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Electrical Specs	L160D	L160T	L160Q
Continuous Force <sup>1</sup>	8.8N (2.0lbs)	13N (2.9lbs)	18N (4.05lbs)
Continuous Current <sup>1</sup>	0.55Arms		
Acceleration Force <sup>2</sup>	35N (7.9lbs)	53N (11.9lbs)	70N (15.7lbs)
Acceleration Current <sup>2</sup>	2.2Arms		
Force Constant ( $K_f$ )	16N/amp (3.6lbs/amp)	24N/amp (5.4lbs/amp)	32N/amp (7.3lbs/amp)
Back EMF ( $K_e$ )	5.4V/m/s	8V/m/s	11V/m/s
Resistance 25°C <sup>3</sup>	21Ω	31Ω	41Ω
Inductance <sup>3</sup>	7.3mH	11mH	15mH
Electric Time Constant	0.39ms	0.36ms	0.37ms
Fundamental Motor Constant ( $K_m$ )	3.51N√W	4.20N√W	4.96N√W
Magnetic Pitch (North-North)	60mm (2.36in)		

Is this the proper Linear Shaft Motor for your application? Use our [SMART sizing program](#) to assist in your decision.

This motor can be customized to fit your application demands; contact your application engineer for more information.

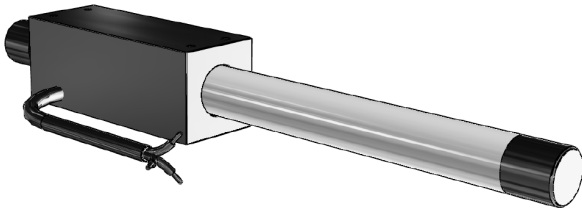
<sup>1</sup> Based on a temp rise of coil surface of 110°K over 25°C ambient temperature stalled forcer, and no external cooling or heat sinking.

<sup>2</sup> Can be maintained for a maximum of 40 seconds. Higher forces and current possible for short periods of time, contact Nippon Pulse for more information.

<sup>3</sup> All winding parameters listed are measured line-to-line (phase-to-phase).

Thermal Specs	L160D	L160T	L160Q
Max Phase Temperature <sup>4</sup>	135°C (275°F)		
Thermal Resistance (Coil) ( $K_c$ )	18°C/W	12°C/W	8.9°C/W

<sup>4</sup>The standard temperature difference between the coil and the forcer surface is 15°C.

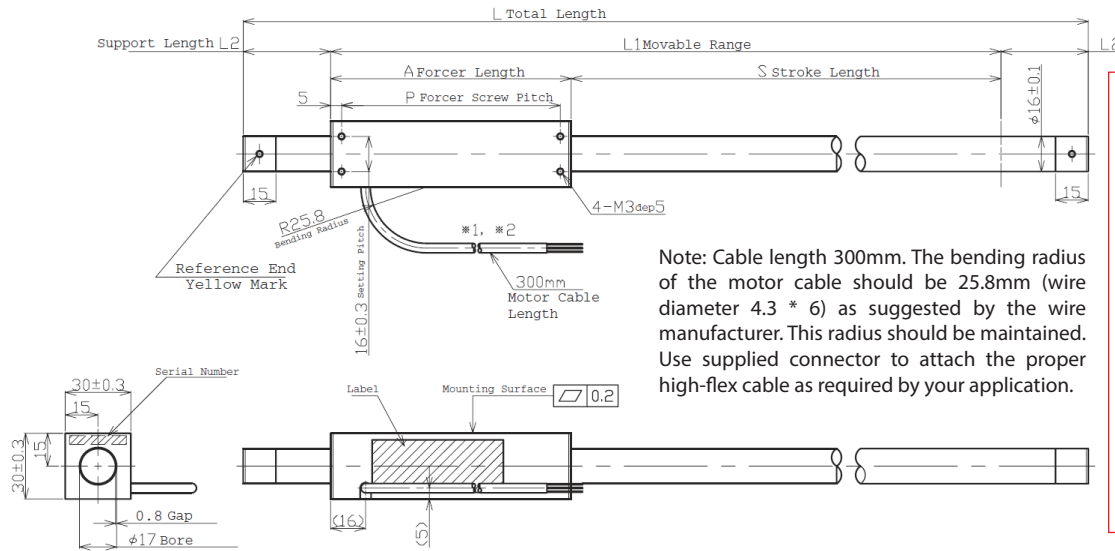


### Part Numbering System

L	—	Shaft Size 160	—	Forcer Size (A) <u>X</u>	—	Parallel Option <u>XX</u>	—	Usable Stroke (S) <u>XXXst</u>	—	Options <u>XX</u>	—	Options <u>XX</u>
				D: Double (2) windings T: Triple (3) windings Q: Quadruple (4) windings		Blank: Single Motor PL: Parallel Motors		100-1800mm		Blank: Standard WP: Water Resistant HA: Digital Hall Effect CE: CE Type Motor FG: Frame Ground		Blank: Standard FO: Forcer Only SO: Shaft Only

These motors have not received a CE Declaration of Conformity, and as such are designated FGA.

