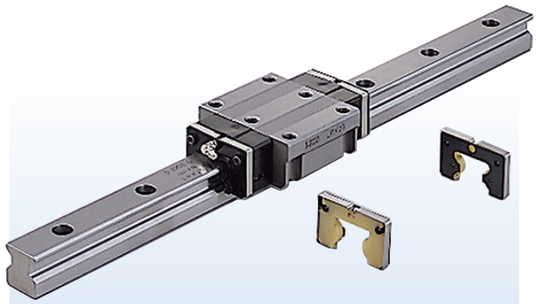
IKO Features of Special Environment Linear Way and Linear Roller Way ⑧

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.

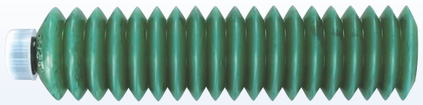


Low Dust-Generation Grease for Clean Environment CGL /YCL

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

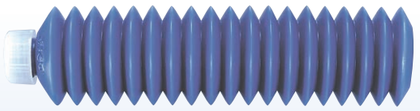


Low Dust-Generation Grease for Clean Environment CG2 /YCG

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



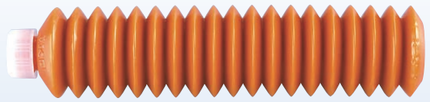
MG10 /CG2 with 10 ml are also available.

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



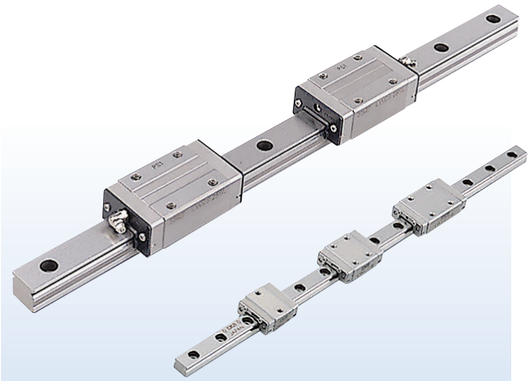
Other special grease

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

Others

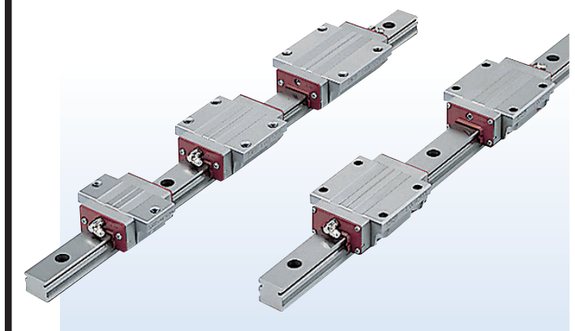
Stainless steel end plate /BS

End plate is changed to stainless steel.



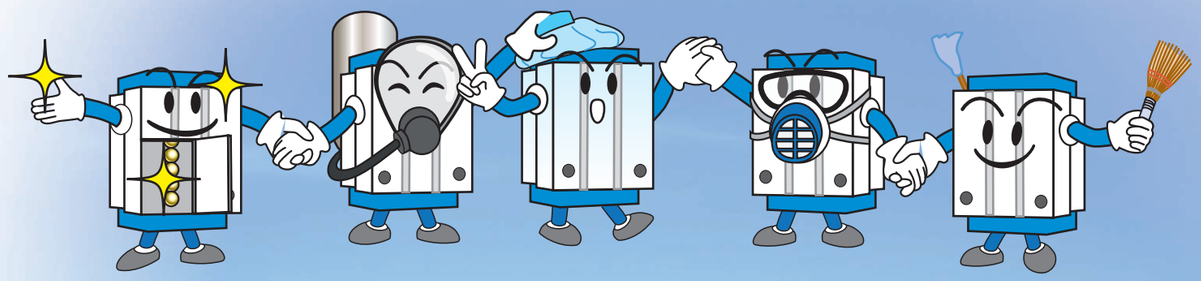
Special environment seal /RE

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.

