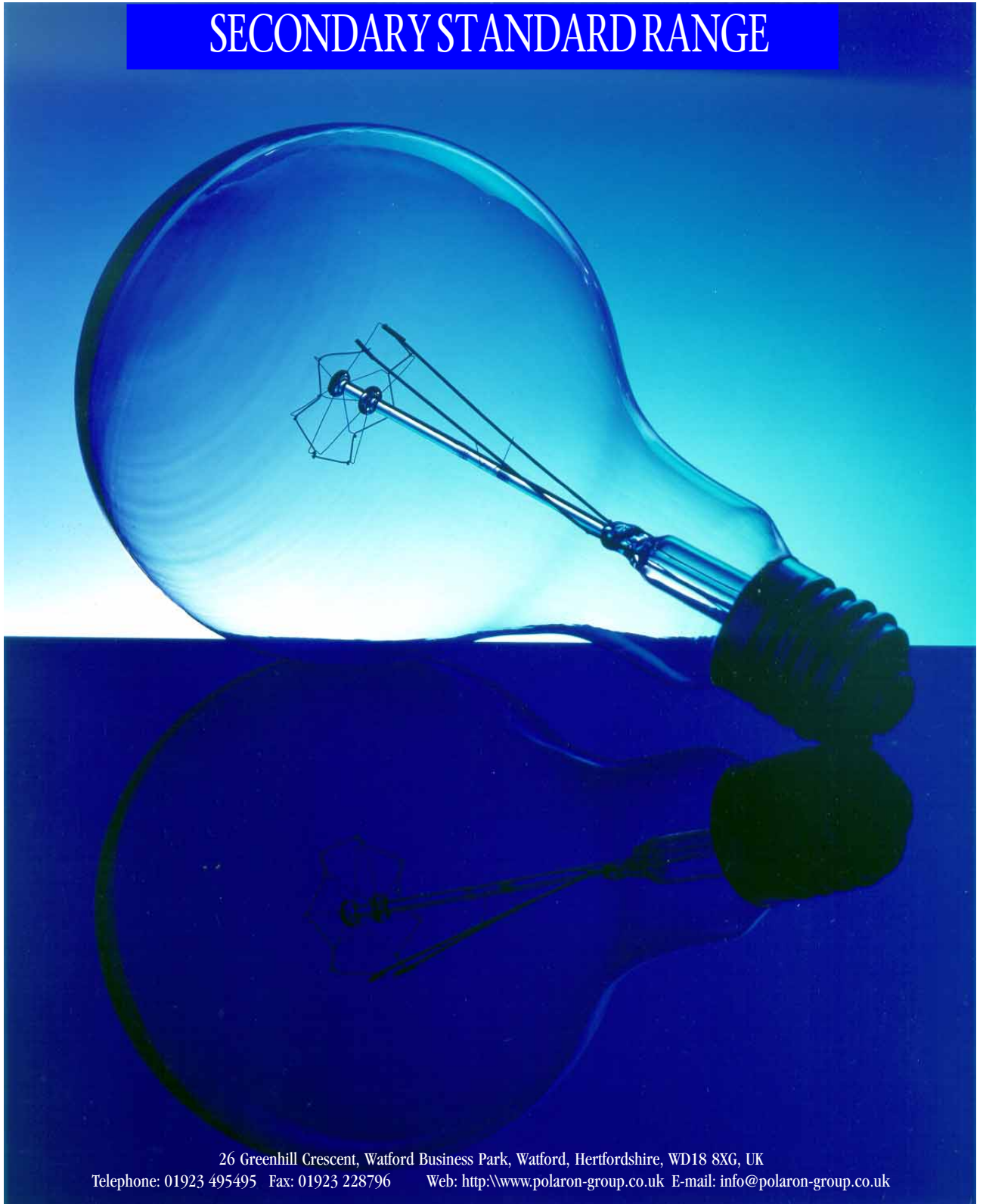

SPECIAL LAMPS DIVISION

SECONDARY STANDARD RANGE



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POLARON COMPONENTS GROUP



**POLARON
SPECIAL LAMPS
DIVISION**

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POLARON SPECIAL LAMPS DIVISION

INTRODUCTION

Following the acquisition in September 1989 of the Special Lamps Division from G.E.C., we can now offer the full range of secondary standards for Radiation and Photometry measurements as developed by G.E.C. Hirst Laboratories in association with the National Physical Laboratory in Teddington.

