

AGV3D THREE-AXIS LASER SCAN HEAD



Maximizing Working Volumes While Minimizing Spot Sizes

Aerotech's AGV3D three-axis laser scan head delivers industry-leading precision in three-dimensional (3D) laser processing by maximizing the motorized working volume and minimizing the focused spot size, while providing the highest levels of thermal stability and dynamic performance available. AGV3D gives you the highest levels of process quality and versatility of any 3D scan head.

Greater precision is possible with the AGV3D because it features direct-drive dynamic focusing optics with high-resolution feedback. The dynamic focusing module's (DFM) high stiffness, excellent dynamics and superior positioning performance minimize positioning errors, resulting in highly optimized laser processing capabilities. Additionally, AGV3D offers the largest motorized working volume available of any 3D scanner, providing versatility and efficiency in your manufacturing process, without the need to stop production make manual focal adjustments. AGV3D can quickly and easily place a sharply focused spot anywhere within the working volume.

Key Applications

AGV3D excels in applications that involve processing 3D volumes, varying the working distance and flattening a large field of view beyond the capabilities of F-theta lenses, including:

- Medical device manufacturing
- Additive manufacturing and 3D laser sintering
- Cylindrical and tubular processing
- Cutting, trimming, drilling and scribing
- Deep engraving
- 3D laser micromachining and microstructuring

- *Delivers superior positioning and focusing performance through a stiff, direct-drive focusing axis design with high resolution*
- *Minimizes drift and ensures long-term, part-processing consistency with rugged construction and optional air- and water-cooling features*
- *Generates the most precise features possible through a novel optical design that minimizes kerf width*
- *Makes following 3D surfaces and adjusting working distances easy with maximum working volume across many laser wavelengths, minimizing the need for manual adjustments*
- *Simplifies integration with turnkey laser processing systems through configurable options and features*
- *Synchronizes seamlessly with other devices (positioning stages, servo and stepper motors, piezo nanopositioners, and hexapods) through the most user-friendly and powerful controller platforms available*
- *Enables smaller, more efficient supporting motion mechanics and smaller overall machine footprint with compact, lightweight design*
- *Executes complex trajectories to deliver outstanding precision for tackling the most challenging applications requiring coordination with servo stages*
- *Ships with preferred configurations pre-set at factory for hassle-free, out-of-the-box user experience*

Optical Specifications		AGV3D-20	AGV3D-30
Compatible Wavelengths ⁽¹⁾		343 nm, 355 nm, 515 nm, 532 nm, 1030 nm, 1064 nm, 1550 nm, 9.3 μm, 10.6 μm	
Aperture		20 mm	30 mm
Input Beam Diameter (1/e ²)		8 mm	12 mm
Beam Displacement		23.2 mm	35.7 mm
Dynamic Performance		AGV3D-20	AGV3D-30
Tracking Error		0 μsec	
Peak Acceleration	Galvo Scanners	500,000 rad/s ²	350,000 rad/s ²
	Z-Focus ⁽²⁾	150 m/s ²	
Continuous Acceleration	Galvo Scanners	130,000 rad/s ²	120,000 rad/s ²
	Z-Focus ⁽²⁾	50 m/s ²	
Maximum Positioning Speed	Galvo Scanners	300 rad/s 40 m/s at 100x100 mm FOV 400 m/s at 1000x1000 mm FOV	125 rad/s 17 m/s at 100x100 mm FOV 170 m/s at 1000x1000 mm FOV
	Z-Focus	1000 mm/s ⁽²⁾ 3.8 m/s at 160 mm working distance 30 m/s at 500 mm working distance 100 m/s at 1000 mm working distance	
Processing Speed ⁽³⁾	Galvo Scanners	50 rad/s at 100x100 mm FOV: 6.5 m/s at 1000x1000 mm FOV: 65 m/s	
	Z-Focus	500 mm/s ⁽²⁾ 1.9 m/s at 160 mm working distance 15 m/s at 500 mm working distance 50 m/s at 1000 mm working distance	
Stability		AGV3D-20	AGV3D-30
Long-Term Drift ⁽⁴⁾	Galvo Scanners	10 μrad / 12 h	
	Z-Focus	0.5 μm / 12 h	
Thermal Drift	Galvo Scanners	10 μrad / °C	
	Z-Focus	2.5 μm / °C	
Mechanical Specifications		AGV3D-20	AGV3D-30
Axes		3 total: Spot positioning (X,Y), Focusing (Z)	
Accuracy	Galvo Scanners	50 μrad pk-pk	
	Z-Focus ⁽²⁾	0.5 μm	
Repeatability	Galvo Scanners	0.4 μrad rms	
	Z-Focus ⁽²⁾	0.15 μm	
Dither (Min. Incremental Motion) ⁽⁵⁾	Galvo Scanners	< 0.4 μrad rms	
	Z-Focus	0.003 μm ⁽²⁾ 0.05 μm at 160 mm working distance 0.25 μm at 500 mm working distance 0.8 μm at 1000 mm working distance	
Cooling ⁽⁶⁾		Air cooling (optional), Water cooling (optional)	
Weight		10.5 kg	11.2 kg
Material		Anodized aluminum	
MTBF		20,000 hours	
Electrical Specifications		AGV3D-20	AGV3D-30
Drive System		Direct-drive brushless motors	
Feedback		Noncontact optical encoders	
Maximum Bus Voltage		± 40 VDC	
Limit Switches	Galvo Scanners	Optical limit switches and software limits	
	Z-Focus	Current limits and software limits	
Home Switch		At center	

