



STANDARD FEATURES	
Stage	Angulares Hybrid Hexapod
Travel	6 Degrees of Freedom (X, Y, Z, Pitch, Roll, and Yaw)
XY Travel	60-300+ mm
Z Travel (Tripod)	62 mm
Angular Travel (Tripod)	+/- 30 degrees (Pitch and Roll), 360 degrees continuous (Yaw)
Motor (XY)	Frameless Torque Motor with Precision Ball Screw with Anti-Backlash Nut (BSD) OR: Direct Drive Ironless Core Linear Motor (CM or LM)
Motor (Tripod)	Frameless Torque Motor with Precision Ball Screw with Anti-Backlash Nut
Motor (Rotary)	Direct Drive Frameless Torque Motor
Feedback (XY + Tripod)	Non-Contact Incremental Optical Linear Encoder (20um Pitch Gold Tape Scale)
Feedback (Rotary)	Non-Contact Incremental or Absolute Optical Rotary Encoder (Stainless Steel Ring)
Backlash	0 nm or 0 arc-sec (No Backlash on Any Axis)
Resolution	1 Vp-p Sin-Cos Analog Output (Digital AqB and Absolute options available) ~ 4.88nm (Linear), < 0.04 arc-sec (Angular) with 4096 Interpolation
Sensors	Integrated Optical Latching Home Index and End of Travel Magnetic NPN Limits
Bearings	High Precision Crossed Roller Bearings (All Axes)
Rotary Brake	Optional: Pneumatic Release, Spring Engage Brake (B)
Cables	High Flex, 10M Cycle, 3m Length from Component (Standard) (some length consumed inside stage), ~5mm OD, 20mm Dynamic Bend Radius (all Motors and Encoders)
Hard Stops	Integrated Hard Stops on XY and Tripod axes
Orientation	Horizontal Only; Inverted OK
Structure	Black Anodized Aluminum 6061-T6
Maintenance	Stages are Greased for Life in Normal Environment; No Maintenance
Environment	Standard
Temperature	Operating: 0°C to 50°C (performance not guaranteed throughout entire range) Storage/Transport: -20°C to 70°C
Humidity	10% to 80% Non-Condensing
Precision	6-D Nano Precision™ Test Methods

XY TRAVEL	Z TRAVEL	PITCH & ROLL TRAVEL	R DIAMETER	LENGTH	WIDTH	HEIGHT @ HOME	HEIGHT @ MID-STROKE	A (inch)	B (inch)	C	D	E	F	G	H	I	J
60 (BSD)	62	+/- 30 degrees	80	199	208	285.2	316.2	4	3	75	100	35	35	60	25	M6 or 1/4-20	M4
100 (LM)	62	+/- 30 degrees	80	415.8	295.5	312.2	343.2	6	6	125	175	70	35	60	25	M6 or 1/4-20	M4
200 (CM)	62	+/- 30 degrees	80	510	336.5	293.2	324.2	6	6	125	175	70	35	60	25	M6 or 1/4-20	M4
200 (LM)	62	+/- 30 degrees	80	571	401	322.2	353.2	7	5	200	225	100	35	60	25	M6 or 1/4-20	M4

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NOTE: AI-HH-30D-100XY-62Z-80R MODEL SHOWN

DRAWN	QWOLF	2021-03-29			
CHECKED					
			TITLE		
Tolerances: x.x ± 0.5 mm x.xx ± 0.13 mm x.xxx ± 0.05 mm ANGLES ± 0.5° MATERIAL			AI-HH-30D-(XY TRAVEL)XY-(Z TRAVEL)Z-(R DIAMETER)R		
FINISH			SIZE	DWG NO	REV
SEE NOTES			B	0010-08073	002
SCALE			0090-07999-016 ALIO STD TEMPLATE		SHEET 1 OF 3

