HyperRapid NX SmartCleave

High-Speed and High-Quality Brittle Material Processing

HyperRapid NX SmartCleave is an industrial high-power picosecond laser that is specifically optimized for high-speed and high-quality cutting of transparent and brittle materials. Using the Coherent patented SmartCleave technology, HyperRapid NX delivers kerf-less cutting on arbitrarily curved outer or inner contours.

HyperRapid NX SmartCleave features 1 millijoule burst energy to cut thick substrate in a single pass with sub-micron edge roughness, therefore enabling new applications in the automotive and consumer electronics markets.

The 50 W average power model is optimal for cost-sensitive applications, while the 100 W version enables high speed applications up to 2 m/s.

FEATURES & BENEFITS

- 1064 nm output
- 100 W power to enable high throughput
- Over 1000 μJ burst energy to cut thicker samples
- Specified burst mode operation for repeatable performance in volume manufacturing
- Compact and light weight, same interfacing as standard HyperRapid NX to allow straightforward integration
- Right of use to the Coherent SmartCleave IP is included

APPLICATIONS

- Cutting of strengthened and unstrengthened glass, sapphire, and ceramics
- Scribing and drilling of glass, sapphire, ceramics, and composite materials
### OPTICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>HyperRapid NX SmartCleave 1064-50</th>
<th>HyperRapid NX SmartCleave 1064-100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Wavelength Output (nm)</td>
<td>1064</td>
<td></td>
</tr>
<tr>
<td>Amplifier Single Pulse Repetition Rate (kHz)</td>
<td>170 to 1000</td>
<td>400 to 1000</td>
</tr>
<tr>
<td>Output Pulse Repetition Rate Range (kHz)</td>
<td></td>
<td>0 to 1000</td>
</tr>
<tr>
<td>Pulse Duration (ps)</td>
<td></td>
<td>&lt;15</td>
</tr>
<tr>
<td>Average Power (W)</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Average Power Stability^2 (RMS 1σ,%)</td>
<td>≤1</td>
<td></td>
</tr>
<tr>
<td>Pulse Energy (µJ)</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>Pulse-to-Pulse Energy Stability (RMS 1σ, %)</td>
<td>≤1</td>
<td></td>
</tr>
<tr>
<td>Beam Quality Parameter (M²)</td>
<td>≤1.3</td>
<td></td>
</tr>
<tr>
<td>Beam Diameter, 1 m in front of laser (mm)</td>
<td>5.0 ±0.5</td>
<td></td>
</tr>
<tr>
<td>Beam Divergence, full angle (mrad)</td>
<td>≤1</td>
<td></td>
</tr>
<tr>
<td>Beam Circularity, 1 m in front of laser (%)</td>
<td>≥85</td>
<td></td>
</tr>
<tr>
<td>Beam-Pointing Stability (µrad/°C)</td>
<td>≤50 (peak-to-peak)</td>
<td></td>
</tr>
<tr>
<td>Bore Sight Accuracy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral (mm) (beam to specified exit location)</td>
<td>≤1</td>
<td></td>
</tr>
<tr>
<td>Angular (mrad) (beam to specified exit direction)</td>
<td>≤5</td>
<td></td>
</tr>
<tr>
<td>Direction of Polarization</td>
<td>Vertical</td>
<td></td>
</tr>
<tr>
<td>Polarization Ratio</td>
<td>&gt;100:1</td>
<td></td>
</tr>
<tr>
<td>Warm-up Time from Chiller Start (minutes)</td>
<td>&lt;45</td>
<td></td>
</tr>
<tr>
<td>Electrical Supply</td>
<td>100 to 230V AC/50 to 60 Hz/2.5 kW</td>
<td></td>
</tr>
<tr>
<td>Mounting Orientation</td>
<td>Horizontal</td>
<td></td>
</tr>
<tr>
<td>Chiller</td>
<td>Water-to-Air or Water-to-Water</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laser Head</td>
<td>600 x 780 x 245 mm (23.6 x 30.7 x 9.6 in.)</td>
<td></td>
</tr>
<tr>
<td>Power Supply</td>
<td>3U 19&quot; rack</td>
<td></td>
</tr>
<tr>
<td>SMC Chiller</td>
<td>500 x 317 x 615 mm (19.7 x 12.5 x 24.2 in.)</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laser Head</td>
<td>70 kg (154.3 lbs.)</td>
<td></td>
</tr>
<tr>
<td>Power Supply</td>
<td>16 kg (35.3 lbs.)</td>
<td></td>
</tr>
<tr>
<td>SMC Chiller</td>
<td>43 kg (94.8 lbs.)</td>
<td></td>
</tr>
</tbody>
</table>

