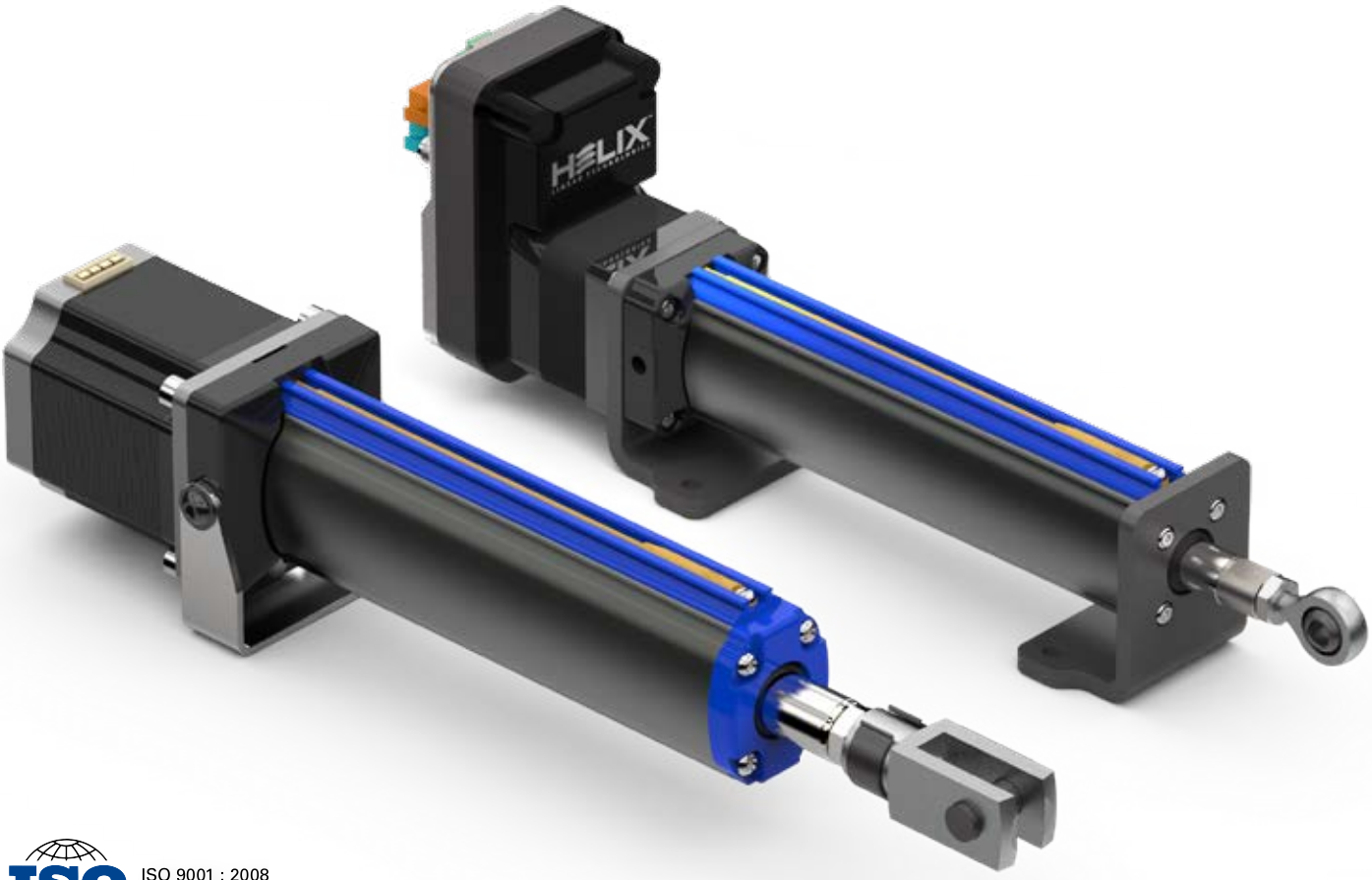
HELIX™
LINEAR TECHNOLOGIES

CAPTIVE ELECTRIC CYLINDERS

Ball Screw and Lead Screw Drives



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AS9100D CERTIFIED ISO 9001

ITAR International Traffic in Arms Regulations Compliant

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Helix Linear Technologies, Inc., Beachwood, Ohio

COMPANY

Helix is a global supplier to the Medical Device, Life Science, Security, Semiconductor, Aerospace, Electromechanical and Defense industries. Helix leads the linear motion industry by manufacturing the highest quality linear actuation solutions in the world. We focus entirely on manufacturing electro-mechanical actuation systems that help our customer be more productive and profitable. Our execution of innovative product designs solves real problems for our customers and builds a foundation for long term success.

HISTORY

Helix was founded in 2011 to manufacture high-quality lead screws for the growing electromechanical actuation industry. Helix's rapid growth has included the addition of linear actuator solutions to deliver integrated and turnkey solutions.

CULTURE

Our culture is based on a team of smart, happy and competitive professionals focused on manufacturing innovative products centered on delivering precise electromechanical linear motion solutions. We are in the people business, as well as the product business. People make and sell our products and a team of smart, happy and competitive people make a company healthy.

OPERATIONS

Our company is built to deliver high-quality products and engineering support to solve the most demanding linear motion applications in any industry. We deliver components and sub-system solutions to high volume OEMs and custom machine builders to help secure their success.

23200 Commerce Park Road | Beachwood, OH 44122 USA | 216-485-2232 or 1-855-435-4958 | email: sales@helixlinear.com

Electric Cylinder Sizes and Models

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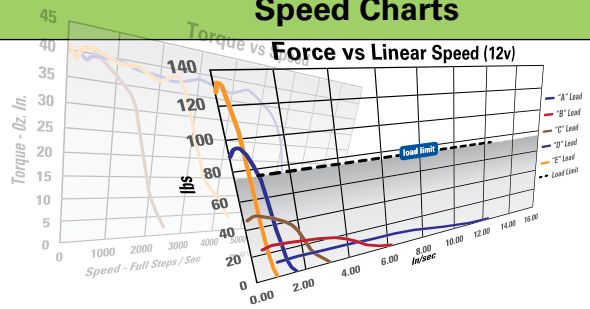
Speed Charts



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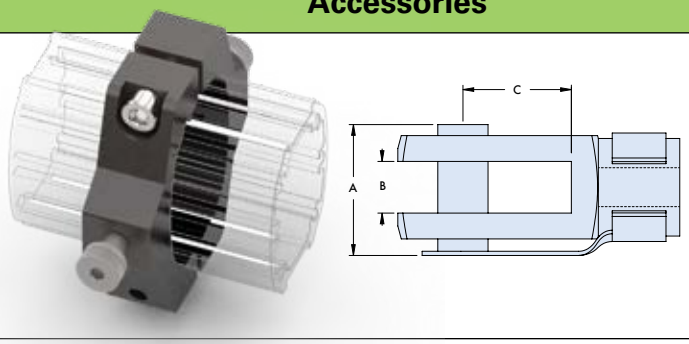
Accessories



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CEC-17 Electric Cylinder with Smart Motor

Features

- NEMA 17 and 23 sizes available
- Built-in protection circuitry
- Optional IP65 rating with M12 connectors
- Input power range from +12 up to +60 VDC
- Auxiliary logic power supply input
- 20 microstep revolutions to 51,200 steps/rev
- Programmable motor run and hold currents

CEC-23 Electric Cylinder

Features

- NEMA 17 and 23 sizes available
- Optional mounts and ends available
- Lead screw and ball screw configurations

FEATURES AND BENEFITS

Helix Electric Cylinders feature smooth, clean, and quiet linear positioning. The Electric Cylinders are built with a 300 series stainless steel lead screw, and coated with the Helix H10X™ dry coating. The lead screw assembly incorporates either standard or anti-backlash nuts in order to eliminate rotation. The Electric Cylinders have versatile mounting options. There are multiple options for motor mounts available. Options for sensors include magnetic sensors or sensor strips.

CAPTIVE ELECTRIC CYLINDER TERMS AND DEFINITIONS

BACKLASH - Backlash (lash) is the relative axial movement between a screw and nut without rotation of the screw or nut. Backlash in electric cylinders occurs wherever reversible load conditions exist. Standard lead screw and ball screw nuts = 0.004" backlash. Anti-backlash lead screw nuts = zero backlash. Ball nuts with reduced backlash = 0.001".

TRAVEL LENGTH

Electric Cylinders are not pre-assembled or stocked with standard length screws. Each cylinder is made to order based on travel length. Cylinders can be built with non-standard lead screws or ball screws to change the cylinder operating speed. Contact Helix Linear for availability of special units.

LEAD ACCURACY

Lead accuracy is the difference between the actual distance traveled versus the theoretical distance traveled based on lead. For example: Consider a lead screw with a .5" lead and +/- .004"/ foot lead accuracy. If the shaft is rotated 24 times, the distance the nut moves is 11.996 to 12.004 inches. The rolled thread screws, as employed in products, are held within +/- 0.0003" per inch lead error.

DUTY CYCLE

Duty cycle is the ratio of run time to total cycle time. Some of the electrical energy input to an electric cylinder is converted into heat. The duty cycle is limited by the ability of the electric cylinder to dissipate this heat. An increase in temperature can affect the properties of some components resulting in accelerated wear, damage and possible unexpected failure. The approximate allowable duty cycles for cylinders are:

Ball Screw versions = 85% ***Acme Screw versions = 25%***

TEMPERATURE

All Electric Cylinders are suitable for operation within the specified limits, provided that the housing temperature is not lower than -20°F or higher than +250°F (based on materials in cylinders not motors). Factory supplied grease in standard units will operate in this range. For higher or lower operating temperature ranges contact Helix Linear, for recommendations.

MAXIMUM LOAD

The maximum thrust load, including shock, that can be applied to the actuator without damaging the assembly.

DYNAMIC CAPACITY

The maximum allowable thrust load based on horsepower, thrust bearing, and screw limitation.

TENSION LOAD

A load that tends to "stretch" the screw.

COMPRESSION LOAD

A load that tends to "squeeze" the screw.

LOAD CAPACITY

All anticipated loads should be within the rated capacity of the cylinder. Loads on the cylinder in most applications include: static loads, dynamic or moving loads, cutting or other reaction forces and acceleration/deceleration loads. For shock loads, the peak load must not exceed the rated capacity of the cylinder, and an appropriate design factor should be applied commensurate with the severity of the shock. For accidental overloads not anticipated in the design of the system, cylinders can sustain the following overload conditions without damage: 10% for dynamic loads, 20% for static loads.

COLUMN STRENGTH

Electric Cylinder capacity may be limited by its column strength. Column strength is the ability of the cylinder to hold compressive loads without buckling. With longer screw lengths, column strength can be substantially lower than nominal cylinder capacity. When the lift screw is in tension only, travel is limited by available screw and/or tube material or by screw critical speed. If there is any possibility for the cylinder to go into compression, the application should be checked for sufficient column strength. The charts on each cylinder specification page are used to determine the cylinder size in applications where the lift screw is loaded in compression. The charts assume proper cylinder alignment with no bending loads present. Effects from side loading are not included in this chart. Also, cylinders operating horizontally with long lift screws can have significant bending from the weight of the screw and tubes. Consult Helix Linear if side loads are anticipated.

MAINTENANCE

Electric Cylinders require minimum maintenance. In addition to maintaining lubrication levels in the gearbox and tubes, the following items should be checked:

- The actuator tube should be kept free of dirt. If possible, the actuator should be returned to the retracted position when not in use.
- For acme cylinders, lash between the lift shaft and travel nut greater than 1/4 the screw pitch indicates the need for replacement of the cylinder lift shaft components.

