HAYDON: 203 756 7441
KERK: 603 213 6290
www.haydonkerkpittman.com

AMETEK®
ADVANCED MOTION SOLUTIONS

Haydon kerk® Motion Solutions

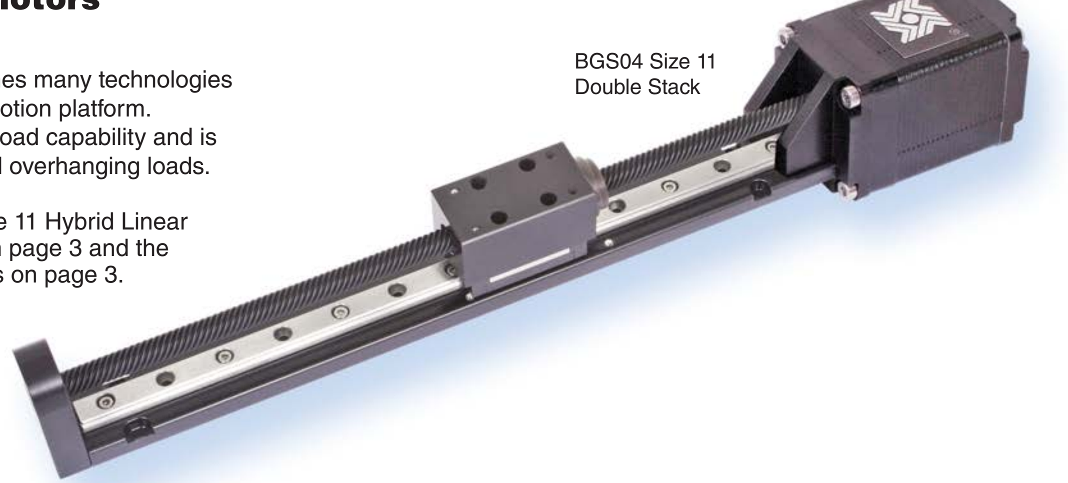
BGS™ Motorized Linear Rails: *BGS04* *Recirculating Ball Slide*

BGS04™ Linear Rail with Hybrid 28000 Series Size 11 Double Stacks or 43000 Series Size 17 Linear Actuator Stepper Motors

The **BGS**™ Linear Rail combines many technologies into a single integrated linear motion platform. The system provides excellent load capability and is engineered for both normal and overhanging loads.

Technical specifications for Size 11 Hybrid Linear Actuator Stepper Motors are on page 3 and the Size 17 Hybrid Linear Actuators on page 3.

BGS04 Size 11
Double Stack



BGS04 Specifications

BGS04 with Hybrid Linear Actuator Motor...	**Size 11 Double Stack Size 17 Single Stack***
Max. Stroke Length	18-in (460 mm)
Max. Load (Horizontal)**	22 lbs (100 N)
Roll Moment	5.72 lbs-ft (7.75 Nm)
Pitch Moment	4.88 lbs-ft (6.60 Nm)
Yaw Moment	5.68 lbs-ft (7.70 Nm)

Nominal Thread Lead inches	mm	**Lead Code**
0.025	0.635	**0025**
0.039	1.00	**0039**
0.050	1.27	**0050**
0.0625	1.59	**0063**
0.079	2.00	**0079**
0.100	2.54	**0100**
0.118	3.00	**0118**
0.200	5.08	**0200**

Nominal Thread Lead inches	mm	**Lead Code**
0.250	6.35	**0250**
0.394	10.00	**0394**
0.500	12.70	**0500**
0.750	19.05	**0750**
1.000	25.40	**1000**

* Size 17 is available with an optional programmable IDEA™ Drive.

** To determine what is best for your application see the Linear Rail Applications Checklist on page 7.

Identifying the Motorized BGS part number codes when ordering

BG | **S** | **04** | **B** – **M** | **0025** – **XXX**

Prefix
BG = Ball Guide System

Frame Style
S = Standard

Frame Size Load*
04 = Max. static load 22 lbs (100 N)

Coating
B = TFE wear resist, dry lubricant Black Ice®

Drive / Mounting
M = Motorized

For 43000 Series Size 17 Only
G = IDEA™ integrated programmable drive – USB communications

J = IDEA™ integrated programmable drive – RS485 communications

Nominal Thread Lead Code
0025 = .025-in (.635)
(see Lead Code charts above)

Unique Identifier
Suffix used to identify Size 11 or Size 17 motor

– or a proprietary suffix assigned to a specific customer application. The identifier can apply to either a standard or custom part.

