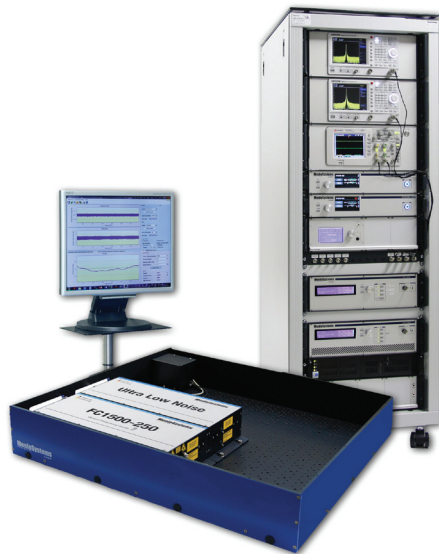


# FC1500-250-ULN

## Ultra Low Noise Optical Frequency Comb



The Menlo Systems FC1500-250-ULN Ultra Low Noise Optical Frequency Comb combines the versatility and ease-of-use of our standard fiber-based frequency comb systems with unprecedented low phase noise and extreme stability of the generated comb radiation. Our all polarization maintaining figure 9<sup>®</sup> mode locking technology together with high bandwidth actuators for both the carrier-envelope offset frequency and the repetition rate guarantees ultimate performance.

Ever increasing demands for stability and accuracy of time and frequency signals require improved oscillators and frequency references. But the even the best optical frequency references have very limited spectral coverage. The FC1500-ULN overcomes these limitations by transferring the spectral purity of these references to the whole wavelength range from 500-2000 nm. This unique feature of the MenloSystems ULN Combs enables the user to compare different (optical) frequency references, stabilize all of his lasers to one absolute frequency reference and to use it as a clockwork for optical clocks. The overall stability is evaluated in an out of loop comparison between two independent ULN combs, which is an elementary part of every systems' quality check at the Menlo factory.

# MenloSystems

### KEY SPECIFICATIONS

- Comb Spacing 250 MHz
- Accuracy  $10^{-17}$  in 1000 s
- Stability: better  $2 \times 10^{-16}$  in 1 s,  $3 \times 10^{-18}$  in 1000 s
- Operational Range from 500 nm to 2  $\mu$ m
- Integrated Phase Noise <100 mrad [100 Hz-2 MHz]

### APPLICATIONS

- High Precision CW Laser Stabilization
- Transfer of CW Laser Stability to Full Comb Spectrum
- Cold Atoms and Ions
- High Resolution Spectroscopy
- Low-noise Microwave Generation

### FEATURES

- High Repetition Rate
- High Bandwidth >500 kHz Actuators for CEO and Repetition Rate
- Fully Fiber-coupled CEO Frequency Generation
- Turnkey Metrology System. Fully automated, including data evaluation software, designed for continuous operation

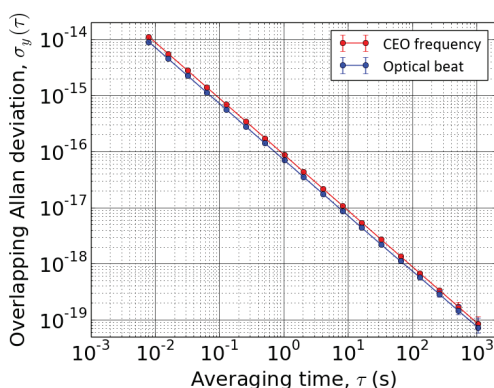
### OPTIONS

#### Complete Solution with Modular Extensions

Menlo Systems Optical Frequency Combs are complete solutions. The modular system architecture allows for easy additions of more functionality to an existing system. Multiple extensions can be combined in a system.

- **M-NIR:** Extension Package
- **M-VIS:** Extension Package
- **HMP:** High Power Measuring Port
- **P250 PM Pulse EDFA:** Erbium-doped Fiber Amplifier
- **M-780:** High Power output around 780 nm
- **BDU:** Beat Detection Unit
- **LLE-SYNCR0:** Laser Locking Electronics
- **Microwave:** Ultrastable RF Output
- **GPS:** -based 10 MHz Frequency Reference
- **WLM-NIR /WLM-VIS:** Integrated Wavelength Meters

### STABILITY OF CEO AND OPTICAL REFERENCE BEAT FREQUENCY



Measured with dead-time free  $\pi$ -type counter.

# FC1500-250-ULN

**MenloSystems**  
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## Ultra Low Noise Optical Frequency Comb

### SPECIFICATIONS

### FC1500-250-ULN

Comb Spacing	250 MHz
Accuracy	$10^{-17}$ in 1000s*
Stability	$2 \times 10^{-16}$ in 1s*, $3 \times 10^{-18}$ in 1000 s*, $5 \times 10^{-13}$ in 1 s $\Delta$
Integrated Phase Noise	<100 mrad [100 Hz-2 MHz]
Linewidth	$\ll 1$ Hz**
Tuning Range of Spacing Between Individual Comb Lines	>2 MHz
Tuning Range of CEO Frequency	>250 MHz
Laser Outputs	five fiber-coupled, linearly polarized, PM output ports
Center Wavelength	1560 nm
Spectral Range	>25 nm (500-1050 nm with M-VIS, 1050-2100 nm with M-NIR)
Average Output Power	>13 mW from each laser port (>60 mW with M-VIS, >200 mW with M-NIR)

\*phase lock to optical reference,  $\Delta$ phase lock to rf reference, \*\*limited by resolution bandwidth of analyzer

### REQUIREMENTS

Input Requirements	cw optical reference, power level approx. 1 mW (see Menlo ORS datasheet) 10 MHz frequency reference, power level +7 dBm
Operating Voltage	100/115/230 VAC
Frequency	50 to 60 Hz
Power Consumption	<500 W, <3kW including chiller
Cooling Requirements	closed cycle chiller included
Operating Temperature	$22 \pm 5$ °C
Optical Unit Dimensions/Weight	706 x 716 mm, approx. 80 kg***
Control Electronics Dimensions/Weight	600 x 800 mm, approx. 140 kg***

\*\*\*Standard system configuration

### ORDERING INFORMATION

Product Code	FC1500-250-ULN
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Please call for pricing. Specifications are subject to change without notice. Custom modifications are available, please inquire.



Invisible laser radiation  
avoid exposure to beam  
Class 4 laser

**MenloSystems**  
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