

## FHS Lens Series

- High efficiency
- Available in 4 different beams
- Patent Pending

The FHS series offers a complete range of lenses specially designed for the LUXEON™ LEDs from Lumileds<sup>(1)</sup>. Both Batwing and Lambertian LUXEON™ radiation patterns are supported.

A software optimized aspheric profile combined to front shaped micro-lens arrays enable the generation of four different lens models: narrow beam, medium beam, wide beam and a special elliptical pattern<sup>(2)</sup>.

The high collection efficiency reaches 85% of the total flux emitted from the LED.

Lenses are also available assembled with Fraen's Universal Lens Holder. The holder ensures the proper relative placement between the lens and the LUXEON™ LEDs. Heat staking the legs of the holder to the support provides excellent mechanical strength.

Typical applications for the FHS lenses coupled with the LUXEON™ LEDs are:

- Reading Lamps
- Signs
- Street Lights
- General Illumination
- Most applications where uniformity and high intensity over a wide angle is required



(1) LUXEON™ is a trademark of Lumileds Lighting, LLC (370 West Trimble Road, San Jose CA 91131). For technical specification on LEDs please refer to the LUXEON™ datasheet or visit [www.luxeon.com](http://www.luxeon.com) and [www.lumileds.com](http://www.lumileds.com)

(2) Typical beam divergence may change with different color LEDs

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## FHS Lens Series **OPTICAL CHARACTERISTICS**

### Typical Beam Divergence FWHM<sup>(3)</sup> with Batwing LED<sup>(4)</sup>

Part Number	Type	LED Color		
		Amber, Red (Degrees)	Blue, Cyan, Green (Degrees)	White (Degrees)
FHS-HNB1-LB01-x	Narrow Beam	6	8	10
FHS-HMB1-LB01-x	Medium Beam	25	28	30
FHS-HWB1-LB01-x	Wide Beam	40	42	45
FHS-HEB1-LB01-x	Elliptical Beam	10 x 22	12 x 25	15 x 30

### Typical Beam Divergence FWHM<sup>(3)</sup> with Lambertian LED<sup>(4)</sup>

Part Number	Type	LED Color		
		Amber, Orange, Red (Degrees)	Blue, Cyan, Green (Degrees)	White (Degrees)
FHS-HNB1-LL01-x	Narrow Beam	8	10	10
FHS-HMB1-LL01-x	Medium Beam	25	28	30
FHS-HWB1-LL01-x	Wide Beam	40	42	45
FHS-HEB1-LL01-x	Elliptical Beam	12 x 24	14 x 25	15 x 30







(3) FWHM full width half maximum is the full angle measured where the luminous intensity is half of the peak value.

(4) Typical divergence angle may change with different color LEDs and depends on the tolerance of the LEDs.










## FHS Lens Series OPTICAL CHARACTERISTICS

Typical on axis intensity<sup>(5)</sup> (candela per Lumen<sup>(6,7)</sup>) with Batwing LED

Part Number	Type	Blue	Cyan	Green	Amber	Red	White
							
FHS-HNB1-LB01-x	Narrow Beam	28.3	29.5	29.5	32.6	32.6	13.5
FHS-HMB1-LB01-x	Medium Beam	5.6	5.7	5.7	4.3	4.3	4.1
FHS-HWB1-LB01-x	Wide Beam	1.6	1.7	1.7	1.4	1.4	1.6
FHS-HEB1-LB01-x	Elliptical Beam	8.2	8.5	8.5	7.7	7.7	5.7

Typical on axis intensity<sup>(5)</sup> (candela per Lumen<sup>(6,7)</sup>) with Lambertian LED

Part Number	Type	Blue	Cyan	Green	Amber	Orange	Red	White
								
FHS-HNB1-LL01-x	Narrow Beam	17.1	18.1	18.1	16.5	16.5	16.5	17.1
FHS-HMB1-LL01-x	Medium Beam	5.3	5.4	5.4	4.3	4.3	4.3	5.5
FHS-HWB1-LL01-x	Wide Beam	1.5	1.7	1.7	1.2	1.2	1.2	1.8
FHS-HEB1-LL01-x	Elliptical Beam	6.2	6.5	6.5	6.4	6.4	6.4	6.7

