



SUPER-HIGH-PRESSURE

UV

Lamp

Super High pressure UV Lamp

Instruction Manual

USHIO

Lighting—Edge Technologies

Super High pressure UV Lamp Instruction Manual

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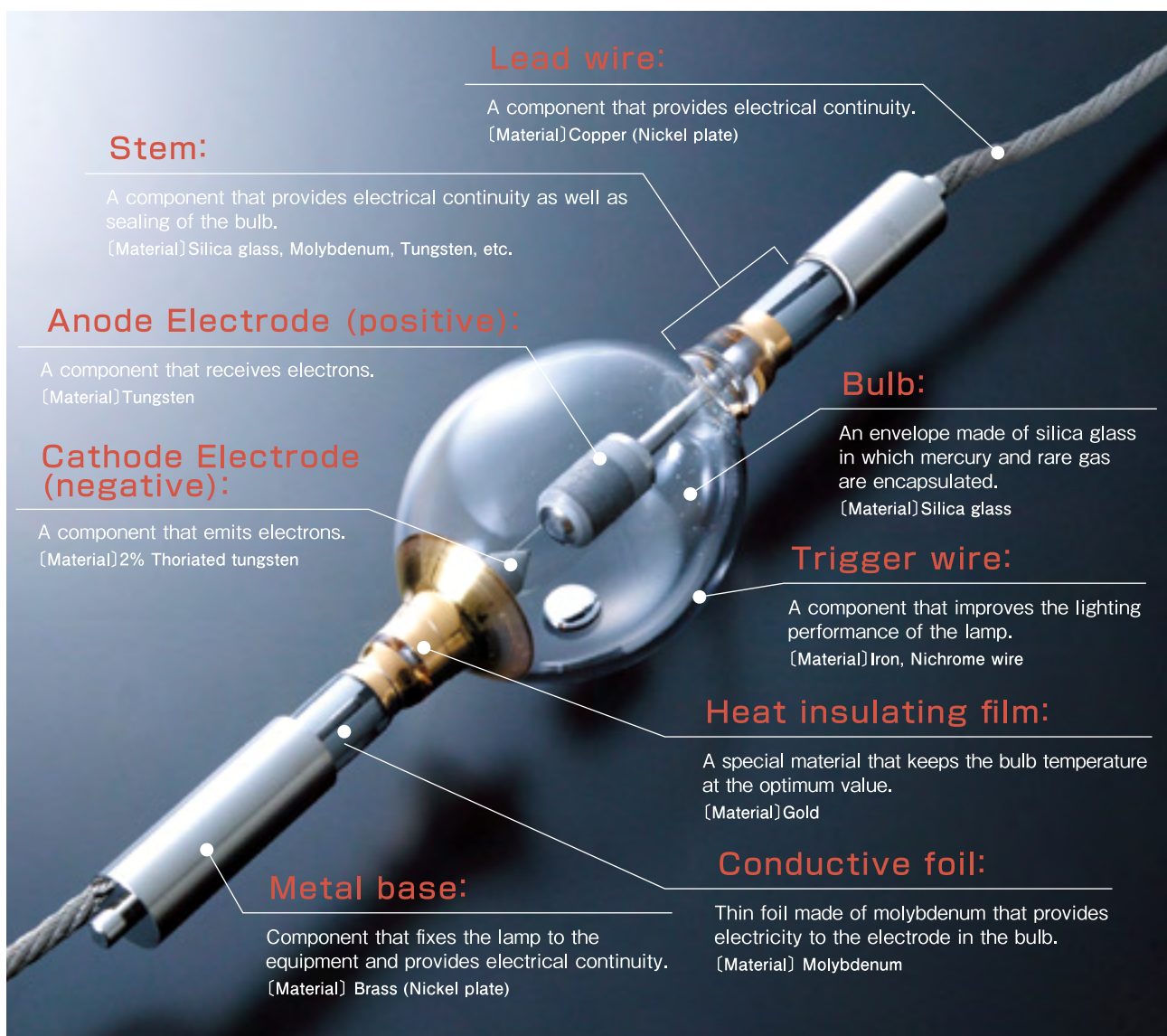
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1-1 Structure of lamp, functions and material of components

Structure of lamp, functions of components and the major material are described below. Check it when you dispose lamps. As some types of lamps include special materials, please refer to Material Safety Data Sheet of each lamp as well when you dispose the lamp.



