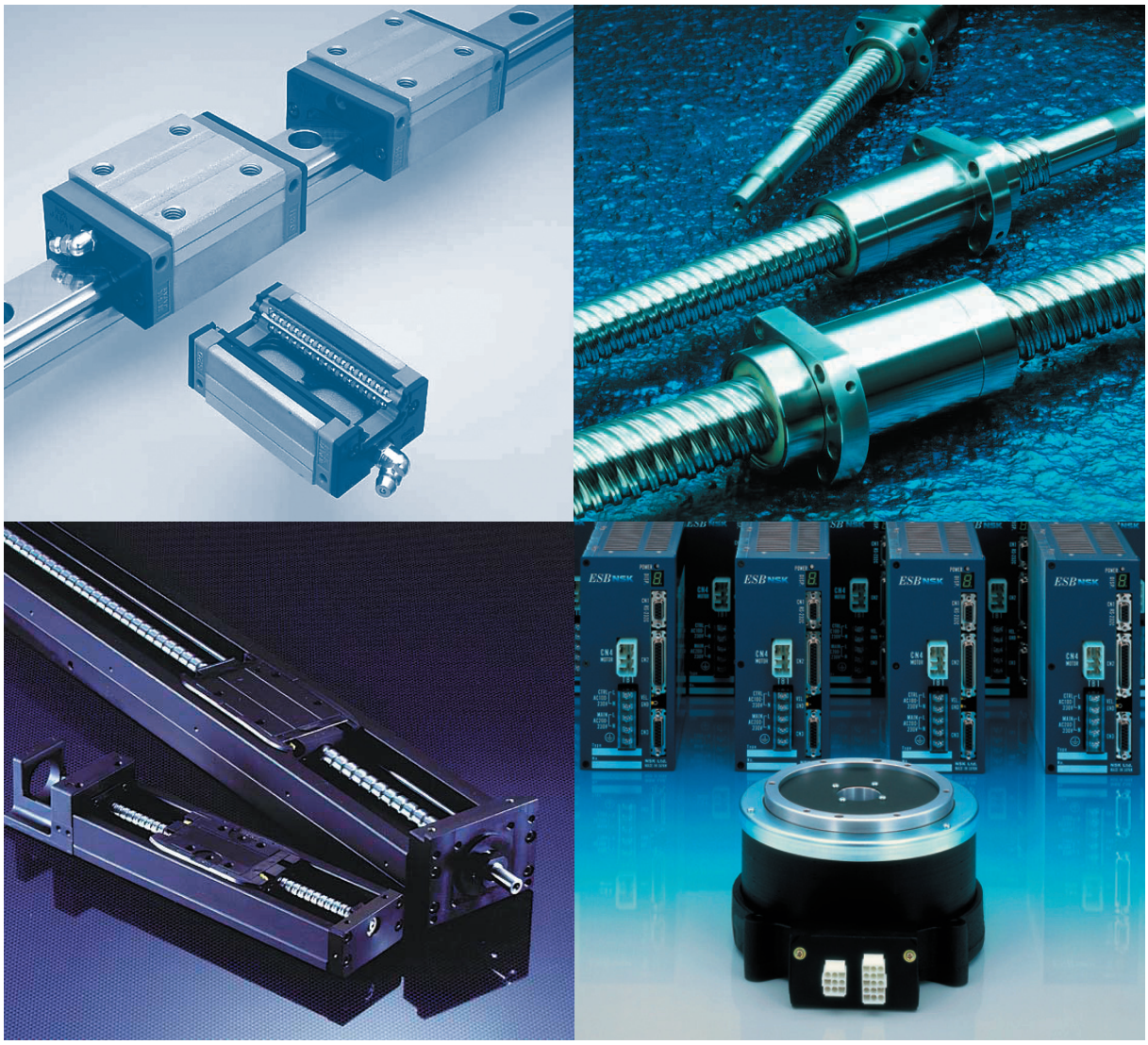
MOTION & CONTROL

NSK

Precision Machine Components

- Linear Guides
- Ball Screws
- Monocarrier
- Megatorque Motors YSB



Edition 2005/01

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We will gratefully acknowledge any additons or corrections.

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Dear customer,

We would like to thank you for choosing NSK products. This catalogue compiles the standard linear guides, ball screws, NSK Monocarrier, and NSK Megatorque motor that are available in stock for prompt delivery.

In the case of the linear guides, this document includes technical information, dimensions and load ratings for the interchangeable types. Interchangeable types enable random matching of rails and ball slides for prompt delivery from stock. For other linear guide specification, please refer to the general catalogue or to the specific flyers.

The ball screws types included in this document belong to the two rolled series of NSK ball screws. For the grinded types, please refer to the general catalogue or to the specific flyers. The R-Series ball screws are our interchangeable clearance type ball screws, and our PR / LPR Series are our precision rolled type, which has no clearance and allows high-speed operation among other advantages.

The NSK Monocarrier integrates in one unit the guiding and driving functions, by combining in one axis a linear guide, a ball screw, and a support bearing unit. These linear actuators are designed to save design and installation time.

This catalogue includes a chapter for the Megatorque motors that is one of our Mechatronic components. The Megatorque motor is a servomotor that equips a position detector for fully closed loop control. It is capable to drive the load directly without using a mechanical speed reducer, and accordingly, it realizes highly accurate positioning without backlash and lost motion.

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Technical description linear guides

- **Reference numbers**
- **Accuracy**
- **Preload and stiffness**
- **Installation**
- **Lubrication**

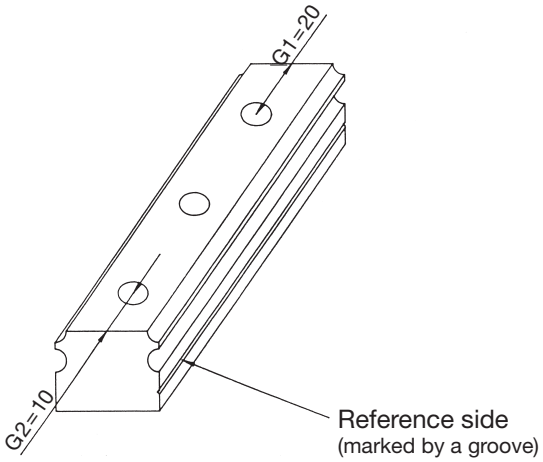
Part numbering

This catalogue covers the interchangeable linear guides. The interchangeable linear guides have separate part numbers for the slider and for the rail. It is possible to write part numbers for the assembly of sliders and rails. The maximum length of the rails is stated in the corresponding tables, but it is always possible to assemble rails up to an unlimited length.

When ordering a rail, together with the total length of the rail it is needed to provide the G dimensions from the centre of the last fixing hole to the end of the rail (see figure).

In case of special G dimensions a sketch is needed in order to avoid any ambiguity.

If the linear guide is formed by different rails butted one next to the other, a sketch for each of the rails forming the total guide is needed.



Reference number for the rail

L1 H 25 0500 L C N G** P C Z

Interchangeable rail code
L1: rail code for ball guides
R1: rail code for roller guides
P1: rail code for PU/PE series

Series
H = LH or SH, S = LS or SS,
W = LW, U = LU, E = LE, A = RA

Size

Rail length (mm)

Rail execution
L or ~ = standard
T = In LU09 and LU12: fixing hole M3
In LS15: fixing hole M4
R = In LU09 and LU12: with groove for ball retainer
S = In LU09 and LU12: with groove for ball retainer and fixing hole M3

Material / surface treatment code
C or – = special high carbon steel (NSK standard)
K = stainless steel
D = special high carbon steel with black chrome plating

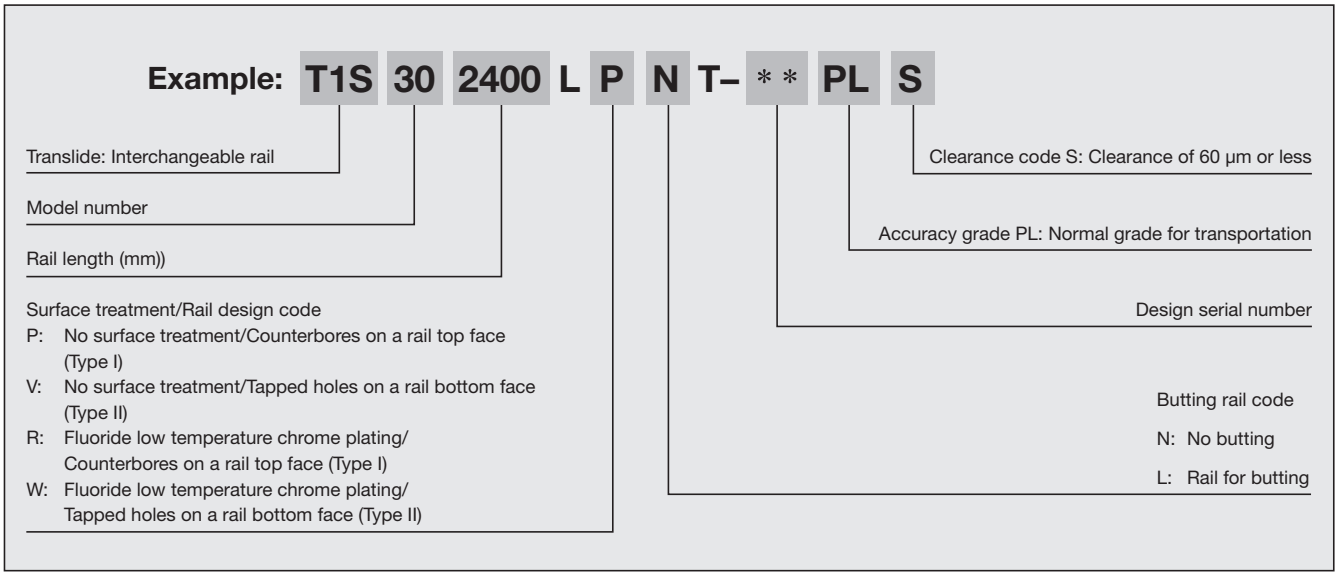
Code for cutting of the rail
N or – = no butting rail
L = butting rail (guide made of butted rails)

Internal drawing code

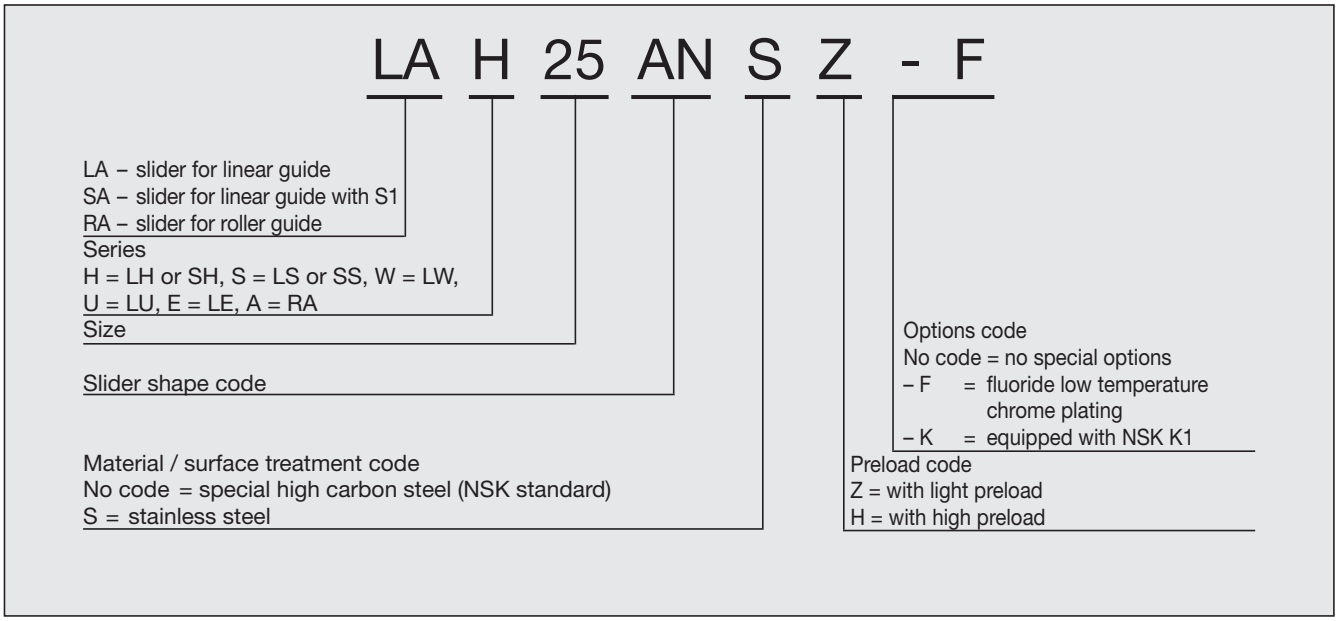
Accuracy grade. PC or – : interchangeable

Z = with preload

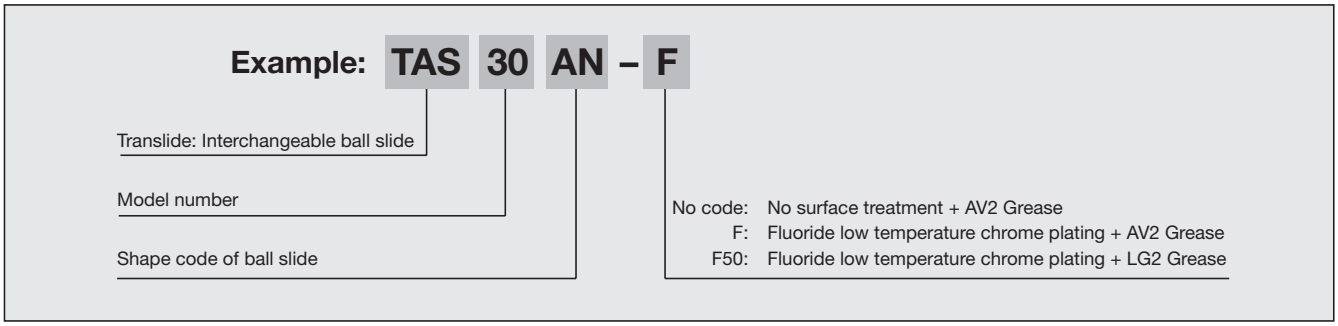
Reference number for the Translide rail



Reference number for interchangeable slider

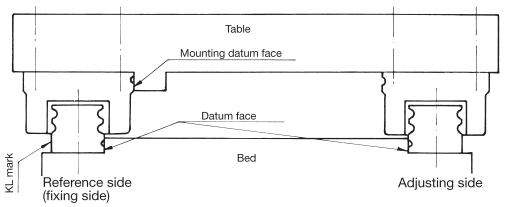


Reference number for the Translide slider



2. Assembly type
The specification for assembled types must include a sketch, in which is shown if the reference surfaces (marked with a groove) of the sliders and of the rail are on the same side, or the other way around.

In case that the reference surfaces of the rail and of the sliders are they are on the same side, the mounting arrangement is called W2. Otherwise, if the reference surfaces of the rail and of the sliders are in opposite sides, the mounting arrangement is called W3.



The datum faces of the rails and of the sliders are marked with a groove.

Interchangeable type assembly

LH 30 0800 AL C 2 G** PC Z

- LH: Series — LH, SH, LS, SS, LW, LU, LE, PU, PE, RA
- 30: Size
- 0800: Rail length (mm) (for lengths above 9999 use: -example- X128 = 12800 mm long)
- AL: Slider shape code
- C: Material / surface treatment code — C or blank = special high carbon steel (NSK standard); D = special high carbon steel with black chrome plating; K = stainless steel
- 2: Number of sliders per rail
- G**: Internal design code
- PC: Accuracy grade: PC for interchangeable type
- Z: Preload code — Z = with light preload; H = with high preload

Reference number for a Translide assembly

Example: TS 30 2400 AN P 2 – * * KL S

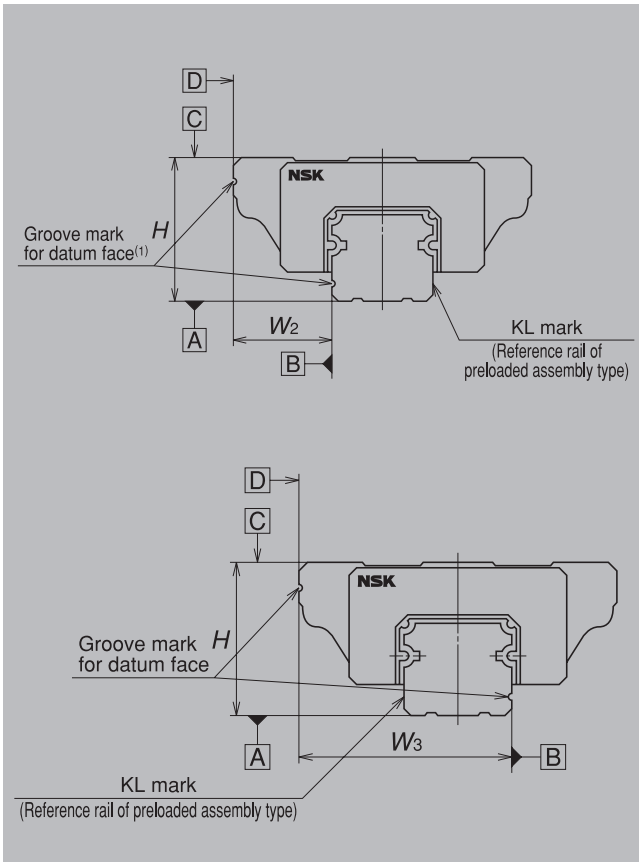
- TS: Translide
- 30: Model number
- 2400: Rail length (mm)
- AN: Shape code of ball slide
- P: Surface treatment / Rails design code
  - P: No surface treatment / Counterbores on a rail top face (Type I)
  - V: No surface treatment / Tapped holes on a rail bottom face (Type II)
  - R: Fluoride low temperature chrome plating / Counterbores on the top face of rail (Type I)
  - W: Fluoride low temperature chrome plating / Tapped holes on the bottom face of rail (Type II)
- 2: Number of ball sliders assembled to a rail
- * *: Design serial number
- KL: Accuracy grade KL: Normal grade for transportation
- S: Preload code S: Clearance of 60 µm or less

Accuracy

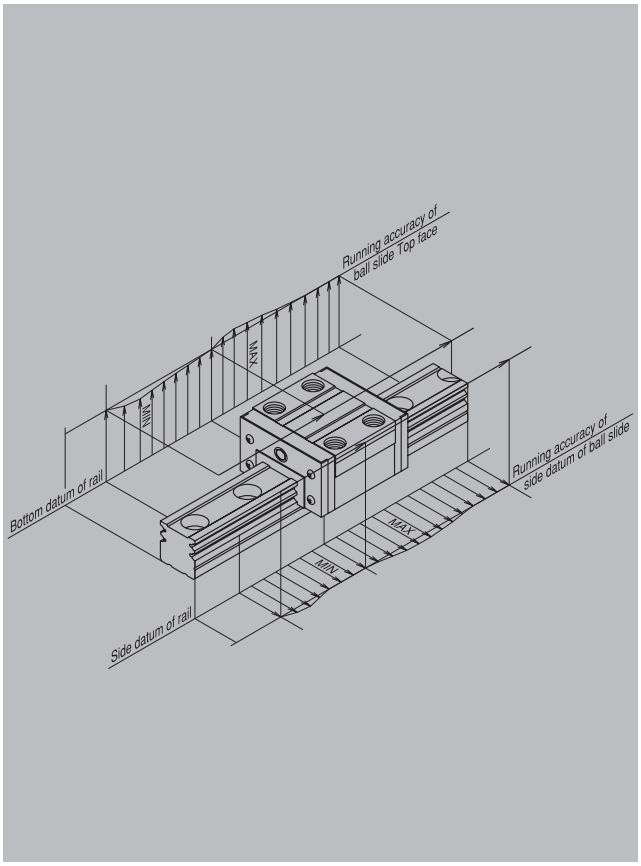
Accuracy Standard

Definition of accuracy

Characteristics	Definition
Mounting height *H*	Distance from A (rail bottom datum face) to C (ball slide top face)
Variation of *H*	Variation of *H* in ball slides assembled to the rails of a set of linear guide
Mounting width W_2 or W_3	Distance from B (rail side datum face) to D (ball slide side datum face). Applicable only to the reference linear guide.
Variation of W_2 or W_3	Difference of the width (W_2 or W_3) between the assembled ball slides which are installed in the same rail. Applicable only to the reference linear guide.
Running parallelism of ball slide, face C to face A	Variation of C (ball slide top face) to A (rail bottom datum face) when ball slide is moving.
Running parallelism of ball slide, face D to face B	Variation of D (ball slide side datum face) to B (rail side datum face) when a ball slide is moving.



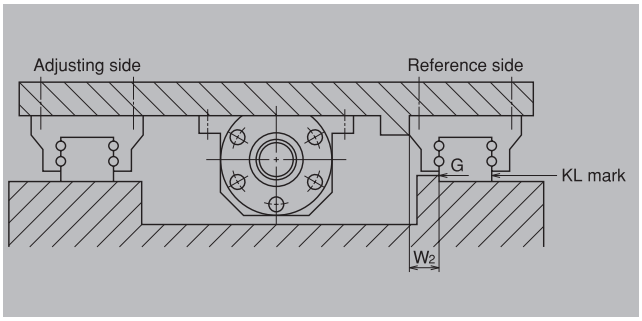
Assembled accuracy (Height and width)



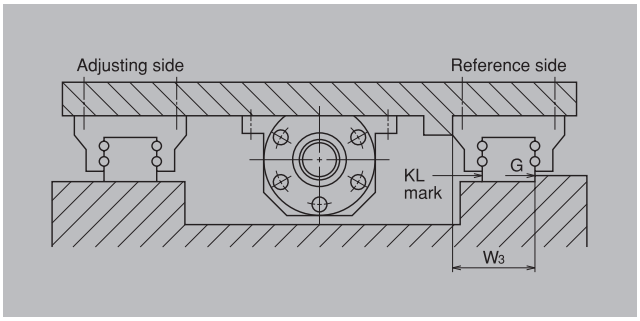
Running parallelism of ball slide

Mounting width: W_2, W_3

• Mounting width differs depending on the arrangement of the datum faces of the rail and ball slide on the reference linear guide (indicated as KL on the rail).



Mounting width W_2



Mounting width W_3

1.2 Running Parallelism of Ball Slide

• Running parallelism of ball slide is common in all series. Specifications of all accuracy grades are shown in Table below. However, applicable accuracy grades differ by series. Please refer to tables on pages 13 and 14.

Running parallelism of ball slide

Unit: μm

Rail over all length (mm)		Interchangeable type
over	or less	Normal grade PC
	~ 50	6
50~	80	6
80~	125	6.5
125~	200	7
200~	250	8
250~	315	9
315~	400	11
400~	500	12
500~	630	14
630~	800	16
800~	1000	18
1000~	1250	20
1250~	1600	23
1600~	2000	26
2000~	2500	29
2500~	3150	32
3150~	4000	34

Accuracy Standard in Interchangeable Types

LH, LS, SH, SS, LW Series

The tables below show the accuracy standards of the LH, LS, SH, SS, LW Series.

Tolerance of LH and SH Series interchangeable type: Normal grade PC Unit: μm

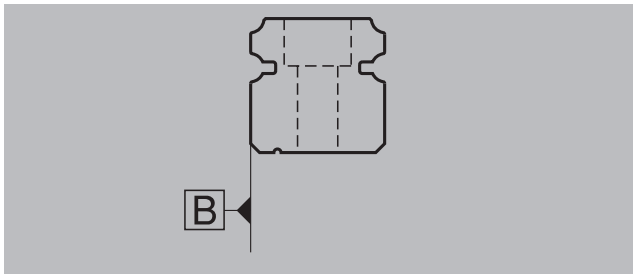
	Characteristics \ Model No.	LH15, 20, 25, 30, 35	LH45, 55, 65
Interchangeable type with clearance	Mounting height *H*	±20	±30
	Variation of mounting height *H*	15① 30②	20① 35②
	Mounting width W_2 or W_3	±30	±35
	Variation of mounting width W_2 or W_3	25	30
	Running parallelism of ball slide, face A to face C Running parallelism of ball slide, face B to face D	See Fig. page 11, table page 12	
Interchangeable type with preload	Mounting height *H*	±20	±30
	Variation of mounting height *H*	15① 30②	20① 35②
	Mounting width W_2 or W_3	±30	±35
	Variation of mounting width W_2 or W_3	25	30
	Running parallelism of ball slide, face A to face C Running parallelism of ball slide, face B to face D	See Fig. page 11, table page 12	

Tolerance of LS, SS and LW Series interchangeable type: Normal grade PC Unit: μm

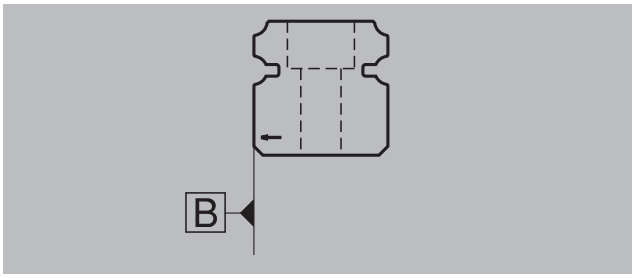
Characteristics \ Model No.	LS15, 20, 25, 30, 35 LW17, 21, 27, 35, 50
Mounting height H	±20
Variation of mounting height *H*	15① 30②
Mounting width W2 or W3	±30
Variation of mounting width W_2 or W_3	25
Running parallelism of ball slide, face A to face C Running parallelism of ball slide, face B to face D	See Fig. Ⅱ-1o1 and Table Ⅱ-1-2.

Note:
① Variation on the same rail
② Variation on multiple rails

Indication of rail datum face of in LH, SH, LS, SS and LW series.



For special high carbon steel (NSK standard material)



For stainless steel

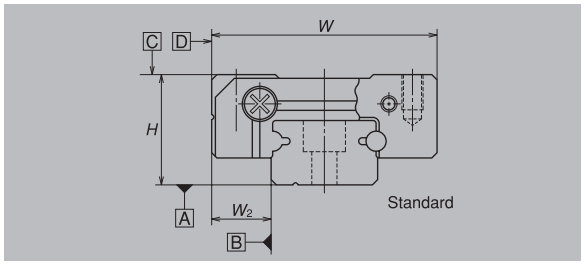
PU, PE Series

The table below shows tolerance of PU and PE Series interchangeable type.

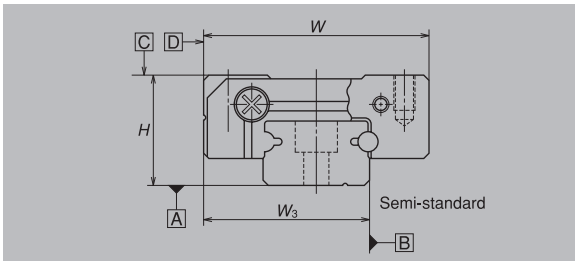
Tolerance of interchangeable type in PU and PE Series Normal grade (PC)

Unit: μm

Characteristic \ Model No.	PU09, 12, 15 PE09, 12, 15
Mounting height *H* Variation of *H*	±20 40
Mounting width W_2 or W_3 Variation of width W_2 or W_3	±20 40
Running parallelism of ball slide, face C to face A Running parallelism of ball slide, face D to face B	Refer to table page 12 See Fig. below

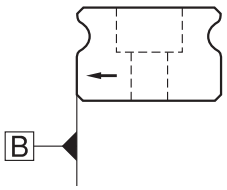
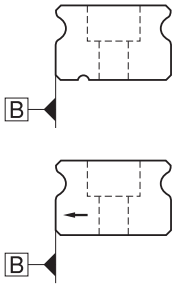
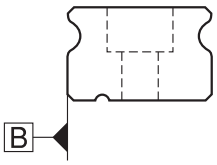


Mounting width (W_2)



Mounting width (W_3)

Indication of rail datum face in PE and PU Series

Material \ Model No.	PU05, 07, 09 PE07, 09, 12	PU12, 15	PE09, 12, 15
Special high carbon steel			
Stainless steel			

Rating Life

Rating Life and Basic Load Rating

Life

Although used in appropriate conditions, the linear guide deteriorates after a certain period of operation, and eventually becomes unusable. In broad definition, the period until the linear guide becomes unusable is called „life.“ There are „fatigue life“ caused by flaking, and „life of accuracy deterioration“ which is caused by wear.

Rating fatigue life

When the linear guide runs under load, the balls and the rolling contact surface of the grooves are exposed to repetitive load. This brings about fatigue to the material, and generates flaking. Flaking is scale-like damage to the surface of the ball groove. Total running distance until first appearance of flaking is called „fatigue life.“ This is „life“ in the narrow sense. Fatigue life varies significantly even in linear guides produced in the same lot, and even when they are operated under the same conditions. This is attributable to the inherent variation of the fatigue of the material itself. „Rating fatigue life“ is the total running distance which allows 90% of the group of linear guides of the same reference number to run without causing flaking when they are independently run under the same conditions. Rating fatigue life is sometimes indicated by total operating hours when the linear guides run at a certain speed.

Revised basic load ratings in compliance with ISO standard

NSK has revised the basic load ratings in compliance with the FDIS (Final Draft International Standard) of ISO.
The basic load ratings as listed in chapters 2 to 9 comply with the following ISO standards.
- Basic dynamic load rating : ISO/FDIS 14728-1
- Basic static load rating : ISO/DFIS 14728-2

Basic dynamic load rating

- Basic dynamic load rating, which indicates load carrying capacity of the linear guide, is a load whose direction and volume do not change, and which furnishes 50 km of rating fatigue life.
- In case of linear guide, it is a constant load applied to downward direction to the center of the ball slide.
- Value of basic dynamic load rating C is shown in chapters 2 to 9.
- NSK defines the basic dynamic load rating as the load that furnishes 50 km of rated fatigue life.
  However some linear guide manufacturers in Europe and the United States define the load for the basic fatigue life of 100 km as the basic dynamic load ratings.

- The following formula may be used to convert the basic dynamic load rating C50 the dynamic load rating for 100 km rated fatigue life.

For balls as rolling element : $C_{100}=C/1.26$ (N)
For rollers as rolling element : $C_{100}=C/1.23$ (N)

Calculation of rating fatigue life

- In general, rating fatigue life „L“ can be calculated from basic dynamic load rating „C“ and the load „F“ to ball slide using the following formula.

For balls as rolling element $L=50\times\left(\frac{C}{F}\right)^3$

L: Rating fatigue life (km)
C: Basic dynamic load rating (N) (50km)
F: Load to a ball slide (N)
(dynamic equivalent load)

- The rating fatigue life L for 100 km can be obtained from the following formulas using the dynamic load rating C_{100}..

For rollers as rolling element $L=100\times\left(\frac{C_{100}}{F}\right)^{\frac{10}{3}}$

L: Rating fatigue life(km)
C_{100}: Dynamic load rating for 100 km
F: Load to ball slide(dynamic equivalent load)

Dynamic equivalent load

- Load applied to the linear guide (ball slide load) comes from various directions up/down and right/left directions and/or as moment load. Sometimes more than one type of load is applied simultaneously. Sometimes volume and direction of the load may change.
  Varying load cannot be used as it is to calculate life of linear guide. Therefore, it is necessary to use a hypothetical load to ball slide with a constant volume which would generate a value equivalent to an actual fatigue life. This is called „dynamic equivalent load.“ For actual calculation, refer to **„A-II-3.2 (4) How to calculate dynamic equivalent load“, in the general catalogue E3161.**

Basic static load rating

- When an excessive load or a momentary large impact is applied to the linear guide, local permanent deformation takes place to the balls and to the rolling contact surface. After exceeding a certain level, the deformation hampers smooth linear guide operation.
- Basic static load rating is a static load when: [Permanent deformation of the balls] + [permanent deformation of the rolling contact surfaces] becomes 0.0001 times of the ball diameter.
- In case of linear guide, it is a load which is applied downward direction to the center of the ball slide.
- Values of basic static load rating C0 are shown in chapters 2 to 9.

Basic static moment load rating

- Generally, NSK linear guide uses a set of two rails and four ball slides for the guide way of one axis. Under some operating condition, static moment load should be taken into account. „M0,“ which is the limit of static moment load in such use is shown in chapters 2 to 9.

Basic load rating by load direction

• The basic load rating is considered to be a downward load to the ball slide and is indicated in the dimension tables as the dynamic load rating C and the static load rating C_0 respectively. However, the load may be applied to a ball slide in upward or lateral directions in actual use. In such a case the basic load rating shall be compensated as shown in Table below. The basic dynamic load rating of the RA Series is the same in C and C_0 for all load directions, up, down and lateral, while the LH Series has different basic load ratings by the load direction as shown in the table.

Basic load ratings by load direction

Load rating / Load direction / Series	Basic dynamic load rating			Basic static load rating		
	Downward	Upward	Lateral	Downward	Upward	Lateral
LH,SH,LS,SS,LW	C	C	$0.88C$	C_0	$0.75C_0$	$0.63C_0$
RA,TS,PU,PE	C	C	C	C_0	C_0	C_0

Lubrication

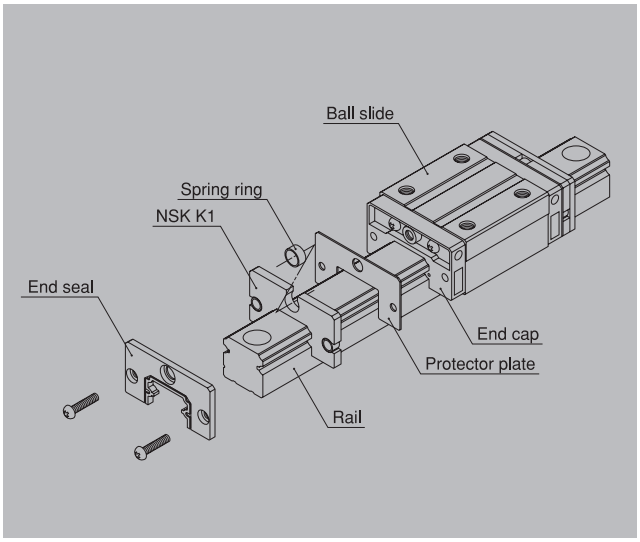
The NSK linear guides LH, SH, LS, SS, LW, and RA series are greased from origin with grease AV2 from Shell. The series LU, PU and PE are greased from origin with grease PS2 from Kyodoyushi. The recommended replenishment intervals are every 3 or 6 months, depending on the working conditions, or every 400 km, as another reference value. The LU, PU, and PE series do not include a grease nipple for replenishment, please apply grease directly on the rail grooves when needed.

It is also possible to do lubrication by oil, but in this case it is needed to install a central lubrication system, and replace the standard grease fittings with adaptors for oil lubrication. Please, consult NSK in this case.

"NSK K1®" Lubrication Unit

What is K1 Lubrication Unit

- This is a lubrication unit made of porous plastic (polyurethane) which contains a large volume of lubrication oil, and is formed into seal.
- NSK K1 Lubrication Unit is not a simple dust prevention seal. This remarkable seal also serves as a lubrication unit by seeping oil from the plastic.
- Along with the protection plate, an NSK K1 Lubrication Unit is installed between the end cap and the end seal at both ends of the linear guide. KI Lubrication Unit is already equipped at the time of delivery.



K1 Lubrication unit

Functions of NSK K1 Lubrication Unit

This unit is markedly effective as a lubrication oil cup in the following occasions.

- Use it when sealed lubricant runs out ····· For production line system (maintenance-free)
- When only a small amount of oil is allowed ····· For clean facility, medical equipment
- When oil is washed away ····· For food processing machines
- When oil-absorbing dust is present ····· For woodworking machines

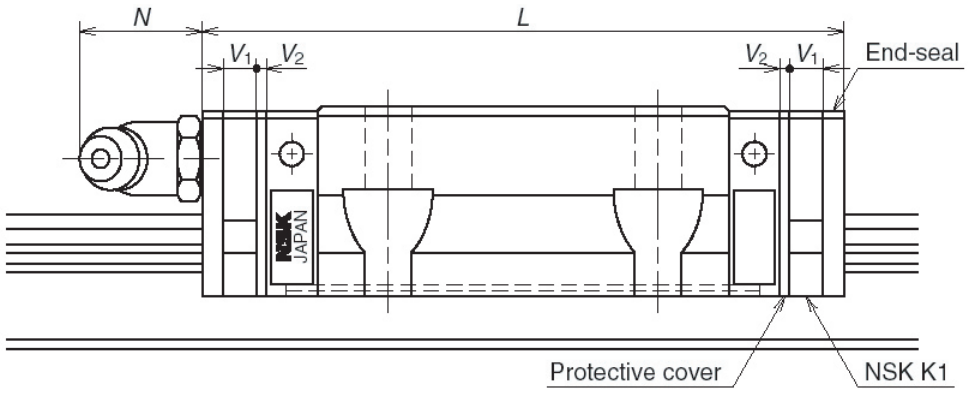
A-Ⅱ-5.3 Dust proof components

NSK has the following items. Select a suitable type for the operating environment.

Table Ⅱ-5•3 Optional dust proof components

Name	Purpose
NSK K1 lubrication unit	Made of oil impregnated resin. Enhances lubricating functions.
Double seal	Combines two end seals, enhancing sealing function.
Protector	Protect end seal from hot and hard contamination.
Rail cap	Prevents foreign matters such as swarf generated in cutting operation from clogging the rail-mounting hole.

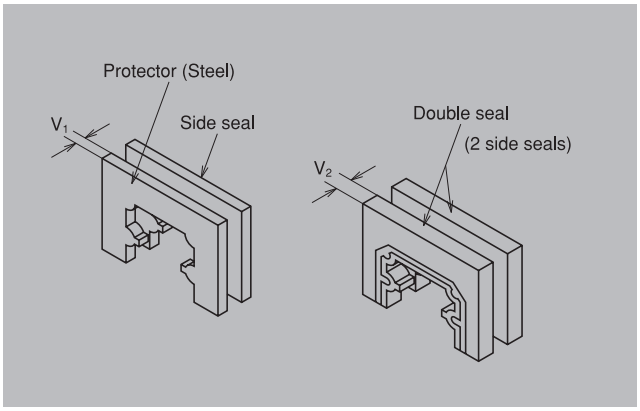
Length of sliders with K1



Model No.	Slider type (length)	Slider type (shape)			Slider length with two NSK K1 *L*
LAH15	Standard		AN	EM	65.6
SAH15	Long		BN	GM	84.6
LAH20	Standard		AN	EM	80.4
SAH20	Long		BN	GM	102.4
LAH25	Standard	AL	AN	EM	90.6
SAH25	Long	BL	BN	GM	118.6
LAH30	Standard	AL	AN		97.6
SAH30	Flange			EM	110.6
	Long	BL	BN	GM	136.6
LAH35	Standard	AL	AN	EM	122
SAH35	Long	BL	BN	GM	156
LAH45	Standard		AN	EM	154
	Long		BN	GM	186
LAH55	Standard		AN	EM	178
	Long		BN	GM	216
LAH65	Standard		AN	EM	211
	Long		BN	GM	271
LAS15	Standard	AL		EM	67.4
SAS15	Short	CL		JM	51
LAS20	Standard	AL		EM	75.8
SAS20	Short	CL		JM	57.8
LAS25	Standard	AL		EM	92
SAS25	Short	CL		JM	70
LAS30	Standard	AL		EM	108.4
SAS30	Short	CL		JM	79.4
LAS35	Standard	AL		EM	121
SAS35	Short	CL		JM	90
LAW17	Standard			EL	61.6
LAW21	Standard			EL	71.4
LAW27	Standard			EL	86.6
LAW35	Standard			EL	123
LAU15	Standard	AL			51.8
PAU05	Standard	TR			24.4
PAU07	Standard	AR			29.4
PAU09	Standard	TR			36.4
PAU12	Standard	TR			42
PAU15	Standard	AL			51.2
PAE05	Standard	AR			28.9
PAE07	Standard	TR			37.1
PAE09	Standard	TR			46.8
PAE12	Standard	AR			53
PAE15	Standard	AR			66.2

Double seal

- A combination of two end seals to enhance seal function.
- When a double seal is installed, the end seal section becomes thicker than the standard item by the size shown in the tables below. Take this thickness into consideration in determining the stroke and the size of section in which a ball slide is going to be installed.
- Double-seal set: Can be installed to a completed standard item later on request. It comprises two end seals, a collar, and a small screw for installation (Figure on page 20).
- When attaching a grease fitting to the end cap after the double seal is equipped, you require a connector shown in Figure on page 20. Please specify the connector set when ordering linear guides.



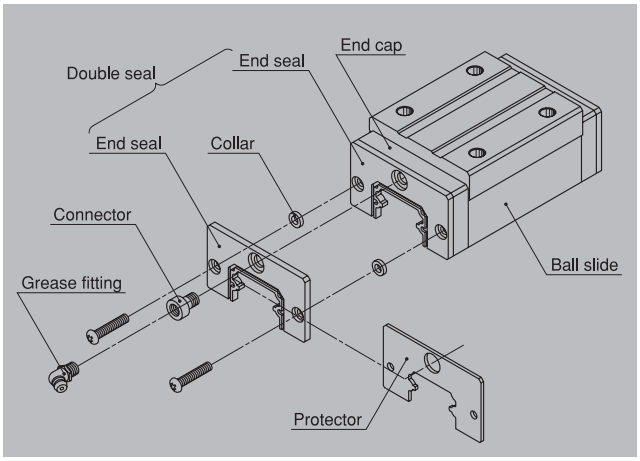
Double seal

Double-seal set

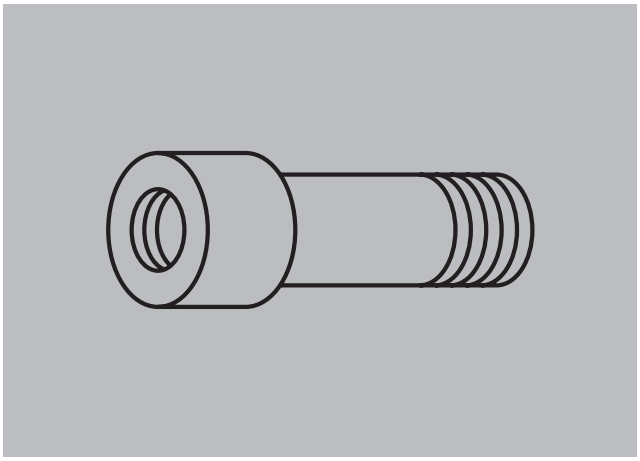
Unit: mm

Model No.	Reference No.		Increased thickness V_2
	Without connector	With connector	
LH15	LH15WS-01	* * *	2.5
LH20	LH20WS-01	LH20WSC-01	2.5
LH25	LH25WS-01	LH25WSC-01	2.8
LH30	LH30WS-01	LH30WSC-01	3.6
LH35	LH35WS-01	LH35WSC-01	3.6
LH45	LH45WS-01	LH45WSC-01	4.3
LH55	LH55WS-01	LH55WSC-01	4.3
LH65	LH65WS-01	LH65WSC-01	4.9
LS15	LS15WS-01	* * *	2.8
LS20	LS20WS-01	LS20WSC-01	2.5
LS25	LS25WS-01	LS25WSC-01	2.8
LS30	LS30WS-01	LS25WSC-01	3.6
LS35	LS35WS-01	LS35WSC-01	3.6

Model No.	Reference No.		Increased thickness V_2
	Without connector	With connector	
LW17	LW17WS-01	* * *	2.6
LW21	LW21WS-01	LW21WSC-01	2.8
LW27	LW27WS-01	LW27WSC-01	2.5
LW35	LW35WS-01	LW35WSC-01	3
LW50	LW50WS-01	LW50WSC-01	3.6



Double seal installation



Connector

Metal protector

- A protector is usually installed outside the end seal to prevent high-temperature fine particles such as welding spatter and other hard foreign matters from entering the ball slide.
- Same as the case with a double seal, when a protector is installed, the ball slide becomes longer by the size shown in the table below. Protector is available as a set.
- When attaching a grease fitting to the end cap after the protector is equipped, you require a connector Please specify the connector set when ordering linear guides.

Protector set

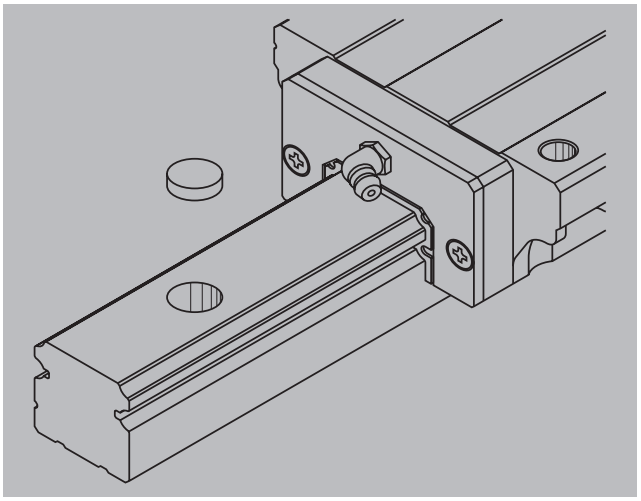
Unit: mm

Model No.	Reference No.		Increased thickness V_1
	Without connector	With connector	
LH15	LH15PT-01	* * *	2.7
LH20	LH20PT-01	LH20PTC-01	2.9
LH25	LH25PT-01	LH25PTC-01	3.2
LH30	LH30PT-01	LH30PTC-01	4.2
LH35	LH35PT-01	LH35PTC-01	4.2
LH45	LH45PT-01	LH45PTC-01	4.9
LH55	LH55PT-01	LH55PTC-01	4.9
LH65	LH65PT-01	LH65PTC-01	5.5
LS15	LS15PT-01	* * *	3
LS20	LS20PT-01	LS20PTC-01	2.7
LS25	LS25PT-01	LS25PTC-01	3.2
LS30	LS30PT-01	LS30PTC-01	4.2
LS35	LS35PT-01	LS35PTC-01	4.2

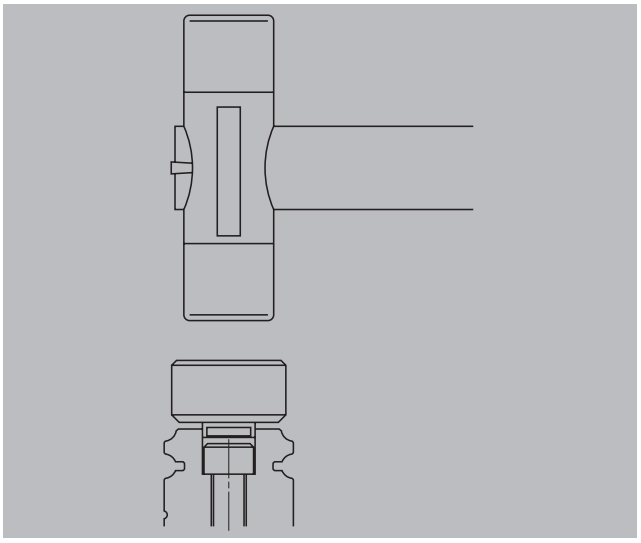
Model No.	Reference No.		Increased thickness V_1
	Without connector	With connector	
LW17	LW17PT-01	* * *	3.2
LW21	LW21PT-01	LW21PTC-01	3.2
LW27	LW27PT-01	LW27PTC-01	2.9
LW35	LW35PT-01	LW35PTC-01	3.6
LW50	LW50PT-01	LW50PTC-01	4.2

Cap to cover the bolt hole for rail mounting

- After the rail is mounted to the machine base, a cap is used to cover the bolt hole to prevent foreign matters from clogging up the hole or from entering into the ball slide.
- The cap for the bolt hole is made of synthetic resin which is superb in its resistance to oil and wear.
- The table below shows sizes of the bolts for the each model number as well as reference number of the cap.
- To insert a cap into the rail bolt hole, use a flat tool. Pound the cap gradually until its height becomes flush with the rail top face. (see figure)



Cap for rail bolt holes



Insertion of the cap into the bolt hole

Caps to cover rail bolt hole

Model No.	Bolt to secure rail	Cap reference No.
SS15(for M3) LS15(for M3) PU09, PU12, PU15 PE09, PE12, PE15	M3	LG-CAP/M3
SH15 SS15(for M4) LH15 LS15(for M4) RA15 LW17 LW21 LW27 TS15	M4	LG-CAP/M4
SH20 SS20 LH20 LS20 RA20 TS20	M5	LG-CAP/M5
SH25 SS25 SS30 LH25 LS25 LS30 RA30 RA25 LW35 TS25	M6	LG-CAP/M6
SH30 SH35 SS35 LH30 LH35 LS35 LA30 LA35 LY30 LY35 LW50 TS30 TS35	M8	LG-CAP/M8
LH45 RA45	M12	LG-CAP/M12
LH55 RA55	M14	LG-CAP/M14
LH65 RA65	M16	LG-CAP/M16

Rust Prevention and Surface Treatment

Rust Prevention (Stainless steel)

NSK linear guide is also available in stainless steel standard series.

○ Stainless steel standard series

LH Series
LS Series
PU Series
PE Series

Select from the above when using in the environment which invites rust.

Surface Treatment

Types of surface treatment

The following are common types of treatment.

○ Electrolytic rust prevention black film treatment (low temperature chrome plating)

• Used to prevent corrosion and light reflection, and for cosmetic purpose.

○ Fluoride low temperature chrome plating

• Fluoroplastic coating is provided following the electrolytic rust prevention black film treatment.

• Resistance to corrosion is higher than electrolytic rust prevention film treatment.

Recommended surface treatment

Among the surface treatments mentioned above, we recommend "electrolytic rust prevention black film treatment" and "fluoride low temperature chrome plating" for rust prevention because of the result of humidity chamber test for antirust characteristics and their cost-effectiveness.
However, never apply any organic solvent for degreasing because it has adverse effect on antirust characteristics.

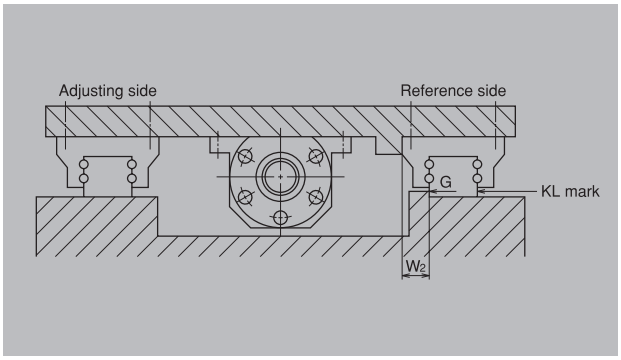
Arrangement and Mounting of Linear Guide

Arrangement

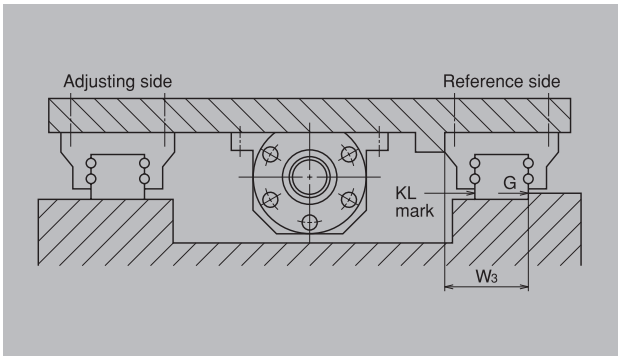
- For NSK linear guide, the datum face of the rail and of the ball slide are marked with either an "datum face groove" or with an "arrow."
- When the datum faces of the reference side rail and ball slides are pressed to their mounting datum faces respectively, the variation of distance (mounting width W_2 or W_3) between the datum faces of the rails and that of the ball slides must be a minimum and therefore, it is specified as the standard. (See figures on the right)
- The ways to indicate the datum faces of PU and PE Series are shown in the table below.

Example of arrangement

- Arrangement of the linear guide must be determined taking into account the table position, its direction (horizontal, vertical, inclined, hanging from the ceiling), stroke, the size of bed and the table in the equipment as a whole. Table on page 24 shows a common arrangement examples, and features/precautions for each case.

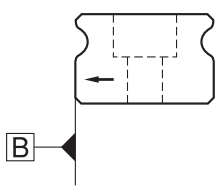
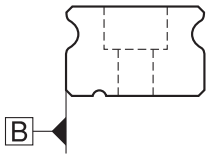
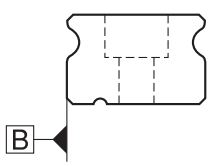
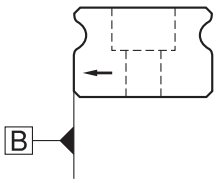


Most common setting of the reference side rail (W_2 mounting)

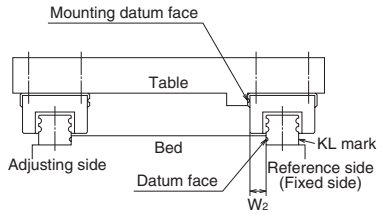
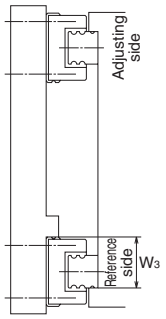
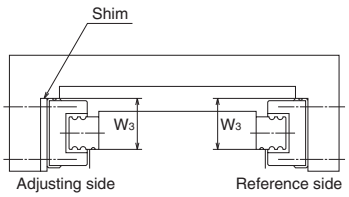
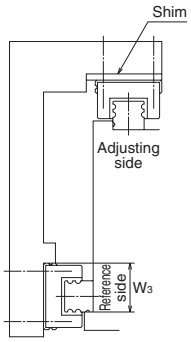
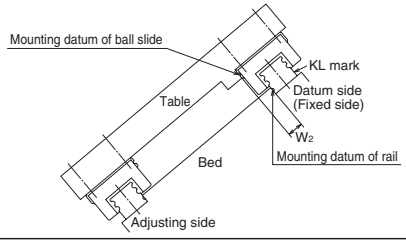
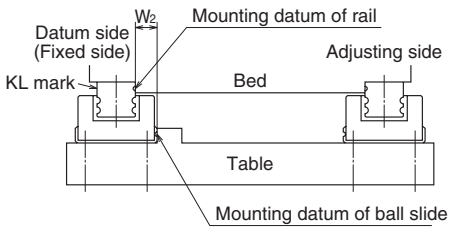


Setting of the reference side rail in certain occasions (W_3 mounting)

Marks on the rail datum faces in PU, PE Series

Model No. / Material	PU05, 07, 09 PE05, 07, 09, 12	PU12, 15	PE09, 12, 15
Special high carbon steel			
Stainless steel			

Arrangement example

Arrangement	Features/Precautions
	• Easy in highly-accurate installation (recommended arrangement)
	• Easy in highly-accurate installation • Lubricant oil may not be supplied to ball slide. Precaution is required in the oil supply design.
	• Slightly difficult for highly-accurate installation • Life of linear guide is affected by mounting accuracy. • When oil lubricant is used, precaution is required in oil supply design.
	• Difficult for highly-accurate installation • For a linear guide mounted in sideways, precaution is required in oil supply design if oil lubricant is used.
	• Rather easy in highly-accurate installation • When oil lubricant is used, precaution is required in oil supply design.
	• Easy in highly-accurate installation if the linear guide is installed to the machine base first, then hang upside down along with the machine base. • Ball slide may detach from the rail and fall down if the linear guide is damaged and all the balls in the ball slide fall out. It is necessary to take preventive measures against the falling of the ball slide.

Mounting Accuracy

Accuracy of the mounting base of machine

- Mounting accuracy of linear guide usually copies the accuracy of the machine base.
- However, when two or more ball slides are assembled to each rail, the table stroke becomes shorter than the mounting surface. This, along with the fact that the mounting error is evenly spread, contributes to a higher table accuracy than the mounting face accuracy, reducing the error to about 1/3 in average. (See figure on the right)

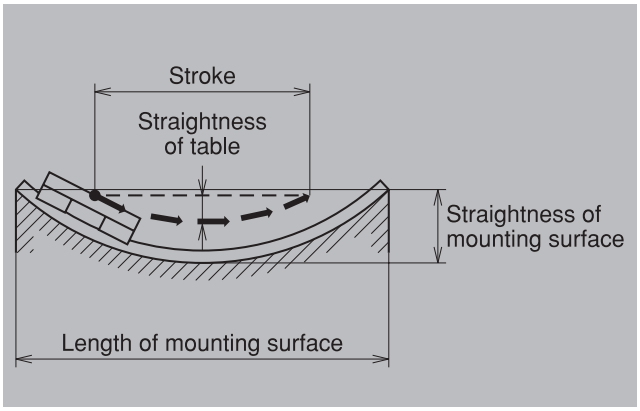
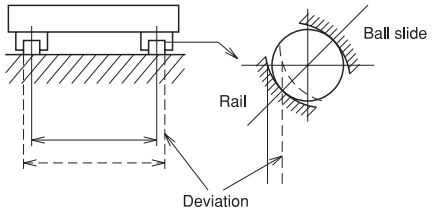
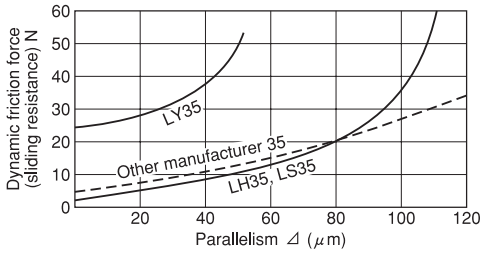
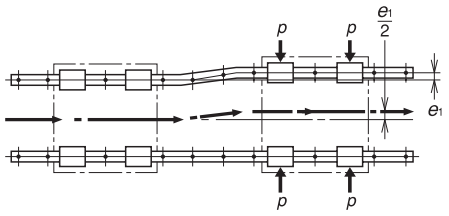


Table stroke vs. mounting surface

Installation error

- Mounting error affects mainly three factors: life, friction and accuracy (Table below).

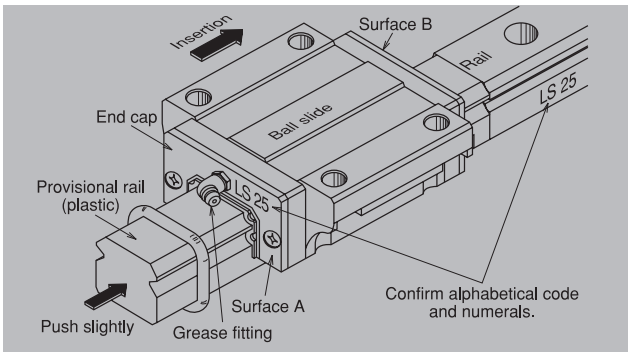
Influence of mounting error

Factor	Influence	
Life		• Large mounting error generates a force which twists the ball slide and reduces its life. • It also distorts the contact point of the ball and the groove and changes contact angle, lowering rigidity.
Friction		• LH and LS Series are affected very little by mounting error thanks to their small friction. (self alignment) • However, because of off-set gothic arch grooves, their friction suddenly soars once the mounting error exceeds a certain level. • Mounting error severely affects friction of LY Series with heavy preload.
Accuracy		• When rigidity of four ball slides are equal, the theoretical straightness becomes 1/2 of the installation error e_1. • However, this value becomes slightly larger due to deformation of the rail and the machine base.

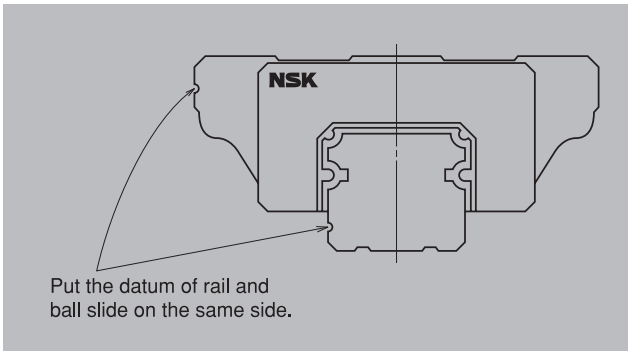
Assemble Interchangeable Linear Guide

- Interchangeable ball slide is assembled on a provisional rail (an inserting tool) when it is delivered (see figure).
- NSK standard grease is packed into the ball slide, allowing immediate use.

Assembly procedures of interchangeable linear guide
Follow steps as described below.
① Wipe off the rust preventive oil from the rail and ball slide.
② Match the datum face of rail and the ball slide (groove for installation) as shown in the figure.
③ Align the provisional rail to the rail in the bottom and side faces. Press the provisional rail lightly against the rail, and move the ball slide over the rail.



Inserting interchangeable ball slide into the rail



Assembly and Installation of NSK Linear Guides

General Industrial Machine

Thank you for choosing NSK linear guides. This manual briefly describes the recommended handling and installation of NSK linear guides for general industrial use. There are two ways installing the linear guides into general industrial machines. One of them provides a datum shoulder on the mounting base of the machine for accurate horizontal alignment the same as the way for machine tools, while the other is not required a datum shoulder. The installation procedure described in this manual assumes that the datum shoulder is not required for horizontal alignment.

NSK recommends interchangeable LH and LS Series linear guides for general industrial application because they feature self-aligning capability better suited to tolerate some misalignment, interchangeability between the rails and ball slides for ease of addition of number of ball slides and their replacement, and standardized stock for short delvery times.

For interchangeable LH and LS Series linear guides, the ball slides and the rails are stocked separately. The ball slides are mounted on plastic provisional rails that allows for easy transfer of the ball slide to and from the steel rail.

The ball slides are designed with retaining wires to prevent the balls from falling out when they are removed from the rail. However, NSK recommends that the ball slide should be stored on a provisional rail prior to installation to prevent contamination from dust and other foreign objects.

The following is a description of how the ball slide should be removed from and replaced on the linear guide rail.

The ball slide is held on the provisional rail using a rubber band. The rubber band should catch the bottom channel in the provisional rail and then twist around to secure the ball slide.

When transferring the ball slide from the provisional rail onto the rail, or vice versa, but the provisional rail up against the rail and slide the ball slide directly from one onto the other. It is a good idea to secure the ball slide onto the provisional rail with a rubber band after removal from the rail.

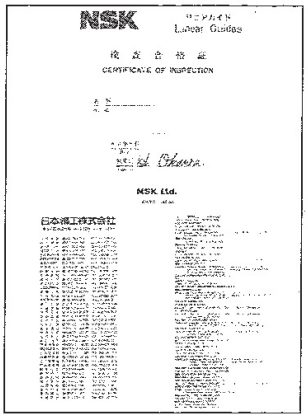
If a ball is accidentally dropped from the ball slide, it should be cleaned and replaced to the appropriate groove. The correct groove can be determined by the size of the clearance between the balls (the groove missing the ball will have greater clearance than the other grooves). It is normal to have a gap of 1.5 ball diameters in each groove.

The following section describes how to install the linear guides on the machine.

Ball slides and rails are supplied separatelly. Each is wrapped in vinyl sheet, and packed in a container. Each container has a certificate of inspection included.

Caps for rail mounting bolt holes are available upon request.

The certificate of inspection included with every rail and ball slide is NSK's guarantee of quality. If you should have any questions about the quality, please feel free to contact your local NSK representative.


