

Technical Manual

High Pressure Sodium Lamps



**Sylvania
Lighting
International**

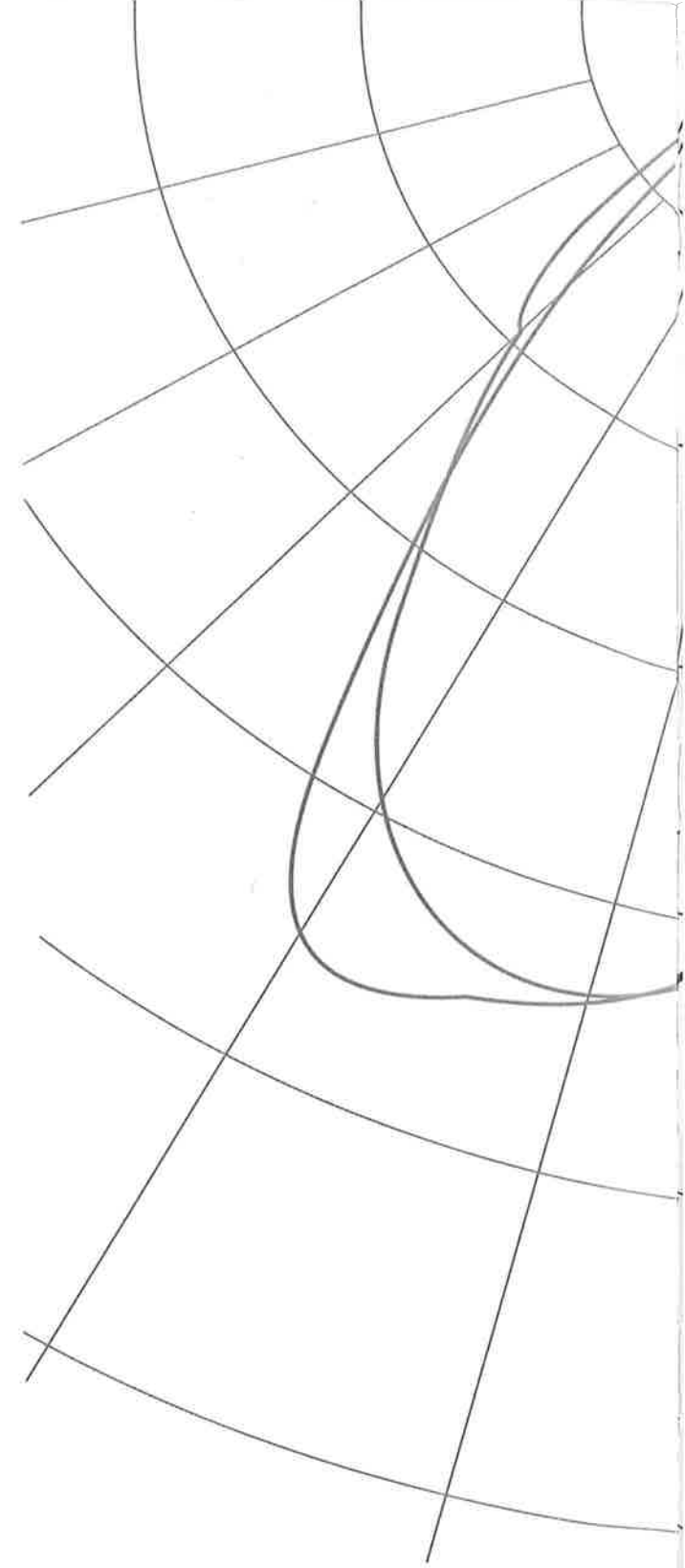
A Source of Inspiration

75

60

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SYLVANIA

TECHNICAL MANUAL

High Pressure Sodium Lamps

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Product Range Summary

This Technical Manual is aimed at luminaire designers, users and specifiers of lighting for commercial and industrial applications. The choice of High Pressure lamps and the applications for which they are suited are many and varied and can include industrial outdoor, road lighting, commercial horticulture, outdoor amenity and also floodlighting applications for security and sport.

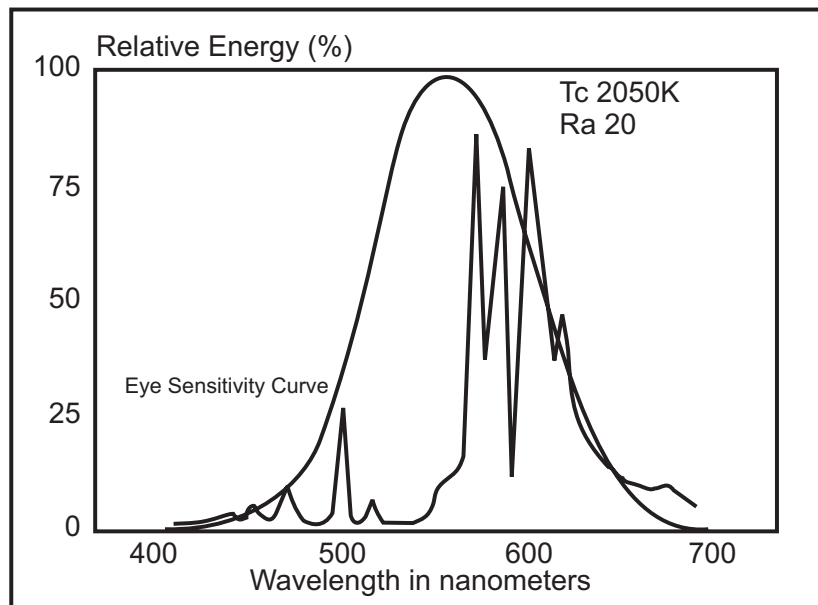
High Pressure Sodium (SHP) lamps are powerful gas discharge lamps characterised by the emission of a broad spectrum of golden-white light of excellent quality. Where such quality requirements combine with the need for operating economy particularly in industrial or outdoor applications i.e. the highest efficacy (lumens/Watt) then SHP represents the best choice.

Sylvania, TwinArc and EcoArc are brands of SLI Inc. Sylvania Lighting International Incorporated is a publicly quoted company on the New York Stock Exchange. Over 5000 people are employed world wide. TwinArc is the generic brand name for the dual arc tube range of SHP lamps and EcoArc is the brand name used for the Mercury retrofit ranges.

From the late 1940's the forerunner of the SHP, the ubiquitous Low Pressure sodium lamp, had revolutionised Road lighting across Europe. High Pressure Sodium lamps (Sylvania designation '**SHP**') - which are also popularly known as SON or HPS were first introduced in the 1960's after the development of new arc tube making materials earlier in the 1950's. The availability of a high temperature resistant, translucent material - **PCA** - polycrystalline alumina (sintered aluminium oxide) - for SHP arc tube design and manufacture - meant that lamp operating temperatures and pressures could be safely increased and more light obtained from smaller and more powerful sources than Low Pressure Sodium. This brochure includes principally the European and also the US range of SHP lamps.

High Pressure Sodium lamps are widely used in road lighting and in many interior and exterior industrial applications. This combination of powerful output, high quality light and small bulb size offers the opportunity to use relatively small luminaires, wider lateral spacings and improved user visibility, all together providing a more cost effective and efficient lighting system.

Spectral Power Distribution of SHP Standard



Choosing a Lamp

Key considerations will be:

Light output - which ranges between 3300 lumens (50W) and 130000 lumens (1000W)

Life - up to 55000 hours average from the SHP TwinArc range

Lumen maintenance - up to 92% at 10000 hours from the SHP Super range

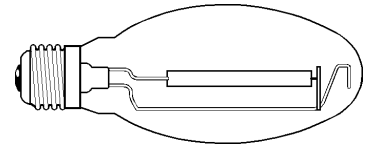
The cost of maintenance intervention is the most significant ownership cost of a lighting installation and exceeds the cost of replacement lamps. Maintenance will be required either to rectify lamp outages or when the installation's lux performance falls below the design service value. The more costly and difficult the intervention the more products such as SHP Super or long life double arc tube **SHP Twin Arc** should be considered.

The requirement for **disposal of spent lamps in an eco-friendly manner** is becoming increasingly important for lamps used in the public lighting sector. Conventional High Pressure Sodium lamps contain some Mercury but Sylvania's SHP Mercury Free contains none. SPX EcoArc lamps, replacing HSL Mercury types in situ without gear modification, contain one tenth the amount in conventional SHP. Where local disposal regulations are stringent, Sylvania's **EcoArc or Mercury Free** High Pressure Sodium lamp programme offers unique choices.

The Range

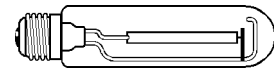
SHP STANDARD

Available from ratings of 50W and 3300 lumens up to 1000W and 130000 lumens and in clear tubular or dispersive coated elliptical versions (50 to 400W), these types are the most widespread in general roadlighting or industrial use. They represent a useful compromise between life, lumen maintenance, light quality and cost where neither maintenance nor disposal are major issues.



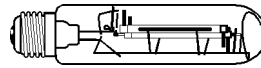
SHP SUPER

Available in ratings from 35W and 1800 lumens up to 600W and 85000 lumens and in clear tubular or dispersive coated elliptical versions (35 to 400W), these increased performance, premium quality lamps are used in demanding installations where long, reliable life and lumen maintenance characteristics can significantly extend the maintenance and replacement cycle and reduce cost. SHP Super lamps need no special control gear and can replace SHP Standard in modern luminaires which are fitted with SIP (Super-imposed pulse) ignitors.



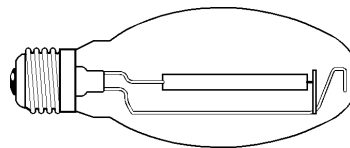
SHP TWINARC AND STANDBY

The first SHP type ever to be constructed with two closely spaced parallel arc tubes placed in the main axis of the lamp and contained in the same outer jacket. These lamps, featuring 'Super' arc tube technology, offer two main advantages. In the case that there is a short mains supply interruption, the previously non-operating arc tube is immediately available to restore light within one minute and avoids potentially dangerous 'blackouts' of up to 5 minutes duration. In the case where an extended life is required, since each arc tube over life receives equal usage, almost **double the life of single arc tube lamps can be obtained**. STANDBY variants are suitable for older installations not fitted with SIP ignitors (see page 11).



SPX ECOARC and SHX

SHX Mercury retrofit plug-in High Pressure Sodium lamps were introduced in 1977 to provide a simple and inexpensive upgrade for HSL Mercury lamps, offering up to 50% more light with a modest reduction in lamp power. The newest addition to the SHP range, SPX EcoArc lamps operate in luminaires originally designed for Mercury Vapour lamps giving 30 - 50% more light and saving up to 25% energy cost, without any modification of the control gear.



A 98W EcoArc replaces a 125W Mercury lamp

A 190W EcoArc replaces a 250W Mercury lamp

A 295W Eco Arc replaces a 400W Mercury lamp

Other important features include:

- The elimination of annoying end of life

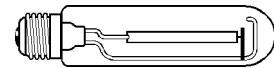
cycling effects.

- Reduced mercury content, by 90% compared to standard SHP.
- Lower ballast currents, important in luminaires which have already seen some years of service, which will prolong ballast life.

Using EcoArc lamps allows for the easy upgrade of older Mercury installations without changing the luminaire.

