Nippon Pulse
Your Partner in Motion Control

S605
Linear Shaft Motor

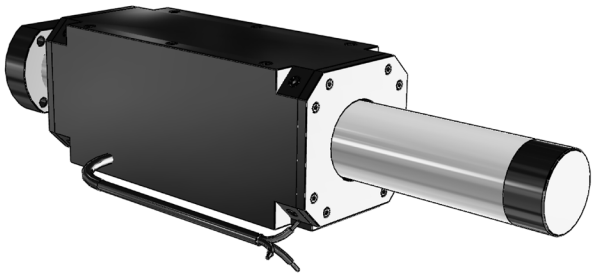
Visit nipponpulse.com to download 3D CAD drawings and 2D prints of this motor.

	S605D		S605T		S605Q		
Electrical Specs	S605D	S605D 1S	S605T	S605T 1S	S605Q	S605Q 2S	S605Q 1S
Continuous Force[1]	420N (94.4lbs)	414N (93.1lbs)	610N (137.1lbs)	611 (137.3lbs)	780N (175.4lbs)	781N (175.6lbs)	
Continuous Current[1]	8.8Arms	18Arms	8.6Arms	26Arms	8.4Arms	16.8Arms	34Arms
Acceleration Force[2]	1700N (382.2lbs)	1654 (371.82lbs)	2400N (539.5lbs)	2442 (548.9lbs)	3100N (696.9lbs)	3125 (702.5lbs)	
Acceleration Current[2]	35Arms	70Arms	34Arms	103Arms	34Arms	67Arms	134Arms
Force Constant (K_f)	47N/arms (10.6lbs/amp)	24N/Arms (5.4lbs/amp)	71N/Arms (16lbs/amp)	24N/Arms (5.4lbs/amp)	93N/Arms (20.9lbs/amp)	47N/Arms (10.6lbs/amp)	23N/Arms (5.2lbs/amp)
Back EMF (K_e)	16V/m/s (0.8V/in/s)	7.8V/m/s (0.39V/in/s)	24V/m/s (0.6V/in/s)	7.9V/m/s (0.2V/in/s)	31V/m/s (0.8V/in/s)	16V/m/s (0.41V/in/s)	7.8V/m/s (0.20V/in/s)
Resistance 25°C[3]	1.1Ω	0.28Ω	1.7Ω	0.19Ω	2.2Ω	0.55Ω	0.14Ω
Inductance[3]	6.5mH	1.6mH	10mH	1.1mH	13mH	3.3mH	0.81mH
Electric Time Constant	5.91ms		5.88ms		5.91ms		
Max. Rated Voltage (AC)	240V						
Fundamental Motor Constant (K_m)	45.51N√W	44.81N√W	54.40N√W	54.46N√W	62.60N√W	62.70N√W	
Magnetic Pitch (North-North)	240mm (9.4in)						

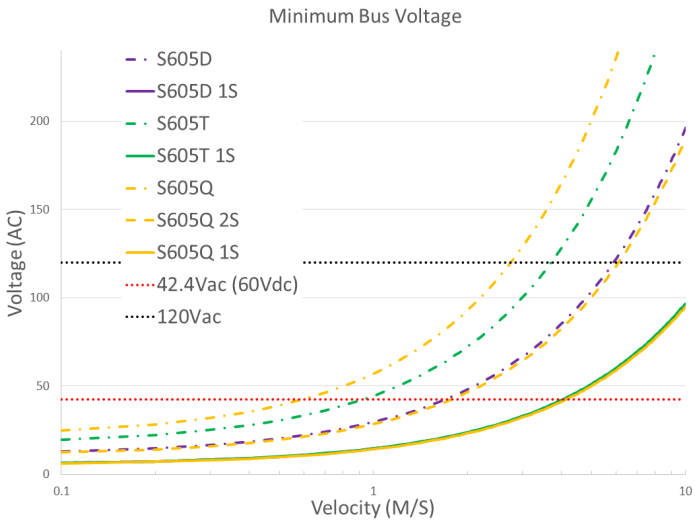
Is this the proper Linear Shaft Motor for your application? Use our SMART sizing program to assist in your decision.
This motor can be customized to fit your application demands; contact your application engineer for more information.
[1] Based on a temp rise of coil surface of 110°K over 25°C ambient 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, consult Nippon Pulse for more information.
[3] All winding parameters listed are measured line-to-line (phase-to-phase).

