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	S320D		S320T		S320Q		
Electrical Specs	S320D	S320D 1S	S320T	S320T 1S	S320Q	S320Q 2S	S320Q 1S
Continuous Force <sup>1</sup>	56N (12.59lbs)	55N (12.37lbs)	85N (19.11lbs)	80N (17.99lbs)	113N (25.40lbs)	104N (23.38lbs)	
Continuous Current <sup>1</sup>	1.2Arms	2.4Arms	1.2Arms	3.5Arms	1.2Arms	2.3Arms	4.6Arms
Acceleration Force <sup>2</sup>	226N (50.81lbs)	221N (49.69lbs)	338N (75.99lbs)	318N (71.49lbs)	451N (101.39lbs)	417N (93.75lbs)	
Acceleration Current <sup>2</sup>	5.0Arms	9.8Arms	5.0Arms	14Arms	5.0Arms	9.2Arms	18.4Arms
Force Constant (K <sub>f</sub> )	45N/Arms	23N/Arms	68N/Arms	23N/Arms	91N/Arms	45N/Arms	23N/Arms
Back EMF (K <sub>e</sub> )	15V/m/s	7.6V/m/s	23V/m/s	7.6V/m/s	30V/m/s	15V/m/s	7.6V/m/s
Resistance 25°C <sup>3</sup>	11Ω	2.8Ω	17Ω	1.9Ω	23Ω	5.8Ω	1.4Ω
Inductance <sup>3</sup>	17mH	4.3mH	26mH	2.9mH	34.0mH	8.5mH	2.1mH
Electric Time Constant	1.55ms		1.53ms		1.48ms		
Max. Rated Voltage (AC)	240V						
Fundamental Motor Constant (K <sub>m</sub> )	13.84N√W	13.66N√W	17.62N√W	16.49N√W	20.49N√W	18.89N√W	
Magnetic Pitch (North-North)	120mm						

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.

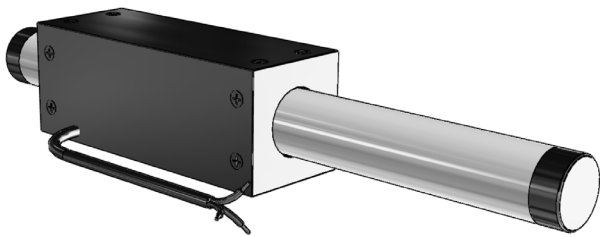
<sup>1</sup> Based on a temp rise of coil surface of 110°K over 25°C ambient temperature stalled forcer, and no external cooling or heat sinking.

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

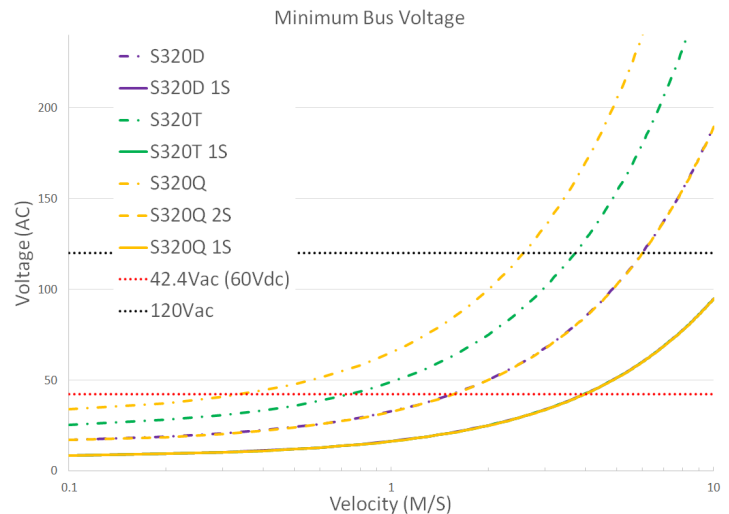
<sup>3</sup> All winding parameters listed are measured line-to-line (phase-to-phase).

Thermal Specs	S320D	S320T	S320Q
Max Phase Temperature <sup>4</sup>	135°C (275°F)		
Thermal Resistance (Coil) (K <sub>c</sub> )	6.7°C/W	4.7°C/W	3.6°C/W

<sup>4</sup> The standard temperature difference between the coil and the forcer surface is 25°C.



