



## Dual-Beam Focus Optical System (FOCOS™) for Luxeon Rebel™ LEDs FXGR-N3-RE-0R & FXGR-W3-RE-0R

- **Patented Fraen Technology**  
U.S. Patent #8,118,451
- **Produces Narrow and Wide Beam Patterns**
- **Compact size**
- **High efficiency**
- **Designed for use with Philips Luxeon Rebel LEDs**

*(Use of the FXGR system with Rebel ES LEDs is not approved. The Rebel ES TVS chip prevents the correct alignment of the FXGR-W3-RE-0R reflector to the Rebel ES LED.)*

Fraen's **FOCOS (FOCUS Optical System)** dual beam system consists of two reflectors that work together to deliver both a narrow spot and a wide flood from a single lighting fixture.

The secret behind the **FOCOS** system is its two reflector, two position design. When the outer reflector is extended away from the LED source, the system delivers a tightly focused beam with excellent throw and maximum projection of light.

For tasks requiring smooth, wide beam lighting, simply move the outer reflector to the retracted position, allowing the inner **FOCOS** reflector to deliver a pleasing and uniform area flood.

Typical **FOCOS** applications are ones requiring dual beam patterns, such as:

- Flashlights
- Bicycle lights
- Mining lights and head lights
- Any application requiring quick changes between flood and spot patterns



- (1) LUXEON® Rebel is a trademark of Philips Lumileds. For technical specification on Rebel LEDs, please refer to the LUXEON® Rebel datasheet or visit [www.philipslumileds.com](http://www.philipslumileds.com)

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## General Characteristics

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### Materials

Reflector Material	Black Polycarbonate with vacuum aluminum coating, protected by clear coat lacquer.
Operating Temperature range	-40° C / + 95° C
Storage Temperature range	-40° C / + 95°C

*Please note that small defects in the reflective coating, and flow lines and weld lines on the surfaces of the reflectors are acceptable if the optical performance of the reflector is within the specification described in the section "OPTICAL CHARACTERISTICS"*

### IMPORTANT NOTE – Reflector handling and cleaning:

- *Handling: Always handle the reflectors by the outside surfaces or flange. Never touch the inside surfaces of the reflector with fingers; finger oils and contamination will absorb or refract light.*
- *Cleaning: Clean reflectors only if necessary. Use only soap and water to clean the surfaces and reflectors. Never expose the reflectors to alcohol, as it will damage the plastic.*

## Scope

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This datasheet provides information about the FXGR Dual Beam Focusable System. (FXGR-N3-RE-0R and FXGR-W3-RE-0R reflector pair)



## Optical Characteristics – On-axis Intensity<sup>1</sup>, Beam Angle<sup>2</sup>, Field Angle<sup>3</sup>

LED	Beam Shape	On-axis Intensity (peak)	Beam Angle (FWHM)	Field Angle (FW10%)
Rebel Cool White	Narrow	31.0 cd/lm	4°	9°
	Wide	2.5 cd/lm	34°	65°
Rebel Warm White	Narrow	29.4 cd/lm	4°	9°
	Wide	2.1 cd/lm	36°	68°

- (1) To calculate the on-axis intensity (cd), multiply the on-axis value, above, of the reflector (cd/lm) by the total flux (lm) of the Luxeon Rebel LED used. See “Illumination Calculations” below. Luminous intensity depends on the flux binning and tolerances of the LEDs. Please refer to the Luxeon Rebel datasheets for more details on flux binning.
- (2) FWHM is the full angle where the beam intensity is half the on-axis peak intensity
- (3) Field angle is the full angle where the beam intensity is 10% of the on-axis peak intensity

## Illumination Calculations

To calculate intensity (cd): Find the central spot “on-axis intensity” value in the table above, then multiply this value by the luminous flux (lm) from your LED (refer to the Luxeon Rebel datasheet for nominal lumen values.) For a more accurate calculation, refer to the intensity “ranking” (binning) tables on the datasheet for the specific LED.