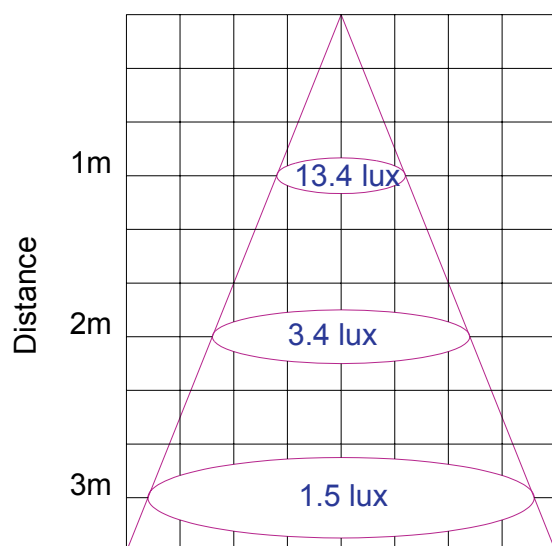
(5) Is the typical on axis luminous intensity measured in candela per lumen (K) with a typical Luxeon LED. Candela per Lumen  $K=I/F$  where  $I$  is the intensity measured in candela and  $F$  is the total flux of the LEDs under test.

(6) Multiply the candela per lumen value  $K$  with the flux of the LED to obtain the expected on axis intensity in candela. Please refer to the Luxeon datasheet to verify the flux bin.

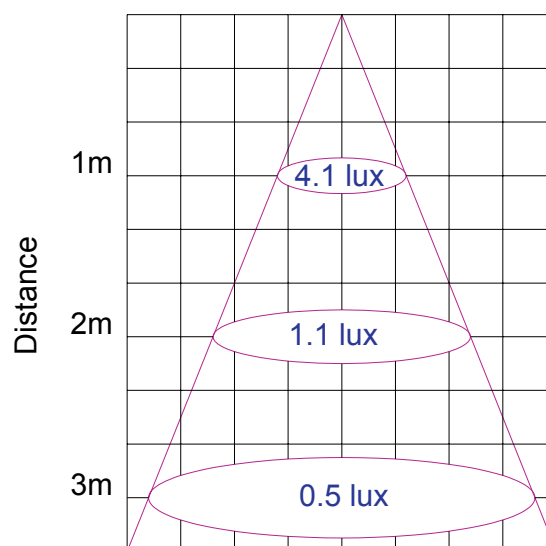
(7) Luminous Intensity depends on the LED flux binning and LED tolerances. Please refer to the Luxeon datasheet for more details on flux binning and mechanical tolerances.

## FHS Lens Series

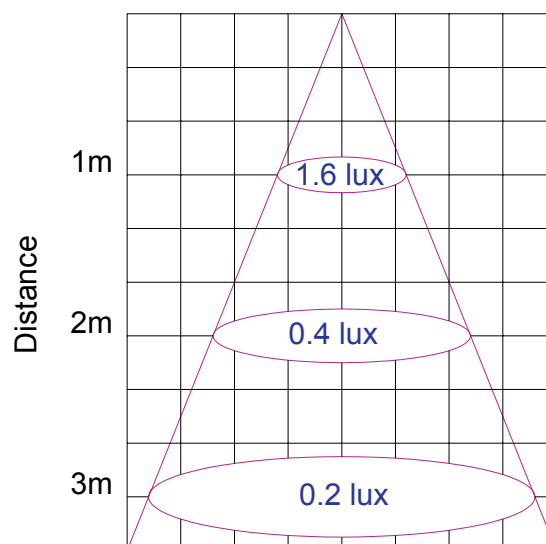
### ILLUMINANCE CHART AT VARIOUS DISTANCES (white Batwing LUXEON™ LED<sup>(8,9)</sup>)



