

# Bessel Beam Generator

## Overview:

The PowerPhotonic Bessel Beam Generator is an advanced refractive optical element engineered to transform a single mode Gaussian beam into a Bessel beam. The Bessel beam it produces has a flattened intensity profile in the direction of propagation. When paired with customer-supplied de-magnification optics, this provides high performance laser processing of glass and other transparent materials.

By generating a uniform intensity profile as the light propagates, the PowerPhotonic Bessel Beam Generator ensures a consistent interaction with materials. For transparent material processing, the uniform profile improves the efficiency of non-linear processing, yielding precise cuts and modifications.

For glass cleaving, the flattened Bessel beam's extended focal range produces clean and controlled modifications. It also offers high power handling, which leads to increased processing speeds and higher cleave quality. The PowerPhotonic Bessel Beam Generator has the added advantage of wavelength flexibility due to its refractive design.

## The PowerPhotonic Effect:

**>95%**

Conversion Efficiency

**>0.9**

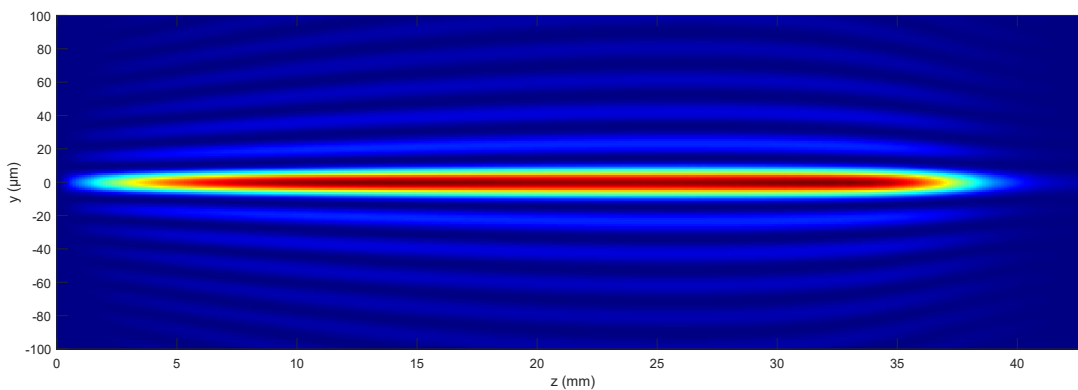
Flatness Factor

As defined in ISO 13694:2019

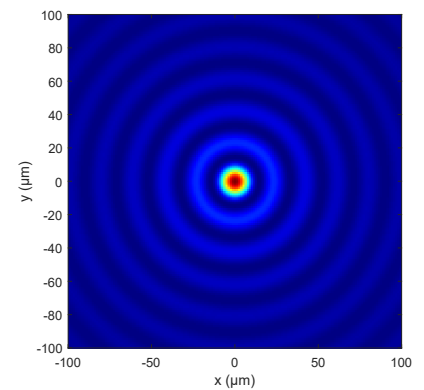
**0.5J/cm<sup>2</sup>**

LIDT at 1030nm, 500fs Pulse Duration and 50kHz Rep Rate

## Output Profiles:



Intensity Profile of Bessel beam along propagation direction



Profile at Z=25mm

## Key Features:

- Flattened Intensity Profile along propagation direction
- High Aspect Ratio of Central Lobe Size to Beam Length
- High Power Handling for CW and Pulsed Lasers

## Target Applications:

- Laser Glass Cleaving
- Transparent Material Processing
- Medical Imaging

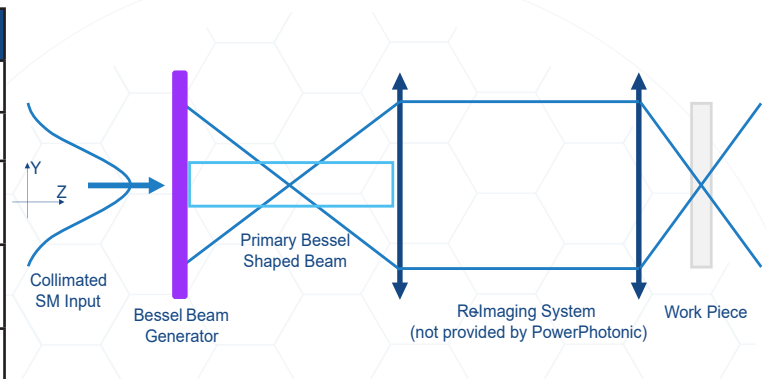


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## Typical Part Specifications

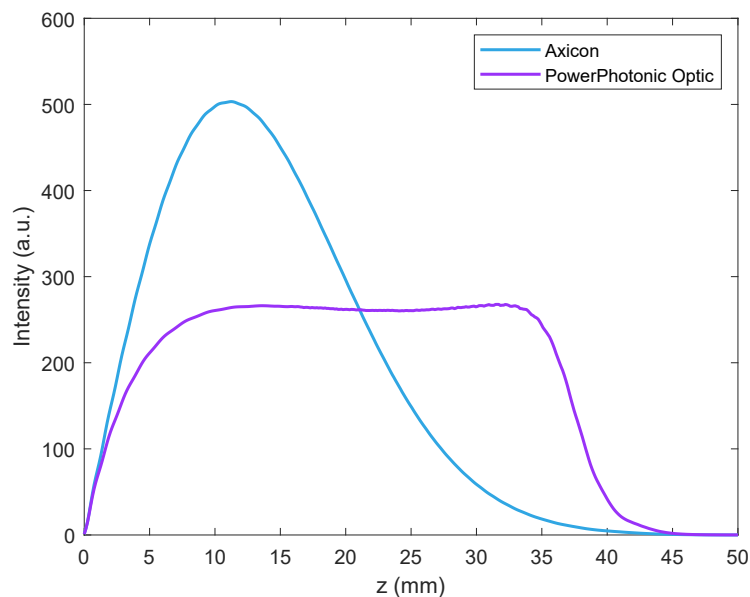
Parameter	Selectable Value
Wavelength Options	500 - 1500nm
Input Beam Diameter	>2mm
Primary Bessel Beam Lengths	10s to 100s of mm
Primary Central Lobe Size	10s of $\mu\text{m}$
Coating (Each Side)	$R < 0.25\%$

## Typical System Set Up



Other Bessel beam lengths and lobe sizes can be generated by demagnifying the system. Bessel Beam length will be reduced by the magnification squared. Central Lobe Size will be reduced by the magnification of the de-magnification system.

## Axicon Comparison:



Bessel beams generated with a conventional axicon have a peaked axial intensity profile, resulting in non-uniform material interactions. The PowerPhotonic Bessel Beam Generator produces a uniform axial profile resulting in homogenous processing in the propagation direction.

## Sales and Technical:

### United Kingdom

PowerPhotonic Ltd.  
5A St. David's Drive  
Dalgety Bay  
Fife  
KY11 9PF  
+44 1383 825 910

### North America

PowerPhotonic Inc.  
16220 S. La Cañada Drive  
Sahaurita  
AZ 85629  
United States  
+1 571 866 0551

### Japan

yoshiyuki.mori@powerphotonic.com  
+81 80 1398 0331

[sales@powerphotonic.com](mailto:sales@powerphotonic.com)

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