

An introduction to Circadian rhythms and why they're important

Circadian rhythms (also known as the “biological clock”) are important to every living thing, and have been described in species from bacteria to human beings.

In particular, light cycles are vital for reptile health, which is why proper lighting is key.

Controlled by the nervous system the circadian rhythm is a way the body functions and responds to daily natural life. In the wild, it helps control critical things, such as when to eat, sleep, reproduce and other bodily functions over the normal day of 24 hours. It is also very important for reptile thermoregulation.

About thermoregulation

Since reptiles cannot control their body temperatures, it's important for them to have a correct biological clock. This rhythm is subconscious, controlled by chemistry, and is also species specific.

While natural, uncontrolled, and organic in the wild, animals in captivity rely on their keepers to give them the most naturalistic experience possible. Understanding this is the best way to provide a healthy environment for your reptile.

How do Circadian rhythms work?

Circadian rhythms are controlled by cells in the body and can influence organs from large muscle systems to photoreceptors in the eyes, which can affect individual behaviours in reptiles (and other animals). Cells can work individually or together to help reptiles detect their environments and respond to fluctuations or changes.

This biological clock is also affected by the environment, and is a way to tell the animal if something is different or wrong. This helps them respond and do what they can to adapt. Overall, it is a part of the way reptiles have survived and evolved into what they are today.

Circadian rhythms in reptiles

In one study, it was found that lizards control their biological clocks by the cells in their eyes. This shows the importance of proper lighting and UV, which is controlled by reptile keepers when in captivity.

Reptiles rely on these natural cycles to control their lifestyle and for many species, are important triggers for breeding and other behaviours.

The biological clock is, without a doubt, an important part of a healthy reptile life, and understanding it helps to provide a more enriching captive experience for your animals.

The biOrb EARTH is engineered to have the most natural Circadian rhythms possible and to replicate sunlight as closely as possible.

The closest to natural sunlight of any vivarium

The proper lighting of your vivarium is a complex issue as the different animals have varied requirements and there is no standard lighting suitable for all kinds of reptiles.

In nature, animals enjoy a light intensity of 100.000 lux and more. In normal vivariums the light intensity is much lower and most vivariums will probably not even reach 10.000 lux, not enough to allow the animals to show their natural behaviour and nicest colours.

It is therefore important that you do not only concentrate on UV but also install a proper daylight lighting as basic lighting for all vivariums. The more light you offer the reptile the better.

With the biOrb EARTH lights it is possible to achieve natural light intensities.

How?

For millions of years, animals and plants have adapted in a protracted

evolutionary process to what the sun sends to the earth.

If we look at the spectrum of sunlight (i.e. the part of solar radiation visible to us), we see a very uniform distribution of all spectral colours.

For this reason, illuminants for vivariums should have a spectrum that is as balanced as possible, without gaps.

A natural sunrise and sunset, from the slimmest light

biOrb EARTH White LED's does offer three dimmable channels of control with 3200 K / 4300 K / 7300 K allowing a natural sunrise and sunset as the light intensity moves across the tank, with a maximum combined output of 1300 lm.

The biOrb EARTH's white LED is slimmer than any other light - yet powerful.

It provides the energy needed for good plant growth.

In addition, it causes an active sun especially for reptiles from sunny areas, as the visible light in vivariums is increased.

The light provides to project up to 65 lumens per watt.

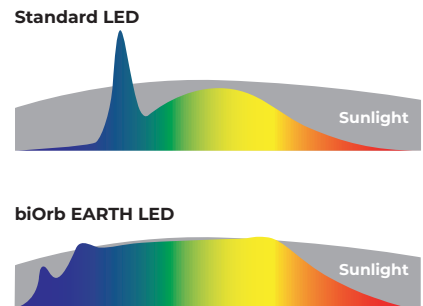
A wider spectrum than conventional lighting

As it can be seen in the graphs, our white LED does cover off more light spectrum than any conventional white LEDs on the market place.

