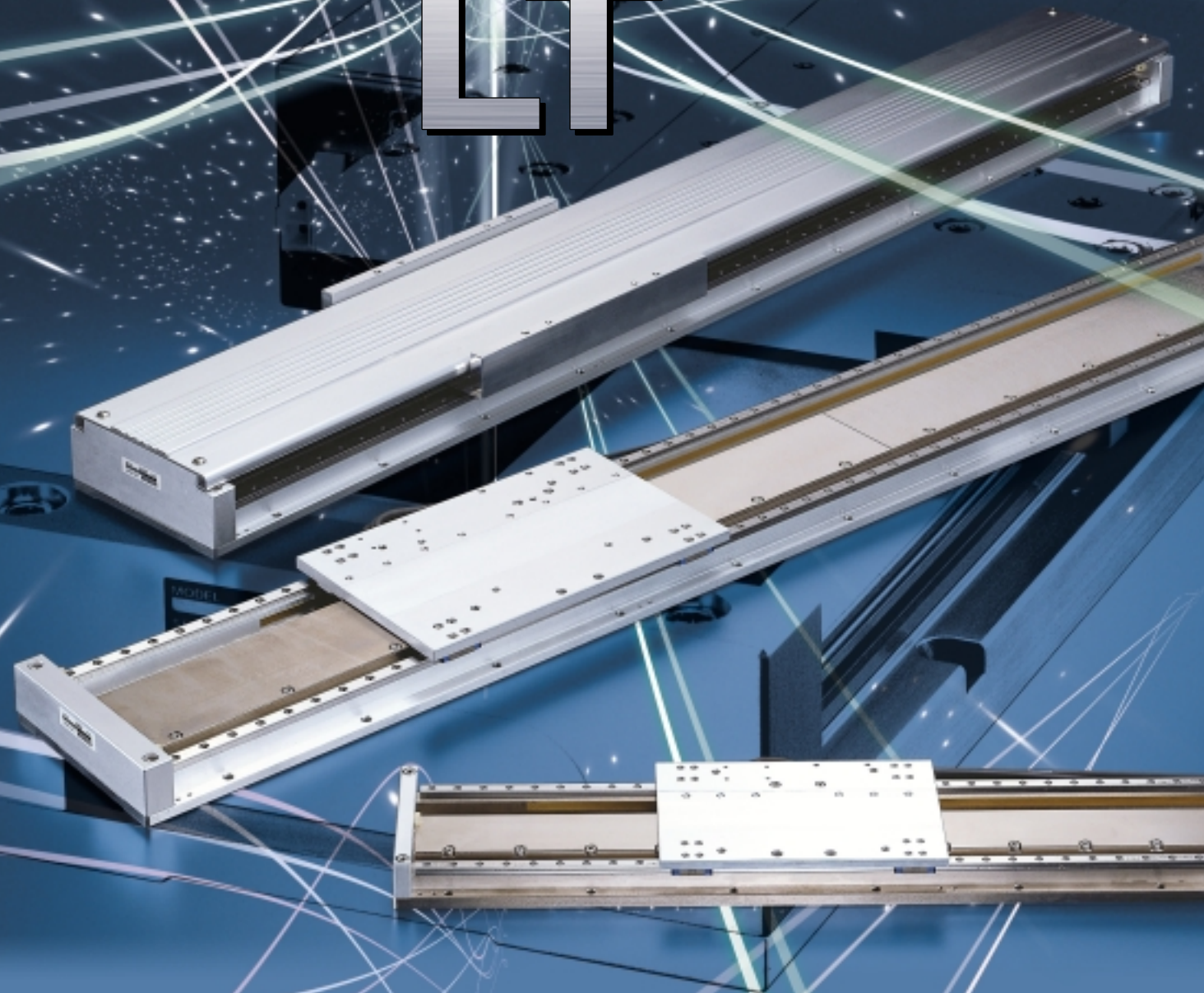


U.S. PATENTED

IKO

Linear Motor Table

LT



CAT-57156

See you again at
IKO Website
<http://www.ikont.co.jp/eg/>

The Ultimate Linear Motor Table

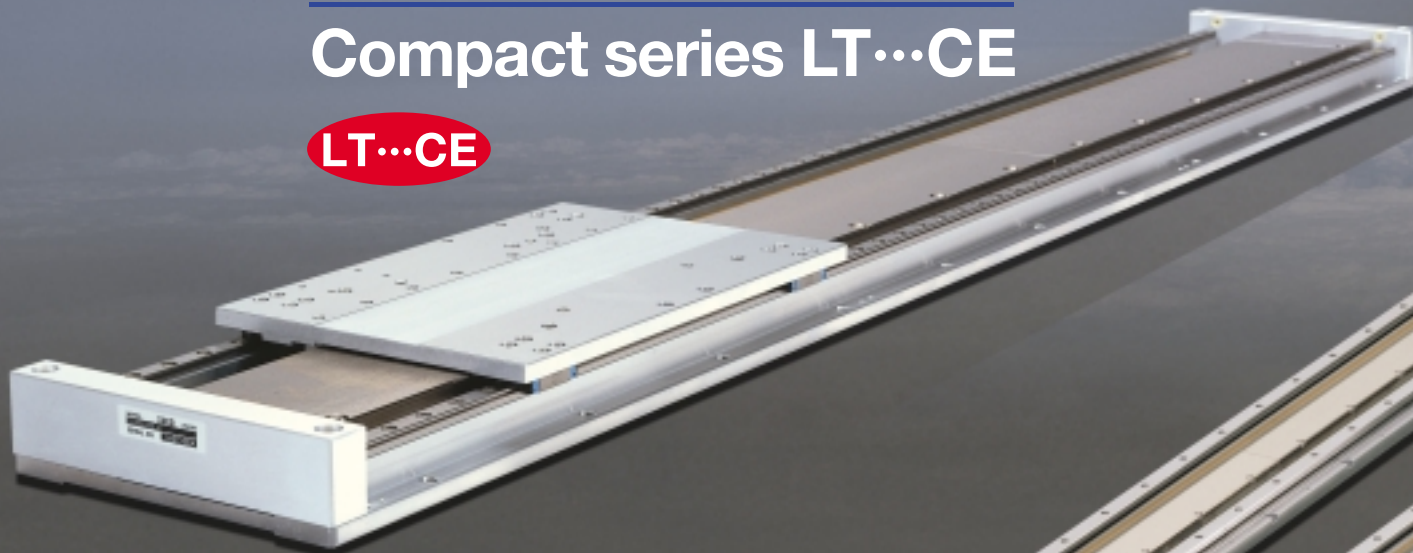
*Vision is the art of seeing the invisible.
We believe in your imagination*

and creatitivity with out technology.

450N maximum thrust provided from
low sectional height as low as 40mm

Compact series LT...CE

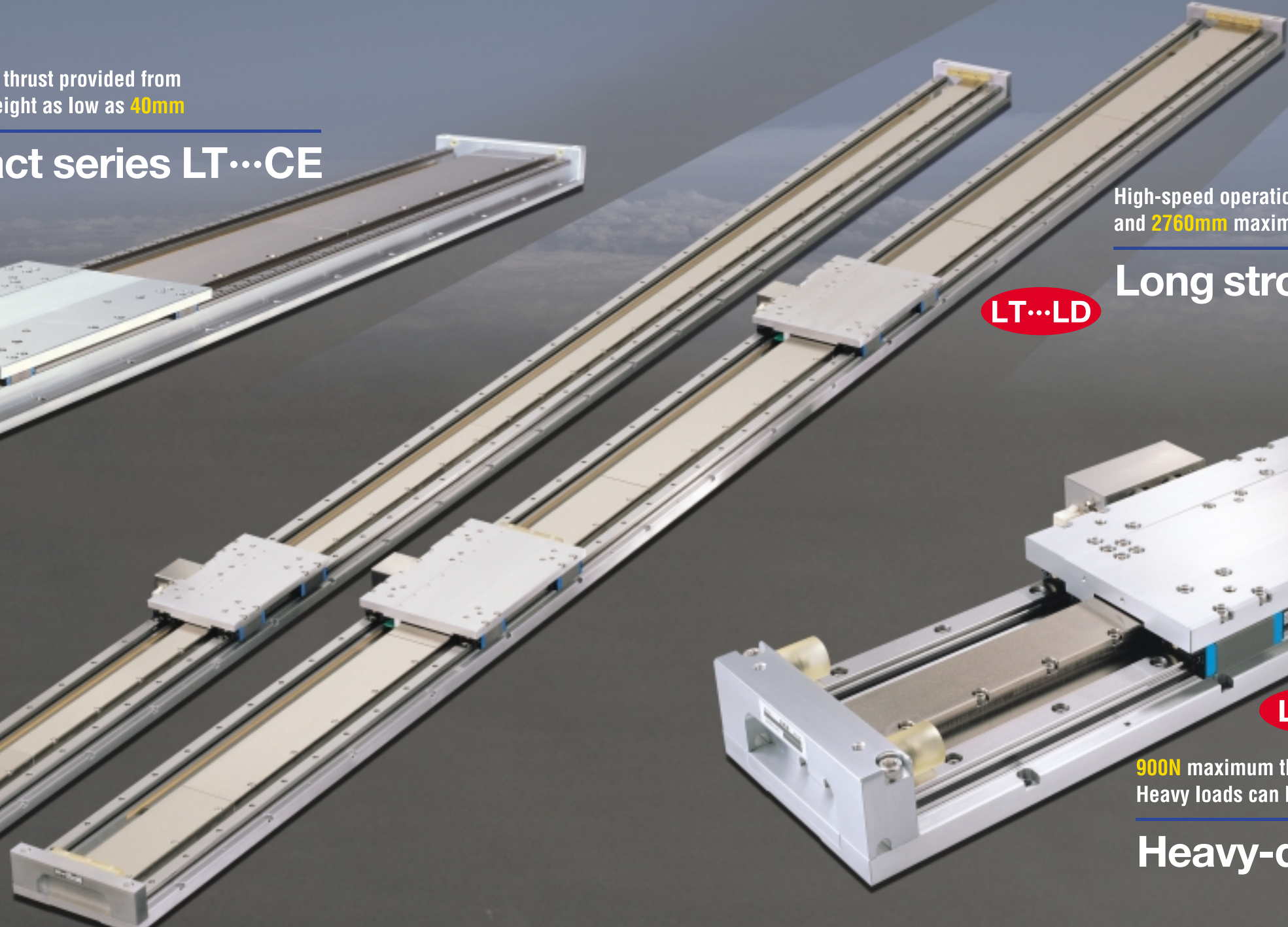
LT...CE



High-speed operation up to 3m/sec maximum speed
and 2760mm maximum stroke length

Long stroke series LT...LD

LT...LD



LT...H

900N maximum thrust
Heavy loads can be positioned accurately and quickly

Heavy-duty series LT...H



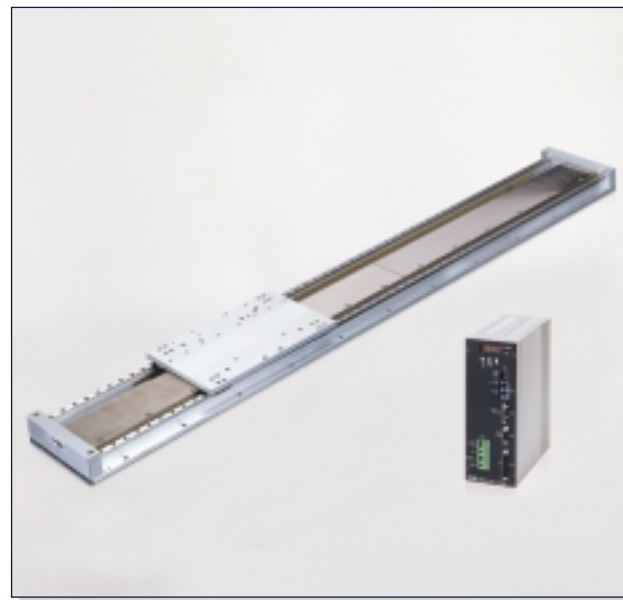
IKO Linear Motor Table LT

IKO Linear Motor Table LT is a direct-drive positioning table, consisting of a moving table and bed of aluminum alloy, in which an AC linear servomotor and an optical linear scale are compactly integrated. Compact and light weight series LT-CE, Long stroke LT-LD series and Heavy-duty LT-H are available.

High acceleration / deceleration and quick response can be achieved due to light-weight moving table with high thrust.

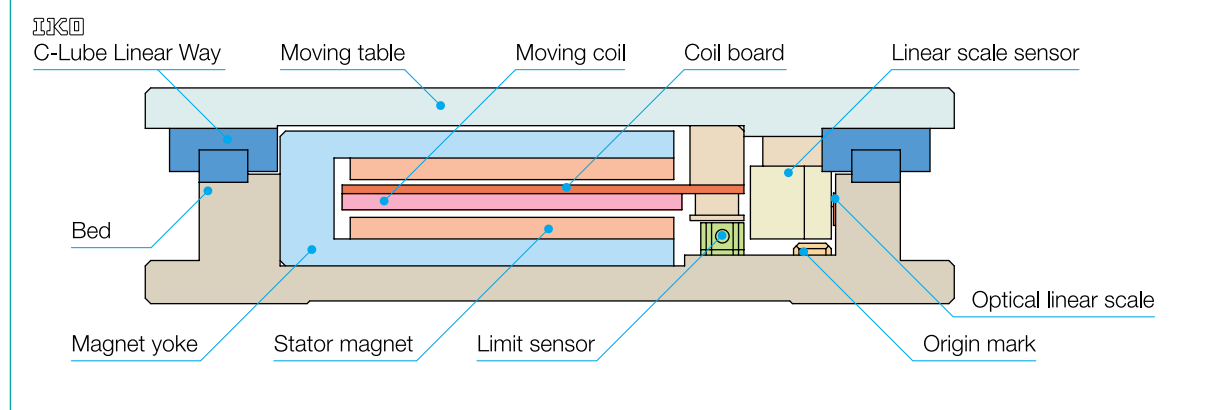
Advanced servo technology provides superior rest and speed stability.

IKO Linear Motor Table LT is the best suited for the equipments and devices used in semiconductor and flat panel display manufacturing machines, other measuring system, assembling machine and transfer machines where high speed operation is required.

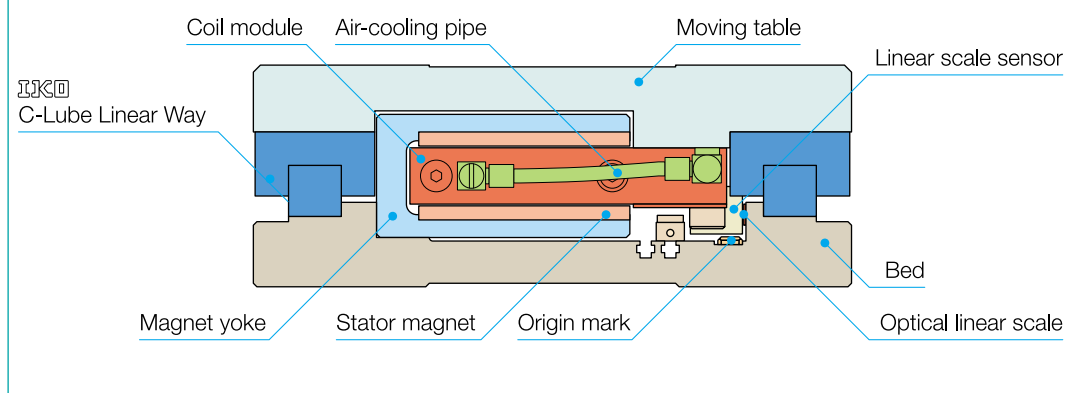


U.S. PATENT No. 6348748

Structure of LT...CE and LT...LD



Structure of LT...H



General features of Linear Motor Table

High speed

High accuracy of positioning and high speed achieved by direct drive system.

Cleanness

Dust generation minimized due to no rotational part such as ball screw being used.

Low operation noise

Low noise characteristic achieved by minimal number of mechanical contacting parts.



Special features of Linear Motor Table

Compactness

Simple structure provides very low sectional height for space saving.

High acceleration / deceleration & Quick response

Light weight moving table with high thrust power realizes high acceleration / deceleration and quick response.

High resolution & accuracy

High resolution and high positioning accuracy can be obtained by full closed loop controlling with optical linear scale.

Two linear motor tables in parallel operation

Operation of two linear motor tables in parallel is possible. This driving set-up provides larger thrust force and higher accuracy in positioning with the minimal motion delay.

Superior speed stability

Superior speed stability is achieved, with a direct drive system and latest servo technology.

Maintenance free

IKO C-Lube Linear Way, maintenance free for 20,000km or 5 years, is adopted for guiding part.

Variable models to meet application

The most suitable table can be chosen from Compact, Long stroke or Heavy-duty models.

