Have you seen our...

Fast Steering Mirror

See page 800

For current pricing, please see our website.

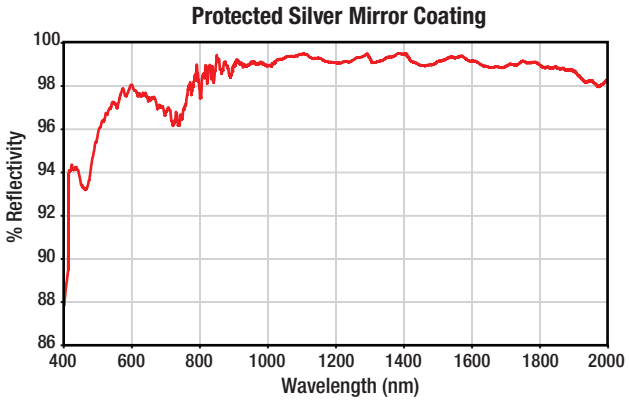
Galvanometer Mirror Systems (Page 1 of 3)

GVS002
Dual-Axis Small Beam Galvo/Mirror Assembly

GVS001
Single-Axis Small Beam Galvo/Mirror Assembly

Galvanometer Features

- 1D and 2D Systems for Small (<5 mm) and Large (<10 mm) Beam Diameters
- Moving Magnet Motor Design for Faster Response
- High-Precision Optical Mirror Position Detection
- Analog PD Control Electronics with Current Damping and Error Limiter
- Protected Silver Mirror Coating (400 - 2000 nm Wavelength Range)



The GVS Series of Scanning Galvanometer Mirror Systems are high-speed (300 or 400 µs small angle response time) mirror positioning systems designed for integration into OEM or custom laser beam steering applications such as laser scanning, laser microscopy, and laser marking. There are two mirror sizes available:

- **GVS001 and GVS002:** Single- and Dual-Axis Systems for Small (<5 mm) Diameter Beams
- **GVS011 and GVS012:** Single- and Dual-Axis Systems for Larger (<10 mm) Diameter Beams

Each assembly includes a single- or dual-axis galvo motor/mirror assembly, together with associated driver cards and heat sinks. The GVS011 and GVS012 systems also include a base plate that is a combined post adapter and tilt platform adapter.

A low noise, linear PSU (GPS011) and a motor/mirror assembly heatsink (GHS003) are available separately.

Motor/Mirror Assembly

The assembly consists of a galvanometer-based scanning motor with an optical mirror mounted on the shaft and a detector that provides positional feedback to the control board. The moving magnet design for the GVS series of galvanometer motors was chosen over a stationary magnet and rotating coil design in order to provide the fastest response times and the highest system resonant frequency. The position of the mirror is encoded using an optical sensing system located inside of the motor housing.

Due to the large angular acceleration of the rotation shaft, the size, shape, and inertia of the mirrors become significant factors in the design of high-performance galvo systems. Furthermore, the mirror must remain rigid (flat) even when subjected to large accelerations. All these factors have been precisely balanced in our galvo systems in order to match the characteristics of the galvo motor and maximize performance of the system.

System Operation

The servo driver must be connected to a DC power supply, the galvo motor, and an input voltage source (the monitoring connection is optional). For continuous scanning applications, a function generator with a square or sine wave output is sufficient for scanning the galvo mirror over its entire range. For more complex scanning patterns, a programmable voltage source should be used.

The ratio between the input voltage and mirror position is switchable and can be 0.5, 0.8, or 1. For the GVS001 and GVS002 systems, when set to 0.8, the ±10 V input will rotate the mirror over its full range of ±12.5°. For the GVS011 and GVS012 systems, the ±10 V input produces the full angular range of ±20° with a scaling factor of 0.5.

Galvanometer Motor/Mirror System Specifications

Maximum Beam Diameter	GVS001/GVS002: 5 mm GVS011/GVS012: 10 mm
Maximum Scan Angle (Mechanical Angle)	GVS001/GVS002: ±12.5° GVS011/GVS012: ±20°
Wavelength Range	400 - 2000 nm
Reflectivity	>87% at 400 to 800 nm, >98% at 800 to 2000 nm
Small Angle Step Response	GVS001/GVS002: 300 µs GVS011/GVS012: 400 µs
Repeatability	15 µrad
Typical Resolution	0.0008° (15 µrad)*
Average Galvo Current	1 A
Peak Galvo Current	GVS001/GVS002: 5 A GVS011/GVS012: 10 A
Optical Position Sensor Output Range	40 to 80 µA
Damage Threshold	100 W/cm^2
Motor and Position Sensor Linearity	99.9%
Scale Drift (Max)	40 ppm/°C
Zero Drift (Max)	10 µrad/°C
Average Galvo Current	1 A
Coil Resistance	2.2 Ω ± 10%
Coil Inductance	150 µH ± 10%
Rotor Inertia	0.02 g·cm^2
Operating Temperature Range	0 to 40 °C
Motor Weight**	GVS001/GVS002: 50 g GVS011/GVS012: 94 g