CEC ORDERING GUIDE TABLE

ECI17M12S	-	AB	-	500	-	10.00	-	MP	-	00	-	CL	-	LP	-	E200	-	NPNC

Model	Motor Size	Motor Length	Nut Style	Screw Code	Stroke Length (inch)	Motor Mounting	Front Mount	Rod End	Linear Potentiometer	Encoder	Sensors (see pages 22-23)
ECI Inline Mount Electric Cylinder	**17** NEMA 17	**S** Single Stack	**S** Standard Lead Screw Nut	See Lead Screw and Ball Screw Code table on Page **5**	**IN** See Pages **6-9** for Actuator Length Data	**TR** Trunnion Mount	**MP** Mounting Plate	**CL** Clevis Rod Ends	**LP** Linear Potentiometer	**00** No Encoder	**00** Cover Strip
		D Double Stack				**FC** Female Clevis Mount **		**SP** Spherical Rod Ends		**E200** 200 CPR	**PNPF** Wire Lead 9.8 ft. (3.0m)
		00 No Motor	**AB** Anti-Backlash Lead Screw Nut			**MC** Male Clevis Mount **	**TR** Trunnion Mount	**AL** Alignment Coupler		**E500** 500 CPR	**NPNF** Wire Leads 9.8 ft. (3.0m)
	17P* NEMA 17 Smart Motor	**S** Single Stack				**FT** Foot Mount	**FT** Foot Mount	**ET** External Threaded Rod	**00** w/o Linear Potentiometer	**E1000** 1000 CPR	**PNPC** Snap-fit connector 0.5 ft. (0.15m)
	17M12* NEMA 17 Smart Motor		**BN** Ball Nut			**MP** Mounting Plate		**ETM** Metric External Threaded Rod		**E2000** 2000 CPR	**NPNC** Snap-fit connector 0.5 ft. (0.15m)
	23 NEMA 23	**S** Single Stack				**00** No Motor Mount	**00** No Front Mount	**00** Standard Internal Thread			
		D Double Stack									
		00 No Motor									
	23P* NEMA 23 Smart Motor	**S** Single Stack	**BL** Ball Nut with Reduced Lash								
	23M12* NEMA 23 Smart Motor										

EXAMPLE PART NUMBER: ECI17M12S-AB-500-10.00-MP-00-CL-LP-E200-NPNC

** **P** suffix = Pluggable connector type **M12** suffix = M12 connector type*
*** Only available for NEMA 23 motor size*

REQUIRED APPLICATION DATA

Load
- Total maximum thrust load on cylinders
- Total maximum thrust load on any one cylinder
- Number of cylinders

Travel
- Inches
- Orientation (vertical, horizontal, arc, diagonal, etc.)

Travel Rate
- Optimal speed
- Minimal and maximum acceptable speed

Duty Cycle
- Distance per cycle
- Number of cycles per time period
- Maximum distance traveled in any year
- Life desired

Configuration
- Tension, compression, or both
- Driven by motor or other
- Translating, Rotating, or Double Clevis

LEAD SCREW AND BALL SCREW SIZES

CEC-17 Captive Electric Cylinder

	NUT TYPE	ECI SIZE	SCREW CODE	MAX STROKE	TPI	LEAD ACCURACY	Backlash
				in	*Turns/in*	*in/ft*	*in*
Standard Lead Screw Nut	S	17	050	18	20.0	0.0003"/in	0.0070
	S	17	100	18	10.0	0.0003"/in	0.0070
	S	17	200	18	5.0	0.0003"/in	0.0070
	S	17	500	18	2.0	0.0003"/in	0.0070
	S	17	999	18	1.0	0.0003"/in	0.0
Anti-Backlash Lead Screw Nut	AB	17	050	18	20.0	0.0003"/in	0.0
	AB	17	100	18	10.0	0.0003"/in	0.0
	AB	17	200	18	5.0	0.0003"/in	0.0
	AB	17	500	18	2.0	0.0003"/in	0.0
	AB	17	999	18	1.0	0.0003"/in	0.0
Standard Ball Nut	BN	17	078	18	12.8	≤ 0.1mm/300mm	0.06 mm
Reduced Lash Ball Nut	BL	17	078	18	12.8	≤ 0.1mm/300mm	0.03mm

CEC-23 Captive Electric Cylinder

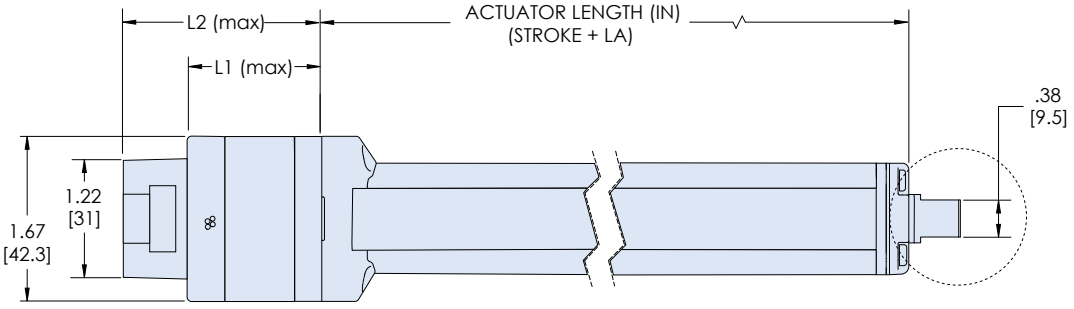
Standard Lead Screw Nut	S	23	157	24	20.00	0.0003"/in	0.0070
	S	23	200	24	10.00	0.0003"/in	0.0070
	S	23	250	24	8.00	0.0003"/in	0.0070
	S	23	375	24	5.00	0.0003"/in	0.0070
	S	23	500	24	2.00	0.0003"/in	0.0070
	S	23	999	24	1.00	0.0003"/in	0.0070
Anti-Backlash Lead Screw Nut	AB	23	157	24	20.00	0.0003"/in	0.0
	AB	23	200	24	10.00	0.0003"/in	0.0
	AB	23	375	24	5.00	0.0003"/in	0.0
	AB	23	500	24	2.00	0.0003"/in	0.0
	AB	23	999	24	1.00	0.0003"/in	0.0
Standard Ball Nut	BN	23	059	24	12.70	≤ 0.1mm/300mm	0.06 mm
	BN	23	079	24	12.70	≤ 0.1mm/300mm	0.06 mm
	BN	23	098	24	10.16	≤ 0.1mm/300mm	0.06 mm
	BN	23	118	24	8.47	≤ 0.1mm/300mm	0.06 mm
	BN	23	197	24	5.08	≤ 0.1mm/300mm	0.06 mm
	BN	23	315	24	3.18	≤ 0.1mm/300mm	0.06 mm
Reduced Lash Ball Nut	BL	23	059	24	16.93	≤ 0.1mm/300mm	0.06mm
	BL	23	079	24	12.70	≤ 0.1mm/300mm	0.03mm
	BL	23	098	24	10.16	≤ 0.1mm/300mm	0.03mm
	BL	23	118	24	8.47	≤ 0.1mm/300mm	0.03mm
	BL	23	197	24	5.08	≤ 0.1mm/300mm	0.03mm
	BL	23	315	24	3.18	≤ 0.1mm/300mm	0.03mm

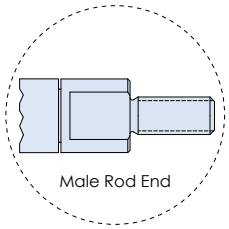
SCREW CODE	Description
S	Standard Lead Screw Nut
AB	Anti-Backlash Nut
BN	Ball Nut
BL	Ball Nut with Reduced Lash

CEC-17 ELECTRIC CYLINDER

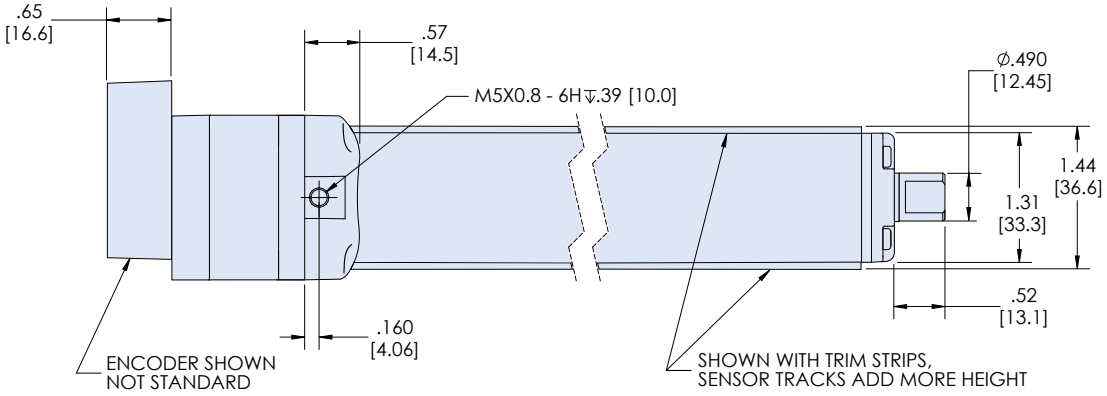
NEMA 17
(1.8° Step Angle)

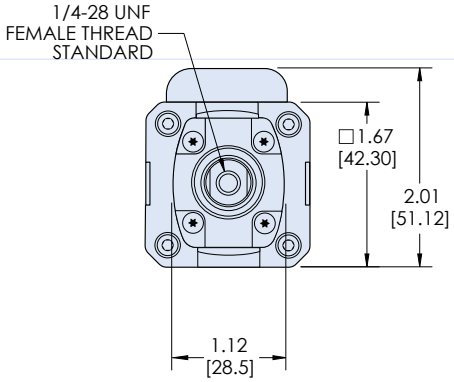
3D CAD ONLINE





Female Rod End is standard
Male Rod End is optional
(see page 12 for details)





	LA (length adder)	
NUT STYLE (see page 4)	**ECI**	**No Motor**
S	1.83	3.15
AB, BN, BL	2.51	3.83

Actuator Length = Stroke + LA (See table above)
We recommend an overtravel of 10mm be added to each end of your desired stroke.
18" maximum stroke length for NEMA 17 electric cylinder (1/2" increments).

Note: *Approximate unit weight .7 Lbs., (single stack motor, "0" travel)*
Add .10 lb per inch of cylinder length.

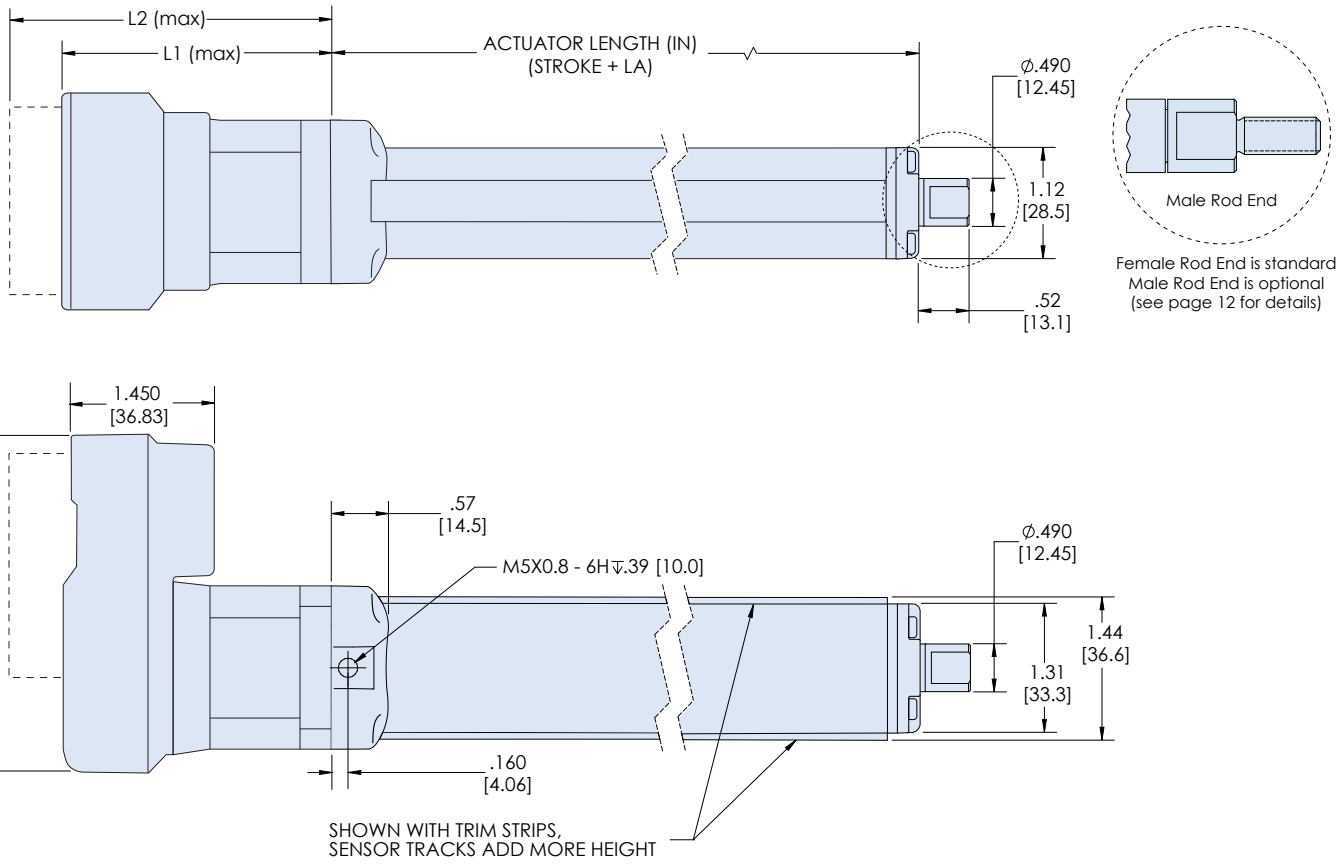
	L1 (max)	L2 (max) *
Motor Stack Length	**Without encoder**	**With encoder**
Single	1.33 (34mm)	1.98 (50.6)
Double	1.89 (48mm)	2.54 (80.6)

*Represents maximum dimension with encoder/options.