NSK Linear Guides

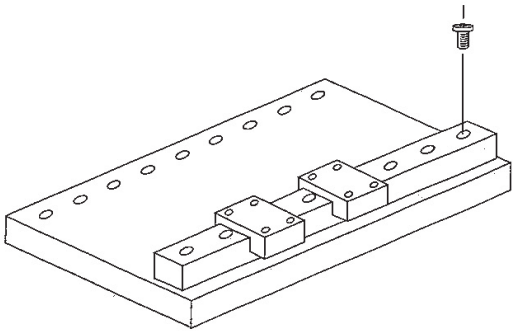
CERTIFICATE OF INSPECTION

NSK Ltd.

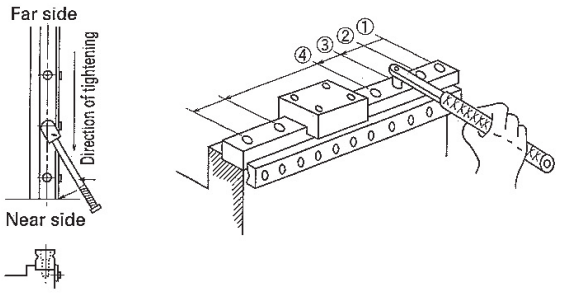
The rail is always shipped with rust preventive oil, which should be wiped off before applying grease to the rail. LH and LS Series ball slides are pre-packed with AV2 grease, so no cleaning is required prior to installation.

Now the linear guide is ready for installation. Put it on a mounting surface.

Snugly tighten its mounting bolts temporarily so that the rail's bottom is firmly against the bed.



Then tighten the bolts firmly with torque wrench to the specified torque starting from the one end.

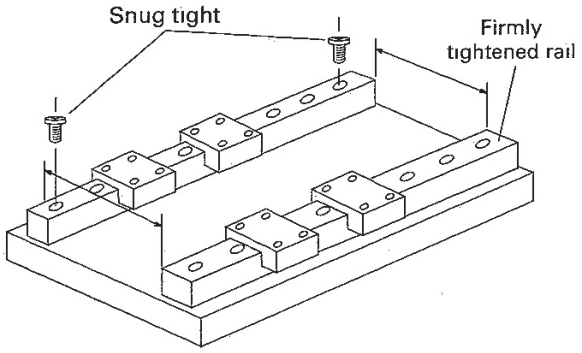


In NSK linear guides, the mounting bolt holes are processed after heat treatment using a precision machining center; therefore, the bolt hole pitch accuracy is as good as the positioning accuracy of the machine, which is considered very good.

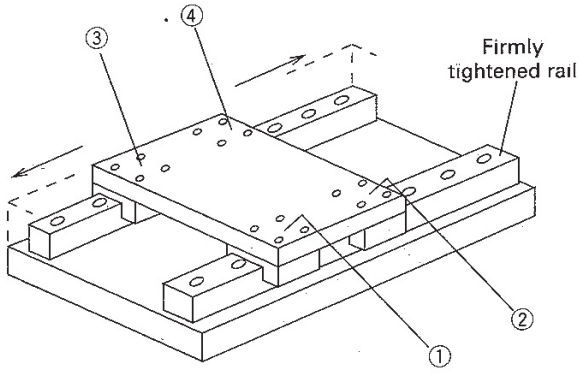
When installing a linear guide rail in a flat surface the same as this case, the rail tends to be slightly bent in the shape of S letter if the bolts are tightened indiscriminately starting near the middle because of friction at the seat of bolt head. NSK recommends that the bolts be tightened starting at one end with the wrench as shown in the above figure.

The rail that has been tightened can now be used as a reference rail. Using a vernier calipers or other accurate tool, measure the distance between the two rails, and adjust each end until they are the same. Tighten a bolt snugly at each end of the rail.

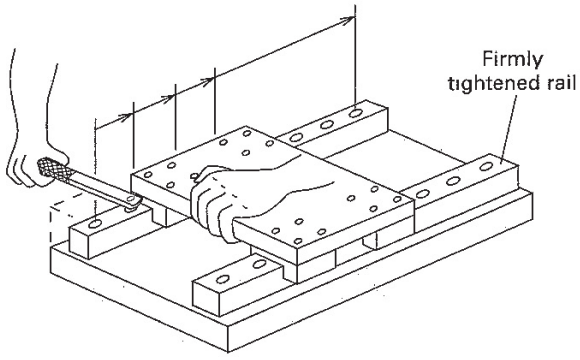
The next step is to install the table, and to use the table to align the rails.



Firmly bolt the table to ball slides 1 and 2 on the firmly secured rail as shown in the diagram. Then position ball slide 3 at the left end of the adjusting rail, and bolt the table to this ball slide. Move the ball slide 3 to right and bolt the table to the ball slide 4.



Move the table to one end of the rails, and start tightening the adjusting rail bolts sequentially to the specified torque while checking excessive friction of table movement. Continue moving the table down the rail tightening each adjacent bolt until they have all been tightened.



As described above, installation of the linear guides is not difficult work if you carefully follow the above procedure.

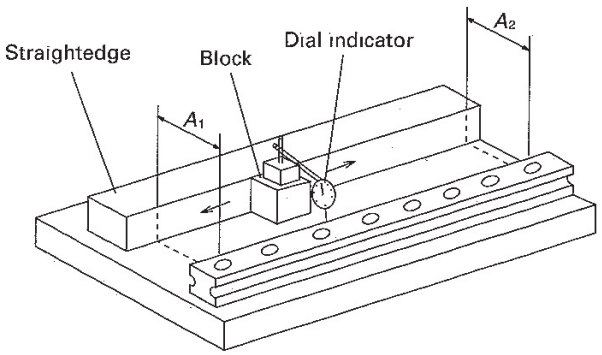
However, objective of the preceding procedure is only for an assembly of the table that moves smoothly. If you need to control motion accuracy of the table (linearity), it requires to add the following procedure.

When bolting the first rail on the machine base, align it straight using a straightedge and a dial indicator.

Bolt on the rail at the both ends lightly, and position a straightedge beside it. Set the straightedge parallel to the rail measuring distance A1 and A2 by a vernier calipers or some other accurate measuring tool.

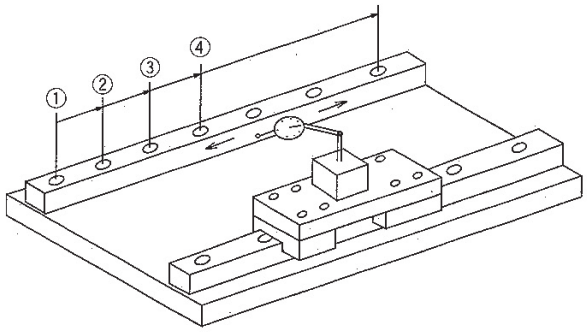
Move the dial indicator along the straightedge, and take readings at every bolt hole along the rail. Make fine adjustment of the rail to the straightedge until the desired reading is made, and tighten the bolt to the specified torque.

When all of the bolts have been tightened, slide the dial indicator from one end of the rail to the other to ensure that the desired straightness has been achieved.



Position the dial indicator on two ball slides on the reference rail as shown in the diagram. Tighten bolts of the adjusting side rail sequentially from the one end while noting the reading of the dial indicator.

Straightness of NSK linear guides is controlled so that it can be easily adjusted manually for easy installation.



In order to maintain stable production of the tables, we recommend to install the linear guides while checking the alignment accuracy quantitatively even smooth operation is the least requirement.

LH Series

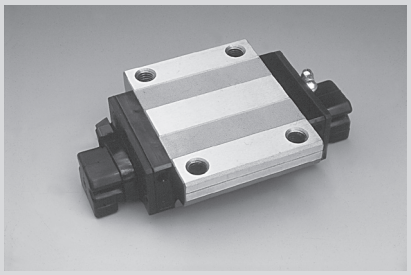
Main features:

Both the sliders and the ball tracks are hardened by surface hardening. Due to the X configuration in the contact points of the balls with the tracks, the LH series feature a high self aligning ability.

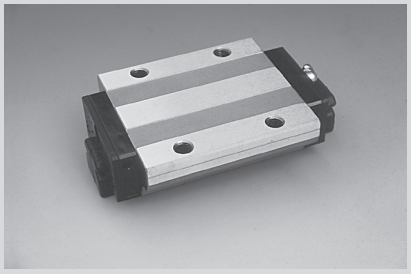
The LH series is available as interchangeable type. Interchangeable types enable random matching of rails and ball slides for prompt delivery.

The LH series are also available in black chrome plating, for enhanced protection in the sort of applications that are potentially corrosive.

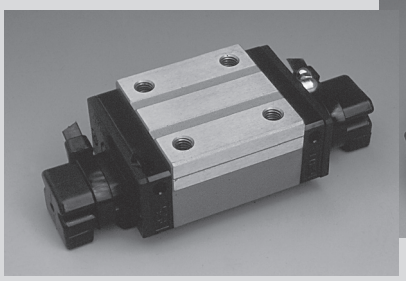
This LH series are ideal for the general applications of the mechanical engineering, particularly for the conveying of heavy loads and the construction of linear positioning systems.



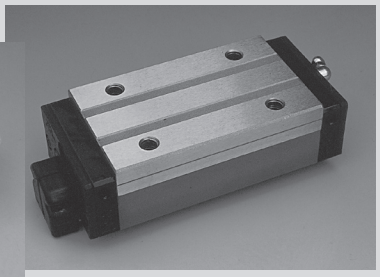
EMZ type
The fixing holes can be used both as drill or as a tap hole.



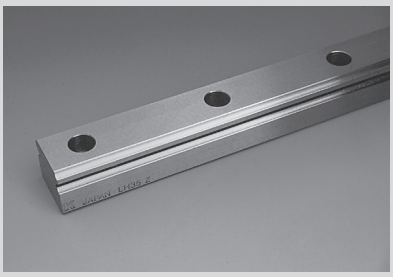
GMZ type
The fixing holes can be used both as drill or as tap hole.



ANZ / ALZ Type
Tap fixing holes.

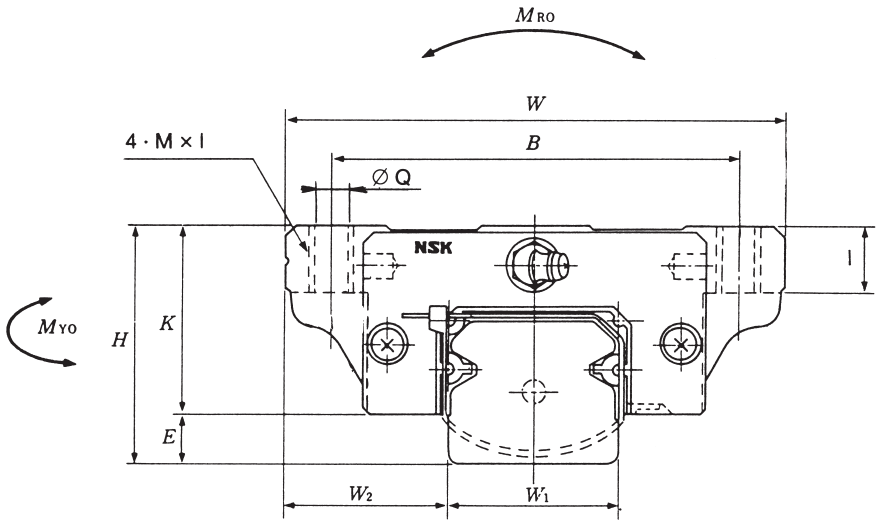


Type BNZ / BLZ
Tap fixing holes.



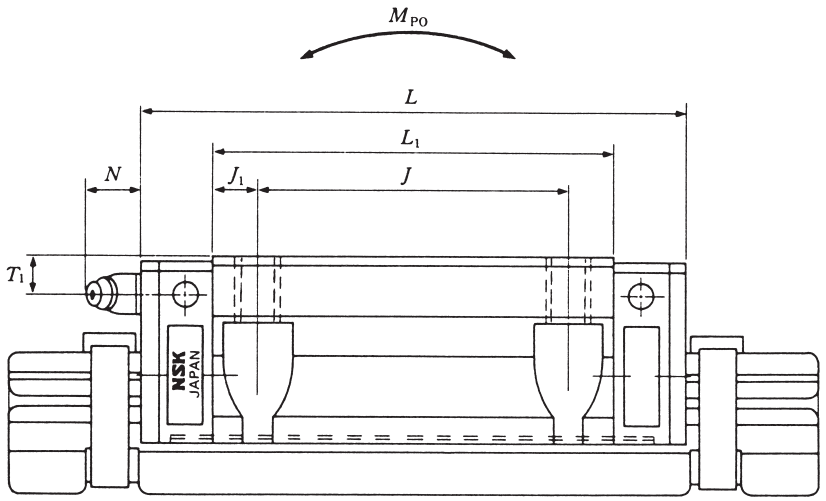
Rail

Sliders EMZ and GMZ type



Slider mounted on a dummy rail. For dimensions of the rail see pages 38 and 39

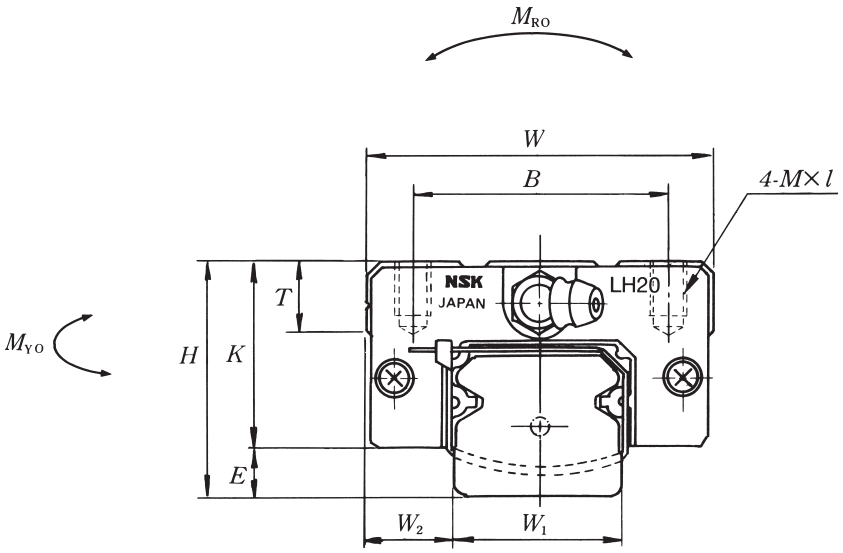
Model-No.		Assembly (mm)			Slider (mm)								
		H	E	W_2	W	B × J	L	L_1	J_1	K	T	Q × l	M × l
LAH15	EMZ	24	4.6	16	47	38 × 30	55	39	4.5	19.4	8	4.5 × 7	M 5 × 8
	GMZ						74	58	14			4.5 × 7	M 5 × 8
LAH20	EMZ	30	5	21.5	63	53 × 40	69.8	50	5	25	10	5.3 × 10	M 6 × 10
	GMZ						91.8	72	16			5.3 × 10	M 6 × 10
LAH25	EMZ	36	7	23.5	70	57 × 45	79	58	6.5	29	11	6.4 × 10	M 8 × 10
	GMZ						107	86	20.5			6.4 × 10	M 8 × 10
LAH30	EMZ	42	9	31	90	72 × 52	98.6	72	10	33	11	8.4 × 12	M 10 × 12
	GMZ						124.6	98	23			8.4 × 12	M 10 × 12
LAH35	EMZ	48	9.5	33	100	82 × 62	109	80	9	38.5	12	8.4 × 13	M 10 × 13
	GMZ						143	114	26			8.4 × 13	M 10 × 13
LAH45	EMZ	60	14	37.5	120	100 × 80	139	105	12.5	46	13	10.5 × 15	M 12 × 15
	GMZ						171	137	28.5			10.5 × 15	M 12 × 15
LAH55	EMZ	70	15	43.5	140	116 × 95	163	126	15.5	55	15	12.5 × 18	M 14 × 18
	GMZ						201	164	34.5			12.5 × 18	M 14 × 18
LAH65	EMZ	90	16	53.5	170	142 × 110	193	147	18.5	74	23	14.6 × 23	M 16 × 23
	GMZ						253	207	48.5			14.6 × 23	M 16 × 23



Slider mounted on a dummy rail. For dimensions of the rail see pages 38 and 39

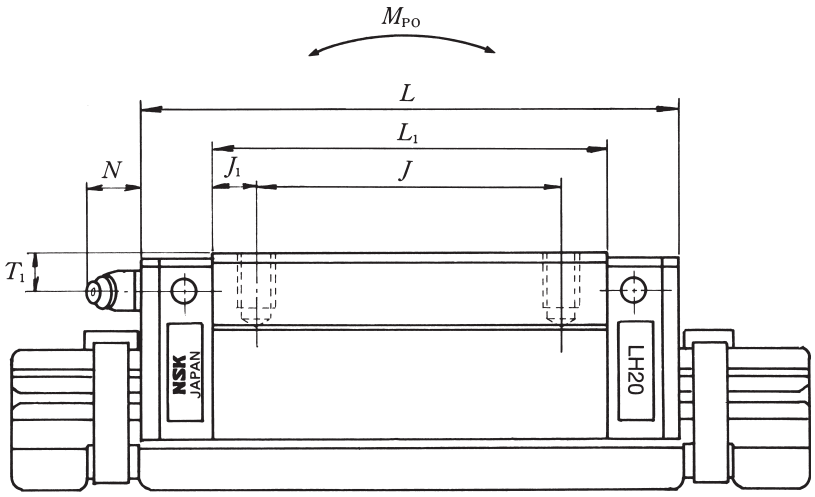
Grease fitting (mm)			Basic load rating (N)		Static moment (Nm)			Weight (kg)	Model-No.	
	T_1	N	Dynamic C	Static C_0	M_{RO}	M_{PO}	M_{YO}			
Ø 3 mm	4.6	3.3	10 800	20 700	108	95	80	0.17	LAH15	EMZ
			14 600	32 000	166	216	181	0.25		GMZ
M 6 × 0.75	5	11	17 400	32 500	219	185	155	0.45	LAH20	EMZ
			23 500	50 500	340	420	355	0.65		GMZ
M 6 × 0.75	6	11	25 600	46 000	360	320	267	0.63	LAH25	EMZ
			34 500	71 000	555	725	610	0.93		GMZ
M 6 × 0.75	7	11	35 500	63 000	600	505	125	1.2	LAH30	EMZ
			46 000	91 500	870	1 030	865	1.6		GMZ
M 6 × 0.75	8	11	47 500	80 500	950	755	630	1.7	LAH35	EMZ
			61 500	117 000	1 380	1 530	1 280	2.4		GMZ
R 1/8“	10	13	81 000	140 000	2 140	1 740	1 460	3.0	LAH45	EMZ
			99 000	187 000	2 860	3 000	2 520	3.9		GMZ
R 1/8“	11	13	119 000	198 000	3 600	3 000	2 510	5.0	LAH55	EMZ
			146 000	264 000	4 850	5 150	4 350	6.5		GMZ
R 1/8“	19	13	181 000	281 000	6 150	4 950	4 150	10.0	LAH65	EMZ
			235 000	410 000	8 950	10 100	8 450	14.1		GMZ

Slider ANZ and BNZ type



Slider mounted on a dummy rail. For dimensions of the rail see pages 38 and 39

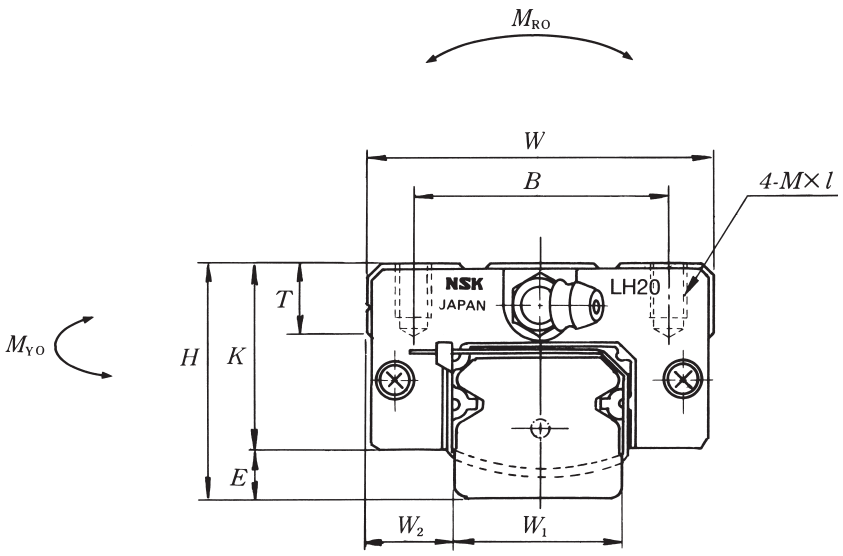
Model-No.		Assembly (mm)			Slider (mm)							
		H	E	W_2	W	B × J	L	L_1	J_1	K	T	M × l
LAH15	ANZ BNZ	28	4.6	9.5	34	26 × 26	55 74	39 58	6.5 16	23.4	8	M 4 × 6
LAH20	ANZ BNZ	30	5	12	44	32 × 36 32 × 50	69.8 91.8	50 72	7 11	25	12	M 5 × 6
LAH25	ANZ BNZ	40	7	12.5	48	35 × 35 35 × 50	79 107	58 86	11.5 18	33	12	M 6 × 9
LAH30	ANZ BNZ	45	9	16	60	40 × 40 40 × 60	85.6 124.6	59 98	9.5 19	36	14	M 8 × 10
LAH35	ANZ BNZ	55	9.5	18	70	50 × 50 50 × 72	109 143	80 114	15 21	45.5	15	M 8 × 12
LAH45	ANZ BNZ	70	14	20.5	86	60 × 60 60 × 80	139 171	105 137	22.5 28.5	56	17	M 10 × 17
LAH55	ANZ BNZ	80	15	23.5	100	75 × 75 75 × 95	163 201	126 164	25.5 34.5	65	18	M 12 × 18
LAH65	ANZ BNZ	90	16	31.5	126	76 × 70 76 × 120	193 253	147 207	38.5 43.5	74	23	M 16 × 20



Slider mounted on a dummy rail. For dimensions of the rail see pages 38 and 39

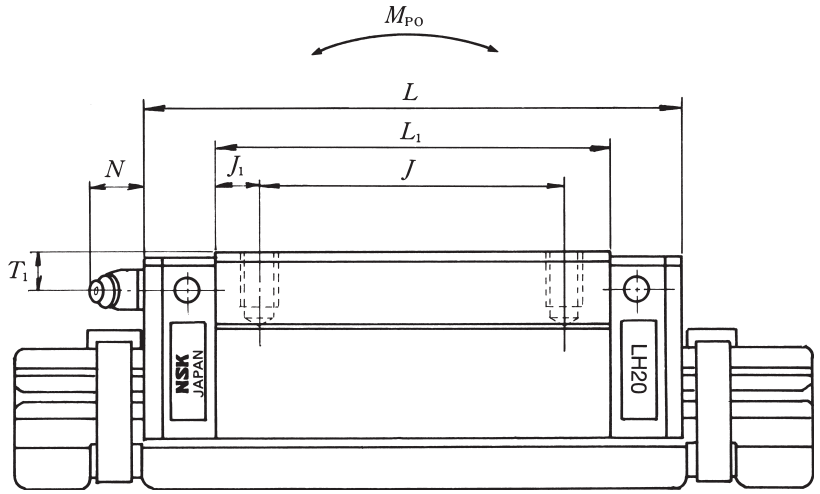
Grease fitting (mm)			Basic load rating (N)		Static moment (Nm)			Weight (kg)	Model-No.	
	T_1	N	Dynamic C	Static C_0	M_{RO}	M_{PO}	M_{YO}			
Ø 3 mm	8.5	3.3	10 800 14 600	20 700 32 000	108 166	95 216	80 181	0.18 0.26	ANZ BNZ	LAH15
M 6 × 0.75	5	11	17 400 23 500	32 500 50 500	219 340	185 420	151 355	0.33 0.48	ANZ BNZ	LAH20
M 6 × 0.75	10	11	25 600 34 500	46 000 71 000	360 555	320 725	267 610	0.55 0.82	ANZ BNZ	LAH25
M 6 × 0.75	10	11	31 000 46 000	51 500 91 500	490 870	350 1 030	292 865	0.77 1.3	ANZ BNZ	LAH30
M 6 × 0.75	15	11	47 500 61 500	80 500 117 000	950 1 380	755 1 530	630 1 280	1.5 2.1	ANZ BNZ	LAH35
R $^1/_8$“	20	13	81 000 99 000	140 000 187 000	2 140 2 860	1 740 3 000	1 460 2 520	3.0 3.9	ANZ BNZ	LAH45
R $^1/_8$“	21	13	119 000 146 000	198 000 264 000	3 600 4 850	3 000 5 150	2 510 4 350	4.7 6.1	ANZ BNZ	LAH55
R $^1/_8$“	19	13	181 000 235 000	281 000 410 000	6 150 8 950	4 950 10 100	4 150 8 450	7.7 10.8	ANZ BNZ	LAH65

Sliders ALZ and BLZ type



Slider mounted on a dummy rail. For dimensions of the rail see pages 38 and 39

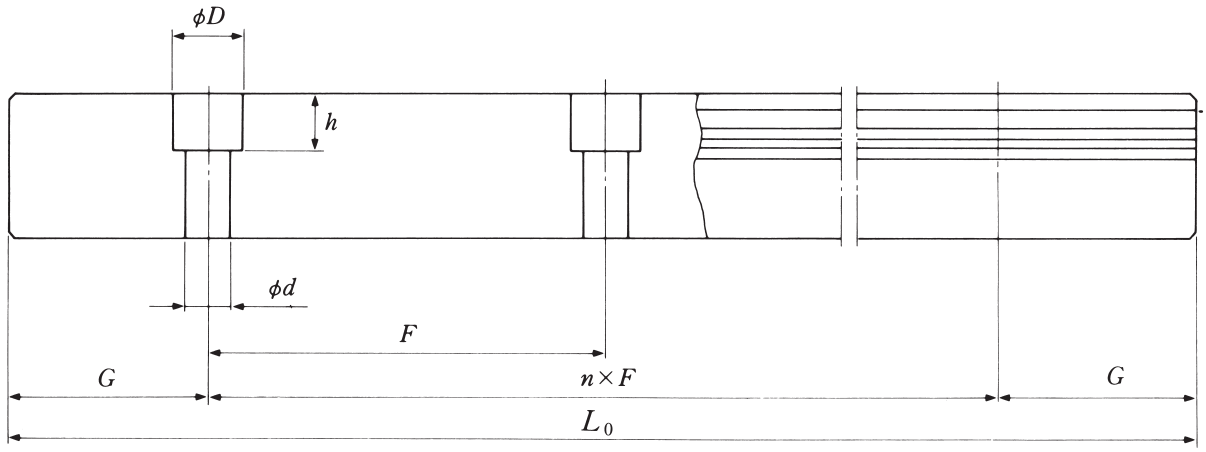
Model-No.		Assembly (mm)			Slider (mm)							
		H	E	W_2	W	B × J	L	L_1	J_1	K	T	M × Lead × l
LAH25	ALZ	36	7	12.5	48	35 × 35	79	58	11.5	29	12	M6 × 1 × 6
	BLZ					35 × 50	107	86	18			
LAH30	ALZ	42	9	16	60	40 × 40	85.6	59	9.5	33	14	M8 × 1.25 × 8
	BLZ					40 × 60	124.6	98	19			
LAH35	ALZ	48	9.5	18	70	50 × 50	109	80	15	38.5	15	M8 × 1.25 × 8
	BLZ					50 × 72	143	114	21			



Slider mounted on a dummy rail. For dimensions of the rail see pages 38 and 39

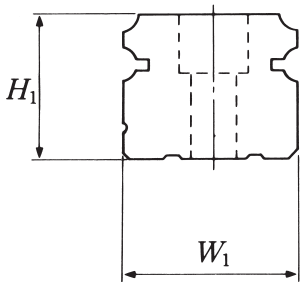
Grease fitting (mm)			Basic load rating (N)		Static moment (Nm)			Weight (kg)	Model-No.
	T_1	N	Dynamic C	Static C_0	M_{RO}	M_{PO}	M_{YO}		
M 6 × 0.75	6	11	25 600 34 500	46 000 71 000	360 555	320 725	267 610	0.46 0.69	LAH25 ALZ BLZ
M 6 × 0.75	7	11	31 000 46 000	51 500 91 500	490 870	350 1 030	292 865	0.69 1.16	LAH30 ALZ BLZ
M 6 × 0.75	8	11	47 500 61 500	80 500 117 000	950 1 380	755 1 530	630 1 280	1.2 1.7	LAH35 ALZ BLZ

Rail LH type



Model-No.	Rail dimensions (mm)				
	W_1	H_1	F	d × D × h	G (recommended)
L1H15 . . . Z	15	15	60	4.5 × 7.5 × 5.3	20 $_{-2}$
L1H20 . . . Z	20	18	60	6 × 9.5 × 8.5	20 $_{-2}$
L1H25 . . . Z	23	22	60	7 × 11 × 9	20 $_{-2}$
L1H30 . . . Z	28	26	80	9 × 14 × 12	20 $_{-2}$
L1H35 . . . Z	34	29	80	9 × 14 × 12	20 $_{-2}$
L1H45 . . . Z	45	38	105	14 × 20 × 17	22.5 $_{-2}$
L1H55 . . . Z	53	44	120	16 × 23 × 20	30 $_{-2}$
L1H65 . . . Z	63	53	150	18 × 26 × 22	35 $_{-2}$

The cutting tolerance of the ends of the rail (G dimension) is - 2 mm for standard, and – 0.5 mm for butting rails.



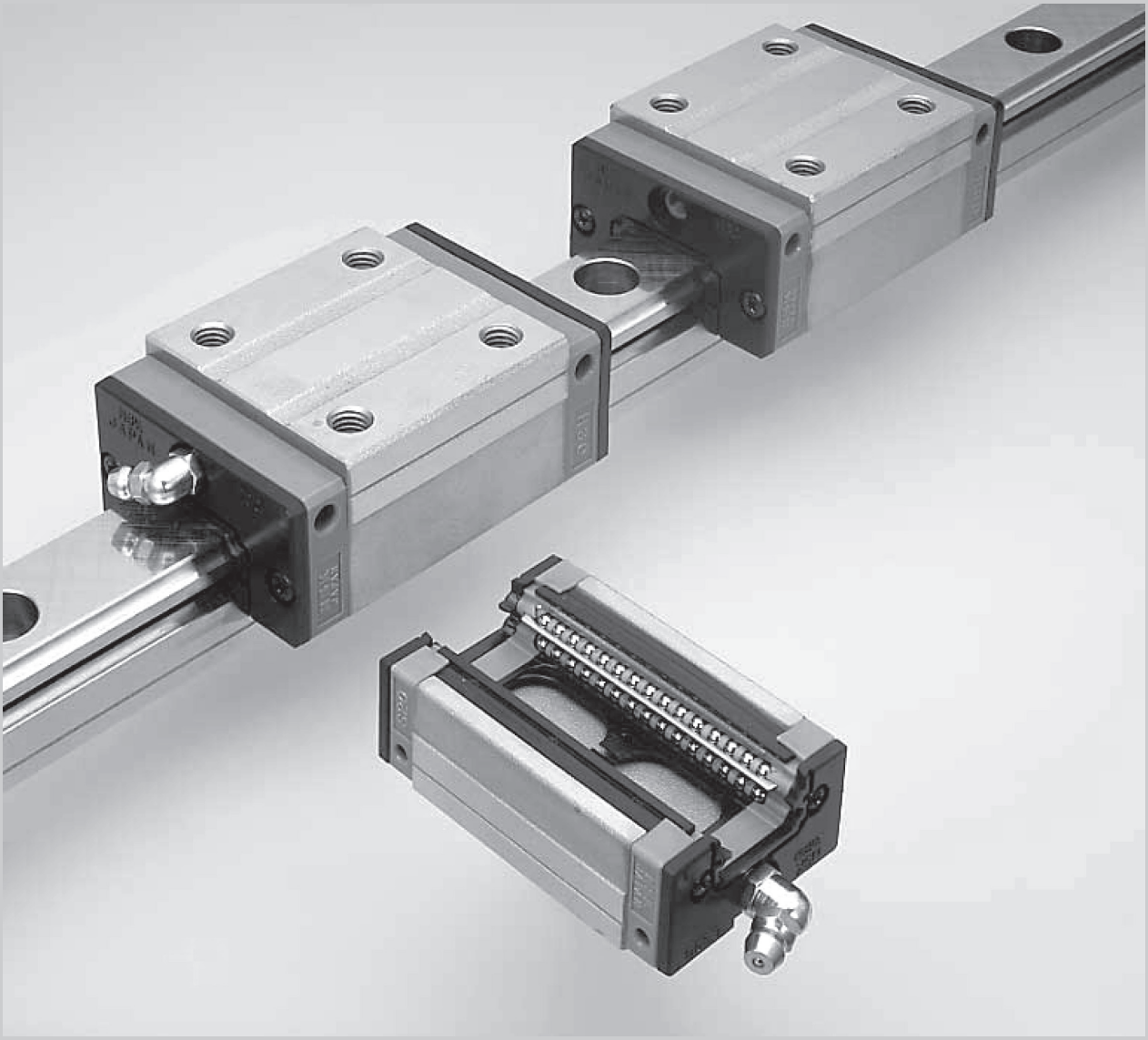
Weight kg/m	Max. Lenght L_0 for standard	Max. Lenght L_0 for black chrome	Model-No.
1.6	2000	2000	L1H15 . . . Z
2.6	3960	3000	L1H20 . . . Z
3.6	3960	3000	L1H25 . . . Z
5.2	4000	3040	L1H30 . . . Z
7.2	4000	3040	L1H35 . . . Z
12.3	3990	3045	L1H45 . . . Z
16.9	3960	3000	L1H55 . . . Z
24.3	3900	3000	L1H65 . . . Z

When cutting the black chrome rails to the desired length, the extreme faces of the rail will lack this black chrome plating.

Main features:

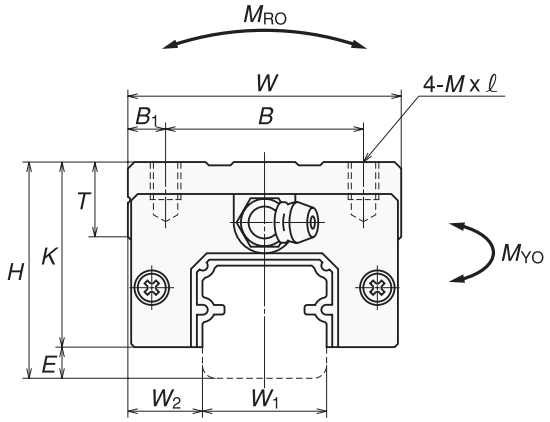
The SH series is available as interchangeable type. Interchangeable types enable random matching of rails and ball slides for prompt delivery.

Silent operation and low friction due to the ball spacers between the balls, that prevent collision and rubbing.



SH interchangeable type

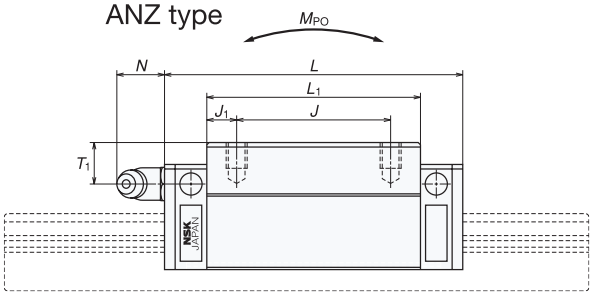
Sliders ANZ and BNZ type



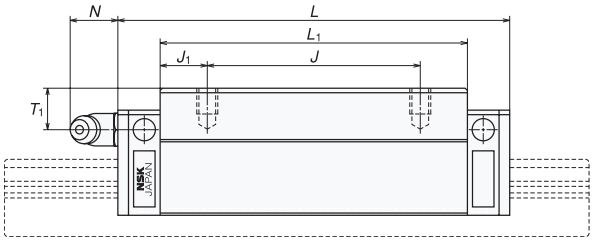
Slider mounted on a dummy rail. For dimensions of the rail see pages 38 and 39

Model-No.	Assembly (mm)			Slider (mm)									
	H	*E*	W_2	*W*	*L*	*B*	*J*	*M*×*Lead*×ℓ	B_1	L_1	J_1	*K*	*T*
SAH15ANZ	28	4.6	9.5	34	55	26	26	M4×0.7×6	4	39	6.5	23.4	8
SAH15BNZ					74					58	16		
SAH20ANZ	30	5	12	44	69.8	32	36	M5×0.8×6	6	50	7	25	12
SAH20BNZ					91.8		50			72	11		
SAH25ANZ	40	7	12.5	48	79	35	35	M6×1×9	6.5	58	11.5	33	12
SAH25BNZ					107		50			86	18		
SAH30ANZ	45	9	16	60	85.6	40	40	M8×1.25×10	10	59	9.5	36	14
SAH30BNZ					124.6		60			98	19		
SAH35ANZ	55	9.5	18	70	109	50	50	M8×1.25×12	10	80	15	45.5	15
SAH35BNZ					143		72			114	21		

ANZ type



BNZ type

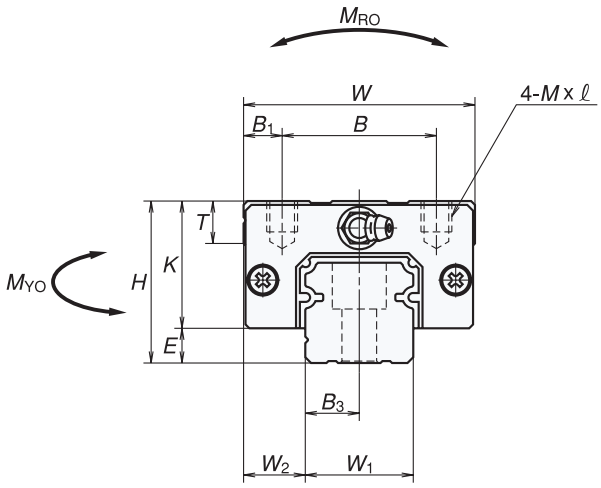


Slider mounted on a dummy rail. For dimensions of the rail see pages 38 and 39

Grease fitting (mm)			Basic load rating (N)		Static moment (N · m)			Ball dia.	Weight		
	T_1	N	*Dynamic C*	*Static* C_0	M_{RO}	M_{PO}	M_{YO}	D_w	Slider (kg)	Rail (kg/m)	Model-No.
∅3	8.5	3.3	10 100	18 800	98	87	73	3.175	0.18	1.6	SAH15ANZ
			13 400	28 200	147	193	162		0.26		SAH15BNZ
M6×0.75	5	11	16 300	29 600	199	167	141	3.698	0.33	2.6	SAH20ANZ
			21 600	44 500	298	360	305		0.48		SAH20BNZ
M6×0.75	10	11	22 400	37 500	295	246	207	4.762	0.55	3.6	SAH25ANZ
			32 000	62 500	490	615	515		0.82		SAH25BNZ
M6×0.75	10	11	31 000	51 500	490	365	305	5.556	0.77	5.2	SAH30ANZ
			46 000	91 500	870	1 060	885		1.3		SAH30BNZ
M6×0.75	15	11	47 500	80 500	950	780	655	6.35	1.5	7.2	SAH35ANZ
			61 500	117 000	1 380	1 600	1 340		2.1		SAH35BNZ

Sliders ALZ and BLZ type

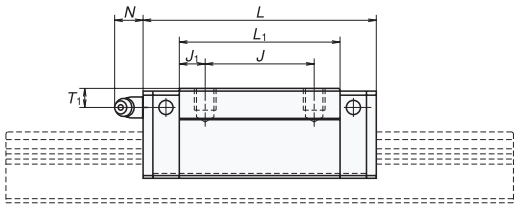
Frontal view of ALZ and BLZ types



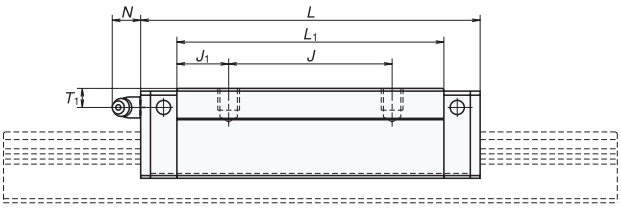
Slider mounted on a dummy rail. For dimensions of the rail see pages 38 and 39

Model-No.	Assembly (mm)			Slider (mm)									
	H	*E*	W_2	*W*	*L*	*B*	*J*	*M*×*Lead*×ℓ	B_1	L_1	J_1	*K*	*T*
SAH25ALZ	36	7	12.5	48	79	35	35	M6×1×6	6.5	58	11.5	29	12
SAH25BLZ					107		50			86	18		
SAH30ALZ	42	9	16	60	85.6	40	40	M8×1.25×8	10	59	9.5	33	14
SAH30BLZ					124.6		60			98	19		
SAH35ALZ	48	9.5	18	70	109	50	50	M8×1.25×8	10	80	15	38.5	15
SAH35BLZ					143		72			114	21		

ALZ type



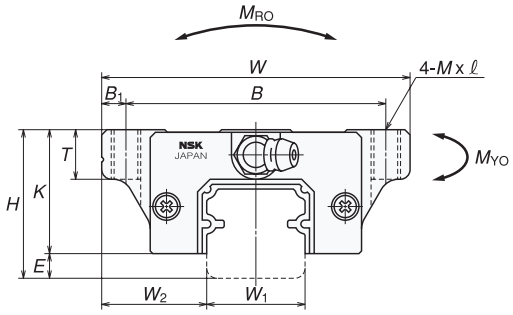
BLZ type



Slider mounted on a dummy rail. For dimensions of the rail see pages 38 and 39

Grease fitting (mm)			Basic load rating (N)		Static moment (N · m)			Ball dia.	Weight		Model-No.
	T_1	N	*Dynamic C*	*Static* C_0	M_{RO}	M_{PO}	M_{YO}	D_w	Slider (kg)	Rail (kg/m)	
M6×0.75	6	11	22 400	37 500	295	246	207	4.762	0.55	3.6	SAH25ALZ
			32 000	62 500	490	615	515		0.82		SAH25BLZ
M6×0.75	7	11	31 000	51 500	490	365	305	5.556	0.77	5.2	SAH30ALZ
			46 000	91 500	870	1 060	885		1.3	^	SAH30BLZ
M6×0.75	8	11	47 500	80 500	950	780	655	6.35	1.5	7.2	SAH35ALZ
			61 500	117 000	1 380	1 600	1 340		2.1		SAH35BLZ

Sliders EMZ and GMZ type

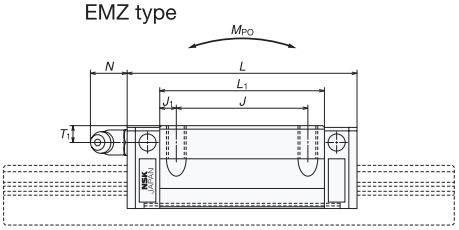


Slider mounted on a dummy rail. For dimensions of the rail see pages 38 and 39

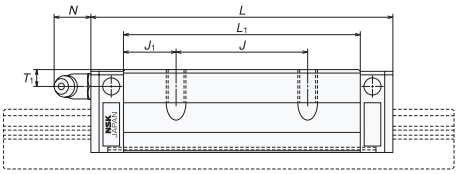
Model-No.	Assembly (mm)			Slider (mm)										
	H	*E*	W_2	*W*	*L*	*B*	*J*	*M*×*Lead*×ℓ	*Q*×ℓ	B_1	L_1	J_1	*K*	*T*
SAH15EMZ	24	4.6	16	47	55	38	30	M5×0.8×7	4.5×7	4.5	39	4.5	19.4	8
SAH15GMZ					74						58	14		
SAH20EMZ	30	5	21.5	63	69.8	53	40	M6×1×9.5	6×10	5	50	5	25	10
SAH20GMZ					91.8						72	16		
SAH25EMZ	36	7	23.5	70	79	57	45	M8×1.25×10	7×10	6.5	58	6.5	29	11
SAH25GMZ					107			(M8×1.25×11.5)	(7×11.5)		86	20.5		(12)
SAH30EMZ	42	9	31	90	98.6	72	52	M10×1.5×12	9×12	9	72	10	33	11
SAH30GMZ					124.6			(M10×1.5×14.5)	(9×14.5)		98	23		(15)
SAH35EMZ	48	9.5	33	100	109	82	62	M10×1.5×13	9×13	9	80	9	38.5	12
SAH35GMZ					143						114	26		

Dimension in ( ) are applicable to stainless steel products.

EMZ type



GMZ type



Slider mounted on a dummy rail. For dimensions of the rail see pages 38 and 39

Grease fitting (mm)			Basic load rating (N)		Static moment (N · m)			Ball dia.	Weight		Model-No.
	T_1	N	*Dynamic C*	*Static* C_0	M_{RO}	M_{PO}	M_{YO}	D_w	Slider (kg)	Rail (kg/m)	
∅3	4.5	3.3	10 100	18 800	98	87	73	3.175	0.17	1.6	SAH15EMZ
			13 400	28 200	147	193	162		0.25		SAH15GMZ
M6×0.75	5	11	16 300	29 600	199	167	141	3.698	0.45	2.6	SAH20EMZ
			21 600	44 500	298	360	305		0.65		SAH20GMZ
M6×0.75	6	11	22 400	37 500	295	246	207	4.762	0.63	3.6	SAH25EMZ
			32 000	62 500	490	615	515		0.93		SAH25GMZ
M6×0.75	7	11	35 500	63 000	600	540	450	5.556	1.2	5.2	SAH30EMZ
			46 000	91 500	870	1 060	885		1.6		SAH30GMZ
M6×0.75	8	11	47 500	80 500	950	780	655	6.35	1.7	7.2	SAH35EMZ
			61 500	117 000	1 380	1 600	1 340		2.4		SAH35GMZ

LS Series

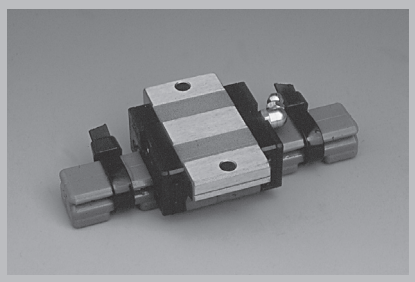
Main features:

Both the sliders and the ball tracks are hardened by surface hardening. Due to the X configuration in the contact points of the balls with the tracks, the LH series feature a high self aligning ability.

The LS series are available as interchangeable type. Interchangeable types enable random matching of rails and ball slides for prompt delivery.

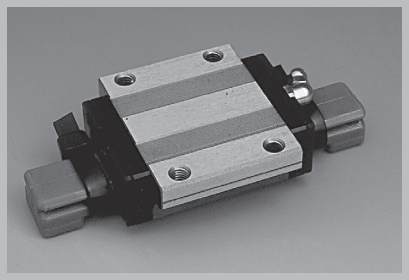
As the LH series, this LS series are ideal for the general applications of the mechanical engineering, specially when there is a limited mounting space.

The LS Series are also available in stainless steel.



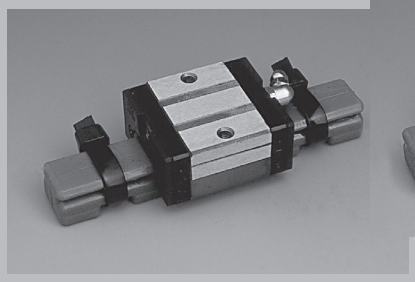
Size
15 to 35

JM type
Drill / tap holes

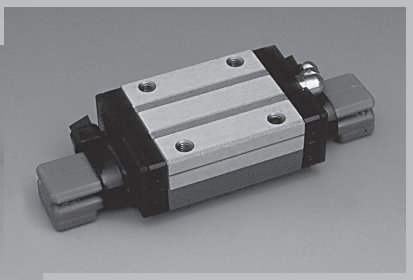


Size
15 to 35

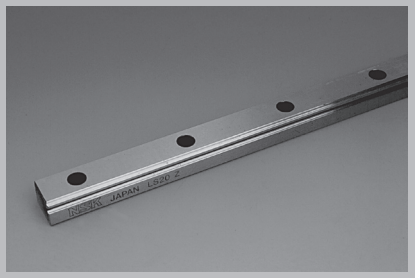
EM type
Drill / tap holes



CL type
Tap fixing holes

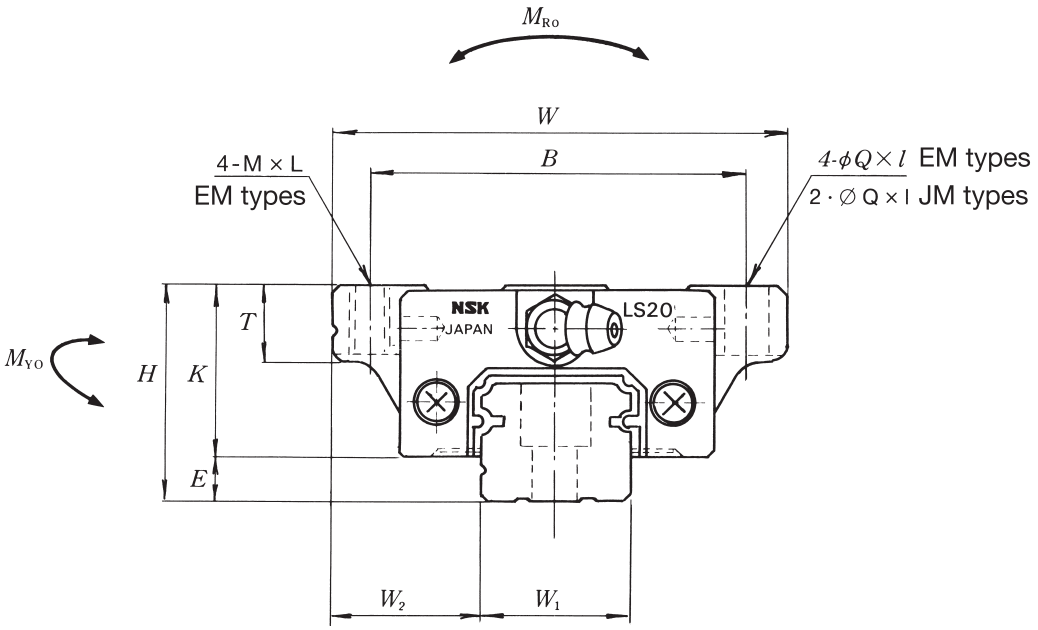


AL type
Tap fixing holes



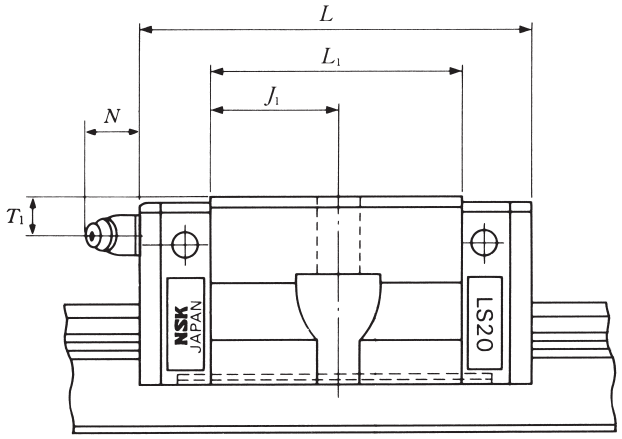
Rail

Sliders JMZ and EMZ type

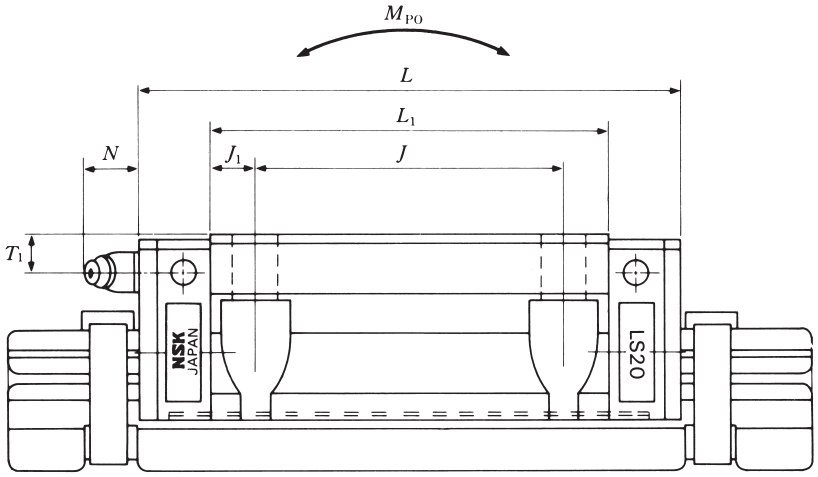


Slider mounted on a dummy rail. For dimensions of the rail see pages 54 and 55

Model-No.	Assembly (mm)			Slider (mm)								
	H	E	W_2	W	B × J	L	L_1	J_1	K	T	Q × I	M × I
LAS 15 JMZ	24	4.6	18.5	52	41	40.4	23.6	11.8	9.4	8	4.5 × 7	M5 × 7
LAS 15 EMZ					41 × 26	56.8	40	7				
LAS 20 JMZ	28	6	19.5	59	49	47.2	30	15	22	10	5.3 × 9	M6 × 9
LAS 20 EMZ					49 × 32	65.2	48	8				
LAS 25 JMZ	33	7	25	73	60	59.4	38	19	26	11	6.8 × 10	M8 × 12
LAS 25 EMZ					60 × 35	81.4	60	12.5				
LAS 30 JMZ	42	9	31	90	72 × 40	96.4	71	15.5	33	11	8.6 × 12	M10 × 12
LAS 30 EMZ					72 × 40	96.4	71	15.5				
LAS 35 JMZ	48	10.5	33	100	82 × 50	108	80	15	37.5	12	8.6 × 13	M10 × 13
LAS 35 EMZ					82 × 50	108	80	15				



JM types

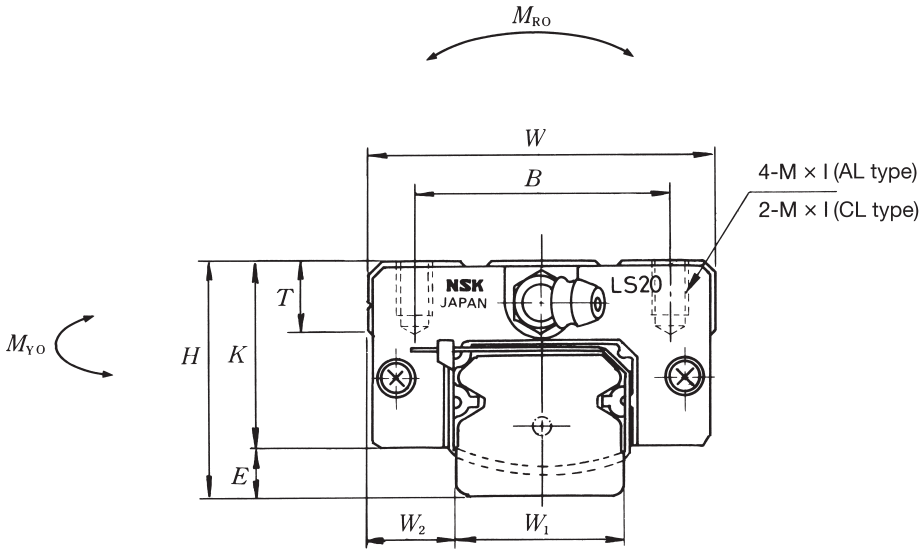


EM types

Slider mounted on a dummy rail. For dimensions of the rail see pages 54 and 55

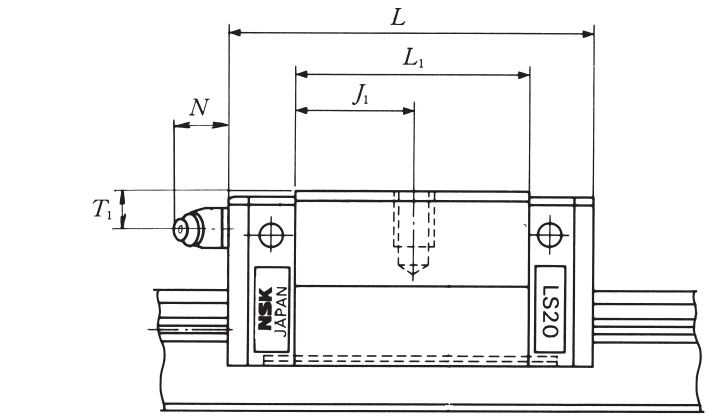
Grease fitting (mm)			Basic load rating (N)		Static moment (Nm)			Weight (kg)	Model-No.
	T_1	N	Dynamic C	Static C_0	M_{RO}	M_{PO}	M_{YO}		
Ø 3	6	3	5 400 8 350	9 100 16 900	46 85	25 77	21 65	0.17 0.26	LAS 15 JMZ EMZ
M 6 × 0.75	5.5	11	7 900 11 700	13 400 23 500	92 160	47 133	39 111	0.24 0.35	LAS 20 JMZ EMZ
M 6 × 0.75	7	11	12 700 18 800	20 800 36 500	164 286	91 258	76 217	0.44 0.66	LAS 25 JMZ EMZ
M 6 × 0.75	8	11	28 800 28 800	55 000 55 000	520 520	435 435	365 365	1.20 1.20	LAS 30 JMZ EMZ
M 6 × 0.75	8.5	11	40 000 40 000	74 500 74 500	865 865	695 695	580 580	1.70 1.70	LAS 35 JMZ EMZ

Sliders CLZ and ALZ type

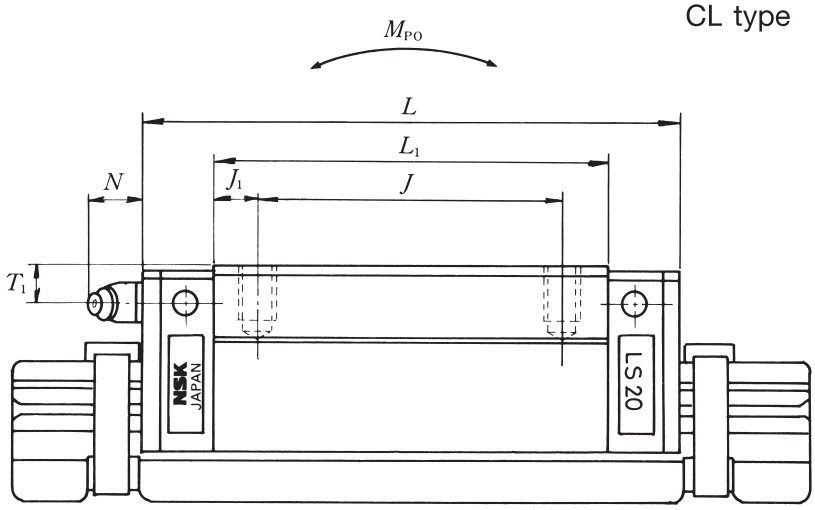


Slider mounted on a dummy rail. For dimensions of the rail see pages 54 and 55

Model-No.		Assembly (mm)			Slider (mm)							
		H	E	W_2	W	B × J	L	L_1	J_1	K	T	M × l
LAS 15	CLZ ALZ	24	4.6	9.5	34	26 26 × 26	40.4 56.8	23.6 40	11.8 7	19.4	10	M4 × 6
LAS 20	CLZ ALZ	28	6	11	42	32 32 × 32	47.2 65.2	30 48	15 8	22	12	M5 × 7
LAS 25	CLZ ALZ	33	7	12.5	48	35 35 × 35	59.4 81.4	38 60	19 12.5	26	12	M6 × 9
LAS 30	CLZ ALZ	42	9	16	60	40 40 × 40	67.4 96.4	42 71	21 15.5	33	13	M8 × 12
LAS 35	CLZ ALZ	48	10.5	18	70	50 50 × 50	77 108	49 80	24.5 15	37.5	14	M8 × 12



CL type

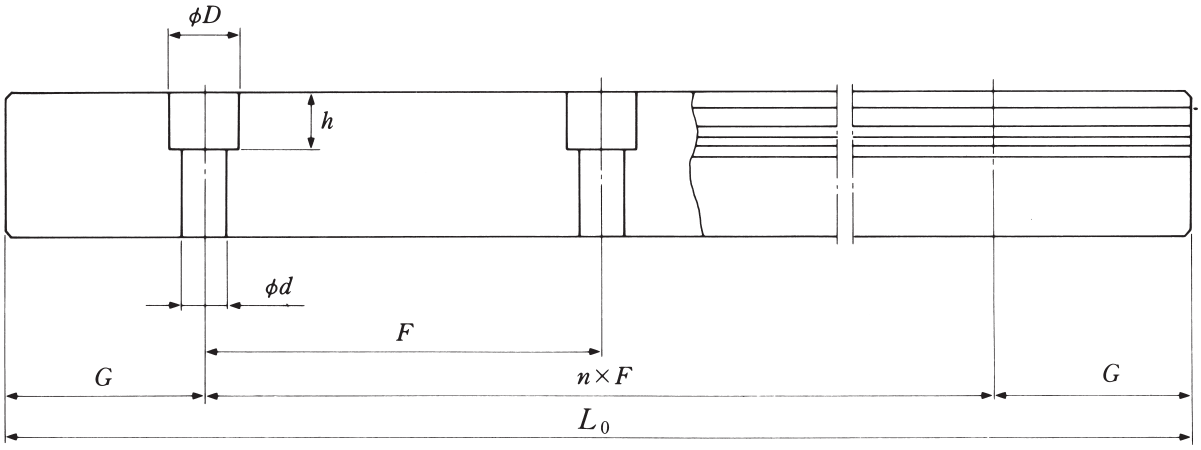


AL type

Slider mounted on a dummy rail. For dimensions of the rail see pages 54 and 55

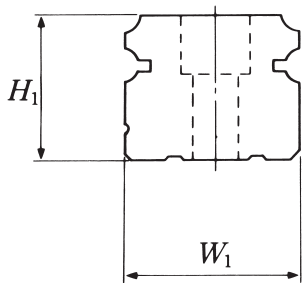
Grease fitting (mm)			Basic load rating (N)		Static moment (Nm)			Weight (kg)	Model-No.	
	T_1	N	Dynamic C	Static C_0	M_{RO}	M_{PO}	M_{YO}			
Ø 3	6	3	5 400 8 350	9 100 16 900	46 85	25 77	21 65	0.14 0.20	CLZ ALZ	LAS 15
M 6 × 0.75	5.5	11	7 900 11 700	13 400 23 500	92 160	47 133	39 111	0.19 0.28	CLZ ALZ	LAS 20
M 6 × 0.75	7	11	12 700 18 800	20 800 36 500	164 286	91 258	76 217	0.34 0.51	CLZ ALZ	LAS 25
M 6 × 0.75	8	11	18 700 28 800	29 600 55 000	282 520	139 435	116 365	0.58 0.85	CLZ ALZ	LAS 30
M 6 × 0.75	8.5	11	26 000 40 000	40 000 74 500	465 865	220 695	185 580	0.86 1.25	CLZ ALZ	LAS 35

Rail LS type



Model-No.	Rail dimensions (mm)				
	W_1	H_1	F	d × D × h	G (recommended)
L1S15 . . . Z	15	12.5	60	3.5 × 6 × 4.5	20_{-2}
L1S15 . . . T . . . Z	15	12.5	60	4.5 × 7.5 × 5.3	20_{-2}
L1S20 . . . Z	20	15.5	60	6 × 9.5 × 8.5	20_{-2}
L1S25 . . . Z	23	18	60	7 × 11 × 9	20_{-2}
L1S30 . . . Z	28	23	80	7 × 11 × 9	20_{-2}
L1S35 . . . Z	34	27.5	80	9 × 14 × 12	20_{-2}

The cutting tolerance of the ends of the rail (G dimension) is - 2 mm for standard, and – 0.5 mm for butting rails.



