

REPTILE SYSTEMS ECO HALOGEN TESTS

**A look at the Eco Halogen Lamp from
Reptile Systems**

**Thomas Griffiths, 2024
tom@tomaskas.co.uk
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DISCLAIMER

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The details provided in this document are based on sole use, and the document contains both scientific information as well as personal opinion. Other people may have different results. The tests have been performed to our best knowledge. Although, the tests do not substitute that of a laboratory test. There are uncontrollable variables when testing a single batch of any item. Different items of the same model number may differ due to their manufacturing batch or operating conditions.

This document may refer to the overall exotic animal keeping hobby as the “reptile hobby”, but this is a force of habit – Tomaskas Ltd. does in fact mean the keeping of the broader herpetological spectrum, including invertebrates, amphibians, and even birds.

REASONS FOR TEST

These tests were completed independently. Reptile Systems provided a unit and lamps for independent testing, but made no attempt to influence the results of the tests.

This report is a public version of a private document provided to Reptile Systems. Reptile Systems is a brand based under the umbrella company Aquarium Systems, with products sold worldwide. They produce and sell products for the reptile, bird and fishkeeping communities.

In order to provide the hobby with a base understanding of such products, it's important that impartial tests are conducted. We have a duty, as a community, to look out for each other and share appropriate good practice.

These tests aim to discover if products are suitable for the hobby, independent of the manufacturer's claims.

These tests aim to provide a better understanding of the product in question. The product is aimed at primarily providing Infrared-A and B.

PRODUCT TESTED

The following product was tested.

REPTILE SYSTEMS ECO HALOGEN

Multiple capsules were tested. There was a selection of bulbs sent, including 25W, 50W, 75W, and 100W – each in 240V and 120V varieties, as well as red versions of each. 16 capsules in total.

The capsules can all be used with the same lamp body. One single lamp body was provided.

The lamp and capsules were provided by Reptile Systems as a part of a paid test before the release of the product.

Tomaskas Ltd. received money for providing consultation and testing services on this product.

INITIAL OBSERVATIONS

DESCRIPTION AND BUILD QUALITY

The capsules are – as expected for any glass lamp – delicate. They fit into the main body with G9 fixtures. The capsules are clear (or red, where appropriate) and fit snug into the main body of the lamp.

The capsules show markings for their wattage and voltage, and also have a CE marking.

The unit is well made and sturdy. It is silver in colour and looks sleek. It utilises a PAR30 body, and a prismatic lens.

The unit I received was a used prototype unit – so had some blemishes.

The main body is branded with the Reptile Systems logo. It has a CE marking, and a double insulation mark – meaning that it does not need a connection to earth. There are other safety markings such as a maximum voltage etc.

There is no UKCA mark on the product itself.

BOX/PACKAGING

I was provided with packaging for the prototype unit, and it contained unfinished artwork. Because of this, I have removed my comments that were made to Reptile Systems regarding this matter as many of them have been addressed before the product was released.

ACCESSORIES

No accessories are provided – although this is expected as a product like this wouldn't generally come with any.

PRESUMPTIONS AND GENERAL OBSERVATIONS

The unit is robust. Being a halogen unit, this lamp is expected to have quite a high output.

There is a premium feel to the device.

Although the design isn't necessarily unique in the wider electronics and lighting world, it is certainly novel in the reptile hobby and not something readily available off the shelf. No other reptile-related company has a product like this that I know of.

Considerations must be made when reading the Power Density of a lamp with a red colour.

PHOTOGRAPHS

Here are some images of the lamp, and box etc. Descriptions are provided where appropriate.



Capsule. This is the 25W and 240V version, as shown by the printing.



PRE-RELEASE Box in different orientations. Final box differs slightly.



Box and packaging for capsule. Presumed not to be retail packaging.



Loose and tightened fitting

POWER DENSITY PERFORMANCE

The instructions state that this unit is only supposed to be used in an enclosure. The unit can be angled up to 40° according to the box. For this test, the unit was always parallel to the floor and level.

As it can be presumed that most average consumers will not burn-in their lamp (there is no instruction to do so on the box), I have allowed the lamps 5 hours to burn-in and then began taking readings.

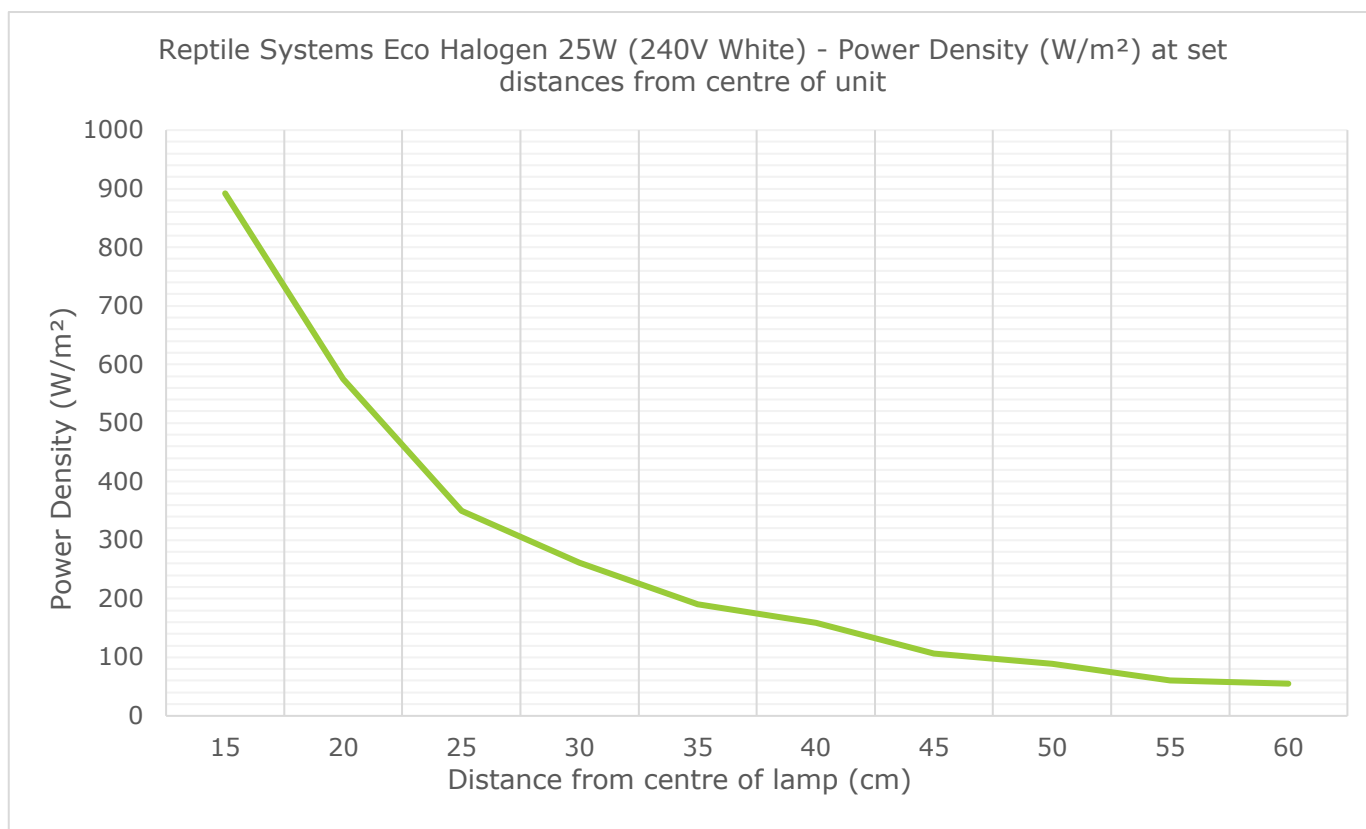
I have measured the Power Density (ISM400), from the centre point of the unit at set distances, with the different wattage bulbs installed.

CENTRE POINT AFTER BURN-IN – WHITE

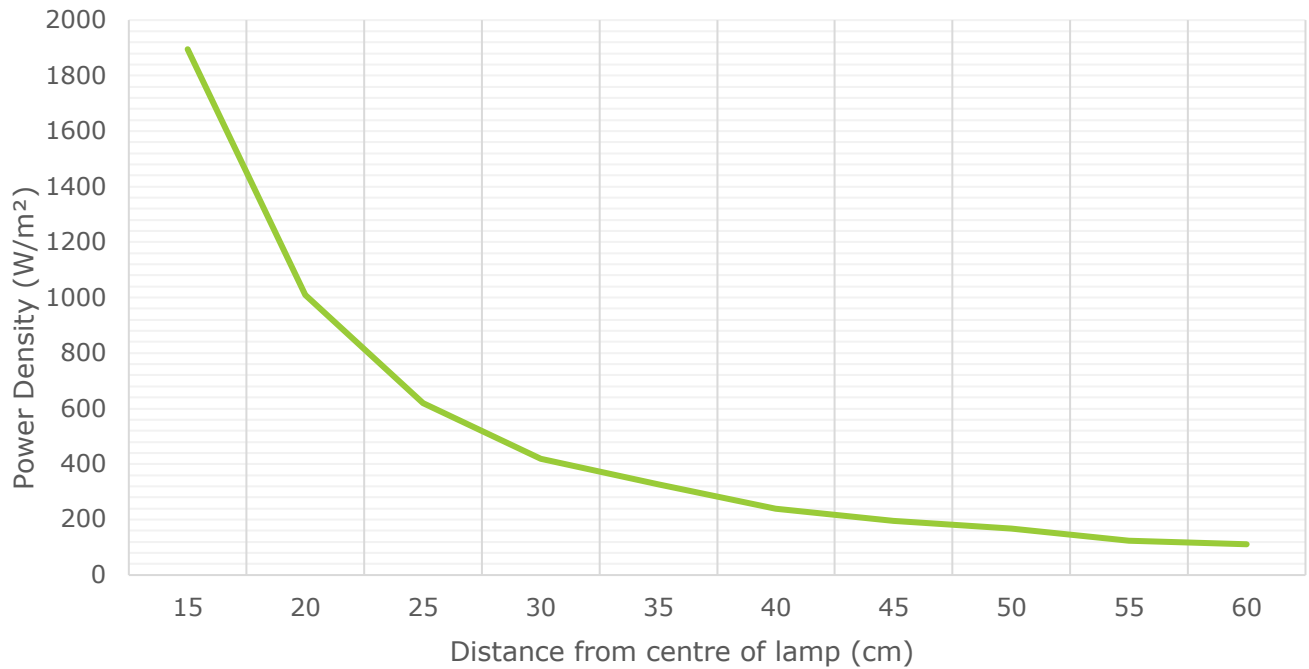
The below measurements were taken at set distances from the centre point of the unit after a 1-hour burn-in. Values were near-identical (all within 10%) for the 120V and 240V versions, so I have included the 240V versions here. Values are in W/m².

Distance (cm)	15	20	25	30	35	40	45	50	55	60
25W	892	575	350	262	190	159	106	89	60	55
50W	1895	1009	620	418	326	239	196	167	123	111
75W	OL	1980	1097	726	572	392	306	252	198	177
100W	OL	OL	1920	973	724	591	427	366	287	241

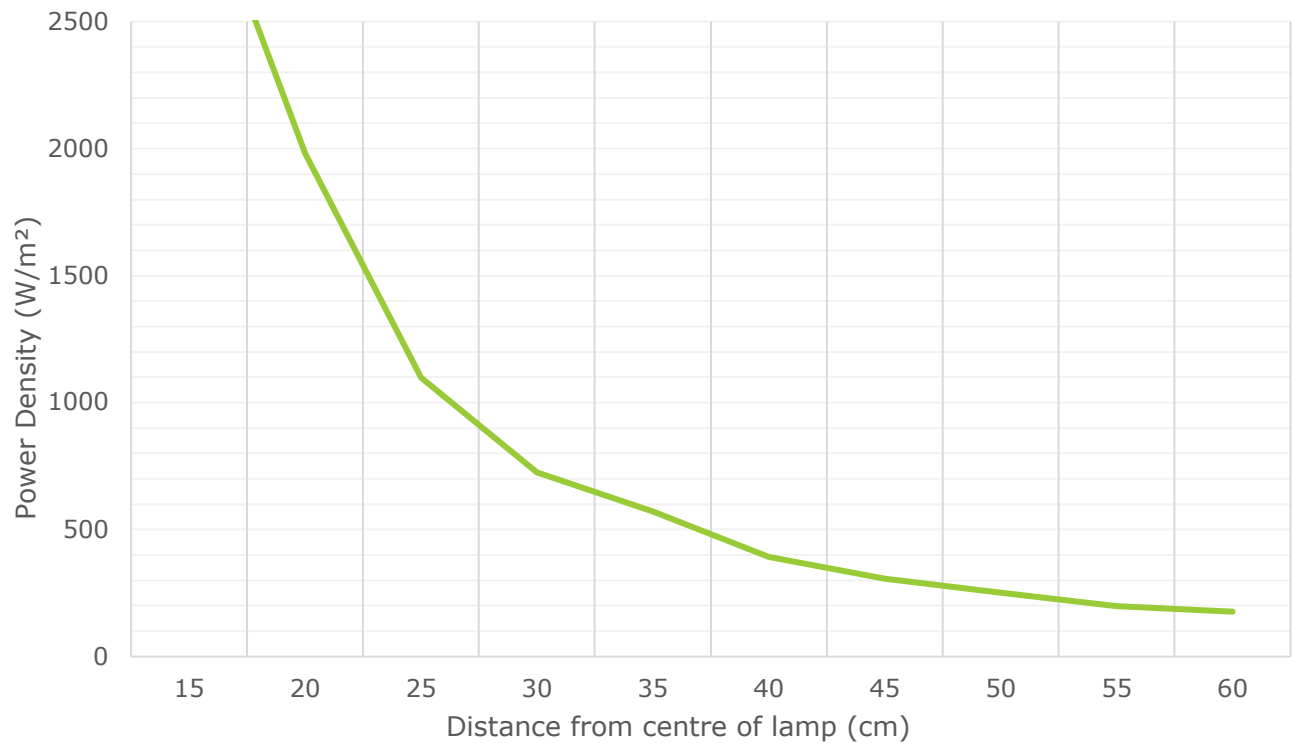
The following is the same data in graphical format for each different respective capsule.