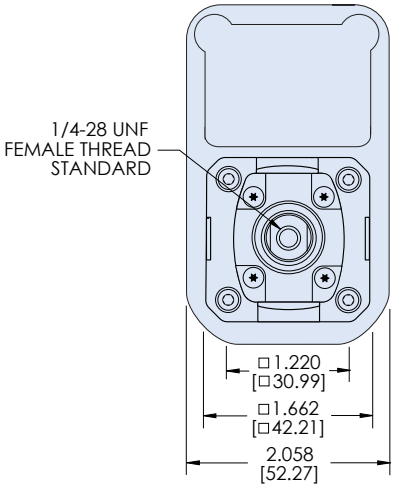
CEC-17 ELECTRIC CYLINDER with Smart Motor

NEMA 17
(1.8° Step Angle)

3D CAD ONLINE



	LA (length adder)	
NUT STYLE (see page 4)	**ECI**	**No Motor**
S	1.83	3.15
AB, BN, BL	2.51	3.83



Actuator Length = L Max + Stroke + LA (See table above)
We recommend an overtravel of 10mm be added to each end of your desired stroke.
18" maximum stroke length for NEMA 17 electric cylinder (1/2" increments).

Note: *Approximate unit weight 1.0 Lbs., (single stack motor, 10" length)*
For cylinders longer than 10" add .10 lb per additional inch of cylinder length.

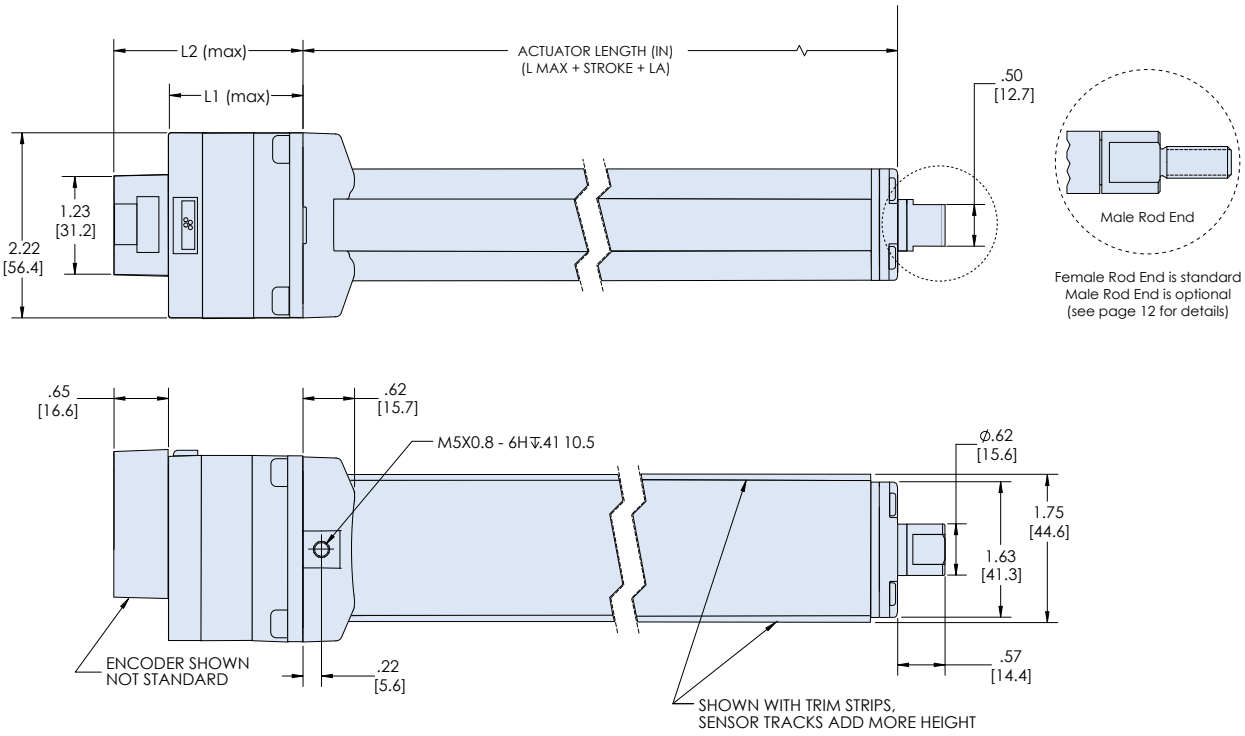
	L1 (max)		L2 (max) *	
Motor Stack Length	**Pluggable connector**	**M12 connector**	**Pluggable connector**	**M12 connector**
Single	2.40 (61.0)	2.78 (70.7)	3.22 (81.8)	3.39 (86.0)

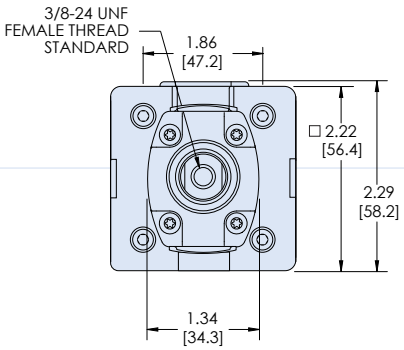
*Represents maximum dimension with connectors/options.

CEC-23 ELECTRIC CYLINDER

NEMA 23
(1.8° Step Angle)

3D CAD ONLINE





	LA (length adder)	
NUT STYLE (see page 4)	**ECI**	**No Motor**
S	2.16	3.42
AB, BN, BL	2.47	3.73

Actuator Length = Stroke + LA (See table above)
We recommend an overtravel of 10mm be added to each end of your desired stroke.
24" maximum stroke length for NEMA 23 electric cylinder (1/2" increments).

Note: *Approximate unit weight 1.66 Lbs., (single stack motor, "0" travel)*
Add .12 lb per inch of cylinder length.

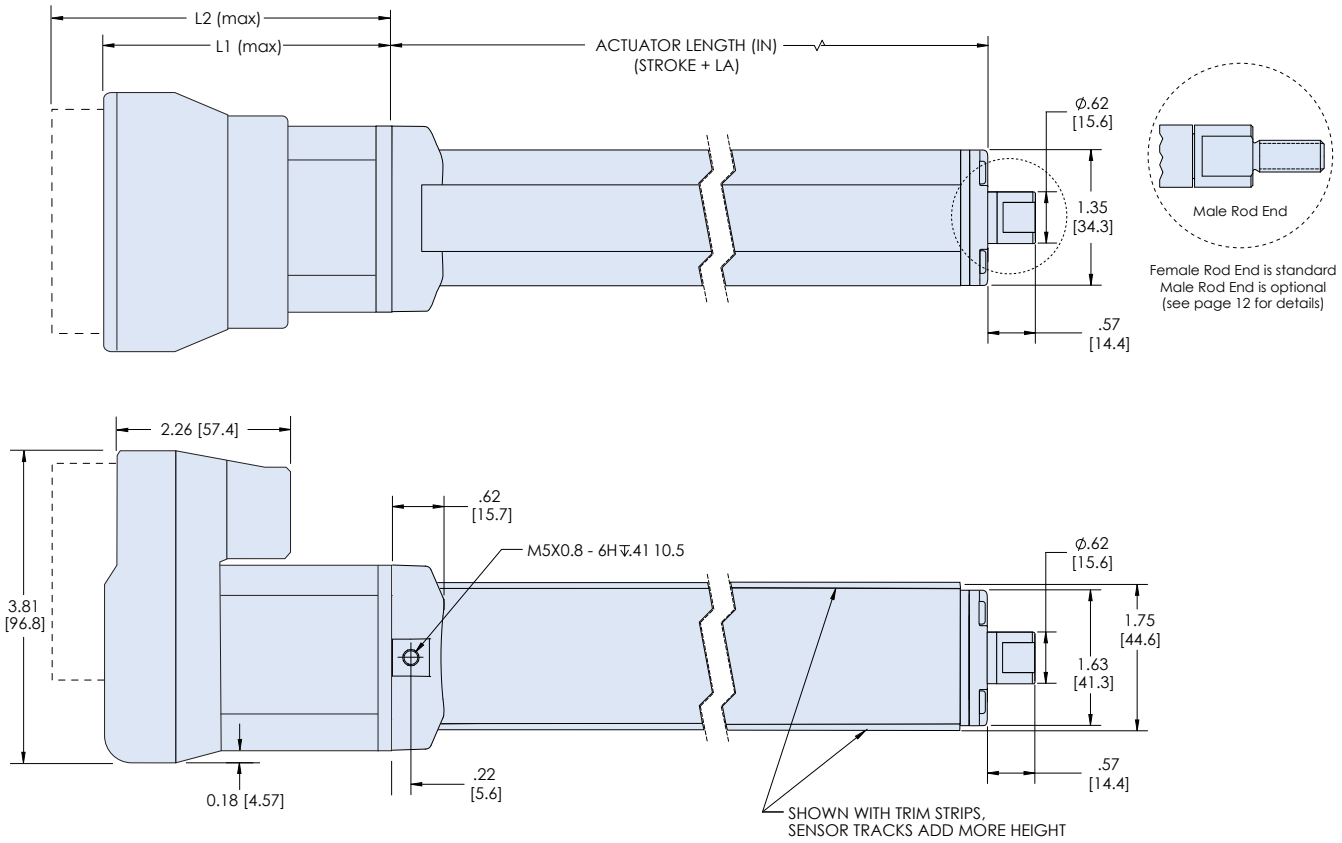
	L1 (max)	L2 (max) *
Motor Stack Length	**Without encoder**	**With encoder**
Single	1.77 (45mm)	2.42 (61.6)
Double	2.52 (64mm)	3.17 (80.6)

*Represents maximum dimension with encoder/options.

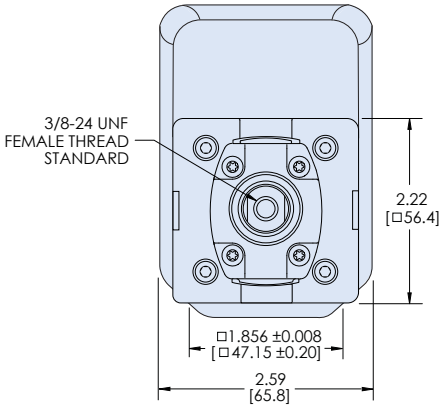
CEC-23 ELECTRIC CYLINDER with Smart Motor

NEMA 23
(1.8° Step Angle)

3D CAD ONLINE



	LA (length adder)	
NUT STYLE (see page 4)	**ECI**	**No Motor**
S	2.16	3.42
AB, BN, BL	2.47	3.73



Actuator Length = Stroke + LA (See table above)
We recommend an overtravel of 10mm be added to each end of your desired stroke.
24" maximum stroke length for NEMA 23 electric cylinder (1/2" increments).

Note: *Approximate unit weight 2.0 Lbs., (single stack motor, "0" travel)*
Add .12 lb per inch of cylinder length.

