

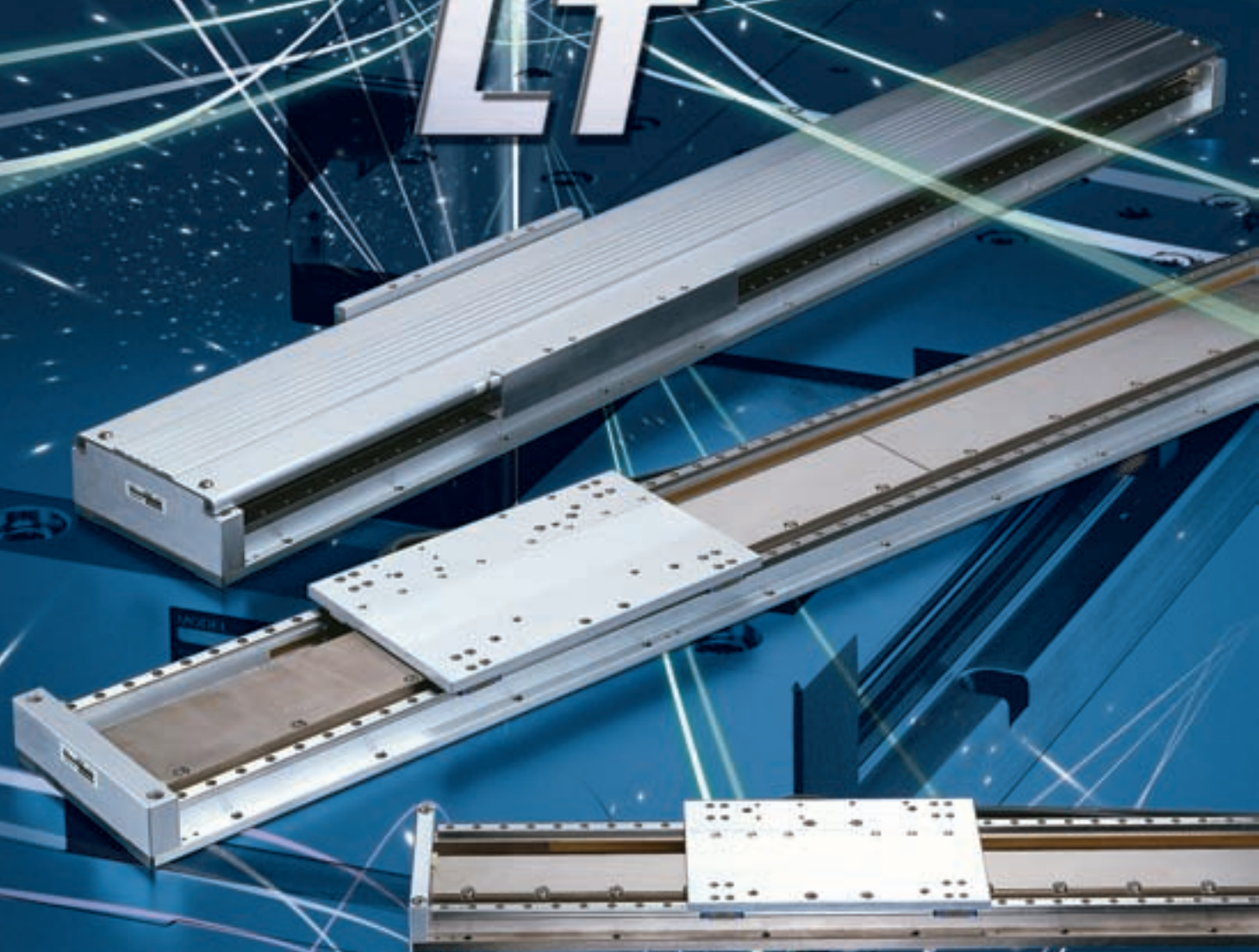


U.S. PATENTED

**IKO**

# Linear Motor Table

# LT



CAT-57156



# The Ultimate Linear Motor Table

*Vision is the art of seeing the invisible.  
We believe in your imagination  
and creativity with our technology.*

## Compact series **LT...CE**

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



## Long stroke series **LT...LD**

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



**NEW**

**Control unit NCD for CE marking**

**NCD**

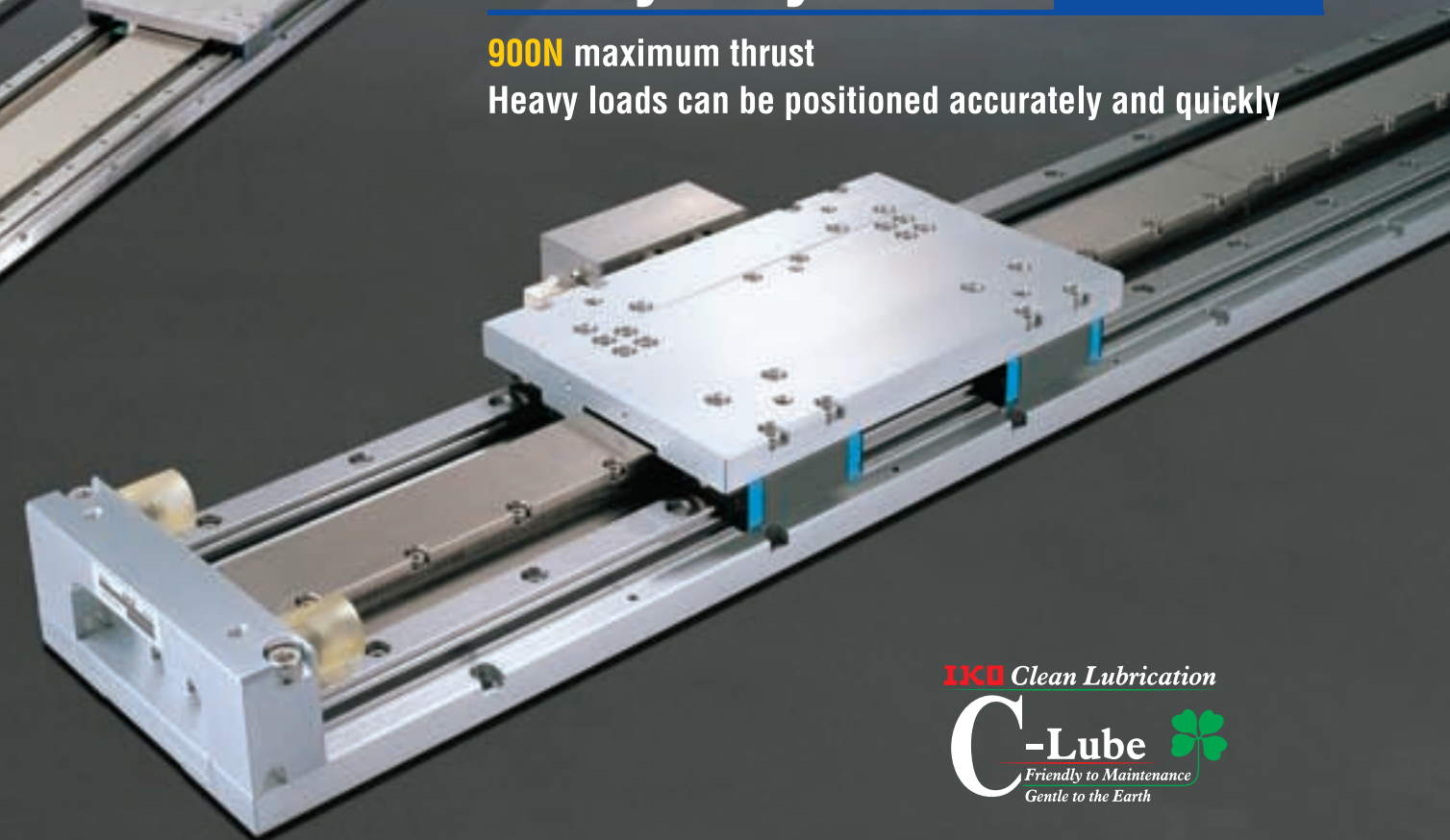
Dedicated control unit NCD for LT is conformed to Low Voltage Directive and ECM command.

**CE**



## Heavy-duty series **LT...H**

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



# 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.

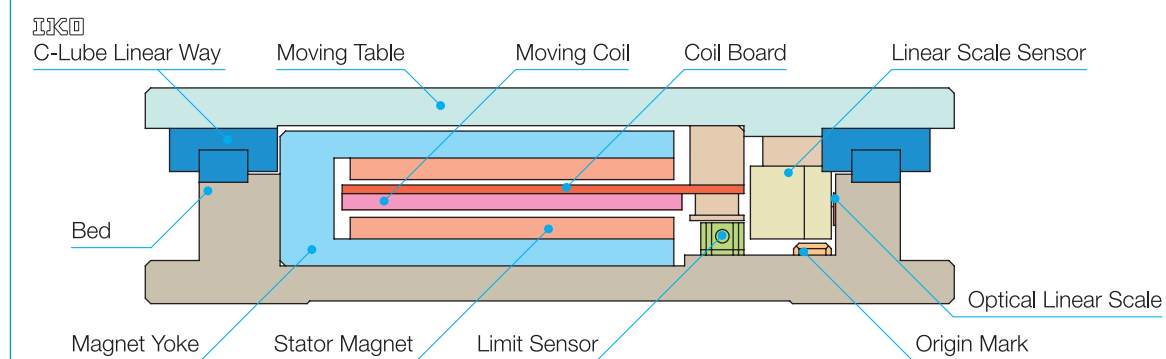
Advanced servo technology provides superior rest and speed stability.

**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.

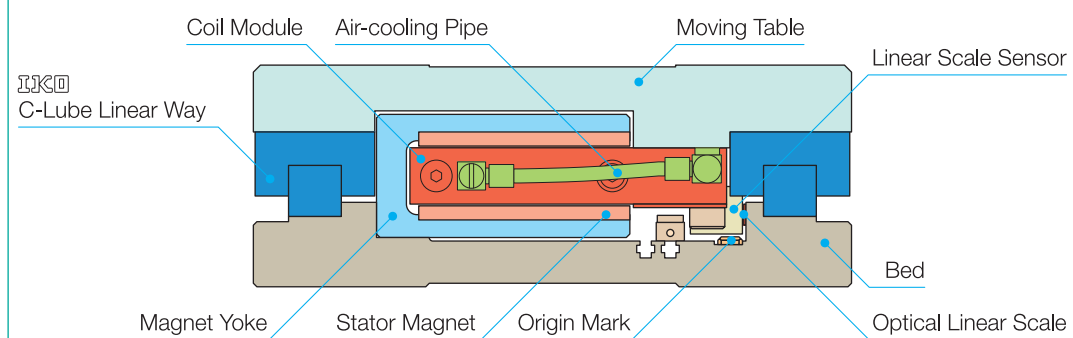


U.S. PATENT No. 6348748

## 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

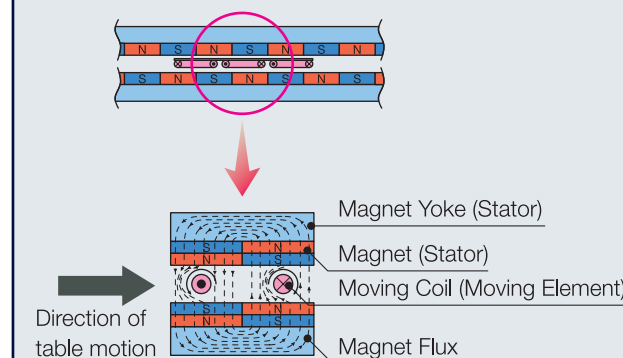
The most suitable table can be chosen from Compact, Long stroke or Heavy-duty models.

## Principle of operation of Linear Motor Table LT

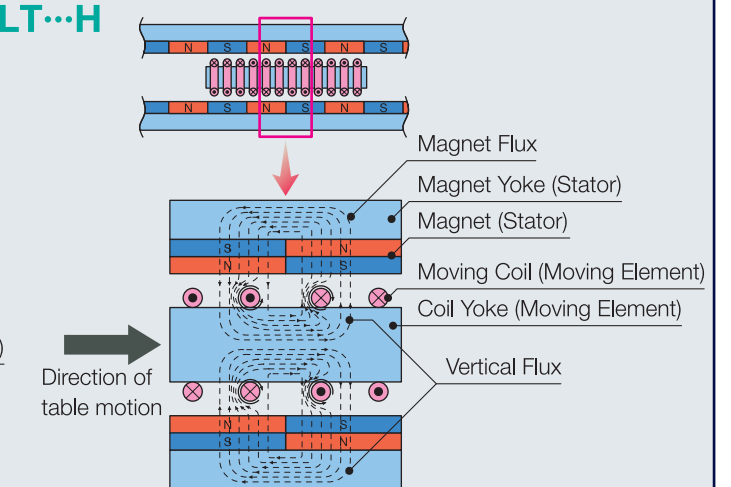
Linear Motor Table LT incorporates a field coil and optical linear scale sensor in the moving table, and a C-shaped yoke with a set of magnets facing to each other and an optical linear scale in the stator. As shown in the figure below, a magnetic flux in the vertical direction is generated by the set 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 switch-

ing 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.

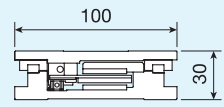
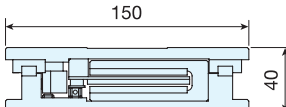
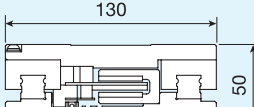
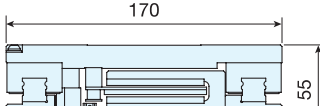
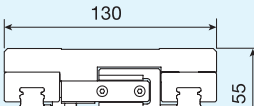
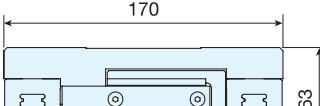
### LT...CE, LT...LD



### LT...H



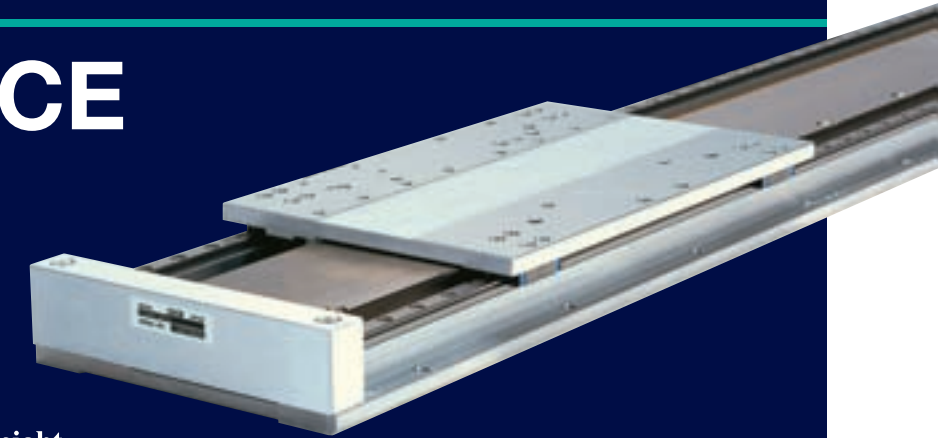
# Three series for your selection

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

**IKO** 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 **IKO** miniature Linear Way ML and an ultra small size optical linear scale to achieve a very compact size.

