SYNRAD Technical Bulletin

0005b

Technical Issue: FH Series Lens Materials

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Description:

FH Series lenses are fabricated from Gallium Arsenide, Germanium, or Zinc Selenide, and naturally each lens material has their own strengths and weaknesses as shown in Table 1.

Table 1 FH Series Lens Characteristics

Lens	Material	Pros	Cons	Transparent to Visible Light[3]
FLA80/FLA125HP	Gallium Arsenide (GaAs)	Good Index of Refraction; Good power handling	Expensive	No
FLA125	Germanium (Ge)	Best Index of Refraction; Inexpensive	Heat Sensitive	No
FLA 200/FLA370	Zinc Selenide (ZnSe)	Good power handling; Inexpensive	Low Index of Refraction	Yes

FLA type lenses were originally designed for Fenix Laser Markers, so Germanium was selected as the material of choice for FLA125 lenses because of its strengths (best Index of Refraction and lowest cost to the customer), while Germanium's lower power handling capability and temperature sensitivity[1] were not issues when coupled with Fenix's 25 W laser.

Because the Index of Refraction is not as important for longer focal length lenses[2], Zinc Selenide was selected for 200 and 370 mm lenses due to its advantages in power handling and cost.

FLA80 and 125HP lenses were designed and introduced when the FH Series Marking Head line was being developed based on the successful 25 W Fenix marking product. Because FH Series heads could be used with SYNRAD's line of 48 Series, Evolution, and Firestar lasers at powers ranging from 10 W to 125 W, Gallium Arsenide lenses were chosen to support marking with the higher-powered lasers being purchased with FH Series marking heads.

Notes:

1 The critical issue with Germanium is the temperature of the lens material itself. As Germanium warms up, it turns opaque and transmits less CO_2 energy. While this behavior would not damage the lens due to the low power density of the expanded beam inside a marking head, it results in poor marking performance and dwindling power output.

2 At shorter focal lengths, spherical aberration becomes an issue with poor Indexes of Refraction. As a result, the beam does not focus to a common point, but instead is focused at a range of points along the Z-axis. This results in a larger measured spot size and the possibility of other artifacts being created.

3 Because most FLA lenses block visible light, the addition of a visible diode pointer option is not feasible. For Zinc Selenide lenses, visible light transmission is not optimum and the difference in the Index of Refraction between visible light and the 10.6 µm CO_2 beam means the diode pointer beam doesn't necessarily focus to or point at the exact same location as the CO_2 beam, especially as it moves away from the center of the mark field.

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