

Form No. S-JDW/R-0806
The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

LASER FIBER SYSTEM

LASER FIBER SYSTEM



NEON RGB LASER FIBER ILLUMINATOR

USHIO is proud to introduce our new Laser Fiber System containing red, green, and blue colors which can be independently modulated. The light is delivered via a standard SMA-905 optical fiber output with a 1.0 mm aperture.

FEATURES AND BENEFITS

- Flexible construction for a variety of complex design applications
- Long life: Up to 50,000 hours with proper thermal management
- Quick and easy to install
- Low cost of ownership
- Wide neon-like color range
- Remote delivery of light
- Application friendly: UV and IR free
- Environmentally friendly: Mercury free, lead free, RoHS compliant

APPLICATIONS

- Neon Replacement
- Water & Ice Lighting
- Extreme Environments
- Cove Lighting
- Pathway Lighting
- Backlighting
- Signs
- Edge Lighting
- Contour Marking
- Refrigeration Cases
- Emergency Signs

USHIO

CHARACTERISTICS & SPECIFICATIONS

LASER FIBER SYSTEM

PARAMETER	SYMBOL	MIN.	LIMITS TYPE	MAX.	UNIT
Operating Power (all colors max power) [3,6]	P_{OP}	9.1	–	10.0	W
Output Power Stability[1]	–	–	3	5	%PP
Operating Temperature Range	T	15	–	30	°C
SMA-905 Output Fiber Diameter	Ø	1.0	–	1.0	mm
Output Fiber Numerical Aperture	NA	0.30	0.39	0.40	–
Infra-Red Leakage[2]	P_{IR}	–	20	40	mW
Weight	–	–	23	–	lbs
		–	10.5	–	kg
RED WAVELENGTH SPECIFICATIONS					
Center	λ_m	636	638	642	nm
Spectral Width	$\Delta\lambda_m$	–	3	5	nm
Operating Power Range[3]	P_{OP}	0.0	–	5.0	W
Maximum Power[6]	P_{max}	4.5	–	5.0	W
GREEN WAVELENGTH SPECIFICATIONS					
Center	λ_m	528	532	536	nm
Spectral Width	$\Delta\lambda_m$	–	0.2	0.5	nm
Operating Power Range[3]	P_{OP}	0	–	2.5	W
Maximum Power[6]	P_{max}	2.3	–	2.5	W
BLUE WAVELENGTH SPECIFICATIONS					
Center	λ_m	462	465	469	nm
Spectral Width	$\Delta\lambda_m$	–	0.2	0.5	nm
Operating Power Range[3]	P_{OP}	0	–	2.5	W
Maximum Power[6]	P_{max}	2.3	–	2.5	W
WARM-UP TIMES					
Warm-Up Time (cold)[4]	T_{on}	–	0.3	5.0	min
AC POWER SOURCE REQUIREMENTS					
Input Voltage	V_{input}	100	–	240	V
Input Current	I_{input}	–	–	2.5	A
Input Frequency		50	–	60	Hz
Total Power Consumption[5]	P_{total}	–	280	–	W

[1] Over 2 hours, after warm-up and ±3°C, above 2W output power for each operating color
[2] IR leakage at max power for all colors
[3] Power is measured coming out from the SMA connector of the box. Power will be less after transport fiber is connected depending on AR-coating, fiber diameter, fiber length, and other factors.
[4] ON is 90% of Item 1 P_{op}
[5] Power consumption measured at operating power of Item 1 at 25 °C. Consumption will be much lower if lasers are run at lower power levels, and also will be affected by the environment temperature as TECs are used to heat/cool the lasers.
[6] Maximum operating power will be lower than the indicated maximum when the white light homogenizing option is installed (i.e., the fiber output is white light instead of the individual RGB combination)

USHIO

LASER FIBER SYSTEM

CHARACTERISTICS & SPECIFICATIONS

COMMUNICATION INTERFACE

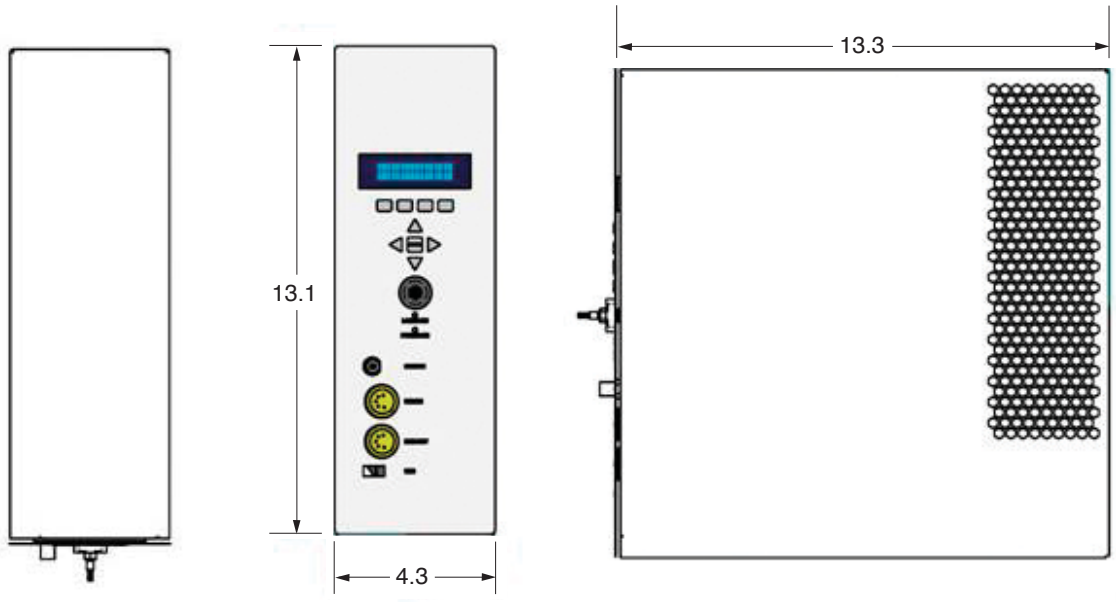
- DMX 3-channel interface via 5-pin XLR connector
- USB
- Simple GUI with basic power commands for smooth RGB control
- Key-enabled turn-on for safety
- Extensive user command set provided upon purchase of USHIO laser fiber system.

LASER FIBER SYSTEM

All dimensions are measured in inches.

FIBER CONNECTION

USHIO recommends at least 1.0 mm diameter fiber at the output of the box in order to capture the maximum amount of exiting light. The fiber tips should be anti-reflection (AR) coated for maximum efficiency.



Distributed by:

Form No. S-LFS-0411
The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

HIGH PRESSURE SODIUM

LU SERIES

HIGH PRESSURE SODIUM SINGLE & DOUBLE ENDED FOR GENERAL LIGHTING

USHIO's LU series High Pressure Sodium lamps are highly efficient and produce a warm color. They are excellent for lighting large areas and are often used in street lighting, industrial high-bay, parks, and other commercial lighting uses where color rendering is not considered critical.

Wattages range from 35 up to 400, and are available in single ended, E26 medium and E39 mogul base.

FEATURES & BENEFITS

- High efficacy 3 to 5 times more efficient than incandescent
- Clear bulb finish
- Lamps are manufactured to standard ANSI specifications
- Long Life

APPLICATIONS

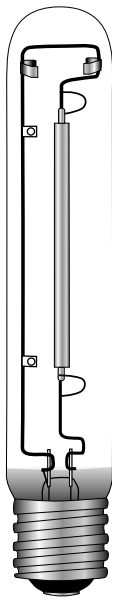
- Commercial and Industrial
- Flood Lighting
- Industrial High-Bay
- Downlighting
- Parking Lots and Garages
- Security

Distributed by:

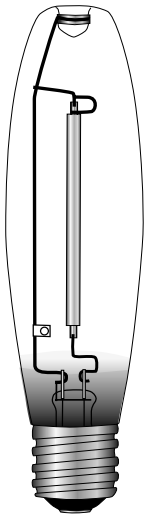
Form No. S-LU/R-0207: The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

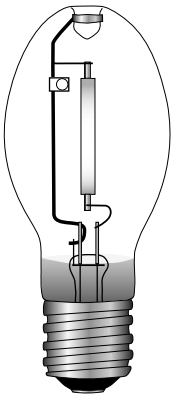
CHARACTERISTICS & SPECIFICATIONS



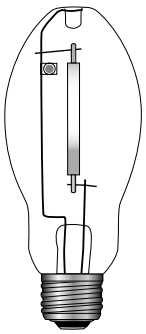
T15
E39 Mogul Base



ED18
E39 Mogul Base



ED23 1/2 • ED28
E39 Mogul Base



ED17
E26 Medium Base

Watts (W)	Ushio Ordering Code	Ushio Lamp Code	Ballast	Dimension OAL (in / mm)	Dimension LCL (in / mm)	Color Temp (K)	Initial Lumens (lm)	Avg Life (h)
	SINGLE ENDED – E26 MEDIUM BASE							
35	5000050**	LU-35/MED, ED17	S76HA-35	5 7/16 138	3 5/16 84	2000	2250	24000
50	5000056	LU-50/MED, ED17	S68LP-50	5 7/16 138	3 5/16 84	2000	4000	24000
70	5000060	LU-70/MED, ED17	S62LG-70	5 7/16 138	3 5/16 84	2000	6400	24000
100	5000040	LU-100/MED, ED17	S54SG-100	5 7/16 138	3 5/16 84	2000	9500	24000
150	5000045	LU-150/MED, ED17	S55RN-150	5 7/16 138	3 5/16 84	2000	16000	24000
	SINGLE ENDED – E39 MOGUL BASE							
50	5000053**	LU-50, ED23 1/2	S68MS-50	7 5/16 186	5 127	2000	4000	24000
70	5000057	LU-70, ED23 1/2	S62ME-70	7 5/16 186	5 127	2000	6300	24000
100	5000037	LU-100, ED23 1/2	S54SB-100	7 5/16 186	5 127	2000	9500	24000
150	5000042	LU-150/55, ED23 1/2	S55SC-150	7 5/16 186	5 127	2000	16000	24000
150	5000967**	LU-150/100, ED28	S56SD-150	8 5/16 211	5 127	2000	15000	24000
200	5000046	LU-200, ED18	S66MN-200	9 3/4 248	5 3/4 146	2000	22000	24000
250	5000047**	LU-250, T15	S50VA-250	10 3/4 260	6 1/4 158	2000	28500	24000
250	5001138	LU-250, ED18	S50VA-250	9 3/4 248	5 3/4 146	2000	28500	24000
250	5001126	LU-250, ED28	S50VA-250	8 5/16 211	5 127	2000	28500	24000
400	5000051	LU-400, ED18	S51WA-400	9 3/4 248	5 3/4 146	2000	48000	24000
400	5001127**	LU-400, T15	S51WA-400	11 1/2 292	6 7/8 175	2000	48000	24000

*Burn Position: Horizontal ±40°

**Special order item only

USHIO

METAL HALIDE LAMPS

MHR SERIES

METAL HALIDE WITH REFLECTOR FOR FIBER OPTIC APPLICATIONS

The MHR series was specifically designed for fiber optic and light pipe applications. These lamps are predominantly used in applications with a fiber diameter of more than 8mm at the input and offers an unproblematic operation with standard ballasts and thus lowers cost applications.

The MHR series features an ellipsoidal reflector coated with a special dichroic coating which transmits most of the lamp's heat radiation toward the rear.

Specifications include a 6.5mm arc gap, total luminous efficacy of 85 lumens per watt and useful lamp life of up to 6000 hours. The MHR series is an economical solution to high development and maintenance costs associated with using lamps developed for applications other than fiber

FEATURES AND BENEFITS

- MHR-100D/L, MHR-100D/HR uses M90 Ballast or Electronic Equivalent, MHR-150N uses M81 Ballast and MHR-250N uses M80 Ballast
- Cold Mirror Reflector- concise front end
- Compact Design
- Aligned to a fiber during manufacturing
- Standardized AMP Connector

Watts (W)	Ushio Ordering Code	Ushio Lamp Code	Voltage (V)	Ignition Voltage (kV)	Lamp Current (A)	Luminous Flux through Aperature ø13mm distance 42mm (lm*)	ø10mm distance 44mm (lm*)	ø25mm distance 33mm (lm**)	Color Temp (K)	CRI	Avg Life (h)
100	5000789	MHR-100D/L	95	4	1.2	1600	1800	4600	5200	72	6000
100	5000790	MHR-100D/HR	95	4	1.2	1600	1800	4600	5200	72	6000
150	5000834	MHR-150N	95	4	1.8	2000	2200	5300	4200	75	6000
250	5001377	MHR-250N	100	4	3.0	3500▲	—	—	4200	72	4000

Distributed by:

* Measurement taken with optical sphere
** Measurement taken through fiber bundle
▲ (ø13mm; distance 53mm)

Form No. S-MHR/R-0907: The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

CHARACTERISTICS & SPECIFICATIONS

MHR-100D, MHR-100D/HR, MHR-150N, MHR-250N

Application Hints

The optimal focal distance between the lamp and the fibre depends on the diameter of the fibre. A rough calculation of the optimal distance between lamp and fixture can be done by the following formula:

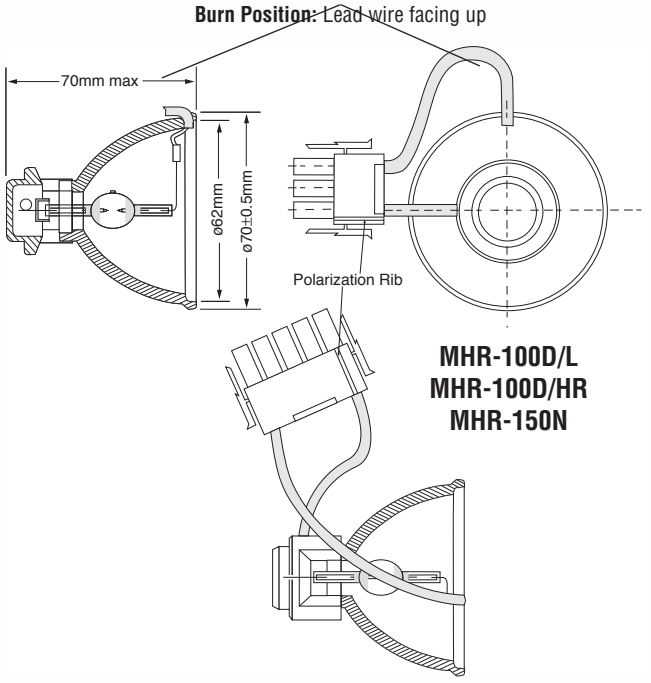
100/150W Fd = 52mm - D * 0.77
250W Fd = 64mm - D * 0.77

Fd(mm): Optimal distance betweeen fiber and lamp
D(mm): Diameter of the fiber bundle

UV and IR radiation from the lamp may cause damage to synthetic fibers. Therefore, reflective or absorbing filters are recommended for use with synthetic fibers.

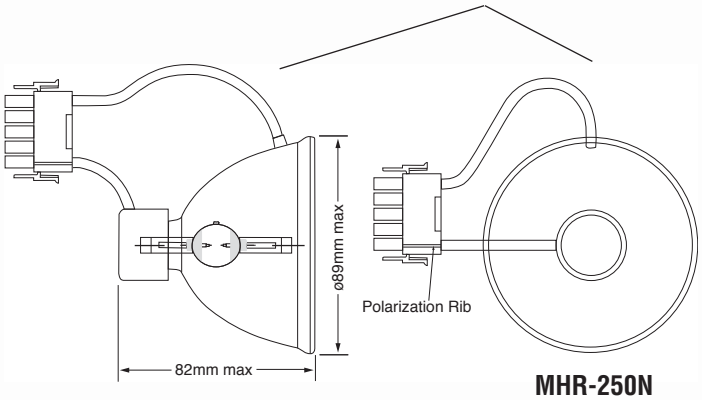
Optimal distance: 100W & 150W 250W from reflector to fiber:	 42mm 53mm (with ø13mm fiber bundle)
Length of Base Lead Wire:	Approx. 75mm
Base Type: MHR-100D/L MHR-100D/HR MHR-150N MHR-250N	AMP Universal Mate-N-Lok 3 channel plug 5 channel plug 5 channel plug 5 channel plug

Burn Position: Lead wire facing up



MHR-100D/L
MHR-100D/HR
MHR-150N

Burn Position: Lead wire facing up



MHR-250N

Ballast & Ignitor Information

100W lamp—M90; 150W lamp—M81; 250W lamp—M80
At the end of their lifetime, metal halide lamps may show rectifier effects causing a rise in current of up to 3 times of the rated value thereby posssibly damaging the ballast. Therefore we recommend to use only ballasts with integrated thermoswitch. For line compensation, a capacitor should be used. It is recommended to use ignitors with a timer switch. The use of electronic ballasts is possible if the operating frequency is below 250Hz. All lamps must be used with 4kV ignitor.

MHR-100D/L
Warm-up Time to 95% luminous flux: 2.5 minutes with standard ballast
Reignition Time: Approximately 1 minute

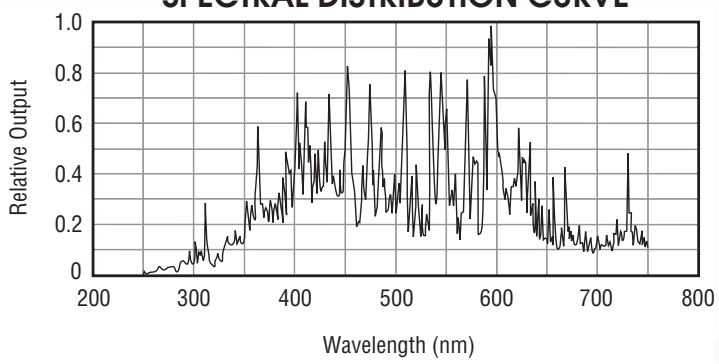
MHR-100D/HR
Warm-up Time to 95% luminous flux: 2.5 minutes with standard ballast
Hot re-strike version

MHR-150N
Warm-up Time: 3 minutes
Reignition Time: Approximately 2 minutes

Warning

The lamp emits UV radiation which can cause serious eye and skin damage. Therefore, the lamp must be used only in closed lamp houses.

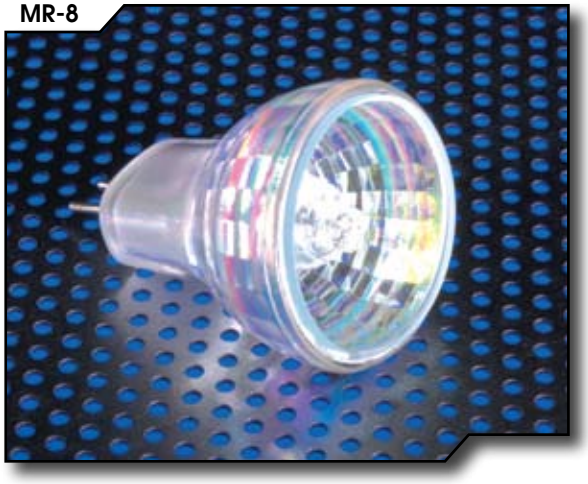
SPECTRAL DISTRIBUTION CURVE



USHIO

MR-8 REFLECTOR LAMP

MR-8



MR-8 LOW VOLTAGE FOR GENERAL LIGHTING

At only one inch in diameter, USHIO's MR-8 lamp allows for even smaller fixture designs than MR-11 and MR-16 lamps.

Available in 20 watt and 35 watt in narrow and wide beam spreads

APPLICATIONS

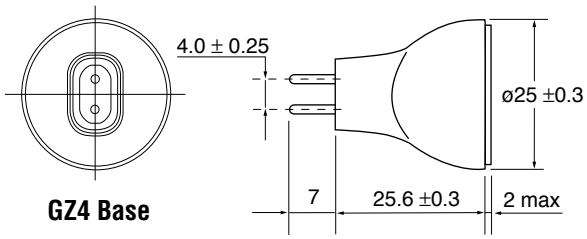
- Decorative Lighting
- Display Lighting
- Accent Lighting
- Low-Voltage Lighting
- Landscape Lighting

FEATURES AND BENEFITS

- 1 Inch in Diameter
- Standard Bi Pin GZ4 Base
- 3050K Color Temperature
- 2000 Hours Average Life
- Integrated Cover Glass
- Precisely Focused Light Cone
- Dimmable
- Cool Beam Dichroic Reflector

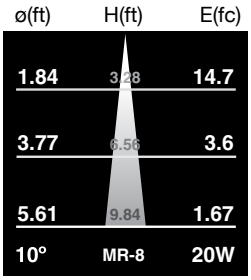
USHIO

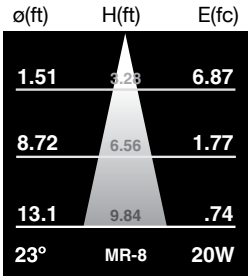
CHARACTERISTICS & SPECIFICATIONS

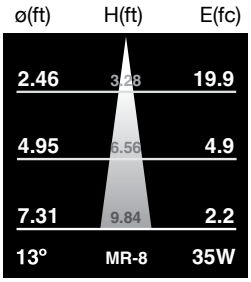


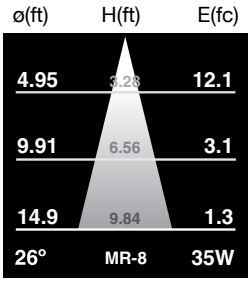
GZ4 Base

All dimensions are in millimeters









Use with **USHIO C-14B socket:**
Ordering Code: 1000109

Watts (W)	Ushio Ordering Code	Ushio Lamp Description	Voltage (V)	Dimension OAL (mm)	Color Temp (K)	Beam Angle	Beam Spread	Luminous Intensity (cd)	Avg Life (h)
20	1003116	MR-8 12V-20W/NSP10/FG	12	34.6	3050	10º	Narrow Spot	1700	2000
20	1003117	MR-8 12V-20W/NFL23/FG	12	34.6	3050	23º	Narrow Flood	800	2000
35	1003118	MR-8 12V-35W/SP13/FG	12	34.6	3050	13º	Spot	2300	2000
35	1003119	MR-8 12V-35W/NFL26/FG	12	34.6	3050	26º	Narrow Flood	1400	2000

Distributed by:

Form No. S-MR8/R-0609: The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

FLEXIBLE LED STRINGS

OPAL-LUX™ SERIES

OPAL-LUX™ SERIES
FLEXIBLE WATERPROOF LED STRINGS

Opal-Lux™ was developed with the lighting design professional, the sign professional and the home improvement contractor in mind. These 12V LED strings are easy to install, very flexible and silicone coated for indoor and outdoor use. At only 6.6 watts per meter (3.2 feet) this energy saving LED string is IP65 waterproof rated. Each one meter string can be cut to fit the length needed and multiple strings can be used on large installations.

Opal-lux™ strings are ideal for cove lighting, pathway lighting, refrigeration cases, backlighting, signs, shelf lighting, edge lighting, counter lighting, recessed and display lighting.

Each 1 meter string contains 99 individual LEDs. The strings are available in White (7000K) or Warm White (3200K).

Straight and flexible resin channels are also available that make installation quick and easy.

FEATURES & BENEFITS

- Flexible for a variety of uses.
- Energy saving: Only 6.6W per meter (3.2 Feet)
- Long life: Up to 35,000 hours with proper thermal management
- Quick and easy to install
- IP65 rated for interior and exterior applications
- Low profile
- Cool operation
- Application friendly: UV and IR free
- Environmentally friendly: Mercury free, lead free, RoHS compliant

APPLICATIONS

- Cove Lighting
- Pathway Lighting
- Backlighting
- Refrigeration Cases
- Signs
- Recessed Lighting
- Edge Lighting
- Contour Marking
- Emergency Signs
- Display Shelf Lighting
- Counter Lighting

Distributed by:

Form No. S-LEDOL-0112

USHIO

CHARACTERISTICS & SPECIFICATIONS

OPAL-LUX™ LED STRINGS

Case Qty: 10

INSTALLATION INFORMATION:

Power Supply Information

1. The LED strings contain no protection against short circuits, overload or overheating. Therefore, it is absolutely necessary to operate the strings on an electrically stable power supply with protection against the above mentioned safety risks.
2. The Opal-Lux™ LED strings require a 12V DC power supply. Each LED string has a maximum load rating of 7 watts.
3. Never operate an LED load in excess of the capacity of the power supply.

Electrical Connection

1. Opal-Lux™ LED strings are equipped with polarized wires. To ensure correct electrical polarity, connect the low voltage load side of the power supply to the LED strings. When finished you may use silicone, shrink tubing, electrical tape or a wire nut to properly manage and protect the contact. Incorrect electrical polarity may destroy the strings.
2. Up to 3 LED strings can be connected in series to a single power supply connection. For large installations, you may connect multiple (3 string sets) in parallel.

Temperature

Opal-Lux™ LED strings are designed to be operated in environments between 14° F and 104° F.

Cutting

1. The Opal-Lux™ strings can be cut to meet size or load constraints. However, due to the circuit design cutting the Opal-Lux™ LED strings is possible only every 3 LEDs. For example, the cuts can be made between the following numbers: 3&4, 6&7, 9&10, 12&13, 15&16, 18&19… There are marks on the strings that indicate where the strings may be cut.
2. Apply a silicone sealant to the cut ends to keep the strings waterproof.
3. Each string can be cut into no more than two workable sections. You must maintain the end sections with the existing lead wires. The middle sections without leads cannot be used.

Precautions

- The installation of the strings must not damage or destroy any of the electrical connections or wiring.
- Opal-Lux™ strings must not be subjected to physical stress or abuse.
- Opal-Lux™ strings will not stretch like ordinary rubber. If forcefully extended the interior circuits will disconnect.
- If the lead wire is forcefully pulled it may disconnect.
- The Opal-Lux™ strings while they are flexible should only be bent at the spaces between the LEDs. Please avoid any unworkable angles that will cause stress to the circuit. Do not bend the LED module in the vertical axis or twist the LED string as this may cause the internal circuit to break.

Watts (W)	Ushio Ordering Code	Ushio Lamp Description	Operating (V)	Height (in)	Length (in)	Width (in)	Viewing Angle	Luminous Flux (lm)	Color Temp (K)	Commercial Life (h)
6.6	1003720	6W OPAL-LUX/WARM WHITE	12	0.65	39.37	0.28	100	74	3200	35,000
6.6	1003719	6W OPAL-LUX/WHITE	12	0.65	39.37	0.28	100	198	7000	35,000

Scan with a smartphone to view this product online.

WARNING:
Installation of these Opal-Lux™ products should be performed in accordance with all applicable electrical and safety standards. Only qualified, licensed electrical contractors should perform these installations.

USHIO

HALOGEN PAR36 LAMPS

PAR 36 SERIES

HALOGEN 12V PAR 36 LAMPS FOR GENERAL LIGHTING

USHIO's Halogen 12V PAR 36 lamps are built to withstand the demanding conditions of landscape use while still providing optimum performance in track lighting and retail applications. With a life rating of 4,000 hours and a flame-sealed lens, these lamps are designed to last twice as long as incandescent lamps and are protected against the adverse affects of moisture.

Not only do these Halogen lamps provide a longer life than incandescent lamps, they also offer up to 40% more energy savings compared to incandescents, improved lamp to lamp color consistency, and a brighter, whiter light source.

Available in 20W, 35W, & 50W lamps; Three premium beam patterns: Narrow Spot, Narrow Flood and Flood.

FEATURES & BENEFITS

- Flame sealed lens — Ensures lamps will not be impacted by moisture
- 4,000 Hour lamp life — Reduces maintenance costs
- Excellent color characteristics— Crisp, white Halogen light
- Energy savings — Saves up to 40% in energy costs compared to higher wattage incandescent reflector lamps.

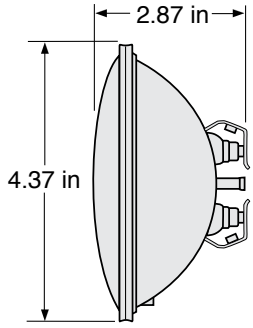
APPLICATIONS

- Commercial Landscape Lighting
- Architectural Lighting
- Retail Lighting
- Track Lighting
- Restaurants

USHIO

CHARACTERISTICS & SPECIFICATIONS

PAR 36
Screw Terminals
Universal Burn Position



Watts (W)	Ushio Ordering Code	Ushio Lamp Code	Volts (V)	Beam Angle	Beam Spread	Luminous Intensity (cd)	Avg Life (h)
20	1003539	20PAR36/NSP8/12V	12	8°	Narrow Spot	3500	4000
20	1003532	20PAR36/NFL20/12V	12	20°	Narrow Flood	1300	4000
20	1003531	20PAR36/FL30/12V	12	30°	Flood	750	4000
35	1003535	35PAR36/NSP8/12V	12	8°	Narrow Spot	7500	4000
35	1003534	35PAR36/NFL20/12V	12	20°	Narrow Flood	2500	4000
35	1003533	35PAR36/FL30/12V	12	30°	Flood	1400	4000
50	1003538	50PAR36/NSP8/12V	12	8°	Narrow Spot	13500	4000
50	1003537	50PAR36/NFL20/12V	12	20°	Narrow Flood	5000	4000
50	1003536	50PAR36/FL30/12V	12	30°	Flood	2000	4000

*These lamps are low voltage lamps and require a transformer to operate.

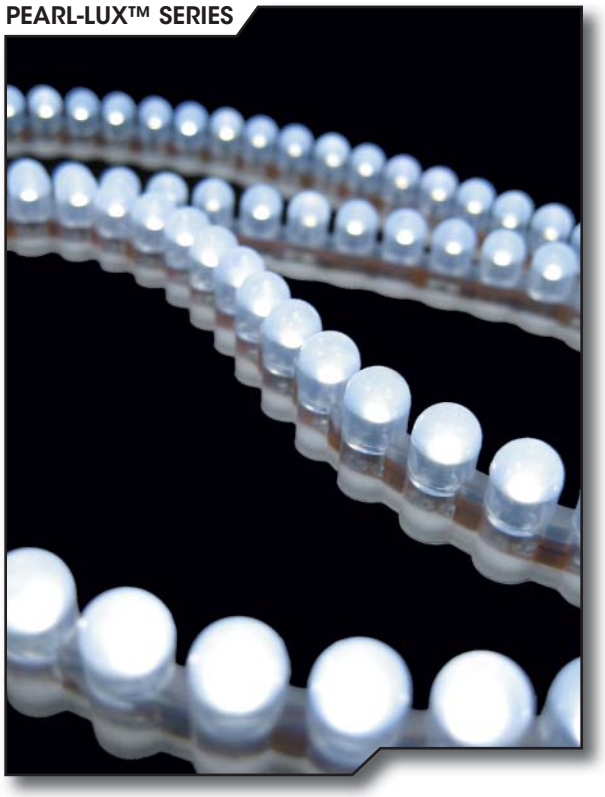
Distributed by:

Form No. S-PAR36-0607: The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

FLEXIBLE LED STRINGS

PEARL-LUX™ SERIES



PEARL-LUX™ SERIES ARCHITECTURAL-GRADE SILICONE FLEXIBLE LED STRINGS

These architectural-grade 12V LED strings are very flexible and silicone coated. They provide limitless possibilities for a variety of general lighting and decorative applications. Pearl-Lux™ offers higher performance and more flexibility than similar LED strips, tapes and rope lighting. At only 6W per meter (3.2 feet) this energy saving, long life string is IP67 rated for interior and exterior use.

