

# Operating instructions

## Power supply

Suitable control gear is required to operate the lamps. This may be chokes or electronic control gear. For chokes, the tap provided for the available supply voltage (usually 230 V AC at 50 Hz) must be used. If a different supply voltage is used, control gear with appropriate taps designed for these voltages must be used.

## Permitted line voltage deviation

The permitted line voltage deviation for HQL® is  $\pm 10\%$  and for HCl®, HQI® and NAV® is  $\pm 3\%$ . Sudden fluctuations in the line voltage of more than  $\pm 10\%$  may cause the lamps to go out. If the deviation from rated supply voltage (230 V or 400 V) is permanent without an adjusted choke tap, high intensity discharge lamps may exhibit changes in chromaticity and luminous flux. Lamp life may also be reduced.

## Safety

OSRAM high intensity discharge lamps meet the safety requirements defined in IEC 62035 and IEC 61167.

Because of their high operating pressure the following lamps may only be used in fully enclosed fixtures designed to take them. In the rare case that a discharge vessel shatters, the fixture must be able to retain all the hot pieces of ceramic or glass throughout its life.

This relates to the following lamps:

- All HCl®-T and HQI®-T lamps
- All HCl®-TM and HQI®-TM lamps
- All HCl®-TC lamps
- All HCl®-TF lamps
- All HCl®-TS and HQI®-TS lamps
- All HCl®-TT and HCl®-ET lamps
- All HQI®-E lamps
- HQI®-R 150 W/NDL lamps

Operating lamps with a damaged outer bulb is dangerous and therefore not permitted. At the end of their lives, sodium high-pressure lamps and metal halide lamps exhibit a "rectification" effect. This is not a manufacturer-specific effect. Because of the excessive DC components, the lamp operating equipment (control gear, transformers and/or starters) may be overloaded. To meet the requirements of IEC 62035 therefore, suitable protective measures must be taken to ensure that safety is maintained under these conditions. This applies also to control gear with the option of power reduction. NAV® PLUG-IN lamps have been developed specially as substitutes for mercury vapor lamps in existing fixtures and are therefore not affected. The chokes and pf correction capacitors generally needed for operating discharge lamps may, under certain conditions, create oscillating circuits. These circuits may then produce excessive currents and voltages, which in turn can destroy the lamps, control gear and capacitors. Such resonance phenomena must be avoided by appropriate circuits and fuses.



## Lamp operation

Operating high intensity discharge lamps for short periods in combination with frequent on/off switching will shorten their life. The lamps should be operated for at least 3 hours and should remain off for at least 30 minutes. This applies in particular to HQI®  $\geq 1000$  W. NAV® lamps are not suitable for short on/off cycles but should burn for at least 5 minutes. In low-temperature applications down to  $-50^\circ\text{C}$  only HCl®, HQI® and NAV® lamps are suitable for operation with an external igniter. Such applications call for special (heatable) igniters such as MZN 400 SU-LT from BAG Turgi (for lamps from 100 to 400 W) and similar igniters from other manufacturers.

The following lamps are suitable for open fixtures:

- All HCl®-E/P, HCl®-PAR and HCl®-TX/P lamps
- All HQI®-E/P lamps

## Fixture design

Fixtures must comply with the EN 60598 standard design (thermal characteristics and fuse protection). HQI® 1000 W to 2000 W lamps should be held without pressure or by means of a lamp support close to the crown end. The same applies to NAV®-T 1000 W lamps in the horizontal burning position. In particular, no radiation must be reflected onto the sensitive parts of the lamp. This may cause thermal overloads, which in turn will generally lead to premature failure. For a detailed description and instructions on how to avoid problems see the brochure entitled "Metal halide lamps. Notes on handling and applications" on the internet at [www.osram.com/hid-general-downloads](http://www.osram.com/hid-general-downloads).

# Operating instructions

## Control gear

HWL®:

No control gear required; connect directly to power supply.

HCI®, HQI®, HQL®, NAV®:

- Control gear:
  - < 220 V high-reactance transformer
  - ≥ 220 V choke

For HCI®, HQI® and NAV® lamps, control gear with suitable overload protection should be used (see Safety).

• Igniters: HCI®, HQI® and NAV® lamps also need an appropriate igniter.

