IKO

Linear Way U

LWU

CAT-57110B

U.S. PATENTED

For saving in re-lubricant cost and man-hour !

ISO 9002 Certified

ISO 14001 Certified

剛 U-effect

The new U-shaped track rail achieves a drastic
More freedom in design is provided,
because the uniquely shaped track rail can be used
by itself as a structural member !

increase in rigidity !

IKO

Linear Way U series

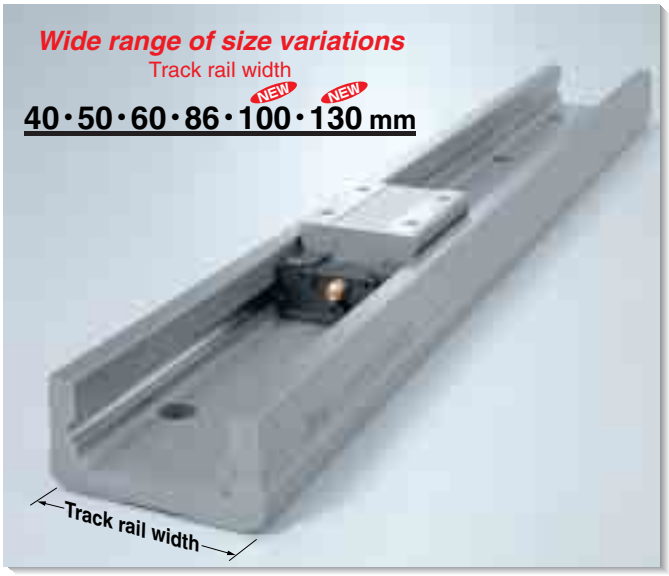
LWU

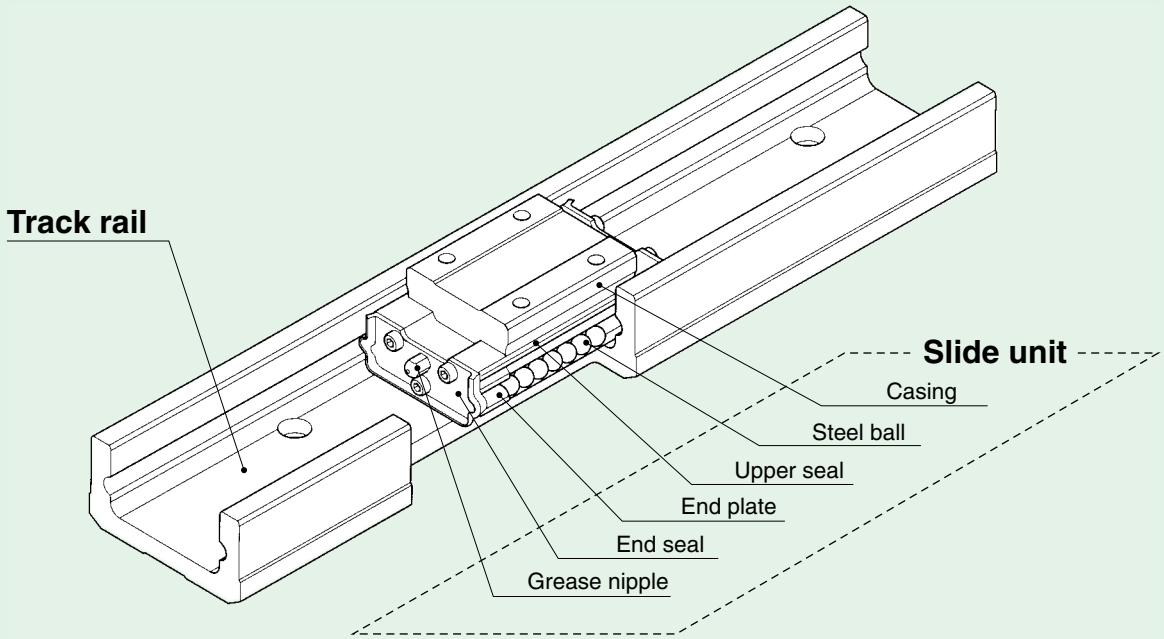
New concept

Large types with track rail widths of
100mm and 130mm
are newly introduced !

