EGS04 Motorized with 28000 Series

Linear Rail with Size 11 Double Stack Hybrid Stepper

Designed for Lab Automation and Electronic Assembly customers who need high-speed and highly-efficient point-to-point motion. This low-profile stage combines our patented screw support system, which allows for extended travel stroke without the normal reduction in screw RPM, with a ball bearing profile rail. The motorized EGS04 Linear Rail is available with either size 11 or size 17 hybrid stepper motors (see page 3). Standard carriage option is designed for horizontal loads up to 67 N (15 lbs.), and a long carriage option is available for higher loads.

- Low-profile
- High speed capability
- Efficient, stiff load support

EGS04 Motorized
Size 11 28000 Series

Specifications			
Design Payload (mass)	6.8kg [15 lbs]	**Pitch Moment***	5.25 N-m [46 lbf-in]
Axial Force	133N [30 lbf]	**Yaw Moment***	3 N-m [26 lbf-in]
Roll Moment*	3.1 N-m [27 lbf-in]	**Repeatability**	+/-25µm [0.001 in]

* Moment data based on 0.25° deflection

Identifying the Motorized EGS Part Numbers when Ordering

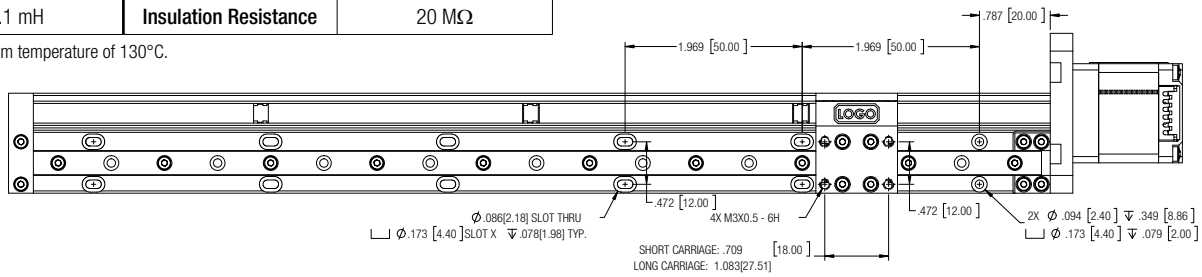
EGS	04	K	—	M	0100	—	E	S	M	—	Axx
Prefix **EGS** = EGS Series	**Nominal Rail Size** **04** = .25 in (6.35mm) diameter screw	**Screw Coating / Grease** **K** = Kerkote (standard) **S** = Uncoated		**Drive Type** **M** = Motorized, stepper	**Lead Code** **0025** = 0.025" lead **0039** = 1mm lead **0050** = 0.050" lead **0063** = 0.0625" lead **0079** = 2mm lead **0100** = 0.100" lead **0118** = 3mm lead **0200** = 0.200" lead **0250** = 0.250" lead **0394** = 10mm lead **0500** = 0.500" lead **0750** = 0.750" lead **1000** = 1.00" lead		**Encoder / Feedback** **E** = Rotary encoder **X** = No encoder	**Carriage(s)** **S** = Standard **L** = Long **M** = Multiple (std or long)	**Carriage Mounting** **E** = Imperial **M** = Metric		**Stroke / Unique Identifier** **Axx** = Unique identifier (e.g. A01)

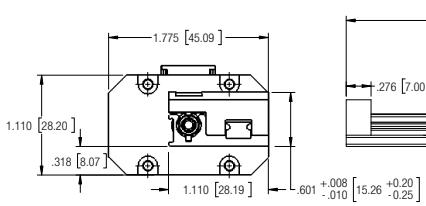
NOTE: Dashes must be included in Part Number (–) as shown above. For assistance call our Engineering Team at 603 213 6290. Carriage holes available in M3x0.5 or #4-40.