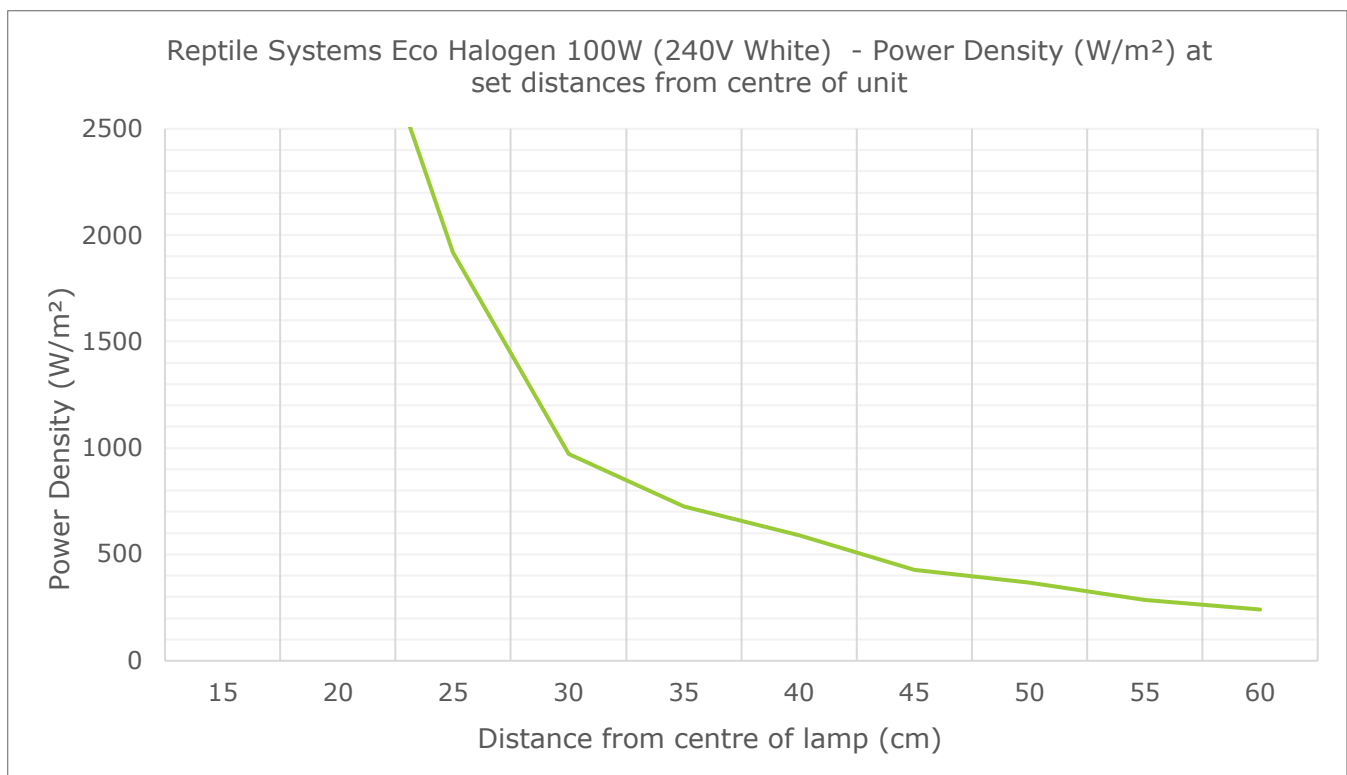


Reptile Systems Eco Halogen 50W (240V White) - Power Density (W/m²) at set distances from centre of unit



Reptile Systems Eco Halogen 75W (240V White) - Power Density (W/m²) at set distances from centre of unit



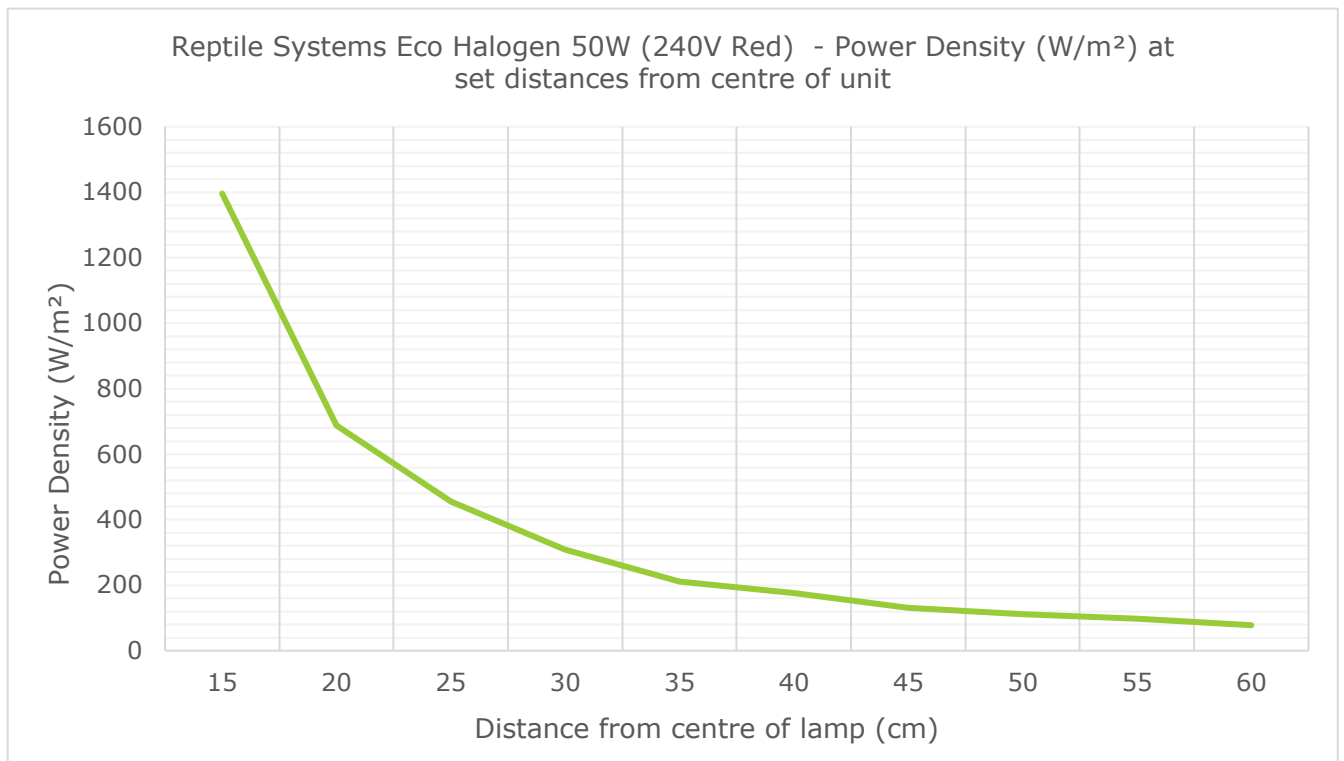
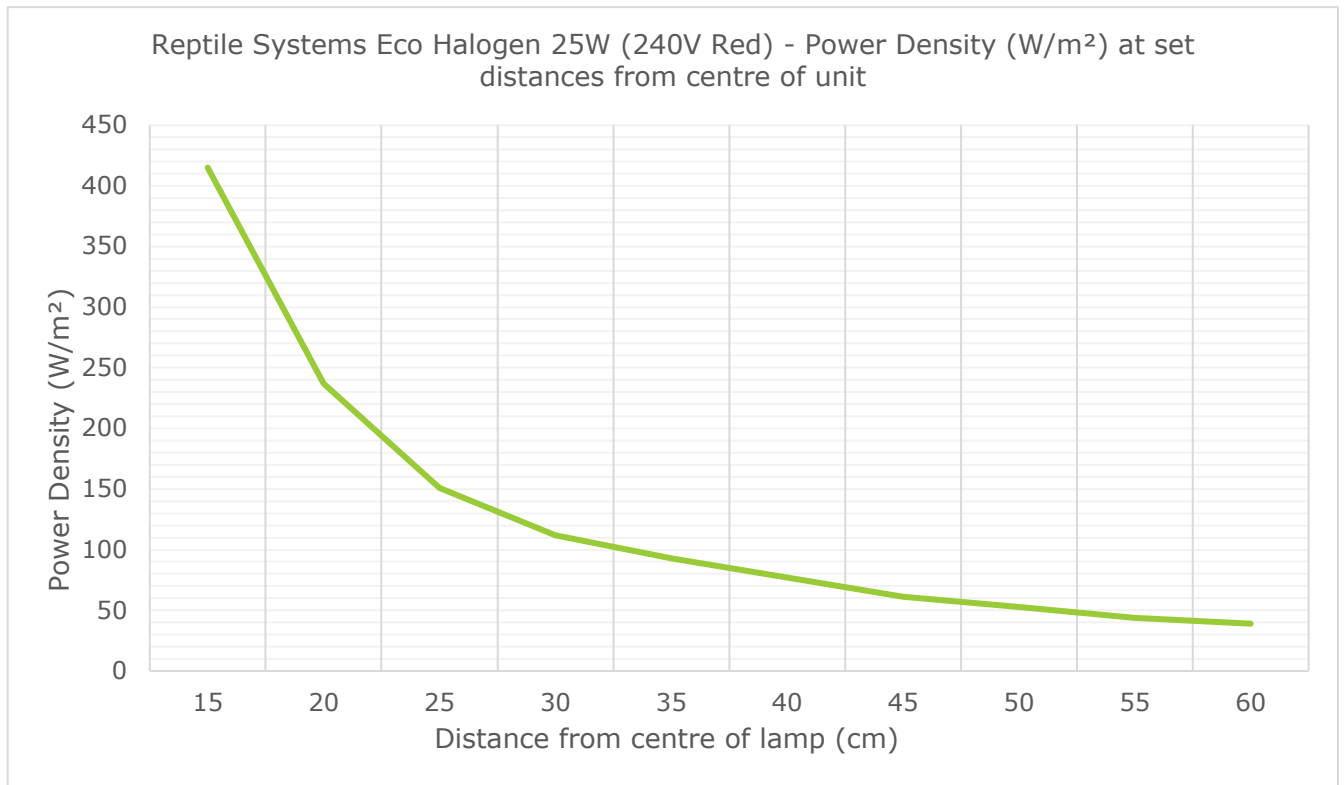


