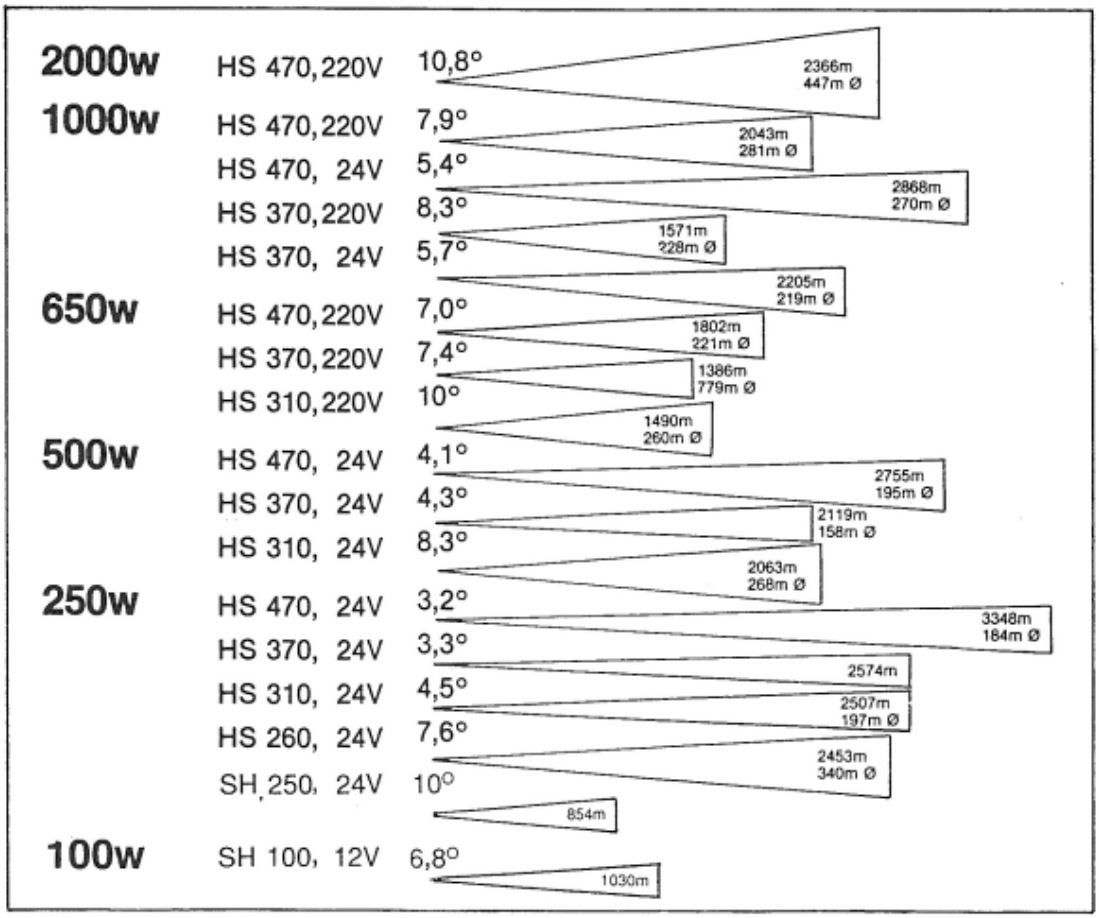
TECHNICAL

Searchlight Data

IT'S NOT JUST A MATTER OF WATTAGE*

The many different high performance possibilities with NORSELIGHT Searchlights give more and simpler ways of chosing RIGHT LIGHT FOR RIGHT USE for your vessel.



* Wattage is just one of several factors affecting the performance of a searchlight.

NORSELIGHT silver plated mirror reflectors, high precision focussing and high luminous lamps and quality in material and finish give good performance for many years.

Trust us, we have been at sea for over 50 years.