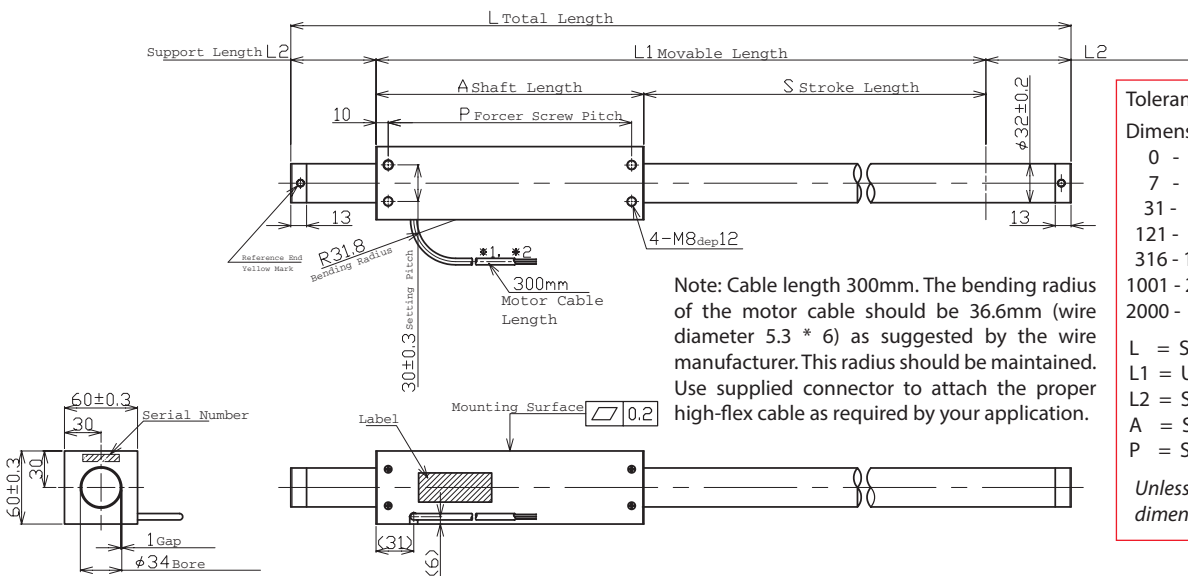
### Bus Voltage



### Part Numbering System

S	—	Shaft Size	320	—	Forcer Size (A)	X	—	Parallel Option	XX	—	Usable Stroke (S)	XXXXst	—	Options	XX	—	Options	XX
					D: Double (2) windings			Blank: Single Motor			100-2000mm			Blank: Standard			Blank: Standard	
					T: Triple (3) windings			PL: Parallel Motors						WP: Water Resistant			FO: Forcer Only	
					Q: Quadruple (4) windings									HA: Digital Hall Effect			SO: Shaft Only	
														CE: CE type motor				
														FG: Frame Ground				

Forcer Specs	S320D	S320T	S320Q
Forcer Length (A)	160mm (6.3in)	220mm (8.7in)	280mm (11.0in)
Forcer Width	60mm (2.36in)		
Forcer Screw Pitch (P)	140mm (5.51in)	200mm (7.9in)	260mm (10.2in)
Forcer Weight	1.2kg (2.6lbs)	1.7kg (3.7lbs)	2.2kg (4.9lbs)
Gap	1.00mm (0.04in)		
Screw	M8		
Tightening Torque	12.5 Nm		



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

The diagram shows the Hall Effect sensor assembly with dimensions:
 

- Forcer Length (A)**: Length of the forcer.
- Forcer Screw Pitch (P)**: Pitch of the forcer screw.
- 1.18**: Distance between screws.
- 30**: Distance from the right end to the last screw.
- 2.36** and **60**: Dimensions of the sensor housing.
- 2.36 ± 0.01** and **60 ± 0.3**: Dimensions of the sensor cable.
- 2.36 ± 0.01** and **60 ± 0.3**: Dimensions of the sensor cable.

 A note states: "Note: The bending radius of the motor cable should be R36.6mm (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."

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 R27.6mm (wire diameter 6.1 \* 6) as suggested by the wire manufacturer. This radius should be maintained.

## FG/FGA Type Motor Cable

Wire Type	UL 1330
Wire AWG	20
Frame Ground	Green/Yellow

**Standard Lead Wire**

Wire Type	UL 2464FA
Wire AWG	20
U Phase	Red
V Phase	White
W Phase	Black

300mm lead wire bare leads. The bending radius of the motor cable should be 36.6mm as suggested by the wire manufacturer.