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MODEL	UNITS	AI-HH-30D-60XY-62Z-80R-BS	AI-HH-30D-100XY-62Z-80R-LM	AI-HH-30D-200XY-62Z-80R-CM	AI-HH-30D-200XY-62Z-80R-LM									
NOMINAL XY TRAVEL FROM HOME INDEX	mm	+/- 30	+/- 50	+/- 100	+/- 100									
XY MAGNETIC LIMIT LOCATIONS (+1/-3mm)	mm	+/- 10	+/- 51	+/- 100	+/- 101									
XY HARD STOP LOCATIONS (+/- 1mm)	mm	+/- 30.25	+/- 52.5	+/- 102	+/- 102.5									
NOMINAL Z TRAVEL FROM HOME INDEX	mm	+62/-0	+62/-0	+62/-0	+62/-0									
Z MAGNETIC LIMIT LOCATIONS (+1/-3mm)	mm	+42/+9	+42/+9	+42/+9	+42/+9									
Z HARD STOP LOCATIONS (+/- 1mm)	mm	+64/-1	+64/-1	+64/-1	+64/-1									
NOMINAL Z POSITION	mm	26	26	26	26									
PITCH (THETA Y) ANGULAR TRAVEL [10]	deg	+/- 31	+/- 31	+/- 31	+/- 31									
ROLL (THETA X) ANGULAR TRAVEL [10]	deg	+/- 31	+/- 31	+/- 31	+/- 31									
CONICAL TILT ANGULAR TRAVEL [10]	deg	+/- 30	+/- 30	+/- 30	+/- 30									
COMPOUND PITCH AND ROLL TRAVEL [14]	deg	+/- 22	+/- 22	+/- 22	+/- 22									
YAW TRAVEL	deg	360 deg continuous	360 deg continuous	360 deg continuous	360 deg continuous									
PERFORMANCE SPECIFICATIONS [1]		(STD) ULTRA NANO	(STD) ULTRA NANO	(STD) ULTRA NANO	(STD) ULTRA NANO									
BIDIRECTIONAL REPEATABILITY PER AXIS	XY	nanometers	+/- 100	+/- 100	+/- 100	+/- 100								
	Z	nanometers	+/- 200	+/- 200	+/- 200	+/- 200								
	PITCH AND ROLL	arc-sec	+/- 1	+/- 1	+/- 1	+/- 1								
	YAW	arc-sec	+/- 0.5	+/- 0.5	+/- 0.5	+/- 0.5								
BACKLASH	XY	nanometers	0 nm / arc-sec (no backlash on any axis)	0 nm / arc-sec (no backlash on any axis)	0 nm / arc-sec (no backlash on any axis)	0 nm / arc-sec (no backlash on any axis)								
	Z	nanometers												
	PITCH AND ROLL	arc-sec												
	YAW	arc-sec												
MINIMUM INCREMENTAL STEP SIZE	XY	nanometers	< 20	< 20	< 20	< 20								
	Z	nanometers	< 20	< 20	< 20	< 20								
	PITCH AND ROLL	arc-sec	< 0.1	< 0.1	< 0.1	< 0.1								
	YAW	arc-sec	< 0.1	< 0.1	< 0.1	< 0.1								
3D ACCURACY [11]	LINEAR ACCURACY	um	CONTACT ALIO TO DISCUSS 3D ACCURACY	CONTACT ALIO TO DISCUSS 3D ACCURACY	CONTACT ALIO TO DISCUSS 3D ACCURACY	CONTACT ALIO TO DISCUSS 3D ACCURACY								
	STRAIGHTNESS	um												
	FLATNESS [2]	um												
	PITCH	arc-sec												
	YAW	arc-sec												
YAW RUNOUT	AXIAL RUNOUT	um	12	10	5	12	10	5	12	10	5	12	10	5
	RADIAL RUNOUT	um	12	10	5	12	10	5	12	10	5	12	10	5
	WOBBLE	arc-sec	20	15	10	20	15	10	20	15	10	20	15	10
RESOLUTION	XY	nanometers	5 nm	5 nm	5 nm	5 nm								
	Z	nanometers	5 nm	5 nm	5 nm	5 nm								
	PITCH AND ROLL	arc-sec	0.15	0.15	0.15	0.15								
	YAW	arc-sec	0.04	0.04	0.04	0.04								
MOTION PROFILE SPECIFICATIONS														
MAX LINEAR VELOCITY [3]	XY	mm/s	50	100	50	100								
	Z	mm/s	15	15	15	15								
MAX LINEAR ACCELERATION [3]	XY	G	0.1	0.3	0.1	0.3								
	Z	G	0.3	0.3	0.3	0.3								
MAX ANGULAR VELOCITY [3]	PITCH AND ROLL	deg/sec	20	20	20	20								
	YAW	deg/sec	>3000	>3000	>3000	>3000								
MAX ANGULAR ACCELERATION [3]	PITCH AND ROLL	deg/sec^2	>1000	>1000	>1000	>1000								
	YAW	deg/sec^2	>2000	>2000	>2000	>2000								
MAX PAYLOAD	kg	5-10 kg	5-10 kg	5 kg	5-10 kg									
PAYLOAD CENTER OF GRAVITY [12]	MAX XY OFFSET	mm	20	20	20	20								
	MAX Z OFFSET	mm	30	30	30	30								
ASSEMBLY MASS	kg	15	14	14	30									
MOVING MASSES	X	kg	13	11	22									
	Y	kg	8	6	10									
	Z	kg	2	2	2									
	YAW	kg	0.3	0.3	0.3									
YAW MASS MOMENT OF INERTIA	kg*m^2	242	242	242	242									