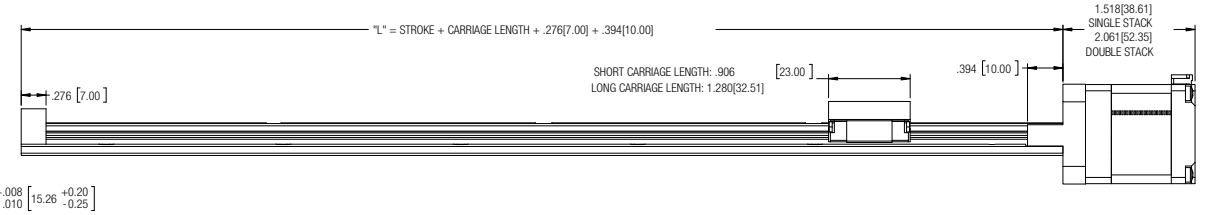
Size 11 Double Stack: 28 mm (1.1-in) Hybrid External Linear Actuator (1.8° Step Angle)			
Wiring	Bipolar	**Power Consumption**	7.5 W Total
Winding Voltage	2.1 VDC	**Rotor Inertia**	13.5 gcm^2
Current (RMS)/phase	1.9 A	**Insulation Class**	Class B (Class F available)
Resistance/phase	1.1 Ω	**Weight**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

Standard motors are Class B rated for maximum temperature of 130°C.

Size 11 Double Stack
28000 Series
External Linear Actuator



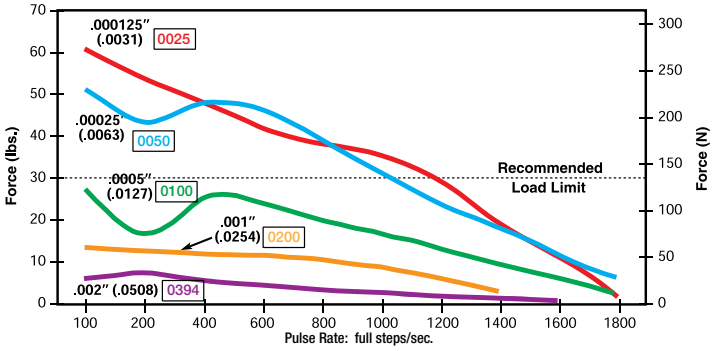




Double Stack

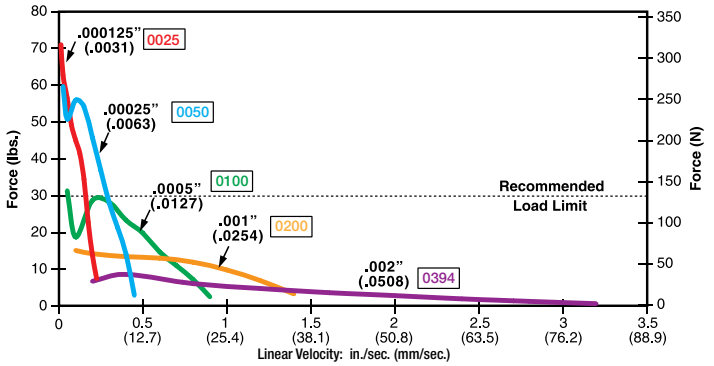
FORCE vs. PULSE RATE

– 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.

Size 11 28000 Series • Stepping Sequence & Wiring

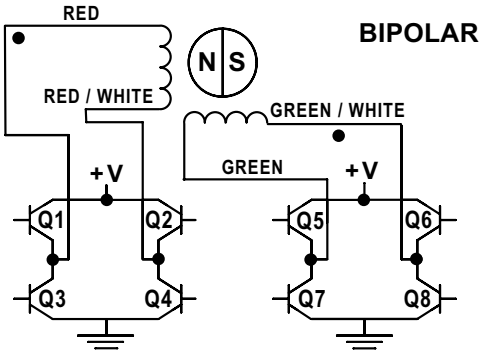
Hybrids: **Stepping Sequence**

EXTEND CW ⟵ ⟶ RETRACT CCW

Bipolar	Q2-Q3	Q1-Q4	Q6-Q7	Q5-Q8
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

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

Hybrids: **Wiring**



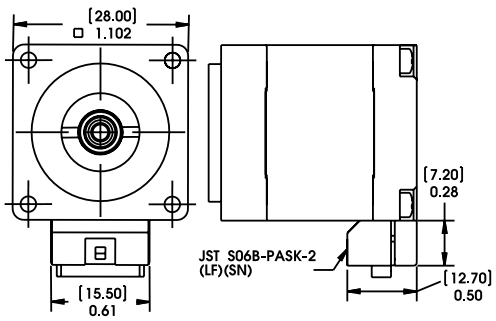
Size 11 28000 Series • Integrated Connector

Offered alone or with a harness assembly, the integrated 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. Ideal for those that want to plug in directly to pre-existing harnesses.