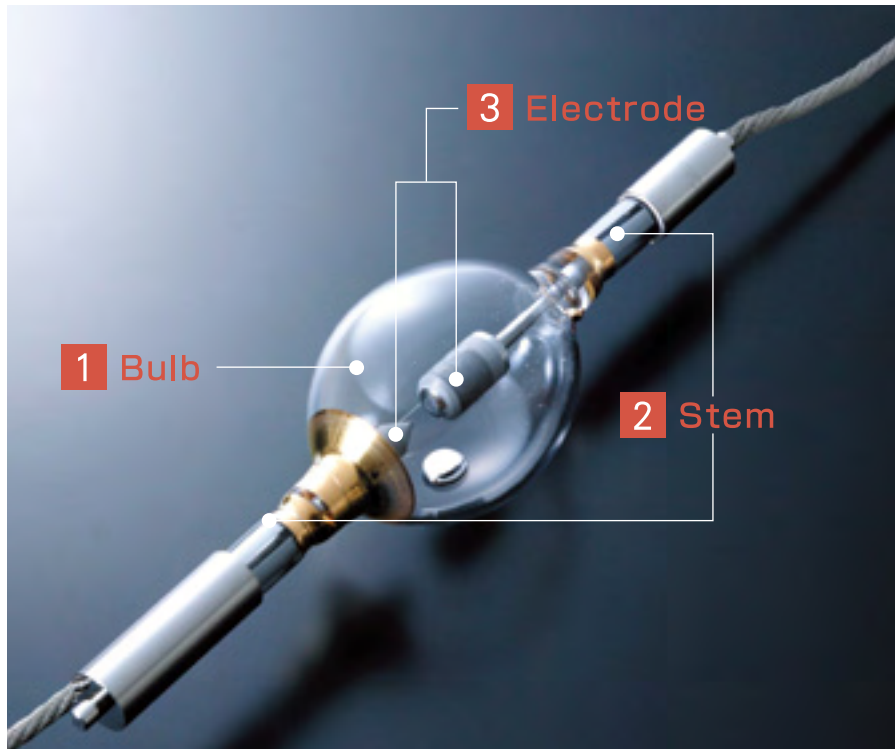
1 Introduction

1-2 Criteria regarding external appearance of the lamp

When rated input power is under 1.2kw and over 17kW, contact us.

We recognize that external appearance is important, thus we have established criteria regarding external appearance. All lamps must meet inspection criteria as described below.

※Scratches and spots on the lamp in the range of criteria regarding external appearance described below do not affect the characteristics of the lamp.



1 Bulb

Bubbles in the bulb

【Criteria】 Dimensions

$d \leq \phi 0.5\text{mm}$	OK
$\phi 0.5\text{mm} < d \leq \phi 0.7\text{mm}$	Acceptable up to 5
$\phi 0.7\text{mm} < d$	NG (Unacceptable)



Spots on the bulb (including red spot)

【Criteria】 Dimensions

$d \leq \phi 0.5\text{mm}$	OK
$\phi 0.5\text{mm} < d \leq \phi 1.0\text{mm}$	Acceptable up to 5
$\phi 1.0\text{mm} < d$	NG (Unacceptable)



Streaks on the bulb

[Criteria] Length

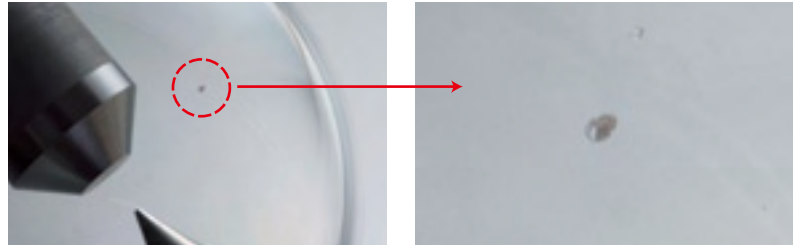
$L \leq 2.0\text{mm}$	OK
$2.0\text{mm} < L \leq 5.0\text{mm}$	Acceptable up to 3
$5.0\text{mm} < L$	NG (Unacceptable)



Stain on the bulb

[Criteria] Dimensions

$d \leq 1.0\text{mm}$	OK
$1.0\text{mm} < d \leq 2.0\text{mm}$	Acceptable up to 2
$2.0\text{mm} < d$	NG (Unacceptable)



Hg inside the bulb

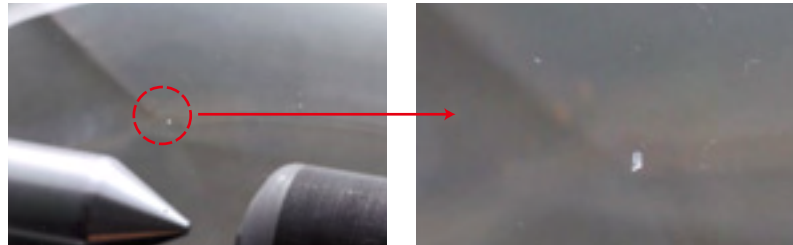
Mercury is encapsulated in the super high pressure UV bulb. Mercury is liquid at ordinary temperature. Before and after operating the lamp, some of the mercury may adhere to the inside surface of the bulb, but will evaporate when the lamp is lit.



