



TLS LIGHTING RIGS - Grounds for success

About TLS



- TLS was founded in 2012 and is backed by staff with more than 20 years of experience in the turf industry.
- Sister company, RA Norway AS, has more than 30 years of experience in design and fabrication of advanced CE marked aluminium products.
- This combined capacity ensures you effective, safe, easy to operate and cost-effective turf grow lighting solutions.

LIGHTING RIGS MODELS



Turf lighting is a necessary reality in stadiums with a covered roof. Lighting units use special light bulbs that have a light spectrum like sunlight, thus replacing sunlight on shaded areas. The growth of the grass and the formation of the root system will be significantly boosted.

The TLS grow lighting rig series includes five tailor made models, the TLS 72, 36, 18, 9, GU 2- 6 and TLS TURFLED 120 HYBRID. The number indicates the quantity of 1000W Hortilux Schreder lights fitted to each rig. The single row rig series gives the user the most flexible system and it is adaptable to any kind of stadium or sports venue worldwide. User friendly, fully CE approved aluminium construction.

Production facilities

- The main production is done in Stavanger, Norway
- More than 3000 m²
- Storage and finishing workshop in Slovakia, convenience for customers and delivery around Europe.
- Custom made production line to ensure consistency, efficiency and continuity



TLS currently has over 400 lighting rigs in use worldwide in various sporting arena's such as Football Stadiums, Training Facilities, Rugby, Golf, Horse Racing and Equestrian Arenas. TLS also offers rental / lease option for their customers on minimum period basis.

Below are just a few clubs that use TLS rigs to improve the quality of their turf:



Light Fixtures

TLS lighting rigs come with special (HPS- High Pressure Sodium) Hortilux Schreder HSE NXT II light fixtures. Hortilux Schreder used the latest technology in their development. For example, the fixture's unique cooling ribs ensure optimum thermoregulation. This protects the electronics against harmful external influences, which guarantees long-term operating reliability.



Treated area sq meters	272 m ² / 480 m ²
Number of 1000W lamps	72
Light efficiency in μmol	μmol
Weight in kg	1427
Lamp height above the surface m	justable
Dimensions (folded LxWxH) in m	3,06
Power Supply Requirements	2 x 63A 400V
Light (PAR) sensors	Yes
Soil and humidity sensors	optional

LIGHTING RIGS MODELS

TYPES OF LIGHTING UNITS	TLS 72	TLS 36	TLS 18	TLS 9	TLS GU 2-6
Treated area sq meters	272 m ² / 480 m ²	120 m ² / 240 m ²	120 m ²	50 m ²	10-20-30 m ²
Number of 1000W lamps	72	36	18	9	2-4-6
Light efficiency in μmol	480 m ² at 315 μmol 272 m ² at 555 μmol	240 m ² at 311 μmol 120 m ² at 555 μmol	240 m ² at 311 μmol 120 m ² at 555 μmol	50 m ² at 378 μmol	425 μmol
Weight in kg	1427	677	394	252	110/130/150
Lamp height above the surface m	2,63 - 4,40 adjustable	2,25	2,25	1,9	1,3/ 1,6/ 1,9 adjustable
Dimensions (folded LxWxH) in m	11, 60 x 2,40 x 3,06	11, 50 x 2,00 x 2,70	10,66 x 2,00 x 2,70	6,05 x 2,00 x 2,29	varies
Power Supply Requirements	2 x 63A 400V	1 x 63A 400V	1 x 32A 400V	1 x 16A 400V	1 x 3-9A 400V
Light (PAR) sensors	Yes	Yes	Yes	Yes	No
Soil and humidity sensors	optional	optional	optional	optional	No
Temperature sensors	optional	optional	optional	optional	No
Options	Electric Drive Storage Covers	Electric Drive Storage Covers	Storage Covers	Storage Covers	Storage Covers
Smart local and remote access through Turfpal TM	Yes	Yes	optional	optional	optional

TLS 72

The largest, height adjustable and most flexible turf grow lighting rig available that covers the largest area in square metres.



TLS 36

TLS 36 lighting rig has been most sold rig by RA TLS through the years. Also available with simple On/Off and 50%/100% button for a simple operating and user environment.



TLS 18

The unique design of the TLS 18 makes it perfect for aiding the recovery of smaller areas such as goal and warm up areas. Also available with simple On/Off and 50%/100% button for a simple operating and user environment.



TLS 9

Perfect when improving the quality of the grass in smaller areas at the pitch. Also available with simple On/Off and 50%/100% button for a simple operating and user environment.



