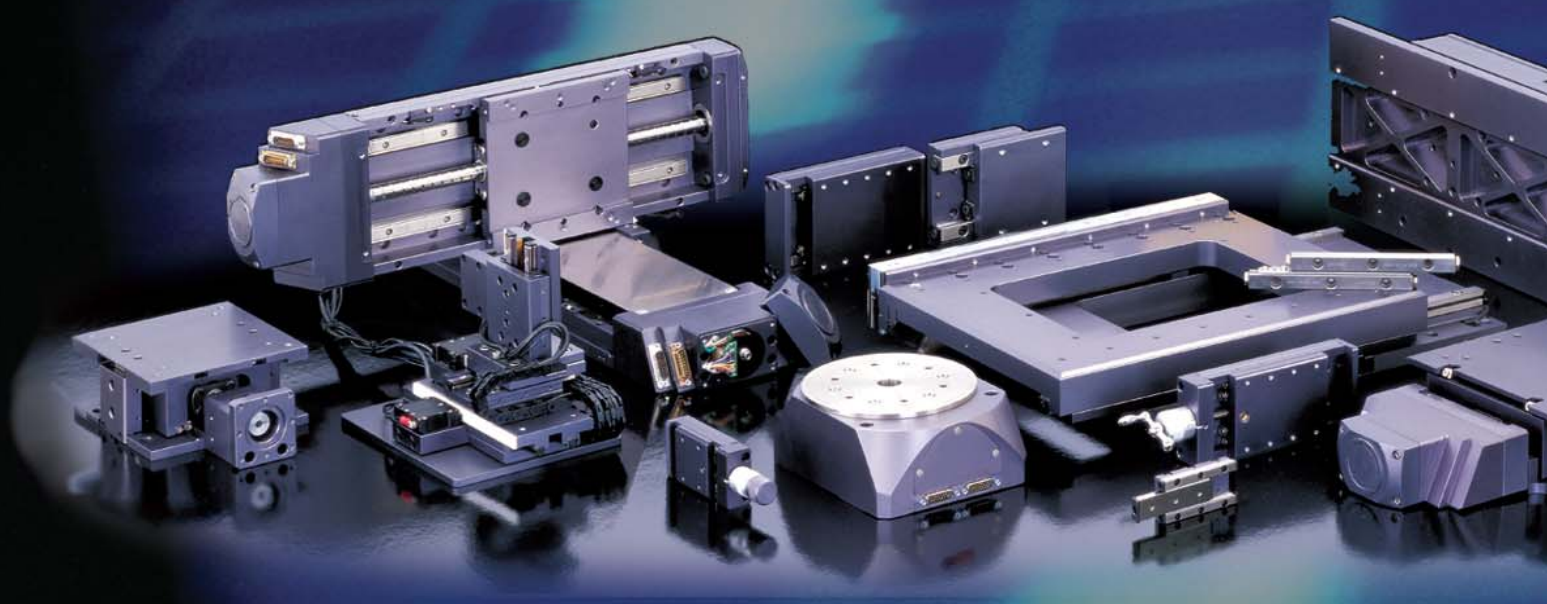
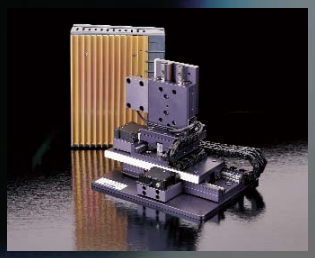
Positioning Stages and Systems



Linear Positioning Stages

Z Wedge Vertical Stages

Nanopositioning Stages



Rotary Stages

Table of Contents

Linear & Rotary Positioning Stages

Crossed Roller Slides & Bearing Sets

Multi-Axis Systems

Positioning Stages:
Application Solutions

XYZ Systems for Thin Film Precision Inspection Equipment

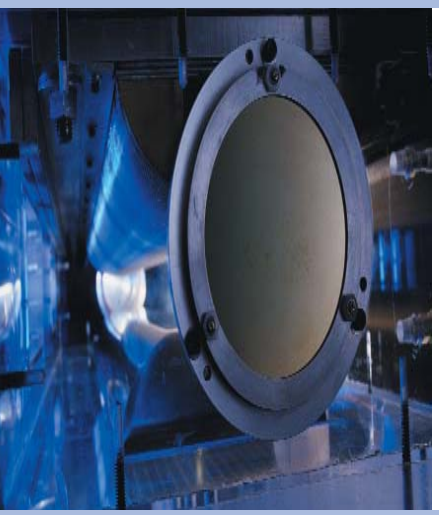
APPLICATION CHALLENGE

The customer, ThermoNoran, manufactured precision thin film inspection equipment used for inspecting wafers in the semiconductor industry. They required an XYZ motion platform to inspect the thickness and identify any irregularities of the thin film substrates being placed on wafers. To stay at the forefront of their industry, they needed better constant velocity and higher throughput. In addition, they needed to process 300mm wafers in their 200mm footprint.

Smoothness and Constant Velocity for Scanning Axis.
The customer used lead screw stages with recirculating ball bearings for moving the scanning equipment. The stage they were using could not supply the required smoothness and constant velocity. The linear ball guides caused Z-Axis jitter when operated at the required velocity and the lead screw limited the velocity capability.

Accuracy, Repeatability and Resolution of Overall System.
The customer required an accuracy and repeatability better than 2 microns and a resolution better than 4 microns from the XYZ motion system.

XYZ Systems for Automated Testing Equipment for MEMS

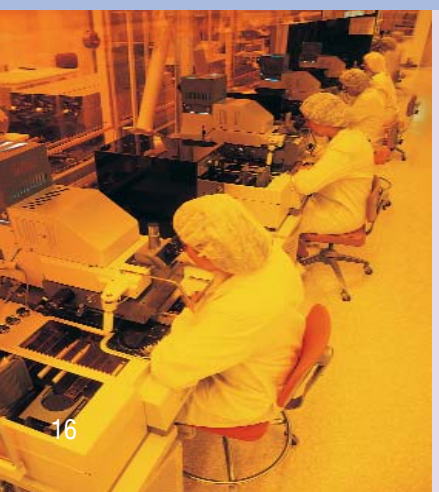


APPLICATION CHALLENGE

In the future, the Telecommunications market is going to demand transmission rates in the magnitude of terabits per second. Fiber Optics manufacturers need to move from first generation switching, where the core processing is done electronically (O-E-O), to next generation switches, where the light signal is redirected optically, greatly increasing transmission rates while eliminating expensive electronics. At the heart of these all-optical systems are Micro-Electro-Mechanical Systems (MEMS), which consists of a system of tilting mirror arrays.

A manufacturer of optical switches used in the Fiber Optics industry was looking for ways to automate their process of checking the position and control of the MEMS used in their switches. Currently the process is being performed manually, in what can best be described as a laboratory environment. In order to meet the future demand for this cutting edge technology, the process needed to be automated in order to increase throughput. Some of the requirements required for a system would be:
1. Smooth motion 2. No servo dither at desired position 3. Sub-micron resolution
4. Small operating envelope

X-Y Scanning Application



APPLICATION CHALLENGE

A customer was manufacturing an optical visual system that was to take dimensional measurements of a read-write head used in the semiconductor industry. The system was using step motors and controls to make small incremental movements, where an operator was to read the display and take measurements used to accept or reject the heads.

What was required of the positioning stage was 1 micron of accuracy over the full travel of the stage, and the ability to provide a resolution of 0.1 microns. The stage the customer was using was not able to provide the proper level of accuracy or provide the required resolution needed to make the incremental readings.

BAYSIDE SOLUTION

X Axis: (1) Luge LM Positioning Stage with Ball Screw Drive and Integral Motor.
Y Axis: (1) High Accuracy Ultra Linear Motor Stage with Crossed Roller Bearings and Ironless Linear Motor.
Z Axis: (1) Z-Wedge Stage with a Ball Screw Drive and Integral Motor.

The Luge LM Positioning Stage (X Axis) is used for stepping motion where its high dynamic stiffness improves the systems settling capability. It featured an integrated motor, built directly onto the ball screw shaft, eliminating compliance between the screw and motor.