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 # 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

EGS04 Motorized with 43000 Series

Linear Rail with Size 17 Single or Double Stack Hybrid Stepper

This low-profile stage combines our patented screw support system, which allows for extended travel stroke without the normal reduction in screw RPM, with a ball bearing profile rail. The motorized EGS04 Linear Rail is available with size 17 hybrid stepper motors. Standard carriage option is designed for horizontal loads up to 67 N (15 lbs.), and a long carriage option is available for higher loads.

- Low-profile
- High speed capability
- Efficient, stiff load support

EGS04 Motorized
Size 17 43000 Series

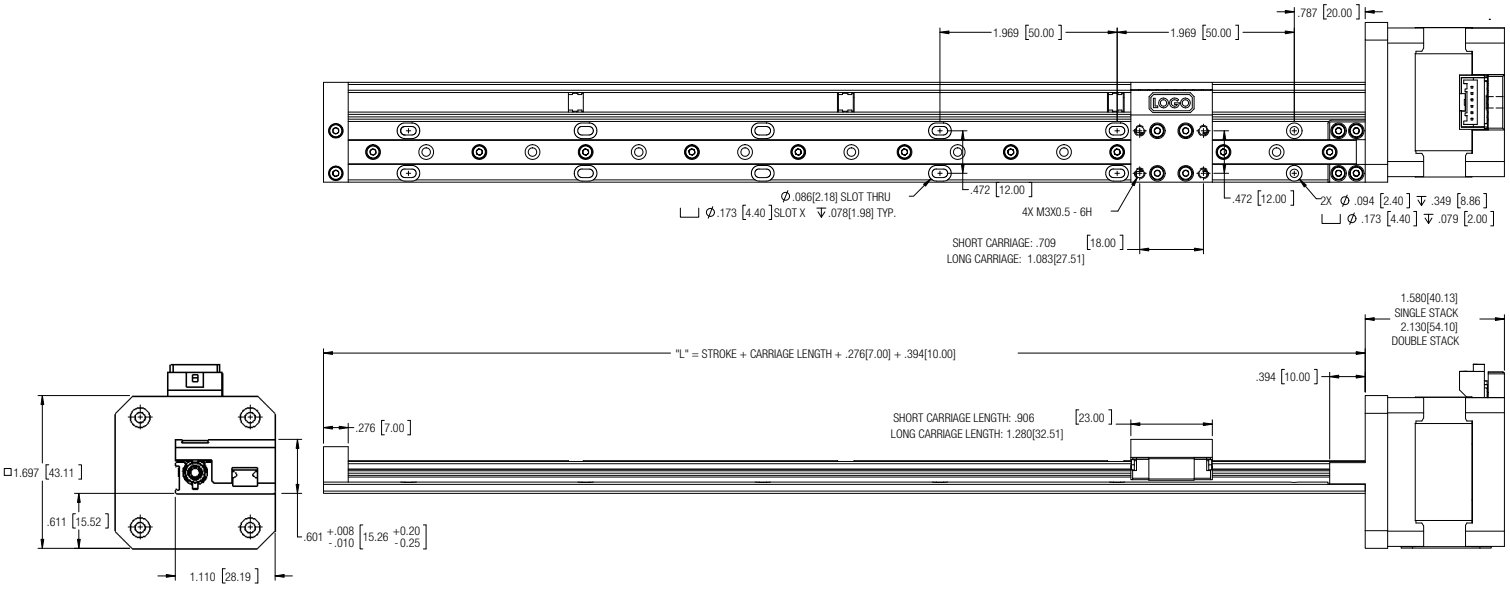
Identifying the Motorized EGS Part Numbers when Ordering

