

## FHS ASYMMETRIC series lenses For LUXEON™ Lambertian LEDs

- Off-axis beam
- High efficiency
- Available in 2 different beams
- Patent Pending

The FHS Asymmetric series offers two lenses especially designed for the LUXEON™ Lambertian LED from Lumileds (1).

A software-optimized aspheric profile combined with front shaped micro-lens arrays enable two different lens models: narrow beam and medium beam (2).

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

Each of these lenses is available assembled with Fraen's universal Lens Holder. The holder assures the proper relative placement between the lens and the Luxeon™ 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)):  
<http://www.fraensrl.com/appnotes.html>

Typical applications are:

- Wall washing lamps
- Sign illumination
- Architectural Lighting
- Artwork illumination



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

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

### FRAEN CORPORATION (US Market)

80 Newcrossing Road  
Reading MA 01867  
USA  
Phone: 781.205.5300  
Fax: 781.942.2426  
[optics@fraen.com](mailto:optics@fraen.com)

### FRAEN Srl (EU Market)

Via Stelvio 12  
20019 Settimo Milanese  
ITALY  
Phone: +39 02.33.54.561  
Fax: +39 02.33.57.65.26  
[info@fraen.it](mailto:info@fraen.it)

Website: [www.fraensrl.com](http://www.fraensrl.com)

Distributed by Future Electronics



Americas: 1-888-LUXEON2

[askluxeon@FutureElectronics.com](mailto:askluxeon@FutureElectronics.com)

Europe: 00-0800-44FUTURE

[luxeon.europe@FutureElectronics.com](mailto:luxeon.europe@FutureElectronics.com)

Asia: 1-800-LUMILEDS

[lumileds.asia@FutureElectronics.com](mailto:lumileds.asia@FutureElectronics.com)

## Material Characteristics:

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Lens Material	Optical Grade PMMA
Holder Material	PC ABS or Transparent PC
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.

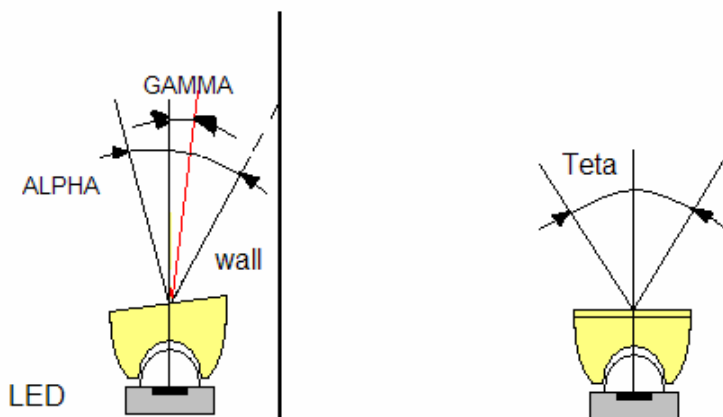
*Please note that flow lines and weld lines on the external surfaces of the lenses are acceptable if the optical performance of the lens is within the specification described in the section "OPTICAL CHARACTERISTICS"*

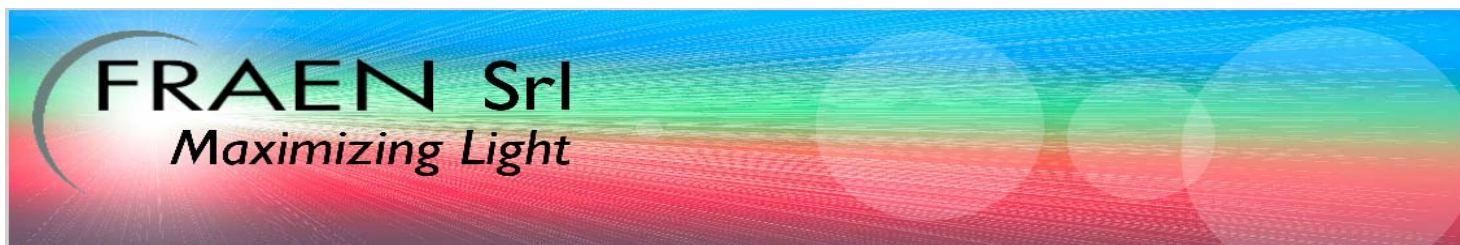
### IMPORTANT NOTE – Lenses handling and cleaning:




- 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: Beam Divergence

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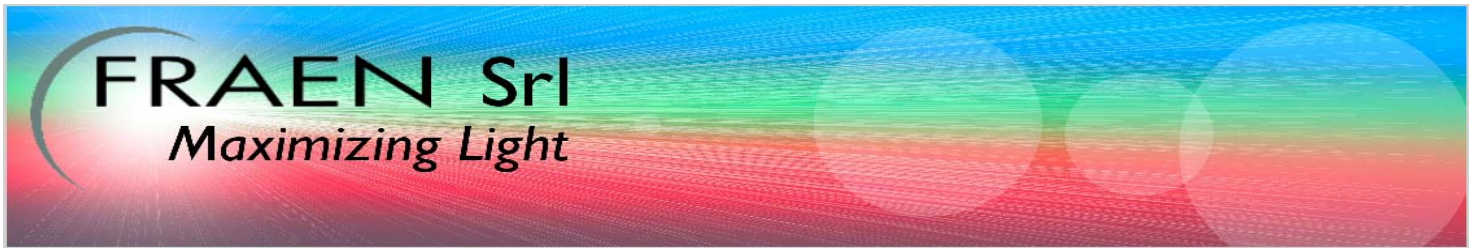
		Typical total beam divergence: Alpha; Theta; Gamma (degrees)		
Lens Part Number	Type of lens	Red, Orange, Amber LEDs 	Blue, Cyan, Green LEDs 	White LEDs 
FHS-HNA1-LLyy-z	Narrow beam	6.5; 6; 4	9; 8; 4	9; 8; 4
FHS-HMA1-LLyy-z	Medium beam	12.5; 14.5; 4	13.5; 15.5; 4	13; 14.5; 4

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

## Optical Characteristics: On-Axis Efficiency

		Typical on-axis efficiency (cd/lm)		
Lens Part Number	Type of lens	Red, Orange, Amber LEDs 	Blue, Cyan, Green LEDs 	White LEDs 
FHS-HNA1-LLyy-z	Narrow beam	16.2	22.8	24.0
FHS-HMA1-LLyy-z	Medium beam	4.8	7.9	8.4

- To estimate the on-axis intensity, multiply the on-axis efficiency of the lens (cd/lm) by the total flux of the Luxeon LED used. For more detail on flux binning please check the Luxeon LED datasheet at <http://www.luxeon.com>.
- Luminous intensity depends on the flux binning and tolerances of the LEDs. Please refer to the Luxeon datasheet for more details on flux binning and mechanical tolerances.



## Assembly Information

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

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

To achieve correct lens position with a Lambertian Luxeon LED, use either:

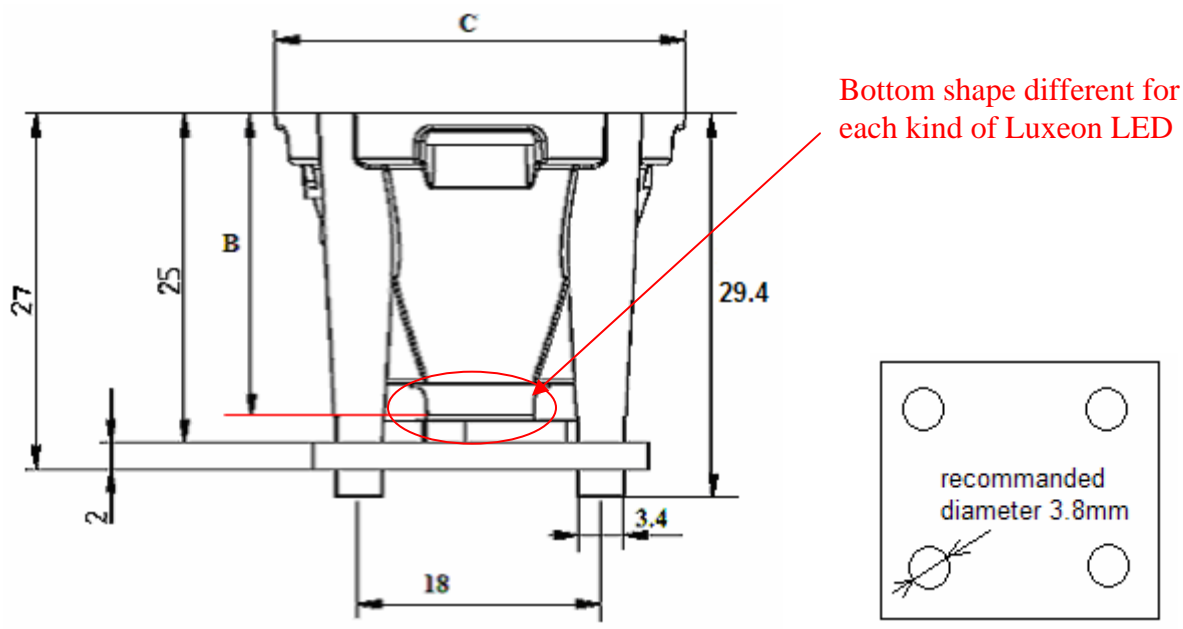
- Lens with a spacer ring,  
or
- Lens + holder assembly.

Part numbering, product selection, and spacer ring selection are detailed near the end of this datasheet.



## Identifying Lens Holders by Their Appearance

### Lens + holder assembly dimensions:



To achieve the correct distance between any Lambertian Luxeon LEDs and the lens, specific holders have been designed. They can be recognized by their interface:

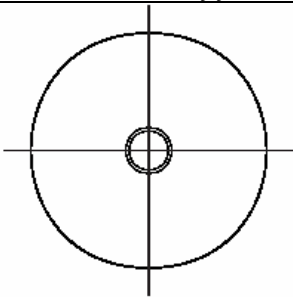
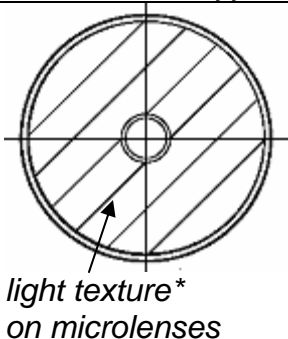
With Lambertian Luxeon LEDs	Bottom of the holder	B	C Standard holder	C MR11 holder version *
1W star 1W emitter 3W emitter 5W emitter		23.8mm	30.5mm	34.9mm
3W star 5W star		23.0mm	30.5mm	34.9mm

Dimensions tolerance is +/-0.2mm

\* -MH and -MS are lens holders with 34.9mm diameter flange for MR11-sized applications.

The outside mechanical dimensions of both the Asymmetrical lenses (Narrow and Medium) are the same for the different beams, except the top of the lens. The lenses can be identified by their top view:

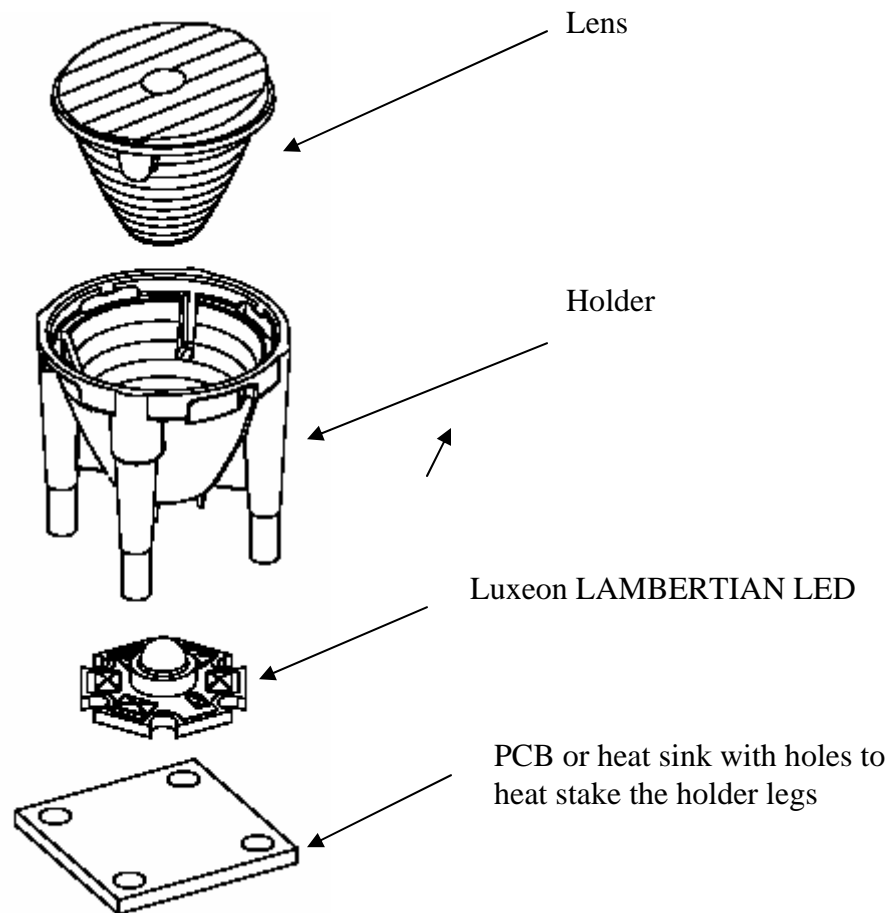
**Top views:**

Narrow beam lens: FHS-HNA1-LLyy-z	Medium Beam lens: FHS-HMA1-LLyy-z
	
flat surface	microlens waves

Dimensions tolerance is +/-0.2mm

\* Note: A light texture has been added to the microlens surface of the medium beam lenses. This texture is sufficient to improve the homogeneity (evenness) of the beam with negligible affect on peak intensity.

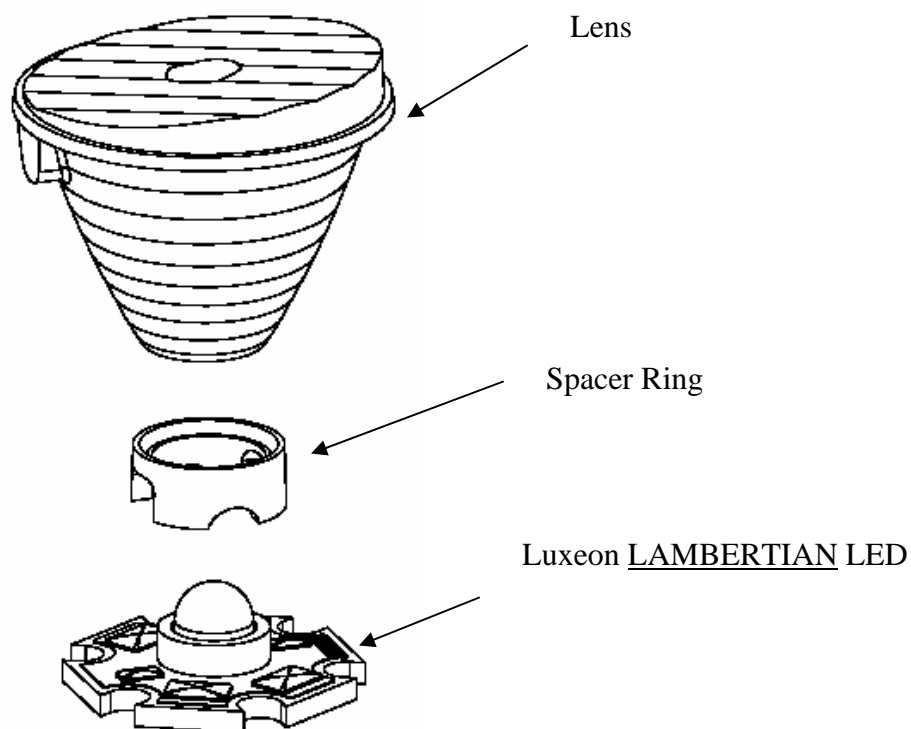
**Lens + holder assembly exploded view:**



