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5440 Cerritos Ave, Cypress, CA 90630
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Dr. S. Xu
Materials Safety Licensing Branch,
Division of Materials Safety, Security, State,
And Tribal Programs
Office of Nuclear Materials Safety and Safeguard

Reference number: 611385
Subject: Ushio America Holdings, Inc,. Additional information for renewal of exempt distribution license 04-23968-01E

March 5th, 2019

Dear Dr. Xu,

This letter is in reference to your letter dated February 26th 2019 in regards to our renewal application request dated February 11, 2019, for U.S. Nuclear Regulatory Commission (NRC) exempt distribution license number 04-23968-01E.

Please find enclosed the information you requested to address Title 10 of the Code of Federal Regulations (10 CFR):

10 CFR 32.14(a) requires the applicant to satisfy the general requirements specified in Section 30.33 of 10 CFR. – Response provided.

10 CFR 32.14(b)(1) requires the applicant to submit the chemical and physical form and maximum quantity of byproduct material in each product. – Response provided.

10 CFR 32.14(b)(2) requires the applicant to submit details of construction and design of each product. Given that we have hundreds of light bulbs and in line with previous application, I picked a sample which has the highest level of thorium/Kr-85. – Response provided.

10 CFR 32.14(b)(3) requires the applicant to submit the method of containment or binding of the byproduct material in the product. Please describe, or identify, the appropriate enclosure that describes the method by which Kr-85 gas is introduced and the glass tube is sealed.- Response provided.

10 CFR 32.14(b)(6) requires the applicant to submit the proposed method of labeling or marking each unit and its container with the identification of the manufacturer or initial transferor of the product and the byproduct material in the product. Note: 10 CFR 32.15(d)(1) requires

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labeling or marking of each unit and its container so that the manufacturer or initial transferor of the product and the byproduct material in the product can be identified.- Response provided.

10 CFR 32.14(b)(7) requires the applicant to submit the radiation level and the method of measurement for products for which limits on levels of radiation are specified in Section 30.15 of this chapter. The levels of radiation from each product containing byproduct material will not exceed the limits specified for that product in Section 30.15 of this chapter. Section 30.15(a)(8) specifies that the levels of radiation from each electron tube containing byproduct material do not exceed 1 millirad per hour at 1 centimeter from any surface when measured through 7 milligrams per square centimeter of absorber. Please resubmit this information in your revised application. – Response provided.

10 CFR 40.52(b)(1) requires the applicant to submit chemical and physical form and maximum quantity of source material in each product. – Response provided.

10 CFR 40.52(b)(2) requires the applicant to submit details of construction and design of each product. Please resubmit this information in your revised application. – Response provided.

10 CFR 40.52(b)(3) require the applicant submit quality control procedures to be followed in the fabrication of production lots of the product and the quality control standards the product will be required to meet. Please submit quality control procedures for manufacturing thorium lamps.- Response provided.

10 CFR 40.52(b)(4) require the applicant to submit the proposed method of labeling or marking each unit, and/or its container with the identification of the manufacturer or initial transferor of the product and the source material in the product. Please provide legible copies of the labels that will be used on each type of product (or container where the product is too small to be labeled). – Response provided.

Sincerely,

Rez Motamed
Sr. Manager, Regulatory Compliance
USHIO AMERICA, INC.
5440 Cerritos Ave, Cypress, CA 90630
rmotamed@ushio.com
Tel: 714-229-3137
Cell: 714-718-5385

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1. General Background

Please note, apart from adding a few more warehouses and the name change in 2018, there has been no changes in construction, design, chemical and physical forms.

Applicant's Application for a Material License is intended to cover various discharged lamps containing the following two items:

Krypton – 85. Gas (Sealed source).

Thorium-232, Thorium-228 or Thorium-230. Thorium tungsten alloy.

Distribution limit: Not to exceed 1.11 megabecquerels (30 microcuries/tube). Total not to exceed 100 millicuries.

Both thorium and krypton 85 are indispensable for improving the quality of lamps. Without using appropriate amounts of these materials, the current functions and performance of lamps cannot be maintained.

2. Responses to NRC questions

1. **Thorium** - No possession license is required.
2. **Kr-85** possession license is attached. Renewal license in process. Products distributed from warehouses in other states do not contain Kr-85.

Kr – 85 Lamps

Kr – 85 Lamps consist of two different kinds of lamps: i) high intensity discharge (HID) lamps and ii) compact fluorescent (CF) lamps with built in glow starter. In all cases, less than 30 µCi of Kr-85 will be contained in a vacuum tight sealed glass tube.

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In HID lamps, the sealed glass tube will either be (a) enclosed within an outer glass envelope which is affixed to a lamp base, or (b) directly affixed to a lamp base. In all of the HID lamps, the Kr-85 containing tube is made of quartz glass, and the thickness of the Kr-85 tube will be at least 1 mm. Depending on the specific lamp, the dimensions of the quartz tube containing the Kr-85 will vary in a range of 1.0 - 17 cm with diameters not exceeding 2.8 cm. Accordingly, the volume of the Kr-85 containing tube in any of the HID lamps will not exceed 420 cm^3 In HID lamps with Kr-85 containing tubes enclosed in outer glass envelopes, the Kr-85 containing tube will be secured within the outer glass envelope. Depending on the product, this may be effected by a wire passing through and sealed in the glass of the inner tube and either sealed in the outer glass envelope or welded to a metal lamp base to which the lamp is affixed, by spring support, by cementing of the lamp assembly in ceramic material, or by some combination of those measures. In lamps consisting only of a glass tube containing Kr-85 and a lamp base, a wire passes through a vacuum tight sealed glass tube and is affixed to the lamp base.

In CF lamps, a very small glass tube (called a glow bottle, glow tube or glow starter) exterior to the lamp tube, housed in the lamp base and containing very small amounts of Kr-85 (96 Bq or .00025 µCi) is splice crimped to the lead wire of the lamp. The Kr-85 is contained in the glow starter by a vacuum tight seal. The pressure in the glow starter is very small (less than 50 torr). The maximum dimensions of the glow starter tube are 8mm diameter and 25mm length, and wall thickness of the glow starter tubes is at least .45 mm.

In the HID lamps, the Kr-85 is contained in quartz glass tubes (commonly called an arc tube) by vacuum tight quartz to metal seals. This vacuum tight seal has been commonly used in the manufacturing of HID lamps for at least 70 years, and insures that the Kr-85 will not leak from the tube under the most severe conditions that are likely to be encountered, and that the quartz to-metal-seal will last far beyond useful lamp life. In HID lamps with Kr-85 tubes enclosed in outer glass envelopes, the Kr-85 containing tube will be secured within the outer glass envelope. Depending on the product, this may be effected by a wire passing through and sealed in the glass of the inner tube and either sealed in the outer glass envelope or welded to a metal lamp base to which the lamp is affixed, by spring support, by cementing of the lamp assembly in ceramic material, or by some combination of those measures. In HID lamps consisting only of a glass tube containing Kr-85 and a lamp base, a wire passes through the vacuum tight sealed glass tube and is affixed to the lamp base.

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In CF lamps with glow starters exterior to the lamp tube and housed in the lamp base, sealed glow starters containing Kr-85 are splice crimped to the lead wire of the lamp

Once the gas mixture containing Kr-85 is properly sealed into a glass tube, the gas mixture does not leak through the glass. Quality control procedures used by the various manufacturers assure proper sealing of the glass tube. Without Kr-85 as an ignition source, the Subject Lamps will not ignite, and visual observation of ignited lamps as part of the manufacturing process confirms proper sealing. Lamp manufacturers are experienced in the well understood process of sealing gases in glass tubes and affixing the glass tubes to lamp bases, and routinely test lamp designs for assured quality and customer acceptance. Specific quality control checks reported by lamp manufacturers include random sampling checks as follows:

- Visual inspection
- Burst checks (pinched arc tube must withstand up to 300 psi);
- Arc tube geometry check (optical comparison between arch tubes and drawing); and
- Fill pressure check (for appropriate pressure, 20 - 130 torr, depending on wattage and arc geometry).
- Lamp life tests

Some manufacturer of HID lamps purchases a mixture of Argon gas and trace amounts of Kr-85 gas from Osram, a major worldwide lamp supplier. The gas mixture has an activity of 500 µCi/1000 cm^3 (attributable to the trace amounts of Kr-85) at one atmosphere of pressure. At 14% atmospheric pressure (the maximum fill pressure in the Kr-85 containing tubes) at a constant temperature, the volume of the gas mixture will expand such that activity will be 70 µCi/1000 cm^3 . The volume of the Kr-85 containing glass tube is never greater than 420 cm^3. Accordingly, the activity of the gas mixture containing the Kr-85 will never exceed 420/1000 x 70 µCi, or 29.4 µCi. In filling the Kr- 85 glass tube, the manufacturer uses calibrated pressure devices like baratrons (capacitive gauge manometers) to assure that the pressure inside the glass tube is no more than 0.14 bar (i.e. 14% of ambient pressure), thus assuring that activity will be less than 30 µCi. It should be noted that lamps having larger volumes usually have significantly lower fill pressures which results in activity levels that are lower than the maximum level stated above.

Some manufacturer of HID lamps reports Kr-85 placement ranging from 0.012 µg - 0.069 µg Kr-85 in its various tubes. Based on a specific activity for Kr-85 of 391.7 µCi/µg, this equates to a range from 4.7 µCi - 27 µCi in the various tubes placed in its lamps.

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Some manufacturer, which manufactures CF lamps, reports activity per glow starter of 96 Bq, which equates to .00025 µCi.

All manufacturers of the Subject Products are certified to ISO 9001 Quality Management Standard, ensuring the quality and integrity of its products. ISO 9001 Quality Management Standard ensures_ appropriate quality control in all facets of the manufacturing process. Specific quality control checks reported by lamp manufacturers include random sampling checks as follows:

- Visual inspection
- Burst checks (pinched arc tube must withstand up to 300 psi);
- Arc tube geometry check (optical comparison between arch tubes and drawing); And
- Fill pressure check (for appropriate pressure, 20 - 40 torr, depending on wattage and arc geometry).
- Lamp life tests

Krypton 85 is used in lamps for the following purposes.

(i) Reduce breakdown voltage at start.
(ii) Improve starting performance of the lamp after being left unused for a long time.
(iii) Secure starting performance in cold regions and dark spaces.

Krypton 85 plays important roles in improving starting performance of lamps and maintaining the starting performance throughout the period of use. Furthermore, the general characteristics apply to all of the lamps:

i) Contain a sealed glass tube containing a mixture of inert gas (such as Argon) and Kr-85.
ii) No more than 30 µCi of Kr-85 are contained in any one lamp
iii) The thickness of the glass tube containing Kr-85 is at least 1 mm for high intensity discharged lamps and at least .45 for the smaller glow starter tube in compact florescent lamps (see further discussion below)
iv) Fill pressure inside the glass tube containing Kr-85 does not exceed 0.14 bar
v) Radiation levels at 5 cm and 25 cm are less than 15 µR/h

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Thorium lamps

Radioactive materials are used in some of our HID lamps (metal halide lamps, high-pressure and super high-pressure UV lamps, and xenon lamps). A sample of detailed construction and design of our DXL-65BA2 which contains the electrode material thoriated tungsten. Please note that the thoriated tungsten that is used contains a very small amount of low level radioactive materials to enhance the start ability and lifetime performance. This leads to significantly lower electrode temperatures and therefore to much longer life times (attached letter from Ushio Japan). For specialty, short arc lamps it is absolutely necessary to use thorium, otherwise arc instability and extremely short life will occur. Most metal halide lamps use thoriated electrodes as well. As mentioned in the attached letter from Ushio Japan, thorium lamps manufactured in Japan are in line with ISO-9001-certification requirements. This is a manufacturing standard requirement for our lamps that contain thorium. See samples provided.

They purchase thoriated tungsten as a finished material. Electrodes are a very essential part of the lamp and are very tightly controlled mechanically and in material consistency. The consistency of the electrodes is extremely important for the function and reliability of the lamps. Please refer to attachment for a sample material inspection sheet. Since the material and the dimensions (aka weight) are very tightly controlled, the thorium amount in the lamp is also very tightly controlled and consistent, as inconsistencies of material or dimensions would have a direct impact on the lamp performance and are therefore easily detectable.

The thoriated tungsten used in Ushio products contains 2 weight % of thorium oxide (ThO2). Radioactive thorium is contained in the cathodes (thoriated tungsten: solid) of super high-pressure UV lamps, xenon lamps, etc. The thoriated tungsten contains 2 weight percent thorium oxide (ThO2).

The radioactive thorium ,metal is combined with tungsten electrodes located in the lamp. Thorium-232 is a naturally occurring radioactive material and is added to the lamp as thoriated tungsten electrodes, or less frequently in the form of 232ThO2 coated tungsten, or as 232Th-iodized admixture in the filling depending on the type and application of the light source. Important advantages of deliberately adding 232Th (or 232ThO2) to the tungsten of the electrode are to improve the metallurgical properties and to increase the stability of the electric arc between the electrodes. Due to the presence of 232Th, the lifetime of the electrodes is prolonged as less material is lost and lumen maintenance over lamp life is better, as less electrode material evaporates and do not darken the glass bulb. These insignificant amounts of thorium are identified as radioactive source material. Radiation does not leave the intact arc tube. Thorium iodine can also be displaced in arc tube. Thorium-232 has been used in electrode systems internationally for several decades in various high performance and special lighting products as the common state of the art of science and technology. The deliberate addition of 232Th to these products is indispensable for their function and high performance. The released thorium iodide from arc tube may cause irritation to the nose, mucus membranes and respiratory tract. The IAEA – TEDOC – 1679 document declares that the effects of radiological materials in lamps to society and the lighting industry

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and other employees, in connection with the lamp for the whole life cycle – including waste disposal – has been shown to be insignificant.

Thorium is used for the following benefits and purposes.

