

# DIAMOND J-3 Series

# RF-Excited OEM Industrial CO<sub>2</sub> Laser

Coherent Diamond J-3 Series are sealed, pulsed  $CO_2$  lasers offering average power greater than 250 Watts in a fully integrated and compact package. The unique pulsing characteristics derived from its slab discharge design enable the J-3 Series laser to reach peak powers well in excess of 750W in contrast to CW modulated lasers. The J-3 Series lasers are available in 10.6  $\mu$ m, 10.2  $\mu$ m, and 9.4  $\mu$ m, and can be operated with pulsed repetition rates up to 200 kHz with fast pulse rise and fall times. This combination of wavelength selection, high peak power and fast rise and fall times, together with power on demand and excellent beam quality makes the J-Series an ideal laser for a wide range of materials processing applications.

The J-3 Series is part of the J-Series family spanning a power range from 150W to greater than 400W. The J-Series family is built on a common platform with common mechanical and electrical interfaces, common optical interfaces, common software and a common service and support strategy. All J-Series lasers offer proactive maintenance capability enabled by the integrated yet field replaceable RF power supply design and overall systems monitoring using Coherent's field proven full suite of on-board diagnostics.

## **FEATURES**

- · Wide operating power range
- High peak power >750W
- Pulse frequency from single-shot to 200 kHz
- Fast rise-and-fall time
- Outstanding beam quality
- Excellent power stability
- Low-cost OEM configuration
- Integrated but removable RF power supply
- Compact design
- Equipped with on-board internetaccessible diagnostics

