WARNING:

In accordance with ANSI/IESNA Standard RP-27, Display/Optic metal halide lamps are a Risk Group 3 product.

Read and understand this warning before using this lamp!

THIS LAMP EMITS ULTRAVIOLET AND INFRARED RADIATION. ALWAYS WEAR SUITABLE EYE PROTECTION WHEN WORKING NEAR THIS LAMP. THIS LAMP OPERATES AT HIGH PRESSURE AND AT HIGH TEMPERATURE AND MAY SHATTER UNEXPECTEDLY. THIS LAMP MUST BE USED IN A FIXTURE THAT HAS A SUITABLE PROTECTIVE SHIELD AND/OR SCREEN TO PROTECT PEOPLE AND SURROUNDINGS AGAINST THE RISK OF PERSONAL INJURY AND/OR PROPERTY DAMAGE FROM LAMP SHATTERING AND EXPOSURE TO INFRARED OR ULTRAVIOLET RADIATION.

RUPTURE & RADIATION (UV-IR-VISIBLE) HAZARD:

1. All Display/Optic metal halide lamps operate at high internal pressures (upwards of 500psi or 35bar possible) and may unexpectedly rupture resulting in the discharge of hot fragments (approximately 800°C / 1472°F) of quartz and/or metal particles, as well as the release of mercury/mercury vapor. In the event of such a rupture, there is a risk of personal injury, burns and fire.
2. All Display/Optic metal halide lamps generate ultraviolet (UV), infrared (IR) and visible radiation during operation. This radiation can cause permanent damage to the eyes (including blindness) and serious injury to the skin (including burns and blistering). To avoid eye damage, other personal injury and/or property damage, the lamp MUST be operated in a suitable fixture.
3. A suitable fixture is one that will prevent the arc from being viewed directly while operating, and in the event of a lamp rupture, will prevent hot (up to 800°C / 1472°F), flying fragments of quartz and/or metal from escaping into the area.
4. To minimize the risk of a lamp rupture, replace the lamp at or before the end of rated life (see OSRAM SYLVANIA product catalog for rated life) or when the lamp shows signs of blackening.
5. The discharge vessel of Display/Optic metal halide lamps is constructed of quartz glass that is filled with a quantity of mercury, elemental metals and/or rare earth elements. These lamps are **not** at positive pressure when cold (not operating, at room temperature).

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GENERAL SAFETY & INSTALLATION TIPS

BROKEN LAMPS (MERCURY VAPOR RELEASE AND DISPOSAL):

1. In the event of a lamp rupturing during operation, all personnel should leave the area immediately to avoid the inhalation of mercury vapor. The area should then be thoroughly ventilated for a minimum of 30 minutes or until the mercury vapor in the area is below the ACGIH TLV (American Conference of Governmental Industrial Hygienists Threshold Limit Value). Inhaling vapor or small particles of mercury or its compounds can be harmful to lungs, kidneys and nervous system. Penetration of the skin or ingestion can also be harmful.
2. To avoid mercury vapor getting into air conditioning systems, mercury vapor-absorbing filters should be used. When the lamp housing has cooled, ***mercury residue may be picked up with special mercury adsorptive agents or a mercury vacuum cleaner (available from laboratory safety equipment suppliers) and disposed of in accordance with local, state and federal regulations.*** There should be no direct skin contact with and/or inhalation of mercury residues that may be residing in lamp housing, optics or lamp parts.
   If a cold (room temperature) lamp is broken, proceed with clean up and disposal as indicated above (in the ***bold, italic statement***).

INSTALLATION:

1. Do not use if lamp is scratched, cracked or damaged in any way.
2. To prevent electric shock, shut off main power to the fixture before attempting to service or replace lamp.
3. To avoid damaging the quartz and causing premature lamp failure, do not handle lamp with bare hands. Use clean gloves.
4. If the quartz parts are inadvertently touched, clean fingerprints off with denatured alcohol and wipe dry with a clean, soft, lint-free cloth. Do not use cleaning rags or material that can leave a residue.
5. To prevent skin burns, allow lamp to cool before handling.
6. To avoid breakage, mounting of the lamp must be free of mechanical stress during installation and during operation by allowing for thermal expansion along its axis.
7. Display/Optic metal halide lamps should not be subjected to force/stress during installation. Single-ended lamp types use a metal bar, which runs parallel to the lamp body and provides an electrical path for the lamp current (from the socket end to the opposite end of the lamp). To avoid overheating the lamp current bar, Display/Optic metal halide lamp types without outer jackets should not have the lamp current bar positioned above the discharge arc during operation. Single-ended lamp types with outer jackets may be operated in any position and with any current bar position.
8. Replace all fixture covers and shields after replacing lamp to prevent eye damage, other personal injury or property damage.
9. Use only in instruments/equipment specifying this light source.
10. **CAUTION – Shorting Hazard:** The HTI 2500 W/SE has both base pins connected to the same point inside the lamp socket. A lead wire on the opposite side of the lamp provides the current connection necessary for operating the lamp.
11. Make sure lamp is properly installed into socket/connector to obtain good electrical and thermal contact and avoid damaging lamp and/or socket/connector. Electrical connections

