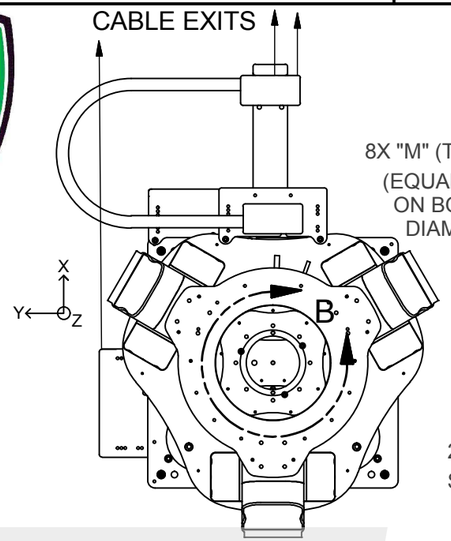
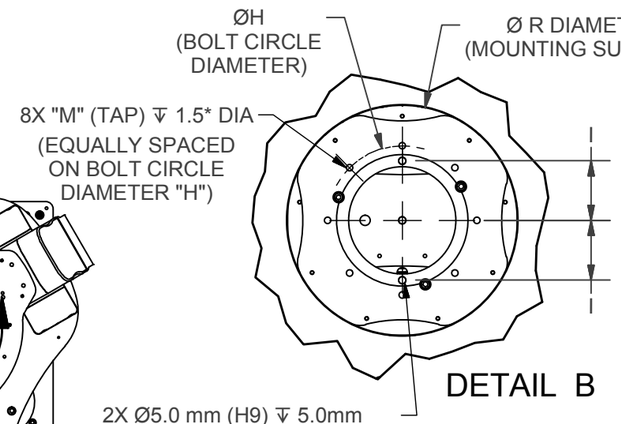
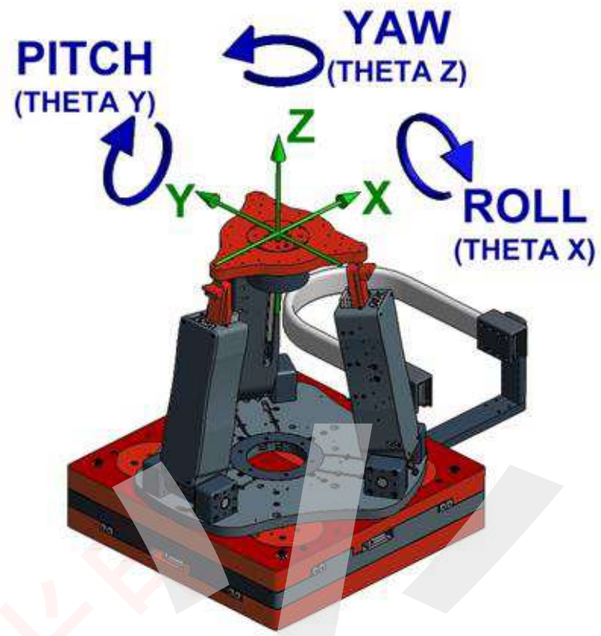
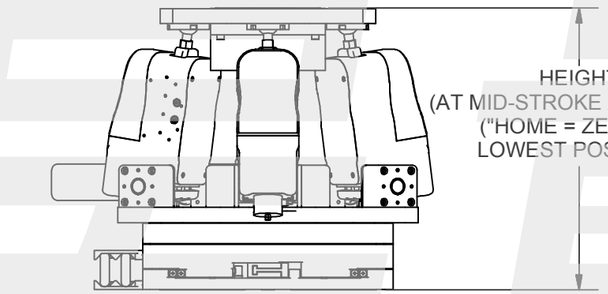
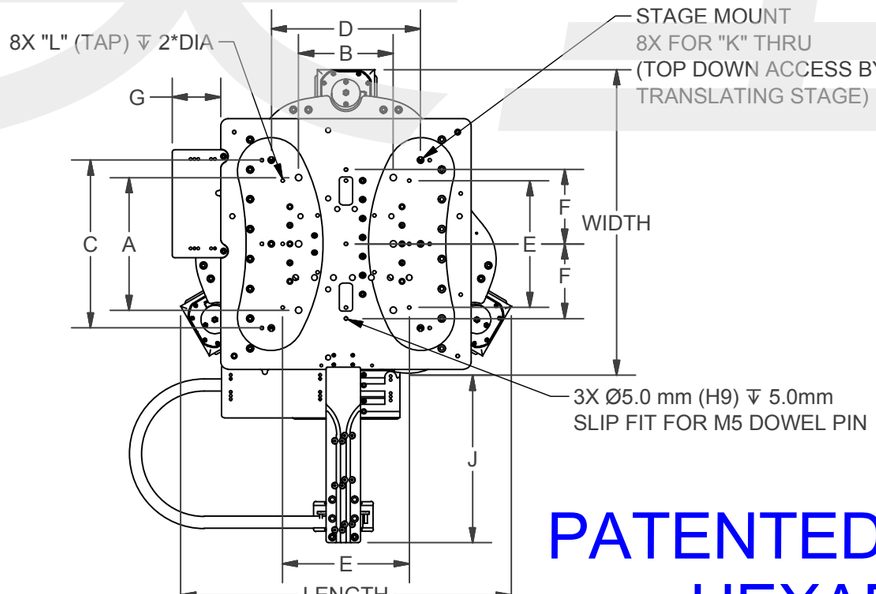