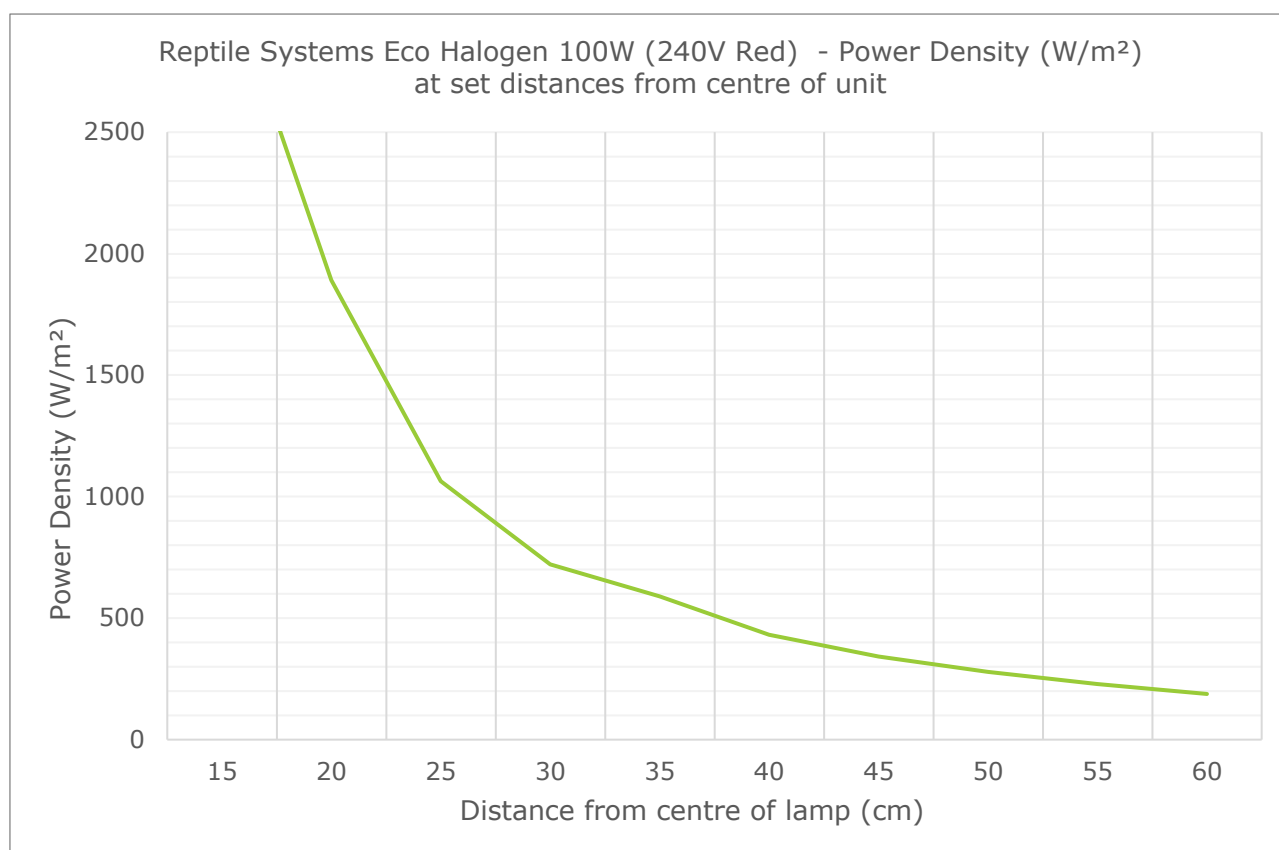
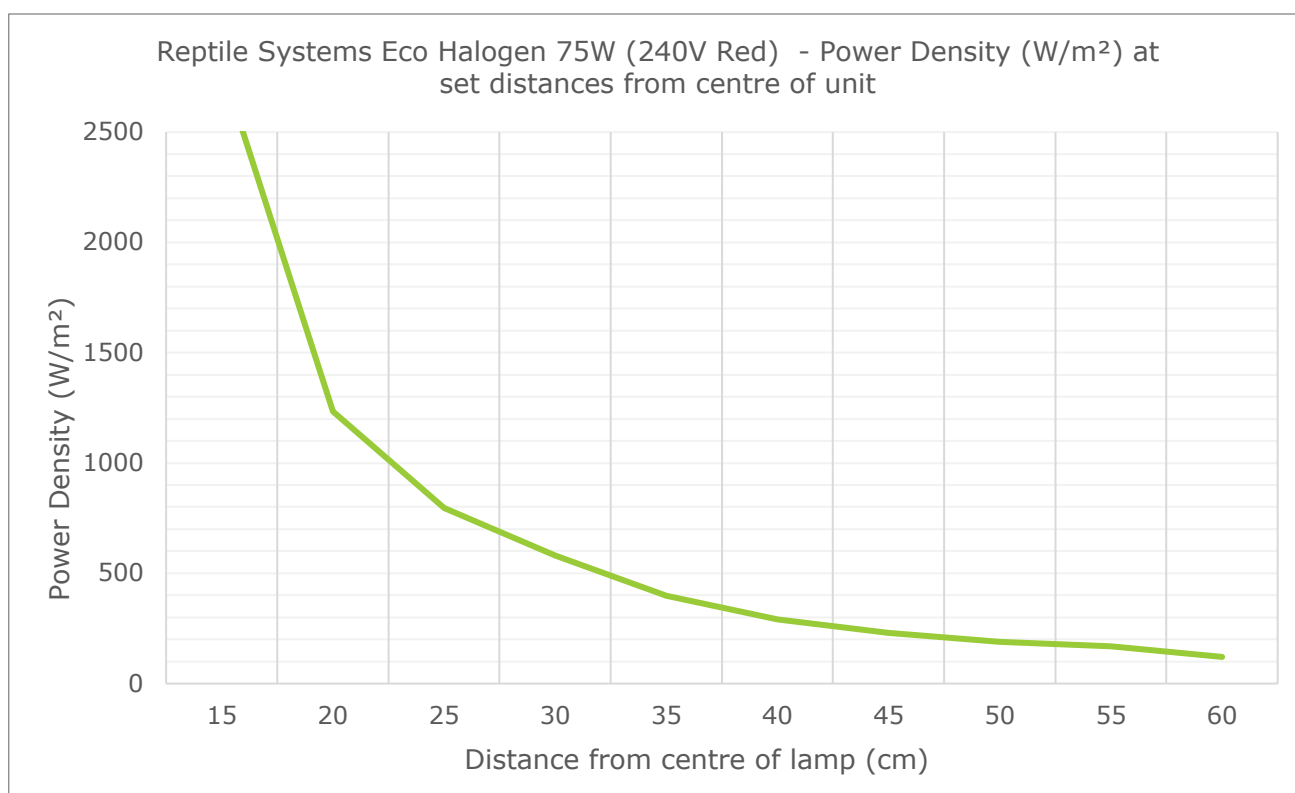
CENTRE POINT AFTER BURN-IN – RED

The below measurements were taken at set distances from the centre point of the unit after a 1-hour burn-in. Values were near-identical (all within 10%) for the 120V and 240V versions, so I have included the 240V versions here. Values are in W/m².

Distance (cm)	15	20	25	30	35	40	45	50	55	60
25W	415	237	151	112	93	77	61	53	44	39
50W	1396	689	456	309	212	176	132	112	97	78
75W	2800	1235	796	581	399	292	229	190	168	121
100W	3200	1891	1065	722	590	431	342	278	230	188

The following is the same data in graphical format for each different respective capsule.





IRRADIANCE CHARTS

PURPOSE

The charts in this chapter are an indication of Power Density (ISM400) output from the unit at set distances, with each respective bulb.

It is possible to visualise how the unit emits radiation as a whole, using Power Density as a measure. This is a good way to see the “spread of light and infrared” or the “beam of light” from the unit.

DISCLAIMER

The charts do not make claim to the safety of the lamps, as there is no data on the spectrum included in the charts. The charts are a guide only. The charts are to scale. A 60-minute warmup was given.

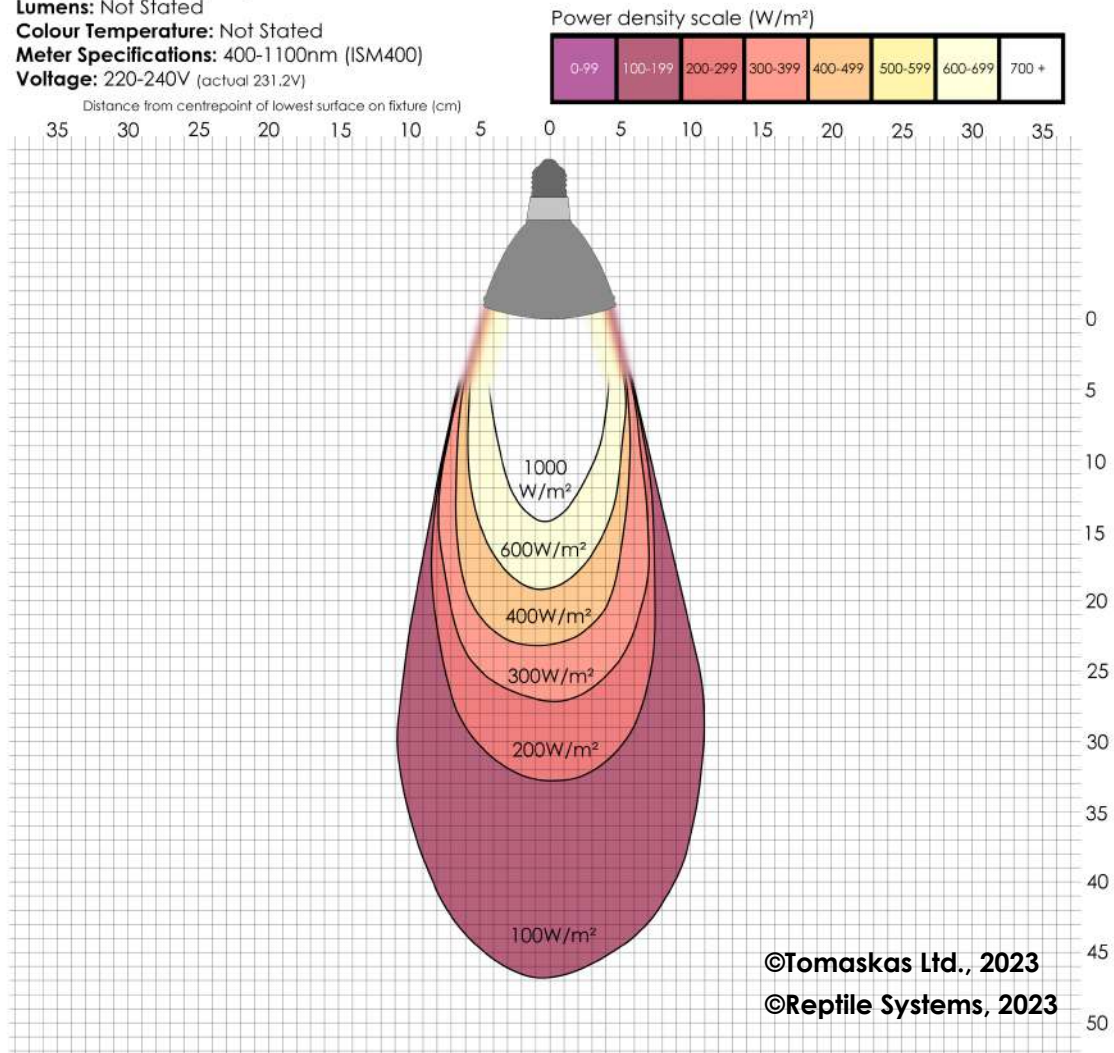
It is worth noting that the red lamps should be viewed in the perspective that a portion of the visible spectrum is removed, thus the range within the sensitivity of the ISM400 is skewed.

240V 25W WHITE

Reptile Systems Eco Halogen Lamp 25W (LAMP ID: TG- RSHAL-025-001)

Power Density Iso Irradiance Chart (Irradiance Map)

Wattage: 25W Rated (actual 23.8W)
Lamp type: PAR30 Halogen
Lumens: Not Stated
Colour Temperature: Not Stated
Meter Specifications: 400-1100nm (ISM400)
Voltage: 220-240V (actual 231.2V)



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240V 50W WHITE

Reptile Systems Eco Halogen Lamp 50W (LAMP ID: TG- RSHAL-050-001)

Power Density Iso Irradiance Chart (Irradiance Map)

Wattage: 50W Rated (actual 49.6W)

Lamp type: PAR30 Halogen

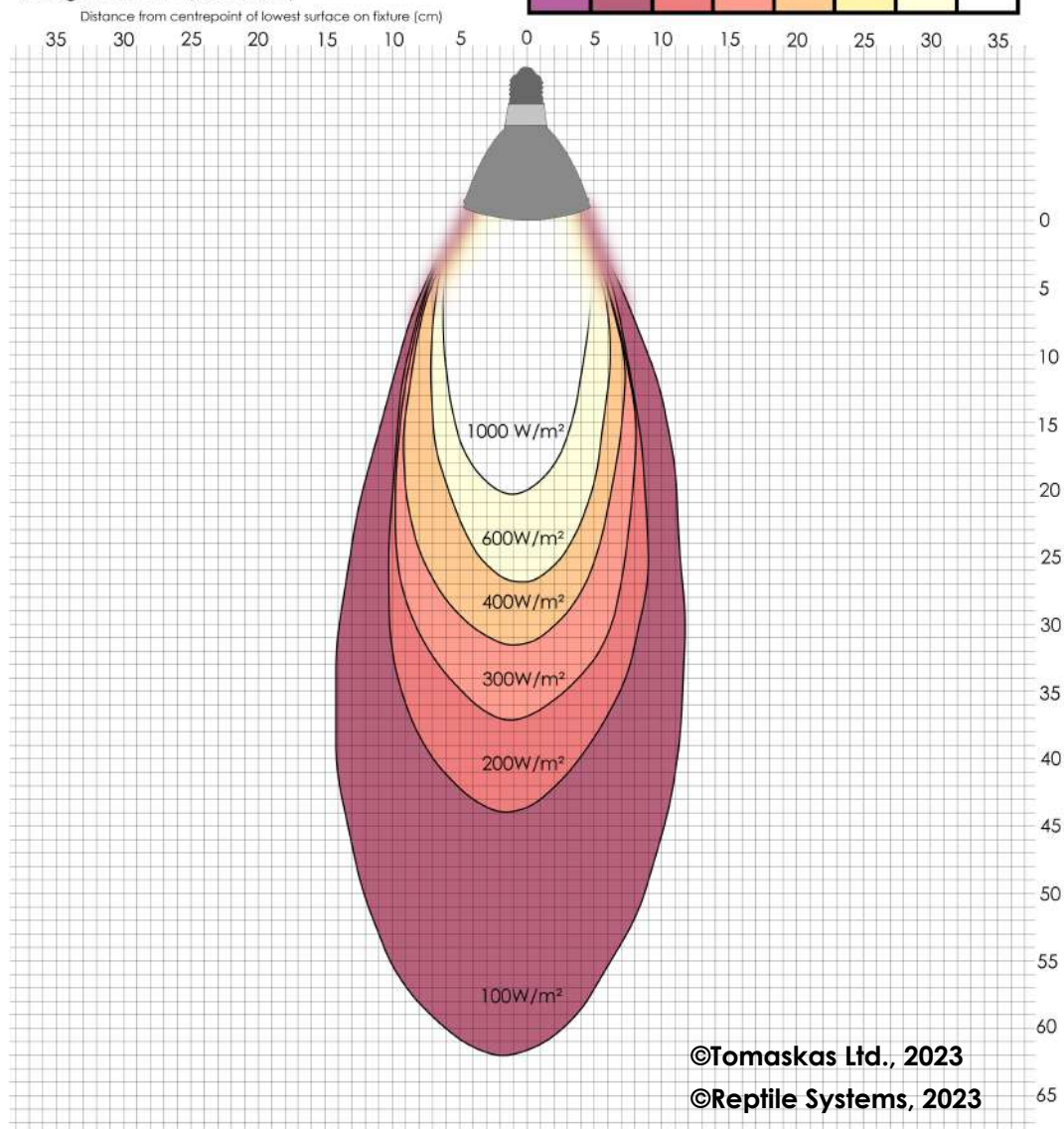
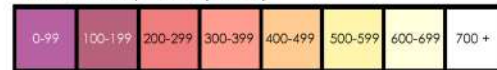
Lumens: Not Stated

