ZT04 Multi-Axis System

Performance in an Ultra-Compact 2-Axis Design

Designed for easy integration in OEM assemblies, the Haydon Kerk Z-Theta™ offers linear + rotary point to point motion in a compact footprint. Unlike in-house component-up designs requiring engineering, multiple vendors and complex assembly integration, Z-Theta is a modular "bolt-in" package.

At the core of Z-Theta is the patented ScrewRail™, which combines guidance and linear transmission in a slender co-axial profile. Haydon Kerk's unique dual-motion integration with a pair of stepper motors adds rotary (theta) motion in manner that reduces motion system size by 50-80% as compared to alternative approaches, and less expensively than the equivalent components purchased separately.

The highly configurable Z-Theta provides flexibility, value, durability and performance suited for a host of lab automation, semiconductor and light factory automation applications. Performance is customized through a variety of leadscrew resolutions, available free-wheeling and anti-backlash nut selections, stepper motor configuration options, and optical encoder line counts.

Z-Theta
Mutli-Axis System

Benefits

- Compact co-axial design enables small footprint
- Easy integration into system design
- Pre-engineered modular design reduces supply chain and time to market
- Configuration options optimize performance for specific applications
- Compatible with a wide range of drive and controllers

Identifying the Z-Theta Part Number Codes when Ordering

ZT	04	A	K	—	B	A	J	A	A	—	E1	—	FY06
Prefix **ZT** = Z-Theta	**Nominal Rail Size** **04** = 1/2 in (13mm)	**Nut Style** **A** = Free-wheeling **B** = Anti-backlash	**Coating** **S** = Uncoated **K** = Kerkote®		**Motors Frame Size** **B** = Steppers, Size 23 Rotary, Size 17 Linear	**Rotary Motor** **A** = 1.8°, 3.25VDC, Bipolar coils (4 wire) **B** = 1.8°, 5VDC, Bipolar coils (4 wire)	**Rotary Motor Encoder** **J** = 12000 CPR **X** = No Encoder	**Linear Motor** **A** = 1.8°, 2.33VDC, Bipolar coils (4 wire) **B** = 1.8°, 5VDC, Bipolar coils (4 wire)	**Linear Motor Encoder** **A** = 500 CPR **C** = 1000 CPR **E** = 2000 CPR **X** = No Encoder		**Nominal Leadscrew Thread** **E1** = .050-in (1.27mm **E2** = .100-in (2.54mm) **E4**= .250-in (6.35mm) **E6**= .500-in (12.7mm) **E7**= 1.00-in (25.4mm)		**Stroke / Unique Identifier** **FYxx** = Standard, stroke = xx** **XXxx** = Unique identifier

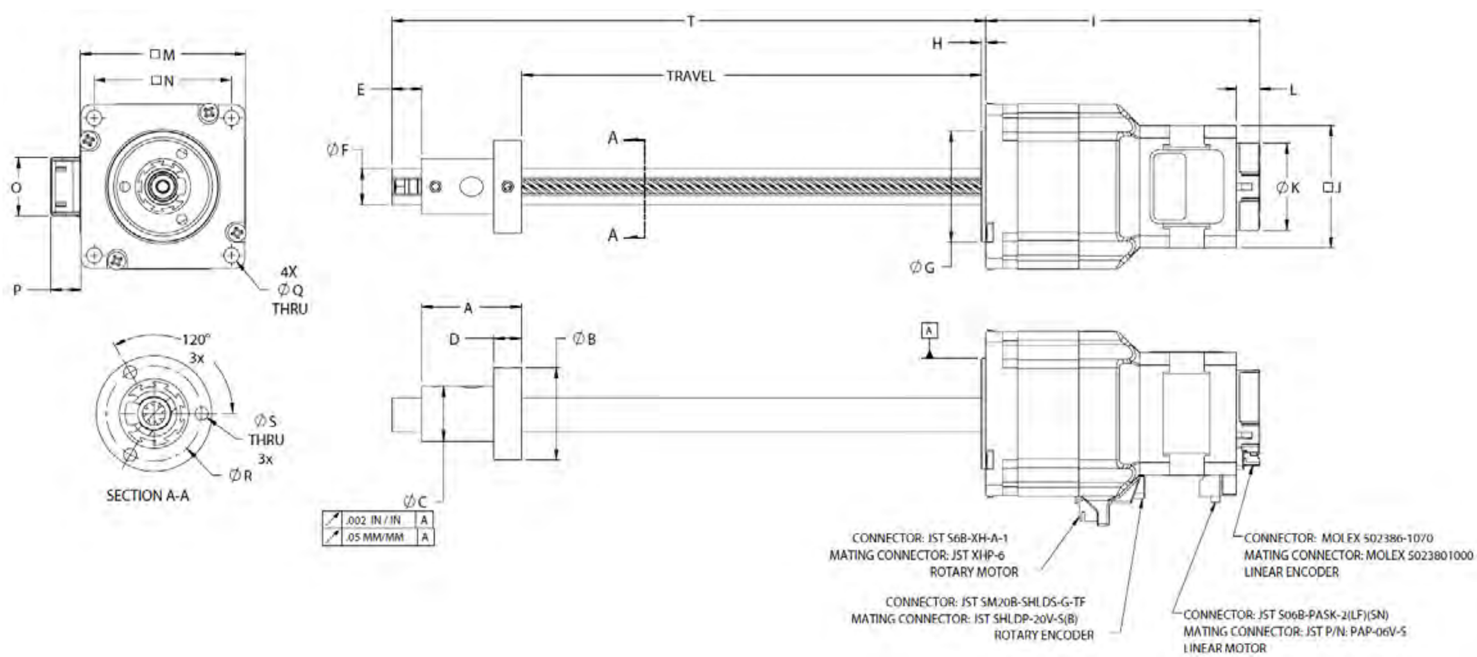
NOTE: Dashes must be included in Part Number (–) as shown above. For assistance call our Engineering Team at 203 756 7441.