NOTE: Dashes must be included in Part Number (–) as shown above. For assistance or order entry, call our engineering team at 603 213 6290.

Carriage holes available in Metric sizes
M2
M2.5
M3
M4

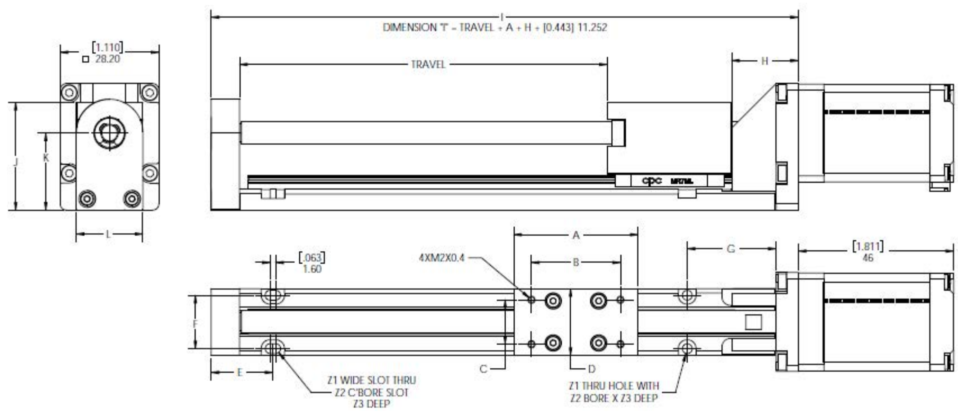
BGS04™ Linear Rail with 28000 Series Size 11 Double Stack linear motors

Recommended for horizontal loads up to 22 lbs (100 N)

	A	B	C	D	E	F	G	H	I	J	K	L	Z1	Z2	Z3
(inch)	(1.40)	(1.0)	(0.50)	(0.75)	(0.69)	(0.60)	(1.00)	(0.75)	*	(1.22)	(0.87)	(0.75)	(0.11)	(0.20)	(0.09)
mm	35.56	25.40	12.70	19.05	17.53	15.24	25.40	19.05	*	30.86	22.10	19.05	2.8	5.1	2.3

* Dimension "I" is a function of required travel distance.