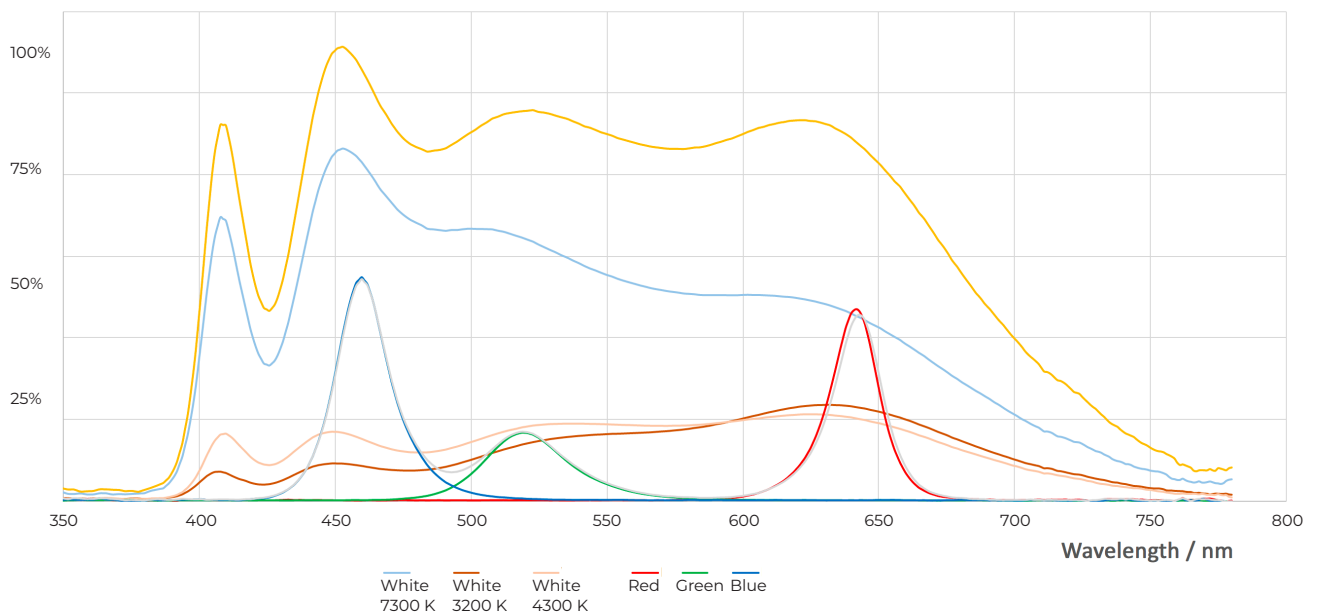
Hence we do offer a more natural daylight / sunlight replication to the vivarium.

There is a blue peak in standard LEDs. It is this peak that affects circadian rhythms.

biOrb EARTH is much closer to natural sunlight.



biOrb EARTH wider light spectrum



Technical data

1x Single UV pre-mounted in lid section

Single CCFL UV A/B light peak wavelength	24V, 4W 318 nm
Performance	1940 / 310 / 119 / 60 / 35 / 23 / 15 μW/ at a distance 0 / 5 / 10 / 15 / 20 / 25 / 30 cm
Lifetime	20,000hrs
<i>Dimmable</i>	



About the efficient and slim UV light

Depending on their origin, vivarium animals also need more or less UV light for their well-being as shown for instance in the “Ferguson Zones”.

Species that actively sunbathe require a rather punctual irradiation with more or less intensive UVB radiation depending on the distribution area.

Species that do not actively bask in the sun prefer a flat irradiation. Depending on the distribution area they rather need longwave UVA or shortwave UVB radiation.

Many nocturnal lizards spend the day in the shade and thus use the lower UV radiation available there. So they also need - depending on species and distribution area - UVB or UVA radiation.

The distance of the lamp has a considerable influence on the intensity of its UV radiation. The

higher a lamp hangs to its reptiles sun-bath place, the more the mild, long-wave radiation range (UV-A) predominates. The lower it hangs, the more the aggressive short-wave range (UV-B or UV-C) increases. If the distance is too short, there is a risk of damage to the conjunctiva and cornea.

So please make sure you place a proper plant or décor piece underneath the UV light to offer the right amount of UVA/UVB light to your reptile.

The EARTH UV light is also dimmable, allowing for a more natural radiation.