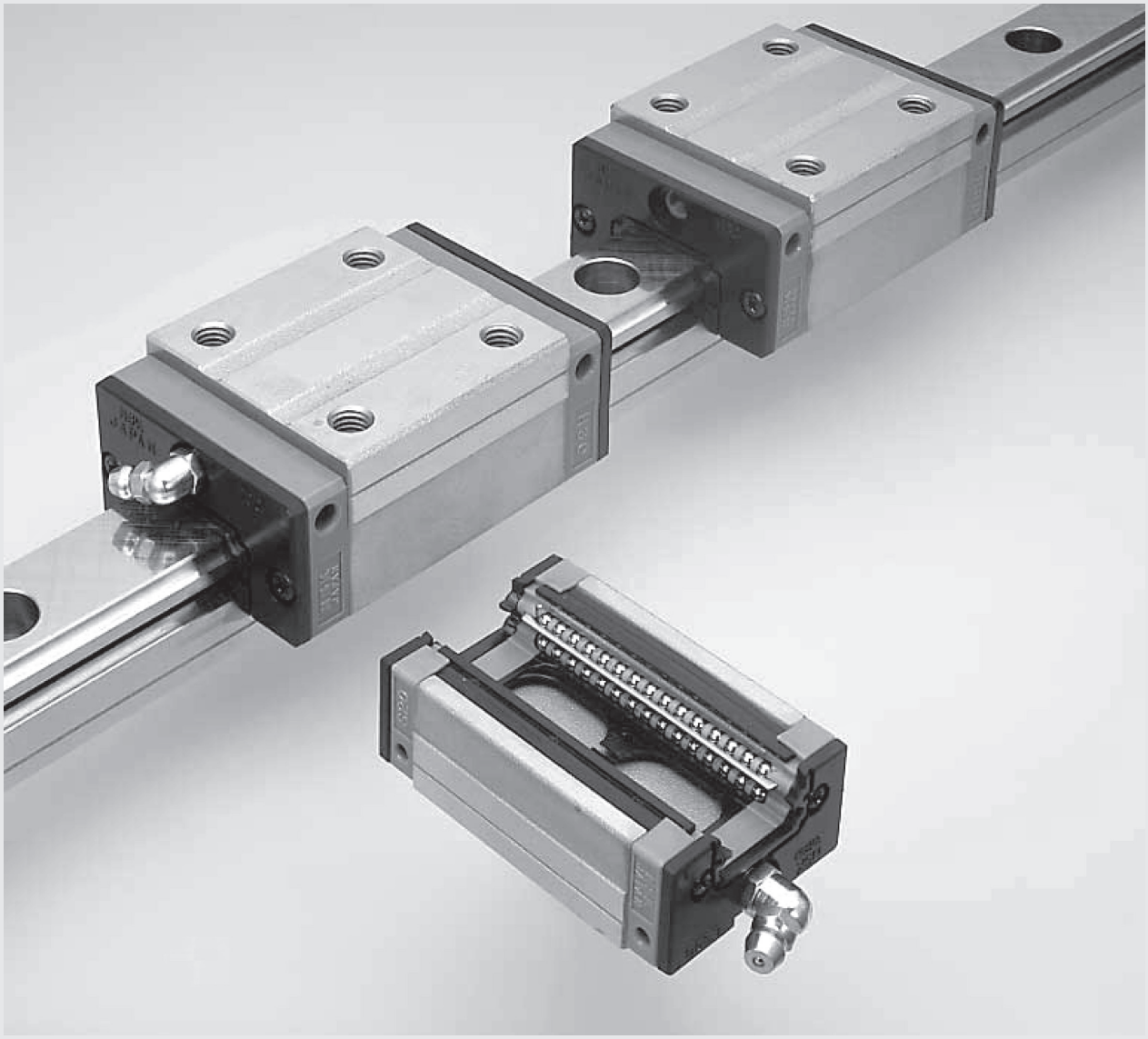
Weight kg	Max. Lenght L_0	Max. Lenght L_0 for stainless steel	Model-No.
1.4	2000	1700	L1S15 . . . Z
1.4	1600	1000	L1S15 . . . T . . . Z
2.3	3960	3500	L1S20 . . . Z
3.1	3960	3500	L1S25 . . . Z
4.8	4000	3500	L1S30 . . . Z
7.0	4000	3500	L1S35 . . . Z

Main features:

The SS Series is the compact version of the SH Series.

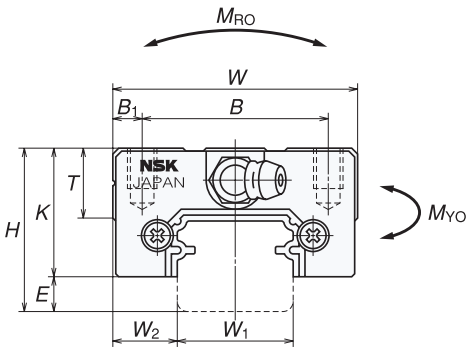
The SS series is available as interchangeable type. Interchangeable types enable random matching of rails and ball slides for prompt delivery.

Silent operation and low friction due to the ball spacers between the balls, that prevent collision and rubbing.



SS interchangeable type

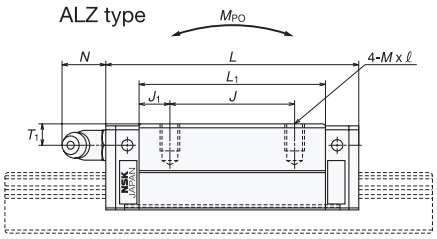
Sliders ALZ and CLZ type



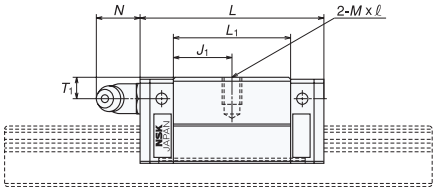
Slider mounted on a dummy rail. For dimensions of the rail see pages 54 and 55

Model-No.	Assembly (mm)			Slider (mm)									
	H	*E*	W_2	*W*	*L*	*B*	*J*	*M*×*Lead*×ℓ	B_1	L_1	J_1	*K*	*T*
SAS15CLZ	24	4.6	9.5	34	40.4	26	—	M4×0.7×6	4	23.6	11.8	19.4	10
SAS15ALZ					56.8		26			40	7		
SAS20CLZ	28	6	11	42	47.2	32	—	M5×0.8×7	5	30	15	22	12
SAS20ALZ					65.2		32			48	8		
SAS25CLZ	33	7	12.5	48	59.6	35	—	M6×1×9	6.5	38	19	26	12
SAS25ALZ					81.6		35			60	12.5		
SAS30CLZ	42	9	16	60	67.4	40	—	M8×1.25×12	10	42	21	33	13
SAS30ALZ					96.4		40			71	15.5		
SAS35CLZ	48	10.5	18	70	77	50	—	M8×1.25×12	10	49	24.5	37.5	14
SAS35ALZ					108		50			80	15		

ALZ type



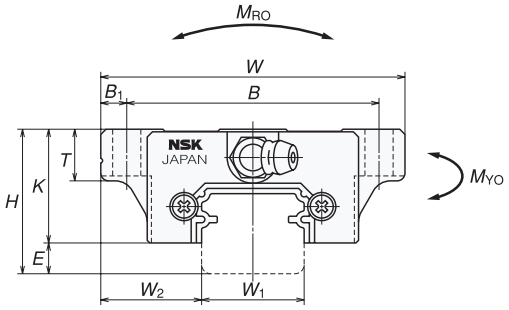
CLZ type



Slider mounted on a dummy rail. For dimensions of the rail see pages 54 and 55

Grease fitting (mm)			Basic load rating (N)		Static moment (N · m)			Ball dia.	Weight		
	T_1	N	*Dynamic C*	*Static* C_0	M_{RO}	M_{PO}	M_{YO}	D_w	Slider (kg)	Rail (kg/m)	Model-No.
∅3	6	3	4 900	7 800	39	21	18	2.778	0.14	1.4	SAS15CLZ
			7 900	15 600	78	74	62		0.2		SAS15ALZ
M6×0.75	5.5	11	7 250	11 800	80	41	34	3.175	0.19	2.3	SAS20CLZ
			11 100	21 800	149	124	104		0.28		SAS20ALZ
M6×0.75	7	11	12 700	20 800	164	97	81	3.968	0.34	3.1	SAS25CLZ
			17 900	33 500	266	242	203		0.51		SAS25ALZ
M6×0.75	8	11	18 700	29 600	282	153	128	4.762	0.58	4.8	SAS30CLZ
			27 300	50 500	480	415	350		0.85		SAS30ALZ
M6×0.75	8.5	11	26 000	40 000	465	234	196	5.556	0.86	7	SAS35CLZ
			38 000	68 500	800	620	520		1.3		SAS35ALZ

Linear guide with slider SS-EMZ (high load type) **and SS-KLZ** (medium load type)

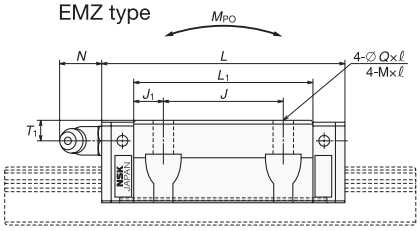


Slider mounted on a dummy rail. For dimensions of the rail see pages 54 and 55

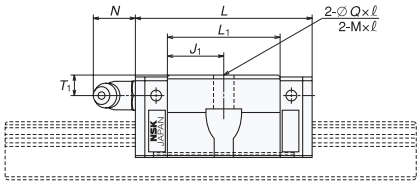
Model-No.	Assembly (mm)			Slider (mm)										
	H	*E*	W_2	*W*	*L*	*B*	*J*	*Q*×ℓ	*M*×Lead×ℓ	B_1	L_1	J_1	*K*	*T*
SAS15JMZ	24	4.6	18.5	52	40.4	41	—	4.4×7	M5×0.8×7	5.5	23.6	11.8	19.4	8
SAS15EMZ					56.8		26				40	7		
SAS20JMZ	28	6	19.5	59	47.2	49	—	5.3×9	M6×1×9	5	30	15	22	10
SAS20EMZ					65.2		32				48	8		
SAS25JMZ	33	7	25	73	59.6	60	—	6.8×10	M8×1.25×10	6.5	38	19	26	11
SAS25EMZ					81.6		35				60	12.5		(12)
SAS30JMZ	42	9	31	90	67.4	72	—	8.6×12	M10×1.5×12	9	42	21	33	11
SAS30EMZ					96.4		40				71	15.5		(15)
SAS35JMZ	48	10.5	33	100	77	82	—	8.6×13	M10×1.5×13	9	49	24.5	37.5	12
SAS35EMZ					108		50				80	15		(15)

Dimensions in ( ) are applicable to stainless steel products.

EMZ type



JMZ type



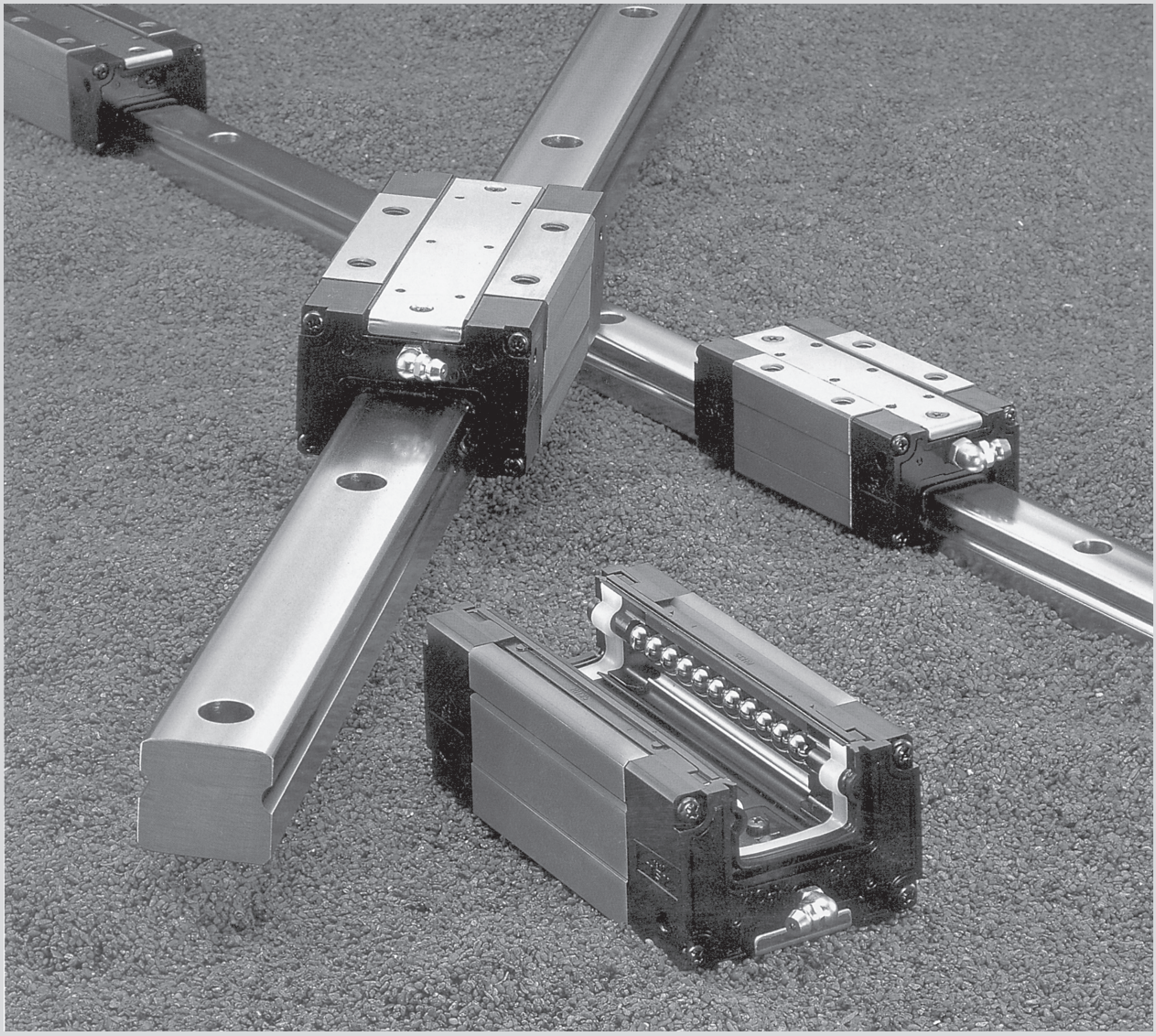
Slider mounted on a dummy rail. For dimensions of the rail see pages 54 and 55

Grease fitting (mm)			Basic load rating (N)		Static moment (N · m)			Ball dia.	Weight		Model-No.
	T_1	N	*Dynamic C*	*Static* C_0	M_{RO}	M_{PO}	M_{YO}	D_w	Slider (kg)	Rail (kg/m)	
∅3	6	3	4 900	7 800	39	21	18	2.778	0.17	1.4	SAS15JMZ
			7 900	15 600	78	74	62		0.26		SAS15EMZ
M6×0.75	5.5	11	7 250	11 800	80	41	34	3.175	0.24	2.3	SAS20JMZ
			11 100	21 800	149	124	104		0.35		SAS20EMZ
M6×0.75	7	11	12 700	20 800	164	96.5	81	3.968	0.44	3.1	SAS25JMZ
			17 900	33 500	266	242	203		0.66		SAS25EMZ
M6×0.75	8	11	18 700	29 600	282	153	128	4.762	0.76	4.8	SAS30JMZ
			27 300	50 500	480	415	350		1.2		SAS30EMZ
M6×0.75	8.5	11	26 000	40 000	465	234	196	5.556	1.2	7	SAS35JMZ
			38 000	68 500	800	620	520		1.7		SAS35EMZ

Translide™

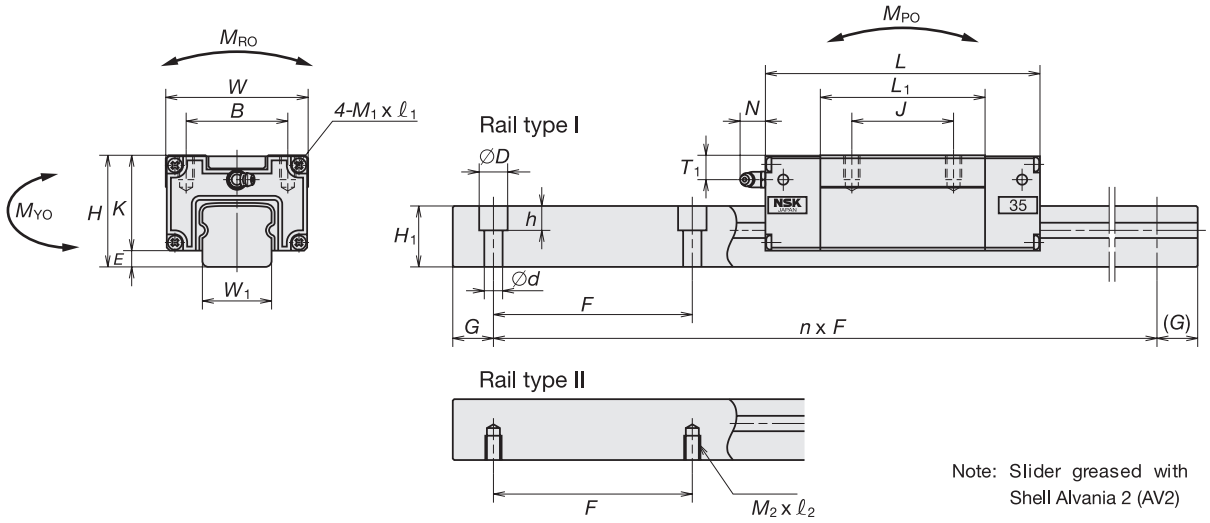
Main features:

This innovative guiding system features an outstanding reliability in contaminated environments, and at the same time is economically convenient. Translide™ is equipped with the K1 lubrication units and with the triple lipped high performance seal as standard. Translide™ is specially suitable for transportation equipment.



AN type
Slider with tap fixing holes.

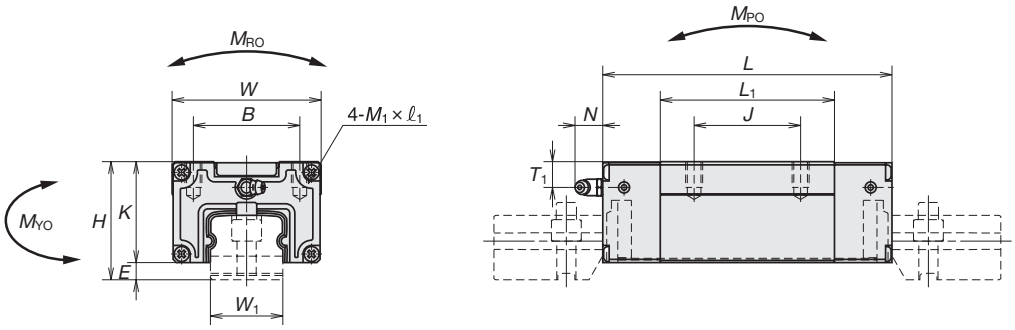
Translide with AN slider



Note: Slider greased with Shell Alvania 2 (AV2)

For the reference number of the rail, see page 9

Model-No.	Assembly (mm)		Slider (mm)										Rail dimensions		
										Grease fitting (mm)					
	$H^{\pm 0.1}$	E	W	L	B	J	$M_1 \times Lead \times \ell_1$	L_1	K		T_1	N	W_1	H_1	F
TAS15AN	28	3	34	72.2	26	26	M4×0.7×6	39	25	∅3	6.5	(5)	15	14	120
TAS20AN	30	3	44	87	32	36	M5×0.8×8	50	27	M6×0.75	6.5	(14)	20	15	120
TAS25AN	40	4	48	100	35	35	M6×1×9	58	36	M6×0.75	9.5	(14)	23	20	120
TAS30AN	45	6.5	60	115	40	40	M8×1.25×10	70	38.5	M6×0.75	9.5	(14)	28	25	160
TAS35AN	55	8	70	135.8	50	50	M8×1.25×12	81.8	47	M6×0.75	12	(14)	34	30	160



For the reference number of the rail, see page 9

Rail dimensions (mm)				Basic load rating (N)		Static moment (N · m)			Ball dia.	Weight	
Type I $d \times h$	Type II $M_2 \times Lead \times \ell_2$	G	Max. lenght L_{0max}*	*Dynamic C*	*Static* C_0	M_{RO}	M_{PO}	M_{YO}	D_w	Slider (kg)	(kg/m)
4.5×7.5×5.3	M4×0.7×6	20	1 960	9 800	11 800	92	64	64	3.968	0.21	1.5
6×9.5×8.5	M5×0.8×8	20	2 920	15 700	19 100	196	137	137	4.762	0.37	2.1
7×11×9	M6×1×9	20	4 000	21 800	26 000	320	217	217	5.556	0.47	3.4
9×14×12	M8×1.25×12	20	4 040	31 000	37 500	565	395	395	6.350	0.77	5.3
9×14×12	M8×1.25×12	20	4 040	46 500	53 000	970	635	635	7.937	1.3	7.7

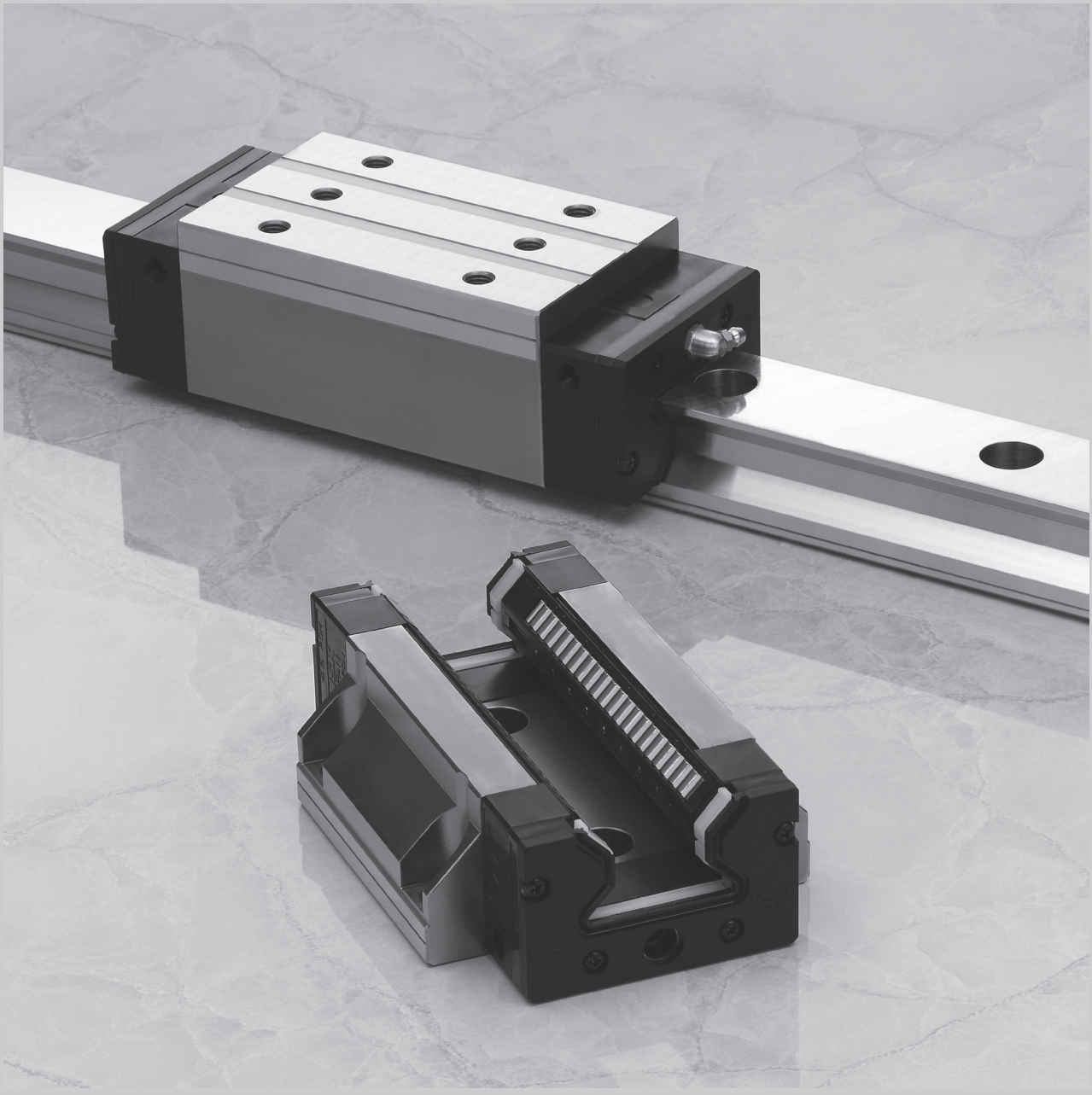
* Maximum length of a rail. Nevertheless, it is possible to assemble various rails up to the desired total length.

RA Series

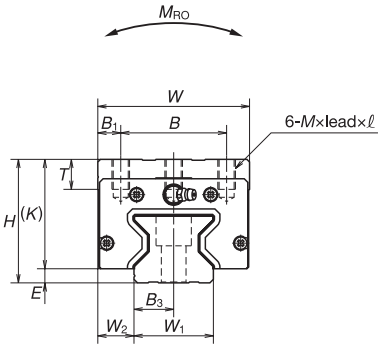
Main features:

A roller guide series employing advanced analysis technology offers super-high load capacity and rigidity. The RA series includes a complete line-up to handle a wide range of applications.

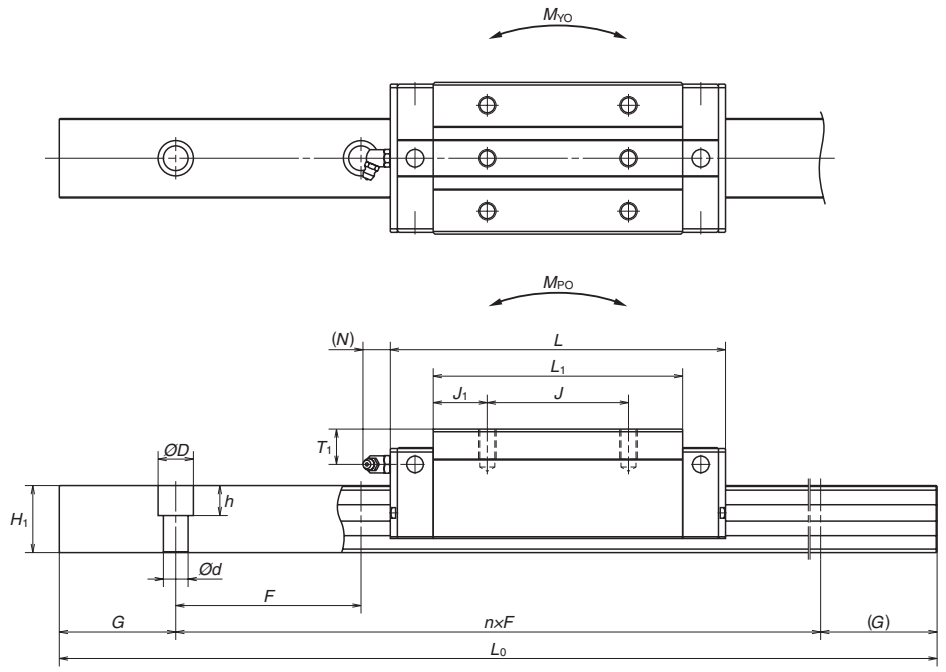
The RA series of roller guides is the product of a combination of NSK's extensive experience in roller bearings and linear guide technologies. The result is an optimal design that takes full advantage of NSK's unique expertise to realize super-high load capacity, rigidity and motion accuracy, plus smooth motion. Capable of handling a variety of applications, the RA series supports high machine performance.



Roller guide with sliders RA-AL, RA-AN (high load type) RA-BL, RA-BN (super-high load type)

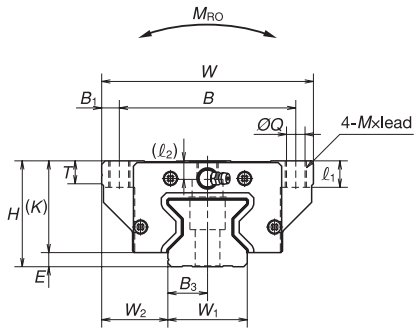


Model No.	Assembly [mm]			Slider [mm]												
						Fixing holes								Grease fitting [mm]		
	H	E	W_2	W	L	B	J	M×lead×ℓ	B_1	L_1	J_1	K	T		T_1	
RA15AL	24	4	9.5	34	70	26	26	M4×0.7×5.5	4	44.8	9.4	20	8	M3×0.5	4	3
RA15AN	28							M4×0.7×6				24			8	
RA15BL	24				85.4			M4×0.7×5.5		60.2	17.1	20			4	
RA15BN	28							M4×0.7×6				24			8	
RA20AN	30	5	12	44	86.5	32	36	M5×0.8×6	6	57.5	10.75	25	12	M3×0.5	4	3
RA20BN					106.3		50			77.3	13.65					
RA25AL	36	5	12.5	48	97.5	35	35	M6×1×9	6.5	65.5	15.25	31	12	M6×0.75	6	11
RA25AN	40											35			10	
RA25BL	36				115.5		50			83.5	16.75	31			6	
RA25BN	40											35			10	
RA30AL	42	6.5	16	60	110.8	40	40	M8×1.25×11	10	74	17	35.5	14	M6×0.75	7	11
RA30AN	45							M8×1.25×11				38.5			10	
RA30BL	42				135.4		60	M8×1.25×11		98.6	19.3	35.5			7	
RA30BN	45							M8×1.25×11				38.5			10	
RA35AL	48	6.5	18	70	123.8	50	50	M8×1.25×12	10	83.2	16.6	41.5	15	M6×0.75	8	11
RA35AN	55											48.5			15	
RA35BL	48				152		72			111.4	19.7	41.5			8	
RA35BN	55											48.5			15	
RA45AL	60	8	20.5	86	154	60	60	M10×1.5×16	13	105.4	22.7	52	17	Rc1/8	10	14
RA45AN	70							M10×1.5×17				62			20	
RA45BL	60				190		80	M10×1.5×16		141.4	30.7	52			10	
RA45BN	70							M10×1.5×17				62			20	
RA55AL	70	9	23.5	100	184	75	75	M12×1.75×18	13	128	26.5	61	18	Rc1/8	11	14
RA55AN	80											71			21	
RA55BL	70				234		95			178	41.5	61			11	
RA55BN	80											71			21	
RA65AN	90	13	31.5	126	228.4	76	70	M16×2×20	25	155.4	42.7	77	22	Rc1/8	19	14
RA65BN					302.5		120			229.5	54.75					

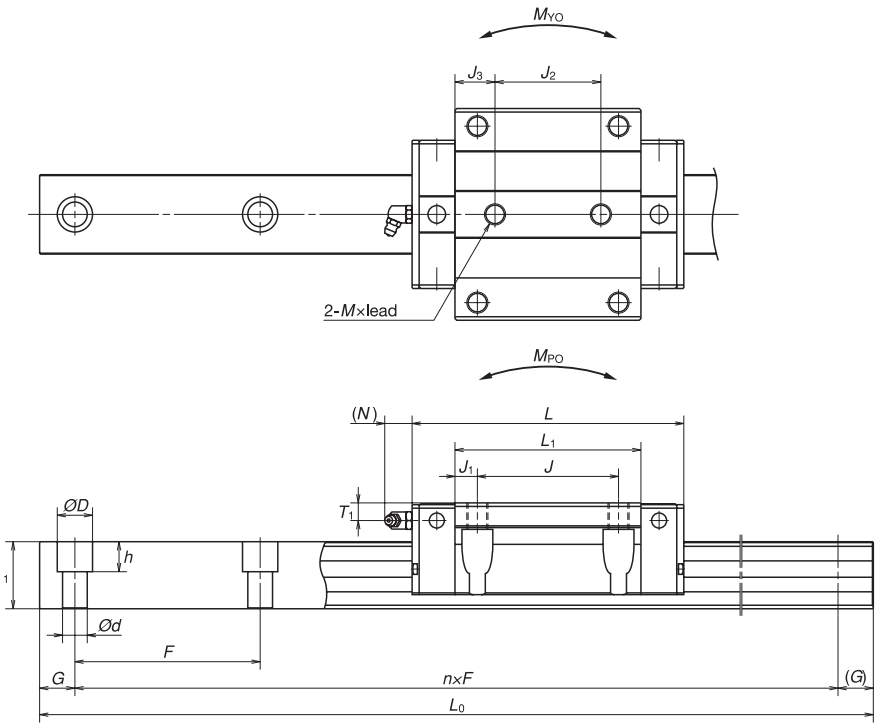


Rail dimensions [mm]							Basic load rating (N)					Weight		Model No.
							Dynamic	Static	Static moment [Nm]			Slider	Rail	
W_1	H_1	F	d×D×h	B_3	G (recommended)	L_{0max}	C (N)	C_0 (N)	M_{R0} (N·m)	M_{P0} (N·m)	M_{Y0} (N·m)	(kg)	(kg/m)	
15	16.3	60 (30)	4.5×7.5×5.3	7.5	20	2000	10300	27500	210	210	210	0.17 0.21	1.6	RA15AL RA15AN
							13000	37000	350	375	375	0.25 0.30		RA15BL RA15BN
20	20.8	60 (30)	6×9.5×8.5	10	20	3000	19200 24000	52500 70000	665 890	505 900	505 900	0.38 0.50	2.6	RA20AN RA20BN
23	24	30	7×11×9	11.5	20	3000	29200	72700	970	760	760	0.45 0.60	3.4	RA25AL RA25AN
							35400	92900	1240	1240	1240	0.80 0.91		RA25BL RA25BN
28	28	40	9×14×12	14	20	3000	38900	93500	1670	1140	1140	0.85 1.0	4.9	RA30AL RA30AN
							47600	121000	2170	1950	1950	1.1 1.3		RA30BL RA30BN
34	31	40	9×14×12	17	20	3000	53300	129000	2810	1800	1800	1.2 1.6	6.8	RA35AL RA35AN
							67400	175000	3810	3250	3250	1.7 2.1		RA35BL RA35BN
45	38	52.5	14×20×17	22.5	22.5	3000	92800	229000	6180	4080	4080	2.5 3.0	10.9	RA45AL RA45AN
							116000	305000	8240	7150	7150	3.4 4.1		RA45BL RA45BN
53	43.5	60	16×23×20	26.5	30	3000	129000	330000	10200	7060	7060	4.1 4.9	14.6	RA55AL RA55AN
							168000	462000	14300	13600	13600	5.7 6.7		RA55BL RA55BN
63	55	75	18×26×22	31.5	35	3000	210000 288000	504000 756000	19200 28700	12700 28600	12700 28600	9.3 12.2	22.0	RA65AN RA65BN

Roller guide with sliders RA-EM (high load type)
RA-GM (super-high load type)



Model No.	Assembly [mm]			Slider [mm]													Grease fitting [mm]		
						Fixing holes													
	H	*E*	W_2	*W*	*L*	*B*	*J*	J_2	*M*×lead×ℓ	*Q*×ℓ	B_1	L_1	J_1	J_3	*K*	*T*		T_1	*N*
RA15EM	24	4	16	47	70	38	30	26	M5×0.8×8.5(6.5)	4.4×8.5(6.5)	4.5	44.8	7.4	9.4	20	8	M3×0.5	4	3
RA15GM					85.4							60.2	15.1	17.1					
RA20EM	30	5	21.5	63	86.5	53	40	35	M6×1×9.5(8)	5.3×9.5(8)	5	57.5	8.75	11.25	25	10	M3×0.5	4	3
RA20GM					106.3							77.3	18.65	21.15					
RA25EM	36	5	23.5	70	97.5	57	45	40	M8×1.25×10(11)	6.8×10(11)	6.5	65.5	10.25	12.75	31	11	M6×0.75	6	11
RA25GM					115.5							83.5	19.25	21.75					
RA30EM	42	6.5	31	90	110.8	72	52	44	M10×1.5×12(12.5)	8.6×12(12.5)	9	74	11	15	35.5	11	M6×0.75	7	11
RA30GM					135.4							98.6	23.3	27.3					
RA35EM	48	6.5	33	100	123.8	82	62	52	M10×1.5×13(7)	8.6×13(7)	9	83.2	10.6	15.6	41.5	12	M6×0.75	8	11
RA35GM					152							111.4	24.7	29.7					
RA45EM	60	8	37.5	120	154	100	80	60	M12×1.75×15(10.5)	10.5×15(10.5)	10	105.4	12.7	22.7	52	13	Rc1/8	10	14
RA45GM					190							141.4	30.7	40.7					
RA55EM	70	9	43.5	140	184	116	95	70	M14×2×18(13)	12.5×18(13)	12	128	16.5	29	61	15	Rc1/8	11	14
RA55GM					234							178	41.5	54					
RA65EM	90	13	53.5	170	228.4	142	110	82	M16×2×24(18.5)	14.6×24(18.5)	14	155.4	22.7	36.7	77	22	Rc1/8	19	14
RA65GM					302.5							229.5	59.75	73.75					



Rail dimensions [mm]							Basic load rating (N)					Weight		Model No.
					G		Dynamic	Static	Static moment [Nm]			Slider	Rail	
W_1	H_1	F	d×D×h	B_3	(recommended)	L_{0max}	C (N)	C_0 (N)	M_{R0} (N·m)	M_{P0} (N·m)	M_{Y0} (N·m)	(kg)	(kg/m)	
15	16.3	60 (30)	4.5×7.5×5.3	7.5	20	2000	10300 13000	27500 37000	210 350	210 375	210 375	0.21 0.28	1.6	RA15EM RA15GM
20	20.8	60 (30)	6×9.5×8.5	10	20	3000	19200 24000	52500 70000	665 890	505 900	505 900	0.45 0.65	2.6	RA20EM RA20GM
23	24	30	7×11×9	11.5	20	3000	29200 35400	72700 92900	970 1240	760 1240	760 1240	0.8 1.1	3.4	RA25EM RA25GM
28	28	40	9×14×12	14	20	3000	38900 47600	93500 121000	1670 2170	1140 1950	1400 1950	1.3 1.7	4.9	RA30EM RA30GM
34	31	40	9×14×12	17	20	3000	53300 67400	129000 175000	2810 3810	1800 3250	1800 3250	1.7 2.3	6.8	RA35EM RA35GM
45	38	52.5	14×20×17	22.5	22.5	3000	92800 116000	229000 305000	6180 8240	4080 7150	4080 7150	3.2 4.3	10.9	RA45EM RA45GM
53	43.5	60	16×23×20	26.5	30	3000	129000 168000	330000 462000	10200 14300	7060 13600	7060 13600	5.4 7.5	14.6	RA55EM RA55GM
63	55	75	18×26×22	31.5	35	3000	210000 288000	504000 756000	19200 28700	12700 28600	12700 28600	12.2 16.5	22.0	RA65EM RA65GM

LW Series

Main features:

The sliders and the ball tracks are hardened by surface hardening.

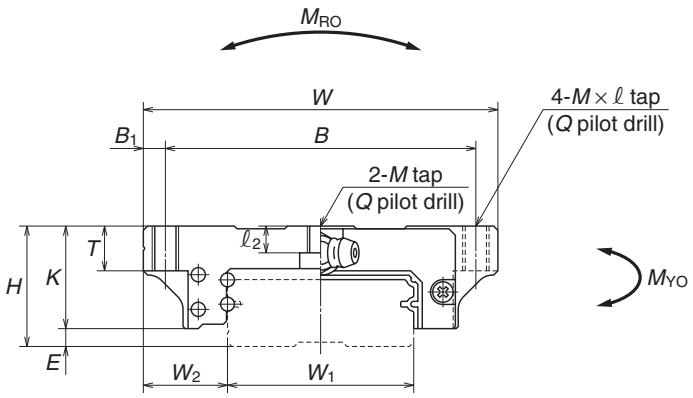
The design of the guide is similar to the LH type, but the width of the rail is over-sized, in order to bear high moment loads in rolling direction.

It is specially suitable for use as single rail, and it is available as interchangeable type for prompt delivery.

LW interchangeable type

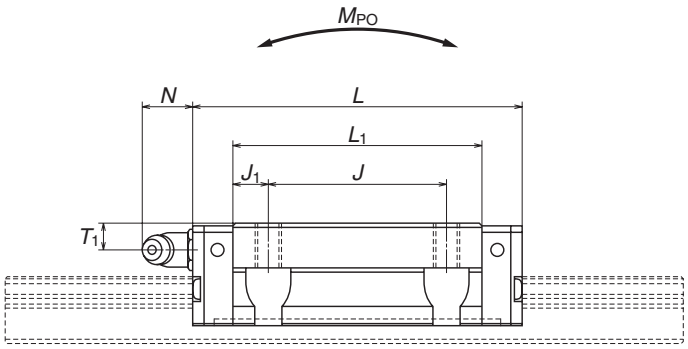
8

Slider ELZ type



Slider mounted on a dummy rail. For dimensions of the rail see pages 76 and 77

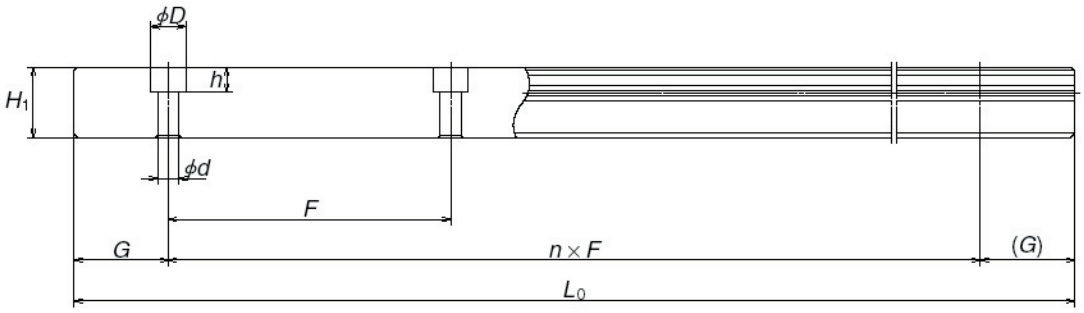
Model-No.	Assembly mm			Slider mm										
	H	E	W_2	W	B	B_1	L	ℓ_2	J	J_1	K	T	M × l	Q
LAW17ELZ	17	2.5	13.5	60	53	3.5	51.4	3.2	26	4.5	14.5	6	M 4 × 6	3.3
LAW21ELZ	21	3	15.5	68	60	4	58.8	3.7	29	6	18	8	M 5 × 8	4.4
LAW27ELZ	27	4	19	80	70	5	74	6	40	8	23	10	M 6 × 10	5.3
LAW35ELZ	35	4	25.5	120	107	6.5	108	9	60	12	31	14	M 8 × 14	6.8
LAW50ELZ	50	4.5	36	162	144	9	140.6	14	80	14	45.5	18	M 10 × 18	8.6



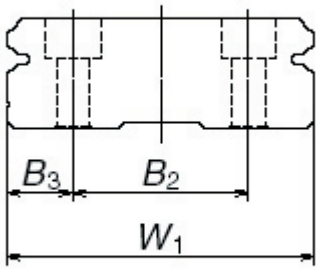
Slider mounted on a dummy rail. For dimensions of the rail see pages 76 and 77

Grease fitting			Basic load rating N		Static moment Nm			Model-No.
	T_1	N	Dynamic C	Static C_0	M_{RO}	M_{PO}	M_{YO}	
Ø 3	4	3	5600	11300	135	44	37	LAW17ELZ
M6 × 0.75	4.5	11	6450	13900	185	66	55	LAW21ELZ
M6 × 0.75	6	11	12800	26900	400	171	143	LAW27ELZ
M6 × 0.75	8	11	33000	66500	1690	645	545	LAW35ELZ
R_c $^1/_8$	14	14	61500	117000	3900	1530	1280	LAW50ELZ

Rail LW Series



Model-No.	Rail dimensions (mm)						
	W_1	H_1	B_2	F	d × D × h	B_3	G (recommended)
L1W17	33	8.7	18	40	4.5 x 7.5 x 5.3	7.5	15
L1W21	37	10.5	22	50	4.5 x 7.5 x 5.3	7.5	15
L1W27	42	15	24	60	4.5 x 7.5 x 5.3	9	20
L1W35	69	19	40	80	7 x 11 x 9	14.5	20
L1W50	90	24	60	80	9 x 14 x 12	15	20



Rail		Model-No.
Max. Lenght $L_{0\ max}$	Weight (kg / m)	
1000	2,1	L1W17
1600	2,9	L1W21
2000	4,7	L1W27
2400	9,6	L1W35
3000	15,8	L1W50

Miniature Series PU and PE

Main features:

PU Series and PE Series
The PU series is a miniature linear guide with the re-circulation way made in resin. This innovative solution allows a weight reduction of the slider a smooth operation, because it is eliminated the metal-to-metal contact in the re-circulation way. For the same reason, the operation of the guide is more silent, and the dust emission is lower. The sealing system was improved, therefore the slider is better protected against the contamination by particles. The PU series can incorporate the lubrication system K1, for long free maintenance periods.

The PE series is similar to the PU series but with oversized wide rail. It allows the guide to bear higher moments in the rolling direction, which makes it suitable for single-rail applications.

PU- and PE Series

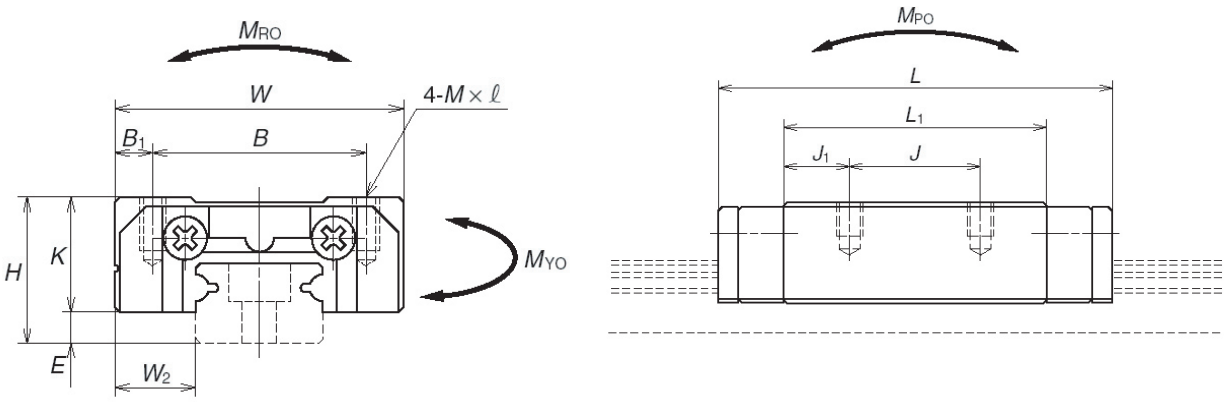
Sizes PU Series
05 TR
07 TR
09 TR
12 TR
15 AL

Sizes PE Series
05 AR
07 TR
09 TR
12 TR
15 AR

LU Series
The LU series is similar to the PU series, but without the resin re-circulation way. Available in size 15, in special high carbon steel.

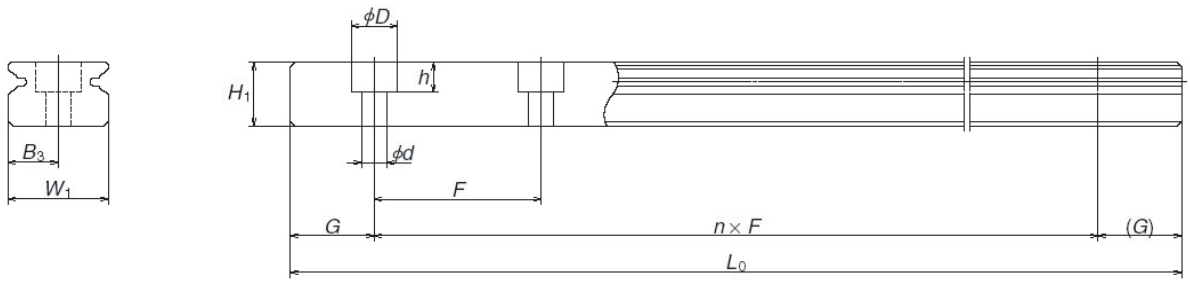
9

Miniature Slider LU Series, size 15



Model No.	Assembly			Slider									Basic load rating (N)		Static moment (N·m)			Ball dia.	Weight
	Height H	E	W_2	Width W	Length L	B	J	M x pitch x l	B_1	L_1	J_1	K	Dynamic C	Static C_0	M_{RO}	M_{PO}	M_{YO}	D_W	Slider (g)
LAU15AL	16	4	8.5	32	43.6	25	20	M3x0.5x4	3.5	27	3.5	12	5550	6600	50	26	26	3.175	70

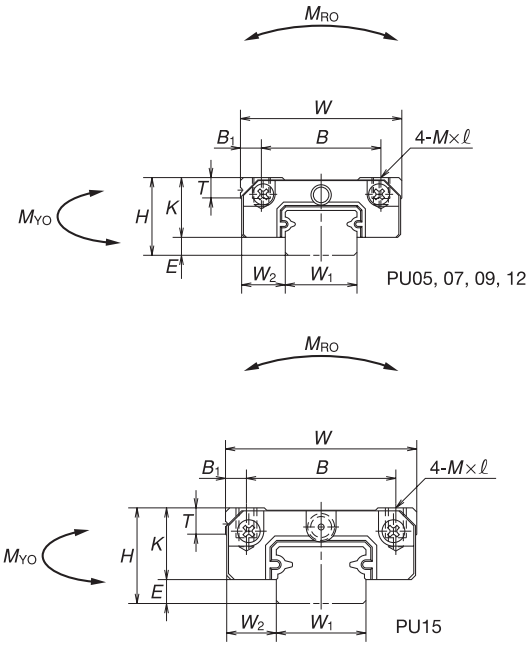
Miniature Rail LU Series, size 15



Model No	Rail								Model No
	Width W_1	Height H_1	Pitch F	Mounting bolt Hole d x D x h	B_3	G (recommended)	Max. length L_{0max}	Weight (g / 100 mm)	
L1U15	**15**	**9.5**	**40**	**3.5x6x4.5**	**7.5**	**15**	**2000**	**105**	**L1U15**

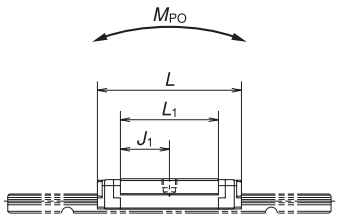
The size LU15AL is available in special high carbon steel (NSK standard)

Miniature linear guide with sliders TR and AL type

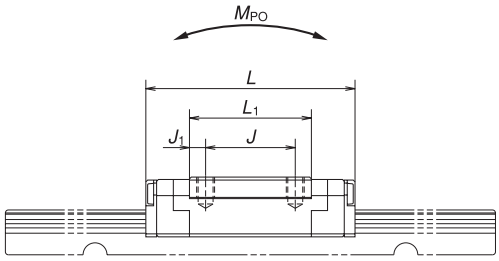


Slider mounted on a dummy rail. For dimensions, see pages 84 and 85

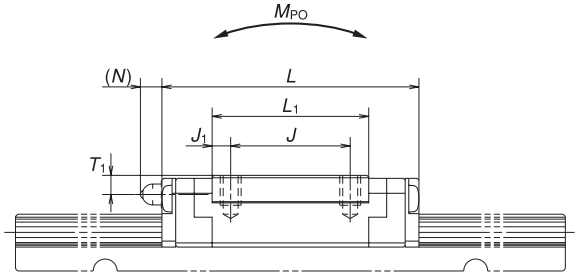
Model-No.	Assembly (mm)			Slider (mm)									
	H	*E*	W_2	*W*	*L*	*B*	*J*	*M*×*Lead*×ℓ	B_1	L_1	J_1	*K*	*T*
PAU05TR	6	1	3.5	12	19.4	8	–	M2×0.4×1.5	2	11.4	5.7	5	2.3
PAU07AR	8	1.5	5	17	23.4	12	8	M2×0.4×2.4	2.5	13.3	2.65	6.5	2.45
PAU09TR	10	2.2	5.5	20	30	15	10	M3×0.5×3	2.5	19.6	4.8	7.8	2.6
PAU12TR	13	3	7.5	27	35	20	15	M3×0.5×3.5	3.5	20.4	2.7	10	3.4
PAU15AL	16	4	8.5	32	43	25	20	M3×0.5×5	3.5	26.2	3.1	12	4.4



PU05



PU07, 09, 12

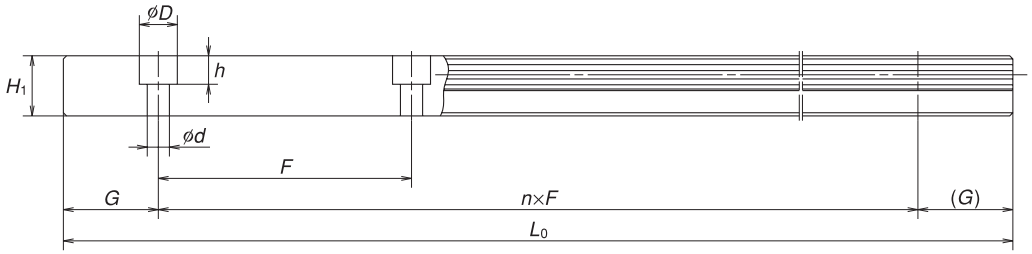


PU15

Slider mounted on a dummy rail. For dimensions, see pages 84 and 85

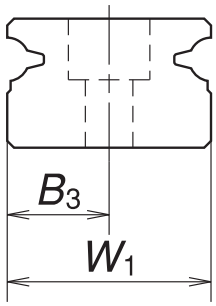
Grease fitting (mm)			Basic load rating (N)		Static moment (N · m)			Ball dia.	Weight		
	T_1	N	Dynamic C	StaticC_0	M_{RO}	M_{PO}	M_{YO}	D_w	Slider (kg)	Rail (kg/m)	Model-No.
–	–	–	520	775	2	1	1	1	3	11	PAU05TR
–	–	–	1 090	1370	5	3	3	1.5875	8	23	PAU07AR
–	–	–	1 490	2150	10	6	6	1.5875	16	35	PAU09TR
–	–	–	2 830	3500	21	11	11	2.3812	32	65	PAU12TR
∅3	3.2	(3.3)	5 550	6600	50	26	26	3.175	59	105	PAU15AL

Rail PU Series



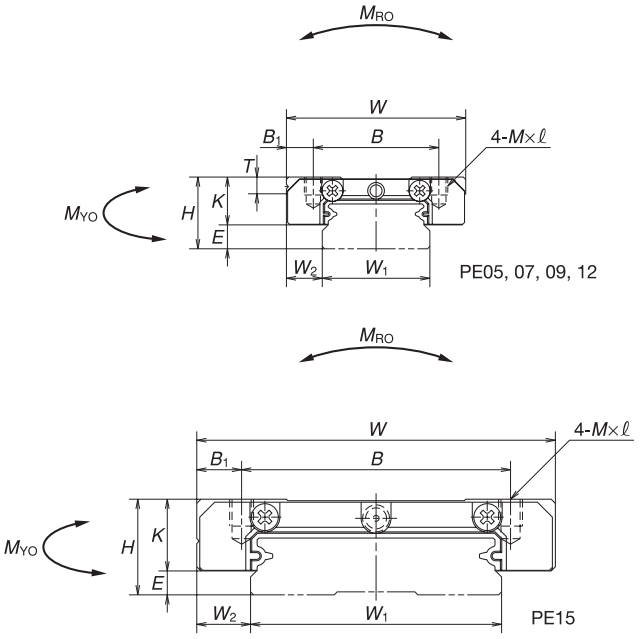
Model-No.	Rail dimensions (mm)					
	W_1	H_1	F	d × D × h	B_3	G (recommended)
P1U05	5	3.2	15	2.3 x 3.3 x 0.8	2.5	5
P1U07	7	4.7	15	2.4 x 4.2 x 2.3	3.5	5
P1U09	9	5.5	20	3.5 x 6 x 4.5	4.5	7.5
P1U12	12	7.5	25	3.5 x 6 x 4.5	6	10
P1U15	15	9.5	40	3.5 x 6 x 4.5	7.5	15

Rail PU Series



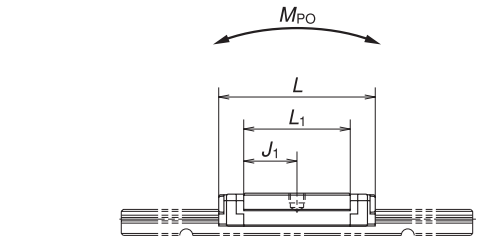
Rail		Model-No.
Max. Lenght $L_{0\ max}$	Weight (g / 100 mm)	
210	11	P1U05
375	23	P1U07
600	35	P1U09
800	65	P1U12
1000	105	P1U15

Miniature wide rail type with sliders AR and TR

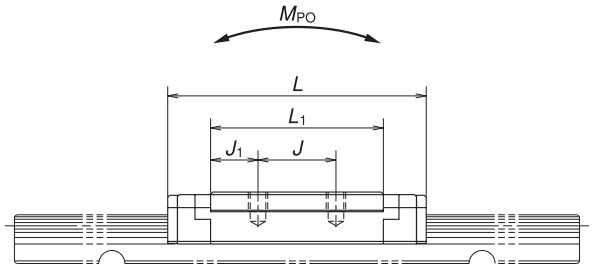


Slider mounted on a dummy rail for dimensions see pages 88 and 89

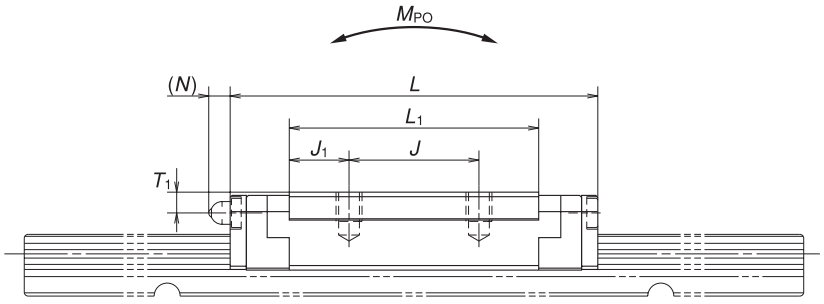
Model-No.	Assembly (mm)			Slider (mm)									
	H	*E*	W_2	*W*	*L*	*B*	*J*	*M*×*Lead*×ℓ	B_1	L_1	J_1	*K*	*T*
PAE05AR	6.5	1.4	3.5	17	24.1	13	–	M2.5×0.45×1.5	2	16.4	8.2	5.1	2.5
PAE07TR	9	2	5.5	25	31.1	19	10	M3×0.5×2.8	3	20.9	5.45	7	3
PAE09TR	12	4	6	30	39.8	21	12	M3×0.5×3	4.5	26.6	7.3	8	2.8
PAE12AR	14	4	8	40	45	28	15	M3×0.5×4	6	31	8	10	3.2
PAE15AR	16	4	9	60	56.6	45	20	M4×0.7×4.5	7.5	38.4	9.2	12	4.1



PE05



PE07, 09, 12

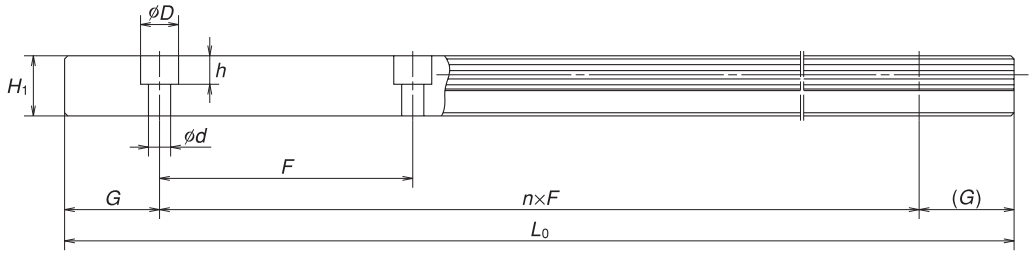


PE15

Slider mounted on a dummy rail for dimensions see pages 88 and 89

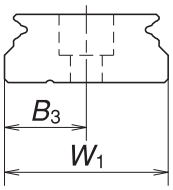
Grease fitting (mm)			Basic load rating (N)		Static moment (N · m)			Ball dia.	Weight		
	T_1	N	Dynamic C	StaticC_0	M_{RO}	M_{PO}	M_{YO}	D_w	Slider (kg)	Rail (kg/m)	Model-No.
–	–	–	690	1160	6	3	3	1	10	34	PAE05AR
–	–	–	1 580	2 350	17	7	7	1.5875	22	55	PAE07TR
–	–	–	3 000	4 500	37	17	17	2	34	95	PAE09TR
–	–	–	4 350	6 350	71	29	29	2.3812	63	140	PAE12AR
∅3	3.2	(3.3)	7 600	10 400	207	59	59	3.175	130	275	PAE15AR

Rail PE Series

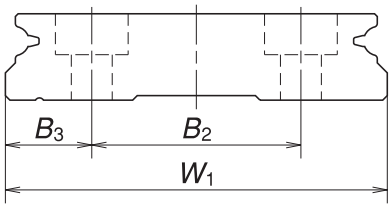


Model-No.	Rail dimensions (mm)						
	W_1	H_1	B_2	F	d × D × h	B_3	G (recommended)
P1E05	10	4	-	20	3 x 5 x 1.6	5	7.5
P1E07	14	5.2	-	30	3.5 x 6 x 3.2	7	10
P1E09	18	7.5	-	30	3.5 x 6 x 4.5	9	10
P1E12	24	8.5	-	40	4.5 x 8 x 4.5	12	15
P1E15	42	9.5	23	40	4.5 x 8 x 4.5	9.5	15

Rail PE Series



PE05, 07, 09, 12



PE15

Rail		Model-No.
Max. Lenght $L_{0\ max}$	Weight (g / 100 mm)	
150	34	P1E05
600	55	P1E07
800	95	P1E09
1000	140	P1E12
1200	275	P1E15

Technical description of Monocarrier

- **Selection**
- **Rigidity**
- **Allowable speed**
- **Life expentancy estimation**
- **Lubrication and maintenance**

10

Technical Description of Monocarrier®

1 Selection of Monocarrier

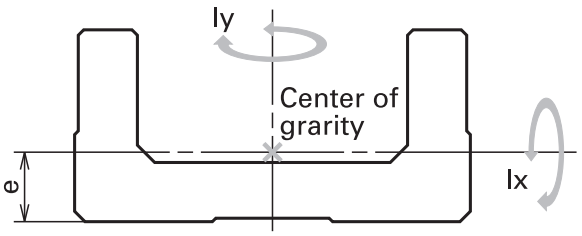
Select a model number of Monocarrier based on stroke, assembly space and rigidity. (Refer to figure on the right and rail rigidity tables below in this page.)