The High Accuracy Linear Motor Stage (Y Axis) provided the extremely smooth, uniform motion required. The stage prevented Z Axis jitter, while supporting a high constant velocity and accurate straightness/flatness specifications. Constant velocity was tested at 0.03% uniformity.

The Z-Wedge Stage (also featuring an integrated motor) provided vertical motion (Z-Axis) and excellent position repeatability and stability in a compact package.

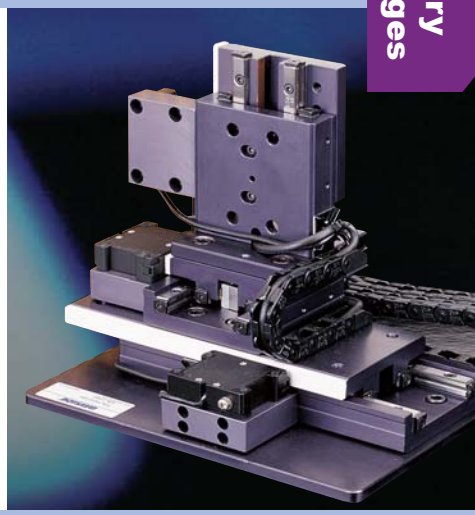
The integrated motors reduced overall system size while maximizing dynamic stiffness.

BAYSIDE SOLUTION

(1) Piezo Motor Stage
The system was used in the customer's automated testing fixture, and increased their throughput by a factor greater than 10.

Bayside accomplishes demanding motion requirements with a stage that uses precision crossed roller bearings that provide exceptional stiffness with smooth rolling action, a linear encoder mounted down the center to minimize the effects of angular error, and a piezoelectric linear motor. Standard positioning systems support 50 nanometer encoder resolution and zero servo dither when the desired position is achieved.

The technology built into Bayside's nanopositioning stages combine the benefits of high resolution motion with the ability to achieve high speeds and long travels. In one compact package Bayside can address load / unload positions, rapid moves (200mm / sec), and the critical motion characteristics for fiber processes.
1.Fiber optic alignment 2.Laser diode test & assembly 3.Mirror calibration
4.Bayside's Nanopositioning Stages



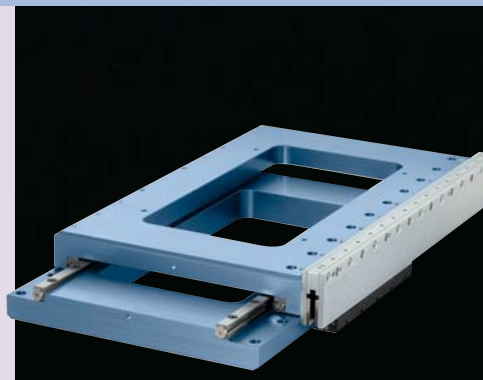
BAYSIDE SOLUTION

(2) Ultra 300mm lead screw stages
Two 300 mm Ultra lead screw stages were mounted in an X-Y configuration to provide the platform for the optical vision system. Non-contact optical encoders were used on the stage, which were certified to 1 micron total error and allowed for moves of 0.1 micron increments.

The Ultra stages feature crossed roller bearings, which provide repeatable, low-friction linear motion.

As opposed to a ball screw, where ball bearings are continuously coming in and out of pre-load, the advantage provided by the lead screw was smooth motion and high stiffness.

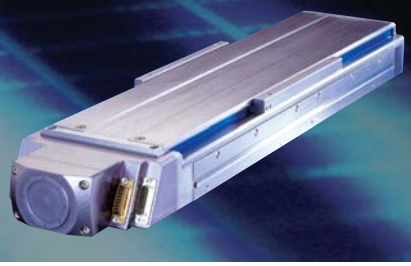
This solution can be used in test and measurement applications in the following industries:
1. Electronics 2. Medical 3. Semiconductor



Luge LM Series:
Linear Module

- Direct Drive Model
- Flanged Mount Model
- Linear Motor Drive Model

Luge LM Series
Overview



• Luge LM Direct Drive Model

Features a revolutionary integral brushless DC motor and encoder design. This feature allows for a more compact overall package and improved system performance by eliminating backlash and wind-up. The high performance ball screw and linear bearings allow speeds up to 1,300mm / sec.

- Integrated Brushless DC motor
- Rugged Compact Packaging
- Improved Dynamic Performance
- Pre-wired Linear or Rotary Encoders
- Pre-wired Limit Switches
- Complete Shielded Design
- All elements Internally Located
- Lowest Profile in the Industry
- Integrated Brake

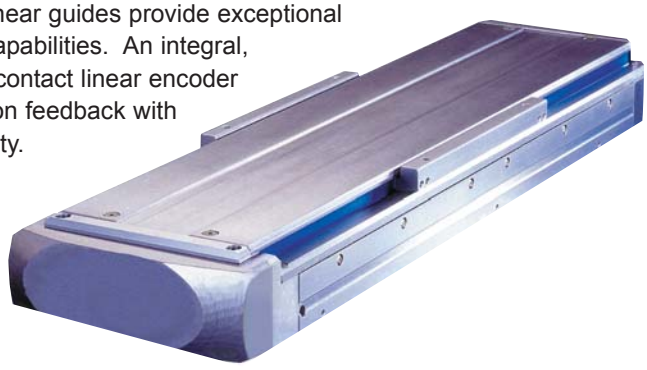
• Luge LM Flanged Mount Model

Ideal for easy mounting to any servo or step motor. For vertically mounted applications, we offer the option of a shaft brake mounted to the ball screw. Linear encoders are also available to increase positional accuracy and offer direct positional feedback regarding carriage location.

- Flange Face to Mount NEMA 23 & 34, size 60 & 90mm Motors
- Pre-wired Limit Switches
- Pre-wired Linear Encoders
- Complete Shielded Design
- Integrated Brake

• Luge LM Linear Motor Drive Model

Designed with an iron based, brushless linear motor, the Luge LM Linear Motor provides accelerations up to 4g's, with velocities to 3,000mm / sec. Recirculating linear guides provide exceptional load carrying capabilities. An integral, precision, non-contact linear encoder provides position feedback with high repeatability.



- Iron Core Linear Motor
- Peak Force 340 N for High Acceleration
- Pre-wired Integrated Cable Carrier
- Pre-wired Linear Encoder Internally Located
- Complete Shielded Design
- Pre-wired Limit Switches

Luge LM Series:
High Speeds, Long Travels

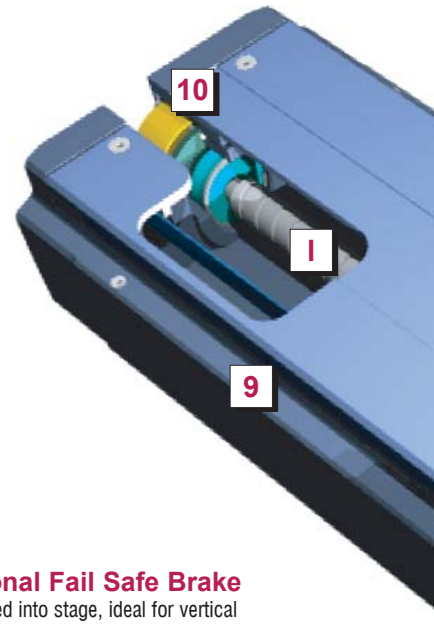
When to Use:

- High speed
- Long travels
- Low profile
- Compact
- Precision
- Fast move and settle
- High duty cycle

Applications:

- Material Handling
- Packaging
- Paper Converting
- Robotics
- Semiconductor

Advanced Stages for Linear Motion:
All Luge LM Stages feature a compact, low profile, totally enclosed aluminum alloy construction for high strength in a lightweight package. The stages are rugged enough for the toughest packaging and automotive requirements, yet accurate enough for precise semiconductor, electronics assembly, and indexing applications. Luge LM stages provide state-of-the-art performance and efficiency at an exceptional value.



