

**High Pressure
Mercury Lamps**

L2

information and data

GEC



High Pressure Mercury Lamps

L2

COMPANION BOOKLETS

- L1 High Pressure Sodium Lamps
- L3 Planned Lighting Maintenance
- L4 Low Pressure Sodium Lamps
- L5 Infra-Red Heaters
- L6 Fluorescent Tubes
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High Pressure Mercury Lamps

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3. The lamp is a high pressure mercury lamp.
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G.E.C. HIGH PRESSURE MERCURY LAMPS

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OSRAM-G.E.C. HIGH PRESSURE MERCURY LAMPS

1. RANGE

The Osram High Pressure Mercury Discharge Lamp range covers the following types:-

- | | |
|--------|---|
| MB/U | having a clear glass outer bulb, no colour correction. |
| MBF/U | having an elliptical outer bulb coated with a fluorescent powder (phosphor) for colour correction. |
| MBFR/U | similar to the MBF/U but having the outer bulb shaped to be an effective reflector and coated with titanium dioxide as reflecting medium. |
| MBFT/V | similar to the MBF/U but incorporating an internal ballast in the form of a filament which also provides some light output. |
| MBI | similar to the MB/U but with the addition of halides to give a strong colour light or with a mixture of halides to give a sensibly white light. |
| MBW/U | similar to the MB/U but having an outer bulb of 'Black Glass' which absorbs nearly all of the visible radiation allowing mostly long wave ultra violet to be emitted. |
| MBWT/V | similar to the MBW/U but incorporating an internal ballast in the form of a filament. |
| ME/D | Compact source. Specialised lamp of very small arc length and high brightness. |

All Osram Mercury Discharge Lamps employ fused silica (quartz) as the arc tube. Earlier types (MA) had glass arc tubes but are now obsolete and have been superseded by the MB range.

Much information is published in this document concerning lamp performance and characteristics. In all such tables the information provided is typical of the product concerned and must not be interpreted as a guarantee of individual lamp characteristics or performance.

11. CONTROL GEAR AND CIRCUITS

All Mercury Discharge Lamps except the MBFT/V and MBWT/V types require control gear appropriate to the wattage of the lamp employed. Only control gear of G.E.C. manufacture or similar high quality should be used.

The basic circuit for Mercury Discharge lamps is shown in FIG. 1.

The electrical characteristics of lamps of the same wattage in the MB/U, MBF/U and MBW/U ranges are similar and use the same control gear and circuit.

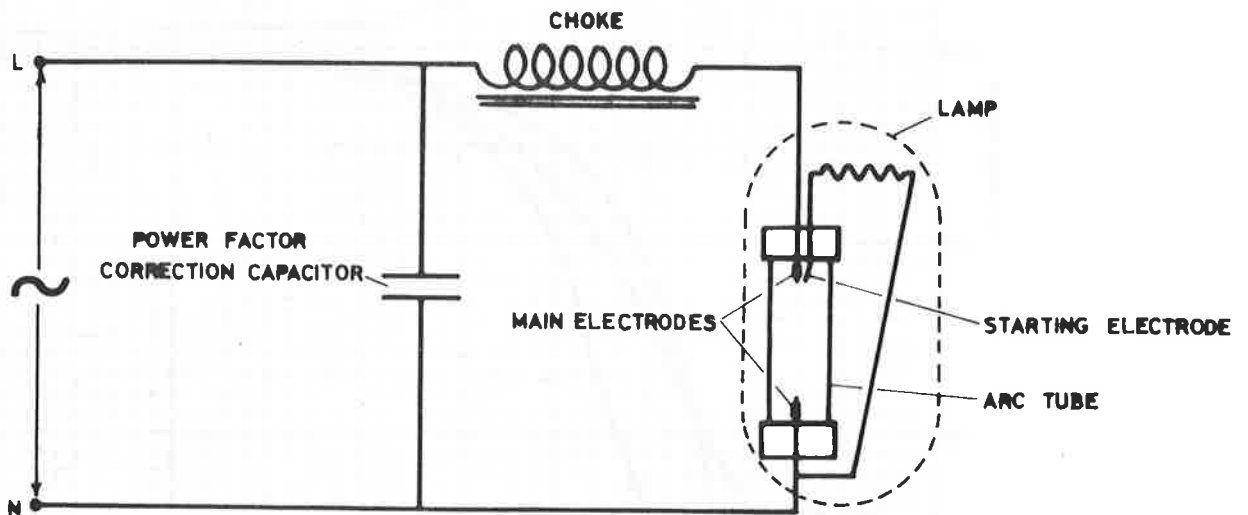


FIG. 1. Basic Circuit for Mercury Discharge Lamps (excluding MBFT/V, MBWT/V and MBI types).

NOTE: The wattage at which a Mercury Discharge lamp operates is determined by the control gear and any attempt to run a lamp at other than its marked wattage is likely to have detrimental effects on both lamp and control gear.

111. STRIKING

An auxiliary starting electrode in close proximity to a main electrode is incorporated to initiate the arc. The lamp will not be stabilized until the whole of the mercury content of the arc tube has been vapourised - this usually takes about 15 minutes. A typical curve relating light output and electrical characteristics with time from switching on is shown in FIG. 11.

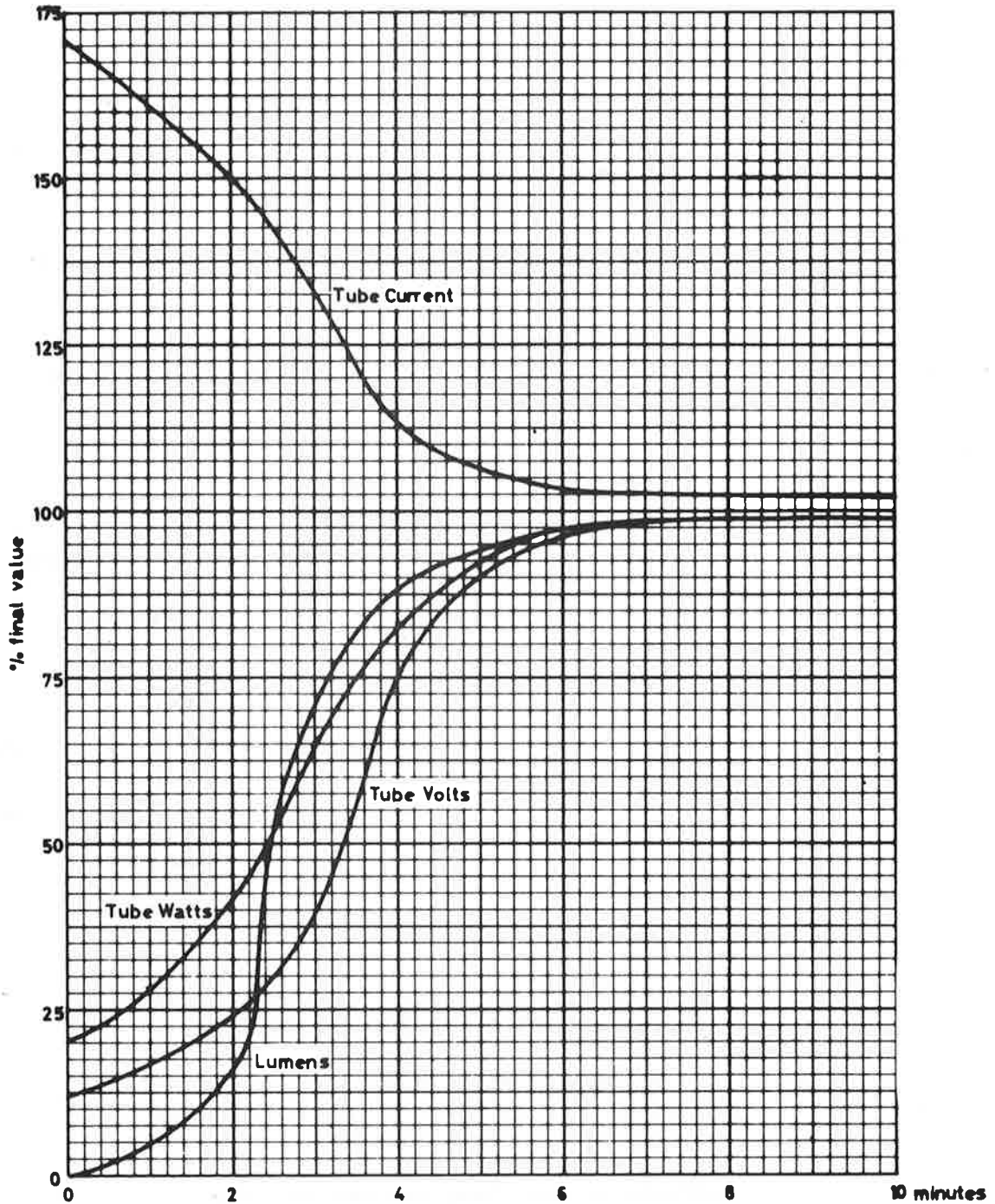


FIG. 11. Typical relationship between light output and electrical characteristics with time from switching on (not including MBI, MBFT/V, MBWT/V and ME/D).

1V. RE-STRIKE

Should the mains supply be momentarily interrupted and the lamp extinguished the lamp will not re-strike until the mercury vapour pressure has been reduced. This usually takes 15 minutes but this time can vary according to the ambient conditions.

NOTE: It is not necessary to switch off during this period. No harm will be done to the lamp if voltage is applied whilst awaiting the correct conditions for striking.

V. ELECTRICAL CONDITIONS ON STRIKING

(a) Rectification at Starting

For a few cycles after the lamp has struck there is a certain 'out of balance' between the emissivity of the two electrodes resulting in greater current in one direction. This is known as rectification and this form of direct current is only controlled by the very low resistance of the control gear and mains supply and momentarily can be several times as great as the lamp running current. It is particularly relevant to new buildings where the lighting is the only load on the mains supply. It will become less apparent when the full load is being drawn. Although the duration of any peaks of high current is very limited and does not usually affect wire fuses, allowance must be made for fast rupturing speed of an H.R.C. fuse.

(b) Fusing

The recommended values are given below.

LAMP WATTAGE	WIRE FUSE (amps)	H.R.C. FUSE (amps)
50	5	5
80	5	5
125	5	7
250	5	10
400	10	15
700	10	20
1000 220/250v	10	20
1000(380/410v (400/450v	10	20

It should be noted that ignoring the rectification referred to in V.(a), short circuit conditions are imposed on the choke by the lamp immediately after striking. At this moment the arc tube voltage is very low and current high, as the mercury vapour pressure inside the lamp increases the voltage increases and current decreases until the normal running conditions have been reached.

VI. OPERATING CONDITIONS

(a) Low Temperature

At normal operating temperatures of about 20°C. high pressure mercury vapour lamps will strike at voltages much below the standard mains voltage. At lower temperatures the "striking" voltage is higher - roughly 1 volt increase for every 1°C. drop in temperature.

A typical relationship between striking voltage and ambient temperature is shown in FIG. 111.

FIG. 111 shows a typical relationship between striking voltage and ambient temperature, but in order that all lamps will strike at temperatures in the range between -5°C. and -10°C. the mains voltage should not be lower than 200V. For temperatures in the range -15°C. and -30°C. the mains voltage should not be lower than 220V.

Where operating conditions and voltages are below these limits consult the Osram Technical Department.