	L1 (max)		L2 (max) *	
Motor Stack Length	**Pluggable connector**	**M12 connector**	**Pluggable connector**	**M12 connector**
Single	3.17 (84.3)	3.32 (84.3)	3.91 (99.3)	4.01 (101.8)

*Represents maximum dimension with connectors/options.

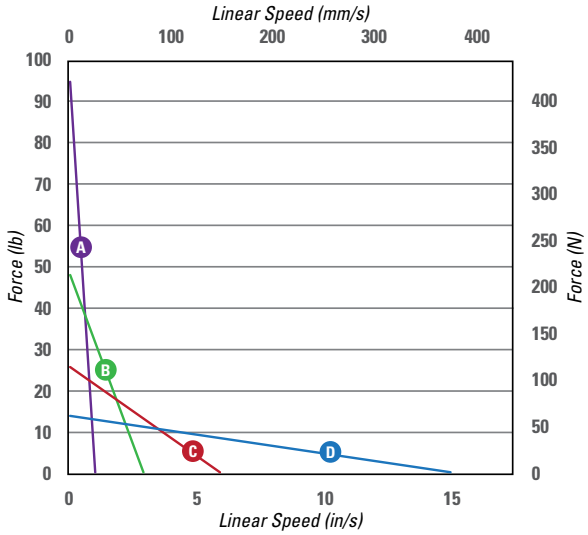
CEC-17 FORCE/SPEED CHARTS - LEAD SCREWS

Available Lead Screws

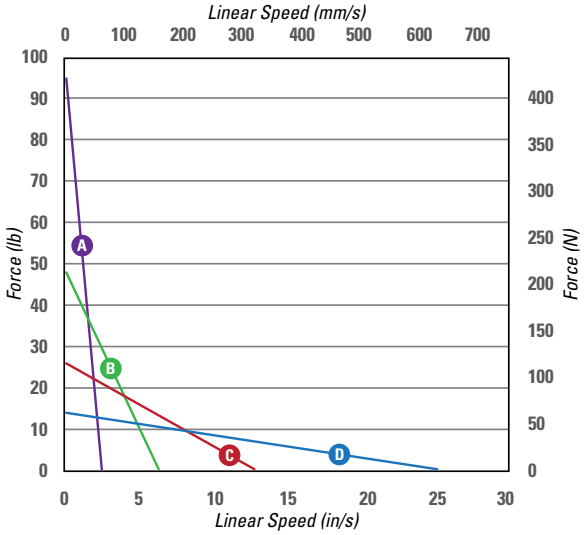
Model	Screw Diameter	Lead	Travel Per Step	Y Intercept	X Intercept (12)	X Intercept (24)	X Intercept (48)	Lead Type
ECI-17-100	0.2500	0.1000	0.00125	95	2	3	4	A
ECI-17-200	0.2500	0.2000	0.00100	48	3	6	9	B
ECI-17-500	0.2500	0.5000	0.00250	28	7	12	17	C
ECI-17-999	0.2500	1.0000	0.00500	14	15	25	34	D

Additional lead screw sizes available upon request.

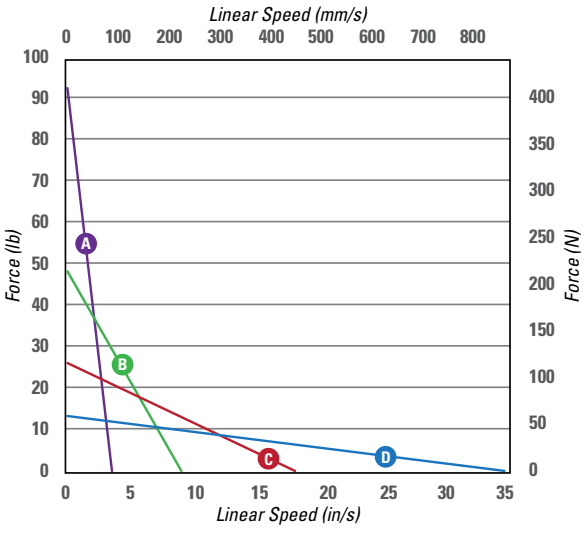
12v FORCE/SPEED



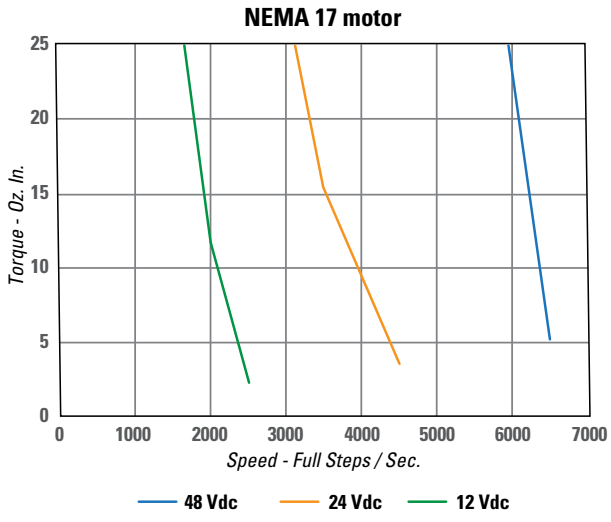
24v FORCE/SPEED



48v FORCE/SPEED



TORQUE v. SPEED



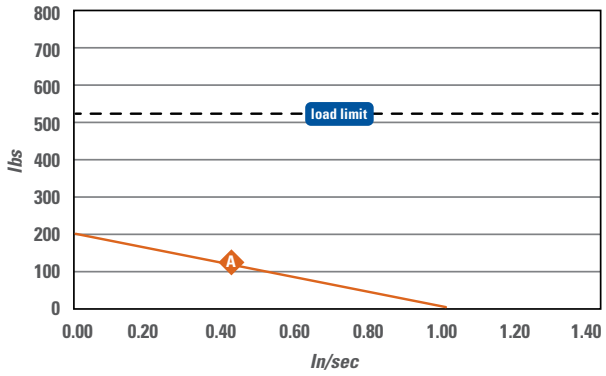
CEC-17 FORCE/SPEED CHARTS - BALL SCREWS

Available Ball Screws

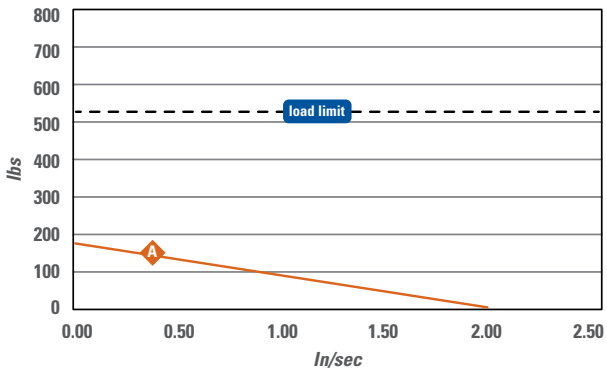
Model	Screw Diameter	Lead	Travel Per Step	Y Intercept	X Intercept (12)	X Intercept (24)	X Intercept (48)	Lead Type
ECI-17-B620	6mm	2mm	0.01mm	200	1.0	2.0	3.25	A

Additional lead screw sizes available upon request.

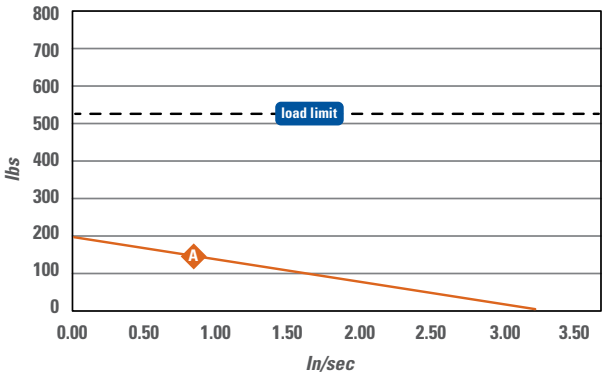
12v FORCE v. LINEAR SPEED



24v FORCE v. LINEAR SPEED



48v FORCE v. LINEAR SPEED



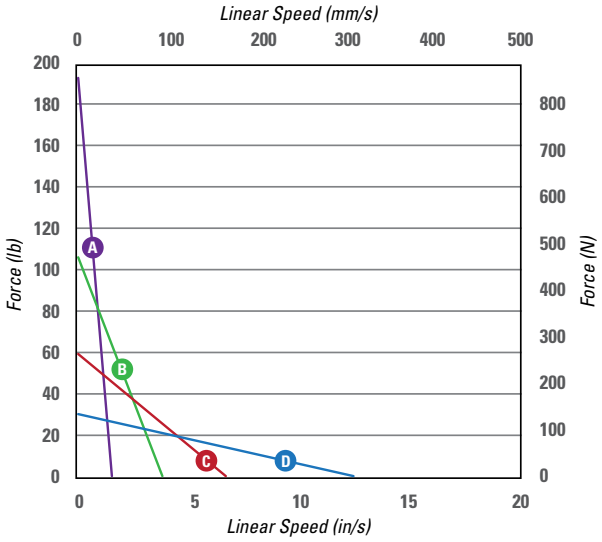
CEC-23 FORCE/SPEED CHARTS - LEAD SCREWS

Available Lead Screws

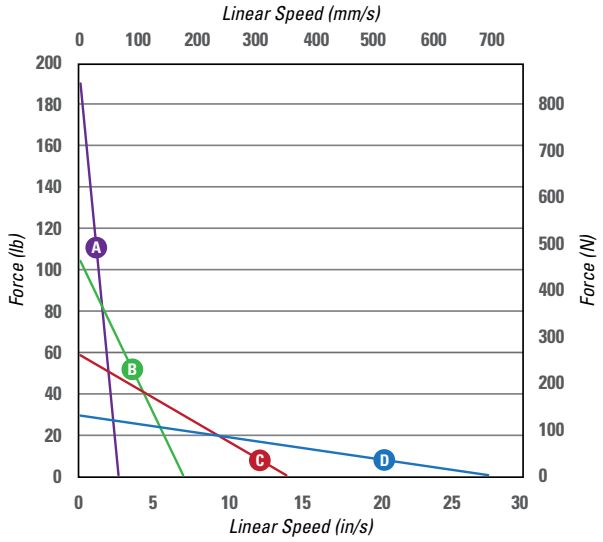
Model	Screw Diameter	Thread Lead	Linear Travel	Y Intercept	X Intercept (24)	X Intercept (48)	X Intercept (60)	Lead Type
ECI-23-157	0.375	0.100	0.0008	190	2	3	4	A
ECI-23-250	0.375	0.2500	0.0013	105	4	7	8	B
ECI-23-500	0.375	0.5000	0.0025	60	6	14	15	C
ECI-23-999	0.375	1.0000	0.0050	30	12	27	30	D

Additional lead screw sizes available upon request.