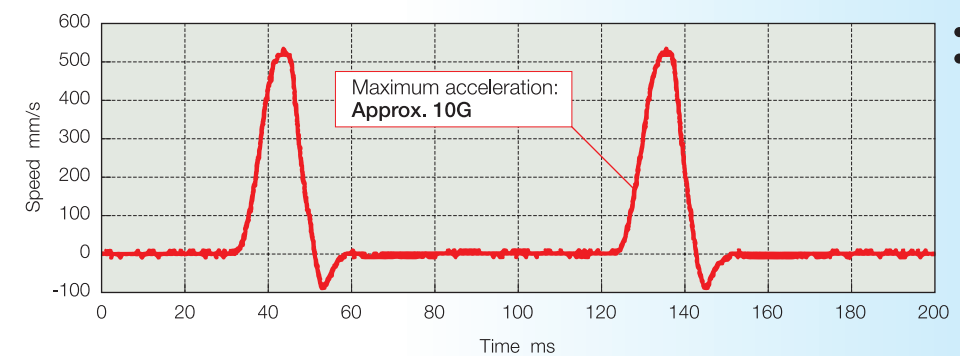
### Low profile and high thrust

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

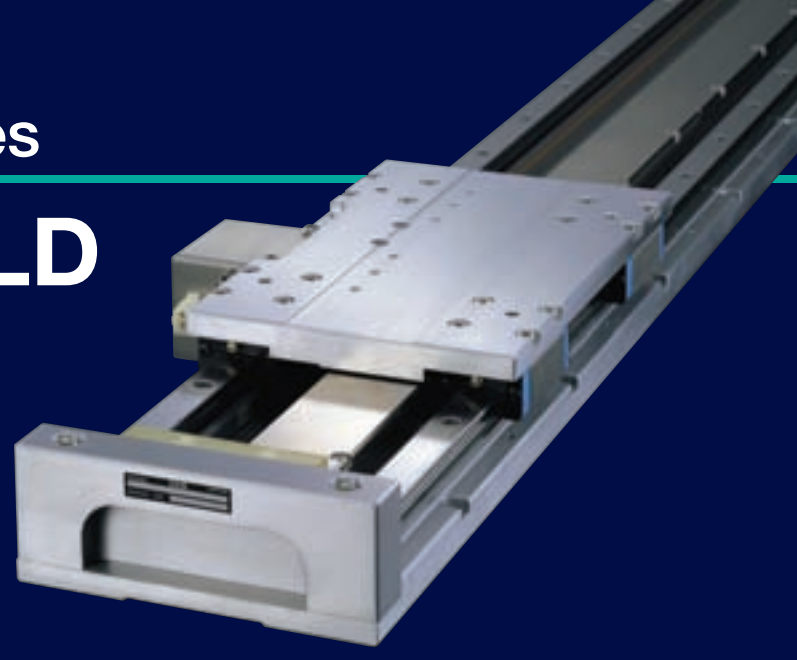


- Test table: LT150CEGS
- Measuring conditions  
Loaded mass: None  
Moving distance: 5mm (Two times)

# Long stroke series

## Features of **LT...LD**

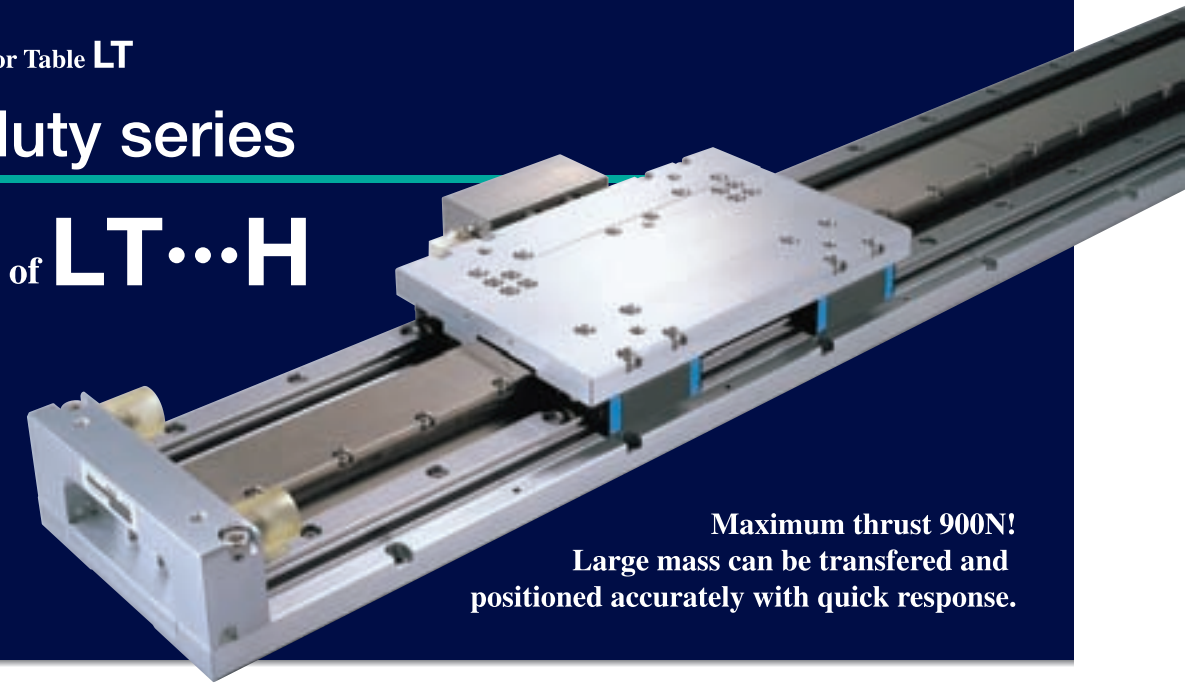
Maximum speed up to 3m/s and 2760mm of long stroke can be achieved.



# Heavy-duty series

## Features of **LT...H**

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



### Maintenance free

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

### Maintenance free

**IKO** 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.

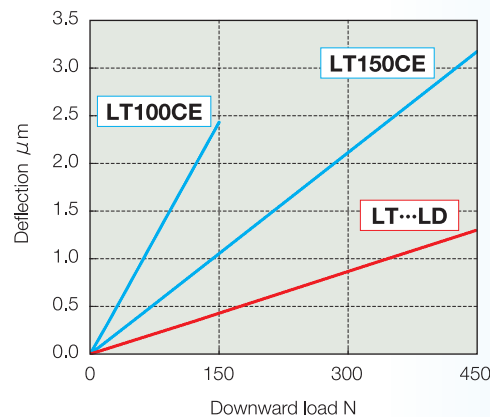
### 120N of rated thrust

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.

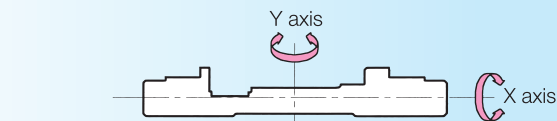
### High performance control unit

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.

### Elastic deformation characteristic

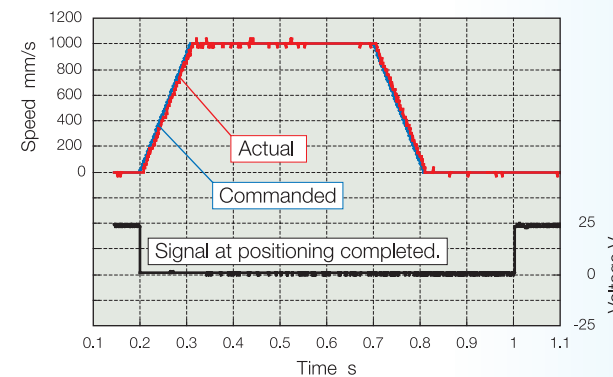


### Moment of inertia of sectional area of bed



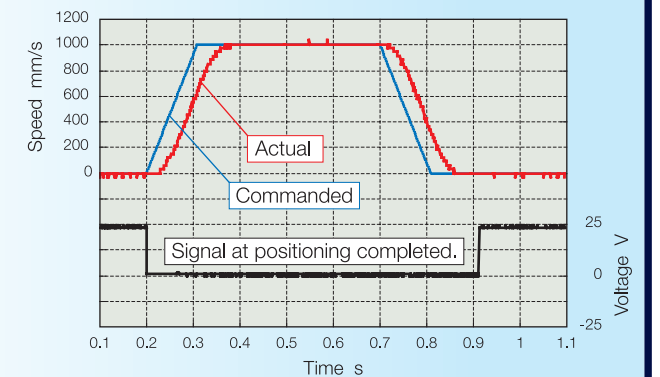
Model	Moment of inertia of sectional area mm <sup>4</sup>	
	I <sub>x</sub>	I <sub>y</sub>
LT130LD	3.8 × 10 <sup>4</sup>	281 × 10 <sup>4</sup>
LT170LD	7.6 × 10 <sup>4</sup>	749 × 10 <sup>4</sup>

### 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/s<sup>2</sup> 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-

cations 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)	
430	

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	—	—	○

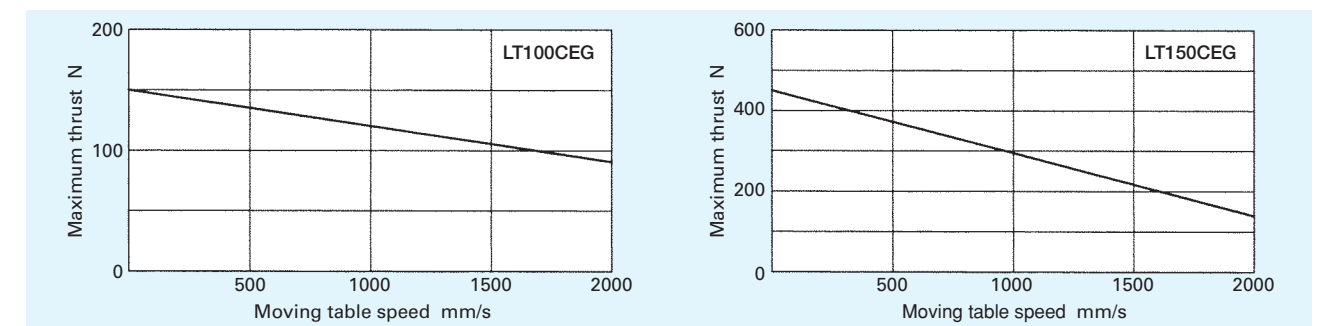
# Specification and Performances

**Table 2 Specification of LT...CE**

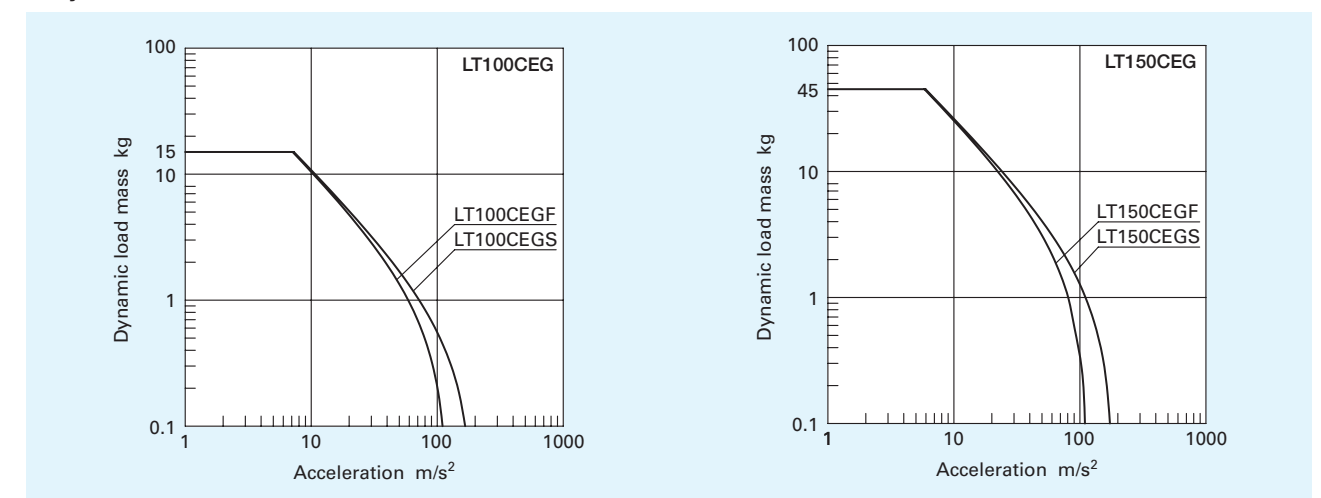
Item	Model	LT100CEG			LT150CEG		
Maximum thrust <sup>(1)</sup>	N	150			450		
Rated thrust	N	15			60		
Maximum load mass	kg	15			45		
Resolution	μm	0.1	0.5	1.0	0.1	0.5	1.0
Maximum speed <sup>(2)</sup>	m/s	0.7	2.0	2.0	0.7	2.0	2.0
Repeatability <sup>(3)</sup>	μm	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0

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

**●Thrust characteristics**



**●Dynamic load mass**



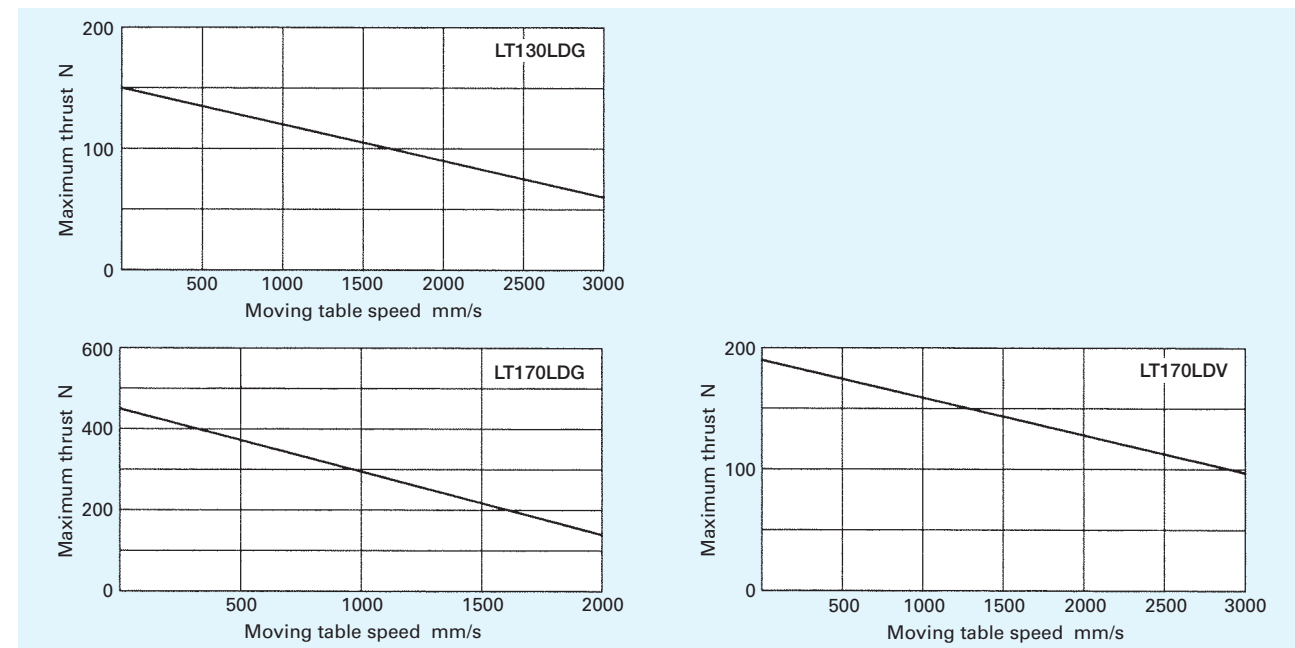
Remark : These values are calculated from the thrust when the table speed at 1000 mm/s.