*With GPS011 Linear PSU **Including Cables, Excluding Brackets

Galvanometer Mirror Systems (Page 2 of 3)

The control circuit also provides monitoring outputs that allow the user to track the position of the mirror. In addition, voltages proportional to the drive current being supplied to the motor and the difference between the command position and the actual position of the mirror are given by the control circuit.

Closed-Loop Mirror Positioning

The angular orientation (position) of the mirror is optically encoded using an array of photocells and a light source, both of which are integrated into the interior of the galvanometer housing. Each mirror orientation corresponds to a unique ratio of signals from the photodiodes, which allows for the closed-loop operation of the galvo mirror system.

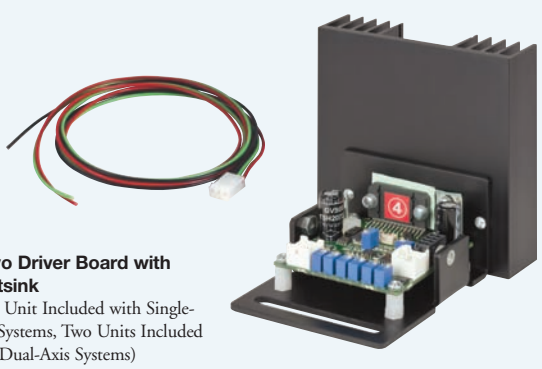
GVS011
Single-Axis Large Beam Galvo/Mirror Assembly

The GVS001 and GVS002 systems can be driven to scan their full mechanical range of ±12.5° at a frequency of 100 Hz when using a square wave control input voltage or at 350 Hz when using a sine wave. For a single, small-angle step of 0.2°, it takes the mirror 300 µs to come to rest at the command position.

The GVS011 and GVS012 systems can be driven to scan their full ±20° range at a frequency of 65 Hz when using a square wave control input voltage and at a frequency of 130 Hz when using a sine wave. For the same 0.2° small angle, the step response is 400 µs.

For all systems, the maximum scan frequency is 1 kHz and the angular resolution is 0.0008° (15 µrad).

GVS012
Dual-Axis Large Beam Galvo/Mirror Assembly



Servo Driver Board with Heatsink
(One Unit Included with Single-Axis Systems, Two Units Included with Dual-Axis Systems)
Size: 3.3" x 2.9" x 1.7" (85 mm x 74 mm x 44 mm)

Servo Driver Board

The Proportional Derivative (PD) servo driver circuit interprets the signals from the optical position detecting system inside the motor and then produces the drive voltage required to rotate the mirror to the desired position. The scanner uses a non-integrating, Class 0 servo that is ideal for use in applications that require vector positioning (e.g., laser marking), raster positioning (printing or scanning laser microscopy), and some step-and-hold applications. Furthermore, the proportional derivative controller gives excellent dynamic performance. The circuit includes an additional current term to ensure stability at high accelerations. The driver board and motor/mirror assembly are tuned at the factory to ensure maximum compatibility and performance and are clearly marked to ensure easy set up.

Drive Electronics Specifications	
Full Scale Bandwidth	GVS001/GVS002: 100 Hz Square Wave, 350 Hz Sine Wave GVS011/GVS012: 65 Hz Square Wave, 130 Hz Sine Wave
Small Angle (±0.2°) Bandwidth	1 kHz
Small Angle Step Response	GVS001/GVS002: 300 µs GVS011/GVS012: 400 µs
Analog Position Signal Input Range	±10 V
Analog Signal Input Resistance	20 kΩ ± 1% (Differential Input)
Position Signal Output Resistance	1 kΩ ± 1%
Mechanical Position Signal Input Scale Factor	0.5 V/degree, 0.8 V/degree, or 1.0 V/degree (Switchable)
Mechanical Position Signal Output Scale Factor	0.5 V/degree
Power Supply	±15 to ±18 VDC
Operating Temperature Range	0 to 40 °C
Servo Board Size (L x W x H)*	3.3" x 2.9" x 1.7" (85 mm x 74 mm x 44 mm)

*Includes Mounting Bracket

Galvanometer Mirror Systems (Page 3 of 3)

Power Supply Option

The GPS011 is a 3 A RMS, ±15 VDC, linear two-channel switching power supply designed to power two galvo motor drivers. The unit has two outputs and comes with two power cables that are terminated so that they can be plugged directly into both the socket on the driver board and the power supply.