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Notes:

- Specifications measured on stage centerline at nominal 20°C, 50mm above mounting surface with no payload. ALIO provides NIST traceable proof for all options/specs per quote.
- Flatness and Pitch specifications dependent on system base. Contact ALIO for more information.
- Stage limitation at no payload. Based on 100% S-curve. Does not account for limitations due to amplifier, resolution, position error, or duty cycle.
- Back EMF plus IR drop must not exceed maximum line to line bus voltage.
- Resistance values do not include cable resistance.
- Continuous operating limits are based on continuous operation at maximum temperature with aluminum heatsink (300mm x 12.5mm x motor length).
- Maximum on time at peak operating limits is 10 seconds.
- All electrical specifications may vary by 12% from listed values.
- Additional motor and travel options are available for each stage for optimized performance as necessary per customer requirements.
- Angular travel is specified when the Z axis is at mid-stroke and all other angles are at zero degrees. Translation from this specified (mid-stroke) position reduces angular travel.
- Three dimensional accuracy is affected by all error sources of all axes as well as the infinite possible process points or tool center points. Thus a single specification is not applicable. ALIO specifies three dimensional accuracy specifications on a case by case basis.
- Payload Cg ideally should be in line with the yaw rotation axis (centered on mounting surface). Offset payload must be within specified range and may influence performance.
- "Conical Tilt" is the max tilt angle the top mounting surface of the hexapod can be tilted in any direction. The hexapod can sweep a cone at this angle around a full Theta Z rotation at the listed Z axis mid-stroke position and with the TCP at zero. Deviation from these Z and TCP limitations reduces angular travel.
- Compound angular travel specified is the max combined +/- pitch and +/- roll travel that can be performed as a compound angle. This max travel is specified at the listed Z axis mid-stroke position and TCP at zero. Deviation from these Z and TCP limitations reduces angular travel.
- Volumetric travel is X, Y, and Z rectangular prism the hexapod can sweep throughout with no limitations. Z travel does not reduce XY travel. This volume is specified with all angular travels at zero degrees.

DRAWN	QWOLF	2021-03-29			
CHECKED					
			TITLE		
Tolerances: Surface Roughness: x.x ± 0.5 mm x.xx ± 0.13 mm x.xxx ± 0.05 mm ANGLES ± 0.5° ✓ RMS MAX.			AI-HH-30D-(XY TRAVEL)XY-(Z TRAVEL)Z-(R DIAMETER)R		
MATERIAL		SIZE	DWG NO	REV	
		B	0010-08073	002	
FINISH SEE NOTES			SCALE	0090-07999-016 ALIO STD TEMPLATE	SHEET 2 OF 3

