Saturn 1B Optical Scanner for 1mm - 4mm apertures

APPLICATIONS

- Laser entertainment (light show) displays
- Small-beam OCT and Microscopy
- Small-beam Laser Marking
- Optical Layout Templates
- Raster Image Projection

Pictured with 3mm Y mirror

UNIQUE ScannerMAX FEATURES

- Stronger magnetic field
- Stronger rotor and shafts
- Integrated back-supporting mirror mount design
- Long-life SV30/silicon dioxide ceramic, hybrid bearings
- Trapezoidal position sensor with high output and low noise
- Cooler-running motor magnetic design

BENEFITS

- Highest-speed small-mirror scanning and positioning
- Wide-angle scanning, up to 110 degrees optical
- Convenient package size, compatible with many existing X-Y mounts
- Low coil resistance for low heat generation during scanning
- Low thermal resistance for enhanced heat removal
- Low wobble and jitter

GENERAL DESCRIPTION

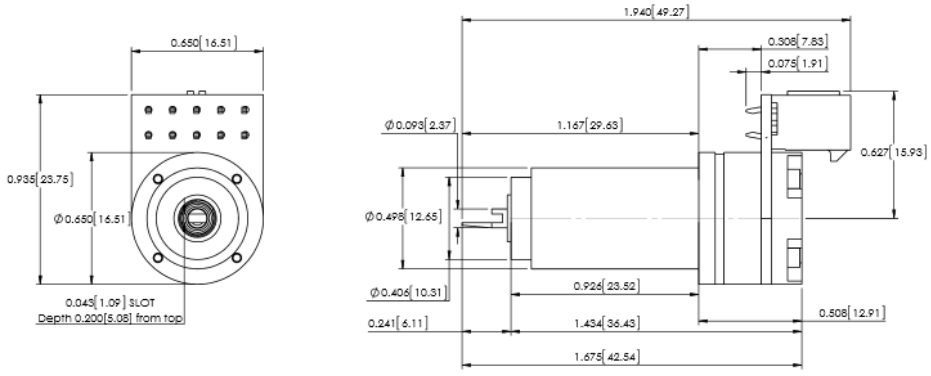
The *Saturn 1B* optical scanner is specifically designed to achieve the highest acceleration and RMS duty cycle of any motor-driven-mirror in the 1mm to 4mm aperture range. Applications include laser entertainment displays and small-beam laser marking and galvanometer-based raster imaging such as those found in scanning microscopes.

Due to the very-small-diameter moving magnet, along with the use of special bearing materials, the *Saturn 1B* boasts the highest peak torque-constant-to-inertia ratio of any moving magnet galvanometer scanner available, as well as a motor-constant-to-inertia ratio that is more than 90% greater than even those competitive galvanometers having twice the rotor inertia. The *Saturn 1B* rotor construction along with the patented *X3* magnetic circuit allow this scanner to achieve scanning speeds of ILDA 60K / 5kHz small signal bandwidth with far less drive power and heat generation than ever before. Speeds of ILDA 90K / 7.5kHz small signal bandwidth are also routinely delivered to clients.

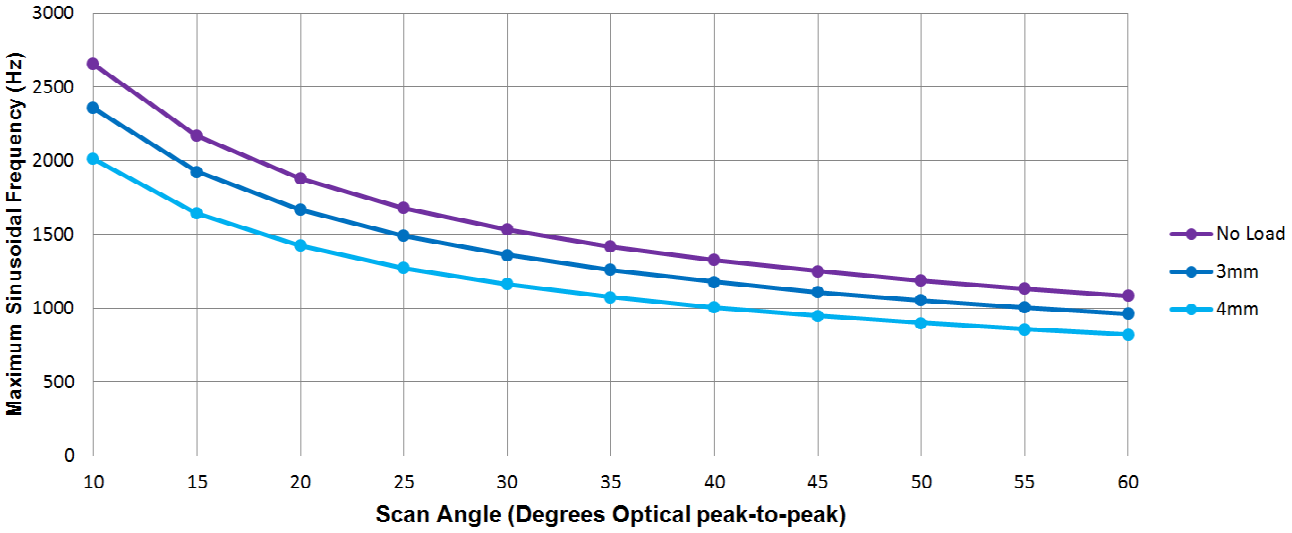
The *Saturn 1B* incorporates all of the other design features of other ScannerMAX Saturn-family scanners, including a half-inch round body diameter, back-supporting mirror mount design, and high-output, low-noise position detector.

