Tungsten Halogen Lamps

SYLVANIA GTE

Efficient Lighting Solutions

Tungsten Halogen Lamps — A History

The conventional incandescent lamp, still today the most-purchased light source in the world, has been the subject of improvement since its inception at the turn of the last century. Since around 1959 an important variant — the tungsten halogen lamp — has been successfully commercialised. One of the limiting features of incandescent lamp design is the evaporation of tungsten from the hot wire filament (coil) which blackens the inside bulb and which eventually leads to a break. The tungsten halogen lamp is designed to significantly reduce the filament evaporation rate and eliminate the blackening process. This process is described in detail later on.

Tungsten halogen lamp operation is essentially dependent on a rigourous distribution of temperatures from filament to bulb wall to the hermetic seal admitting the electrical connections. For the most part these lamps are also high power light sources involving very strong and compactly-made filaments. The general design resulting from these considerations are ranges of very compact (therefore photometrically efficient) and powerful (high luminous flux) lamps. Moreover, the halogen cycle, which controls the tungsten filament evaporation rate, permits much higher filament operating temperatures. As a result, compared with our conventional incandescent lamp, the light output (lumens) per watt of electrical energy consumed is almost double.

Today Tungsten Halogen lamps come in a wide variety of shapes and sizes serving floodlighting, display, airfield, auto vehicle, photographic, medical and infra-red heating applications. This catalogue deals with the Sylvania programme of lamps for general lighting needs.

More recently Erlangen provided a very special new lamp design for a successful Space Lab experiment to grow silicon crystals in zero gravity in cooperation with the University of Freiburg and the MBB Company. The lamp design compensated for the lack of gravity which otherwise provides fill gas convection currents to stabilize the lamp thermally.

Sylvania lamp engineers solved the problem via radical design studies involving special filament constructions.

Sylvania is backed by the full resources of one of the world's largest industrial organizations, the General Telephone & Electronics Group. That's the GTE in GTE Sylvania — which represents 200,000 employees, 150 research, manufacturing and service facilities on all 5 continents with an annual turnover of > $ 14 billion.

SYLVANIA Tungsten Halogen Manufacturing

The European home of Sylvania's manufacturing operations for tungsten halogen lamps is Erlangen, West Germany. Since the first days of operation 25 years ago by Sylvania Tungsten Halogen lamps for general lighting, for fusing, for copying and photographic purposes have been made. The introduction of the Sylvania Energy Saver Tungsten Halogen programme was made possible there using advanced computer-programmed lamp fill techniques.

The Tungsten Halogen Cycle

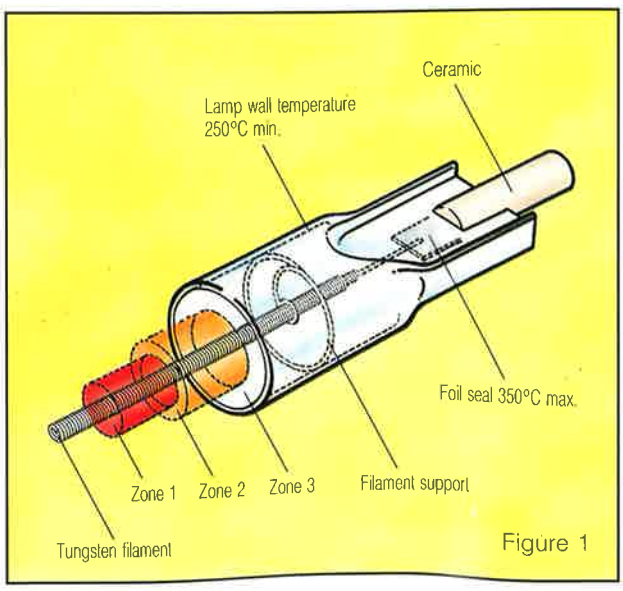


Figure 1

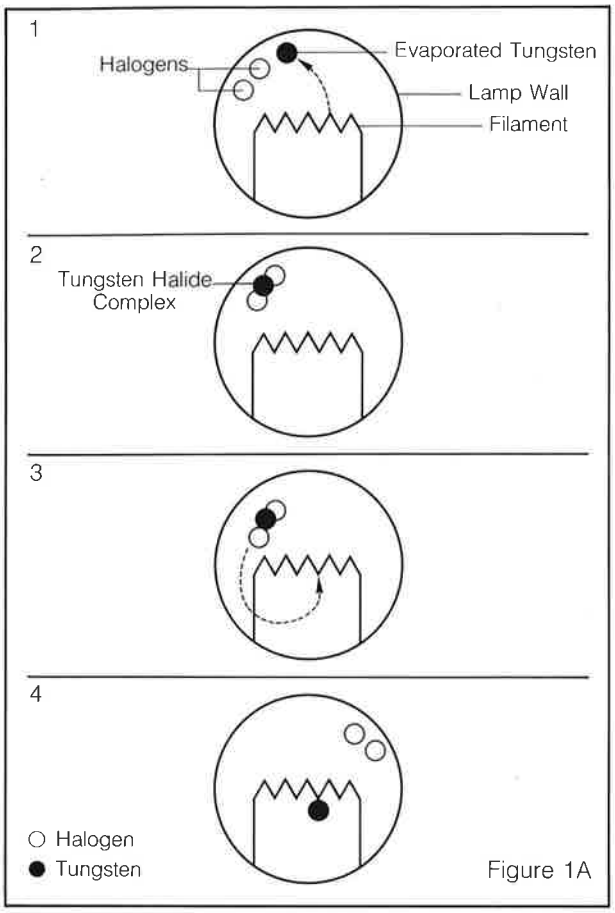


Figure 1A

Figures 1 and 1A illustrate the halogen cycle as applied to a floodlight lamp. The ceramic cap containing a contact button is connected via a molybdenum foil seal to a tungsten filament enclosed hermetically within a translucent quartz envelope. The filament operating temperature is typically 2600°C and is surrounded by a chemically inert fill gas such as nitrogen and/or argon, also halogens such as bromine or iodine in easy dissociable compound form and gettering or scavenging agents. A thermal gradient is formed between the coil and the lamp wall whose operating temperature should be always above 250°C. The tungsten evaporate in the region of the coil mixes with dissociated halogens but with no chemical reactions. In the centre the atoms of tungsten and the halogen atoms form tungsten halides. This process completes in the proximity of the bulb wall where, providing the temperature is correct, the tungsten halide diffuses back toward the centre dissociating into the atomic form very close to the coil.

The tungsten atoms in the vapour phase are then in excess for stable equilibrium and the tungsten will re-deposit on the coil, the exact locations depend on the coil local temperatures.

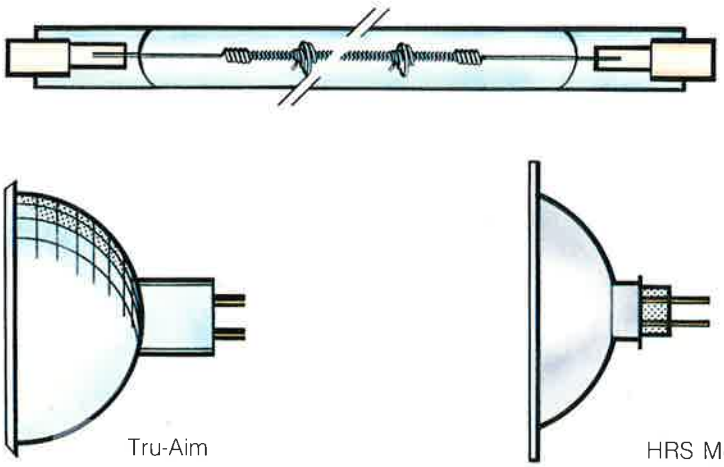


Figure 2

Constructional Features and Materials

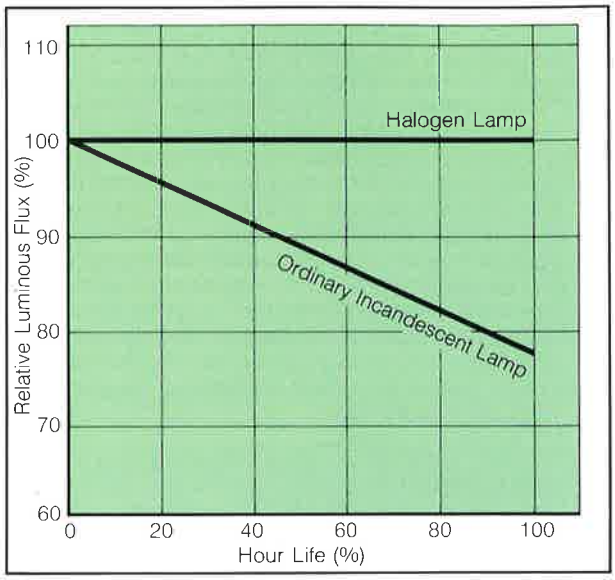
Bulb Shapes and Sizes

Tungsten Halogen lamps are mostly constructed from quartz (fused silica) or aluminosilicate hard glass which is essential to maintain the high temperatures and pressures required for operation of the halogen cycle.

Bulb shapes are tubular double-ended for floodlights, single-ended capsule types or capsules integrated into metal or dichroic glass reflectors for display lighting work.

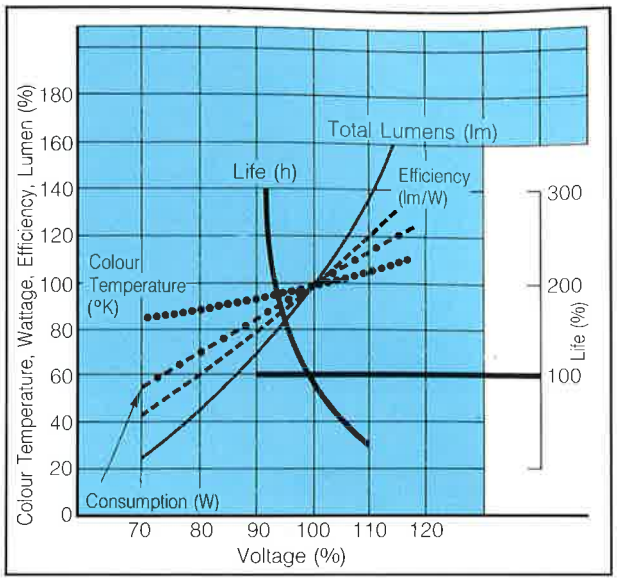
Bulb materials must be capable of withstanding high operating temperatures (up to 900°C) and pressures. Quartz has a melting point of 1650°C and can usually be operated at up to 1100°C satisfactorily. Up to 600°C operating temperature may be served by high-silica glass, for instance in some photo lamps. Aluminosilicate hard glass may be used in low voltage Tungsten Halogen lamps, 50W-rating or less, with wall temperatures around 400°C.

Lumen Maintenance Curve



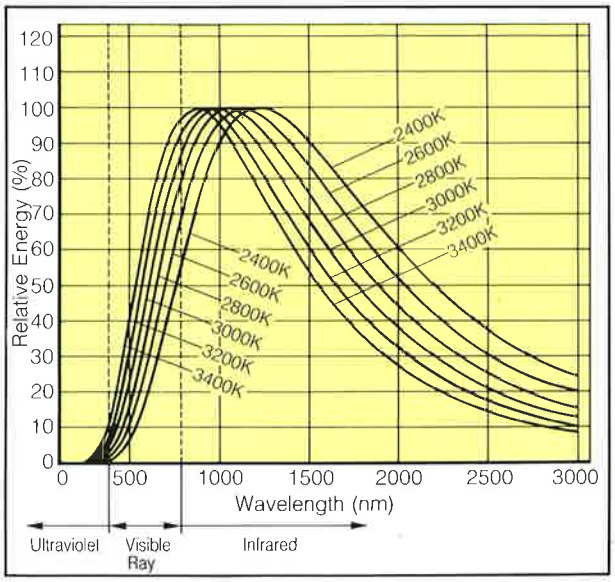
Voltage Fluctuation Characteristics of Halogen Lamp

This diagram shows average figures of common characteristics of halogen lamps.
Figures vary according to type of halogen lamp.

