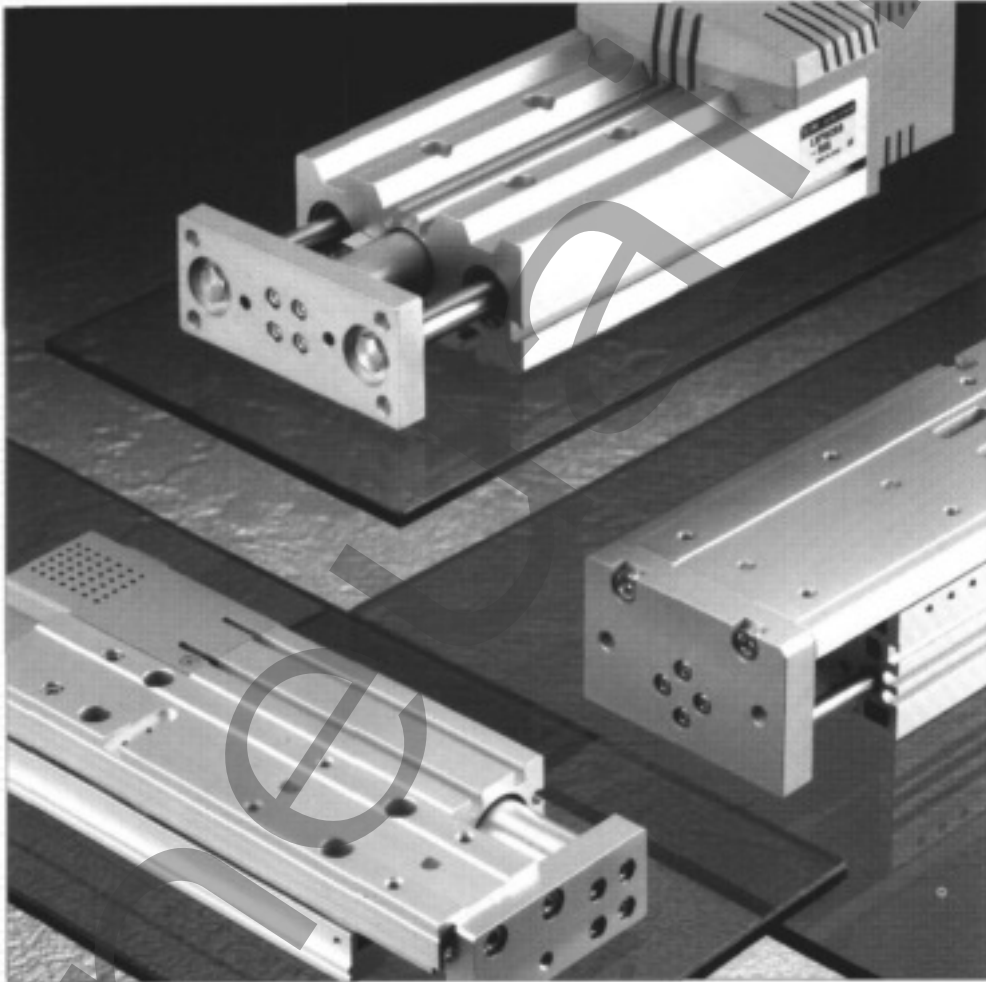


# *LX Series*

Compact Electric Actuators



- Compact, Low Profile
- Rigid Linear Guides
- DC Stepper Motor  
(Optional AC Servo Motor)

# Table of Contents

## Series LX - Compact Electric Actuators

Features and Benefits .....	page 4 & 5
Product Variations .....	page 6 & 7

## Series LXF - Low Profile Slide Table

Specifications/Construction/Parts List .....	page 8
Selection Chart & Duty Ratio .....	page 9
Kinetic Moment Allowance & Table Deflection .....	page 10
Criteria of Accelerating Speed .....	page 11
How To Order .....	pages 12 & 13
How to Mount .....	page 14
Dimensions.....	pages 15 & 16

## Series LXP - Low Profile with Guides

Specifications/Construction/Parts List .....	page 17
Selection Chart & Duty Ratio .....	page 18
Criteria of Accelerating Speed .....	page 19
Table Deflection .....	page 20
Working Range & Operating Conditions .....	page 21
How To Order.....	pages 22 & 23
How to Mount .....	page 24
Dimensions.....	pages 25 & 26

## Series LXS - Slide Table w/ High Rigidity Guides

Specifications/Construction/Parts List .....	page 27
Selection Chart & Duty Ratio .....	page 28
Kinetic Moment Allowance/Table Deflection.....	page 29
Criteria of Accelerating Speed .....	page 30
How To Order .....	pages 31 & 32
How to Mount .....	page 33
Dimensions.....	pages 34 & 35

## Made to Order Options .....

## Stepper Motor Control Overview .....

## LX Control Methods .....

## LC6C & LC6D Positioning Driver .....

## Auto Switch Specifications .....

## Safety Instructions .....

## Glossary of Reference Terms .....

# Stepping Motor and Slide Screw Provide

Multi-point positioning possible: Accuracy to  $\pm 0.03\text{mm}$

Ball/Slide screw mechanism is enclosed

Choice of motor types

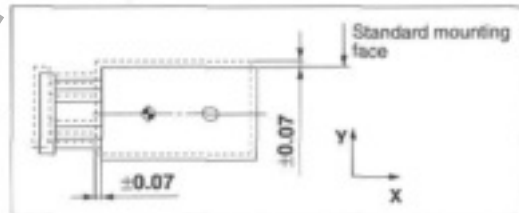
2-phase/5-phase stepping motor is standard with optional AC servo motor.

Proximity Sensor & Auto switch capable

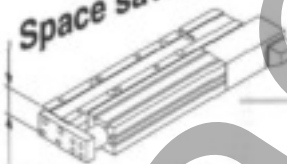
Auto switch grooves provide flush installation.

Precision body installation:  $\pm 0.07\text{mm}$

Can be precisely installed even with repeated removal and reinstallation due to standard mounting face supplied by NC machining process and positioning pin hole.



Space saving



Thickness: 31mm

Horizontal Orientation, Low Profile Space Saving Body, Slide Table With Linear Guide

## Series LXF

Max. pay load: 30N (In horizontal mounting)

Max. thrust: 15N

Max. speed: 200mm/s

Available strokes: 25mm, 50mm, 75mm, 100mm

With Linear Guide

### Noise level comparison

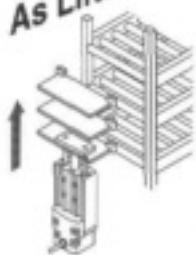
Model	Noise (dB)	Specifications
LXFH5SA-100	58	5-phase stepping motor, screw lead 6
LXFH5SB-100	57	5-phase stepping motor, screw lead 6

### Weight

Model	Standard stroke(mm)			
	25	50	75	100
LXF	0.8	1.0	1.1	1.2

# Positioning Repeatability to $\pm 0.03\text{mm}$

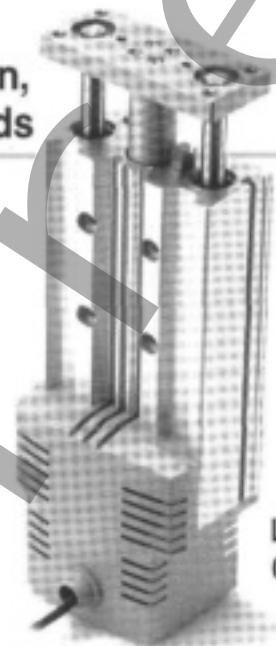
As Lifter



Horizontal/Vertical Orientation,  
Linear Ball Bearing Guide Rods

## Series LXP

- Max. pay load: 60N (In horizontal mounting)
- Max. pay load: 50N (In vertical mounting)
- Max. thrust: 220N
- Max. speed: 200mm/s
- Available strokes: 50mm, 75mm, 100mm,  
125mm, 150mm, 175mm, 200mm



Linear Ball Bearing  
Guide Rods

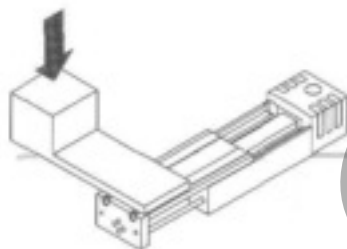
### Noise level comparison

Model	Noise (dB)	Specifications
LXPB2SB-100	58	2-phase stepping motor, screw lead 12
LXPB5SB-100	57	5-phase stepping motor, screw lead 12

### Weight

(kg)

Model	Standard stroke (mm)						
	50	75	100	125	150	175	200
LXP	2	2.2	2.3	2.6	2.8	2.9	3.1



Horizontal/Vertical Orientation,  
Slide Table With High Rigidity Guides

## Series LXS

- Max. pay load: 100N (In horizontal mounting)
- Max. pay load: 50N (In vertical mounting)
- Max. thrust: 220N
- Max. speed: 200mm/s
- Available strokes: 50mm, 75mm,  
100mm, 125mm, 150mm



With High  
Rigidity Guides

### Noise level comparison

Model	Noise (dB)	Specifications
LXSH2SB-100	60	2-phase stepping motor, screw lead 12
LXSH5SB-100	58	5-phase stepping motor, screw lead 12

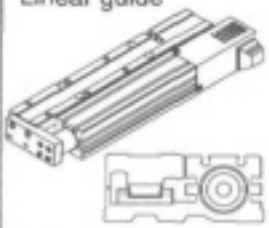
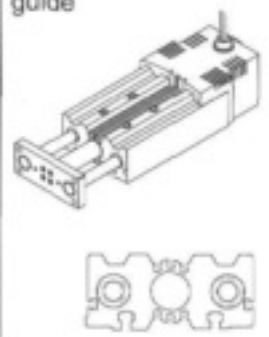
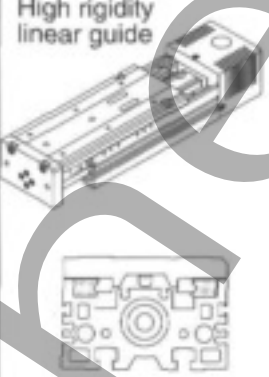
### Weight

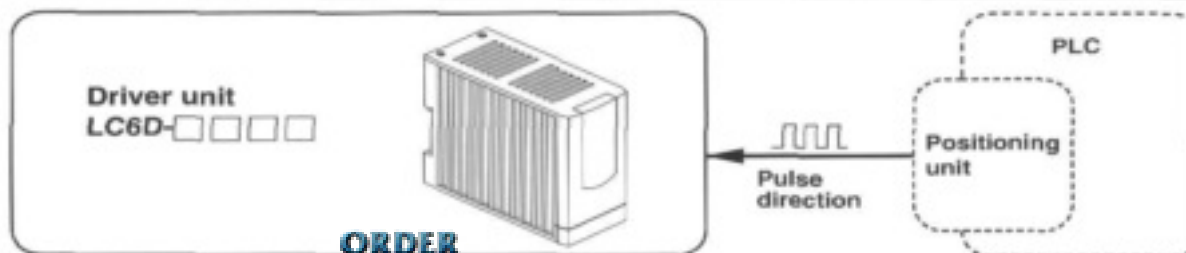
(kg)

Model	Standard stroke (mm)				
	50	75	100	125	150
LXS	1.9	2.1	2.3	2.5	2.7

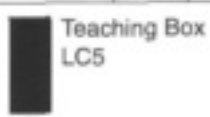
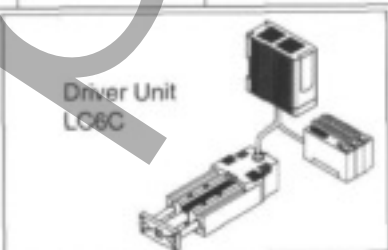
Specifications introduced in this page are measured with SMC LGS Series driver. (See page 40 and 45)

Series LX Product Variations

Series	Type of Guide	Drive Screw Type	Model	Max. Horizontal Payload (N)	Max. Vertical Payload (kg)	Max. thrust (N)
Series LXF	Linear guide 	Ball Screw	LXFH5BC	30	—	—
			LXFH5BD	30	—	—
		Slide Screw	LXFH5SA	30	—	15
			LXFH5SB	20	—	9
Series LXP	Linear ball bearing guide 	Ball Screw	LXPB2BC	60	50	220
			LXPB2BD	60	50	90
			LXPB5BC	60	50	160
			LXPB5BD	60	50	70
		Slide Screw	LXPB2SA	60	50	60
			LXPB2SB	30	30	30
			LXPB5SA	40	40	40
			LXPB5SB	20	20	20
Series LXS	High rigidity linear guide 	Ball Screw	LXSH2BC	100	50	220
			LXSH2BD	100	50	90
			LXSH5BC	100	50	160
			LXSH5BD	100	50	70
		Slide Screw	LXSH2SA	90	40	60
			LXSH2SB	45	20	30
			LXSH5SA	60	20	40
			LXSH5SB	30	10	20



Max. speed (mm/s)	Positioning repeatability (mm)	Slide screw specifications	Motor specifications	Stroke (mm)									
				25	50	75	100	125	150	175	200		
30	±0.03	Ø8; 2mm lead	ø5 stepping										
80		Ø8; 5mm lead		•	•	•	•						
100	±0.05	Ø8; 6mm lead											
200		Ø8; 12mm lead											
30	±0.03	Ø8; 2mm lead	ø2 stepping										
80		Ø8; 5mm lead											
30	±0.05	Ø8; 2mm lead	ø5 stepping										
80		Ø8; 5mm lead		•	•	•	•	•	•	•	•	•	
100	±0.05	Ø8; 6mm lead	ø2 stepping										
200		Ø8; 12mm lead											
100	±0.05	Ø8; 6mm lead	ø5 stepping										
200		Ø8; 12mm lead											
30	±0.03	Ø8; 2mm lead	ø2 stepping										
80		Ø8; 5mm lead											
30	±0.05	Ø8; 2mm lead	ø5 stepping										
80		Ø8; 5mm lead		•	•	•	•	•					
100	±0.05	Ø8; 6mm lead	ø2 stepping										
200		Ø8; 12mm lead											
100	±0.05	Ø8; 6mm lead	ø5 stepping										
200		Ø8; 12mm lead											

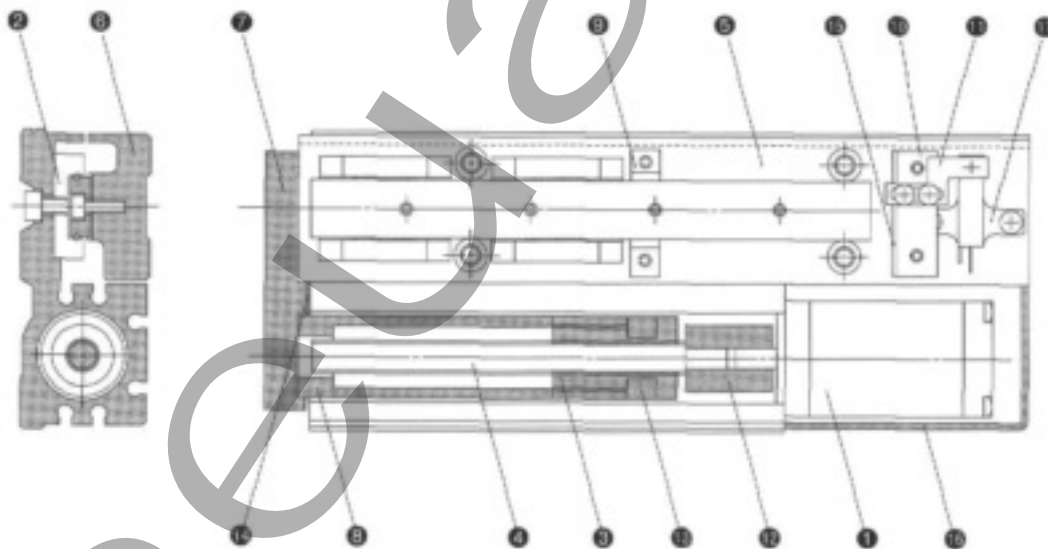


See Page 40

## Specifications

Model	LXFH5SA	LXFH5SB	LXFHBC	LXFHBD
Stroke(mm)	25, 50, 75, 100			
Motor	5-phase stepping motor			
Screw(mm)	ø8, Lead 6	ø8, Lead 12	ø8, Lead 2	ø8, Lead 5
Max. pay load (horizontal orientation)	30N (6.6 lb)	20N (4.4 lb)	30N (6.6 lb)	30N (6.6 lb)
Max. speed	100mm/s	200mm/s	30mm/s	80mm/s
Positioning repeatability	±0.05mm		±0.03mm	
Type of guide	Linear guide			
Operating temperature range	5 to 40°C (40-105°F)			
Static moment allowance	Pitch (Nm)	4		
	Roll (Nm)	3		
	Yaw (Nm)	4		

## Construction

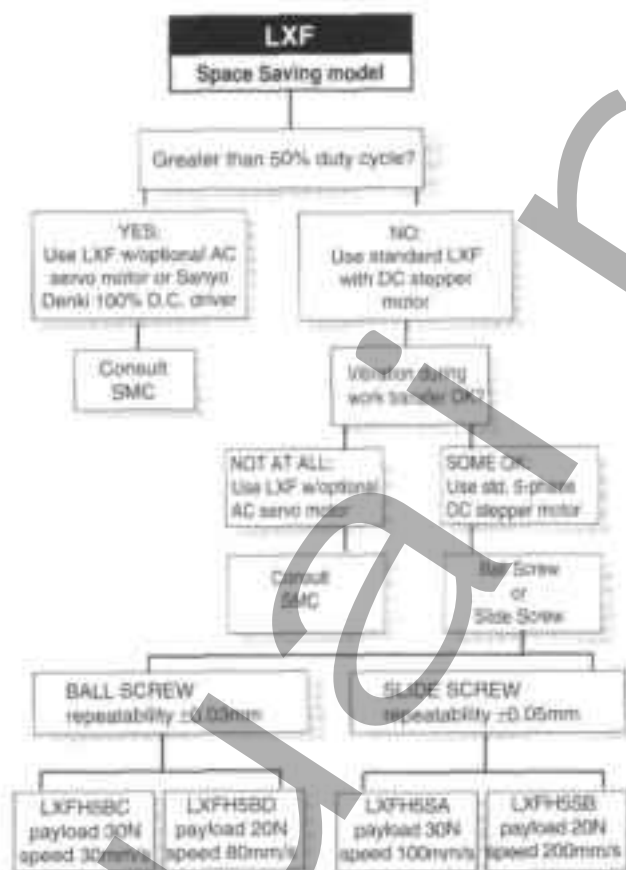


### Component parts

No.	Description	Material	Note
1	Motor	—	
2	Linear guide	—	
3	Nut	Resin	
4	Forged screw	Alloy steel	
5	Body	Aluminum alloy	Anodized
6	Table	Aluminum alloy	Anodized
7	End plate	Aluminum alloy	Anodized
8	Tube	Aluminum alloy	Anodized
9	Stopper A	Aluminum alloy	

### Component parts

No.	Description	Material	Note
10	Stopper B	Aluminum alloy	
11	Sensor plate	Soft steel	Chromated
12	Coupling	Aluminum alloy	
13	Magnet	—	
14	Damper	Rubber	
15	Cushion damper	Rubber	
16	Motor cover	Resin	
17	Photo micro sensor	—	



## Duty ratio

When using a stepping motor actuator must be operated at less than 50% of duty ratio\* independent of pay load value. Continuous operation time\*\* should be less than 30 seconds.

Examples below show how to acquire duty ratio and possibility of use.

\*Duty ratio: ratio of actuator operating time and suspended time in a cycle. It is calculated by the formula below.

$$\text{Duty ratio} = (\text{Operating time} / (\text{Operating time} + \text{Suspended time})) \times 100$$

\* Refer to the examples.

\*\*Continuous operation time: time between the initiation and the end of slider movement

Remark) The operation provisionally ends when slider turns at the stroke end; the operation is no longer "continuous".

### Example 1

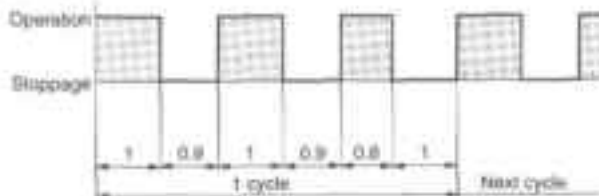


Figure 1

$$\text{Duty ratio} = (1 + 1 + 0.8) / (1 + 0.8 + 1 + 0.8 + 1) \times 100 = 58\%$$

∴ Possible to use.

### Example 2

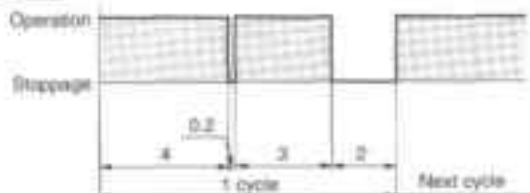


Figure 2

$$\text{Duty ratio} = (4 + 3) / (4 + 0.2 + 3 + 0.2) \times 100 = 78\%$$

∴ Not possible to use.



Kinetic Moment Allowance

Table receives moment from each direction according to center of gravity of work. Overhang of work should be within the range shown in the figures below.

