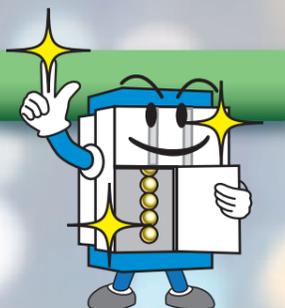


# IKO's unique ideas and experiences are utilized to explore new world for special environment applications.

IKO Linear Way and Linear Roller Way are available for various special environment by using different materials and grease, surface treatment and dust protection measures, etc. Typical application fields and major countermeasures are described below.

## Clean Environment

When the Linear Way or Linear Roller Way is used in clean environment such as a clean room, it is required that the environment is not polluted by dust-generation by the Linear Way or Linear Roller Way and it must have excellent rust prevention property as rust prevention oil cannot be used.



## Vacuum Environment

When the Linear Way or Linear Roller Way is used in vacuum environment, it is required that the gas discharged from the Linear Way or Linear Roller Way does not pollute the environment or reduce the degree of vacuum, and it must have excellent rust prevention property as rust prevention oil cannot be used.



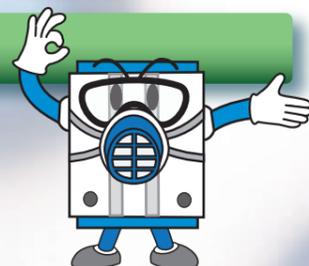
## Heat Resistance Measures

When the Linear Way is used in an environment where temperature is higher than usual, heat resistance of synthetic resin components and metal parts will be an issue.



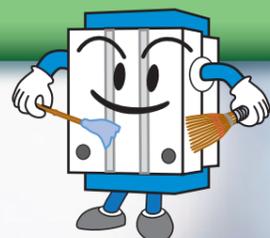
## Dust Protection

If dust such as metal or wooden chips get into the way of the Linear Way or Linear Roller Way, reduction of life and accuracy may be caused. Therefore, measures to prevent foreign substances from entering into the way are necessary.



## Spatter Protection

Spatter of welding, etc. is so hot that it adheres to components. Foreign substances adhering to the track rail firmly cannot be fully removed by normal dust protection measures, so measures to avoid adherence and enhanced foreign substances removal measures are necessary.



are utilized to explore new world for

### Clean

- LCL Linear Way and Linear Roller Way
- Stainless Linear Way and Linear Roller Way
- Black chrome surface treatment
- Specified grease (CG2 or CGL grease)
- ◇ Fluorine grease

### Corrosion resistance

- Hybrid C-Lube Linear Way L
- Non-magnetic stainless Linear Roller Way Super X
- Stainless Linear Way and Linear Roller Way
- Black chrome surface treatment

### Vacuum

- LCL Linear Way and Linear Roller Way
- No end seal
- Stainless steel end plate
- ◇ Fluorine grease

### Heat resistance

- Stainless steel end plate
- Special environment seal
- ◇ High temperature grease

### Foreign substances (wood chips and metal powder, etc.)

- Linear Way H Ultra seal specification
- Track rail mounting from bottom
- Double end seals
- Scrapers
- C-Wiper
- Caps for rail mounting holes
- Rail cover plate for track rail
- Rail cover sheet
- Female threads for bellows
- Specific bellows

### Spatter

- Scrapers
- Caps for rail mounting holes (aluminum alloy)
- Rail cover sheet
- Fluorine black chrome surface treatment
- Stainless steel end plate

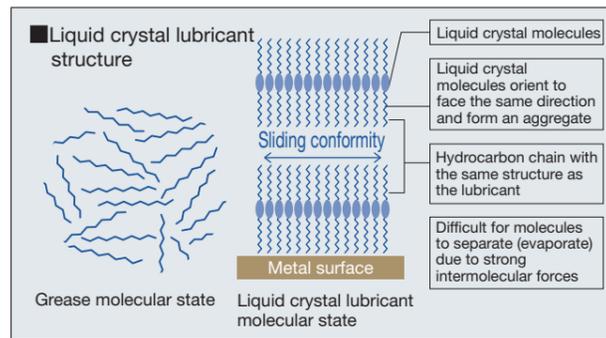
- Linear motion rolling guide series for special environment :  
Collective name of linear motion rolling guide series models corresponding to special environment.
- Special specification for special environment :  
Special specification corresponding to special environment by combination of linear motion rolling guide series.
- ◇ Lubricant :  
Lubricant suitable for each special environment can be selected.

# LCL Linear Way and Linear Roller Way

Neither grease nor oil

## World's first Liquid Crystal Lubricant

Liquid Crystal Lubricants are completely different from greases composed of base oils and thickeners. Liquid Crystal Lubricants are composed only of liquid crystal compounds, forming a new type of lubricant never seen before. Conventional grease base oils lubricate using dissimilar molecules, causing difficulties with adhesion to metal surfaces and evaporation. Liquid Crystal Lubricant forms molecular aggregates, improving adhesion to metal surfaces and minimizing evaporation. The Liquid Crystal Lubricant used in the LCL Linear Way and Linear Roller Way is the world's first Liquid Crystal Lubricant for bearings, achieving excellent lubrication functionality even under high contact pressure during rolling contact and successfully creating revolutionary new functions.



### Features

#### Superior load durability

Long-term durability exceeds 70 times that of fluorine grease at room temperature and atmospheric pressure. 2 to 6 times greater durability than other types of grease, even in high-temperature environments.

#### Superior low dust-generation properties

Dust generation is less than 1/10 of lithium soap based grease.

#### Excellent outgas properties

The outgassing characteristics in high vacuum environments show excellent performance even even at high temperatures.

#### Minimizes lubricant evaporation

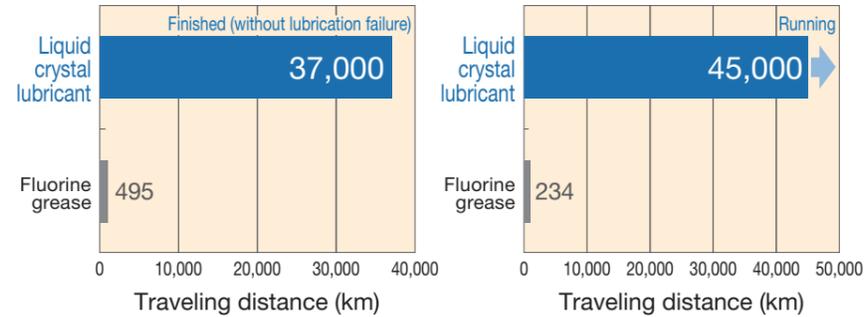
Zero mass loss even at 100°C. Liquid crystal lubricants have no loss due to evaporation.