TLS GU 2-6

The TLS GU 2-6 is mostly used at golf courses. It is perfect when improving the quality of the grass at smaller areas. Comes as standard with On/Off and 50%/100% button for a simple operation.



TLS TURFLED 120 HYBRID

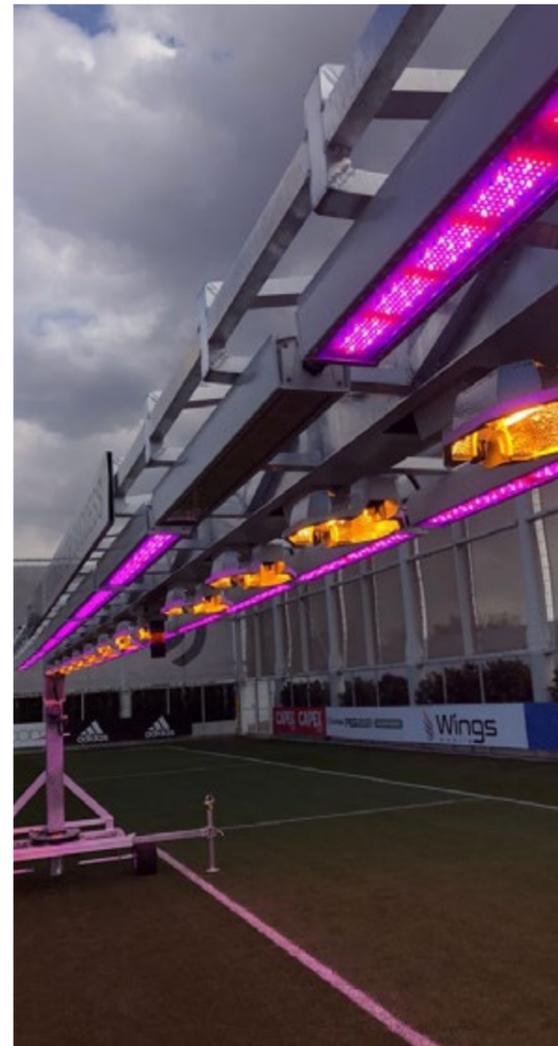


The TLS TurfLed 120 Hybrid comes with 20x 336 W HORTILED LED and 13x 1000W Hortilux HPS grow lights and covers an area of 120 m² at 420 μmol. It is height adjustable, can be set between 2.15 meters and 3.5 meters.

The LED grow lights do not radiate any heat and save approximately 40% energy over HPS grow lights. However at low temperatures a row of 1000W HPS lamps provide both heat and grow light.

Turfpal control system will select the optimal combination of LED and HPS lights, making it a significant energy saver compared to traditional LED lighting rigs.

Lighting footprints and light level options	120 m ² and 193 μmol with LED lights only, 420 μmol with all lights on
Weight	850 kilograms
Dimensions (lifted, maximum footprint)	L: 11 451 mm, W: 3 200 mm, H: 3 920 mm
Dimensions (storage)	L: 11451 mm, W: 2 000 mm, H: 2 570 mm
Light Fixtures	20 x HORTILED Top V19 336W13 x HORTILUX HSE NXT II 1000W
Interconnectivity	The Turfled120 can be connected in a series of two rigs
Power Supply Requirements	1 x 32A 400V Three-phase 5 pin supply and 1 x 30 A load with all lights on
Power Management	Delayed start with soft start and stop of the lights. Voltage input measurement and log
Smart TurfpaITM PLC control box	Soil and air humidity and temperature sensors, PAR sensor, gyroscope, voltage measurement and log. Local operation through the built-in touch screen.
TurfpaITMweb-based turf management system	Available
CE Approved and Certified	TLS Turfled120 is fully CE approved



TURF MANAGEMENT SYSTEM



Turfpal is a turf centred software that can be used by football, golf, rugby, or any sports arena with natural turf. It helps you to better operate, prepare and understand. Turfpal is a web based sports turf operations and management solution. It comes with multiple modules and applications for turf monitoring, testing, maintenance, analysis, remote monitoring and operation of auxiliary equipment, budgeting and more. You will get full online access to the system via your PC, tablet, or phone. You can select one, multiple, or all modules to tailor Turfpal to your needs.

All new lighting rigs from TLS will be Turfpal compatible providing you with online monitoring and operation of the lighting rigs anytime and anywhere.