Luge LM Flange Mount

- For externally mounted servo or stepper motors

Luge LM Linear Motor

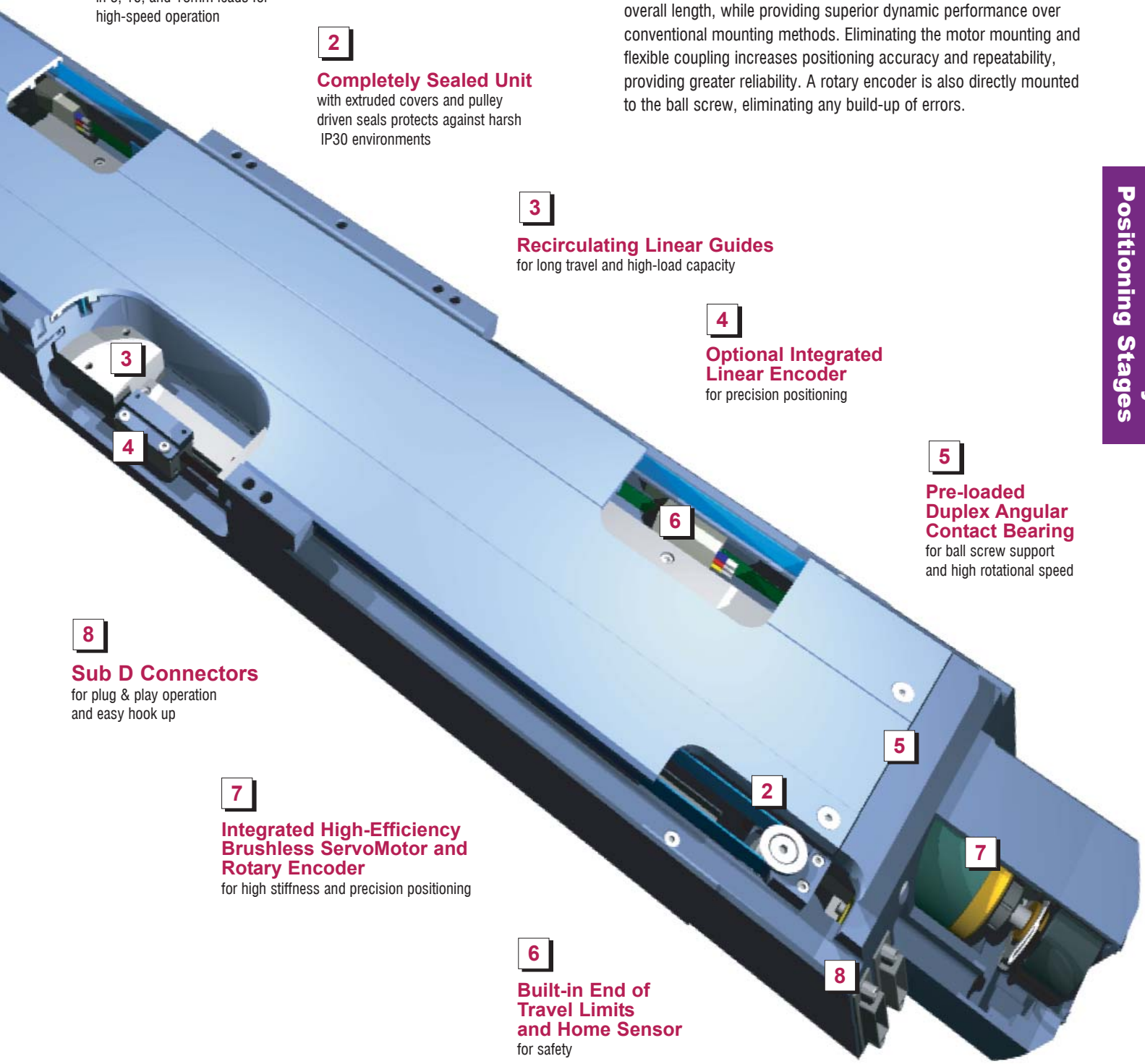
- With integrated brushless linear motor and linear encoder.

10
Optional Fail Safe Brake
Integrated into stage, ideal for vertical applications

9
Low-Profile, Lightweight Aluminum Construction
fits into compact areas

A Stage and Motor all-in-one

The **Luge LM Direct Drive** is unique because the brushless servomotor is built directly onto the ball screw. This decreases overall length, while providing superior dynamic performance over conventional mounting methods. Eliminating the motor mounting and flexible coupling increases positioning accuracy and repeatability, providing greater reliability. A rotary encoder is also directly mounted to the ball screw, eliminating any build-up of errors.



1 **Precision Ball Screw**
in 5, 10, and 16mm leads for high-speed operation

2 **Completely Sealed Unit**
with extruded covers and pulley driven seals protects against harsh IP30 environments

3 **Recirculating Linear Guides**
for long travel and high-load capacity

4 **Optional Integrated Linear Encoder**
for precision positioning

5 **Pre-loaded Duplex Angular Contact Bearing**
for ball screw support and high rotational speed

6 **Built-in End of Travel Limits and Home Sensor**
for safety

7 **Integrated High-Efficiency Brushless ServoMotor and Rotary Encoder**
for high stiffness and precision positioning

8 **Sub D Connectors**
for plug & play operation and easy hook up

Luge LM Series:
Direct Drive Motor

Motor Specifications

KO44 Frameless Motor with: Voltage	160V	300V
K_{EL-L} (V/kRPM)	23.5	46.9
K_{TL-L} (Nm/amp)	0.22	0.45
(oz in/amp)	31.7	62.4
R_{L-L} (ohms)	7.7	30.8
L_{L-L} (mH)	8	32
Pole	6	6
Rotor Inertia	0.044 gm cm sec^2	
	0.00061 oz in sec^2	

Rotary Encoder Specifications

Resolution:
2,000 Line

Electrical Input:
5 Vdc, 60 ma maximum

Encoder Output:
Dual channel quadrature
Differential, TTL compatible
Frequency Response 500 KHz

Brake

Fail Safe Brake:
24 Vdc, 0.2 amps

Brake Holding Force:

Lead (mm)	Force (kgf)	(lbf)
5	38	86
10	19	43
16	12	27

Inertia

Model No.	Screw Inertia (gm cm sec^2)	(oz in sec^2)
LM150D-200	0.2057	0.0029
LM150D-300	0.2582	0.0036
LM150D-400	0.3108	0.0043
LM150D-500	0.3634	0.0051
LM150D-600	0.4159	0.0058
LM150D-700	0.4685	0.0065
LM150D-800	0.5210	0.0072
LM150D-900	0.5736	0.0080
LM150D-1000	0.6261	0.0087
LM150D-1200	0.7312	0.0102
LM150D-1400	0.8363	0.0116

Performance Specifications

Model No.	Travel (mm)	(in)	Maximum Velocity[1] (mm/sec)	(in/sec)	Maximum Load (kgf)	(lbf)	Maximum Axial Load (kgf)	(lbf)	Maximum Acceleration[1] (m/sec^2)	(in/sec^2)
LM150D-200	200	7.87	1,300	51	650	1,434	209	460	29	1,142
LM150D-300	300	11.81	1,300	51	650	1,433	209	460	29	1,142
LM150D-400	400	15.74	1,300	51	650	1,433	209	460	29	1,142
LM150D-500	500	19.69	1,190	46.9	650	1,433	209	460	29	1,142
LM150D-600	600	23.62	900	35.4	650	1,433	209	460	29	1,142
LM150D-700	700	27.56	700	27.6	650	1,433	209	460	29	1,142
LM150D-800	800	31.49	560	22.1	650	1,433	209	460	29	1,142
LM150D-900	900	35.43	460	18.1	650	1,433	209	460	29	1,142
LM150D-1000	1,000	39.37	385	15.2	650	1,433	209	460	29	1,142
LM150D-1200	1,200	47.24	280	11.5	650	1,433	209	460	29	1,142
LM150D-1400	1,400	55.12	215	8.5	650	1,433	209	460	29	1,142

