

# AGV-SPO

## High-Performance Single Pivot-Point Galvanometer

Larger field of view than traditional 2D scanners simplifies the processing of larger parts

Minimal spot distortion over the entire field of view minimizes processing variation for the highest quality laser-processed parts

Air and water cooling options provide thermal stability and improve long-term accuracy

Many choices of mirror surface treatments for a variety of laser wavelengths

Aerotech's AGV-SPO single pivot-point galvanometer scanner provides an alternative to traditional two-mirror galvo scanners. Derived from the popular AGV-HPO scanner, the AGV-SPO enables a larger field of view and reduced spot distortion for critical laser micromachining applications.

### Large Field Of View With Minimal Spot Distortion

A unique optical design effectively controls the beam entrance pupil to be coincident for the X and Y scanner motion, increasing the effective numerical aperture of the scanner system. This design directly enables a larger field of view for a given focal length and reduces spot distortion over the entire working area. These advantages mean that the AGV-SPO is able to process larger parts faster and with greater consistency.

### Design Configurations

The AGV-SPO is available with a selection of optical coatings and focusing optics to support a variety of commonly-used laser wavelengths and focal lengths. To support other needs, Aerotech can supply the AGV-SPO with customized optics and optical mounting features upon request.



*The AGV-SPO galvo scanner offers an increased field of view over traditional two-mirror galvos, along with less spot distortion.*

The AGV-SPO can be configured with air-cooled mirrors, water-cooled motors, or both. These active cooling features help to preserve working-plane accuracy in the presence of thermal disturbances caused by the laser as well as aggressive motion profiles.

### Advanced Programming Features

The AGV-SPO utilizes all of Aerotech's advanced motion and Position Synchronized Output (PSO) capabilities that have been developed for laser processing applications with traditional galvos and servo stages. Contouring functions such as Acceleration Limiting can be used to automatically reduce speeds in tight corners or small radii to minimize overshoot. The laser can be triggered based on the position feedback of the mirrors with PSO to ensure consistent spot overlap as the scanner changes speed.

Aerotech's Infinite Field of View (IFOV) function seamlessly combines servo and scanner motion to extend the marking capability of the scanner across the entire travel range of the servo stages, eliminating stitching errors that can occur in a more traditional move-expose-repeat process.

