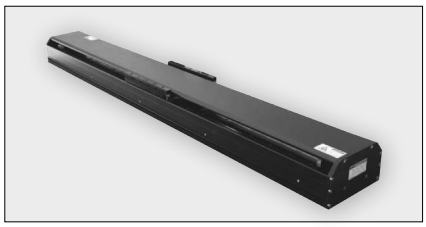
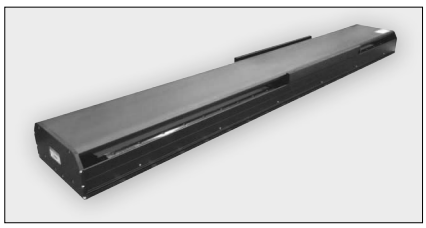
Linear Robot

Compact Linear stage





LSI Series Linear Robot Module

- Variety of base width (150, 175, 200, 280 mm)
- Long stroke (over 4,000mm) and multi mover available
- High speed option available – Max 2,000 mm/sec
- Competitive pricing with TPC linear motor
- Can be used with other linear motor brands
- Built-in precise linear encoder
- Customization available
  - Mounting type and position of limit senser and other accessories
- Detachable side cover for easy maintenance
- Quick delivery time

How to order

LSI 150 – 120 N – 0000 S1 – 10 H – B – P140012-0

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

① Series
LSI(standard single base)

② Model(width of base:mm)
Width of base
☞ 150, 175, 200, 280

③ Linear Motor (unit : newton)

Base	120N	180N	370N	500N	550N	750N	1200N	2400N
150	•	•						
175			•	•				
200					•	•		
280							•	•

④ Manufacturer of linear motor
N : NMT(TPC subsidiary)

⑤ Moving Stroke
Stroke of moving slide
☞ 100mm ~ 2,000 mm

⑥ Moving slide count
Moving slide count

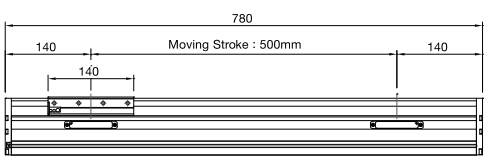
⑦ Linear encoder resolving power
10 : 1.0 ㎛ (square wave signal)

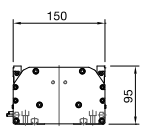
⑧ Manufacturer of encoder
H : Heidenhain

⑨ Color
Color of anodized surface
☞ N : None
☞ B : Black
☞ W : White

⑩ Customization code

Linear robot order(example)
▶ LSI150-120N-500S1-10H-B





- Aluminum profile base with 150mm width
- 120N linear motor
- Moving stroke(limit to limit):500mm/single slide
- 1μm resolving power encoder (TTL output)
- Color surface : black anodized
- Length of robot: 780mm length

※ Stroke (500mm) + Slide (140mm) + Stopper (140mm)
※ For more details, please refer to 198-199 page

