# Diode-Pumped Solid-State Laser Kit

*LASKIT®-500*

For Education & Research

***Five different laser sources at the price of one!***


Laser kit with various options

## Five Modes of Operation

- CW @ 1064 nm
- Q-switched @ 1064 nm
- Intracavity Frequency Doubled CW @ 532 nm
- Intracavity Frequency Doubled and Q-Switched @ 532 nm
- External Frequency Doubling of the Q-Switched 1064 nm

## Applications

- Education in Theory & Practice
- Laser & Optics Research & Testing
- Laser-Matter Interaction
- Start-Up for DPSS Laser Development

The LASKIT®-500 is a multipurpose laser source aimed at education, research and testing. In fact, it is the most versatile DPSS laser kit on the market, featuring *five* modes of operation.

**A fiber-pumped version is also available**

**The following fundamentals of laser theory and practice can be investigated*:**

- Stability regions of laser cavity
- Various transversal cavity modes ($TEM_{00}$ and higher)
- Optimum cavity configuration for $TEM_{00}$ mode
- Optimum output coupling
- Laser threshold and differential efficiency
- Passive Q-switching threshold phenomena, pulse forms, optimization for maximum output power and maximum output energy, shortest pulse conditions
- Internal frequency doubling in CW-operation
- External frequency doubling in Q-switched mode
- Fluorescence lifetime of the active medium
- Laser dynamics (relaxation oscillations, Q-switching), dependence on active medium parameters; comparison between different active media (Nd:YAG and $Nd:YVO_4$)

*Suggestions only.

**The LASKIT®-500 includes:**

- Pump laser diode with Peltier cooler and attached pump optics
- Laser diode driver & thermoelectric controller LDD1-1T (optional: LPS1-2T, microprocessor-controlled)
- Laser crystal Nd:YAG ($Nd:YVO_4$ optional), with a heat sink
- Set of two laser cavity mirrors (flat/curved)
- $Cr^{4+}$:YAG passive Q-switch, AR/AR coated
- KTP frequency doubler with special coatings, in a holder
- Mirror and crystal mounts (3 pieces)
- Optical bench
- Diode laser module (670 mm) for aligning the laser cavity, with holder
- Infrared-to-visible converter (model IR-VIS-15-B), Ø 15 mm, for aligning the IR laser and mode analysis (also suitable for high-power lasers)
- Ultrafast photo detector (model UPD-300-SP) with rise time <300 ps, spectral range 320 - 1100 nm, external power supply, suitable for observing the relaxation oscillations and pulse duration of the Q-switched mode
- CCD linear array (model CCD-2000M) with 2048 pixels, high sensitivity, driver electronics and power supply, suitable for laser beam analysis, $M^2$ measurements, autocorrelators, etc.

The laser crystal, the passive Q-switch and the KTP-doubler are mounted in special holders for fast and easy exchange, alignment and handling. Switching from one mode of operation to another (e.g. from CW to Q-switched, or from IR to frequency doubling) can be done in a minute.

***Special discounts for educational and research institutions!***

## DPSS Laser Kit

## LASKIT®-500 • Modes of Operation

| Mode of Operation | Output Power Nd:YAG Laser Crystal | Output Power Nd:$YVO_4$ Laser Crystal | Pulse Duration / Repetition Rate | Comments |
|---|---|---|---|---|
| CW @ 1064 nm | min. 300 mW typ. 500 mW | min. 300 mW typ. 500 mW | Not applicable | $TEM_{00}$ with plano-concave cavity. |
| Q-Switched @ 1064 nm | min. 80 mW typ. 100 mW | min. 80 mW typ. 100 mW | **Nd:YAG** : 10 - 50 ns, 5 - 50 kHz<br>**Nd:$YVO_4$** : 50 - 100 ns, 50 - 100 kHz | Passively Q-switched with $Cr^{4+}$:YAG crystal. |
| CW @ 532 nm | min. 10 mW typ. 15 mW | min. 20 mW typ. 40 mW | Not applicable | Intracavity frequency doubled. |
| Q-Switched @ 532 nm | min. 20 mW typ. 25 mW | min. 5 mW typ. 10 mW | **Nd:YAG** : 10 - 30 ns<br>**Nd:$YVO_4$** : 50 - 100 ns | Intracavity frequency doubled & passively Q-switched with $Cr^{4+}$:YAG crystal. |
| Q-Switched @ 532 nm | min. 20 mW typ. 30 mW | min. 3 mW typ. 5 mW | **Nd:YAG** : 10 - 40 ns<br>**Nd:$YVO_4$** : 50 - 100 ns | See -E-SHG option below. External frequency doubling, with optional 8 mm long KTP crystal & focusing lens. |