Pearl-Lux™ strings are ideal for cove lighting, pathway lighting, refrigeration cases, backlighting, signs, shelf lighting, edge lighting, counter lighting, recessed and display lighting.

Each 1 meter string contains ninety-six individual LED's. The strings are available in White (6500K) or Warm White (2700K).

Straight and flexible resin channels are also available that make installation quick and easy.

FEATURES & BENEFITS

- Flexible construction for a variety of complex design applications
- Energy saving: Only 6W per meter (3.2 feet)
- Long life: Up to 50,000 hours with proper thermal management
- Quick and easy to install
- IP67 rated for dust tight and water resistant applications
- Low profile
- Cool operation
- Application friendly: UV and IR free
- Environmentally friendly: Mercury free, lead free, RoHS compliant

APPLICATIONS

- Cove Lighting
- Pathway Lighting
- Backlighting
- Refrigeration Cases
- Signs
- Edge Lighting
- Damp Location
- Contour Marking
- Emergency Signs
- Display Shelf Lighting
- Counter Lighting
- Recessed Lighting
- Harsh Environments

USHIO

PEARL-LUX™ LED STRINGS

CHARACTERISTICS & SPECIFICATIONS

Watts (W)	Ushio Ordering Code	Ushio Lamp Description	Volts (V)	Dimensions Height (in)	Dimensions Length (in)	Dimensions Width (in)	Viewing Angle degree	Approx Lumens (lm)	Color Temp (K)	Commercial Life (h)	Case Qty
		PEARL-LUX™ LED STRINGS									
6	1003620	6W PEARL-LUX / WARM WHITE	12	0.65	39.37	0.31	45°	83	2700	50,000	10
6	1003621	6W PEARL-LUX / WHITE	12	0.65	39.37	0.31	45°	180	6500	50,000	10
		MOUNTING CHANNELS FOR LED STRINGS									
N/A	1003622	*STRAIGHT RESIN CHANNEL	N/A	0.43	39.37	0.79	N/A	N/A	N/A	N/A	10
N/A	1003623	*FLEXIBLE RESIN CHANNEL	N/A	0.43	39.37	0.79	N/A	N/A	N/A	N/A	10
N/A	1003643	STRAIGHT ALUMINUM CHANNEL	N/A	0.43	39.37	0.79	N/A	N/A	N/A	N/A	10
N/A	1003644	FLEXIBLE ALUMINUM CHANNEL	N/A	0.43	39.37	0.79	N/A	N/A	N/A	N/A	10

*Resin Channels for Indoor Use Only.

PEARL-LUX™ LED STRINGS

INSTALLATION INFORMATION:

Power Supply Information

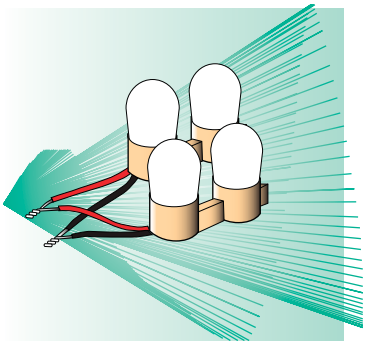
1. The LED strings contain no protection against short circuits, overload or overheating. Therefore, it is absolutely necessary to operate the strings on an electrically stable power supply with protection against the above mentioned safety risks.

2. The Pearl-Lux™ LED strings require a 12V DC power supply. Each LED string has a maximum load rating of 6 watts.

3. Never operate an LED load in excess of the capacity of the power supply.

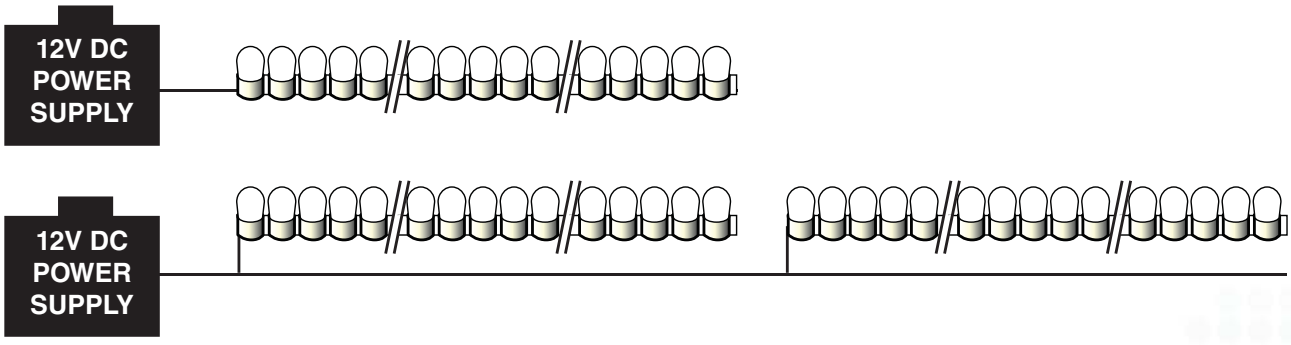
Electrical Connection

1. Pearl-Lux™ LED strings are equipped with polarized wires (red – positive, black – negative). To ensure correct electrical polarity, connect the low voltage load side of the power supply to the LED strings. When finished you may use silicone, shrink tubing, electrical tape or a wire nut to properly manage and protect the contact. Incorrect electrical polarity may destroy the strings. (See illustration 1).



(Illustration 1)

2. Up to 3 LED strings can be connected in series to a single power supply connection. For large installations you may connect multiple (3 string sets) in parallel. (See illustration 2).



(Illustration 2)

USHIO

INSTALLATION INFORMATION

PEARL-LUX™ LED STRINGS

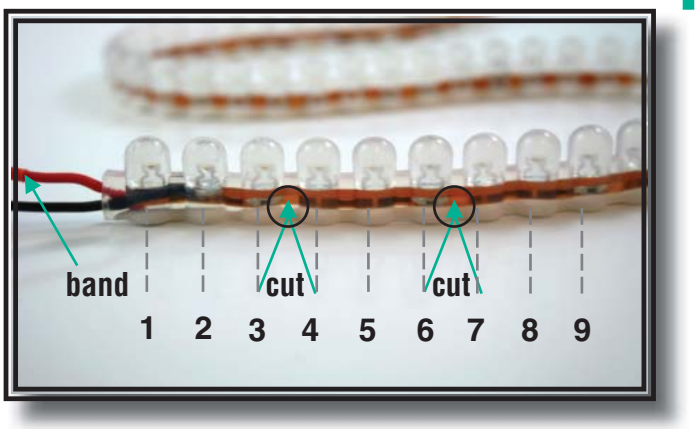
INSTALLATION INFORMATION:

Temperature

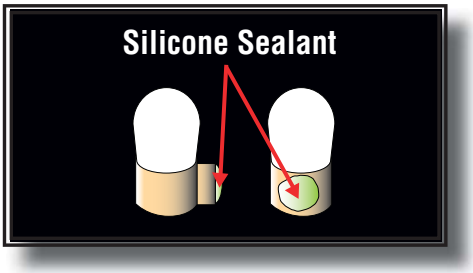
Pearl-Lux™ LED strings are designed to be operated in environments between -22° F and 158° F.

Cutting

1. The Pearl-Lux™ strings can be cut to meet size or load constraints. However due to the circuit design cutting the Pearl-Lux™ LED strings is possible only every 3 LED's. For example: (Starting from the band side), the cuts can be made between the following numbers: 3&4, 6&7, 9&10, 12&13, 15&16, 18&19… (See illustration 3).
2. Apply a silicone sealant to the cut ends to keep the strings waterproof. (See illustration 4).
3. Each string can be cut into no more than two workable sections. You must maintain the end sections with the existing lead wires. The middle sections without leads cannot be used.



(Illustration 3)



(Illustration 4)

Precautions

- The installation of the strings must not damage or destroy any of the electrical connections or wiring.
- Pearl-Lux™ strings must not be subjected to physical stress or abuse.
- Pearl-Lux™ strings will not stretch like ordinary rubber. If forcefully extended the interior circuits will disconnect.
- If the lead wire is forcefully pulled, it may disconnect.
- The Pearl-Lux™ strings, while they are flexible, should only be bent at the spaces between the LED's. Please avoid any unworkable angles that will cause stress to the circuit. Do not bend the LED module in the vertical axis or twist the LED string as this may cause the internal circuit to break.

WARNING:
Installation of these Pearl-Lux™ products should be performed in accordance with all applicable electrical and safety standards. Only qualified, licensed electrical contractors should perform these installations.

Scan with a smartphone to view this product online.

The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

Distributed by:

USHIO

MR-16 REFLECTOR LAMPS

POPSTAR SERIES

POPSTAR - MR-16 with COLORED DICHROIC LENS FOR GENERAL LIGHTING

USHIO Popstar lamps allow colors to be added to your design without the added expense of colored filters and gels. The highest quality dichroic coatings are applied to the front cover glass of these MR-16 lamps to provide deep color saturation. Computer controlled alignment of the axial filaments in the Popstar lamps allow precise beam control. All of the Popstar lamps have UV protecting quartz used for the bulb wall to protect both the dichroic filter and the illuminated subject.

Available in colors: Red, Orange, Yellow, Green, Blue and Magenta

FEATURES AND BENEFITS

- 4000 Hours Average Life
- Integrated Dichroic Colored Front Glass Cover
- 50Watt; 12Volt
- Dimmable
- GU5.3 Base
- Universal Burn Position
- UV Protection
- Cool Beam

APPLICATIONS

- Archi-tainment
- P.O.P. Displays
- Retail
- Theme Parks
- Night Clubs
- Landscape
- Waterscape

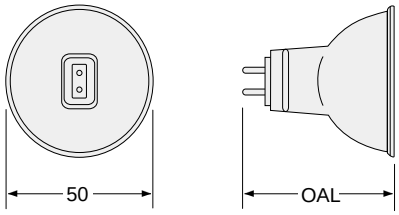
USHIO

CHARACTERISTICS AND SPECIFICATIONS

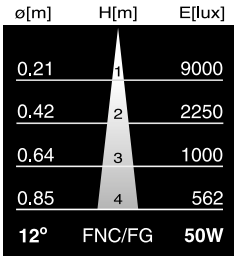
Chromaticity Coordinates

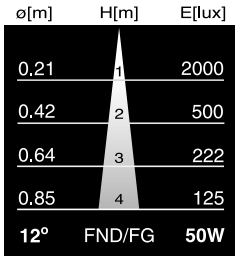
50W	Yellow	x = .520	y = .471
	Red	x = .686	y = .307
	Blue	x = .135	y = .307
	Green	x = .286	y = .681
	Orange	x = .618	y = .378
	Magenta	x = .577	y = .312

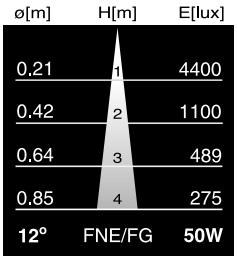
All dimensions are in millimeters

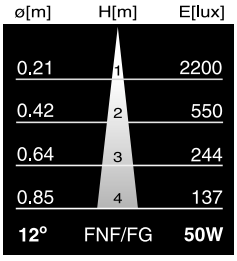


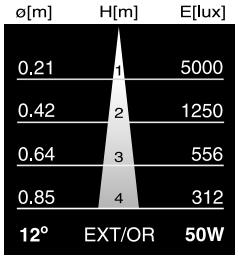
Base: GU5.3

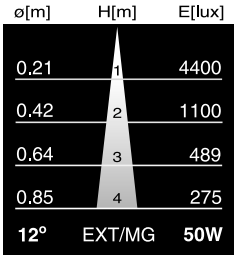












Watts (W)	Ushio Ordering Code	Ushio Lamp Code	Voltage (V)	Dimension OAL (mm)	Color	Beam Angle	Luminous Intensity (cd)	Avg Life (h)
50	1000580	FNC/FG	12	45.2	Yellow	12º	9000	4000
50	1000582	FND/FG	12	45.2	Red	12º	2000	4000
50	1000584	FNE/FG	12	45.2	Green	12º	4400	4000
50	1000586	FNF/FG	12	45.2	Blue	12º	2200	4000
50	1003132	EXT/OR	12	45.2	Orange	12º	5000	4000
50	1003200	EXT/MG	12	45.2	Magenta	12º	4400	4000

Popstar lamps are manufactured under ISO 9001 guidelines ensuring quality and security for the purchaser

Distributed by:

Form No. S-MR16PS-0701: The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

HALOGEN PAR LAMPS

PRO-PAR™ SERIES

PAR 20, 30, 30 LONG NECK, & 38 FOR GENERAL LIGHTING

USHIO's Halogen PRO-PAR™ lamps combine a multi-layered coating process for improved reflectivity and beam control with a unique filament mount that utilizes a center support. The 3-support mount provides an additional layer of protection against failures due to minor vibration. These lamps are ideal for accent and display lighting environments.

Halogen PRO-PAR™ lamps can save up to 60% in energy costs as a direct replacement for higher wattage incandescent reflector lamps. Not only are they an energy efficient option, they are a whiter (2900K) and brighter alternative to incandescent lamps with excellent color rendering properties (100 CRI).

Available in wattages ranging from 35W to 120W in sizes PAR20, PAR30, Long Neck PAR30 and PAR38 with beam patterns including Spot, Flood, Narrow Flood and Wide Flood.

FEATURES & BENEFITS

- Center Support Filament Mount — Extra protection against vibration and filament sag
- Multi-Layered Aluminized Reflector — Additional layers of coating provides an improved beam pattern and protects against reflector degradation
- Energy Saving — Saves up to 60% in energy costs vs. incandescent reflector lamps

APPLICATIONS

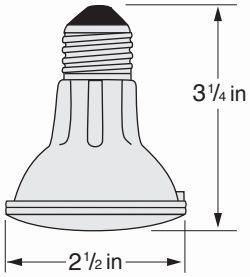
- Retail Store Display Lighting
- Downlights in Offices, Hotels, Retail Establishments
- Track Lighting
- Accent Lighting
- Indoor / Outdoor Flood Lighting

USHIO

CHARACTERISTICS & SPECIFICATIONS

PRO-PAR™ 20

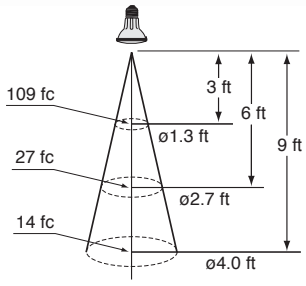
2900K Color Temperature
E26 Medium Screw Base
Universal Burn Position



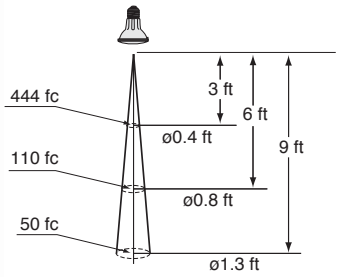
PAR-20

Watts (W)	Ushio Ordering Code	Ushio Lamp Description	Volts (V)	Beam Angle	Center Beam (cp)	Approx Lumens (lm)	Avg Life (h)	Ratings @ 120V Watts (W)	Ratings @ 120V Lumens (lm)	Ratings @ 120V Avg Life (h)
		PRO-PAR™ 20								
35	1003064	35PAR20/FL30/120V	120	30°	900	425	2500	—	—	—
50	1001505	50PAR20/SP10/120V	120	10°	5000	600	2500	—	—	—
50	1001504	50PAR20/SP10/130V	130	10°	5000	600	2500	44	470	5000
50	1001503	50PAR20/NFL30/120V	120	30°	1250	600	2500	—	—	—
50	1001502	50PAR20/NFL30/130V	130	30°	1250	600	2500	44	470	5000
50	1001499	50PAR20/FL40/120V	120	40°	900	600	2500	—	—	—
50	1001500	50PAR20/FL40/130V	130	40°	900	600	2500	44	470	5000

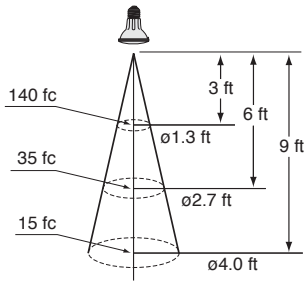
Only for use in approved Halogen fixtures
Case Quantity: 15/case



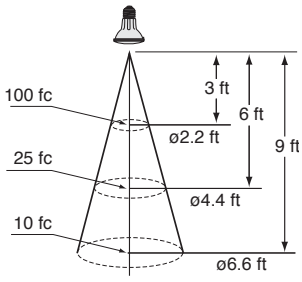
35W PAR20 FLOOD 30°



50W PAR20 SPOT 10°



50W PAR20 NARROW FLOOD 30°



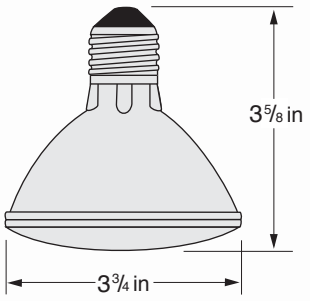
50W PAR20 FLOOD 40°

USHIO

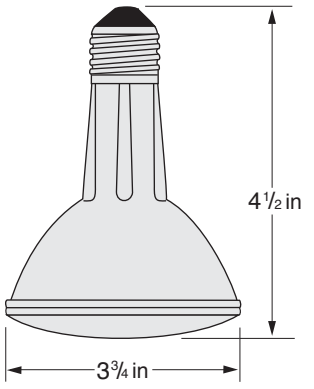
CHARACTERISTICS & SPECIFICATIONS

PRO-PAR™ 30
PRO-PAR™ 30 LONG NECK

2900K Color Temperature
E26 Medium Screw Base
Universal Burn Position



PAR-30



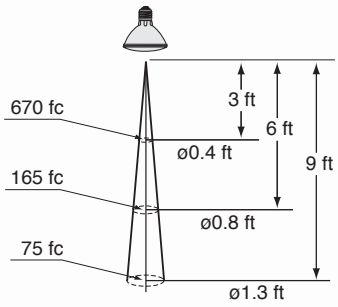
PAR-30
Long Neck

Watts (W)	Ushio Ordering Code	Ushio Lamp Description	Volts (V)	Beam Angle	Center Beam (cp)	Approx Lumens (lm)	Avg Life (h)	Ratings @ 120V Watts (W)	Ratings @ 120V Lumens (lm)	Ratings @ 120V Avg Life (h)
		PRO-PAR™ 30								
Ⓔ 50	1001514	50PAR30/SP10/120V	120	10°	6000	600	2500	—	—	—
Ⓔ 50	1001513	50PAR30/SP10/130V	130	10°	6000	600	2500	44	470	5000
Ⓔ 50	1001510	50PAR30/NFL30/120V	120	30°	2000	600	2500	—	—	—
Ⓔ 50	1001511	50PAR30/NFL30/130V	130	30°	2000	600	2500	44	470	5000
Ⓔ 50	1001507	50PAR30/FL40/120V	120	40°	1300	600	2500	—	—	—
Ⓔ 50	1001508	50PAR30/FL40/130V	130	40°	1300	600	2500	44	470	5000
Ⓔ 75	1001540	75PAR30/SP10/120V	120	10°	14000	1100	2500	—	—	—
Ⓔ 75	1001539	75PAR30/SP10/130V	130	10°	14000	1100	2500	66	860	5000
Ⓔ 75	1001536	75PAR30/NFL30/120V	120	30°	3200	1100	2500	—	—	—
Ⓔ 75	1001537	75PAR30/NFL30/130V	130	30°	3200	1100	2500	66	860	5000
Ⓔ 75	1001533	75PAR30/FL40/120V	120	40°	2000	1100	2500	—	—	—
Ⓔ 75	1001534	75PAR30/FL40/130V	130	40°	2000	1100	2500	66	860	5000
		PRO-PAR™ 30 LONG NECK								
Ⓔ 50	1001522	50PAR30LN/SP10/120V	120	10°	6000	600	2500	—	—	—
Ⓔ 50	1001523	50PAR30LN/SP10/130V	130	10°	6000	600	2500	44	470	5000
Ⓔ 50	1001519	50PAR30LN/NFL30/120V	120	30°	2000	600	2500	—	—	—
Ⓔ 50	1001520	50PAR30LN/NFL30/130V	130	30°	2000	600	2500	44	470	5000
Ⓔ 50	1001516	50PAR30LN/FL40/120V	120	40°	1300	600	2500	—	—	—
Ⓔ 50	1001517	50PAR30LN/FL40/130V	130	40°	1300	600	2500	44	470	5000
Ⓔ 75	1001548	75PAR30LN/SP10/120V	120	10°	14000	1100	2500	—	—	—
Ⓔ 75	1001549	75PAR30LN/SP10/130V	130	10°	14000	1100	2500	66	860	5000
Ⓔ 75	1001545	75PAR30LN/NFL30/120V	120	30°	3200	1100	2500	—	—	—
Ⓔ 75	1001546	75PAR30LN/NFL30/130V	130	30°	3200	1100	2500	66	860	5000
Ⓔ 75	1001542	75PAR30LN/FL40/120V	120	40°	2000	1100	2500	—	—	—
Ⓔ 75	1001543	75PAR30LN/FL40/130V	130	40°	2000	1100	2500	66	860	5000

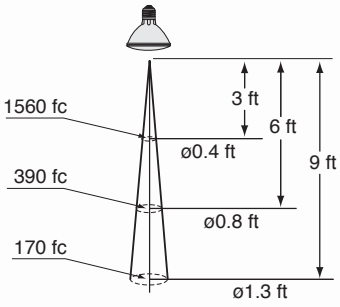
Ⓔ = This Bulb Meets US Federal Minimum Efficiency Standard

Only for use in approved Halogen fixtures
Case Quantity: 15/case

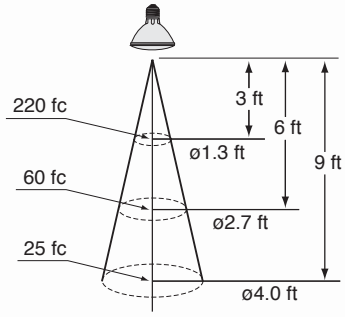
PRO-PAR 30
PRO-PAR 30 LONG NECK



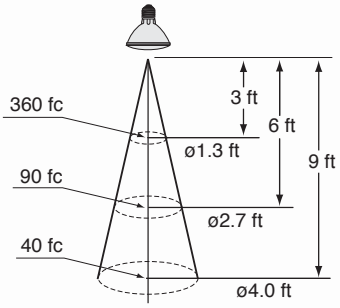
50W PAR30 SPOT 10°



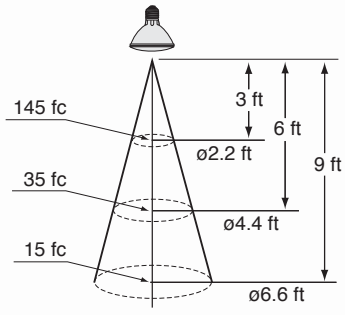
75W PAR30 SPOT 10°



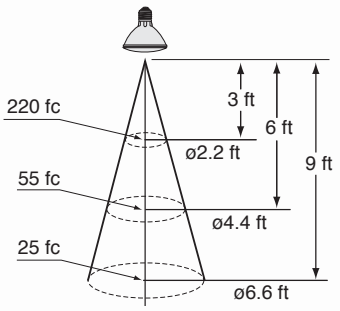
50W PAR30 NARROW FLOOD 30°



75W PAR30 NARROW FLOOD 30°



50W PAR30 FLOOD 40°



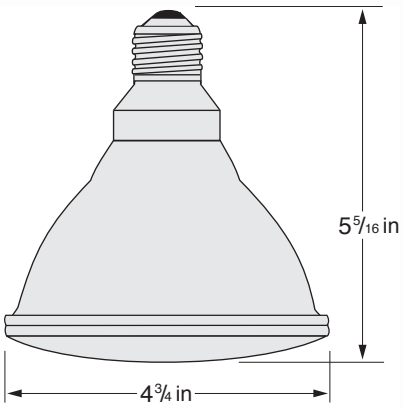
75W PAR30 FLOOD 40°

USHIO

CHARACTERISTICS & SPECIFICATIONS

PRO-PAR™ 38

2900K Color Temperature
E26 Medium Screw Base
Universal Burn Position



PAR-38

Watts (W)	Ushio Ordering Code	Ushio Lamp Description	Volts (V)	Beam Angle	Center Beam (cp)	Approx Lumens (lm)	Avg Life (h)	Ratings @ 120V Watts (W)	Ratings @ 120V Lumens (lm)	Ratings @ 120V Avg Life (h)
		PRO-PAR™ 38								
Ⓔ 45	1001487	45PAR38/SP10/120V	120	10°	7000	520	2900	—	—	—
Ⓔ 45	1001488	45PAR38/SP10/130V	130	10°	7000	520	2500	40	400	5000
Ⓔ 45	1001483	45PAR38/FL30/120V	120	30°	2000	520	2500	—	—	—
Ⓔ 45	1001484	45PAR38/FL30/130V	130	30°	2000	520	2500	40	400	5000
Ⓔ 45	1001489	45PAR38/WFL50/120V	120	50°	600	520	2500	—	—	—
Ⓔ 45	1001490	45PAR38/WFL50/130V	130	50°	600	520	2500	40	400	5000
Ⓔ 60	1002246	60PAR38/SP10/120V	120	10°	15000	720	2500	—	—	—
Ⓔ 60	1003191	60PAR38/SP10/130V	130	10°	15000	720	2500	53	560	5000
Ⓔ 60	1001530	60PAR38/FL30/120V	120	30°	3200	720	2500	—	—	—
Ⓔ 60	1003192	60PAR38/FL30/130V	130	30°	3200	720	2500	53	560	5000
Ⓔ 75	1003193	75PAR38/SP10/120V	120	10°	17500	1100	2500	—	—	—
Ⓔ 75	1003194	75PAR38/SP10/130V	130	10°	17500	1100	2500	53	560	5000
Ⓔ 75	1001725	75PAR38/FL30/120V	120	30°	3500	1100	2500	—	—	—
Ⓔ 75	1003195	75PAR38/FL30/130V	130	30°	3500	1100	2500	53	560	5000
Ⓔ 90	1001556	90PAR38/SP10/120V	120	10°	19500	1300	2500	—	—	—
Ⓔ 90	1001557	90PAR38/SP10/130V	130	10°	19500	1300	2500	79	1015	5000
Ⓔ 90	1001553	90PAR38/FL30/120V	120	30°	5000	1300	2500	—	—	—
Ⓔ 90	1001554	90PAR38/FL30/130V	130	30°	5000	1300	2500	79	1015	5000
Ⓔ 90	1001558	90PAR38/WFL50/120V	120	50°	1500	1300	2500	—	—	—
Ⓔ 90	1001559	90PAR38/WFL50/130V	130	50°	1500	1300	2500	79	1015	5000
Ⓔ120	1003068	120PAR38/FL30/120V	120	30°	8000	1900	2500	—	—	—

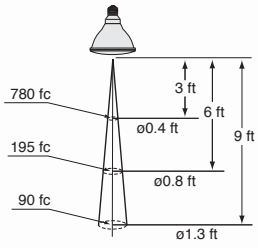
Ⓔ = This Bulb Meets US Federal Minimum Efficiency Standard

Only for use in approved Halogen fixtures
Case Quantity: 15/case

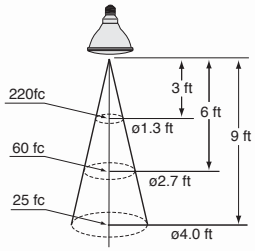
USHIO

PRO-PAR™ 38

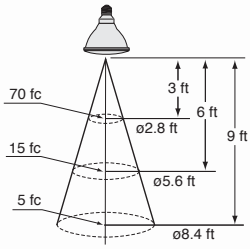
PHOTOMETRICS



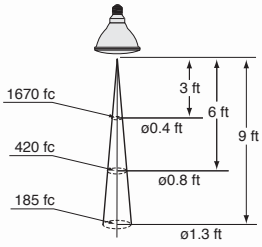
45W PAR38 SPOT 10°



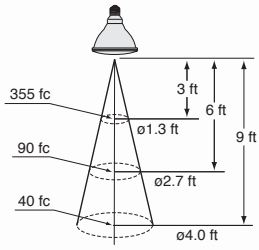
45W PAR38 FLOOD 30°



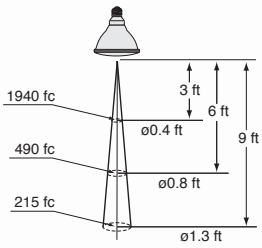
45W PAR38 WIDE FLOOD 50°



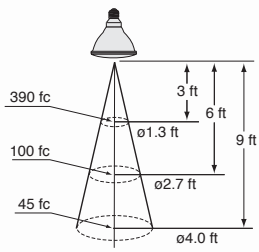
60W PAR38 SPOT 10°



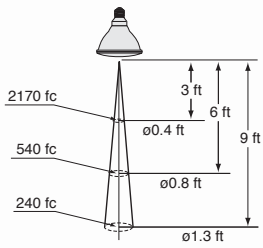
60W PAR38 FLOOD 30°



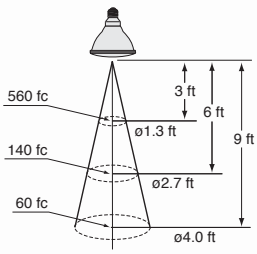
75W PAR38 SPOT 10°



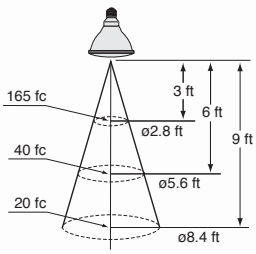
75W PAR38 FLOOD 30°



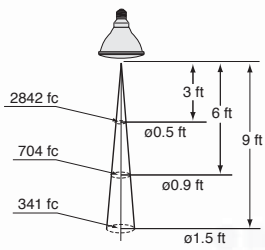
90W PAR38 SPOT 10°



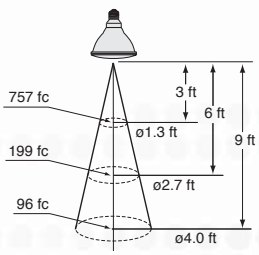
90W PAR38 FLOOD 30°



90W PAR38 WIDE FLOOD 50°



120W PAR38 SPOT 12°



120W PAR38 FLOOD 30°

HALOGEN PAR LAMPS

- DANGER! Halogen lamps operate at extremely high temperatures that can cause serious physical injuries and property damage.
- Only use Halogen lamps in Halogen approved fixtures.
- Do not use Halogen lamps in close proximity of paper, cloth or other combustible materials that can cause a fire hazard.
- Lamps are very fragile. Do not drop, crush, bend or shake them. Vibration or impact will cause filament breakage and short lamp life.
- Never touch the lamp when it is on, or soon after it has been turned off, as it is hot and may cause serious burns.
- Do not look directly at the operating lamp for any period of time; this may cause serious eye injury.
- Always turn off the electrical power before inserting, removing, or cleaning the lamp.
- Affix the lamp securely in the socket. Improper installations will cause electrical arcing, overheating and short life to lamp and socket. Replace lamp holders and sockets when necessary.
- Make sure lamps of specified wattage and voltage are only used in appropriately rated fixtures. Unspecified use will lead to short lamp life, breakage and overheating of fixture.
- Lamps should not be operated beyond the total rated voltage. Avoid the use of dimmers that may drive your lamp over its rated voltage.
- Use an external fuse when required.
- Do not allow one lamp to directly expose another. This may lead to overheating and shortened lamp life.