Foreign matter inside the bulb

[Criteria] Length

$L \leq 1.5\text{mm}$	Acceptable up to 3
$1.5\text{mm} < L \leq 2.0\text{mm}$	Acceptable up to 1
$2.0\text{mm} < L$	NG (Unacceptable)

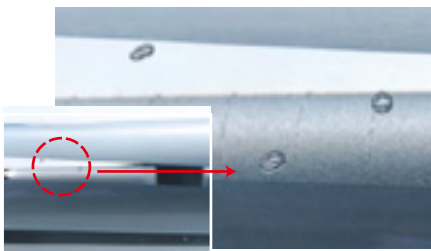


2 Stem

Spots or bubbles at the stem

[Criteria] Dimensions

$d \leq \phi 0.5\text{mm}$	OK
$\phi 0.5\text{mm} < d \leq \phi 2.0\text{mm}$	Acceptable up to 15
$\phi 2.0\text{mm} < d$	NG (Unacceptable)



Stain on the stem

[Criteria] Dimensions

$d \leq \phi 1.0\text{mm}$	OK
$\phi 1.0\text{mm} < d \leq \phi 3.0\text{mm}$	Acceptable up to 5
$\phi 3.0\text{mm} < d$	NG (Unacceptable)



Streaks on the stem (air lines)

[Criteria] Length

- In the area within 15mm from the edge of the metal base
Length: $0.5\text{mm} < L \leq 15\text{mm}$ Acceptable up to 3
- In an area other than that described above
Length: $2.0\text{mm} < L \leq 6.0\text{mm}$ Acceptable up to 3



※ Ring-form flaws and streaks generated during the manufacturing process are harmless.

※ However, they are unacceptable if they reach the luminous portion.

3 Electrode

Hg on the electrode surface

Mercury is encapsulated in the super high pressure UV bulb. Some mercury may adhere to the electrode giving the impression of defective plating, but this is not the case.

If mercury adheres to the electrode as described above, it will vaporize completely from the electrode surface when the lamp is lit.



- The lamp is precision mechanical equipment made of glass and metal. Vibration or shock may cause breakage or burst when lamp is operated. To use the lamp safely, follow the precautions as described below.
When lamp is dropped, return it to our sales representative.
- In the event the lamp impacts the equipment and becomes cracked, lamp failure is imminent.
Do not use a cracked or broken lamp.
- When replacing the lamp, follow the instructions described in the "Operation Manual" or "Maintenance Manual" of the relevant equipment.
- If the procedures and precautions described in this manual are not followed, the following accidents or injury may occur.
 - (1) Breakage or lamp burst may occur resulting in injury.
 - (2) Breakage, burst, or short lamp life may occur.
 - (3) Direct viewing of bulb in operation may cause severe eye injury and even blindness.
 - (4) Touching a lamp that has not been cooled sufficiently may cause burn injury.
 - (5) If the lamp is broken or burst, the escaping mercury and its vapor may cause a health hazard.

2-1 Transporting

■ Receiving

When receiving lamps, confirm the exclusive carrying box (exterior box) is not damaged or dented by external impacts to packaging.

When receiving exclusive carrying box (exterior box) with Shock Watch attached, confirm condition of Shock Watch device. If the exclusive carrying box (exterior box) is damaged or the color of Shock Watch is changed, inform your supplier.

■ When transporting by hand

- 1 When carrying the lamp (including used lamps), use the exclusive protective cover and container box.
- 2 Carry the lamp in the upright position with the "UP mark" on the upper side. Hold the bottom firmly so that the lamp does not slide out of the outer cover. (See Photo1).
To carry a large lamp with a capacity of 8 kW or more, which is too large to carry in the upright position, keep it in the horizontal position and ensure that the lamp is not subjected to shock or vibration. When carrying in the horizontal position, care should be taken so that the lamp does not slide out of the outer cover sideways. (See Photo2).