Forcer Specs	L160D	L160T	L160Q
Forcer Length (A)	80mm (3.15in)	110mm (4.3in)	140mm (5.5in)
Forcer Width	30mm ±0.3 (1.18in)		
Forcer Screw Pitch (P)	70mm (2.8in)	100mm (3.94in)	130mm (5.1in)
Forcer Weight	0.15kg (0.33lbs)	0.20kg (0.44lbs)	0.30kg (0.66lbs)
Gap	0.8mm (0.03in)		



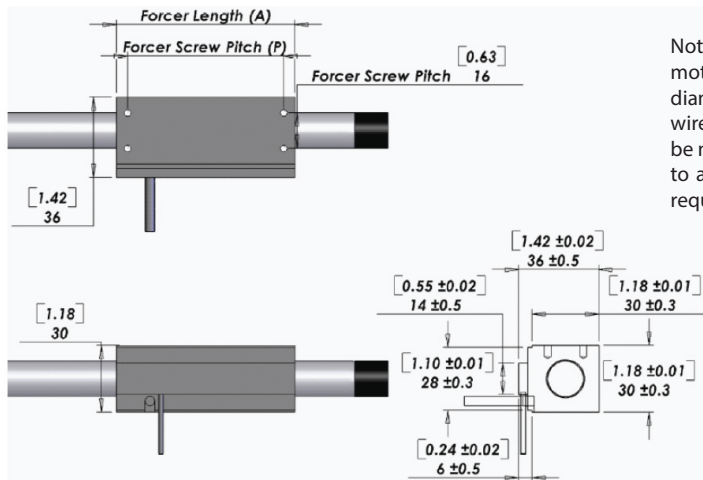
Tolerances are as follows:

Dimension (mm)	Tolerance (mm)
0 - 6	±0.1
7 - 30	±0.2
31 - 120	±0.3
121 - 315	±0.5
316 - 1000	±0.8
1001 - 2000	±1.2
2000 -	±1.5

L = See Shaft Length  
L1 = Usable Stroke + A  
L2 = See Support Length  
A = See Forcer Length  
P = See Forcer Screw Pitch

Unless otherwise specified, dimensions are in mm

## Hall Effect Specs



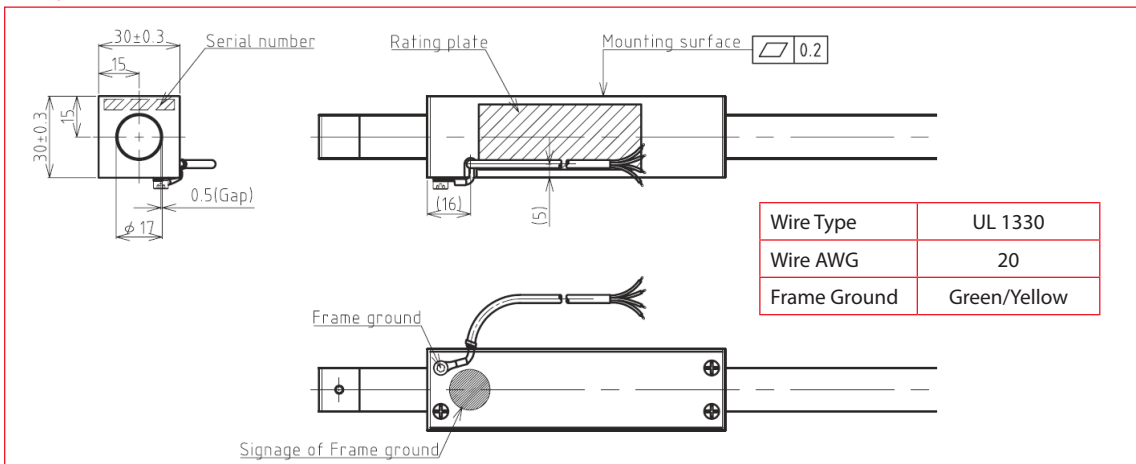
Note: The bending radius of the motor cable should be R27.6mm (wire diameter 4.6 \* 6) as suggested by the wire manufacturer. This radius should be maintained. Use supplied connector to attach the proper high flex cable as required by your application.

