

Tideland Signal Corp.

featuring Aids to Navigation Products

1.2. Lanterns, Lamps, LED's, Flashers, Controllers and Self Contained Lanterns

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A. MaxLumina Marine Signal Lanterns

In 1967 Tideland introduced the world's largest single-piece acrylic optic for marine lanterns, the 300 mm MaxLumina lens. It is still today the most efficient injection moulded 300 mm lantern lens available. This marine drum lens is so nearly perfect that it produces required effective intensities from smaller wattage marine lamps, surpassing any other lens of comparable size - with a resulting reduction in power usage and extension of battery life.

Using the same level of innovation, Tideland has produced a full line of MaxLumina marine signal lanterns with single-piece acrylic optics that deliver maximum beamed light for the lowest possible power consumption. Tideland manufactures MaxLumina lanterns approved for use in each class of marine application:



- General Marine Use (GMU).
- Underwriters Laboratories Inc. (UL) listed for Class I, Division 2, Group D Hazardous Locations, as described in the National Electrical Code (NEC).
- Certified under the EU ATEX Directive for use in Zone 1 and 2 flammable atmospheres.

Low-maintenance MaxLumina lanterns are reliable and cost-effective to operate. They accommodate a variety of incandescent lamps in flasher/lampchangers and LED light sources

It is true to say that most users are now taking full advantage of LED lanterns and the LED technology is further described in this document.

Available lanterns include 300mm, 200mm, 155mm, 140mm and 120mm diameter fresnel lenses. Some examples are shown below:



MaxLED-200



MLED-300



MLED-120E

B. Incandescent Lamps and LED's

Up until the end of the last millennium, the light source in an AtoN lantern has been, primarily, a marine signal lamp, and a variety of lamp types with different voltage and current/power ratings were and still are available. In recent years the industry has moved steadily towards the replacement of lamps with LED light sources.

C. Lamps

Standard marine, pre-focused, single contact and twin-filament double contact incandescent lamps.

These are found in DC powered lanterns and the choice of lamp will be easily identified in manufacturer's lantern brochures where their candela (cd) output in the relevant lantern will be tabulated.

Hard Wire Contact twin-filament lamps are available for use in EX certified lanterns. The single contact lamps have a design life of 1000 hours. Twin-filament lamps are designed with a life of 1500 hours on each filament. However, the heat generated by the first filament significantly reduces the life of the second filament, so it has become the custom to change out the lamp once first filament failure is indicated.



Quartz Halogen and High Pressure Halogen lamps

With the introduction of these lamps in the 1980's, lantern cd output increased and lamp life jumped - to 2000 hours for Quartz Halogen and 3000 hours for High Pressure Halogen lamps.

120VAC rated lamps

A variety of these can be found in high intensity lanterns when AC mains power is available.

Metal Halide lamps

These are also 120VAC rated, and are well suited to use as the fixed light source in rotating beacons when the highest levels of intensity are required.

When calculating lamp power requirements it is important to take into account the “surge” effect for a given lamp. The table below indicates the correct value to use for a particular contact closure time.

LAMP SIZE (amperes)	AVERAGE CURRENT (In amperes)				
	CCT 0.2 sec	CCT 0.3 sec	CCT 0.4 sec	CCT 0.5 sec	CCT 1.0 sec
0.25	0.282	0.272	0.268	0.262	0.254
0.55	0.666	0.639	0.621	0.605	0.578
0.58	0.715	0.682	0.664	0.647	0.618
0.77	0.970	0.916	0.894	0.870	0.816
0.833	1.060	1.002	0.974	0.945	0.887
1.00	1.310	1.230	1.180	1.150	1.070
1.15	1.530	1.415	1.380	1.334	1.242
1.35	1.836	1.728	1.647	1.592	1.471
1.67	2.35	2.20	2.09	2.02	1.82
1.9	2.73	2.55	2.43	2.32	2.09
2.03	2.96	2.76	2.62	2.50	2.23
2.92		4.25	3.97	3.73	3.27
3.00			4.07	3.84	3.36
3.05	-	4.49	4.15	3.91	3.42
3.33			4.60	4.30	3.73
4.17			4.64	4.56	4.40
6.25					6.63
8.33					8.87

**AVERAGE CURRENT
DURING FLASHING
PERIOD FOR LOW
VOLTAGE LAMPS**
(Corrected for Surge Effect)

For example;