Distributed by:

Form No. S-PAR/R-0211: The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

MR-16 REFLECTOR LAMPS

PRO-STAR™ SERIES

LINE VOLTAGE MR-16 LAMPS FOR GENERAL LIGHTING

Pro-Star™ line voltage MR-16 lamps were designed for applications where the compact appearance of an MR-16 is desired without the requirement of a low voltage transformer. The Pro-Star™ lamps feature a "turn-in / turn-out" locking base that is designed for easy installation in compact spaces. In addition, the overall length of Pro-Star™ lamps is shorter than PAR-16 and JDR Halogen lamps making them a perfect fit for compact lighting designs.

These lamps are available in aluminum (GU10) reflectors with UV-stop front glass that protects objects from harmful ultraviolet emissions. With beam spreads of 25 degree narrow flood and 50 degree wide flood, these lamps are ideal for most indoor general lighting applications.

Available in— 50W, Narrow Flood and Wide Flood beam spreads

FEATURES & BENEFITS

- GU10 Base with Aluminized reflector
- Dimmable
- Line Voltage — No transformers needed
- UV Protected
- Compact design
- Turn-In / Turn-Out base for easy installation

APPLICATIONS

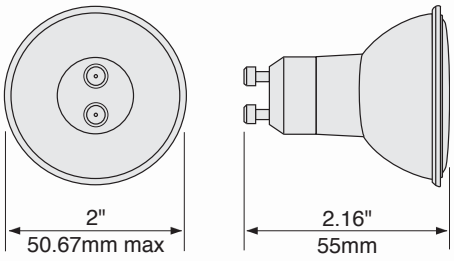
- Track Lighting
- Display Lighting
- Retail Lighting
- Museums and Galleries
- Accent Lighting

USHIO

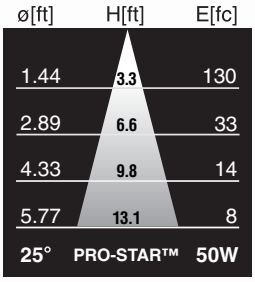
CHARACTERISTICS & SPECIFICATIONS

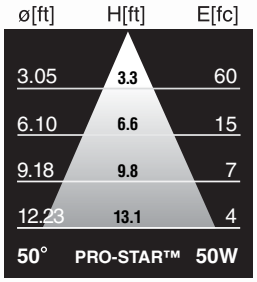
PRO-STAR™ MR-16

Aluminized Reflector



GU10





Watts (W)	USHIO Ordering Code	USHIO Lamp Description	Voltage (V)	Color Temp (K)	Beam Angle	Beam Spread	Luminous Intensity (cd)	Avg Life (h)	Base Type
50	1003301	50MR16/GU10/NFL25	120	2750	25°	Narrow Flood	1400	2500	GU10
50	1003303	50MR16/GU10/WFL50	120	2750	50°	Wide Flood	650	2500	GU10

Scan with a smartphone
to view this product online.

Distributed by:

Form No. S-MR16PROS/R-0611
The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

METAL HALIDE LAMPS

PULSESTRIKE™ SERIES

PULSE START METAL HALIDE MEDIUM & MOGUL BASE FOR GENERAL LIGHTING

USHIO's PulseStrike™ Metal Halide lamps utilize a specialized formed-body arc tube where the quartz glass is contoured to follow the natural curve of the arc stream between the electrodes. This advanced arc tube design allows for the use of a higher fill gas pressure in the arc chamber which dramatically reduces the damage to the electrodes caused by electrode evaporation. This permits an increase in life and superior lumen maintenance.

PulseStrike™ Metal Halide lamps produce higher lumens per watt, superior color uniformity, and greater energy savings. These lamps can reduce warm-up time by 50% and improve hot re-strike time by 75% when compared to standard probe-start Metal Halide lamps.

Available in—

Medium Base E26: 70W, 100W, and 150W
Mogul Base E39, EX39: 250W, 320W, 350W, and 400W

FEATURES & BENEFITS

- High efficacy — increased luminous flux
- Better color performance and consistency
- 50% faster warm up time (2 minutes vs. 4 minutes)— reduces electrode wear up to 50%
- Improved hot re-strike capability (4 minutes vs. 15 minutes)— up to 75% faster than probe-start

APPLICATIONS

- Commercial and Industrial
- Flood Lighting
- Stadium and Sports Facilities
- Downlighting
- Parking Garages / Lots
- Security
- Retail
- Retrofit / Upgrade
- Gas Stations

Distributed by:

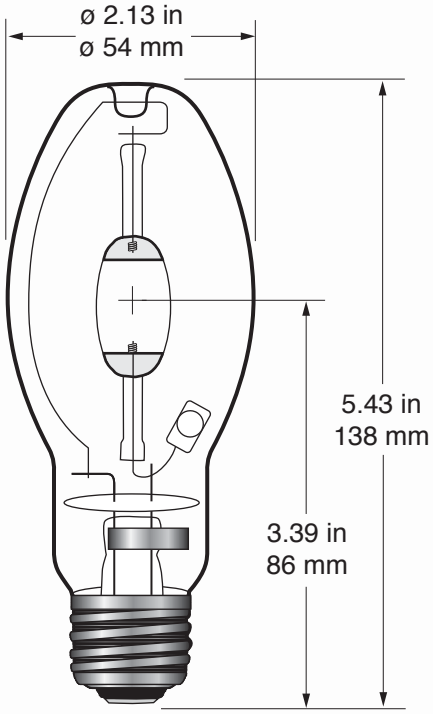
USHIO

CHARACTERISTICS & SPECIFICATIONS

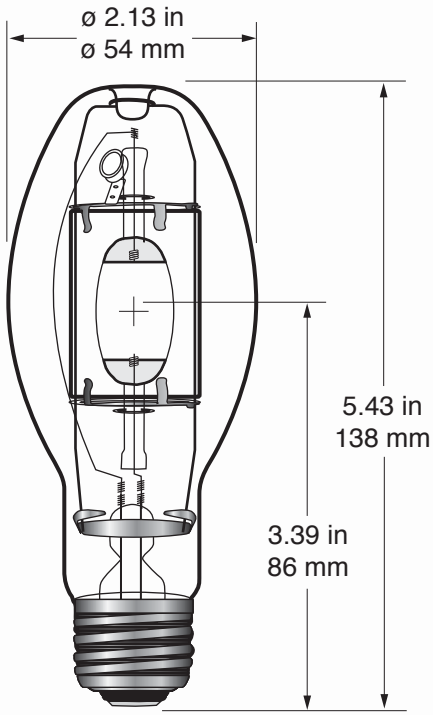
PULSESTRIKE™ METAL HALIDE

Color Rendering Index:
70W & 100W - 65 CRI
150W - 68 CRI

Medium Base:
E26 — Enclosed (/E) and Open (/O) Fixture



ED17
/E = Enclosed fixtures only



EDX17
/O = Open or Enclosed fixtures

Watts (W)	Ushio Ordering Code	Ushio Lamp Description	ANSI Ballast	Bulb Type	Color Temp (K)	Initial Lumens Vert / Horiz Burn Position	Approx Mean Lumens Vert / Horiz Burn Position	Avg Life (h)
E26 MEDIUM BASE								
70	5001342	MP70/U/MED/32/PS	M98/O	EDX17 Clear	3200	5500 / 5200	4100 / 3300	15000*
70	5001344	MH70/U/MED/40/PS	M98/E	ED17 Clear	4000	6000 / 4850	4100 / 3150	15000*
70	5001346	MP70/U/MED/40/PS	M98/O	EDX17 Clear	4000	5500 / 5150	4000 / 3550	15000*
100	5001414	MP100/U/MED/32/PS	M90/O	EDX17 Clear	3200	8800 / 8400	5700 / 5575	15000*
100	5001348	MH100/U/MED/40/PS	M90/E	ED17 Clear	4000	8500 / 8100	5300 / 5100	15000*
100	5001350	MP100/U/MED/40/PS	M90/O	EDX17 Clear	4000	8100 / 8050	4900 / 4800	15000*
150	5001354	MP150/U/MED/32/PS	M102/O	EDX17 Clear	3200	13300 / 12400	9200 / 8300	15000*
150	5001356	MH150/U/MED/40/PS	M102/E	ED17 Clear	4000	14000 / 12100	9700 / 9600	15000*
150	5001358	MP150/U/MED/40/PS	M102/O	EDX17 Clear	4000	12300 / 12200	9500 / 9400	15000*

Case Quantity: 12

Burn Position:
Medium E26 Base — Universal

Burn Cycle:
*11 hours ON, 1 hour OFF
**120 hours ON, 1 hour OFF
(Recommended shut down 15 minutes per week)

ANSI Fixture Requirement:
/E =Enclosed Fixtures Only
/O = Open or Enclosed Fixtures

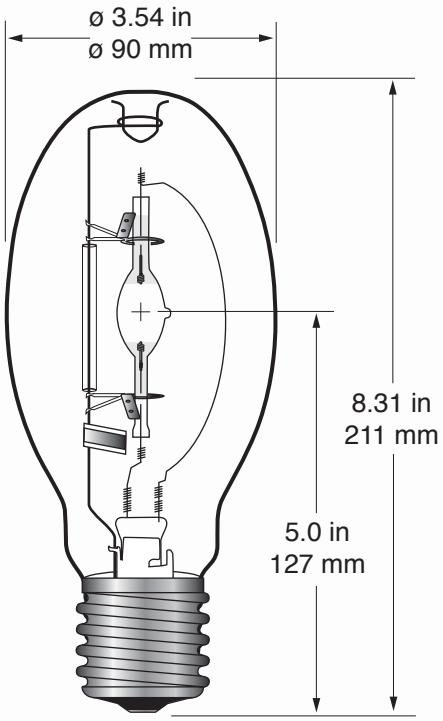
USHIO

CHARACTERISTICS & SPECIFICATIONS

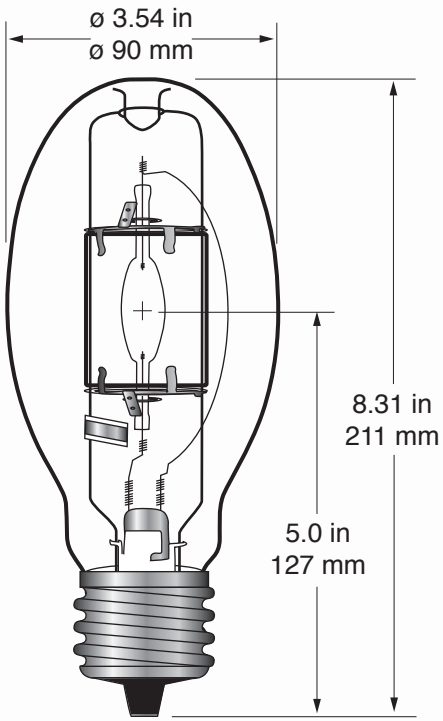
PULSESTRIKE™ METAL HALIDE

Color Rendering Index:
(4000K - 68 CRI)

Mogul Base:
E39— Enclosed Fixture (/E)
EX39— Open Fixture (/0)



ED28
/E = Enclosed fixtures only



ED28
/O = Open or Enclosed fixtures

Watts (W)	Ushio Ordering Code	Ushio Lamp Description	ANSI Ballast	Bulb Type	Color Temp (K)	Initial Lumens Vert / Horiz Burn Position	Approx Mean Lumens Vert / Horiz Burn Position	Avg Life (h)
		E39 MOGUL BASE						
250	5001360	MH250/U/MOG/40/PS	M153/E	ED28 Clear	4000	25000 / 23500	19000 / 17500	15000*/20000**
250	5001362	MP250/U/MOG/40/PS	M153/O	ED28 Clear	4000	26000 / 24500	19500 / 18200	15000*/20000**
320	5001364	MH320/U/MOG/40/PS	M154/E	ED28 Clear	4000	32500 / 31500	25500 / 25000	20000*/30000**
320	5001366	MP320/U/MOG/40/PS	M154/O	ED28 Clear	4000	32500 / 30500	23000 / 22000	20000*/30000**
350	5001368	MH350/U/MOG/40/PS	M131/E	ED28 Clear	4000	37000 / 35500	28000 / 27000	20000*/30000**
350	5001370	MP350/U/MOG/40/PS	M131/O	ED28 Clear	4000	39000 / 36500	29000 / 26500	20000*/30000**
400	5001372	MH400/U/MOG/40/PS	M155/E	ED28 Clear	4000	40000 / 39000	32000 / 30000	20000*/30000**
400	5001374	MP400/U/MOG/40/PS	M155/O	ED28 Clear	4000	42000 / 41000	30500 / 30000	20000*/30000**

Case Quantity: 12

Burn Position:
Mogul E39 & EX39 Base — Universal

Burn Cycle:
*11 hours ON, 1 hour OFF
**120 hours ON, 1 hour OFF
(Recommended shut down 15 minutes per week)

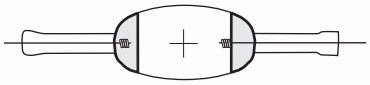
ANSI Fixture Requirement:
/E =Enclosed Fixtures Only
/O = Open or Enclosed Fixtures

USHIO

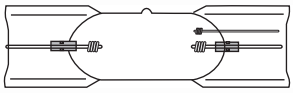
PULSESTRIKE™ TECHNOLOGY

What is the difference in Metal Halide arc tube bodies?
PulseStrike™ pulse start lamps have formed body arc tubes and require an ignitor to start the lamp. Standard Metal Halide lamps have pinched arc tubes with a probe start electrode and uses a bi-metal switch and the crest voltage to start the lamp.

- **Precise geometry tolerances**
- **Smaller mass; accelerates start up and cool down**
- **Superior lumen maintenance**
- **Envelope contour follows natural curve of arc stream**



PulseStrike™ Formed Body

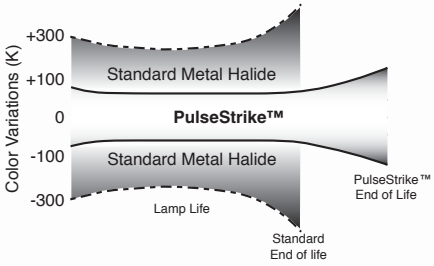


Standard Metal Halide Pinched Body (Probe Start)

- **Uses additional probe start electrode**
- **Larger cold surface area; reduces Metal Halide efficiency**
- **Standard technology, over 35 years old**

Improved Color Uniformity

The formed arc tubes of PulseStrike™ lamps are manufactured to precise geometry tolerances. Thus the temperature of the arc tube can be controlled more accurately, reducing color temperature differences from lamp to lamp and improving color maintenance over the life of the lamp.

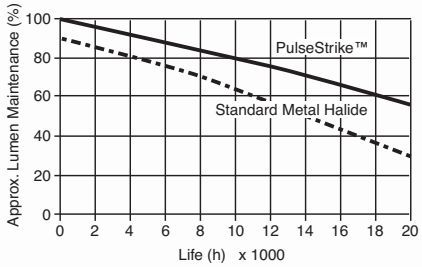


Energy Saving

The formed arc tube of PulseStrike™ lamps and the use of pulse start technology ballasts enables the PulseStrike™ lamps to produce up to 105 lm/W. Standard Metal Halide lamps begin life at a lower efficacy of approximately 80 lm/W and their light output may rapidly decrease over time.

A facility requiring fifty standard 400W standard Metal Halide lamps, can be fitted with 320 W PulseStrike™ lamps for an annual energy savings of $5,250. $105 per fixture savings @ $0.15/kWh (24 hour operation cycle).

Superior Lumen Maintenance



In the formed arc tube of PulseStrike™ lamps, the use of a pulse start ignitor and low current crest factor results in less electrode wear and thus producing superior lumen maintenance over the life of the lamp. In standard pinched body Metal Halide lamps, the probe start electrode is not in use when the lamp is burning; consequently, resulting in additional tungsten evaporation, quicker blackening of the arc tube and reduced light.

Faster Start-up and Re-strike Time

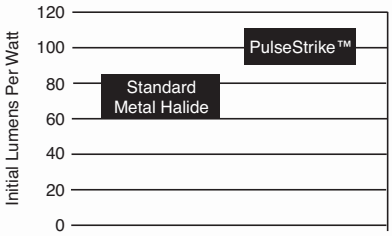
The formed arc tube of PulseStrike™ lamps and the use of a high voltage ignitor, enables the Metal Halide gases to be broken up faster (up to 50%), allowing a higher gas fill pressure. The formed arc tube design furthermore means less mass that has to be heated, thus resulting in a faster start up time. This also ensures quicker cool-down time, allowing the lamp to be restruck faster.

Longer Life

PulseStrike™ lamps have a long rated life, and maintain high light output over the life of the lamp. This enables the user to replace lamps less, thereby saving on lamp and lamp change-out costs. Standard Metal Halide lamps have long rated lamp life; however, due to the lumen output drop over lifetime, they become inefficient very quickly.

Higher Lumen Per Watt Efficacy

PulseStrike™ lamps are 20% more effective at the beginning of lamp life, boasting up to 160 lm/W and approximately 40% more efficient over the life of the lamp. This gives a superior mean lumen package. Standard Metal Halide lamps have an efficacy of approximately 80 lm/W. This light output rapidly decreases over time.



Better Cold Starting

The formed arc tube of PulseStrike™ lamps and the use of a high voltage ignitor, again enables the higher fill pressure Metal Halide gases to be broken up faster. This enables the use of these lamps in very cold areas as low as -30^0 C, cold storage facilities and freezer warehouses. Standard Metal Halide lamps take more than 6 minutes from start up to full lumen output and in very cold conditions, they may not start at all.

Scan with a smartphone to view this product online.

Hg LAMP CONTAINS MERCURY
Manage in Accord with Disposal Laws
See: www.lamprecycle.org or 1-800-895-8842

R - NON SELF EXTINGUISHING LAMP
WARNING: This lamp can cause serious skin burn and eye inflammation from shortwave ultraviolet radiation if outer envelope of the lamp is broken or punctured. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used. Lamps that will automatically extinguish when the outer envelope is broken or punctured are commercially available. Complies with the USA Federal Standard 21 CFR 1040.30 and Canada Standard SOR/80-381.

Form No. S-PSMH/R-0911: The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

COMPACT FILAMENT LAMPS

QXL™ SERIES
FOR ENTERTAINMENT LIGHTING

For ETC Fixture:
SOURCE FOUR™ REVOLUTION™

USHIO's QXL™ (Quick eXchange Lamp) Halogen lamp, was designed in conjunction with ETC's new Source Four™ Revolution™ automated spotlight. The QXL™ utilizes the proven performance characteristics of the 750 watt HPL with increased lumen output.

The patented QXL™ base is revolutionary in that it allows the user to quickly change the lamp without opening the fixture. This feature eliminates any issues with lamp alignment and optical settings.

Because overheating is a common adversary with Halogen lamps, USHIO has developed new Heat-Shield™ technology that prevents seal failure due to high thermal radiation generated from the Halogen capsule. This ensures that 300 rated life hours will be achieved.

ETC Source Four™
Revolution™

FEATURES & BENEFITS

- High output of 22,950 lumens
- Proven compact four filament design
- Unique "Quick eXchange" lamp base (patents pending)
- New Heat-Shield™ technology for higher heat tolerance

LAMP SPECIFICATIONS

Wattage:	750W
Voltage:	77V
Average Life:	300 hours
Color Temp:	3250K

The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

MR-16 REFLECTOR LAMPS

SOFTLINE™ SERIES

MR-16 LAMPS with FROSTED FRONT GLASS FOR GENERAL LIGHTING

USHIO Softline™ series of MR-16 lamps feature a frosted front glass cover. The frosted front glass cover reduces glare and evenly distributes white Halogen light without dark spots or striations.

The UV protected Halogen capsule is computer aligned inside a Titanium Oxide coated reflector. The proper alignment of the filament and the reflector ensures a precise beam pattern. The hard Titanium Oxide surface provides consistent color throughout the life of the lamp.

Available in: 20W, 35W, 50W and 75W

FEATURES & BENEFITS

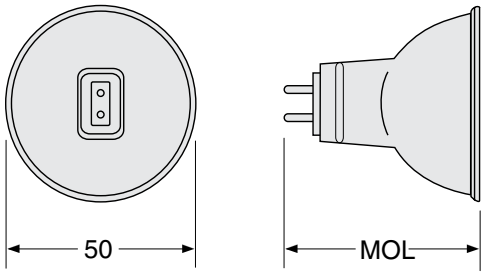
- Reduces glare
- Creates soft beam of white Halogen light
- Integrated frosted cover glass
- Consistent color
- 4000 hours average life
- Dimmable
- UV protected
- Axial filament

APPLICATIONS

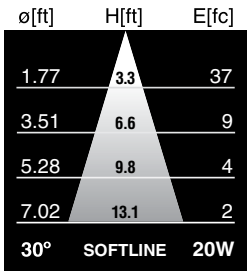
- Accent Lighting
- Museums and Galleries
- Decorative Lighting
- Restaurants
- Track Lighting
- Display Lighting

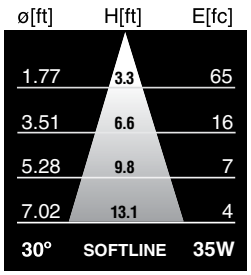
USHIO

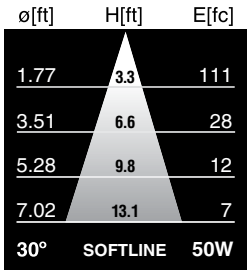
SOFTLINE™ MR-16

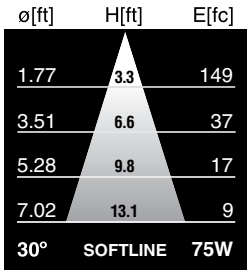


GU5.3









All dimensions are in millimeters

Watts (W)	Ushio Ordering Code	Ushio Lamp Code	Voltage (V)	Dimension MOL (mm)	Color Temp (K)	Beam Angle	Luminous Intensity (cd)	Avg Life (h)
20	1003284	JR12V-20W/FL30/FG/SFT	12	45.2	2950	30°	400	4000
35	1003285	JR12V-35W/FL30/FG/SFT	12	45.2	2950	30°	700	4000
50	1003286	JR12V-50W/FL30/FG/SFT	12	45.2	2950	30°	1200	4000
75	1003287	JR12V-75W/FL30/FG/SFT	12	45.2	2950	30°	1600	3500

LAMP SOCKET

The model C-33U socket is rated up to 24V-7A for use with all low voltage USHIO GU5.3 based MR-16 lamps. The metal clips secure the lamp firmly into the socket. Use Ordering Code 1002142

Softline™ lamps are manufactured under ISO 9001 guidelines ensuring quality and security for the purchaser

Distributed by:

The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

USHIO

HALOGEN PAR LAMPS

SOFTLINE™ PAR SERIES

FROSTED SOFTLINE™ PAR LAMPS FOR GENERAL LIGHTING

USHIO's Softline™ series of Halogen reflector lamps feature a frosted lens that reduces glare and evenly distributes white Halogen light without dark spots and striations.

USHIO's Softline™ Halogen PAR lamps combine uniquely designed fluted reflectors with a multi-layered coating process for improved optics and beam control. The filament mount utilizes a center support providing additional protection against failures due to minor vibrations.

Available in 90W PAR lamps.

FEATURES & BENEFITS

- Reduces Glare
- Creates soft beam of white Halogen light
- Inside frosted front lens
- Improved optics and color consistency
- Dimmable
- UV Protected

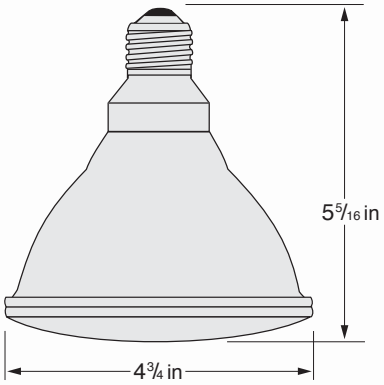
APPLICATIONS

- Accent Lighting
- Museums and Galleries
- Decorative Lighting
- Restaurants
- Track Lighting
- Display Lighting

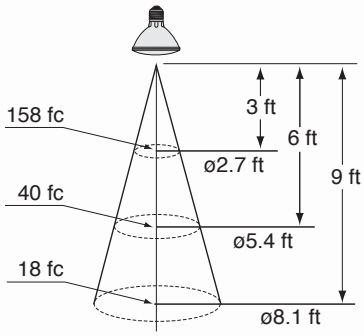
USHIO

CHARACTERISTICS & SPECIFICATIONS

SOFTLINE™ PAR



PAR-38



90W PAR38 FLOOD 40°

Watts (W)	Ushio Ordering Code	Ushio Lamp Description	Volts (V)	Beam Angle	Center Beam (cp)	Approx Lumens	Avg Life (h)	Ratings @ 120V Watts (W)	Ratings @ 120V Lumen (lm)	Ratings @ 120V Avg Life (h)
90	1003506	90PAR38/FL/130V/SFT	130	40°	1700	1300	2500	79	1015	5000

Scan with a smartphone to view this product online.

Form No. S-SFTLPAR/R-1211: The specifications on this sheet supercede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

Distributed by:

Sōlarc® LIGHT

10 WATT LAMP & BALLAST

The 10W Sōlarc® lamps are specifically designed for battery-powered applications. Some of these lamps have industry-standard aluminum reflectors coated for maximum reflectivity in visible applications. The following specifications illustrate reflectorized lamp performance, except for the M10N001 which is a single-ended lamp (SEL).

Performance			
Technical Specifications @ 25°C and 10-watt rated power	**M10P001**	**M10P002**	**M10N001**
Initial Luminous Flux	450 (Face lm)		500 (Total lm)
Lumen Maintenance @ 350 hours	Approx 85%		90%
Lumen Maintenance @ 700 hours	Approx 75%		85%
Lumen Maintenance @ 1000 hours	Approx 70%		80%
Correlated Color Temperature	6,000K		7,500K
Chromaticity (x, y)	0.309, 0.332		0.297, 0.323
Beam Divergence	6°	13°	–
Center Beam Candlepower	13,000	4,100	–
Rated Median Life @ 1 hour on/15 minutes off	1,000 Hours		
Warm-up Time to >90% of Rated Output	10 Seconds		
Restart Time to >90% of Rated Output	5 Seconds		
Flicker (peak to peak)	< 5%		

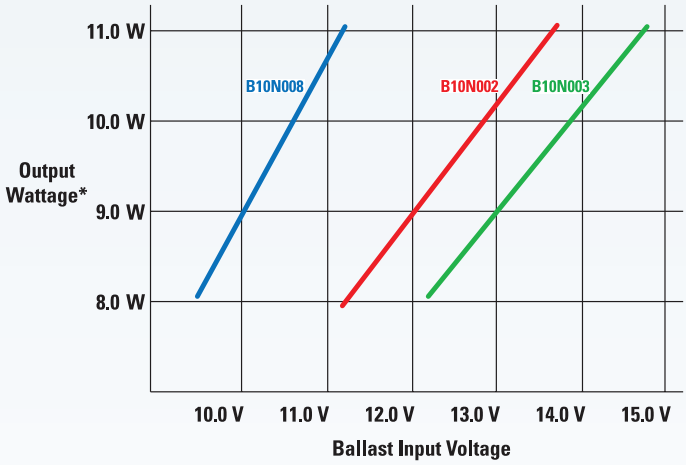
Application Information

Orientation: Lamp performance is specified in horizontal orientation. Lamp may be operated in other orientations although some variation in performance will occur.

Cooling: Lamp performance measured under laboratory conditions. Actual performance may vary depending on application. Special attention should be paid to the lamp's operating thermal environment.

USHIO

10 Watt Ballast—Nonregulated			
Technical Specifications @ 25°C Ambient values are typical unless otherwise noted.	**B10N002**	**B10N003**	**B10N008**
Application	8 Alkaline 10 NiCAD or NiMH	11 Cell NiCAD or NiMH	8 Cell NiCAD or NiMH
Input Voltage @ 10 Watts	12.8 V	13.8 V	10.4 V
Max. Safe Continuous Operating Voltage	13.6 V	15.0 V	11.0 V
Absolute Max. Instantaneous Voltage	14.2 V	15.5 V	11.8 V
Identifying Markings (Lead Colors) -/+	Black/Red	Black/Blue	Black/Yellow
Absolute Max. Case Temperature	90°C		
Reverse Polarity w/o Protection	<1 Sec		
Efficiency	70%–75%		
Shut-Down Time	3 Seconds		
Ballast Reset Time After Shutdown	3 Seconds		
Nominal Starting Voltage	6.0 kV		



Notes

1. It is recommended that all applications be properly fused with a 2 A fuse.
2. Heat sinking the ballast will provide optimal efficiency and operation.
3. For applications where the ballast is located 6 inches or further from the power source it is important that its wires be continuously twisted to prevent voltage spikes. Additional filtering may be needed if the distance to the power source is longer than 6 inches or the source has high impedance characteristics.