TLS TURF FAN



Portable, affordable and innovative air circulation Turf fan, weighing 427 kgs. The TLS Turf fan generates all-important air movement, an essential component for a healthy turf on all sports venues. The standard features of the fans include durable steel trailer, oscillating assemblies, electric power control and easy to use features. This fan has been specially designed in-house for promoting the healthiest turf through improved air circulation, the alleviation of stress and reduction in turf diseases.

Key features:

- Easy to use interface
- Adjustable aluminium blades
- Vertical and horizontal oscillation
- Maximize air flow
- Dimensions - L: 2.5 m, W: 1.68 m, H: 2.30 m
- Weight – 427 kg
- CE Approved and Certified
- Tailored to customers requirements

TLS 510 MIST COOLER TURF FAN



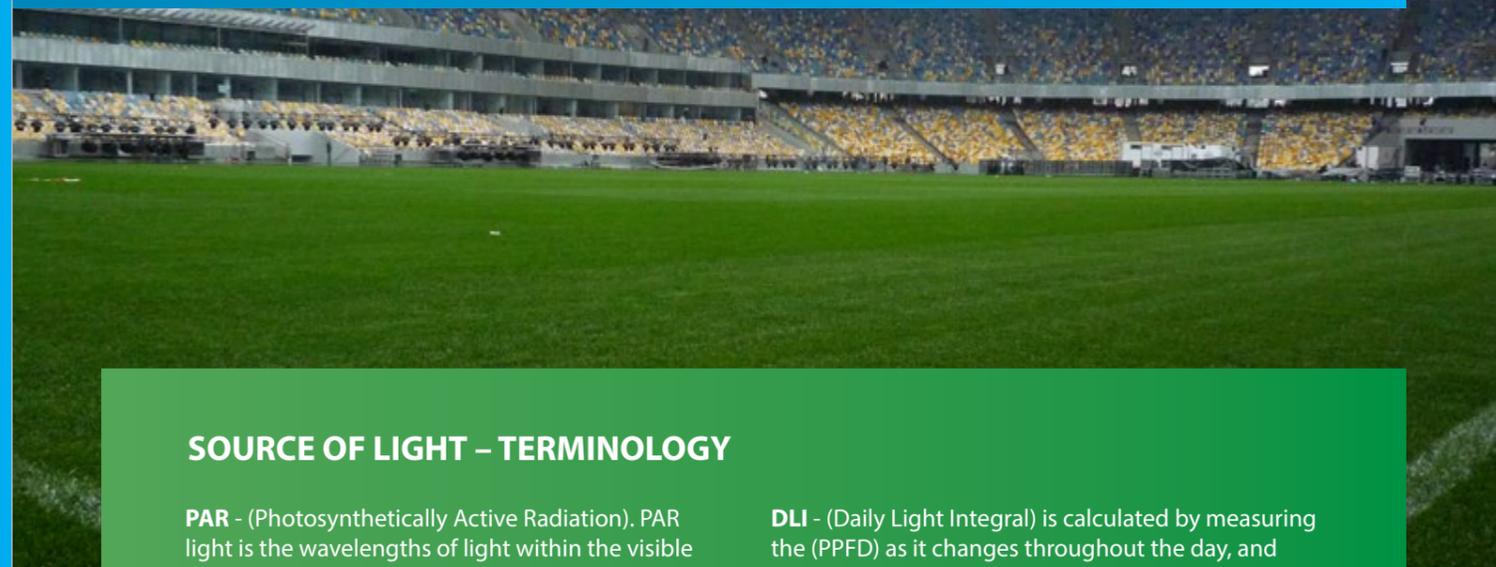
The TLS Turf Fan 510 series cools the air by means of mist in combination with a Fan. The grass cooling system consists of a fan and a micro mist system. The system can be used to ventilate only or to be combined with the misting system to cool the air for an improved environmental temperature to avoid stress to the grass.

Key features:

- Settings for interval programs.
- Determines the projection angle.
- Built in timer.
- Used both as a fan (air movement) and turf movement cooler.
- Built in filter system.
- Smart local and remote operation through TurfPal™

Water connection	1" BSP male
Consumption of Fan kW	Pump booster/oscillator / 4 KW / 0.2KW
Weight	390 kgs
Projection distance	50 metres
Dimensions (folded, minimum footprint/storage)	L: 1.55m, W: 1.60m, H: 2.25m
Water consumption	Min 270 L/h max 2700 L/h.
Power Supply Requirements	1 x 63A 400V Three-phase 5 pin supply
Sprinklers	30
TurfPal™ web-based turf management system	Available
CE Approved and Certified	TLS Turf Fan is fully CE approved