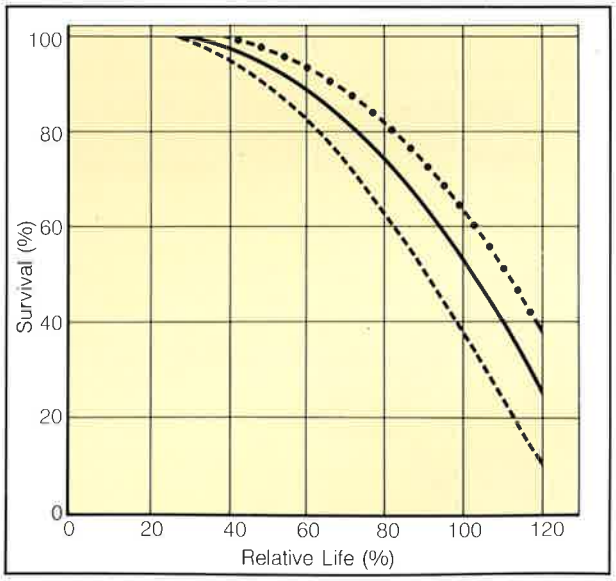


Spectral Energy Distribution

Tungsten Halogen Lamps have the same colour rendering properties and spectral energy distributions as conventional incandescent lamps, but they have increased efficiency both from a lumen output and a colour temperature standpoint. Tungsten Halogen Lamps can operate at much higher internal pressures than conventional incandescent lamps.



Lamp Life



Lamp Fills

Tungsten Halogen lamps are filled with argon/nitrogen, krypton/argon or other similar combinations plus a halogen vapour fill. The halogen vapour may be iodine or one of its organic derivates (e.g. CH_3I-methyl iodide) or of bromine (e.g. CH_3Br, CH_2Br_2 – Methyl or Methylene bromide).

In addition to these compounds, needed to activate the halogen regenerative cycle, the operating pressure is crucial to the filament evaporation rate therefore lamp life. The operating gas pressure is therefore at plus several atmospheres. A getter such as bromophosphonitrite $(PNBr_2)_{3,4}$ is used to reduce traces of hydrogen, oxygen or water vapour which may be present in minute amounts.

Filaments

Tungsten Halogen lamp filaments operate at very high temperatures and are generally of close-wound construction. They must remain rigid, without sagging, throughout life. The purity of the material and the precision thickness of the tungsten wire are also essential to long life.

Tungsten Halogen Lamps

2.40.1	**Hi-Light ES** Tungsten Halogen Floodlight Lamps	**225 V, 245 V;** 450 W, 900 W, 1250 W, 1750 W
2.41.1	Standard Tungsten Halogen Floodlight Lamps	**225 V;** 250 W, 300 W, 500 W, 750 W, 1000 W, 1500 W, 2000 W
2.41.2	Standard Tungsten Halogen Floodlight Lamps	**245 V;** 300 W, 500 W, 750 W, 1000 W, 1500 W, 2000 W
2.41.3	Standard Tungsten Halogen Floodlight Lamps	**120 V;** 300 W, 500 W
2.42.1	Single-ended High Voltage Tungsten Halogen Lamps	**225 V, 245 V;** 250 W Mini-can, 250 W E14, 250 W E27
2.43.1	**Hi-Light HRS** Low Voltage Tungsten Halogen Lamps without reflector	**12 V;** 20 W/G4, 50 W/GY 6.35, 100 W/GY 6.35, 50 W/GY 6.35 for traffic signals
2.43.2	**Hi-Light HRS** Low Voltage Tungsten Halogen Lamps with 48 mm dia. metal reflector	**12 V;** 20 W 10° Spot/G4, 20 W 15° Flood/G4
2.43.3	**Hi-Light HRS** Low Voltage Tungsten Halogen Lamps with 70 mm dia. metal reflector	**12 V;** 20 W 10° Spot/BA15d; 30° Flood/BA15d **12 V;** 50 W 10° Spot/BA15d; 30° Flood/BA15d
2.44.1a	**Hi-Light Tru-Aim** Low Voltage Tungsten Halogen Lamps with 50 mm dia. dichroic reflector	
2.44.1b	ENL Data	12 V 50 W 30° Narrow Flood
2.44.2b	EXN Data	12 V 50 W 38° Flood
2.44.3b	ESX Data	12 V 20 W 12° Narrow Spot
2.44.4b	EYR Data	12 V 42 W 12° Narrow Spot
2.44.5b	EXT Data	12 V 50 W 13° Narrow Spot
2.44.6b	EYF Data	12 V 75 W 14° Narrow Spot
2.44.7b	EXZ Data	12 V 50 W 24° Spot
2.44.8b	BAB Data	12 V 20 W 36° Flood
2.44.9b	EYC Data	12 V 75 W 38° Flood
2.45.1	**Hi-Light Tru-Aim** Low Voltage Tungsten Halogen Lamps with 50 mm dia. coloured dichroic reflector	**12 V;** 50 W 13° Spot in red, yellow, green, blue

Tungsten Halogen Lamp Product Information

Description: **Hi-Light ES** Tungsten Halogen Floodlight Lamps
450 W, 900 W, 1250 W, 1750 W
in **225 V and 245 V**

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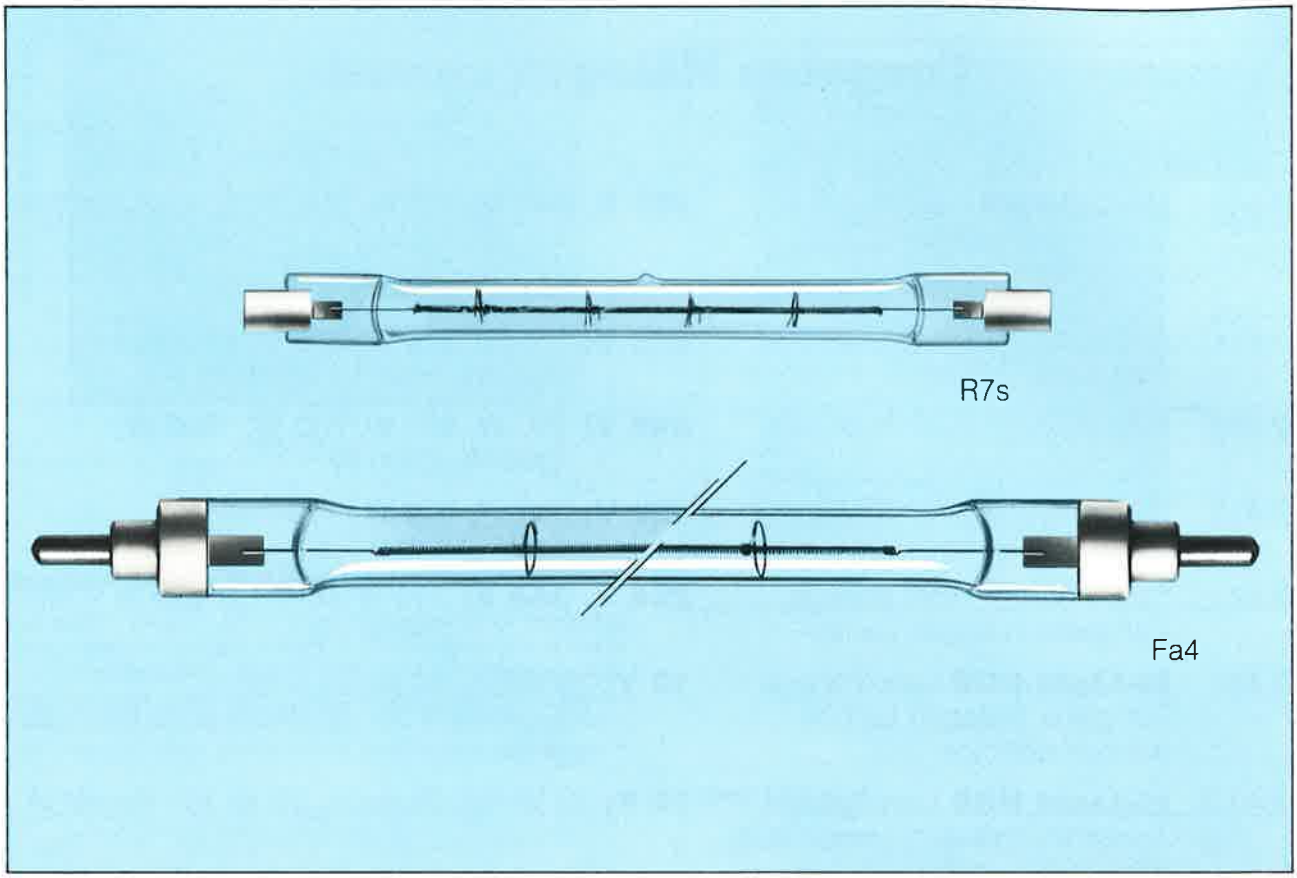

Mechanical Data and Illumination Characteristics

General Information								
Lamp Rating	225 V **450 W**	245 V **450 W**	225 V **900 W**	245 V **900 W**	225V **1250W**	245V **1250W**	225V **1750W**	245V **1750W**
Type Description	L 2291	L 2292	L 2289	L 2290	L 2280	L 2281	L 2287	L 2288
Mechanical Data								
Maximum Overall Length mm	119.6	119.6	191.1	191.1	256.1	256.1	334.4	334.4
Contact Length, nom. mm	114.2	114.2	185.7	185.7	250.7	250.7	—	—
Clearance Length, max. mm	117.6	117.6	189.1	189.1	254.1	254.1	322.0	322.0
Bulb Diameter, max. mm	12	12	12	12	12	12	12	12
Bulb Type/Finish	Clear/Tubular	Clear/Tubular	Clear/Tubular	Clear/Tubular	Clear/Tubular	Clear/Tubular	Clear/Tubular	Clear/Tubular
Cap	R7s	R7s	R7s	R7s	R7s	R7s	Fa4	Fa4
Average Life (hrs)	2000	2000	2000	2000	2000	2000	2000	2000
Illumination Characteristics								
Nominal lm	9500	9500	22000	22000	33000	33000	44000	44000

Features **Energy Saver replacement for Standard Tungsten Halogen Floodlight Lamps**

- 450 W replaces 500 W saving 10% energy
- 900 W replaces 1000 W saving 10% energy
- 1250 W replaces 1500 W saving 16% energy
- 1750 W replaces 2000 W saving 13% energy

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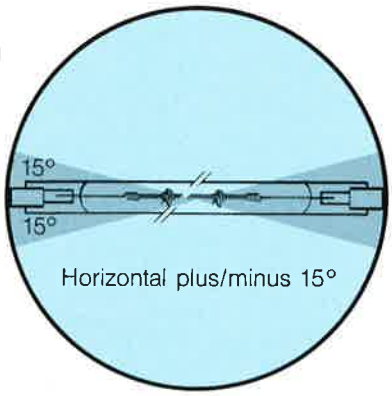
Applications

- Floodlighting of Building Sites, Car Parks Monuments, Parks and Gardens especially where instant light after switch-on is needed

Burning Position



Construction/Performance Data

Thermal:

Min. Bulb Wall Temperature: 250°C

Max. Pinch Temperature : 350°C

Construction:

Bulb: T3 Quartz/Clear.

Cap:

According to IEC Publication 61

Ordering Information								
Lamp Rating	225 V **450 W**	245 V **450 W**	225 V **900 W**	245 V **900 W**	225 V **1250 W**	245 V **1250 W**	225 V **1750 W**	245 V **1750 W**
Type Description	L 2291	L 2292	L 2289	L 2290	L 2280	L 2281	L 2287	L 2288
Packing Quantity	10	10	10	10	10	10	10	10
Order Code	21778	21779	21776	21777	21740	21741	21774	21775

Special Notes

(1) Do not touch the quartz envelope with bare fingers.
(2) Use quick-acting H.R.C. fuses in the external circuit.
(3) Use in luminaires preferably fitted with toughened front glasses.
(4) All wattage and lumen ratings are subject to tolerances.