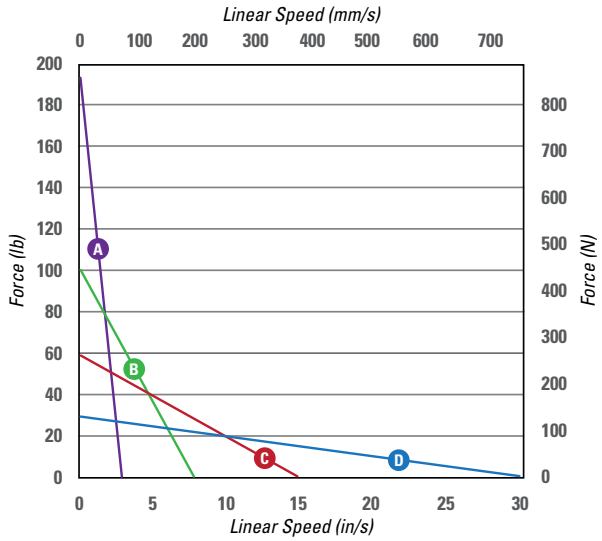
24v FORCE/SPEED



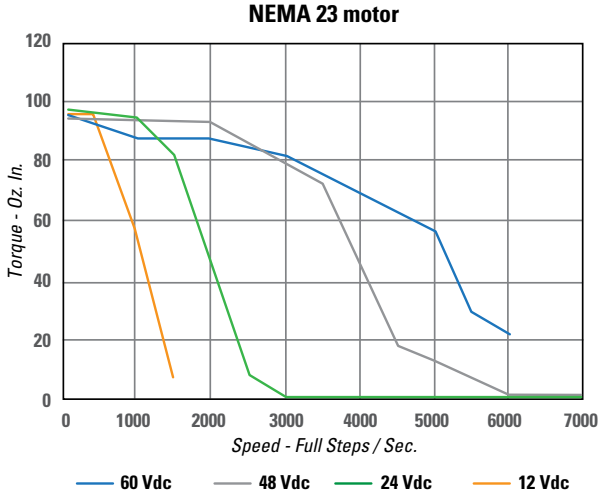
48v FORCE/SPEED



60v FORCE/SPEED



TORQUE v. SPEED



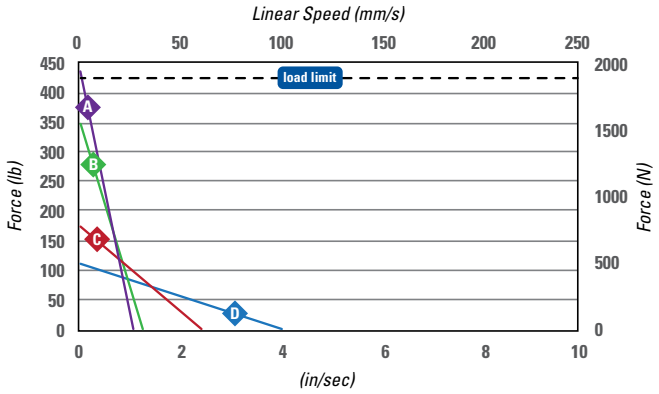
CEC-23 FORCE/SPEED CHARTS - BALL SCREWS

Available Ball Screws

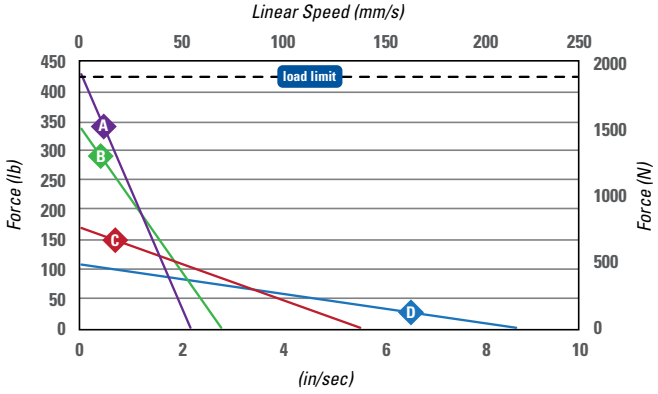
Model	Screw Diameter	Lead	Linear Travel	Y Intercept	X Intercept (24)	X Intercept (48)	X Intercept (60)	Lead Type
ECI-23-B820	8mm	2.0mm	0.0100	440	1	2.1	2.1	A
ECI-23-B825	8mm	2.5mm	0.0125	350	1.2	2.8	2.9	B
ECI-23-B850	8mm	5.0mm	0.0250	175	2.1	5.0	6.0	C
ECI-23-B880	8mm	8.0mm	0.0400	110	4.0	8.9	8.5	D

Additional lead screw sizes available upon request.

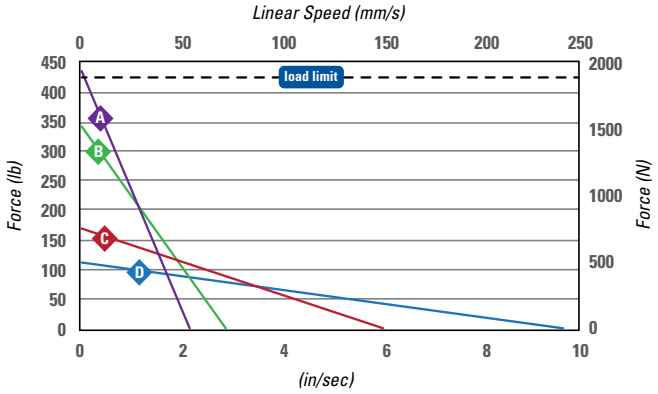
24v FORCE v. LINEAR SPEED



48v FORCE v. LINEAR SPEED



60v FORCE v. LINEAR SPEED

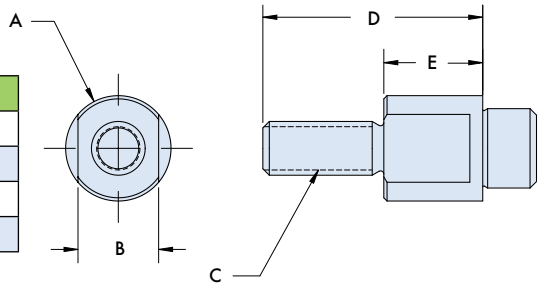


CYLINDER SHAFT ENDS

ROD END - ROD END MALE

Order Code: ET (Imperial) - ETM (Metric)

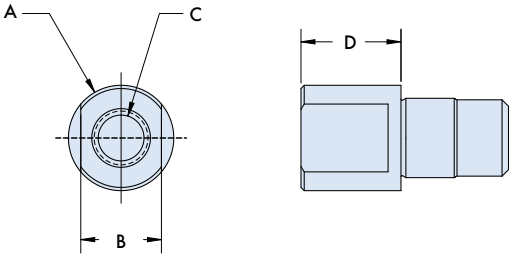
ROD END - MALE	A	B	C	D	E
16082254 (NEMA 17)	Ø.490	.375	1/4 - 28 UNF	1.02	.46
16082255 (NEMA 23)	Ø .615	.500	3/8 - 24 UNF	1.34	.46
18063769 (NEMA 17)	Ø.490	10 mm	M10 x 1.25 6g	1.33	.46
18063770 (NEMA 23)	Ø .615	13 mm	M12 x 1.25 6g	1.40	.46



ROD END - ROD END FEMALE

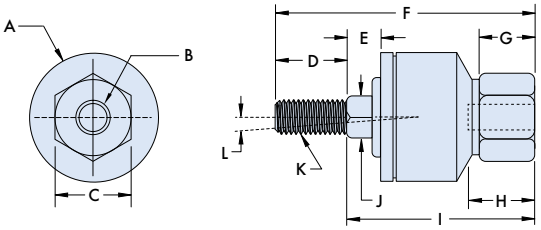
Order Code: 00 (Imperial)

ROD END - FEMALE	A	B	C	D
17062904 (NEMA 17)	Ø .490	.375	1/4-28 UNF↧ .50	.47
17062905 (NEMA 23)	Ø .615	.500	3/8-24 UNF↧ .75	.46



ROD END - CEC 17 ALIGNMENT COUPLER

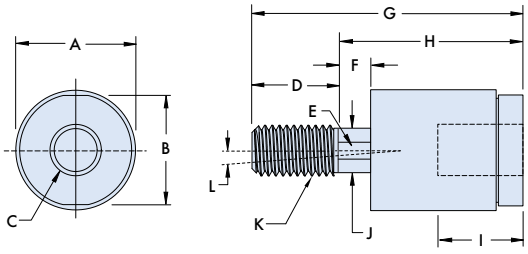
Order Code: AL17



COUPLER - 17	A	B	C	D	E	F	G	H	I	J	K	L
17123328 (NEMA 17)	0.94	1/4 - 28	.56	.50	.25	1.88	.41	.50	1.38	.31	1/4 - 28	5º

ROD END - CEC 23 ALIGNMENT COUPLER

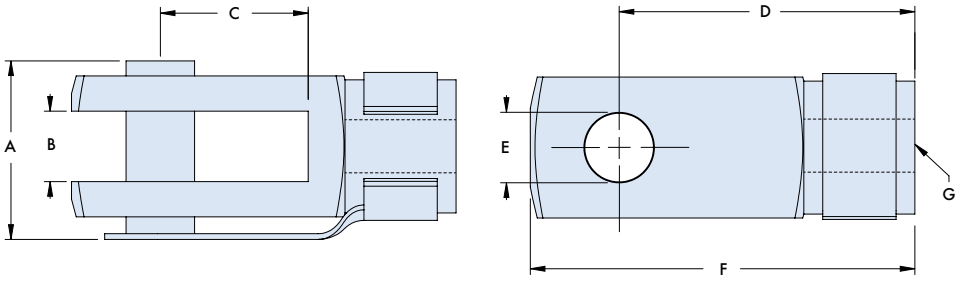
Order Code: AL23



COUPLER - 23	A	B	C	D	E	F	G	H	I	J	K	L
17123332 (NEMA 23)	.875	.812	3/8 - 24	.625	.312 flats	.250	2.00	1.375	.625	.312	3/8 - 24	2º

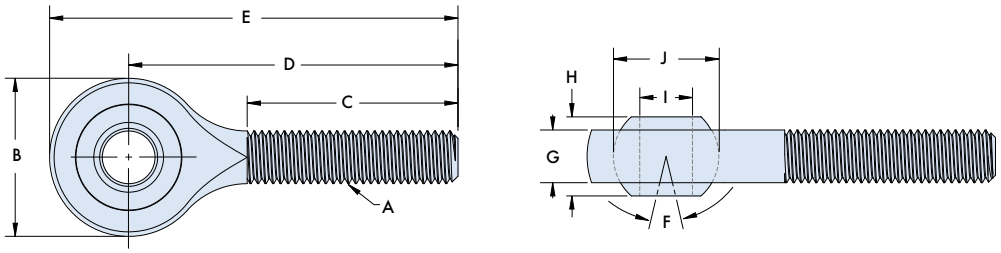
CYLINDER SHAFT ENDS (continued)

ROD END - ROD END CLEVIS
Order Code: CL

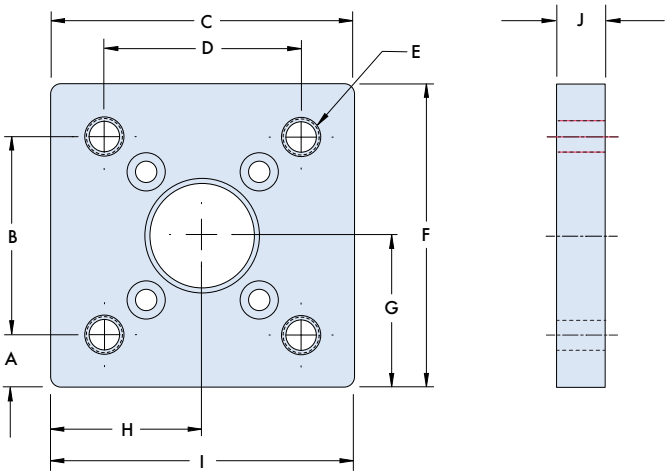


CLEVIS ROD END	A	B	C	D	E	F	G
17123327 (NEMA 17)	.641	.250	.469	.938	.250	1.218	1/4 - 28 UNF
17123331 (NEMA 23)	.953	.375	.781	1.562	.375	2.046	3/8 - 24 UNF

ROD END - BALL JOINT - MALE
Order Code: SPM



BALL JOINT ROD END - MALE	A	B	C	D	E	F	G	H	I	J
17123326 (NEMA 17)	1/4-28	.750	1.00	1.562	1.937	27° max.	.250	.375	.250	.500
17123330 (NEMA 23)	3/8-24	1.00	1.25	1.937	2.437	22° max.	.359	.500	.375	.718

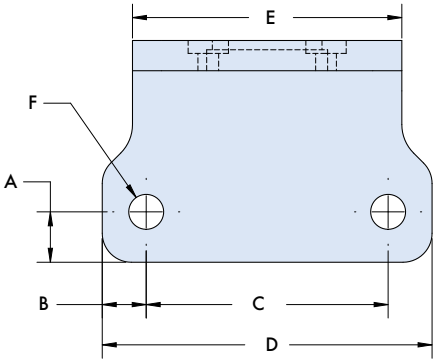


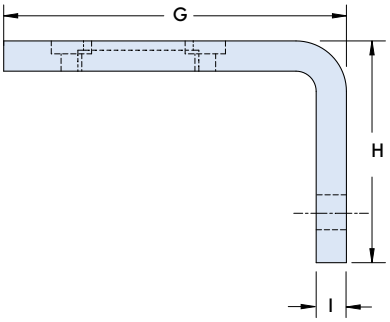
GUIDE ROD ADAPTER PLATE	A	B	C	D	E	F	G	H	I	J
18063789 (NEMA 17)	.34	1.280	1.280	.730	M6X1.0 THRU ALL	1.96	.984	.984	1.96	.31
18063790 (NEMA 23)	.38	1.496	1.496	.800	M6X1.0 THRU ALL	2.27	1.142	1.142	2.27	.38

