Safe, durable and economical

Signal lamps that signal quality

SEE THE WORLD IN A NEW LIGHT OSRAM

Display and signal lamps and lamps for traffic light installations. Lamps that set standards.

Road and rail traffic light installations are crucial to safety, which is why the lamps used in these installations have to meet such high demands. Reliability is obviously the number one priority. Economy also has an important role to play. These two factors are influenced to a large extent by the quality of the lamps used. OSRAM offers a range of lamps that sets standards in terms of safety and also in terms of economy.

You can rely on renowned OSRAM quality to provide the following, to name a few:
– High luminous flux for good signalling effect even in difficult weather conditions
– Precise lamp alignment and shape for correct luminous intensity distribution
– Standardised high-quality bases that enable lamps to be replaced without the need for realignment even after many hours of operation
– Low maintenance costs thanks to long lamp life
– Low power consumption thanks to high luminous efficacy.

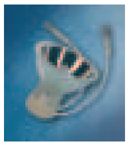
The existing range will be maintained and further developed to meet changing customer requirements. LONGLIFE versions are now available in almost all signal lamp groups.

16,000 h

Low-voltage halogen lamps .... P. 12

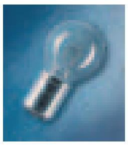
Because of their superior technology and excellent economy, low-voltage halogen lamps are among the most important lamps for traffic signalling equipment. These lamps have been developed over the past few years to such an extent that their life has doubled. Now they only need replacing on a two-year cycle (life of around 16,000 hours).

This has been made possible by the various known benefits of low-voltage design but in particular by halogen technology. The halogen cycle means that the life of the lamp can be significantly increased while retaining almost constant luminous flux over the entire life of the lamp.



Lamps for fibre-optic signalling installations ..... P. 13

OSRAM has developed SIRIUS® dichroic reflector lamps specifically for use in fibreoptic matrix displays for variable traffic control. The major benefits of these lamps include optimum adjustment, high luminous intensity, long lamp life, high-quality reflector and corrosion and heat-resistant connecting cables.



Low-voltage overpressure lamps .... P. 14/18

10V technology has become the established technology in modern traffic light installations, and for good reason. Low-voltage overpressure signal lamps have a much higher luminous efficacy than mains voltage signal lamps. This means that low-voltage overpressure lamps with significantly lower wattages can often be used, with a resultant reduction in the power consumption of the signalling equipment. This lamp technology is also used in rail traffic light installations (see p. 18). Existing 230V signal installations can be converted to 10V systems by replacing the lamp and the reflector and installing a transformer. OSRAM has also developed LONGLIFE versions of low-voltage overpressure lamps. By using the new LONGLIFE low-voltage overpressure lamps it is possible to extend the maintenance cycle to a maximum of one year.

Signal lamps for mains voltage .... P. 16

Most traffic light installations throughout Europe are still operated on mains voltage. OSRAM has therefore developed the tried and trusted standard and krypton signal lamps into LONGLIFE signal lamps. These can be used as direct replacements for existing standard and krypton lamps without having to modify the installations in any way. Maintenance cycles are considerably extended as a result. Depending on the installation, maintenance cycles of up to eight months are possible, which help enormously in reducing maintenance costs.

Lamp life

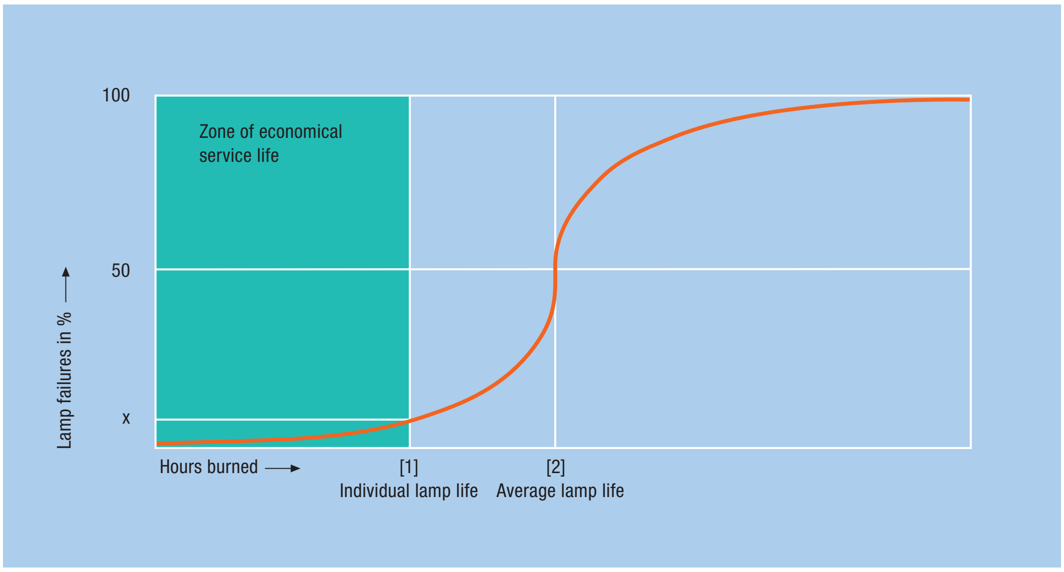
OSRAM signal lamps for road and rail traffic light installations are precision lamps which are manufactured in large numbers. A comprehensive range of quality assurance measures during manufacture ensures that these lamps are of consistently high quality.

Users are interested only in the period of time in which the lamps can be used economically. In other words they are looking for the maximum possible time in which the inevitable early failures remain below a certain threshold. This period of time differs from one type of lamp to another and is defined as the individual lamp life:

Individual lamp life: The time during which a lamp remains functional when tested under standard operating conditions (see DIN 49842 Part 3).

Individual lamp life up to a failure rate of x%: The period of time during which x% of the lamps reach the end of their individual lamp life (see [1] in the graph).

Example: In the case of LONGLIFE mains voltage signal lamps, the failure rate in the first 5,500 hours of operation is no more than 2%.



Lamp life

Average lamp life: This is the arithmetic average of all individual lamp lives of a number of lamps tested under standard operating conditions (see [2] in the graph).

Example: In the case of LONGLIFE mains voltage signal lamps, the failure rate in the first 14,000 hours of operation is no more than 50%.

In most cases it is uneconomical to exploit the full average lamp life since individual replacement costs are often out of proportion to lamp costs.

OSRAM builds on quality

The technical conditions of supply specified for the individual lamp categories contain additional technical information on limit values, test conditions and references to the "Acceptable Quality Levels (AQL values)" based on the rules of statistical quality control and in accordance with the guidelines of the Deutsche Gesellschaft für Qualität e. V. (German Quality Society) (DGQ). The technical conditions of supply are available from OSRAM on request. The entire manufacturing process at OSRAM is accompanied by a comprehensive system of tests and inspections. Quality assurance begins at the development stage and with the purchase of raw materials and continues through all stages of production up to final inspection and dispatch to the customer. OSRAM develops and manufactures in compliance with the requirements of the ISO 9001 standard.

For signal lamps for road traffic light installations, our warranty conditions are based on the DIN 49842 standard, Parts 1 to 3.

All the values listed are rated values. The lamps must be installed only in the burning positions specified. Any other burning positions will lead to premature failure of the lamps.

