

**Koheras**  
**HARMONIK H31**  
High-power UV & VIS fiber laser system



# Single frequency, low noise

Ideal for cutting-edge quantum physics projects

The HARMONIK is a range of high-power frequency-converted laser systems consisting of our popular low-noise Koheras fiber laser platform, BOOSTIK HP, in combination with our frequency converter module, HARMONIK.

The system gives you simultaneous power operation at the fundamental and frequency converted wavelength.

These maintenance-free laser systems provides a superior low-noise single-frequency signal with a unique combination of narrow linewidth, excellent beam quality, and high output power.



## Koheras HARMONIK H31

### Applications

Quantum computing

Cold atom research

Quantum metrology and  
optical clocks

# Benefits

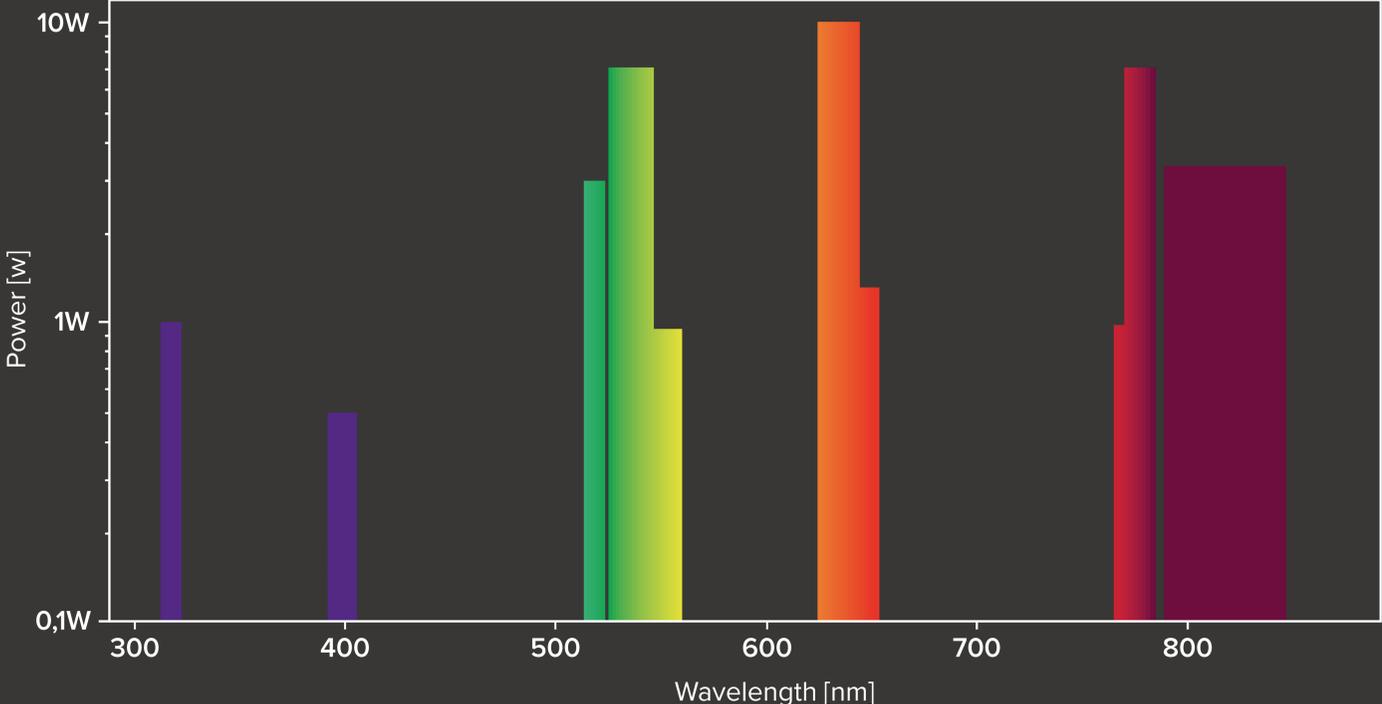
HARMONIK is a range of high-power frequency-converted fiber laser systems with low linewidth and phase noise. Upon request, further linewidth and RIN reduction options are available.

### High output power and excellent beam quality

The output power of the HARMONIK systems depends on the wavelength, with the highest obtainable output of 10 W. The excellent beam quality,  $M2 < 1.1$ , is suitable for cutting-edge quantum physics projects such as quantum sensing and laser cooling and trapping.

### Ideal for quantum optics

With its ultra-stable and narrow linewidth, the HARMONIK is ideal for applications such as quantum optics, computing and other phenomena like optical trapping, optical lattice, Bose-Einstein condensate, atom interferometer, and squeezing.