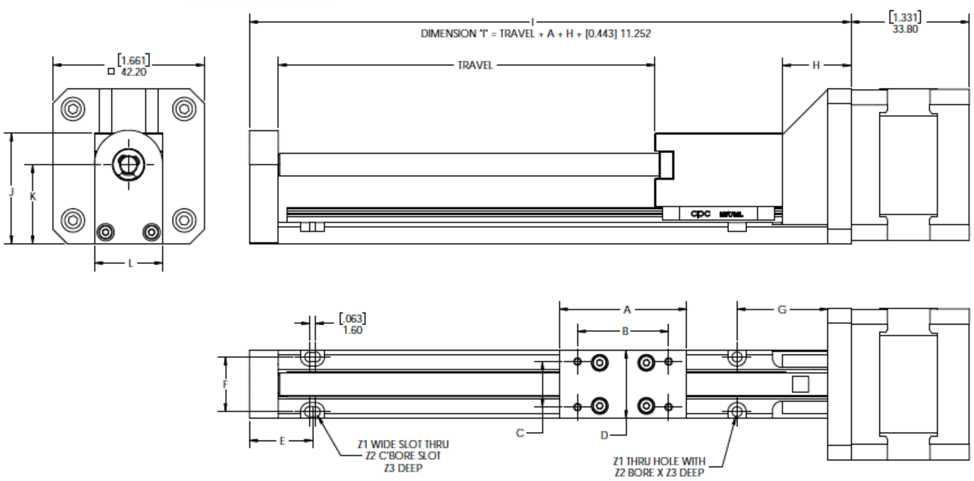
Dimensions
= (inches) mm



BGS04™ Linear Rail with 43000 Series Size 17 Single Stack linear motors

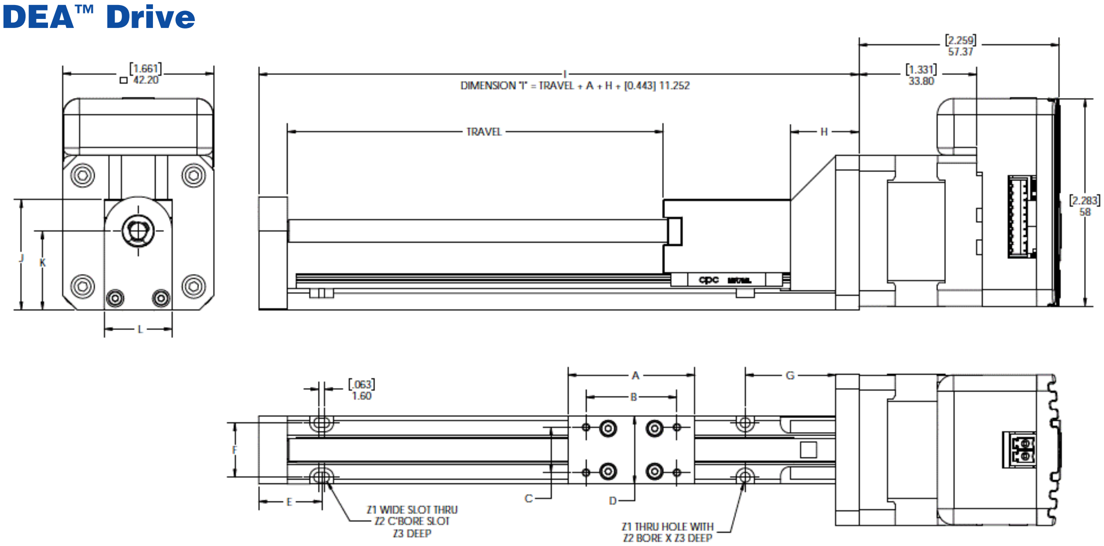
Recommended for horizontal loads up to 22 lbs (100 N)

Dimensions
= (inches) mm



...with IDEA™ Drive

Dimensions
= (inches) mm



Specifications: Haydon® 28000 Series Size 11 Double Stack

Size 11: 28 mm (1.1-in) Double Stack Hybrid Linear Actuator (1.8° Step Angle)			
Wiring	Bipolar		
Winding Voltage	2.1 VDC	5 VDC	12 VDC
Current (RMS)/phase	1.9 A	750 mA	313 mA
Resistance/phase	1.1 Ω	6.7 Ω	34.8 Ω
Inductance/phase	1.1 mH	5.8 mH	35.6 mH
Power Consumption	7.5 W Total		
Rotor Inertia	13.5 gcm^2		
Insulation Class	Class B (Class F available)		
Weight	5.8 oz (180 g)		
Insulation Resistance	20 MΩ		

Size 11
Double Stack External Linear

Specifications: Haydon® 43000 Series Size 17 Single Stack

Size 17: 43 mm (1.7-in) Hybrid Linear Actuator (1.8° Step Angle)					
Wiring	Bipolar			Unipolar**	
Programmable Drive	IDEA™ Drive Option Available			Not Applicable	
Winding Voltage	2.33 VDC*	5 VDC	12 VDC	5 VDC	
Current (RMS)/phase	1.5 A	700 mA	290 mA	700 mA	12 VDC
Resistance/phase	1.56 Ω	7.2 Ω	41.5 Ω	7.2 Ω	290 mA
Inductance/phase	1.9 mH	8.7 mH	54.0 mH	4.4 mH	41.5 Ω
Power Consumption	7 W				27.0 mH
Rotor Inertia	37 gcm^2				
Insulation Class	Class B (Class F available)				
Weight	8.5 oz (241 g)				
Insulation Resistance	20 MΩ				

* 43000 Series Single Stack with IDEA programmable drive. Contact Haydon Kerk if higher voltage motor is desired.

** Unipolar drive gives approximately 30% less thrust than bipolar drive.

Size 17
External
Linear

Size 17
External Linear
with programmable
IDEA Drive

IDEA™ Drive software is simple to use with on-screen buttons and easy-to-understand programming guides.