MOUNTING HARDWARE

FRONT MOUNT - ROD END FOOT MOUNT

Order Code: FT

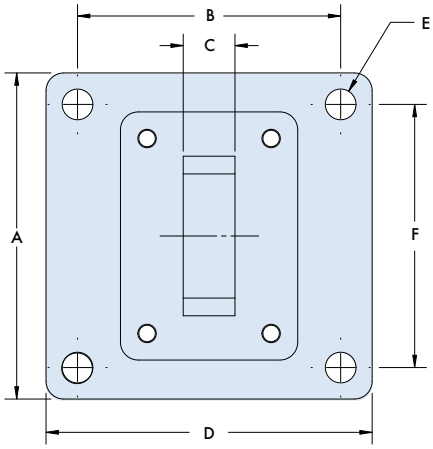


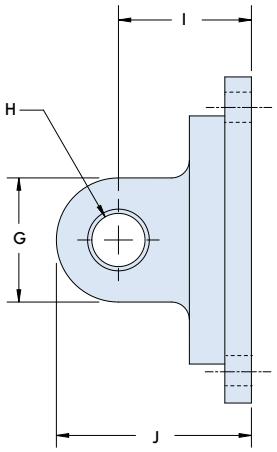


ROD END FOOT MOUNT	A	B	C	D	E	F	G	H	I
17082960 (NEMA 17)	.313	.273	1.500	2.05	1.67	.217	2.13	1.38	.19
17082986 (NEMA 23)	.313	.235	1.750	2.22	1.67	.26	2.53	1.38	.19

MOTOR MOUNT - CLEVIS MOUNT - MALE

Order Code: MC

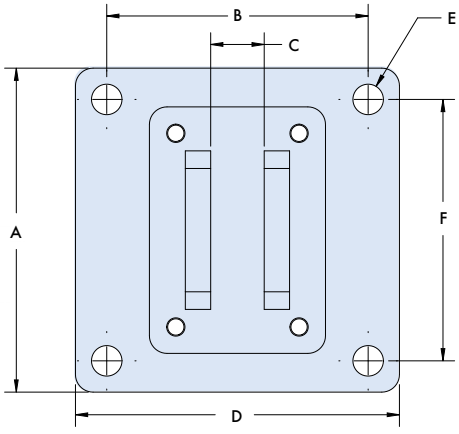


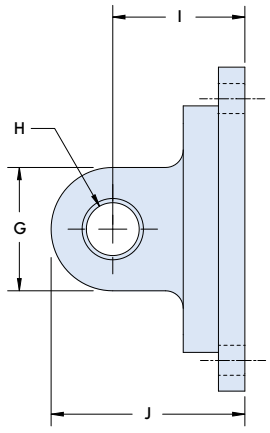


CLEVIS MOUNT - MALE	A	B	C	D	E	F	G	H	I	J
17082994 (NEMA 23 only)	2.30	1.856	.365	2.30	.217	1.856	.88	.376	.94	1.38

MOTOR MOUNT - CLEVIS MOUNT - FEMALE

Order Code: FC

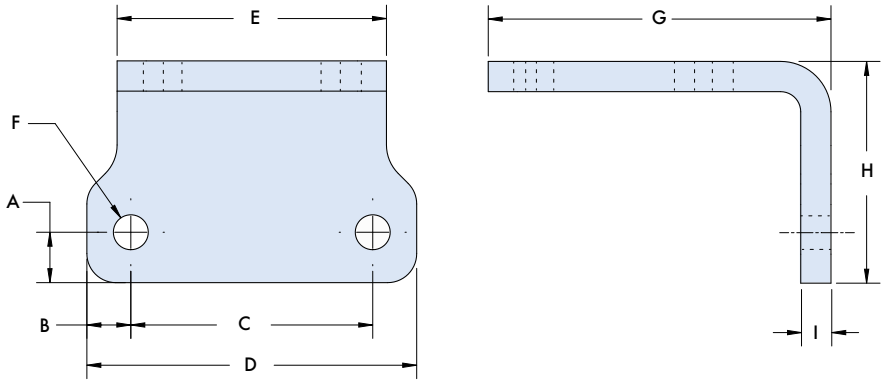




CLEVIS MOUNT - FEMALE	A	B	C	D	E	F	G	H	I	J
17082993 (NEMA 23 only)	2.30	1.856	.380	2.30	.217	1.856	.88	.376	.94	1.38

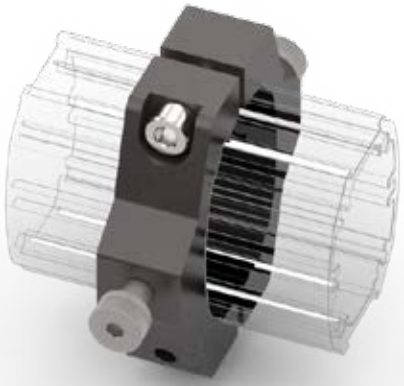
MOUNTING HARDWARE (continued)

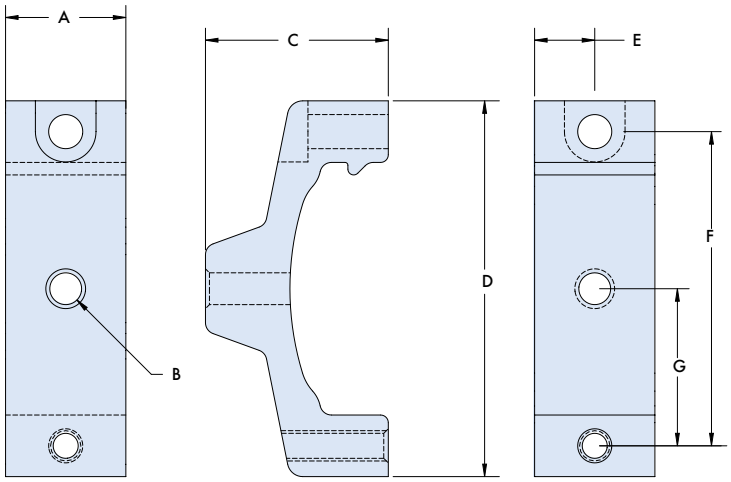
MOTOR MOUNT - MOTOR FOOT MOUNT
Order Code: FT



MOTOR FOOT MOUNT	A	B	C	D	E	F	G	H	I
17082961 (NEMA 17)	.313	.273	1.500	2.05	**1.67**	.217	2.13	1.38	.19
17082987 (NEMA 23)	.313	.235	1.750	2.22	**2.22**	.260	2.63	1.38	.19

FRONT MOUNT - MID-BODY TRUNNION MOUNT
Order Code: TR



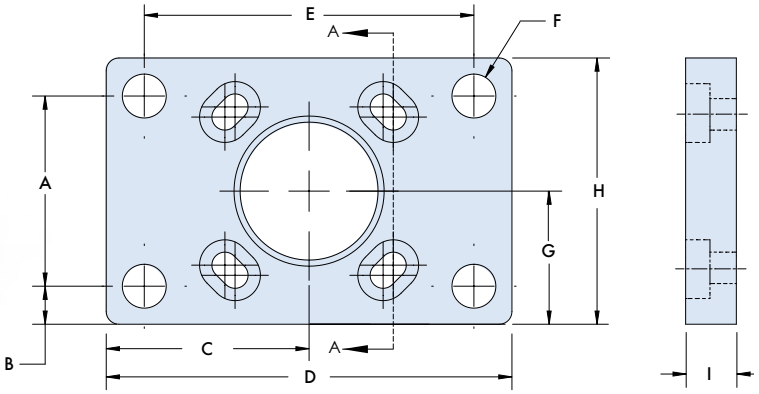


MID-BODY TRUNNION MOUNT	A	B	C	D	E	F	G
17123324 (NEMA 17)	.63	M5x0.8 - 6H ↧.500 Ø .207 X 90°, near side	.95	1.95	.313	1.633	.816
17123323 (NEMA 23)	.63	M5x0.8 - 6H ↧.500 Ø .217 X 90°, near side	1.08	2.38	.313	2.000	1.000

MOUNTING HARDWARE (continued)

FRONT MOUNT - FRONT FACE MOUNT

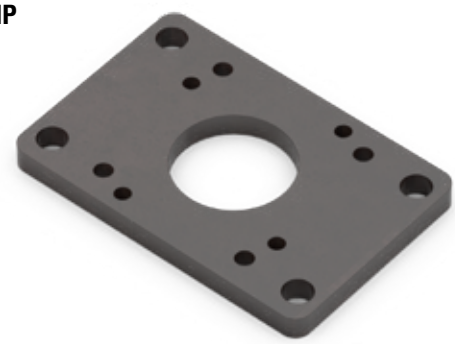
Order Code: MP

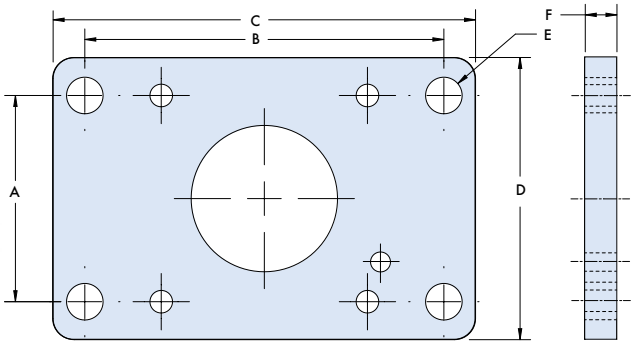


FRONT FACE MOUNT	A	B	C	D	E	F	G	H	I
17082962 (NEMA 17)	.938	.188	1.00	2.00	1.625	.217	.656	1.31	.250
17082989 (NEMA 23)	1.125	.250	1.107	2.21	1.750	.260	.813	1.63	.250

MOTOR MOUNT - REAR FACE MOUNT

Order Code: MP

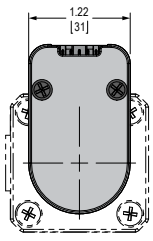


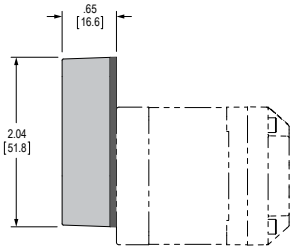


REAR FACE MOUNT	A	B	C	D	E	F
17082963 (NEMA 17)	1.220	2.125	2.50	1.67	.217	.19
17082988 (NEMA 23)	1.750	2.750	3.25	2.30	.260	.19

OPTICAL ROTARY ENCODERS (Available for standard NEMA Sizes 17 and 23 models only)

- Designed to provide digital feedback information
- Molded polycarbonate enclosure
- 5 or 10-pin finger latching connector (sold separately)
- 32 to 5000 cycles per revolution (CPR)
- 128 to 20000 pulses per revolution (PPR)
- 2 channel quadrature TTL squarewave outputs
- Optional index (3rd channel)
- -25 to +100C operating temperature
- Mounting compatibility with HEDS-5500





ENCODER OPTIONS

- Optical Rotary Encoders
- 32-5000 CPR available
- 128-20,000 pulses per revolution
- 2-channel quadrature TTL squareware outputs
- 5 pin or 10 pin latching connector

