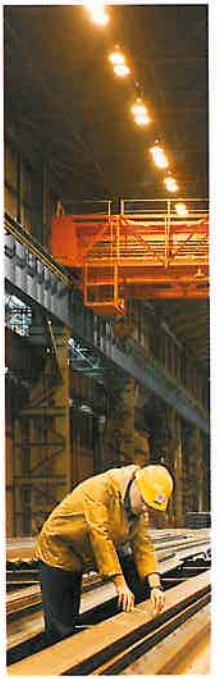
THORN LIGHTING

COMPREHENSIVE CATALOGUE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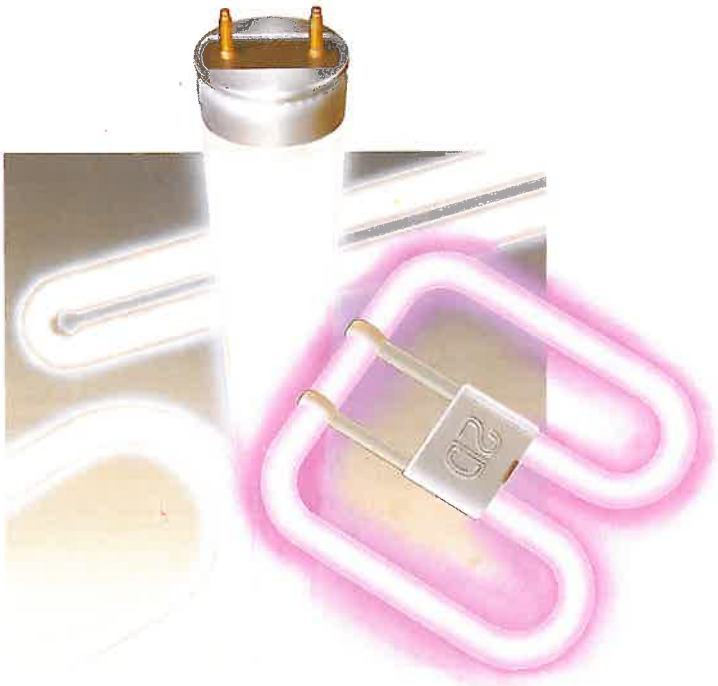
Sectional Index

Sectional Index

FLUORESCENT TUBES



Compact Fluorescent Lamps

Application

These compact fluorescent lamps are designed as replacements for GLS lamps and long fluorescent tubes.

16W 2D lamps replace GLS lamps of up to 100W whilst the larger 28 and 38W 2D lamps replace lamps of between 150 and 200W. The 38W 2D is an ideal light package for use in 300 x 300mm modular ceiling systems.

2L lamps replace long fluorescent tubes of at least twice their length and are used in commercial premises, e.g. shops, offices and hotels, whilst the smaller sizes are ideal for outdoor amenity lighting.

The electronically ballasted 40W 2L is the optimum size and performance package for 600 x 600mm modules, which together with its ideal length (leaving no dark areas at the edges), and high frequency benefits (lack of flicker, instant starting and economy of operation) make it the ultimate solution for situations where only the best is good enough.

Colours

Both 2D and 2L lamps use Polylux phosphors for high light output and good colour rendering.

2D lamps are available in Polylux 2700 which closely matches the colour of tungsten filament lamps for most indoor applications and Polylux 3500 to match the standard commercial lighting colour.

16W versions are also available in seven vibrant coloured hues for decorative and display use.

2L lamps are available in Polylux 3500, as the standard UK colour for commercial lighting, as well as Polylux 3000 for a warmer effect and Polylux 4000 to produce a cooler, more businesslike effect.

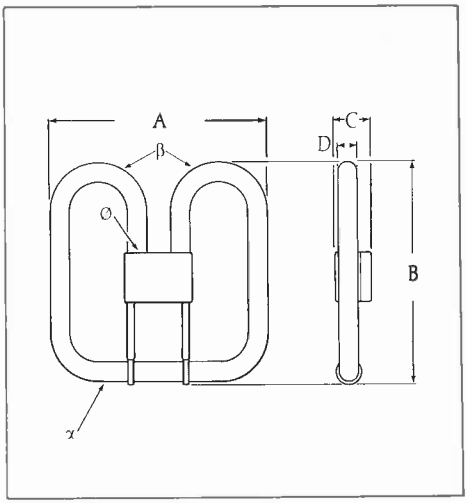
For details of the relevant control gear, please see fluorescent control gear section.

2D Lamps

DIMENSIONS (mm – nominal)

Type	A	B	C	D	Weight g
16W 2D	140	140	27	15	65
28W and 38W 2D	205	205	35	24	130

	Cap Options
16W	The 2-pin version is standard and includes a built-in starter switch. A 4-pin version is also available without internal starter for use in special applications, e.g. emergency and transport lighting.
28W	The 4-pin cap is standard but a 2-pin version is available for replacement purposes only.
38W	4-pin cap.



To order

Specify, for example, "16W 2D 2-pin 2700K".

ELECTRICAL DATA

Rated Watts	Objective Watts	Tube Volts	Tube Amps	Average Life (hrs)
16	15.5	97	0.20	5,000
28	28	107	0.32	10,000
38	38	110	0.43	10,000

Colour Options and Lumens*

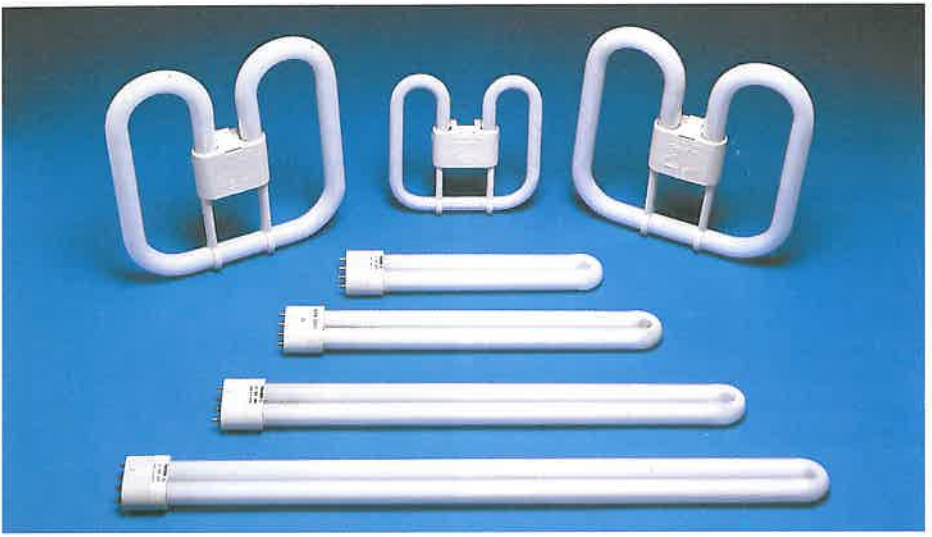
	Polylux 2700	Polylux 3500	Red	Green	Blue	Peach	Lemon	Lilac	Magenta
16W 100 hr	1050	1050	850	1400	400	1000	1050	575	700
2000 hr	925	925							
28W 100 hr	2050	2050							
2000 hr	1850	1850							
38W 100 hr	2950	2950							
2000 hr	2600	2600							

*Light output is at optimum operating conditions.

OPERATING POSITION

16 and 28W	Any
38W	Any except where leg "α" is higher than bends "β" in order to keep region Ø of cap. as cool as possible.

Compact Fluorescent Lamps



2L Lamps

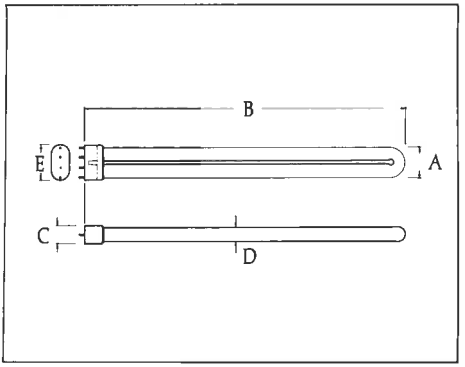
DIMENSIONS (mm – maximum)

Rated W	A	B	C	D	E	Weight g
18	**40**	225	23.6	**20**	**43.9**	**96**
24	40	**320**	23.6	**20**	43.9	**132**
36	**40**	415	23.6	**20**	**43.9**	**168**
40	40	530	23.6	20	43.9	215

ELECTRICAL DATA

Rated watts	Objective watts	Tube **volts**	Tube amps	Average **rated** life (hrs)
18	18.2	61	0.37	7,500
24	**24.4**	91	**0.34**	7,500
36	**36.4**	**112**	0.43	7,500
40*	40	126	**0.32**	10,000

* Values given are for operation on electronic ballasts.



Colour Options and Lumens

All sizes available in Polylux 3000, 3500 and 4000 – same lumen outputs.

	100hr lumens	2000hr lumens
18W	**1200**	**1130**
24W	1800	**1690**
36W	**2900**	**2725**
40W	3500	3300

Fluorescent Tubes – Main Range

Definition of Lamp Types

Polylux Tubes:

THORN Polylux tubes are high efficiency, high colour rendering tri-phosphor tubes which are recommended for all new installations.

Polylux phosphors produce about 12% more light than conventional phosphors and give high colour rendering values. In the standard 26mm diameter Krypton filled versions, there is also an 8% saving of energy for equivalent light output. These lamps also have excellent light output maintenance.

Pluslux Tubes:

THORN Pluslux tubes are 26mm diameter versions of the standard colour range. They offer the 8% energy saving of Krypton filled tubes without the increased light output and improved colour rendering characteristics of Polylux tubes.

Standard Tubes:

Argon filled tubes usually 38mm in diameter, but some ratings are in 26mm diameter (e.g. 18" 15W, 3' 30W, 1050mm 40W and 5' 50W).

The phosphors are split into two types – ordinary and specialist.

- Ordinary phosphors are generally halophosphates and comprise the colours of White, Warm White, Cool White, Natural and Tropical Daylight and are used for general lighting.
- Specialists phosphors are of the Deluxe type and are used for specific applications. For example °Kolor-rite, Northlight, Artificial Daylight, De Luxe Natural, Rosetta, Grolux and colours.

Colour Data

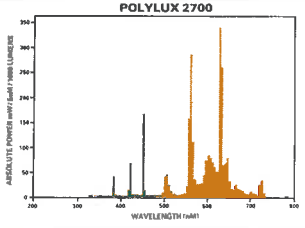
Type	CCT	Ra	CIE/ CIBSE Group	CIE Class	Chromaticity Co-ordinates x	y
Polylux 2700	2700	82	1B	warm	0.464	0.416
Polylux 3000	2950	85	1B	warm	0.440	0.402
Polylux 3500	3400	85	1B	intermediate	0.415	0.402
Polylux 4000	4000	85	1B	cool	0.380	0.377
Pluslux 3000 Warm White	2900	51	3	warm	0.440	0.403
Pluslux 3500 White	3500	54	3	intermediate	0.409	0.394
Pluslux 4000 Cool White	4200	58	3	cool	0.372	0.375
Natural	4000	73	2	cool	0.381	0.375
Northlight	6500	93	1A	cold	0.317	0.324
Artificial Daylight	6500	92	1A	cold	0.313	0.329
°Kolor-rite	4000	89	1B	cool	0.380	0.377
Deluxe Natural	3500	92	1A	intermediate	0.393	0.356
Rosetta	3200	80	1B	warm	0.385	0.310
Grolux			4	warm	0.322	0.329

For further information see Data Sheet 4:92.9.
CCT – Correlated Colour Temperature
SPD – Spectral Power Distribution See pages 318-320.

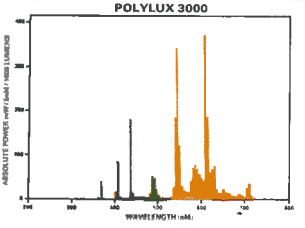
Fluorescent Tubes Main Range

Spectral Power Distribution Curves

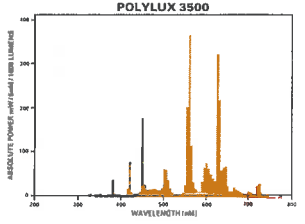
POLYLUX 2700



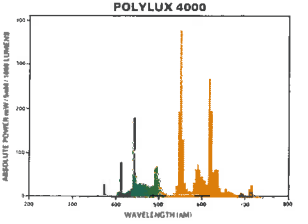
POLYLUX 3000



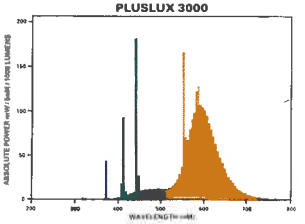
POLYLUX 3500



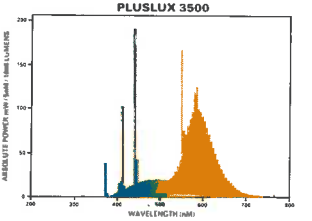
POLYLUX 4000



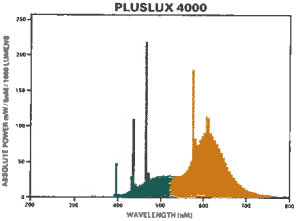
PLUSLUX 3000



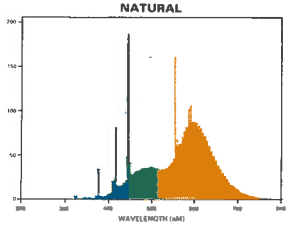
PLUSLUX 3500



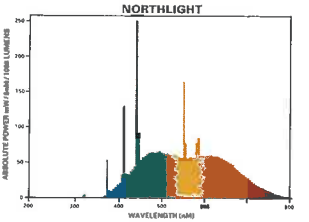
PLUSLUX 4000



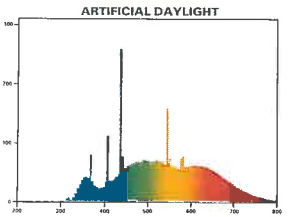
NATURAL



NORTHLIGHT

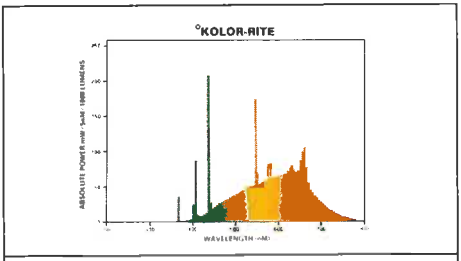


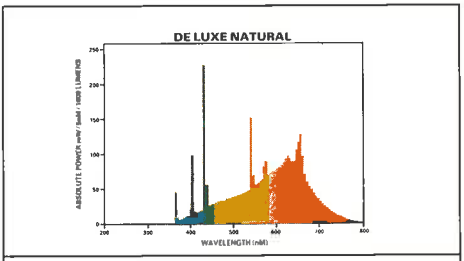
ARTIFICIAL DAYLIGHT

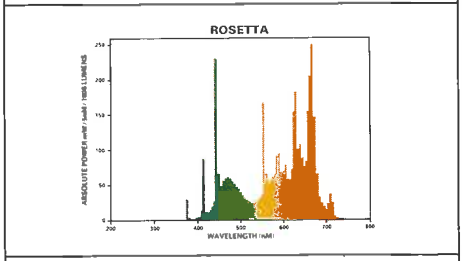


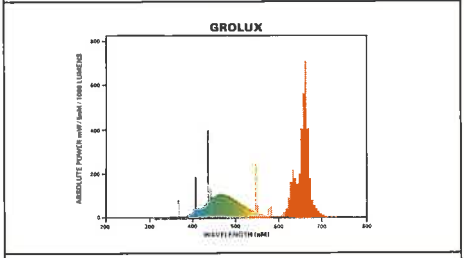
Fluorescent Tubes Main Range

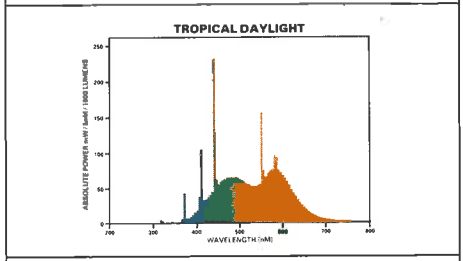
Spectral Power Distribution Curves

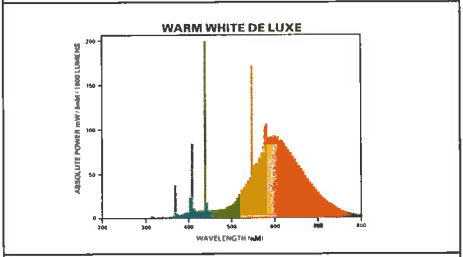


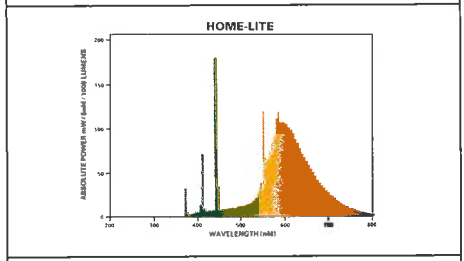


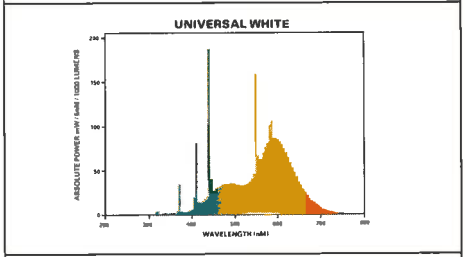


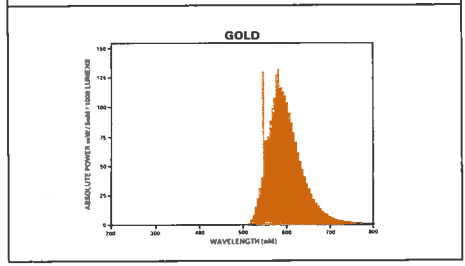


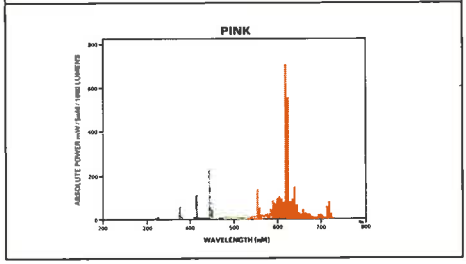




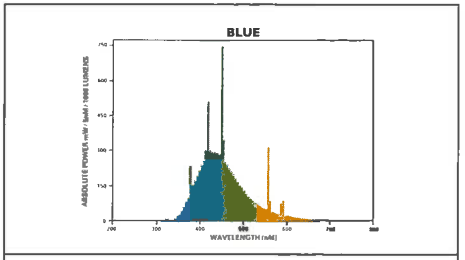


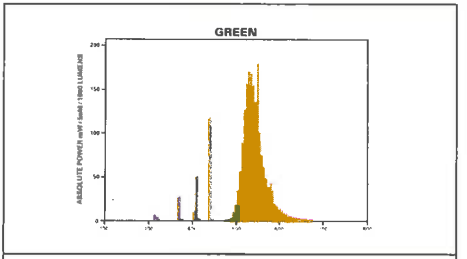


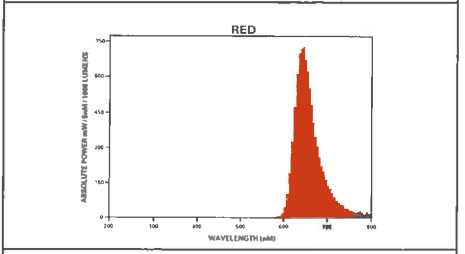


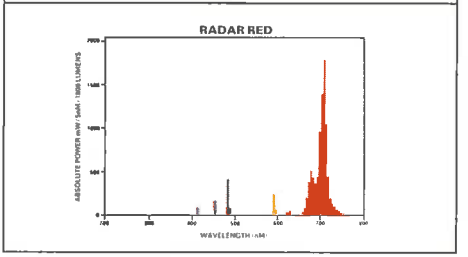


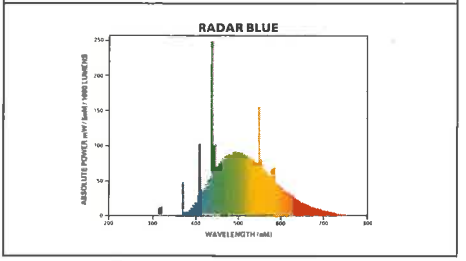
Fluorescent Tubes Main Range











Light Output Data

The lumen outputs quoted are measured at 25°C in accordance with BS1853, i.e. in free air under draught free conditions.