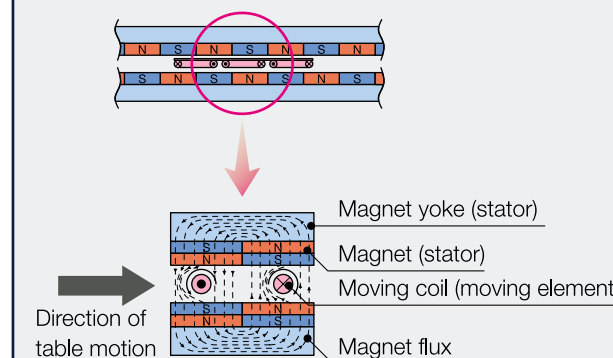
Principle of operation of Linear Motor Table LT

Linear Motor Table LT incorporates a field coil and optical linear scale in the moving table, and a C-shaped yoke with a set of magnets facing to each other and an optical linear scale in the stator. As shown in the figure below, a magnetic flux in the vertical direction is generated by the set of magnets facing each other. When a rotating magnetic flux is generated around the coil due to a coil current, a force is applied to the coil in the horizontal direction. (Fleming's left-hand rule)

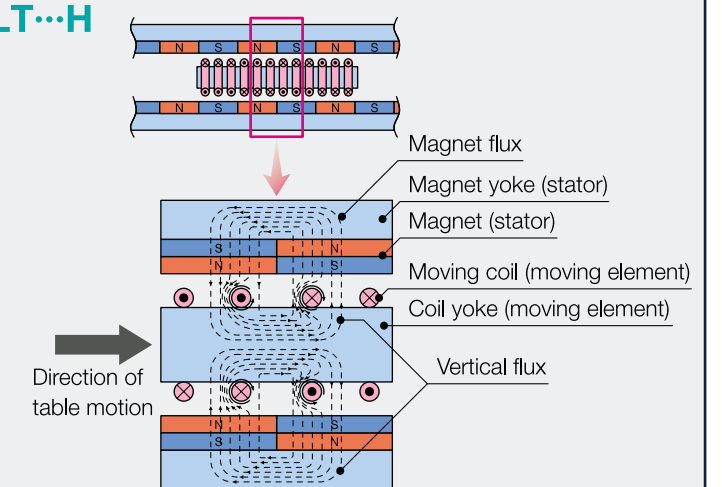
A unidirectional thrust can be continuously obtained by switching the coil current according to the vertical flux direction, so that the moving part can keep moving in one direction. Acceleration control by current level and position control by opposition signal from the optical linear scale are made for travel and accurate positioning.

In Heavy-duty series, high density coil is located in the vertical flux which is created or top and underneath of the coil yoke so that superior high level of thrust can be obtained from compact structure.

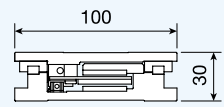
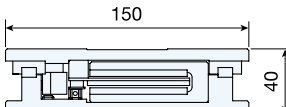
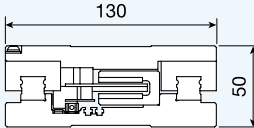
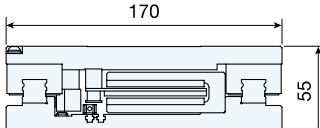
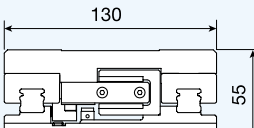
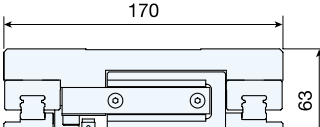
LT...CE, LT...LD



LT...H



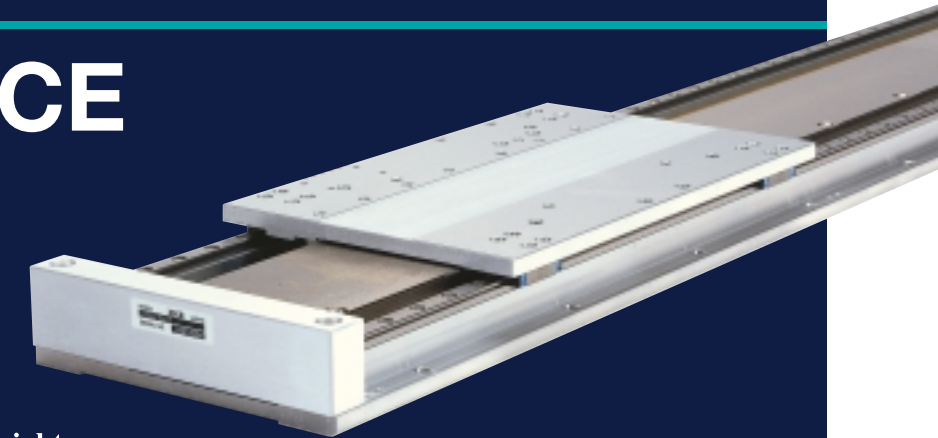
Three series for your selection

Series	Sectional dimensions mm	Type and size	Maximum thrust N	Rated thrust N	Maximum speed m/s	Stroke length mm
Compact series LT...CE	 LT100CE	High thrust LT100CEG	150	15	2.0	1000
	 LT150CE	High thrust LT150CEG	450	60	2.0	1200
Long stroke series LT...LD	 LT130LD	High thrust and high speed LT130LDG	150	15	3.0	2760
	 LT170LD	High thrust LT170LDG	450	60	2.0	2720
		High speed LT170LDV	190	25	3.0	
High thrust series LT...H	 LT130H	Heavy-duty LT130H	300	60 (75)	2.0	2710
	 LT170H	Heavy-duty LT170H	900	120 (150)	2.0	2670

Value in () is applicable under air cooling condition.

Compact series

Features of **LT...CE**



450N of force is provided with only 40mm of sectional height.

Maintenance free

IJKO C-Lube Linear Way ML is incorporated to realize maintenance free for 5 years or 20,000km so that the man-hours for troublesome lubrication control can be reduced.

Compact

This series incorporates a set of **IJKO** miniature Linear Way ML and an ultra small size optical linear scale to achieve a very compact size.

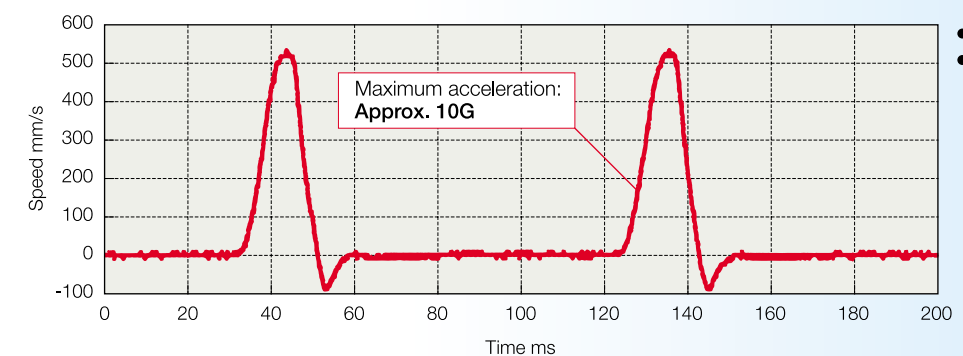
Low profile and high thrust

With a sectional height of only 40mm, a maximum thrust of 450N is achieved.

High acceleration / deceleration and quick response

The moving table is ultra-light, mass only 1.5kg approx. With high thrust, the table achieves high acceleration/deceleration of up to 10G or more.

Measurement data at high acceleration / deceleration operation

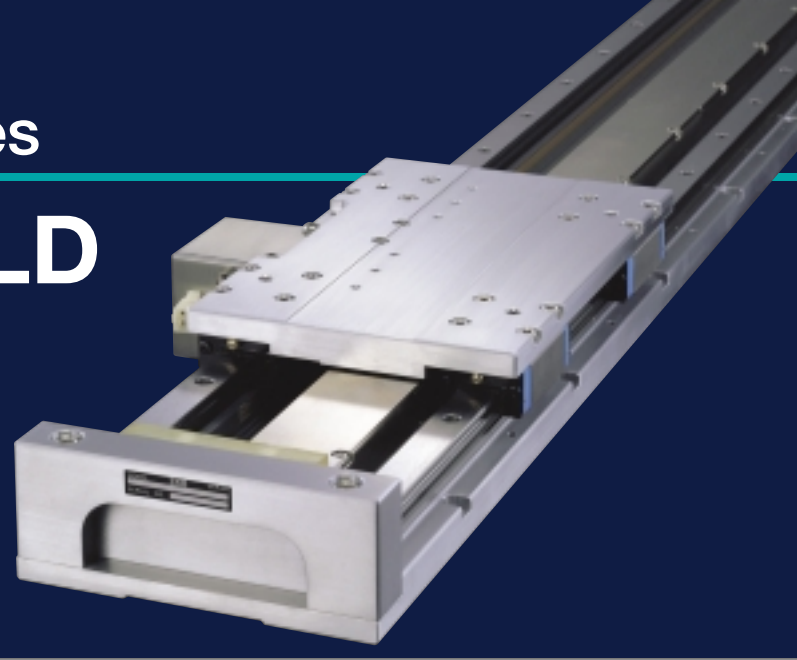


- Test table: LT150CEGS
- Measuring conditions
Loaded mass: None
Moving distance: 5mm (Two times)

Long stroke series

Features of LT...LD

Maximum speed up to 3m/s and 2760mm of long stroke can be achieved.



Maintenance free

IJKO C-Lube Linear Way ML is incorporated to realize maintenance free for 5 years or 20,000km so that the man-hours for troublesome lubrication control can be reduced.

Super long stroke

Incorporating IJKO C-Lube Linear Way ME of butt-jointing track rails, this type provides a long stroke length of up to 2760mm.

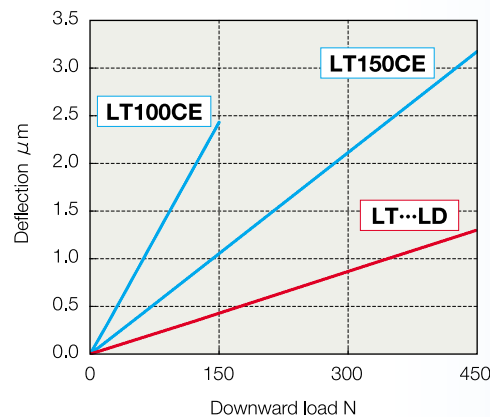
High speed

High-speed operation can be performed up to 3m/s.

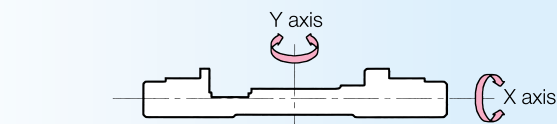
High rigidity

By adopting IJKO C-Lube Linear Way ME for the linear motion rolling guides mounted on a thick bed, a high rigidity table structure is provided.

Elastic deformation characteristic



Moment of inertia of sectional area of bed

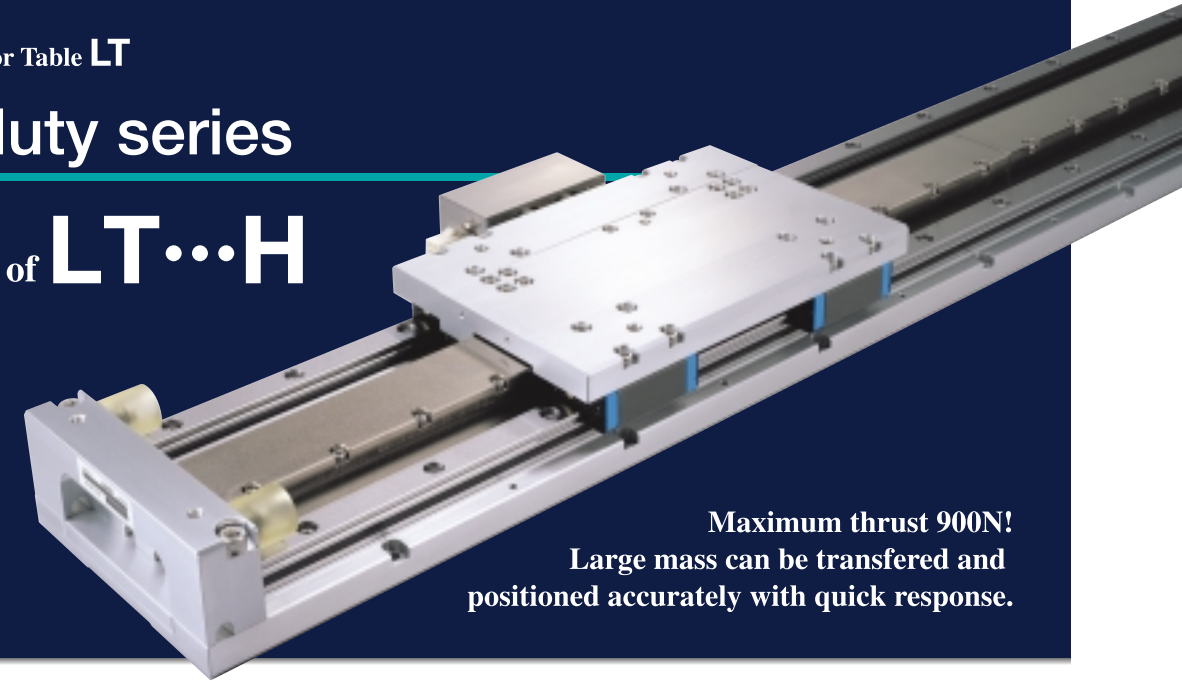


Model	Moment of inertia of sectional area mm ⁴	
	I _x	I _y
LT130LD	3.8 × 10 ⁴	281 × 10 ⁴
LT170LD	7.6 × 10 ⁴	749 × 10 ⁴

Heavy-duty series

Features of LT...H

Maximum thrust 900N! Large mass can be transferred and positioned accurately with quick response.



Maintenance free

IJKO C-Lube Linear Way ML is incorporated to realize service free for 5 years or 20,000km so that the man-hours for troublesome lubrication control can be reduced.

900N of maximum thrust

Large mass can be quickly transferred and accurately positioned because of enormous thrust.

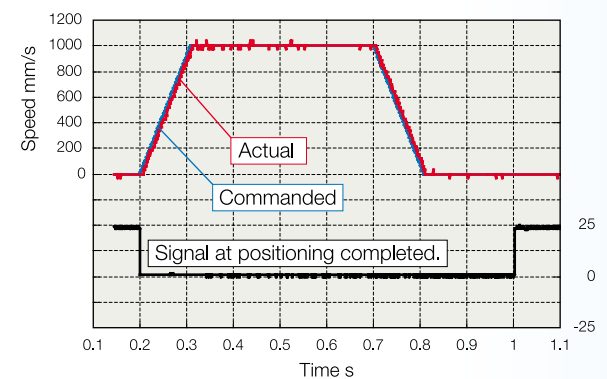
120N of rated thrust

Rated thrust without air-cooling are 60N for LT130H and 120N for LT170H. They can be increased up to 75N for LT130H and 150N for LT170H under air-cooling condition.

High performance control unit

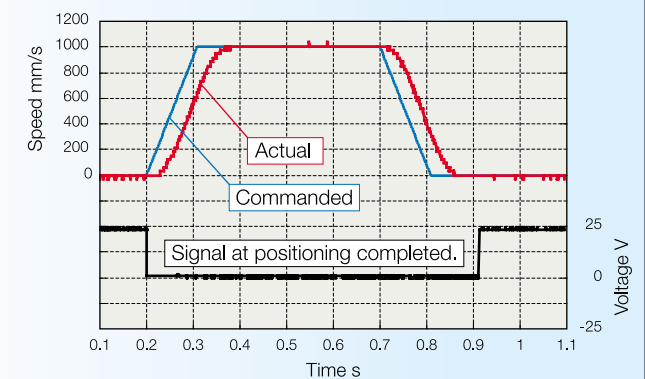
Controller with programming function and driver are integrated compactly. Man-hours for electric wiring can be reduced and compact size contributes space saving. Furthermore, I/O sequence function, check function and other usable functions are available.

Operation by pulse line input



- This chart shows moving speed and signal of positioning completion of LT170HS. Loaded mass: 45kg Acceleration/deceleration time: 0.1s Maximum moving speed: 1,000mm/s

Operation by NCD170G programming function



- Over 10m/s² is possible with 45kg of carrying weight
- Program function of NCD170G can reduce tact time including stabilization time due to high thrust of linear motor and by its smooth acceleration / deceleration that is less affective adversely to the rigidity of the bed.

Identification Number and Models

Nine models of Linear Motor Table LT are available in three series, namely, compact series LT-CD, long stroke series LT-LD and heavy-duty series LT-H. Specifications such as twin table specification of which two moving table can be controlled independently, and table cover speci-

fications are also prepared. These models can be selected considering their respective characteristics to meet the requirements in a wide range of applications. An example of identification number of Linear Motor Table LT is shown below.

Example of identification number

LT 100 CE G F - 430 / 5 D SC T2

Model code	
LT...CE	Compact series
LT...LD	Long stroke series
LT...H	Heavy-duty series

Table width		
100	Width : 100mm	Applicable to LT...CE
150	Width : 150mm	
130	Width : 130mm	Applicable to LT...LD & LT...H
170	Width : 170mm	

Thrust/speed specification	
G	High-thrust (high-speed) specification
V	High-speed specification
No symbol	Applicable to LT...H only

Shape of moving table	
S	Standard
F	Flanged

Stroke length (mm)	

Resolution	
1	0.1 μm
5	0.5 μm
10	1.0 μm

Cooling specification	
No symbol	Self-cooling
CA	Air-cooling

Note : CA is applicable to LT...H only.

Cover specification	
No symbol	Without cover
D	With bridge cover

Note : No symbol (without cover) is applicable to standard shape moving table only.
D (with bridge cover) is applicable to flanged shape moving table only.

Sensor specification	
No symbol	Without sensor
SC	With sensor (Limit, pre-origin) on sensor rail

Note : SC is applicable to LT-CE
In LT...LD and LT...H, sensors are attached in standard.