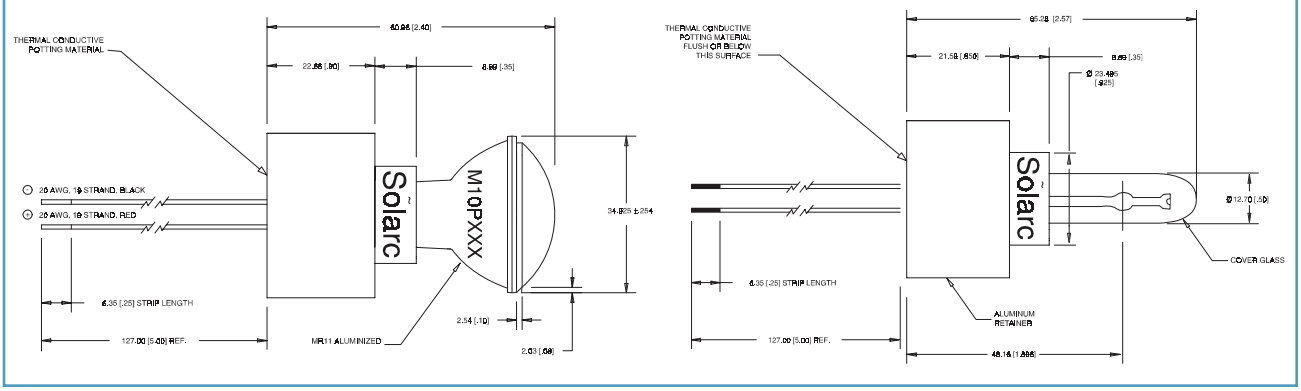
**Output wattage measured after lamp/ballast reach steady state operating temperatures.*

IMPORTANT! Running the lamp above 11 watts or below 8 watts for an extended period is not recommended.

Physical Description

Lamp Base . . . . . Special Bipin
Reflector Coating . . . . . Aluminum
Reflector, Parabolic MR11
Weight . . . . . 65 Grams

10 Watt Lamp—All measurements in mm [inches]



Sōlarc® LIGHT

B19R001, B22R001R, B25R001R
BALLASTS

USHIO's ballasts are designed to operate with USHIO Sōlarc® lamp products only. The ballast consists of an internal regulator that delivers constant power to the Sōlarc® lamp. This design is ideally suited for both battery and AC power supply driven applications where both small size and high efficiency are needed.

USHIO's ballasts are self-contained systems with all the necessary starting, regulating and safety features to meet any needs from commercial to medical applications.

Performance Specifications

Electrical		B19R001	B22R001R	B25R001R
Input Power		Specifications, unless otherwise indicated, are nominal at or near 25°C.		
Turn On Voltage[1] (volts DC)		9.8		
Turn Off Voltage[1] (volts DC)		9.2		
Maximum Voltage (volts DC)		16		
Steady State Current[2] (DC @12V)		2.0A	2.3A	2.6A
Environment				
Operating Temperature (°C)		0 to 70 (forced convection cooling recommended)		
Storage Temperature (°C)		-40 to 105		
Pinouts	Connector			
Input Power (Molex 41761 series)	J101	Pin 1 = "+" input power Pin 2 = "-" input power		
Output Power	P1 P2	Anode, white wire on ballast connector Cathode, black wire on ballast connector		

[1] Turn on and turn off specifications are a function of input wiring resistance. The specifications shown are for the condition where the voltage at the pins of J101 are regulated using the remote sense leads of a power supply.

[2] Steady state current flow after lamp warm up.

USHIO

Mechanical

Figure 1. Assembly dimensions and connector locations. Dimension units are mm (inches).

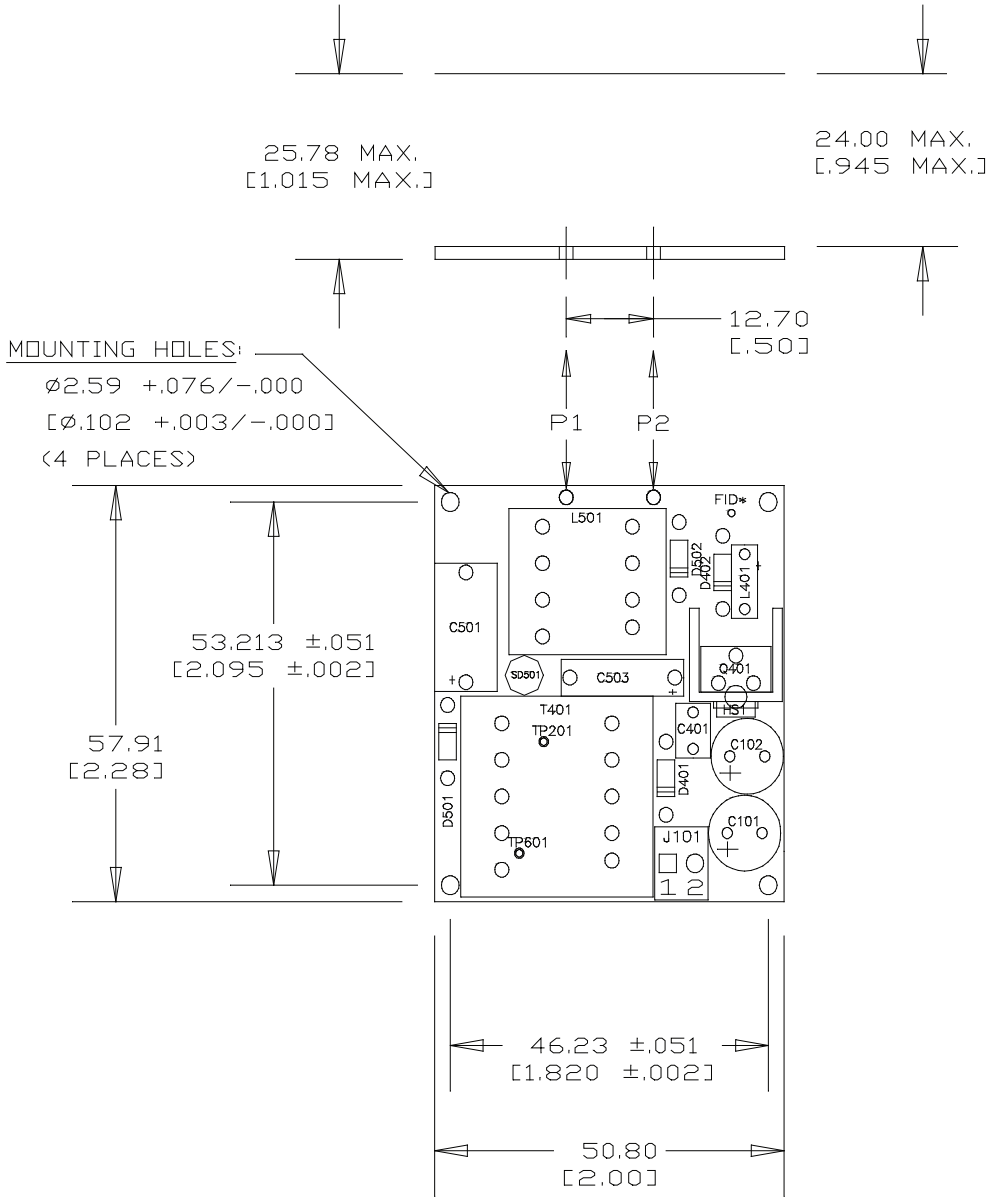
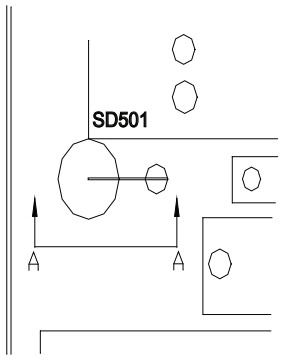
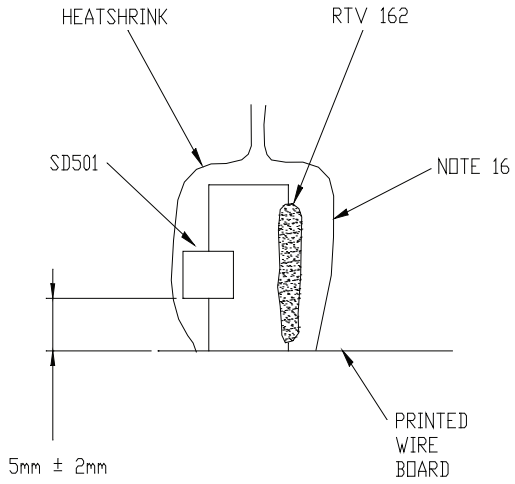


Figure 2



VIEW A



VIEW A-A

Don't allow the metal end of the can, bottom end, to make contact with the upper lead when it is formed and inserted into the PWB.

Don't allow the leads or the metal ends of the can to come into contact with any adjacent parts.

Wiring and Preparation Instructions

1) Mount the ballast as desired using the corner holes provided on the PWB or some other acceptable means.

2) Construct an input power connector assembly suitable to your application. Slide the connector housing portion of the assembly onto the J101 connector until the mating halves lock in place. Observe polarity in wiring as specified in the pinouts section in the performance specifications table. Locate J101 on the bottom edge of the assembly view in Figure 1.

3) Solder the Cathode lead (black wire) of the lamp connector assembly to P2. Solder the Anode lead (white wire) of the lamp connector assembly to P1. Locate P1 and P2 on the top edge of the assembly view in Figure 1. Failure to observe the lamp wiring polarity will degrade important performance features of the lamp.

- Shortening the connector assembly leads is permissible.
- Route the anode lead to minimize stray capacitance to it.
- **High voltage pulses are present on P1 during ignition.**
- **Using the provided lamp connector assures proper operation.**

4) Mount the lamp suitably for your evaluation purposes. Keep in mind that mounting techniques affect operating temperature and lamp performance. Lamp life is inversely proportional to operating temperature.

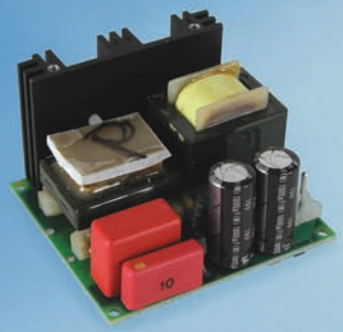
5) Connect the lamp and ballast using the appropriate connector assembly.

6) A small amount of air flow is recommended for cooling the ballast.

Safety

These Sōlarc® lamp ballasts have been designed to meet worldwide safety regulations when applied correctly. Since it is a secondary device, it is part of the end product's approval. It may also conform to any EMC directives when the ballast and the lamp are enclosed in a metal or metal-coated enclosure. Proper interlocking for lamp replacement is always highly recommended. There is a risk of electric shock when using the ballast without proper precautions.

Sōlarc LIGHT



B50R004R BALLAST

USHIO America's ballast products are designed to operate with USHIO America Sōlarc® lamp products only. The ballast consists of an internal regulator that delivers constant power to the Sōlarc lamp. This design is ideally suited for both battery and AC power supply-driven applications where both small size and high efficiency are needed. The new wattage setting feature allows you to select your lamp wattage within a 10W range to achieve a 20% light output difference. The ballast is a self-contained system with all the necessary starting, regulating and safety features to meet any application, from commercial to medical.

Performance Specifications

Electrical (all measurements are at 25°C)

Absolute Maximum Input Voltage	**16.0 VDC**
Minimum Safe Input Voltage Range	**11.0 VDC**
Operating Input Voltage Range	12.0 VDC to 15.0 VDC
Input Current Range	5.6 A @ 12.0 VDC, 4.4 A @ 15.0 VDC
Lamp Run-Up (Cold)	2.0 A/sec
Nominal Lamp Voltage	55V ± 6V
Inrush Current	~15 A < 100 µsec
Time to Shut Down	3.0 sec nominal
Ignition Voltage	~9 kV Peak
Output Wattage	Switchable in 3 increments: 50, 55, 60W*
Efficiency	~78% @ 15.0 VDC and 25°C

Environmental

Storage Temperature Range	-40°C to +105°C
Operating Temperature Range	0°C to +70°C
Air Flow Requirements	10 cfm @ 25°C ambient

*The B50R004R is factory preset at 50-watts operation. If other wattage settings are desired, refer to user-selectable "Power Setting" diagram on the back of this datasheet. Consult the factory for technical assistance per lamp and ballast. Cooling, lamp life and output performance will change depending on ballast wattage setting.

Application Notes

Increase airflow requirements by 1 cfm for every 2°C rise above 25°C. Do not allow the temperature of the MOSFET attached to the heat sink to rise above 90°C. Additional heat sinking is possible by screwing more thermally conducting material to the top of the heat sink. Use a #2 screw and thermal compound to ensure proper conduction.

USHIO

Mounting

Mount the ballast using the four holes in the corners with a #2 screw. The heat sink should not be used for mounting because it is electrically floating. Since there is high voltage on the board, spacing of 6.35mm [0.25 inches] on all sides is required or appropriate insulating material must be used.

Safety

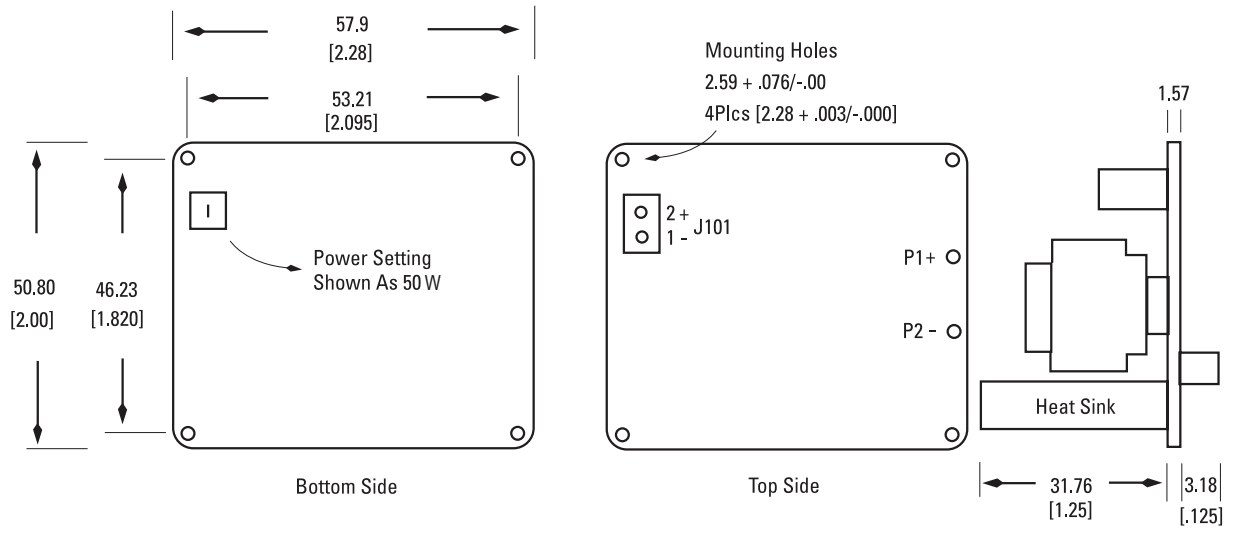
This ballast, as well as all others produced by USHIO America for the Sōlarc arc lamp, has been designed to pass commercial and medical safety regulations world-wide when applied correctly. Since it is a secondary device, it is part of the end product's approval. It also may conform to any EMC directives when the ballast and the lamp are enclosed in a metal or metal-coated enclosure. Proper interlocking for lamp replacement is always recommended. There is a risk of electric shock when using the ballast without proper precautions.

Connections

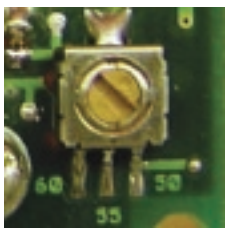
Input Power . . . . . Molex Part Number 09-05-1021 – J101 pin 2: +
J101 pin 1: –

Lamp Connection . . . . . P1 + Soldered High-Voltage Wires
P2 – Soldered High-Voltage Wires

Mechanical (All dimensions are in mm [inches].)



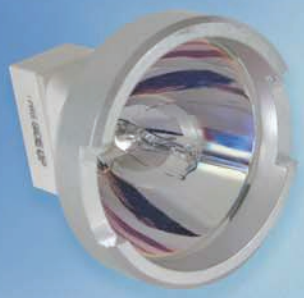
Power Settings—User Selectable



Factory preset at 50W operation.

Set switch for discrete wattage settings (50, 55, 60W) as shown here.

Sōlarc® LIGHT



ELLIPTICAL REFLECTORS

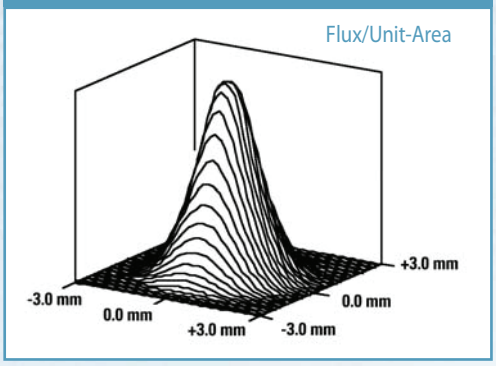
The Short Arc Gap

USHIO's Sōlarc® single-ended lamps allow the equipment designer to capitalize on the lamp's unique short arc length. At 1.27mm, with a peak luminance at the cathode, the lamp begins to approximate a point source. Coupled with carefully designed lenses or reflectors with maximum light capture and the appropriate focus, the lamp can deliver high-intensity light to tightly controlled or divergent beam applications. The figure below shows the luminous intensity distribution of the arc. The two sources of peak intensity lie near the electrode tips.

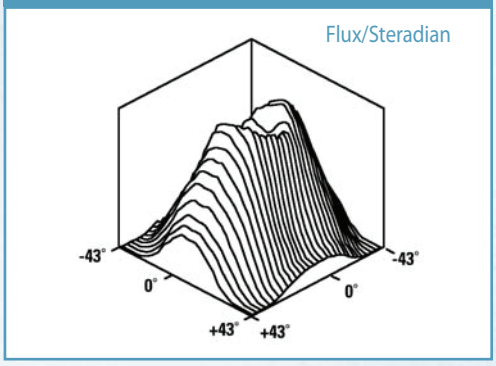
Highest Efficacy

Metal halide lamps are inherently very efficient, providing two to three times the efficacy of either halogen or xenon lamps. Optimizing the optical system using the short arc can provide an efficiency increase in many applications, allowing the Sōlarc lamp to deliver as much light as a halogen lamp with four to five times more wattage. High efficacy plus the resultant decreased demand for power allow the equipment designer to develop miniature, lighter weight, portable and even battery-powered product configurations.

Intensity Distribution



Angular Distribution



Bright White Light

Sōlarc lamps inherently exhibit a correlated color temperature comparable to the sun of 5,000K–7,000K. Halogen lamps normally operate in the 3,000°K–3,200°K range and vacuum incandescent lamps in the 2,600K–2,900K range. In visible terms, the lower color temperature dictates more red or yellow in the light. The higher color temperature enables realistic visualization of color rendering and contrast. While it is possible to operate halogen lamps up to 4,300K by the use of filters, it is at the expense of severely reducing the lamp's light output and life. The daylight color temperature of the Sōlarc lamp produces a whiter, "cooler" light, which reproduces the full range of colors. The output is color balanced, making it ideal for use with CCD video cameras.

USHIO

Excellent Light Maintenance

Unlike many metal halide lamps, Sōlarc lamps maintain much of their intensity and color balance throughout their life. In applications requiring white light, the life of the Sōlarc lamp could be many times that of a competing halogen lamp. Typically our lamps will maintain 75% of their initial intensity. Shifts in X and Y chromaticity values are typically less than 1.5%.

Lamp life is defined as a rated median life with a duty cycle of one hour on and 15 minutes off for 19, 22 and 25W lamps. The median life is the time at which 50% of the lamps are still operational. An application requiring a duty cycle with a longer “on” time for each start will extend the life, and shorter “on” times will reduce lamp life. The predominant symptom of end of life will be failure of the lamp to start.

The Spectrum

A typical spectral distribution of reflectorized lamps is illustrated on pages 3 and 6. In general, the distribution is optimized for the visible range. The dichroic coating of the reflector reduces the projected infrared, but lamps can be manufactured which are uniquely rich in the mid and far infrared.

Additional Cooling

Sōlarc lamps operate at relatively high temperatures and require adequate cooling. The reflectorized lamps are designed to let the heat pass through the reflector, simplifying the mechanical/thermal design. Ushio America can offer a test lamp with embedded thermocouples to evaluate the cooling design of your application.

Accessories

Sōlarc lamps require a ballast to ignite and sustain operation. The ballast model numbers listed in the tables on pages 3 and 6 are specifically designed to operate Ushio America’s patented arc lamp technology. A special connector, C18A003, is required to connect the lamp and ballast. This connector assembly includes a polarized mating connector with 457 mm of silicone-jacketed wire rated for high-voltage pulses.

Operating Characteristics

Start/Restart: Igniting the lamp requires short high-voltage pulses provided by the Ushio America ballast. The lamp will require some time, generally less than 50 seconds, to reach 90% of its light output. Color temperature will vary during start-up.

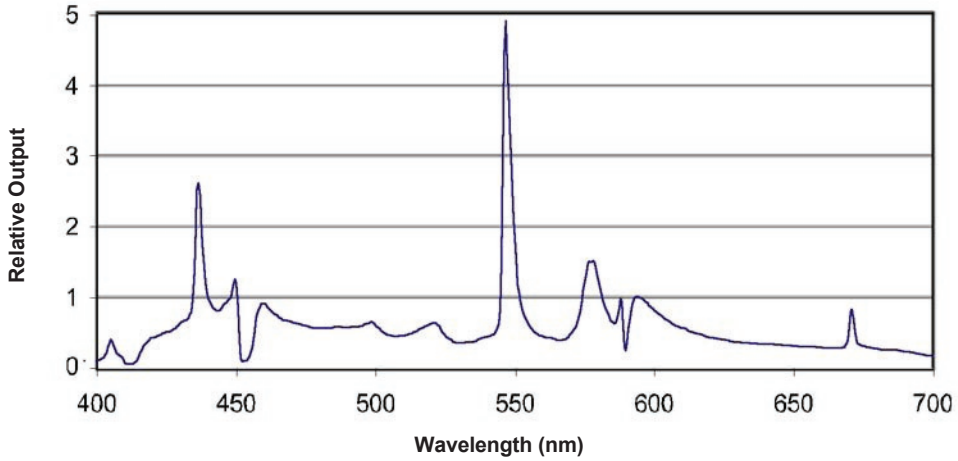
Orientation and Cooling

The lamp data provided was characterized in the recommended horizontal operating position. The lamp may be operated in other mounting orientations but performance may vary significantly. To maximize lamp life, the anode and cathode seal areas must be maintained at 200°C to 285°C and 100°C to 150°C, respectively.

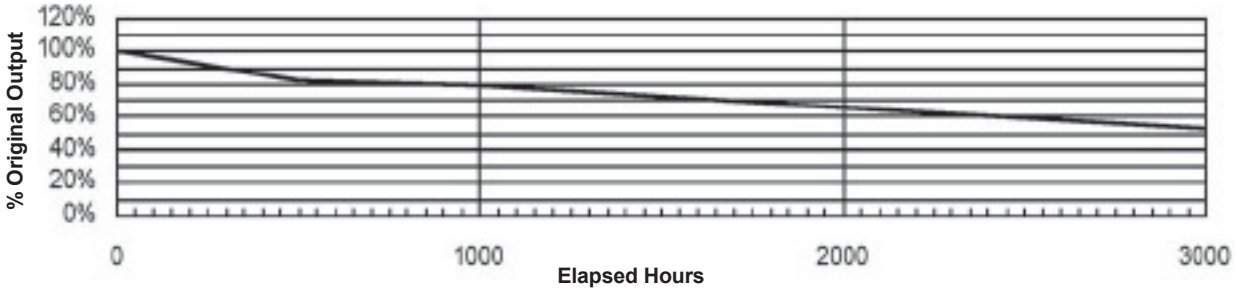
Sōlarc® MR-16 Elliptical Lamp Performance Specifications

LAMP P/N	M50E014/M50E012	M50E021/AL-5060
Wattage	50W	50W
Performance @ Rated Power: Luminous Flux		
Lumens Through a 10 mm Aperture	1,300	2,500
Lumens Through a 8 mm Aperture	1,300	–
Lumens Through a 6 mm Aperture	–	2,000
Lumens Through a 4 mm Aperture	–	1,250
Lumens Through a 2 mm Aperture	–	400
Correlated Color Temperature (K)	6,500	5,700
Chromaticity (CIX, CIY)	0.308, 0.314	0.33, 0.37
Lamp Life (Hours)	2,500	
Lamp Maintenance and Spectrum	Refer to charts below	
Warm-Up Time to 90% Output	40 Seconds	
Restart Time to 90% Output	60 Seconds	
Reflectorized Lamp Application Information		**MR16**
Numerical Aperture	NA–0.42	NA–0.69
Spot Size @ Focal Plane F2	10 mm @50% Intensity	6 mm @50% Intensity
F2 Distance from Rim	47.2 mm / 38.0 mm	23.8 mm / 18.6 mm
Ballast Requirements		
Regulated Ballast P/N	B50R004R	
Input Voltage (VDC)	12.0–15.0	
Steady State Current (Amps)	5.6 @ 12 VDC	

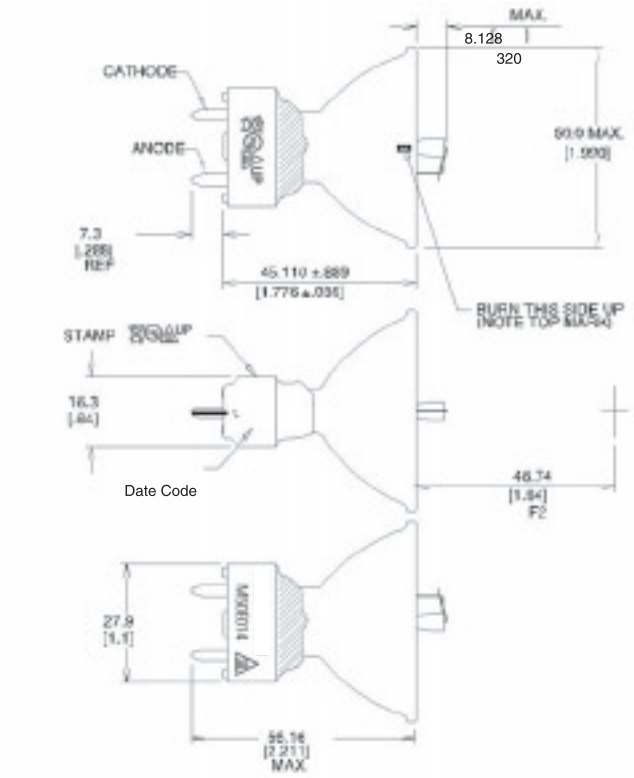
50W Typical Spectral Output (Reference)



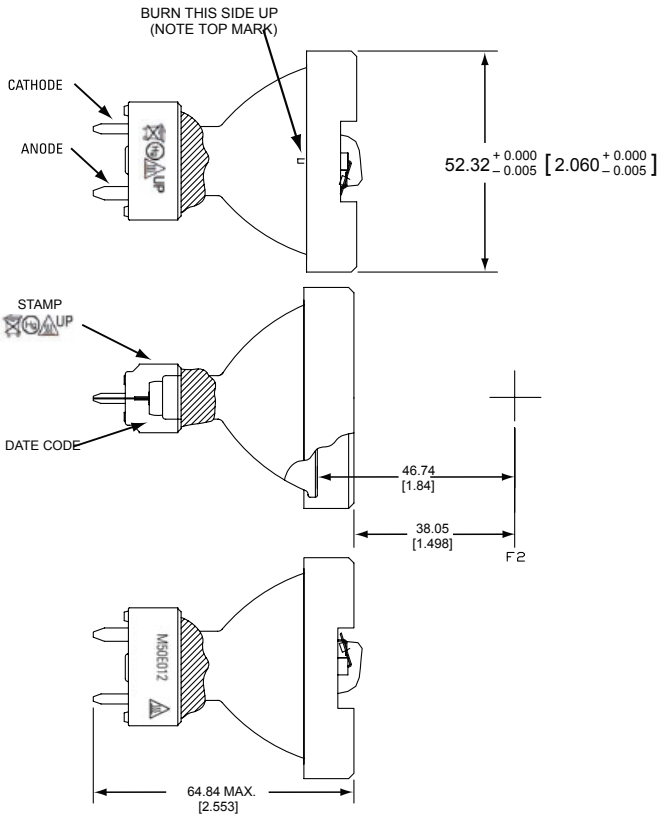
Typical Light Maintenance–50W Lamp



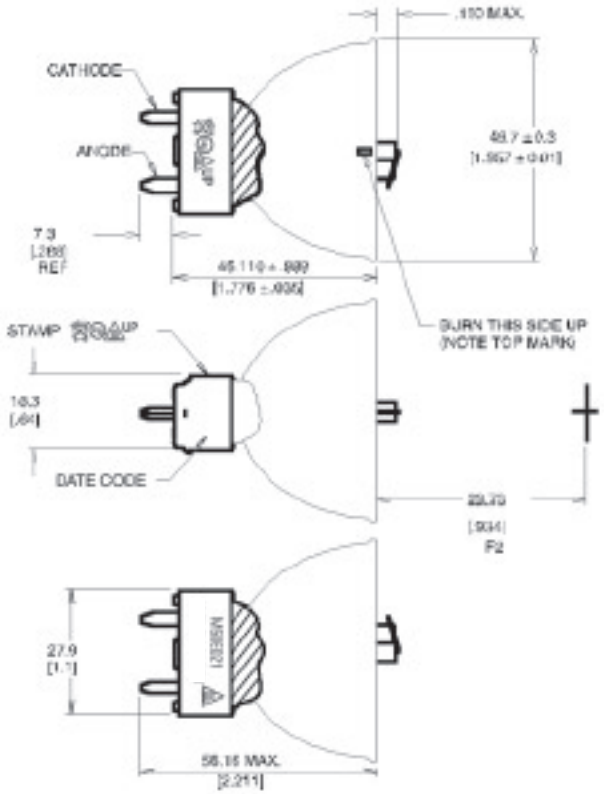
M50E014 (Measurements are in mm [inches].)



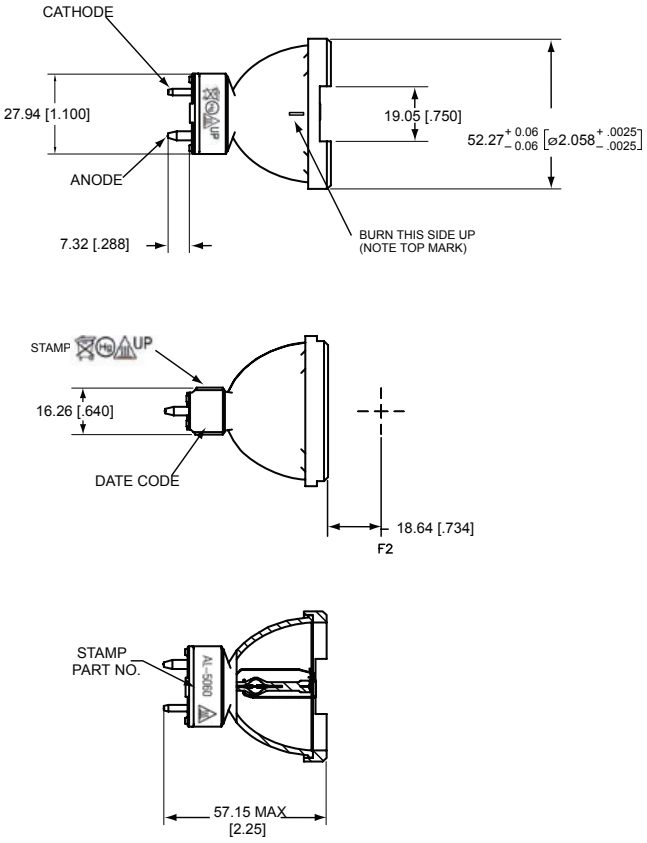
M50E012 (Measurements are in mm [inches].)