#### **APPLICATIONS**

- Converting
- Drilling
- Cutting
- Scribing
- Engraving
- Marking





Wavelength (µm)         9.36 ±0.05         10.25 ±0.1         10.6 ±0.4           Output Power* (W)         ±250         ±225         ±250           Power Range* (W)         10 to 225         10 to 225         10 to 250           Nominal Peak Power* (W)         ±750         •           Power Stability** (W)         ±6         •           Mode Quality (M*2)         ±1.2         •           Beam Waist Diameter** at 1/e2 (mm)         7.0 ±1.0         8.5 ±1.0         •           Full-Angle Beam Divergence* (mrad)         ±2.4         ±2.0         ±2.0         •	SPECIFICATIONS	Diamond J-3-9.4	Diamond J-3-10.2	DIAMOND J-3-10.6	
Power Range <sup>3</sup> (W)	Wavelength (μm)	9.36 ±0.05	10.25 ±0.1	10.6 ±0.4	
Nominal Peak Power <sup>4</sup> (W) ≥750  Power Stability <sup>2,5</sup> (%) ±6  Mode Quality (M²) < 1.2  Beam Waist Diameter <sup>6,7</sup> at 1/e² (mm) 7.0 ±1.0 8.5 ±1.0 8.5 ±1.0  Full-Angle Beam Divergence² (mrad) ≤2.4 ≤2.0 ≤2.0  Polarization (parallel to baseplate) Linear ≥100.1  Beam Ellipticity <sup>6,7</sup> ≥0.83, ≤1.2  Pulse Frequency (kH²) Single-shot to 200  RF Excitation Pulse Width Range (µsec) 2 to 1000  Duty Cycle Limit (%) ≤60  Fall Time* (µs) ≤60  Weight 45 kg (99.2 lbs.)  Dimensions (L x W x H) 1064.1 x 198.1 x 227.6 mm (41.89 x 7.8 x 8.96 in.)  ELECTRICAL POWER REQUIREMENTS  DC Input Voltage (VPC) 48 ±1.0%  Continuous DC Current® (A) ≤90  Peak Current (A) ≤200 for ≤6 ms  COOLANT  Heat Load (kW) ≤4.5  Dynamic Coolant Flow Rate (l/min.) ≤5.7  Coolant Setpoint Temperature Range 21 to 25°C (69.8 to 77°F)  Coolant Temperature Stability (max.) 103 (15 psi) at 5.7 l/min. (1.5 gpm)  Coolant Maximum Static Pressure (kPa) 827 (120 psi)  ENVIRONMENTAL CONDITIONS  Ambient Temperature	Output Power <sup>2</sup> (W)	≥250	≥225	≥250	
Power Stability25 (%) ±6  Mode Quality (M²) < 1.2  Beam Waist Diameter* at 1/e² (mm)	Power Range <sup>3</sup> (W)	10 to 225	10 to 225	10 to 250	
Mode Quality (M²)         <1.2	Nominal Peak Power <sup>4</sup> (W)		≥750		
Beam Waist Diameter <sup>6,7</sup> at 1/e² (mm)         7.0 ± 1.0         8.5 ± 1.0         8.5 ± 1.0           Full-Angle Beam Divergence² (mrad)         ≤2.4         ≤2.0         ≤2.0           Polarization (parallel to baseplate)         Linear ≥ 100:1         €8.3, st. 2           Pulse Frequency (kHz)         \$lingle-shot to 200         €8.7           RF Excitation Pulse Width Range (µsec)         \$lingle-shot to 200         €8.7           Duty Cycle Limit (%)         ≤60         €8.7           Fall Time³ (µs)         ≤60         €8.7           Weight         45 kg (99.2 lbs.)         €9.0           Dimensions (L x W x H)         1064.1 x 198.1 x 227.6 mm (41.89 x 7.8 x 8.96 in.)           ELECTRICAL POWER REQUIREMENTS           DC Input Voltage (VDC)         48 ± 1.0%           Continuous DC Current® (A)         ≤90           Peak Current (A)         ≤200 for ≤6 ms           COOLANT           Heat Load (kW)           Dynamic Coolant Flow Rate (l/min.)         ≤4.5           Dynamic Coolant Flow Rate (l/min.)         ≤5.7           Coolant Setpoint Temperature Range         21 to 25°C (69.8 to 77°)           Coolant Pilore entrial Pressure¹ (kPa)         Anti-corrosion treated water           Coolant Maximum Static Pressure (kPa)	Power Stability <sup>2,5</sup> (%)		±6		
Full-Angle Beam Divergence? (mrad)  Polarization (parallel to baseplate)  Beam Ellipticity <sup>62</sup> Pulse Frequency (kHz)  RF Excitation Pulse Width Range (µsec)  Duty Cycle Limit (%)  Fall Time* (µs)  Weight  ELECTRICAL POWER REQUIREMENTS  DC Input Voltage (VDC)  Continuous DC Current* (A)  Peak Current (A)  COOLANT  Heat Load (kW)  Dynamic Coolant Flow Rate (l/min.)  Coolant Setpoint Temperature Range  Coolant Temperature Stability (max.)  Coolant Differential Pressure (kPa)  ENVIRONMENTAL CONDITIONS  Ambient Temperature  5 to 45°C (41 to 113°F)	Mode Quality (M <sup>2</sup> )		<1.2		
