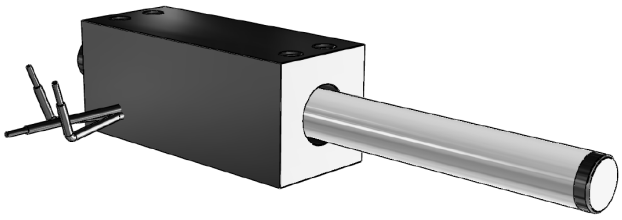
Nippon Pulse
Your Partner in Motion Control

S040
Linear Shaft Motor

Visit nipponpulse.com to download 3D CAD drawings and 2D prints of this motor.

Electrical Specs	S040D	S040T	S040Q	S040X
Continuous Force[1]	0.29N (0.07lbs)	0.45N (0.10lbs)	0.58N (0.13lbs)	0.94 (0.22lbs)
Continuous Current[1]	0.3Arms			0.6Arms
Acceleration Force[2]	1.2N (0.27lbs)	1.8N (0.40lbs)	2.3N (0.52lbs)	3.8N (0.86lbs)
Acceleration Current[2]	1.1Arms			2.2Arms
Force Constant (K_f)	1.0N/amp (0.23lbs/amp)	1.6N/amp (0.37lbs/amp)	2.1N/amp (0.47lbs/amp)	1.7N/amp (0.39lbs/amp)
Back EMF (K_e)	0.4V/m/s (0.01V/in/s)	0.5V/m/s (0.01V/in/s)	0.7V/m/s (0.02V/in/s)	0.6V/m/s (0.02V/in/s)
Resistance 25°C,[3]	11.2Ω	16.8Ω	22.4Ω	11.2Ω
Inductance[3]	0.5mH	0.7mH	1.0mH	0.5mH
Electric Time Constant	0.045ms	0.042ms	0.044ms	0.045ms
Fundamental Motor Constant (K_m)	0.31N√W	0.39N√W	0.44N√W	0.50N√W
Magnetic Pitch (North-North)	18mm (0.71in)			

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.
[1] 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.
[2] 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.
[3] All winding parameters listed are measured line-to-line (phase-to-phase).



Bus Voltage

Forcer Specs	S040D	S040T	S040Q	S040X
Forcer Length (A)	25mm (0.98in)	34mm (1.34in)	43mm (1.69in)	79mm (3.1in)
Forcer Width	10mm (0.39in)			
Forcer Screw Pitch (P)	21.5mm (0.85in)	30.5mm (1.20in)	39.5mm (1.56in)	75.5mm (2.97in)
Forcer Weight	9g (0.02lb)	11g (0.02lb)	14g (0.03lb)	35g (1.23oz)
Gap	0.50mm (0.02in)			
Screw	M3			
Tightening Torque	0.17 Nm			

Part Numbering System

S	—	Shaft Size	Forcer Size (A)	—	Parallel Option	—	Usable Stroke (S)	—	Options
		040	X		XX		XXXXst		XX
			D: Double (2) windings T: Triple (3) windings Q: Quadruple (4) windings		Blank: Standard PL: Parallel Motors		20, 30, 40		Blank: Standard FO: Forcer Only SO: Shaft Only

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

Thermal Specs	S040D	S040T	S040Q	S040X
Max Phase Temperature[4]	135°C (275°F)			
Thermal Resistance (Coil) (K_q)	125.3°C/W	83.5°C/W	62.6°C/W	31.3°C/W