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Friction

Friction of linear motion rolling guide

The static friction (start-up friction) of linear motion rolling guides is much lower than that of conventional plain guides. Also, the difference between static friction and dynamic friction is small, and frictional resistance varies little when velocity changes. These are excellent features of linear motion rolling guides, and account for their ability to reduce power consumption, suppress operating temperature rise, and increase traveling speed.
Since frictional resistance and variation are small, high-speed response characteristics to motion commands and high accuracy positioning can be achieved.

Friction coefficient

The frictional resistance of linear motion rolling guides varies with their model, applied load, velocity and characteristics of lubricant. Generally, lubricant or seals are major factors in determining the frictional resistance in light load or high-speed operation, while the amount of load is the major factor in heavy load or low speed operation. The frictional resistance of linear motion rolling guides depends on various factors, but generally the following formula is used.

$$F=\mu P \cdots\cdots (13)$$

where, F : Frictional resistance, N
μ : Dynamic friction coefficient
P : Applied load, N

For sealed guides, seal resistance is added to the above value, but this resistance varies greatly depending on the interference amount of seal lip and lubrication conditions.
Where the lubrication and mounting condition are correct and the load is moderate, the friction coefficients of Linear Way and Linear Roller Way in operation are within the range shown in Table 10. Generally, friction coefficient is large under small load.

Table 10 Friction coefficient

Series name	Dynamic friction coefficient μ (1)
Linear Way	0.0040～0.0060
Linear Roller Way	0.0020～0.0040

Note (1) These friction coefficients do not include seal.

Lubrication

Objectives of lubrication

The objectives of applying lubricant for linear motion rolling guides is to keep raceways, rolling elements, etc. in a linear motion rolling guide from metal contact, and thereby reduce friction and wear preventing heat generation and seizure. When an adequate oil film is formed at the rolling contact area between the raceways and rolling elements, the contact stress due to load can be reduced. To manage the formation of adequate oil film is important for ensuring the reliability of linear motion rolling mechanism.

Selection of lubricant

To obtain the full performance of linear motion rolling guides, it is necessary to select an appropriate lubricant and lubrication method by considering the model, load and velocity of each linear motion rolling guide. However, as compared with plain guides, lubrication of linear motion rolling guides is much simpler. Only a small amount of lubrication oil is needed and replenishment interval is longer, so maintenance can be greatly reduced. Grease and oil are the two most commonly used lubricants for linear motion rolling guides.

Grease lubrication

For linear motion rolling guides, lithium-soap base grease (Consistency No.2 of JIS) is commonly used. For rolling guides operating under heavy load conditions, grease containing extreme pressure additives is recommended.
In clean and high-vacuum environments, where low dust generating performance and low vaporization characteristics are required, greases containing a synthetic-base oil or a soap other than the lithium-soap base are used. For applications in these environments, due consideration is necessary to select a grease that is suitable for the operating conditions of linear motion rolling guide and achieves satisfactory lubrication performance at the same time.

Table 11 Pre-packed grease list

Series name	Pre-packed grease
C-Lube Linear Way ML Linear Way L	MULTEMP PS No.2 [KYODO YUSHI CO., LTD.]
C-Lube Linear Way MLV	
C-Lube Linear Way MV	Alvania EP Grease 2 [Shell Lubricants Japan K.K.]
C-Lube Linear Way ME Linear Way E	
C-Lube Linear Way MH(1) Linear Way H(1)	
Linear Way F	
C-Lube Linear Way MUL Linear Way U(2)	MULTEMP PS No.2 [KYODO YUSHI CO., LTD.]
C-Lube Linear Roller Way Super MX Linear Roller Way Super X	Alvania EP Grease 2 [Shell Lubricants Japan K.K.]
Linear Roller Way X	
Linear Way Module	

Notes (1) MULTEMP PS No.2 is pre-packed in size 8 to 12 series.
(2) Alvania EP Grease 2 is pre-packed in size 40 to 86 series.

