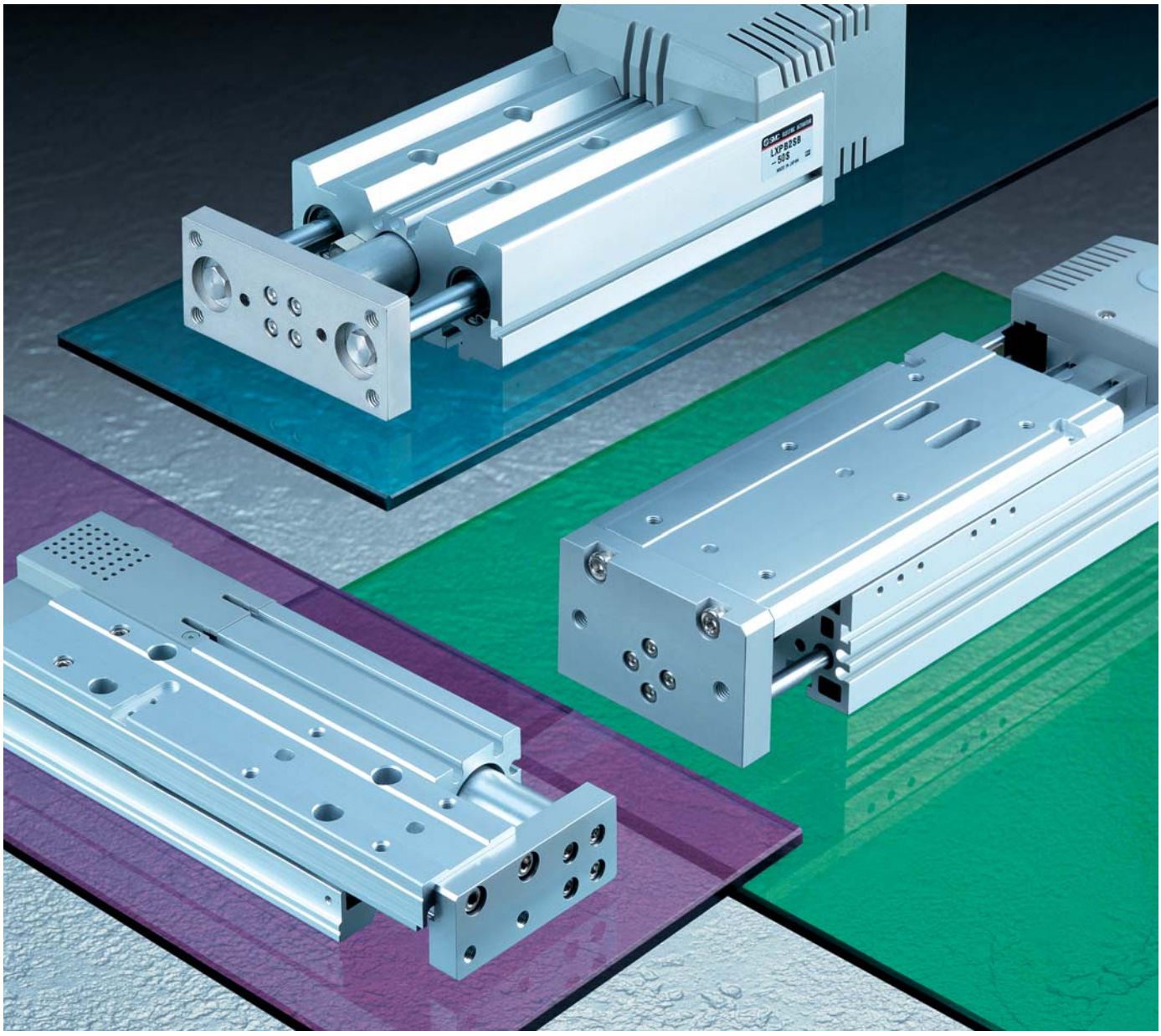
CAT.EMC-LX/LC6D-01-UK

SMC®

Electric Actuators
Series LX/LC6D

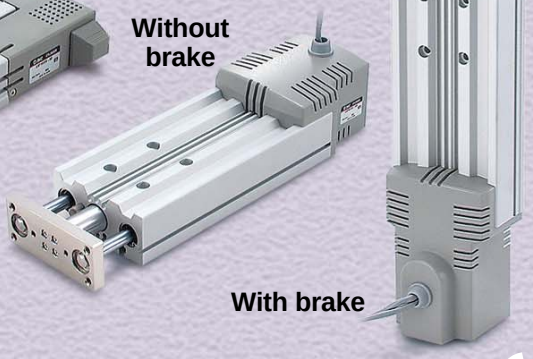


Short Stroke Electric Actuator *Series LX*

Stepper motor

Low Profile Slide Table
Series LXF P. 1

Guide Rod Type
Series LXP P. 5

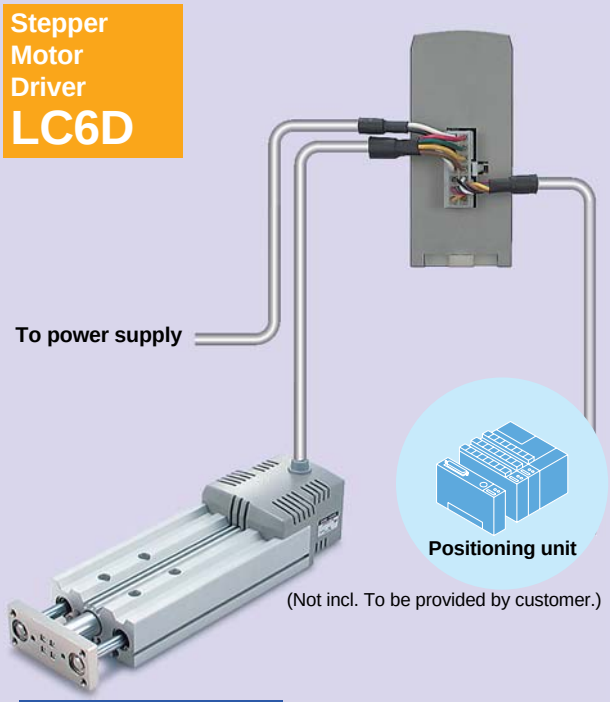


High Rigidity Slide Table Type
Series LXS P. 9

Low Particulate Generation Specification P. 13
Series LXF
Series LXP
Series LXS

Stepper Motor Driver
Series LC6D
P. 26

Stepper Motor Driver
LC6D



CE

Series LX

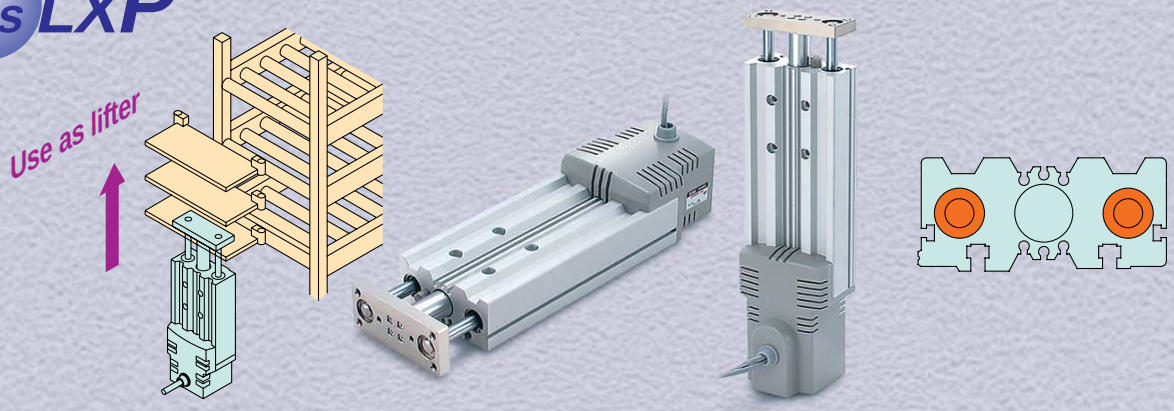
Short Stroke Type with Three Guide Variations

Series LXF

Low profile slide table type with stepper motor

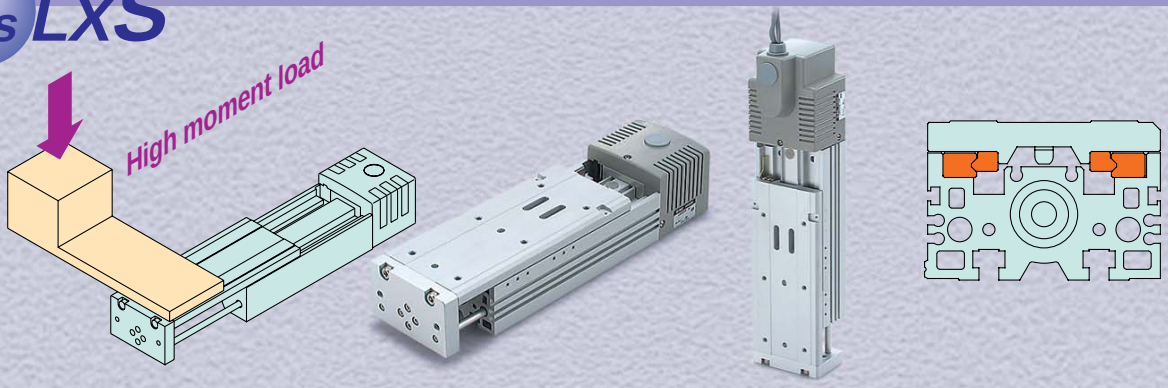
Series LXP

Guide rod type with stepper motor

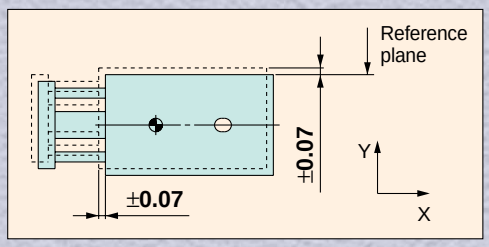


Series LXS

High rigidity slide table type with stepper motor



Improved body mounting accuracy: ±0.07 mm



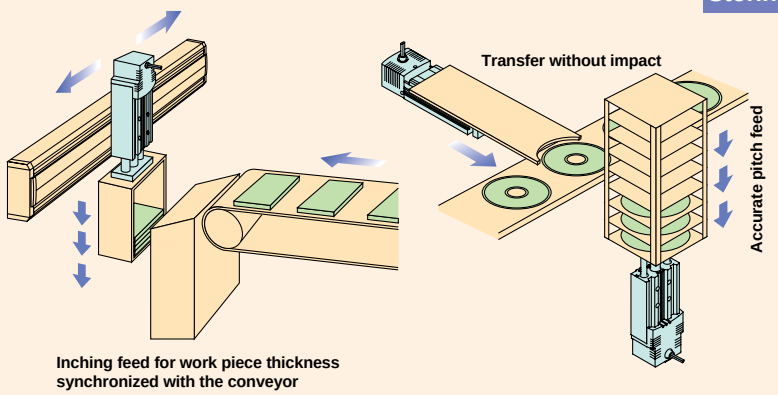
An NC machined reference plane and positioning pin hole provided on each series body improves the repeatability of actuator body mounting.

Variations

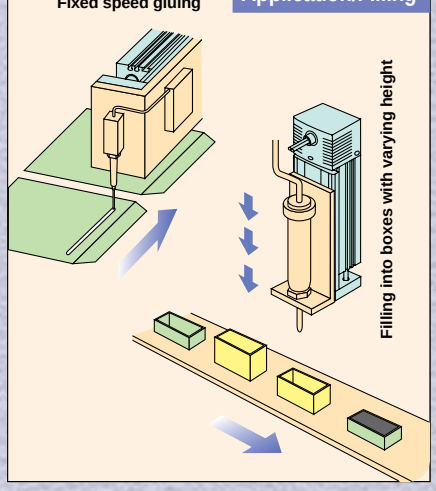
Series	Motor type (Stepper motor)	Guide type	Mounting orientation	Lead screw type	Sensor	Made to order
LXF	5 phase	Direct acting guide	Horizontal	Ball screw Slide screw	Auto switch Proximity switch	Low particulate generation specification
LXP	2 phase 5 phase	Ball bushing	Horizontal Vertical		Auto switch	
LXS		High rigidity direct acting guide			Auto switch Proximity switch	

Applications

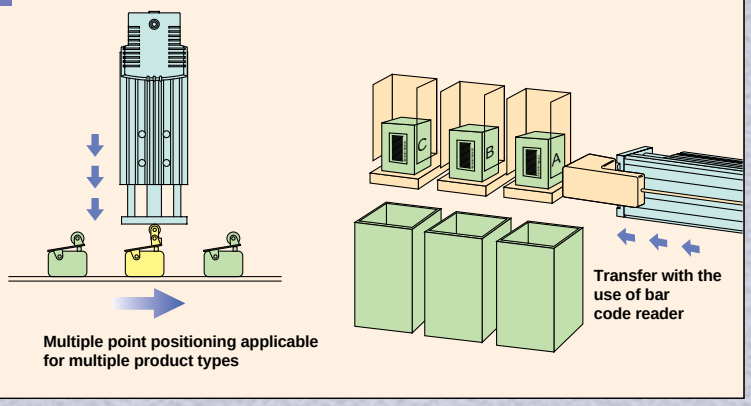
Storing



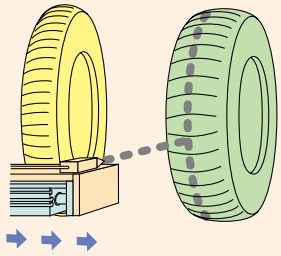
Application/Filling



Testing



Marking



Simplified Selection Flow Chart

Short Stroke Type Electric Actuator *Series LX* (Stepper Motor)

Series	Low particulate generation	Brake	Work load kg	Maximum speed mm/s	Positioning repeatability mm	Lead screw	Guide type	Motor Manufacturer
Low profile slide table type **Series LXF** 	—	Without motor brake	2	200	±0.05	Slide screw	Direct acting guide	Sanyo Denki Co., Ltd.
	●		3	30	±0.03	Ball screw		
	●			80				
	—			100	±0.05	Slide screw		
Guide rod type **Series LXP**  	—	Without motor brake	2	200	±0.05	Slide screw	Ball bushing guide	Sanyo Denki Co., Ltd.
	—		3	200				
	—		4	100				
	●		6	30	±0.03	Ball screw		
	●			80				
	●							
	●							
	—			100	±0.05	Slide screw		
	—	With motor brake	2	200	±0.05	Slide screw		
	—		3	200				
	—		4	100				
	●		5	30	±0.03	Ball screw		
	●			80				
	●							
	●							
	—			100	±0.05	Slide screw		
High rigidity slide table type **Series LXS**  	—	Without motor brake	3	200	±0.05	Slide screw	High rigidity direct acting guide	Sanyo Denki Co., Ltd.
	—		4.5	200				
	—		6	100				
	—		9	100				
	●		10	30	±0.03	Ball screw		
	●			80				
	●							
	●							
	—	With motor brake	1	200	±0.05	Slide screw		
	—		2	200				
	—			100				
	—		4	100				
	●		5	30	±0.03	Ball screw		
	●			80				
	●							
	●							

Phases	Standard stroke (mm) and Maximum speed (mm/s)								Model
	25	50	75	100	125	150	175	200	
5 phase		to 200							LXFH5SB
5 phase		to 30							LXFH5BC
5 phase		to 80							LXFH5BD
5 phase		to 100							LXFH5SA
5 phase			to 200						LXPB5SB
2 phase			to 200						LXPB2SB
5 phase			to 100						LXPB5SA
2 phase			to 30						LXPB2BC
5 phase			to 30						LXPB5BC
2 phase			to 80						LXPB2BD
5 phase			to 80						LXPB5BD
2 phase			to 100						LXPB2SA
5 phase			to 200						LXPB5SB-□B
2 phase			to 200						LXPB2SB-□B
5 phase			to 100						LXPB5SA-□B
2 phase			to 30						LXPB2BC-□B
5 phase			to 30						LXPB5BC-□B
2 phase			to 80						LXPB2BD-□B
5 phase			to 80						LXPB5BD-□B
2 phase			to 100						LXPB2SA-□B
5 phase				to 200					LXSH5SB
2 phase				to 200					LXSH2SB
5 phase				to 100					LXSH5SA
2 phase				to 100					LXSH2SA
5 phase				to 30					LXSH5BC
2 phase				to 30					LXSH2BC
5 phase				to 80					LXSH5BD
2 phase				to 80					LXSH2BD
5 phase				to 200					LXSH5SB-□B
2 phase				to 200					LXSH2SB-□B
5 phase				to 100					LXSH5SA-□B
2 phase				to 100					LXSH2SA-□B
5 phase				to 30					LXSH5BC-□B
2 phase				to 30					LXSH2BC-□B
5 phase				to 80					LXSH5BD-□B
2 phase				to 80					LXSH2BD-□B

Slide screw option

LX F H 5 S □ — 50 S — M9N 1 — Q

CE marking

Actuator configuration

F	Flat table type

Guide type

H	Direct acting guide

Motor type

5	5 phase stepper motor

Lead screw type

S	Slide screw

Lead screw lead

A	6mm
B	12mm

Stroke

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

Home position switch

Nil	None
S	Yes (cable length 0.3m)

Number of auto/proximity switches

1	1 pc.
2	2 pcs.
⋮	⋮
6	6 pcs.

When using both auto and proximity switches, list the proximity switch part number after the autoswitch part number.
Example) M9N1G2

Auto switch type

Symbol	Model	Wiring/ Output type	Lead wire length (m)	Contact
Nil	Without autoswitch			
M9N	D-M9N	3 wire/NPN	0.5	N.O. (A contact)
M9P	D-M9P	3 wire/PNP	0.5	N.O. (A contact)
F9G	D-F9G	3 wire/NPN	0.5	N.C. (B contact)
F9H	D-F9H	3 wire/PNP	0.5	N.C. (B contact)
F9GL	D-F9GL	3 wire/NPN	3	N.C. (B contact)
F9HL	D-F9HL	3 wire/PNP	3	N.C. (B contact)
M9B	D-M9B	2 wire	0.5	N.O. (A contact)
M9NL	D-M9NL	3 wire/NPN	3	N.O. (A contact)
M9PL	D-M9PL	3 wire/PNP	3	N.O. (A contact)
M9BL	D-M9BL	2 wire	3	N.O. (A contact)

Proximity switch type

Symbol	Model	Wiring/ Output type	Lead wire length (m)	Contact
GN	With sensor rail, without proximity switch			
G	GXL-8F	3 wire/NPN	1	N.O. (A contact)
GD	GXL-8FI	3 wire/NPN	1	N.O. (A contact)
GB	GXL-8FB	3 wire/NPN	1	N.C. (B contact)
GDB	GXL-8FIB	3 wire/NPN	1	N.C. (B contact)
GU	GXL-8FU	2 wire/solid state	1	N.O. (A contact)
GUB	GXL-8FUB	2 wire/solid state	1	N.C. (B contact)

Ball screw option

LX F H 5 B □ — 50 S — GD 1 — Q

CE marking

Actuator configuration

F	Flat table type

Guide type

H	Direct acting guide

Motor type

5	5 phase stepper motor

Lead screw type

B	Ball screw

Lead screw lead

C	2mm
D	5mm

Stroke

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

Home position switch

Nil	None
S	Yes (cable length 0.3m)

Number of proximity switches

1	1 pc.
2	2 pcs.
⋮	⋮
6	6 pcs.

Proximity switch type

Symbol	Model	Wiring/ Output type	Lead wire length (m)	Contact
GN	With sensor rail, without proximity switch			
G	GXL-8F	3 wire/NPN	1	N.O. (A contact)
GD	GXL-8FI	3 wire/NPN	1	N.O. (A contact)
GB	GXL-8FB	3 wire/NPN	1	N.C. (B contact)
GDB	GXL-8FIB	3 wire/NPN	1	N.C. (B contact)
GU	GXL-8FU	2 wire/solid state	1	N.O. (A contact)
GUB	GXL-8FUB	2 wire/solid state	1	N.C. (B contact)

Specifications

Motor	5 phase stepper (without brake)			
Lead screw	Slide screw ø8mm		Ball screw ø8mm	
Lead (mm)	6	12	2	5
Position repeatability	± 0.05mm		± 0.03mm	
Speed (mm/s) Note1	6 to 100	12 to 200	2 to 30	5 to 80
Work load horizontal (kg) Note2	3(2)	2(2)	3(2)	3(2)
Guide type	Direct acting guide			
Operating temperature range °C	5 to 40 (with no condensation)			
Home position switch	Photo micro sensor EE-SX672 (Refer to page 36)			
Applicable driver	LC6D-507AD-Q / LC6D-507AD-P1-X316			
CE marking accesories	Holding plate: MB1 (1 pc.) Phillips countersunk head screw M3 x 6L (1 pc.) Phillips binding head screw: M3 x 4L (2 pc.), Toolhed lock washer M3 (2 pc.) Binding Band: T18S (1 pc.)			
Body Weight				
Standard stroke	25	50	75	100
Weight (kg)	0.8	1.0	1.1	1.2

Note 1) As vibration may increase with slower speed, it is advised that a minimun motor speed of 1rps is used (e.g 6mm/s for 6mm lead).

Note 2) When mounting a work piece on the actuator's end plate, the max workload should be that specified between the ().