All angles are optical unless otherwise specified.

All specifications are per axis unless otherwise specified.

(1) Contact Aerotech to inquire about additional wavelengths.

(2) As measured at the focusing apparatus.

(3) Processing speed is dependent on allowable tracking error. Achievable with < 2% velocity error over continuous velocity portion of the move.

(4) After initial 3-hour warm-up with ambient temperature variation < ±0.5°C.

(5) Without -AC option.

(6) For -AC option, if nitrogen is used, it must be 99.99% pure and filtered to 0.25 μm. If compressed air is used, it must be filtered to 0.25 μm, dry to 0° F dew point and oil free.

(7) Working distance is measured from the bottom surface of the scan head.

AGV3D-20		Spot Diameter Range (µm) within Field of View per Wavelength								
Nominal Field of View	Nominal Working Distance	343 nm	355 nm	515 nm	532 nm	1030 nm	1064 nm	1550 nm	9.3 µm	10.6 µm
100 mm x 100 mm	83 mm	7.0 - 7.5	7.2 - 7.8	10.3 - 11.1	10.6 - 11.4	20.4 - 22.0	21.1 - 22.7	30.7 - 32.9	190.5 - 204.7	216.7 - 232.8
200 mm x 200 mm	221 mm	11.7 - 12.7	12.1 - 13.2	17.3 - 18.9	17.8 - 19.6	34.1 - 37.3	35.2 - 38.5	51.1 - 56.0	316.4 - 346.2	360.2 - 394.1
300 mm x 300 mm	358 mm	16.2 - 17.9	16.8 - 18.5	24.3 - 26.8	25.0 - 27.6	47.8 - 52.7	49.3 - 54.4	71.6 - 79.1	442.6 - 488.1	503.9 - 555.7
400 mm x 400 mm	495 mm	20.8 - 23.0	21.5 - 23.8	31.2 - 34.6	32.2 - 35.7	61.5 - 68.1	63.5 - 70.4	92.2 - 102.2	568.8 - 630.0	647.6 - 717.4
500 mm x 500 mm	632 mm	25.3 - 28.1	26.3 - 29.2	38.1 - 42.4	39.4 - 43.8	75.2 - 83.6	77.6 - 86.3	112.8 - 125.4	695.0 - 771.9	791.3 - 878.9
600 mm x 600 mm	770 mm	29.9 - 33.3	31.0 - 34.5	45.1 - 50.2	46.6 - 51.9	88.9 - 99.0	91.8 - 102.3	133.4 - 148.6	821.1 - 913.7	934.9 - 1040.2
700 mm x 700 mm	907 mm	34.5 - 38.4	35.8 - 39.9	52.1 - 58.1	53.8 - 60.0	102.7 - 114.5	106.0 - 118.3	154.1 - 171.8	947.2 - 1055.4	1078.3 - 1201.2
800 mm x 800 mm	1045 mm	39.1 - 43.6	40.5 - 45.2	59.1 - 65.9	61.0 - 68.1	116.5 - 130.1	120.3 - 134.3	174.7 - 195.1	1073.2 - 1196.9	1221.4 - 1361.9
1000 mm x 1000 mm	1320 mm	48.2 - 53.9	50.1 - 55.9	73.1 - 81.7	75.4 - 84.4	144.1 - 161.2	148.8 - 166.4	216.2 - 241.8	1324.6 - 1479.1	1506.8 - 1682.0

