# LCX

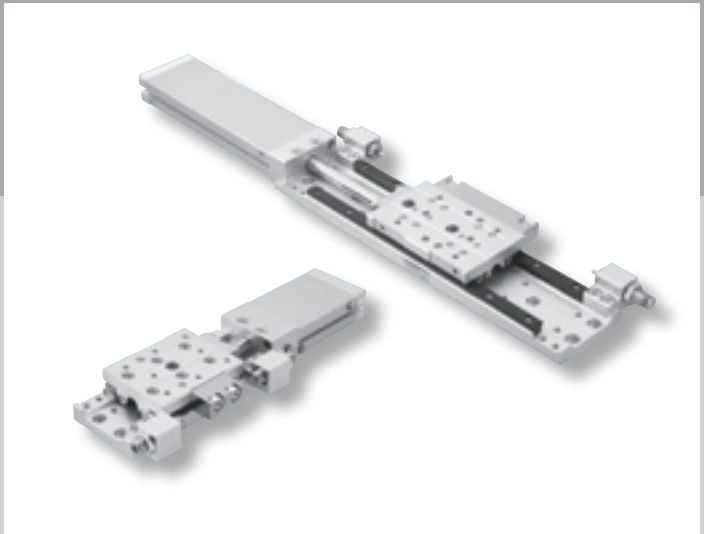
## Linear slide cylinder

ø25/ø32

## Combined functions

Overview

Thin, light, rigid linear slide cylinder perfect for narrow space.



CONTENTS

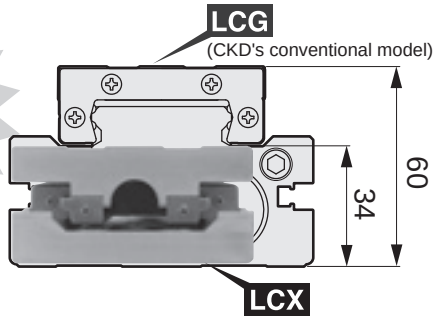
# Thin, light, rigid LCX Series

## A wide variety of option variations are available for use in more applications.

### Thin

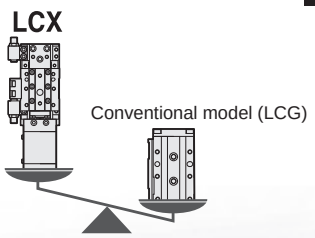
About 50% thinner than the conventional model (LCG).
The height **reduced from 60 mm to 34 mm**.
The extremely thin body can fit to narrow space.

Compared with the conventional model 43% thinner!



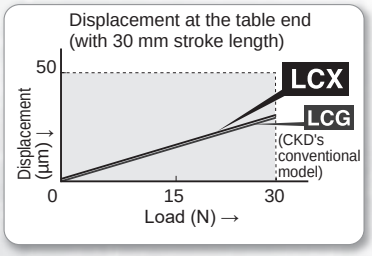

### Lightweight

**50% lighter** than the conventional model (LCG).
The moving part becomes lighter and thus enables efficient, energy-saving equipment.



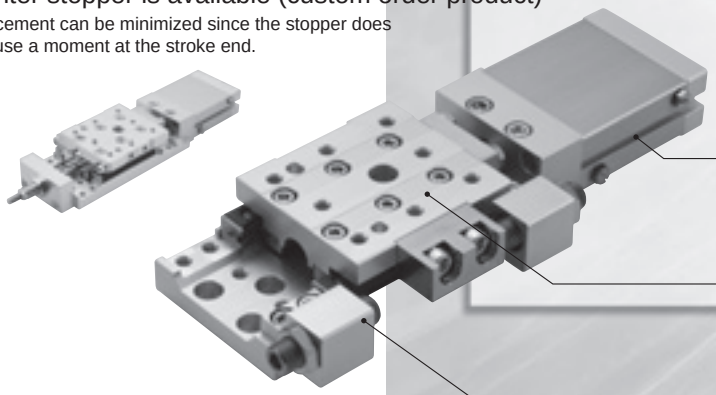

### Rigid

The separate linear guide provides **the same level of rigidity as the conventional model (LCG)**, even with the thin and light body.

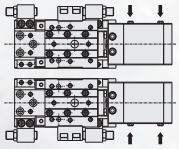



## A wide range of variations

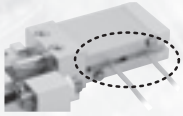
■ A center stopper is available (custom order product)
Displacement can be minimized since the stopper does not cause a moment at the stroke end.



■ Laterally symmetrical
Pipes and stoppers can be installed on both the right and left sides.
⬅ shows the piping direction.



■ Compatible with T switch
The proximity 2-color display switch is available.



■ Anti-rust
Anti-rust treated as standard.

■ Different of stoppers


■ Metal stopper


■ Rubber cushion stopper

**LCX Series**

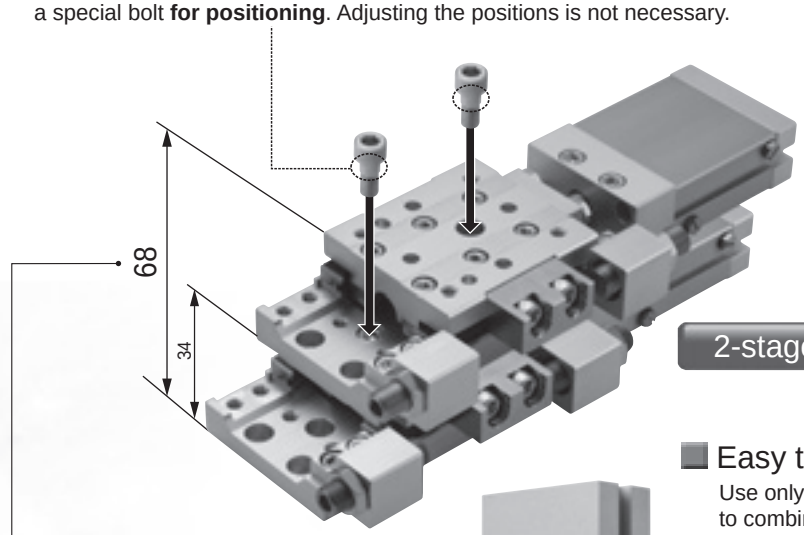
Linear slide cylinder

# Integrated units - simple, secure, high precision

Components can be combined as desired. Select from various options such as the position locking, long stroke (max. 150 mm) and with a positioning hole. Use the integrated units in a wide range of uses including conveyor and positioning so as to improve productivity of multiple products.

## High precision positioning mechanism

Components can be simply combined with high precision positioning holes and a special bolt **for positioning**. Adjusting the positions is not necessary.



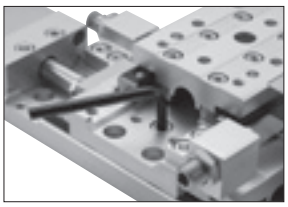

2-stage unit

## Only 68 mm even when components are stacked

Direct mount without connecting plates enables thin profile design.

## Easy to install

Use only a Alan wrench to combine the components.

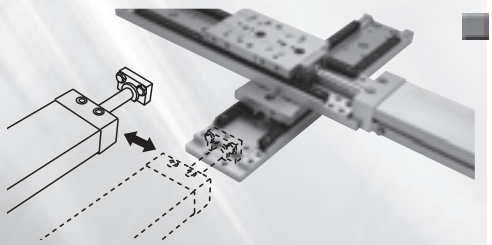


Cross unit

## Rigid, wide guide

42 mm wide rail fits inside.



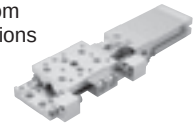
## Large reduction in maintenance time

The cylinder can be replaced with the body installed on the equipment.

## ■ LCX product variations

### LCX-P7*

Double acting/single rod
Clean room specifications



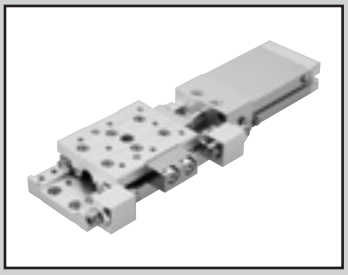
ø 25, ø 32
Stroke length: 10 to 50 mm

### LCX-*L-P7*

Double acting/single rod
clean room specifications
Long stroke

ø 25, ø 32
Stroke length: 75 to 150 mm

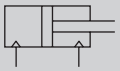
* The picture shows the standard product.



Linear slide cylinder Double acting/single rod clean room specifications

# LCX Series

● Bore size: ø25/ø32

JIS symbol 

RoHS CAD

## Specifications

| Descriptions | LCX-P7* | |
|---|---|---|
| Bore size mm | ø25 | ø32 |
| Actuation | Double acting | |
| Working fluid | Compressed air | |
| Max. working pressure MPa | 0.7 | |
| Min. working pressure MPa | 0.15 | |
| Proof pressure MPa | 1.05 | |
| Ambient temperature °C | -10 to 60 (no freezing) (*1) | |
| Port size | M5 | |
| Port size (relief port) | M5 | |
| Stroke tolerance mm | +2.0 0 (*2) | |
| Working piston speed mm/s | 20 to 500 | |
| Cushion | With rubber cushion | |
| Lubrication | Not available | |
| Allowable energy absorption J | Refer to table 3 on page 189. | |

## Structure and material restriction

| | Structure | Model No. |
|---|---|---|
| P7 Series | Exhaust treatment | P72 |
| | Vacuum treatment | P73 |

## Stroke length

| Bore size (mm) | Standard stroke length (mm) |
|---|---|
| ø25 | 10, 20, 30, 40, 50 |
| ø32 | 10, 20, 30, 40, 50 |

Note: Stroke lengths other than above are not available.

*1: Contact CKD if the use environment is always cold (5°C or less) or hot (40°C and over).
*2: Note that there will be a slight gap between the end plate and floating bush if no stopper is attached.
*3: Keep within 20 to 200 mm/s when using a metal stopper.

## Theoretical thrust table

Refer to page 188.

## Switch specifications

● 1-color/2-color display

| Descriptions | Reed 2-wire | | | | Proximity 2-wire | | Proximity 3-wire | | |
|---|---|---|---|---|---|---|---|---|---|
| | T0H/T0V | | T5H/T5V | | T2H/T2V | T2WH/T2WV | T3H/T3V | T3PH/T3PV | T3WH/T3WV |
| Applications | Programmable controller, relay | | Programmable controller, relay IC circuit (without indicator lamp), serial connection | | Programmable controller | | Programmable controller, relay | | |
| Output method | - | | - | | - | | NPN output | PNP output | NPN output |
| Power supply voltage | - | | - | | - | | 10 to 28 VDC | | |
| Load voltage | 12/24 VDC | 110 VAC | 5/12/24 VDC | 110 VAC | 10 to 30 VDC | 24 VDC±10% | 30 VDC or less | | |
| Load current | 5 to 50 mA | 7 to 20 mA | 50 mA or less | 20 mA or less | 5 to 20 mA (*2) | | 100 mA or less | | 50 mA or less |
| Indicator lamp | LED (Lit when ON) | | Without indicator lamp | | LED (Lit when ON) | Red/green LED (Lit when ON) | LED (Lit when ON) | Yellow LED (Lit when ON) | Red/green LED (Lit when ON) |
| Leakage current | 0 mA | | | | 1 mA or less | | 10 μA or less | | |
| Weight g | 1 m: 18 3 m: 49 5 m: 80 | | | | 1 m: 18 3 m: 49 5 m: 80 | | 1 m: 18 3 m: 49 5 m: 80 | | |

*1: Refer to page 309 for detailed switch specifications and dimensions.
*2: The maximum load current of 20 mA is for 25°C. The current will be lower than 20 mA when operating ambient temperature around the switch is higher than 25°C. (5 to 10 mA at 60°C)

