



**Laser System Model 1101-XX-CW-YYYY-BF
Continuous Wave Room Temperature High Power OEM QCL Module**



Model 1101-XX-CW-YYYY-BF is OEM version of Pranalytica's high power, continuous wave, room temperature midwave infrared laser system. It provides up to 3.5 W of continuous wave, room temperature (CW/RT) optical power at the wavelength of 4.6 μm or up to 2.5 W of CW/RT power at 4.0 μm . The butterfly package includes the high power quantum cascade laser mounted on a thermoelectric cooler, a thermistor to sense the QCL temperature and appropriate optics for collimating the output from the QCL.

The quantum cascade laser incorporates Pranalytica's unique patent-pending structure designs, which permit continuous wave high power operation of the laser at room temperature without the need for external chillers or water cooling. The quantum cascade laser also incorporates Pranalytica's proprietary high reflectivity facet coating technology for high reliability operation of the laser at high CW power levels.

The OEM butterfly module requires appropriate thermal management system to maintain the butterfly package body at temperatures below 35°C. Electrical power specifications are provided with each module and the customer needs to supply current regulated power for driving the QCL as well as the TEC. The TEC current needs to be feedback controlled using the thermistor data to maintain QCL at a constant operating temperature. The thermistor data should also be used to provide a QCL power shutoff should the QCL device temperature rise above 45°C.

When the high power QCLs are supplied in the OEM package and are operated with electronics drivers other than those provided by Pranalytica, there is no implicit or explicit warranty on the performance or lifetime of the QCL.

The OEM version of the high power QCL is offered in several power output versions:

Model 1101-XX-CW-500-BF: Power output of ≥ 0.5 W, continuous wave in an ambient environment with the butterfly package at $T < 35^\circ\text{C}$.

Model 1101-XX-CW-750-BF: Power output of ≥ 0.75 W, continuous wave in an ambient environment with the butterfly package at $T < 35^\circ\text{C}$.

Model 1101-XX-CW-1000-BF: Power output of ≥ 1.0 W, continuous wave in an ambient environment with the butterfly package at $T < 35^\circ\text{C}$.

Model 1101-XX-CW-1500-BF: Power output of ≥ 1.5 W, continuous wave in an ambient environment with the butterfly package at $T < 35^\circ\text{C}$.

Model 1101-XX-CW-2000-BF: Power output of ≥ 2.0 W, continuous wave in an ambient environment with the butterfly package at $T < 35^\circ\text{C}$.

Model 1101-XX-CW-2500-BF: Power output of ≥ 2.5 W, continuous wave in an ambient environment with the butterfly package at $T < 35^\circ\text{C}$.

Model 1101-XX-CW-3000-BF: Power output of ≥ 3.0 W, continuous wave in an ambient environment with the butterfly package at $T < 35^\circ\text{C}$ (presently only at 4.6 μm)

Model 1101-XX-CW-3500-BF: Power output of ≥ 3.5 W, continuous wave in an ambient environment with the butterfly package at $T < 35^\circ\text{C}$ (presently only at 4.6 μm)

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| Quantum cascade laser (laser head): Model 1101-XX-CW-YYYY-BF | |
|---|---|
| Laser | <ul style="list-style-type: none"> • Single emitter quantum cascade laser |
| Operation | <ul style="list-style-type: none"> • CW operation with the butterfly package at room temperature |
| Wavelength | <ul style="list-style-type: none"> • 4.6 μm and 4.0 μm (other wavelengths between 4 and 12 μm are available) |
| Output spectrum | <ul style="list-style-type: none"> • Broadband power centered $\sim 4.6 \mu\text{m}$; spectral width $\sim 150 \text{ nm}$ |
| Power output | <ul style="list-style-type: none"> • Up to 3.5 W (model-dependent) |
| Output beam | <ul style="list-style-type: none"> • Nearly collimated, spot size $< 5 \text{ mm}$ at the exit from the laser head |
| Output beam divergence | $< 5 \text{ mrad}$ |
| Output beam pointing stability | $< 100 \mu\text{rad}$ |
| Output beam height | <ul style="list-style-type: none"> • 17 mm from the bottom of the butterfly package mounting surface |
| Output beam quality | <ul style="list-style-type: none"> • Nearly diffraction limited (please call for details) |
| Output polarization | <ul style="list-style-type: none"> • Linearly polarized (vertical, extinction ratio $> 500:1$) |
| Output level control | <ul style="list-style-type: none"> • Controllable from 0% to 100% of rated output |
| Cooling | <ul style="list-style-type: none"> • Provided by customer (30 W-60 W to be removed from the butterfly package base depending on the model) |
| Reliability | <ul style="list-style-type: none"> • Measured lifetime data for $> 3,500$ hours with no power degradation at full power |
| Storage temperature | <ul style="list-style-type: none"> • -40°C to $+70^\circ\text{C}$ (noncondensing) |
| Physical Details | <ul style="list-style-type: none"> • Size: Volume $\sim 35 \text{ cm}^3$ • Weight: $< 100 \text{ g}$ |

| Quantum cascade laser power supply: Model 1101-XX-CW-YYYY-PS | |
|---|--|
| Laser | <ul style="list-style-type: none"> • Provides the necessary laser drive current for the quantum cascade laser (factory adjusted to deliver the specified laser output power) |
| Thermoelectric cooler | <ul style="list-style-type: none"> • Provides the necessary drive current for the associated thermoelectric coolers (factory adjusted to provide the needed cooling at the optimum operating point) |
| Laser output level control | <ul style="list-style-type: none"> • Controllable from 0% to 100% of rated output via 0-5V DC |
| CW operation | <ul style="list-style-type: none"> • Model 1101-XX-CW-YYYY-BF may be operated in true CW mode by applying +5V DC to the modulation input connector (front panel) |
| Modulated operation | <ul style="list-style-type: none"> • Model 1101-XX-CW-YYYY-BF may be modulated from 0 Hz to 100 kHz by applying TTL modulation to input connector (front panel). The quantum cascade laser can be modulated at rates up to 1 GHz with special power supply |
| QCL temperature control | <ul style="list-style-type: none"> • Feedback control system for maintaining a constant preset QCL temperature |
| Protection | <ul style="list-style-type: none"> • Laser power supply equipped with multiple levels of protection for trouble free operation of the QCL • 5 second startup delay time • Laser activated by a separate switch • Compliant with U.S. FDA Performance Standards for Light-emitting Products / Laser Products (21 CFR 1040.10 and 1040.11) |
| Display | <ul style="list-style-type: none"> • Monitors and displays operating parameters of the QCL <ul style="list-style-type: none"> – QCL current, voltage and temperature – TEC current and voltage – Laser operation time |
| Monitoring outputs | <ul style="list-style-type: none"> • Multiple operating parameters available as analog voltages on a DB9 connector (optional extra) |
| Physical details | <ul style="list-style-type: none"> • Size: 28 cm (W), 18 cm (H), 37 cm (D) • Weight: 10 kg |
| Electrical details | <ul style="list-style-type: none"> • 110/220 V, 4 A (max). • Optional modification available for operation from a single 28V DC with somewhat lower power consumption. |

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