- Fully Programmable
- RoHS Compliant
- USB or RS-485 Communication
- Microstepping Capability – Full, 1/2, 1/4, 1/8, 1/16, 1/32, 1/64
- Graphic User Interface
- Auto-population of Drive Parameters
- Programmable Acceleration/Deceleration and Current Control

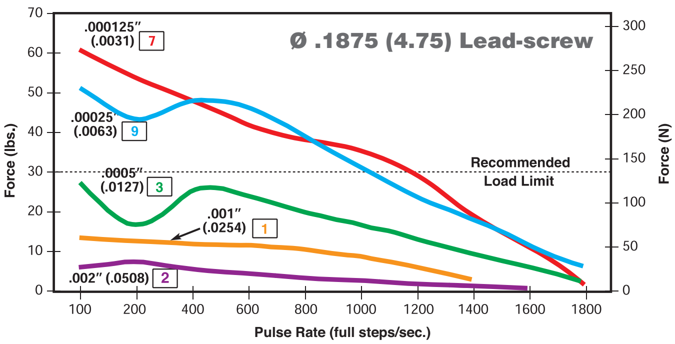
For more information see the
Haydon Kerk **IDEA™ Drive** Data Sheet

HAYDON: 203 756 7441
KERK: 603 213 6290
www.haydonkerkpittman.com
AMETEK®
ADVANCED MOTION SOLUTIONS

