

3502 Series

Phase Locked Optical Choppers



The newly redesigned Model 3502 optical chopper provides rock-solid stability and flexibility because its chopping frequency is phase-locked to its own internal frequency synthesizer. The Model 3502 can now chop from 4 Hz to 10.65 kHz, using either the internal frequency synthesizer or an external source as the reference. You can chop at the fundamental, a harmonic (2 to 15), or even a sub-harmonic (1/2 to 1/15) of the reference. Unique features of the Model 3502 include outputs at the sum and difference of the inner and outer wheels' chopping frequencies for nonlinear-optics experiments, and a high-stability phase shifter that can lock two choppers together for long fluorescence-decay measurements.

- Stable and reliable phase locking
- Chopping is phase-locked to an internal frequency synthesizer
- Frequencies from 4 Hz to 10.65 kHz
- Lock to external references for harmonic or subharmonic chopping

Complete Chopper System

The 3502 optical chopper comes complete with six chopper wheels, a chopper head motor with built-in wheel cover, and a controller with a USB interface. The 3502-BASE model excludes the six standard chopper wheels, providing a lower cost alternative with wheels ordered separately.



Broadband Absorber Coated Chopper Wheels

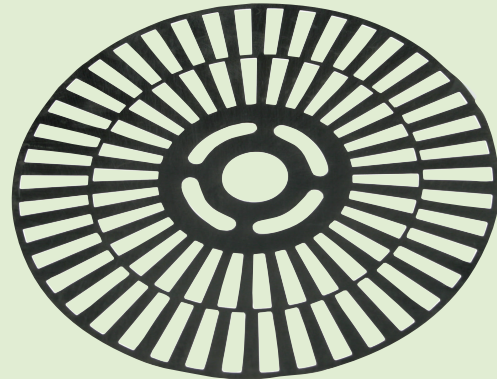
Six chopper wheels are included with the 3502 optical chopper system allowing for chopping frequencies from 4 Hz to 10.65 kHz (not included in the 3502-BASE model). All chopper wheels are 4.50 inch (114.3 mm) diameter. These high quality chopper wheels are made of a beryllium copper alloy, which offer superior performance compared to lower cost steel alternatives. This material choice allows for better thermal conductivity, higher strength, tighter machine tolerances, and are non-magnetic, non-sparking, and corrosion resistant.

Advanced Optical Chopper Controller

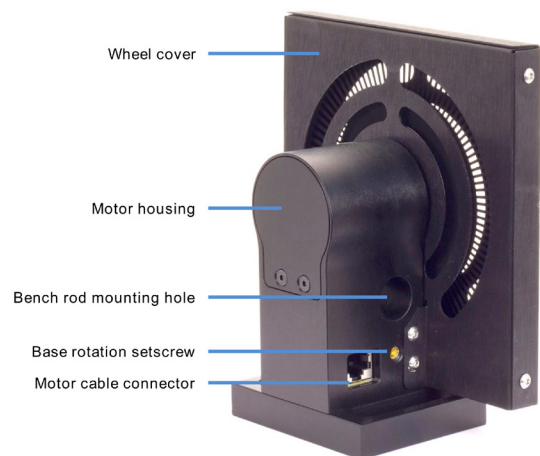
The front panel display of the controller allows monitoring of the chopping frequency, as well as a number of other operating parameters. Easy-to-use cursor keys provide easy adjustment of operating parameters. The chopping rate may be set from 4 Hz to 2.00 kHz, using either the internal frequency synthesizer or an external source as the reference. Chopping mode options are selectable at the fundamental, a harmonic (2 to 15), or even a sub-harmonic (1/2 to 1/15) of the reference.

Stable and Reliable Phase Locking

For stable chopping with minimum jitter and drift, the Model 3502 optical chopper uses precision photo-etched wheels mounted on a high-quality DC motor. In addition, the chopper controller has its own internal crystal-controlled frequency synthesizer and phase-locked loop for precisely locking the chopping frequency. A photo-interrupter on the chopper head monitors the chopping frequency, and the chopper controller actively stabilizes the motor speed to ensure stable chopping with a minimum of frequency drift. In internal-reference mode, the chopper controller uses its internal frequency synthesizer as the reference. When the Model 3502 is operated in external-reference mode, the chopping rate is locked to the user-provided reference from another chopper or signal source. The chopper may also be run asynchronously with the rear-panel analog-control-voltage input. In all cases, the frequency-synthesizer output is available on the front panel for use in your measurement setup. The reference signal can be divided and multiplied by the sub-harmonic and harmonic generators before being processed by the phase shifter.

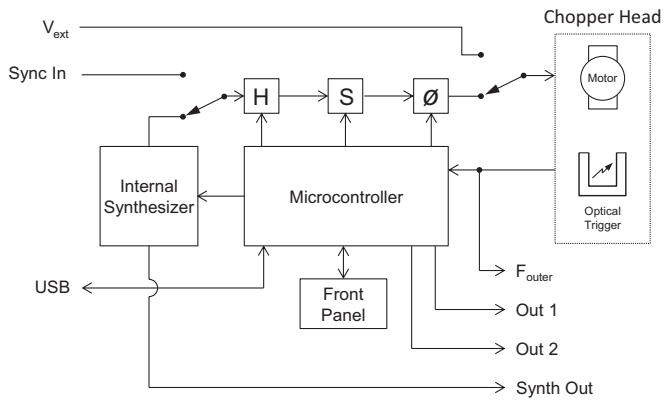


The 3513 Chopper Wheel has 42/30 slots. Included with the 3502 system, must be ordered separately with the 3502-BASE system.