### BURST MODE OPERATION

<table>
<thead>
<tr>
<th>Burst Mode Operation</th>
<th>Maximum Number of Pulses in the Burst^8</th>
<th>See table on next page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Number of Pulses in the Burst</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Burst Mode Operation Range (kHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Energy in the Burst (µJ)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### OPERATING SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>+15°C to +30°C (free of condensation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allowed Temperature Range During Operation</td>
<td></td>
</tr>
<tr>
<td>Humidity (%)</td>
<td>0 to 90 RH, non-condensing, Dew-point &lt;22°C</td>
</tr>
</tbody>
</table>

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1. At lowest amplifier pulse repetition rate, unless stated otherwise.
2. Maximum output power (variable attenuator and process shutter at maximum transmission).
3. After warm-up time.
4. Steady-state (no pulse gating or change of pulse repetition rate).
5. Single-pulse operation.
6. At 500 kHz.
7. Over 8 hours, ± 1°C ambient temperature.
8. Maximum number of pulses in the burst depends on repetition rate.
Specifications: HyperRapid NX SmartCleave 1064-50

<table>
<thead>
<tr>
<th>Number of Pulses in the Burst</th>
<th>Burst Energy (µJ)</th>
<th>Min. Rep. Rate (kHz)</th>
<th>Max. Rep. Rate (kHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>400</td>
<td>110</td>
<td>1000</td>
</tr>
<tr>
<td>3</td>
<td>520</td>
<td>85</td>
<td>1000</td>
</tr>
<tr>
<td>4</td>
<td>600</td>
<td>75</td>
<td>1000</td>
</tr>
<tr>
<td>5</td>
<td>700</td>
<td>65</td>
<td>1000</td>
</tr>
<tr>
<td>6</td>
<td>750</td>
<td>60</td>
<td>830</td>
</tr>
<tr>
<td>7</td>
<td>830</td>
<td>55</td>
<td>710</td>
</tr>
<tr>
<td>8</td>
<td>875</td>
<td>55</td>
<td>620</td>
</tr>
<tr>
<td>9</td>
<td>925</td>
<td>50</td>
<td>550</td>
</tr>
<tr>
<td>10</td>
<td>1000</td>
<td>50</td>
<td>500</td>
</tr>
</tbody>
</table>

1 Burst energy specification is given at the minimum repetition rate.

Specifications: HyperRapid NX SmartCleave 1064-100

<table>
<thead>
<tr>
<th>Number of Pulses in the Burst</th>
<th>Burst Energy (µJ)</th>
<th>Min. Rep. Rate (kHz)</th>
<th>Max. Rep. Rate (kHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>400</td>
<td>240</td>
<td>1000</td>
</tr>
<tr>
<td>3</td>
<td>520</td>
<td>185</td>
<td>1000</td>
</tr>
<tr>
<td>4</td>
<td>600</td>
<td>155</td>
<td>1000</td>
</tr>
<tr>
<td>5</td>
<td>700</td>
<td>135</td>
<td>1000</td>
</tr>
<tr>
<td>6</td>
<td>750</td>
<td>125</td>
<td>830</td>
</tr>
<tr>
<td>7</td>
<td>830</td>
<td>115</td>
<td>710</td>
</tr>
<tr>
<td>8</td>
<td>875</td>
<td>105</td>
<td>620</td>
</tr>
<tr>
<td>9</td>
<td>925</td>
<td>100</td>
<td>550</td>
</tr>
<tr>
<td>10</td>
<td>1000</td>
<td>95</td>
<td>500</td>
</tr>
</tbody>
</table>

1 Burst energy specification is given at the minimum repetition rate.

HyperRapid NX SmartCleave 1064-50

HyperRapid NX SmartCleave 1064-100

HyperRapid NX SmartCleave

Datasheet

COHERENT.
HyperRapid NX SmartCleave Burst Mode Operation
Oscilloscope trace showing 5 pulses in the burst at 100 kHz repetition rate. The pulses in the burst are separated by 25 ns

HyperRapid NX SmartCleave Applications
Typical industrial applications served by HyperRapid NX SmartCleave: glass cutting (left), automotive dashboard cutting (right)
MECHANICAL SPECIFICATIONS

HyperRapid NX SmartCleave

Bottom View

760 mm (29.53 in.)

