

APPLICATIONS

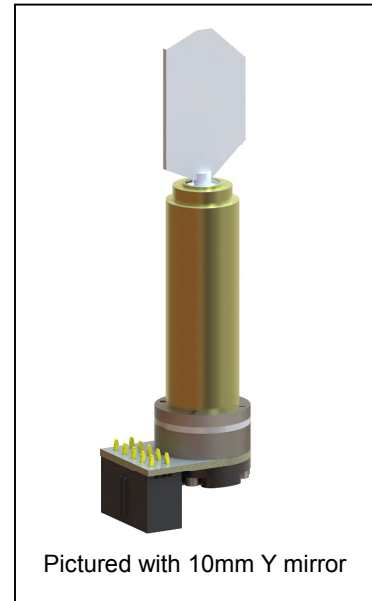
- High power laser entertainment (light show) displays
- Large-beam sinusoidal scanning and image projection

UNIQUE ScannerMAX FEATURES

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

BENEFITS

- High-speed, large mirror 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



Pictured with 10mm Y mirror

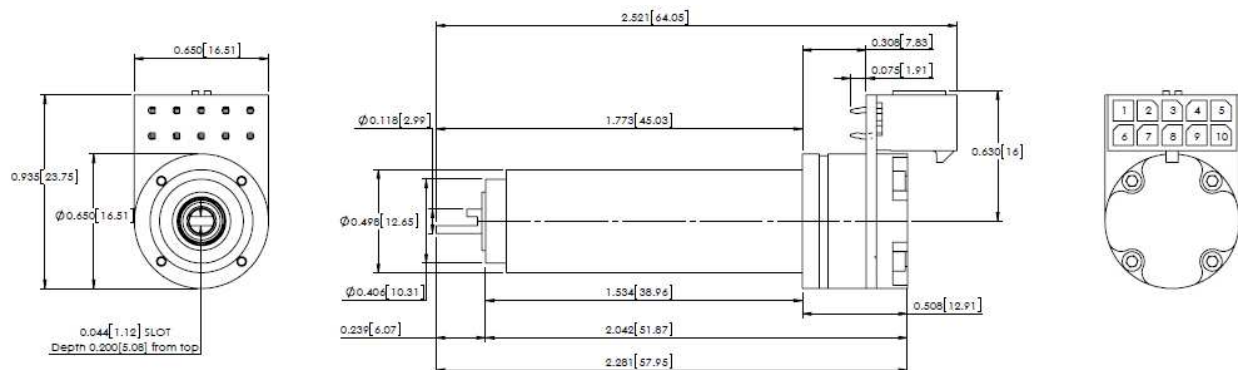
GENERAL DESCRIPTION

The *Saturn 9B* optical scanner is specifically designed to move large diameter beams quickly, over a wide angle. Applications include very high power laser entertainment displays. The *Saturn 9B* is capable of moving a 10mm beam through an optical angle of 40° at a frequency of over 500 Hz with a sinusoidal drive. Step response times with a 10mm beam can be lower than 300 microseconds for a small optical step, and 1 millisecond for a 40° optical step, delivering scanning speeds of ILDA 30K / 2.5kHz small signal bandwidth, even with a large 10mm beam. The new -46S and -56S versions utilize coil configurations optimized for small-signal and large-signal applications respectively, both of which further reduce heat generated by the scanner as well as the servo driver.