Tungsten Halogen Lamp Product Information

Description: Standard Tungsten Halogen Floodlight Lamps 250 W, 300 W, 500 W, 750 W, 1000 W, 1500 W, 2000 W in **245 V**

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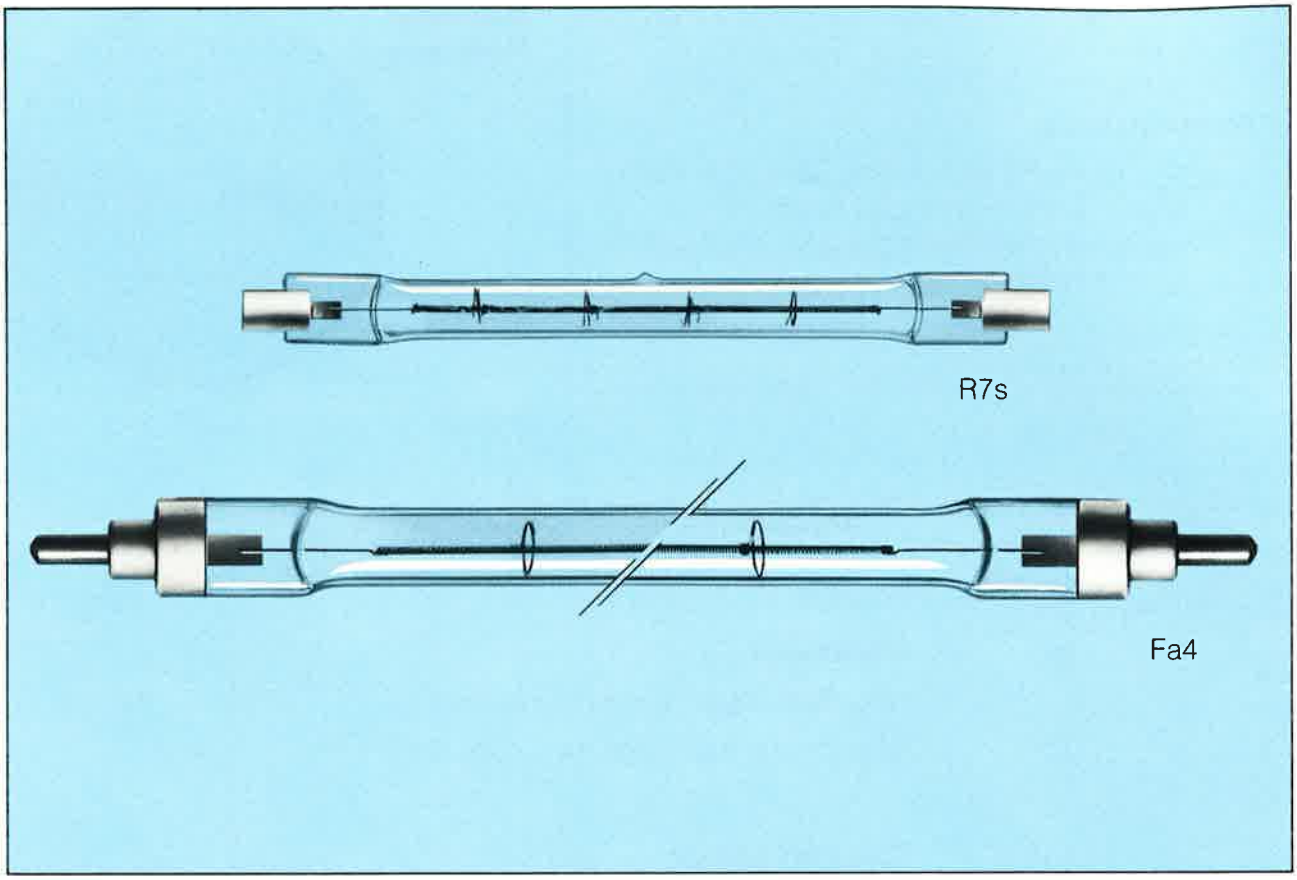

Mechanical Data and Illumination Characteristics

General Information								
Lamp Rating	245 V **250 W**	245 V **300 W**	245 V **500 W**	245 V **750 W**	245 V **1000 W**	245 V **1500 W**	245 V **2000 W**	
Type Description	L 2283	L 2270	L 2229	L 2230	L 2228	L 2201	L 2269	
Mechanical Data								
Maximum Overall Length mm	119.6	119.6	119.6	191.1	191.1	256.1	334.4	
Contact Length, nom. mm	114.2	114.2	114.2	185.7	185.7	250.7	—	
Clearance Length, max. mm	117.6	117.6	117.6	189.1	189.1	254.1	322.0	
Bulb Diameter, max. mm	9	9	12	12	12	12	12	
Bulb Type/Finish	Clear/Tubular	Clear/Tubular	Clear/Tubular	Clear/Tubular	Clear/Tubular	Clear/Tubular	Clear/Tubular	
Cap	R7s	R7s	R7s	R7s	R7s	R7s	Fa4	
Average Life (hrs)	1000	2000	2000	2000	2000	2000	2000	
Illumination Characteristics								
Nominal lm	4000	5000	9500	15000	22000	33000	44000	

Features
- Long service life
- Excellent lumen maintenance
- Suitable for luminaires such as **Sylvania FMH/FEH**

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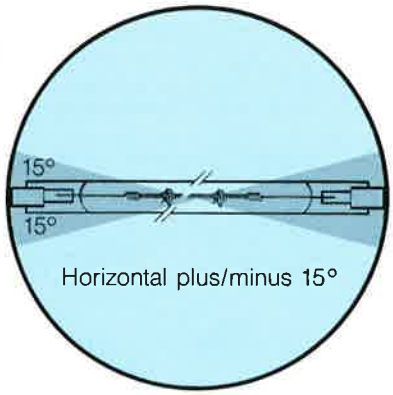
Applications

- Floodlighting of Building Sites, Car Parks Monuments, Parks and Gardens especially where instant light after switch-on is needed

Burning Position



Construction/Performance Data

Thermal:

Min. Bulb Wall Temperature: 250°C

Max. Pinch Temperature : 350°C

Construction:

Bulb: T2.5 and T3 Quartz/Clear.

Cap:

According to IEC Publication 61

Ordering Information								
Lamp Rating	245 V **250 W**	245 V **300 W**	245 V **500 W**	245 V **750 W**	245 V **1000 W**	245 V **1500 W**	245 V **2000 W**	
Type Description	L 2283	L 2270	L 2229	L 2230	L 2228	L 2201	L 2269	
Packing Quantity	10	10	10	10	10	10	10	
Order Code	21743	21653	21621	21623	21625	21628	21652	

Special Notes
(1) Do not touch the quartz envelope with bare fingers.
(2) Use quick-acting H.R.C. fuses in the external circuit.
(3) Use in luminaires preferably fitted with toughened front glasses.
(4) All wattage and lumen ratings are subject to tolerances.

Sylvania reserves the right to change data and specifications without notice. Data for guidance only.

Tungsten Halogen Lamp
Product Information

Description: Standard Tungsten Halogen Floodlight Lamps
300 W, 500 W in **120 V**

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Mechanical Data and Illumination Characteristics

General Information								
Lamp Rating	120 V **300 W**	120 V **500 W**						
Type Description	L 2274	L 2207						
Mechanical Data								
Maximum Overall Length mm	119.6	119.6						
Contact Length, nom. mm	114.2	114.2						
Clearance Length, max. mm	117.6	117.6						
Bulb Diameter, max. mm	9	12						
Bulb Type/Finish	Clear/Tubular	Clear/Tubular						
Cap	R7s	R7s						
Average Life (hrs)	2000	2000						
Illumination Characteristics								
Nominal lm	5100	10500						

Features

- Long service life
- Excellent lumen maintenance
- Suitable for luminaires such as **Sylvania FMH/FEH**

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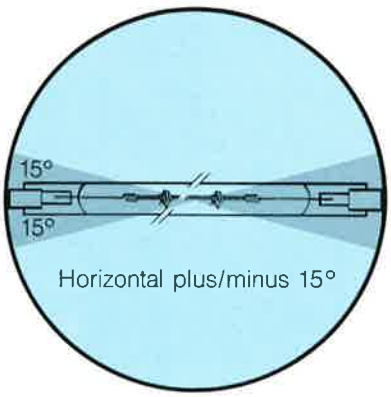
Applications

- Floodlighting of Building Sites, Car Parks Monuments, Parks and Gardens especially where instant light after switch-on is needed

Burning Position



Construction/Performance Data

Thermal:

Min. Bulb Wall Temperature: 250°C

Max. Pinch Temperature : 350°C

Construction:

Bulb: T2.5 and T3 Quartz/Clear.

Cap:

According to IEC Publication 61

Ordering Information								
Lamp Rating	120 V **300 W**	120 V **500 W**						
Type Description	L 2274	L 2207						
Packing Quantity	50	50						
Order Code	21685	21619						

Special Notes (1) Do not touch the quartz envelope with bare fingers.
(2) Use quick-acting H.R.C. fuses in the external circuit.
(3) Use in luminaires preferably fitted with toughened front glasses.
(4) All wattage and lumen ratings are subject to tolerances.

Sylvania reserves the right to change data and specifications without notice. Data for guidance only.

Tungsten Halogen Lamp Product Information

Description: Single-ended High Voltage Tungsten Halogen Lamps 250 W MINI-CAN, 250 W E14, 250 W E27 in **225 V and 245 V**

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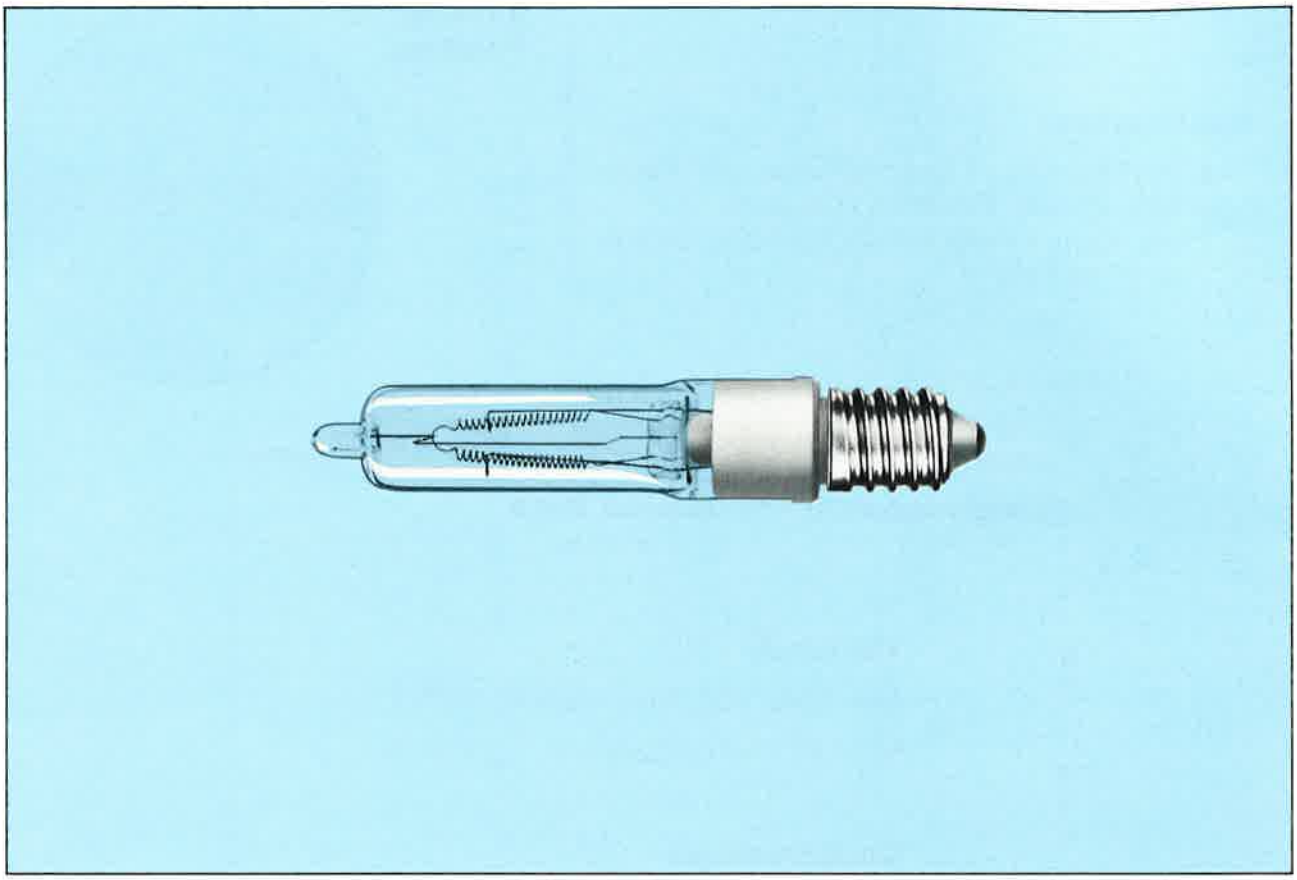