IKO Linear Way U
LWU

IKO Linear Way U is a linear motion rolling guide featuring a track rail with a U-shaped cross section. Raceways are provided on the inside surface of the track rail, and a slide unit mounted inside the track rail travels along the raceways.
The U-shaped track rail of IKO Linear Way U has much higher rigidity as compared with the track rail with a rectangular cross section, especially under moment and torsion. Therefore, in addition to the conventional way of fastening a track rail on a mounting base, it can be used by itself as a structural member of machines and equipment, in a cantilever position or being supported at both ends.
Track rails come in six widths, ranging from 40mm to 130mm. Number of slide units, preload, accuracy, etc. can also be specified in the same way as in other Linear Way series, so that the optimal specification can be selected meeting the requirements in the application.





Structure of Linear Way U

U.S. PATENT No. 6,176,617
No. 6,082,899
No. 5,967,667

Creating new applications! IKO Linear Way U

The U-shaped track rail of Linear Way U can be used as a structural member; it is a new design concept !

Rigidity of track rail under moment and torsion is very much increased by adopting the U-shaped design. The track rails can, therefore, be mounted on machines and equipment as structural members, either in a cantilever position or supported at both ends, so they can be combined and assembled freely.

Low cross sectional height and compact shape!

Slide units and track rails have compact shapes, with cross sectional height made as low as possible. As the result, design of drive mechanisms and other peripheral divices can be made more freely, and machine size and weight can be reduced.

High precision and rigidity!

Large diameter steel balls in the slide unit are arranged in two rows, and makes contact with the raceways at four points. Stable high precision and rigidity are thus obtained even under fluctuating or complex load.

Additional work on track rail is possible!

Additional work can be made on track rails, so that drive mechanisms and other peripheral devices can be fixed directly to the track rails.

*(*Note that additional work cannot be made near the raceways of track rail. For details, please consult IKO .)*

Wide variations of assembly configurations contribute to increase design flexibility!

A construction of open frame table assembly

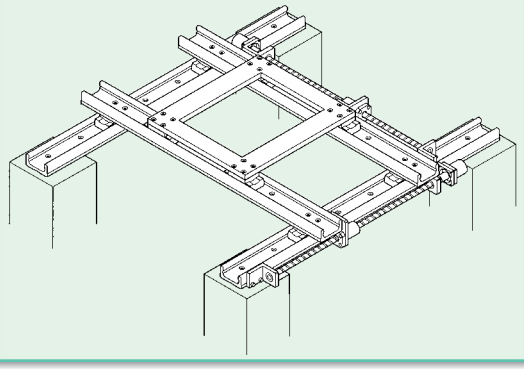
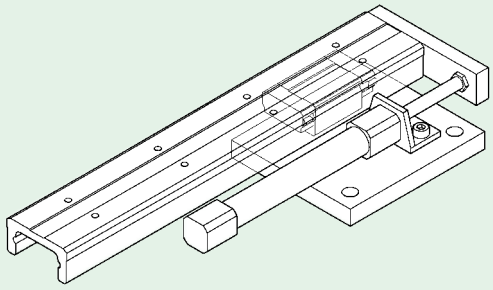
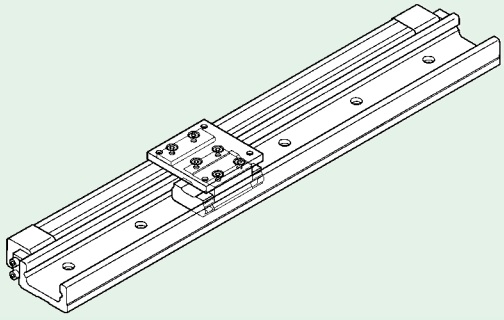


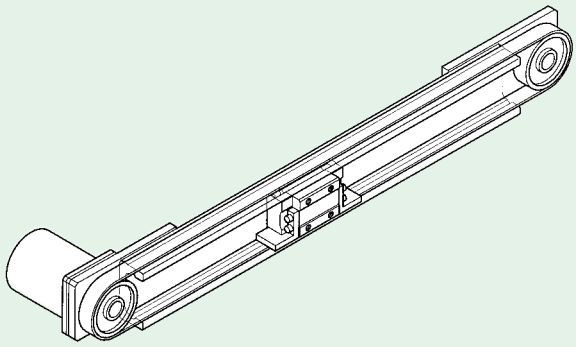
Table with air cylinder



High speed slide table with rod-less cylinder



Compact design with belt drive



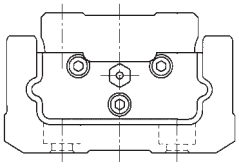
Identification number

The specification of IKO Linear Way U is indicated by the identification number, consisting of a model code, a size, a part code, a preload symbol, a classification symbol, and any supplemental codes.