The Polaron Group has manufactured specialised glass, high vacuum and scientific products for the last three decades and is therefore well equipped to carry out the precision manufacturing of the vacuum and gas filled lamps used as secondary standards.

Secondary standards are manufactured for the following applications:

High Temperature Radiation measurements

Lamps in the range 10 – 11/V/G are suitable where highest accuracy and high stability are required (decremental rates 0.1°C - 0.3°C/100h). This design incorporates Tungsten Ribbon or Black-body filaments consisting of a tungsten tube containing a bundle of fine tungsten wires. Heat is removed from the lamp by means of water-cooled bases. These lamps are manufactured according to the designs of T.J.Quinn & C.R.Barber of the N.P.L. They may be vacuum or gas filled for operation at low or high temperatures. Windows are normally Pyrex, however, Silica windows can be incorporated if required.

Lamps in the range 20 – 24/V/G may be used for slightly less accurate work (decremental rate 0.5 - 0.7°C/100h). These lamps have E40 screw cap bases and modified window and filament geometries for different applications. In addition there is a choice of window materials, Pyrex, U.V. grade silica, Infra Red grade and W.F. grade for the transmission of wavelengths within the limits 0.2µm – 3.5 µm and 1000 K – 1950 K correlated colour temperature.

Photometry

Specially developed Tungsten-filament lamps are available as transfer standards for the measurement of photometric quantities such as luminous flux, luminous intensity and colour temperature. A number of different designs are available. Lamp selection will depend on specific applications. Characteristics which may be required for such lamps are uniform irradiance field in a specific direction, freedom from short-term fluctuations in radiant output such as those arising from convection induced fluctuations in filament temperature. Other requirements are long-term stability, repeatability, unlimited shelf life, ability to match the shape of standard lamps being calibrated.

Lamps are available in the following ranges:

LF4/1000 – Coiled filament lamps in GLS envelopes. Decremental rate ~ 1.0% per 100 hrs.

25G – Inverted ribbon filament lamp with pointer and Pyrex or Silica windows. For use where minimum short-term fluctuation (<0.02%) is required. Operating to 2856 K, decremental rate 0.5% per 100hrs.

L.I.S. – S - Unsupported double helix filament lamp with Pyrex or Silica windows operating to 3200 K, for use where uniform irradiance is required in a specific direction. Decremental rate 1.0% per 100hrs.

Ageing & Calibration

Prior to use, each lamp must be aged then calibrated. In the UK, this service is provided by the NPL and other standards institutes such as the BSI. Polaron can supply lamps in uncalibrated form or arrange calibration by the appropriate body to customer specific requirements. The calibration will depend on the intended application. Typically standard radiation sources can be supplied to manufacturers of radiation detectors, optical fibre and fibre optic device Spectrophotometers. Light sources may be calibrated as secondary standards for measurement of:

Relative spectral power distribution

Absolute spectral power distribution

A similar service is provided for lamp calibrations of luminous flux, luminous intensity and colour temperature; a parameter important in assessing the appearance of coloured objects such as paints, fabrics and filters.

For more detailed information about calibration and costs, please contact our Technical Sales Department.