**Table 3 Specification of LT...LD**

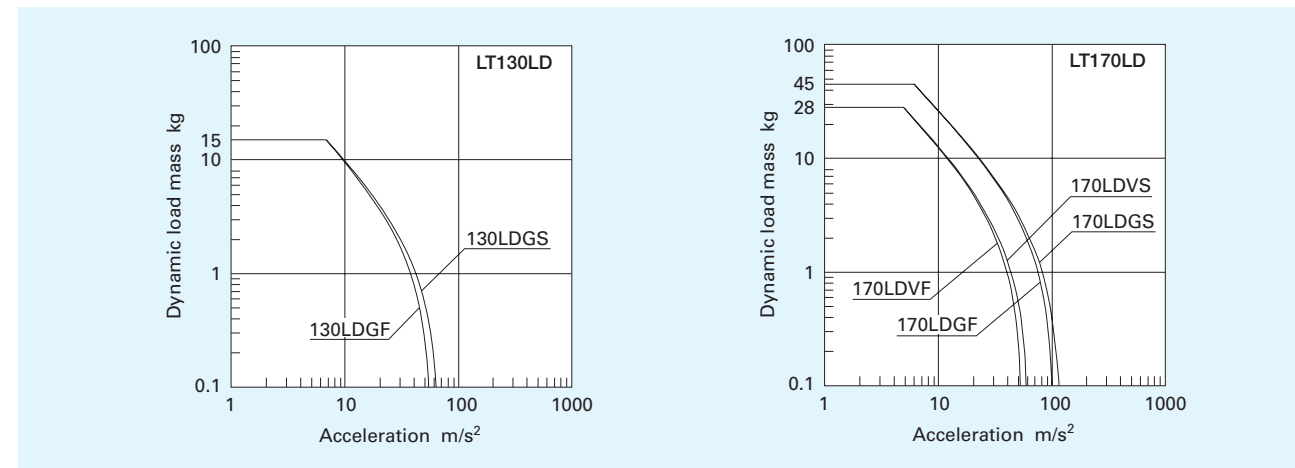
Item	Model	LT130LDG			LT170LDG			LT170LDV		
		0.1	0.5	1.0	0.1	0.5	1.0	0.1	0.5	1.0
Maximum thrust <sup>(1)</sup>	N	150			450			190		
Rated thrust	N	15			60			25		
Maximum load mass	kg	15			45			28		
Resolution	μm	0.1	0.5	1.0	0.1	0.5	1.0	0.1	0.5	1.0
Maximum speed <sup>(2)</sup>	m/s	0.7	2.0	3.0	0.7	2.0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

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

**●Thrust characteristics**



**●Dynamic load mass**



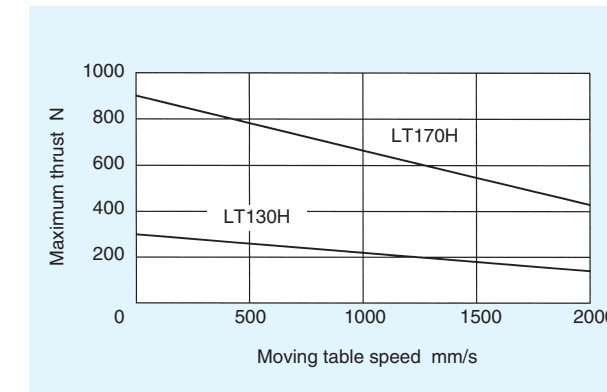
Remark: These values are calculated from the thrust when the table speed at 1000 mm/s.

**Table 4 Specification of LT...H**

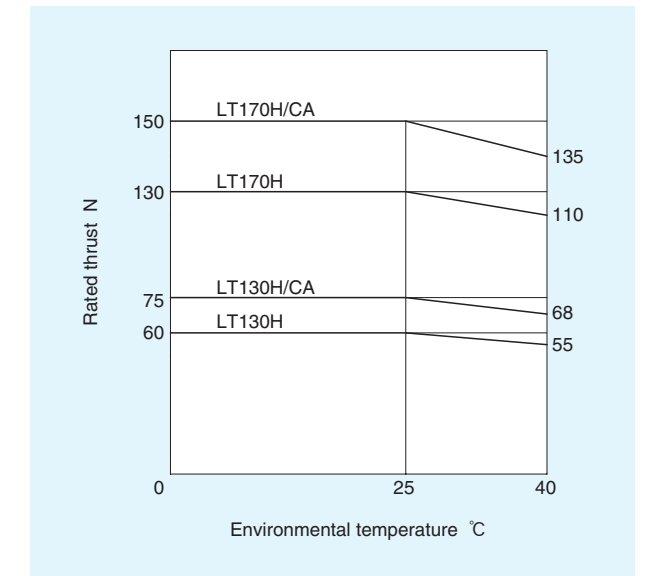
Item	Model	LT130H			LT170H		
		0.1	0.5	1.0	0.1	0.5	1.0
Maximum thrust <sup>(1)</sup>	N	300			900		
Rated thrust <sup>(2)</sup>	N	Self-cooling			60		
		Air-cooling <sup>(3)</sup>			75		
Maximum load mass	kg	30			90		
Resolution	μm	0.1	0.5	1.0	0.1	0.5	1.0
Maximum speed <sup>(4)</sup> <sup>(5)</sup>	m/s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

Note<sup>(1)</sup>: The duration of maximum thrust is one second maximum.  
<sup>(2)</sup>: In case surrounding temperature is 0 to 25 °C and table is fixed on rigid mounting bed. Refer to below figure. (Rated thrust characteristics)  
<sup>(3)</sup>: In case airflow is 30NL/min.  
<sup>(4)</sup>: When the maximum speed exceeds 1.5m/s is required, please consult IKO for further information.  
<sup>(5)</sup>: This speed may not be reached depending on the maximum output frequency of the controller used.  
<sup>(6)</sup>: These values are applicable when the temperature of Linear Motor Table LT is at the stable state.

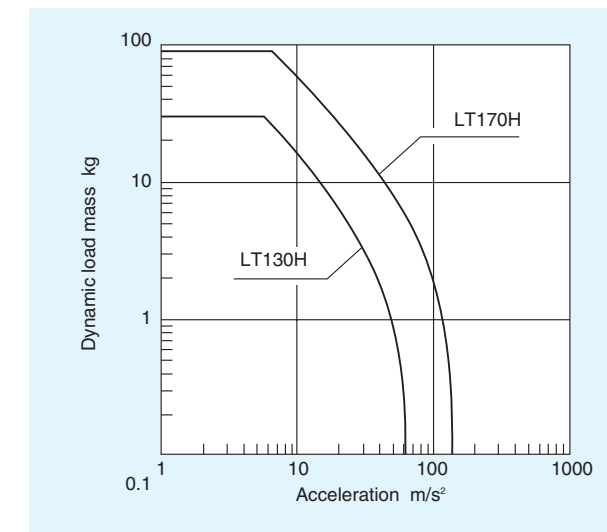
**●Thrust characteristics**



**●Rated thrust characteristics**



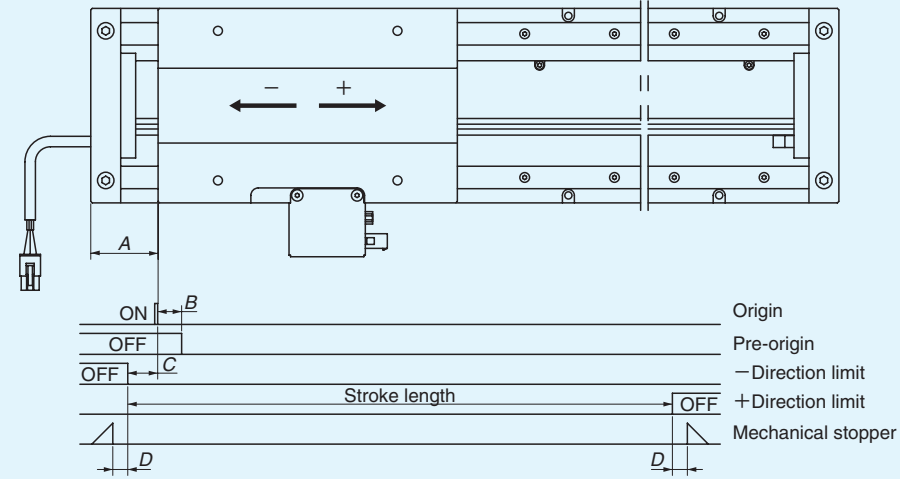
**●Dynamic load mass**



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

# Sensor Specification

## ●Sensor timing chart for single table

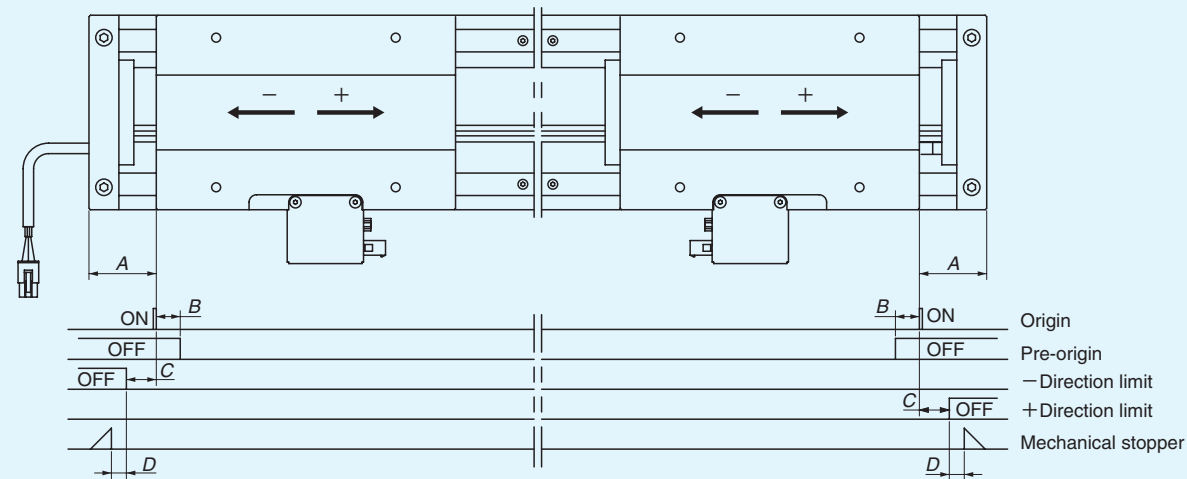


unit : mm

Size	A	B <sup>(1)</sup>	C <sup>(1)</sup>	D <sup>(1)</sup>
LT100CE.../SC	34	3	5	16
LT150CE.../SC	44	3	5	16
LT130LD	45	3	5	10
LT170LD	44	3	5	9
LT130H	82	3	17	20
LT170H	92	3	17	20

Note<sup>(1)</sup> : 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

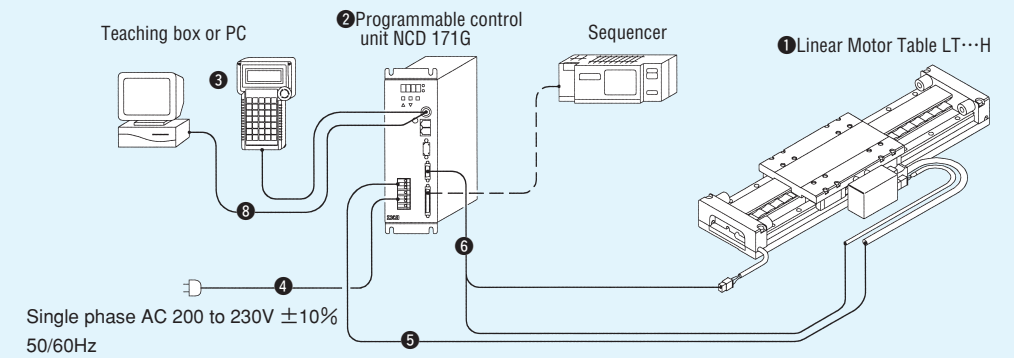
Model	A	B <sup>(1)</sup>	C <sup>(1)</sup>	D <sup>(1)</sup>
LT100CE.../SCT2	34	3	5	16
LT150CE.../SCT2	44	3	5	16
LT130LD.../T2	45	3	5	10
LT170LD.../T2	44	3	5	9
LT130H.../T2	82	3	17	20
LT170H.../T2	92	3	17	20

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

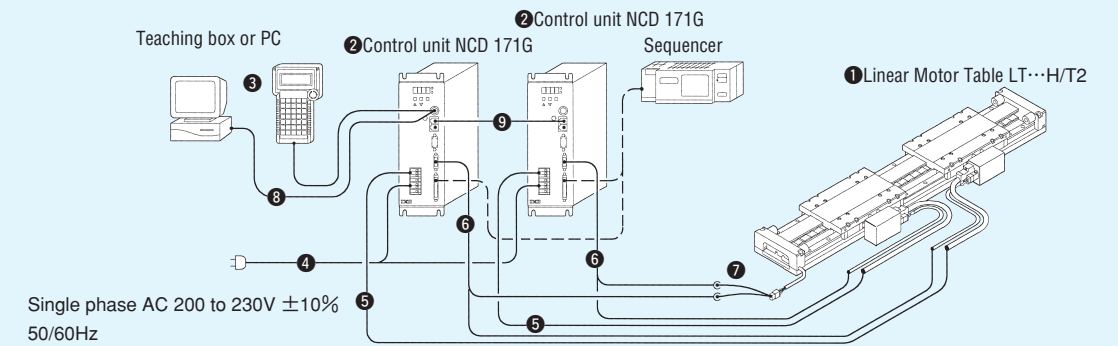
# System Configuration

Table 5 System configurations

## ●System configuration of single table



## ●System configuration of twin tables



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-L2620			NCD171G-L6820
③	Teaching box with cord	TAE1050-TB			
④	Power cord	Prepared by customer			
⑤	Motor relay cord	TAE20C8-MC□□			
⑥	Encoder relay cord <sup>(1)</sup>	TAE20S5-EC□□	—	—	—
⑦	Limit/Encoder relay cord	—	TAE20D2-EC□□	—	TAE20C9-EC□□
⑧	Limit separation cord (0.1m)	TAE20D0-BC			
⑨	Communication cable (2.0m)	TAE1098-RS			
⑩	Inter axial cable (1.0m)	TAE1099-LC			

Note<sup>(1)</sup> : Applicable to LT-CE which does not have sensor.  
Cord for limit sensor is not appended.