Mechanical Specifications

ZT04: Size 23 Rotary Motor, Size 17 Linear Motor		
Stroke Length Limit	in [mm]	12 [305]
Speed Limit	in/sec [mm/s]	6 [152]
Axial Force Limit	lb-f [N]	15 [67]
Load Limit (mass)	lb [kg]	5 [2.3]
Moment Load	in-lb [NM]	15 [1.7]
Torque, Theta Axis Motor	in-lb [NM]	3 [0.34]
Nut Length	in [mm]	1.4 [36]
Unit Height	in [mm]	Travel + 5.5 [140]
Width, Mounting Flange	in [mm]	2.23 [57]
Rail Material		Steel
Rail Runout	in/in [mm/25mm]	0.002 [0.05]
Rotary Repeatability (Open Loop)	in [mm]	+/-0.005 [0.13]
Rotary Resolution (@6" Radius)	in [mm]	+/-0.0031 [0.08]
Duty Cycle		100%

ZT04 Linear Specifications						
Lead Code		E1	E2	E4	E6	E7
Lead	in	0.050	0.100	0.250	0.500	1.00
	[mm]	[1.27]	[2.54]	[6.35]	[12.7]	[25.4]
Nominal Screw Diameter	in	0.25				
	[mm]	[6]				
Max Drag Torque	oz-in	2.0	TBD	3.0	4.0	5.0
	[NM]	[0.014]		[0.021]	[0.028]	[0.035]
Torque to Move Load	oz-in/lb	0.5	TBD	1.5	2.5	4.5
	[NM/Kg]	[0.004]		[0.011]	[0.018]	[0.32]
Resolution (Open Loop)	in	0.00025	0.0005	0.00125	0.0025	0.005
	[mm]	[0.00625]	[0.0127]	[0.03175]	[0.0635]	[0.127]

Dimensional Drawings



Units	A	B	C	D	E	F	G	H	I	J
in	1.35 ± .01	1.250 ± .005	.750 ± .005	.375 ± .005	.40 ± .01	.489 - .492	1.498 - 1.500	.06 ± .01	3.7 ± .1	1.65 ± .01
mm	34.29 ± 0.25	31.75 ± 0.13	19.05 ± 0.13	9.53 ± 0.13	10.16 ± 0.25	12.42 - 12.50	30.05 - 38.1	1.52 ± 0.25	93.98 ± 2.54	41.91 ± 0.25

Units	K	L	M	N	O	P	Q**	R	S**	T
in	1.18 ± .02	.32 ± .02	2.23 ± .02	1.856 ± .005	.79 - .81	.41 - .43	.205 ± .005	1.030 ± .005	.140 ± .005	= Travel + E +A+H (± .040)
mm	29.97 ± 0.51	8.13 ± 0.51	56.64 ± 0.51	19.05 ± 0.13	20.07 - 20.57	10.41 - 10.92	19.05 ± 0.13	19.05 ± 0.13	19.05 ± 0.13	= Travel + E +A+H (± 0.1)

** Tapped holes also available

Motor Specifications (Rotary)

Size 23: 57 mm (2.3 inch) Hybrid Rotary Stepper Motor (1.8° Step Angle)			
Motor Ordering Code	**A**	**B**	**C**
Stack Length	Single		
Wiring	Bipolar		
Winding Voltage	3.25 VDC	5 VDC	12 VDC
Current/phase	2.0 Arms	1.3 Arms	540 mArms
Resistance/phase	1.63 Ω	3.85 Ω	22.2 Ω
Inductance/phase	3.5 mH	10.5 mH	58 mH
Holding Torque	8.5 kg-cm		
Power Consumption	13 W Total		
Insulation Class	Class B		
Insulation Resistance	20 MΩ		

†Part numbering information on page 1

Motor Specifications (Linear)

Size 17: 43 mm (1.7 inch) Hybrid Rotary Stepper Motor (1.8° Step Angle)			
Motor Ordering Code	**A**	**B**	**C**
Stack Length	Single		
Wiring	Bipolar		
Winding Voltage	2.33 VDC	5 VDC	12 VDC
Current/phase	1.5 A	700 mA	290 mA
Resistance/phase	1.56 Ω	7.2 Ω	41.5 Ω
Inductance/phase	1.9 mH	8.7 mH	54.0 mH
Power Consumption	7 W		
Rotor Inertia	37 gcm2		
Insulation Class	Class B (Class F available)		
Insulation Resistance	20 MΩ		