Moving table specification	
No symbol	Single table
T2	Twin tables

Table 1 Applicable thrust and speed

Symbol	G	V	No symbol
Model	○	—	—
LT...CE	○	—	—
LT...LD	○	○	—
LT...H	—	—	○

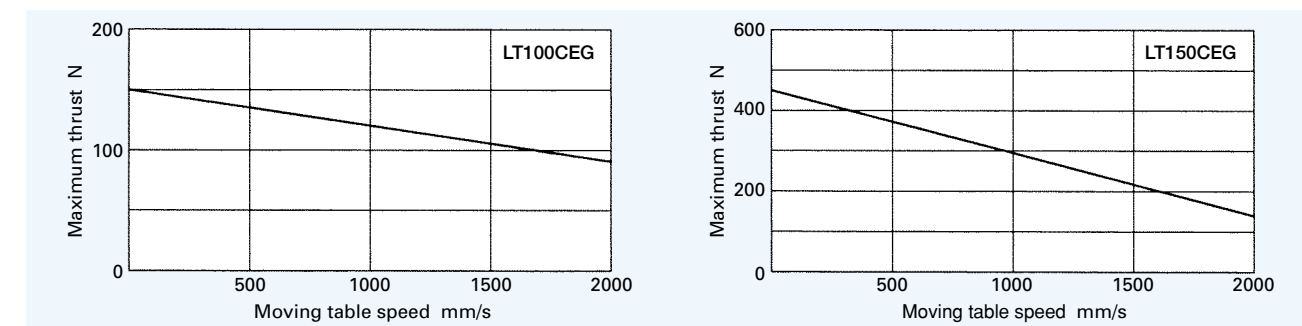
Specification and Performances

Table 2 Specification of LT...CE

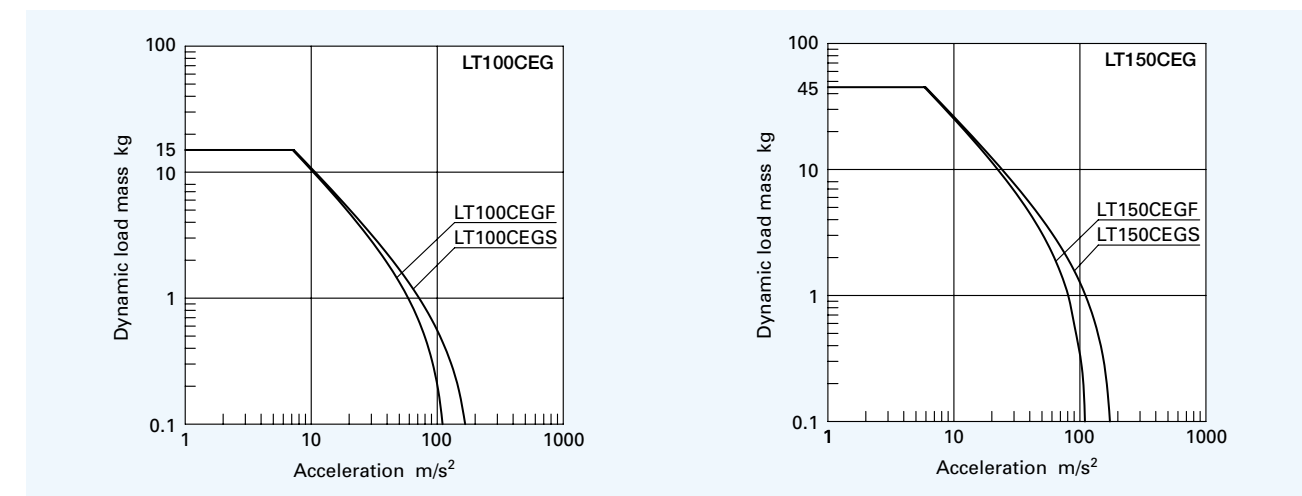
Item	Model	LT100CEG			LT150CEG		
		0.1	0.5	1.0	0.1	0.5	1.0
Maximum thrust ⁽¹⁾ N		150			450		
Rated thrust N		15			60		
Maximum load mass kg		15			45		
Resolution μm		0.1	0.5	1.0	0.1	0.5	1.0
Maximum speed ⁽²⁾ m/s		0.7	2.0	2.0	0.7	2.0	2.0
Repeatability ⁽³⁾ μm		±0.5	±0.5	±1.0	±0.5	±0.5	±1.0

Note⁽¹⁾ : The duration of maximum thrust is one second maximum.
⁽²⁾ : This speed may not be reached depending on the maximum output frequency of the controller used.
⁽³⁾ : These values are applicable when the temperature of Linear Motor Table LT is at the stable state.

●Thrust characteristics



●Dynamic load mass



Remark : These values are calculated from the thrust when the table speed is 1000 mm/s.

Table 3 Specification of LT...LD

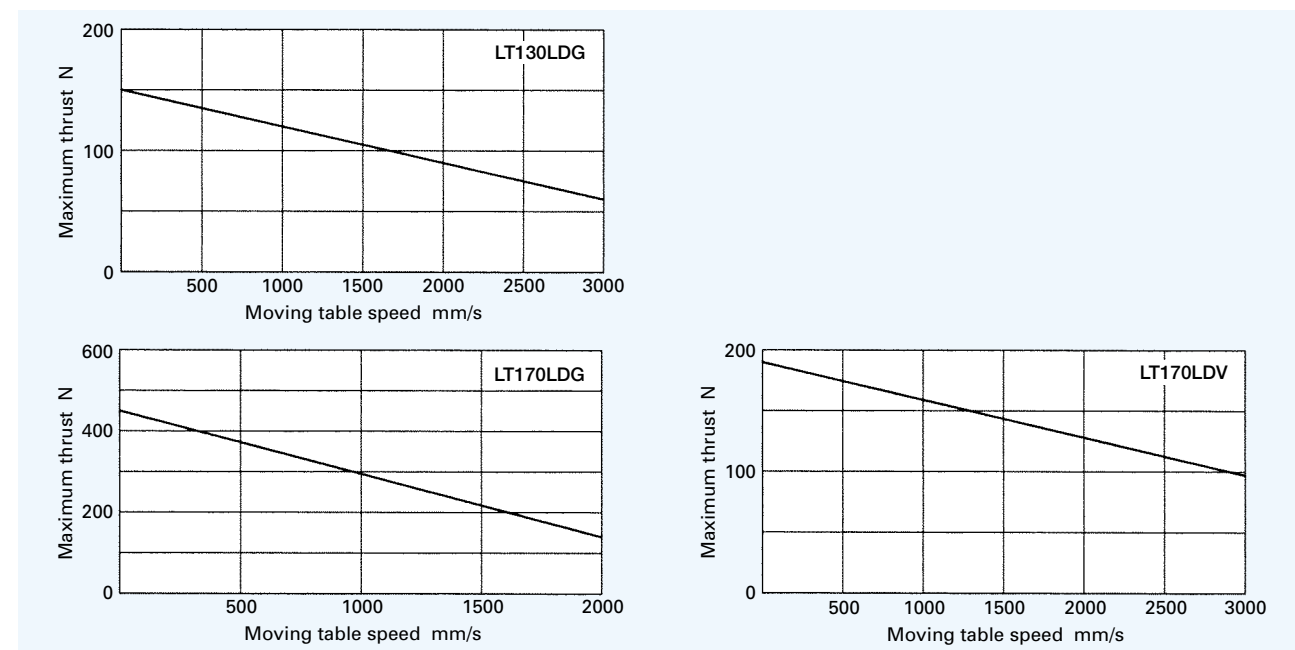
Item	Model	LT130LDG			LT170LDG			LT170LDV		
		0.1	0.5	1.0	0.1	0.5	1.0	0.1	0.5	1.0
Maximum thrust ⁽¹⁾	N	150			450			190		
Rated thrust	N	15			60			25		
Maximum load mass	kg	15			45			28		
Resolution	μm	0.1	0.5	1.0	0.1	0.5	1.0	0.1	0.5	1.0
Maximum speed ⁽²⁾	m/s	0.7	2.0	3.0	0.7	2.0	2.0	0.7	2.0	3.0
Repeatability ⁽³⁾	μm	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0

Note⁽¹⁾: The duration of maximum thrust is one second maximum.

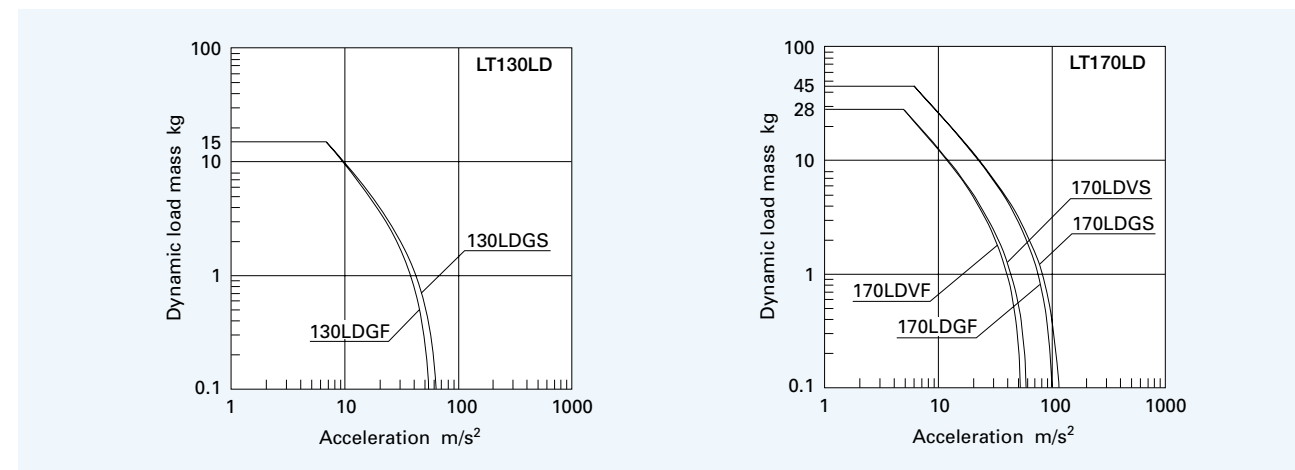
⁽²⁾: This speed may not be reached depending on the maximum output frequency of the controller used.

⁽³⁾: These values are applicable when the temperature of Linear Motor Table LT is at the stable state.

●Thrust characteristics



●Dynamic load mass



Remark: These values are calculated from the thrust when the table speed is 1000 mm/s.

Table 4 Specification of LT...H

Item	Model	LT130H			LT170H		
		0.1	0.5	1.0	0.1	0.5	1.0
Maximum thrust ⁽¹⁾	N	300			900		
Rated thrust ⁽²⁾	Self-cooling	60			120		
	Air-cooling ⁽³⁾	75			150		
Maximum load mass	kg	30			90		
Resolution	μm	0.1	0.5	1.0	0.1	0.5	1.0
Maximum speed ⁽⁴⁾ ⁽⁵⁾	m/s	0.7	1.5(2.0)	1.5(2.0)	0.7	1.5(2.0)	1.5(2.0)
Repeatability ⁽⁶⁾	μm	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0

Note⁽¹⁾: The duration of maximum thrust is one second maximum.

⁽²⁾: In case surrounding temperature is 0 to 25 °C and table is fixed on rigid mounting bed. Refer to below figure. (Rated thrust characteristics)

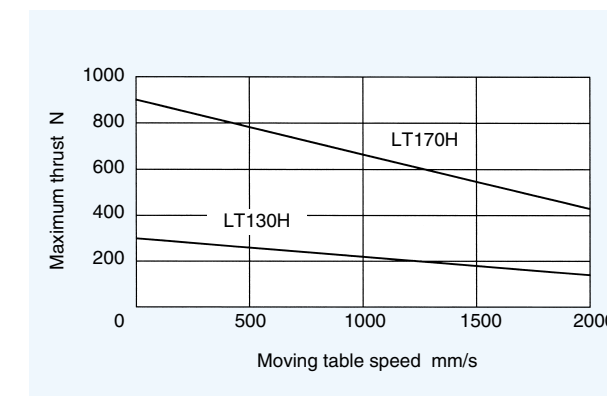
⁽³⁾: In case airflow is 30NL/min.

⁽⁴⁾: When the maximum speed exceeds 1.5m/s is required, please consult for further information.

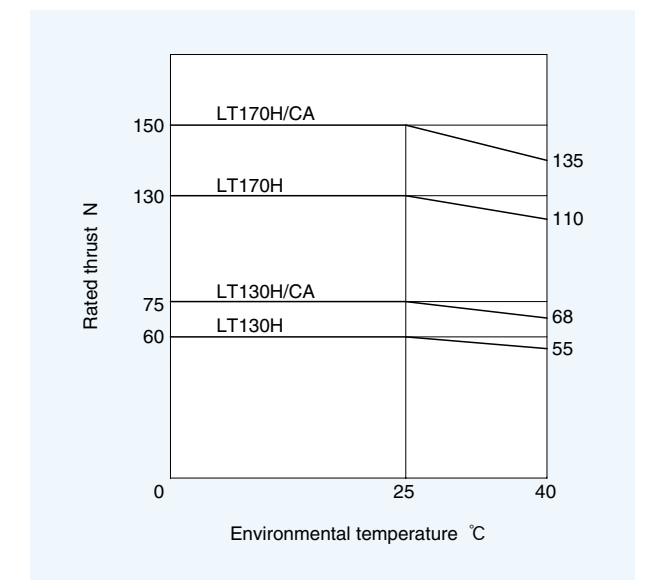
⁽⁵⁾: This speed may not be reached depending on the maximum output frequency of the controller used.

⁽⁶⁾: These values are applicable when the temperature of Linear Motor Table LT is at the stable state.

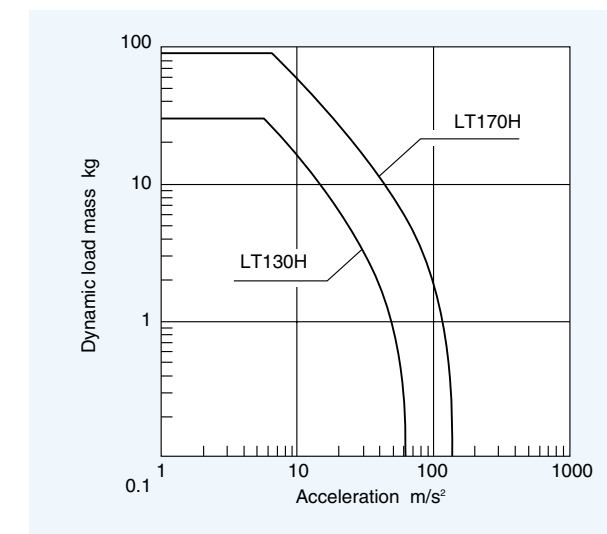
●Thrust characteristics



●Rated thrust characteristics



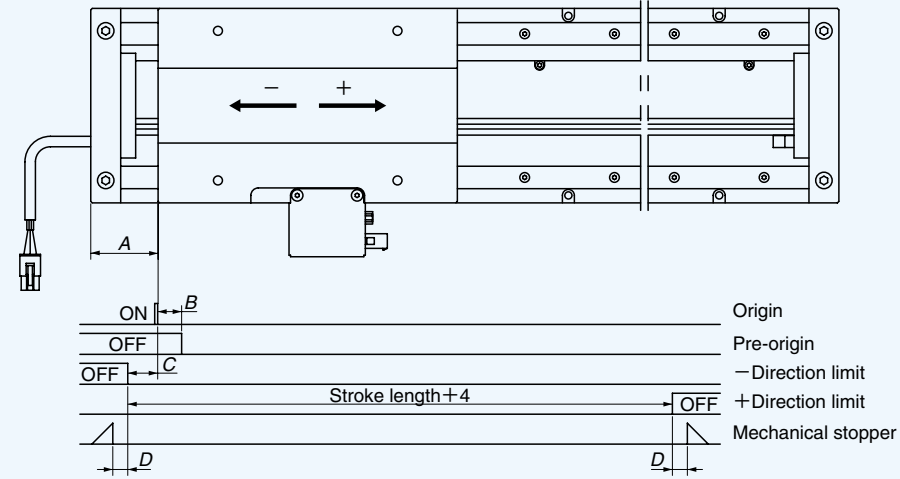
●Dynamic load mass



Remark: These values are calculated from the thrust when the table speed is 1000 mm/s.

Sensor specification

●Sensor timing chart for single table

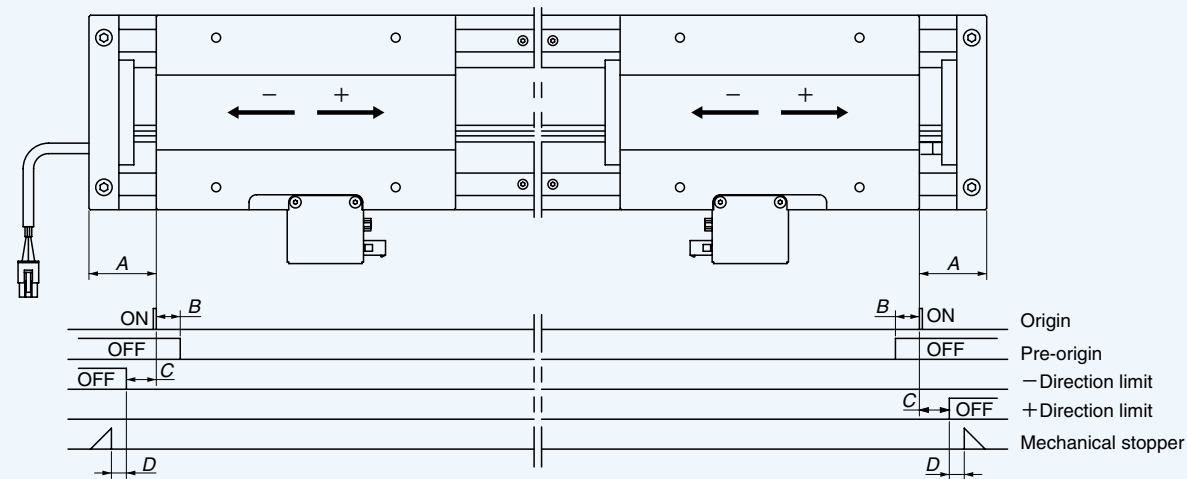


unit : mm

Model	A	B ⁽¹⁾	C ⁽¹⁾	D ⁽¹⁾
LT100CE.../SC	34	3	7	14
LT150CE.../SC	44	3	7	14
LT130LD	45	3	7	8
LT170LD	44	3	7	7
LT130H	82	3	17	20
LT170H	92	3	17	20

Note⁽¹⁾ : The values in the table are reference only. For detail, please consult .
Remark : Output signals from sensor are provided from specific control unit.