#### Light and smooth sliding

The rolling resistance is lower than that of fluorine grease or lithium soap-based grease.

### Performance

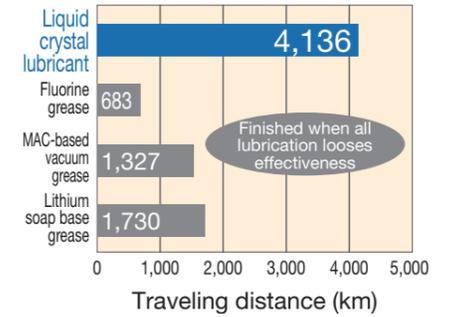
#### Load durability (room temperature)



Test conditions ① Model number: LWL9-B Speed: 1m/s Load: 181N

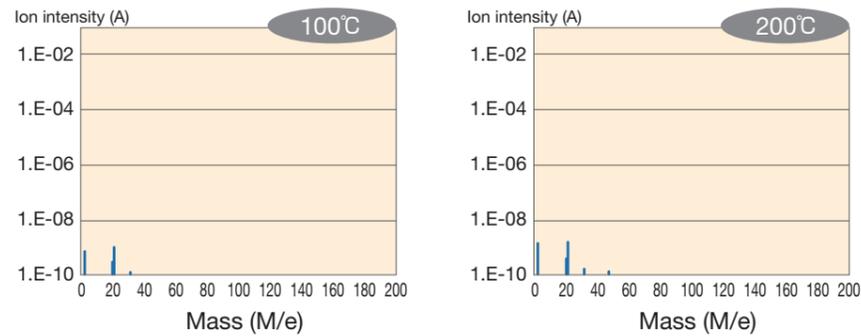
Test conditions ② Model number: LRXD20SL Speed: 1m/s Load: 2340N

#### Load durability (high temperature)



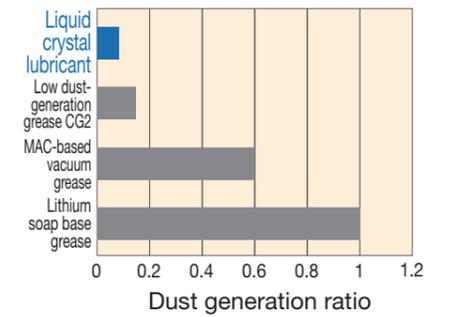
Test conditions Model number: LWL18-B Speed: 1m/s Temperature: 120°C Load: 114N Evaluation: Traveling distance until lubrication failure

#### Outgas properties



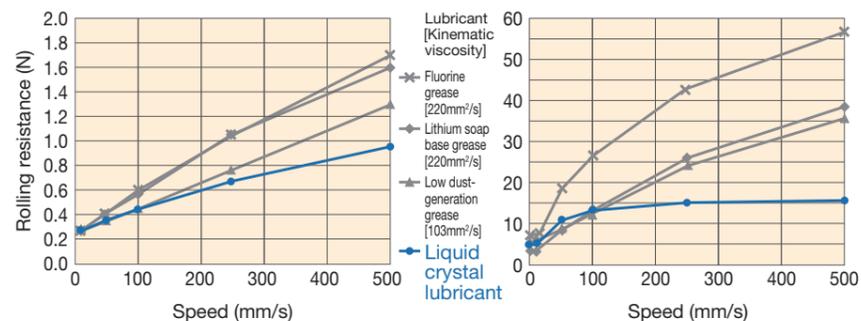
Measuring conditions Vacuum level: 10<sup>-5</sup>Pa Conditions: Liquid crystal lubricant only

#### Low dust-generation properties



Test conditions Model number: LWL9-B/N Load: 80N Speed: 1m/s Evaluation time: 30 hrs Measured particle size: 0.5µm or more

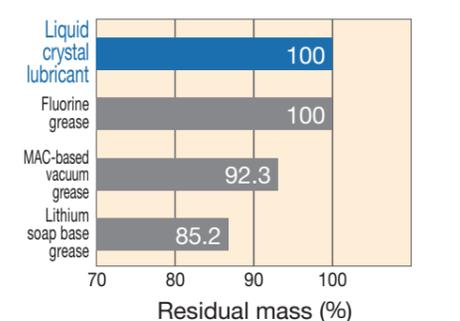
#### Rolling resistance



Test conditions Model number: LWL9-B/N

Test conditions Model number: LRXSG20

#### Evaporation characteristics



Test conditions Environment: Open atmosphere Temperature: 100°C Time: 770 hours

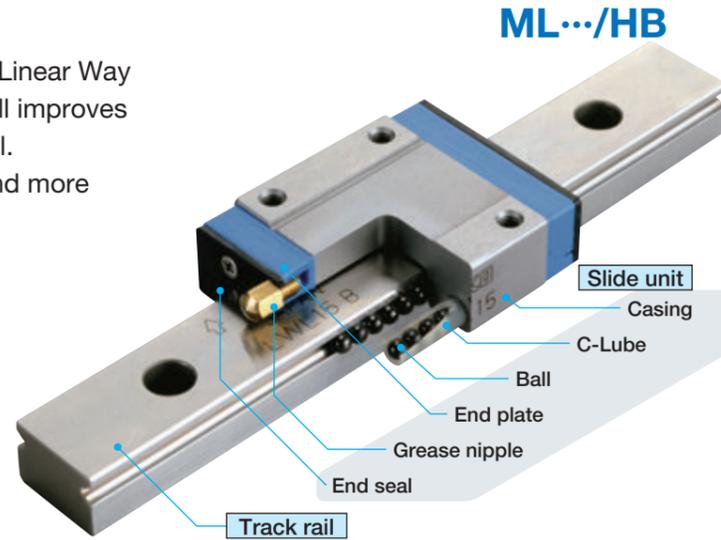
#### Applicable products

- Compatible series
- Linear Way L Series
  - Linear Way E Series
  - Linear Way H Series
  - Linear Way F Series
  - Linear Roller Way Super X Series

Remark 1. Applicable for stainless steel models from each series.  
Remark 2. LCL Linear Ways and Linear Roller Ways are individually made to order. If needed, please contact IKO.