# Koheras HARMONIK H31

The graph shows the VIS wavelength capabilities of the HARMONIK.

All lasers are pumped by our low-noise fiber lasers in the NIR (not shown), allowing the lasers to be locked to frequency references at either their fundamental or converted wavelengths.

Model	H31	H40	H53	H55	H63	H76	H78	H81
Wavelengths [nm]	312-322	392-405	525-546	547-560	624-644	765-769	770-785	789-845
Output power [W]	> 1	> 0.5	> 7	> 1	> 10	> 4	> 7	> 3
Linewidth [kHz]	< 40	< 40	< 40	< 40	< 20	< 0.4	< 0.4	< 40

# Features and Benefits

## Ultra-low noise

The HARMONIK systems offer an ultra-low phase noise as well as low RIN. The RIN is preserved from the pump laser while the linewidth is doubled.

## Fast wavelength modulation

The systems are equipped with easy and user-friendly fast wavelength modulation. This feature is typically used to lock the laser to an external stable reference — such as an atomic transition line or interferometer — to obtain even higher wavelength stability than provided by the free-running laser.

## Thermal tuning

All Koheras fiber lasers are equipped with thermoelectric temperature controllers (TECs).

The TECs stabilize the operation of the laser and makes it insensitive to environmental temperature fluctuations. The TECs also make it possible to tune the center wavelength by changing the operating temperature of the laser.

At standard room temperature (around 20-30°C or 68-86°F) the laser can be thermally tuned to an industry-leading 1000 pm.

## Free-space or fiber output

As default, the HARMONIK systems come with free-space output. If fiber coupling is needed, we can propose an efficient coupling via our unique polarization-maintaining single mode photonic crystal fiber that ensures high-power delivery.

Our pre-angled fiber couplers are easy and fast to align. They give a very high coupling efficiency, which does not decrease significantly over time, so it is possible to obtain a long term stable coupling.

## Rack system and table top

The BOOSTIK HP system is delivered in a turn-key 19" rack system and the HARMONIK frequency-conversion modules are supplied as tabletop units that also fit a 19" rack-mount module.

# Koheras HARMONIK H31

---

## FEATURES

- Up to 10 W depending on wavelength
- Sub-kHz linewidth
- Ultra-low frequency and intensity noise
- Wide wavelength tunability
- Excellent beam quality,  $M2 < 1.1$
- Temperature stabilized
- Optional PM fiber delivery
- Plug and Play
- Simple user operation
- Robust and maintenance-free

# Specifications

## Optical

<b>Model</b>	H31
<b>Center wavelength <sup>1</sup> [nm]</b>	312-322
<b>Standard wavelength [nm]</b>	317
<b>Laser emission</b>	CW - Inherently single frequency
<b>Beam quality</b>	$M^2 < 1.1$
<b>Output power <sup>2</sup> [W]</b>	> 1
<b>Linewidth [kHz]</b>	< 40
<b>RIN peak [MHz]</b>	0.5-2.0
<b>RIN level [dBc/Hz]</b>	
<b>@ peak</b>	< -100
<b>@ 10 MHz</b>	< -140
<b>Long term stability (peak-peak, 1h @25°C) <sup>3</sup> [%]</b>	< 10
<b>Optical S/N (50 pm res.) [dB]</b>	> 70
<b>Polarization / PER [dB]</b>	> 20
<b>Min. thermal wavelength tuning range [pm]</b>	± 70
<b>Total thermal wavelength tuning range [pm]</b>	200

<b>Fast wavelength modulation range [GHz]</b>	> 16
<b>Fast wavelength modulation [kHz]</b>	Up to 20
<b>Pump unit(s) size for 19" rack system [U]</b>	8
<b>Number of frequency conversion modules <sup>4</sup></b>	2

- 1) Center wavelength is selectable within the specified range.
- 2) Shot noise-limited > 5 Mhz.
- 3) After a 10-20 minute warm-up.
- 4) Delivered as tabletop module(s).

# Koheras HARMONIK H31

## SERVICE AND WARRANTY EXTENSIONS

The Koheras warranty and service package ensures trouble free operation of your Koheras laser. The Standard Package gives you a two year warranty extension plus remote diagnostics of key laser parameters through a remote connection to the system.

Our Premium Package adds a guarantee that we always stock a laser with your specifications - ready to ship - should you need it.

# Specifications

## Electrical/Mechanical/Environmental

HARMONIK H31 <sup>1</sup>	
Power supply requirements [VAC, Hz]	100-240 VAC, 50-60 Hz
Digital interface	Ethernet 10/100
Monitor output	Standard: Free-space Optional: 2.5m high power, single mode fiber delivery FC/APC
Dimensions (WxHxL) [mm]	516 x 97 x 320
Weight [kg]	< 30

1) For the BOOSTIK HP system, please refer to the BOOSTIK HP datasheet.