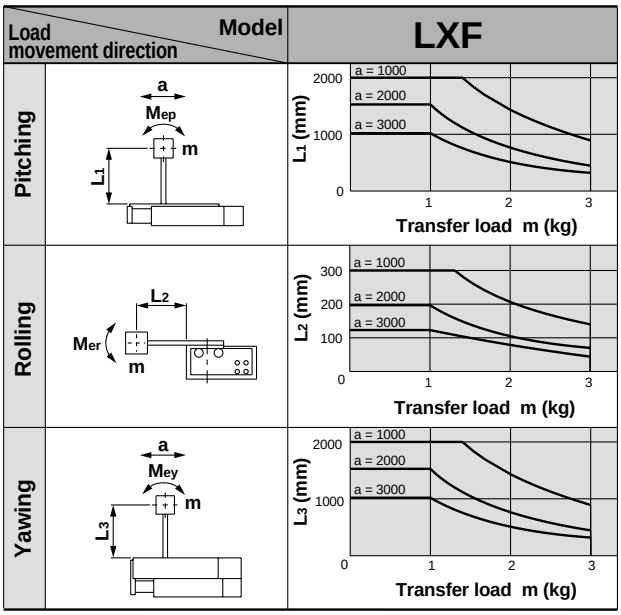
Allowable Moment (N·m)

Allowable static moment

Pitching	4
Rolling	3
Yawing	4

m : Transfer load (kg)
L : Overhang to work piece centre of gravity (mm)
a : Work piece acceleration (mm/sec²)
Me: Dynamic moment

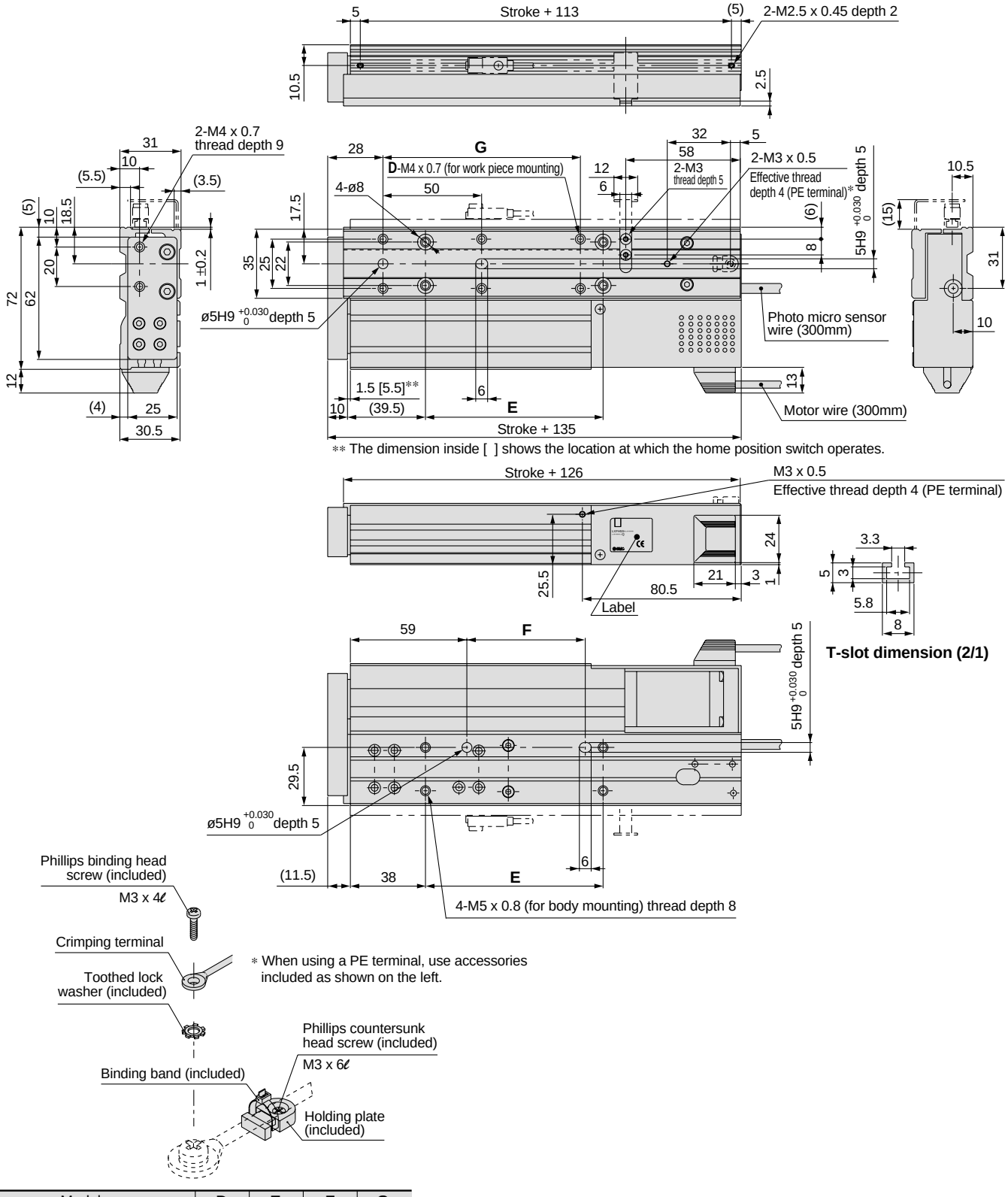
Allowable dynamic moment



Refer to page 25 for deflection data.

Dimensions/LXFH5

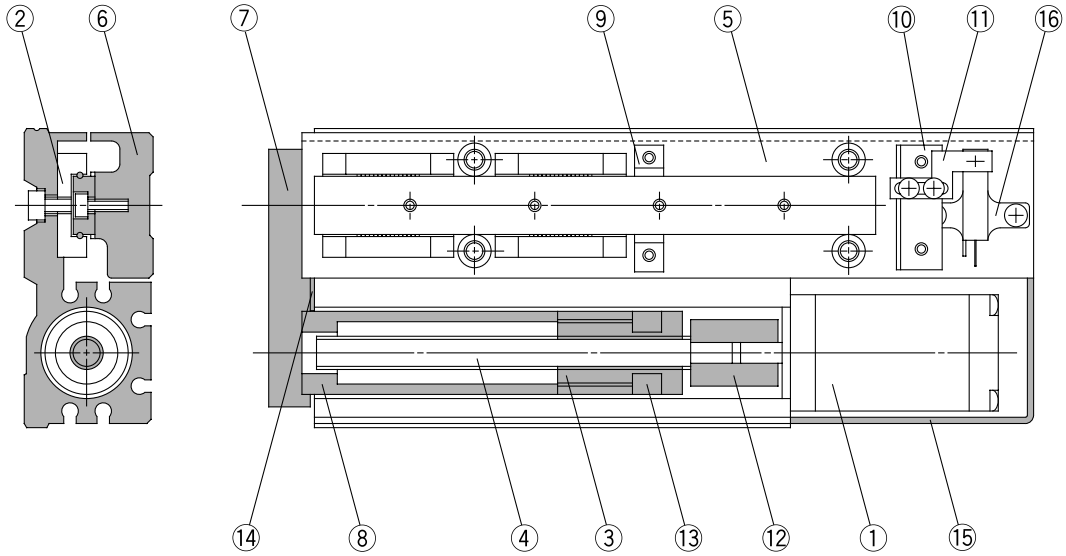
Scale: 35%



Model	D	E	F	G
LXFH5□□-25	4	60	30	(50)
LXFH5□□-50	4	90	60	(50)
LXFH5□□-75	6	90	60	100
LXFH5□□-100	6	90	60	100

Construction

Series LXF



Parts list

No.	Description	Material	Note
1	**Motor**	——	
2	**Direct acting guide**	——	
3	**Nut**	Resin/Alloy steel	
4	**Rolled 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**	——	

Parts list

No.	Description	Material	Note
10	**Stopper B**	Aluminum alloy	
11	**Sensor plate**	Mild steel	Chromated
12	**Coupling**	Aluminum alloy	
13	**Magnet**	——	
14	**Bumper**	Rubber	
15	**Motor cover**	Resin	
16	**Photo micro sensor**	——	

Slide screw option

LX P B □ S □ — 100 S B — M9N 1 — Q

Actuator configuration

P	Guide rod type

Guide type

B	Ball bushing

Motor type

2	2 phase stepper motor
5	5 phase stepper motor

Lead screw type

S	Slide screw

Lead screw lead

A	6mm
B	12mm

Stroke

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

Brake

Nil	Without brake
B	With brake

Home position switch

Nil	None
S	Yes (cable length 0.3m)

CE marking

Number of auto switches

1	1 pc.
2	2 pcs.
⋮	⋮
6	6 pcs.

Auto switch type

Symbol	Model	Wiring/ Output type	Lead wire length (m)	Contact
Nil	Without autoswitch			
M9N	D-M9N	3 wire/NPN	0.5	N.O. (A contact)
M9P	D-M9P	3 wire/PNP	0.5	N.O. (A contact)
F9G	D-F9G	3 wire/NPN	0.5	N.C. (B contact)
F9H	D-F9H	3 wire/PNP	0.5	N.C. (B contact)
F9GL	D-F9GL	3 wire/NPN	3	N.C. (B contact)
F9HL	D-F9HL	3 wire/PNP	3	N.C. (B contact)
M9B	D-M9B	2 wire	0.5	N.O. (A contact)
M9NL	D-M9NL	3 wire/NPN	3	N.O. (A contact)
M9PL	D-M9PL	3 wire/PNP	3	N.O. (A contact)
M9BL	D-M9BL	2 wire	3	N.O. (A contact)

Ball screw option

LX P B □ B □ — 100 S B — M9N 1 — Q

Actuator configuration

P	Guide rod type

Guide type

B	Ball bushing

Motor type

2	2 phase stepper motor
5	5 phase stepper motor

Lead screw type

B	Ball screw

Lead screw lead

C	2mm
D	5mm

Stroke

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

Brake

Nil	Without brake
B	With brake

Home position switch

Nil	None
S	Yes (cable length 0.3m)

CE marking

Number of auto switches

1	1 pc.
2	2 pcs.
⋮	⋮
6	6 pcs.

Auto switch type

Symbol	Model	Wiring/ Output type	Lead wire length (m)	Contact
Nil	Without autoswitch			
M9N	D-M9N	3 wire/NPN	0.5	N.O. (A contact)
M9P	D-M9P	3 wire/PNP	0.5	N.O. (A contact)
F9G	D-F9G	3 wire/NPN	0.5	N.C. (B contact)
F9H	D-F9H	3 wire/PNP	0.5	N.C. (B contact)
F9GL	D-F9GL	3 wire/NPN	3	N.C. (B contact)
F9HL	D-F9HL	3 wire/PNP	3	N.C. (B contact)
M9B	D-M9B	2 wire	0.5	N.O. (A contact)
M9NL	D-M9NL	3 wire/NPN	3	N.O. (A contact)
M9PL	D-M9PL	3 wire/PNP	3	N.O. (A contact)
M9BL	D-M9BL	2 wire	3	N.O. (A contact)

Specifications

Motor		2 phase stepper motor (with/without brake)				5 phase stepper motor (with/without brake)			
Lead screw		Slide ø8mm		Ball ø8mm		Slide ø8mm		Ball ø8mm	
Lead (mm)		6mm	12mm	2mm	5mm	6mm	12mm	2mm	5mm
Position repeatability (mm)		±0.05	±0.05	±0.03	±0.03	±0.05	±0.05	±0.03	±0.03
Speed (mm/s) Note 1)		6 to 100	12 to 200	2 to 30	5 to 80	6 to 100	12 to 200	2 to 30	5 to 80
Work load (kg)	Horizontal Note 2)	6	3	6	6	4	2	6	6
	Vertical Note 2)	5	3	5	5	4	2	5	5
Guide type		Ball bushing							
Operating temperature range °C		5 to 40 (with no condensation)							
Home position switch		Photo micro sensor EE-SX673 (refer to page 36)							
Brake specifications (Electromagnetic brake)	Model	De-energized operating type							
	Static torque	0.1Nm or more							
	Rated voltage	24VDC ±5%							
	Power consumption	5W							
Applicable driver		LC6D-220AD-Q / LC6D-220AD-P1-X316				LC6D-507AD-Q / LC6D-507AD-P1-X316			
CE marking accessories		Holding plate: MB1 (1pc.) Phillips countersunk head screw M3 x 6L (1pc.) Phillips binding head screw: M3 x 4L (2pcs). Toothed lock washer M3 (2pcs). Binding band: T18S (1pc).							

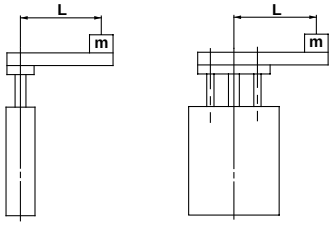
Body Weight								
Standard stroke		50	75	100	125	150	175	200
Weight (kg)	With brake	2.2	2.4	2.5	2.6	3.0	3.1	3.3
	Without brake	2	2.2	2.3	2.8	2.8	2.9	3.1

Note 1) As vibration may increase with slower speed, it is advised that a minimum motor speed of 1rps is used (e.g 6mm/s for 6mm lead).
Note 2) Based on the operating conditions, establish a separate guide when exceeding the maximum allowable lateral load.

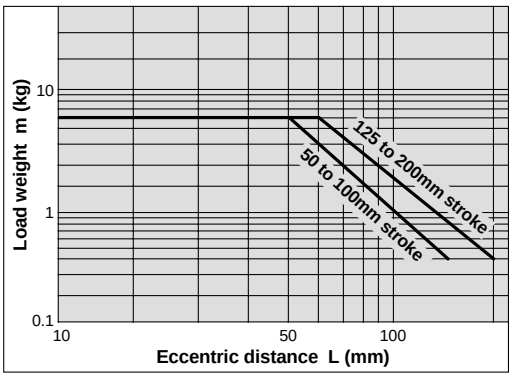
Allowable loads and moments for horizontal and vertical applications

Lifter Operation Range

This is the operating range for ball bushings.
Use within the allowable thrust range.



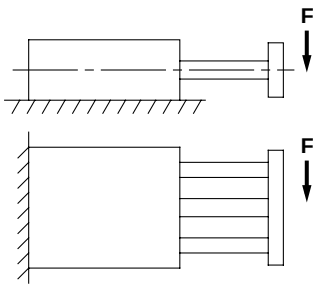
50 to 200mm stroke



Operating Conditions

Allowable lateral load (F)

Stroke	Load (N)
50	42
75	42
100	40
125	42
150	32
175	24
200	17



Allowable plate rotation torque (T)

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

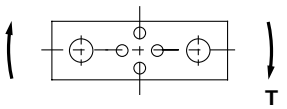
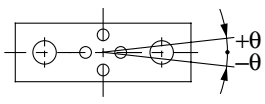


Plate non-rotating accuracy (θ)

Non-rotating accuracy (θ)
±0.09°



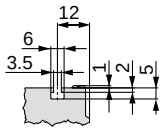
Refer to page 25 for deflection data.

Dimensions/LXPB $\frac{2}{5}$

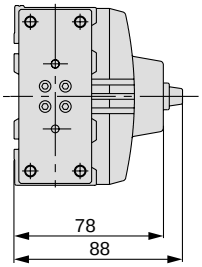
**When two dimensions are shown,
the top dimensions is for 50 to 75 and 100mm stokes, and
the bottom dimension is for 125, 150, 175, and 200mm strokes.**

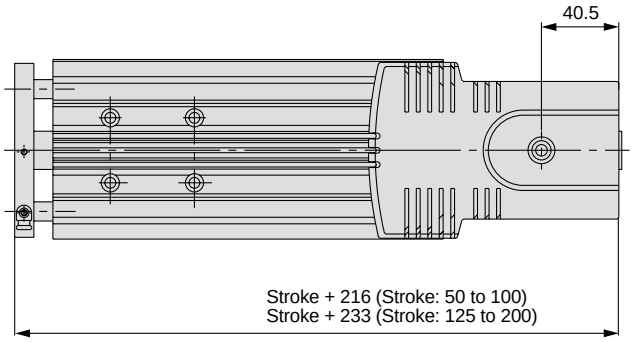
Scale: 25%

With brake

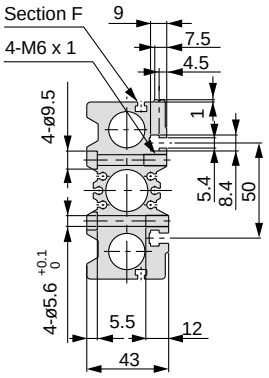


Section F detail
(Scale: 2/1)

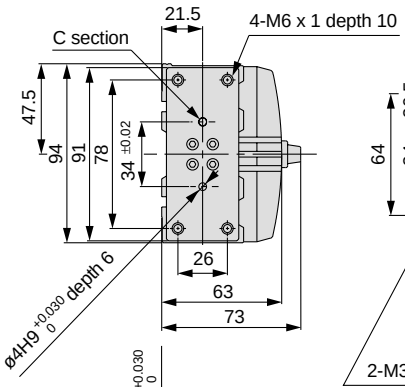


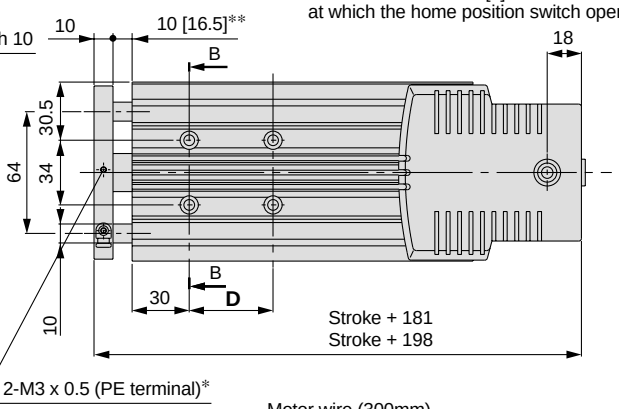


Without brake

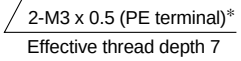


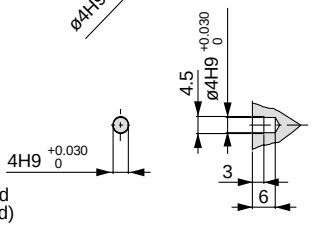
Cross section BB



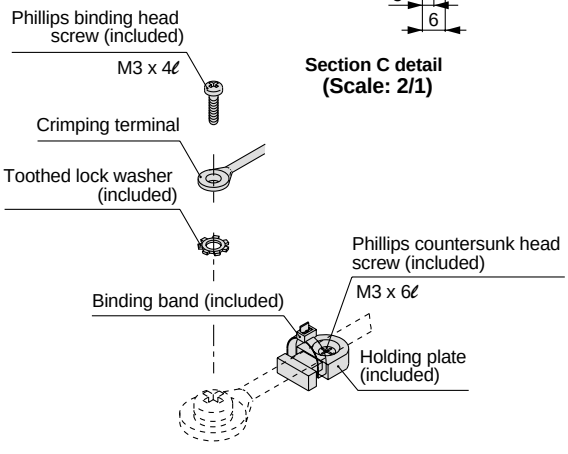


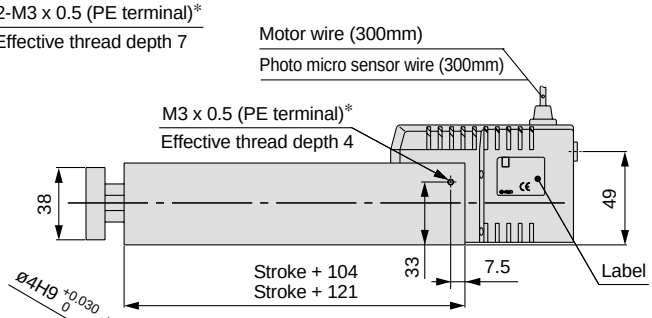
** The dimension inside [ ] shows the location at which the home position switch operates.

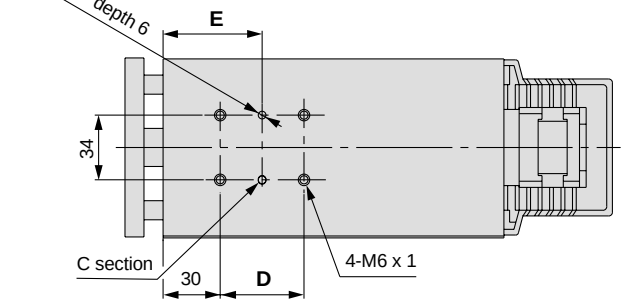




**Section C detail
(Scale: 2/1)**







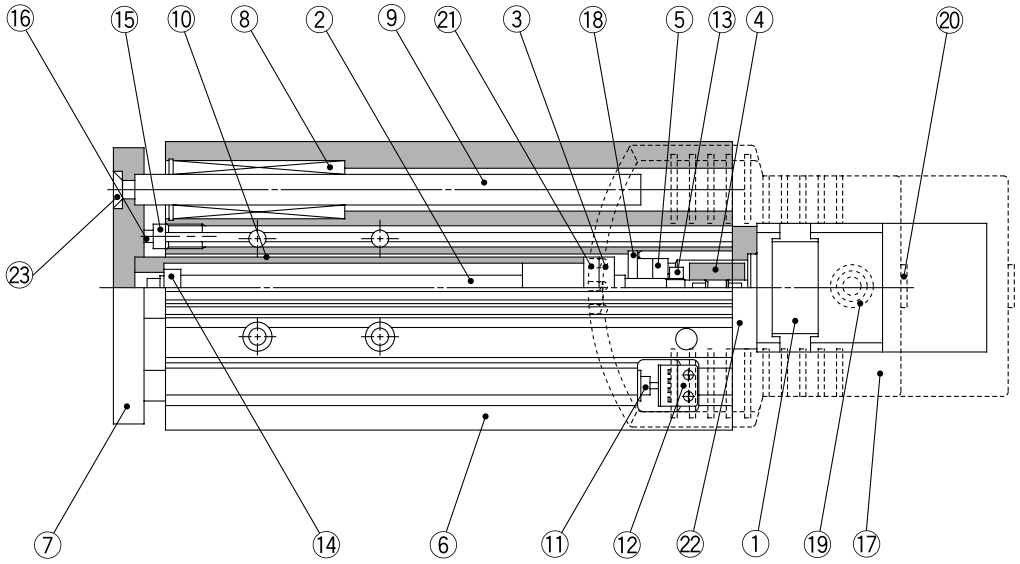
* When using a PE terminal, use accessories included as shown above.