SHP MERCURY FREE

The small amount of mercury that is present in SHP Standard, Super, TwinArc and SPX EcoArc lamps is a useful and inexpensive material which stabilises the electrical characteristics of the lamp, providing reliability through life. Where the disposal of Mercury-containing lamps is restricted by local regulations, Sylvania's SHP Mercury Free offers a unique and simple answer. The lamp is stabilised by a much increased pressure of Xenon fill gas in the arc tube, which not only results in a slightly improved light colour but also offers similarly enhanced life and lumen maintenance characteristics as the SHP Super range.



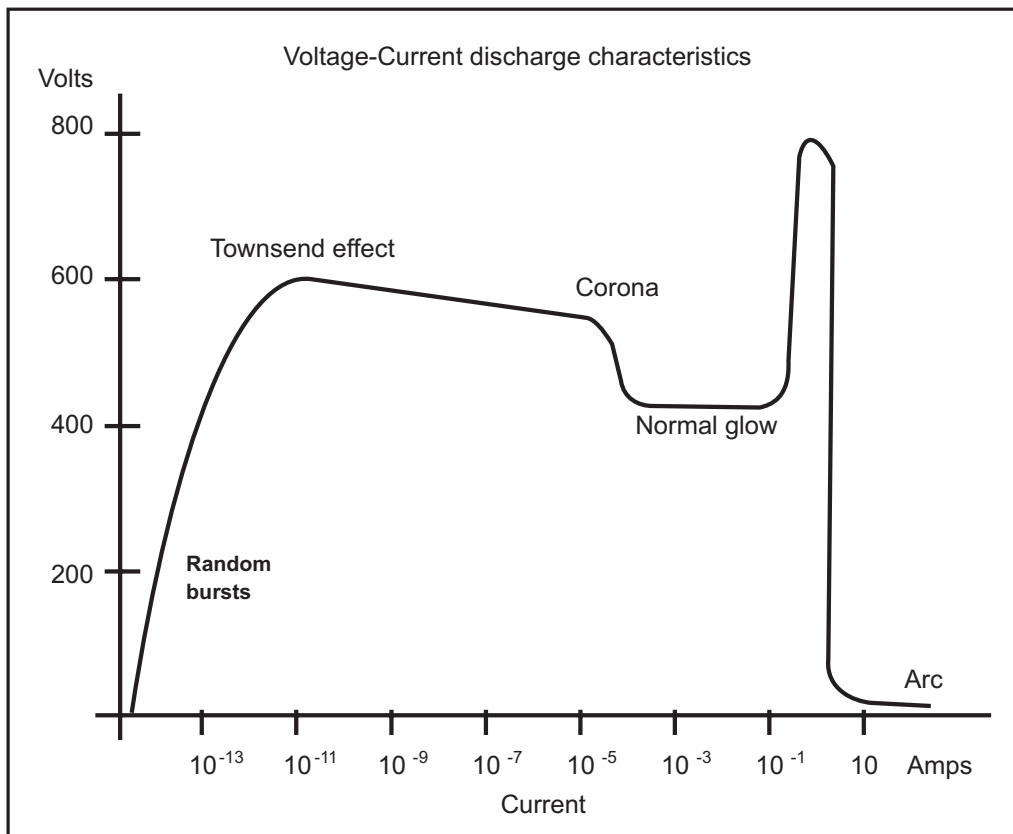
SHP-TS GROLUX

A new Super tubular 400W lamp with a very high light output of 58,000 lumens and an improved spectral distribution in the blue which is particularly useful in improving crop yields for professional plant growers, both for flowering plants and vegetables.

Principles of Operation

High Pressure Sodium lamps are high efficacy, long-lived gas discharge lamps which emit a golden-white light. Although evolved from Low Pressure Sodium lamps their shape, size, method of ballasting and starting have much in common with Metal Halide. The Britelux range of Metal halide lamps, for example, is designed to be operated on SHP control gear.

Voltage-current ratio during lamp starting



The above diagram illustrates the V/I (voltage to current) relationship of a typical HID lamp ballasted by a choke ignitor circuit. A suitable ballast must always be used with any High Pressure Sodium lamp.

Two main points are of some interest:

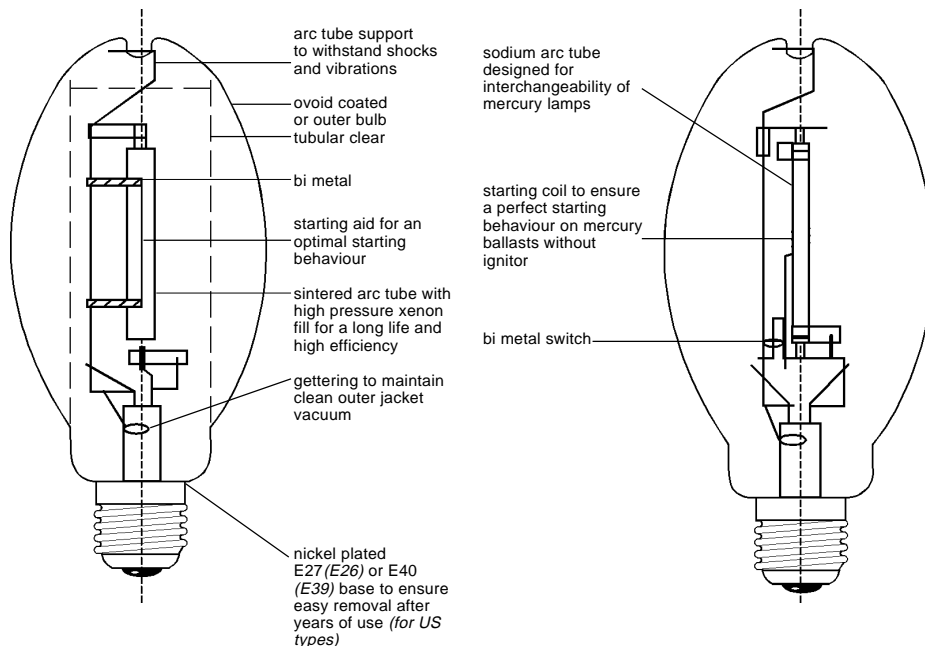
1. The process of electron generation in the arc tube after starting is known as the Townsend avalanche. Without the connection of a ballast the lamp current would theoretically continue to increase exponentially, therefore the correct ballast must always be connected as marked on its label.

2. A high voltage is required initially to break down the starting gas in the arc tube and bring the lamp through the glow-to-arc transition in order to provide a short switch-on time. The device that achieves this is called the starter or ignitor and may be an electro-mechanical device or all solid state electronics. These devices are dealt with in detail on page 25, but it is useful at this stage to list the most common types:

- **Glo-starter incorporated** (mounted inside the lamp outer jacket) - useful in lamps of 70W rating or below - providing reliable and inexpensive starting.
- **Solid state incorporated** (also mounted inside the lamp outer jacket or in the base) - as in EcoArc, for example, to ensure reliable starting over a whole range of ratings and where, as for Mercury circuits, there is no starter present in the existing external circuit.
- **Solid state external - SIP type (Super-imposed pulse)** - the most useful and effective device fitted to the external circuit which ensures reliable starting under a wide range of application conditions.
- **Solid state external - Impulse type** - a simpler and less expensive device not generally suited to 'Super' versions of SHP, Twin Arc or Mercury free lamps.
- **Hybrid external** - a combination of a glo-starter and solid state fitted to the external circuit and little used in modern systems.

Construction

The arc tube is the key element in the construction of the SHP lamp. Hot sodium vapour, present in the arc tube during normal operation, is highly reactive. Only high purity translucent materials such as PCA are capable of containing the discharge over a long service life. Through life the sodium in the arc tube has a tendency to migrate from around the arc tube seals or to react with the electrode assembly. Great care is taken in the process to ensure that migration or reactive absorption of the sodium is minimised and that a long service life and high lumen output is preserved, which characterises the SLI commitment to quality and performance.



Outer jacket :

European range of 50 and 70W elliptical types: rugged soda lime glass..
US range: thermal shock resistant lead borosilicate (hard) glass.

All other types: Lead borosilicate glass, which is resistant to high temperatures and designed to resist thermal shock and mechanical damage. SHP lamps have no outer jacket gas fill and are high vacuum types. Some types are fitted with a chemical button called a 'getter' which reacts with any small amounts of air or water vapour left by the pumping and sealing process which serves to maintain the vacuum purity through life. Sylvania has improved this process to the extent that a flashed-film getter is not required in certain types. In order to provide a good visual indication of the vacuum quality a 'blue spot' of oxygen-sensitive material is then used (in the past in chemical flashbulb manufacture). As long as the dot has the correct blue colour, all is well.

Internal Powder coating:

E27/(E26) and E40/(E39) elliptical bulb lamps are provided with an evenly applied high transmission internal coating whose principal function is to reduce disability glare and improve the user's visual acuity where the lamp is viewed directly, or where the luminaire optical system particularly requires a large luminous 'area' for the required flux distribution.

Starting aids:

Unless specifically mentioned in the relevant data sheet, assume an external electronic ignitor is *required* in the operating circuit.

SHP Super lamps are additionally fitted with internal starting enhancers to enable rapid and reliable starting. These can be identified as straight molybdenum wires mounted alongside the PCA arc tube outer surface on a pair of bi-metals. After the lamp starts the bi-metals move the starting aid away from the arc tube, prolonging service life.

Caps:

Nickel plated brass for corrosion protection through life. All E40 and (E39) types feature a metal-to-glass thread mould and a neck solder lock to provide at least 5Nm torque resistance to ensure good contact-making with the lampholder and to resist any chance of loosening

during life due to local installation vibration. E27/(E26) lamps are cemented to withstand 3 Nm of torque. A high temperature solder is used to secure the centre contact electrical connections, for improved reliability.

Arc Tube:

The polycrystalline alumina (PCA) arc tube is the most critical part of the lamp. The following is a summary of the principal components and their purpose:

Electrodes:

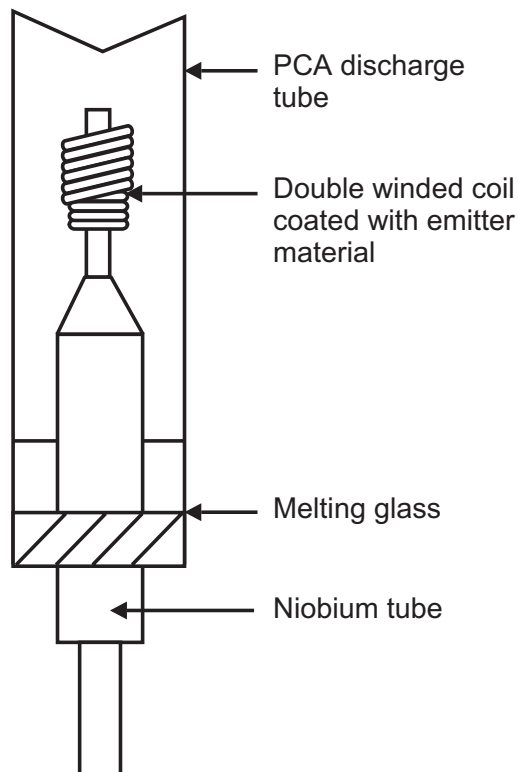
Double-wound tungsten coil with a low evaporation rate at high operating temperatures ensuring a long life.