MariTeam Lighting Inc.
A Glamox Company

Subject to technical modifications without notice

Lighting Terms

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Technical Lighting Quantities and Units (according to DIN 5031)

Quantity		Unit			
Name	**Symbol**	**Name**	**Symbol**	**Correlation**	**Explanation**
Luminous Flux	ϕ	Lumen	lm		Given luminous efficiency from light source
Quantity of light	Q	Lumen Hour	lm-h	$Q=\phi \times t$	The product of the luminous flux ϕ and its duration **t**
Luminous Intensity	I	Candela	cd	$I=\phi / \omega$	The quotient of the luminous flux ϕ transmitted by a light source in a defined solid angle ω and the illuminated solid angle ω
Luminance	L	Candela per square meter	cd/m^2	$L(\varepsilon)=\frac{I(\varepsilon)}{A \times \cos\varepsilon}$	For luminous planes: Quotient of the luminous intensity **I** of one light source in the direction ε and the area of the luminous plane seen from this angle.
		Stilb	sb	$Sb=10^4 \times cd/m^2$	
		Candela per square meter	cd/m^2	$L(\varepsilon)=\frac{p \times E}{\pi}$	For illuminated planes: Product of illuminance **E** and reflection degree **p**; valid only for totally diffused reflection surfaces. $1\ sb=\pi \times 10^4 asb$
		Apostilb	asb	$L=p \times E$	
Illuminance	E	Lux	lx	$E=\phi/A$	Quotient of the luminous flux ϕ to a surface and the area of that surface **A**.

Technical Lighting Efficiency (according to DIN 5031)

Quantity			
Name	**Symbol**	**Correlation**	**Explanation**
Luminous Efficiency from a light source	η	$\eta = \phi / P$	The luminous efficiency η of a light source is the quotient of the luminous flux emitted ϕ and the electrical power required to produce it. Unit: lm/W.
Optical Efficiency of a luminaire	η_L	$\eta_L = \phi_L / \phi_o$	Quotient of the luminaire's luminous flux ϕ_L and the sum of the lamps luminous fluxes ϕ_o. For temperature dependent lamps such as fluorescent lamps, the optical efficiency is the highest level of efficiency and no factors affecting the luminous flux such as ambient temperature has been taken into consideration. It indicates only the optical properties of a luminaire and is not to be used for technical light calculations.
Light output Ratio	η_{LB}	$\eta_{LB} = \phi_{LB}(tu) / \phi_o$	Quotient of a luminaires luminous flux ϕ_L emitted of a luminaires ambient temperature to 25^0 C, and the sum of the lamps luminous fluxes ϕ_o at a lamps ambient temperature of 25^0 C. The light output ratio is affected by the luminous flux/temperature behavior of the lamps and is, in general, less than the optical efficiency of the luminaire. It takes into account optical ant thermal properties under working conditions. Only the light output ratio should be used for technical lighting calculations.
Utilization	η_R	$\eta_R = \phi_N / \phi_L$	Quotient of the luminous flux ϕ_N, emitted to the affected area, and the total luminous flux ϕ_L radiated to the room from the luminaires.
Utilization Factor	η_B	$\eta_B = \phi_N / \phi_O$ $\eta_B = \eta_R \times \eta_{LB}$	Quotient of the luminous flux ϕ_N emitted to the affected area and the sum of the luminous flux ϕ_o of all the lamps installed in the luminaires. It is the product of the area effectivity factor η_R and the light output ratio η_{LB}

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Lamp Comparison

Incandescent lamps

In general there are no major problems. They are economical to install, requiring only a lampholder with two terminals. Burning position is not critical, temperature effects are minimal and the bulbs can be dimmed without difficulty. Luminaires using incandescent bulbs can be used with different voltage supplies simply by changing the bulb. Average life is approximately 1000 hours. Bulbs for navigation lights are developed especially in a view of their intended use in optical systems, they vary greatly from normal incandescent bulbs:

1) Special socket in order to prevent the use of normal bulbs in navigation lights and signaling lights. The special socket also ensures correct filament alignment to lens and horizontal shade systems.
2) Light output and wattage are pushed to a high lumen per watt ratio.
3) Special filament holders ensure equal light emission over an unbroken sector of 360.
4) Schemed manufacturing processes guarantee tight tolerance of filament itself and mounting filament.
5) Approved in conjunction with the appropriate navigation lights worldwide.

Halogen lamps

Halogen lamps have a higher luminous efficiency than the ordinary incandescent bulb. Lifetime is estimated at 2000 hours average. Halogen lamps can be dimmed down to 60% and burn at full strength immediately after a temporary break in supply. This is useful when considering the question of accident prevention and cannot be achieved with high power discharge lamps.

