XBO® - Xenon short arc lamps

SEE THE WORLD IN A NEW LIGHT
Oscar-winning light show

OSRAM has set milestones in the photo-optical sector right from the early days of the electric light with the development of innovative lighting solutions. Consistent and focused development work has led to superior special lamps, frequently with a pioneering impact for the lighting sector – such as our XBO® lamps.

XBO® lamps are short arc discharge lamps on the basis of a stationary high-intensity arc discharge in pure Xenon gas and were developed by OSRAM in the 1950s. From the beginning the application as a light source for commercial projection was dominant.

1949 Start of XBO® development
1952 XBO® 1000 W lamp for 35 mm projection
1954 First commercial film projection in the world: with first air cooled XBO® 1000 W lamp
1970 XBO® lamps for horizontal operation
1980 Introduction of ozone-free quartz glass OFR
1983 OSCAR

XBO® lamps gained particular popularity from about 1970 onwards when the efforts succeeded in designing lamps which could be operated also in horizontal position. As a result of this development it was possible to increase the screen brightness by about 30 %.

1949 Start of XBO® development
1952 XBO® 1000 W lamp for 35 mm projection
1954 First commercial film projection in the world: with first air cooled XBO® 1000 W lamp
1970 XBO® lamps for horizontal operation
1980 Introduction of ozone-free quartz glass OFR
1983 OSCAR

Over the past 20 years the reliability and the service life behaviour of XBO® lamps have been steadily improved by consistent development of:
- Pre-materials (e.g. electrodes)
- Lamp components
- Production processes

Today OSRAM offers a lamp spectrum from 50 to 12000 W for all applications in the market. The main characteristics and benefits of XBO® lamps are:
- High luminance (point source)
- Daylight color temperature of approx. 6000 K
- Continuous spectrum in the visible range
- High color rendering index ($R_a > 95$)
- High arc stability
- DC operation
- Hot restart

Two OSCARS awarded by the Academy of Motion Pictures Arts and Sciences, for the development and consistent improvement of the OSRAM HMI® and XBO® lamps, which are so important and successful in the world of cinema, document in exemplary fashion their recognition worldwide.
Practical information

In this brochure you will find in compact and clear layout the most important technical data and other information on almost all XBO® lamps from OSRAM. The application in professional film projection is still the most important commercial area of use. We have not, however, included lamps of less than 250 W.

With this in mind, our small manual is meant in particular for cinema operators and film projectionists. But also for all other users and areas of application, for example
- Architectural illumination and effects lighting
- Microscopy and medical optics
- Light measurement and solar simulation

It represents a helpful reference work on the subject of XBO® lamps.

The brochure focuses not only on the physical and lighting-technology principles of XBO® lamps but also on the practical requirements which have to be fulfilled to ensure safe and advantageous operation of the lamps.

In it you will find:
- the most important advantages
- key information about installation, electrical connection, cleaning, transport and disposal of the lamps
- a description of and possible solutions for the “most common” problems that can arise during operation
- a useful, easy-to-follow maintenance sheet

OSRAM not only sells innovative lamps, but also offers its customers and users wide-ranging technical and other service and support:
- fully, competent advice and help on the telephone
- prompt delivery of required products and information
- speedy concrete problem solving on site
- Because: “Your show must go on!”
<table>
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<tr>
<th>Lamp reference</th>
<th>NAED</th>
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<th>V</th>
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1) Distance from end of base to tip of electrode (cold)
2) With vertical burning position: anode (+) on top
3) Measured in vertical burning position at rated wattage
4) Design wattage

X) Also available in ozone-free version with the same data:
XBO 450 W OFR (NAED 69243)

O) Also available in Suprasil quartz version:
XBO 250 W/4, XBO 450 W/4 (NAED 69244)

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1) Distance from end of base to tip of electrode (cold)
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1) Distance from end of base to tip of electrode (cold)
2) With vertical burning position: anode (+) on top
3) Measured in vertical burning position at rated wattage
4) Design wattage

- **C** = Cable
- **CA** = Cable on anode base
- **OFR** = Ozone free
- **H** = Suitable for horizontal burning position
- **S** = Short
- **W** = Watt
- **requ.** = Required

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**Legend:**
- **XBO** = Lamp reference
- **a** = Design wattage
- **Im** = Rated current
- **t[b]** = Life in hours
- **t[N]** = Life in hours
- **d** = Diameter
- **I max.** = Maximum current
- **a max.** = Maximum rating
- **C** = Cable
- **CA** = Cable on anode base
- **H** = Suitable for horizontal burning position
- **S** = Short
- **W** = Watt
- **OFR** = Ozone free
**Lamp reference**

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<tbody>
<tr>
<td>XBO 3000 W/HS OFR</td>
<td>69250</td>
<td>3000</td>
<td>29</td>
<td>100</td>
<td>130000</td>
<td>12000</td>
<td>90000</td>
<td>60·110</td>
<td>1500</td>
<td>1500</td>
<td>s30 p30</td>
<td>requ.</td>
<td>requ.</td>
<td>1.7x5.0</td>
<td>66</td>
<td>342</td>
<td>302</td>
</tr>
</tbody>
</table>

