FRC Series Reflector

for Osram OSTAR™ LEDs

- **High efficiency**
- **Focused central beam with useful spill illumination**
- **Available in two different beam distributions**

The FRC series offers two reflectors especially designed for the OSTAR™ LED from Osram Opto Semiconductors Inc. (1).

A software-optimized aspheric profile combined with precision facets provides narrow and medium beam patterns with homogeneous central spots and useful peripheral spilled light.

The high collection efficiency reaches 88% of the total flux emitted from the LED.

Three locating legs assure proper relative placement between the reflector and the OSTAR™ LED.

Typical applications are:

- Portable lighting (flashlights, bicycle lamps, headlamps)
- Retail (product) lighting
- Most application requiring a bright central spot with peripheral spilled light

OSRAM Opto Semiconductors

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FRAEN Corporation OMG
80 Newcrossing Road
Reading MA 01867
USA
Phone: +1 781.205.5300
Fax: +1 781.942.2426

FRAEN Corporation Srl
Via delle Querce, 26
27020 Trivolzio (PV)
Italy
Phone: +39 0382 1933.1
Fax: +39 0382 1933.239

Inquiries: optics@fraen.com
Website: FraenOMG.com

For ordering or sales information in your region, please contact one of our offices listed above or visit www.FraenOMG.com/Contact.

General Characteristics

Materials

Reflector Material	Black Polycarbonate with reflective 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"

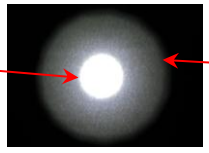
IMPORTANT NOTE – Reflector handling and cleaning:

- *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

This datasheet provides information about the **FRC-M1-35-BOS** reflector.

Optical Characteristics – On-axis Intensity[1], Beam Angle[2], Field Angle[3]

Reflector Part Number	Beam Description	Beam Angle (Full Width Half Maximum)	Beam Appearance	Full Width (at cutoff, degrees)
FRC-N1-35-BOS	Narrow beam	See next data table below		100
FRC-M1-35-BOS	Medium beam	See next data table below		100

LED	Beam Shape	On-axis Intensity (peak)	Beam Angle (FWHM)	Spill Intensity (cut-off at 100° - Full Width)
OSTAR 4-chip domed	Narrow	9.6 cd/lm	11°	0.2 cd/lm°
OSTAR 4-chip flat topped)	Narrow	21.7 cd/lm	7°	0.3 cd/lm
OSTAR 6-chip domed	Narrow	7.2 cd/lm	12°	0.2 cd/lm
OSTAR 6-chip flat topped)	Narrow	14.4 cd/lm	8°	0.3 cd/lm
OSTAR 4-chip domed	Medium	2.4 cd/lm	25°	0.2 cd/lm
OSTAR 4-chip flat topped)	Medium	2.3 cd/lm	27°	0.3 cd/lm
OSTAR 6-chip domed	Medium	2.3 cd/lm	27°	0.2 cd/lm
OSTAR 6-chip flat topped)	Medium	2.1 cd/lm	26°	0.3 cd/lm

(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 LED used. See "Illumination Calculations" below. Luminous intensity depends on the flux binning and tolerances of the LEDs. Please refer to the LED datasheet 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

Example Calculations

To calculate intensity (cd): Find the central spot on-axis intensity (cd/lm) for the reflector and then multiply this value by the luminous flux (lm) of the LED. Refer to the LED's datasheet for typical flux values; drive current versus flux ratios; color temperature and binning characteristics.

Example intensity calculations:

If a Fraen reflector with an on-axis intensity of 21 candela per lumen (cd/lm) is used with an LED that produces 105 lumens of flux, the calculations are as follows:

On-axis intensity = (21 cd/lm) x (105 lumens) = 2205 candela on-axis intensity (one LED).

If 12 LEDs are used in a fixture, then the on-axis intensity = 12 LEDs x 2205 candela/LED
= 26460 cd (on-axis – 12 LEDs)

An explanation of illuminance and the effect of distance

One candela at 1-meter distance produces 1 lux. In the above example, the 12 LED fixture produced 26460 candela. If that fixture is illuminating a surface one meter distant, then the *illuminance* on that surface is 26460 lux.