DRIVE SPECIFICATIONS

			NEMA 17	NEMA 23
Input power	Voltage	VDC	**17 +12 ...+48**	**+12 ...+60**
Motor	Current maximum [1]	Amp	2.0	3.5
	Frame size	NEMA	17	23
		mm	42	57
	Holding torque	oz-in	44	103
		N-cm	31	73
	Premium high torque motor	Option	no	yes
	Length	Stack sizes	Single	Single
Thermal	Operating temp non-condensing	Heat sink maximum	85°C	
		Motor maximum	100°C	
Protection	Type	Temp warning	0 ... 84°C, user selectable	
		Earth grounding	via product chassis ground lug	
		IP ratings	IP20, IP65	
Aux. logic input	Voltage range [2]	VDC	+12 ...+24	
Motion	Microstep resolution	Number of settings	20	
		Steps per revolution	200, 400, 800, 1000, 1600, 2000, 3200, 50 00, 6400, 10000, 12800, 20000, 25000, 25600, 40000, 50000, 51200, 36000 (0.01 deg/µstep), 21600 (1 arc minute/µstep), 25400 (0.001mm/µstep)	
	Encoder [3]	Line count	1000 lines / 4000 edges per rev	
		Style	internal, magnetic	
Hardware I/O sourcing or sinking	Analog input	Resolution	12 bit	
		Voltage range	0 ...+5 VDC, 0 ...+10 VDC, 0 ... 20 mA, 4 ... 20 mA	
	Signal inputs	Voltage range	+5 ... +24 VDC, TTL level compatible	
		Protection	current limited 5-20 volts	
	Power outputs	Current rating	-100 ...+100mA	
		Voltage range	-24 ...+24 VDC	
		Protection	over current, transient voltage suppression, inductive clamp	
	High-speed signal output	Current open collector/ emitter	5.5 mA	
		Voltage open collector	+60 VDC	
		Voltage open emitter	+7 VDC	
Communication	Protocol type	Ethernet TCP/IP	Profinet, EtherNet/IP (ODVA compliant), ModbusTCP, MCode/TCP on configuration port 503	
		CANopen	CANopen CiA DS301, DSP402, 2.0B active with features: node guarding, heartbeat, SDOs, PDOs (variable mapping)	
		RS-422/485	Baud rate 4.8 ... 115.2 kbps	

(1) Actual power supply current will depend on voltage and load.
(2) When input voltage is removed, maintains power only to control and feedback circuits. Not applicable to Pulse/Direction products.
(3) Encoders available - Contact our Application Engineers for more details.

MOTOR SPECIFICATIONS (smart motors)

SPECIFICATIONS - Programmable Motion Control, CANopen & Ethernet Products

			NEMA 17	NEMA 23
I/O sourcing or sinking	Number of I/O (1)	Analog input	1	1
		Signal inputs	3	4
		Power outputs	0	2
		Signal outputs	1	1
	Analog input	Resolution	12 bit	
		Voltage range	0 ...+5 VDC, 0 ...+10 VDC, 0 ... 20 mA, 4 ... 20 mA	
	Signal inputs	Voltage range	+5 ... +24 VDC, TTL level compatible	
		Protection	current limited 5-20 volts	
	Power outputs	Current rating	-100 ...+100mA	
		Voltage range	-24 ...+24 VDC	
		Protection	over current, transient voltage suppression, inductive clamp	
	High-speed signal output	Current open collector/emitter	5.5 mA	
		Voltage open collector	+60 VDC	
		Voltage open emitter	+7 VDC	
Motion	Counters	Type	position, encoder / 32 bit	
		Edge rate maximum	5 MHz	
	Velocity	Range	+/- 2,560,000 steps per second	
		Resolution	0.5961 steps per second	
	Accel/ Decel	Range	1.5 x 109 steps per second	
		Range	1.5 x 109 steps per second	

SPECIFICATIONS - Pulse/Direction Products

			NEMA 17	NEMA 23
Signal inputs	Number		2	
	Voltage range, isolated		+5 ...+24 VDC sourcing or sinking	
Analog input	Number		1	
	Resolution		12 bit	
	Voltage range		0 ...+5 VDC, 0 ...+10 VDC, 0 ... 20 mA, 4 ... 20 mA	
Attention output	Current	Open collector/emitter	5.5 mA	
	Voltage	Open collector	+60 VDC	
		Open emitter	+7 VDC	
Motion	Open loop configuration Operating modes		Pulse/direction, speed control, velocity mode	
	Closed loop configuration, requires LMD with encoder Operating modes		Pulse/direction input, variable speed control, constant velocity mode, variable torque mode	
	Encoder Outputs		6 TTL level compatible	
	Digital filter range		50 nS ... 12.9 µS (10 MHz ... 38.8 kHz)	
	Clock types (step mode)		Step / direction, quadrature, step up/ step down, clockwise / counterclockwise	
	Step frequency	Maximum	2.56 MHz	
		Minimum pulse width	100 ns	

MOTOR SPECIFICATIONS - (smart motors) *continued*

NEMA 17 Motor Specifications

Motor	Stack length	Single
Holding torque	*oz-in*	43.9
	N-cm	31
Detent torque	*oz-in*	1.7
	N-cm	1.2
Rotor inertia	*oz-in-sec²*	0.0005
	kg-cm²	0.038
Radial load limit, center of shaft	*lbs*	8.5
	kg	3.8
Axial load limit @ 1500 rpm (5000 full steps/sec)	*lbs*	10
	kg	4.5
Weight (motor+driver)	*oz*	13.6
	g	385

NEMA 23 Motor Specifications

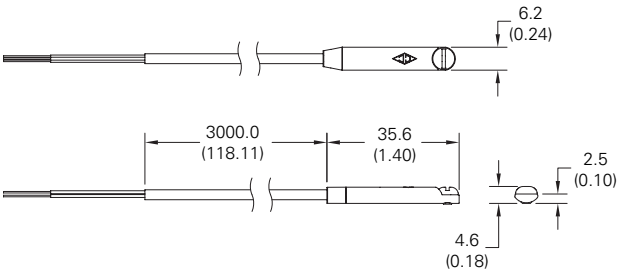
Motor	Stack length	Single	
Holding torque	*Torque level*	STD	HIGH
	oz-in	103	152
	N-cm	73	107
Detent torque	*oz-in*	3.9	8.5
	N-cm	2.7	6.0
Rotor inertia	*oz-in-sec²*	0.0025	0.0019
	kg-cm²	0.18	0.14
Radial load limit, center of shaft	*lbs*	15	15
	kg	6.8	6.8
Axial load limit @ 1500 rpm (5000 full steps/sec)	*lbs*	20	20
	kg	9	9
Weight (motor+driver)	*oz*	26.4	26.4
	g	748	748

MOTOR PERFORMANCE (standard motors)

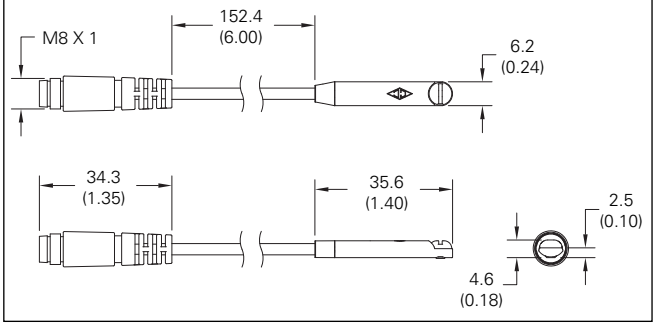
NEMA Rating	Motor Power	Current Per Phase	Holding Torque		Detent Torque		Rotor Inertia		Length mm (in)	Weight (g)
		A	N•mm	oz•in	N•mm	oz•in	g•cm2	oz•in2		
NEMA 17	Single	1.3	280	39.65	16	2.27	34	0.19	34 (1.34)	220
NEMA 17	Double	1.7	520	73.68	26	3.68	68	0.37	48 (1.89)	350
NEMA 23	Single	0.6	800	113.29	28	3.96	190	1.04	45 (1.77)	520
NEMA 23	Double	1.0	1500	212.42	50	7.08	380	2.08	64 (2.52)	850

POSITIONING SENSORS

CPS9Q-xx-A (wire lead style)



CPS9Q-xx-F (Snap-fit connector style)

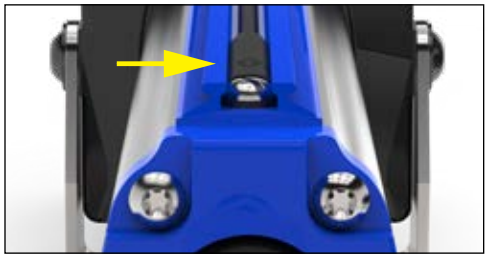


Helix sensors are designed to meet the need for low cost position sensing on the Electric Cylinders. It is highly accurate, with sensor repeatability up to ± .004" (0.1MM). This design allows users to install and adjust multiple sensors on a single actuator and integrate easily with a motion control system. The sensor system is supplied with two PNP or NPN (normally closed) switches. For additional switches or to order a normally open switch, contact Helix Application Engineers. Helix sensors are designed to allow easy field adjustments. Magnets are secured to the extension tube to ensure a positive response once it passes near the position sensor. To adjust the position sensors simply position the extension tube in the correct position, loosen the locking screw, and then slide the movable sensor to the desired location until the sensor indicates a response. Additional sensors can be added or moved. It is also possible to add multiple sensors to the same slot.

DC rated operational voltage: 10-30 VDC
DC rated operational amperage: < 150 mA
Operating temperature: -13°F to +158°F

Part No.	Output	Connection Type	Description
16011781-021	PNP	Wire leads 9.8 ft. (3.0m)	Electric cylinder switch, for position sensing, magnetic, rectangular, normally open, 3-wire, 5-28 VDC, electronic PNP transistor output, status LED (yellow), 9.8 ft. (3.0m) cable with wire leads. Low profile housing that can be mounted on cylinders with 6.5 x 3.2 mm T-slots.
16011781-011	NPN	Wire leads 9.8 ft. (3.0m)	Electric cylinder switch, for position sensing, magnetic, rectangular, normally open, 3-wire, 5-28 VDC, electronic NPN transistor output, status LED (red), 9.8 ft. (3.0m) cable with wire leads. Low profile housing that can be mounted on cylinders with 6.5 x 3.2 mm T-slots.
18043695-021	PNP	Snap-fit connector 0.5 ft. (0.15m)	Electric cylinder switch, for position sensing, magnetic, rectangular, normally open, 3-wire, 5-28 VDC, electronic PNP transistor output, status LED (yellow), 0.5 ft. (0.15m) cable with M8 snap-fit connector. Low profile housing that can be mounted on cylinders with 6.5 x 3.2 mm T-slots.
18043695-011	NPN	Snap-fit connector 0.5 ft. (0.15m)	Electric cylinder switch, for position sensing, magnetic, rectangular, normally open, 3-wire, 5-28 VDC, electronic NPN transistor output, status LED (red), 0.5 ft. (0.15m) cable with M8 snap-fit connector. Low profile housing that can be mounted on cylinders with 6.5 x 3.2 mm T-slots.