Example of identification number

LWU 50 C2 R640 T_1 H /Q

❶ Series	Model code	LWU
❷ Size of rolling guide	Size	40、50、60、86、100、130
❸ Number of slide units	Part code	C○
❹ Length of track rail	Part code	R○
❺ Preload amount	Preload symbol	Standard : No-symbol Light preload : T_1
❻ Accuracy	Classification symbol	Ordinary class : No-symbol High class : H
❼ Special specification	Supplemental code	/L○、/Q、/W○



The number of slide units mounted on one track rail is indicated.

The length of track rail is indicated in the unit of mm. See Table 11 on page 12 for the standard length and maximum length.

See Table 4 on page 8 for the details of preload amount.

See Table 3 on page 7 for the details of accuracy.

See Table 6 on page 9 for applicable special specifications.

Load Rating and Life

Basic dynamic load rating C

The basic dynamic load rating is defined as a constant load both in direction and magnitude under which a group of identical IKO Linear Way U are individually operated and 90% of the units in the group can travel over the distance of 50×10^3 m without material damage due to rolling contact fatigue.
The basic dynamic load rating of IKO Linear Way U is equal in upward, downward and lateral directions.

Basic static load rating C_0

The basic static load rating is defined as a static load that gives a prescribed constant contact stress at the center of the contact area between rolling elements and raceways receiving the maximum load. It is the maximum allowable load under which a rolling element rolls normally. It is generally used in combination with a static safety factor.
The basic static load rating of IKO Linear Way U is equal in upward, downward and lateral directions.

Static moment ratings T_0、T_X、T_Y

The static moment rating is defined as a static moment load (See Fig. 2) that gives a prescribed contact stress at the center of the contact area between rolling elements and raceways receiving the maximum load when a moment is applied. It is the maximum allowable moment under which a rolling element rolls normally. It is generally used in combination with a static safety factor.

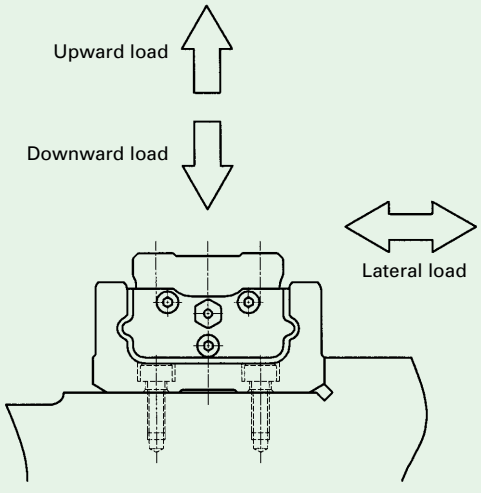


Fig.1 Load direction

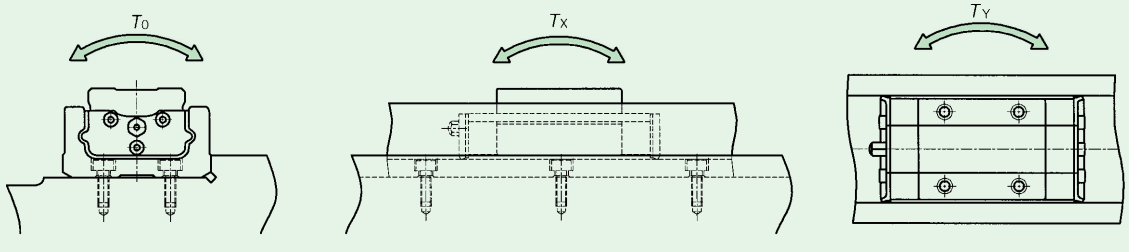


Fig.2 Direction of static moment ratings

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

Life

The basic rating life of IKO Linear Way U is obtained from the following formula.

$$L = 50\left(\frac{C}{P}\right)^3 \quad \cdots\cdots (1)$$

where, L : Rating life, 10^3 meters
C : Basic dynamic load rating, N
P : Equivalent load, N

If the stroke length and the number or strokes per minute are known, the life in hours can be obtained from the following formula.

$$L_h = \frac{10^6 L}{2Sn_1 \times 60} \quad \cdots\cdots (2)$$

where, L_h : Rating life in hours, h
S : Stroke length, mm
n_1 : Number of strokes per minute, cpm

Static safety factor

The static safety factor fs of IKO Linear Way U is given in the following formula.

$$f_s = \frac{C_0}{P_0} \quad \cdots\cdots (3)$$

where, f_s : Static safety factor
C_0 : Basic static load rating, N
P_0 : Static load (maximum load), N

Table 1 Static safety factor

Conditions	f_s
Operation with vibration and shocks	3～5
Operation requiring high running performance	2～4
Normal operation	1～3

Load factor

Actual loads applied on the linear motion rolling guide sometimes exceed the theoretically calculated loads due to vibration, shocks and other factors caused by machine operation. The load for life calculation is generally determined by multiplying the theoretically calculated load by a load factor shown in Table 2.