(i) Improve starting performance by reducing starting voltage.
(ii) Stabilize the plasma arc at the time of lighting.
(iii) Reduce damage to and evaporation of tungsten, thereby reducing the blackening of glass tubes.
(iv) Improve the rate of maintaining the lifespan of lamps.
(v) Enhance mechanical strength.

Thoriated tungsten plays important roles in improving starting performance, arc stability, lifespan, and mechanical strength of lamps.

All of the Kr-85 and thorium containing lamps are subject to manufacturer quality control procedures and all of the manufactures of the Kr-85 and thorium lamps are licensed by relevant local authorities for the use of Kr-85 and thorium manufacturing and production. Level of radiation from the lightbulbs is minuscule and not measurable.

Labelling.

Samples provided.

Distribution points:

1) 5440 Cerritos Avenue, Cypress CA 90630
2) 14 Mason Drive, Irvine CA 92618
3) 11101 Metro Airport Center Drive, Ste # 109, Romulus, MI. 48174
4) 1080 Citrus Street, Riverside, CA 92507
5) 2050 E Mountainview Drive, Newberg, OR 97132

The mailing address for NRC license communications is the Cypress address, as follows:

Ushio America Holdings, Inc.
Attention: Radiation Safety Officer
5440 Cerritos Avenue
Cypress, CA 90630

Please see attachments for:

i) Labelling samples
ii) Construction and design sample
iii) Amount of thorium and Kr-85 gas in each product

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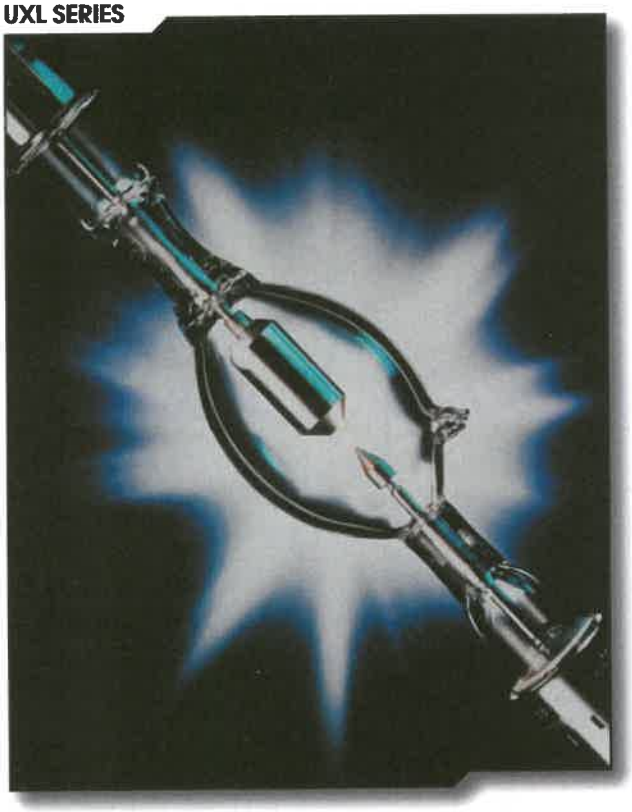
XENON SHORT ARC LAMPS

UXL SERIES



FOR STRONG FOLLOWSPOTS

UXL-20FS • UXL-2000FS • UXL-3000FS

These three new xenon lamps from USHIO are specifically designed and approved for use in STRONG high performance followspots. During manufacturing, the quartz tip-off position was moved to the cathode side of the lamp to allow easier installation and a more precise fit into the reflector. The cable on the UXL-3000FS has been lengthened to allow ease of lamp positioning during installation.

USHIO's UXL series are high pressure, short-arc xenon discharge lamps. UXL spectral distribution is well balanced in the visible spectrum to resemble daylight. The high gas fill pressure provides high luminance and high luminous efficacy. Fast ignition and a stable arc are what USHIO has achieved with the UXL lamp design.

*Strong Spotlights, Super Trouper®, Super Trouper II®, and Gladiator III® are trade names owned by Ballantyne of Omaha, Inc.

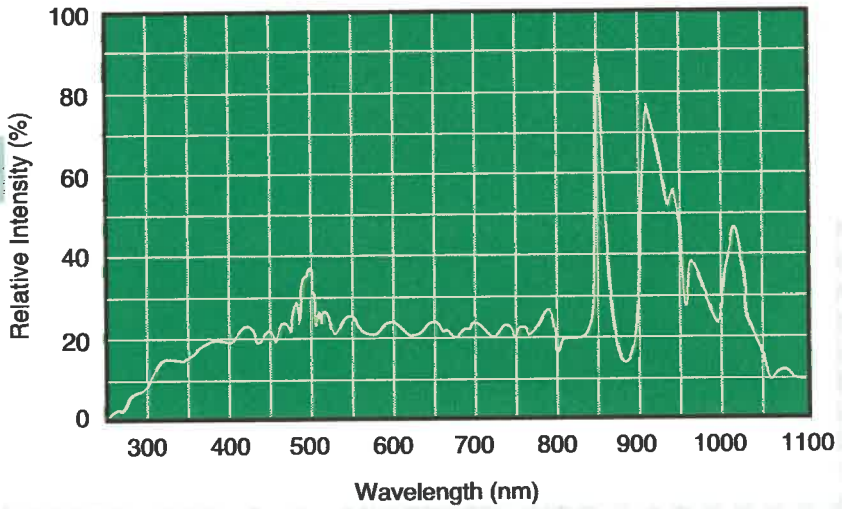
STRONG FOLLOWSPOTS

- UXL-2000FS – for Xenon Super Trouper® 83070, 83080
- UXL-20FS – for Super Trouper II® 24000
- UXL-3000FS – for Xenon Gladiator III® 47061

APPLICATIONS

- Concert Touring
- Theatrical Events
- Sports Events
- Special Venues

XENON SPECTRAL DISTRIBUTION



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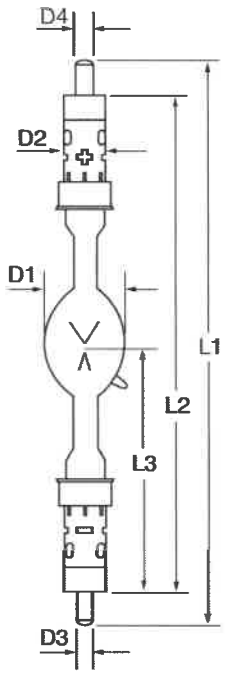
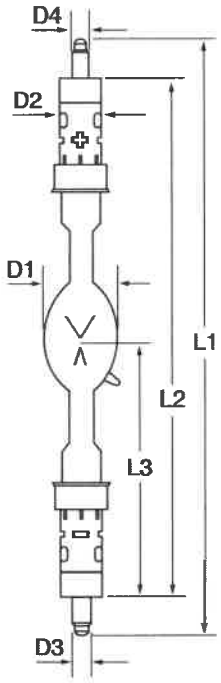
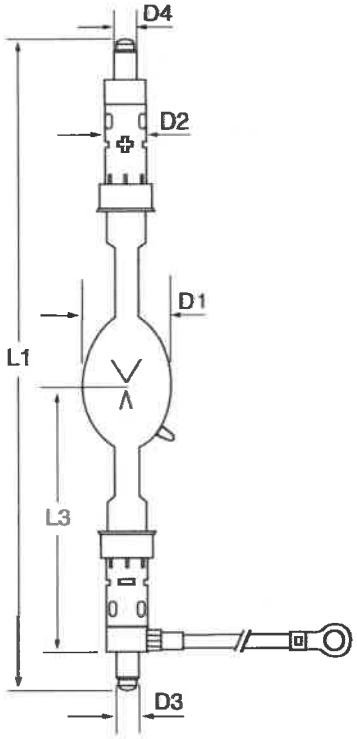
CHARACTERISTICS & SPECIFICATIONS



UXL-20FS



UXL-2000FS



UXL-3000FS

Watts (W)	Ushio Ordering Code	Ushio Lamp Code	Rated Lamp Current (A)	Operating Current Range (A)	Lamp Voltage at Rated Current (V)	Diameter (D1)	(D2)	(D3)	(D4)	Length (L1)	(L2)	(L3)
UXL Series Xenon Short Arc Lamps												
2000	5001062	UXL-20FS	80	50~85	25	60	27	7.8	9.4	342	302	147
2000	5001063	UXL-2000FS	70	50~85	29	55	27	12	10	370	320	145
3000	5001064	UXL-3000FS	100	60~100	30	70	27	14	13	428	—	171

Average life: UXL-20FS & UXL-2000FS – 2000 hours
UXL-3000FS – 1200 hours

Arc Gap: UXL-20FS & UXL-2000FS – 6mm
UXL-3000FS – 7mm

All dimensions are approximate measurements in millimeters

Operating Conditions

Burn Position: Vertical (anode up) or Horizontal ± 15°

Base surface temperature: 200°C Max.

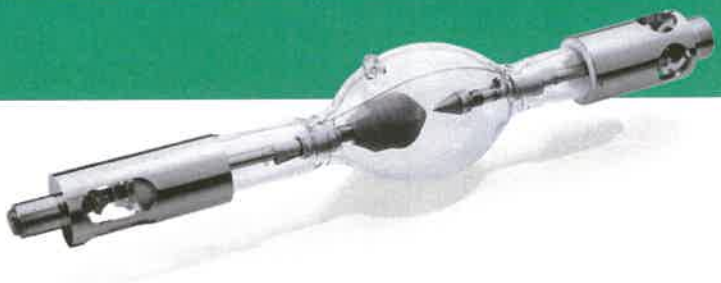
Cooling: Forced 10-13 m/s

Current Ripple: 10% Max.

These lamps are ozone free

Form No. S-UXL/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.

DXL Digital Xenon Lamps



For NEC Digital Cinema Projectors

Ushio's DXL series of Xenon lamps have been developed as the preferred light sources for NEC digital cinema projectors, providing high stability and high reliability.

These high-luminance light sources are optimized to meet the increased demands of digital projection and 3-D exhibition standards. Ushio's DXL series are officially approved and recommended for use in NEC digital cinema projectors.

WHY CHOOSE USHIO DXL:

- Ushio's DXL series of digital xenon lamps achieve the highest performance for digital cinema projection.
- Digital cinema projectors have a more complex optical system than that of film projectors and require lamps with much higher brightness and a more stable arc. Ushio's DXL series are 20-50% brighter than that of standard film lamps of the same wattages.
- DXL lamps are optimized to meet technical standards especially for digital 3-D screenings.
- Ushio offers its L-Series (Long Life) Digital Xenon lamps.
- Ushio now offers LUMINITY Series (Extreme Life) Digital Xenon lamps.

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DXL Digital Xenon Lamps for NEC Digital Projectors

L-SERIES LUMINITY

NEC Projector	Ordering Code	Lamp Description	Wattage Max./Min.	Lamp Current Max./Min.	Total Projected Lumens	100% Warranty Hours	Lamp Series
NC1200C NC1600C NC2000C	5002267	DXL-12SN	1200 / 840	75 / 35	4400	3000	
	5002268	DXL-15SN	1500 / 1050	80 / 40	7100	3000	
	5002168	DXL-20SN3	2000 / 1400	85 / 50	9700	2400	
NC1600C NC2000C	5002449	DXL-30SN2/L	3000 / 2100	125 / 65	12400	1800	L Series (Long Life)
	5002170	DXL-40SCN	4000 / 2800	138 / 83	12700	1500	
	5002178	DXL-40SN2	4000 / 2800	138 / 83	15000	1000	
	5002451	DXL-40SN/L	4000 / 2800	138 / 83	18300	850	L Series (Long Life)
NC2500S (4kW), NC3200S (4kW), NC3240S (4kW)	5002276	DXL-12SN2	1200 / 840	75 / 35	5600	3000	
	5002269	DXL-21SN3	2000 / 1400	90 / 50	11800	2400	
NC2500S (4kW & 7kW) NC3200S (4kW & 7kW) NC3240S (4kW & 7kW)	5002450	DXL-31SN2/L	3000 / 2100	125 / 65	15400	1800	L Series (Long Life)
	5002229	DXL-41SCN	4000 / 2800	138 / 83	16000	1500	
	5002228	DXL-41SN2	4000 / 2800	138 / 83	20800	1000	
	5002452	DXL-41SN/L	4000 / 2800	138 / 83	22000	850	L Series (Long Life)
NC2500S (7kW) NC3200S (7kW) NC3240S (7kW)	5002273	DXL-45SN/L	4500 / 3150	158 / 95	21400	1200	L Series (Long Life)
	5002274	DXL-60SN/L	6000 / 4200	167 / 105	26000	800	L Series (Long Life)
	5003271	DXL-60SN/LU	6000 / 4200	155 / 105	26000	1000	LUMINITY (Extreme Life)
	5002174	DXL-70SN	7000 / 4900	180 / 115	33000	300	

UXL Film Lamps for NEC Digital Projectors

NEC Projector	Ordering Code	Lamp Description	Wattage Max.	Lamp Current Max./Min.	100% Warranty Hours*	NEC Required Film Lamp Adapters
NC1200C	5002223	UXL-10SCB	1000	55 / 30	2000	Please contact local distributor for adapter
NC1200C, NC1600C NC2000C	5001434	UXL-20SC	2000	85 / 50	2400	Use NEC standard film lamp adapter NC1600C / NC2000C
NC1600C, NC2000C NC2500S, NC3200S NC3240S - 4kW & 7kW	5001079	UXL-30SC	3000	110 / 60	1500	Use NEC standard film lamp adapter NC1600C / NC2000C For NC 2500S/3200S3240S 3kW film projector use NEC optional film lamp adapter NC-25CL02
NC2500C NC3200S NC3240S - 4kW & 7kW	5000631	UXL-40SC	4000	150 / 80	1200	For 4kW - 7kW film projector lamp bulbs use NEC standard film lamp adapter NC2500S/NC3200S/NC3240S
	5002044	UXL-50SCA	5000	150 / 100	1000	
	5000943	UXL-60SC	6000	170 / 120	600	
	5000634	UXL-70SC	7000	170 / 120	500	

L Series (Long Life)
LUMINITY Series (Extreme Life)
*Ushio's stated 100% warranty hours may differ from the average lifetime hours.