FHS-HNB 1-LB01-x  
Narrow Beam Lens for Batwing LED



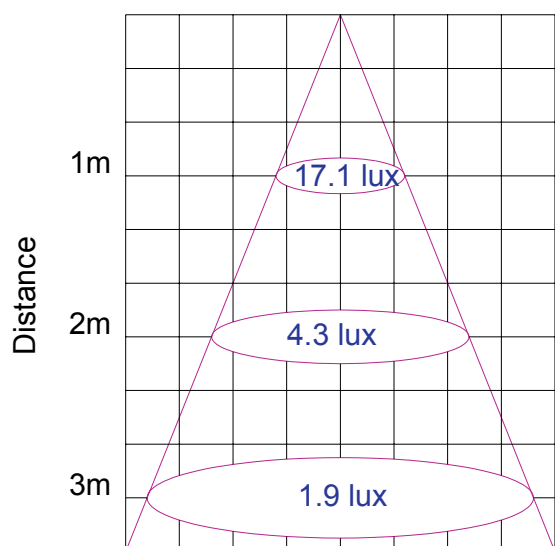
FHS-HMB 1-LB01-x  
Medium Beam Lens for Batwing LED



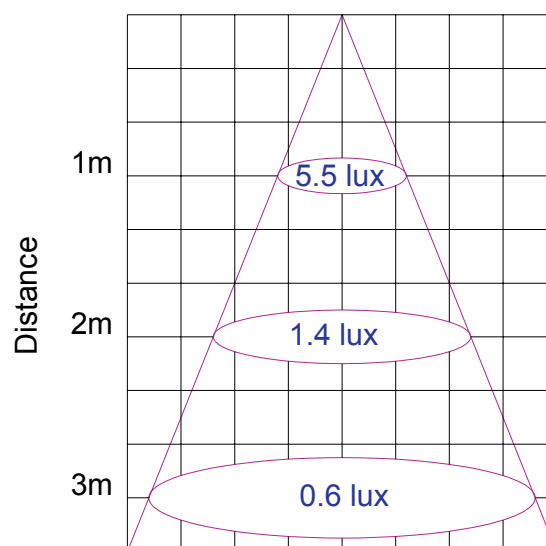
FHS-HWB 1-LB01-x  
Wide Beam Lens for Batwing LED

## FHS Lens Series

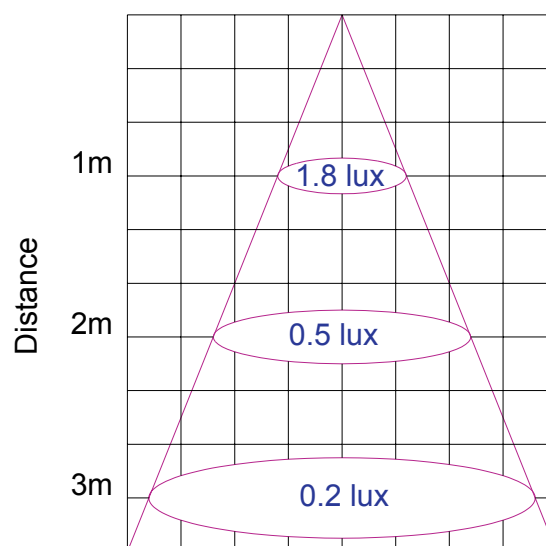
### ILLUMINANCE CHART AT VARIOUS DISTANCES (white Batwing LUXEON™ LED<sup>(8,9)</sup>)



FHS-HNB 1-LL01-x  
Narrow Beam Lens for Lambertian LED



FHS-HMB 1-LL01-x  
Medium Beam Lens for Lambertian LED



FHS-HWB 1-LL01-x  
Wide Beam Lens for Lambertian LED

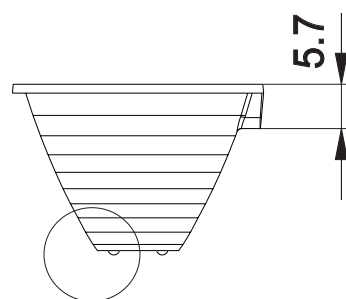
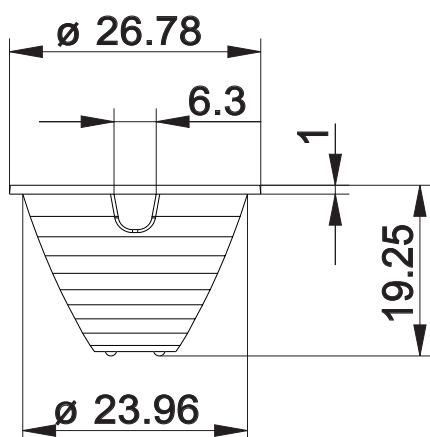
(8) Typical illuminance measured in lux per lumen (E) with a typical LUXEON™ LED. Multiply the lux per lumen value E with the flux of the LED to obtain the expected illuminance in lux.