Emitter material:

Coats the electrodes so that the current flows easily into the gas vapour discharge. Electrode life is extended and rapid starting is ensured.

Electrode mounts:

The Niobium tube provides a hermetic seal in to the PCA material and has the same thermal expansion characteristics, which guarantees a perfect seal at all operating temperatures. The electrode assembly (see diagram) is then sealed with a special glass to the PCA tube.



Chemical Constituents: The arc tube contains an inert gas, typically Xenon, which acts as a starting gas and thermally insulates the discharge in order to provide a high lumen output. The Xenon fill pressure can be 30 torr (760 torr = 1 standard atmosphere) for standard lamps or 300 torr for all Super based increased lumen output lamps. This higher Xenon pressure gives a 15% increase in efficacy (lumens/watt) and a longer service life *but the use of a solid state SIP ignitor is essential.*

Sodium/Mercury Amalgam:

A small amount of sodium dissolved in mercury with 12 - 25% sodium composition by weight depending on the type of lamp (excepting SHP Mercury Free which contains no Mercury but an increased Xenon pressure).

SPX EcoArc types contain only 10% of the total amalgam weight of standard SHP. The purpose of the mercury is to provide suitable lamp electrical characteristics, acting as a buffer, and the sodium is the light-generating element in the gas discharge.

Arc Tube Mounts:

The arc tube is supported by welded nickel plated steel rods which avoids any high temperature corrosion, provides a long lamp life and is very resistant to vibration or shock.

Applications and Target Markets

The principal advantages of High Pressure Sodium lamps are:

1. The arc tube is very compact, which results in highly efficient luminaire optical efficiencies.
2. The combination of lumen maintenance and service life are unequalled in its light quality category. (For SHP TwinArc lamps, the availability of the second arc tube through life allows average service lives of up to 55000 hours).
3. Luminaire designs can be cost effective being only slightly more expensive than for Mercury Vapour or equal to Metal Halide lamps of the same rating, but with significantly higher light output.
4. A Grolux plant growth variant is available (400W) with a high photosynthesis output and long life.

Applications	Target Markets
Outdoor:	
Roadlighting - all road categories	Public lighting authorities Lighting maintenance contractors
Storage yards	Industrial users
Docks	Electrical contractors
Monuments and listed public buildings	Public lighting authorities
Airports and Military installations	Maintenance and installation design units
Indoor:	
Workshops and Warehouses	Industrial users Electrical contractors
Greenhouses	Horticultural product distributors

Relative Features and Benefits of SHP lamps

Features	Benefits
1. Efficacy of 70 - 130 lm/W	High efficacy lowers power costs, especially for SHP Supers, for a greater lux level.
2. Colour Tc: 2050 - 2200K	Golden, pleasant light produced at frequencies close to the optimum sensitivity of the human eye produces optimum seeing conditions.
3. Ra 25 (Class 4)	Good for most outdoor uses and some Industrial Indoor applications, e.g., Workshops and warehouses.
4. No Mercury content with SHP Mercury Free	Eco-friendly and low cost end of life disposal.
5. SPX EcoArc and SHX replaces Mercury HSL simply and easily	Easy, low cost upgrade to SHP benefits as no new luminaires are required.
6. Full range of power ratings from 35W to 1000W	All SHP benefits from a full and flexible range available to small and large installations, irrespective of lux level or mounting position requirements.
7. SHP Twin Arc and Standby Extended life of up to 55,000h (400W) and instant restart after a momentary electrical supply failure, with full light output in one minute	A significant reduction in lamp change labour costs, particularly at difficult sites and improved safety in the event of a mains failure, possibly avoiding an unwelcome and expensive accident.

**Product Range and ILCOS Codes
(European Range)**

Product Description **ILCOS CODE**
Product Code

Unless otherwise stated, lamps are elliptical, coated versions

Notes: "T" versions are clear tubular

"S" versions are high-output Supers

SHP MERCURY FREE

20990 SHP-TS 70W MF	ST-70/22/4-H90/E-E27-39/156 NOHg
20991 SHP-S 70W MF	SE-70/22/4-H90/E-E27-72/165 NOHg
20992 SHP-TS 100W MF	ST-100/22/4-H100/E-E40-48/211 NOHg
20993 SHP-S 100W MF	SE-100/22/4-H100/E-E40-76/186 NOHg
20994 SHP-TS 150W MF	ST-150/22/4-H100/E-E40-48/211 NOHg
20995 SHP-S 150W MF	SE-150/22/4-H100/E-E40-76/186 NOHg
20996 SHP-TS 250W MF	ST-250/22/4-H100/E-E40-48/260 NOHg
20997 SHP-S 250W MF	SE-250/22/4-H100/E-E40-91/227 NOHg
20998 SHP-TS 400W MF	ST-400/22/4-H105/E-E40-48/292 NOHg
20999 SHP-S 400W MF	SE-400/22/4-H100/E-E40-122/292 NOHg

SHP TWINARC

20712 SHP-TS 50W TWINARC	STT-50/20/4-H85/E-E27-39/156
20717 SHP-S 50W TWINARC	SET-50/20/4-H85/E-E27-72/165
20718 SHP-TS 70W TWINARC	STT-70/20/4-H90/E-E27-39/156
20719 SHP-S 70W TWINARC	SET-70/20/4-H90/E-E27-72/165
20724 SHP-TS 100W TWINARC	STT-100/20/4-H100/E-E40-48/211
20725 SHP-S 100W TWINARC	SET-100/20/4-H100/E-E40-76/186
20739 SHP-TS 150W TWINARC	STT-150/20/4-H100/E-E40-48/211
20740 SHP-S 150W TWINARC	SET-150/20/4-H100/E-E40-76/186
20741 SHP-TS 250W TWINARC	STT-250/20/4-H100/E-E40-48/260
20742 SHP-S 250W TWINARC	SET-250/20/4-H100/E-E40-91/227
20743 SHP-TS 400W TWINARC	STT-400/20/4-H105/E-E40-48/292
20744 SHP-S 400W TWINARC	SET-400/20/4-H100/E-E40-122

Product Description Product Code	ILCOS CODE
SHP STANDBY	
20700 SHP 70W SBY	SE-70/20/4-H90/E-E27-72/165 SBY
20695 SHP-T 70W SBY	ST-70/20/2-H90/E-E27-39/165 SBY
20699 SHP 100W SBY	SE-100/20/4-H100-E-E40-76/186 SBY
20696 SHP-T 100W SBY	ST-100/20/4-H100-E-E40-48/211 SBY
20654 SHP 150W SBY	SE-150/20/4-H100-E-E40-76/186 SBY
20670 SHP-T 150W SBY	ST-150/20/4-H100-E-E40-48/211 SBY
20653 SHP 250W SBY	SE-250/20/4-H100-E-E40-91/227 SBY
20559 SHP-T 250W SBY	ST-250/20/4-H100-E-E40-48/260 SBY
20652 SHP 400W SBY	SE-400/20/40-H100-E-E40-122/292 SBY
20596 SHP-T 400W SBY	ST-400/20/40-H100-E-E40-48/292 SBY
SPX ECOARC	
20800 SPX ECOARC 98W	SE-98/20/4-H-155/E-E27-76/178
20801 SPX ECOARC 190W	SE-190/20/4-H160/E-E40-91/227
20802 SPX ECOARC 295W	SE-295/20/4-H295/E-E40-122/292
SHX	
20560 SHX 110W	SE-110/20/4-H115-E-E40-178/76
20448 SHX 210W	SE-210/20/4-H117-E-E40-227/91
20490 SHX 350W	SE-350/20/4-H117-E-E40-292/122
SHP - Internal starter	
20552 SHP50/CL/I	SC-50/20/4-H85/I-E27-72/165
20550 SHP50/CO/I	SE-50/20/4-H85/I-E27-72/165
20553 SHP70/CL/I	SC-70/20/4-H90/I-E27-72/165
20551 SHP70/CO/I	SE-70/20/4-H90/I-E27-72/165

Product Description Product Code	ILCOS CODE
SHP-S and SHP-TS SUPER	
20687 SHP-TS 50W E27	ST-50/20/4-H85/E-E27-39/156
20688 SHP-S 50W E27	SE-50/20/4-H85/E-E27-72/165
20678 SHP-TS 70W E27	ST-70/20/4-H90/E-E27-39/156
20690 SHP-S 70W E27	SE-70/20/4-H90/E-E27-72/165
20686 SHP-TS 100W E27	ST-100/20/4-H100/E-E40-48/211
20563 SHP-S 100W E27	SE-100/20/4-H100/E-E27-76/186
20692 SHP-S 100W E40	SE-100/20/4-H100/E-E40-76/186
20685 SHP-TS 150W	ST-150/20/4-H100/E-E40-48/211
20693 SHP-S 150W	SE-150/20/4-H100/E-E40-76/186
20713 SHP-TS 250W	ST-250/20/4-H100/E-E40-48/260
20715 SHP-S 250W	SE-250/20/4-H100/E-E40-91/227
20714 SHP-TS 400W	ST-400/20/4-H105/E-E40-48/292
20716 SHP-S 400W	SE-400/20/4-H100/E-E40-122/292
20805 SHP-TS 600	ST-600/20/4-H100/E-E40-48/292
SHP and SHP-T STANDARD	
20480 SHP-T 150	ST-150/20/4-H100/E-E40-48/211
20479 SHP 150	SE-150/20/4-H100/E-E40-76/186
20482 SHP-T 250	ST-250/20/4-H100/E-E40-48/260
20481 SHP 250	SE-250/20/4-H100/E-E40-91/227
20485 SHP-T 400	ST-400/20/4-H105/E-E40-48/292
20484 SHP 400	SE-400/20/4-H100/E-E40-122/292
20504 SHP-T 1000	ST-1000/20/4-H100/E-E40-67/382

**Product Range and NAED Codes
(US Range)**

Vendor ID No: DCI	UPC
502 0002	HPS 50/E/MOG
502 0003	HPS 70/E/MOG
502 0004	HPS100/E/MOG
502 0005	HPS 150/55/E/MOG
502 0007	HPS 50/D/MOG
502 0008	HPS 70/D/MOG
502 0009	HPS 100/D/MOG
502 0010	HPS 150/55/D/MOG
502 0050	HPS 250/T/MOG
502 0051	HPS 400/T/MOG
502 0101	HPS 35/E/MED
502 0102	HPS 50/E/MED
502 0103	HPS 70/E/MED
502 0104	HPS 100/E/MED
502 0105	HPS 150/55/E/MED
502 0106	HPS 35/D/MED
502 0107	HPS 50/D/MED
502 0108	HPS 70/D/MED
502 0109	HPS 100/D/MED
502 0110	HPS 150/55/D/MED
502 0111	HPS 150/100/E/MOG
502 0052	HPS 250/D/MOG
502 0053	HPS 400/D/MOG
502 0200	HPS 1000/T/MOG
502 0201	HPS 200/T/MOG
502 0202	HPS 310/T/MOG

Compliance with Standards: EN's and IEC's

Notes and definitions:

CENELEC: The European Union standards-setting body which publishes directives and standards relating to the safety and performance of electrical products and which are incorporated into relevant EU member state standards, laws or regulations.

Low Voltage Directive: A set of EU regulations concerning electrical safety and the harmonisation and adoption of standards.