(mm)

Model	D	E
LXPB□□□- 50	44	52
LXPB□□□- 75		
LXPB□□□-100		
LXPB□□□-125	120	90
LXPB□□□-150		
LXPB□□□-175		
LXPB□□□-200		

Construction

Series LXP



Parts list

No.	Description	Material	Note
1	**Motor**	——	Stepper motor
2	**Rolled screw**	Alloy steel	
3	**Nut**	Resin	
4	**Coupling**	——	
5	**Bearing**	——	
6	**Body**	Aluminum alloy	Anodized
7	**Mounting plate**	Mild steel	Nickel plated
8	**Ball bushing**	——	
9	**Guide rod**	Bearing steel	Chrome plated
10	**Tube**	Aluminum alloy	Anodized
11	**Sensor pin**	Stainless steel	

Parts list

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

Slide screw option

LX S H □ S □ — 100 S B — M9N 1 — Q

Actuator configuration

S	Slide table type

Guide type

H	Direct acting guide

Motor type

2	2 phase stepper motor
5	5 phase stepper motor

Lead screw type

S	Slide screw

Lead screw lead

A	6mm
B	12mm

Stroke

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

Home position switch

Nil	None
S	Yes (cable length 0.3m)

Brake

Nil	Without brake
B	With brake

CE marking

Number of auto switches

1	1 pc.
2	2 pcs.
⋮	⋮
6	6 pcs.

When using both auto and proximity switches, list the proximity switch part number after the autoswitch part number.
Example) M9N1G2

Auto switch type

Symbol	Model	Wiring/ Output type	Lead wire length (m)	Contact
Nil	Without autoswitch			
M9N	D-M9N	3 wire/NPN	0.5	N.O. (A contact)
M9P	D-M9P	3 wire/PNP	0.5	N.O. (A contact)
F9G	D-F9G	3 wire/NPN	0.5	N.C. (B contact)
F9H	D-F9H	3 wire/PNP	0.5	N.C. (B contact)
F9GL	D-F9GL	3 wire/NPN	3	N.C. (B contact)
F9HL	D-F9HL	3 wire/PNP	3	N.C. (B contact)
M9B	D-M9B	2 wire	0.5	N.O. (A contact)
M9NL	D-M9NL	3 wire/NPN	3	N.O. (A contact)
M9PL	D-M9PL	3 wire/PNP	3	N.O. (A contact)
M9BL	D-M9BL	2 wire	3	N.O. (A contact)

Proximity switch type

Symbol	Model	Wiring/ Output type	Lead wire length (m)	Contact
GN	With sensor rail, without proximity switch			
G	GXL-8F	3 wire/NPN	1	N.O. (A contact)
GD	GXL-8FI	3 wire/NPN	1	N.O. (A contact)
GB	GXL-8FB	3 wire/NPN	1	N.C. (B contact)
GDB	GXL-8FIB	3 wire/NPN	1	N.C. (B contact)
GU	GXL-8FU	2 wire/solid state	1	N.O. (A contact)
GUB	GXL-8FUB	2 wire/solid state	1	N.C. (B contact)

Ball screw option

LX S H □ B □ — 100 S B — M9N 1 — Q

Actuator configuration

S	Slide table type

Guide type

H	Direct acting guide

Motor type

2	2 phase stepper motor
5	5 phase stepper motor

Lead screw type

B	Ball screw

Lead screw lead

C	2mm
D	5mm

Stroke

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

Home position switch

Nil	None
S	Yes (cable length 0.3m)

Brake

Nil	Without brake
B	With brake

CE marking

Number of auto switches

1	1 pc.
2	2 pcs.
⋮	⋮
6	6 pcs.

When using both auto and proximity switches, list the proximity switch part number after the autoswitch part number.
Example) M9N1G2

Auto switch type

Symbol	Model	Wiring/ Output type	Lead wire length (m)	Contact
Nil	Without autoswitch			
M9N	D-M9N	3 wire/NPN	0.5	N.O. (A contact)
M9P	D-M9P	3 wire/PNP	0.5	N.O. (A contact)
F9G	D-F9G	3 wire/NPN	0.5	N.C. (B contact)
F9H	D-F9H	3 wire/PNP	0.5	N.C. (B contact)
F9GL	D-F9GL	3 wire/NPN	3	N.C. (B contact)
F9HL	D-F9HL	3 wire/PNP	3	N.C. (B contact)
M9B	D-M9B	2 wire	0.5	N.O. (A contact)
M9NL	D-M9NL	3 wire/NPN	3	N.O. (A contact)
M9PL	D-M9PL	3 wire/PNP	3	N.O. (A contact)
M9BL	D-M9BL	2 wire	3	N.O. (A contact)

Proximity switch type

Symbol	Model	Wiring/ Output type	Lead wire length (m)	Contact
GN	With sensor rail, without proximity switch			
G	GXL-8F	3 wire/NPN	1	N.O. (A contact)
GD	GXL-8FI	3 wire/NPN	1	N.O. (A contact)
GB	GXL-8FB	3 wire/NPN	1	N.C. (B contact)
GDB	GXL-8FIB	3 wire/NPN	1	N.C. (B contact)
GU	GXL-8FU	2 wire/solid state	1	N.O. (A contact)
GUB	GXL-8FUB	2 wire/solid state	1	N.C. (B contact)

Specifications

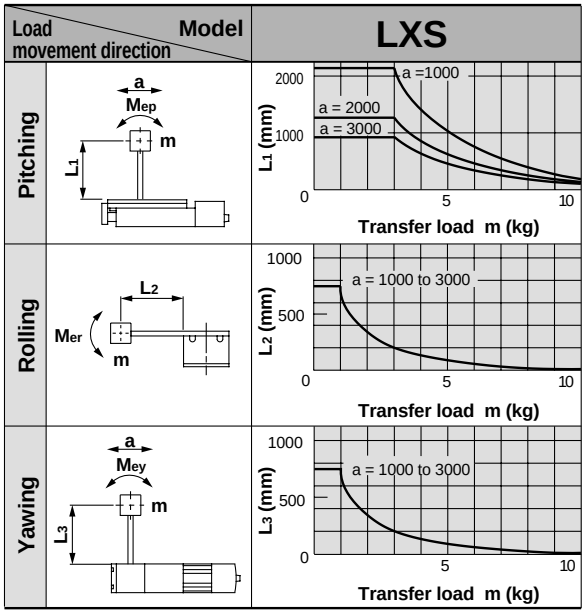
Motor		2 phase stepper motor (with/without brake)				5 phase stepper motor (with/without brake)			
Lead screw type		Slide ø8mm		Ball ø8mm		Slide ø8mm		Ball ø8mm	
Lead (mm)		6mm	12mm	2mm	5mm	6mm	12mm	2mm	5mm
Position repeatability (mm)		±0.05	±0.05	±0.03	±0.03	±0.05	±0.05	±0.03	±0.03
Speed (mm/s) Note 1)		6 to 100	12 to 200	2 to 30	5 to 80	6 to 100	12 to 200	2 to 30	5 to 80
Work load (kg)	Horizontal Note 2)	9(4)	4.5(4)	10(4)	10(4)	6(4)	3(3)	10(4)	10(4)
	Vertical Note 2)	4(4)	2(2)	5(4)	5(4)	2(2)	1(1)	5(4)	5(4)
Guide type		High rigidity direct acting guide							
Operating temperature range °C		5 to 40 (with no condensation)							
Home position switch		Photo micro sensor EE-SX673 (refer to page 36)							
Brake specifications (Electromagnetic brake)	Model	De-energized operating type							
	Static torque	0.1Nm or more							
	Rated voltage	24VDC ±5%							
	Power consumption	5W							
Applicable driver		LC6D-220AD-Q / LC6D-220AD-P1-X316				LC6D-507AD-Q / LC6D-507AD-P1-X316			
CE marking accessories		Holding plate: MB1 (1pc.) Phillips countersunk head screw M3 x 6L (1pc.) Phillips binding head screw: M3 x 4L (2pcs). Toothed lock washer M3 (2pcs). Binding band: T18S (1pc).							

Body Weight						
Standard stroke		50	75	100	125	150
Weight (kg)	With brake	2.1	2.3	2.5	2.7	2.9
	Without brake	1.9	2.1	2.3	2.5	2.7

Note 1) As vibration may increase with slower speed, it is advised that a minimum motor speed of 1rps is used (e.g 6mm/s for 6mm lead).
Note 2) When mounting a work piece on the actuators end plate, the max. workload should be that specified between the ().

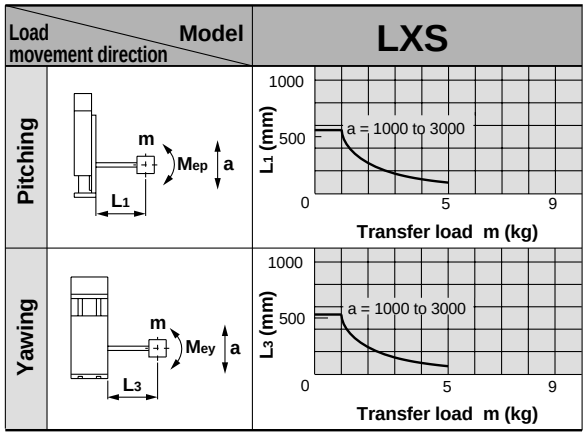
Allowable Moment (N·m)

Allowable dynamic moment



Note) Obtain maximun load and speed from the specifications table.

Allowable dynamic moment



Allowable static moment

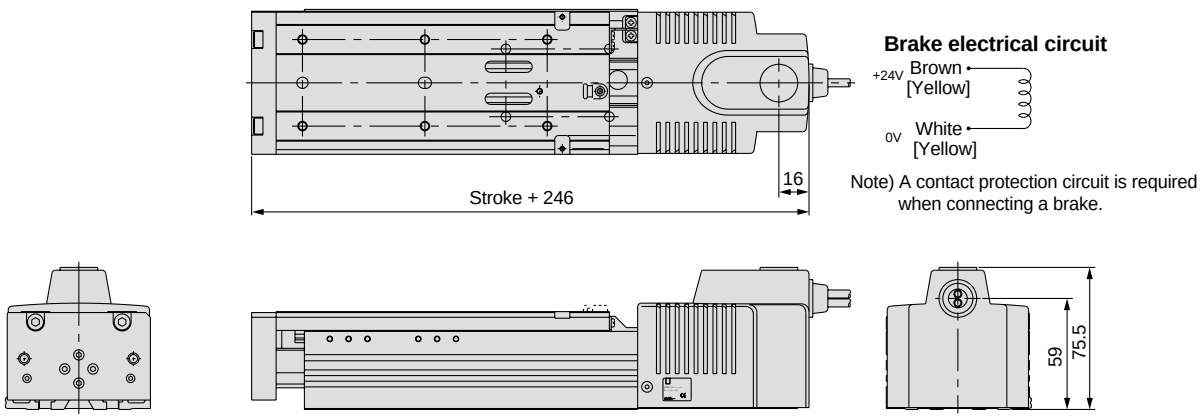
Pitching	15.7
Rolling	15.7
Yawing	7.84

m: Transferload (kg)
L: Overhang to work piece centre of gravity (mm)
a: Work piece acceleration (mm/sec^2)
Me: Dynamic moment

Dimensions/LXSH $^{2}_{5}$

Scale: 25%

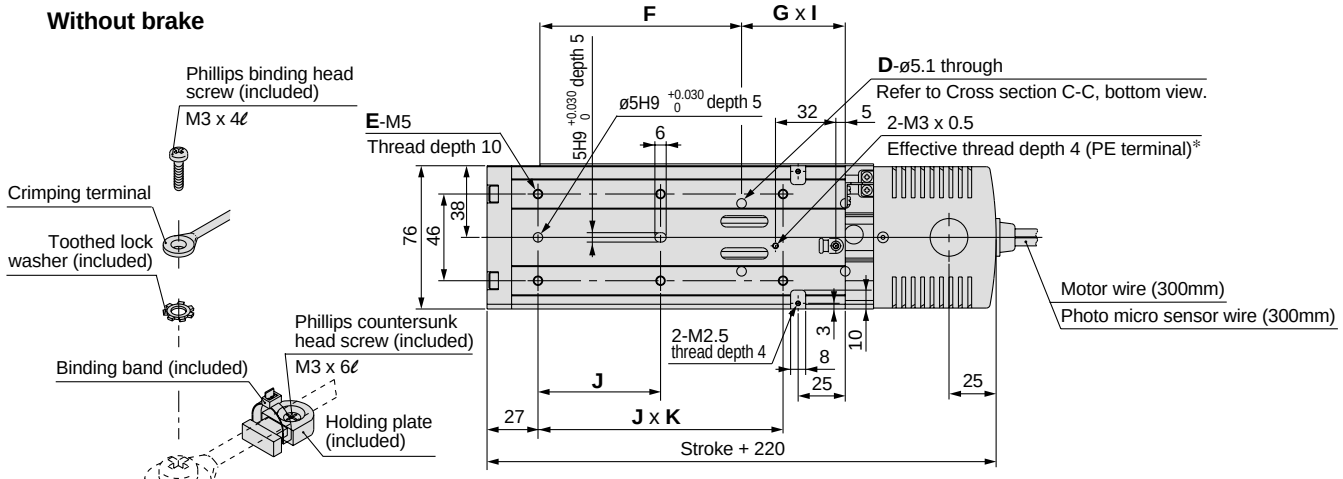
With brake



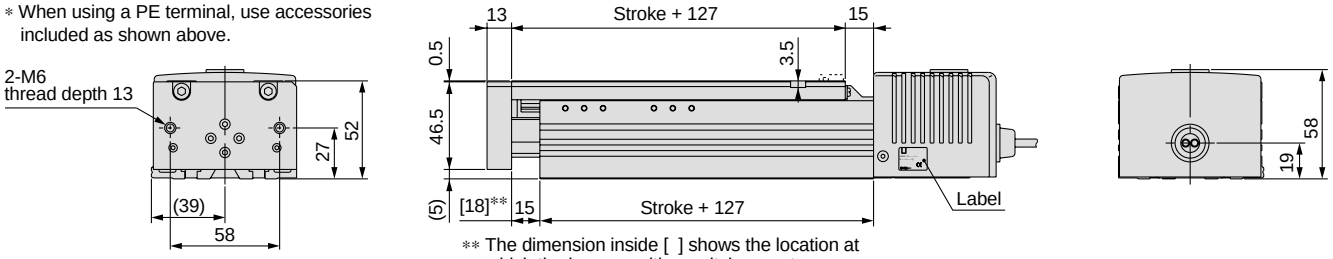
Brake electrical circuit

Note) A contact protection circuit is required when connecting a brake.

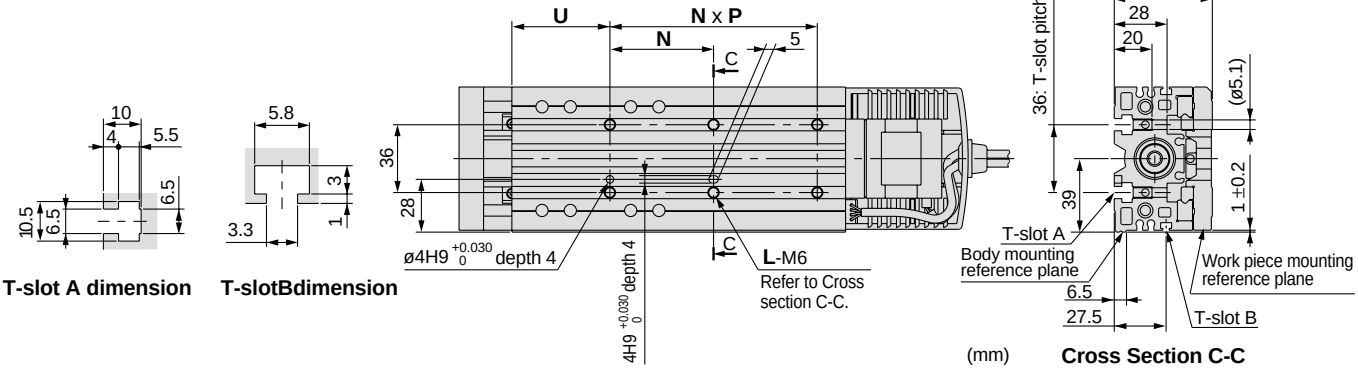
Without brake



* When using a PE terminal, use accessories included as shown above.



** The dimension inside [ ] shows the location at which the home position switch operates.



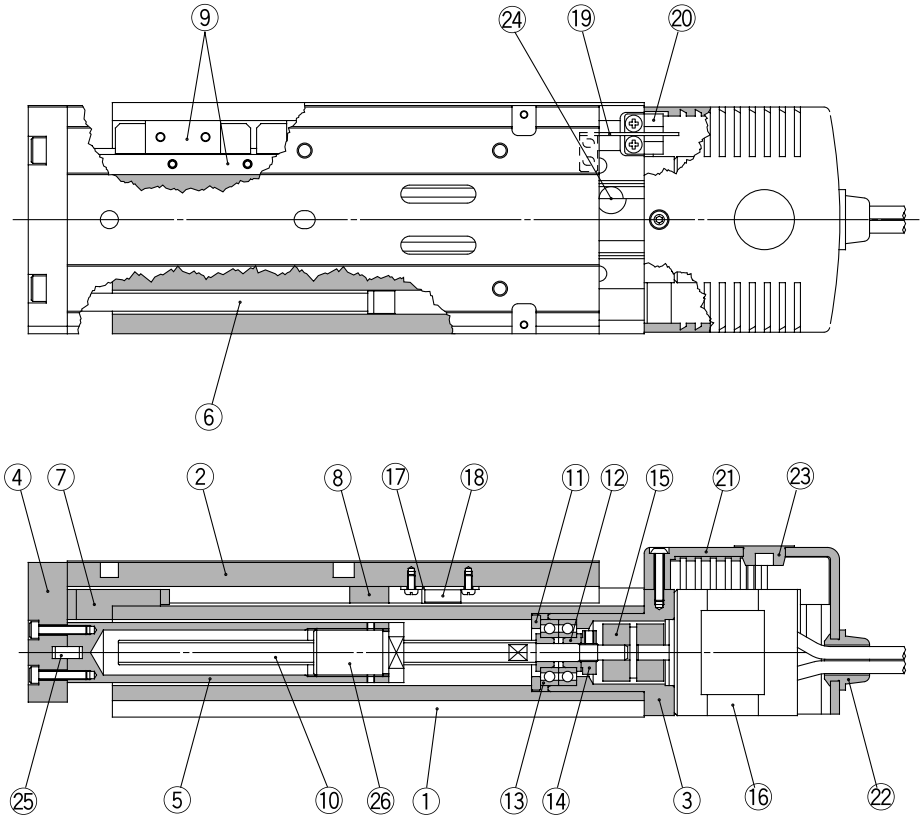
T-slot A dimension **T-slotBdimension** **Cross Section C-C**

(mm)

Model	D	E	F	G	I	J	K	L	N	P	U
LXSH□□- 50□	4	6	107	55	1	65	2	6	55	2	52
LXSH□□- 75□	4	6	112	65	1	75	2	6	65	2	47
LXSH□□-100□	4	8	122	75	1	65	3	6	75	2	47
LXSH□□-125□	4	8	132	85	1	70	3	6	85	2	47
LXSH□□-150□	6	8	112	65	2	75	3	8	65	3	47