10/V & 10/G HIGH-STABILITY TUNGSTEN-RIBBON LAMPS

FEATURES

1. 1.5mm wide 0.07mm thick tungsten ribbon with a small notch to indicate the calibration point.
2. Bulb fitted with two 80mm diameter, 4mm thick Pyrex windows angled at nominal 5° to axis to prevent reflections.
3. Special base (WCB) available designed for temperature control of the lamp pins by water-cooling to improve reproducibility. It is essential that the base remains soldered to the lamp and is fitted prior to calibration using special low-melting point, 125°C solder.
4. Vacuum and gas-filled versions for low and high temperature ranges. The gas-filled version is filled with research grade argon.
5. Rigorous cleaning and baking schedule during manufacture to increase stability.

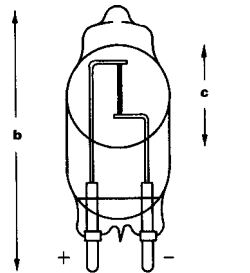
VACUUM AND GAS-FILLED LAMPS

Two versions of the lamp are available:

1. Vacuum lamp with a vertical ribbon length of 62mm for the range 700 – 1700°C radiance temperature (1000 – 2200 K correlated colour temperature).
2. Gas-filled lamp with a vertical ribbon length of 34mm for the range 1600 – 2200°C radiance temperature (2050 – 2850 K correlated colour temperature).

DIMENSIONS

CODE	Nominal (mm)		
	b	c	d
10/V	225	80	190
10/G	252	80	190



APPROXIMATE ELECTRICAL CHARACTERISTICS AND DECREMENTAL RATES

1. Vacuum lamps: 5.5V 14A d.c. at 1700°C with a typical decremental rate of 0.01°C/h at 1700°C.
2. Gas-filled lamps: 8V 22A d.c. at 2200°C with a typical decremental rate of 2°C/100h at 2200°C.

PLEASE NOTE

The voltage and current values are for guidance only. Individual lamps may differ and each requires its own specific calibration. Wider filaments can be supplied to special order, the current drawn increasing approximately pro rata with the width.

11/V & 11/G BLACK-BODY LAMPS

These lamps differ to the tungsten-ribbon lamps and because of their emissivity will operate at higher maximum radiance temperatures than the corresponding ribbon lamps.

FEATURES

1. A 2mm diameter 45mm long tungsten tube containing a bundle of fine tungsten wires constitutes the radiation cavity. A 1mm diameter aperture is placed near the end of the tube and behaves as a source of radiation of emissivity greater than 0.990 within the wavelength range 400-800nm.
2. Bulb fitted with two 80mm diameter, 4mm thick Pyrex windows.
3. Specially designed water-cooled base available to control the lamp pin temperature. It is essential that this base remains soldered to the lamp and is fitted prior to calibration using special low-melting point, 125°C solder.
4. Vacuum and gas-filled versions for low and high temperature ranges. The gas-filled version is filled with research grade argon.
5. Rigorous cleaning and baking schedule during manufacture to increase stability.

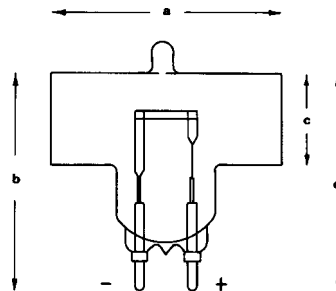
VACUUM AND GAS-FILLED LAMPS

Two versions of the lamp available:

1. Vacuum lamp for the range 1000 - 1700 °C radiance temperature.
2. Gas-filled lamp for the range 1600 - 2650 °C radiance temperature.

DIMENSIONS:

CODE	a	b	c	d
11/V	190	215	80	190
11/G	190	240	80	190



APPROXIMATE ELECTRICAL CHARACTERISTICS AND DECREMENTAL RATE

1. Vacuum lamps: 4V 30A d.c. at 1700°C with a typical decremental rate of 0.3°C/h at 1700°C.
2. Gas-filled lamps: 12V 64A d.c. at 2650°C with a typical decremental rate of 0.1°C/h at 2650°C.