W: Applicable load weight (kg)  
L1, L2: Overhang distance to the center of gravity of work (mm)  
a: Acceleration of work (mm/sec<sup>2</sup>)  
Me: Kinetic moment

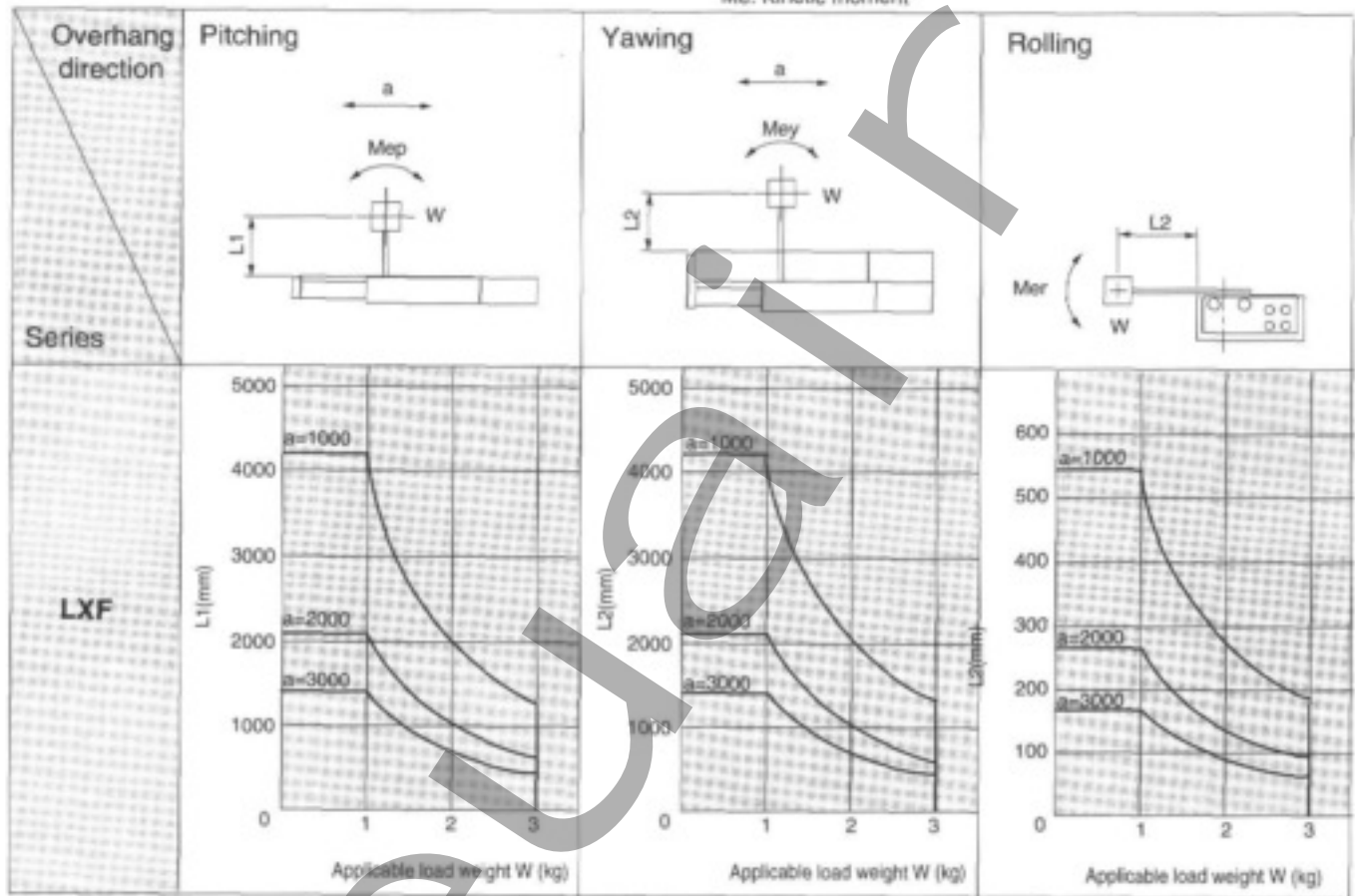
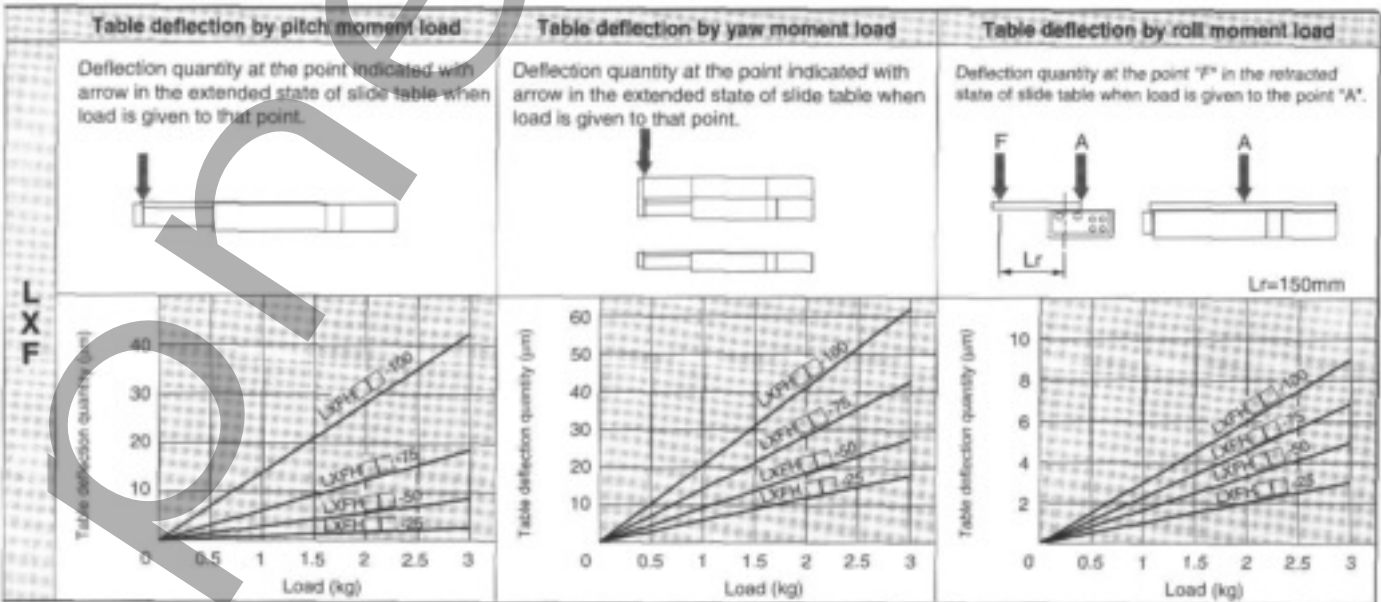


Table Deflection

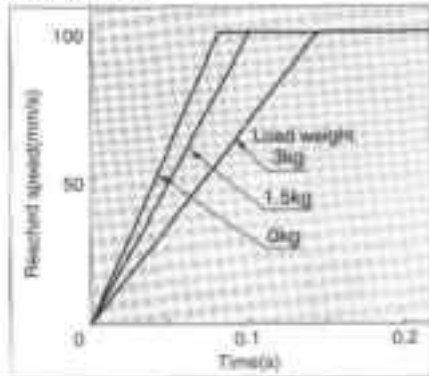


How to use the graph

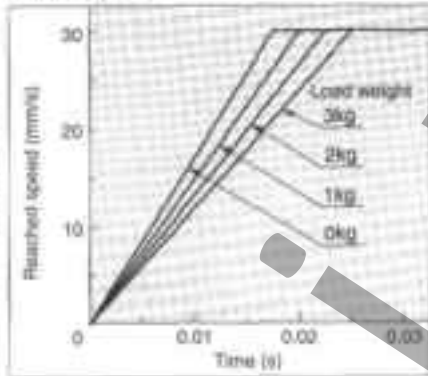
1. If work overhangs to the direction of "L1" or "L2", 70% of applicable load weight shown in the graph is the upper limit.
  2. The graph above shows the case of horizontal orientation of actuator. If using in vertical, static moment should NOT exceed static moment allowance.
  3. Above graph is based on calculation; therefore, there may be difference of actual usage. Safe margin must be taken into consideration when designing.
- See the specifications of each model for static moment allowance.

Criteria of Accelerating Speed (Horizontal Orientation)

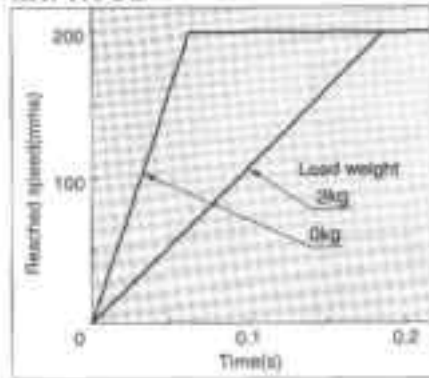
LXFH5SA



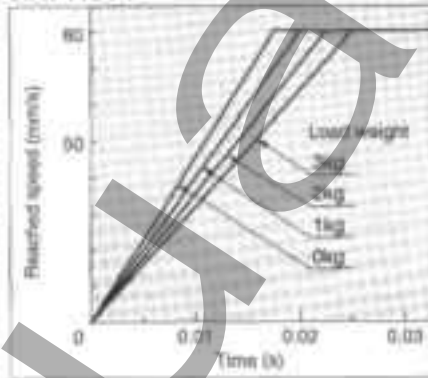
LXFH5BC



LXFH5SB



LXFH5BD



**⚠ Caution**

- \*Payload should be under the max. payload.
- \*Accelerating time is decided per payload and reached speed.
- \*If operating beyond the range shown in these graphs, unit may function improperly.
- \*The data in these graphs represents the LXS used with the LCD in half-step mode.
- \*Data varies depending upon operating conditions.

Pneumatic

# Series LXF

## Compact Electric Actuators

How To Order Ball Screw Type

**LX F H 5 B C 50 S GD 1**

**Actuator shape**  
F Slide table w/linear guide

**Type of guide**  
H Linear guide

**Motor type**  
S 5-phase stepping motor

**Type of screw**  
B Ball screw

**Screw lead**  
C 2mm  
D 3mm

**Stroke**  
25 25mm  
50 50mm  
75 75mm  
100 100mm

**Number of Proximity Sensors**

1	1 pc.
2	2 pcs.
3	3 pcs.
6	6 pcs.

**Type of auto switch**

	without switch
GN	with sensor rail, without switch
G	GXL-8F (Wire length 1m)
GD	GXL-8F1 (Wire length 1m)
GB	GXL-8FB (Wire length 1m)
GDB	GXL-8FB1 (Wire length 1m)

\*Switch rail and sensor plate are attached proximity switch specification. Auto switch specification is not available.

**Origin point switch**

	Without switch
S	With switch(Wire length 3m)

### Proximity Sensor Information

The LX series uses SUNK brand GXL-8F series photo proximity sensors. For more information on these sensors, please visit the SUNK website at [www.sunk-tanaka.com](http://www.sunk-tanaka.com)

Designator	G	GD	GB	GDB
SUNK Part Number	GXL-8F	GXL-8FB	GXL-8F1	GXL-8FB1
Sensing Type	Approach-ON	Depart-ON	Approach-ON Varied Frequency*	Depart-ON Varied Frequency*
Output	NPN Open-Collector (100mA)			
Sensing Direction	Front			
Sensing Range	2.5mm ±20% (rated), 0-1.8mm (normal)			
Indication	Red LED when ON			
Cable Length	1m, extendable up to 100m			

\*Units with the suffix "1" are varied oscillating frequency type. Use this type when installing 12mm or closer to the nearest sensor. Separate by at least 2mm when using three or more sensors.

### Applicable driver unit

LXFH50	DC power supply type driver
	LC8D-507AD

LX F H 5 S B 50 S F9N 1

Actuator shape

F Guided slide table

Type of guide

H Linear guide

Motor type

5 5-phase stepping motor

Type of screw

S Acme screw

Screw lead

A	5mm
B	12mm

Stroke

25	25mm
50	50mm
75	75mm
100	100mm

Number of auto switch

1	1 pc.
2	2 pcs.
3	3 pcs.
4	4 pcs.
5	5 pcs.

Type of auto switch

	Nil
F9N	D-F9N(Lead wire length: 0.5m)
F9P	D-F9P(Lead wire length: 0.5m)
F9B	D-F9B(Lead wire length: 0.5m)
F9NL	D-F9NL(Lead wire length: 3m)
F9PL	D-F9PL(Lead wire length: 3m)
F9BL	D-F9BL(Lead wire length: 3m)

Origin point switch

	Without switch
S	With switch(Wire length 3m)



Applicable auto switch

Part number	Type	Wiring method/output type	Indicator light	Electrical safety	Lead wire length(m)	
					0.5m	3m
D-F9N	Slide table switch	3-wire/NPN	With	In-line	•	•
D-F9P	Slide table switch	3-wire/PNP	With	In-line	•	•
D-F9B	Slide table switch	2-wire	With	In-line	•	•

\* Refer to page 47 for further specifications of auto switch.

Applicable driver unit

	DC power supply type driver
LXFN50□	LC6D-507AD

Origin Home Switch Information

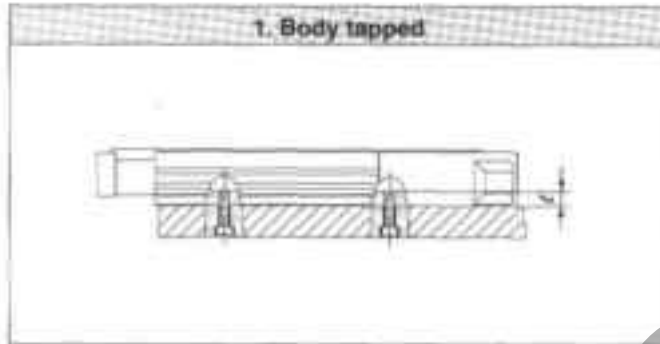
LX series actuators are available with an optional photo micro sensor as an origin home switch to detect when the actuator is fully retracted. The LC6C series positioning driver requires an input from the origin home switch or some other sensor when homing the actuator. The origin home switch can be used for other purposes as well, and likewise other sensors can be used to trigger the home position. Please refer to pages 42 and 45 of this catalog for more information and precautions regarding the optional origin home switch.

Mounting Instructions

How to mount LXF

How to mount actuator

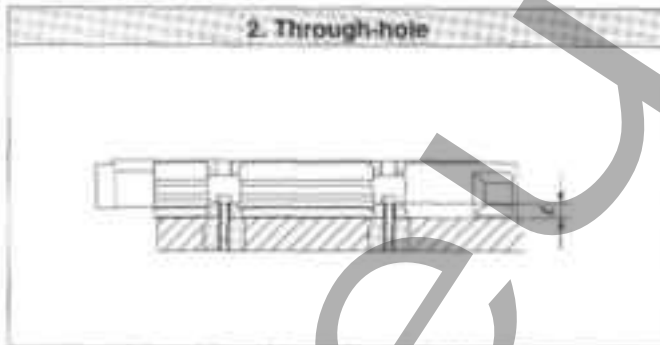
Actuator can be mounted from two directions according to machinery or work requirements.



Series	Bolt	Max. tightening torque Nm(kgf-cm)	Max. tightening depth (Z mm)
LXF	M5x0.8	4.4(44.0)	8

**Caution**

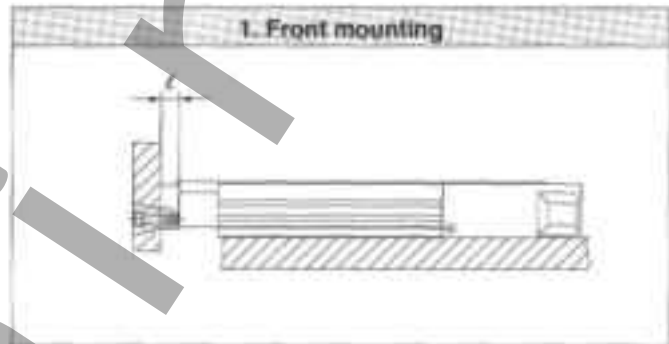
Bolt should be at least 0.5mm shorter than the max. tightening depth to prevent bolt from pressing the body.



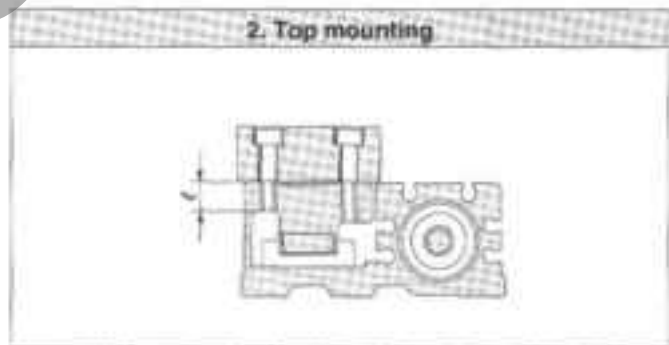
Series	Bolt	Max. tightening torque Nm(kgf-cm)	Body thickness (Z mm)
LXF	M4x0.7	2.1(21.4)	8

How to mount work

Work can be mounted on two faces of the actuator.



Series	Bolt	Max. tightening torque Nm(kgf-cm)	Body thickness (Z mm)
LXF	M4x0.7	2.1(21.4)	10



Series	Bolt	Max. tightening torque Nm(kgf-cm)	Max. tightening depth (Z mm)
LXF	M4x0.7	2.1(21.4)	8

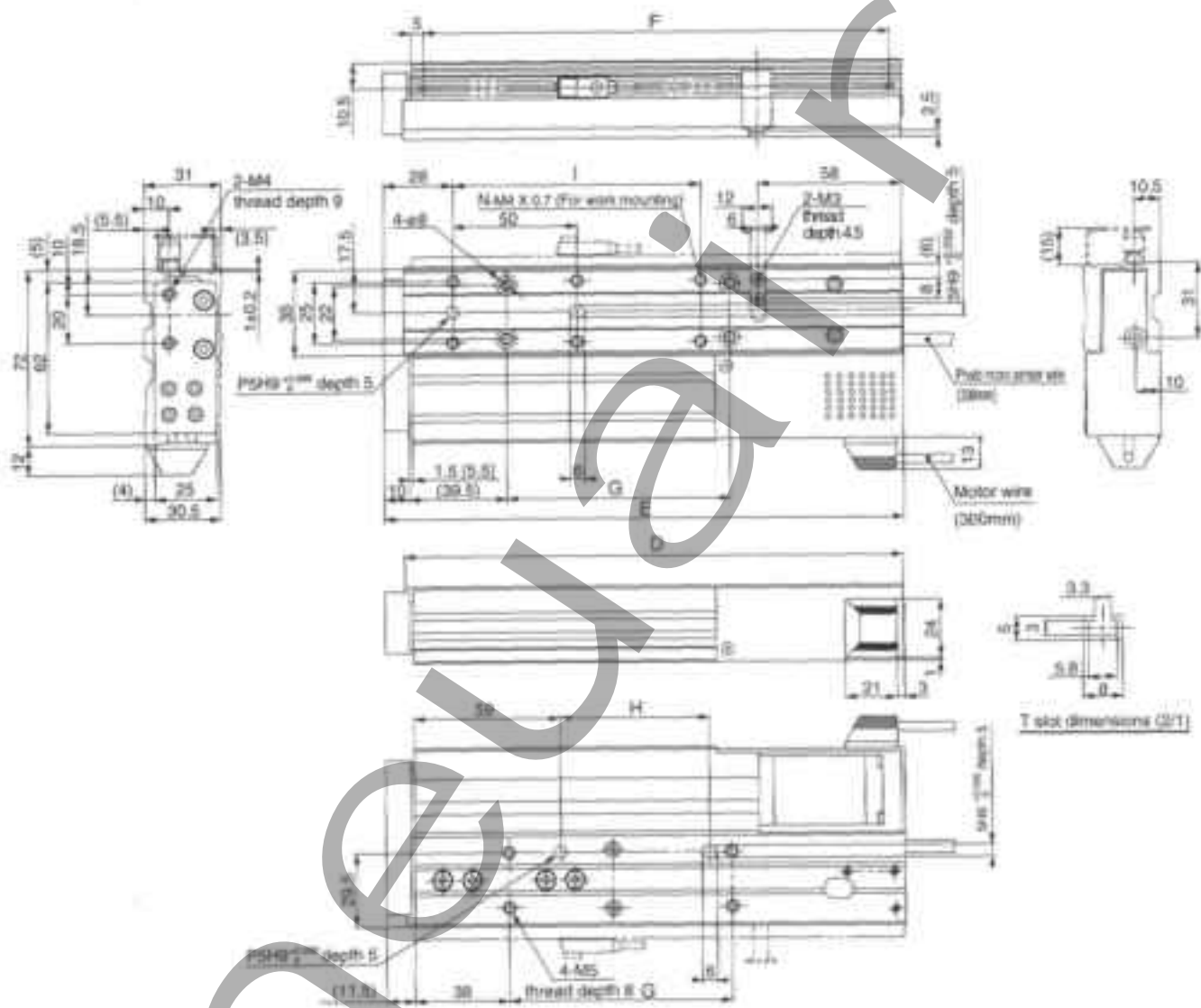
**Caution**

Bolt should be at least 0.5mm shorter than the max. tightening depth to prevent bolt from pressing the body.

How To Operate The LXF

The standard LXF series actuator uses a 5-phase uni-polar DC stepper motor. (0.7A/10). The motor requires a driver to move the motor based on the input commands. The LXF can be operated with either the LC6D-507AD basic stepper driver or other compatible driver. See pages 31-39 for more information on SMC's LC6 series drivers.

LXFH5B



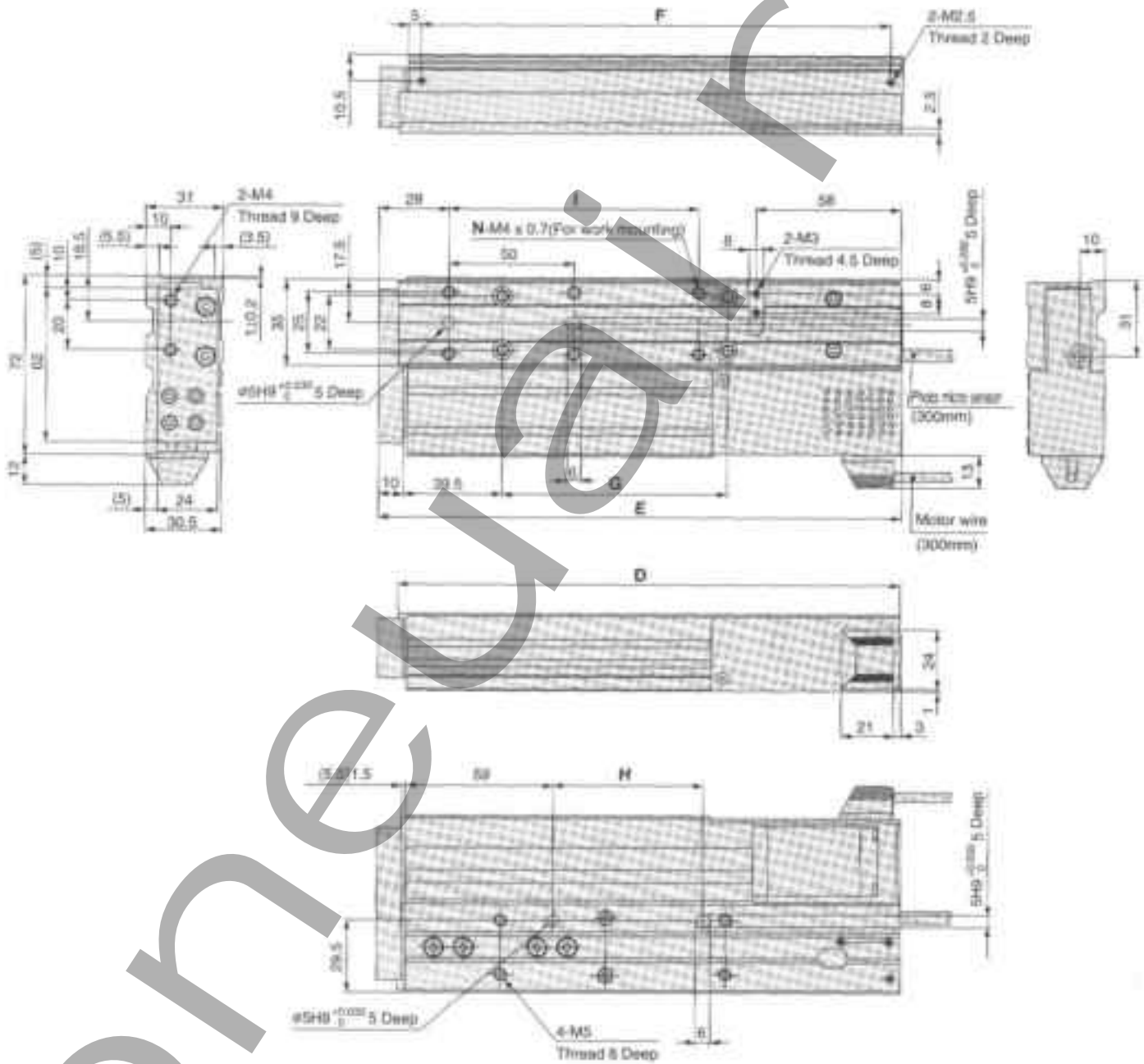
[ ] shows the location at which origin point switch operates.