EGS	04	K	—	M	0100	—	E	S	M	—	Axx
Prefix **EGS** = EGS Series	**Nominal Rail Size** **04** = .25 in (6.35mm) diameter screw	**Screw Coating / Grease** **K** = Kerkote (standard) **S** = Uncoated		**Drive Type** **M** = Motorized, stepper	**Lead Code** **0025** = 0.025" lead **0039** = 1mm lead **0050** = 0.050" lead **0063** = 0.0625" lead **0079** = 2mm lead **0100** = 0.100" lead **0118** = 3mm lead **0200** = 0.200" lead **0250** = 0.250" lead **0394** = 10mm lead **0500** = 0.500" lead **0750** = 0.750" lead **1000** = 1.00" lead		**Encoder / Feedback** **E** = Rotary encoder **X** = No encoder	**Carriage(s)** **S** = Standard **L** = Long **M** = Multiple (std or long)	**Carriage Mounting** **E** = Imperial **M** = Metric		**Stroke / Unique Identifier** **Axx** = Unique identifier (e.g. A01)

NOTE: Dashes must be included in Part Number (–) as shown above. For assistance call our Engineering Team at 603 213 6290. Carriage holes available in M3x0.5 or #4-40.

Size 17: 43 mm (1.7-in) External Linear Actuator (1.8° Step Angle)								
	Single Stack					Double Stack		
Wiring	Bipolar			Unipolar**		Bipolar		
Winding Voltage	2.33 VDC†	5 VDC	12 VDC	5 VDC	12 VDC	2.33 VDC†	5 VDC	12 VDC
Current (RMS)/phase	1.5 A	700 mA	290 mA	700 mA	290 mA	2.6 A	1.3 A	550 mA
Resistance/phase	1.56 Ω	7.2 Ω	41.5 Ω	7.2 Ω	41.5 Ω	0.9 Ω	3.8 Ω	21.9 Ω
Inductance/phase	1.9 mH	8.7 mH	54.0 mH	4.4 mH	27.0 mH	1.33 mH	8.21 mH	45.1 mH
Power Consumption	7 W					13.2 W		
Rotor Inertia	37 gcm^2					78 gcm^2		
Insulation Class	Class B (Class F available)					Class B (Class F available)		
Weight	8.5 oz (241 g)					12.5 oz (352 g)		
Insulation Resistance	20 MΩ					20 MΩ		

