FT3 Series Tri-Lens

for Philips Lumileds LUXEON Rebel & Rebel ES™ LEDs

- **High efficiency**
- **3 beams available**
- **MR-16 size tri-lens**

The FT3 tri-lens offers MR16 size lenses specifically designed for the Philips Lumileds LUXEON[1] Rebel & Rebel ES LEDs.

A software-optimized aspheric profile enables the generation of three different output patterns: narrow, medium, and wide beams[2].

The tri-lens is assembled with a holder that is available in either white or clear polycarbonate. The holders provide the proper alignment and distance between the LEDs and the lenses.

The lens holder can be heat-staked to the PCB to provide a secure assembly.

Typical applications are:

- MR-16 LED lamps
- Architectural lighting
- General illumination
- Street lights

(1) LUXEON is a trademark of Philips Lumileds Inc. For technical specification on LEDs please refer to the Luxeon datasheet or visit http://www.philipslumileds.com/

(2) Typical beam divergence may change with LED color temperature and binning.

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General Characteristics

Lens Material	Optical Grade PMMA
Holder Material	Polycarbonate: white or clear
Operating Temperature range	- 40 deg C / + 80 deg C
Storage Temperature range	- 40 deg 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 solvents such as alcohol, as it will damage the plastic.*

Scope

This datasheet provides information about the following FT3 series tri-lenses.

Lens and holder (assembly):

- FT3-N1-RE-H
- FT3-M1-RE-H
- FT3-W1-RE-H

White Holder

- FT3-N1-RE-HT
- FT3-M1-RE-HT
- FT3-W1-RE-HT

Transparent Holder

Optical Characteristics – Beam Angle[1] FWHM[2] (degrees, full angle at ½ peak)

Lens Part Number	Type of lens	Rebel White	Rebel ES White
FT3-N1-RE-yy	Narrow beam	8.5°	11.5°
FT3-M1-RE-yy	Medium beam	24°	23°
FT3-W1-RE-yy	Wide beam	33°	32.5°

(1) The typical divergence may vary with LED color and binning.
(2) FWHM is Full Width Half Maximum or Beam Angle. It is the full angle where the beam intensity drops to 50% of the maximum.

Optical Characteristics – On-Axis Intensity[2,3] (candela/lumen)

Lens Part Number	Type of lens	Rebel White	Rebel ES White
FT3-N1-RE-yy	Narrow beam	28 cd/lm	16 cd/lm
FT3-M1-RE-yy	Medium beam	4.7 cd/lm	4.5 cd/lm
FT3-W1-RE-yy	Wide beam	2.1 cd/lm	2.1 cd/lm

(2) To calculate the on-axis illumination, multiply the on-axis intensity of the lens (cd/lm) by the total flux of the Philips Lumileds Luxeon Rebel LED used. See "Illumination Calculations" below. For more detail on flux binning please check the Philips Lumileds Luxeon Rebel or Rebel ES LED datasheet at http://www.philipslumileds.com/
(3) Illumination depends on the flux binning and tolerances of the LEDs. Please refer to the Philips Lumileds Luxeon LED datasheet for more details on flux binning and mechanical tolerances.

Example Calculations

To calculate intensity (cd): Find the central spot on-axis intensity (cd/lm) for the lens 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 lens 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 lens. 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 lenses 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 lenses have Beam and Field Angles that are rotationally symmetrical about the center axis of the lens. Lenses 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