Colour Temperature: Not Stated

Meter Specifications: 400-1100nm (ISM400)

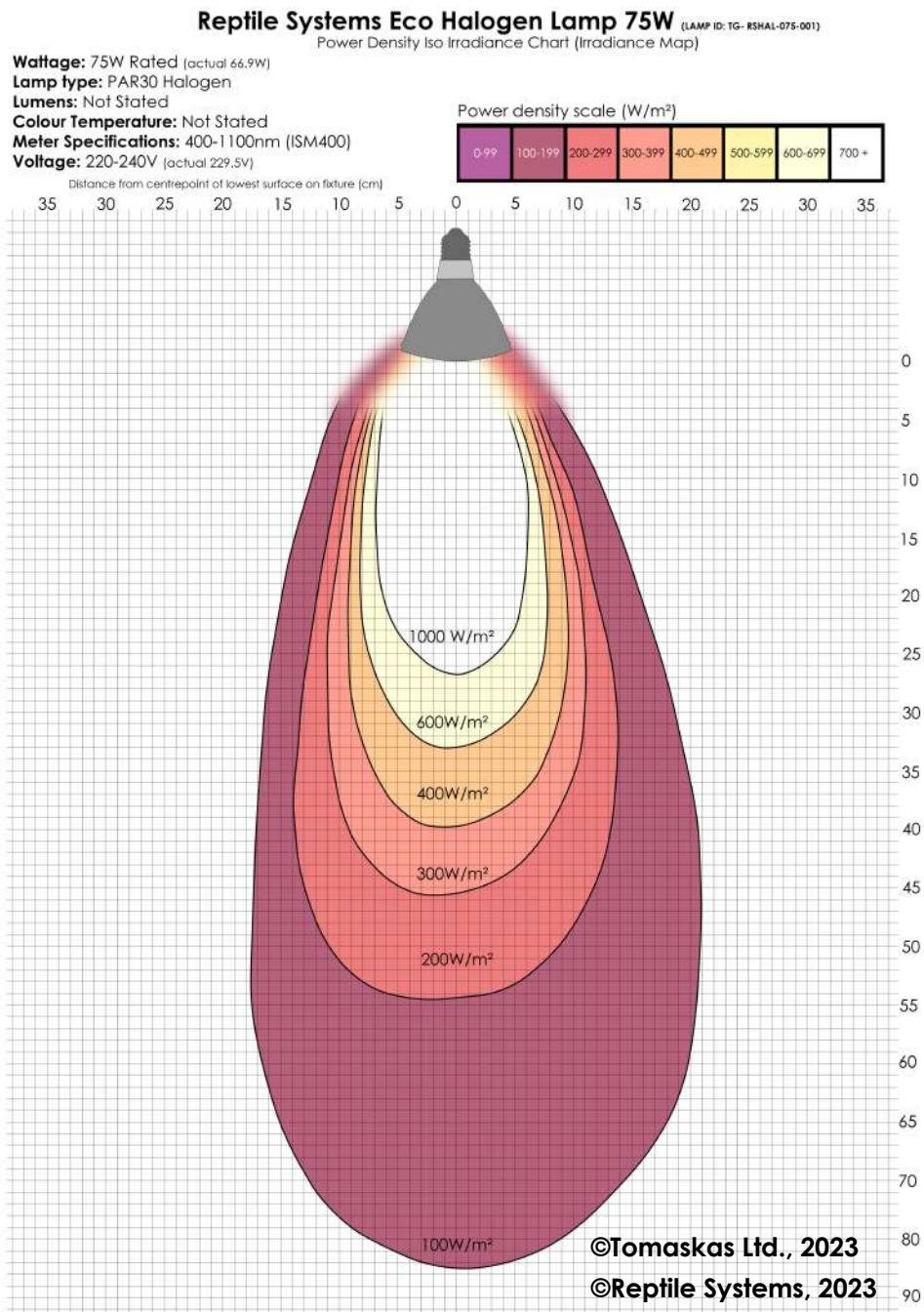
Voltage: 220-240V (actual 232.2V)

Power density scale (W/m²)



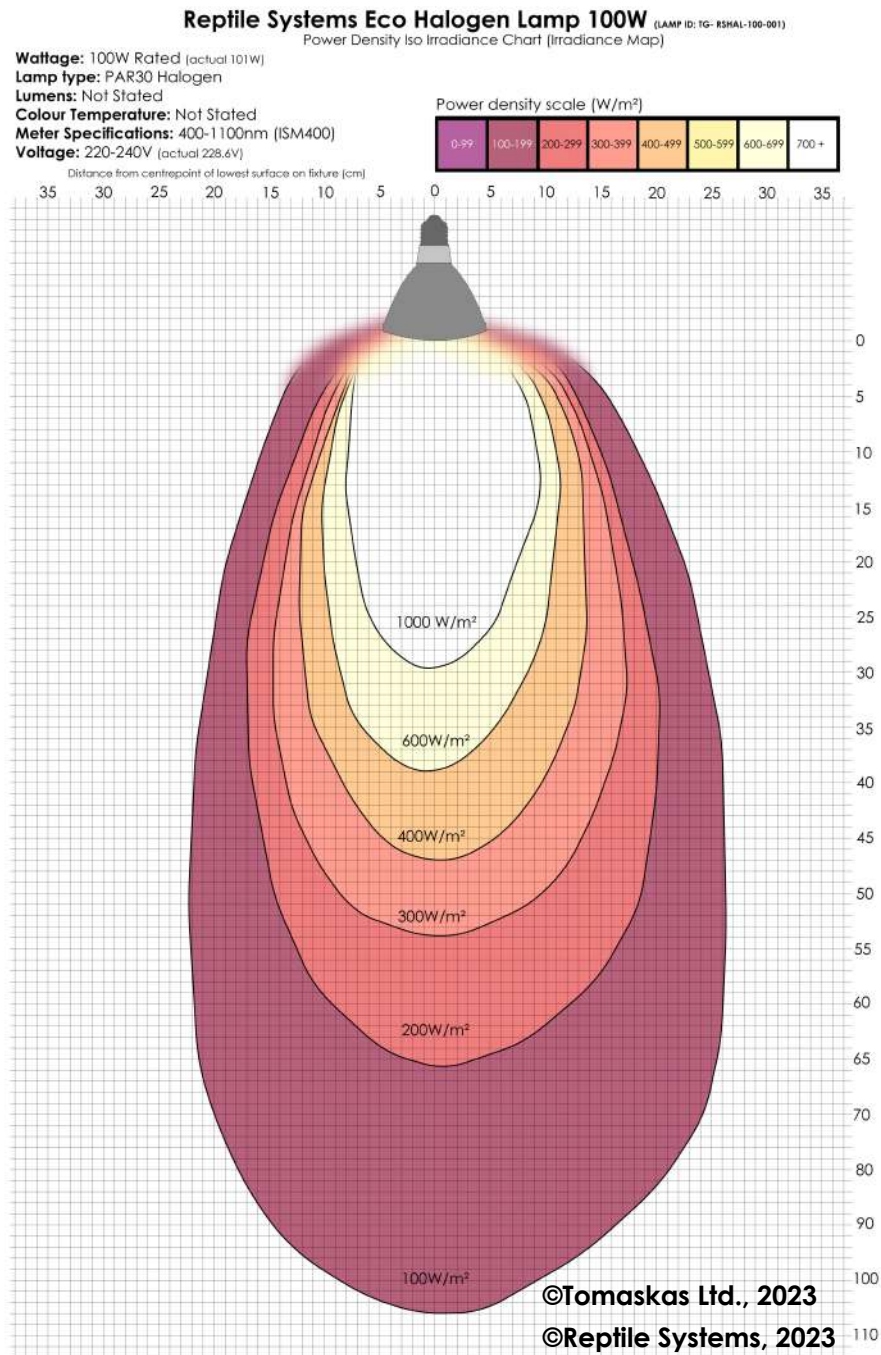
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240V 75W WHITE



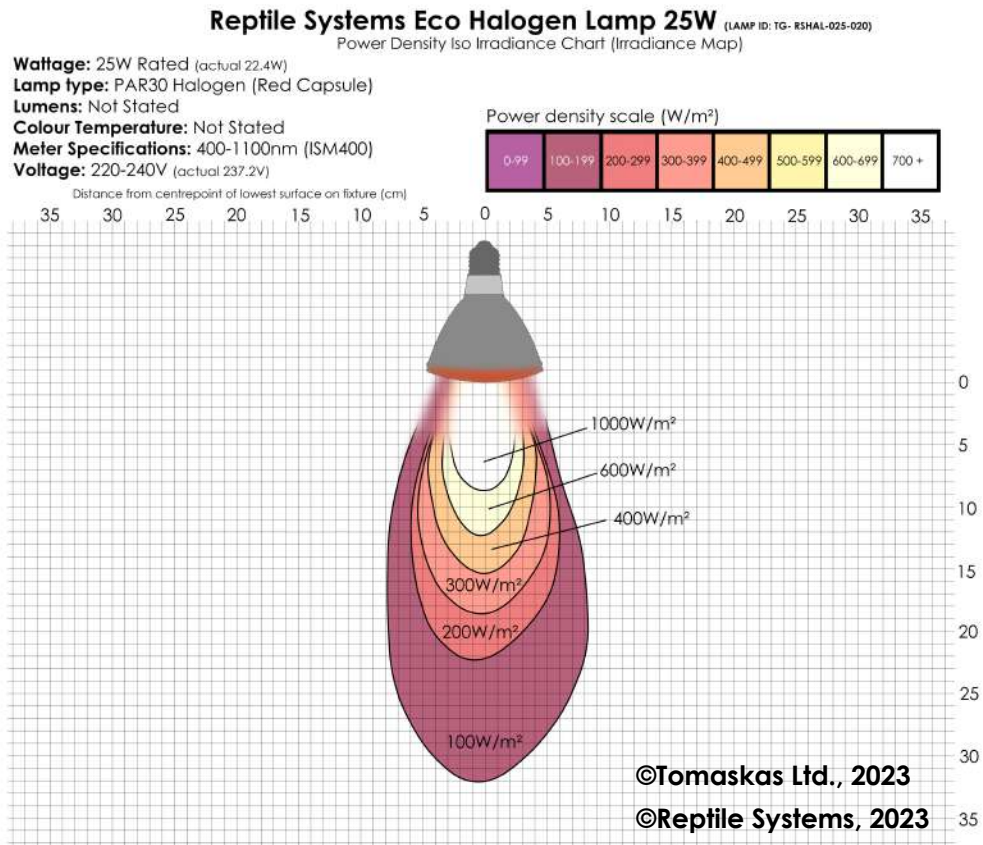
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240V 100W WHITE