Mechanical Data and Illumination Characteristics

General Information								
Lamp Rating	225 V **250 W** Mini-Can	245 V **250 W** E14		225 V **250 W** E27				
Type Description	L 2273	L 2276		L 2300				
Mechanical Data								
Maximum Overall Length mm	90	95		90				
Bulb Diameter, max. mm	16	16		16				
Bulb Type/Finish	Capsule/Clear	Capsule/Clear		Capsule/Clear				
Base	Minican	E14		E27				
Average Life (hrs)	2000	2000		2000				
Illumination Characteristics								
Nominal lm	3800	3800		4200				

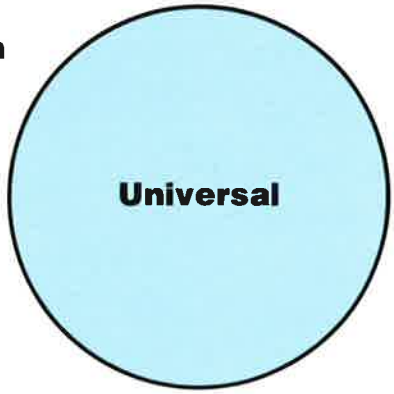
Features

- Compact dimensions, high light output, long service life
- Lamp mounted into rugged ceramic base
- Filament construction suitable for parabolic spot/flood optics

Applications

- Spot and floodlighting for show windows and general display work

Burning Position



Construction/Performance Data

Thermal:

Min. Bulb Wall Temperature: 250°C

Max. Pinch Temperature : 350°C

Construction:

Tubular Clear Quartz Bulb

Cap:

NB: Do not overtighten/apply excessive force on insertion

Ordering Data								
Lamp Rating	225 V **250 W** Mini-Can	245 V **250 W** E14		225 V **250 W** E27				
Type Description	L 2273	L 2276		L 2300				
Packing Quantity	50	50		50				

Special Notes (1) Do not touch the quartz envelope with bare fingers.
(2) Use quick-acting H.R.C. fuses in the external circuit.
(3) Use in luminaires always fitted with toughened front glasses.

Sylvania reserves the right to change data and specifications without notice. Data for guidance only.

Tungsten Halogen Lamp
Product Information

Description: **Hi-Light HRS** Low Voltage Tungsten Halogen Lamps **without reflector**
12 V; 20 W, 50 W, 100 W. G4 or GY 6.35 Bi-Pin base
12 V; 50 W for Traffic Signals. GY 6.35 Bi-Pin base

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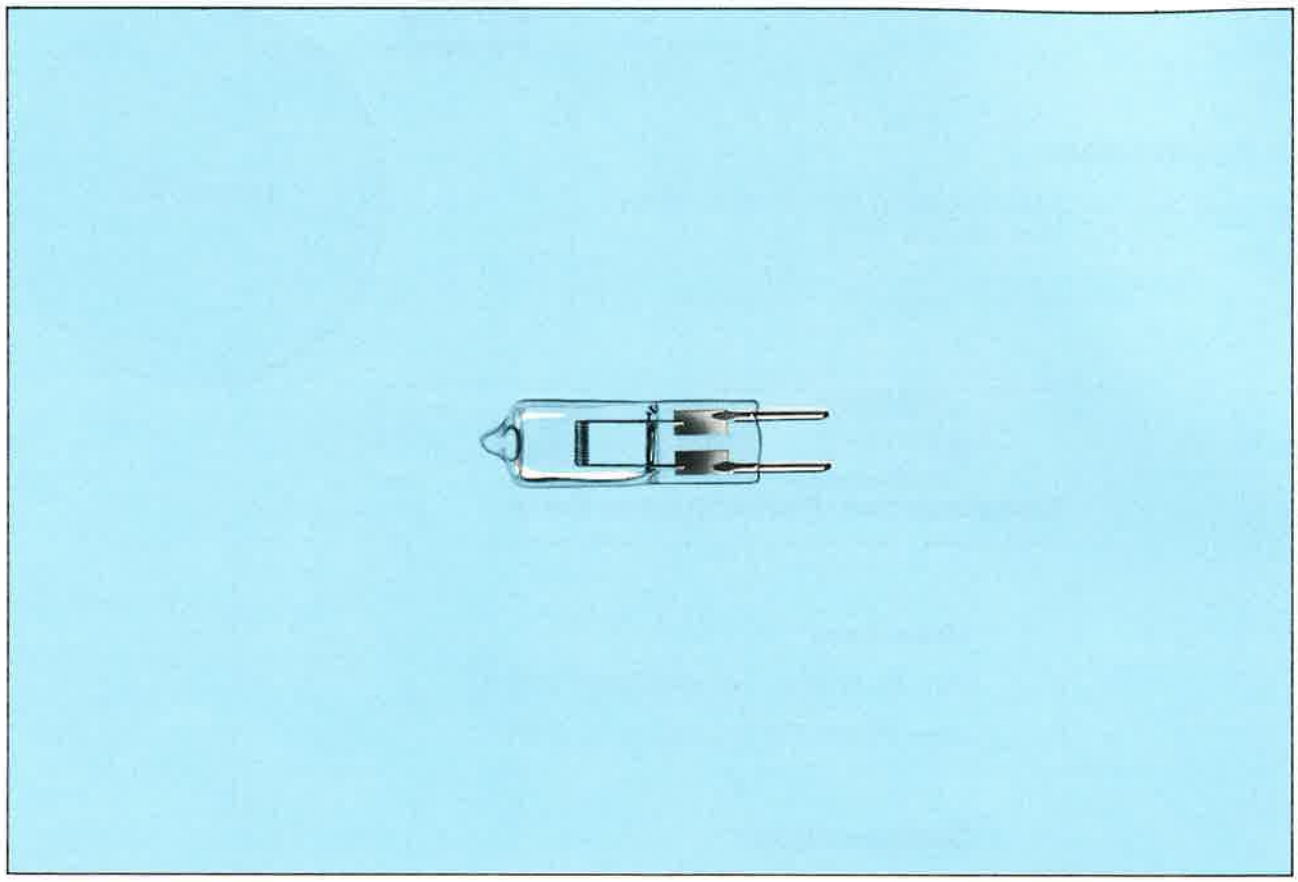

Mechanical Data and Illumination Characteristics

General Information								
Lamp Rating	12 V **20 W**	12 V **50 W**	12 V **100 W**		12 V **50 W**			
Type Description	L 2279	L 2294	L 2235		L 2303 Traffic.			
Mechanical Data								
Maximum Overall Length mm	31.0	44.0	44.0		44.0			
Contact Pin Length, min. mm	7.5	7.5	7.5		7.5			
Bulb Diameter, max. mm	9	12	12		12			
Bulb Type/Finish	Capsule/Clear	Capsule/Clear	Capsule/Clear		Capsule/Clear			
Base	G4	GY 6.35	GY 6.35		GY 6.35 Plated			
Average Life (hrs)	2000	2000	2000		3000			
Illumination Characteristics								
Nominal lm	350	950	2500		850			

Features
- Very compact dimensions for optimum luminaire design
- High performance rugged lamp construction filament for long life
- Rough service version available for traffic signals
- Platinum plated coated pins (L 2303)

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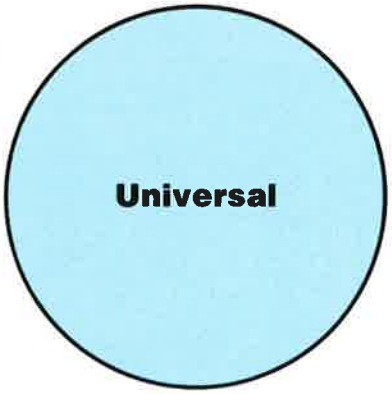
Applications

- L 2303 — Traffic Signals (switching cycle 30 sec. "on", 30 sec. "off")
- Others — Interior Displays, Show Windows, Restaurants, Discotheques
  — Precision Task Lighting

Burning Position



Construction/Performance Data

Thermal:

Min. Bulb Wall Temperature: 250°C

Max. Pinch Temperature : 350°C

Construction:

Tubular Clear Quartz Bulb

Base:

NB: Do not overtighten/apply excessive force on insertion

Ordering Data								
Lamp Rating	12 V **20 W**	12 V **50 W**	12 V **100 W**		12 V **50 W**			
Type Description	L 2279	L 2294	L 2235		L 2303			
Packing Quantity	50	50	50		50			
Order Code	21794	21789	21601		21692			

Special Notes (1) Do not touch the quartz envelope with bare fingers.
(2) Use quick-acting H.R.C. fuses in the external circuit.
(3) Use in luminaires preferably fitted with toughened front glasses.

Tungsten Halogen Lamp
Product Information

Description: **Hi-Light HRS** Low Voltage Tungsten Halogen Lamps **with 48 mm diameter reflector** **12 V;** 20 W 10° Spot, 15° Flood/G4 Bi-Pin Base

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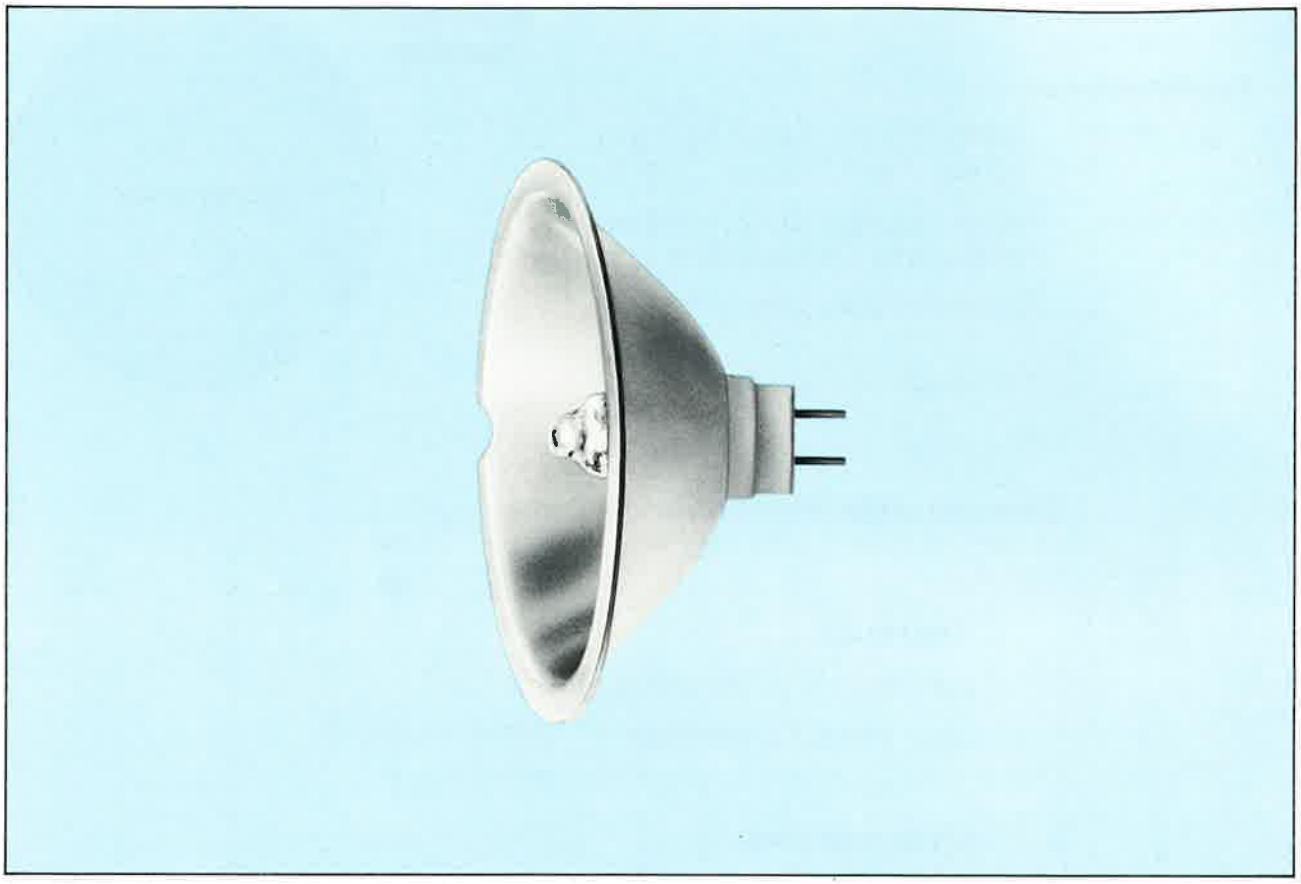