Accuracy Specifications

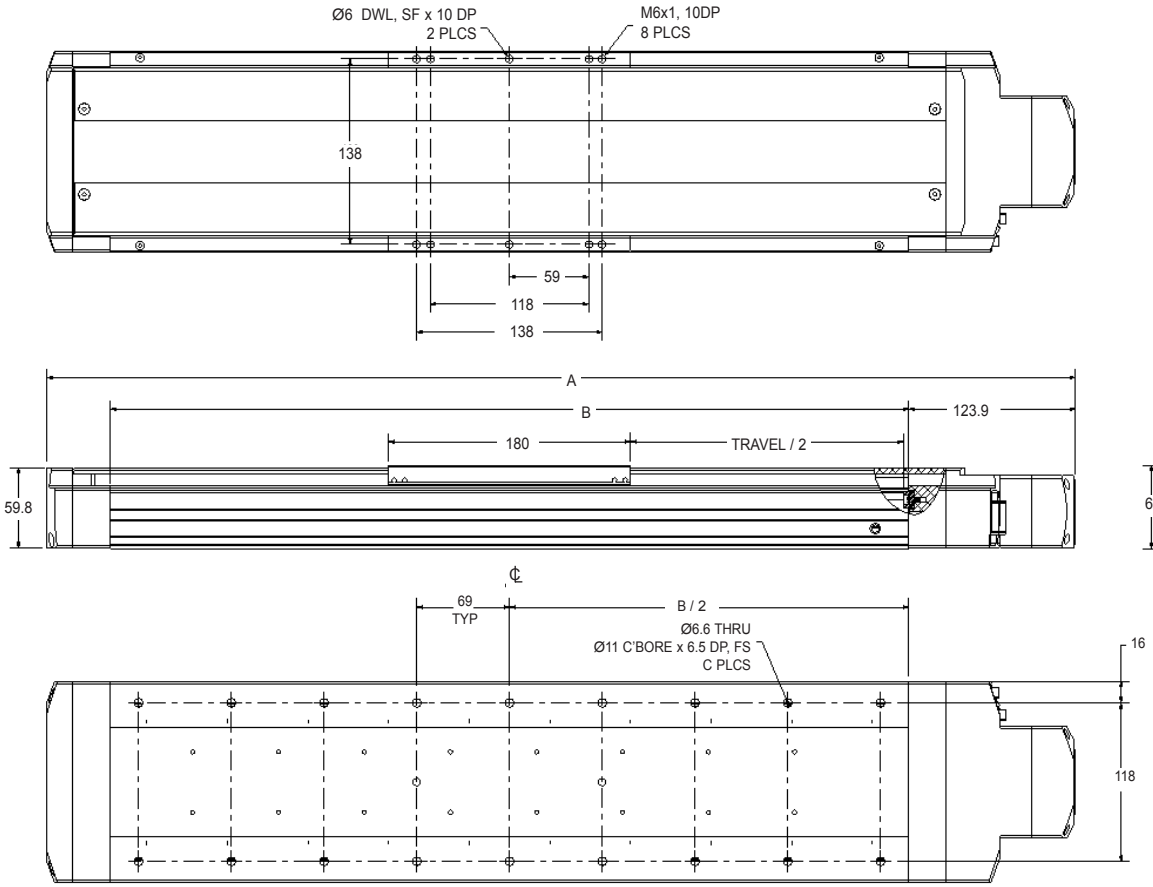
Model No.	Straightness/Flatness[2] (microns)	(in)	Accuracy[2, 3] (microns)	(in)	Repeatability[2] (microns)	(in)
LM150D-200	15	0.0006	15	0.0006	± 5	± 0.0002
LM150D-300	18	0.0007	30	0.0012	± 5	± 0.0002
LM150D-400	22	0.0008	32	0.0013	± 5	± 0.0002
LM150D-500	25	0.0010	54	0.0021	± 5	± 0.0002
LM150D-600	27	0.0011	57	0.0022	± 5	± 0.0002
LM150D-700	30	0.0012	66	0.0026	± 5	± 0.0002
LM150D-800	32	0.0012	76	0.0030	± 5	± 0.0002
LM150D-900	34	0.0013	90	0.0035	± 5	± 0.0002
LM150D-1000	48	0.0019	100	0.0039	± 5	± 0.0002
LM150D-1200	72	0.0028	120	0.0047	± 5	± 0.0002
LM150D-1400	94	0.0037	140	0.0055	± 5	± 0.0002

(1) Based on 16mm lead ball screw.
(2) Specifications are based on the stage mounted to a flat granite surface and measured at 25mm above the center of the stage,
(3) Higher precision available please consult factory.
Note: Cable Options - All Luge LM D products are available with standard motor and encoder cables.

Luge LM Direct Drive Speed vs. Force Analysis

(Maximum velocity may be limited by ball screw. See Performance Specifications above.)

Dimensions



Model No.	Travel		A Overall Length		B Base Length		C # of Holes	Stage Weight		Moving Slide Weight	
	(mm)	(in)	(mm)	(in)	(mm)	(in)		(kgf)	(lbf)	(kgf)	(lbf)
LM150D-200	**200**	7.87	**565**	22.24	**394**	15.51	10	**7.85**	17.3	**1.92**	4.24
LM150D-300	**300**	11.81	**665**	26.18	**494**	19.45	14	**9.39**	20.7	**1.92**	4.24
LM150D-400	**400**	15.75	**765**	30.11	**594**	23.39	18	**10.88**	24.0	**1.92**	4.24
LM150D-500	**500**	19.69	**865**	34.05	**694**	27.32	18	**12.38**	27.3	**1.92**	4.24
LM150D-600	**600**	23.62	**965**	37.99	**794**	31.26	22	**13.92**	30.7	**1.92**	4.24
LM150D-700	**700**	27.56	**1,065**	41.93	**894**	35.20	26	**15.42**	34.0	**1.92**	4.24
LM150D-800	**800**	31.50	**1,165**	45.86	**994**	39.13	26	**16.92**	37.3	**1.92**	4.24
LM150D-900	**900**	35.43	**1,265**	49.80	**1,094**	43.07	30	**18.46**	40.7	**1.92**	4.24
LM150D-1000	**1,000**	39.37	**1,365**	53.74	**1,194**	47.01	34	**19.95**	44.0	**1.92**	4.24
LM150D-1200	**1,200**	47.24	**1,565**	61.61	**1,394**	54.88	38	**22.99**	50.7	**1.92**	4.24
LM150D-1400	**1,400**	55.12	**1,765**	69.48	**1,594**	62.76	46	**25.99**	57.3	**1.92**	4.24

Luge LM Series:
Flanged Mount Motor

Performance Specifications

Model No.	Travel		Maximum Velocity(1)		Maximum Load		Maximum Axial Load		Maximum Acceleration(1)	
	(mm)	(in)	(mm/sec)	(in/sec)	(kgf)	(lbf)	(kgf)	(lbf)	(m/sec^2)	(in/sec^2)
LM150F-200	200	7.87	1,300	51	650	1,434	209	460	29	1,142
LM150F-300	300	11.81	1,300	51	650	1,433	209	460	29	1,142
LM150F-400	400	15.74	1,300	51	650	1,433	209	460	29	1,142
LM150F-500	500	19.69	1,190	46.9	650	1,433	209	460	29	1,142
LM150F-600	600	23.62	900	35.4	650	1,433	209	460	29	1,142
LM150F-700	700	27.56	700	27.6	650	1,433	209	460	29	1,142
LM150F-800	800	31.49	560	22.1	650	1,433	209	460	29	1,142
LM150F-900	900	35.43	460	18.1	650	1,433	209	460	29	1,142
LM150F-1000	1,000	39.37	385	15.2	650	1,433	209	460	29	1,142
LM150F-1200	1,200	47.24	280	11.0	650	1,433	209	460	29	1,142
LM150F-1400	1,400	55.12	215	8.5	650	1,433	209	460	29	1,142