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



## Exclusive Control Unit *NCD171G-L2620 NCD171G-L6820*

### ●Two axes parallel operation

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

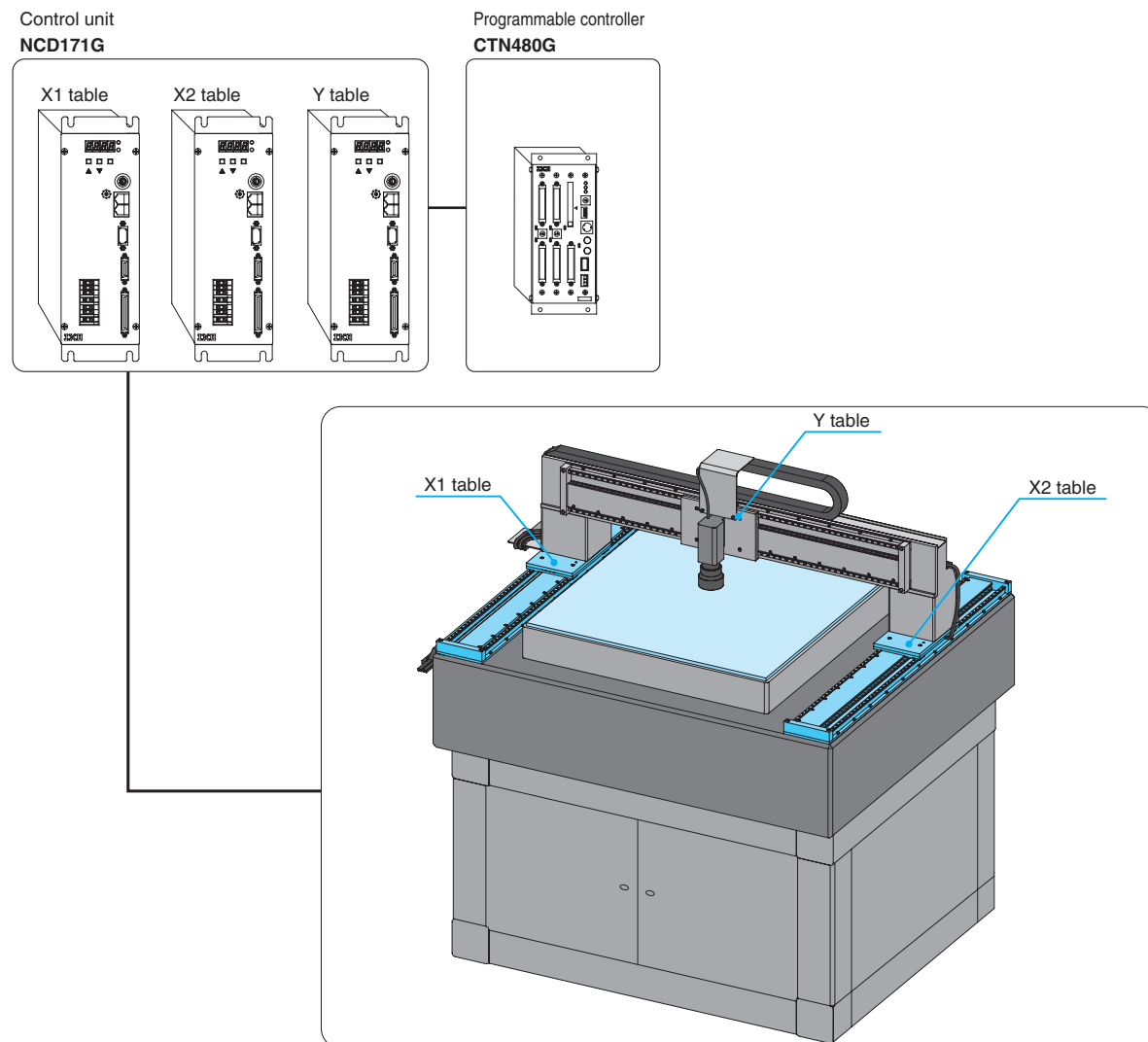
This driving system provides more stable and accurate positioning with minimum motion delays compare to a typical single axis driving by combination of driving table and following table. This driving system is suitable for large works and long stroke transportation like liquid crystal panel manufacturing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


Consult  if required.

### Characteristics by driving system

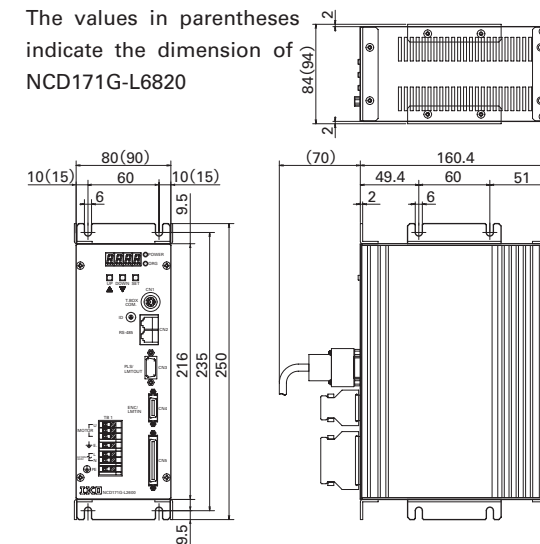
Two axes parallel operation	Single table operation or two tables operation by single driving table
<ul style="list-style-type: none"> <li>• Larger thrust force</li> <li>• More accurate positioning with minimum motion delay</li> <li>• Cost saving compare to synchronized operation</li> </ul>	<ul style="list-style-type: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

### System configuration




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

The values in parentheses indicate the dimension of NCD171G-L6820



- Programmable controller and servo driver are compactly integrated.
- Easy cable connection contributes to reduce man-hours.
- 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.
- In CE marking, The Low Voltage Directives and ECM command were confirmed.

Specification		Item	NCD171G-L2620	NCD171G-L6820
Control specification	Number of control axis		One axis	
	Applicable Linear Motor		LT100CE, LT150CE, LT130LD, LT170LD	LT130H, LT170H
	Signal feeding back		Incremental linear encoder	
	Resolution		0.1 μm, 0.5 μm, 1.0 μm	
	Command	Position control	Input by outside controller	+direction/-direction pulse, Positioning command pulse/Direction command, A/B-phase, Max. 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	
	Function		Jump, Call, Repeat, Speed setting, Acceleration/deceleration setting, Timer setting, I/O control, Blanching input condition, Various editing functions (Create, Erase, Delete, Insert, etc.)	
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% 500mA			
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 AC200 to 230V ±10% <sup>(1)</sup> 50/60Hz		
	Continuous rated current	0.6Arms	2.4Arms	
	Maximum consumption current	4.7Arms	15Arms	
	Ambient temperature	0 to 40 degree C, -10 to 60 degree C 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<sup>(1)</sup> : When NCD171G-L2620 of AC 100V specification is required, consult .

**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

**●Regarding CE marking**

CE marking for control unit was confirmed by the standards shown below.

The Low Voltage Directives : EN50178

ECM Command : EN55011 Gr1 ClassA, EN61000-6-2

Suitability to the CE marking was confirmed by IKO standard system configuration. The suitability of the total system with other equipment should be checked and confirmed individually because of the differences of wire ring and other conditions.

## Thrust and Dynamic Load Mass

**■What is “Thrust” ?**

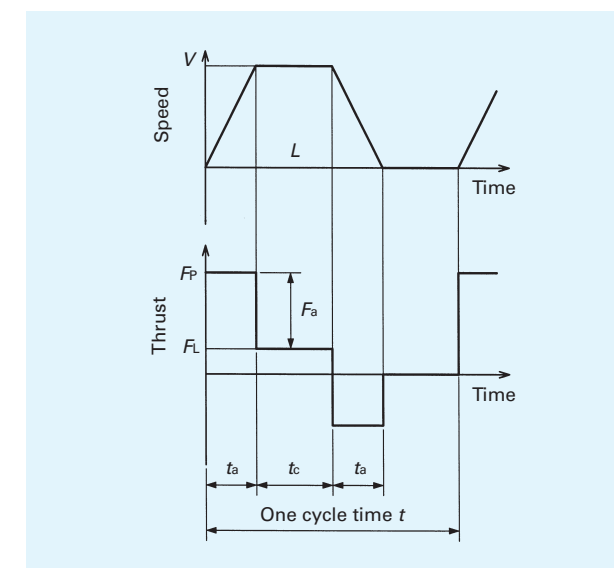
Thrust is the force in the moving direction exerted by the moving coil as shown in figure (page 4) illustrating Principle of Operation. Thrust becomes the maximum when the table is at rest, and decreases as the table speed increases. Thrust value required for acceleration or deceleration must be examined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

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

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/s<sup>2</sup> in maximum in the case of LT150CEG.

# Examination of Operation Pattern

## ■ Calculation of 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 formulae.

● 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  $t_a$

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

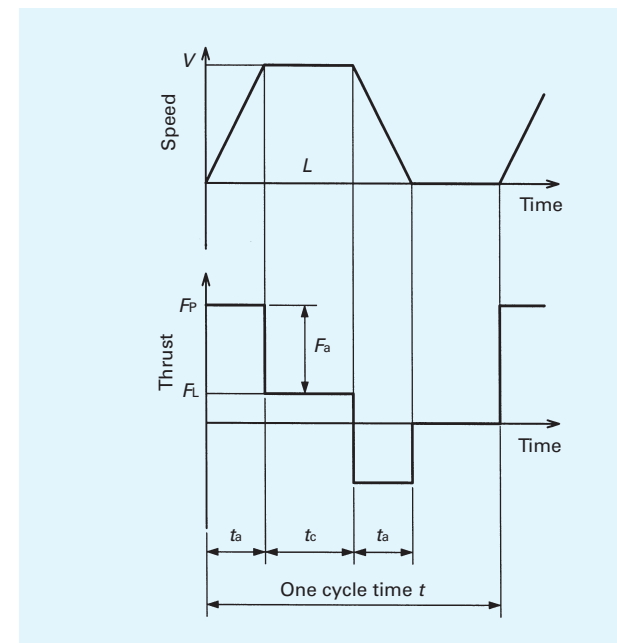
where,

- $\mu$  : 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, <sup>(1)</sup> [N]
- $F_M$  : Thrust of Linear Motor Table LT, [N]  
Maximum thrust at travel speed  $V$  (See pages 10 to 12.)
- $t_a$  : Acceleration time, [s]
- $V$  : Travel speed, [m/s]
- $g$  : Gravitational acceleration, 9.8 [m/s<sup>2</sup>]
- $k$  : Safety factor, 1.3

Note<sup>(1)</sup>: The pulling resistance differs depending on the cord mass and pulling method. Use expectable amount of resistance 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 be overheated or seized that can lead to breakdowns or injuries. 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

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.

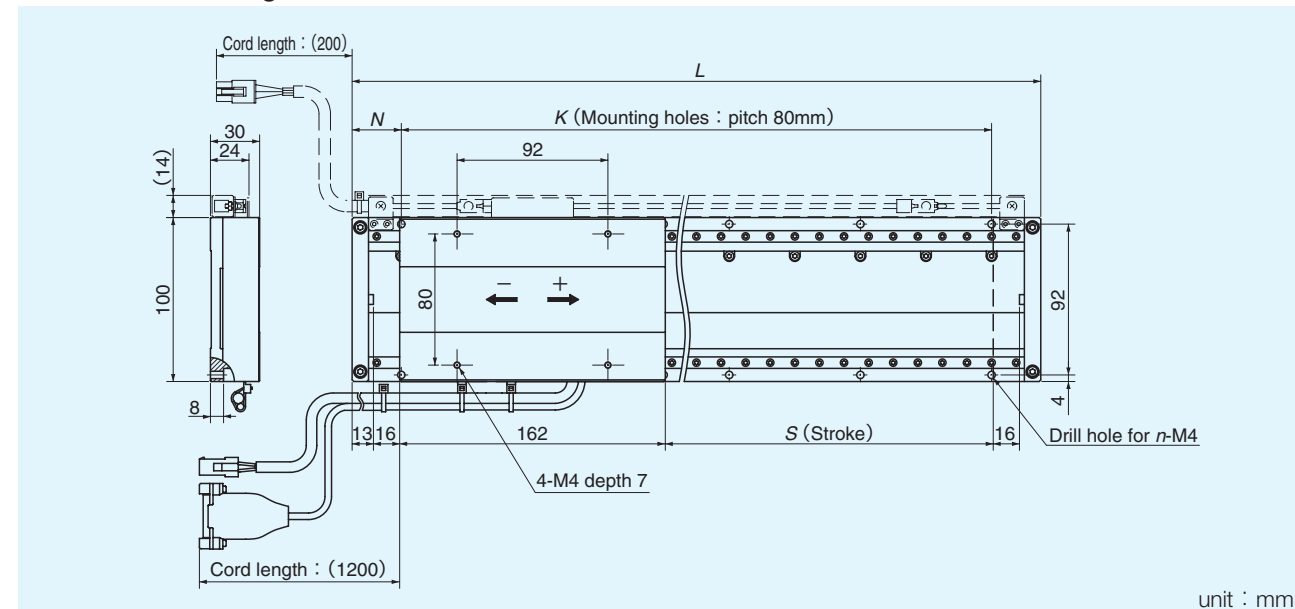
## Cautions in Use

- ◆ 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.
- ◆ Moving table has motor and other cord. Allow additional space for these moving cables in design. Furthermore take necessary measure to avoid external forces that may be applied on the cables.
- ◆ 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.