Grease replenishment interval

The quality of any grease will gradually deteriorate as operating time passes. Therefore, periodic replenishment is necessary. Grease replenishment interval varies depending on the operating conditions. A six month interval is generally recommended, and if the machine operation consists of reciprocating motions with many cycles and long strokes, replenishment every three month is recommended.
In addition, linear motion rolling guides in which the lubrication part "C-Lube" is built deliver long-term maintenance free performance. This eliminates the need for lubrication mechanism and workload which used to be necessary for linear motion rolling guides and significantly reduces maintenance cost.

Grease replenishment method

New grease must be supplied through a grease feed device such as a grease nipple until old grease is discharged. After grease is replenished, running-in is performed and excess grease will be discharged to outside of the linear motion rolling guide. Discharged grease must then be removed before starting the operation.
The amount of grease required for standard replenishment is about 1/3 to 1/2 of the free space inside the linear motion rolling guide. When grease is supplied from a grease nipple for the first time, there will be grease lost in the replenishment path. The amount lost should be taken into consideration.
Generally, immediately after grease is replenished, frictional resistance tends to increase. If additional running-in is performed for 10 to 20 reciprocating cycles after excess grease is discharged, frictional resistance becomes small and stable.
For applications where low frictional resistance is required, the replenishment amount of grease may be reduced, but it must be kept to an appropriate level so as not to give a bad influence on the lubrication performance.

Mixing of different type of grease

Mixing different types of grease may result in changing the properties of base oil, soap base, or additives used, and, in some cases, severely deteriorate the lubrication performance or cause trouble due to chemical changes of additives. Old grease should therefore be removed thoroughly before filling with new grease.

Lubrication part "C-Lube"

C-Lube is a porous resin with molding formed fine resin powder. It is a lubrication part impregnated with a large amount of lubrication oil in its open pores by capillary inside.
Lubrication oil is supplied directly to balls (steel balls) or rollers (cylindrical rollers), not to the track rail. When the balls or rollers have contact with C-Lube built in the slide unit, lubrication oil is supplied to the surface of the balls or rollers. As the balls or rollers circulate, the lubricant is distributed to the loading area along the track rail. This results in adequate lubrication oil being properly maintained in the loading area and lubrication performance will last for a long time.
The surface of C-Lube is always covered with the lubrication oil. Lubrication oil is continuously supplied to the surface of balls or rollers by surface tension in the contact of C-Lube surface and balls or rollers.

Oil lubrication

For oil lubrication, heavy load requires high oil viscosity and high velocity requires low oil viscosity. Generally, for linear motion rolling guides operating under heavy load, lubrication oil with a viscosity of about 68 mm^2/s is used. For linear motion rolling guides under light load at high-speed operation, lubrication oil with a viscosity of about 13 mm^2/s is used.

Table 12 Grease brands used in linear motion rolling guide

Brand		Base oil	Thickener	Consistency	Range of operating temperature (2) ℃	Usage
Alvania EP Grease 2	[Shell Lubricants Japan K.K.]	Mineral oil	Lithium	284	-20～110	General application with extreme-pressure additive
Alvania Grease S2	[Shell Lubricants Japan K.K.]	Mineral oil	Lithium	283	-25～120	General application
MULTEMP PS No.2	[KYODO YUSHI CO., LTD.]	Synthetic oil, Mineral oil	Lithium	275	-50～130	General application
IKO Low Dust-Generation Grease for Clean Environment CG2	[NIPPON THOMPSON CO., LTD.]	Synthetic oil	Urea	280	-40～200	For clean environment Long life
IKO Low Dust-Generation Grease for Clean Environment CGL	[NIPPON THOMPSON CO., LTD.]	Synthetic oil, Mineral oil	Lithium / Calcium	225	-30～120	For clean environment Low sliding
Klüberalfa GR Y-VAC3(1)	[NOK KLUEBER]	Synthetic oil	Ethylene tetra-fluoride	No.3	-20～250	For vacuum
IKO Anti-Fretting Corrosion Grease AF2	[NIPPON THOMPSON CO., LTD.]	Synthetic oil	Urea	285	-50～170	Fretting-proof
6459 Grease N	[Shell Lubricants Japan K.K.]	Mineral oil	Poly-urea	305	–	Fretting-proof