Spot diameter is expressed as $1/e^2$ assuming a beam quality of $M^2 = 1$.

Nominal working distance is measured from the bottom surface of the scan head.

Refer to Field Configuration table to determine which field configuration option is required to achieve a specific nominal field of view for the desired wavelength.

Contact Aerotech for additional data.

AGV3D-30		Spot Diameter Range (µm) within Field of View per Wavelength								
Nominal Field of View	Nominal Working Distance	343 nm	355 nm	515 nm	532 nm	1030 nm	1064 nm	1550 nm	9.3 µm	10.6 µm
100 mm x 100 mm	83 mm	4.8 - 5.0	5.0 - 5.2	7.4 - 7.7	7.7 - 7.9	14.6 - 14.7	15.0 - 15.2	21.1 - 21.8	128.5 - 137.1	145.8 - 155.8
200 mm x 200 mm	221 mm	7.9 - 8.6	8.2 - 8.9	11.9 - 13.2	12.2 - 13.6	22.4 - 24.7	23.3 - 25.7	33.2 - 36.5	211.1 - 231.2	240.3 - 263.1
300 mm x 300 mm	358 mm	11.0 - 12.2	11.3 - 12.5	17.3 - 19.2	17.8 - 19.8	32.3 - 35.9	33.4 - 37.0	47.3 - 52.4	296.1 - 326.8	337.0 - 371.9
400 mm x 400 mm	495 mm	14.2 - 15.8	14.6 - 16.2	22.7 - 25.3	23.3 - 26.0	42.2 - 47.1	43.5 - 48.5	61.5 - 68.4	381.3 - 422.6	433.9 - 481.0
500 mm x 500 mm	632 mm	17.5 - 19.4	17.8 - 19.8	28.2 - 31.6	28.9 - 32.4	52.2 - 58.4	53.8 - 60.1	75.8 - 84.5	466.5 - 518.6	531.0 - 590.3
600 mm x 600 mm	770 mm	20.7 - 23.0	21 - 23.4	33.8 - 38.1	34.6 - 38.9	62.3 - 69.8	64.1 - 71.7	90.1 - 100.7	552.0 - 614.9	628.3 - 699.9
700 mm x 700 mm	907 mm	23.9 - 26.6	24.3 - 27	39.7 - 44.8	40.5 - 45.6	72.6 - 81.4	74.5 - 83.5	104.5 - 116.0	637.6 - 711.4	725.8 - 809.8
800 mm x 800 mm	1045 mm	27.0 - 30.1	27.5 - 30.6	45.7 - 51.8	46.5 - 52.6	82.8 - 93.0	84.9 - 95.3	119.0 - 133.2	723.5 - 808.2	823.6 - 920.0
1000 mm x 1000 mm	1320 mm	33.3 - 37.1	33.9 - 37.8	58.4 - 66.7	59.0 - 67.0	103.1 - 116.5	106.0 - 119.1	148.0 - 166.0	895.9 - 1002.6	1019.9 - 1141.4

Spot diameter is expressed as $1/e^2$ assuming a beam quality of $M^2 = 1$.