M50E021 (Measurements are in mm [inches].)



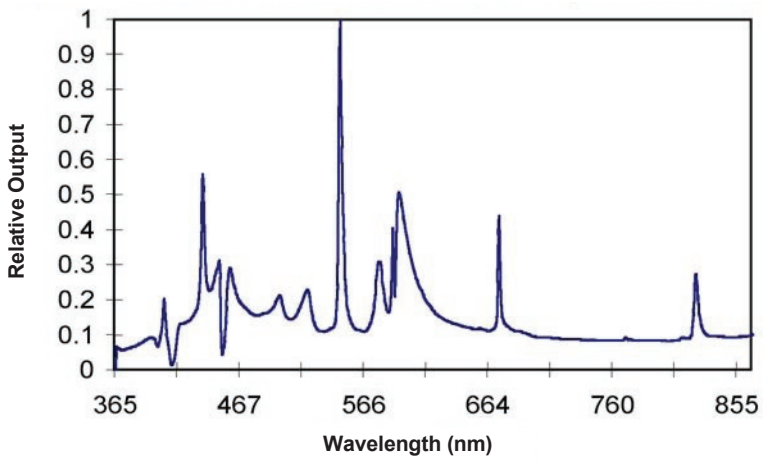
AL50-60 (Measurements are in mm [inches].)



Sõlarc® MR-11 Elliptical Lamp Performance Specifications

Wattage	19 Watts	22 Watts	25 Watts
Performance @ Rated Power: Luminous Flux			
Lumens Through a 4 mm Aperture	560	620	720
Lumens Through a 2 mm Aperture	200	260	350
Correlated Color Temperature (K)	6,900	6,200	5,200
Chromaticity (CIX, CIY)	0.32, 0.31	0.33, 0.32	0.33, 0.34
Lamp Life (Hours)	1,100	750	350
Lamp Maintenance and Spectrum	Refer to charts below		
Warm-Up Time to 90% Output	20 seconds		
Restart Time to 90% Output	30 seconds		
Reflectorized Lamp Application Information	**MR11**		
Numerical Aperture	NA–0.67		
Spot Size @ Focal Plane F2	2 mm @ 50% Intensity		
F2 Distance from Rim	14.7 mm		
Ballast Requirements	**Refer to Ballast Datasheet LSL018**		
Regulated Ballast P/N	B19R001	B22R001R	B25R001R
Input Voltage (VDC)	9.8	9.8–15.0	9.8–15.0
Steady State Current (Amps)	2.0	2.3	2.6

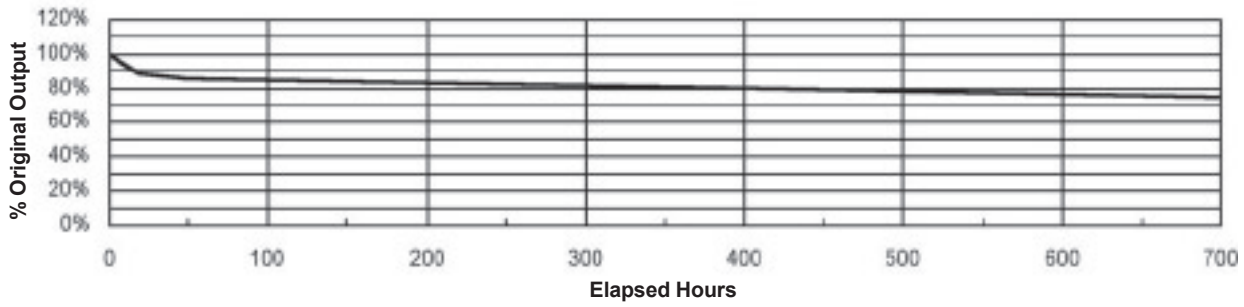
21W Typical Spectral Output (Reference)



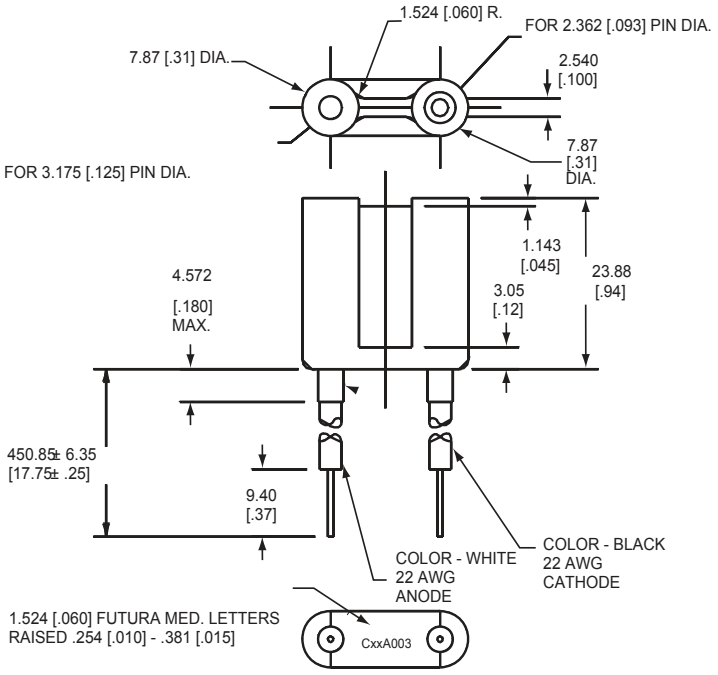
Click below to order

Interlight Specialty Bulbs
1-800-743-0005
www.interlight.biz

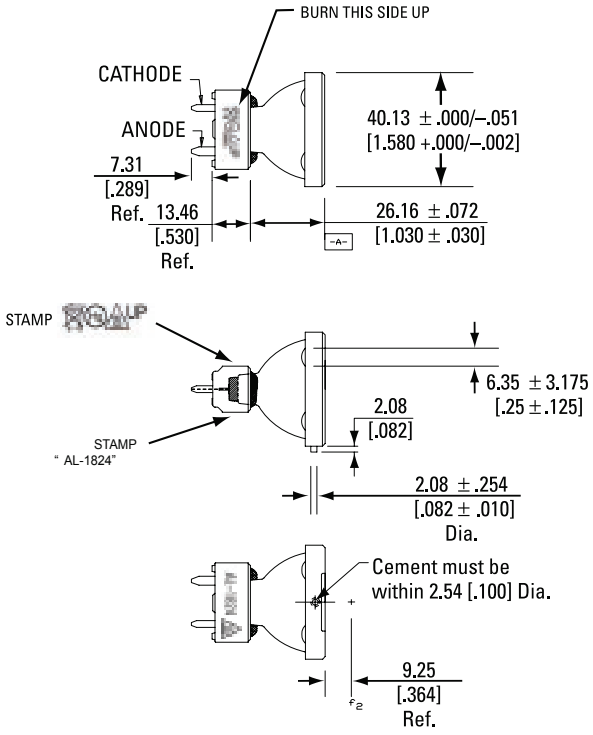
Typical Light Maintenance—21W Lamp



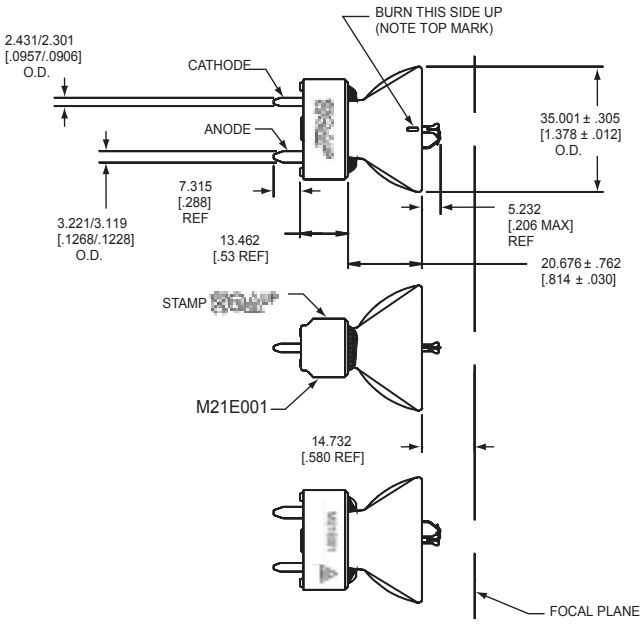
C18A003 Connector Assembly (All dimensions in mm [inches])



AL-1824



M21E001



FIBER OPTIC ILLUMINATORS

Sōlarc® Arc lamps bring bright, white light into tight spaces. Our light engines and modules enable applications to deliver up to five times the brightness of halogen—with a whiter color temperature. Sōlarc® technology is ideally suited for medical applications, as well as those found in more rugged, industrial environments.

USHIO offers a complete line of fiber optic illuminators and illuminator components. Included in this brochure are product images, a comparison graph and performance specifications.

The Sōlarc® line offers wattages ranging from 24W to 60W, with corresponding outputs from 200 to 1200 lumens. Products LB24 (24W) and LB50IND (50W) are designed for industrial use. All Sōlarc® products use Sōlarc® light sources.

Offering the flexibility of battery or AC power, Sōlarc® lamps have significantly longer lives than their halogen counterparts, and can be integrated into small, lightweight, yet durable products. Finally, the cost of use is noticeably less than with other illumination systems, further adding to customer satisfaction—and your profitability.

LIGHT BOXES

USHIO's Fiber Optic Illuminators exhibit superior performance, lamp life and, most importantly, the end user's cost of ownership. If the cost of light is one of the primary factors motivating key purchase decisions, then look no further than USHIO. Below is our comprehensive OEM product line of fiber optic illuminators for either medical or industrial applications. See the Performance Specification table on page 2.

LIGHT MODULES AND LIGHT ENGINES

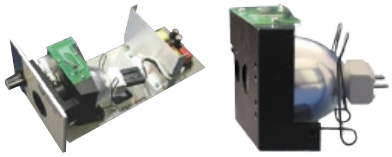
USHIO makes available a variety of Sōlarc® Light Engines and Modules that are designed to allow easy and reliable integration into your system. They provide the proper lamp environment, optical characteristics and a variety of flexible mechanical configurations. See the Performance Specification table on page 2.

LB24 (24W)

LB50IND (50W)

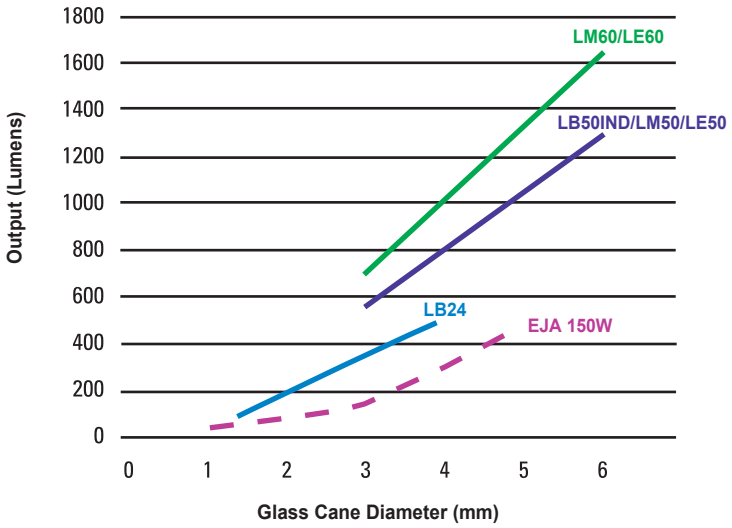
LE24 & LM24

LE50 & LM50



USHIO

Performance Comparisons—Lumen Output vs. Diameter



Performance Specifications

Product	Dimension w x h x l (mm)	Weight	Lamp Power	Lumens	Color	Source	Source NA	Fiber Adapter	Intended Use	Optimal Fiber Size	Median Lamp Life
Sõlarc® Line											
LB24	81 x 64 x 114	0.8 kg	24W	590 [1]	90+CRI @ 5,500K	Sõlarc®	0.67	ACMI 12.5 mm	Industrial	2 mm–4 mm	750 hrs [2]
LB50IND LE50 LM50	93 x 230 x 230 86 x 64 x 208 66 x 82 x 73	2.4 kg 0.6 kg 0.4 kg	50W	800 [1]	80+CRI @ 7,200K	Sõlarc®	0.69	ACMI Wolf Storz Olympus Pentax Machida	Industrial	3 mm–6 mm	3,500 hrs [3]
LE60 LM60	86 x 64 x 208 66 x 82 x 73	0.6 kg 0.4 kg	60W	1000 [1]	80+CRI @ 6,500K	Sõlarc®	0.69	ACMI Wolf Storz Olympus Pentax Machida	Medical	3 mm–6 mm	800 hrs [4]

1. 4 mm glass rod
2. Duty cycle: 3.5 hrs on / .5 hr off
3. Duty cycle: 11 hrs on / 1 hr off
4. Duty cycle: 2 hrs on / 1 hr off

USHIO

USHIO

Sōlarc® LIGHT

Sōlarc® Technology
Lamp Identification Guide

AL-5060

Elliptical Reflector (MR16)
Aluminum Ring
Ceramic Bi-pin Base
Mirror Finish

M50E031 **M50E032**

Elliptical Reflector (MR16)
Ceramic Bi-pin Base
UV Finish

M21E001

Elliptical Reflector (MR11)
Ceramic Bi-pin Base
Mirror Finish

(shown with B10R001 Ballast)

M10E001

Elliptical Reflector (MR11)
Brown Base w/Black O-Ring
2-Pin Connector
Plastic Polymer Ring
Mirror Finish

Pre 3/2009 White Ring
Post 3/2009 Gold/Beige Ring

AL-1824 (M21E00S-001)

Elliptical Reflector (MR11)
Ceramic Bi-pin Base
Ceramic (white) or
Plastic Polymer (gold/beige) Ring
Mirror Finish

M24E200-501

Elliptical Reflector (MR11)
Black Plastic Base
Recessed Bi-pins
Mirror Finish

M10N001

Black Plastic Base
Black O-Ring

M10N003

Brown Plastic Base
Black O-Ring w/Red Dot

M21N002

Black Plastic Base
2-Pin Connector

M21N003

Black Plastic Base
2-Pin Connector

(shown with B10Nxxx Ballast)

M10P001

Parabolic Reflector
6 Degree Beam
Black Base

6 Degree Beam Reflector

(shown with B10R001 Ballast)

M10P003

Parabolic Reflector
6 Degree Beam
Black Base

M10P002

Parabolic Reflector
13 Degree Beam
Black Base

13 Degree Beam Reflector

M10P004

Parabolic Reflector
13 Degree Beam
Black Base

M21P021

Parabolic Reflector
20 Degree Beam
Ceramic Bi Pin Base

M21P011

Parabolic Reflector
12 Degree Beam
Ceramic Bi Pin Base

Images are not to scale.

Sōlarc LIGHT

LB24 SERIES INDUSTRIAL FIBER-OPTIC ILLUMINATOR

High-Intensity Arc Lamp Technology

USHIO's Sōlarc® Fiber-Optic Illuminators use patented Sōlarc® lamp technology. Sōlarc® Illuminators combine the efficiencies of high-pressure metal halide arc lamps, precision miniature lamp construction and precise optical alignment to deliver unequaled fiber illumination performance and value.

Brilliant White Light

Unlike halogen-based light sources, Sōlarc® Illuminators deliver intense, brilliant white light, typically with a color temperature greater than 5,000K — comparable to true daylight.

Long Life and Cost Effective

Sōlarc® lamp technology is at the heart of the illuminator, requiring only 24 watts of energy and typically lasting about 500 hours (median life). Comparable halogen-based illuminators require 150 watts of power and may have average rated lifetimes between 40-50 hours. Sōlarc® lamps consume considerably less energy and last nearly 10-12 times longer, assuring lower cost of ownership.

Superior Fiber-Optic Coupling

Available with an ACMI and optional industry-standard optical couplers, precisely aligned, highly efficient Sōlarc® lamps provide superior light coupling into small and miniature fiber bundles. This allows the lamps to deliver significantly more light at a fraction of the size and wattage when compared to halogen alternatives.

Flexible Design

The LB24 series is available with a variety of fiberoptic couplers. The available power supply is rated for operation on voltages between 100 VAC and 240 VAC and frequencies from 50 Hz to 60 Hz.

Enhanced Features

- Internal Thermal Cutout
- Double Insulated
- Low Electrical Noise
- Cooler Operation
- Positive-Lock ACMI Fiber Adapter
- Full-Off Light Attenuation
- Medical-Grade UV/IR Filter Included
- Threaded Input Port—Allows for Custom Adapters
- Improved Lamp Retention System

Conforms to Industrial Standards

The LB24 series meets the standards identified in the accompanying specifications. Sōlarc® Illuminators are the solution for applications that require intense, white illumination, such as lighting for borescopes, fiberscopes, UV/NDT inspection, fluorescence or microscopes.

Styles Available

LB24-NO
No Adapter
Allows fiber adapter design flexibility

LB24-N4
ACMI Adapter

USHIO

LB24 Specifications

Illumination System	
Lamp	Sõlarc® Lamp Technology
Light Output	590 Lumens (4 mm [0.16"] glass rod)
Color Temperature	5,000K
Lamp Life (Median)	500 Hrs
Integral Iris	0%–100% attenuation
Physical	
Dimensions	147.3 mm [5.8"] length x 88.9 mm [3.5"] weight x 71.1 [2.8"] height
Weight	1.0 kg (2.2 lbs)—includes power supply 0.5 kg (1.2 lbs)—device only
Electrical	
Power Supply	
Input Voltage	100 to 240 VAC, 50-60 Hz
Input Current	1 A @ 100 VAC
Output	12 VDC, 3.4 A
Device Only	
Input Voltage	12 VDC
Connector Type	2.1 mm [0.08"] x 5.5 mm [0.22"] Center Positive Jack (ref. Switchcraft 722A)
Environmental	
Temperature	10˚C (50˚F) to 30˚C (86˚F)
Humidity	15% to 95% RH noncondensing
Approvals	EN/IEC 61010-1 CAN/CSA C22.2 No. 61010-1 CONFORMS TO: UL STD 61010-1

Ordering Information

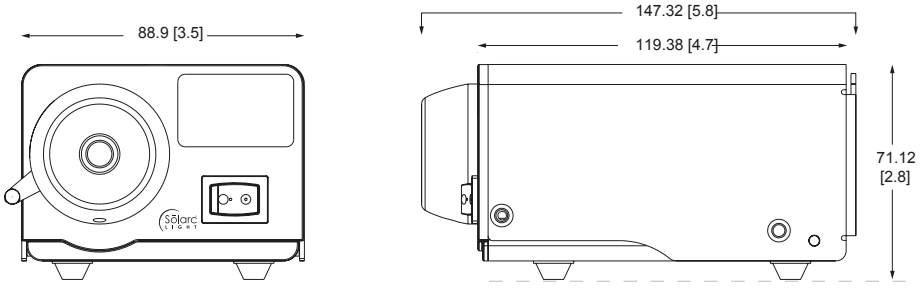
Part Number	Description
LB24-N4	Illuminator/ACMI Adapter
LB24-NO	Illuminator/No Adapter
LBM-PS-00	Power Supply—North American
LBM-PS-01	Power Supply—International
LB-CLP	Cigarette Lighter Power Plug
AL-1824	Replacement Sõlarc® Lamp
704904	AC Power Supply Cord—Europe
704905	AC Power Supply Cord—Australia
704906	AC Power Supply Cord—UK
50160	Olympus Adapter (screw-on)
50159	Storz Adapter (screw-on)

Available Power Supplies

LBM-PS-00 included with LB24MS00-004-00. North American-Style Plug

LBM-PS-01 included with LB24MS00-004-01. IEC Adapter to allow a variety of cords (sold separately)

LB24 (All measurements in mm [inches].)



USHIO

Sōlarc® LIGHT

LB24M SERIES MEDICAL FIBER-OPTIC ILLUMINATOR

High-Intensity Arc Lamp Technology

USHIO's Sōlarc® Fiber-Optic Illuminators use patented Sōlarc® lamp technology. Sōlarc® Illuminators combine the efficiencies of high-pressure metal halide arc lamps, precision miniature lamp construction and precise optical alignment to deliver unequaled fiber illumination performance and value.

Brilliant White Light

Unlike halogen-based light sources, Sōlarc® Illuminators deliver intense, brilliant white light, typically with a color temperature greater than 5,000K—comparable to true daylight.

Long Life and Cost Effective

Sōlarc® lamp technology is at the heart of the illuminator, requiring only 24 watts of energy and typically lasting about 500 hours (median life). Comparable halogen based illuminators require 150 watts of power and may have average rated lifetimes between 40-50 hours. Sōlarc® lamps consume considerably less energy and last nearly 10-12 times longer than standard halogen lamps, assuring lower cost of ownership.

Superior Fiber-Optic Coupling

Available with an ACMI and optional industry-standard optical couplers, precisely aligned, highly efficient Sōlarc® lamps provide superior light coupling into small and miniature fiber bundles. This allows the lamps to deliver significantly more light at a fraction of the size and wattage when compared to halogen alternatives.

Flexible Design

The LB24M series is available with a variety of fiber-optic couplers. It is rated for operation on voltages between 100 VAC and 240 VAC and frequencies from 50 Hz to 60 Hz.

USHIO

Enhanced Features

- Internal Thermal Cutout
- Double Insulated
- Low Electrical Noise
- Cooler Operation
- Positive-Lock ACMI Fiber Adapter
- Full-Off Light Attenuation
- Medical-Grade UV/IR Filter Included
- Threaded Input Port—Allows for Custom Adapters
- Improved Lamp Retention System

Conforms to Medical Standards

The LB24M series meets the standards identified in the accompanying specifications. Sōlarc® Illuminators are the solution for applications that require intense, white illumination, such as lighting for medical and dental procedures.

Power Supply Included with Each Illuminator

LBM-PS-00 included with LB24MS00-004-00. North American-Style Plug

LBM-PS-01 included with LB24MS00-004-01. IEC Adapter to allow a variety of cords (sold separately)

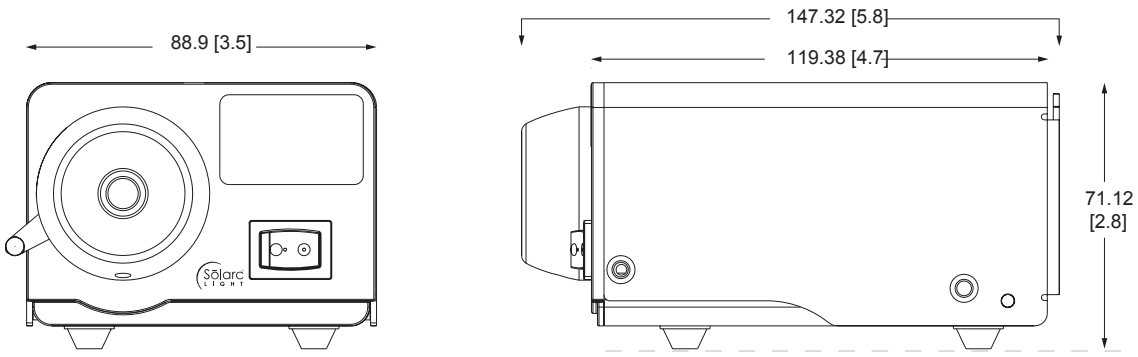
LB24M Specifications

Illumination System	
Lamp	AL-0950 Sõlarc® Lamp Technology
Light Output	590 Lumens (4 mm [0.16"] glass rod)
Color Temperature	5,000K
Lamp Life (Median)	500 Hrs
Integral Iris	0%–100% attenuation
Physical	
Dimensions	147.3 mm [5.8"] length x 88.9 mm [3.5"] weight x 71.1 mm [2.8"] height
Weight	1.0 kg [2.2 lbs]—includes power supply
Electrical	
Input Voltage	100 to 240 VAC, 50-60 Hz
Input Current	1 A @ 100 VAC
Leakage Current	<100 µA
Environmental	
Temperature	10˚C (50˚F) to 30˚C (86˚F)
Humidity	15% to 95% RH noncondensing
Approvals	
	EN/IEC 60601-1
	CAN/CSA C22.2 No. 601-1, 1-M90
	JIS T0601/J1000
	IEC60601-1-2
	UL60601-1
	AS3200.1
	EN55011

Ordering Information

Part Number	Description
LB24MS00-004-00	Illuminator/ACMI Adapter—North America Power Supply
LB24MS00-004-01	Illuminator/ACMI Adapter—International Power Supply (requires power cord—sold separately)
LBM-PS-00	Replacement Power Supply—North America
LBM-PS-01	Replacement Power Supply—International (requires cord—sold separately)
704904	AC Power Supply Cord—Europe
704905	AC Power Supply Cord—Australia
704906	AC Power Supply Cord—UK
50160	Olympus Adapter (screw-on)
50159	Storz Adapter (screw-on)

LB24M (All measurements in mm [inches].)



USHIO

Sōlarc LIGHT

LB50 SERIES

Arc Lamp-Based Light Source

USHIO's Sōlarc® Fiber-Optic Illuminators are based upon the use of low-wattage metal halide arc lamps. Sōlarc® Fiber-Optic Illuminators offer up to five times the light output per watt when compared to halogen light sources and even outperform some xenon-based sources.[1]

Brilliant White Light

Unlike many halogen-based light sources, Sōlarc® Illuminators deliver an intense amount of white light with a correlated color temperature (CCT) over 6,500K, providing true daylight illumination for improved color rendering and color balance.

Long Life/Cost Effective

The arc lamp used in Sōlarc® Illuminators has a significantly longer life than comparable halogen lamps. Depending on power-up/power-down cycles, the Sōlarc® lamp will last up to 10 times longer than many halogen lamps and up to five times longer than comparable xenon lamps.

Effective Light Coupling Into Fiber Bundles

The 1.2 mm short arc gap of USHIO's Sōlarc® lamps efficiently launches light into small-diameter fiber bundles. This is in contrast to a halogen light source, which may waste a great deal of available light when coupling to fiber-optic cables.

Compact Enclosure

The Sōlarc® Illuminator is housed in a compact metal chassis—so small, it may be mounted in or on test or inspection equipment.

Choice of Fiber Bundle Receptacles

The Sōlarc® Illuminator is available with a choice of industry-standard fiber connectors.

Universal Power Supply

The product is provided with an internal switching power supply capable of operation with voltages between 90 and 240 VAC, at 50 to 60 Hz. The AC input cord is detachable so that international cord sets may be used.

Cool and Quiet

The LB50 runs so quietly you will hardly notice that it is running. The low-wattage lamp ensures cool operation without compromising brightness.

[1] Internal laboratory measurements of multiple sources using glass canes, 2001.

USHIO

LB50 Specifications	
Physical Dimensions Weight	 230 mm [9.05"] wide x 93 mm [3.66"] high x 230 mm [9.05"] length Light Box: 2.42 kg [5.34 lbs]
Environmental Temperature—Operating Temperature—Storage Humidity—Operating	 0˚C (32˚F) to 40˚C (104˚F) -21˚C (-5.8˚F) to 54˚C (129.2˚F) 0% to 95% Relative Humidity, noncondensing
Electrical Power Supply Input Voltage Power cords available: Domestic, Japan, Europe, UK, Australia	 90 to 240 VAC, 50/60 Hz
Optical Interfaces Fiber Bundle Adapters Intensity Control	 LB50IND-001—Industrial Light Box, 50 W Pentax LB50IND-002—Industrial Light Box, 50 W Machida LB50IND-003—Industrial Light Box, 50 W Storz LB50IND-004—Industrial Light Box, 50 W ACMI LB50IND-005—Industrial Light Box, 50 W Wolf LB50IND-006—Industrial Light Box, 50 W Olympus (Custom on request) Provides 0% to 100% attenuation of output light using mechanical light vane
Reflector Specifications	Type: Elliptical MR-16 Numerical Aperture: 0.69 Spot Size @ Focal Plane: 6 mm [0.24"] @ 50% Intensity
Light Output—LB50IND Correlated Color Temperature	 White Light 7,200K (nominal)
Light Delivery Into Fiber Bundle—LB50IND Measured through 4 mm cladded glass rod (Numerical Aperture: 0.64)	800 Lumens (average)
Lamp Life—LB50IND Typical Laboratory Tested	3,500 hours (median) at 11 hours on, 30 minutes off duty cycle
Agency Certificates—LB50IND	Industrial Version (Optional) ETL Listed UL 61010-1 CAN/CSA – C22.2 No. 61010-1 (Spaced Intentionally) EN 61010-1 IEC 61010-1 (or IEC/EN 61010-1 in place of listing it separately) (Spaced Intentionally) FCC Part 15 Class A, EN55011, IEC/CISPR 11, EN/IEC 61000-6-2
Warranty	One Year, excluding Lamp
Mounting	Desktop Mounting on Rubber Feet
Replacement Bulb	Sōlarc® Metal Halide Arc Lamp, P/N AL-5060

Please Note: Continuous product improvement requires we reserve the right to change these specifications without notice.

USHIO

Sōlarc® LIGHT

LM24 SERIES

Sōlarc® 24W Light Module

Designed specifically for applications that require bright, white light in confined spaces. The LM24, with the compact yet powerful Sōlarc® lamp, delivers superior lumens/watt illumination: three times brighter than halogen equivalents. Three separate components make up the module—the lamp with an integrated cooling mounting block, ballast and connector that are sold separately. Fiber optic adapters are easily attached by the two front threaded mounting holes, preserving the lamp's focal point. The Sōlarc® Light Module system dramatically reduces time to market by allowing you to quickly integrate Sōlarc® technology into your equipment. The LM24 significantly improves maintenance; lamp replacement cycles and provides cool, quiet operation.

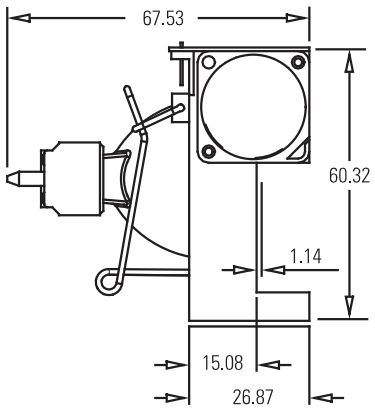
Lamp Replacement

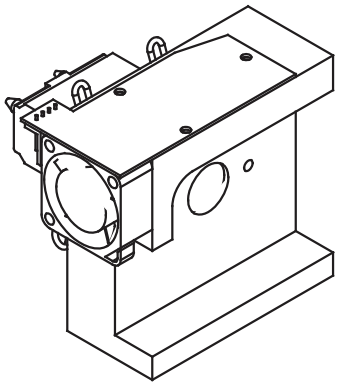
The LM24 Sōlarc® lamp has been laboratory tested to 1,000 hours median life at 3-1/2 hours on, 15 minutes off duty cycle, delivering a true economic advantage over the life of your product. The integrated lamp mounting block ensures the optimal thermal environment without excessive power requirements or noise.