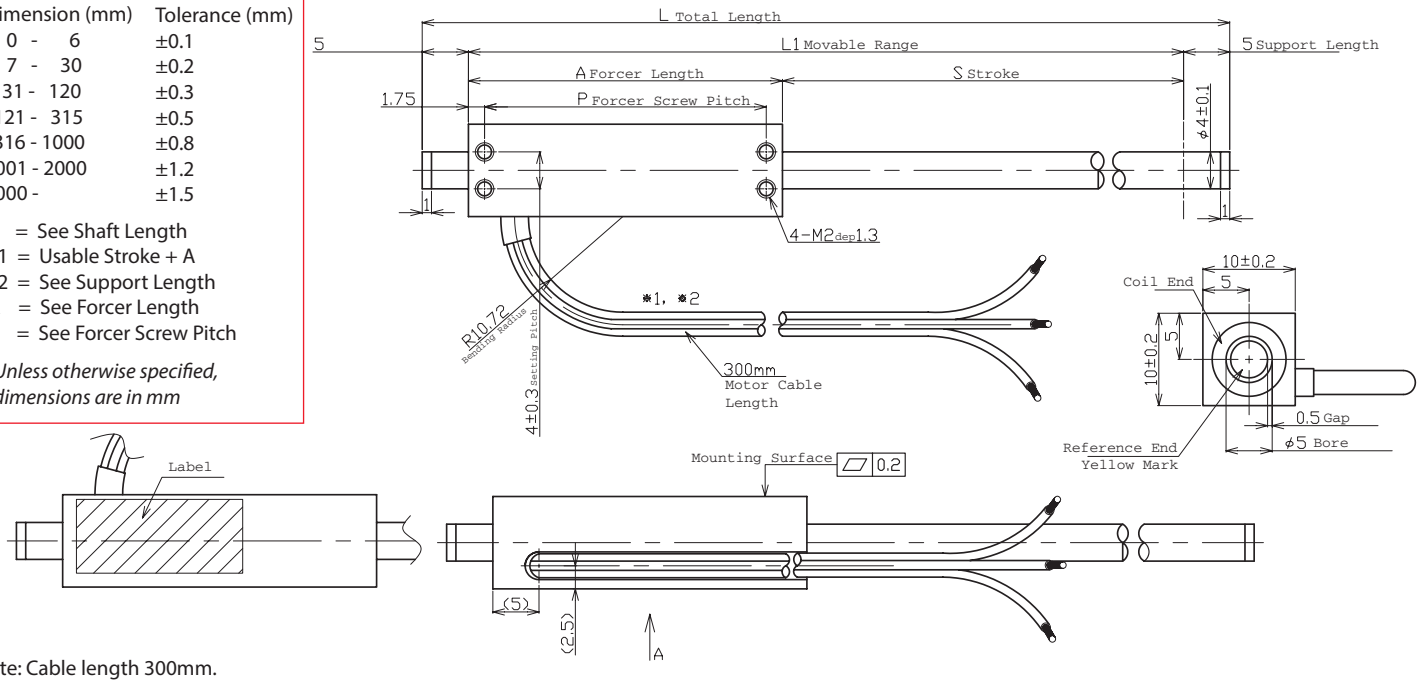
[4]The standard temperature difference between the coil and the forcer surface is 10°C.

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



Note: Cable length 300mm.
The bending radius of the motor cable should be 10.72 mm (wire diameter 1.34 * 8) 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.

Shaft Length (L)

Stroke	S040D	S040T	S040Q	S040X
20	55mm (2.2in)	64mm (2.5in)	73mm (2.9in)	109mm (4.3in)
30	65mm (2.6in)	74mm (2.9in)	83mm (3.3in)	119mm (4.7in)
40	75mm (3.0in)	84mm (3.3in)	93mm (3.7in)	129mm (5.1in)

Shaft Diameter - 4mm ±0.1
Additional stroke lengths are available (up to 250mm for S040D, and up to 200mm for S040T, S040Q, S040X). Contact Nippon Pulse for more information.