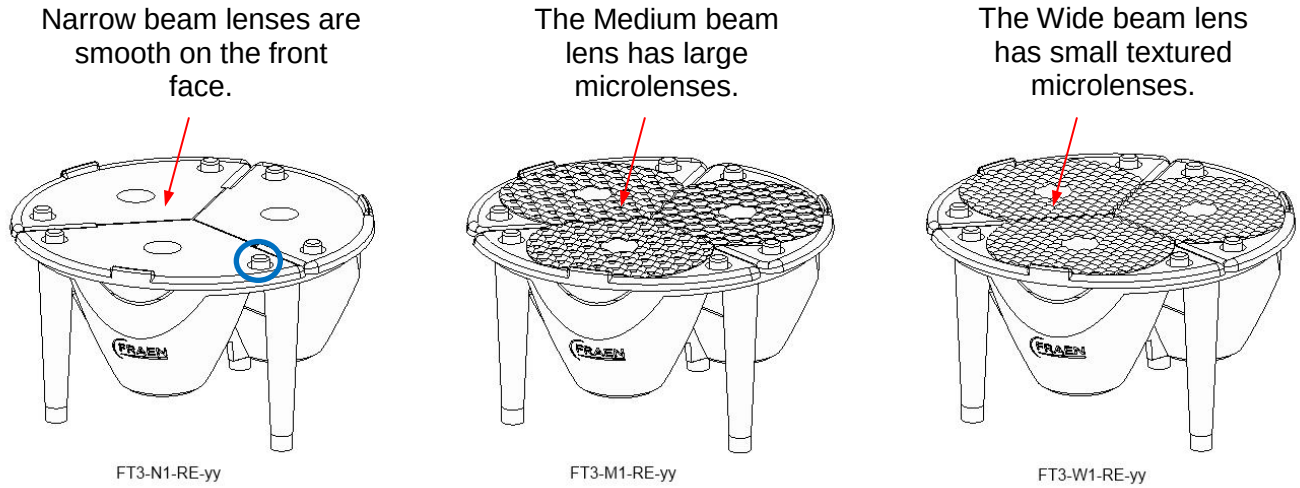

Figure 1: The tri-lens assemblies can be identified by the top surfaces of the lenses. The FT3 series are offered as holder assemblies that provides the correct LEDs alignment.

NOTE: The heat stake pins (blue circle) are formed into a shorter 'mushroom' head during the manufacturing process. Finished assemblies will be delivered with the shorter mushroom head.

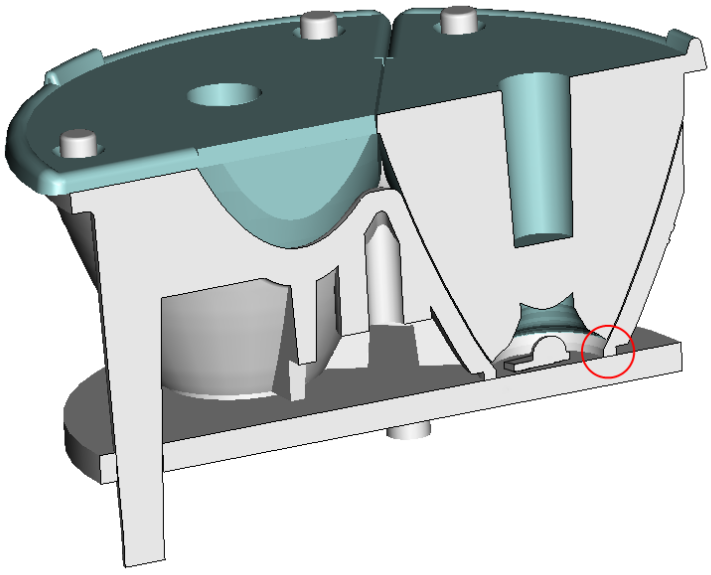

Figure 2: Cross-section view of the assembly shows the lenses touching the PCB. The assembly holder provides proper alignment between the lenses and the LEDs.