Construction

Series LXS



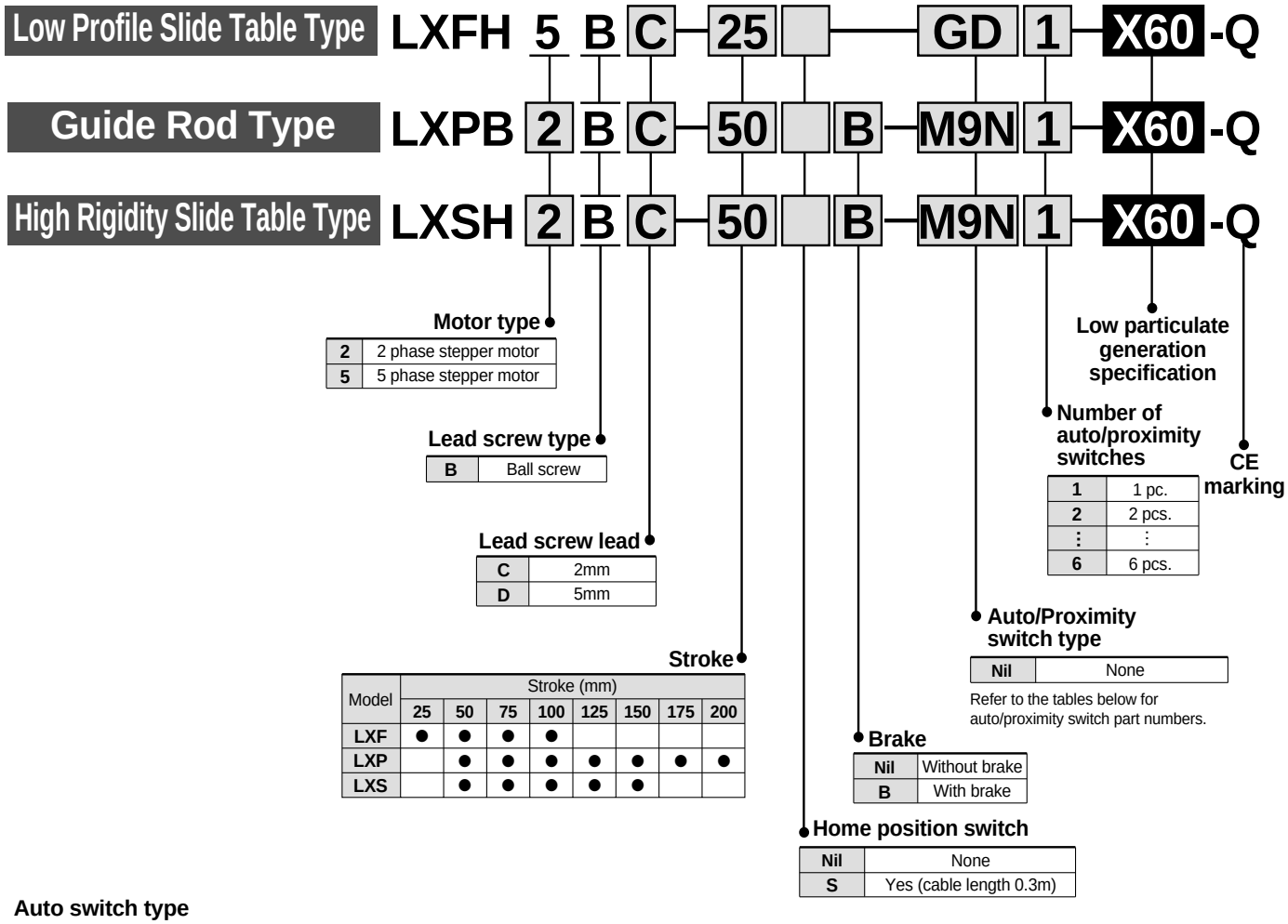
Parts list

No.	Description	Material	Note
1	**Body**	Aluminum alloy	Anodized
2	**Table**	Aluminum alloy	Anodized
3	**Adaptor**	Aluminum alloy	Anodized
4	**Plate**	Aluminum alloy	Anodized
5	**Tube**	Aluminum alloy	Anodized
6	**Rod assembly**	——	With magnet
7	**Stopper A**	——	With bumper
8	**Stopper B**	——	
9	**Direct acting guide (block, rail)**	——	
10	**Rolled screw (shaft only)**	Alloy steel	
11	**Tension ring**	Stainless steel	
12	**Bearing retainer**	Stainless steel	
13	**Bearing**	——	

Parts list

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

How to Order



Auto switch type

Symbol	Model	Wiring/ Output type	Lead wire length (m)	Contact	Applicable actuator
Nil	Without autoswitch				LXP LXS
M9N	D-M9N	3 wire/NPN	0.5	N.O. (A contact)	
M9P	D-M9P	3 wire/PNP	0.5	N.O. (A contact)	
F9G	D-F9G	3 wire/NPN	0.5	N.C. (B contact)	
F9H	D-F9H	3 wire/PNP	0.5	N.C. (B contact)	
F9GL	D-F9GL	3 wire/NPN	3	N.C. (B contact)	
F9HL	D-F9HL	3 wire/PNP	3	N.C. (B contact)	
M9B	D-M9B	2 wire	0.5	N.O. (A contact)	
M9NL	D-M9NL	3 wire/NPN	3	N.O. (A contact)	
M9PL	D-M9PL	3 wire/PNP	3	N.O. (A contact)	
M9BL	D-M9BL	2 wire	3	N.O. (A contact)	

Proximity switch type

Symbol	Model	Wiring/ Output type	Lead wire length (m)	Contact	Applicable actuator
GN	With sensor rail, without proximity switch				LXF LXS
G	GXL-8F	3 wire/NPN	1	N.O. (A contact)	
GD	GXL-8FI	3 wire/NPN	1	N.O. (A contact)	
GB	GXL-8FB	3 wire/NPN	1	N.C. (B contact)	
GDB	GXL-8FIB	3 wire/NPN	1	N.C. (B contact)	
GU	GXL-8FU	2 wire/solid state	1	N.O. (A contact)	
GUB	GXL-8FUB	2 wire/solid state	1	N.C. (B contact)	

When using both auto and proximity switches, list the proximity switch part number after the autoswitch part number. Example) M9N1G2
Note: Only proximity switch option available for LXF with ball screw.

Specifications

Model	LXF	LXP	LXS
Guide type	Direct acting guide Stainless steel, With low particulate generating grease	Ball bushing Stainless steel, With low particulate generating grease	High rigidity direct acting guide Stainless steel, With low particulate generating grease
Lead screw	Ball screw ø8mm 2mm/5mm lead Black chrome coating + Special fluororesin coating, AFE grease (made by THK) applied		

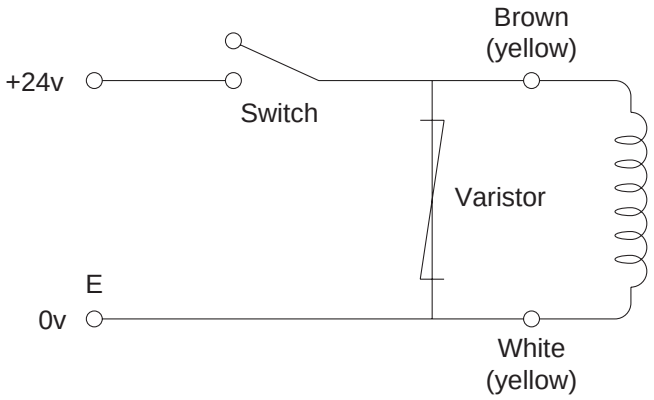
Please refer to the pages of the standard products LXF, LXP, LXS for more specifications.

The Material changes as listed above reduce particle generation. Please ensure that these material changes are suitable for your application:

Brake Wiring

- The brake is engaged when not energized. DC24V is required to unlock it.
- When any alarm has ocurred, eliminate cause and ensure safety before resetting the machine.
- When power is restored after power failure, keep away from the machine in case of sudden machine movement (design machine to avoid this possible hazard on restart).

Brake electric circuit



⚠ Caution

Operation of LX series with stepper motor

Please check for an increase of surface temperature of the motor during operation.

Put in place measures for cooling the motor, for when the surface temperature of the motor is over 100°C.

We confirm that the surface temperature of the motor did not exceed 100°C under the following conditions. Therefore this can be used as a reference for your design.

Test conditions and results:

Operation temperature range: 5°C to 40°C.

Duty-cycle*: 50% or less.

*Duty-cycle means ratio of actuator operating time to resting time in a cycle.

Note:

Also when continuosly operated for over 30 seconds the surface temperature of the motor rose to 100°C. (Based on a 50% duty cycle).

Therefore it is not recommended to continuously operate the motor for more tan 30 seconds.

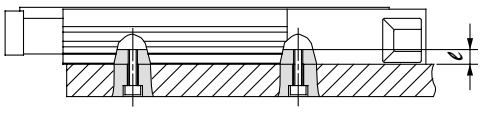
Mounting

Series LXF

Actuator mounting

An actuator can be mounted from two directions, which can be selected depending on the equipment or work piece.

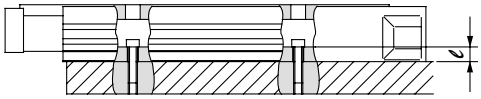
1. Tapped holes



Model	Bolt	Max. tightening torque N·m	Max. screw-in depth (ℓ mm)
LXF	M5 x 0.8	4.4	8

⚠Caution Use bolts at least 0.5mm shorter than the maximum screw-in depth, so they do not touch the body.

2. Through holes

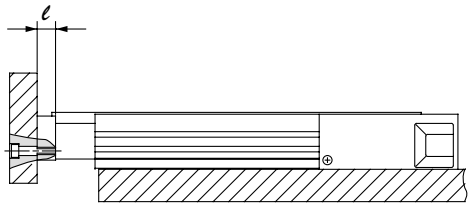


Model	Bolt	Max. tightening torque N·m	Body thickness (ℓ mm)
LXF	M4 x 0.7	2.1	8

Work piece mounting

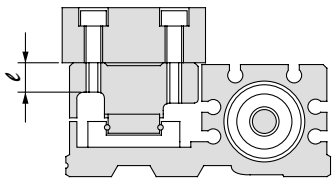
Work pieces can be mounted on two sides of the actuator.

1. Front mount type



Model	Bolt	Max. tightening torque N·m	Body thickness (ℓ mm)
LXF	M4 x 0.7	2.1	10

2. Top mount type



Model	Bolt	Max. tightening torque N·m	Max. screw-in depth (ℓ mm)
LXF	M4 x 0.7	2.1	8

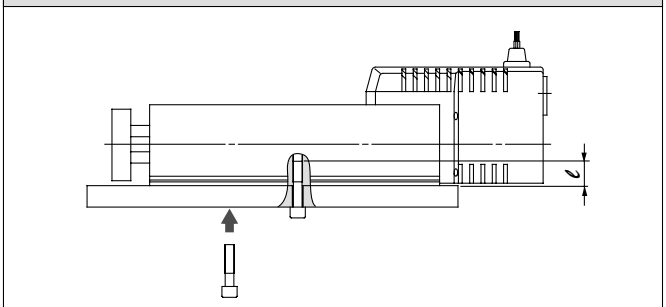
⚠Caution Use bolts at least 0.5mm shorter than the maximum screw-in depth, so they do not touch the body.

Mounting

Series LXP

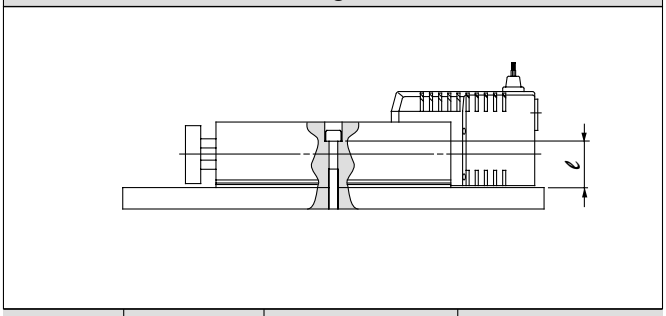
Actuator mounting

1. Tapped holes



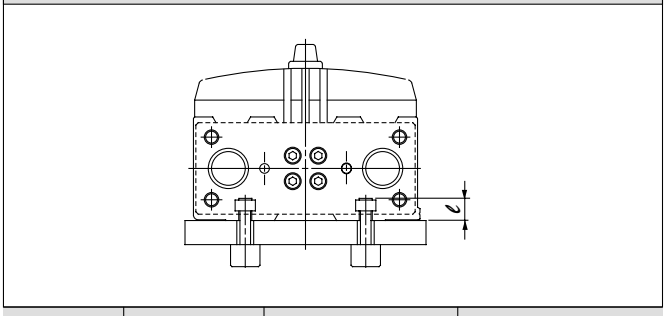
Model	Bolt	Max. tightening torque N·m	Max. screw-in depth (ℓ mm)
LXP	M6 x 1	7.4	12

2. Through holes



Model	Bolt	Max. tightening torque N·m	Body thickness (ℓ mm)
LXP	M5 x 0.8	4.4	37.5

3. T-slots

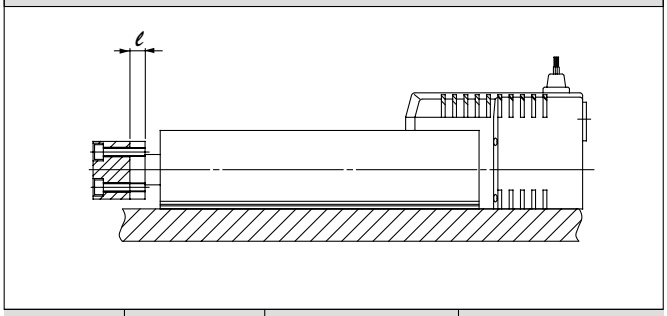


Model	Bolt	Max. tightening torque N·m	Max. screw-in depth (ℓ mm)
LXP	M5 x 0.8	7.4	8.5

⚠ Caution Use bolts at least 0.5mm shorter than the maximum screw-in depth, so they do not touch the body.

Work piece mounting

1. Front mount type



Model	Bolt	Max. tightening torque N·m	Body thickness (ℓ mm)
LXP	M6 x 1	7.4	10

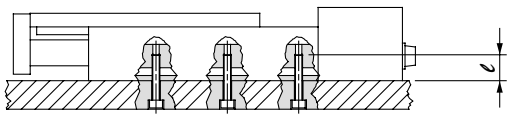
Mounting

Series LXS

Actuator mounting

An actuator can be mounted from two directions, which can be selected depending on the equipment or work piece.

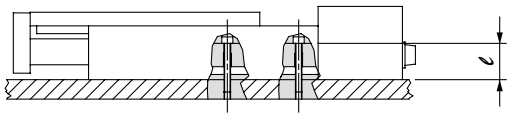
1. Tapped holes



Model	Bolt	Max. tightening torque N·m	Max. screw-in depth (ℓ mm)
LXS	M6 x 1	7.4	20

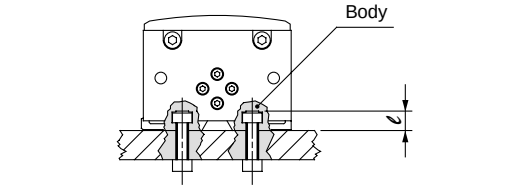
⚠ **Caution** Use bolts at least 0.5mm shorter than the maximum screw-in depth, so they do not touch the body.

2. Through holes



Model	Bolt	Max. tightening torque N·m	Body thickness (ℓ mm)
LXS	M5 x 0.8	4.4	28

3. T-slots



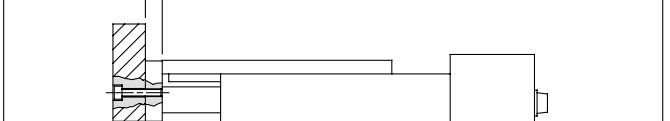
Model	Bolt	Max. tightening torque N·m	Max. screw-in depth (ℓ mm)
LXS	M6 x 1	7.4	10

⚠ **Caution** Use bolts at least 0.5mm shorter than the maximum screw-in depth, so they do not touch the body.

Work piece mounting

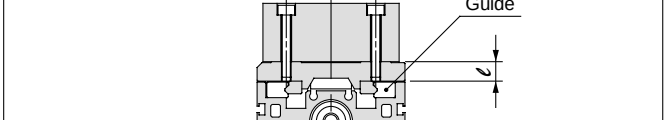
Work pieces can be mounted on two sides of the actuator.

1. Front mount type



Model	Bolt	Max. tightening torque N·m	Body thickness (ℓ mm)
LXS	M6 x 1	7.4	13

2. Top mount type



Model	Bolt	Max. tightening torque N·m	Max. screw-in depth (ℓ mm)
LXS	M5 x 0.8	4.4	10

⚠ **Caution** Use bolts at least 0.5mm shorter than the maximum screw-in depth, so they do not touch the body.

Positioning Time Guide (theoretical reference only)

LXFH5BC

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 3kg

		Positioning time (sec)			
Positioning distance (mm)		1	10	50	100
Speed (mm/s)	10	0.2	1.1	5.1	10.1
	20	0.1	0.6	2.6	5.1
	30	0.1	0.4	1.7	3.4

LXFH5BD

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 3kg

		Positioning time (sec)			
Positioning distance (mm)		1	10	50	100
Speed (mm/s)	10	0.2	1.1	5.1	10.1
	40	0.1	0.3	1.3	2.6
	80	0.1	0.2	0.7	1.3

LXFH5SA

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 1kg

		Positioning time (sec)			
Positioning distance (mm)		1	10	50	100
Speed (mm/s)	10	0.2	1.1	5.1	10.1
	50	0.1	0.3	1.1	2.1
	100	0.1	0.2	0.6	1.1

For transfer load of 2kg to 3kg

		Positioning time (sec)			
Positioning distance (mm)		1	10	50	100
Speed (mm/s)	10	0.2	1.1	5.1	10.1
	50	0.1	0.3	1.1	2.1
	100	0.1	0.3	0.7	1.2

LXFH5SB

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg

		Positioning time (sec)			
Positioning distance (mm)		1	10	50	100
Speed (mm/s)	50	0.1	0.3	1.1	2.1
	100	0.1	0.2	0.6	1.1
	200	0.1	0.2	0.4	0.6

For transfer load of 1kg

		Positioning time (sec)			
Positioning distance (mm)		1	10	50	100
Speed (mm/s)	50	0.1	0.3	1.1	2.1
	100	0.1	0.2	0.6	1.1
	200	0.1	0.2	0.4	0.7

For transfer load of 2kg

		Positioning time (sec)			
Positioning distance (mm)		1	10	50	100
Speed (mm/s)	50	0.1	0.3	1.1	2.1
	100	0.1	0.2	0.6	1.1
	200	0.1	0.2	0.5	0.7

LXPB2BC

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 6kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.2	1.1	5.1	10.1	20.1
	20	0.1	0.6	2.6	5.1	10.1
	30	0.1	0.4	1.7	3.4	6.7

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.2	1.1	5.1	10.1	20.1
	20	0.1	0.6	2.6	5.1	10.1
	30	0.1	0.4	1.7	3.4	6.7

LXPB2BD

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 6kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.2	1.1	5.1	10.1	20.1
	40	0.1	0.3	1.3	2.6	5.1
	80	0.1	0.2	0.7	1.3	2.6

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.2	1.1	5.1	10.1	20.1
	40	0.1	0.3	1.3	2.6	5.1
	80	0.1	0.2	0.7	1.3	2.6

LXPB2SA

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 6kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.2	1.1	5.1	10.1	20.1
	50	0.1	0.3	1.1	2.1	4.1
	100	0.1	0.2	0.6	1.1	2.1

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.2	1.1	5.1	10.1	20.1
	50	0.1	0.3	1.1	2.1	4.1
	100	0.1	0.2	0.6	1.1	2.1

LXPB2SB

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 3kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	50	0.1	0.3	1.1	2.1	4.2
	100	0.1	0.2	0.6	1.1	2.1
	200	0.1	0.1	0.3	0.6	1.1

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 1.5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	50	0.1	0.3	1.1	2.1	4.1
	100	0.1	0.2	0.6	1.1	2.1
	200	0.1	0.1	0.3	0.6	1.1

For transfer load of 3kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	50	0.1	0.3	1.1	2.1	4.1
	100	0.1	0.2	0.6	1.1	2.1
	200	0.1	0.2	0.5	0.7	1.2

LXPB5BC

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 6kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.2	1.1	5.1	10.1	20.1
	20	0.1	0.6	2.6	5.1	10.1
	30	0.1	0.4	1.7	3.4	6.7

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.2	1.1	5.1	10.1	20.1
	20	0.1	0.6	2.6	5.1	10.1
	30	0.1	0.4	1.7	3.4	6.7

LXPB5BD

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 6kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.2	1.1	5.1	10.1	20.1
	40	0.1	0.3	1.3	2.6	5.1
	80	0.1	0.2	0.7	1.3	2.6

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.2	1.1	5.1	10.1	20.1
	40	0.1	0.3	1.3	2.6	5.1
	80	0.1	0.2	0.7	1.3	2.6

LXPB5SA

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 4kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.2	1.1	5.1	10.1	20.1
	50	0.1	0.3	1.1	2.1	4.1
	100	0.1	0.2	0.6	1.1	2.1

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 2 kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.2	1.1	5.1	10.1	20.1
	50	0.1	0.3	1.1	2.1	4.1
	100	0.1	0.2	0.6	1.1	2.1

For transfer load of 4kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.2	1.1	5.1	10.1	20.1
	50	0.1	0.3	1.1	2.1	4.1
	100	0.1	0.3	0.7	1.2	2.2

LXPB5SB

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 2kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	50	0.1	0.3	1.1	2.1	4.1
	100	0.1	0.2	0.6	1.1	2.1
	200	0.1	0.1	0.3	0.6	1.1

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 2kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	50	0.1	0.3	1.1	2.1	4.1
	100	0.1	0.2	0.6	1.1	2.1
	200	0.1	0.1	0.3	0.6	1.1

LXSH2BC

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 10kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	20	0.1	0.6	2.6	5.1	7.6
	30	0.1	0.4	1.7	3.4	5.1

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	20	0.1	0.6	2.6	5.1	7.6
	30	0.1	0.4	1.7	3.4	5.1

LXSH2BD

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 10kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	40	0.1	0.3	1.3	2.6	3.8
	80	0.4	0.2	0.7	1.3	1.9

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	40	0.1	0.3	1.3	2.6	3.8
	80	0.1	0.2	0.7	1.3	1.9

For transfer load of 2.5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	100
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	40	0.1	0.3	1.3	2.6	3.8
	80	0.1	0.2	0.7	1.3	2.0

For transfer load of 5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	200
Speed (mm/s)	10	0.1	1	5	10	20
	40	0.1	0.3	1.3	2.6	5.1
	80	0.1	0.2	0.7	1.3	2.6

LXSH2SA

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 9kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	50	0.1	0.3	1.1	2.1	3.1
	100	0.1	0.2	0.6	1.1	1.6

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 4kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	50	0.1	0.3	1.1	2.1	3.1
	100	0.1	0.2	0.6	1.1	1.6

LXSH2SB

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 2.5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	50	0.1	0.3	1.1	2.1	3.1
	100	0.1	0.2	0.6	1.1	1.6
	200	0.1	0.1	0.3	0.6	0.8

For transfer load of 4.5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	50	0.1	0.3	1.1	2.1	3.1
	100	0.1	0.2	0.6	1.1	1.6
	200	0.1	0.2	0.4	0.6	0.9

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 2kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	50	0.1	0.3	1.1	2.1	4.1
	100	0.1	0.2	0.6	1.1	2.1
	200	0.1	0.1	0.3	0.6	1.1

LXSH5BC

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 10kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	20	0.1	0.6	2.6	5.1	7.6
	30	0.1	0.4	1.7	3.4	5.1