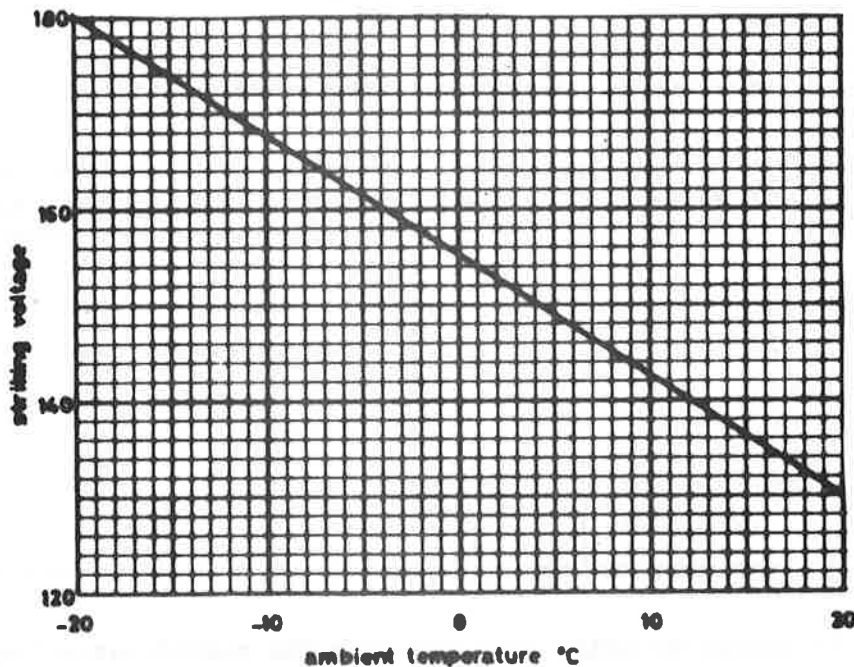


FIG. 111. Typical relationship between striking voltage and ambient temperature.

(b) High Temperature

When ambient conditions are such that the gas and vapour pressures inside the arc tube are too high to allow striking to take place it is necessary to force cool the lamp.

NOTE: Once the lamp has struck the ambient temperature has very little effect on performance or characteristics except in very high temperatures where lamp making materials are affected.

(c) Vibration

The Osram Mercury Discharge lamp is designed to withstand very severe conditions of vibration. The inner assembly is rigidly supported by the "thimble" or "stud" attached to the outer bulb.

(The MBFT/V and MBWT/V lamps having internal filaments are not suitable for very rough service conditions.)

NOTE: It is essential that the weight of the bulbs of lamps above 400W should not be taken by the fixing of cap to bulb. The bulb should be steadied preferably by means of a harness attached to the fittings or lantern and located in the "thimble" at the end of the bulb.

(d) Unprotected Lamps

All lamps (except MBFT/V) of 250W upwards have an outer bulb of glass with a low co-efficient of expansion (hard glass) and will withstand water splashes when the lamp is burning. They are, therefore, suitable for external conditions in open fittings or lanterns.

(e) D.C. Operation

Although designed for use on A.C. supplies High Pressure Mercury Vapour lamps can be operated on D.C. For lamps other than MBFT/V and MBWT/V a resistance in series with the lamp is necessary to operate it at the correct current. The wattage consumed by the resistance will increase the total circuit wattage without adding to the lumen output.

Life and lumen maintenance are reduced when the lamp is operated on D.C.

If the use of D.C. is unavoidable, it is recommended that a suitable inverter is used so that the lamp can operate under A.C. conditions.

(f) Stroboscopic Effect

The light output from the arc tubes of all High Pressure Mercury lamps will give rise to a Stroboscopic effect. It is minimised with lamps which incorporate a fluorescent coating. The level from such lamps is usually acceptable but where it is necessary to completely eliminate any stroboscopic effect, the layout should be arranged so that adjacent lamps are on different phases.

(g) Radio Interference

High Pressure Mercury Vapour lamps do not usually give rise to objectionable radio or television interference.

Experience has indicated that in the few cases that have been investigated, lamps near the end of their lives were the case.

NOTE: The presence of the choke and power factor capacitor probably reduces the effect and it is possible that the MBFT type which does not use a choke may appear to be more prone to interference. The usual techniques for eliminating interference will usually suffice where the level is intolerable.

NOTE: Under certain viewing conditions, a 50 cycle flicker is noticeable. This is in addition to the usual 100 cycle stroboscopic flicker which is not usually perceptible. The 50 cycle flicker may come and go on normal choke operated circuits, but if it is objectionable it can be cured by the use of special circuits. Details may be obtained on application to G.E.C.

(h) Effect of Voltage Variation

Normal voltage fluctuations, for example $\pm 6\%$ do not have any serious effect upon High Pressure Mercury lamps (excepting MBFT/V and MBWT/V).

Too low a voltage will not allow a lamp to operate.

Too high a voltage usually causes damage to control gear before affecting a lamp. The effect of voltage on lamp characteristics and performance is shown in a typical graph in FIG. 1V.

(i) Effect of Burning Position

The suffix "U" in the lamp nomenclature indicates that the lamp can be operated in any burning position without its performance being seriously affected.

When lamps are operated in a horizontal position there is an increase of about 1% in tube voltage, together with an increase of about 1% in light output. Lamps operated in this position are generally less stable and will be more liable to extinction with sudden drops in mains voltage when the mains voltage is at the lower end of the range, i.e. in the 200V region.

NOTE: All data given in this booklet for universal burning lamps refers to lamps operated in the vertical position cap up.

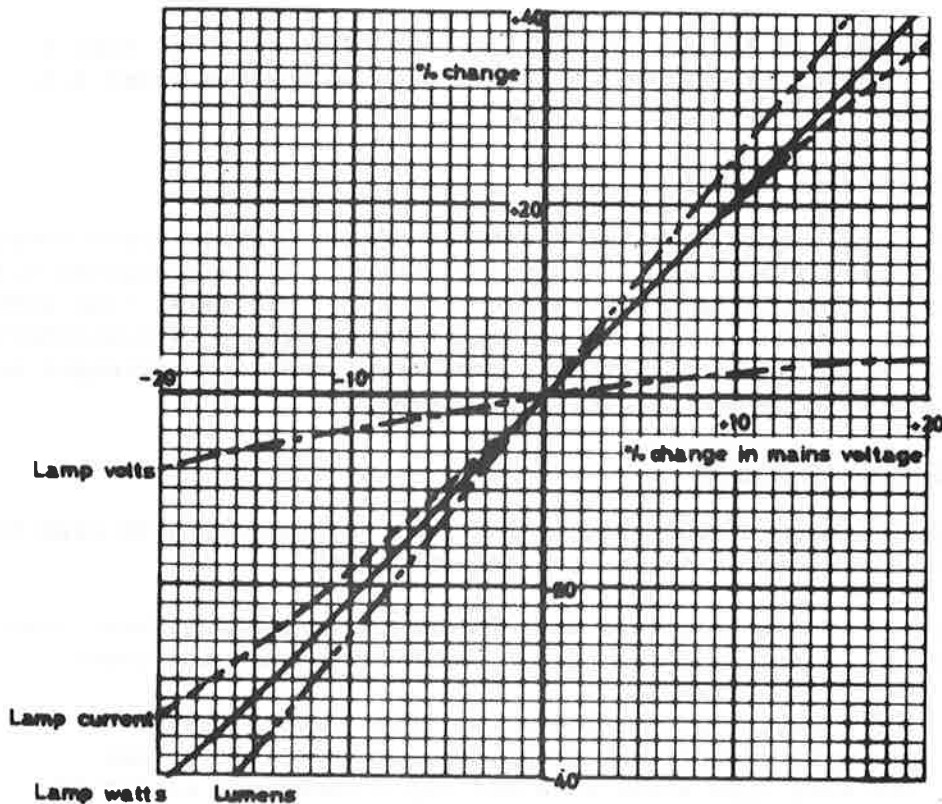


FIG. 1V. Typical mains voltage lamp characteristics curve except MBFT/V, MBWT/V and MBI.

NOTE: The effect on life is not shown as there is no substantial evidence that voltage variation reduces life except where a lamp continuously attempts to strike on low voltage.

VII. PRECAUTIONS

Precautions to be taken in connection with the use and disposal of Osram High Pressure Mercury lamps.

- (a) The radiation produced inside the arc tube includes harmful ultra violet. This radiation is absorbed by the glass of the outer bulb and provided this bulb is intact all Osram Mercury Vapour lamps are harmless to the person. If the bulb is shattered it is possible for the lamp to function for several hours. Under these circumstances the mains supply must be switched off and the lamp removed.
- (b) Although mercury is contained within the arc tube and has toxic properties the amount is so small that the danger of harmful effects is negligible provided normal care is taken in disposing of failed lamps.
- (c) In disposing of lamps, goggles and face mask should be worn to prevent fragments of glass getting to the eyes and mouth. If a large quantity of lamps are being broken up, then the debris should be disposed of in accordance with local authority requirements.

VIII. LIFE

The lives of MB, MBF and MBFR types of mercury lamp are very long, lasting many thousands of hours. However, because of other factors, such as lumen depreciation and cost of individual replacement, it is not usually economic to burn these lamps to destruction. Generally replacement is advisable at about 8000 hours. This is the "economic life".

A typical survivor curve for Osram Mercury lamp types, MB, MBF, MBFR is given in FIG. V.

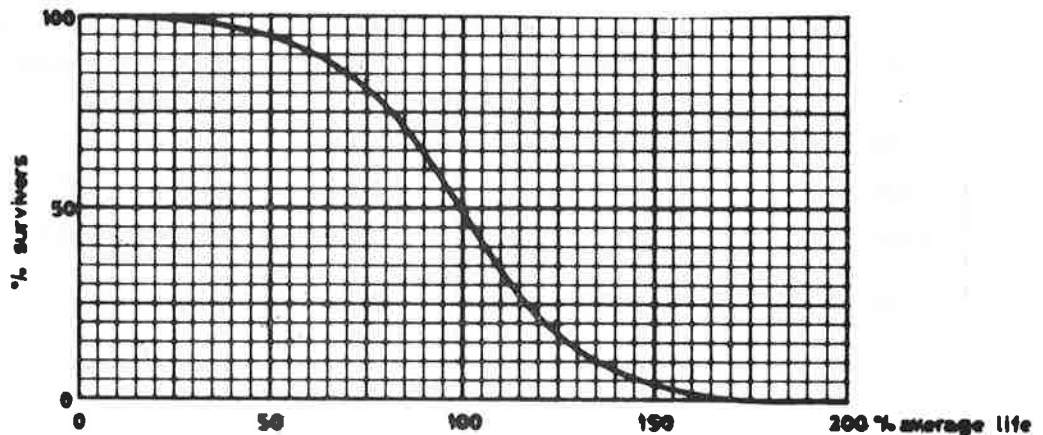
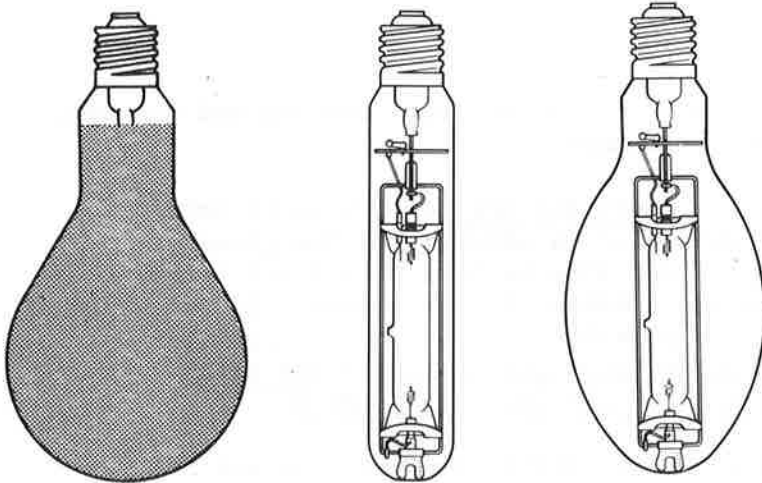


FIG. V. Typical survivor curve for Osram High Pressure Mercury lamps.

