





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 Solarc 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.



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.









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

Solarc 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.

Solarc [®] 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 I	nformation	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			
The hypical Spectral Output (Reference) 10.9 0.9 0.6 0.7 0.6 0.6 0.6 0.6 0.6 0.7 0.6 0.6 0.6 0.6 0.7 0.6 0.6 0.6 0.7 0.6 0.6 0.6 0.7 0.6 0.6 0.6 0.6 0.7 0.6 0.6 0.6 0.6 0.7 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.855 Wavelength (nm)						
Typical Light Maintenance—21W Lamp						
120% 100% 80% 60% 40% 0% 0 100 200 300 400 500 600 700 Elapsed Hours						



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

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SINGLE-ENDED LAMP

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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 Solarc 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 Solarc 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. Solarc lamps also deliver less heat to the object.











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.



Additional Cooling

Solarc 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 Solarc® SEL Assembly—All measurements in inches

M21N002 Solarc® 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.

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.

PARABOLIC REFLECTORIZED LAMPS

USHIO's parabolic reflectorized lamps are specifically designed for general illumination applications. These industrystandard reflectors are dichroic coated for maximum reflectivity for visible applications. With our patented Solarc® 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.

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.

Typical Laboratory Data

B19R001, B22R001R, B25R001R BALLASTS

USHIO's ballasts are designed to operate with USHIO Solarc® lamp products only. The ballast consists of an internal regulator that delivers constant power to the Solarc® 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.

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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.