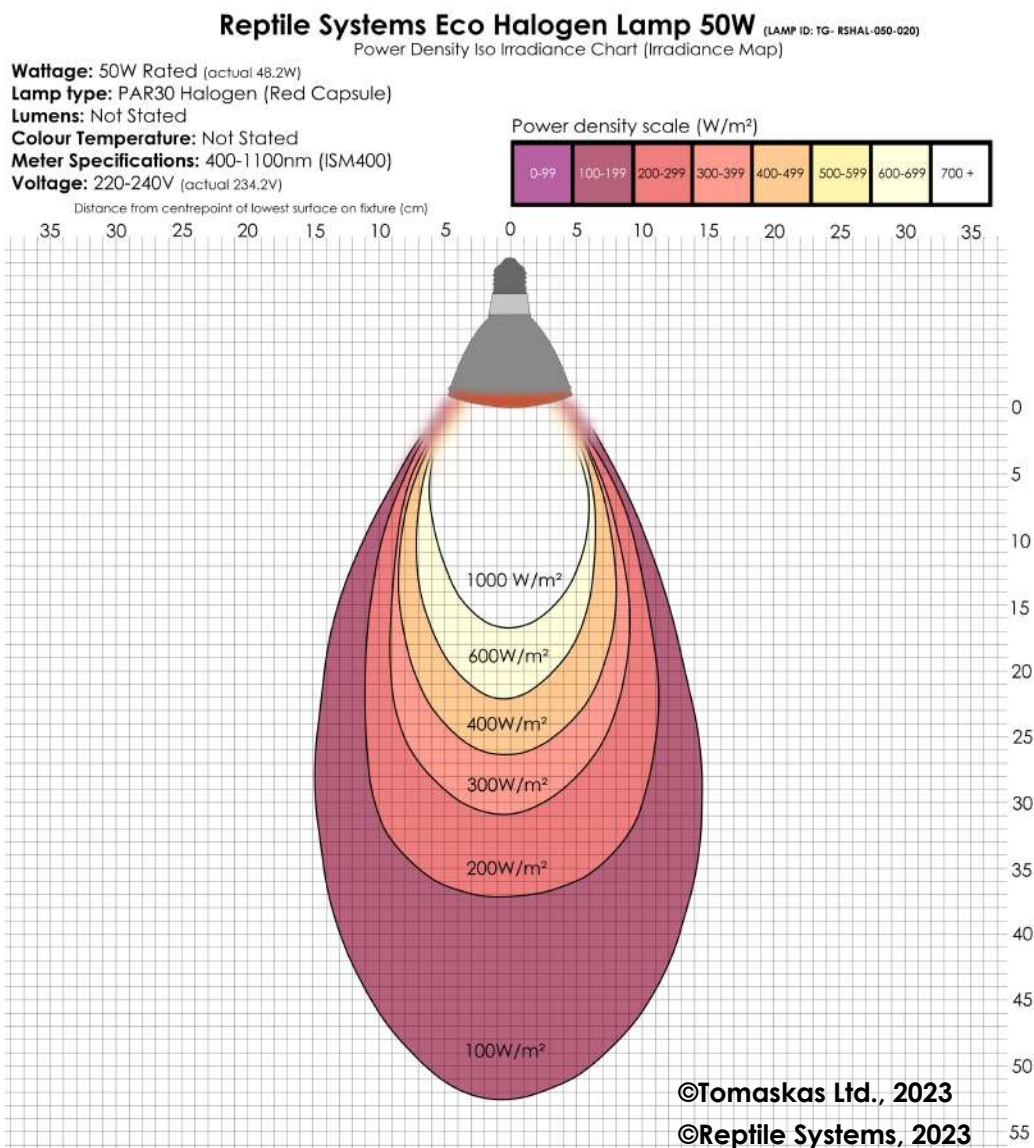
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240V 25W RED



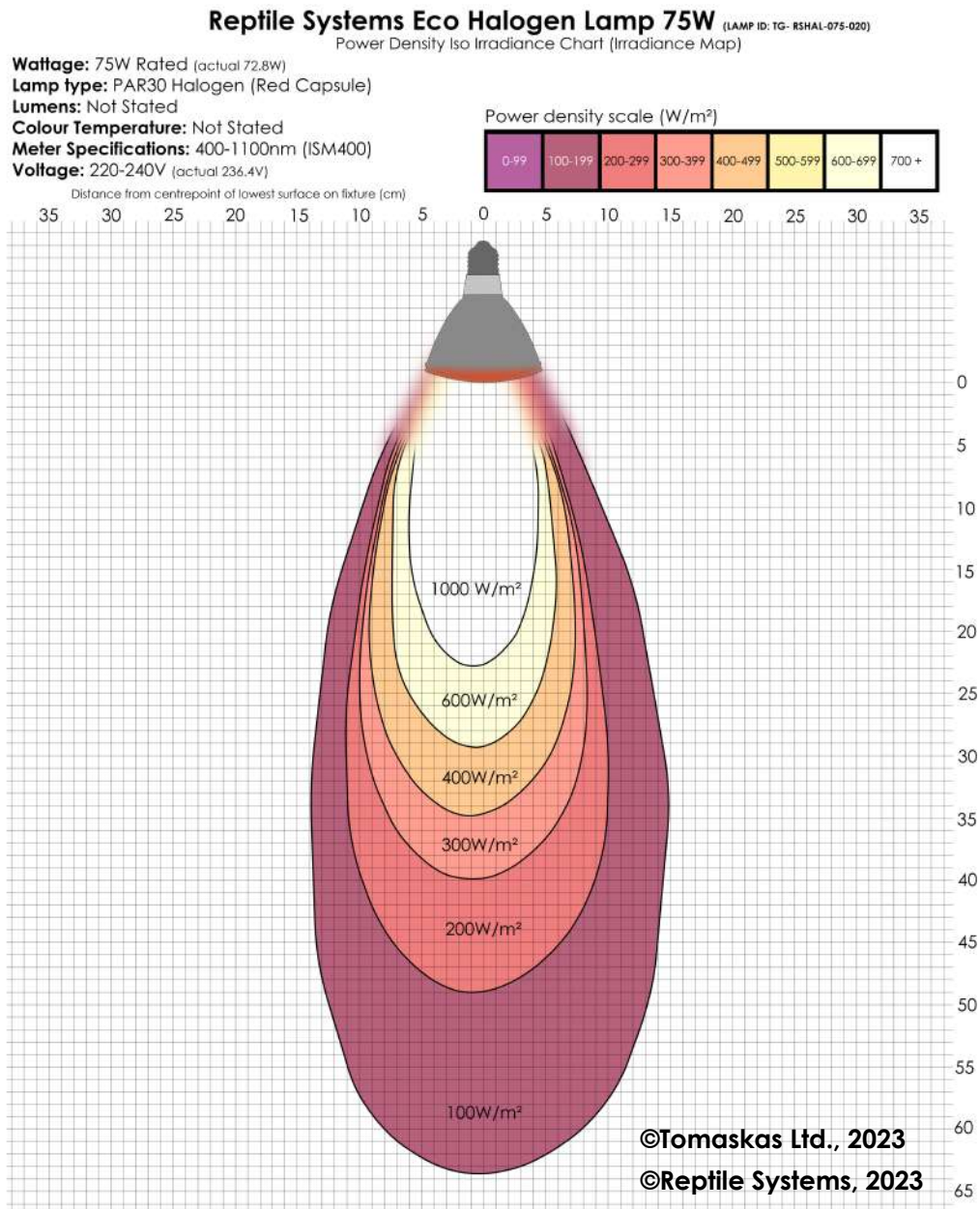
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240V 50W RED



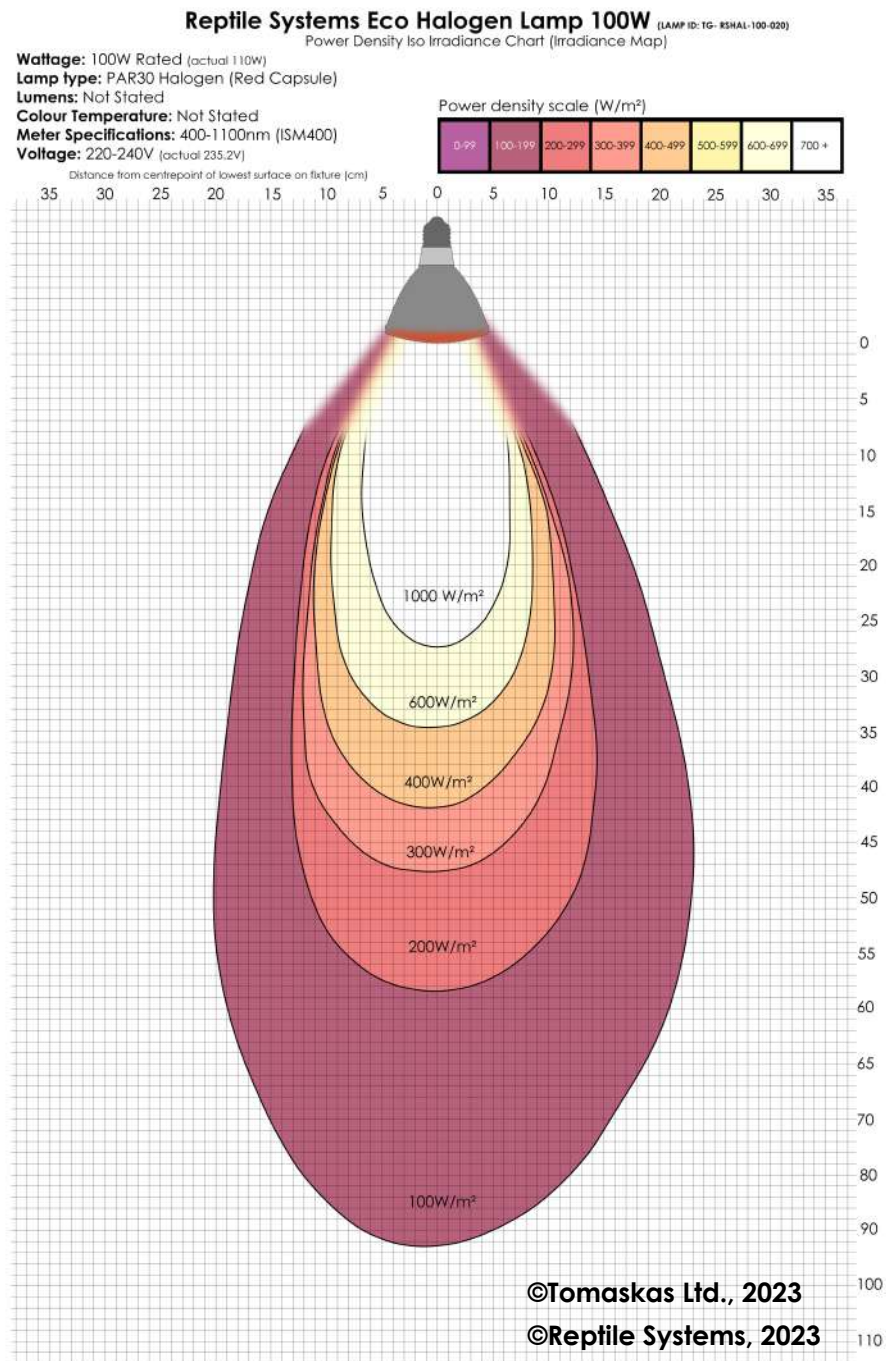
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240V 75W RED



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240V 100W RED



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120V 25W WHITE

Reptile Systems Eco Halogen Lamp 25W

(LAMP ID: TG- RSHAL-025-011)

Power Density Iso Irradiance Chart (Irradiance Map)

Wattage: 25W Rated (actual 24W)

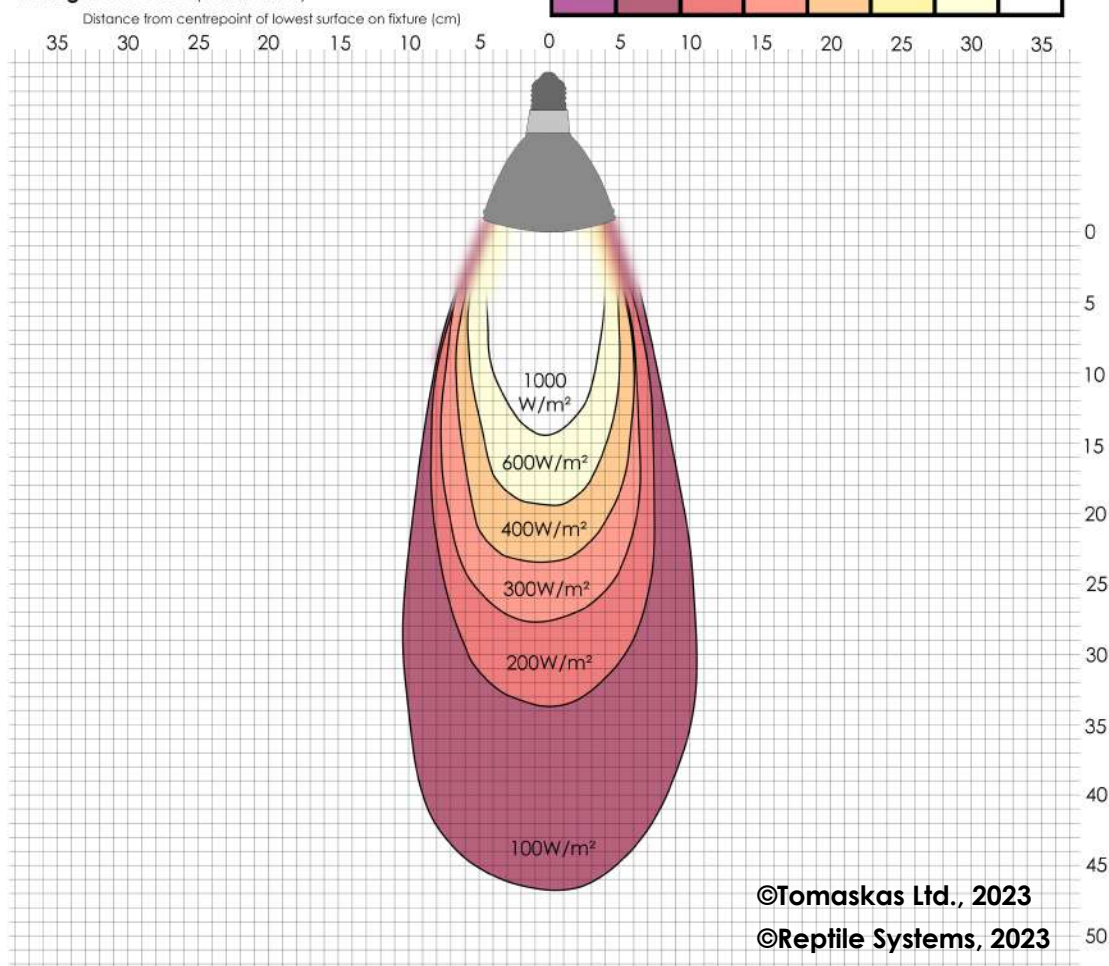
Lamp type: PAR30 Halogen

Lumens: Not Stated

Colour Temperature: Not Stated

Meter Specifications: 400-1100nm (ISM400)