†Part numbering information on page 1

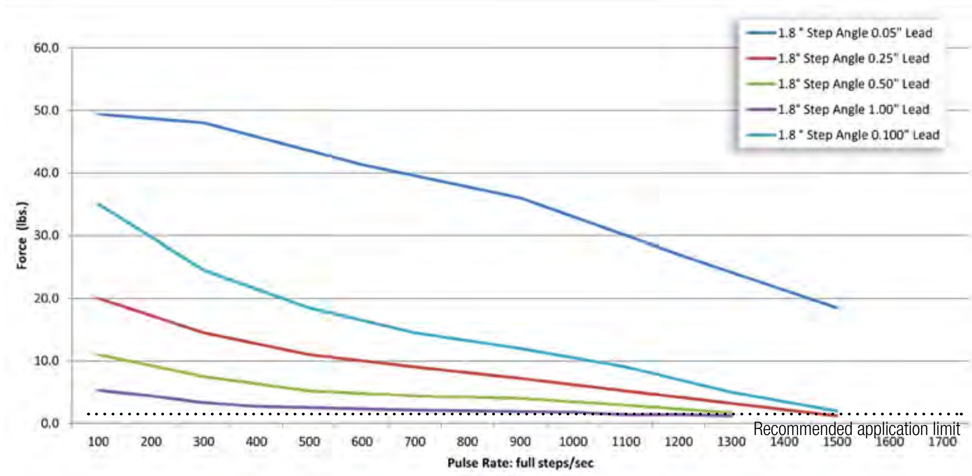
■ Performance Curves

SPEED vs. LINEAR FORCE (LINEAR MOTION)

– Chopper

– Bipolar

– 100% Duty Cycle



*Care should be taken when utilizing these screw pitches to ensure that the physical load limits of the motor are not exceeded. Please consult the factory for advice in selecting the proper pitch for your application.

NOTE: 5 volt motor and 40 Vdc power supply (8:1 voltage ratio), X axis is Speed (Full-steps/sec), Y axis is Force (lbs)

The maximum step rate shown for each type of motor is the highest no-load start speed.

Ramping can increase the performance of a motor either by increasing the top speed or getting a heavier load accelerated up to speed faster. Also, deceleration can be used to stop the motor without overshoot.

With L/R drives peak force and speeds are reduced, using a unipolar drive will yield a further 30% force reduction.

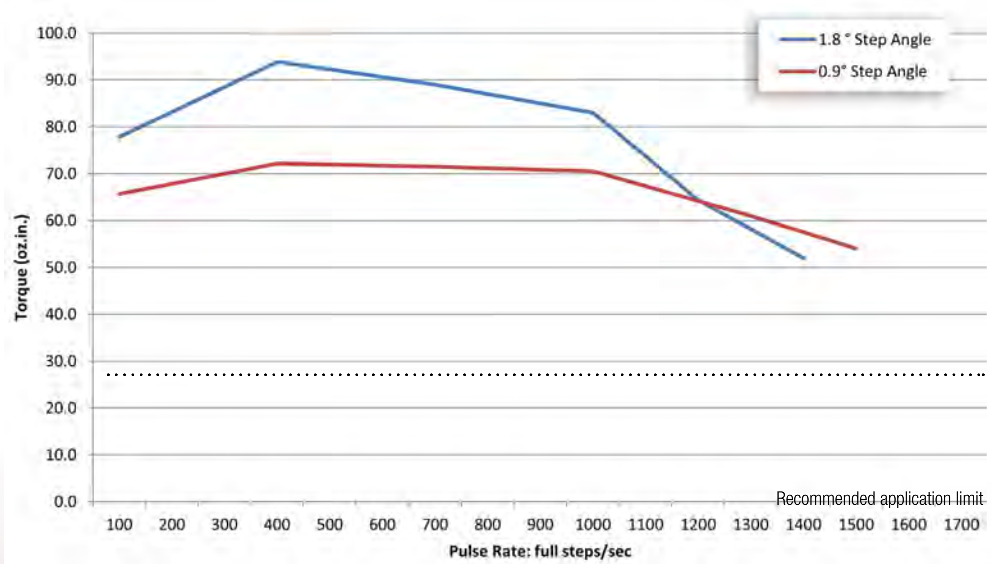
Loading is on axis with nut.

SPEED vs. PULL-OUT TORQUE (ROTARY MOTION)

– Chopper

– Bipolar

– 100% Duty Cycle



NOTE: 5 volt motor and 40 Vdc power supply (8:1 voltage ratio), X axis is Speed (Full-steps/sec), Y axis is Torque (oz-in).

Ramping can increase the performance f a motor by either increasing the top speed or getting a heavier load up to speed faster. Also, deceleration can be used to stop the motor without overshoot.