

# The DRAGON series High Power LED Light Sources

## Features

- Plug-and-play frame for LEDs
- Interchangeable LED heads provided
- 455nm, 475nm, 505nm, 530nm, 590nm, 617nm, 630nm, white 5500 K, white 3300 K
- Selection of collimating optics/ attachments
- Selection of base units
- Fast analog control (some models)
- Low-noise CW control (some models)
- Fast pulsed (digital) control (some models)
- Narrow bandwidth or broadband
- Wide field or focused output
- Continuous, waveforms, or pulses to <150ns
- Up to 400mW CW, x5 intensity short pulse
- Accepts LEDs with 0.2", 0.4", 0.6", 0.8", 1", 1.2" pin spacing
- Mounting to standard and metric posts (8-32 and M4x0.75 threads in base unit)
- Base unit diameter 1.450" (36.8mm)

## Applications

- Fluorescence excitation
- High-speed imaging
- Synchronous detection
- Machine vision
- Biomedical optics

## Description

The HPLS-36 series of high power LED light sources are designed as flexible system of interchangeable components for applications where it is hard to standardize the requirements for mass-production.

Building a system comes down to (1) selection of appropriate base with specific functionality and type of control; (2) selection of LED head[s] and (3) focusing optics specific for the application.

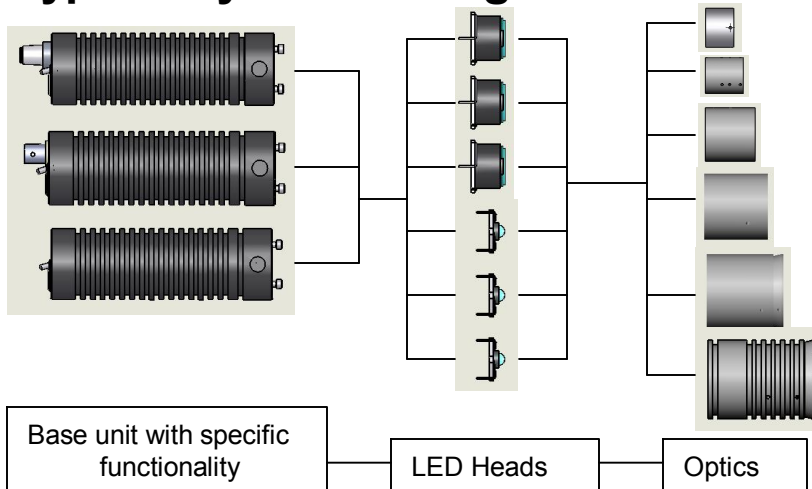
Functionality of base units include fast analog control (to generate any optical function, sine, saw, square, CW...); low-noise CW control (for applications where ATC-like or PWM algorithms may cause problem); and fast pulsed (digital) control (faster and more powerful than analog).

Selection of the way the optical power is set include external digital/analog signal supplied thru connector (BNC/Twin BNC), or, for CW application, Built-In Potentiometer/ Remote Potentiometer/ 2-level Switch).

LED heads are currently available in two form-factors: LEDHR-xxx series, pre-collimated with built-in reflector and 1.2" pin spacing for close-range illumination, and LEDH-xxx series with 0.8" pin spacing for higher performance and wider selection of focusing optics. Many other models of LEDs can be adapted.

The function of focusing optics is to direct the light to the certain spot size on certain distance as required and often custom designed for specific application. Most of new optics is backward-compatible (fits the units previously shipped)

## Typical system configuration



# Base Units

## HPLS-36AD3500, AD3500-DI



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### Description

HPLS Base Unit with built-in 2-channel driver. Analog channel has linear control and continuously variable output. Digital channel has 2-level ON-OFF control (active HI). Output current is the sum of outputs of both channels. In HPLS-36AD3500, the switch on the control panel selects which channel is addressed by input BNC connector, thus selecting Digital or Analog mode. HPLS-36AD3500-DI (Dual Input model) has dual-signal Twin BNC connector to address both channels simultaneously and additional Aiming mode for Analog channel.

