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THORLABS

LSK-GG - December 7, 2018

Item # LSK-GG was discontinued on December 7, 2018. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

GALVO-GALVO SCAN HEAD AND CONTROLLER

- **Large-Area XY Scanning With User-Defined Scan Shapes**
- **±7.5° Mechanical Scan Range (±15° Optical Scan Range)**
- **Pre-Aligned, Wired, and Calibrated for Plug-And-Play Use**
- **Drive Using DC, Sine, or Sawtooth Wave Signal**
- **SM-Thread and Cage System Compatible**

Scan Head

LSK-GG

Controller

Application Idea
Galvo-Galvo Scanner Incorporated into a Cerna® DIY Microscope System

Galvo-Galvo Scanner

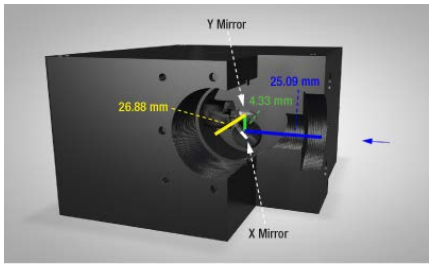
Hide Overview

OVERVIEW

Features

- Optical Scan Range of ±15° (±7.5° Mechanical Scan Range) for Beams up to Ø4 mm
- Driven by User-Supplied DC, Sine, or Sawtooth Wave Signal
- BNC Connectors for Position Control and Readout
- Compatible with National Instruments Cards and Breakout Boxes
- Protected Silver Coating for High Reflectance in Visible and NIR
- Scan Head is SM Threaded, Cage System Compatible, and Post Mountable

Our LSK-GG Galvo-Galvo Scanner contains two galvo scan mirrors that deflect an incident laser beam in X and Y. Identical to the galvo-galvo scanner used in our Bergamo® II multiphoton microscopes and complete Cerna®-based confocal systems, each mirror has a mechanical scan range of ±7.5°, corresponding to an optical scan range of ±15°. This range is large enough to explore the entire diffraction-limited FN20 field of view of Thorlabs' SL50 scan lenses for laser scanning microscopy.



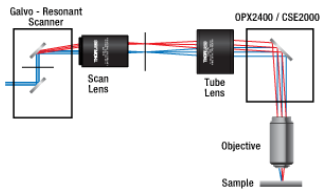
Click to Enlarge
Cutaway View of Galvo-Galvo Scan Head
The scan lens being used with the scan head needs to be positioned such that its focus is at the midpoint of the 4.33 mm green line. For the input, that distance corresponds to 27.255 mm, while for the output, that corresponds to 29.045 mm. The input port has internal SM05 threads, internal SM1 threads, and four Ø6 mm bores for a 30 mm cage system, while the output port has internal SM1 threads and four 4-40 taps for a 30 mm cage system.

A National Instruments (NI) 68-pin connector is available to directly control and monitor the scanner via an NI card or breakout box (not included). The beam can also be steered by supplying DC, sine, or sawtooth wave drive signals through two BNC connectors. For sine wave signals, a maximum scan rate of 500 Hz is supported. Two additional BNC connectors provide X and Y position feedback signals. This scanner is also compatible with Vidrio's ScanImage software.

Each scan mirror has a protected silver coating that provides high reflectance in the visible and NIR; see the *Specs* tab for details. Since the coating is metallic, its performance varies minimally over the ±7.5° mechanical scan range of the mirror.

The scan head is connected to the controller using the included DB25 cable. If using the BNC input connectors to drive the galvo mirrors, a drive voltage of

±10 V at an impedance of 200 kΩ will be required for each axis. The BNC output connectors have a voltage range of ±4 V and an impedance of 2 kΩ.



Click for Details
Incorporate the LSK-GR08 galvo-resonant scanner into a DIY laser scanning microscopy setup.

Mounting

The input face of the scan head has internal SM05 (0.535"-40) threads, internal SM1 (1.035"-40) threads, and four Ø6 mm bores spaced for our 30 mm cage system. The output face has internal SM1 threads and four 4-40 taps for our 30 mm cage system.