Exceptions:

- HQI®-T 2000/N
- HQI®-T 2000/D/I
- NAV®-E 50/I 4Y®
- NAV®-E 70/I 4Y®
- NAV®-E 50/I
- NAV®-E 70/I
- NAV®-E 110
- NAV®-E 210
- NAV®-E 350

NAV® SUPER lamps require igniters with a higher ignition energy.

With suitable igniters or operating equipment HCI®, HQI® and NAV® lamps can be instantly restarted while hot. For more information see Restarting.

SOX, SOX-E:

Operation with high-reactance transformers (except SOX 18 tapped choke and 5 µF ignition capacitor) or hybrid control gear.

For the distances between the lamp and the control gear, check the information provided by the equipment manufacturer.

## Start-up current

HCI®, HQI®, NAV®, HQL®:

Depending on the control gear used, the start-up current may be up to twice as high as the operating current.

## Circuit protection

Fuses for HCI®, HQI® and NAV® lamps must be slow-acting. If fuse-wire is used it should be rated for twice the rated lamp current. If MCBs are provided they should comply with characteristic "C".

## Holders

The holders used must be capable of withstanding the high voltages that occur during ignition and hot restrikes. Suitable high-voltage holders can be ordered from lampholder manufacturers. A retainer is recommended for outdoor applications to prevent them coming loose (IEC 60238).

## Power factors

(without correction)

- HWL®:  $\cos \varphi \sim 1$
- HCI®, HQI® and HQL®:  $\cos \varphi$  0.5 to 0.7
- NAV®: With chokes  $\cos \varphi$  0.5
- SOX, SOX-E:  $\cos \varphi \sim 0.3$  (SOX 18:  $\cos \varphi \sim 0.9$ )

For the PFC capacitors required check the manufacturer's specifications. For examples see pages 6.43 to 6.49.

## Power reduction

HQI® lamps must not be operated at reduced wattage as this may result in color shifts, poorer maintenance and shorter lamp life. In principle, dimming of HCI® POWERBALL® lamps is technically feasible. The higher thermal load capacity of the round ceramic burner offers better dimming behavior in terms of luminous efficacy and color rendering compared to metal halide lamps with quartz burners or cylindrical ceramic burners.

As before, however, dimming does lead to a change in the chromaticity coordinates. Lamps operated at dimmed settings suffer a greater loss of luminous flux and a greater color shift over their lifetime. These effects are unwanted particularly in indoor lighting. They are more pronounced in CGG mode than in ECG mode.



## Operating instructions

OSRAM therefore advises against dimming in CCG mode and in indoor lighting for lamps currently available.

The method of dimming has a strong influence on the results. It is advisable to reduce the lamp power with a controllable square-wave ECG; dimming should not be achieved by reducing the voltage or by leading-edge phase dimming. The product characteristics cannot be guaranteed for lamps that are operated at dimmed settings.

The combination of POWERBALL® HCl® and POWERTRONIC® PTo offers energy-saving operation wherever optimum color rendering is not essential for outdoor lighting.

PTo with square-wave operation and optimized ignition operates POWERBALL® HCl® lamps at optimum performance down to 60% of rated lamp output. There are no significant adverse effects even if power is reduced to 85% of rated output.

Operation between 85% and 60% of rated lamp output also has no impact on the failure rate. The lamps increasingly exhibit a slight green tinge and may differ from one another in terms of their color (color spread). Luminous flux decreases over the life of the lamp at a faster rate in dimming mode than at 100% output on PTo. This effect can be reduced by mixed operation involving dimming mode and 100% mode.

NAV® and HQL® lamps can be operated at up to 50% lower wattage by changing the impedance, provided ignition takes place at rated wattage.

### Switch-on

HWL®: Instant full luminous flux. Starting current approx. 30% higher

HQL®: Full luminous flux after approx. 5 minutes. Starting current approx. 40% higher

HCl®: Full luminous flux after approx. 1 to 3 minutes. Starting current approx. 40% to 90% higher – depending on lamp type and control gear

HQI®: Full luminous flux after approx. 2 to 4 minutes. Starting current approx. 40% to 90% higher – depending on lamp type and control gear

NAV®: Full luminous flux after approx. 6 to 10 minutes depending on lamp type and control gear. Starting current approx. 25% higher

SOX, SOX-E: Full luminous flux after approx. 12 to 15 minutes. Or longer at low ambient temperatures. No higher starting current.

