Monaco SmartCleave

Structured Transparent Material Cutting

Monaco SmartCleave is an industrial laser with a MOPA architecture. Based on the Monaco femtosecond platform, the SmartCleave model is configured and specified for cutting structured transparent materials. Seeder burst energies >320 µJ cut materials from 0.1 mm to >2 mm thick in a single pass. Additionally, the ultrashort pulse nature of Monaco allows layered or coated glass and sapphire to be processed with little or no heat affected zone. Monaco SmartCleave further expands the options for glass and film cutting to enable next generation display production.

FEATURES & BENEFITS
• >320 µJ/pulse for cutting 0.1 mm to >2 mm thick materials
• >150 kHz seeder burst mode to enable >1 m/s cutting speeds
• Femtosecond performance for filament and ablative cutting in a single laser
• Femtosecond operation to yield low HAZ in complex, layered materials
• Variable pulsewidth from <300 fs to >10 ps for process tailoring
• Compact single box design for ease of integration
• HALT-designed/HASS-verified for superior quality and reliability

APPLICATIONS
• Structured Glass Cutting
• Coated Transparent Material Cutting
• Structured Sapphire Cutting
• OLED Stack Cutting
• LCD Cutting and Tailoring
• Display Glass Cutting
### OPTICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th></th>
<th>Monaco SmartCleave 1035-40-40</th>
<th>Monaco SmartCleave 1035-80-60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamental Center Wavelength (nm)</td>
<td>1035 ±5</td>
<td>1035 ±5</td>
</tr>
<tr>
<td>Output Power (W)</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>Energy (µJ)</td>
<td>40 (at 1 MHz)</td>
<td>80 (at 750 kHz)</td>
</tr>
<tr>
<td>Seeder Burst Mode (µJ) (max. energy)</td>
<td>&gt;200</td>
<td>&gt;320</td>
</tr>
<tr>
<td>Seeder Burst Count (µJ) (max. energy)</td>
<td>5 x 40</td>
<td>4 x 80</td>
</tr>
<tr>
<td>Seeder Burst Mode Repetition Rate (kHz) (max. energy)</td>
<td>200</td>
<td>188</td>
</tr>
<tr>
<td>Native Repetition Rate</td>
<td>Single-shot to 1 MHz, higher rep. rates without AOM pulsepicking: 1 to 50 MHz standard</td>
<td></td>
</tr>
<tr>
<td>Pulsewidth (fs)</td>
<td>&lt;350</td>
<td></td>
</tr>
<tr>
<td>Tuning Range</td>
<td>&lt;350 fs to &gt;10 ps</td>
<td></td>
</tr>
<tr>
<td>Spatial Mode</td>
<td>TEM₀₀, M² &lt;1.2</td>
<td></td>
</tr>
<tr>
<td>Beam Divergence (mrad, 2θ)</td>
<td>&lt;1</td>
<td></td>
</tr>
<tr>
<td>Beam Diameter at Output¹ (mm, 1/e²)</td>
<td>2.7 ±0.3</td>
<td></td>
</tr>
<tr>
<td>Beam Circularity (%)</td>
<td>&gt;85</td>
<td></td>
</tr>
<tr>
<td>Polarization Ratio</td>
<td>&gt;100:1</td>
<td></td>
</tr>
<tr>
<td>Polarization Direction³</td>
<td>Vertical ±3°</td>
<td></td>
</tr>
<tr>
<td>Beam Pointing Stability (µrad/°C)</td>
<td>&lt;25</td>
<td></td>
</tr>
<tr>
<td>Pulse Energy Stability (%) (RMS)</td>
<td>&lt;1.5</td>
<td></td>
</tr>
<tr>
<td>Power Stability (%) (RMS, 2σ)</td>
<td>&lt;1.5</td>
<td></td>
</tr>
<tr>
<td>Warm-up Time (minutes)</td>
<td>Cold Start 45</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Warm Start 15</td>
<td></td>
</tr>
<tr>
<td>Long-term Pointing Stability (µrad)</td>
<td>±25 over 8 hours</td>
<td></td>
</tr>
<tr>
<td>Head Weight</td>
<td>50 kg (110 lbs.)</td>
<td></td>
</tr>
<tr>
<td>External Comms</td>
<td>RS-232, Ethernet, USB</td>
<td></td>
</tr>
<tr>
<td>Power Consumption² (typical)</td>
<td>48VDC, &lt;500W</td>
<td></td>
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</tbody>
</table>

### OPERATING SPECIFICATIONS

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<thead>
<tr>
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<tbody>
<tr>
<td>Temperature (non-condensing)</td>
<td>10 to 30°C (50 to 86°F)</td>
</tr>
<tr>
<td>Laser Head</td>
<td>-20 to +60°C (-4 to 140°F)</td>
</tr>
<tr>
<td>Power Supply</td>
<td>5 to 65°C (41 to 149°F)</td>
</tr>
<tr>
<td>Non-Operation (storage)</td>
<td>&lt;90, non-condensing</td>
</tr>
</tbody>
</table>

### SHIPPING SPECIFICATIONS

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<tr>
<td>Temperature</td>
<td>-20 to +60°C (-4 to 140°F)</td>
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</table>

¹ All specifications at maximum energy.
² Measured at 1m from laser output window.
³ External isolation required depending on application.
⁴ Optional 110 to 240VAC power supply available.
TYPICAL PERFORMANCE DATA

Monaco SmartCleave Sample Spatial Mode

Monaco SmartCleave Sample Seeder Burst with 20 ns Spacing

MECHANICAL SPECIFICATIONS

Monaco SmartCleave
Power Supply
MECHANICAL SPECIFICATIONS

Monaco SmartCleave

Front View

41.6 mm (1.64 in.)
Laser Emission Height

166.9 mm (6.57 in.)

Rear View

87.7 mm (3.45 in.)

40.7 mm (1.60 in.)

68.7 mm (2.67 in.)

80.1 mm (3.15 in.)

40.7 mm (1.60 in.)

113.5 mm (4.47 in.)

35.7 mm (1.39 in.)

Side View

668.7 mm (26.33 in.)

190.0 mm (7.48 in.)

Front View

Coolant Return

Coolant Supply

Top View

438.0 mm (17.24 in.)

14.0 mm (0.55 in.)

161.4 mm (6.35 in.)

137.3 mm (5.40 in.)

174.8 mm (6.88 in.)

360.3 mm (14.19 in.)

36.1 mm (1.42 in.)

176.1 mm (6.93 in.)

141.0 mm (5.55 in.)