Ref: L2/3HT

IX. LAMP TYPE MB/U



<u>RANGE</u>	125W)	
	250W)	220/250V
	400W)	
	1000W	220/250V
	1000W	(380/410V (400/450V)

(a) Dimensions (in millimetres)

WATTAGE	OVERALL LENGTH	DIAMETER	NOMINAL ARC LENGTH	LIGHT CENTRE LENGTH
125	174 ± 4	88 ± 1	35	112 ± 4
250	250 ± 5	51 ± 1	50	170 ± 5
400	280 ± 5	51 ± 1	70	177 ± 5
1000 220/250V	400 ± 10	165 ± 2	135	248 ± 5
1000 (380/410V (400/450V)	345 ± 5	165 ± 2	120	212 ± 5

(b) Finish

WATTAGE	SHAPE	FINISH	CAP (nickel plated)
125	Pear	Pearl	E.S. or 3-pin B.C. or G.E.S.
250	Tubular	Clear	G.E.S. (E40)
400	Tubular	Clear	G.E.S. (E40)
1000 220/250V	Elliptical	Clear	G.E.S. (E40)
1000 (380/410V (400/450V)	Elliptical	Clear	G.E.S. (E40)

(c) Electrical Characteristics

LAMP WATTAGE	SUPPLY VOLTAGE	MAINS		ARC TUBE		
		Starting Current Amps	Running Current Amps	Voltage	Starting Current Amps	Running Current Amps
125	240	1.0	0.7	125	1.7	1.15
250	240	2.5	1.4	130	3.75	2.15
400	240	3.8	2.2	135	5.5	3.25
1000 (220/250V)	240	10.0	5.5	145	11.5	7.75
(380/410V)	380	5.0	2.7	265	7.0	4.0
(400/450V)	415	5.0	2.7	300	7.0	3.3

Starting current is taken 15 secs. after the lamp has struck.

Measurements have been taken with power factor correction.

(d) Lumen Output

WATTAGE	INITIAL (100 hrs.)	LIGHTING DESIGN (2000 hrs.)
125	5,200	4,900
250	12,000	11,000
400	20,500	20,000
1000 220/250V	54,000	50,000
1000 (380/410V (400/450V)	56,000	52,000

(e) Life - See Vlll. Page 11.

(f) Burning Position - Universal

(g) Colour Characteristics - (Objective)

(i) Red Ratio 0.5% (measured with Wratten No. 25 Filter)

(ii) Chromaticity co-ordinates

$$x = 0.365 \quad y = 0.410$$

(iii) Spectral Energy (8 band)

1	2	3	4	5	6	7	8
0.01	0.53	0.07	1.0	47.1	49.8	1.1	0.06

(iv) A typical Relative Spectral Energy curve is shown in FIG. V1.

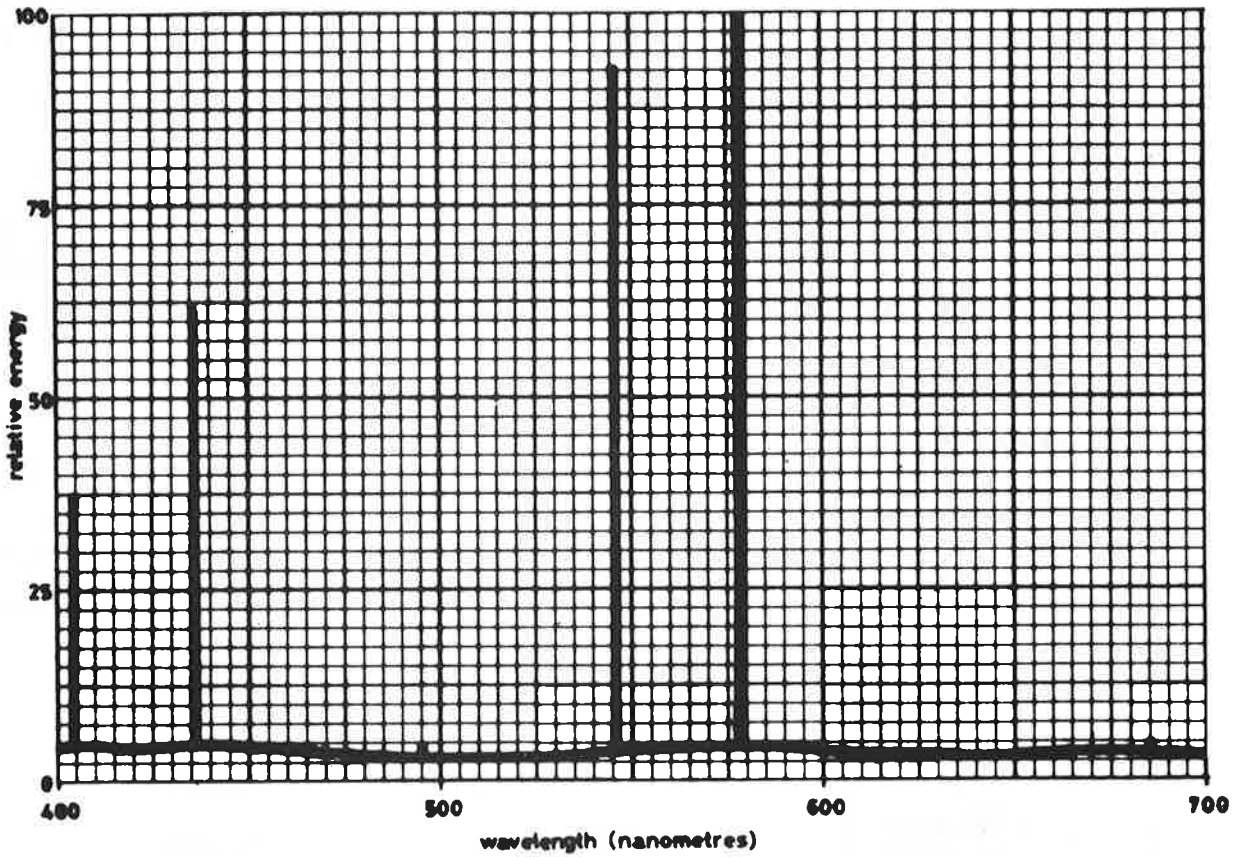


FIG. V1. Typical Relative Spectral Energy Curve for MB/U lamp.

(h) Application

Any situation where normal colour rendition is not important, or where lamps of high actinic content are required.

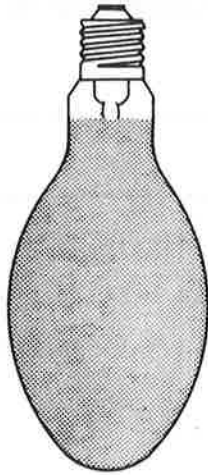
Photo-printing

Photo-chemical

Plant Irradiation

Situations where optical control is important

X. LAMP TYPE MBF/U TRUELITE



<u>RANGE</u>	50W)	
	80W)	
	125W)	
	250W)	220/250V
	400W)	
	700W)	
	1000W	220/250V
	1000W	(380/410V
		(400/450V

(a) Dimensions (in mm.)

WATTAGE	OVERALL LENGTH	DIAMETER	NOMINAL ARC LENGTH	LIGHT CENTRE LENGTH
50	126 ± 4	55 ± 1	11	90 ± 4
80	161 ± 4	70 ± 1	20	103 ± 4
125 ES & 3-pin BC cap	174 ± 4	75 ± 1	35	112 ± 4
250	223 ± 4	90 ± 1	50	150 ± 4
400	280 ± 5	120 ± 1.5	70	177 ± 4
700	315 ± 5	141 ± 2	95	208 ± 5
1000 220/250V	400 ± 10	165 ± 2	135	260 ± 5
1000 (380/410V (400/450V	345 ± 5	165 ± 2	120	212 ± 5

Light centre length of coated lamps is measured to the point of maximum diameter of the bulb which may not always be exactly the centre point of the arc tube. This is in line with International Practice.

Ref: L2/3HT/EX

(b) Finish

Truelite MBF/U types have the outer bulb coated internally with a fluorescent powder.

WATTAGE	BULB	CAP (nickel plated)
50	Elliptical	E.S. (E27)
80	Elliptical	*E.S. (E27) or 3-pin B.C. (B22d-3)
125	Elliptical	*E.S. (E27) or 3-pin B.C. (B22d-3) or G.E.S. (E40)
250	Elliptical	G.E.S. (E40)
400	Elliptical	G.E.S. (E40)
700	Elliptical	G.E.S. (E40)
1000 220/250V	Elliptical	G.E.S. (E40)
1000 (380/410V 400/450V)	Elliptical	G.E.S. (E40)

* Preferred cap type

(c) Electrical Characteristics

LAMP WATTAGE	SUPPLY VOLTAGE	MAINS		ARC TUBE		
		Starting Current Amps	Running Current Amps	Voltage (Objective)	Starting Current Amps	Running Current Amps
50	240	0.27	0.2	95	0.8	0.6
80	240	0.8	0.45	115	1.3	0.8
125	240	1.0	0.7	125	1.7	1.15
250	240	2.5	1.4	130	3.75	2.15
400	240	3.8	2.2	135	5.5	3.25
700	240	5.0	3.7	140	8.0	5.45
1000 (220/250V)	240	10.0	5.5	145	11.5	7.75
(380/410V)	380	5.0	2.7	265	7.0	4.0
(400/450V)	415	5.0	2.7	300	7.0	3.3

Starting current is taken 15 secs. after the lamp has struck.

Measurements have been taken with power factor correction.

(d) Lumen Output

WATTAGE	INITIAL	LIGHTING DESIGN
50	1,950	1,750
80	3,450	3,175
125	5,700	5,500
250	14,000	13,100
400	22,700	22,000
700	39,500	38,000
1000 220/250V	54,500	53,000
1000 (380/410V 400/450V)	57,500	54,000

(e) Colour Characteristics (objective)

(i) Red Ratio - measured with Wratten No. 25 filter 9 - 11%

(ii) Chromaticity co-ordinates (400W)

$$x = .390 \quad y = .395$$

(iii) Spectral Energy - 8 band

1	2	3	4	5	6	7	8
0.0007	0.54	0.08	0.09	42.2	47.0	9.12	1.18

(iv) A typical Relative Spectral Energy Curve for the Truelite MBF/U lamps is shown in FIG. V11.

(h) Life - See V111. Page 11.

(i) Burning Position - Universal.

(j) Application

Industrial, Streetlighting, Commercial, Shoplighting and Horticultural installations.