should be free from dirt and corrosion. Socket/connector condition may affect lamp life. Replace socket/connector or lamp if deterioration (pitting, scorching, corrosion, etc.) is observed.

Please note that certain Display/Optic, AC metal halide lamps have dedicated pins or connectors for high voltage ignition.

OPERATION:

1. Magnetic current-limiting ballasts (chokes) provide sine-wave current operation for lamps. However, electronic control gear (ECG) allows for square wave current operation, often at higher frequencies. Some Display/Optic metal halide lamps have been designed for, and therefore require, ECG square-wave operation. Please see OSRAM literature for power requirements for your specific lamp type.
2. Operate with compatible power supply and fixture only.
3. OSRAM Display/Optic metal halide discharge lamps are designed for either hot re-start (high ignition voltages) or cold start (low ignition voltages only). Please see OSRAM literature for power requirements for your specific lamp type.
4. To ensure that lamps operate at the correct power during AC operation, connections on the ballast/choke in the power supply should be made to the correct voltage taps; i.e., tap voltage should match input line voltage. To avoid wall blackening, overheating or other premature failure modes, OSRAM strongly advises against operating Display/Optic metal halide lamps at higher than rated wattage ("boosted operation"). Only OSRAM HMP Display/Optic metal halide lamps are offered with a unique power feature allowing for operation at increased wattage of up to 1.5 times their rated wattage, but with reduced service life. For safe lamp operation and optimum performance, use only those ballasts/power supplies that have been approved by OSRAM. See your OSRAM dealer for a list of approved equipment.
5. Dimming of Display/Optic metal halide lamps, like incandescent lamps, causes a drop in luminous output. If a metal halide lamp is dimmed by electrical means, it will not reach its optimum operating state and, unlike incandescent lamps, will not last longer. When dimmed, the lamp wall temperature falls more rapidly on a lamp that has no outer jacket. In metal halide lamps without an outer jacket, reduced power operation causes an increase in the color temperature and a reduction in CRI. Lamps with outer jackets can have either a vacuum or filling gas (often Nitrogen) within. Metal halide lamps with outer jackets tend to maintain their color properties better under dimmed conditions because the outer jacket provides thermal insulation against internal lamp cooling.
6. Display/Optic metal halide lamps need 5 to 20 minutes (depending on lamp type and cooling conditions) before they reach their operating temperatures. To ensure proper ignition on subsequent start-up, lamps should not be switched off during the warm-up period.
7. Average service life of these lamps is determined by the ON/OFF duty cycle. Lamp performance is reduced with increased duty cycle.

OPERATING POSITION:

Display/Optic metal halide lamps may only be used in the operating positions described in the OSRAM SYLVANIA product catalog. Please note that lamp photometric values and arc stability can be effected by the operating position.

OZONE GENERATION:

- During operation, Display/Optic metal halide lamps produce a spectrum that ranges from about 150 nm in the ultraviolet region to the infrared region.
- If the quartz glass bulb is transparent in the ultraviolet region between 180 and 220 nm, this short-wave radiation will convert a small quantity of atmospheric oxygen (O_2) surrounding the lamp into ozone (O_3). Moreover, the oxygen molecules will link together with the nitrogen (N_2) in the air, creating nitrogen oxides (NO_x). (Some believe that the smell attributed to ozone is in actuality from the nitrogen oxides.)
- Ozone gas is toxic when inhaled in high concentrations over long periods of time. Ozone levels can be measured and monitored with commercial measuring equipment. Always keep ozone levels below the applicable TLV (threshold limit value).
- An "ozone smell" (or smell of nitrogen oxide) may be detected shortly after ignition. There are two probable causes for this condition. O_3 and NO_x production is caused by the (short-duration) radiation of the spark gap used for lamp ignition. Or, the cold condition of the quartz glass bulb has slightly shifted its UV-absorption characteristics thus permitting a small amount of radiation in the very short-wave ultraviolet range to be emitted by the bulb. Typically, after the lamp has run up to its operating temperature range, virtually no ozone is produced by the lamp, as a rule, due to the quartz glass absorption and the self-absorption of the plasma.