Polarization (parallel to baseplate)  Beam Ellipticity <sup>A7</sup> ≥0.83, ≤1.2  Pulse Frequency (kHz)  RF Excitation Pulse Width Range (µsec)  Duty Cycle Limit (%)  Fall Time¹ (µs)  Weight  45 kg (99.2 lbs.)  Dimensions (L x W x H)  ELECTRICAL POWER REQUIREMENTS  DC Input Voltage (VDC)  Continuous DC Current³ (A)  Peak Current (A)  COOLANT  Heat Load (kW)  Dynamic Coolant Flow Rate (l/min.)  Coolant Setpoint Temperature Range  Coolant Temperature Stability (max.)  Coolant Pressure¹¹0 (kPa)  Coolant Pressure¹¹0 (kPa)  Coolant Maximum Static Pressure (kPa)  ENVIRONMENTAL CONDITIONS  Ambient Temperature  S to 45°C (41 to 113°F)	Beam Waist Diameter <sup>6,7</sup> at 1/e <sup>2</sup> (mm)	7.0 ±1.0	8.5 ±1.0	8.5 ±1.0	
Beam Ellipticity <sup>6-7</sup> 20.83, ≤1.2           Pulse Frequency (kHz)         Single-shot to 200           RF Excitation Pulse Width Range (µsec)         2 to 1000           Duty Cycle Limit (%)         ≤60           Fall Time <sup>4</sup> (µs)         ≤60           Weight         45 kg (99.2 lbs.)           Dimensions (L x W x H)         1064.1 x 198.1 x 227.6 mm (41.89 x 7.8 x 8.96 in.)           ELECTRICAL POWER REQUIREMENTS           DC Input Voltage (VDC)         48 ±1.0%           Continuous DC Current <sup>8</sup> (A)         ≤90           Peak Current (A)         ≤200 for ≤6 ms           COOLANT           Heat Load (kW)         ≤4.5           Dynamic Coolant Flow Rate (l/min.)         ≥5.7           Coolant Setpoint Temperature Range         21 to 25°C (69.8 to 77°F)           Coolant Temperature Stability (max.)         ±1.0°C (±1.8°F)           Coolant <sup>9</sup> Anti-corrosion treated water           Coolant Differential Pressure (kPa)         827 (120 psi)           ENVIRONMENTAL CONDITIONS           Ambient Temperature         5 to 45°C (41 to 113°F)	Full-Angle Beam Divergence <sup>7</sup> (mrad)	≤2.4	≤2.0	≤2.0	
Pulse Frequency (kHz)         Single-shot to 200           RF Excitation Pulse Width Range (µsec)         2 to 1000           Duty Cycle Limit (%)         ≤60           Fall Time⁴ (µs)         ≤60           Weight         45 kg (99.2 lbs.)           Dimensions (L x W x H)         1064.1 x 198.1 x 227.6 mm (41.89 x 7.8 x 8.96 in.)           ELECTRICAL POWER REQUIREMENTS           DC Input Voltage (VDC)         48 ±1.0%           Continuous DC Current³ (A)         ≤90           Peak Current (A)         ≤200 for ≤6 ms           COOLANT           Heat Load (kW)         ≤4.5           Dynamic Coolant Flow Rate (l/min.)         ≥5.7           Coolant Setpoint Temperature Range         21 to 25°C (69.8 to 77°F)           Coolant Temperature Stability (max.)         ±1.0°C (±1.8°F)           Coolant³         Anti-corrosion treated water           Coolant Differential Pressure¹⁰ (kPa)         103 (15 psi) at 5.7 l/min. (1.5 gpm)           Coolant Maximum Static Pressure (kPa)         827 (120 psi)           ENVIRONMENTAL CONDITIONS           Ambient Temperature         5 to 45°C (41 to 113°F)	Polarization (parallel to baseplate)		Linear ≥100:1		
RF Excitation Pulse Width Range (µsec)         2 to 1000           Duty Cycle Limit (%)         ≤60           Fall Time⁴ (µs)         ≤60           Weight         45 kg (99.2 lbs.)           Dimensions (Lx W x H)         1064.1 x 198.1 x 227.6 mm (41.89 x 7.8 x 8.96 in.)           ELECTRICAL POWER REQUIREMENTS           DC Input Voltage (VDC)         48 ± 1.0%           Continuous DC Current³ (A)         ≤90           Peak Current (A)         ≤200 for ≤6 ms           COOLANT           Heat Load (kW)         ≤4.5           Dynamic Coolant Flow Rate (l/min.)         ≥5.7           Coolant Setpoint Temperature Range         21 to 25°C (69.8 to 77°F)           Coolant Temperature Stability (max.)         ±1.0°C (±1.8°F)           Coolant*0         Anti-corrosion treated water           Coolant Differential Pressure¹⁰ (kPa)         103 (15 psi) at 5.7 l/min. (1.5 gpm)           Coolant Maximum Static Pressure (kPa)         827 (120 psi)           ENVIRONMENTAL CONDITIONS           Ambient Temperature         5 to 45°C (41 to 113°F)	Beam Ellipticity <sup>6,7</sup>	≥0.83, ≤1.2			