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

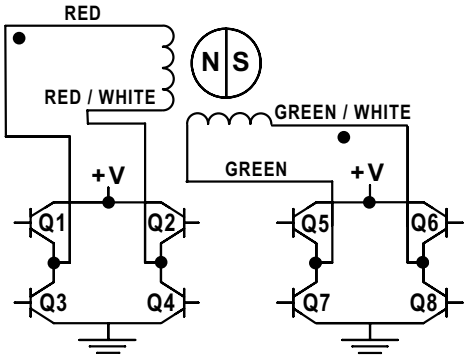


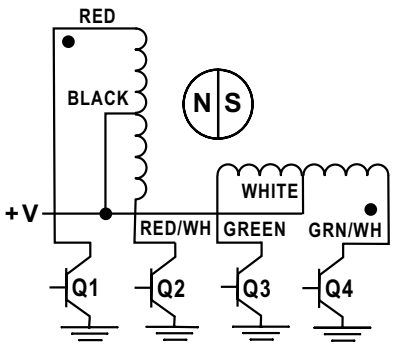
Hybrids: **Stepping Sequence**

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

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

Hybrids: **Wiring**

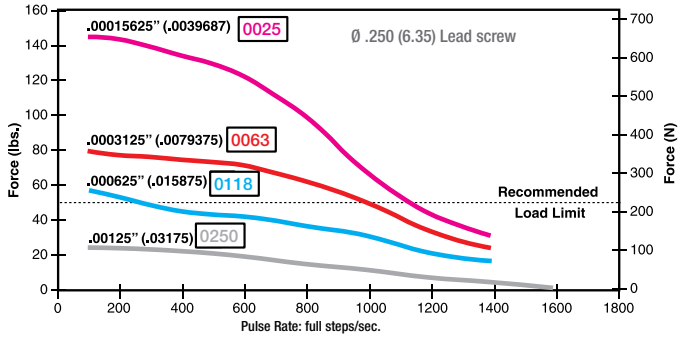




Single Stack

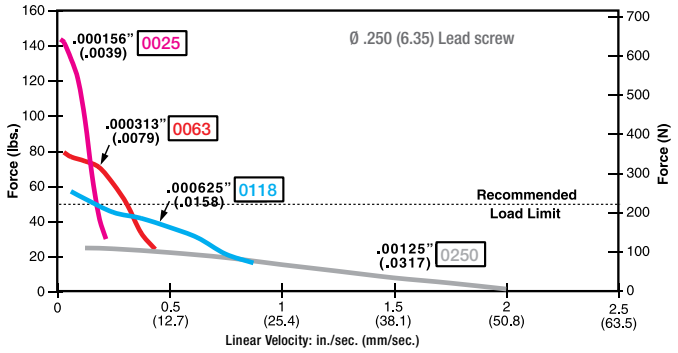
FORCE vs. PULSE RATE

– Chopper – Bipolar – 100% Duty Cycle



FORCE vs. LINEAR VELOCITY

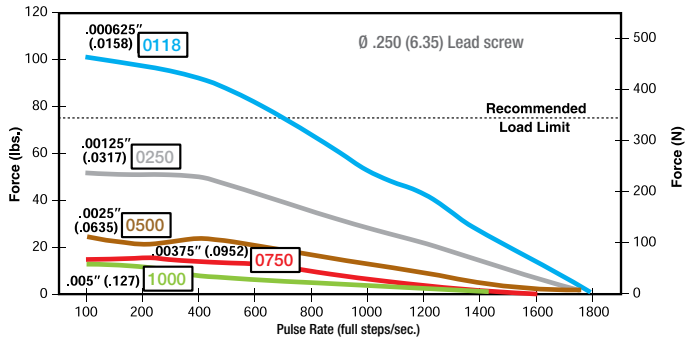
– Chopper – Bipolar – 100% Duty Cycle



Double Stack

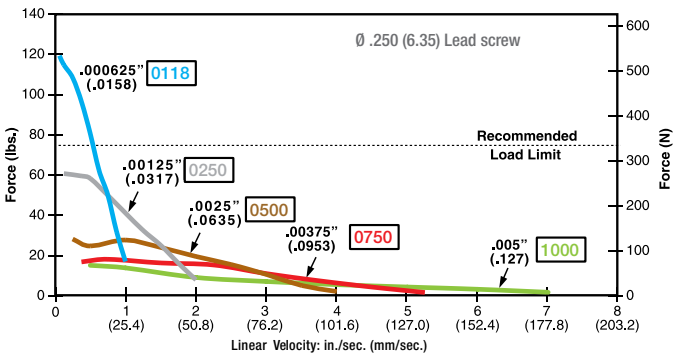
FORCE vs. PULSE RATE

– 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.

Size 17 47000 Series • Integrated Connector

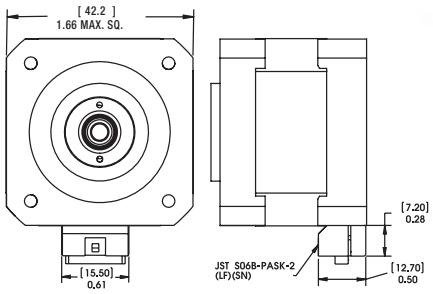
Offered alone or with a harness assembly, the integrated connector is RoHS compliant and features a positive latch in order for high connection integrity. The connector is rated up to 3 amps and the mating connector will handle a range of wire gauges from 22 to 28. Ideal for those that want to plug in directly to pre-existing harnesses.

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 # SPHD-001T-P0.5

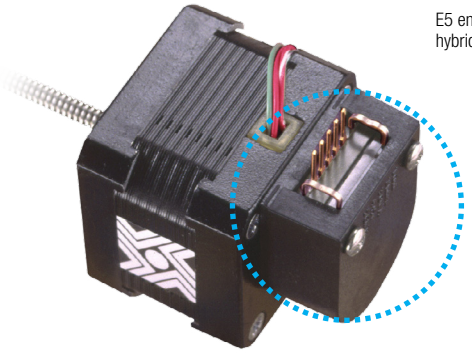
Pin #	Bipolar	Unipolar	Color
1	Phase 2 Start	Phase 2 Start	G/W
2	Open	Phase 2 Common	–
3	Phase 2 Finish	Phase 2 Finish	Green
4	Phase 1 Finish	Phase 1 Finish	R/W
5	Open	Phase 1 Common	–
6	Phase 1 Start	Phase 1 Start	Red



Encoders Designed for All EGS Rails

EGS Series rails are available with specifically designed encoders for applications that require feedback. The compact optical incremental encoder designs are available with two channel quadrature TTL squarewave outputs. Version with Index channel are also available. Various resolutions are available, up to 5000 CPR.