### Example calculations:

If the Fraen FXGR Narrow is used on a Rebel Cool White driven at 350 mA, a typical luminous flux of the LED is 105 lumens.

The calculation is: (31.0 cd/lm) x (105 lumens) = 3255 candela on-axis intensity.

One candela at 1-meter distance produces 1 Lux. This means the peak illuminance at 1 meter will be 3255 lux. The illuminance decreases as a function of the distance squared, so at 2 meters the peak illuminance will be 3255 / (2<sup>2</sup>) = 814 lux. At 3 meters distance, the peak illuminance will be 3255 / (3<sup>2</sup>) = 362 lux.

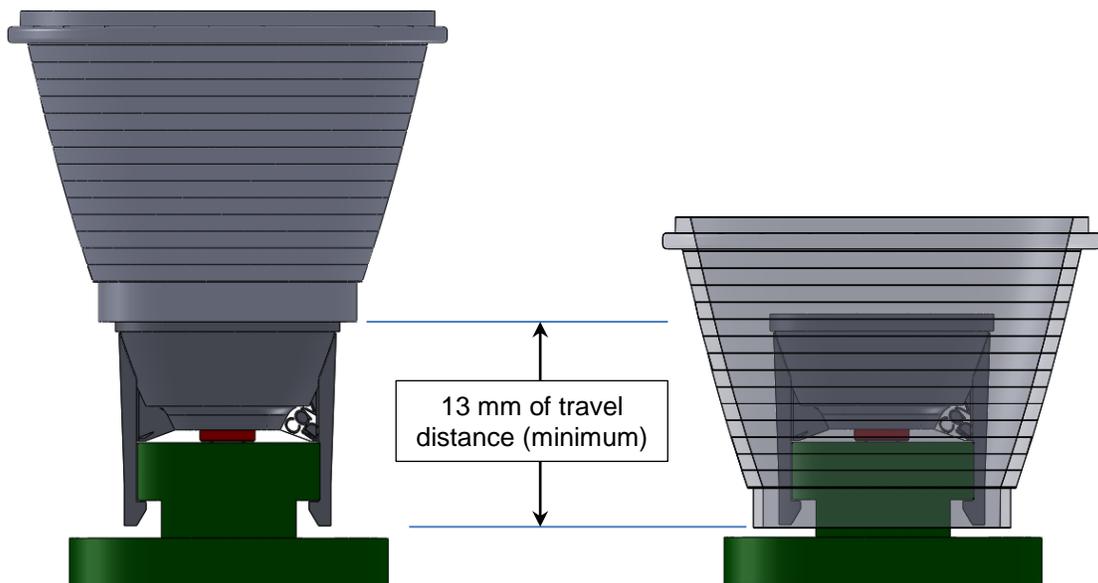
The beam angle specified in the table above is 4 degrees FWHM (full angular width measured where the beam intensity equals half the on-axis maximum intensity.) This means at ±2 degrees off-axis (half of 4 degrees), the intensity should be half of 3637 candela, or 1818 candela.



## Mechanical Characteristics

The FXGR Dual-Beam Focusable Reflector System consists of a narrow (FXGR-N3-RE-0R) and wide (FXGR-W3-RE-0R) reflector pair. When in the extended position (see figure 1), the two reflectors work in tandem to product a narrow illumination beam with sharp cut-off of the spill beam.

When the large reflector is in the retracted position, the FXGR delivers a smooth, wide beam illumination.



FXGR in Narrow Spot position with larger reflector fully extended

FXGR in Wide Flood position with larger reflector fully retracted

Extending or retracting the large reflector by 13 mm changes the illumination pattern from narrow spot to wide flood. The heat-sink/pedestal (in green) and the LED (in red) are shown for illustration purposes only and are not provided by Fraen Corporation.