Performance Curves: Haydon® 28000 Series Size 11 Double Stack

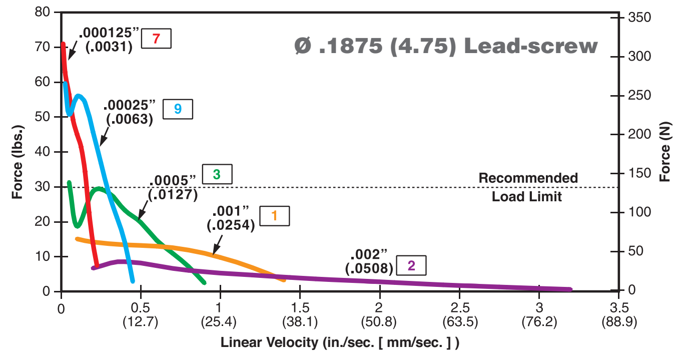
FORCE vs. PULSE RATE

Chopper • Bipolar • 100% Duty Cycle



FORCE vs. LINEAR VELOCITY

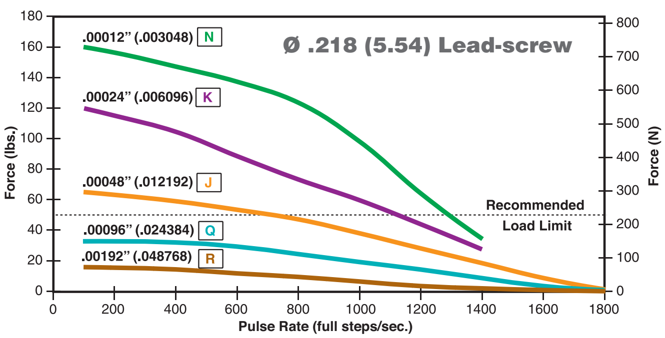
Chopper • Bipolar • 100% Duty Cycle

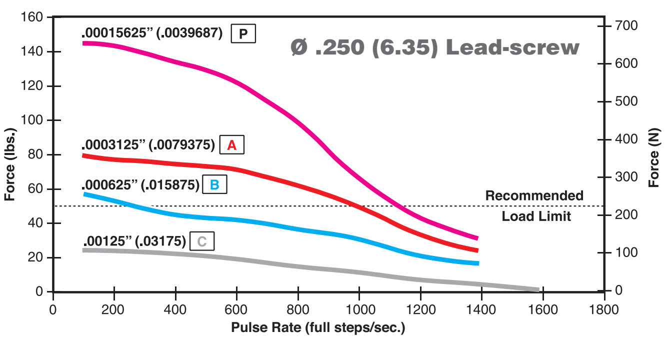


Performance Curves: Haydon® 43000 Series Size 17 Single Stack

FORCE vs. PULSE RATE

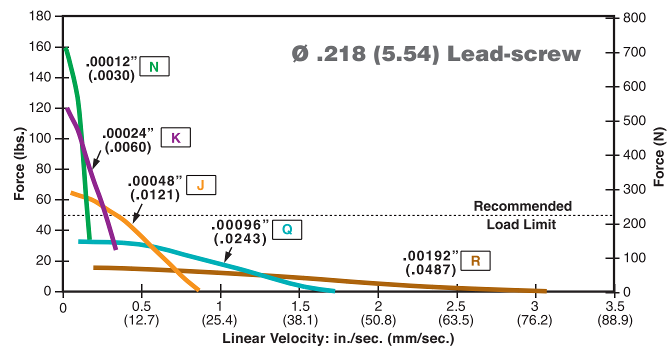
Chopper • Bipolar • 100% Duty Cycle

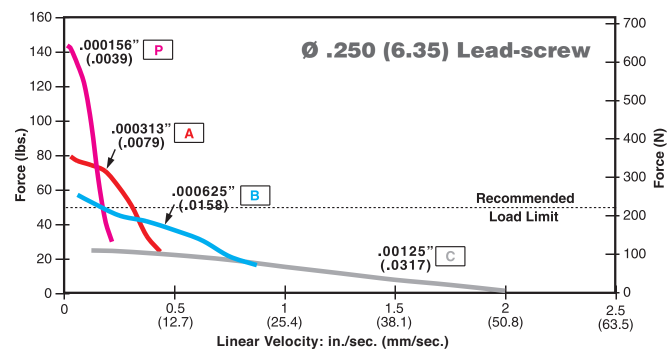




FORCE vs. LINEAR VELOCITY

Chopper • Bipolar • 100% Duty Cycle





NOTE: All chopper drive curves were created with a 5 volt motor and a 40 volt power supply.

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.

Haydon® 28000 Series Size 11 and 43000 Series Size 17

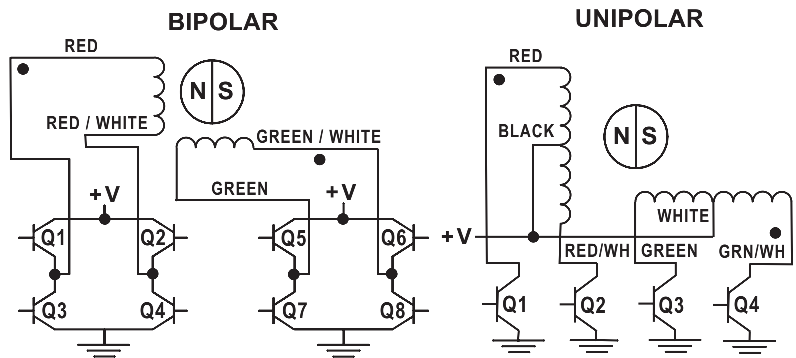
Hybrids: Stepping Sequence

Bipolar	Q2-Q3	Q1-Q4	Q6-Q7	Q5-Q8
Unipolar	Q1	Q2	Q3	Q4
Step				
1	ON	OFF	ON	OFF
2	OFF	ON	ON	OFF
3	OFF	ON	OFF	ON
4	ON	OFF	OFF	ON
1	ON	OFF	ON	OFF

EXTEND CW ↓
RETRACT CCW ↑

Note: Half stepping is accomplished by inserting an off state between transitioning phases.

Hybrids: Wiring



Integrated Connectors

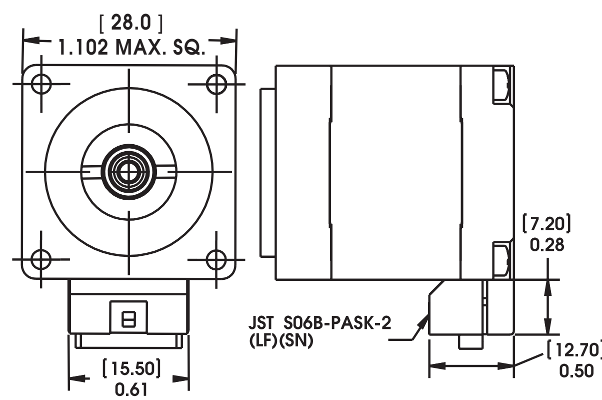
Hybrid Size 11 Double Stack and Size 17 Single Stack linear actuators are available with an integrated connector. Offered alone or with a harness assembly, this connector is RoHS compliant and features a positive latch in order for high connection integrity. The connector is rated up to 3 amps and the mating connector will handle a range of wire gauges from 22 to 28. This motor is ideal for those that want to plug in directly to pre existing harnesses. In addition to standard configurations, Haydon Kerk Motion Solutions can custom design this motor to meet your specific application requirements.

