



## FHS SERIES LENSES for LUXEON™ K2 LED

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

The FHS series offers a complete range of solutions designed for the LUXEON™ K2 LED from Lumileds (1).

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

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

Each of these lenses is available either with a Spacer Ring or assembled with Lens Holder. These assure the proper relative placement between the lens and the K2 LED. Heat staking the four legs of the holder to the customer's PCB or heat sink provides excellent optical and mechanical assembly (see Fraen Application Note FAN01-EN (at [www.fraensrl.com](http://www.fraensrl.com))).

Typical applications are:

- Reading lamps
- Signs
- Architectural Lighting
- Street Lights
- Most application where uniformity and high intensity over a wide angle is required.



(1) LUXEON™ is a trademark of Lumileds Lighting, LLC. For technical specification on LEDs please refer to the LUXEON™ datasheet or visit <http://www.luxeon.com> or [www.lumileds.com](http://www.lumileds.com)

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## General Characteristics

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Lens Material	Optical Grade PMMA
Holder Material	PC ABS
Operating Temperature range	-40deg C / + 80 deg C
Storage Temperature range	-40deg C / + 80 deg C

Average transmittance in visible spectrum (400 – 700nm) >90%, as measured using 3mm thick Optical Grade PMMA.

*Please note that flow lines and weld lines on the external surfaces of the lenses are acceptable if the optical performance of the lens is within the specification described in the section "OPTICAL CHARACTERISTICS"*

### **IMPORTANT NOTE – Lenses handling and cleaning:**

*Handling: Always use gloves to handle lenses and/or handle the lenses only by the flange. Never touch the outside surfaces of the lenses with fingers; finger oils and contamination will absorb or refract light.*

*Cleaning: Clean lenses only if necessary. Use only soap and water to clean the surfaces and lenses. Never expose the lenses to alcohol, as it will damage the plastic.*



## Optical Characteristics: Total Beam Divergence

Lens Part Number	Type of lens	Typical total divergence (degrees)		
		Red, Amber LEDs ● ●	Blue, Cyan, Green LEDs ● ● ●	White LED ○
FHS-HNB1-LLK2-z	Narrow beam	7.0	9.0	9.0
FHS-HMB1-LLK2-z	Medium beam	21.0	22.0	22.0
FHS-HWB1-LLK2-z	Wide beam	38.0	38.0	38.0
FHS-HEB1-LLK2-z	Elliptical beam	10.0 x 20.0	10.0 x 20.0	10.0 x 20.0

- Divergence varies with LED color due to different chip size and chip position tolerance.
- Total divergence is the full angle measured where the luminous intensity is half of the peak value.

## Optical Characteristics: On-Axis Efficiency

Lens Part Number	Type of lens	Typical on axis efficiency (cd/lm)		
		Red, Amber LEDs ● ●	Blue, Cyan, Green LEDs ● ● ●	White LED ○
FHS-HNB1-LLK2-z	Narrow beam	16.9	18.5	21.0
FHS-HMB1-LLK2-z	Medium beam	3.2	4.6	4.4
FHS-HWB1-LLK2-z	Wide beam	0.9	1.2	1.2
FHS-HEB1-LLK2-z	Elliptical beam	6.0	8.6	7.9

## Mechanical Characteristics

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### **IMPORTANT - Assembly information:**

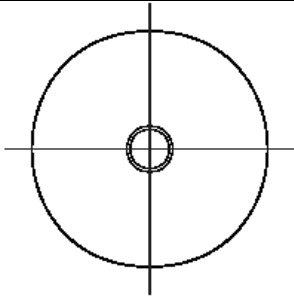
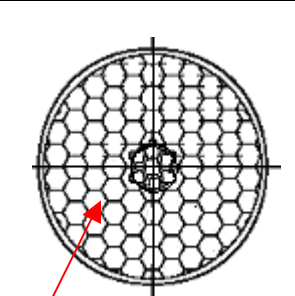
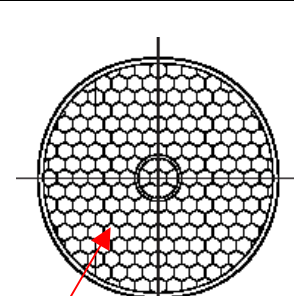
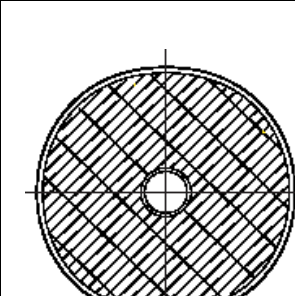
For best optical performance (shown above), correct mechanical position of the lens on the Luxeon LED is critical.

To achieve the correct lens position *with a Luxeon K2 LED* (lens not touching the LED), the lens must be used/assembled with either a lens holder or with a ring spacer.

The outside mechanical dimensions of all lenses (Narrow, Medium, Wide and Elliptical beam) are the same, except the top of the lens.