Accepts LED heads with 0.2-1.2 inch pin spacing. (LEDH, LEDHR). Accepts focusing optics and attachments mounted on LED head directly and models that have index "36" in a part number.

### Common Specifications

- Two operating modes: Analog/Digital
- Dimensions: Ø1.45x4.5" (36.8x115mm)
- Weight: 0.66 lb (0.3 kg)
- Power Requirement: 12V, 0.5A
- Power Connector: 5.5/2.1 mm Power Jack, center positive, barrel common ground
- Control Signal Connector: BNC/Twin BNC
- Thermal resistance, convection: 5 C/Wt

#### HPLS-36AD3500 control panel:

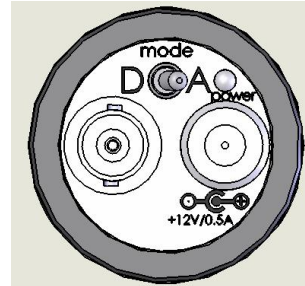
Switch function: mode selection

- Left: Digital mode
- Center: OFF
- Right: Analog mode

BNC connector:

- Central pin: input signal
- Barrel: common ground

LED: input power indicator



### Absolute Maximum Ratings

- Power Input: -1 to 14V; -2A to 2A; fuse protected (2A)
- Signal Input, Digital Mode: -2.5V to 7V; 50mA max, 50 Ohm input impedance
- Input, Analog Mode: -10V to 20V

#### HPLS-36AD3500-DI control panel:

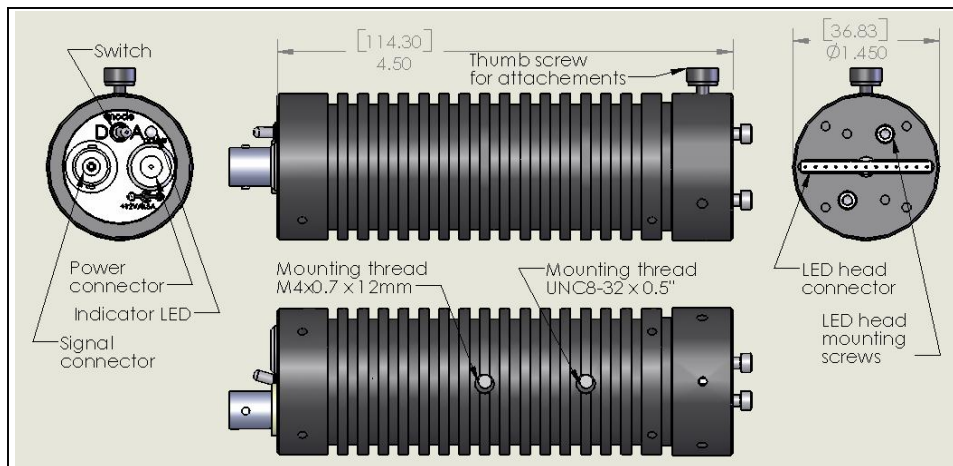
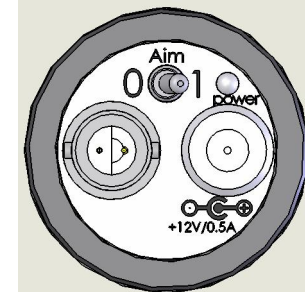
Switch function: analog channel mode

- Left: normal (external control)
- Center: Analog OFF
- Right: Aiming ON (500mA)

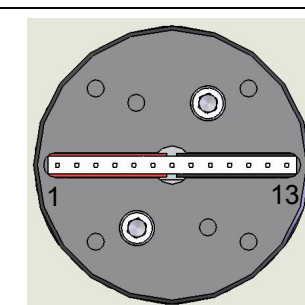
Twin BNC connector:

- Male pin: digital channel
- Female pin: analog channel
- Barrel: common ground

LED: input power indicator



HPLS-36AD3500[DI] exterior view, dimensions and mounting interface. HPLS-36AD3500 shown. DI has different signal connector (twin BNC) and switch notations.