## Cylinder weight

● Clean room specifications (Unit: g)

| Bore size (mm) | Basic Stroke length (mm) | | | | |
|---|---|---|---|---|---|
| | 10 | 20 | 30 | 40 | 50 |
| ø25 | 1,010 | 1,040 | 1,060 | 1,180 | 1,200 |
| ø32 | 1,060 | 1,090 | 1,110 | 1,240 | 1,260 |

● Weight of variation/option (stopper) (Unit: g)

| Bore size (mm) | Option/stopper code | | | |
|---|---|---|---|---|
| | S1 to S4 | M1 to M4 | S5/S6 | M5/M6 |
| ø25 | 170 | | 240 | |
| ø32 | | | | |

## How to order

Without switch (Magnet for switch incorporated)

LCX - 25 - 40 ——— S5 E P72

With switch (Magnet for switch incorporated)

LCX - 25 - 40 - T2H* - R - S1T E P72

Model No.
Ⓐ Bore size
Ⓑ Stroke length
Ⓒ Switch model No. *7
Ⓓ Switch quantity
Ⓔ Stopper
Ⓕ Option
Ⓖ Clean room specifications

| Code | Content |
|---|---|
| **Ⓐ Bore Code size** | |
| **25** | ø25 |
| **32** | ø32 |
| **Ⓑ Stroke length (mm)** | |
| **10** | 10 |
| **20** | 20 |
| **30** | 30 |
| **40** | 40 |
| **50** | 50 |

**Ⓒ Switch model No.**

| Lead wire straight | Lead wire L-shaped | Contact | Voltage AC | Voltage DC | Display | Lead wire |
|---|---|---|---|---|---|---|
| **T0H*** | **T0V*** | Reed | ● | ● | 1-color display | 2 wires |
| **T5H*** | **T5V*** | Reed | ● | ● | Without indicator lamp | 2 wires |
| **T2H*** | **T2V*** | Proximity | | ● | 1-color display | 2 wires |
| **T3H*** | **T3V*** | Proximity | | ● | 1-color display | 3 wires |
| **T3PH*** | **T3PV*** | Proximity | | ● | 1-color display (PNP output) | 3 wires |
| **T2WH*** | **T2WV*** | Proximity | | ● | 2-color display | 2 wires |
| **T3WH*** | **T3WV*** | Proximity | | ● | 2-color display | 3 wires |

| *** Lead wire length** | |
|---|---|
| **Blank** | 1 m (standard) |
| **3** | 3 m (option) |
| **5** | 5 m (option) |

| **Ⓓ Switch quantity** | |
|---|---|
| **R** | 1 (on rod end) |
| **H** | 1 (on head end) |
| **D** | 2 |

| **Ⓔ Stopper** | | |
|---|---|---|
| **Blank** | Without stopper | |
| **S Cushion cushion stopper** | | ***1, *4** |
| **S1*** | Stopper position (1) (can be changed to (4)) | Stopper mounting position |
| **S2*** | Stopper position (2) (can be changed to (3)) | |
| **S3*** | Stopper position (3) (can be changed to (2)) | |
| **S4*** | Stopper position (4) (can be changed to (1)) | |
| **S5*** | Stopper position (1), (3) | |
| **S6*** | Stopper position (2), (4) | |
| **M Metal stopper** | | ***1, *3, *4, *5** |
| **M1*** | Stopper position (1) (can be changed to (4)) | Stopper mounting position |
| **M2*** | Stopper position (2) (can be changed to (3)) | |
| **M3*** | Stopper position (3) (can be changed to (2)) | |
| **M4*** | Stopper position (4) (can be changed to (1)) | |
| **M5*** | Stopper position (1), (3) | |
| **M6*** | Stopper position (2), (4) | |
| *** Part** | | |
| **Blank** | Stopper block material: Rolled steel | |
| **T** | Stopper block material: Alloy steel (nitriding) | *2 |

| **Ⓕ Option** | |
|---|---|
| **Blank** | No option |
| **E** | With positioning hole |

| **Ⓖ Clean room specifications** | |
|---|---|
| | Structure |
| P72 | Exhaust treatment |
| P73 | Vacuum treatment |

### ⚠ Precautions for model No. selection

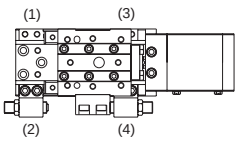
*1: To change the adjustable stroke length, use a discrete rubber cushion stopper or metal stopper on page 178.
*2: Can be selected for the type with stopper only.
*3: The alloy steel stopper block (code: T) is recommended for a metal stopper.
*4: Combination of the rubber cushion stopper and metal stopper is custom order.
*5: Keep within 20 to 200 mm/s when using a metal stopper.
*6: Refer to page 179 for a discrete cylinder model No.
*7: Be careful of the lead wire direction when designing the 30 mm or less stroke length of axial lead wire and the 20 mm stroke length of radial lead wire since a switch is installed in each groove of the body.

[Example of model No.]

**LCX-25-40-T2H-R-S1TEP72**

Model No.: Linear slide cylinder Double acting/ single rod (clean room specifications) LCX-P7*
Ⓐ Bore size : ø25
Ⓑ Stroke length : 40 mm
Ⓒ Switch model No.: Proximity/2 wires/Lead wire 1 m Lead wire straight
Ⓓ Switch quantity : 1 (on rod end)
Ⓔ Stopper : Rubber cushion stopper Stopper position (1) Material, alloy steel (nitriding)
Ⓕ Option : With positioning hole
Ⓖ Clean room specifications : Exhaust treatment

● Stopper position



## How to order switch

**SW - T2H3**

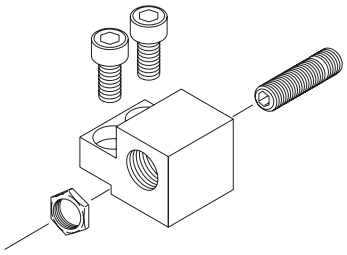
Switch model No.
(Item Ⓒ on page 177)

## How to order a stopper set

- A set of a stopper and rubber cushion stopper or metal stopper
- Use this when changing from the standard to the with rubber cushion stopper or metal stopper

**LCX - 25 - S 2 - S02**

Bore size
(Item Ⓐ on page 177)



| Ⓐ Stopper | |
|---|---|
| **S** | Cushion stopper |
| **M** | Metal stopper |

| Ⓑ Stopper mounting position | |
|---|---|
| **1** | Stopper position (1) or for (4) |
| **2** | Stopper position (2) or for (3) |

| Ⓒ Stroke adjusting amount | |
|---|---|
| **Blank** | Adjustable stroke range 10 mm |
| **S02** | Adjustable stroke range 20 mm |

(Unit: g)

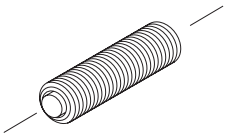
| Model No. | | | | Weight |
|---|---|---|---|---|
| LCX | 25 | S1 | Blank | 70 |
| | | S2 | S02 | 80 |
| | 32 | M1 | Blank | 70 |
| | | M2 | S02 | 80 |

## How to order discrete rubber cushion stopper

- Hexagon socket set screw with urethane
- Use this when changing the adjustable stroke range or when using custom stroke length

**LCX - 25 - S02**

Bore size
(Item Ⓐ on page 177)



| Ⓐ Adjustable stroke range | |
|---|---|
| **S01** | Single side 10 mm (standard) |
| **S02** | Single side 20 mm |

(Unit: g)

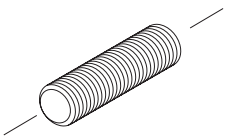
| Model No. | | | Weight |
|---|---|---|---|
| LCX | 25 | S01 | 30 |
| | 32 | S02 | 40 |

## How to order discrete metal stopper

- Use when changing the adjustable stroke range or when using a custom stroke length

**LCX - 25 - M02**

Bore size
(Item Ⓐ on page 177)



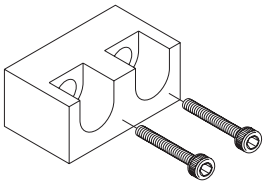
| Ⓐ Adjustable stroke range | |
|---|---|
| **M01** | Single side 10 mm (standard) |
| **M02** | Single side 20 mm |

(Unit: g)

| Model No. | | | Weight |
|---|---|---|---|
| LCX | 25 | M01 | 30 |
| | 32 | M02 | 40 |

## How to order discrete stopper block

● Use this when changing from the standard to the with rubber cushion stopper or metal stopper



**LCX - 25 - SB1 T**

Bore size
(Item Ⓐ on page 177)

| Ⓐ Stopper block | |
|---|---|
| **SB1** | For 30, 50 mm stroke length |
| **SB2** | For 10, 20, 40 mm stroke length |

| Ⓑ Material | |
|---|---|
| **Blank** | Stopper block material: Rolled steel |
| **T** | Stopper block material: steel (nitriding) |

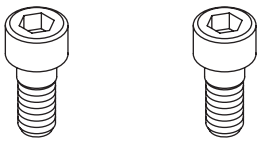
(Unit: g)

| Model No. | | | Weight |
|---|---|---|---|
| **LCX** | 25 | SB1 (T) | 80 |
| | 32 | SB2 (T) | 100 |

## How to order positioning bolt

● A hexagon socket head cap screw for positioning
● Enables assembling of the crossed unit and two-stage unit without adjusting the position

**LCX - 25 - J**



(2 pieces/set)

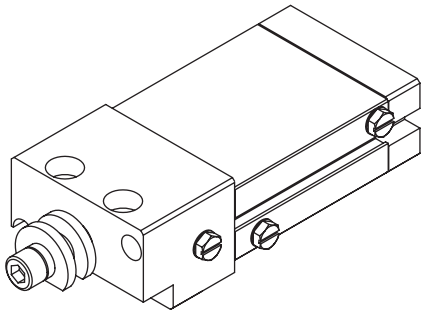
(Unit: g)

| Model No. | | | Weight |
|---|---|---|---|
| **LCX** | 25 | J | 10 |

* Weight per set (2 pieces)