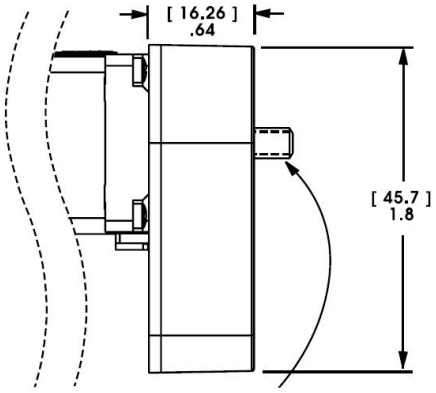
Simplicity and low cost make the encoders ideal for both high and low volume motion control applications. The internal monolithic electronic module converts the real-time shaft angle, speed, and direction into TTL compatible outputs. The encoder modules incorporate a lensed LED light source and monolithic photodetector array with signal shaping electronics to produce the two channel bounceless TTL outputs.



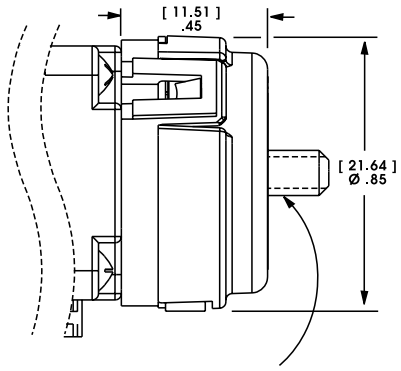
E5 encoder on Size 17 hybrid motor

E5 Encoder Dimensions

Dimensions = [mm] inches



E4T Encoder Dimensions



Electrical Specifications				
	Minimum	Typical	Maximum	Units
Input Voltage	4.5	5.0	5.5	VDC
Output Signals	4.5	5.0	5.5	VDC

2 channel quadrature TTL squarewave outputs.
Channel B leads A for a clockwise rotation of the rotor viewed from the encoder cover.
Tracks at speeds of 0 to 100,000 cycles/sec.
Index available on E4T.

Operating Temperature		
	Minimum	Maximum
E4T	- 20°C (- 28°F)	100°C (212°F)
E5	- 20°C (- 40°F)	100°C (212°F)

Mechanical Specifications	
	Maximum
Acceleration	250,000 rad/sec2
Vibration (5 Hz to 2 kHz)	20 g

Resolution				
	Standard Resolutions (CPR)			Maximum (CPR)
E4T	200	400	1000	1000
E5	200	400	1000	5000

*Other Resolutions Available - Contact Factory

Pinouts

E4T Single-Ended		E4T Differential		E5 Single-Ended		E5 Differential	
Connector Pin#	Description	Connector Pin#	Description	Connector Pin#	Description	Connector Pin #	Description
1	+5VDC power	1	Ground	1	Ground	1	Ground
2	A channel	2	A channel	2	Index	2	Ground
3	Ground	3	A- channel	3	A channel	3	Index-
4	B channel	4	+5VDC power	4	+5VDC power	4	Index+
		5	B channel	5	B channel	5	A- channel
		6	B- channel			6	A+ channel
						7	+5 VDC Power
						8	+5 VDC Power
						9	B- channel
						10	B+ channel

EGS04 Motorized with BLDC

EGS04 Motorized
BLDC Motor

Linear Rail with BLDC Motor

This low-profile stage features screw support with a ball bearing profile rail. The motorized EGS04 Linear Rail is available with a 42mm brushless DC (BLDC) servo motor for high speed applications. Standard configuration is a single stack EC042B with 1000cpr E30D encoder included. Recommended for horizontal loads up to 15 lbs (67N).

- Low-profile
- High speed capability
- Efficient, stiff load support

Refer to EC042B data sheet for complete motor specifications.