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DATASHEET

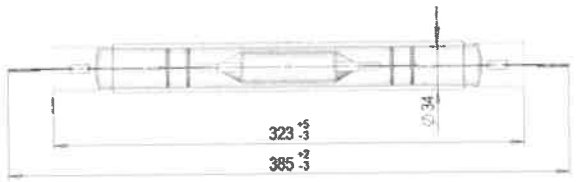
Hi-LuxGro MH 1000 W DE 5.5K

Metal halide lamp for plant growth

Application **Efficient growth lighting for professional greenhouses and turf lighting.**

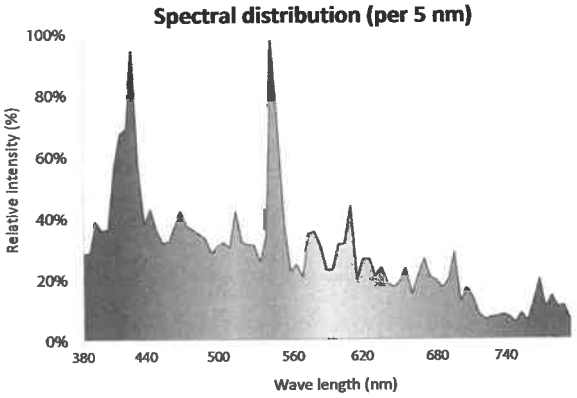
Description
Colour temperature similar to daylight
High blue light ratio and full spectrum output for healthy plant growth and robustness
Superior µmol output within the PAR spectral range (Photosynthesis Active Radiation)
Easy lamp change
Special lamp design optimised for usage in open luminaires

1. Specifications

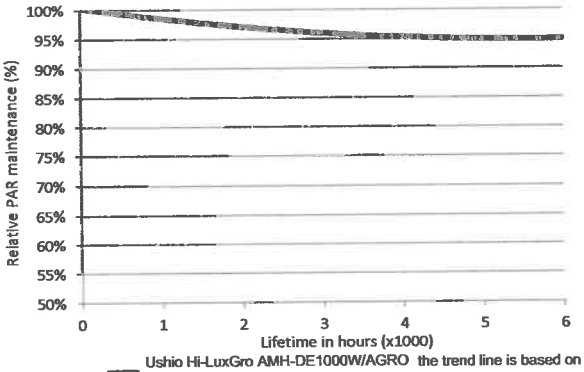


Designation	AMH-DE1000W/AGRO
Part number	5003100
ILCOS-Code	MD-1000/60-H220-cable-3.5/330
Lamp power	1000 W
Lamp current	4,8 A
Lamp voltage	220 V
Ignition voltage	3,2 kV (peak to earth)
PAR	1800 µmol/s
Color Temperature	5500 K
Service Lifetime	6000 h
Power supply (PS)	1000 W electronic / 100–150 kHz
PS output power	1015 W
Base	cables
Bulb contour	tubular
Bulb type	clear
Lamp holder	K12x30S

Spectral distribution (per 5 nm)

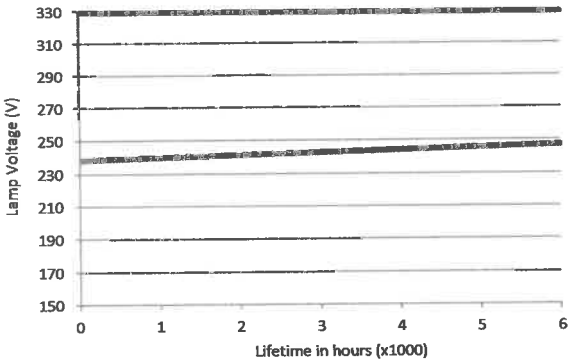


PAR Maintenance



Ushio Hi-LuxGro AMH-DE1000W/AGRO the trend line is based on tests under defined and stable laboratory conditions and represents an average of all values measured.

Lamp Voltage



Electronic Control gear safety switch off
Ushio Hi-LuxGroMH-DE1000W/AGRO *the measurements are performed in a Ulbricht sphere with a Net frequency of 50Hz and a configured lamp power of 1000W)*

-072017

2. Safety instructions for the operation of lamps in luminaires

For the USA and Canada: ANSI type M_/O for open rated luminaires according to ANSI C78.380 and C78.389

- Only operate the lamp in its designated operating position.
- Never operate a lamp beyond its rated useful life. The risk of a lamp burst increases with lamp age, temperature, improper operation and improper handling.
- Always use lamps in their intended luminaires, e.g. only in open luminaires as a closed luminaire will overheat the lamp.
- Do not use the lamp in close proximity of paper, cloth or other combustible material that can cause a fire hazard.
- Never touch the lamp when it is on, or soon after it has been turned off, as it is hot and will cause serious burns. Lamps should be allowed to cool down for a minimum of 10 minutes after the lamp is switched off.
- Do not look directly at the operating lamp for any period of time; this may cause serious eye injury.

3. Safety instructions for the lamp installation

- The lamps must be installed by an expert and operated in accordance with the mounting specifications into luminaires intended for this type of lamp, along with the components intended and suitable for that purpose.
- Always turn off the electrical power before inserting, removing, or cleaning the lamp.
- Never bump, drop, apply excessive stress, or scratch the lamp. This could cause the lamp to burst! Do not operate any lamps with any traces of scratches, cracks, or physical damage.
- Affix the lamp securely in the socket. Improper installations will cause electrical arcing, overheating and short life to lamp and socket.

3.1 Installing the lamp

✓ Wear protective gloves to avoid fingerprints.

1. Make sure that the lamp is correctly positioned.
2. Insert the lamp in the luminaire.
3. Make sure that the lamp holders are correctly closed before operation.

4. Safety instructions for maintenance and inspection

- Always turn off the electrical power before inserting, removing, or cleaning the lamp.
- Replace the lamp at or before the end of its rated life. Group relamping is always recommended.
- Clean any dirt, oil, or lint away from the lamp with alcohol and a lint-free cloth or tissue. Dirt or other contaminants will affect light output and may cause the lamp to overheat and decrease lamp life.
- Electrical connections should be clean and in good condition. Replace lamp holders and sockets when needed.

7. Usage and operation

- The lamp must be ignited at specified ignition voltage and operated at rated lamp power (+/- 3%).
- The power supply needs to comply with the specifications set out in the datasheet. The lamp technically can dim, but is then excluded from warranty.
- The lamp must be operated with switching cycle intervals which are longer than 180 minutes

8. Conformity

Compliance with standards and directives (including all applicable amendments):

- Low voltage directive 2014/35/EU
- RoHS directive 2011/65/EU
- EN 62035:2014 (Discharge lamps (excluding fluorescent lamps) – Safety specifications)

Department/ Division	Technology Section XL Technology & Engineering Department Projection Business Unit Business Division II	Specification Sheet	Document No.	KE-BC-0422
		Xenon Short Arc Lamp DXL-60BA2/L	Approved by	Y.Kono
			Checked by	
Original Date			Designed by	K.Sugaya

1. Scope

The specifications are for xenon short arc lamp type DXL-60BA2/L.

2. Application

The lamp is to be used as a light source for DLP projector (Model: DP2K-32B, DP4K-32B) made by Barco.

3. Appearance and Dimensions

Appearance and dimensions are described in the drawing (Drawing No. DRW0911727).

4. Characteristics

4.1 Electrical characteristics

1) Electrical characteristics are described in the drawing (Drawing No.DRW0911727)
2) Standard lamp voltage is an initial standard value, when the lamp is operated in Ushio 's standard lamp house and under standard lamp power and ignition conditions described in the drawing (Drawing No. DRW0911727)
   Lamp voltage could vary for approx.1-2V, depending on cooling conditions, utilized mirror type, etc.

5. Operation Conditions

5.1 Lamp operation conditions

1) Lamp current : The lamp must be operated in the range of the utility current as described in the drawing (Drawing No. DRW0911727)
2) Operating position : The lamp must be operated Horizontal ±5°or Vertical (Anode up) ±5°.
3) Ignition interval : Must be 1-24 hours
   (Repetition of On and Off in short time and continuous operation for a long time might cause short lamp life ; Interval between the ignitions: Must be more than 20 minutes)

Rev.	Date	Description	Approved by	Designed by
△				
△				
△				
△				
△				

5.2 Cooling Conditions

1) Maximum base temperature : 200℃ for both anode and cathode bases

2) Maximum sealing part temperature : 330℃

3) Maximum gradient part temperature: 430℃

5.3 Power Supply and igniter

1) Power supply : No-load voltage : should be 120V DC or more.
Current ripple : maximum 5% (p-p).

2) Igniter : Supply input voltage to the lamp should be 35kV AC(zero to peak) or more.
Frequency : 5MHz

6. Lamp Life

1) Definition of end of life

Lamp life is defined as below a) or b)

a) When the lamp does not ignite with an ignition device that satisfies the conditions of 5.3.

b) When lamp flicker goes over the specifications

The lamp flicker is determined in such a way that the fluctuation of lamp voltage goes over 1.2V when operated in Ushio's standard lamp house.

Measurement : Ushio's standard lamp house.

YOKOGAWA LR series recorder

Model : LR8100E LR4100E

Setting : chart speed 120mm/hour

voltage range 25V-45V

Measurement time : 20min after voltage stabilization

Fluctuation of lamp voltage : represented by print outs from the measurement equipment

【Reference】 Flicker spec by Barco : Less than 6%

Measuring method : By Barco evaluation method for Flicker

Sampling rate : 50sample/sec

Sampling times : 200 times

Flicker(%)=(maximum value – minimum value) ÷Average value×100

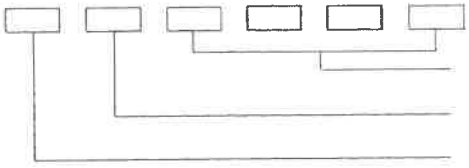
If claimed lamp is more than 6%, Barco and Ushio will discuss.

2)Average life

1100 hours

7. Numbering of Serial Numbers

Numbering of each product's serial number will be as follows:



① Letter representing production year

The letters A through Z will represent the production year.

Year	2011	2012	2013	2014	2015	···	2022	2023	2024	···
Letter	O	P	Q	R	S	···	Z	A	B	···

② Letter representing production month

The letters A through Z will represent the production month.

Month	1	2	3	4	5	6	7	8	9	10	11	12
Letter	A	B	C	D	E	F	G	H	I	J	K	L

③ When the first digit of the four digit consecutive number exceeds nine, the first digit will be symbolized as follows:

Number	10	11	12	···	32	33
Symbol	A	B	C	···	Y	Z

EX). 10000;A000, 11999:B999, 33123:Z123

I and O are not included in Symbol because these letters are similar to numbers.

8. Warning on Handling

8.1 Handling instructions

(1) Since the lamp is a made of glass, and is filled with high-pressure xenon gas, there is always a possibility that the lamp might burst when ignited or even not. Use exclusive protecting case and individual packing box for carriage and stock.
(If the lamp explodes, it might cause injury.)

(2) Wear facemasks, protective gloves and thick long-sleeves when handling the lamps.
(If the lamp explodes, it might cause injury.)

(3) Do not touch the glass directly. If touched by bare hands or becomes contaminated, wipe off with a clean cloth soaked with alcohol.

(4) Do not use the lamp near inflammable chemicals such as thinner.
(May cause fire or explosion)

(5) Do not force to bend or twist the lamp.
(If lamp explodes, may cause injuries)

(6) Do not shake or give shock to the lamp.
(May cause explosion or shorten lamp life)

(7) If the lamp is dropped, it will burst. Even if dropped from 10cm high, lamp might burst.

8.2 Installation and Removal of lamp

(1) When installing the lamp, never fail to wear facemasks, protective gloves and thick long-sleeves.
(May cause injury if lamp bursts.)

(2) Turn off the lamp when installing or removing the lamp or cleaning the lamp house.
(May cause electric shock)

(3) When installing the lamp, first fix the cathode base, and then electrically connect the anode base without giving access strength to the lamp. Be cautious not to mistake the polarity of the lamp under any circumstances. When the anode and cathode side is set wrong, the lamp will be of no use.

(4) When installing and connecting electrically, do not force to bend or twist the lamp.

(5) The lead-wire that connects the igniter to the lamp should be placed at least 30mm apart from the metal parts around it or should be treated so that high-voltage will not leak at the metal parts.

(6) Make sure that no rust no burnt portion or discoloration exists between the electrical connections of the lamp and equipment before making connections.

8.3 Cautions on Operations

(1) Turn on the lamp only in designated lamp houses.

(2) Use ballast conforming to the lamp, and operate the lamp at specified power. Never look at the lamp or the arc during operation by the naked eyes. If there is need to look those directly, wear sunglasses with sufficient density.
(May cause eye irritation or eyesight disorder)

(3) Do not expose the skin directly to the light of the lamp.
(May cause skin infection)

(4) During ignition, intensive light and high temperature heat are emitted. Do not keep or cover the lamp with inflammable materials such as paper or cloth, when the lamp is turned on or shortly after turned off.
(May cause fire)

(5) Do not touch the lamp when the lamp is turned on or shortly after it is turned off. The lamp will be extremely hot.

8.4 Turning off the lamp

Carry out forced air-cooling for at least 10minutes after turning off the lamp.

8.5 Removal of the Lamp

(1) Turn off the power supply before removing the lamp.
(May cause electric shock)

(2) When removing the lamp, wear facemasks, protective gloves and thick long-sleeves.
(May cause injury if lamp bursts.)

(3) Do not remove the lamp before 15 minutes have passed after the lamp is turned off, and be sure the lamp and lamp house are sufficiently cooled.

(4) Keep the removed lamp in a designated protecting cases and a packing individual box.

8.6 Replacement of Lamp

Lamps exceeding average life, more tends to break due to deterioration of glass, with more possibility of burst. Replace and dispose lamp by following the instructions.