Mechanical Data and Illumination Characteristics

General Information								
Lamp Rating	12 V **20 W**	12 V **20 W**						
Type Description	L 2275 SP	L 2297 FL						
Mechanical Data								
Maximum Overall Length mm	32.0	32.0						
Contact Pin Length, min. mm	7.5	7.5						
Reflector Diameter, max. mm	48.8	48.8						
Reflector Type/Finish	Alloy/ Reflector Neutral	Alloy/ Reflector Neutral						
Base	G4 Bi-Pin	G4 Bi-Pin						
Average Life (hrs)	2000	2000						
Illumination Characteristics								
Peak Luminous Intensity (cd)	3800	1000						
Half Peak Angle	10°	15°						

Features

- Very compact dimensions for optimum luminaires design
- High performance, rugged construction filament/optic design
- Highly efficient treated aluminium alloy reflector for good through-life performance

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2.43.2b

Applications

- Special effects, e.g. fibre optics
- Accent lighting in show windows, etc. where heat in the beam is not a problem
- Home lighting (with a suitable luminaire)

Burning Position

Universal

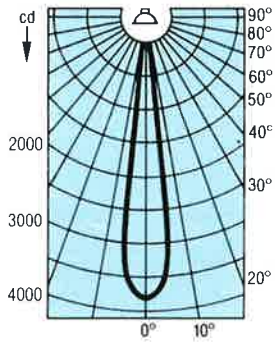
Photometric Data

Axial Polar Curve Data

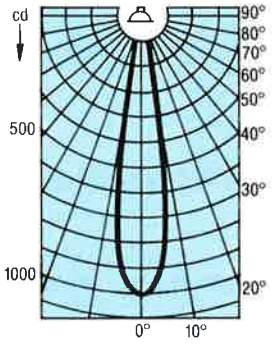
(in candelas)

A L2275
D L2297

A



D



DISTANCE (M)	L 2275 LUX LEVEL	L 2297 LUX LEVEL
1	3800	1300
2	950	325
3	422	144
4	237	81
Half Peak Angle		
	10°	15°

Lux Plot

Ordering Data								
Lamp Rating	12 V **20 W**	12 V **20 W**						
Type Description	L 2275 SP	L 2297 FL						
Packing Quantity	10	10						
Order Code	21793	21796						

Special Notes

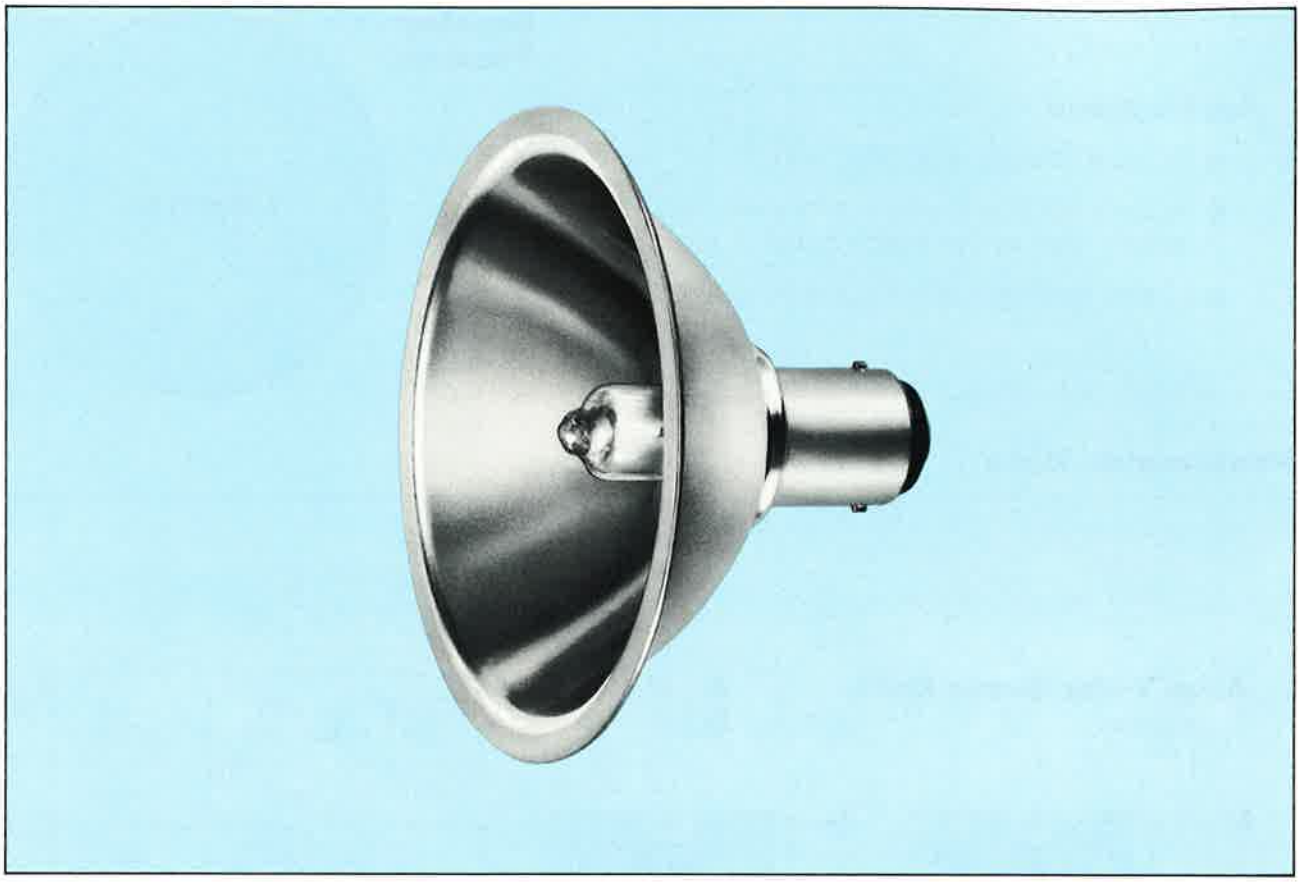
(1) Do not touch the quartz envelope with bare fingers.
(2) Pinch temperature should not exceed 350°C.
(3) Use quick-acting H.R.C. fuses in the external circuit.
(4) Use in luminaires preferably fitted with toughened front glasses.

Tungsten Halogen Lamp Product Information

Description: **Hi-Light HRS** Low Voltage Tungsten Halogen Lamps **with 70 mm diameter reflector** **12 V;** 20 W, 50 W; 10° Spot and 30° Flood/BA15d Base

T-HAL

2.43.3a



Mechanical Data and Illumination Characteristics

General Information								
Lamp Rating	12 V **20 W**	12 V **20 W**	12 V **50 W**	12 V **50 W**				
Type Description	L 2296 SP	L 2299 FL	L 2295 SP	L 2298 FL				
Mechanical Data								
Maximum Overall Length mm	46.5	46.5	46.5	46.5				
Reflector Diameter, max. mm	70.2	70.2	70.2	70.2				
Reflector Type/Finish	Alloy/Matt Reflector Neutral	Alloy/Matt Reflector Neutral	Alloy/Matt Reflector Neutral	Alloy/Matt Reflector Neutral				
Base	BA15d	BA15d	BA15d	BA15d				
Average Life (hrs)	2000	2000	2000	2000				
Illumination Characteristics								
Peak Luminous Intensity (cd)	5000	600	10000	1100				
Half Peak Angle	10°	30°	10°	30°				

Features

- Very compact dimensions for optimum luminaire design
- High performance, rugged construction filament/optic design
- Highly efficient treated large diameter aluminium Alloy reflector for good through-life performance
- BA15d bayonet cap for solid lamp location and good electrical contact to socket

SYLVANIA GTE

Applications

- Special effects, e.g. fibre optics
- Accent lighting in shop windows, etc. where heat in the beam is not a problem
- Home lighting (with a suitable luminaire)

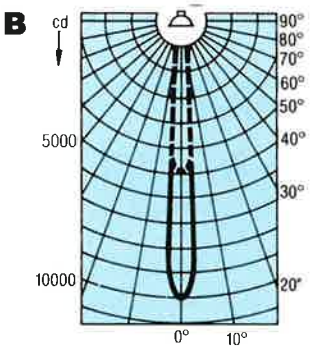
Burning Position

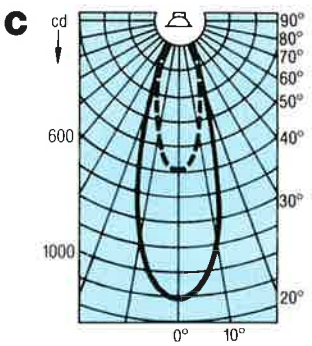
Universal

Photometric Data

Axial Polar Curve Data
(in candelas)

B L2295/L2296
C L2298/L2299





Lux Plot

DISTANCE (M)	L 2296 LUX LEVEL	L 2299 LUX LEVEL	L 2295 LUX LEVEL	L 2298 LUX LEVEL
1	5000	600	10000	1100
2	1250	150	2500	275
3	556	67	1111	122
4	313	38	625	69
Half Peak Angle	10°	30°	10°	30°

Ordering Data								
Lamp Rating	12 V **20 W**	12 V **20 W**	12 V **50 W**	12 V **50 W**				
Type Description	L 2296 SP	L 2299 FL	L 2295 SP	L 2298 FL				
Packing Quantity	10	10	10	10				
Order Code	21795	21797	21790	21798				

Special Notes
(1) Do not touch the quartz envelope with bare fingers.
(2) Pinch temperature should not exceed 350°C.
(3) Use quick-acting H.R.C. fuses in the external circuit.
(4) Use in luminaires preferably fitted with toughened front glasses.