## How to order discrete cylinder

**LCX - CYL - 25 - 40 - P72**



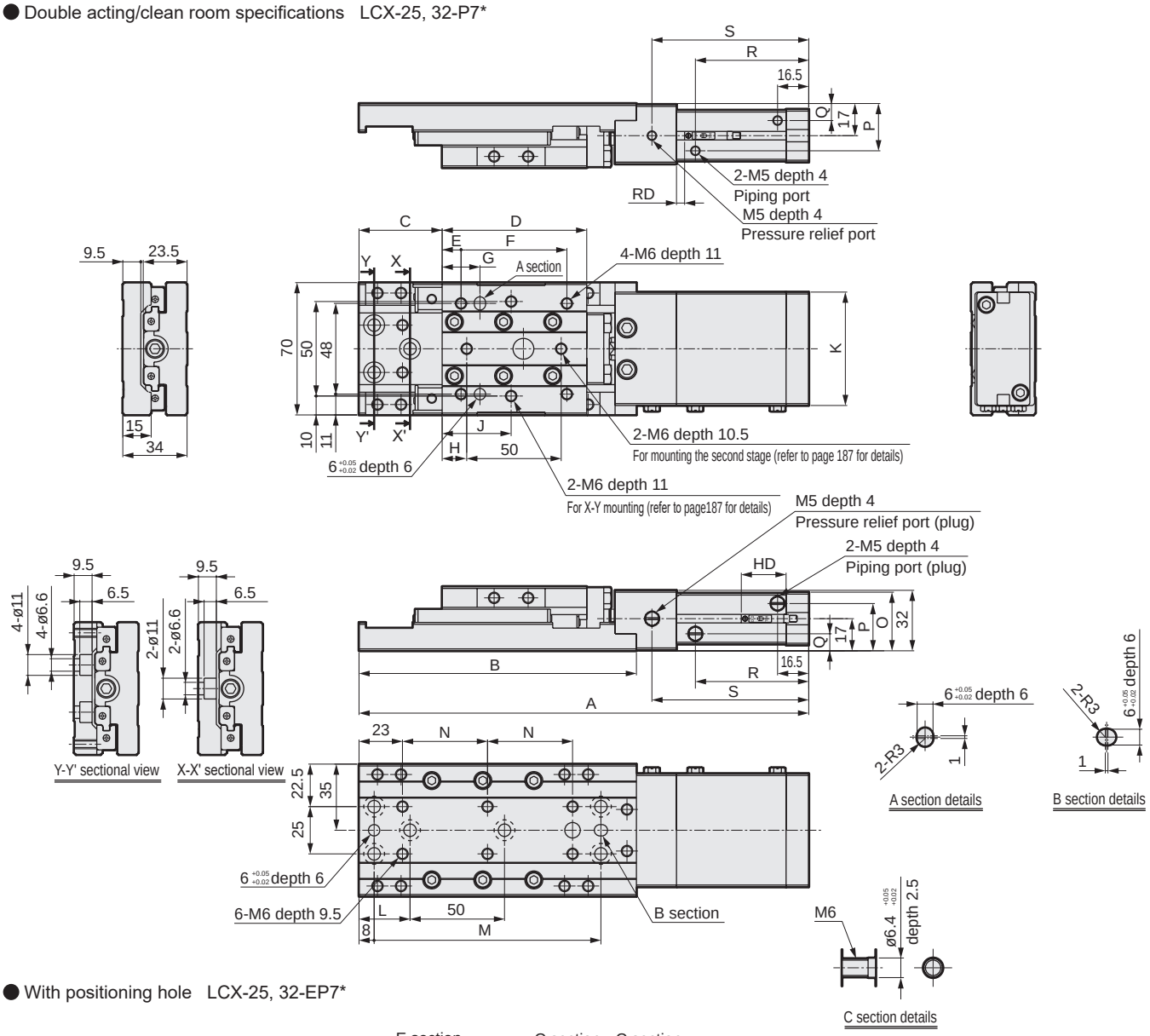
Bore size
(Item Ⓐ on page 177)

Stroke length
(Item Ⓑ on page 177)

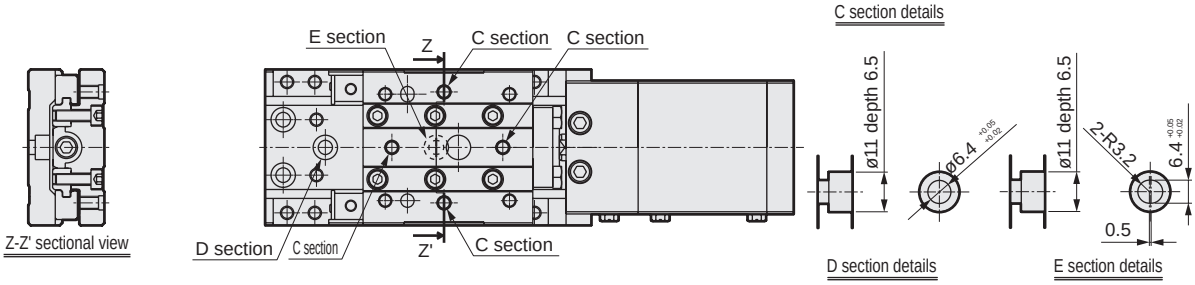
| Ⓐ Variation | |
|---|---|
| **P72** | Clean room specifications (exhaust treatment) |
| **P73** | Clean room specifications (vacuum treatment) |

## Dimensions CAD

● Double acting/clean room specifications LCX-25, 32-P7*

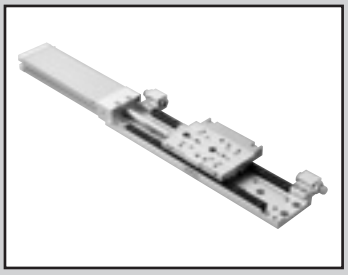



● With positioning hole LCX-25, 32-EP7*




| Bore size | Stroke length | A | B | C | D | E | F | G | H | J | K | L | M | N | O | P | Q | R | S | RD T0* T2* T5* T3* | RD T2W* T3W* | HD T0* T2* T5* T3* | HD T2W* T3W* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ø25 | 10 | 218 | 147 | 34 | 76.5 | 10 | 56 | 20 | 13 | 36.5 | 50 | 27 | 120 | 45 | 29.5 | 24.5 | 9.5 | 40 | 63 | 5 | 6.5 | 23.5 | 21.5 |
| | 20 | 228 | | 39 | | | | | | | | | | | | | | 50 | 73 | | | | |
| | 30 | 238 | | 44 | | | | | | | | | | | | | | 60 | 83 | | | | |
| | 40 | 268 | 167 | 49 | 86.5 | 15 | 64 | 30 | 23 | 46.5 | | 41 | 140 | 55 | | | | 70 | 93 | | | | |
| | 50 | 278 | | 54 | | | | | | | | | | | | | | 80 | 103 | | | | |
| ø32 | 10 | 218 | 147 | 34 | 76.5 | 10 | 56 | 20 | 13 | 36.5 | 60 | 27 | 120 | 45 | 31 | 25 | 9 | 40 | 63 | | | | |
| | 20 | 228 | | 39 | | | | | | | | | | | | | | 50 | 73 | | | | |
| | 30 | 238 | | 44 | | | | | | | | | | | | | | 60 | 83 | | | | |
| | 40 | 268 | 167 | 49 | 86.5 | 15 | 64 | 30 | 23 | 46.5 | | 41 | 140 | 55 | | | | 70 | 93 | | | | |
| | 50 | 278 | | 54 | | | | | | | | | | | | | | 80 | 103 | | | | |

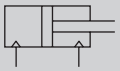
# MEMO



Linear slide cylinder double acting/single rod clean room specifications/long stroke length

# LCX-*L Series

● Bore size: ø25/ø32

JIS symbol 

RoHS CAD

## Specifications

| Descriptions | LCX-*L-P7* | |
|---|---|---|
| Bore size mm | ø25 | ø32 |
| Actuation | Double acting | |
| Working fluid | Compressed air | |
| Max. working pressure MPa | 0.7 | |
| Min. working pressure MPa | 0.15 | |
| Proof pressure MPa | 1.05 | |
| Ambient temperature °C | -10 to 60 (no freezing) (*1) | |
| Port size | M5 | |
| Port size (relief port) | M5 | |
| Stroke tolerance mm | +2.0 0 (*2) | |
| Working piston speed mm/s | 20 to 500 | |
| Cushion | With rubber cushion | |
| Lubrication | Not available | |
| Allowable energy absorption J | Refer to table 3 on page 189. | |

*1: Contact CKD if the use environment is always cold (5°C or less) or hot (40°C and over).
*2: Note that there will be a slight gap between the end plate and floating bush if no stopper is attached.
*3: Keep within 20 to 200 mm/s when using a metal stopper.

## Structure and material restriction

| | Structure | Model No. |
|---|---|---|
| P7 Series | Exhaust treatment | P72 |
| | Vacuum treatment | P73 |

## Stroke length

| Bore size (mm) | Standard stroke length (mm) |
|---|---|
| ø25 | 75, 100, 125, 150 |
| ø32 | 75, 100, 125, 150 |

Note: The stroke length other than above is not available.

## Theoretical thrust table

Refer to page 188.

## Switch specifications

● 1-color/2-color display

| Descriptions | Reed 2-wire | | | | Proximity 2-wire | | Proximity 3-wire | | |
|---|---|---|---|---|---|---|---|---|---|
| | T0H/T0V | | T5H/T5V | | T2H/T2V | T2WH/T2WV | T3H/T3V | T3PH/T3PV | T3WH/T3WV |
| Applications | Programmable controller, relay | | Programmable controller, relay IC circuit (without indicator lamp), serial connection | | Programmable controller | | Programmable controller, relay | | |
| Output method | - | | - | | - | | NPN output | PNP output | NPN output |
| Power supply voltage | - | | - | | - | | 10 to 28 VDC | | |
| Load voltage | 12/24 VDC | 110 VAC | 5/12/24 VDC | 110 VAC | 10 to 30 VDC | 24 VDC ±10% | 30 VDC or less | | |
| Load current | 5 to 50 mA | 7 to 20 mA | 50 mA or less | 20 mA or less | 5 to 20 mA (*2) | | 100 mA or less | | 50 mA or less |
| Indicator lamp | LED (Lit when ON) | | Without indicator lamp | | LED (Lit when ON) | Red/green LED (Lit when ON) | LED (Lit when ON) | Yellow LED (Lit when ON) | Red/green LED (Lit when ON) |
| Leakage current | 0 mA | | | | 1 mA or less | | 10 μA or less | | |
| Weight g | 1 m: 18 3 m: 49 5 m: 80 | | | | 1 m: 18 3 m: 49 5 m: 80 | | 1 m: 18 3 m: 49 5 m: 80 | | |

*1: Refer to page 309 for detailed switch specifications and dimensions.
*2: The maximum load current of 20 mA is for 25°C. The current will be lower than 20 mA when operating ambient temperature around the switch is higher than 25˚C. (5 to 10 mA at 60°C)

## Cylinder weight

● Clean room specifications (Unit: g)

| Bore size (mm) | Basic Stroke length (mm) | | | |
|---|---|---|---|---|
| | 75 | 100 | 125 | 150 |
| ø25 | 1,530 | 1,670 | 1,820 | 1,960 |
| ø32 | 1,660 | 1,810 | 1,960 | 2,110 |

● Weight of variation/option (stopper) (Unit: g)

| Bore size (mm) | Option/stopper code | | | |
|---|---|---|---|---|
| | S1 to S4 | M1 to M4 | S5/S6 | M5/M6 |
| ø25 | 320 | | 400 | |
| ø32 | | | | |

## How to order

Without switch (Magnet for switch incorporated)

LCX - 25 L - 100 ——— S5 P72

With switch (Magnet for switch incorporated)

LCX - 25 L - 100 - T2H* - R - S1T P72

Model No.
Ⓐ Bore size
Ⓑ Stroke length
Ⓒ Switch model No. *8
Ⓓ Switch quantity
Ⓔ Stopper
Ⓕ Clean room specifications

| Code | Content |
|---|---|
| **Ⓐ Bore size** | |
| **25** | ø25 |
| **32** | ø32 |
| **Ⓑ Stroke length (mm)** | |
| **75** | 75 |
| **100** | 100 |
| **125** | 125 |
| **150** | 150 |

**Ⓒ Switch model No.**

| Lead wire straight | Lead wire L-shaped | Contact | Voltage AC | Voltage DC | Display | Lead wire |
|---|---|---|---|---|---|---|
| **T0H*** | **T0V*** | Reed | ● | ● | 1-color display | 2 wires |
| **T5H*** | **T5V*** | | ● | ● | Without indicator lamp | |
| **T2H*** | **T2V*** | Proximity | | ● | 1-color | 2 wires |
| **T3H*** | **T3V*** | | | ● | display | 3 wires |
| **T3PH*** | **T3PV*** | | | | 1-color display (PNP output) | 3 wires |
| **T2WH*** | **T2WV*** | | | ● | 2-color | 2 wires |
| **T3WH*** | **T3WV*** | | | ● | display | 3 wires |

| *** Lead wire length** | |
|---|---|
| **Blank** | 1 m (standard) |
| **3** | 3 m (option) |
| **5** | 5 m (option) |