Duty Cycle Limit (%)         ≤60           Fall Time⁴ (µs)         ≤60           Weight         45 kg (99.2 lbs.)           Dimensions (L x W x H)         1064.1 x 198.1 x 227.6 mm (41.89 x 7.8 x 8.96 in.)           ELECTRICAL POWER REQUIREMENTS           DC Input Voltage (VDC)         48 ±1.0%           Continuous DC Current® (A)         ≤90           Peak Current (A)         ≤200 for ≤6 ms           COOLANT           Heat Load (kW)         ≤4.5           Dynamic Coolant Flow Rate (l/min.)         ≥5.7           Coolant Setpoint Temperature Range         21 to 25°C (69.8 to 77°F)           Coolant Temperature Stability (max.)         ±1.0°C (±1.8°F)           Coolant*0         Anti-corrosion treated water           Coolant Differential Pressure¹0 (kPa)         103 (15 psi) at 5.7 l/min. (1.5 gpm)           Coolant Maximum Static Pressure (kPa)         827 (120 psi)           ENVIRONMENTAL CONDITIONS           Ambient Temperature         5 to 45°C (41 to 113°F)	Pulse Frequency (kHz)	Single-shot to 200			
Fall Time <sup>4</sup> (µs)	RF Excitation Pulse Width Range (µsec)	2 to 1000			
Weight       45 kg (99.2 lbs.)         Dimensions (L x W x H)       1064.1 x 198.1 x 227.6 mm (41.89 x 7.8 x 8.96 in.)         ELECTRICAL POWER REQUIREMENTS         DC Input Voltage (VDC)       48 ±1.0%         Continuous DC Current® (A)       ≤90         Peak Current (A)         COOLANT         Heat Load (kW)         Sp.7         Coolant Flow Rate (l/min.)       ≥5.7         Coolant Setpoint Temperature Range       21 to 25°C (69.8 to 77°F)         Coolant Temperature Stability (max.)       ±1.0°C (±1.8°F)         Coolant Differential Pressure¹0 (kPa)       103 (15 psi) at 5.7 l/min. (1.5 gpm)         Coolant Maximum Static Pressure (kPa)       827 (120 psi)         ENVIRONMENTAL CONDITIONS         Ambient Temperature       5 to 45°C (41 to 113°F)	Duty Cycle Limit (%)	≤60			
Dimensions (L x W x H)         ELECTRICAL POWER REQUIREMENTS         DC Input Voltage (VDC)       48 ±1.0%         Continuous DC Current® (A)       ≤90         Peak Current (A)       ≤200 for ≤6 ms         COOLANT         Heat Load (kW)       ≤4.5         Dynamic Coolant Flow Rate (I/min.)       ≥5.7         Coolant Setpoint Temperature Range       21 to 25°C (69.8 to 77°F)         Coolant Temperature Stability (max.)       ±1.0°C (±1.8°F)         Coolant Differential Pressure¹⁰ (kPa)       103 (15 psi) at 5.7 I/min. (1.5 gpm)         Coolant Maximum Static Pressure (kPa)       827 (120 psi)         ENVIRONMENTAL CONDITIONS       5 to 45°C (41 to 113°F)	Fall Time <sup>4</sup> (µs)	≤60			
ELECTRICAL POWER REQUIREMENTS  DC Input Voltage (VDC)  Continuous DC Current® (A)  Peak Current (A)  COOLANT  Heat Load (kW)  Dynamic Coolant Flow Rate (I/min.)  Coolant Setpoint Temperature Range  Coolant Temperature Stability (max.)  Coolant 9  Coolant Differential Pressure (kPa)  ENVIRONMENTAL CONDITIONS  Auti-Corrosion treated water  5 to 45°C (41 to 113°F)	Weight	45 kg (99.2 lbs.)			
DC Input Voltage (VDC)       48 ±1.0%         Continuous DC Current® (A)       ≤90         Peak Current (A)       ≤200 for ≤6 ms         COOLANT         Heat Load (kW)       ≤4.5         Dynamic Coolant Flow Rate (I/min.)       ≥5.7         Coolant Setpoint Temperature Range       21 to 25°C (69.8 to 77°F)         Coolant Temperature Stability (max.)       ±1.0°C (±1.8°F)         Coolant®       Anti-corrosion treated water         Coolant Differential Pressure¹0 (kPa)       103 (15 psi) at 5.7 I/min. (1.5 gpm)         Coolant Maximum Static Pressure (kPa)         ENVIRONMENTAL CONDITIONS         Ambient Temperature       5 to 45°C (41 to 113°F)	Dimensions (L x W x H)	1064.1 x 198.1 x 227.6 mm (41.89 x 7.8 x 8.96 in.)			