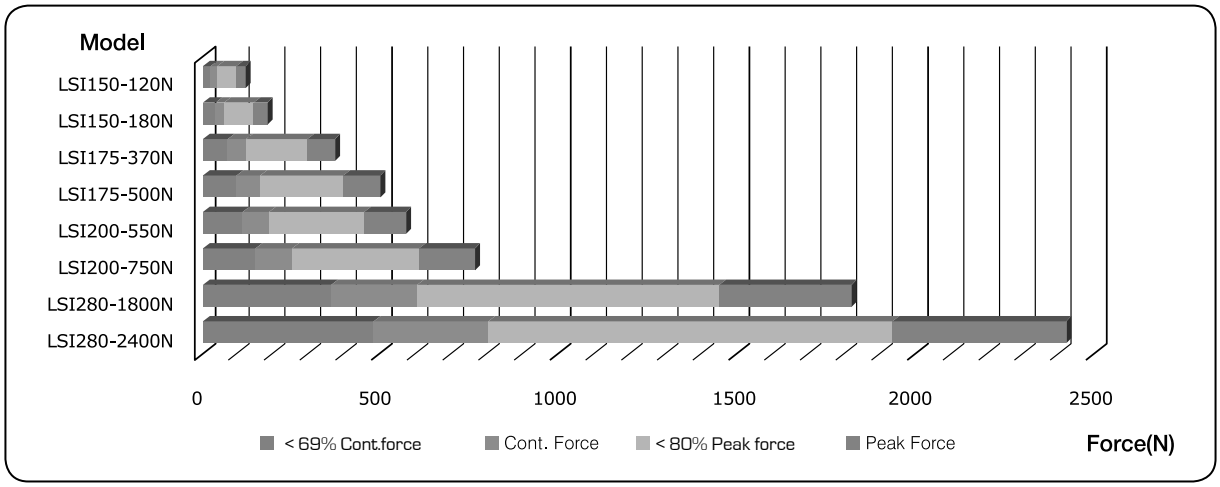
Linear Robot Specifications

Linear Robot	LSI 150 Series		LSI 175 Series		LSI 200 Series		LSI 280 Series	
Linear Motor	120N	180N	370N	500N	550N	750N	1800N	2400N
Continuous Force (Fcn)	40 N	61 N	124 N	166 N	190 N	254 N	605 N	806 N
Peak Force (Fpk)	122 N	183 N	373 N	498 N	572 N	763 N	1,815 N	2,420 N
Maximum Stroke (1)	4,000 mm (Please contact us for over 4,000mm stroke)							
Position Repeatability	± 3.0 μm (@ Linear Encoder Resolution : 1.0 μm)							
Accuracy (2)	± 10 um / 300 mm							
Flatness/ Straightness	± 10 um / 300 mm							
Maximum Velocity	2,000 mm/sec (Without Payload)							
Maximum Acceleration	1.0 G							

※ The max customizable moving stroke is 10,000mm

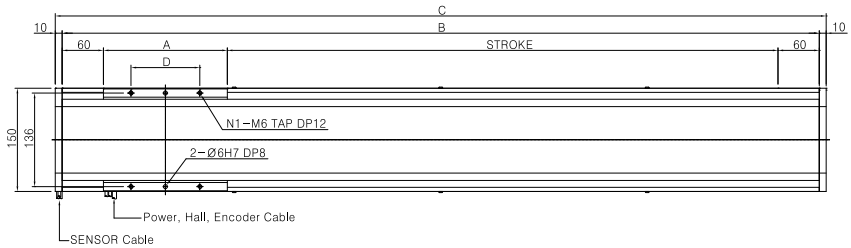
Linear Motor Specifications

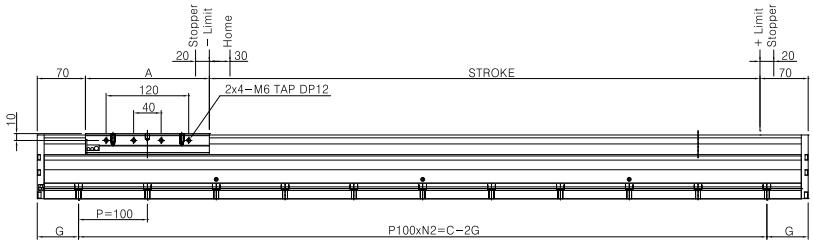
Linear Robot		LSI 150 Series		LSI 175 Series		LSI 200 Series		LSI 280 Series	
Linear Motor		120N	180N	370N	500N	550N	750N	1800N	2400N
Continuous Current (Icn)	Arms	1.3	1.3	2.0	2.0	3.8	3.8	6.4	6.4
Peak Current (Ipk)	Arms	3.9	3.9	6.0	6.0	11.4	11.4	19.2	19.2
Coil Force Constant (Kf)	N/Arms	31.3	47.0	62.3	83.0	50.3	66.9	94.6	126.1
B-EMF Constant (Ke)	V/(m/s)	15.9	23.8	32.3	43.0	21.0	28.0	48.9	65.3
Coil Resistance (R_{25})	Ω (p-p)	5.4	8.1	6.7	8.9	2.7	3.6	2.9	3.8
Inductance	mH(p-p)	10.7	16.0	18.9	25.2	9.9	13.1	22.5	29.9
Normal Force (Fm)	mH(p-p)	203.7	305.6	622.8	830.4	954.5	1272.6	3025.4	4033.9