8.7 Disposal of used lamps

(1) Keep used lamp in protecting cases and packing boxes provided with the lamp until the lamps are disposed of by breaking the glass part.

(2) High-pressure Xenon gas is sealed in the lamp. When disposing of lamps, always break the glass by following the instructions below. If disposed of by not breaking the glass, the lamp may burst during the disposal procedures. For your safety when handling the lamps, wear facemasks, protective gloves and thick long-sleeves.

a) Place the used lamp in designated protecting case and securely lock the slider.
b) Remove parts which fix the bases out of the packing individual box.
c) Place the lamp packed in designated protective case, in packing individual box and tape it tightly so that the lid and the sides of the packing box will not open.
d) Drop the packing box (with the lamp inside) horizontally to a firm floor from a height of about 1 meter.
e) Shake the packing box to make sure the lamp has been broken.
f) Dispose of it as industrial waste.
If metal and glass must be disposed of separately, dispose of them accordingly.

9. Term of Warranty

Warranty period is five years after the manufacturing date.

10. Storage of Lamp

Lamps must be kept within the following conditions:

Temperature : -25～65℃

Humidity : 20～95%RH

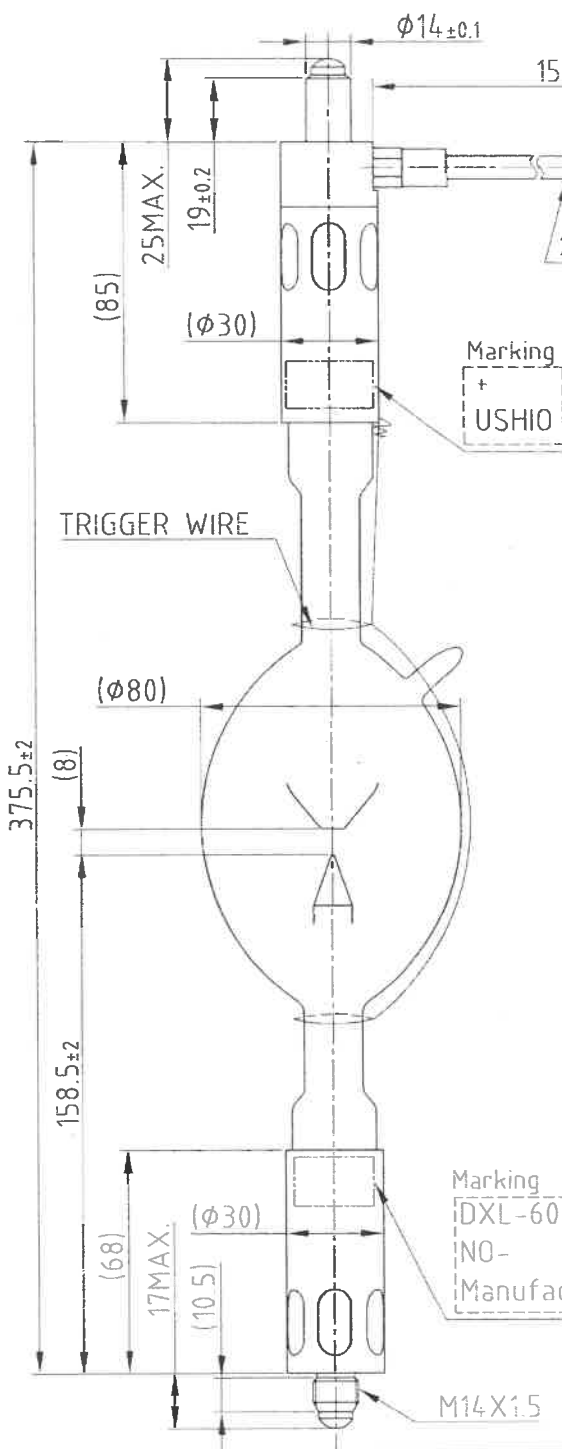
No condensation is allowed.

11. Materials

All materials and process used in the manufacture of this assembly shall conform to RoHS requirement.

12. Others

Issues that are not mentioned in this specification sheet must by determined thorough discussions between both parties. If unexpected incidents should occur, both parties shall discuss countermeasures with sincerity.



Electical characteristics

Useful lamp power	4200~6000W
Rated lamp current	155A
Lamp Voltage at rated current	Approx. 39V
Rated lamp power	6000W

Conditions

Operating position	Horizontal±5° Vertical ±5°
Base surface temperature	200°C MAX.
Current ripple	5% MAX.

Notes
This lamp is ozone free type.

REV.	DATE	DESCRIPTION	APPROVED	CHARGE
REVISION RECORD				

DRAWN BY K.SUGAYA	SCALE	1/2	PROJ.
DESIGNED BY K.SUGAYA	TYPE	XENON SHORT ARC LAMP	
CHECKED BY	TITLE	DXL-60BA2/L	
APPROVED BY Y.KONO	DWG No.	DRW0911727	
ORIGINAL DATE	Jan.19.2012	SHEET 1 OF 1	

Form. XA-086

USHIO INC.

Lamps containing Kr-85

Item Number	Description	Kr-85 uCi per Lamp
3000304	GPX9, Germicidal Lamp	0.27000000
3000323	GPX13, Germicidal Lamp	0.01000000
3000501	GPX9/BULK, Germicidal Lamp	0.01000000
5000061	MHL-1000, High Int Discharge	0.01000000
5000064	MHL-1000S, High Int Discharge	0.01000000
5000065	MHL-1007, High Int Discharge	0.01000000
5000071	MHL-121HT, High Int Discharge	0.01000000
5000089	MHL-250, High Int Discharge	0.01000000
5000090	MHL-261L, High Int Discharge	0.01000000
5000092	MHL-281L, High Int Discharge	0.01000000
5000098	MHL-3001S, High Int Discharge	0.01000000
5000106	MHL-33LY, High Int Discharge	0.01000000

5000107	MHL-38KT, High Int Discharge	0.01000000
5000114	MHL-450, High Int Discharge	0.01000000
5000120	MHL-5000/7, High Int Discharge	0.01000000
5000124	MHL-5007S, High Int Discharge	0.01000000
5000129	MHL-5027S, High Int Discharge	0.01000000
5000133	MHL-7000, High Int Discharge	0.01000000
5000134	MHL-7007, High Int Discharge	0.01000000
5000182	UHI-150DM/UVP, NW/4200K	0.01000000
5000184	UHI-150DW/UVP, WW/3000K	0.01000000
5000188	UHI-250DM/UVP, NW/4200K	0.01000000
5000221	UMH-175/U, ED28,E39	0.15000000
5000222	UMH-175/U/MD, ED17, E26	0.15000000
5000225	UMH-250/U, ED28, E39	0.15000000
5000227	UMH-400/U, ED37, E39	0.15000000
5000230	UMH-50/U, ED17, E26	0.04000000

5000440	UHI-150AQ/10, Aqualite	0.01000000
5000456	MHL-800, High Int Discharge #	0.01000000
5000722	MHL-450/HG, High Int Discharge	0.01000000
5000760	UHI-S400AQ/10, Aqualite	0.01000000
5000761	UHI-S175AQ/10, Aqualite	0.01000000
5000762	MHL-5000/7L,High Int Discharge	0.01000000
5000763	UHI-250AQ/10, Aqualite	0.01000000
5000788	MHL-252L, High Int Discharge	0.01000000
5000789	MHR-100D, Metal Halide Lamp	0.01000000
5000798	UHI-S400DD, 400W	0.01000000
5000803	MHL-400/XX, High Int Discharge	0.01000000
5000834	MHR-150N, Metal Halide Lamp	0.01000000
5000875	UHI-S150DM/A/UVP, 4200K	0.01000000

5000938	UMH-400/U/ED28, E39	0.15000000
5000947	UHI-S400BL, Blue	0.01000000
5000948	UHI-S400MG, Magenta	0.01000000
5000950	UHI-S150DW/A/UVP, 3000K	0.01000000
5001070	UHI-S250AQ/10/CWA, Aqualite	0.01000000
5001175	UHI-S250DD, 250W	0.01000000
5001342	MP70/U/MED/32/PS, Pulsestrike	0.02270000
5001344	MH70/U/MED/40/PS, Pulsestrike	0.02270000
5001346	MP70/U/MED/40/PS, Pulsestrike	0.02270000
5001348	MH100/U/MED/40/PS, Pulsestrike	0.01380000
5001350	MP100/U/MED/40/PS, Pulsestrike	0.01380000
5001354	MP150/U/MED/32/PS, Pulsestrike	0.02910000
5001356	MH150/U/MED/40/PS, Pulsestrike	0.02910000
5001360	MH250/U/MOG/40/PS, Pulsestrike	0.07060000

5001362	MP250/U/MOG/40/PS, Pulsestrike	0.07060000
5001364	MH320/U/MOG/40/PS, Pulsestrike	0.12400000
5001366	MP320/U/MOG/40/PS, Pulsestrike	0.12400000
5001368	MH350/U/MOG/40/PS, Pulsestrike	0.18000000
5001370	MP350/U/MOG/40/PS, Pulsestrike	0.15000000
5001372	MH400/U/MOG/40/PS, Pulsestrike	0.18000000
5001374	MP400/U/MOG/40/PS, Pulsestrike	0.17200000
5001377	MHR-250N, 4200K Metal Halide	0.01000000
5001408	UMH-250/HOR/MOG/32/T15	0.15000000
5001409	UMH-400/HOR/MOG/32/T15	0.25000000
5001414	MP100/U/MED/32/PS, Pulsestrike	0.01380000
5001454	UHI-S175W/E26/GREEN	0.01000000
5001455	UHI-S175W/E26/BLUE	0.01000000
5001468	MHL-70WG12, High Int Discharge	0.01000000
5001484	UHI-S250BL/E39/BLUE	0.01000000

5001486	UHI-S250MG/E39/MAGENTA	0.01000000
5001492	UHI-S400AQ/10/CWA, Aqualite	0.01000000
5001498	UHI-S150W/E26/MAGENTA	0.01000000
5001587	UHI-150AQ/14, Aqualite	0.01000000
5001588	UHI-150AQ/20+, Aqualite	0.01000000
5001589	UHI-250AQ/14, Aqualite	0.01000000
5001590	UHI-250AQ/20+, Aqualite	0.01000000
5001591	UHI-S175AQ/14, Aqualite	0.01000000
5001592	UHI-S175AQ/20, Aqualite	0.01000000
5001606	UHI-70AQ/20+, Aqualite	0.01000000
5001607	UHI-S400AQ/20+, Aqualite	0.01000000
5001608	UHI-S400AQ/14, Aqualite	0.01000000
5001673	HILUX GRO, AMH-1000/Opti-Blue	0.59000000
5001674	HILUX GRO, AMH-400/Opti-Blue	0.46000000

5001675	HILUX GRO, AMH-600/Opti-Blue	0.51000000
5002003	USD-250/2, Metal Halide Lamp	0.04000000
5002008	USR-575/2, Metal Halide Lamp	0.13000000
5002010	USR-700/SA, Metal Halide Lamp	0.06000000
5002093	UHI-S250AQ/20/CWA, Aqualite	0.01000000
5002094	UHI-S400AQ/14/CWA, Aqualite	0.01000000
5002095	UHI-S400AQ/20/CWA, Aqualite	0.01000000
5002390	MHL-400, High Int. Discharge #	0.01000000
5002392	USR-1200/2, Metal Halide Lamp	0.01000000
5002441	MHL-450G1-SE High Int Discharg	0.03862703
5002448	MHL-470, High Int. Discharge	0.05150270
5002536	CMH-315W/930/A GRO	0.03600000
5002537	CMH-315W/942/A GRO	0.03600000

5003100	AMH-DE1000W/AGRO	0.06000000
5003119	MHL-250 #	0.01000000
9101489	AMH-DE1000W/BLV#29999004	0.09000000
Total		**5.42102973**

Lamps which contain Thorium

Item Number	Description01	Thorium 228 Per Lamp uCi	Thorium 230 Per Lamp uCi	Thorium 232 Per Lamp uCi	Total Thorium uCi
11041	Electrode 0.7x8x26deg fired	0.00005732	0.00001703	0.00011484	0.00018919
11053	0.7 X 10mm coiless cathode	0.00007370	0.00002189	0.00014765	0.00024324
11054	0.7 X 10mm coiless cath- fired	0.00007370	0.00002189	0.00014765	0.00024324
123-1007	Ozonizer wire covering	0.00000000	0.00000000	0.00000000	0.00000000
24027	Electrode Assy 0.7x8 - 75W	0.00007370	0.00002189	0.00014765	0.00024324
24028	Electrode Assy 2.2x8 - 75W	0.00007370	0.00002189	0.00014765	0.00024324
24030	Electrode Assy 8X0.4 - 75W -FL	0.00007370	0.00002189	0.00014765	0.00024324
25021	Arc Tube 75W DC	0.00007370	0.00002189	0.00014765	0.00024324
25049	UXL-S75XE, XE 80W	0.00217832	0.00064703	0.00436384	0.00718919
5000061	MHL-1000, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000064	MHL-1000S, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000065	MHL-1007, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000071	MHL-121HT, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000073	MHL-1403, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000082	MHL-170L, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000085	MHL-2000/2, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000086	MHL-2000/3, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000089	MHL-250, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000090	MHL-261L, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000091	MHL-280L, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000092	MHL-281L, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000093	MHL-282L, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000098	MHL-3001S, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000106	MHL-33LY, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000107	MHL-38KT, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000112	MHL-4007, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000114	MHL-450, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000116	MHL-5000, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000120	MHL-5000/7, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000124	MHL-5007S, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000127	MHL-5020S, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000129	MHL-5027S, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000132	MHL-6027S, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000133	MHL-7000, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000134	MHL-7007, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000135	MHL-8027S, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000182	UHI-150DM/UVP, NW/4200K	0.00212919	0.00063243	0.00426541	0.00702703
5000184	UHI-150DW/UVP, WW/3000K	0.00212919	0.00063243	0.00426541	0.00702703
5000188	UHI-250DM/UVP, NW/4200K	0.00212919	0.00063243	0.00426541	0.00702703
5000214	UMH-1000/U, BT56, E39	0.00074522	0.00022135	0.00149289	0.00245946
5000217	UMH-1500/HBU, BT56, E39	0.00085659	0.00025443	0.00171601	0.00282703
5000221	UMH-175/U, ED28,E39	0.00013922	0.00004135	0.00027889	0.00045946
5000222	UMH-175/U/MD, ED17, E26	0.00013922	0.00004135	0.00027889	0.00045946
5000225	UMH-250/U, ED28, E39	0.00039308	0.00011676	0.00078746	0.00129730
5000227	UMH-400/U, ED37, E39	0.00074522	0.00022135	0.00149289	0.00245946
5000230	UMH-50/U, ED17, E26	0.00004914	0.00001459	0.00009843	0.00016216
5000273	USH-102D, Hg 100W	0.00243219	0.00072243	0.00487241	0.00802703
5000274	USH-102DH, Hg 100W	0.00243219	0.00072243	0.00487241	0.00802703
5000276	USH-200DP, Hg 200W	0.00289078	0.00085865	0.00579111	0.00954054
5000277	USH-205DP, Hg 200W	0.00289078	0.00085865	0.00579111	0.00954054
5000323	UXL-150M-O, Xe 150W	0.00388168	0.00115297	0.00777616	0.01281081