Tungsten Halogen Lamp Product Information

Description: **Hi-Light Tru-Aim**
Low Voltage Tungsten Halogen Lamps
with 50 mm diameter dichroic reflector
12 V; 20 W, 42 W, 50 W, 75 W-GX5.3 Base

T-HAL

2.44.1a

Mechanical Data and Illumination Characteristics

General Information									
Lamp Rating	50 W/12 V	50 W/12 V	20 W/12 V	42 W/12 V	50 W/12 V	75 W/12 V	50 W/12 V	20 W/12 V	75 W/12 V
Type Description	ENL	EXN	ESX	EYR	EXT	EYF	EXZ	BAB	EYC
Mechanical Data									
Maximum Overall Length mm	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Contact Pin Length Min. Max. mm	4.45-6.86	4.45-6.86	4.45-6.86	4.45-6.86	4.45-6.86	4.45-6.86	4.45-6.86	4.45-6.86	4.45-6.86
Rim Diameter, max. mm	50.67	50.67	50.67	50.67	50.67	50.67	50.67	50.67	50.67
Reflector Type	Dichroic	Dichroic	Dichroic	Dichroic	Dichroic	Dichroic	Dichroic	Dichroic	Dichroic
Base	GX5.3	GX5.3	GX5.3	GX5.3	GX5.3	GX5.3	GX5.3	GX5.3	GX5.3
Average Life (hrs)	3000	3000	2000	2500	3000	3500	3000	2000	3500
Illumination Characteristics									
Peak Luminous Intensity cd	2500	1500	3300	7070	9150	11500	3000	460	2000
Colour Temperature K	3050	3050	2925	3025	3025	3050	3075	2925	3050
Half Peak Angle (nominal)	28°/NFL	38°/FL	12°/NSP	12°/NSP	13°/NSP	14°/NSP	24°/SP	36°/FL	38°/FL

Features

- Compact, high performance filaments mounted in super-efficient reflector
- Dichroic reflector coatings permit substantial reduction in infrared energy projected in the beam
- Long service lives typically around 3000 hrs

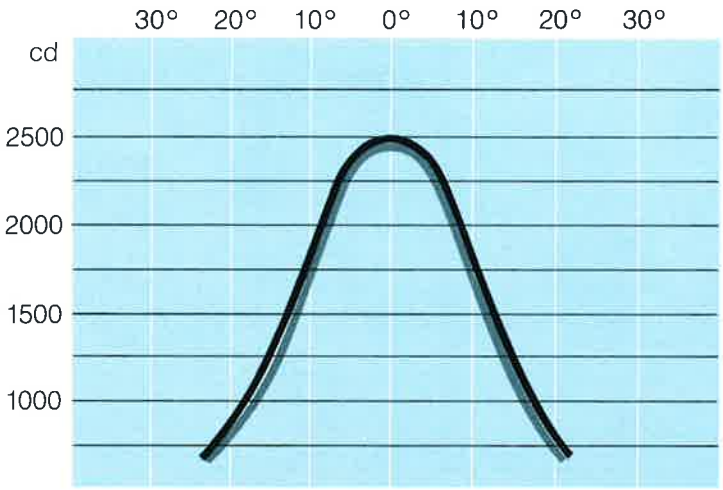
Applications

- Particularly suited for display lighting of foodstuffs, works of art, fabrics, jewellery from recessed downlights, wall mounted spots and track-mounted luminaires

Burning Position

Universal

Photometric Data: Type ENL



Polar Curve (Axial)

28° Narrow Flood

DISTANCE (m)	LUX LEVEL
1	**2500**
2	**625**
3	**278**
4	**156**
Half Peak Angle	
28°HOR	26°VERT

Lux Plot

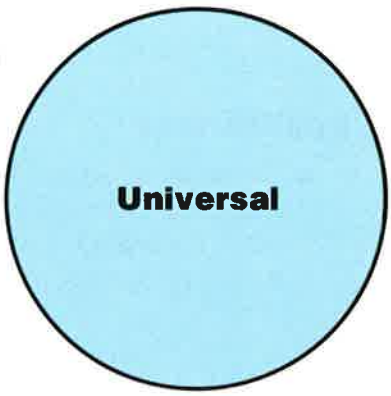
Ordering Data									
Lamp Rating	50 W/12 V								
Type Description	ENL								
Packing Quantity	12								
Order Code	60979								

Special Notes
(1) Do not touch the quartz envelope with bare fingers.
(2) Pinch temperature should not exceed 350°C.
(3) Use quick-acting H.R.C. fuses in the external circuit.
(4) Use in luminaires preferably fitted with toughened front glasses.

Applications

- Particularly suited for display lighting of foodstuffs, works of art, fabrics, jewellry from recessed downlights, wall mounted spots and track-mounted luminaires

Burning Position



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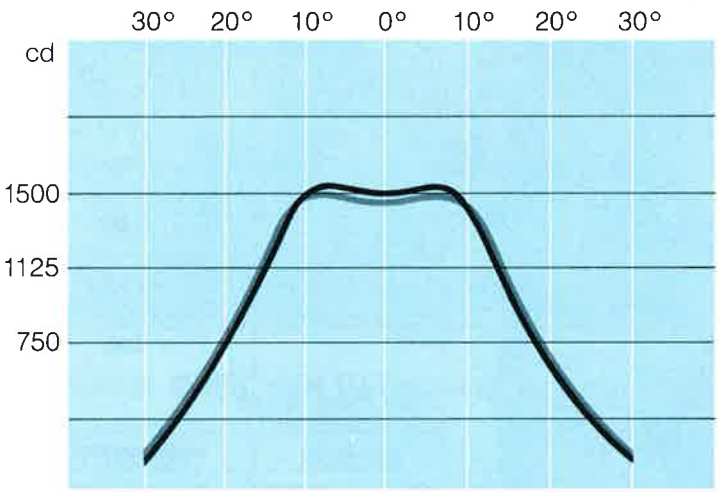


Polar Curve (Axial)

38° Flood

DISTANCE (m)	LUX LEVEL
1	**1500**
2	**375**
3	**167**
4	**94**
Half Peak Angle	
39°HOR	37°VERT

Lux Plot

Ordering Data									
Lamp Rating	50 W/12 V								
Type Description	EXN								
Packing Quantity	12								
Order Code	60988								

Special Notes
(1) Do not touch the quartz envelope with bare fingers.
(2) Pinch temperature should not exceed 350°C.
(3) Use quick-acting H.R.C. fuses in the external circuit.
(4) Use in luminaires preferably fitted with toughened front glasses.

T-HAL

2.44.3b

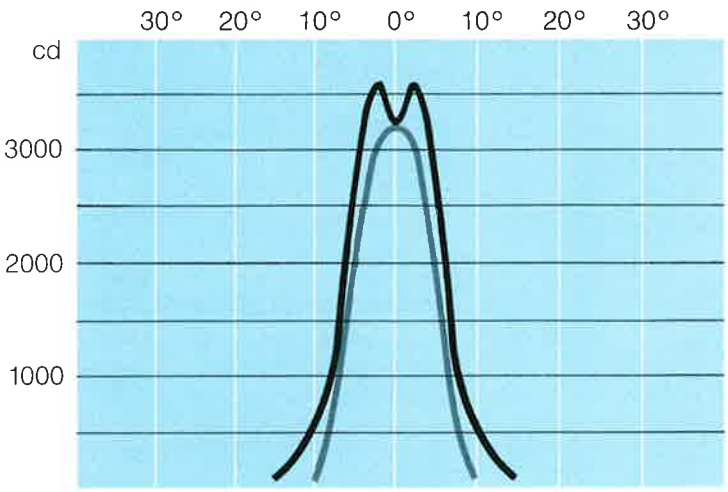
Applications

- Particularly suited for display lighting of foodstuffs, works of art, fabrics, jewellry from recessed downlights, wall mounted spots and track-mounted luminaires

Burning Position

Universal

Photometric Data: Type ESX



Polar Curve (Axial)

12° Narrow Spot

DISTANCE (m)	LUX LEVEL
1	**3300**
2	**825**
3	**367**
4	**206**
Half Peak Angle	
13°HOR	10°VERT

Lux Plot

Ordering Data									
Lamp Rating	20 W/12 V								
Type Description	ESX								
Packing Quantity	12								
Order Code	60987								

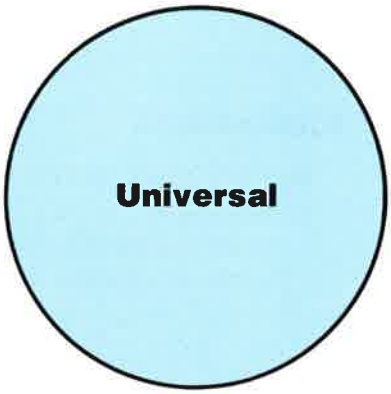
Special Notes
(1) Do not touch the quartz envelope with bare fingers.
(2) Pinch temperature should not exceed 350°C.
(3) Use quick-acting H.R.C. fuses in the external circuit.
(4) Use in luminaires preferably fitted with toughened front glasses.

SYLVANIA GTE

Applications

- Particularly suited for display lighting of foodstuffs, works of art, fabrics, jewellry from recessed downlights, wall mounted spots and track-mounted luminaires

Burning Position



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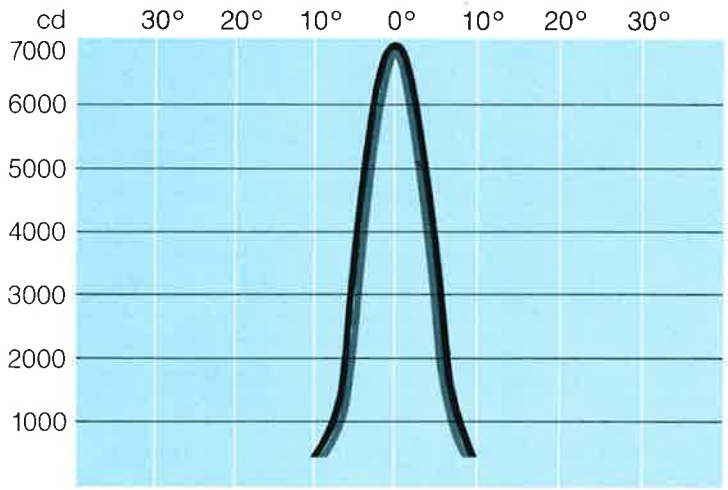


Polar Curve (Axial)

12° Narrow Spot

DISTANCE (m)	LUX LEVEL
1	**7070**
2	**1768**
3	**786**
4	**442**
Half Peak Angle	
13°HOR	10°VERT

Lux Plot

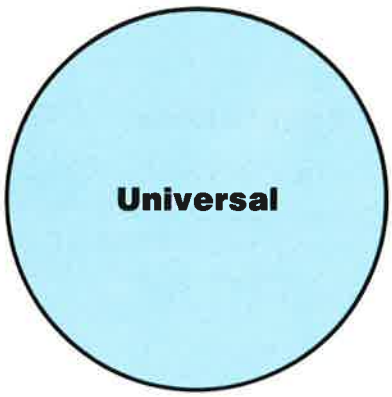
Ordering Data									
Lamp Rating	42 W/12 V								
Type Description	EYR								
Packing Quantity	12								
Order Code	60989								

Special Notes
(1) Do not touch the quartz envelope with bare fingers.
(2) Pinch temperature should not exceed 350°C.
(3) Use quick-acting H.R.C. fuses in the external circuit.
(4) Use in luminaires preferably fitted with toughened front glasses.