EN ISO 9001:2000
DNV
Certified Company

Operational characteristics at undervoltage

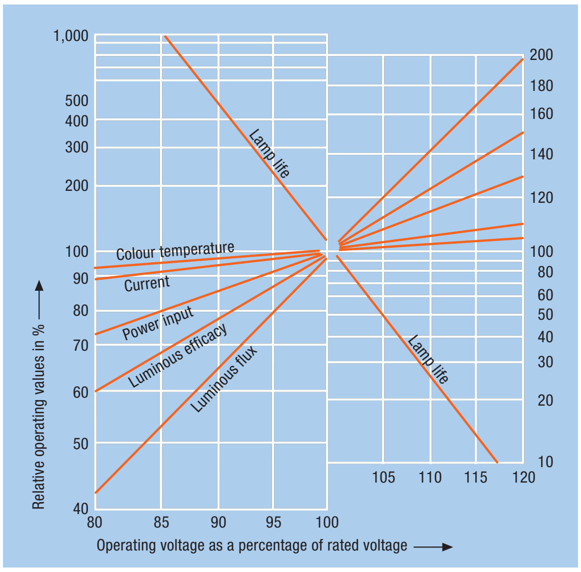


Fig. 1: Operational characteristics of gas-filled lamps

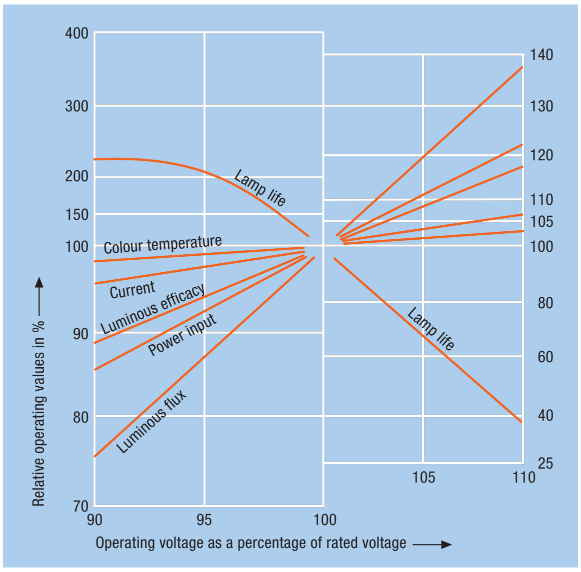


Fig. 2: Operational characteristics of halogen lamps (referred to $L_{max} \leq$ 1,000 h)

The graphs show average values for a large number of lamp types and cannot therefore be linked to any particular type or any individual lamp.

When an incandescent lamp is operated at voltages within a given range the characteristics of the lamp will change exponentially compared with its characteristics at rated voltage. The relative changes for gas filled incandescent lamps as the operating voltage deviate from the rated voltage are shown for the following characteristics (Fig. 1):

- Luminous flux Ø
- Luminous efficacy n
- Electrical power P
- Lamp current I
- Colour temperature T_f, T_n
- Lamp life L

Note that the lamps become less and less economical as the voltage drops. The relationship between power consumed and luminous flux produced gets progressively worse.

The theoretical average lamp life is of no significance in actual practice. Because of the changes that take place within the lamp due to the physical processes involved, especially in the filament wire, any theoretical increase in lamp life cannot be achieved in practice. In particular, the proportion of early failures is not reduced by any significant amount.

The tungsten halogen cycle is such that it operates most effectively at rated voltage. For this reason, the expected increase in lamp life in the range between 90 and 95% of rated voltage is not as high as with standard incandescent lamps (low-voltage overpressure) (Fig. 2).

Changes to the lamp data due to undervoltage

	Rated data	**Undervoltage**			
Voltage (V)	**240**	**230**	(-4.2%)	**220**	(-8.3%)
Current input (mA)	270	265	(-1.9%)	255	(-5.6%)
Wattage (W)	65	61	(-6.2%)	56	(-13.8%)
Luminous flux (lm)	430	357	(-17.0%)	292	(-32.0%)
Theor. average lamp life (h)	8,000	15,760	(+97.0%)	30,400	(+280.0%)

Economy: Reduction in operating costs in actual applications

With its extensive product range, OSRAM offers many different ways of reducing the operating costs of signalling installations. In particular, considerable reductions in operating costs can be achieved by using low-voltage halogen lamps.

The elements that make up operating costs for signalling installations are shown in Table 1.

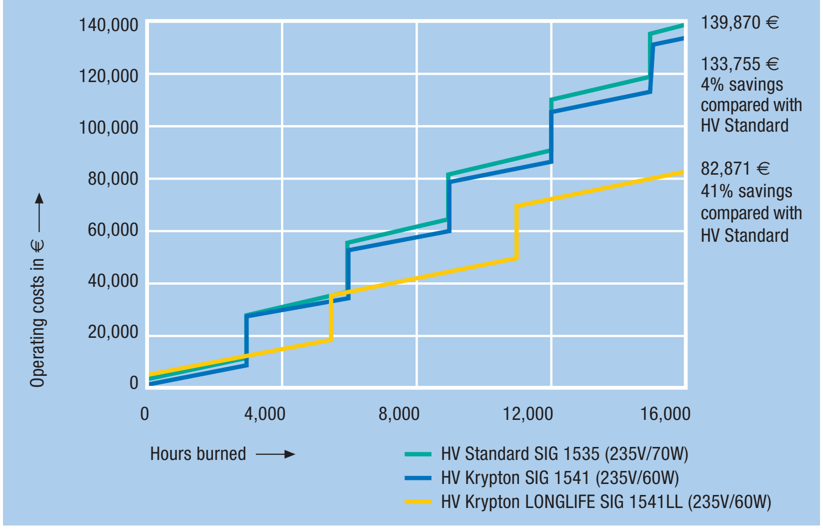
Existing mains voltage signal installations can be converted to low-voltage systems by replacing the lamps and reflectors and installing a transformer. Using low-voltage halogen lamps instead of standard mains voltage signal lamps can reduce operating costs by up to 80% (= 114,000 €).

Operating costs[1)] = Energy costs + lamp costs + replacement costs		
Energy costs = (BD * Lz/3 * P * Sp)/1,000	BD	= Hours burned (16,000 hours = life of the halogen LV lamp)
	Lz	= Number of lamps installed (1,008)
	Lz/3	= Only 1/3 of the lamps burn in the signal
	P	= Power input of the lamp in W
	Sp	= Electricity price (€ 0.125/kWh)
Lamp costs = Lp * Lz * Wz	Lp	= Lamp price
	Wz	= Number of lamp replacements within 16,000 hours
Replacement costs = Az * Wz * Wk	Az	= Number of installations = (for 12 signal lamps per installation = 84 installations)
	Wk	= Replacement costs (200 € per installation and replacement)

Table 1

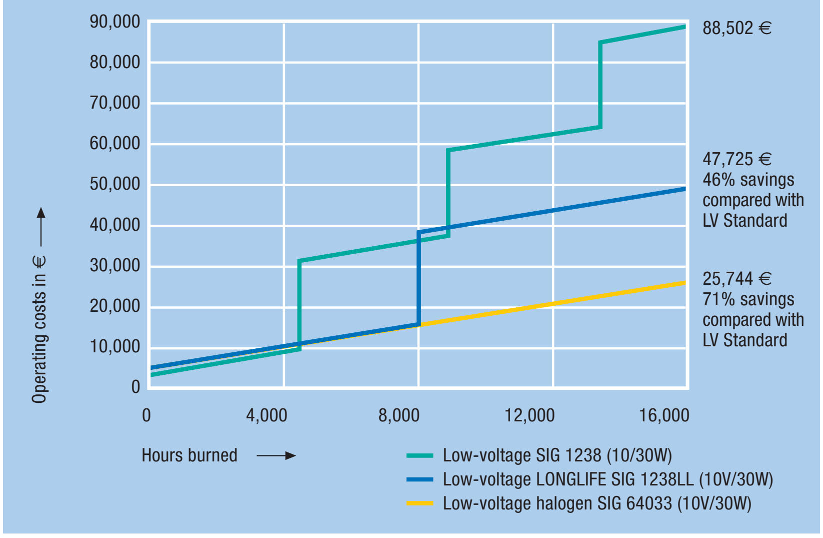
Changing from standard mains voltage lamps to mains voltage krypton LONGLIFE lamps can lead to savings of up to 57,000 €!

I. Sample calculation for mains voltage signal lamps:



Changing from standard low-voltage lamps to innovative halogen signal lamps can lead to savings of up to 62,700 €!