5000325	UXL-150S, Xe 150W	0.00388168	0.00115297	0.00777616	0.01281081
5000326	UXL-150S-O, Xe 150W	0.00388168	0.00115297	0.00777616	0.01281081
5000327	UXL-151D-O, Xe 150W	0.00444673	0.00132081	0.00890814	0.01467568
5000328	UXL-151H, Xe 150W	0.00351316	0.00104351	0.00703792	0.01159459
5000329	UXL-151H-O, Xe 150W	0.00351316	0.00104351	0.00703792	0.01159459
5000330	UXL-152H, Xe 150W	0.00388168	0.00115297	0.00777616	0.01281081
5000343	UXL-300D-O, Xe 300W	0.00176886	0.00052541	0.00354357	0.00583784
5000346	UXL-302-O, Xe 300W	0.00176886	0.00052541	0.00354357	0.00583784
5000348	UXL-306, Xe 300W	0.00176886	0.00052541	0.00354357	0.00583784
5000350	UXL-351E-O, Xe 350W	0.00208005	0.00061784	0.00416697	0.00686486
5000355	UXL-450SO, Xe 450W	0.00148224	0.00044027	0.00296938	0.00489189
5000357	UXL-451-O, Xe 450W	0.00148224	0.00044027	0.00296938	0.00489189
5000368	UXL-553, Xe 550W	0.00505273	0.00150081	0.01012214	0.01667568
5000371	UXL-75XE, Xe w/Trigger Wire	0.00237486	0.00070541	0.00475757	0.00783784
5000375	UXL-S150M-O, Xe 150W	0.00378341	0.00112378	0.00757930	0.01248649
5000376	UXL-S75XE, Xe 80W	0.00217832	0.00064703	0.00436384	0.00718919
5000378	UXM-200H, Hg/Xe 200W	0.00351316	0.00104351	0.00703792	0.01159459
5000382	**Use 5002534**	0.00080254	0.00023838	0.00160773	0.00264865
5000440	UHI-150AQ/10, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5000456	MHL-800, High Int Discharge #	0.00212919	0.00063243	0.00426541	0.00702703
5000487	SHL-50AC1, Hg 50W	0.00000409	0.00000122	0.00000820	0.00001351
5000499	USH-205S, Hg 200W	0.00161327	0.00047919	0.00323186	0.00532432
5000501	USH-250BY, Hg 250W	0.00307095	0.00091216	0.00615203	0.01013514
5000503	USH-250D, Hg 250W	0.00298905	0.00088784	0.00598797	0.00986486
5000506	USH-350DP, Hg 350W	0.00198178	0.00058865	0.00397011	0.00654054
5000508	USH-350DS, Hg 350W	0.00161327	0.00047919	0.00323186	0.00532432
5000511	USH-351DS, Hg 350W	0.00161327	0.00047919	0.00323186	0.00532432
5000516	USH-450GS, Hg 450W	0.00264511	0.00078568	0.00529895	0.00872973
5000518	USH-500D, Hg 500W	0.00515100	0.00153000	0.01031900	0.01700000
5000520	USH-500FU, Hg 500WP/200WI	0.00153957	0.00045730	0.00308422	0.00508108
5000521	USH-500MB, Hg 500W	0.00677246	0.00201162	0.01356727	0.02235135
5000525	USH-508S, Hg 500W	0.00262873	0.00078081	0.00526614	0.00867568
5000528	USH-510FU, Hg 500W	0.00153957	0.00045730	0.00308422	0.00508108
5000531	USH-1000DW, Hg 1000W	0.00488895	0.00145216	0.00979403	0.01613514
5000533	USH-1003FA, Hg 1000WP/700WI	0.00723924	0.00215027	0.01450238	0.02389189
5000537	USH-1000FG, Hg 1000WP/700WI	0.00723924	0.00215027	0.01450238	0.02389189
5000539	USH-1000FGI, Hg 1000WP/700WI	0.00972057	0.00288730	0.01947322	0.03208108
5000545	USH-1000KS, Hg 1000W	0.00665781	0.00197757	0.01333759	0.02197297
5000548	USH-1002FCL, Hg 1000WP/700WI	0.00648584	0.00192649	0.01299308	0.02140541
5000549	USH-1002FG, Hg 1000WP/700WI	0.00723924	0.00215027	0.01450238	0.02389189
5000557	USH-1003FGI, Hg 1000WP/700WI	0.00972057	0.00288730	0.01947322	0.03208108
5000574	USH-3500MR, Hg 3500W	0.01166959	0.00346622	0.02337770	0.03851351
5000583	UXM-S200KL, Hg/Xe 200W #	0.00378341	0.00112378	0.00757930	0.01248649
5000584	UXM-S200MB, Hg/Xe 200W	0.00378341	0.00112378	0.00757930	0.01248649
5000588	UXM-501MA, Hg/Xe 500W	0.00291535	0.00086595	0.00584032	0.00962162
5000589	UXM-501MD, Hg/Xe 500W	0.00291535	0.00086595	0.00584032	0.00962162
5000591	UXM-502MD, Hg/Xe 500W	0.00291535	0.00086595	0.00584032	0.00962162
5000592	UXM-1001MD, Hg/Xe 1000W	0.00850038	0.00252486	0.01702881	0.02805405
5000602	PC-5000MF, Hg/Xe 5000W	0.01166959	0.00346622	0.02337770	0.03851351
5000631	UXL-40SC, Xe 4000W	0.01169416	0.00347351	0.02342692	0.03859459
5000634	UXL-70SC, Xe 7000W	0.01905624	0.00566027	0.03817538	0.06289189
5000640	UXW-15KD, Xe 15000W	0.18293011	0.05433568	0.36646395	0.60372973
5000722	MHL-450/HG, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000724	USH-1000FNL3, Hg 1000WP/700WI	0.00648584	0.00192649	0.01299308	0.02140541

5000725	USH-1002FNL3, Hg 1000WP/700WI	0.00648584	0.00192649	0.01299308	0.02140541
5000731	USH-1003FAL3, Hg 1000WP/700WI	0.00648584	0.00192649	0.01299308	0.02140541
5000733	USH-1002FNIL2, Hg 1000WP/700WI	0.00972057	0.00288730	0.01947322	0.03208108
5000734	USH-1000FGIL2, Hg 1000WP/700WI	0.00972057	0.00288730	0.01947322	0.03208108
5000736	SUV-1501CIL, Hg 1500W	0.02428914	0.00721459	0.04865843	0.08016216
5000737	SUV-2000NIL, Hg 2000W	0.02287241	0.00679378	0.04582030	0.07548649
5000738	SUV-2001NIL, Hg 1750W	0.02456757	0.00729730	0.04921622	0.08108108
5000743	USH-1000FGL3, Hg 1000WP/700WI	0.00648584	0.00192649	0.01299308	0.02140541
5000744	SUV-2001CIL, Hg 2000W	0.03228997	0.00959108	0.06468651	0.10656757
5000748	USH-508SA, Hg 500W M4-PO.7	0.00262873	0.00078081	0.00526614	0.00867568
5000749	USH-1002FGL3, Hg 1000WP/700WI	0.00648584	0.00192649	0.01299308	0.02140541
5000752	SUV-2011NI, Hg 2000W	0.02193884	0.00651649	0.04395008	0.07240541
5000759	UXL-70SA, Xe 7000W w/Ferrule	0.01905624	0.00566027	0.03817538	0.06289189
5000760	UHI-S400AQ/10, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5000761	UHI-S175AQ/10, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5000762	MHL-5000/7L,High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000763	UHI-250AQ/10, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5000767	UXL-S150M-O/KL, Xe 150W	0.00378341	0.00112378	0.00757930	0.01248649
5000770	UXL-40SA	0.01169416	0.00347351	0.02342692	0.03859459
5000788	MHL-252L, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000789	MHR-100D, Metal Halide Lamp	0.00212919	0.00063243	0.00426541	0.00702703
5000797	UXL-100CL	0.00262873	0.00078081	0.00526614	0.00867568
5000798	UHI-S400DD, 400W	0.00212919	0.00063243	0.00426541	0.00702703
5000799	UXL-75X-O, Xe 75W	0.00212919	0.00063243	0.00426541	0.00702703
5000803	MHL-400/XX, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5000828	UVL-800-O1	0.00271881	0.00080757	0.00544659	0.00897297
5000833	USH-1003FSIL2,Hg 1000WP/700WI	0.00972057	0.00288730	0.01947322	0.03208108
5000834	MHR-150N, Metal Halide Lamp	0.00212919	0.00063243	0.00426541	0.00702703
5000840	SUV-2011NIL, Hg 2000W	0.02147205	0.00637784	0.04301497	0.07086486
5000848	SUV-2501NIL, Hg 2500W	0.01166959	0.00346622	0.02337770	0.03851351
5000857	SHL-50AC2, Hg 50W	0.00000409	0.00000122	0.00000820	0.00001351
5000866	SUV-1500SIL, Hg 1500W	0.02240562	0.00665514	0.04488519	0.07394595
5000875	UHI-S150DM/A/UVP, 4200K	0.00212919	0.00063243	0.00426541	0.00702703
5000876	UXL-S75MA, Xe 75W	0.00193265	0.00057405	0.00387168	0.00637838
5000881	SUV-2500SIL, Hg 2500W	0.03053749	0.00907054	0.06117576	0.10078378
5000909	SUV-3500SIL, Hg 3500W	0.03138916	0.00932351	0.06288192	0.10359459
5000910	UHI-S1000AQ/10, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5000936	UXL-150S, Xe 150W	0.00388168	0.00115297	0.00777616	0.01281081
5000938	UMH-400/U/ED28, E39	0.00074522	0.00022135	0.00149289	0.00245946
5000943	UXL-60SC, Xe 6000W	0.01905624	0.00566027	0.03817538	0.06289189
5000947	UHI-S400BL, Blue	0.00212919	0.00063243	0.00426541	0.00702703
5000948	UHI-S400MG, Magenta	0.00212919	0.00063243	0.00426541	0.00702703
5000950	UHI-S150DW/A/UVP, 3000K	0.00212919	0.00063243	0.00426541	0.00702703
5001047	SUV-1800UTS, Hg 1750W#	0.02456757	0.00729730	0.04921622	0.08108108
5001053	SUV-2510NIL, Hg 2500W	0.03396876	0.01008973	0.06804962	0.11210811
5001062	UXL-20FS, Xe 2000W	0.00691168	0.00205297	0.01384616	0.02281081
5001063	UXL-2000FS, Xe 2000W	0.00691168	0.00205297	0.01384616	0.02281081
5001064	UXL-3000FS, Xe 3000W	0.00903268	0.00268297	0.01809516	0.02981081
5001070	UHI-S250AQ/10/CWA, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5001075	UXL-10SB, Xe 1000W	0.00311189	0.00092432	0.00623405	0.01027027