EMC: Electromagnetic Compatibility standard: Ensures that certain electrical products do not cause interference with the operation of other devices.

EN: European Norm - originally an IEC until accepted by CENELEC.

IEC's: International Electrotechnical Standards: Industry standards normally becoming EN's, which may include both US and European lamps.

CE mark: applied to the lamp packaging materials or the lamp and is evidence that the manufacturer claims to meet all relevant EU standards.

Sylvania High Pressure Sodium lamps comply with the relevant requirements of the following IEC's/EN's unless otherwise stated:

- IEC 61-1 Lamp caps
- IEC 662 High Pressure Sodium lamps
- IEC 923 Ballasts for HID lamps
- IEC 927 Ignitors (including RF emissions)
- IEC 410 QA Inspection Plan
- CE marking

Note: Where relevant, US types will conform to the appropriate ANSI (American National Standards Institute) specification.

Lamp Data (Electrical)

Product Description

Product Code

Note: The electrical values listed below are typical for all lamps of a similar power rating

	Lamp Voltage (V) Volt	Lamp Current (I) Ampere	Power (W) Watt	PFC Value Mfd
European Range (50Hz)				
SHP-TS 50W E27	85	0.76	50	8
SHP-TS 70W E27	90	0.98	70	10
SHP-S 100W E40	100	1.20	100	12
SHP-TS 150W	100	1.80	150	20
SHP-TS 250W	100	2.90	255	40
SHP-S 400W E40	105	4.45	408	45
SHP-TS 400W	100	4.60	400	45
SHP-TS 600	100	6.20	600	60
SHP-T 1000	100	10.60	960	100
SPX ECOARC 98W	155	0.80	98	10
SPX ECOARC 190W	160	1.50	190	18
SPX ECOARC 295W	165	2.30	300	25
	V	I	W	
US Range				
HPS 35/E/MED	52	0.83	35	
HPS 50/E/MED	52	1.18	50	
HPS 70/E/MED	52	1.60	70	
HPS 100/E/MED	55	2.10	100	
HPS 150/55/E/MED	55	3.20	150	
HPS 150/100/E/MOG	100	1.8	150	
HPS 250/D/MOG	100	3.00	250	
HPS 400/D/MOG	100	4.60	400	

Run-up Conditions (220/240 Volt - 380/440 Volt Systems)

During the first 1.5 - 2 minutes after switch on, up to +40% more current is drawn from the supply until the lamp stabilises. Accordingly the following minimum fuse ratings should be used, per lamp:

70 - 100W: 2.5A

150W: 4.0A

250W: 10.0A

400W: 10.0A

1000W: 15.0A

2000W 220/240V: 25.0A

2000W 380/440V: 25.0A

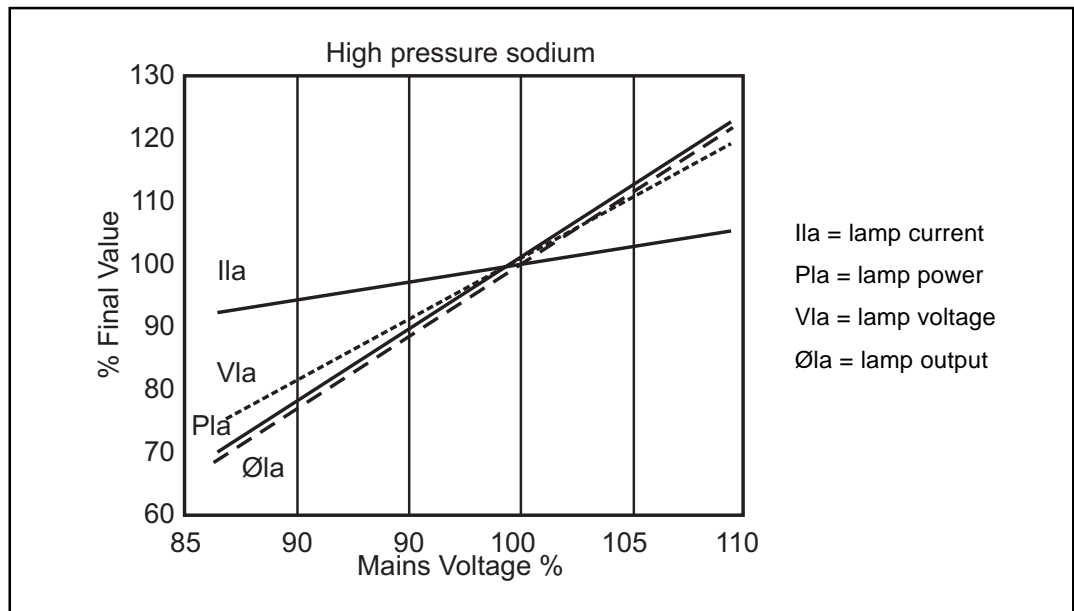
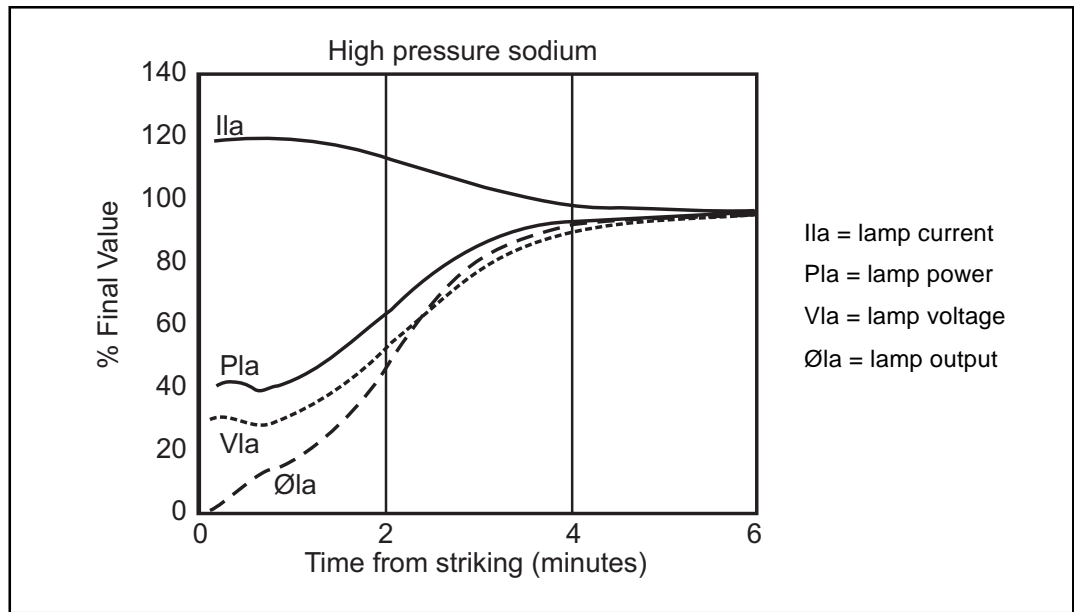
Fuse ratings for multiple lamp circuits:

The fuse rating in amperes below should be used for multiple configurations (up to 6 lamps) run from a single mains supply feed

TYPE	Number of lamps per circuit					
	1	2	3	4	5	6
SHP 70W	4A	4A	4A	4A	6A	6A
SHP 100+150W	4A	4A	6A	10A	10A	10A
SHP 250W	10A	16A	16A	20A	20A	20A
SHP 400W	16A	20A	20A	25A	25A	25A
SHP 1000W	20A	25A	35A	40A	50A	63A

Line Voltage Variation and Lamp Performance

The following graph illustrates the behaviour of medium wattage High Pressure Sodium lamps when the line voltage varies:



Three-Phase Systems (European Range)

With the exception of the 1000W SHP and SHP-T, all other lamps are normally operated on single phase 220V-240V 50Hz supplies (in Europe) or 100V-120V 60Hz (US standard) mains supplies. Cross phase operation with a supply voltage of 380/440V (Europe) or 277V (US standard) can be used for the types mentioned above using appropriate ballasts, but then care should be taken to ensure that the wattage loading on each phase is precisely balanced. A different ignitor to the single phase type may be needed. Circuit breakers should be arranged to disconnect all three phases in the case of a lamp or luminaire extinguishing. The neutral line should always be connected according to the ballast manufacturer's instructions.

Multi-tapped Ballasts (European Range)

Check the ballast marking to ensure that the correct voltage type corresponding to the electricity supply provided is being used. Many manufacturers offer multi-tapped types where a choice of input line voltage is available to suit local conditions. In order to ensure the rated light output is obtained from the lamp it is recommended that tapped ballasts be used, properly matched to the supply voltage. All ballasts should operate a lamp stably at minus 8% of the rated line voltage on the tap chosen.

Use of Ignitors

SHP Low wattage Self-starting types (European Range)

Only the SHP70/**/I series of lamps SHX and the SPX EcoArc lamps (see the listing on page 19) need no external ignitor. These lamps are constructed containing a long-life internally mounted starter which will last the life of the lamp. This enables a minimum configuration of control gear, a ballast and PFC capacitor to be used, enabling highly cost effective designs, particularly for small area floodlights and amenity luminaries.

External Ignitor Lamps - general

Care is needed in choosing or specifying an ignitor for High Pressure Sodium lamps. Any type that has been designed around the high-output SHP SUPER 'S' 300 torr Xenon arc tube fill pressure technology uses *only* the SIP type. The higher fill pressure requires a resonating triple-pulse high voltage train applied to the lamp on each 50 Hz half-cycle during starting as shown in the diagram on page 26.

Sylvania recommends the use of solid state electronic types of the 'Impulse' or 'SIP' Superimposed pulse type, depending upon the lamp type to be operated.

Impulse Type

These ignitors are generally of the high pulse width, single pulse type, operating sometimes only once per 50Hz cycle. Their use is only recommended for the SHP STANDARD series since if used on SHP SUPERS, TwinArc or Mercury Free, hard or difficult starting will occur in later life.

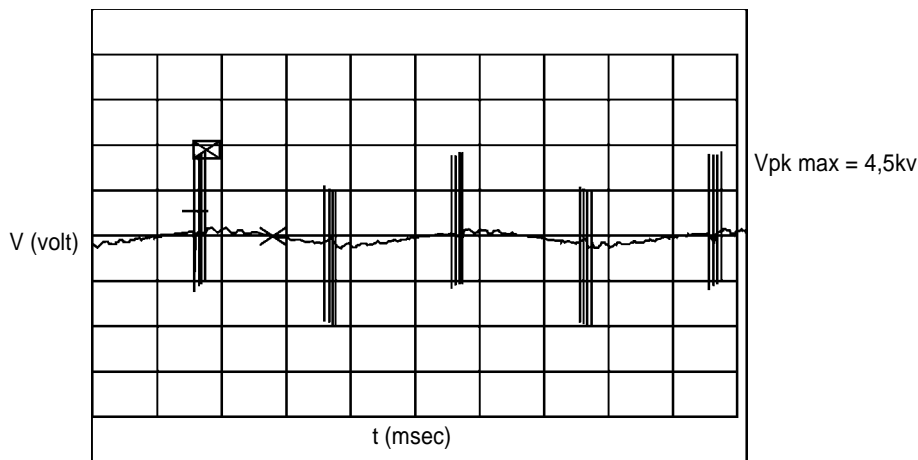
SIP Type (preferred)

All SHP High Pressure Sodium lamps benefit in terms of starting reliability during life from the SIP starting voltage pulse configuration. In case of doubt select an SIP ignitor to avoid any unconsidered problems.

