



# AQUATIC LIGHTING GUIDE

MAKE EVERYTHING GLO AGAIN



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# Introduction

## What is Light?

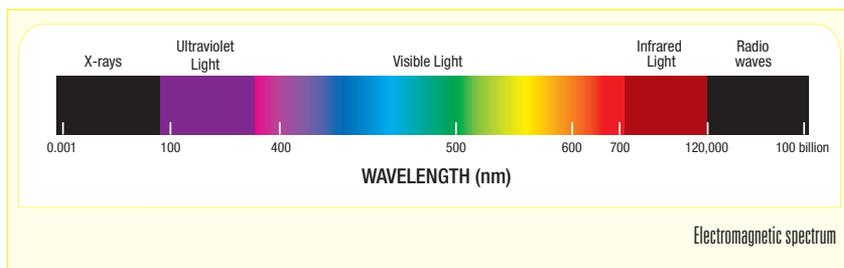
Light to the human eye can be defined as the visible portion of the electromagnetic spectrum; all electromagnetic wavelengths can be referred to as light. Light is in fact electromagnetic radiation and

is based on photons, the carrier of all wavelengths of electromagnetic radiation. The length of these wavelengths are expressed in nanometers (nm), 1 nanometer equaling 1 billionth of a meter. Every wavelength is represented by a different colour. The sun is yellow because its light is most powerful at the visible wavelength of yellow.

There are many wavelengths beyond visible light, some of them shorter and some of them longer; all together they compose the electromagnetic spectrum. The shortest wavelengths of the spectrum are in fact the most powerful, starting with gamma rays, followed by X-rays, then ultraviolet light, and then visible light which represents a very small portion of the electromagnetic spectrum.

Light is a very complex subject and in regards to aquarium keeping it is the visible portion that is of importance. Ultraviolet light can be said to be of importance in regards to UVC, short wave ultraviolet light, in that it is used as a sterilizer in aquarium UV sterilizers but for the purposes of this guide it will not be discussed.

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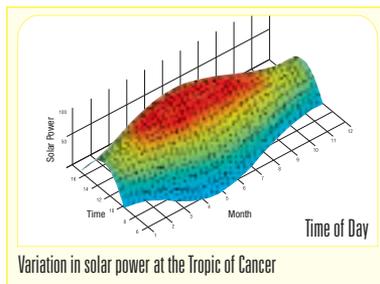
## Visible Light

Visible light serves two main functions: it allows us and our fish to see properly and for plants and photosynthetic corals, it directly governs photosynthesis; without light there is no photosynthesis. Light provides the energy for this process, which in fact is a fundamental for life itself.

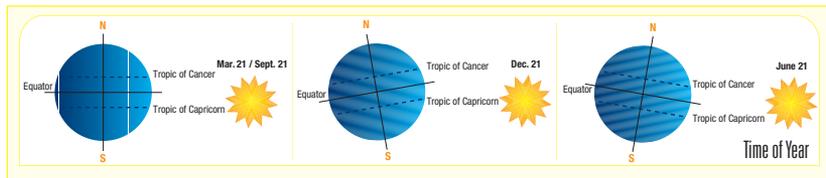
The visible light spectrum ranges from 390 to 700 nm. The light seen by the eye and the colour of it depends on the strength of each wavelength. The sensitivity of the eye to certain wavelengths of visible light varies between living things, human eyes for example are most sensitive to the green spectrum as it stimulates all three types of cones within the eye. Plants, corals and other photosynthetic invertebrates, are capable of using many wavelengths for photosynthesis; there are however some wavelengths that are more efficiently used.

## Light Intensity

The earth's climate is determined by the amount of solar radiation that strikes the surface. Factors that affect light intensity are the sun's position, the earth's rotation, geographic location, the ozone layer, clouds, air humidity, elevation, environment and others. In the aquatic environment, the time of day is in fact a major factor. Reflection from the water's surface is far greater in the early morning and late afternoon, resulting in lesser light intensities under water during those times.



Maximum light intensity occurs at midday with minimal wind during clear skies in environments with no overhead obstructions, the light above the surface can exceed 100,000 lux.

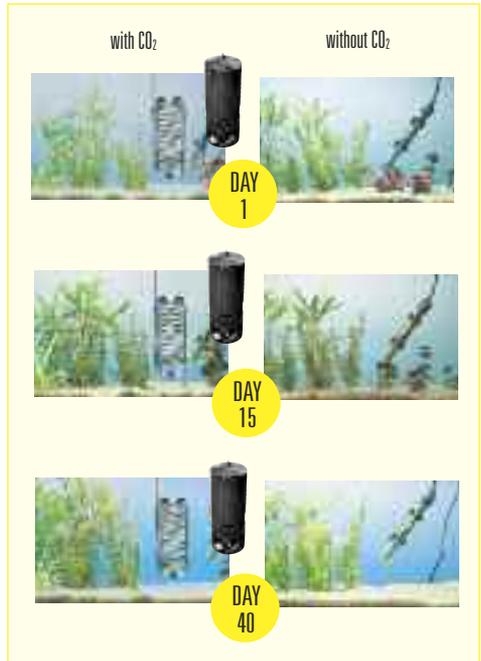


# Photosynthesis

This essential process requires three key components: light, water and CO<sub>2</sub>. These three elements can be adjusted to stimulate and optimize the growth, health and condition of plants, by affecting their rate of photosynthesis.

Photosynthesis is a process whereby chlorophyll (primary pigments that absorb light and the reason that most plants are green in colour) in plants transform light energy into an alternate form to be able to process water and carbon dioxide into sugars such as glucose and then into starches. Chlorophyll is in fact supported by accessory pigments, such as carotenes and xanthophylls. This is followed by other actions within the plant, all of which are important for vigorous healthy growth and condition.

It has been shown that aquatic plants can photosynthesize very efficiently when exposed to lighting that is rich in the green and yellow spectrums.

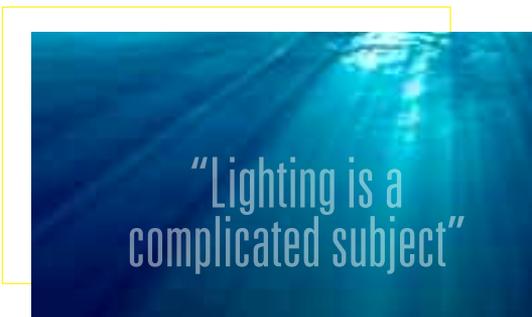


Full spectrum bulbs, such as Life-Glo, a tri-phosphor linear fluorescent (T8 & T5 HO availability) rich in green spectrum, are in fact excellent plant growth bulbs.