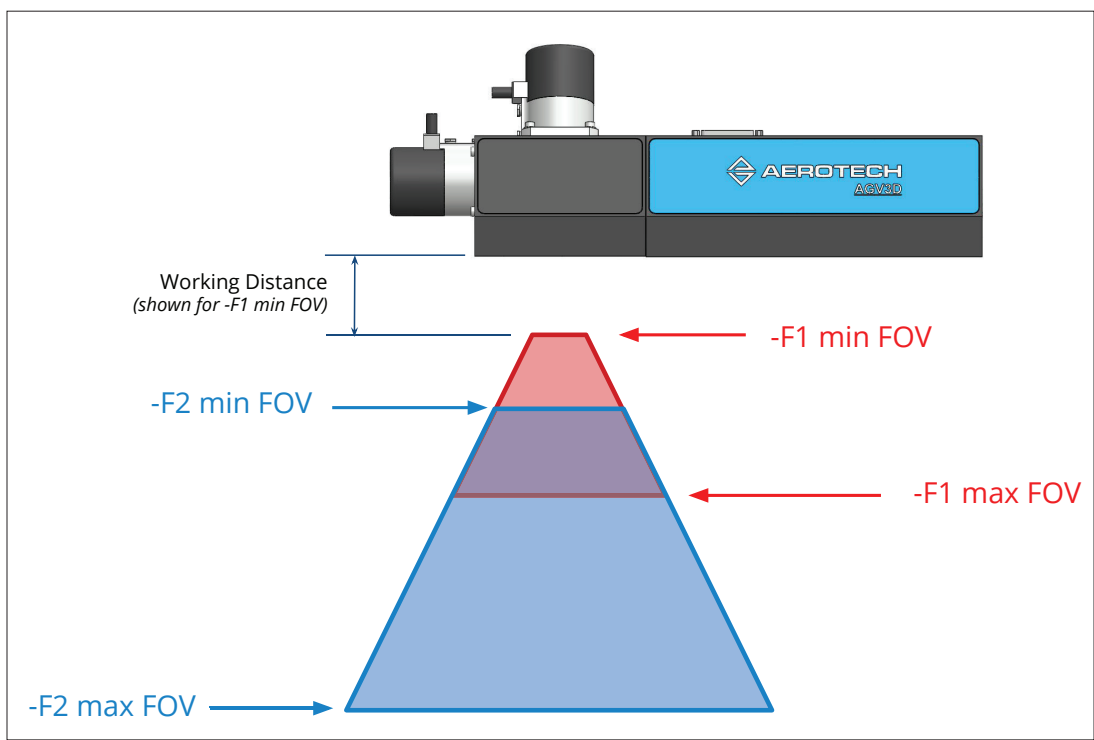
Nominal working distance is measured from the bottom surface of the scan head.

Refer to Field Configuration table to determine which field configuration option is required to achieve a specific nominal field of view for the desired wavelength.

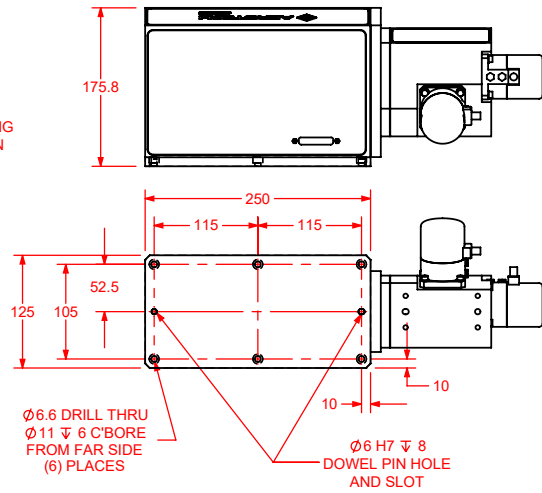
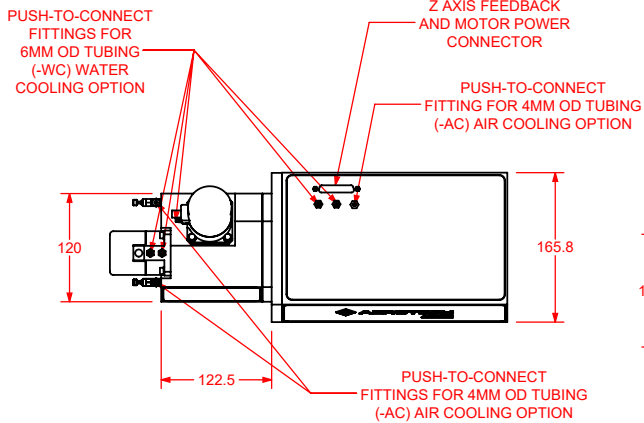
Contact Aerotech for additional data.