Continuous DC Current® (A)≤90Peak Current (A)≤200 for ≤6 msCOOLANTHeat Load (kW)≤4.5Dynamic Coolant Flow Rate (I/min.)≥5.7Coolant Setpoint Temperature Range21 to 25°C (69.8 to 77°F)Coolant Temperature Stability (max.)±1.0°C (±1.8°F)Coolant®Anti-corrosion treated waterCoolant Differential Pressure® (kPa)103 (15 psi) at 5.7 I/min. (1.5 gpm)Coolant Maximum Static Pressure (kPa)827 (120 psi)ENVIRONMENTAL CONDITIONSAmbient Temperature5 to 45°C (41 to 113°F)	ELECTRICAL POWER REQUIREMENTS				
Peak Current (A) ≤200 for ≤6 ms  COOLANT  Heat Load (kW) ≤4.5  Dynamic Coolant Flow Rate (I/min.) ≥5.7  Coolant Setpoint Temperature Range 21 to 25°C (69.8 to 77°F)  Coolant Temperature Stability (max.) ±1.0°C (±1.8°F)  Coolant 9 Anti-corrosion treated water  Coolant Differential Pressure¹⁰ (kPa) 103 (15 psi) at 5.7 I/min. (1.5 gpm)  Coolant Maximum Static Pressure (kPa) 827 (120 psi)  ENVIRONMENTAL CONDITIONS  Ambient Temperature 5 to 45°C (41 to 113°F)	DC Input Voltage (VDC)	48 ±1.0%			
Heat Load (kW)  Sequence Sequence Stability (max.)  Coolant Temperature Range  Coolant Temperature Stability (max.)  Coolant Temperature Stability (max.)  Coolant Differential Pressure (kPa)  Coolant Maximum Static Pressure (kPa)  Ambient Temperature  Sequence Se	Continuous DC Current <sup>8</sup> (A)	≤90			
Heat Load (kW)  Dynamic Coolant Flow Rate (I/min.)  Coolant Setpoint Temperature Range  21 to 25°C (69.8 to 77°F)  Coolant Temperature Stability (max.)  £1.0°C (±1.8°F)  Coolant Differential Pressure¹⁰ (kPa)  Coolant Maximum Static Pressure (kPa)  ENVIRONMENTAL CONDITIONS  Ambient Temperature  \$\frac{4.5}{2.57}\$  21 to 25°C (69.8 to 77°F)  Anti-corrosion treated water  103 (15 psi) at 5.7 I/min. (1.5 gpm)  827 (120 psi)  ENVIRONMENTAL CONDITIONS	Peak Current (A)	≤200 for ≤6 ms			
Dynamic Coolant Flow Rate (I/min.)  Coolant Setpoint Temperature Range  Coolant Temperature Stability (max.)  Coolant 9  Coolant Differential Pressure (kPa)  Coolant Maximum Static Pressure (kPa)  ENVIRONMENTAL CONDITIONS  Ambient Temperature  ≥5.7  21 to 25°C (69.8 to 77°F)  ±1.0°C (±1.8°F)  Anti-corrosion treated water  103 (15 psi) at 5.7 I/min. (1.5 gpm)  827 (120 psi)  ENVIRONMENTAL CONDITIONS  Ambient Temperature	COOLANT				
Coolant Setpoint Temperature Range  Coolant Temperature Stability (max.)  Coolant 9  Coolant Differential Pressure (kPa)  Coolant Maximum Static Pressure (kPa)  ENVIRONMENTAL CONDITIONS  Ambient Temperature  21 to 25°C (69.8 to 77°F)  Anti-corrosion treated water  Anti-corrosion treated water  103 (15 psi) at 5.7 l/min. (1.5 gpm)  827 (120 psi)  ENVIRONMENTAL CONDITIONS  5 to 45°C (41 to 113°F)	Heat Load (kW)	≤4.5			
Coolant Temperature Stability (max.)  Coolant 9  Anti-corrosion treated water  Coolant Differential Pressure (kPa)  Coolant Maximum Static Pressure (kPa)  ENVIRONMENTAL CONDITIONS  Ambient Temperature  5 to 45°C (41 to 113°F)	Dynamic Coolant Flow Rate (I/min.)		≥5.7		
Coolant 9 Anti-corrosion treated water  Coolant Differential Pressure 10 (kPa) 103 (15 psi) at 5.7 l/min. (1.5 gpm)  Coolant Maximum Static Pressure (kPa) 827 (120 psi)  ENVIRONMENTAL CONDITIONS  Ambient Temperature 5 to 45°C (41 to 113°F)	Coolant Setpoint Temperature Range		21 to 25°C (69.8 to 77°F)		
Coolant Differential Pressure 10 (kPa)  Coolant Maximum Static Pressure (kPa)  ENVIRONMENTAL CONDITIONS  Ambient Temperature  103 (15 psi) at 5.7 l/min. (1.5 gpm)  827 (120 psi)  5 to 45°C (41 to 113°F)	Coolant Temperature Stability (max.)		±1.0°C (±1.8°F)		
Coolant Maximum Static Pressure (kPa) 827 (120 psi)  ENVIRONMENTAL CONDITIONS  Ambient Temperature 5 to 45°C (41 to 113°F)	Coolant <sup>9</sup>		Anti-corrosion treated water		
ENVIRONMENTAL CONDITIONS  Ambient Temperature 5 to 45°C (41 to 113°F)	Coolant Differential Pressure <sup>10</sup> (kPa)	10	103 (15 psi) at 5.7 l/min. (1.5 gpm)		
Ambient Temperature 5 to 45°C (41 to 113°F)	Coolant Maximum Static Pressure (kPa)		827 (120 psi)		
	ENVIRONMENTAL CONDITIONS				
Relative Humidity <sup>11</sup> (non-condensing) (%) ≤95	Ambient Temperature		5 to 45°C (41 to 113°F	)	
	Relative Humidity <sup>11</sup> (non-condensing) (%)		≤95		
Altitude ≤2000 m (≤6500 ft.)	Altitude		≤2000 m (≤6500 ft.)		