Notes (1) Set replenishment intervals to short.
(2) The ranges of operating temperature are quoted from the grease manufacturer's cataloged values, but do not guarantee regular use under high temperature environment.
Remarks Check with the chosen grease manufacturer's catalog before use.
For grease for applications other than those listed, please contact IKO.

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

Miniature greaser

The miniature greaser is specially prepared for grease replenishment for Linear Way and Linear Roller Way with an oil hole. Table 13 shows types of grease and specifications of miniature greasers.



Table 13 Grease type and miniature greaser

Identification number	Grease name	Amount	Outer diameter of grease feed needle
MG10B/MT2	Lithium-Based Grease MT2	10 ml	ϕ1 mm
MG10B/CG2	IKO Low Dust-Generation Grease for Clean Environment CG2		
MG2.5B/EP2	Lithium-Based Grease EP2	2.5 ml	
MG2.5B/CG2	IKO Low Dust-Generation Grease for Clean Environment CG2		
MG2.5B/CGL	IKO Low Dust-Generation Grease for Clean Environment CGL		
MG2.5B/AF2	IKO Anti-Fretting Corrosion Grease AF2		

Grease nipple and supply nozzle

Tables 14.1 and 14.2 show the specifications of grease nipples and applicable types of supply nozzles, and Table 15 shows the specifications of supply nozzles.

Table 14.1 Grease nipple and applicable supply nozzle type

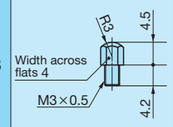
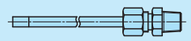
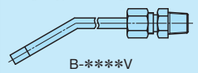
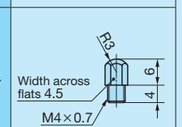
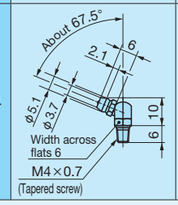
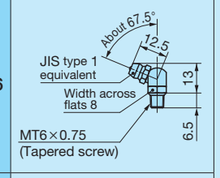
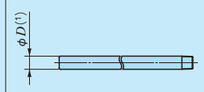
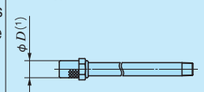
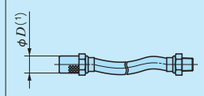
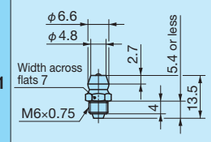
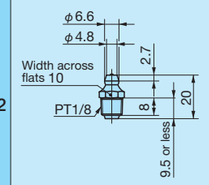
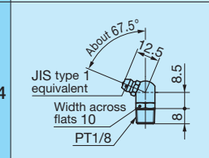
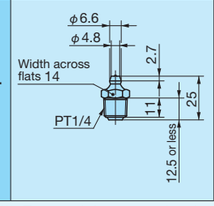
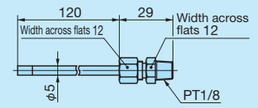
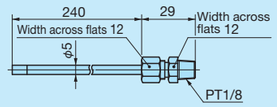
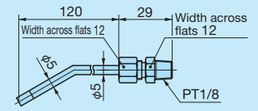
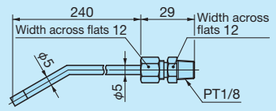
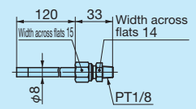
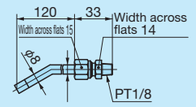
Grease nipple		Applicable supply nozzle type	
Type	Dimensions and shape	Type	Shape
A-M3		A-5120V A-5240V B-5120V B-5240V	Straight type  A-****V Straight type with angle  B-****V
A-M4			
B-M4		A-8120V B-8120V	