Model	N	D	E	F	G	H	I
LXFH5B - 25	4	151	160	138	60	30	(50)
LXFH5B - 50	4	176	185	163	90	60	(50)
LXFH5B - 75	6	201	210	188	90	60	100
LXFH5B - 100	6	226	235	213	90	60	100

Dimensions - Slide Screw Type

LXFH5S

Scale: 40%



I shows the location at which origin point switch operates.

Model	N	D	E	F	G	H	I
LXFH5S -25	4	151	160	130	60	30	(50)
LXFH5S -50	4	170	180	163	90	60	(50)
LXFH5S -75	6	201	210	188	90	60	100
LXFH5S -100	6	226	235	213	90	60	160

Low Profile  
Electric Actuator  
with Guides

ORDER  
ONLINE

# Series LXP



## Specifications

Model	LXPB2SA	LXPB2SB	LXPB5SA	LXPB5SB
Stroke (mm)	50, 75, 100, 125, 150, 175, 200			
Motor	2-phase stepping motor		5-phase stepping motor	
Screw (mm)	ø8, Lead 6	ø8, Lead 12	ø8, Lead 6	ø8, Lead 12
Max. pay load (horizontal)	6kg	3kg	4kg	2kg
Max. pay load (vertical)	5kg	3kg	4kg	2kg
Max. speed	100mm/s	200mm/s	100mm/s	200mm/s
Positioning repeatability	±0.05mm			
Type of guide	Linear ball bearing			
Operating temperature range	5 to 40°C (No dewing)			

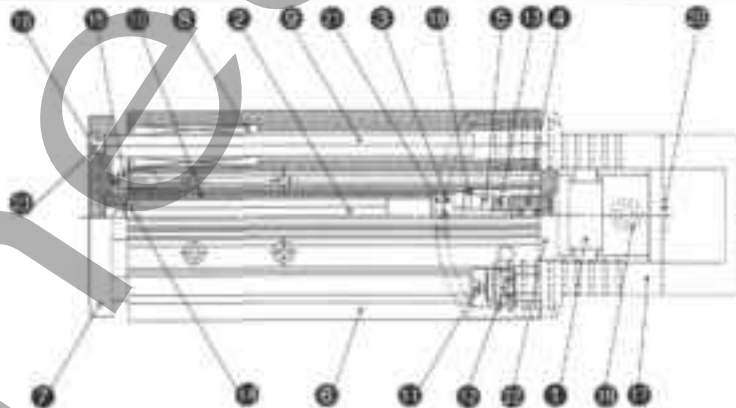
## Brake specifications

Model	Negative actuate type
Static torque	0.1Nm (1kgf-cm) or more
Rated voltage	24V(DC)±5%
Power consumption	5W(at 75°C)

Model	LXPB2BC	LXPB2BD	LXPB5BC	LXPB5BD	
Ball screw	ø8 lead 2mm	ø8 lead 5mm	ø8 lead 2mm	ø8 Lead 5mm	
Max. allowable weight	Horizontal	60N			
	Vertical	50N(23N)	50N(30N)	50N(16N)	50N(20N)
Max. speed	30mm/s	80mm/s	30mm/s	80mm/s	
Positioning repeatability	± 0.03mm		± 0.03mm		
Min. lead *	Half step	0.005mm	0.0125mm	0.002mm	0.005mm
	Full step	0.01mm	0.025mm	0.004mm	0.01mm

\* With one pulse input

## Construction



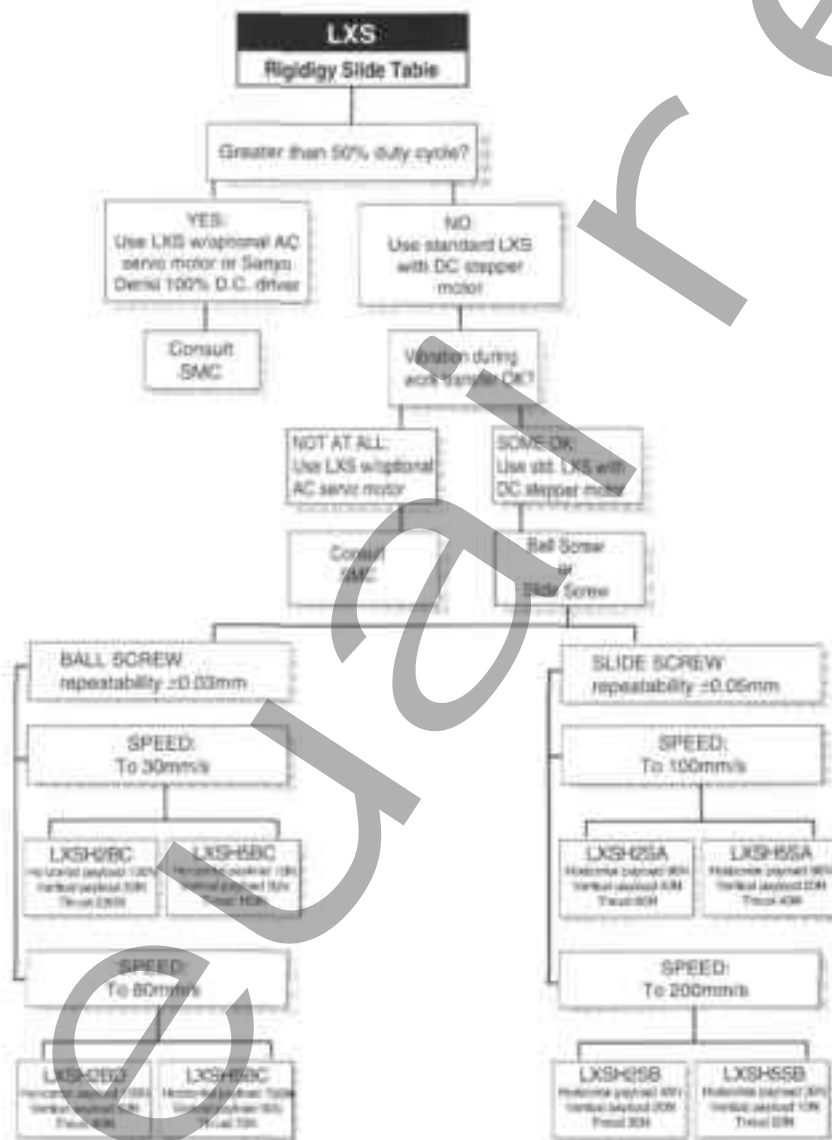
### Component parts

No.	Description	Material	Note
1	Motor	—	Stepping motor
2	Forged screw	Alloy steel	
3	Nut	Resin	
4	Coupling	—	Chromated
5	Bearing	—	Nickel plated
6	Body	Aluminum alloy	
7	Mounting plate	Soft steel	Chromated
8	Linear ball bearing	—	Anodized
9	Guide rod	Bearing steel	
10	Tube	Aluminum alloy	
11	Sensor pin	Stainless steel	

### Component parts

No.	Description	Material	Note
12	Photo micro sensor	—	
13	Lock nut	Carbon steel	Black zinc chromated
14	Stopper nut	Aluminum alloy	
15	Damper bolt	Bearing steel	Nickel plated
16	Damper	Resin	
17	Motor cover	Resin	
18	Tension ring	Stainless steel	
19	Capic cap	—	
20	Plug	—	
21	Magnet	—	
22	Adapter	Aluminum alloy	
23	Plate mounting bolt	Carbon steel	Nickel plated





**Duty ratio**

When using a stepping motor actuator must be operated at less than 50% of duty ratio independent of pay load value. Continuous operation time should be less than 30 seconds.

Duty ratio: ratio of actuator operating time and suspended time in a cycle. It is calculated by the formula below.

$$\text{Duty ratio} = \frac{\text{Operating time}}{\text{Operating time} + \text{Suspended time}} \times 100$$

Refer to the examples.

Continuous operation time: time between the initiation and the end of slider movement

Remark) The operation provisionally ends when slider turns at the stroke end, the operation is no longer "continuous".

**Example 1**

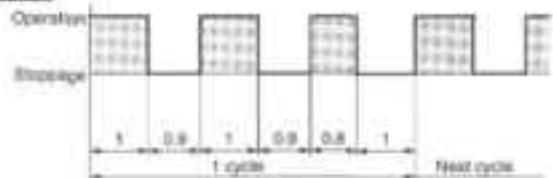


Figure 1

$$\text{Duty ratio} = \frac{(1 + 0.8) \div (1 + 0.8 + 1 + 0.8 + 1)}{4} \times 100 = 90\%$$

Not possible to use.

**Example 2**

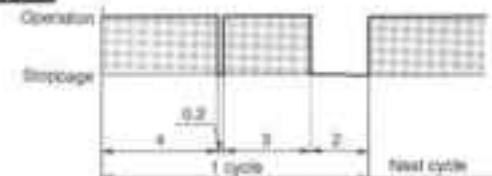


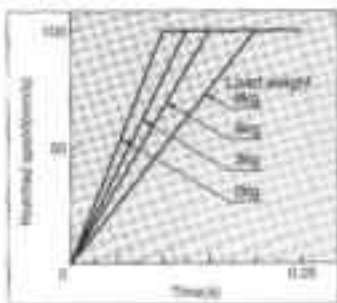
Figure 2

$$\text{Duty ratio} = \frac{(4 + 0.2) \div (4 + 0.2 + 3 + 2)}{9.2} \times 100 = 76\%$$

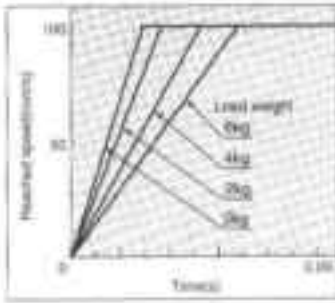
Not possible to use.

Criteria of Accelerating Speed (Horizontal Orientation)

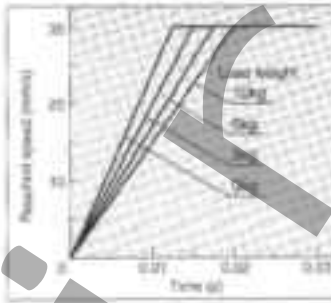
LXPB2SA



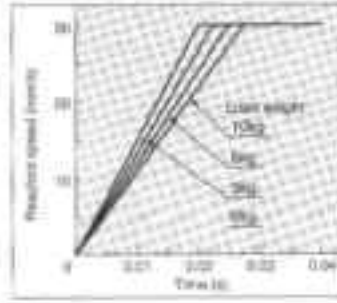
LXPB5SA



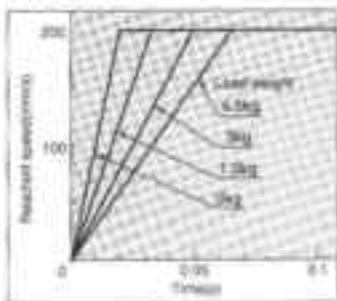
LXPB2BC



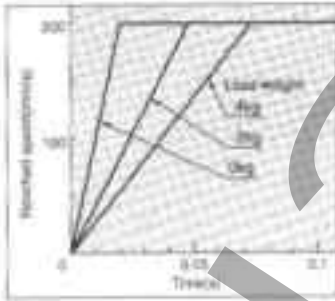
LXPB5BC



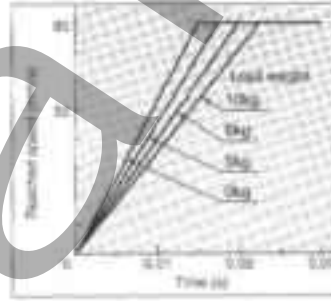
LXPB2SB



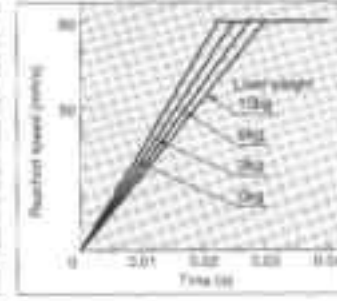
LXPB5SB



LXPB2BD

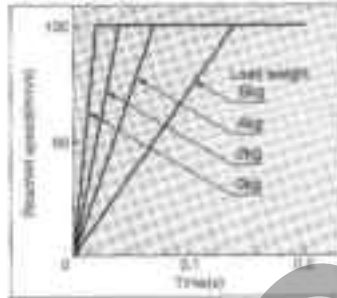


LXPB5BD

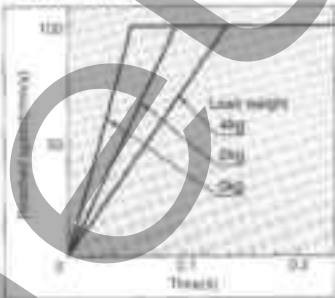


Criteria of Accelerating Speed (Vertical Orientation)

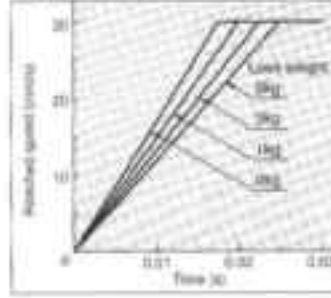
LXPB2SA



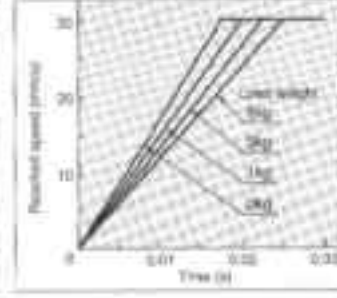
LXPB5SA



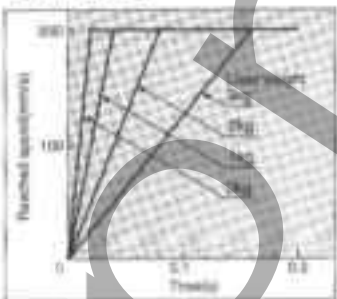
LXPB2BC



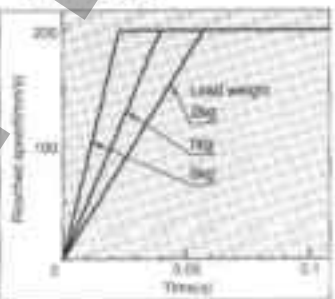
LXPB5BC



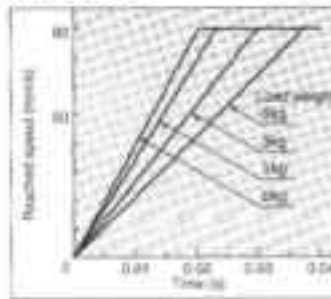
LXPB2SB



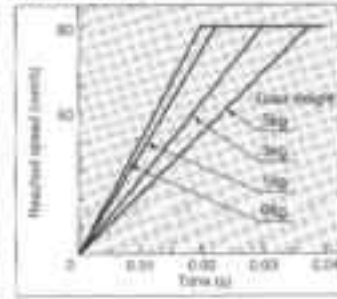
LXPB5SB



LXPB2BD



LXPB5BD

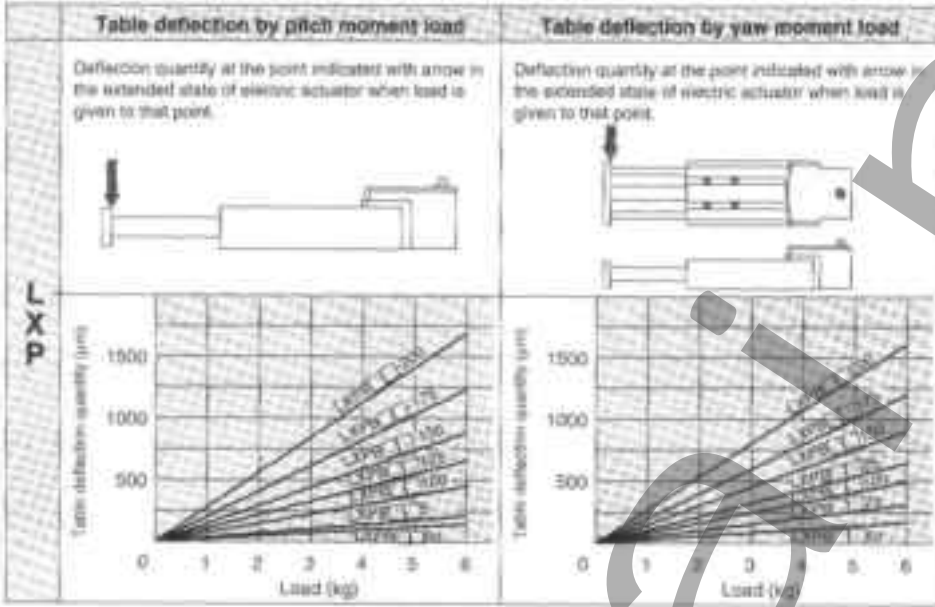


**Caution**

Pay load should be under the maximum pay load.  
 Accelerating time is decided per pay load and reached speed.  
 If operating beyond the range shown in these graphs, unit may function improperly.  
 These graphs consist of data when SMC made DC power supply input type driver unit is used and the excitation is half step.  
 Data varies depending upon operating conditions.

Table Deflection

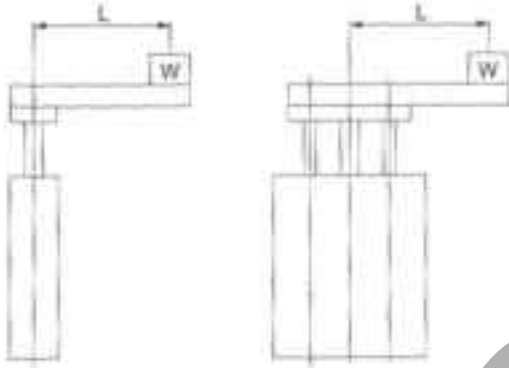
Table Deflection



Pneuhair E

**Working range when LXP is used as lifter**

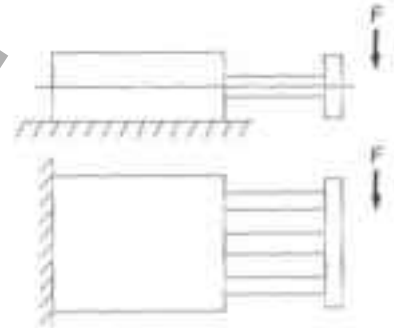
Working range to linear ball bearing. Use within allowable thrust.