Accuracy Specifications

Model No.	Straightness/Flatness(2)		Accuracy(2, 3)		Repeatability(2)	
	(microns)	(in)	(microns)	(in)	(microns)	(in)
LM150F-200	15	0.0006	15	0.0006	± 5	± 0.0002
LM150F-300	18	0.0007	30	0.0012	± 5	± 0.0002
LM150F-400	22	0.0008	32	0.0013	± 5	± 0.0002
LM150F-500	25	0.0010	54	0.0021	± 5	± 0.0002
LM150F-600	27	0.0011	57	0.0022	± 5	± 0.0002
LM150F-700	30	0.0012	66	0.0026	± 5	± 0.0002
LM150F-800	32	0.0012	76	0.0030	± 5	± 0.0002
LM150F-900	34	0.0013	90	0.0035	± 5	± 0.0002
LM150F-1000	36	0.0014	100	0.0039	± 5	± 0.0002
LM150F-1200	39	0.0015	120	0.0047	± 5	± 0.0002
LM150F-1400	42	0.0017	140	0.0055	± 5	± 0.0002

(1) Based on 16mm lead ball screw.
(2) Specifications are based on the stage mounted to a flat granite surface and measured at 25mm above the center of the stage.with 2 point slope correction.
(3) Higher precision available please consult factory.
Note: Cable Options - All Lug e LM F products are available with standard motor and encoder cables.

Inertia

Model No.	Coupling Inertia		Screw Inertia	
	($gm\ cm\ sec^2$)	($oz\ in\ sec^2$)	($gm\ cm\ sec^2$)	($oz\ in\ sec^2$)
LM150F-200	0.0999	0.00139	0.1656	0.0023
LM150F-300	0.0999	0.00139	0.2159	0.0030
LM150F-400	0.0999	0.00139	0.2663	0.0037
LM150F-500	0.0999	0.00139	0.3239	0.0045
LM150F-600	0.0999	0.00139	0.3743	0.0052
LM150F-500	0.0999	0.00139	0.4247	0.0059
LM150F-800	0.0999	0.00139	0.4751	0.0066
LM150F-500	0.0999	0.00139	0.5327	0.0074
LM150F-1000	0.0999	0.00139	0.5830	0.0081
LM150F-1200	0.0999	0.00139	0.6910	0.0096
LM150F-1400	0.0999	0.00139	0.7918	0.0110

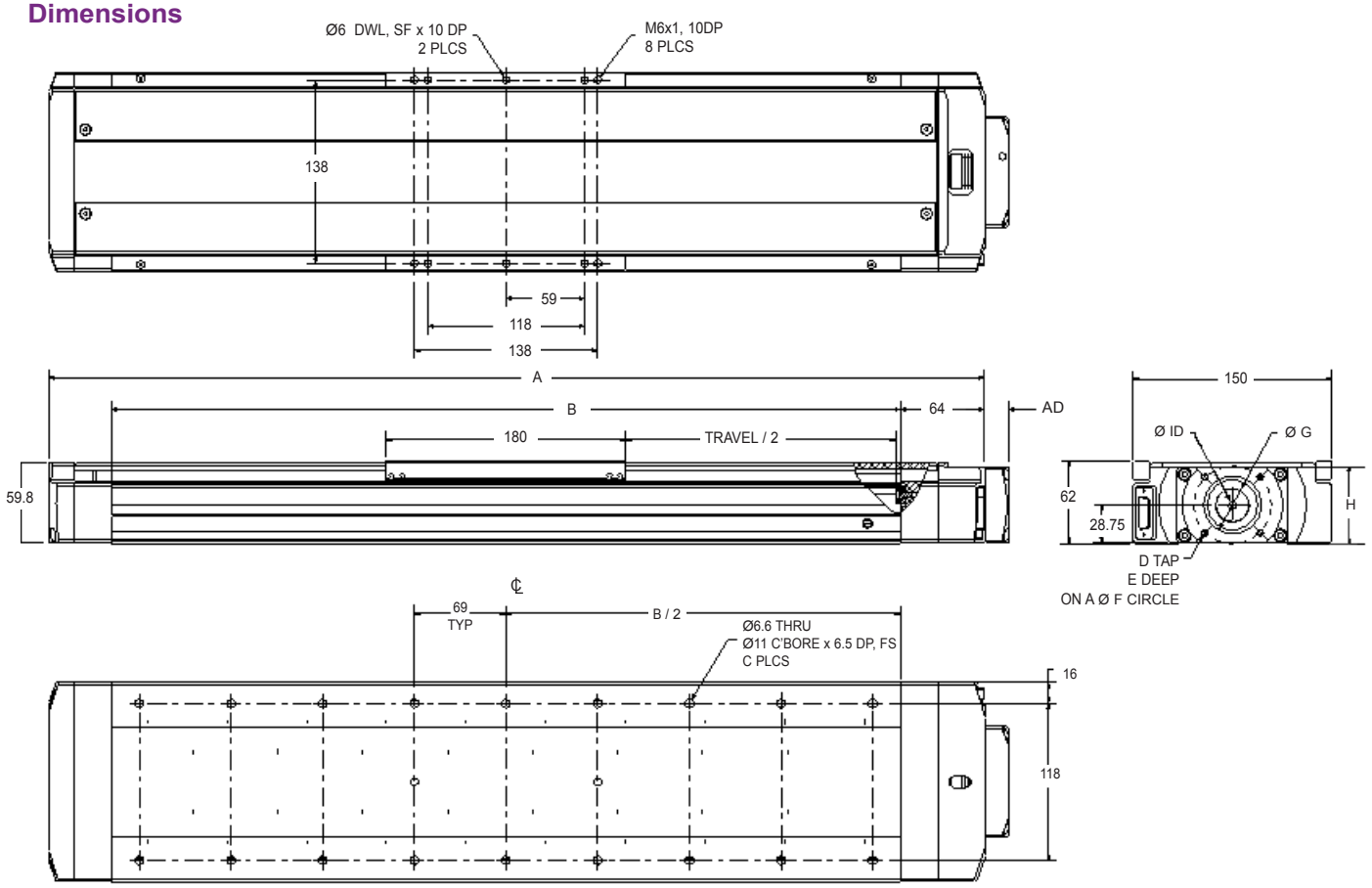
Brake

Fail Safe Brake:
24 Vdc, 0.2 amps

Brake Holding Force:

Lead (mm)	Force (kgf)	Force (lbf)
5	38	86
10	19	43
16	12	27

Dimensions



Model No.	Travel		A Overall Length		B Base Length		C # of Holes	Stage Weight		Moving Slide Weight	
	(mm)	(in)	(mm)	(in)	(mm)	(in)		(kgf)	(lbf)	(kgf)	(lbf)
LM150F-200	**200**	7.87	**505**	19.88	**394**	15.51	10	**7.57**	16.7	**1.92**	4.24
LM150F-300	**300**	11.81	**605**	23.82	**494**	19.45	14	**9.07**	20.0	**1.92**	4.24
LM150F-400	**400**	15.75	**705**	27.76	**594**	23.39	18	**10.57**	23.3	**1.92**	4.24
LM150F-500	**500**	19.69	**805**	31.69	**694**	27.32	18	**12.11**	26.7	**1.92**	4.24
LM150F-600	**600**	23.62	**905**	35.63	**794**	31.26	22	**13.61**	30.0	**1.92**	4.24
LM150F-700	**700**	27.56	**1,005**	39.57	**894**	35.20	26	**15.10**	33.3	**1.92**	4.24
LM150F-800	**800**	31.50	**1,105**	43.50	**994**	39.13	26	**16.64**	36.7	**1.92**	4.24
LM150F-900	**900**	35.43	**1,205**	47.44	**1,094**	43.07	30	**18.14**	40.0	**1.92**	4.24
LM150F-1000	**1,000**	39.37	**1,305**	51.38	**1,194**	47.01	34	**19.64**	43.3	**1.92**	4.24
LM150F-1200	**1,200**	47.24	**1,505**	59.25	**1,394**	54.88	38	**22.68**	50.0	**1.92**	4.24
LM150F-1400	**1,400**	55.12	**1,705**	67.13	**1,594**	62.76	46	**25.71**	56.7	**1.92**	4.24