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	20	0.1	0.6	2.6	5.1	7.6
	30	0.1	0.4	1.7	3.4	5.1

LXSH5BD

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	40	0.1	0.3	1.3	2.6	3.8
	80	0.1	0.2	0.7	1.3	1.9

For transfer load of 5kg to 10kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	40	0.1	0.3	1.3	2.6	3.8
	80	0.1	0.2	0.7	1.3	2.0

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	40	0.1	0.3	1.3	2.6	3.8
	80	0.1	0.2	0.7	1.3	1.9

For transfer load of 2.5kg to 5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	40	0.1	0.3	1.3	2.6	3.8
	80	0.1	0.2	0.7	1.3	2.0

LXSH5SA

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 6kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	50	0.1	0.3	1.1	2.1	3.1
	100	0.1	0.2	0.6	1.1	1.6

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 2kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	10	0.2	1.1	5.1	10.1	15.1
	50	0.1	0.3	1.1	2.1	3.1
	100	0.1	0.2	0.6	1.1	1.6

LXSH5SB

Positioning Time Guide (for Horizontal Mount)

For transfer load of 0kg to 1.5kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	50	0.1	0.3	1.1	2.1	3.1
	100	0.1	0.2	0.6	1.1	1.6
	200	0.1	0.1	0.3	0.6	0.8

For transfer load of 3kg

		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	50	0.1	0.3	1.1	2.1	3.1
	100	0.1	0.2	0.6	1.1	1.6
	200	0.1	0.2	0.4	0.6	0.9

Positioning Time Guide (for Vertical Mount)

For transfer load of 0kg to 1kg

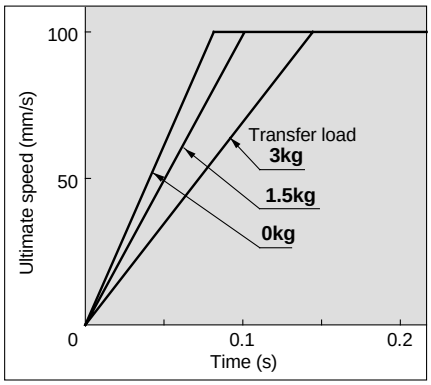
		Positioning time (sec)				
Positioning distance (mm)		1	10	50	100	150
Speed (mm/s)	50	0.1	0.3	1.1	2.1	3.1
	100	0.1	0.2	0.6	1.1	1.6
	200	0.1	0.1	0.3	0.6	0.8

Acceleration Time Guide

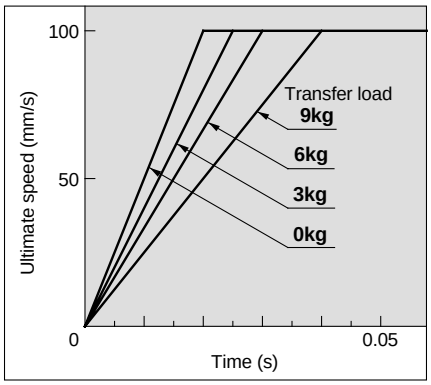
Theoretical reference guide only

Acceleration Time Guide/Slide Screw Specification (Horizontal)

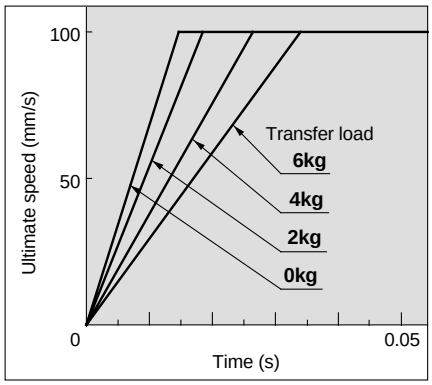
LXFH5SA



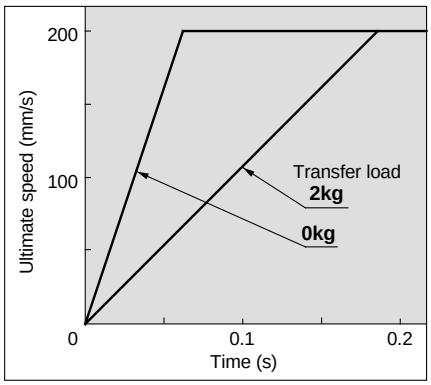
LXPB2SA/LXSH2SA



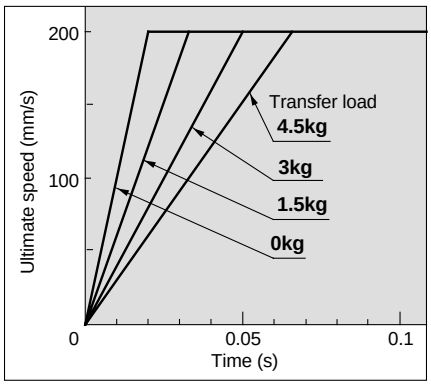
LXPB5SA/LXSH5SA



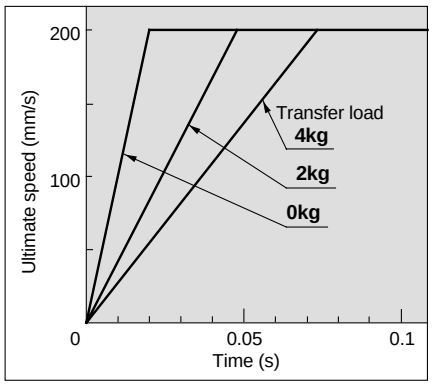
LXFH5SB



LXPB2SB/LXSH2SB

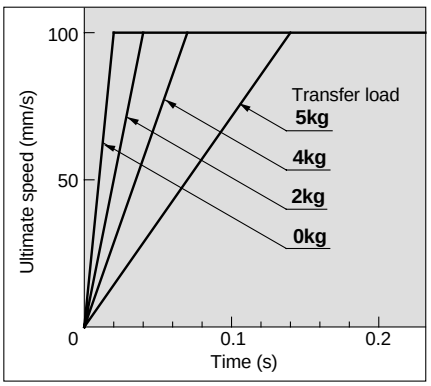


LXPB5SB/LXSH5SB

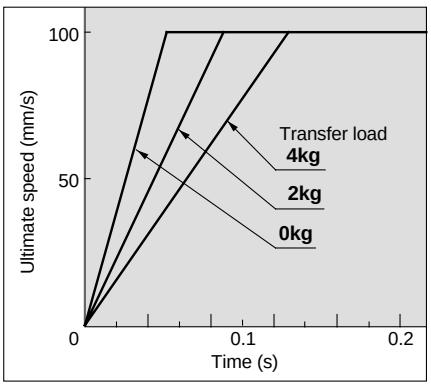


Acceleration Time Guide/Slide Screw Specification (Vertical)

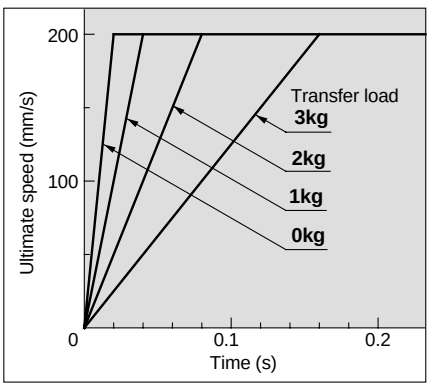
LXPB2SA/LXSH2SA



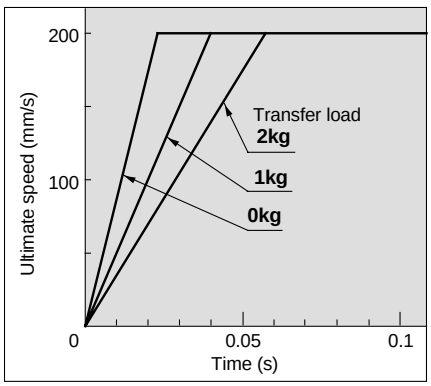
LXPB5SA/LXSH5SA



LXPB2SB/LXSH2SB



LXPB5SB/LXSH5SB

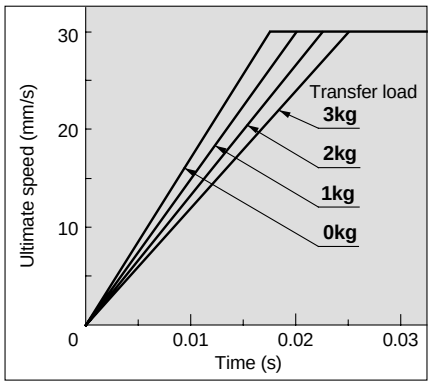


⚠ Caution

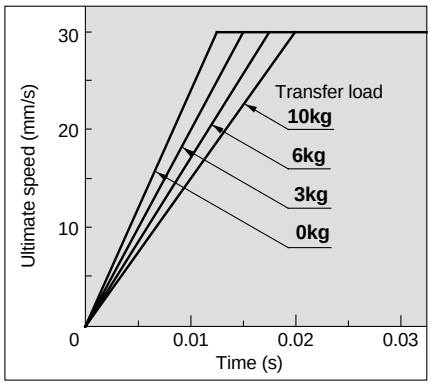
- Transfer loads should not exceed each model's work load specification.
- Determine the acceleration time based on the transfer load and ultimate speed.
- Operating over the graph ranges will cause loss of synchronism.
- The graphs are based on operation using an SMC DC power input type driver with halfstep energization.
- Data fluctuate depending on the operating conditions.

Acceleration Time Guide/Ball Screw Specification (Horizontal)

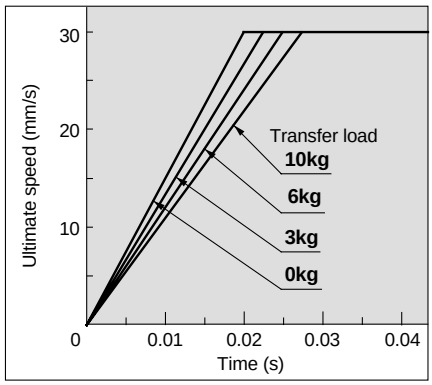
LXFH5BC



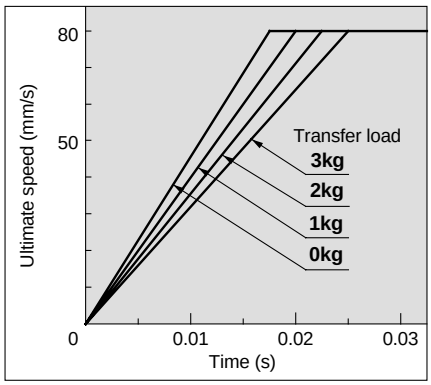
LXPB2BC/LXSH2BC



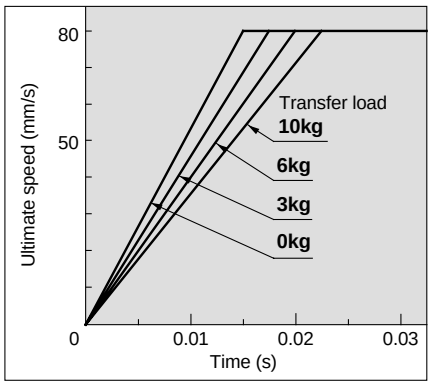
LXPB5BC/LXSH5BC



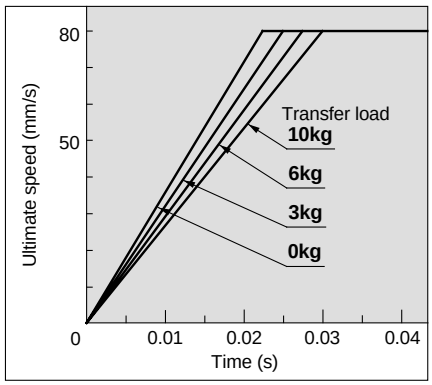
LXFH5BD



LXPB2BD/LXSH2BD

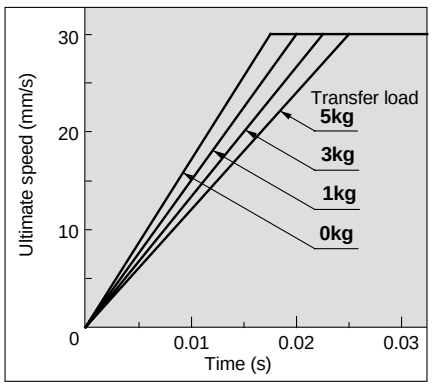


LXPB5BD/LXSH5BD

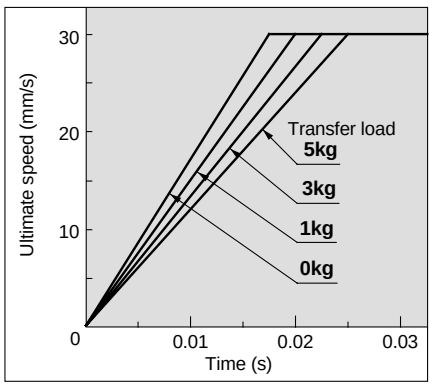


Acceleration Time Guide/Ball Screw Specification (Vertical)

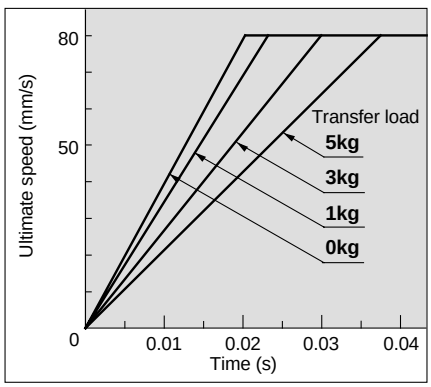
LXPB2BC/LXSH2BC



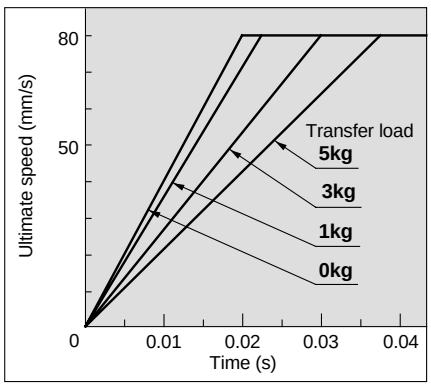
LXPB5BC/LXSH5BC



LXPB2BD/LXSH2BD



LXPB5BD/LXSH5BD



⚠ Caution

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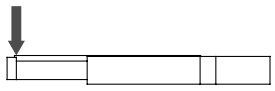
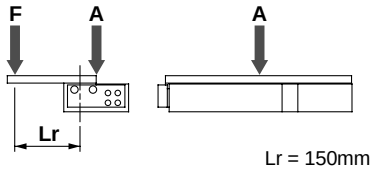
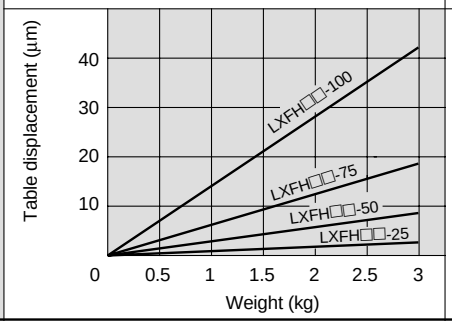
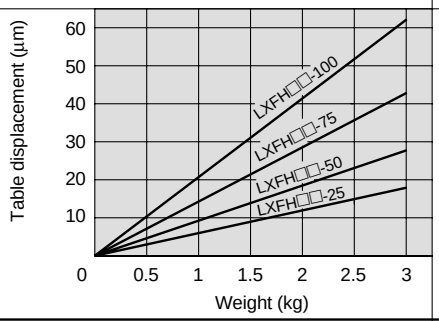
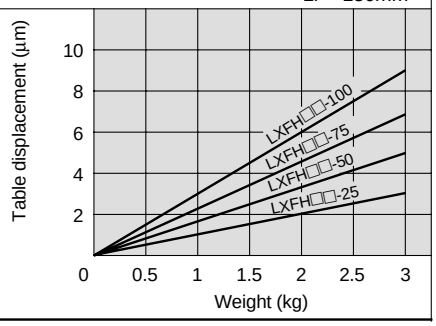
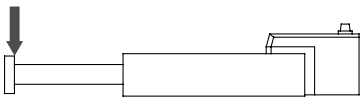
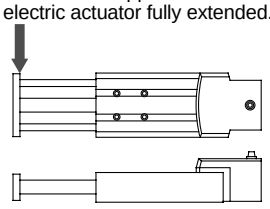
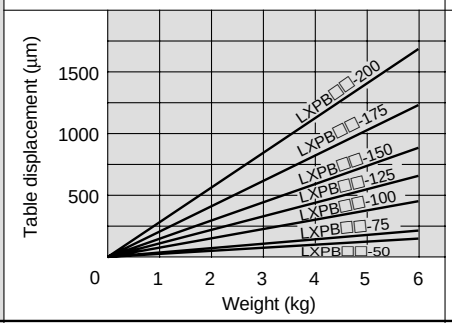
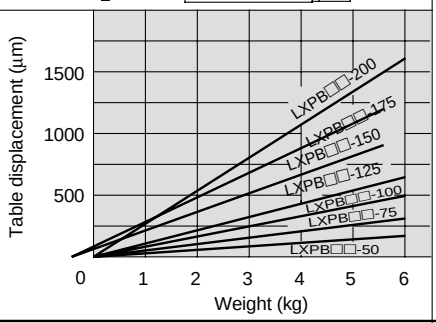
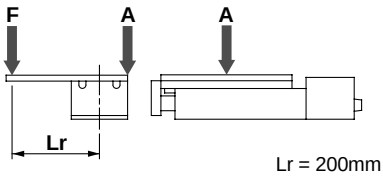
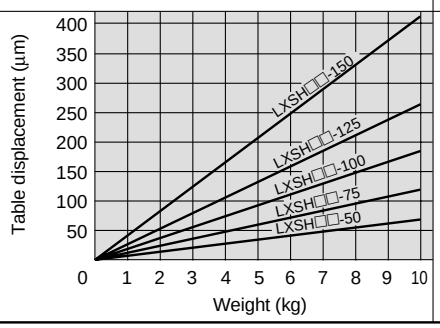
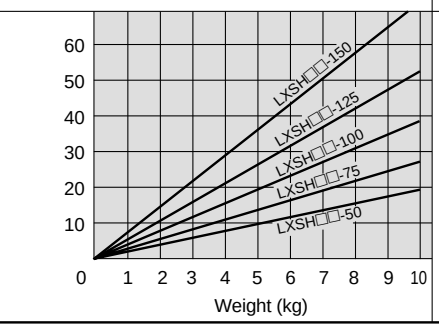
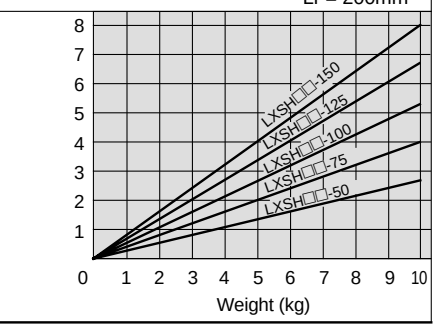
- Determine the acceleration time based on the transfer load and ultimate speed.
- Operating over the graph ranges will cause loss of synchronism.
- The graphs are based on operation using an SMC DC power input type driver with halfstep energization.
- Data fluctuate depending on the operating conditions.

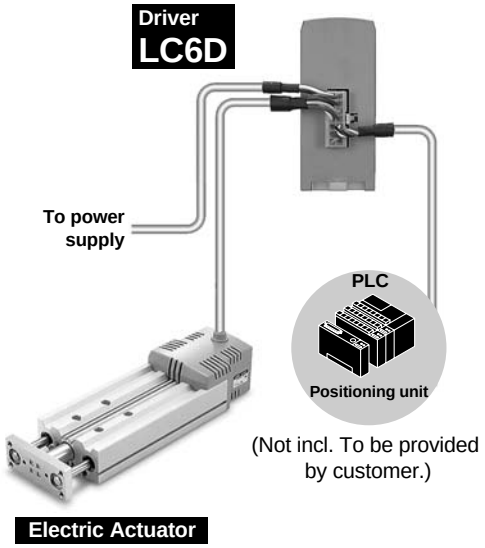
Table Deflection

Theoretical reference guide only

Table Deflection

	Table displacement by pitch moment load	Table displacement by yaw moment load	Table displacement by roll moment load
LXF	Displacement at the section indicated by the arrow when a load is applied to this section with the slide table fully extended.	Displacement at the section indicated by the arrow when a load is applied to this section with the slide table fully extended.	Displacement at "A" when a load is applied to "F" with the slide table retracted.
			
			Lr = 150mm
			
LXP	Displacement at the section indicated by the arrow when a load is applied to this section with the electric actuator fully extended.	Displacement at the section indicated by the arrow when a load is applied to this section with the electric actuator fully extended.	
			
			
LXS	Displacement at the section indicated by the arrow when a load is applied to this section with the slide table fully extended.	Displacement at the section indicated by the arrow when a load is applied to this section with the slide table fully extended.	Displacement at "A" when a load is applied to "F" with the slide table retracted.
			
			Lr = 200mm
			

- **Can be mounted on a DIN rail**
- **Driver position controlled by pulse signal**
- **Can be controlled by a general positioning unit or controller**



(Not incl. To be provided by customer.)