STANDARD FEATURES	
Stage	Hybrid Hexapod
Travel	6 Degrees of Freedom (X, Y, Z, Pitch, Roll, and Yaw)
XY Travel	200 mm
Z Travel	60 mm
Angular Travel	+/- 14 degrees (Pitch and Roll) 360 degrees continuous (Yaw)
Max Payload	20.0 kg
Motor	Ironless Core Linear Motor and Frameless Torque Motor with Precision Ball Screw
Brake	On all 3 Tripod Links; Pneumatic Release, Spring Lock
Feedback	Non-Contact Optical Incremental Encoder Optional: Absolute Encoder (BISS-C)
Scale	Gold Tape Scale and Stainless Steel Ring Optional: Near Zero CTE ZeroMet
Linear Resolution	~5 nm
Angular Resolution	< 0.02 arc-sec
Sensors	Integrated Home and End of Travel Limits
Bearings	High Precision Crossed Roller Bearings
Cables	High Flex, 10M Cycle, 3m Length
Structure	Anodized Aluminum 6061-T6 Optional: Stainless Steel
Environment	Standard Optional: Vacuum 10-5 Torr, Vacuum 10-7 Torr
Temperature	0°C to 50°C
Humidity	10% to 80% Non-Condensing
Precision	6-D Nano Precision ™ Test Methods





NOTE: MODEL AI-HH-BSD-200XY-60Z-154RA SHOWN.

XY TRAVEL	Z TRAVEL	PITCH & ROLL TRAVEL	R DIAMETER	OPTION	LENGTH	WIDTH	HEIGHT (at home)	HEIGHT (at mid-stroke)	A (inch)	B (inch)	C	D	E	F	G	H	I	J	K	L	M
200	60	+/- 14 degrees	154 (RA)	--	443.2	410.1	378.0	408.0	7	5	225	200	170	100	65	100	40	228.3	M6 or 1/4-20	M6	M5

* All units millimeters unless otherwise noted.
* All hole patterns centered on M5 dowel pin at center of XY stage or centered on thru hole of top rotary stage.
* See specification sheet and contact ALIO technical sales for assistance in model selection.
# M5 dowel pins on the mount surface are rotated 90 degrees relative to dowel pins shown on this datasheet.