#### LED head connector:

- 13 pins x 0.1" pitch
- Pins 1-6, marked red or yellow: positive
- Pin 7: NC
- Pins 8-13: negative
- Accepts 0.025" (0.64m) square pins, 0.230" long

## Waveforms and specifications

### Digital mode specifications:

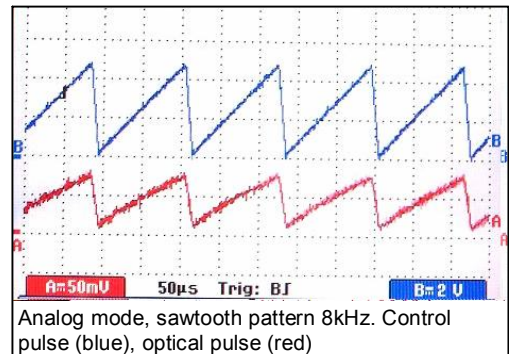
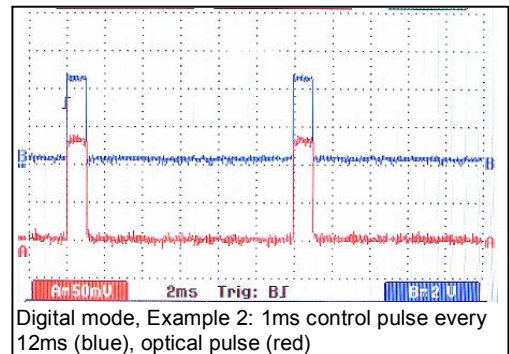
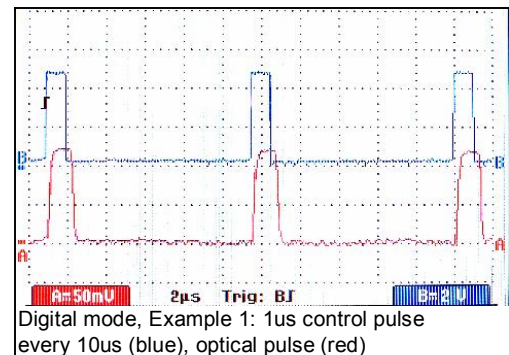
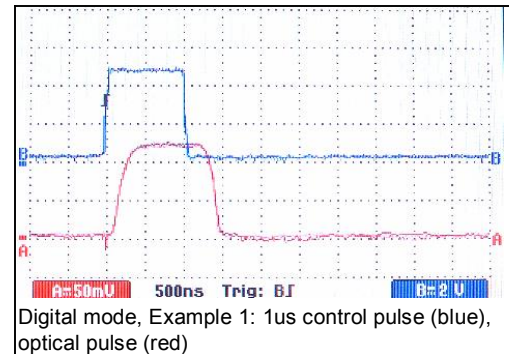
- Rise Time/Delay: 80ns(1/2); 200ns(90%)/ 100ns Delay
- Nominal Signal Level: 3.3-5V; TTL/CMOS
- Logical "0" (light OFF): <0.8V
- Logical "1" (light ON): >2.4V
- Fall Time/Delay: 140ns(1/2); 200ns(90%)/ 200ns Delay
- Smart Time Limiting Circuitry for LED Protection Limits the Cumulative Energy Delivered to LED
- Shortest Single Pulse (Control Signal): 50ns
- Longest Single Pulse: 1 ms
- Maximum Duty Cycle of Continuous Waveform: 10%
- Average Ratio, Active Time/Relaxation Time: 1:10
- Any Repetition Rate
- Trimmer on the Board to Down Regulate the Pulsed Current and Optical Power