Select a ball screw lead referring to page 93 Allowable Speed" so that the maximum rotational speed does not exceed the limit.

Study the loads to be applied to the linear guide and obtain equivalent load Fe substituting them for Equation (1) or (2) on Page 94. Then calculate life of the linear guide.

Obtain the equivalent load to the ball screw and support unit based on the load conditions, and then calculate life of ball screw and support uint.

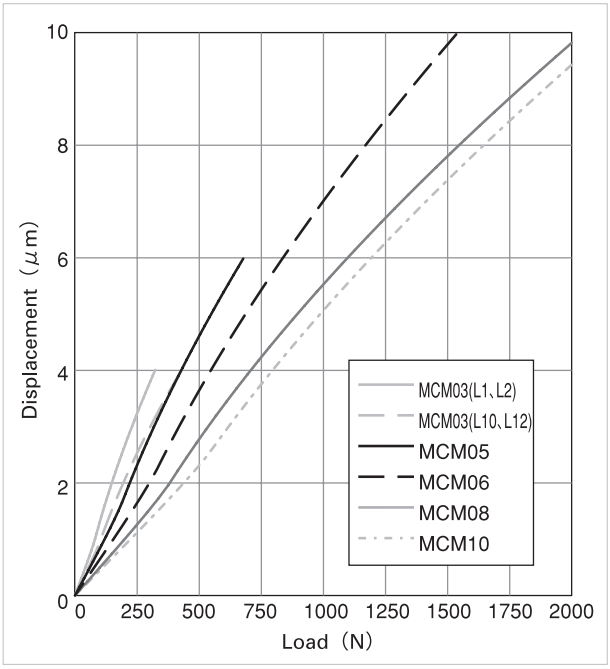
1. 2 Rigidity



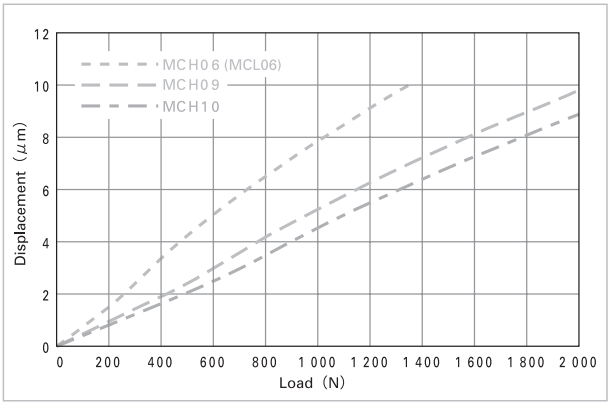
Rigidity of rail

	MCH06	MCL06	MCH09	MCH10
Ix(mm⁴)	6.5×10^{4}	2.58×10^{4}	2.87×10^{5}	5.40×10^{5}
Iy(mm⁴)	3.82×10^{5}	2.96×10^{5}	1.72×10^{6}	3.07×10^{6}
Ip(mm⁴/rad)	2.00×10^{4}	1.71×10^{4}	1.10×10^{5}	1.70×10^{5}
e(mm)	10.8	7.8	15.5	18
W (kg/100mm)	0.67	0.56	1.48	1.93

2 Rigidity



Monocarriers rigidity in radial direction



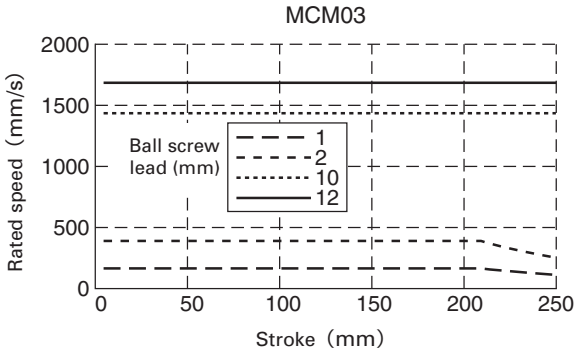
Linear guide section rigidity in radial direction

Rigidity of rail

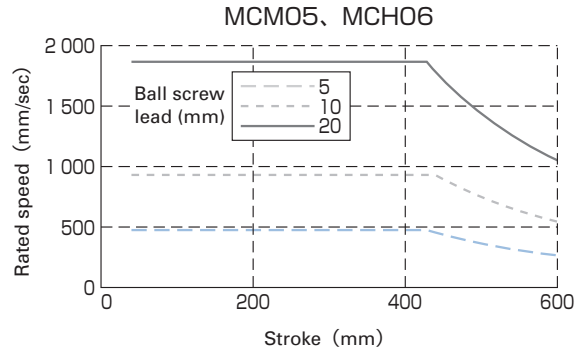
	Geometrical moment of inertia (mm⁴)		Polar of inertia of area (mm⁴)	Center of gravity (mm)	Mass (kg/100m)
	Ix	Iy	Iz	e	w
MCM03	0.30×10^{4}	0.33×10^{4}	0.22×10^{4}	4.5	
MCM05	0.78×10^{4}	1.14×10^{4}	0.53×10^{4}	6.0	
MCM06	2.14×10^{4}	2.61×10^{4}	2.64×10^{4}	7.0	
MCM08	5.90×10^{4}	8.10×10^{4}	5.10×10^{4}	9.2	
MCM10	15.6×10^{4}	21.9×10^{4}	18.4×10^{4}	12.2	
MCH06	6.5×10^{4}	38.2×10^{4}	2.00×10^{4}	10.8	0.67
MCH08	2.58×10^{4}	29.6×10^{4}	1.71×10^{4}	7.8	0.56
MCH09	28.7×10^{4}	172×10^{4}	11.0×10^{4}	15.5	1.48
MCH10	54.0×10^{4}	307×10^{4}	17.0×10^{4}	18	1.73

3 Allowable Speed

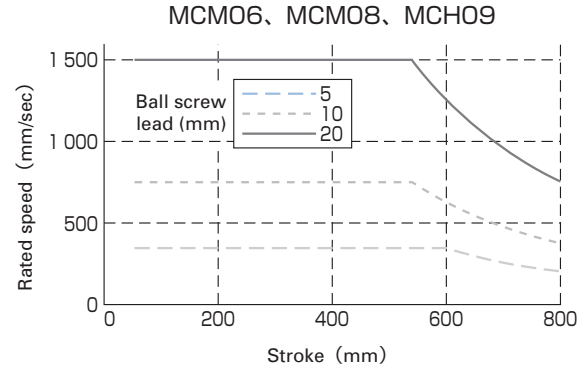
Permissible Rotational speed of MCM 03



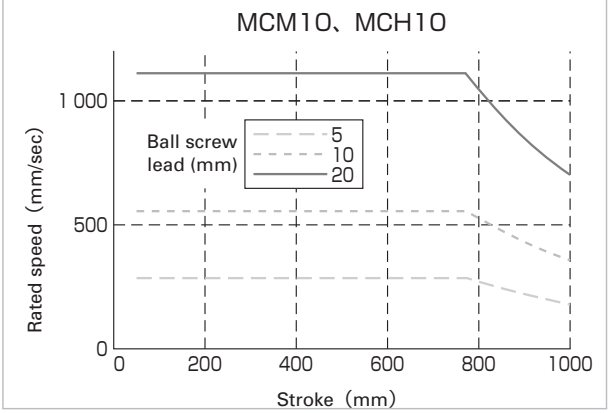
Permissible Rotational speed of MCM 05 and 06



Permissible Rotational speed of MCM 06, 08 and 09



Permissible Rotational speed of MCM 10 and MCH 10



4 Estimation of Life Expectancy

4. 1 Life of Linear Guide

Select the reference number of Monocarrier based on the required stroke, space or other factors. Then, determine the ball screw lead so as to ensure that the operating speed may fall within the range of allowable speed as given in page 87. The allowable speed is to be determined from the allowable rotational speed of ball screw.
The equivalent load (Fe) is determined by substituting the load acting on the linear guide of monocarrier for Eq. (1) (Eq. (2) in case of the tightly coupled double-slider type).

$$Fe=Y_H F_H+Y_V F_V+Y_R \varepsilon_R M_R+Y_P \varepsilon_P M_P+Y_Y \varepsilon_Y M_Y \quad \cdots (1)$$

(In case of the single-slider)

$$Fe=\frac{Y_V F_V}{2}+\frac{Y_H F_H}{2}+Y_R \varepsilon_{Rd} M_R+Y_P \varepsilon_{Pd} M_P+Y_R \varepsilon_{Yd} M_Y \ldots (2)$$

(In case of tightly coupled double-slider)

ε_R, ε_P, ε_Y, ε_{Rd}, ε_{Pd}, ε_{Yd}: Refer to Table "Load constant" on the right
F_V, F_H: Load (N) acting on the slider
M_R, M_P, M_Y: Moment load (N·m) acting on the slider
Y_V, Y_H, Y_R, Y_P, Y^Y : F_V, F_H, $\varepsilon_R M_R$, $\varepsilon_P M_P$, $\varepsilon_Y M_Y$: Among F_V, F_H, $\varepsilon_R M_R$, $\varepsilon_P M_P$, $\varepsilon_Y M_Y$, the maximum load is assumed to be 1.0, and others to be 0.5.

In case when the load acting on the slider may fluctuate (In general, M_P, M_Y may fluctuate with the acceleration/deceleration of slider), the mean effective load is determined by Eq. (3).
Travelling distance L_1 under the equivalent load F_1
Travelling distance L_2 under the equivalent load F_2
⋮ ⋮
Travelling distance L_n under the equivalent load F_n

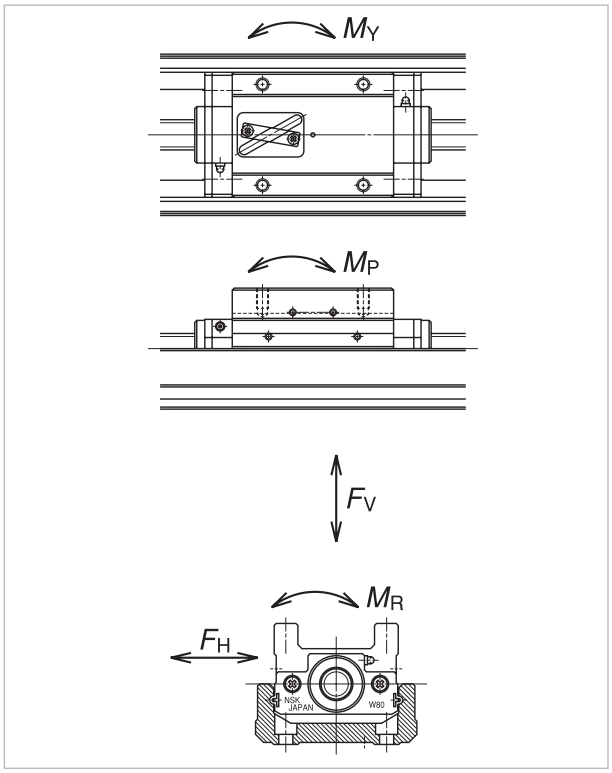
$$Fm=\sqrt[3]{\frac{1}{L}(F^3{}_1 L_1+F^3{}_2 L_2+\ldots+F^3{}_n L_n)} \quad \ldots\ldots\ldots\ldots\ldots (3)$$

Fm: Mean effective load of fluctuating loads
L: Total travelling distance
If the mean effective load thus determined is less than 10% of the basic dynamic load rating of the Monocarrier linear guide, it may have no adverse influence on the life of linear guide.

The life of linear guide is calculated from Eq. (4).

$$L=L_a \times \left[\frac{C}{f_W \cdot Fm}\right]^3 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

L : Life of linear guide (km)
L_a : Rated running distance (km)
C : Basic dynamic load rating (N)
Fm : Mean effective load acting on the linear guide (N)
f_W : Load factor (refer to Table "Values of load factor" in the next page.



Direction of load

Load constant

Figures in parentheses ( ) are load constants in case of the Monocarrier without NSK K1

Model	MCH06	MCH09	MCH10
Lead	5、10、20	5、10、20	10、20
ε_R	48.3 (48.3)	34.5 (32.5)	28.6 (27.8)
ε_P	75.1 (75.1)	47.9 (48.8)	41.0 (45.2)
ε_Y	75.1 (75.1)	47.9 (48.8)	41.0 (45.2)
ε_{Rd}	24.2 (24.2)	17.2 (17.2)	14.3 (14.3)
ε_{Pd}	11.4 (13.2)	8.11 (9.10)	6.98 (7.82)
ε_{Yd}	11.4 (13.2)	8.11 (9.10)	6.98 (7.82)

Value in parenthesis is for a butted double slider.

Load constant

Figures in parentheses ( ) are load constants in case of the Monocarrier without NSK K1

Model	MCM03		MCM05	MCM06	MCM08	MCM10
Lead	1、2	10、12	5、10、20	5、10、20	5、10、20	10、20
ε_R	79.4(79.4)	79.4(79.4)	52.6(52.6)	45.5(45.5)	32.5(32.5)	27.8(27.8)
ε_P	113.9(113.9)	84.2(84.2)	81.3(81.3)	65.1(65.1)	48.8(48.8)	45.2(45.2)
ε_Y	113.9(113.9)	84.2(84.2)	81.3(81.3)	65.1(65.1)	48.8(48.8)	45.2(45.2)
ε_{Rd}	39.7(39.7)	39.7(39.7)	26.3(26.3)	22.7(22.7)	16.3(16.3)	13.9(13.9)
ε_{Pd}	17.1(20.5)	14.2(16.4)	10.4(12.2)	9.7(11.5)	7.6(8.6)	7.1(8.0)
ε_{Yd}	17.1(20.5)	14.2(16.4)	10.4(12.2)	9.7(11.5)	7.6(8.6)	7.1(8.0)

In case when the mean effective load is more than 10% of basic dynamic load rating of the Monocarrier linear guide, the mean effective load on the linear guide is to be calculated again after the following measures are taken:

1. Change from the single-slider type to double-slider type.
2. If the change to double-slider type can not still meet the requirement, use a larger sige Monocarrier.

Values of load factor f_w

Operating conditions	Load Factor f_W
At smooth operation with no mechanical shock	1.0～1.2
At normal operation	1.2～1.5
At operation with mechanical shock and vibrations	1.5～3.0

4. 2 Life of Ball Screw and Support Unit

The mean effective load is determined from the axial loads.
For calculation of the mean effective load, use Eq. (3).
Service life of ball screw, support unit is calculated by Eq. (5).

$$L=\ell \times \left[\frac{C}{f_W \cdot Fm}\right]^3 \quad \cdots\cdots(5)$$

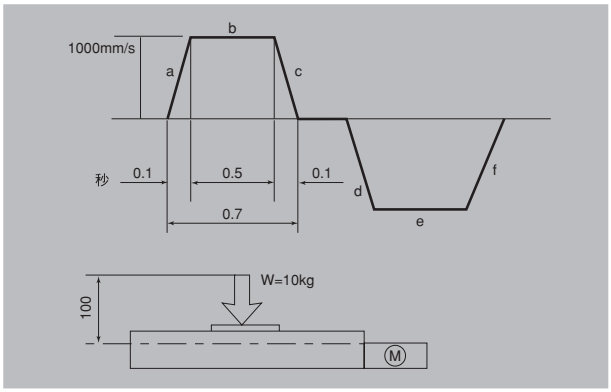
ℓ : Lead of ball screw
L : Life of ball screw, support unit (km)
C : Basic dynamic load rating (N) of the ball screw,support unit
(For the load rating of the support unit, refer to page 114)
Fm : Mean effective load (N) acting on the ball screw, support unit
f_W : Load factor (Refer to Table "Values of load factor f_W")

If the life of ball screw/support unit can not meet the required life, use the Monocarrier of larger size.

Upon calculations as mentioned above, selection of Monocarrier completed.
However, various calculation methods as stated in this section can give only approximate values. For more detailed calculation, particularly in case when the life of linear guide is shorter than the required one, please consult with NSK.

5 Example of Life Estimation

This section offers an example how to estimate the life of Monocarrier based on the life of each component.



1. Use condition

Stroke	: 600 mm
Maximum speed	: 1000 mm/s
Load mass	: 10 kg
Maximum acceleration	: g = 9.8 m/s^2
Setting position	: Horizontal
Operation profile	: See above chart.

2. Selection of model size

2-1. Interim selection

Firstly, select a greater ball screw lead as the maximum speed is 1000 mm/s. The interim selection is MCM0606H20K, a single slider specification that has 20 mm lead ball screw and stroke of 600 mm.

3. Estimation of life

3-1. Linear guide

3-1-1. Fatigue life

Multiply the load constant (Table "Load constant", single slider) to the result of the Equation (1) to convert the load mass to a load force onto the linear guide.

From above operation profile:

i) Constant speed $Fe_1 = Y_H F_V = Y_H W_g = 1 \cdot 10 \cdot 9.8 = 98$N

ii) Accelerating $Fe_2 = Y_H F_V + Y_P \varepsilon_P M_P = 0.5 \cdot 100 \cdot 9.8 + 1 \cdot 48.8 \cdot 0.1 \cdot 100 = 537$N

iii) Decelerating $Fe_3 = Y_H F_V + Y_P \varepsilon_P M_P = 0.5 \cdot 10 \cdot 9.8 + 1 \cdot 48.8 \cdot 0.1 \cdot 100 = 537$N

Mean effective load *Fm*

$$Fm = \sqrt[3]{\frac{1}{L}\left(Fe_1^3 \cdot L_1 + Fe_2^3 \cdot L_2 + Fe_3^3 \cdot L_3\right)}$$

$$= \sqrt[3]{\frac{1}{600}\left(98^3 \cdot 500 + 537^3 \cdot 50 + 537^3 \cdot 50\right)}$$

$$= 299 \text{ N}$$

$$L = \left(\frac{C}{f_w \cdot F_m}\right)^3 \times L_a$$

$$= \left(\frac{15900}{1.2 \cdot 299}\right)^3 \times 20$$

$$= 1.7 \times 10^6 \text{km}$$

3-1-2. Static safety factor

Divide the basic static load rating by the maximum load.

$$F_S = \frac{C_{0a}}{Fe} = \frac{C_{0a}}{Fe_2} = \frac{17000}{299} = 56.8$$

3-2. Ball screw

3-2-1. Fatigue life

Obtain the axial load of each stage of operation referring to the operation profile, then calculate the mean load.

i) Forward/backward stroke at constant speed (b and e in the operation profile above)

$Fe_1 = \mu \cdot W \cdot g = 0.01 \cdot 10 \cdot 9.8 = 0.98$

ii) Forward at acceleration/deceleration (a and f in the operation profile above)

$Fe_2 = Fe_1 + m\alpha = 101$N

iii) Backward at acceleration and deceleration (c and d in the operation profile above)

$Fe_3 = Fe_1 - m\alpha = 99$N

Axial mean effective load *Fm*

$$Fm = \sqrt[3]{\frac{1}{L}\left(Fe_1^3 \cdot L_1 + Fe_2^3 \cdot L_2 + Fe_3^3 \cdot L_3\right)}$$

$$= \sqrt[3]{\frac{1}{600}\left(0.98^3 \cdot 500 + 101^3 \cdot 50 + 99^3 \cdot 50\right)}$$

$$= 55 \text{ N}$$

$$= \left(\frac{C}{f_w \cdot F_m}\right)^3 \times \ell$$

$$= \left(\frac{456}{1.2 \cdot 55}\right)^3 \times 20$$

$$= 6.5 \times 10^6 \text{km}$$

3-2-2. Static safety factor

Divide the basic static load rating by the maximum axial load.

$$F_S = \frac{C_{0a}}{Fe} = \frac{C_{0a}}{Fe_2} = \frac{7750}{101} = 76.7$$

3-2-3. Critical speed

According to the table of allowable speed on page 93, MCM06 with 600 mm stroke is possible to operate under the maximum speed of 1000 mm/s.

3-3. Support unit

3-3-1. Fatigue life

Use the axial mean load Fm = 52N, that is the result of above calculation.

$$L=\left(\frac{C}{fw\cdot Fm}\right)^3=\left(\frac{6550}{1.2\cdot 50}\right)^3=1.65\times10^{12}\ rev$$
$$=2.6\times10^7\ \text{km}$$

3-3-2. Static safety factor
Divide the basic static load rating by the maximum axial load.

$$F_S=\frac{C_{0a}}{Fe}=\frac{C_{0a}}{Fe_2}=\frac{2730}{161}=27.0$$

3.4. Result

MCM06060H20K	Linear guide	Ball screw	Support unit
Fatigue life	1.7× 10^4km	6.5× 10^6km	2.6× 10^7km
Static safety factor	56.8	76.7	27.0

The shortest fatigue life of linear guide among the components must be taken as the life of the Monocarrier. The interim selection of MCM0606H20K, that is chosen based on the use conditions, satisfies the required life.

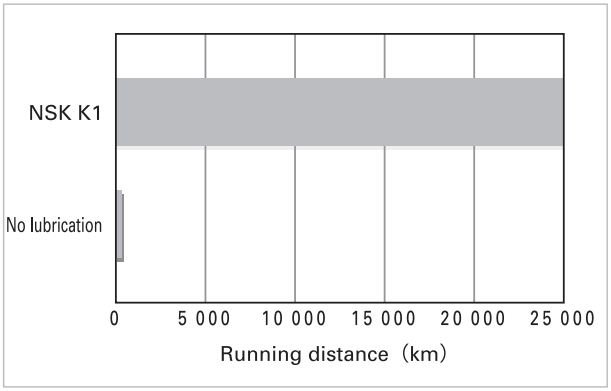
6 NSK K1® Lubrication Unit

NSK K1 lubrication unit exhibits outstanding features, confirmed by abundant experimental data, along with proven performance of linear guides and ball screws that are equipped with NSK K1.

6. 1 High-speed Durability Test of Linear Guides without Lubricant

Results of high-speed durability testing of linear guide without lubricant are shown in Fig. below While the linear guide cannot be operated without lubricant for even short periods without damage, the installation of the NSK K1 permits the linear guide to run over 25,000 km without any problem.

Conditions	Test piece: LH30AN (Preload Z1)
	Speed: 200 m/min
	Stroke: 1800 mm
No lubricant	All grease removed
NSK K1	All grease removed + NSK K1

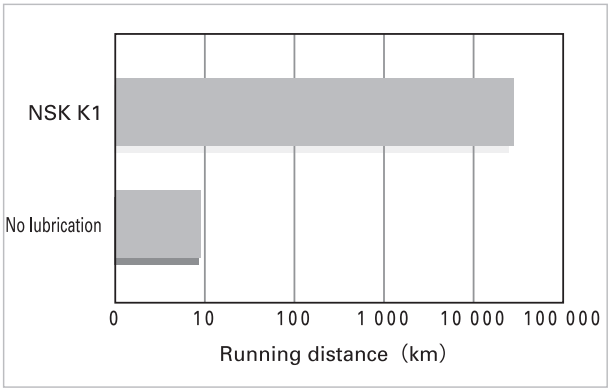


Results of high-speed durability test of linear guides without lubricant

6. 2 High-speed durability test of ball screws without lubricant

Results of high-speed durability testing of ball screw without lubrication are shown in Fig. below While the ball screw cannot be operated without a lubricant at 8.5 km without damage, the installation of the NSK K1 permits the ball screw to run over 21,000 km without any problem.

Conditions	Test piece: RBS2020 (ball screw)
	Shaft diameter: 20 mm
	Lead: 20 mm
	Load: none
	Speed: 4000 rpm (80 m/min)
	Stroke: 600 mm
No lubricant	All grease removed
NSK K1	All grease removed + NSK K1



Results of high-speed durability test of ball screw without lubricant

NSK K1 lubrication unit for food processing is available.

For safety equipment of food processing and medical care, NSK provides the Monocarrier equipped with special NSK K1 lubrication unit that is made of compatible material with FDA regulations.

Dimensions are the same as the standard NSK K1 lubrication unit, and special handling care is not required.

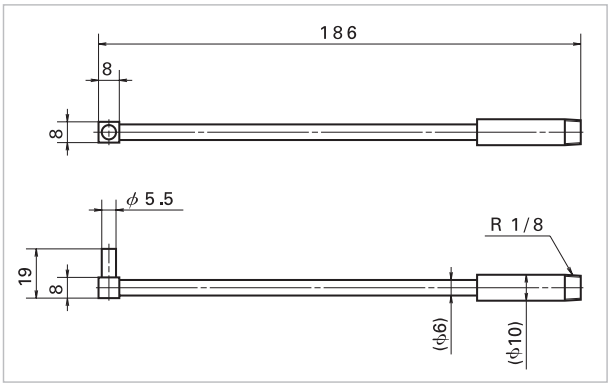
7 Maintenance

1. For standard Monocarrier, we pack AV2 grease in slider, linear guides and ball screw, and PS2 grease for support unit.

2. The Monocarriers equip with NSK K1 lubrication unit as a standard feature, and therefore, you can operate it for 5 years or 10000 km, whichever comes first, without the maintenance. However replenishment of preceded grease may extend its life substantially.

3. NSK K1 lubrication unit demonstrates its effects in environment where oily dust exists. However, the life may be shorter than the case described in the Clause 2 above. In such a case, it requires the measures such as increasing the frequency of replenishment.

4. Nozzle for NSK grease gun exclusive for MCH Monocarrier is available as an option.



F

Precautions for handling

1. Please consult with NSK when the motor is coupled to the ball screw using a pulley because there is a restriction on allowable torque to the end of ball screw shaft.
2. To extend high performance of NSK K1 lubrication unit, please observe the following.

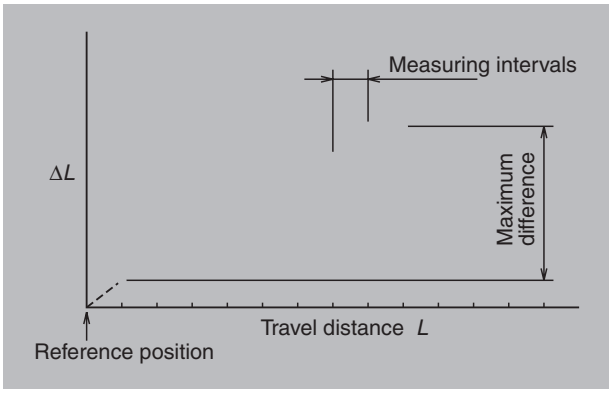
1. Temperature range	Ambient temperature :	50˚C
	Max. instantaneous temperature :	80˚C
2. Use of chemicals	Never leave a Monocarrier in close proximity of grease removing organic solvents such as hexane or thinner. Never immerse it in an antirust solvent that contains kerosene.	

Note: Other oils, such as water-based and oil based cutting oil, and grease (mineral oil based AV2 and ester-based PS2) do not cause any problems.

8 Characteristics and Evaluation Method

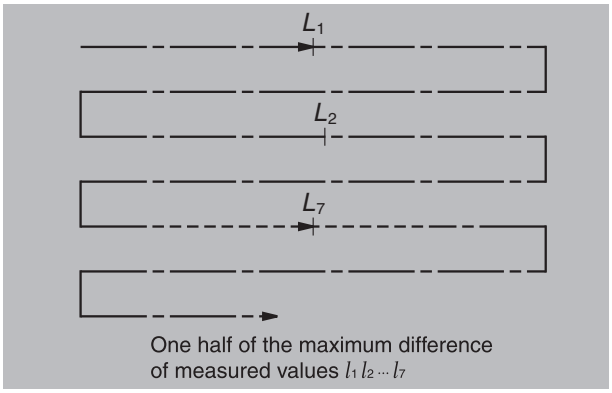
8.1 Positioning Accuracy

Perform positioning successively from the reference position in a specific direction. Measure the difference between the actual and desired travel distances for each point from the reference position. Repeat this measurement seven times to determine the average value. Measure such average value almost over the entire travel distance at the intervals specified for each model and take the maximum difference of the average values determined at respective positions as the measured value.



8.2 Repeatability

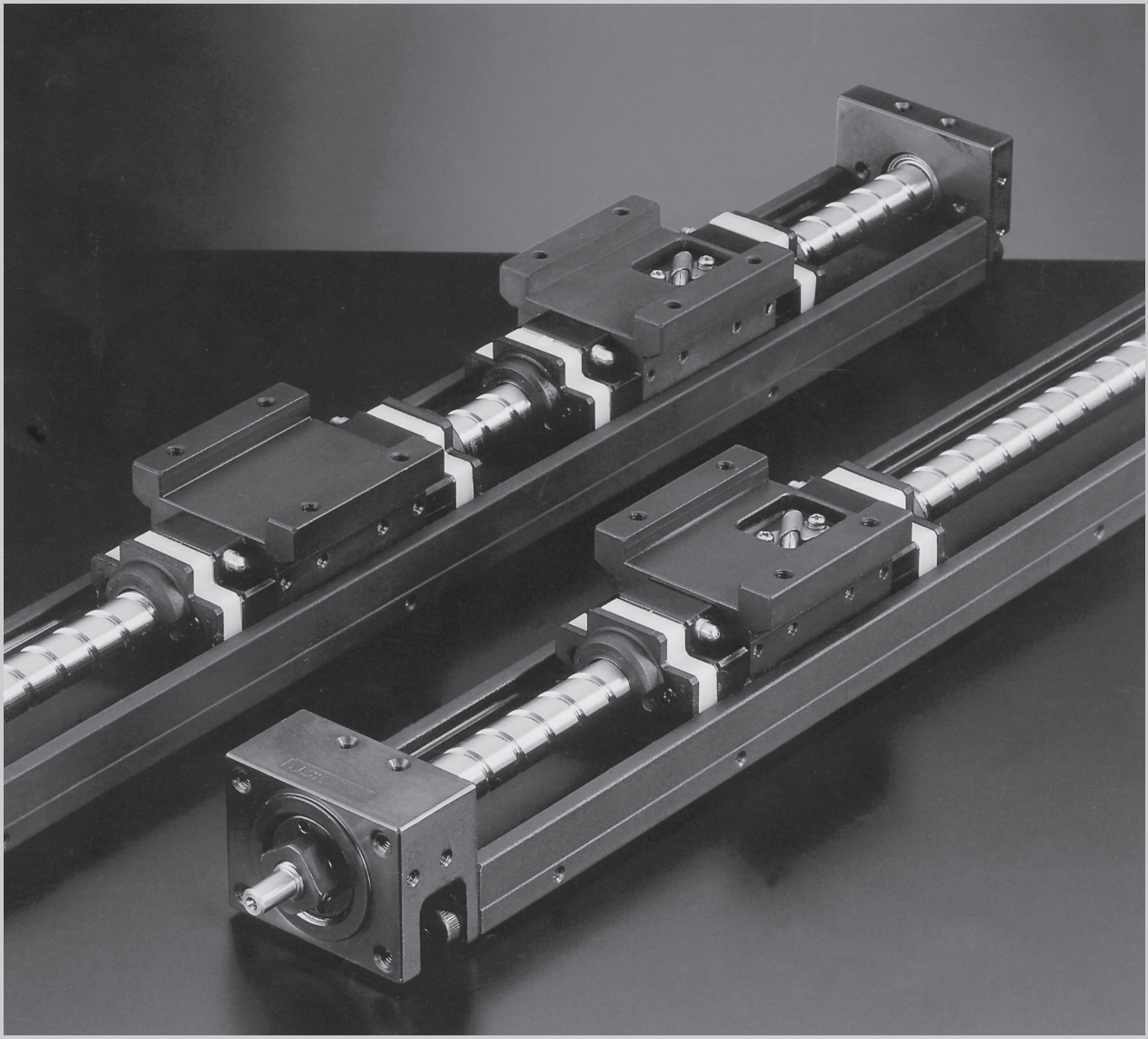
Repeat positioning at any point seven times from the same direction to measure the stopping position and determine one half of the maximum difference of readings. Repeat this measurement almost over the entire travel distance at the intervals specified for each model. Take the maximum difference of the determined values as the measured value. Express one half of the maximum difference with a plus-or-minus (±) sign.



Maintenance-free Series MCM Monocarrier

Main features:

Compact actuator combines ball screws and linear motion bearings. Clean lubricating unit protects the environment while providing low-cost, maintenance-free operation. Equipped with NSK K1® and black chrome plating.



MCM Type Monocarrier®

Reference Number Coding

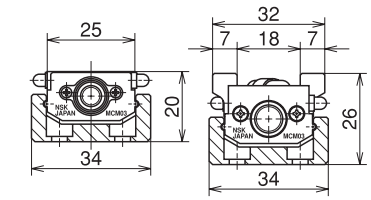
The reference number of Monocarrier Maintenance-free Series describes of main basic specifications.

Sample : **MC M 08 040 H 10 K**

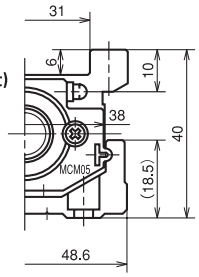
- MC — Monocarrier
- M — Type (M: M type)
- 08 — Nominal size (rail width, Unit: 10 mm)
- 040 — Stroke (Unit: 10 mm)
- H — Accuracy grade [H: High grade, P: Precision grade (made to order)]
- 10 — Ball screw lead (mm)
- K — K: single slider, D: double slider

MCM03
Mass 0.7 kg
(100 mm stroke product)

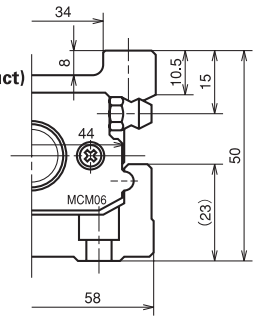
(Lead 1 or 2 mm) (Lead 10 or 12 mm)



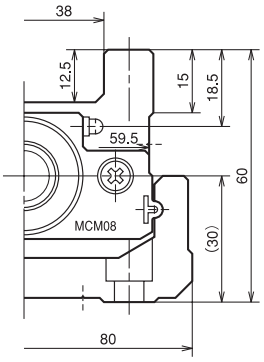
MCM05
Mass 2.7 kg
(400 mm stroke product)



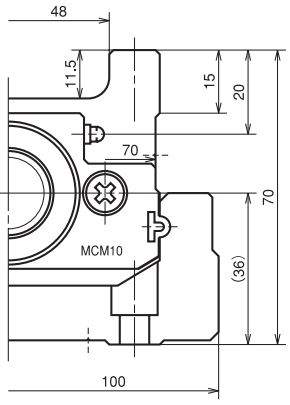
MCM06
Mass 5.2 kg
(400 mm stroke product)



MCM08
Mass 7.4 kg
(400 mm stroke product)



MCM10
Mass 13.0 kg
(400 mm stroke product)



Standard Combination of Stroke and Ball Screw Lead

In order to meet the demand for fast delivery, three types of ball screw lead are available as standard: 5, 10 and 20 mm. The accuracy grade of high grade (H) products are also provided as standard inventory by combination of stroke and lead as shown in the table below. For MCM03, leads of 1, 2, 10 and 12 mm are available.

In order to increase rigidity and load capacity of linear guides, double slider specification with an additional sub-slider, which simply functions as a ball slide of linear guide, are set as standard specification. The table below shows available combinations of model number and stroke. (Double slider specification is not standard for MCM03.)

Stroke and lead of products with a single slider as a standard specification

● mark: standard inventory, ○ mark: made to order Unit: mm

Nominal size	MCM03				MCM05			MCM06			MCM08			MCM10	
Lead / Stroke	1	2	10	12	5	10	20	5	10	20	5	10	20	10	20
50	●	●	—	—	○	●	—	○	○	—	○	—	—	—	—
100	●	●	●	●	○	●	—	●	●	—	○	●	—	—	—
150	○	○	○	○	○	●	—	—	—	—	○	—	—	—	—
200	—	—	●	○	○	●	—	●	●	—	○	●	—	●	—
250	—	—	○	○	—	●	—	—	—	—	—	—	—	—	—
300	—	—	—	—	—	●	●	●	●	●	—	●	●	●	●
400	—	—	—	—	—	●	●	●	●	●	—	●	●	●	●
500	—	—	—	—	—	●	●	○	○	○	—	●	●	○	○
600	—	—	—	—	—	●	○	—	○	○	—	●	○	●	○
700	—	—	—	—	—	—	—	—	●	●	—	○	○	○	○
800	—	—	—	—	—	—	—	—	○	○	—	○	○	●	○
900	—	—	—	—	—	—	—	—	—	—	—	—	—	○	○
1000	—	—	—	—	—	—	—	—	—	—	—	—	—	○	○

Products with a double slider as a standard specification

● mark: made to order Unit: mm

Nominal size	MCM05		MCM06			MCM08		MCM10	
Lead / Stroke	10	20	5	10	20	10	20	10	20
60	○	—	—	—	—	—	—	—	—
70	—	—	—	—	—	—	—	○	—
80	—	—	—	—	—	○	—	—	—
110	○	—	○	○	—	—	—	—	—
160	○	—	—	—	—	—	—	—	—
170	—	—	—	—	—	—	—	○	○
180	—	—	—	—	—	○	○	—	—
210	○	○	○	○	○	—	—	—	—
270	—	—	—	—	—	—	—	○	○
280	—	—	—	—	—	○	○	—	—
310	○	○	○	○	○	—	—	—	—
370	—	—	—	—	—	—	—	○	○
380	—	—	—	—	—	○	○	—	—
410	○	○	○	○	○	—	—	—	—
470	—	—	—	—	—	—	—	○	○
480	—	—	—	—	—	○	○	—	—
510	○	○	—	○	○	—	—	—	—
570	—	—	—	—	—	—	—	○	○
580	—	—	—	—	—	○	○	—	—
610	—	—	—	○	○	—	—	—	—
670	—	—	—	—	—	—	—	○	○
680	—	—	—	—	—	○	○	—	—
710	—	—	—	○	○	—	—	—	—
870	—	—	—	—	—	—	—	○	○

Accuracy Grade

The accuracy grade of Monocarrier standard inventories is high grade(H). Please contact NSK for details on precision grade (P).

Accuracy standard

Unit: μm

Grade	High grade (H)			Precision (P)			
Stroke (mm)	Repeatability	Running parallelism (vertical)	Backlash	Repeatability	Positioning accuracy	Running parallelism (vertical)	Backlash
50	±10	14	20 or less	±3	20	8	3 or less
100							
150							
200							
250							
300		16			25	10	
400							
500		20				12	
600					30		
700		23				15	
800					35		
900							
1000							

NSK evaluation system is adopted.

Basic Load Rating

Basic load rating

	Lead	Shaft dia.	Basic dynamic load rating (N)				Basic static load rating (N)		
	mm	mm	Ball screw	Linear guides*	Support unit	Rated running distance Km	Ball screw	Linear guide*	Support unit
MCM03	1	ϕ 6	735	10900	2670	1	1230	4900	1040
	2	ϕ 6	735	8650	2670	2	1230	4900	1040
	10	ϕ 8	1230	6250	2670	10	1690	6620	1040
	12	ϕ 8	1230	5880	2670	12	1690	6620	1040
MCM05	5	ϕ 12	3760	15600	4400	5	6310	10900	1450
	10	ϕ 12	2260	12400	4400	10	3780	10900	1450
	20	ϕ 12	2260	9850	4400	20	3780	10900	1450
MCM06	5	ϕ 16	7310	25200	6550	5	13500	17000	2730
	10	ϕ 15	7060	20000	6550	10	12700	17000	2730
	20	ϕ 15	4560	15900	6550	20	7750	17000	2730
MCM08	5	ϕ 16	7310	30800	7100	5	13500	22800	3040
	10	ϕ 15	7060	24400	7100	10	12700	22800	3040
	20	ϕ 15	4560	19400	7100	20	7750	22800	3040
MCM10	10	ϕ 20	10900	33500	7600	10	21700	29400	3380
	20	ϕ 20	7060	26600	7600	20	12700	29400	3380

Note
●Basic dynamic and static load ratings indicate the values for one slider. ●Basic dynamic load rating of the linear guide is the load of perpendicular direction to the axis that allows 90% of a group of the same Monocarriers to operate "Rated running distance*" in the table, that is equivalent to 1 million revolutions of the ball screw and the support unit, under the same condition without causing flaking by rolling contact fatigue. ●Basic dynamic load rating of the ball screw is a load to axial direction that allows 90% of ball screws of a group of the same Monocarriers to rotate 1 million revolutions under the same condition without causing flaking by rolling contact fatigue. ●Basic dynamic load rating of the support unit is a constant load to axial direction that allows 90% of support units of the same group of Monocarriers to rotate 1 million revolutions under the same condition without causing flaking by rolling contact fatigue. ●Basic static load rating is a load that results in combined permanent deformations at the contact points of balls and ball grooves of respective parts is 0.01 % of the ball diameter.

Basic static moment load of linear guide

	Lead	Slider	Basic static moment (N•m)		
	mm		Rolling (M_{RO})	Pitching (M_{PO})	Yawing (M_{YO})
MCM03	1、2	Single	68	28	28
	1、2	Double	136	198	198
	10、12	Single	92	51	51
	10、12	Double	184	315	315
MCM05	5、10、20	Single	229	89	89
	5、10、20	Double	455	765	765
MCM06	5、10、20	Single	415	174	174
	5、10、20	Double	825	1220	1220
MCM08	5、10、20	Single	770	300	300
	5、10、20	Double	1540	2050	2050
MCM10	10、20	Single	1170	425	425
	10、20	Double	2340	2940	2940

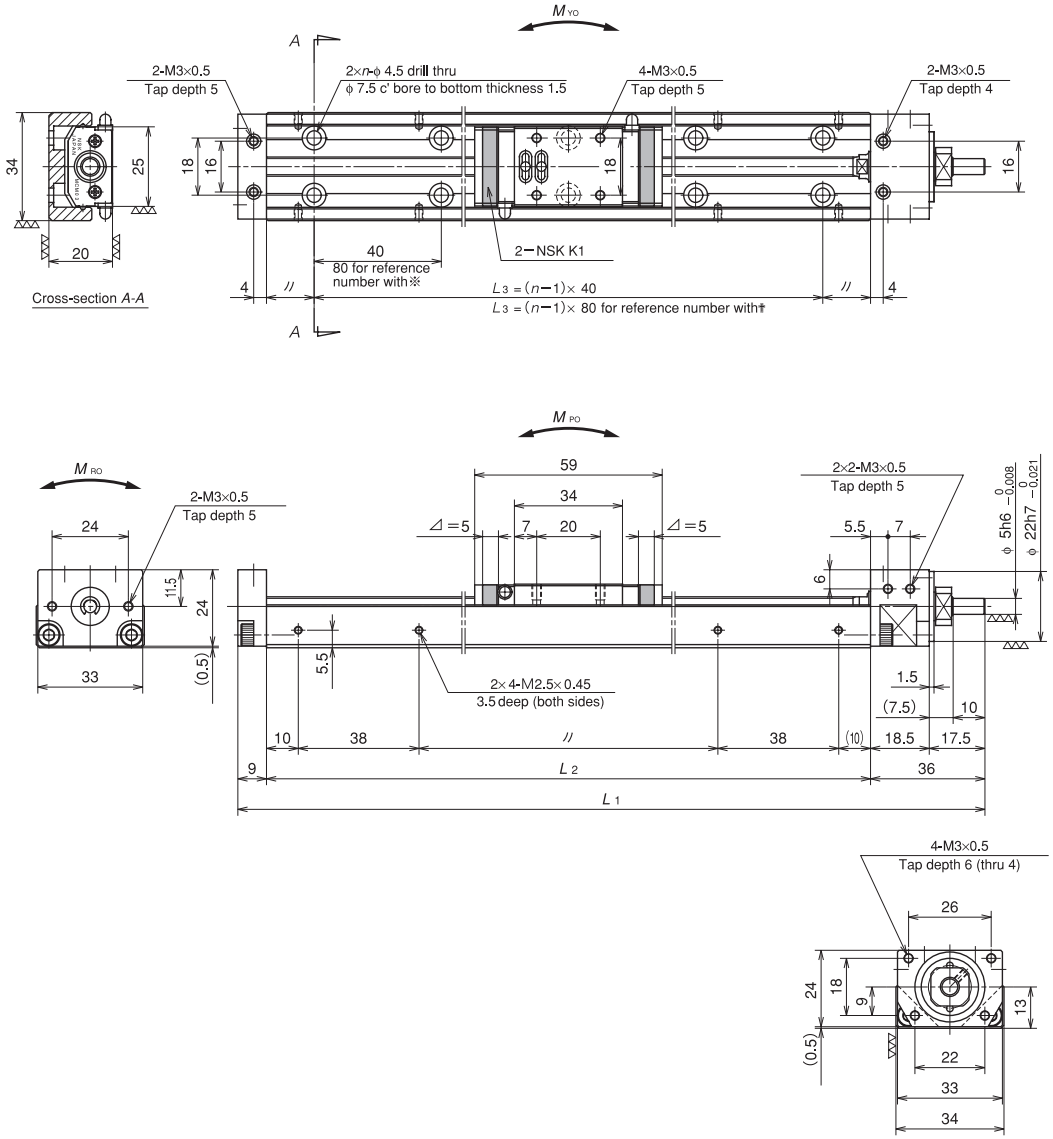
●Basic static moment of double slider is a value when two sliders equipped with NSK K1 are butted against each other.
●The basic static moment is the value when a rolling contact pressure of balls exceeds 4000 N/mm2.
●If you require to apply extremely heavy load, consult NSK for estimation of fatigue life.

Dimensions of Standard Products

Accuracy grade: Precision (P)

MCM03

Ball screw lead 1 and 2



Dimension of MCM03 (Single slider)

Reference number	Nominal stroke (mm)	Stroke limit (mm)	Ball screw lead (mm)	Body length (mm)			No. of mounting holes	Inertia X10⁻⁵(kg·m²)	Mass (kg)
				L_1	L_2	L_3	n		
★ **MCM03005P01K**	50	56	1	160	115	80	2	0.015	0.6
★ **MCM03005P02K**			2					0.016	
★ **MCM03010P01K**	100	131	1	235	190	160	5	0.021	0.7
★ **MCM03010P02K**			2					0.022	
MCM03015P01K	150	181	1	285	240	200	6	0.025	0.8
MCM03015P02K			2					0.026	

Units marked with ★ are standard stock. Others will be made to order.

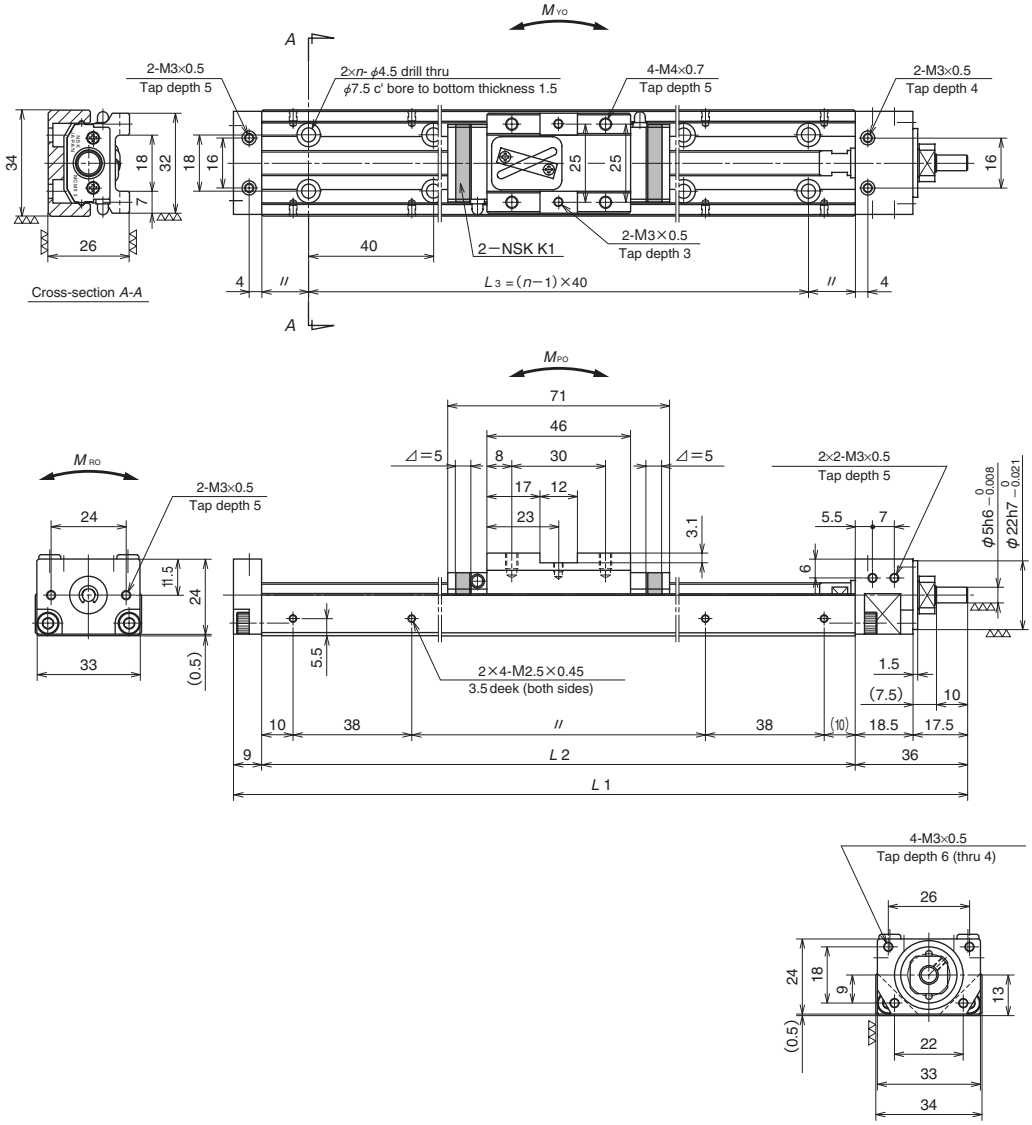
Monocarrier dynamic torque specification (N·cm)		
Ball screw lead (mm)	1	0.2～1.7
	2	

Notes
1. Frictional resistance of NSK K1 is included in the dynamic torque in the table.
2. Grease (Shell AV2) is packed into ball screw and linear guide parts.
3. Consult NSK for life estimates under large moment loads.

MCM03

Accuracy grade: High grade (H)

Ball screw lead 10 and 12



Dimension of MCM03 (Single slider)

Reference number	Nominal stroke (mm)	Stroke limit (mm)	Ball screw lead (mm)	Body length (mm)			No. of mounting holes	Inertia X10⁻⁵(kg·m²)	Mass (kg)
				L_1	L_2	L_3	n		
★ **MCM03010H10K**	100	119	10	235	190	160	5	0.092	0.7
★ **MCM03010H12K**			12					0.109	
MCM03015H10K	150	169	10	285	240	200	6	0.105	0.8
MCM03015H12K			12					0.122	
★ **MCM03020H10K**	200	219	10	335	290	240	7	0.118	0.9
MCM03020H12K			12					0.135	
MCM03025H10K	250	269	10	385	340	280	8	0.131	1.0
MCM03025H12K			12					0.147	

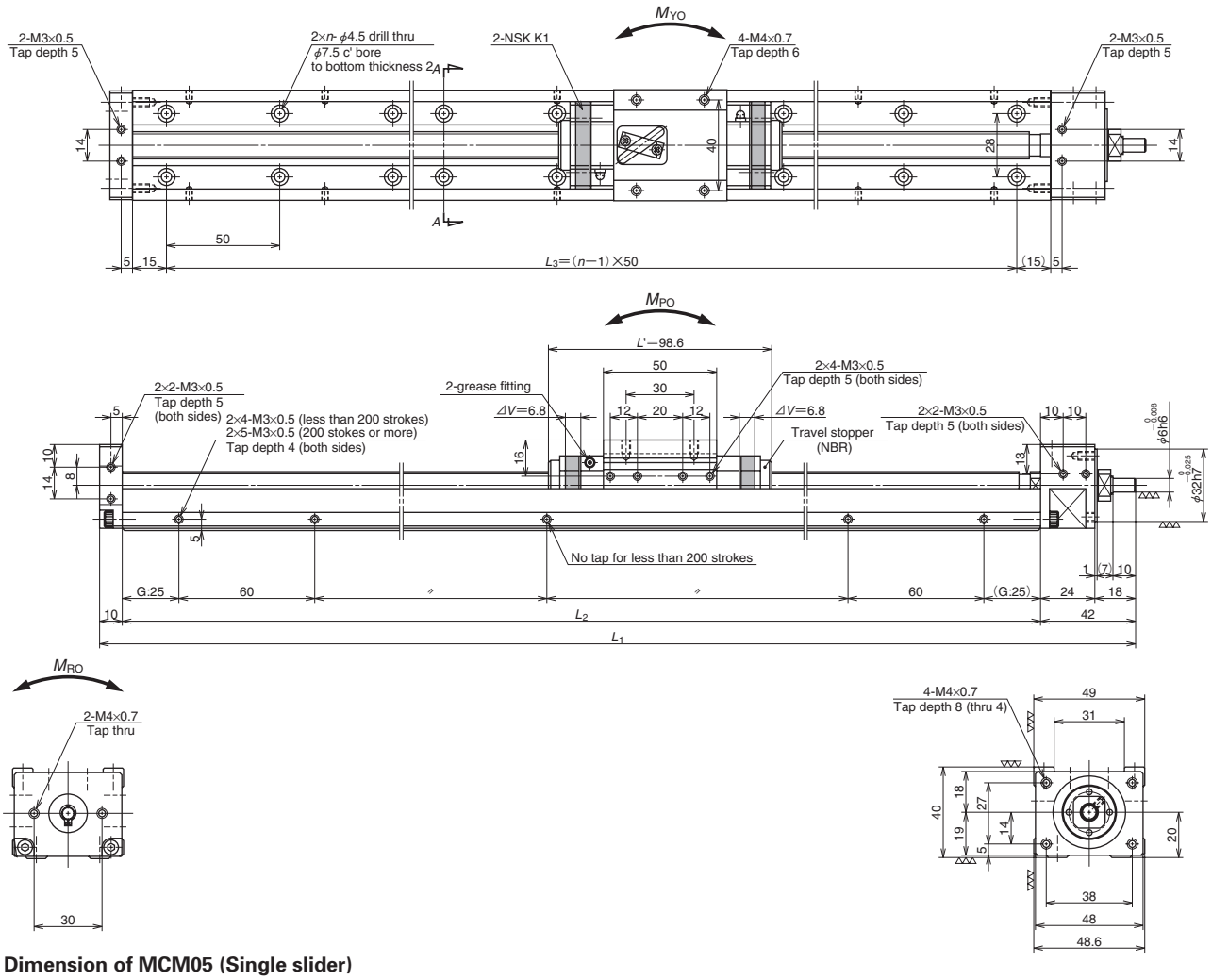
Units marked with ★ are standard stock. Others will be made to order.

Monocarrier dynamic torque specification (N·cm)		
Ball screw lead (mm)	10	0.3〜3.0
	12	

Notes
1. Frictional resistance of NSK K1 is included in the dynamic torque in the table.
2. Grease (Shell AV2) is packed into ball screw and linear guide parts.
3. Consult NSK for life estimates under large moment loads.
4. Stroke limit = stroke + (9.5 [margin] × 2)

MCM05

Accuracy grade: High grade (H)



Dimension of MCM05 (Single slider)

Reference number	Nominal stroke (mm)	Stroke limit (mm)	Ball screw lead (mm)	Body length (mm)			No. of mounting holes	Inertia $X10^{-4}$(kg·m²)	Mass (kg)
				L_1	L_2	L_3	n		
※MCM05005H05K	50	80	5	232	180	150	4	0.025	1.4
★※MCM05005H10K			10					0.035	
MCM05010H05K	100	130	5	282	230	200	5	0.031	1.6
★ MCM05010H10K			10					0.040	
MCM05015H05K	150	180	5	332	280	250	6	0.036	1.8
★ MCM05015H10K			10					0.046	
MCM05020H05K	200	230	5	382	330	300	7	0.042	2.0
★ MCM05020H10K			10					0.051	
★ MCM05025H10K	250	280	10	432	380	350	8	0.057	2.2
★ MCM05030H10K	300	330	10	482	430	400	9	0.063	2.3
★ MCM05030H20K			20					0.101	
★ MCM05040H10K	400	430	10	582	530	500	11	0.074	2.7
★ MCM05040H20K			20					0.112	
★ MCM05050H10K	500	530	10	682	630	600	13	0.085	3.1
★ MCM05050H20K			20					0.123	
★ MCM05060H10K	600	630	10	782	730	700	15	0.096	3.5
MCM05060H20K			20					0.134	

Dimension G is 15 for those marked with ※.

Units marked with ★ are standard stock. Others will be made to order.

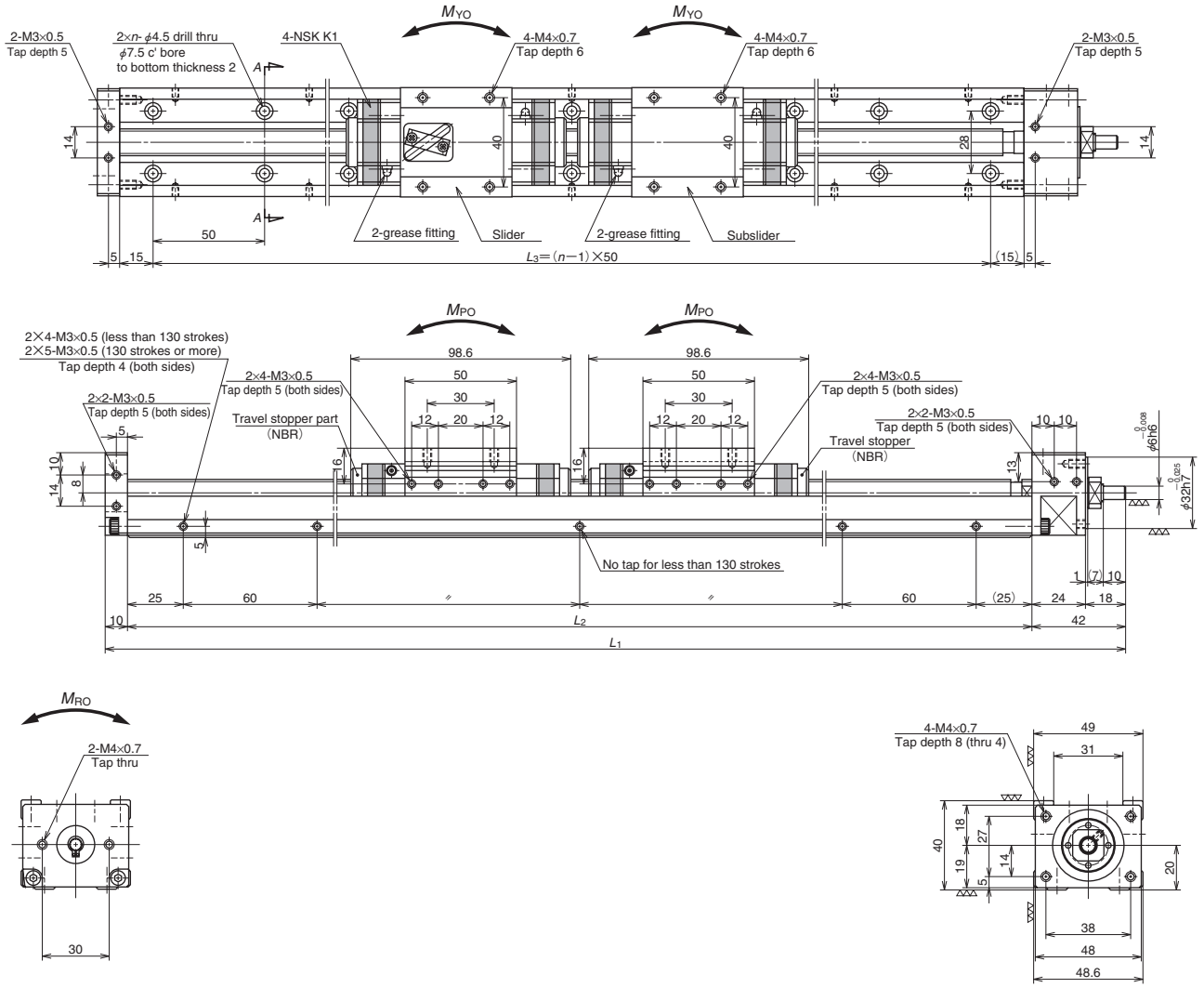
Monocarrier dynamic torque specification (N·cm)		
Ball screw lead (mm)	5	1.0～4.8
	10	1.1～5.8
	20	1.6～7.9

Notes

1. Frictional resistance of NSK K1 is included in the dynamic torque in the table.
2. Grease (Shell AV2) is packed into ball screw and linear guide parts.
3. Consult NSK for life estimates under large moment loads.
4. Stroke limit = stroke + (15 [margin] × 2)

MCM05

Accuracy grade: High grade (H)



Dimension of MCM05 (Double slider)

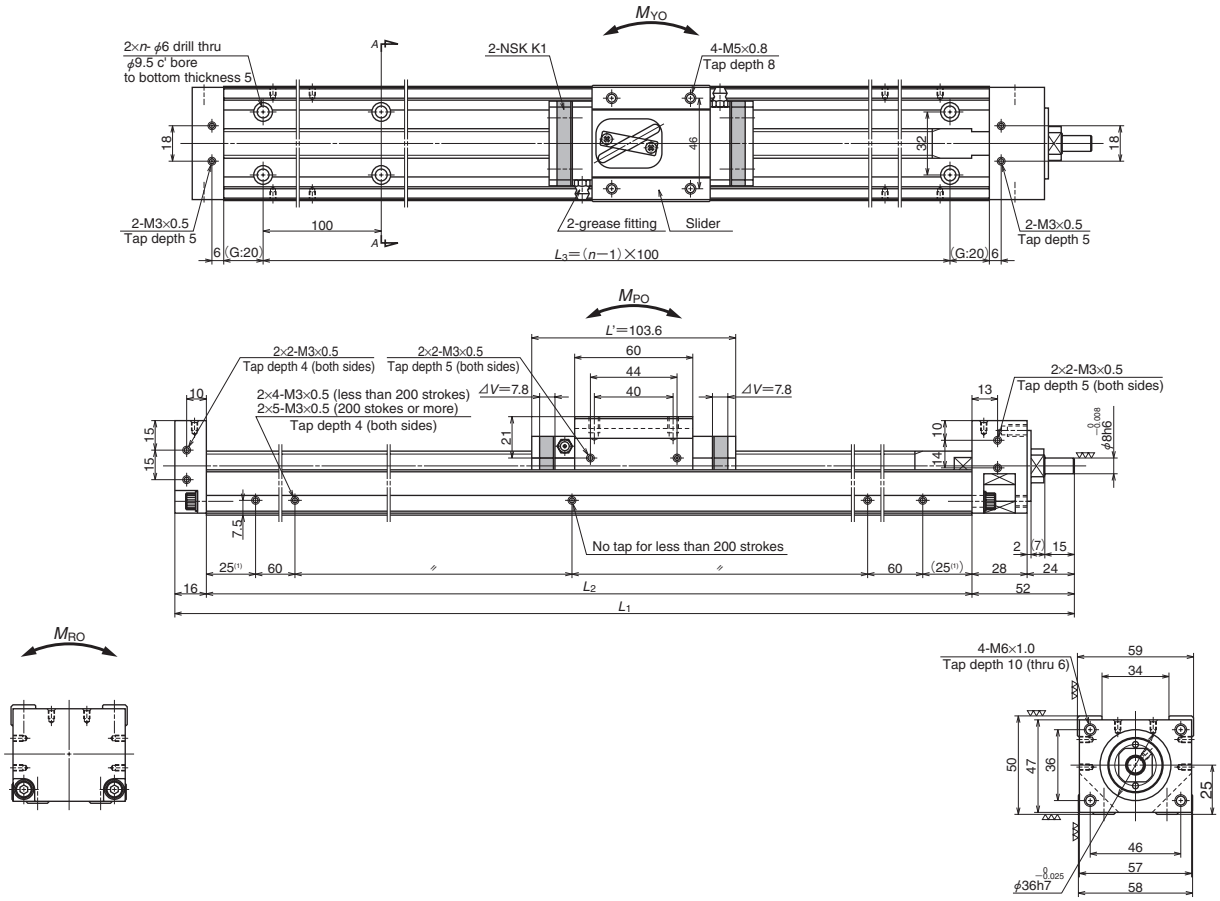
Reference number	Nominal stroke (mm)	Ball screw lead (mm)	Body length (mm)			No. of mounting holes	Inertia X10^{-4}(kg·m^2)	Mass (kg)
			L_1	L_2	L_3	n		
MCM05006H10D	60	10	332	280	250	6	0.058	2.3
MCM05011H10D	110	10	382	330	300	7	0.064	2.5
MCM05016H10D	160	10	432	380	350	8	0.070	2.7
MCM05021H10D	210	10	482	430	400	9	0.075	2.8
MCM05021H20D		20					0.151	
MCM05031H10D	310	10	582	530	500	11	0.086	3.2
MCM05031H20D		20					0.162	
MCM05041H10D	410	10	682	630	600	13	0.098	3.6
MCM05041H20D		20					0.174	
MCM05051H10D	510	10	782	730	700	15	0.109	4.2
MCM05051H20D		20					0.185	

Monocarrier dynamic torque specification (N·cm)		
Ball screw lead (mm)	10	1.5～ 7.6
	20	2.3～11.8

Notes
1. Frictional resistance of NSK K1 is included in the dynamic torque in the table.
2. Grease (Shell AV2) is packed into ball screw and linear guide parts.
3. Consult NSK for life estimates under large moment loads.
4. Stroke limit = stroke + (11.4 [margin] × 2)

MCM06

Accuracy grade: High grade (H)



Dimension of MCM06 (Single slider)

Reference number	Nominal stroke (mm)	Stroke limit (mm)	Ball screw lead (mm)	Body length (mm) L_1	L_2	L_3	No. of mounting holes n	Inertia X10^{-4}(kg·m^2)	Mass (kg)
※MCM06005H05K	50	85	5	258	190	100	2	0.083	2.7
※MCM06005H10K			10					0.077	
★ MCM06010H05K	100	135	5	308	240	200	3	0.103	3.0
★ MCM06010H10K			10					0.092	
★ MCM06020H05K	200	235	5	408	340	300	4	0.142	3.8
★ MCM06020H10K			10					0.121	
★ MCM06030H05K	300	335	5	508	440	400	5	0.180	4.5
★ MCM06030H10K			10					0.150	
★ MCM06030H20K			20					0.196	
★ MCM06040H05K	400	435	5	608	540	500	6	0.219	5.2
★ MCM06040H10K			10					0.180	
★ MCM06040H20K			20					0.225	
MCM06050H05K	500	535	5	708	640	600	7	0.258	6.0
MCM06050H10K			10					0.209	
MCM06050H20K			20					0.255	
MCM06060H10K	600	635	10	808	740	700	8	0.239	6.7
MCM06060H20K			20					0.284	
★ MCM06070H10K	700	735	10	908	840	800	9	0.268	7.4
★ MCM06070H20K			20					0.314	
MCM06080H10K	800	835	10	1008	940	900	10	0.298	8.1
MCM06080H20K			20					0.343	

Dimension G is 45 and 25[1] is 15 for those marked with ※.