SHADE ANALYSIS AND HEMIVIEW COMPARISON



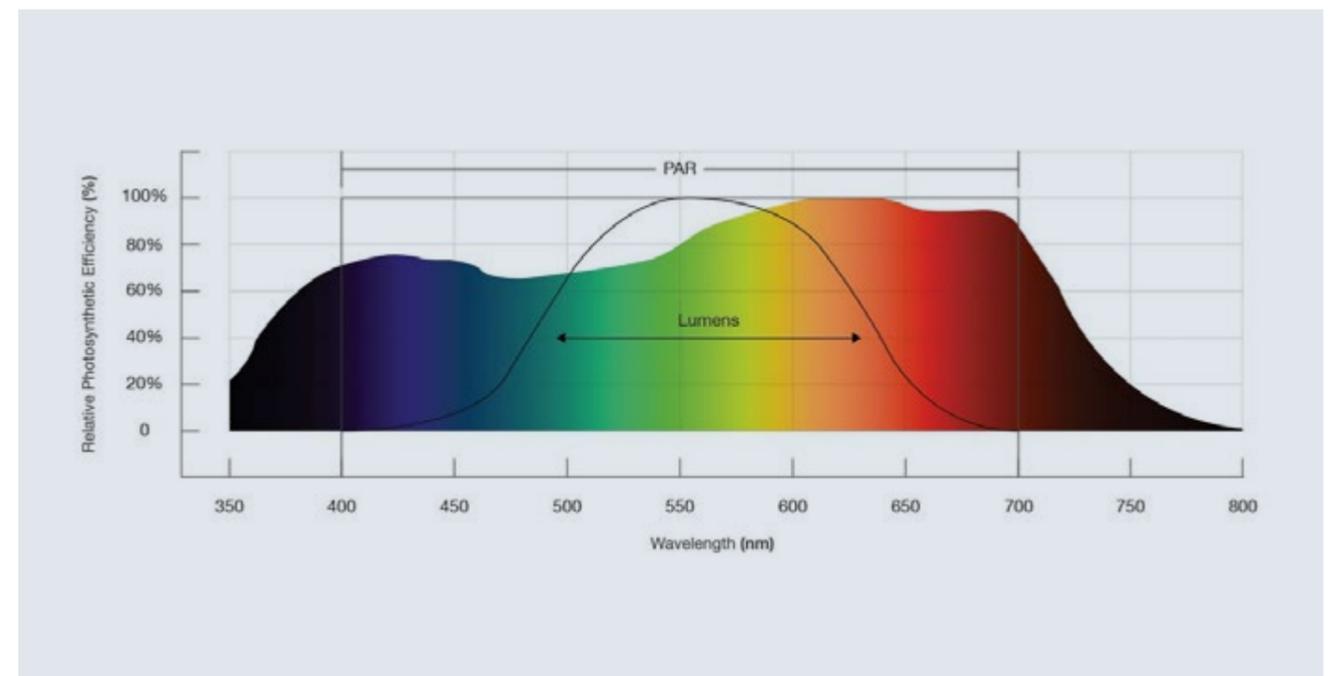
SOURCE OF LIGHT – TERMINOLOGY

PAR - (Photosynthetically Active Radiation). PAR light is the wavelengths of light within the visible range of 400 to 700 nanometres (nm) which drive photosynthesis.
Units of measure: $\mu\text{Mol}/\text{S}$

PPFD - measures the amount of PAR that actually arrives at the plant. The units of PPFD are micromoles of photons per square meter per second ($\mu\text{mol}/\text{s}/\text{m}^2$)
Units of measure: $\mu\text{Mol}/\text{M}^2\text{S}$

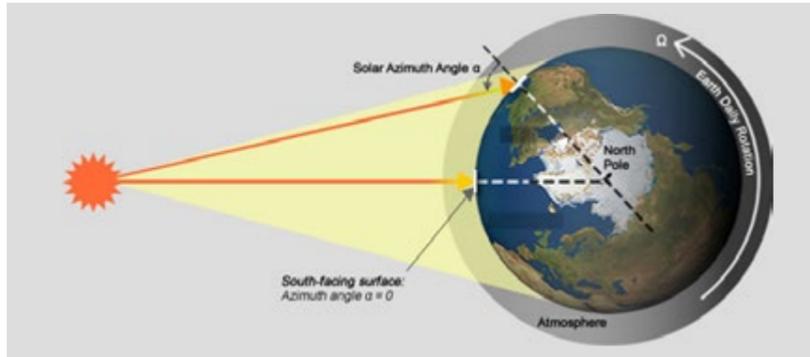
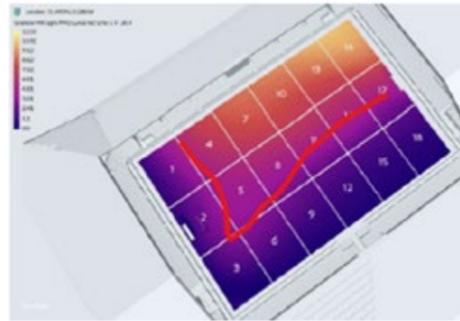
DLI - (Daily Light Integral) is calculated by measuring the (PPFD) as it changes throughout the day, and then used to calculate total estimated number of photons in the PAR range received over a 24-hour period for a specific area, usually expressed as moles of light (mol photons) per square meter (m^2) per day (d), or: $\text{mol}/\text{m}^2/\text{d}$.