Bulb life may be reduced by three factors:

1) Vibration particularly relevant to high voltage lamps. In areas of severe vibration resilient mounts should be used.
2) Excess voltage as for incandescent lamps.
3) Burning position linear. Linear halogen bulbs should usually be installed with the longitudinal axis horizontal or within + 4 degrees, however considerable differences exist between individual makes and some bulbs are available which will function independently of the burning position.

Halogen low voltage lamps

High luminous flux, long lamp life (2000 h), constant luminous flux during the total life of the lamp combined with excellent colour rendering are the advantages of these lamps. Their small dimensions make the design of small, unobtrusive fittings for new versatile fields of application possible.

Halogen low voltage lamps with reflector (cool beam)

The lamps radiation of heat is reduced to 34% in order to illuminate objects sensitive to heat. These lamps can be dimmed without problems.

Fluorescent lamps

The main advantage of fluorescent lamps is their economy. In addition, the elongated shape provides a good lumen/watt ratio and relatively low luminance on the surface. The tubes therefore produce less glare. They have a very long working life, with an average luminous efficiency of about 80% after 5000-7500 hours. Operation beyond 10,000 hours is possible although the luminous efficiency will decline. Lamps up to 1200 mm in length have a good vibration/shock resistance, corresponding to the installation. With electronic ballast for dimming, standard fluorescent lamps can be dimmed without problems. The lamps are not sensitive to voltage fluctuation compared with other lamps, but sensitive to ambient temperatures. Deviation from average ambient temperature causes a decline in luminous flux.

High pressure Mercury Lamps

This type of lamps needs no ignition unit and operates with a mercury arc. The light from the arc is supplemented by light from UV sensitive phosphors. Different light colours, also for rendering good colour and for special purposes are offered. Burning position is not critical. These lamps offer problem free operation, but one disadvantage is that they are sensitive to voltage interruptions and fluctuations, both of which are likely to occur onboard ships. Warm lamps may take several minutes to achieve full output after an interruption of power. Lamp life is around 24,000 hours

Low pressure sodium lamps

Offer the highest luminous efficiency of all. They are useful in all areas where the colour rendered is unimportant as they produce a monochromatic yellow light rendering poor colours. Contrast definition is good, particularly in foggy conditions. Burning position is important, but no ignitor is necessary and lifetime is similar to that of mercury vapour lamps.

High pressure sodium lamps

These combine very high luminous efficiency with small lamp dimensions. The lamps render good colour and are insensitive to vibrations. Ignition is required and small increases to operating voltage over the normal voltage can overload the lamp and reduce lifetime. Average lifetime is 24,000 hours and this type of lamp is especially suitable for flood and spot lighting ships exteriors.

Metal halide lamps

These lamps have a high luminous efficiency and are excellent for rendering good colour. Ignition unit is not required. The burning position of the 250W lamp is limited to +150 degrees out of the vertical and horizontal axis. The average lifetime is approx. 15,000 hours. They are used in spots and floodlights. Manufacturers specification for burning position of the lamp must be considered.

Different Process

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Mariteam Process – Reflectors

Our secret chemical process imparts a pure aluminum-oxide surface on reflectors. This silken smooth finish reflects light semi-diffused and free of interference, without glare and high maximum luminances. Removal of the iron particles means that the optics retain their illumination qualities – even in the toughest of environments.

Powder Coating

Our luminaires are powder coated with MX-powder (binder combination of epoxy and polyester)

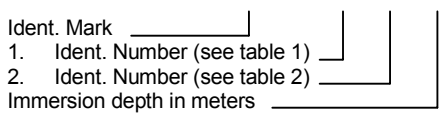
The powder gets static charged and automatically sprayed on to the product, which is suspended to an "earthed" conveyor. The static charge makes the powder stick to the product until the powder is melted and hardened in the tempering furnace.

After the product is sprayed with powder, it goes into a tempering furnace with an air temperature of approx. 200 degrees Celsius for 15 minutes causing the powder to melt and harden.

IP PROTECTION CLASSES

The following protection degrees define the protection of electrical appliances against accidental contact, foreign matters and water as stated in IEC Publication 529 and DIN 40050.