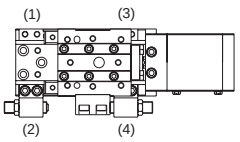
| **Ⓓ Switch quantity** | |
|---|---|
| **R** | 1 (on rod end) |
| **H** | 1 (on head end) |
| **D** | 2 |

| **Ⓔ Stopper** | | |
|---|---|---|
| **Blank** | Without stopper | |
| **S Cushion cushion stopper** | | ***1, *4** |
| **S1*** | Stopper position (1) (can be changed to (4)) | Stopper mounting position |
| **S2*** | Stopper position (2) (can be changed to (3)) | |
| **S3*** | Stopper position (3) (can be changed to (2)) | |
| **S4*** | Stopper position (4) (can be changed to (1)) | |
| **S5*** | Stopper position (1), (3) | |
| **S6*** | Stopper position (2), (4) | |
| **M Metal stopper** | | ***1, *3, *4, *5** |
| **M1*** | Stopper position (1) (can be changed to (4)) | Stopper mounting position |
| **M2*** | Stopper position (2) (can be changed to (3)) | |
| **M3*** | Stopper position (3) (can be changed to (2)) | |
| **M4*** | Stopper position (4) (can be changed to (1)) | |
| **M5*** | Stopper position (1), (3) | |
| **M6*** | Stopper position (2), (4) | |

| *** Part** | |
|---|---|
| **Blank** | Stopper block material: Rolled steel |
| **T** | Stopper block material: Alloy steel (nitriding) *2 |

| **Ⓕ Clean room specifications** | |
|---|---|
| | Structure |
| P72 | Exhaust treatment |
| P73 | Vacuum treatment |

● Stopper position




### ⚠ Precautions for model No. selection

*1: To change the adjustable stroke length, use a discrete rubber cushion stopper or metal stopper on page 184.
*2: Can be selected for the type with stopper only.
*3: The alloy steel stopper block (code: T) is recommended for a metal stopper.
*4: Combination of the rubber cushion stopper and metal stopper is custom order.
*5: Keep within 20 to 200 mm/s when using a metal stopper.
*6: Refer to page 185 for a discrete cylinder model No.
*7: The long stroke length has a positioning hole as standard.
*8: Be careful of the lead wire direction when designing the 30 mm or less stroke length of axial lead wire and the 20 mm stroke length of radial lead wire since a switch is installed in each groove of the body.

[Example of model No.]

**LCX-25L-100-T2H-R-S1TP72**

Model No.: Linear slide cylinder Double acting/ single rod (clean room specifications) LCX-P7*
Ⓐ Bore size : ø25
Ⓑ Stroke length : 100 mm
Ⓒ Switch model No. : Proximity/2 wires/ Lead wire 1 m Lead wire straight
Ⓓ Switch quantity : 1 (on rod end)
Ⓔ Other options : Rubber cushion stopper Stopper position (1) Material, alloy steel (nitriding)
Ⓕ Clean room specifications : Exhaust treatment

## How to order switch

**SW - T2H3**

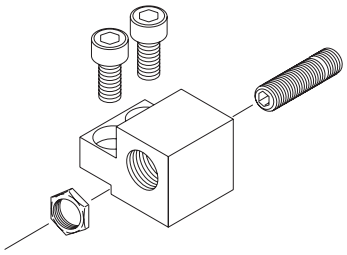
Switch model No.
(Item Ⓒ on page 183)

## How to order a stopper set

- A set of a stopper and rubber cushion stopper or metal stopper
- Use this when changing from the standard to the with rubber cushion stopper or metal stopper

**LCX - 25 - S 2 - S02**

Bore size
(Item Ⓐ on page 183)



| Ⓐ Stopper | |
|---|---|
| **S** | Cushion stopper |
| **M** | Metal stopper |

| Ⓑ Stopper mounting position | |
|---|---|
| **1** | Stopper position (1) or for (4) |
| **2** | Stopper position (2) or for (3) |

| Ⓒ Stroke adjusting amount | (*1) |
|---|---|
| **Blank** | Adjustable stroke range 10 mm |
| **S02** | Adjustable stroke range 20 mm |

(Unit: g)

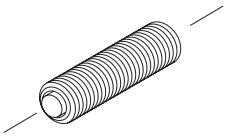
| Model No. | | | | Weight |
|---|---|---|---|---|
| LCX | 25 | S1 | Blank | 70 |
| | | S2 | S02 | 80 |
| | 32 | M1 | Blank | 70 |
| | | M2 | S02 | 80 |

## How to order discrete rubber cushion stopper

- Hexagon socket set screw with urethane
- Use it when changing the adjustable stroke range or when using custom stroke length

**LCX - 25 - S02**

Bore size
(Item Ⓐ on page 183)



| Ⓐ Adjustable stroke range | |
|---|---|
| **S01** | Single side 10 mm (standard) |
| **S02** | Single side 20 mm |

(Unit: g)

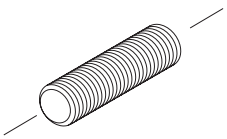
| Model No. | | | Weight |
|---|---|---|---|
| LCX | 25 | S01 | 30 |
| | 32 | S02 | 40 |

## How to order discrete metal stopper

- Use this when changing the adjustable stroke range or when using custom stroke length

**LCX - 25 - M02**

Bore size
(Item Ⓐ on page 183)



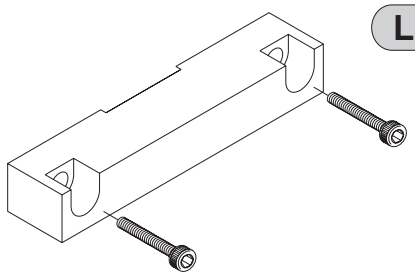
| Ⓐ Adjustable stroke range | |
|---|---|
| **M01** | Single side 10 mm (standard) |
| **M02** | Single side 20 mm |

(Unit: g)

| Model No. | | | Weight |
|---|---|---|---|
| LCX | 25 | M01 | 30 |
| | 32 | M02 | 40 |

## How to order discrete stopper block

● Use it when changing from the standard to the with rubber cushion stopper or metal stopper



LCX - 25 L - SB3 T

Bore size
(Item Ⓐ on page 183)

| Ⓐ Material | |
|---|---|
| Blank | Stopper block material: Rolled steel |
| T | Stopper block material: Alloy steel (nitriding) |

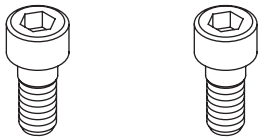
(Unit: g)

| Model No. | | | Weight |
|---|---|---|---|
| LCX | 25L<br>32L | SB3 (T) | 250 |

## How to order positioning bolt

● A hexagon socket head cap screw for positioning
● Enables assembling of the crossed unit and two-stage unit without adjusting the position

LCX - 25 - J



(2 pieces/set)

(Unit: g)

| Model No. | | | Weight |
|---|---|---|---|
| LCX | 25 | J | 10 |

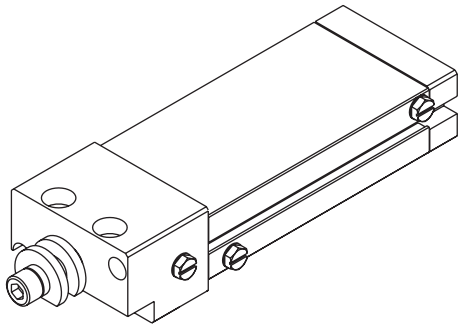
* Weight per set (2 pieces)

## How to order discrete cylinder

LCX - CYL - 25 L - 100 - P72

Bore size
(Item Ⓐ on page 183)

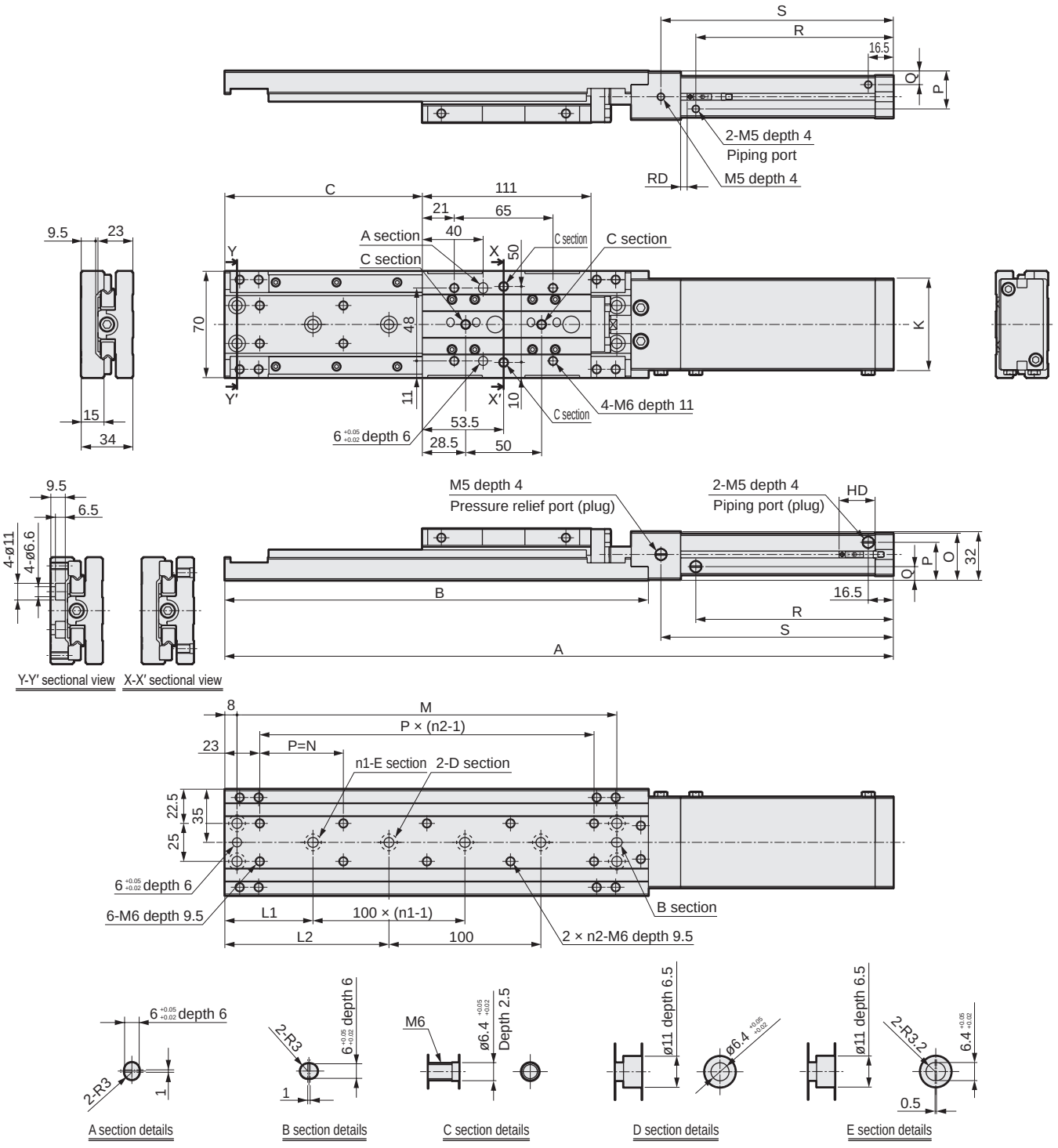
Stroke length
(Item Ⓑ on page 183)



| Ⓐ Variation | |
|---|---|
| P72 | Clean room specifications (exhaust treatment) |
| P73 | Clean room specifications (vacuum treatment) |

## Dimensions

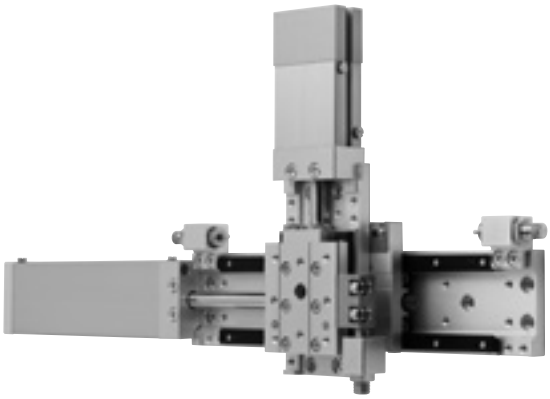
● Double acting/single rod clean room specifications/long stroke length LCX-*L-P7*