## Sensor Cable Specs

Wire Type	UL 758
Wire AWG	28
VCC	White/Red
GND	White/Black
Sensor 1	Orange/Red
Sensor 2	Orange/Black
Sensor 3	Gray/Red

The bending radius of the sensor cable should be R26.46mm (wire diameter 4.4 \* 6) as suggested by the wire manufacturer. This radius should be maintained. Attach the proper high flex cable as required by your application.

## FG Type Motor Cable



## Shaft Length (L)

Stroke	L160D	L160T	L160Q
100	230mm (9.1in)	260mm (10.2in)	290mm (11.4in)
150	280mm (11in)	310mm (12.2in)	340mm (13.4in)
200	330mm (13in)	360mm (14.2in)	390mm (15.4in)
250	380mm (15in)	410mm (16.1in)	440mm (17.3in)
300	430mm (16.9in)	460mm (18.1in)	490mm (19.3in)
350	480mm (18.9in)	510mm (20.1in)	540mm (21.3in)
400	560mm (22in)	590mm (23.2in)	620mm (24.4in)
450	610mm (24in)	640mm (25.2in)	670mm (26.4in)
500	660mm (26in)	690mm (27.2in)	720mm (28.3in)
550	710mm (28in)	740mm (29.1in)	770mm (30.3in)
600	760mm (29.9in)	790mm (31.1in)	820mm (32.3in)
650	810mm (31.9in)	840mm (33.1in)	870mm (34.3in)
700	860mm (33.9in)	890mm (35in)	920mm (36.2in)
750	910mm (35.8in)	940mm (37in)	970mm (38.2in)
800	960mm (37.8in)	990mm (39in)	1020mm (40.2in)
850	1050mm (41.3in)	1080mm (42.5in)	1110mm (43.7in)
900	1100mm (43.3in)	1130mm (44.5in)	1160mm (45.7in)
950	1150mm (45.3in)	1180mm (46.5in)	1210mm (47.6in)
1000	1200mm (47.2in)	1230mm (48.4in)	1260mm (49.6in)
1050	1250mm (49.2in)	1280mm (50.4in)	1310mm (51.6in)
1100	1300mm (51.2in)	1330mm (52.4in)	1360mm (53.5in)
1150	1350mm (53.1in)	1380mm (54.3in)	1410mm (55.5in)
1200	1400mm (55.1in)	1430mm (56.3in)	1460mm (57.5in)
1250	1450mm (57.1in)	1480mm (58.3in)	1510mm (59.4in)
1300	1500mm (59.1in)	1530mm (60.2in)	1560mm (61.4in)
1350	1550mm (61in)	1580mm (62.2in)	1610mm (63.4in)
1400	1600mm (63in)	1630mm (64.2in)	1660mm (65.4in)
1450	1650mm (65in)	1680mm (66.1in)	1710mm (67.3in)
1500	1700mm (66.9in)	1730mm (68.1in)	1760mm (69.3in)
1550	1750mm (68.9in)	1780mm (70.1in)	1810mm (71.3in)
1600	1800mm (70.9in)	1830mm (72in)	1860mm (73.2in)
1650	1850mm (72.8in)	1880mm (74in)	1910mm (75.2in)
1700	1900mm (74.8in)	1930mm (76in)	1960mm (77.2in)
1750	1950mm (76.8in)	1980mm (78in)	2010mm (79.1in)