## Shaft Length (L)

Stroke	S320D	S320T	S320Q
100	Stroke is less than the electrical cycle length. Contact Nippon Pulse.		
150	410mm (16.1in)	470mm (18.5in)	530mm (20.9in)
200	460mm (18.1in)	520mm (20.5in)	580mm (22.8in)
250	510mm (20.1in)	570mm (22.4in)	630mm (24.8in)
300	560mm (22in)	620mm (24.4in)	680mm (26.8in)
350	610mm (24in)	670mm (26.4in)	730mm (28.7in)
400	660mm (26in)	720mm (28.3in)	780mm (30.7in)
450	710mm (28in)	770mm (30.3in)	830mm (32.7in)
500	760mm (29.9in)	820mm (32.3in)	880mm (34.6in)
550	810mm (31.9in)	870mm (34.3in)	930mm (36.6in)
600	860mm (33.9in)	920mm (36.2in)	980mm (38.6in)
650	910mm (35.8in)	970mm (38.2in)	1030mm (40.6in)
700	960mm (37.8in)	1020mm (40.2in)	1080mm (42.5in)
750	1010mm (39.8in)	1070mm (42.1in)	1130mm (44.5in)
800	1100mm (43.3in)	1160mm (45.7in)	1220mm (48in)
850	1150mm (45.3in)	1210mm (47.6in)	1270mm (50in)
900	1200mm (47.2in)	1260mm (49.6in)	1320mm (52in)
950	1250mm (49.2in)	1310mm (51.6in)	1370mm (53.9in)
1000	1300mm (51.2in)	1360mm (53.5in)	1420mm (55.9in)
1050	1350mm (53.1in)	1410mm (55.5in)	1470mm (57.9in)
1100	1400mm (55.1in)	1460mm (57.5in)	1520mm (59.8in)
1150	1450mm (57.1in)	1510mm (59.4in)	1570mm (61.8in)
1200	1500mm (59.1in)	1560mm (61.4in)	1620mm (63.8in)
1250	1550mm (61in)	1610mm (63.4in)	1670mm (65.7in)
1300	1600mm (63in)	1660mm (65.4in)	1720mm (67.7in)
1350	1650mm (65in)	1710mm (67.3in)	1770mm (69.7in)
1400	1700mm (66.9in)	1760mm (69.3in)	1820mm (71.7in)
1450	1750mm (68.9in)	1810mm (71.3in)	1870mm (73.6in)
1500	1800mm (70.9in)	1860mm (73.2in)	1920mm (75.6in)
1550	1910mm (75.2in)	1970mm (77.6in)	2030mm (79.9in)
1600	2020mm (79.5in)	2080mm (81.9in)	2140mm (84.3in)
1650	2130mm (83.9in)	2190mm (86.2in)	2250mm (88.6in)

## Shaft Mass

Stroke	S320D	S320T	S320Q
100	Stroke is less than the electrical cycle length. Contact Nippon Pulse.		
150	2.1kg (4.6lb)	2.4kg (5.4lb)	2.8kg (6.1lb)
200	2.4kg (5.2lb)	2.7kg (6lb)	3kg (6.7lb)
250	2.7kg (5.8lb)	3kg (6.6lb)	3.3kg (7.3lb)
300	2.9kg (6.5lb)	3.3kg (7.2lb)	3.6kg (8lb)
350	3.2kg (7.1lb)	3.6kg (7.8lb)	3.9kg (8.6lb)
400	3.5kg (7.7lb)	3.8kg (8.5lb)	4.2kg (9.2lb)
450	3.8kg (8.3lb)	4.1kg (9.1lb)	4.5kg (9.8lb)
500	4.1kg (8.9lb)	4.4kg (9.7lb)	4.7kg (10.4lb)
550	4.3kg (9.6lb)	4.7kg (10.3lb)	5kg (11.1lb)
600	4.6kg (10.2lb)	5kg (10.9lb)	5.3kg (11.7lb)
650	4.9kg (10.8lb)	5.2kg (11.6lb)	5.6kg (12.3lb)
700	5.2kg (11.4lb)	5.5kg (12.2lb)	5.9kg (12.9lb)
750	5.5kg (12.1lb)	5.8kg (12.8lb)	6.1kg (13.5lb)
800	5.8kg (12.9lb)	6.2kg (13.6lb)	6.5kg (14.4lb)
850	6.1kg (13.5lb)	6.5kg (14.3lb)	6.8kg (15lb)
900	6.4kg (14.1lb)	6.7kg (14.9lb)	7.1kg (15.6lb)
950	6.7kg (14.7lb)	7kg (15.5lb)	7.4kg (16.2lb)
1000	7kg (15.4lb)	7.3kg (16.1lb)	7.6kg (16.9lb)
1050	7.3kg (16lb)	7.6kg (16.7lb)	7.9kg (17.5lb)
1100	7.5kg (16.6lb)	7.9kg (17.4lb)	8.2kg (18.1lb)
1150	7.8kg (17.2lb)	8.2kg (18lb)	8.5kg (18.7lb)
1200	8.1kg (17.9lb)	8.4kg (18.6lb)	8.8kg (19.3lb)
1250	8.4kg (18.5lb)	8.7kg (19.2lb)	9.1kg (20lb)
1300	8.7kg (19.1lb)	9kg (19.8lb)	9.3kg (20.6lb)
1350	8.9kg (19.7lb)	9.3kg (20.5lb)	9.6kg (21.2lb)
1400	9.2kg (20.3lb)	9.6kg (21.1lb)	9.9kg (21.8lb)
1450	9.5kg (21lb)	9.8kg (21.7lb)	10.2kg (22.4lb)
1500	9.8kg (21.6lb)	10.1kg (22.3lb)	10.5kg (23.1lb)
1550	10.2kg (22.5lb)	10.5kg (23.3lb)	10.9kg (24lb)
1600	10.5kg (23.1lb)	10.8kg (23.9lb)	11.2kg (24.6lb)
1650	10.8kg (23.8lb)	11.1kg (24.5lb)	11.5kg (25.2lb)