Voltage: 110-120V (actual 115.9V)



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120V 50W WHITE

Reptile Systems Eco Halogen Lamp 50W

(LAMP ID: TG- RSHAL-050-011)

Power Density Iso Irradiance Chart (Irradiance Map)

Wattage: 50W Rated (actual 48W)

Lamp type: PAR30 Halogen

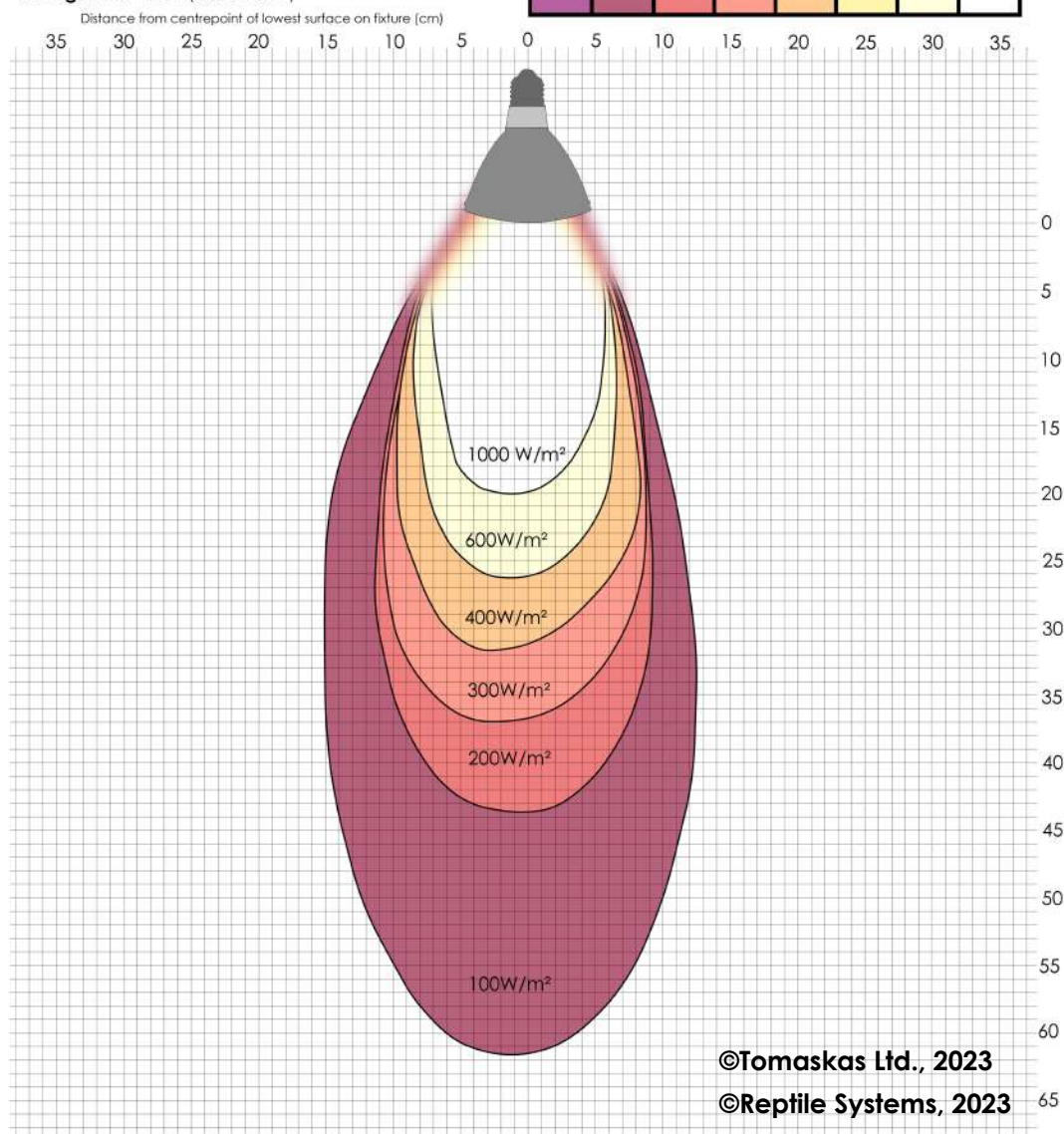
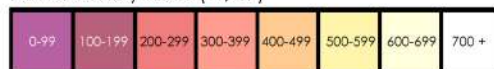
Lumens: Not Stated

Colour Temperature: Not Stated

Meter Specifications: 400-1100nm (ISM400)

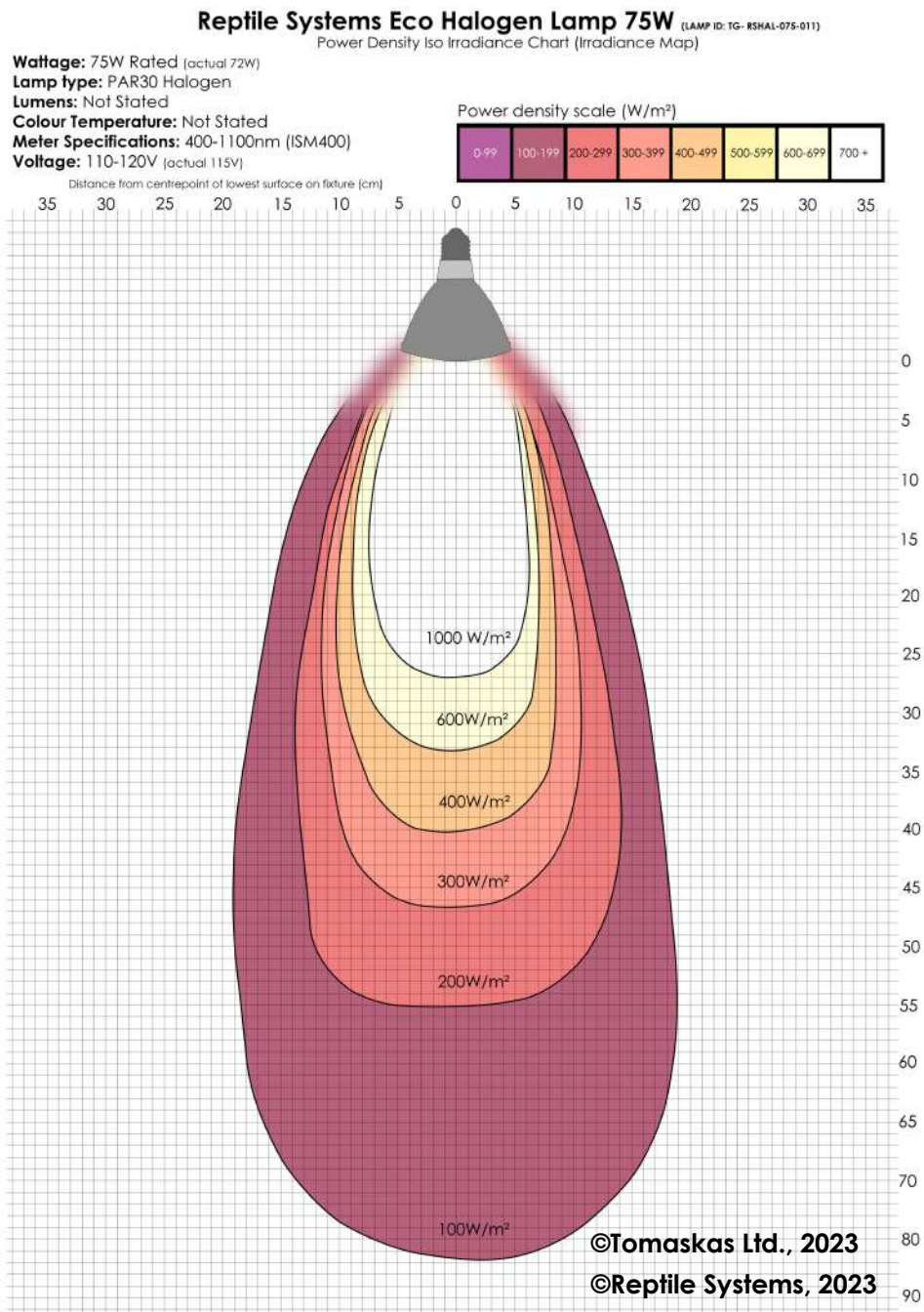
Voltage: 110-120V (actual 118.2V)

Power density scale (W/m²)



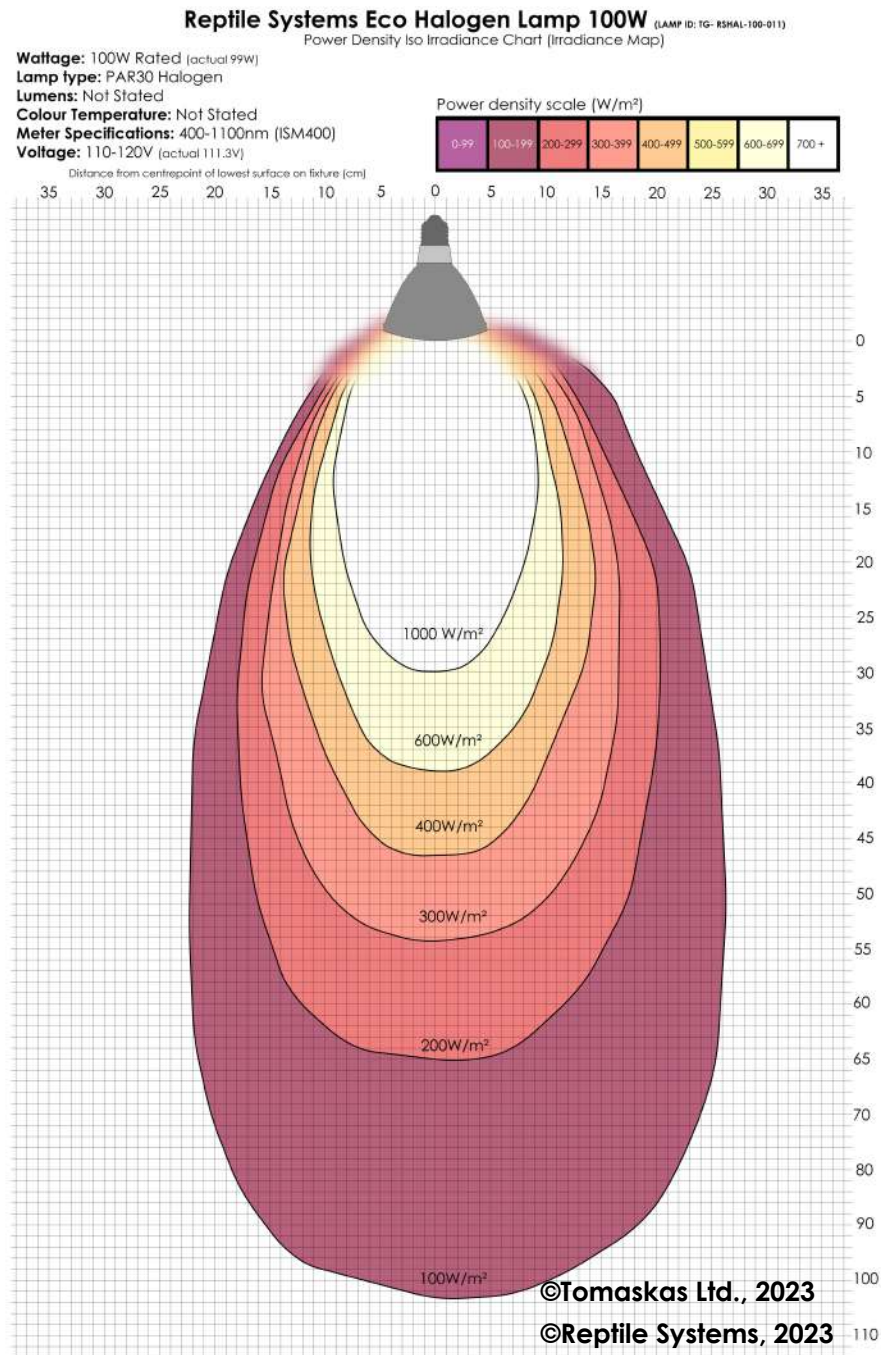
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120V 75W WHITE