II. Sample calculation for low-voltage signal lamps:



1) Other costs such as the purchase cost of the installation, cleaning costs, etc. have not been included! Values in brackets form the basis for the sample calculation

Advantages of different signal lamp technologies over standard mains voltage lamps

Mains voltage technology	Advantages
Mains voltage krypton lamps:	
	– Unchanged LCL[1)] – No modifications needed to the installation – Krypton filler · High luminous efficacy · Impressive economy through energy savings · Long lamp life – Narrow filament cradle diameter · Up to 24% more light

Low-voltage technology	Advantages
10V overpressure lamp	
Mains voltage transmitter needs upgrading. Replacement of the lamp + reflector + transformer.	– Compact filament · High optical efficiency – Inert filler gas at overpressure · High luminous flux · High luminous efficacy · Impressive economy through energy savings · Impressive economy through long lamp life – Thick filament wire · High resistance to shocks and vibrations
10V halogen lamp	
Mains voltage transmitter needs upgrading. Replacement of the lamp + reflector + transformer.	**In addition to the advantages of the overpressure lamp because of:** – The halogen additive · Even higher luminous flux · Virtually constant luminous flux throughout the life of the lamp · Extremely long lamp life

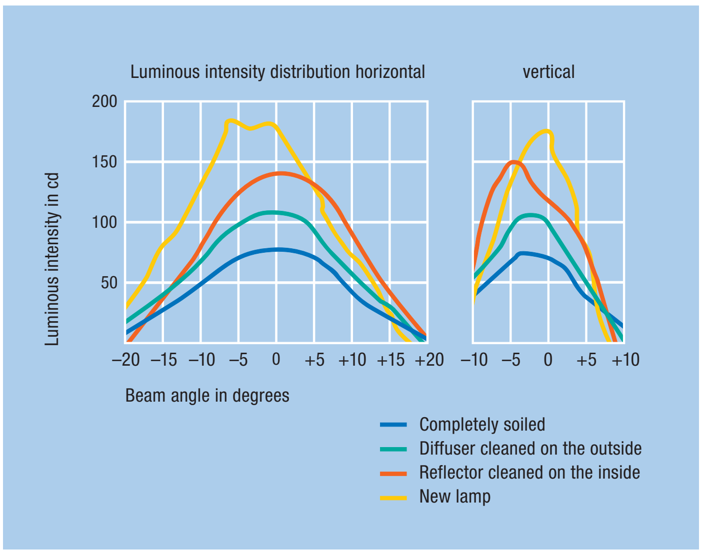
1) LCL = light centre length

Loss of luminous intensity due to soiling

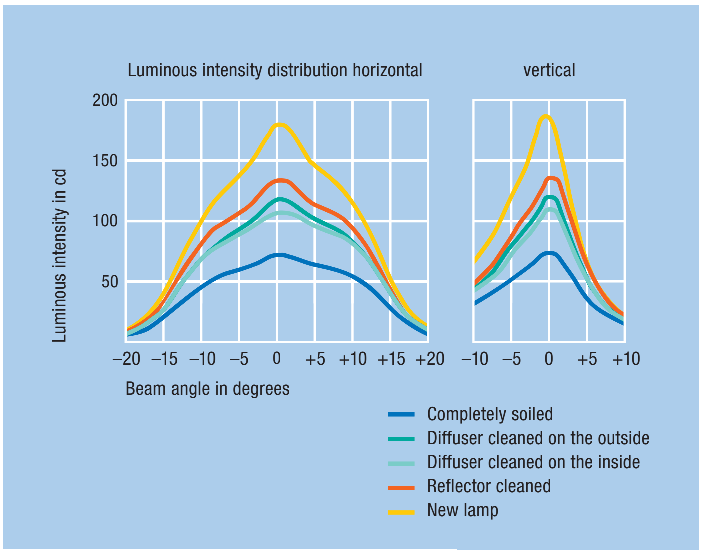
Soiling of the internal and external surfaces of the signalling optics is a major contributor to the loss of luminous intensity. Measurements have been taken on signalling equipment over a long period of time. The diagrams below show the luminous intensity distributions as an average of all the measurements.

In this connection, note also the following from DIN 67527 Part 1 Section 6 – Maintenance: “Cleaning and maintenance should be carried out at intervals so that the minimum values* indicated in DIN EN 12368:2000-03, Table 1 are not undershot by more than 20%. As a general rule, it is more economical to carry out maintenance work at fixed intervals when all the lamps can be replaced and the signal lights cleaned.”

* (for the luminous intensity)



Effect of soiling and bulb blackening on the signal luminous intensity of a mains voltage lamp



Effect of soiling and bulb blackening on the signal luminous intensity of a low-voltage lamp

Lamp technology: Loss of luminous flux due to bulb blackening

To achieve a high level of optical efficiency (luminous efficacy) from an incandescent lamp the filament temperature has to be as high as possible. There are, however, limits to the extent to which the filament temperature can be raised as the rate at which tungsten vaporises increases rapidly as the temperature rises. The life of incandescent lamps is therefore reduced considerably as the filament temperature rises. What's more, the vaporised tungsten atoms condense on the lamp bulb, which produces a black deposit. This in turn results in loss of light due to absorption (Fig. 1). Ultimately, this means that the lamp has to be replaced in order to comply with the minimum values for luminous intensity.

Compared with a vacuum lamp (e. g. HV Standard) the vaporisation rate and therefore bulb blackening can be greatly reduced by adding an inert gas (N_2, Ar, Kr, Xe). As a result of adding inert gas and the associated option of varying the filler pressure, the filament temperature can be increased, which in turn increases the luminous efficacy. With mains voltage krypton lamps, optical efficiency can therefore be raised by as much as 60% compared with standard mains voltage lamps.

On the other hand, there is also the possibility of keeping the filament temperature the same and using inert gases to prolong the life of the lamps. The possible increases in lamp life depend to a large extent on the inert gas used (Fig. 2). The most effective inert gases are very expensive however, so for reasons of economy there is no point in using these gases for large bulb volumes and high filler pressures.

Bulb blackening was only effectively prevented with the development of the halogen cycle (Fig. 3). The halogen cycle has reduced loss of luminous flux over the life of the lamp to such an extent that signal lamps with very long lives can now be produced (Fig. 4). It has also enabled lamps with very compact bulb dimensions to be developed. These small bulb volumes make it economically viable to use expensive inert gases such as krypton and xenon at high filler pressures. This considerably reduces the vaporisation rate of tungsten, which in turn prolongs the life of the lamps compared with conventional low-voltage lamps.

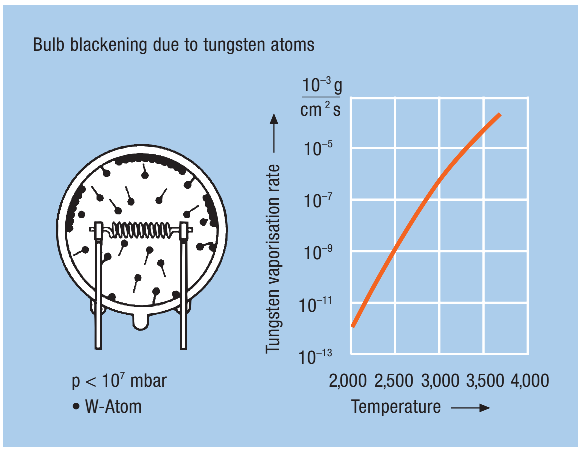


Fig. 1: Vacuum lamps with tungsten vaporisation rate

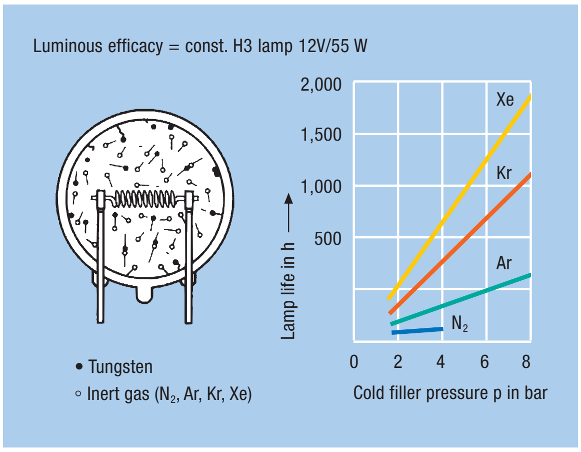


Fig. 2: Gas-filled lamp showing lamp life as a function of cold filler pressure and type of gas

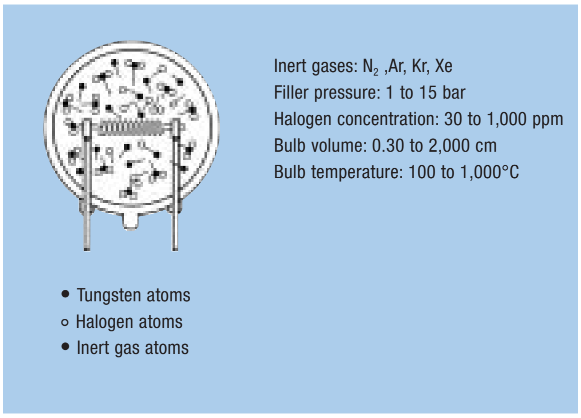


Fig. 3: Halogen lamp with halogen cycle

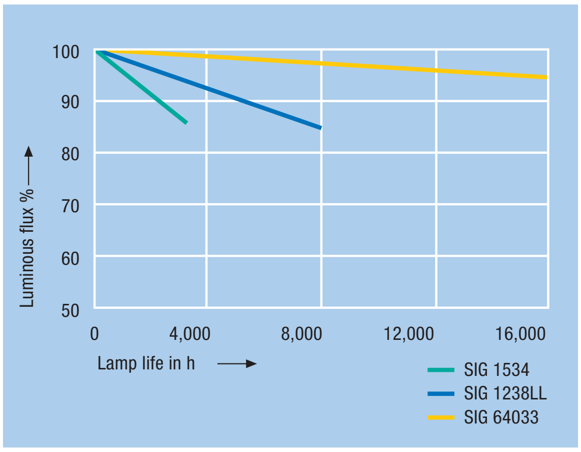


Fig. 4: Residual luminous flux for different signal lamps (HV/NV/HAL)