5001076	UXL-16SB, Xe 1600W	0.00311189	0.00092432	0.00623405	0.01027027
5001077	UXL-25SC, Xe 2500W	0.00691168	0.00205297	0.01384616	0.02281081
5001078	MHL-7500/1,High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5001079	UXL-30SC, Xe 3000W	0.00565054	0.00167838	0.01131973	0.01864865
5001120	UXL-S150WA, Xe 150W #	0.00378341	0.00112378	0.00757930	0.01248649
5001139	UMH-1000/U/BT37, Metal Halide	0.00074522	0.00022135	0.00149289	0.00245946
5001175	UHI-S250DD, 250W	0.00212919	0.00063243	0.00426541	0.00702703
5001188	UHI-S1000GR, Green	0.00212919	0.00063243	0.00426541	0.00702703
5001189	UHI-S1000BL, Blue	0.00212919	0.00063243	0.00426541	0.00702703
5001329	USH-103D, Hg 100W	0.00237486	0.00070541	0.00475757	0.00783784
5001332	USH-2002MAL, Hg 2000W	0.03259297	0.00968108	0.06529351	0.10756757
5001342	MP70/U/MED/32/PS, Pulsestrike	0.00001687	0.00000501	0.00003380	0.00005568
5001344	MH70/U/MED/40/PS, Pulsestrike	0.00001687	0.00000501	0.00003380	0.00005568
5001346	MP70/U/MED/40/PS, Pulsestrike	0.00001687	0.00000501	0.00003380	0.00005568
5001348	MH100/U/MED/40/PS, Pulsestrike	0.00002702	0.00000803	0.00005414	0.00008919
5001350	MP100/U/MED/40/PS, Pulsestrike	0.00002702	0.00000803	0.00005414	0.00008919
5001354	MP150/U/MED/32/PS, Pulsestrike	0.00004283	0.00001272	0.00008580	0.00014135
5001356	MH150/U/MED/40/PS, Pulsestrike	0.00004283	0.00001272	0.00008580	0.00014135
5001360	MH250/U/MOG/40/PS, Pulsestrike	0.00016215	0.00004816	0.00032483	0.00053514
5001362	MP250/U/MOG/40/PS, Pulsestrike	0.00016215	0.00004816	0.00032483	0.00053514
5001364	MH320/U/MOG/40/PS, Pulsestrike	0.00023257	0.00006908	0.00046591	0.00076757
5001366	MP320/U/MOG/40/PS, Pulsestrike	0.00023257	0.00006908	0.00046591	0.00076757
5001368	MH350/U/MOG/40/PS, Pulsestrike	0.00038735	0.00011505	0.00077598	0.00127838
5001372	MH400/U/MOG/40/PS, Pulsestrike	0.00038735	0.00011505	0.00077598	0.00127838
5001377	MHR-250N, 4200K Metal Halide	0.00212919	0.00063243	0.00426541	0.00702703
5001381	MHL-150 G12 High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5001403	SUV-2701CIL, Hg 2700W	0.01560859	0.00463622	0.03126870	0.05151351
5001407	SUV-1501CILH, Hg 1500W	0.01560859	0.00463622	0.03126870	0.05151351
5001408	UMH-250/HOR/MOG/32/T15	0.00001638	0.00000486	0.00003281	0.00005405
5001409	UMH-400/HOR/MOG/32/T15	0.00018835	0.00005595	0.00037732	0.00062162
5001414	MP100/U/MED/32/PS, Pulsestrike	0.00002702	0.00000803	0.00005414	0.00008919
5001419	UXL-75PB Xe 75W w/Trigger Wire	0.00237486	0.00070541	0.00475757	0.00783784
5001434	UXL-20SC, Xe 2000W	0.00691168	0.00205297	0.01384616	0.02281081
5001450	LMP-150S, Wild Fire #	0.00212919	0.00063243	0.00426541	0.00702703
5001454	UHI-S175W/E26/GREEN	0.00212919	0.00063243	0.00426541	0.00702703
5001455	UHI-S175W/E26/BLUE	0.00212919	0.00063243	0.00426541	0.00702703
5001468	MHL-70WG12, High Int Discharge	0.00212919	0.00063243	0.00426541	0.00702703
5001484	UHI-S250BL/E39/BLUE	0.00212919	0.00063243	0.00426541	0.00702703
5001486	UHI-S250MG/E39/MAGENTA	0.00212919	0.00063243	0.00426541	0.00702703
5001492	UHI-S400AQ/10/CWA, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5001493	UHI-S1000AQ/10/CWA, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5001498	UHI-S150W/E26/MAGENTA	0.00212919	0.00063243	0.00426541	0.00702703
5001533	SMR-75/EV, W/Reflector 75W	0.00007370	0.00002189	0.00014765	0.00024324
5001551	CDXL-30, Xe 3000W	0.01126832	0.00334703	0.02257384	0.03718919
5001576	USH-1201FAL, Hg 1200W	0.02048935	0.00608595	0.04104632	0.06762162
5001587	UHI-150AQ/14, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5001588	UHI-150AQ/20+, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5001589	UHI-250AQ/14, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5001590	UHI-250AQ/20+, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5001591	UHI-S175AQ/14, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5001592	UHI-S175AQ/20, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5001594	SUV-2001CILH/S, Hg 2000W	0.03190508	0.00947676	0.06391546	0.10529730
5001603	VAC175-F-C/U, Xenon Lamp	0.00420105	0.00124784	0.00841597	0.01386486
5001606	UHI-70AQ/20+, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5001607	UHI-S400AQ/20+, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703

5001608	UHI-S400AQ/14, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5001610	SMR-75/BT1	0.00007370	0.00002189	0.00014765	0.00024324
5001620	SUV-1501CILh/S, HG 1500W	0.01560859	0.00463622	0.03126870	0.05151351
5001629	SUV-7500NI, Hg 7500W	0.15435803	0.04584892	0.30922549	0.50943243
5001636	SUV-5001NIL, HG 5000W	0.07121319	0.02115243	0.14266141	0.23502703
5001647	SUV-2001NIL/R, Hg 1750W	0.02410078	0.00715865	0.04828111	0.07954054
5001659	SUV-3500NIL, Hg 3500W	0.03323992	0.00987324	0.06658954	0.10970270
5001662	SMR-75/DV1	0.00007370	0.00002189	0.00014765	0.00024324
5001665	SUV-2011NIHL, Hg 2000W	0.02159489	0.00641432	0.04326105	0.07127027
5001666	UXM-S150WA, Hg/Xe 150W #	0.00378341	0.00112378	0.00757930	0.01248649
5001673	HILUX GRO, AMH-1000/Opti-Blue	0.00025386	0.00007541	0.00050857	0.00083784
5001674	HILUX GRO, AMH-400/Opti-Blue	0.00018835	0.00005595	0.00037732	0.00062162
5001675	HILUX GRO, AMH-600/Opti-Blue	0.00018835	0.00005595	0.00037732	0.00062162
5001687	V300-Y18, Xe Parabolic Module	0.00420105	0.00124784	0.00841597	0.01386486
5002041	SUV-2510NIHL, Hg 2500W	0.03379678	0.01003865	0.06770511	0.11154054
5002046	SMR-75/D1, EmArc Elliptical	0.00007370	0.00002189	0.00014765	0.00024324
5002060	UXL-10S, Xe 1000W	0.00311189	0.00092432	0.00623405	0.01027027
5002084	SUV-4500CIHL	0.04224803	0.01254892	0.08463549	0.13943243
5002088	SUV-5500SIL, Hg 5500W	0.04621159	0.01372622	0.09257570	0.15251351
5002089	DXL-20SRX, Xe 2000W	0.00438122	0.00130135	0.00877689	0.01445946
5002090	DXL-30SRX, Xe 3000W	0.00970419	0.00288243	0.01944041	0.03202703
5002091	DXL-40SRX, Xe 4200W	0.01159589	0.00344432	0.02323005	0.03827027
5002093	UHI-S250AQ/20/CWA, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5002094	UHI-S400AQ/14/CWA, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5002095	UHI-S400AQ/20/CWA, Aqualite	0.00212919	0.00063243	0.00426541	0.00702703
5002097	SMR-75DX1	0.00007370	0.00002189	0.00014765	0.00024324
5002115	SUV-5500SIHL, Hg 5500W	0.04621159	0.01372622	0.09257570	0.15251351
5002117	DXL-12BAF, Xe 1200W	0.00360324	0.00107027	0.00721838	0.01189189
5002164	UXL-16E/OR1, Xe 1600W	0.00311189	0.00092432	0.00623405	0.01027027
5002168	DXL-20SN3, Xe 2000W	0.00438122	0.00130135	0.00877689	0.01445946
5002170	DXL-40SCN, Xe 4000W	0.01144030	0.00339811	0.02291835	0.03775676
5002174	DXL-70SN, Xe 7000W	0.00483981	0.00143757	0.00969559	0.01597297
5002178	DXL-40SN2, Xe 4000W	0.01084249	0.00322054	0.02172076	0.03578378
5002206	SUV-3500SIHL, Hg 3500W	0.03138916	0.00932351	0.06288192	0.10359459
5002221	UXL-20EQ1-34ATM	0.00007370	0.00002189	0.00014765	0.00024324
5002222	SUV-4500CIL/S, Hg 4500W	0.04300962	0.01277514	0.08616119	0.14194595
5002224	PC-S43BY, Hg 4.3Kw	0.06067370	0.01802189	0.12154765	0.20024324
5002228	DXL-41SN2, Xe 4000W	0.01084249	0.00322054	0.02172076	0.03578378
5002229	DXL-41SCN, Xe 4000W	0.01144030	0.00339811	0.02291835	0.03775676
5002239	DXL-70BA, Xe 7000W	0.00483981	0.00143757	0.00969559	0.01597297
5002252	DXL-30BAF/L, Xe 2800W	0.00970419	0.00288243	0.01944041	0.03202703
5002258	LPB1014 #	0.00243219	0.00072243	0.00487241	0.00802703
5002263	DXL-20BAF/L, Xe 2000W	0.00753405	0.00223784	0.01509297	0.02486486
5002264	DXL-30BA/L, Xe 3000W	0.01126832	0.00334703	0.02257384	0.03718919
5002265	DXL-45BA/L, Xe 4500W	0.00483981	0.00143757	0.00969559	0.01597297
5002266	DXL-60BA2/L, Xe 6000W	0.00483981	0.00143757	0.00969559	0.01597297
5002267	DXL-12SN, Xe 1200W	0.00360324	0.00107027	0.00721838	0.01189189
5002268	DXL-15SN, Xe 1500W	0.00438122	0.00130135	0.00877689	0.01445946
5002269	DXL-21SN3, Xe 2000W	0.00438122	0.00130135	0.00877689	0.01445946
5002273	DXL-45SN/L, Xe 4500W	0.00483981	0.00143757	0.00969559	0.01597297
5002274	DXL-60SN/L, Xe 6000W	0.00483981	0.00143757	0.00969559	0.01597297
5002276	DXL-12SN2, Xe 1200W	0.00438122	0.00130135	0.00877689	0.01445946
5002283	CXL-16M, Xe 1600W	0.00311189	0.00092432	0.00623405	0.01027027
5002294	**Use 5002570**	0.01270143	0.00377270	0.02544478	0.04191892
5002308	UXL-20EQ3, 30atm	0.00003000	0.00000891	0.00006009	0.00009900

5002310	PXL-25BA3, Xe 2500W	0.00993349	0.00295054	0.01989976	0.03278378
5002311	PXL-17UNV1, Xe 2000W	0.00621559	0.00184622	0.01245170	0.02051351
5002312	SMR-75/LFL w/ AL Ring	0.00005569	0.00001654	0.00011156	0.00018378
5002320	SMR-100 XEAR	0.00262873	0.00078081	0.00526614	0.00867568
5002321	DXL-20SRX/L, Xe 2000W	0.00682978	0.00202865	0.01368211	0.02254054
5002322	DXL-30SRX/L, Xe 3000W	0.00970419	0.00288243	0.01944041	0.03202703
5002323	DXL-16BAF, Xe 1600W	0.00438122	0.00130135	0.00877689	0.01445946
5002324	DXL-22BAF, Xe 2200W	0.00970419	0.00288243	0.01944041	0.03202703
5002325	DXL-40SRX/LL, Xe 4000W	0.01084249	0.00322054	0.02172076	0.03578378
5002330	SMR-7589N1	0.00009174	0.00002725	0.00018378	0.00030277
5002388	DXL-40BAF/L, Xe 4200W	0.01201354	0.00356838	0.02406673	0.03964865
5002390	MHL-400, High Int. Discharge #	0.00212919	0.00063243	0.00426541	0.00702703
5002391	SMH-200LS2 Custom Base	0.00006991	0.00002077	0.00014005	0.00023073
5002392	USR-1200/2, Metal Halide Lamp	0.00212919	0.00063243	0.00426541	0.00702703
5002393	SUV-7500NIL, HG 7500W	0.00311189	0.00092432	0.00623405	0.01027027
5002417	PC-S120BYH/P, Hg 12Kw	0.13268124	0.03941027	0.26580038	0.43789189
5002419	SUV-5500SIHL/HQ, Hg 5500W	0.00311189	0.00092432	0.00623405	0.01027027
5002441	MHL-450G1-SE High Int Discharg	0.00041708	0.00012388	0.00083553	0.00137649
5002445	USH-2001BY, Hg 2000W	0.00311189	0.00092432	0.00623405	0.01027027
5002448	MHL-470, High Int. Discharge	0.00018508	0.00005497	0.00037076	0.00061081
5002449	DXL-30SN2/L, Xe 3000W	0.00970419	0.00288243	0.01944041	0.03202703
5002450	DXL-31SN2/L, Xe 3000W	0.00970419	0.00288243	0.01944041	0.03202703
5002451	DXL-40SN/L, Xe 4000W	0.01182519	0.00351243	0.02368941	0.03902703
5002452	DXL-41SN/L, Xe 4000W	0.01182519	0.00351243	0.02368941	0.03902703
5002456	SMR-100XEAR2	0.00262873	0.00078081	0.00526614	0.00867568
5002476	DXL-9BAF, Xe 850W	0.00445492	0.00132324	0.00892454	0.01470270
5002487	UXL20-EQ9 30atm #	0.00003000	0.00000891	0.00006009	0.00009900
5002492	USH-F200AM, Hg 200W#	0.00289078	0.00085865	0.00579111	0.00954054
5002495	UXR-300KS#	0.00049135	0.00014595	0.00098432	0.00162162
5002524	UXL-2000PR1	0.00095788	0.00028452	0.00191892	0.00316132
5002525	PXL-40BA, XE 4000W	0.01250639	0.00371477	0.02505405	0.04127521
5002527	USH-250SC, Hg 250W	0.00328386	0.00097541	0.00657857	0.01083784
5002533	SUV-2000NIL/S, Hg 2000W	0.00090081	0.00026757	0.00180459	0.00297297
5002534	UXR-300BF	0.00049135	0.00014595	0.00098432	0.00162162
5002546	CDXL-21S1, Xe 2000W	0.00438122	0.00130135	0.00877689	0.01445946
5002547	SUV-2710CIL, Hg 2700	0.00311189	0.00092432	0.00623405	0.01027027
5002568	SUV-7500NIBL/S, HG 7500W	0.00342308	0.00101676	0.00685746	0.01129730
5002570	DXL-65BA3, Xe, 6500W	0.00532297	0.00158108	0.01066351	0.01756757
5002572	UXL-S75SN-35A	0.00217832	0.00064703	0.00436384	0.00718919
5002573	ASML Yieldstar L-M Refurbish	0.00217832	0.00064703	0.00436384	0.00718919
5002574	UAI-YS Refurbished	0.00217832	0.00064703	0.00436384	0.00718919
5002575	UXL20EQ3B, 30atm w/base #	0.00013922	0.00004135	0.00027889	0.00045946
5002579	UXL-20PRS, Xe 2000W	0.00096632	0.00028703	0.00193584	0.00318919
5002580	UXR-300BFM, Lamp Module- Green	0.00049135	0.00014595	0.00098432	0.00162162
5003096	UXR-175BF	0.00049135	0.00014595	0.00098432	0.00162162
5003098	UXR-300ES, Cera-Xe	0.00049135	0.00014595	0.00098432	0.00162162
5003101	SMR-75/UV1 Emarc	0.00007370	0.00002189	0.00014765	0.00024324
5003118	USH-1001BP, Hg 1000W	0.00713278	0.00211865	0.01428911	0.02354054
5003119	MHL-250 #	0.00212919	0.00063243	0.00426541	0.00702703
5003123	MHL 450/HG SPDI #	0.00212919	0.00063243	0.00426541	0.00702703
5003184	SUV-2510NIHL/S	0.00218651	0.00064946	0.00438024	0.00721622
5003188	CDXL-14M, Xe 1430W	0.00360324	0.00107027	0.00721838	0.01189189
5003190	CDXL-19SC, Xe 1900W	0.00438122	0.00130135	0.00877689	0.01445946
5003191	CDXL-20LB, Xe 2000W	0.00682978	0.00202865	0.01368211	0.02254054