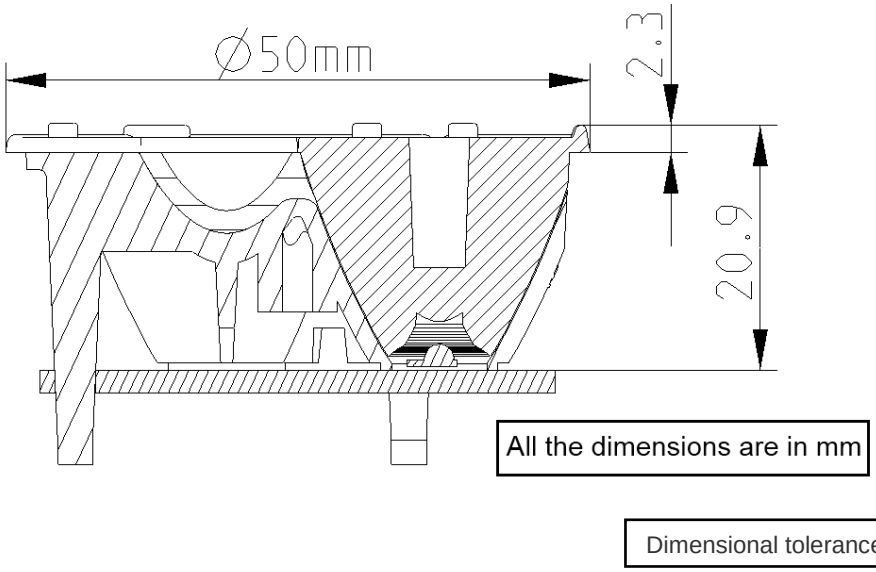

Figure 3: Cross-section view. The dimension “20.9 mm” represents the distance from the top of the lens assembly PCB plane.

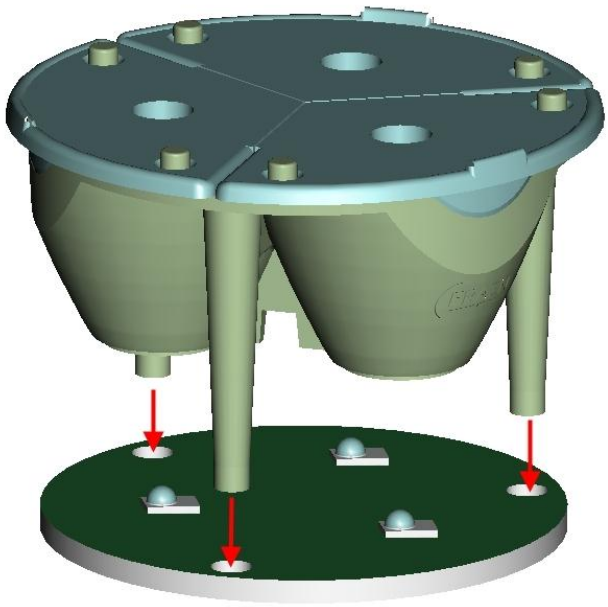

Figure 4: The three legs on the tri-lens require clearance holes in the circuit board. The legs have stepped diameters. The smaller diameter allows the leg to fit into the holes on the PCB. The larger diameter is intended to contact the top of the PCB and provide proper height alignment of the lens to the LED.

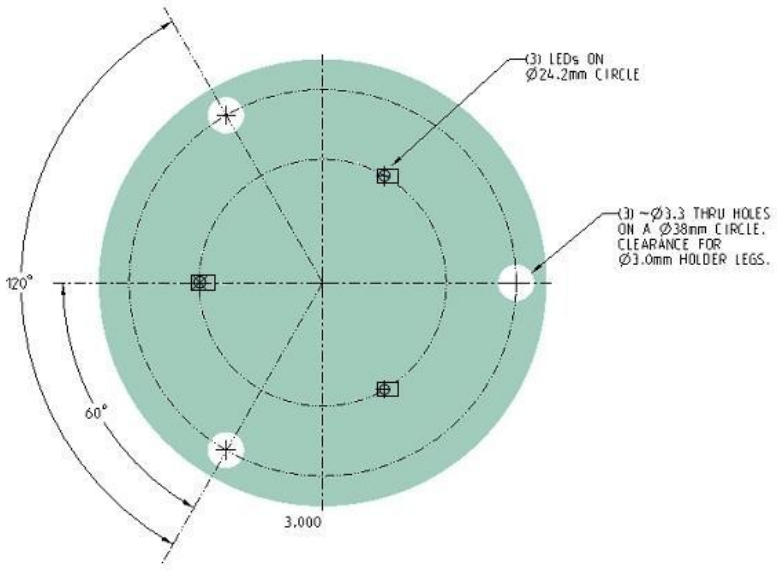

Figure 5: For proper fit of the FT3 tri-lens, the PCB should have thru holes and LEDs located as shown. The indicated LED position aligns the electrical contacts of the LED with the clearance channels in the lens holder.

Ordering part numbers

FT3-_1-RE-yy

Holder type:
H: White
HT: Clear

N: Narrow beam
M: Medium beam
W: Wide beam