Table 14.2 Grease nipple and applicable supply nozzle type

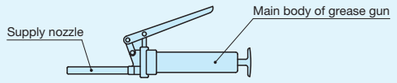
Grease nipple		Applicable supply nozzle type	
Type	Dimensions and shape	Type	Shape
B-M6		Products available on the market	Straight type  Chuck type  Hose type 
JIS type 1			
JIS type 2			
JIS type 4			
A-PT 1/4			

Note (1) For straight type, chuck type and hose type supply nozzles available on the market, it is recommended to use one with an outer diameter D of 13 mm or less.

Table 15 Types and dimensions of supply nozzle

Type	Dimensions and shape
A-5120V	
A-5240V	
B-5120V	
B-5240V	
A-8120V	
B-8120V	

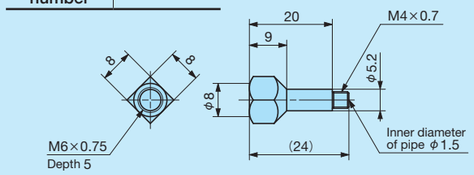
Remark: The supply nozzles shown in the table can be mounted on the main body of a common grease gun available on the market shown below. If needed, specify the supply nozzle type and place an order to IKO.



Piping joint

When applying centralized grease or oil lubrication, detach the grease nipple or plug from the slide unit, and replace them with piping joints, which are prepared for various female threads for piping. Use them after confirming the dimensions of the piping joints and H_3 dimensions in the dimensions table of each models, because the top face of some piping joints is at the same or higher level than the top face of slide unit. Fig. 4.1 and 4.2 and Tables 16.1, 16.2, 16.3, and 16.4 show identification number and dimensions of piping joints. Note that some of them are not applicable for the slide units of special specifications. Piping joints can be mounted on Linear Way and Linear Roller Way prior to delivery upon request. If needed, please contact IKO.

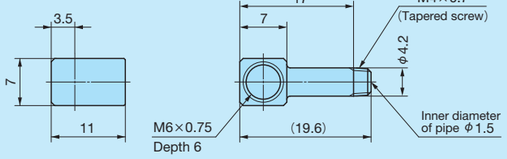
Identification number	SC4-20S



Remark: Not applicable to MX, LRX series.

Fig. 4.1 Piping joint for M4×0.7 (Straight type)

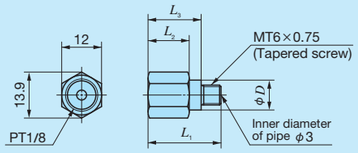
Identification number	LC4-17



Remark: It is recommended to mount the straight type piping joint in Table 16.1 for female threads (M6×0.75).

Fig. 4.2 Piping joint for M4×0.7 (L type)

Table 16.1 Piping joint for M6×0.75 (Straight type)



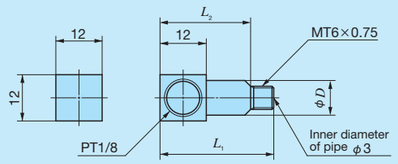
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Identification number	L_1	L_2	L_3	D
SC6-16	22	12.4	16	9
SC6-22S	28	12	22	6
SC6-25S	31	12	25	6

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

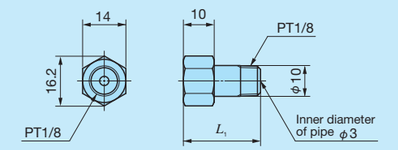
Table 16.2 Piping joint for M6×0.75 (L type)



unit: mm

Identification number	L_1	L_2	D
LC6-18	25	18	9
LC6-22S	28	–	6
LC6-24	30.5	23.5	9
LC6-25S	31	–	6