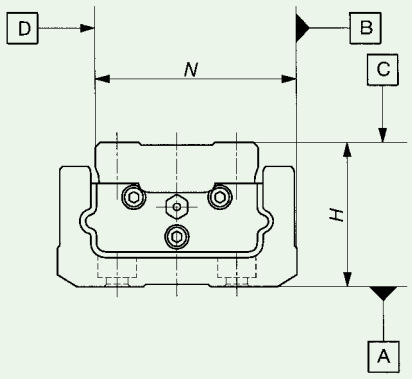
Table 2 Load factor

Conditions	f_w
Smooth operation free from vibration and/or shocks	1 ～1.2
Normal operation	1.2～1.5
Operation with shock loads	1.5～3

Accuracy

Accuracy for IKO Linear Way U is shown in Table 3.

Table 3 Accuracy



unit: mm

Item \ Classification (Symbol)	Ordinary (no symbol)	High (H)
Dim. H tolerance	±0.100	±0.050
Dim. N tolerance	±0.100	±0.050
Dim. variation of H (1)	0.050	0.040
Dim. variation of N (1)	0.050	0.040
Parallelism in operation of C to A	See Fig. 3	
Parallelism in operation of D to B	See Fig. 3	

Note(1): The size variation between slide units mounted on the same track rail is indicated.

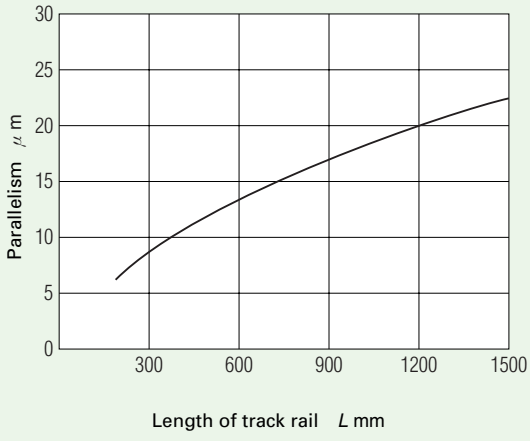


Fig.3 Parallelism in operation

Preload

The average amount of preload for IKO Liner Way U is shown in Table 4.

Table 4 Preload amount

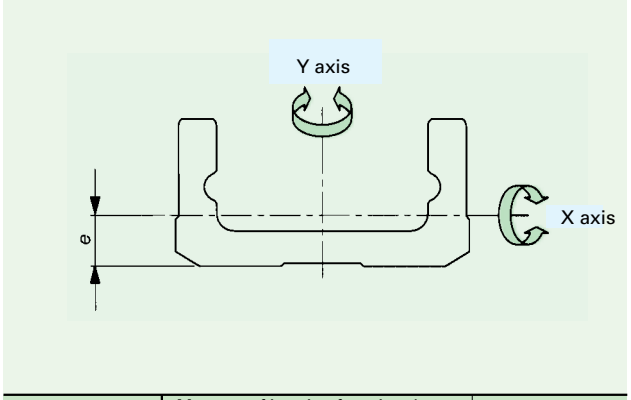
Item / Preload type	Symbol	Preload amount (N)	Application
Standard preload	(No symbol)	0 (1)	Smooth and precise motion
Light preload	T_1	$0.02C_0$	Minimum vibration Evenly balanced load Smooth and precise motion

Note(1): Zero or minimal amount of preload
Remark: C_0 means the basic static load rating.

Moment of inertia of sectional area

High rigidity design of IKO Linear Way U is achieved by adopting a U-shaped track rail. Table 5 shows the moment of inertia of sectional area of track rails.

Table 5 Moment of inertia of sectional area of track rails



Model number	Moment of inertia of sectional area mm⁴		Center of gravity *e* mm
	I_X	I_Y	
LWU 40	1.0×10^4	6.8×10^4	6.6
LWU 50	2.8×10^4	1.7×10^5	8.7
LWU 60	6.4×10^4	3.8×10^5	10.9
LWU 86	2.4×10^5	1.6×10^6	14.6
LWU 100	5.9×10^5	3.3×10^6	18.8
LWU 130	1.4×10^6	8.8×10^6	23.0

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

Special specifications

IKO Linear Way U with the special specifications shown in Table 6 are optionally available.
When ordering, add any supplemental code at the end of the identification number. If a combination of special specifications is required, indicate the supplemental codes in the alphabetical order.