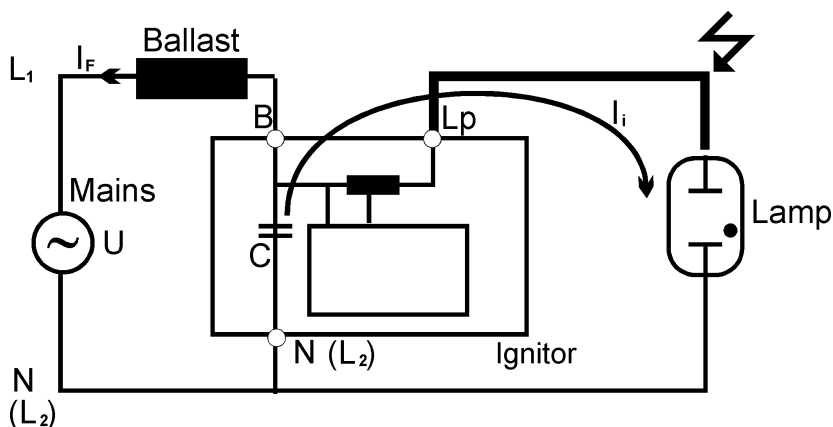
End of life: When a lamp fails certain impulse ignitors will pulse the lamp continuously. SIP solid state electronic ignitors can be designed to self-disconnect from the circuit after a precise time has elapsed, until the electrical supply is reset. In terms of safety, the latter type is to be preferred.

The SIP ignitor operation has the following properties:

1. It does not need to use the ballast as a pulse transformer and therefore stresses the ballast less.
2. A 3.5 to 4.5kV* 2 microsecond width triple pulse train is superimposed on the ballast open circuit voltage during starting at very precise points in each 50Hz half cycle which most favours reliable lamp starting. A typical pulse profile is shown below.



In order to achieve the performance described above the ignitor remains in series with the ballast and lamp after starting and must be of the correct current rating. Check the ignitor manufacturer's label if in doubt. The diagram below illustrates a typical SIP set up:



Lampholder Specification

A standard E27 lampholder (as used for High Pressure Sodium SHP 50 and 70W lamps) is rated for a maximum peak pulse of 2.5kVpk (500V DC rated). Generally a porcelain or temperature resistant GRP lamp holder will be used to ensure limit temperatures are not exceeded.

The E40 lampholder (for 100W -1000W types) is rated for a peak ignitor pulse of 5.0kVpk. Choose a lampholder that complies with the relevant safety standard.

US lamps use E26 (medium base) and E39 (mogul base) sockets, which should be UL listed.

Power Factor Correction

Choke-ignitor circuits without power factor correction will yield a low lagging power factor of between 0.3 and 0.5. This means that only 30-50% of the current drawn from the supply is effective in powering the lamp and is therefore considered undesirable by power supply companies. In most larger commercial or industrial installations the power supply company will financially penalize a consumer where power factor actual values fall below 0.85. Although it is possible to install bulk power factor correction at the mains supply panel it is usual to correct the power factor in each luminaire installed. The conventional method is to add a power factor correction capacitor to the luminaire which is connected across the incoming line terminals. The value of the capacitor required is stated for convenience in the relevant data sheet for the lamp concerned and is also summarised on page 21 above - 'Electrical Data'.

Electromagnetic Compatibility (Europe)

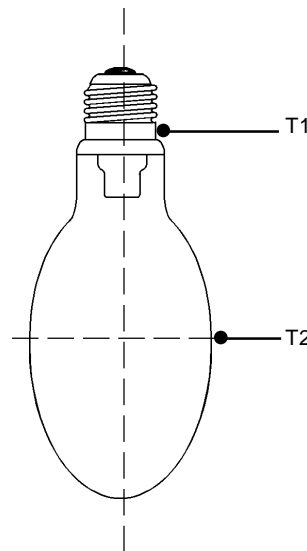
It is necessary to comply with EMC regulations concerning conducted RF emissions. Ballasts and ignitors should comply with IEC 923 and 927 and it is strongly recommended that EMC testing is performed on the luminaire by a competent test house to ensure compliance.

Lamp Testing

If a lamp or its luminaire are suspected as defective consult the section “Troubleshooting” below. For design, photometric or construction test purposes the following points should be observed:

1. Refer to the relevant IEC’s or EN’s listed above, which contain detailed required procedures.
2. Light output (luminous flux) measurements must be made in a 1.5m diameter Ulbricht sphere on lamps aged 100h, in a 25C ambient temperature on an appropriate reference ballast at +/-0.5% of the nominal line voltage. Take care to observe any burning position limitations. Burn the lamp for at least 15 minutes in the sphere and do not move it before measurement.
3. True RMS electrical instruments (CCF capability 2.5) should be used and only switched in after the ignitor has started the lamp and ceased operating in order to avoid the c.5.0 kV pulses affecting the instruments.

Critical Temperatures



SHP lamps have two limit temperatures to be observed. Each limit must be considered as a 'worst case maximum' in situ in the luminaire having paid due regard to the maximum ambient temperature in the installation and +10% line voltage.

Measuring point		Maximum temperature (Celsius)	
T1	- Base type	E27 (150W or lower)	210
		E40 (above 150W)	250
T2	- Bulb	(150W or lower)	310
		(above 150W)	400

Burning Position Recommendations

All High Pressure Sodium lamps are rated as **universal burning** and may be burned in any position.

Lumen Output Selection (European Range)

Code	Description	Lumen Output
------	-------------	--------------

SHP-S and SHP-TS SUPER

20687	SHP-TS 50W E27	4000
20688	SHP-S 50W E27	3600
20678	SHP-TS 70W E27	6500
20690	SHP-S 70W E27	6000
20686	SHP-TS 100W E27	10000
20563	SHP-S 100W E27	9500
20692	SHP-S 100W E40	9500
20685	SHP-TS 150W	17000
20693	SHP-S 150W	15500
20713	SHP-TS 250W	32000
20715	SHP-S 250W	31500
20714	SHP-TS 400W	55000
20716	SHP-S 400W	52500
20805	SHP-TS 600	85000

SHP and SHP-T STANDARD

20480	SHP-T 150	14500
20479	SHP 150	14000
20482	SHP-T 250	28000
20481	SHP 250	26000
20485	SHP-T 400	48000
20484	SHP 400	47000
20504	SHP-T 1000	130000
20550	SHP 50 CO	3300
20552	SHP 50 CL	3500
20455	SHP-T 50 CL	3500
20551	SHP 70 CO	5800
20553	SHP 70 CL	6000
20457	SHP-T 70 CL	6000

SHP MERCURY FREE

20990	SHP-TS 70W MF	6500
20991	SHP-S 70W MF	6000
20992	SHP-TS 100W MF	10000
20993	SHP-S 100W MF	9500
20994	SHP-TS 150W MF	17000
20995	SHP-S 150W MF	15500
20996	SHP-TS 250W MF	32000
20997	SHP-S 250W MF	31500
20998	SHP-TS 400W MF	55000
20999	SHP-S 400W MF	52500

Code	Description	Lumen Output
SHP TWINARC		
20712	SHP-TS 50W TWINARC	4000
20717	SHP-S 50W TWINARC	3600
20718	SHP-TS 70W TWINARC	6500
20719	SHP-S 70W TWINARC	6000
20724	SHP-TS 100W TWINARC	10000
20725	SHP-S 100W TWINARC	9500
20739	SHP-TS 150W TWINARC	17000
20740	SHP-S 150W TWINARC	15500
20741	SHP-TS 250W TWINARC	32000
20742	SHP-S 250W TWINARC	31500
20743	SHP-TS 400W TWINARC	55000
20744	SHP-S 400W TWINARC	52500
SHP STANDBY		
20700	SHP 70W SBY	5800
20695	SHP-T 70W SBY	6000
20699	SHP 100W SBY	8500
20696	SHP-T 100W SBY	9000
20654	SHP 150W SBY	14000
20670	SHP-T 150W SBY	14000
20653	SHP 250W SBY	26000
20559	SHP-T 250W SBY	28000
20652	SHP 400W SBY	47000
20596	SHP-T 400W SBY	48000
SPX ECOARC		
20800	SPX ECOARC 98W	7400
20801	SPX ECOARC 190W	17000
20802	SPX ECOARC 295W	32000
SHX		
20560	SHX 110W	8000
20448	SHX 210W	18000
20490	SHX 350W	34500
SHP - Internal Starter		
20552	SHP50/CL/I	3500
20550	SHP50/CO/I	3300
20553	SHP70/CL/I	6000
20551	SHP70/CO/I	5800

Lumen Output and Dimensions (US Range)

Code	Description	Lumens	Bulb	Max. overall length (mm)	Diameter (mm)
502 0101	HPS 35/E/MED	2250	ED17	138	54
502 0102	HPS 50/E/MED	4000	ED17	138	54
502 0103	HPS 70/E/MED	6000	ED17	138	54
502 0104	HPS 100/E/MED	95000	ED17	138	54
502 0105	HPS 150/55/E/MED	16000	ED17	138	54
502 0106	HPS 35/D/MED	2150	ED17	138	54
502 0107	HPS 50/D/MED	3800	ED17	138	54
502 0108	HPS 70/D/MED	5700	ED17	138	54
502 0109	HPS 100/D/MED	8800	ED17	138	54
502 0110	HPS 150/55/D/MED	15000	ED17	138	54
MOGUL BASE					
502 0002	HPS 50/E/MOG	4000	ED23.5	197	75
502 0003	HPS 70/E/MOG	6000	ED23.5	197	75
502 0004	HPS100/E/MOG	9500	ED23.5	197	75
502 0005	HPS 150/55/E/MOG	16000	ED23.5	197	75
502 0007	HPS 50/D/MOG	3800	ED23.5	197	75
502 0008	HPS 70/D/MOG	5700	ED23.5	197	75
502 0009	HPS 100/D/MOG	8800	ED23.5	197	75
502 0010	HPS 150/55/D/MOG	15000	ED23.5	197	75
502 0050	HPS 250/T/MOG	28000	T46	248	46
502 0051	HPS 400/T/MOG	48000	T46	248	46
502 0052	HPS 250/D/MOG	26000	ED28	292	120
502 0053	HPS 400/D/MOG	47000	ED37	292	120
502 0200	HPS 1000/T/MOG	140000	T57	383	57
502 0201	HPS 200/T/MOG	22000	T46	248	46
502 0202	HPS 310/T/MOG	37000	T46	248	46

Colour Temperature Through Life

High Pressure Sodium lamps will change colour temperature by only a small degree during life. As lamps age two processes come into effect. Firstly there is a slight end blackening of the arc tube and secondly some sodium migration effects occur which alter the mercury-sodium amalgam ratio in the arc tube. The first effect will reduce the light output of the lamp slightly and is described in the section 'Lumen maintenance and Lamp Survival' on page 36. The first and second effect will both have a marked influence on lamp behaviour at the end of life since they will produce the phenomenon known as '**cycling**' and at this point the lamp will be considered to have reached the end of life. The exception is the EcoArc - see next section.