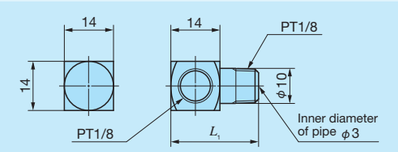
Table 16.3 Piping joint for PT1/8 (Straight type)



unit: mm

Identification number	L_1
SC1/8-19S	25
SC1/8-34S	40

Table 16.4 Piping joint for PT1/8 (L type)



unit: mm

Identification number	L_1
LC1/8-19S	25
LC1/8-34S	40

Dust Protection

Purpose of dust protection

To obtain the full performance of linear motion rolling guides, it is important to protect them from the intrusion of dust and other harmful foreign substances. Select an effective sealing or dust-protection device to withstand any operating conditions that might be imposed.

Method of dust protection

Linear Way and Linear Roller Way have end seals as a standard specification. In addition, double seals or scrapers are provided as special specifications for improvement in dust protection performance. Also caps and a rail cover sheet to cover the mounting hole of track rail (Fig. 5) and track rail mounting from bottom with no mounting hole on the upper surface (Fig. 6) will further increase the reliability of dust protection.
However, if large amount of contaminant or dust are floating, or if large particles of foreign substances such as chips or sand may adhere to the raceway, complete dust protection becomes difficult. In this case, it is recommended to cover the whole unit with bellows (Fig. 7), telescope type shield, etc.
When rail cover sheet or track rails mounting from bottom specification is needed, please contact IKO.

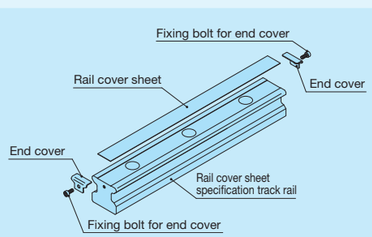


Fig. 5 Rail cover sheet

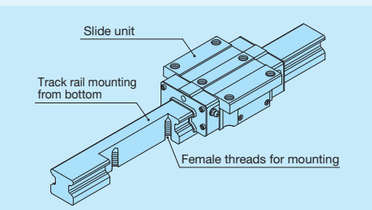


Fig. 6 Track rail mounting from bottom

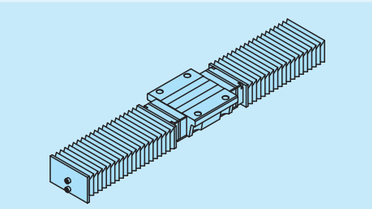


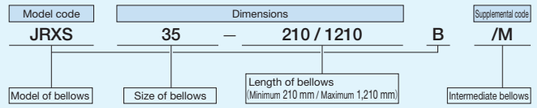
Fig. 7 Bellows

Specific bellows

The specific bellows are manufactured to match the dimensions of Linear Way and Linear Roller Way for easy mounting and excellent dust protection.
If special bellows to be used in an upside-down position or those made of heat-resistant material are needed, please contact IKO.

Identification number of bellows

The identification number of bellows consists of a model code, dimensions, and any supplemental codes. Its standard arrangement is shown below.



Calculation of minimum length of bellows

The minimum necessary length of specific bellows is determined, by first calculating the necessary number of accordion pleats as follows.

$$ns=\frac{S}{\ell s_{max}-\ell s_{min}}$$

where, ns : Number of pleats (Raise decimal fractions)
S : Stroke length, mm
ℓs_{max} : Maximum length of one pleat (See Tables 18.1 and 18.2)
ℓs_{min} : Minimum length of one pleat (See Tables 18.1 and 18.2)

$$L_{min}=ns\times \ell s_{min}+m\times 5+10$$
$$L_{max}=S+L_{min}$$

where, L_{min} : Minimum length of bellows, mm
L_{max} : Maximum length of bellows, mm
m : Number of internal guide plates (See Table 17)