**IKO** Linear Motor Table LT...CE

LT100CEGS Single table

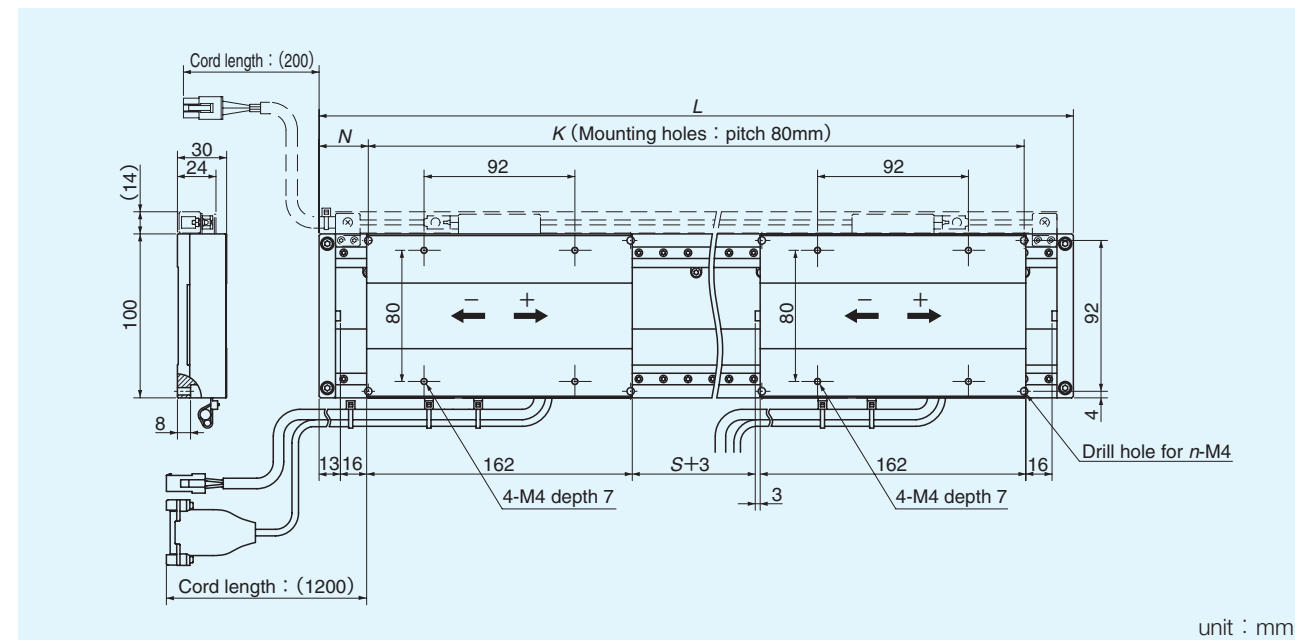


unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult .  
Remark : Dashed line shows the dimension of model with sensor (/S/C).

LT100CEGS/T2 Twin tables



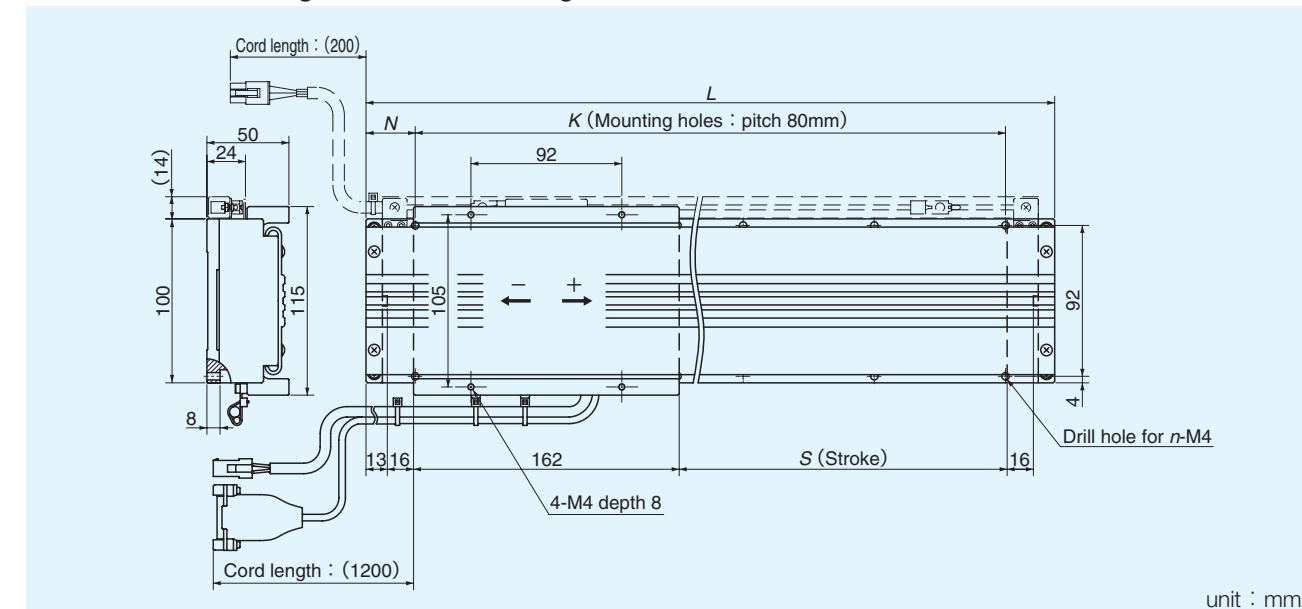
unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult .  
Remark : Dashed line shows the dimension of model with sensor (/S/C).

**IKO** Linear Motor Table LT...CE

LT100CEGF/D Single table with bridge cover

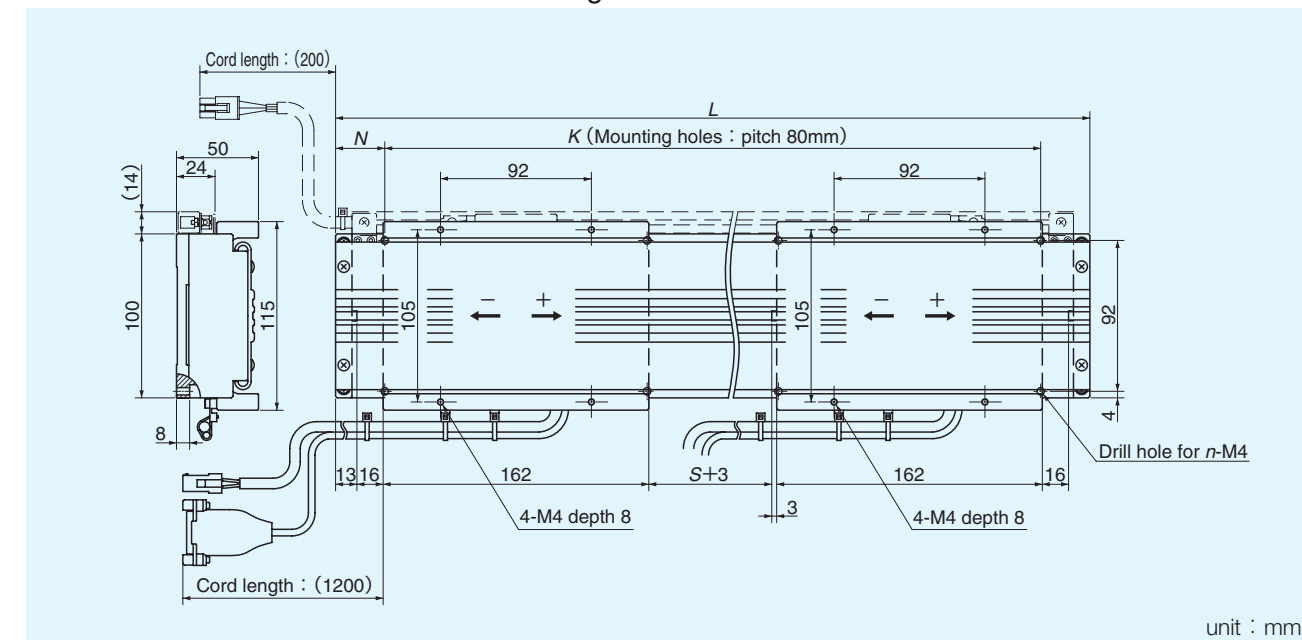


unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult .  
Remark : Dashed line shows the dimension of model with sensor (/S/C).

LT100CEGF/DT2 Twin tables with bridge cover



unit : mm

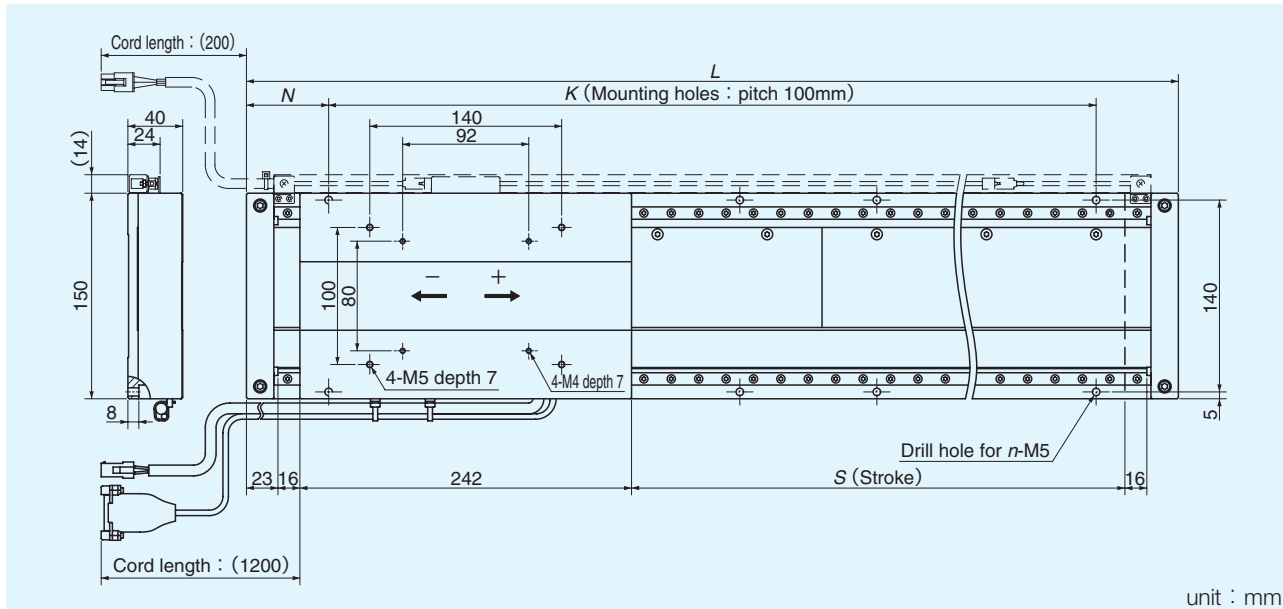
Model code	Stroke length S <sup>(1)</sup>	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT100CEGF-230/DT2	230	620	30	560	16	8.7	0.93
LT100CEGF-430/DT2	430	820	50	720	20	10.9	
LT100CEGF-630/DT2	630	1020	30	960	26	13.2	
LT100CEGF-830/DT2	830	1220	50	1120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

Note<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult .  
Remark : Dashed line shows the dimension of model with sensor (/S/C).

1N=0.102kgf=0.2248lbs.  
1mm=0.03937inch

**IKO** Linear Motor Table LT...CE

LT150CEGS Single table

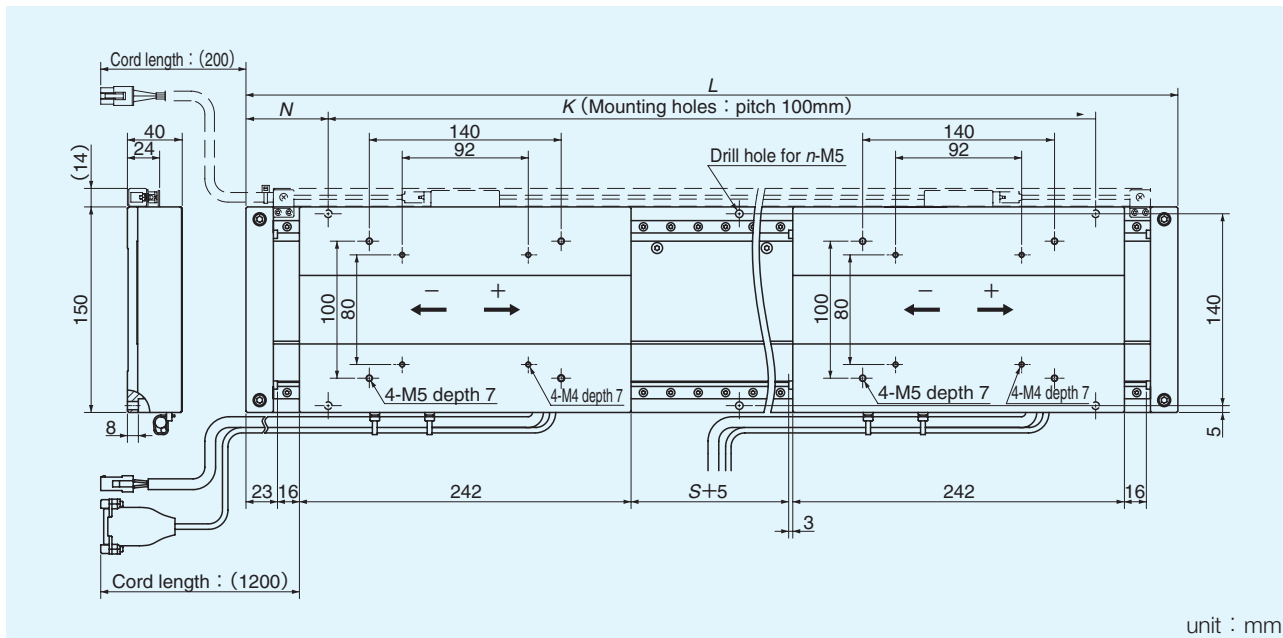


unit : mm

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 .  
Remark : Dashed line shows the dimension of model with sensor (/SC).