Effects of Temperature Changes
When installed in a luminaire, the temperature of the air surrounding the tube can change and this can affect the light output of the tube. The effects of changes in ambient temperature for a typical tube are shown below.

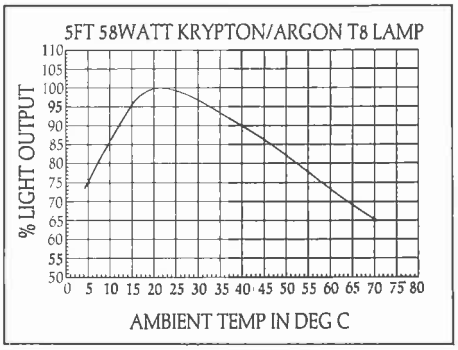


Fig. (1) Light Output Relative to Ambient Temperature

Ballast Lumen Factor
Lumen outputs are given for tubes run on a reference ballast. Commercial ballasts can operate tubes at different characteristics and a ballast lumen factor will be given for each ballast to determine actual light output figures. (See "Fluorescent Control Gear" section).

Effects of High Frequency Operation
A characteristic of fluorescent tubes is that their efficacy (lumens/watt) increases with frequency. Increasing the frequency of operation from that of the normal mains supply of 50/60Hz to 25/30kHz improves tube efficacy by approximately 10%.

Electronic ballasts also consume less power than wirewound ballasts, giving a further increase in circuit efficacy and producing less heat.

By designing the electronic ballasts to operate tubes at 95% of bare tube lumens in an ambient temperature of 25°C, watts are reduced by about 14%. At more frequently encountered operating temperatures of approximately 35°C to 40°C light output is equivalent to that in a conventional circuit and at higher temperatures it is better.

A power saving of around 20% can be achieved over conventional 50/60Hz systems with the same light output levels.

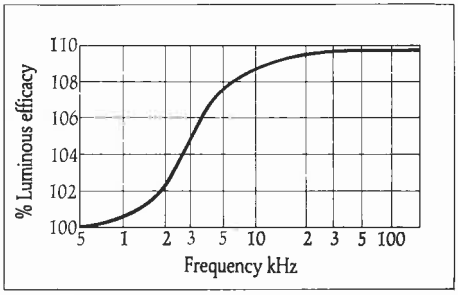


Fig. (2) Variation of tube efficacy with operating frequency.

Fluorescent Tubes – Main Range

Initial and Lighting Design **Lumens (L.D.L.)**
Initial lumens are measured after 100 hours of operation.
Lighting design lumens are measured at 2000 hours.

LIGHT OUTPUT DATA

Lumens 100hrs 2000hrs	8′ 125W T12	8′ 100W T12	8′ 85W T12	6′ 75/85W T12	6′ 70W T8	5′ 65/80W T12	5′ 58W T8	5′ 50W T8	4′ 40W T12	4′ 36W T8	1050mm 1M 40W T8	40W T12	3′ 30W T8	2′ 40W T12	2′ 20W T12	2′ 18W T8	18″ 15W T8
Polylux **2700**		9400 8900			6550 6300		5400 5100			3450 3200						1450 1300	
Polylux 3000		9400 8900			6550 6300		5400 5100			3450 3200			2500 2300			1450 1300	
Polylux **3500**		9400 8900			6550 6300		5400 5100			3450 3200	3450 3200					1450 1300	
Polylux **4000**	10900 10350	9400 8900	8450 8000	6700 6350	6550 6300	5400 5100	5400 5100		3450 3200	3450 3200			2500 2300		1450 1300	1450 1300	
White/ **3500** Plusiux	9500 8900	8600 8100	7350 6850	5850 5500	5800 5500	5000 4600	4800 4450	3800 3550	3050 2800	3000 2800	3050 2800		2300 2150	2000 1700	1225 1100	1225 1100	950 800
Warm 3000 White/Pluslux	9500 8900	8600 8100	7350 6850	5850 5500	5800 5500	5000 4600	4800 4450	3800 3550	3050 2800	3000 2800	3050 2800	2920 2600	2300 2150		1225 1100	1225 1100	950 800
Cool **4000** White/Pluslux	9300 8500	8450 7800	7150 6550	5700 5450	5700	4850 4500	4700 4350		3000 2750	3000 2750	3000 2750	2750 2550	2250 2100		1200 1100	1200 1100	900 750
Tropical Daylight																	730 650
Natural	7700 7050	6850 6350	5800 5350	4650 4350		3875 3550			2450 2200			2150 1950	1780 1600		1000 890		740 650
°Kolor-rite	6300 5700	5700 5200	4800 4400	3900 3500		3300 3000			2000 1800				1500 1400		850 750		
Delux Natural	5500 4800	4900 4400	4300 3800	3400 2900		2900 2500	2750 2350		1750 1500	1750 1500	1750 1500	1650 1400	1300 1150		700 600	700 600	540 440
Artificial Daylight	5200 4750			3300 2850		2900 2700			1750 1620						700 600		
Northlight	6000 5600	5500 5000	4500 4100	3700 3400		3150 2900			2000 1850				1500 1400		850 750		650 550
Grolux/ Supergro						— 1500			— 900				— 700		— 350		— 250
Radar Red						*			*								
Pink				1500		1250			750						290		
Blue				1400		1150			700						270		
Green				5600		4600			2800						1100		
Gold				2900		2400			1450						550		
Red				270		230			140						50		
Rosetta	5130 4260	4590 3900		3110 2580	2960 2460	2540 2110	2550 2120		1670 1420	1620 1380	1620 1380	1460 1240	1200 1020		690 590	670 570	510 430

* Lumen figures not applicable.

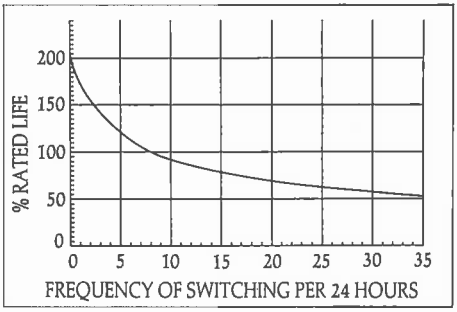
Life and Lumen Depreciation Factors

The Effects of Switching

When a tube is operating, a small amount of the electron emissive material on the cathodes is continually consumed, but at starting a relatively large amount is dislodged. End of life is reached when no active emitter remains on the cathode and the tube is unable to start.

A frequently switched tube will fail much earlier than one that is hardly switched at all but in the latter case its light output will have fallen very low before actual failure.

The graph shows the effect on life of different switching cycles.

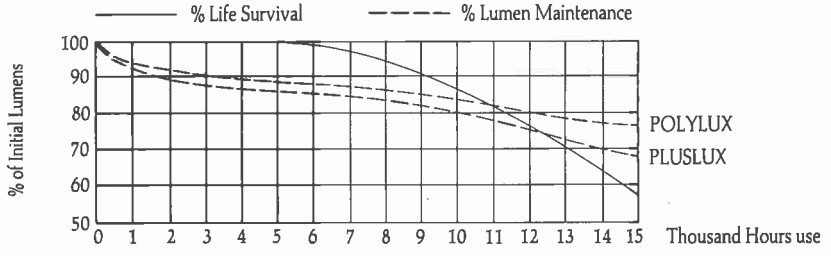


Economic Life

Most tubes employed in today's modern environment operate with an extended period (greater than 3 hours) between switchings which results in long lives, and because of this due consideration should be given to the "lighting economics".

The economic factor arises from the gradual degradation in the tube's light output during operation due to deterioration of the phosphors whereby it becomes desirable to replace the tube prior to actual failure. The favourable economics of Polylux tubes become apparent when compared with other tubes because of their superior lumen maintenance characteristics.

Typical lumen maintenance and survival curves for Pluslux/ Polylux fluorescent tubes



One definition of 'economic life' is the time at which the light output has fallen to 70% of the initial (100 hour) figure. This is defined as the time during which the light output – as a result of mortality and light reduction – has dropped 30% from the initial light output.

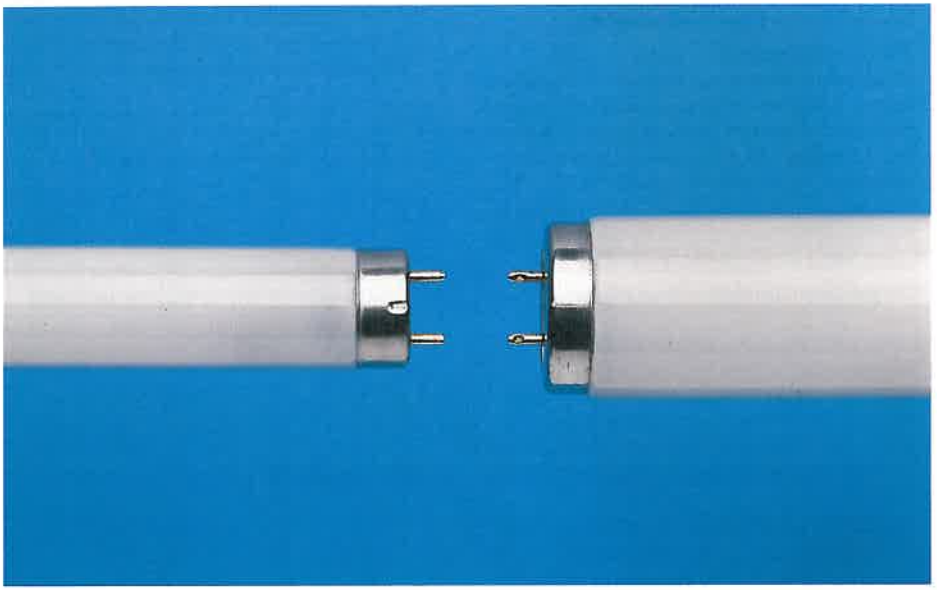
Planned Lighting Maintenance

The most sensible way to arrange tube replacement is to choose a planned lighting maintenance system. This ensures that:

a) The installation maintains a uniform appearance.
b) The risk of damage to the control gear by tubes failing is reduced.
c) Cleaning of the luminaires can be undertaken at the same time as the lamp change, at little extra cost.

The few individual tubes which fail between the planned replacement times should be replaced immediately.

Fluorescent Tubes Main Range



Electrical Data and Dimensions

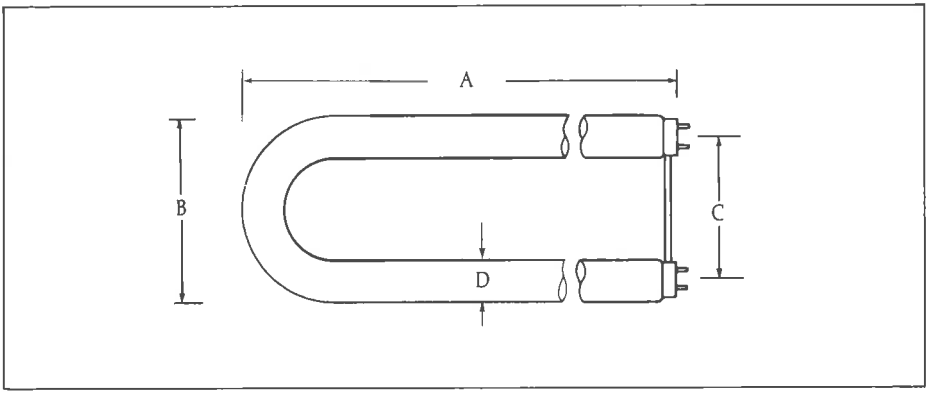
Average performance tested at 25°C to BS2818 and BS1853. These standards allow for certain manufacturing tolerances.

Figures given are nominal and subject to tolerances.

Tube Rating	Length mm.	Diameter mm.	Rated Tube Watts	Objective Tube Watts	Tube Volts	Tube Amps
Polylux & Pluslux						
8′ 100W	2400	38	100	102	125	0.96
6′ 70W	1800	26	70	69	128	0.70
5′ 58W	1500	26	58	58	110	0.67
4′ 36W	1200	26	36	36	103	0.43
2′ 18W	600	26	18	18	57	0.37
Argon Filled Tubes						
8′ 125W	2400	38	125	123	149	0.94
8′ 85W	2400	38	85	85	178	0.55
6′ 75/85W	1800	38	75	75	130	0.67
5′ 65/80W	1500	38	65	64	110	0.67
5′ 50W	1500	26	50	48	154	0.37
4′ 40W	1200	38	40	39	103	0.43
1050mm 40W	1050	26	40	39	112	0.42
1M 40W	997	38	40	40	81	0.56
3′ 30W	900	26	30	30	96	0.36
2′ 40W	600	38	40	37	45	0.88
2′ 20W	600	38	20	19	57	0.37
18″ 15W	450	26	15	15	56	0.31

Fluorescent Tubes – Other Types

"U" Tubes



DIMENSIONS (mm)

Rated Wattage	Nominal dimensions	Cap	Length overall-A Max.	Length overall-B Max.	Leg Centres-C Max.	Bulb Diameter-D Max.
40	525 x 120	2 x G13	524.0	120.66	94.0	26.66

Note: Maximum difference in lamp leg length = 2.0mm.

ELECTRICAL DATA

Rated Watts	Objective Watts	Tube Volts	Tube Amps
40	39	112	0.42

COLOUR OPTIONS AND LUMENS

	100hr lumens	2000hr lumens
Polylux 3500	3250	3000
White	2875	2575
Warm White	2875	2575

Fluorescent Tubes – Other Types

Circular Fluorescent Tubes

DIMENSIONS (mm)

Rated Wattage	Nominal diameter	Cap	Outside Lamp diameter-C max.	Bulb diameter-D1 max.
32	305	G10q	311.2	34.1
40	406	G10q	412.8	34.1
60	406	G10q	412.8	34.1

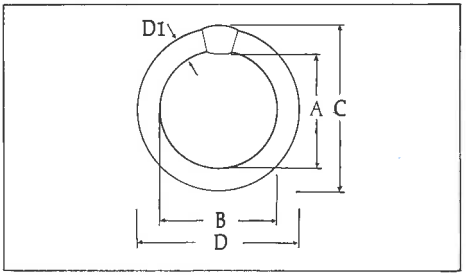
ELECTRICAL DATA

Rated Watts	Objective Watts	Tube Volts	Tube Amps
32	32	81	0.45
40	40	110	0.42
60	58	92	0.75

LUMENS

	100hr lumens	2000hr lumens
32W	1800	1600
40W	2500	2300
60W	3700	3400

Colour: Warm White only.



Miniature Fluorescent Tubes

DIMENSIONS AND ELECTRICAL DATA

Type	Length mm.	Diameter mm.	Cap	Rated Watts	Objective Watts	Tube Volts	Tube Amps
21" 13W	525	15	G5	13	13	95	0.17
12" 8W	300	15	G5	8	7	56	0.15
9" 6W	225	15	G5	6	6	42	0.16
6" 4W	150	15	G5	4	4	29	0.17

COLOUR OPTIONS AND LUMENS

100hr / 2000hr	21" 13W	12" 8W	9" 6W	6" 4W
White	850 / 750	480 / 420	300 / 250	150 / 120
Warm White	850 / 750	480 / 420	300 / 250	— / —
Cool White	800 / 700	450 / 400	290 / 250	— / —

Fluorescent Tubes – Other Types

Ultra Violet

These are standard fluorescent tubes in which the phosphor emits long wave ultra-violet (UV-A) radiation together with a small amount of visible light. The peak output at 365nm attracts insects and makes these tubes especially useful in insect traps. Other applications include chemical processing and some printing processes.

Caution

These tubes emit UV radiation – recommendations for their safe use can be found in the publication "Protection against ultra violet radiation in the workplace" issued by the National Radiological Protection Board and available from H.M.S.O.

Size Range

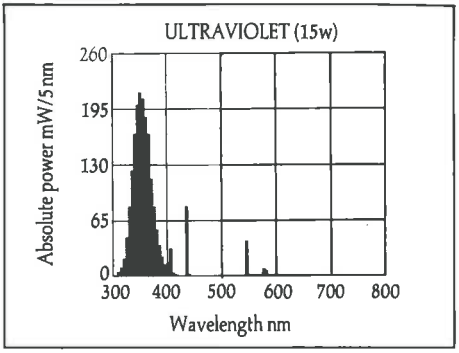
- Standard products
  - 18" 15W
  - 12" 8W
- Special products
  - other sizes and shapes may be made to special order

Electrical Characteristics and Dimensions

The same as standard tubes of the same rating.

Life

Ultra violet lamps should be replaced after 2000 hours operation due to degradation of the UV producing phosphor.



British Standards

Fluorescent tubes described in this catalogue conform to British Standard 1853 and International Standard IEC81 where applicable.
THORN Lighting holds Licence no. 5247 for the manufacture of fluorescent tubes to BS 1853.

Marking of rated wattage on tubes

The wattage dissipated and lumen output of any discharge lamp, including a fluorescent tube, depend mainly on the characteristics of the ballast with which the particular lamp is operated and on the mains supply voltage at any given time.

Because of this the marking of a rated wattage on any given fluorescent tube does not necessarily indicate the wattage which the tube is intended to dissipate in any given circuit arrangement.

The appropriate fluorescent tube and associated ballast specifications list the rated or nominal wattage of any given tube type and also the 'objective wattage' which is the actual target wattage the tube should dissipate when operated under prescribed conditions in association with a mid-point reference ballast.

Ballast Lumen Factor

The ratio of the light output of the lamp when the ballast under test is operated at its rated voltage, compared with the light output of the same lamp operated with the appropriate reference ballast supplied at its rated voltage and frequency.

Electrical Data

This is given for standard control gear operated in 240V 50Hz tube circuits. Average performance is determined at 25°C in accordance with BS 2818. The circuit watts quoted may be reduced by up to 5% when operating in some luminaires because circuit watts reduce as the lamp operating temperature rises.

Tube Grades

There are different grades of tube to suit various types of control gear and the correct type must be used to obtain satisfactory starting performance.

Standard 26mm and 38mm Diameter Tubes

All standard THORN 26mm and 38mm diameter argon filled tubes are for use in all luminaires.

For starterless circuits the metal chassis must extend the full length of the tube, be not more than 20mm from it, and be bonded to earth. Switchless start circuits must be used only on 200-250V 50Hz supplies where the neutral conductor is at earth potential. 26mm diameter Krypton filled (Pluslux and Polylux) tubes are suitable for switchstart, Vivatronic or electronic ballast start only.

Miscellaneous Tubes

Metal Strip Tubes (MCFA/U)

These are supplied for use where earthed metalwork is not adjacent to the tube. A metallic conducting strip is cemented to the outside of the tube, connected to both caps, which must be earthed. A limited range of the more popular tubes in 600-1800mm lengths, can be supplied with metal strip.