DLI determines the scope of the grass's light needs:



„PSG-SA“ simulates shade distribution on real size 3D model taking into account very accurate shape of the stadium. SA's simulation of the sunlight is also very accurate based on the newest data and calculations.

The main purpose of the analysis is to demonstrate the need for an additional lighting to maintain the turf in optimal condition.



Accurate analysis helps to efficiently and optimally control the lighting installations, using them in points and while saving energy consumption.

DLI generated by the SUN in different areas:

DLI generated by the SUN in different months:

ANNUAL DLI MAP

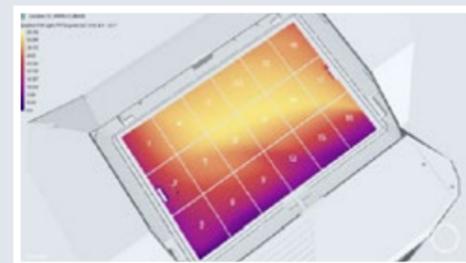
Europe



mols/m2/day



MAY



SEPTEMBER



CASE STUDY Brentford UK:

CALCULATIONS FOR SUPPLEMENTARY LIGHT – 3 x 6 GRIDS
Demonstrating the results based on calculations from January.

JANUARY		TLS72 Average PPFD 300µmol/m ² *s	
ZONE	Ave. DLI per zone (Mol/m ² *d)	Required hours of light per zone (h) 14 DLI	Required hours of light per zone (h) 23 DLI
1	0,79	379	637
2	0,72	381	640
3	0,29	394	652
4	1,94	346	604
5	1,58	356	615
6	0,36	392	650
7	2,45	332	590
8	1,44	361	619
9	0,29	394	652
10	2,74	323	582
11	1,08	371	629
12	0,22	396	654
13	2,81	321	580
14	0,86	377	635
15	0,14	398	656
16	2,81	321	580
17	0,79	379	637
18	0,14	398	656
TOTAL			

MINIMUM REQUIREMENT		
JANUARY		
ZONE	Number of days of artificial light required for 14 DLI	Quantity of rigs required to cover the position
1	16	0,51
2	16	0,51
3	16	0,53
4	14	0,47
5	15	0,48
6	16	0,53
7	14	0,45
8	15	0,49
9	16	0,53
10	13	0,43
11	15	0,50
12	17	0,53
13	13	0,43
14	16	0,51
15	17	0,53
16	13	0,43
17	16	0,51
18	17	0,53
TOTAL	9	

OPTIMUM REQUIREMENT		
JANUARY		
ZONE	Number of days of artificial light required for 14 DLI	Quantity of rigs required to cover the position
1	16	0,75
2	16	0,76
3	16	0,78
4	14	0,69
5	15	0,71
6	16	0,78
7	14	0,66
8	15	0,72
9	16	0,78
10	13	0,64
11	15	0,74
12	17	0,79
13	13	0,64
14	16	0,75
15	17	0,79
16	13	0,64
17	16	0,75
18	17	0,79
TOTAL	13	

Accordingly, the results for the remaining months are calculated in the same way and are summarized in the last 2 tables:

3 x 6 GRIDS

MINIMUM Amount of rigs required for each month	
January	16
February	16
March	16
April	14
May	15
June	16
July	14
August	15
September	16
October	13
November	15
December	17
MAX of 12 months	13

OPTIMUM Amount of rigs required for each month	
January (14 DLI)	16
February (14 DLI)	16
March (14 DLI)	16
April (23 DLI)	14
May (23 DLI)	15
June (23 DLI)	16
July (23 DLI)	14
August (23 DLI)	15
September (14 DLI)	16
October (14 DLI)	13
November (14 DLI)	15
December (14 DLI)	17
MAX of 12 months	14



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