●Sensor timing chart for twin tables



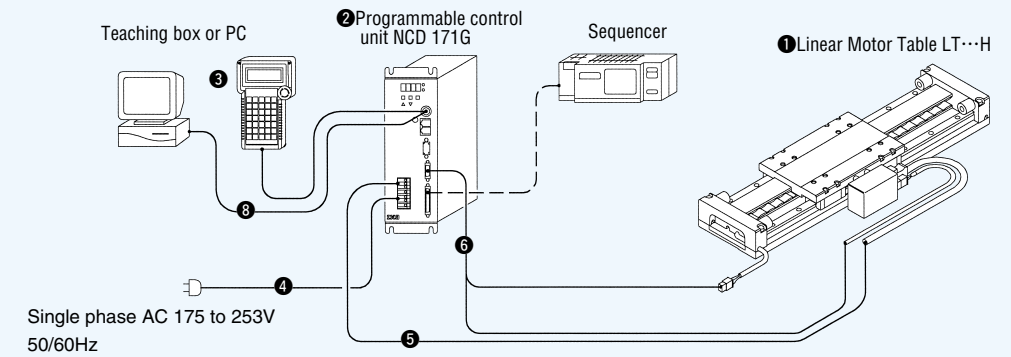
unit : mm

Model	A	B ⁽¹⁾	C ⁽¹⁾	D ⁽¹⁾
LT100CE.../SCT2	34	3	7	14
LT150CE.../SCT2	44	3	7	14
LT130LD.../T2	45	3	7	8
LT170LD.../T2	44	3	7	7
LT130H.../T2	82	3	17	20
LT170H.../T2	92	3	17	20

Note⁽¹⁾ : The values in the table are reference only. For detail, please consult .
Remark : Output signals from sensor are provided from specific control unit.

System Configuration

●System configuration of single table



●System configuration of twin tables

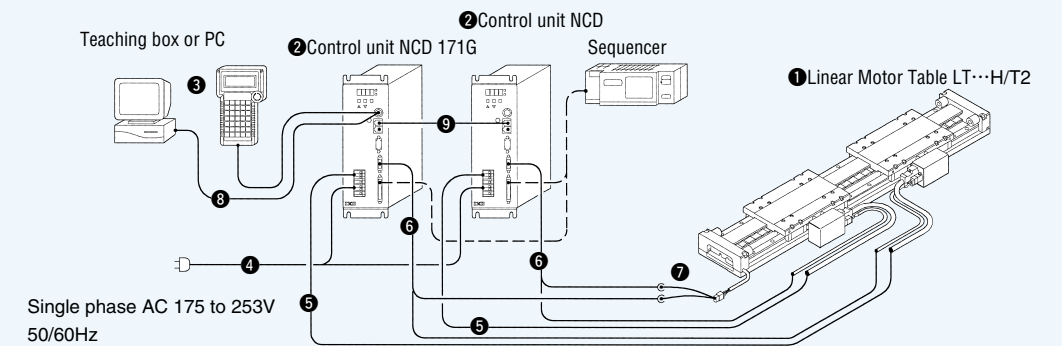


Table 5 System configurations

No.	Item	Type of Linear Motor Table			
		LT...CE	LT...CE/SC	LT...LD	LT...H
①	Linear Motor Table	See page 19 to 30			
②	Control unit	NCD171G-L2600			NCD171G-L6800
③	Teaching box with cord	TAE1050-TB			
④	Power cord	Prepared by customer			
⑤	Motor relay cord	TAE20C8-MC□□			
⑥	Encoder relay cord ⁽¹⁾	TAE20S5-EC□□	—	—	—
⑥	Limit/Encoder relay cord	—	TAE20D2-EC□□	—	TAE20C9-EC□□
⑦	Limit separation cord (0.1m)	TAE20D0-BC			
⑧	Communication cable (2.0m)	TAE1098-RS			
⑨	Inter axial cable (1.0m)	TAE1099-LC			

Note⁽¹⁾ : Applicable to LT-CE which do not have sensor.
Cord for limit sensor is not appended.

Remark : The lengths of motor relay cord, limit/encoder relay cord can be specified by □□ in the end of supplemental cord. Selectable length is 3m to 10m in increments of 1m. Length of limit cord is 1.5m shorter than other cord.
Cording example : TAE20C8-MC03 (In case of 3m length)

●Two axes parallel operation

Two sets of Linear Motor Table LT in parallel can be driven in parallel.

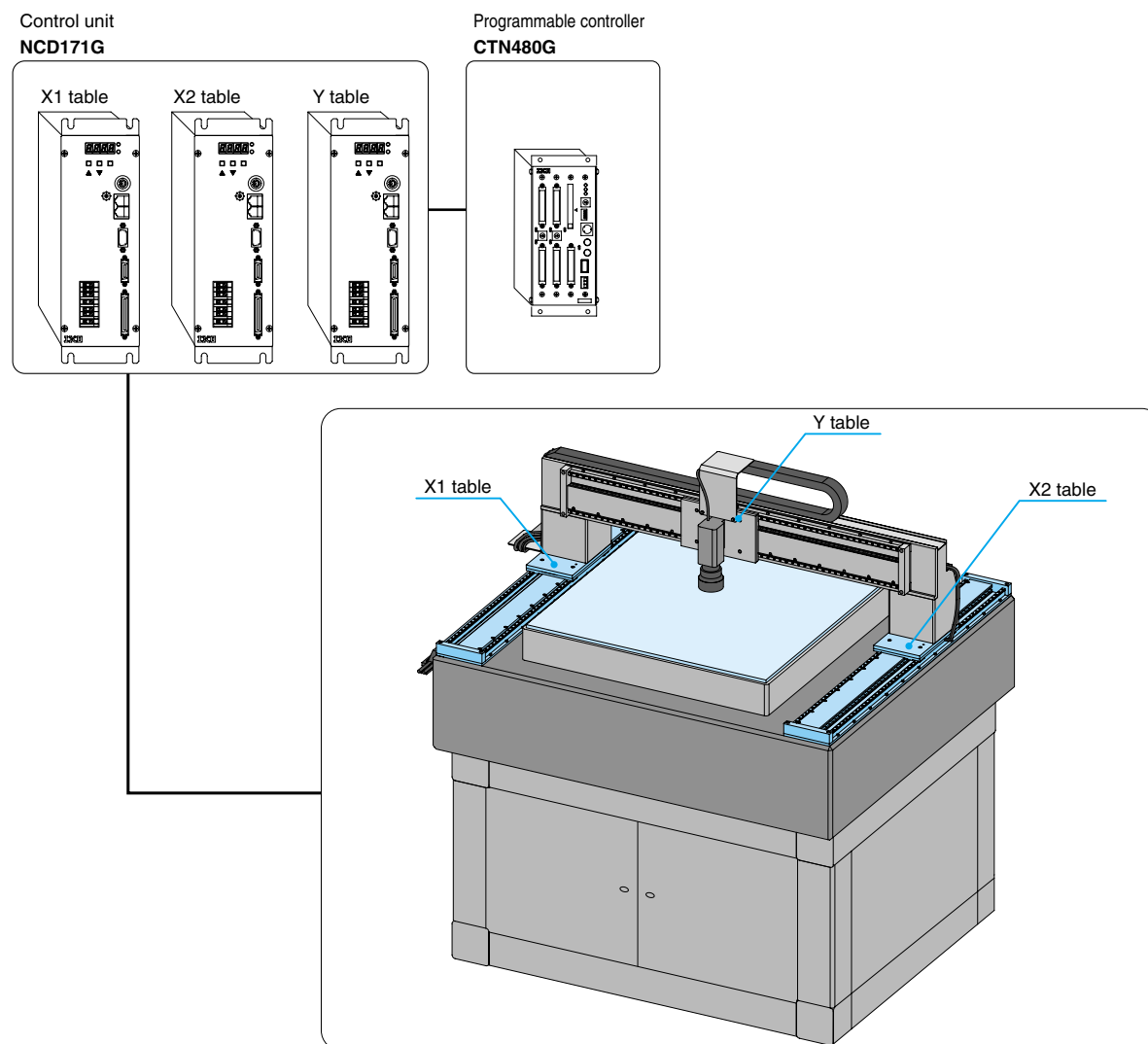
This driving system provides more stable and accurate positioning with minimum motion delay compare to typical one axis driving by combination of driving table and following table. This driving system is suitable for large work and long stroke transportation like liquid crystal panel manufacturing equipment.

Consult  if required.

Characteristics by driving system

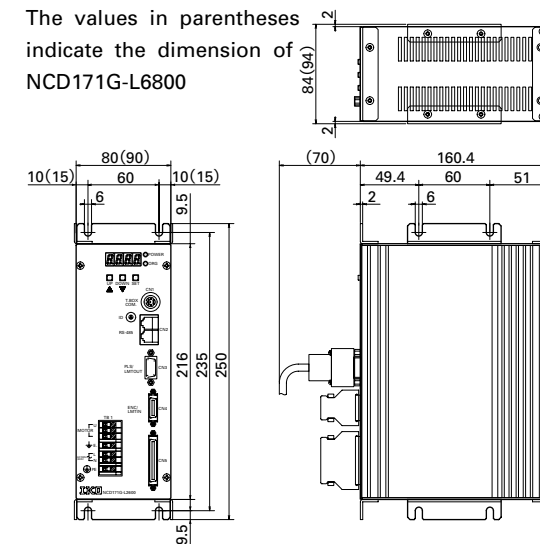
Two axes parallel operation	Single table operation or two tables operation by single table driven
<ul style="list-style-type: none"> • Larger thrust force • More accurate positioning with minimum motion delay • Cost saving compare to synchronized operation 	<ul style="list-style-type: none"> • Less thrust force • Delay and twist motion is estimated. • Less positioning accuracy

System configuration



This is a system example for two axes (X1 and X2) operation together with  Programmable Controller CTN480G.

The values in parentheses indicate the dimension of NCD171G-L6800



- Programmable controller and servo driver are compactly integrated.
- Easy cable connection contributes to reduce man-hour.
- One teaching box can operate multiple axes simultaneously.
- Power source DC 24 V is prepared for input/output and sensors.
- I/O sequencer is prepared inside so that another sequencer may not be necessary for simple applications.
- Various checking functions make connection checking easier.
- Programming language is very simple and allows easy programming.
- Battery replacement is not necessary due to incorporated flash memory.
- Monitoring drive force in operation and limiting drive force are possible.
- Teaching box can be used as sub memory system.
- Various methods of returning to origin point are prepared and optional sensor may not be necessary.
- PC can be used as control terminal connecting by RS232C interface.

Specification		Item		NCD171G-L2600	NCD171G-L6800
Control specification	Number of control axis	One axis			
	Applicable Linear Motor	LT100CE, LT150CE, LT130LD, LT170LD		LT130H, LT170H	
	Signal feeding back	Incremental linear encoder			
	Resolution	0.5 μm, 1.0 μm		0.5 μm, 1.0 μm	
	Maximum speed	700mm/s ⁽¹⁾	3000mm/s ⁽²⁾	700mm/s ⁽¹⁾	2000mm/s ⁽²⁾
	Command	Position control	Input by outside controller	+direction/-direction pulse, Positioning command pulse/Direction command, A/B-phase Maximum 5MHz	
Input by program			Maximum command : ±2147483647pulses		
Speed control		Input by analog	±10V/rated speed (Adjustable by parameter) Resolution 10V/372division		
Program specification	Program input	MDI, Teaching, PC input by RS-232C			
	Type of command input	Absolute command or incremental command			
	Program capacity	11K bites (1100 steps or more)			
	Number of positioning point	512 points			
General purpose input and output	Input	Number of input	LS input : 3 points, I/O input : 20 points		
		Programmable input	Start, Stop, Emergency stop, +/- Bi-directional manual operation, Return to origin Reset alarm, Reset deviation counter, Servo control (Interrupt by parameter to I/O input)		
		Input system	Photo isolated bi-directional input (Applicable to non voltage contact, open collector, open emitter)		
	Output	Number of output	I/O output : 12 points		
		Programmable output	During automatic operation, Limit works, Emergency stop, Return to origin complete, Servo ready, Alarm, Positioning completion, Pre-origin sensor Interruption (Setting distribution to I/O output by parameter)		
		Output system	Open emitter output (Maximum switch voltage : 30V, maximum load current : 100mA)		
Input & output power voltage	DC24V±5% 1A				
Protection function	Over current, Over voltage, Under voltage, Encoder malfunction, Command deviation, Regeneration resistance overheating, CPU malfunction, etc.				
Other main functions	RS232C (Read, Write, Direct operation etc.), Software limit, Thrust force limitation, Monitoring thrust force, Speed adjustment in the operation, Changing LS logic, Other check functions				
General specification	Main power supply voltage	Single phase AC175 to 253V ⁽³⁾ 50/60Hz			
	Continuous rated current	2.5Arms			
	Maximum consumption current	11.3Arms	16.9Arms		
	Ambient temperature	0 to 50 degrees, -10 to 60 degrees in storage (Keep freeze free)			
	Ambient humidity	35~85%RH (Keep dewdrop free)			
Countermeasure for breakout	Flash memory (No necessary for battery change)				
Mass (ref.)	Main body : 1.7kg Teaching box : 0.5kg		Main body : 1.9kg Teaching box : 0.5kg		


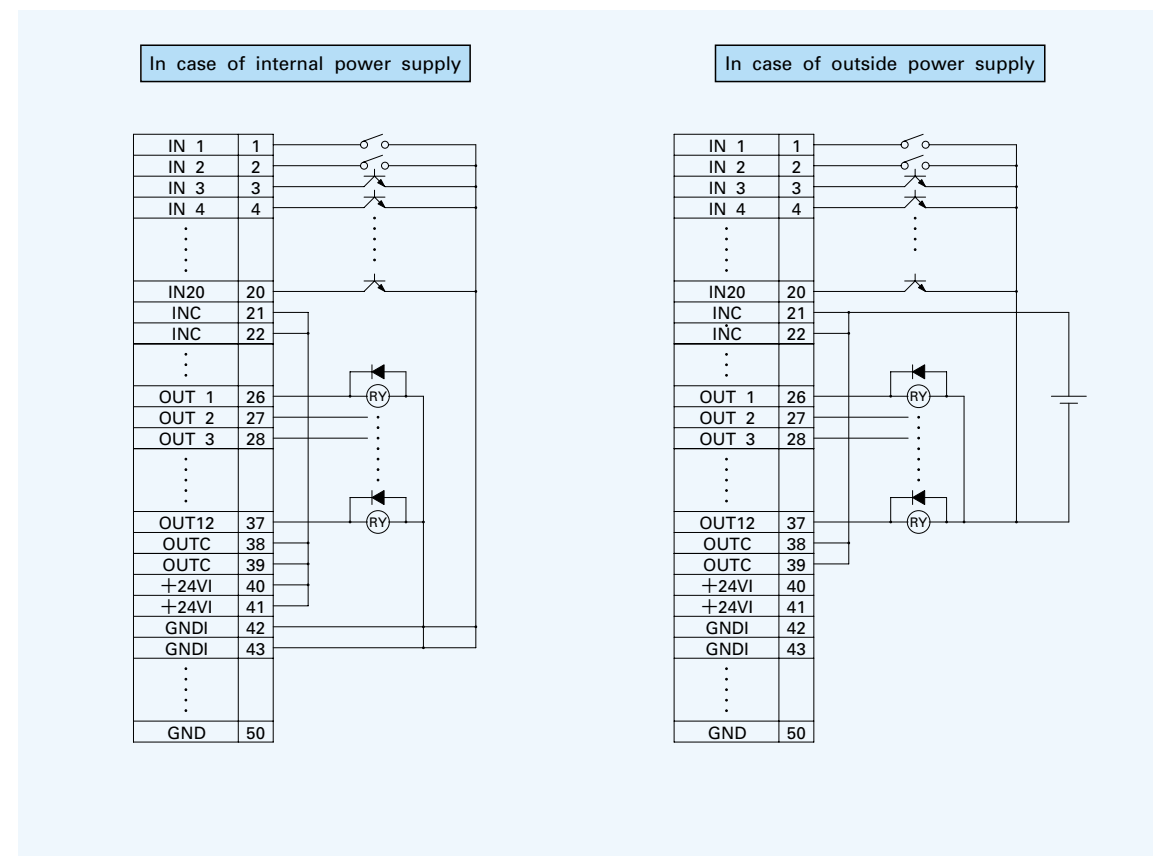
Note⁽¹⁾ : In case of resolution 0.1μm. However, maximum speed is 500mm/s when positioning by external command.
 Note⁽²⁾ : In case of resolution 0.5μm or 1.0μm. Maximum speed is according to models and resolution. In detail, refer to P8 ~ P10.
 Note⁽³⁾ : For 100V specification, consult  for future information.