LSI 150 Model Dimensions

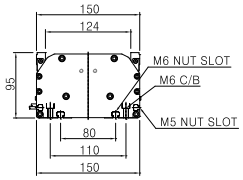
(unit : mm)





Weight		
Standard weight	End plate, stopper base, slide and cable not included	2.00 kg
Weight of base	Weight per 100mm base	1.67 kg

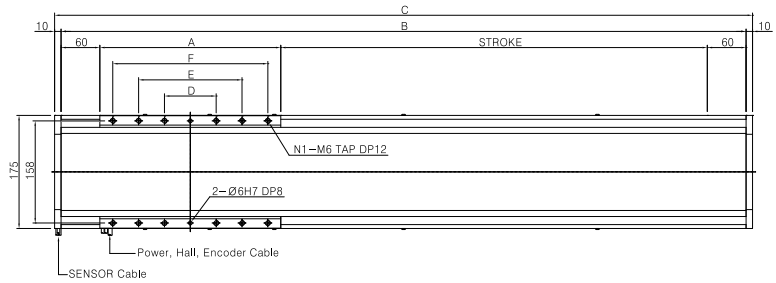
Total weight
=standard weight +(weight per base × length of rail/100) + slide weight + options

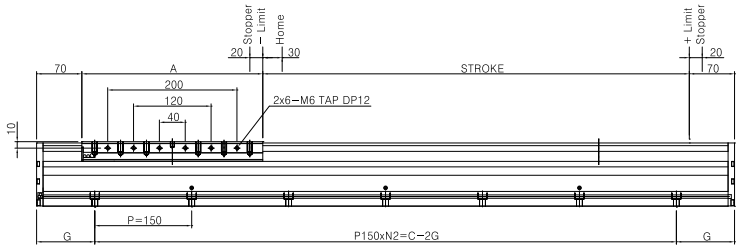


Model	A	B	C	D	E	F	N1	Slide Weight
LSI 150-120N	140 mm	ST + 260 mm	ST + 280 mm	80 mm	-	-	4 ea	3.2 kg
LSI 150-180N	180 mm	ST + 300 mm	ST + 320 mm	100 mm	-	-	4 ea	3.6 kg

LSI 175 Model Dimensions

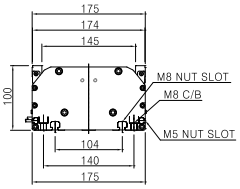
(unit : mm)





Weight		
Standard weight	End plate, stopper base, slide and cable not included	2.50 kg
Weight of base	Weight per 100mm base	2.15 kg

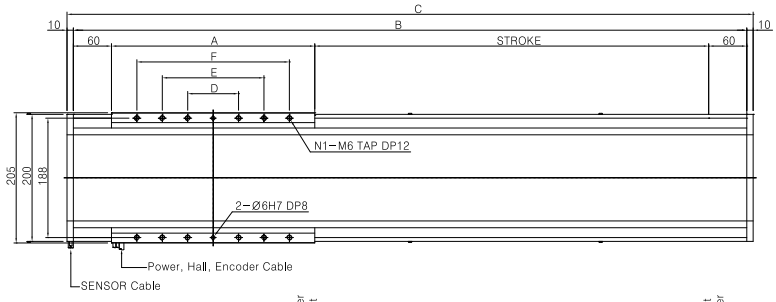
Total weight
=standard weight +(weight per base × length of rail/100) + slide weight + options

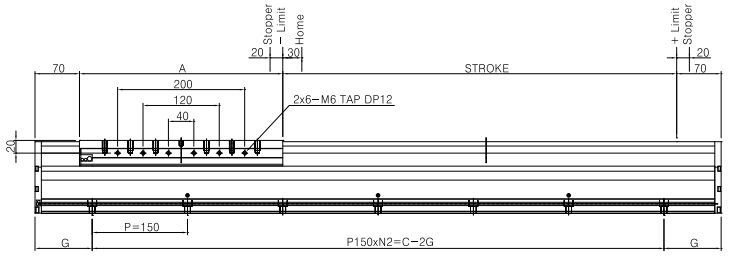


Model	A	B	C	D	E	F	N1	Slide Weight
LSI 175-370N	220 mm	ST + 340 mm	ST + 360 mm	80 mm	160 mm	-	8 ea	5.2 kg
LSI 175-500N	280 mm	ST + 400 mm	ST + 420 mm	80 mm	160 mm	240 mm	12 ea	6.1 kg