Table 6 Special specifications

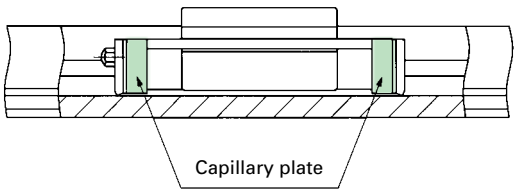
Special specification	Supplemental code
Black chrome surface treatment	/L○
Capillary plate (1)	/Q
Matched sets to be used as an assembled group	/W○

Note(1): Applicable to sizes 40, 50, 60, and 86.

Black chrome surface treatment
/LC /LR /LCR

After a black chrome permeable film is formed, the acrylic resin coating on top of a black chrome film is formed for further improvement in corrosion resistance.
❶/LC
The casing is treated.
❷/LR
The track rail is treated.
❸/LCR
The casing and track rail are treated.
Coding example : LWU 50 C2 R640 H /LCR

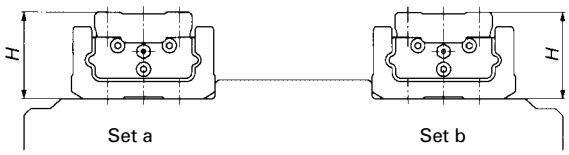
With capillary plates /Q



The capillary plate is assembled inside of the end seal in the slide unit. It is impregnated with lubricant so that the re-lubrication interval can be made longer. For the overall length of a slide unit with capillary plates, refer to Table 7.

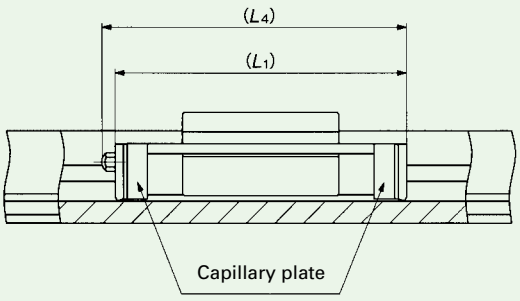
Coding example : LWU 50 C2 R640 H /Q

Matched sets to be used as an assembled group /W



When two or more sets of Linear Way U are used on the same plane as an assembled group requiring a uniform height variation among the sets, indicate the supplemental code "/W" with the number of sets to be used as a group. The dimensional variation of H among the matched sets is the same as that in a single set. Place an order by quantity of sets instead of the number of complete assembled groups.
Coding example (In this example, one assembled group consists of two matched sets.)
LWU 50 C2 R640 H /W2

Table 7 Dimensions of slide unit with capillary plates (Supplemental code /Q)



unit: mm

Model number	L_1	L_4
LWU 40	67	68
LWU 50	82	83
LWU 60	95	102
LWU 86	142	148
LWU 100	166	172
LWU 130	190	196

Lubrication and Dust Protection

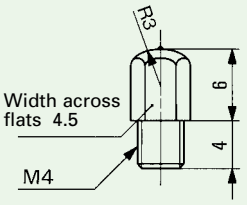
A quality lithium-soap base grease containing extreme-pressure additives (Shell Albania EP Grease 2) is supplied in IKO Linear Way U on delivery. However, the quality of any grease will gradually deteriorate as operating time passes. Therefore, periodic re-lubrication is necessary. It is generally recommended that the grease is re-lubricated every six months under general usage and every three months for the daily operation consisting of many cycles and long strokes. A grease nipple is attached to the slide unit, and Table 8 shows the grease nipples for respective models. Grease injector nozzles matching each of these grease nipples are also available. If required, please consult IKO .

Re-lubrication interval can be extended by using the special specification Capillary Plate (supplemental code "/Q"). Also, re-lubrication and other maintenance works can be reduced.

IKO Linear Way U is dust-protected with special rubber seals. But, if large amount of fine contaminants are present, or if large particles of foreign matter such as dust or chips may fall on the track rail, it is recommended to provide protective covers for the entire linear motion mechanism.

Table 8 Grease nipple

unit: mm

Model number	Grease nipple	
	Model number	Dimensions
LWU 40 LWU 50	A–M4	
LWU 60 LWU 86 LWU 100 LWU 130	JIS A–M6F	

Precaution for Use

❶ Assembly of a slide unit and track rail

The steel balls of IKO Linear Way U will drop off, if the slide unit is separated from the track rail. Therefore, do not separate the slide unit from the track rail. If it is needed to separate it for handling, dummy plastic rails can be used. Dummy plastic rails are available upon request. Please consult IKO .