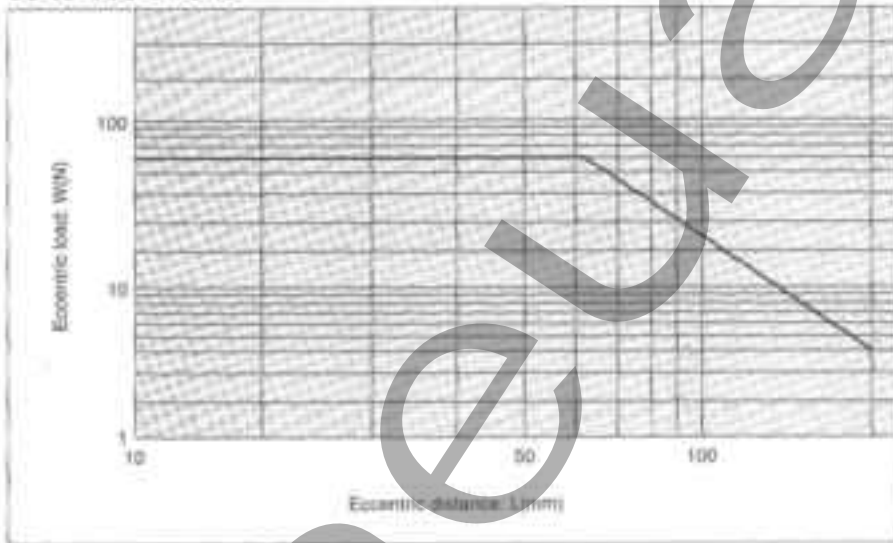
**Operating conditions**

**Lateral load allowance**

Stroke	Load (N)
50	60
75	60
100	58
125	56
150	54
175	48
200	43

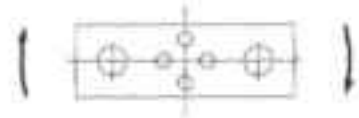


**50 to 100 stroke**

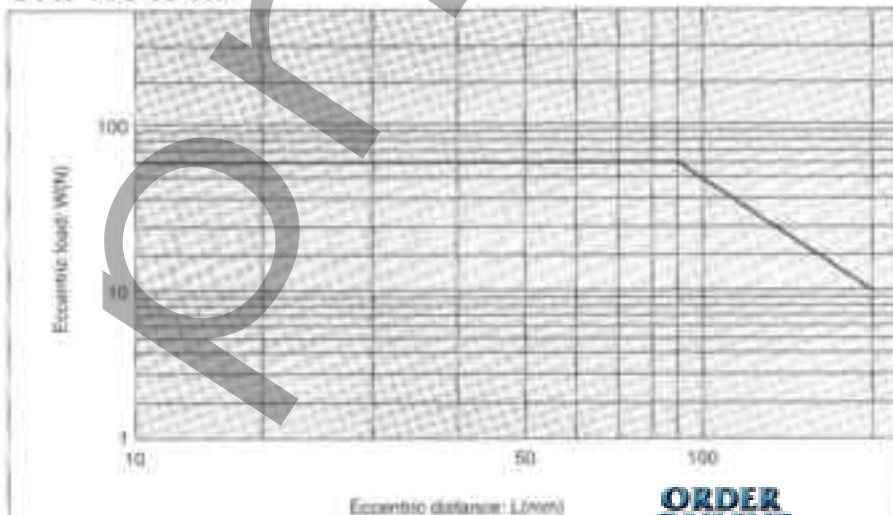


**Plate rotation torque**

Stroke	Torque (Nm)
50	2.87
75	2.47
100	2.17
125	2.38
150	2.16
175	1.98
200	1.82



**Over 100 stroke**

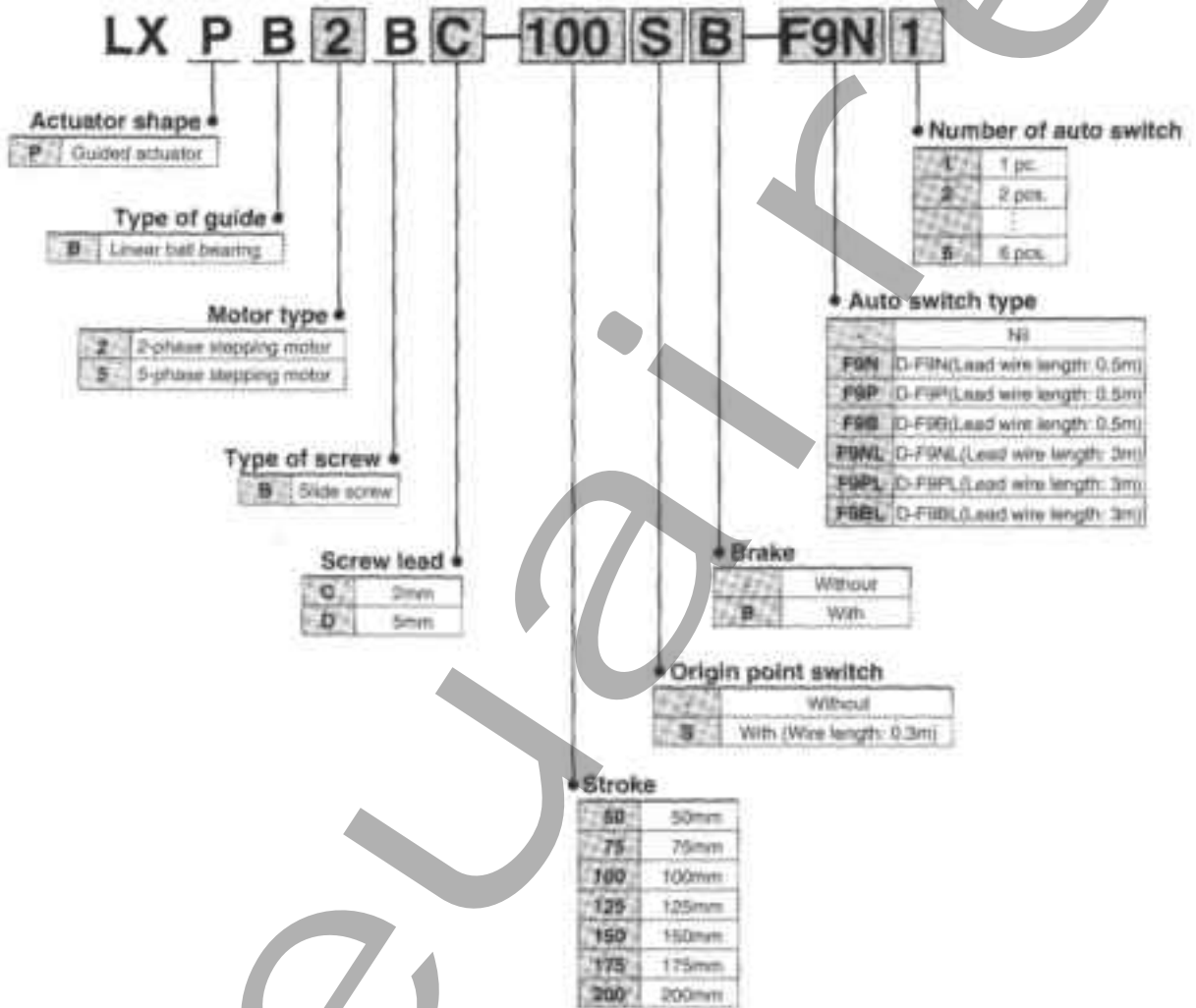


**Non-rotating accuracy of plate**

Non-rotating accuracy  $\theta$   
 $\pm 0.09^\circ$



How To Order - Ball Screw Type



### Applicable driver unit

	DC power supply type driver
LXP50B	LC6D-225AD, LC6C-225AD
LXP55B	LC6D-507AD

### Origin Home Switch Information

LX series actuators are available with an optional photo micro sensor as an origin home switch to detect when the actuator is fully retracted. The LC6C series positioning driver requires an input from the origin home switch or some other sensor when homing the actuator. The origin home switch can be used for other purposes as well, and likewise other sensors can be used to trigger the home position. Please refer to pages 42 and 45 of this catalog for more information and precautions regarding the optional origin home switch.

LX P B 2 S B 100 S B F9N 1

Actuator shape \*

P	Guided actuator
---	-----------------

Type of guide \*

B	Linear ball bearing
---	---------------------

Motor type \*

2	2-phase stepping motor
5	5-phase stepping motor

Type of screw \*

S	Slide screw
---	-------------

Screw lead \*

A	6mm
B	12mm

Brake

	Without
B	With

Origin point switch

	Without
S	With (Wire length: 0.3m)

Stroke

50	50mm
75	75mm
100	100mm
125	125mm
150	150mm
175	175mm
200	200mm

Number of auto switch

1	1 pc.
2	2 pcs.
6	6 pcs.

Auto switch type

	Nil
F9N	D-F9N(Lead wire length: 0.5m)
F9P	D-F9P(Lead wire length: 0.5m)
F9B	D-F9B(Lead wire length: 0.5m)
F9NL	D-F9NL(Lead wire length: 3m)
F9PL	D-F9PL(Lead wire length: 3m)
F9BL	D-F9BL(Lead wire length: 3m)



Applicable auto switch

Part number	Type	Wiring method/output type	Indicator light	Electrical entry	Lead wire length (m)	
					0.5	3
D-F9N	Solid state switch	3-wire/NPN	With	In-line	*	*
D-F9P		3-wire/PNP	With	In-line	*	*
D-F9B		3-wire	With	In-line	*	*

\* Refer to page 47 for further specifications of auto switch.

Applicable driver unit

	DC power supply type driver
LXPB25	LC6C-250AD, LC6C-320AD
LXPB55	LC6C-507AD

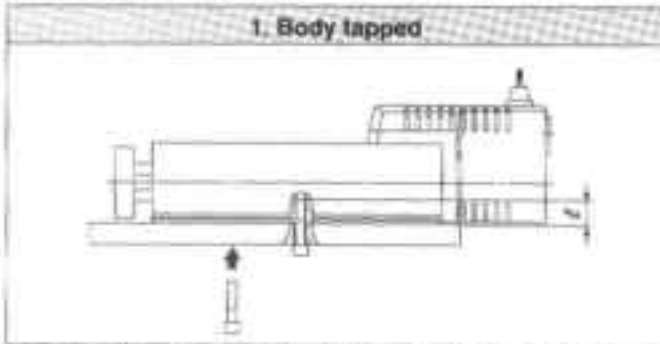
Origin Home Switch Information

LX series actuators are available with an optional photo micro sensor as an origin home switch to detect when the actuator is fully retracted. The LC6C series positioning driver requires an input from the origin home switch or some other sensor when homing the actuator. The origin home switch can be used for other purposes as well, and likewise other sensors can be used to trigger the home position. Please refer to pages 42 and 45 of this catalog for more information and precautions regarding the optional origin home switch.

## How To Mount LXP

### How to mount actuator

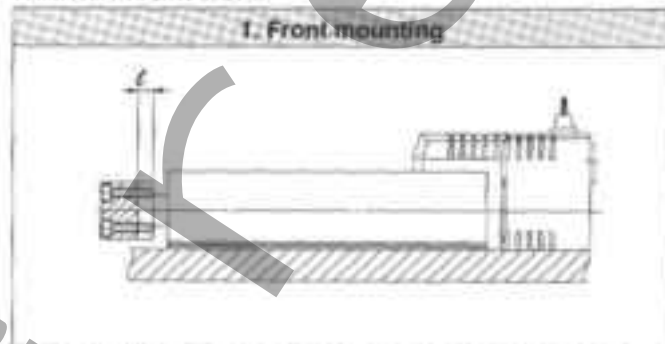
#### 1. Body tapped



Series	Bolt	Max. tightening torque Nm(kgf-cm)	Max. tightening depth (mm)
LXP	M6x1	7.4(75.5)	12

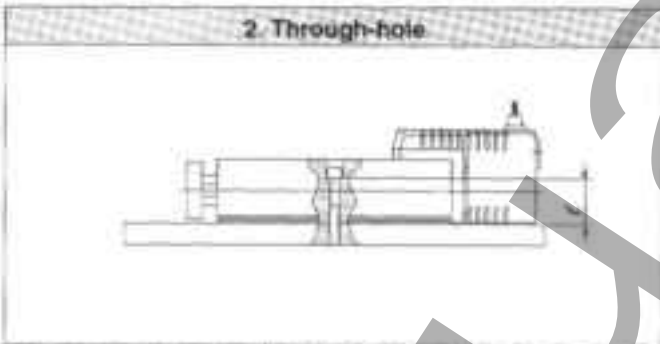
### How to mount work

#### 1. Front mounting



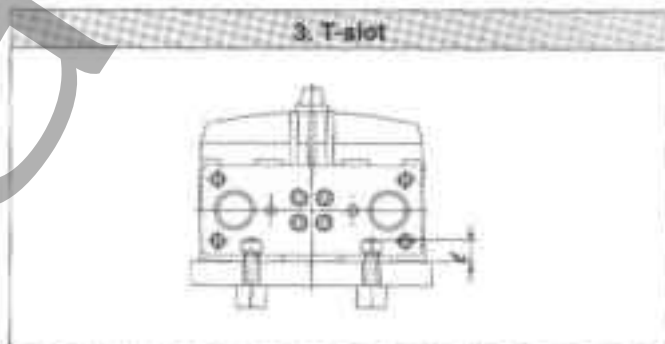
Series	Bolt	Max. tightening torque Nm(kgf-cm)	Max. tightening depth (mm)
LXP	M6x1	7.4(75.5)	10

#### 2. Through-hole



Series	Bolt	Max. tightening torque Nm(kgf-cm)	Body thickness (mm)
LXP	M5x0.8	4.4(44.0)	37.5

#### 3. T-slot



Series	Bolt	Max. tightening torque Nm(kgf-cm)	Max. tightening depth (mm)
LXP	M5x0.8	7.4(75.5)	25

### ⚠ Caution

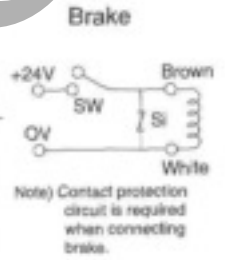
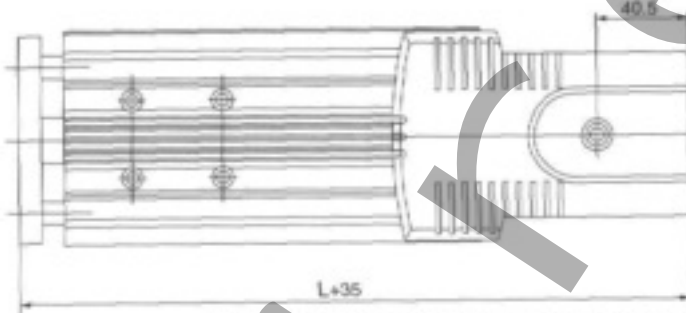
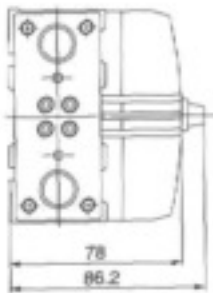
Bolt should be at least 0.5mm shorter than the max. tightening depth to prevent bolt from passing the body.

### How To Operate The LXP

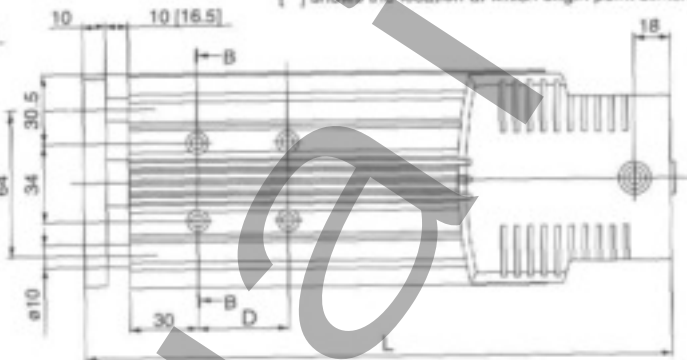
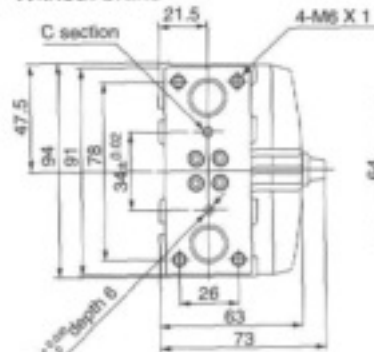
The standard LXP series actuator is available with either a 2-phase (2.0A/e) or a 5-phase (0.7A/e) uni-polar DC stepper motor. The motor requires a driver to move the motor based on the input commands. The LXP can be operated with either the LC6D-220AD (2e) or LC6D-507AD (5e) basic stepper driver, the LC6C-220AD (2e) positioning driver, or other compatible driver. See pages 40-46 for more information on SMC's LC6 series drivers.

LXPB\_B\_

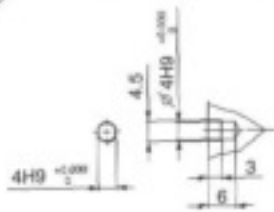
With brake



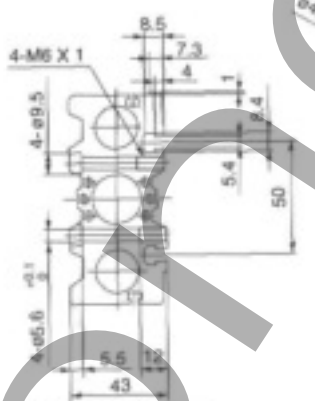
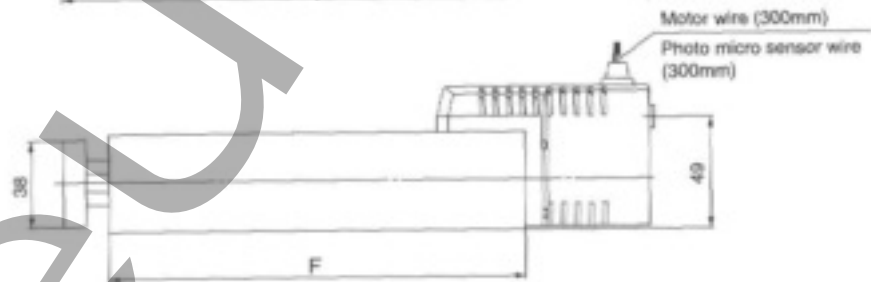
Without brake



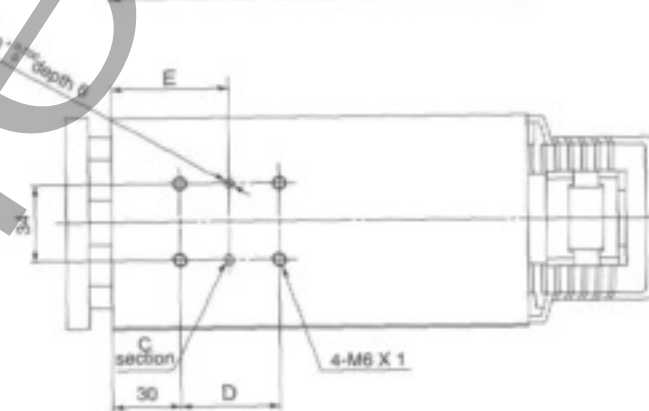
[ ] shows the location at which origin point switch operates.



C section details



Cross section BB



Model	D	E	F	L
LXPB_B_-50	44	52	154	231
LXPB_B_-75			179	256
LXPB_B_-100			204	281
LXPB_B_-125	120	90	246	323
LXPB_B_-150			271	348
LXPB_B_-175			296	373
LXPB_B_-200			321	398

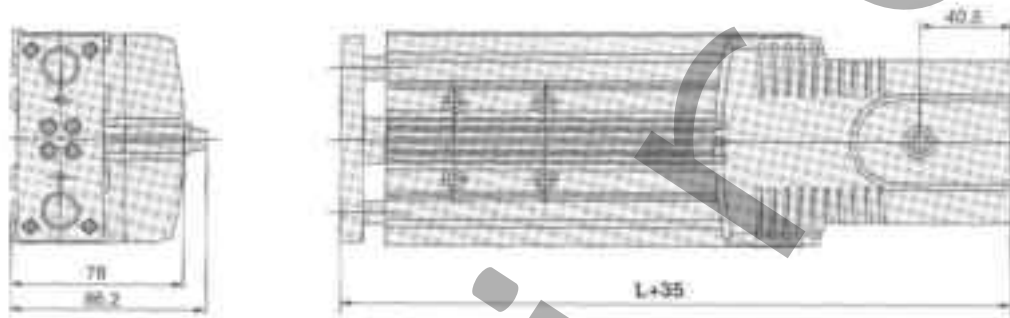


Dimensions - Slide Screw Type

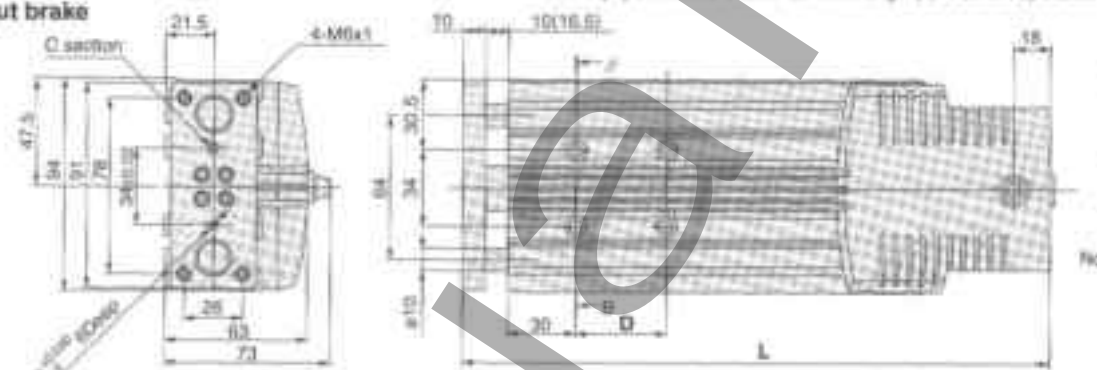
## LXPB S

With brake

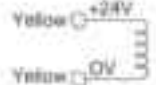
Scale: 30%



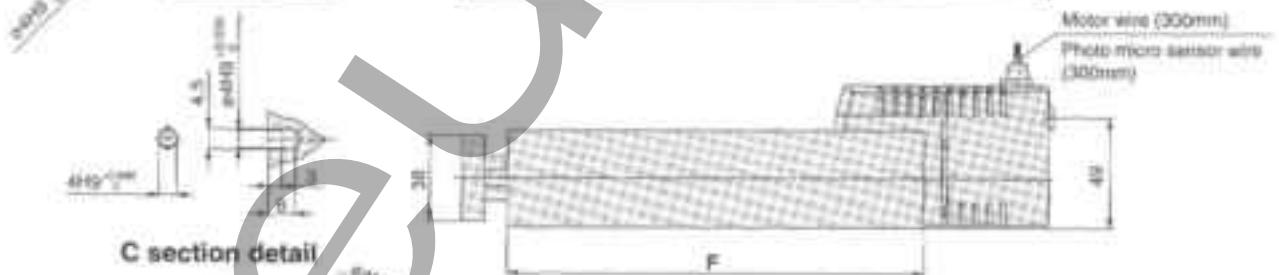
Without brake



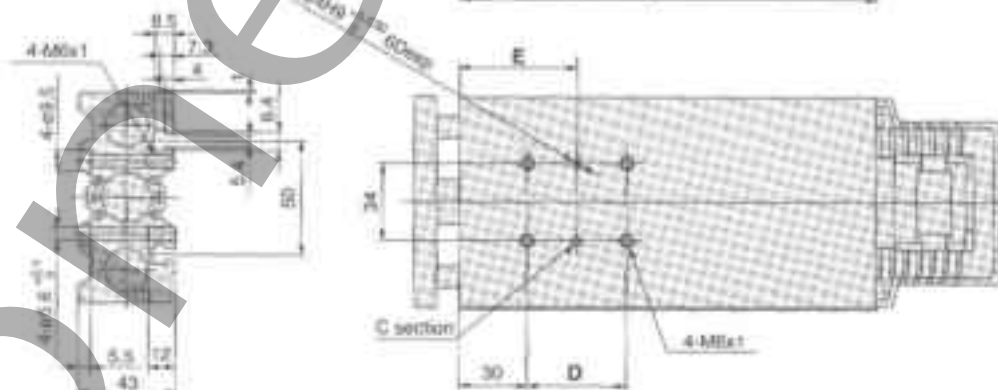
**Brake electric circuit**



Note) Contact protection circuit is required when connecting brake.