Photo1



Photo2

■ When transporting by a truck or cart

- 1 Use the exclusive container box and carrying box (exterior box). Place the lamp in the exclusive container box so the negative electrode (the smaller electrode) of the lamp is set to the "UP Mark" side of the container box.
- 2 Place the exclusive container box in the carrying box (exterior box) with the "UP mark" on the upper side. If there is vacant space in the box, fill it with sufficient cushioning material.
- 3 When transporting the lamp, do not throw or drop it. When transporting the lamp by cart be sure to protect the lamp from vibration and impacts of any type. Do not transport the lamp over surfaces that will transfer shock and vibration to the lamp.

※Please note that the design of the packing material for the lamp you have may be different from the photo.



Exclusive carrying box (exterior box)



Exclusive container box



"UP mark" of the container box.
(When carrying the lamp.)

2-2 Unpacking

- 1 When handling the lamp, always wear a face shield to protect the face and neck, protective gloves, and long-sleeved heavy-duty clothing.
- 2 The lamp is made of glass and the envelope in under internal pressure. Since the inside pressure of the bulb is very high, do not impact or apply excessive force.

Handle with care!

The label pictured below is placed onto the exclusive container boxes and the protective cover to inform users that the lamp contains gas under high pressure. Extra Care should be taken because the pressure is higher (About 0.3MPa more than normal lamps.) (See Photo3).

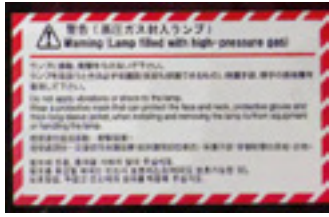


Photo3

- 3 Do not apply vibration or shock to the lamp.
- 4 Never touch the lamp directly with your bare hands. If the lamp becomes soiled, wipe it with a clean cloth moistened with alcohol.

2-3 Storing

- 1 When storing the lamp (including used lamps), use the exclusive protective cover and container box.
- 2 Store the lamps in the same packaging as it is delivered.
- 3 If 2. is impossible, remove the lamp from the exclusive carrying box (exterior box), and place the exclusive container box in a horizontal position in a safe storage location.

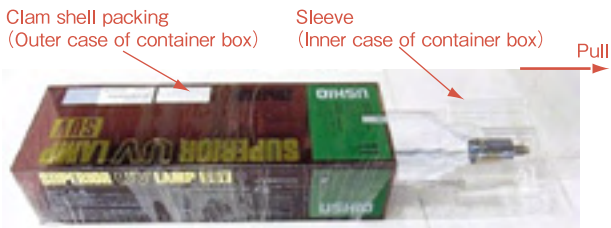


"UP mark" of the container box. (When storing the lamp.)

※Placing the lamp unsupported in a vertical position may cause the lamp to fall over and break.

2-4 Removal from the container box

- 1 When removing the lamp from the container box, place the container box in the horizontal position and pull the clam shell packing out of the sleeve. (Some lamp types do not use the exclusive protective cover or terminal cover).



- 2 When removing the lamp, check that the lamp and terminal are covered with the exclusive protective cover.



Protective cover



Terminal cover

- 3 Handle the lamp carefully holding both metal bases. (See Photo4).
- 4 Handle the lamp carefully so that the lead wire or terminal does not touch the glass parts.



Photo4

2-5 Mounting

- ◎When mounting the lamp, check the electrical polarity described in the specification sheet.
- ◎Check that the power supply is turned off before mounting the lamp.
- ◎Extra care should be taken when mounting lamps of 8kw and higher. These lamps are heavy and can be awkward to handle.

- 1 When mounting the lamp to the equipment, always wear a face shield to protect the face and neck, protective gloves, and long-sleeved heavy clothing. (See Photo5).



Photo5

Protective cover

- 2 Mount the lamp carefully so that the lead wire does not touch the bulb or mirror. Also, keep the lead wire from contacting any nearby metal parts as much as possible. (See Photo6).
- 3 Remove the plastic terminal cover attached to the terminal located at the end of the lead wire right before connecting to the specified position of the equipment. (Some lamps do not have the terminal cover).
- 4 Care should be taken so that the bulb does not touch the mirror, cooling nozzle, etc. in the equipment. When mounting the lamp, avoid applying twisting force or lateral force to the lamp. (See Photo7).