Figure 1 Showing Narrow and Wide positions

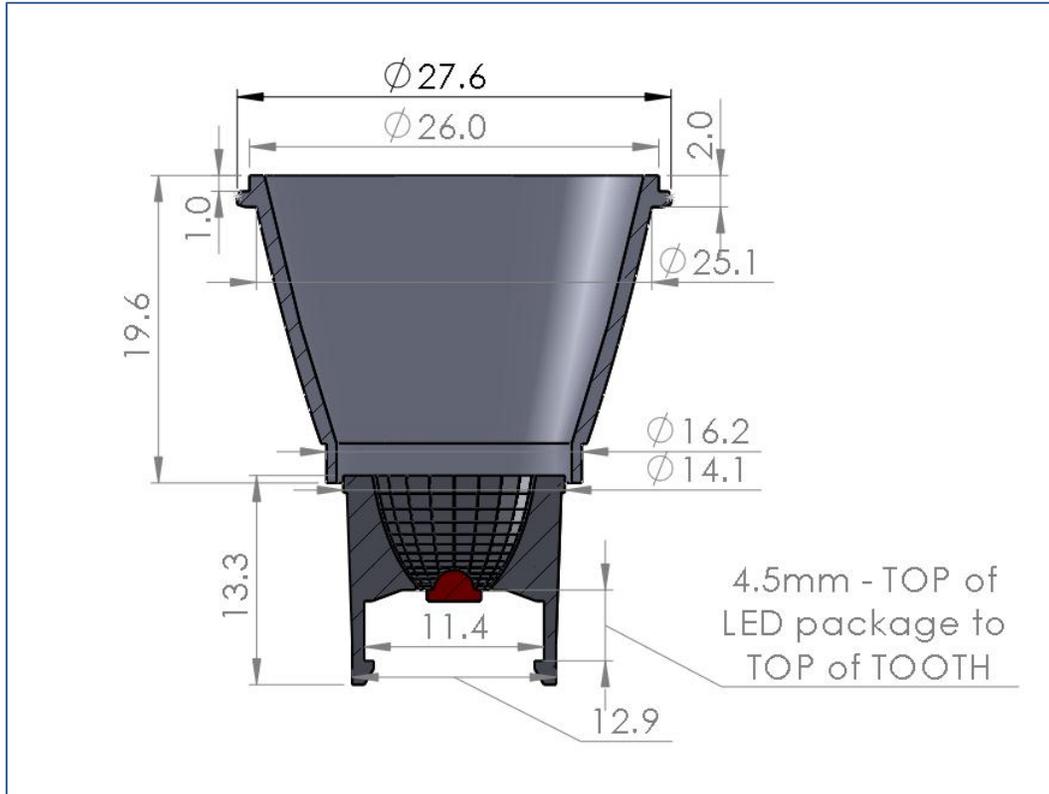


Figure 2 – Mechanical dimensions of the FXGR Dual-Beam Focusable Reflector System

Changing the illumination pattern from a narrow to a wide beam requires that the large reflector be moved relative to the LED. The large reflector is designed with a mounting flange, allowing the designer to properly align, secure and move the reflector in their assembly.

The smaller reflector is designed for a snap fit onto the customer's heatsink or PCB. The dimensions of your heatsink will be determined by the LED used. Maximum reflector performance is realized when the top of the LED package is coincident with the bottom of the small reflector, as shown in figure 2.

To permit full retraction of the large reflector, the LED must be mounted on a heat-sink/pedestal feature (figure 1 in green). Proper design of your heat sink to accommodate the full retraction of the large reflector and the snap fit of the small reflector is an important design consideration.



## **Ordering Part Numbers**

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**FXGR-N3-RE-0R (Large, narrow spot reflector)**

**FXGR-W3-RE-0R (Small, wide flood reflector)**

These parts must be ordered as reflector pairs to achieve dual beam performance. While the reflectors may be used individually, their performance in this configuration has not been fully evaluated.

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