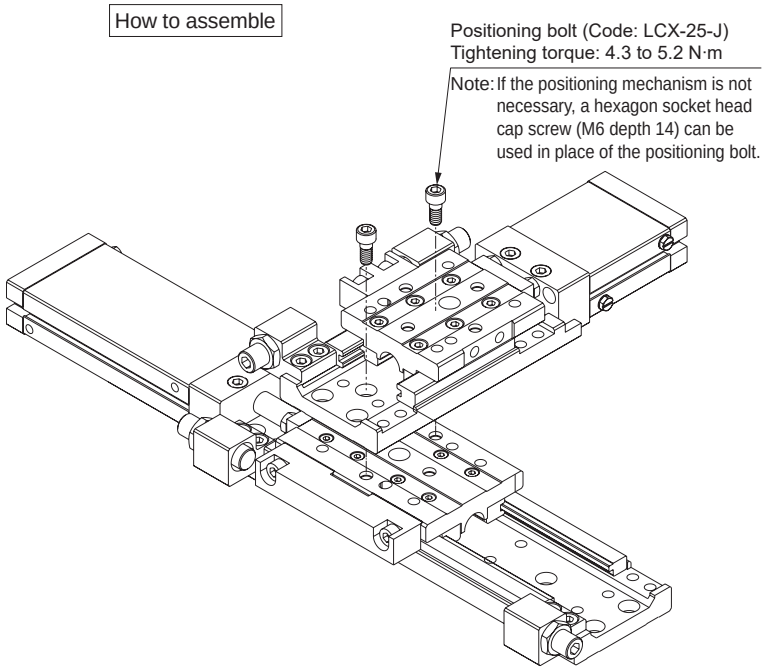

| Bore size | Stroke length | A | B | C | K | L1 | L2 | n1 | n2 | M | N | O | P | Q | R | S | RD | | | HD | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | T0* T5* | T2* T3* | T2W* T3W* | T0* T5* | T2* T3* | T2W* T3W* |
| ø25 | 75 | 390 | 254 | 105 | 50 | 45.5 | 95.5 | 2 | 5 | 225 | 49 | 29.5 | 24.5 | 9.5 | 105 | 128 | 5 | | 6.5 | 23.5 | | 21.5 |
| | 100 | 440 | 279 | 130 | | 58 | 108 | 2 | 5 | 250 | 55 | | | | 130 | 153 | | | | | | |
| | 125 | 490 | 304 | 155 | | 45.5 | 95.5 | 3 | 6 | 275 | 49 | | | | 155 | 178 | | | | | | |
| | 150 | 540 | 329 | 180 | | 58 | 108 | 3 | 6 | 300 | 54 | | | | 180 | 203 | | | | | | |
| ø32 | 75 | 390 | 254 | 105 | 60 | 45.5 | 95.5 | 2 | 5 | 225 | 49 | 31 | 25 | 9 | 105 | 128 | | | | | | |
| | 100 | 440 | 279 | 130 | | 58 | 108 | 2 | 5 | 250 | 55 | | | | 130 | 153 | | | | | | |
| | 125 | 490 | 304 | 155 | | 45.5 | 95.5 | 3 | 6 | 275 | 49 | | | | 155 | 178 | | | | | | |
| | 150 | 540 | 329 | 180 | | 58 | 108 | 3 | 6 | 300 | 54 | | | | 180 | 203 | | | | | | |

## Unit example

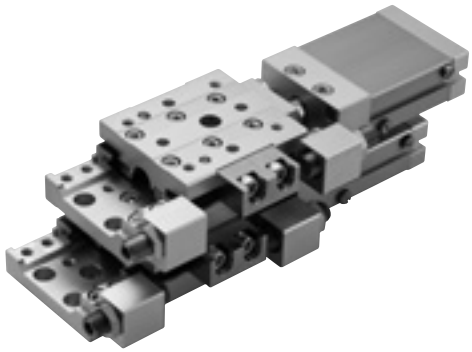
● Crossed unit



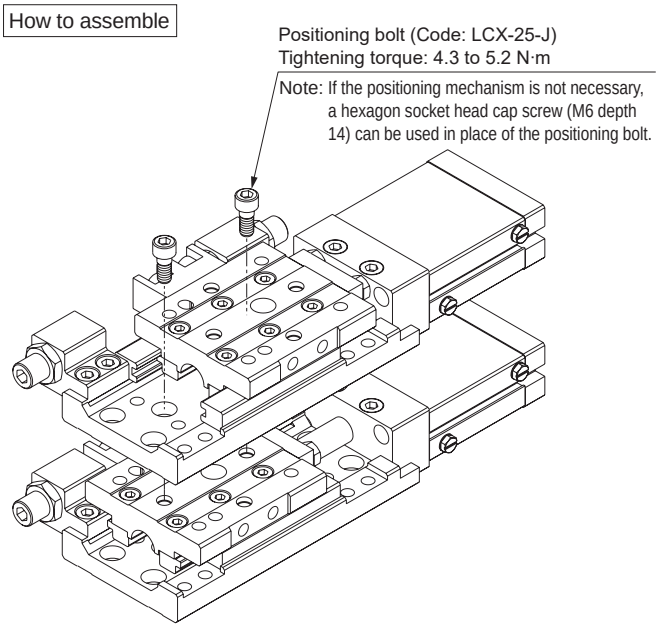
How to assemble



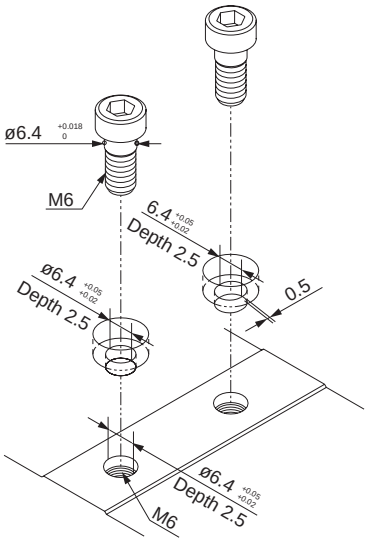

● 2-stage unit



How to assemble




[Fastening with positioning bolt]




* The picture shows the standard product.

## STEP-1

Calculate the load factor and decide the bore size.

$$\alpha = \frac{F_0}{F} \times 100\ (\%)$$

α : Load factor

$F_0$ : Force (N) required to move the workpiece

F : Cylinder theoretical thrust (N) (Table 1)

| For horizontal operation | For vertical operation |
|---|---|
| $F_0 = F_W$ | $F_0 = W + F_W$ |
| FW: W × 0.2Note (N) | |
| W: Load (N) | |

Note : coefficient of friction

(Table 1) Theoretical thrust table (Unit: N)

| Bore size | Operating direction | Working pressure MPa | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 0.15 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 |
| ø25 equiv. | PUSH | 74 | 99 | 148 | 197 | 246 | 296 | 345 |
| | PULL | 57 | 76 | 114 | 152 | 190 | 228 | 266 |
| ø32 equiv. | PUSH | 116 | 155 | 233 | 310 | 388 | 466 | 543 |
| | PULL | 99 | 133 | 199 | 265 | 332 | 398 | 464 |

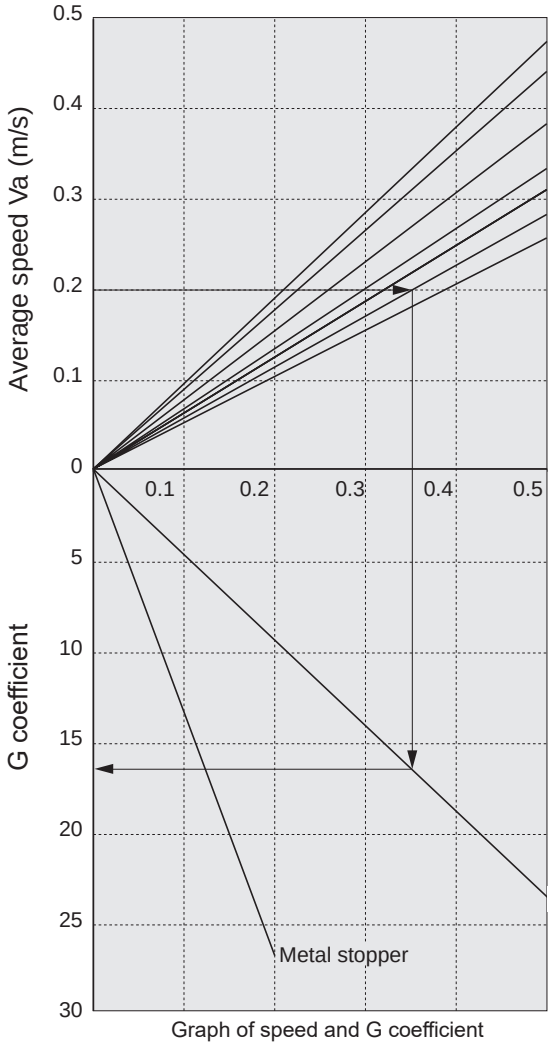
(Table 2) Rough indication of load factor

| Working pressure MPa | Load factor (%) |
|---|---|
| 0.2 to 0.3 | α ≦ 40 |
| 0.3 to 0.6 | α ≦ 50 |
| 0.6 to 0.7 | α ≦ 60 |

## STEP-2

Obtain the stroke end speed (Vm) and G coefficient.

Obtain the stroke end speed (Vm) and G coefficient from the average speed (Va) and load factor obtained in STEP-1.




Graph of speed and G coefficient

G coefficient=

The arrows (→) in the figure shows an example that the stroke end speed of 0.35 m/s and G coefficient of 16.8 are obtained at the 0.20 m/s average speed and 50% load factor.

## STEP-3

Check the allowable absorbed energy.

$$E = \frac{1}{2} \times (m + m_\alpha) \times Vm^2$$

E : Kinetic energy at workpiece end (J)

m : Load weight (kg) $(m \fallingdotseq \frac{W\ (N)}{9.8})$

$m_\alpha$ : Table weight (from Table 4)

Vm : Stroke end speed (m/s)

E max : Max. allowable value of $E_0$ (from Table 3)

Confirm E ≤ E max.

(Table 3) LCX allowable absorbed energy value ($E_0$)

| Bore size | Standard (J) | Cushion stopper (J) | Metal stopper (J) |
|---|---|---|---|
| ø25 | 0.34 | 0.14 | 0.07 |
| ø32 | | | |

(Table 4) Table weight (Unit: kg)

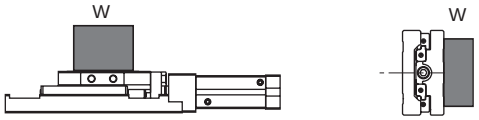
| Bore size | Stroke length (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 40 | 50 | 75 | 100 | 125 | 150 |
| ø25 | 0.030 | | | 0.035 | | | | | |
| ø32 | | | | | | | | | |

## STEP-4

Obtain M'T (resultant moment at rest).

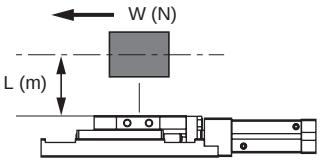
Calculate the load (moment) and the moment of impact occurring at the stroke end and obtain M'T (resultant moment at rest).