Motor Connector:
JST part # S06B-PASK-2
Mating Connector:
JST part # PAP-06V-S
Haydon Kerk Part #56-1210-5 (12 in. Leads)
Wire to Board Connector:
JST part number SPHD-001T-P0.5

Pin #	Bipolar	Unipolar	Color
1	Phase 2 Start	Phase 2 Start	G/W
2	Open	Phase 2 Common	–
3	Phase 2 Finish	Phase 2 Finish	Green
4	Phase 1 Finish	Phase 1 Finish	R/W
5	Open	Phase 1 Common	–
6	Phase 1 Start	Phase 1 Start	Red

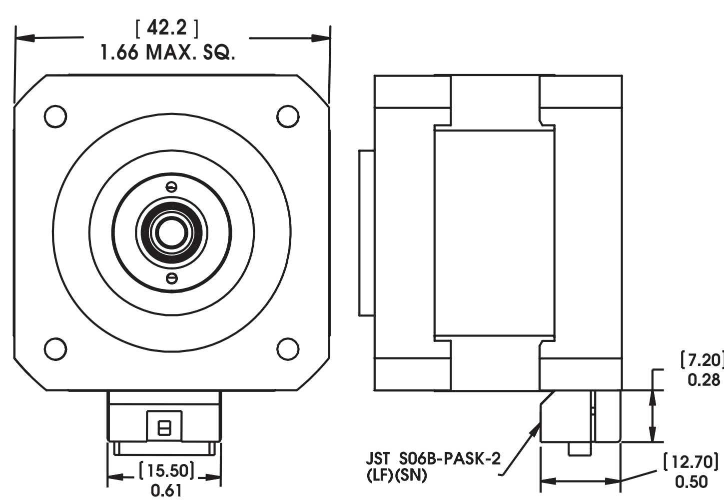
Dimensional Drawing: Integrated Connector with 28000 Series Size 11

Dimensions = (mm) inches



Dimensional Drawing: Integrated Connector with 43000 Series Size 17

Dimensions = (mm) inches



HAYDON: 203 756 7441
KERK: 603 213 6290
www.haydonkerkpittman.com
AMETEK®
ADVANCED MOTION SOLUTIONS

Linear Rails: Properly Sizing A Linear Rail System

Information needed to properly size a linear rail system

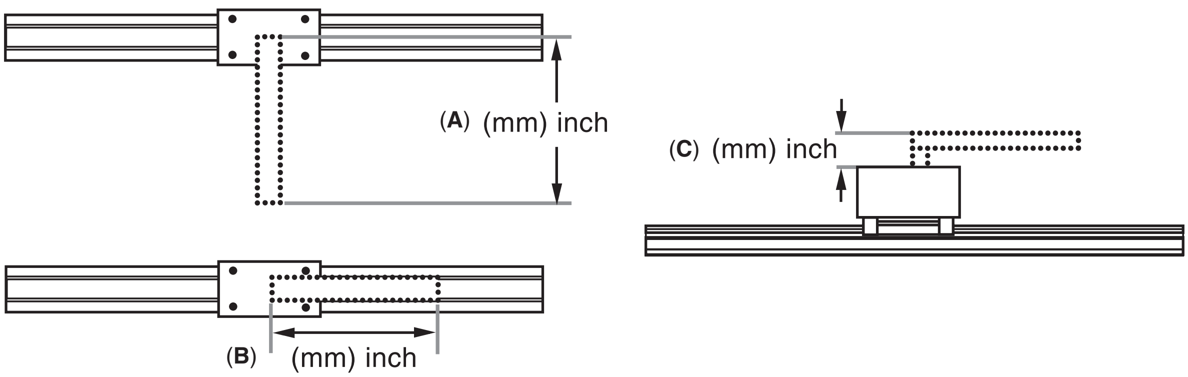
Haydon Kerk™ Linear Rail Systems are designed to be **precision motion devices**. Many variables must be considered before applying a particular rail system in an application. The following is a basic checklist of information needed that will make it easier for the Haydon Kerk engineering team to assist you in choosing the proper linear rail.

Linear Rail Application Checklist

1) ❏ **Maximum Load?** _______________ (N or lbs.)