711.2 mm (28.0 in.)

675 mm (26.57 in.)

300 mm (11.81 in.)

35 mm (0.98 in.)

Beam Output

254 mm (10.0 in.)

365 mm (14.37 in.)

25 mm (0.98 in.)

HyperRapid NX SmartCleave

Datasheet

MECHANICAL SPECIFICATIONS

HyperRapid NX SmartCleave

Beam Height

90 mm (3.54 in.)

Top View

180 mm

(7.09 in.)

240 mm

(9.45 in.)

Required Space for Service

46.5 mm

(1.83 in.)

945 mm (37.16 in.)

845 mm (33.27 in.)

18 mm

(0.71 in.)

Beam Output

218.5 mm

(8.6 in.)

244.5 mm

(9.64 in.)

Emission LED

285 mm

(11.22 in.)

780.5 mm (30.73 in.)

Required Space for Cables and Tubes

710 mm (28.0 in.)

675 mm (26.57 in.)

300 mm (11.81 in.)

25 mm (0.98 in.)

35 mm (0.98 in.)

Beam Output

254 mm (10.0 in.)

365 mm (14.37 in.)

25 mm (0.98 in.)

HyperRapid NX SmartCleave

Datasheet

MECHANICAL SPECIFICATIONS

HyperRapid NX SmartCleave

Beam Height

90 mm (3.54 in.)

Front View

600 mm (23.62 in.)

300 mm (11.81 in.)

675 mm (26.57 in.)

711.2 mm (28.0 in.)

760 mm (29.53 in.)

250 mm (9.84 in.)

163 mm (6.41 in.)

845 mm (33.27 in.)

240 mm (9.45 in.)

240 mm (9.45 in.)

Required Space for Service

710 mm (28.0 in.)

675 mm (26.57 in.)

300 mm (11.81 in.)

25 mm (0.98 in.)

35 mm (0.98 in.)

Beam Output

254 mm (10.0 in.)

365 mm (14.37 in.)

25 mm (0.98 in.)

HyperRapid NX SmartCleave

Datasheet

MECHANICAL SPECIFICATIONS

HyperRapid NX SmartCleave

Beam Height

90 mm (3.54 in.)

Side View

240 mm (9.45 in.)

240 mm (9.45 in.)

Required Space for Service

710 mm (28.0 in.)

675 mm (26.57 in.)

300 mm (11.81 in.)

25 mm (0.98 in.)

35 mm (0.98 in.)

Beam Output

254 mm (10.0 in.)

365 mm (14.37 in.)

25 mm (0.98 in.)

HyperRapid NX SmartCleave

Datasheet

MECHANICAL SPECIFICATIONS

HyperRapid NX SmartCleave

Beam Height

90 mm (3.54 in.)

Rear View

434 mm (17.09 in.)

600 mm (23.62 in.)

160.5 mm (6.30 in.)

244.5 mm (9.64 in.)

285 mm (11.22 in.)

780.5 mm (30.73 in.)

Required Space for Service

160 mm (6.30 in.)

240 mm (9.45 in.)

240 mm (9.45 in.)

Required Space for Service

710 mm (28.0 in.)

675 mm (26.57 in.)

300 mm (11.81 in.)

25 mm (0.98 in.)

35 mm (0.98 in.)

Beam Output

254 mm (10.0 in.)

365 mm (14.37 in.)

25 mm (0.98 in.)

HyperRapid NX SmartCleave

Datasheet

MECHANICAL SPECIFICATIONS

HyperRapid NX SmartCleave

Beam Height

90 mm (3.54 in.)

Required Space for Service