# Koheras HARMONIK H31

## RELIABILITY

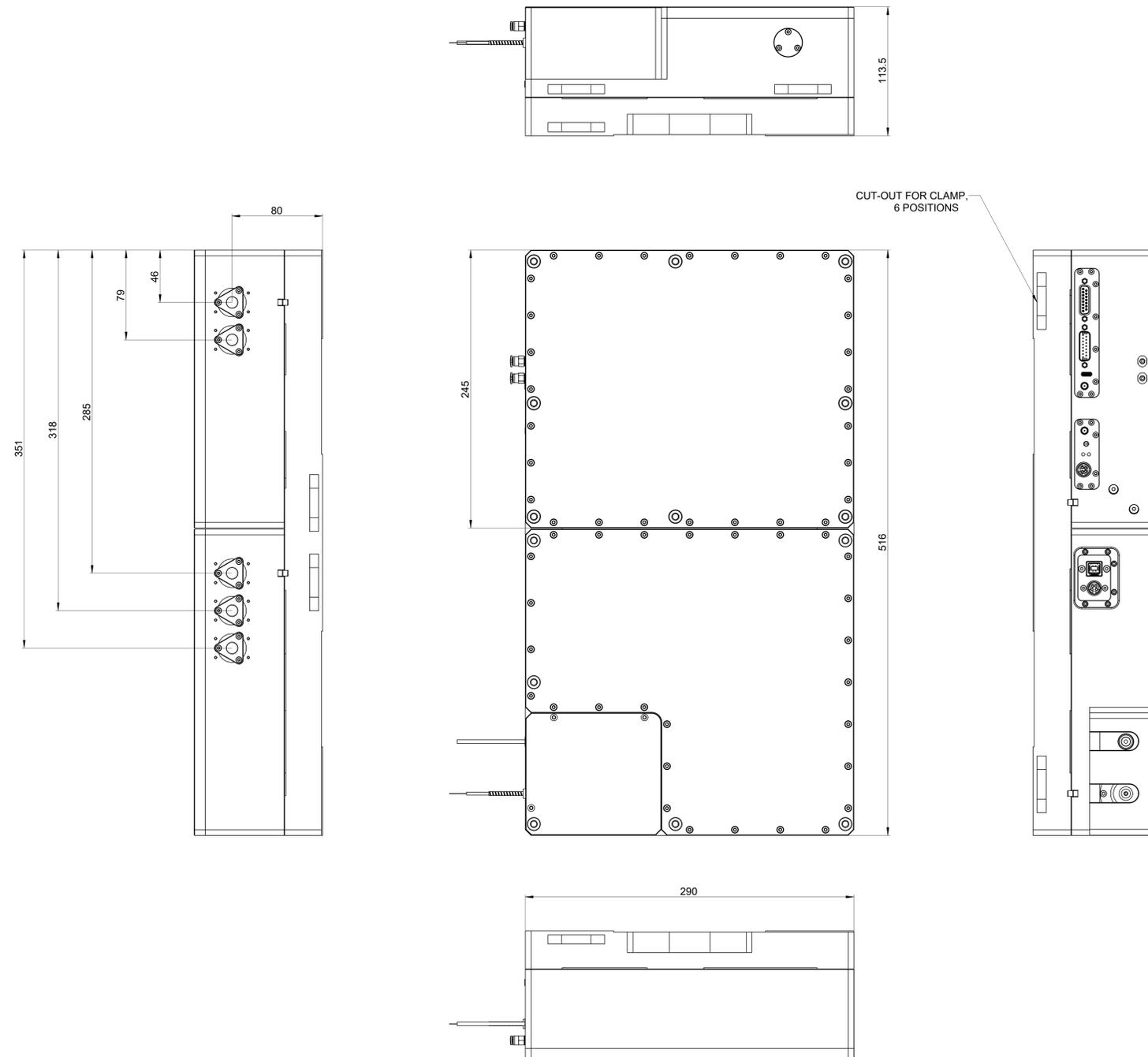
The Koheras range of single frequency fiber lasers is based on telecom-grade fiber components and built to last thousands of hours with no service or maintenance.

With several thousand lasers installed in environments varying from fully climate controlled national standards laboratories to the demanding environment on oil rigs and submarines, the Koheras line is the most robust single-frequency laser range on the market with an unmatched reliability track record.

# Technical Drawings

## Koheras HARMONIK H31

All NKT Photonics products are produced under our quality management system certified in accordance with the ISO 9001:2015 standard.



# SOLUTIONS FOR INNOVATORS