Cycling Effects and High Pressure Sodium Lamps

SHP STANDARD, SUPER, STANDBY TWINARC and SHX

The arc tube of the above types of High Pressure Sodium lamp contain a small amount of mercury and sodium in the Amalgam form. The sodium material vapourises as the lamp runs up and then in a few minutes produces the characteristic SHP golden-white colour. During life the hot sodium metal vapour tends to migrate from the arc tube by a series of physical and chemical processes which changes the composition of the amalgam.

The end blackening also raises the temperature in a critical zone of the arc tube called the **cold spot**. Both of these effects can cause lamp arc voltage to rise (see the nominal data in the table on page 21) to a point beyond which the ballast can no longer sustain the lamp and it will spontaneously extinguish with possibly inconvenient effects for the user.

On cooling down, if the electrical supply is still connected and if the ignitor is still pulsing the lamp it will restart only to extinguish again some minutes later. This is called 'cycling' and it occurs only after 22000 to 30000 hours in the case of the highly reliable long-lived Super range.

SHP MERCURY FREE

These lamps contain no Mercury but sodium migration effects do occur.

SPX ECOARC

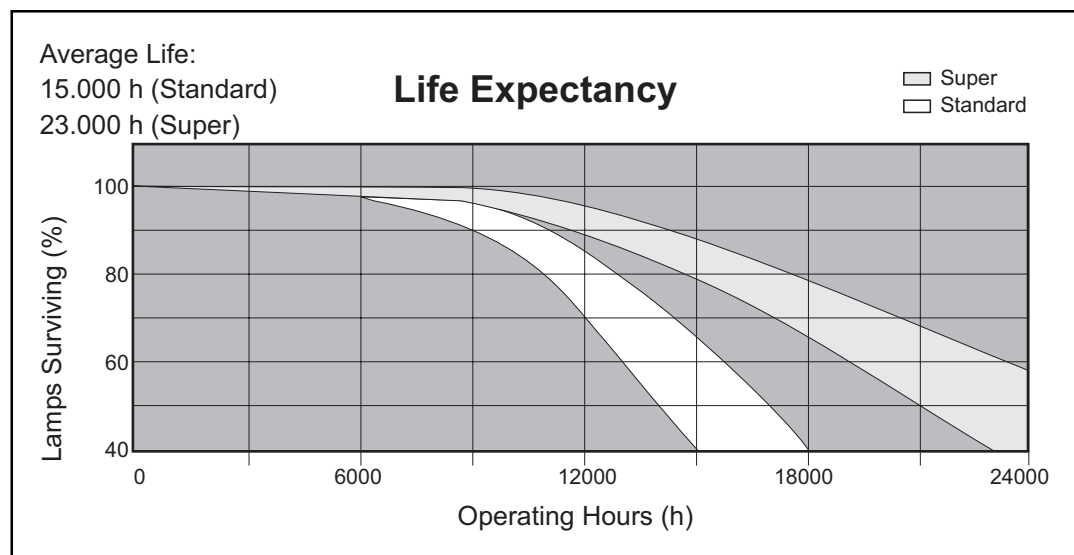
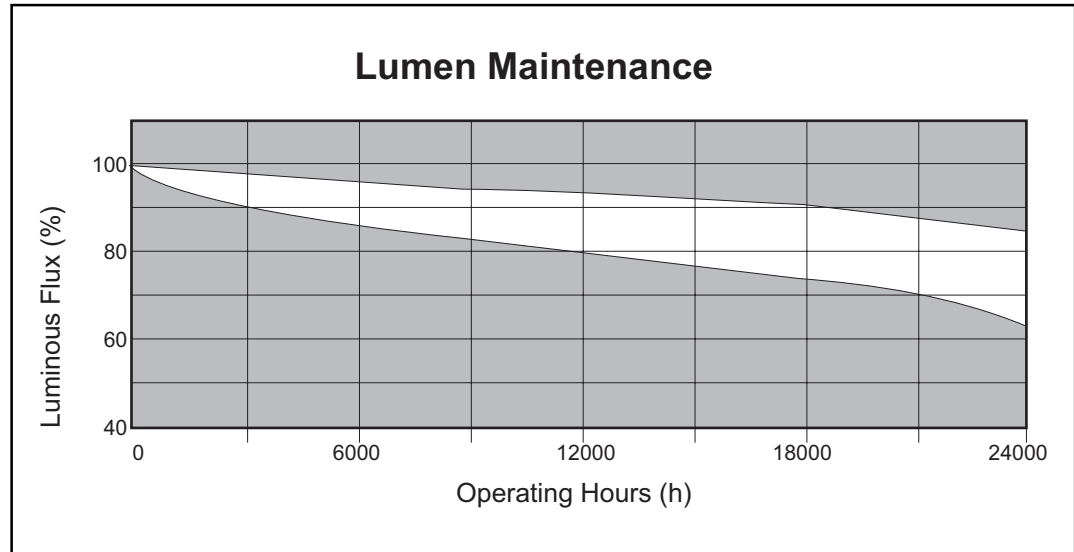
EcoArc lamps are unique in that because this lamp uses only a fraction of the amalgam dose of an SHP - a limited amalgam dose. Also because of a very high pressure Xenon fill, these lamps **do not cycle at the end of life** but effectively assume the characteristics of a Mercury lamp, including changing to a whitish colour, but with some light loss after some average of 24000 hours operation. If for any reason, be it maintenance convenience, safety, or simply to avoid complaints from road lighting users then **EcoArc should even be considered for a new installation** and not just as a retrofit upgrade for an existing Mercury installation.

Lumen Maintenance and Lamp Survival

Standard: SHP/SHP-T 50 - 150W and SHX 110W

Super: SHP-S/SHP-TS 50 - 150W (Mercury Free)

EcoArc: 98W

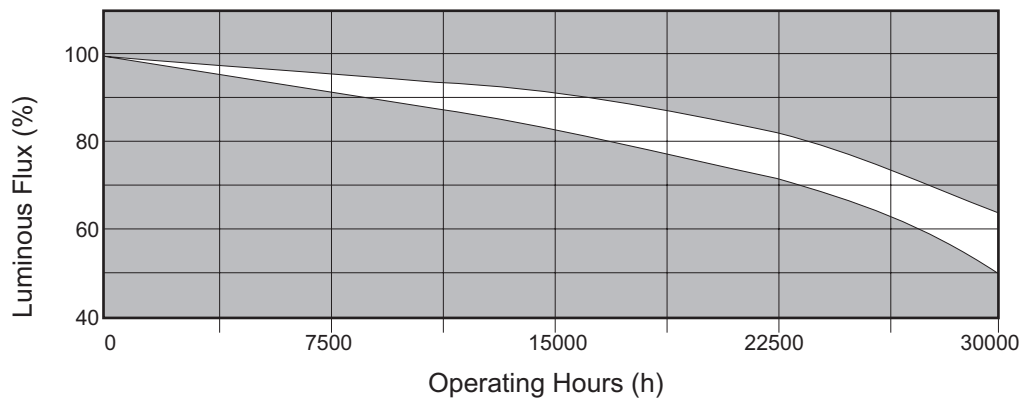


Standard: SHP/SHP-T 250 - 400W and SHX 210 - 350W

Super: SHP-S/SHP-TS 250 - 400W (Mercury Free)

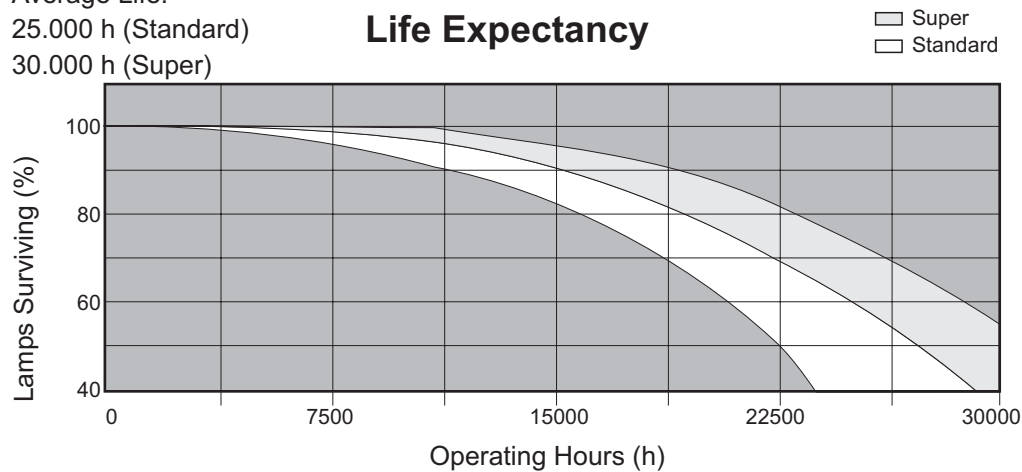
EcoArc: 190W and 295W

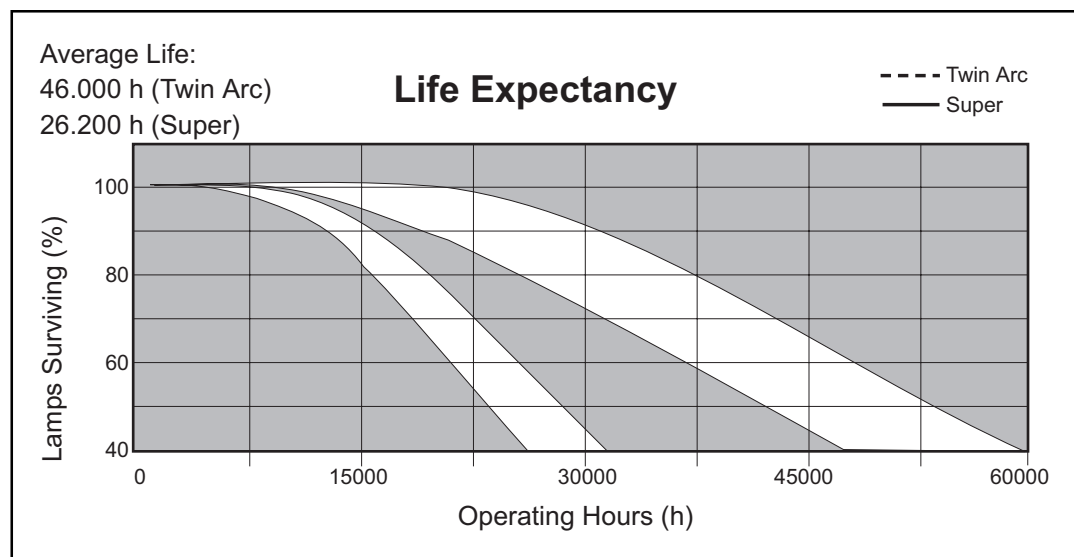
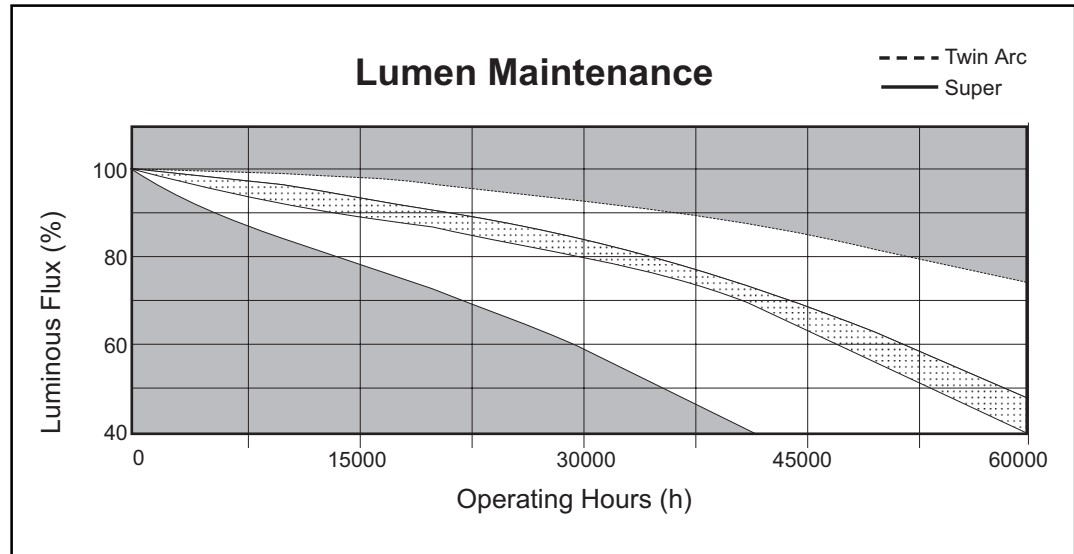
Lumen Maintenance