Coupling

Motor Mounting	Coupling I.D. (mm)	(in)
NEMA 23	**6.35**	0.25
	9.52	0.375
NEMA 34	**9.52**	0.375
	12.7	0.5

Motor	D	E (mm)	E (in)	F (mm)	F (in)	G (mm)	G (in)	H (mm)	H (in)	AD (mm)	AD (in)
NEMA 23	8-32	**8.5**	0.335	**66.675**	2.625	**38.1**	1.5	**56.50**	2.224	**19**	0.748
NEMA 34	10-32	**10**	0.394	**98.425**	3.875	**73.025**	2.875	**79.15**	3.116	**25**	0.984
BM60	M5x0.8	**10**	0.394	**70**	2.756	**50**	1.969	**60.00**	2.362	**19**	0.748
BM90	M6x1.0	**12**	0.472	**100**	3.937	**80**	3.15	**83.15**	3.274	**25**	0.984

Luge LM Series:
Linear Motor Drive

Performance Specifications

Model No.	Maximum Velocity (mm/sec)	(in/sec)	Maximum Acceleration(1) (m/sec^2)	(in/sec^2)	Maximum Load(2) (kgf)	(lbf)
LM150L	**3,000**	118	**29**	1,142	**497**	1,096

Model No.	Continuous Force Single Coil (N)	(lbf)	Continuous Force Double Coil (N)	(lbf)	Peak Force Single Coil (N)	(lbf)	Peak Force Double Coil (N)	(lbf)
LM150L	**57**	12.8	**104**	23.4	**170**	38.2	**340**	76.4

Accuracy Specifications

Model No.	Straightness/Flatness (3) (microns)	(in)	Accuracy (3, 4) (microns)	(in)	Repeatability (3, 4) (microns)	(in)
LM150L-200	**15**	0.0006	**10**	0.0004	**± 2**	± 0.00008
LM150L-300	**18**	0.0007	**10**	0.0004	**± 2**	± 0.00008
LM150L-400	**22**	0.0009	**10**	0.0004	**± 2**	± 0.00008
LM150L-500	**25**	0.0010	**12**	0.0005	**± 2**	± 0.00008
LM150L-600	**27**	0.0011	**12**	0.0005	**± 2**	± 0.00008
LM150L-700	**30**	0.0012	**16**	0.0006	**± 2**	± 0.00008
LM150L-800	**32**	0.0012	**18**	0.0007	**± 2**	± 0.00008
LM150L-900	**34**	0.0013	**22**	0.0009	**± 2**	± 0.00008
LM150L-1000	**48**	0.0019	**34**	0.0013	**± 2**	± 0.00008
LM150L-1200	**72**	0.0028	**42**	0.0017	**± 2**	± 0.00008
LM150L-1400	**94**	0.0037	**54**	0.0021	**± 2**	± 0.00008
LM150L-1600	**112**	0.0044	**60**	0.0024	**± 2**	± 0.00008
LM150L-1800	**120**	0.0047	**76**	0.0030	**± 2**	± 0.00008
LM150L-2000	**130**	0.0051	**90**	0.0035	**± 2**	± 0.00008

Motor Specifications

Rated Performance		Units	Single Coil	Double Coil
Peak Force	F_p	**N** lbf	**170** 38	**340** 76
Continuous Force	F_c	**N** lbf	**57** 13	**104** 23
Peak Current	I_p	A_{rms}	13.7	13.7
Continuous Current @ t_{max}(1)	I_c	A_{rms}	3.7	3.4
Resistance @25°C ± 10%	R_m	ohms L-L	1.1	2.1
Inductance ± 20%	L	mH_{L-L}	3.0	6.1
Back EMF Constant @25°C ± 10%	K_E	**Vpeak/m/sec L-L** Vpeak/in/sec L-L	**12.6** 0.32	**25.2** 0.64
Max Continuous Dissipation	P_c	W	30	51
Force Constant @25°C ± 10%	K_F	**N/A_{rms}** lbf/A_{rms}	**15.4** 3.5	**30.9** 6.9
Motor Constant	Km	**N/ W** lb/ W	**$\sqrt{10.3}$** $\sqrt{2.3}$	**14.6** 3.3

(1) t_{max} = 130 °C coil temperature

(1) Maximum Acceleration is dependent on load and friction. Motor peak force up to 340N (76.4 lbf)

(2) Maximum load is on a complete system basis. Bearing static / dynamic capacity is significantly higher.

(3) Specifications are based on the stage mounted to a flat granite surface and measured at 25mm above the center of the stage.

(4) Based on a closed loop system with a 1µm linear encoder, utilizing a 2 point slope correction

Note: Cable Options - All Luge LM Linear Motor products are available with standard motor and encoder cables.