Table 6 Specifications of I/O connector (CN5)

Pin No.	Signal name	Function	Pin No.	Signal name	Function
1	IN 1	GENERAL INPUT 1	26	OUT 1	GENERAL OUTPUT 1
2	IN 2	GENERAL INPUT 2	27	OUT 2	GENERAL OUTPUT 2
3	IN 3	GENERAL INPUT 3	28	OUT 3	GENERAL OUTPUT 3
4	IN 4	GENERAL INPUT 4	29	OUT 4	GENERAL OUTPUT 4
5	IN 5	GENERAL INPUT 5	30	OUT 5	GENERAL OUTPUT 5
6	IN 6	GENERAL INPUT 6	31	OUT 6	GENERAL OUTPUT 6
7	IN 7	GENERAL INPUT 7	32	OUT 7	GENERAL OUTPUT 7
8	IN 8	GENERAL INPUT 8	33	OUT 8	GENERAL OUTPUT 8
9	IN 9	GENERAL INPUT 9	34	OUT 9	GENERAL OUTPUT 9
10	IN10	GENERAL INPUT 10	35	OUT10	GENERAL OUTPUT10
11	IN11	GENERAL INPUT 11	36	OUT11	GENERAL OUTPUT11
12	IN12	GENERAL INPUT 12	37	OUT12	GENERAL OUTPUT12
13	IN13	GENERAL INPUT 13	38	OUTC	General output common
14	IN14	GENERAL INPUT 14	39	OUTC	General output common
15	IN15	GENERAL INPUT 15	40	+24VI	+24V output supply
16	IN16	GENERAL INPUT 16	41	+24VI	+24V output supply
17	IN17	GENERAL INPUT 17	42	GNDI	+24V output supply common
18	IN18	GENERAL INPUT 18	43	GNDI	+24V output supply common
19	IN19	GENERAL INPUT 19	44	A+	A phase +Output
20	IN20	GENERAL INPUT 20	45	A-	A phase -Output
21	INC	General input common	46	B+	B phase +Output
22	INC	General input common	47	B-	B phase -Output
23	MON1	Monitor output1	48	Z+	Z phase +Output
24	MON2	Monitor output2	49	Z-	Z phase -Output
25	GND	Monitor output common	50	GND	Encoder output common

●General circuit



■What is “thrust” ?

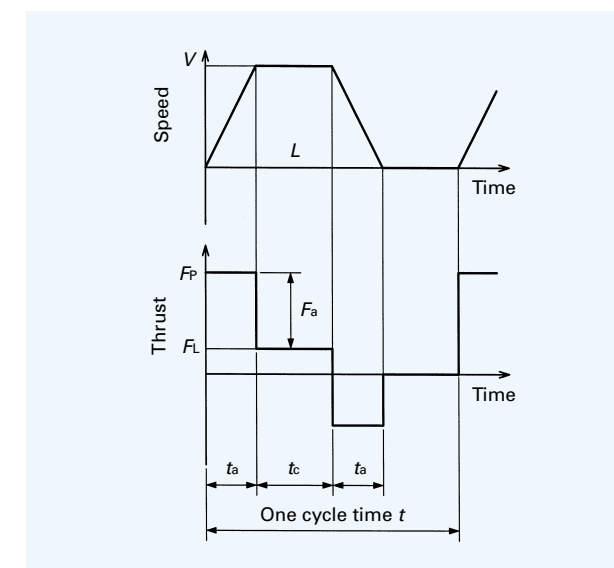
Thrust is the force in the moving direction exerted by the moving coil as shown in figure (page 4) illustrating Principle of Operation. Thrust becomes the maximum when the table is at rest, and decreases as the table speed increases. Thrust value required for acceleration or deceleration must be examined referring to the graphs of thrust characteristics on page 10 to 12.

■What is “effective thrust” ?

Effective thrust is the effective value of the thrust required in a given operation pattern. When this value exceeds the rated thrust of Linear Motor Table LT, the motor may overheat or seize. Therefore, make sure that, in principle, the calculated effective thrust does not exceed the rated thrust. Also, note that the operation limit may depend on the operation environment, etc. In general, the effective thrust (F_{rms}) is obtained as follows. (For a calculation example, see page 19.)

$$F_{rms} = \sqrt{\frac{F_P^2 \times t_a + (F_P - 2 \times F_L)^2 \times t_a + F_L^2 \times t_c}{t}}$$

where, F_P is the force required for acceleration/deceleration. F_L is the force due to running resistance consists of the friction of liner motion rolling guide incorporated in Linear Motor Table LT, the pulling resistance of electrical cord, etc.



■What is “dynamic load mass” ?

Dynamic load mass is the maximum mass that can be placed on the table with required acceleration or deceleration. When examining operation patterns, the relationship between the mass of load and acceleration/deceleration must be considered because the larger the mass, the smaller the acceleration and deceleration capacities. The graphs showing the relationship between the dynamic load mass and acceleration on page 10 to 12 are given for the thrust of Linear Motor Table LT at the speed of 1000 mm/s. For example, the acceleration/deceleration under the load of 10kg is about 24m/s² in maximum in the case of LT150CEG.

Examination of Operation Pattern

■ Calculation an acceleration/deceleration time

The thrust required for driving Linear Motor Table LT reaches its peak during acceleration. The thrust required during acceleration cannot exceed the output thrust of Linear Motor Table LT. The limit acceleration time is therefore calculated by the following formula.

● In case of LT···CE and LT···LD

• **Friction resistance of the rolling guide** F_f

$$F_f = \mu(W_L + W_T)g \text{ [N]}$$

where, the minimum value of F_f is set as follows :

2.5N for LT100CE

5.0N for LT150CE

6.0N for LT130LD

6.0N for LT170LD

• **Force due to running resistance** F_L

$$F_L = F_f + F_C \text{ [N]}$$

● In case of LT···H

• **Operating friction** F_R

20N for LT130H

40N for LT170H

• **Speed coefficient factor** f_v

Operation speed V [m/s]	LT130H	LT170H
0.5 or less	1	
Over 0.5 upto 1.0	1.5	
Over 1.0 upto 1.5		2.25

• **Force due to running resistance** F_L

$$F_L = f_v \times F_R + F_C \text{ [N]}$$

From the above, limit acceleration time can be given by following formulae.

• **Force due to acceleration** F_a

$$F_a = (W_L + W_T) \frac{V}{t_a} \text{ [N]}$$

• **Thrust required for acceleration** F_P

$$F_P = F_a + F_L \text{ [N]}$$

• **Limit acceleration time** t_a

$$t_a = \frac{(W_L + W_T) \cdot V \cdot k}{F_M - F_L} \text{ [s]}$$

where,

μ : Friction coefficient of rolling guide, 0.01

W_L : Mass of load, [kg]

W_T : Mass of moving part, [kg]

F_C : Pulling resistance of the electrical cord, (1) [N]

F_M : Thrust of Linear Motor Table LT, [N]

Maximum thrust at travel speed V (See pages 12 to 14.)

t_a : Acceleration time, [s]

V : Travel speed, [m/s]

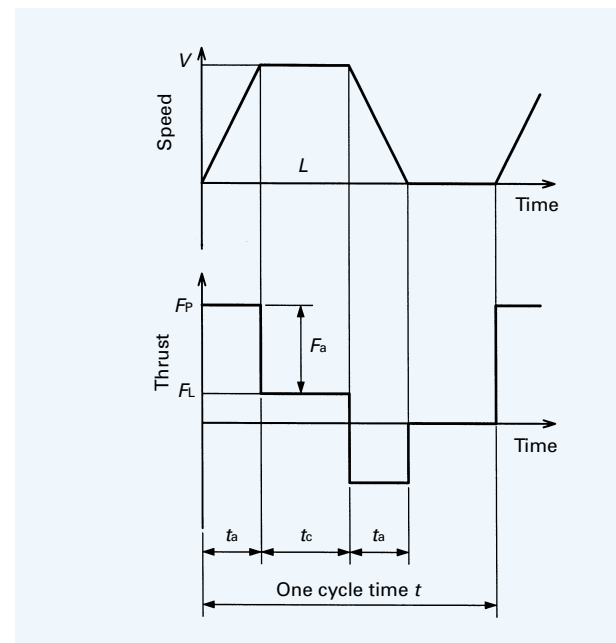
g : Gravitational acceleration, 9.8 [m/s²]

k : Safety factor, 1.3

Note(1) : The pulling resistance differs depending on the cord mass and pulling method. Assume an appropriate resistance value for calculation.

■ Example of examination of operation pattern

Depending on the operation rate of Linear Motor Table LT, the effective thrust may exceed the rated thrust of the motor, and the motor may overheat or seize leading to a breakdown or injury. Before operating this table, make sure that the effective thrust does not exceed the rated thrust of the motor. An example of examination of an operation pattern is given for the case of LT170HS. Assume an operation pattern as shown below considering the limit acceleration time and dynamic load mass on page 12.



Items

Items	Model	LT170HS (Self cooling)
Linear Motor Table Specification	Mass of the moving table	W_T 4.0 [kg] Refer page 21 to 32
	Maximum thrust at operating speed V	F_M 550 [N] approx. Refer page 12
	Operating friction	F_R Refer to "Calculation an acceleration/deceleration time" [In case of LT···H]
	Speed coefficient	f_v
	Mass of the load	W_L 30 [kg]
Travel distance	L 1.2 [m]	
Travel speed	V 1.5 [m/s]	
Time	t_a	0.3 [s]
	t_c	0.5 [s]
	t	2.5 [s]
Pulling resistance of the cord	F_C	1.0 [N] Assumed value
Thrust safety factor	k	1.3
Environment temperature	—	30°C

Step 1 : Calculating the thrust required for acceleration (or deceleration)

① **Force due to running resistance** F_L

$$F_L = f_v \times F_R + F_C = 2.25 \times 40 + 1 = 91 \text{ [N]}$$

② **Force due to acceleration** F_a

$$F_a = (W_L + W_T) \frac{V}{t_a}$$

$$= (30 + 4.0) \times \frac{1.5}{0.3} = 170 \text{ [N]}$$

③ **Thrust required for acceleration** F_P

$$F_P = F_a + F_L$$

$$= 170 + 91 = 261 \text{ [N]}$$

Check if $F_P \times k$ (thrust safety factor) is lower than the thrust characteristics curve on page 12.

If this value is higher than the curve, re-examine the maximum speed, acceleration (deceleration) time and other factors of the operation pattern. In the example pattern, the thrust value is lower than the thrust characteristics curve as follows.

$$F_M \text{ (maximum thrust at 1.5m/s)} = 550 \text{ [N] approx.}$$

$$F_P \times k = 261 \times 1.3 \approx 339.3 < F_M$$

Step 2 : Calculating an effective thrust

The effective thrust F_{rms} can be determined as follows.


$$F_{rms} = \sqrt{\frac{F_P^2 \times t_a + (F_P - 2 \times F_L)^2 \times t_a + F_L^2 \times t_c}{t}}$$

$$= \sqrt{\frac{261^2 \times 0.3 + (261 - 2 \times 91)^2 \times 0.3 + 91^2 \times 0.5}{2.5}}$$

$$\approx 103 \text{ [N]}$$

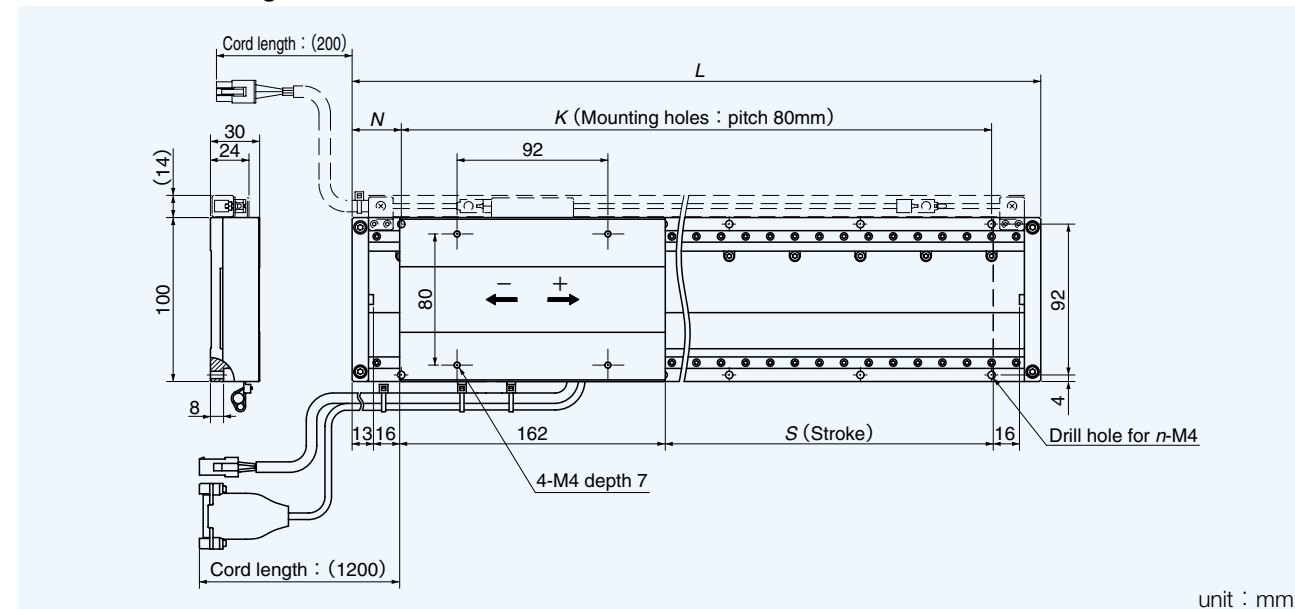
Make sure that F_{rms} does not exceed the rated thrust of the motor shown on page 12. If it may exceed the rated thrust, re-examine the maximum speed, acceleration (deceleration) time and other factors of the operation pattern. In LT···H, rated thrust characteristics may change by surrounding temperature. Refer to the chart on page 12. In the example pattern, continuous operation is possible because 103N is lower than self cooling rated thrust 117N under 30°C temperature.

Cautions in Use

- ◆ Linear Motor Table LT is a precision equipment. Therefore, handle it with great care and do not apply an excessive load or strong shock on it.
- ◆ Operate this product in clean environment free from water, oil, dust, etc.
- ◆ Make sure that the mounting base is free from dirt and harmful foreign matters.
- ◆ The flatness of mounting base for Linear Motor Table LT must be better than 30μm.
- ◆ Linear Motor Table LT contains strong magnets inside. If ferromagnetic body is placed close to the table, it may be pulled suddenly by a strong force.
- ◆ In design, take necessary measures to avoid external forces that may be applied on the cables.
- ◆ The linear motion rolling guide assembled in Linear Motor Table LT is lubricated with grease. So make sure to keep dirt or any foreign matter from entering into the table.
- ◆ Linear Motor Table LT is machined, assembled, and adjusted very precisely. Therefore, never disassemble or modify the table.
- ◆ The magnetic circuit inside of Linear Motor Table LT is a closed circuit. However, a slight magnetic flux leakage exists and may influence to devices sensitive to magnetism which is close to the linear motor. In such instances, please consult .
- ◆ In case the table is installed on a wall, cables must be placed underneath the table.
- ◆ Linear Motor Table LT cannot be used in a vertical position.

◎ The appearance, specifications, and other details of the product are subject to change without prior notice for improvement.

LT100CEGS Single table

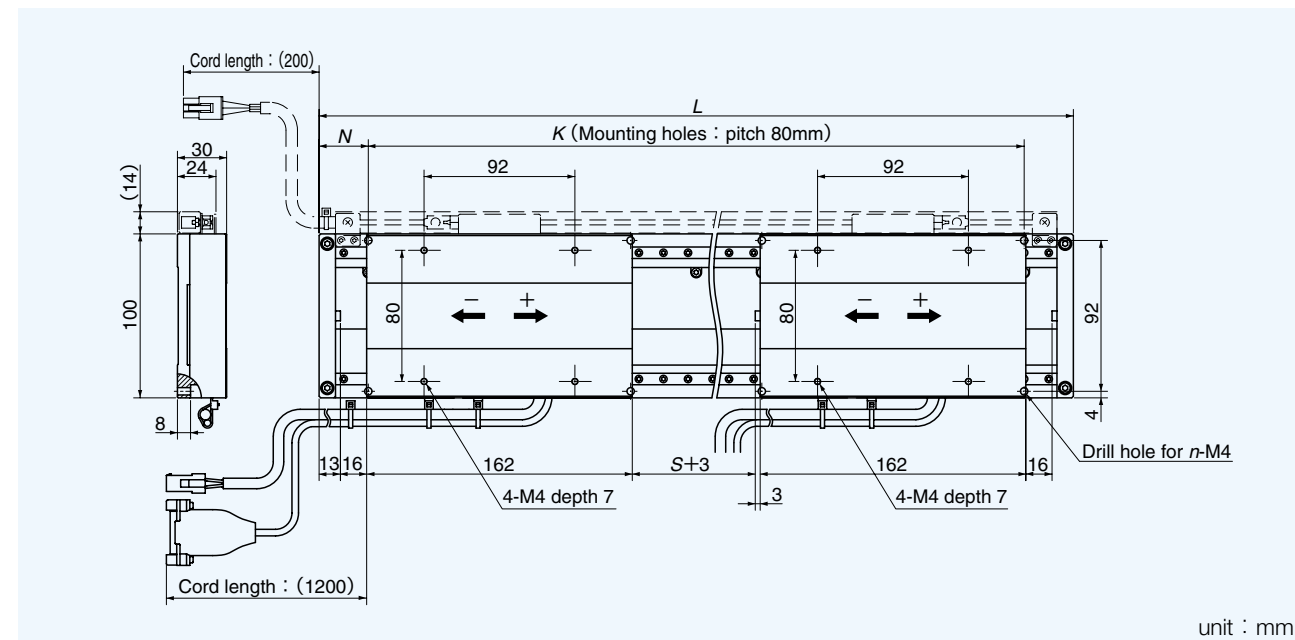


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT100CEGS-200	200	420	50	320	10	4.9	0.58
LT100CEGS-400	400	620	30	560	16	6.9	
LT100CEGS-600	600	820	50	720	20	9.0	
LT100CEGS-800	800	1020	30	960	26	11.1	
LT100CEGS-1000	1000	1220	50	1120	30	13.1	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT100CEGS/T2 Twin tables