PATENTED HYBRID HEXAPOD

DRAWN	QWOLF	2020-04-17
CHECKED		
Tolerances: x.x ± 0.5 mm x.xx ± 0.13 mm x.xxx ± 0.05 mm ANGLES ± 0.5°	Surface Roughness: RMS MAX.	
MATERIAL		
FINISH	SEE NOTES	

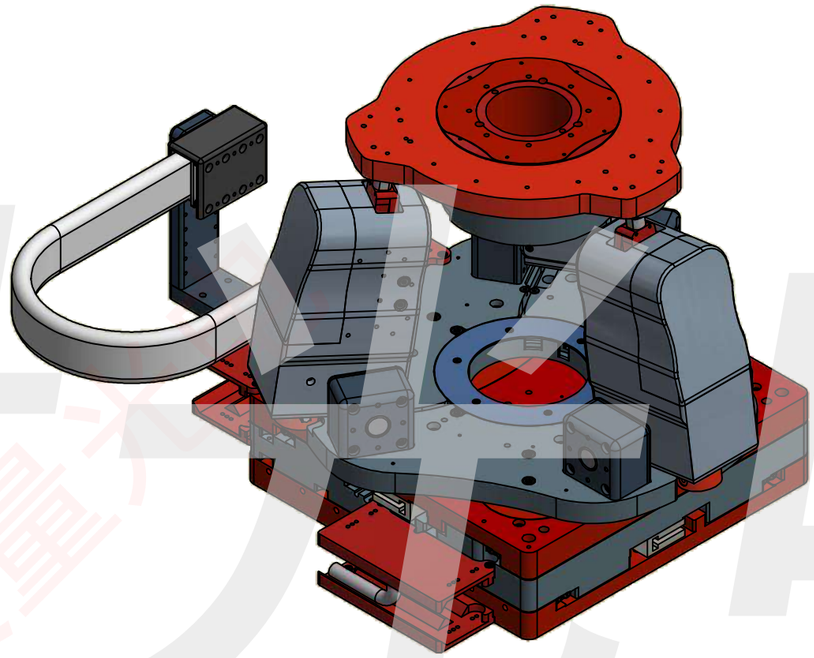
ALIO 6-D

TITLE
HYBRID HEXAPOD®
MODEL: AI-HH-BSD-(XY TRAVEL)XY-(Z TRAVEL)Z-(R DIAMETER)R-(OPTION)

SIZE	DWG NO	REV
B	0010-08070	001

SCALE | ALIO STD TEMPLATE_REV.013 | SHEET 1 OF 3

MODEL		UNITS	AI-HH-200XY-60Z-154RA		
OPTION		--	--		
XY TRAVEL		mm	200		
Z TRAVEL		mm	60		
PITCH AND ROLL TRAVEL [10]		deg	+/- 14		
YAW TRAVEL		deg	360 deg continuous		
PERFORMANCE SPECIFICATIONS [1]			(STD)	ULTRA	NANO
BIDIRECTIONAL REPEATABILITY	XY	nanometers	+/- 100		+/- 70
	Z	nanometers	+/- 100		+/- 70
	PITCH AND ROLL	arc-sec	+/- 0.6		+/- 0.4
	YAW	arc-sec	+/- 0.6		+/- 0.4
BACKLASH	XY	nanometers	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		
	Z	nanometers	< 20		
	PITCH AND ROLL	arc-sec	< 0.1		
	YAW	arc-sec	< 0.1		
3D ACCURACY [11]	LINEAR ACCURACY	um	CONTACT ALIO TO DISCUSS 3D ACCURACY		
	STRAIGHTNESS	um			
	FLATNESS [2]	um			
	PITCH	arc-sec			
	YAW	arc-sec			
	ROLL	arc-sec			
YAW RUNOUT	AXIAL RUNOUT	um	10	7	4
	RADIAL RUNOUT	um	10	7	4
	WOBBLE	arc-sec	20	10	6
RESOLUTION	XY	nanometers	~5 nm		
	Z	nanometers	~5 nm		
	PITCH AND ROLL	arc-sec	~0.02		
	YAW	arc-sec	~0.01		
MOTION PROFILE SPECIFICATIONS					
MAX LINEAR VELOCITY [3]	XY	mm/s	500.0		
	Z	mm/s	30.0		
MAX LINEAR ACCELERATION [3]		G	0.3		
MAX ANGULAR VELOCITY [3]	PITCH AND ROLL	deg/sec	60		
	YAW	deg/sec	1800		
MAX ANGULAR ACCELERATION [3]	PITCH AND ROLL	deg/sec^2	>1000		
	YAW	deg/sec^2	>3600		
MAX PAYLOAD		kg	20		
PAYLOAD CENTER OF GRAVITY [12]	MAX XY OFFSET	mm	50		
	MAX Z OFFSET	mm	50		
ASSEMBLY MASS		kg	57		
MOVING MASSES	X	kg	49		
	Y	kg	37		
	Z	kg	8.4		
	YAW	kg	2.00		
YAW MASS MOMENT OF INERTIA		kg*mm^2	7000		