(9) Illuminance depends on the LED flux binning and LED tolerances. Please refer to the LUXEON™ datasheet to verify the flux bin.

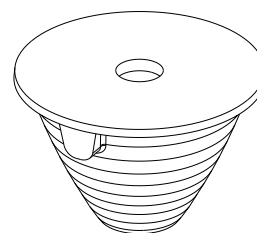
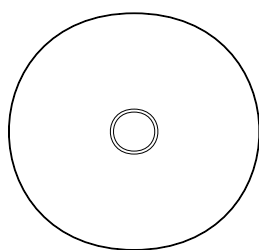
## FHS Lens Series **DRAWINGS**

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### Batwing LEDs Lenses Layout



The 4 pins on the bottom allow you to mount the lens directly on your Batwing LUXEON™ LED.



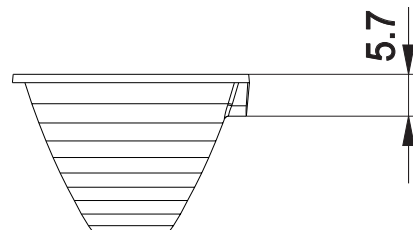
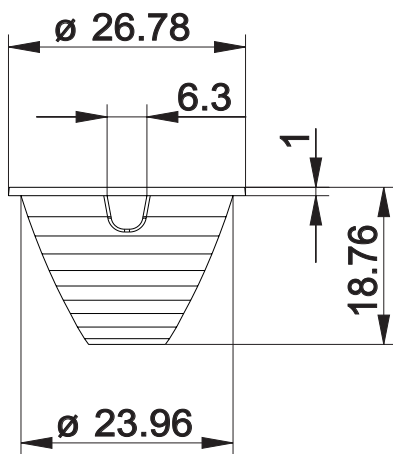
Dimension tolerance is +/- 0.2mm

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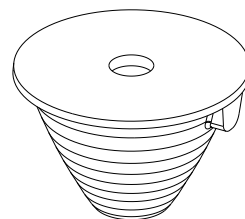
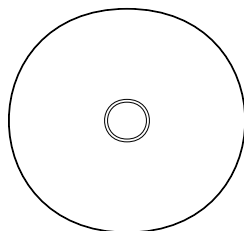


FHS Lens Series **DRAWINGS**

Lambertian LEDs Lenses Layout



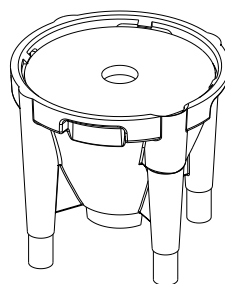
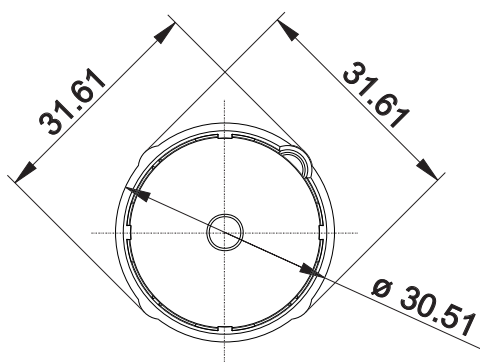
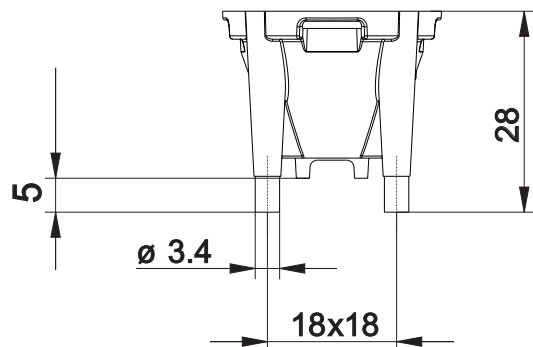
To mount the lens directly on your Lambertian LUXEON™ LED a ring spacer is required.  
See details on page 8.