UV-A stimulates pigmentation.
UV-B stimulates vitamin D3 synthesis from the precursor vitamin D2.
Therefore the biOrb EARTH includes a very thin high efficiency UVA/B light with a lifetime of 20.000 hours. Such

a thin light with such a long lifetime is unique to the market.

Our biOrb EARTH UVA/B light offers mild, long wavelength radiation visible to reptiles but also short-wave, relatively aggressive radiation in one product.

Overall our lights offers a range of 295nm – 440nm peaking at 318 nm.



Technical data

2x White LED pre-mounted in lid section.

White /warm white LED
 3 Channel on 1 PCB, Independently controllable.
 24V, 11 W each light module

Warm white for sunrise / sunset
 3200 K / 4300 K / 7300 K

Max. combined output: 1300 lm for 2 lights in summary.

Lifetime: 50,000hrs

biOrb EARTH LED's wavelengths are the closest to natural sun light and are human centric, the lights can be re-positioned in any of the four slots in the lid.



How biorb EARTH fills the wavelengths with RGB & Infrared lights

Additionally, the Infrared & RGB LEDs that are implemented to our system fulfill the rest of the needed wavelength for our reptiles. The RGB is not beneficial for the reptile, it rather focusses on producing real sunrise and sunset effects within the vivarium.

Infrared wavelengths produced by the sun are the primary wavelengths known to penetrate the skin, which

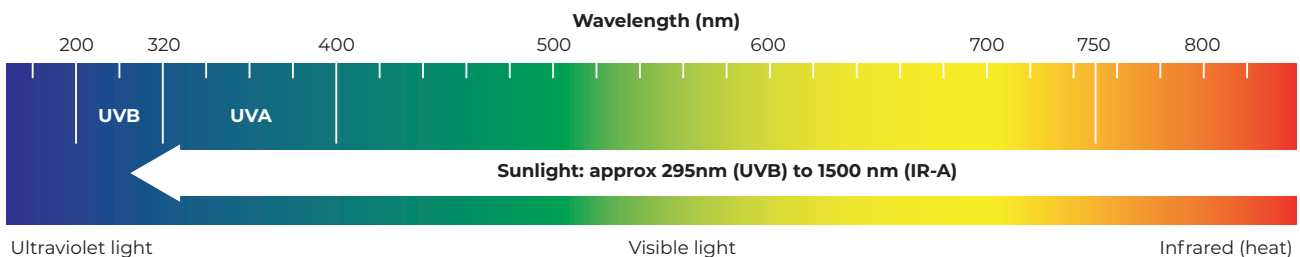
we feel as warmth. This means that they are also more effective at heating our animals.

Infrared-A –which is part of our Infrared light - is also known as ‘near infrared’.

It is the shortest wavelengths within the group: 750-1400 nanometers. That is because it is the closest to visible light – that which humans can see. It

has a high energy and as such is beneficial for animals. This is because the photons penetrate into the dermis of the skin.

Our Infrared LED is not like a conventional heat spot. It rather covers off a range of wavelength necessary for the replication of natural sunlight.