C section detail



Cross section BB

Model	D	E	F	L
LXPB S -50			154	211
LXPB S -75	44	62	179	254
LXPB S -100			204	281
LXPB S -125			246	323
LXPB S -150	120	90	271	348
LXPB S -175			296	373
LXPB S -200			321	398

# Series LXS



## Specifications

Model	LXSH2SA	LXSH2SB	LXSH5SA	LXSH5SB
Stroke (mm)	50, 75, 100, 125, 150			
Motor	2-phase stepping motor		5-phase stepping motor	
Screw (mm)	ø8 Lead 6	ø8 Lead 12	ø8 Lead 6	ø8 Lead 12
Max. pay load (horizontal)	9kg	4.5kg	6kg	3kg
Max. pay load (vertical)	4kg	2kg	2kg	1kg
Max. speed	100mm/s	200mm/s	100mm/s	200mm/s
Positioning repeatability	±0.05mm			
Type of guide	High rigidity linear guide			
Operating temperature	5 to 40°C (No dewing)			
Static moment allowance	Pitching (Nm)		15.7	
	Rolling (Nm)		15.7	
	Yawing (Nm)		7.84	

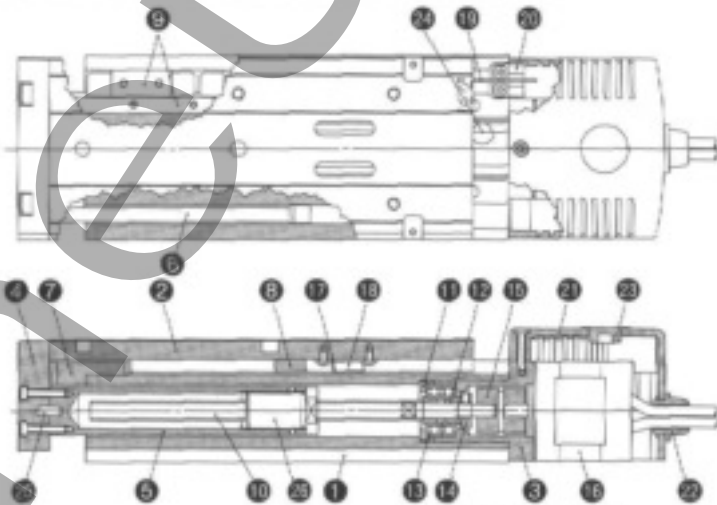
## Brake specifications

Model	Negative actuate type
Static torque	0.1 Nm(1 kgf-cm) or more
Rated voltage	24V (DC) ±5%
Power consumption	5W(at 75°C)

Model	LXSH2BC	LXSH2BD	LXSH5BC	LXSH5BD	
Ball screw	ø8 lead 2mm	ø8 lead 5mm	ø8 lead 2mm	ø8 Lead 5mm	
Max. allowable weight	Horizontal 100N				
	Vertical 50N(220N) 50N(90N) 50N(160N) 50N(70N)				
Max. speed	30mm/s	80mm/s	30mm/s	80mm/s	
Positioning repeatability	± 0.03mm		± 0.03mm		
Min. lead *	Half step	0.005mm	0.0125mm	0.002mm	0.005mm
	Full step	0.01mm	0.025mm	0.004mm	0.01mm

\* With one pulse input

## Construction

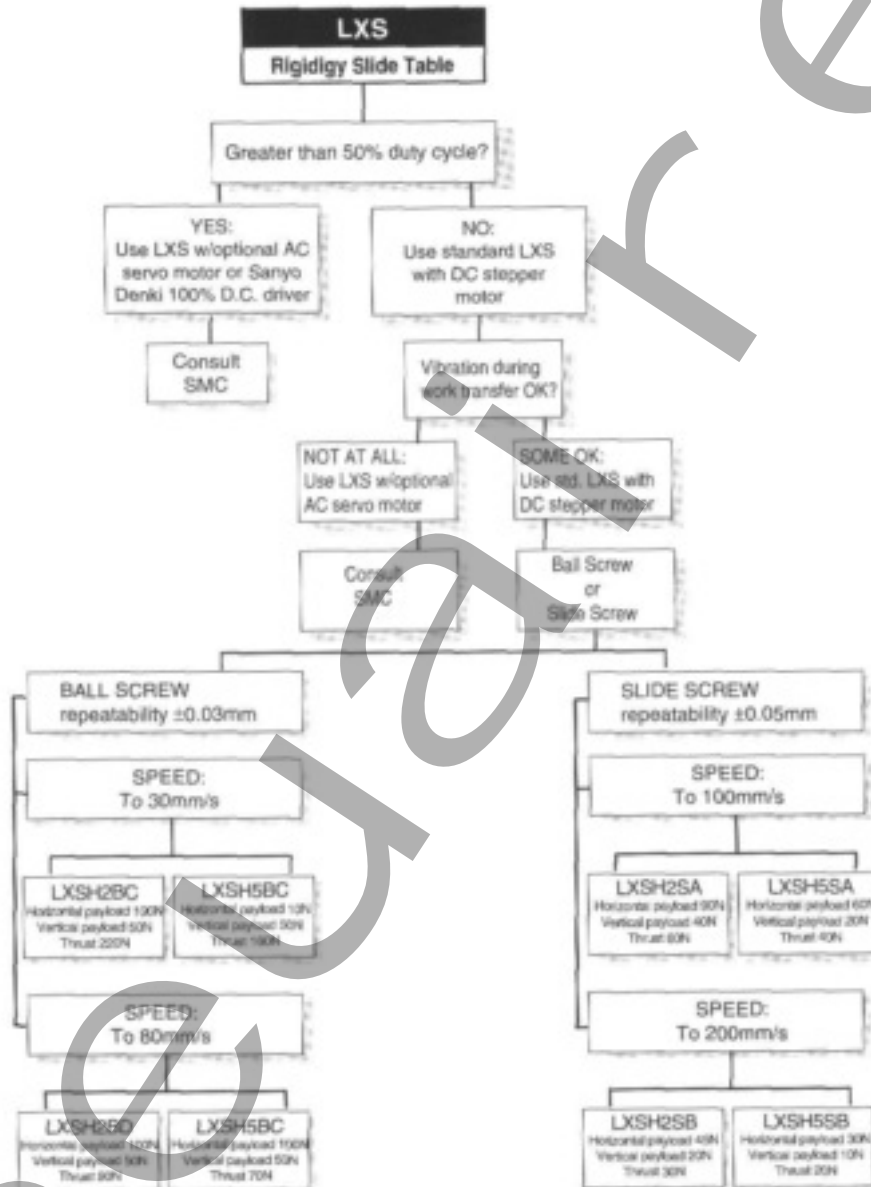


### Component parts

No.	Description	Material	Note
1	Body	Aluminum alloy	Anodized
2	Table	Aluminum alloy	Anodized
3	Adopter	Aluminum alloy	Anodized
4	Plate	Aluminum alloy	Anodized
5	Tube	Aluminum alloy	Anodized
6	Rod ass'y	—	With magnet
7	Stopper A	—	With damper
8	Stopper B	Aluminum alloy	
9	Linear guide (block, rail)	—	
10	Acme screw (shaft)	Alloy steel	
11	Tension ring	Stainless steel	
12	Bearing retainer	Stainless steel	
13	Bearing	—	

### Component parts

No.	Description	Material	Note
14	Lock nut	Carbon steel	Black zinc chromated
15	Coupling	—	
16	Motor	Resin	
17	Magnet holder	Rare earth magnet	
18	Magnet	Mild steel	
19	Sensor plate	—	Model with origin point switch
20	Photo micro sensor	Resin	Model with origin point switch
21	Motor cover	—	
22	Plug A	—	
23	Plug B	—	
24	Cap	Carbon steel	
25	Parallel pin Nut	Resin	



**Duty ratio**

When using a stepping motor actuator must be operated at less than 50% of duty ratio independent of pay load value. Continuous operation time should be less than 30 seconds.

Duty ratio: ratio of actuator operating time and suspended time in a cycle. It is calculated by the formula below.

$$\text{Duty ratio} = \left( \frac{\text{Operating time}}{\text{Operating time} + \text{Suspended time}} \right) \times 100$$

Refer to the examples.

Continuous operation time: time between the initiation and the end of slider movement

Remark) The operation provisionally ends when slider turns at the stroke end; the operation is no longer "continuous".

**Example 1**

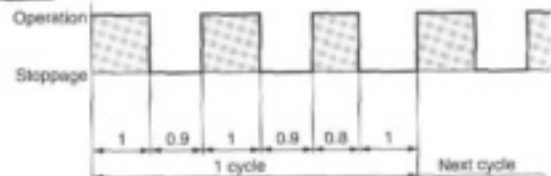


Figure 1

$$\text{Duty ratio} = \left( \frac{1 + 1 + 0.8}{1 + 0.9 + 1 + 0.9 + 1} \right) \times 100 = 50\%$$

∴ Possible to use.

**Example 2**

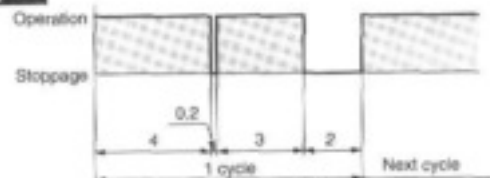


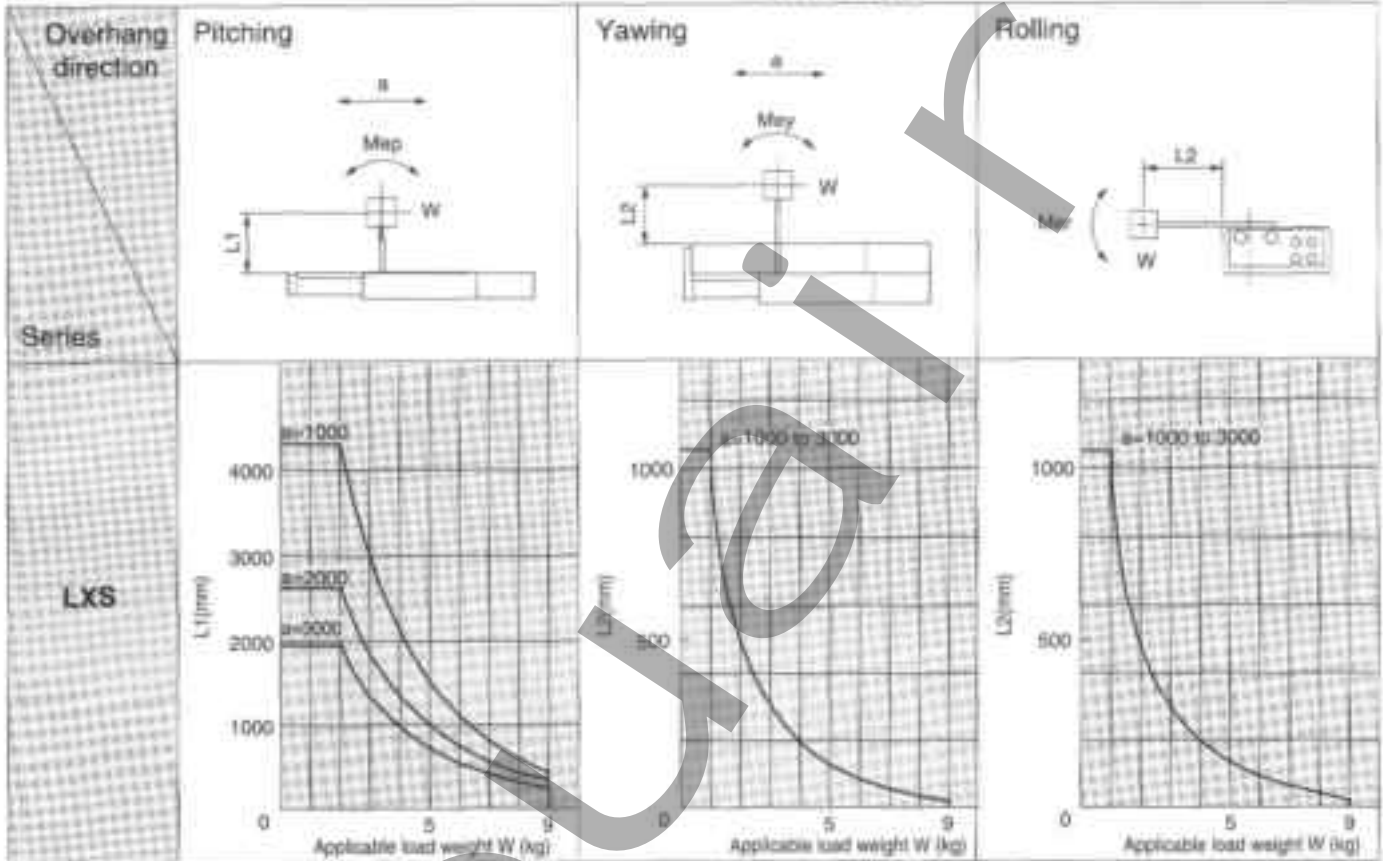
Figure 2

$$\text{Duty ratio} = \left( \frac{4 + 3}{4 + 0.2 + 3 + 2} \right) \times 100 = 76\%$$

∴ Not possible to use.

Table receives moment from each direction according to center of gravity of work. Overhang of work should be within the range shown in the figures below:

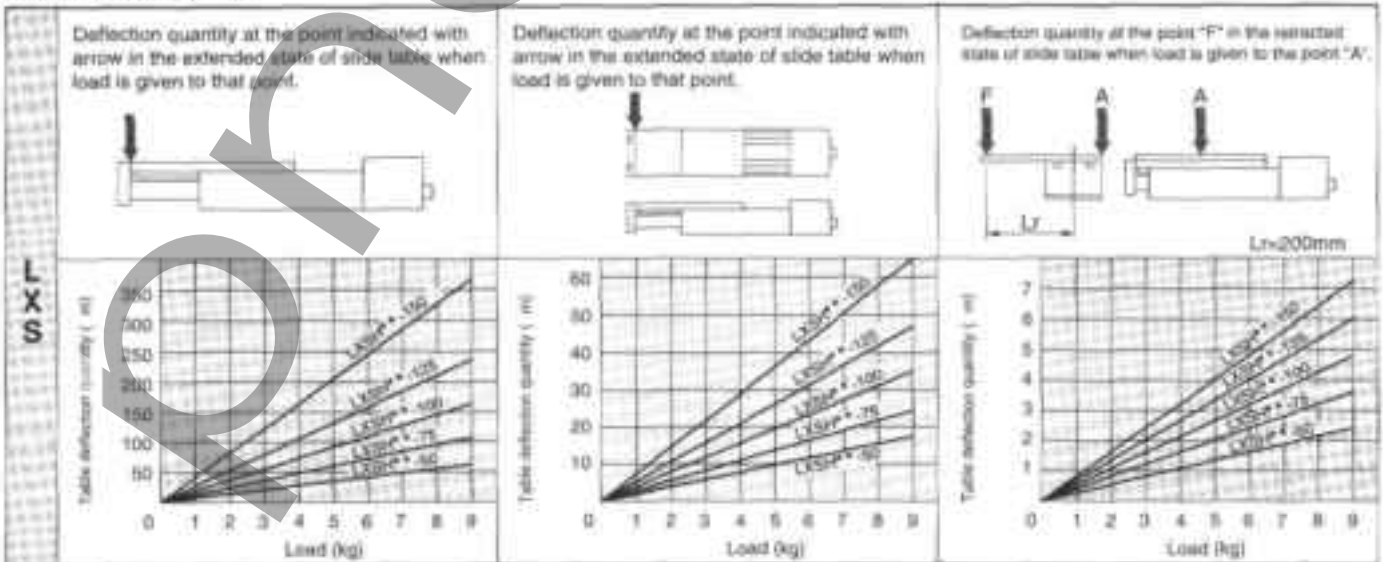
W: Applicable load weight (kg)  
L1, L2: Overhang distance to the center of gravity of work (mm)  
a: Acceleration of work (mm/sec<sup>2</sup>)  
Me: Kinetic moment



**How to use the graph**

1. If work overhangs to the direction of "L1" or "L2", 70% of applicable load weight shown in the graph is the upper limit.
2. The graph above shows the case of horizontal orientation of actuator. If using in vertical, static moment should NOT exceed static moment allowance.
3. Above graph is based on calculation; therefore, there may be differences from values of actual usage. Safe margin must be taken into consideration when designing. See the specifications of each model for static moment allowance.

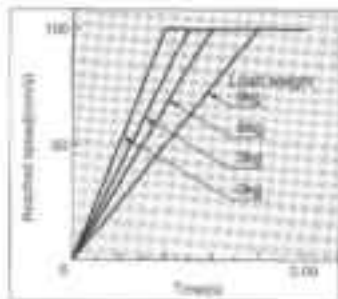
**Table Deflection**



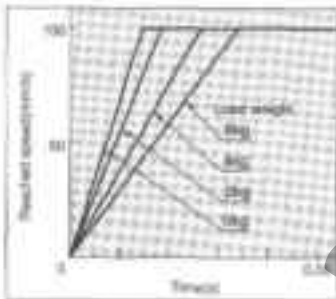
Model Selecting Method

Criteria of Accelerating Speed (Horizontal Orientation)

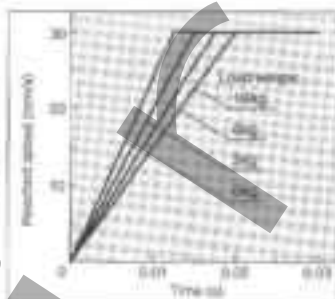
LXSH2SA



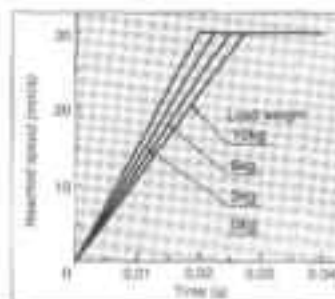
LXSH5SA



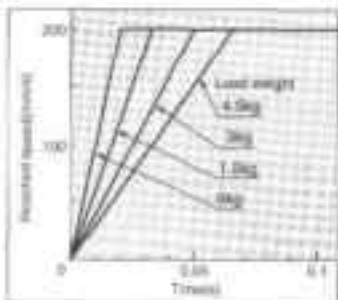
LXSH2BC



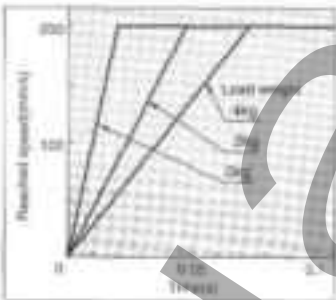
LXSH5BC



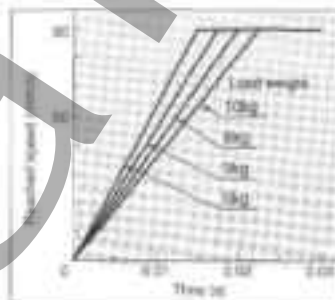
LXSH2SB



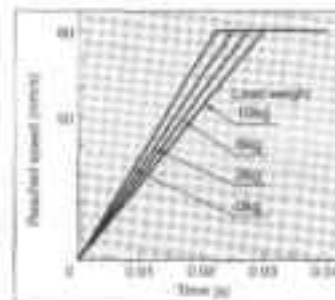
LXSH5SB



LXSH2BD

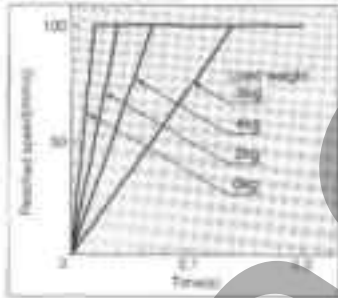


LXSH5BD

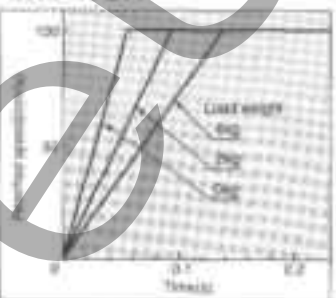


Criteria of Accelerating Speed (Vertical Orientation)

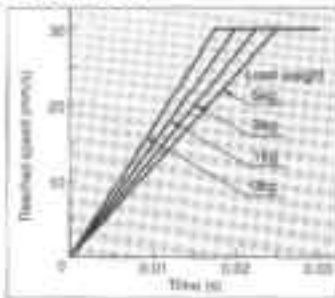
LXSH2SA



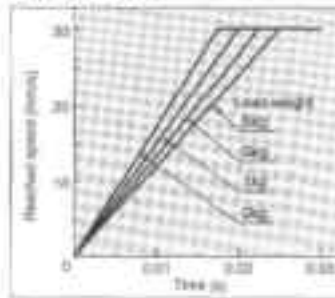
LXSH5SA



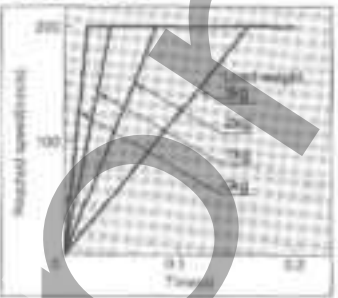
LXSH2BC



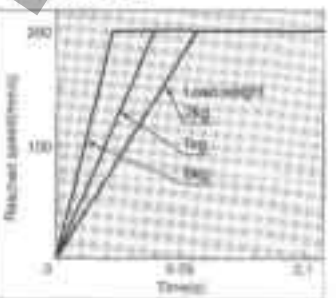
LXSH5BC



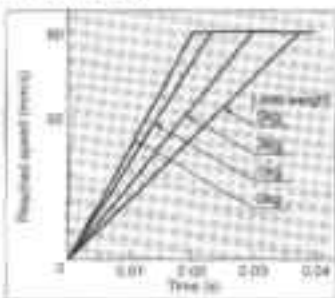
LXSH2SB



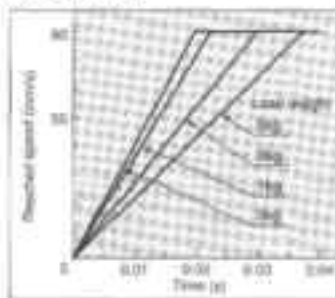
LXSH5SB



LXSH2BD



LXSH5BD



⚠ Caution

Pay load should be under the maximum pay load.

Accelerating time is decided per pay load and reached speed.

If operating beyond the range shown in these graphs, unit may function improperly.

These graphs consist of data when SMC made DC power supply input type driver unit is used and the excitation is half step.

Data varies depending upon operating conditions.

LX S H 2 B C 100 S B F9N 1

Actuator shape •

S	Guided Slide Table
---	--------------------

Type of guide •

H	Linear Guide
---	--------------

Motor type •

2	2-phase stepping motor
S	5-phase stepping motor

Type of screw •

B	Slide screw
---	-------------

Screw lead •

C	2mm
D	3mm

Number of auto switch

1	1 pos.
2	2 pos.
6	6 pos.

Auto switch type

	HL
F9N	D-F9N (Lead wire length: 0.5m)
F9P	D-F9P (Lead wire length: 0.5m)
F9B	D-F9B (Lead wire length: 0.5m)
F9NL	D-F9NL (Lead wire length: 3m)
F9PL	D-F9PL (Lead wire length: 3m)
F9BL	D-F9BL (Lead wire length: 3m)
GN	no sensor plate, without proximity switch
G	GXL-8F (Wire length: 1m)
GD	GXL-8FI (Wire length: 1m)
GB	GXL-8FB (Wire length: 1m)
GBB	GXL-8FIB (Wire length: 1m)

Sensor plate is attached with proximity switch specifications. When auto switch and proximity switch are used, specify the part number of proximity switch after auto switch part number (Ex: F9N1G2).

Brake

	Without
B	With

Origin point switch

	Without
S	With (Wire length: 0.3m)

Stroke

50	50mm
75	75mm
100	100mm
125	125mm
150	150mm

Proximity Sensor Information

The LX series uses GXL-8F and GXL-8FI series non-contact proximity sensors. For more information on these sensors, please visit the SUNX website at [www.sunx.com](http://www.sunx.com)

Designator	G	GD	GB	GBB
SUNX Part Number	GXL-8F	GXL-8FB	GXL-8FI	GXL-8FIB
Sensing Type	Approach-ON	Depart-ON	Approach-ON Varied Frequency*	Depart-ON Varied Frequency*
Output	NPN Open-Collector (100mA)			
Sensing Direction	Front			
Sensing Range	2.5mm ±20% (rated), 0-1.8mm (normal)			
Indication	Red LED when ON			
Cable Length	1m, extendable up to 100m			

\*This with the suffix "F" are varied oscillating frequency type. Use this type when installing 120cm or more to the nearest sensor. Separate by at least 20mm when using three or more sensors.

Applicable driver unit

	DC power supply type driver
LXSH2	LC6D-220AD, LC5C-220AD
LXSH5	LC6D-557AD

How To Order - Slide Screw Type

LX S H 2 S B 100 S B F9N 1

Actuator shape

S	Guided slide table
---	--------------------

Type of guide

H	Linear guide
---	--------------

Type of motor

2	2-phase stepping motor
5	5-phase stepping motor

Type of screw

S	Slide screw
---	-------------

Screw lead

A	6mm
B	12mm

Stroke

50	50mm
75	75mm
100	100mm
125	125mm
150	150mm

Number of auto switch

1	1 pc.
2	2 pcs.
3	3 pcs.
4	4 pcs.
6	6 pcs.