Photo6

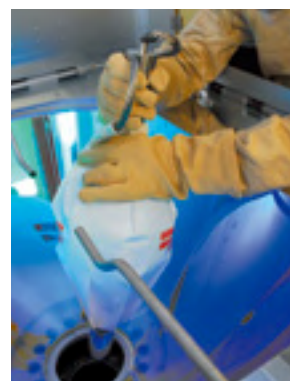


Photo7

- 5 Care should be taken so that the lead wire does not touch the mirror, cooling nozzle, etc. Do not stretch or apply tension to the lead wire. (See Photo8).
- 6 Securely connect the lamp terminal to the specified position in the equipment.
- 7 Check that the polarity and wiring of the lamp are correct.
- 8 Before lighting a newly mounted lamp, remove the exclusive protective cover wrapped around the bulb. (See Photo9).
※The exclusive protective cover is designed to protect the operator by containing all quartz material in the event of a lamp burst.
- 9 Do not leave the exclusive protective cover and terminal cover in the equipment.
※Please note that the design of the protective cover and terminal cover may be changed without prior notice.

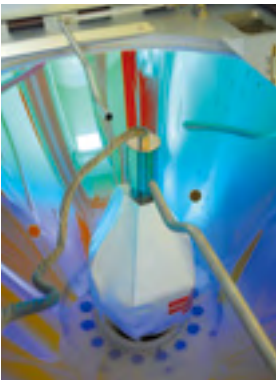


Photo8



Photo9

2-6 When the lamp is lit

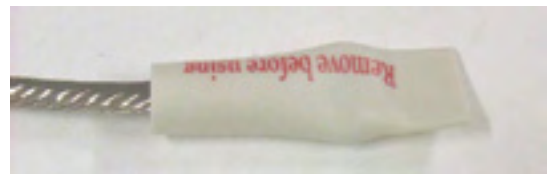
The lamps described in this document emit extremely high brightness and ultraviolet light which is harmful to humans. Never look directly at the lamp during operation or expose bare skin to the light emitted by these lamps.

2-7 Lamp removal

- ◎Before removing the lamp from the equipment, always turn off the power supply.
- ◎Do not open the door at least 10 minutes after turning off the light so that the lamp is sufficiently cooled.

- 1 Before opening the door of the equipment, always wear a face shield to protect the face and neck, protective gloves, and long-sleeved heavy clothing.

- 2 When removing the lamp from the equipment, carefully wrap the protective cover around the lamp. Care should be taken so that the bulb does not touch the mirror, cooling nozzle, or other lamp house components.
- 3 Remove the lamp carefully so that the lead wire does not touch the bulb or mirror.
4. After removing the lamp from the equipment, wrap the terminal cover around the crimping terminal located at the end of the lead wire.



Terminal cover

- 5 Cool the lamp sufficiently before placing it in the exclusive container box.
- 6 Place the lamp in the exclusive container box so that the cathode electrode (the smaller one) is located on the "UP" mark" side.

2-8 In case of lamp burst or breakage

- 1 If the lamp bursts or is broken when it is lit, leave the room immediately and ventilate the area for at least 30minutes.

◇Although the mercury encapsulated in the lamp is the same inorganic mercury as that used in fluorescent lamps, care should be taken not to inhale the vapor. In the event of inhalation, consult a doctor immediately and follow the doctor's instructions.

- 2 Turn off the "Main Power" and "Breaker" of the lamp power supply before opening the lamp house cover.
- 3 When collecting mercury from a burst or broken lamp, wear appropriate protective clothing and breathing apparatus must be worn.

- ◇Wear heavy gloves that provide adequate protection from exposure to mercury and broken glass.
- ◇Always wear appropriate breathing apparatus when exposed to mercury.
- ◇Make sure your breathing apparatus is specified to filter mercury (Hg). Carefully follow directions provided by mask manufacturer.

- 4 Check that the lamp (components) in the equipment are sufficiently cooled before removing the lamp.
- 5 If broken lamp envelope is still in one piece (cracked), place lamp into its original exclusive packaging. Then,

place the exclusive packaging into doubled, thick polyethylene bag so that the broken lamp is sealed tightly to prevent the contents from leaking, should the lamp envelope break completely.

6 If lamp bursts, be sure that glass chips and lamp components have sufficiently cooled before collecting them. Wear hand, arm and eye protection appropriate for collecting glass shards.

◇Collect large glass chips, components to be data for investigation of the defect. Collect them carefully to keep the same way as it is collected.

7 Collect mercury, small glass chip, and small components of the lamp with a broom and a dustpan, etc.

8 Collect mercury and glass pieces and seal in a nonmetallic air-tight container. Contact the appropriate waste management firm to dispose the mercury. Or send mercury to us with all remaining lamp parts (glass chips and components).