# Hybrid C-Lube Linear Way ML

While maintenance free performance of C-Lube Linear Way ML is maintained, the silicon nitride ceramics ball improves high-speed performance and reduces noise level. Ceramics has more resistance to deformation and more rigidity than bearing steel and stainless steel.



| Standard specification |  |
|------------------------|--|
| Casing                 | Martensitic stainless steel                  |
| Track rail             | Martensitic stainless steel                  |
| Ball                   | Silicon nitride ceramics                     |
| C-Lube                 | Capillary lubricating element (Porous resin) |

## Features

**Superior high-speed performance** ... More than three times durability

**Noise reduction** ..... Noise reduction by about 4.5 dB

**High rigidity** ..... Displacement volume reduced by about 10%

**Superior abrasion resistance** ... Preload reduction volume is about one fourth

※ All of the above based on comparison with our C-Lube Linear Way ML



**Maintenance free**

Achieved long term maintenance free

**Eco-friendly**

Minimized lubrication oil consumption

**Compact**

Integral lubrication parts

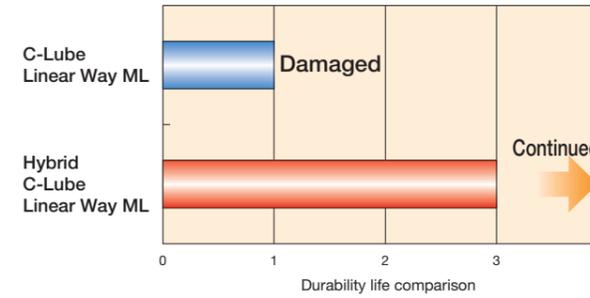
**Smooth**

Excellent sliding characteristic

## Performance

### More than three times durability

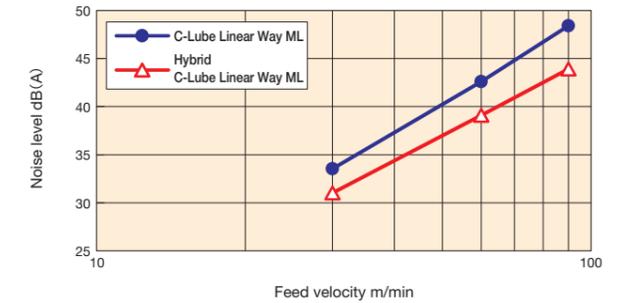
#### High-speed performance



Test conditions Model : ML12 Velocity: 300 m/min Acceleration: 40 G

### Noise reduction by about 4.5 dB

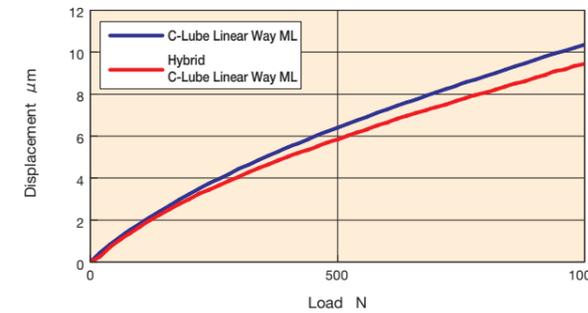
#### Low decibel



Test conditions Model : ML12 Measurement velocity: 30, 60, 90 m/min

### Small deformation of rolling elements and excellent rigidity

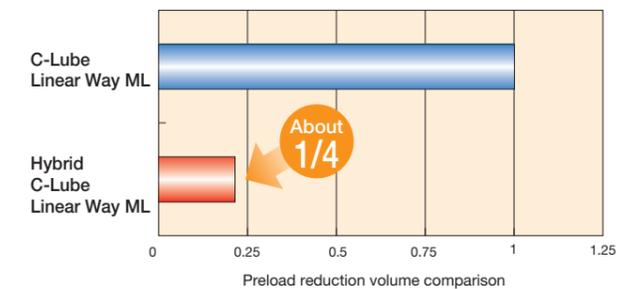
#### High rigidity



Test conditions Model : ML12 Preload: Standard Preload Load direction: Downward

### Low preload reduction volume and accuracy maintained after operation

#### Abrasion resistance

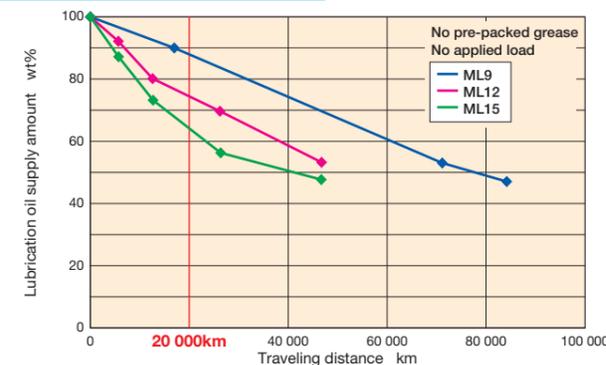


Test conditions Model : ML12 Velocity: 300 m/min Acceleration: 40 G Traveling distance: 13,000 km