### Digital mode, protocol examples:

- Example 1: 1us pulse permitted every 10us
- Example 2: 1 ms max duration pulse every 10ms
- Example 3: 50% duty cycle waveform 2ms total duration, permitted every 10ms
- Example 4: 20% duty cycle waveform 5ms total duration, permitted every 10ms
- Example 5: 200ns starting pulse: optical pulse has Gaussian profile, 420ns(1/2), peak is 100% of steady level
- Example 6: 100ns starting pulse: optical pulse has Gaussian profile, 270ns(1/2), peak is 80% of steady level
- Example 7: 50ns starting pulse: optical pulse has Gaussian profile, 200ns(1/2), peak is 60% of steady level

### Analog mode specifications:

- Input/Output relationship: Linear, 1% offset
- Output current: 0-500mA
- Input Signal Format: User Programmable (4-Dip switch on the driver board)
- Input Signal Format (Default): 0-5V
- Input Signal Formats: 0-10V; 0-20mA, 4-20mA
- Rise Time/Delay for 0-250mA transit: 400ns(50%), 1.2us(90%) / 1.8us Delay
- Fall Time/Delay for 250-0mA transition: 750ns(50%), 500ns(90%)/ 20ns Delay
- Rise Time/Delay for 50-300mA transition: 350ns(50%), 800ns(90%); 20ns Delay



Specifications subject to change without notice



# LED Heads

## LEDH, LEDHR series



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### Specifications p.1

LEDH and LEDHR are user-replaceable, LED-based light sources, attached to the HPLS-36 series base units, which provide electrical connection to the driver, means of mechanical mounting and the heat dissipation from the LED. Available in two form factors – LEDHR, bigger, with built-in reflector to collimate the light emitted from the LED, and LEDH, smaller, higher performance, un-collimated light source. Reference to the table below for typical optical power achievable by 14 different models of LED heads when plugged into various HPLS-36 models. For spectral information, form factors, and temperature coefficient of optical power, see the next page. Specifications can vary with LED batches.

HPLS-36 [ ] model suffix <sup>(5)</sup>	AD500		AP750		AP1000		AD3500		AD3500		AD3500					
	DD500	AD3500	AR750	AT750	AR1000	AT1000	AD3500-	DI	AD3500-	AD3500-DI	AD3500-	AD3500-DI	DD10A	DD10A		
Optical power range, min-max, mWt <sup>(3), (4)</sup>																
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
Current, A	0.5		0.75		1		3.5		3.5		3.5		10		10	
duty cycle, % <sup>(6)</sup>	100		100		100		10		5		2		5		2	
LEDHR-455 <sup>(1)</sup>	148	270	192	351	222	405	666	1215	681	1242	814	1485	1125	2052	1302	2376
LEDHR-470 <sup>(1)</sup>	131	255	170	332	197	383	590	1148	603	1173	721	1403	996	1938	1153	2244
LEDHR-505 <sup>(1)</sup>	90	160	113	200	135	240	297	528	306	544	315	560	522	928	540	960
LEDHR-530 <sup>(1)</sup>	80	145	100	181	120	218	264	479	272	493	280	508	464	841	480	870
LEDHR-595 <sup>(1)</sup>	36	85	45	106	54	128	119	281	122	289	126	298	0	0	0	0
LEDHR-617 <sup>(1)</sup>	246	340	308	425	369	510	935	1292	1230	1700	1427	1972	0	0	0	0
LEDHR-630 <sup>(1)</sup>	177	280	230	364	266	420	673	1064	885	1400	1027	1624	0	0	0	0
LEDHR-3500 <sup>(1)</sup>	70	120	88	150	105	180	315	540	322	552	385	660	532	912	616	1056
LEDHR-5500 <sup>(1)</sup>	115	190	144	238	173	285	518	855	529	874	633	1045	874	1444	1012	1672
LEDH-455 <sup>(2)</sup>	211	272	274	354	317	408	950	1224	971	1251	1161	1496	1604	2067	1857	2394
LEDH-470 <sup>(2)</sup>	201	320	261	416	302	480	905	1440	925	1472	1106	1760	1528	2432	1769	2816
LEDH-505 <sup>(2)</sup>	167	210	209	263	251	315	551	693	568	714	585	735	969	1218	1002	1260
LEDH-530 <sup>(2)</sup>	92	170	115	213	138	255	304	561	313	578	322	595	534	986	552	1020
LEDH-595 <sup>(2)</sup>	99	150	124	188	149	225	327	495	337	510	347	525	0	0	0	0
LEDH-617 <sup>(2)</sup>	235	350	294	438	353	525	893	1330	1175	1750	1363	2030	0	0	0	0
LEDH-630 <sup>(2)</sup>	262	380	341	494	393	570	996	1444	1310	1900	1520	2204	0	0	0	0
LEDH-3500 <sup>(2)</sup>	108	180	135	225	162	270	486	810	497	828	594	990	821	1368	950	1584
LEDH-5500 <sup>(2)</sup>	158	240	198	300	237	360	711	1080	727	1104	869	1320	1201	1824	1390	2112