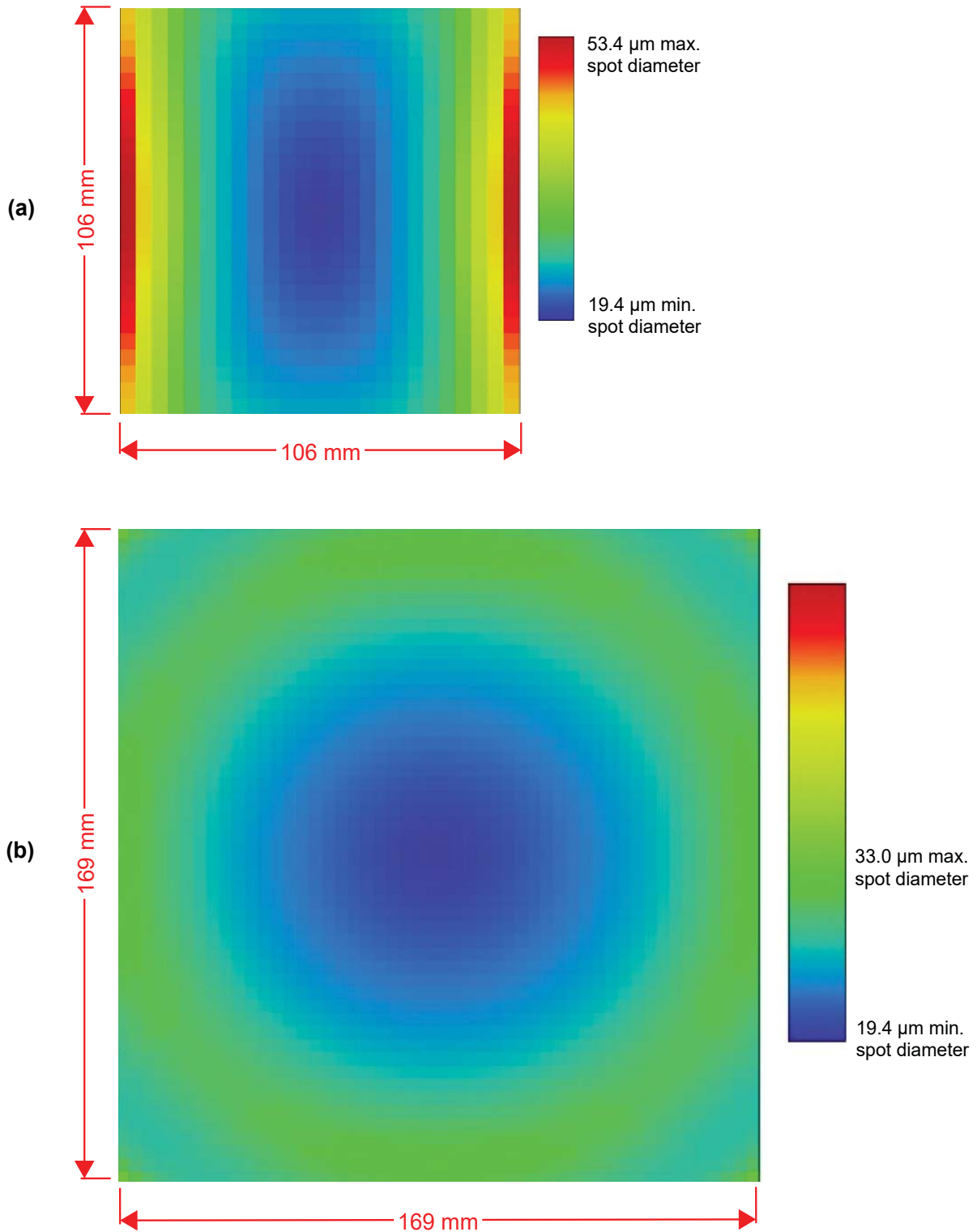
## AGV-SPO SPECIFICATIONS

Mechanical Specifications		AGV14SPO
<b>Optical Performance</b>		
Beam Aperture		14 mm
Maximum Scan Angle		±20°
Beam Displacement		35 mm
Dither (Min. Incremental Motion) <sup>(2)</sup>		0.3 $\mu\text{rad}_{\text{rms}}$
Accuracy		50 $\mu\text{rad}$ pk-pk
Repeatability <sup>(3)</sup>		0.6 $\mu\text{rad}_{\text{rms}}$
Gain Error		0.05 mrad
Non-Linearity		0.005%
<b>Dynamic Performance</b>		
Tracking Error		0 $\mu\text{sec}$
Peak Acceleration <sup>(4,5)</sup>		60,000 $\text{m/s}^2$
Continuous Acceleration <sup>(4,6)</sup>		20,000 $\text{m/s}^2$
Positioning Speed <sup>(4)</sup>		50 $\text{m/s}$
Processing Speed <sup>(4, 7, 8)</sup>		5 $\text{m/s}$
Jump & Settle Time, 1 mm Move <sup>(4,9)</sup>		700 $\mu\text{sec}$
<b>Stability</b>		
Long-Term Drift	Offset	10 $\mu\text{rad}/12$ hrs 15 $\mu\text{rad}/24$ hrs
	Gain	10 ppm/24 hrs
Thermal Drift	Offset	20 $\mu\text{rad}/^\circ\text{C}$
	Gain	1 ppm/ $^\circ\text{C}$
<b>Mechanical Specifications</b>		
Weight		5.1 kg
Material		Aluminum (Black Anodize and Blue Paint)
MTBF (Mean Time Between Failure)		20,000 hours