Notes:

1. Specifications measured on stage centerline, 50mm above mounting surface. ALIO provides NIST traceable proof for all options/specs per quote.
2. Flatness specifications dependent on system base. Contact ALIO for more information.
3. Stage limitation at no load. Does not account for drive or resolution limitations.
4. Back EMF plus IR drop must not exceed maximum line to line bus voltage.
5. Resistance values do not include cable resistance. Cable resistance adds 0.146 ohm/m for Delta connection and 0.44 ohm/m for Wye Connection.
6. Continuous operating limits are based on continuous operation at maximum temperature with aluminum heat sink (300mm x 12.5mm x motor length).
7. Maximum on time at peak operating limits is 10 seconds.
8. All electrical specifications may vary by 12% from listed values.
9. Additional motor and travel options are available for each stage for optimized performance as necessary per customer requirements.
10. Angular travel is specified when the Z axis is at mid-stroke and all other angles are at zero degrees.
11. Three dimensional accuracy is affected by all error sources of all axes as well as the infinite possible
12. Payload Cg should be in line with the yaw rotation axis (centered on mounting surface). Offset payload
13. Pneumatic counterbalance supply pressure specified is the estimated pressure required at the max payload.

DRAWN QWOLF	2020-04-17	ALIO 6-D
CHECKED		TITLE: HYBRID HEXAPOD
		MODEL: AI-HH-BSD-(XY TRAVEL)XY-(Z TRAVEL)Z-(R DIAMETER)R-(OPTION)
Tolerances: x.x ± 0.5 mm, x.xx ± 0.13 mm, x.xxx ± 0.05 mm, ANGLES ± 0.5°	Surface Roughness: √ RMS MAX.	SIZE B / DWG NO 0010-08070 / REV 001
MATERIAL		
FINISH SEE NOTES		SCALE ALIO STD TEMPLATE - REV 013 SHEET 2 OF 3

MODEL	UNITS	AI-HH-200XY-60Z-154RA
OPTION	--	--
XY MOTOR INFORMATION		
MOTOR TYPE	--	
MOTOR MODEL	--	AI-LM-256BSN-D
MAGNETIC PITCH (N-N)	mm	30.48
MAX VOLTAGE (LINE TO LINE) [4]	V	500
ELECTRICAL TIME CONSTANT	msec	0.20
MAX MOTOR TEMP	°C	130
MOTOR CONNECTION	--	DELTA
FORCE CONSTANT	N/Apk	28.7
PHASE RESISTANCE (@25° C) [5]	Ohm	11.7
PHASE RESISTANCE (@130° C) [5]	Ohm	16.6
INDUCTANCE	mH	2.3
CONTINUOUS FORCE [6]	N	93
CONTINUOUS CURRENT [6]	Apk	3.2
PEAK FORCE [7]	N	295
PEAK CURRENT [7]	Apk	10.3
BACK EMF CONSTANT	V/m/s	28.7
TRIPOD MOTOR INFORMATION		
MOTOR TYPE	FRAMELESS TORQUE AC SERVO	
MOTOR MODEL	--	AI-TM-64BE-Y
MAGNETIC PITCH (N-N)	deg	90
MAX VOLTAGE (LINE TO LINE) [4]	VDC	340
MAX MOTOR TEMP	°C	155
THERMAL SENSOR	--	NONE
MOTOR CONNECTION	--	WYE
TORQUE CONSTANT	Nm/Arms	0.4
PHASE RESISTANCE (@25° C) [5]	Ohm	5.6
INDUCTANCE	mH	10.2
CONTINUOUS TORQUE [6]	Nm	1.0
CONTINUOUS CURRENT [6]	Arms	2.4
PEAK TORQUE [7]	Nm	3.2
PEAK CURRENT [7]	Apk	7.7
BACK EMF CONSTANT	Vrms/krpm	25.8
ROTARY MOTOR INFORMATION		
MOTOR TYPE	FRAMELESS TORQUE AC SERVO	
MOTOR MODEL	--	AI-TM-133CN
MAGNETIC PITCH (N-N)	deg	25.714
MAX VOLTAGE (LINE TO LINE) [4]	VDC	230
MAX MOTOR TEMP	°C	110
MOTOR CONNECTION	--	WYE
TORQUE CONSTANT	Nm/Arms	2.10
PHASE RESISTANCE (@25° C) [5]	Ohm	4.2
INDUCTANCE	mH	11.5
CONTINUOUS TORQUE [6]	Nm	10.00
CONTINUOUS CURRENT [6]	Arms	4.7
PEAK TORQUE [7]	Nm	20.60
PEAK CURRENT [7]	Arms	13.3
BACK EMF CONSTANT	Vrms/krpm	126.0