Example: IP 6 7 h0.3



1. Ident No.		Protection level (contact and foreign matters)
Table 1	**0**	No special protection
	1	Protection against penetration of solid foreign matters, diameter > 50 mm, no protection against intentional contact e.g. by hand, body contact, however, is prevented.
	2	Protection against penetration of solid foreign matters with outside diameter of more that 12 mm; finger contact or similar is prevented.
	3	Protection against penetration of solid foreign matters with outside diameter of more that 2.5 mm. Prevents insertion of tools, wires or similar matters larger than 2.5 mm.
	4	Protection against penetration of solid foreign matters with outside diameter of more than 1 mm. Prevents insertion of tools, wires or similar matters larger than 1 mm.
	5	Protection against damaging dust accumulation. The penetration of dust is not totally prevented but is not permitted to penetrate to such a degree that the effectiveness of the equipment is affected. Complete contact protection.
	6	Protection against penetration of dust. Complete contact protection.

2. Ident No.		Protection level (water)
Table 2	**0**	No special protection
	1	Protection against vertical falling drip water shall have no harmful effect.
	2	Protection against vertical falling drip water, when fixture is shifted up to 15 degrees from its normal operating condition there shall be no harmful effect (flanking drip water).
	3	Protection against spray water falling at any angle up to 60 degrees against perpendicular. It shall have no harmful effect (spray water).
	4	Protection against water splashed against the fixture from any direction, shall have no harmful effect (splash water).
	5	Protection against water projected by a nozzle against the fixture from any direction, shall have no harmful effect (hosed water).
	6	Protection against heavy seas or strong jet stream, water must not enter the fixture in harmful quantities (overflooding).
	7	Protection against water when fixture is submerged under defined conditions of depth. Water shall not enter fixture in harmful quantities (submerging).
	8	The equipment is suitable for continuous submersion in water under conditions specified by the manufacturer.

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Materials

All Mariteam products are manufactured in materials which are best suited to withstand whatever atmospheric and mechanical conditions they are exposed to. For this reason our products have an excellent reputation for reliability and long-life, particularly in rough usage areas.

Aluzinc

Aluzinc is cold rolled steel with a metal coating. The steel guarantees mechanical strength. The coating, made up mainly of an alloy of Aluminum (55%), zinc(43.4%) and Si(1.6%) guarantees excellent resistance to corrosion. Zinc also gives cathodic protection of cut edges or surface scratches.

For applications requiring flat corrosion resistant steel, the answer is Aluzinc, which also demonstrates properties of unchanging surface characteristics at high temperatures up to 310 degrees Celcius. Thanks to these characteristics, Aluzinc fills the gap between zinc-coated steel and much more expensive materials such as aluminum or stainless steel.

Stainless Steel

Stainless Steel is used in luminaires which are being exposed to the harsh environments at sea, in special industry, especially chemical industries etc.

In the Mariteam product range you will find luminaires of stainless steel quality SIS 2343, which is identical to American Standards AISI 316, except for containing slightly more molybdenum and nickel, thus making the steel easier to form (deepdrawn).

Plastic

Depending upon the application, a variety of high quality plastic materials are used in production. Some physical characteristics are shown in the table below and the material used is specified in the individual data sheet.

	Polymethylmetacrylate 1 - PMMA	**Polycarbonate 2 - PC**	**Polyethersulfon 3 – PES**
Trade name	Acrylic Plexiglass	Markrolon Lexan	Ultrason Victex
Temperature range	-50° C - +85° C	- 150° C - +130° C	- 100° C - +200° C
Mechanical properties	Good under normal conditions of use	Especially tough (shock resistant)	Good under normal conditions of use
Transmissivity - colourless	92%	82%	80%
Transmissivity – white/opal	46% - 65%	46% - 65%	-
Combustibility according to UL	94-HB	94V-2 / 94V-0	94V-0
Chemical resistance – general - solvents	good not to be used	good not to be used	good not to be used

General

In any industry where flammable materials are produced, processed or stored there is a potential risk of explosion. Although the objective is to prevent the release of gases or flammable mixtures into the atmosphere a release may take place. Therefore actions are taken to assess the probability of occurrence of hazardous areas and explosion-proof equipment must be installed in order to prevent an explosion.

Class I
Flammable Gases, Vapors or Liquids

Class I Area Classification

Division 1: Where ignitable concentrations of flammable gases, vapors or liquids can exist all of the time or some of the time under normal operating conditions.	**Zone 0:** Where ignitable concentrations of flammable gases, vapors or liquids are present continuously or for long periods of time under normal operating conditions.
	Zone 1: Where ignitable concentrations of Flammable gases, vapors or liquids are likely to exist under normal operating conditions.
Division 2: Where ignitable concentrations of flammable gases, vapors or liquids are not likely to exist under normal operating conditions.	**Zone 2:** Where ignitable concentrations of flammable gases, vapors or liquids are not likely to exist under normal operating conditions.