## Shaft Mass

Stroke	L160D	L160T	L160Q
100	0.28kg (0.62lb)	0.33kg (0.73lb)	0.37kg (0.82lb)
150	0.35kg (0.77lb)	0.4kg (0.88lb)	0.44kg (0.97lb)
200	0.42kg (0.93lb)	0.47kg (1.0lb)	0.51kg (1.1lb)
250	0.49kg (1.1lb)	0.54kg (1.2lb)	0.58kg (1.3lb)
300	0.56kg (1.2lb)	0.61kg (1.3lb)	0.65kg (1.4lb)
350	0.64kg (1.4lb)	0.68kg (1.5lb)	0.72kg (1.6lb)
400	0.72kg (1.6lb)	0.77kg (1.7lb)	0.81kg (1.8lb)
450	0.79kg (1.7lb)	0.84kg (1.9lb)	0.88kg (1.9lb)
500	0.86kg (1.9lb)	0.91kg (2.0lb)	0.95kg (2.1lb)
550	0.93kg (2.1lb)	1kg (2.2lb)	1kg (2.2lb)
600	1kg (2.2lb)	1kg (2.2lb)	1.1kg (2.4lb)
650	1.1kg (2.4lb)	1.1kg (2.4lb)	1.2kg (2.6lb)
700	1.1kg (2.4lb)	1.2kg (2.6lb)	1.2kg (2.6lb)
750	1.2kg (2.6lb)	1.3kg (2.9lb)	1.3kg (2.9lb)
800	1.3kg (2.9lb)	1.3kg (2.9lb)	1.4kg (3.1lb)
850	1.4kg (3.1lb)	1.4kg (3.1lb)	1.5kg (3.3lb)
900	1.5kg (3.3lb)	1.5kg (3.3lb)	1.5kg (3.3lb)
950	1.5kg (3.3lb)	1.6kg (3.5lb)	1.6kg (3.5lb)
1000	1.6kg (3.5lb)	1.6kg (3.5lb)	1.7kg (3.7lb)
1050	1.7kg (3.7lb)	1.7kg (3.7lb)	1.7kg (3.7lb)
1100	1.7kg (3.7lb)	1.8kg (4.0lb)	1.8kg (4.0lb)
1150	1.8kg (4.0lb)	1.9kg (4.2lb)	1.9kg (4.2lb)
1200	1.9kg (4.2lb)	1.9kg (4.2lb)	2kg (4.4lb)
1250	2kg (4.4lb)	2kg (4.4lb)	2kg (4.4lb)
1300	2kg (4.4lb)	2.1kg (4.6lb)	2.1kg (4.6lb)
1350	2.1kg (4.6lb)	2.2kg (4.9lb)	2.2kg (4.9lb)
1400	2.2kg (4.9lb)	2.2kg (4.9lb)	2.3kg (5.1lb)
1450	2.3kg (5.1lb)	2.3kg (5.1lb)	2.3kg (5.1lb)
1500	2.3kg (5.1lb)	2.4kg (5.3lb)	2.4kg (5.3lb)
1550	2.4kg (5.3lb)	2.4kg (5.3lb)	2.5kg (5.5lb)
1600	2.5kg (5.5lb)	2.5kg (5.5lb)	2.6kg (5.7lb)
1650	2.6kg (5.7lb)	2.6kg (5.7lb)	2.6kg (5.7lb)
1700	2.6kg (5.7lb)	2.7kg (6.0lb)	2.7kg (6.0lb)
1750	2.7kg (6.0lb)	2.7kg (6.0lb)	2.8kg (6.2lb)


Additional stroke lengths are available. Contact Nippon Pulse for more information.

## Standard Lead Wire

Wire Type	UL 2464FA
Wire AWG	25
U Phase	Red
V Phase	White
W Phase	Black

300mm lead wire bare leads. The bending radius of the motor cable should be 25.8mm as suggested by the wire manufacturer.

## CE Type Lead Wire Option

Ground Wire	
Wire Type	UL 1330
Wire AWG	24
U Phase	Red
V Phase	White
W Phase	Black

300mm lead wire bare leads. The bending radius of the motor cable should be 16.96mm as suggested by the wire manufacturer. FG type with insulating sheet between coils and case. Meets all requirements of EN60034-1 (1998).

Note: Metric units guaranteed. Imperial (United States customary) units are calculated.

## Forcer Spacing Distance

Spec	L160T	L160Q
Forcer Spacing Distance	10mm	
Pole (N/S) Distance	30mm	
Forcer Length	110mm	140mm
Flip Forcers	No	Yes

Tandem L160D forcers are possible, but are equivalent to one (1) L160Q forcer and thus are not listed above.

## Tandem Forcer



Forcer Spacing Distance

## Connector (Motor Cable)

Receptacle Housing	XMR-03V
Plug Housing	XMP-03V
Retainer	XMS-03V
Pin Contact	SXM-001T-P0.6
Socket Contact	SXA-001T-P0.6

To be installed by the user.

## Support and Bending

Stroke	Support Length (L2)	Max. Bending
0~350	25mm	0.00mm
351~500	40mm	0.30mm
501~800	40mm	0.50mm
801~max	60mm	0.50mm

Shaft Diameter (D) - 16mm ±0.1

Total Length (L)=Stroke (S)+Forcer Length(A)  
+(Support Length (L2)x2)