Thermal Specs	S605D	S605T	S605Q
Max Phase Temperature[4]	135°C (275°F)		
Thermal Resistance (Coil) (K_q)	1.3°C/W	0.9°C/W	0.7°C/W

[4] The standard temperature difference between the coil and the forcer surface is 40°C.



Bus Voltage



Part Numbering System

	Shaft Size	Forcer Size (A)		Parallel Option		Usable Stroke (S)		Options		Options
S	605	X	—	XX	—	XXXXst	—	XX	—	XX
		D: Double (2) windings T: Triple (3) windings Q: Quadruple (4) windings		Blank: Single Motor PL: Parallel Motors		200-2000mm		Blank: Standard WP: Water Resistant HA: Digital Hall Effect		Blank: Standard FO: Forcer Only SO: Shaft Only

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

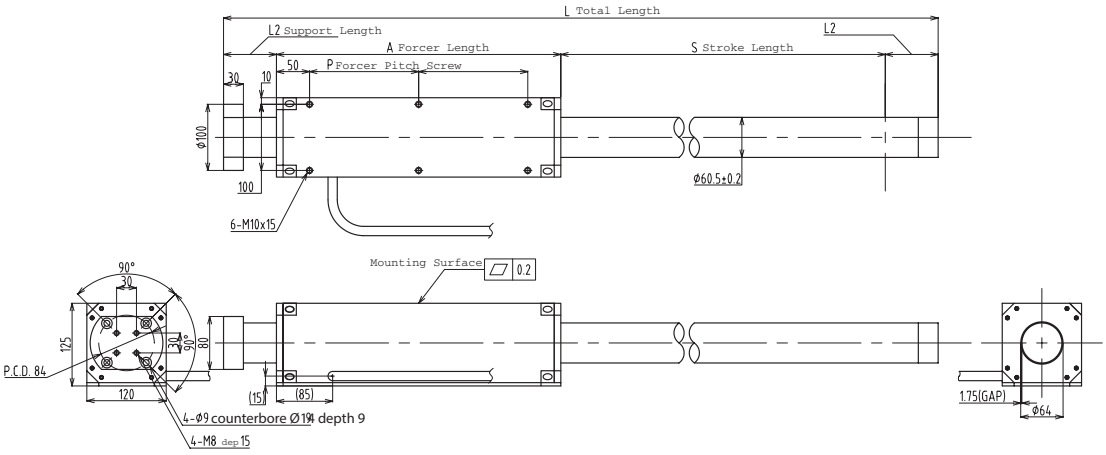
Forcer Specs	S605D	S605T	S605Q
Forcer Length (A)	310mm (12.2in)	430mm (16.9in)	550mm (21.7in)
Forcer Width	125 x 120mm (4.9 x 4.72in)		
Forcer Screw Pitch (P)	105mm (4.13in)	165mm (6.5in)	225mm (8.9in)
Forcer Weight	16kg (35.3lbs)	21kg (46.3lbs)	27kg (59.5lbs)
Gap	1.75mm (0.07in)		
Screw	M10		
Tightening Torque	24 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

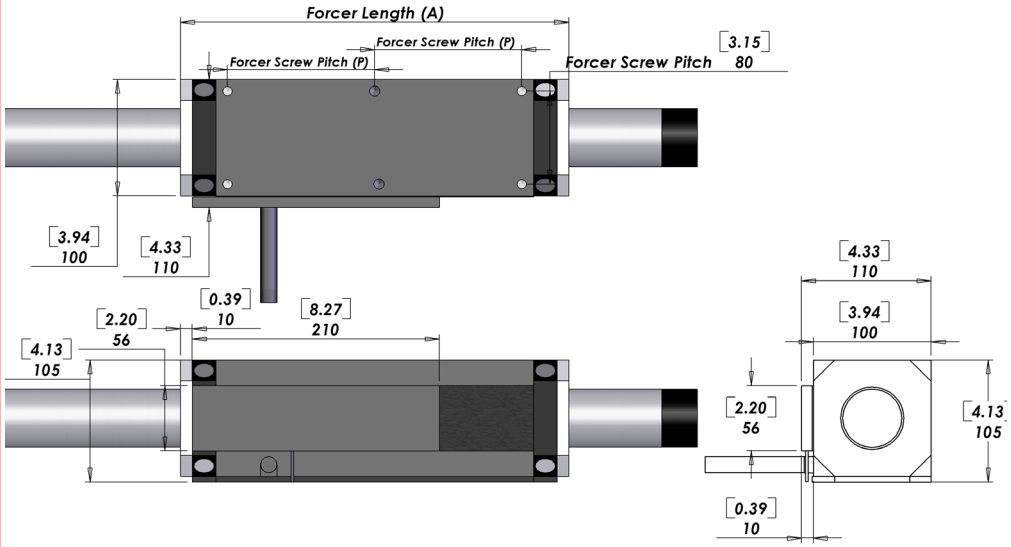
L = See Shaft Length
L1 = Usable Stroke + A
L2 = See Support Length
A = See Forcer Length
P = See Forcer Screw Pitch