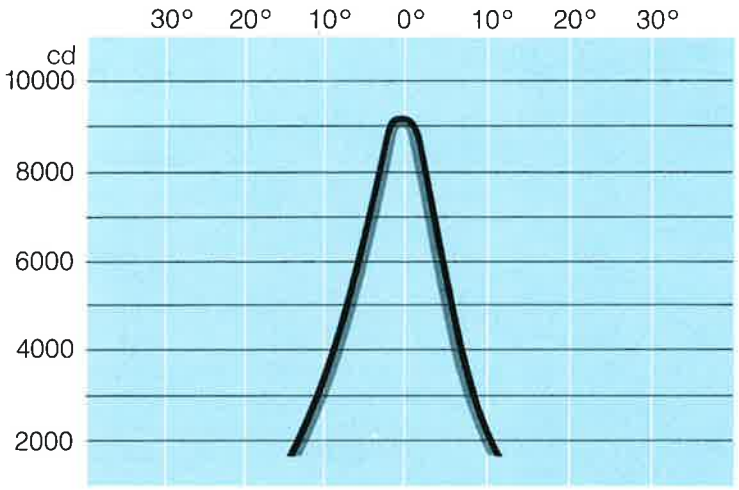
Applications

- Particularly suited for display lighting of foodstuffs, works of art, fabrics, jewellry from recessed downlights, wall mounted spots and track-mounted luminaires

Burning Position



Photometric Data: Type EXT



Polar Curve (Axial)

13° Narrow Spot

DISTANCE (m)	LUX LEVEL
1	**9150**
2	**2288**
3	**1017**
4	**572**
Half Peak Angle	
13°HOR	11°VERT

Lux Plot

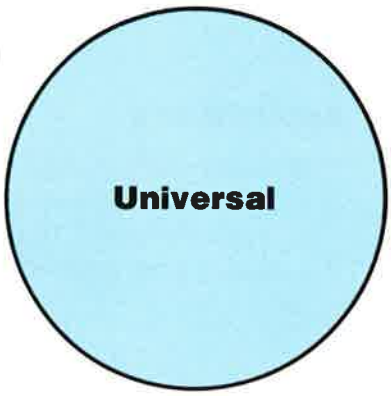
Ordering Data									
Lamp Rating	50 W/12 V								
Type Description	EXT								
Packing Quantity	12								
Order Code	60997								

Special Notes
(1) Do not touch the quartz envelope with bare fingers.
(2) Pinch temperature should not exceed 350°C.
(3) Use quick-acting H.R.C. fuses in the external circuit.
(4) Use in luminaires preferably fitted with toughened front glasses.

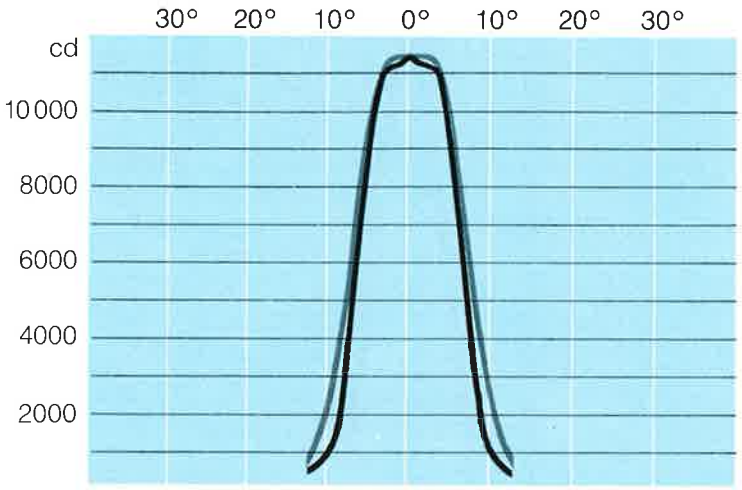
Applications

- Particularly suited for display lighting of foodstuffs, works of art, fabrics, jewellry from recessed downlights, wall mounted spots and track-mounted luminaires

Burning Position



Photometric Data: Type EYF



Polar Curve (Axial)

14° Narrow Spot

DISTANCE (m)	LUX LEVEL
1	**11500**
2	**2875**
3	**1278**
4	**719**
Half Peak Angle	
15°HOR	14°VERT

Lux Plot

Ordering Data									
Lamp Rating	75 W/12 V								
Type Description	EYF								
Packing Quantity	12								
Order Code	60999								

Special Notes
(1) Do not touch the quartz envelope with bare fingers.
(2) Pinch temperature should not exceed 350°C.
(3) Use quick-acting H.R.C. fuses in the external circuit.
(4) Use in luminaires preferably fitted with toughened front glasses.

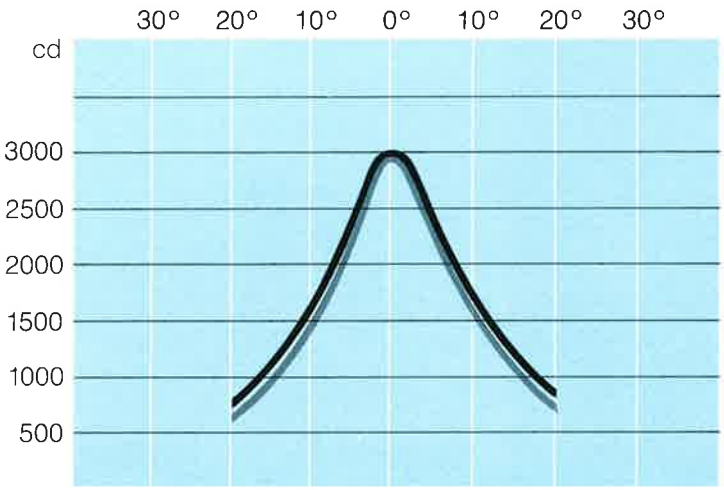
Applications

- Particularly suited for display lighting of foodstuffs, works of art, fabrics, jewellry from recessed downlights, wall mounted spots and track-mounted luminaires

Burning Position

Universal

Photometric Data: Type EXZ



Polar Curve (Axial)

24° Spot

DISTANCE (m)	LUX LEVEL
1	**3000**
2	**750**
3	**333**
4	**188**
Half Peak Angle	
24°HOR	22°VERT

Lux Plot

Ordering Data									
Lamp Rating	50 W/12 V								
Type Description	EXZ								
Packing Quantity	12								
Order Code	61000								

Special Notes
(1) Do not touch the quartz envelope with bare fingers.
(2) Pinch temperature should not exceed 350°C.
(3) Use quick-acting H.R.C. fuses in the external circuit.
(4) Use in luminaires preferably fitted with toughened front glasses.

T-HAL

2.44.8b

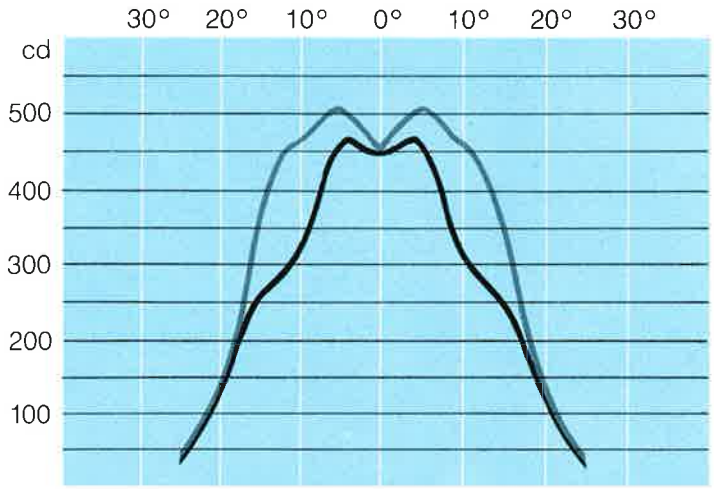
Applications

- Particularly suited for display lighting of foodstuffs, works of art, fabrics, jewellry from recessed downlights, wall mounted spots and track-mounted luminaires

Burning Position

Universal

Photometric Data: Type BAB



Polar Curve (Axial)

36° Wide Flood

DISTANCE (m)	LUX LEVEL
1	**460**
2	**115**
3	**51**
4	**29**
Half Peak Angle	
36°HOR	38°VERT

Lux Plot

Ordering Data									
Lamp Rating	20 W/12 V								
Type Description	BAB								
Packing Quantity	12								
Order Code	61001								

Special Notes
(1) Do not touch the quartz envelope with bare fingers.
(2) Pinch temperature should not exceed 350°C.
(3) Use quick-acting H.R.C. fuses in the external circuit.
(4) Use in luminaires preferably fitted with toughened front glasses.

T-HAL

2.44.9b

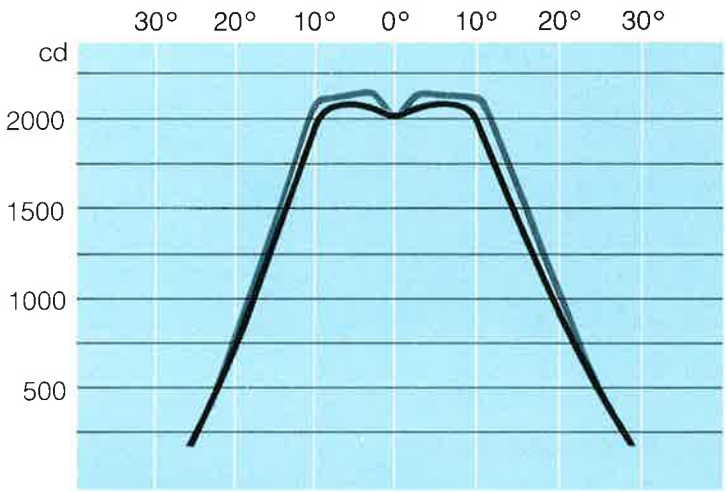
Applications

- Particularly suited for display lighting of foodstuffs, works of art, fabrics, jewellry from recessed downlights, wall mounted spots and track-mounted luminaires

Burning Position

Universal

Photometric Data: Type EYC



Polar Curve (Axial)

38° Flood

DISTANCE (m)	LUX LEVEL
1	**2000**
2	**500**
3	**222**
4	**125**
Half Peak Angle	
40°HOR	38°VERT

Lux Plot

Ordering Data									
Lamp Rating	50 W/12 V								
Type Description	EYC								
Packing Quantity	12								
Order Code	61002								

Special Notes

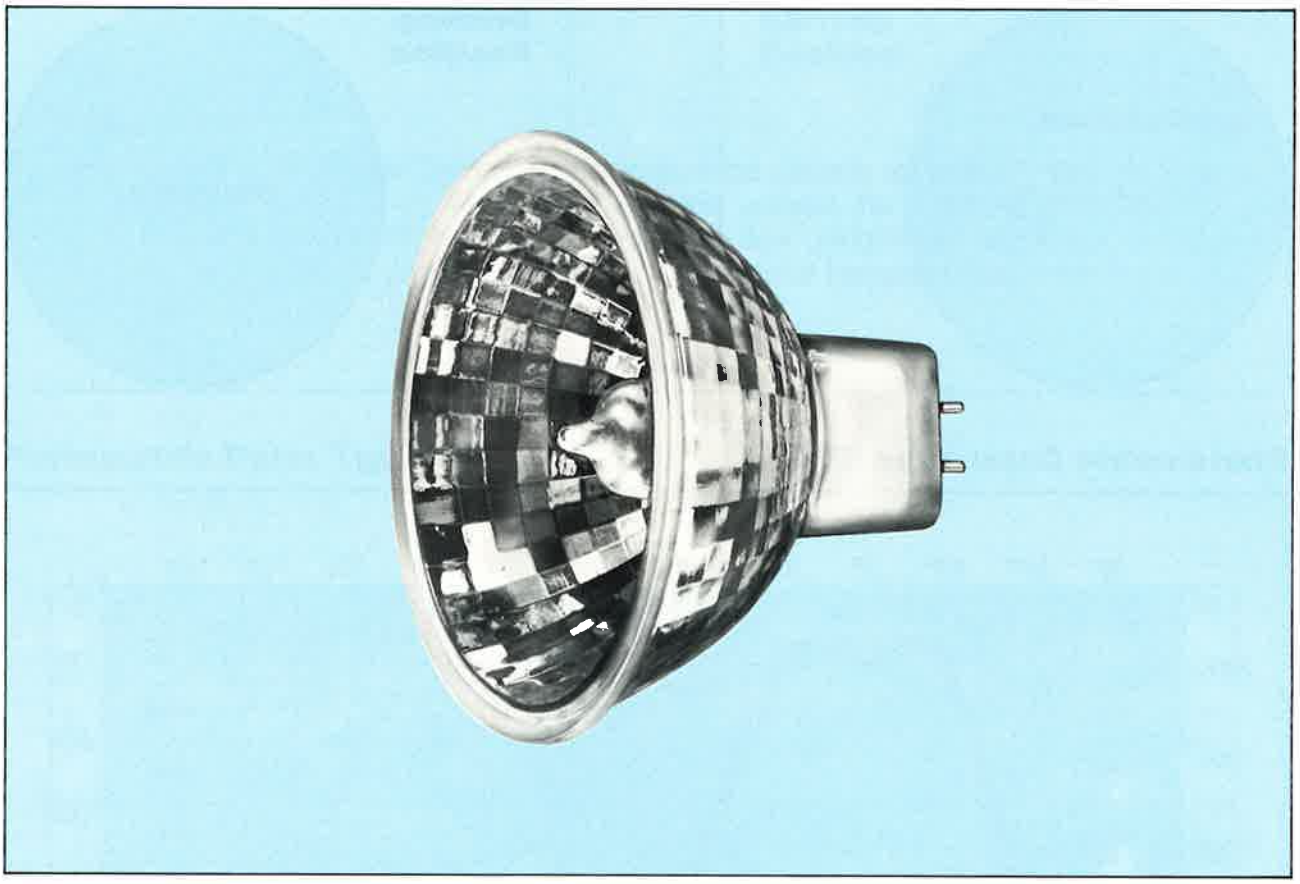
(1) Do not touch the quartz envelope with bare fingers.
(2) Pinch temperature should not exceed 350°C.
(3) Use quick-acting H.R.C. fuses in the external circuit.
(4) Use in luminaires preferably fitted with toughened front glasses.