9 Return the collected lamp (glass chips and components) after placing the lamp remains into a large, thick polyethylene bag (double-bagged) and sealed tightly so that mercury does not leak. Collect mirror in the lamp house and return it in the same polyethylene bag as the lamp (glass chips and components). Ask the waste management firm to dispose the broom and dustpan, which you used to collect the lamp parts, as the mercury might have attached to them. Or send them to us with the lamp (glass chips and components).

10 In the unlikely event mercury cannot be completely cleaned from the lamp housing, consult the equipment maker for replacement of contaminated parts.

2 When disposing of used lamps, inform the proper waste disposal firm that the lamp "contains mercury" and "high pressure gas is encapsulated." If you have any questions, contact your supplier.

3 Structure and materials of a general lamp are described. (See p1 1-1). You are required to dispose of these lamps in accordance with Laws and Ordinances pertaining to Hazardous Waste Disposal.

2-10 Returning a defective lamp

◎When lamp failure occurs, always contact supplier to return the lamp. Delays or failure to return the lamp could affect eligibility on any warranty claim.

◎These lamps carry a manufactures guaranteed shelf life of five (5) years. (Lamp identification serial number and its location are shown below in Figure 1.)

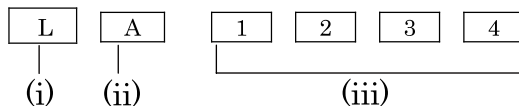
1 Place the lamp in the exclusive container box in the same way as it is delivered. Place the lamp in the exclusive container box so that the cathode electrode (the smaller electrode) of the lamp is set to the "UP mark" side of the container box.

2 Put the lamp in the exclusive container box and place the container box in the exclusive carrying box (exterior box) (with the "UP mark " on the upper side), and return it to your supplier. If there are gaps between the exclusive container box and exclusive carrying box, fill them with sufficient cushioning material.

2-9 Disposals

1 When disposing of used lamps, use the exclusive protective cover and exclusive container box.

Figure 1 Identifications of lamp serial No.



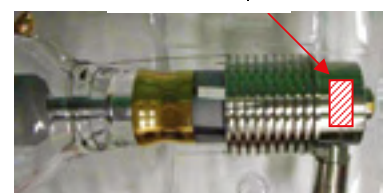
(i) Indicate the production year (alphabetized)

J	K	L	M	N	O	P	...
A.C.2006	A.C.2007	A.C.2008	A.C.2009	A.C.2010	A.C.2011	A.C.2012	...

(ii) Indicate the production month (alphabetized)

A	B	C	D	E	F	G	H	I	J	K	L
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

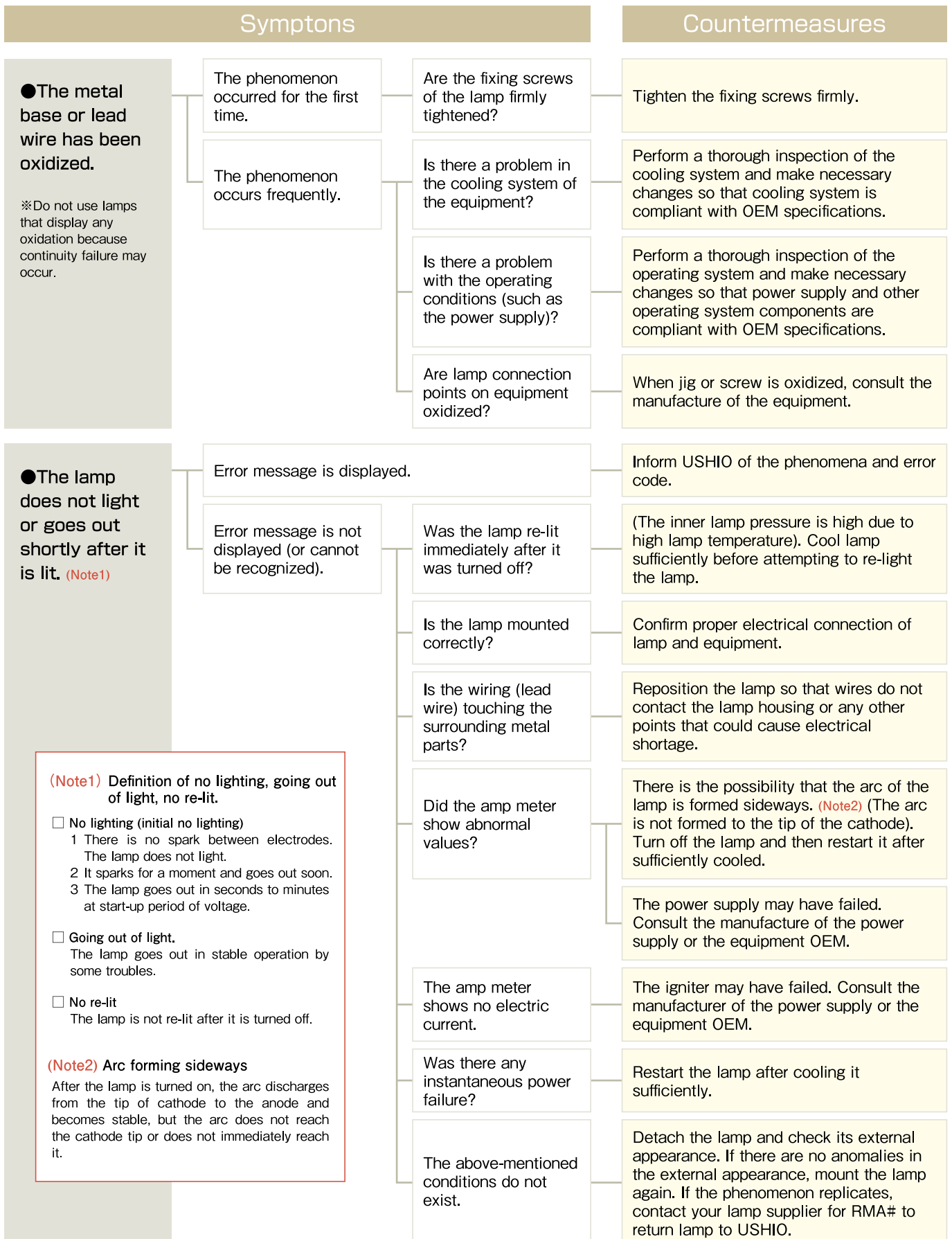
(iii) 4-digit number (random number for each lamp)