PLEASE NOTE

The voltage and current values are for guidance only. Individual lamps may differ and each requires its own specific calibration.

20 – 24V/G TUNGSTEN-RIBBON LAMPS

FEATURES

1. 1.3mm wide 0.07mm thick tungsten ribbon with a pointer to indicate the mid-point. Other ribbon widths are available on request. A ribbon with a small notch to indicate the mid-point can also be provided.
2. Vacuum and gas-filled versions for different temperature ranges.
3. Choice of bulb designs for different applications.
4. Goliath Edison screw caps (E40) for use on D.C. supplies, with centre contact positive.

LAMP DESIGNS

1. Cylindrical enveloped types have the simplest design and are especially suitable for calibrating optical pyrometers.
2. Single plane windowed types giving improved optics of sighting onto the ribbon. The gas-filled version of this lamp is recommended as a secondary standard for radiance particularly when fitted with a silica window.
3. Double angled windowed types combine the improved optical quality with a reduction in unwanted reflections.
4. Inverted type construction with the filament supported from above reduces short-term fluctuations in radiant output arising from convection induced fluctuations in filament temperature.

WINDOW MATERIALS

1. Pyrex glass for use in the visible and infrared regions of the spectrum from 0.35 μ m to 2.3 μ m.
2. Vitreous silica to extend the radiation emerging from the lamp further into the U.V. or I.R. regions. The silica used may be one of three types:
 - (a) U.V. transmissive grade of silica which transmits well between 0.2 μ m and 2.0 μ m but has a strong absorption band at 2.73 μ m and weaker bands at 1.38 μ m and 2.22 μ m.
 - (b) Infrared grade which transmits well between 0.27 μ m and 2.7 μ m cutting off sharply at 3.5 μ m. W.F. grade of silica which transmits well between 0.2 μ m and 2.7 μ m cutting off sharply at 3.5 μ m but may not, however, have the high optical quality of the other grades.

VACUUM AND GAS-FILLED LAMPS

All the ribbon lamps can be supplied in two versions according to the temperature range required.

1. Vacuum lamps with a vertical ribbon length of 50mm for the range 700 – 1500°C radiance temperature (1000 – 1950 K correlated colour temperature).
2. Gas-filled lamps with a vertical ribbon length of 34mm for the range 1300 – 2300°C radiance temperature (1700 – 2950 K correlated colour temperature).

APPROPRIATE ELECTRICAL CHARACTERISTICS AND DECREMENTAL RATES

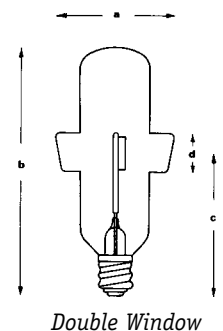
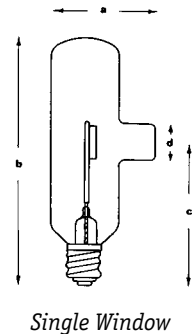
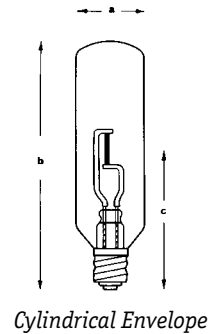
1. Vacuum lamp: 3.5V 9.5A d.c. at 1500°C with a typical decremental rate better than 5°C/100h.
2. Gas-filled lamp: 8V 20A d.c. at 2300°C with a typical decremental rate better than 7°C/100h.

PLEASE NOTE

The voltage and current values are for guidance only. Individual lamps may differ and each requires its own specific calibration. Wider filaments can be supplied to special order, the current drawn increasing approximately pro rata with the width. The lamps undergo a preliminary ageing for 16h before despatch but are normally supplied uncalibrated.