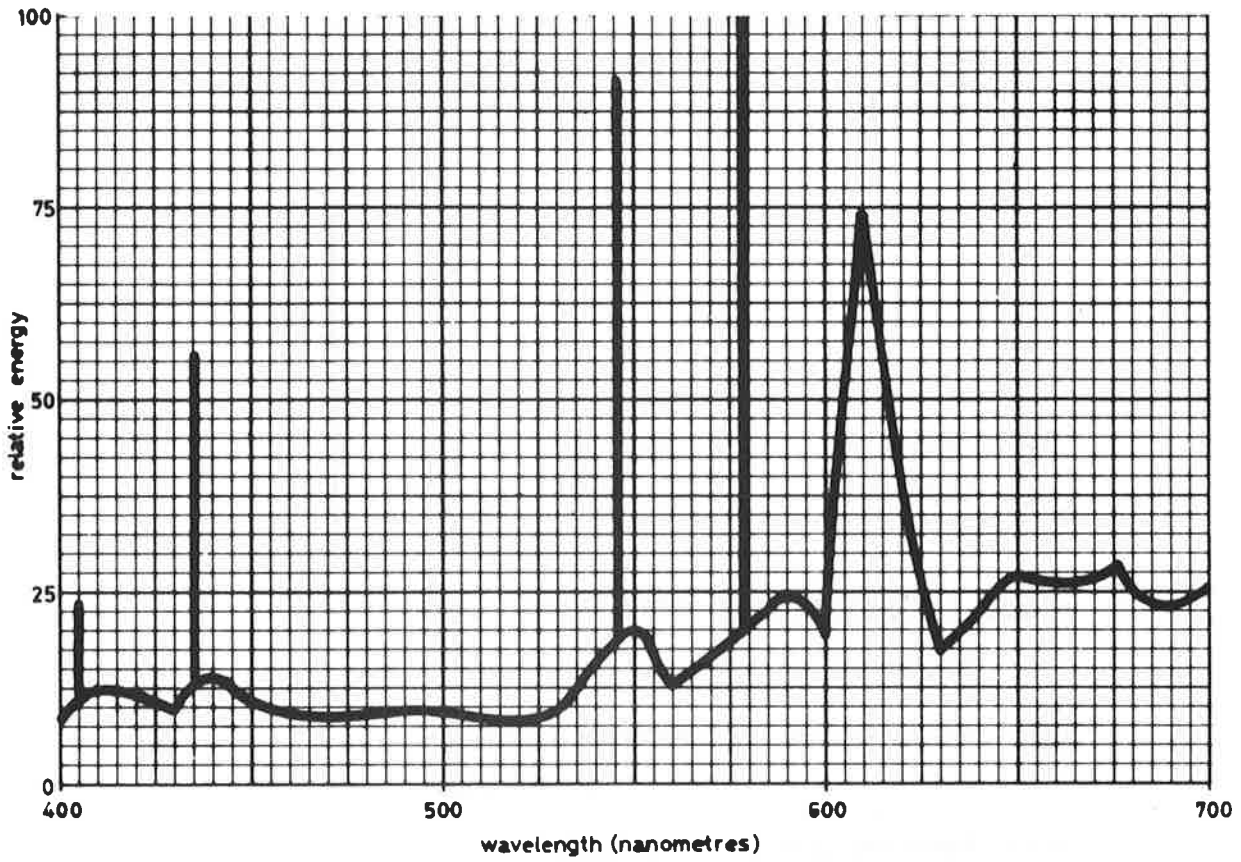


FIG. V11. Typical Relative Spectral Energy Curve for Truelite lamps.

XI. LAMP TYPE MBFR/U (Toplite Truelite)



<u>RANGE</u>	125W)	
	250W)	
	400W)	220/250V
	700W)	
	1000W	220/250V
	1000W	(380/410V 400/450V)

(a) Dimensions (in millimetres)

LAMP WATTAGE	OVERALL LENGTH	DIAMETER
125	174 ± 5	125 ± 2
250	245 ± 5	166 ± 2
400	270 ± 5	181 ± 2
700	305 ± 7	201 ± 2
1000 220/250V	350 ± 7	248 ± 2.5
1000 (380/410V 400/450V)	350 ± 7	248 ± 2.5

(b) Finish

All Toplite lamps have an internal reflecting surface of Titanium Dioxide. 250W and higher wattages are capped with G.E.S. (E40) nickel plated caps. 125W are available with E.S. (E27) caps.

(c) Electrical Characteristics

LAMP WATTAGE	SUPPLY VOLTAGE	MAINS		ARC TUBE		
		Starting Current Amps	Running Current Amps	Voltage	Starting Current Amps	Running Current Amps
125	240	1.0	0.7	125	1.7	1.15
250	240	2.5	1.4	130	3.75	2.15
400	240	3.8	2.2	135	5.5	3.25
1000 (220/250V)	240	10.0	5.5	145	11.5	7.75
(380/410V)	380	5.0	2.7	265	7.0	4.0
(400/450V)	415	5.0	2.7	300	7.0	3.3

Starting current is taken 15 secs. after the lamp has struck.

Measurements have been taken with power factor correction.

(d) Lumen Output

LAMP WATTAGE	INITIAL (100 hrs.)	LIGHTING DESIGN
125	4,800	4,400
250	12,500	11,500
400	21,500	20,500
700	34,500	32,500
1000 220/250V	52,000	49,000
1000 (380/410V (400/450V)	53,000	50,000

(e) Colour Characteristics (Objective)

(i) Red Ratio - measured with Wratten No. 25 Filter 5 - 7%

(ii) Chromaticity co-ordinates

$$x = .413 \quad y = .427$$

(iii) Spectral Energy - 8 band

1	2	3	4	5	6	7	8
0.01	0.33	0.06	0.95	44.0	49.4	4.6	0.5

(f) Life - See Vlll Page 11.

(g) Burning Position - Universal

(h) Glare

The B.Z. factor for the lamp alone is 6. With the G.E.C. Topsaver Fitting 3 - 4.

(i) Polar Distribution - See FIG. Vlll.

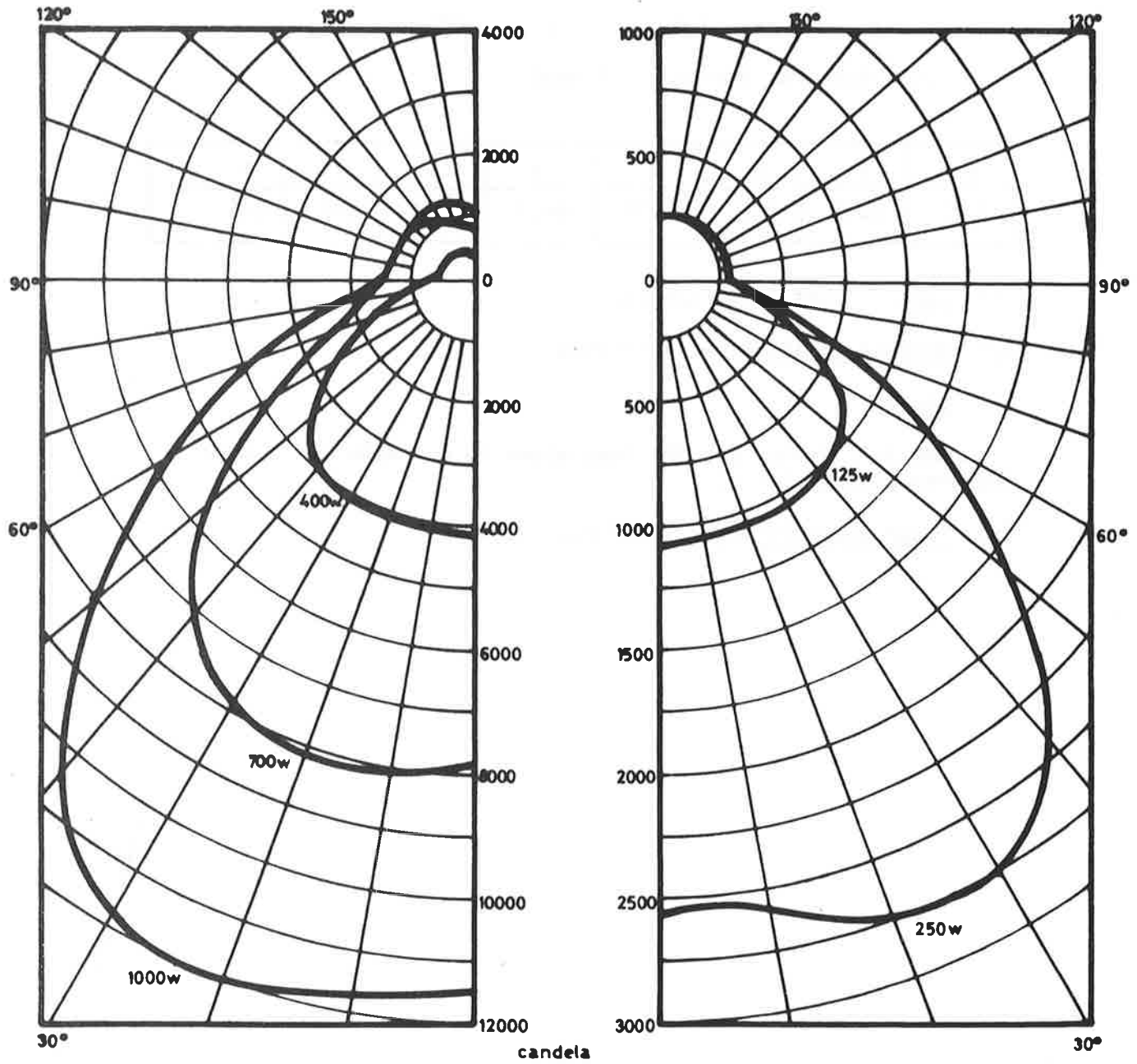


FIG. Vlll. Typical Polar Distribution curve for Toplite Truelite lamps.

(j) Application

The Toplite (with Topsaver fitting) will provide, at lower capital cost, most of the advantages obtained with an MBF/U lamp in a correctly designed fitting.

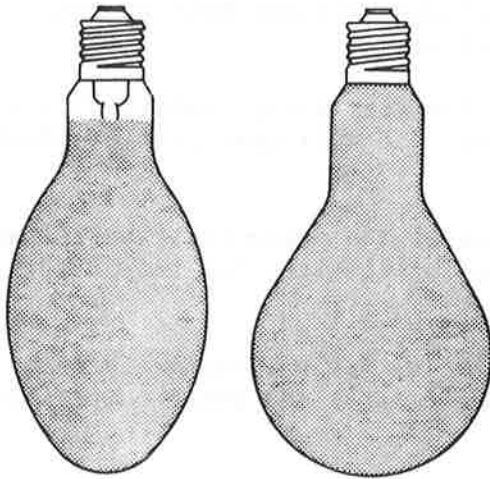
It is especially suitable for very dirty installations; any dust or soot settling on the bulb will have little effect on the light output.

The relatively smaller size of the whole unit lends itself to usage as a portable lighting installation for temporary requirements, building sites etc.

The 125W lamp when used with suitable fittings is ideal for shop window, foyer lighting, display and other comparable situations.

Note: The use of titanium dioxide as a reflecting material allows some upward transmission of light and prevents an undesirable "tunnel" effect.

X11. LAMP TYPE MBFT/V - BLENDED TRUELITE



RANGE 100W)
160W) 240/250V
250W)

The Blended Truelite lamp has an internal ballast in the form of a tungsten filament. This filament is in series with the arc tube and when the lamp is burning contributes towards the overall light output of the lamp. No external ballast is required and the lamp is connected directly to the mains supply.

(a) Dimensions (in millimetres)

LAMP WATTAGE	OVERALL LENGTH	DIAMETER
100	161 ± 4	70 ± 1
160	174 ± 4	75 ± 1
250	233 ± 7	110 ± 1.5

(b) Finish

LAMP WATTAGE	BULB	CAP
100	Elliptical	2-pin B.C. (B22d) or E.S. (E27)
160	Elliptical	2-pin B.C. (B22d) or E.S. (E27)
250	Pear Shape	G.E.S. (E40)

All Blended Truelite lamps are internally coated with a fluorescent powder and all caps are nickel plated.

(c) Electrical Characteristics

LAMP WATTAGE	RATING	LAMP CURRENT (amps) (also mains current)	
		Starting	Running
100	240/250	0.60	0.45
160	240/250	0.90	0.65
250	240/250	1.50	1.05

NOTE: The power factor of an MBFT/V lamp is almost unity due to the absence of an inductive ballast.

(d) Lumen Output

WATTAGE	INITIAL (100 hrs.)	LIGHTING DESIGN
160	2,150	1,970
250	4,700	4,100

(e) Life - Objective Average Life - 8,000 hours.

As with any lamp having an incandescent filament component of the light source, the MBFT/V is affected by any variation in mains voltage. A typical life/mains voltage curve is shown in FIG. 1X.

Because of the higher operating temperature of the filament ballast immediately after striking, the life of the MBFT/V is affected by the switching rate. The objective life is quoted for one switching during every 12 hours burning.