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MODEL	UNITS	AI-HH-30D-60XY-62Z-80R-BSD	AI-HH-30D-100XY-62Z-80R-LM	AI-HH-30D-200XY-62Z-80R-CM	AI-HH-30D-200XY-62Z-80R-LM
XY MOTOR INFORMATION					
MOTOR TYPE	--	FRAMELESS TORQUE AC SERVO MOTOR	LINEAR BRUSHLESS AC SERVO MOTOR	LINEAR BRUSHLESS AC SERVO MOTOR	LINEAR BRUSHLESS AC SERVO MOTOR
MOTOR MODEL	--	WITH PRECISION BALL SCREW	AI-LM-144BSN-D	AI-CM-144BEP-D	AI-LM-144BSN-D
MAGNETIC PITCH (N-N)	mm		30.48	30.48	30.48
MAX VOLTAGE (LINE TO LINE) [4]	V		500	250	500
ELECTRICAL TIME CONSTANT (@ 25°C)	msec		0.22	0.20	0.20
MAX MOTOR TEMP	°C		125	125	130
THERMAL SENSOR (options available)	--		NEGATIVE COEFFICIENT THERMISTOR	POSITIVE COEFFICIENT THERMISTOR	NEGATIVE COEFFICIENT THERMISTOR
MOTOR CONNECTION	--		DELTA	DELTA	DELTA
FORCE CONSTANT	N/Apk		16.3	7.1	28.7
PHASE RESISTANCE (@ 25°C) [5]	Ohm		11.6	5.8	11.74
PHASE RESISTANCE (@ MAX°C) [5]	Ohm		16.4	8.3	16.59
INDUCTANCE @ 1kHz	mH		2.1	1.2	2.3
CONTINUOUS FORCE [6]	N		47	19.8	93.1
CONTINUOUS CURRENT [6]	Apk		2.9	2.8	3.25
PEAK FORCE [7]	N		151	42	295
PEAK CURRENT [7]	Apk		9.2	6	10.27
BACK EMF CONSTANT	V/m/s		16.3	7.1	28.7
TRIPOD MOTOR INFORMATION					
MOTOR TYPE	--	FRAMELESS TORQUE AC SERVO MOTOR	FRAMELESS TORQUE AC SERVO MOTOR	FRAMELESS TORQUE AC SERVO MOTOR	FRAMELESS TORQUE AC SERVO MOTOR
MOTOR MODEL	--	AI-TM-32A8-W	AI-TM-32A8-W	AI-TM-32A8-W	AI-TM-32A8-W
MAGNETIC PITCH (N-N)	deg	180	180	180	180
MAX VOLTAGE (LINE TO LINE) [4]	VDC	340	340	340	340
MAX MOTOR TEMP	°C	155	155	155	155
THERMAL SENSOR	--	NONE	NONE	NONE	NONE
MOTOR CONNECTION	--	WYE	WYE	WYE	WYE
TORQUE CONSTANT	Nm/Arms	0.030	0.030	0.030	0.030
PHASE RESISTANCE (@ 25°C) [5]	Ohm	2.2	2.2	2.2	2.2
INDUCTANCE @ 1kHz	mH	1.1	1.1	1.1	1.1
CONTINUOUS TORQUE [6]	Nm	0.08	0.08	0.08	0.08
CONTINUOUS CURRENT [6]	Arms	2.8	2.8	2.8	2.8
PEAK TORQUE [7]	Nm	0.26	0.26	0.26	0.26
PEAK CURRENT [7]	Arms	8.8	8.8	8.8	8.8
BACK EMF CONSTANT	Vrms/krpm	1.8	1.8	1.8	1.8
YAW (ROTARY) MOTOR INFORMATION					
MOTOR TYPE	--	FRAMELESS TORQUE MOTOR	FRAMELESS TORQUE MOTOR	FRAMELESS TORQUE MOTOR	FRAMELESS TORQUE MOTOR
MOTOR MODEL	--	AI-TM-65BY-W	AI-TM-65BY-W	AI-TM-65BY-W	AI-TM-65BY-W
MAGNETIC PITCH (N-N)	deg	90	90	90	90
MAX VOLTAGE (LINE TO LINE) [4]	VDC	420	420	420	420
MAX MOTOR TEMP	°C	100	100	100	100
THERMAL SENSOR	--	NONE	NONE	NONE	NONE
MOTOR CONNECTION	--	WYE	WYE	WYE	WYE
TORQUE CONSTANT	Nm/Arms	0.12	0.118	0.118	0.118
PHASE RESISTANCE (@ 25°C) [5]	Ohm	0.8	0.799	0.799	0.799
INDUCTANCE @ 1kHz	mH	1.6	1.62	1.62	1.62
CONTINUOUS TORQUE [6]	Nm	0.7	0.66	0.66	0.66
CONTINUOUS CURRENT [6]	Arms	5.6	5.61	5.61	5.61
PEAK TORQUE [7]	Nm	0.9	0.85	0.85	0.85
PEAK CURRENT [7]	Arms	7.6	7.58	7.58	7.58
BACK EMF CONSTANT	Vrms/krpm	7.2	7.2	7.2	7.2

Notes:

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CHECKED				
			TITLE	
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MATERIAL			SIZE	DWG NO
FINISH			B	0010-08073
SEE NOTES			SCALE	REV
			0090-07999-016 ALIO STD TEMPLATE	002
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