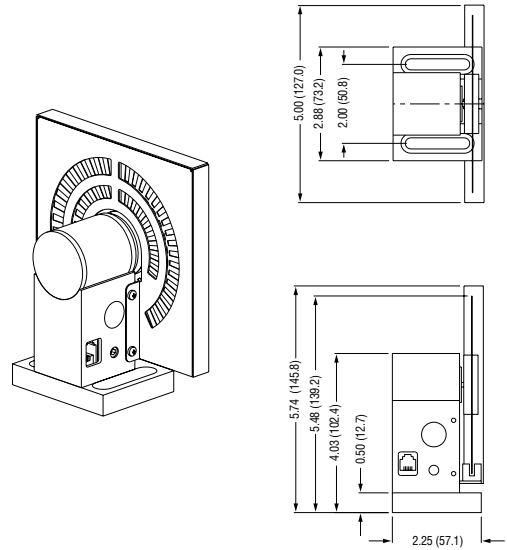


Optical chopper head diagram with notable features and protective wheel cover installed.

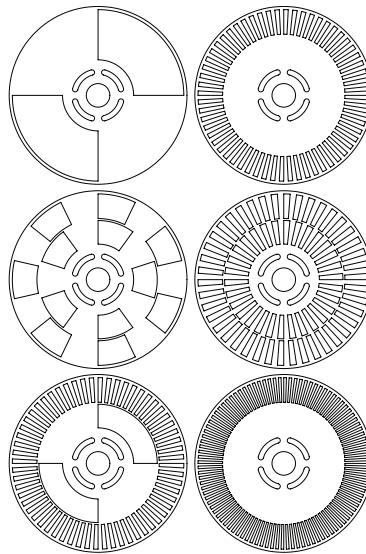
Dimensional Drawings



Functional block diagram for Model 3502 Optical Chopper

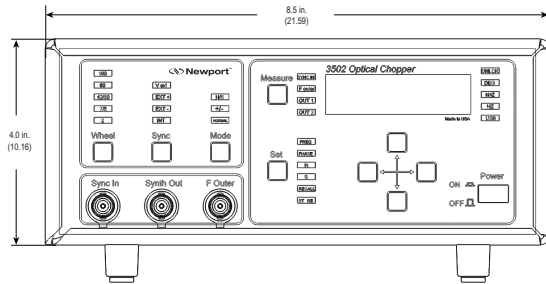


Dimensions of Model 3502 Optical Chopper Head.
Dimensions in inches (mm).

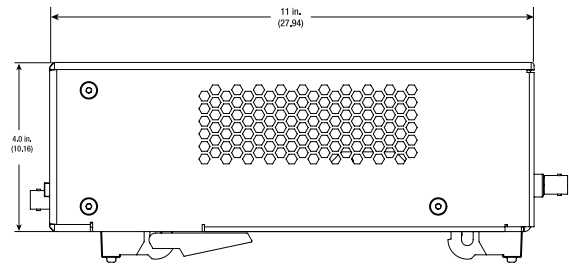


Top row: 2-slot and 60-slot wheels. Middle row: 7/5-slot and 42/30-slot wheels.
Bottom row: 60/2-slot and 100-slot wheels. All wheels are 4.50" (114.3 mm) O.D.

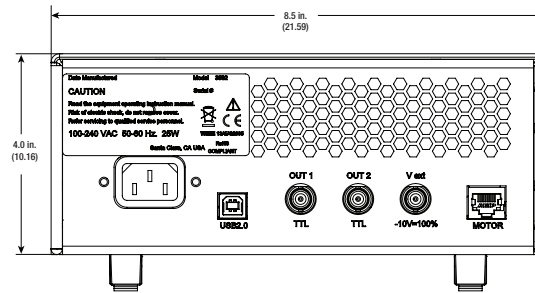
Dimensional Drawings continued



Front View



Side View



Rear View

Description	Model Number	Lowest Frequency (F_{outer})	Highest Frequency (F_{outer})	Jitter ($\mu\text{s p-p}$, typical)	
				@ Minimum Frequency	@ Maximum Frequency
Chopper Wheel, 2 Slot, for 3502 Chopper	3511	4 Hz	213 Hz	2000	50
Chopper Wheel, 7 and 5 Slot, for 3502 Chopper	3512	14 Hz	746 Hz	1000	15
Chopper Wheel, 42 and 30 Slot, for 3502 Chopper	3513	84 Hz	4.48 kHz	150	5
Chopper Wheel, 60 Slot, for 3502 Chopper	3514	120 Hz	6.4 kHz	150	3
Chopper Wheel, 100 slot, for 3502 Chopper	3515	200 Hz	10.65 kHz	200	5

Order Table

Model	Description
3502	Optical Chopper, Phase Locked, Includes 6 Wheels
3502-BASE	Optical Chopper, Phase Locked, no wheels