The most important DIN standards

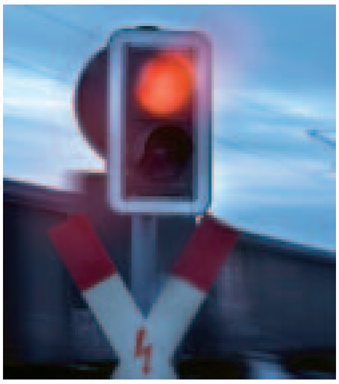
DIN-compliant operation

There is no disputing that signalling installations that do not function properly constitute a real danger. Local authorities are under enormous financial pressure to make savings wherever they can. There is therefore a risk that maintenance intervals for traffic lights will be extended beyond the values prescribed in the relevant standards.

The technical aspects and the resultant problems are often underestimated, particularly the consequences of more stringent product liability and the duty of care towards road users. There is a risk of personal liability if signalling installations are not operated in accordance with the relevant standards or if signal lamps that do not comply with these standards are used.

Although DIN standards are not laws of a binding character for the actual design of the signalling installations, they do define the current product specifications and are used by courts of law to establish the appropriate safety levels for road users and therefore the nature of the liability.

The most important information and data for road traffic light installations and associated lamps are summarised in the following standards:



DIN 49842 “Lamps for road traffic signals”

Part 1: Extra-low-voltage lamps for fixed signal lights; definition of technical design, and photometric data for low-voltage signal lamps.

Part 2: High-voltage lamps; definition of technical design, and photometric data for high-voltage signal lamps.

Part 3: Requirements and testing; definition of requirements and test criteria.

DIN 67527 Part 1 “Photometric properties of traffic signal lights”

Part 1: Fixed road traffic signal lights. Definition of optical requirements (including maintenance threshold).

DIN 12368 “Signal lights”

Definition of technical requirements of signal lights and their testing.

DIN/VDE 0832 “Road traffic signalling installations”

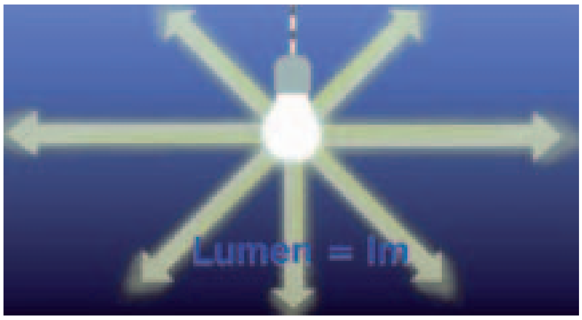
This contains the requirements for maintenance work.

The most important photometric concepts

Like any branch of science or technology, lighting has its own technical terms and standardized units of measurement for evaluating lamps and luminaires. The most important of these are briefly described here.

Luminous flux

Luminous flux indicates how much light a lamp emits in all directions. Unit of measurement: Lumen (lm).

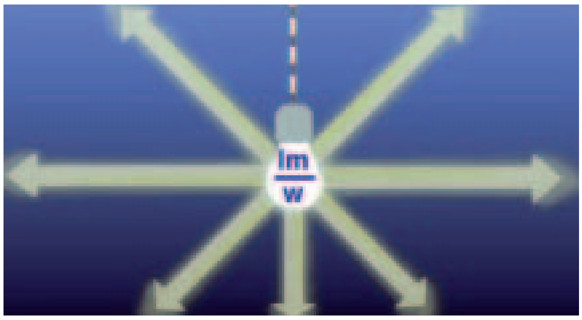


Luminous flux

Luminous efficacy

Luminous efficacy defines the efficiency with which electric power is converted into visible light, in other words how many lumens the lamp produces from each watt of electrical power it consumes. Unit of measurement: Lumen per watt (lm/W).

$$\text{Luminous efficacy (lm/W)} = \frac{\text{Generated luminous flux [lm]}}{\text{Electrical power consumed (W)}}$$



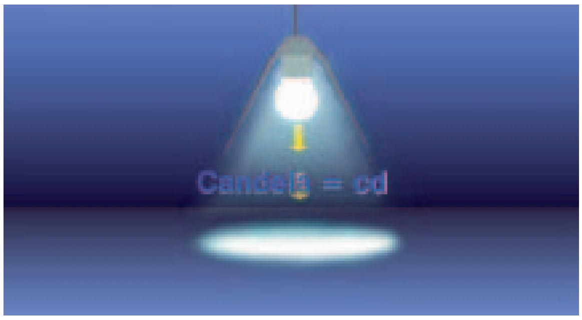
Luminous efficacy

Luminous intensity

Luminous intensity defines the amount of luminous flux emitted by a lamp or luminaire per solid angle ω (Greek: omega) in a particular direction. Unit of measurement: Candela (cd).

By making the solid angle smaller and smaller, we eventually obtain the luminous intensity in one direction of emission.

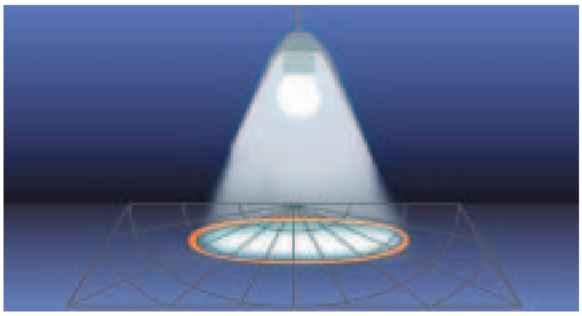
$$\text{Luminous intensity (cd)} = \frac{\text{Luminous flux in solid angle (lm)}}{\text{Solid angle } \omega}$$



Luminous intensity

Polar diagrams

The luminous intensity values of a lamp or luminaire in various directions are plotted in polar diagrams. The length of the arrow between the lamp or luminaire and the curve is a measure of the luminous intensity in that particular direction.

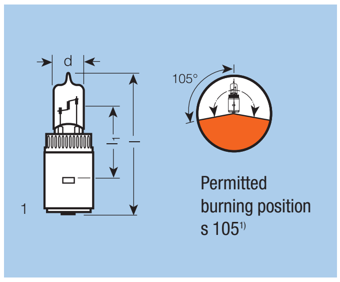


Polar diagram

Lamps for road traffic signalling equipment

16,000 h

Optimum lamp life. These 10V halogen signal lamps offer a 2-year replacement cycle

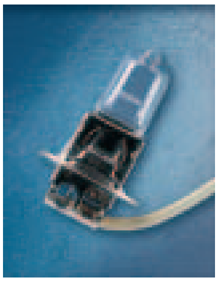


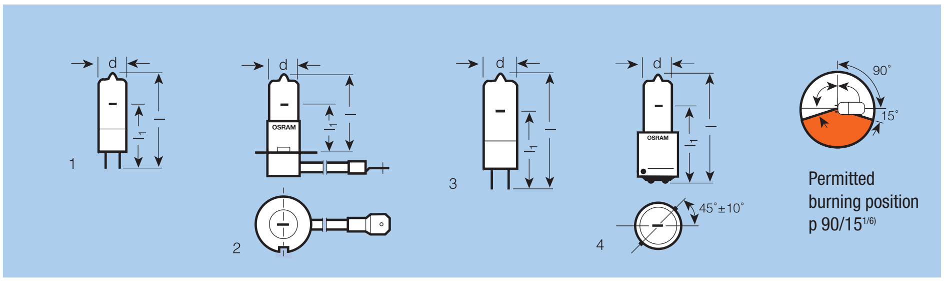
Product reference	Product number	V TEST	W	lm	Base	d max. [mm]	l max. [mm]	l1 [mm] 2)	No.	Packaging
Halogen signal lamps for 10V technology in installations to DIN 67527, Part 1 and DIN EN 12358										
SIG 64032	4050300**402109**	10.5	20	270	BA20s	12.5	65	31	1	40/200
SIG 64033	4050300**402123**	10.5	30	400	BA20s	12.5	65	31	1	40/200

Halogen signal lamps for 10V technology

Thanks to continual improvements, low-voltage halogen lamps now offer an excellent set of properties. Superior technology and high production quality combine to enable the lamps to be replaced on a **two-year cycle** (lamp life of around 16,000 hours) for a maximum premature failure rate of 2% [3)], which saves on maintenance costs. Other benefits include high resistance to shocks and vibrations and a very high luminous efficacy that remains almost constant throughout the life of the lamp as halogen technology prevents the bulb from blackening. Their geometry, luminous flux and electronic data comply with existing standards (DIN 49842 Parts 1 and 3), which means these lamps can be used in existing installations without the need for upgrades or adjustments.