DIMENSIONS Nominal (mm)

LAMP TYPE	CODE Vacuum	CODE Gas-filled	a	b	c	d
Cylindrical Envelope	20/V	20/G	63.2	235	135	-
Single Pyrex Window	21/V	21/G	95	235	135	35*
Double Pyrex Window	22/V	22/G	115	235	135	35*
Single Silica Window	-	23/G/UV 23/G/IR 23/G/WF	100	235	135	35*
Double Silica Window	-	24/G/UV 24/G/IR 24/G/WF	155	235	138	35*



*Minimum 25mm undistorted diameter

LF4 – 1000 LUMINOUS FLUX STANDARD LAMPS

FEATURES

1. Large size, clear round bulb selected for good optical quality.
2. Mica disc mounted across the neck of the lamp to improve the streamline flow of gas convection currents within the bulb and thus prevent light fluctuations due to turbulence. The disc also reduces cap-heating and heat losses in the neck.
3. Coiled filament welded to the supports for maximum operating reproducibility and robustness during handling.
4. Filament mounted in a flat wreath and stabilised while rotating in a vertical plane to reduce sag and minimise the angular variations in light output. In the low-voltage 100 watt and 200 watt lamps, filaments are mounted in parallel to give complete octagons, which further improves the light distribution.
5. Rigorous cleaning and baking schedule during manufacture.

HIGH VOLTAGE & LOW VOLTAGE LAMPS

Lamps are available in two nominal voltage ratings.

1. Low-voltage: nominal 100 volts.
2. High-voltage: nominal 220 volts.

WATTAGE RANGE AND LAMP CAPS

The range 4 watts to 1000 watts is covered and a choice of caps is offered for the lower wattages.

1. 40W, 60W, 100W, 150W, 200W: Edison Screw (E27) or Bayonet Cap (B22d).
2. 330W, 500W, 1000W: Goliath Edison Screw (E40).
3. 4W: Medium Edison Screw (E14).

Other ratings are available to special order.

APPROXIMATE ELECTRICAL AND PHOTOMETRIC DATA

The quoted ratings must be regarded as nominal since welding the filament to the supports reduces the filament rating. It is recommended that the lamps should not be operated at colour temperatures above those quoted on the table. Also given in the table are the approximate electrical and photometric characteristics of the lamps at their maximum operating colour temperatures. The voltage and luminous flux figures quoted are for guidance only and individual lamps may differ and each requires its own specific calibration.

Rating	Maximum Recommended Colour Temperature K	Low-voltage Lamps		High-Voltage Lamps	
		Volts	Lumens	Volts	Lumens
4W	2850	4	50	-	-
40W	2650	85	250	-	-
60W	2650	100	500	220	550
100W	2700	90	1000	210	1000
150W	2700	100	1700	210	1600
200W	2750	90	2500	210	2400
300W	2750	100	4000	205	3700
500W	2800	100	7000	220	7000
1000W	2850	95	14500	190	15000

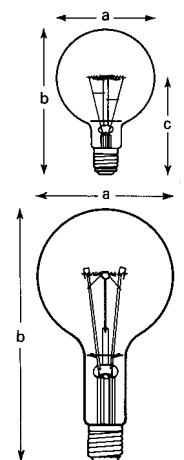
The decremental rate of luminous flux is in the region 1% per 100hours with polarity reversal.

LAMP CHOICE AND OPERATION

The low-voltage lamps have more robust filaments than the high-voltage lamps and in general, screw caps give better electrical contact than bayonet caps; however, consideration must be given to the availability of a suitable stabilised power supply and the general photometric requirement of using standard lamps as similar as possible to the lamps being measured. The colour temperatures quoted are the maximum recommended values; the lamps may be underrun with consequent gain long-term stability. The lamps should always be used in the cap-up position. They may be operated on either a.c. or d.c. supply; however, if operated on d.c. reversal of the polarity each time the lamps are used will reduce the decremental rate to a minimum.