5003193	CDXL-23S, Xe 2300W	0.00438122	0.00130135	0.00877689	0.01445946
5003194	CDXL-70, Xe 7000W	0.00483981	0.00143757	0.00969559	0.01597297
5003195	CDXL-14M, Xe 1430W#	0.00360324	0.00107027	0.00721838	0.01189189
5003196	CDXL-16M, Xe 1600W#	0.00438122	0.00130135	0.00877689	0.01445946
5003197	CDXL-18SD, Xe 1800W#	0.00438122	0.00130135	0.00877689	0.01445946
5003199	CDXL-20, Xe 2000W#	0.00682978	0.00202865	0.01368211	0.02254054
5003201	CDXL-20SD, Xe 2000W#	0.00438122	0.00130135	0.00877689	0.01445946
5003202	CDXL-20SP, Xe 2000W#	0.00682978	0.00202865	0.01368211	0.02254054
5003205	CDXL-30, Xe 3000W#	0.01126832	0.00334703	0.02257384	0.03718919
5003206	CDXL-30SD, Xe 3000W#	0.00970419	0.00288243	0.01944041	0.03202703
5003207	CDXL-30SP, Xe 3000W#	0.01126832	0.00334703	0.02257384	0.03718919
5003208	CDXL-45, Xe 4500W#	0.00504454	0.00149838	0.01010573	0.01664865
5003209	CDXL-45SP , Xe 4500W#	0.00483981	0.00143757	0.00969559	0.01597297
5003210	CDXL-60, Xe 6000W#	0.00504454	0.00149838	0.01010573	0.01664865
5003211	CDXL-60SP, Xe 6000W#	0.00483981	0.00143757	0.00969559	0.01597297
5003218	SUV-2701CIL/S	0.01560859	0.00463622	0.03126870	0.05151351
9100214	DXL-12BAF	0.00311189	0.00092432	0.00623405	0.01027027
9100754	UXL-S75KF w/lead wire	0.00217832	0.00064703	0.00436384	0.00718919
9100924	DXL-9BAF Barco	0.00437117	0.00129837	0.00875676	0.01442629
9100980	UXL-151H 22atm Syn	0.00351316	0.00104351	0.00703792	0.01159459
9101056	DXL-40BAF/L	0.01168597	0.00347108	0.02341051	0.03856757
9101057	DXL-30BAF/L	0.00903268	0.00268297	0.01809516	0.02981081
9101080	UVL-4000-O	0.00000106	0.00000032	0.00000213	0.00000351
9101243	Takumi-2000A Follow Spot	0.00096632	0.00028703	0.00193584	0.00318919
9101358	DXL-65BA3	0.00532297	0.00158108	0.01066351	0.01756757
9101384	HIT1000 CW E40	0.00212919	0.00063243	0.00426541	0.00702703
9101428	DXL-40SRX, Xe 4200W	0.01616546	0.00480162	0.03238427	0.05335135
9101474	DXL-22BAF, Xe 2200W	0.00991607	0.00294537	0.01986486	0.03272630
9101483	UXR-300BFM, Lamp Module - Blue	0.00049135	0.00014595	0.00098432	0.00162162
9101507	USH-2001FA	0.00311189	0.00092432	0.00623405	0.01027027
9101559	DXL-20BAF/L	0.00461051	0.00136946	0.00923624	0.01521622
9101560	DXL-45BA/L	0.01270143	0.00377270	0.02544478	0.04191892
9101567	SUV-7500NIAL/Y	0.00188351	0.00055946	0.00377324	0.00621622
9101581	SUV-5001NIL/S	0.07121319	0.02115243	0.14266141	0.23502703
9101589	USH-350DS-Z3	0.00161327	0.00047919	0.00323186	0.00532432
9101590	USH-450GS-Z2	0.00264511	0.00078568	0.00529895	0.00872973
AL-1824-1	AL-1824-1, Arc Lamp 18-24W#	0.00016378	0.00004865	0.00032811	0.00054054
AL-5060-1	AL-5060-1, Arc Lamp 50-60W#	0.00016378	0.00004865	0.00032811	0.00054054
DA-L400-1	DA-L400-1, Lamp Assembly	0.00008189	0.00002432	0.00016405	0.00027027
M50E052	M50E052, 50W VIS Dose	0.00016378	0.00004865	0.00032811	0.00054054
Total		2.63971522	0.78407383	5.28814238	8.71193143

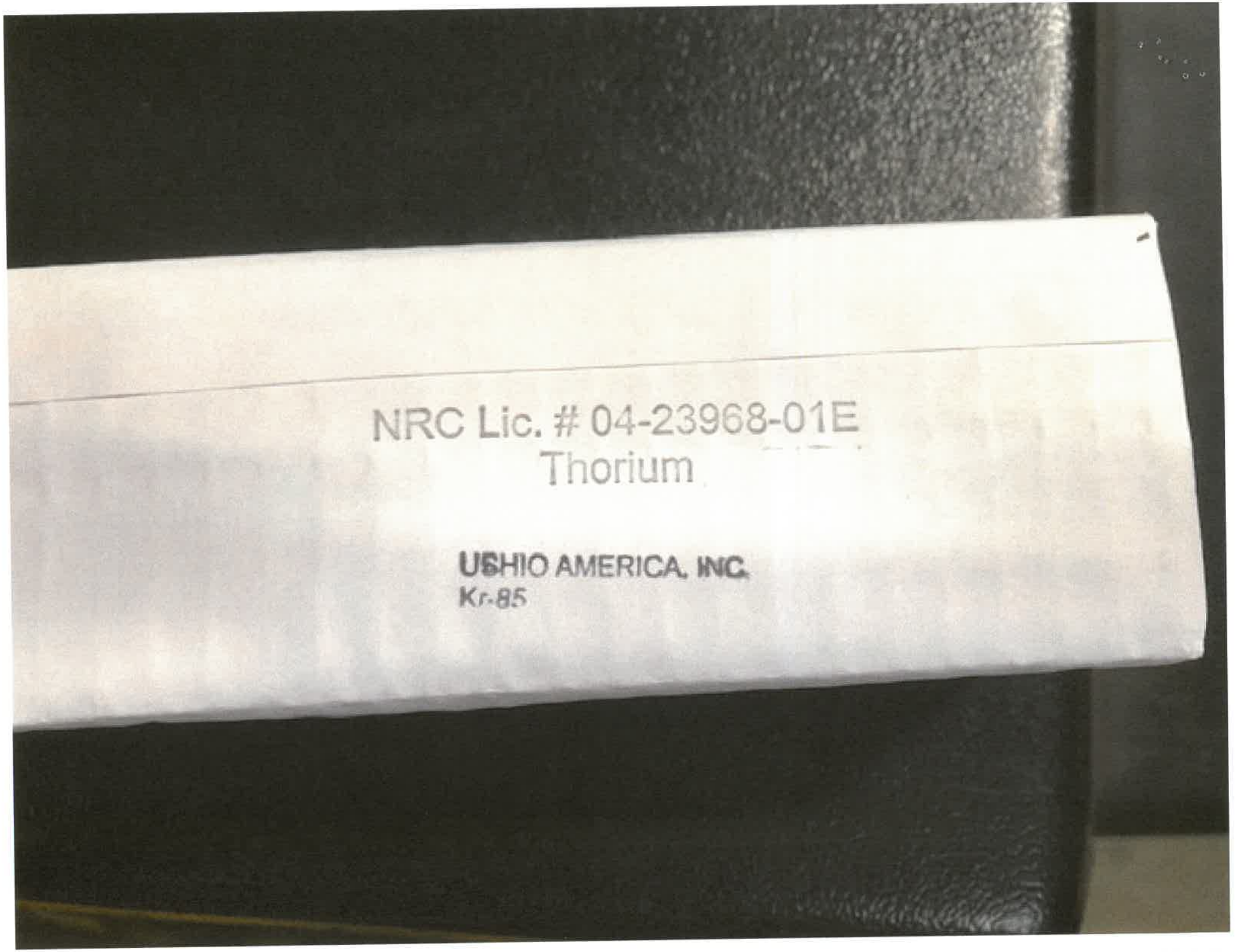
Other warehouses

Quantity Shipped Jan 2018 to December 2018 (12 months)	Th232	Th228	Th230	Total Thorium Content per Lamp (Bq)
462	267	133	40	440
1,227	324	162	49	535
1,285	324	162	49	535
58	324	162	49	535
938	505	253	76	834
39	505	253	76	834
307	324	162	49	535
655	505	253	76	834
289	324	162	49	535
55	324	162	49	535
1,874	834	417	125	1376
1,051	718	359	108	1185
1,485	834	417	125	1376
742	373	187	56	616
547	358	179	54	591
6,124	373	187	56	616
1,033	358	179	54	591
58	358	179	54	591
18,229				**13094**

Other warehouses

Quantity Shipped Jan 2018 to December 2018 (12 months)	Th232	Th228	Th230	Total Thorium Content per Lamp (Bq)
462	267	133	40	440
1,227	324	162	49	535
1,285	324	162	49	535
58	324	162	49	535
938	505	253	76	834
39	505	253	76	834
307	324	162	49	535
655	505	253	76	834
289	324	162	49	535
55	324	162	49	535
1,874	834	417	125	1376
1,051	718	359	108	1185
1,485	834	417	125	1376
742	373	187	56	616
547	358	179	54	591
6,124	373	187	56	616
1,033	358	179	54	591
58	358	179	54	591
18,229				**13094**


Ushio America, Inc.
MHL 121HT
5000071 Kr 85 Thorium
0 048777 265482
CE
www.ushio.com


NRC Lic. # 04-23968-01E
Thorium
USHIO AMERICA, INC.
Kr-85


Titanium

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.

Thorium
Kr85

UHI-S1000AQ/10
10.000K
5000910 M83/E Kr85
0 048777 352496

USHIO


本标记仅在对中华人民共和国
出货时需要标注。
This mark is required only when
the product is shipped into China.
このマークは中華人民共和国内のみ有効。

Thorium

USHIO

Technical Sheet

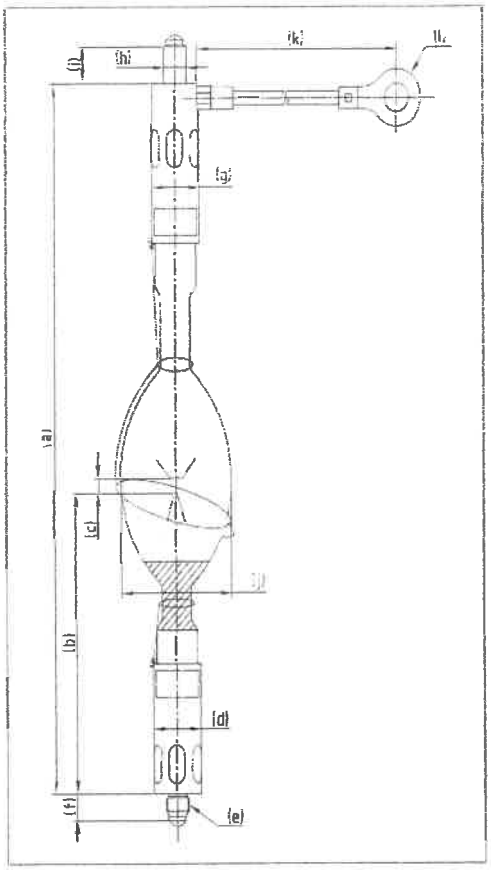
2016/08 Edition

Xenon Lamps for BARCO Digital Cinema Projector

DXL-65BA2

Technical Data

Input Power		W	-	6500
Voltage		V	-	39.5
Current		A	-	165
Operating Range		W/A	-	110-178(A)
Lamp Length		mm	a	375.5
LCL		mm	b	158.5
Cold Arc Gap		mm	c	8
Cathode	Base Diameter	mm (Φ)	d	30
	Pin Diameter	mm (Φ)	e	M14×1.5
	Pin Length	mm	f	10.5
Anode	Base Diameter	mm (Φ)	g	30
	Pin Diameter	mm (Φ)	h	14
	Pin Length	mm	i	19
Bulb diameter		mm (Φ)	j	70
Cable length		mm	k	156
Crimping terminal		mm	l	22-14



Warranty Hours

DXL-65BA2	500

Cross Reference

Lamp Type	Projector Model
DXL-65BA2	DP2K-32B DP4K-32B

TO USHIO INC.