Coloured Tubes

Red and Gold tubes are only for use on starter switch circuits and not switchless-start circuits.

Colour Temperatures for Fluorescent Tubes

The term 'colour temperature' should strictly be applied only to spectral distributions that give chromaticity co-ordinates close to the black body locus. Thus in fluorescent tube colours the 'colour temperature' is merely an indication of the location of the chromaticity co-ordinates on a colour chart.

The 'colour temperatures' should not be used as a guide for photographic purposes.

Spectral Distribution

Spectral distribution data is given in graphical form. Horizontal scales are wavelengths in nanometres (10^{-9} metres).

Vertical scales are power in milliwatts per 5 nanometre band width per 1000 lumens for a 1500mm tube at 58W or 65W as appropriate.

Lumen Outputs

The lumen outputs quoted in this catalogue are measured at 25°C in accordance with BS 1853.

Note that lumen outputs of individual tubes are within the limits specified in BS 1853 according to rating.

Initial Lumens

Initial lumens are measured after 100 hours operation.

Lumens During Life

Lamp outputs at 2000 hours are also included as a guide to lighting engineers planning scheme layouts. Lumen output beyond 2000 hours decreases by 2% to 4% per 1000 hours use according to the colour and loading (see curves on preceding pages).

BI-PIN/BC Adaptor GB 1515

Adaptor converting bi-pin lamp cap to BC. The overall length of a 1500mm bi-pin tube with these adaptors does not exceed the length of a BC tube.

DISCHARGE LAMPS

General Discharge Lamp Information

Sydney Opera House

Lighting Advisory Service
Discharge lamps are compact high output light sources and their successful application for interior or exterior use depends upon several factors. Luminaire design, layout and decor are all important elements in achieving visual satisfaction. Advice from THORN Lighting Engineers is available on request.

Supply Voltage
All lamps are suitable for 220V and 240V supplies using suitable control gear.

Lamps will start and operate with a 10% reduction in rated supply voltage provided the correct control gear is used.

However, in order to maximise lamp survival, lumen maintenance and colour uniformity it is recommended that the supply voltage and ballast design voltage should be within ± 3%.

Supply voltage excursions of ± 5% from normal will not be detrimental provided that for most of the time the variation is within ± 3%.

Fusing
For a very short period after switch-on, a discharge lamp may act as a rectifier and as a result the ballast may allow several times the normal circuit current to flow. To avoid fuse failures the ratings recommended in the **Discharge Control Gear** section should be used. For further information refer to Data Sheet 4:90.2.

To prevent rectification occurring at end of life continuous operation of discharge lamps should be avoided and a switch off introduced at least once every 24 hours.

Lamp Standards
The information included in this catalogue indicates typical performance of a representative number of lamps measured under controlled conditions, it is not a guarantee of individual lamp performance.

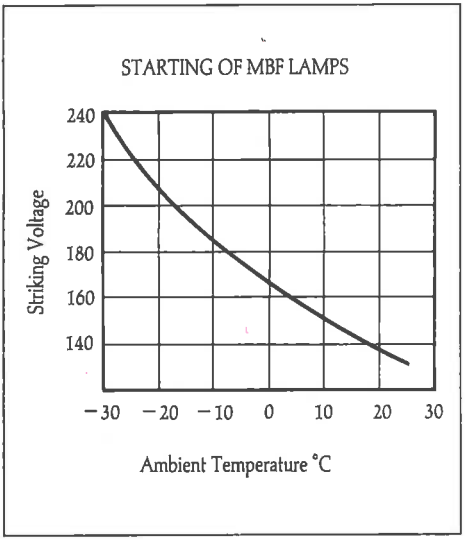
The appropriate lamp standards allow for tolerances in electrical characteristics which, together with tolerances in ballast impedances, and variations in mains voltage supplies will result in the characteristics of individual lamps varying from the objective when measured under site conditions. THORN discharge lamps comply with, and values included in these tables conform to, the following standards.

BS 3677 High Presure Mercury Vapour Lamps
BS 3767 Low Pressure Sodium Vapour Lamps
IEC 188 High Pressure Mercury Vapour Lamps
IEC 192 Low Pressure Sodium Vapour Lamps
IEC 662 High Pressure Sodium Vapour Lamps

Cap Designations

ES	— E27
GES	— E40
BC	— B22
3pin BC	— B22-3

Ambient Temperature
Discharge lamps will normally start at minimum temperatures of −20°C [−40° for SON and −30° for CSI]. Mercury lamps which do not use a high voltage ignitor device are dependent upon supply voltage.



General Discharge Lamp Information

Gloucester Cathedral

Run-up and re-strike times

When a discharge lamp is switched on, current first flows through the starting gas of the arc tube. The heat generated vapourises the mercury, sodium or halide filling until the operating conditions are achieved. This is known as the run-up.

The following table shows typical times for both run up and re-strike. The actual time will vary according to location, luminaire and ambient temperature. Re-strike time is based upon lamps that have fully run-up and are subject to a momentary interruption to the supply voltage. Run-up times are for the period up to 90% normal light output.

Most discharge lamps, except for mercury lamps are started by a high voltage pulse supplied by separate ignitor which ceases to function once the lamp has started. External starting simplifies lamp construction and is very reliable.

All THORN Lighting SON lamps carry the internationally agreed ⚠ symbol to indicate suitability for use with external ignitor circuits.

For information relating to Installation, Operation and Disposal of discharge lamps, please refer to instructions packed with the product.

Data Sheets

The following THORN Lighting Data sheets contain more detailed information on specific subjects and lamp types and are available on request.

4:90 Series – General Information

4:90.1 Lumen outputs of Discharge Lamps
4:90.2 Fuse Ratings for Discharge Lamps
4:90.3 Electrical Characteristics of Discharge Lamps

4:91 Series – Mercury and Metal Halide Lamps

4:91.2 MBF KOLORLUX
4:91.6 MBI/MBIF KOLORARC
4:91.7 ARCSTREAM
4:91.11 MBIL
4:91.13 MBF Super Deluxe
4:99.7 1kW CSI Sealed Beam

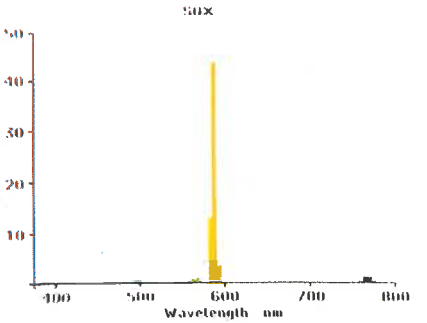
4:96 Series – High and Low Pressure Sodium Lamps

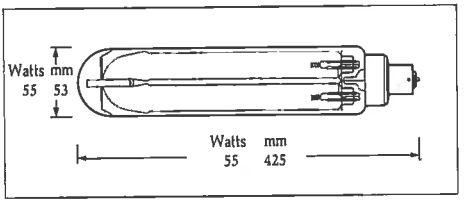
4:96.1 SON-E*
4:96.2 SON-T
4:96.3 SONDL-E
4:96.4 SONDL-T
4:96.5 SON-TD
4:96.6 SON-R
4:96.7 SOX

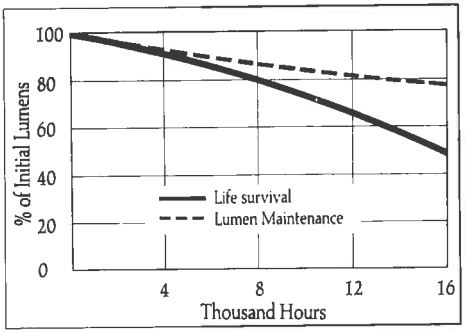
Lamp Type	Rating Watts	Run-up time mins.	Re-strike time mins.
*SOX	18	12	Instant
	35	9	Instant
	55	9	Instant
	90	9	10
	135	8	10
SOX-E	26	9	Instant
	36	9	Instant
	66	9	10
	91	8	10
SON	50	3	Less than 1
	70	3	Less than 1
	100	4	Less than 1
	150	6	Less than 1
	250	6	Less than 1
	400	4	Less than 1
	1000	6	3
SONDL	150	8	Less than 1
	250	8	Less than 1
	400	8	Less than 1
MBI/MBIF	250	2	7
	400	2	7
	1000	2	7
MBI-T ARCSTREAM 3000/4000	150	1	4
MBF/MBFSD/MBFR	50	5	4
	80	3	4
	125	3	4
	250	4	4
	400	4	4
	700	3	6
	1000	2	7
MBIL	750	2	8-12†
	1500	2	15-20†
CSI	1000	1	10*

† In floodlight
* Hot re-strike version also available

SOX/SOX-E Lamps







Low Pressure Sodium

The visible energy from a low pressure sodium lamp is concentrated at wavelengths of 589 and 589.6mm. This monochromatic radiation occurs close to the peak sensitivity of the human eye and therefore provides the highest luminous efficacy of lamp types for general lighting purposes. It is this characteristic which produces the familiar yellow colour.

Description

SOX lamps consist of a low pressure sodium discharge operating in a U-shaped arc tube which is mounted in a tubular outer bulb. This bulb has an internal infra-red reflecting coating to provide thermal insulation and to ensure the optimum operating temperature of the arc tube.

Applications

The high efficacy results in low power costs which makes the lamps particularly suitable where long operating hours are required. The main applications are for external lighting – roads and pathways – and security lighting – car parks, subways, storage areas, construction sites. SOX lamps are also useful where monochromatic radiation is required for scientific and graphic arts purposes. The lamps should not be used where colour discrimination is required.

Operating position

Horizontal ± 20°. 18-55W ratings may also be operated vertically, cap up.

RANGE

Rating Watts	Lamp Type	Cap	Lamp voltage V	Lamp Current amps	Lumen output 100 hrs	Lumen output 2000 hrs
18	SOX	BC	57	0.35	1800	1750
35	SOX	BC	70	0.6	4600	4500
55	SOX	BC	109	0.59	7650	7500
90	SOX	BC	112	0.94	12750	12500
135	SOX	BC	164	0.95	22000	21500

SOX/SOX-E Lamps

A1(M) Hatfield Tunnel

Low Pressure Sodium
SOX-E lamps confer the same luminous advantages associated with standard SOX lamps in that the monochromatic radiation emitted by SOX-E corresponds closely to the optimum sensitivity of the human eye. The nature of this radiation means that colour performance is, therefore, also the same. However, by modifying the construction of the standard SOX lamp, power savings can be achieved and this amounts for the "E" suffix which stands for ECONOMY.

Description
The construction of SOX-E is similar to standard SOX (see previous page) except that the thermal insulation is improved. This increases the efficacy of the lamp and by reducing the Wattage, significant power savings can be achieved with only a small reduction in light output.

SOX-E lamps are interchangeable with standard SOX lamps in the following way:

Equivalent Ratings

SOX	SOX-E
35W	26W
55W	36W
90W	66W
135W	91W

Applications
As for SOX – where long operating hours and low power costs are required. For example external lighting for roads, car parks, precincts etc.

Operating Position
Horizontal ± 20°. 26, 36W rating may also be operated vertically, cap up.

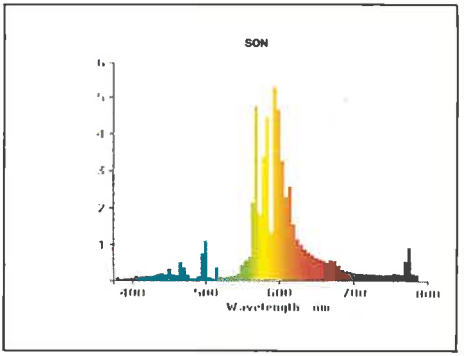
Note
Although significant power savings can be achieved by substituting SOX-E lamps for SOX, the rated Wattage figures for SOX-E will only be achieved when they are operated on control gear designed specifically for SOX-E. All figures quoted in this catalogue for SOX-E are for lamps operated on SOX control gear.

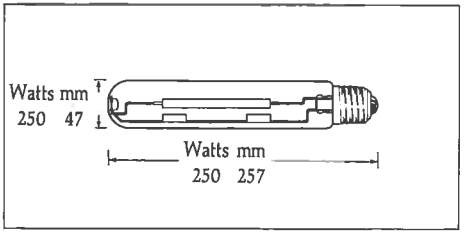
RANGE

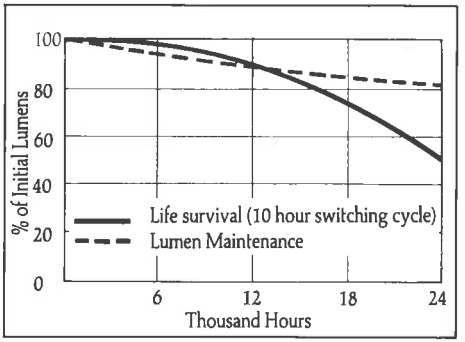
Rating Watts	Lamp Type	Cap	Lamp voltage V	Lamp Current amps	Lumen output 100 hrs	2000 hrs
26	SOX-E	BC	60	0.62	3950	3800
36	SOX-E	BC	82	0.61	5950	5750
66	SOX-E	BC	88	0.97	10500	10000
91	SOX-E	BC	140	0.94	16800	16300

SOX-E Lumens apply to operation on SOX Control Gear

SON-T, SON-E Lamps







High Pressure Sodium

High pressure sodium lamps offer a distinct improvement in colour appearance and colour rendering in comparison with low pressure sodium lamps.

SON lamps combine high efficacy, long life and exceptionally good lumen maintenance which makes them particularly suitable for situations where operating costs are high. SON lamps emit a pleasant golden-white light with adequate colour rendering for colour discrimination purposes.

The compact size of the lamps offers flexibility for luminaire design and better optical control, particularly with the clear tubular version.

Description

SON lamps consist of a high pressure sodium discharge operating within a sintered alumina arc tube which is mounted in an outer glass bulb. This bulb may be either tubular clear or diffuse elliptical shape.

All THORN lamps are marked ⚠ which indicates that they are suitable for use with external ignitor circuits. External starting simplifies lamp construction and is very reliable.

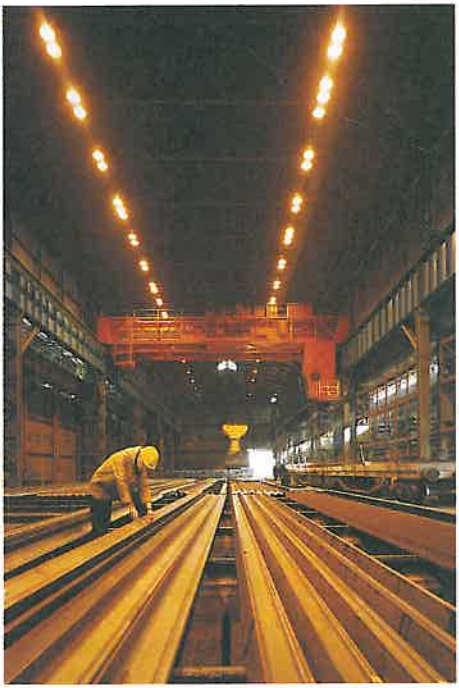
Applications

The combination of high efficiency, good lumen maintenance and long life make this lamp suitable for many applications both internal and exterior. Warehouses, roadways, floodlighting and security lighting.

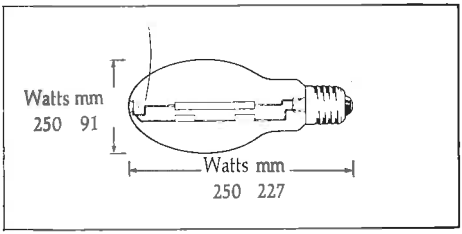
Operating Position

Universal. IEC 662 gives specific operating conditions for all luminaires.

SON-T, SON-E Lamps



British Steel Corporation, Workington

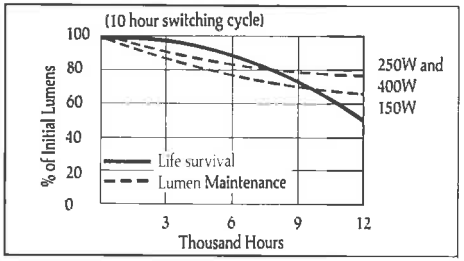


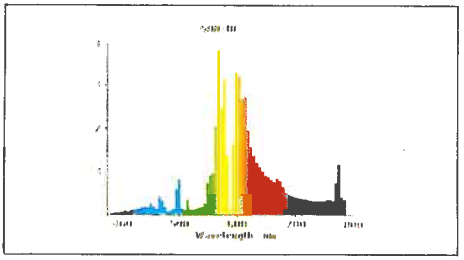
RANGE

Rating Watts	Lamp Type	Cap	Lamp voltage V	Lamp Current amps	Lumen output 100 hrs	2000 hrs
50	SON-E	ES	85	0.76	3500	3100
70	SON-E	ES	90	0.98	5800	5300
100	SON-E	GES	100	1.2	9200	8800
150	SON-E	GES	100	1.8	15500	15000
250	SON-E	GES	100	3.0	26500	25500
400	SON-E	GES	105	4.4	46000	45000
1000	SON-E	GES	110	10.3	120000	110000
50	SON-T	ES	85	0.75	3500	3100
70	SON-T	ES	90	0.98	6000	5500
100	SON-T	GES	100	1.2	9600	9200
150	SON-T	GES	100	1.8	16000	15500
250	SON-T	GES	100	3.0	28500	28000
400	SON-T	GES	100	4.6	48000	47000
1000	SON-T	GES	110	10.3	130000	120000

Correlated Colour Temp (K)		50-70W 1900	100W 1950	150-400W 2000	1000W 2050
Colour co-ordinates	x	0.542	0.530	0.530	0.520
	y	0.415	0.418	0.415	0.415
General colour rendering index (Ra)		35	25	25	20

SONDL Lamps





High Pressure Sodium – Deluxe

SONDL combines all of the energy saving benefits associated with standard SON but the colour appearance is substantially whiter and the colour rendering abilities of the lamp are improved with a dramatic leap to Ra 65 on the Colour Rendering Index.

Description

SONDL lamps consist of a sodium discharge operating within a sintered alumina arc tube. However, in order to achieve the benefits in colour performance, this discharge operates at a higher pressure than is the case with standard SON and for this reason, a specially designed arc tube is employed.

SONDL lamps are available in either clear tubular or diffuse elliptical versions and because they are compact offer considerable flexibility for luminaire design and good optical control, particularly with the clear tubular version. SONDL lamps are electrically and dimensionally interchangeable with standard SON.

Applications

As a result of the improved colour, SONDL is ideally suitable for commercial interior applications or, in fact any application where good colour rendering is preferred or required. However, SONDL is equally suitable for decorative floodlighting and amenity lighting.

Operating Position

Universal.

