

TECHNICAL SPECIFICATION:

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Detailing operating parameters and characteristics of 'Lumarled' - a high performance LED indicator lamp custom designed for direct filament bulb replacement in signalling applications.

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Red 025-501-78

Amber 025-521-78

Green 025-943-78

Product Description:

The "lumarled" is a solid-state replacement indicator unit for an incandescent bulb used in the signal head unit for underground railway signalling systems, utilising a Westinghouse signal head system. The light source is generated from a cluster of high intensity LEDs mounted in a purpose built housing and fitted with a BA 15 lamp cap to make it a direct replacement of the bulb unit. Integral to the LED unit, and contained within the housing, is an electronic circuit designed to provide transient protection to RIA standards. This circuit also allows the unit to operate within the voltage range specified and to meet the safety requirements of the existing current proving relay safety systems.

In addition to the ease of installation offered by a unit supplied as a direct replacement in fit, form and function for the incandescent lamp, there are added advantages of greater reliability and extended lifetime. This translates into a number of user benefits including enhanced system safety, reduced service disruption, reduced maintenance costs, therefore reducing overall life time cost of ownership.

The units are supplied as 3 separate part numbers, which are installed in their specific lens position to provide a specific spectral output from the Westinghouse signal head, (specified in LUL Specification SE465, Westinghouse Drawing Reference: E12100/2 and SE81A, Westinghouse Drawing Reference: C2865).

An outline product drawing is available – see Marl drawing reference: SPL 4353.

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1 INTRODUCTION

This specification details the key function and performance characteristics and supporting data associated with the supply of a solid-state indicator unit for a direct replacement of a filament bulb used in the signal head unit for underground railway signalling systems.

2 FUNCTION AND PERFORMANCE

2.1 FUNCTION

The unit is designed to suit direct replacement of a filament light source and illuminate a specific coloured signal head lens as part of the railway signalling system employed by London Underground Ltd.

2.2 PERFORMANCE

The unit is designed to exceed the intensity of the existing bulb when viewed behind the lens by a factor of 100%. The method of comparing light output from the incandescent unit is detailed in Marl laboratory report number: LAB1830. The following sections, (3 to 6), detail specific performance related characteristics.

3 ENVIRONMENTAL CHARACTERISTICS

The unit will operate in the following environmental conditions:

3.1 TEMPERATURE RANGE

The lamp has been designed for the following parameters:

Operating temperature range:	-20°C to +55°C.
Storage temperature range:	-20°C to +55°C.

3.2 RELATIVE HUMIDITY

The lamp will meet the relative humidity requirements of LUL specification E7201 A1, section 10.1.

3.3 INGRESS PROTECTION

The unit is sealed against moisture ingress in accordance with IP 65 rating, as detailed in BS EN 60592.

3.4 VIBRATION

The unit will withstand vibration, as detailed in LUL specification 6140-SP-106747, to RIA20 specification (category 1).

4 ELECTRICAL INTERFACE

4.1 OPERATING VOLTAGE

The operating voltage of the unit is 80 to 110 Vac, as detailed in LUL specification 6140-SP-106747. In addition, the unit will exhibit the following electrical characteristics.

4.2 MAXIMUM CURRENT

The maximum current drawn by any unit will be 30 mA at any rated supply voltage.

4.3 MINIMUM CURRENT

At an operating voltage of 40 Vac, the unit will draw a minimum of 10 mA, without any visible illumination.

4.4 CIRCUIT PROTECTION

Surge transient and EMC protection testing to EN50121-4 has been successfully completed.

5 MECHANICAL INTERFACE

5.1 CAP STYLE

The Lumarled is a direct replacement for an incandescent bulb, (LUL specification reference: 6174-A4-103454), and is fitted with a BA15 type lamp cap to BS EN 60061-1:1997 section 7004-11A-9.

5.2 WEIGHT

The maximum weight is 130 grams per production unit.

5.3 PRODUCT DRAWING

Product dimensions and mechanical arrangement are detailed on Marl drawing reference: SPL 4353.

6 OPTICAL PERFORMANCE

6.1 OPTICAL DESIGN

The optical performance of the product is designed to replicate the output of the existing incandescent bulb when the signal is viewed by the train driver. The rationale behind this is that the unit only matches the correct colour requirements as a combined result of the bulb output and the specific colour of the lens.

6.2 LIGHT OUTPUT

The optical output from the existing unit has been analysed and detailed in Marl laboratory report number LAB1830. This report details the measurement techniques employed in making the comparisons between the incandescent lamp and the LED units.

London Underground specification has been revised to indicate light output to be 100% greater than the incandescent bulb which it is replacing. The test method is defined by London Underground.

Notes:

- 6.2.1 In common with current LED technology, it is anticipated that light output from the device will degrade by up to 20% during the first 10,000 hours of operating life, and should not exceed 40% during the total life of the device. The optical design has taken account of this degradation.
- 6.2.2 An MTBF calculation has been made showing 517665 hours, in excess of London Underground specification of 0.5×10^6 hours.
- 6.2.3 Marl are not responsible for the final colour observed through the lens as we have no control over the lens transmission characteristics which have varied in the samples supplied to Marl. The wavelength of the light output will be as defined in SPL 4353. The intensity as observed through a lens will be no less than 100% greater than that from a main signal lamp, part number 2461/233, measured under the same conditions and as defined by London Underground.

7 TESTING

7.1 TYPE TESTING

It is understood that LUL successfully completed type testing during the development phase of the project. In-house testing by Marl has successfully completed thermal management, vibration, temperature cycling and opto-electrical compliance.

7.2 BATCH TESTING

Production units will be 100% tested electrically and visually.

7.2.1 Electrical test will be made to ensure product illuminates at the nominal supply voltage and that the current drawn is within specification.

7.2.2 Visual inspection will be made to ensure that all LEDs illuminate and are correct in colour when the voltage is supplied.

7.3 RIA CONFORMANCE

The PCB and associated components and circuitry has been designed to comply with RIA specifications 12,13 and 20.

7.4 QUALITY ASSURANCE

This product is designed and manufactured following controlled systems and processes approved to ISO 9001: BS 5750 Part 1, EN29001, UK MOD DCL listed CNAC 4K6 M01.

8 PACKAGING AND MARKING

8.1 PRODUCT PACKAGING

Marl will supply in standard packaging, (to be subjected to customer approval), which would offer a service type carrier with “obvious” marking to identify the 3 variant colours. Packaging would include ESD protection, and will be designed to suit transportation within the UK and reasonable periods of storage in a suitable environment for electronic components.

8.2 PRODUCT MARKING

The Lumarled will be supplied with colour identification marking on the emitting face of the product, in addition to full product labelling on the rear of the product, which will include a second colour reference, CE marking, manufacturers part number, and customer part number / stock reference if required.

9 HEALTH AND SAFETY

9.1 RISK ASSESSMENT

Following a detailed assessment, conducted under COSHH procedures, Marl has produced Health and Safety data regarding safe handling and disposal of the product, which could be supplied with the product.

9.2 CE DIRECTIVE

The Lumarled device complies with the CE directive, and will be marked accordingly, (see section 8.2 above).

APPENDICES

The relevant outline specification, sub-assembly and component drawings for this product are detailed as follows:

DRAWING NUMBER	TITLE
SPL 4353	Lumarled specification
PCB 4106	Lumarled component pcb
ASS 4176	Assembly drawing
CCT 4618	Circuit diagram
COM 4175	Housing
COM 4310	Lens
COM 4697	Sealing ring