Shaft length and mass continued on following page...

## Shaft Length (L), continued

1700	2240mm (88.2in)	2300mm (90.6in)	2360mm (92.9in)
1750	2350mm (92.5in)	2410mm (94.9in)	2470mm (97.2in)
1800	2460mm (96.9in)	2520mm (99.2in)	2580mm (101.6in)
1850	2570mm (101.2in)	2630mm (103.5in)	2690mm (105.9in)
1900	2680mm (105.5in)	2740mm (107.9in)	2800mm (110.2in)
1950	2790mm (109.8in)	2850mm (112.2in)	2910mm (114.6in)
2000	2900mm (114.2in)	2960mm (116.5in)	3020mm (118.9in)

Additional stroke lengths are available (up to 2310mm for S320D, 2250mm for S320T, and 2190mm for S320Q). Contact Nippon Pulse for more information.

## Forcer Spacing Distance

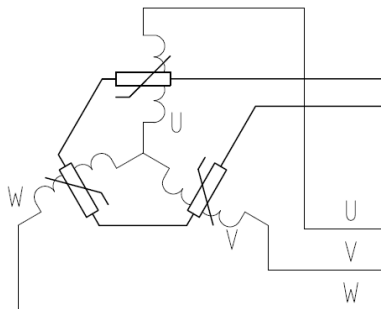
Spec	S320T	S320Q
Forcer Spacing Distance	20mm	
Pole (N/S) Distance	60mm	
Forcer Length	220mm	280mm
Flip Forcers	No	Yes

Tandem S320D forcers are possible, but are equivalent to one (1) S320Q forcer and thus are not listed above.

## Tandem Forcer



## THM Option



Circuit Diagram

4. Thermistor  
PTCSL20T071DBE(Vishay)

## Thermocouple

Thermal sensor  
Thermocouple K type (marked each phase name)  
Attached to the surface of inside of coil  
Length 3000mm

Not all motors on this datasheet have received a CE Declaration of Conformity. Only the standard S320D, S320T and S320Q motors have been certified to CE standards. The motors and motor options with the following designations have not received a CE Declaration of Conformity, and as such are designated FGA: S320D-1S, S320T-1S, S320Q-2S, S320Q-1S, any S320 motor with Hall Effects, Thermistor or Thermocouple options.

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

## Shaft Mass, continued

1700	11.1kg (24.4lb)	11.4kg (25.1lb)	11.7kg (25.9lb)
1750	11.3kg (25lb)	11.7kg (25.7lb)	12kg (26.5lb)
1800	11.6kg (25.6lb)	12kg (26.4lb)	12.3kg (27.1lb)
1850	11.9kg (26.2lb)	12.2kg (27lb)	12.6kg (27.7lb)
1900	12.2kg (26.9lb)	12.5kg (27.6lb)	12.9kg (28.3lb)
1950	12.5kg (27.5lb)	12.8kg (28.2lb)	13.1kg (29lb)
2000	12.7kg (28.1lb)	13.1kg (28.8lb)	13.4kg (29.6lb)

## Support and Bending

Stroke (D/T/Q)	Support Length (L2)	Max. Bending
0~750	50mm	0.00mm
751~1000	70mm	0.30mm
1001~1500	70mm	0.70mm
1501~max	100mm	0.70mm

Shaft Diameter (D) - 32mm ±0.2

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

## Connector (Motor Cable)

Receptacle Housing	HLR-03V
Plug Housing	HLP-03V
Retainer	HLS-03V
Pin Contact	SSM-21T-P1.4
Socket Contact	SSF-21T-P1.4

To be installed by the user.