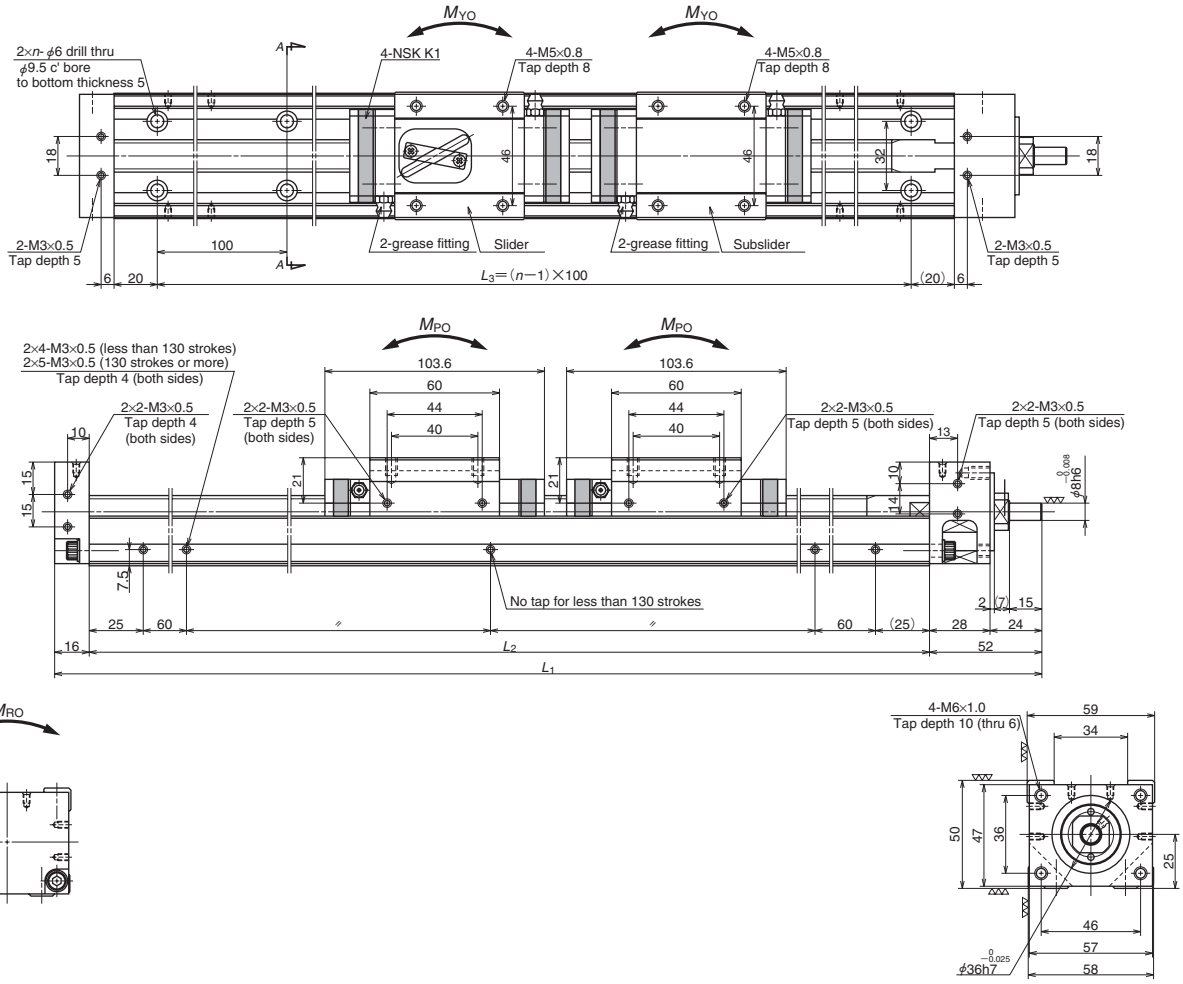
Units marked with ★ are standard stock. Others will be made to order.

Monocarrier dynamic torque specification (N·cm)		
Ball screw lead (mm)	5	1.9～ 7.4
	10	2.2～ 8.6
	20	2.8～11.0

Notes
1. Frictional resistance of NSK K1 is included in the dynamic torque in the table.
2. Grease (Shell AV2) is packed into ball screw and linear guide parts.
3. Consult NSK for life estimates under large moment loads.
4. Stroke limit = stroke + (17.5 [margin] × 2)

MCM06

Accuracy grade: High grade (H)



Dimension of MCM06 (Double slider)

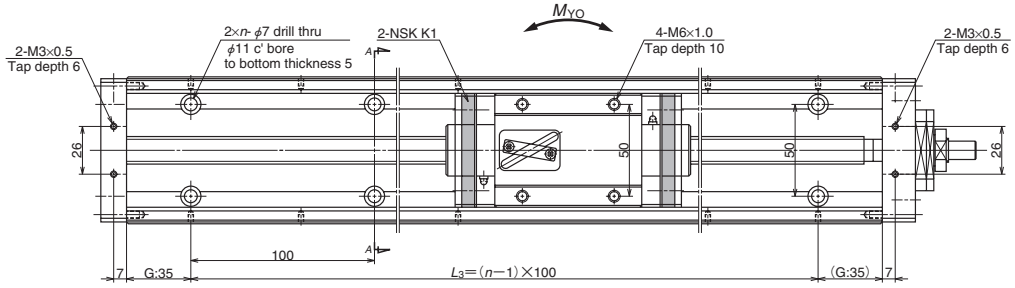
Reference number	Nominal stroke (mm)	Ball screw lead (mm)	Body length (mm)			No. of mounting holes	Inertia X10^{-4}(kg·m^2)	Mass (kg)
			L_1	L_2	L_3	n		
MCM06011H05D	110	5	408	340	300	4	0.145	4.4
MCM06011H10D		10					0.136	
MCM06021H05D	210	5	508	440	400	5	0.184	5.1
MCM06021H10D		10					0.166	
MCM06021H20D		20					0.257	
MCM06031H05D	310	5	608	540	500	6	0.223	5.8
MCM06031H10D		10					0.195	
MCM06031H20D		20					0.286	
MCM06041H05D	410	5	708	640	600	7	0.262	6.6
MCM06041H10D		10					0.224	
MCM06041H20D		20					0.316	
MCM06051H10D	510	10	808	740	700	8	0.254	7.3
MCM06051H20D		20					0.345	
MCM06061H10D	610	10	908	840	800	9	0.283	8.0
MCM06061H20D		20					0.375	
MCM06071H10D	710	10	1008	940	900	10	0.313	8.7
MCM06071H20D		20					0.404	

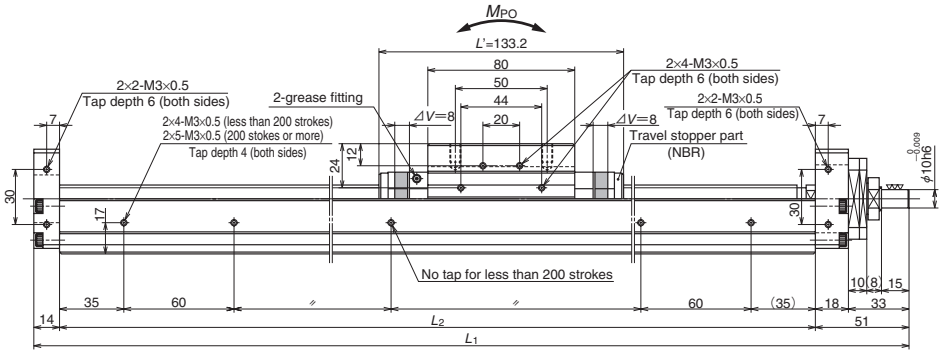
Monocarrier dynamic torque specification (N·cm)		
Ball screw lead (mm)	5	2.3～ 8.5
	10	2.7～10.9
	20	4.0～15.9

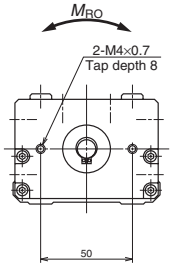
Notes
1. Frictional resistance of NSK K1 is included in the dynamic torque in the table.
2. Grease (Shell AV2) is packed into ball screw and linear guide parts.
3. Consult NSK for life estimates under large moment loads.
4. Stroke limit = stroke + (11.4 [margin] × 2)

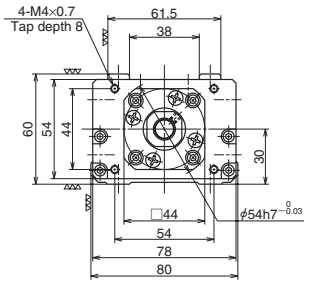
MCM08

Accuracy grade: High grade (H)









Dimension of MCM08 (Single slider)

Reference number	Nominal stroke (mm)	Stroke limit (mm)	Ball screw lead (mm)	Body length (mm)			No. of mounting holes	Inertia X10⁻⁴(kg·m²)	Mass (kg)
				L_1	L_2	L_3	n		
※MCM08005H05K	50	85	5	285	220	100	2	0.101	4.1
MCM08010H05K	100	135	5	335	270	200	3	0.120	4.6
★ MCM08010H10K			10					0.114	
※MCM08015H05K	150	185	5	385	320	200	3	0.139	5.1
MCM08020H05K	200	235	5	435	370	300	4	0.159	5.5
★ MCM08020H10K			10					0.144	
★ MCM08030H10K	300	335	10	535	470	400	5	0.173	6.5
★ MCM08030H20K			20					0.249	
★ MCM08040H10K	400	435	10	635	570	500	6	0.203	7.4
★ MCM08040H20K			20					0.279	
★ MCM08050H10K	500	535	10	735	670	600	7	0.232	8.4
★ MCM08050H20K			20					0.308	
★ MCM08060H10K	600	635	10	835	770	700	8	0.262	9.3
MCM08060H20K			20					0.338	
MCM08070H10K	700	735	10	935	870	800	9	0.291	10.5
MCM08070H20K			20					0.367	
MCM08080H10K	800	835	10	1035	970	900	10	0.320	11.2
MCM08080H20K			20					0.396	

Dimension G is 60 for those marked with ※.

Units marked with ★ are standard stock. Others will be made to order.

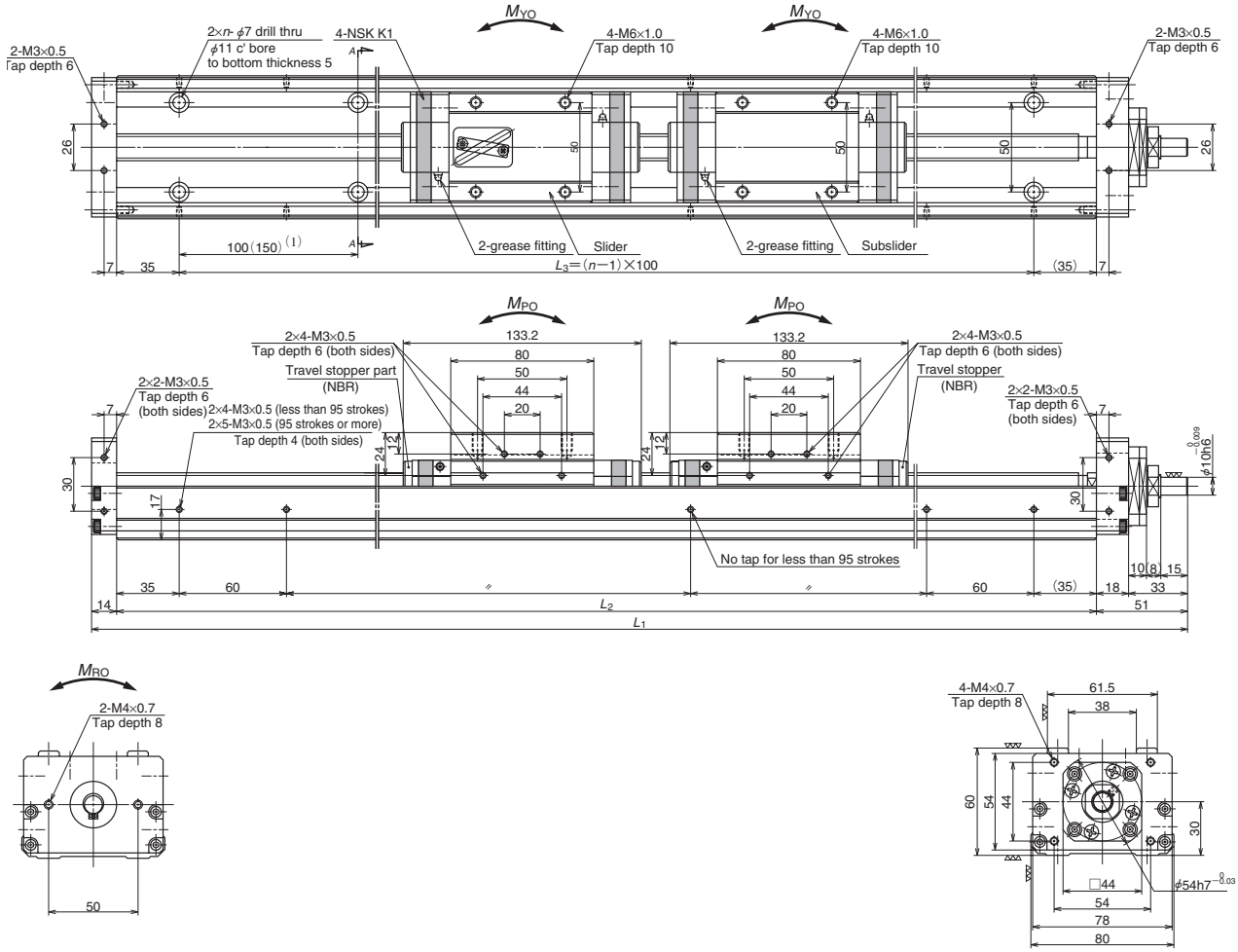
Monocarrier dynamic torque specification (N·cm)		
Ball screw lead (mm)	5	1.0～ 5.9
	10	2.0～ 7.8
	20	2.0～10.8

Notes

1. Frictional resistance of NSK K1 is included in the dynamic torque in the table.
2. Grease (Shell AV2) is packed into ball screw and linear guide parts.
3. Consult NSK for life estimates under large moment loads.
4. Stroke limit = stroke + (17.5 [margin] × 2)

MCM08

Accuracy grade: High grade (H)



Dimension of MCM08 (Double slider)

Reference number	Nominal stroke (mm)	Ball screw lead (mm)	Body length (mm)			No. of mounting holes	Inertia X10^{-4}(kg·m^2)	Mass (kg)
			L_1	L_2	L_3	n		
●**MCM08008H10D**	80	10	435	370	300	3	0.169	6.5
MCM08018H10D	180	10	535	470	400	5	0.199	7.5
MCM08018H20D		20					0.351	
MCM08028H10D	280	10	635	570	500	6	0.228	8.4
MCM08028H20D		20					0.380	
MCM08038H10D	380	10	735	670	600	7	0.257	9.4
MCM08038H20D		20					0.409	
MCM08048H10D	480	10	835	770	700	8	0.287	10.3
MCM08048H20D		20					0.439	
MCM08058H10D	580	10	935	870	800	9	0.316	11.5
MCM08058H20D		20					0.468	
MCM08068H10D	680	10	1035	970	900	10	0.346	12.2
MCM08068H20D		20					0.498	

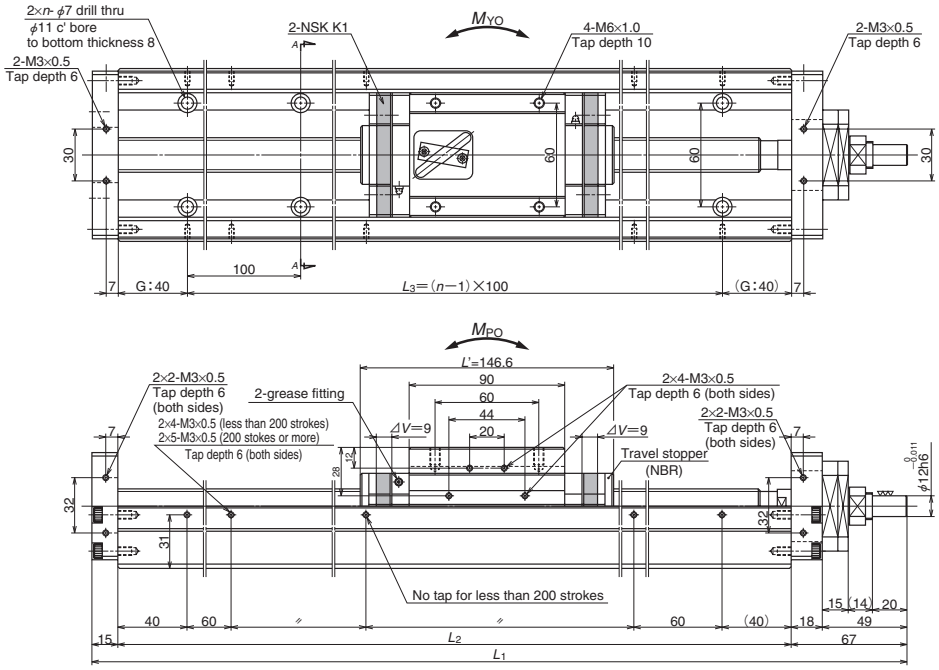
For an item marked by ●, dimension of (1) in above drawing is 150 mm.

Monocarrier dynamic torque specification (N·cm)		
Ball screw lead (mm)	10	2.5～10.8
	20	4.0～17.2

Notes
1. Frictional resistance of NSK K1 is included in the dynamic torque in the table.
2. Grease (Shell AV2) is packed into ball screw and linear guide parts.
3. Consult NSK for life estimates under large moment loads.
4. Stroke limit = stroke + (11.8 [margin] × 2)

MCM10

Accuracy grade: High grade (H)



Dimension of MCM10 (Single slider)

Reference number	Nominal stroke (mm)	Stroke limit (mm)	Ball screw lead (mm)	Body length (mm)			No. of mounting holes	Inertia X10⁻⁴(kg·m²)	Mass (kg)
				L_1	L_2	L_3	n		
★ **MCM10020H10K**	200	230	10	462	380	300	4	0.425	9.5
★ **MCM10030H10K**	300	330	10	562	480	400	5	0.519	11.2
★ **MCM10030H20K**			20					0.633	
★ **MCM10040H10K**	400	430	10	662	580	500	6	0.612	13.0
★ **MCM10040H20K**			20					0.726	
MCM10050H10K	500	530	10	762	680	600	7	0.706	14.6
MCM10050H20K			20					0.820	
★ **MCM10060H10K**	600	630	10	862	780	700	8	0.800	16.3
MCM10060H20K			20					0.914	
MCM10070H10K	700	730	10	962	880	800	9	0.893	18.0
MCM10070H20K			20					1.007	
★ **MCM10080H10K**	800	830	10	1062	980	900	10	0.987	19.7
MCM10080H20K			20					1.101	
MCM10090H10K	900	930	10	1162	1080	1000	11	1.081	21.4
MCM10090H20K			20					1.195	
※**MCM10100H10K**	1000	1030	10	1262	1180	1000	11	1.174	23.1
※**MCM10100H20K**			20					1.288	

Dimension G is 90 for those marked with ※.

Units marked with ★ are standard stock. Others will be made to order.

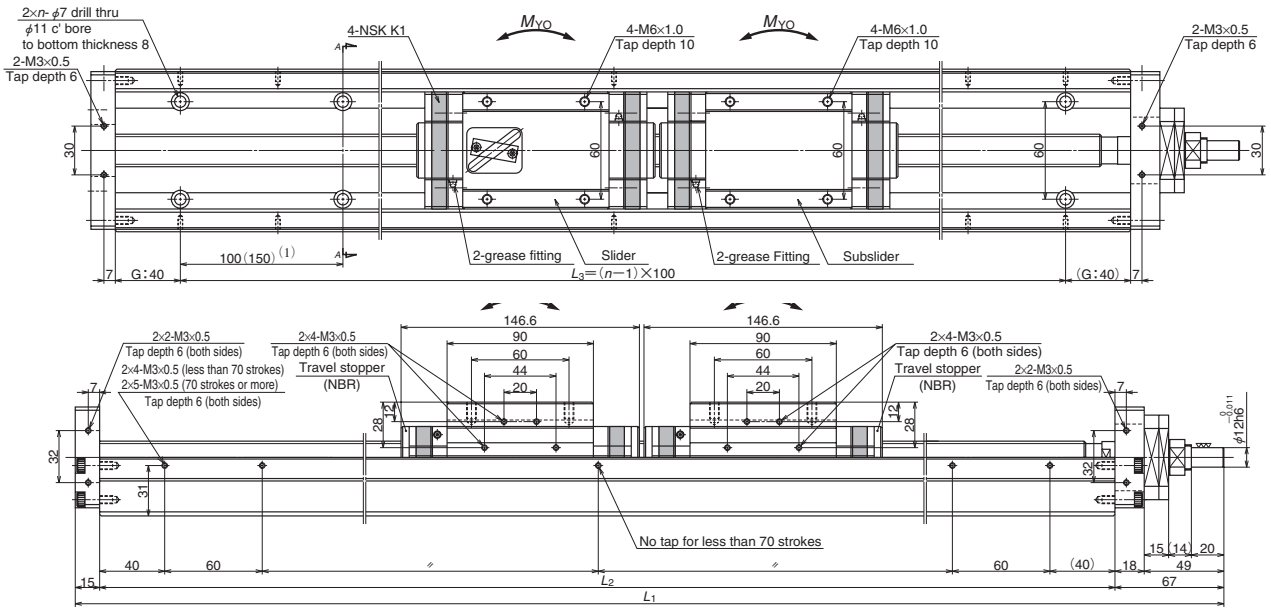
Monocarrier dynamic torque specification (N·cm)		
Ball screw lead (mm)	10	1.5～ 7.6
	20	2.3～11.8

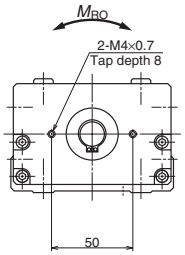
Notes

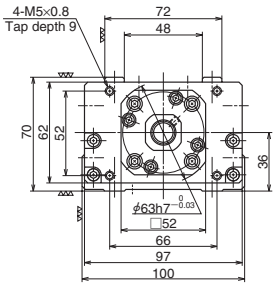
1. Frictional resistance of NSK K1 is included in the dynamic torque in the table.
2. Grease (Shell AV2) is packed into ball screw and linear guide parts.
3. Consult NSK for life estimates under large moment loads.
4. Stroke limit = stroke + (15 [margin] × 2)

MCM10

Accuracy grade: High grade (H)







Dimension of MCM10 (Double slider)

Reference number	Nominal stroke (mm)	Ball screw lead (mm)	Body length (mm)			No. of mounting holes	Inertia X10^{-4}(kg·m^2)	Mass (kg)
			L_1	L_2	L_3	n		
●**MCM10007H10D**	70	10	462	380	300	3	0.463	11.0
MCM10017H10D	170	10	562	480	400	5	0.557	12.7
MCM10017H20D		20					0.785	
MCM10027H10D	270	10	662	580	500	6	0.650	13.4
MCM10027H20D		20					0.878	
MCM10037H10D	370	10	762	680	600	7	0.744	15.1
MCM10037H20D		20					0.972	
MCM10047H10D	470	10	862	780	700	8	0.838	17.8
MCM10047H20D		20					1.066	
MCM10057H10D	570	10	962	880	800	9	0.931	19.5
MCM10057H20D		20					1.159	
MCM10067H10D	670	10	1062	980	900	10	1.025	21.2
MCM10067H20D		20					1.253	
※**MCM10087H10D**	870	10	1262	1180	1000	11	1.212	23.6
※**MCM10087H20D**		20					1.440	

Dimension G is 90 for those marked with ※.

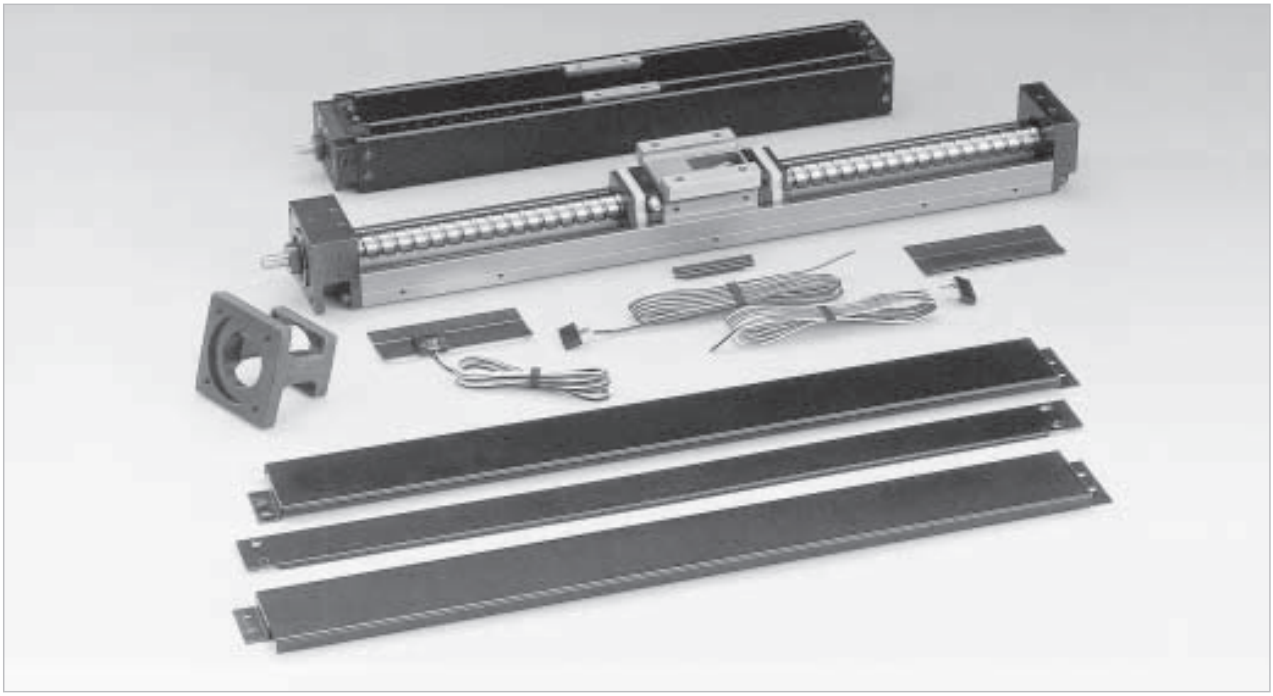
For an item marked by ●, dimension of (1) in above drawing is 150 mm.

Monocarrier dynamic torque specification (N·cm)		
Ball screw lead (mm)	10	4.2〜15.6
	20	5.0〜19.6

Notes

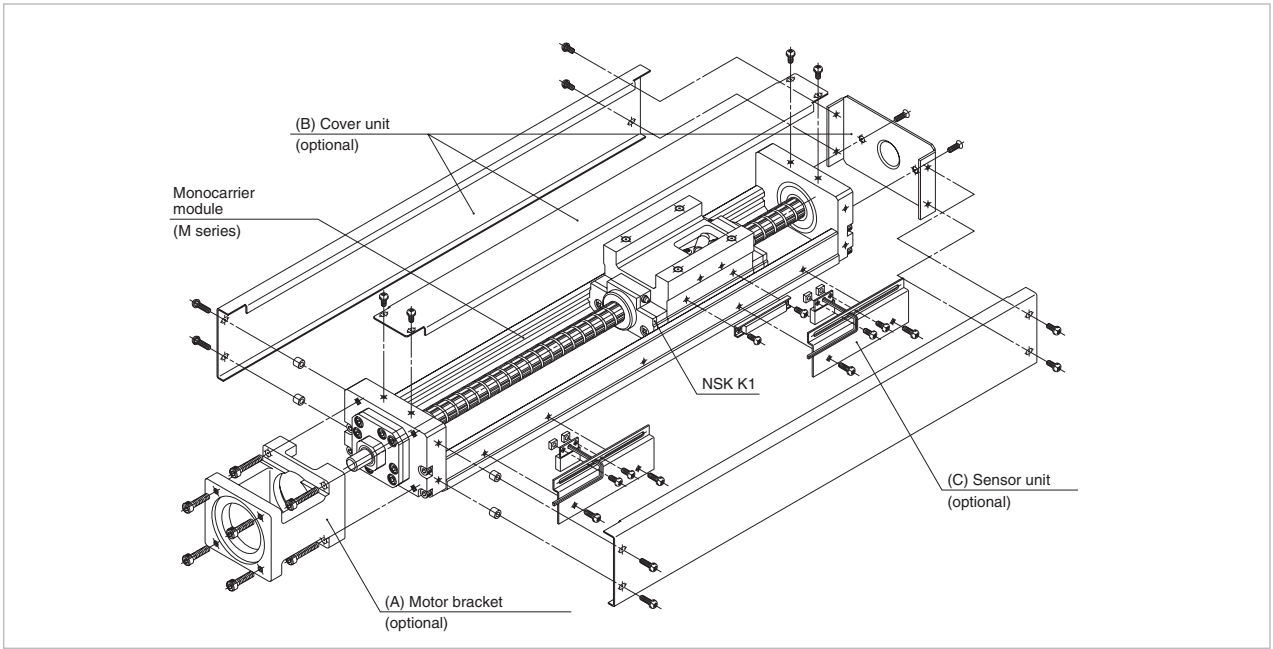
1. Frictional resistance of NSK K1 is included in the dynamic torque in the table.
2. Grease (Shell AV2) is packed into ball screw and linear guide parts.
3. Consult NSK for life estimates under large moment loads.
4. Stroke limit = stroke + (8.4 [margin] × 2)

Optional Components



Optional components

MCM Monocarrier offers optional parts as standard stock.
Optional components are sold separately from the main unit. Please contact NSK for details.



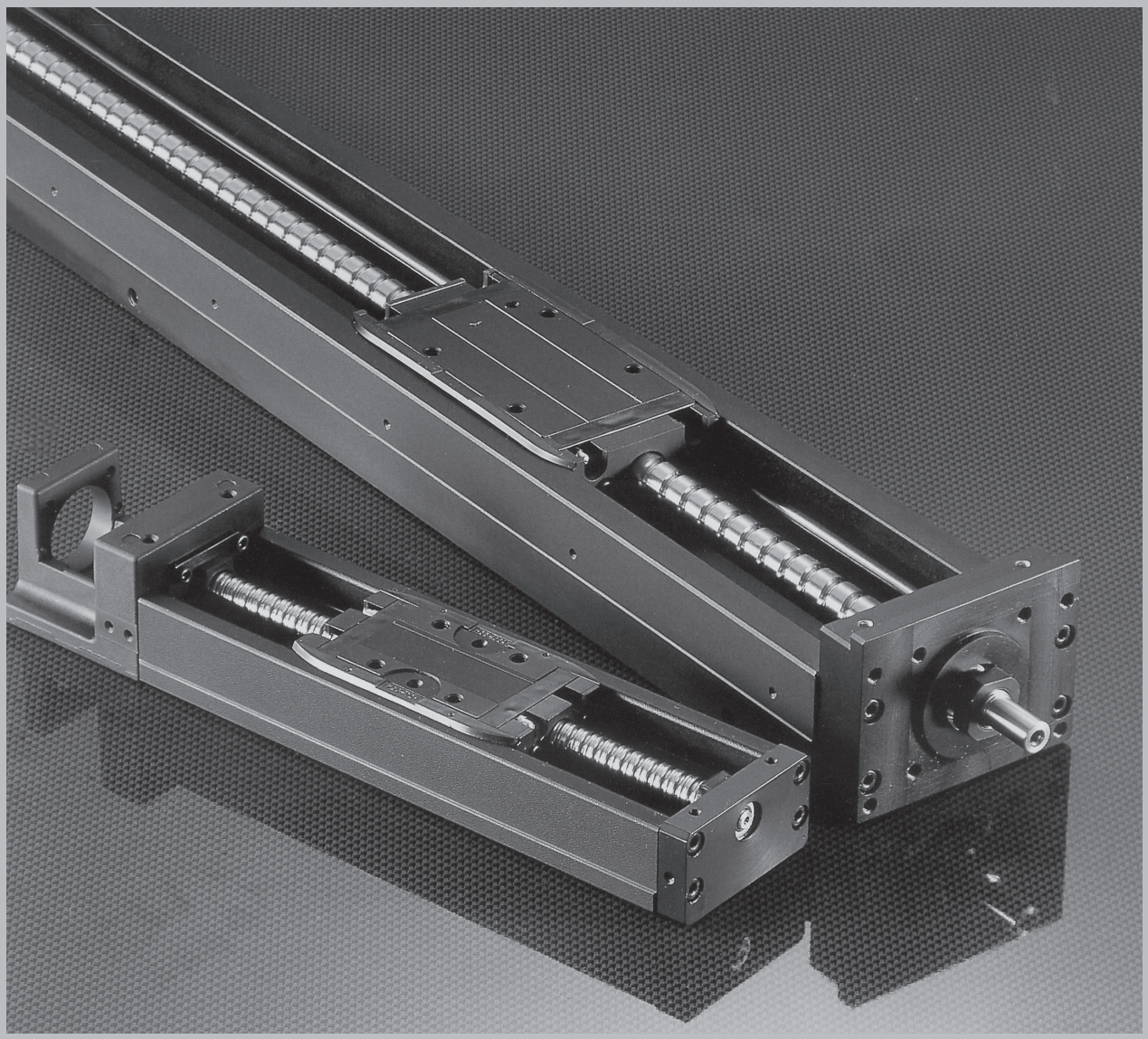
Optional components for MCM10 (example)

(A) Cover unit: top cover and side cover are available.
(B) Sensor unit: sensor and sensor-mounting parts are available.
(C) Motor bracket: bracket for mounting motor is available.

High-Rigidity Type MCH Monocarrier

Main features:

Cutting-edge NSK technologies deliver clean, long-term maintenance-free operation, with super high-rigid rails suitable for cantilever beams.



12

MCH Type Monocarrier®

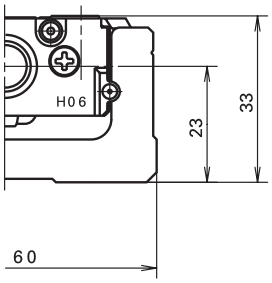
1 Reference Number Coding

Sample : MC H 06 040 H 10 K

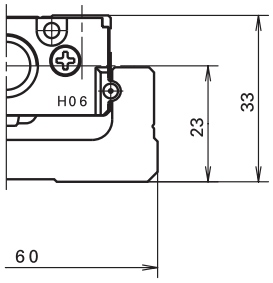
- MC — Monocarrier
- H — Series H : Rigid type、L : Low profile rail type (L type is only for 06 size)
- 06 — Nominal size (rail width, Unit: 10 mm)
- 040 — Stroke (Unit: 10 mm)
- H — Accuracy grade [H: High grade, P: Precision grade (made to order)]
- 10 — Ball screw lead (mm)
- K — K: single slider, D: double slider

Cross section of each model

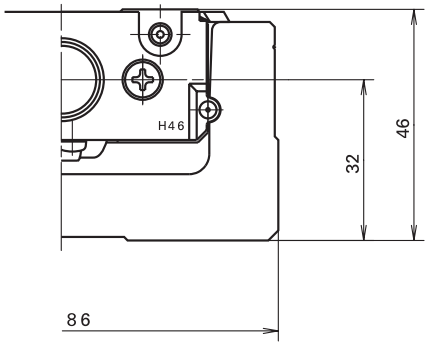
MCH06



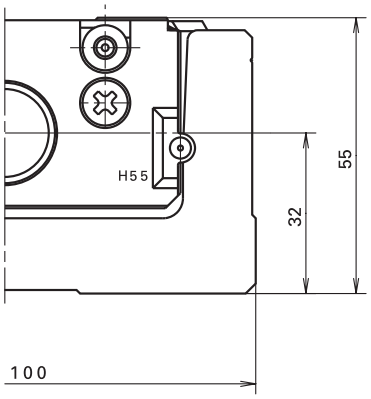
MCL06



MCH09



MCH10



Mounting dimensions of MCL06 are the same as those of MCH06. Only rail height differs. It suits for application such as an end effector of robot that requires a lightweight actuator.

2 Standard Combination of Stroke and Ball Screw Lead

MCH06			
Lead mm	5	10	20
Stroke mm			
50	●	●	○
100	●	●	○
200	●	●	○
300	○	●	●
400	○	●	●
500	○	●	●

MCH09			
Lead mm	5	10	20
Stroke mm			
200	●	●	○
300	●	●	○
400	●	●	○
500	○	●	●
600	○	●	●
700	○	●	●

MCH10		
Lead mm	10	20
Stroke mm		
400	●	●
500	●	●
600	●	●
700	●	●
800	●	●
900	○	●
1 000	○	●
1 100	○	○
1 200	○	○
1 800	○	○

MCL06		
Lead mm	10	20
Stroke mm		
50	○	○
100	○	○
200	○	○
300	○	○
400	○	○
500	○	○

●mark : standard inventory ○mark : made to order *Double slider is available upon request. (made to order)

3 Accuracy

Accuracy standard

Unit: μm

Grade	High grade (H)			Precision (P)			
Stroke (mm)	Repeatability	Running parallelism (vertical)	Backlash	Repeatability	Positioning accuracy	Running parallelism (vertical)	Backlash
～150	± 10	14	20 or less	± 3	20	8	3 or less
200							
300		16			25	10	
400							
500		20			30	12	
600							
700		23				15	
800					35		
900							
1000							
1100		30			40	20	
1200							

4 Load Rating

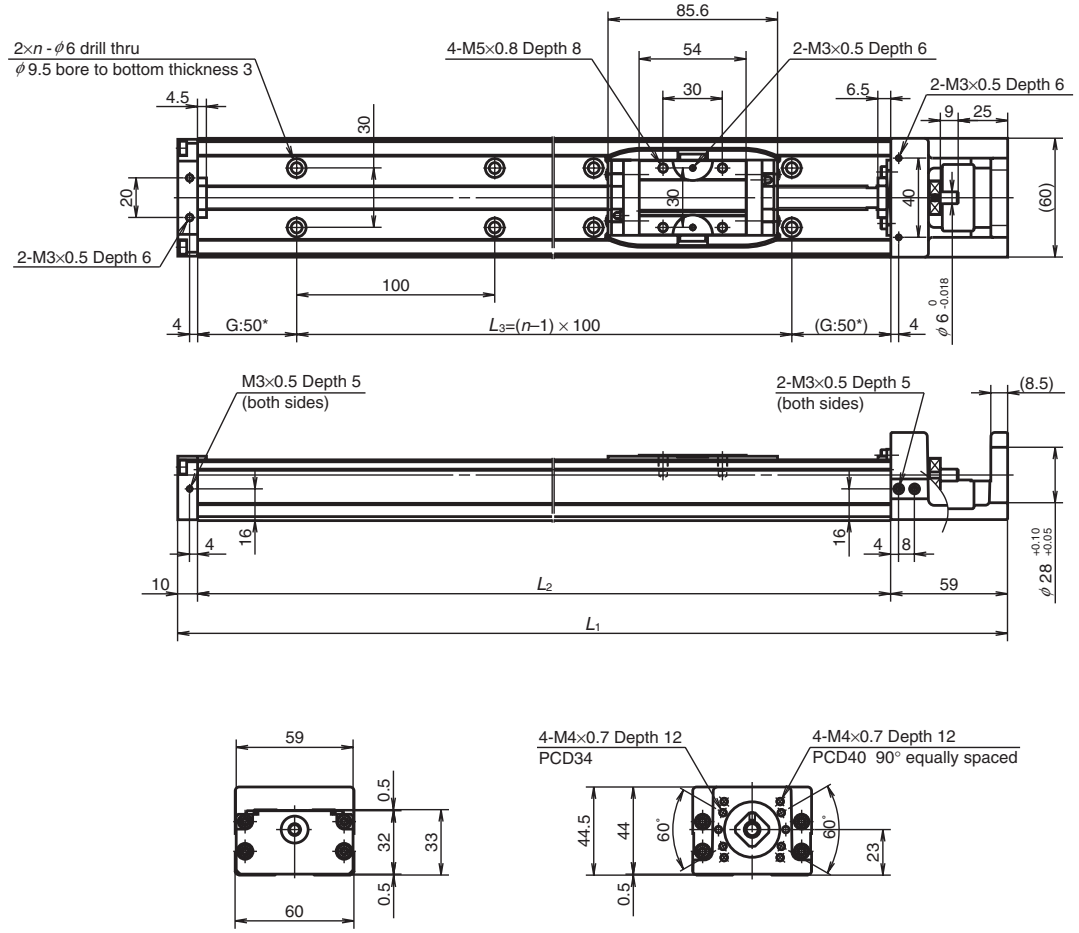
			Ball Screw No.	Code	Unit	MCH06（MCL06）			MCH09			MCH10	
Linear guide specification			Ball Screw lead	ℓ	mm	5	10	20	5	10	20	10	20
			Rated running distance*	L_a	Km	5	10	20	5	10	20	10	20
			Basic dynamic load rating	C_a	N	22 800	18 100	14 400	40 600	32 200	25 500	44 600	35 400
			Basic static load rating	C_{0a}	N	16 300			30 500			42 000	
	Single		Dynamic momment	M_{RO}	Nm	335			890			1.460	
				M_{PO}	Nm	133			385			610	
				M_{YO}	Nm	133			385			610	
	Double		Static momment	M_{RO}	Nm	770			1 780			2 920	
				M_{PO}	Nm	730			2 070			3 430	
				M_{YO}	Nm	730			2 070			3 430	
Ball screw specification			Shaft dia.	mm		12	12	12	15	15	15	20	20
			Lead	mm		5	10	20	5	10	20	10	20
	High grade		Basic dynamic load rating	C_a	N	3 000	1 930	1 930	6 820	5 110	3 290	8 230	5 300
			Basic static load rating	C_{0a}	N	5 410	3 160	3 160	13 200	9 290	5 620	17 100	10 300
	Accuracy		Basic dynamic load rating	C_a	N	3 760	2 260	2 260	7 100	7 060	4 560	10 900	7 060
			Basic static load rating	C_{0a}	N	6 310	3 780	3 780	13 000	12 700	7 750	21 700	12 700
Support unit specification	Fixed		Model No.			WBK08			WBK12			WBK15	
			Basic dynamic load rating	C_a	N	4 400			7 100			7 600	
			load limit	C_{0a}	N	1 450			3 040			3 380	
	Simple support		Model No.			696ZZ			6900ZZ			6901ZZ	
			Basic dynamic load rating	C_a	N	1 730			2 700			2 890	
Dynamic torque			Single	N・cm		1.0～4.8	1.1～5.8	1.6～7.9	1.0～5.9	2.0～7.8	2.0～10.8	2.7～10.8	3.1～12.7
			Double	N・cm		1.2～5.2	1.5～9.6	2.3～11.8	1.5～7.0	2.5～10.8	4.0～17.2	4.2～15.6	5.0～19.6

Note:
●Basic dynamic and static load ratings indicate the values for one slider.●Basic static moment of double slider is a value when two sliders equipped with NSK K1 are butted against each other.●Basic dynamic load rating of the linear guide is the load of perpendicular direction to the axis that allows 90% of a group of the same Monocarriers to operate “Rated running distance*” in the table, that is equivalent to 1 million revolutions of the ball screw and the support unit, under the same condition without causing flaking by rolling contact fatigue.●Basic dynamic load rating of the ball screw is a load to axial direction that allows 90% of ball screws of a group of the same Monocarriers to rotate 1 million revolutions under the same condition without causing flaking by rolling contact fatigue.●Basic dynamic load rating of the support unit is a constant load to axial direction that allows 90% of support units of the same group of Monocarriers to rotate 1 million revolutions under the same condition without causing flaking by rolling contact fatigue.●Basic static load rating of each part is a load that results in combined permanent deformations at the contact points of balls and ball grooves of respective parts is 0.01% of the ball diameter.●The basic static moment is the value when a rolling contact pressure of ball grooves is 4000 N/mm^2. This is allowable static contact pressure of the Monocarrier linear guide.

5 Dimensions of Standard Products

MCH06

Accuracy grade: High grade (H)



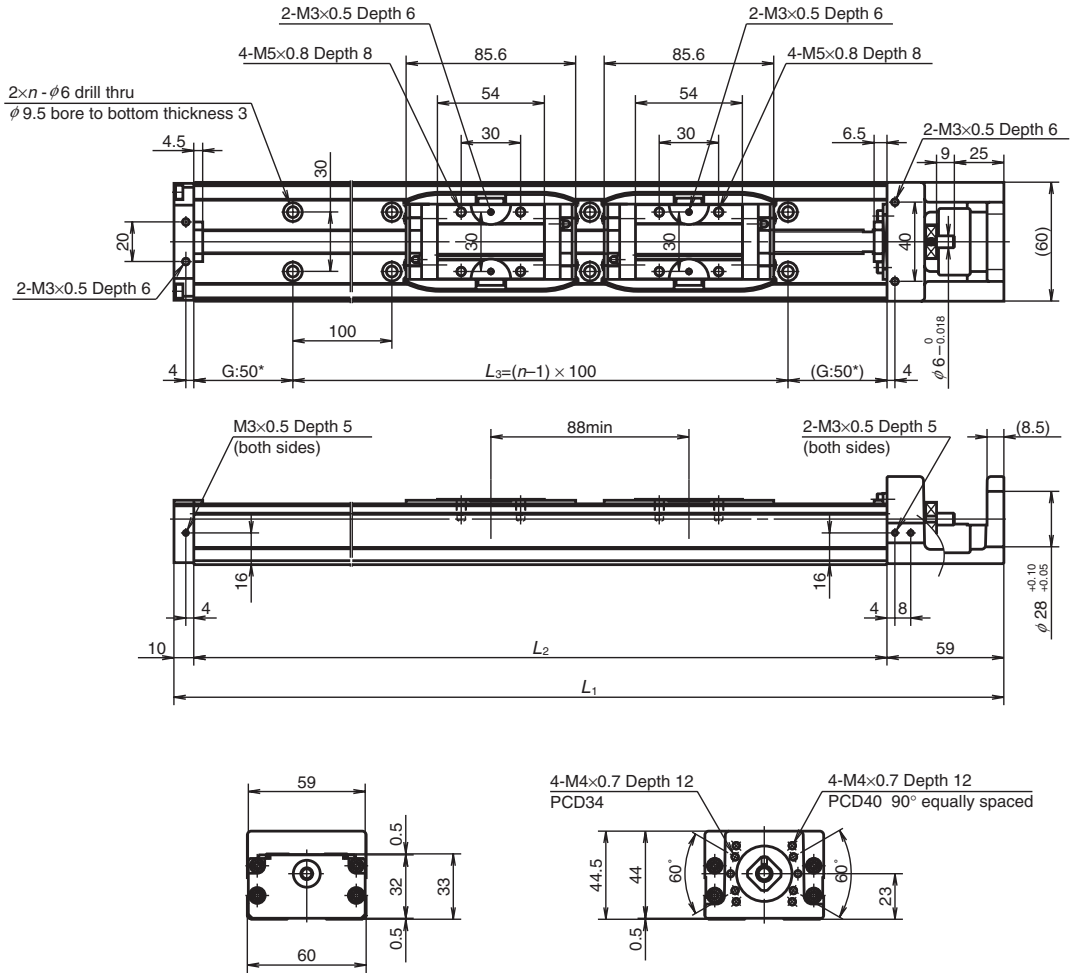
Dimension of MCH06 (Single slider)

Reference number	Nominal stroke (mm)	Stroke limit (mm) (K1 is not equipped.)	Ball screw lead (mm)	Body length (mm) L_1	L_2	L_3	n	Inertia ×10⁻⁶(kg·m²)	Mass (kg)
※ **MCH06005H05K**	50	53 (65)	5	219	150	100	2	2.38	1.8
※ **MCH06005H10K**			10					3.45	
MCH06010H05K	100	103 (115)	5	269	200	100	2	3.17	2.2
MCH06010H10K			10					4.12	
MCH06020H05K	200	203 (215)	5	369	300	200	3	4.51	3.0
MCH06020H10K			10					5.46	
MCH06030H10K	300	303 (315)	10	469	400	300	4	6.80	3.7
MCH06030H20K			20					10.6	
MCH06040H10K	400	403 (415)	10	569	500	400	5	8.13	4.5
MCH06040H20K			20					11.9	
MCH06050H10K	500	503 (515)	10	669	600	500	6	9.47	5.2
MCH06050H20K			20					13.3	

Dimension G is 50 in 25 for those marked with ※.

MCH06

Accuracy grade: High grade (H)

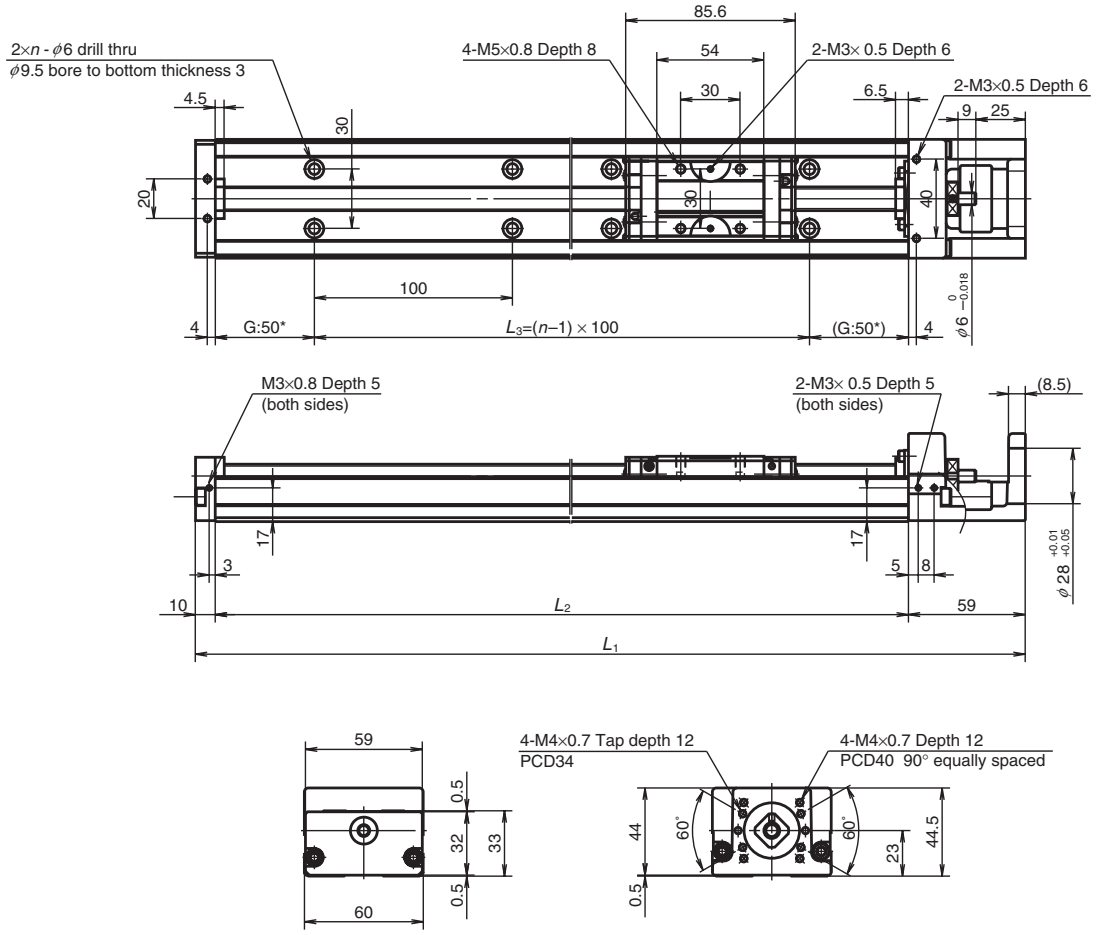


Dimension of MCH06 (Double slider)

Reference number	Nominal stroke (mm)	Stroke limit (mm) (K1 is not equipped.)	Ball screw lead (mm)	Body length (mm)				Inertia ×10⁻⁶(kg·m²)	Mass (kg)
				L_1	L_2	L_3	n		
MCH06010H05D	100	115 (139)	5	369	300	200	3	4.82	3.5
MCH06010H10D			10					6.72	
MCH06020H05D	200	215 (239)	5	469	400	300	4	8.06	4.2
MCH06020H10D			10					15.7	
MCH06030H05D	300	315 (339)	5	569	500	400	5	9.40	5.0
MCH06030H10D			10					17.0	
MCH06040H10D	400	415 (439)	10	669	600	500	6	10.7	5.7
MCH06040H20D			20					18.3	

MCL06

Accuracy grade: High grade (H)



●We made MCL06 lighter than MCM06 by lowering its rail height. Weight ratio: MCH : MCL = 5 : 4.

●Double slider is available upon request.

●Combinations of the leads and the strokes are the same as MCH06.

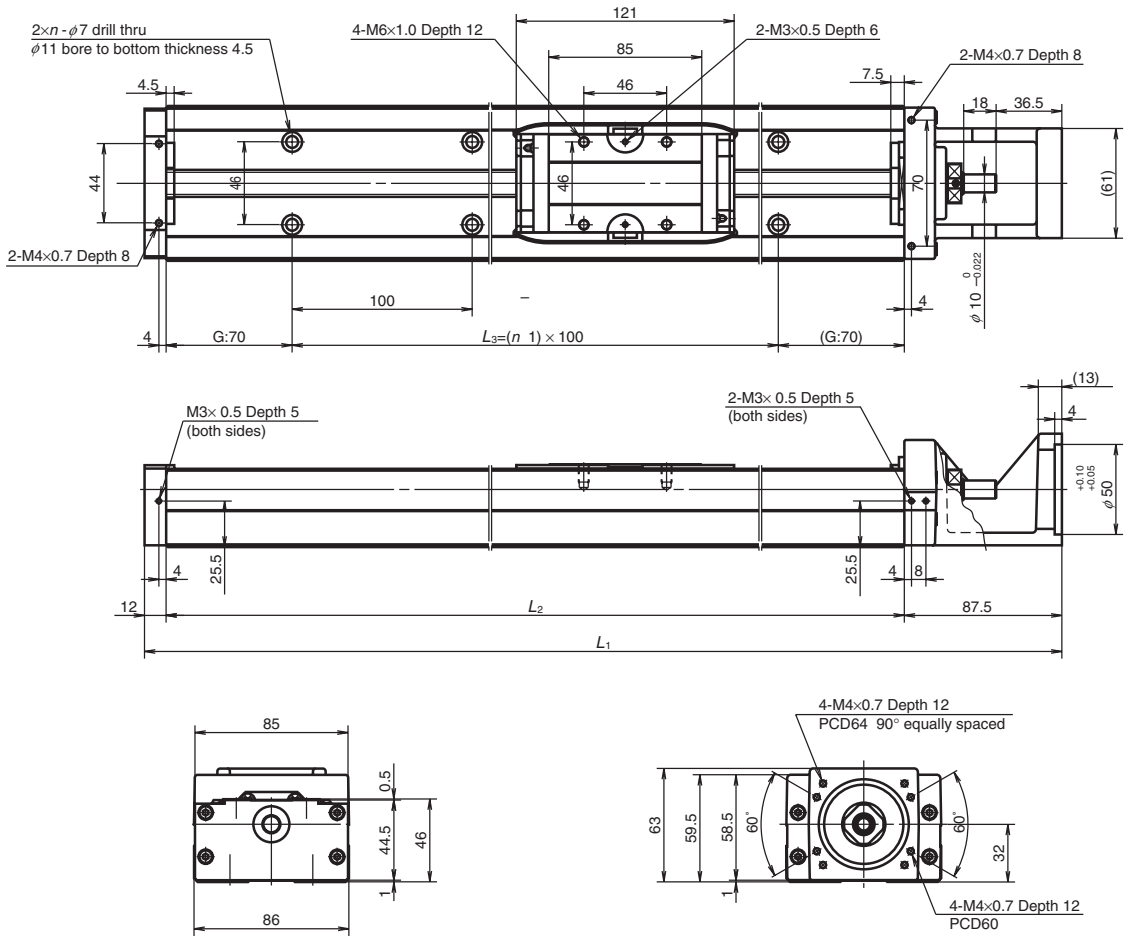
Dimension of MCL06 (Single slider)

Reference number	Nominal stroke (mm)	Stroke limit (mm) (K1 is not equipped.)	Ball screw lead (mm)	Body length (mm)				Inertia ×10⁻⁶(kg·m²)	Mass (kg)
				L_1	L_2	L_3	n		
※ **MCL06005H05K**	50	53 (65)	5	219	150	100	2	2.38	1.0
※ **MCL06005H10K**			10					3.45	
MCL06010H05K	100	103 (115)	5	269	200	100	2	3.17	1.3
MCL06010H10K			10					4.12	
MCL06020H05K	200	203 (215)	5	369	300	200	3	4.51	1.9
MCL06020H10K			10					5.46	
MCL06030H10K	300	303 (315)	10	469	400	300	4	6.80	2.6
MCL06030H20K			20					10.6	
MCL06040H10K	400	403 (415)	10	569	500	400	5	8.13	3.2
MCL06040H20K			20					11.9	
MCL06050H10K	500	503 (515)	10	669	600	500	6	9.47	3.9
MCL06050H20K			20					13.3	

Dimension G is 25 instead of 50 for those marked with ※.