❷ Reference mounting surface

The reference mounting surfaces of the slide unit D and track rail B of IKO Linear Way U are the side surfaces opposite to the IKO mark (see Fig. 4).

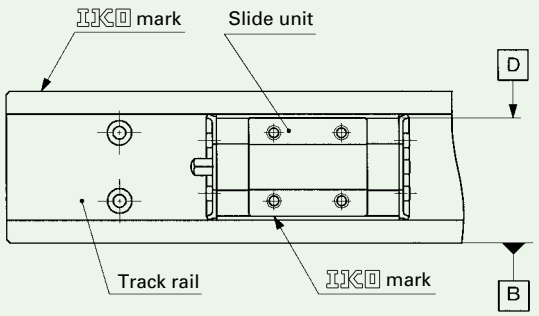


Fig.4 Reference mounting surface

❸ Standard mounting example

The reference mounting surfaces B and D and the mounting surfaces A and C of IKO Linear Way U are precisely finished by grinding. Therefore, by finishing the mating reference mounting surfaces and the mating mounting surfaces of the machine accurately and by fitting the Linear Way U to these surfaces correctly, a stable and accurate linear motion can be achieved.

It is recommended to make a relieved fillet at the corner of the mating reference mounting surface of the machine or equipment, on which LWU is assembled as shown in Fig. 6. A round corner can also be used. Table 9 shows recommended values for shoulder height and corner radius of the mating reference mounting surface.

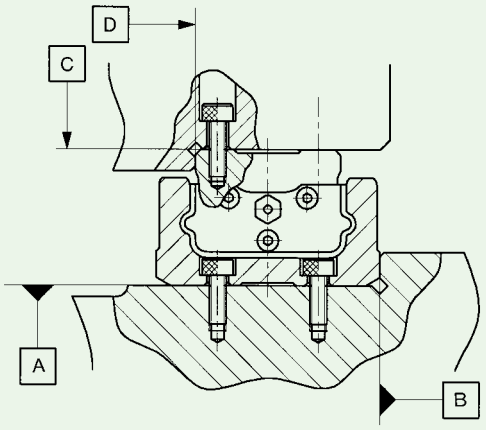


Fig.5 Mounting example

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

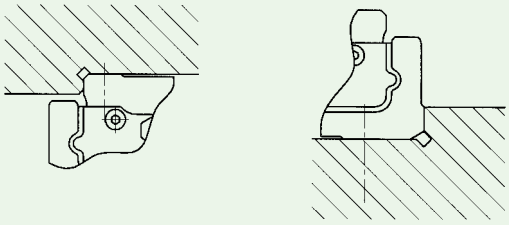
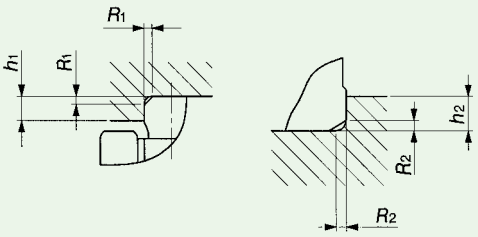


Fig. 6 Relieved fillet at the corner of reference mounting surfaces

Table 9 Shoulder height and corner radius for the mating reference mounting surface



Slide unit Track rail

unit: mm

Model number	Slide unit		Track rail	
	Shoulder height h_1	Corner radius $R_{1(maximum)}$	Shoulder height h_2	Corner radius $R_{2(maximum)}$
LWU 40	3	0.5	5	1
LWU 50	3	0.5	7	2
LWU 60	3	0.5	9	2
LWU 86	4	0.5	11	2
LWU 100	4	0.5	13	1
LWU 130	5	1	14	2

❹ Rigidity of mounting surface

The accuracy and performance of IKO Linear Way U are affected by the rigidity and material of the mating mounting surfaces. It is recommended to mount IKO Linear Way U on a bed with sufficiently high rigidity in applications where high running accuracy is required.

❺ Multiple slide units mounted in close distance

When using multiple slide units in close distance to each other, the actual load may be greater than the calculated load depending on the accuracy of the mounting surface and the reference mounting surface of the machine. It is suggested in such cases to assume a greater actual load than the calculated load.

❻ Tightening torque of fastening screws

Table 10 shows the tightening torque for mounting IKO Linear Way U on a steel part in general application. The torque values 1.2 to 1.5 times higher than the ones in the table are recommended, when the machine or equipment is subjected to large vibration, impact, fluctuating load or moment load. If the mating part is made of cast iron or aluminum, reduce the tightening torque considering the strength properties of the material.