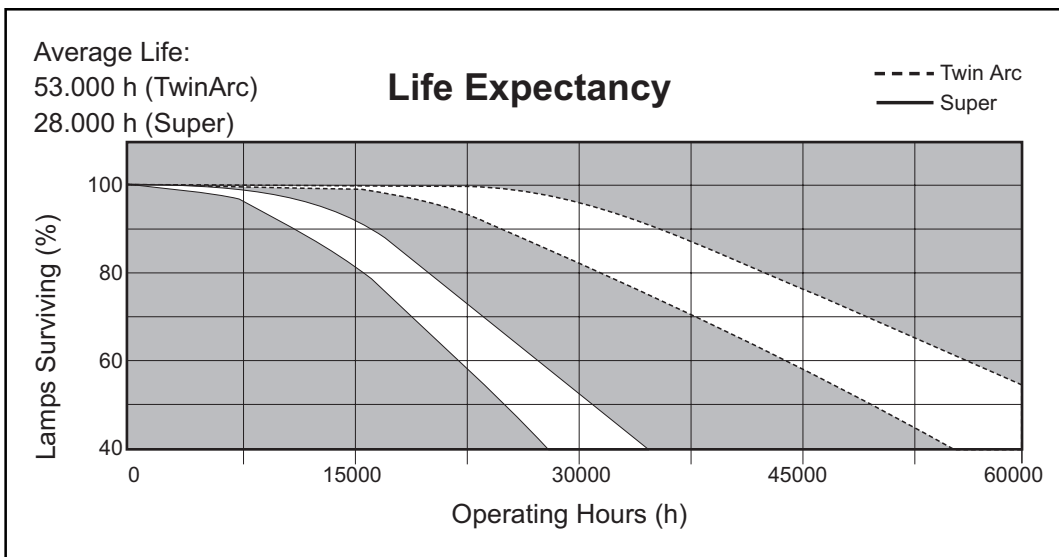
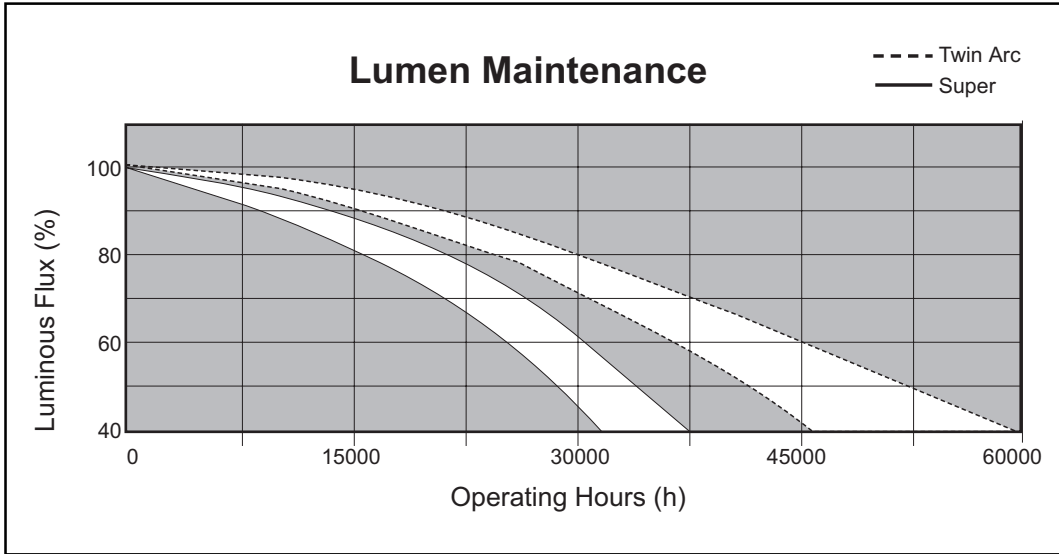
Average Life:
25.000 h (Standard)
30.000 h (Super)

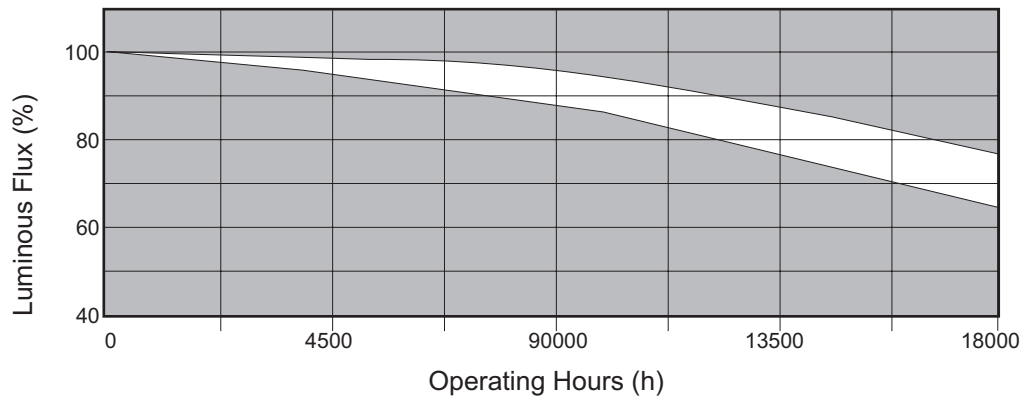
Life Expectancy



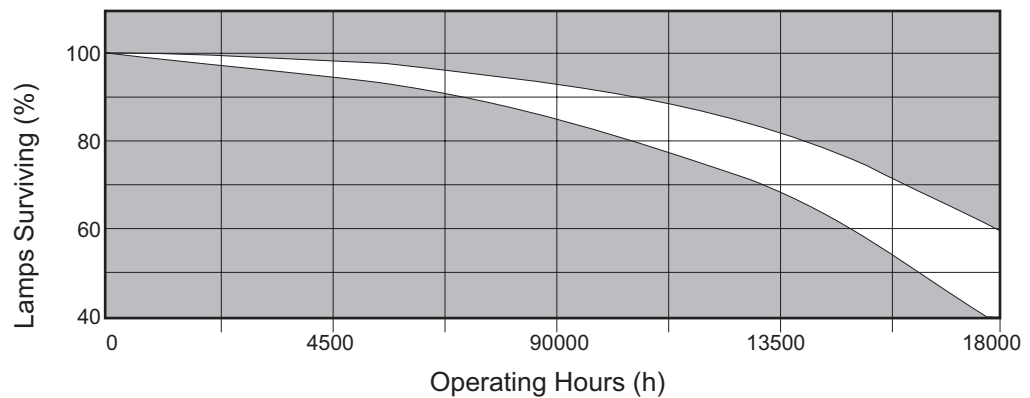
SHP/SHP-T 50 - 150W Super

SHP/SHP-T 250 - 400W Super

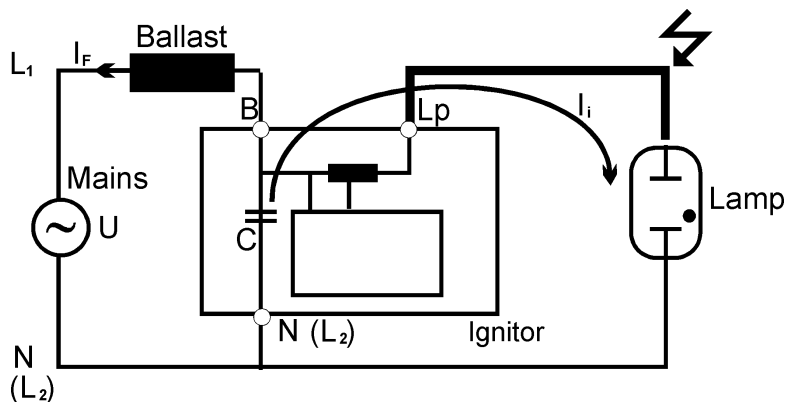


SHP-T 1000W**Lumen Maintenance**

Average Life:
17,500 h

Life Expectancy

Ballast Recommendations



All lamps are ballasted on a series inductor circuit generally laid out as in the above diagram. See also the section on page 25 concerning Ignitors.

The following manufacturers may be consulted for further information:

Europe**USA**

Tridonic

Magnetek Inc.

Vossloh Schwabe

Power Lighting Products Inc.

Magnetek

Advance

Helvar

Atlas Components

Transtar

(Note: The above list is not exhaustive nor intentionally exclusive)

Dimensions (max. overall length and cross-section) (European Range)

Product Description	Bulb Type	Max. Overall length (mm)	Max. Diameter (mm)
SHP-T & SHP-TS 50W E27	Tubular	156	39
SHP-T & SHP-TS 70W E27	Tubular	156	39
SHP-S 100W E40	Elliptical	178	76
SHP-T & SHP-TS 150W	Tubular	211	48
SHP & SHP-S 250W	Elliptical	227	97
SHP-T & SHP-TS 250W	Tubular	260	48
SHP & SHP-S 400W E40	Elliptical	292	122
SHP-T & SHP-TS 400W	Tubular	292	48
SHP-TS 600	Tubular	292	48
SHP-T 1000	Tubular	390	66
<i>Dimensions of TWINARC and MERCURY FREE are identical with the above types, for the same wattage rating.</i>			
SPX ECOARC 98W	Elliptical	178	76
SPX ECOARC 190W	Elliptical	227	91
SPX ECOARC 295W	Elliptical	292	122
SHX 110W		178	76
SHX 210		227	91
SHX 350W		292	122

(US Range) - see page 34

Switching, Dimming and Continuous Operation

Switching

All life data provided for Sylvania High Pressure Sodium lamps is based on the Average Rated Life concept, which is the point at which a statistically significant population of lamps will have reached 50% survival. Switching frequency will have a marked influence on life. The switch cycle used in life test is 2 times per day, 11 hours on and 1 hour off. Life tests are conducted at nominal line voltage.