Table 1. Optical power range of various models of LED heads vs. HPLS-36 model, current, and duty cycle.

- (1) Note: Optical power for LEDHR is measured after reflector, using 2" (5cm) diameter optical power meter placed on optical axes 4" (10 cm) from the LED
- (2) Note: For LEDH, the optical power is the total of the chip before any optics, and measured by 2" (5cm) diameter optical power meter placed on optical axes touching the LED lens.
- (3) Due to the nature of the semiconductor structures involved, important parameter of LEDs such as optical power, maximum current that the LED can tolerate, spectrum and voltage drop, vary greatly for different batches and affect the performance of the HPLS-36 series light sources. It is not uncommon that the power of LEDs from different batches differs 2 times and more. The information presented here should be used for reference only. Please ask if your application demands more stringent requirements.
- (4) Optical power is measured with LED head attached to the HPLS-36 unit, at the room temperature 25C.
- (5) Optical power indicated is power range while ON, for Digital models, and maximum power for continuously variable models. Please note the 2-channel models such as AD3500 and AD3500-DI, presented in 2 columns, for digital and analog channels, respectively.
- (6) Duty cycle affects the performance of LEDs. Typically, for a given current, optical power is higher for lower duty cycle due to lower heating effect of the LED chip. For the pulsed units, exceeding duty cycles indicated for the given current can cause permanent damage to the LED. Some HPLS-36 models have built-in protection against exceeding duty cycle, however, due to wide spread of duty cycle requirements and flexible nature of HPLS-36 series, it is impossible to satisfy to all the requirements in one unit.