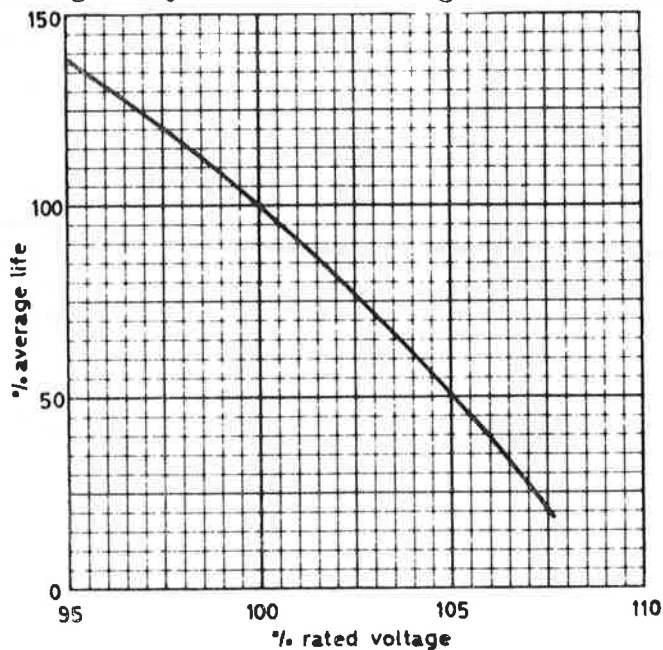


FIG. 1X. Typical relationship of life of MBFT/V and mains voltage.

(f) Colour Characteristics (Objective)

(i) Red Ratio - measured with Wratten No. 25 Filter - 11%

(ii) Chromaticity co-ordinates

$$x = .380 \quad y = .400$$

(iii) Spectral Energy - 8 band

1	2	3	4	5	6	7	8
0.01	0.40	0.09	2.1	45.0	45.0	6.5	0.6

(iv) A typical relative spectral energy curve is shown in FIG. X.

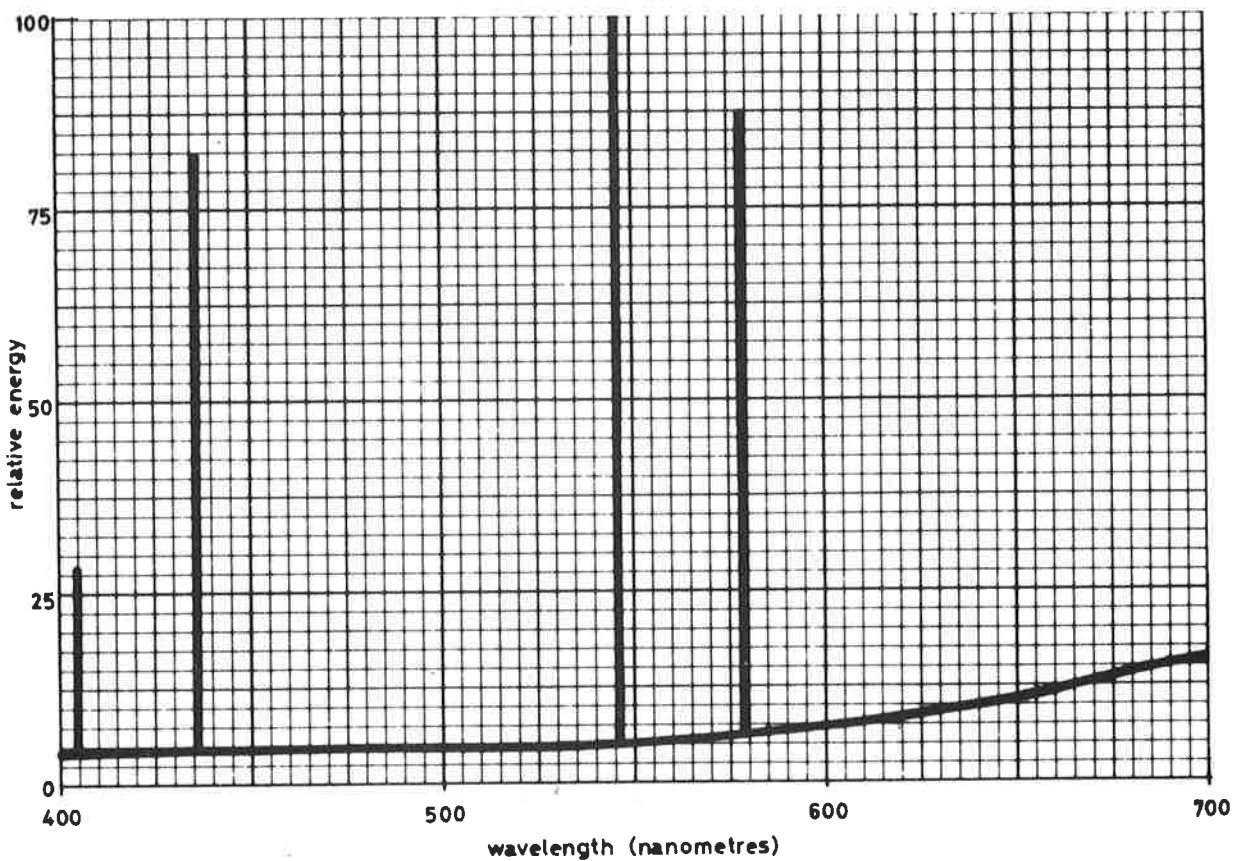


FIG. X. Typical relative spectral energy curve for Blended Truelite lamp.

(g) Variation in Supply

(i) Voltage

The performance and characteristics of a Blended Truelite lamp are affected by mains voltage variation. The effect is shown typically in FIG. X1.

(ii) Frequency

A Blended Truelite will not usually function satisfactorily on frequencies below 45 Hz.

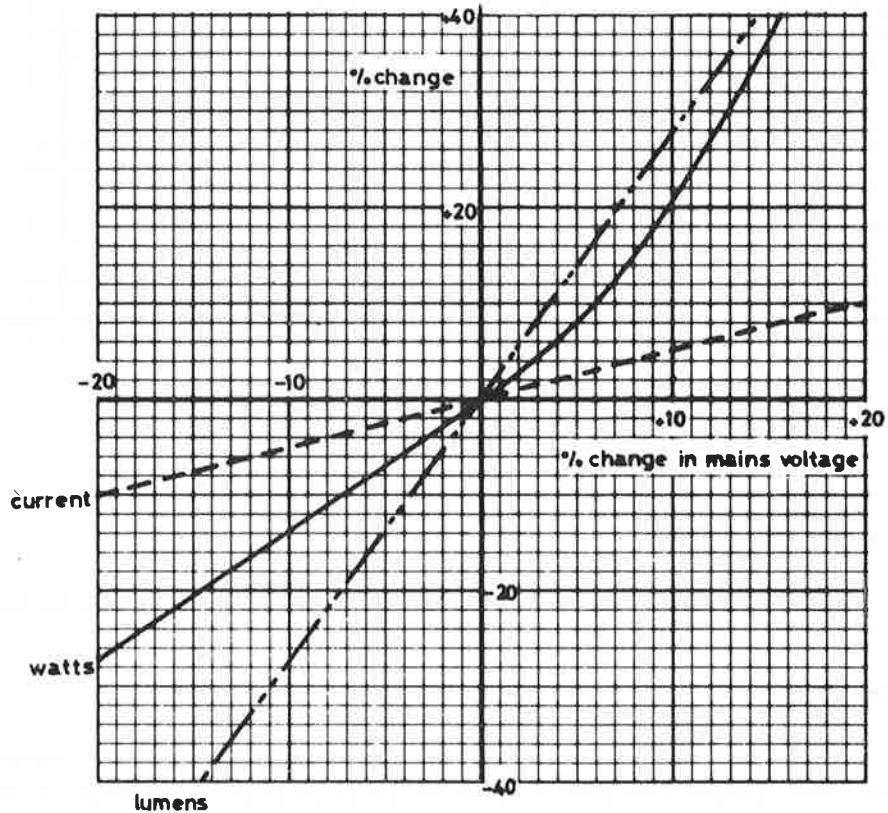


FIG. X1. Typical effect of mains voltage variation on performance and characteristics of "Blended Truelite" lamps.

(h) Starting Characteristics

The characteristics of a "Blended Truelite" lamp at starting are different from the standard types of High Pressure Mercury lamps. Typical curves are shown in FIG. X11.

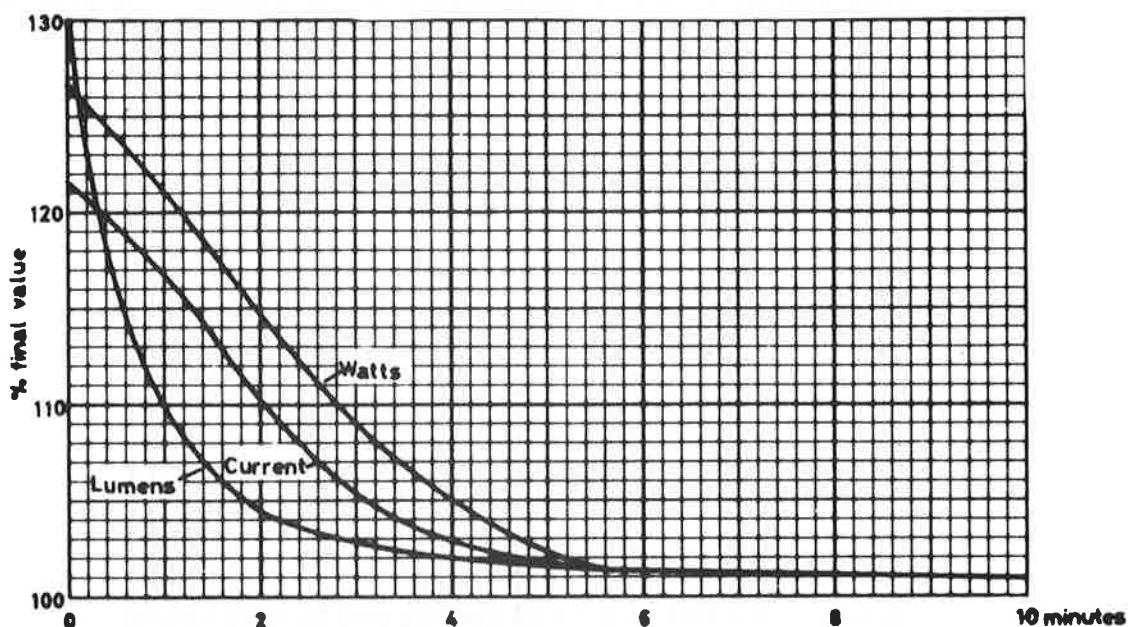


FIG. X11. Typical starting characteristics of "Blended Truelite" lamps.

(i) Unprotected Lamps

The Blended Truelite lamp should be protected in situations where thermal shock to the outer bulb is likely.

(j) Vibration

Owing to the presence of an internal filament "Blended Truelite" lamps are not suitable in conditions of high vibration.

(k) Burning Position

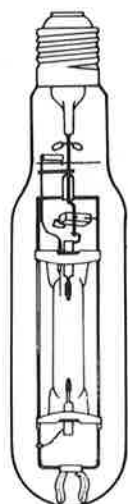
Generally the "Blended Truelite" lamp can be operated in any position, but occasionally when operated horizontally, it may run up and then extinguish, afterwards it will restart and follow the same cycle. This is due to the elongation of the arc raising the arc tube voltage. Increase of the supply voltage if possible will overcome this problem although life may be shorter in positions other than vertical cap up.

(1) Application

The "Blended Truelite" lamp can be connected direct to the mains supply without the cost of control gear. It is, therefore, suitable as a direct replacement for a G.L.S. lamp of similar or smaller dimensions. With its much longer life it has economic advantages in installations where replacement of lamps involves high costs and/or inconvenience, e.g. bulkhead fittings, shop windows.

Generally the MBFT/V lamp provides up to 8 times the life with similar light for the same wattage G.L.S. lamp.