Identifying the Motorized EGS Part Numbers when Ordering

EGS	04	K	—	P	0100	—	E	S	M	—	Axx
Prefix **EGS** = EGS Series	**Nominal Rail Size** **04** = .25 in (6.35mm) diameter screw	**Screw Coating / Grease** **K** = Kerkote (standard) **S** = Uncoated		**Drive Type** **P** = Motorized BLDC **Q** = Integrated drive, BLDC	**Lead Code*** 0025, 0039, 0050, 0063, 0079, 0100, 0118, 0200, 0250, 0394, 0500, 0750, 1000		**Encoder / Feedback** **E** = Rotary encoder **X** = No encoder	**Carriage(s)** **S** = Standard **L** = Long **M** = Multiple (std or long)	**Carriage Mounting** **E** = Imperial **M** = Metric		**Stroke / Unique Identifier** **Axx** = Unique identifier (e.g. A01)

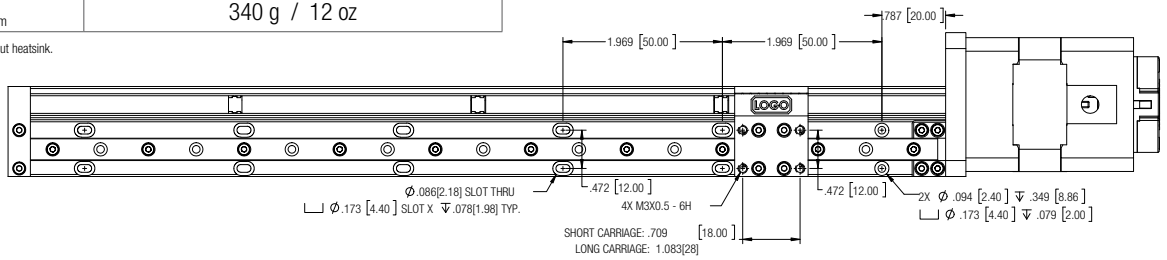
* Refer to page 1 or 3 for coordinating lead resolutions.

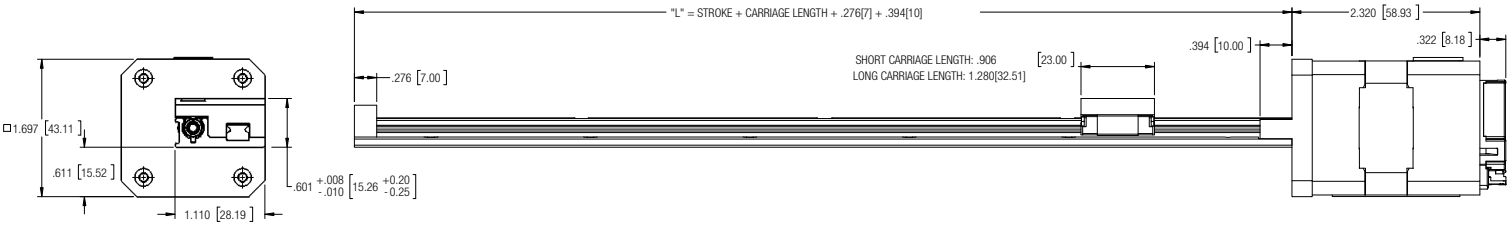
NOTE: Dashes must be included in Part Number (–) as shown above. For assistance call our Engineering Team at 603 213 6290. Carriage holes available in M3x0.5 or #4-40.

Motor Data		EC042B-1
Max DC Terminal Voltage	V_T	96 V
Max Speed (Mechanical)	ω_{MAX}	9000 rpm
Continuous Stall Torque[1]	T_{CS}	0.064 Nm / 9.0 oz-in
Peak Torque (Maximum)[1]	T_{pk}	0.38 Nm / 54 oz-in
Coulomb Friction Torque	T_f	0.0014 Nm / 0.20 oz-in
Viscous Damping Factor	D	3.4E-06 V/(rad/s) / 0.050 oz-in/krpm
Thermal Time Constant	τ_{th}	5.1 min
Thermal Resistance	R_{th}	9.1 °C/W
Max. Winding Temperature	Θ_{MAX}	105 °C
Rotor Inertia	J_r	1.4E-05 kg-m^2 / 0.0021 oz-in-s^2
Motor Weight	W_m	340 g / 12 oz

[1]Recorded at maximum winding temperature at 25°C ambient and without heatsink.

EC042B motor





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