Please note that the scan lens needs to be positioned such that its entrance pupil is at the midpoint between the galvo mirrors; when being used at the input, the distance is 27.255 mm, while at the output, the distance is 29.045 mm. For the CLS-SL Scan Lens, an LCP02(/M) Cage System Size Adapter can be used to convert the 30 mm cage system to a 60 mm cage system to mount and position this scan lens at the correct distance using a LCP8S Cage Plate. To mount an SL50-CLS2, SL50-2P2, or SL50-3P Scan Lens at the correct distance from the scanner a special adapter is available by contacting Tech Support.

The scan head weighs 0.49 kg, so it may be useful to support it directly using a Ø1/2" post or Ø1" post. Four 1/4"-20 tapped holes and five 8-32 tapped holes are located on the bottom. Note that there are no metric tapped holes.

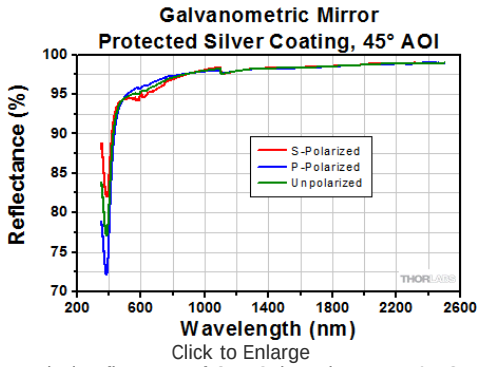
Hide Specs

SPECS

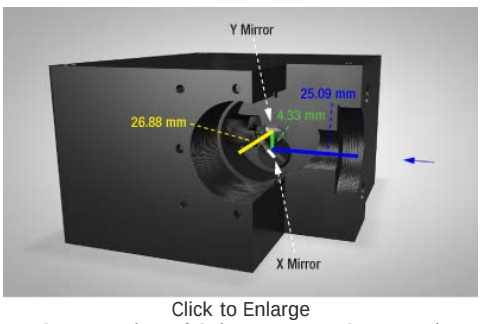
LSK-GG Specifications		
Mirrors		
Mechanical Scan Range	±7.5°	
Optical Scan Range	±15°	
Beam Diameter	4 mm (Max)	
Coating	Protected Silver	
Reflectance (Average)[a]	350 - 450 nm	>70%
	450 - 550 nm	>90%
	550 - 650 nm	>92.5%
	650 - 1080 nm	>95%
	1080 - 7000 nm	>97%
X Mirror Clear Aperture[b]	Ellipse 6.22 mm Major Axis 4.00 mm Minor Axis	
Y Mirror Clear Aperture[b]	Ellipse 5.82 mm Major Axis 5.22 mm Minor Axis	
Front Surface Flatness	λ/4 (at 633 nm)	
Front Surface Quality	60-40 Scratch-Dig	
Substrate	Silicon[c]	
Position Sensor		
Repeatability	8 µrad[d]	
Small Angle Step Response[e]	130 µs (Typical)	
Maximum Step Angle[f]	0.65°	
Time Delay Between Input and Output Signal	90 µs	
Linearity	99.9%	
Scale Drift	50 ppm/°C (Max)	
Zero Drift	15 µrad/°C (Max)	
RMS Current (Max)	2.4 A	
Peak Current	8.0 A	
Input / Output		

BNC Input	**Bandwidth**	0-500 Hz (Max)[g]
	Voltage	±10 V
	Impedence	200 kΩ
	Scale Factor	1.33 V per Mechanical Degree
BNC Output	**Voltage**	±4 V
	Impedance	2 kΩ
	Scale Factor	0.5 V per Mechanical Degree
Controller Voltage Input		90 - 264 VAC, 50 - 60 Hz
Power Consumption		120 VA (Max)
Physical		
Scan Head Dimensions		97.5 mm x 79.8 mm x 50.8 mm (3.84" x 3.14" x 2.00")
Controller Dimensions		316.7 mm x 199.8 mm x 79.2 mm (12.47" x 7.87" x 3.12")
SM Threading		Internal SM05 (0.535"-40) Internal SM1 (1.035"-40)
Cage Compatibility		30 mm Cage (4-40 Tap, 4 Places; Ø6 mm Bore, 4 Places)
Post Mounting		1/4"-20 Tap, 4 Places 8-32 Tap, 5 Places
Operating Temperature Range		0 to 50 °C