SWITCH SPECIFICATIONS

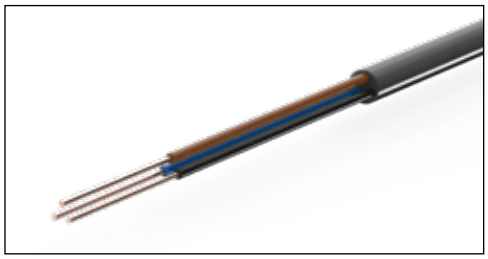


Detail "A" *illustrating the location of the positioning sensor.*

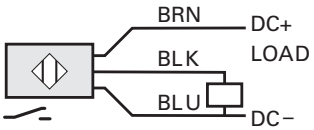
HELIX ELECTRIC CYLINDER SWITCH SPECIFICATIONS

Operating Voltage	5-28 VDC
Voltage Drop	1.0 V
Current Rating	0.2 Amps Max.
Switching Power	4.8 Watts Max.
Switching Speed	4µs operate / 4µs release
Short Circuit Protection	No
Reverse Polarity Protection	Yes
Overload Protection	No
Leakage Current	<0.01 mA
Sensing Technology	GMR
Off Delay Time	150-200 ms
Function Display	PNP switching status yellow / NPN switching status red
Switching Frequency	<1000 Hz
Magnetic Sensitivity	2.5 millitesla (25 gauss)
Housing Material	Ultem
Operation Temperature	-4° to 176°F (-20°C to 80°C)
Protection Rating	NEMA 6 / IP 67
Agency Approvals	CE, RoHS, REACH

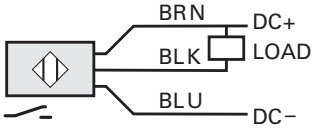
WIRING DIAGRAM



CPS9Q-**AN**-**A** *or* CPS9Q-**AP**-**A**

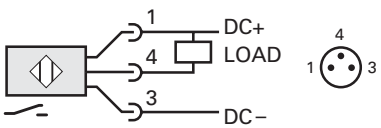


CPS9Q-AP-A

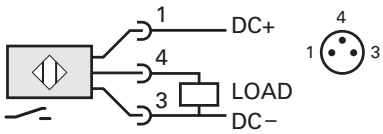


CPS9Q-AN-A

CPS9Q-**AN**-**F** *or* CPS9Q-**AP**-**F**

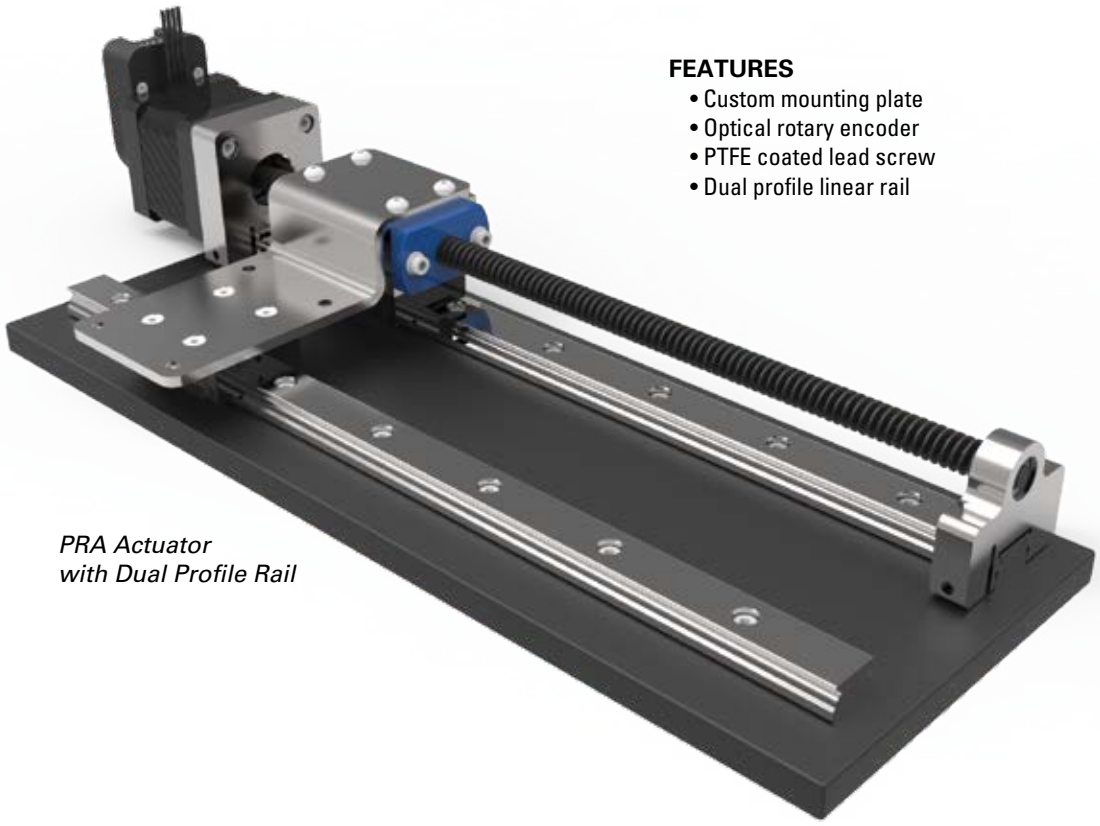


CPS9Q-AN-F



CPS9Q-AP-F

NEMA 17 CUSTOM PRA LINEAR ACTUATOR



PRA Actuator with Dual Profile Rail

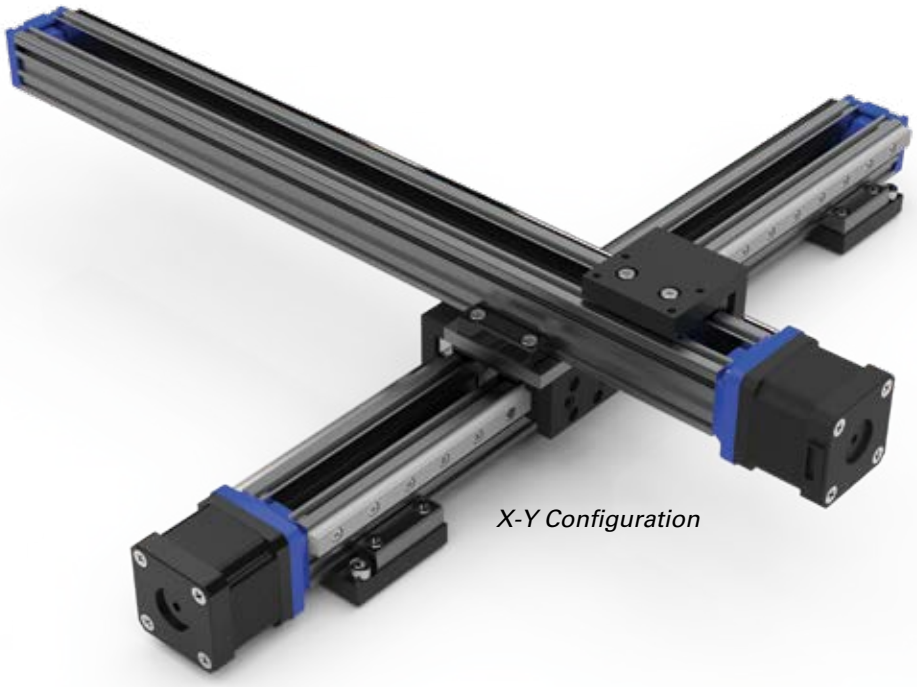
FEATURES

- Custom mounting plate
- Optical rotary encoder
- PTFE coated lead screw
- Dual profile linear rail

NEMA 17 CUSTOM DUAL MPA LINEAR ACTUATORS

FEATURES

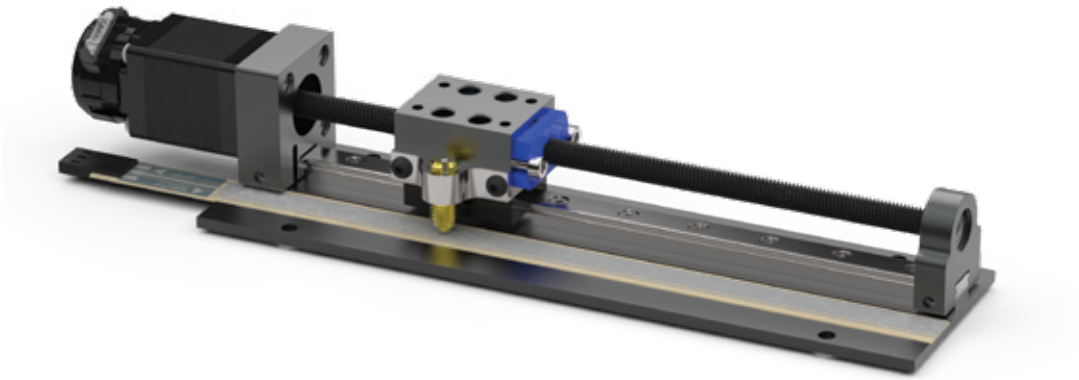
- Multi-axis design (X-Y-Z)
- Hybrid stepper motors; NEMA 11, 17, 23
- PTFE coated lead screws
- Custom motors available



X-Y Configuration

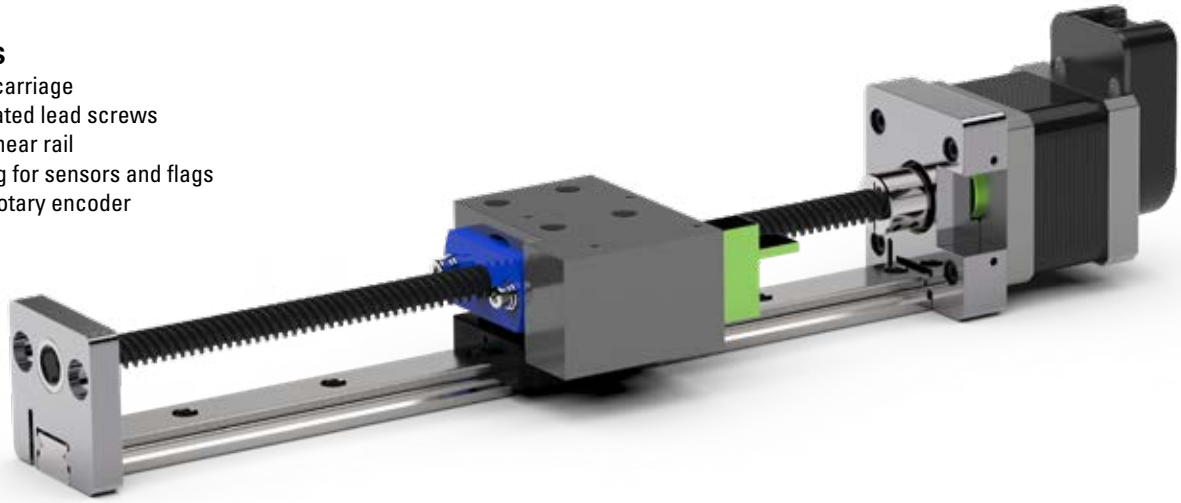
NEMA 8 HYBRID STEPPER MOTOR AND LINEAR POTENTIOMETER

FEATURES
- Profile linear rail
- Linear potentiometer
- PTFE coated lead screw
- Custom base plate
- Optical rotary encoder

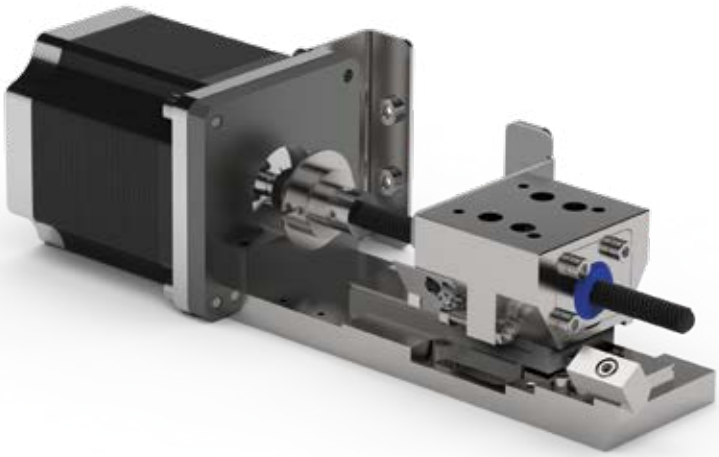


NEMA 17 LINEAR ACTUATOR AND OPTICAL ROTARY ENCODER

FEATURES
- Custom carriage
- PTFE coated lead screws
- Profile linear rail
- Mounting for sensors and flags
- Optical rotary encoder



NEMA 23 CUSTOM LINEAR ACTUATOR



FEATURES
- Anti-backlash nut
- Clean room compatible
- Vacuum rated
- Mounting for flags and sensors

LINEAR MOTION APPLICATIONS

High Quality, Precision Linear Motion Solutions

LIFE SCIENCES

- Auto samplers
- Syringe pumps
- Microscopes
- MRI scanners
- CT scanners
- Radiographic machines
- In-vitro diagnostics
- Genomics
- Blood gas chemistry

PRINTING & BINDING

- "Z" axis actuators
- Multi-axis gantries
- 3D printing
- Automation / Material handling
- Additive manufacturing (AD)
- Large format sign printing
- Digital offset printing process
- Folding and sealing equipment
- Thermal CTP systems

SECURITY - MILITARY

- Automated door locking systems
- Pan-tilt-zoom cameras
- Automated gates
- Tactical automated security cameras
- Missile fin actuation
- Tank sighting systems
- Drones and UAVs
- Torpedo fin actuation
- Guided munitions

SEMICONDUCTOR

- Burnishing stages
- Stacking systems
- Vision inspection machines
- X, Y, Z gantries
- Wafer elevators / Wafer handling
- Acoustic microscopes
- Ultrasonic imaging
- Tuning coils
- Vacuum chamber doors

HELIX™ LINEAR TECHNOLOGIES

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