XIII. LAMP TYPE MBI



RANGE 400W BLUE OR GREEN
 - nominal 240V mains
 2 kW WHITE
 - 380/450V supplies

(a) Dimensions (in millimetres)

WATTAGE	OVERALL LENGTH	DIAMETER	LIGHT CENTRE LENGTH NOMINAL
400W (GREEN & BLUE)	280 ± 8	65 ± 2	175
2000W	420 ± 10	100 ± 2	258

(b) Finish

All G.E.C. MBI lamps have clear bulbs and nickel plated G.E.S. caps (E40).

(c) Electrical Characteristics

WATTAGE	SUPPLY VOLTAGE	MAINS		ARC TUBE		
		Starting Current Amps	Running Current Amps	Voltage	Starting Current Amps	Running Current Amps
400W GREEN & BLUE	240	3.8	2.8	120 ± 20	5.5	3.6
2000W	380/450V	8.5	6.1	240 ± 30	13.5	9.1

Starting current is measured 15 seconds after the lamp has struck.

Measurements have been taken with power factor correction.

(d) Circuits 400W

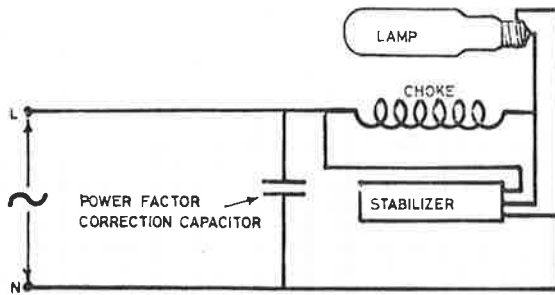
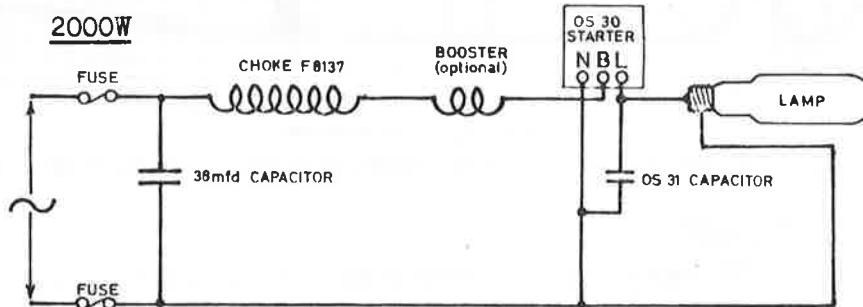


FIG. XI1. Typical circuit for 400W MBI lamp.

NOTE: Chokes as supplied for 400W HPMV lamps can be used with appropriate adjustment as follows:-

<u>Supply Volts</u>	<u>Use Tappings Marked</u>
230	220
240	230
250	240



NOTE 1

38 mfd. Capacitor may consist of
 2 x 14 mfd 440V F8566L
 1 x 10 mfd 440V Z1790XL

NOTE 2

Fuses 415V 20A Class O1
 B5 88-1967

FIG. XLV. Typical circuit for 2 kW MBI lamp.

(e) Lumen Output

TYPE	INITIAL (100 hrs.)	LIGHTING DESIGN
400W BLUE	8,000	6,000 at 2000 hrs.
400W GREEN	26,000	23,000 at 2000 hrs.
2000W WHITE	150,000	140,000 at 500 hrs.

(f) Colour Characteristics (Objectives) 400W BLUE

(i) Chromaticity co-ordinates

$$x = .224 \quad y = .175$$

(ii) Spectral Energy 8 band

1	2	3	4	5	6	7	8
0.043	0.48	6.4	12.8	45.7	28.9	7.1	0.66

(iii) A typical Spectral Energy curve is shown in FIG. XV.

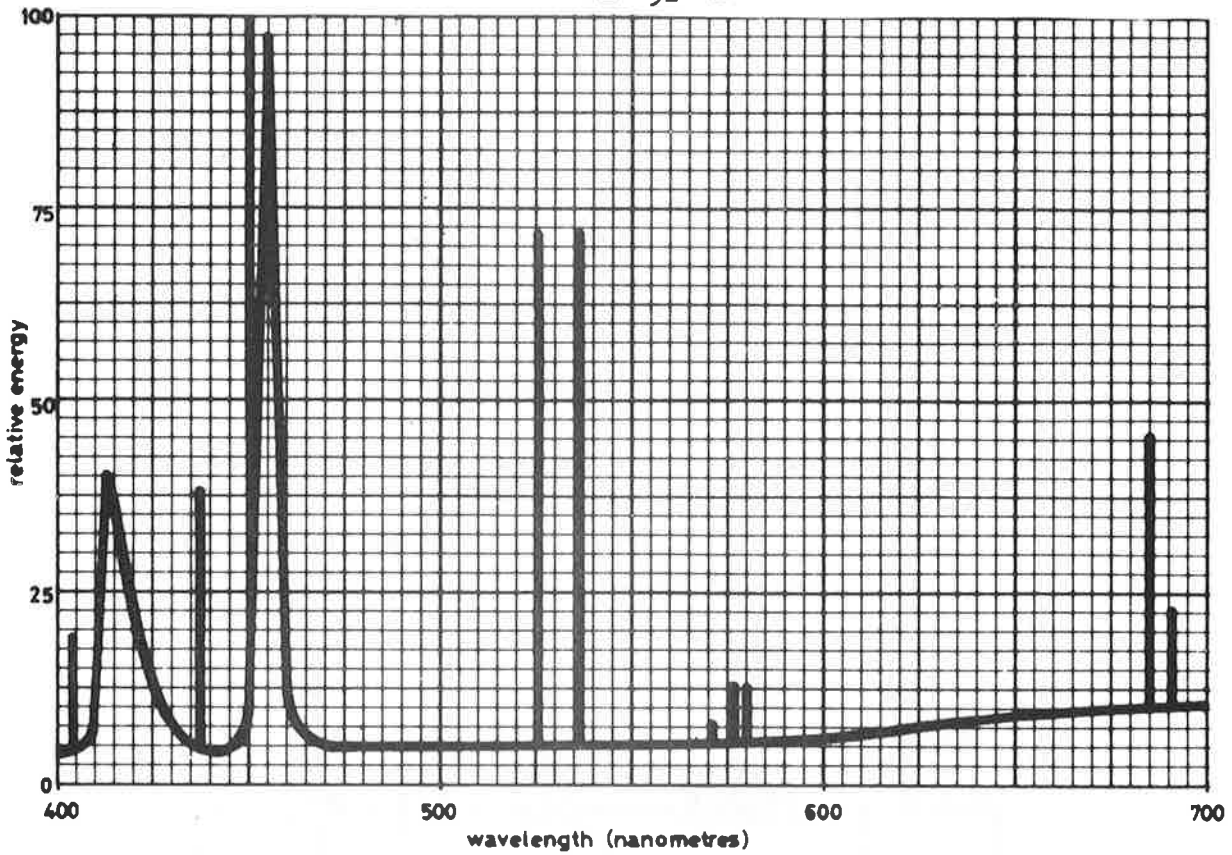


FIG. XV. Typical relative Spectral Energy curve for BLUE MBI lamp.

400W GREEN

(iv) Chromaticity co-ordinates $x = .262$ $y = .580$

(v) Spectral Energy 8 band

1	2	3	4	5	6	7	8
0.004	0.11	2.25	2.15	96.1	9.88	0.9	0.2

(vi) A typical relative Spectral Energy curve is shown in FIG. XVI.

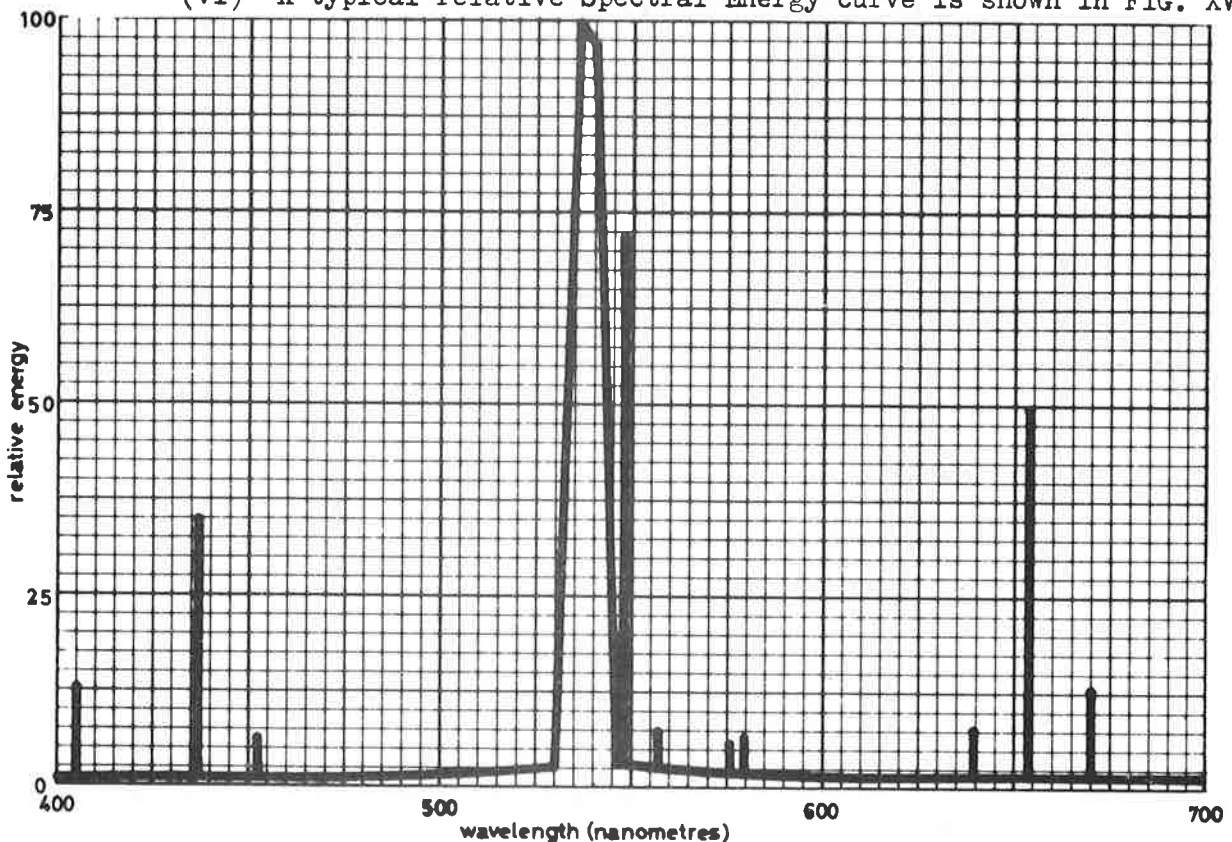


FIG. XVI. Typical relative energy curve for GREEN MBI lamp.

2000W WHITE

(iv) Chromaticity co-ordinates $x = .375$ $y = .375$

(v) Spectral energy 8 band

1	2	3	4	5	6	7	8
0.01	0.09	2.20	1.40	35.00	57.70	3.79	0.50

(vi) A typical relative Spectral Energy curve is shown in FIG. XV11.