Table 10 Mounting bolt tightening torque

Bolt size	Tightening torque N・m
	Carbon steel made bolt (strength division 12.9)
M 3×0.5	1.7
M 4×0.7	4.0
M 5×0.8	7.9
M 6×1	13.3
M 8×1.25	32.0
M10×1.5	62.7

❼ Operating temperature

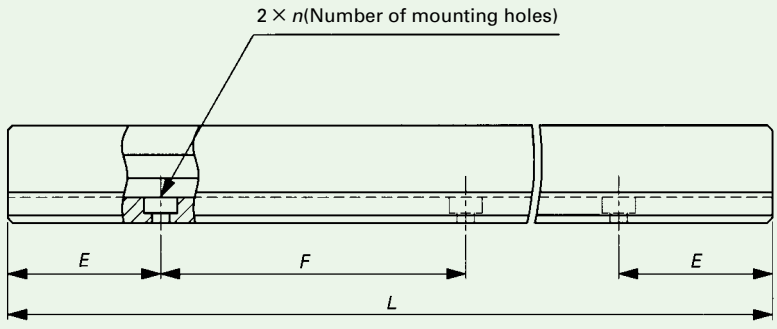
The maximum operating temperature is 120℃ and a continuous operation is possible at temperatures up to 100℃. If the temperature in operation is higher than 100℃, please consult IKO.

Maximum allowable temperature for the "with capillary plates" specification is 80℃.

Track Rail Length

Table 11 shows the standard length and maximum length of the track rail of IKO Linear Way U and recommended mounting bolt. Prepare the necessary quantities of mounting bolts for the length of track rail.
If a track rail having a length different from the standard length, or butt-joint track rails specification longer than table 11 maximum length is required, consult IKO .

Table 11 Track rail length and recommended mounting bolt

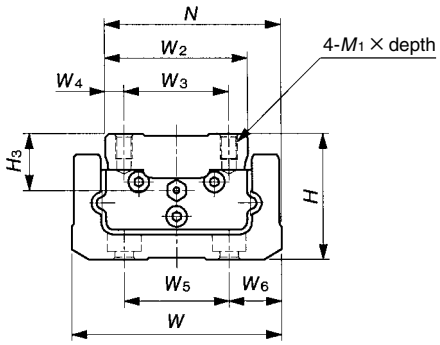


unit: mm

Item \ Model number	LWU 40	LWU 50	LWU 60	LWU 86	LWU 100	LWU 130
Standard length L(n)	180(3) 240(4) 300(5) 360(6) 420(7) 480(8)	240(3) 320(4) 400(5) 480(6) 560(7) 640(8)	300(3) 400(4) 500(5) 600(6) 700(7) 800(8)	300(3) 400(4) 500(5) 600(6) 700(7) 800(8)	450(3) 600(4) 750(5) 900(6) 1050(7) 1200(8)	450(3) 600(4) 750(5) 900(6) 1050(7) 1200(8)
Pitch of mounting holes F	60	80	100	100	150	150
E	30	40	50	50	75	75
Maximum length	720	800	1000	1200	1500	1500
Recommended mounting bolt (1)	M3 × 8	M4 × 10	M5 × 12	M6 × 16	M8 × 20	M10 × 25

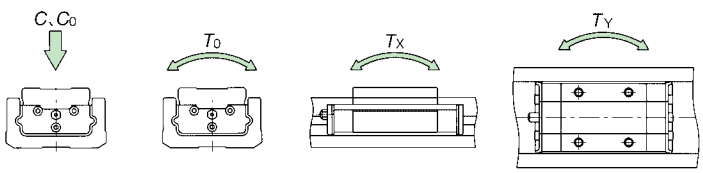
Note(1): It is recommended to use hexagon socket head cap bolts of strength division 12.9 according to JIS B 1176.
Remark: M8 female threads for hanging bolt are provided on track rail of size 100. And M10 female threads for hanging bolt are provided on track rail of size 130.