How to Order

LC 6 D— [ ] A D— [ ]

Applicable motor

6	Stepper motor

Function

D	Driver function only

Motor type

220	2 phase motor (2.0A/phase)
507	5 phase motor (0.75A/phase)

Input/Output type

A	Photo coupler input/output

Driver power supply

D	24VDC

Signal input type

P1-X316	Movement pulse and direction input
Q	CW/CCW pulse

Applicable Actuators

Driver model	Applicable actuator		Motor type
LC6D-220AD	Guide rod type	LXPB2	2 phase stepper motor
	High rigidity slide table type	LXSH2	
LC6D-507AD	Low profile slide table type	LXFH5	5 phase stepper motor
	High rigidity slide table type	LXSH5	
	Guide rod type	LXPB5	

Specifications

Part no.	LC6D-220AD	LC6D-507AD
Power supply	24VDC ±10%, 3A	24VDC ±10%, 2.5A
Energization (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 330Ω)	
Maximum input frequency (See caution below.)	10kHz for full step 20kHz for half step	
Function	Auto current down, Power down input	
Connection method	Connector	
Operating environment	5° to 40°C	
	35 to 85% (with no condensation)	
Accessories	Connectors (receptacle, female terminal) Cable should be arranged by customer.	

CE marking

1. **The combination of Series LC6D and Series LX has been certified for EMC conformity.**

   EMC changes depending on the customer's control panel configuration, and the relationship between other electrical equipment and wiring. Therefore, conformity cannot be certified for the customer's equipment in the actual operating environment. As a result, it is necessary for the customer to verify final EMC conformity for the machinery and equipment as a whole.

⚠Caution

Maximum speeds of actuators vary depending on the type. Observe the maximum speed of the actuator in use.

Pulse Signals

LC6D positioning (distance driven) is controlled by the number of pulse signal inputs (i) to the CW and CCW terminals on the "LC6D-□□□AD-Q" or (ii) to the U/D clock input terminal on the "LC6D-□□□AD-P1-X316". The speed is controlled by the pulse frequency.

Calculation for speed

Pulse frequency [pps]= Required speed [mm/s] ÷ Lead [mm] x Divisions per rotation (depends on motor phase and energization type).

Calculation for moving distance and pulse numbers

Pulses reqired per movement= (Moving distance [mm] ÷ Lead [mm] X Divisions per rotation (depends on motor phase and energization type).

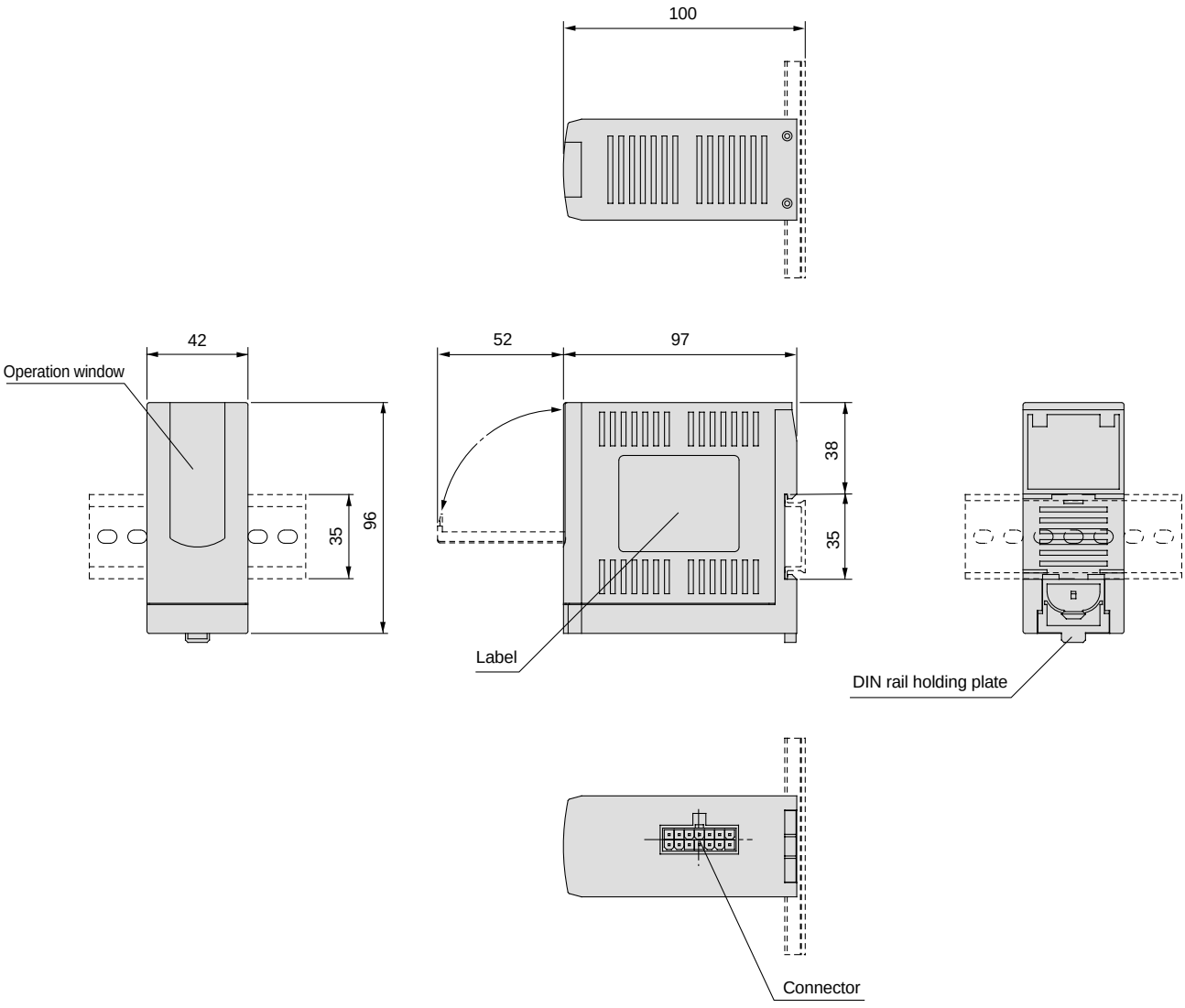
Divisions per rotation

Driver	Energization type	Division per rotation
LC6D-220AD	Full step	200
	Half step	400
LC6D-507AD	Full step	500
	Half step	1000

Maximun frequency Input

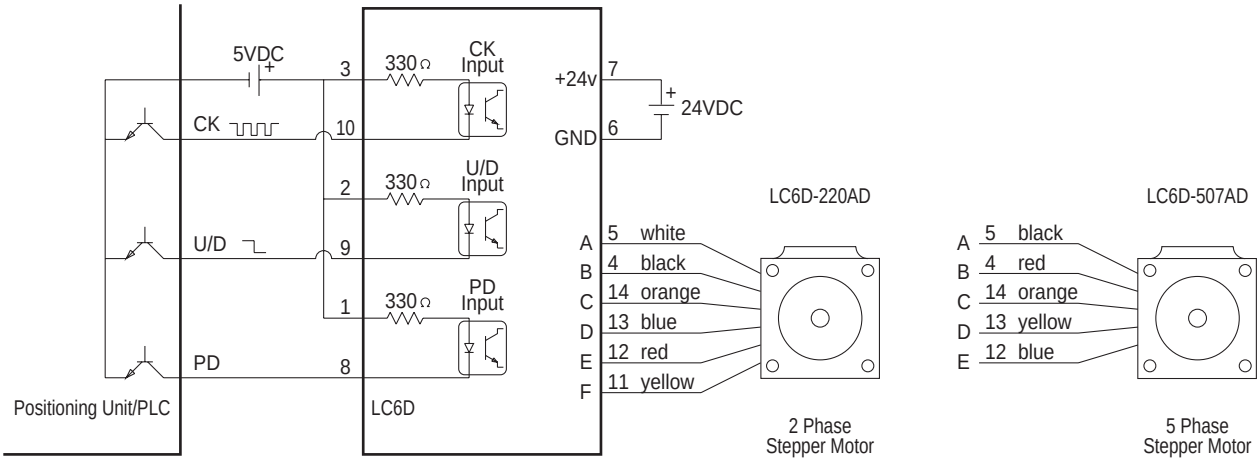
Actuator type	Lead (mm)	Max. Speed (mm/s)	Motor type	Energization	Frequency (Hz)
LXFH5SA	6	100	5 phase	Half step	16,667
LXPB5SA	6				
LXSH5SA	6			Full step	8,333
LXFH5SB	12	200		Half step	16,667
LXPB5SB	12				
LXSH5SB	12			Full step	8,333
LXFH5BC	2	30		Half step	15,000
LXPB5BC	2				
LXSH5BC	2			Full step	7,500
LXFH5BD	5	80		Half step	16,000
LXPB5BD	5				
LXSH5BD	5			Full step	8,000
LXPB2SA	6	100	2 phase	Half step	6,667
LXSH2SA	6			Full step	3,333
LXPB2SB	12	200		Half step	6,667
LXSH2SB	12			Full step	3,333
LXPB2BC	2	30		Half step	6,000
LXSH2BC	2			Full step	3,000
LXPB2BD	5	80		Half step	6,400
LXSH2BD	5			Full step	3,200

Dimensions

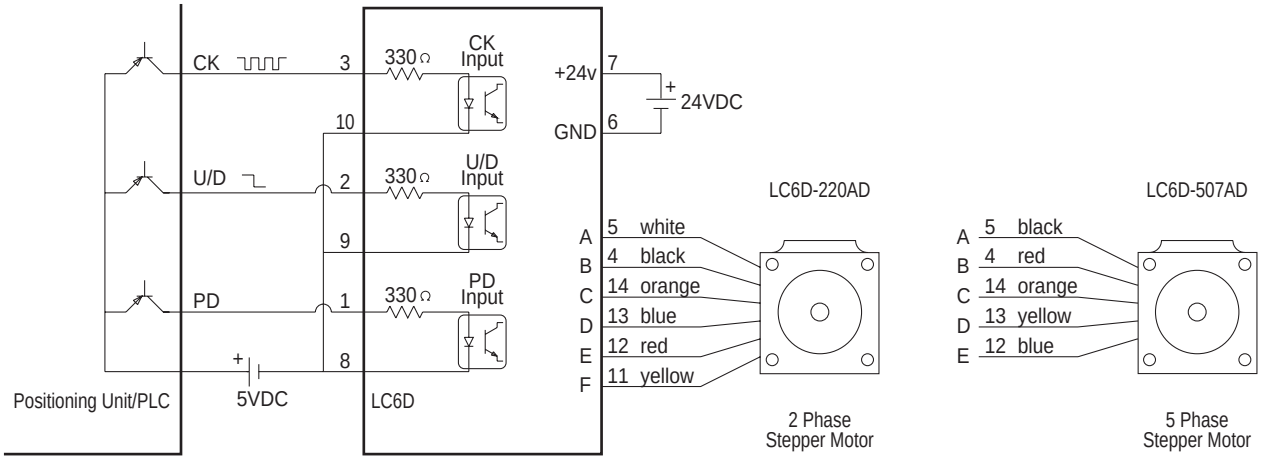

100
42
Operation window
52
97
38
35
96
35
Label
DIN rail holding plate
Connector

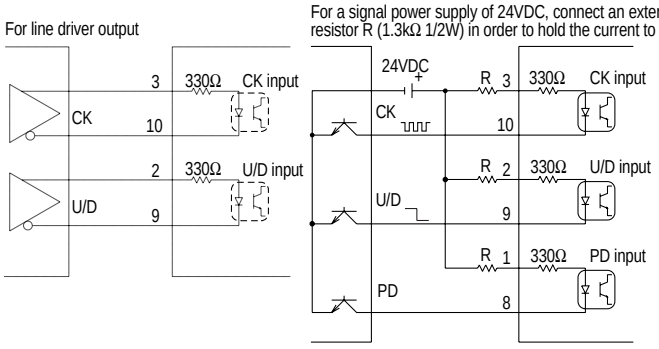
Movement pulse and direction input connection

LC6D-□□□AD-P1-X316 connection to NPN sink output



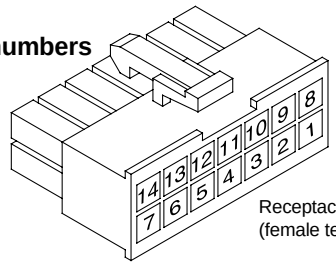
LC6D-□□□AD-P1-X316 connection to PNP source output





Signal description	Function	Pin no.
+24V	Driver power supply +24V	7
GND	Driver power supply GND	6
CK+	CK (clock) pulse input terminal (+)	3
CK-	CK (clock) pulse input terminal (-)	10
U/D+	U/D (direction) input terminal (+)	2
U/D-	U/D (direction) input terminal (-)	9
PD+	Power down input terminal (+)	1
PD-	Power down input terminal (-)	8
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-220AD only)	11

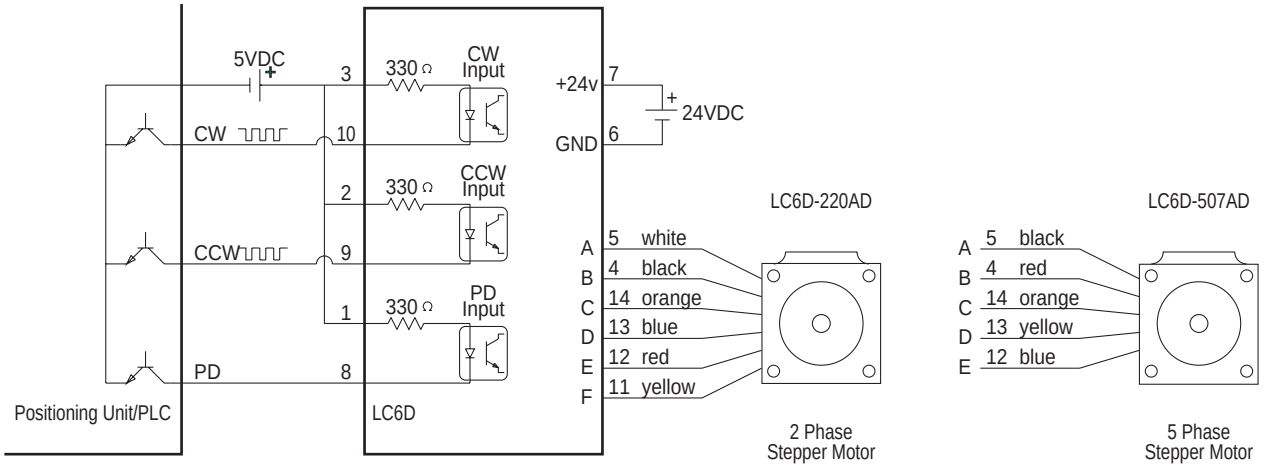
• Wiring numbers



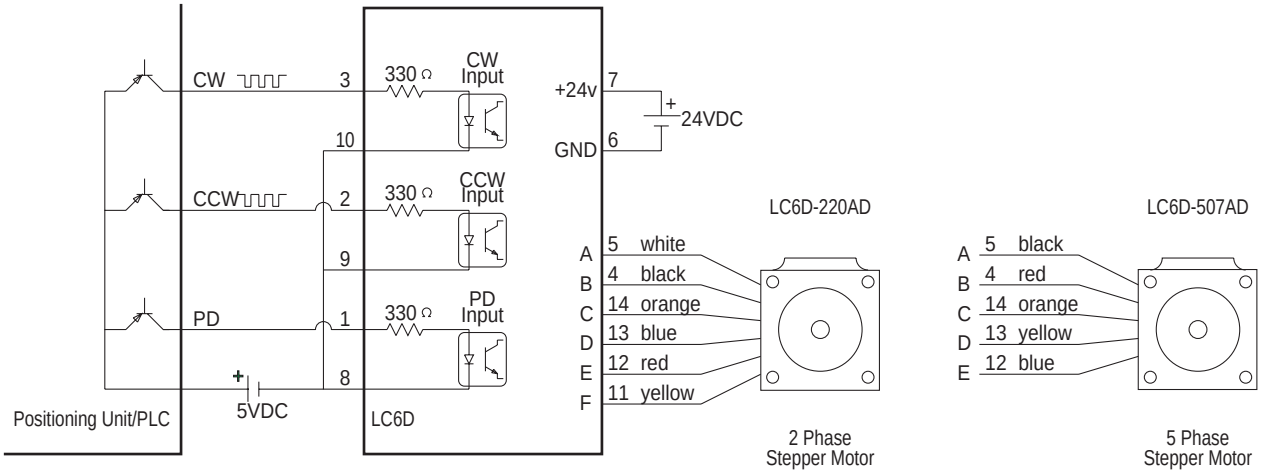
Receptacle side
(female terminal insertion side)

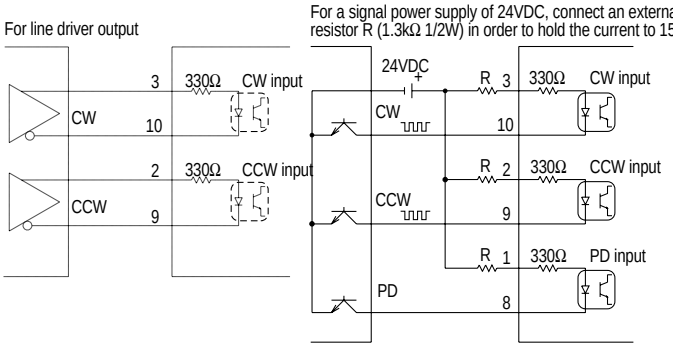
Foward pulse and reverse pulse input connection

LC6D-□□□AD-Q connection to NPN sink output

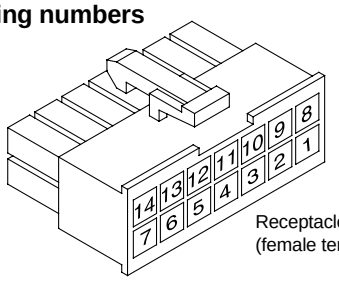


LC6D-□□□AD-Q connection to PNP source output





• Wiring numbers

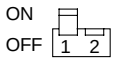


Receptacle side
(female terminal insertion side)

Signal description	Function	Pin no.
+24V	Driver power supply +24V	7
GND	Driver power supply GND	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
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	11

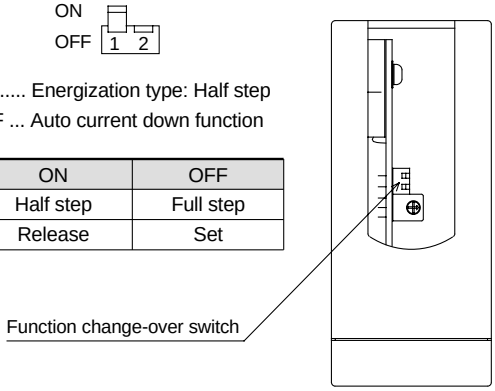
• Function change-over switch

Use the function change-over switch to set each function.
It is set as follows when shipped.



1. ON ..... Energization type: Half step
2. OFF ... Auto current down function

	ON	OFF
1	Half step	Full step
2	Release	Set



Input signal terminal

Power Down input terminal:
By applying the "H" level input, the motor current is shut off and the motor becomes de-energized.

(Movement pulse and direction input connection)
CK (Clock pulse input terminal):
By applying the pulse input, the actuator moves the specified distance in either direction. (Direction specified by Direction Input)

U/D (Direction Input terminal):
By applying a current through this terminal, it allows the actuator to move from motor side to end side. If the current is removed then the actuator will move from the end side to the motor side.

(Forward pulse and reverse pulse input connection)
CW (Clockwise pulse input terminal):
By applying the pulse input, the actuator moves from the motor side to the end side.

CCW (Counter Clockwise pulse input terminal):
By applying the pulse input, the actuator moves from the end side to the motor side.

Functions
Auto current down:
This is a function that reduces the motor current to half when the motor stops. This will prevent the motor and driver from generating heat. Although auto current down causes the holding torque to be reduced when the motor stops, the holding torque that supports the actuator transfer load is maintained.

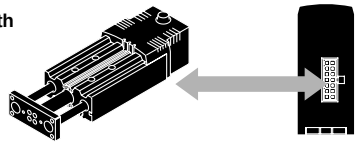
Power down
This function shuts off the motor current and de-energizes the motor. Use this function to release the electric actuator for maintenance, etc.

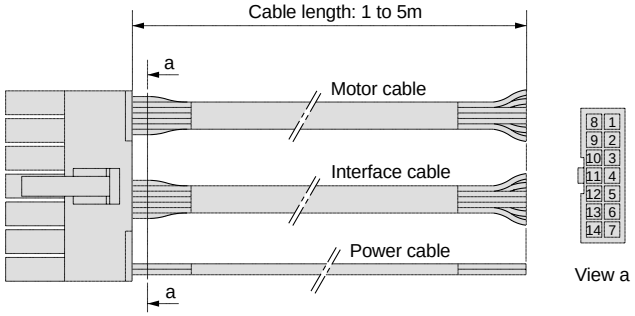
Options

LC6D Connector Cable

Model **LC6-1-C1-□-X258**

● **Cable length**
1 - 1m
3 - 3m
5 - 5m





View a

• **Connectors included** [Manufacturer: Molex Japan Co. Ltd.]

Description	Part no.	Quantity
Receptacle	5557-14R	1
Female terminal	5556PBTL	14

• **Wiring tools** [Manufacturer: Molex Japan Co. Ltd.]
Wiring tools should be arranged by the customer.

Description	Part no.
Crimping tool	54026-5000 (for UL1007) 54027-5000 (for UL1015)
Puller	57031-6000

• Important Note:
These cables are intended to cover most applications. However for harsh electrically noisy environments similar to those set out by EN6100-6-2 and EN6100-6-4 from directive 89/336/EEC, customers are advised to prepare their own connector and cable set. Further details can be found in the LC6D Series installation manual and customers are advised to contact SMC for further details relating to this if in doubt before purchase.