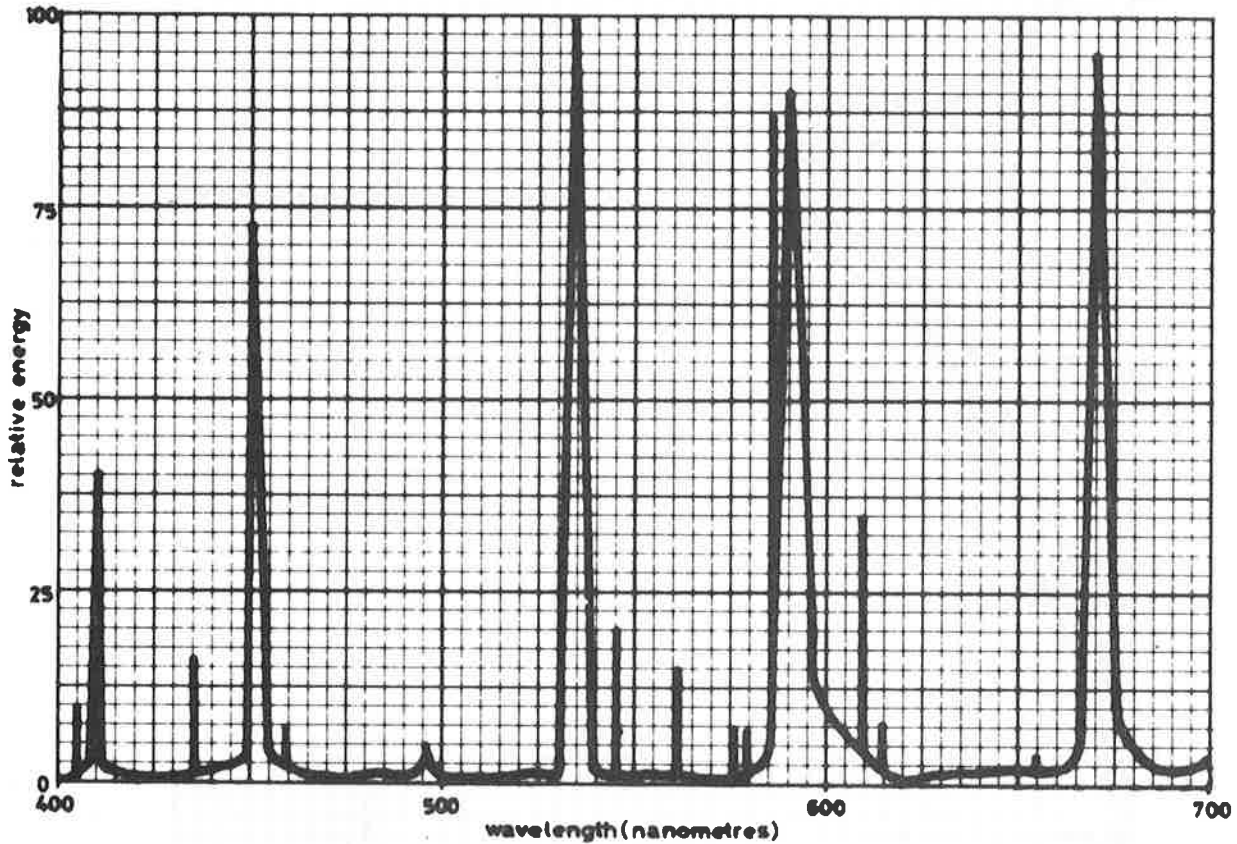


FIG. XV11. Typical relative energy curve for WHITE MBI lamp.

(g) Objective Average Life

- 400W BLUE or GREEN - 3,000 hours
- 2000W WHITE - 2,000 hours.

(h) Position of Burning

The 2000W MBI lamp should be operated within 20° of horizontal.
The colour will change if lamp is not horizontal.

(i) Starting Characteristics

Typical characteristics of MBI lamps after striking are shown in FIG. XVlll.

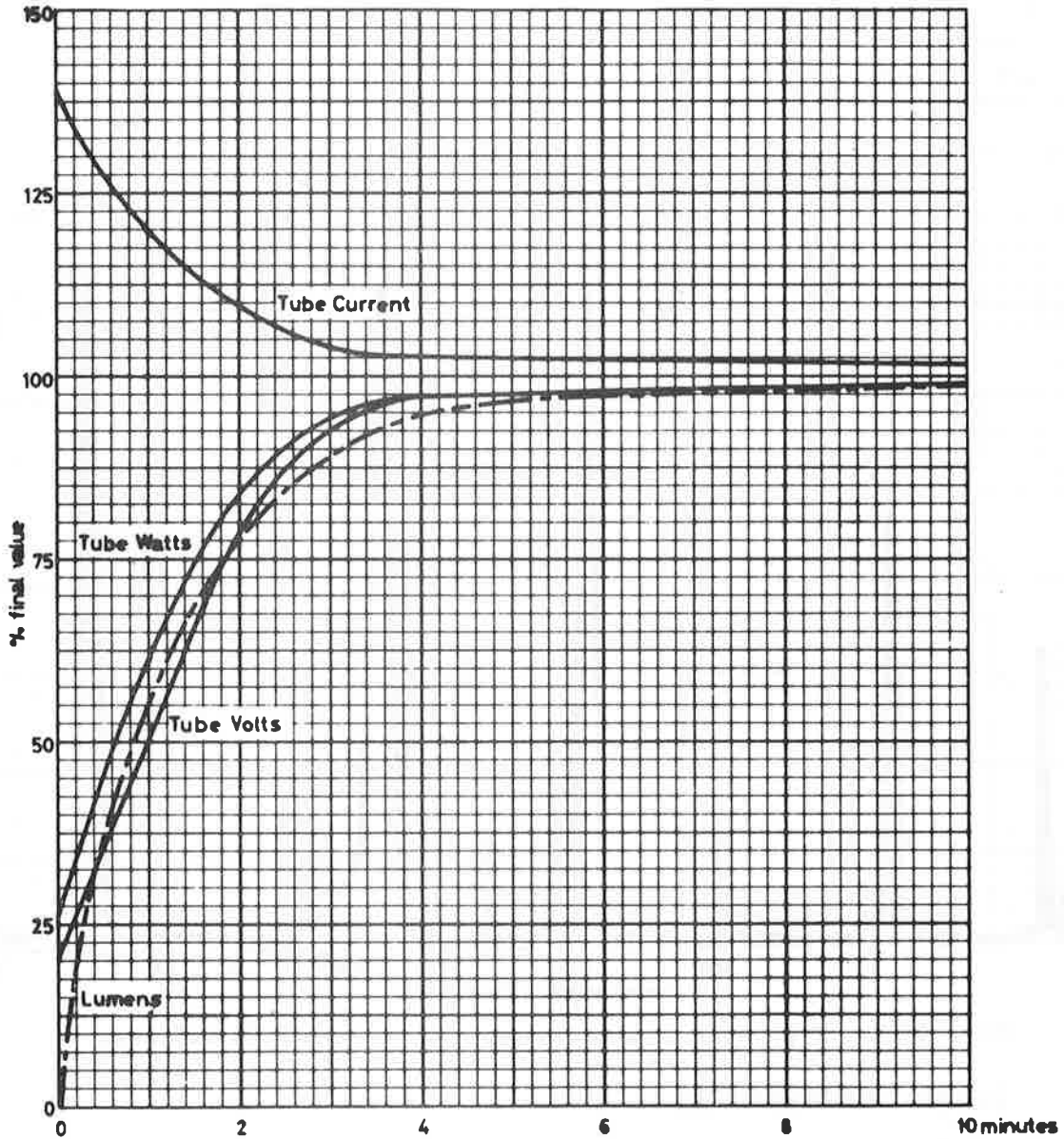


FIG. XVlll. Typical run-up characteristics of MBI lamps after striking.

(j) Mains Voltage Variation

The effect of mains voltage variation on 400W MBI lamp characteristics is similar to that of standard High Pressure Mercury Vapour lamps as shown in FIG. lV. The effect on 2000W lamps is as shown in FIG. XLX.

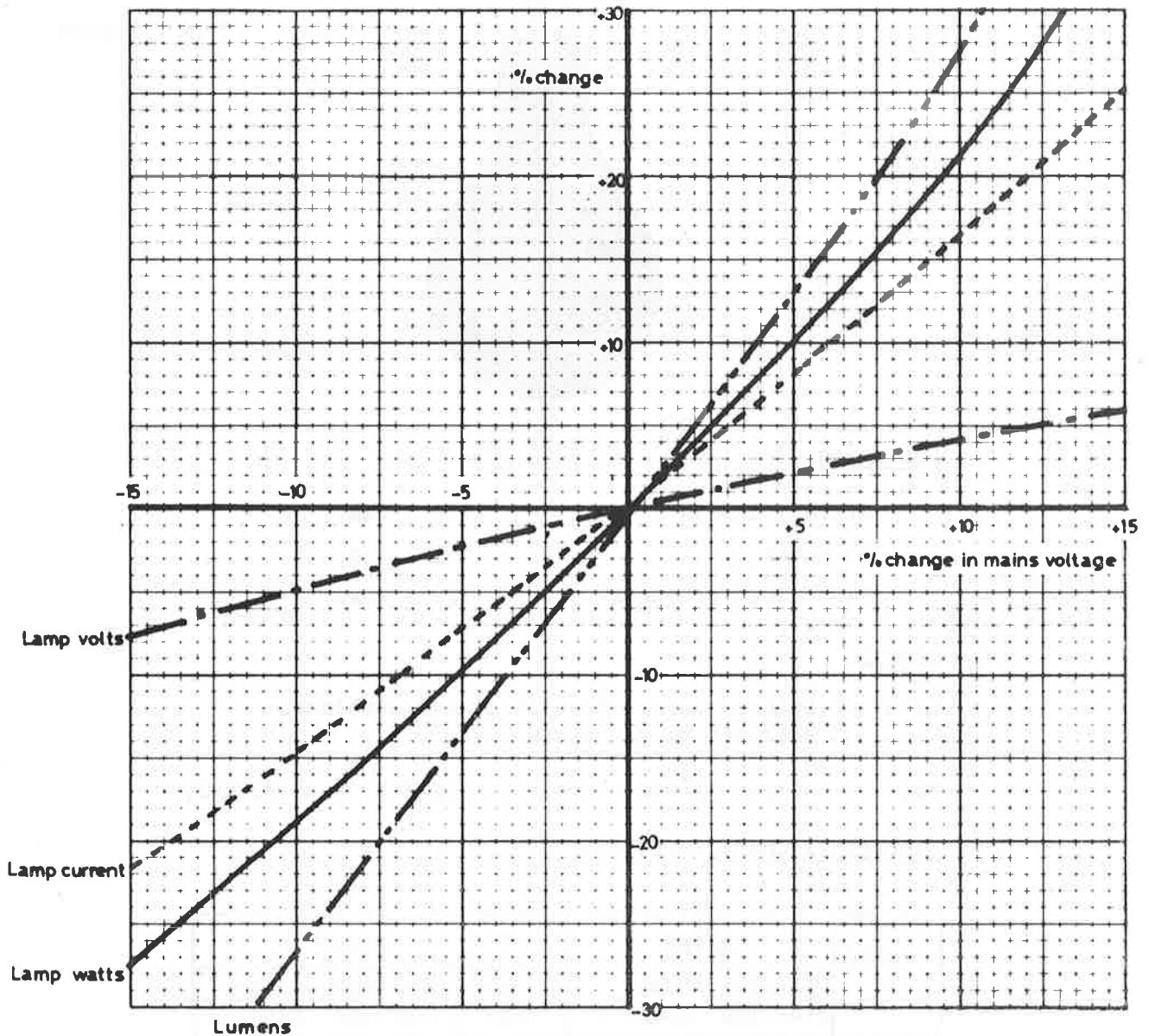


FIG. XLX. Typical mains voltage characteristics curve for 2000W WHITE MBI.

(k) Application

Coloured Types

The strong coloured light from the MBI lamps make it extremely suitable for floodlighting. The BLUE MBI is also suitable for Photochemical and Photo-printing processes.

2000W WHITE

Because of its high light output and good colour rendition this lamp is particularly suitable for floodlighting football stadia or similar areas in which the use is of limited duration.

XIV. LAMP TYPE MBW/U

RANGE 125W 220/250V



(a) Dimensions

Overall Length	174 ± 4mm.
Diameter	90 ± 1mm.
Light Centre Length	112 ± 4mm.

(b) Finish

Bulb - Pear shaped in "Woods" glass (sometimes referred to as "Black Glass")

Cap - Nickel plated 3-pin B.C. (B22d-3) or E.S. (E27)

(c) Electrical Characteristics

VOLTS	MAINS		LAMP		
	Current - Amps		Volts	Current - Amps	
	Starting	Running		Starting	Running
240	1.0	0.7	125	1.7	1.15

The information given above has been obtained with power factor correction.