The *Saturn 1B* is now available with coil configurations optimized for laser display, and certain imaging applications.

OUTLINE DRAWING



Saturn 1B-80S Performance with selected ScannerMAX mirror sets[1]



SPECIFICATIONS

Parameter	-80P	Standard	-80S	Units
Optimal Mirror Size		1 – 4		Millimeters, clear aperture
Rotation Angle [2]		+/- 27.5		Degrees, Maximum (110 degrees optical)
Rotor Inertia		0.010		Gram • Centimeters^2
Torque Constant [3]	13,000	18,500	26,000	Dyne • Centimeters per Ampere
Maximum Rotor Temperature		110		°C
Thermal Resistance [3]	1.25	1.5	1.25	°C per Watt
Coil Resistance [3]	0.75	1.8	2.8	Ohms
Coil Inductance [3]	53	100	212	µh
Back EMF Voltage [2, 3]	22.7	32.3	45.4	µV per degree per second
Peak Current [3]		20		Amperes, Maximum
RMS Current [3]	6.6	3.75	3.3	Amperes at Tcase of 50°C
Electrical Power Handling Capacity [3]	40	33	40	Watts at Tcase of 50°C
Small Angle Step Response [3]	75	90	200	µS with ScannerMAX 3mm mirror set
PD Linearity over 20 degrees p-p [2]		99.9		% Minimum
PD Linearity over 40 degrees p-p [2]		99.5		% Typical
PD Output Signal (Common Mode) [2]		600		µA with LED current of 20mA
PD Output Signal (Differential Mode) [2]		43.6		µA per degree, with LED current of 20mA
Mass		25		Grams

NOTES

1. Graph denotes theoretical maximum performance of the scanner due to thermal limitations, with case at 50°C. Other factors may prevent the scanner from reaching this maximum, such as servo driver and power supply.
2. Angular specifications are in mechanical degrees. For most applications, optical angle = 2x mechanical angle.
3. Saturn 1B versions –80P and –80S use different coil configurations, beneficial in certain imaging applications. Saturn scanners can easily be fabricated with alternative coil configurations to achieve different specifications. Please contact us if you have different coil resistance, inductance, torque, current or connector requirements.

Specifications are at a temperature of 25° C. All mechanical and electrical specifications are +/-10%.

MORE INFORMATION

More information about the Saturn series of optical scanners, including additional application hints and tips can be found at www.ScannerMAX.com.

OEMs are strongly encouraged to work with us to make sure that the most appropriate scanner is chosen and designed-in.

LASER SCANNING BOOK AVAILABLE

Detailed information about galvanometer scanners, servo driver techniques, and scanner applications can be found in the #1 best-selling book *LASER SCANNERS: Technologies and Applications*, written by Pangolin's President William R. Benner, Jr. The book can be found at www.LaserScanningBook.com.

SCANNERS AND ACTUATORS AVAILABLE FROM SCANNERMAX

- *VRAD 506:* a low-cost, open-loop rotary actuator capable of wide-angle rotation – perfect for shutters
- *Compact 506:* the lowest-cost, lightest-weight, and most versatile galvo scanner for 3mm to 1-inch beams
- *Saturn 1B:* providing the highest-speed vector scanning available, for 1mm to 4mm beams
- *Saturn 2B:* a resonant-scanner substitute for high-frequency sinusoidal scanning of 1mm to 4mm beams
- *Saturn 5B:* for both vector and raster scanning of 5mm and 6mm beams
- *Saturn 9B:* providing the best large-signal vector scanning performance for 8mm to 10mm beams
- *Saturn 9B Plus:* for 10mm raster scanning with 40% less heat generation
- *Beam Brush:* a Z-axis focusing / divergence control device for 3D laser marking and lightshow applications

PATENT AND TRADEMARK INFORMATION

US Utility Patent Number: 10,539,433
US Utility Patent Number: 9,530,559
US Utility Patent Number: 9,366,860
US Utility Patent Number: 9,270,144
US Utility Patent Number: 9,195,061
German Patent (Utility Model) Number: 20 2020 000 007
German Patent (Utility Model) Number: 20 2013 000 369.3
German Patent (Utility Model) Number: 20 2014 000 846.9
Chinese Utility Model No. ZL201420102156.6
Chinese Application for Invention No. 201310128586.5
Other US and International Patents Pending.

Compact 506, Saturn 1B, Saturn 5B and *ScannerMAX* are trademarks of Pangolin Laser Systems, Inc.

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