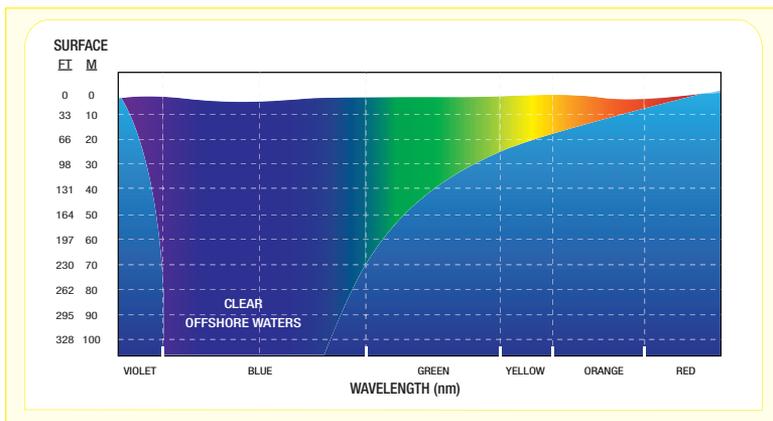
Photosynthesis only takes place when the aquarium is illuminated. As they photosynthesize, plants primarily take in carbon dioxide and give off oxygen. Then, when the lights are off and photosynthesis is halted, plants release some CO<sub>2</sub> back into the water.

## Aquatic Light

Within the aquatic environment there are additional factors versus terrestrial light that seriously impact light levels, molecules that absorb light (water; organics), particles that impact light transmission and others. In the ocean for example, at a depth of approximately 10 meters on a perfect day light, intensity may measure between 7,000 to 8,000 lux, this of course is lower at the beginning and end of the day. In freshwater tropical environments with dense overhead jungle growth, limited direct daylight, mostly filtered by a rich green canopy, actually makes it to the water's surface. From there, aquatic factors serve to reduce levels even



more. The two main factors are that water molecules absorb red light while dissolved organic content absorbs blue light. The resulting predominance of green/yellow spectrum makes aquatic light in these environments quite different from terrestrial light. Aquatic plants in these waters have had to adapt to a different available light spectrum.



# Understanding Bulb Specifications

Lighting is a complicated subject and in fact often misunderstood. Gaining a basic understanding of the various specifications present on bulb packaging can help you gain some perspective on lighting characteristics that may meet your aquarium's lighting needs.

- Spectrum Graphs
- CRI
- Colour Temperature
- Lux
- Lumens

## Spectrum Graphs

On most aquarium bulb packaging a spectrum graph will be present. The spectrum graph provides an indication of the relative power of the various wavelengths of light produced by the bulb. This enables a basic reference to spectral bulb output and the potential fulfillment of requirements based on what spectrums are most necessary for the application.

For a planted aquarium and the fact that photosynthesis in aquatic plants may implicate a green component, the Life-Glo spectrum ideally meets this requirement (along with a balanced representation of blue and red spectrums) while offering accurate viewing of colours by the human eye, thanks to the high CRI value of this excellent bulb.

Marine reef aquariums have a strong requirement for light emitted between the wavelengths of 420 and 460 nm. Photosynthetic coral and other invertebrates require a number of wavelengths within this range for efficient stimulation of photosynthesis. The Marine-Glo spectrum, as clearly shown by its spectrum graph, depicts significant light output in this critical range.

## CRI

This abbreviation stands for colour rendering index and is defined as the ability of a light source to illuminate an object as compared to natural sunlight having a CRI of 100. This specification is based on human vision and as such it is useful in regards to accurate presentation of an aquatic display that does not overly accentuate specific colours, providing a balanced overall look to an aquarium.

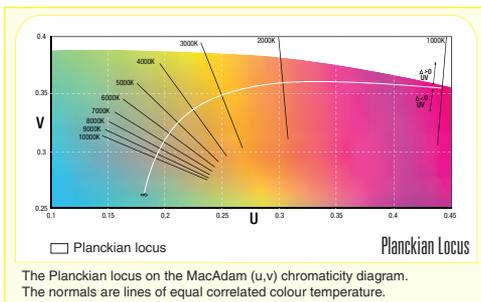
## Colour Temperature

Colour temperature of a light source is usually expressed in degrees Kelvin, as denoted by the "K" that follows a number. This temperature relates to the colour of a black body object heated to that temperature. Fluorescent lighting does not radiate light and because of this, the colour temperature as defined, needs to be correlated for fluorescent lighting. It is assigned a value based on a human colour perception that matches the colour of the particular lamp.

In describing colour temperatures, a low value of approximately 2,500K, typical of an incandescent light for example, the light cast would have a warm red-yellow appearance. A typical fluorescent bulb that would mimic a colour temperature of day light with a colour temperature range of 5,000K to 7,000K would cast a bluish white light. Daylight colour temperatures are typically at 5,600K to 5,800K at mid-day, but can range from as low as 2,000K at sunset to more than 18,000K in overcast or humid conditions.

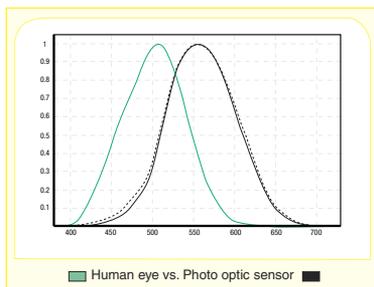
## Lux

A unit of illumination which indicates the amount of light falling on a given area.



## Lumens

A unit of measurement that delivers the amount of brightness originating from a light source. The lumen is the standard unit for luminous flux, an indicator of the energy within the wavelengths of the electromagnetic spectrum humans perceive as light.



It is important to note that the photo optic sensors that measure this quantity of light have a similar response curve to the human eye and as such, there is larger green spectrum component weighted within this measurement.

# Aquarium Lighting

## Introduction

Aquarium lighting is an essential component of an aquatic system and is often neither properly considered when planning an aquarium nor properly maintained.