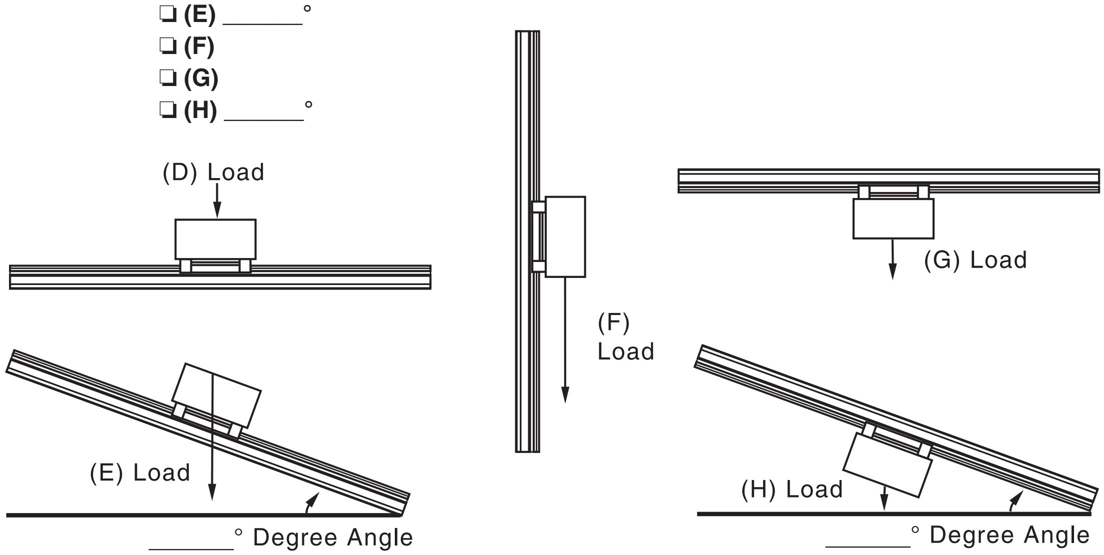
2) ❏ **Load Center of Gravity (cg) Distance and Height** (mm or inches)**?** See illustrations (A) (B) (C) below.
Dimensions (❏ **mm /** ❏ **inch)**:

❏ **(A)** _______ **... OR...** ❏ **(B)** ______ **AND...** ❏ **(C)** ________



3) ❏ **Rail Mount Orientation?** The force needed to move the load is dependent on the orientation of the load relative to the force of gravity. For example, total required force in the horizontal plane (D) is a function of friction and the force needed for load acceleration ($F_f + F_a$). Total force in the vertical plane is a function of friction, load acceleration, and gravity ($F_f + F_a + F_g$).

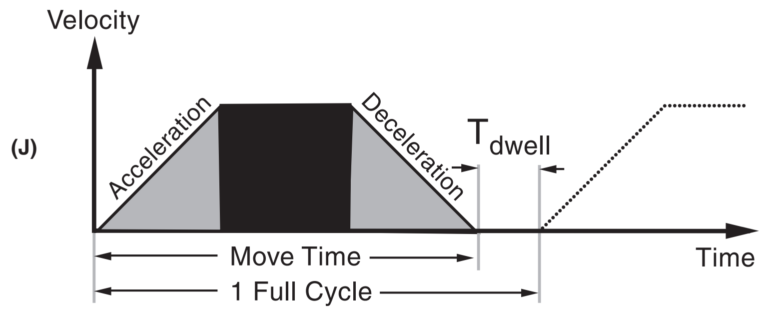
Orientation:
❏ **(D)**
❏ **(E)** ______°
❏ **(F)**
❏ **(G)**
❏ **(H)** ______°

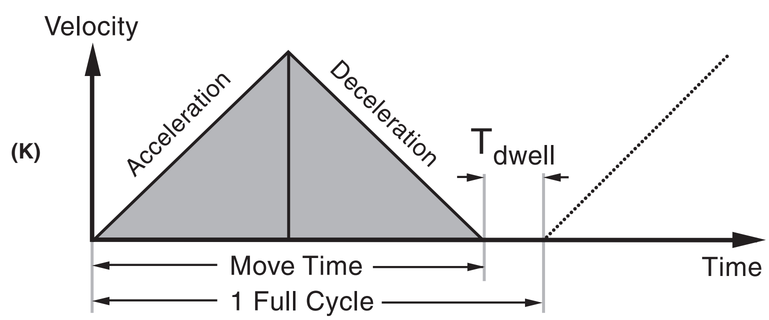


Linear Rail Application Checklist *(Continued)*

4) ❑ **Stroke Length to Move Load?** _______________ (mm or inches)
Overall rail size will be a function of stroke length needed to move the load, the rail frame size (load capability), the motor size, and whether or not an integrated stepper motor programmable drive system is added.