Tungsten Halogen Lamp Product Information

Description: **Hi-Light Tru-Aim**
Low Voltage Tungsten Halogen Lamps
with 50 mm diameter coloured dichroic reflector
12 V; 50 W, 10° spot in red, yellow, green, blue – GX5.3

T-HAL

2.45.1a



Mechanical Data and Illumination Characteristics

General Information								
Lamp Rating	50 W/12 V	50 W/12 V	50 W/12 V	50 W/12 V				
Type Description	JCR12-50SB	JCR12-50SY	JCR12-50SG	JCR12-50SR				
Mechanical Data								
Maximum Overall Length mm	45.0	45.0	45.0	45.0				
Contact Pin Length Min. Max. mm	4.45-6.86	4.45-6.86	4.45-6.86	4.45-6.86				
Rim. Diameter, max. mm	50.67	50.67	50.67	50.67				
Reflector Type	Dichroic	Dichroic	Dichroic	Dichroic				
Base	GX5.3	GX5.3	GX5.3	GX5.3				
Average Life (hrs)	3000	3000	3000	3000				
Illumination Characteristics								
Colour	Blue	Yellow	Green	Red				
Half Peak Angle	13°	13°	13°	13°				

Features

- Compact high performance filaments mounted in super efficient coloured reflector
- Choice of red, yellow, green or blue
- Cool-beam performance reducing heat projected in the beam
- Long service life of 3000 hrs

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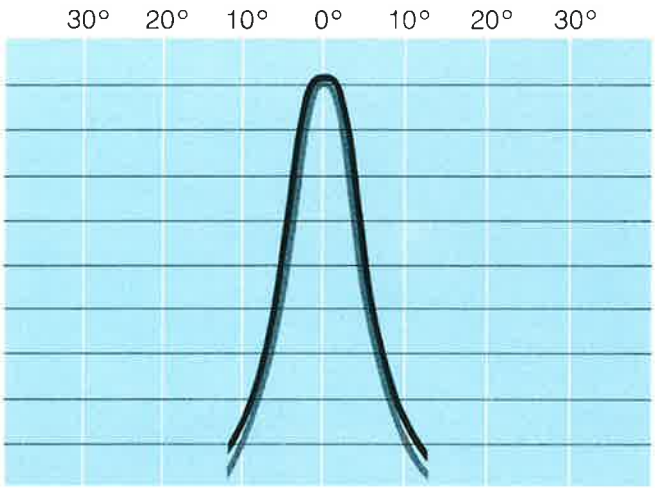
Applications

- For special effect display lighting of merchandize, fabrics, jewellry, glassware and ceramics from recessed downlights, wall-mounted spots and track mounted luminaires

Burning Position

Universal

Photometric Data: Type



Polar Curve (Axial)

Ordering Data								
Lamp Rating	50 W/12 V	50 W/12 V	50 W/12 V	50 W/12 V				
Type Description	JCR12-50SB	JCR12-50SY	JCR12-50SG	JCR12-50SR				
Packing Quantity	12	12	12	12				
Order Code	61005	61006	61007	61008				

Special Notes
(1) Do not touch the quartz envelope with bare fingers.
(2) Pinch temperature should not exceed 350°C
(3) Use quick-acting H.R.C. fuses in the external circuit.
(4) Use in luminaires preferably fitted with toughened front glasses.

Notes

Notes

Notes

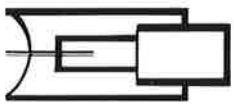
Lead Wires and Seals

The electrical connections to the filament must pass through a hermetic seal formed between the quartz and the lead wires known as a "press seal". It is crucial to ensure that the thermal expansion characteristics of the quartz are matched by the metal of the lead wires in order to avoid strain cracks. It is equally important not to exceed local temperatures at the seal which should normally be a maximum of 350°C. The longevity of the seal is obtained using thin-section molybdenum foil welded to tungsten rods (filament end).

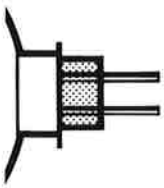
Caps

Lamp caps for Tungsten Halogen lamps are designed to be suitable for high temperatures and high current amperes. In a 12 volt 60 Watt lamp, for example, the current is 5 amperes. Low electrical resistance and durable contact surfaces versus corrosion over long periods of use are essential.

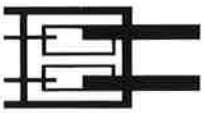
Caps for lighting lamps fall into two general categories — high voltage double-ended and low voltage single-ended. The caps for double-ended lamps are standardized around the R7s and Fa4 — see the drawing below. The low voltage lamps use a variety of push-in pin types of which the GY6.35 and GX5.3 bases are among the most popular. Generally speaking such bases are for electrical connection purposes only, the lamp rim taking care of the mechanical support and optical positioning requirements.



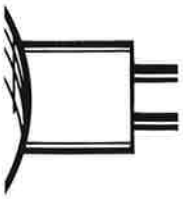
R7's base



G4 Pin Base



GY 6,35 Pin Base



GX 5,3 Pin Base

New Tungsten Halogen Lamp Technology

Low Voltage Tungsten Halogen Display Lamps

The dimensions of a Tungsten Halogen filament depend largely on the current (filament wire diameter) and the voltage drop (filament length). The filament thickness increases with increasing ampères and the filament length decreases with decreasing applied voltage. The effect is that for a given power rating, lowering the applied voltage effectively makes the filament dimension much more compact. As a result the filament more closely approximates to a photometrically ideal light source — the "point" source — which improves substantially the fundamental efficiency of a reflector lamp system.

One substantial problem with all incandescent light sources, especially light-concentrating types such as reflector lamps, is that not only are visible frequencies emitted but also infrared. In some cases, for instance, in displaying foodstuffs or fabrics, this heat radiation is undesirable. For this reason two general types of lamp-reflector combinations have evolved — metal reflectors and "dichroic" glass multifacetted reflectors.

Dichroic Reflector Theory

The dichroic reflector has the properties of a semi-transparent system which can selectively reflect specified wavelengths in the visible region and transmit in the opposite sense unwanted wavelengths in the infrared region. The lamps may also be designed to reflect certain colours. The Sylvania "Tru-Aim" series comprises red, blue, green and yellow reflector versions. Such lamps are excellent for special effect display work and avoid the use of filters which are very light absorbent and which often cannot be placed close to the lamp due to heat generation problems.

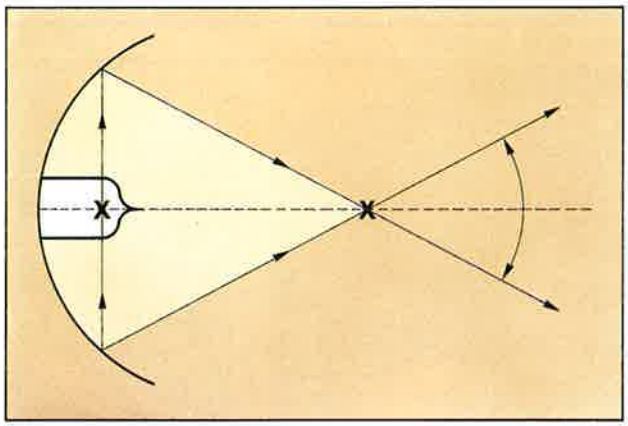
The dichroic reflector is formed from several layers of two different transparent materials on glass, usually magnesium fluoride and zinc sulphide, in a silica substrate to give hardness and prevent rapid degradation of the reflector surface. There are several critical parameters to be met in order to fabricate a good quality reflector:

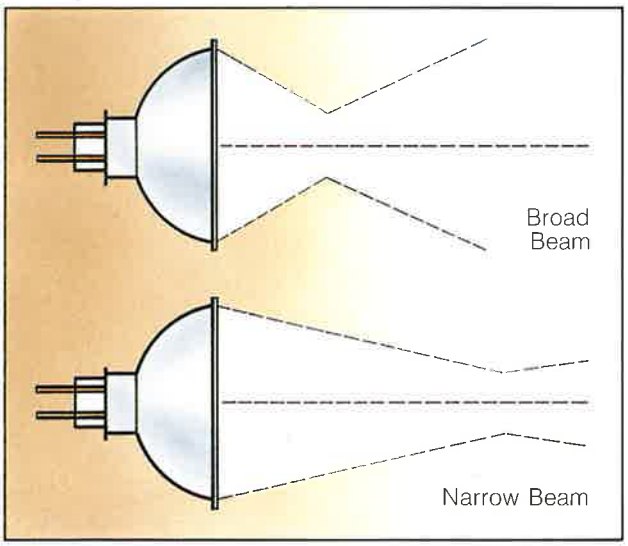
- the alternate layering of high and low refractive index materials must be of a thickness equal to one quarter of the wavelength to be reflected
- up to thirty layers must be built up in a vacuum furnace starting and finishing with the highest refractive index material.

The dichroic reflector uses the principle of "phase shifting" of the incident lightwave train since at every layer boundary the incident light ray suffers a phase-change of 180°. As the light passes through each layer interference effects occur. Depending on the coating thickness certain wavelengths will be reflected and others transmitted.

The reflector efficiency obtained by this system is generally excellent.

Optical Principles of Ellipsoid Reflectors





Using Tungsten Halogen Lamps

Tungsten Halogen lamps are an easy-to-use lighting product, nevertheless, there are a few simple rules to observe in order to ensure satisfactory service is received from the product.

Handling

Lamp bulbs should not be touched with bare fingers as salt/fatty acids and skin oils present will cause the quartz material to stain and crack leading to short life. One should also take care in inserting lamps into the luminaire lampholder so as not to apply shear forces to the cap or pins.

Protection — Fusing

For safety reasons, the lamp must be protected in series by a quick-acting, high-breaking capacity fuse (according to IEC Publication 127/CEE 4 or the equivalent National Standard) of proper rating (see table).

Directives are included in the lamp packaging, however, the recommendations are listed below:

Lamp		Fuse	
Voltage (V)	Wattage (W)	Rated Current (A) a)	b)
100-135	200-300	4.0	
200-250	200-300	2.0	
100-135	420	4.0	
100-135	450-500	6.3	
200-250	450-500	4.0	
100-135	750	10.0*	10.0
200-250	750	6.3	6.0
100-135	900-1000	10.0*	10.0
200-250	900-1000	6.3	6.0
100-135	1250-1500		20.0
200-250	1250-1500	6.3	6.0
100-135	1750-2000		25.0
200-250	1750-2000		10.0

a) "Quick-acting" miniature fuses, 250 V with "high-breaking capacity" (IEC Publication 127/CEE 4, or the equivalent National Standard).

b) "Quick-acting" D-fuses, 500 V (IEC Publication 241/CEE 16, or the equivalent National Standard).

* Not included in IEC Publication 127, or CEE Publication 4, but in common use.

Protection — Lamp Shattering

This lamp operates with an internal pressure greater than atmospheric pressure and may, in rare cases, shatter. Precautions must be taken to ensure that lamp fragments cannot cause damage to persons, animals or property. Therefore, only luminaires fitted with a means of preventing ejection of such fragments must be used.

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