Aquarium dimensions; fish, coral and plant life; filter media; black-water supplements and decorative components that may affect water transparency and aesthetics, are all important factors to consider when choosing and optimizing aquarium lighting.



## Aquarium Dimensions

Deeper aquariums will usually require more lighting and can benefit significantly from the use of efficient reflectors and closer placement of bulbs to the water's surface.

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In fact, the **inverse square law** clearly defines the fact that as distance is increased from the source of light, the increasing area (water surface in this case) that must be illuminated, will result in a less intense illumination per area. Therefore, to make the most of light that is available when it is really needed, always try to get bulbs as close to the water's surface as possible. This can be safely done with linear fluorescent bulbs (this is not possible with metal halide and some other high output technologies that generate much heat and need protective shielding). Properly designed reflectors that are parabolic type shapes with suitable dimensions (small reflectors with tightly packed multiple bulbs are less efficient), will also improve light entry into deeper aquariums due to optimal reflection characteristics. GLO T5 HO and T8 reflectors are designed for maximum reflection potential.

Placing high light requiring corals and plants closer to the direct point of light emission of bulbs will also help meet their needs in certain aquariums.



## Fish, Coral and Plant Life

The types of fish, coral and plants kept in an aquarium need to be considered when deciding on what kind of lighting technology and how much lighting power will be necessary.



### Fish

The types of habitats that many tropical fish species have evolved in, vary and should be considered when selecting light spectrums and when deciding on the lighting power requirements. For example, many African cichlids, that originate from the great rift lakes (Tanganyika, Malawi), are exposed to direct intense light levels and as such, are comfortable in brightly lit aquariums that feature higher colour temperature bulbs.

The types of habitats that many tropical

Structure is equally important, cave dwelling species for example, require appropriate structure to enable them to comfortably retire from intense lighting at any time.

Many anabantoids for example, that have evolved in plant choked waterways, are also used to intense light levels with dense plant structure absorbing the sun's powerful rays. Many of these fish display better coloration and better behavior patterns when plants partially cover the surface. When this is the case, plants that are present under the cover of other plant species should tolerate lower light levels, like many species of cryptocorynes for example.

An excellent example of long time aquarium favorites, the angelfish and the discus, fish that evolved in structure that often features branches and dense over hanging trees. These fish are comfortable



Power-Glo T5 HO



with full spectrum type light, strong in the green component as it mimics the type of light that shines down through the overhanging canopy of vegetation.



Life-Glo T5 HO

The considerations can be many but the basic premise is simple, investigate the basic conditions the fish you plan to keep have evolved in and make sure they are similar to the rest of the life, structure and water chemistry the aquarium will contain.

## Plants

Plants are 100% dependent on light for their existence, without it they would perish. Plants are indispensable in an aquarium, not only do they provide one of the most pleasing aesthetic elements, but they are also one of nature's primary filter systems in an aquatic environment. Plants should be



included in an aquarium whenever possible.

Light requirements of plants vary and in fact are relatively easy to meet with the use of linear fluorescent bulbs. Even the high light requiring species in aquariums supplemented with carbon dioxide can be accommodated thanks to powerful T5 HO linear fluorescent bulbs.

There are many excellent publications that provide accurate information as to the general light levels required by various species. It is strongly recommended to review them as well as the Nutrafin Plant Guide.



## Corals



Photosynthetic corals are the most recommended for aquarium keeping and in fact are invertebrates. These fascinating marine creatures are fully dependent on light for their existence and have varying requirements in regards to lighting. Soft corals have their lighting needs covered with linear fluorescent lighting while stony corals sourced from the ocean, often require metal halide lighting supplemented with linear fluorescent bulbs. Thanks to the efforts of many dedicated and well informed aquarists, tank raised cultivated fragments that originate from aquarium acclimated stony corals, are constantly gaining popularity. These domestically produced corals are often raised under intense fluorescent lighting and in fact can flourish under this form of light. This avoids the requirement of higher energy consuming and heat producing metal halide lighting required by many wild stony corals.



## Filter Media, Blackwater Supplements and Decorative Components

Aquariums using natural filter media such as aquatic grade peat, blackwater supplements and / or featuring decorations including natural driftwood, usually exhibit a natural stain imparted in the water that necessitates more illumination for adequate viewing purposes and/or plant growth. These natural substances impart many benefits to aquarium water and for the many species of fish that have evolved in similar conditions. This type of aquarium is often best illuminated by adding additional T8 bulbs or by utilizing the popular T5 HO fluorescent lighting system.

## How Much and What Kind of Lighting is Required

There are a few basic ways of evaluating the amount of lighting required, the simplest and relatively accurate one is that of watts per volume of aquarium water.

For most freshwater aquariums a range of 1 to 3 watts per gallon (4 liters) is suggested, with 2.5 to 3 watts per gallon usually being sufficient to supply the intense lighting required by CO<sub>2</sub> injected fully planted systems. The average planted aquarium containing slow to medium growth type aquatic plants supplemented with "natural type" carbon dioxide systems can usually support most aquatic plants very well with the right spectrum linear fluorescent lighting in a T8 format.



Life-Glo T8

For planted aquariums supplemented with pressurized CO<sub>2</sub> systems and containing mostly rapid growth aquatic plants, T5 HO linear fluorescent lighting is called for:



Life-Glo T5 HO



Marine-Glo T5 HO

Marine aquariums usually require more lighting when using the general guideline aforementioned, falling within a suggested range of 2 to 4 watts per gallon or approximately 4 L of aquarium water. Planted aquariums equipped with "natural fermentation" type CO<sub>2</sub> systems featuring slow to medium growth rate plants are usually best lit with full spectrum T8 fluorescent bulbs. Thanks to fluorescent T5 HO technology, these types of intense light levels are now achievable with minimal heat production vs. metal halide lighting. In fact, it is usually recommended to supplement typical 10,000K metal halide bulbs with quality linear fluorescent actinic type bulbs. This not only provides the required additional blue spectrum many corals require, but acts as an excellent dawn and dusk natural light condition simulator.

## How to Maximize Lighting Efficiency

Maintaining proper lighting levels in an aquarium does entail some maintenance as well as follow up in regards to regular bulb replacement.

Consistent light levels are important to both plants and corals as well as for a beautiful looking aquarium.

In order to support photosynthesis within plants and corals, regular bulb replacement is strongly recommended and should be done on a staggered basis in multiple bulb set ups to avoid shocking sensitive species. A period of approximately one to three weeks is usually sufficient when staggering bulb changes within multiple bulb installations.