a. A typical reflectance curve is shown to the right.
b. The X and Y mirrors are denoted in the schematic to the right.
c. Click Link for Detailed Specifications on the Substrate
d. The system noise is less than 16 bits over a full voltage range (-10 to 10 V).
e. Response corresponds to a 0.1° movement from 1% to 99% of its final position.
f. This is the maximum incremental movement at which the mirrors are able to settle within 130 µs. For movements greater than this, add a slope (Δv/Δt, where v is the difference between the voltages and t is the time difference) to your voltage profile. For example, for a step angle of 1.3°, the settling time is 260 µs.
g. Bandwidth measured for a ±10 V sine wave. Results vary depending on the waveform chosen.



Click to Enlarge
Typical Reflectance of One Galvo Mirror at 45° AOI
Please note that lot-to-lot variations will occur in the reflectance. The table to the left contains minimum average reflectance values over the recommended wavelength range.



Click to Enlarge
Cutaway View of Galvo-Resonant Scan Head
The scan lens being used with the scan head needs to be positioned

such that its focus is at the midpoint of the 4.33 mm green line. For the input, that distance corresponds to 27.255 mm, while for the output, that corresponds to 29.045 mm. The input port has internal SM05 threads, internal SM1 threads, and four Ø6 mm bores for a 30 mm cage system, while the output port has internal SM1 threads and four 4-40 taps for a 30 mm cage system.

Hide Pin Diagrams

PIN DIAGRAMS

Click to Enlarge
The front of the controller has a DB25 connector for the scan head, as well as BNC connectors and an NI 68-pin connector for position control and readout.

X IN and Y IN

BNC Female

X IN and Y IN	
Input Signal Types	DC, Sine, or Sawtooth Wave
Input Voltage Range	±10 V
Input Impedance	200 kΩ
Input Scale Factor	1.33 V per Mechanical Degree
Input Bandwidth	0-500 Hz (Max)[a]

a. Bandwidth measured for a sine wave with 10 V amplitude. Results vary depending on the waveform chosen.

X OUT and Y OUT

BNC Female

X OUT and Y OUT	
Output Voltage Range	±4 V
Output Impedance	2 kΩ
Output Scale Factor	0.5 V per Mechanical Degree

DAQ

NI 68-Pin Connector

DAQ		
Pin	**Name**	**Description**

21	Y Position In	±10 V Input 200 kΩ Impedance
22	X Position In	±10 V Input 200 kΩ Impedance
26	X Velocity	Output Voltage Proportional to Scanner Velocity 2 kΩ Impedance
28	Y Velocity	Output Voltage Proportional to Scanner Velocity 2 kΩ Impedance
30	X Position Out	±4 V Output 2 kΩ Impedance
38	Y Fault	Output Pulled from 12 V to 0 V When Fault Detector Trips 4.75 kΩ Impedance
46	X Fault	Output Pulled from 12 V to 0 V When Fault Detector Trips 4.75 kΩ Impedance
54	Ground	Ground Return for User Inputs
57	X Current	Output Voltage Proportional to Motor Current 2 kΩ Impedance
60	Y Current	Output Voltage Proportional to Motor Current 2 kΩ Impedance
65	Y Position Out	±4 V Output 2 kΩ Impedance

Hide Shipping List

SHIPPING LIST

LSK-GG Shipping List

Click to Enlarge
Item # Shown: LSK-GG

Each Galvo-Galvo Scanner Includes the Following:

- Scan Head
- Controller
- DB-25 Scan Head Control Cable
- Region-Specific Power Cord
- Four ER05 Cage System Assembly Rods

Note because the galvo-galvo scanner can be steered using multiple methods of input signals, neither BNC cables nor an NI 68-pin cable are included.

Hide

Part Number	Description	Price	Availability
LSK-GG	**Galvo-Galvo Scanner and Controller**	**$9,750.00**	**Today**


GALVO / GALVO CONTROLLER
LSK-GG
SCANNER
X IN
Y IN
POWER
X FAULT
Y FAULT
DAQ
X OUT
Y OUT
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