(d) Spectral Energy

A typical Spectral Energy curve for the MBW lamps is shown in FIG. XX.

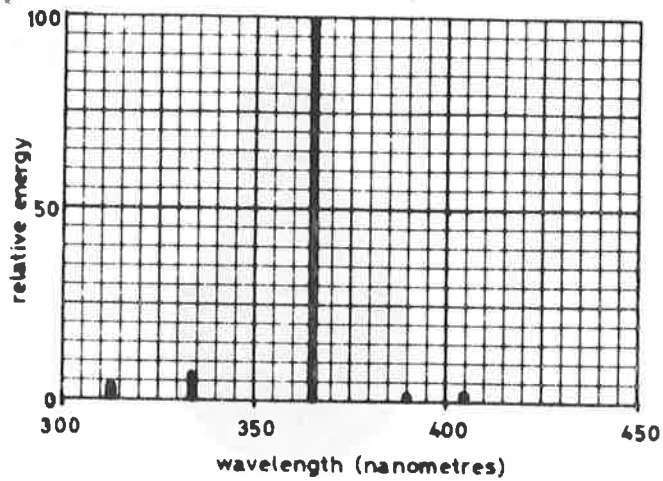


FIG. XX. Typical Relative Spectral Energy Curve for MBW lamp.

(e) Life - See Vlll Page 11.

(f) Application

The MBW lamp gives practically no visible radiation but transmits ultra violet in the longer wavelength region almost exclusively 365 nm. It is very suitable for examining substances which fluoresce weakly under these wavelengths, e.g. oil, certain pigments.

It can be used for identifying laundry marks, examination of documents for forgery, porcelain for repair, postage stamps for cancellation marks, etc.

It is also used for visual effects in dance halls or stage presentations.

XV. LAMP TYPE MBWT/V - BLACK MAGIC



RANGE

175W 220/250V
supply

(a) Dimensions (in millimetres)

Overall length	174 ± 4
Diameter	90 ± 1
Neck Diameter	39 ± 1

(b) Finish

- Bulb - Pear shaped in "Woods" glass (sometimes referred to as "Black Glass").
- Cap - Nickel plated B.C. (B22d) or E.S. (E27)

(c) Electrical Characteristics

Starting current - 0.93 amps	} on 240V supply
Running current - 0.77 amps	

The effect of voltage variations on lamp current and wattage is shown in FIG. X1.

Starting characteristics are shown in FIG. X11.

NOTE:

- (1) The power factor of an MBWT/V lamp is almost unity due to the absence of an inductive ballast.
- (2) The MBWT/V lamp will not usually function satisfactorily on frequencies below 45 Hz.

(d) Life - Objective Average Life - 3,000 hours on 240V supply.

As with any lamp having an incandescent filament component the MBWT/V is affected by any variation in mains voltage.

Because of the higher operating temperature of the filament ballast immediately after striking, the life of the MBWT/V is affected by the switching rate. The objective life is quoted for one switching during every 12 hours burning.

A typical life/mains voltage curve is shown in FIG. X.

(e) Unprotected Lamps

The Black Magic lamp should be protected in situations where thermal or mechanical shock to the outer bulb is likely.

(f) Vibration

Owing to the presence of an internal filament the Black Magic lamp is not suitable in conditions of high vibration.

(g) Burning Position

Generally the Black Magic lamp can be operated in any position but occasionally when operated horizontally it may run up and then extinguish, afterwards it will restart and follow the same cycle. Increasing the supply voltage, if this is possible, will overcome this problem.

(h) Spectral Energy

A typical spectral energy curve of the MBWT/V lamp is given in FIG. XXI.

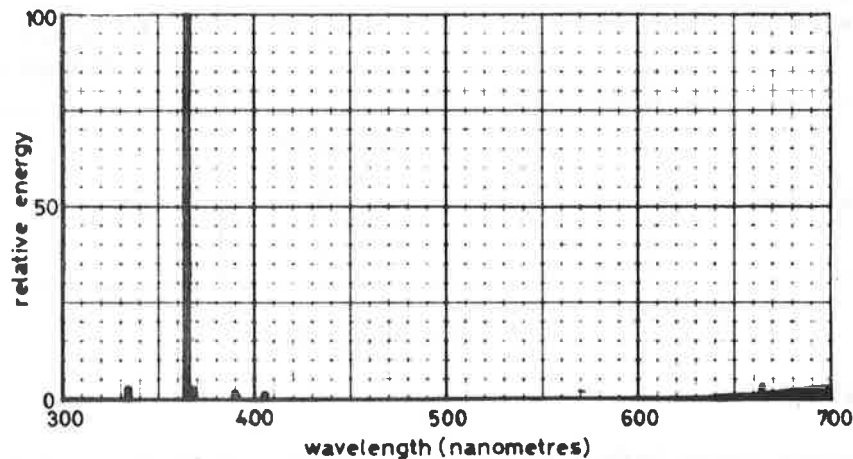
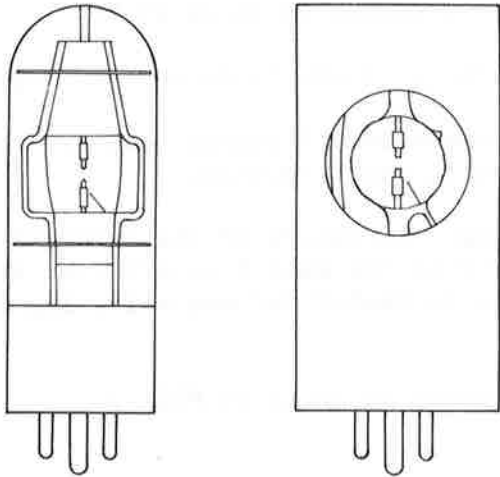


FIG. XXI. Typical relative Spectral Energy Curve for MBWT lamp.

(i) Application

The MBWT/V lamp is suitable for all applications as described for the MBW/U lamp. Because of its flexibility in installing it, it is also very effective for discotheque, amateur stage lighting and commercial display.

XVI. LAMP TYPE ME/D (Compact Source)



RANGE 250W Glass Bulb
250W Metal Box
(glass window)

Both will operate on
200/250V A.C. or D.C.
supplies.

The ME/D Compact Source lamp operates at high pressure of the order of 20 atmospheres and has a light source length of only a few millimetres.

(a) Dimensions (in millimetres)

TYPE	OVERALL LENGTH	DIAMETER	LIGHT CENTRE LENGTH
Glass Bulb (3-pin base)	140 ± 3 *	50 ± 2	85 ± 1
Glass Bulb (pre-focus cap)	150 ± 3	50 ± 2	65 ± 0.5 (to flange of cap)
Metal Box	130 ± 3 *	Rect.sect. 65 ± 1 X 55 ± 1	80 ± 1

* Excluding Pins

(b) Finish

The glass types have clear tubular bulbs. With the metal box type the outer glass bulb is replaced by a black enamelled metal box with a glass window of approximately 45mm. diameter.

Both standard glass and metal box types have 3-pin bases whilst the pre-focus type has a large pre-focus cap.

(c) Electrical Characteristics

Mains voltage	-	240V
Lamp voltage	-	70V
Lamp starting current	-	4.5 Amp
Lamp running current	-	4.2 Amp

Measurements have been taken with power factor correction 15 minutes after the lamp has struck.

(d) Performance

Arc length	-	3.75mm.
Arc width	-	2.5mm.
Max. arc brightness	-	200 Mcd/m ²
Average arc brightness	-	0.8 max. brightness
Life	-	500 hours average objective

(e) Circuits

- (i) A.C. Operation - The basic circuit for High Pressure Mercury applies although different control gear is used.
- (ii) D.C. Operation - Control gear for 250W ME/D lamps is not suitable for operation on D.C. but a series resistance is required in the basic A.C. circuit. The recommended series resistance is as follows:-

<u>Mains Voltage</u>	<u>Ballast Resistance (ohms)</u>
200	34
210	37
220	41
230	44
240	48
250	51

The resistance should be capable of carrying 5 amps continuously.

(f) Operating Position - Vertical, cap down.

(g) Operating Precautions

The lamp should be freely ventilated and in view of the high internal pressure during operation suitable protective housing is recommended.

(h) Spectral Energy

A relative Spectral Energy curve is shown in FIG. XX11.

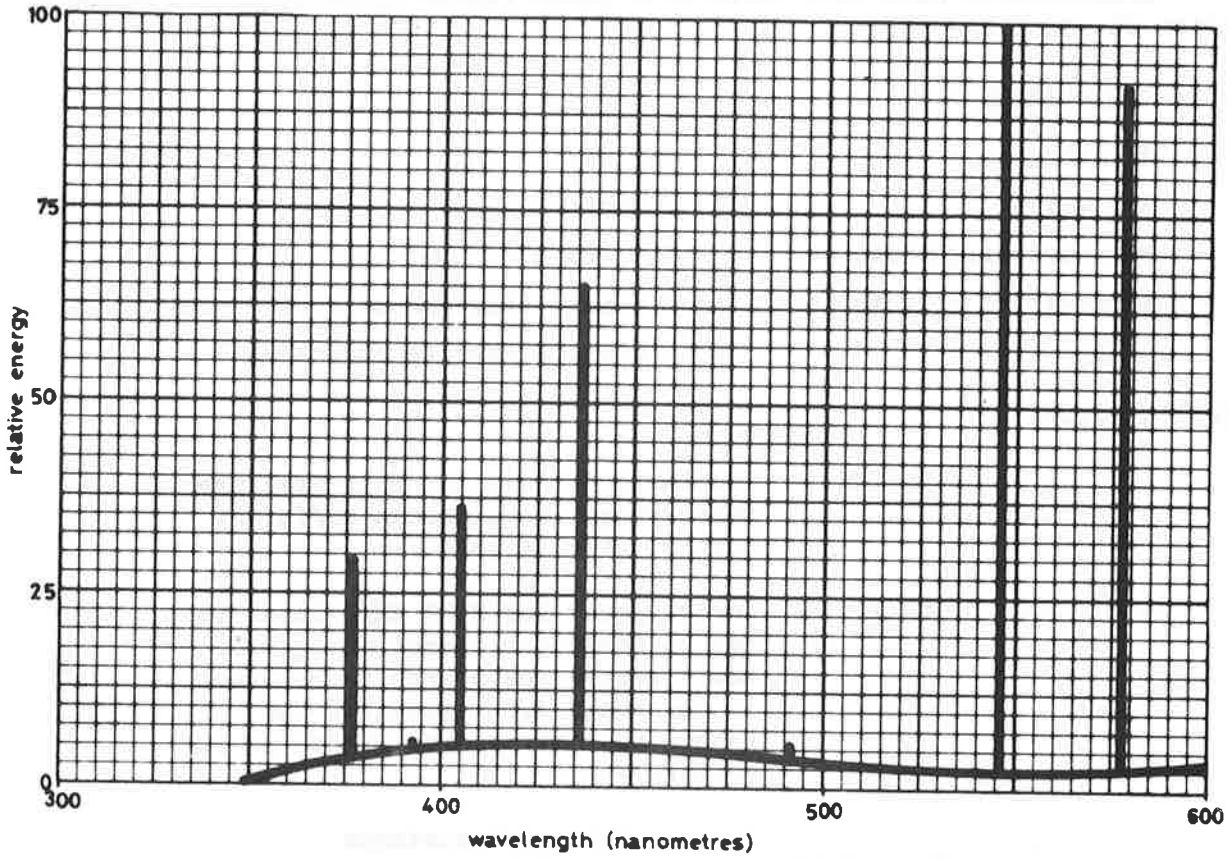


FIG. XX11. Typical Relative Spectral Energy curve for ME/D lamp.

(i) Application

Projection, including Projection Microscopy.

Photomicrography

Fluorescent Microscopy

11

11

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