Maintenance for best long term performance and consequentially healthy plant and coral growth should be expected, especially since exposure to water inherently means mineral deposits which seriously reduce light emissions into

the aquarium. This fact is most important in saltwater aquariums where corrosive marine salt will not only rapidly reduce light emissions but can be expected to deteriorate even the most resistant reflectors and other lighting system components if insufficient maintenance is performed.

### To get the best performance from your lighting system it is strongly recommended to:

1. Keep any glass or other protective lenses between bulb and water surface free of algae or mineral deposits.
2. Clean the bulb surface weekly if it is directly exposed to the aquarium water surface (use a damp soft sponge).
3. If bulbs or lenses have accumulated mineral deposits, clean with a mild acid such as vinegar.
4. In situations requiring higher light levels the use of GLO reflectors will significantly improve light emissions into the aquarium.
5. Replace fluorescent bulbs annually for maximum efficiency.
6. Make note of bulb installation dates for accurate replacement frequency. Glo bulbs incorporate "Make Me GLO Again" reminder tabs on their packaging.
7. Combine different spectrums of bulbs for applications that have specific spectral requirements.
8. Use electronic ballasts when possible for the following reasons:
  - Higher voltage frequency eliminating bulb flickering and improving visual presentation.
  - Better energy efficiency due to a higher power factor, typically 0.96 or greater, indicating that almost all of the electricity consumed is available for light production.
  - Last longer than conventional ballasts.
  - Increase bulb life.
  - Are able to trigger a greater range of fluorescent bulb diameters, T8, T10 or T12.
  - They generate less heat.
9. Avoid turning lights on and off unnecessarily.
10. Use timers to control lighting systems. This will ensure regular illumination time and prevents the unnecessary use of lighting that could contribute to unwanted algae growth.

## CO<sub>2</sub> and Aquarium Lighting

Carbon is the most important nutrient for plants as demonstrated by the fact that 40 to 50% of the dry weight of a plant is composed of it. The absorption of carbon dioxide is the easiest and most efficient way a plant can obtain its carbon requirements. In nature there are various sources of carbon available to plants, in an aquarium, this is not the case.

The nutritional requirements of plants are increased when they are kept in conditions that accelerate photosynthesis, for example, the use of T5 HO lighting systems equipped with Life-Glo bulbs. Higher light levels increase the rate at which plants uptake necessary nutrients, carbon being the main macro-nutrient. It is also important to ensure that when high output lighting is employed, particularly in aquariums containing a majority of fast growing plants, that a quality micro-nutrient supplement is regularly added, specifically those with B vitamins to support sound metabolic processes.



It is also suggested in the case of pressurized CO<sub>2</sub> systems, that they are non functional when aquarium lighting is not on, as plants uptake oxygen in the dark and give off some carbon dioxide. This can cause oxygen shortages in heavily planted aquariums as well as resulting in dangerously low pH values in soft water conditions. The use of a dual outlet timer is a convenient way of ensuring that the CO<sub>2</sub> solenoid is shut off at the same time as the lighting system. Natural type CO<sub>2</sub> systems can usually be functional 24 hours a day.



Nutrafin Natural Plant System

## GLO T8 Lighting Program

The GLO line of T8 linear fluorescent aquarium bulbs is available in 6 different spectrums that are designed to meet most fresh and saltwater aquatic lighting requirements.

GLO T8 bulbs feature quality components and raw materials along with stringent manufacturing processes that contribute to long lasting performance. Linear fluorescent T8 lighting technology offers excellent energy efficiency combined with powerful light output from bulbs such as Life-Glo. For example, a 40 watt 48 inch GLO T8 bulb which emits 3,300 lumens yields a bountiful 82.5 lumens per watt.

- GLO T8 Linear Fluorescent Bulbs
- GLO T8/T10/T12 Ballast Lighting Systems
- GLO T8/T10/T12 Single Bulb Reflectors

**GLO T8 linear fluorescent lighting technology offers the following advantages that should always be considered when deciding on what aquatic lighting is best:**

1. Close placement to water surface potential to maximize light entry into the aquarium.
2. Energy efficiency.
3. Wide range choice of spectrums for various aquatic applications.
4. Bulbs with high CRI values for accurate viewing of aquariums.
5. Low heat production.
6. Even light coverage across the length of the aquarium and best visual blending when combining various bulb spectrums.
7. Economical pricing.

# GLO T8 Linear Fluorescent Bulbs

## AQUA-GLO

### Fish Colour Enhancing Aquarium Bulb

Aqua-Glo will maximize the beauty of your fish while being an excellent bulb to combine with Power-Glo and/or Life-Glo in most planted aquariums.

- Ideal spectral peaks for enhancing fish colour
- Strong photosynthetic spectrum range to stimulate vigorous plant growth
- Recommended for combination with Power-Glo or Life-Glo



ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1581	14W	300	30	15" (38 cm)	25 mm	A1585	30W	900	120	36" (91 cm)	25 mm
A1582	15W	290	35	18" (46 cm)	25 mm	A1586	40W	1110	140	42" (107 cm)	25 mm
A1583	20W	555	80	24" (61 cm)	25 mm	A1587	40W	1215	150	48" (122 cm)	25 mm
A1584	25W	735	100	30" (76 cm)	25 mm						

## SUN-GLO

### Daylight Aquarium Bulb

Sun-Glo is an excellent aquarium bulb emitting a warm white light that is most suited to freshwater community set-ups.

- Natural daylight spectrum
- Presents balanced natural aquarium look
- Refreshing natural white light



ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1589	14W	740	70	15" (38 cm)	25 mm	A1593	30W	2200	210	36" (91 cm)	25 mm
A1590	15W	840	80	18" (46 cm)	25 mm	A1594	40W	2945	250	42" (107 cm)	25 mm
A1591	20W	1300	125	24" (61 cm)	25 mm	A1595	40W	3100	300	48" (122 cm)	25 mm
A1592	25W	1870	175	30" (76 cm)	25 mm						

## MARINE-GLO

### Actinic Blue Marine Aquarium Bulb

Marine-Glo replicates the essential actinic blue wavelengths that corals and other photosynthetic invertebrates require. The strong blue light is also effective at enhancing fish colour, accentuating blue and violet tones.