Type of auto switch

	Full
F9N	D-F9N(Lead wire length: 0.5m)
F9P	D-F9P(Lead wire length: 0.5m)
F9B	D-F9B(Lead wire length: 0.5m)
F9NL	D-F9NL(Lead wire length: 3m)
F9PL	D-F9PL(Lead wire length: 3m)
F9BL	D-F9BL(Lead wire length: 3m)

Brake

	Without brake
B	With brake

Origin Point switch

	Without
S	With (Wire length 0.3m)



Applicable auto switch

Part number	Type	Wiring/output	Velocity type	Electrical entry	Lead wire length (m)	
					0.5m(L)	3m(L)
D-F9N	2-wire/stop-state switch	3-wire/MPN	With	in-line	•	•
D-F9P	2-wire/stop-state switch	3-wire/PNP	With	in-line	•	•
D-F9B	2-wire/stop-state switch	2-wire	With	in-line	•	•

Refer to page 47 for the further auto switch specifications.

Applicable driver unit

	DC power supply type driver
LXSHDS	LC6D-220AD, LC6C-220AD
LXSHSE	LC6D-507AD

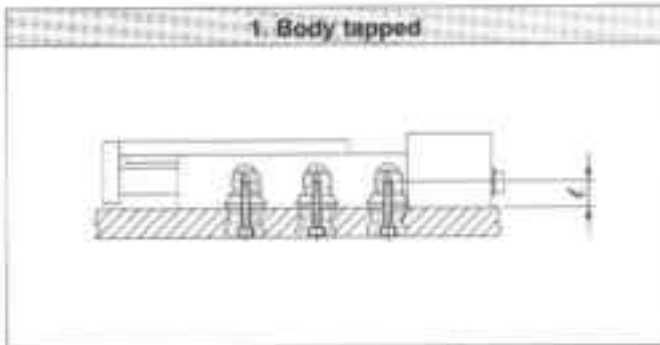
Origin Home Switch Information

LX series actuators are available with an optional photo micro sensor as an origin home switch to detect when the actuator is fully retracted. The LC6C series positioning driver requires an input from the origin home switch or some other sensor when homing the actuator. The origin home switch can be used for other purposes as well, and likewise other sensors can be used to trigger the home position. Please refer to pages 42 and 45 of this catalog for more information and precautions regarding the optional origin home switch.

## How to mount LXS

### How to mount actuator

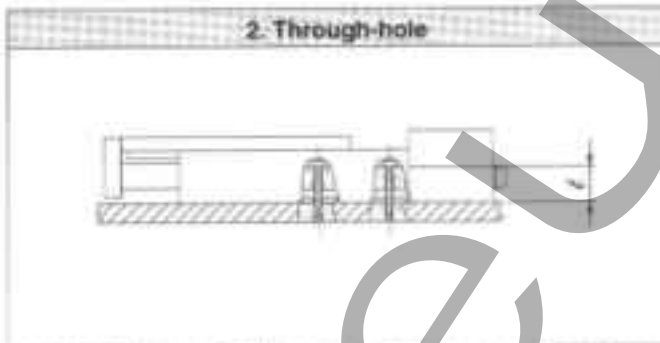
Actuator has 3-way mounting method as shown below. Select the optional method according to your requirements.



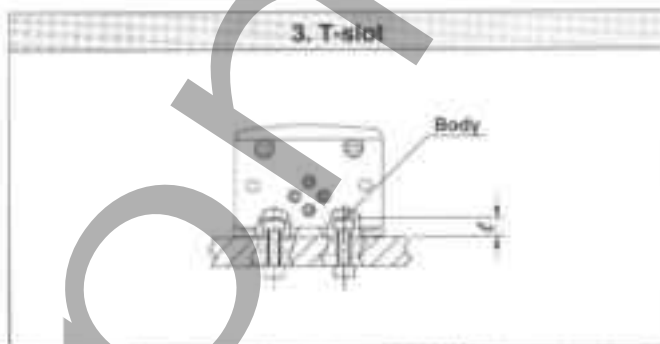
Series	Bolt	Max. tightening torque Nm(kgf-cm)	Max. tightening depth (mm)
LXS	M6x1	7.4(75.5)	20

#### Caution

Bolt should be at least 0.5mm shorter than the max. tightening depth to prevent bolt from pressing the body.



Series	Bolt	Max. tightening torque Nm(kgf-cm)	Max. tightening depth (mm)
LXS	M5x0.8	4.4(44.9)	25



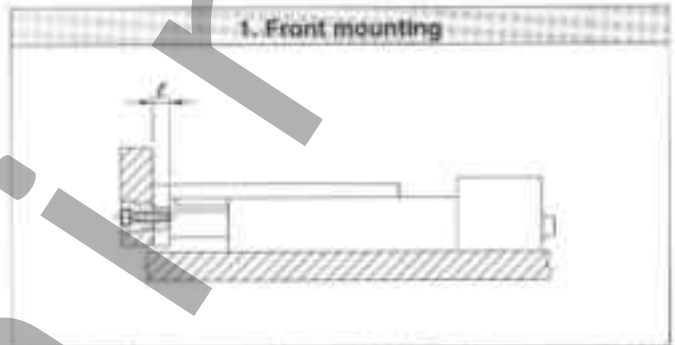
Series	Bolt	Max. tightening torque Nm(kgf-cm)	Max. tightening depth (mm)
LXS	M6x1	7.4(75.5)	10

#### Caution

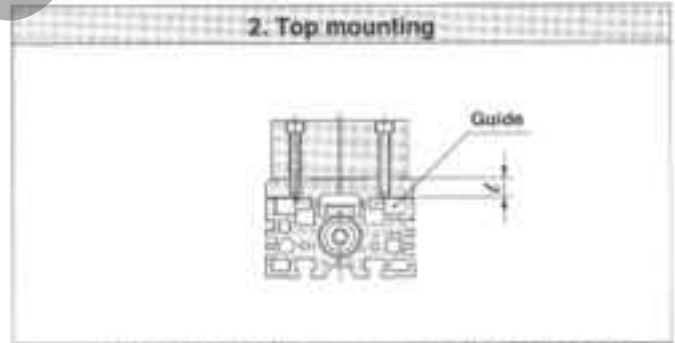
Bolt should be at least 0.5mm shorter than the max. tightening depth to prevent bolt from pressing the body.

### How to mount work

Work can be mounted on 2-face of actuator body.



Series	Bolt	Max. tightening torque Nm(kgf-cm)	Max. tightening depth (mm)
LXS	M6x1	7.4(75.5)	10



Series	Bolt	Max. tightening torque Nm(kgf-cm)	Max. tightening depth (mm)
LXS	M5x0.8	4.4(44.9)	11

#### Caution

Bolt should be at least 0.5mm shorter than the max. tightening depth to prevent bolt from pressing the body.

### How To Operate The LXS

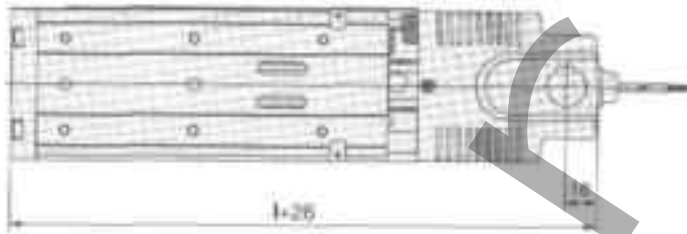
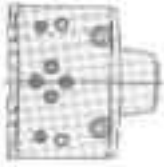
The standard LXS series actuator is available with either a 2-phase (2.0A/ø) or a 5-phase (0.7A/ø) uni-polar DC stepper motor. The motor requires a driver to move the motor based on the input commands. The LXS can be operated with either the LC6D-220AD (2ø) or LC6D-507AD (5ø) basic stepper driver, the LC6C-220AD (2ø) positioning driver, or other compatible driver. See pages 40-48 for more information on SMC's LC6 series drivers.



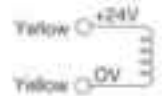


LXSH □ S □

With brake



Brake electrical circuit



Note) Contact protection circuit is required when connecting brake.

Without brake

2-M5 Thread 13 Deep

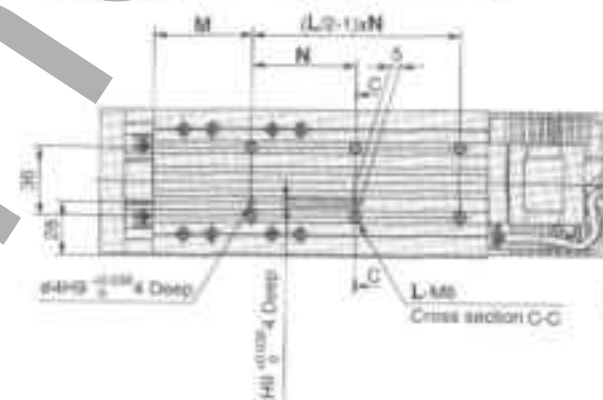
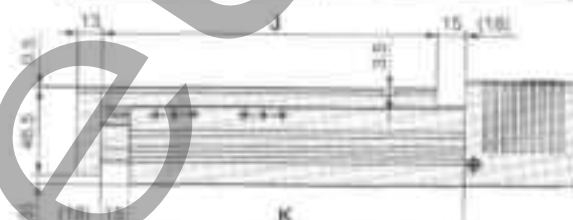
F-M5 Thread 10 Deep

Ø4H9/10 5 Deep  
Ø4H9/10 5 Deep  
D=Ø5 Through-hole  
Cross section C-C



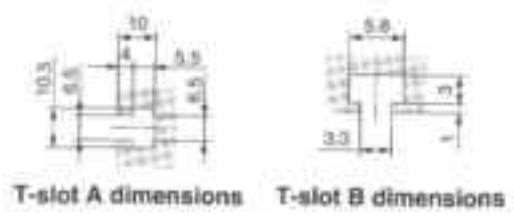
Motor wire(300mm)  
Photo micro sensor wire(300mm)

I shows the location at which origin point switch operates.



Cross section C-C

Model	D	F	G	I	J	K	L	M	N
LXSH S -50	4	6	65	270	177	177	6	50	66
LXSH S -75	4	6	75	295	200	200	6	47	66
LXSH S -100	4	8	66	300	227	227	6	47	76
LXSH S -125	4	8	70	345	252	252	6	47	85
LXSH S -150	6	8	75	370	277	277	6	47	86



T-slot A dimensions T-slot B dimensions

Made To Order

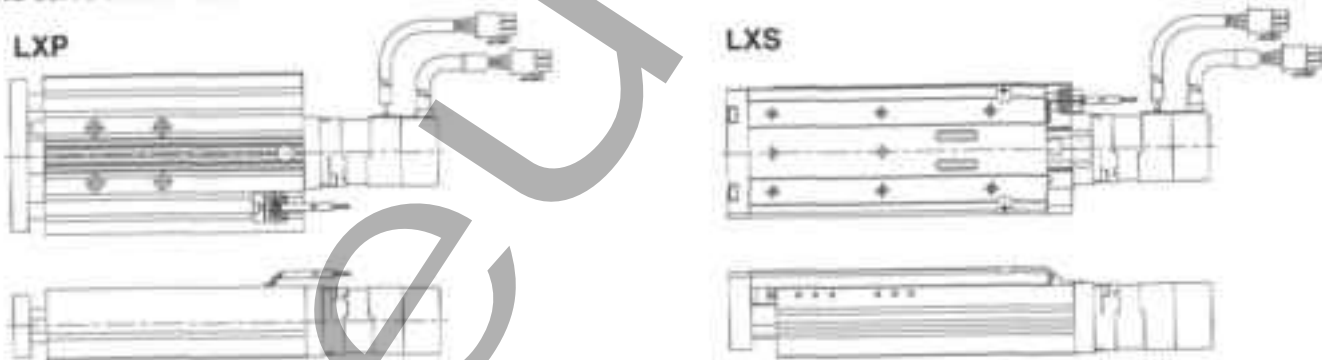
AC Servo Motor Specifications

Reference No.	Manufacturer	Power supply voltage for driver unit	Brake	Motor part number	Driver unit part number	Applicability			
						LXP	LXP	LXS	
1	Toshiba Sanki	100VAC	Without	TS4501N	None	—	Applicable	Applicable	
2			With	TS4501N		—	Applicable	Applicable	
3		200VAC	Without	TS4501N		—	Applicable	Applicable	
4			With	TS4501N		—	Applicable	Applicable	
5	Panasonic (Mitsubishi Electric Industrial Company Ltd.)	100VAC	Without	MSM2AZ21A	MSS2A121P	Applicable	—	—	
6		200VAC	Without	MSM2AZ21A	MSS2A321P	Applicable	—	—	
7		100VAC	Without	MSM2AZP1A	MSS2A1P1E	—	Applicable	Applicable	
8			With	MSM2AZP1B	MSS2A1P1E	—	Applicable	Applicable	
9		200VAC	Without	MSM2AZP1A	MSS2A3P1E	—	Applicable	Applicable	
10			With	MSM2AZP1B	MSS2A3P1E	—	Applicable	Applicable	
11		Mitsubishi Electric	100VAC	Without	HC-PQ03	MR-C10A1	—	Applicable	Applicable
12				With	HC-PQ03B	MR-C10A1	—	Applicable	Applicable
13			200VAC	Without	HC-PQ03	MR-C10A	—	Applicable	Applicable
14				With	HC-PQ03B	MR-C10A	—	Applicable	Applicable
15	Yaskawa Electric	100VAC	Without	SQME-A3B12	SQDE-A3BP	—	Applicable	Applicable	
16			With	SQME-A3B12B	SQDE-A3BP	—	Applicable	Applicable	
17		200VAC	Without	SQME-A3AF12	SQDE-A3AP	—	Applicable	Applicable	
18			With	SQME-A3AF12B	SQDE-A3AP	—	Applicable	Applicable	

Note 1) AC servo motor is basically available in combination with driver unit. However, in the case of Ref. No. 1 to 4, Series LC1 should be separately ordered due to unavailability of driver unit with AC servo motor. Please contact SMC for its part number when ordering due to special product.

Note 2) AC servo motor equipped model does not have motor cover.

AC servo motor model external view



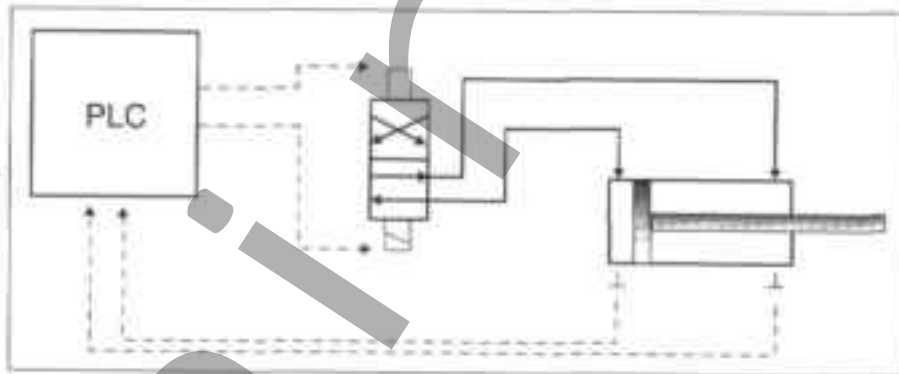
Series	Motor Manufacturer	Motor Output	Driver Voltage	Suffix	Typical part number
LXS	Mitsubishi	30W	100VAC	-X11	LXSHAB0-100SB-F3N2-X11
			200VAC	-X12	LXSHAB0-100SB-F3N2-X12
	Panasonic	30W	100VAC	-X15	LXSHAB0-100SB-F3N2-X15
			200VAC	-X16	LXSHAB0-100SB-F3N2-X16
	Toshiba	30W	100VAC	-X12	LXSHAB0-100SB-F3N2-X12
			200VAC	-X13	LXSHAB0-100SB-F3N2-X13
LXP	Mitsubishi	30W	100VAC	-X21	LXSHAB0-100SB-F3N2-X21
			200VAC	-X22	LXSHAB0-100SB-F3N2-X22
	Panasonic	30W	100VAC	-X15	LXSHAB0-100SB-F3N2-X15
			200VAC	-X16	LXSHAB0-100SB-F3N2-X16
	Toshiba	30W	100VAC	-X12	LXSHAB0-100SB-F3N2-X12
			200VAC	-X13	LXSHAB0-100SB-F3N2-X13
Yaskawa	30W	100VAC	-X21	LXSHAB0-100SB-F3N2-X21	
		200VAC	-X22	LXSHAB0-100SB-F3N2-X22	

## Different Actuator Operation Methods

DC stepper motor actuators and AC servo motor actuators are not that different from familiar pneumatic cylinders and actuators. Electric actuators give you more control and precision, and in return they require more explicit instructions than pneumatic actuators. Compare the basic differences in the illustrations below.

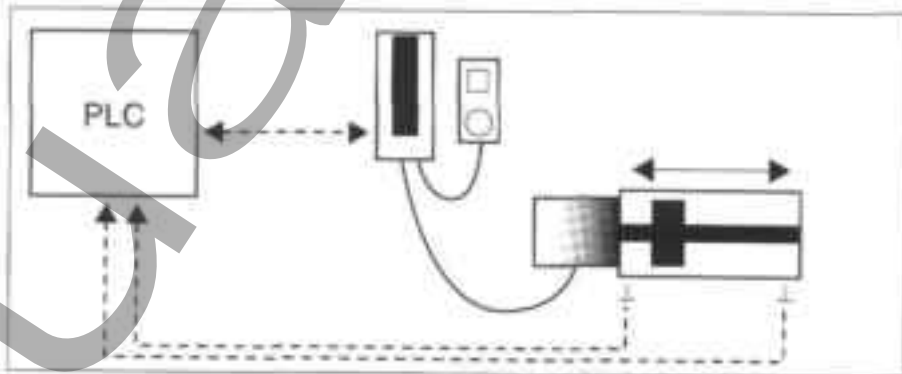
### Pneumatic System

The PLC is programmed to turn the outputs on or off based on the various inputs. In this example there is an output to each solenoid on the pneumatic valve, and 2 inputs from the auto-switches on the cylinder, for a total of four I/O points. The solenoid valve directs the air pressure to move the cylinder piston, and the auto-switches tell whether the rod is extended or retracted.



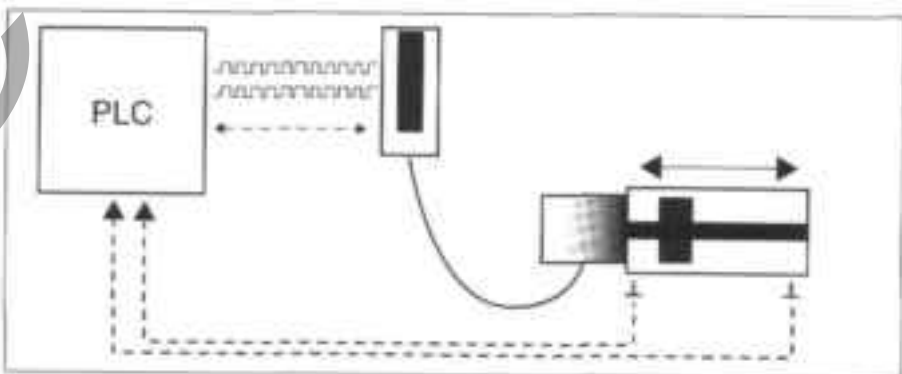
### DC Stepper System (LC6C)

The Valve and tubing are replaced with a driver and wiring. The PLC is programmed like before, but the driver is also pre-loaded (using a teaching pendant) with different moves, speeds, and acceleration rates. The PLC then uses I/O to tell the driver which moves to make, and the driver reports back when it's done. This gives you multi-point positioning and speed control of your actuator.



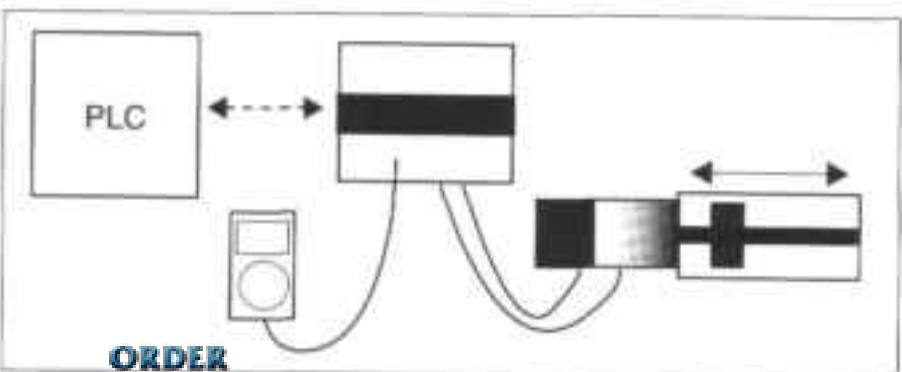
### DC Stepper System (LC6C)

Here too, the valve and tubing are replaced with a driver and wiring. This time the PLC is programmed to send out quick pulses instead of steady ON or OFF I/O. Most PLCs have high-speed pulse outputs built in, and plug-in cards are available too. This lets you take total control over the actuator by pulsing the motor clockwise and counter-clockwise for your moves.



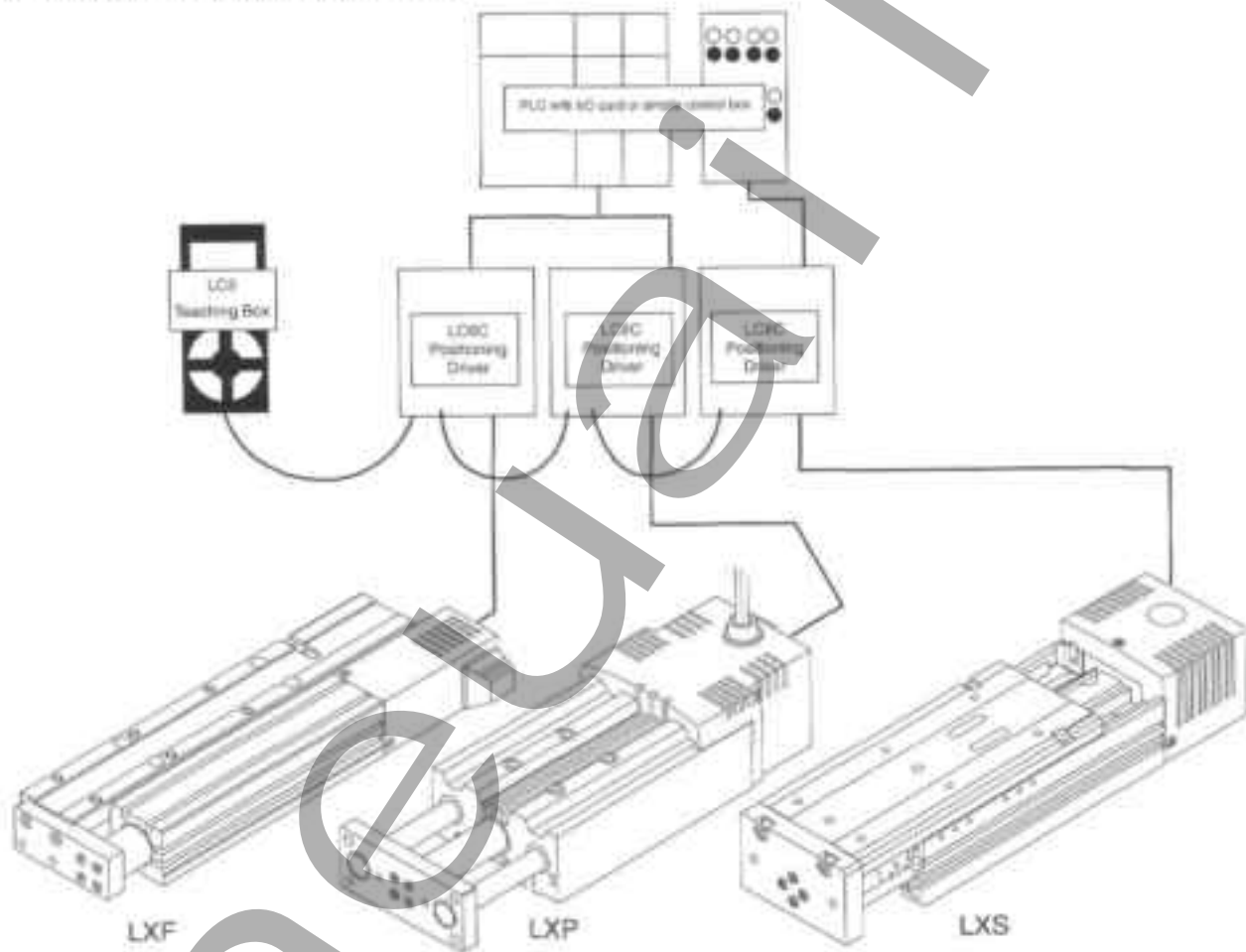
### AC Servo System

The AC servo system uses a driver like the DC stepper system (LC6C) above, but also has a controller for automatic acceleration, position, & velocity control. You preload positions, speeds, and routines into the controller, and then use the PLC to run them. The driver uses the controller instructions to turn the motor, and the encoder tells the controller the current position. SMC's LC7 is both a controller and driver in one.



