

APPLICATIONS

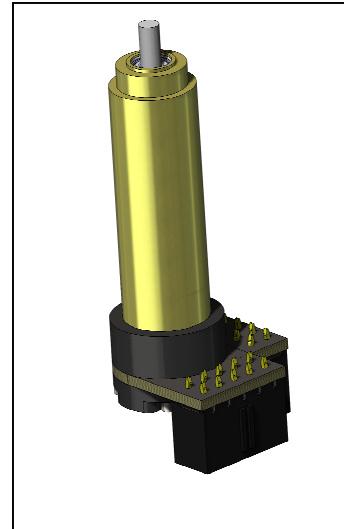
- Instantly positioning an aperture wheel
- Rotating diffraction wheels very slowly or quickly
- Directly rotating an optical element over 360 degrees

UNIQUE FEATURES

- Compact motor package
- Extremely high acceleration (>12 million radians / sec^2)
- Ability to operate at very high RPM ($>100\text{K}$ RPM)
- Ability to operate at very low RPM (<1 rev per hour)
- Integral high-resolution encoder (>16 bits over 360 degrees)

BENEFITS

- Performs start-stop as well as continuous rotation
- Low coil resistance for low heat generation during operation
- Low thermal resistance for enhanced removal of any heat generated



GENERAL DESCRIPTION

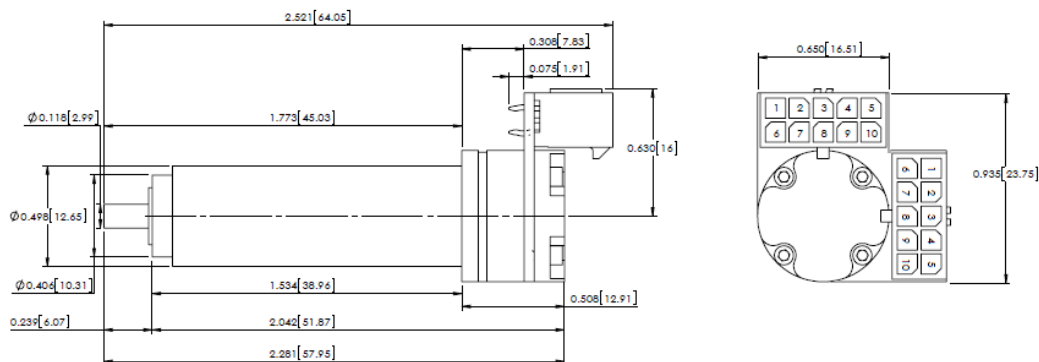
In 2013, ScannerMAX invented and patented a brand new actuator technology – one that allows for the creation of motors that have very low inertia, very high rotor stiffness, and ones that provide the highest torque possible. This new technology was initially employed in our Saturn-series of optical scanners, which have garnered strong adoption in the laser display, medical imaging, and autonomous vehicle industries.

Over the past few years, customers who recognized the advantages of our scanners have asked us if it was possible to create a continuous-rotation version. At first this seemed impossible because the construction our scanners maximizes torque over the limited range of angles experienced in optical scanning applications. However, after extensive research using computer models, as well as the development of real-world prototypes, we have successfully produced continuous-rotation motors that deliver the same extraordinary level of performance as our optical scanners. The hallmark of this development is the extremely high acceleration capability – allowing this motor technology to go from a dead stop to 120,000 RPM in 1 millisecond (which takes place in only a single revolution)!

This new “Sin-Cos” motor uses sine-cosine drive and provides sine-cosine position feedback. When mated to our Mach-DSP servo driver, it provides the ability to perform rapid point-to-point motion in any direction and at any angle over 360 degrees. Continuous rotation is also possible, in either direction, and at very low or very high RPM.

Although prototypes have been built and the principles of operation have been proven, we are not yet entering the market with a “standard” product offering. Instead, we are looking for customers and partners who have applications that can benefit from this new motor technology, whose size and performance can be scaled up or down as needed.

OUTLINE DRAWING (of prototypes that have been built and were demonstrated at Photonics West)





**High Acceleration Brushless Motor
for optical positioning applications**

SPECIFICATIONS (of prototypes that have been built and were demonstrated at photonics trade shows)

Parameter	-24S	-46S	Units
Rotation Angle ⁽¹⁾	360		Degrees Continuous, CW and CCW
Rotor Inertia	0.03		Gram • Centimeters ²
Torque Constant ⁽²⁾	22,500	44,000	Dyne • Centimeters per Ampere
Maximum Rotor Temperature	110		°C
Thermal Resistance ⁽²⁾	0.7		°C per Watt
Coil Resistance ⁽²⁾	0.88	3	Ohms, per phase (sine-cosine)
Coil Inductance ⁽²⁾	54	190	µh, per phase
Back EMF Voltage ^(1, 2)	39.3	76.8	µV per degree per second
Peak Current ⁽²⁾	25		Amperes Maximum, per phase
RMS Current ⁽²⁾	8	4.3	Amperes total, at Tcase of 50°C
Electrical Power Handling Capacity ⁽²⁾	72		Watts at Tcase of 50°C
Small Angle Step Response ⁽²⁾	< 200		µS with no load
Encoder Output (Common Mode) ⁽¹⁾	300		µA with LED current of 20mA
Encoder Output (Differential Mode) ⁽¹⁾	20		µA per degree, with LED current of 20mA
Mass	36		Grams

NOTES

1. Angular specifications are in mechanical degrees.
2. This technology 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.



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MORE INFORMATION

More information about motors, optical scanners, and rotary actuators, including additional application hints and tips, can be found at www.ScannerMAX.com.

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
- *ARC 12532*: a low-cost scanner for vector scanning with up to 50mm beams

PATENT AND TRADEMARK INFORMATION

German Patent (Utility Model) Number: 20 2020 000 420
International Patent Application Number: PCT/US18/44614
International Patent Application Number: PCT/US18/44624
Other US and International Patents Pending.

ScannerMAX is a trademark of Pangolin Laser Systems, Inc.

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