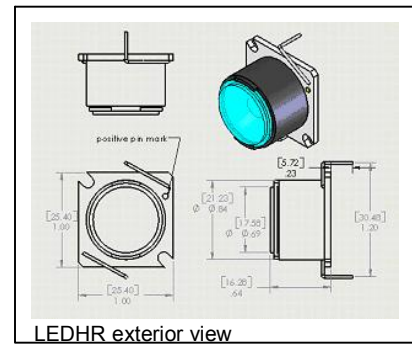
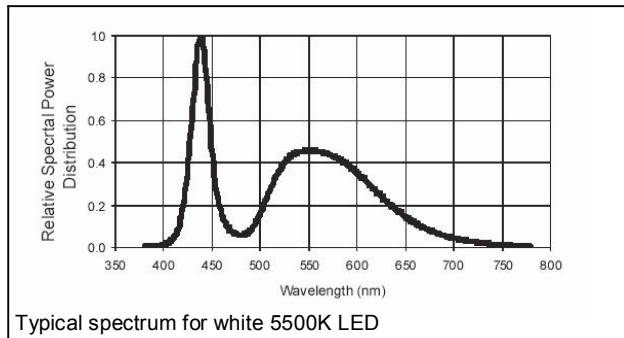
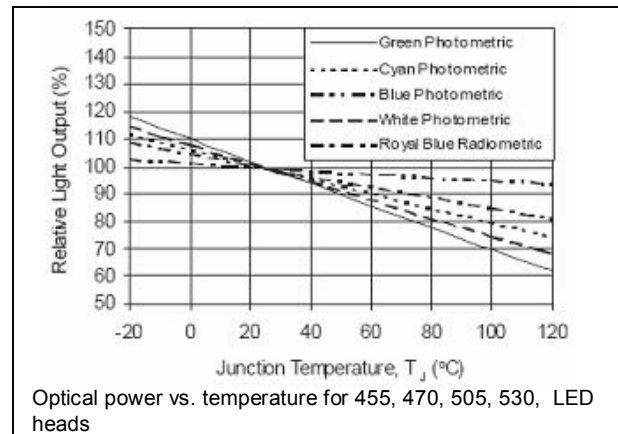
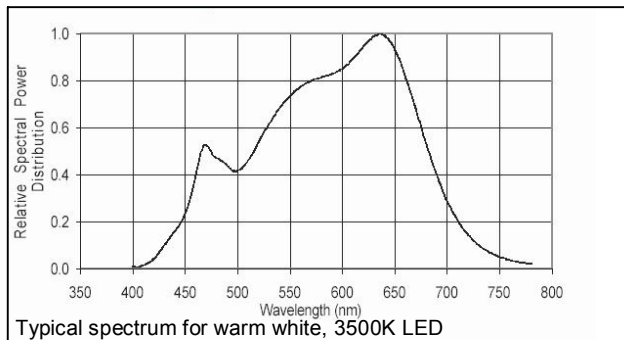
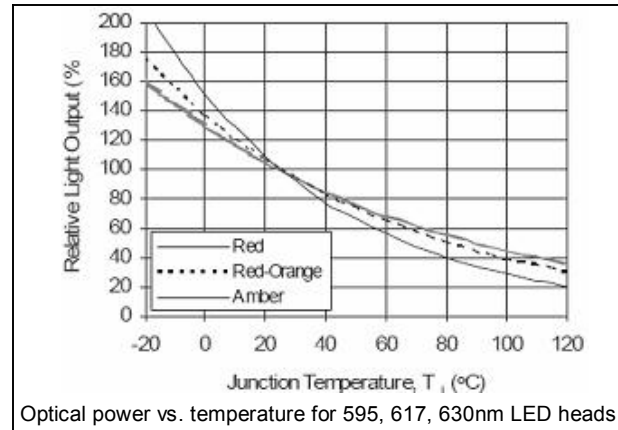
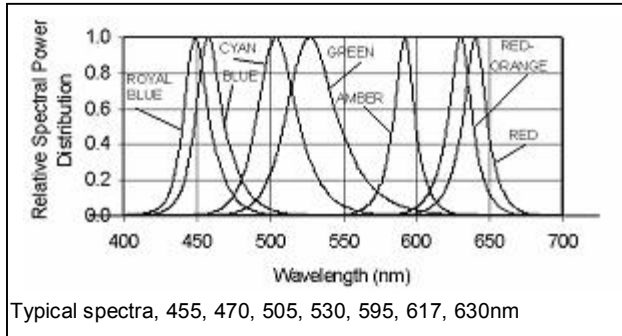
# LED Heads

## LEDH, LEDHR series



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### Specifications p.2



Ordering information:  
 LEDH[R] - XXXX (color, temperature) – XXXX (performance model, for LEDH only)  
 -455 (royal blue) -omitted: 1.0x1.0 mm die, basic performance  
 -470 (blue) -3: 1.0x1.0mm die, high brightness, high power  
 -505 (cyan) -5: 3x3mm die, moderate brightness, high power  
 -530 (green) -K2: 1.0x1.0mm die, best brightness, best power  
 -590 (amber)  
 -617 (red orange)  
 -630 (red)  
 -3500 (warm white)  
 -5500 (bright white)

examples:  
 LEDHR-470: blue, 1.2" pitch, with reflector, basic performance LED head  
 LEDH-530: green, 0.8" pitch, basic performance LED head.  
 LEDH-455-K2: royal blue, 0.8" pitch, best brightness/power LED head.