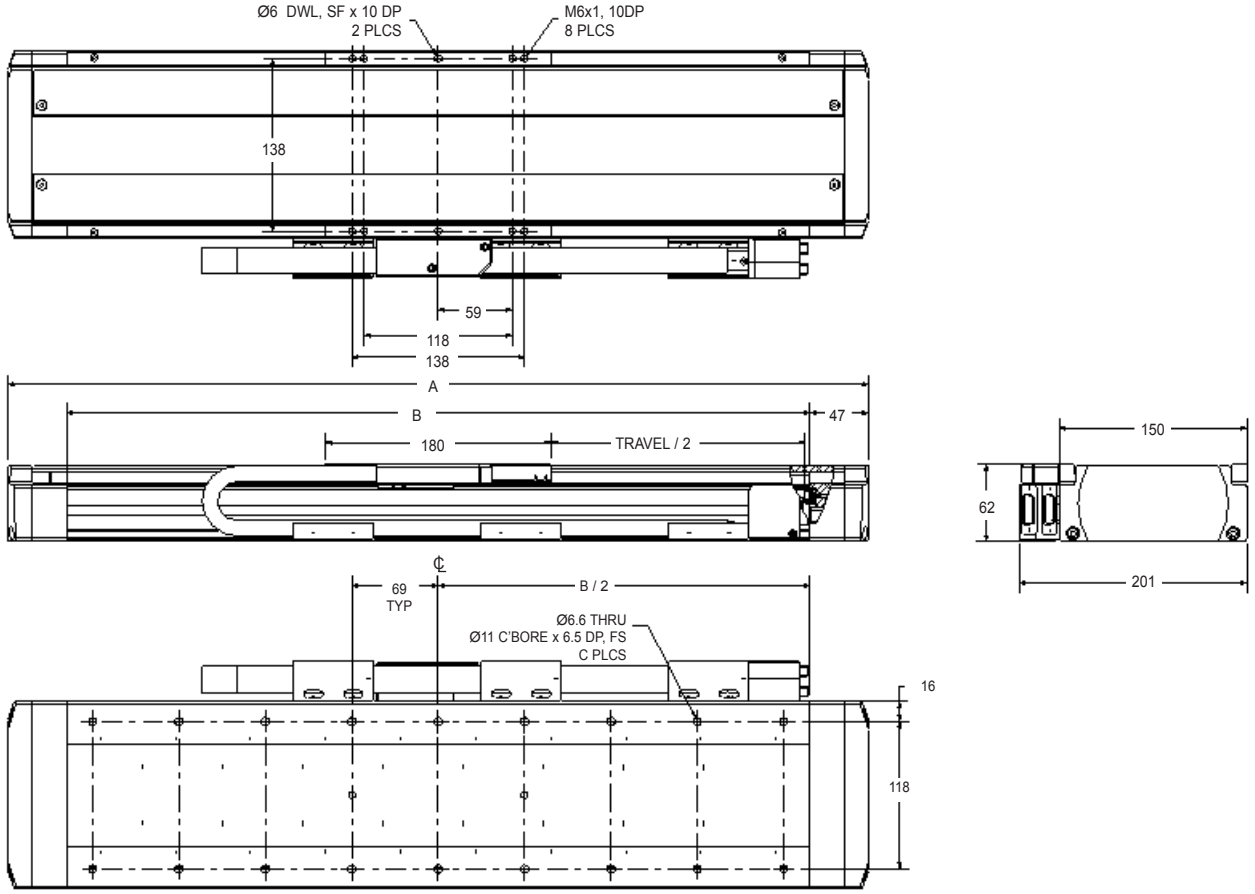
Linear Encoder Specifications

Resolution:
0.1µm, 0.5µm, 1.0µm, & 5.0µm

Electrical Input:
5 Vdc, 120 ma typical
5 Vdc, 250 ma for 0.1µm only

Encoder Output:
Dual channel quadrature
Differential, TTL compatible

Dimensions



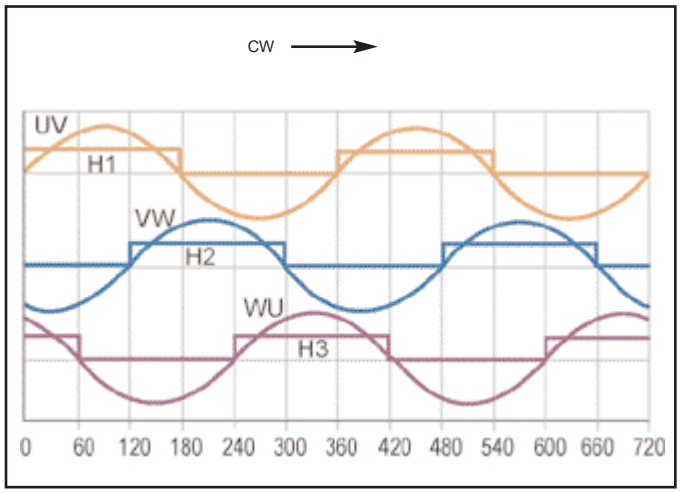
Model No.	Travel		A Overall Length				B Base Length				C # of Holes	
			Single Coil		Double Coil		Single Coil		Double Coil		Single Coil	Double Coil
	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)		
LM150L-200	200	7.87	488	19.21	578	22.76	394	15.51	484	19.06	10	12
LM150L-300	300	11.81	588	23.15	678	26.69	494	19.45	584	22.99	14	16
LM150L-400	400	15.75	688	27.09	778	30.63	594	23.39	684	26.93	18	20
LM150L-500	500	19.69	788	31.02	878	34.57	694	27.32	784	30.87	18	22
LM150L-600	600	23.62	888	34.96	978	38.50	794	31.26	884	34.80	22	26
LM150L-700	700	27.56	988	38.90	1,078	42.44	894	35.20	984	38.74	26	28
LM150L-800	800	31.50	1,088	42.83	1,178	46.38	994	39.13	1,084	42.68	26	32
LM150L-900	900	35.43	1,188	46.77	1,278	50.31	1,094	43.07	1,184	46.61	30	34
LM150L-1000	1,000	39.37	1,288	50.71	1,378	54.25	1,194	47.01	1,284	50.55	34	36
LM150L-1200	1,200	47.24	1,488	58.58	1,578	62.13	1,394	54.88	1,484	58.43	38	42
LM150L-1400	1,400	55.12	1,688	66.46	1,778	70.00	1,594	62.76	1,684	66.30	46	48
LM150L-1600	1,600	62.99	1,888	74.33	1,978	77.87	1,794	70.63	1,884	74.17	50	54
LM150L-1800	1,800	70.87	2,088	82.20	2,178	85.75	1,994	78.50	2,084	82.05	58	60
LM150L-2000	2,000	78.74	2,288	90.08	2,378	93.62	2,194	86.38	2,284	89.92	62	66

Luge LM Series:
Linear Motor Drive

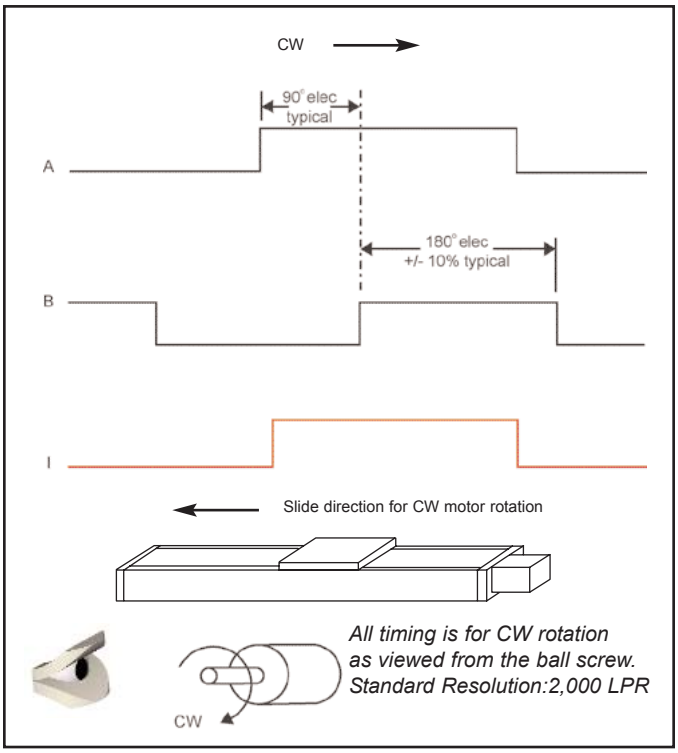
Weights

Model No.	Stage Weight				Moving Slide Weight			
	Single Coil		Double Coil		Single Coil		Double Coil	
	(kgf)	(lbf)	(kgf)	(lbf)	(kgf)	(lbf)	(kgf)	(lbf)
LM150L-200	9.26	20.4	9.75	21.5	2.38	5.24	2.87	6.34
LM150L-300	10.07	22.2	10.56	23.3	2.38	5.24	2.87	6.34
LM150L-400	10.88	24	11.37	25.1	2.38	5.24	2.87	6.34
LM150L-500	11.7	25.8	12.19	26.9	2.38	5.24	2.87	6.34
LM150L-600	12.51	27.6	13.0	28.7	2.38	5.24	2.87	6.34
LM150L-700	13.32	29.4	13.81	30.5	2.38	5.24	2.87	6.34
LM150L-800	14.13	31.2	14.62	32.3	2.38	5.24	2.87	6.34
LM150L-900	14.94	32.9	15.43	34.0	2.38	5.24	2.87	6.34
LM150L-1000	15.75	34.7	16.24	35.8	2.38	5.24	2.87	6.34
LM150L-1200	17.37	38.3	17.86	39.4	2.38	5.24	2.87	6.34
LM150L-1400	18.99	41.9	19.48	43.0	2.38	5.24	2.87	6.34
LM150L-1600	20.61	45.5	21.1	46.6	2.38	5.24	2.87	6.34
LM150L-1800	22.24	49	22.73	50.1	2.38	5.24	2.87	6.34
LM150L-2000	23.86	52.6	24.35	53.7	2.38	5.24	2.87	6.34

Motor Signal Timing
at motor connector

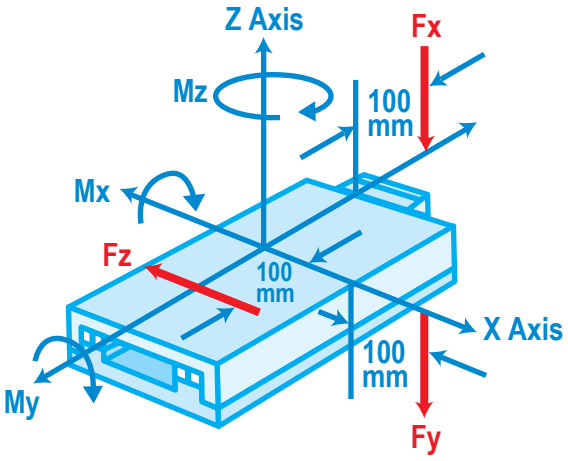


Encoder Timing



All timing is for CW rotation as viewed from the ball screw. Standard Resolution:2,000 LPR

Luge LM Series:
Moment Loading



Fx is the load applied in the Z Axis direction, 100mm off end, causing Mx rotation around the X Axis.

