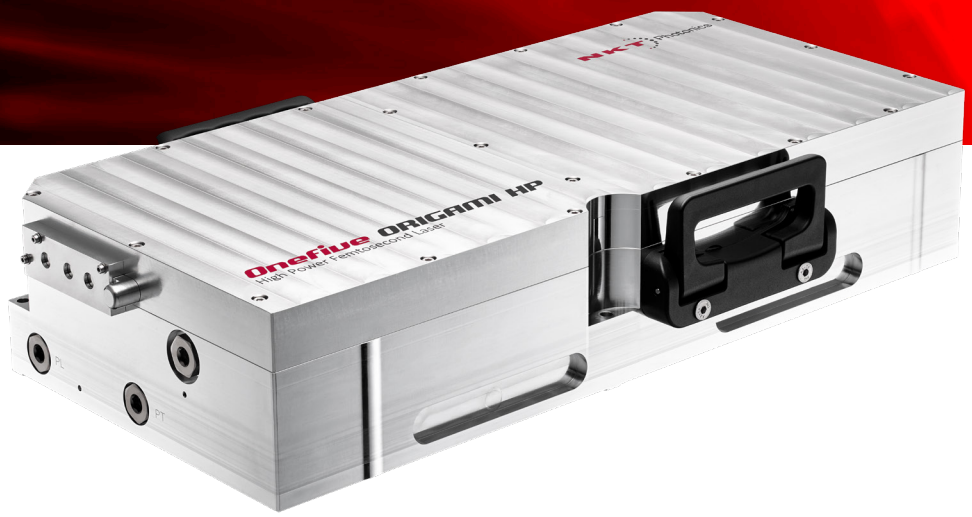
NKT Photonics

# OneFive ORIGAMI HP

## High power, high repetition rate femtosecond laser




## COMPACT ULTRAFAST LASER WITH CLEAN TRANSFORM-LIMITED PULSES

### Ideal for multi-photon excitation as well as micro and nano structuring

This second-generation ORIGAMI HP is an ultra-compact, soliton mode-locked femtosecond laser.

It provides transform-limited output pulses in excess of 4 W with pulse durations down to less than 120 fs and a repetition rate of 80 MHz at 1050 nm.

### Applications

- Multi-photon microscopy and imaging
- Multi-photon polymerization
- Micro/nano-structuring
- Supercontinuum generation
- Terahertz generation
- Pump-probe spectroscopy
- Inspection
- Optogenetics
- Seed for amplifiers
- Clock synchronisation for e.g. X-Ray accelerators/FEL

# ONEFIVE ORIGAMI HP

## High power, clean pulses, and high repetition rate

The second-generation ORIGAMI HP is an ultra-compact soliton mode-locked femtosecond laser. It provides transform-limited output pulses in excess of 4 W with pulse durations down to less than 120 fs and a repetition rate of 80 MHz at 1050 nm.

## The market's lowest phase-noise and timing jitter

Based on our monolithic industrial platform, the ORIGAMI HP provides diffraction-limited beam quality with excellent pointing as well as the lowest phase-noise and timing jitter on the market.

## Versatile and ideal for many applications

The ORIGAMI HP allows for a broad range of industrial and scientific applications. With clean pulse quality, high peak power and ideal beam profile, the ORIGAMI HP is especially attractive to fields of optogenetics, multi-photon imaging as well as micro and nano structuring.

The clean transform-limited pulses ensure efficient excitation/activation with good penetration in tissue. Together with the excellent power and pointing stability, the ORIGAMI HP is an ideal addition to Ti-Sa lasers for multi-photon processes, or standalone for two-photon polymerisation.

## Synchronization to external clocks is an option

By incorporating options for repetition rate control and tunability, the ORIGAMI HP can be synchronised to external clocks for ultra-stable timing applications, exploiting the laser's low-noise performance.

## Maintenance-free and OEM-ready

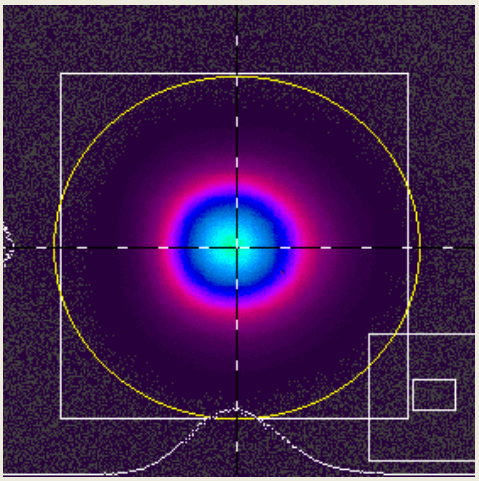
With no alignment required, the ORIGAMI HP guarantees high stability with 24/7 operation and is ideal for OEM integration.