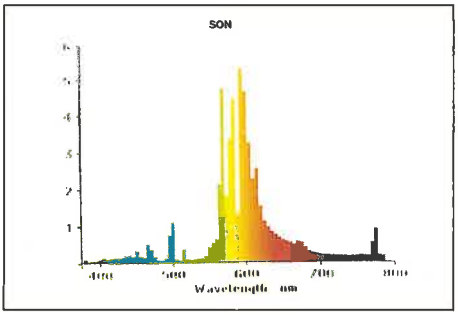
RANGE

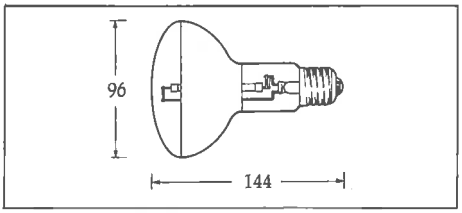
Rating Watts	Lamp Type	Cap	Lamp voltage V	Lamp Current amps A	Lumen output 100 hrs	2000 hrs
150	SONDL-E	GES	100	1.8	11500	11000
250	SONDL-E	GES	100	3.0	20000	19000
400	SONDL-E	GES	105	4.4	34000	33000
150	SONDL-T	GES	100	1.8	12000	11500
250	SONDL-T	GES	100	3.0	21000	20500
400	SONDL-T	GES	100	4.6	35000	34000

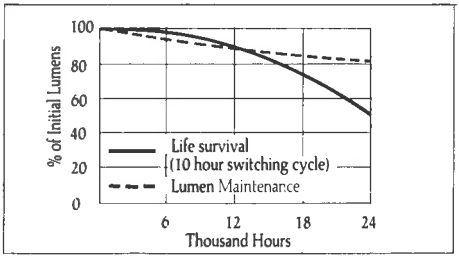
Correlated Colour Temp [K]		2200
Colour co-ordinates	x	0.504
	y	0.411
General colour rendering Index [Ra]		65

Dimensions see pages 354 and 355.

SON-R Lamps







High Pressure Sodium – Reflector

SON-R incorporates all the economic benefits of high pressure sodium lamps – high efficacy, long life and reliability. With its internal reflector, however, SON-R provides accurate optical control without the need for expensive luminaires and also results in low maintenance, especially cleaning costs.

Description

SON-R operates in the same manner as standard SON. The high pressure sodium discharge operates in a sintered alumina arc tube which is mounted in a shaped glass bulb. This glass bulb incorporates the internal reflector.

Applications

SON-R can be used in areas where the warm golden light is useful for decorative purposes. It is particularly useful for downlighting in, for example, foyers, stairwells, canopy lighting. In addition, the accurate optical control makes the lamp useful for plant and floral displays.

Operating Position

Universal.

RANGE

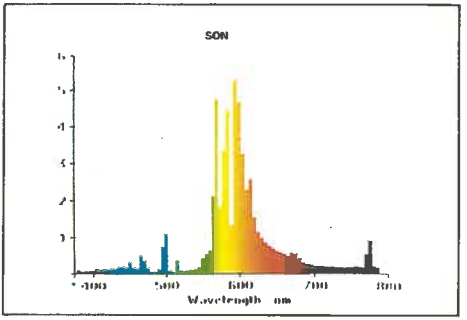
Rating Watts	Lamp Type	Cap	Lamp voltage V	Lamp Current amps A	Lumen output 100 hrs	Lumen output 2000 hrs
70	SON-R	ES	80	0.98	4800	4500

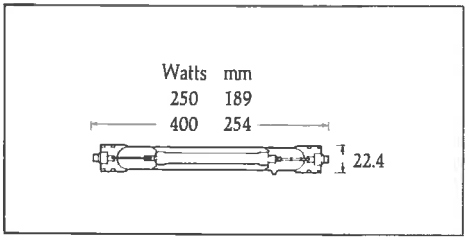
Correlated Colour Temp [K]	1900
Colour co-ordinates x	0.542
y	0.415
General colour rendering Index [Ra]	35

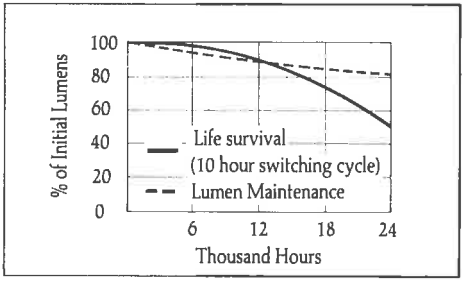
BEAM INFORMATION

Peak Intensity [kcd]	8.4
½ peak beam angle	18°
⅓a peak beam angle	70°

SON-TD Lamps







High Pressure Sodium – Linear

SON-TD is exclusive to market leaders THORN Lighting for operation in luminaires which have been specially designed to optimise the lamp's optical performance. All the economic advantages of standard SON are inherent in SON-TD and the lamp combines economy of operation and high performance with excellent optical control making it an ideal choice where long operating hours are required.

Description

SON-TD arc tube is similar to standard SON but is mounted in a clear tubular quartz outer jacket which is double ended for use in specific luminaires.

RANGE

Rating Watts	Lamp Type	Cap	Lamp voltage V	Lamp current A	Lumen output 100 hrs	2000 hrs
250	SON-TD	Rx7s	100	3.0	26000	25000
400	SON-TD	Rx7s	105	4.4	48000	46000

Correlated Colour Temp (K)		2000
Colour co-ordinates	x	0.530
	y	0.415
General colour rendering index (Ra)		25

Applications

Because of the excellent optical control which can be achieved when used in these luminaires and the economic advantages of using high pressure sodium, SON-TD is ideal for floodlighting applications. The lamp is used in widely differing situations: outdoor and indoor sports arenas, ski slopes etc; decorative lighting of public buildings; security lighting; floodlighting in hazardous areas.

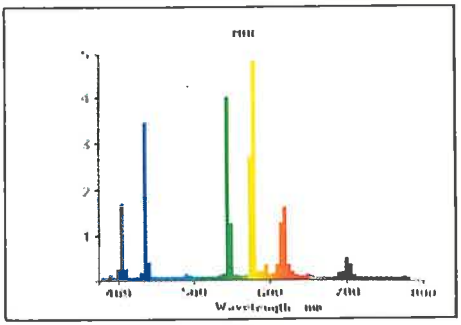
Operating Position Horizontal ± 20°.

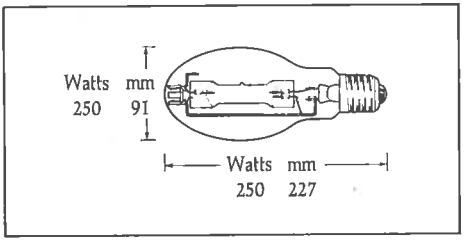
NB

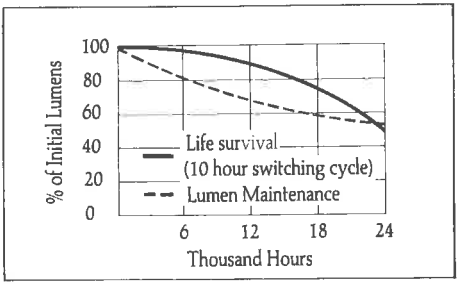
All lamp performance figures are quoted for operation in a suitable luminaire. Performance will not be achieved in free air.

Operation of the lamp in a vertical position may adversely affect the quoted life.

MBF Lamps







High Pressure Mercury – KOLORLUX

Standard MBF lamps are of well established design and have, over the years, proved themselves to be highly reliable. They offer the typical benefits associated with discharge lighting: high output; long life and low operating costs. Two of the great features of the lamp are that it provides white light with reasonable colour rendering ability and, because it operates on a simple ballast circuit a KOLORLUX package is simple and incurs low capital costs.

Description

MBF lamps consist of a high pressure mercury discharge operating within a quartz arc tube. The arc tube is mounted in an elliptical glass bulb which is coated with a fluorescent phosphor. This phosphor both improves the colour that would normally be emitted from a bare arc tube and diffuses the light.

Applications

With their reasonable colour rendering abilities, MBF lamps may be used for internal applications where some colour judgement is required. However, the lamps are more widely used for external applications such as roadlighting, security and amenity lighting.

Operating Position

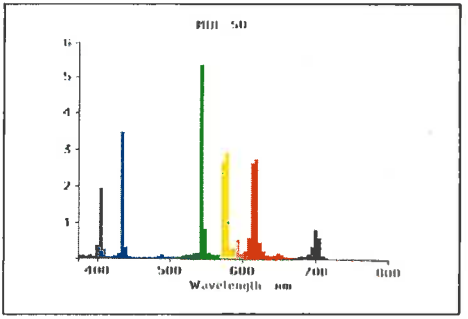
Universal.

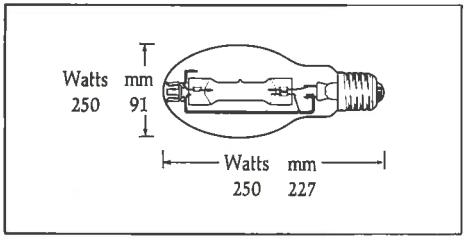
Correlated Colour Temp (K)	3800
Colour co-ordinates x	0.390
y	0.385
General colour rendering Index (Ra)	45

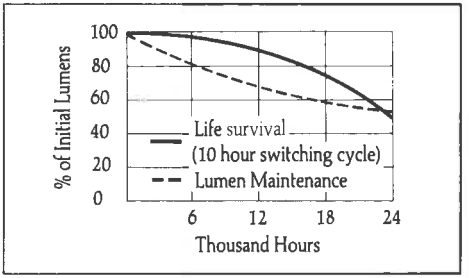
RANGE

Rating Watts	Lamp Type	Cap	Lamp voltage V	Lamp Current amps	Lumen output 100 hrs	2000 hrs
50	MBF	ES	95	0.61	2000	1900
80	MBF	ES	115	0.8	3850	3650
125	MBF	ES	125	1.15	6300	5800
250	MBF	GES	130	2.13	13500	12500
400	MBF	GES	135	3.25	23000	21500
700	MBF	GES	140	5.2	42000	38000
1000	MBF	GES	145	7.5	58000	55000

MBFSD Lamps







High Pressure Mercury – Super Deluxe

MBFSD lamps operate in the same manner as standard MBF except that these new lamps incorporate a new "Super Deluxe" phosphor which has recently been developed. This phosphor converts even more of the light normally produced from the arc tube into the "redder" part of the spectrum than the phosphor in standard MBF lamps and thus the colour of the lamp improves significantly.

Description

The construction and operation of this lamp is the same as for standard MBF (see previous page) with a change in phosphor-coating only. This phosphor reduces the colour temperature to a warmer and more acceptable 3300K (allowing an acceptable blend with fluorescent and tungsten lighting) and improves the colour rendering to an Ra of 55. In addition the lumen output for most ratings of MBFSD is 5% more than that achieved from standard MBF.

Applications

The improved colour performance means that MBFSD can be used for commercial applications or for any lighting application where adequate colour rendering is required. In fact, because MBFSD is dimensionally and electrically interchangeable with standard MBF, the new lamps can be used as direct replacements to improve the quality of lighting in any current MBF installation.

Operating Position

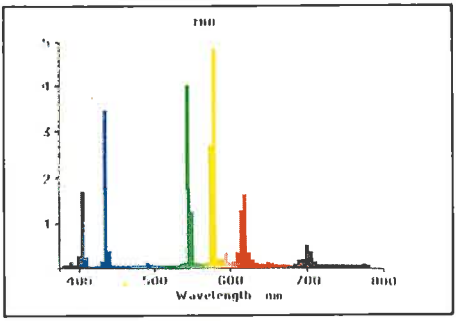
Universal.

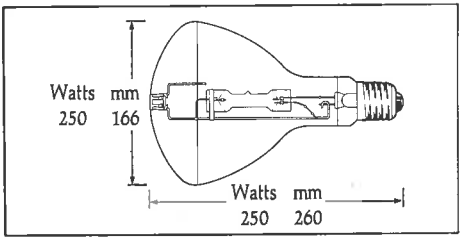
Correlated Colour Temp [K]	3300
Colour co-ordinates x	0.420
y	0.395
General colour rendering Index [Ra]	55

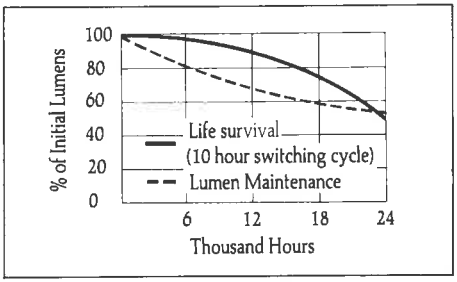
RANGE

Rating Watts	Lamp Type	Cap	Lamp voltage V	Lamp Current amps	Lumen output 100 hrs	2000 hrs
50	MBSFD	ES	95	0.61	2000	1900
80	MBSFD	ES	115	0.8	3850	3650
125	MBSFD	ES	125	1.15	6500	6200
250	MBSFD	GES	130	2.13	14000	13300
400	MBSFD	GES	135	3.25	24000	22800

MBFR Lamps







High Pressure Mercury – Reflector

MBFR lamps offer all the benefits of standard Mercury lamps but, having internal reflectors, offer two great advantages. Firstly, the lamps provide good optical control without the need for expensive reflector systems. Secondly, the optical performance is not restricted by the build-up of dirt or corrosion on reflecting surfaces as is the case with conventional luminaires. As a result, the use of MBFR both reduces capital cost and cleaning/maintenance costs.

Description

MBFR lamps consist of a high pressure mercury discharge operating within a quartz arc tube. The arc tube is mounted in a shaped, hard glass bulb which is coated with a colour-improving phosphor and a reflecting layer.

Applications

MBFR lamps are particularly suitable for operation in dirty industrial environments or inaccessible areas where minimum maintenance is required. In addition, as the bulb is shaped from hard glass, MBFR lamps can be used externally.

Operating Position

Universal.

RANGE

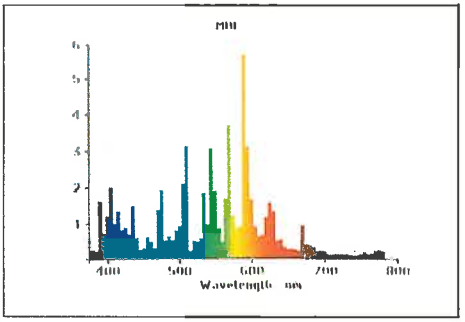
Rating Watts	Lamp Type	Cap	Lamp voltage V	Lamp Current amps	Lumen output 100 hrs	2000 hrs
250	MBFR	GES	130	2.13	11500	10500
400	MBFR	GES	135	3.25	20500	18000
700	MBFR	GES	140	5.20	35000	32500
1000	MBFR	GES	145	7.50	52000	48000

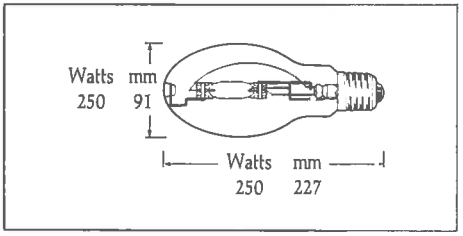
BEAM INFORMATION

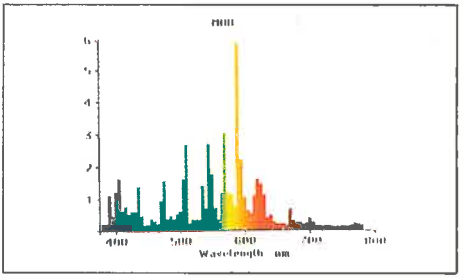
	250W	400W	700W	1000W
Peak Intensity (kcd)	3.1	5.1	9.1	13.5
½ peak beam angle	120°	120°	112°	112°
1/10 peak beam angle	150°	160°	160°	160°

Correlated Colour Temp [K]	3800
Colour co-ordinates x	0.395
y	0.400
General colour rendering Index [Ra]	35

MBI/MBIF Lamps







Metal Halide – KOLORARC
In terms of development, KOLORARC lamps are a progression from standard mercury lamps. The luminous efficacy is almost 25% higher and the lamps have excellent colour rendering abilities and a clean white colour appearance.

Description
KOLORARC lamps consist of a high pressure discharge in mercury vapour with Metal Halide additives, operating in a quartz arc tube. It is these metallic additives which provide the excellent colour performance. The quartz arc tube is mounted in an elliptical glass bulb which is either clear for the MBI version, or coated internally with a fluorescent phosphor for the MBIF lamp.

Applications
KOLORARC lamps are ideally suited for applications where high quality white light is required. They are particularly suitable for commercial interiors, industrial workshops and exhibition areas but are also suitable for situations where television cameras are likely to be used or where any filming is likely to take place. Finally, the MBI version lends itself to floodlighting applications as the clear lamp allows good optical control when used in suitable luminaires.

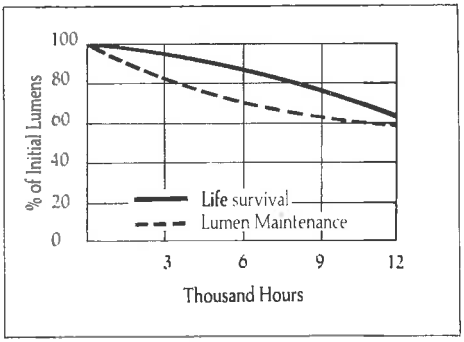
Operating Positions:
BUH — Base Up to Horizontal. Operates in any position between cap up and cap 15° below horizontal.
H — Horizontal. Primarily designed to operate ± 15° of horizontal but can be used up to ± 60° of horizontal.
BU — Base Up. Permitted operating position is base up within ± 30° of the vertical.
BD — Base down. Permitted operating position is base down within ± 30° of the vertical.
U — Universal. Suitable for operating in any position.

Not all permutations of wattage and operating position are available with KOLORARC lamps. Please check before ordering.

Notes
It is important that these lamps are operated in suitably enclosed luminaires with UV absorbing cover glasses. Full enclosure will also retain the fragments of glass in the unusual event of the outer bulbs shattering at the end of life.

As there are no international standards for Metal Halide lamps such as these it is important to check the compatibility of lamp and control gear.

MBI/MBIF Lamps



	MBI	MBIF
Correlated Colour Temp [K]	4100	3800
Colour co-ordinates x	0.380	0.395
y	0.385	0.395
General colour rendering Index [Ra]	65	70

In order to maintain uniformity of appearance group replacement is recommended.

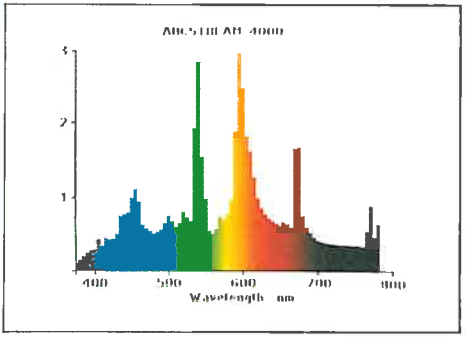
RANGE

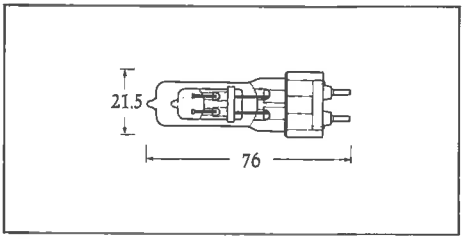
Rating Watts	Lamp Type	Cap	Lamp voltage V	Lamp Current amps	Lumen output 100 hrs	2000 hrs
250	MBIF/BUH	GES	100	2.9	19000	16000
400*	MBIF/BU	GES	120	3.5	29000	24000
400*	MBIF/H	GES	120	3.5	29000	24000
1000	MBIF/U	GES	250	4.2	92000†	85000†
400*	MBI/BU	GES	120	3.5	29000	24000
1000	MBI/U	GES	250	4.2	92000†	85000†

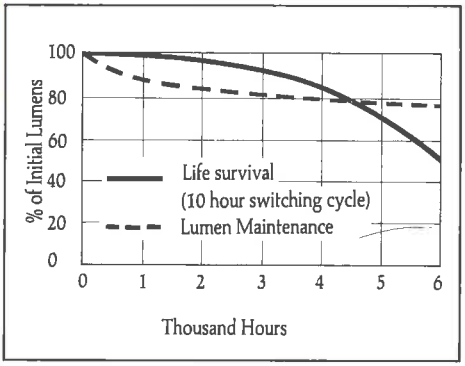
* When operated with THORN control gear, lamp operates at 375W. Lumen outputs quoted for this condition.
† Applies to vertical position; when operated horizontally, reduce by 10%.