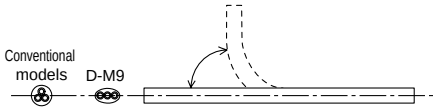
⚠Caution

- **Do not repeatedly apply bending stress or tension to the cables.**
  Wiring that subjects cables to repeated bending stress and tension causes line breakage.
- **Make connections based on each driver's connection example.**

Solid-state Auto Switches for Direct Mounting
Series D-M9

Grommet

- Reduced load currents for two-wire model (2.5 to 40 mA)
- Compliance with lead-free requirements
- Use of UL-approved lead wires (style 2844)
- Increase in elasticity performance by a factor of 1.5 (as compared with conventional in-house models)



Auto Switch Specifications

D-M9□ (with Indicator light)			
Model number	D-M9N	D-M9P	D-M9B
Wiring	Three-wire		Two-wire
Output	NPN	PNP	—
Applicable load	Integrated circuit, relay and PLC		24 V DC relay and PLC
Power voltage	5, 12, or 24 V DC (4.5 to 28 V DC)		—
Current consumption	10 mA or less		—
Load voltage	28 V DC or less	—	24 V DC (10 to 28 V DC)
Load current	40 mA or less		2.5 to 40 mA
Internal voltage drop	0.8 V or less		4 V or less
Leakage current	100 μA max. at 24 V DC		0.8 mA or less
Indicator light	Red LED lights when ON.		

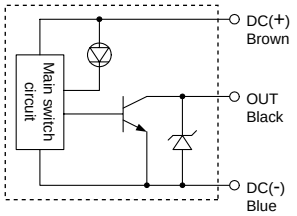
• Lead wire: oil-proof heavy-duty vinyl cable
2.7 x 3.2 with elliptic cross-section, 0.15 mm^2, two cores (D-M9B), or three cores (D-M9N and D-M9P)

Solid state switch specifications

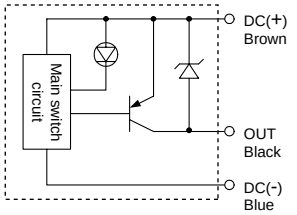
Leakage current	3-wire: 100 μA or less; 2-wire: 0.8 mA max.
Operating time	1 ms or less
Impact resistance	1000 m/s^2
Insulation resistance	50 MΩ or more at 500 V DC (between lead wire and case)
Withstand voltage	1000 V AC for 1 min. (between lead wire and case)
Ambient temperature	−10°C to 60°C
Enclosure	IEC529 standard IP67, JIS C 0920 watertight construction

Internal circuits

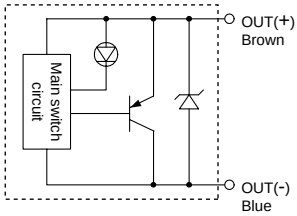
D-M9N



D-M9P



D-M9B



Weight

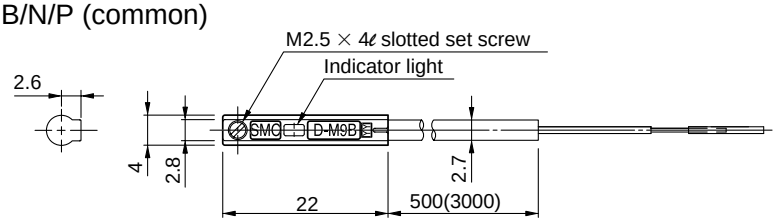
Unit: g

Model		D-M9N	D-M9P	D-M9B
Lead wire length (m)	0.5	8	8	7
	3	41	41	38

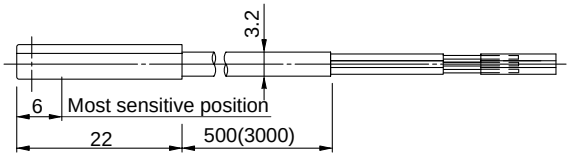
Auto Switch Dimensions

D-M9□

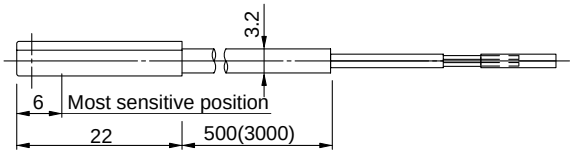
D-M9B/N/P (common)



D-M9N/P (3-wire)



D-M9B (2-wire)



Solid State Switches

Applicable Actuators

D-M9	Series LXF*, LXP, LXS

* Cannot be mounted on Series LXF with ball screw specification.

Auto Switch Specifications

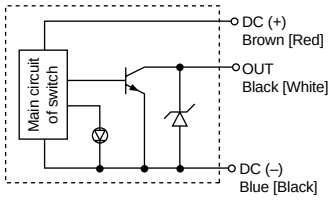
Auto switch part no.	D-F9G	D-F9H
Contact	N.C. (B contact)	
Electrical entry		
Wiring type	3 wire	
Output type	NPN	PNP
Applicable load	IC circuit, Relay, PLC	
Power supply voltage	5, 12, 24VDC (4.5 to 28V)	
Current consumption	10mA or less	
Load voltage	28VDC or less	—
Load current	40mA or less	80mA or less
Internal voltage drop	1.5V or less (0.8V or less at load current of 10mA)	0.8V or less
Leakage current	100μA or less at 24VDC	
Indicator light	Red LED lights up when OFF	

- Lead wire ———— Oil resistant heavy duty vinyl cord, ø2.7, 0.15mm² x 3 wire (Brown, Black, Blue [Red, White, Black]), 0.18mm² x 2 wire (Brown, Blue [Red, Black])
- Insulation resistance —— 50MΩ or more at 500VDC (between lead wire and case)
- Withstand voltage ——— 1000VAC for 1 min. (between lead wire and case)
- Indication light ———— Lights when ON
- Ambient temperature —— –10 to 60°C
- Operating time ———— 1ms or less
- Impact resistance ——— 1000m/s²

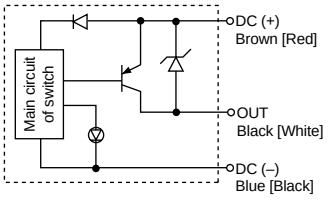
Auto switch internal circuits

Lead wire colors inside [ ] are those prior to conformity with IEC standards.

D-F9G



D-F9H

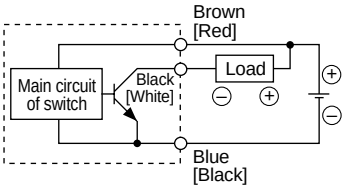


Solid State Switch Connection and Examples

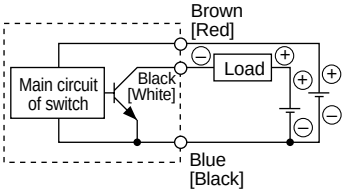
Basic Wiring

3 wire, NPN

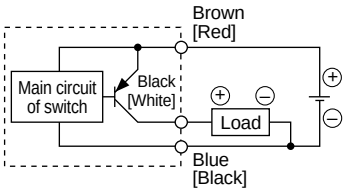
(When the switch power supply and load power supply are the same)



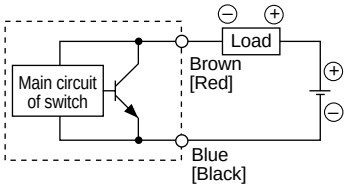
(When the switch power supply and load power supply are separate)

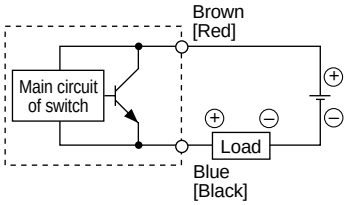


3 wire, PNP



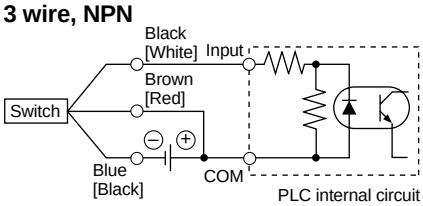
2 wire



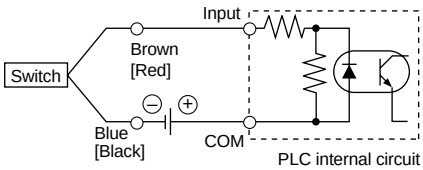


Examples of Connection to PLC

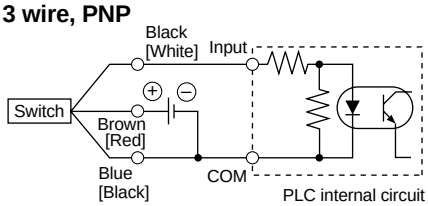
Sink input specifications, 3 wire, NPN



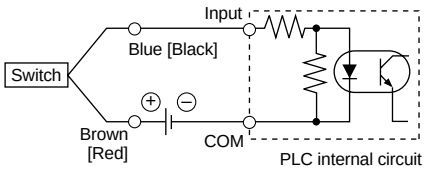
2 wire



Source input specifications, 3 wire, PNP



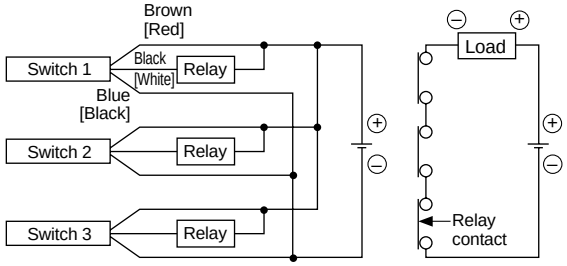
2 wire



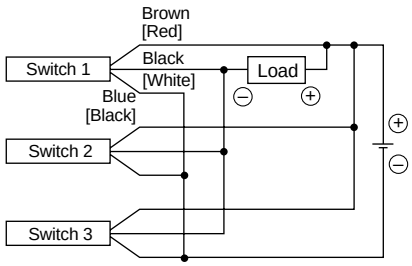
Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

Connection Examples for AND (Series) and OR (Parallel)

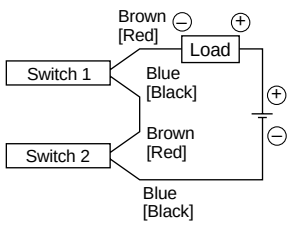
3 wire, AND connection for NPN output



3 wire, OR connection for NPN output



2 wire with 2 switch AND connection

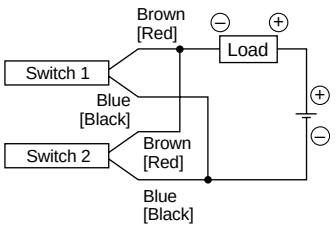


When two switches are connected in series, a load may malfunction because the load voltage will decline when in the ON state.
The indicator lights will light up when both of the switches are in the ON state.

Load voltage at ON = Power supply voltage – Residual voltage x 2 pcs.
= 24V – 4V x 2 pcs.
= 16V

Example: Power supply voltage is 24VDC.
Internal voltage drop in switch is 4V.

2 wire with 2 switch OR connection



When two switches are connected in parallel, malfunction may occur because the load voltage will increase when in the OFF state.

Load voltage at OFF = Leakage current x 2 pcs. x Load impedance
= 1mA x 2pcs. = 3kΩ
= 6V

Example: Load impedance is 3kΩ.
Leakage current from switch is 1mA.

Applicable switch models

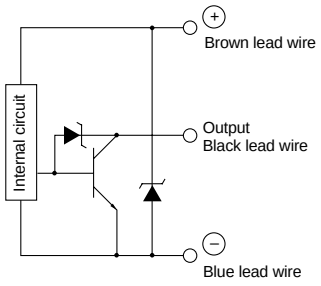
Applicable model	Model type	Part no.	Switch type		
LXF LXS	**G**	GXL-8F	Standard	N.O. (A contact)	3 wire
	GD	GXL-8FI	Varying frequencies	N.O. (A contact)	3 wire
	GB	GXL-8FB	Standard	N.C. (B contact)	3 wire
	GDB	GXL-8FIB	Varying frequencies	N.C. (B contact)	3 wire
	GU	GXL-8FU	Standard	N.O. (A contact)	2 wire
	GUB	GXL-8FUB	Standard	N.C. (B contact)	2 wire

Switch specifications (SUNX Corporation)

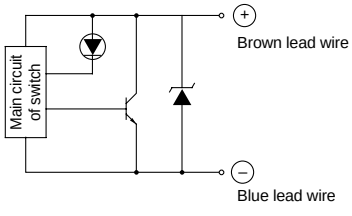
Part no.		GXL-8F(I)(B)	GXL-8FU	GXL-8FUB
Repeatability		Direction of detecting axis, Perpendicular to detecting axis: 0.04mm or less		
Power supply voltage		12 to 24VDC ±10%, Ripple P-P 10% or less		
Current consumption		15mA	0.8mA or less (when output is OFF)	
Output		NPN Maximum load current: 100mA Maximum applied voltage: 30VDC Residual voltage: 1V or less	2 wire solid state DC Load current: 3 to 70mA Residual voltage: 3V or less	
Maximum response frequency		500Hz	1kHz	
Indicator light		Red LED (lights up when ON)	Green LED (stable detection) Red LED (unstable detection)	
Environmental resistance	Ambient temperature	–10° to 55°C	–25° to 70°C	
	Ambient humidity	45 to 85% RH		
	Noise resistance	Power line: 240Vp, pulse width of 0.5µs		
Detecting distance fluctuation	Temperature characteristics	Within +15/–10% of detecting distance at 20°C within ambient temperature range		
	Voltage characteristics	Within ±2% with ±10% fluctuation of operating voltage		
Cable		0.08mm 3 wire heavy duty cable 1m	0.15mm 2 wire heavy duty cable 1m	

Proximity switch internal circuit

GXL-8F(I)(B)

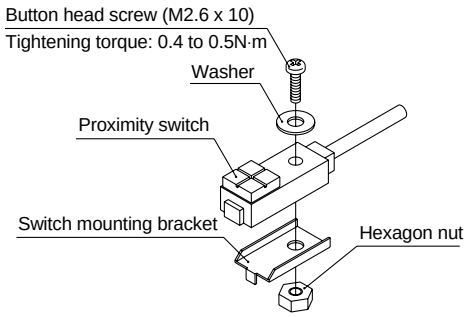


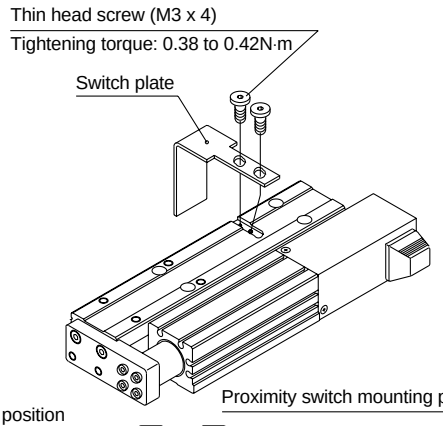
GXL-8FU(B)(I)

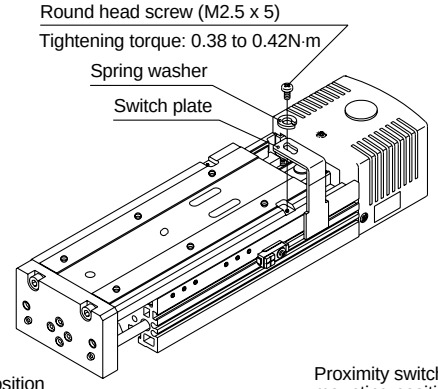


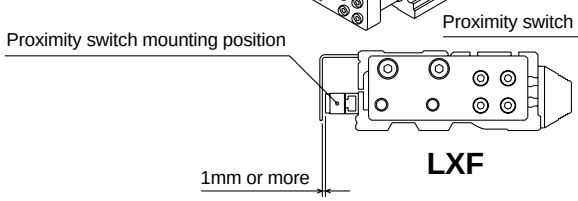
Proximity Switch/Switch Plate Mounting

Be sure to use the mounting screws included, and mount the proximity switch as shown in the drawing to the right.
Mount the switch plate as shown below.
Always use the proper tightening torque and use a thread locking agent on screws to prevent loosening.
The switch body is made of PBT and acrylic resin. Select a thread locking agent that will not affect these materials.

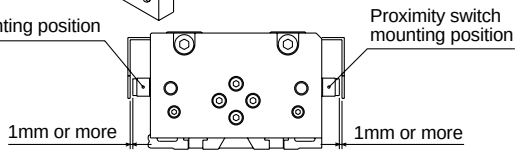








LXF

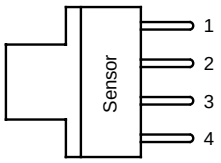


LXS

Standard Photo Micro Sensor for Home Position (OMRON Corporation)

Rating

Power supply voltage	5 to 24VDC ±10%, Ripple (p-p) 10% or less	
Current consumption	35mA or less	
Control output	5 to 24VDC load current (Ic) 100mA, Residual voltage 0.8V or less Load current (Ic) 40mA, Residual voltage 0.4V or less	
Ambient temperature	Operation: –25° to 55°C (When stored: –30° to 80°C)	
Ambient humidity	Operation: 5 to 85%RH (When stored: 5 to 95%RH)	
Part no.	EE-SX672 equivalent	EE-SX673 equivalent
Applicable actuator	**LXF**	**LXP, LXS**

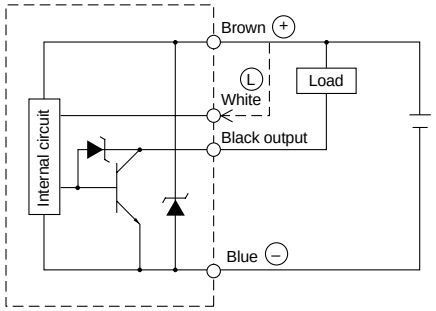
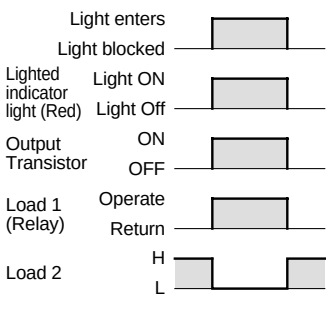
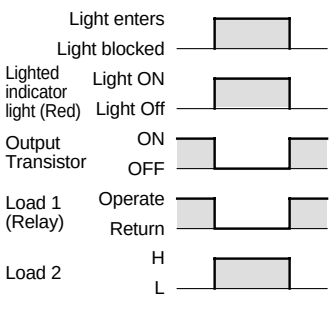


Terminal arrangement

1	Brown	Vcc ⊕
2	White	L*
3	Black	OUTPUT
4	Blue	GND (OV) ⊖

* Normally ON when light is blocked. However, if the Ⓛ terminal and ⊕ terminal are shorted, it changes to ON when light enters.

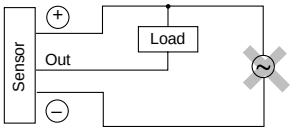
Output level circuit

Operating condition of output transistor	ON when light enters	ON when light is blocked
Output circuit		
Time chart		

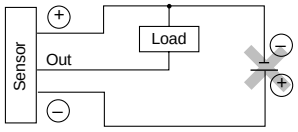
* Normally ON when light is blocked. However, if the Ⓛ terminal and ⊕ terminal are shorted, it changes to ON when light enters.

⚠Precautions

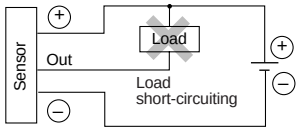
1. Do not use the EE-SX at voltage exceeding the rated voltage range, otherwise the EE-SX may be damaged.



2. Do not make mistakes in wiring, such as mistakes in polarity, otherwise the EE-SX may be damaged.



3. Do not short-circuit the load (i.e., do not connect a power supply directly to the Sensor) as shown below, otherwise the EE-SX may be damaged.



⚠Caution

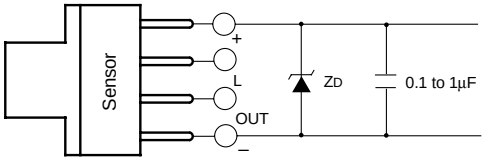
Mounting

1. The EE-SX is a Sensor to be built into equipment. Therefore, no special protective measures have been taken to protect the EE-SX from external light disturbance. Make sure that the EE-SX is not affected by incandescent lamps or other light sources that may cause external light disturbance, otherwise the EE-SX may malfunction.
2. Be sure to mount the Sensor securely to flat plates. The characteristics of the Through-beam Sensor change if the slot is deformed.
3. Use M3.0 screws when mounting the EE-SX. Be sure to use spring washers with the screws so that the screws will not loosen. The tightening torque applied to each screw must be no more than 0.59N.m (6kgf.cm).
4. Make sure that nothing will come into contact with the sensing element of the Sensor. If the sensing element has scratch damage, the characteristics of the Sensor will decrease.
5. Make sure that the EE-SX is securely mounted and not loosened by vibration or shock.

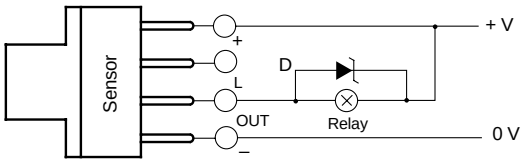
Wiring

Countermeasures Against Surge.

1. If the power supply has surge voltage, connect a Zener diode withstanding 30 to 35V or 0.1 to 1-μF capacitor in parallel to the power supply to absorb the surge voltage.



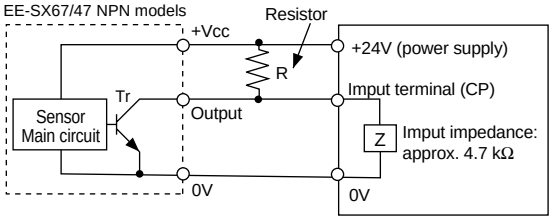
2. If the load is a relay or other small inductive load, connect the load to the EE-SX as shown below. Be sure to connect a diode for countervoltage absorption.



3. Do not wire power lines or high-tension lines alongside the lines of the EE-SX in the same conduit, otherwise the EE-SX may be damaged or malfunction due to induction. Be sure to wire the lines of the EE-SX separately from power lines or high-tension lines or lay them in an exclusive, shielded conduit.