| Model | 05HP | 10HP |
|---|---|---|
| Center wavelength | 525 nm | 1055 nm |
| Pulse duration | < 120 fs | < 120 fs |
| Average power | > 2 W | > 4 W |
| Pulse energy | > 25 nJ | > 50 nJ |

## Features

- Lowest phase noise on the market
- Diffraction-limited beam quality
- No Kelly sidebands or spectral ripple
- No amplifier built-in/no ASE noise
- Transform-limited soliton pulses of outstanding cleanliness
- Plug and Play
- Maintenance-free 24/7 operation

## Far field beam profile



# OPTIONS AND PACKAGES

## Options

The ORIGAMI HP is designed as an all-in-one module; containing both laser and control elements in a compact, sealed housing.

The system can be configured to provide additional integrated elements to the laser oscillator, allowing greater choice and flexibility for the application of choice. Choose from [1]:

- Internal optical isolator [2]
- Trigger output
- Motorised variable attenuator
- Dispersion pre-compensation [3]
- Internal power monitor
- SHG switchable
- SHG power monitor
- Synchronization to external clock, low noise
- Synchronization to external clock, drift removal
- Fiber tap output

1) Please note that not all options can be combined together.
2) Pulse duration will be affected.
3) A fixed value to achieve the shortest pulse possible at the target/sample. Dispersion compensation up to 12,000 fs$^2$. Values known for Zeiss and Leica Microscope Systems.

## Preconfigured packages

Choose from three preconfigured packages:

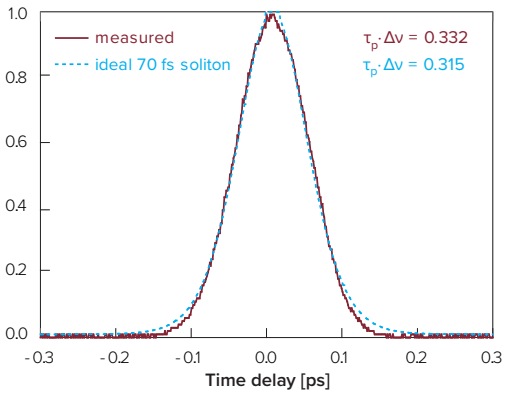
### ORIGAMI HP Entry
- ORIGAMI HP laser
- Internal power monitor
- Trigger output

### ORIGAMI 10HP for multi-photon imaging
- ORIGAMI 10HP laser
- Integrated isolator
- Dispersion pre-compensation
- Motorized variable attenuator
- Trigger output

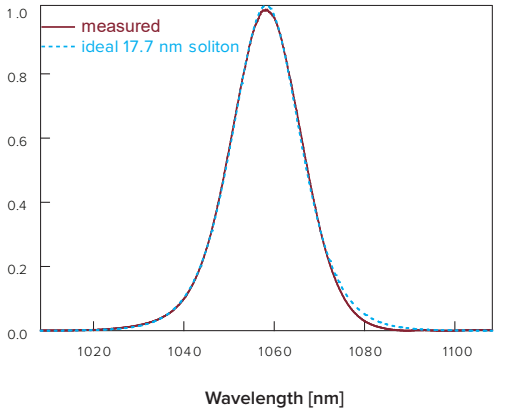
### ORIGAMI HP for synchronization applications
- ORIGAMI HP laser
- Synchronization to external clock, low noise *or* Synchronization to external clock, drift removal (please specify required timing jitter)
- Fiber tap output [4]

4) Only applicable to low-noise synchronization.

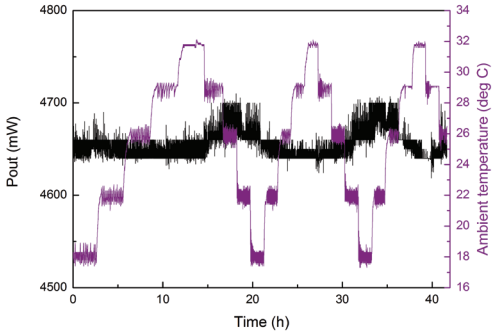
**Typical pulse profile - Autocorrolation**