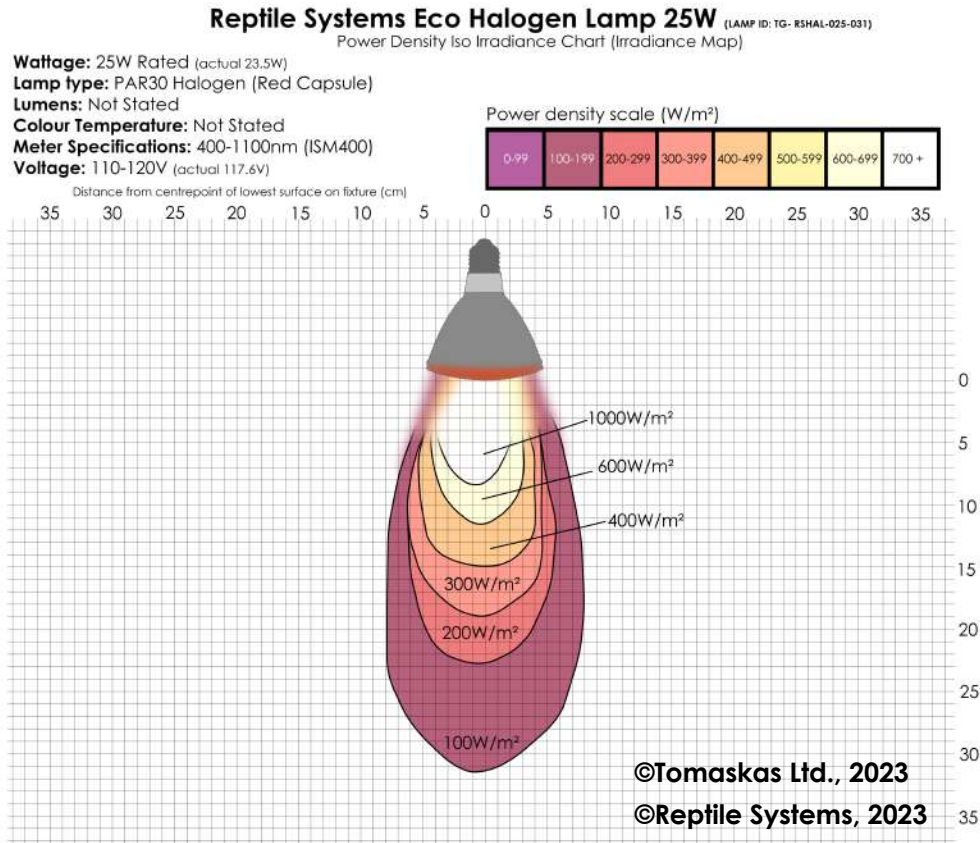
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120V 100W WHITE



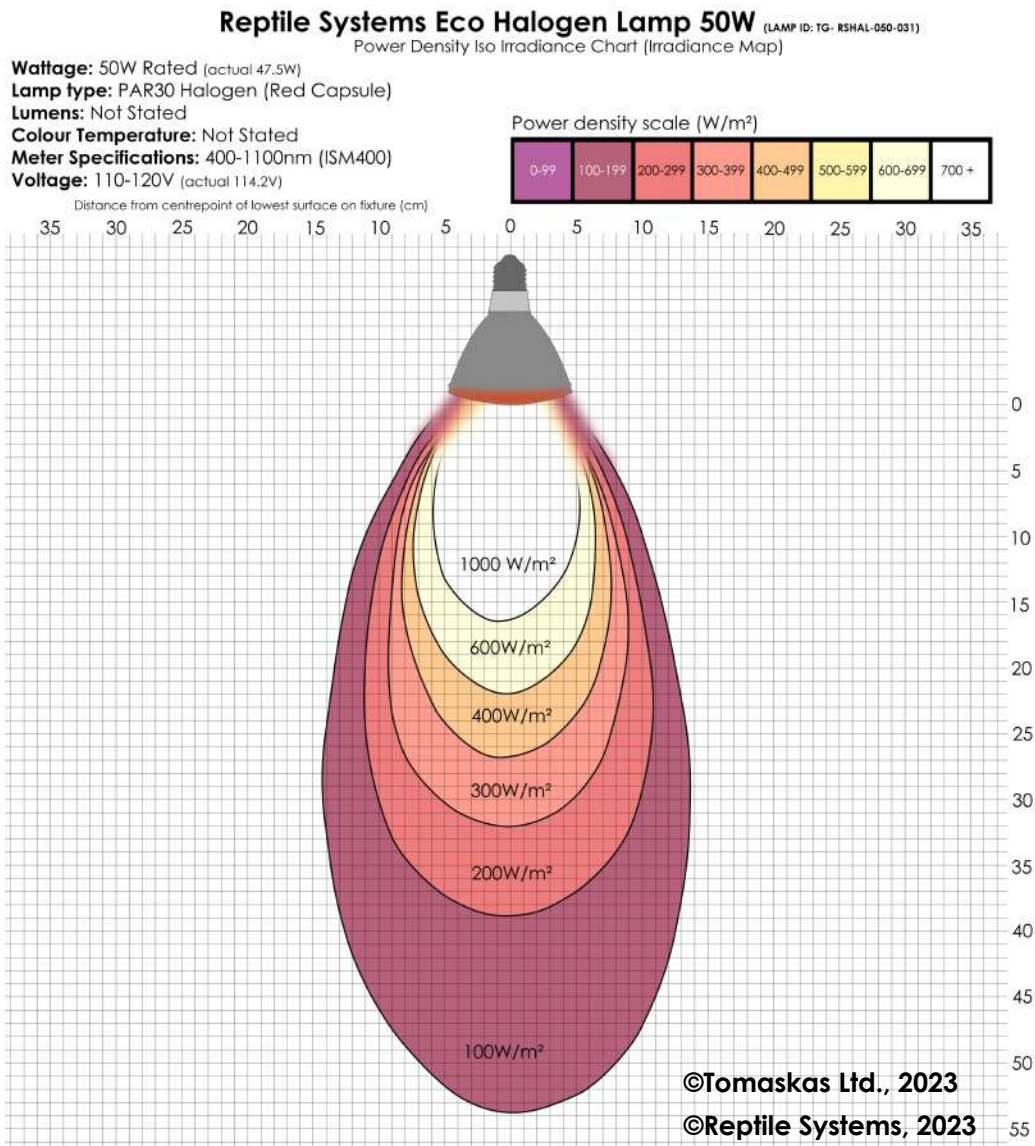
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120V 25W RED



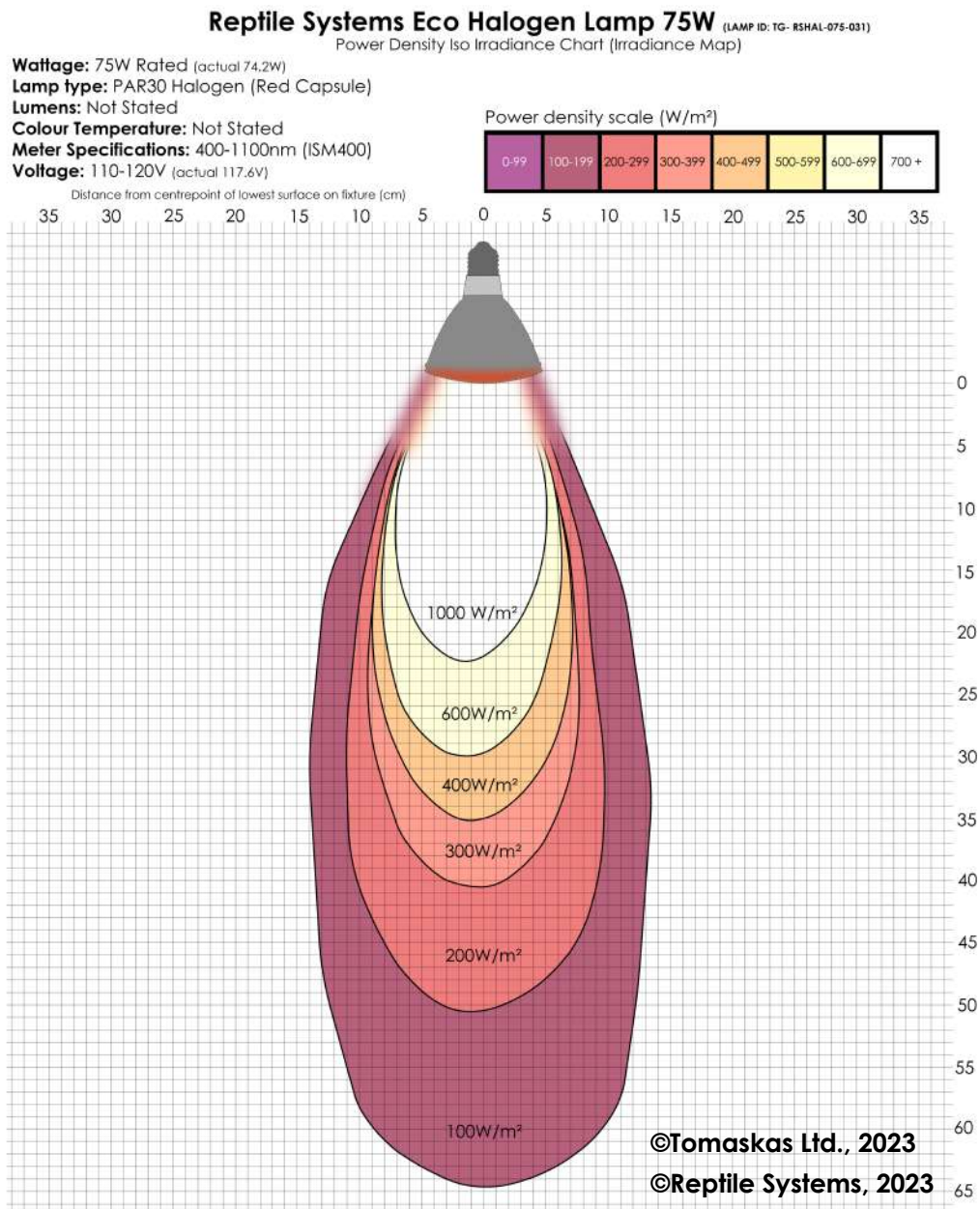
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120V 50W RED



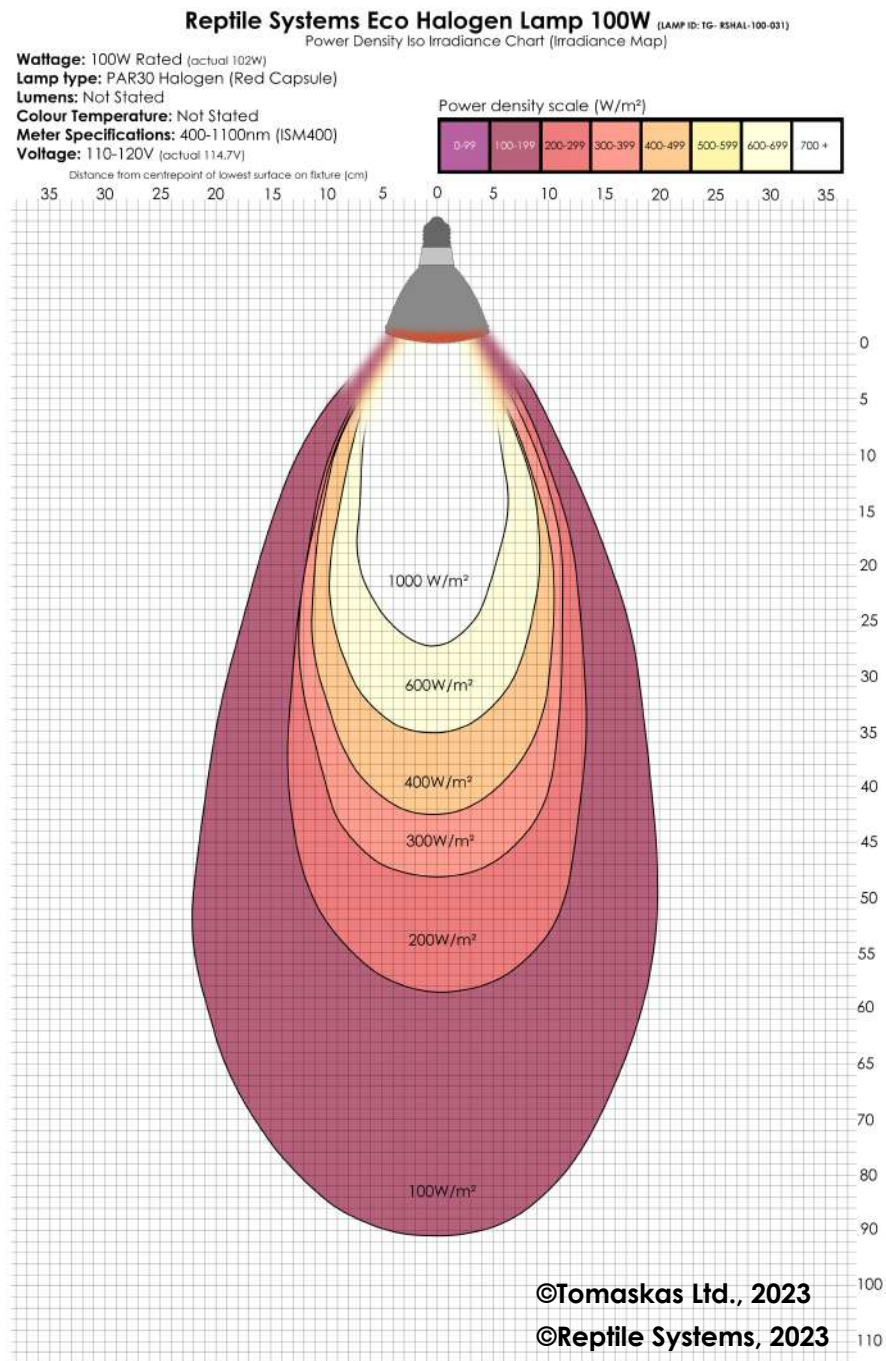
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120V 75W RED



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120V 100W RED



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OTHER MEASUREMENTS

OVERVIEW

This section contains other measurements, such as power consumption details. The unit was given 60 minutes to warm up before each measurement was taken.