Voltage Output

1. A Sensor with open collector output can be connected to a device with voltage-input specifications by connecting a resistor between the power supply and output terminals as shown in the following circuit diagram. The resistance of the resistor is normally 4.7kΩ and must withstand a power of 0.5W at 24V and 0.25W at 12V.



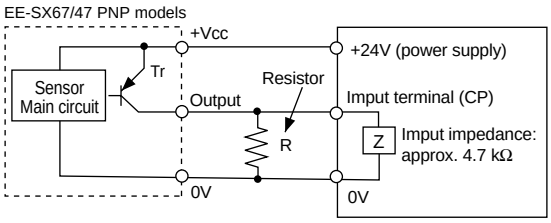
EE-SX47/67 NPN Models with a 4.7-kΩ Resistor
High level:

$$\text{Input voltage } (V_H) = \frac{Z}{R+Z} V_{CC} = \frac{4.7k}{4.7k + 4.7k} \times 24V = 12V$$

Low level:

Input voltage (V_L) ≤ 0.4 V

$$\text{Load current } (I_C) = \frac{V_{CC}}{R} = \frac{24V}{R} = 5.1mA \leq 50 \text{ to } 100 \text{ mA}$$



EE-SX47/67 PNP Models with a 4.7-kΩ Resistor
High level:

Input voltage (V_H) = Vcc–residual voltage
~24V–1.3 V= 22.7V

Low level:

Input voltage (V_L) ~ 0V

Note: Refer to the ratings of the Sensor for the relationship between the residual voltage and load current.

Electric Actuators
Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of **"Caution", "Warning"** or **"Danger"**. To ensure safety, be sure to observe ISO 10218 Note 1), JISB 8433 Note 2) and other safety practices.

⚠ Caution: Operator error could result in injury or equipment damage.

⚠ Warning: Operator error could result in serious injury or loss of life.

⚠ Danger: In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 10218: Manipulating industrial robots - Safety
Note 2) JISB 8433: General Rules for Robot Safety

⚠ Warning

1. **The compatibility of electric actuators is the responsibility of the person who designs the system or decides its specifications.**
   Since the products specified here are used in various operating conditions, their compatibility for the specific system must be based on specifications or after analysis and/or tests to meet your specific requirements.
2. **Only trained personnel should operate this equipment.**
   Electric actuators can be dangerous if an operator is unfamiliar with them. Assembly, handling or repair of systems using electric actuators should be performed by trained and experienced operators.
3. **Do not service machinery/equipment or attempt to remove components until safety is confirmed.**
   1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
   2. When equipment is to be removed, confirm the safety process as mentioned above, and shut off the power supply for this equipment.
   3. Before machinery/equipment is restarted, confirm that safety measures are in effect.
4. **Contact SMC if the product is to be used in any of the following conditions:**
   1. Conditions and environments beyond the given specifications, or if product is used outdoors.
   2. Installation on equipment in conjunction with atomic energy, medical equipment, food and beverages, or safety equipment.
   3. An application which has the possibility of having negative effects on people, property or animals, requiring special safety analysis.
5. **To operate properly, read the instruction manual carefully, or confirm with the distributor or SMC before use.**
6. **Carefully read the handling precautions in this catalogue for proper operation.**
7. **Operating applications and/or locations are restricted for some products in this catalogue. Confirm with the distributor or SMC.**

Electric Actuator Precautions 1

Be sure to read before handling.

General

Operation

⚠Caution

1. **In order to ensure proper operation, be certain to read the instruction manual carefully. As a rule, handling or usage/operation other than that contained in the instruction manual are prohibited.**
2. **If the actuator will be used in an environment where it will be exposed to chips, dust, cutting oil (water, liquids), etc., a cover or other protection should be provided.**
3. **Operate with cables secured. Avoid bending cables at sharp angles where they enter the actuator, and also make sure that cables do not move easily.**

Design

⚠Warning

1. **In cases where dangerous conditions may result from power failure or malfunction of the product, install safety equipment to prevent damage to machinery and human injury. Consideration must also be given to drop prevention with regard to suspension equipment and lifting mechanisms.**
2. **Consider possible loss of power sources.**

   Take measures to protect against human injury and machine damage in the event that there is a loss of air pressure, electricity or hydraulic power.
3. **Consider emergency stops.**

   Design so that human injury and/or damage to machinery and equipment will not be caused when machinery is stopped by a safety device under abnormal conditions such as a power outage or a manual emergency stop.
4. **Consider the action when operation is restarted after an emergency stop or abnormal stop.**

   Design the machinery so that human injury or equipment damage will not occur upon restart of operation.

Selection

⚠Warning

1. **Confirm the specifications.**

   The products in this catalog should not be used outside the range of specifications, as this may cause damage or malfunction, etc. (Refer to specifications.)

Mounting

⚠Caution

1. **Take care that cables are not caught by actuator movement.**
2. **Do not use in locations where there is vibration or impact shock. Contact SMC before using in this kind of environment, as damage may result.**

Mounting

⚠Caution

3. **Give adequate consideration to the arrangement of wiring, etc., when mounting. If wiring is forced into inappropriate arrangement, this may lead to breaks in the wiring and result in malfunction.**

Operating Environment

⚠Caution

1. **Avoid use in the following environments.**
   1. Locations with a lot of debris or dust, or where chips may enter.
   2. Locations where the ambient temperature is outside the range of the temperature specification (refer to "Specifications").
   3. Locations where the ambient humidity is outside the range of the humidity specification (refer to "Specifications").
   4. Locations where corrosive or combustible gases are generated.
   5. Locations where strong magnetic or electric fields are generated.
   6. Locations where direct vibration or impact shock, etc., will be applied to the actuator unit.
   7. Locations with a lot of dust, or where water or oil splashes on the actuator.

Maintenance

⚠Warning

1. **Perform maintenance according to the procedures indicated in the instruction manual.**

   If handled improperly, malfunction and damage of machinery or equipment may occur.
2. **Removal of equipment**

   When equipment is to be removed, first confirm that measures are in place to prevent dropping or runaway of driven objects, etc., and then proceed after shutting off the electric power. When starting up again, proceed with caution after confirming that conditions are safe.

Actuator

Design

⚠Warning

1. **There is a possibility of dangerous sudden action by actuators if sliding parts of machinery are twisted due to external forces, etc.**

   In such cases, human injury may occur, e.g., by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be adjusted for smooth operation and designed to avoid such dangers.
2. **A protective cover is recommended to minimize the risk of human injury.**

   If a driven object and moving parts of an actuator pose a danger of human injury, design the structure to avoid contact with the human body.

Electric Actuator Precautions 2

Be sure to read before handling.

Actuator

Design

⚠Warning

3. Securely tighten all stationary parts and connected parts of electric actuators so that they will not become loose.

Avoid use in locations where direct vibration or impact shock, etc., will be applied to the body of the actuator.

Usage

⚠Caution

1. Perform the following inspections before operating an actuator/controller.

a) Inspection for damage to the actuator/controller power line and each signal wire

b) Inspection for looseness of the connector to each power line and signal line

c) Inspection for looseness of the actuator/controller mounting

d) Inspection for abnormal operation of the actuator/controller

e) Emergency stop function

2. Implement preventive measures such as a fence or enclosure to prevent human entry to the operating area of the actuator/controller and related equipment.

3. Take measures to perform an emergency stop by using a sensor, etc., in case of human entry into the area described above.

4. Take necessary measures to prevent danger from related equipment in case the actuator/controller stops due to an abnormal condition.

5. Take necessary measures to prevent danger from the actuator/controller in case of the related equipment in an abnormal condition.

6. Take necessary measures to prevent cuts and damage to the actuator/controller power supply, power line, and each signal line from pinching, shearing, getting caught, scratching or rubbing, etc.

7. If abnormal heating, smoking or fire, etc., occurs in the actuator/controller, immediately shut off the power supply.

8. When installing, adjusting, inspecting or performing maintenance on the actuator/controller, be sure to shut off the power supply to the actuator/controller and related equipment. Then, lock it so that no one other than the person working can turn the power on, or implement measures such as a safety plug. Also, post a sign in a conspicuous place to inform that work is being performed.

9. When more than one person is performing work, decide on the procedures, signals, measures and resolution for abnormal conditions before beginning the work. Also, designate a person to supervise work other than those performing work.

Operation

⚠Caution

1. This actuator can be used within its allowable range with a direct load applied, but when connected to a load having an external guide mechanism careful alignment is necessary. The longer the stroke, the greater the amount of variation in the centre axis, and therefore, a method of connection which can absorb the displacement should be considered.

2. Since the bearing parts and parts surrounding the lead screw are adjusted at the time of shipment, do not change the setting of the adjusted parts.

3. This actuator can be used without lubrication. In the event that lubrication is applied, a special grease must be used. Confirm with SMC or the distributor upon purchasing.

4. If the electric actuator is repeatedly operated for short stroke cycles (20mm for LJ, 10mm for LX), this may cause loss of grease. Therefore, operate the actuator for a full stroke once every 40 to 60 cycles.

5. Motor rotation should be one rotation or more per second for an electric actuator with stepper motor specification.

However, since vibration from the motor is large with low rotations (2 rotations or less) and may affect the work piece, confirm the operating conditions before operating.

Mounting

⚠Caution

1. Do not use until you verify that the equipment can operate properly.

2. The product should be mounted and operated after thoroughly reading the instruction manual and understanding its contents.

3. Do not dent, scratch or cause other damage to the body and table mounting surfaces.

This may cause a loss of parallelism in the mounting surfaces, looseness in the guide unit, an increase in operating resistance or other problems.

4. When attaching a work load, do not apply strong impact shock or a large moment.

If an outside force exceeding the allowable moment is applied, this may cause looseness in the guide unit, an increase in sliding resistance or other problems.

5. When connecting a load having an external support or guide mechanism, be sure to select a suitable connection method and perform careful alignment.

Electric Actuator Precautions 3

Be sure to read before handling.

Controller/Driver/Positioning Driver/Regenerative Absorption Unit

Handling

⚠Warning

1. **Never touch the inside of the controller/driver unit. It may cause electric shock or failure.**
2. **The motor and controller/driver should be used in the designated combinations.**

⚠Caution

1. **Do not disassemble or modify the equipment. This may cause failure, malfunction or fire.**
2. **Do not touch the driver during energizing or for a few minutes after de-energizing due to high temperature.**
3. **When fire or danger to personnel is predicted due to abnormal heating, burning or smoking of the product, shut off the power supply to the main unit and the system immediately.**

Power Supply

⚠Caution

1. **In cases where voltage fluctuations greatly exceed the prescribed voltage, a constant voltage transformer, etc., should be used to operate within the prescribed range.**
2. **Use a power supply that has low noise between lines and between power and ground. In cases where noise is high, an isolation transformer should be used.**
3. **Perform wiring by separating the power supply from the general-purpose input/output and control terminal interface power supply (24VDC).**
4. **Avoid bundling the power supply lines together with, or routing them near, the general-purpose input/output lines, control terminal output lines and encoder signal lines.**
5. **Implement measures to protect against surge from lightning. When doing this, separate the lightning surge absorber ground from the controller ground.**

Grounding

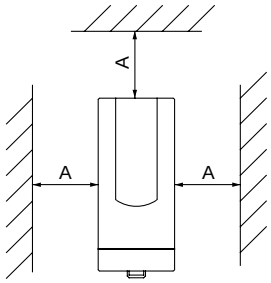
⚠Caution

1. **Be sure to carry out grounding in order to ensure the noise tolerance of the controller.**
2. **Dedicated grounding should be used as much as possible. Grounding should be to a type 3 ground. (Ground resistance of 100Ω or less.)**
3. **Grounding should be as close as possible to the controller, and the ground wires should be as short as possible.**
4. **In the unlikely event that malfunction is caused by the ground, it may be disconnected.**

Mounting

⚠Caution

1. **Mount the controller/driver on non-combustible substance. Mounting directly on or closely to combustible material may cause fire.**
2. **Provide cooling so that the operating temperature of the body will be within the range shown in the specifications. For that reason, each face of the body should be separated by a sufficient amount of distance from other construction or components.**



∗ Provide the following distances:
A = 80mm for LC1
A = 50mm or more for LC6, LC7R

3. **Avoid mounting the controller/driver on a panel where a vibration source such as large size electromagnetic contactor or circuit fuse breaker is also mounted. If the driver is mounted on the same panel with such a vibration source, it should be separated from the source.**
4. **Design the machinery so that the product can be freely connected/disconnected after installation.**
5. **When there are dents, bumps or warping on the mounting surface of the controller, excessive force will be applied to the frame or case and will cause failure. Therefore, mount the controller on a flat surface.**

Wiring

⚠Danger

1. **Adjusting, mounting or wiring change should never be done before shutting off the power supply to this product. There is a danger of electric shock.**

⚠Caution

1. **Wiring should be properly completed.**

   Do not apply any voltage to the terminals other than those specified in the instruction manual. The unit may be damaged.
2. **Connector should be securely connected.**
3. **Be sure to take measures against noise .**

   Noise in a signal line may cause malfunction. As a counter-measure, separate high voltage wires and low volage wires, and shorten wiring lengths, etc.
4. **When connecting the electric actuator motor power line and encoder signal line, carefully confirm their corresponding indications and the connector orientation.**

Electric Actuator Precautions 4

Be sure to read before handling.

Controller/Driver

Wiring

⚠Caution

5. Avoid bundling the electric actuator power line and encoder signal line with 100VAC wiring and other high voltage wiring. Separate them as much as possible.

6. Never connect/disconnect the control terminal, general purpose input/output terminal, motor power line or encoder signal line while the controller power supply is ON.

Brake

There exists a very slight possibility of failure of the brake mechanism; should this occur, inertial running may be seen in the system. To prepare for such a failure, safety measures for machinery should be carefully considered and implemented. Multiple safety measures should be taken.

Construction

⚠Danger

1. Do not use in flammable or explosive atmospheres.

Slip during activation or braking may generate sparks. Never use in grease or combustible gas atmospheres which have a possibility of flash or explosion.

2. Not applicable for braking.

This brake is a de-energized operating type designed only for holding and emergency stoppage. If repeatedly used for braking, its original performance and specifications can easily deteriorate within a short time and brake releasing becomes impossible. If used in this way, the brake will be damaged and holding performance will definitely be compromised, leading to accidents such as runaway of machinery. Refer to the instruction manual for the brake wiring and perform wiring securely. Confirm that the brake operates properly during a daily inspection.

Before Mounting

⚠Danger

1. Use the appropriate wire size for the power supply capacity.

If insufficient wire size is used, the insulation covering will be melted and electric shock or fire may result.

2. Start operation after confirming proper electrical wiring for the brake.

The brake is locked in the de-energized state. 24VDC is needed to release the lock. Confirm that the wiring is appropriate for the purpose and application.

Brake

During Operation

⚠Danger

1. Immediately stop operation if abnormal operation noise or vibration occurs.

In case abnormal operation noise or vibration occurs, the product may have been improperly mounted. Unless operation is stopped for inspection, machinery may be seriously damaged.

2. Do not touch the brake unit while in operation.

The brake unit surface temperature increases to approximately 90°C to 100°C due to slip heat and heat generated by the built-in coils. As this may cause burns, do not touch the brake unit when in operation. Furthermore, since the brake unit surface may become heated to a high temperature just by energization, do not touch the brake unit.

Maintenance and Inspection

⚠Danger

1. Do not apply oil or water.

If water or oil is applied to friction surfaces or even to the body, torque performance will be compromised drastically, and the system may overrun causing human injury.

Operation

⚠Caution

1. Do not share the brake power supply and control signal power supply (VDC).

2. Install a surge absorber to suppress the surge voltage caused by turning the relay (RY) ON/OFF.

3. If the brake is to be activated in the event of power loss, make a connection that will shut off the brake power supply instantaneously.

4. When releasing the brake for an inspection, etc., the work piece will drop due to its own weight. Ensure sufficient safety before beginning work.

5. Actuation time is required for the opening and closing of the brake. Allow for this time to lapse when designing.

Auto Switch Precautions 1

Be sure to read before handling.
Refer to the appropriate section in this catalog regarding detailed precautions for each series.

Design and Selection

⚠Warning

1. Confirm the specifications.

Read the specifications carefully and use this product appropriately. The product may be damaged or malfunction if it is used outside the range of specifications of load current, voltage, temperature or impact.

2. Keep wiring as short as possible.

Although wire length should not affect switch function, use a wire 100m or shorter.

3. Do not use a load that generates surge voltage.

Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if the surge is applied repeatedly. When a load, such as a relay or solenoid, which generates surge is directly driven, use a type of switch with a built-in surge absorbing element.

4. Ensure sufficient clearance for maintenance activities.

When designing an application, be sure to allow sufficient clearance for maintenance and inspections.

Mounting and Adjustment

⚠Warning

1. Do not drop or bump.

Do not drop, bump, or apply excessive impacts (300m/s² or more) while handling. Even if the switch body is not damaged, there may be internal damage and possible malfunction.

2. Do not carry an actuator by the auto switch lead wires.

Never carry an actuator by its auto switch lead wires. This may not only cause broken lead wires, but it may cause internal elements of the switch to be damaged by the stress.

3. Mount switches using the proper tightening torque.

When a switch is tightened beyond the range of tightening torque, the mounting screws, mounting bracket or switch may be damaged. On the other hand, tightening below the range of tightening torque may allow the switch to slip out of position.

4. Mount a switch at the center of the operating range.

Adjust the mounting position of an auto switch so that the magnet stops at the center of the operating range (the range in which a switch is ON). If mounted at the end of the operating range (around the borderline of ON and OFF), operation may be unstable.

Wiring

⚠Warning

1. Avoid repeatedly bending or stretching lead wires.

Broken lead wires will result from applying bending stress or stretching force to the lead wires.

2. Confirm proper insulation of wiring.

Be certain that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

3. Do not wire with power lines or high voltage lines.

Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits containing auto switches may malfunction due to noise from these other lines.

4. Do not allow short circuit of loads.

All models of PNP output type switches do not have built-in short circuit protection circuits. If loads are short circuited, the switches will be instantly damaged.

Take special care to avoid reverse wiring with the brown [red] power supply line and the black [white] output line on 3 wire type switches.

5. Avoid incorrect wiring.

1) If connections are reversed (power supply line + and power supply line –) on a 3 wire type switch, the switch will be protected by a protection circuit. However, if the power supply line (+) is connected to the blue [black] wire and the power supply line (–) is connected to the black [white] wire, the switch will be damaged.

Note) Lead wire colours inside [ ] are those prior to conformity with IEC standards.

Maintenance

⚠Warning

1. Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.

1) Retightening of switch mounting screws
If screws become loose or the mounting position is dislocated, retighten them after readjusting the mounting position.

2) Confirm that there is no damage to lead wires.
To prevent faulty insulation, replace switches or repair lead wires, if damage is discovered.

Auto Switch Precautions 2

Be sure to read before handling.
Refer to the appropriate section in this catalog regarding detailed precautions for each series.

Operating Environment

⚠Warning

1. Never use in an atmosphere of explosive gases.

The construction of auto switches is not intended to prevent explosion. Never use in an atmosphere with an explosive gas since this may cause a serious explosion.

2. Do not use in an area where a magnetic field is generated.

Auto switches will malfunction or magnets inside actuators will become demagnetized.

3. Do not use in an environment where the auto switch will be continually exposed to water.

Do not use switches in applications where they will be continually exposed to water splash or spray. Poor insulation or swelling of the potting resin inside switches may cause malfunction.

4. Do not use in an environment with oil or chemicals.

Consult SMC if auto switches will be used in an environment with coolant, cleaning solvent, various oils or chemicals. If auto switches are used under these conditions for even a short time, they may be adversely affected by improper insulation, malfunction due to swelling of the potting resin, or hardening of the lead wires.

5. Do not use in an environment with temperature cycles.

Consult SMC if switches are used where there are temperature cycles other than normal air temperature changes, as they may be adversely affected internally.

6. Do not use in an area where surges are generated.

When there are units (solenoid type lifter, high frequency induction furnace, motor, etc.) which generate a large amount of surge in the area around actuators with solid state auto switches, this may cause deterioration or damage to the internal circuit elements of the switch. Avoid sources of surge generation and crossed lines.

7. Avoid accumulation of iron waste or close contact with magnetic substances.

When a large amount of ferrous waste such as machining chips or spatter is accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with an auto switch actuator, it may cause auto switches to malfunction due to a loss of the magnetic force inside the actuator.

Other

⚠Warning

1. Consult SMC concerning water resistance, flexibility of lead wires, and usage at welding sites, etc.

Photo Micro Sensor and Proximity Switches

Incorrect Usage

⚠Caution

1. Do not operate beyond the rated voltage range.

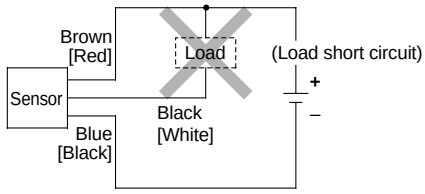
If applying voltage over the rated voltage range, equipment may be damaged.

2. Avoid incorrect wiring such as polarity of power supply.

Otherwise, equipment may be damaged.

3. Do not short circuit the load. (Do not connect to power supply.)

Otherwise, equipment may be damaged.



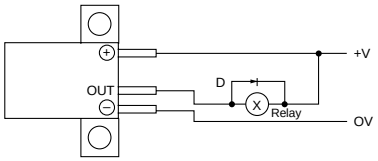
Note) Lead wire colours inside [ ] are those prior to conformity with IEC standards.

Other

⚠Caution

1. Power lines and high voltage lines should not be in the same piping or duct with wiring of the photo micro sensor, as the system may malfunction or be damaged due to induction. Separate wiring or individual piping is required to avoid such trouble.

2. If operating with a small induction load such as a relay, wire as shown in the figure below. (In this case, be sure to connect a reverse voltage suppression diode.)



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