LT150CEGS/T2 Twin tables



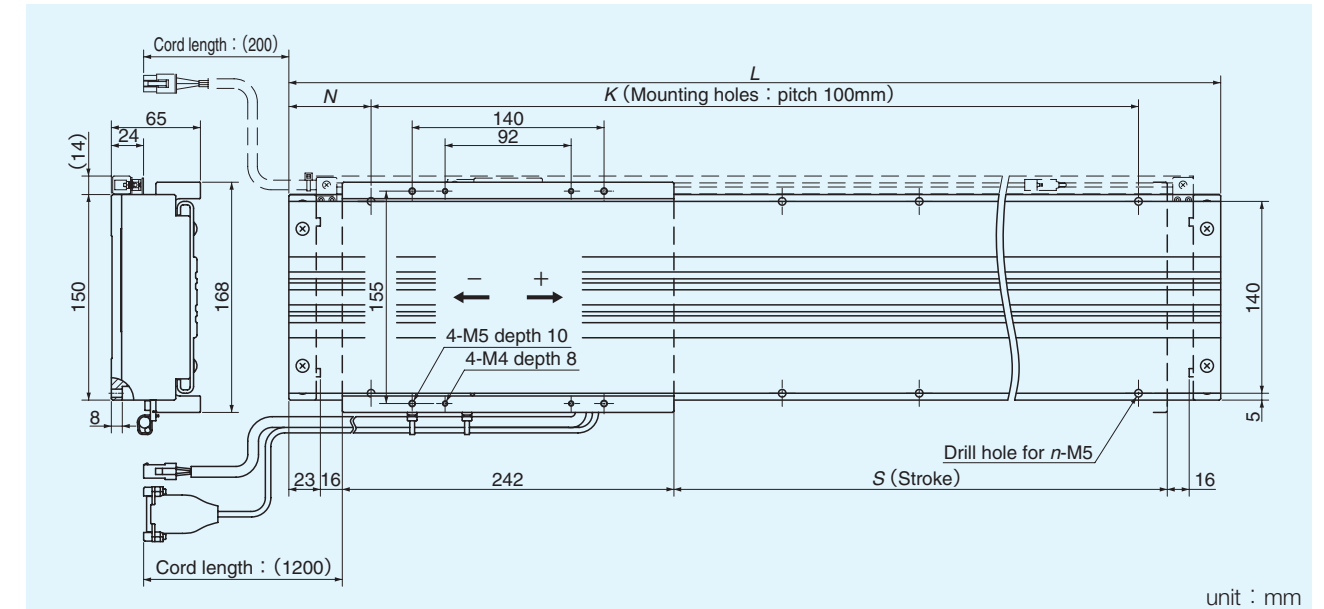
unit : mm

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 .  
Remark : Dashed line shows the dimension of model with sensor (/SC).

**IKO** Linear Motor Table LT...CE

LT150CEGF/D Single table with bridge cover

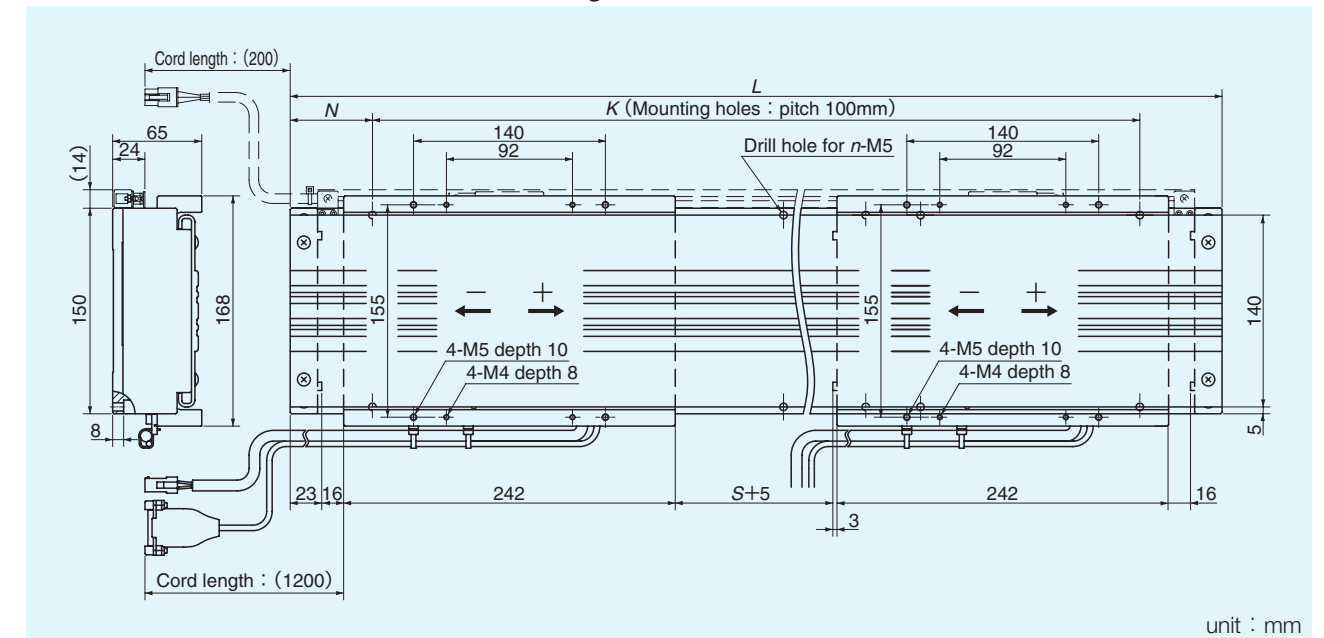


unit : mm

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 .  
Remark : Dashed line shows the dimension of model with sensor (/SC).

LT150CEGF/DT2 Twin tables with bridge cover



unit : mm

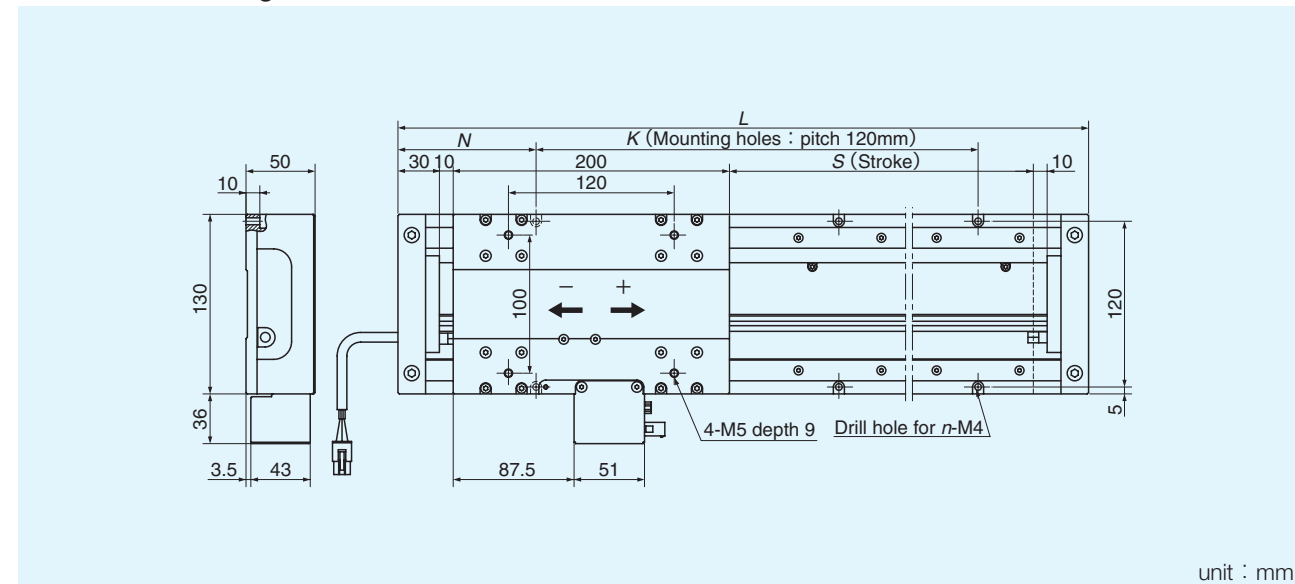
Model code	Stroke length S(1)	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT150CDGF-350/DT2	350	920	60	800	18	20.5	2.4
LT150CDGF-550/DT2	550	1120	60	1000	22	23.9	
LT150CDGF-750/DT2	750	1320	60	1200	26	27.3	
LT150CDGF-950/DT2	950	1520	60	1400	30	30.6	

Note(1) : For models with stroke lengths other than those shown in the table, please consult .  
Remark : Dashed line shows the dimension of model with sensor (/SC).

1N=0.102kgf=0.2248lbs.  
1mm=0.03937inch

**IKO** Linear Motor Table LT...LD

LT130LDGS Single table

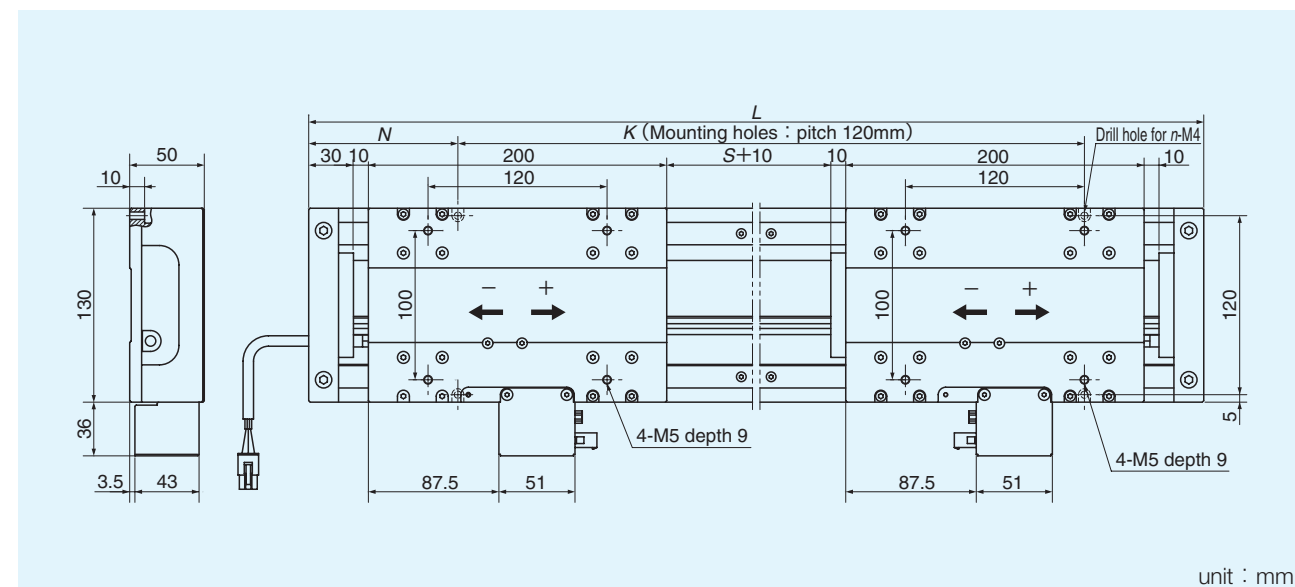


unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

LT130LDGS/T2 Twin tables



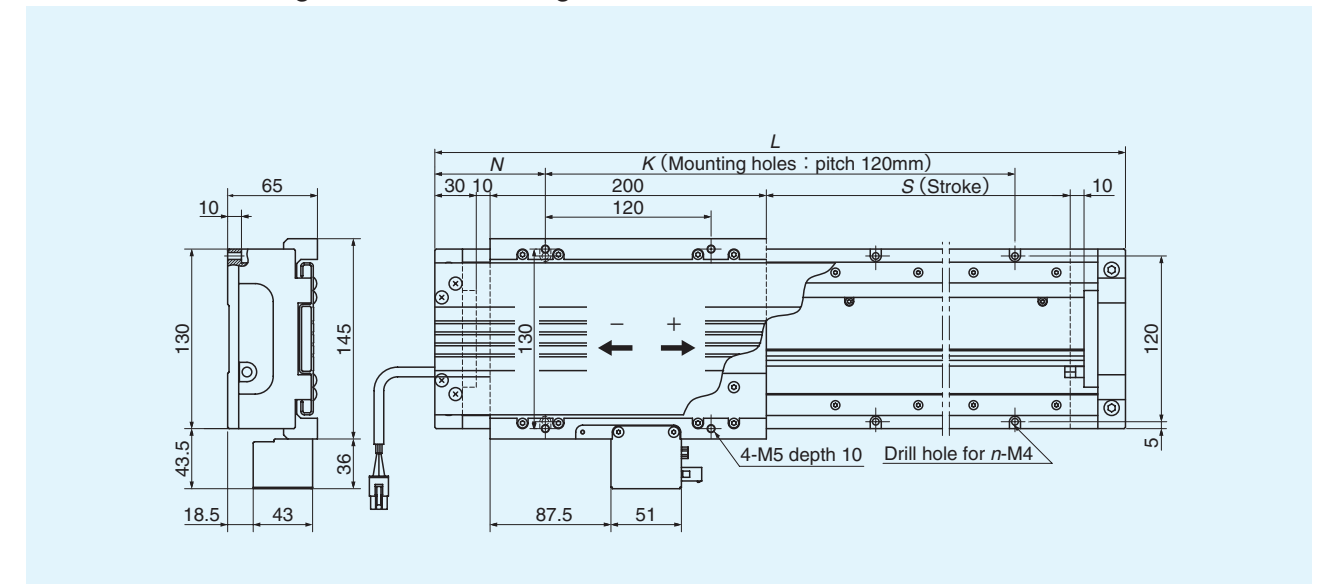
unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