## Basic performance of C-Lube Linear Way

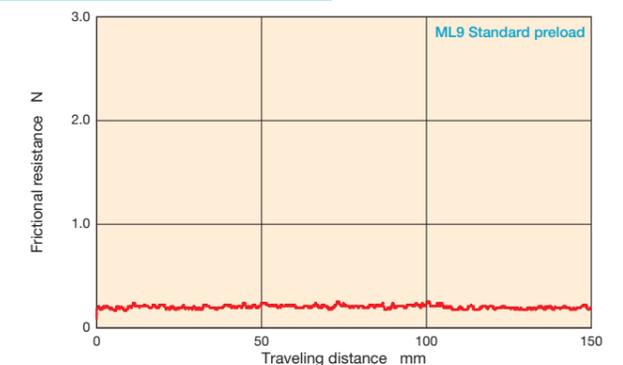
### Achieved long term maintenance free

#### Maintenance free



### Achieved light and smooth sliding

#### Sliding characteristic

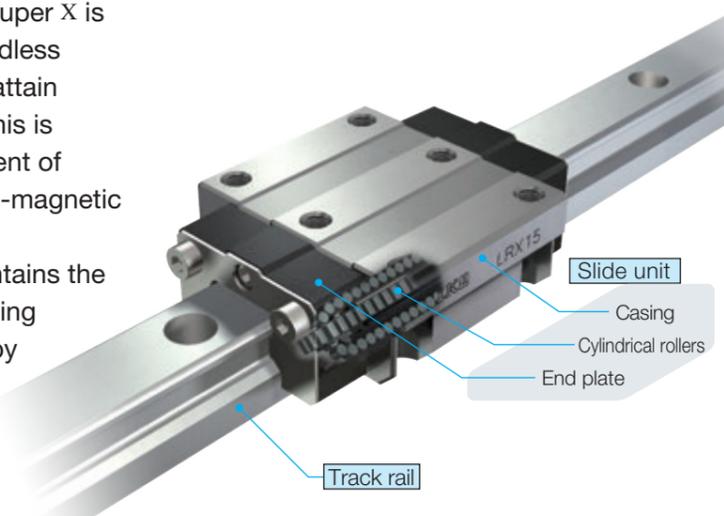


1N=0.102kgf=0.2248lbs.  
1mm=0.03937inch

# Non-magnetic stainless Linear Roller Way Super X

The non-magnetic stainless Linear Roller Way Super X is the world's first non-magnetic stainless steel endless motion roller type linear motion rolling guide to attain relative magnetic permeability of 1.01 or less. This is accomplished through the dedicated development of silicon nitride ceramic cylindrical rollers and non-magnetic stainless steel casings and track rails.

Despite being non-magnetic material it still maintains the superior vibration characteristics, excellent running accuracy, and friction characteristics provided by the Linear Roller Way Super X. This allows for accurate and rapid positioning in environments affected by minimal magnetism.



The world's first non-magnetic roller type with relative magnetic permeability of 1.01 or less



## Features

### World first for roller types

The first non-magnetic specifications ever realized in the world for endless motion roller type linear motion rolling guides

### Relative magnetic permeability 1.01 or less

Allows for accurate and rapid positioning in environments affected by minimal magnetism

### High corrosion resistance

Optimal for use in clean environment thanks to non-magnetic stainless steel

### High running accuracy

The superb vibration characteristics of roller type linear motion rolling guides allow superior running accuracy

## Non-magnetic stainless steel characteristics

| Material name  | Non-magnetic stainless steel | Silicon nitride ceramics       |
|--|------------------------------|--------------------------------|
| Characteristics                                      |                              |                                |
| Relative magnetic permeability (1)                   | 1.01 or less (1.005)         | 1 (0.999991)                   |
| Electric conductivity                                | ○                            | ×                              |
| Hardness (HV)  | 380~450                      | 1400~1600                      |
| Linear expansion coefficient (×10 <sup>-6</sup> /°C) | 19.0 (20~400°C)              | 3.2 (20~400°C)                 |
| Specific gravity (g/cm)                              | 7.9                          | 3.2                            |
| Main ingredients                                     | Fe, Mn, Cr                   | Si <sub>3</sub> N <sub>4</sub> |
| Cost   | ○                            | △                              |
| Remarks  | —                            | Good corrosion resistance      |

Note(1) ( ) is only an example of the measurement value.

## Selection of lubricant

By setting appropriate lubricants such as vacuum grease and low dust-generating grease, any operating environment can be supported.

### ● Applicable products

|            |                           |
|------------|---------------------------|
| Series     | Linear Roller Way Super X |
| Main model | LRX15, LRXD15, LRXS15     |

For detailed specifications or manufacturing information, please contact IKO.

### ■ Main component materials

|                    |                              |
|--------------------|------------------------------|
| Casing             | Non-magnetic stainless steel |
| Track rail         | Non-magnetic stainless steel |
| Cylindrical roller | Silicon nitride ceramics     |
| End plate          | Engineering plastic          |

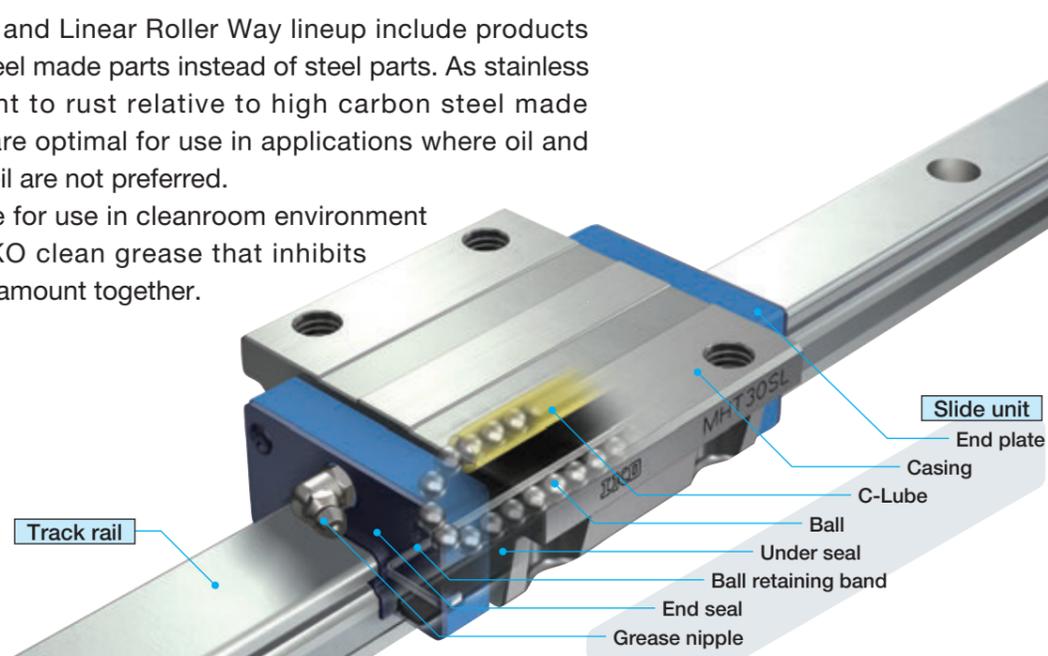
Ball types can also be manufactured upon request. For detailed information, please contact IKO.