The GPS011 can be used with either a 115 VAC or 230 VAC main input. The black power supply enclosure measures 274 mm x 179 mm x 116 mm (10.8" x 7.0" x 4.6"), has a cooling fan, and is protected from power surges by a main input fuse.

GPS011
Galvo System
Power Supply

Mechanical Drawings Available on the WEB

Galvo Mirror Systems Kits

We also supply the GVS001 and GVS002 small diameter galvanometers as part of a complete kit. The kit includes the following:

- 1D (GVS001) or 2D (GVS002) Galvo Mirror Assembly
- Galvo Motor Mount and GHS003 Heatsink
- Galvo Motor Driver Cards, with Heatsink and Cover
- GPS011 Power Supply

Galvo Mirror System Package Contents

The single-axis galvo mirror systems come with a single mirror mounted on a galvo motor, which is held in a small aluminum mount that can be secured to a larger structure. The kits also include the driver (with heatsink) for the galvo motor and four cables. The cable connecting the motor to the driver is connectorized on both ends, while the power, analog input, and output monitoring cables are only connectorized on the end that attaches to the driver circuit.

The dual-axis galvo mirror systems come with two galvo motors, each with a mirror. The mirror on the second galvo motor is elongated so that the full scan range of both mirrors can be used. The mirrors are factory aligned so that the zero position of the two mirrors is orthogonal. Also included are two drivers (with heatsinks) and two of each of the cables included with the single-axis systems described above.

Please see the full presentation on page 1726 for further details.

ITEM #	METRIC ITEM #	$	£	€	RMB	DESCRIPTION
GVS001	—	$ 925.00	£ 666.00	€ 804,75	¥ 7,372.25	1D Small Beam Galvo System Mirror, Motor, Drivers, and Cables
GVS002	—	$ 1,895.00	£ 1,364.40	€ 1.648,65	¥ 15,103.15	2D Small Beam Galvo System Mirror, Motor, Drivers, and Cable
GVSM001	GVSM001/M	$ 1,451.00	£ 1,044.72	€ 1.262,37	¥ 11,564.47	1D Small Beam Galvo Mirror System Kit
GVSM002	GVSM002/M	$ 2,421.00	£ 1,743.12	€ 2.106,27	¥ 19,295.37	2D Small Beam Galvo Mirror System Kit
GVS011	GVS011/M	$ 1,365.00	£ 982.80	€ 1.187,55	¥ 10,879.05	1D Large Beam Galvo System Mirror, Motor, Drivers, and Cables
GVS012	GVS012/M	$ 2,775.00	£ 1,998.00	€ 2.414,25	¥ 22,116.75	2D Large Beam Galvo System Mirror, Motor, Drivers, and Cables
GPS011	—	$ 450.00	£ 324.00	€ 391,50	¥ 3,586.50	Galvo Power Supply, Dual Output

Accessories for Galvanometer Systems

Heatsink and Post Mount

Typically, the galvo motors do not generate enough heat to need an additional heatsink. However, it may be necessary for applications that involve a rapidly changing drive signal waveform. The GHS003 (GHS003/M) provides additional heat sinking for such conditions. The heat sink also serves as a post adapter, allowing the GVS001 and GVS002 galvo mirror assembly to be mounted on our 8-32 UNC (M4 x 0.7) threaded posts. A suitable post adapter is included with the GVS011 and GVS012 systems.

Mechanical Drawings Available on the WEB

GHS003
Heat Sink for the All GVS systems

GVS002
Mounted on a GHS003
Post and Post Holder not Included

ITEM #	METRIC ITEM #	$	£	€	RMB	DESCRIPTION
GHS003	GHS003/M	$ 20.00	£ 14.40	€ 17,40	¥ 159.40	Galvanometer Heat sink and Post Adapter