Note: If using a Lambertian Luxeon™ LED and a Fraen lens without a lens holder, a “Spacer Ring” is required to achieve the correct distance between the Luxeon™ LED and the lens. Further information about Spacer rings is available below (Section “Spacer Rings, Usage”).

## Spacer Rings, Usage

**Lens + spacer ring assembly, for Lambertian LED and lens without lens holder:**



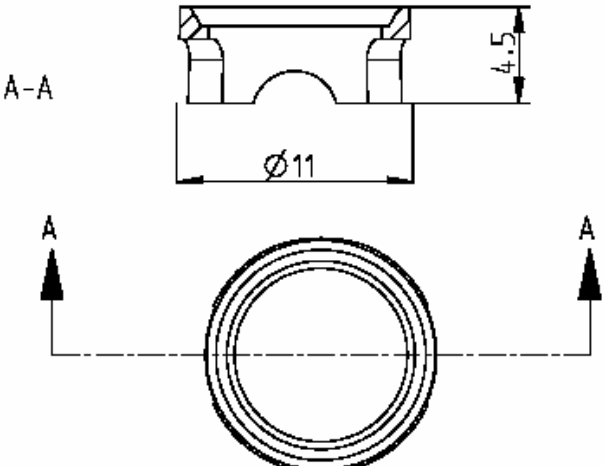
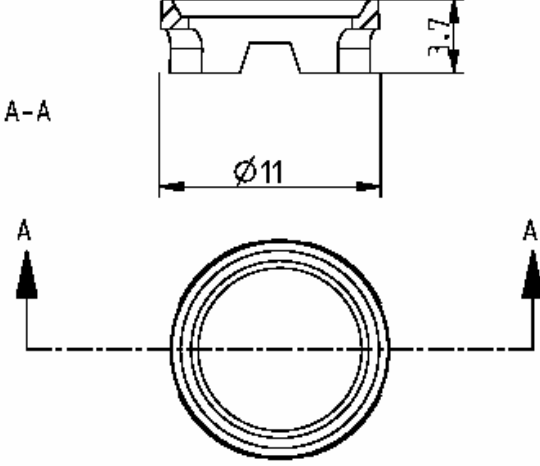
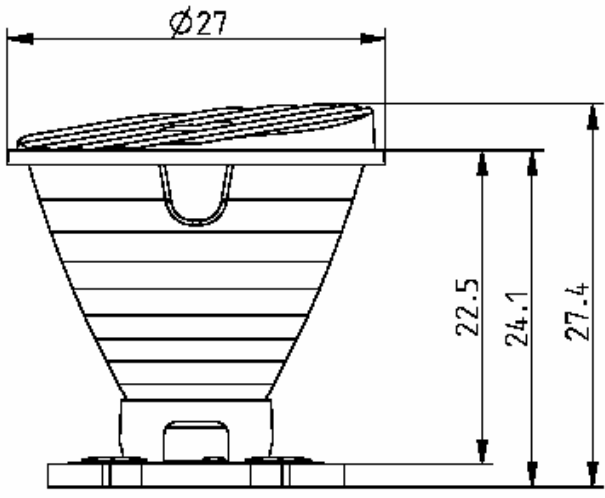
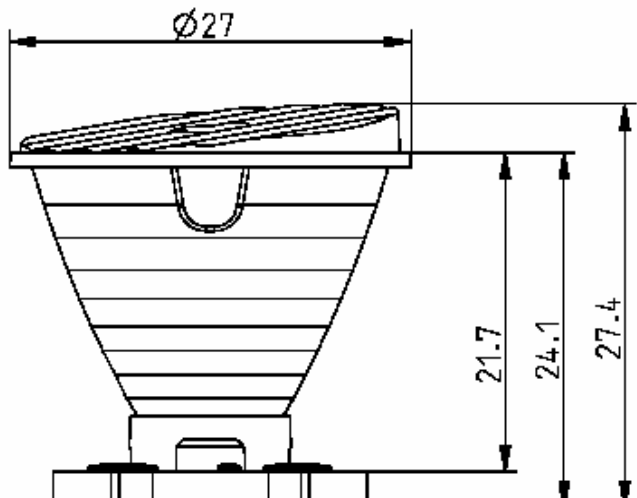
Notes:

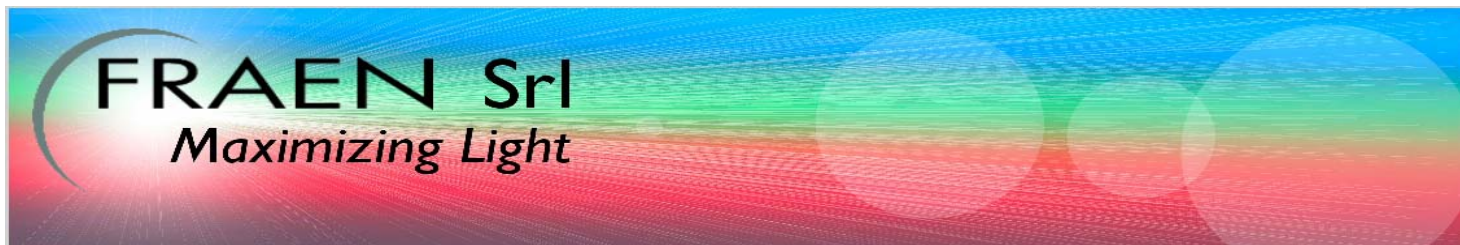
- Spacer rings are only required for Lambertian lenses used without holders.
- Information for selecting spacer rings is shown below.