Fy is the load applied in the Z Axis direction, 100mm off side, causing My rotation around the Y Axis.

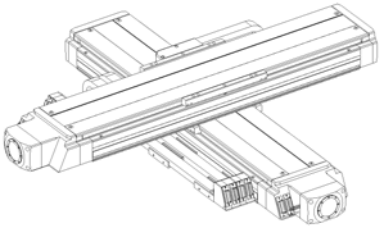
Fz is the load applied around the Z Axis at a 100mm radius from the center, causing Mz rotation around the Z Axis.

Moment Loading

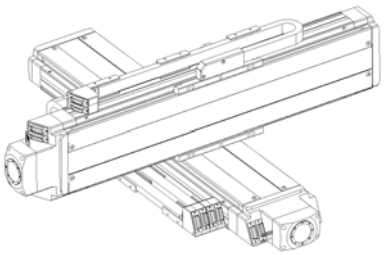
Model No.	F(Mx) (Load applied at 100mm off end)		F(My) (Load applied at 100mm off side)		F(Mz) (Load applied at 100mm off center)	
	(kg)	(lb)	**(kg)**	(lb)	**(kg)**	(lb)
LM150	**780**	1,720	**856**	1,888	**628**	1,385

Luge LM Series:
Configuration & Options

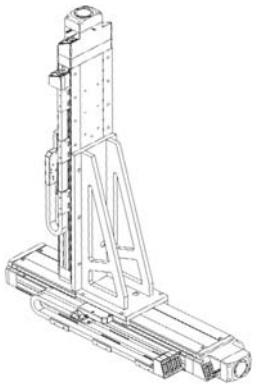
Suggested Orientations:



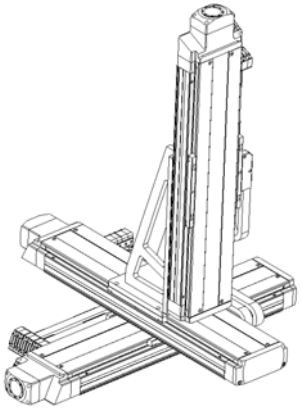
Option 1



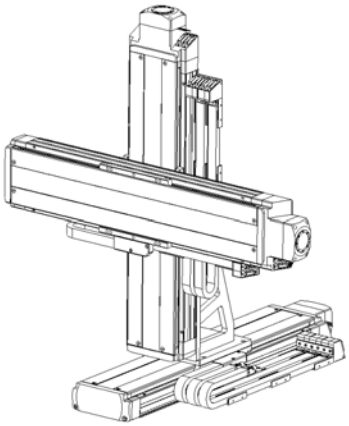
Option 2



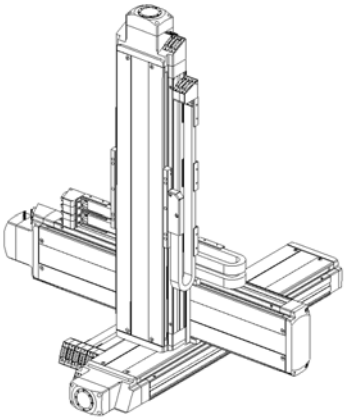
Option 3



Option 4



Option 5



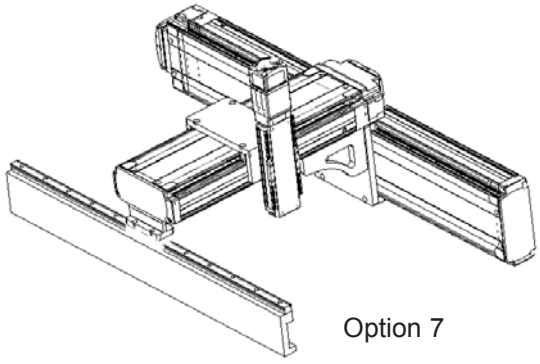
Option 6

Options

Multi-Axis Configurations
Various Multi-Axis configurations with brackets are available (see examples)

Calibration Option
Bayside provides laser calibration to optimize your stage for the most demanding applications.

Cables
Power and Sensor Cables for the Luge LM are available. Options include cables with connectors to Bayside's i-Drive digital amplifier or with flying leads for hook up to any servo amplifier. Custom motor files can be supplied to drive the Luge LM with Non-Bayside amplifiers.



Option 7

Mating Power Cable

Part Number	Length	Used With
10963204	3 meter	Flying Leads
10963205	8 meter	Flying Leads

Mating Sensor Cable

Part Number	Length	Used With
10963194	3 meter	Flying Leads
10963201	3 meter	i-Drive
10963202	8 meter	Flying Leads
10963203	8 meter	i-Drive
12602001[1]	—	i-Drive / Controller

(1) NOTE: When an external controller is used in a closed loop mode an additional sensor cable, part number 12602001, is required.

Luge LM Series:
How to Order

Catalog Configuration Numbering:

LM	150	D	-	0300	-	D	10	L	N	05	E	V	-	XXX
A	B	C		D		E	F	G	H	I	J	K		L

A Stage Series

LM	Luge LM Series

B Metric Width of Stage

100	100 mm (4in)	(2)
150	150 mm (6in)	
250	250 mm (10in)	(1)

C Drive Type

D	Motor, Direct Drive
F	Flange Mount
L	Motor, Linear (3)

D Travel

Travel	Width 100 (mm)	150 (mm)	250 (mm)
0050	50	—	—
0100	100	—	—
0150	150	—	—
0200	200	200	200
0250	250	—	—
0300	300	300	300
0350	350	—	—
0400	400	400	400
0450	450	—	—
0500	500	500	500
0550	550	—	—
0600	600	600	600
0700	—	700	700
0800	—	800	800
0900	—	900	900
1000	—	1,000	1,000
1200	—	1,200	1,200
1400	—	1,400	1,400
1600	—	1,600 (6)	1,600 (6)
1800	—	1,800 (6)	1,800 (6)
2000	—	2,000 (6)	2,000 (6)

E Motor Type

D	Motor, Rotary Direct Drive (160V, 2,000 LPR)
E	Motor, Rotary Direct Drive (300V, 2000 LPR)
I	Motor, Linear, Ironcore (3)
B	Motor, Mounting for BM/GM60
C	Motor, Mounting for BM/GM90
N	Motor, Mounting for NEMA 23 (shaft Ø 0.250in)
R	Motor, Mounting for NEMA 23 (shaft Ø 0.375in)
P	Motor, Mounting for NEMA 34 (shaft Ø 0.375in)
S	Motor, Mounting for NEMA 34 (shaft Ø 0.500in)

F Drive Variations

Ball Screw Options		
05	5 mm Lead	(7)
10	10 mm Lead	(7)
16	16 mm Lead	(7)
Linear Motor Options		
03	Single Coil	(6)
06	Double Coil	(6)

G Home & Limit

N	None
L	NPN Normally Closed (+5~24Vdc, Sinking 20mA Max)

H Brake

B	Fail Safe Brake Option (7)
N	None

I Encoder, Linear

		Max Speed
00	None (7)	—
01	0.1 µm	0.7m/sec
05	0.5 µm	3 m/sec
10	1 µm	3 m/sec
50	5 µm	3 m/sec

J Protection

C	Extruded Cover (8)
E	Fully Enclosed (8)

K Environment

C	10,000 Class Cleanroom
S	Standard

L Special

XXX	Factory Issued

NOTES:

(1) 250 available 2nd Quarter 2003
(2) 100 available 3rd Quarter 2003
(3) Not available on LM100 models
(4) Only available for choice D in section C
(5) Only available for choice F in section C
(6) Only available for choice L in section C
(7) Not available for choice L in section C
(8) Not available for travels greater than 1200 mm

Specifications are subject to change without notice.

How to Order

1. Select options to create catalog configuration number, this is a Reference number
2. When placing an order, Bayside will issue the unique part number for your configuration.

Luge LM Stages are supported by a worldwide network of offices and local distributors. Call **1-800-305-4555** for application engineering assistance or for the name of your local distributor. Information can also be obtained at **www.baysidemotion.com**.