Technical data

1x RGB Light and Infrared LED pre-mounted in lid section

RGB
3 Channel RGB 24V, 11 W

Luminous flux / lm:
R: 16 lm
G: 32 lm
B: 8 lm

Lifetime
50,000hrs

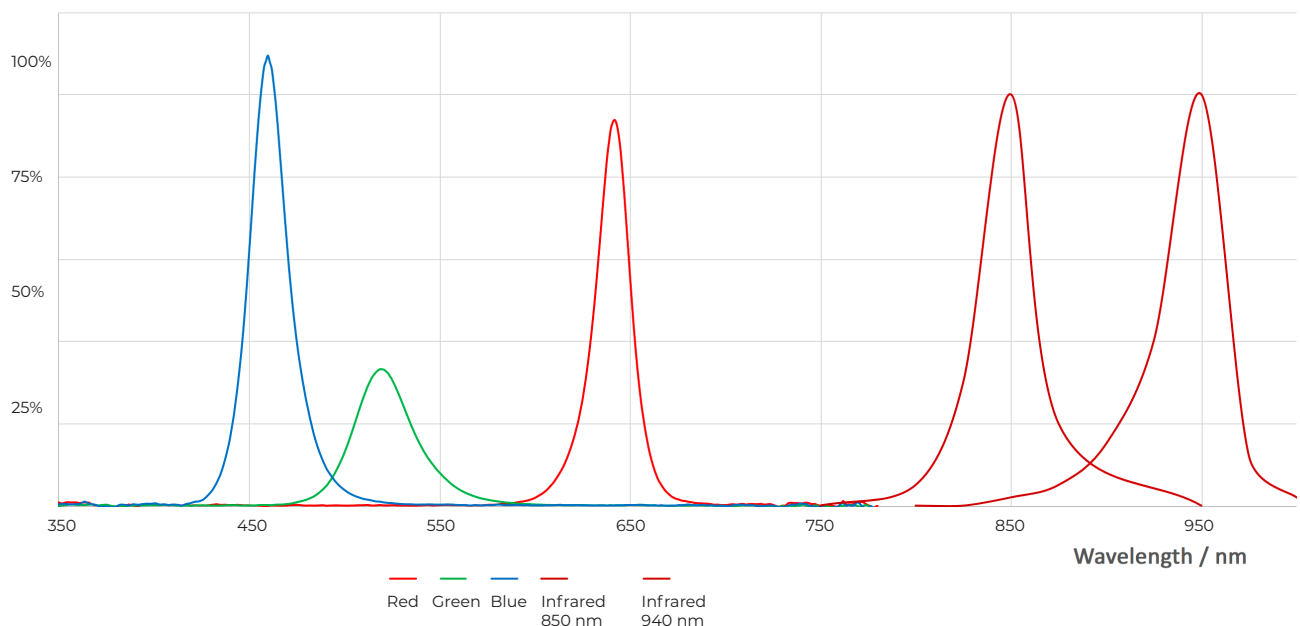
Infrared LEDs

Different wave length:
2 x 850 nm
2 x 940 nm



Replicating natural sunlight with RGB and Infrared light

Have a look at the overall graph of all our biOrb EARTH lights and you will see that we cover off a huge spectrum of wavelength, replicating natural sunlight in its best possible way.



Light measurements

Module	Colour	Lm (lumen)	CRI Colour Rendering Index
W light	3200 K	240	97
W light	4300 K	260	97
W light	7300 K	800	97
W light	All	1300	97
W light	standalone	650	
RGB IR light	R	16	-
RGB IR light	G	32	-
RGB IR light	B	8	-
RGB IR light	IR	-	-
RGB IR light	All	55	-

P / W = Power consumption

Lm (lumen) (For supporting plant growth)

CRI + Colour Rendering Index (The quality of white light compared to normal lights which have 80)

The colour rendering index

The colour rendering index (CRI) of a light source greatly dictates whether our eyes recognise an illuminated object or an illuminated wall of a building in its actual colour and whether illuminated plants or trees appear in a vivid way too. In this case, sunlight represents the reference value with a CRI of 100. The biOrb EARTH LED lights have a value of 97.

Illuminance (lux)

The lux value represents the intensity of the incoming light on an area at a specific point or height. The following reference values are used by way of comparison: Sunny day in summer: 100,000 lx, Sunny day in winter: 20,000 lx, A candle one metre away: 1 lx, Full moon light: 0.2–0.5 lx.

Luminous flux (lumen)

The lumen value represents the total amount of light emitted at the light source and allows conclusions to be made about the brightness of the light.

UV light measurements

UV Light (Output vs distance to UV light)

Measured with a solarmeter 6.5 /6.2	UVI	UVB $\mu\text{W} / \text{cm}^2$
0 cm	64	1940
5 cm	9	310
10cm	4	119
15 cm	2	60
20 cm	1	35
25 cm	0.7	23
30 cm	0.5	15

UV index

The UV index depends primarily on the position of the sun; it therefore changes most with the season, time of day, and latitude. The total ozone concentration in the atmosphere, cloud cover and the altitude of a location also play a role. Light cloud cover hardly reduces the UV index. In contrast, it can even increase for a short time in special cloudy situations due to additional scattered radiation compared to the UV index under clear skies.

UVB

Important for vitamin D3 synthesis is UVB radiation. It is therefore essential for the well-being of your reptiles.