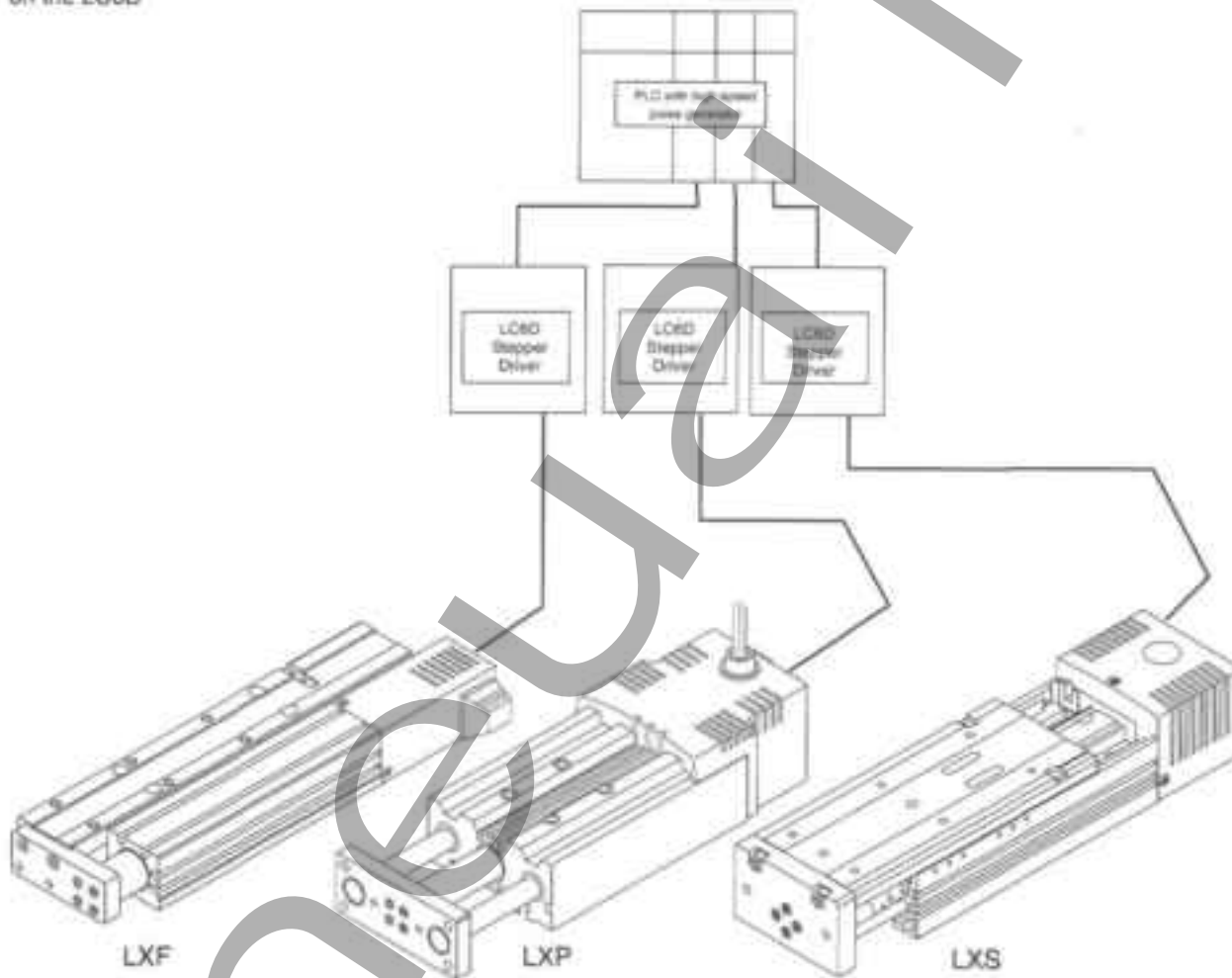
### LX Control Methods - LC6C

The LC6C is a easy to use yet full function positioning driver for 2-phase LX series actuators. Simply pre-program up to 28 incremental or absolute moves and 8 speed profiles using the LC5 teaching box. Then select amove using a control box or I/O from your PLC. The LC6C automatically moves the LX the desired amount, and gives an "all done" output when complete. To make things easier, up to sixteen LC6C drivers can be preset at once using a single LC5 teaching box. See page 40 for more information on the LC6C.



## LX Control Methods - LC6D

The LC6D is a basic DC stepper motor driver designed especially for 2-phase and 5-phase LX series actuators. LC6D takes a pulse signal from the PLC counter or other source and excites the motor in full or half steps. The LC6D features photo-coupler I/O isolation, an automatic current reduction when the motor is stopped, and an on-demand power down feature to disengage the motor. The LC6D is rated for a 50% duty cycle. 100% duty cycle micro-stepping drivers are available for this series from Sanyo Denki America\* or Applied Motion Products\*\*. See page 45 for more information on the LC6D.



\* Contact Sanyo Denki America at (734)414-8640 for information on their PMM-MD-53031-10 series driver

\*\* Contact Applied Motion Products at (800) 525-1609 for information on their S3540 series driver/indexer.

# Series LC6C

# Positioning Driver Unit for Series LX

Positioning Driver Unit for Series LX Actuators

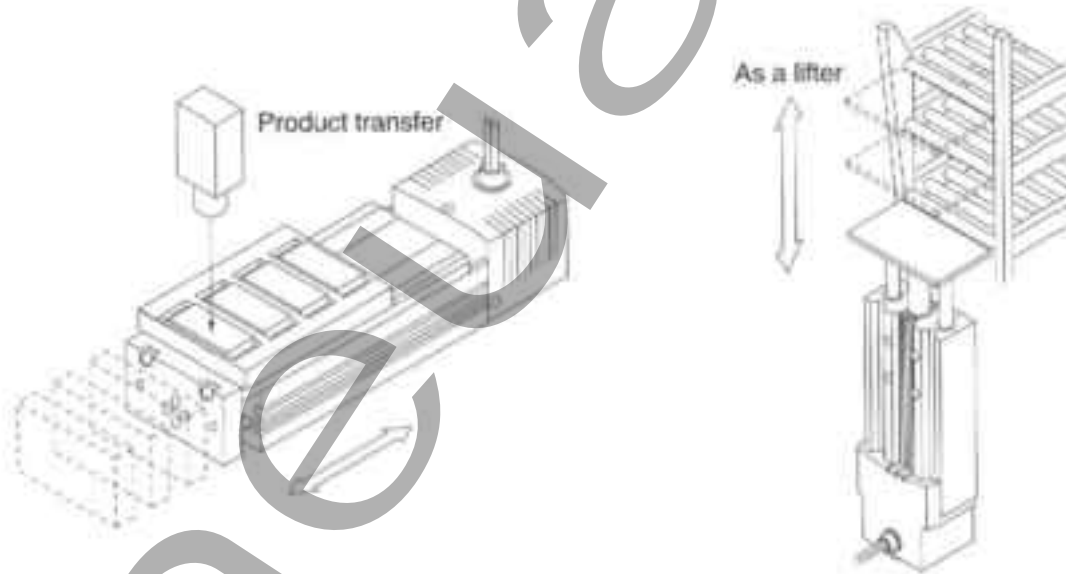
## Series LC6C Positioning Driver

- Driver LC6D has built-in pulse control function
- Position information can be set up to a maximum of 28 points
- Point movement can be easily accomplished with a PLC, etc.
- Compatible with Series LX electric actuator 2-phase stepping motor

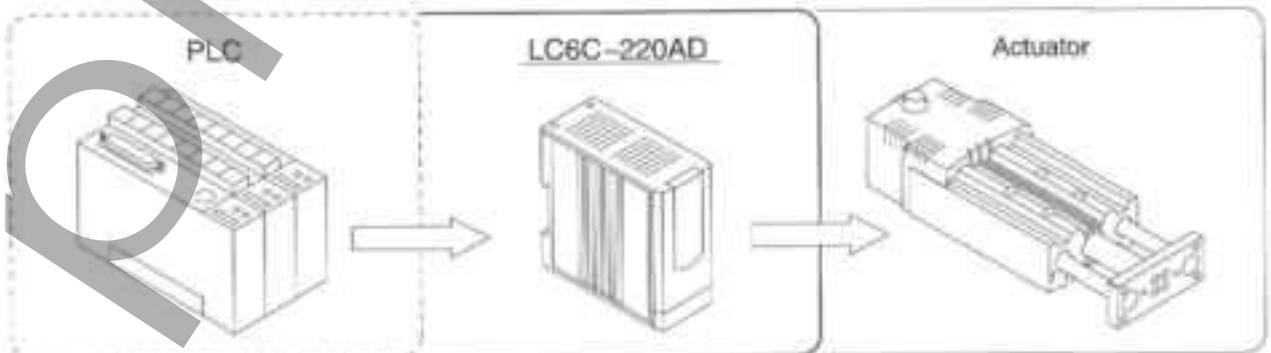


## Application examples

Can be used in operation patterns like these.

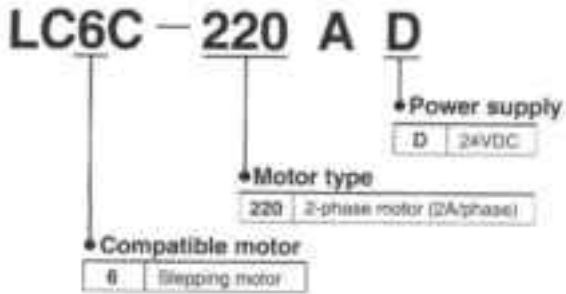


## System configuration



To be provided by customer:

How to Order



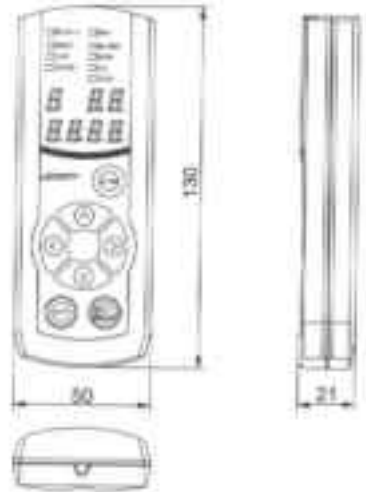
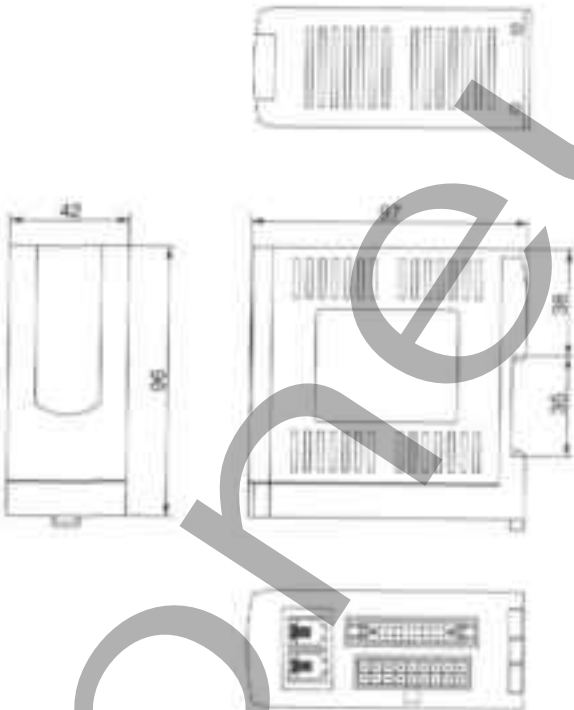
Specifications

Compatible actuator	LXPE200-00000
Power supply	24VDC ± 10% Max. 3.0A
Number of setting positions	26 points
Position setting method	Setting with dedicated teaching box (LC5-1-T1-02)
Position control method	Absolute and incremental moves Speed: 6 to 20 mm/s (with lead screw lead of 12mm)
Input signal capacity	Optically isolated input 24VDC Max. 6mA
Output signal capacity	Optically isolated output Max. 30VDC or less Max. 20mA
Parameter setting	Position data setting, Speed acceleration setting, etc.
Indication LED	LED for power supply, LED for alarm
Operating temperature	5 to 40°C

Dimensions

LC6C-220AD

Dedicated teaching box  
LC5-1-T1-02





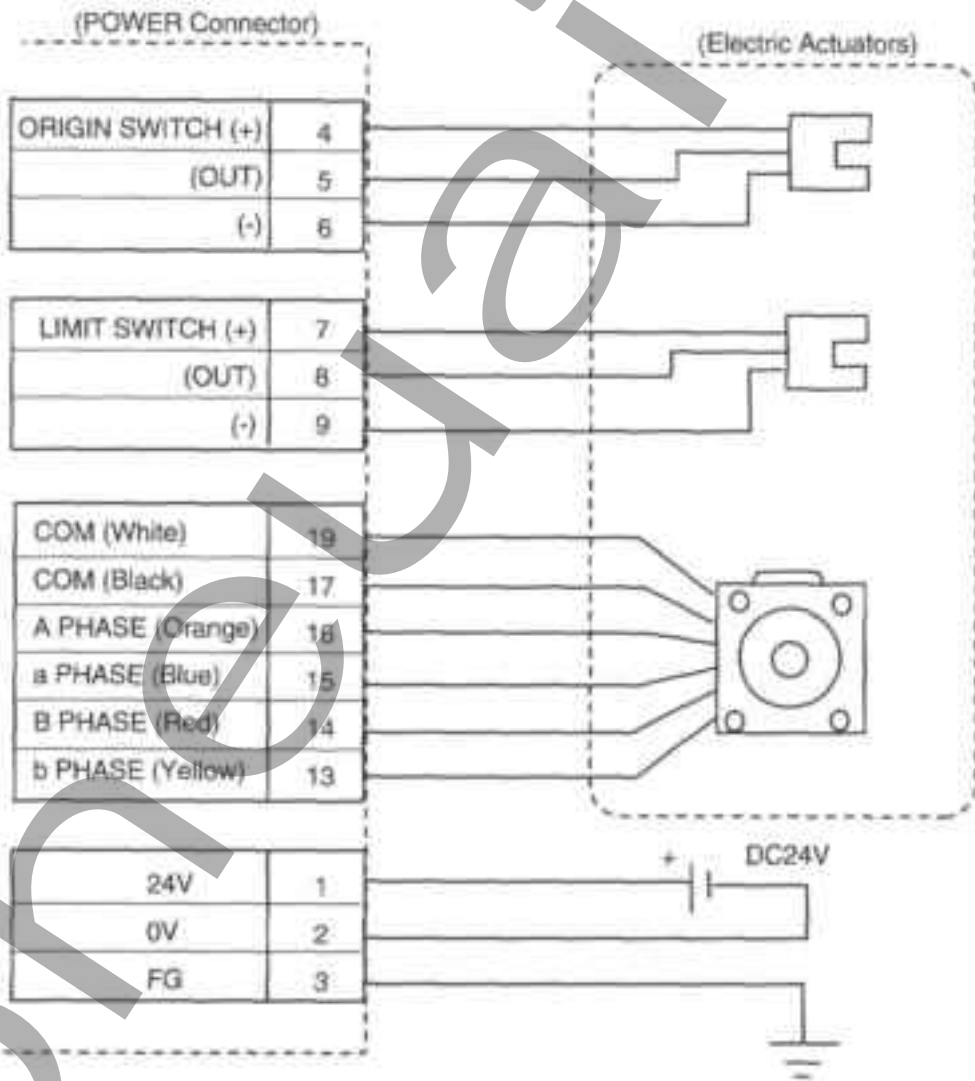
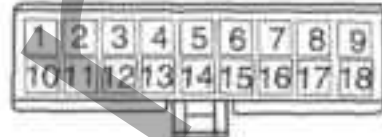
Connecting Example

Series LC6C

Connecting Example

• Power Connector

Molex Inc. part number 39-01-2180 (receptacle), 39-00-0039 (pins). Uses crimp tool 11-01-0014 and pin extraction tool number 11-03-0044.

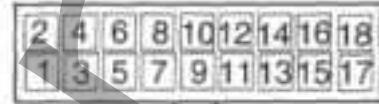


Series LC6C

Connecting Example

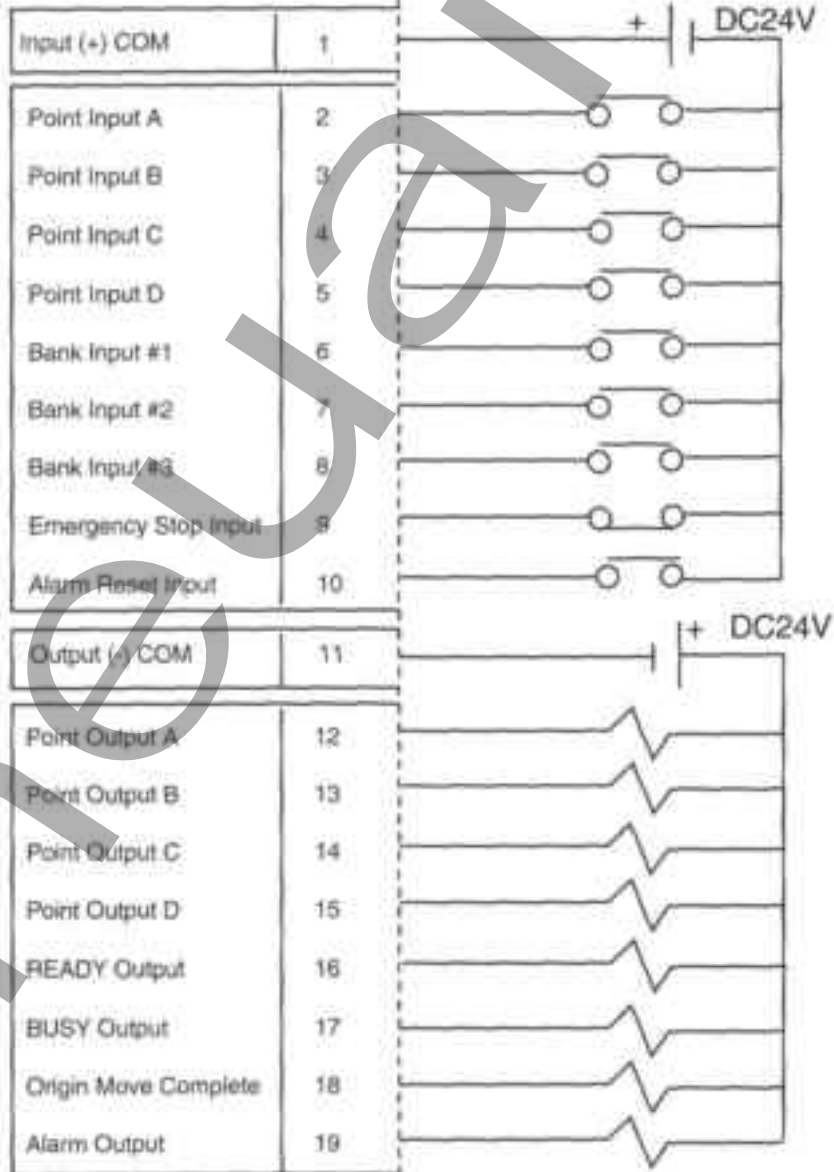
• Interface Connector

Omron part number XG4M-2030



▲ Note) Viewed from cable side not PIN side.

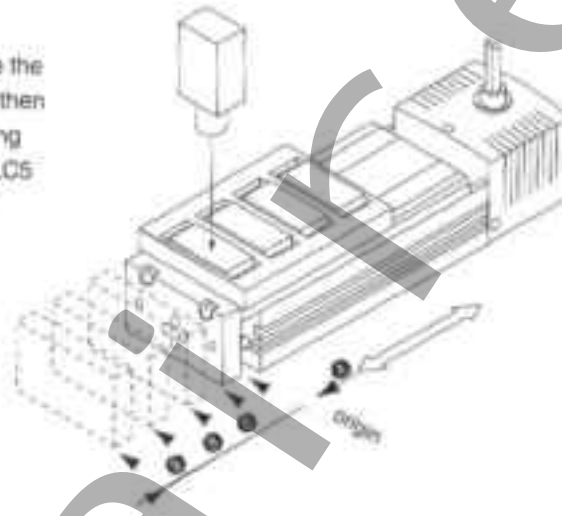
(Interface Connector)



### Program Example

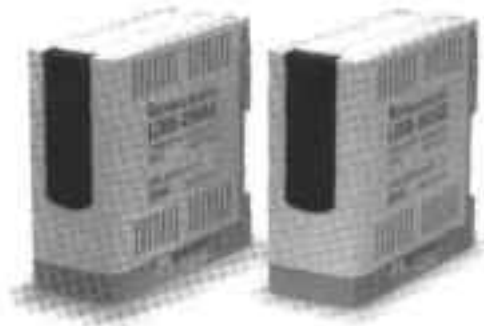
#### LC6C Program Example LXS Work Transfer

Below is an example of a work-transfer program. Move the actuator out 800 pulses to inspect the first work piece, then increment out 1,000 pulses three times for the remaining three work pieces and finally return to home. Use the LC5 teaching box to preset the LC6C with the position and speed/acceleration information.