Notes:

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2. Flatness specifications dependent on system base. Contact ALIO for more information.
3. Stage limitation at no load. Does not account for drive or resolution limitations.
4. Back EMF plus IR drop must not exceed maximum line to line bus voltage.
5. Resistance values do not include cable resistance. Cable resistance adds 0.22 ohm/m for Delta connection and 0.66 ohm/m for Wye Connection.
6. Continuous operating limits are based on continuous operation at maximum temperature with aluminum heat sink (300mm x 12.5mm x motor length).
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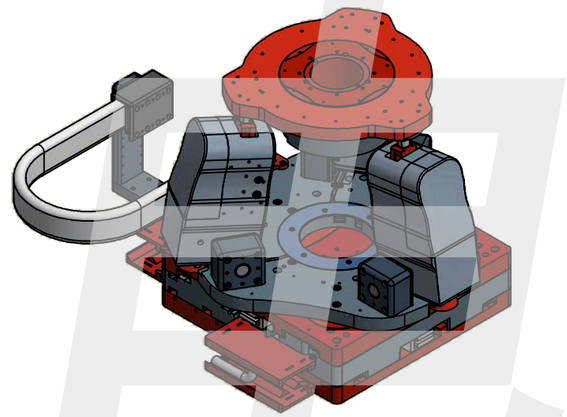
13. Pneumatic counterbalance supply pressure specified is the estimated pressure required at the max payload.

BRAKE SPECIFICATIONS

BRAKE DESCRIPTION		
ALL 3 LINKS HAVE THE SAME BRAKE DESIGN AND OPERATE ON A SINGLE PNEUMATIC CIRCUIT		
BRAKE LOCK (& FAILSAFE)	SPRING ACTIVATED	
BRAKE RELEASE	PNEUMATIC ACTIVATED	
BRAKE SUPPLY TUBE	4mm Outer Diameter High Flex	
MINIMUM SUPPLY PRESSURE	~0.1 Mpa	
MAXIMUM SUPPLY PRESSURE	1.0 MPa	
MAXIMUM THEORETICAL DISPLACEMENT UPON BRAKE ACTIVATION	LINK 1	~15 um
	LINK 2	~15 um
	LINK 3	~15 um
CUSTOMER TO SUPPLY AIR SUPPLY AND DIGITAL OUTPUT CONTROL OF PNEUMATIC VALVE FOR BRAKE ACTIVATION		
BRAKE ON/OFF VERIFICATION IS VIA INLINE PRESSURE SENSOR CONNECTED TO ONE DIGITAL INPUT		



DRAWN	QWOLF	2020-04-17
CHECKED		
Tolerances: x.x ± 0.5 mm x.xx ± 0.13 mm x.xxx ± 0.05 mm ANGLES ± 0.5°	Surface Roughness: RMS MAX.	
MATERIAL		
FINISH	SEE NOTES	

ALIO 6-D

TITLE

HYBRID HEXAPOD

MODEL: AI-HH-BSD-(XY TRAVEL)XY-(Z TRAVEL)Z-(R DIAMETER)R-(OPTION)

SIZE	DWG NO	REV
B	0010-08070	001

SCALE: | ALIO STD TEMPLATE - REV 013 | SHEET 3 OF 3