MCH09

Accuracy grade: High grade (H)

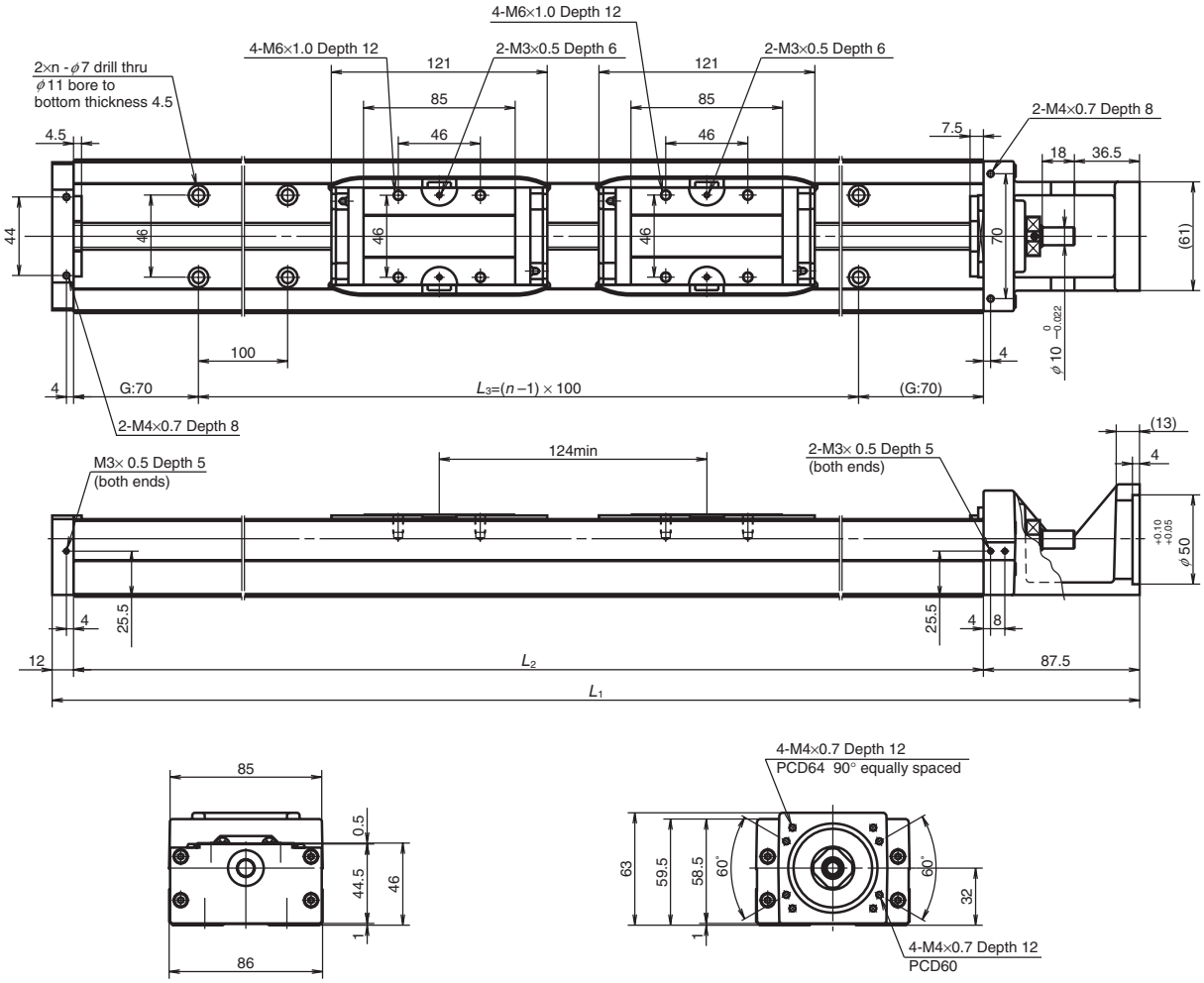


Dimension of MCH09 (Single slider)

Reference number	Nominal stroke (mm)	Stroke limit (mm) (K1 is not equipped.)	Ball screw lead (mm)	Body length (mm)				Inertia X10^{-6}(kg·m^2)	Mass (kg)
				L_1	L_2	L_3	n		
MCH09020H05K	200	207 (221)	5	439.5	340	200	3	12.4	6.5
MCH09020H10K			10					13.9	
MCH09030H05K	300	307 (321)	5	539.5	440	300	4	15.6	8.1
MCH09030H10K			10					17.1	
MCH09040H05K	400	407 (421)	5	639.5	540	400	5	18.8	9.7
MCH09040H10K			10					20.3	
MCH09050H10K	500	507 (521)	10	739.5	640	500	6	23.5	11
MCH09050H20K			20					29.6	
MCH09060H10K	600	607 (621)	10	839.5	740	600	7	26.7	13
MCH09060H20K			20					32.8	
MCH09080H10K	800	807 (821)	10	1 039.5	940	800	9	33.2	16
MCH09080H20K			20					39.2	

MCH09

Accuracy grade: High grade (H)

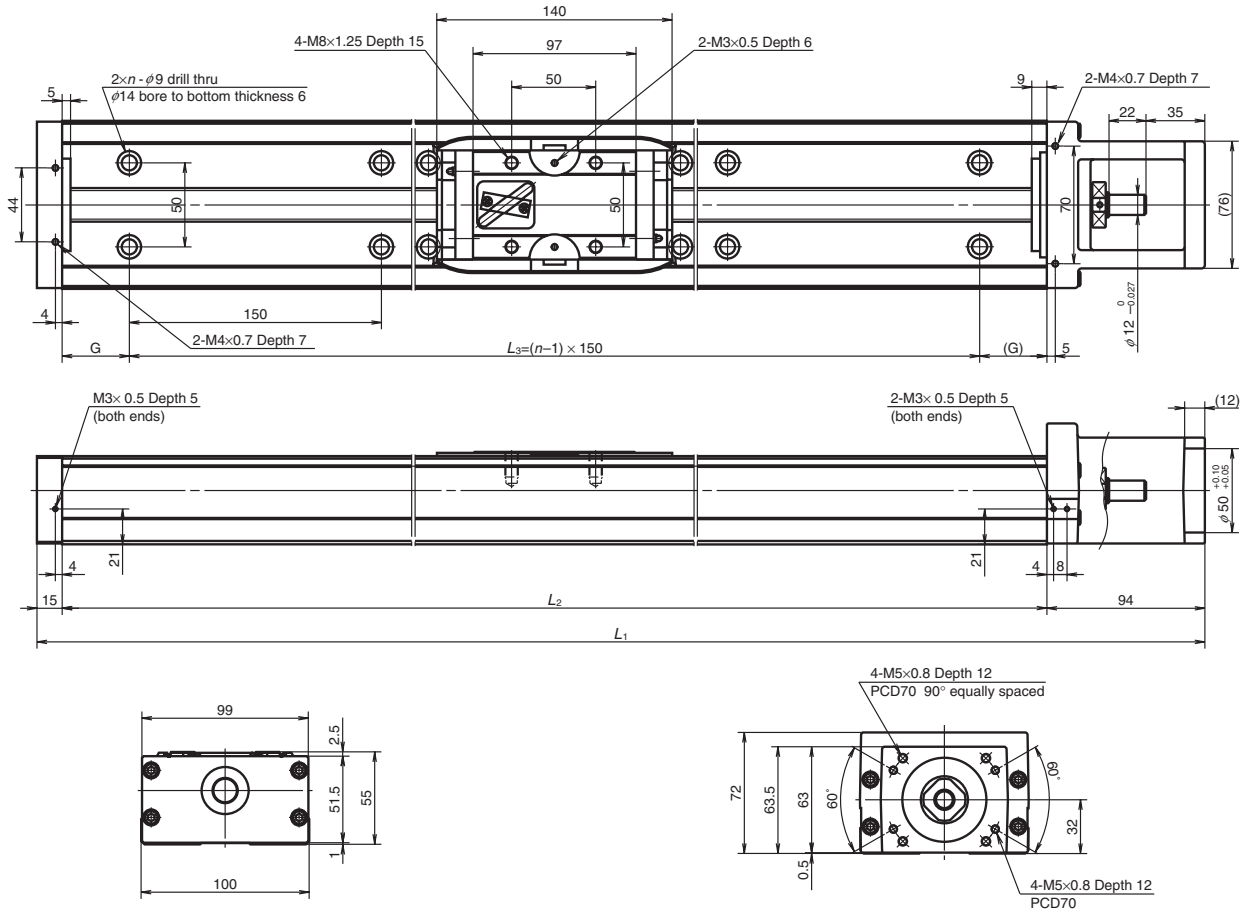


Dimension of MCH09 (Double slider)

Reference number	Nominal stroke (mm)	Stroke limit (mm) (K1 is not equipped.)	Ball screw lead (mm)	Body length (mm)				Inertia ×10⁻⁶(kg·m²)	Mass (kg)
				L_1	L_2	L_3	n		
MCH09015H05D	150	183 (211)	5	539.5	440	300	4	16.1	8.9
MCH09015H10D			10					19.2	
MCH09025H05D	250	283 (321)	5	639.5	540	400	5	19.3	11
MCH09025H10D			10					22.4	
MCH09035H05D	350	383 (421)	5	739.5	640	500	6	22.5	12
MCH09035H10D			10					25.6	
MCH09045H10D	450	483 (521)	10	839.5	740	600	7	28.8	14
MCH09045H20D			20					40.9	
MCH09065H10D	650	683 (621)	10	1 039.5	940	800	9	35.2	17
MCH09065H20D			20					47.3	

MCH10

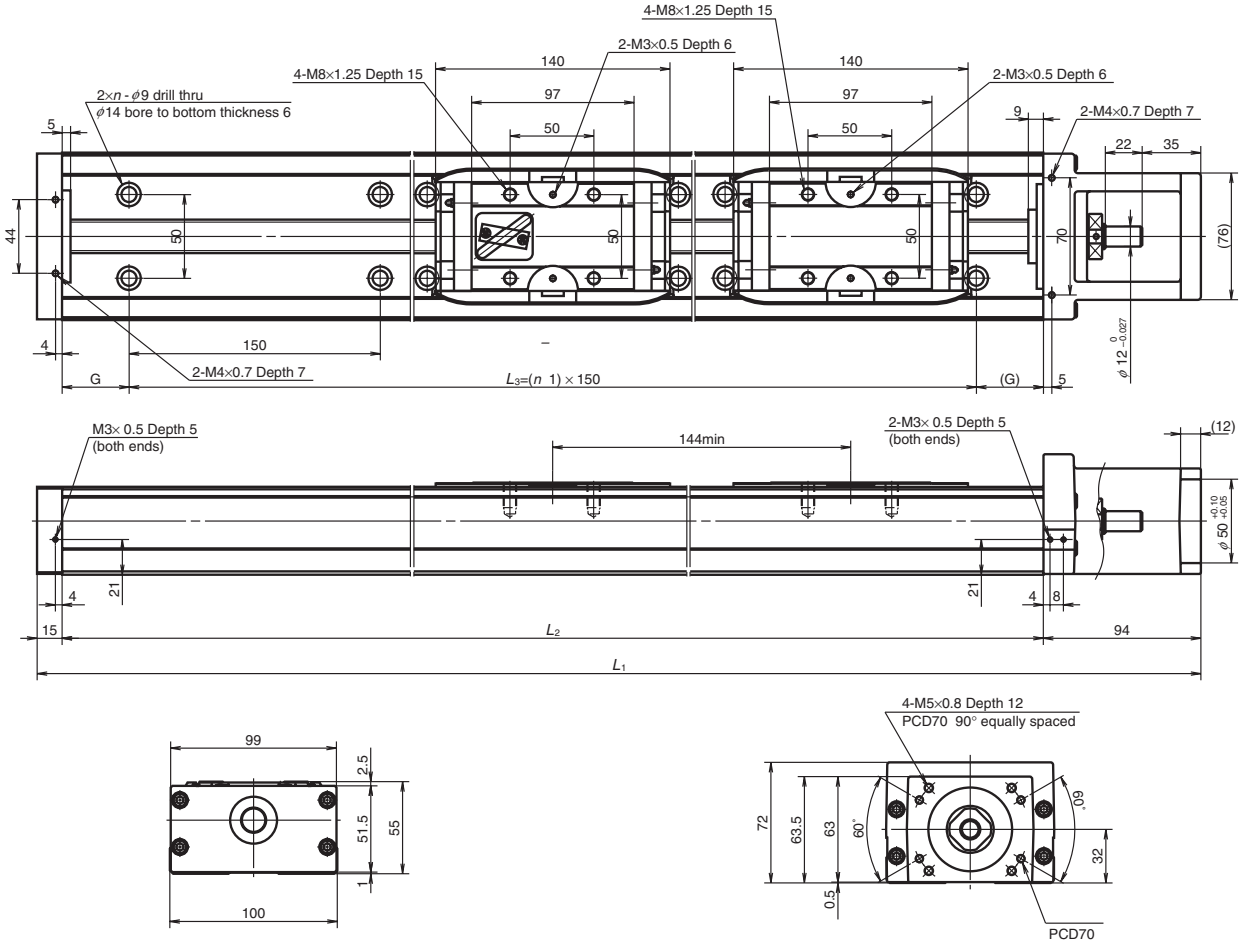
Accuracy grade: High grade (H)



Dimension of MCH10 (Single slider)

Reference number	Nominal stroke (mm)	Stroke limit (mm) (K1 is not equipped.)	Ball screw lead (mm)	Body length (mm)					Inertia $\times 10^{-6}$(kg·m^2)	Mass (kg)
				L_1	L_2	G	L_3	n		
MCH10040H10K	400	426(442)	10	689	580	65	450	4	62.4	14
MCH10050H10K	500	526 (542)	10	789	680	40	600	5	74.7	16
MCH10050H20K			20						82.3	
MCH10060H10K	600	626 (642)	10	889	780	15	750	6	84.9	19
MCH10060H20K			20						92.5	
MCH10070H10K	700	726 (742)	10	989	880	65	750	6	95.1	21
MCH10070H20K			20						103	
MCH10080H10K	800	826 (842)	10	1 089	980	40	900	7	105	23
MCH10080H20K			20						113	
MCH10090H20K	900	926(942)	20	1 189	1 080	15	1 050	8	123	25
MCH10100H20K	1 000	1 026(1 042)	20	1 289	1 180	65	1 050	8	133	27
MCH10110H20K	1 100	1 126(1 142)	20	1 389	1 280	40	1 200	9	143	29
MCH10120H20K	1 200	1 226(1 242)	20	1 489	1 380	15	1 350	10	154	32

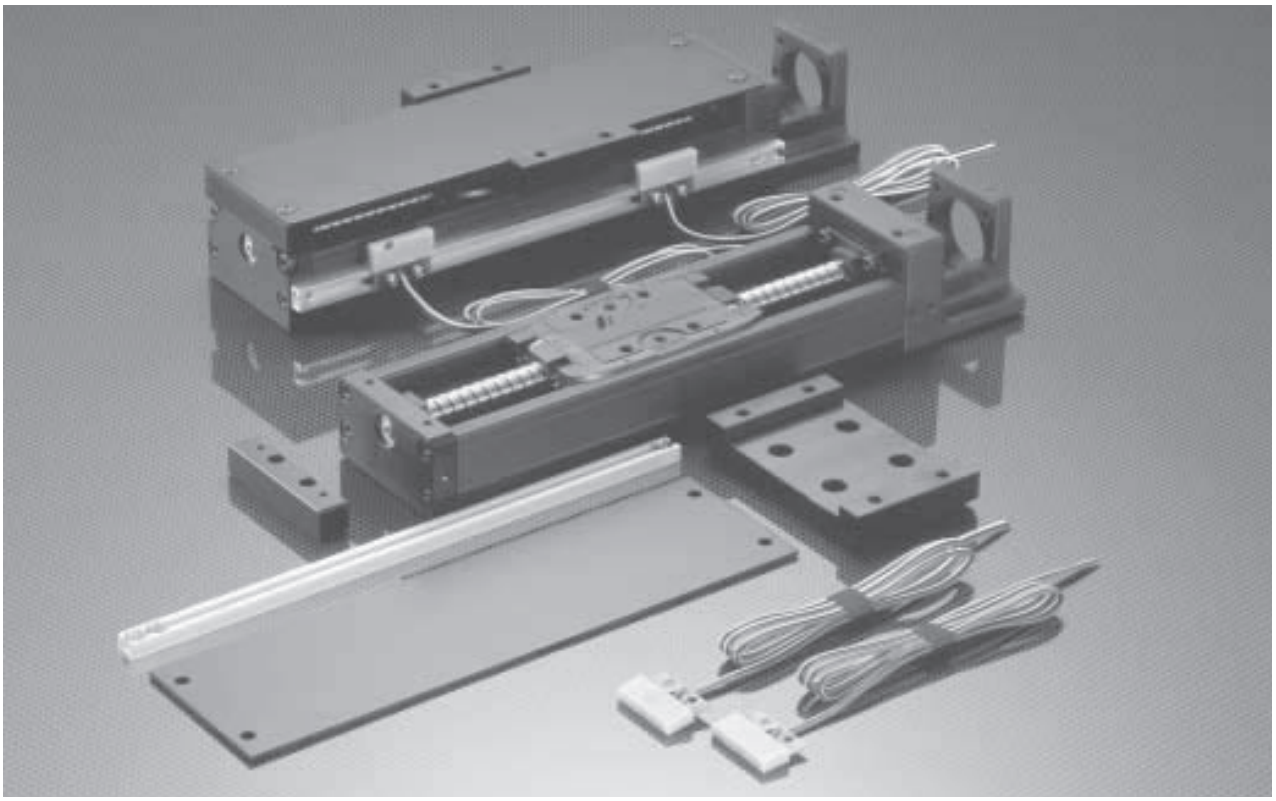
MCH10



Dimension of MCH10 (Double slider)

Reference number	Nominal stroke (mm)	Stroke limit (mm) (K1 is not equipped.)	Ball screw lead (mm)	Body length (mm)					Inertia $\times 10^{-6}$(kg·m^2)	Mass (kg)
				L_1	L_2	G	L_3	n		
MCH10025H10D	250	282(314)	10	689	580	65	450	4	67.1	15
MCH10035H10D	350	382 (414)	10	789	680	40	600	5	77.3	17
MCH10035H20D			20						92.5	
MCH10045H10D	450	482 (514)	10	889	780	15	750	6	87.5	20
MCH10045H20D			20						103	
MCH10055H10D	550	582 (614)	10	989	880	65	750	6	97.7	22
MCH10055H20D			20						113	
MCH10065H10D	650	682 (614)	10	1 089	980	40	900	7	108	24
MCH10065H20D			20						123	
MCH10075H20D	750	782(814)	20	1 189	1 080	15	1 050	8	133	26
MCH10085H20D	850	882(914)	20	1 289	1 180	65	1 050	8	143	28
MCH10095H20D	950	982(1 014)	20	1 389	1 280	40	1 200	9	154	30
MCH10105H20D	1 050	1 082(1 114)	20	1 489	1 380	15	1 350	10	164	33

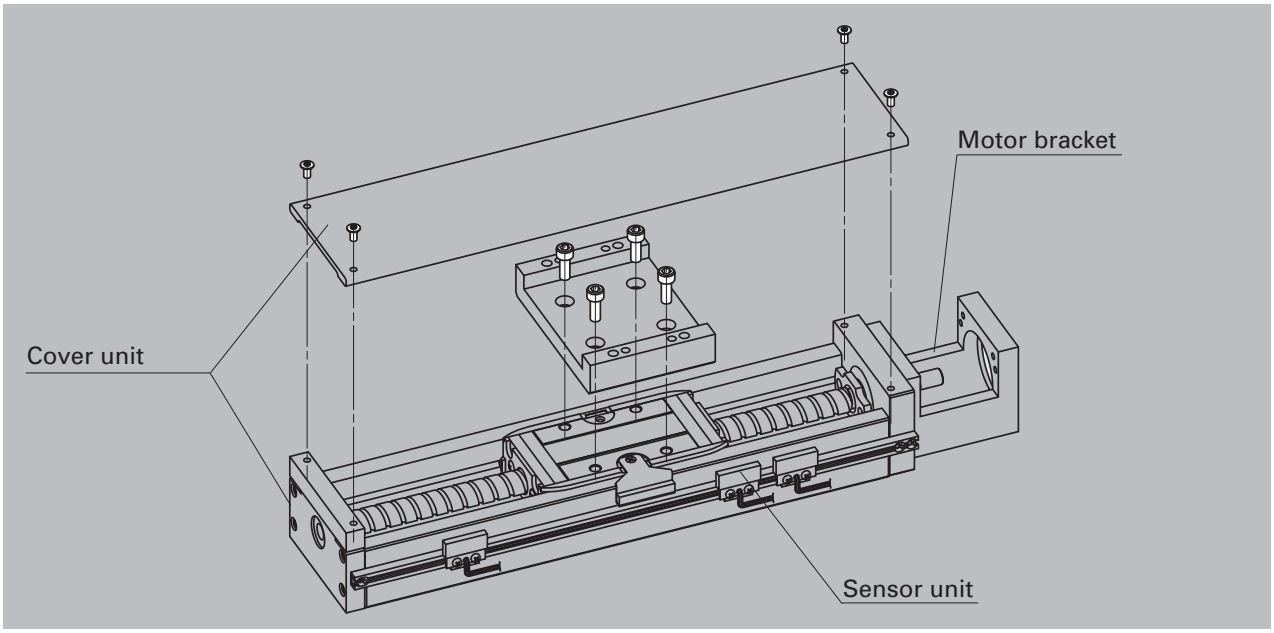
Dimensions of Optional Components



Note : Surface of cover unit is treated by white alumite.

Optional Components

Optional components for MCH Monocarriers are available at standard stock.
Note 1: Optional components are sold separately from the main products.



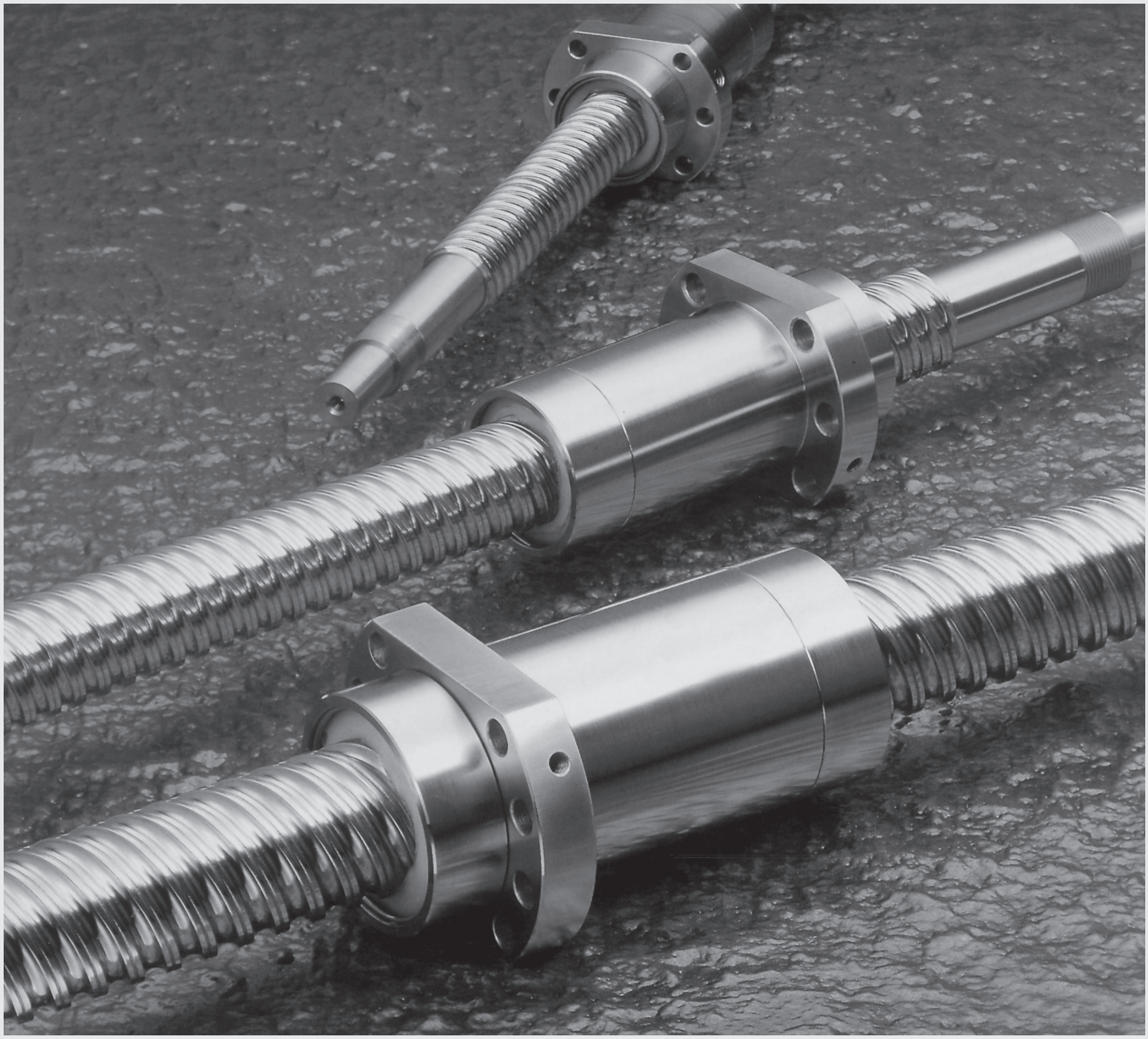
Optional components (Example for MCH10)

1. Sensor unit: Consists of sensor and its fixing parts.
2. Cover unit: Consists of top cover.
3. Intermediary plate for motor mounting is available.

Precision Rolled Ball Screws

Main features:

Compact ball nut heralding in the next generation standard.
Extended maintenance free operation with NSK K1®
lubrication unit and new grease retaining seal.
Suitable for high speed and long stroke operation.



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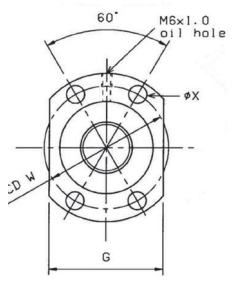
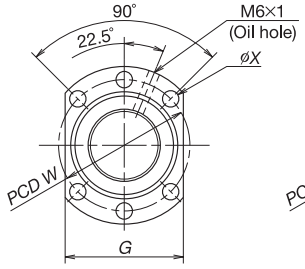
Precision Rolled Ball Screws PR and LPR Series

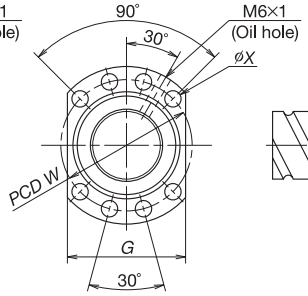
Ball nut dimensions



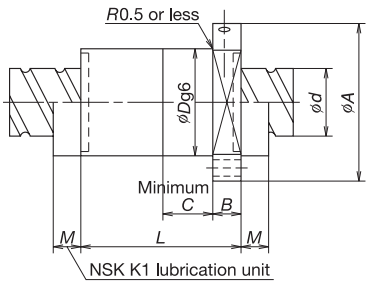
Shaft diameter: ø12 mm



Shaft diameter: ø15, ø20, ø25 and ø32 mm



Shaft diameter: ø40 and ø50 mm



NSK K1 lubrication unit

PR Series

Unit: mm

Model No.	Shaft diameter	Lead	Effective turns of balls	Basic load rating (N)		Dimensions									Maximum screw shaft length	
	d	*ℓ*		Dynamic load rating C_a	Static load rating C_{oa}	*D*	*A*	*G*	*B*	*L*	*C*	*W*	*X*	*M***	Ct5	Ct7
PR1205	12	5	2.7x1	3 200	5 860	24	40	26	11	30	10	32	4.5	(18)	500	900
PR1505	15	5	2.7x1	5 460	10 200	28	48	40	11	30	10	38	5.5	(18)	600	1 200
PR1510	15	10	2.7x1	5 460	10 200	28	48	40	11	43	15	38	5.5	(18)	600	1 200
PR2005	20	5	2.7x1	8 790	18 500	36	58	44	13	31	10	47	6.6	(18)	800	1 600
PR2010	20	10	2.7x1	8 790	18 500	36	58	44	13	45	15	47	6.6	(18)	800	1 600
PR2505	25	5	2.7×1	9 760	23 600	40	62	48	12	32	10	51	6.6	(21)	2500	3 200
PR2510	25	10	3.7×1	12 800	32 300	40	62	48	12	56	15	51	6.6	(21)	2 500	3 200
PR3210	32	10	3.7×1	19 000	51 500	50	80	62	12	59	10	65	9	(23)	3 200	4 000
PR3220	32	20	3.7×1	19 000	51 500	50	80	62	12	98	15	65	9	(23)	3 200	4 000
PR4010	10	10	3.7x1	33 800	89 900	63	93	70	14	60	10	78	9	(23)	1 600	3 200

LPR Series

Unit: mm

Model No.	Shaft diameter	Lead	Effective turns of balls	Basic load rating (N)		Dimensions									Maximum screw shaft length	
	d	*ℓ*		Dynamic load rating C_a	Static load rating C_{oa}	*D*	*A*	*G*	*B*	*L*	*C*	*W*	*X*	*M*	Ct5	Ct7
LPR2020	20	20	1.7×2	5 890	21 600	36	58	44	13	54	25	47	6.6	(18)	800	1 600
LPR2525	25	25	1.7×2	11 000	27 500	40	62	48	12	63	30	51	6.6	(21)	2 500	3 200
LPR3232	32	32	1.7×2	16 300	43 900	50	80	62	14	79	40	65	9	(23)	3 200	4 000
LPR4040	40	40	1.7×2	29 000	76 200	63	93	70	16	94	45	78	9	(26)	4 000	6 500
LPR5050	50	50	1.7×2	32 200	96 200	75	110	85	18	115	45	93	11	(26)	4 000	6 500

* Please, consult NSK. ** only for reference.

Specification number

For ordering, please quote the specification number.

Reference number: **H S P 40 40 K 1 D 2002 S A1**

Accuracy grade and axial play
HSP (Ct5, axial play 0 mm)
VSP (Ct7, axial play 0 mm)

Model number
2505: Screw shaft diameter 25, Lead 5
2510: Screw shaft diameter 25, Lead 10
2525: Screw shaft diameter 25, Lead 25
3210: Screw shaft diameter 32, Lead 10
3220: Screw shaft diameter 32, Lead 20
3232: Screw shaft diameter 32, Lead 32
4040: Screw shaft diameter 40, Lead 40
5050: Screw shaft diameter 50, Lead 50

K: Equipped with NSK K1 unit
N: No NSK K1 unit
(Equipped with grease retaining seal only)

Number of nut

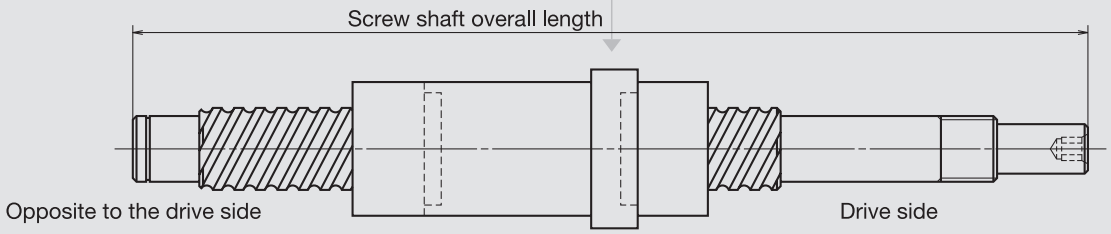
Position of ball nut flange
D: Screw shaft drive side
S: Opposite to drive side

Bearing journal for fixed support side: please refer to the configuration of the screw shaft end outlined in the catalog.

Bearing journal for simple support side: please refer to the configuration of the screw shaft end outlined in the catalog.

Overall length of screw shaft
If the length is less than 1000 mm, enter 0 to the forth digit.
The available lengths are as follows:

Model number	Ct5	Ct7
2505	0300—2500	0300—3200
2510	0300—2500	0300—3200
2525	0300—2500	0300—3200
3210	0500—3200	0300—4000
3220	0300—3200	0300—4000
3232	0300—3200	0300—4000
4040	0500—4000	0300—6500
5050	0500—4000	0300—6500



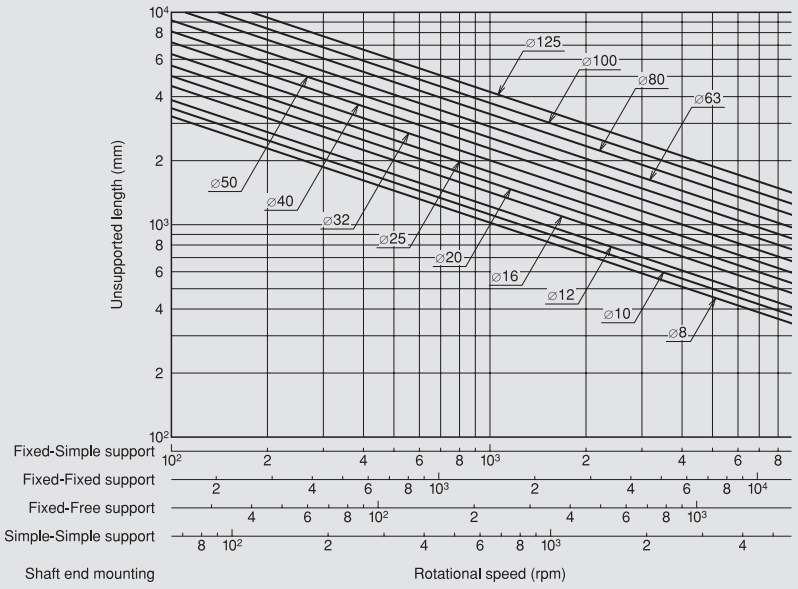
Permissible rotational speed of precision rolled ball screws

We strongly recommend reviewing the allowable speed of the screw shaft.

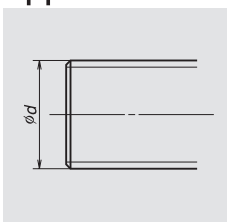
The allowable rotational speed of the ball screw shall be checked on the following.

- d·N value, which is involved in damaging the ball re-circulation components (Where, d: shaft diameter measured in mm, N: rotational speed measured in rpm)
- Critical speed of the screw shaft (caused by the resonance of the screw shaft)
- Permissible d·N
  Preferably d·N≦150 000. Please consult with NSK if your ball screw exceeds the limitation.
- Critical speed
  See the chart below. For detailed calculations, please refer to the catalog: Precision Machine Component (CAT No. E3161).

Permissible rotational speeds vs. critical speeds



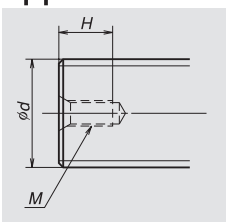
Drive side shaft end and opposite end: P



Unit: mm

Screw shaft
Diameter *d*
25
32
40
50

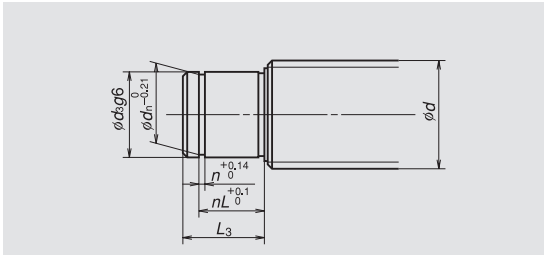
Drive side shaft end and opposite end: R



Unit: mm

Screw shaft	Tap hole	
Diameter *d*	Size *M*	Depth *H*
25	M6×1	12
32	M6×1	12
40	M8×1.25	16
50	M8×1.25	16

Opposite to drive side shaft end: S

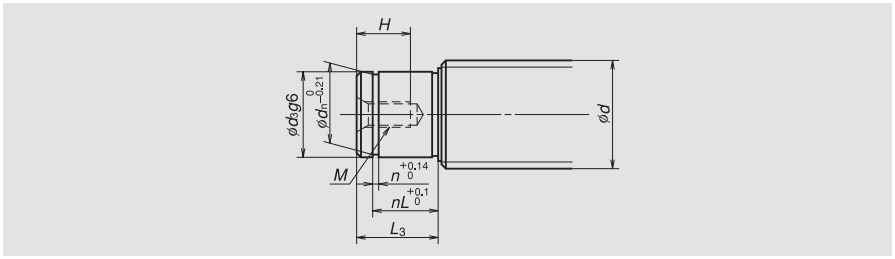


Unit: mm

Support unit	Screw shaft	Bearing journal		Snap ring groove		
Reference number	Diameter *d*	Diameter d_3	Length L_3	Width *n*	Diameter *dn*	Position *nL*
WBK20S-01	25	20	19	1.35	19	15.35
WBK25S-01	32	25	20	1.35	23.9	16.35
(6206)	40	30	22	1.75	28.6	17.75
(6207)	50	35	25	1.75	33	18.75

( ): Reference number of bearing

Opposite to drive side shaft end: T

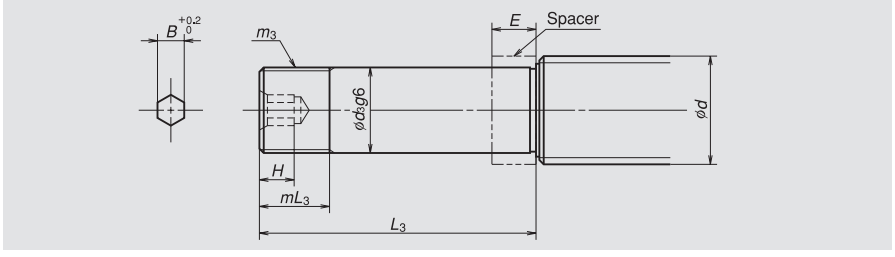


Unit: mm

Support unit	Screw shaft	Bearing journal		Snap ring groove			Tap hole	
Reference number	Diameter *d*	Diameter d_3	Length L_3	Width *n*	Diameter *dn*	Position *nL*	Size *M*	Depth *H*
WBK20S-01	25	20	19	1.35	19	15.35	M6×1	12
WBK25S-01	32	25	20	1.35	23.9	16.35	M6×1	12
(6206)	40	30	22	1.75	28.6	17.75	M8×1.25	16
(6207)	50	35	25	1.75	33	18.75	M8×1.25	16

( ): Reference number of bearing

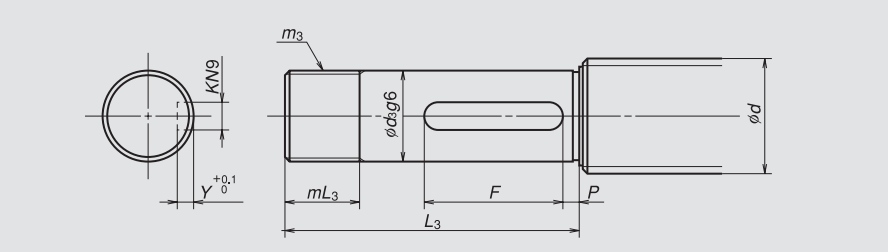
Drive side shaft end: C
Opposite to drive side shaft end: U



Unit: mm

Support unit		Spacer	Screw shaft	Bearing journal		Lock nut thread		Hexagon hole	
Reference number		Reference number	Diameter *d*	Diameter d_3	Length L_3	Nominal m_3	Length mL_3	Width across the flats *B*	Depth *H*
WBK20-01	WBK20-11	WBK20K	25	20	64	M20×1	16	6	8
WBK25-01	WBK25-11	WBK25K	32	25	76	M25×1.5	20	8	10
WBK30DF-31		Not required	40	30	89	M30×1.5	26	10	12
WBK35DF-31		Not required	50	35	92	M35×1.5	30	12	14

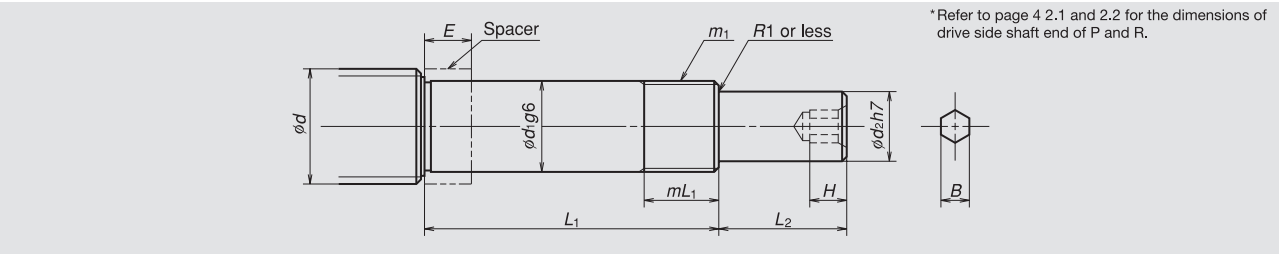
Opposite to drive side shaft end: V



Unit: mm

Support unit	Screw shaft	Bearing journal		Lock nut thread		Key seat			
Reference number	Diameter d	Diameter d_3	Length L_3	Nominal m_3	Length mL_3	Width K	Position P	Depth Y	Length F
	25	20	64	M20×1	16	6	4	3.5	30
	32	25	76	M25×1	20	8	4	4	40
	40	30	89	M30×1.5	26	8	5	4	40
	50	35	92	M35×1.5	30	10	5	5	50

Drive side shaft end: A1

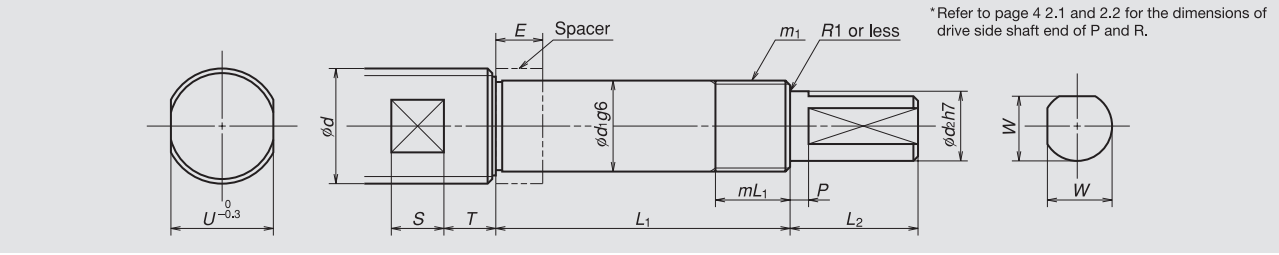


*Refer to page 4 2.1 and 2.2 for the dimensions of drive side shaft end of P and R.

Unit: mm

Support unit		Spacer	Screw shaft	Bearing journal		Lock nut thread		Drive section		Hexagon hole	
Reference number		Reference number	Diameter d	Diameter d_1	Length L_1	Nominal m_1	Length mL_1	Diameter d_2	Length L_2	Width across the flats B	Depth H
WBK20-01	WBK20-11	WBK20K	25	20	64	M20×1	16	15	27	6	8
WBK25-01	WBK25-11	WBK25K	32	25	76	M25×1.5	20	20	33	8	10
WBK30DF-31		Not required	40	30	89	M30×1.5	26	25	61	10	12
WBK35DF-31		Not required	50	35	92	M35×1.5	30	30	63	12	14

Drive side shaft end: A3

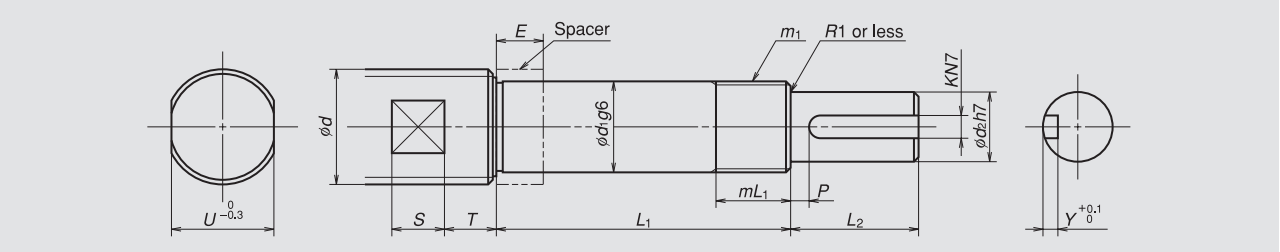


*Refer to page 4 2.1 and 2.2 for the dimensions of drive side shaft end of P and R.

Unit: mm

Support unit		Spacer	Screw shaft	Bearing journal		Lock nut thread		Drive section		D		Wrench flats		
Reference number		Reference number	Diameter d	Diameter d_1	Length L_1	Nominal m_1	Length mL_1	Diameter d_2	Length L_2	Position P	Depth W	Width across the flats U	Position T	Length S
WBK20-01	WBK20-11	WBK20K	25	20	64	M20×1	16	15	27	4	14	22	10	11
WBK25-01	WBK25-11	WBK25K	32	25	76	M25×1.5	20	20	33	4	19	32	10	15
WBK30DF-31		Not required	40	30	89	M30×1.5	26	25	61	5	24	36	16	16
WBK35DF-31		Not required	50	35	92	M35×1.5	30	30	63	5	29	41	16	18

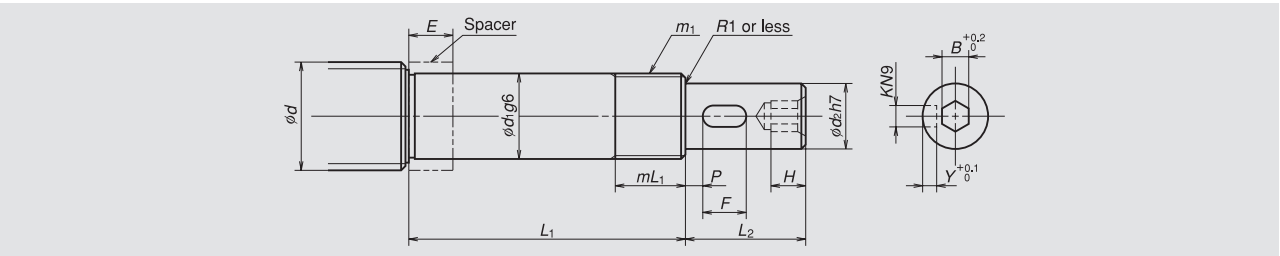
Drive side shaft end: A4



Unit: mm

Support unit		Spacer	Screw shaft	Bearing journal		Lock nut thread		Drive section		Key seat			Wrench flats		
Reference number		Reference number	Diameter	Diameter	Length	Nominal	Length	Diameter	Length	Width	Position	Depth	Width across the flats	Position	Length
			d	d_1	L_1	m_1	mL_1	d_2	L_2	K	P	Y	U	T	S
WBK20-01	WBK20-11	WBK20K	25	20	64	M20×1	16	15	27	5	4	3	22	10	11
WBK25-01	WBK25-11	WBK25K	32	25	76	M25×1.5	20	20	33	6	4	3.5	32	10	15
WBK30DF-31		Not required	40	30	89	M30×1.5	26	25	61	8	5	4	36	16	16
WBK35DF-31		Not required	50	35	92	M35×1.5	30	30	63	8	5	4	41	16	18

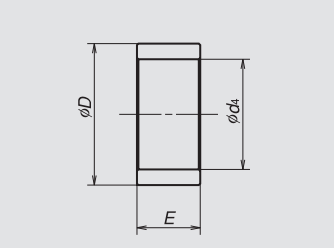
Drive side shaft end: A5



Unit: mm

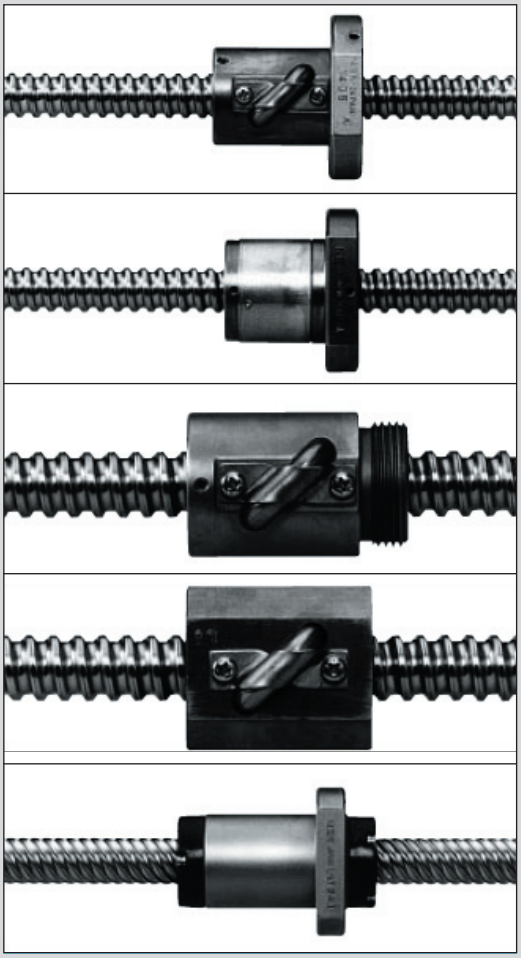
Support unit		Spacer	Screw shaft	Bearing journal		Lock nut thread		Drive section		Key seat				Hexagon hole	
Reference number		Reference number	Diameter	Diameter	Length	Nominal	Length	Diameter	Length	Width	Position	Depth	Length	Width across the flats	Depth
			d	d_1	L_1	m_1	mL_1	d_2	L_2	K	P	Y	F	B	H
WBK20-01	WBK20-11	WBK20K	25	20	64	M20×1	16	15	27	5	4	3	10	6	8
WBK25-01	WBK25-11	WBK25K	32	25	76	M25×1.5	20	20	33	6	4	3.5	15	8	10
WBK30DF-31		Not required	40	30	89	M30×1.5	26	25	61	8	5	4	40	10	12
WBK35DF-31		Not required	50	35	92	M35×1.5	30	30	63	8	5	4	40	12	14

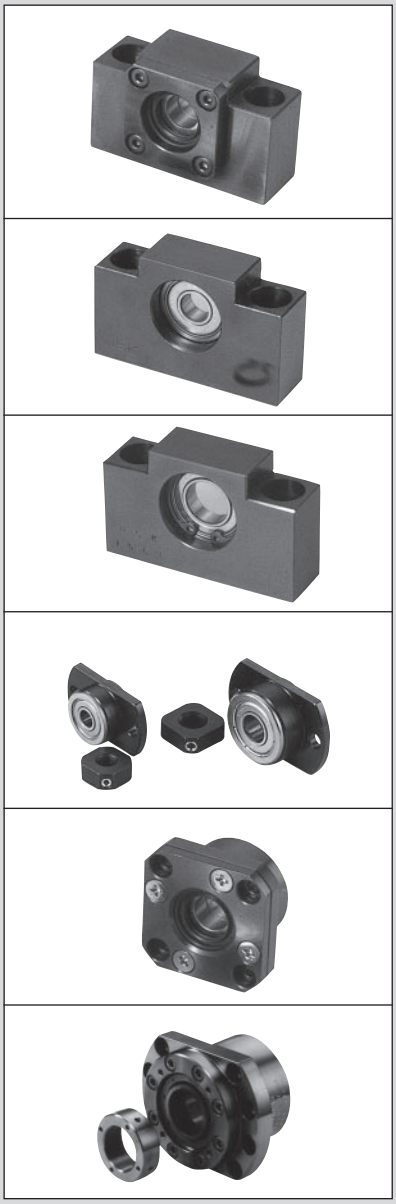
Spacer



Unit: mm

Reference number	Bearing journal	Spacer dimensions		
	Diameter	Bore	Diameter	Width
	d_1	d_4	D	E
WBK20K	20	20	25.5	11
WBK25K	25	25	32	14





- Short delivery time: R Series is standardized, and available in stock.
- Interchangeable screw shaft and ball nut: Screw shaft and nut assembly components are sold separately, and randomly-matched. The maximum axial play after assembly is shown in the dimension tables.
- Low prices: Screw shaft is processed by rolling. This is why prices are lower than those of precision types.
- Abundant series: There are 128 types of nut assembly combinations in the series. Each combination has two to three different lengths in screw shaft.

Support units

① **Classification**

Ball screw support units are classified into categories by their shape. Select the type that is appropriate for you to use.

② **Features**

- Short delivery time: Standardized items in stock
- Use most suitable bearings
  On the fixed support side, the angular contact ball bearing is used. It has great rigidity and low friction torque which match the rigidity of the ball screw.
  The thrust angular contact ball bearing with high precision and great rigidity is another choice for the fixed support side.
- High dust prevention, and low friction torque
  Oil seal is installed in small clearance on the fixed support side. A deep-groove ball bearing with a shield on both sides is used on the simple support side. This minimizes friction torque.
- Lock nut is provided.
  A lock nut of fine grade finish is provided to fix the bearing with high precision.

Rolled Ball Screws

Nut model	Picture group		Recirculation system	Lead classification
RNFTL		Flanged, Tube projecting type	Return tube type	Fine, medium lead High helix lead
RNFBL		Flanged Circular	Return tube type	Fine, medium lead
RNCT		V-thread (no flange) Projecting tube type	Return tube type	Fine lead
RNSTL		Square type	Return tube type	Small, medium leads
RNFCL		Flanged Circular	End cap type	High helix lead Ultra high helix lead

- Short delivery time: R Series is standardized, and available in stock.
- Interchangeable screw shaft and ball nut: Screw shaft and nut assembly components are sold separately, and randomly-matched. The maximum axial play after assembly is shown in the dimension tables.
- Low prices: Screw shaft is processed by rolling. This is why prices are lower than those of precision types.
- Abundant series: There are 128 types of nut assembly combinations in the series. Each combination has two to three different lengths in screw shaft.

Reference number

Nut assembly (example)

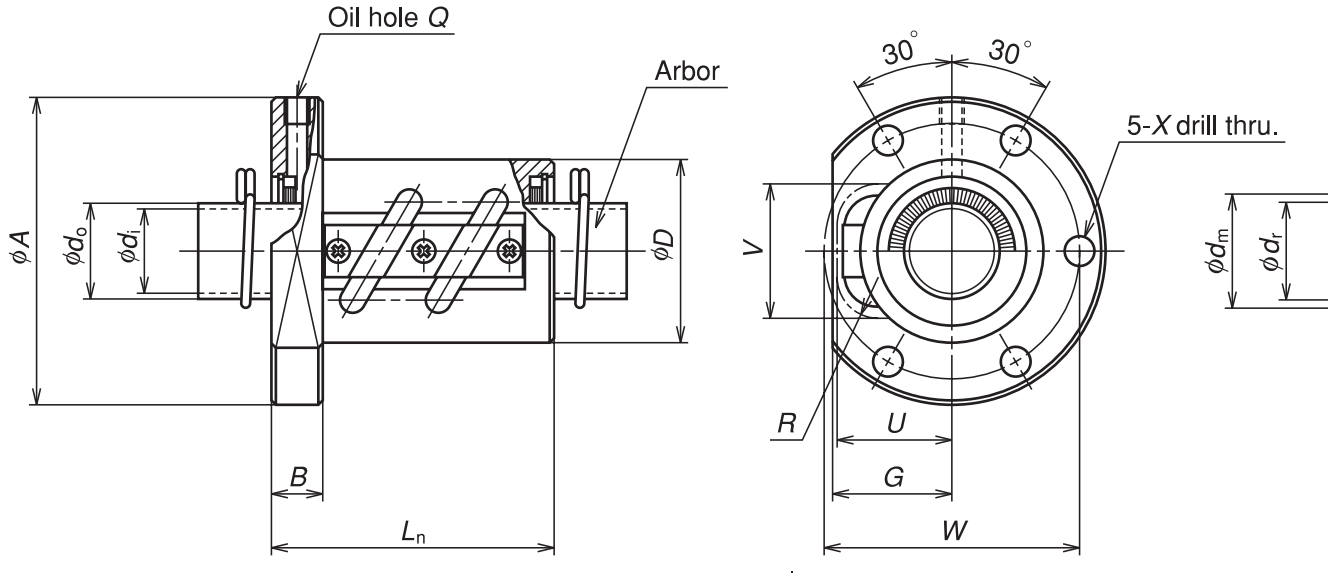
R N F T L 2 5 1 0 A 5 S

- Product code (rolled nut)
- Nut model FTL, FBL, STL, CT, FCL
- Screw shaft diameter (mm)
- Lead (mm)
- Internal design code
- Effective turns of balls (turns of balls x circuit number)
- Seal code S: With seal / No code: Without seal

Screw shaft (example)

R S 2 5 1 0 A 2 0

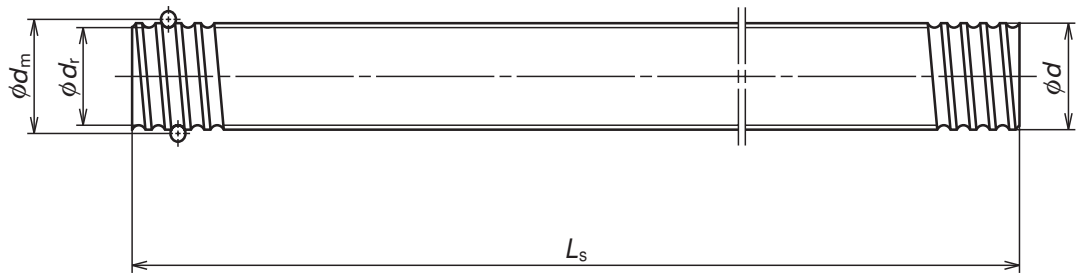
- Product code (Rolled screw shaft)
- Screw shaft diameter (mm)
- Lead (mm)
- Internal design code
- Screw shaft length (x 100 mm)



Ball nut No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating N Dynamic C_a	Basic load rating N Static C_{0a}	Axial plax Max.
RNFTL 1003A3.5	10	3	2.381	10.65	8.0	3.5×1	3780	6730	0.10
RNFTL 1006A2.5S	10	6	2.381	10.65	8.1	2.5×1	2830	4810	0.10
RNFTL 1208A2.5S	12	8	2.778	12.65	9.6	2.5×1	3730	6560	0.10
RNFTL 1404A3.5S	14	4	2.778	14.5	11.5	3.5×1	5370	10800	0.10
RNFTL 1405A2.5S	14	5	3.175	14.5	11.0	2.5×1	5260	9720	0.10
RNFTL 1610A2.5 **RNFTL 1610A2.5S**	16	10	3.175	16.75	13.3	2.5×1	5660	11500	0.10
RNFTL 1808A3.5 **RNFTL 1808A3.5S**	18	8	4.762	18.5	13.6	3.5×1	13200	25800	0.15
RNFTL 2005A2.5 **RNFTL 2005A2.5S**	20	5	3.175	20.5	17.0	2.5×1	6360	14200	0.10
RNFTL 2010A2.5 **RNFTL 2010A2.5S**	20	10	4.762	21.25	16.2	2.5×1	10900	21800	0.15
RNFTL 2505A5 **RNFTL 2505A5S**	25	5	3.175	25.5	22.0	2.5×2	12800	36300	0.10
RNFTL 2510A2.5 **RNFTL 2510A2.5S**	25	10	6.35	26	19.	2.5×1	17500	35200	0.20
RNFTL 2510A5 **RNFTL 2510A5S**						2.5×2	31800	70300	

Remarks 1. Protruding portion of the tube does not have any interference with the ball nut housing if its dimensions corresponding to U and V are large enough.
2. The actual entire screw shaft length may become slightly longer than nominal length Ls due to manufacturing tolerance.
3. Seal is contained in the nut. Therefore, the external dimensions of those with a seal are the same as those without. In the side view drawing of ball nut, the above of the center line is with seal, and beneath is without seal.
Seal for those with the shaft diameter of 14 mm or less is made of synthetic resin. Seal for those of 16 mm or over is a "Brush-seal."

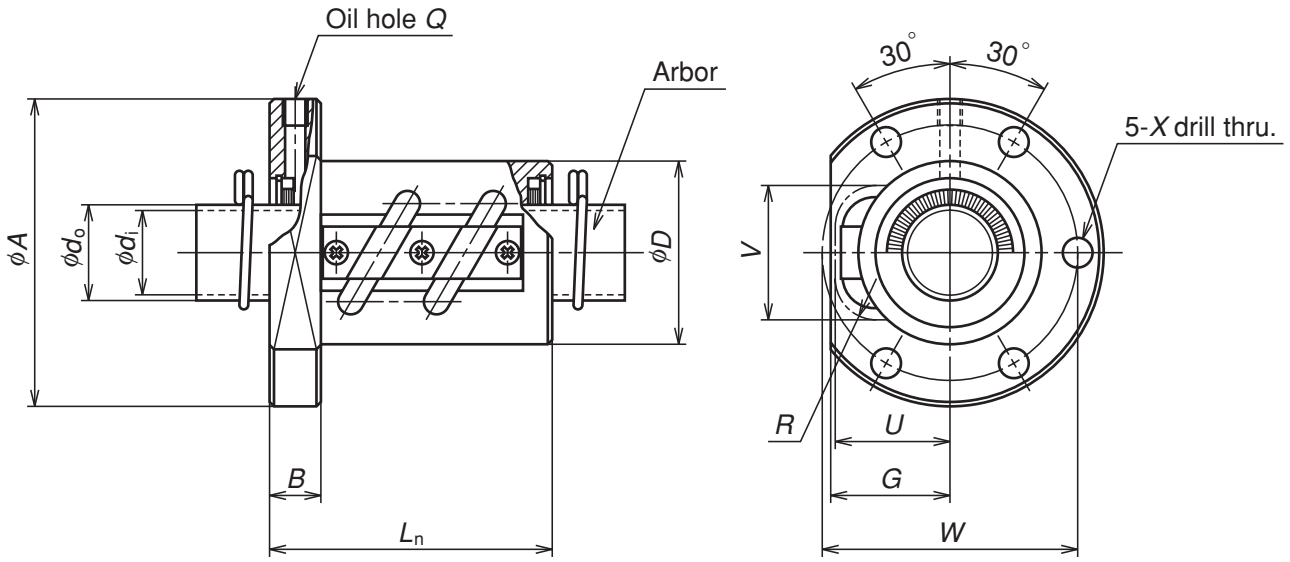
Standard stock



Unit: mm

Ball nut dimensions											Arbor		Screw shaft			
Outside dia.	Flange			Length	Bolt hole		Oil hole	Projecting tube			Outside dia.	Bore	Standard length			Screw shaft No.
D	*A*	*G*	*B*	L_n	*W*	*X*	*Q*	*U*	*V*	*R*	d_0	d_i	L_s			
20	40	15	6	34	30	4.5	M3×0.5	15	15	7	8.1	6.1	400	800		RS1003A**
20	40	15	6	36	30	4.5	M3×0.5	15	15	5	8.1	6.1	400	800		RS1006A**
25	45	19	8	46	35	4.5	M3×0.5	19	18	7	9.6	7.6	400	800		RS1208A**
25	50	19	10	43	40	4.5	M6×1	19	20	7	11.5	9.5	500	1000		RS1404A**
30	50	22	10	45	40	4.5	M6×1	22	21	8	11.0	9.0	500	1000		RS1405A**
30	53	23	10	54	41	5.5	M6×1	23	22.5	8	13.3	11.3	500	1000	1500	RS1610A**
34	63	27	12	58	49	6.6	M6×1	27	27	14	13.6	11.6	500	1000	1500	RS1808A**
40	60	28	10	46	50	4.5	M6×1	28	27	10	17.0	14.6	500	1000	2000	RS2005A**
40	67	30	12	59	53	6.6	M6×1	30	29	12	16.2	13.8	500	1000	2000	RS2010A**
42	71	28	12	66	57	6.6	M6×1	28	31	10	22.0	19.6	1000	2000	2500	RS2505A**
44	80	34	15	62	62	9	M6×1	34	37	17	19.0	16.6	1000	2000	2500	RS2510A**
44	80	34	15	92	62	9	M6×1	34	37	17						

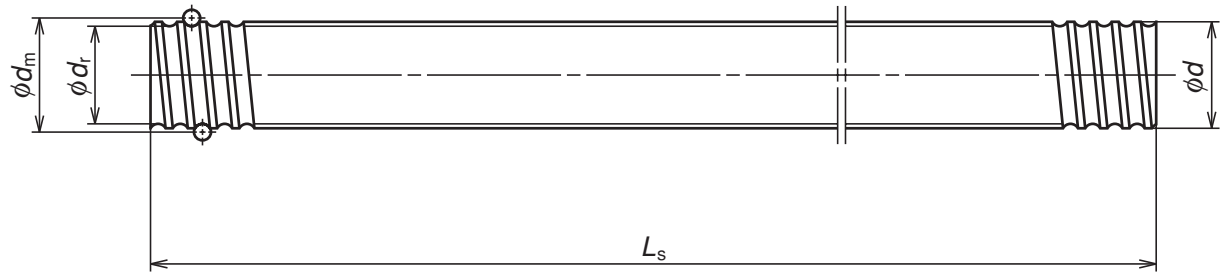
Remarks 4. Nut assembly with arbor and the screw shaft are separated at time of delivery.
5. At the end of the screw shaft reference number where marked with "**", fill with the value obtained by dividing the standard screw shaft length by 100 mm.
6. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.