### Restarting

HCl®, HQI®, NAV®, HQL®, HWL®:

These lamps need a little time (0.25 to 15 minutes) to cool down before they can be restarted because the ignition voltage to begin with would be higher than the supply voltage or, in the case of HCl®, HQI® and NAV®, above the ignition voltage of the igniter. Instant restarting is possible with suitable igniters for the following lamps:

HQI®-TS EXCELLENCE

HQI®-TS (exception: HQI®-TS 2000W/N/L)

HCl®/HQI®-TM...HR (HR – Hot Restrike)

NAV®-TS

The necessary restrike voltage is 25 to 60 kV.

SOX, SOX-E:

SOX 18 lamps can be instantly restarted. All other SOX lamps need a cooling time of a few minutes before they can be restarted.

### Radio interference

After ignition, radio interference does not normally occur with high pressure lamps. Should radio interference occur with HQL® lamps it can be avoided by connecting a low induction capacitor of 0.1 µF parallel to the lamp. Capacitors must not be connected parallel to any other high-pressure lamp. The requirements of DIN EN 50160 must be met.



## Operating instructions

### Photometric and electrical data

All lamp-specific electrical and photometric data is measured after 100 hours of operation under laboratory conditions on reference equipment. For HCl<sup>®</sup> lamps the specified values relate to the horizontal burning position for TS-, TT-, and ET- types and to the base-up burning position for other types, unless otherwise indicated. For HQI<sup>®</sup> lamps the specified values apply to the horizontal burning position for -T and -TS types and for the base-up burning position for -E and -TM types, unless otherwise indicated. NAV<sup>®</sup> lamps are all measured in the horizontal burning position, and HQ and HW lamps in the base-up position. In other burning positions there may be considerable differences in the measured values, particularly the luminous flux, color temperature and life. With the exception of SOX, the luminous flux is virtually unaffected by the ambient temperature outside the fixture. At low ambient temperatures down to around -50 °C special igniters are needed.

All POWERBALL<sup>®</sup> HCl<sup>®</sup>-TS ..., POWERSTAR<sup>®</sup> HQI<sup>®</sup>-TS ... and VIALOX<sup>®</sup> NAV<sup>®</sup>-TS ... lamps achieve their rated data at relatively high ambient temperatures, such as those in typical fixtures or fixture simulators.

Detailed information on thermal protection tubes (fixture simulators) for determining lamp data for HQI<sup>®</sup>-TS and HCl<sup>®</sup>-TS can be found in IEC 61167, Annex B.6. NAV<sup>®</sup>-TS ... lamps should be treated similarly.

### Color shift

HCl<sup>®</sup> and HQI<sup>®</sup> lamps may show color shifts from lamp to lamp. These shifts may be due to external influences such as the line voltage, control gear, burning position or fixture design.

### End of life

High intensity discharge lamps (HCl<sup>®</sup>, HQI<sup>®</sup>, NAV<sup>®</sup> and HQL<sup>®</sup>) can be considered to have reached the end of their life if:

- there is a marked change in their color or
- there is a significant loss of brightness or
- the lamp no longer ignites or
- the lamp periodically goes out and comes on again.

To protect the control gear and to avoid unnecessary radio interference, HCl<sup>®</sup>, HQI<sup>®</sup>, NAV<sup>®</sup> and HQL<sup>®</sup> lamps must be replaced as soon as they reach the end of their life.

### Guarantee

High intensity discharge lamps are only guaranteed if the prescribed operating conditions are observed; in other words, in particular if the maximum permissible lamp temperatures are not exceeded and the lamps are operated only on appropriate control gear. In addition, the lifetimes specified by OSRAM apply only to operation in fixtures that do not reflect radiation onto the lamp (see Fixture design, page 6.50).



## OSRAM System+ Guarantee for HCl<sup>®</sup>/HQI<sup>®</sup>/NAV<sup>®</sup> lamps and POWERTRONIC<sup>®</sup> ECGs



POWERTRONIC<sup>®</sup> control gear from OSRAM enables high intensity discharge lamps to be operated with perfect results and a high degree of intelligence.

For system operation you get an extended guarantee on the POWERTRONIC<sup>®</sup> ECG and on the relevant HCl<sup>®</sup>/HQI<sup>®</sup>/NAV<sup>®</sup> lamp.

For detailed usage and guarantee conditions and a registration form go to [www.osram.com/system-guarantee](http://www.osram.com/system-guarantee).