Field Configuration Table										
AGV3D FOV Extents and Working Distance (WD) by Field Configuration Option and Wavelength		343 nm	355 nm	515 nm	532 nm	1030 nm	1064 nm	1552 nm	9.3 μm	10.6 μm
F1	min	100 mm x 100 mm (83 mm WD)								
	max	600 mm x 600 mm (770 mm WD)	550 mm x 550 mm (701 mm WD)	450 mm x 450 mm (564 mm WD)	425 mm x 425 mm (530 mm WD)	375 mm x 375 mm (461 mm WD)	375 mm x 375 mm (461 mm WD)	350 mm x 350 mm (427 mm WD)	325 mm x 325 mm (392 mm WD)	300 mm x 300 mm (358 mm WD)
F2	min	150 mm x 150 mm (152 mm WD)	150 mm x 150 mm (152 mm WD)	175 mm x 175 mm (186 mm WD)	175 mm x 175 mm (186 mm WD)	175 mm x 175 mm (186 mm WD)	175 mm x 175 mm (186 mm WD)	175 mm x 175 mm (186 mm WD)	200 mm x 200 mm (221 mm WD)	200 mm x 200 mm (221 mm WD)
	max	1000 mm x 1000 mm (1320 mm WD) ⁽¹⁾								

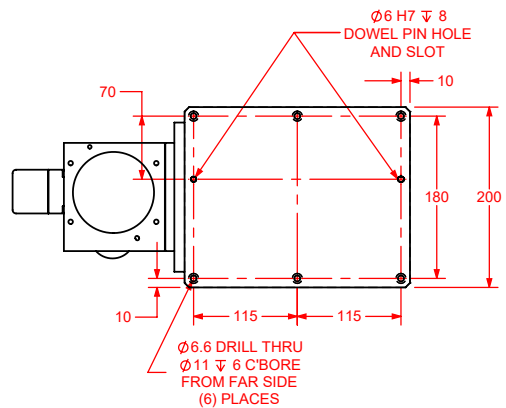
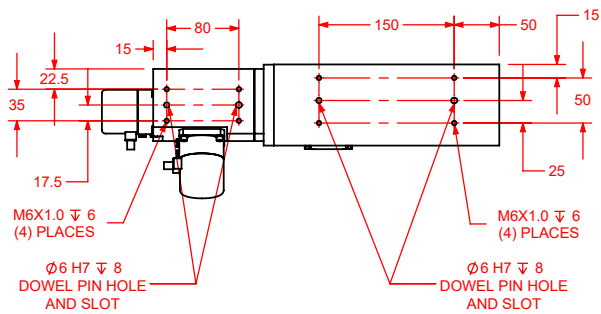
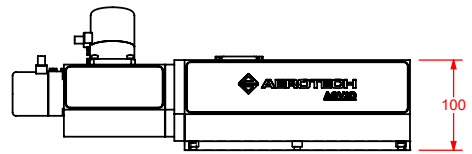
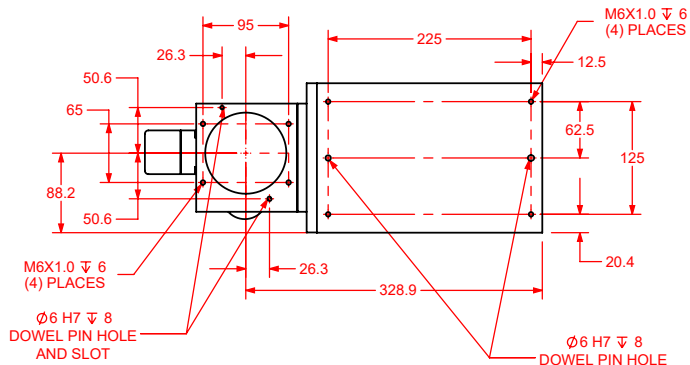
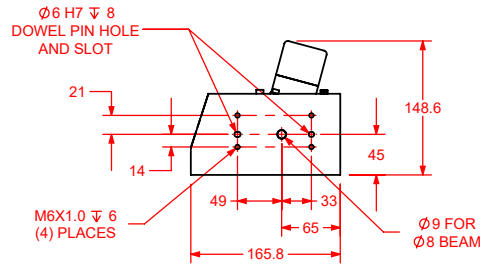
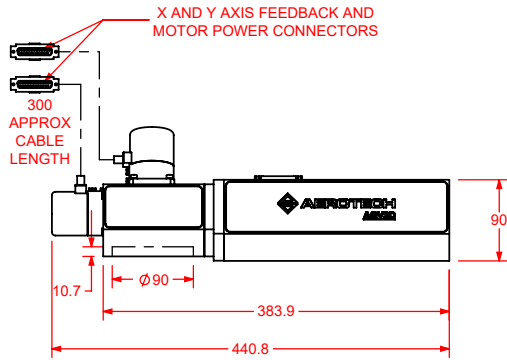
(1) For fields of view exceeding this value, or for applications using an F-theta lens in conjunction with AGV3D, contact Aerotech.
 (2) Working distance is measured from the bottom surface of the scan head.