I have listed Power Density (Watts/m²) at 30cm, Power Factor, Amps, Frequency, Voltage and average wattage values.

There was no spectrum collected, as the spectrum of a halogen lamp has been widely studied and nothing is to be learned from this.

MEASUREMENTS (AFTER BURN-IN) – 240V WHITE

The following are readings taken from the bulbs after a 1-hour burn-in period and a further 60-minute warm up each.

Category	25W	50W	75W	100W
Amps	0.1	0.2	0.29	0.44
Average Wattage	23.8	49.6	66.9	101
Frequency (Hz)	50	50	50	50
Voltage	231.2	232.2	229.5	228.6
Power Factor	1.0	1.0	1.0	1.0

MEASUREMENTS (AFTER BURN-IN) – 240V RED

The following are readings taken from the bulbs after a 1-hour burn-in period and a further 60-minute warm up each.

Category	25W	50W	75W	100W
Amps	0.1	0.2	0.3	0.47
Average Wattage	22.4	48.2	72.8	110
Frequency (Hz)	50	50	50	50
Voltage	237.2	234.2	236.4	235.2
Power Factor	1.0	1.0	1.0	1.0

MEASUREMENTS (AFTER BURN-IN) – 120V WHITE

The following are readings taken from the bulbs after a 1-hour burn-in period and a further 60-minute warm up each.

Category	25W	50W	75W	100W
Amps	0.21	0.41	0.63	0.89
Average Wattage	24	48	72	99
Frequency (Hz)	50	50	50	50
Voltage	115.9	118.2	115	111.3
Power Factor	1.0	1.0	1.0	1.0

MEASUREMENTS (AFTER BURN-IN) – 120V RED

The following are readings taken from the bulbs after a 1-hour burn-in period and a further 60-minute warm up each.

Category	25W	50W	75W	100W
Amps	0.19	0.42	0.63	0.89
Average Wattage	23.5	47.5	72.4	102
Frequency (Hz)	50	50	50	50
Voltage	117.6	114.2	117.6	114.7
Power Factor	1.0	1.0	1.0	1.0

COMMENTARY ON FINDINGS

OUTPUT OF INFRARED

The unit clearly outputs infrared when paired with each capsule, and the power output of infrared-A increases as the wattage increases – which is to be expected.

The bulbs primarily output IRA and IRB. This is to be expected for a halogen lamp with a colour temperature around 2700°K.

The capsules provided for testing, the ones sold by Reptile Systems for this lamp, appear to be generic G9 capsules. Such lamps are readily available off the shelf in the wattages needed for the unit.

I am not sure how Reptile Systems can circumvent customers choosing alternative replacement capsules unless their versions are offered for a similar price or with some kind of guarantee of longevity.

The 100W capsules all appeared to use slightly more than 100W when in use. They are all within 10%, but this may be something that Reptile Systems wishes to investigate.

The Pre-release packaging clearly shows a bare hand touching the halogen capsule. This has changed in a more recent update to the packaging ready for retail release.

The retail packaging shows the hands holding onto the plastic cushioning instead. This is more appropriate; however, I feel that the use of plastic packaging does not fit well with the “Eco” naming.

Perhaps cardboard or paper packaging would be more appropriate.

USES

Reptile Systems makes no claim for this lamp to be the sole lamp in an enclosure. When speaking to Reptile Systems, they say that they always make recommendation for their heat lamps be paired with a high-quality visible light (LED) and a high quality UVB system.

If paired with an LED product and an appropriate UVB emitter such as a T5HO fluorescent (appropriate for the relevant Ferguson Zone or UVI requirements), the result would be a wide basking area with a fairly broad spectrum of light and good colour rendering properties.

This lamp should not be used as a UVA-emitter, despite common marketing that halogen lamps provide UVA.

This lamp fits into the requirement of heat and IRA in an enclosure. And I believe that it does a good job of it. In order to best replicate sunlight, the ‘white’ version is recommended alongside other lamps, rather than the ‘red’ version.

The lamp would work with animals of different ecological niches, as long as the appropriate wattage is determined for appropriate Power Density, and the temperatures are kept safe.

OTHER COMMENTS

The Power Factor of the bulbs is approximately 1.0. This is to be expected for a resistance-based load such as a halogen lamp.

If used properly, without directly touching the capsules with skin when installing, and with the appropriate measures in place to avoid overheating or burning an animal, this unit is safe and can form a part of a full spectrum lighting setup.

This novel approach of replacing just one small part of a halogen lamp is refreshing. I think it will be viewed positively by the hobby and profession as a whole. There have been comments made by some that this design is not innovative. Although I agree that similar components to those used in this product can be purchased from specialist electronic retailers, I don't feel that such a comparison is fair. This is because the same can be said for many products marketed towards animals.

This design is novel to the animal world, and suits well as an "off the shelf solution" to providing infrared in an enclosure. Providing it is priced correctly, this product will appeal to many reptile owners and zoos alike.

The PAR30 body is rated up to 100W, no matter which wattage version is purchased. The only difference in the different versions that can be purchased is the wattage of the capsule in the box. This means you can buy the 25W version of the PAR30 body, and use a 100W capsule with it.

I can see myself using this lamp for a long time, and I have continued to use it personally with my own animals long after I tested the prototype.

FURTHER TESTS

LONGEVITY AND DEGRIDATION

There is no longevity stated. It would also be difficult to test longevity as halogens can vary widely. A large sample size would be needed for this, with significant time set aside to turn the lamps on and off. This would certainly be doable with enough time and resources.

TEARDOWN

At this point I have not conducted a teardown of the unit. This could involve reviewing electronics inside, although I may seek further counsel on this first as I don't want to break any laws regarding intellectual property.

G9 capsules are widely used in other industries, so I don't suspect there is any ground-breaking technology inside to warrant a teardown.

TERMINOLOGY USED

As with many things, there may be more than one correct or colloquial way to describe the same item. There may also be common terms used that may not be correct in everyday usage. I've tried to remain consistent throughout the document so that if I refer to a specific part of an item, you as the reader will know with confidence which part I'm referring to. I'm only human though, and there may be mistakes.

KIT

This refers to everything that comes in a box, including fittings and instructions.

LAMP/BULB

This refers to the physical bulb item in the kit. In this case, different wattages were tested, but were all halogen capsules.

HALOGEN BULB/CAPSULE

The term given to a bulb that has a tungsten-based filament and a quartz glass body. Inside the glass, the area is filled with a halogen gas mixture – allowing the filament to burn hot.

FERGUSON ZONE(S)

The Ferguson Zones are classification markers for different exposure levels to different UVI. There are 4 Zones. Animals that expose themselves naturally to lower UVI are classified as Ferguson Zone 1, and animals that naturally expose themselves to high UVI are classified as Ferguson Zone 4. This document does not aim to educate about this specifically, and further reading is readily available online. By continuing, it is presumed that you have an understanding of Ferguson Zones – including the differences between the different Zones.

COLOUR TEMPERATURE (AND CORRECTED COLOUR TEMPERATURE)

Colour temperature, or CT, is widely used to define the colour appearance of a light source. Colour temperature is technically only used for “true” light sources – defined as a black body that reads close enough to the Planckian locus.

Corrected Colour Temperature, or CCT, is used on a light source that doesn’t read close to the Planckian locus.

Both are defined in degrees Kelvin where a Warm White is around 2700K moving to Neutral White at around 4000K to Cool White, 5000K or more. Note that Colour Temperature and CCT do not tell you anything about the colour rendering ability of a light.

This document does not aim to educate about this specifically, and further reading is readily available online. By continuing, it is presumed that you have an understanding of CT/CCT – including the differences and similarities.

COLOUR RENDERING (INDEX)/CRI

Broadly defined as an indication of how well a light source can provide wavelengths that allow for certain colours to be visible to the human eye. This is defined by the CIE in greater detail, along with standardisations on measuring the level of colour rendering capability – referred to as the “index” of colour rendering.

Light with a low CRI is less effective as one with a high CRI. The CRI of unobstructed sunlight is 100.

This document does not aim to educate about this specifically, and further reading is readily available online. By continuing, it is presumed that you have an understanding of CRI.

POWER DENSITY (PD)

For the sake of this document, this refers to a reading in Watts per square metre (W/m^2) in certain wavelengths.

INFRARED (IR)

IR is the term given to a section of the electromagnetic spectrum on certain wavelengths. It is invisible to humans. The range is so vast that it has been split into subcategories – A, B, and C. Some of these wavelengths (IRA or sometimes “Near IR”) are associated with “deep heating” of skin and organs, whereas others (IRC or sometimes “Far

IR”) are associated with general warming of the air and generally aren’t suitable for “basking”.

There is a limited, but growing, understanding of infrared in the reptile hobby and herpetoculture as a whole. We know that there are a multitude of biological benefits that short-wave infrared has on the body. In more recent years, the use of short-wave infrared has become more popular even regarding human physiology and medicine, although it has been noted in scientific literature since at least the 1960’s.

It is difficult to measure infrared – specialist hardware is needed in order to measure the true temperature of a black body (although there is a relationship with colour temperature), or to conduct infrared spectroscopy.

However, some assumptions can be made based on our understanding of black body radiation are our knowledge that a tungsten filament acts like a black body radiator (again, there is a direct relationship between kelvin and wavelength).

This document does not aim to educate about this specifically, and further reading is readily available online. By continuing, it is presumed that you have an understanding of IR – including the differences between short wavelength (Near) IR (primarily associated with IRA and IRB) and long wavelength (Far) IR (primarily associated with some IRB and all of IRC).

TESTING METHODS

EQUIPMENT

In order to ensure that results are as true and comparable as possible, I have used readily available measuring devices for the test and industry standard devices too.

Room temperature measurements were taken with an Inkbird branded digital thermometer, with part number IBS-TH2. The manufacturer claims the device to have an accuracy of $\pm 0.3^{\circ}\text{C}$.

A power meter was used, model KWE-PM01, to monitor power usage.

Power Density was measured with an ISM400 unit from RS. This device directly responds to wavelengths ranging from 400nm to 1100nm (visible light and some IRA).

METHODS

The method for creating ISO Irradiance charts is very close to the method documented by other professionals for UVI charts, and by myself for Power Density charts. The ISM400 was central in relation to the lamp.

Power Density was measured in the testing room before each test to ensure that results were only measuring the lamps and not any other sources. I have also tested the reflected radiation from my wall and found that even at close range, the reflected light detected by the sensor was negligible (3-8W/m²) with a 400W lamp.

The lamps were given 30 – 60 minutes to “warm up” before each individual test, unless otherwise noted. Spectrometer readings were taken in line with standard processes.

The lamps had between 1 hour of “burn-in” before the tests began, unless otherwise noted. Capsules were handled carefully, as should be done with any capsule halogen bulb. Before every test took place, a dry microfibre towel was used to wipe the lamp and reflector to ensure that the lamp was clean.

SPECIAL THANKS

Special thanks are in order for many friends, colleagues, and partners. I'd like to give a thank you to the following, but there are undoubtedly more that have not been named.

COLLEAGUES

Reptile Systems provided lamps for testing and paid for the tests as a part of a consultation package.

The work of others has been highly beneficial to being able to conduct these tests. Including but not limited to Roman Muryn C.Eng, Dr Sarina Wunderlich, Joseph Brabin, Quentin Dishman, and Dr Frances Baines. These individuals did not take part in consultation, nor do they necessarily approve this product.

LITERATURE AND FURTHER READING

In this paper, I have made comments supported by scientific literature, both peer-reviewed and not. Here is a list of literature that I have either directly referenced, or used in support of points and claims that I've made. The list is not extensive.

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