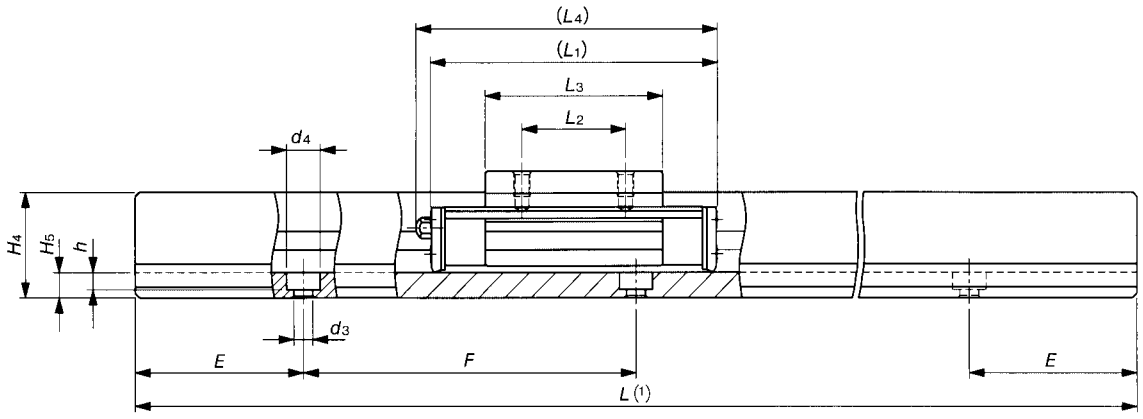
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch



Model number	Mass(Ref.)		Dimensions of assembly mm		Dimensions of slide unit mm								
	Slide unit kg	Track rail kg/m	*H*	*N*	W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1 × depth	H_3
LWU 40	0.12	2.64	24	33	26	18	4	55	18	31.5	59	M 3× 5	10.5
LWU 50	0.27	4.05	30	42	34	25	4.5	70	25	42.8	73	M 4× 6	13.5
LWU 60	0.40	6.69	35	49	38	28	5	83	28	52.4	90	M 5× 8	14.5
LWU 86	1.32	14.1	48	71	56	46	5	130	46	93	136	M 6×12	25.5
LWU 100	2.20	21.5	58	82	65	50	7.5	154	50	111	158	M 8×15	29
LWU 130	4.49	33.0	72	109	88	70	9	178	70	132	182	M10×20	35.5

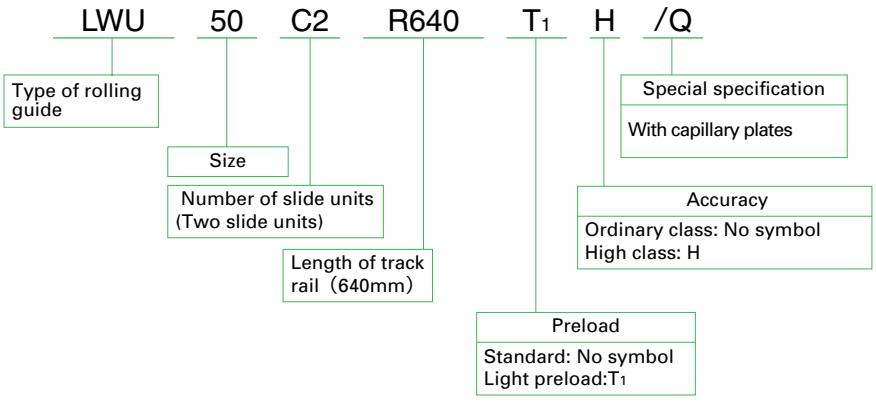
Note([1]): Track rail length is shown in Table 11.
([2]): The basic dynamic load rating (*C*), basic static load rating(C_0), and static moment rating (T_0, T_X and T_Y) are the values in the directions indicated in the sketches below.
The upper figures in "T_X" and "T_Y" column are the figures for one slide unit. The lower values are for two slide in close contact.
Remark: For the specifications of grease nipples, see Table 8.





Dimensions of track rail mm										Basic dynamic load rating(2)	Basic static load rating(2)	Static moment rating(2)		Model number
W	H_4	H_5	W_5	W_6	d_3	d_4	*h*	*E*	*F*	*C* N	C_0 N	T_0 N · m	T_X、T_Y N · m	
40	19	5	18	11	3.4	6.5	3.1	30	60	7 570	10 100	139	54.9 364	**LWU 40**
50	25	6	25	12.5	4.5	8	4.1	40	80	12 000	16 400	291	118 738	**LWU 50**
60	30	8	28	16	5.5	9.5	5.4	50	100	16 600	22 400	441	187 1 190	**LWU 60**
86	42	13	46	20	7	11	7	50	100	35 900	53 400	1 520	792 4 270	**LWU 86**
99.5	52	17	50	24.5	9	14	9	75	150	47 100	71 000	2 310	1 250 6 700	**LWU 100**
130	65	20	70	30	11	17.5	10.6	75	150	60 200	92 100	4 070	1 900 9 980	**LWU 130**

Example of identification number



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

LWU

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