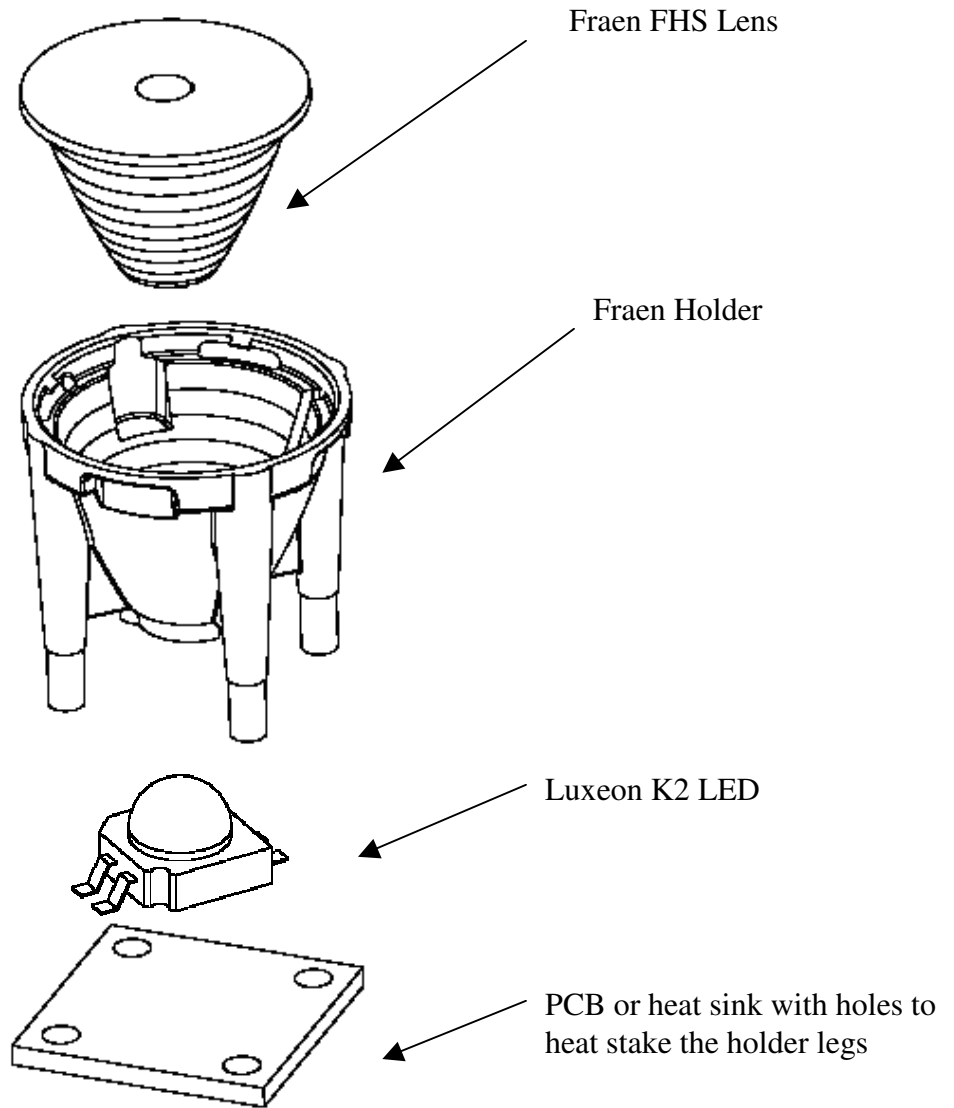
The lenses can be recognized by the **top view** as shown below.

### **Top views:**

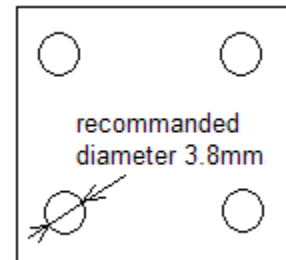
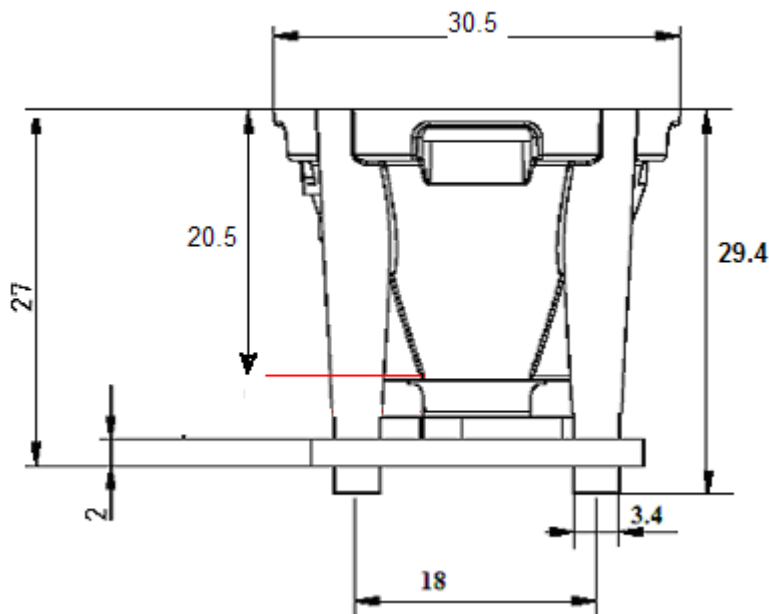
Narrow beam lens: FHS-HNB1-LLK2-z	Medium Beam lens: FHS-HMB1-LLK2-z	Wide beam lens: FHS-HWB1-LLK2-z	Elliptical lens: FHS-HEB1-LLK2-z
			