LAMP COOLING:

1. All Display/Optic metal halide lamp bases must be kept below 230ºC (446ºF) during operation to prevent premature lamp failure. If convection cooling is inadequate, forced air-cooling may be used. Please see OSRAM literature for cooling requirements of specific lamp types.
2. If forced air-cooling is used, care must be taken to direct airflow at the bases only. Striking elsewhere on the lamp with the airflow will result in poor lamp performance or premature failure.
3. Discoloration, surface pitting, and/or corrosion of the lamp connections indicate a thermal overload. To obtain optimum lamp performance, components exhibiting these conditions must be cleaned or replaced.

LAMP REMOVAL:

- Turn off power to the lamp and allow lamp to cool (forced or convection) for a minimum of 30 minutes prior to shutting main fixture power and opening fixture. Do not remove lamp until it has cooled.
- Lamps should be placed in their original OSRAM SYLVANIA packaging for temporary storage until disposal and/or transportation to a disposal location. See “Lamp Transportation” and “Lamp Disposal” sections below for relevant information.

LAMP TRANSPORTATION:

1. All Display/Optic metal halide lamps should be transported ONLY in their original packaging.
2. Transportation in non-original packaging can damage the lamp and void warranty.
3. U.S. Federal regulations require mercury-containing lamps to be shipped ONLY in DOT-compliant packaging. Original OSRAM packaging is DOT-compliant.

MERCURY FILL OF DISPLAY/OPTIC METAL HALIDE LAMPS:

- Mercury is referred to by its chemical symbol, Hg, which is derived from the Greek and Latin "hydrargyrum," a silvery shiny liquid metal at room temperature. In humid air it is covered with a gray oxide skin. Of all metals it has the highest vapor pressure which increases exponentially with rising temperatures. For this reason, mercury is volatile at room temperature. The colorless and odorless vapors produced are poisonous and heavier than air.
- The inhalation (respiration) of mercury or mercury compounds as vapor or dust will lead to the damage of lungs, kidneys, and the nervous system. Apart from inhalation, mercury can be transmitted through the skin (penetration) or through the gastro-intestinal tract (ingestion), which is also harmful.
- The ACGIH TLVs are merely guidelines to assist in the control of health hazards. The ACGIH states that the TLVs refer to airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. Therefore, the TLV for mercury should never be exceeded.
- Analytical detection of mercury vapor is possible by means of gas/vapor detector tubes (rough measurement) or air-monitors that absorb mercury vapor.

OSRAM metal halide lamps have the following mercury contents:

Lamp Family	Maximum Mercury Content (mg)
HMI	1200
HMP	70
HTI	340
HSR/HSD	130
HMD	520
HCD	23

PROPERTIES OF MERCURY:

- Chemical symbol: Hg
- Atomic number: 80
- Molecular Weight: 200.59
- Density: 13.6 g/cm^3 @ 20°C / 68°F
- Melting Point: -39°C / -38.2°F
- Boiling Point: 357°C / 674°F
- Vapor pressure: 160 Pa @ 20ºC / 68ºF
  370 Pa @ 30ºC / 86ºF
  823 Pa @ 40ºC / 104ºF
- Concentration in air: 13.6 mg/m^3 @ 20ºC / 68ºF
  29.6 mg/m^3 @ 30ºC / 86ºF
  62.7 mg/m^3 @ 40ºC / 104ºF
- CAS Registry Number: 7439-97-6
- RCRA waste number: U151
- Other Names: Hydrargyrum, Colloidal mercury, Kwik, Mercure, Mercurio, Metallic mercury, Quecksilber, Quick silver, Liquid Silver

LAMP DISPOSAL:

1. Disposal of spent lamps must be in accordance with applicable federal, state/provincial, and local regulations. State laws may differ in their disposal requirements for lamps.
2. Lamp users in North America may obtain specific state or province information concerning disposal regulations, toll-free, by calling 1-866-666-6850.
3. OSRAM SYLVANIA Products Inc. cannot advise lamp users as to general or specific disposal regulations for federal, state/provincial, and/or local municipalities. It is the responsibility of the waste generator to ensure proper classification and disposal of waste products.