Dimming - General Note

Dimming systems for SHP lamps are offered by specialist manufacturers for road lighting applications where when traffic levels are significantly lower, such as in the early morning hours and energy can be saved by reducing the power supplied to the lamps. Because the SHP lamp arc tubes are made from a ceramic material, PCA, they cannot be subjected to rapid changes of power loading and temperature without the risk of causing cracks and leaks which will lead to premature sodium loss and short life. For this reason bi-level hard-stepping systems should be carefully evaluated before use. Good dimming systems will gradually raise or lower the lamp voltage by about 10 volts per minute in order not to risk inappropriate thermal stress to the arc tube.

Lamp Cap Types - European Range

The lamp caps used for HID lamps are described in detail in IEC 61-1/EN60061-1 and the relevant lamp data sheet as follows:

50 and 70W types: E27/27

100W E27: E27/27

150W, 250W, 400W
and 600W: E40/45

Base Types - US Range

35 - 150W types: E26 medium base or E39 mogul base

150, 200, 250, 310 and 400W: E39 mogul base

Luminaire Design Considerations

Luminaires must be constructed to the requirements of relevant sections of IEC598/EN60598 or UL requirements (USA).

Enclosure and Safety

Enclosure is not required for any Sylvania High Pressure Sodium lamp as the internal operating pressures are either below, or only slightly above, atmospheric pressure.

Ultra-violet Radiation and Protection

No special precautions need be taken as the small amount of UVA produced by these lamps has no significant ill-effects in the type of application recommended in this brochure.

Disposal

The disposal of all Discharge lamps must be treated as a specialised task and confided to a properly trained person. High Pressure Sodium lamps contain small amounts of Mercury and Sodium in the arc tube which is normally in a solid mass.

The arc tube is surrounded by an outer jacket which contains a vacuum. Breaking the outer jacket must be done wearing safety glasses, gloves and any other equipment prescribed by the Health and Safety Authority and should be performed in a well ventilated space in the dry. The outer jacket glass will implode on breaking so releasing glass fragments and should be done inside an open-topped metal container. These fragments may be crushed and recycled after collection.

The arc tubes should not be broken under any circumstances or exposed to water but can be temporarily stored in the dry before putting to waste. Local Authority waste disposal regulations are to be observed at all times and in the case of doubt consult the appropriate authority. It is not necessary to return lamps to the manufacturer. Specialised recycling companies should preferably be used to carry out disposal where available.

Troubleshooting

General: When investigating an apparent fault it is imperative for safety reasons that the operating circuit is switched off.

Always check the fuse or circuit breaker in the external circuit first. If tripped, reset or replace the fuse cartridge but if the fuse trips out again then it is most likely the fault is in the luminaire (device) or lamp. Next ensure that the correct lamp has been inserted into the luminaire socket. The maker's label should give the correct information.

Please use the following checklist in order to determine how to rectify the fault:

A. Lamp out

1. Check that the supply is switched on and that the external fuse has not tripped. If the fuse trips again then:
 - a. Check that the power factor capacitor has not developed a short circuit condition. You may remove it temporarily to check.
 - b. Check that all wiring insulation is in good condition. An electric strength test with a PAT (portable appliance tester) should be made. Replace any defective wiring. If the lamp still does not start then switch off and verify that all internal wiring connections in the luminaire are properly connected and go to 2.
2. Make sure that there is good 'Earth' continuity between the terminal block and the luminaire frame. Repeat the PAT test and go to 3.
3. If no attempt to start the lamp is observed, switch off again and withdraw the device's local fuse, if serviceable. Check or replace the fuse.
4. If the lamp still does not start and the operating circuit contains a starter, replace it.
5. Isolate the ballast and for choke inductors only perform a continuity check using a multi-meter equipped with a low voltage DC battery. Never 'Megger' test any ballast for any reason. If an open circuit or zero impedance is found then replace the ballast.
6. If the lamp still does not start consult the manufacturer.

B. Lamp does not appear to give its full output

1. Ensure the correct lamp is fitted.
2. Check the electrical supply available voltage and match this it to the ballast maker's label information. If ballast taps have been provided make sure the most suitable one has been connected.
3. Check that the luminaire is venting properly to avoid heat building up. Many instances of overheating are related to poor design or over-running a luminaire with a lamp and/or ballast combination for which it was never designed. Sometimes restricted ventilation or improper burning position may be the cause. Use all common sense methods to allow the luminaire to thermally stabilise properly. Consult the luminaire manufacturer.
4. The lamp is not burning in the optimum position in the luminaire/ installation. Consult the manufacturer's data sheets.

C. Lamp flashes and does not ignite again

No ballast present - rectify the fault

Ballast short-circuited - replace the choke

Check the connections with the manufacturer's label

Capacitor in parallel with lamp - replace and connect properly

D. Lamp does not ignite, but remains in the glow stage

Lamp damaged after over loading

Ignitor defective - replace

Choke open circuit voltage is low - check for correct choke type

E. Lamp cycles (ignites but then extinguishes quickly) or shows signs of arc tube blackening

Lamp is at the end of life -replace

Luminaire is too hot - go to 3 above.

Line voltage variation is too great - check and consult the electricity supplier

F. Lamp develops bulges or crevices in the outer jacket

Overloaded, check ballast type and all connections. Replace lamp.

G. Lamps operate with abnormal colour

- Check only after 100 hours operation. Then check burning position is within limits prescribed on the data sheets.

Table of Equivalents

Product Descriptions - European Range

Lamp Type	Sylvania	Philips	Osram	Radium	Mazda	GE Europe
High Pressure Sodium	SHP	SON	NAV-E	RNP-E	MACS	LUCAL
Elliptical	SHP-S	SON PLUS	NAV SUPER			LUCALOX-E
Internal Ignitor	SHP/**/**/I	SON				LUCALOX-I
Tubular	SHP-T	SON-T	NAV-T	RNP-T	MAC	LUCALOX-T
	SHP-TS	SON-T PLUS	NAV-T SUPER			LUCALOX-HO
Mercury Retrofit	SPX EcoArc		NAV-E		MAX	
High Colour Rendering		WHITE SON	NAV DE LUXE			LUCALOX
Double Arc Tube	SHP-S Twinarc					
	SHP-TS Twinarc					
Mercury-Free	SHP MF					
Horticultural	SHP Gro-LUX	SON Agro-T	Planta	---	---	---

Product Descriptions - US Range

Lamp Type	Sylvania	Philips	OSI	Eye	GE	
SHP	HPS	Ceramalux	Lumalux	Sunlux	Lucalox	
Mercury Retro	SHX	Retrolux	Unalux	UltraAce	Ezlux	
Double Arc Tube	New	DualArc	SBY	Twinarc TT	Standby	
Internal Ignitor				Ignitron		
Plant Growth	New	SON Agro	Lumalux	Hortilux	Lucalox	

Worldwide Marketing and Manufacturing Locations



**Sylvania
Lighting
International**

AUSTRIA

Sylvania Ges.mbh
Otto-Probst-Str. 22-24
1100 WIEN

BELGIUM

Sylvania N.V.
Cross Roads Park
Wezembeekstraat 2
1930 ZAVENTEM
Tel. (+32) 2 711 05 00
Fax (+32) 2 725 60 60

MANUFACTURING LOCATION:

Sylvania N.V.
Industriepark
3300 TIENEN
Tel. (+32) 16 80 02 11
Fax (+32) 16 81 89 45

DENMARK

Sylvania A/S
Jernholmen 38
2650 HVIDOVRE
Tel. (+45) 36 78 36 00
Fax (+45) 36 78 05 53

FINLAND

Sylvania-Lumiance Oy
Sirrikuja 3A
00940 HELSINKI
Tel. (+358) 954 21 21 00
Fax (+358) 954 21 21 30

FRANCE

MARKETING LOCATION:

SLI France S.A.
(Sylvania, Claude, Concord)
29, rue des Trois Fontanot
92722 NANTERRE Cedex, FRANCE
Tel. (+33) 1 555 111 51
Fax (+33) 1 555 111 52

MANUFACTURING LOCATIONS:

22, rue Berjon
69336 LYON Cedex 09
Tel. (+33) 72 19 12 00
Fax (+33) 72 19 12 01-3

LIGHTING CENTRE

rue des Acières
42000 SAINT-ETIENNE
Tel. (+33) 77 92 27 30
Fax (+33) 77 92 27 31

MANUFACTURING LOCATION:

Z.I. de Montreynaud
11, Rue Victor Grignard
42000 SAINT-ETIENNE
Tel. (+33) 77 92 27 27
Fax (+33) 77 93 41 50

GERMANY

SLI Lichtsysteme GmbH
Graf-Zeppelin Str. 9-11
91056 ERLANGEN
mail: Postfach 1740
D-91051 ERLANGEN

CEG MARKETING:

Tel. (+49) 9131 7930
Fax Marketing (+49) 9131 793-388
Export/East (+49) 9131 793-496

MANUFACTURING LOCATION:

Tel. (+49) 9131 7930
Fax (+49) 9131 793-203

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19.5 Klm Lavriou Ave.
19002 Peania
Tel. (+30) 1 66 46 564/565/566
Fax (+30) 1 66 47 142

ITALY

Sylvania S.p.A.
Via Figino 105
20016 PERO MI
Tel. (+39) 02 3393 111 (must dial 0!)
Fax (+39) 02 3392 1191

NETHERLANDS

Lumiance bv
Perkinsbaan 15a
NL-3439 ND NIEUWEGEIN
P.O.Box 1392
NL-3430 BJ NIEUWEGEIN
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Fax (+31) 30 604 78 97

MANUFACTURING LOCATION:

Lumiance bv
Oudeweg 155
P.O. Box 6310
2031 CC HAARLEM
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Fax (+31) 23 531 72 86

NORWAY

Sylvania A/S
Postboks 94 Lambertseter
Sandstuveien 60A
1184 OSLO
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Fax (+47) 23 16 5253

PORTUGAL

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1700 Lisbon
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Fax (+351) 1 793 7737

SPAIN

SLI Sylvania S.A.
Los Llanos de Jerez 17
Poligono Industrial
28820 COSLADA (MADRID)
Tel. (+34) 1 669 90 00
Fax (+34) 1 674 11 04 (gen.mgr.)
Fax (+34) 1 671 60 61 (marketing)

SWEDEN

Sylvania AB
Uppköparvägen 7
12044 Årsta
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Fax (+46) 8 556 322 10

SWITZERLAND

EXPORT DEPARTMENT:

Sylvania Lighting S.A.
4, Chemin des Léchères
1217 MEYRIN
Tel. (+41) 22 719 8535
Fax (+41) 22 719 8531

SWISS SALES OFFICES:

Sylvania Lighting S.A.
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1217 MEYRIN
Tel. (+41) 22 719 8580
Fax (+41) 22 719 8581

U.K.

Concord Lighting Ltd.
Avis Way
NEWHAVEN
East Sussex BN9 OED
Tel. (+44) 1273 51 58 11
Fax (+44) 1273 51 26 88

LONDON SHOWROOM:

174 High Holborn
LONDON WC1V 7AA
Tel. (+44) 171 497 14 00
Fax (+44) 171 497 14 04

SHIPLEY SALES OFFICES:

SLI Lighting Ltd.
Otley Road
Charlestown, SHIPLEY
West Yorkshire BD17 7SN
Tel. (+44) 1274 53 25 52
Fax (+44) 1274 53 38 12

MANUFACTURING LOCATION:

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