- Strong actinic blue spectral peaks
- Strongly recommended for photosynthetic corals and other marine life
- Visible dominant blue spectral emissions highlight blue coloration in fish, corals and other invertebrates
- Recommended in combination with Life-Glo, Power-Glo or with lighting requirements calling for added actinic blue spectrum



ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1602	15W	405	30	18" (46 cm)	25 mm	A1605	30W	970	80	36" (91 cm)	25 mm
A1603	20W	650	50	24" (61 cm)	25 mm	A1606	40W	1260	90	42" (107 cm)	25 mm
A1604	25W	795	65	30" (76 cm)	25 mm	A1607	40W	1325	95	48" (122 cm)	25 mm

## GLO T8 Linear Fluorescent Bulbs

### FLORA-GLO

#### Freshwater Plant Growth Aquarium Bulb

Flora-Glo is strongly recommended in planted aquariums to ensure a broad red and blue spectral presence, beneficial for photosynthesis in plants.

- Photosynthetic spectrum, ideal for planted aquariums and terrariums
- Stimulates plant growth
- Recommended in combination with Sun-Glo or Life-Glo



ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1614	15W	420	65	18" (46 cm)	25 mm	A1618	40W	1730	200	42" (107 cm)	25 mm
A1615	20W	650	90	24" (61 cm)	25 mm	A1619	40W	1850	210	48" (122 cm)	25 mm
A1617	30W	1090	150	36" (91 cm)	25 mm						

### POWER-GLO

#### Super Bright Aquarium Bulb

Power-Glo delivers a bright bluish white light with a high colour temperature, great for simulating open water lighting conditions as well as providing a beneficial spectrum for a variety of freshwater and marine aquariums.

- Super bright lighting, strong blue spectral range, supports photosynthetic corals, invertebrates and other marine life
- Ideal for marine and African cichlid aquariums
- Intensifies fish and coral colours



ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1624	14W	430	40	15" (38 cm)	25 mm	A1628	30W	1330	105	36" (91 cm)	25 mm
A1625	15W	580	50	18" (46 cm)	25 mm	A1629	40W	1705	140	42" (107 cm)	25 mm
A1626	20W	750	60	24" (61 cm)	25 mm	A1630	40W	1820	150	48" (122 cm)	25 mm
A1627	25W	1160	80	30" (76 cm)	25 mm						

### LIFE-GLO

#### Premium Full Spectrum Aquarium Bulb

Life-Glo delivers a balanced intense natural white light which closely mimics daylight, ideal for planted freshwater aquariums and saltwater. Its high CRI value will ensure accurate viewing and present aquarium inhabitants the way nature would.

- Premium tri-phosphor formulation for balanced high light output performance
- Closely mimics natural mid-day sun, accurate colour rendering
- Effectively stimulates photosynthetic process in plants, corals and other invertebrates
- Recommended in combination with Marine-Glo, Flora-Glo and/or Aqua-Glo



ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1632	14W	860	80	15" (38 cm)	25 mm	A1636	30W	2335	220	36" (91 cm)	25 mm
A1633	15W	980	95	18" (46 cm)	25 mm	A1637	40W	3255	310	42" (107 cm)	25 mm
A1634	20W	1470	130	24" (61 cm)	25 mm	A1638	40W	3320	320	48" (122 cm)	25 mm
A1635	25W	2000	190	30" (76 cm)	25 mm						

## GLO T8/10/12 Ballast Lighting Systems

GLO T8 Ballast Lighting Systems are available in single conventional ballast and double electronic ballast configurations. These units provide a flexible lighting solution for aquarium cabinets, multiple aquariums on racking, shop set-ups and custom installations.



These convenient, practical, well equipped lighting systems include everything you need to make your installation simple and adaptable to most applications. Simply mount the ballast and bulb clip holders to a solid surface and attach the water resistant bulb end caps to the bulbs and you are ready to light up your aquarium installation.



### GLO T8/10/12 Single Bulb Conventional Ballast Lighting System

- Easy mount ballast housing
- Sufficient wiring to allow rear cabinet mounting
- Water resistant end caps
- Allows close placement of bulbs to water surface
- Adapters and bulb clips included to allow for T8, T10, T12 applications (30W & 40W units)
- On/Off switch
- Replaceable starter

ART. #	DESCRIPTION	WATTS	BULB REQUIRED	BULB DIAMETER	MODEL
A1565	Single Unit	20W	1 x 24" (61cm)	25 mm	T8
A1567	Single Unit	30W	1 x 36" (91cm)	25, 32 or 38 mm	T8/T10/T12
A1570	Single Unit	40W	1 x 42" (107cm) or 48"(122cm)	25, 32 or 38 mm	T8/T10/T12



## GLO T8/T10/T12 Double Bulb Electronic Ballast Lighting System

- Electronic ballast technology for low heat and high energy efficiency
- Easy mount ballast housing
- Aesthetic modern style
- Enough included electrical wiring to allow series placement of bulbs in multiple aquarium rack type set-ups
- Water resistant end caps
- Adapters and bulb clips included to allow for T8,T10,T12 applications (30W & 40W units)
- Illuminated On/Off switch

ART. #	DESCRIPTION	WATTS	BULB REQUIRED	BULB DIAMETER	MODEL
A1573	Double Unit	20W	2 x 24" (61cm)	25 mm	T8
A1575	Double Unit	30W	2 x 36" (91cm)	25, 32 or 38 mm	T8/T10/T12
A1578	Double Unit	40W	2 x 42" (107cm) or 48"(122cm)	25, 32 or 38 mm	T8/T10/T12

## GLO T8/T10/T12 Single Bulb Reflectors

GLO linear fluorescent single bulb reflectors significantly increase light transmission into the aquarium. Small reflectors that do not allow adequate space beside the bulb severely reduce reflector effectiveness. GLO reflectors provide optimum width to ensure maximum light reflection as well as an efficient parabolic shape further maximizing performance.

Constructed with thick highly polished aluminum, these robust units will last for years and represent the best quality linear fluorescent bulb reflectors available.