Class I Groups

Division 1 and 2	**Zone 0, 1 and 2**
A (acetylene)	IIC (acetylene & hydrogen)
B (hydrogen)	
C (ethylene)	IIB (ethylene)
D (propane)	IIA (propane)

Class I Temperature Codes

Division 1 and 2	**Zone 0, 1 and 2**
T1 (≤ 450°C)	T1 (≤ 450°C)
T2 (≤300°C)	T2 (≤300°C)
T2A, T2B, T2C, T2D (≤280°C, ≤260°C, ≤230°C, ≤215°C)	—
T3 (≤200°C)	T3 (≤200°C)
T3A, T3B, T3C (≤180°C, ≤165°C, ≤160°C)	—
T4 (≤135°C)	T4 (≤135°C)
T4A (≤120°C)	—
T5 (≤100°C)	T5 (≤100°C)
T6 (≤85°C)	T6 (≤85°C)

Class I, Division 1 and 2 Protection Methods

Area	Protection Methods	Applicable Certification Documents U.S.	Canada
Div. 1	• Explosionproof	UL1203	CSA-30
	• Intrinsically safe (2 fault)	UL 913	CSA-157
	• Purged/pressurized (Type X or Y)	NFPA 496	NFPA 496
Div. 2	• Nonincendive	UL 1604	CSA-213
	• Non-sparking device	UL 1604	CSA-213
	• Purged/pressurized (Type Z)	NFPA 496	NFPA 496
	• Hermetically sealed	UL 1604	CSA-213
	• Any Class I, Div.1 method	—	—
	• Any Class I, Zone 0, 1 or 2 method	UL 2279	CSA-E79 Series

Class I, Zone 0, 1 and 2 Protection Methods

Area	Protection Methods	Applicable Certification Documents U.S.	Canada	IEC	Europe
Zone 0	• Intrinsically safe, 'ia' (2 fault)	UL 2279, Pt. 11	CSA-E79-11	IEC 60079-11	EN 50020
	• Class I, Div. 1 intrinsically safe (2 fault) method	UL 913	CSA-157	—	—
Zone 1	• Encapsulation, 'm'	UL 2279, Pt. 18	CSA-E79-18	IEC 60079-18	EN 50028
	• Flameproof, 'd'	UL 2279, Pt. 1	CSA-E79-1	IEC 60079-1	EN 50018
	• Increased safety, 'e'	UL 2279, Pt. 7	CSA-E79-7	IEC 60079-7	EN 50019
	• Intrinsically safe, 'ib' (1 fault)	UL2279, Pt. 11	CSA-E79-11	IEC 60079-11	EN 50020
	• Oil immersion, 'o'	UL 2279, Pt. 6	CSA-E79-6	IEC 60079-6	EN 50015
	• Powder filling, 'q'	UL 2279, Pt. 5	CSA-E79-5	IEC 60079-5	EN 50017
	• Purged/pressurized, 'p'	—	CSA-E79-2	IEC 60079-2	EN 50016
	• Any Class I, Zone 0 method	—	—	—	—
	• Any Class I, Div. 1 method	—	—	—	—
Zone 2	• Nonincendive, 'nC'	UL 2279, Pt. 15	CSA-E79-15	IEC 60079-15	EN 50021
	• Non-sparking, 'nA'	UL 2279, Pt. 15	CSA-E79-15	IEC 60079-15	EN 50021
	• Restricted breathing, 'nR'	UL 2279, Pt. 15	CSA-E79-15	IEC 60079-15	EN 50021
	• Hermetically sealed, 'nC'	UL 2279, Pt. 15	CSA-E79-15	IEC 60079-15	EN 50021
	• Energy limited, 'nC' ('nL' for Europe)	UL 2279, Pt. 15	CSA-E79-15	IEC 60079-15	EN 50021
	• Simplified pressurization, 'nP'	—	—	—	EN 50021
	• Any Class I, Zone 0 or 1 method	—	—	—	—
	• Any Class I, Div. 1 or 2 method	—	—	—	—