# NL300 SERIES

## Compact Flash-Lamp Pumped Q-switched Nd:YAG Lasers


NL300 series electro-optically Q-switched nanosecond Nd:YAG lasers produce high energy pulses with 3–6 ns duration. Pulse repetition rate can be selected in range of 5–20 Hz.

NL30×HT models are designed for maximum energy extraction from the active element. Up to 1200 mJ pulse energy can be produced at a 5 Hz pulse repetition rate.

A wide range of harmonic generator modules for generation up to a 5$^{th}$ harmonic is available.

Harmonics generators can be combined with attenuators that allow smooth output energy adjustment without changing other laser parameters, i.e. pulse duration, pulse-to-pulse stability, divergence or beam profile. For a more detailed description of harmonic and attenuator modules please check our harmonic generators selection guide on the page 72.

The extremely compact laser head is approximately 480 mm long and can be fitted into tight spaces. The laser power supply has a 330 × 490 mm footprint. Easy access to the water tank from the back side of the power supply facilitates laser maintenance. Replacement of flashlamp does not require removal of pump chamber from the laser cavity and does not lead to possible misalignment.

The powering unit can be configured with water-to-water or water-to-air heat exchangers. The latter option allows for laser operation without the use of tap water for cooling.

For customer convenience the laser can be controlled via a RS232 or USB port with LabView™ drivers (included) or a user-friendly remote control pad. Both options allow easy control of laser settings.

### FEATURES

- *Rugged sealed laser cavity*
- *Up to **1200 mJ** pulse energy*
- *Better than 1 % StDev pulse energy stability*
- ***5–20 Hz** pulse repetition rate*
- ***3–6 ns** pulse duration*
- *Thermo stabilized second, third, fourth and fifth harmonics generator modules*
- *Optional attenuators for fundamental and/or harmonics wavelengths*
- *Water-to-water or water-to-air cooling options*
- *Replacement of flashlamps without misalignment of laser cavity*
- *Remote control via keypad and/or RS232/USB port*

### APPLICATIONS

- *Material processing*
- *OPO, Ti:Sapphire, dye laser pumping*
- *Laser spectroscopy*
- *Remote sensing*


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## SPECIFICATIONS [1]

| Model | NL303HT | | NL305HT | |
|---|---|---|---|---|
| Pulse repetition rate | 10 Hz | 20 Hz | 5 Hz | 10 Hz |
| Pulse energy: | | | | |
| at 1064 nm | 800 mJ | 700 mJ | 1200 mJ | 1100 mJ |
| at 532 nm [2] | 380 mJ | 320 mJ | 700 mJ | 500 mJ |
| at 355 nm [3] | 250 mJ | 210 mJ | 450 mJ | 320 mJ |
| at 266 nm [4] | 80 mJ | 60 mJ | 120 mJ | 100 mJ |
| at 213 nm [5] | 13 mJ | 10 mJ | 25 mJ | 20 mJ |
| Pulse energy stability (StdDev) [6] | | | | |
| at 1064 nm | 1 % | | | |
| at 532 nm | 1.5 % | | | |
| at 355 nm | 3 % | | | |
| at 266 nm | 3.5 % | | | |
| at 213 nm | 6 % | | | |
| Power drift [7] | ±2 % | | | |
| Pulse duration [8] | 3–6 ns | | | |
| Polarization | vertical, >90 % | | vertical, >65 % | |
| Optical pulse jitter [9] | <0.5 ns rms | | | |
| Linewidth | <1 $cm^{-1}$ | | | |
| Beam profile [10] | Hat-Top in near and near Gaussian in far fields | | | |
| Typical beam diameter [11] | ~8 mm | | ~10 mm | |
| Beam divergence [12] | <0.6 mrad | | | |
| Beam pointing stability [13] | 50 µrad rms | | | |
| Beam height | 68 mm | | | |
| **PHYSICAL CHARACTERISTICS** | | | | |
| Laser head size (W × L × H) [14] | 154 × 475 × 128 mm | | | |
| Power supply unit (W × L × H) | 330 × 490 × 585 mm | | | |
| Umbilical length | 2.5 m | | | |
| **OPERATING REQUIREMENTS** | | | | |
| Water consumption (max 20 °C) [15] | <8 l/min | <12 l/min | <6 l/min | <10 l/min |
| Ambient temperature | 15–30 °C | | | |
| Relative humidity | 20–80 % (non-condensing) | | | |
| Power requirements [16] [17] | 208–240 V AC, single phase 50/60 Hz | | | |
| Power consumption [18] | <1 kVA | <1.5 kVA | <1 kVA | <1.5 kVA |

1) Due to continuous improvement, all specifications are subject to change without notice. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise all specifications are measured at 1064 nm.

2) With H300SH, H300S or H300SHC harmonics generator modules. See harmonics generator selection guide on the page 72 for more detailed information.

3) With H300THC, H300STH and H300ST harmonics generator modules. See harmonics generator selection guide on the page 72 for more detailed information.

4) With H300SH and H400FHC harmonics generator modules. See harmonics generator selection guide on the page 72 for more detailed information.