Globe, Stockholm

ARCSTREAM Lamps







ARCSTREAM 3000 or 4000

Metal Halide lamps – MBI-T/BDH.

Arcstream is the very latest in metal halide lamp development. It is extremely compact and while being a low wattage lamp has a high lumen output and a long life which makes it a highly efficient lightsource. In addition Arcstream's colour performance is excellent. With a high Ra, colour rendering is extremely accurate and with a choice of colour temperatures – 3000K (warm) and 4000K (cool), Arcstream provides a high quality white light which is sure to match any lighting installation – particularly Lightstream and fluorescent.

Applications

Arcstream's compact size, its high lumen output and colour performance make it a highly versatile lightsource. Being such a small, point like source, precise optical control can be achieved with equally compact fittings. It is, therefore, particularly useful for display lighting where the quality of light and its controllability is vital. This controllability also makes Arcstream extremely useful as a means of floodlighting. Equally, its ability to blend with other lighting means that Arcstream is also an excellent choice for commercial interiors, particularly when used in conjunction with the new range of slim uplighters which have been specially designed for Arcstream.

Finally, being single-ended, installation and maintenance is much easier than for double-ended versions.

ARCSTREAM Lamps

Operating Position
BDH – Base Down to Horizontal. Operates in any position between cap down and cap 15° above horizontal.

Note
It is important that these lamps are operated in suitably enclosed luminaires with a UV absorbing cover glass. Full enclosure will also retain any fragments of quartz in the unusual event of the outer bulb shattering at the end of life.

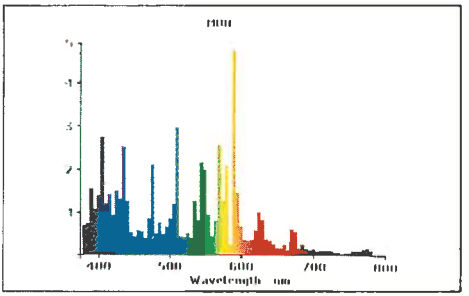
RANGE

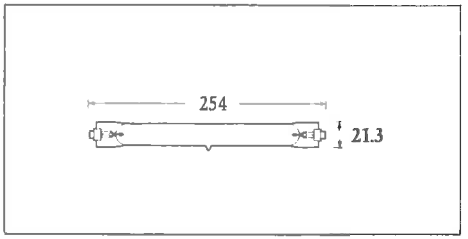
Rating Watts	Lamp Type	Cap	Lamp voltage V	Lamp Current amps	Lumen output 100 hrs	2000 hrs
150	MBI-T/BDH	G12	95	1.8	12000	10000
150	MBI-T/BDH	G12	95	1.8	12000	10000

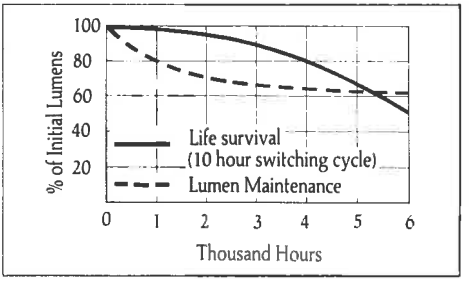
Correlated Colour Temp (K)	3000	4000
Colour co-ordinates x	0.434	0.380
y	0.402	0.377
General colour rendering Index (Ra)	80	85

Royal Museum of Scotland

MBIL Lamps







Metal Halide – Linear

MBIL lamps are the powerful metal halide lamps which have changed floodlighting systems dramatically over recent years. The lamps are slim and double-ended in design which allows positive location in luminaires and ensures that focussing is extremely accurate. It is this control which when combined with the right reflector design allows even illumination without uncomfortable glare as a result of light spillage. Being metal halide, MBIL has excellent colour performance. Colour rendering is good and colour temperature is 5200K – cool white light which approximates to daylight. Finally, despite its small size MBIL has an extremely high lumen output and a long life. Operational and maintenance costs are, therefore lower than would normally be achieved from conventional floodlighting lamps.

Description

MBIL lamps consist of a high pressure discharge with Metal Halide additives operating in a double-ended quartz arc tube. The arc tube is not mounted in an outer bulb but is left bare for use in suitably designed luminaires such as THORN Lighting's OW 1500.

Applications

With its high quality white light and high output MBIL is extremely useful for stadia lighting where T.V. broadcasts are likely to be made. It is also important for general sports lighting – indoors and outdoors – tennis courts, ski slopes or riding schools. MBIL is also suitable for decorative and security floodlighting – of public buildings, building sites or car parks.

Operating Position

Horizontal.

Notes

The 1500W lamp requires 380/415V supply or use of a step-up transformer.

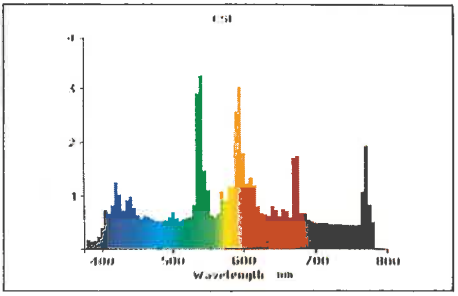
All lamp performance figures are quoted for operation in a suitable fitting. Performance will not be achieved in free air.

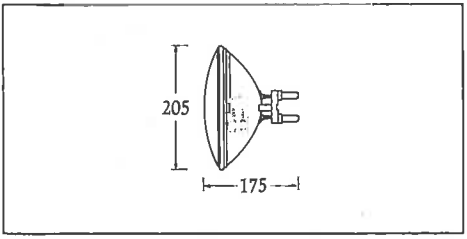
Rating	750W	1500W
Correlated Colour Temp [K]	5200	5200
Colour co-ordinates x	0.340	0.340
y	0.360	0.360
General colour rendering Index [Ra]	65	65

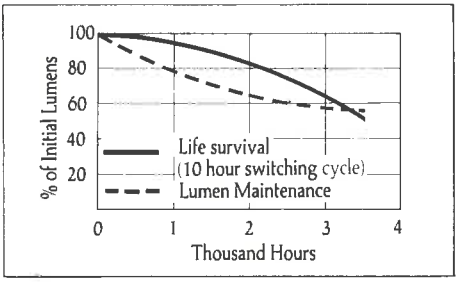
RANGE

Rating Watts	Lamp Type	Lamp reference	Cap	Lamp voltage V	Lamp current A	Lumen Output 100 hrs	Lumen Output 2000 hrs
750	MBIL	91-7461	Rx7s	500	1.75	67000	58500
1500	MBIL	91-7473	Rx7s	250	6.70	120000	110000

CSI Lamps







Metal Halide – Compact Source, Sealed Beam

CSI Sealed Beam lamps extend the possibilities of floodlighting scheme design by providing a projector or spotlight rather than a wide beam flood which the MBIL offers. Being a Metal Halide lightsource, colour performance is excellent, with a high Ra and colour temperature of 4000K. With its own in-built reflector system, optical control is extremely accurate and is made even more controllable when used in conjunction with special luminaires such as THORN Lighting's OQ1000. CSI lamps are also available in a hot restrike version so that in the event of an interruption to the power supply, the lamps will re-start immediately. Finally, with their high efficacy and long life, operational and maintenance costs are lower than would be expected from conventional floodlighting lamps.

Description

CSI consists of a high pressure discharge with Metal Halide additives operating in a quartz arc tube. The arc tube is mounted in a PAR 64 sealed beam unit with a clear front glass. This unit not only provides thermal and physical protection for the arc tubes but also acts as an integral precision reflector system.

Applications

CSI are ideal for the long range projection of light from high towers. They are, therefore, most frequently used for major sporting stadia especially as their excellent colour rendering and appearance makes them highly suitable where television cameras are used. However, with their economy of operation, CSI lamps are frequently used for many other general floodlighting applications, particularly decorative lighting of buildings, monuments, columns or atria.

Operating Position

Universal.

Correlated Colour Temp (K)	4000
Colour co-ordinates **x**	0.395
y	0.395
General colour rendering Index (Ra)	80

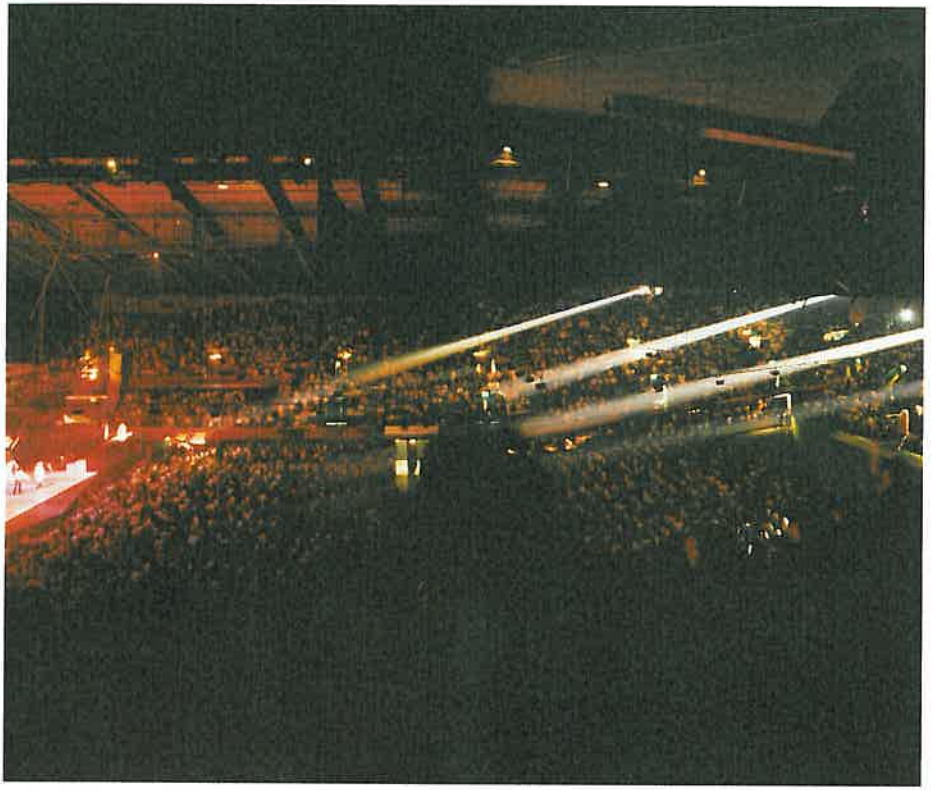
BEAM INFORMATION

Peak Intensity (kcd)	1500
½ peak beam angle	6°
⅒ peak beam angle	18°

RANGE

Rating Watts	Lamp Type	Lamp reference	Cap	Lamp voltage V	Lamp current A	Lumen Output 100 hrs	Lumen Output 2000 hrs
1000	CSI	99-1222	G38	70-85	15	76000	67000

Discharge Lamps for Special Applications



THORN Lighting are pleased to advise on the application of their standard discharge sources for special situations. A typical example of this is in the use of THORN MBI lamps by Trinity House in unmanned Lighthouses, an application which makes full use of their long life, good maintenance and white light characteristics. The lamps directly replace incandescent lamps in optics of the rotating lens type.

Special discharge lamps have been made by THORN for many specific and diverse applications. Typical examples are disco lighting, criminal forensic work, water sterilisation, plant growth and a multitude of applications in the Graphic Arts Industry.

THORN are the world's recognised leaders in the development of short arc metal halide lamps. Such types as their CSI and CID range are used all over the world for lighting in the Film and Television Industry. Sealed Beam (PAR64) types are used for sports fields floodlighting especially where illumination is required to television standards.

A range of Xenon lamps, of the short arc high brightness, high pressure type typically used in film projection and optical and laboratory applications, is also available.

INCANDESCENT LAMPS

General Lamp Information

THORN Lighting Ltd. offer a comprehensive range of incandescent lamps suitable for domestic, commercial or industrial applications. Over 99% of the lamps listed in this section are manufactured in our UK factories where meticulous attention is paid to quality control and where the latest high speed manufacturing equipment ensures that a safe and reliable product is produced.

British and International Standards

Lamps described in this section comply with the following British and European standards where applicable:

British Standard	International Equivalent	Description
BS161	IEC54	Specification for tungsten filament lamps for general lighting service.
BS5971	IEC432	Safety and interchangeability of tungsten filament lamps for domestic and general lighting purposes.
BS5101	—	Specification for lamp caps and holders together with gauges for the control of interchangeability and safety.
BS6179	—	Specification for tungsten filament lamps for general lighting service with lives of 2000 hours.

Lumen Outputs of GLS Lamps

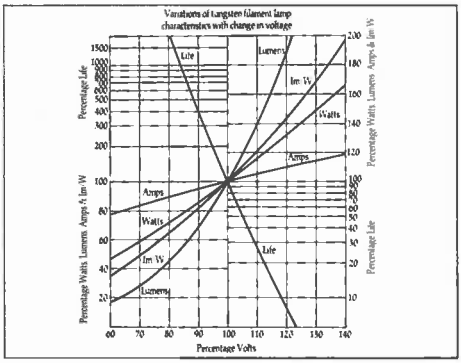
This information is given in the table below. The figures are derived from National and International specifications and are provided for the guidance of lighting engineers. Initial lumens are the average lumen outputs at the start of life, while Lighting Design Lumens are the average lumen outputs throughout the life of the lamp.

Average Life and Initial Lumens

The quality control of GLS lamps has been extremely well developed, but because minute variations within laid down production tolerances produce proportionally greater changes in average life and lumens, it is impossible to guarantee these figures for an *individual* lamp.

The average life (the rated life of a doublelife lamp is 2000 hours: all others 1000 hours) and lumens quoted in our literature and on lamp cartons is calculated statistically by regularly measuring and life testing sample quantities of lamps to BS161 and IEC64, and taking these results as being representative of our production of a particular type of lamp. These results are recorded and over a period of time an on-going indication of quality is established. The average life of a small quantity of lamps should not be taken as typical unless the results are read in conjunction with BS161 and IEC64.

Operating conditions, particularly supply voltage and burning position, will affect achieved life. As can be seen from the following graph, a 5% increase in supply voltage will reduce the expected life by 50%, hence correct matching of lamp and supply voltage is essential.



Watts	240V Initial lumens	LDL*	Doublelife 240V Initial lumens	LDL*	Netabulb 240V Initial lumens	LDL*	110V Initial lumens	LDL*	50V Initial lumens	LDL*	25V Initial lumens	LDL*
15W	115	105	—	—	—	—	—	—	—	—	—	—
25W	215	200	—	—	—	—	—	—	290	275	335	310
40W	410	390	370	350	385	365	500	460	495	465	620	580
60W	700	665	630	595	660	625	840	770	870	820	998	940
75W	940	890	—	—	—	—	—	—	—	—	—	—
100W	1330	1260	1200	1140	1250	1185	1580	1450	1600	1500	1720	1610
150W	2140	2030	1900	1800	2030	1925	2360	2160	—	—	—	—
200W	2880	2730	—	—	—	—	3250	2980	—	—	—	—
300W	4550	4300	—	—	—	—	5050	4710	5400	5050	—	—
500W	8200	7700	—	—	—	—	8900	8270	—	—	—	—
1000W	18400	17300	—	—	—	—	—	—	—	—	—	—

* Lighting design lumens.

Mazda Stylelight Range

For line illustrations see pages 396-398

GLS **5 x 10 WAY** (SHRINKWRAPPED)

Volts	**Watts**	Cap	Finish	Pack Type	Diagram	Box Quantity
240	25	BC	Pearl	**T**	1	**50**
240	40	BC	Pearl	T	1	**50**
240	**60**	**BC**	Pearl	**T**	1	50
240	**75**	BC	**Pearl**	T	**1**	**50**
240	**100**	BC	**Pearl**	T	**1**	50
240	**150**	BC	Pearl	T	1	50
240	40	BC	**Clear**	**T**	**1**	**50**
240	**60**	BC	**Clear**	T	1	50
240	**100**	BC	**Clear**	**T**	**1**	50
240	60	ES	**Pearl**	T	**3**	**50**
240	100	ES	**Pearl**	T	3	50

T = Tuckend *B = Blister Pack*

GLS **TWINPAK 2 x 50 WAY** (SHRINKWRAPPED)

Volts	**Watts**	Cap	**Finish**	Pack Type	**Diagram**	**Box** Quantity
240	40	BC	**Pearl**	T	1	**2** x 50
240	**60**	BC	**Pearl**	**T**	**1**	**2 x** 50
240	100	BC	Pearl	**T**	**1**	2 **x 50**

Mazda Stylelight Range

NETABULB 5 x 10 WAY (SHRINKWRAPPED) *T = Tuckend B = Blister Pack*

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	40	BC	Opal	T	2	50
240	60	BC	Opal	T	2	50
240	100	BC	Opal	T	2	50

DOUBLELIFE 5 x 10 WAY (SHRINKWRAPPED)

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	40	BC	Pearl	T	1	50
240	60	BC	Pearl	T	1	50
240	100	BC	Pearl	T	1	50
240	150	BC	Pearl	T	1	50
240	40	BC	Clear	T	1	50
240	60	BC	Clear	T	1	50
240	100	BC	Clear	T	1	50

COLOURED GLS

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
200/250	60	BC	Amber	B	1	20
200/250	60	BC	Blue	B	1	20
200/250	60	BC	Yellow	B	1	20
200/250	60	BC	Green	B	1	20
200/250	60	BC	Red	B	1	20
200/250	60	BC	Pink	B	1	20
200/250	25	BC	Red, Green, Blue	B	1	3 x 10
200/250	25	BC	Pink, Amber, Yellow	B	1	3 x 10

FIREGLOW

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
200/250	60	BC	Lacquered	B	6	20

NIGHTLIGHT

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
200/250	8/12	BC	Pearl	B	3	20

PYGMY

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
200/250	15	BC	Clear	B	7	20
200/250	15	SBC	Clear	B	7	20
200/250	15	SES	Clear	B	7	20
200/250	25	SBC	Clear	B	7	20
200/250	25	SES	Clear	B	7	20
200/250	15	BC	Red	B	7	20
200/250	15	SBC	Red	B	7	20
200/250	15	BC	Amber	B	7	20
200/250	15	SBC	Amber	B	7	20

CROWN SILVER

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
200/250	60	ES	Crown Silver	B	21	20

Mazda Stylelight Range

CANDLE 36mm (TWIN BLISTER PACK)

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	25	BC	Opal	B	16	2 x 10
240	25	BC	Clear	B	16	2 x 10
240	25	SBC	Opal	B	16	2 x 10
240	25	SBC	Clear	B	16	2 x 10
240	40	BC	Opal	B	16	2 x 10
240	40	BC	Clear	B	16	2 x 10
240	40	SBC	Opal	B	16	2 x 10
240	40	SBC	Clear	B	16	2 x 10
240	40	SES	Opal	B	16	2 x 10
240	40	SES	Clear	B	16	2 x 10
240	60	BC	Opal	B	16	2 x 10
240	60	BC	Clear	B	16	2 x 10
240	60	SBC	Opal	B	16	2 x 10
240	60	SBC	Clear	B	16	2 x 10
240	40	BC	Warm Orange	B	16	2 x 10
240	40	BC	Pink	B	16	2 x 10
240	40	BC	Soft Pink	B	16	2 x 10
240	40	BC	Patterned	B	16	2 x 10
240	40	BC	Soft Green	B	16	2 x 10
240	40	BC	Lemon	B	16	2 x 10

DECOR SPOT 50mm

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	40	SES	Diffuse	B	22	20

DECOR SPOT 63mm

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	60	BC	Diffuse	B	23	20
240	60	ES	Diffuse	B	23	20
240	60	ES	Amber	B	23	20
240	60	ES	Blue	B	23	20
240	60	ES	Green	B	23	20
240	60	ES	Red	B	23	20
240	60	ES	Yellow	B	23	20
240	60	ES	Neospot	B	23	20

DECOR SPOT 80mm

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	60	BC	Diffuse	B	24	10
240	60	ES	Diffuse	B	24	10
240	100	BC	Diffuse	B	24	10
240	100	ES	Diffuse	B	24	10

DECOR SPOT 95mm

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	75	BC	Diffuse	B	25	10
240	75	ES	Diffuse	B	25	10

Mazda Stylelight Range

DECOR ROUND 45mm (TWIN BLISTER PACK)

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	**25**	SES	Opal	**B**	**18**	**2 x** 10
240	40	BC	Clear	B	18	2 x 10
240	**40**	BC	Opal	B	**18**	**2 x 10**
240	40	SBC	Clear	B	18	2 x 10

DECOR ROUND 68mm

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	**40**	BC	Opal	B	**18**	**20**
240	60	BC	Opal	B	18	20

DECOR ROUND 95mm

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	**60**	BC	Opal	B	18	**10**
240	100	BC	Opal	**B**	**18**	10
240	**40**	BC	Purple	**B**	18	**10**
240	40	BC	Amber	B	18	10
240	40	BC	Green	B	18	10
240	40	BC	Red	B	18	10

DECOR ROUND 126mm

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	100	BC	Opal	B	18	10
240	150	BC	Opal	B	18	10

CARRIAGE LAMP

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
220/240	40	BC	Clear	B	18	10

PAR 38

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	100	ES	Clear	B	26	10

STRIPLIGHT BULB

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	30	221mm	Opal	B	19	20
240	30	221mm	Clear	B	**19**	**20**
240	30	**284mm**	Opal	B	19	20
240	30	284mm	Clear	B	**19**	**20**
240	60	**221mm**	Opal	**B**	19	20
240	60	284mm	Clear	B	19	20

Mazda Stylelight Softglow

Mazda Softglow is a range of GLS Lamps (240v 60w BC) in four subtle shades, Apricot White, Primrose White, Apple White and Rose White, which give a hint of colour designed to co-ordinate with home decor. Manufactured in the UK using the latest machinery Softglow lamps are internally coated to give a soft even spread light.