# Stainless Linear Way and Linear Roller Way

## A variety of stainless steel series

IKO Linear Way and Linear Roller Way lineup include products with stainless steel made parts instead of steel parts. As stainless steel is resistant to rust relative to high carbon steel made products, they are optimal for use in applications where oil and rust prevention oil are not preferred.

It is also suitable for use in cleanroom environment room, so use IKO clean grease that inhibits dust-generation amount together.



| Main component materials |                                    |
|--------------------------|------------------------------------|
| Casing                   | Martensitic stainless steel        |
| Track rail               | Martensitic stainless steel        |
| Ball                     | Martensitic stainless steel        |
| Ball retaining band      | Stainless steel                    |
| End plate                | Engineering plastic                |
| End seal                 | Stainless steel + Synthetic rubber |
| Grease nipple            | Brass                              |

### Series name

#### Linear Way

##### Ball Type Miniature Series

- C-Lube Linear Way ML
- C-Lube Linear Way MLV
- Linear Way L
- Micro Linear Way L

##### Ball Type Compact Series

- C-Lube Linear Way ME
- Linear Way E

##### Ball Type High Rigidity Series

- C-Lube Linear Way MH
- Linear Way H

##### Ball Type Wide Type Series

- Linear Way F

##### Ball Type U-Shaped Track Rail Series

- C-Lube Linear Way MUL

#### Linear Roller Way

##### Roller Type

- C-Lube Linear Roller Way Super MX
- Linear Roller Way Super X

## Combination with special specification corresponds to use in special environment!

### Rust prevention

#### Black chrome surface treatment /L

Black chrome surface treatment on the track rail and slide unit improves rust prevention capacity.

#### Fluorine black chrome surface treatment /LF

Coating of fluorinated resin is applied over the black chrome surface treatment to prevent foreign substances from sticking and improve the rust prevention capacity.

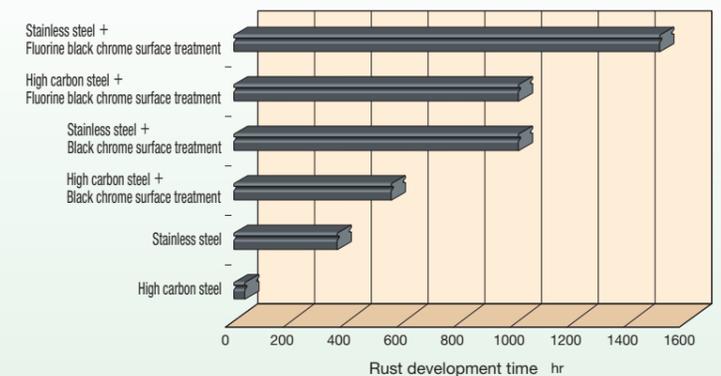


### Black chrome surface treatment

#### Features

- Thin film
- Uniform film
- Strong adhesion
- Excellent rust prevention capacity
- Low temperature processing to prevent distortion
- No peeling and no effects on life and cleanroom environment

Corrosion resistance comparison based on humidity cabinet test\*



Test conditions Temperature 50°C, Relative humidity 95%RH

\*An example from internal evaluation testing.

# Special specification for special environment

IKO Linear Way and Linear Roller Way lineup include following special specifications to correspond to various special environments.

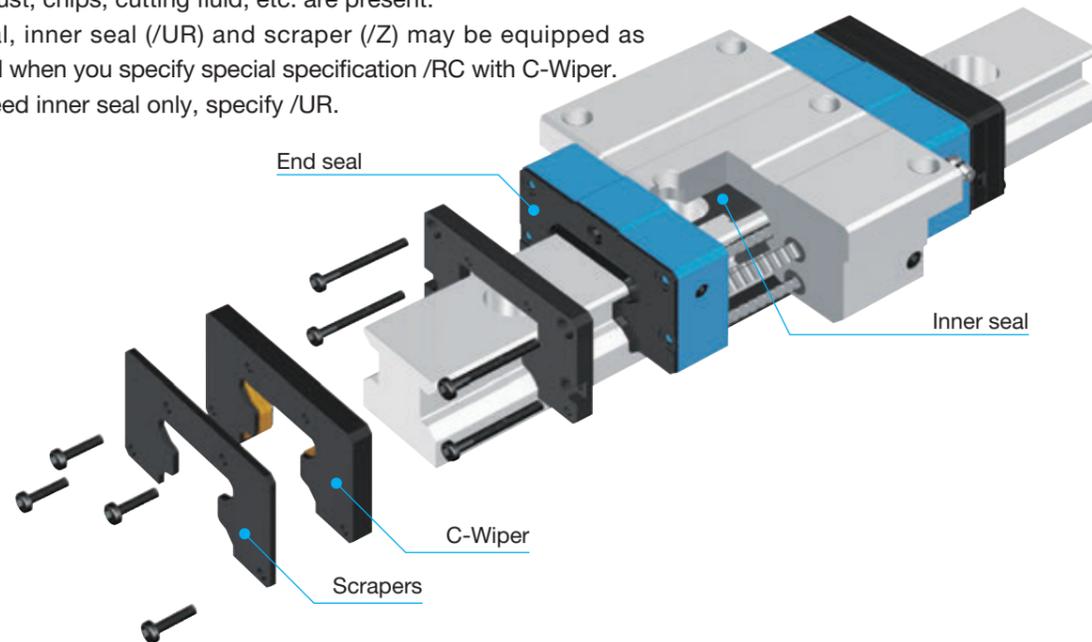
## Dust protection

### C-Wiper /RC

A lubricated C-Wiper can be installed on the outside of the end seal. It can be used for a long period of time because it enhances the dustproof effect and suppresses the increase in frictional resistance even in harsh environments where dust, chips, cutting fluid, etc. are present.

End seal, inner seal (/UR) and scraper (/Z) may be equipped as standard when you specify special specification /RC with C-Wiper.

If you need inner seal only, specify /UR.