Illuminance decreases with the square of the distance. If you move the fixture so that it is two meters from the surface, then the illuminance falls to 26460 lux/ $(2m)^2$ or 6615 lux. Moving the fixture three meters from the surface decreases the illuminance to 26460 lux/$(3m)^2$ or 2940 lux.

Beam and Field Angles

Beam and Field Angles are methods of describing the light distribution of a reflector. The Beam Angle is expressed as a FWHM value (Full angular Width of the beam where it reaches Half the Maximum intensity). The Field Angle is a similar concept, sometimes expressed as FW10%, and represents the Full Width angle where the beam reaches 10% of maximum intensity.

If the reflectors in our example fixture, above, have a Beam Angle of 10° and an on-axis intensity of 26460 cd, then at ± 5° (half of 10°) the intensity will drop to half of 26460 or 13230 cd. If the Field Angle for the fixture is 19°, then at ± 9.5° (half of 19°) the intensity should be 10% of 26460 or 2646 cd.

Most reflectors have Beam and Field Angles that are rotationally symmetrical about the center axis of the reflector. Reflectors with an elliptical beam profile or optics with specifically shaped beam profiles are the exception.

Intensity, illuminance, Beam and Field Angle are all important factors to be considered in a fixture design. Some applications may require specific ratios between the Beam and Field Angle values.

Mechanical Characteristics

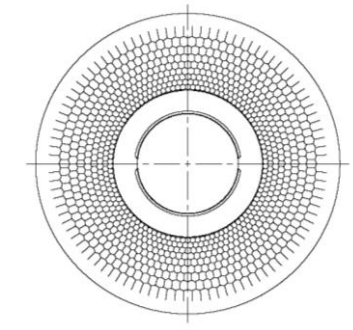
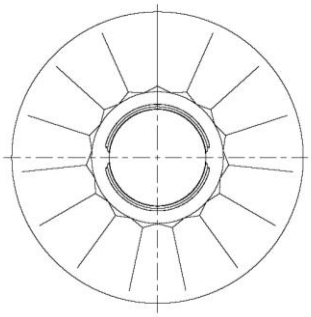
Narrow beam reflector: FRC-N1-35-BOS	Medium beam reflector: FRC-M1-35-BOS
	

Figure 1: Identifying the reflectors by their front appearance

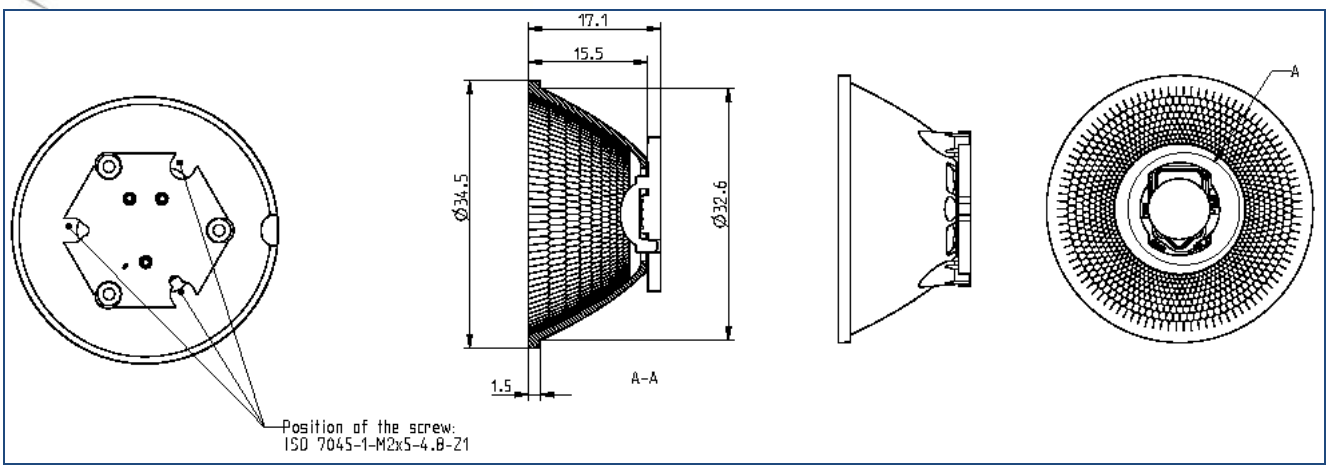


Figure 2: General views and dimensions of the FRC-N1-35-RIB reflector
(All dimensions in millimeters – Mechanical CAD files available upon request)

