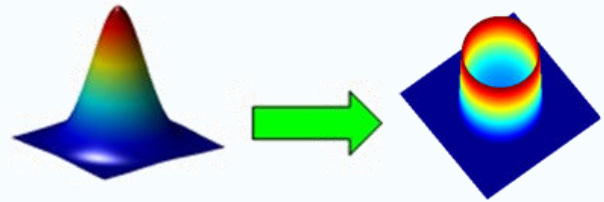


## M-Shaper for Scanning Applications



**HOLO/OR's** M-Shaper, is a diffractive optical elements (DOE) used to transform a Gaussian laser beam (or other) into a unique 2D M-shaped intensity profile, with sharp edges in a specific work plane.

### FEATURES

- Round M-Shape output profile (before integration)
- Uniform output intensity profile when integrated over a scanned line
- Sharp beam edge
- High efficiency
- High-power threshold

### APPLICATIONS

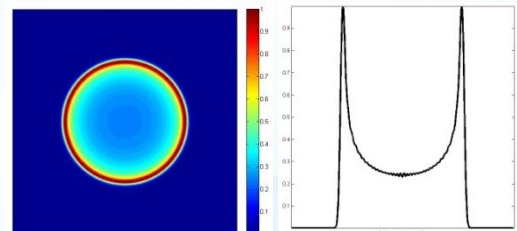
Material Processing applications:

- Welding
- Cutting
- Scribing
- Strong weld seams (also in Plastics)

The M-Shaper optical function is not possible by conventional reflective or refractive optical elements. It provides higher quality of the process & enables more flexibility in the system configuration. For example, it allows optimization of the intensity profile, and image size, without changing the laser, fiber cable and/or optic head.

In general, the intensity profile influences the heat distribution during laser material processing. The benefits of our optimized M-shaped intensity profile, in scanning applications (i.e., for the welding process) include:

- Uniform exposure over the scanned line.
- Ensures a defined edge.
- Enables very strong weld seams.



**Figure 1** Simulated intensity profiles of diffractive M-Shaper laser spots (Without integration)  
Left: upper view; Right: side view

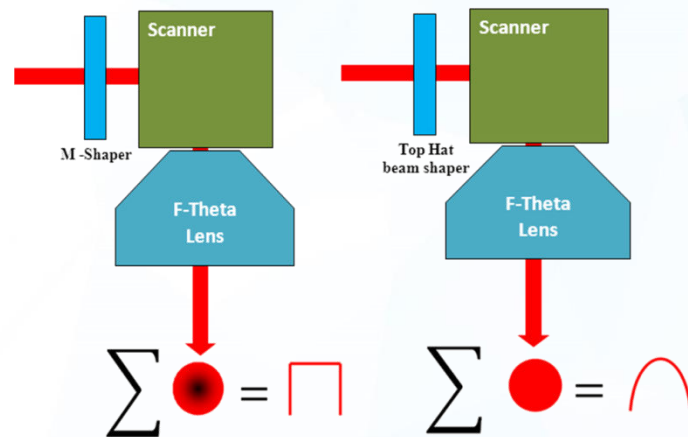
### SPECIFICATION RANGE

Materials	Fused Silica, ZnSe
Wavelength range	193 nm to 10.6 um
Full angle	Large range of full angles
Doe design	2-level (binary) to 16-level
Diffraction efficiency	86%-96%
Element size	Few mm to 100 mm
Coating (optional)	AR/AR coating
Custom design	Almost any size and intensity profile

## DESIGN CONSIDERATIONS

- In principal, to get a flat-top scanning profile (as shown in Fig.3), optical designer needs to notice the following points:
  - Use a collimated laser beam with DOE
  - Place the DOE before the scanning head
  - Use a scanner lens (i.e. F-Theta lens) in order to achieve a well-focused spot at a certain distance, for all scanning angles, as shown in Fig.2
  - Scan in straight lines
- Energy distribution can be designed for any non-uniform distribution meeting.
- The application's requirements.

**Figure 2** Schematic set-up and integrated ( $\Sigma$ ) intensity profile across scan direction  
Left: with M-Shaper, Right: with flat-top beam shaper



**Figure 3** Left: Gaussian intensity profile vs. M-Shaped profile, in scanning mode. Right: Top-Hat intensity profiles vs. M-Shaped profile