● Vertical load: W' (N)



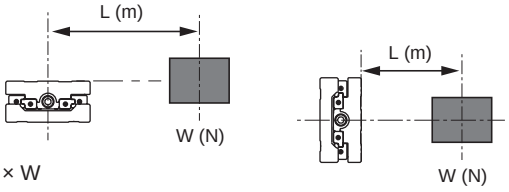

W' = W

● Bending moment: M1' (N·m)



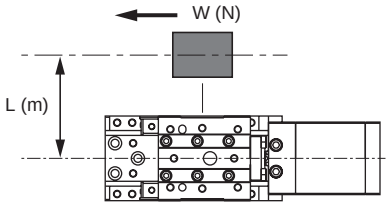

M1'= L × W

● Radial moment: M2' (N·m)




M2'= L × W

● Torsion moment: M3' (N·m)




M3'= L × W

W' = ☐ (N)

M1' × G = ☐ (N·m)

M2' = ☐ (N·m)

M3' × G = ☐ (N·m)

$$M'_T = \frac{W'}{W'max} + \frac{M1' \times G}{M1'max} + \frac{M2'}{M2'max} + \frac{M3' \times G}{M3'max} = \square$$

M'T : Synthesis of moment

G : G coefficient

W'max : Maximum allowable value of W' (from Table 5)

M1'max : Max. allowable value of M1' (from Table 5)

M2'max : Max. allowable value of M2' (from Table 5)

M3'max : Max. allowable value of M3' (from Table 5)

(Table 5) Allowable static load

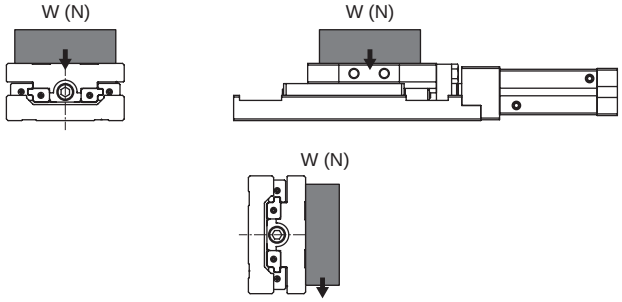
| Bore size | Stroke length | Vertical load W'max (N) | Bending moment M1'max (N·m) | Radial moment M2'max (N·m) | Torsion moment M3'max (N·m) |
|---|---|---|---|---|---|
| ø25 | 10, 20, 30, 40, 50 | 670 | 52 | 110 | 52 |
| ø32 | | | | | |
| ø25 | 75, 100, 125, 150 | 970 | 128 | 116 | 128 |
| ø32 | | | | | |

Confirm M'T ≤ 1.

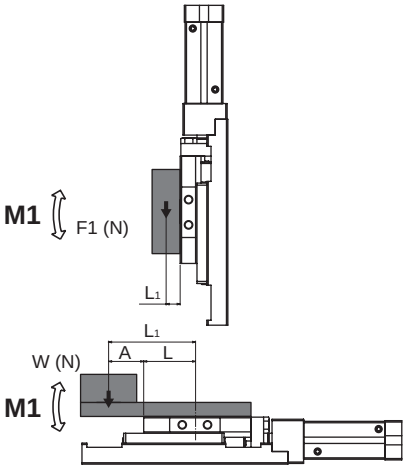
## STEP-5

Obtain $M_T$ (resultant moment during movement) (Note that it differs from that obtained in STEP-4.)

### ● Vertical load: W (N)




### ● Bending moment: M1 (N·m)



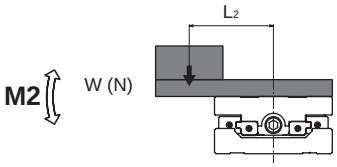

$M1 = F1 \times L_1$

$M1 = W \times L_1$

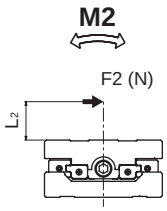
$L_1 = A + L$

L is a value in the table below.

### ● Radial moment: M2 (N·m)

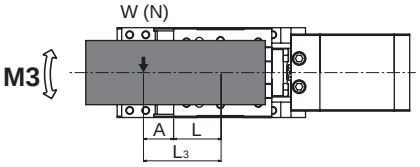



$M2 = W \times L_2$




$M2 = F2 \times L_2$

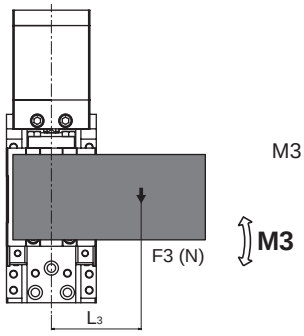
### ● Torsion moment: M3 (N·m)




$M3 = W \times L_3$

$L_3 = A + L$

L is a value in the table below.




$M3 = F3 \times L_3$

L (length from the table end to the center of the bearing) Unit (m)

| Bore size | Stroke length | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 40 | 50 | 75 | 100 | 125 | 150 |
| ø25 | 0.037 | | | 0.042 | | 0.0535 | | | |
| ø32 | | | | | | | | | |

W = W = ☐ (N)

M1 = M1 = ☐ (N·m)

M2 = M2 = ☐ (N·m)

M3 = M3 = ☐ (N·m)

$M_T = \frac{W}{Wmax} + \frac{M1}{M1max} + \frac{M2}{M2max} + \frac{M3}{M3max} = $ ☐

$M_T$ : Synthesis of moment

Wmax : Maximum allowable value of W (from Table 7)

M1max : Maximum allowable value of M1 (from Table 7)

M2max : Maximum allowable value of M2 (from Table 7)

M3max : Maximum allowable value of M3 (from Table 7)

(Table 7) Allowable moving load

| Bore size | Stroke length | Vertical load Wmax (N) | Bending moment M1max (N·m) | Radial moment M2max (N·m) | Twist moment M3max (N·m) |
|---|---|---|---|---|---|
| ø25 | 10, 20, 30, 40, 50 | 97 | 7 | 15 | 7 |
| ø32 | | | | | |
| ø25 | 75, 100, 125, 150 | 130 | 17 | 16.5 | 17 |
| ø32 | | | | | |

Can be used when $M_T \leq 1$ is satisfied.

## Displacement at point A

### [Displacement of table due to M1, M2 and M3 moments]

M1 moment: Displacement at the table end when the load (F1) is applied to the table end

M2 moment: Displacement at the table end (point A) when the load (F2) is applied to the point 100 mm away from the center of the cylinder

M3 moment: Displacement angle of the table when the rotation moment (M3) is applied to the cylinder

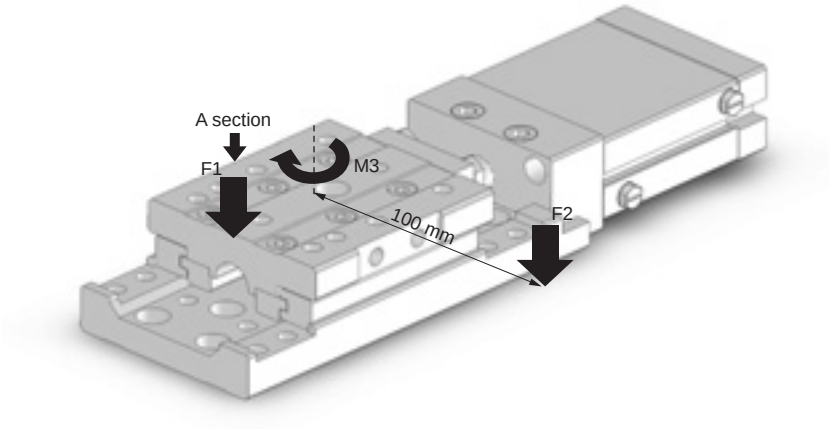



Table deflection of M1 moment

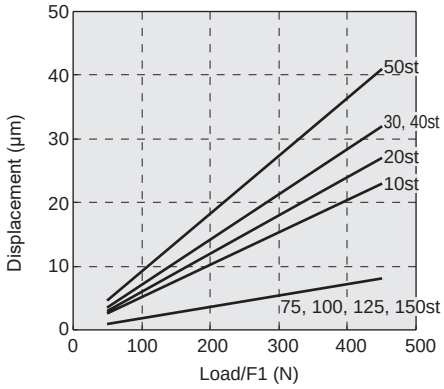



Table deflection of M2 moment

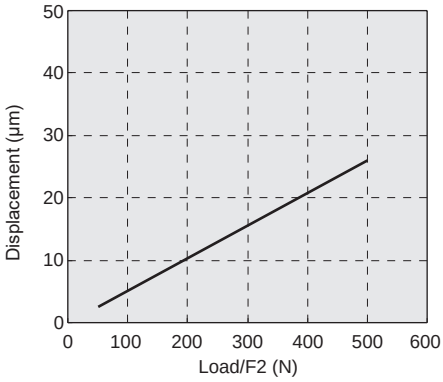
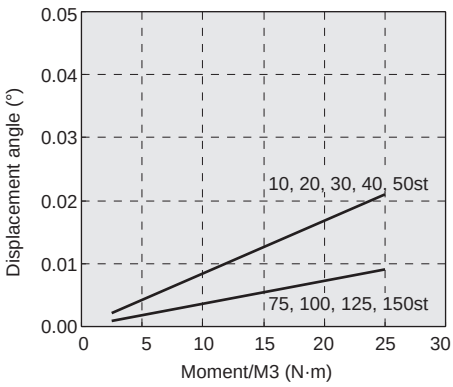
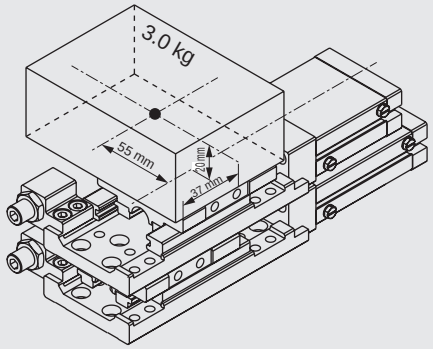



Table deflection of M3 moment



## Selection guide: selection example (1)




[Operation condition]

Model used (upper): LCX-25-30-M6 (product weight: 1,270 (g))
(lower): LCX-32-30-S6 (product weight: 1,440 (g))
Pressure: 0.5 (MPa)
Weight of workpiece: 3.0 (kg)
Operating direction: Horizontal
Average speed (upper): 100 (mm/s)
(lower): 230 (mm/s)
Shape of workpiece: As shown on the left

## STEP-1 Check of the load factor and decision of the bore size (For details on how to calculate, refer to page 188.)

### Formula

$\alpha = \frac{F_0}{F} \times 100$ (%)

$\alpha$ : Load factor
$F_0$ : Force (N) required to move the workpiece
$F$ : Cylinder theoretical thrust (N)

### Selection example

[Cylinder on upside]

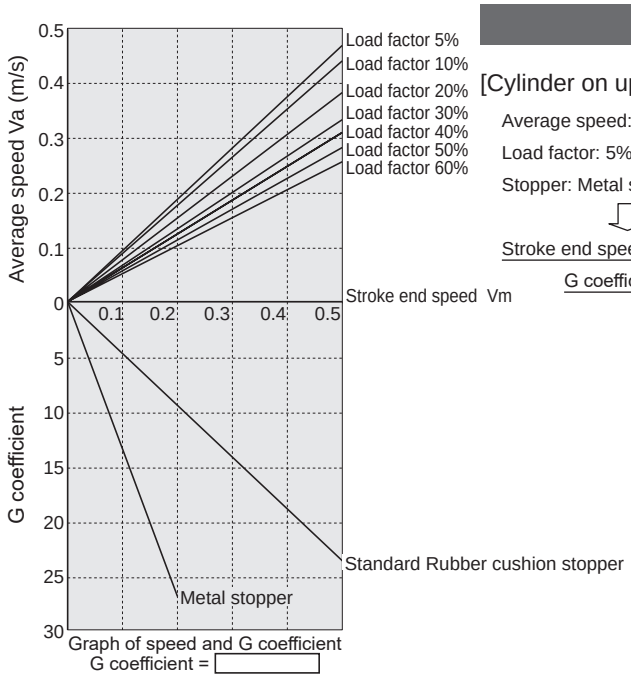
$\alpha 1 = \frac{(3.0 \times 9.8) \times 0.2}{190} \times 100$
$= 3.1\%$