Ballast / Power Supply

The LM24 ballast has been designed to meet demanding requirements for small size, high efficiency, and consistent performance. A self-contained system that combines starting, regulating and safety features, the B25R001 ballast is ready to support any Sōlarc® application: commercial, industrial or medical.

B25R001 Ballast (All measurements are in mm.)





Note: This ballast must be connected to DC power; it cannot be plugged into a wall socket AC line.
A separate connector cable assembly, C18A003, is required to connect the LM24 and B25R001.

USHIO

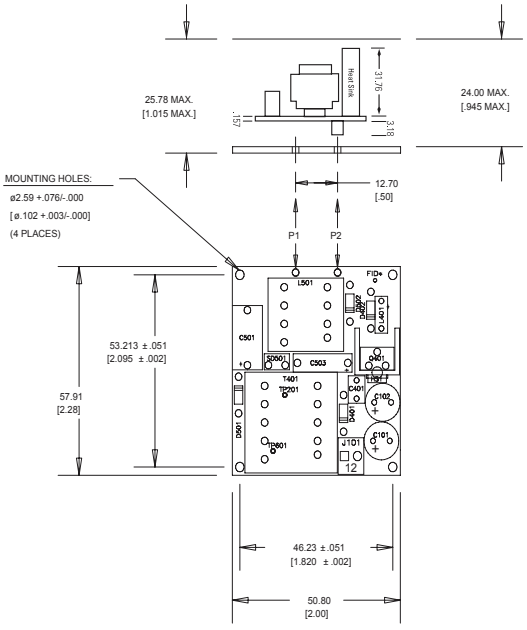
Specifications

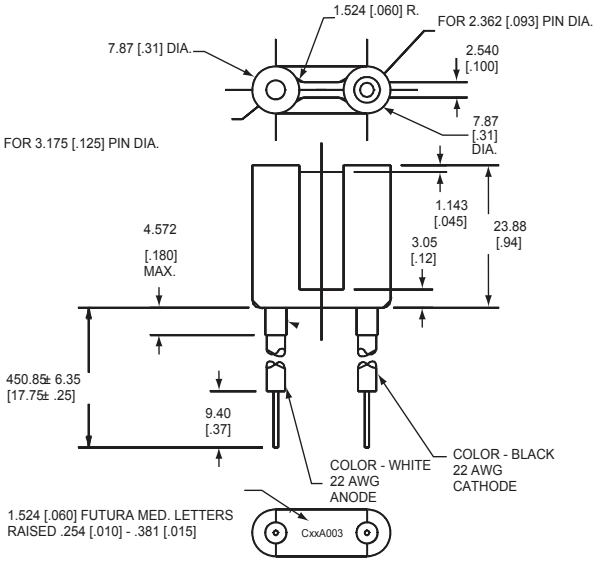
Physical	
Dimensions	69 mm (2.72 in) wide x 60 mm (2.36 in) high x 68 mm (2.68 in) length
Weight	198 gms (0.44 lbs)
Environmental	
Temperature—Operating	0˚C to 40˚C
Temperature—Storage	-21˚C to 54˚C
Humidity—Operating	0% to 95% Relative Humidity, noncondensing
Electrical/Ballast B25R001	
Input Voltage	+11 to +16.0 VDC
Input Current, Steady State (SS)	Sõlarc® LM24—2.6 A average @12 VDC
Inrush Current	50 A < 100 µsec peak, 15 A < 1 msec average
Lamp Strike Voltage	~9 kV peak
Efficiency	~78% at 15 VDC & 25˚C
Light Output	
Correlated Color Temperature	White Light 5,460K (nominal)
Light Delivery Into Fiber Bundle	500 lumens (avg) through 4 mm cladded glass rod (Numerical Aperture: 0.64)
Reflector Specifications	Type: Elliptical MR-11 Numerical Aperture: 0.67 Spot Size @ focal plane: 2 mm @ 50% intensity
Lamp Life	
Typical Laboratory Tested	500 hours (median) @ 1 hour on / 15 minutes off duty cycle 1,000 hours (median) @ 3.5 hours on / 15 minutes off duty cycle
Warranty	One year, excluding lamp
Replacement Bulb	Sõlarc® metal halide arc lamp, P/N AL-1824

B25R001 Ballast

C18A003 Connector Assembly

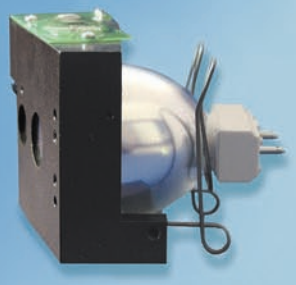
All measurements are in mm [inches]





Note: This ballast must be connected to DC power; it cannot be plugged into a wall socket AC line.
A separate connector cable assembly, C18A003, is required to connect the LM24 and B25R001.

Sōlarc LIGHT



LM50 SERIES

Sōlarc® 50W Light Module

Designed specifically for industrial applications that require bright, white light in confined spaces. The LM50 lamp delivers the industry's best lumens/watt illumination: more than three times brighter than halogen equivalents. Three separate components make up the module—the lamp with an integrated cooling mounting block, the ballast and connector cable assembly that are sold separately. Fiber-optic connections are easily attached by the two front-thread mounting holes, preserving the lamp's focal point. The Sōlarc® system dramatically reduces time to market, significantly improves maintenance and replacement cycles, and provides cool, quiet operation.

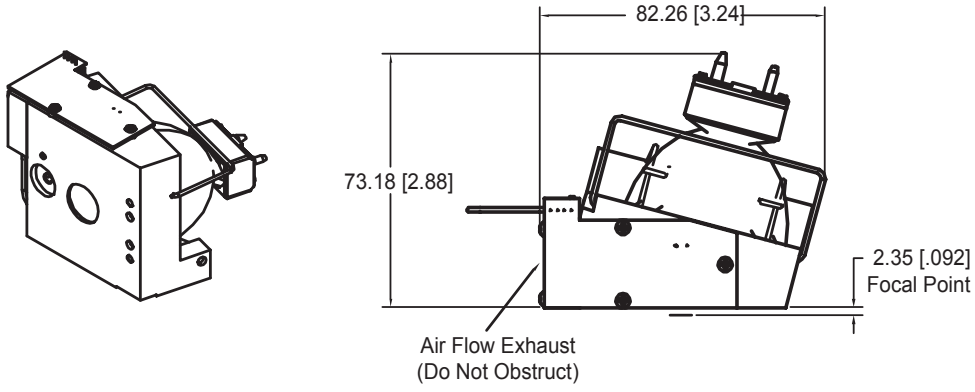
Lamp Replacement

The LM50 Sōlarc® lamp has been laboratory tested to 3,500 hours median life at 11 hours on/30 minutes off duty cycle, delivering a true economic advantage over the life of your product. The integrated fan—which adjusts its operation to match local temperature—ensures an optimal thermal environment without excessive power requirements or noise.

Ballast/Power Supply

The LM50 ballast has been designed to meet demanding requirements for small size, high efficiency and consistent performance. It provides selectable wattage settings, allowing roughly 20% variation in light output. A self-contained system that combines starting, regulating and safety features, the LM50's ballast is ready to support any Sōlarc® application: commercial, industrial or medical.

LM50 Light Module (Measurements are in mm [inches].)



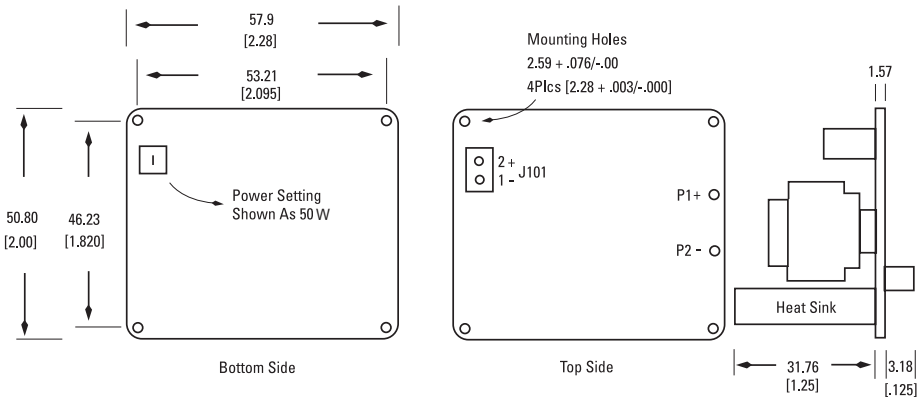
Note: This ballast must be connected to DC power; it cannot be plugged into a wall socket AC line.
A separate connector cable assembly, C18A003, is required to connect the LM50 and B50R004R ballast.

USHIO

LM50 Specifications

Physical	
Dimensions	66 mm [0.24"] wide x 82 mm [3.23"] high x 73 mm [2.87"] length
Weight	369 gm
Environmental	
Temperature–Operating	0˚C (32˚F) to 40˚C (104˚F)
Temperature–Storage	-21˚C (-6˚F) to 54˚C (129˚F)
Humidity–Operating	0% to 95% Relative Humidity, noncondensing
Electrical/Ballast (B50R004R Ballast)	
Input Voltage	+11 to +16.0 VDC
Input Current, Steady State (SS)	Sōlarc® LM50 - 4.8 A average @ 12.0 VDC
Inrush Current	~15 A < 100 µsec
Lamp Strike Voltage	~9 kV peak
Output Wattage (switchable)	50, 55, 60W Nominal performance specifications of the LM50 are significantly altered when operating at wattages other than 50W.
Efficiency	~78% @ 15 VDC and 25˚C (77˚F)
Light Output	
Correlated Color Temperature	White Light 6,500K (nominal)
Light Delivery Into Fiber Bundle	800 Lumens (avg) through 4 mm [0.16"] cladded glass rod (Numerical Aperture: 0.64)
Reflector Specifications	Type: Elliptical MR-16 Numerical Aperture: 0.69 Spot Size @ focal plane: 6 mm [0.24"] @ 50% intensity
Lamp Life	
Typical Laboratory Tested	3,500 Hours (median at 11-hours on/30-minutes off duty cycle)
Warranty	One year, excluding lamp
Replacement Bulb	Sōlarc® metal halide arc lamp, P/N AL-5060

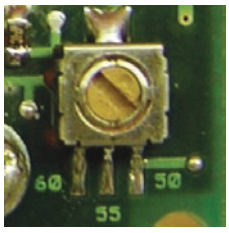
B50R004R Ballast (All measurements are in mm [inches].)



Note: This ballast must be connected to DC power; it cannot be plugged into a wall socket AC line. A separate connector cable assembly, C18A003, is required to connect the LM50 and B50R004R ballast.

Power Settings

User Selectable



Factory preset at 50W operation. Set switch for discrete wattage settings (50, 55, 60W) as shown here.

Please Note: Continuous product improvement requires we reserve the right to change these specifications without notice.

Sōlarc LIGHT

LOW WATTAGE HID FIBER ILLUMINATION SYSTEM

Lamp Specifications

Characteristic	14.0 Watt Operation
Luminous Flux (2mm Aperture)	270 Lumens
Luminous Flux (4mm Aperture)	600 Lumens
Lamp Life (Median)	500 Hrs
Color Temperature	7,800K
Lumen Maintenance	80%

Ballast Specifications

Input Voltage . . . . . 9V – 16V
Maximum Case Temperature . . . . . 90˚C
Efficiency . . . . . 86% Nominal
Compact Size . . . . . MR11/Low Profile
Power Delivery . . . . . Fully Regulated/User Selectable

Part Number & Description

M10E001 . . . . . MR11 Elliptical Lamp Assembly
B10R001 . . . . . Dual Wattage (9.5W & 14.0W) Regulated Ballast

Improved Performance [1]

- 42% Improvement in Lamp Efficiency
- 20%+ Improvement in Ballast Efficiency
- 70%+ Total System Efficiency

End-User Benefits

- HID/Metal Halide Technology
  - High Brightness for Intense Fiber Optic Illumination
  - Delivers Light Effectively into 1mm to 4mm Diameter Fibers
  - High Color Quality
- Compact Size
  - Low System Costs
  - Potential Portable Operation
- Low Power
  - Allows Battery Operation
  - Reduced Heat for Easier Thermal Management
- Nearly 2X Brightness Keeping Battery Life the Same [1]

[1] Over prior generation low wattage portable HID technology.

USHIO

The Next Evolution of Portable Fiber Illumination

Sōlarc® vs. Multi-Lamp LED

- Lighter Heads — No Heavy Heat Sinking Required
- Natural Daylight Appearance (7,800K)
- Richer Colors/Higher Color Rendering Index
- Sharper Spots
- Smaller Size and Higher Output
- More Intense Fiber Illumination

The Difference is the Arc!

Miniature Arc Produces Intense Light in a Concentrated Area → Optically Ideal Point Source

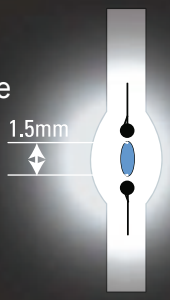
Benefits of Point Source

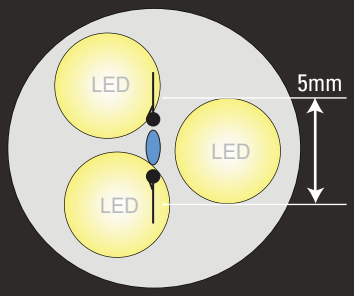
- Easy to Focus
- Easy to Control
- Smaller Head Size
- Optically Efficient: More Light Captured and Used

Energy Goes into the Arc and Out of the Front of the Lamp → Lighter Weight and Smaller Size

Compare the Difference!

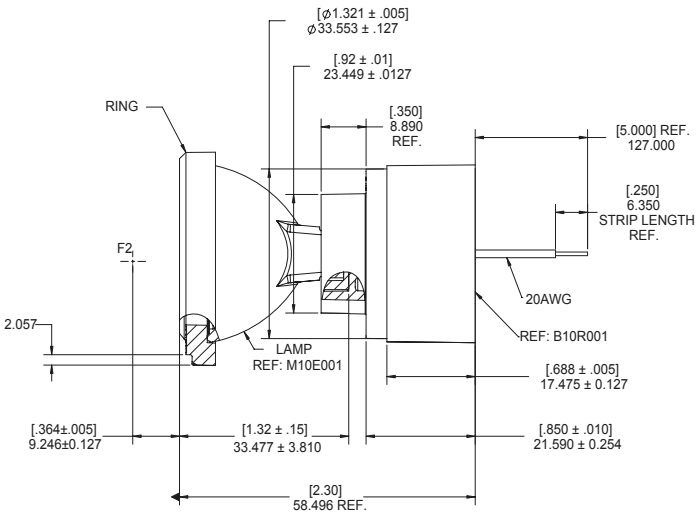
Sōlarc® lamps produce intense light in a micro-sized space yielding crisp brilliant beams.





LEDs produce light from large glowing disks yielding large diffuse sources and consequently fuzzy spots.

(All measurements in mm [inches])



USHIO

Sōlarc LIGHT

The Next Generation of Portable Sōlarc® Technology

Lamp Specifications		
Characteristic	**14.0 Watts**	**9.5 Watts**
Luminous Flux	1000 Lumens	500 Lumens
Lamp Efficacy	71.4 LPW	52.6 LPW
Lamp Life (Median)	350 Hrs	700 Hrs
Color Temperature	6,900K	13,700K
Lumen Maintenance	80%	80%

Ballast Specifications

Input Voltage . . . . . 9V – 16V
Maximum Case Temperature . . . . . 90˚C
Efficiency . . . . . 86% Nominal
Compact Size . . . . . MR11/Low Profile
Power Delivery . . . . . Fully Regulated/User Selectable

Part Number & Description

M10N003 . . . . . Single Ended Dome Lamp Assembly
M10N004 . . . . . Single Ended Lamp Assembly
M10P003 . . . . . 6 degree MR11 Parabolic Lamp Assembly
M10P004 . . . . . 13 degree MR11 Parabolic Lamp Assembly
B10R001 . . . . . Dual Wattage Regulated Ballast

Improved Performance

- 42% Improvement in Lamp Efficiency
- 20%+ Improvement in Ballast Efficiency
- 70%+ Total System Efficiency

End-User Benefits

- Nearly 2X Battery Life Over Prior Designs at Same Light Output

OR

- Nearly 2X Brightness Keeping Battery Life the Same

USHIO

Next Generation Low Wattage Portable Sōlarc®

Improvements Over Prior 10W Design

✓ 1000+ Lumens Capability!

✓ Burner Advances
- More Robust Design
- Higher Efficiency +42%

✓ Reflector Advances
- Improved Spot Uniformity
- Improved Consistency; lamp-to-lamp
- Same Package Size

✓ Ballast Advances
- Accommodates Wide Range of Input Voltages
- Constant Wattage Output
- Improved Mounting Features!
- Higher Efficiency Nearly +20%!
- Rapid On

✓ End Use Benefits
- Lumens Per Watt Efficiency +73%
  - 1,000+ Lumens Output Capable

  OR
  - Extended Battery Life at Existing Outputs
- No Costly Voltage Regulation Circuit Required
- Brighter — More Consistent Spot Quality
- Premium HID Color — 6,900˚K

Sōlarc vs. Multi Lamp LED

- Lighter Heads — No Heavy Heat Sinking Required
- Better Color
- Natural Daylight Appearance (6,900˚K)
- Richer Colors/Higher Color Rendering Index
- Sharper Beams
- Smaller Size and Higher Output
- More Intense Beams
- Farther Throw and Higher Center Beam Candle Powers

The Difference is the Arc!

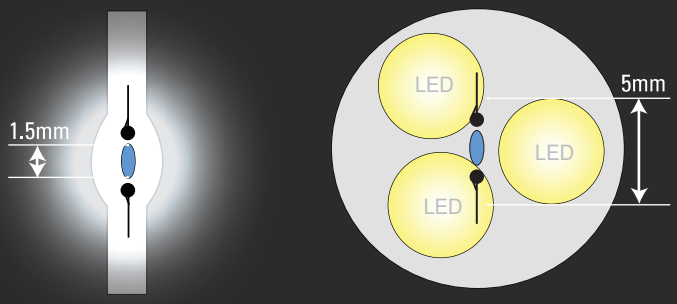
Miniature Arc Produces Intense Light in a Concentrated Area → Optically Ideal Point Source

Benefits of Point Source
- Easy to Focus
- Easy to Control
- Smaller Head Size
- Optically Efficient: More Light Captured and Used

Energy Goes into the Arc and Out of the Front of the Lamp → Lighter Weight and Smaller Size

Compare the Difference!

Sōlarc lamps produce intense light in a micro-sized space yielding crisp brilliant beams.



LEDs produce light from large glowing disks yielding large diffuse sources and consequently fuzzy beams.

Sōlarc Puts The Light Precisely Where You Want It!

Please Note: Continuous product improvement requires we reserve the right to change these specifications without notice.

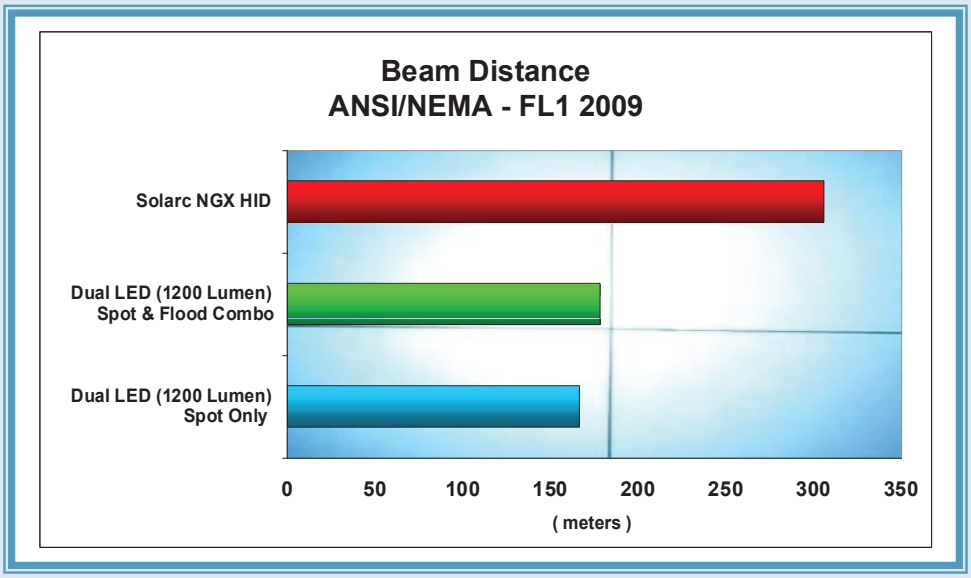
USHIO

Sōlarc NGX
Pierce the Darkness

Sōlarc® NGX Technology Still Outshines Even the Best LED

We recently tested a new Dual LED battery powered sports light from a leading bicycle accessory manufacturer against the ANSI/NEMA-FL1 2009 portable illumination standard and found amazing results.

- **Solarc NGX delivers 72% more beam distance**
- **An individual LED delivered 650 lumens compared to 844 lumens from the single Solarc NGX HID system**
- **Solarc NGX offers in excess of 60% longer estimated battery run time**



Device	Beam Distance	Lumens	Run Time
Solarc NGX HID	**306 m**	**844 lm**	**8 hrs**[1]
Dual LED (1200 Lumen) Spot & Flood Combo	**178 m**	**1,358 lm**	**2.5 hrs**
Dual LED (1200 Lumen) Spot Only	**166 m**	**698 lm**	**5 hrs**

[1] Assuming Equivalent 9.6Ahr, 8cell, 14.4V Li Ion Battery

USHIO

Sōlarc LIGHT

PARABOLIC REFLECTORIZED LAMPS

USHIO's parabolic reflectorized lamps are specifically designed for general illumination applications. These industry-standard reflectors are dichroic coated for maximum reflectivity for visible applications. With our patented Sōlarc® metal halide arc lamp technology mounted to these reflectors, the resultant illumination produces various beam divergences measured at the 50% intensity points.

Performance Specifications		
LAMP P/N	**M21P011**	**M21P021**
Output Performance		
Output (CBCP)	14,500	5,000
Beam Divergence (@ 50% Intensity)	12	20
Application Information		
Color Temperature	6,000K	
Chromaticity (x, y)	0.32, 0.32	
Median Life	750 Hours	
Warm-up Time to >90% of Rated Output	20 Seconds	
Restart Time to >90% of Rated Output	25 Seconds	
Ballast	**B22R001**	
Input Voltage	9.8 V–15 V	9.8 V–15 V
Current @ 12 VDC	2.3 A	2.3 A
Lamp Connector	**C18A003**	

Duty cycle for Rated Median Lamp Life: 21W – 1 Hr on / 15 min off. 50W – 2 Hrs. on / 15 min off

Orientation and Cooling

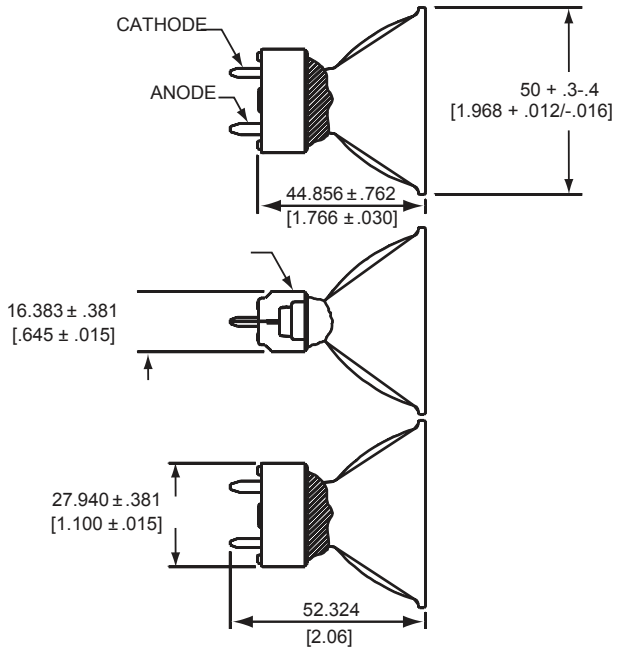
The lamp data provided was characterized in the recommended horizontal operating position. The lamp may be operated in other mounting orientations but performance may vary significantly. To maximize lamp life, the anode and cathode seal areas must be maintained at 200°C to 285°C and 100°C to 150°C, respectively.

Notes

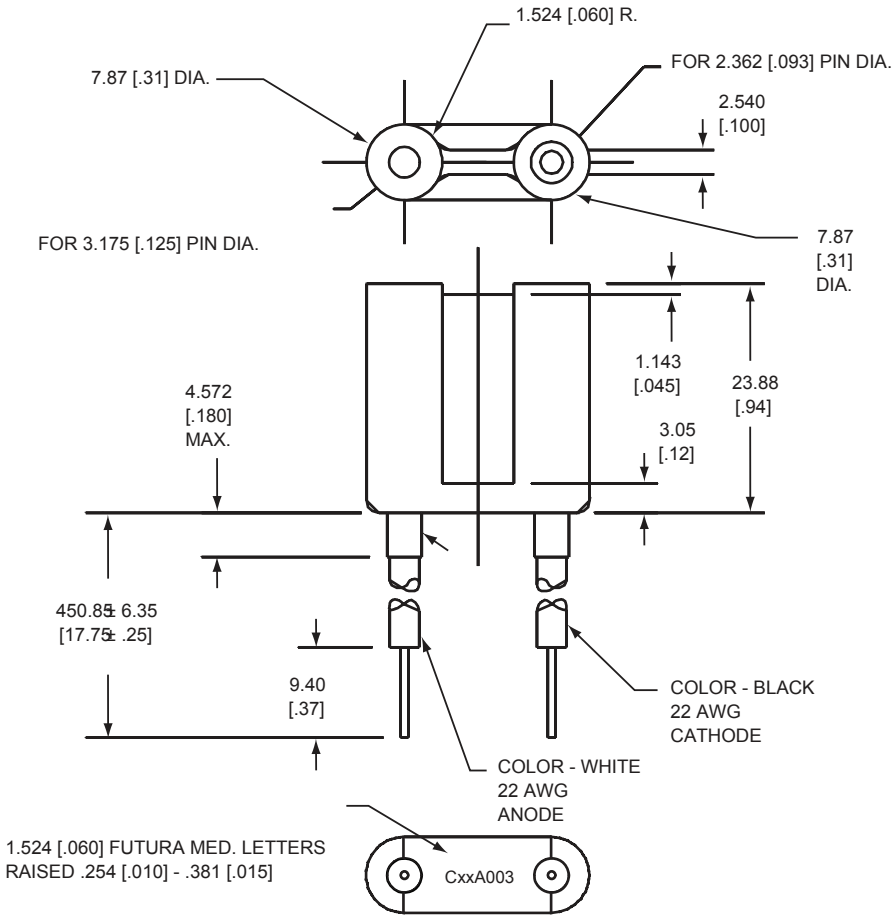
Other lamp/reflector configurations are available upon request. M21P011 has same mechanical dimensions as M21P021. See next page.

USHIO

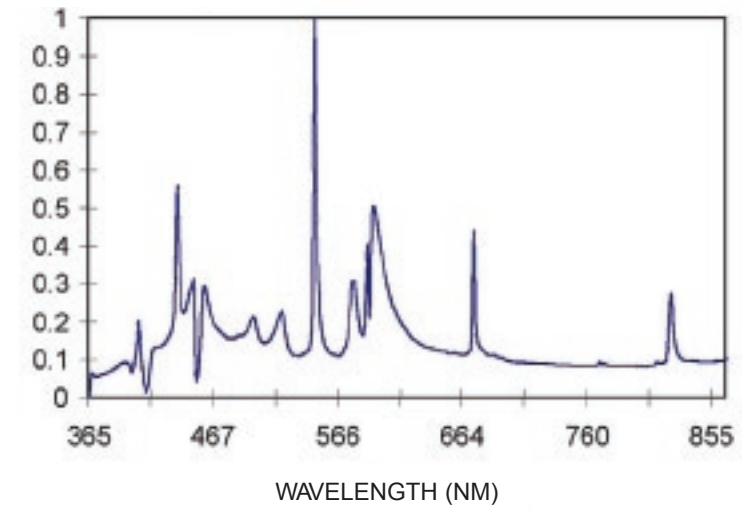
Mechanical & Output Specifications: M21P011 & M21P021 (All dimensions in mm [inches])



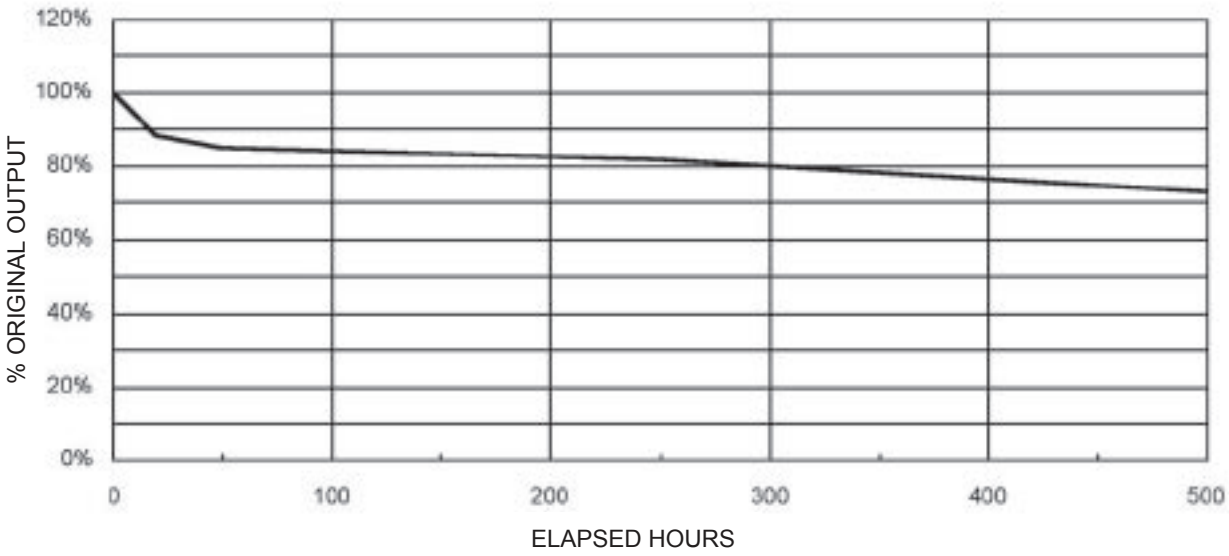
Mechanical & Output Specifications: C18A003 Connector (All dimensions in mm [inches])



Spectrum



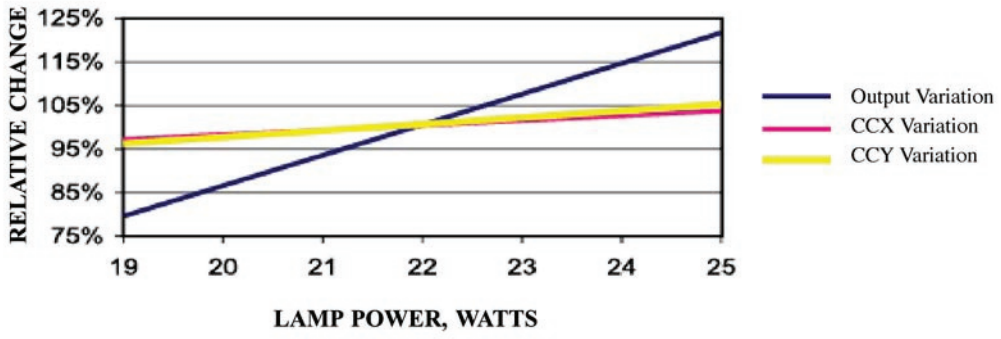
Typical Light Maintenance



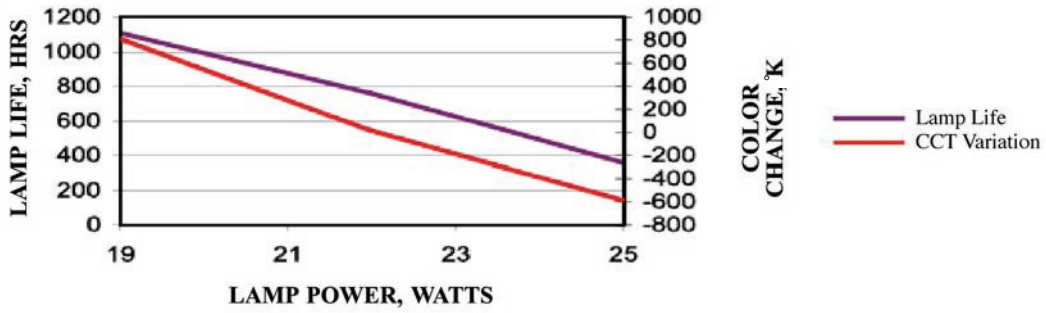
Power Variations

Some medium wattage lamps may be operated on B19R, B22R and B25R series ballasts for more output options. The accompanying charts show performance trade-offs when using different ballasts.