Ball nut No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating N Dynamic C_a	Basic load rating N Static C_{0a}	Axial play Max.
RNFTL 2806A2.5 **RNFTL 2806A2.5S**	28	6	3.175	28.5	25.0	2.5×1	7430	20300	0.10
RNFTL 2806A5 **RNFTL 2806A5S**						2.5×2	13500	40600	
RNFTL 3210A5 **RNFTL 3210A5S**	32	10	6.35	33.75	27.0	2.5×2	35700	92200	0.20
RNFTL 3610A2.5 **RNFTL 3610A2.5S**	36	10	6.35	37	30.	2.5×1	21000	51000	0.20
RNFTL 3610A5 **RNFTL 3610A5S**						2.5×2	38100	102000	
RNFTL 4010A7 **RNFTL 4010A7S**	40	10	6.35	41.75	35.0	3.5×2	53500	164000	0.20
RNFTL 4512A5 **RNFTL 4512A5S**	45	12	7.144	46.5	39.0	2.5×2	49600	147000	0.23
RNFTL 5010A7 **RNFTL 5010A7S**	50	10	6.35	51.75	45.0	3.5×2	59500	205000	0.20
RNFTL 5016A5 **RNFTL 5016A5S**	50	16	9.525	52	42.0	2.5×2	99900	293000	0.23

Remarks 1. The protruding portion of the tube does not interfere with nut housing if its corresponding dimensions to U and V are large enough.
2. The actual screw shaft length may become slightly longer than nominal length of Ls due to manufacturing tolerance.
3. The seal is contained in the nut. Therefore, the external dimensions of those with a seal are the same as those without.
In the side view drawing of the nut, the above of the center line is with seal, and beneath is without seal.
Seal is "Brush-seal".

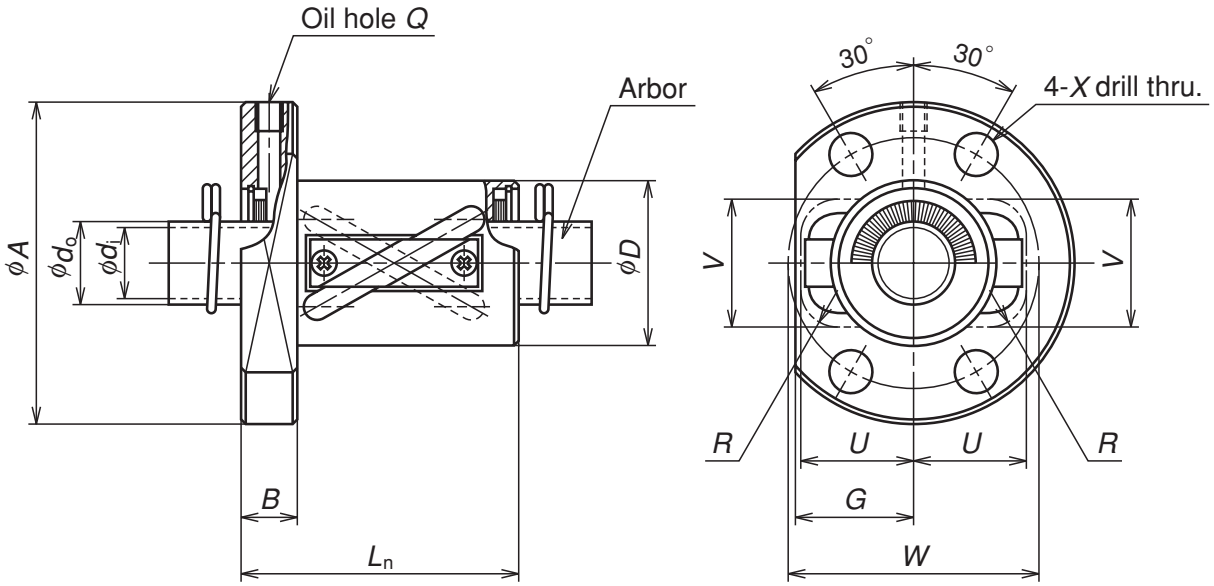
Standard stock



Unit: mm

Ball nut dimensions											Arbor		Screw shaft			
Outside dia.	Flange			Length	Bolt hole		Oil hole	Projecting tube			Outside dia.	Bore	Standard length			Screw shaft No.
D	*A*	*G*	*B*	L_n	*W*	*X*	*Q*	*U*	*V*	*R*	d_0	d_i	L_s			
50	79	33	15	55	65	6.6	M6×1	33	34	10	25.0	22.6	1000	2000	2500	RS2806A**
50	79	33	15	79	65	6.6	M6×1	33	34	10						
55	97	39	18	97	75	11	M6×1	39	42	17	27.0	24.6	1000	2000	3000	RS3210A**
60	102	42	18	68	80	11	M6×1	42	46	17	30.0	27.6	1000	2000	3000	RS3610A**
60	102	42	18	98	80	11	M6×1	42	46	17						
65	114	44	20	120	90	14	M6×1	44	50	20	35.0	31.8	2000	3000	4000	RS4010A**
70	130	47	22	116	100	18	M6×1	47	55	20	39.0	35.8	2000	3000	4000	RS4512A**
80	140	52	22	122	110	18	M6×1	52	59	20	45.0	41.8	2000	3000	4000	RS5010A**
85	163	57	28	146	125	22	M6×1	57	63	25	42.0	38.8	2000	3000	4000	RS5016A**

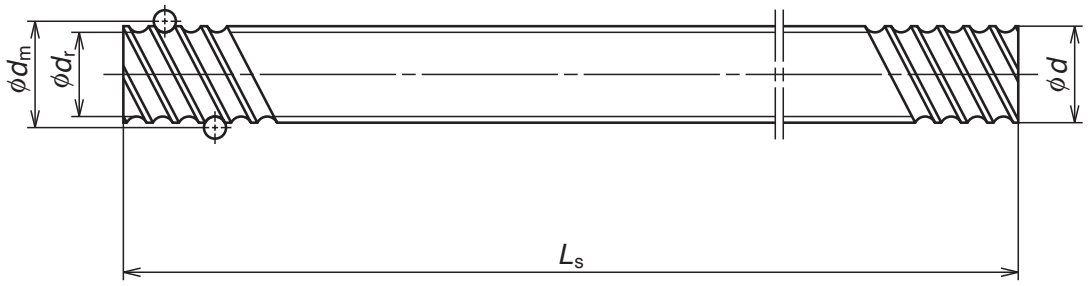
Remarks 4. Nut assembly with arbor and the screw shaft are separated at time of delivery.
5. At the end of the screw shaft reference number where marked with "**", fill with the value obtained by dividing the standard screw shaft length by 100 mm.
6. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.



Ball nut No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial play Max.
RNFTL 1212A3	12	12	2.381	12.65	10.1	1.5 × 2	3360	6270	0.10
RNFTL 1616A3 **RNFTL 1616A3S**	16	16	2.778	16.65	13.6	1.5 × 2	4880	9650	0.10
RNFTL 2020A3 **RNFTL 2020A3S**	20	20	3.175	20.75	17.3	1.5 × 2	7010	15400	0.10
RNFTL 2525A3 **RNFTL 2525A3S**	25	25	3.969	26	22.0	1.5 × 2	10500	24100	0.12
RNFTL 3232A3 **RNFTL 3232A3S**	32	32	4.762	33.25	28.0	1.5 × 2	15300	37100	0.15
RNFTL 4040A3 **RNFTL 4040A3S**	40	40	6.35	41.75	35.0	1.5 × 2	24400	61600	0.20

Remarks 1. Protruding portion of the tube does not have any interference with the ball nut housing if its dimensions corresponding to U and V are large enough.
2. The actual entire screw shaft length may become slightly longer than nominal length Ls due to manufacturing tolerance.
3. Seal is contained in the nut. Therefore, the external dimensions of those with a seal are the same as those without.
In the side view drawing of ball nut, the above of the center line is with seal, and beneath is without seal.
Seal for those with the shaft diameter of 14 mm or less is made of synthetic resin. Seal for those of 16 mm or over is a "Brush-seal."

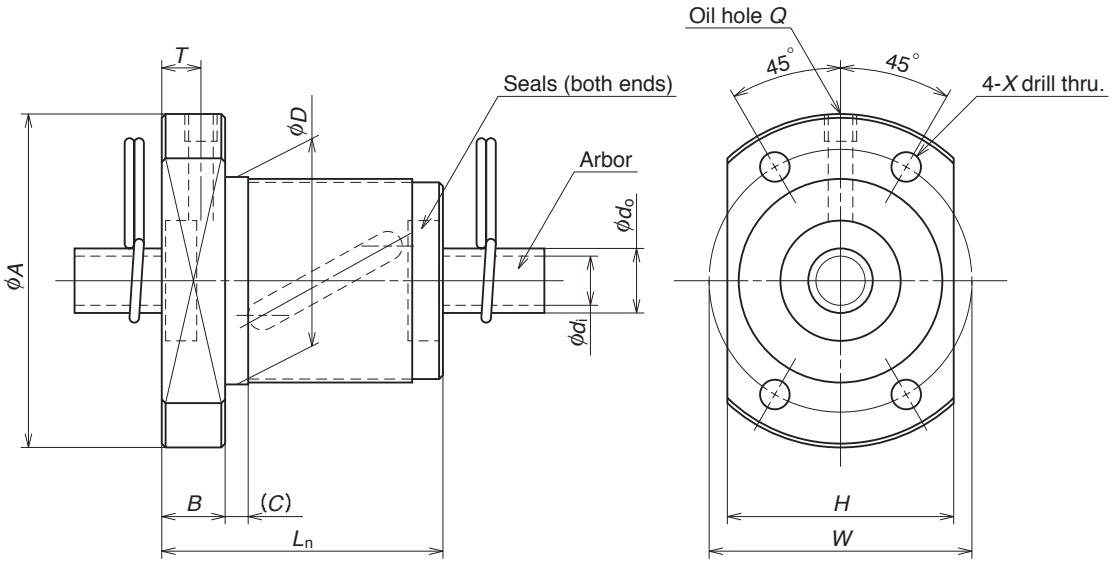
Standard stock



Unit: mm

Ball nut dimensions											Arbor		Screw shaft	
Outside dia.	Flange			Length	Bolt hole		Oil hole	Projecting tube			Outside dia.	Bore	Standard length	Screw shaft No.
D	*A*	*G*	*B*	L_n	*W*	*X*	*Q*	*U*	*V*	*R*	d_0	d_i	L_s	
24	44	17	8	44	34	4.5	M3 × 0.5	17	16	5	10.1	8.1	400 800	RS1212A**
30	55	22	10	50	43	6.6	M6 × 1	22	22	7	13.6	11.6	500 1000 1500	RS1616A**
35	68	25	12	59	52	9	M6 × 1	25	27	8	17.3	14.9	500 1000 2000	RS2020A**
45	80	31	12	69	63	9	M6 × 1	31	32	10	22.0	19.6	1000 2000 2500	RS2525A**
55	100	37	15	84	80	11	M6 × 1	37	40	12	28.0	25.6	1000 2000 3000	RS3232A**
70	120	46	18	103	95	14	M6 × 1	46	49	15	35.0	31.8	2000 3000 4000	RS4040A**

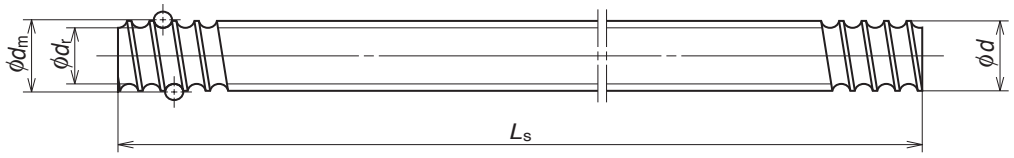
Remarks 4. Nut assembly with arbor and the screw shaft are separated at time of delivery.
5. At the end of the screw shaft reference number where marked with "**", fill with the value obtained by dividing the standard screw shaft length by 100 mm.
6. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.



Ball nut No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Axial play Max.
RNFBL 1006A2.5S	10	6	2.381	10.65	8.1	2.5×1	2830	4810	0.10
RNFBL 1208A2.5S	12	8	2.778	12.65	9.6	2.5×1	3730	6560	0.10
RNFBL 1404A3.5S	14	4	2.778	14.5	11.5	3.5×1	5370	10800	0.10
RNFBL 1405A2.5S	14	5	3.175	14.5	11.0	2.5×1	5260	9720	0.10
RNFBL 1808A3.5S	18	8	4.762	18.5	13.6	3.5×1	13200	25800	0.15
RNFBL 2005A2.5S	20	5	3.175	20.5	17.0	2.5×1	6360	14200	0.10
RNFBL 2010A2.5S	20	10	4.762	21.25	16.2	2.5×1	10900	21800	0.15
RNFBL 2505A2.5S	25	5	3.175	25.5	22.0	2.5×1	7070	18200	0.10
RNFBL 2505A5S						2.5×2	12800	36300	
RNFBL 2510A2.5S	25	10	6.35	26	19.0	2.5×1	17500	35200	0.20
RNFBL 2510A5S						2.5×2	31800	70300	
RNFBL 2806A2.5S	28	6	3.175	28.5	25.0	2.5×1	7430	20300	0.10
RNFBL 2806A5S						2.5×2	13500	40600	
RNFBL 3210A2.5S	32	10	6.35	33.75	27.0	2.5×1	19700	46100	0.20
RNFBL 3210A5S						2.5×2	35700	92200	
RNFBL 3610A2.5S	36	10	6.35	37	30.0	2.5×1	21000	51000	0.20
RNFBL 3610A5S						2.5×2	38100	102000	
RNFBL 4010A5S	40	10	6.35	41.75	35.0	2.5×2	40100	116000	0.20

Remarks 1. The actual screw shaft length may be slightly longer than nominal length Ls due to manufacturing tolerance.
2. Nut assembly with arbor and screw shaft are separated at time of delivery.
3. The value obtained by dividing the standard screw length by 100 mm will be entered at the end of the reference number where marked with "* *."

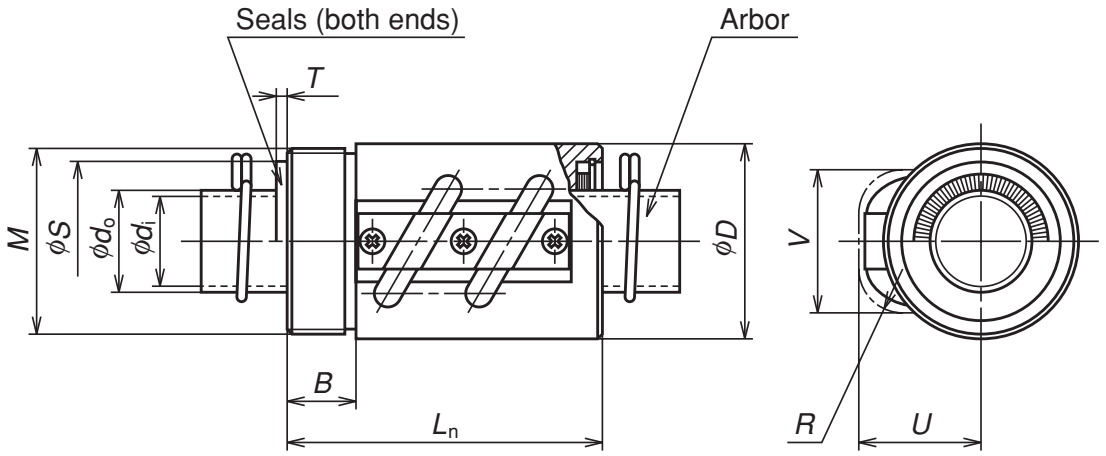
Standard stock



Unit: mm

Ball nut dimensions										Arbor		Screw shaft			
Outside dia.	Flange			Length		Bolt hole		Oil hole		Outside dia.	Bore	Standard length			Screw shaft No.
				Overall length											
D	*A*	*H*	*B*	*L*	(*C*)	*W*	*X*	*Q*	*T*	d_0	d_i	L_s			
26	42	29	8	36	3	34	4.5	M3×0.5	5.0	8.1	6.1	400	800		RS1006A**
29	45	32	8	44	3	37	4.5	M3×0.5	5.5	9.6	7.6	400	800		RS1208A**
31	50	37	10	40	4	40	4.5	M6×1	5.0	11.5	9.5	500	1000		RS1404A**
32	50	38	10	40	4	40	4.5	M6×1	5.0	11.0	9.0	500	1000		RS1405A**
50	80	60	12	61	4	65	6.6	M6×1	6.0	13.6	11.6	500	1000	1500	RS1808A**
40	60	46	10	40	4	50	4.5	M6×1	5.0	17.0	14.6	500	1000	2000	RS2005A**
52	82	64	12	61	5	67	6.6	M6×1	6.0	16.2	13.8	500	1000	2000	RS2010A**
43	67	50	10	40 55	4	55	5.5	M6×1	5.0	22.0	19.6	1000	2000	2500	RS2505A**
60	96	72	15	66 96	5	78	9.0	M6×1	7.5	19.0	16.6	1000	2000	2500	RS2510A**
50	80	60	12	47 65	5	65	6.6	M6×1	6.0	25.0	22.6	1000	2000	2500	RS2806A**
67	103	78	15	67 97	5	85	9.0	M6×1	7.5	27.0	24.6	1000	2000	3000	RS3210A**
70	110	82	17	69 99	5	90	11.0	M6×1	8.5	30.0	27.6	1000	2000	3000	RS3610A**
76	116	88	17	99	5	96	11.0	M6×1	8.5	35.0	31.8	2000	3000	4000	RS4010A**

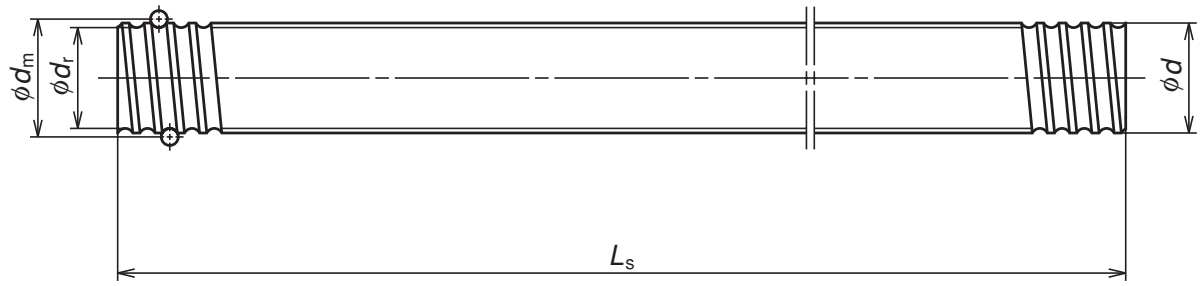
Remarks 4. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.
5. Seal for those with the shaft diameter of 14 mm or less is made of synthetic resin. Seal for those with 16 mm or larger is "Brush-seal."



Ball nut No	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial play Max.
RNCT 1003A3.5	10	3	2.381	10.65	8.0	3.5 × 1	3780	6730	0.10
RNCT 1404A3.5S	14	4	2.778	14.5	11.5	3.5 × 1	5370	10800	0.10
RNCT 1405A2.5S	14	5	3.175	14.5	11.0	2.5 × 1	5260	9720	0.10
RNCT 1808A3.5 **RNCT 1808A3.5S**	18	8	4.762	18.5	13.6	3.5 × 1	13200	25800	0.15
RNCT 2005A2.5 **RNCT 2005A2.5S**	20	5	3.175	20.5	17.0	2.5 × 1	6360	14200	0.10
RNCT 2505A5 **RNCT 2505A5S**	25	5	3.175	25.5	22.0	2.5 × 2	12800	36300	0.10
RNCT 2510A5 **RNCT 2510A5S**	25	10	6.35	26	19.0	2.5 × 2	31800	70300	0.20
RNCT 2806A5 **RNCT 2806A5S**	28	6	3.175	28.5	25.0	2.5 × 2	13500	40600	0.10
RNCT 3210A5 **RNCT 3210A5S**	32	10	6.35	33.75	27.0	2.5 × 2	35700	92200	0.20
RNCT 3610A5 **RNCT 3610A5S**	36	10	6.35	37	30.0	2.5 × 2	38100	102000	0.20
RNCT 4010A7 **RNCT 4010A7S**	40	10	6.35	41.75	35.0	3.5 × 2	53500	164000	0.20
RNCT 4512A5 **RNCT 4512A5S**	45	12	7.144	46.5	39.0	2.5 × 2	49600	147000	0.23
RNCT 5010A7 **RNCT 5010A7S**	50	10	6.35	51.75	45.0	3.5 × 2	59500	205000	0.20
RNCT 5016A5 **RNCT 5016A5S**	50	16	9.525	52	42.0	2.5 × 2	99900	293000	0.23

Remarks 1. Protruding portion of the tube does not have any interference with the ball nut housing if its dimensions corresponding to U and V are large enough.
2. The actual entire screw shaft length may become slightly longer than nominal length Ls due to manufacturing tolerance.
3. A seal cannot be installed in the V thread side. It may be installed in the opposite side.
Seal is contained in the nut. Therefore, the external dimensions of those with a seal are the same as those without.
In the side view drawing of ball nut, the above of the center line is with seal, and beneath is without seal.

Standard stock

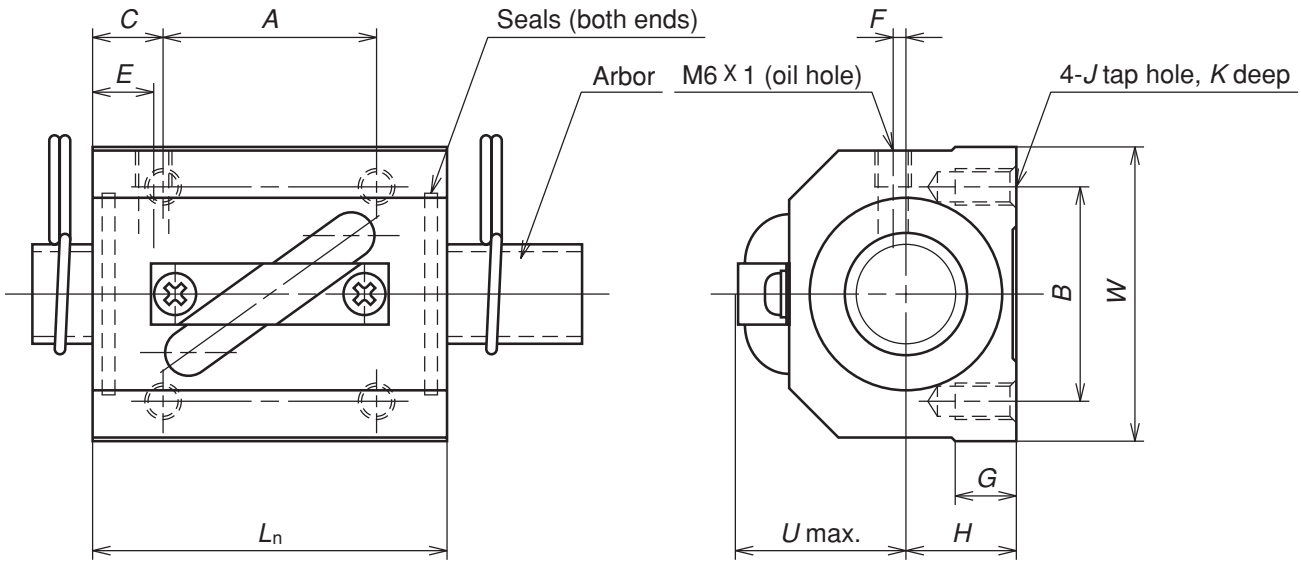


Unit: mm

Ball nut dimensions							Seal dimensions		Arbor		Screw shaft			
Outside dia.	Flange		Length	Projecting tube			Diameter	Thickness	Outside dia.	Bore	Standard length			Screw shaft No.
D	*M*	*B*	L_n	*U*	*V*	*R*	*S*	*T*	d_0	d_i	L_s			
20	M18×1	10	38	15	15	7			8.1	6.1	*400*	800		RS1003A**
25	M24×1	10	43	19	20	7			11.5	9.5	500	1000		RS1404A**
30	M26×1.5	10	45	22	21	8			11.0	9.0	500	1000		RS1405A**
34	M32×1.5	12	58	27	27	14	28.5	2.5	13.6	11.6	500	1000	1500	RS1808A**
40	M36×1.5	12	48	28	27	10	29.5	2.5	17.0	14.6	500	1000	2000	RS2005A**
42	M40×1.5	15	69	28	31	10	34.5	2.5	22.0	19.6	1000	2000	2500	RS2505A**
44	M42×1.5	15	92	34	37	17	38.5	2.5	19.0	16.6	1000	2000	2500	RS2510A**
50	M45×1.5	15	79	33	34	10	37.5	2.5	25.0	22.6	1000	2000	2500	RS2806A**
55	M50×1.5	18	97	39	42	17	45.5	2.5	27.0	24.6	1000	2000	3000	RS3210A**
60	M55×2	18	98	42	46	17	50.5	3.0	30.0	27.6	1000	2000	3000	RS3610A**
65	M60×2	25	125	44	50	20	54.5	3.0	35.0	31.8	2000	3000	4000	RS4010A**
70	M65×2	30	124	47	55	20	60.5	3.0	39.0	35.8	2000	3000	4000	RS4512A**
80	M75×2	40	140	52	59	20	64.5	3.0	45.0	41.8	2000	3000	4000	RS5010A**
85	M80×2	40	158	57	63	25	68.5	3.0	42.0	38.8	2000	3000	4000	RS5016A**

Seal for those with the shaft diameter of 14 mm or less is made of synthetic resin. Seal for those of 16 mm or over is a "Brush-seal."
There is no seal on the V-thread side for RNCT1404A3.5S and RNCT1405A2.5S

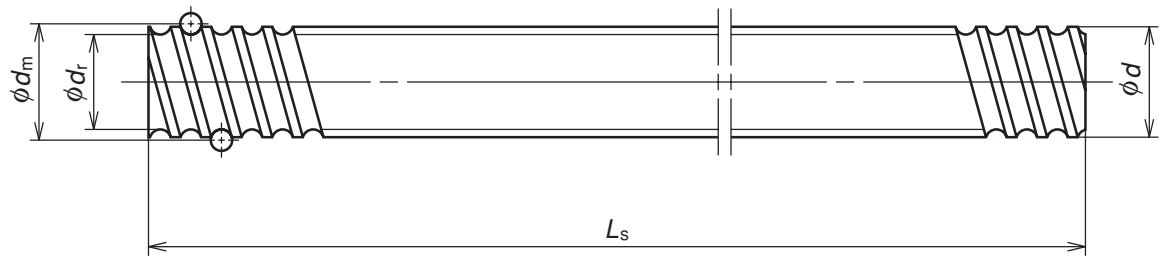
4. Nut assembly with arbor and the screw shaft are separated at time of delivery.
5. At the end of the screw shaft reference number where marked with "**", fill with the value obtained by dividing the standard screw shaft length by 100 mm.
6. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.



Ball nut No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Axial play Max.
RNSTL 1404A3.5S	14	4	2.778	14.5	11.5	3.5 × 1	5370	10800	0.10
RNSTL 1405A2.5S	14	5	3.175	14.5	11.0	2.5 × 1	5260	9720	0.10
RNSTL 1808A3.5S	18	8	4.762	18.5	13.6	3.5 × 1	13200	25800	0.15
RNSTL 2005A2.5S	20	5	3.175	20.5	17.0	2.5 × 1	6360	14200	0.10
RNSTL 2010A2.5S	20	10	4.762	21.25	16.2	2.5 × 1	10900	21800	0.15
RNSTL 2505A2.5S	25	5	3.175	25.5	22.0	2.5 × 1	7070	18200	0.10
RNSTL 2510A5S	25	10	6.35	26	19.0	2.5 × 1	31800	70300	0.20
RNSTL 2806A2.5S	28	6	3.175	28.5	25.0	2.5 × 1	7430	20300	0.10
RNSTL 2806A5S						2.5 × 2	13500	40600	
RNSTL 3210A2.5S	32	10	6.35	33.75	27.0	2.5 × 1	19700	46100	0.20
RNSTL 3210A5S						2.5 × 2	35700	92200	
RNSTL 3610A2.5S	36	10	6.35	37	30.0	2.5 × 1	21000	51000	0.20
RNSTL 3610A5S						2.5 × 2	38100	102000	
RNSTL 4512A2.5S	45	12	7.144	46.5	39.0	2.5 × 2	49600	147000	0.23

Remarks 1. The actual screw shaft length may be slightly longer than nominal length Ls due to manufacturing tolerance.
2. Nut assembly with arbor and screw shaft are separated at time of delivery.
3. The value obtained by dividing the standard screw length by 100 mm will be entered at the end of the reference number where marked with "* *."

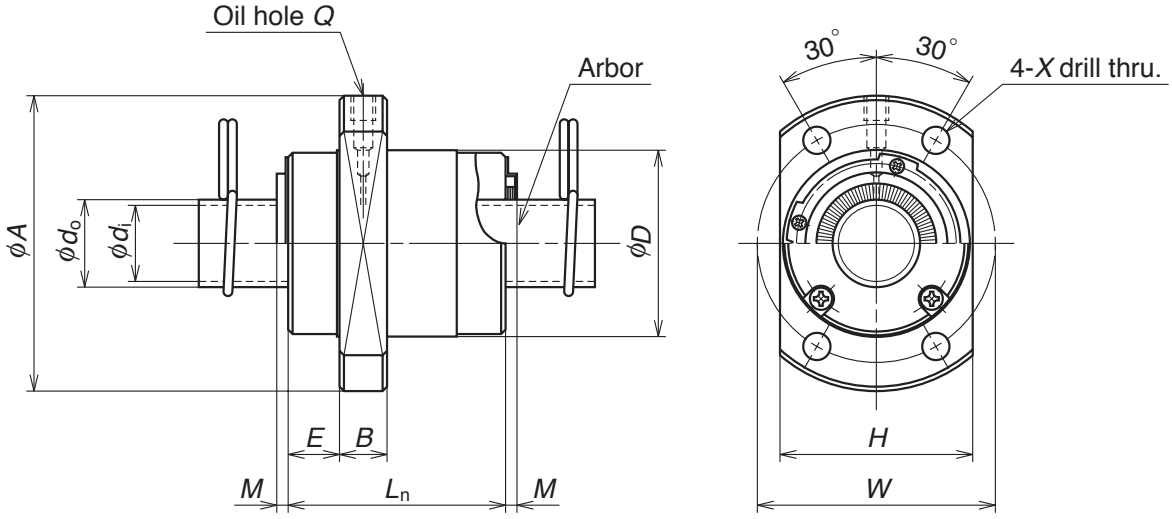
Standard stock



Unit: mm

Ball nut dimensions											Arbor		Screw shaft			
Length	Width	Center height	Bolt hole					Oil hole			Outside dia.	Bore	Standard length			Screw shaft No.
L_n	W	H	A	B	C	J	K	E	F	U	d_0	d_i	L_s			
38	34	13	22	26	8	M4	7	7	3	20	11.5	9.5	500	1000		RS1404A**
38	34	13	22	26	10.5	M4	7	7	3	21	11.0	9.0	500	1000		RS1405A**
56	48	17	35	35	11	M6	10	8	3	26	13.6	11.6	500	1000	1500	RS1808A**
38	48	17	22	35	8	M6	9	6	2	27	17.0	14.6	500	1000	2000	RS2005A**
58	48	18	35	35	11.5	M6	10	10	2	28	16.2	13.8	500	1000	2000	RS2010A**
35	60	20	22	40	6.5	M8	10	6	0	27	22.0	19.6	1000	2000	2500	RS2505A**
94	60	23	60	40	17	M8	12	10	0	32	19.0	16.6	1000	2000	2500	RS2510A**
42 67	60 60	22 22	18 40	40 40	12 13.5	M8	12	8	0	32	25.0	22.6	1000	2000	2500	RS2806A**
64 94	70 70	26 26	45 60	50 50	9.5 17	M8	12	10	0	38	27.0	24.6	1000	2000	3000	RS3210A**
64 96	86 86	29 29	45 60	60 60	9.5 18	M10	16	11	0	41	30.0	27.6	1000	2000	3000	RS3610A**
115	100	36	75	75	20	M12	20	13	0	46	39.0	35.8	2000	3000	4000	RS4510A**

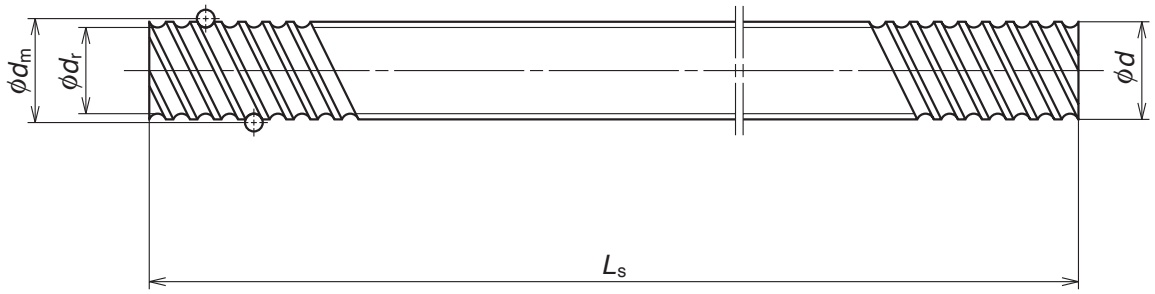
Remarks 4. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.
5. Seal for those with the shaft diameter of 14 mm or less is made of synthetic resin. Seal for those with 18 mm or larger is "Brush-seal."



Ball nut No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls Turns × Circuits	Basic load rating (N) Dynamic C_a	Basic load rating (N) Static C_{0a}	Axial play Max.
RNFCL 1212A3	12	12	2.381	12.65	10.1	1.7 × 2	3740	6640	0.10
RNFCL 1212A6						1.7 × 4	6780	13300	
RNFCL 1520A3 **RNFCL 1520A3S**	15	20	3.175	15.5	12.2	1.7 × 2	6730	12300	0.10
RNFCL 1616A3 **RNFCL 1616A3S**	16	16	2.778	16.65	13.5	1.7 × 2	5430	10400	0.10
RNFCL 1616A6 **RNFCL 1616A6S**						1.7 × 4	9860	20800	
RNFCL 2020A3 **RNFCL 2020A3S**	20	20	3.175	20.75	17.3	1.7 × 2	7810	16500	0.10
RNFCL 2020A6 **RNFCL 2020A6S**						1.7 × 4	14200	33000	
RNFCL 2525A3 **RNFCL 2525A3S**	25	25	3.969	26	22.0	1.7 × 2	11700	25800	0.12
RNFCL 2525A6 **RNFCL 2525A6S**						1.7 × 4	21200	51500	
RNFCL 3232A3 **RNFCL 3232A3S**	32	32	4.762	33.25	28.0	1.7 × 2	17100	40500	0.15
RNFCL 3232A6 **RNFCL 3232A6S**						1.7 × 4	31000	81000	
RNFCL 4040A3 **RNFCL 4040A3S**	40	40	6.35	41.75	35.0	1.7 × 2	27200	67900	0.20
RNFCL 4040A6 **RNFCL 4040A6S**						1.7 × 4	49300	136000	
RNFCL 5050A3 **RNFCL 5050A3S**	50	50	7.938	52.25	44.0	1.7 × 2	40600	106000	0.25
RNFCL 5050A6 **RNFCL 5050A6S**						1.7 × 4	73700	212000	

Remarks 1. The actual screw shaft length may be slightly longer than nominal length Ls due to manufacturing tolerance.
2. Nut assembly with arbor and screw shaft are separated at time of delivery.
3. The value obtained by dividing the standard screw length by 100 mm will be entered at the end of the reference number where marked with "* *."

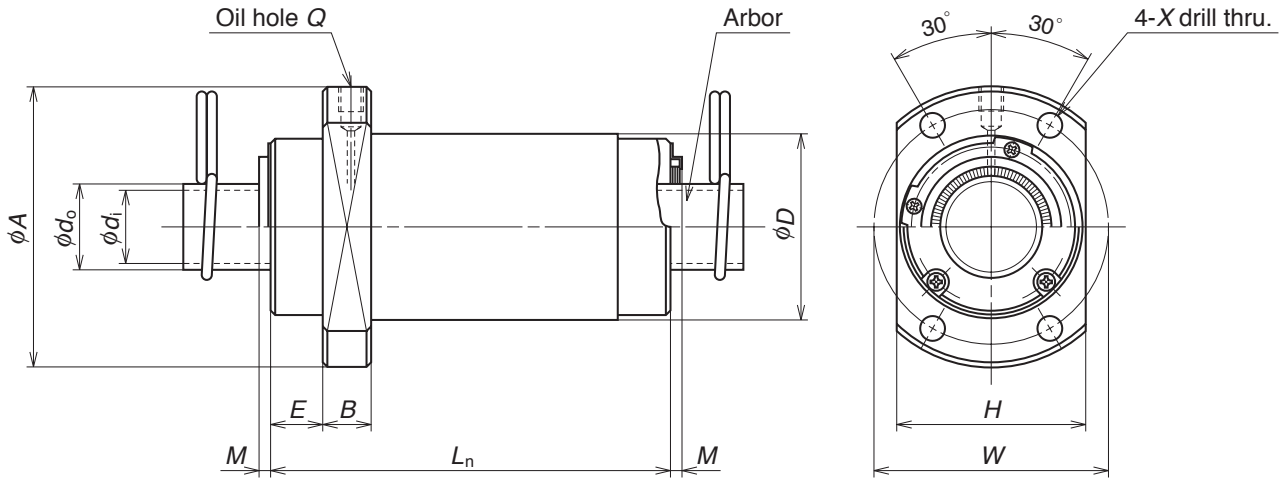
Standard stock



Unit: mm

Ball nut dimensions										Arbor		Screw shaft			
Outside dia.	Flange			Length			Bolt hole		Oil hole	Outside dia.	Bore	Standard length			Screw shaft No.
D	*A*	*H*	*B*	*E*	L_n	*M*	*W*	*X*	*Q*	d_0	d_i	L_s			
26	44	28	6	9	30	—	35	4.5	M3 × 0.5	10.1	8.1	400	800		RS1212A**
33	51	35	10	11	45	— 3	42	4.5	M6 × 1	12.2	10.2	500	1000	1500	RS1520A**
32	53	34	10	10	38	— 3 — 3	42	4.5	M6 × 1	13.6	11.6	500	1000	1500	RS1616A**
39	62	41	10	11.5	46	— 3 — 3	50	5.5	M6 × 1	17.3	14.9	500	1000	2000	RS2020A**
47	74	49	12	13	55	— 3 — 3	60	6.6	M6 × 1	22.0	19.6	1000	2000	2500	RS2525A**
58	92	60	12	16	70	— 3 — 3	74	9	M6 × 1	28.0	25.6	1000	2000	3000	RS3232A**
73	114	75	15	19.5	85	— 3.5 — 3.5	93	11	M6 × 1	35.0	31.8	2000	3000	4000	RS4040A**
90	135	92	20	21.5	107	— 3.5 — 3.5	112	14	M6 × 1	44.0	40.8	2000	3000	4000	RS5050A**

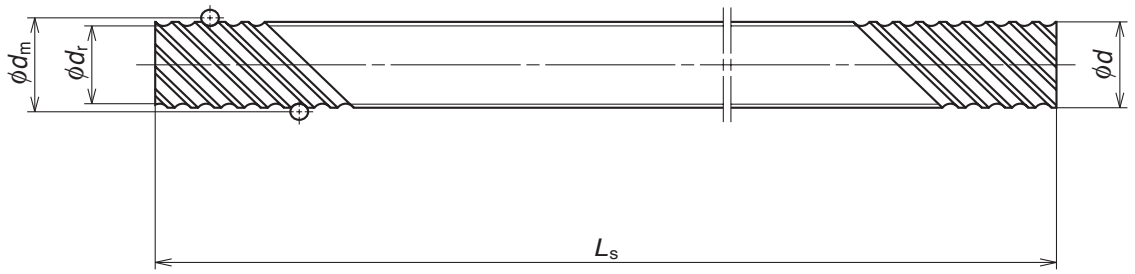
Remarks 4. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.
5. The entire length of the nut becomes longer by "2 x M " for those with a seal. The seal is "Brush-seal."



Ball nut No.	Shaft dia. d	Lead l	Ball dia. D_w	Ball circle dia. d_m	Root dia. d_r	Effective turns of balls: Turns × Circuits	Basic load rating (N): Dynamic C_a	Basic load rating (N): Static C_{0a}	Axial play Max.
RNFCL 1632A2 **RNFCL 1632A2S**	16	32	2.778	16.65	13.5	0.7 × 4	4600	8460	0.10
RNFCL 1632A3 **RNFCL 1632A3S**						1.7 × 2	5430	10400	
RNFCL 1632A6 **RNFCL 1632A6S**						1.7 × 4	9860	20800	
RNFCL 2040A2 **RNFCL 2040A2S**	20	40	3.175	20.75	17.3	0.7 × 4	6610	13600	0.10
RNFCL 2040A3 **RNFCL 2040A3S**						1.7 × 2	7810	16500	
RNFCL 2040A6 **RNFCL 2040A6S**						1.7 × 4	14200	33000	
RNFCL 2550A2 **RNFCL 2550A2S**	25	50	3.969	26	22.0	0.7 × 4	9870	21200	0.12
RNFCL 2550A3 **RNFCL 2550A3S**						1.7 × 2	11700	25800	
RNFCL 2550A6 **RNFCL 2550A6S**						1.7 × 4	21200	51500	
RNFCL 3264A3 **RNFCL 3264A3S**	32	64	4.762	33.25	28.0	1.7 × 2	17100	40500	0.15
RNFCL 3264A6 **RNFCL 3264A6S**						1.7 × 4	31000	81000	
RNFCL 4080A3 **RNFCL 4080A3S**	40	80	6.350	41.75	35.0	1.7 × 2	27200	67900	0.20
RNFCL 4080A6 **RNFCL 4080A6S**						1.7 × 4	49300	136000	

Remarks 1. The actual screw shaft length may be slightly longer than nominal length Ls due to manufacturing tolerance.
2. Nut assembly with arbor and screw shaft are separated at time of delivery.
3. The value obtained by dividing the standard screw length by 100 mm will be entered at the end of the reference number where marked with "* *."

Standard stock



Unit: mm

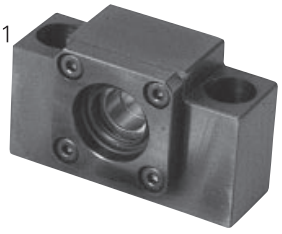
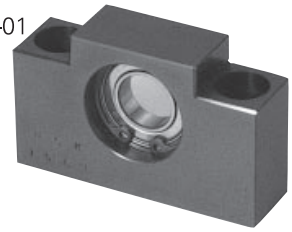
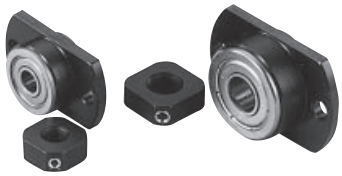
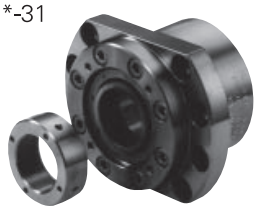
Ball nut dimensions										Arbor		Screw shaft	
Outside dia.	Flange			Length			Bolt hole		Oil hole	Outside dia.	Bore	Standard length	Screw shaft No.
D	A	H	B	E	L_n	M	W	X	Q	d_0	d_i	L_s	
32	50	34	10	10	34	—	41	4.5	M6 × 1	13.5	11.5	500 1000 1500	RS1632A**
						3							
					66	—							
						3							
					66	—							
						3							
38	58	40	10	11	41	—	48	5.5	M6 × 1	17.3	14.9	500 1000 1500 2000	RS2040A**
						3							
					81	—							
						3							
					81	—							
						3							
46	70	48	12	13	50	—	58	6.6	M6 × 1	22.0	19.6	1000 2000 2500	RS2550A**
						3							
					100	—							
						3							
					100	—							
						3							
58	92	60	12	15.5	126	—	74	9	M6 × 1	28.0	25.6	1000 2000 3000 4000	RS3264A**
						3							
						—							
						3							
73	114	75	15	19	158	—	93	11	M6 × 1	35.0	31.8	2000 3000 4000 5000	RS4080A**
						3.5							
						—							
						3.5							

Remarks 4. Items in stock are not applied surface treatment. NSK provides treatment such as phosphate coating on request.
5. The entire length of the nut becomes longer by "2 x M " for those with a seal. The seal is "Brush-seal."

Support units

Accessories to use with ball screw are available in stock.

Support unit categories

Application		Shape	Support side	Bearing in use	Bearing bore Bearing seat diameter
Small equipment, light load	Square	WBK**-01 	Fixed support side	Angular contact ball bearing	ϕ 6 ~ ϕ 25
		WBK**S-01 	Simple support side	Deep groove ball bearing	ϕ 6 ~ ϕ 25
		WBK**SF-01 		Deep groove ball bearing	ϕ 12, ϕ 15 (Exclusive for VFA Series)
	Round	WBK**R-01 (Support kit) 	Fixed support side	Deep groove ball bearing (arranged to have angular contact)	ϕ 4, ϕ 6 (Exclusive for RMA and RMS Series)
		WBK**-11 		Angular contact ball bearing	ϕ 6 ~ ϕ 25
Machine tools, heavy load	Round	WBK**DF*-31 	Fixed support side	Thrust angular contact ball bearing	ϕ 17 ~ ϕ 40

Support units

① Classification

Ball screw support units are classified into categories by their shape (Table I-6.6). Select the type that is appropriate for you to use.

② Features

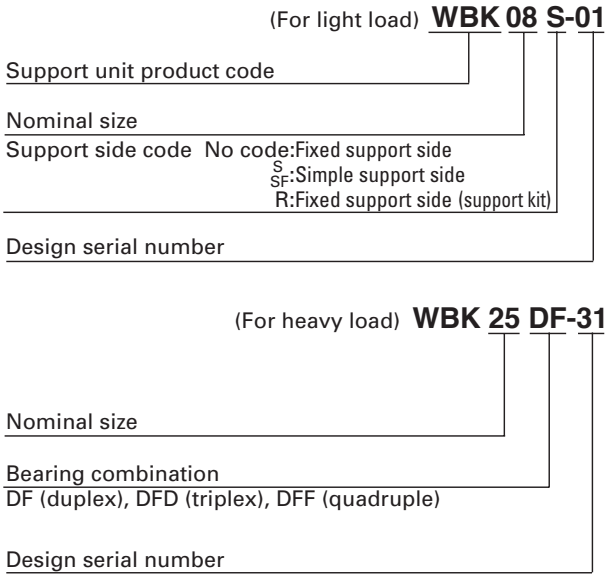
- Short delivery time: Standardized items in stock
- Use most suitable bearings

  On the fixed support side, the angular contact ball bearing is used. It has great rigidity and low friction torque which match the rigidity of the ball screw. The thrust angular contact ball bearing with high precision and great rigidity is another choice for the fixed support side.
- High dust prevention, and low friction torque

  Oil seal is installed in small clearance on the fixed support side. A deep-groove ball bearing with a shield on both sides is used on the simple support side. This minimizes friction torque.
- Lock nut is provided.

  A lock nut of fine grade finish is provided to fix the bearing with high precision.

③ Reference number and applicable ball screw



The table below show "shaft diameter/lead combinations" of standard ball screws that are applicable to support units.

Support units for light load and applicable "shaft diameter/lead combinations"

Light load / small equipment

Support unit / reference number			"Shaft diameter/lead combinations" of standard ball screws that are applicable to support unit
Square		Round	
Fixed support side (driving motor side)	Simple support side (opposite to driving motor)	Fixed support side	
WBK06-01A	—	WBK06-11	$\phi 4 \times 1$, $\phi 6 \times 1$
WBK08-01A	WBK08S-01	WBK08-11	$\phi 8 \times 1$, $\phi 8 \times 1.5$, $\phi 8 \times 2$, $\phi 10 \times 2$, $\phi 10 \times 2.5$
WBK10-01A	WBK10S-01	WBK10-11	$\phi 10 \times 4$, $\phi 12 \times 2$, $\phi 12 \times 2.5$, $\phi 12 \times 5$, $\phi 12 \times 10$
WBK12-01A	WBK12S-01	WBK12-11	$\phi 14 \times 5$, $\phi 14 \times 8$, $\phi 15 \times 10$, $\phi 15 \times 20$, $\phi 16 \times 2$ $\phi 16 \times 2.5$, $\phi 16 \times 5$, $\phi 16 \times 16$, $\phi 16 \times 32$
WBK15-01A	WBK15S-01	WBK15-11	$\phi 20 \times 4$, $\phi 20 \times 5$, $\phi 20 \times 10$, $\phi 20 \times 20$, $\phi 20 \times 40$
WBK20-01	WBK20S-01	WBK20-11	$\phi 20 \times 4$, $\phi 20 \times 5$, $\phi 20 \times 6$, $\phi 20 \times 10$, $\phi 20 \times 20$ $\phi 25 \times 25$, $\phi 25 \times 50$, $\phi 28 \times 5$, $\phi 28 \times 6$
WBK25-01	WBK25S-01	WBK25-11	$\phi 32 \times 5$, $\phi 32 \times 6$, $\phi 32 \times 8$, $\phi 32 \times 10$ $\phi 32 \times 25$, $\phi 32 \times 32$,

Remarks 1. Reference number is based on the bearing bore on the fixed support side.
2. Please note that the reference numbers 12 or below on the simple-support side do not match the bore of the deep-groove ball bearing in use.

Support units for heavy load and applicable "shaft diameter/lead combinations"

Heavy load / machine tools

Support unit / reference number		"Shaft diameter/lead combinations" of standard ball screws that are applicable to the support unit
Fixed support side (drive motor side)	Fixed support side (opposite to drive motor)	
WBK30DF-31	WBK25DF-31	$\phi 36 \times 10$
WBK30DFD-31	WBK25DFD-31	$\phi 36 \times 10$, $\phi 40 \times 10$
WBK30DF-31	WBK30DF-31	$\phi 40 \times 5$, $\phi 40 \times 8$, $\phi 40 \times 10$, $\phi 40 \times 12$
WBK30DFD-31	WBK30DFD-31	$\phi 40 \times 12$
WBK35DF-31	WBK35DF-31	$\phi 45 \times 10$
WBK40DF-31	WBK40DF-31	$\phi 50 \times 10$
WBK40DFD-31	WBK40DFD-31	$\phi 50 \times 10$

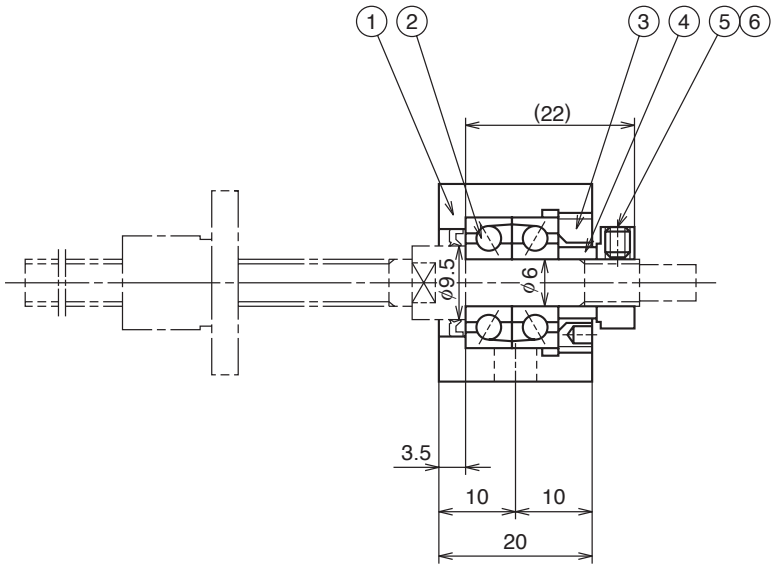
Dimensions of support unit for light load / small equipment

The table shows characteristic value of the support units for light load / small equipment.

Characteristic values of support units for light load

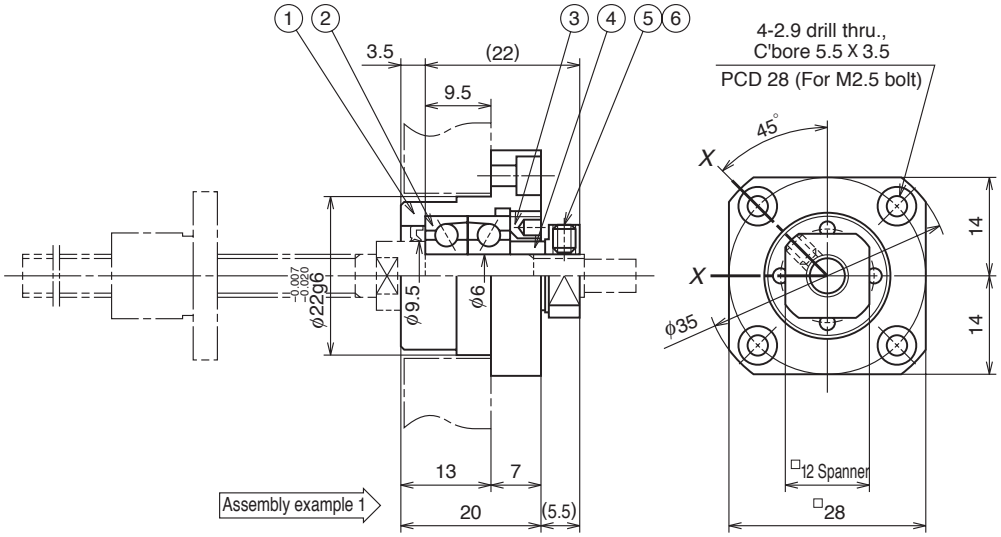
Fixed side support unit							Support unit on simple support side		
Support unit reference number	Bearing in use (angular contact ball bearing)						Bearing in use (deep-groove ball bearing)		Support unit reference number
	Bearing reference number	Axial direction				Maximum starting torque N•cm	Bearing reference number	Radial direction	
		Basic dynamic load rating C_a N	Load limit N	Preload N	Rigidity N/μm			Basic dynamic load rating C N	
WBK06-01A (Square) WBK06-11 (Round)	706ATYDFC7P5	2670	1040	17	28	0.49	—	—	—
WBK08-01A (Square) WBK08-11 (Round)	708ATYDFC8P5	4400	1450	59	53	0.88	606ZZ	2260	WBK08S-01 (Square)
WBK10-01A (Square) WBK10-11 (Round)	7000ATYDFC8P5	6600	2730	200	94	1.9	608ZZ	3300	WBK10S-01 (Square)
WBK12-01A (Square) WBK12-11 (Round)	7001ATYDFC8P5	7150	3040	215	104	2.1	6000ZZ	4550	WBK12S-01 (Square)
WBK15-01A (Square) WBK15-11 (Round)	7002ATYDFC8P5	7600	3370	235	113	2.3	6002ZZ	5600	WBK15S-01 (Square)
WBK20-01 (Square) WBK20-11 (Round)	7204ATYDFC8P5	17900	8260	440	155	5.4	6204ZZ	12800	WBK20S-01 (Square)
WBK25-01 (Square) WBK25-11 (Round)	7205ATYDFC8P5	20200	10000	580	192	7.2	6205ZZ	14000	WBK25S-01 (Square)

Square type Reference number: WBK06-01A



Section *X-X*

Round type Reference number: WBK06-11

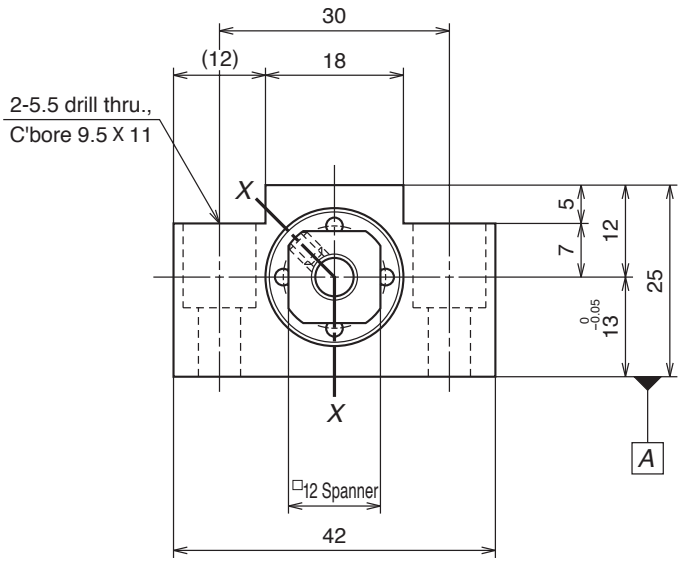


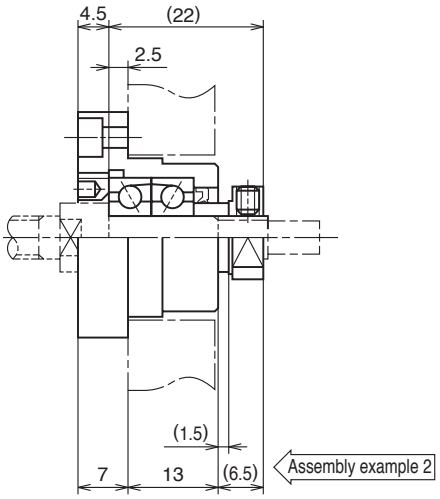
Section *X-X*

WBK06

Standard stock

Unit: mm



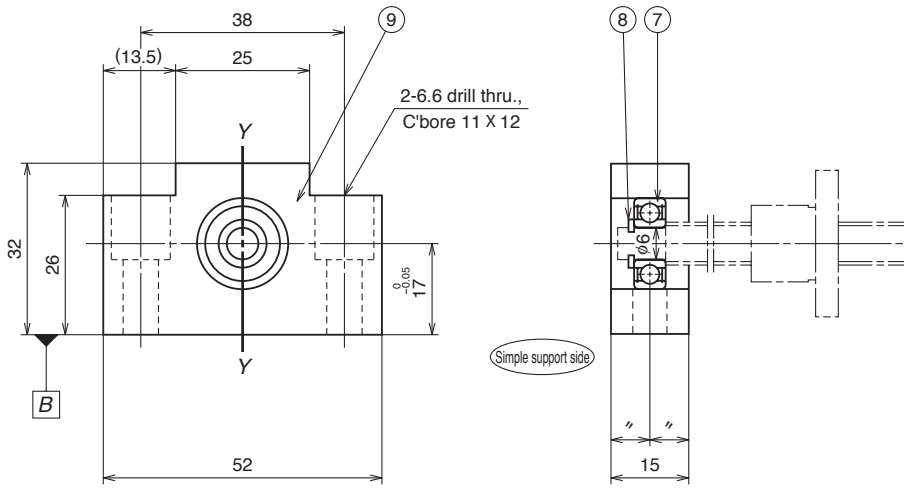


Parts list

Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal
②	Bearing	One set	706ATYDFC7P5
③	Retaining cover	1	
④	Spacer	1	
⑤	Lock nut	1	For M6, tightening torque 245N•cm {25kgf•cm}
⑥	Set screw	1	M3, with a set piece (pad)

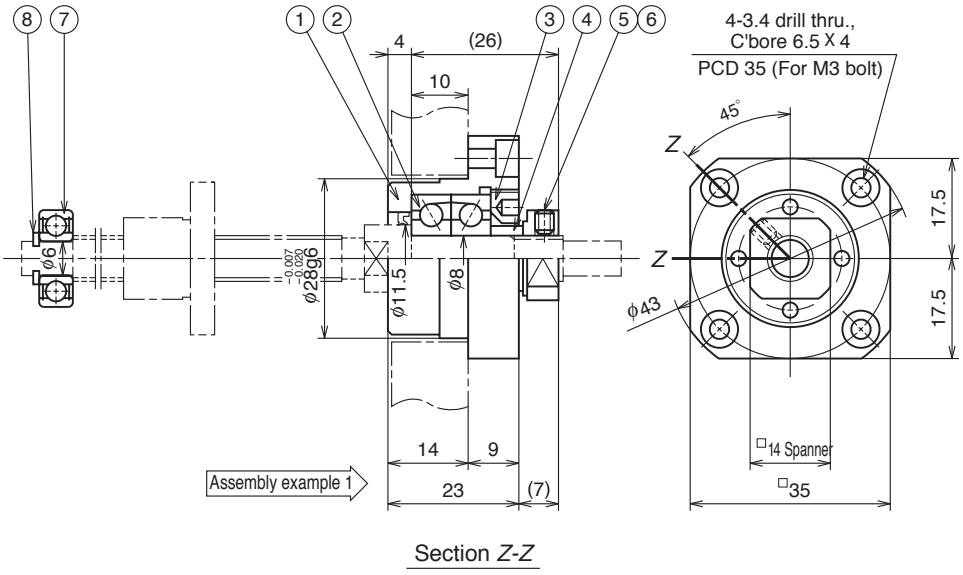
Remarks
1. When installing a square support unit, place A side to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑥ after adjustment.