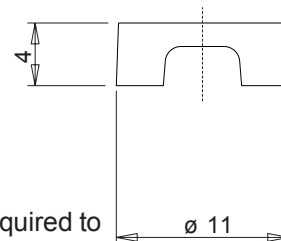
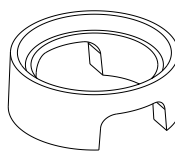
Dimension tolerance is +/- 0.2mm

## FHS Lens Series **DRAWINGS**

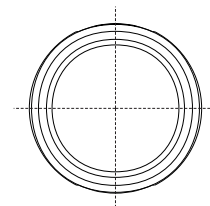
Lens and holder assembly layout  
FHS-xxxx-Lx01-H



Lens holder assembly should be mounted to the proper support by heat staking the four legs on the bottom. Please refer to the application note FAN-01EN for more details on required tooling and procedures.



The Ring Spacer (P/N FTS-S) is required to couple the Lambertian FHS lenses directly on the Lambertian LUXEON™ LEDs without the Universal Lens Holder.

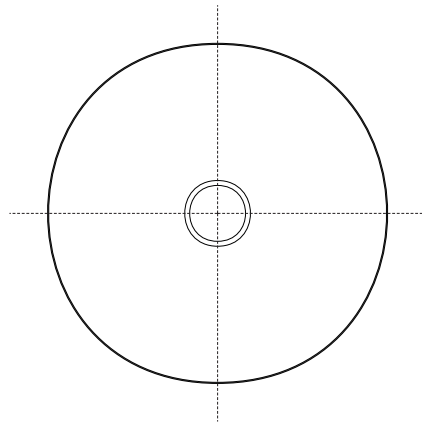


Dimension tolerance is +/- 0.2mm

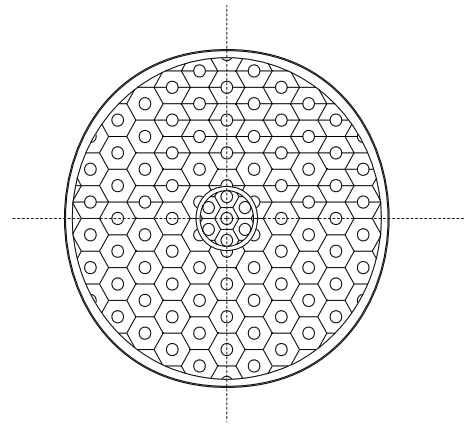


## FHS Lens Series **DRAWINGS**

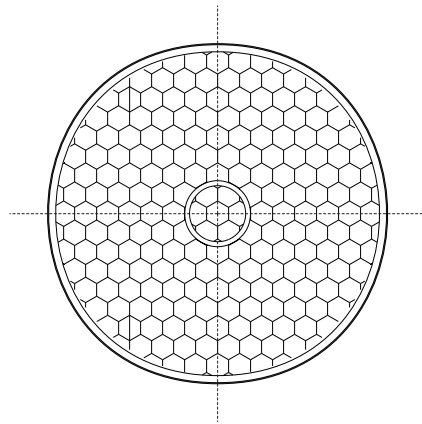
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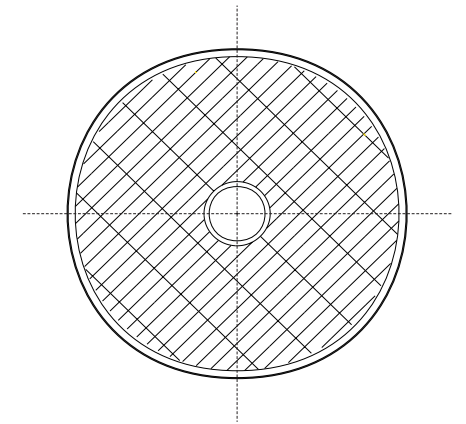
FHS-HNB1-Lx01-x  
Narrow Beam Lens, flat surface