Unless otherwise specified, dimensions are in mm



Note: Cable length 300mm. The bending radius of the motor cable should be 36.6mm (wire diameter 8.9 * 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.

Hall Effect Specs



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 R27.6mm (wire diameter 4.6 * 6) as suggested by the wire manufacturer. This radius should be maintained. Attach the proper high-flex cable as required by your application.

FGA/CE Type Motor Cable

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

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

300mm lead wire bare leads. The bending radius of the motor cable should be 16.96mm as suggested by the wire manufacturer.

Forcer Spacing Distance

Spec	S605T	S605Q
Forcer Spacing Distance	50mm	
Pole (N/S) Distance	120mm	
Forcer Length	430mm	550mm
Flip Forcers	No	Yes

Tandem S605D forcers are possible, but are equivalent to one (1) S605Q forcer and thus are not listed above.

Shaft Length (L)

Stroke	S605D	S605T	S605Q
100	Stroke is less than the electrical cycle length. Contact Nippon Pulse.		
150			
200	670mm (26.4in)	790mm (31.1in)	910mm (35.8in)
250	720mm (28.3in)	840mm (33.1in)	960mm (37.8in)
300	770mm (30.3in)	890mm (35in)	1010mm (39.8in)
350	820mm (32.3in)	940mm (37in)	1060mm (41.7in)
400	870mm (34.3in)	990mm (39in)	1110mm (43.7in)
450	920mm (36.2in)	1040mm (40.9in)	1160mm (45.7in)
500	970mm (38.2in)	1090mm (42.9in)	1210mm (47.6in)
550	1020mm (40.2in)	1140mm (44.9in)	1260mm (49.6in)
600	1070mm (42.1in)	1190mm (46.9in)	1310mm (51.6in)
650	1120mm (44.1in)	1240mm (48.8in)	1360mm (53.5in)
700	1170mm (46.1in)	1290mm (50.8in)	1410mm (55.5in)
750	1220mm (48in)	1340mm (52.8in)	1460mm (57.5in)
800	1310mm (51.6in)	1430mm (56.3in)	1550mm (61in)
850	1360mm (53.5in)	1480mm (58.3in)	1600mm (63in)
900	1410mm (55.5in)	1530mm (60.2in)	1650mm (65in)
950	1460mm (57.5in)	1580mm (62.2in)	1700mm (66.9in)
1000	1510mm (59.4in)	1630mm (64.2in)	1750mm (68.9in)
1050	1560mm (61.4in)	1680mm (66.1in)	1800mm (70.9in)
1100	1610mm (63.4in)	1730mm (68.1in)	1850mm (72.8in)
1150	1650mm (65in)	1780mm (70.1in)	1900mm (74.8in)
1200	1710mm (67.3in)	1830mm (72in)	1950mm (76.8in)
1250	1750mm (68.9in)	1880mm (74in)	2000mm (78.7in)
1300	1810mm (71.3in)	1930mm (76in)	2050mm (80.7in)
1350	1860mm (73.2in)	1980mm (78in)	2100mm (82.7in)
1400	1910mm (75.2in)	2030mm (79.9in)	2150mm (84.6in)
1450	1960mm (77.2in)	2080mm (81.9in)	2200mm (86.6in)
1500	2010mm (79.1in)	2130mm (83.9in)	2250mm (88.6in)
1550	2100mm (82.7in)	2180mm (85.8in)	2300mm (90.6in)
1600	2150mm (84.6in)	2230mm (87.8in)	2350mm (92.5in)
1650	2200mm (86.6in)	2280mm (89.8in)	2400mm (94.5in)
1700	2250mm (88.6in)	2330mm (91.7in)	2450mm (96.5in)
1750	2300mm (90.6in)	2380mm (93.7in)	2500mm (98.4in)
1800	2350mm (92.5in)	2430mm (95.7in)	2550mm (100.4in)
1850	2400mm (94.5in)	2480mm (97.6in)	2600mm (102.4in)
1900	2450mm (96.5in)	2530mm (99.6in)	2650mm (104.3in)
1950	2500mm (98.4in)	2580mm (101.6in)	2700mm (106.3in)
2000	2550mm (100.4in)	2630mm (103.5in)	2750mm (108.3in)