## Spacer Rings, Selection

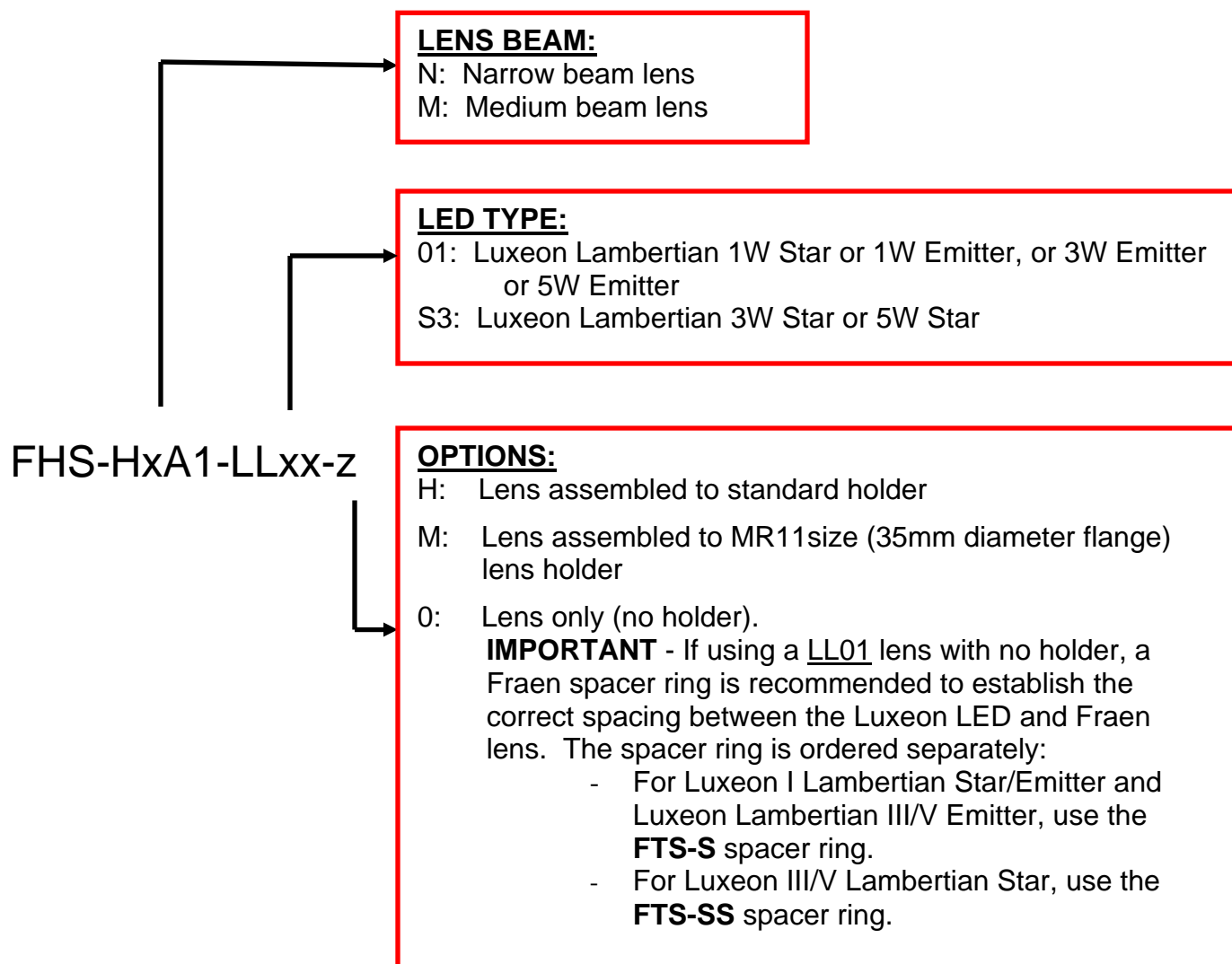
<p>With the following Luxeon LEDs:</p> <ul style="list-style-type: none"> <li>- Luxeon I Lambertian 1W star</li> <li>- Luxeon I Lambertian 1W emitter</li> <li>- Luxeon III Lambertian 3W emitter</li> <li>- Luxeon V Lambertian 5W emitter</li> </ul>	<p>With the following LUXEON LEDs:</p> <ul style="list-style-type: none"> <li>- Luxeon III Lambertian 3W star</li> <li>- Luxeon V Lambertian 5W star</li> </ul>
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use spacer ring <b>FTS-S</b>	use spacer ring <b>FTS-SS</b>
	
<p>Assembly:</p> 	<p>Assembly:</p> 
<p>With the following Luxeon LEDs:</p> <ul style="list-style-type: none"> <li>- Luxeon I Lambertian Star</li> <li>- Luxeon I Lambertian Emitter</li> <li>- Luxeon III Lambertian Emitter</li> <li>- Luxeon V Lambertian Emitter</li> </ul> <p>Use Fraen spacer ring part number: <b>FTS-S</b></p>	<p>With the following LUXEON LEDs:</p> <ul style="list-style-type: none"> <li>- Luxeon III Lambertian Star</li> <li>- Luxeon V Lambertian Star</li> </ul> <p>Use Fraen spacer ring part number: <b>FTS-SS</b></p>



## Ordering part numbers



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### Document Revision Record

Rev	Date	Author	Description
00	24 February 06	D. De Gaetano	Initial Release
01	09 June 06	C. Jones	Fraen Italy contact info updated.