3

Troubleshooting

The following flow chart shows symptoms and countermeasures for problems that occur during lamp use. If the symptoms do not disappear after the countermeasures are taken, please contact your lamp supplier.



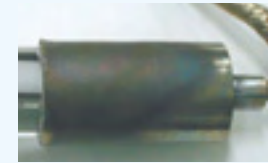
Point to be checked

The phenomenon shown on the right occurs when the temperature of the lamp exceeds a specified value. Check these four points when such phenomenon occurs.

- (1) Are the operating conditions and cooling conditions correct?
- (2) Is the "lead wire or metal base" connected properly to the mounting port in the equipment?
- (3) Is the light converged on the wiring (lead wire) or metal base?
※The mirror may have been set so that the light converges on the wiring (lead wire) or metal base. Consult the manufacturer of the equipment.
- (4) Is there any discoloration or deformation of the mounting port for the lamp or conducting parts being used?
※Since the electrical resistance of discolored (oxidized) parts increases, replace such parts with new ones.



Normal goods

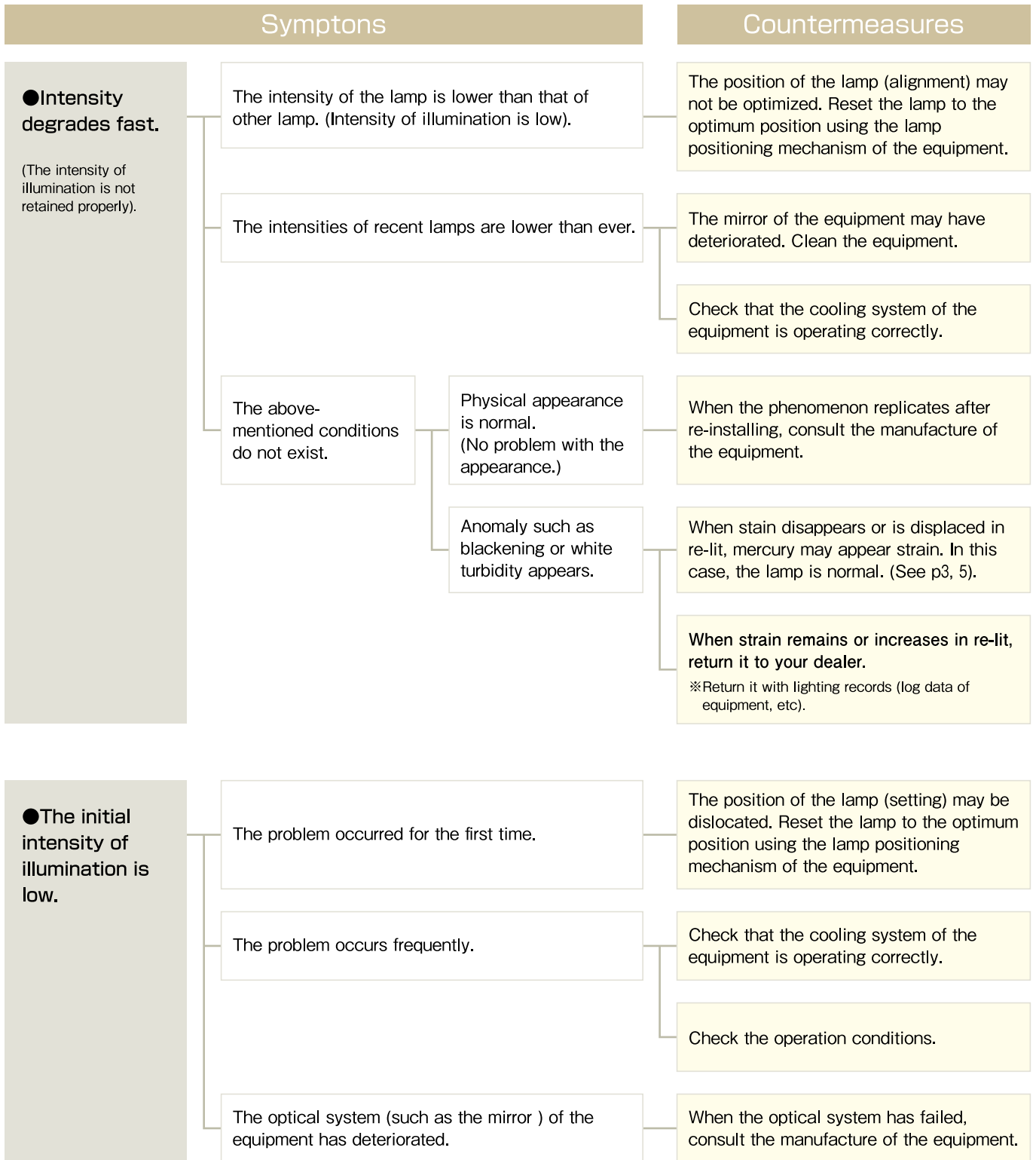


Discoloration of metal base (oxidation)

- Since the temperature and inner pressure are high immediately after the lamp is turned off, allow enough time to cool before turning the lamp on again.
※Please take enough cooling time until the vaporized mercury will re-condense inside the lamp.
- When the output of the igniter is reduced, ignition failure is apt to occur. If ignition failure occurs frequently, consult the equipment OEM or manufacturer of the power supply.
※Deterioration of the igniter or high-voltage leakage may be at fault.
- The arc may extinguishes immediately after the lamp is turned on without reaching the tip of the cathode. If the arc extinguishes within one minute of lighting, try to light again immediately.
※Please note that the countermeasures for the extinguishes of the arc due to instantaneous power failure are different.
- Ignition failure or the extinguishing of arc may occur when contact failure exists in the wiring, lamp. Check that there is no connection failures associated with any connection points providing power to the lamp.