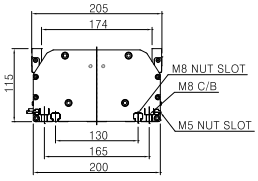
LSI 200 Model Dimensions

(unit : mm)





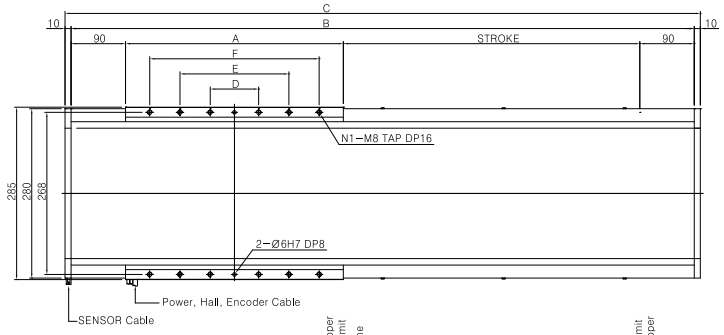
Weight		
Standard weight	End plate, stopper base, slide and cable not included	3.60 kg
Weight of base	Weight per 100mm base	2.71 kg
Total weight =standard weight +(weight per base × length of rail/100) + slide weight + options		

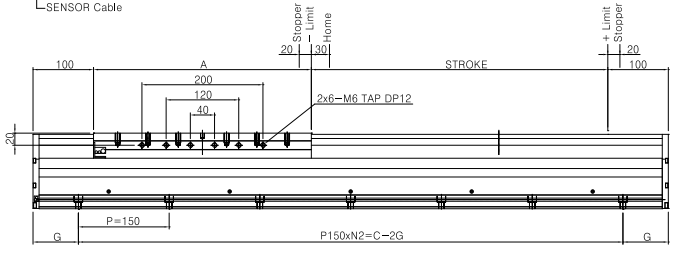


Model	A	B	C	D	E	F	N1	Slide Weight
LSI 200-550N	280 mm	ST + 400 mm	ST + 420 mm	80 mm	160 mm	240 mm	12 ea	9.7 kg
LSI 200-750N	320 mm	ST + 440 mm	ST + 460 mm	80 mm	160 mm	240 mm	12 ea	10.8 kg

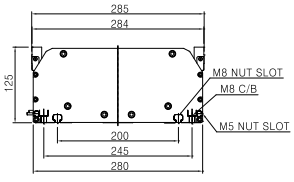
LSI 280 Model Dimensions

(unit : mm)





Weight		
Standard weight	End plate, stopper base, slide and cable not included	5.50 kg
Weight of base	Weight per 100mm base	3.92 kg
Total weight =standard weight +(weight per base × length of rail/100) + slide weight + options		

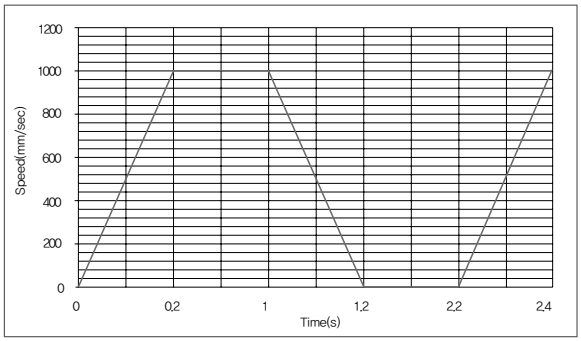


Model	A	B	C	D	E	F	N1	Slide Weight
LSI 280-1800N	360 mm	ST + 540 mm	ST + 580 mm	80 mm	180 mm	280 mm	12 ea	20.8 kg
LSI 280-2400N	460 mm	ST + 640 mm	ST + 680 mm	80 mm	240 mm	400 mm	12 ea	27.5 kg

How to select linear motor(example)