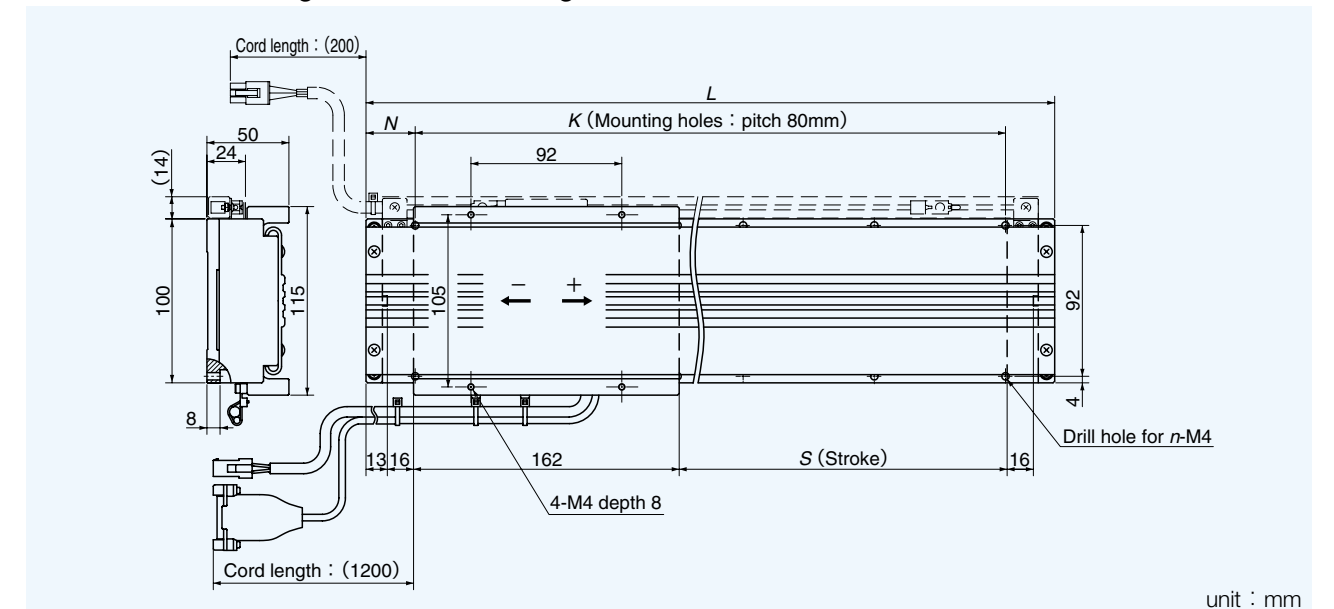


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT100CEGS-230/T2	230	620	30	560	16	7.5	0.58
LT100CEGS-430/T2	430	820	50	720	20	9.6	
LT100CEGS-630/T2	630	1020	30	960	26	11.7	
LT100CEGS-830/T2	830	1220	50	1120	30	13.7	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT100CEGF/D Single table with bridge cover

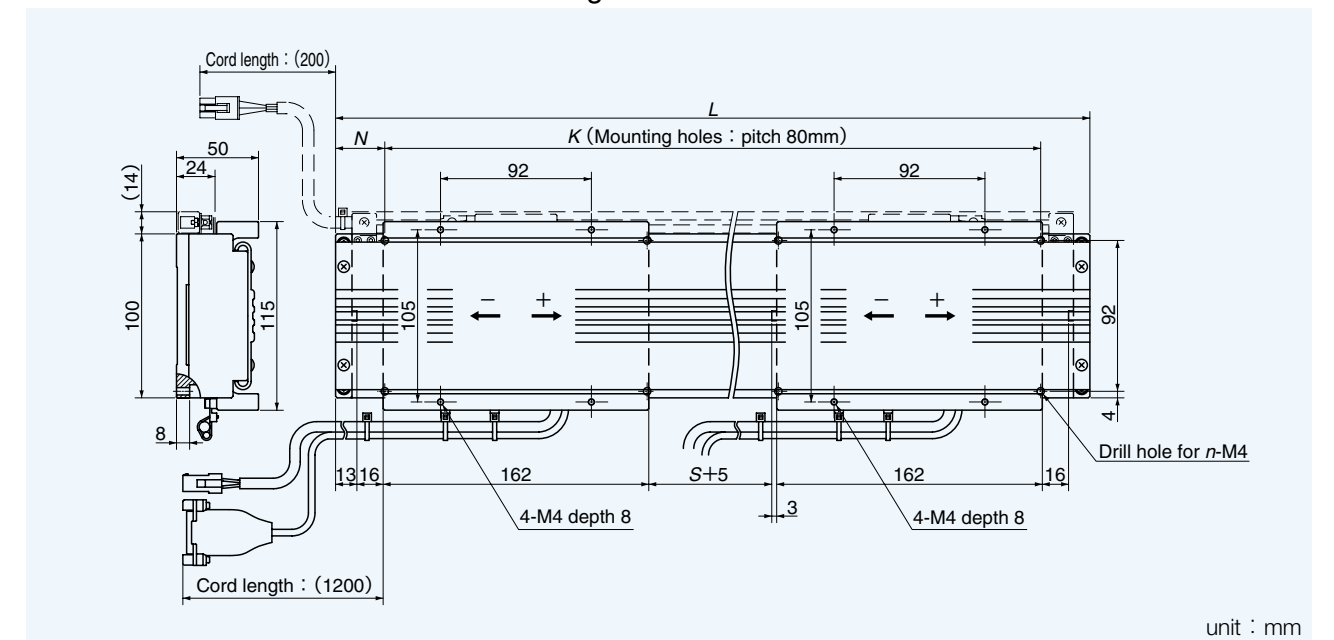


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT100CEGF-200/D	200	420	50	320	10	5.6	0.93
LT100CEGF-400/D	400	620	30	560	16	7.8	
LT100CEGF-600/D	600	820	50	720	20	10.0	
LT100CEGF-800/D	800	1020	30	960	26	12.2	
LT100CEGF-1000/D	1000	1220	50	1120	30	14.4	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT100CEGF/DT2 Twin tables with bridge cover

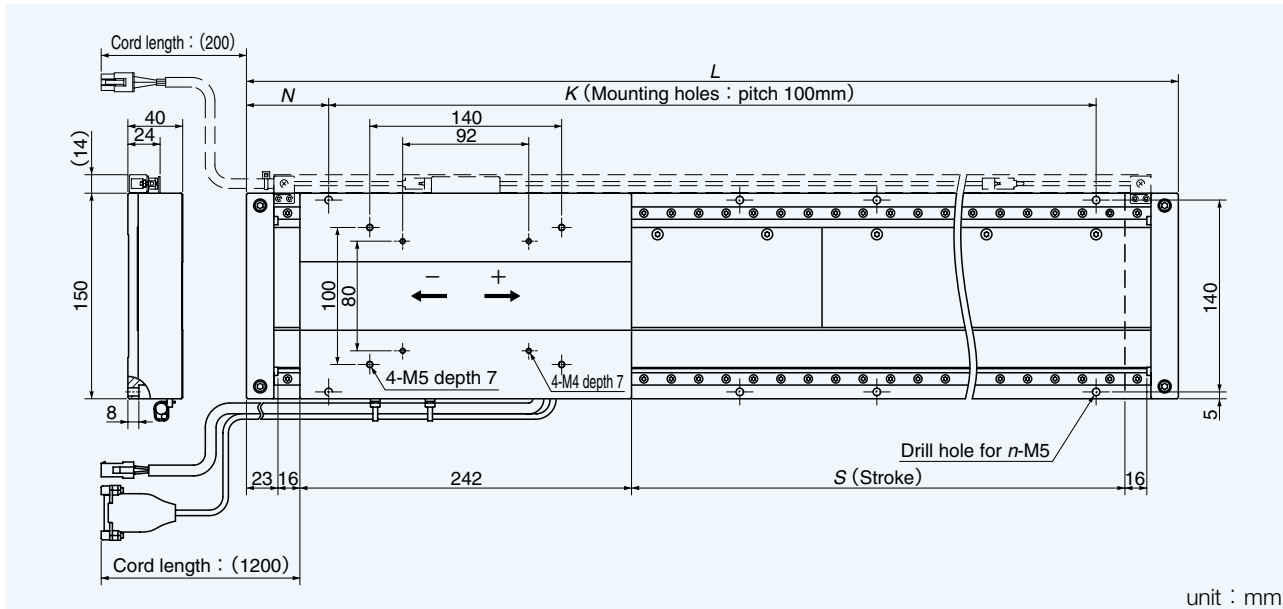


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT100CEGF-230/DT2	230	620	30	560	16	8.7	0.93
LT100CEGF-430/DT2	430	820	50	720	20	10.9	
LT100CEGF-630/DT2	630	1020	30	960	26	13.2	
LT100CEGF-830/DT2	830	1220	50	1120	30	15.4	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT150CEGS Single table

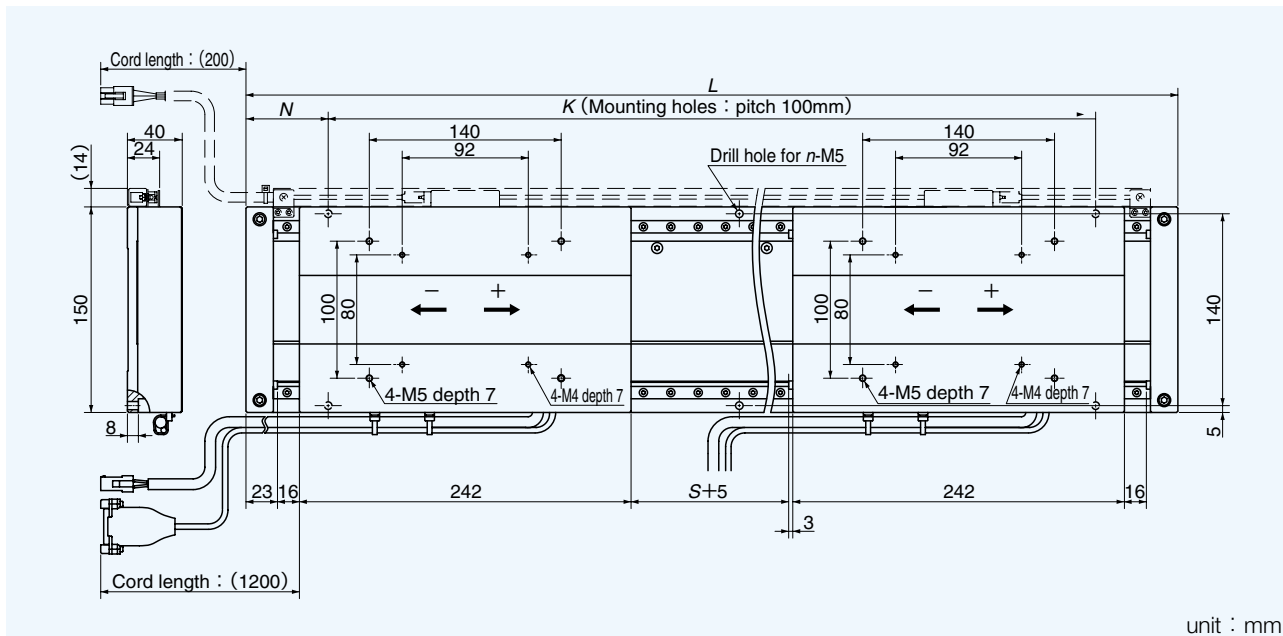


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT150CDGS-400	400	720	60	600	14	12.4	1.5
LT150CDGS-600	600	920	60	800	18	15.5	
LT150CDGS-800	800	1120	60	1000	22	18.6	
LT150CDGS-1000	1000	1320	60	1200	26	21.6	
LT150CDGS-1200	1200	1520	60	1400	30	24.7	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT150CEGS/T2 Twin tables

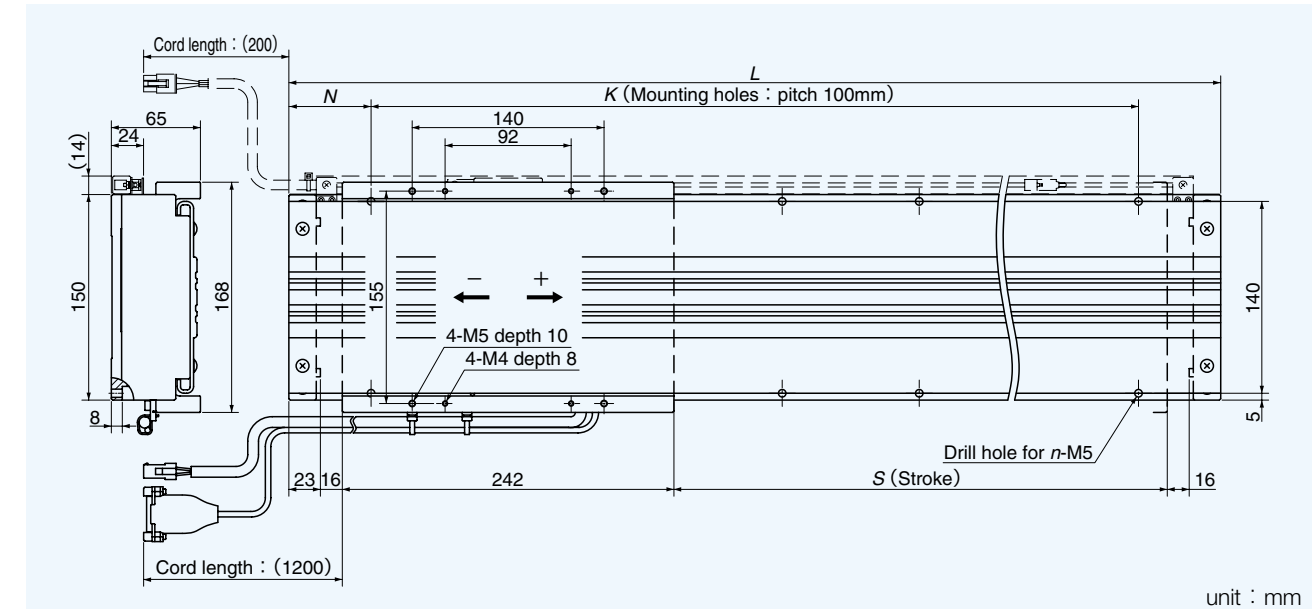


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT150CDGS-350/T2	350	920	60	800	18	17.0	1.5
LT150CDGS-550/T2	550	1120	60	1000	22	20.1	
LT150CDGS-750/T2	750	1320	60	1200	26	23.1	
LT150CDGS-950/T2	950	1520	60	1400	30	26.2	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT150CEGF/D Single table with bridge cover

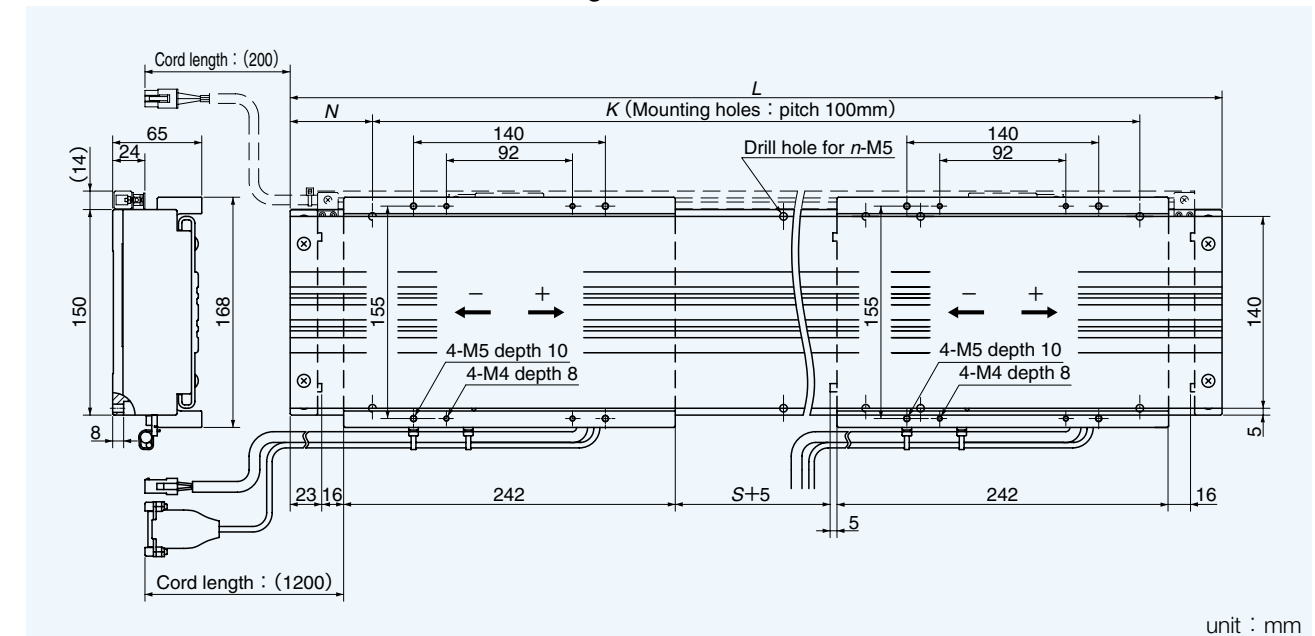


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT150CDGF-400/D	400	720	60	600	14	14.8	2.4
LT150CDGF-600/D	600	920	60	800	18	18.1	
LT150CDGF-800/D	800	1120	60	1000	22	21.5	
LT150CDGF-1000/D	1000	1320	60	1200	26	24.8	
LT150CDGF-1200/D	1200	1520	60	1400	30	28.2	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT150CEGF/DT2 Twin tables with bridge cover