Applicable C-Wiper size

| Model                                     | Length of slide unit | Model code   | Size |    |                  |    |    |    |    |    |    |
|---|----------------------|--------------|------|----|------------------|----|----|----|----|----|----|
|   |                      |              | 12   | 15 | 20               | 25 | 30 | 35 | 45 | 55 | 65 |
| Flange type mounting from top / bottom    | Short                | <b>MXC</b>   | —    | —  | ○ <sup>(1)</sup> | ○  | ○  | ○  | ○  | ○  | ○  |
|   | Standard             | <b>MX</b>    | —    | —  | ○ <sup>(1)</sup> | ○  | ○  | ○  | ○  | ○  | ○  |
|   | Long                 | <b>MXG</b>   | —    | —  | ○ <sup>(1)</sup> | ○  | ○  | ○  | ○  | ○  | ○  |
|   | Extra long           | <b>MXL</b>   | —    | —  | ○ <sup>(1)</sup> | ○  | ○  | ○  | ○  | ○  | ○  |
| Block type mounting from top              | Short                | <b>MXDC</b>  | —    | —  | ○                | ○  | ○  | ○  | ○  | ○  | ○  |
|   | Standard             | <b>MXD</b>   | —    | —  | ○                | ○  | ○  | ○  | ○  | ○  | ○  |
|   | Long                 | <b>MXDG</b>  | —    | —  | ○                | ○  | ○  | ○  | ○  | ○  | ○  |
|   | Extra long           | <b>MXDL</b>  | —    | —  | ○                | ○  | ○  | ○  | ○  | ○  | ○  |
| Compact block type mounting from top      | Short                | <b>MXSC</b>  | —    | —  | ○                | ○  | ○  | —  | —  | —  | —  |
|   | Standard             | <b>MXS</b>   | —    | —  | ○                | ○  | ○  | ○  | ○  | —  | —  |
|   | Long                 | <b>MXSG</b>  | —    | —  | ○                | ○  | ○  | ○  | ○  | —  | —  |
|   | Extra long           | <b>MXSL</b>  | —    | —  | ○                | ○  | ○  | —  | —  | —  | —  |
| Low profile flange type mounting from top | Standard             | <b>MXN</b>   | —    | —  | —                | —  | ○  | ○  | ○  | —  | —  |
|   | Long                 | <b>MXNG</b>  | —    | —  | —                | —  | ○  | ○  | ○  | —  | —  |
|   | Extra long           | <b>MXNL</b>  | —    | —  | —                | —  | ○  | ○  | ○  | —  | —  |
|   | Standard             | <b>MXNS</b>  | —    | —  | —                | —  | ○  | ○  | ○  | —  | —  |
| Low profile block type mounting from top  | Long                 | <b>MXNSG</b> | —    | —  | —                | —  | ○  | ○  | ○  | —  | —  |
|   | Extra long           | <b>MXNSL</b> | —    | —  | —                | —  | ○  | ○  | ○  | —  | —  |

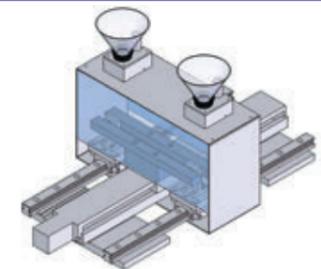
Note (1) Also applicable to models mounting from bottom (MXHC20, MXH20, MXHG20, MXHL20).

## Dust protection

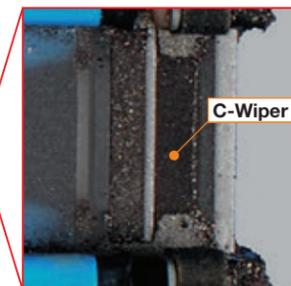
### Durability test result backing excellent dust protection effect of [C-Wiper]!

#### Durability test in environment with foreign substances

| Test conditions    |  |
|--------------------|--|
| Test portion       | MX35 T3 preload / caps for rail mounting holes and C-Wiper included  |
| Maximum velocity   | 18 m/min   |
| Stroke length      | 500 mm   |
| Foreign substances | Fine metal chips<br>Particle diameter lower than 125 μm<br>Hardness 40 ~ 50HRC<br>Application dose 1 g/hr (total dose: 1 kg) |



After operation of 1,000 km



Only few foreign substances may get into the slide unit.

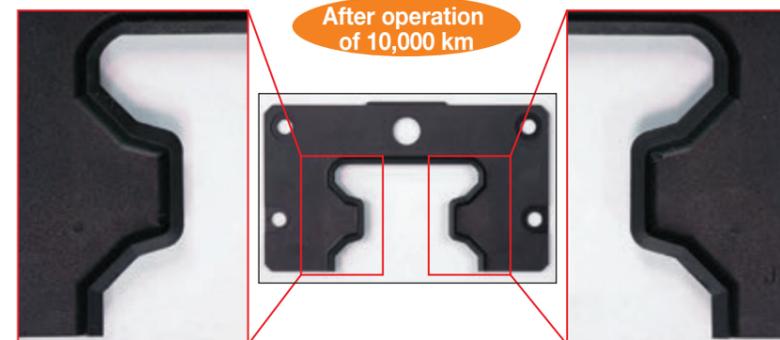
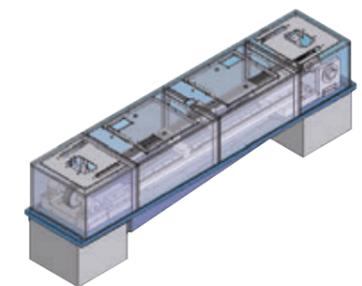
After operation of 1,000 km



Only few foreign substances get into the way!

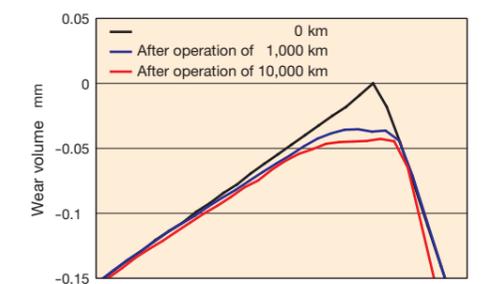
#### Durability test in coolant mist environment

| Test conditions  |   |
|------------------|---|
| Test portion     | MX35 T3 preload / caps for rail mounting holes and C-Wiper included |
| Maximum velocity | 115.2 m/min   |
| Stroke length    | 300 mm  |
| Coolant          | Soluble type<br>Dilute strength 20 times<br>Spray amount 5 cc/hr    |



End seal is not damaged.