These low-voltage tungsten-halogen lamps are available for signalling equipment designed for lamp supply voltages of 10 or 12 V





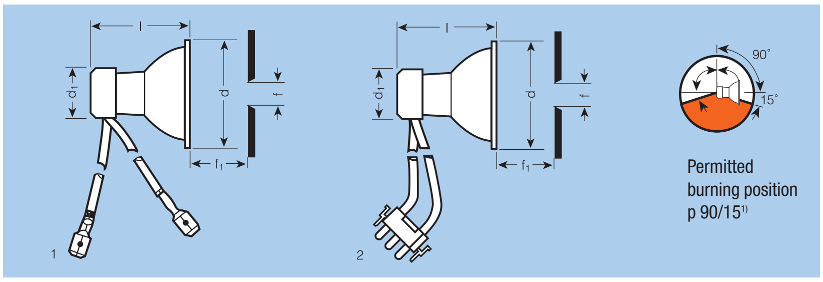
Product reference	Product number	V TEST	W	lm	t [h] *	Base	d max. [mm]	l max. [mm]	l1 [mm]	No.	Packaging
Low-voltage tungsten-halogen lamps											
SIG 64012/1	4050300**244402**	12	20	320	2,000	G4	9.0	31	19.5	1	100
SIG 64014[4)]	4050300**222509**	10	50	950	2,000	PKX22s	11.5	32	18	2	100
SIG 64015	4050300**217543**	10	50	750	8,000	PKX22s	11.5	32	18	2	100
SIG 64016	4050300**837741**	12	50	900	4,000	GY6,35-15	12.0	44	30	3	100
PA 62165[5)]	4050300**224046**	10	50	820	2,000	BA15d	11.5	50	26	4	100

Low-voltage tungsten-halogen lamps

The advantages of this series of lamps are as follows:

– Particularly high luminous flux
– Small dimensions
– Almost point-like light source for optimum focusing
– Virtually constant luminous flux throughout the life of the lamp
– Long lamp life

1) The lamps must be installed only in the burning positions specified. Any other burning positions will lead to premature failure of the lamp. The abbreviations indicate the main burning position and the permitted angle in degrees. Main burning positions: s = standing (vertical), base down
2) LCL = light centre length (distance from the coil to top of base)
3) The premature failure rate is restricted to cases that are due to lamp faults and not to external influences
4) Particularly suitable for use in fibre-optic traffic signals
5) Supplied on request
6) Lamps with transverse filaments should only be inclined perpendicular to the filament plane
* Average lamp life



OSRAM SIRIUS® dichroic reflector lamps have been designed specifically for use in fibre optic traffic signs (matrix displays)

Product reference	Product number	V TEST	W/A	lm 4)	t [h] *	Base	Ø d max. [mm]	Ø d1 max. [mm]	l max. [mm]	f	f1	No.	Pack
Low-voltage tungsten-halogen lamps with SIRIUS® dichroic reflector													
SIG 64004	4050300**245225**	10	50 W	350	2,000	K23d	49.7	24.5	46.5	10.2	42	1	10
SIG 64005	4050300**282060**	10	50 W	250	6,000	K23d	49.7	24.5	46.5	10.2	42	1	10
SIG 64009[2]	4050300**510309**	10	39 W	210	6,000	K23d	49.7	24.5	46.5	10.2	42	1	10
SIG 64002	4050300**246505**	12	20 W	120	2,000	K23d	49.7	24.5	46.5	10.2	42	1	10
SIG 64002 B[3]	4050300**324562**	12	1.67 A	120	2,000	KX23d	49.7	24.5	46.5	10.2	42	2	10

Low-voltage tungsten-halogen lamps with SIRIUS® dichroic reflector

The major benefits of SIRIUS® dichroic reflector lamps include optimum adjustment, high luminous intensity, long lamp life, high-quality reflector and corrosion and heat-resistant connecting cables. The following two wattages are mainly used:

– 50 W for daylight operation, possibly with reduced output at night
– 20 W for tunnels, multi-storey car parks and other dark areas, and for railway lighting installations.

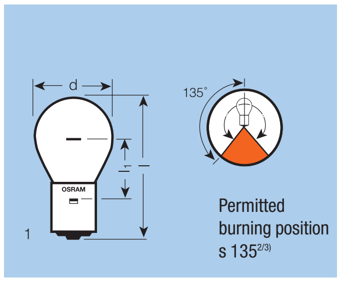
Operating instructions

All halogen signal lamps operate at high temperature and pressure. They may therefore only be operated in signal equipment/luminaires specially designed for the purpose. Make sure that the lamps are protected against moisture during operation and in particular during relamping. When installing a new lamp, handle it by its protective cardboard sleeve.

1) The lamps must be installed only in the burning positions specified. Any other burning positions will lead to premature failure of the lamp. The abbreviations indicate the main burning position and the permitted angle in degrees. Main burning positions: s = standing (vertical), base down
2) Supplied on request
3) For rail signals
4) Measured behind the aperture of 10.2 mm Ø = W fibre bundle
* Average lamp life

Lamps for road traffic signalling equipment

Compared with high-voltage lamps, low-voltage overpressure signal lamps have a considerably higher luminous efficacy. This is due to the higher gas pressure and the inert filler gas



Product reference	Product number	V TEST	W	lm	Base	d max. [mm]	l max. [mm]	l1 [mm] 4)	No.	Pack
Low voltage for 10V technology in installations to DIN 67527, Part 1										
SIG 1227	4050300**235028**	10.5	22	270	BA20s	36	67	31	1	100/200
SIG 1238	4050300**253091**	10.5	30	400	BA20s	36	67	31	1	100/200
SIG 1259	4050300**831770**	10.5	45	600	BA20s	36	67	31	1	100/200
Low voltage LONGLIFE for 10V technology in installations to DIN 67527, Part 1										
SIG 1227 LL	4050300**900179**	10.5	22	270	BA20s	36	67	31	1	100/200
SIG 1238 LL	4050300**790503**	10.5	30	400	BA20s	36	67	31	1	100/200

Low-voltage overpressure lamps for 10V systems

Low-voltage overpressure signal lamps have a much higher luminous efficacy than high-voltage signal lamps. This is due to the higher gas pressure and the inert filler gas. The larger diameter of the tungsten wire of the low-voltage filament also helps increase efficiency. This means that low-voltage overpressure lamps with significantly lower wattages can often be used, with a resultant reduction in the power consumption of the signalling equipment. The filament wire is more stable than in the HV lamp, which means that resistance to shocks and vibration is particularly high.

The failure rate for standard 10V low-voltage overpressure lamps is less than 2% within the first 4,400 hours of operation[1)].

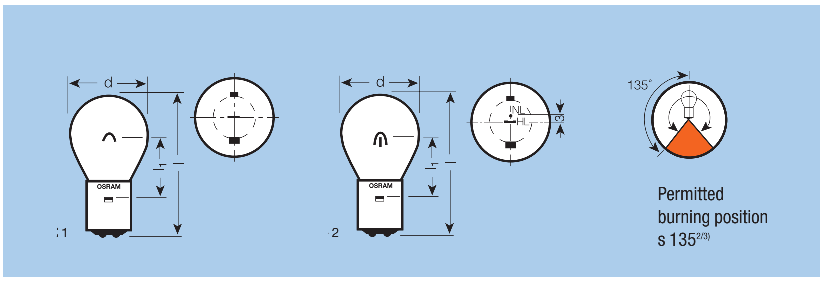
These benefits can also be put to use in existing 230V signalling installations as it is possible to convert mains voltage installations to 10V technology. The lamp and reflector have to be replaced and a transformer installed.

