Chop-In Opus 1™
Digital Dual-Phase Lock-In Amplifier & Phase-Locked Chopper Combination

- **Affordable** lock-in amplifier and chopper system for the price of a chopper alone
- Provides digital dual-phase lock-in amplifier functionality at frequencies up to 5 kHz
- USB powered—no additional power needed
- Compact 3 inch diameter chopper disk
# Chop-In Opus 1™ Specifications

## Input channel
- **Input signal**: Differential (± 3 V max), 1 MΩ input impedance
- **Gain settings**: 1x, 10x, 100x, 1000x
- **Sensitivity**\*\*: 20 nV

## Reference channel
- **Reference signal**: 3.3-5 V logic
- **Frequency range**: 20-5000 Hz (lock-in amplifier), 20-700 Hz (chopper)
- **Frequency resolution**: 0.1 Hz or 0.01%, whichever is greater
- **Harmonic #**: Selectable, limited by the frequency range and sampling rate

## Chopper
- **Disk diameter**: 3" (76 mm)
- **Aperture**: 9 mm
- **Mounting**: 8-32 and M4 threaded holes, compatible with standard optical posts

## Demodulator
- **Implementation**: Bundled application
- **Time constant**: 0.001-1000 s (6, 12, 18, 24 dB/Oct rolloff)
- **Dynamic range**\*\*: Typically > 120 dB
- **SNR**\*\*: Typically > 90 dB
- **Harmonic rejection ratio**\*\*: Typically > 80 dB
- **Measurement accuracy**\*\*: < 0.1% (20-1000 Hz); 0.1-3% (1000-5000 Hz)

## Outputs
- **Host computer GUI**: X, Y, R, θ and reference frequency

## Front panel input/output connectors
- **Signal input**: BNC (Input)
- **External reference input**: BNC (Ref In)
- **Chopper control**: 3.5mm audio jacks
- **Chopper frequency control**: Via software
- **Data interface and power**: Mini-USB connector
- **Power indicator**: LED

## Software
- **Stand-alone executable**: Controls the hardware, implements signal acquisition, digital demodulation and filtering—req. min. Windows 7, Pentium i3, and 4GB RAM or higher
- **An example LabView VI**: Demonstrates full user control of the hardware, data acquisition, graphical display of the results and saving of the data

## Power, dimensions and weight
- **Power source**: +5 V (via USB), 300 mA + 50 mA per chopper
- **Dimensions**: Main unit: 7.0" (W) x 7.5" (D) x 2.5" (H); chopper: 3" (W) x 2.5" (D) x 3.5" (H)
- **Weight**: Main unit: 800 g; chopper: 120 g

\*First harmonic signal measurement, time constant 100 ms (24 dB/Octave)

Note: specifications are subject to change