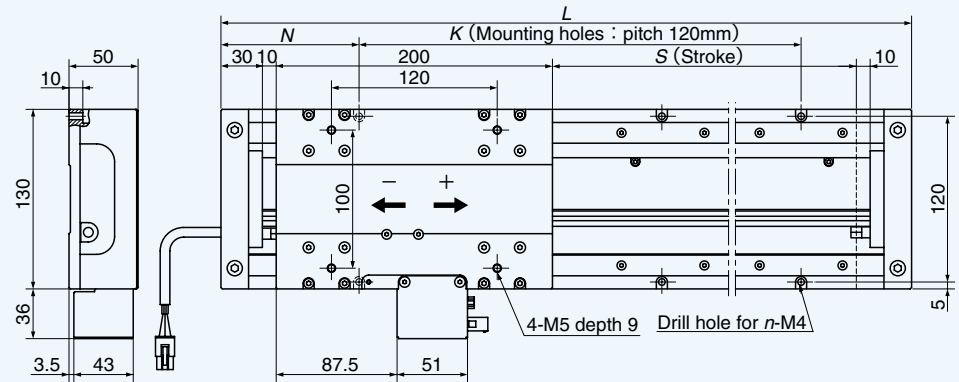


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT150CDGF-350/DT2	350	920	60	800	18	20.5	2.4
LT150CDGF-550/DT2	550	1120	60	1000	22	23.9	
LT150CDGF-750/DT2	750	1320	60	1200	26	27.3	
LT150CDGF-950/DT2	950	1520	60	1400	30	30.6	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT130LDGS Single table

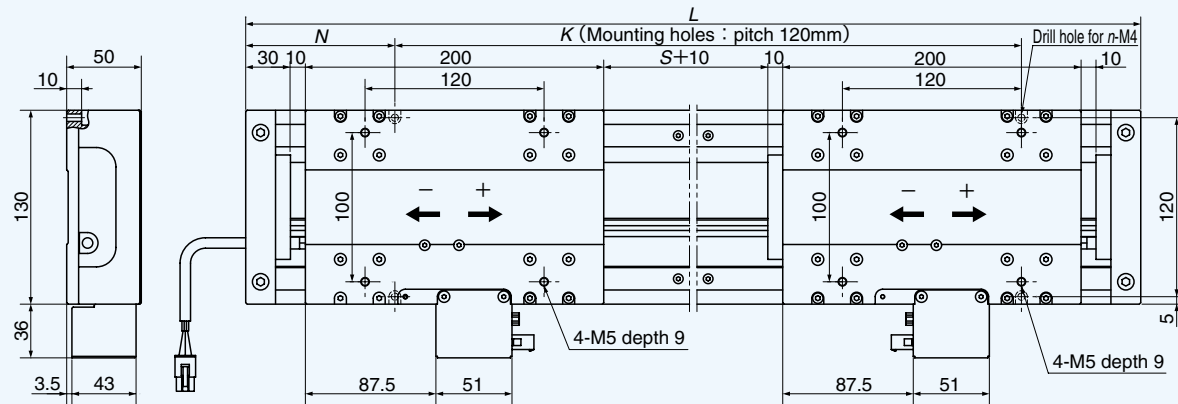


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT130LDGS-240	240	520	80	360	8	7.6	1.7
LT130LDGS-720	720	1000	80	840	16	13.5	
LT130LDGS-1200	1200	1480	80	1320	24	19.4	
LT130LDGS-1680	1680	1960	80	1800	32	25.3	
LT130LDGS-2160	2160	2440	80	2280	40	31.2	
LT130LDGS-2640	2640	2920	80	2760	48	37.1	
LT130LDGS-2760	2760	3040	80	2880	50	38.6	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT130LDGS/T2 Twin tables

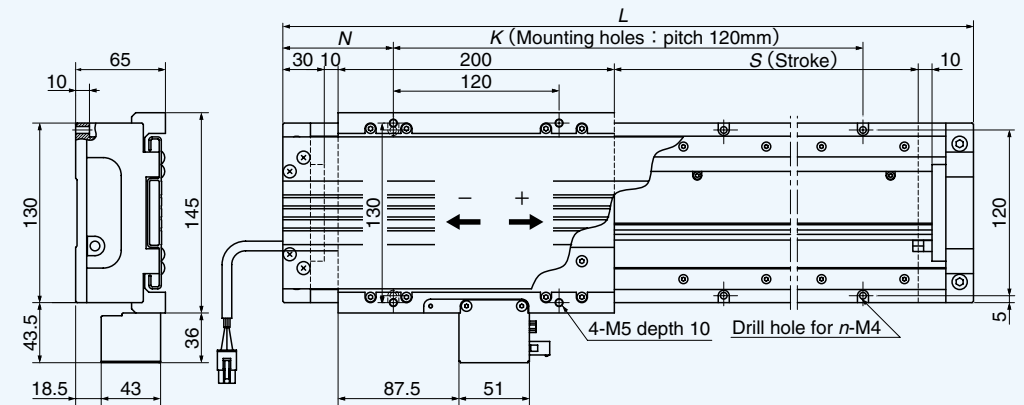


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT130LDGS-500/T2	500	1000	80	840	16	15.2	1.7
LT130LDGS-980/T2	980	1480	80	1320	24	21.1	
LT130LDGS-1460/T2	1460	1960	80	1800	32	27.0	
LT130LDGS-1940/T2	1940	2440	80	2280	40	32.9	
LT130LDGS-2420/T2	2420	2920	80	2760	48	38.8	
LT130LDGS-2540/T2	2540	3040	80	2880	50	40.3	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT130LDGF/D Single table with bridge cover

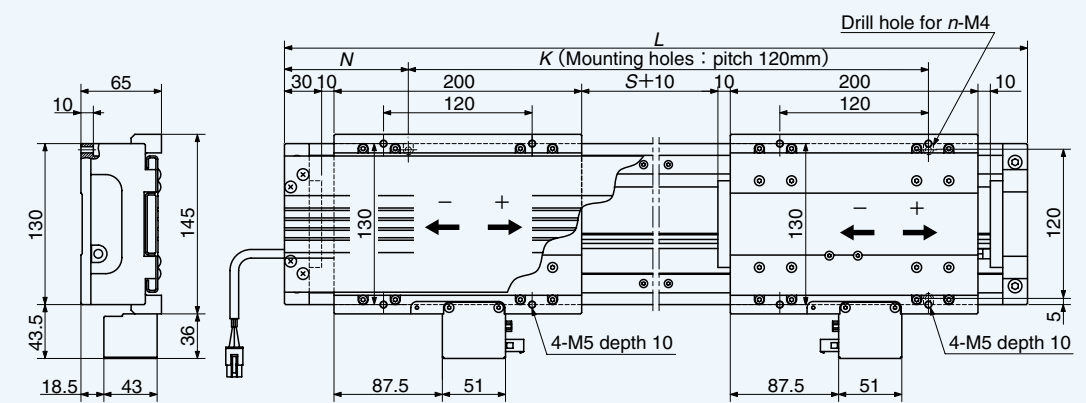


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT130LDGF-240/D	240	520	80	360	8	8.3	2.0
LT130LDGF-720/D	720	1000	80	840	16	14.6	
LT130LDGF-1200/D	1200	1480	80	1320	24	20.9	
LT130LDGF-1680/D	1680	1960	80	1800	32	27.2	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT130LDGF/DT2 Twin tables with bridge cover

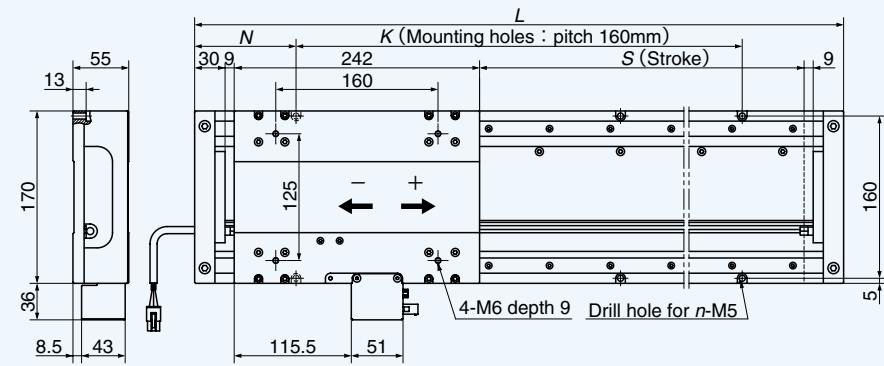


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT130LDGF-500/DT2	500	1000	80	840	16	16.6	2.0
LT130LDGF-980/DT2	980	1480	80	1320	24	22.8	
LT130LDGF-1460/DT2	1460	1960	80	1800	32	29.1	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT170LDG(V)S Single table

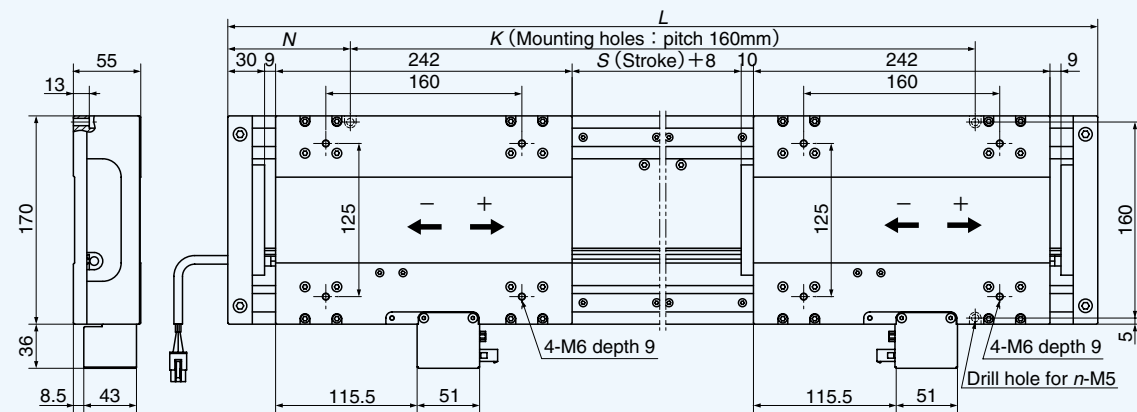


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT170LDG(V)S- 680	680	1000	100	800	12	22.6	2.5
LT170LDG(V)S-1160	1160	1480	100	1280	18	32.7	
LT170LDG(V)S-1640	1640	1960	100	1760	24	42.7	
LT170LDG(V)S-2120	2120	2440	100	2240	30	52.8	
LT170LDG(V)S-2600	2600	2920	100	2720	36	62.9	
LT170LDG(V)S-2720	2720	3040	80	2880	38	65.4	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT170LDG(V)S/T2 Twin tables

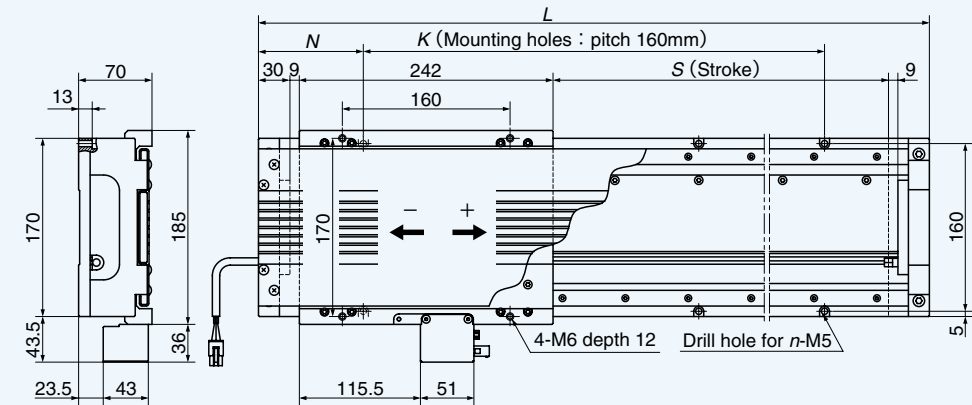


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT170LDG(V)S- 420/T2	420	1000	100	800	12	25.1	2.5
LT170LDG(V)S- 900/T2	900	1480	100	1280	18	35.2	
LT170LDG(V)S-1380/T2	1380	1960	100	1760	24	45.2	
LT170LDG(V)S-1860/T2	1860	2440	100	2240	30	55.3	
LT170LDG(V)S-2340/T2	2340	2920	100	2720	36	65.4	
LT170LDG(V)S-2460/T2	2460	3040	80	2880	38	67.9	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT170LDG(V)F/D Single table with bridge cover

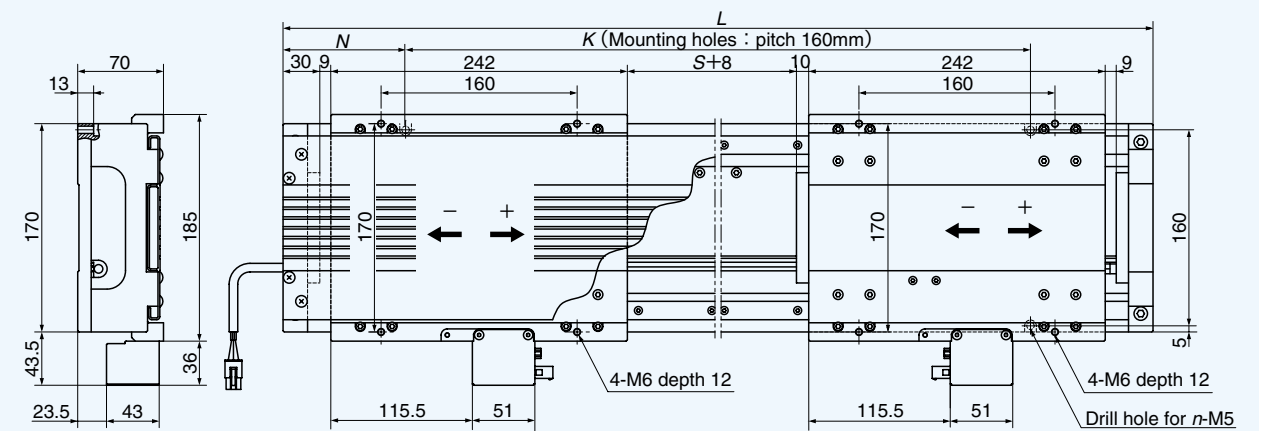


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT170LDG(V)F- 680/D	680	1000	100	800	12	24.0	2.8
LT170LDG(V)F-1160/D	1160	1480	100	1280	18	34.6	
LT170LDG(V)F-1640/D	1640	1960	100	1760	24	45.2	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT170LDG(V)F/DT2 Twin tables with bridge cover

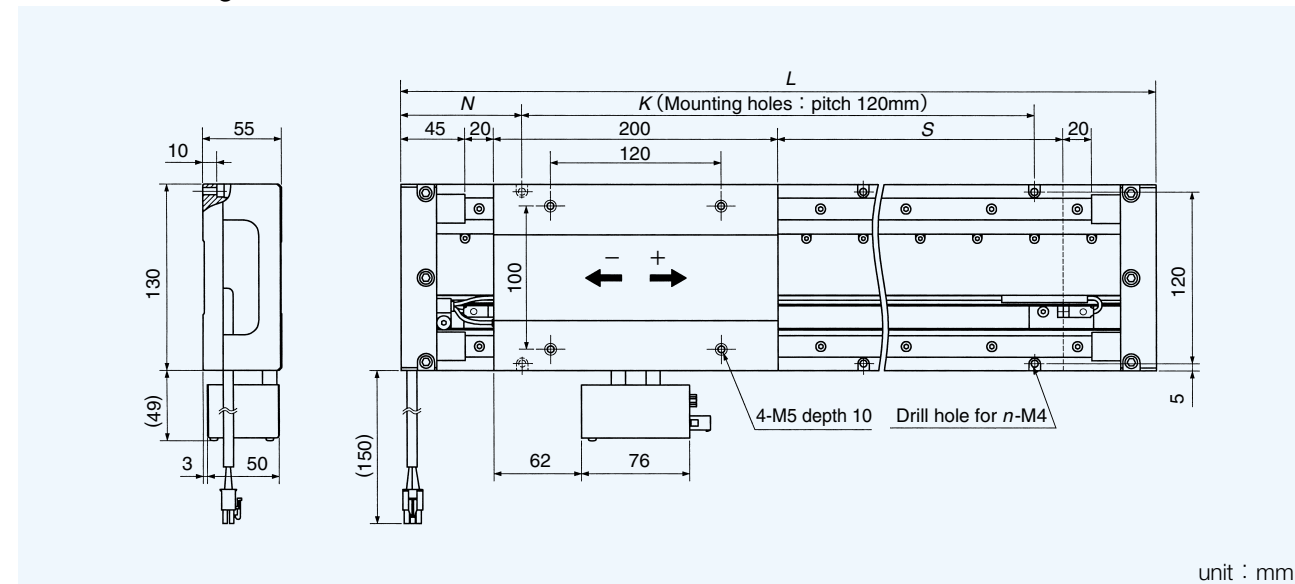


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT170LDG(V)F- 420/DT2	420	1000	100	800	12	26.9	2.8
LT170LDG(V)F- 900/DT2	900	1480	100	1280	18	37.5	
LT170LDG(V)F-1380/DT2	1380	1960	100	1760	24	48.0	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT130HS Single table