[Cylinder on downside]

$\alpha 2 = \frac{((3.0 + 1.27 + 0.01) \times 9.8) \times 0.2}{332}$
$\times 100 = 2.5\%$

Can be used since the estimated load factor at 0.5 MPa is
Can be used as "$\alpha \leqq 50$"

## STEP-2 Check of the stroke end speed and G factor (For details on how to calculate, refer to page 188.)




Graph of speed and G coefficient
G coefficient = [ ]

### Selection example

[Cylinder on upside]

Average speed: 100 mm/s
Load factor: 5% or less (3.1%)
Stopper: Metal stopper

⇩

Stroke end speed: 110 mm/s
G coefficient: 14

[Cylinder on downside]

Average speed: 230 mm/s
Load factor: 5% or less (2.5%)
Stopper: Rubber cushion stopper

⇩

Stroke end speed: 240 mm/s
G coefficient: 12

## STEP-3 Check of the allowable absorbed energy (For details on how to calculate, refer to page 189.)

### Formula

$E = \frac{1}{2} \times (m + m_\alpha) \times Vm^2$

$E$ : Kinetic energy at workpiece end (J)
$m$ : Load weight (kg)
$m_\alpha$ : Table weight (kg)
$Vm$ : Stroke end speed (m/s)

### Selection example

[Cylinder on upside]

$E = \frac{1}{2} \times (3.0 + 0.03) \times 0.11^2$
$= 0.02$ (J)

Can be used since the allowable absorbed energy of the metal stopper is "0.07J"

[Cylinder on downside]

$E = \frac{1}{2} \times (3.0 + 1.27 + 0.01 + 0.035)$
$\times 0.24^2 = 0.124$ (J)

Can be used since the allowable absorbed energy of the rubber cushion stopper is "0.14J"

## STEP-4 Check of the allowable static load (For details on how to calculate, refer to page 189.)

### Formula

● Vertical load

W' = W

● Bending moment: M1' (N·m)

$M1' = L_1 \times W$

● Radial moment: M2' (N·m)

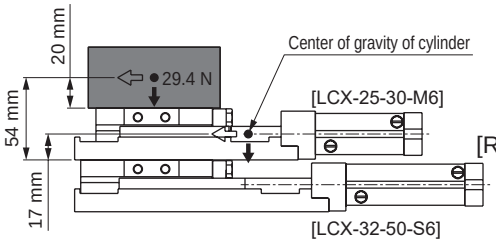
$M2' = L_2 \times W$

● Torsion moment: M3' (N·m)

$M3' = L_3 \times W$

◎ Synthesis of moment

$$M'_T = \frac{W'}{W'max} + \frac{M1' \times G}{M1'max} + \frac{M2'}{M2'max} + \frac{M3' \times G}{M3'max}$$




### Selection example

[Calculating load and moment]

[Cylinder on upside]

W' = 3.0 × 9.8 = 29.4 (N)

M1' = 0.02 × 29.4 = 0.6 (N·m)

M2' = 0.055 × 29.4 = 1.6 (N·m)

M3' = 0.055 × 29.4 = 1.6 (N·m)

[Cylinder on downside]

W' = 3.0 × 9.8 + 1.27 × 9.8

= 41.8 (N)

M1' = 0.054 × 29.4

+ 0.017 × 1.27 × 9.8

= 1.8 (N·m)

(Omit the underlined part if the cylinder on upside does not work as a moment of impact.)

M2' = 0.055 × 29.4 = 1.6 (N·m)

M3' = 0.055 × 29.4 = 1.6 (N·m)

[Resultant moment when the cylinder on upside operates]

Stroke end speed: 110 mm/s, G factor: 14

[Cylinder on upside]

$$M'_T = \frac{29.4}{670} + \frac{0.6 \times 14}{52} + \frac{1.6}{110} + \frac{1.6 \times 14}{52} = 0.7$$

Can be used since the resultant moment (M'T) is "1 or less"

[Cylinder on downside]

$$M'_T = \frac{41.8}{670} + \frac{1.6 \times 14}{52} + \frac{1.6}{110} + \frac{1.6 \times 14}{52} = 1.0$$

Can be used since the resultant moment (M'T) is "1 or less"

[Resultant moment when the cylinder on downside operates]

Stroke end speed: 240 mm/s, G factor: 12

[Cylinder on upside]

$$M'_T = \frac{29.4}{670} + \frac{0.6 \times 12}{52} + \frac{1.6}{110} + \frac{1.6 \times 12}{52} = 0.6$$

Can be used since the resultant moment (M'T) is "1 or less"

[Cylinder on downside]

$$M'_T = \frac{41.8}{670} + \frac{1.8 \times 12}{52} + \frac{1.6}{110} + \frac{1.6 \times 12}{52} = 0.9$$

Can be used since the resultant moment (M'T) is "1 or less"

## STEP-5 Check of the allowable dynamic load (For details on how to calculate, refer to page 190.)

### Formula

● Vertical load

W = W

● Bending moment: M1 (N·m)

$M1 = L_1 \times W$

● Radial moment: M2 (N·m)

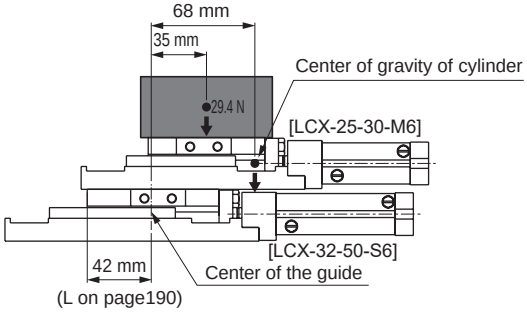
$M2 = L_2 \times W$

● Torsion moment: M3 (N·m)

$M3 = L_3 \times W$

◎ Synthesis of moment

$$M_T = \frac{W}{Wmax} + \frac{M1}{M1max} + \frac{M2}{M2max} + \frac{M3}{M3max}$$




### Selection example

[Cylinder on upside]

W = 3.0 × 9.8 = 29.4 (N)

M1 = 0 (N·m)

M2 = 0.055 × 29.4 = 1.6 (N·m)

M3 = 0 (N·m)

$$M_T = \frac{29.4}{97} + \frac{0}{7} + \frac{1.6}{15} + \frac{0}{7} = 0.4$$

Can be used since the resultant moment (M'T) is "1 or less"

[Cylinder on downside]

W = 3.0 × 9.8 + 1.27 × 9.8

= 41.8 (N)

M1 = 0.035 × 29.4 + 0.068 × 1.27 × 9.8

= 1.9 (N·m)

(Add the value of the cylinder on upside since it works as a moment. Substitute the center of the external dimensions for the center of gravity of the cylinder.)

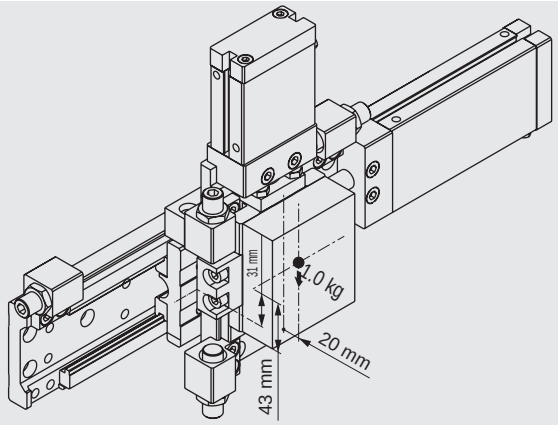
M2 = 0.055 × 29.4 = 1.6 (N·m)

M3 = 0 (N·m)

$$M_T = \frac{41.8}{97} + \frac{1.9}{7} + \frac{1.6}{15} + \frac{0}{7} = 0.8$$

Can be used since the resultant moment (M'T) is "1 or less"

## Selection guide: selection example (2)




[Operation condition]

Model used (X-axis): LCX-32-150-A6 (product weight: 2,450 (g))
(Z-axis): LCX-32-30-S6 (product weight: 1,440 (g))
Pressure: 0.5 (MPa)
Weight of workpiece: 1.0 (kg)
Operating direction: Horizontal + vertical
Average speed (X-axis) : 300 (mm/s)
(Z-axis): 50 (mm/s)
Shape of workpiece: As shown on the left

## STEP-1 Check of the load factor and decision of the bore size (For details on how to calculate, refer to page 188.)

### Formula

$\alpha = \frac{F_0}{F} \times 100$ (%)

$\alpha$ : Load factor
$F_0$ : Force (N) required to move the workpiece
$F$ : Cylinder theoretical thrust (N)

### Selection example

[X-axis cylinder]

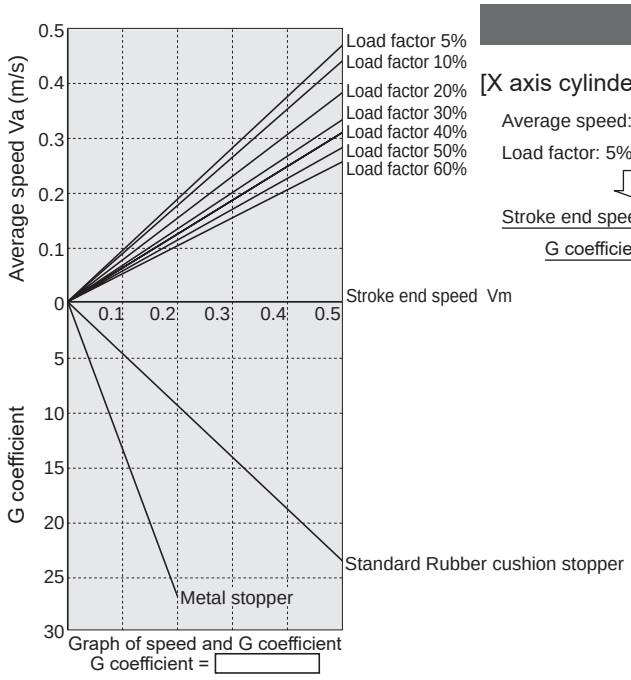
$\alpha 1 = \frac{((1.0 + 1.29 + 0.01) \times 9.8) \times 0.2}{332} \times 100 = 1.4\%$

[Z axis cylinder]

$\alpha 2 = \frac{(1.0 \times 9.8) + 0.2 \times (1.0 \times 9.8)}{332} \times 100 = 3.5\%$

Can be used since the estimated load factor at 0.5 MPa is
Can be used as "$\alpha \leqq 50$"

## STEP-2 Check of the stroke end speed and G factor (For details on how to calculate, refer to page 188.)




Graph of speed and G coefficient
G coefficient = ☐

### Selection example

[X axis cylinder]

Average speed: 300 mm/s
Load factor: 5% or less (1.4%)
⇩
Stroke end speed: 310 mm/s
G coefficient: 4

[Z axis cylinder]

Average speed: 50 mm/s
Load factor: 5% or less (3.5%)
Stopper: Rubber cushion stopper
⇩
Stroke end speed: 55 mm/s
G coefficient: 3

## STEP-3 Check of the allowable absorbed energy (For details on how to calculate, refer to page 189.)

### Formula

$E = \frac{1}{2} \times (m + m_\alpha) \times Vm^2$

$E$ : Kinetic energy at workpiece end (J)
$m$ : Load weight (kg)
$m_\alpha$ : Table weight (kg)
$Vm$ : Stroke end speed (m/s)

### Selection example

[X axis cylinder]

$E = \frac{1}{2} \times (1.0 + 1.29 + 0.01 + 0.035) \times 0.31^2 = 0.11$ (J)

Can be used since the allowable absorbed energy of the shock absorber stopper is "1.3J"

[Z axis cylinder]

$E = \frac{1}{2} \times (1.0 + 0.035) \times 0.055^2 = 0.002$ (J)

Can be used since the allowable absorbed energy of the rubber cushion stopper is "0.14J"

## STEP-4 Check of the allowable static load (For details on how to calculate, refer to page 189.)

### Formula

● Vertical load

W' = W

● Bending moment: M1' (N·m)

$M1' = L_1 \times W$

● Radial moment: M2' (N·m)

$M2' = L_2 \times W$

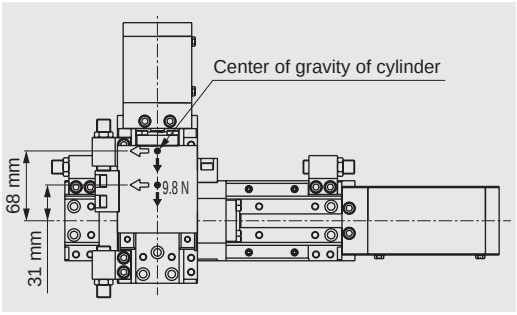
● Torsion moment: M3' (N·m)

$M3' = L_3 \times W$

◎ Synthesis of moment

$$M'_T = \frac{W'}{W'max} + \frac{M1' \times G}{M1'max} + \frac{M2'}{M2'max} + \frac{M3' \times G}{M3'max}$$

Note) In the crossed unit, a moment of impact may occur in the M2 direction. Multiply the G coefficient with the M2' value as necessary.