Wear condition of end seal lip tip



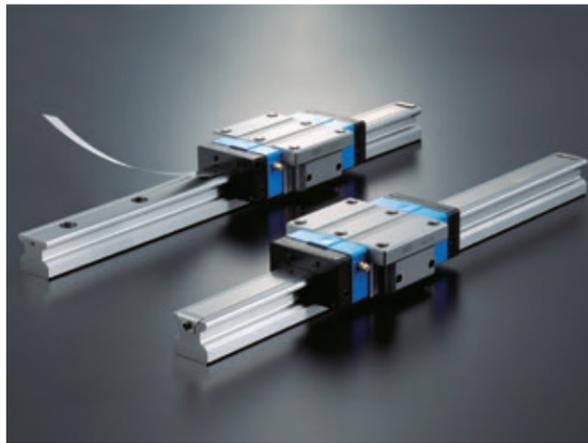
Wear on the end seal is negligible!

**Special specification for special environment**

**Dust protection**

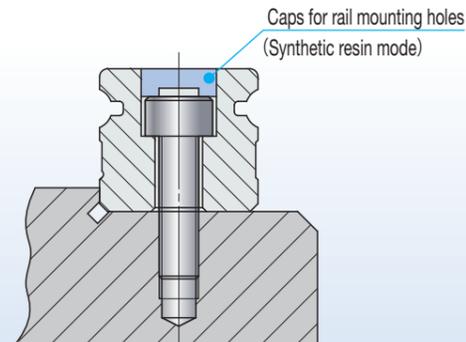
**Rail cover sheet**

Rail cover sheet that consists of steel plate and adhesive tape and fastened to the dedicated track rail with groove on the track rail prevents foreign substances from entering into the slide unit.



**Caps for rail mounting holes /F**

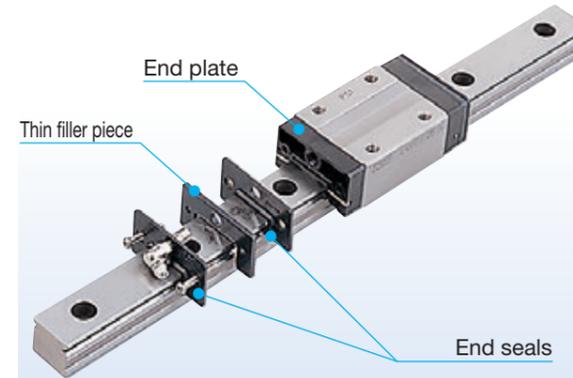
Caps for rail mounting holes close the track rail mounting holes to prevent foreign substances from entering into the slide unit.  
Contact IKO for aluminum alloy caps for rail mounting holes.



**Dust protection**

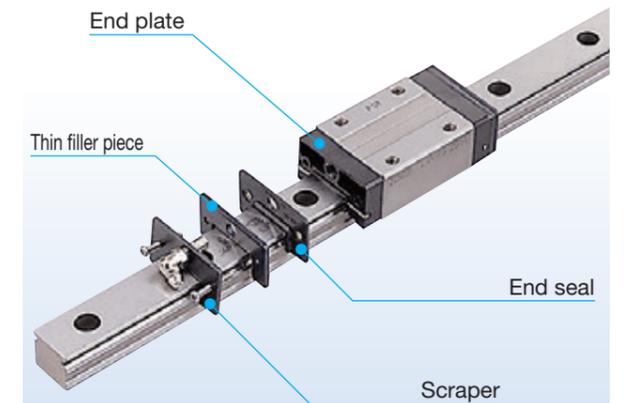
**Double end seals /V**

Double end seals improve the dust protection property further.



**Scraper /Z**

Mounted to the outside of end seal, it may remove large foreign substances adhering to the track rail.



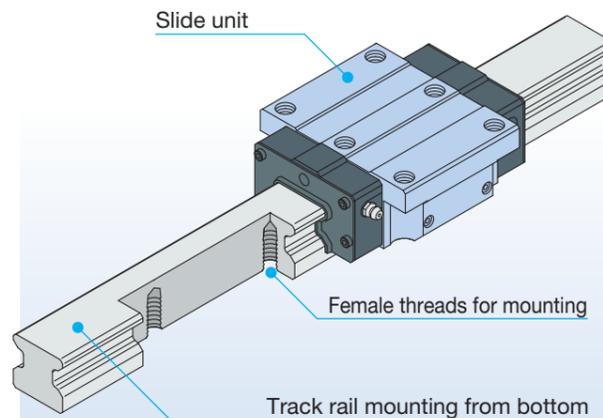
**Rail cover plate /PS**

Rail cover plate totally covers the upper surface of the track rail to prevent foreign substances from entering into the track rail.



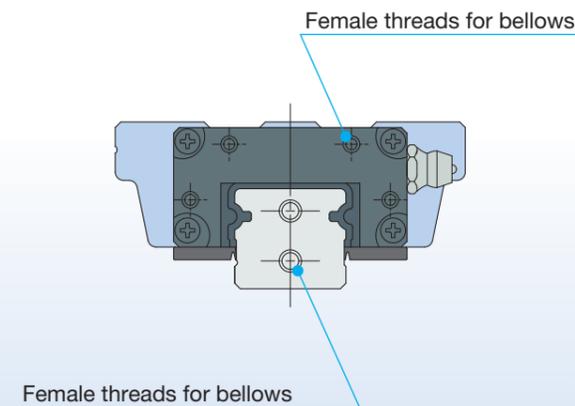
**Track rail mounting from bottom**

This is the specification that track rail is fixed from the mounting surface side. As there are no mounting holes on the track rail upper surface, adherence with the seal is superior and better dust protection effect is achieved.



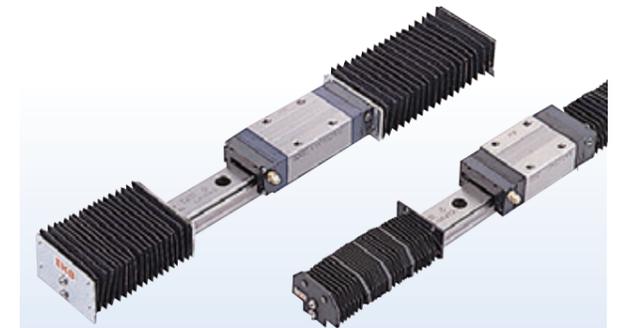
**Female threads for bellows /J**

Female threads for bellows are prepared on the slide unit and track rail ends.