Notes:

1. All angles are optical unless otherwise specified.
2. Without air cooling option.
3. After initial 3-hour warm-up, ambient temperature variation  $<\pm 0.5^\circ\text{C}$ .
4. Typical performance with  $f = 160$  mm F-theta objective.
5. Based on maximum rated current of the motor.
6. Based on rated rms current of the motor with water cooling option; maximum acceleration is 70% of this value without water cooling.
7. Achievable with  $<1\%$  velocity error over continuous velocity portion of move.
8. Marking speed depends on allowable tracking error.
9. Settled to within 1% of move distance.
10. All specifications are per-axis unless otherwise noted.

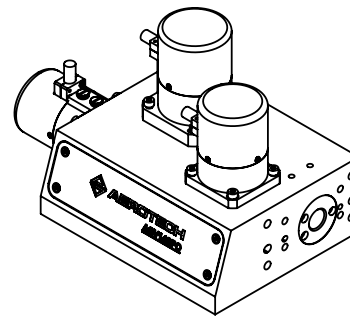
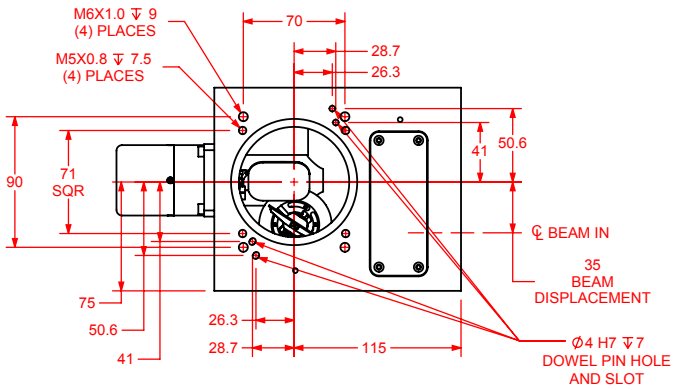
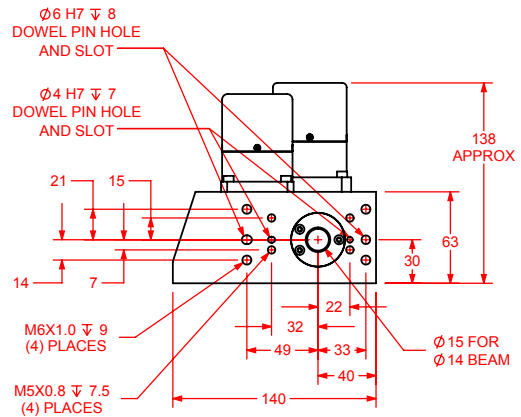
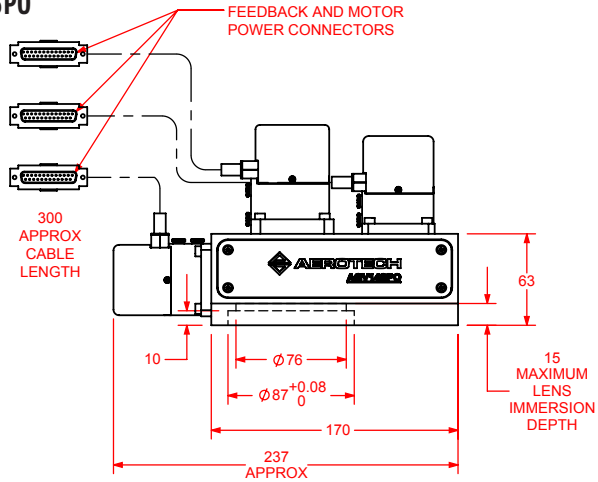
Electrical Specifications		AGV14SPO
Drive System		Brushless Direct-Drive Galvano Motor
Feedback		Noncontact Rotary Encoder
Maximum Bus Voltage		±40 VDC
Limit Switches		Optical Limit Switches and Software Limits
Home Switch		At Center



