For current pricing, please see our website.

# FC1500-250-WG: Er-Doped Optical Frequency Synthesizer


The FC1500-250-WG Optical Frequency Synthesizer is a compact and flexible fiber-based femtosecond frequency comb system. With an extension package for the visible spectral range, the system provides a stabilized optical frequency comb for frequency metrology in both the visible and near infrared spectral regions. A wide range of optional units enables us to tailor this versatile system to customer-specific metrology solutions.

The optical frequency comb technology and its stabilization are covered by several international patents (e.g., see EU patent EP 1161782 and US patent 6,785,303 B1). Menlo Systems holds the exclusive rights on the patents. The 2005 Nobel Prize in Physics was awarded to one of the founders of Menlo Systems, Theodor W. Hänsch, and J. Hall for their invention of the frequency comb technology.

Base Unit

- **FC1500-250-WG** M-Comb oscillator, P250 PULSE-EDFA amplifier, XPS 1500 wave guided f:2f interferometer with electronic control tower

Optional Units

- **M-NIR** extension package extends the stabilized comb spectrum to the 1050 - 2100 nm range
- **M-VIS** extension package extends the stabilized comb spectrum to the 530 - 900 nm range
- **P250 PULSE-EDFA** erbium-doped fiber amplifier for high-power output at 1560 nm
- **780 Measurement Port** for high-power output at 780 nm
- **HMP** high-power measurement port for high-precision measurement of low-power lasers for user-defined wavelengths
- **BDU-FS, BDU-FC,** and **BDU-FF** broadband free-space and adjustment-free, fiber-coupled beat detection units
- **SYNCRO-LLE** electronics to phase lock the external CW lasers to the stabilized comb
- **GPS 5-10** 10 MHz frequency reference to serve as RF reference for the frequency comb

## Specifications

| | |
|---|---|
| Comb Spacing | 250 MHz |
| Accuracy* | $10^{-14}$ |
| Stability* | $5x10^{-13}$ in 1 s |
| Tuning Range of Spacing Between Individual Comb Lines | >2 MHz |
| Tuning Range of CEO Frequency | >250 MHz |
| **Optical Output Ports** | |
| **LC/APC Ports – Three Fiber-Coupled, Elliptically Polarized** | |
| Center Wavelength | 1560 nm |
| Spectral Range | >35 nm |
| Average Output Power | >18 mW from Each Port |
| **Extension Package to the Near Infrared** | |
| **NIR Measurement Port – Free-Space, Unpolarized** | |
| Spectral Range | 1050 - 2100 nm |
| Average Output Power | >200 mW |
| **Extension Package to the Visible** | |
| **VIS Measurement Port – Free-Space, Unpolarized** | |
| Spectral Range | 530 - 900 nm |
| Average Output Power | >60 mW |
| **Additional Amplifier at 1560 nm** | |
| Average Output Power | >400 mW |
| Pulse Length | <90 fs |
| **Optional Port at 780 nm** | |
| Average Output Power | >150 mW |
| **High-Power Measurement Port** HMP633** | |
| Average Output Power | >5 mW |

* Same as reference, whichever applies first

** In 3 nm window at 633 nm, available for other user-defined wavelengths.

The M-NIR extension package amplifies the light from the femtosecond fiber laser and then spectrally broadens the amplified output in a highly nonlinear optical fiber. This supercontinuum comprises a comb of frequency lines, separated by the laser repetition rate and with an arbitrary frequency offset. By phase locking the comb spacing and the offset frequency to a radio frequency (RF) reference source, the comb will form an accurate frequency ruler for the 1050 to 2100 nm region.

The operational range can be extended to the visible part of the spectrum by amplifying and frequency doubling part of the fiber laser output and then broadening it in a photonic crystal fiber. The visible comb spanning 530 - 900 nm retains the phase stability.

The frequency comb provides a direct link between the optical and microwave frequencies in both directions. Phase-locked to an RF reference, any unknown optical frequency can then be measured by simply comparing its frequency to that of the nearest tooth of the stabilized frequency comb. The accuracy of the measurement is only limited by the reference.

Conversely, by phase locking one tooth of the frequency comb to a continuous wave (CW) laser that is locked to a narrow atomic transition or high-finesse resonator, the frequency comb divides the extremely rapid optical oscillations of this optical reference to countable microwave frequencies.

| ITEM # | $ | £ | € | RMB | DESCRIPTION |
|---|---|---|---|---|---|
| FC1500-250-WG | CALL | | | | Erbium Optical Frequency Synthesizer |

**For local and updated pricing, please call Menlo Systems, Inc. in North America 973-300-4490, Menlo Systems GmbH in Europe +49-89-189-1660, or Thorlabs Japan, Inc. in Asia +81-3-5979-8889, or email sales@menlosystems.com.**