If a 2.03A lamp is selected, the flash character duty cycle is 30%, the “on” time is 0.5 second and the lantern is used for a 14 hour night, the calculation is;

$$2.5A \times 0.3 \text{ duty cycle} \times 14 \text{ hours} = 10.5Ah \text{ per day}$$

The INCORRECT calculation would be;

$$2.03A \times 0.3 \text{ duty cycle} \times 14 \text{ hours} = 8.52Ah \text{ per day (an error of 20\%)}$$

D. Lamp Changers



These can be two-place, four place or, more commonly six-place. In a modern lantern, a failed lamp disconnects the flow of power to that lamp position. A turret motor automatically rotates the carousel in search of a good lamp, to reconnect the power to it. The lamp changing circuitry ensures that the motor only has sufficient drive to complete one and a third rotations in search of a good lamp, thus guarding against an all-lamp failure that might have led to an exceptional battery drain.

E. Lamp Holders



Lamp holders with twin-filament lamps are normally controlled by flashers fitted with an LED indicating first filament failure. GMU versions have been superseded by LED lights but Zone I certified units continue to meet a requirement for secondary and subsidiary lights on offshore platforms and in hazardous areas in general.

F. Flasher Units

Flasher units are often an integral part of the lampchanger and can vary widely in capability from a basic circuit that provides up to 256 flash character timing code selections; that operates under sunswitch control; that has reverse polarity protection; that can accept input voltage up to 36 V, and can ensure that the light source operates from the correct rated voltage.

“Smarter” units can have a variety of additional capabilities including an integral solar controller; synchronisation via a GPS timing signal; access to GPS data for “off-station” reports on a buoy, remote monitoring of lamp count, battery voltages and flash character code settings, either by polled report or automatic exception reporting governed by preset parameters. Their light source can be switched on and off by overriding the sunswitch.

G. LED Light Sources

These can vary widely in composition from LEDs in single or dual packages to a tier of single LEDs, to a stack of tiers, with widely different cd outputs and input power requirements. Single and dual packages can also act as retrofit kits to upgrade existing lanterns to LED technology.



LED AtoN lanterns were introduced towards the end of the last millennium. Since then, LED lantern technology has been revolutionizing the AtoN industry. With long maintenance intervals, relatively low power consumption and no moving parts; LED lanterns have become the AtoN lights of the present let alone the future. The technology has been moving fast with better performing LEDs constantly being made available to lantern designers.

Performance

Intensity

With advances in LED technology, LEDs, singly or in combinations, can provide more intensity per input power than conventional omnidirectional AtoN lanterns especially when radiated through a Fresnel lens. This difference is most marked in red, green and yellow LED lanterns. These do not require the use of coloured lenses that reduce light intensity in conventional lanterns with a multiplication factor. For example, a green LED lantern consuming 2.5W can provide 1.5 x the effective intensity of a conventional 155 mm green lantern consuming 10W.

Another important feature of LED lantern performance is the effect of heat on cd output and, in a major difference between LED lanterns and those with incandescent lamps; intensity reduces as the duty factor of a light character increases.

Life

Useful lantern life is defined by IALA as being the time when advertised intensity reduces to 80%. With incandescent lamps, designed lamp life lies between 1000 hours for standard marine lamps and 3000 hours for high-pressure halogen lamps. LED intensity does not die suddenly; it declines, over an extended period. If driven with moderate power as recommended by the manufacturer, LED's can be operated for >50000 hours before reaching the 80% level.

Power Consumption

LED lanterns flash by switching their input power. Thus there is no surge current, as there is in incandescent lamps, and the power consumption is the same whatever the duration of a flash.

H. Self Contained Lanterns

Self Contained lanterns are becoming the standard unit for many authorities. Conventional lanterns require a separate solar and battery system with electrical wiring between. More components on an AtoN and more wiring increase the possibility of failure.

A Self Contained unit is the complete AtoN in one simple package. It comprises an LED lantern, solar modules and an internal battery. Some manufacturers supply this as a completely sealed unit that cannot be maintained. The two examples below are units that can be disassembled and items such as the battery renewed. Service lifetimes are between 3 and 5 years.



An important design feature with any Self-Contained lantern is that the flash character duty cycle should be less than 30%, lowering the duty cycle to say 15% will ensure optimum performance in most geographical areas.