5) ❑ **Move Profile?**
A **trapezoidal** move profile divided into 3 equal segments (J) is a common move profile and easy to work with. Another common move profile is a **triangular** profile divided into 2 equal segments (K).





If using a **trapezoidal** (J) or **triangular** (K) move profile, the following is needed…

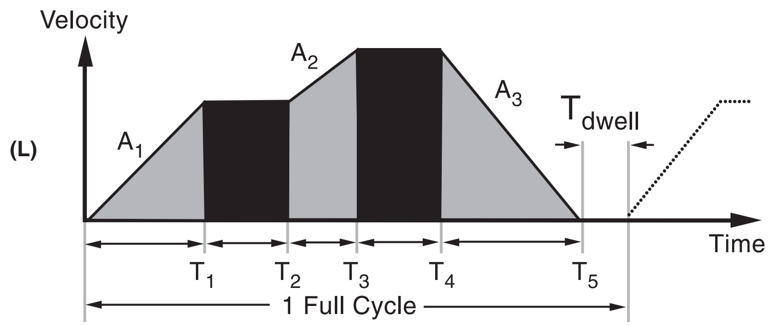
a) ❑ Point to point move distance ___________ (mm or inches)
b) ❑ Move time ___________ (seconds) including time of acceleration and deceleration
c) ❑ Dwell time between moves ___________ (seconds)

The trapezoidal move profile (J) is a good starting point in helping to size a system for prototype work.

A **complex** move profile (L) requires more information.

a) ❑ Time (in seconds) including: T_1, T_2, T_3, T_4, T_5…T_n and T_{dwell}
b) ❑ Acceleration / Deceleration (mm/sec.^{2} or inches/sec.^{2}) including: A_1, A_2, A_3…A_n

For more information call Haydon Kerk Motion Solutions Engineering at 203 756 7441.

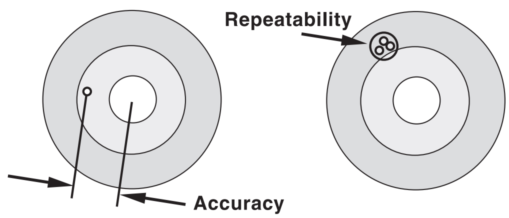


Linear Rail Application Checklist *(Continued)*

6) ❑ **Position Accuracy Required?** __________ (mm or inches)
Accuracy is defined as the difference between the theoretical position and actual position capability of the system. Due to manufacturing tolerances in components, actual travel will be slightly different than theoretical "commanded" position. See figure (M) below.

7) ❑ **Position Repeatability Required?** __________ (mm or inches)
Repeatability is defined as the range of positions attained when the rail is commanded to approach the same position multiple times under identical conditions. See figure (M) below.

(M)



8) ❑ **Positioning Resolution Required?** __________ (mm/step or inches/step)
Positioning resolution is the smallest move command that the system can generate. The resolution is a function of many factors including the drive electronics, lead screw pitch, and encoder (if required). The terms "resolution" and "accuracy" should never be used interchangeably.

9) ❑ **Closed-Loop Position Correction Required?** ❑ YES ❑ NO
In stepper motor-based linear rail systems, position correction is typically accomplished using a rotary incremental encoder (either optical or magnetic).

10) ❑ **Life Requirement?** (select the most important application parameter)
a) ❑ Total mm or inches _________
... or ... b) ❑ Number of Full Strokes _________
... or ... c) ❑ Number of Cycles _________

11) ❑ **Operating Temperature Range** ____________ (°C or °F)
a) ❑ Will the system operate in an environment in which the worst case temperature is above room temperature?
b) ❑ Will the system be mounted in an enclosure with other equipment generating heat?

12) ❑ **Controller / Drive Information?**
a) ❑ Haydon Kerk IDEA™ Drive (with Size 17 Stepper Motors only)
b) ❑ Customer Supplied Drive... Type? ❑ Chopper Drive ❑ L / R Drive
Model / Style of Drive: ____

13) ❑ **Power Supply Voltage?** ______________ (VDC)

14)* ❑ **Step Resolution?** a) ❑ Full Step b) ❑ Half-Step c) ❑ Micro-Step

15)* ❑ **Drive Current?** ____________ (A_{rms} / Phase) and ____________ (A_{peak} / Phase)

16)* ❑ **Current Boost Capability?** ________ (%)

** If the Haydon Kerk IDEA™ Drive is used disregard items 14, 15, and 16.*