- Equipped with bulb clips for T8/T10/T12 bulb installation
- Parabolic design for optimum reflection
- Optimum dimensions for maximum light reflection performance
- Thick robust aluminum construction for longevity and durability
- Slotted for easy installation



ART. #	DESCRIPTION	BULB REQUIRED	BULB DIAMETER	MODEL
A3925	Single	1 x 24" (61 cm)	25, 32 or 38 mm	T8/T10/T12
A3926	Single	1 X 36" (91 cm)	25, 32 or 38 mm	T8/T10/T12
A3927	Single	1 x 48" (122 cm)	25, 32 or 38 mm	T8/T10/T12

# GLO T5 HO Lighting Program

## T5 HO Lighting Technology

This highly efficient high output fluorescent lighting technology has proven itself to be reliable, durable and at the same time delivers the higher light levels required by many reef and planted aquarium owners.

T5 HO being a small diameter linear fluorescent bulb offers tremendous lighting potential. With a small diameter of 5/8" / 16mm, two of these bulbs can occupy approximately the same area as one T8, 1" / 25mm bulb. For example, comparing a 40 watt T8 Life-Glo at 3,300 lumens of light (measured at 25 °C) to two GLO T5 HO Life-Glo bulbs, the light output of the latter is substantially greater at 9,000 lumens (measured at 35 °C, 2 x 4,500 lumens per 54 watt T5 HO bulb). GLO T5 HO bulbs emit more light at slightly warmer temperatures, the optimal bulb surface temperature being 35 °C. Standards dictate that our packaging reflects measurements taken at 25 °C.

- T5 HO Lighting Technology
- GLO T5 HO Linear Fluorescent Bulbs
- GLO T5 HO Linear Fluorescent Lighting Systems
- GLO T5 HO Ballast Kits and Reflectors

You can be assured that your GLO T5 HO bulb is actually outputting approximately 5 to 10% more light than what is actually indicated on the packaging.



It is also possible to place a GLO T5 HO fluorescent bulb much nearer the water's surface versus a metal halide. Unlike some other high output lighting technologies which generate a lot of heat and can rupture when exposed to water splash, GLO T5 HO is safe and efficient.

Considering energy consumed and light output in lumens when comparing 4 x 54 watt T5 HO linear fluorescent bulbs (total of 216 watts measured at 35 °C) to similar metal halide bulbs, the GLO T5 HO Life-Glo light emission is 18,000 lumens, the same as the 250 watt metal halide bulbs.

Heat generation with T5 HO lighting is minimal when compared to other high output and high intensity lighting systems; superior for consistent aquarium temperatures and less likelihood of requiring expensive water chillers.

Mixing light spectrums with different T5 HO bulbs is also aesthetically superior, while providing a better distributed light output across the aquarium versus high output power compact lighting or



metal halide. When different colour temperature and spectrum bulbs are mixed with other high output bulb technologies, the aquarium exhibits patches of different colours and shades. It is clear that T5 HO lighting technology offers large light output potential and numerous other advantages at competitive prices, the clear choice in efficient high output lighting.

## GLO T5 HO Linear Fluorescent Bulbs

The GLO line of T5 HO linear fluorescent aquarium bulbs, are available in 3 different spectrums designed to meet most fresh and saltwater aquatic lighting requirements.

GLO T5 HO bulbs feature quality components and raw materials along with stringent manufacturing processes that contribute to long lasting performance. Linear fluorescent T5 HO lighting technology offers excellent energy efficiency combined with powerful light output from bulbs such as Life-Glo. Compared to other high output light technologies, T5 linear fluorescent high output lighting offers great light output potential and minimal energy consumption.



**GLO T5 HO linear fluorescent lighting technology offers the following advantages that should always be considered when deciding on which aquatic lighting is best:**

1. Close placement to water surface potential to maximize light entry into the aquarium.
2. Energy efficiency with large light output potential. Compact T5 dimensions allow two GLO T5 HO bulbs in the same approximate space as one T8 bulb.
3. Choice of spectrums for various aquatic applications.
4. Bulbs with high CRI values for accurate viewing of aquariums.
5. Low heat production versus other high output and high intensity lighting options.
6. Even light coverage across the length of the aquarium and best visual blending of combining various light spectrums.
7. Economical pricing.

## GLO T5 HO Linear Fluorescent Bulbs

### POWER-GLO

#### Super Bright Aquarium Bulb

Power-Glo delivers a bright bluish white light with a high colour temperature, great for simulating open water lighting conditions as well as providing a beneficial spectrum for a variety of freshwater and marine aquariums.

- Super bright lighting, strong blue spectral range, supports photosynthetic corals, invertebrates and other marine life
- Ideal for marine and African cichlid aquariums
- Intensifies fish and coral colours
- Compact dimensions, two T5 HO bulbs require only approximately as much space as one T8 bulb
- Measured at 35 °C output for one 46 inch (115 cm) 54W T5 HO bulb can reach up to 2,150 lumens
- High colour temperature of 18,000K suggested supplemental light for marine reefs



ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1656	24W	900	122	22" (55 cm)	16 mm
A1658	39W	1500	181	34" (85 cm)	16 mm
A1660	54W	2150	233	46" (115 cm)	16 mm

### LIFE-GLO

#### Premium Full Spectrum Aquarium Bulb

Life-Glo delivers a balanced intense natural white light which closely mimics daylight, ideal for planted freshwater aquariums and saltwater. Its high CRI value will ensure accurate viewing and present aquarium inhabitants the way nature would.

- Premium tri-phosphor formulation for balanced high light output performance
- Closely mimics natural mid-day sun, accurate colour rendering
- Effectively stimulates photosynthetic process in plants, corals and other invertebrates
- Compact dimensions, two T5 HO bulbs require only approximately as much space as one T8 bulb
- Measured at 35 °C output for one 46 inch (115 cm) 54W T5 HO bulb can reach up to 4,300 lumens



ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1666	24W	1700	187	22" (55 cm)	16 mm
A1668	39W	3000	314	34" (85 cm)	16 mm
A1670	54W	4300	422	46" (115 cm)	16 mm

## MARINE-GLO

### Actinic Blue Marine Aquarium Bulb

Marine-Glo replicates the essential actinic blue wavelengths that corals and other photosynthetic invertebrates require. The strong blue light is also effective at enhancing fish colour; accentuating blue and violet tones.