**Notes:**
1) Distance from end of base to tip of electrode (cold)
2) With vertical burning position: anode (+) on top
3) Same Dimensions as XBO 1600 W/HS OFR
4) Measured in vertical burning position at rated wattage
5) Design wattage

**Abbreviations:**
- H = Suitable for horizontal burning position
- SHSC = Super short
- OFR = Ozone free
- TP = Threaded pin
- TT = Two threaded pins
- S = Short
- W = Watt
- requ. = Required

**Additional Notes:**
- X) Also available as XBO 2001 W/HTP OFR (NAED 69310)
  - with 25 V at 80 A
CA = Cable on anode base
GS = Gap short
H = Suitable for horizontal burning position
OFR = Ozone free
S = Short
SA = Short arc
TP = Threaded pin
W = Watt
requ. = Required
BM = Base modified
C = Cable

1) Distance from end of base to tip of electrode (cold)
2) With vertical burning position: anode (+) on top
3) Base with axial cable (560 mm)
4) Also available as XBO 4200 W/GS with 60 mm bulb diameter and 500 h life
5) Measured in vertical burning position at rated wattage
6) Design wattage
**Safety:**
Because of their high luminance, UV radiation and internal pressure in both the hot and cold state, XBO® lamps may only be operated in enclosed lamp casings specially constructed for the purpose. Always use the safety boxes supplied when handling XBO® lamps. When handling the lamps without their safety boxes, always wear safety goggles, a face mask and gauntlets with wrist protectors. XBO® lamps with the OFR suffix do not generate any ozone during operation. Lamps with standard or Suprasil quartz emit intense UV radiation and produce ozone in the surrounding air.

**Literature:**
For further information on XBO® lamps and notes for manufacturers of control gear, please refer to the following publications, available on request from OSRAM:
- Guidelines for control gear and igniters XENON Short Arc Lamps Photo Optics
- Technology and applications, XBO® theatre lamps
- Manufacturers of control gear and igniters for special discharge lamps
- Magnetic stabilisation for XENON Short Arc Lamps
- Problems and Solutions
Handling of OSRAM XBO® lamps

Mechanical Installation

XBO lamps are extremely reliable and robust. But they are still made of quartz and need to be handled accordingly – in other words they must be protected against shock, impact and excessive force.

Certain precautions must therefore be observed when handling them:

• All XBO lamps are supplied in a safety cover. This protects users from possible spontaneous or induced bursting of the lamp. You should handle lamps only with safety cover. Store this safety cover for use during the removal of the lamp at the end of its service life.

• You should wear leather gloves covering the arteries and veins of your wrists and protective goggles or complete face protection covering the arteries and veins of your neck, such as a transparent plastic mask. See safety instruction send with every lamp.

• For some types of lamp the safety cover acts as a tool for fitting the cathode end of the lamp into its holder.

• Under no circumstances must force be exerted on the lamp during installation: For example, screwing in the cathode base by holding and turning the lamp at its anode base is grossly negligent.

• The lamp may only be clamped in position at one end, in order to allow for expansion and distortion of the housing. Small (short) lamps can be left free and unsupported at the other end. Larger (longer) lamps must have a soft, flexible support. It should support the lamp but allow unrestricted expansion, including expansion perpendicular to the lamp axis.

• Lamps may only be stored if suspended freely from their bases inside their safety covers. Leaving them to roll around unprotected on a desk or shelf can result in microcracks in the surface of the quartz glass, and burst lamps later on.

• If the lamp is inadvertently operated inside its safety cover, the sleeve will melt within a few seconds and the lamp will be unusable.

• When removing lamps, the reverse procedure must be followed: first put the safety cover or some protection around the lamp, then remove the lamp.

Electrical Connection

Similar precautions must be observed for connecting XBO lamps electrically as for handling them mechanically:

• Lamps without a cable connection often have their “loose” end connected to the supply unit with a gripping device. In these cases the gripping device must be fastened first, and only then can the lamp be fixed in its permanent connection, even if this is somewhat complicated. Otherwise there is a risk of unintentionally exerting strong bending forces on the lamp and it may break.

• The lamp must be connected electrically by means of the base components provided for this purpose, for example the base pins or cables. Under no circumstances must the cable be cut and the power supply connection passed through the base sleeve. This can result in a circuit which is not permissible and may result in destruction of the lamp.

• Connecting surfaces must be clean and offer the maximum contact area. In cases of doubt, it is better to recondition or preferably replace the contacts rather than risk lamp failure due to corroded and overheated contacts.

• In most cases good electrical contact is synonymous with good thermal contact to dissipate the heat produced by the lamp. Nickel or chromeplated brass or bronze are the main materials used; other metals such as aluminium are unsuitable.