RANGE

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
240	60	BC	Rose White	B	1	10
240	60	BC	Apricot White	B	1	10
240	**60**	BC	Apple White	B	1	10
240	60	BC	Primrose White	B	1	10

For line illustrations see pages 396-398

General Lighting Service Lamps

For line illustrations see pages 396-398

STANDARD GLS

Volts	Watts	Cap	**Finish**	Diagram	**Box** Quantity*
240	40	BC	**Pearl**	I	AB
240	60	BC	**Pearl**	I	AB
240	100	BC	**Pearl**	I	AB
240	150	BC	**Pearl**	I	AB

DOUBLE LIFE

Volts	Watts	Cap	**Finish**	Diagram	**Box** Quantity*
240	40	BC	**Pearl**	I	C
240	60	BC	**Pearl**	I	C
240	100	**BC**	**Pearl**	I	C
240	150	BC	**Pearl**	I	C

General Lighting Service Lamps

COLOURED

Volts	Watts	Cap	Finish	Diagram	Box Quantity*
200/250	15	BC	Amber, Blue, Green, Pink, Yellow, Red	1	C
200/250	25	BC	Amber, Blue, Green, Pink, Yellow, Red	1	C
200/250†	40	BC	Amber, Blue, Green, Pink, Yellow, Red	1	C
200/250†	60	BC	Amber, Blue, Green, Pink, Yellow, Red	1	C

† Not suitable for outdoor use unless enclosed for protection against rain.

NETABULB (MUSHROOM LAMP)

Volts	Watts	Cap	Finish	Diagram	Box Quantity*
240	40	BC	Silverlight	2	A
240	60	BC	Silverlight	2	A
240	100	BC	Silverlight	2	A
240	150	BC	Silverlight	2	A

* BOX QUANTITIES
A. 25 lamps in tuckend cartons.
B. 100 lamps in tuckend cartons, shrink wrapped in 10s.
C. 50 lamps in tuckend cartons, shrink wrapped in 10s.

OTHER G.L.S. LAMPS

25 VOLT

Volts	Watts	Cap	Finish	Diagram	Box Quantity
25	25	BC	Pearl	3	25
25	25	ES	Pearl	3	25
25	40	BC	Pearl	3	25
25	40	3 pin BC	Pearl	3	25
25	40	ES	Pearl	3	25
25	60	BC	Pearl	3	25
25	60	ES	Pearl	3	25
25	100	BC	Pearl	3	25
25	100	ES	Pearl	3	25

50 VOLT

50	25	BC	Pearl	3	25
50	25	ES	Pearl	3	25
50	40	BC	Pearl	3	25
50	40	ES	Pearl	3	25
50	60	BC	Pearl	3	25
50	60	ES	Pearl	3	25
50	100	BC	Pearl	3	25
50	100	ES	Pearl	3	25
50	300	GES	Clear	3	10

110 VOLT

110	40	BC	Pearl	3	25
110	60	BC	Clear	3	25
110	60	BC, ES	Pearl	3	25
110	100	BC	Clear	3	25
110	100	BC, ES	Pearl	3	25
110	150	BC, ES	Pearl	4	25
110	200	ES	Pearl	4	25
110	300	GES	Clear	5	25
110	500	GES	Clear	5	25

General Lighting Service Lamps

240 VOLT

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	15	BC	Clear	3	25
240	15	BC	Pearl	3	25
240	25	BC, ES	Pearl	3	25
240	25	BC	Clear	3	25
240	40	ES	Pearl	3	25
240	40	BC	Clear	3	25
240	60	ES	Pearl	3	25
240	60	BC, ES	Clear	3	25
240	75	BC	Pearl	3	25
240	100	BC, ES	Clear	3	25
240	100	ES	Pearl	3	25
240	150	BC, ES	Clear	4	25
240	150	ES	Pearl	4	25
240	200	BC, ES	Clear	4	25
240	200	BC, ES	Pearl	4	25
240	300	ES, GES	Clear	5	10
240	500	GES	Clear	5	10
240	1000	GES	Clear	5	10

250 VOLT

250	25	BC	Pearl	3	25
250	40	BC	Pearl	3	25
250	60	BC	Pearl	3	25
250	100	BC	Clear	3	25
250	100	BC	Pearl	3	25
250	150	BC	Clear	4	25
250	150	BC	Pearl	4	25
250	300	GES	Clear	5	10
250	500	GES	Clear	5	10
250	1000	GES	Clear	5	10

Special Service Lamps

For line illustrations see pages 396-398

FIREGLOW

Volts	Watts	Cap	Finish	Pack Type	Diagram	Box Quantity
200/250	**60**	BC	Lacquered	B	**6**	**20**

PYGMY

Volts	Watts	Cap	Finish	Diagram	Box Quantity
25	**15**	BC, SBC	Clear	**7**	**50**
50	**15**	BC, SBC, ES	Clear	**7**	50
60	**15**	BC	Clear	**7**	50
110/120	**15**	BC, SBC, **ES, SES**	Clear	**7**	**50**
150	15	BC	Clear	**7**	50
200/250	**15**	BC, SBC, ES, **SES**	Clear	**7**	**50**
200/250	**15**	BC, SBC	Amber, Blue, Green, Pink, Red, Yellow, White	**7**	50
200/250	25	BC, SBC, ES, SES	Clear	**7**	**50**
260/300	15	BC	Clear	**7**	50

Special Service Lamps

PYGMY – ROUGH SERVICE

Volts	Watts	Cap	Finish	Diagram	Box Quantity
200/250	15	BC, SBC, SES	Clear	7	50
200/250	25	BC, SBC, ES, SES	Clear	7	50

SWITCHBOARD INDICATOR

Volts	Watts	Cap	Finish	Diagram	Box Quantity
200/260	12	BC	Clear	7	50

PILOT INDICATOR*

Volts	Watts	Cap	Finish	Diagram	Box Quantity
50	10	SBC, CAND	Clear	8	25
100/130	10	SBC, SES, CAND	Clear	8	25
200/250	10	SBC, SES, CAND	Clear	8	25

* SES versions are intended for use in appliances only and not for general lighting.

ROUGH SERVICE

Volts	Watts	Cap	Finish	Diagram	Box Quantity
110/120	40	BC, ES	Pearl	9	25
110/120	60	BC, ES	Pearl	9	25
110/120	100	BC, ES	Pearl	9	25
200/250	25	BC	Pearl	9	25
200/250	40	BC, ES	Pearl	9	25
200/250	40	BC	Clear	9	25
200/250	60	BC, ES	Pearl	9	25
200/250	60	BC	Clear	9	25
200/250	100	BC, ES	Pearl	9	25
200/250	100	BC	Clear	9	25

TRAFFIC SIGNAL

Volts	Watts	Nominal L.C.L.*	Cap	Finish	Diagram	Box Quantity
240/250	65	62	ES	Clear	10	25

* Light centre length in mm.

INFRA-RED REFLECTOR Hard glass bulb (domestic and other uses)

Volts	Watts	Cap	Finish	Diagram	Box Quantity
200/250	275	BC, ES	Clear front	11	10
200/250	275	BC, ES	Red front	11	10

SINGLE ENDED TUBULAR

Volts	Watts	Cap	Finish	Diagram	Box Quantity
200/230	25	BC	Clear	12	50
240/250	25	BC, SBC, SES	Clear	12	50
240/250	40	BC, SBC	Clear	12	50

Special Service Lamps

NAVIGATION LAMPS

Volts	Watts	Cap	Finish	Diagram	Box Quantity
220/240	40	BC	Clear	13	25
220/240	40	ES	Clear	13	25
220/240	60	BC	Clear	13	25
220/240	60	ES	Clear	13	25

BUS LAMPS (For Interior Lighting)

Lamp Ref.	Volts	Watts	Cap	Finish	Diagram	Box Quantity
804	12	12	B22d	Pearl	14	100
805	12	12	BA15d	Pearl	14	100
809	12	24	B22d	Pearl	14	100
810	12	24	BA15d	Pearl	14	100
816	24	12	B22d	Pearl	14	100
817	24	12	BA15d	Pearl	14	100
821	24	20	B22d	Pearl	14	100
822	24	20	BA15d	Pearl	14	100

PHOTOGRAPHIC LAMPS CLASS P1

Lamp Ref.	Volts	Watts	Cap	Diagram	Box Quantity
P1/1	240/250	275	BC	15	1
P1/1	240/250	275	ES	15	1
P1/2	240/250	500	BC	15	1
P1/2	240/250	500	ES	15	1

Decorative Lamps

For line illustrations see pages 396-398

NIGHTLIGHT

Volts	Watts	Cap	Finish	Diagram	Box Quantity
200/250	8/12	BC	Pearl	3	10

PLAIN CANDLE 36mm

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	25	BC, SBC	Clear	16	5 x 10
240	25	BC, SBC, SES	Silverlight	16	5 x 10
240	40	BC, SBC, SES	Clear	16	5 x 10
240	40	BC	Amber. Soft Pink, Pink	16	5 x 10
240	40	BC, SBC, SES	Silverlight	16	5 x 10
240	60	BC, SBC, SES	Clear	16	5 x 10
240	60	BC, SBC, SES	Silverlight	16	5 x 10

Decorative Lamps

PLAIN CANDLE 46mm

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	60	BC, SBC	Clear	16	5 x 10
240	60	BC, SBC	Silverlight	16	5 x 10
240	60	BC, SBC	Pearl	16	5 x 10

TWISTED CANDLE 46mm

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	40	BC, SBC	Clear	17	5 x 10
240	40	BC, SBC	Pearl	17	5 x 10
240	60	BC, SBC	Clear	17	5 x 10
240	60	BC, SBC	Pearl	17	5 x 10

DECOR ROUND 45mm

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	25	BC, SBC, SES	Silverlight	18	5 x 10
240	40	BC, SBC, ES, SES	Silverlight	18	5 x 10
240	40	BC, SBC, SES	Clear	18	5 x 10
240	60	BC, SBC	Silverlight	18	5 x 10
240	60	BC, SBC	Clear	18	5 x 10

DECOR ROUND 68mm

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	40	BC, ES	Silverlight	18	25
240	60	BC, ES	Silverlight	18	25

DECOR ROUND 95mm

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	40	BC, ES	Clear	18	10
240	40	BC, ES	Silverlight	18	10
240	60	BC, ES	Silverlight	18	10
240	100	BC, ES	Silverlight	18	10
240	100	BC	Clear	18	10
240	150	BC	Silverlight	18	10

DECOR ROUND 126mm

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	100	BC	Silverlight	18	10
240	150	BC	Silverlight	18	10

STRIPLIGHTS

Volts	Watts	Length mm	Cap	Finish	Box Diagram	Quantity
240	30	221	S15s	Clear	19	25
240	30	221	S15s	Opal	19	25
240	30	284	S15s	Clear	19	25
240	30	284	S15s	Opal	19	25
240	60	221	S15s	Clear	19	25
240	60	221	S15s	Opal	19	25
240	60	284	S15s	Clear	19	25
240	60	284	S15s	Opal	19	25

Display Lamps

For line illustrations see pages 396-398

LS 45 LEMON SHAPE

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	40	SES	Crown silvered	20	20

CROWN SILVER DISPLAY

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	60	BC, ES	Crown silvered	21	25
240	100	3PBC, ES	Crown silvered	21	25

DECORSPOT 50

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	25	SES	Diffuse front	22	25
240	40	SES	Diffuse front	22	25

Display Lamps

DECORSPOT 63

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	40	ES	Diffuse front	23	50
240	60	ES	Clear front	23	50
240	60	ES, BC	Diffuse front	23	50
240	60**	ES	Disco lamp, Lacquered Amber, Blue, Green, Red and Yellow	23	50

DECORSPOT 80

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	40	BC, ES	Diffuse front	24	10
240	60	BC, ES	Diffuse front	24	10
240	60	BC, ES	Clear	24	10
240	60**	ES	Disco lamp, Amber, Blue, Green, Red and Yellow	24	10
240	100	BC, ES	Satin etch	24	10

**These lamps are designed for non-continuous operation. If run continuously, lacquer could deteriorate after 500 hours.

DECORSPOT 95

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240/250	75	BC, ES	Diffuse front	25	10
240/250	75	ES	Diffuse front, Lacquered Amber, Blue, Green, Red and Yellow	25	10
240/250	100	BC, ES	Diffuse front	25	10
240/250	100	ES	Diffuse front, Lacquered Amber, Blue, Green, Red and Yellow	25	10

DECORSPOT 125

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240/250	150	BC, ES	Diffuse front	25	10

PAR 38 SEALED BEAM

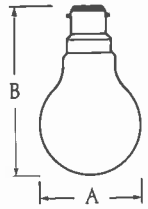
Volts	Watts	Cap	Finish	Diagram	Box Quantity
240	80	ES	Clear front, Spot	26	12
240	80	ES	Clear front, Flood	26	12
240	100	ES	Clear front, Spot	26	12
240	100	ES	Clear front, Flood	26	12
240	100	ES	Flood lacquered Blue, Green, Red, Yellow, Amber	26	12
240	120	ES	Clear front, Spot	26	12
240	120	ES	Clear front, Flood	26	12
240	150	ES	Clear front, Spot	26	12
240	150	ES	Clear front, Flood	26	12

PAR 58 SEALED BEAM

Volts	Watts	Cap	Finish	Diagram	Box Quantity
240/250	300	GX16d	Clear front, Wide beam	27	6
240/250	300	GX16d	Clear front, Medium beam	27	6
240/250	300	GX16d	Clear front, Narrow beam	27	6

Line Illustrations

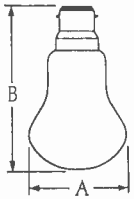
1



		A	B
15-100W	BC	61mm	108.5mm
150W	BC	69mm	128.5mm

Standard GLS
Doublelife
Coloured GLS

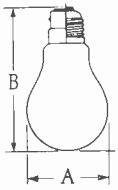
2



	A	B
40, 60, 100W	61mm	103.5mm
150W	76mm	124.5mm

Netabulb

3

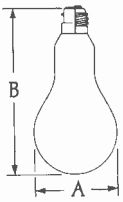


	A	B
8/12-100W BC	61mm	108.5mm

(For ES Caps add 1.5mm
to length of BC equivalent)

Other GLS
and Nightlight

4

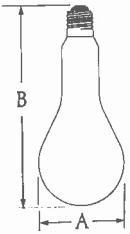


	A	B
150W	69mm	128.5mm
200W BC	81mm	164.5mm

(For ES Caps add 1.5mm
to length of BC equivalent)

150W 200W GLS

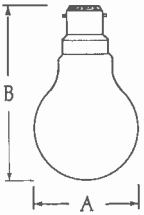
5



	A	B
300W ES	111.5mm	245mm
300-500W GES	111.5mm	239mm
1000W GES	131.5mm	299mm

300-1000W
GLS

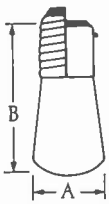
6



	A	B
60W BC	61mm	108.5mm
60W 3-PIN BC	61mm	108.5mm

Fireglow

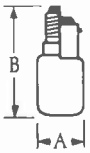
7



	A	B
15-25W BC	29mm	59mm
15-25W SBC	29mm	65mm
15-25W SES	29mm	66mm

Pygmy and
Switchboard
Indicator

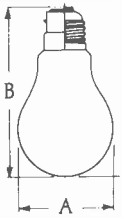
8



	A	B
10W SBC	19mm	43mm
10W CAND	19mm	48mm
10W SES	19mm	49mm

Pilot
Indicator

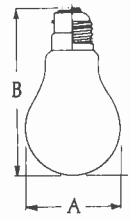
9



	A	B
40-60W	61mm	108.5mm
110/120V 100W	61mm	108.5mm
200/250V 100W	69mm	128.5mm

Rough Service

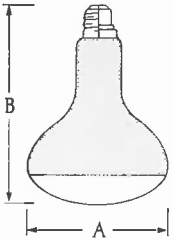
10



	A	B
65W ES	61mm	110mm

Traffic Signals

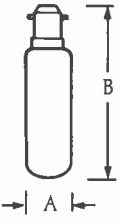
11



	A	B
150-275W	127.5mm	182.5mm

Heating Lamps

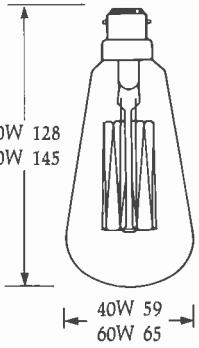
12



	A	B
25, 40W BC, SBC, SES	26mm	85mm

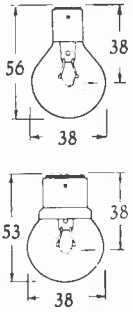
Single Ended Tubular

13



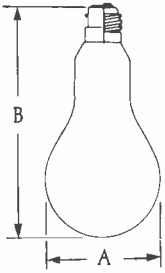
Navigation/Carriage Lamp

14



Bus Lamp

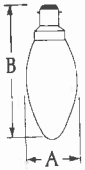
15



	A	B
P1/1	61mm	108.5mm
P1/2	82mm	164.5mm

Photographic Lamp (For ES Caps add 1.5mm to length of BC equivalent)