Flat surface	2.6mm hexagonal shaped microlens array	1.7mm hexagonal shaped microlens array	1.0 x 3.7mm rectangular shaped microlens array



**Lens + holder assembly view:**



**Lens + holder assembly dimensions:**

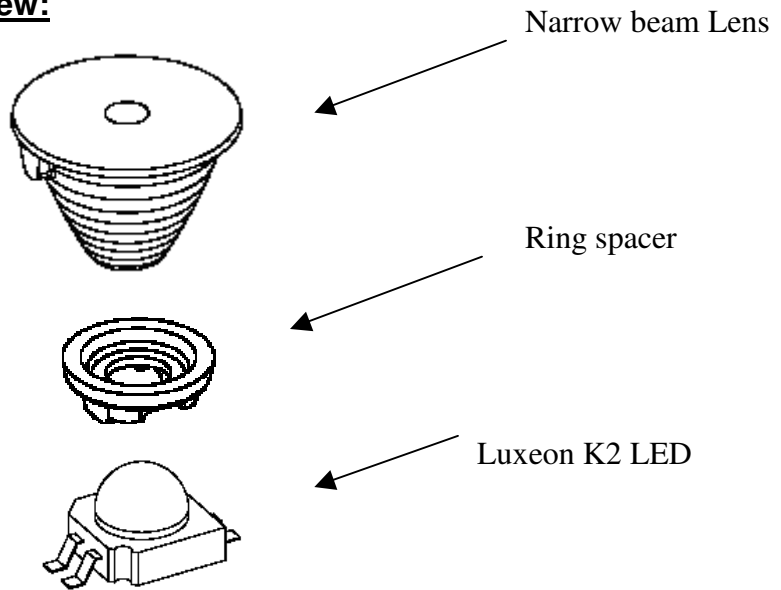


Dimensions tolerance is +/-0.2mm

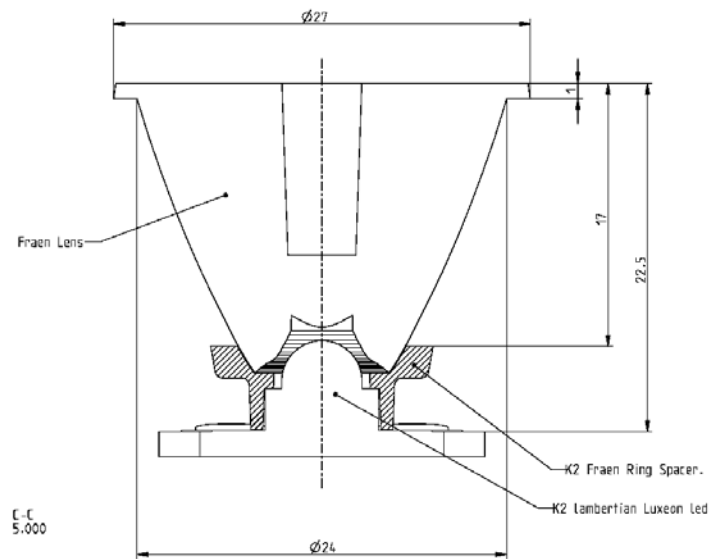


**Spacer Ring:** If using a lens without the lens holder, spacer ring **FTS-SK2** must be used to set the correct gap between the lens and K2 LED. This spacer ring is included with all lens ordered without a holder.

**Lens + ring spacer assembly view:**



**Lens + ring spacer assembly dimensions:**





## Ordering part numbers

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FHS-HxB1-LLK2-z

**LENS TYPE:**

- N: Narrow beam lens
- M: Medium beam lens
- W: Wide beam lens
- E: Elliptical beam lens

**OPTIONS:**

- H: lens assembled to plastic holder.
- 0: lens + required spacer ring (FTS-SK2)

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Rev	Date	Author	Description
00	23 May 2006	S. Hampton	Pre-Release
01	25 May 2006	C. Jones	Release
02	19 June 2006	C. Jones	Added -LL01-0 option and spacer ring part number
03	08-23-2006	S.A.H.	Revised Part Numbers + Cosmetic Update
04	09-07-2006	S.A.H.	Corrections + Photo update