• Care must be taken to ensure that the lamp is connected with correct polarity; the positive pole of the rectifier must be connected to the base marked “+”, the negative pole to the base marked “-”. Incorrect polarity results in total lamp failure within a few seconds.
Handling of OSRAM XBO® lamps

Cleaning the Lamp

XBO lamps may only be held by the base. If the quartz bulb or the shafts should ever be inadvertently touched with bare fingers (which should never happen, because unprotected lamps should only be handled with leather gloves), the fingerprints must be removed immediately. A lint-free cloth moistened with spirit is best for this, after which the lamp should be rubbed dry, taking care not to scratch the quartz glass surface. Damage to the quartz may cause the lamp to break during later operation.

If fingerprints are not removed they burn into the quartz glass surface where they act as a seed for ever-expanding recrystallization of the quartz. This causes the quartz to lose its strength and increases the risk of bursting.

Transport

XBO lamps are supplied packed in printed cardboard boxes for shelf storage and in an outer transport packaging. Inside the transport packaging the shelf packaging is freely suspended and mechanically cushioned; in this condition lamps can be sent by mail without any problem.

Most lamps will break if transported in the shelf packaging only.

XBO lamps withstand the stresses of transport best if they are sent individually in a vertical position. Their resistance to sudden shock is about ten times greater along the lamp axis than perpendicularly to it.

If XBO lamp housings have to be transported, the lamps – especially highwattage lamps – should be removed and transported separately in their original packaging.

Disposal

Burnt-out XBO® lamps can either be returned to the manufacturer for appropriate disposal by methods consistent with modern recycling or they can be destroyed by the user.

Prior to destruction the lamps must be wrapped in a strong, coarse cloth, observing all the precautions given in the section “Mechanical Installation” and broken with a hammer.

The Xenon gas that escapes is not poisonous and returns to the atmosphere. The remains of the lamp can then be disposed of as normal rubbish.
# Problems and Solutions

There are a number of reasons why a lamp may not give satisfactory performance. The following may help you to locate and correct the more common problems that can cause failure, and ensure longer life for the replacement lamp.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Fault</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector base discoloured</td>
<td>Connector base overheated, above 230°C, due to:</td>
<td>Check electrical connections:</td>
</tr>
<tr>
<td>Blackening or clouding of quartz bulb</td>
<td>• Faulty electrical connection</td>
<td>• Tighten or renew</td>
</tr>
<tr>
<td>Severe cathode electrode damage, grey/brown deposits on quartz envelope</td>
<td>• Improper lamp cooling</td>
<td>• Check cooling system</td>
</tr>
<tr>
<td>Abnormal anode electrode deterioration, blackening of lamp</td>
<td>• Optical system out of alignment</td>
<td>• Check/adjust optical system</td>
</tr>
<tr>
<td>Deposits on anode front</td>
<td>• Improper operating current</td>
<td>• Check operating current</td>
</tr>
<tr>
<td>Asymmetrical blackening of lamp</td>
<td>Arc instability due to:</td>
<td>Ensure proper operational current, as noted for overheated base. Check electrical connections:</td>
</tr>
<tr>
<td>(horizontal burning position)</td>
<td>• Lamp operated outside current control range</td>
<td>• Tighten or renew</td>
</tr>
<tr>
<td></td>
<td>• Lamp operated with poor quality operational current</td>
<td>• Check cooling system</td>
</tr>
<tr>
<td></td>
<td>• Improper magnetic stabilization</td>
<td>• Check/adjust optical system</td>
</tr>
<tr>
<td></td>
<td>• Improper forced cooling</td>
<td>• Check operating current</td>
</tr>
<tr>
<td></td>
<td>Rectifier/power supply defect</td>
<td>Ensure forced cooling as required by OSRAM</td>
</tr>
<tr>
<td></td>
<td>• Run up current limit exceeded</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• High current ripple</td>
<td></td>
</tr>
</tbody>
</table>

Reversed polarity due to:
- Electrical feed incorrectly supplied to lamp
- Faulty wiring

Arc instability due to:
- Lamp operated outside current control range
- Lamp operated with poor quality operational current
- Improper magnetic stabilization
- Improper forced cooling

Rectifier/power supply defect
- Run up current limit exceeded
- High current ripple

Check
- Rectifier/power supply
- Run up current
- Current ripple
OSRAM XBO® Xenon Short Arc Lamps

Notes:

________________________________________

________________________________________

 Maintenance chart

<table>
<thead>
<tr>
<th>Projector:</th>
<th>Type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>Lamp Type</td>
<td></td>
</tr>
<tr>
<td>Lamp No</td>
<td></td>
</tr>
<tr>
<td>Hours on counter at mounting lamp</td>
<td></td>
</tr>
<tr>
<td>Hours on counter at removal lamp</td>
<td></td>
</tr>
<tr>
<td>Hours functioned</td>
<td></td>
</tr>
<tr>
<td>Cooling checked yes</td>
<td></td>
</tr>
<tr>
<td>Cooling checked no</td>
<td></td>
</tr>
<tr>
<td>Current checked yes</td>
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</tr>
<tr>
<td>Current checked no</td>
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</tr>
<tr>
<td>Observations</td>
<td></td>
</tr>
<tr>
<td>Signature</td>
<td></td>
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</table>