## FGA/CE Option - Lead Wire

Ground Wire	CE
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 18.96mm as suggested by the wire manufacturer. FG type with insulating sheet between coils and case. Meets all requirements of EN60034-1 (1998).

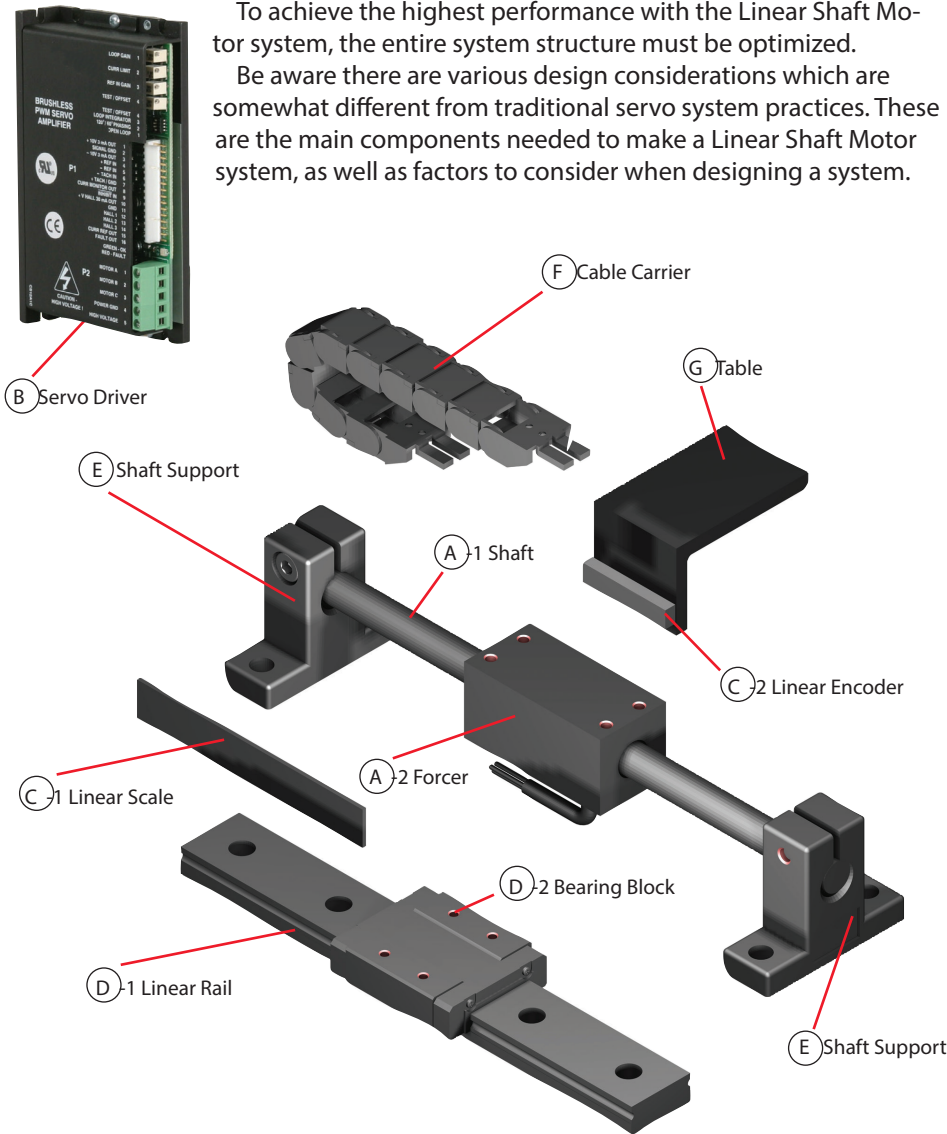
For assistance in selecting the best motor for your application, contact Nippon Pulse to speak with an applications engineer. 1-540-633-1677

[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.