**Specific bellows**

Dust protection cover over the exposed part of the track rail.

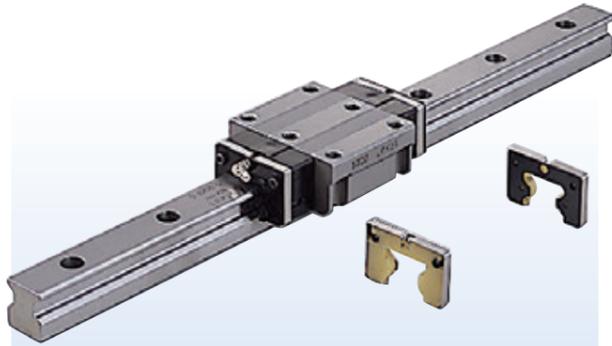


**Special specification for special environment**

**Lubrication**

**With C-Lube plate /Q**

Lubrication parts to substantially reduce the need for lubrication management, i.e. grease job.



**Low Dust-Generation Grease for Clean Environment CGL /YCL**

For this grease, mixed soap is used as thickener and synthetic oil and low pour point mineral oil are mixed with base oil, so it has excellent low dust generating performance, rolling resistance, lubrication, and rust prevention property.

Bellows cartridge (80 g)  
JG80 /CGL



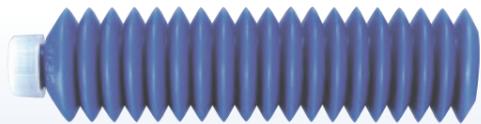
With miniature greaser (2.5 ml)  
MG2.5B /CGL



**Low Dust-Generation Grease for Clean Environment CG2 /YCG**

For this grease, urea is used as thickener and synthetic oil is used as base oil, so it has excellent low dust generating performance, operating temperature range, lubrication property, rust prevention property and oxidation stability.

Bellows cartridge (80 g)  
JG80 /CG2



With miniature greaser (2.5 ml)  
MG2.5B /CG2

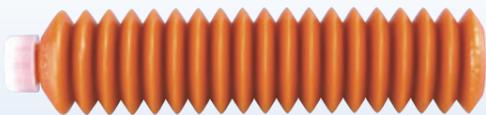


MG10 /CG2 with 10 ml are also available.

**Anti-Fretting Corrosion Grease AF2 /YAF**

Grease with excellent fretting-proof corrosion property.

Bellows cartridge (80 g)  
JG80 /AF2



With miniature greaser (2.5 ml)  
MG2.5B /AF2



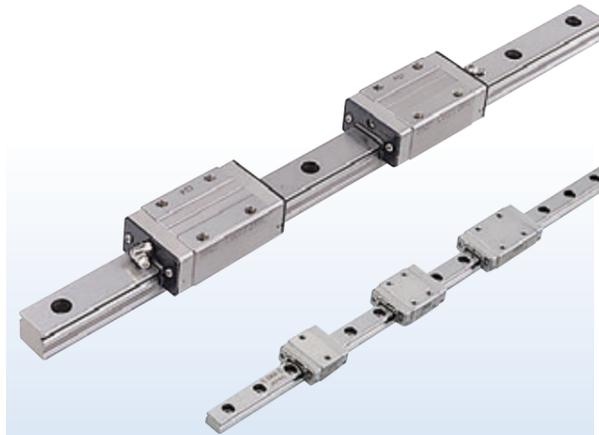
**Other special grease**

For special grease for vacuum or high temperature, please contact IKO.

**Others**

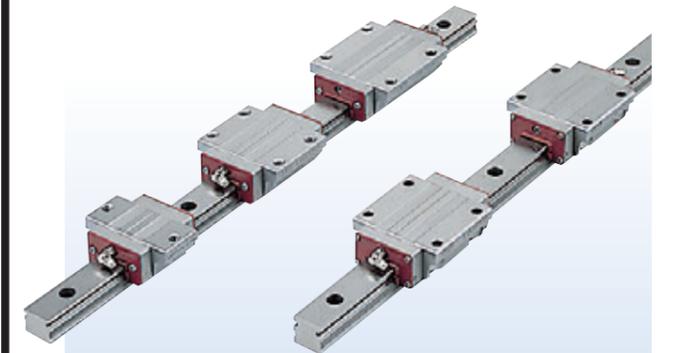
**Stainless steel end plate /BS**

End plate is changed to stainless steel.



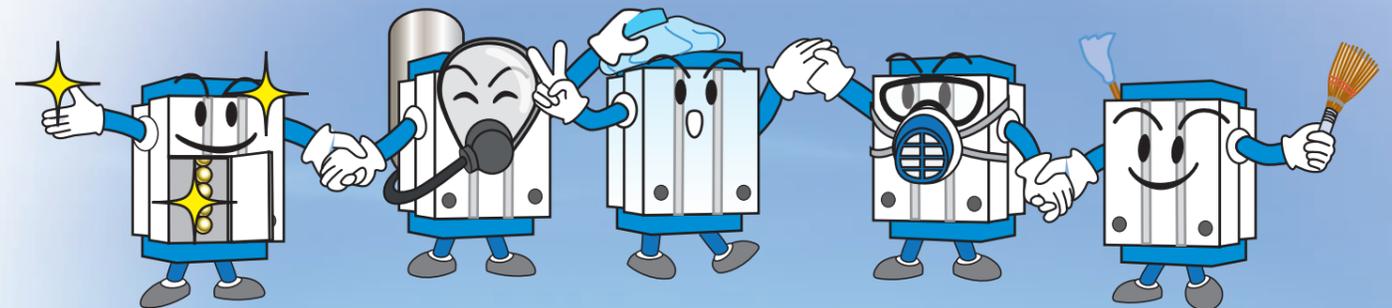
**Special environment seal /RE**

The end and under seals are replaced with end seals for special environment that can be used at high temperatures. When it is used in high temperature environment, stainless steel end plate (/BS) and high temperature grease should be combined.



The photo shows a combination of special environment seal (/RE) and stainless steel end plate (/BS).

**IKO can offer products for special environment!**



If needed, please contact IKO.