Table 17 Number of internal guide plates for bellows

Model	P dimensions of specific bellows (1) mm Above	Below	Number of internal guide plates m
JEF JRES	—	35	$m=\frac{ns}{7}-1$
JES JHS JFS JRXS···B JFFS	—	22	$m=\frac{ns}{16}$ when $ns\leqq 20$, then $m=0$
	22	25	$m=\frac{ns}{12}$ when $ns\leqq 18$, then $m=0$
	25	35	$m=\frac{ns}{8}$

Note (1) For P dimensions, see Table 18.1 and Table 18.2.
Remark: In calculating the number of internal guide plates m, raise the decimal fractions for JEF and JRES and omit the decimal fractions for others.

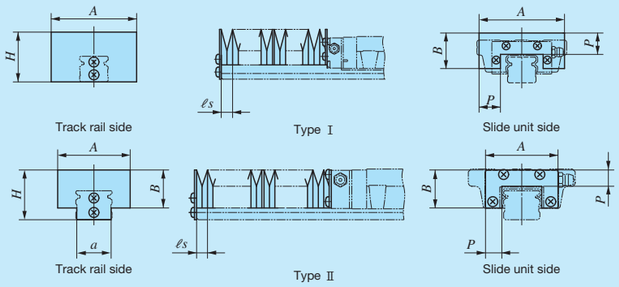
Intermediate bellows

Since different type of mounting plate is used for mounting bellows between slide units. add supplemental code "/M" onto the identification number when ordering.
Reinforced bellows are also available, which are specially designed for use on long track rails or for lateral mounting. The width A of reinforced bellows is greater than that of standard type bellows. If needed, please contact IKO.

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www.almotion.nl | www.lineairegeleiding.nl | www.lineairegeleidingshop.nl | www.linearmotion.nl

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

Table 18.1 Dimensions of bellows and applicable models

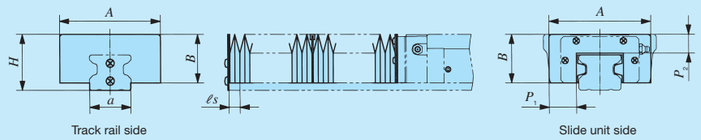


unit: mm

Series name	Size	Bellows model code	Type	H	A	a	B	P	ℓs_{min}	ℓs_{max}
C-Lube Linear Way ME Linear Way E	15	JEF 15	Ⅱ	23.5	34	14	17	8	2	9
	20	JEF 20		27.5	40	19	21	9	2	10
	25	JEF 25		32	46	22	24	10	2	11
	30	JES 30		42	70	27	35	15	2	14
	35	JES 35		48	85	33	40	18	2	18.5
	45	JES 45		60	105	44	50	22	2	23.5
C-Lube Linear Way MH Linear Way H(1)	15	JHS 15	Ⅰ	31(2)	55	–	19.5	15	2	14
	20	JHS 20		35(2)	60	–	25	15	2	14
	25	JHS 25		39(2)	64	–	29.5	15	2	14
	30	JHS 30		42	70	–	35	15	2	14
	35	JHS 35		48	85	–	40	18	2	18.5
	45	JHS 45		60	105	–	50	22	2	23.5
	55	JHS 55		70	120	–	57	25	2	28
	65	JHS 65		90	158	–	76	35	2	42
Linear Way F	33	JFFS 33	Ⅱ	26(2)	66(3)	–	23	15	2	15
	37	JFFS 37	Ⅱ	27.5(2)	70(3)	–	24	15	2	15
	40	JFS 40	Ⅰ	32(2)	80	–	27	15	2	14
	42	JFFS 42	Ⅱ	30.5(2)	76(3)	–	27.5	15	2	15
	60	JFS 60	Ⅰ	36(2)	100	–	30	15	2	14
	69	JFFS 69	Ⅱ	36(2)	106	–	31.5	15	2	15
	90	JFS 90	Ⅰ	50	150	–	43	22	2	23.5

Notes (1) Not applicable to horizontal mounting type LWHY.
(2) The height of bellows may become higher than the height H of dimensions of assembly of slide units. Check H dimensions of each series in dimension table.
(3) The width of bellows may become larger than the W_2 dimensions of slide units. Check with W_2 dimensions of each series in dimension table.