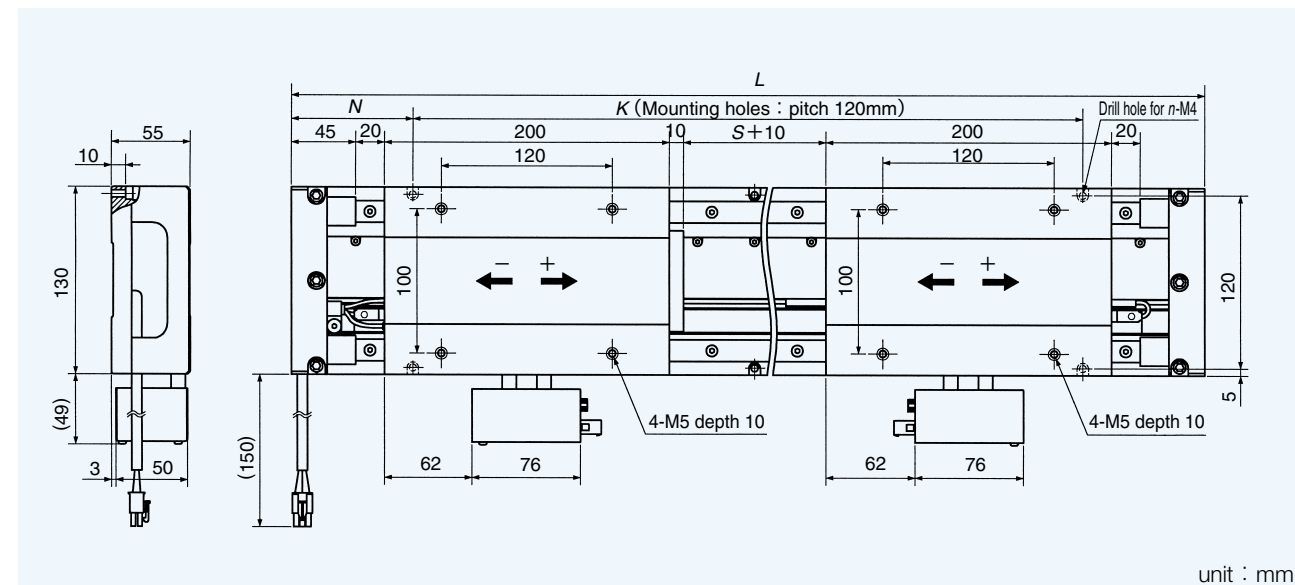


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT130HS-680	680	1010	85	840	16	15.6	2.5
LT130HS-1160	1160	1490	85	1320	24	21.7	
LT130HS-1640	1640	1970	85	1800	32	27.8	
LT130HS-2120	2120	2450	85	2280	40	33.9	
LT130HS-2600	2600	2930	85	2760	48	40.0	
LT130HS-2710	2710	3040	80	2880	50	41.4	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT130HS/T2 Twin tables

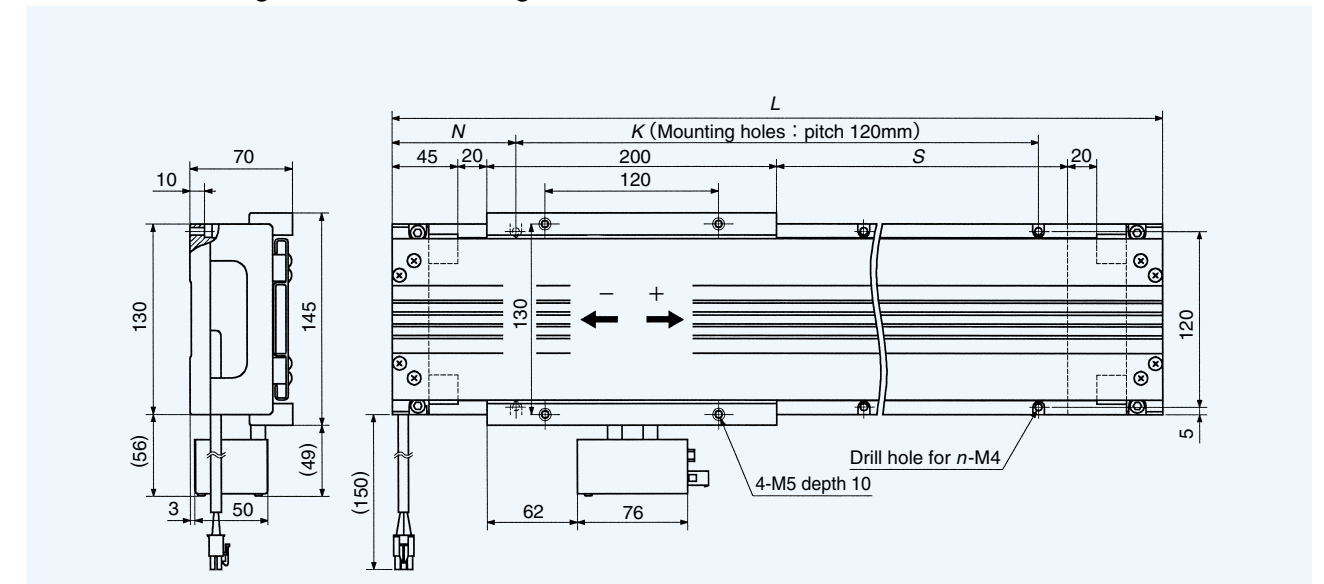


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT130HS-460/T2	460	1010	85	840	16	18.1	2.5
LT130HS-940/T2	940	1490	85	1320	24	24.2	
LT130HS-1420/T2	1420	1970	85	1800	32	30.3	
LT130HS-1900/T2	1900	2450	85	2280	40	36.4	
LT130HS-2380/T2	2380	2930	85	2760	48	42.5	
LT130HS-2490/T2	2490	3040	80	2880	50	43.9	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT130HF/D Single table with bridge cover

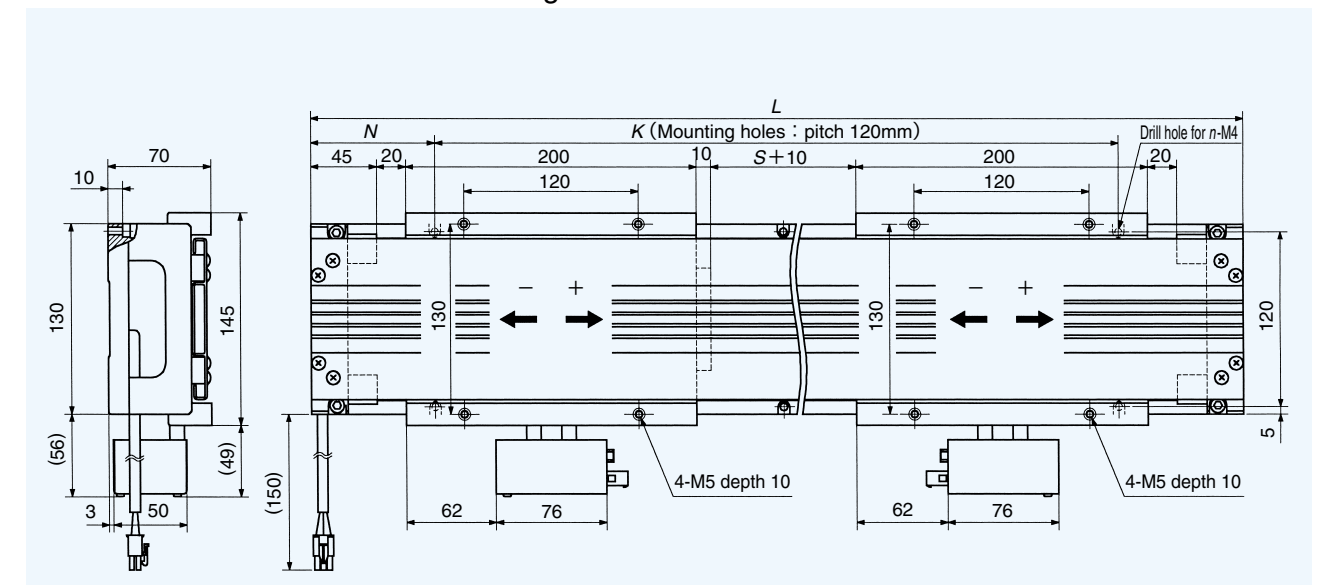


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT130HF-680/D	680	1010	85	840	16	16.1	2.9
LT130HF-1160/D	1160	1490	85	1320	24	22.2	
LT130HF-1640/D	1640	1970	85	1800	32	28.4	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT130HF/DT2 Twin tables with bridge cover

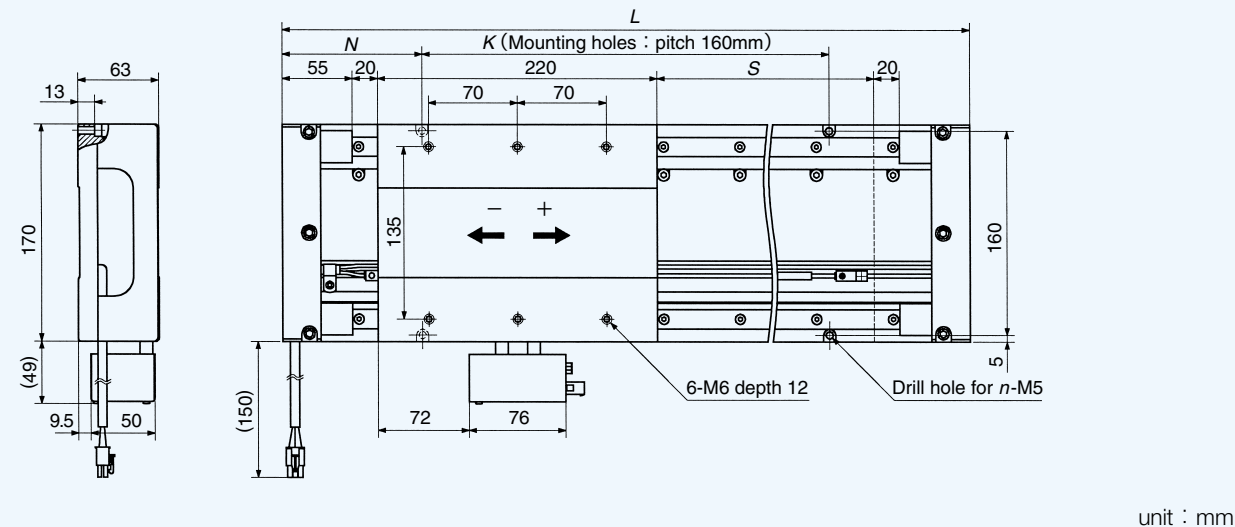


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT130HF-460/DT2	460	1010	85	840	16	18.8	2.9
LT130HF-940/DT2	940	1490	85	1320	24	24.9	
LT130HF-1420/DT2	1420	1970	85	1800	32	31.0	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT170HS Single table

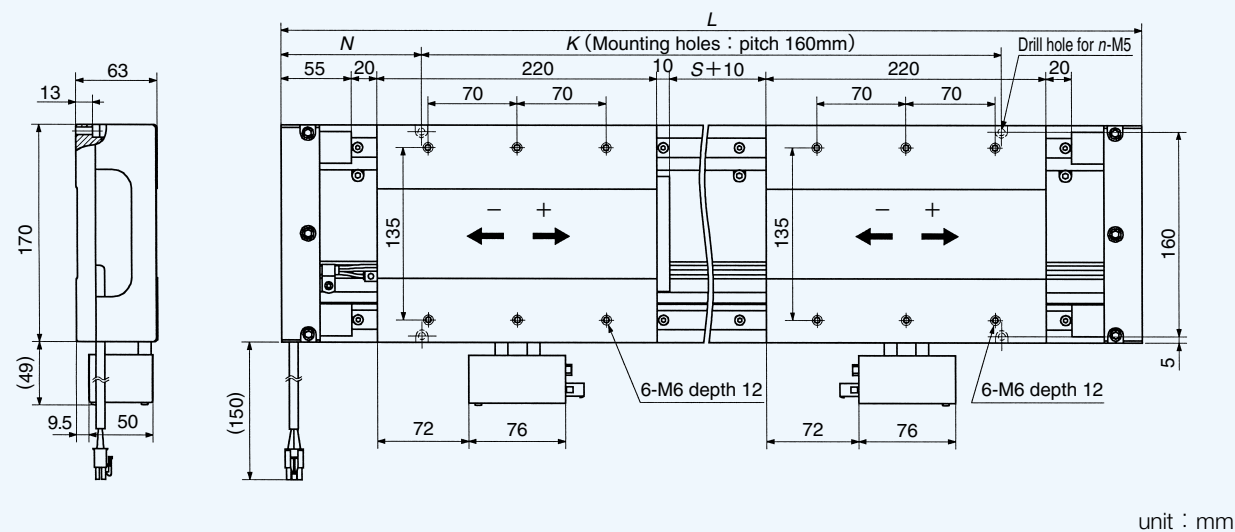


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT170HS-650	650	1020	110	800	12	25.1	4.0
LT170HS-1130	1130	1500	110	1280	18	34.9	
LT170HS-1610	1610	1980	110	1760	24	44.6	
LT170HS-2090	2090	2460	110	2240	30	54.4	
LT170HS-2570	2570	2940	110	2720	36	64.1	
LT170HS-2670	2670	3040	80	2880	38	66.4	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT170HS/T2 Twin tables

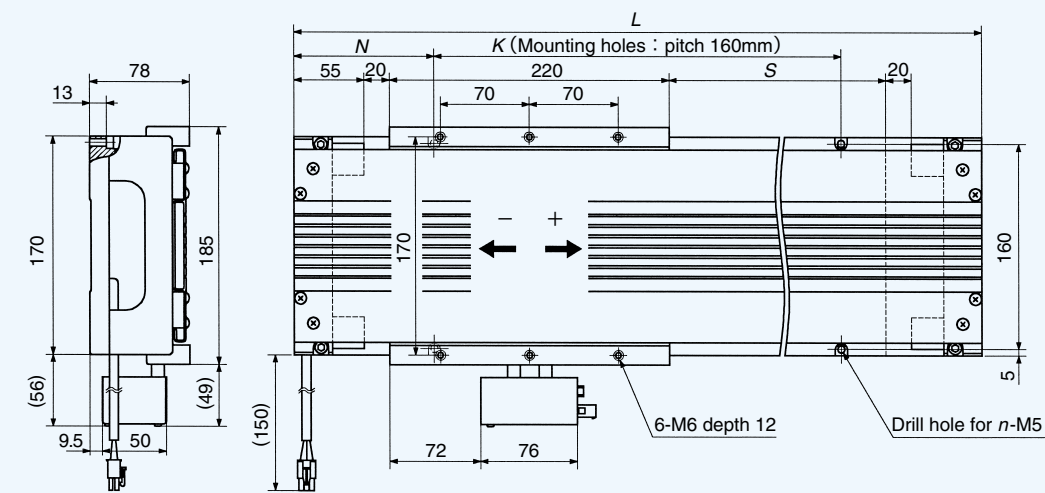


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT170HS-410/T2	410	1020	110	800	12	29.1	4.0
LT170HS-890/T2	890	1500	110	1280	18	38.9	
LT170HS-1370/T2	1370	1980	110	1760	24	48.6	
LT170HS-1850/T2	1850	2460	110	2240	30	58.4	
LT170HS-2330/T2	2330	2940	110	2720	36	68.1	
LT170HS-2430/T2	2430	3040	80	2880	38	70.4	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT170HF/D Single table with bridge cover

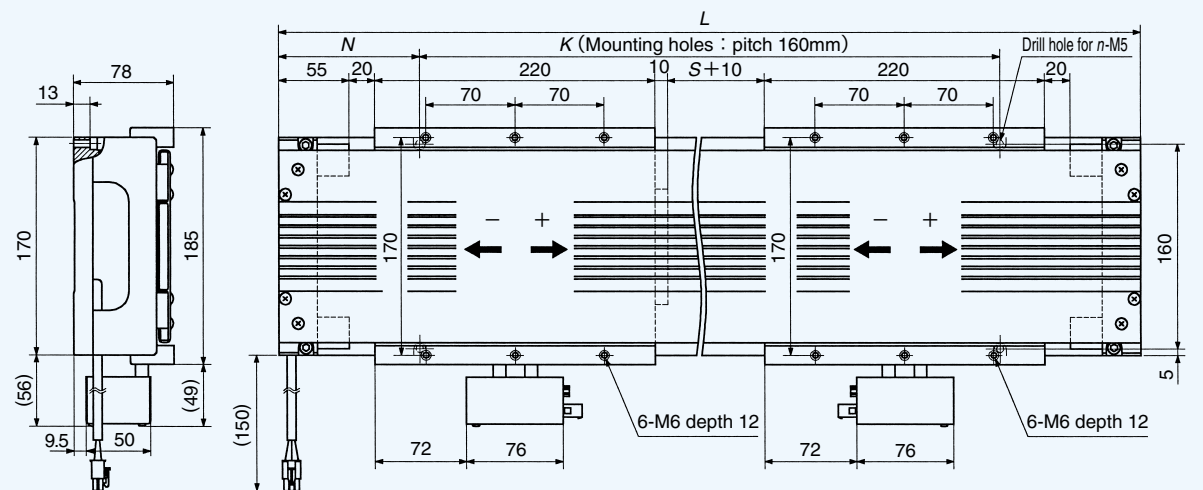


unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT170HF-650/D	650	1020	110	800	12	25.5	4.4
LT170HF-1130/D	1130	1500	110	1280	18	35.2	
LT170HF-1610/D	1610	1980	110	1760	24	45.0	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

LT170HF/DT2 Twin tables with bridge cover



unit : mm

Model code	Stroke length S ⁽¹⁾	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT170HF-410/DT2	410	1020	110	800	12	29.9	4.4
LT170HF-890/DT2	890	1500	110	1280	18	39.6	
LT170HF-1370/DT2	1370	1980	110	1760	24	49.4	

Note⁽¹⁾ : For models with stroke lengths other than those shown in the table, please consult

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