DIMENSIONS Nominal (mm)

Code	Rating	Low-Voltage	High-Voltage	a	b	c
	4W	30/04	-	38	63	43
	40W	30/40	-	90	136	91
	60W	30/60	31/60	90	136	91
	100W	30/100	31/100	90	136	91
	150W	30/150	31/150	130	190	125
	200W	30/200	31/200	130	190	125
	300W	30/300	31/300	150	300	225
	500W	30/500	31/500	150	300	225
	1000W	30/1000	31/1000	170	335	250



25/G/WF Gas-filled Ribbon Filament Inverted Lamp

FEATURES

Although the conventional GES (E40) cap is employed to support the lamp from below, the current does not pass through the cap but is carried by flying leads thus avoiding the contact problems which can arise with screw-caps.

1. Ribbon filament – 1.6mm wide with an index pointer provided adjacent to the filament to indicate the calibrated area. The overall length of the vertical portion of the ribbon is 35mm.
2. Window material – The lamp is available with a plane-polished window of either Pyrex or, for use at shorter wavelengths, ultraviolet-transmitting vitreous silica.
3. Electrical Connections – Flying leads are provided to eliminate electrical-contact problems between lamp-cap and lamp-holder.

RATING

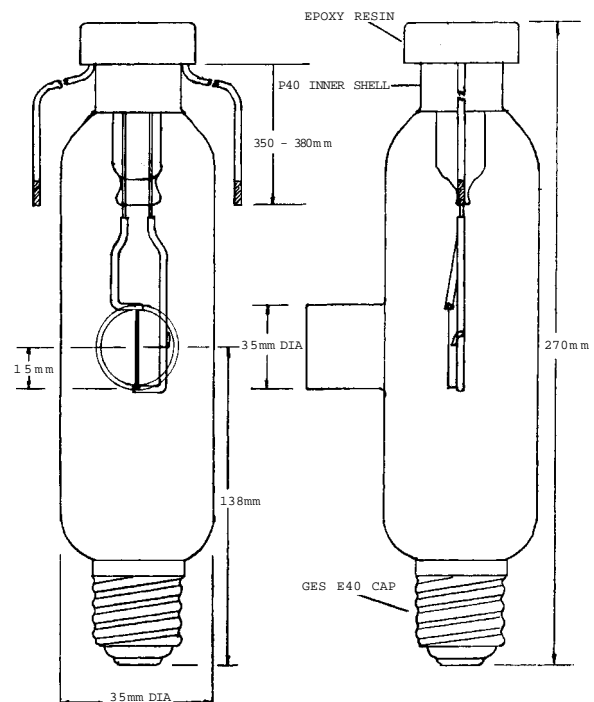
Approximately 24A 7V at a correlated colour temperature of 2856 K. The lamp is intended for d.c. operation at fixed polarity.

AGEING

Approximately 0.5% per 100 hours at 2856 K after the usual preliminary ageing.

SHORT-TERM FLUCTUATIONS

Generally <0.02% at 2856 K



LIS & LIS/S Luminous-intensity Standard Lamp

FEATURES

1. Tungsten filament - Two vertical helixes with the normal tight coiling opened out. Emitting area is approximately 10mm x 15mm.
2. Window material - The lamp is available with either Pyrex for photometric applications and spectroradiometric use down to 380nm or silica, for use down to 300nm.
3. Electrical Connections - Flying leads to eliminate electrical-contact problems associated with lamp sockets and should be operated at a set current rather than a set voltage, using a d.c. current stabilised supply.

RATING

25.5A 12.7V at a correlated colour temperature of 2856 K.

PHOTOMETRIC CHARACTERISTICS OF NPL/POLARON HEAVY DUTY LUMINOUS INTENSITY STANDARD

COLOUR TEMPERATURE	CURRENT (amperes)	VOLTS	CANDELAS
1800K	12.7	3.5	2
2045	15.5	5	12.5
2500	20.9	8.8	130
2856	25.5	12.7	470
3000	27.6	14.7	740
3300	32.1	19.2	1630