#	Operation	LX/LC6C Actions & Reactions
1	Initialize	<ol style="list-style-type: none"> <li>OV to Emergency Stop input.</li> <li>No alarm output should be on.</li> </ol>
2	Move actuator to origin/home.	<ol style="list-style-type: none"> <li>Set bank 1, 2, &amp; 3 inputs off.</li> <li>Set point A input on.</li> <li>Busy output is on while actuator homes.</li> <li>Busy output turns off, and origin return output turns on.</li> <li>Set point A input off, and point A output turns off.</li> </ol>
3	Load 4 work pieces	
4	Move from home to point A (800 pulses)	<ol style="list-style-type: none"> <li>Set bank 1 input on, 2 &amp; 3 off.</li> <li>Set point A input on.</li> <li>Busy output is on while actuator moves.</li> <li>Busy output turns off; point A output turns on.</li> <li>Set point A input off, and point A output turns off.</li> </ol>
5	First work piece is inspected.	
6	Move from present position to next piece (increment + 1,000 pulses).	<ol style="list-style-type: none"> <li>Set bank 1 input on, 2 &amp; 3 off.</li> <li>Set point B input on.</li> <li>Busy output is on while actuator moves.</li> <li>Busy output turns off; point B output turns off.</li> <li>Set point B input off, and point B output turns off.</li> </ol>
7	Repeat steps 5 and 6 three more times.	
8	Return to home.	<ol style="list-style-type: none"> <li>Set bank 1, 2, &amp; 3 inputs off.</li> <li>Set point A input on.</li> <li>Busy output is on while actuator homes.</li> <li>Busy output turns off, and origin return output turns on.</li> <li>Set point A input off, and point A output turns off.</li> </ol>
9	Return to step #2 to repeat.	

How to Order



LC 6 D - 2 20 A D

Corresponding motor  
 6 Stepping motor

Driver power supply  
 24VDC

Function  
 D Driver function only

Input/output  
 A Photo coupler type

Phase number of corresponding motor  
 2 2-phase  
 5 5-phase

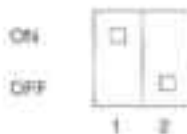
Motor rated voltage  
 07 0.75A/phase  
 20 2.0A/phase

\*07 corresponds to 5-phase type  
 \*20 corresponds to 2-phase type

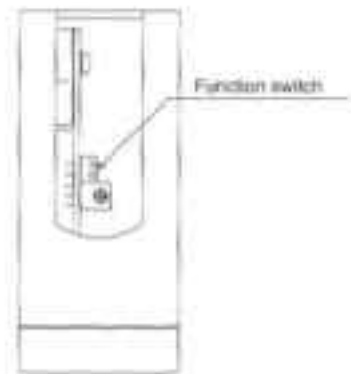
Specifications

	LC6D-220AD	LC6D-007AD
Power supply	24VDC±10% 3A	24VDC±10% 2.5A
Excitation (Step angle)*	Full step (1.8°) Half step (0.9°)	Full step (0.72°) Half step (0.36°)
Motor current	2.0A/phase	0.75A/phase
Input signal	Photo coupler input (Input impedance 300Ω)	
Max. input frequency	10kHz at Full step 20kHz at Half step	
Function**	Auto current down*, Power down input	
Connecting method	Connector	
Ambient temperature	5 to 40°C	
Ambient humidity	35 to 85% (No dewing)	
Corresponding actuator	LXSH2S LXPB2S	LXPH5S LXSH5S LXPB5S

\*Set by function change switch. Product is set as shown below when shipped from factory.



- 1. ON: Excitation/Half step
- 2. OFF: Auto current down function

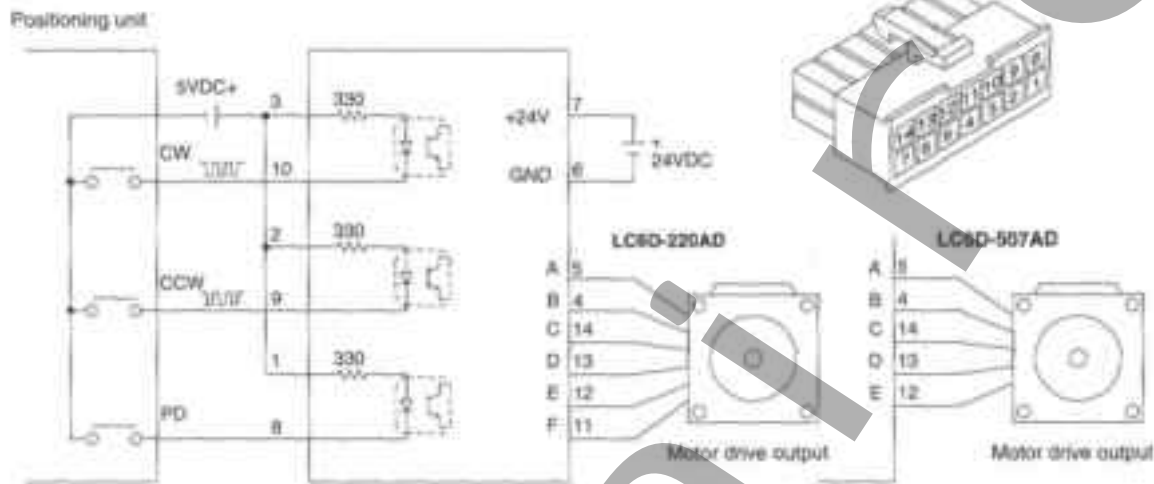


	ON	OFF
1	Half step	Full step
2	Release	Setting

\*\*Function:  
 Auto current down: Function to automatically reduce 50% of current output to motor when stopped.  
 Power down input: Current flow to motor is shut down by this input, and motor goes to non-excitation.

Connecting Example and Dimensions

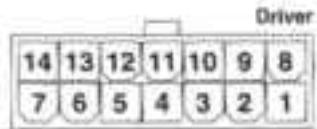
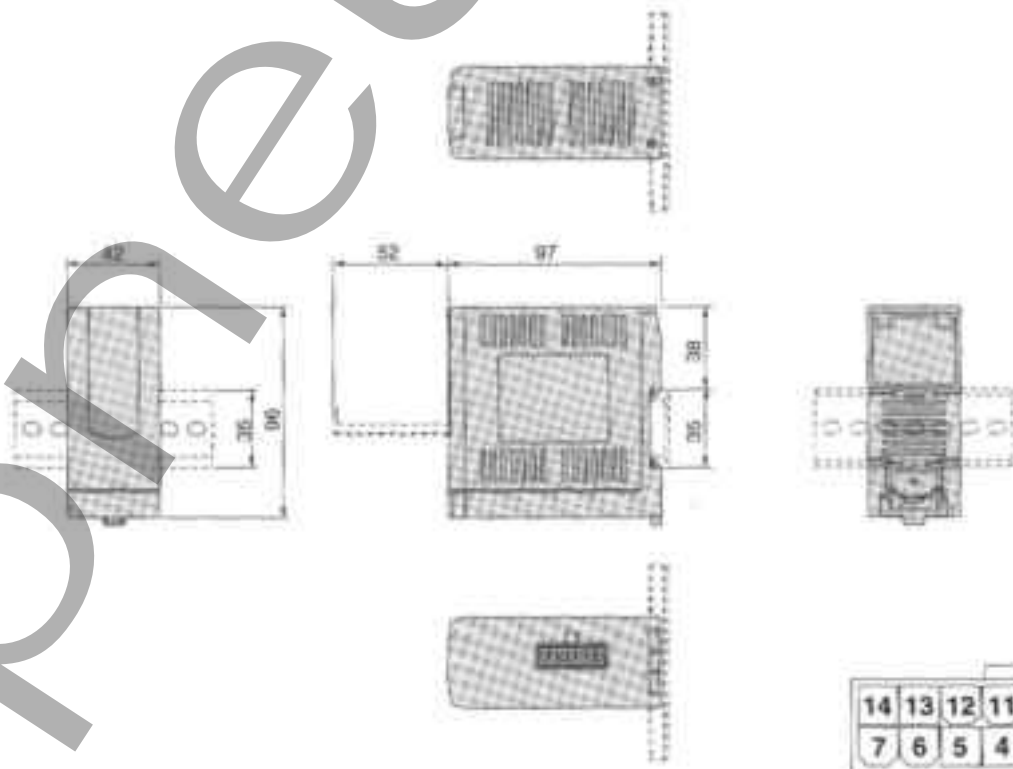
Connecting example



Signal code	Function	Pin
+24V	Driver power supply +24V	7
GND	Driver power supply ground	6
CW+	CW pulse input terminal (+)	3
CW-	CW pulse input terminal (-)	10
CCW+	CCW pulse input terminal (+)	2
CCW-	CCW pulse input terminal (-)	9
PD+	Power down input terminal (+)	1
PD-	Power down input terminal (-)	8

Signal code	Function	Pin
A	Motor drive output A	5
B	Motor drive output B	4
C	Motor drive output C	14
D	Motor drive output D	13
E	Motor drive output E	12
F	Motor drive output F (*LC6D-507AD* only)	11

Dimensions





Applicable auto switch

Model	Auto switch	Specifications	Electrical entry	
LXF	Solid state auto switch	D-F9N	Grimblet	In-line
LXP		D-F9P		
LXS		D-F9B	2 wire	

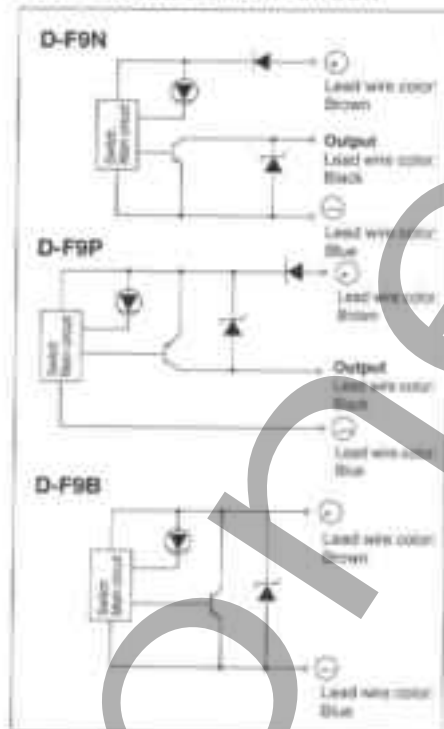
\*All the solid state auto switches are equipped with indicator light.

Auto switch specifications

Part number	Output	Power supply	Load voltage	Load current	Internal voltage drop	Leak current	Application
D-F9N	NPN	10DC to 28V	28VDC or less	50mA or less	0.4V or less	10 mA or less at 24VDC	24VDC Relay PLC
D-F9P	PNP		—		1.5V or less		
D-F9B	—	—	24VDC (10 to 28VDC)	5 to 30mA	4.5V or less	1 mA or less at 24VDC	

- \*Lead wire—OH (polyester) heavily insulated cable,  $\phi 0.7, 0.15mm^2 \times 3$  wire (brown, black, blue) or 0.15mm<sup>2</sup>  $\times 2$  wire (brown, blue)
- \*Insulation resistance—20M $\Omega$  or more at 25VDC (Between lead case and cable)
- \*Withstand voltage—1,000 VAC for 1 min. (Between lead case and cable)
- \*Ambient temperature—10 to 55°C \*Operating time—1 ms or less
- \*Switch resistance—100 $\Omega$  or less (100%)

Auto switch internal circuit



Auto switch dimensions

D-F9N/D-F9P/D-F9B



Part No.	L (mm)
D-F9N	22
D-F9P	26.5
D-F9B	26.5

How to mount auto switch

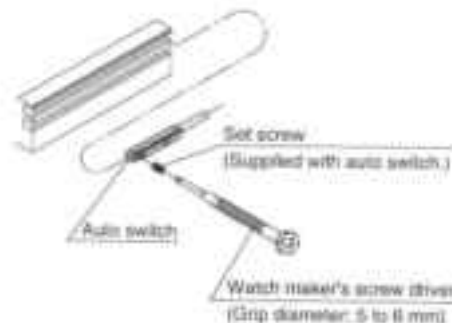
**Caution**

Auto switch mounting tool

Use switch maker's screw driver with a grip diameter of 5 to 6 mm to tighten the set screw which is delivered with auto switch.

Tightening torque

The tightening torque should be 0.05 to 0.15Nm.

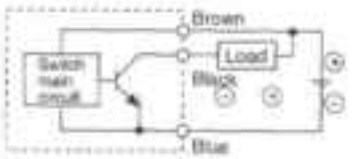


### Solid State Switch Connection and Example

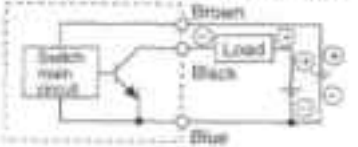
#### Basic wiring

##### 3 wire NPN

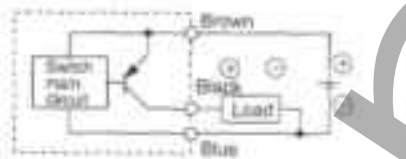
(When power source for switch and load is common)



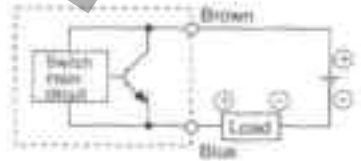
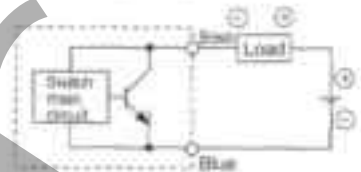
(When power source for switch and load is not common)



##### 3 wire PNP

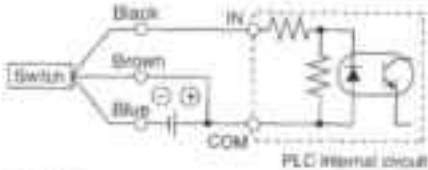


##### 2 wire



#### Typical PLC (sequence controller) connection circuits

##### 3 wire NPN/Sink input

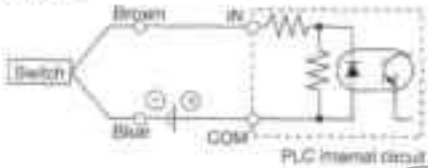


##### 3 wire PNP/Source input

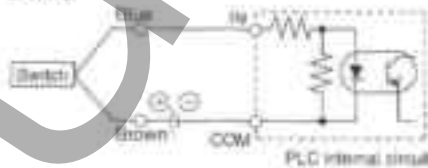


Connect according to the input specification of PLC because the connection method varies with the input specification of PLC.

##### 2 wire



##### 2 wire

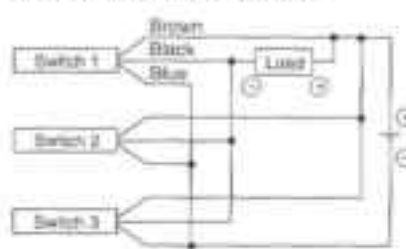


#### AND(serial), OR(parallel) connection examples

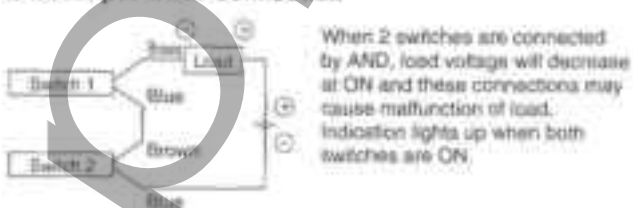
##### 3 wire NPN/AND connection



##### 3 wire NPN/OR connection

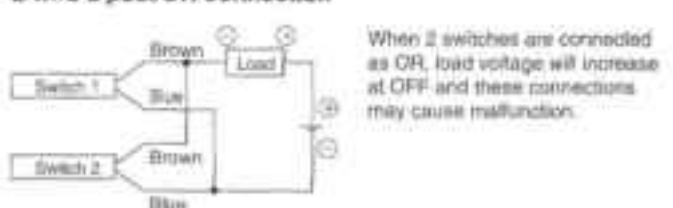


##### 2 wire 2 pcs./AND connection



When 2 switches are connected by AND, load voltage will decrease at ON and these connections may cause malfunction of load. Indication lights up when both switches are ON.

##### 2 wire 2 pcs./OR connection



When 2 switches are connected as OR, load voltage will increase at OFF and these connections may cause malfunction.

$$\begin{aligned} \text{Load voltage at ON} &= \text{Supply voltage} - \text{Residual voltage} \times 2 \text{ pcs.} \\ &= 24\text{V} - 4\text{V} \times 2 \text{ pcs.} \\ &= 16\text{V} \end{aligned}$$

Example) Supply voltage 24VDC  
Switch internal voltage drop 4V

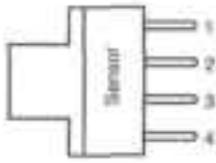
$$\begin{aligned} \text{Load voltage at OFF} &= \text{Leakage current} \times 2 \text{ pcs.} \times \text{Load impedance} \\ &= 1\text{mA} \times 2 \text{ pcs.} \times 3\text{k}\Omega \\ &= 6\text{V} \end{aligned}$$

Example) Load impedance 3kΩ  
Switch leakage current 1mA

Standard photo micro sensor for origin point

Specifications

Supply voltage	5VDC to 24VDC $\pm 10\%$ , Ripple(p-p) 10% or less
Power consumption	35mA or less
Controlled output	5VDC to 24VDC, Load current(Ic) 100mA, Residual voltage 0.8V or less 5VDC to 24VDC, Load current(Ic) 40mA, Residual voltage 0.4V or less
Ambient temperature	Operation: -25 to +55°C (At holding: -30 to 80°C)
Ambient humidity	Operation: 5 to 85%RH (At holding: 5 to 95%RH)



Terminal positioning

1	Brown	Vcc	(+)
2	White	L*	
3	Black	OUTPUT	
4	Blue	DND(OV)	(-)


\*ON while light is shaded, if "L\*" terminal and "4" terminal are shorted, it changed to ON while light is passed.

Output level circuit

Operating condition of output transistor	ON while light is passed	ON while light is shaded
Output circuit	<p>* In the case of use in voltage output, resistor should be installed at "RL" and use "load 2". Refer to the page for the criterion of resistor.</p>	
Time chart	<p>(L*~4* short circuit)</p> <p>ON while light is passed: Light ON (Red) ON, Light OFF (Red) OFF, Output Transistor ON, OFF, Load 1 (Relay) Operate, Return, Load 2 H, L</p>	<p>(L*~4* Open circuit)</p> <p>ON while light is shaded: Light ON (Red) OFF, Light OFF (Red) ON, Output Transistor ON, OFF, Load 1 (Relay) Operate, Return, Load 2 H, L</p>



# Common Terms Related to Electric Actuators

2-Phase Motor, 5-Phase Motor	A five-phase motor runs much smoother than a two-phase motor because it has two more magnetic poles than a two-phase motor does. This means there is less torque ripple or vibration from resonance. However, actuators with five-phase motors have slightly lower payload ratings than those with two-phase motors.
Ball Screw	Both ball screws and slide screws consist of a rolling contact on a lead screw. For ball screws, the rolling contact is a housing with recirculating ball bearings inside. The lead screw has machined grooves for the ball bearings to roll in. SMC offers two types of ball screw: a ground type (higher precision, higher cost) and a rolled type (lower precision, lower cost).
Closed Loop Control System	A closed loop control system is a system that utilizes a feedback device (encoder, resolver, and so on) to enhance performance of the system by providing better acceleration and speed capabilities, as well as better system stability. The closed loop control system also provides assurance that the programmed position is actually achieved. See also Open Loop Control System.
Duty Cycle	Duty cycle is the variation of torque or speed or both with time during a specified operating cycle. The LCB stepper driver has a duty cycle of 50%, regardless of actuator load. Also, LCB continuous operation may not exceed thirty seconds. Continuous operation is defined as the time from when the slider begins to move until it stops moving (not just pauses at stroke end). $\text{duty cycle} = \frac{\text{run time}}{\text{run time} + \text{stopped time}} \times 100$
Full Step	A full step is a logic pattern that will produce one unit of incremental motion from a stepper motor (the increments being determined by the stepper motor structure). For example, SMC's 5-phase LX actuator motors are divided into 500 steps. Thus, one pulse in full step mode equals $(360^\circ \div 500) = 0.72^\circ$ of shaft rotation. See also Stepping.
Half Step	A half step is the unit of incremental motion that is 1/2 the basic motion step. SMC's 2-phase LX actuator motors are divided into 200 steps. Each pulse in half step mode equals $0.9^\circ$ of rotation. See also Stepping.
Indexer	An indexer is the part of a stepper motor controller that retains the motion command data to determine the move sequence, such as a single move or a series of moves that are stored in "memory", available for continuous positioning tasks. SMC's LCB does not have this feature.
Input Frequency	The LCB driver's input signal is a square wave pulse. The internal circuit can only "listen to" a certain number of these wave cycles per second. These are listed in terms of kilohertz, meaning "thousand cycles." 
Linear Guide	A crossed roller linear guide bearing offers twice the load-carrying capability of a ball bearing guide, making it ideal for applications needing high precision, high rigidity, high repeatability, and low friction.
Linearity	Linearity is a measure of the degree to which the output of a control device maintains a constant relationship to the input over a range of input values.
Loop, Open or Closed	In motion control, these terms are used to describe a system having some sort of speed or position feedback (to compare to the original commands): SMC's electric actuators equipped with DC stepper motors are open loop, that is, there is no feedback other than auto-switches. SMC's AC servo electric actuators are closed loop if an application has irregular or unpredictable loads, a closed-loop system may be desirable over an open-loop one. See also Closed Loop Control System, Open Loop Control System.
Micro-Step	The subdivision of a full-step into some finer increment than the half-step. A micro step is a logic patterns that will produce regular increments smaller than a half step. Micro-stepping is a function of the driver; SMC's LCB driver does not have this feature.
Open Loop Control System	An open loop control system is a system that utilizes the stepper motor inherent positioning capabilities to provide precise positioning. There is no position confirmation feedback from the motor itself. See also Closed Loop Control System.
Servo	A servo system is a control system that employs feedback in order to control a desired output such as speed or position. A servo mechanism will detect and attempt to correct deviations from the desired output. Servo systems can offer higher speed, torque, and acceleration flexibility than step motor systems. Also, a servo is a closed-loop system, providing position and velocity feedback, whereas stepper motors are open loop systems.
Slide Screw	Slide screws are simpler than ball screws. The lead screw and rolling contact are machined with a trapezoidal pitch, and are in direct contact when moving. Slide screws give worse positioning repeatability, but are much less expensive than ball screws.
Stepper Motor	The stepper motor is the device that accepts the translated electrical current from the stepper driver and converts it to actual incremental motion; stepper motors are inexpensive, simple to position, and offer high torque and good resolution, but no position feedback.
Stepping	Stepping is the process of supplying a proper logic pattern of drive signals that cause the stepper motor driver to supply the required stepper motor windings with current at appropriate times to create incremental motion. Full-stepping, half-stepping, and micro-stepping are a function of the stepper motor driver, and not the motor itself. See also Full Step, Half Step, Micro Step.