Lamp Power Performance Trade-Offs



Lamp Power Performance Trade-Offs



Typical Laboratory Data

Sōlarc® LIGHT

SINGLE-ENDED LAMP

The Short Arc Gap

USHIO's Sōlarc® single-ended lamps allow the equipment designer to capitalize on the lamp's unique short arc length. At 1.27mm, with a peak luminance at the cathode, the lamp begins to approximate a point source. Coupled with carefully designed lenses or reflectors with maximum light capture and the appropriate focus, the lamp can deliver high-intensity light to tightly controlled or divergent beam applications. The figure below shows the luminous intensity distribution of the arc. The two sources of peak intensity lie near the electrode tips.

Highest Efficacy

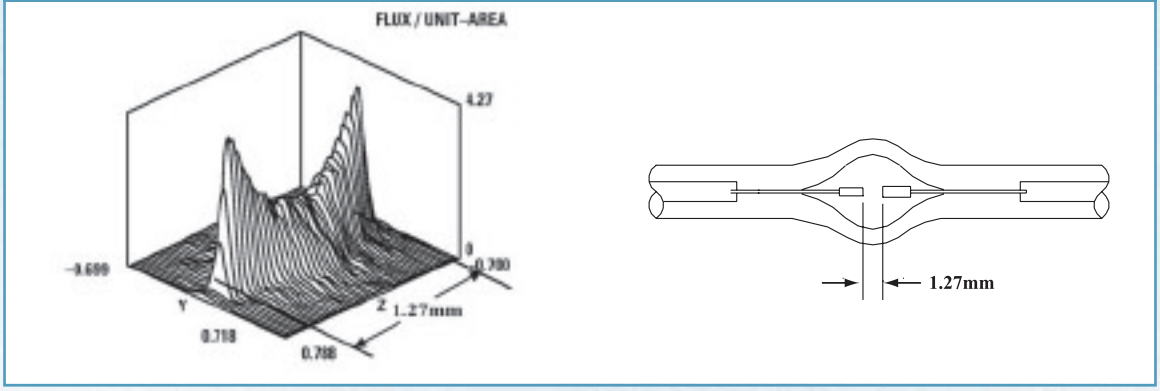
Metal halide lamps are inherently very efficient, providing two to three times the efficacy of either halogen or xenon lamps. Optimizing the optical system using the short arc can provide an efficiency increase in many applications, allowing the Sōlarc lamp to deliver as much light as a halogen lamp with four to five times more wattage. High efficacy plus the resultant decreased demand for power allow the equipment designer to develop miniature, lighter weight, portable and even battery-powered product configurations.

White Light

Sōlarc lamps produce a color temperature in the range of 5,000K–7,000K, putting it in the same range as the sun. For comparison, halogen lamps normally operate in the 3,000K–3,200K range and incandescent lamps in the 2,800K-2,900K range. In visible terms, the lower color temperature dictates more red or yellow in the light.

The higher color temperature enables realistic visualization of color. While it is possible to operate halogen lamps up to 4,300K by the use of filters, it is only at a severe reduction in lamp life and output. The 5,000K–7,000K color temperature of Sōlarc produces a whiter "cooler" light which reproduces the full range of colors. The output is color balanced, making it ideal for use with CCD video cameras. Sōlarc lamps also deliver less heat to the object.

Luminous Intensity/Arc Cross Section



USHIO

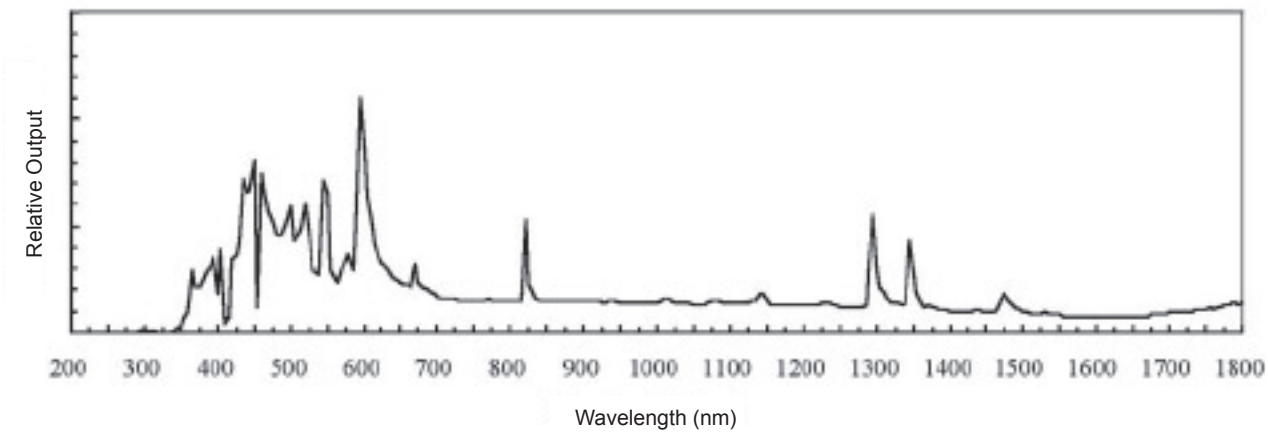
Excellent Light Maintenance

Unlike many metal halide lamps, Sōlarc® lamps maintain their intensity and color balance throughout their life. In applications requiring white light, the life of the Sōlarc lamp could be many times that of a competing halogen lamp. Typically a lamp will maintain over 80% of its initial intensity. Shifts in X and Y chromaticity values are typically less than 1.5%. Lamp life is specified as a median life. Median life defines the number of hours, at a given duty cycle, that half of the lamps will continue to operate. Life is also dependent on the duty cycle of the lamp. Sōlarc lamp life is specified on the basis of a duty cycle of one hour on for each start. A duty cycle with a longer "on" time for each start will extend the life, and shorter "on" times will reduce lamp life.

The Spectrum

A typical spectral distribution of the lamp is indicated below. In general, the distribution is optimized for the visible range, but it is possible to develop systems with varying spectral content. Lamps can be manufactured which are uniquely rich in the mid- and far-infrared.

Typical Spectral Output—21W Lamp



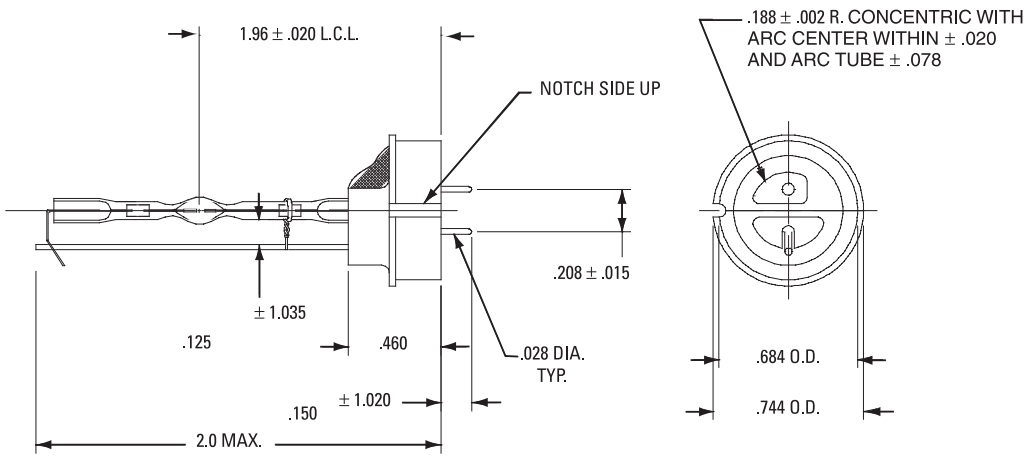
Additional Cooling

Sōlarc lamps operate at relatively high temperatures and require adequate cooling. The reflectorized lamps are designed to let the heat pass through the reflector, simplifying the mechanical/thermal design. USHIO America offers a test lamp with embedded thermocouples to evaluate the cooling design of your application.

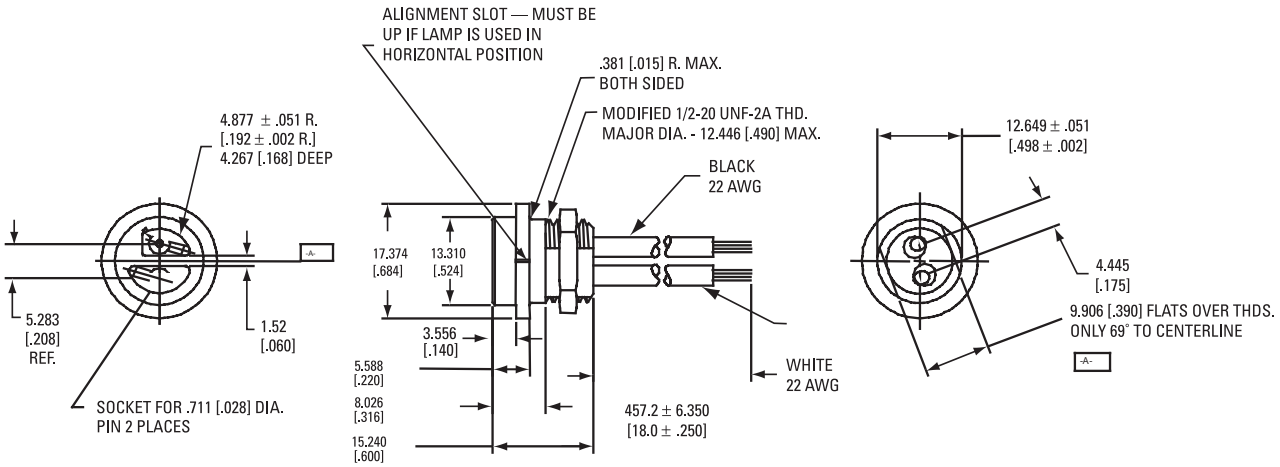
Accessories

Sōlarc lamps require a ballast to ignite and sustain operation. The ballast model numbers listed in the table on page 4 are specifically designed to operate USHIO America patented arc lamp technology. A special connector, C18A004, is required to connect the lamp and ballast. This connector assembly includes a polarized mating connector with 45.7cm (18 inch) of silicone-jacketed wire rated for high-voltage pulses with tinned leads for solder connection to the ballast.

M21N002 Sōlarc® SEL Assembly—All measurements in inches



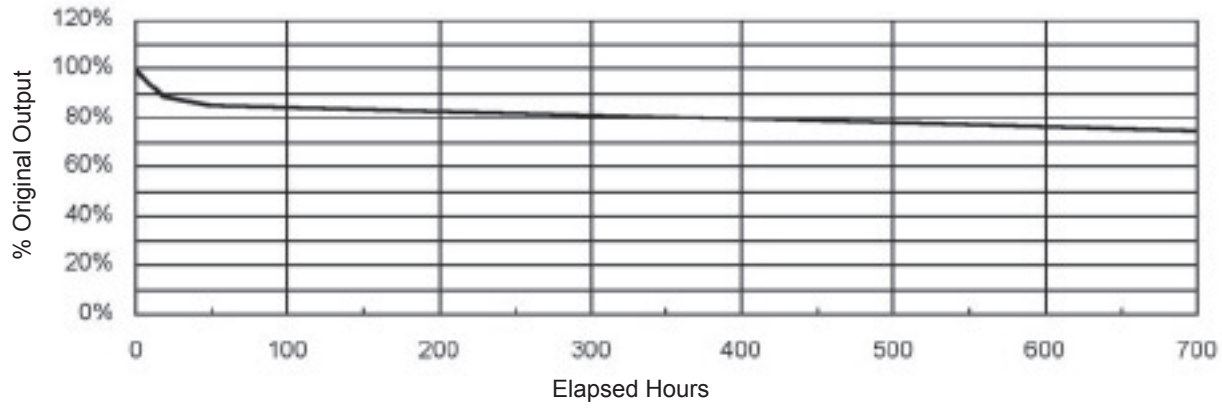
C18A004 Connector Assembly—All measurements in mm [inches]



M21N002 Sōlarc® SEL Performance Specifications			
Wattage	19 Watts	22 Watts	25 Watts
Initial Lumens	1,150	1,500	1,850
Correlated Color Temperature	6,250K	5,830K	5,460K
Chromaticity (x, y)	0.32, 0.31	0.33, 0.32	0.33, 0.34
Median Lamp Life [1]	1,100	750	350
Lamp Maintenance and Spectrum	Refer to data below and on page 2		
Warm-up Time to 90% Output	20 Seconds		
Restart Time to 90% Output	30 Seconds		
Ballast Requirements			
Regulated Ballast P/N	B19R001	B22R001	B25R001
Input Voltage (VDC)	9.8–15.0		
Steady-State Current (Amps)	2.0	2.3	2.6

[1] Median Lamp Life: 1 hour on / 15 minutes off duty cycle.

Typical Light Maintenance—21W Lamp



Operating Characteristics

Start/Restart: Igniting the lamp requires short, high voltage pulses provided by the USHIO America ballast. In less than 20 seconds, the 21W lamp will reach 90% of its light output. Color temperature will vary during start-up condition.

Orientation and Cooling

The lamp data above was characterized in the recommended horizontal operating position. The lamp may be operated in other mounting orientations but performance may vary significantly. To maximize lamp life, the anode and cathode seal areas must be maintained at 200°C to 285°C and 100°C to 150°C, respectively.

Sōlarc®
LIGHT

TECHNICAL OPERATION GUIDE

USHIO

TABLE OF CONTENTS

Today's markets dictate that the products you design must meet your customers' needs as well as stand out from their competition. You're asked to deliver brighter, longer-lasting illumination in a smaller, more portable product. Put another way, your customers want the power of the sun in the palm of their hands.

With USHIO's Sōlarc® lamps, that's precisely what they get. Sōlarc lamps, Light Engines and Light Modules are used worldwide to supply high-quality, white light in a wide variety of optical illumination systems. This is because Sōlarc products give you the design flexibility for use in a wide variety of applications. When properly applied, they will reliably provide hundreds of hours of excellent product performance. And, with their simple packaging, they can be designed into your products with ease.

As with any new technology, it is important that you understand key application techniques. This Sōlarc Technical Operation Guide has been arranged to help you easily find the information you need for your specific application. It summarizes the important information and assembly hints that will help get you started. For more detailed information on specific Sōlarc lamp solutions, please contact your USHIO America representative.

By following the guidelines given in this guide, you (and your customers) will be rewarded with years of dependable, trouble-free service from your new Sōlarc products. Please read these instructions thoroughly before use.

Sōlarc® LAMP OVERVIEW

Each Sōlarc lamp is a metal halide light source in the class of high-pressure, high-intensity-discharge (HID) lights, which differ from halogen, incandescent, fluorescent or light emitting diode (LED) illumination sources. Light is emitted from an arc discharge between two closely spaced electrodes, which are hermetically sealed inside a small quartz glass envelope. During operation, small amounts of metals are heated to a liquid state that provides the needed vapors to create the desired light color.

The light emitted from this arc tube is intense. Appropriate safety precautions relating to exposure protection are required. Metal halide lamps operate at very high temperatures and pressures so proper mounting, cooling and ventilation are required to assure reliable operation. While highly efficient, these metal halide lamps are sensitive to thermal fluctuations and orientation effects. Expect larger variations in color and output than other lower efficiency technologies.

Sōlarc lamps have unique operating and handling characteristics that should be understood to achieve successful and reliable operation:

- Sōlarc quartz glass must be kept clean
- The glass lamps should be handled with care, giving special attention to the quartz arc tube
- Metal halide lamps use high-voltage, short-duration pulses to initiate operation
- Sōlarc is a direct current (DC) lamp, and proper electrical wiring polarity must be observed to prevent damage to the lamp

Sōlarc® LAMP ADVANTAGES

Brilliant Illumination

As a result of USHIO's patented design, the Sōlarc miniature arc lamp provides pure, white illumination with a high color temperature. Sōlarc inherently provides solar-quality brightness, true color rendition and true color balance, ensuring unparalleled results for virtually any lighting product application.

Low Power Draw

Sōlarc lamps operate at 60+ lumens per watt. This allows your product to produce three times the amount of light compared to a halogen lamp running at the same power level. With a standard selection of outputs of 10, 18, 21, 24 and 50W, Sōlarc allows you to design products that are more compact, flexible, reliable and efficient.

Precision Focus

Sōlarc lamps feature a small, typically 1.2 mm, arc gap, and the smallest gap available in a metal halide arc lamp. Combined with elliptical reflectors, this arc gap allows you to focus illumination with laser-like precision into very small areas, such as projection display panels or fiber-optic cables.

Portability

Because they offer low-power arc lamp operation, Sōlarc lamps allow you to design smaller, lightweight and portable products. For example, a 21W Sōlarc lamp with elliptical reflector weighs just 24g. To further facilitate portability, the lamp's ballast, measuring 5.1 x 5.8 x 1.1 cm, weighs just 60g. In addition, Sōlarc's low power draw (10, 18, 21, 24 or 50W) makes battery operation possible, thus enhancing your product's value to your customers.

Shock Resistance

Sōlarc's arc lamp generates its brilliant illumination with precisely aligned electrodes in place of a tungsten filament. This design enhances Sōlarc's durability against shock or vibration, making it an ideal lamp for products that demand superior illumination in rugged operating environments.

Consistent Light Output

Sōlarc superior quality light output will typically maintain at least 75% of its initial value throughout its life. This means that both your reputation and your customers' products will benefit from reliable, consistent performance over longer periods of time.

Easier to Use

High-efficiency operation—combined with its lower gas volume and miniature size—mean that Sōlarc lamps provide solar-quality light output, yet require 1/3 less power than halogen lamps. Additionally, Sōlarc lamps' low wattage generates less heat than halogen lamps. This feature allows you to design products requiring less complex thermal management systems. The net result of these features is that you can design products that deliver optimum performance and safety at a lower manufacturing cost.

USHIO Quality

Every USHIO Sōlarc lamp is designed and manufactured within our strict production standards and tight tolerances to ensure that each operates to its exact specifications. By demanding precise performance from our lamps and our manufacturing processes, we will ensure the value of your products.

Sōlarc® LAMP OPERATING CHARACTERISTICS

Sōlarc lamps contain small amounts of metals. These metals are in both liquid and solid forms when the lamp is cold. When cold, these metals may appear to be dark reddish or reddish-brown in color, can appear as spots or even a film on the inside surface of the arc tube chamber. This appearance is normal and, as the lamp warms up, the metals evaporate and do not interfere with the proper operation of the lamp.

Warm-up

Sōlarc lamps take a brief time to come up to full power after they are turned on (the general rule being about 1 second per watt). For example, a 20W lamp will take about 20 seconds to come to normal brightness. Some amount of instability, i.e., flickering or flashing, is normal during warm-up and will diminish after the lamp reaches its thermal equilibrium.

Restart

If power is interrupted to an operating lamp, the pressure inside the chamber is still very high and the starting pulses will not be strong enough to form an arc between the electrodes. The lamp must cool to a point where an arc can be started. The time required to cool follows our general rule of about 1 second per watt. (A 10W lamp will require about 10 seconds to cool down prior to restarting.)

Operating Orientation

Sōlarc arc is a glowing, heated ball of vapor. Because heat rises relative to the force of gravity, high-intensity discharge lamps are sensitive to orientation. Sōlarc lamps are designed to be operated in one orientation, usually horizontal unless otherwise specified. Orienting the lamp contrary to its original design will cause the thermal environment to change, thus increasing output variability and possibly reducing life.

Ballast Compatibility

A ballast is the electronic control circuit required to operate a discharge lamp. Sōlarc lamps are direct current (DC) metal halide arc lamps. As such, they are to be operated with only approved electronic ballasts. In order to start the lamp, an arc must be struck across the gap formed by the electrodes. To do this, the ballast generates a series of very high voltage (~10 kV) and very short (<1 microsecond) pulses to start the lamp. They can often be heard and sound like a series of clicks. Again, Sōlarc lamps are DC operated and there is a distinct polarity associated with proper electrical connection. Improper wiring can cause either lamp or ballast failure.

Output Ratings

The industry standard for measuring output of light is the lumen. Lumen is a measure of the visible light related to the sensitivity of the human eye. Sōlarc lamps are generally designed, built, and characterized using the lumen as the measure of output and using maintained lumens as the measure of output over time. Because Sōlarc lamps produce full-color light across the entire visible spectrum (UV to IR), they are often chosen for their unique blue (UV curing) or red (IR detection) output. Check specifications carefully to be sure that the lamp is controlled for the light characteristics you are designing in.

Output Stability

Light output fluctuations are a normal characteristic of discharge lights. Generally, fluctuations are not objectionable if they vary no more than 5% at any given time. Sōlarc lamps are controlled to have no more than 5% fluctuations in initial output. Metal halide lamps can also exhibit occasional flaring, or bright flashes of red or pinkish light. Flaring occurs as the liquid metals settle into a stable thermal location within the bulb chamber. Flaring generally occurs during initial warm-up, if the lamp is jarred, or if it changes orientation.

LAMP SAFETY, HANDLING & DISPOSAL

Safety

As with any high-power lighting system, it's important to remember specific safety issues. The Sōlarc lamp system generates a series of high-voltage ignition pulses of approximately 6–10 kV for a short time during each starting cycle. If a lamp fails to start, those starting pulses will stop after 2 seconds. Do not switch the light source from ON to OFF in rapid succession, as this will dramatically shorten lamp life. We also recommend that each application be fused in order to protect the product against any internal failures.

Always allow lamp to cool before replacing. Do not remove the lamp from equipment until it has cooled completely. For optimum performance, avoid handling the bulb or the reflector. Fingerprints or other contaminants on the glass may result in performance degradation.

Photobiological Safety Compliance Standard RP-27.3

As with any Sōlarc product, UV precautions must be taken when directly handling the lamp. Ultraviolet, visible and infrared radiations are emitted from metal halide lamps. Possible skin or eye irritation can result from exposure to the output of a 21W Sōlarc lamp exceeding 15 minutes in one day. Use appropriate personal protective equipment. Do not stare at an exposed lamp in operation. Due to the extremely high brightness of the lamp, proper attenuating glasses must be worn when directly viewing the bulb. During operation, the lamp should be enclosed in a housing to prevent injury in the circumstance of the lamp shattering.

Handling

Ballast products are electrostatic sensitive electronic assemblies and should be handled as such. Proper electrostatic discharge (ESD) handling procedures must be employed.

Protect the quartz arc tube when handling the lamp. The arc tube may be protruding from the end of some reflectorized lamp assemblies. Keep the arc lamp clean. Do not touch the quartz tube, the inside surface of the reflector, or the connecting wires. Contamination can degrade lamp performance or cause premature failures. If necessary, clean the lamp by wiping with a lint-free towel or cotton swab immersed in denatured alcohol.

The high-intensity light at the front of the light source and possibly at the tip of the fiber optic bundle, if used, may give rise to bright light and high temperatures. To minimize the risk of injury, avoid direct viewing or contact.

Disposal

Sōlarc lamps contain a small amount of mercury—usually no more than found in typical fluorescent lighting. Disposal and handling must conform to local regulations and hazardous waste disposal guidelines.

Do not remove lamp from equipment until it has cooled. Never handle the lamp when it is operating!

LAMP LIFE & MAINTENANCE

The industry standard for reporting lamp life is median hours—the point at which 50% of the lamps have stopped operating satisfactorily. Generally, a lamp is considered to have failed if it no longer starts or the lumen output has fallen to half of its initial value. USHIO defines a rated "median life" for all Solarc lamps. This is a statistical determination—based on periodic testing—of the median operating time for randomly selected groups of lamps. One half of the lamps will continue to operate beyond this median life while others will reach their end-of-life earlier.

The predominate symptom of end-of-life is the inability to start the lamp. Once a lamp has started, one can generally count on that lamp continuing to operate throughout a given procedure, however there is a possibility that the lamp could rupture. For that reason, lamps should be installed in an enclosure.

To fully characterize lamp life, one must also define a duty cycle. Duty cycle is how often a lamp is turned on and off. Sōlarc lamps are typically tested in the laboratory with a duty cycle of one or two hours on and 15 or 30 minutes off. More frequent cycling will reduce the lamp life. For instance, turning the lamp off every 10 minutes may reduce rated life as much as 50%. Conversely, operating the lamp in a continuous mode may extend life up to 30%.

Lamp life will also be decreased if the lamp is operated above designed operating temperatures. (Please refer to Lamp Temperature & Cooling on page 6.) It is important that the equipment designer ensures that the maximum operating temperature is not exceeded and that free airflow is available at all times.

Figure 9 (page 10) depicts a graph of lumen maintenance versus life for the 21W lamp. This data was taken with the lamps operating in their standard duty cycles at rated wattage. Performance can vary substantially under different operating conditions. You should always qualify performance for the specific operation that you design.

In Figures 10–13 (starting on page 11), you will find graphs indicating the color stability of the lamp. The first pair of plots indicates X and Y chromaticity deviation versus life, while the second set of plots show a spectral distribution taken from a typical lamp when new and after a period of time. Sōlarc lamps will maintain a high level of both chromaticity and light intensity throughout their lives.

DESIGNING Sōlarc® LAMPS INTO YOUR PRODUCTS

Packaging

When developing mountings and enclosures for Sōlarc lamps and ballasts there are several design aspects to consider. Heat management is critical. In many applications forced-air cooling is used to maintain the recommended temperatures at the critical measurement points. For Sōlarc lamps with no cover glass, drawing the air across the face of the lamp is preferable—blowing air on the lamp is not recommended. Use the natural effect of heat rising as a supplement to drawing the air up from the bottom of the lamp. This is how all devices manufactured by USHIO America are designed. If the system cannot be cooled using forced-air cooling, such as in a flashlight or torch, sufficient thermal conduction methods must be used to assure critical thermal points are within specification. When designing light engine and light module components which incorporate vents and cooling fans, be careful to assure sufficient clearance and pathways so that the airflow is not obstructed.

While Sōlarc lamps have no filament to break, nonetheless, they are made of quartz glass and subject to breakage from shock and vibration. Shock mounting techniques and shock isolation can provide a more robust design. Remember it is up to you, the OEM, to test the end product in its intended use to assure it meets your customer's requirement.

Mounting

Sōlarc arc lamps are specified for operation in a specific orientation, such as horizontal or vertical base down. Verify specified orientation with the appropriate lamp specification sheet. Lamps specified for horizontal operation have a preferred rotational orientation. Refer to the specific lamp data sheet or follow the "THIS SIDE UP" or "UP" designation on the lamp base. To prevent damage during lamp installation, mounting and replacing, care must be taken to avoid mechanical interference with the quartz arc tube.

Mount the printed circuit board version of the ballast as desired by using the four corner through-holes provided on the circuit board assembly or by some other acceptable means. Exercise care when handling and mounting the circuit board assembly to prevent mechanical stressing of the ballast components. It is not recommended to use the ballast heat sink for mounting, as it is electrically floating. Since there is high voltage on the board, spacing of 9.53 mm (0.375 in) on all sides of the ballast is required, or appropriate nonconductive electrical insulating material must be used.

Electromagnetic Interference (EMI)

The Sōlarc product family has been designed to pass industry-standard EMI requirements. The ballast should be located close to the lamp for this very reason. It may be necessary to add an additional metal shield over both the lamp and ballast depending on the specified EMI immunity levels. In addition, it is best to keep the distance from the power source to the ballast as short as possible. When specifying long wire lengths it is best to use twisted pair configuration and/or shielded wire to minimize radiated EMI from that wire.

System Integration Guidelines to Minimize EMI

Ballasts and other power conversion circuitry emit parasitic energy that may affect or interfere with the operation of other equipment. The following guidelines are recommended to minimize ballast emissions and reduce the possibility of radiated or conducted interference with other equipment.