- All specifications apply when the product is operated in accordance with the guidelines defined in the operators manual.

  Measured at 10 kHz PRF, 60% duty cycle.

  Output stability specification may not be met at lowest power or at acoustic resonances.

  Measured for a 100 µs pulse width at 1 kHz repetition frequency.

  Measured as ± (P<sub>max</sub>-P<sub>min</sub>)/2P<sub>max</sub>.

  Measured at waist location ~ 1.0 m from the location cuttout.

- Measured at Sitmax\*\* min/2r max.

  Measured at waist location ~1.0 m from the laser output.

  Measured at 10 kHz PRF, 25% duty cycle.

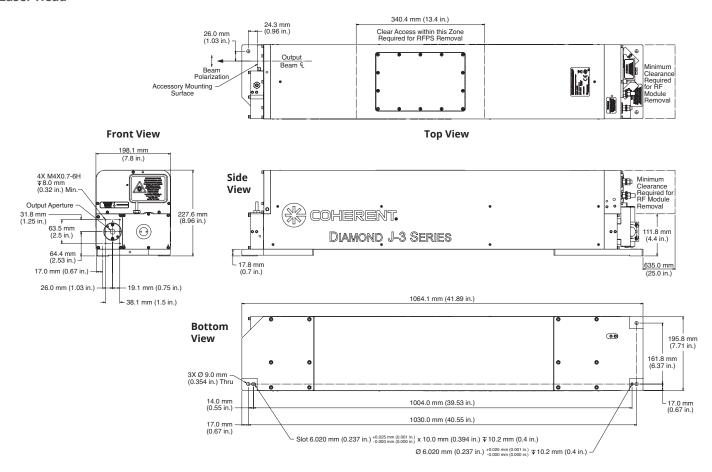
  At 10 kHz PRF, maximum duty cycle operation.

- At 10 kHz Phr, maximum day cycle operation.
   See manual for details.
   This differential pressure is from system input to output and does not include the pressure drop from chiller fittings and the supply and return hose.
   Do not operate at or below dew point.



#### MECHANICAL SPECIFICATIONS

#### Laser Head





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All specifications subject to change without notice. Coherent, Inc. warrants to the original purchaser for a period of two years from the date of delivery that the Duxnova J-3 Series product is free from defects in material and workmanship. The warranty does not apply to any unit damaged by accident, abuse or operation in a manner inconsistent with the procedures and specifications outlined in the manual supplied with the laser.

The Diamond J-3 CO<sub>2</sub> laser is a component that does not include all safety features as required by the FDA and the Center for Devices and Radiological Health (CDRH). It is sold solely to qualified manufacturers who in their end product will supply all interlocks and indicators, and will comply fully with CDRH regulations and/or local regulatory agencies. Printed in the U.S.A. MC-016-14-0M0617Rev.B Copyright ©2017 Coherent, Inc.