**IKO** Linear Motor Table LT...LD

LT130LDGF/D Single table with bridge cover

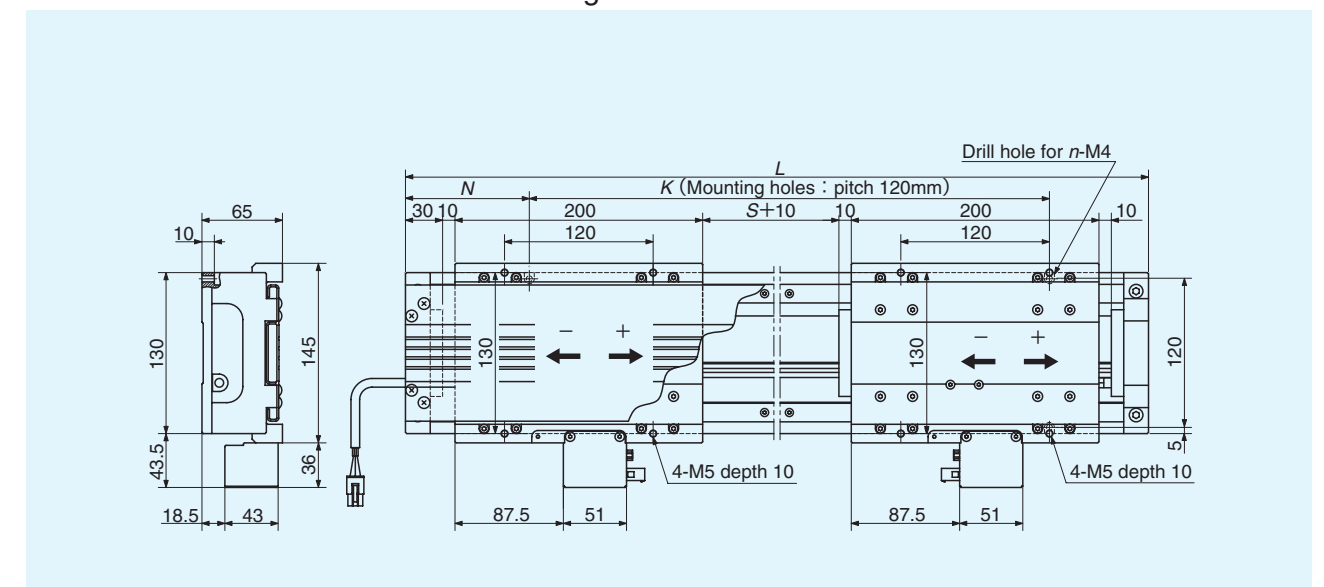


unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

LT130LDGF/DT2 Twin tables with bridge cover



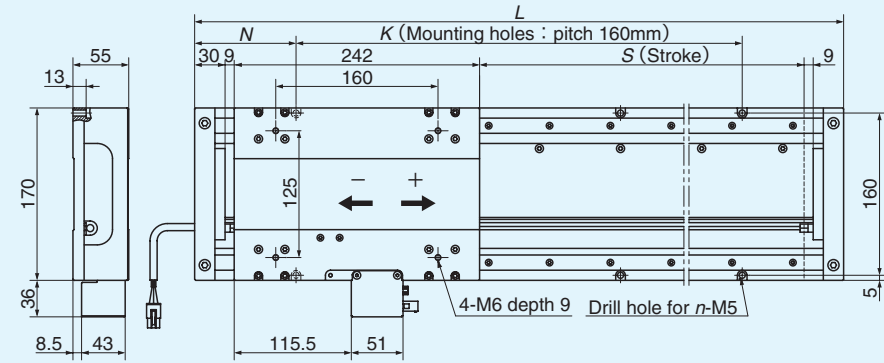
unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

**IKO** Linear Motor Table LT...LD

LT170LDG(V)S Single table

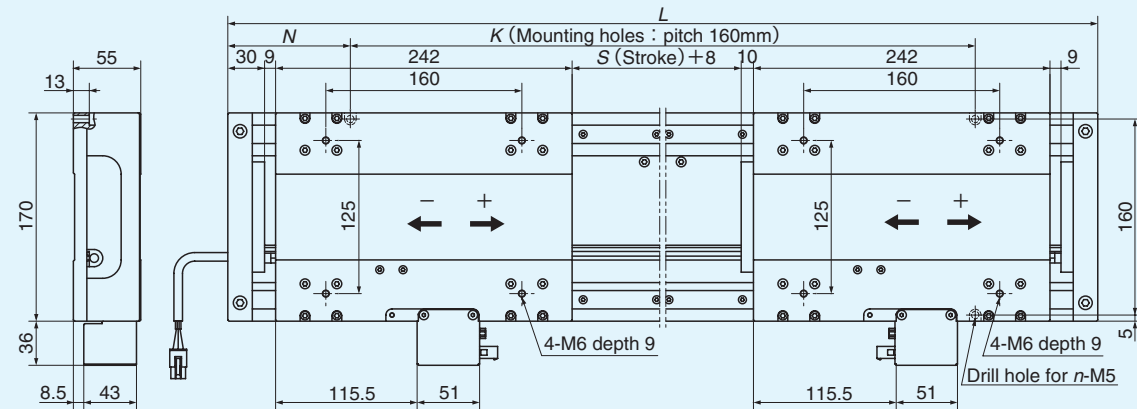


unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

LT170LDG(V)S/T2 Twin tables



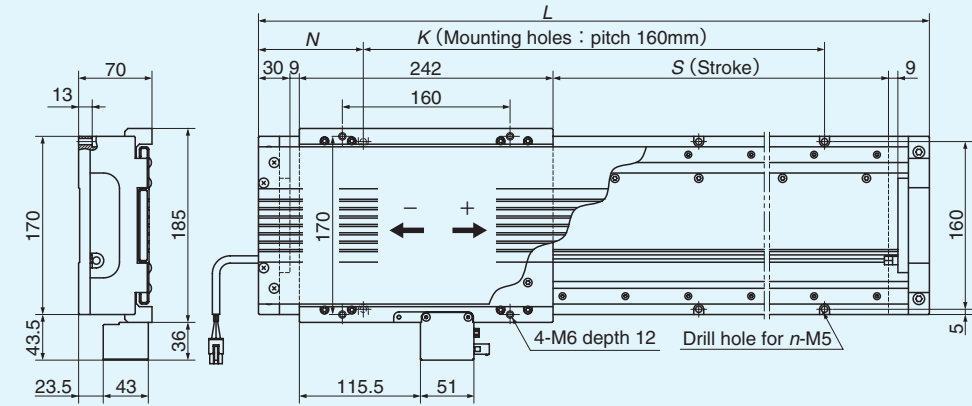
unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

**IKO** Linear Motor Table LT...LD

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

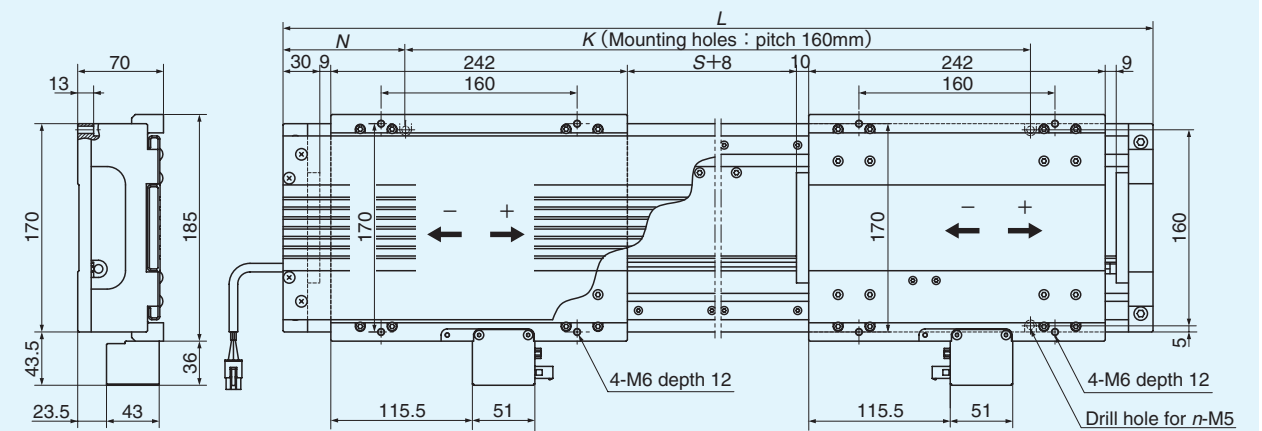


unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

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



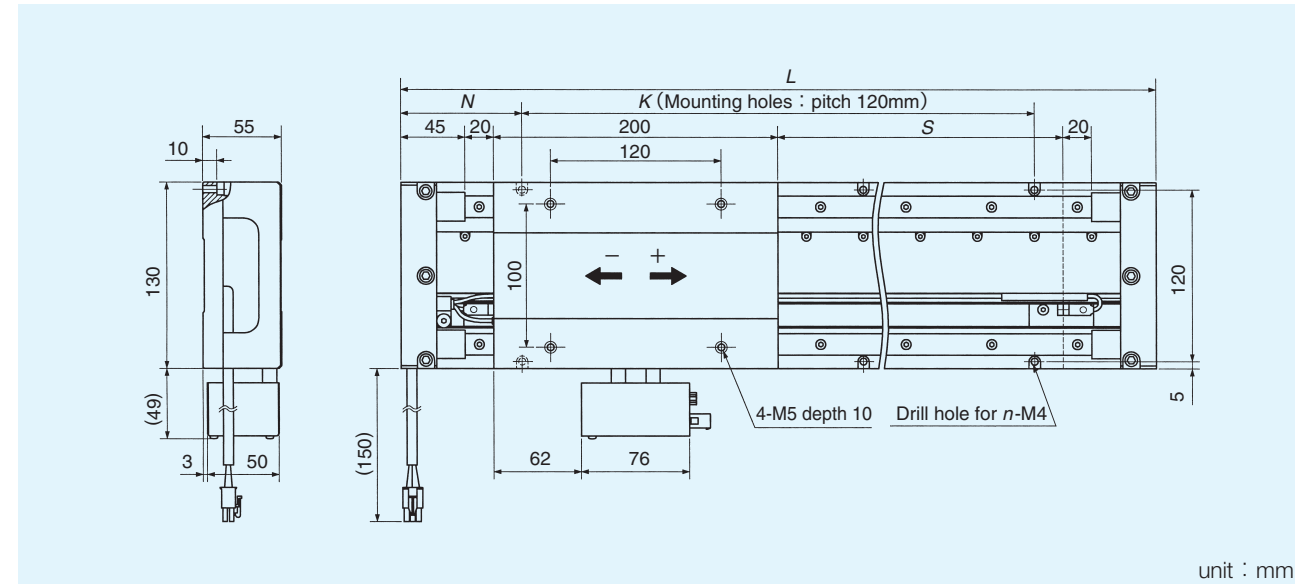
unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

**IKO** Linear Motor Table LT...H

LT130HS Single table

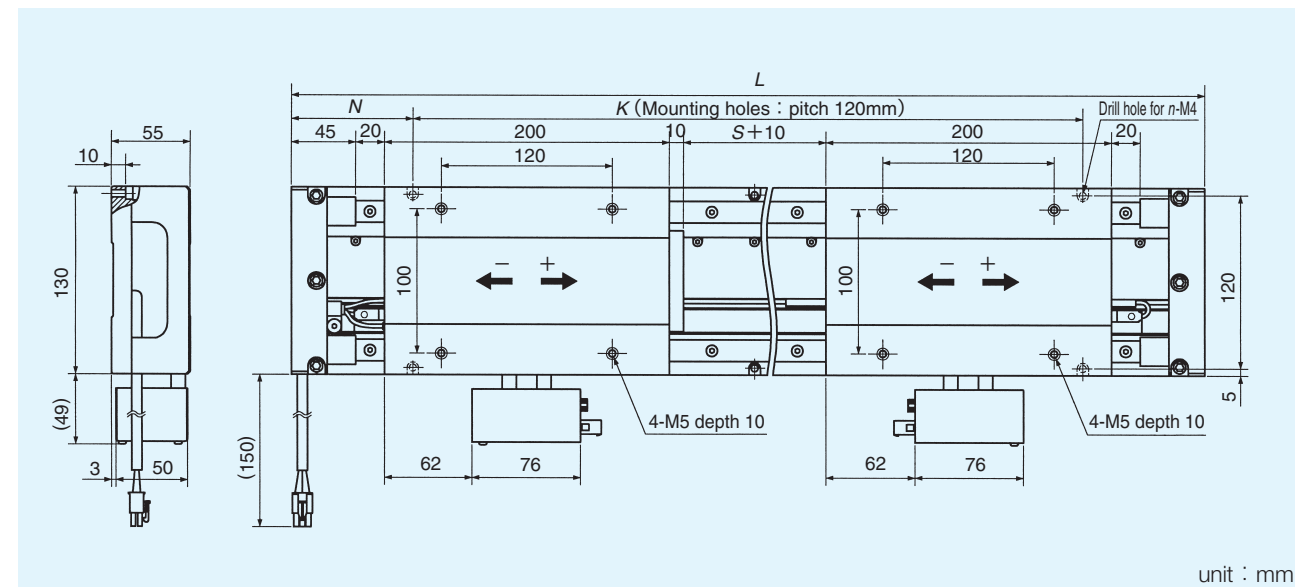


unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

LT130HS/T2 Twin tables



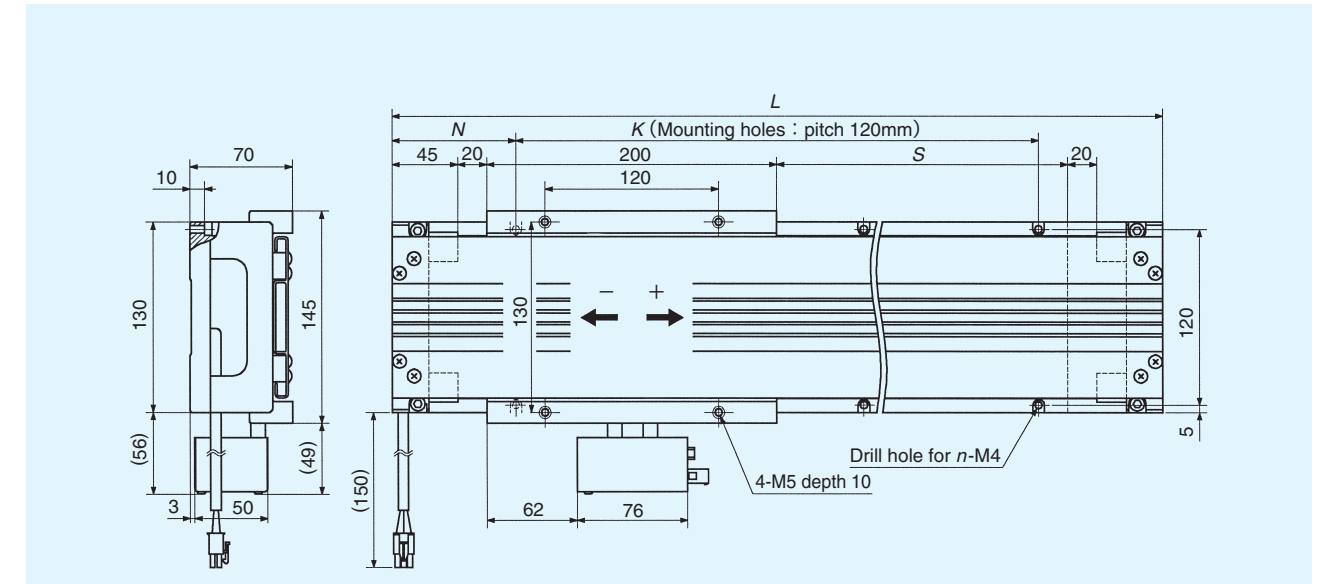
unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