Low-voltage LONGLIFE lamps for 10V systems

The old low-voltage signal lamp has now been further developed into a LONGLIFE lamp. With these lamps, a failure rate of 2% is not exceeded in the first 8,000 hours[1)]. With these lamps therefore the maintenance interval may be up to one year (depending on the installation).

This means that the advantages of low-voltage technology are now available in mains voltage installations

1) The premature failure rate is restricted to cases that are due to lamp faults and not to external influences
2) Lamps with transverse filaments should only be inclined perpendicular to the filament plane
3) The lamps must be installed only in the burning positions specified. Any other burning positions will lead to premature failure of the lamp. The abbreviations indicate the main burning position and the permitted angle in degrees. Main burning positions: s = standing (vertical), base down
4) LCL = light centre length (distance from the coil to top of base)



Product reference	Product number	V TEST	W	lm	Base	d max. [mm]	l max. [mm]	l1 [mm] 4)	No.	Pack
Low-voltage overpressure lamps for 40V systems, single-coil lamps										
SIG 1455 Ü	4050300**832364**	40	25	250	BA20d	36	67	31	1	100
SIG 1462 Ü	4050300**832326**	40	40	500	BA20d	36	67	31	1	100
SIG 1470 Ü	4050300**832289**	40	60	800	BA20d	36	67	31	1	100
Dual-coil lamps										
SIG 1456 Ü	4050300**832340**	40	25/25	250	BA20d	36	67	31	2	100
SIG 1463 Ü	4050300**832302**	40	40/40	500	BA20d	36	67	31	2	100
SIG 1471 Ü	4050300**832265**	40	60/60	800	BA20d	36	67	31	2	100

The compact coil ensures a high level of optical efficiency and a high axial luminous intensity; the inert gas filling ensures impressive economy

Low-voltage overpressure lamps for 40V systems

The average lamp life is 8,000 hours. The lamps comply with DIN 49842 Parts 1 and 3. The failure rate is less than 2% within the first 3,000 hours of operation[1]. In other words, maintenance intervals will be around four months (depending on the installation).

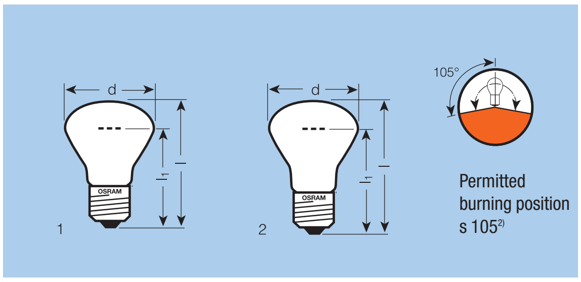
Dual-coil lamps

The operational reliability of dual-coil lamps is much higher than that of single-coil lamps. If the main filament fails, it is possible to switch to the secondary filament. Availability of the installation is therefore increased. For safety reasons, however, it is recommended that the lamp be replaced as soon as possible. The dual-coil lamp is used mainly for the red signal.

1) The premature failure rate is restricted to cases that are due to lamp faults and not to external influences
2) Lamps with transverse filaments should only be inclined perpendicular to the filament plane
3) The lamps must be installed only in the burning positions specified. Any other burning positions will lead to premature failure of the lamp. The abbreviations indicate the main burning position and the permitted angle in degrees. Main burning positions: s = standing (vertical), base down
4) LCL = light centre length (distance from the coil to top of base)

Lamps for road traffic signalling equipment

Mains voltage krypton lamps are used in systems that comply with DIN 67527, Part 1, and EN 12368



Product reference	Product number	V TEST	W	lm		d max. [mm]	l max. [mm]	l1 [mm]	No.	
Mains voltage krypton lamps for systems to DIN 67527, Part 1										
SIG 1541	4050300**405070**	235	60	420	E27	62	91	69	1	100
SIG 1543	4050300**032443**	235	75	600	E27	62	91	69	1	100
SIG 1546	4050300**222608**	235	100	840	E27	62	101	79	2	100

High-voltage krypton lamps

The majority of road traffic light installations are still operated on a voltage of 220 to 240V. For these systems, special lamps have been developed which meet the high requirements demanded of the signal optics. Mains voltage signal lamps are designed for an average lamp life of 8,000 hours. However, this is in no way an indication of their useful service life. The yardstick for useful service life is the “individual lamp life” or premature failure rate. In the case of mains voltage signal lamps, the failure rate in the first 3,000 hours of operation is no more than 2%[1]. In other words, maintenance intervals will be around four months (depending on the installation). The krypton inert-gas lamps conform to the specifications of DIN 49842, Parts 2 and 3. This means that in modern signal lights the luminous intensity values laid down in DIN 67527 Part 1 and DIN EN 12368 are met.

The advantages of high-voltage krypton lamps are as follows:
- Excellent optical efficiency thanks to a small cradle diameter
- High luminous efficacy from krypton as the filler gas
- High resistance to shock and vibrations thanks to the nine supports for the filament

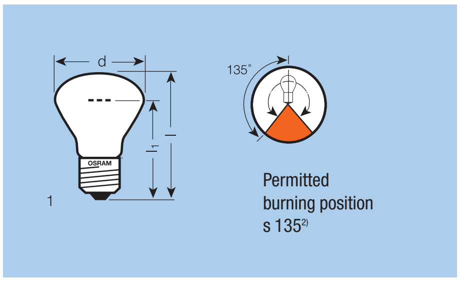
Product reference	Product number	V TEST	W	lm		d max. [mm]	l max. [mm]	l1 [mm]	No.	
Mains voltage LONGLIFE krypton lamps for systems to DIN 67527, Part 1										
SIG 1541 LL	4050300**613642**	235	60	380	E27	62	91	69	1	100
SIG 1543 LL	4050300**613666**	235	75	540	E27	62	91	69	1	100
SIG 1546 LL	4050300**613680**	235	100	780	E27	62	101	79	2	100

Mains voltage LONGLIFE krypton lamps

We have managed to improve our tried and trusted mains voltage lamp technology even further. Maintenance cycles are longer with the new LONGLIFE signal lamps. Depending on the system, these cycles may be up to eight months. Average lamp life is 14,000 hours. Within the first 5,500 hours of operation there will be no more than 2% lamp failures[1]. The rated luminous intensities defined in EN 12368 are achieved at all wattage levels. LONGLIFE lamps correspond completely to the successful standard series in their technical design, gas filler, E 27 base and unchanged light centre length. They can therefore be used in existing mains voltage signals without the need for upgrades or adjustments.

1) The premature failure rate is restricted to cases that are due to lamp faults and not to external influences

2) The lamps must be installed only in the burning positions specified. Any other burning positions will lead to premature failure of the lamp. The abbreviations indicate the main burning position and the permitted angle in degrees. Main burning positions: s = standing (vertical), base down



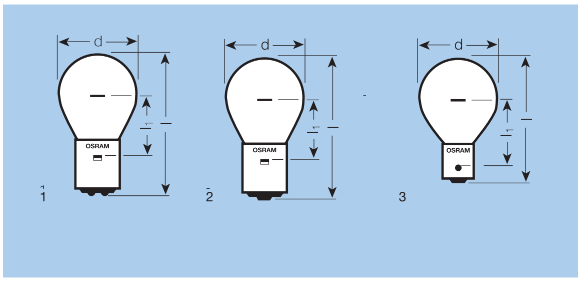
Mains voltage standard lamps are used primarily where there are no special requirements in terms of the luminous intensity of the signal lights

Product reference	Product number	V TEST	W	lm		d max. [mm]	l max. [mm]	l1 [mm]	No.	
Standard mains voltage lamps										
SIG 1534[1)]	4050300**032474**	235	40	230	E27	62	110	69	1	100
SIG 1535[1)]	4050300**032467**	235	70	380	E27	62	110	69	1	100
Standard LONGLIFE mains voltage lamps										
SIG 1534 LL[1)]	4050300**613703**	235	40	200	E27	62	110	69	1	100

OSRAM quality combines reliability with long lamp life – the essential ingredients for safe control of road traffic

1) Not for new designs
2) The lamps must be installed only in the burning positions specified. Any other burning positions will lead to premature failure of the lamp. The abbreviations indicate the main burning position and the permitted angle in degrees. Main burning positions: s = standing (vertical), base down