Shaft Mass

Stroke	S040D	S040T	S040Q	S040X
20	5.5g (0.19oz)	6.4g (0.23oz)	7.3g (0.26oz)	10.9g (0.38oz)
30	6.5g (0.23oz)	7.4g (0.26oz)	8.3g (0.29oz)	11.9g (0.42oz)
40	7.5g (0.26oz)	8.4g (0.3oz)	9.3g (0.33oz)	12.9g (0.46oz)

Forcer Spacing Distance

Spec	S040T	S040Q
Forcer Spacing Distance	2mm	
Pole (N/S) Distance	9mm	
Forcer Length	34mm	43mm
Flip Forcers	No	Yes

Tandem S040D forcers are possible, but are equivalent to one (1) S040Q forcer and thus are not listed.

Support and Bending

Stroke	Support Length (L2)	Max. Bending
All	5mm	0mm

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.

Lead Wire

Wire Type	UL 1430
Wire AWG	28
U Phase	Red
V Phase	White
W Phase	Black

300mm lead wire bare leads. The bending radius of the motor cable should be 10.72mm as suggested by the wire manufacturer.

Tandem Forcer

Forcer Spacing Distance

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

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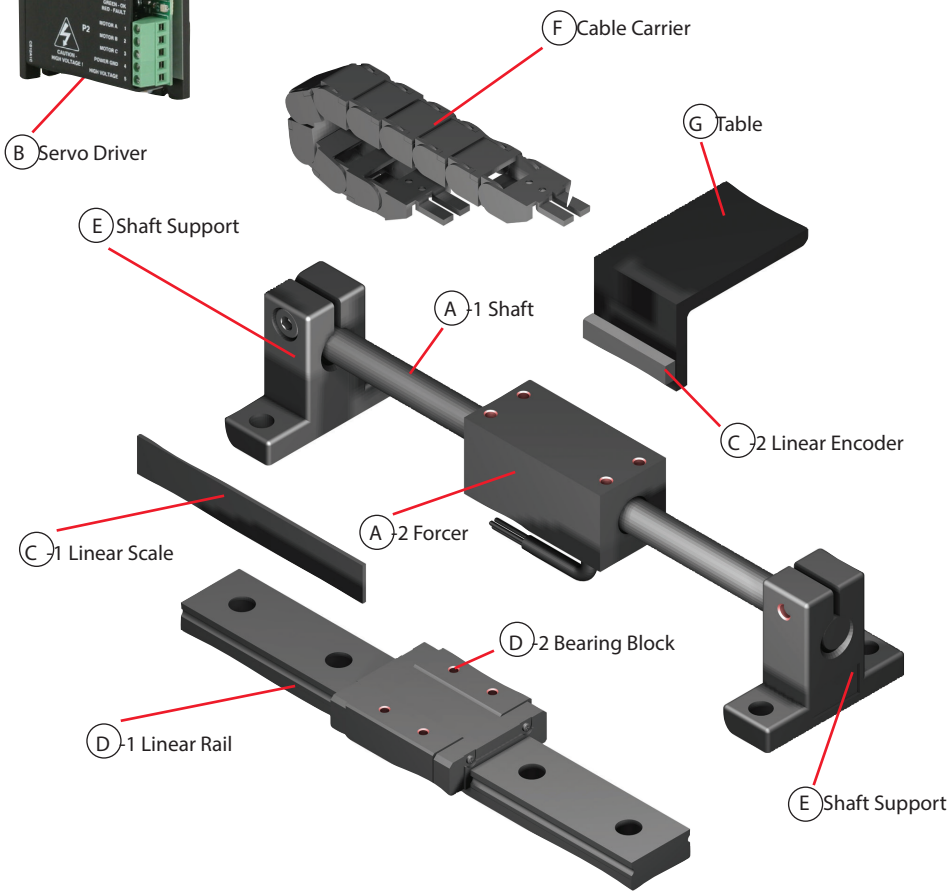
System Design
Linear Shaft Motor

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.



Steps to putting together a Linear Shaft Motor System

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

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Choose the shaft supports based on design and motor specifications.

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

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Choose the linear encoder to achieve the required position resolution.

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

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