Shaft Mass

Stroke	S605D	S605T	S605Q
100	Stroke is less than the electrical cycle length. Contact Nippon Pulse.		
150			
200	13.57kg (29.9lb)	14.9kg (32.9lb)	17.3kg (38.2lb)
250	14.58kg (32.1lb)	15.9kg (35.1lb)	18.3kg (40.4lb)
300	15.59kg (34.4lb)	16.9kg (37.3lb)	19.3kg (42.6lb)
350	16.59kg (36.6lb)	17.9kg (39.5lb)	20.3kg (44.8lb)
400	17.60kg (38.8lb)	18.9kg (41.7lb)	21.3kg (47.1lb)
450	18.61kg (41lb)	19.9kg (43.9lb)	22.3kg (49.3lb)
500	19.61kg (43.2lb)	20.9kg (46.2lb)	23.4kg (51.5lb)
550	20.62kg (45.5lb)	21.9kg (48.4lb)	24.4kg (53.7lb)
600	21.62kg (47.7lb)	23kg (50.6lb)	25.4kg (55.9lb)
650	22.63kg (49.9lb)	24kg (52.8lb)	26.4kg (58.1lb)
700	23.64kg (52.1lb)	25kg (55lb)	27.4kg (60.4lb)
750	24.64kg (54.3lb)	26kg (57.3lb)	28.4kg (62.6lb)
800	26.20kg (57.8lb)	27kg (59.5lb)	29.4kg (64.8lb)
850	27.21kg (60lb)	28kg (61.7lb)	30.4kg (67lb)
900	28.22kg (62.2lb)	29kg (63.9lb)	31.4kg (69.2lb)
950	29.22kg (64.4lb)	30kg (66.1lb)	32.4kg (71.5lb)
1000	30.23kg (66.6lb)	31kg (68.3lb)	33.4kg (73.7lb)
1050	31.24kg (68.9lb)	32kg (70.6lb)	34.4kg (75.9lb)
1100	32.24kg (71.1lb)	33kg (72.8lb)	35.4kg (78.1lb)
1150	33.25kg (73.3lb)	34kg (75lb)	36.4kg (80.3lb)
1200	34.25kg (75.5lb)	35kg (77.2lb)	37.4kg (82.5lb)
1250	35.26kg (77.7lb)	36kg (79.4lb)	38.4kg (84.8lb)
1300	36.27kg (80lb)	37kg (81.7lb)	39.5kg (87lb)
1350	37.27kg (82.2lb)	38kg (83.9lb)	40.5kg (89.2lb)
1400	38.28kg (84.4lb)	39.1kg (86.1lb)	41.5kg (91.4lb)
1450	39.28kg (86.6lb)	40.1kg (88.3lb)	42.5kg (93.6lb)
1500	40.29kg (88.8lb)	41.1kg (90.5lb)	43.5kg (95.9lb)
1550	41.30kg (91.1lb)	42.1kg (92.7lb)	44.5kg (98.1lb)
1600	42.30kg (93.3lb)	43.1kg (95lb)	45.5kg (100.3lb)
1650	43.31kg (95.5lb)	44.1kg (97.2lb)	46.5kg (102.5lb)
1700	44.32kg (97.7lb)	45.1kg (99.4lb)	47.5kg (104.7lb)
1750	45.32kg (99.9lb)	46.1kg (101.6lb)	48.5kg (106.9lb)
1800	46.33kg (102.1lb)	47.1kg (103.8lb)	49.5kg (109.2lb)
1850	47.33kg (104.3lb)	48.1kg (106.1lb)	50.5kg (111.4lb)
1900	48.34kg (106.6lb)	49.1kg (108.3lb)	51.5kg (113.6lb)
1950	49.35kg (108.8lb)	50.1kg (110.5lb)	52.5kg (115.8lb)
2000	50.35kg (111lb)	51.1kg (112.7lb)	53.5kg (118lb)

Additional stroke lengths are available (up to 3000mm). Contact Nippon Pulse for more information.