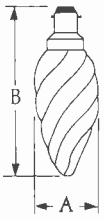
16



	A	B
25W-60W BC	36mm	97mm
SBC	36mm	103mm
SES	36mm	104mm
60W BC	46mm	130mm
SBC	46mm	135mm

Plain Candle

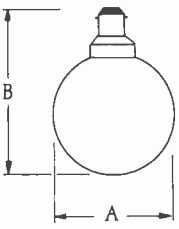
17



	A	B
40W-60W BC	46mm	130mm
SBC	46mm	135mm

Twisted Candle

18

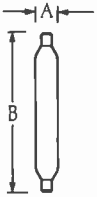


	A	B
40-150W BC	97mm	142.5mm
40-100W ES	97mm	144mm

Decor Round

Line Illustrations

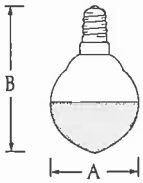
19



	A	B
30 and 60W	26mm	222mm
30 and 60W	26mm	285mm

Striplight

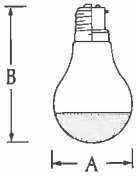
20



	A	B
40W	46mm	77.5mm

LS45 Lemon Shape

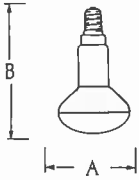
21



	A	B	
60W	61mm	108.5mm	60W
100W	69mm	128.5mm	100W

Crown Silver

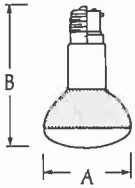
22



	A	B
25W & 40W	50mm	86mm

Decorspot 50

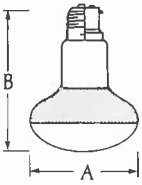
23



	A	B
40W & 60W	63.5mm	103mm

Decorspot 63

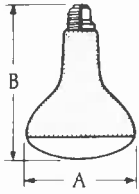
24



	A	B
40W, 60W & 100W	81mm	113mm

Decorspot 80

25

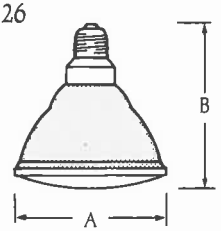


	A		B
75W & 100W	96mm 127.5mm	150W	136.5mm 181mm

(For ES caps add 1.5mm to length of BC equivalent)

Decorspot 95/125

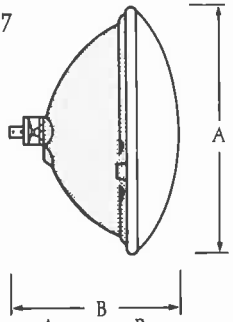
26



	A	B
80, 100, 120 & 150W	123mm	138mm

Par 38

27



A	B
178.6mm	133.4mm

Par 56

Tungsten Halogen Lamps

Linear Lamps
Lamps below 500W use a quartz spine filament support design which allows longer life and universal burning. All lamps up to 500W have an internal fuse, except for 120V lamps where it is not necessary.

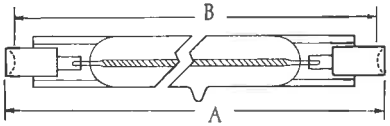
Tubular Lamps
These lamps are fused internally with a ballotini fuse.

Operating Temperatures
During operation, the temperature of the lamp pinch seal should not exceed 350°C, whilst the bulb wall temperature must not drop below 250°C in order to maintain the tungsten halogen cycle.

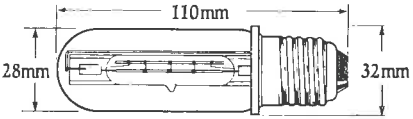
Fusing
It is recommended that a suitably rated fuse be used in the luminaire or external circuit, as listed.

Recommended Fuse Ratings (HBC Type)

Lamp Watts	110/120V	200/250V
100-300	3.15A	2A
500	6.3A	4A
750	10A	4A
1000	**10A**	6A
1500		10A
2000		**10A**



Dimensions overleaf.



Linear and Tubular Tungsten Halogen Lamps

High Voltage Single Ended Tubular Lamps: Class K

Lamp Type	Volts	Watts	Cap	Rated Average Life hrs.	Nominal Lumens	Colour Temp. K	Operating Position
K16	120	100	E27	4000	1450	2850	Universal
K16	200/230	100	E27	4000	1350	2850	Universal
K16	240/250	100	E27	4000	1350	2850	Universal
K13	120	150	E27	4000	2300	2850	Universal
K13	200/230	150	E27	4000	2100	2850	Universal
K13	240/250	150	E27	4000	2100	2850	Universal

High Voltage Double Ended Linear Lamps: Class K

Lamp type	Volts	Watts	Caps	Contact to ceramic max (A) mm.	Contact to contact (B) mm.	Rated average life hrs.	Nominal lumens*	Colour temp. K	Operating position
K14	120	100	R7s	78.3	74.9 ± 1.6	4000	1450	2850	Universal
K14	200/230	100	R7s	78.3	74.9 ± 1.6	4000	1350	2850	Universal
K14	240/250	100	R7s	78.3	74.9 ± 1.6	4000	1350	2850	Universal
K12	120	150	R7s	78.3	74.9 ± 1.6	4000	2300	2850	Universal
K12	200/230	150	R7s	78.3	74.9 ± 1.6	4000	2100	2850	Universal
K12	240/250	150	R7s	78.3	74.9 ± 1.6	4000	2100	2850	Universal
K11	120	200	R7s	117.6	114.2 ± 1.6	4000	3200	2900	Universal
K11	200/230	200	R7s	117.6	114.2 ± 1.6	4000	3100	2900	Universal
K11	240/250	200	R7s	117.6	114.2 ± 1.6	4000	3100	2900	Universal
K15	120	250	R7s	78.3	74.9 ± 1.6	4000	4300	2900	Universal
K15	200/230	250	R7s	78.3	74.9 ± 1.6	4000	4000	2900	Universal
K15	240/250	250	R7s	78.3	74.9 ± 1.6	4000	4000	2900	Universal
K9	110/115	300	R7s	117.6	114.2 ± 1.6	4000	5250	2900	Universal
K9	200/230	300	R7s	117.6	114.2 ± 1.6	4000	5000	2900	Universal
K9	240/250	300	R7s	117.6	114.2 ± 1.6	4000	5000	2900	Universal
K1	110	500	R7s	117.6	114.2 ± 1.6	2000	10500	2900	Horizontal
K1	120	500	R7s	117.6	114.2 ± 1.6	2000	10500	2900	Horizontal
K1	200/230	500	R7s	117.6	114.2 ± 1.6	2000	9500	2900	Horizontal
K1	240/250	500	R7s	117.6	114.2 ± 1.6	2000	9500	2900	Horizontal
K3	200/230	750	R7s	189.1	185.7 ± 1.6	2000	15000	3000	Horizontal
K3	240/250	750	R7s	189.1	185.7 ± 1.6	2000	15000	3000	Horizontal
K4	110	1000	R7s	189.1	185.7 ± 1.6	2000	22000	3000	Horizontal
K4	200/230	1000	R7s	189.1	185.7 ± 1.6	2000	21000	3000	Horizontal
K4	240/250	1000	R7s	189.1	185.7 ± 1.6	2000	21000	3000	Horizontal
K10	200/230	1000	R7s	254.1	250.7 ± 1.6	2000	21000	3000	Horizontal
K10	240/250	1000	R7s	254.1	250.7 ± 1.6	2000	21000	3000	Horizontal
K5	200/230	1500	R7s	254.1	250.7 ± 1.6	2000	33000	3000	Horizontal
K5	240/250	1500	R7s	254.1	250.7 ± 1.6	2000	33000	3000	Horizontal
K8	200/230	2000	R7s	331.0	327.4 ± 1.6	2000	44000	3000	Horizontal
K8	240/250	2000	R7s	331.0	327.4 ± 1.6	2000	44000	3000	Horizontal

*The lumen output of individual lamps will be subject to normal commercial tolerances.

Single Ended Dichroic Halogen Display Lamps

Thorn's comprehensive range of low voltage dichroic halogen lamps offers considerable advantages.

1. Low volt safety.
2. Cool beam.
3. Precision dichroic reflector.
4. Compact design.
5. Virtually 100% capsule lumen maintenance.
6. Universal operating position.
7. High colour temperature.
8. High efficacy.
9. Robust construction.
10. Money saving.

Fusing
It is recommended that a suitably rated fuse be used in the luminaire or external circuit.

Operating Temperatures
During operation the temperature of the lamp pinch seal should not exceed 350°C. The bulb wall temperature should not drop below 250°C in order to maintain the tungsten-halogen cycle.

Accessories
Thorn can offer the complete package of lamp, lampholder, filter and transformer.

Lampholders
The appropriate lampholders covering this range are on page 403.

Filters
A range of clip-on filters is available for both 50mm and 35mm lamps. The filters are available in black ash or grey with clear, red, yellow, green or blue glasses.

Transformers
A range of transformers for single and multilamp applications is available. It is important that where applicable only THORN transformers are used with these lamps. THORN Lighting cannot accept any responsibility if tranformers other than those shown on page 128 (which comply with the relevant international specifications) are used.

Low Voltage Single Cap Capsule Lamps

Lamp Type	ANSI Code	Volts	Watts	Base	Maximum Overall Length mm.	Maximum Bulb Diameter mm.	Nominal Lumens	Rated Average Life hrs.	Operating Position
M29	ESA	6	10	G4	30	10	210	100	Universal
M30	ESB	6	20	G4	30	10	420	100	Universal
M34	FHE	6	20	G4	30	10	350	2000	Universal
M91		12	12	G4	30	10	150	2000	Universal
M47		12	20	G4	30	10	350	2000	Universal
M35		12	20	G4	30	10	400	200	Universal
M76		12	20	GY6.35	44	12	300	3000	Universal
M75		12	35	GY6.35	44	12	600	3000	Universal
M95		12	35	GY6.35	44	12	550	3000	Universal
M32		12	50	GY6.35	44	12	850	3000	Universal
M74		12	50	GY6.35	44	12	900	3000	Universal
M73		12	75	GY6.35	44	12	1350	3000	Universal
M28	EVA	12	100	GY6.35	44	12	2400	2000	VBD ± 90°
M67		24	100	GY6.35	44	12	1800	2000	VBD ± 90°
M33		24	250	GY6.35	55	13.5	8400	300	VBD ± 90°
M36		24	250	GY6.35	58	16	5750	2000	VBD ± 90°

Halogen Lamps

50mm Single Ended Halogen Display Lamps with Dichroic Reflector – 'Lightstream' Range

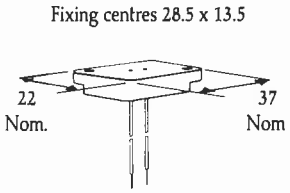
Lamp Ref.	ANSI Code	Volts	Watts	Lamp Cap	Average Rated Life hrs.	Maximum Overall Length mm.	Maximum Overall Diameter mm.	Beam Angle to ½ peak	Peak Beam Candelas
M68	ESX	12	20	GX5.3	3000	44.5	50.7	11°	5000
M94	BBF	12	20	GX5.3	3000	44.5	50.7	24°	1000
M69	BAB	12	20	GX5.3	3000	44.5	50.7	36°	500
M71	FRB	12	35	GX5.3	3000	44.5	50.7	8°	9000
M70	FRA	12	35	GX5.3	3000	44.5	50.7	18°	3600
M81	FMW	12	35	GX5.3	3000	44.5	50.7	38°	970
M49	EXT	12	50	GX5.3	3000	44.5	50.7	10°	12000
M57	—	12	50	SBC/B15d	3000	50.0	50.7	10°	12000
M50	EXZ	12	50	GX5.3	3000	44.5	50.7	21°	3700
M56	—	12	50	SBC/B15d	3000	50.0	50.7	21°	3700
M58	EXN	12	50	GX5.3	3000	44.5	50.7	38°	1550
M80	FNV	12	50	GX5.3	3000	44.5	50.7	60°	700
M60	EYF	12	75	GX5.3	3000	44.5	50.7	12°	16000
M82	FNW	12	75	GX5.3	3000	44.5	50.7	18°	7500
M61	EYC	12	75	GX5.3	3000	44.5	50.7	38°	2250
M98	—	12	75	GX5.3	3000	44.5	50.7	60°	900

Dichroic coated mirrors reduce by 50% the heat forward. Consequently, higher temperatures can be generated behind the lamp than for comparable aluminised reflectors.

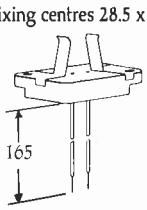
35mm Single Ended Halogen Display Lamps with Dichroic Reflector – 'Lightstream' Range

Lamp Ref.	ANSI Code	Volts	Watts	Lamp Cap	Average Rated Life hrs.	Maximum Overall Length mm.	Maximum Overall Diameter mm.	Beam Angle to ½ peak	Peak Beam Candelas
M64	FTA	12	12	GZ4	2000	35.0	35.3	7°	6400
M52	FTB	12	20	GZ4	3000	35.0	35.3	10°	5500
M55	FSS	12	20	SBC/B15d	3000	42.0	35.3	10°	5500
M51	FTC	12	20	GZ4	3000	35.0	35.3	17°	1760
M54	FST	12	20	SBC/B15d	3000	42.0	35.3	17°	1760
M62	FTD	12	20	GZ4	3000	35.0	35.3	30°	600
M63	FSV	12	20	SBC/B15d	3000	42.0	35.3	30°	600
M65	FTE	12	35	GZ4	3000	35.0	35.3	8°	9000
M66	FTF	12	35	GZ4	3000	35.0	35.3	20°	3000

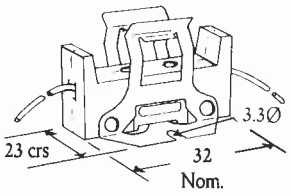
Dichroic coated mirrors reduce by 50% the heat forward. Consequently, higher temperatures can be generated behind the lamp than for comparable aluminised reflectors.



GL 1079-W

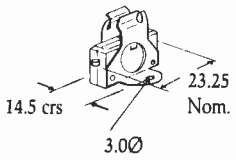


GL 1079-SLW



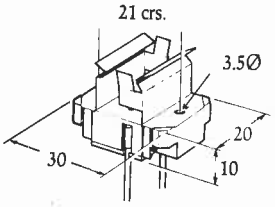
GL 1177

GL 1105 is superseded by GL 1177 (same mounting centres) suitable for GY9.5 caps e.g. A1/233, A1/247, and M38.



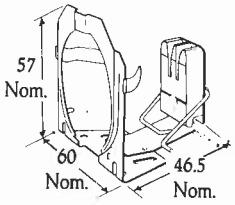
GL 1123-A

Suitable for use with low volt miniature tungsten lamps having G4 caps. eg. M29, M30, M34, M35.



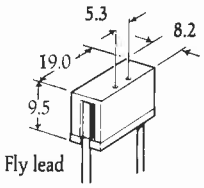
GL 1228

For use with Lightstream GX5.3 Base display lamps. Lamp requires no front mount.



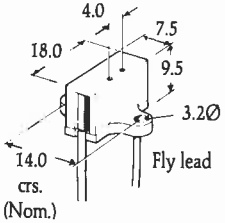
GL 1210

Lampholder for 50mm Lightstream lamps with GX5.3 base e.g. M49, M50, etc. Fixing centres 38mm x 3.3mmØ.



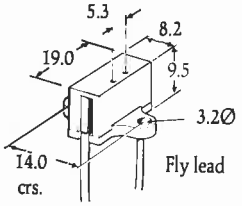
GL 1218

For lamps with GX5.3 Base e.g. M49, M50.



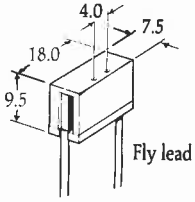
GL 1212

For lamps with G4/GZ4 Base e.g. M29, M35, M48 and M51.



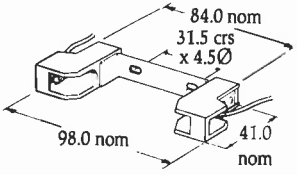
GL 1219

For lamps with GX5.3 Base e.g. M49, M50.



GL 1211

For lamps with G4/GZ4 Base e.g. M29, M35, M48 and M51.

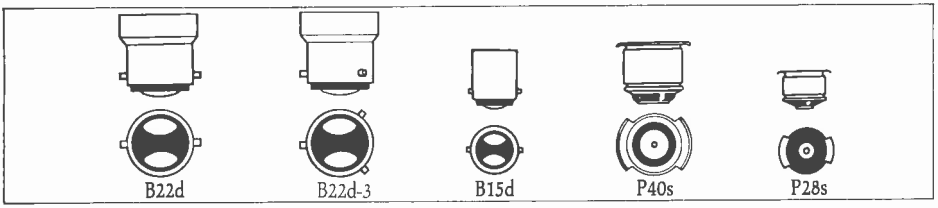


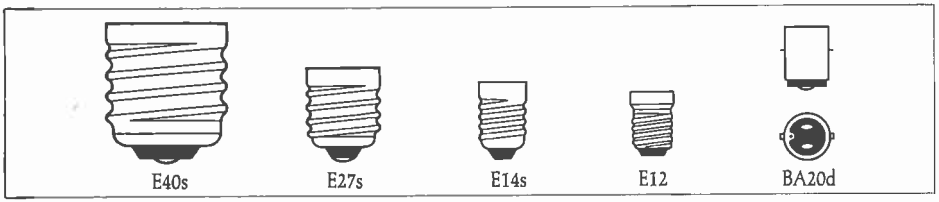
SUL 150

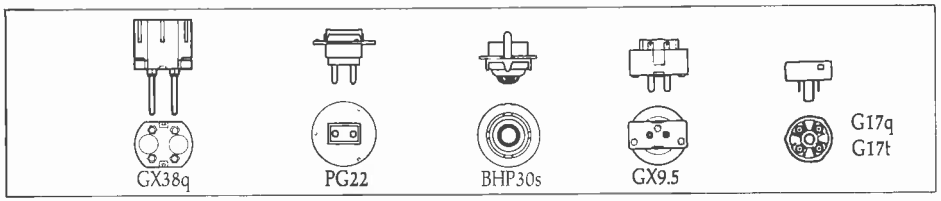
For use with 150W K12 TH lamp.