**IKO** Linear Motor Table LT...H

LT130HF/D Single table with bridge cover

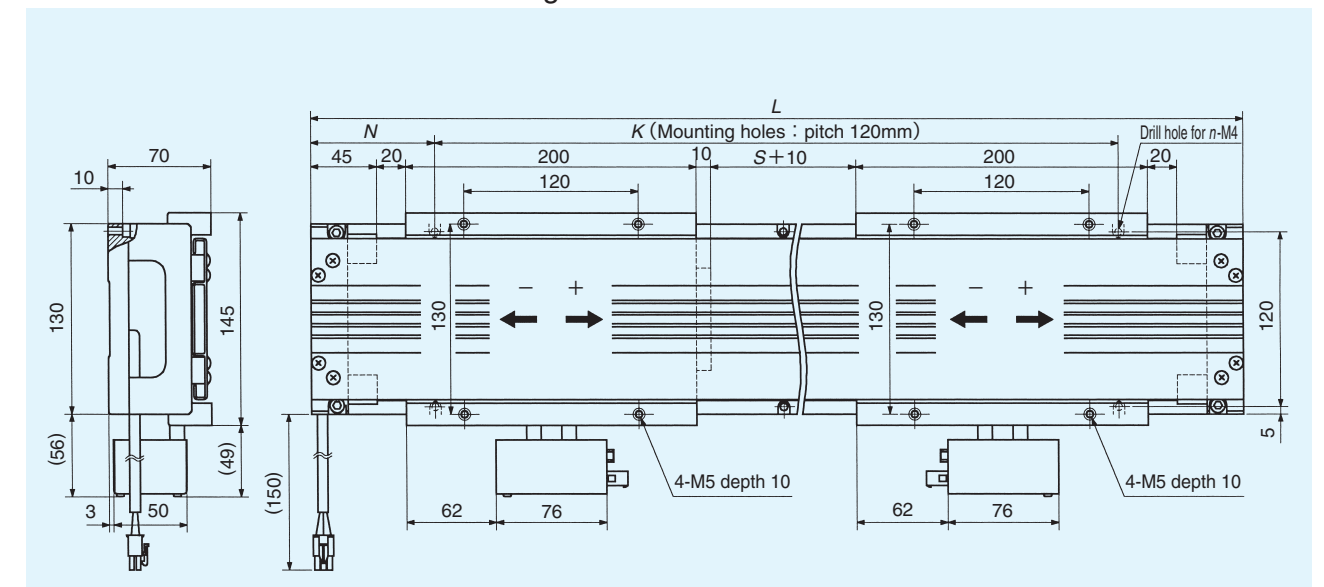


unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

LT130HF/DT2 Twin tables with bridge cover



unit : mm

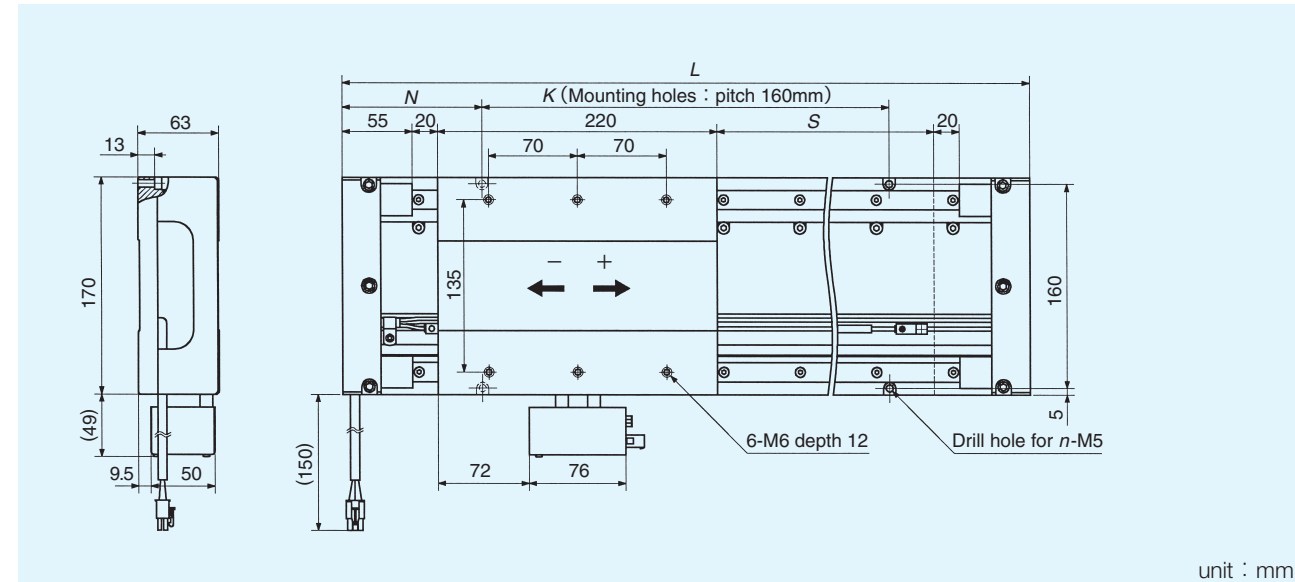
Model code	Stroke length S <sup>(1)</sup>	Overall length L	Mounting hole in bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT130HF— 460/DT2	460	1010	85	840	16	18.8	2.9
LT130HF— 940/DT2	940	1490	85	1320	24	24.9	
LT130HF—1420/DT2	1420	1970	85	1800	32	31.0	

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



**IKO** Linear Motor Table LT...H

LT170HS Single table

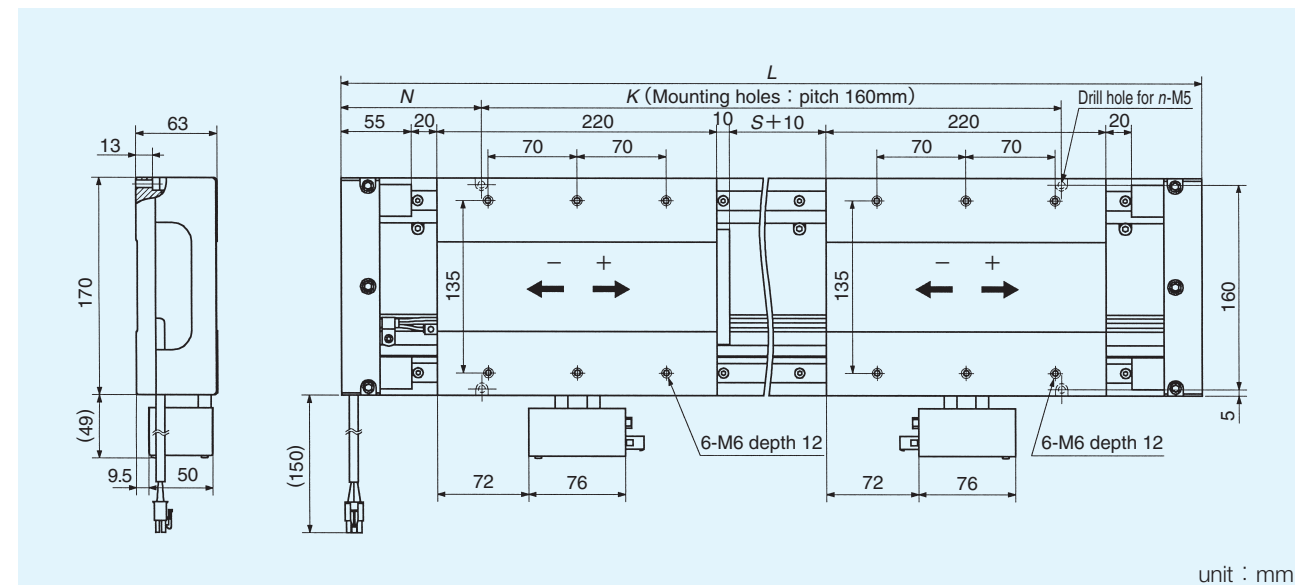


unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

LT170HS/T2 Twin tables



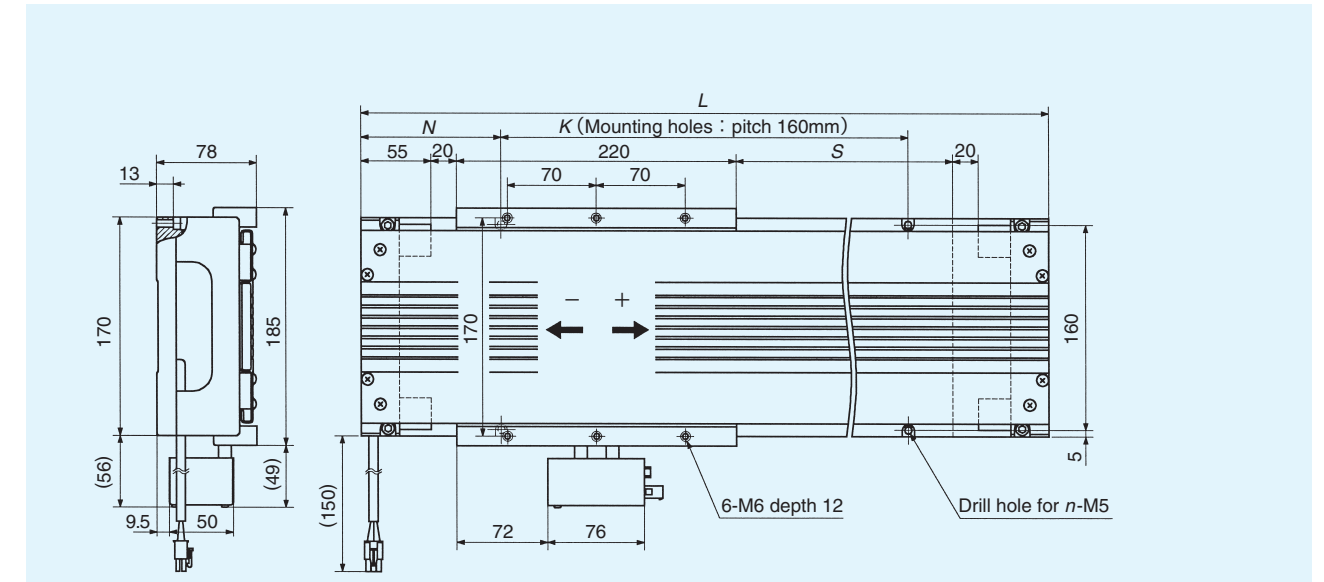
unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

**IKO** Linear Motor Table LT...H

LT170HF/D Single table with bridge cover

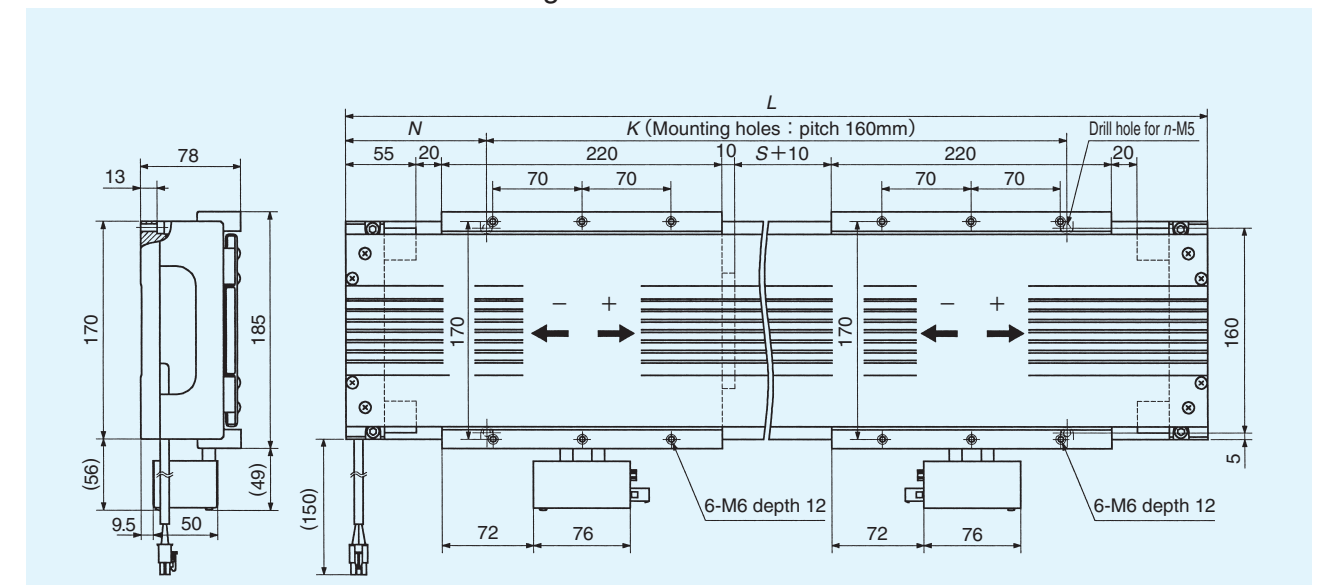


unit : mm

Model code	Stroke length S <sup>(1)</sup>	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<sup>(1)</sup> : 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 <sup>(1)</sup>	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<sup>(1)</sup> : For models with stroke lengths other than those shown in the table, please consult

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