AGV3D-20

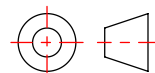


(-MP1) MOUNTING PLATE OPTION

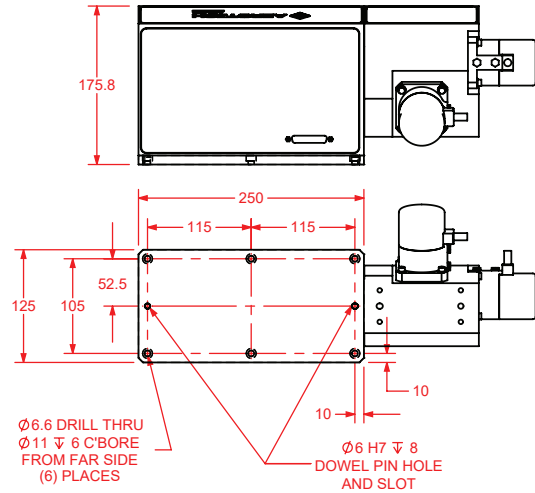
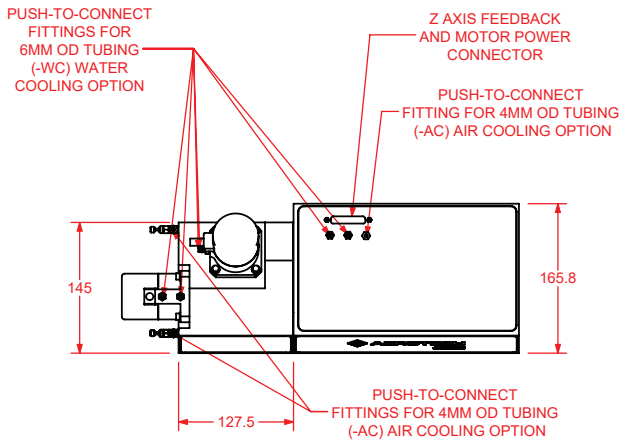