Lamps for rail traffic signalling equipment



Product reference	Product number	V TEST	W	lm	t [h] *		d max. [mm]	l max. [mm]	l1 [mm] 4)		No.	
Normal pressure lamps												
SIG 4020[1)3)]	4050300 –	40	20	200	600	BA20s	36	67	29.6	Universal	2	100
Overpressure lamps												
SIG 1206 Ü[1)3)]	4050300**832869**	12	6	55	600	BA20d[2)]	36	67	29.6	Universal	1	100
SIG 1220 Ü[1)3)]	4050300**831596**	12	20	280	2,000	BA20d	36	65	30.0	Universal	1	100
SIG 1226 Ü[1)]	4050300**831534**	12	20	230	6,000	BA20s	36	62	30.0	Universal	2	100
SIG 1260 Ü[1)3)]	4050300**832036**	10	20	240	5,000	BA15s	36	62	33.5	Universal	3	100

Single-filament lamps

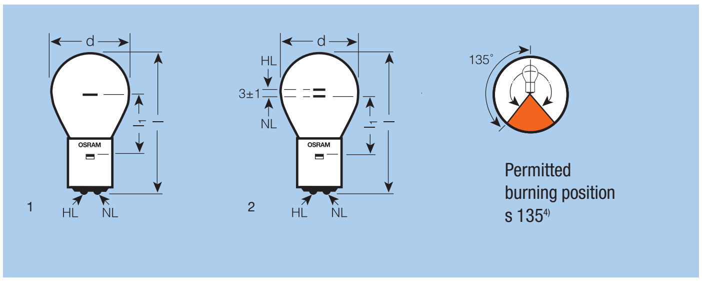
Safety on the railways calls for reliable signalling equipment. Defective lamps pose a serious risk, cause expensive delays to train schedules and lead to costly and time-consuming maintenance work because of the large distances between signals. OSRAM has played a major role over many years in ensuring that railways have operated at high levels of safety and efficiency. The advantages of OSRAM lamps are as follows:

- Narrow tolerances
- Exact light centre
- Long lamp life
- High reliability

Extremely strict quality controls ensure compliance with tight geometrical tolerances, photometric values and specified life. The various wattages of the normal and overpressure types (= reference "Ü") are matched to the specific needs of the relevant optical systems.

Extremely strict quality controls ensure absolute reliability, close tolerances, a precise light centre length and long lamp life

1) Supplied on request
2) One base contact is a blind contact
3) Not for new designs
4) LCL = light centre length (distance from the coil to top of base)
* Average lamp life



Product reference	Product number	V TEST	W	lm	t [h] *	Base	d max. [mm]	l max. [mm]	l1 [mm] 3)	Burning position	No.	Packing
Overpressure lamps												
SIG 1810 Ü[1/2]	4050300**832142**	12	10/10	137	600	BA20d	36	67	29.6	Universal	1	100
SIG 1210 Ü[1]	4050300**832173**	12	10/10	137	600	BA20d	36	67	29.6	Universal	1	100
SIG 1820 Ü[1]	4050300**832234**	12	20/20	350	600	BA20d	36	67	29.6	Universal	1	100
SIG 1230 Ü[1]	4050300**832203**	12	30/30	520	600	BA20d	36	67	29.6	Universal	1	100
SIG 1235 Ü[1]	4050300**831817**	12	35/35	570	600	BA20d	36	67	29.6	Universal	1	100
SIG 2460 Ü[1]	4050300**831756**	24	60/60	700	8,000	BA20d	36	67	31.0	s135	2	100
SIG 3015 Ü[1]	4050300**832111**	30	15/15	213	600	BA20d	36	67	29.6	Universal	1	100
SIG 5025 Ü[1]	4050300**831985**	50	25/25	380	600	BA20d	36	67	29.6	Universal	1	100

Note: Lamps with transverse filaments should only be inclined perpendicular to the filament plane.

Dual-filament lamps

All dual-filament lamps are now manufactured as over-pressure lamps. The second filament takes over from the main filament if the main filament fails. Changeover may be manual or automatic. This provides a certain safety margin for rail traffic until the lamp is replaced. For safety reasons, however, it is recommended that the lamp be replaced as soon as possible. The various wattages are matched to the specific needs of the relevant optical systems.

Doubly safe: the second coil takes over from the main coil if the main coil fails

1) Supplied on request
2) Not for new designs
3) LCL = light centre length (distance from the coil to top of base)
* Average lamp life

4) The lamps must be installed only in the burning positions specified. Any other burning positions will lead to premature failure of the lamp. The abbreviations indicate the main burning position and the permitted angle in degrees. Main burning positions: s = standing (vertical), base down

Head office Germany

OSRAM GmbH
Hellabrunner Strasse 1
81543 München
Tel.: +49-89-62 13-0
Fax: +49-89-62 13-20 20

International addresses

Albania
(supported by OSRAM Greece)

Argentina
OSRAM Argentina S.A.C.I.
Ramos Mejia 2456
B 1643 ADN Beccar
Pcia. De Buenos Aires
Tel.: +54-11-6333-8000
Fax: +54-11-6333-8001

Australia
OSRAM Australia Pty. Ltd. Sydney
11th Floor, Building 1
P.O. Box 673
423 Pennant Hills Road
2120 New South Wales
Tel.: +61-29-4 81-83 99
Fax: +61-29-4 81-94 68

Austria
OSRAM GmbH
Lemböckgasse 49/C/5
1230 Wien
Postfach 1 62
1231 Wien
Tel.: +43-1-6 80 68-0
Fax: +43-1-6 80 68-7

Azores
(supported by OSRAM Portugal)

Belgium
OSRAM N.V.
Greenhill Campus Haasrode
Interleuvenlaan 15 C
3001 Leuven (Heverlee)
Tel.: +32-2-7 19 29 11
Fax: +32-2-7 21 40 85

Bosnia-Herzegovina
(supported by OSRAM Croatia)

Brazil
OSRAM do Brasil Lâmpadas Elétricas Ltda.
Av. Dos Autonomistas, 4229
06090-901 Osasco-SP/Brazil
Tel.: +55-11-36 84 74 08
Fax: +55-11-36 85 94 95

Bulgaria
OSRAM EOOD
Nikola Obreschkov 1
Wh. A., App. 1
1113 Sofia
Tel.: +359-2-9 71 22 62
Fax: +359-2-9 71 45 46

Canada
OSRAM SYLVANIA Ltd./Lte.
2001 Drew Road
Mississauga
Ontario L5S 1S4
Tel.: +1-905-6 73 61 71
Fax: +1-905-6 71 55 84

Chile
OSRAM Chile Ltda.
Santa Elena de Huechuraba
1135 B
Comunade Huechuraba
Santiago de Chile
Tel.: +56-2-7 40-09 39
Fax: +56-2-7 40-04 66

China
OSRAM Foshan Lighting Co. Ltd.
No.1 North Industrial Road,
Postal Code 528000
Foshan, Guangdong
Tel.: +86-757-864 82-111
Fax: +86-757-864 82-222

OSRAM Shanghai Rep. Office
Harbour Ring Plaza
No. 18 Xi Zang Middle Road
Room 2802, 2803 A
Shanghai, 200001 P.R.C.
Tel.: +86-21-53 86 28-48
Fax: +86-21-64 86 12-19

Colombia
OSRAM de Colombia
Diagonal 109 No. 21-05
Oficina 607, 608
Bogotá
Tel.: +57-1-6 19 24 07
Fax: +57-1-6 37 18 55

Croatia
OSRAM d.o.o.
Majstora Radonje 10
10000 Zagreb
Tel.: +385-1-303-20 00
Fax: +385-1-303-20 01

Czechia
OSRAM spol. s.r.o.
Kodanska 1441/46
100 10 Praha 10
Tel.: +420 234 06 60 00
Fax: +420 234 06 60 20

Denmark
OSRAM A/S
Dybendalsvænget 3
2630 Tåstrup
Postboks 259
2630 Tåstrup
Tel.: +45-44-77 50-00
Fax: +45-44-77 50-55

Egypt
OSRAM Rep. Office Cairo
5th Floor, Unit No. 507
57 Giza Street
Cairo, Giza
Tel.: +20-2-7 48 66 46
Fax: +20-2-7 48 66 46

Ecuador
OSRAM del Ecuador S.A.
Casilla 09-01-8410
Guayaquil
Tel.: +593-4-2 89 36 09
Fax: +593-4-2 89 35 58

Estonia
(supported by OSRAM Finland)