## LASKIT®-500 • Optional Upgrades*

* Multiple upgrades can be ordered with one laser kit.

| Upgrade | Description | Average Power | Output Energy | Pulse Duration | Peak Power | Comments |
|---|---|---|---|---|---|---|
| -EOD | Actively Q-Switched @ 1064 nm ($Nd^{3+}$:YAG) | typ. 20 mW @ 1 kHz<br>typ. 100 mW @ 10 kHz | typ. 20 µJ @ 1 kHz<br>typ. 10 µJ @ 10 kHz | typ. 25 ns @ 1 kHz<br>typ. 50 ns @ 10 kHz | typ. 1 kW @ 1 kHz<br>typ. 0.2 kW @ 10 kHz | Electro-Optic Deflector (EOD) as the active Q-switch.<br>Operating voltage: max. 1 kV, HV pulse duration <1 µs. |
| -PC | Actively Q-Switched @ 1064 nm ($Nd^{3+}$:YAG) | typ. 35 mW @ 1 kHz<br>typ. 100 mW @ 10 kHz | typ. 35 µJ @ 1 kHz<br>typ. 10 µJ @ 10 kHz | typ. 35 ns @ 1 kHz<br>typ. 50 ns @ 10 kHz | typ. 1 kW @ 1 kHz<br>typ. 0.2 kW @ 10 kHz | Pockels Cell as the active Q-switch.<br>Operating voltage: max. 1 kV, HV pulse duration <1 µs. |
| -MC | Monolithic MICROCHIP Laser ($Cr^{4+}$:$Nd^{3+}$:YAG) | min. 120 mW typ. 140 mW | min. 5 µJ typ. 10 µJ | typ. 800 ps | typ. 10 kW | External frequency doubling, min. 40% efficiency with optional 8 mm KTP crystal and a lens. |
| -E-SHG | External Frequency Doubling @ 532 nm | | | | | |
| -THG | External Frequency Tripling @ 355 nm | | | | | |
| -FHG | External Frequency Quadrupling @ 266 nm | | | | | |

- **Active Q-Switching**: Explore the superior alternative to the Pockels cell Q-switch: The EOD option implements an electro-optic deflector as the Q-switch. A high-speed driver is included. The low-voltage (<1 kV) short-pulse (<1 µs) design assures safe operation. Classical active Q-switching with a Pockels Cell is also available (PC option).
- **Monolithic $Cr^{4+}$:$Nd^{3+}$:YAG MICROCHIP Laser**: Generates high peak-power subnanosecond laser pulses at 1064 nm. The microchip laser needs no alignment because the laser mirrors are deposited directly on the laser crystal faces. The laser chip runs immediately when pumped with the laser diode of the laser kit. Best suited as a research tool in nonlinear optics, micromachining, laser-matter interaction, etc.

## Related Product

- **Laser Power Meter (Model LPM-12)**: This device complements the laser kit to build a complete laser laboratory measurement instrumentation. The power meter employs a broadband (0.2 - 10 µm) thermopile detector unit with an analogue output and a digital display.

## Picosecond Laser Kit

A Picosecond Laser Kit (Model LASKIT®-pico) is also available. This diode-pumped passively mode-locked laser kit is sold at a fraction of the price of commercial lasers:

- Wavelength: 1064 nm
- Output Power: 300 mW
- Pulse Duration: 10 ps
- Repetition Rate: 100 MHz
- Semiconductor Saturable Absorber Technology

*Please refer to the separate data sheet.*

### Laser Safety

This product is intended for expert users only. The laser kit is sold as a set of components; it is not a complete laser. The laser kit may only be assembled, installed and operated under the strict supervision and instructions of qualified personnel who are aware of ALL applicable laser safety rules and standards. These qualified personnel must be experts and must have excellent knowledge of laser design, laser construction as well as principles of laser operation. ALPHALAS GmbH assumes no liability whatsoever, expressed or implied, for the use of this product, nor its assembly or installation. Although the laser kit has been designed to comply with the international standard for safety of laser products IEC 60825-1 and the corresponding European standard EN 60825-1, it can ONLY comply with these standards if properly assembled by qualified personnel.
The laser kit is for laser laboratory use ONLY (i.e. training, education or research). It is NOT for household or other uses. Students are NOT allowed to work with the laser kit without authorized supervision. The training, educational or research establishment of the customer shall take all necessary measures to ensure that ALL laser safety requirements are met.

VISIBLE AND INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT

Max. Avg. Power: 5 W
Max. Peak Power: 50 kW
Pulse Duration:<1 ns - CW
Wavelengths: 1064, 808, 532, 355, 266 nm

ONLY IF PROPERLY ASSEMBLED:
Compliant with IEC 60825-1 2007-03

***Always use suitable laser safety protective eyewear!***

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