- Overlapping sections of the ballast/electronic enclosure should be clean and free from paint
- Use metal screws to fasten cabinet sections together
- Attempt to keep fasteners approximately two inches apart and avoid any distortion of the clean metal mating surfaces. Use EMI gasketing if distortion is unavoidable
- Avoid dissimilar shielding metals and moisture that will cause galvanic action and thus cause deterioration of the clean metal shielding surfaces
- Maximum shielding occurs with materials that have the highest conductivity
- Principal EMI issues arise due to breaches in shielding
- Cover or subdivide areas inside large electronic enclosures
- Avoid long ground wire connections to reduce loop size
- Route all internal cables as close to the ground plane/surfaces as possible to minimize loop size
- Use an IEC power input filter module
- Mount an IEC power input filter module to a clean, paint-free section of the cabinet wall and as close as possible to the DC power supply. Use the widest and shortest possible strap to ground the input filter module to the ground plane if unable to ground the filter module directly to cabinet wall
- Plastic-coated enclosures provide excellent HF shielding, but considerable care is needed to ensure that all seams are conductively closed
- Do not route cables close to seams or openings and especially not close to small openings or cracks
- Terminate all cable shields to the enclosure
- Use holes and avoid the use of slots for cooling openings
- Use chokes on power leads and or twist power leads to eliminate noise issues
- Make sure all power terminals are clean and tight
- Do not run wires parallel to each other, which could cause crosstalk issues
- Avoid tying or locating signal leads (DC) close to power leads (AC)
- Keep ballast module approximately two feet away from a CRT, computer or other magnetic field-sensitive devices. Use thicker shielding if close proximity is unavoidable
- Ferrite cores can normally be used to eliminate a resonance problem or control interference

System Integration Hints

Physically locate the ballast away from circuitry that is noise sensitive or circuitry that is routed outside of the system housing. This will help control EMI/RFI emissions and help enable the ballast to be compatible with the system. Don't bundle sensitive signal leads with the ballast input and output power leads. Intentional spacing or shielding may be required to enable the ballast to be compatible with adjacent circuitry. A common symptom is interference with adjacent circuits during ignition.

Operating Voltage

Maintaining the proper input voltage is extremely important. Do not exceed the absolute maximum voltage listed for your particular ballast. It may cause a nonrecoverable failure of the lamp, ballast or both. When operating with batteries, it's important to research the batteries' characteristics when fully charged and how they discharge to ensure compatibility with your ballast. If a lamp fails to start, the ballast will shut down and will only draw a low amount of power. The power must be cycled off and back on in order to re-light the lamp.

Input Power Supply Selection

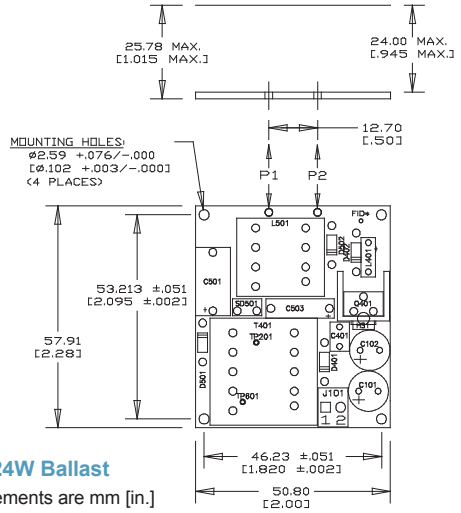
The power ratings of the ballasts refer to the output power to the lamp. The ballast input power will always be greater than its output power because of its efficiency limitations. The ballast has a capacitive input, which will demand a short-duration in rush current from the power supply. This is usually not a cause for concern.

Input Wiring for Printed Circuit Board (PC) Version Ballast

USHIO America recommends complying with IPC-A610D solder process standard or equivalent. Construct an input power connector assembly compatible with the input connector (Molex 41791 connector 2-pin series or equivalent) located on the ballast circuit board assembly. The input connector can be found at the bottom edge of the ballast assembly shown in Figures 1 & 2, location J101. Pin 1 is the positive input voltage and Pin 2 is the negative input voltage. Slide the connector housing portion of the assembly onto the input power connector, location J101, until the mating halves lock in place. Observe the wiring voltage polarity as specified in the pinouts section in the performance specifications table. Failure to observe input power wiring polarity could result in failure of the product.

Wiring for Printed Circuit Board (PC) Version Ballast

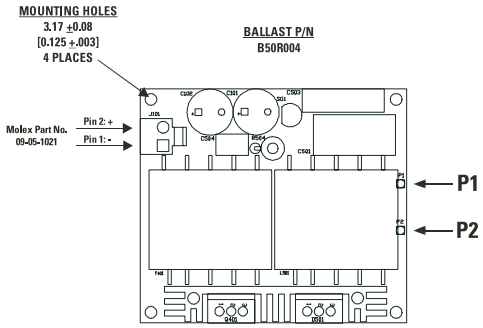
Figure 1: Ballast Assemblies



18, 21 & 24W Ballast

All measurements are mm [in.]

Figure 2: Ballast Assemblies



50W Ballast

All measurements are mm [in.]

USHIO America's Solarc lamps are designed for direct current (DC) operation. It is vital that the lamp be installed and maintained with the correct polarity. The supplied polarized connectors, which electrically couple the arc lamp and ballast, are designed to provide the proper voltage polarity.

The two insulated wires supplied with the connection assemblies are colored-coded: the black wire is connected to the cathode and the white wire is connected to the anode of the arc lamp. Solder the anode lead (white wire) of the lamp connector assembly to P1. Solder the cathode lead (black wire) of the lamp connector assembly to P2. Trim any excess material. The P1 and P2 output terminals can be found at the top middle edge of the ballast assemblies shown in Figures 1 and 2.

- Avoid connecting the P1 and P2 terminals to anything other than the arc lamp. Instrumentation and/or other circuitry connected to either one of these electrical nodes can drastically affect normal ballast operating performance
- High-voltage pulses are present on the P1 terminal during ignition
- Failure to observe input power wiring polarity could result in catastrophic failure of the product

Labeling

Proper labeling is important with any product, and the Sōlarc is no exception. Warnings reminding users that the lamps can be hot and should be allowed to cool down prior to replacement, and not to put anything, including fingers, into the lamp socket, should be clearly marked in the appropriate languages.

LAMP TEMPERATURE & COOLING

Cooling (10W Systems)

Heat removal is important. The main heat transfer occurs through the ballast. The ballast sides also provide the best mechanical surface for heat conduction to occur. Although plastic housings can be designed into your product, it is best to have a solid metal-to-metal contact with the ballast can. An air gap between the ballast and its mounting surface should be avoided. If plastic is preferred, then heat-transferring plastics such as 30% carbon-filled or glass-filled material are best.

The most important measurement of a proper Sōlarc lamp and ballast installation is the temperature on the ballast metal can. With a thermocouple attached half way up the side of the ballast, you can measure the heat conduction of the system. It's important to keep the maximum case temperature no greater than 90°C.

Unusual increases in operating temperature can be caused by a variety of factors:

- Nothing should be mounted directly to the back side of the reflector
- An additional heat shield (commonly found on halogen installations) will cause a significant rise in operating temperatures within the assembly
- Any housing that immediately surrounds the lamp should be black so as not to reflect stray light back into the lamp
- When an additional cover glass is used, make sure it is rated for high transmission; otherwise reflected light energy from the front can overheat the system
- Never use any plastic material as an outside barrier
- The common cause of high temperature is overvoltage to the ballast. Make sure that you have the correct ballast for the particular battery type and configuration

When designing the enclosure, consider the fact that your product may not always be running in an ideal laboratory environment. The 90°C maximum temperature should take into account typical operating temperatures the product will experience in actual use, as well as any extreme conditions it might encounter.

Cooling (18W – 60W Systems)

The maintenance of adequate cooling is another critical consideration in lamp life and arc stability. The lamp must not exceed its operating temperature limits, which in most cases requires that the lamp be forced air-cooled. Cooling must be sufficient to maintain the temperature at the tip of the arc tube generally between 200°C and 285°C.

In a few situations it may be possible to cool the lamp by convection. In general however, the equipment designer must be certain that the flow of air is adequate and cannot be blocked. Conversely, it's also important that the lamp not operate overly cooled or it will experience instability, inconsistent performance, an arc that is bluer in color and may cause possible flickering.

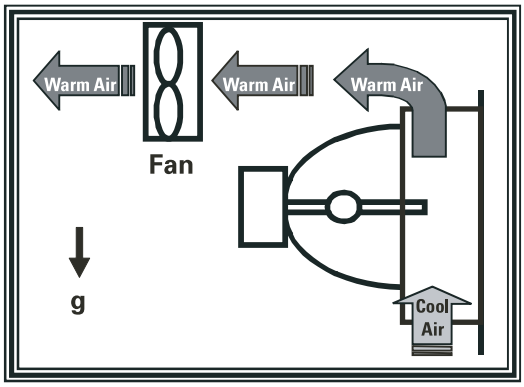
The critical temperatures are at the seals of the arc tube and at the molybdenum foils. If the temperature limits at these points are exceeded, the seal between the foils and the glass envelope may fail and create a leak, thus shortening lamp life and causing erratic performance.

It is equally important not to directly cool the arc chamber (the center of the bulb). This may also cause erratic performance and shortened life.

Figures 14 and 15 (located on page 11) show the critical regions of the lamp and the optimum temperature ranges. To help you design the Sōlarc lamp into your equipment, USHIO America can provide specially prepared lamps with Type K thermocouples attached to the exposed end of the arc tube (anode seal) and embedded at the cathode seal. Using these sensors, thermal management systems and operating temperatures can be monitored and optimized. While the operating temperature at both ends of the tube is important, the thermal characteristics of the lamp construction actually make the exposed end of the arc tube the most vulnerable. The reflector tends to conduct heat away from the near end. For this reason, it is wise to carefully distribute the airflow to the lamp.

Some air must be directed across the reflector in order to prevent adverse effects. The designer must also allocate some airflow across the bulb tip without directly cooling the arc chamber itself. This may require careful design since the reference surface for the lamp is the front face of the reflector. Drawing air across the front of the reflector and directly cooling the tip of the arc tube and anode seal can accomplish this. (Refer to Figure 3.) Sōlarc lamps have been incorporated in USHIO America proprietary products using forced-air cooling at flows ranging from 9 to 20 cfm (ft3/min) (0.25 to 0.57 m3/min), depending on external environment and chassis restrictions.

Figure 3: Lamp Cooling



Many of the same considerations apply to a single-ended lamp, except that the application may be complicated by the user's own optical design.

The ballast should reside in a well ventilated housing. Forced-air cooling is highly recommended, but not a strict requirement. The power field effect transistor (FET) heat sink (largest heat sink on PC board) located adjacent to the input power connections must be maintained below 90°C. See Figures 1 and 2 for the power FET location.

For optimum temperature measurement, position and adhere a thermocouple on the reverse side of the FET heat sink at the same height as the FET. Increase airflow requirements by 1 cfm for every 2°C rise above 25°C. Do not allow the temperature of the heat sink to rise above 125°C. Additional heat sinking is possible by screwing more thermally conducting material to the top of the heat sink. Use a #2 screw and thermal compound to ensure proper conduction.

OPTICAL PERFORMANCE OPTIMIZATION

Sōlarc lamps are typically mounted within dichroic coated reflectors for visible applications. For fiber optic illumination, typical elliptical reflectors are utilized where the arc is positioned at the internal reflector focal point (F1) and light emitted from the lamp is reflected and redirected to the external focal point (F2). The majority of reflected light is focused at the F2 position within a defined solid angle. The angular distribution of the light emitted from the reflector is a function of the ellipse geometry and the radiation emitted from the arc source. For maximum transmission through fiber optics, it is critical to match the reflector angular distribution to the fiber optic acceptance cone angle (otherwise known as numerical aperture—NA). The NA of the lamp must match the NA of the fiber for optimal performance.

The angular distribution of the lamp coupled with larger bundle diameters can impact the optical performance. A light depression is typically observed when the angular distribution propagates through the fiber optics. In most applications, it is desirable to tilt the lamp's optical axis relative to the fiber optic opto-mechanical axis to eliminate this propagated depression for uniform projected illumination as viewed from the fiber optic distal end. USHIO typically sets this angle at about 12 degrees.

This tilting of the lamp can also be used to provide additional thermal optimization. Tilting the lamp's connector downward allows the reflector's top to open slightly, allowing the chimney effect to exhaust more efficiently.

LAMP REPLACEMENT INSTRUCTIONS

(LE, LM, LB MODELS)

1. Turn unit off and unplug the power from the light engine
2. Rotate lamp spring retainer from lamp spring
3. Disconnect the lamp connector and remove the lamp by pulling back and up against the lamp spring
4. Replace with USHIO America replacement lamp only
5. Reconnect the lamp to the connector and insert lamp so that the lamp is seated properly in the lamp block; pay attention to applicable keys or alignment pins
6. Rotate lamp spring retainer back into position over lamp spring

TROUBLESHOOTING

Discharge lamps fail for a variety of causes that all relate to thermal and mechanical stresses imposed by the extreme operating temperatures inside the lamp. Typical failure modes include chamber rupture (sometimes with an audible pop), cracking and leaks of chamber, and cracking and leaks of or near the glass-to-metal seals. These types of failure modes are normal and do not imply a defective lamp.

If the lamp fails to ignite:

- Check input and output wiring polarity and integrity
- Attempt ignition a second time after properly resetting the ballast by disconnecting and reconnecting the input voltage
- Verify proper input power—both voltage and current

If the above steps fail to correct the problem:

- Ensure the anode wire is not routed near any metal or other conductor
- Ensure that no arcing occurs on the ballast assembly in the area near the P1 connector. (A dark room enables visual detection of arcing)
- Ensure that no arcing occurs between the ballast assembly and any adjacent subassembly within the system (components, subassemblies, wire harnesses, etc.). A 9.53 mm (0.375") air spacing (or higher dielectric strength) is recommended in the above mentioned areas

Lamp Stability

Unstable lamp operation accompanied by a markedly bluish cast to the light may indicate an overcooled lamp. Verify proper power input and operation of the thermal control circuit.

Early lamp failure accompanied by a markedly reddish cast to the light may indicate a lamp that is overheated. Verify proper power input and operation of the thermal control circuit. Verify that no obstructions exist in the airflow path.

Maintenance and Repair (LE)

Only qualified personnel should make electrical inspections and repair USHIO America's Sōlarc light engines, light modules and light boxes.

WARRANTY

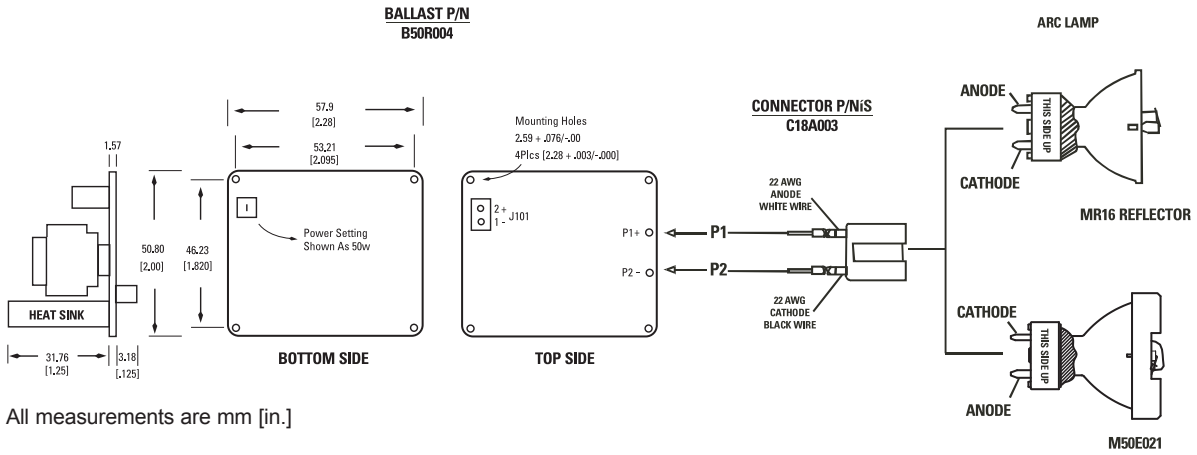
Refer to USHIO America's standard terms and conditions of sale for warranty information.

CONCLUSION

USHIO America's Sōlarc lamps combine all the features you're looking for in a lamp: high-quality illumination, low power consumption, precision focus, safety and multiple wattage configurations. All this—along with USHIO America's assurance that each and every Sōlarc lamp will operate to specifications-combines to deliver lamps that ensure your product's success.

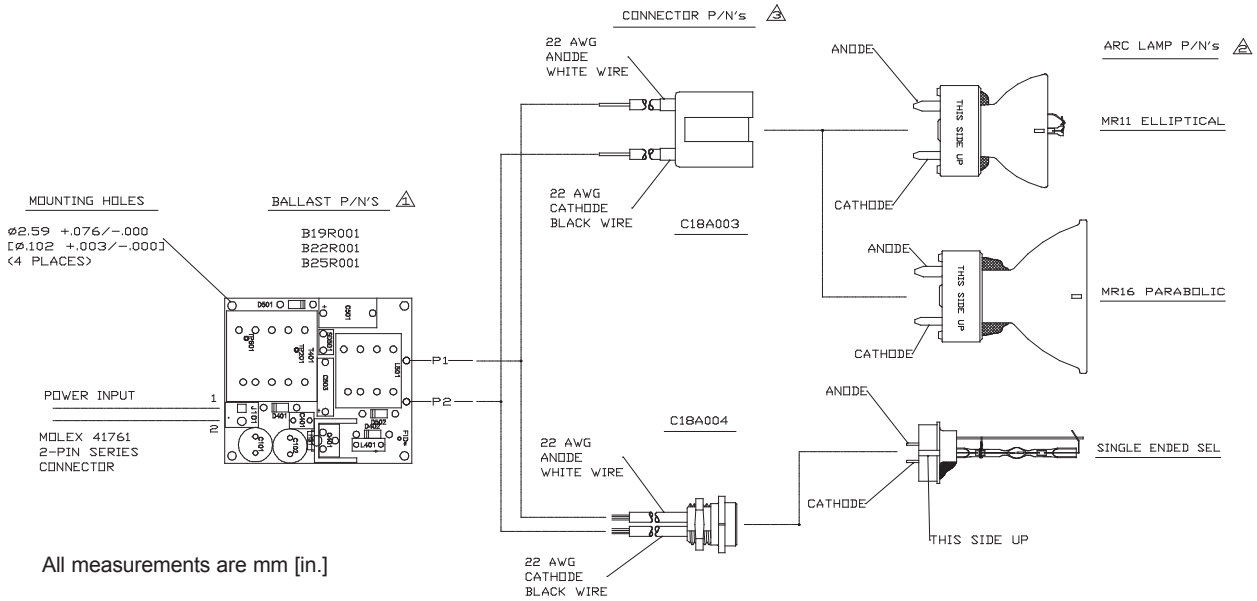
To take full advantage of the design possibilities that Sōlarc can deliver, feel free to draw from our experience in designing products using Sōlarc lamps by contacting us. If you would like further guidance and/or information on any of the design issues found in this manual, contact an USHIO representative today at 800-838-7446.

Figure 4: Ballast / Arc Lamp Configuration



All measurements are mm [in.]

Figure 5: Ballast / Arc Lamp Configuration



All measurements are mm [in.]

Figure 6: Parabolic Reflectorized Lamp Typical Performance Specifications

LAMP P/N	M21P011	M21P021
Output Performance		
Output (CBCP)	14,500	5,000
Beam Divergence (@ 50% Intensity)	12	20
Application Information		
Color Temperature	6,000K	
Chromaticity (x, y)	0.32, 0.32	
Median Life	750 Hours	
Warm-up Time to >90% of Rated Output	20 Seconds	
Restart Time to >90% of Rated Output	25 Seconds	
Ballast	**B22R001**	
Input Voltage	9.8 V–15 V	9.8 V–15 V
Current @ 12 VDC	2.3 A	2.3 A
Lamp Connector	**C18A003**	

Duty cycle for Rated Median Lamp Life: 21W – 1 Hr on / 15 min off. 50 W – 2 Hr on / 15 min off

Figure 7: 19, 22 & 25 Watt Ballasts Performance Specifications

ELECTRICAL		B19R001	B22R001	B25R001
Input Power		Specifications, unless otherwise indicated, are nominal at or near 25˚C.		
Turn-on Voltage[1]		9.8 VDC		
Turn-off Voltage[1]		9.2 VDC		
Maximum Voltage		16.0 VDC		
Steady State Current [2]		2.0 A	2.3 A	2.6 A
ENVIRONMENTAL				
Operating Temperature		0˚ to +70˚C (forced convection cooling recommended)		
Storage Temperature		-40 to +105˚C		
PINOUTS	**CONNECTOR**			
Input Power (Molex 41791 series)	J101 41671 or 26-48-1025	Pin 1 = "+" input power Pin 2 = "-" input power		
Output Power	P1 P2	Anode, white wire on ballast connector Cathode, black wire on ballast connector		

[1] Turn-on and turn-off specifications are a function of input wiring resistance. The voltage at the pins of J101 are regulated using the remote sense leads of a power supply.
[2] Steady state current flow after lamp warm-up @ 12 V.

Figure 8: Sõlarc® MR-11 Elliptical Lamp Performance Specifications

Wattage	19 Watts	22 Watts	25 Watts
Performance @ Rated Power: Luminous Flux			
Lumens Through a 4 mm Aperture	560	620	720
Lumens Through a 2 mm Aperture	200	260	350
Correlated Color Temperature (˚K)	6,900	6,200	5,200
Chromaticity (CIX, CIY)	0.32, 0.31	0.33, 0.32	0.33, 0.34
Lamp Life (Hours)	1,100	750	350
Lamp Maintenance and Spectrum	Refer to charts below		
Warm-Up Time to 90% Output	20 seconds		
Restart Time to 90% Output	30 seconds		
Reflectorized Lamp Application Information	**MR11**		
Numerical Aperture	NA–0.67		
Spot Size @ Focal Plane F2	2 mm @ 50% Intensity		
F2 Distance from Rim	14.7 mm		

Figure 9: 21W Lamp - Typical Light Maintenance

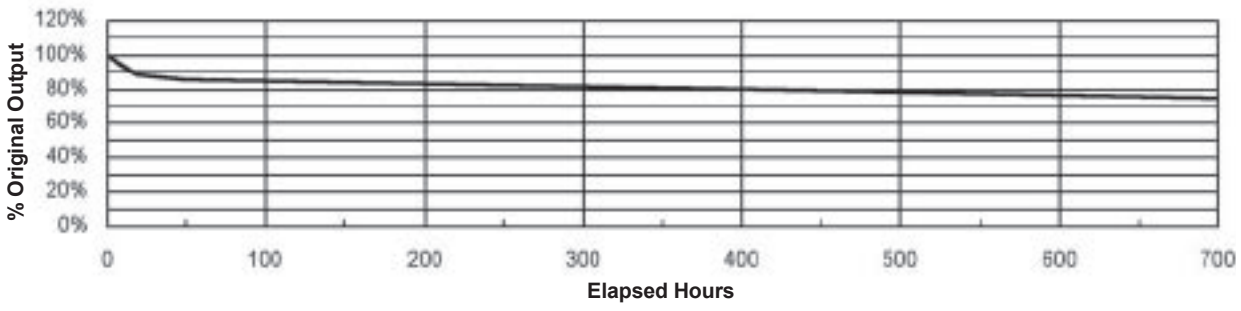


Figure 10: CIX Chromaticity Maintenance

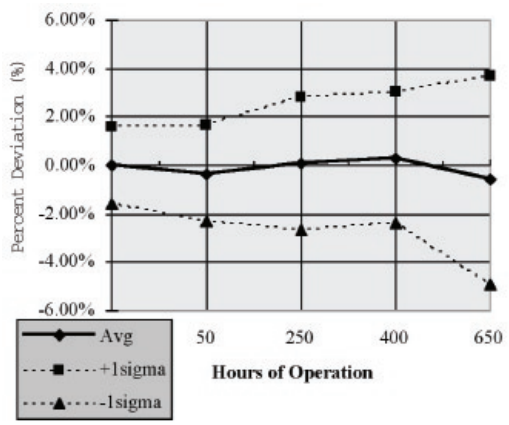


Figure 11: CIY Chromaticity

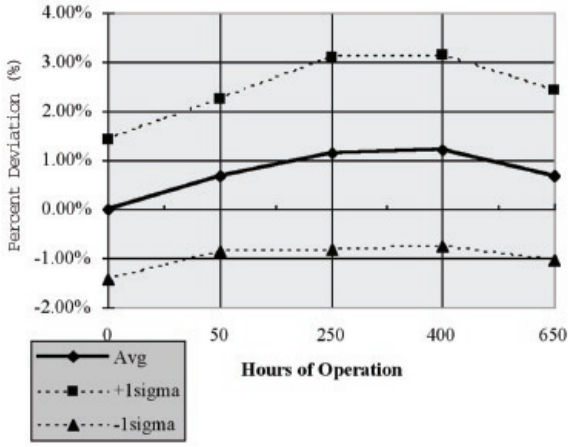


Figure 12: Spectral Output at Zero Hours

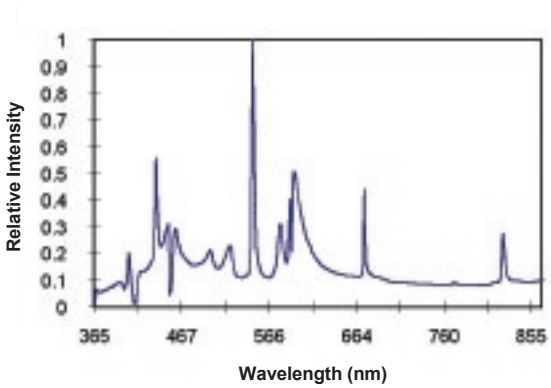
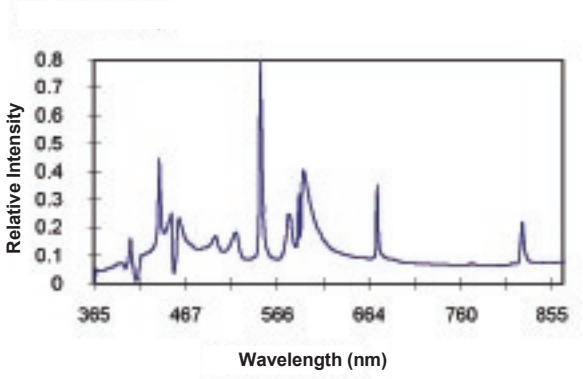


Figure 13: Spectral Output at 650 Hours



Spectral Distribution

The plots above provide an indication of the degree of relative energy changes within the spectral distribution as the lamp ages. The curves describe the performance of a typical 21W lamp in its reflector, operated at rated wattage and standard duty cycle.

Figure 14: 18, 21 & 24W Reflectorized & Sel Lamps

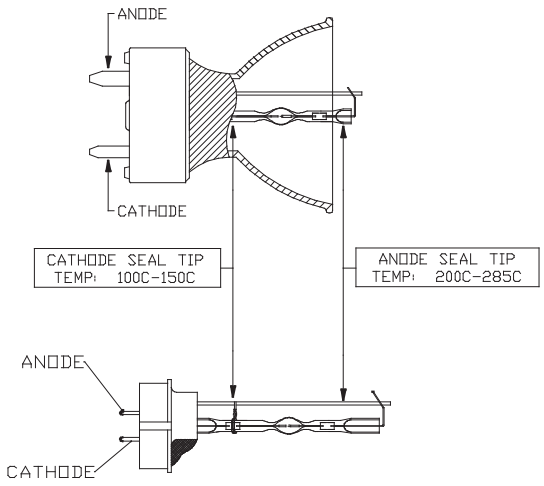
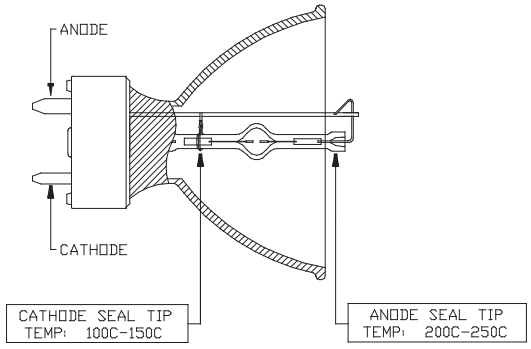


Figure 15: 50W Reflectorized Lamp



Sōlarc® LIGHT

ULTRAVIOLET LIGHT SOURCES

Advanced High-Performance Ultraviolet Light Sources

High-Intensity Metal Halide Discharge Sōlarc® Lamps deliver high-level UVA output where you need it most, resulting in advanced performance equipment.

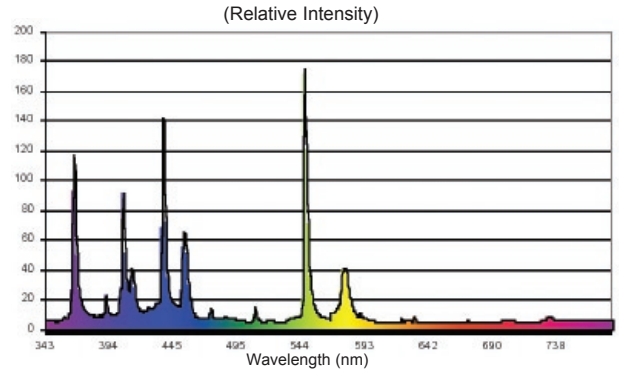
All UV Products Feature

- Technically specified UVA output
- Precise dimensional construction
- High-performance materials for optimal output
- Custom designs available
- Guaranteed performance

Why Use UVA Products?

- Certainty of performance
- Highly efficient sources minimize power consumption, size and electrical demands
- Consistent and repeatable
- Proven analytical, medical, dental & industrial applications
- Outstanding customer service and support

Spectral Output for Sōlarc HID Lamp



Typical Applications

- Spot Curing
- Photo-Activation
- Forensics
- Dental/Teeth Whitening
- Military/Homeland Defense
- Fluorescence
- Spectroscopy
- Spectrophotometers
- Point of Care Testing
- Medical
- Leak Detection

Sōlarc® High-Intensity-Discharge UV-Enhanced Products

Part No.	Description	Electrical Characteristics	UV Output (Nominal)	Accessories Required
M21E031	24-watt high-intensity elliptically focused light for spot & fiber illumination.	24W	8 mm spot @ 46.7 mm 0.85 watts (350-400 nm) 1.72 watts (400-500 nm)	B25R001R (ballast) C18A003 (lamp connector)
M50E014	50-watt high-intensity elliptically focused light for spot & fiber illumination.	50W	8 mm spot @ 46.7 mm 1.660 watts (420-480 nm)	B50R004R (ballast) C18A003 (lamp connector)
M50E031		50W	5 mm spot @ 46.7 mm 1.50 watts (320-410 nm) 2.70 watts (320-500 nm)	
M50E032 Includes Protective Mounting Ring		50W	5 mm spot @ 38.0 mm 1.50 watts (320-410 nm) 2.70 watts (320-500 nm)	
LM50UVS-001	Integrated assembly incorporating patented cooling techniques for optimal lamp life. Includes M50E032.		5 mm spot @ 23.6 mm 1.50 watts (320-410 nm) 2.70 watts (320-500 nm)	B50R004R (ballast) C18A003 (lamp connector)

USHIO

Please Note: Continuous product improvement requires we reserve the right to change these specifications without notice.