Tandem Forcer

Forcer Spacing Distance

Lead Wire

Wire Type	UL 2570FA
Wire AWG	14
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.

Connector (Motor Cable)

Receptacle Housing	VLR-03V
Plug Housing	VLP-03V
Retainer	VLS-03V
Pin Contact	SVM-61T-P2.0
Socket Contact	SVF-61T-P2.0

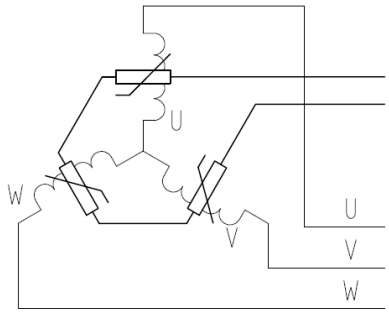
To be installed by the user.

Support and Bending

Stroke	Support Length (L2)	Max. Bending
0~550	80mm	0.00mm
551~750	80mm	0.15mm
751~1500	100mm	0.60mm
1501~max	120mm	1.10mm

Shaft Diameter (D) - 60.5mm ±0.2
Total Length (L)=Stroke (S)+Forcer Length (A)+(Support Length (L2)x2)

THM Option



Circuit Diagram

4. Thermistor
PTCSL20T071DBE(Vishay)

Thermocouple

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

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

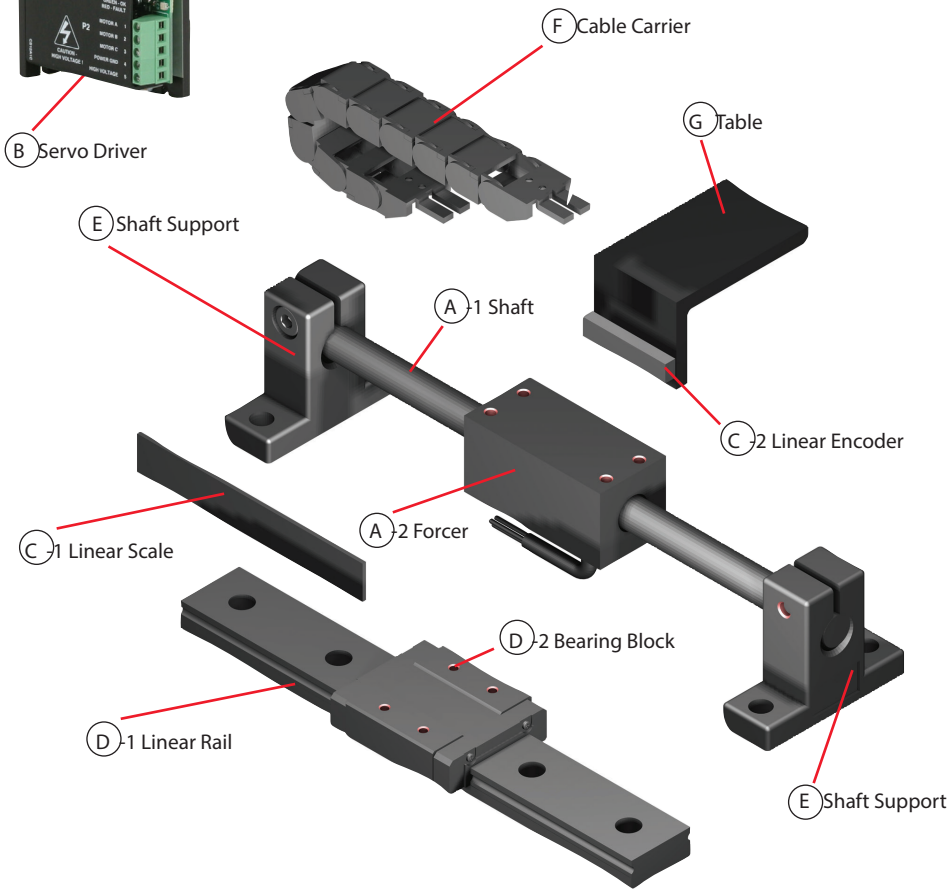
NPM Nippon Pulse
Your Partner in Motion Control

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.



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.

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.