Pay Load, Mp : 20 kg
Stroke, S : 1,000 mm
Velocity, V : 1,000 mm/ sec
Acceleration, A : 0.5 G (1G≒10m/s²)
Tw : 1 sec

(1) Speed profile



– Acceleration time (Ta) = Deceleration time (Td)
Ta = V / A = 1000 / 5000 = 0.2 sec

– Constant time (Tc)
Tc = [S − V {(Ta + Td) / 2}] / V
= [1000 − 1000 {(0.2 + 0.2) / 2}] / 1000 = 0.8 sec

– Cycle Time (T)
T = Ta + Tc + Td + Tw = 0.2 + 0.8 + 0.2 + 1 = 2.2 sec

(2) Linear robot selection procedure

1) Calculate thrust force along with acceleration time and payload and then select appropriate model
F = Mp × A = 20 kg × 0.5 G × 10 m/s² = 100 N (For linear robots with over 100N constant thrust force, select linear robot with linear motor)
2) Selected model of linear robot : LSI175–370N

Continuous Force (Fcn)	124.5 N	Coil Resistance (R_{25})	6.7 ohm
Continuous Current (Icn)	2 Arms	Coil Force Constant (Kf)	62.2 N/Arms
Peak Force (Fpk)	373.7 N	B–EMF constant (Ke)	32.2 V/(m/s)
Peak Current (Ipk)	6 Arms	Inductance (p–p)	18.9 mH
Normal Force (Fm)	622.8 N	Moving Slide Weight (Ms)	5.2 kg
Bearing friction coefficient (μ)	0.05 (depends on bearing)	Bearing frictional force (Fe)	20 N (depends on bearing)

3) Calculation of each factor

Factor	Symbol	Calculation formula	Calculation
Total payload	Mt	Mp + Ms	= 20 + 5.2 = 25.2 kg
Inertial force	Fi	Mt × A × 10	= 25.2 × 0.5 × 10 = 126 N
Payload frictional force	Ff	μ× Mt × 10	= 0.05 × 25.2 × 10 = 12.6 N
Attracting frictional force	Fn	μ× Fm	= 0.05 × 622.8 = 31.1 N
Total frictional force	Ft	Ff + Fn + Fe	= 12.6 + 31.1 + 20 = 63.7 N
Accelerating thrust force	Fa	Ft + Fi	= 63.7 + 126 = 189.7 N
Constant thrust force	Fc	Ft	= 63.7 N
Decelerating thrust force	Fd	Ft − Fi	= 63.7 − 126 = −62.3 N
Max thrust force rate	Fp	Fa (biggest value out of Fa,Fc and Fd)	= 189.7 N ※ Thrust force under payload
Constant thrust foce rate	Frms	$\sqrt{\{(Fa^2 \times Ta + Fc^2 \times Tc + Fd^2 \times Td)/T\}}$	$= \sqrt{\{(189.7^2 \times 0.2 + 63.7^2 \times 0.8 + (-62.3)^2 \times 0.2) / 2.2\}} = 71.4$ N
Max current rate	Ip	Fp / Kf	= 189.7 / 62.2 = 3.1 Arms ※ Current under payload
Constant current rate	Ic	Frms / Kf	= 71.4 / 62.2 = 1.2 Arms
Bus Voltage	Vbus	Ipk × R_{25}+ Ke × V	= 6 × 6.7 + 32.2 × 1 = 72.4 Vdc

4) Final selection
– The appropriate model (LSI175–370N) meets working conditions. If not, please recheck the payload and speed or consider another models.

Max payload rate	%	Max thrust force rate/Max thrust force (Fp / Fpk)	= 189.7 / 373.7 × 100 = 50.8 %	〈80% recommended
Rated payload rate	%	Constant thrust force rate/Constant thrust force	= 71.4 / 124.5 × 100 = 57.3 %	〈60% recommended

– Linear driver selection
• Max driver current 〉3.1 Arms(Ip, rated max current)
• Constant driver current 〉1.2Arms(IC,rated constant current)
• Bus voltage value: 〉80% of max applied voltage (ex. If applied voltage is 311Vdc(220Vac),voltage within 248Vdc is sufficient