INFO:

Please make sure that, if you have a reptile that climbs upside down - and therefore may sit directly underneath the UV light unit - that you may reduce the UV output so it does not get a sunburn. The UV light is dimmable.

Technical data

Product	Electrical Data	Unit	Value
biOrb EARTH 125	Input Voltage Power supply	V	100 - 240
biOrb EARTH 125	Input frequency Power supply	Hz	50 - 60
biOrb EARTH 125	Power consumption Power supply max.	W	120
biOrb EARTH 125	Power consumption Power supply idle	W	31
biOrb EARTH 125	Input Voltage EARTH	V	24
biOrb EARTH 125	Power consumption EARTH max.	W	105
biOrb EARTH 125	Power consumption EARTH idle	W	28
biOrb EARTH 125	Luminous flux cold white	lm	800
biOrb EARTH 125	Luminous flux neutral white	lm	260
biOrb EARTH 125	Luminous flux warm white	lm	240
biOrb EARTH 125	Colour temperature cold white	K	7300
biOrb EARTH 125	Colour temperature neutral white	K	4300
biOrb EARTH 125	Colour temperature warm white	K	3200
biOrb EARTH 125	CRI White light	-	97
biOrb EARTH 125	Luminous flux red	lm	16
biOrb EARTH 125	Luminous flux green	lm	32
biOrb EARTH 125	Luminous flux blue	lm	8
biOrb EARTH 125	UV-B Power (0 / 5 / 10 / 15 / 20 / 25 / 30 cm)	μW/cm ²	1940 / 310 / 119 / 60 / 35 / 23 / 15
biOrb EARTH 125	UV Index (0 / 5 / 10 / 15 / 20 / 25 / 30 cm)	-	64 / 9 / 4 / 2 / 1 / 0,7 / 0,5
biOrb EARTH 125	UV-B Wavelength	nm	318
biOrb EARTH Sunlight LED Kit	Input Voltage Power supply	V	100 - 240
biOrb EARTH Sunlight LED Kit	Input frequency Power supply	Hz	50/60
biOrb EARTH Sunlight LED Kit	Power consumption Power supply max.	W	11
biOrb EARTH Sunlight LED Kit	Input Voltage LED module	V	24
biOrb EARTH Sunlight LED Kit	Power consumption LED module	W	10
biOrb EARTH Sunlight LED Kit	Luminous flux	lm	650
biOrb EARTH Sunlight LED Kit	Colour temperature	K	5500
biOrb EARTH Sunlight LED Kit	CRI	-	97
biOrb EARTH Sunlight LED Kit	Energy Efficiency Class	A-G	G
biOrb EARTH Sunlight LED Kit	Weighted energy consumption	kwh/1000h	11
biOrb EARTH RGB & Infrared Kit	Input Voltage Power supply	V	100 - 240
biOrb EARTH RGB & Infrared Kit	Input frequency Power supply	Hz	50/60
biOrb EARTH RGB & Infrared Kit	Power consumption Power supply max.	W	11
biOrb EARTH RGB & Infrared Kit	Input Voltage LED module	V	24
biOrb EARTH RGB & Infrared Kit	Power consumption LED module	W	10
biOrb EARTH RGB & Infrared Kit	Luminous flux total	lm	60
biOrb EARTH UV-light Kit	Input Voltage Power supply	V	100 - 240
biOrb EARTH UV-light Kit	Input frequency Power supply	Hz	50/60
biOrb EARTH UV-light Kit	Power consumption Power supply max.	W	3,5
biOrb EARTH UV-light Kit	Input Voltage UV module	V	24
biOrb EARTH UV-light Kit	Power consumption UV module	W	3
biOrb EARTH UV-light Kit	UV-B Power (0 / 5 / 10 / 15 / 20 / 25 / 30 cm)	μW/cm ²	1940 / 310 / 119 / 60 / 35 / 23 / 15
biOrb EARTH UV-light Kit	UV Index (0 / 5 / 10 / 15 / 20 / 25 / 30 cm)	-	64 / 9 / 4 / 2 / 1 / 0,7 / 0,5
biOrb EARTH UV-light Kit	UV-B Wavelength	nm	318