5) With H300FiHC harmonics generator module. See harmonics generator selection guide on the page 72 for more detailed information.

6) Averaged from pulses, emitted during 30 sec time interval.

7) Measured over 8 hours period after 20 min warm-up when ambient temperature variation is less than ±2 °C.

8) FWHM.

9) Relative to SYNC OUT pulse.

10) Near field (at the output aperture) TOP HAT fit is >70%.

11) Beam diameter is measured at 1064 nm at the $1/e^2$ level.

12) Full angle measured at the $1/e^2$ level.

13) Beam pointing stability is evaluated as movement of the beam centroid in the focal plane of a focusing element.

14) See harmonics generator selection guide on the page 72 for harmonics generators units sizes.

15) For water cooled version. Air cooled version does not require tap water for cooling.

16) Power requirements should be specified when ordering.

17) 110 V AC powering is available, please inquiry for details.

18) Required current rating can be calculated by dividing power value by mains voltage value.

## OPTIONAL HARMONICS GENERATOR AND ATTENUATORS MODULES

The following are suggested optimal configurations of H300 series modules for various output wavelengths:

1. For **2nd harmonics** output only: the H300SHC module.

2. For **2nd and 3rd harmonics**:
   a) H300SH+H300S+H300THC – for SH and TH output as specified in the NL300 series brochure.
   b) H300STH+H300ST – a cost-effective solution not requiring the replacement of modules when changing from a 532 nm to 355 nm beam and vice versa. The 532 nm beam specification will, however, be 15% lower relative to the values in the NL300 series brochure due to extra components in the beam path.

3. For **2nd and 4th harmonics**: H300SH+H300S+H300FHC modules.

4. For **all harmonics including 4th**:
   a) H300STH+H300ST+H300FHC – a cost-effective solution. The 266 nm and 532 nm beam specifications will be 15% lower relative to the values in the NL300 series brochure.
   b) H300SH+H300S+H300THC+H300FHC – a slightly more expensive solution with output values adhering to those in the NL300 series brochure.

5. For **all harmonics including 5th**: modules described in paragraph #4 plus the H300FiHC module.

6. For **attenuators** for all wavelengths up to the 4th harmonic: H300SH+H300A2+H300TH+H300A3+H300A4 modules.

## MODULES SELECTION GUIDE

| Module | Description | Output ports | Output pulse energy specifications | Dimensions W×L×H, mm | Extension possible? | Notes |
|---|---|---|---|---|---|---|
| H300SH | Second harmonic generator | Port 1: 1064, 532 nm | N/A | 154×160×128 | Yes | |
| H300S | 532 nm beam separator | Port 1: 532 nm<br>Port 2: residual 1064 nm | See NL300 specifications for 532 nm beam | 154×160×128 | No | Should be used with H300SH |
| H300SHC | Second harmonic generator with 532 nm beam separator | Port 1: 532 nm<br>Port 2: residual 1064 nm | See NL300 specifications for 532 nm beam | 154×210×128 | No | |
| H300TH | Third harmonic generator | Port 1: 1064, 532 & 355 nm | N/A | 154×160×128 | Yes | Should be used with H300SH |
| H300THC | Third harmonic generator with 355 nm beam separator | Port 1: 355 nm<br>Port 2: residual 1064 & 532 nm | See NL300 specifications for 355 nm beam | 154×210×128 | No | Should be used with H300SH |
| H300STH | Second and third harmonics generator | Port 1: 1064, 532 & 355 nm | N/A | 154×210×128 | Yes | |
| H300ST | 355 nm beam separator | Port 1: 355 nm<br>Port 2: residual 532 nm | See NL300 specifications for 355 nm beam | 154×160×128 | No | Recommended to use with H300STH |
| H300FHC | Fourth harmonic generator with 266 nm beam separator | Port 1: 266 nm<br>Port 2: residual 532 nm | See NL300 specifications for 266 nm beam | 154×290×128 | No | Should be used with H300SH |
| H300FiHC | Fifth harmonics generator with 213 nm beam separator | Port 1: 213 nm<br>Port 2: residual 1064, 532 & 266 nm | See NL300 specifications for 213 nm beam | 154×350×128 | No | |
| H300A1 | Attenuator for 1064 nm beam | Port 1: 1064 nm beam | Transmission in 5-90% range at 1064 nm | 154×210×128 | No | |
| H300A2 | Attenuator and beam separator for 532 nm beam | Port 1: 532 nm<br>Port 2: residual 532 nm | Transmission in 5-90% range at 532 nm | 154×210×128 | No | Should be used with H300SH |
| H300A3 | Attenuator and beam separator for 355 nm beam | Port 1: 355 nm<br>Port 2: residual 355 nm | Transmission in 5-90% range at 355 nm | 154×210×128 | No | Should be used with H300TH or H300STH |
| H300A4 | Fourth harmonic generator, beam sepa-rator and attenuator for 266 nm beam | Port 1: 266 nm<br>Port 2: residual 266 nm | Transmission in 5-90% range at 266 nm | 154×350×128 | No | Should be used with H300SH |



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## OPTIONS

- **Option -AW** – air-cooled power supply option. An adequate air conditioner should be installed in order to keep room temperature stable.
- **Harmonics generator options** – an extensive selection of harmonics generators up to 5th harmonics.
- **Attenuator options** allow a smooth change of laser pulse energy, while other laser pulse parameters, such as pulse duration, jitter, pulse-to-pulse stability, beam divergence and profile remain the same.