Table 18.2 Dimensions of bellows and applicable models



unit: mm

Series name	Size	Bellows model code	H	A	a	B	P_1	P_2	ℓs_{min}	ℓs_{max}
C-Lube Linear Roller Way Super MX Linear Roller Way Super X	15	JRES 15	34(1)	55(2)	14	30	17.5	15	2	15
	20	JRES 20	39(1)	60(2)	19	34	15	15	2	15
	25	JRES 25	42(1)	65(2)	22	36	16.5	15	2	15
	30	JRES 30	46(1)	70(2)	27	39.5	15	15	2	15
	35	JRES 35	48	88(2)	33	41.5	24	15	2	15
	45	JRES 45	60	108(2)	44	52	29	20	2	21
	55	JRES 55	70	122(2)	52	61	31	22	2	23.5
	65	JRES 65	88	140(2)	61	76	25	25	2	30
	85	JRES 85	107	180	82	89	30	30	2	36
Linear Roller Way X	25	JRXS 25···B	40	60	22	34	15	12	2	10
	35	JRXS 35···B	48	88	34	41.5	24	15	2	14
	45	JRXS 45···B	60	108	44	52	29	20	2	21
	55	JRXS 55···B	70	122	54	61	31	22	2	23.5
	75	JRXS 75···B	90	160	74	80	40	30	2	36

Notes (1) The height of bellows may become higher than the height H of dimensions of assembly of slide units. Check H dimensions of each series in dimension table.
(2) The width of bellows may become larger than the W_2 dimensions of slide units. Check W_2 dimensions of each series in dimension table.

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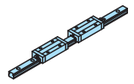
Identification number and quantity for ordering

IKO

To order a set of Linear Way and Linear Roller Way, please specify the number of sets based on the number of track rails. For slide units of the interchangeable specification or single track rails, please specify the number of units.

Non-interchangeable specification

Assembled set



(When 1 set is needed)

Example of identification number indication

LWESG 25 C2 R640 SL T1 P /FU

Order quantity
1 set

Interchangeable specification

Single slide unit



(When 2 pieces are needed)

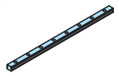
Example of identification number indication

LWESG 25 C1 SL T1 P SO /U

Only C1 is specified. Please specify S1 or S2.

Order quantity
2 pieces

Single track rail



(When 1 unit is needed)

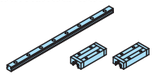
Example of identification number indication

LWE 25 R640 SL P SO /F

Please specify S1 or S2.

Order quantity
1 unit

Assembled set



(When 1 set is needed)

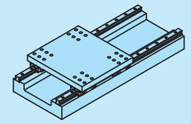
Example of identification number indication

LWESG 25 C2 R640 SL T1 P SO /FU

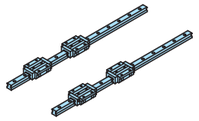
Please specify S1 or S2.

Order quantity
1 set

Specification with 1 multiple assembled sets as 1 assembled group (Special specification /W)



Linear Way and Linear Roller Way



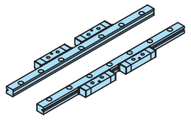
(When 2 sets as 1 assembled group is needed)

Example of identification number indication

LRX 45 C2 R1260 T3 SP /W2

Order quantity
2 sets

Linear Way Module



(When 2 sets as 1 assembled group is needed)

Example of identification number indication

LWLM 9 M2 R360 P /W2

Order quantity
2 set

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

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