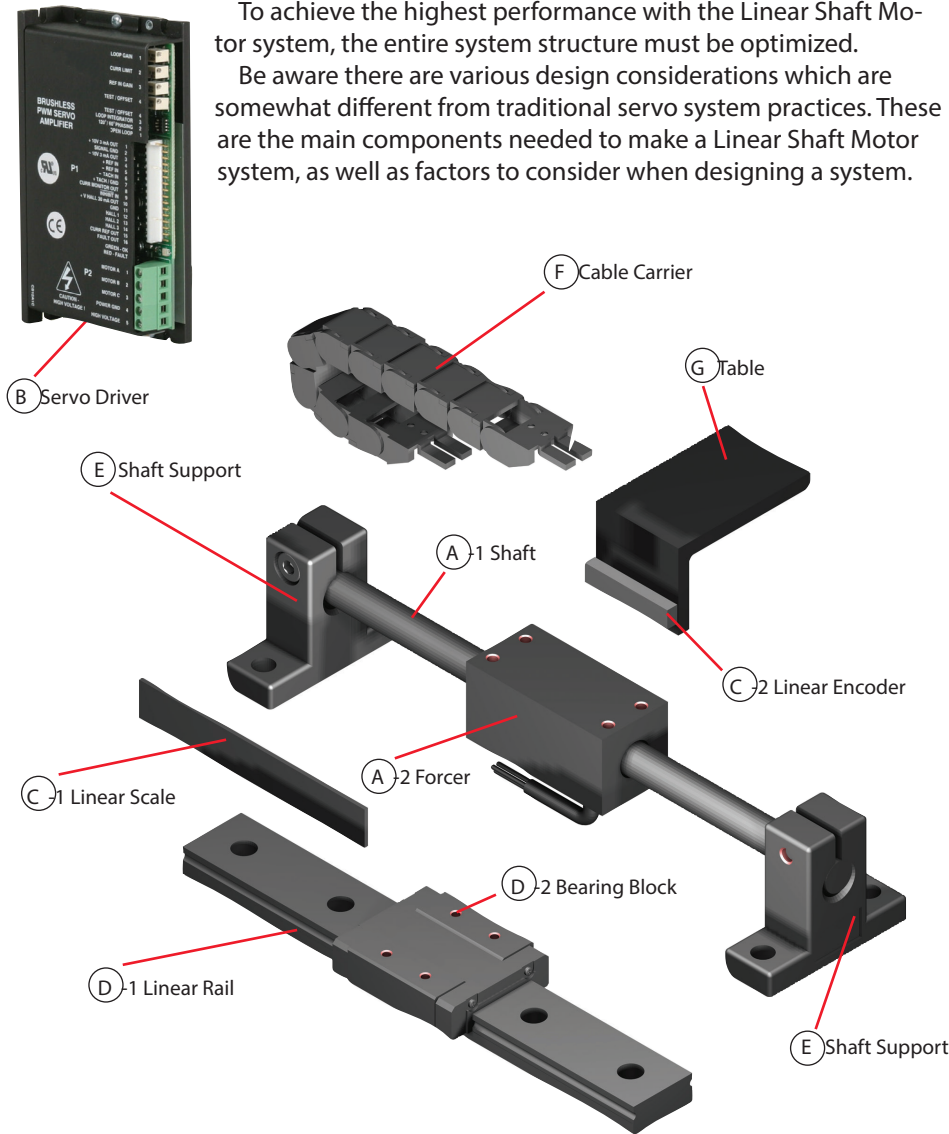
For assistance in selecting the best motor for your application, contact Nippon Pulse to speak with an applications engineer. 1-540-633-1677

[www.nipponpulse.com](http://www.nipponpulse.com)

The design of the Linear Shaft Motor allows you to replace traditional linear motion systems, such as a standard ball screw, with the Linear Shaft Motor and achieve higher speed and resolution.

To achieve the highest performance with the Linear Shaft Motor system, the entire system structure must be optimized.

Be aware there are various design considerations which are somewhat different from traditional servo system practices. These are the main components needed to make a Linear Shaft Motor system, as well as factors to consider when designing a system.



### Configuring the Linear Shaft Motor

To configure a system using the Linear Shaft Motor, the following peripheral devices are required:

- A. Linear Shaft Motor
- B. Servo Driver
- C. Linear encoder (optical or magnetic)

Item D (Linear Guide) is a necessary part of a system, but consideration must be given to the application, demand specifications, environmental conditions, and which will be moving--the forcer or the shaft.

The other items, E through G, are optional and will need to be selected depending on the application.

## System Design Linear Shaft Motor

### Steps to putting together a Linear Shaft Motor System

Choose the Linear Shaft Motor based on force and stroke requirements.

Choose the shaft supports based on design and motor specifications.

Choose the linear guide (bearings) based on cost and smoothness (performance) constraints.

Choose the linear encoder to achieve the required position resolution.

Choose the servo driver to match the power requirements of the Linear Shaft Motor.

Choose the OTL, limit switches/other components and assemble the Linear Shaft Motor system.