## OUTLINE DRAWINGS

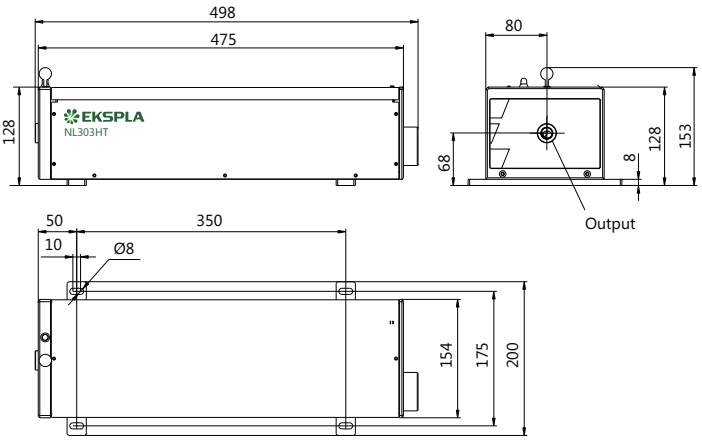



*Fig 1.* Typical NL300 series laser head outline drawing

## ORDERING INFORMATION

**NL303HT-10-AW-H300SH-H300THC**

- **NL303HT** – Model
- **10** – Pulse repetition rate in Hz
- **AW** – Options: AW → water-air heat exchanger
- **H300SH-H300THC** – Optional harmonic generator modules and other accessories

# HARMONIC GENERATORS

## For NL300 Series Lasers

Nanosecond Q-switched lasers enable simple and cost effective laser wavelength conversion to shorter wavelengths through harmonics generation. EKSPLA offers a broad selection of wavelength conversion accessories for NL300 series lasers. The purpose of this guide is to help configure available harmonic generator and attenuator modules for NL300 series lasers for optimal performance.

The harmonics module uses a modular design that allows reconfiguration of laser output for the appropriate experiment wavelength.

A typical module houses a non-linear crystal together with a set of dichroic mirrors for separating the harmonic beam from the fundamental wavelength. Nonlinear crystals used for the purpose of wavelength conversion are kept at an elevated temperature in a thermo-stabilized oven.

Two or more modules can be joined together for higher harmonics generation: attaching one extra module to a second harmonic generator allows for the generation of 3rd or 4th harmonic wavelengths.

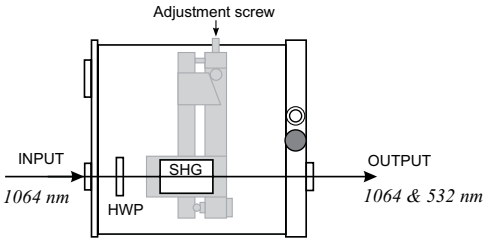
It should be noted that only modules with a single output port can be joined together: it is possible to attach a H300S module to a H300SH unit for 532 nm beam separation, or a H300FHC module for 4th harmonics generation (see detailed description below). Modules with two output ports (e.g., H300SHC) cannot be attached to extra units.

### FEATURES

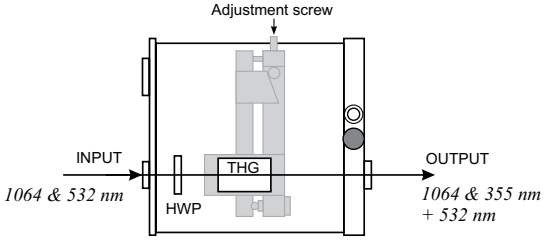
- *Compact harmonic modules*
- *Thermo stabilized crystals for long lifetime*
- *Dichroic mirrors*
- *AR coatings on crystals*
- *Phase matching by mechanical adjustment*
- *High conversion efficiency*
- *Wide selection of different configurations*

### H300SH, H300TH harmonics generators

H300SH or H300TH modules contain a SH or TH crystal with a half-wave plate for input polarization adjustment. The output of the H300SH module has both **532 nm** and **1064 nm** wavelengths; the output of the H300SH+H300TH modules also has a **355 nm** wavelength.



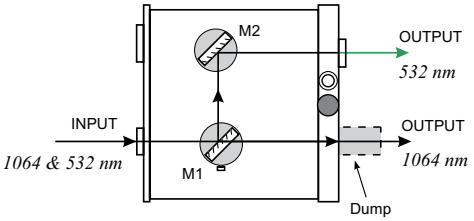

H300SH




H300TH

### H300S harmonics separator

The H300S module has two output ports for the separation of **1064 nm** and **532 nm** wavelengths.




H300S