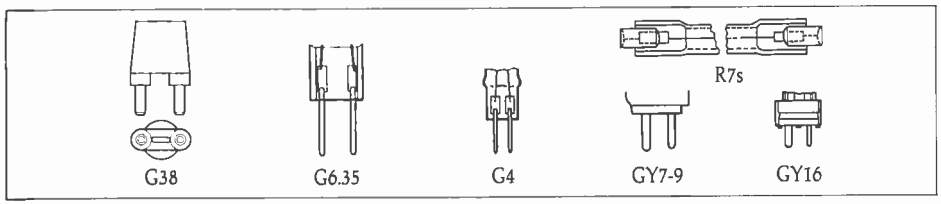
Lamp Caps

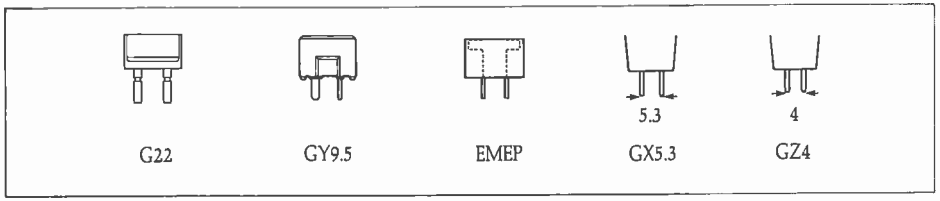
BS/IEC	Common Designation	Description
B15d	SBC	Small bayonet cap
B22d	BC	Bayonet Cap
B22d-3	3-pin BC	Bayonet cap 3-pin
E12	CAND	Candelabra screw
E14	SES	Small Edison screw
E27	ES	Edison screw
E40	GES	Goliath Edison screw









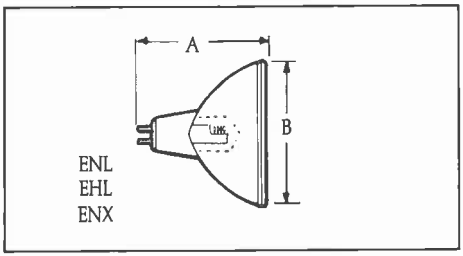


PHOTOGRAPHIC AUTO & MINIATURE LAMPS

Photographic & Studio Lamps

MICROGRAPHIC AND FIBREOPTIC LAMPS

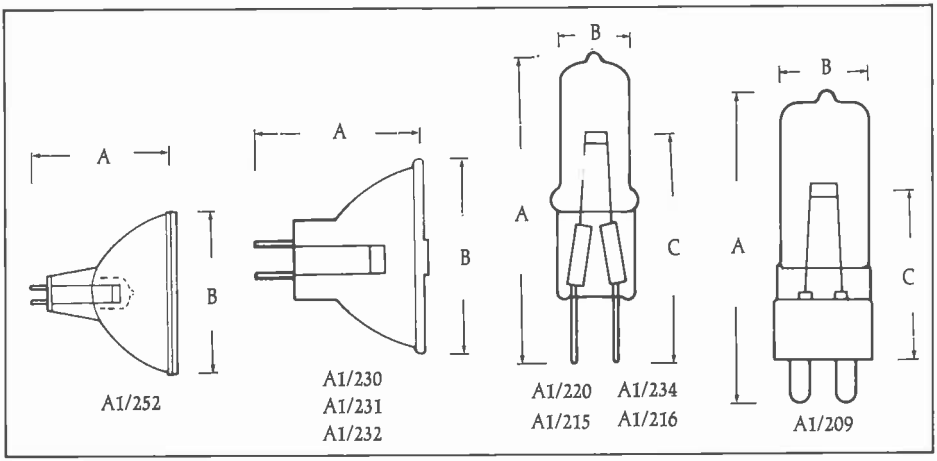
Lamp Ref. ANSI Code	Volts	Watts	Cap.	A Maximum Overall Length mm.	B Maximum Overall Diameter mm.	Rated Average Life hours	Operating Position	
ENL	12	50	G5.3	44.5	50.6	3000	Universal	Focal distance 381mm
ELH	120	300	GY5.3	44.5	50.6	35	BD ± 90°	Focal distance 152.5mm
ENX	82	360	GY5.3	44.5	50.6	75	BD ± 90°	Focal distance 289mm



TUNGSTEN HALOGEN PROJECTOR LAMPS
CLASS A1 (50-200W)

Lamp Ref.	ANSI Code	Volts	Watts	Cap.	A Maximum Overall Length mm.	B Maximum Bulb Diameter mm.	C Light Centre Length mm.	Nominal Lumens	Rated Average Life hours	Operating Position	
A1/220	BRL	12	50	G6.35	44	11.5	30 ± 0.25	1400	50	BD ± 90°	Focal distance 32mm
A1/230	EFN	12	75	G6.35	42	50	—	—		HOR	Focal distance 32mm
A1/209	FDX	12	100	G6.35	44	11	24-0.5	3000	50	BD ± 90°	—
A1/215	FCR	12	100	G6.35	44	11	30 + 0.25	3000	50	BD ± 90°	—
A1/231	EFP	12	100	G6.35	42	50	—	—	50	HOR	Focal distance 32mm
A1/232	EFR	15	150	G6.35	42	50	—	—	50	HOR	Focal distance 32mm
A1/234	BRJ	15	150	G6.35	44	11	30 ± 0.25	4650	50	BD ± 90°	—
A1/216	FCS	24	150	G6.35	47	13.5	32-0.5	5000	50	BD ± 90°	—
A1/252	EJL	24	200	GX5.3	44.5	50.6	—	—	50	HOR	Focal distance 32mm

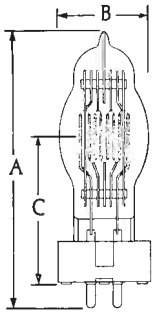
All these projector lamps should have a minimum bulb wall temperature of 350°C for the tungsten halogen cycle to function fully.



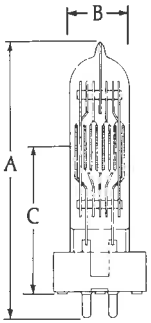
THEATRE SPOTLIGHT LAMPS CLASS T

Lamp Ref.	Volts	Watts	Cap.	A Maximum Overall Length mm.	B Maximum Bulb Diameter mm.	C Light Centre Length mm.	Nominal Lumens	Rated Average Life hours	Operating Position	
T/28*	240	500	P28s	130	25	55.5	11000	750	BD ± 90°	Replaces T/1
T/12*	240	650	GX9.5	110	25	55	13500	750	BD ± 90°	Replaces T/10
T/11**	240	1000	GX9.5	110	35	55	23000	750	BD ± 90°	Replaces T/9
T/19**	240	1000	GX9.5	110	35	55	21000	750	BD ± 90°	

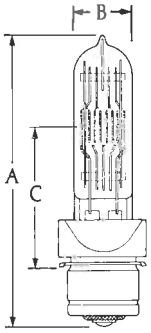
*3 or 4 amp HBC fuse necessary
**5 or 6 amp HBC fuse necessary



T/11 T/19



T/12



T/17

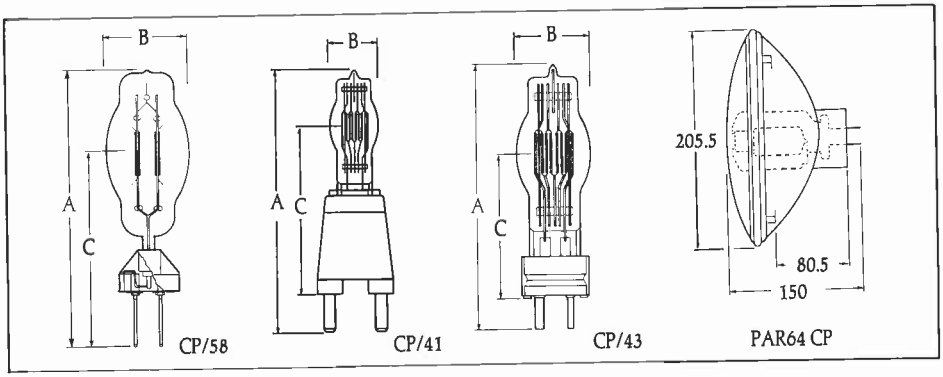
Photographic & Studio Lamps

TUNGSTEN HALOGEN PHOTOGRAPHIC LAMPS CLASS CP (Suitable for use with colour film balanced for 3200K)

Lamp Ref.	ANSI Code	Volts	Watts	Cap.	A Maximum Overall Length mm.	B Maximum Bulb Diameter mm.	C Light Centre Length mm.	Nominal Lumens	Rated Average Life hours	Operating Position
CP/58		240	1250/ 2500	GX38q	220	70	143	27000/59000 91000	300	BD ± 45°
CP/41	FKK	240	2000	G38	210	40	127	54000	400	BD ± 90°
CP/43		240	2000	GY16	145	40	70	54000	400	BD ± 90°

PAR 64 SEALED BEAM CP LAMPS

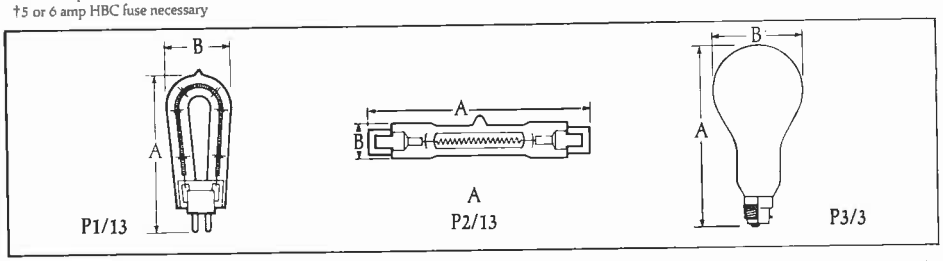
Lamp Ref.	ANSI Code	Volts	Watts	Cap.	Peak intensity K cds.	Beam angle to ½ peak (°)	Field angle to 1/10 (°)	Rated average life hours	Operating position	
CP/86		240	500	EMEP	240	V7 x H10	V13 x H16	300	Universal	Clear Spot
CP/87		240	500	EMEP	140	V9 x H11	V16 x H19	300	Universal	Stipple Spot
CP/88		240	500	EMEP	65	V10 x H21	V19 x H32	300	Universal	Flood
CP/60	EXC	240	1000	EMEP	320	V9 x H12	V17 x H20	300	Universal	Clear Spot
CP/61	EXD	240	1000	EMEP	140	V10 x H14	V20 x H22	300	Universal	Stipple Spot
CP/62	EXE	240	1000	EMEP	65	V11 x H24	V20 x H38	300	Universal	Flood



PHOTOGRAPHIC LAMPS CLASS P

Lamp Ref.	ANSI Code	Volts	Watts	Cap.	A Maximum Overall Length mm.	B Maximum Bulb Diameter mm.	Nominal Lumens	Rated Average Life hours	Operating Position
P1/13*	BVM	240/250	650	G6.35	65	28	20000	15	BD ± 90°
P2/13†	DXX	240/250	800	R7s	80	15	20000	75	Universal
P3/3		240	75	BC.ES	108.5	61	1150	100	Universal

*3 or 4 amp HBC fuse necessary
†5 or 6 amp HBC fuse necessary



Auto and Miniature Lamps

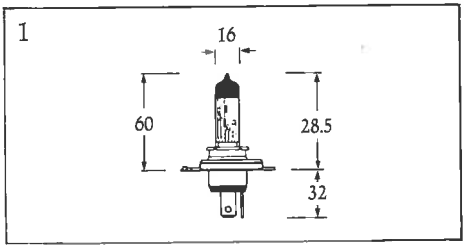
THORN manufacture a wide range of vehicle and miniature lamps. These are supplied to the major European vehicle manufacturers for initial embodiment and the same high quality should be used for lamps for replacement purposes.

All THORN Auto Lamps, where applicable, are manufactured to European Standard Regulation 37 and are marked accordingly.

Only a few representative types are shown here. A full listing appears in the Comprehensive Price List and specialist brochures and data sheets for some lamps are available from your nearest THORN Lighting Regional Sales Office.

A selection of Auto and Miniature Lamps.

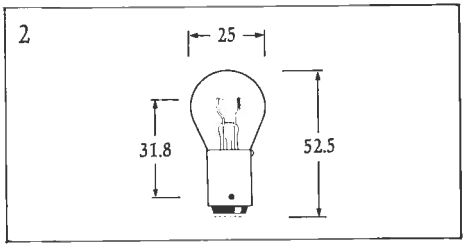
1



H4 TUNGSTEN HALOGEN HEADLAMPS

Lamp Ref.	European Ref.	Volts	Watts	Cap.	Diagram
472	H4	12	60/55	P43t	1
475	H4	24	75/70	P43t	1
2970		12	100/80	P43t	1

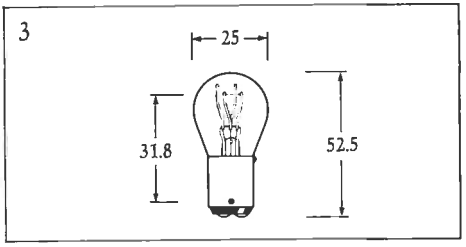
2



STOP AND TAIL LAMPS

Lamp Ref.	European Ref.	Volts	Watts	Cap.	Diagram
380	P21/5W	12	21/5	BAY15d	2
334		24	24/6	BAY15d	2

3

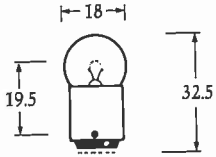


FLASHER AND STOP LAMPS

Lamp Ref.	European Ref.	Volts	Watts	Cap.	Diagram
382	P21W	12	21	BA15s	3
335	P21W	12	21	BA15d	3
241	P21W	24	21	BA15s	3
346	P21W	24	21	BA15d	3

Auto and Miniature Lamps

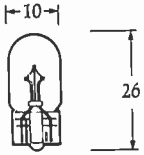
4



SIDE MARKER AND INTERIOR LAMPS

Lamp Ref.	European Ref.	Volts	Watts	Cap.	Diagram
207	R5W	12	5	BA15s	4
209	R5W	12	5	BA15d	4
149	R5W	24	5	BA15s	4
150	R5W	24	5	BA15d	4
245	R10W	12	10	BA15s	4
246	R10W	24	10	BA15s	4

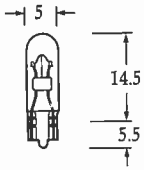
5



SIDE FLASHER AND PANEL LAMPS

Lamp Ref.	European Ref.	Volts	Watts	Cap.	Diagram
504	W3W	12	3	W2.1 x 9.5d	5
505	W3W	24	3	W2.1 x 9.5d	5
501	W5W	12	5	W2.1 x 9.5d	5
507	W5W	24	5	W2.1 x 9.5d	5

6



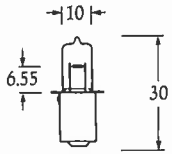
PANEL LAMPS

Lamp Ref.	European Ref.	Volts	Watts	Cap.	Diagram
286		12	1.2	W2 x 4.6d	6
508		24	1.2	W2 x 4.6d	6

HALOGEN MINERS LAMPS

Lamp Ref.	European Ref.	Volts	Watts	Cap.	Diagram
GH47		4	1 amp	P13.5s	7
GH49		4	1.2 amp	P13.5s	7
GH144		4	1.5 amp	P13.5s	7

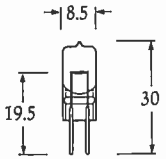
7



HALOGEN CYCLE LAMPS

Lamp Ref.	European Ref.	Volts	Watts	Cap.	Diagram
GH90	HS3	6	2.4	P13.5s	7
GH98 (Yellow)	HS3	6	2.4	P13.5s	7

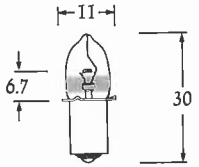
8



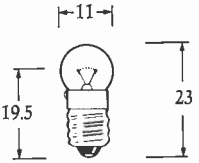
HALOGEN TORCH AND BATTERY TYPES

Lamp Ref.	European Ref.	Volts	Watts	Cap.	Diagram
GH11		6	6	G4	8
GH15		6	6	P13.5s	7
GH20		6	10	G4	8
GH24		6	10	P13.5s	7
GH152		3.7	0.7 amp	P13.5s	7
GH153		5.2	0.7 amp	P13.5s	7
GH155		2.5	0.8 amp	P13.5s	7
GH157		4.75	0.5 amp	P13.5s	7

9



10



STANDARD TORCH AND BATTERY TYRES

Lamp Ref.	European Ref.	Volts	Watts	Cap.	Diagram
278		2.5	0.3 amp	P13.5s	9
972		2.5	0.3 amp	E10/11	10
2094		2.7	0.42 amp	P13.5s	9
2097 Krypton		4.75	0.5 amp	P13/5s	9
5626 Krypton		2.4	1 amp	P13.5s	9

THORN LIGHTING

UK Regional Sales Offices and Showrooms

For more detailed information on THORN products please consult your nearest THORN Lighting office.

Northern Ireland
Prince Regent Road, Castlereagh
Belfast BT5 6QR
Telephone/Fax 0232 401122
Telex 74695 TLLBft G

Midlands
Thorn House, Aston Church Road
Saltley Trading Estate
Birmingham B8 1BE
Telephone/Fax 021 327 1535
Telex 337435 TLLBhm G

South West
Thorn House, Penarth Road
Cardiff, Wales CF1 7YP
Telephone/Fax 0222 344200
Telex 498334 TLL Cdf G

North East
Northern Distribution Centre
California Drive, Castleford,
West Yorkshire, WF10 5QH
Telephone 0977 518844
Telex 55110 TLLLds G
Fax 0977 514342

London (Inside M25)
3 King George Close
Eastern Avenue West
Romford, Essex RM7 7PP
Telephone 0708 730888
Telex 897759 THLITE G
Fax Sales 0708 32944
Technical 0708 27370

South East
3 King George Close
Eastern Avenue West
Romford, Essex RM7 7PP
Telephone 0708 730880
Telex 897759 THLITE G
Fax Sales 0708 32944
Technical 0708 27370

London Showroom
Suite 330
The Business Design Centre
Upper Street
Islington Green
London N1 0QH
Telephone 01-288 6064
Fax 01-288 6205

North West
Thorn House, 2 Claytonbrook Road
Clayton, Manchester M11 1BP
Telephone 061 223 1322
Telex 668642 TLLMcr G
Fax 061 223 1013

Scotland
Thorn House, Industrial Estate
Larkhall, Lanarkshire ML9 2PA
Telephone 0698 886007
Telex 777930 TLLLkh G
Fax 0698 881660

Government Contracts
Lincoln Road,
Enfield, Middlesex EN1 1SB
Telephone 01-366 1166
Telex 915891 THORN G
Fax 01-366 1166 Ext. 3180

Road Lighting & Airfield Lighting
Lincoln Road,
Enfield, Middlesex EN1 1SB
Telephone 01-366 1166
Telex 915891 THORN G
Fax 01-366 1166 Ext. 3180

Head Office
284 Southbury Road
Enfield, Middlesex EN1 1TJ
Telephone 01-366 1166
Telex 915891 THORN G
Fax 01-366 1166 Ext. 3226

International Sales and Marketing
284 Southbury Road
Enfield, Middlesex EN1 1TJ
Telephone 01-366 1166
Telex 915891 THORN G
Fax-Day 01-366 1166 Ext. 2869
Fax-Night 01-367 8596

Subsidiaries in:

Australia
Thorn Lighting Limited
Telephone 648 8000

Austria
Thorn Licht GmbH
Telephone 222 233571

Canada
Thorn Lighting Canada Limited
Telephone 677 4248

Denmark
Thorn Belysning AS
Telephone 254 0677

Finland
Thorn Orno Oy
Telephone 0246901

France
Thorn Eclairage
Telephone 78 49 81 12

Germany
Thorn Licht GmbH
Telephone 2932 2050

Ireland
Thorn Lighting (Ireland) Limited
Telephone 961 877

Italy
Sivi Illuminazione SpA
Telephone 444 595100

Malaysia
Thorn Lighting
Manufacturing Industries SDN BHD
Telephone (03) 7913893
7913896

Netherlands
Thorn Jämkonst bv
Telephone 02979 88941

New Zealand
Thorn Lighting Limited
Telephone 9 887 155

Norway
Thorn Scanlux AS
Telephone 02-76 0350

Singapore
Thorn Lighting Singapore
Telephone 748 4949

South Africa
Thorn Lighting (Pty) Limited
Telephone 11 673 4308

Sweden
Thorn Belysning AB
Telephone 883 4100
Thorn Jämkonst AB
Telephone 419 52000