- Strong actinic blue spectral peaks
- Strongly recommended for photosynthetic corals and other marine life
- Ideal supplementary light source for marine reefs using on 10,000K colour temperature lighting
- Visible dominant blue spectral emissions highlight blue coloration in fish, corals and other invertebrates
- Recommended in combination with Life-Glo, Power-Glo or with lighting requirements calling for added actinic blue spectrum
- Compact dimensions, two T5 HO bulbs require only approximately as much space as one T8 bulb. Facilitates installation as supplementary actinic source for marine reefs.
- Measured at 35 °C output for one 46 inch (115 cm) 54W T5 HO bulb can reach up to 1,600 lumens



ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1672	24W	670	79	22" (55 cm)	16 mm
A1674	39W	1130	133	34" (85 cm)	16 mm
A1676	54W	1600	177	46" (115 cm)	16 mm

## GLO T5 HO Linear Fluorescent Lighting Systems

GLO T5 HO linear fluorescent lighting systems are available in single and double bulb lighting versions to meet the lighting needs of most aquariums. Well engineered and constructed of quality materials, long term performance can be expected from these aesthetically designed units. GLO T5 HO linear fluorescent lighting systems meet global standards and as such, ensure effective, safe and long term performance.

This highly efficient lighting technology now permits reef aquarists and serious plant enthusiasts alike to provide the intense light levels required to support photosynthesis.

In regards to reef installations, even those that house stony corals can consider T5 HO as a primary lighting



system, especially when considering the quantity of tank raised specimens that are currently grown under fluorescent lighting.

The CO<sub>2</sub> supplemented planted aquarium will thrive under the immense light output generated by T5 HO, easily achievable when considering that 4 to 6 x T5 HO bulbs can be installed over an 18 inch (45 cm) wide aquarium. In fact 6 x 54 watt T5 HO Life-Glo bulbs can generate up to 27,000 lumens.

Aquariums that do not contain live plants or corals can also enjoy the benefits of attractively styled GLO T5 HO linear fluorescent lighting systems by replacing double T8 fluorescent light units with single GLO T5 HO units.

Single Light Unit



Double Light Unit

## GLO T5 HO Linear Fluorescent Lighting Systems



Available in single and double T5 HO bulb configurations



Built in high efficiency parabolic reflector, for maximum light reflection



Easy to install



Integrated extension brackets to fit a variety of aquarium lengths



Compact dimensions allow the use of multiple units for high light applications



Integrated suspension tabs (North American Model Only) to suspend above aquarium, suspension kit included



Water Resistant Compression-Fit Bulb End Caps for safe, reliable long-term performance



Aquarium Mounting Brackets, securely fasten to the aquarium and allow for 4 different vertical positions. Allows light level adjustment and choice of visual presentation

ART. #	DESCRIPTION	WATTS	UNIT SIZE	T5HO BULB REQUIRED	AQUARIUM LENGTH
A3900	Single Unit	24W	24" (61 cm)	1 x 22" (55cm)	23-40" (58-101.5 cm)
A3901	Single Unit	39W	36" (91 cm)	1 x 34" (85cm)	35-52" (89-132 cm)
A3902	Single Unit	54W	48" (122 cm)	1 x 46" (115cm)	46.75-64" (118.5-162.5 cm)
A3910	Double unit	24W	24" (61 cm)	2 x 22" (55cm)	23-40" (58-101.5 cm)
A3911	Double unit	39W	36" (91 cm)	2 x 34" (85cm)	35-52" (89-132 cm)
A3912	Double unit	54W	48" (122 cm)	2 x 46" (115cm)	46.75-64" (118.5-162.5 cm)

## GLO T5 HO Ballast Kits and Reflectors

### GLO T5 HO Ballast Lighting Systems

GLO T5 HO ballast lighting system kits and reflectors have been designed with performance enhancing features and a convenience orientation.

All GLO remote lighting system kits come with enough electrical cord to allow bulbs to be positioned in series, an important advantage for the multiple aquarium owner. GLO double electronic T5 HO ballast lighting systems also feature an illuminated on/off indicator along with an attractively styled housing.

These convenient lighting units are ideal for illuminating; aquariums encased in walls; within wooden cabinet systems;



multiple aquarium systems; custom installations; refugiums; as well as providing specific additional light output and spectrums for marine reefs or other specific aquatic lighting requirements.

GLO T5 HO ballast lighting systems have been tuned to work best with GLO T5 HO bulbs. This is desirable as GLO bulbs are manufactured to exacting performance standards and represent the best choice in T5 HO linear fluorescent bulbs.



ART. #	DESCRIPTION	WATTS	BULB REQUIRED	BULB DIAMETER	MODEL
A1555	Double Unit	24W or 39W	2 x 22" (55 cm) or 2 x 34" (85 cm)	16 mm	T5 HO
A1558	Double Unit	54W	2 x 46" (115 cm)	16 mm	T5 HO

## GLO T5 HO Reflectors

Highly polished internal surface and constructed of thick durable aluminum combined with proper dimensions for optimal light reflection, make GLO T5 HO reflectors, the best choice for ensuring maximum light into the aquarium. Properly designed reflectors can easily double light entry into an aquarium and when combined with GLO T5 HO linear fluorescent lighting, heavily planted aquariums and reefs flourish.

Complete with slots and mounting kits for linear fluorescent bulbs these durable reflectors are comprehensive and easily installed.



ART. #	DESCRIPTION	BULB REQUIRED	BULB DIAMETER	MODEL
A3920	Single Unit	1 x 22" (55 cm)	16 mm	T5 HO
A3921	Single Unit	1 x 34" (85 cm)	16 mm	T5 HO
A3922	Single Unit	1 x 46" (115 cm)	16 mm	T5 HO

## GLO T5 HO Lighting Centre



### GLO PRODUCT LISTING

#### T5 HO LINEAR FLUORESCENT AQUARIUM BULBS

ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	
A1656	24W	900	122	22" (55 cm)	16 mm	POWER-GLO
A1658	39W	1500	181	34" (85 cm)	16 mm	
A1660	54W	2150	233	46" (115 cm)	16 mm	
A1666	24W	1700	187	22" (55 cm)	16 mm	LIFE-GLO
A1668	39W	3000	314	34" (85 cm)	16 mm	
A1670	54W	4300	422	46" (115 cm)	16 mm	
A1672	24W	670	79	22" (55 cm)	16 mm	MARINE-GLO
A1674	39W	1130	133	34" (85 cm)	16 mm	
A1676	54W	1600	177	46" (115 cm)	16 mm	