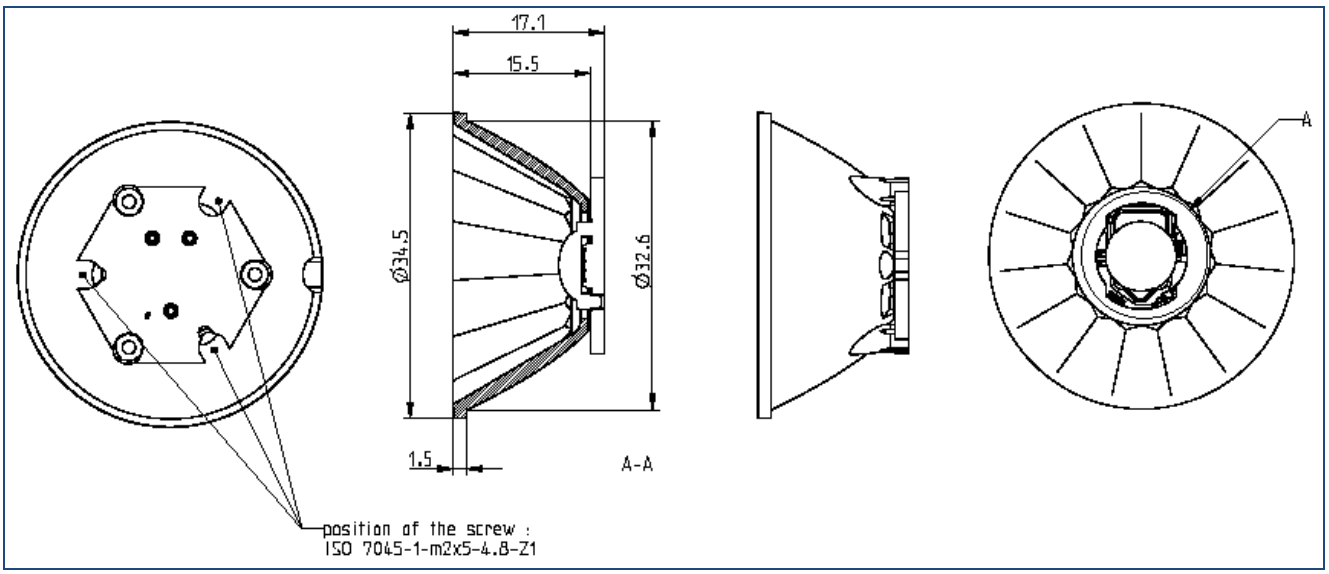


Figure 3: General views and dimensions of the FRC-M1-35-RIB reflector
(All dimensions in millimeters – Mechanical CAD files available upon request)

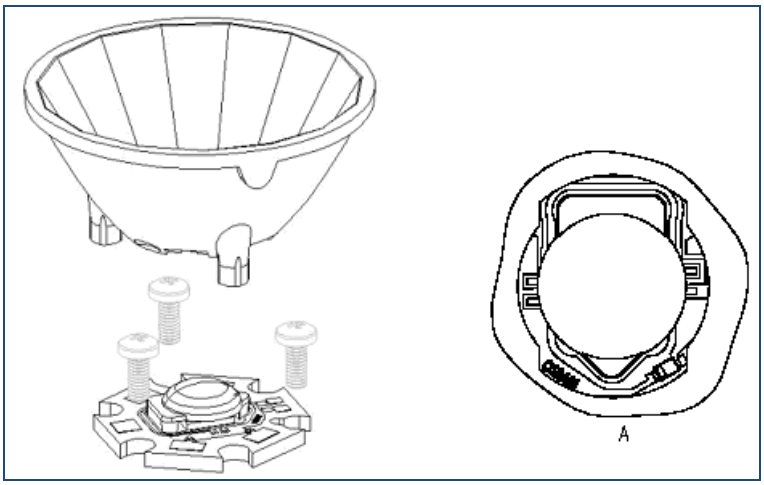


Figure 4: Showing relationship between a star board mounted LED and the reflector

Ordering Part Numbers

FRC-N1-35-BOS	Narrow beam reflector
FRC-M1-35-BOS	Medium beam reflector