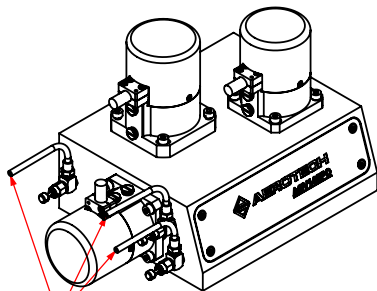
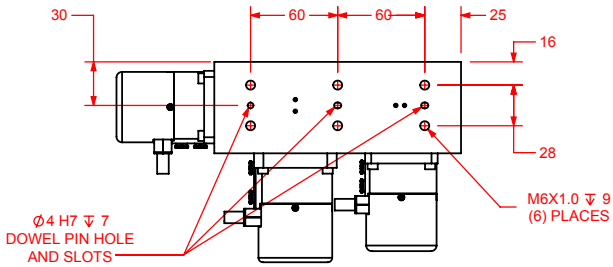
Comparison of (a) AGV14HPO and (b) AGV14SPO, using a beam with 355 nm wavelength and 14 mm diameter, and an F-theta lens with 255 mm effective focal length. The advantages of the AGV14SPO are clear, offering a 2.5x larger field of view and a 38% smaller maximum spot diameter over the entire field of view.

# AGV-SPO DIMENSIONS

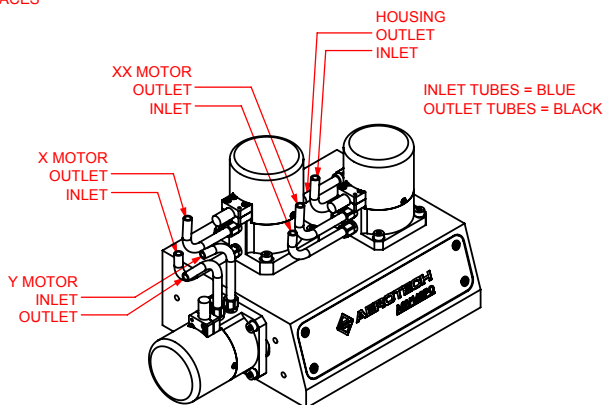
## AGV14SPO



NO COOLING OPTIONS

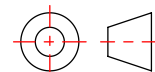


AIR COOLING INLETS (-AC) AIR COOLING OPTION



(-WC) WATER COOLING OPTION

DIMENSIONS: MILLIMETERS



## AGV14SPO High-Performance Single-Pivot Point Galvanometer Scanner, 14 mm Aperture ORDERING INFORMATION

### Wavelength of Mirror Coating (Required)

-W001	10.6 um Wavelength Coating
-W004	1064 nm Wavelength Coating
-W006	532 nm Wavelength Coating
-W008	355 nm Wavelength Coating
-W009	343 nm Wavelength Coating

Note: Other wavelengths available; inquire with factory.

### F-Theta Lens (Optional)

-Lxx	A variety of F-Theta lenses with different focal length and wavelength combinations are available; inquire with factory
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### Air Cooling (Optional)

-AC	Air Cooling
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### Water Cooling (Optional)

-WC	Water Cooling
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### Performance Grade (Required)

-PL0	Standard Performance Grade
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### Integration (Required)

Aerotech offers both standard and custom integration services to help you get your system fully operational as quickly as possible. The following standard integration options are available for this system. Please consult Aerotech if you are unsure what level of integration is required, or if you desire custom integration support with your system.

-TAS	Integration - Test as system Testing, integration, and documentation of a group of components as a complete system that will be used together (ex: drive, controller, and stage). This includes parameter file generation, system tuning, and documentation of the system configuration.
-TAC	Integration - Test as components Testing and integration of individual items as discrete components that ship together. This is typically used for spare parts, replacement parts, or items that will not be used together. These components may or may not be part of a larger system.