Finland
Oy OSRAM AB, Helsinki
Vanha Porvoontie 229
01380 Vantaa
Box 91
01301 Vantaa
Tel.: +358-9-74 22 33 00
Fax: +358-9-74 22 33 74

France
OSRAM SASU
5, Rue d’Altorf
67124 Molsheim
BP 1 09
67124 Molsheim
Tel.: +33-388-49 75 99
Fax: +33-388-49 75 975

Great Britain
OSRAM Ltd., London
OSRAM House
Waterside Drive
Langley, Berkshire
SL3 6EZ
Tel.: +44-17 53 48 41 00
Fax: +44-17 53 48 42 22

Greece
OSRAM A.E.
Frantzi 6 & Ag. Pavlon
12132 Peristeri
Tel.: +30-210-5 20 18 00
Fax: +30-210-5 22 72 00

Hong Kong
OSRAM Prosperity Co. Ltd.
Rm 4007-09 Office Tower
Convention Plaza
1 Harbour Road, Wanchai
Tel.: +852-25 11 22 68
Fax: +852-25 11 20 38

Hungary
OSRAM KFT.
Alkotas utca 41.
1123 Budapest
Tel.: +36-1-2 25-30 55
Fax: +36-1-2 25-30 54

India
OSRAM India Ltd.
Signature Towers, 11th Floor,
Tower-B South City-I
122001 Gurgaon Haryana/India
Tel.: +91-124-238 31-80
Fax: +91-124-238 31-82

Indonesia
PT. OSRAM Indonesia
Jalan Siliwangi KM 1
Desa Keroncong
Jatiuwung
15134 Tangerang
Tel.: +62-21-5 90 01 27
Fax: +62-21-5 90 05 59

Iran
OSRAM Lamps
OSRAM PJS Co.
Bokharest Ave, Str. 6, No. 13
Tehran
Tel.: +98-21-8 73 84 76
Fax: +98-21-8 73 24 13

Italy
OSRAM Società Riunite
OSRAM Edison-Clerici Spa
Via Savona 105
20144 Milano
Tel.: +39-02-42 49-1
Fax: +39-02-42 49-380

Japan
OSRAM MELCO Ltd.
Tobu Yokohama Bldg.No. 3 (4F)
8-29 Kita-Saiwai 2-chome, Nishi-Ku
220-0004 Yokohama
Tel.: +81-45-3 23 51-20
Fax: +81-45-3 23 51-55

OSRAM Ltd.
Tobu Yokohama Bldg.No. 3 (6F)
8-29 Kita-Saiwai 2-chome, Nishi-Ku
220-0004 Yokohama
Tel.: +81-45-3 23 51-00
Fax: +81-45-3 23 51-10

Korea
OSRAM Korea Co. Ltd.
3rd. Fl. Ye-Sung Bldg.
150-30 Samsung-dong, Kangnam-Ku
Seoul 135-090
Tel.: +82-2-5 54 41 12
Fax: +82-2-5 56 16 44

Latvia
(supported by OSRAM Finland)

Lithuania
(supported by OSRAM Finland)

Macedonia
(supported by OSRAM Greece)

Madeira
(supported by OSRAM Portugal)

Malaysia
OSRAM Sdn Bhd
7.05-7.06 Amoda Building
22 Jalan Imbi
55100 Kuala Lumpur
Tel.: +60-3-21 45 95-33
Fax: +60-3-21 45 95-35

Mexico
OSRAM de México, S.A. de C.V.
Camino a Tepalcapa No. 8
Col. San Martin
54900 Tultitlán
Edo. de México
Tel.: +52-55-58 99-18 00
Fax: +52-55-58 84-65 60

Netherlands
OSRAM Nederland B.V.
Vennootsweg 15
2404 CG Alphen a/d Rijn
Postbus 3 32
2400 Alphen a/d Rijn
Tel.: +31-172-48 38 38
Fax: +31-172-44 30 25

Norway
OSRAM AS
Strandveien 50
1366 Lysaker
Tel.: +47-67 83 67-00
Fax: +47-67 83 67-40

Philippines
OSRAM Philippines Ltd. Corp.
Unit 2002–2003
Antel Global Corporate Center
Julia Vargas Avenue
Ortigas Center
Pasig City
Tel.: +632-687 60 48-50
Fax: +632-687 60 57

Poland
OSRAM sp. z o.o.
ul. Wiertnicza 117
02292 Warszawa
Tel.: +48-22-6 51 78 69
Fax: +48-22-6 42 14 18

Portugal
OSRAM Empresa de
Aparelhagem Eléctrica Lda.
Rua do Alto do Montijo
Nr. 15-4 andar
2795-619 Carnaxide
Tel.: +351-2 14 16 58 60
Fax: +351-2 14 17 12 59

Romania
OSRAM Romania S.R.L.
Sos. Pipera 41 Sector 2
7000 Romania/Bucaresti
Tel.: +40-21-2 33 02-12
Fax: +40-21-2 33 02-14

Russia
OSRAM Moscow
Ul. Malaja Kaluschskaja 15/4
117071 Moscow
Tel.: +7-095-9 35 70-70
Fax: +7-095-9 35 70-76

Singapore
OSRAM Pte. Ltd.
159 Sin Ming Road
#05-04 Amtech Building
575625 Singapore
Tel.: +65-65 52 01 10
Fax: +65-65 52 71 17

Slovakia
OSRAM Slovakia a.s.
Komárnanská cesta 7
94093 Nové Zámky
Tel.: +42-1-35 64 64-0
Fax: +42-1-35 64 64-883

Slovenia
(supported by OSRAM Austria)

South Africa
OSRAM (Pty.) Ltd.,
260, 15th Road
1683 Randjespark/Midrand
Private BAG X 206
1685 Halfway House/Midrand
Tel.: +27-11-2 07 56 00
Fax: +27-11-8 05 17 11

Spain
OSRAM, S.A.
Calle de la Solana, 47
28850 Torrejón de Ardoz (Madrid)
Tel.: +34-91-6 55 52 00
Fax: +34-91-6 56 82 16

Sweden
OSRAM AB
Rudanvägen 1
13625 Haninge
Box 5 04
13625 Haninge
Tel.: +46-8-7 07 44-00
Fax: +46-8-7 07 44-40

Switzerland
OSRAM AG, Winterthur
In der Au 6
8401 Winterthur/Töss
Postfach 2179
8401 Winterthur/Töss
Tel.: +41-52-2 09 91 91
Fax: +41-52-2 09 99 99

Taiwan
OSRAM Taiwan Company Ltd.
Sung Chiang Road, 7th Floor, No. 87
Sug Ching Road
P.O. Box 46304
Taipei - Taiwan, R.O.C.
Tel.: +886-2-25 08 35 02
Fax: +886-2-25 09 67 82

Thailand
OSRAM Thailand Co. Ltd.
100/45, 24th Floor
Sathorn Nakorn Tower
North Sathorn Road
Khwaeng Silom
Khet Bangrak, Bangkok 10500
Tel.: +66-2-6 36 74 75
Fax: +66-2-6 36 74 77

Turkey
OSRAM AMPUL TIC. A.S.
Meclisi Mebusan Caddesi 125
80400 Findikli, Istanbul/TR
Tel.: +90-212-334-1334
Fax: +90-212-334-1142

Ukraine
OSRAM Rep. Office
ul. Vorovskogo, 36
01054 Kiev/Ukraine
Tel.: +380-44-2 46 93 14
Fax: +380-44-2 46 99 91

United Arab Emirates
OSRAM Middle East FZE
P.O. Box 17476
Room #602-603, LOB #16
Jebel Ali Free Zone
Dubai United Arab Emirates
Tel.: +971-4-88 13-767
Fax: +971-4-88 13-769

USA
OSRAM SYLVANIA INC.
100 Endicott Street
Danvers, MA 01923
Tel.: +1-978-777-19 00
Fax: +1-978-750-21 52

Vietnam
OSRAM Singapore Pte. Ltd.
Rep. Office Vietnam
59A Ly Thai To Street,
Hanoi Press Club
Hoan Kiem District
Hanoi
Tel.: +84-4-93 49-801
Fax: +84-4-93 49-803

Yugoslavia
Rep. Office of OSRAM GmbH
Predstavništvo OSRAM GmbH
Čika Ljubina 15/V
11000 Beograd
Tel.: +381-11-30 30-860
Fax: +381-11-30 30-853

Internet
http://www.osram.de
http://www.osram.com
http://catalog.myosram.com/DE
http://catalog.myosram.com/EN

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