納入先 ウシオ電機株式会社 殿

Inspection Sheet (Chemical composition, Structure, ThO_2 Particle size, Dispersion)
検査成績書(化学成分・組織・ThO2粒径・分散)

product name
品 名 W5660S-6.0MX14.7

粉末ロット番号 W56-437A

powder Lot #

inspection date
検査年月日 2017年 8月 29日

[redacted]
材料部品製造部
品質保証担当
Materials& Components Manufacturing Dept.
Quality assurance

Chemical composition
【化学成分】

Specification → 規格 上限値 / 下限値

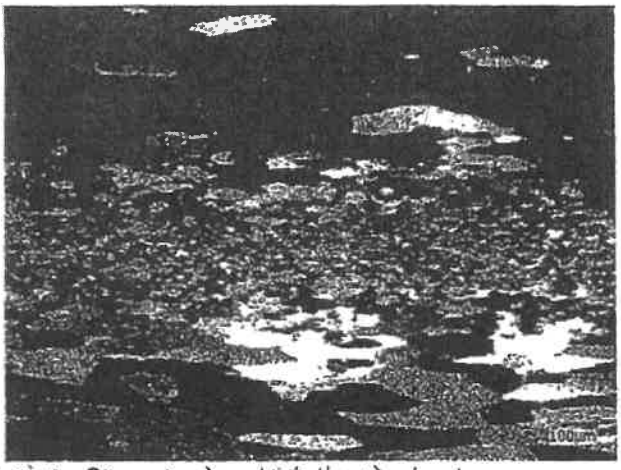
Lot # → 製造ロット番号

MAK → MIN

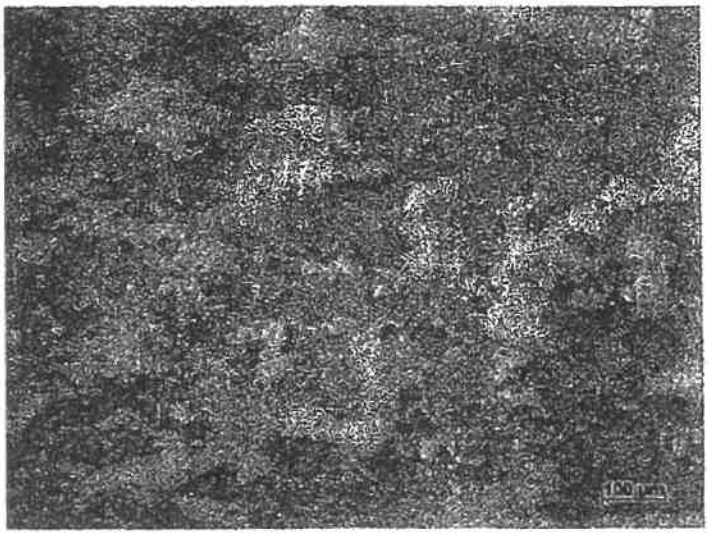
UNIT
【単位 : wt%】

製造ロット番号		ThO2	Fe	Mo	K	C	Si	Ni	Ti
規格	上限値	2.1	0.005	0.005	0.001	0.003	0.002	0.002	0.002
	下限値	1.6							
MIN		1.95	0.0014	<0.0005	<0.0005	0.001	0.0012	0.0005	<0.0005

Structure
【組織】 CCD : 50倍



< ThO_2 Particle size, Dispersion > Metallurgical microscope
【ThO2粒径・分散】 金属顕微鏡 : 1,000倍



検 11.8.29

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 26, 2019

Ushio America Holdings, Inc.
ATTN: Rez Motamed
Senior Manager, Regulatory Compliance
5440 Cerritos Avenue
Cypress, CA 90630

SUBJECT: USHIO AMERICA HOLDINGS, INC., REQUEST FOR ADDITIONAL INFORMATION FOR RENEWAL OF EXEMPT DISTRIBUTION LICENSE 04-23968-01E

Dear Mr. Motamed:

This letter refers to your license renewal application request dated February 11, 2019, for U.S. Nuclear Regulatory Commission (NRC) exempt distribution license number 04-23968-01E.

We do not have sufficient information to complete the review of your application. In order to continue our review, please address the issues listed in the enclosure to this letter. This information is required by Title 10 of the *Code of Federal Regulations* (10 CFR) 32.14, 32.15, 40.52 and 40.53. To ensure that the documentation supporting a renewed license is based on current and accurate information, you should respond to all of the regulatory requirements in the enclosure. You may provide previously submitted documents as long as they are current. These should be provided as attachments to your response to this letter.

We will continue our review upon receipt of this information. If we do not receive your reply within 30 calendar days from the date of this letter, we will consider your application as having been abandoned by you. This action would be without prejudice to the resubmission of another application with the required information.

Please be aware that upon your request, proprietary information submitted to the NRC may be withheld from public disclosure. To do this, you must follow the procedures in 10 CFR 2.390(b) including requesting withholding at the time the information is submitted and complying with the document marking and affidavit requirements set forth in 10 CFR 2.390 (b)(1).

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Any correspondence regarding this renewal application should reference control number 611385.

If you have any questions, you may contact me at (301) 415-7640, or by e-mail at Shirley.Xu@nrc.gov.

Sincerely,

Shirley S. Xu
Materials Safety Licensing Branch
Division of Materials Safety, Security, State,
and Tribal Programs
Office of Nuclear Materials Safety
and Safeguard

Docket No. 030-37966
Mail Control: 611385

Enclosure:
Request for Additional Information

Ushio America Holdings, Inc. Application dated February 11, 2019
Request for Additional Information

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the Ushio America Holdings, Inc. application for exempt-distribution license renewal dated February 11, 2019, and has determined that additional information is needed. In order to continue with our review, please address the issues listed below.

The information related to review of your exempt distribution license application is required by Title 10 of the *Code of Federal Regulations* (10 CFR) 32.14, 32.15, 40.52 and 40.53, and is described in the relevant guidance document NUREG-1556, Volume 8, Rev. 1, titled "Program-Specific Guidance about Exempt Distribution Licenses," available on the NRC public web site (https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1556/v8/).

Please provide the information required by each of the following regulations. You may need to obtain some of this information from your supplier(s).

1. 10 CFR 32.14(a) requires the applicant to satisfy the general requirements specified in Section 30.33 of 10 CFR. Please note that a renewal of your exempt distribution license will not be issued until we received your possession and use license.

2. 10 CFR 32.14(b)(1) requires the applicant to submit the chemical and physical form and maximum quantity of byproduct material in each product. Your application did not appear to address this requirement. Please provide this information.

3. 10 CFR 32.14(b)(2) requires the applicant to submit details of construction and design of each product. Please submit this information in your revised application. Please identify the appropriate enclosure(s) and provide descriptive text of the construction and design each product.

4. 10 CFR 32.14(b)(3) requires the applicant to submit the method of containment or binding of the byproduct material in the product. Please describe, or identify, the appropriate enclosure that describes the method by which Kr-85 gas is introduced and the glass tube is sealed.

5. 10 CFR 32.14(b)(6) requires the applicant to submit the proposed method of labeling or marking each unit and its container with the identification of the manufacturer or initial transferor of the product and the byproduct material in the product. Note: 10 CFR 32.15(d)(1) requires labeling or marking of each unit and its container so that the manufacturer or initial transferor of the product and the byproduct material in the product can be identified.

6. 10 CFR 32.14(b)(7) requires the applicant to submit the radiation level and the method of measurement for products for which limits on levels of radiation are specified in Section 30.15 of this chapter. The levels of radiation from each product containing byproduct material will not exceed the limits specified for that product in Section 30.15 of this chapter. Section 30.15(a)(8) specifies that the levels of radiation from each electron tube containing byproduct material do not exceed 1 millirad per hour at 1 centimeter from any surface when measured through 7 milligrams per square centimeter of absorber. Please resubmit this information in your revised application.

7. 10 CFR 40.52(b)(1) requires the applicant to submit chemical and physical form and maximum quantity of source material in each product. Please submit this information as required.

8. 10 CFR 40.52(b)(2) requires the applicant to submit details of construction and design of each product. Please resubmit this information in your revised application. Please provide descriptive text of the construction and design of each product.

9. 10 CFR 40.52(b)(3) require the applicant submit quality control procedures to be followed in the fabrication of production lots of the product and the quality control standards the product will be required to meet. Please submit quality control procedures for manufacturing thorium lamps.

10. 10 CFR 40.52(b)(4) require the applicant to submit the proposed method of labeling or marking each unit, and/or its container with the identification of the manufacturer or initial transferor of the product and the source material in the product. Please provide legible copies of the labels that will be used on each type of product (or container where the product is too small to be labeled).

RADIOACTIVE MATERIAL LICENSE

Pursuant to the California Code of Regulations, Division 1, Title 17, Chapter 5, Subchapter 4, Group 2, Licensing of Radioactive Material, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, use, possess, transfer, or dispose of radioactive material listed below; and to use such radioactive material for the purpose(s) and at the places(s) designated below. This license is subject to all applicable rules, regulations, and orders of the California Department of Public Health now or hereafter in effect and to any standard or specific condition specified in this license.

1. Licensee	Ushio America, Inc.	3. License Number 7749-30	Amendment Number :
2. Address	5440 Cerritos Avenue Cypress, CA 90630	4. Expiration date February 04, 2019	(5)
Attention:	Martin Brown Radiation Safety Officer	5. Inspection agency	Radiologic Health Branch South

License Number 7749-30 is hereby issued as a new license:

6. Nuclide	7. Form	8. Possession Limit
A. Krypton-85	A. Gas	A. 0.71 µCi/tube, total not to exceed 1 Curie.

9. Authorized Use

A. The licensee is authorized to possess and store the devices (lamps) containing sealed sources of Krypton-85 gas diluted in Argon, specified in Condition 12 of the license. Krypton-85 is added to metal halide lamps to improve the ignition behavior of the lamps. Lamps are imported from several manufacturers and stored for a brief period of time at the licensed facility. Lamps will be distributed from the facility to persons (retailers) exempt from licensing, throughout the United States compliant with an exempt distribution license issued by the US Nuclear Regulatory Commission.

LICENSE CONDITIONS

10. Radioactive material shall be used only at the following location:

(a) 5440 Cerritos Avenue, Cypress, CA.

11. This license is subject to an annual fee for sources of radioactive material authorized to be possessed at any one time as specified in Items 6, 7, 8 and 9 of this license. The annual fee for this license is required by and computed in accordance with Title 17, California Code of Regulations, Sections 30230-30232 and is also subject to an annual cost-of-living adjustment pursuant to Section 100425 of the California Health and Safety Code.

12. Radioactive material described in Subitem A of this license may be used by individuals as follows:

(a) Maintenance of the records of all packages received, containing Kr-85 glass tubes, inspection for appropriate markings, and labels, and repair of tubes shall be performed by individuals specifically authorized to perform such services.

(b) Monitoring for contamination is required only when upon receipt, a package containing Krypton-85 lamp is damaged and shall be performed only by individuals who:

(1) Have received a certificate of satisfactory completion of a course in all operations of lamps storage containing Krypton-85, such course conducted by a person recognized by the State of California to provide such training; and also

(2) Have been designated, in writing, by the Radiation Safety Officer as qualified to perform monitoring packages.

(c) Maintenance and storage of lamps containing Krypton-85 shall be performed only by, or under the supervision of individuals who have been designated, in writing, by the Radiation Safety Officer as qualified to use Krypton-85 in these manners.

The following table lists the devices, which the licensee is authorized to possess and store pursuant to the terms and conditions of this license. Column 1 lists the device model number, and columns 2 and 3 identify the manufacturer and model number, and maximum activity of the sealed source(s) respectively.

Device Model (Kr-85 Lamps)	Lamp Manufacturer	Maximum Activity
UAI P/N 5001671	Narva, GLE (P/N - 80030014, 1000 Watts)	0.71 μCi/tube
UAI P/N 5000458	BLV (P/N - 23250418, 1000 Watts)	0.26 μCi/tube
UAI P/N 3000205	Gulf Adv. Lighting (P/N -GT26C, 26 Watts)	0.01 μCi/tube

13. Except as specifically provided otherwise by this license, the licensee shall possess and store radioactive material described in Items 6, 7, 8 and 9 of this license in accordance with the statements, representations, and procedures contained in the documents listed below. The Department's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.

    (a) The new application dated September 26, 2008, with attachments, signed by Kenji Hamashima. The attachments include radiation safety program, drawing of the facility, Forms RH 2050A, and certificates of training

14. (a) The Radiation Safety Officer in this program shall be Martin Brown.

15. Radioactive materials shall be used by occupational workers in such a manner that the dose limits specified in Title 10, Code of Federal Regulations, Part 20, Subpart C, Sections 20.1201 through 20.1208 are not exceeded.

16. The licensee shall conduct a physical inventory every six months to account for all sealed sources and/or devices received and possessed under the license. Records of the inventories shall be maintained for inspection, and may be disposed of, following Department inspection.

17. At least 30 days prior to vacating any address of use listed in Condition 10 of this license, the licensee shall provide written notification thereof to the California Department of Public Health, in accordance with Title 17, California Code of Regulations, Section 30256 (b).

18. A copy of this license and a copy of all records and documents pertaining to this license shall be maintained available for inspection at 5440 Cerritos Avenue, Cypress, CA.

RADIOACTIVE MATERIAL LICENSE

License Number: 7749-30

Amendment Number:

19. The licensee will provide the Low Level Radioactive Waste (LLRW) reports specified in the California Health and Safety Code section 115000.1(h) to the California Department of Public Health (CDPH) on an annual basis for both shipped and stored LLRW. Alternatively, LLRW shipment information may be provided on a per shipment basis. LLRW shipment information and annual reports shall be mailed to:

Attn: LLRW Tracking Program
California Department of Public Health
Radiologic Health Branch, MS 7610
P.O. Box 997414
Sacramento, CA 95899-7414

Issued for the California Department of Public Health

Date: February 04, 2009

By: John G Fassell

John G. Fassell, CHP
Senior Health Physicist
Radiologic Health Branch
MS 7610, P.O. Box 997414
Sacramento, CA 95899-7414