FHS-HMB1-Lx01-x  
Medium Beam Lens, 2.6mm hexagonal  
shape micro-lens array



FHS-HWB1-Lx01-x  
Wide Beam Lens, 1.7mm hexagonal  
shape micro-lens array

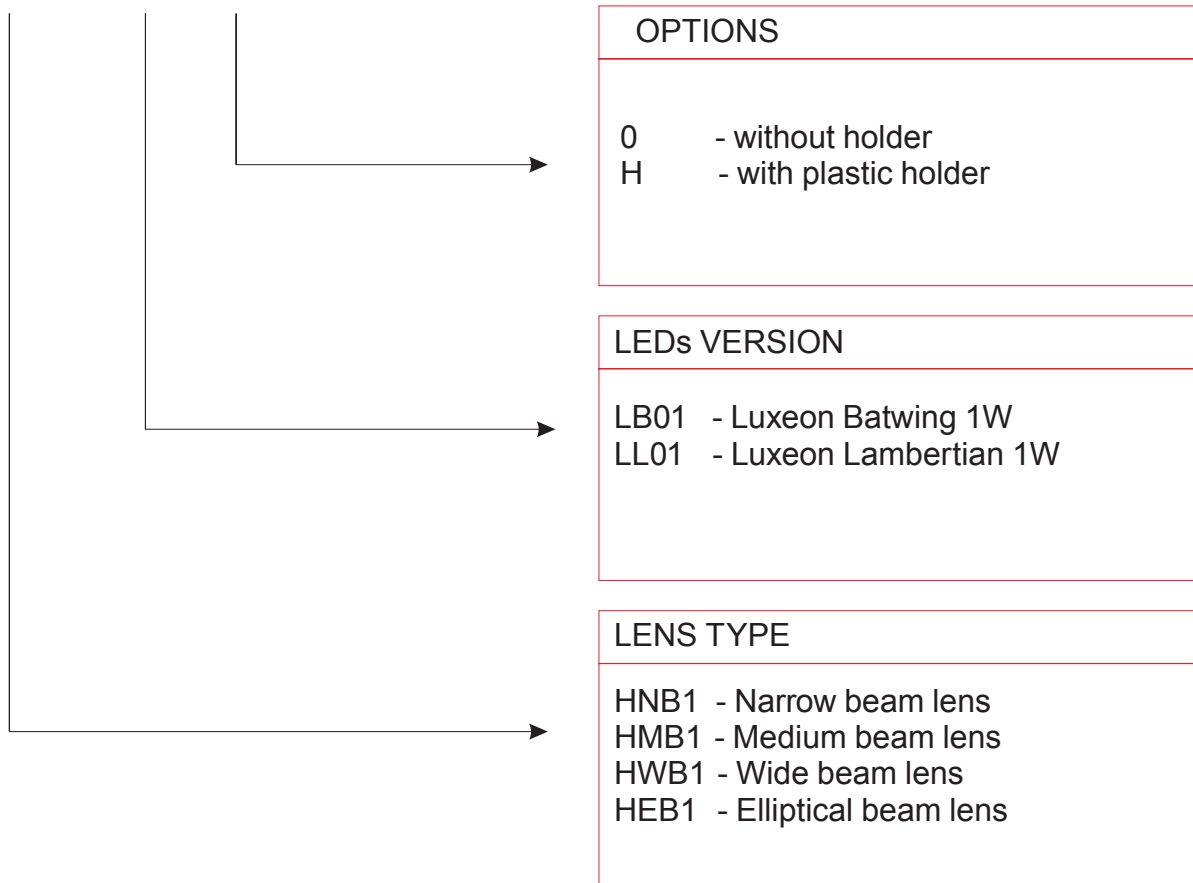


FHS-HEB1-Lx01-x  
Elliptical Beam Lens 1 x 3.7mm  
rectangular shape micro-lens array



## FHS Lens Series ORDERING NUMBER

FHS - XXXX - YYYY - Z



Lenses are distributed by Future Electronics.  
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