(-MP2) MOUNTING PLATE OPTION

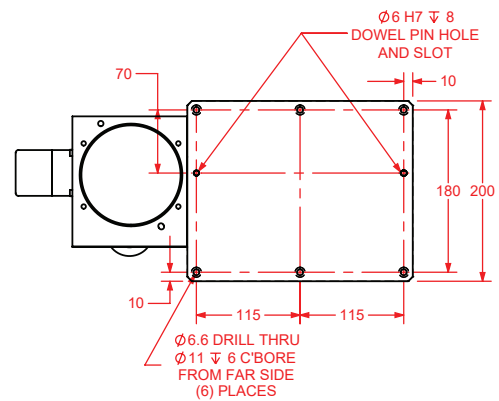
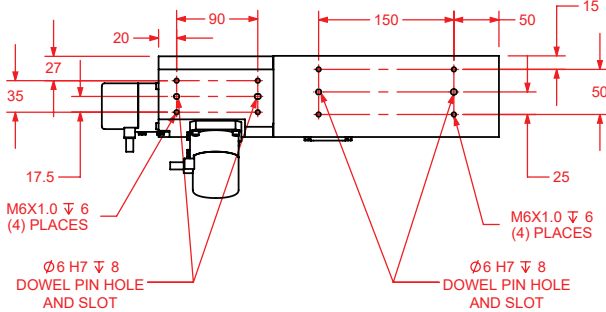
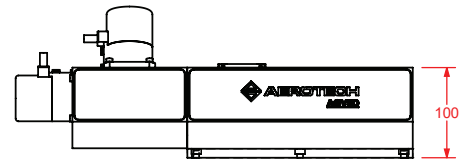
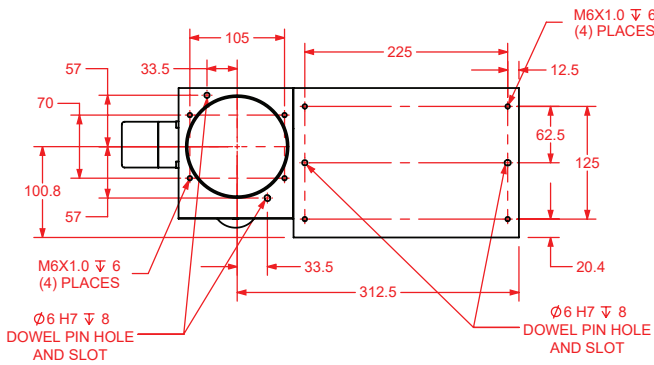
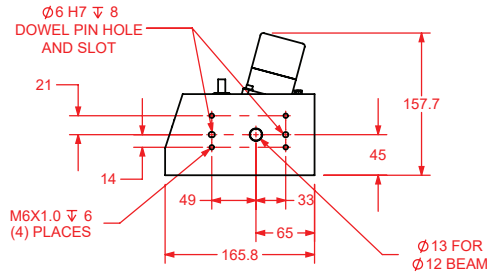
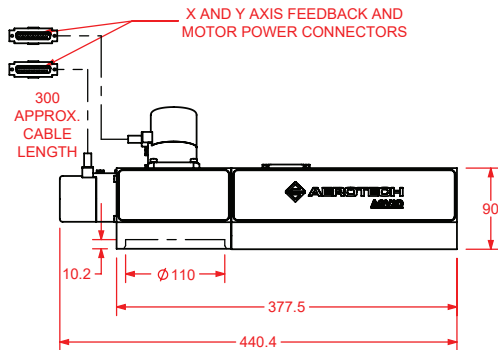
DIMENSIONS: MILLIMETERS



AGV3D-30

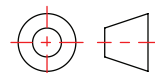


(-MP1) MOUNTING PLATE OPTION



(-MP2) MOUNTING PLATE OPTION

DIMENSIONS: MILLIMETERS



Scanner Aperture (Required)

-20	20 mm scanner aperture
-30	30 mm scanner aperture

Field Configuration (Required)

-F1	Near field of view
-F2	Far field of view

Field-of-view size is dependent on wavelength. Field configuration is user-adjustable but must be specified at time of order. See Field Configuration table for details.

Wavelength (Required)

-W001	10.6 μm
-W003	1552 nm
-W004	1064 nm
-W005	1030 nm
-W006	532 nm
-W007	515 nm
-W008	355 nm
-W009	343 nm
-W012	9.3 μm

Contact factory for additional wavelengths.

Mounting Plate (Optional)

-MP1	Rear-mounting adapter plate, mounts AGV3D by its rear face
-MP2	Bottom-mounting adapter plate, mounts AGV3D by its bottom face

Air Cooling (Optional)

-AC	Adds features for air-cooling the galvo scan head and the dynamic focusing module
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Water Cooling (Optional)

-WC	Adds features for water-cooling the galvo scan head and the dynamic focusing module
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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. This is typically used for spare parts, replacement parts or items that will not be used or shipped together (ex: stage only). These components may or may not be part of a larger system.