**Typical optical spectrum - Spectral power density [nm$^{-1}$]**




**Power vs temperature change**



# SPECIFICATIONS

## Optical [1)]

| Model | 05HP | 10HP |
|---|---|---|
| Center wavelength [nm] | 525 ± 2.5 | 1055 ± 5 |
| Pulse duration [fs] | < 120 | < 120 |
| Spectral bandwidth | Transform-limited, soliton shape, no ripples, no pedestals, un-chirped | |
| Average power [W] | > 2 | > 4 |
| Pulse energy [nJ] | > 25 | > 50 |
| Peak power [kW] | > 160 | > 330 |
| Repetition rate [MHz] | 80 ± 2 | 80 ± 2 |
| Beam quality ($TEM_{00}$) | $M^2 \leq 1.2$ | $M^2 \leq 1.1$ |
| Polarization / PER (vertical) [dB] | > 23 | > 23 |
| Amplitude noise (RMS) [%] | < 1.0 | < 1.0 |
| Timing jitter (1 kHz - 10 MHz) [fs] | < 50 | < 50 |
| Output power [%] | 0.5 - 100 via variable attenuator | 0.5 - 100 via optional variable attenuator |
| Pointing stability | < 5 µrad / °C , 18 – 35 °C | < 5 µrad / °C , 18 – 35 °C |

1) Please inquire for possible combinations of pulse duration, average power, and repetition rate.

# SPECIFICATIONS

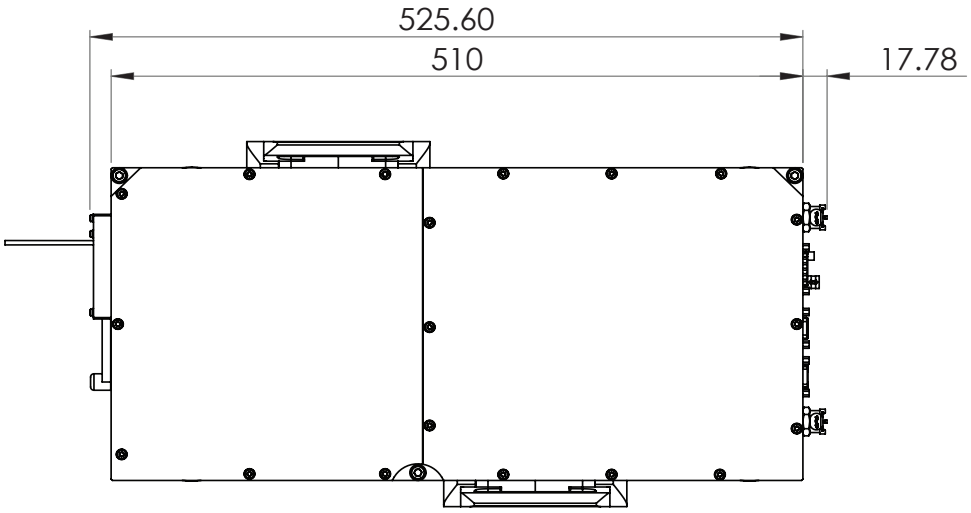
## Mechanical/Electrical

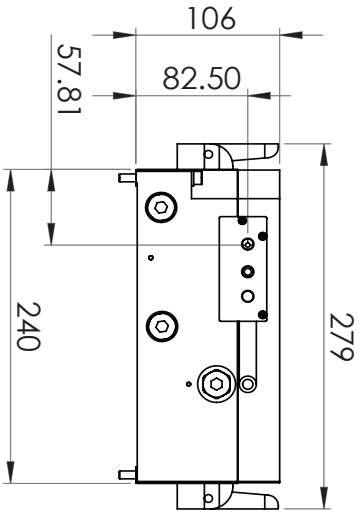
| | |
|---|---|
| Laser output | Collimated free-space |
| Warm-up time [min.] | < 15 |
| Operation temperature [°C] | 18 – 32 |
| Storage temperature [°C] | -20 – 55 |
| Power supply requirements | 24 VDC/9A or 90-264 VAC, 47-63 Hz |
| Power consumption (steady state) [W] | < 50 |
| Laser head dimensions (WxHxL) [mm³] | 279 x 106 x 525.6 |
| Laser head weight [kg] | 40 |
| Laser head cooling | Water |

## Support and warranty

All ORIGAMI products come with an industry leading reliability and are backed by our standard 2-year warranty.

However, should you need the extra security of an extended warranty and remote diagnostics support, this is available in our support and warranty extension package.




All ORIGAMI products are produced under our quality management system certified in accordance with the ISO 9001:2015 and ISO 13485:2016 standard.