- If the wiring to the lamp touches the external metal parts of the lamp housing, the initial high voltage output of the igniter may leak resulting in ignition failure. Check that the wiring is not touching the surrounding metal parts.
- A power failure of several milliseconds may cause extinguishing of the arc. Restart the lamp after it is sufficiently cooled to confirm the lamp did not extinguish by some other cause.
- If any over-heat prevention system such as a thermal fuse is built in the power supply, the lamp may be extinguished by such system when the temperature in the lamp house exceeds the specified value. In such a case, turn off the power supply once and restart it to confirm if the non-lighting or extinguishing of the lamp does not happen again.
- When noise affecting the waveform of the AC line occurs, the safety circuit of the power supply may operate resulting in extinguishing of the arc. In such a case, turn off the power supply once and restart it to confirm if the non-lighting or extinguishing of the lamp does not happen again.
- When the lamp is operated in an over-cooled condition, the mercury may not be able to vaporize completely and the specified values for lamp voltage and electrical current will not be obtained. Then, if a protective device is provided in the power supply system, the shut-down mechanism will operate resulting in extinguishing of the arc before the lamp is stabilized. Check that the cooling conditions are within equipment specifications.
- Contact failure in the internal circuit of the power supply causes ignition failure or extinguishing of the arc. In such a case, turn off the power supply once and restart it to confirm if the non-lighting or extinguishing of the lamp does not happen again.
- Some types of equipment are provided with a mechanism that shuts down the equipment when the lamp input reaches a certain value. Check that the setting value of the shut down mechanism is correct.

3

Troubleshooting



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USHIO INC.