#### T5 HO LINEAR FLUORESCENT LIGHTING SYSTEMS

ART. #	DESCRIPTION	WATTS	UNIT SIZE	T5HO BULB REQUIRED	AQUARIUM LENGTH
A3900	Single Unit	24W	24" (61 cm)	1 x 22" (55cm)	23-40" (58-101.5 cm)
A3901	Single Unit	39W	36" (91 cm)	1 x 34" (85cm)	35-52" (89-132 cm)
A3902	Single Unit	54W	48" (122 cm)	1 x 46" (115cm)	46.75-64" (118.5-162.5 cm)
A3910	Double Unit	24W	24" (61 cm)	2 x 22" (55cm)	23-40" (58-101.5 cm)
A3911	Double Unit	39W	36" (91 cm)	2 x 34" (85cm)	35-52" (89-132 cm)
A3912	Double Unit	54W	48" (122 cm)	2 x 46" (115cm)	46.75-64" (118.5-162.5 cm)

#### T5 HO BALLAST LIGHTING SYSTEM KITS

ART. #	DESCRIPTION	WATTS	BULB REQUIRED	BULB DIAMETER	MODEL
A1555	Double Unit	24W or 39W	2 x 22" (55 cm) or 2 x 34" (85 cm)	16 mm	T5 HO
A1558	Double Unit	54W	2 x 46" (115 cm)	16 mm	T5 HO

#### T5 HO BULB REFLECTORS

ART. #	DESCRIPTION	BULB REQUIRED	BULB DIAMETER	MODEL
A3920	Single Unit	1 x 22" (55 cm)	16 mm	T5 HO
A3921	Single Unit	1 x 34" (85 cm)	16 mm	T5 HO
A3922	Single Unit	1 x 46" (115 cm)	16 mm	T5 HO



## PRODUCT LISTING

### T8 LINEAR FLUORESCENT AQUARIUM BULBS

ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1581	14W	300	30	15" (38 cm)	25 mm	A1585	30W	900	120	36" (91 cm)	25 mm
A1582	15W	290	35	18" (46 cm)	25 mm	A1586	40W	1110	140	42" (107 cm)	25 mm
A1583	20W	555	80	24" (61 cm)	25 mm	A1587	40W	1215	150	48" (122 cm)	25 mm
A1584	25W	735	100	30" (76 cm)	25 mm						

### AQUA-GLO

ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1589	14W	740	70	15" (38 cm)	25 mm	A1593	30W	2200	210	36" (91 cm)	25 mm
A1590	15W	840	80	18" (46 cm)	25 mm	A1594	40W	2945	250	42" (107 cm)	25 mm
A1591	20W	1300	125	24" (61 cm)	25 mm	A1595	40W	3100	300	48" (122 cm)	25 mm
A1592	25W	1870	175	30" (76 cm)	25 mm						

### SUN-GLO

ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1602	15W	405	30	18" (46 cm)	25 mm	A1605	30W	970	80	36" (91 cm)	25 mm
A1603	20W	650	50	24" (61 cm)	25 mm	A1606	40W	1260	90	42" (107 cm)	25 mm
A1604	25W	795	65	30" (76 cm)	25 mm	A1607	40W	1325	95	48" (122 cm)	25 mm

### MARINE-GLO

ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1614	15W	420	65	18" (46 cm)	25 mm	A1618	40W	1730	200	42" (107 cm)	25 mm
A1615	20W	650	90	24" (61 cm)	25 mm	A1619	40W	1850	210	48" (122 cm)	25 mm
A1617	30W	1090	150	36" (91 cm)	25 mm						

### FLORA-GLO

ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1624	14W	430	40	15" (38 cm)	25 mm	A1628	30W	1330	105	36" (91 cm)	25 mm
A1625	15W	580	50	18" (46 cm)	25 mm	A1629	40W	1705	140	42" (107 cm)	25 mm
A1626	20W	750	60	24" (61 cm)	25 mm	A1630	40W	1820	150	48" (122 cm)	25 mm
A1627	25W	1160	80	30" (76 cm)	25 mm						

### POWER-GLO

ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1632	14W	880	80	15" (38 cm)	25 mm	A1636	30W	2335	210	36" (91 cm)	25 mm
A1633	15W	960	95	18" (46 cm)	25 mm	A1637	40W	3255	310	42" (107 cm)	25 mm
A1634	20W	1470	130	24" (61 cm)	25 mm	A1638	40W	3320	320	48" (122 cm)	25 mm
A1635	25W	2000	190	30" (76 cm)	25 mm						

### LIFE-GLO

ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER	ART. #	WATTS	LUMEN	LUX	SIZE	DIAMETER
A1632	14W	880	80	15" (38 cm)	25 mm	A1636	30W	2335	210	36" (91 cm)	25 mm
A1633	15W	960	95	18" (46 cm)	25 mm	A1637	40W	3255	310	42" (107 cm)	25 mm
A1634	20W	1470	130	24" (61 cm)	25 mm	A1638	40W	3320	320	48" (122 cm)	25 mm
A1635	25W	2000	190	30" (76 cm)	25 mm						

### T8/T10/T12 BALLAST LIGHTING SYSTEM KITS

ART. #	DESCRIPTION	WATTS	BULB REQUIRED	BULB DIAMETER	MODEL
A1565	Single Unit	20W	1 x 24" (61cm)	25 mm	T8
A1567	Single Unit	30W	1 x 36" (91cm)	25, 32 or 38 mm	T8/T10/T12
A1570	Single Unit	40W	1 x 42" (107cm) or 48"(122cm)	25, 32 or 38 mm	T8/T10/T12
A1573	Double Unit	20W	2 x 24" (61cm)	25 mm	T8
A1575	Double Unit	30W	2 x 36" (91cm)	25, 32 or 38 mm	T8/T10/T12
A1578	Double Unit	40W	2 x 42" (107cm) or 48"(122cm)	25, 32 or 38 mm	T8/T10/T12

### T8/T10/T12 BULB REFLECTORS

ART. #	DESCRIPTION	BULB REQUIRED	BULB DIAMETER	MODEL
A3925	Single Unit	1 x 24" (61 cm)	25, 32 or 38 mm	T8/T10/T12
A3926	Single Unit	1 X 36" (91 cm)	25, 32 or 38 mm	T8/T10/T12
A3927	Single Unit	1 x 48" (122 cm)	25, 32 or 38 mm	T8/T10/T12



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