### Selection example

[Calculating load and moment]

[X axis cylinder]

W' = 1.0 × 9.8 + 1.44 × 9.8 = 23.9 (N)

M1' = 0.054 × 9.8 + 0.017 × 1.44 × 9.8
= 0.8 (N·m)

(Add the value of the Z-axis cylinder since it works as a moment.)

M2' = 0.054 × 9.8 + 0.017 × 1.44 × 9.8
= 0.8 (N·m)

M3' = 0.031 × 9.8 + 0.068 × 1.44 × 9.8
= 1.3 (N·m)

[Z axis cylinder]

W' = 0 (N)

M1' = 0.02 × 9.8 = 0.2 (N·m)

M2' = 0.02 × 9.8 = 0.2 (N·m)

M3' = 0.001 × 9.8 = 0.01 (N·m)

[Resultant moment when the X-axis cylinder operates]

Stroke end speed: 310 mm/s, G factor: 4

[X axis cylinder]

$$M'_T = \frac{23.9}{970} + \frac{0.8 \times 4}{128} + \frac{0.8}{116} + \frac{1.3 \times 4}{128} = 0.1$$

Can be used since the resultant moment (M'T) is "1 or less"

[Z axis cylinder]

$$M'_T = \frac{0}{670} + \frac{0.2}{52} + \frac{0.2 \times 4}{110} + \frac{0.01 \times 4}{52} = 0.01$$

(Multiply the G factor if a moment of impact in M2 direction is caused in the Z-axis cylinder by operation of the X-axis cylinder.)

Can be used since the resultant moment (M'T) is "1 or less"

[Resultant moment when the Z-axis cylinder operates]

Stroke end speed: 55 mm/s, G factor: 3

[X axis cylinder]

$$M'_T = \frac{23.9}{970} + \frac{0}{128} + \frac{0.5 \times 3 + 0.2}{116} + \frac{0}{128} = 0.04$$

(Multiply the G factor if a moment of impact in M2 direction is caused in the X-axis cylinder by operation of the Z-axis cylinder.)

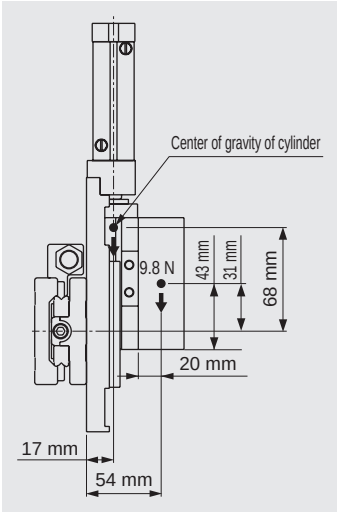
Can be used since the resultant moment (M'T) is "1 or less"

[Z axis cylinder]

$$M'_T = \frac{0}{670} + \frac{0.2 \times 3}{52} + \frac{0}{110} + \frac{0}{52} = 0.01$$

Can be used since the resultant moment (M'T) is "1 or less"

## STEP-5 Check of the allowable dynamic load (For details on how to calculate, refer to page 190.)




### Formula

● Vertical load

W = W

● Bending moment: M1 (N·m)

$M1 = L_1 \times W$

● Radial moment: M2 (N·m)

$M2 = L_2 \times W$

● Torsion moment: M3 (N·m)

$M3 = L_3 \times W$

◎ Synthesis of moment

$$M_T = \frac{W}{Wmax} + \frac{M1}{M1max} + \frac{M2}{M2max} + \frac{M3}{M3max}$$

### Selection example

[X axis cylinder]

W = 1.0 × 9.8 + 1.44 × 9.8
= 23.9 (N)

M1 = 0 (N·m)

M2 = 0.054 × 9.8 + 0.017 × 1.44 × 9.8
= 0.8 (N·m)

M3 = 0 (N·m)

$$M_T = \frac{23.9}{130} + \frac{0}{17} + \frac{0.8}{16.5} + \frac{0}{17} = 0.2$$

Can be used since the resultant moment (MT) is "1 or less"

[Z axis cylinder]

W = 0 (N)

M1 = 0.02 × 9.8 = 0.2 (N·m)

M2 = 0 (N·m)

M3 = 0 (N·m)

$$M_T = \frac{0}{97} + \frac{0.2}{7} + \frac{0}{15} + \frac{0}{7} = 0.03$$

Can be used since the resultant moment (MT) is "1 or less"

# Safety Precautions

Always read this section before use.
Refer to page 2 for general information of the cylinder, and to page 320 for general information of the cylinder switch.



Thin linear slide cylinder LCX Series

## Design & selection

### 1. Common

**⚠CAUTION**

■ When selecting the cylinder, follow the "LCX selection guide" on pages 188 to 190.

■ Protect the cylinder with a cover to prevent damage and malfunction in a place where it is exposed to water or oil drops, or corrosive conditions.

■ Caution for mounting the switch

● Be careful of the lead wire direction when designing the 30 mm or less stroke length of axial lead wire and the 20 mm stroke length of radial lead wire since a switch is installed in each groove of the body.

■ Keep the supply pressure 0.5 MPa and over when the ambient temperature of the cylinder is 5°C or less.

■ Contact CKD if the use environment is always cold (5°C or less) or hot (40°C and over).

■ The following two types of stopper with stroke adjusting function are available.

● Rubber cushion stopper
The stopper has an integrated urethane rubber cushion. A stopper allowing for contact to the metal part at 0.4 MPa and over for a stable stop position is also available. Contact CKD for details.

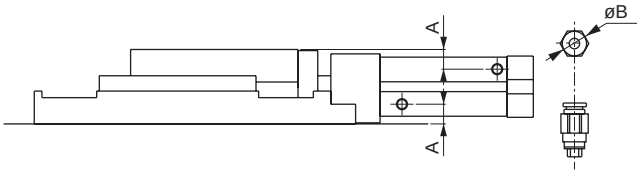
● Metal stopper
The stopper has no cushion mechanism and should be used for a low-load and low-speed application. The stop position is stable since it does not suffer from deformation of a rubber cushion.

## Mounting, installation & adjustment

### 1. Common; when piping

**⚠CAUTION**

■ Precautions for piping
Be sure to attach a speed controller during piping before use. The available fittings are as below.



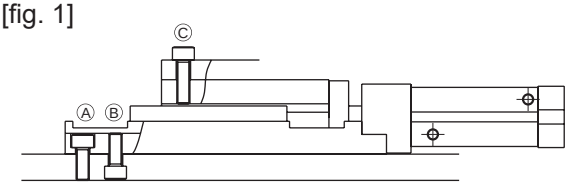

| Descriptions / Bore size (mm) | Port diameter | Port location dimensions A | Applicable fitting | Fitting O.D. B |
|---|---|---|---|---|
| ø25 | M5 | 9.5 | SC3W-M5-4-P7*<br>SC3W-M5-6-P7*<br>GWS4-M5-S-P7*<br>GWS4-M5-P7*<br>GWL4-M5-P7*<br>GWS6-M5-S-P7*<br>GWS6-M5-P7*<br>GWL6-M5-P7* | ø17 or less |
| ø32 | | 9 | | |

### 2. Common; when installing

**⚠CAUTION**

■ The installation surfaces of the base and table have been finished with precision machining to obtain high-precision linear movement. Therefore, grinding the installation surface of the device to improve flatness will enable more stable high-precision performance. (Recommended flatness: 0.01 mm or less) Do not damage surface flatness by denting or scratching the mounting surface.

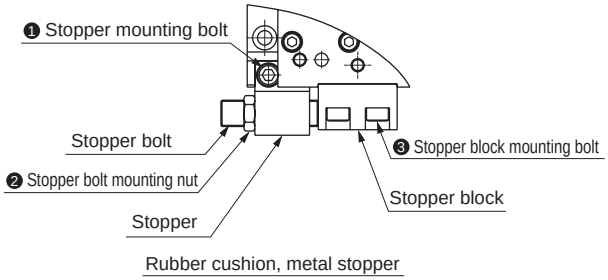
■ Observe the following bolt insertion lengths and tightening torque when installing the jig on the table or base.
[fig. 1]




| Descriptions | Ⓐ | | Ⓑ | | | Ⓒ | | |
|---|---|---|---|---|---|---|---|---|
| | Applicable bolts | Tightening torque (N·m) | Applicable bolts | Tightening torque (N·m) | Max. insertion length | Applicable bolts | Tightening torque (N·m) | Max. insertion length |
| LCX-25 | M6 | 4.3 to 5.2 | M6 × 1.0 | 4.3 to 5.2 | 9.5 mm | M6 × 1.0 | 4.3 to 5.2 | 11 mm |
| LCX-32 | | | | | | | | |

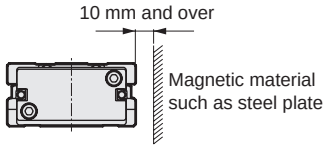
## Mounting, installation & adjustment

■ Observe the following tightening torque of bolts and nuts of the stopper.
[Fig. A]

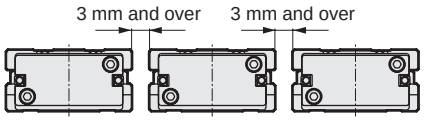



| Descriptions | ❶ Stopper mounting bolt (N·m) | ❷ Stopper bolt mounting nut (N·m) | ❸ Stopper block mounting bolt (N·m) |
|---|---|---|---|
| LCX-25 | 4.3 to 5.2 | 4.5 to 6.0 | 4.3 to 5.2 |
| LCX-32 | | | |

■ The cylinder switch could malfunction if there is a magnetic substance such as a metal plate installed adjacently. To ensure safe operation, keep it 10 mm and over away from the cylinder surface or change the installation surface of the cylinder switch.
(Common for all port sizes)




■ The cylinder switches may accidentally function if the cylinders are close to each other. Keep the distance between the surfaces of the cylinders.
(Common for all port sizes)




■ When using a positioning hole, use a pin of the dimensions that do not require press fitting. If a pin is press fitted, the load of press fitting may damage or distort the linear guide, lowering the accuracy.
The recommended tolerance of a pin is JIS tolerance m6 or less.

## During use & maintenance

### 1. Common

**⚠ CAUTION**

■ Apply AFF grease (THK) to the guide rail in six months or when the number of operation times reaches one million, whichever comes first.

### 2. Long stroke length LCX-*L

■ The preload of the linear guide has been adjusted to an optimum value.
Do not loosen or tighten the hexagon socket set screw. Doing so may degrade the product performance.