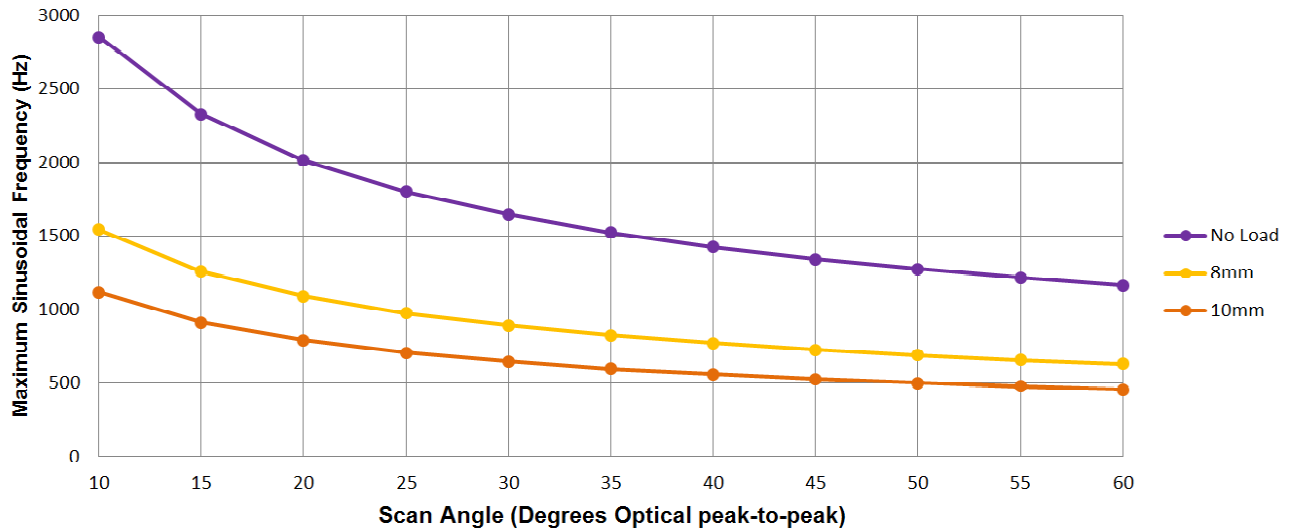
In addition to its high-speed and large-beam capabilities, the *Saturn 9B* incorporates several very desirable design features. First, because of its half-inch-round body dimensions, the *Saturn 9B* is easily retrofitable into many existing systems. Second, the integral back-supporting mirror mount helps to control “diving board” bending-mode mirror resonances while also easing field replacement of mirrors. And finally, the high-output, low-noise position detector enhances short-term repeatability and minimizes dither.

The patented X3 magnetic circuit boasts air gap flux densities of over 14,000 Gauss. The intense magnetic field strength, combined with the low coil resistance and relatively low rotor inertia, gives the *Saturn 9B* the highest RMS-torque-to-inertia ratio of any commercially-available optical scanner capable of moving a 10mm beam.

OUTLINE DRAWING



Saturn 9B-46S Performance with selected ScannerMAX mirror sets ⁽¹⁾



SPECIFICATIONS

Parameter	-46S	STD	-56S	Units
Optimal Mirror Size	8 – 10			Millimeters, clear aperture
Rotation Angle ⁽²⁾	+/- 27.5			Degrees, Maximum (110 degrees optical)
Rotor Inertia	0.032			Gram • Centimeters ²
Torque Constant ⁽³⁾	39,600	41,000	47,800	Dyne • Centimeters per Ampere
Maximum Rotor Temperature	110			°C
Thermal Resistance ⁽³⁾	0.6	0.7	0.7	°C per Watt, Maximum
Coil Resistance ⁽³⁾	1.12	1.65	1.95	Ohms
Coil Inductance ⁽³⁾	125	130	178	µh
Back EMF Voltage ^(2, 3)	69.1	71.6	83.4	µV per degree per second
Peak Current ⁽³⁾	25			Amperes, Maximum
RMS Current ⁽³⁾	7.5	5.7	5.3	Amperes at Tcase of 50°C
Electrical Power Handling Capacity ⁽³⁾	83	72	72	Watts at Tcase of 50°C
Small Angle Step Response ⁽³⁾	300			µS with ScannerMAX 10mm 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	36			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 9B versions –46S and –56S 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%.



Saturn 9B Optical Scanner for 8mm - 10mm apertures

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 Pangolin 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

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.

Saturn 9B and *ScannerMAX* are trademarks of Pangolin Laser Systems, Inc.

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