Square type Reference number: WBK08-01A (fixed support side); WBK08S-01 (simple support side)



WBK08S-01

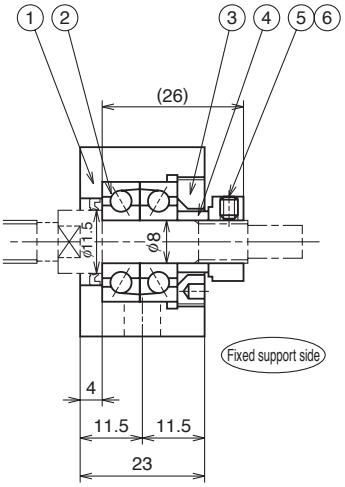
Round type Reference number: WBK08-11



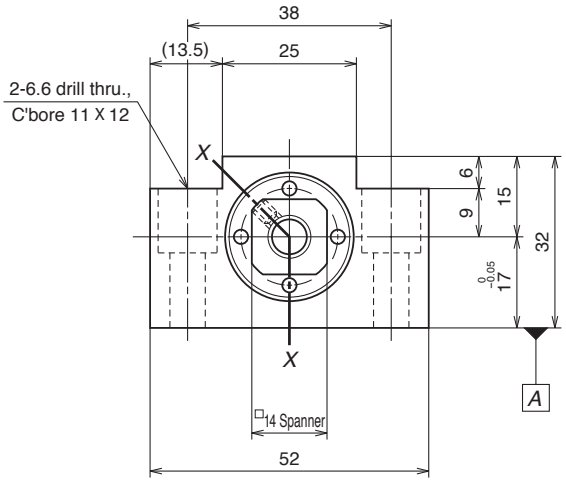
WBK08

Unit: mm

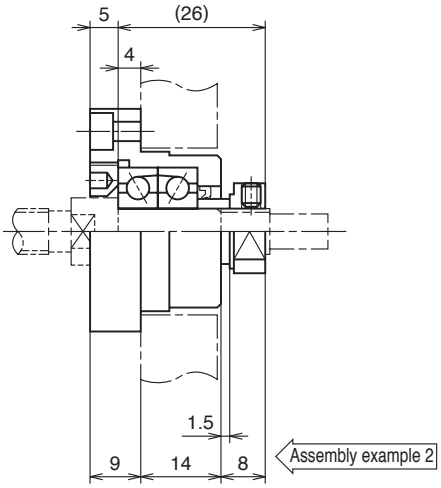
Standard stock



Section *X-X*



WBK08-01A

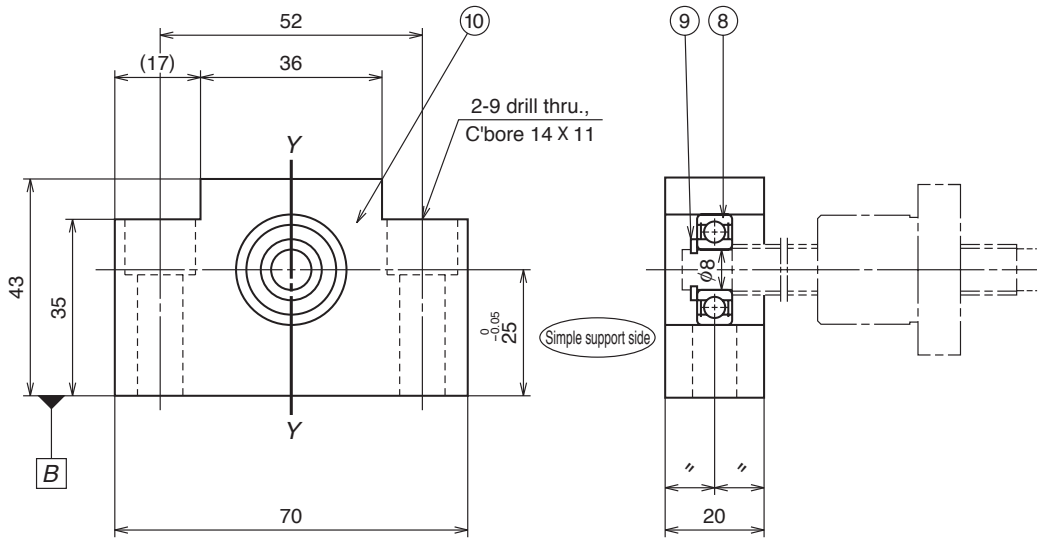


Parts list

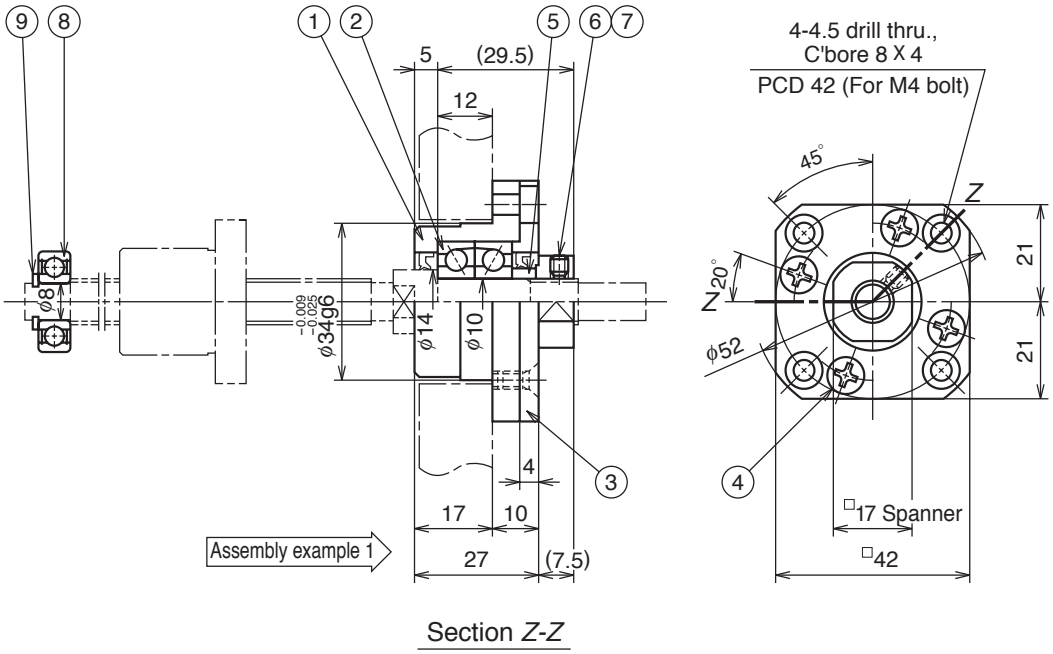
Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal on fixed support side
②	Bearing	One set	706ATYDFC7P5
③	Retaining cover	1	
④	Spacer	1	
⑤	Lock nut	1	For M8, tightening torque 490N•cm {50 kgf•cm}
⑥	Set screw	1	M3, with a set piece (pad)
⑦	Bearing	1	606ZZ
⑧	Retaining ring	1	
⑨	Bearing housing	1	Simple support side (only square type)

Remarks
1. When installing a square support unit, place A and B sides to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑥ after adjustment.

Square type Reference number: WBK10-01A (fixed support side); WBK10S-01 (simple support side)



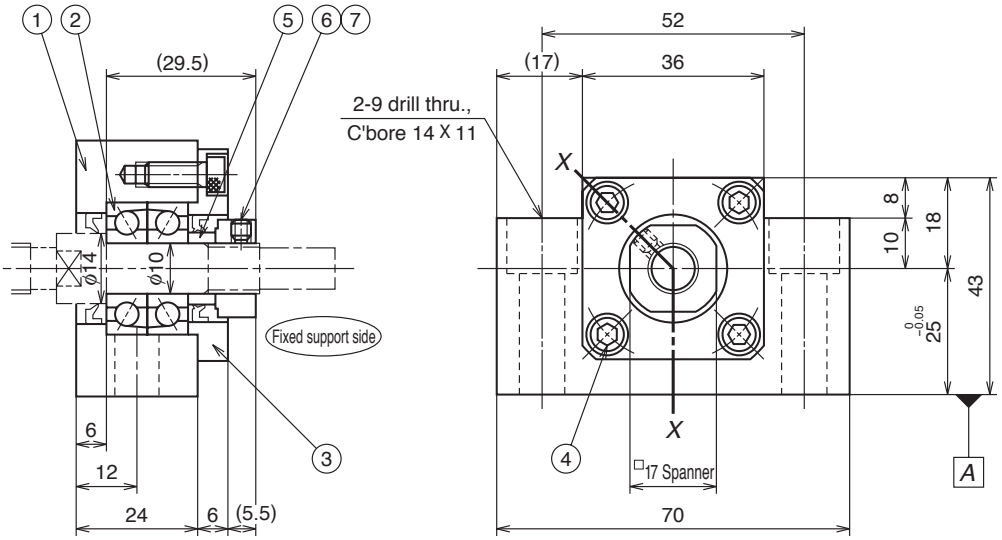
Round type Reference number: WBK10-11

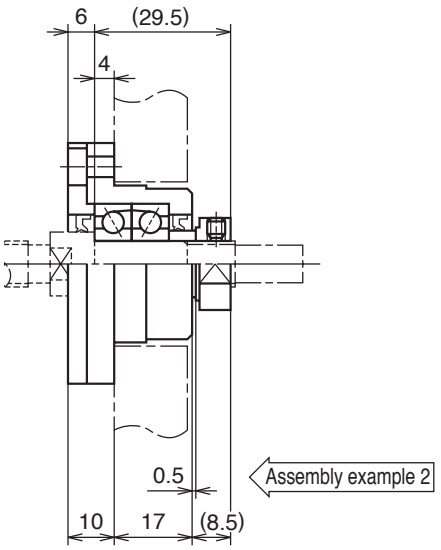


WBK10

Standard stock

Unit: mm



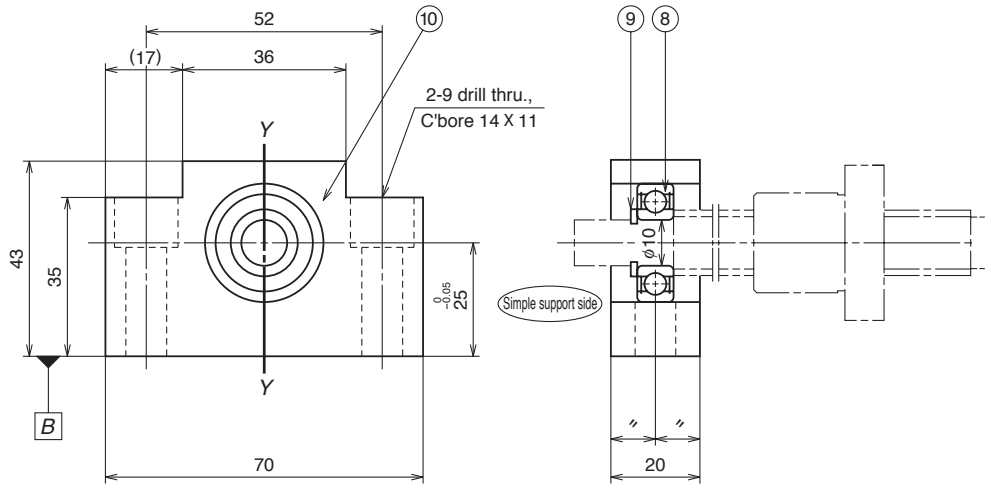


Parts list

Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal on fixed support side
②	Bearing	One set	7000ATYDFC8P5
③	Retaining cover	1	
④	Hexagon socket head cap screw or cross recessed pan head screw	4	M4
⑤	Spacer	1	
⑥	Lock nut	1	For M10, tightening torque 930N•cm {95 kgf•cm}
⑦	Set screw	1	M4 with a set piece (pad)
⑧	Bearing	1	608ZZ
⑨	Retaining ring	1	
⑩	Bearing housing	1	Simple support side (only square type)

Remarks
1. When installing a square support unit, place A and B sides to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑦ after adjustment.

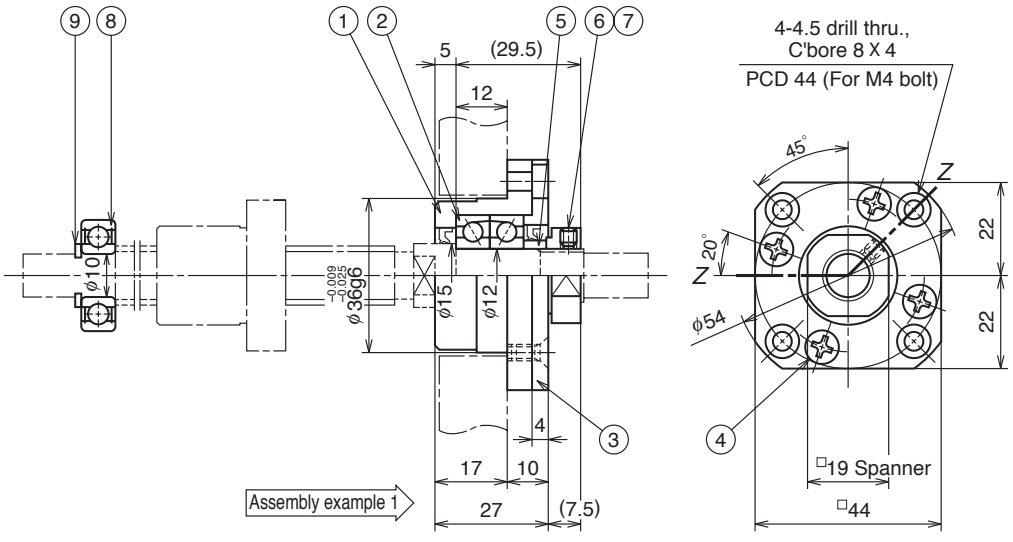
Square type Reference umber: WBK12-01 (fixed support side); WBK12S-01 (simple support side)



WBK12S-01

Section *Y-Y*

Round type Reference number: WBK12-11

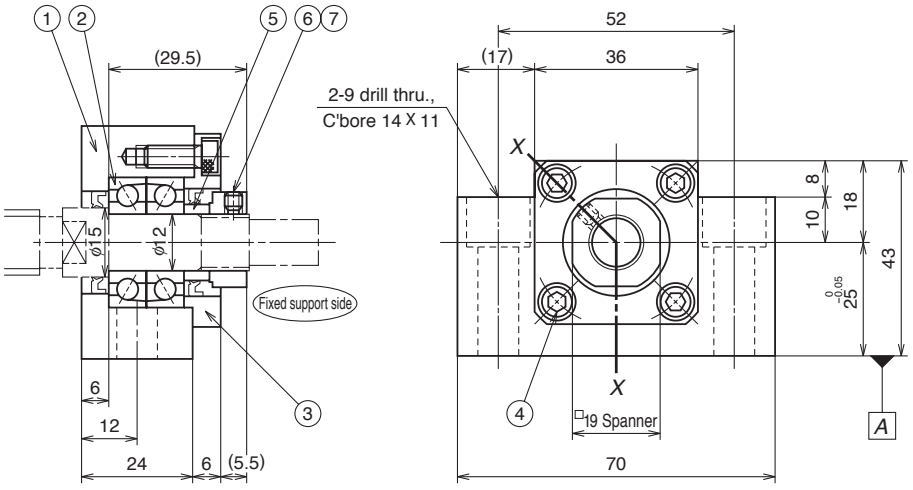


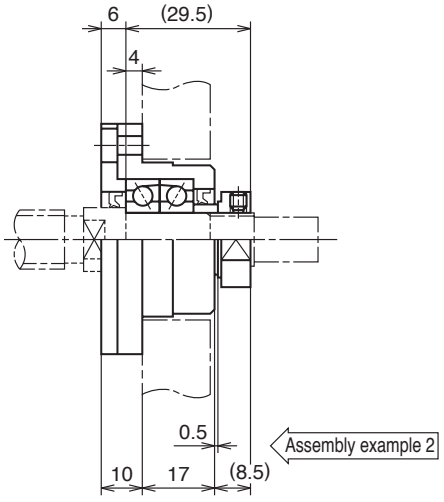
Section *Z-Z*

WBK12

Standard stock

Unit: mm



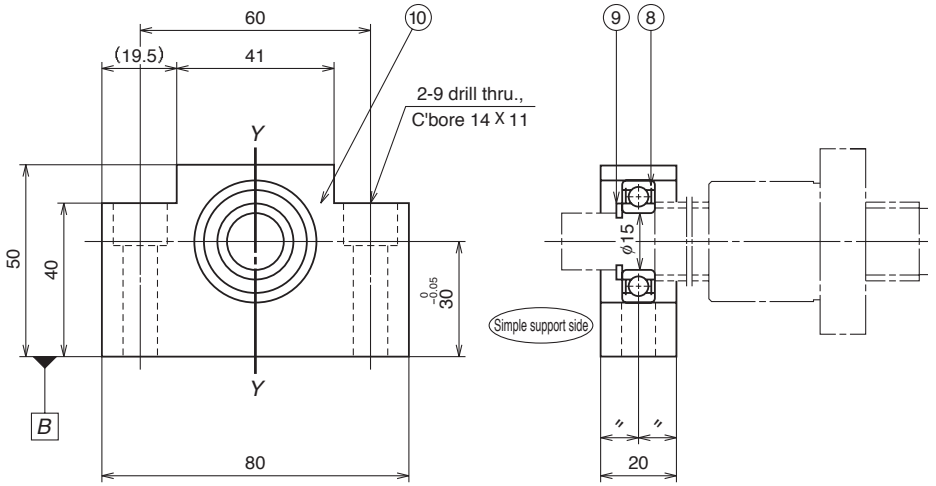


Parts list

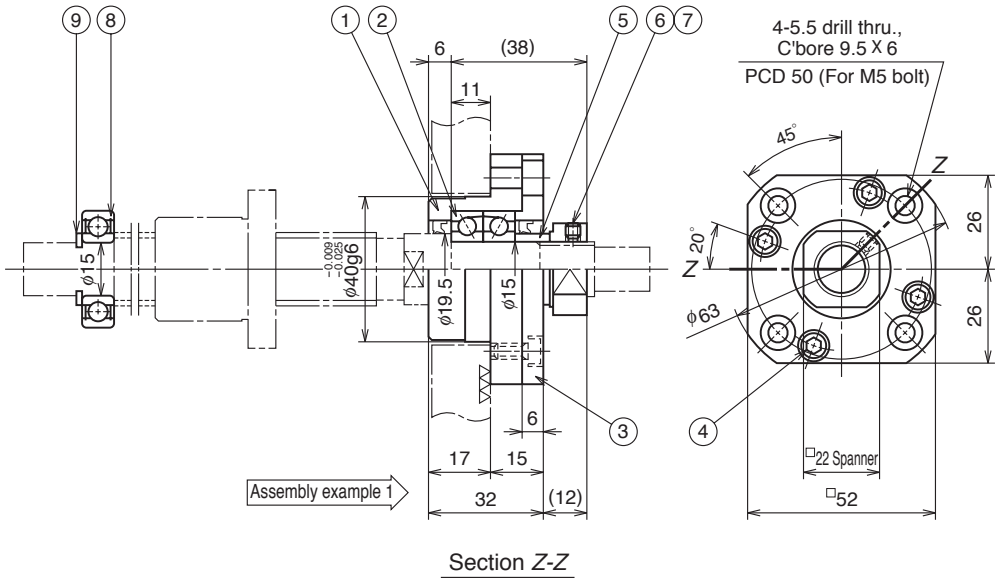
Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal on fixed support side
②	Bearing	One set	7001ATYDFC8P5
③	Retaining cover	1	
④	Hexagon socket head cap screw or cross recessed pan head screw	4	M4
⑤	Spacer	1	
⑥	Lock nut	1	For M12, tightening torque 1370N•cm {140 kgf•cm}
⑦	Set screw	1	M4 with a set piece (pad)
⑧	Bearing	1	6000ZZ
⑨	Retaining ring	1	
⑩	Bearing housing	1	Simple support side (only square type)

Remarks
1. When installing a square support unit, place A and B sides to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑦ after adjustment.

Square type Reference number: WBK15-01A (fixed support side); WBK15S-01 (simple support side)



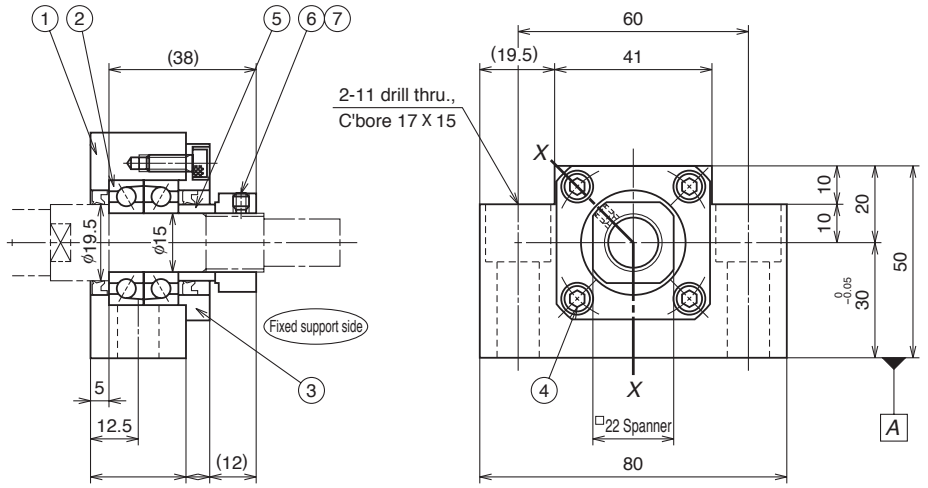
Round type Reference number: WBK15-11

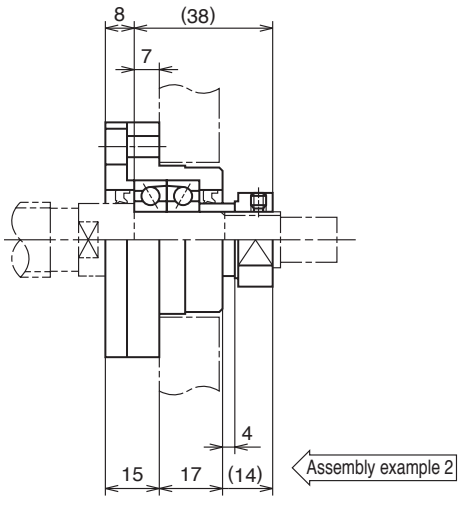


WBK15

Standard stock

Unit: mm



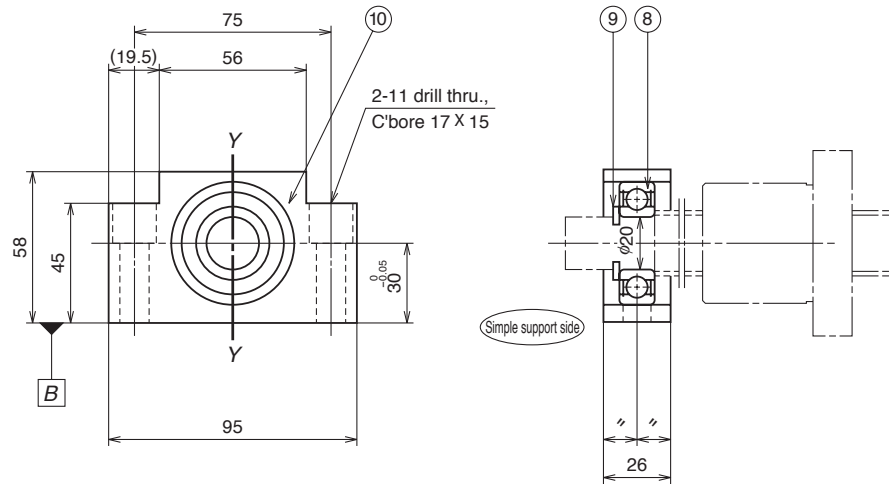


Parts list

Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal on fixed support side
②	Bearing	One set	7002ATYDFC8P5
③	Retaining cover	1	
④	Hexagon socked head cap screw	4	M4
⑤	Spacer	1	
⑥	Lock nut	1	For M15, tightening torque 2350N•cm {240 kgf•cm}
⑦	Set screw	1	M4 with a set piece (pad)
⑧	Bearing	1	6002ZZ
⑨	Retaining ring	1	
⑩	Bearing housing	1	Simple support side (only square type)

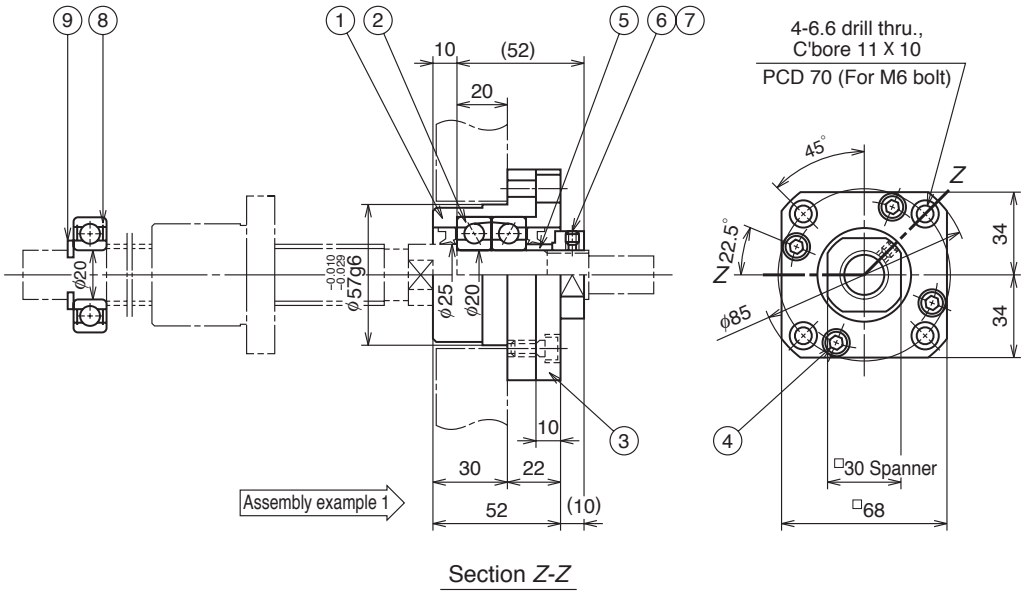
Remarks
1. When installing a square support unit, place A and B sides to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑦ after adjustment.

Square type Reference number: WBK20-01 (fixed support side); WBK20S-01 (simple support side)



WBK20S-01

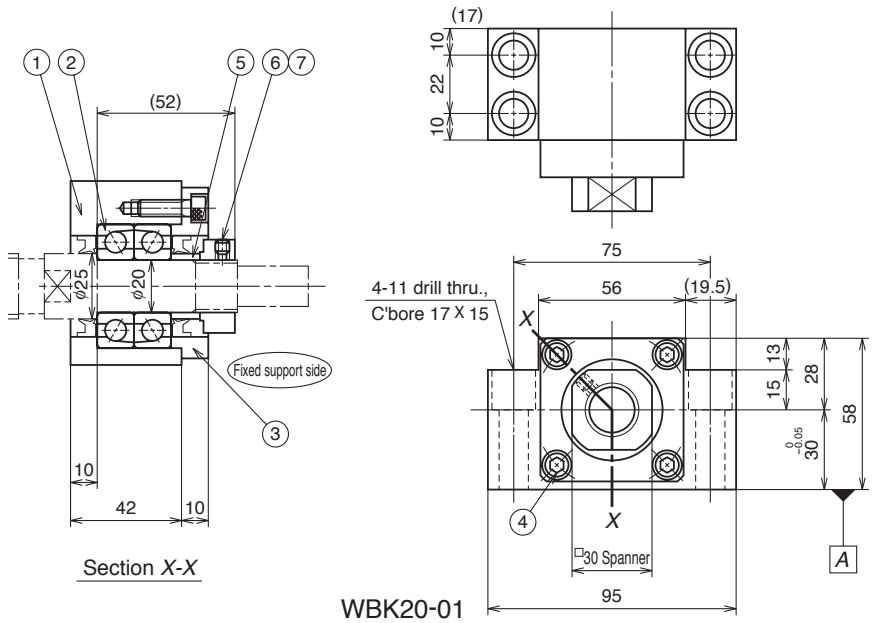
Round type Reference number: WBK20-11

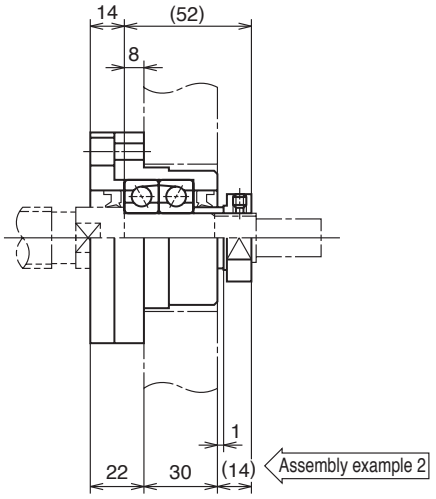


WBK20

Standard stock

Unit: mm



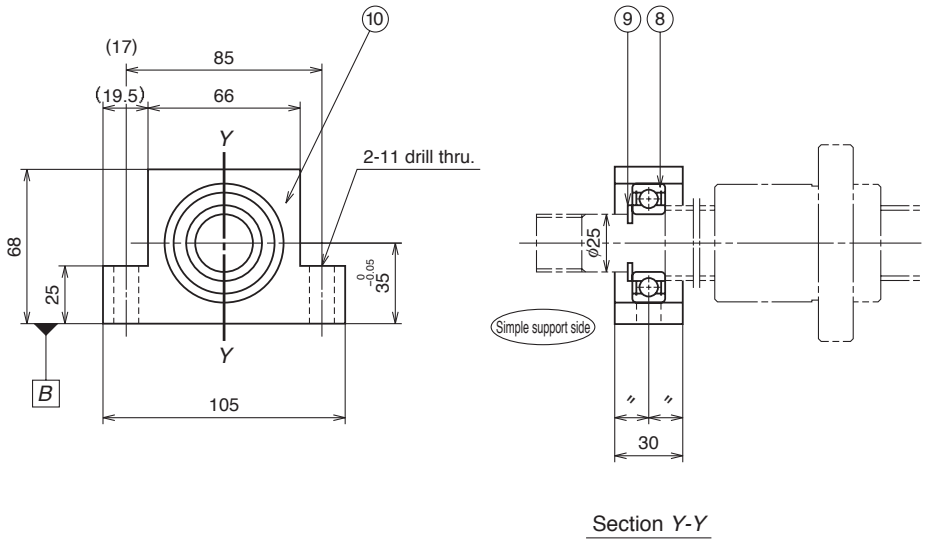


Parts list

Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal on fixed support side
②	Bearing	One set	7204ATYDFC8P5
③	Retaining cover	1	
④	Hexagon socked head cap screw	4	M6
⑤	Spacer	1	
⑥	Lock nut	1	For M20, tightening torque 4700N•cm {480 kgf•cm}
⑦	Set screw	1	M4 with a set piece (pad)
⑧	Bearing	1	6204ZZ
⑨	Retaining ring	1	
⑩	Bearing housing	1	Simple support side (only square type)

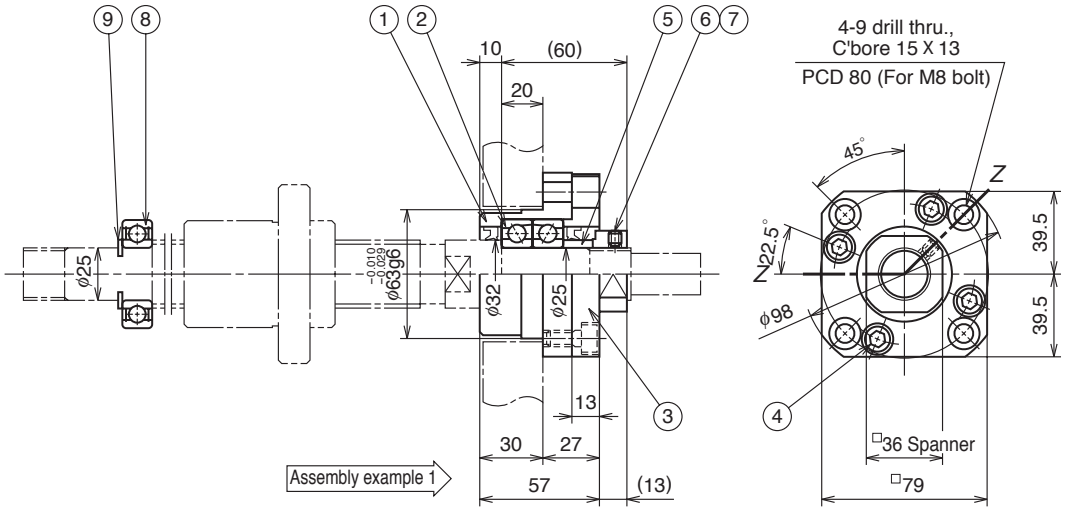
Remarks
1. When installing a square support unit, place A and B sides to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑦ after adjustment.

Square type Reference number: WBK25-01 (fixed support side); WBK25S-01 (simple support side)



WBK25S-01

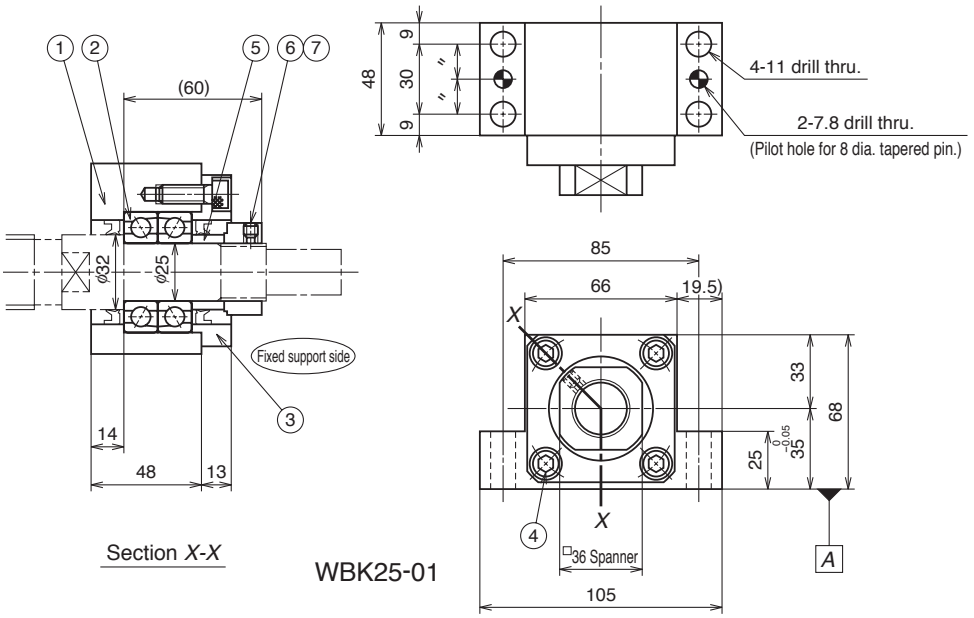
Round type Reference number: WBK25-11

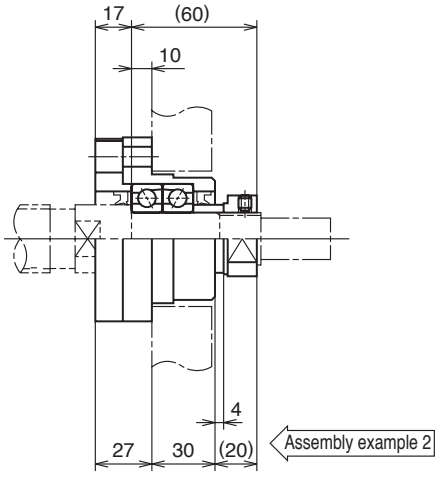


WBK25

Standard stock

Unit: mm



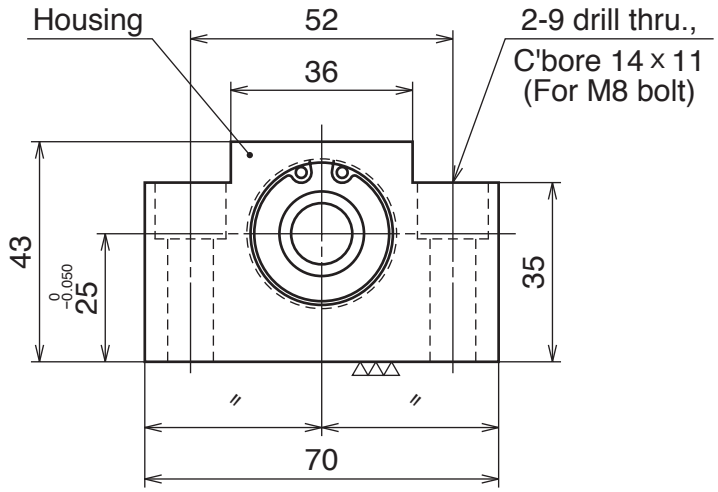


Parts list

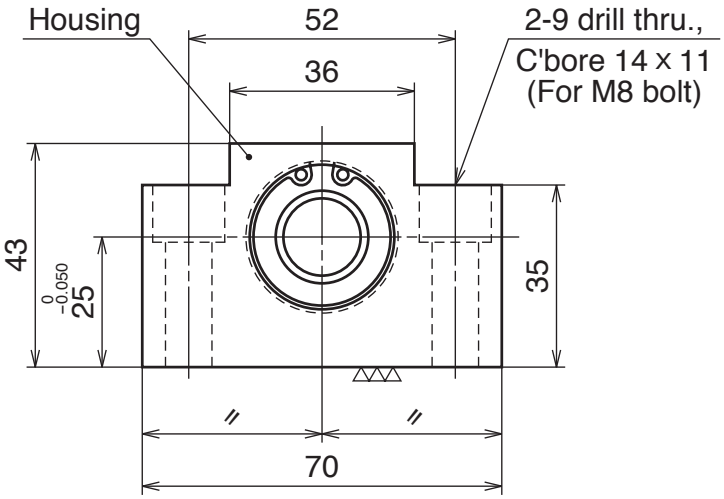
Number	Name of part	Quantity	Remarks
①	Bearing housing	1	With oil seal on fixed support side
②	Bearing	One set	7204ATYDFC8P5
③	Retaining cover	1	
④	Hexagon socked head cap screw	4	M6
⑤	Spacer	1	
⑥	Lock nut	1	For M25, tightening torque 8400N•cm {860 kgf•cm}
⑦	Set screw	1	M6 with a set piece (pad)
⑧	Bearing	1	6205ZZ
⑨	Retaining ring	1	
⑩	Bearing housing	1	Simple support side (only square type)

Remarks
1. When installing a square support unit, place A and B sides to the base. Use a spacer if necessary to adjust height.
2. Components ①, ②, ③ are assembled into a unit. Do not disassemble.
3. An appropriate volume of grease is packed in the support unit.
4. Tighten the set screw ⑦ after adjustment.

Square type Reference number: WBK12SF-01 (Simple support side: For VFA1210)



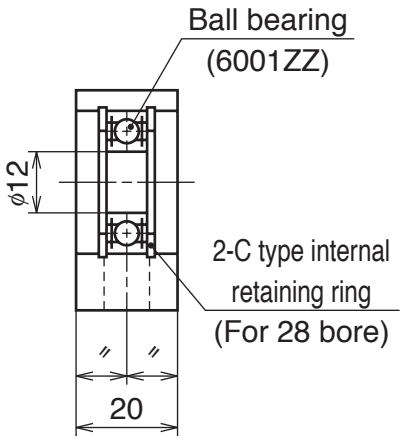
Square type Reference number: WBK15SF-01 (Simple support side: For VFA1510)



WBK12SF

Standard stock

Unit: mm

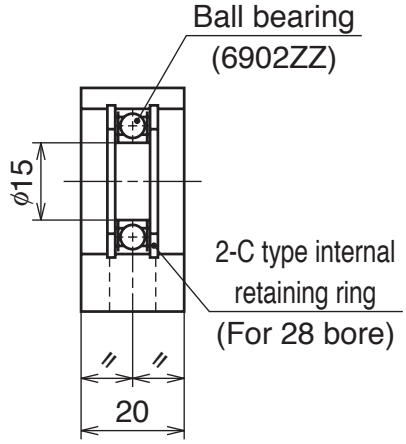


Parts list (WBK12SF-01)

Number	Name of part	Quantity	Remarks
①	Bearing housing	1	Simple support side
②	Bearing	1	6001ZZ
③	Retaining ring	2	

Remarks 1. When installing the square support unit, place side A to the base and install the unit in the vertical direction. Use a spacer if necessary to adjust height.
2. Do not disassemble the support unit.
3. An appropriate volume of grease is packed in the bearing.

Applicable ball screw : **VFA1210**



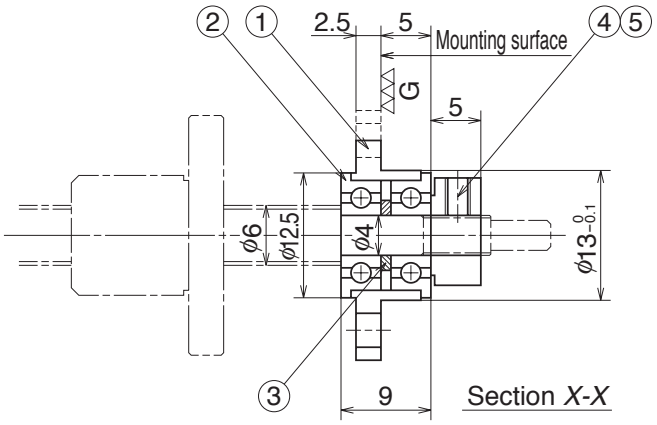
Parts list (WBK15SF-01)

Number	Name of part	Quantity	Remarks
①	Bearing housing	1	Simple support side
②	Bearing	1	6902ZZ
③	Retaining ring	2	

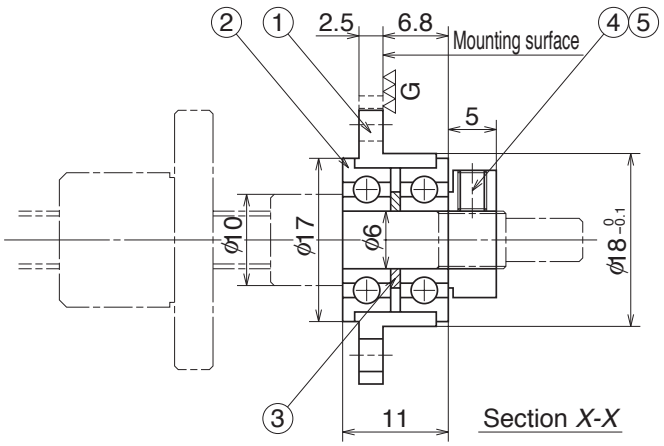
Remarks 1. When installing the square support unit, place side A to the base and install the unit in the vertical direction. Use a spacer if necessary to adjust height.
2. Do not disassemble the support unit.
3. An appropriate volume of grease is packed in the bearing.

Applicable ball screw : **VFA1510, VFA1520**

Round type Reference number: WBK04R-11



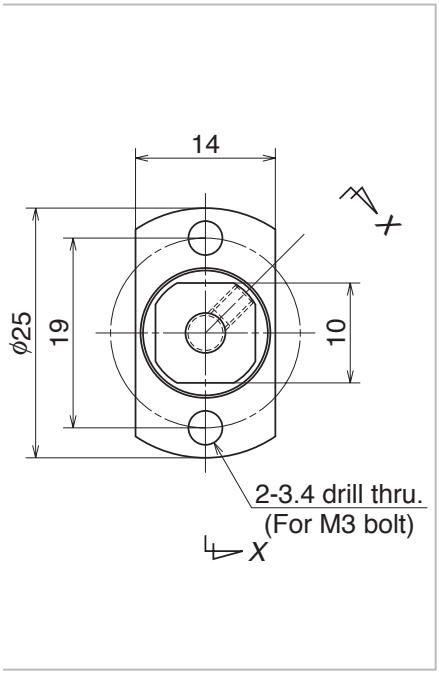
Round type Reference number: WBK06R-11



WBK**R

Standard stock

Unit: mm

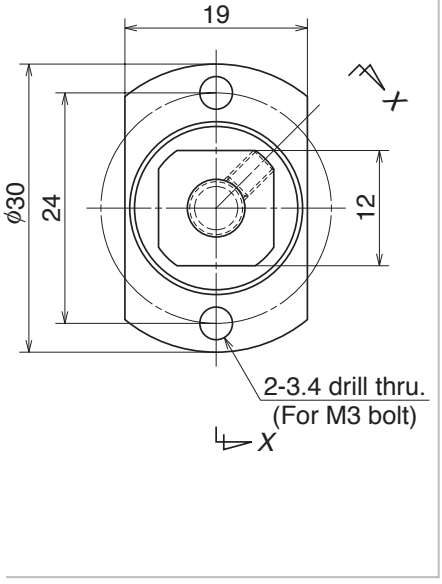


Parts list (WBK04R-11)

Number	Name of part	Quantity	Remarks
①	Bearing housing	1	
②	Bearing	One set	F694ZZ
③	Spacer	1	
④	Lock nut	1	For M4, tightening torque 98N•cm {10 kgf•cm}
⑤	Set screw to secure the lock nut	1	M2.5 with a set piece (pad)

Remarks
1. Adjust phases of the bearing and the lock nut at time of assembly, and secure them in the state when the run out of the flange mounting surface is minimal.
2. Assembled to an arbor (M4 bolt, nut) at time of delivery. Remove it from the arbor and move to the ball screw shaft end before use.
3. An appropriate volume of grease is packed into the bearing.
4. Slightly tighten the set screw ⑤ after adjustment.

Applicable ball screw : **RMA0601**



Parts list (WBK06R-11)

Number	Name of part	Quantity	Remarks
①	Bearing housing	1	
②	Bearing	One set	F696ZZ
③	Spacer	1	
④	Lock nut	1	For M6, tightening torque 118N•cm {12 kgf•cm}
⑤	Set screw to secure the lock nut	1	M2.5 with a set piece (pad)

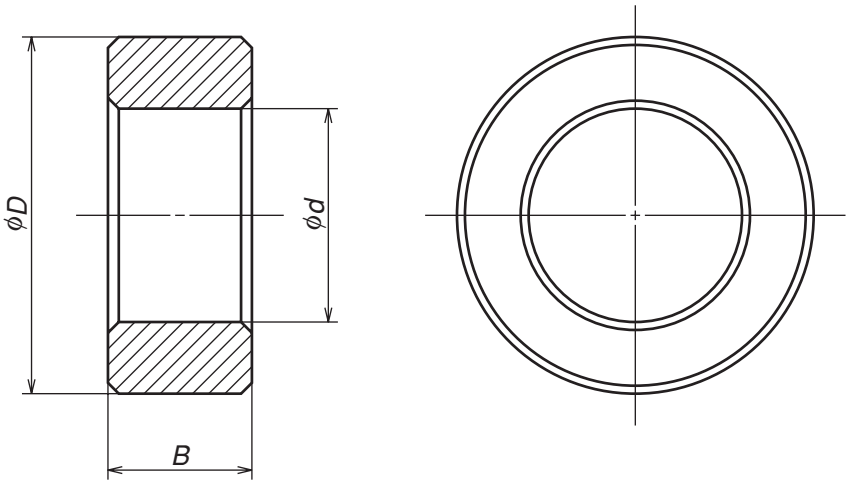
Remarks
1. Adjust phases of the bearing and the lock nut at time of assembly, and secure them in the state when the run out of the flange mounting surface is minimal.
2. Assembled to an arbor (M6 bolt, nut) at time of delivery. Remove it from the arbor and move to the ball screw shaft end before use.
3. An appropriate volume of grease is packed into the bearing.
4. Slightly tighten the set screw ⑤ after adjustment.

Applicable ball screw : **RMA0801, RMA0801.5, RMA0802**

When using with a rolled ball screw

When using a support unit (for small equipment) for a rolled ball screw, install a spacer for holding a seal in the ball screw side of the shaft end.

The table shows the dimensions of spacer. NSK will provide the spacers on request. Use the reference number in the table, and place an order separately.



Drawing of support unit spacer

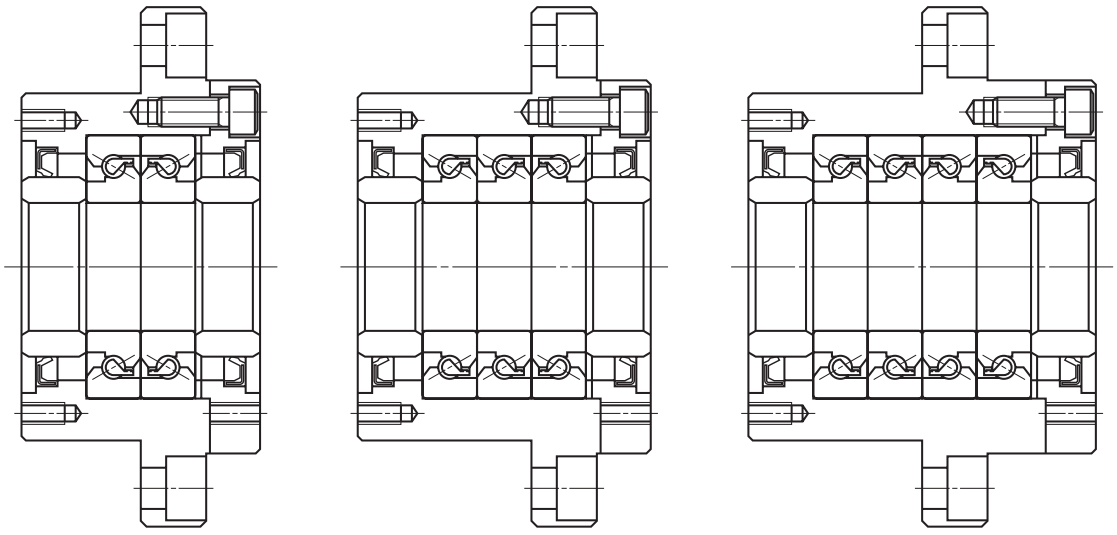
Dimensions of support unit spacer

Unit: mm

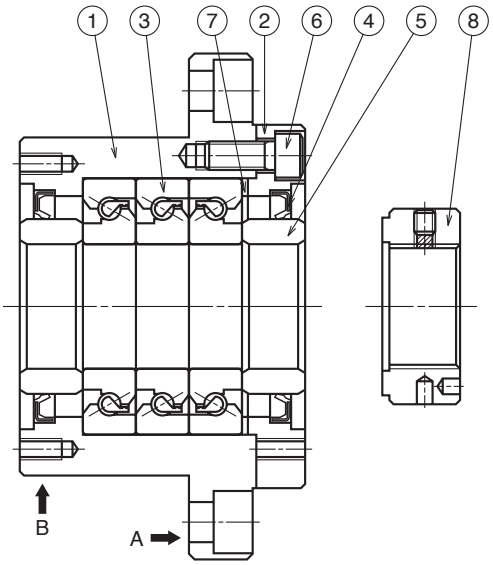
Spacer reference number	Dimensions			Applicable support unit reference number
	Internal diameter *d*	Outside diameter *D*	Width *B*	
WBK06K	6	9.5	5.0	WBK06-**
WBK08K	8	11.5	5.5	WBK08-**
WBK10K	10	14.5	5.5	WBK10-**
WBK12K	12	15.0	5.6	WBK12-**
WBK15K	15	19.5	10.0	WBK15-**
WBK20K	20	25.5	11.0	WBK20-**
WBK25K	25	32.0	14.0	WBK25-**

(2) Dimensions of support unit: heavy-load / for machine tools

Support units for heavy-load / machine tools use a thrust angular contact ball bearing (TAC Series) with high rigidity and accuracy. The thrust angular contact ball bearing has very suitable functions and structure as a ball screw support bearing. There are three combinations as shown below.



DF combination **DFD combination** **DFF combination**

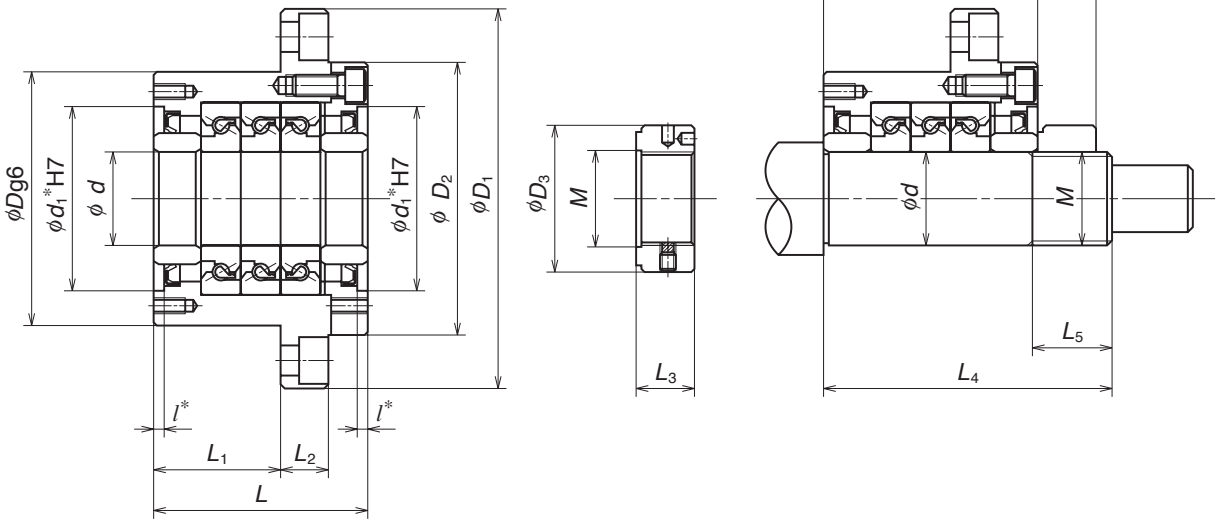


Parts list

Part number	Part name	Quantity
①	Housing	1
②	Retaining cover	1
③	High accuracy thrust angular contact ball bearing	One set
④	Dust seal	2
⑤	Collar	2
⑥	Preload bolt	6 or 8
⑦	Shim	One set
⑧	Lock nut	1

Remarks

1. Mount sections A and B to the machine base.
2. NSK support units are precisely preloaded and adjusted. Components ①, ②, ③, ④, ⑥, ⑦ are assembled into a unit. Do not disassemble.
3. Grease is packed into support units.
4. Lock nut ⑧ is exclusively prepared for ball screw. The end face of the nut is in strict control being precisely perpendicular to the V thread. Secure the lock nut using the set screw.
   Lock nut is also available as an accessory (See page 180. Refer to general catalogue E3161 "Precision Machine Components" for high precision trust angular contact ball bearing (TAC Series).



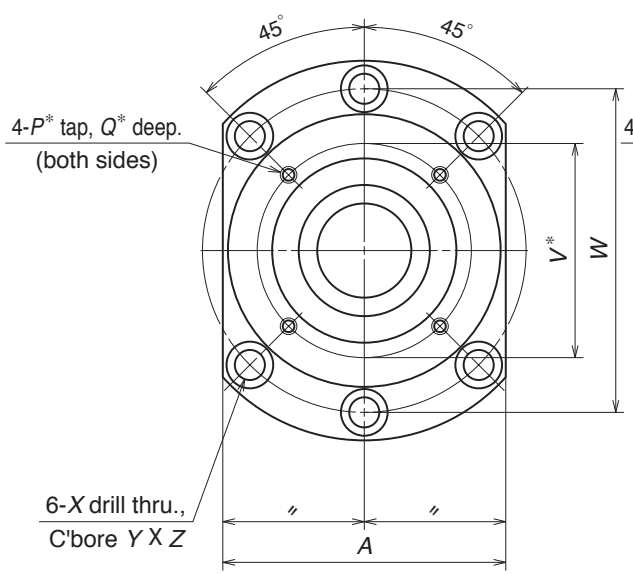
Lock nut

Dimensions of bearing seat

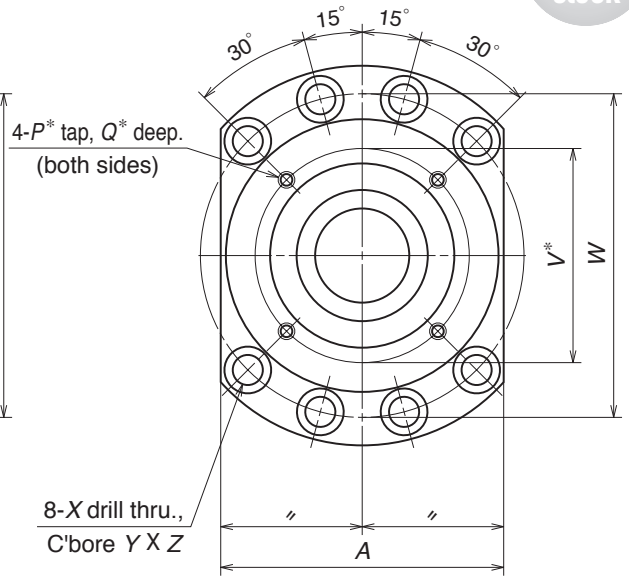
Support unit No.	Support unit																	Basic dynamic load rating C_a	
	d	*D*	D_1	D_2	*L*	L_1	L_2	*A*	*W*	*X*	*Y*	*Z*	d_1*	*l**	*V**	*P**	*Q**	N	{kgf}
WBK 17DF-31	17	70	106	72	60	32	15	80	88	9	14	8.5	45	3	58	M5	10	21900	2240
WBK 20DF-31	20	70	106	72	60	32	15	80	88	9	14	8.5	45	3	58	M5	10	21900	2240
WBK 25DF-31	25	85	130	90	66	33	18	100	110	11	17.5	11	57	4	70	M6	12	28500	2910
WBK 25DFD-31					81	48												46500	4700
WBK 30DF-31	30	85	130	90	66	33	18	100	110	11	17.5	11	57	4	70	M6	12	29200	2980
WBK 30DFD-31					81	48												47500	4850
WBK 35DF-31	35	95	142	102	66	33	18	106	121	11	17.5	11	69	4	80	M6	12	31000	3150
WBK 35DFD-31					81	48												50500	5150
WBK 35DFF-31					96	48												50500	5150
WBK 40DF-31	40	95	142	102	66	33	18	106	121	11	17.5	11	69	4	80	M6	12	31500	3250
WBK 40DFD-31					81	48												51500	5250
WBK 40DFF-31					96	48												51500	5250

Remarks 1. Rigidity
Values in the Table are theoretical values obtained from the elastic deformation between the groove and the balls.
2. Starting torque
Starting torque indicates torque due to the preload of the bearing. It does not include seal torque.
3. The tolerance of the shaft bearing seat
We recommend "h5 grade of the fits tolerance.

Standard stock



Bearing bore $d \leqq 30$



Bearing bore $d \geqq 35$

Unit: mm

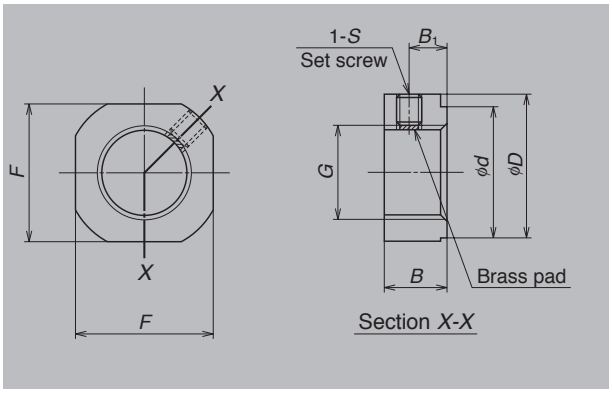
Permissible axial load		Preload		Axial rigidity		Starting torque		Lock nut			Bearing seat for unit		
N	{kgf}	N	{kgf}	N/μm	{kgf/μm}	N•m	{kgf•m}	*M*	D_3	L_3	*d*	L_4	L_5
26600	2710	2150	220	750	75	14.0	1.5	M17×1.0	37	18	17	81	23
26600	2710	2150	220	750	75	14.0	1.5	M20×1.0	40	18	20	81	23
40500	4150	3150	320	1000	100	23.0	2	M25×1.5	45	20	25	89	26
81500	8300	4300	440	1470	150	31.0	3					104	
43000	4400	3350	340	1030	105	24.0	2.5	M30×1.5	50	20	30	89	26
86000	8800	4500	460	1520	155	33.0	3					104	
50000	5100	3800	390	1180	120	28.0	3	M35×1.5	55	22	35	92	30
100000	10200	5200	530	1710	175	37.0	4					107	
100000	10200	7650	780	2350	240	55.0	5.5					122	
52000	5300	3900	400	1230	125	28.0	3	M40×1.5	60	22	40	92	30
104000	10600	5300	540	1810	185	38.0	4					107	
104000	10600	7850	800	2400	245	57.0	5.5					122	

Remarks 4. Dimensions with * (asterisk) mark
*Pilot diameter and tapped screws marked with "asterisk *" are used for seal unit installation for NSK standard hollow shaft ball screws. They also can be used for dust cover and damper installation.
5. Grease is packed into the bearing. It is not necessary to apply grease before use. We recommend "h5 grade of the fits tolerance.

In addition to the support units, NSK has other components for the ball screw as shown below.

Lock nuts

Ball screw support bearing must be installed with minimum inclination. NSK lock nuts exclusive for ball screw help to reduce this inclination.



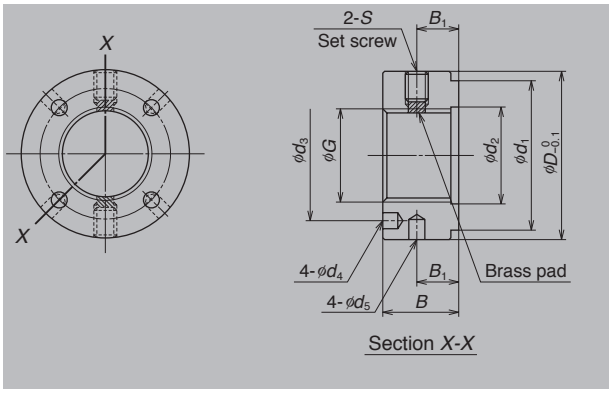
A Type Shapes and dimensions

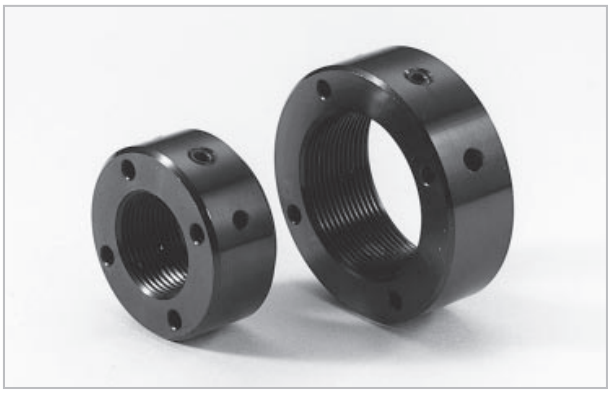
A Type lock nuts

Unit: mm

Lock nut reference number	*M*	*D*	*F*	*B*	*d*	B_1	*S*	Tightening torque N•m (for reference)
WBK06L-01	M6 × 0.75	14.5	12	5	10	2.7	M3, with brass made set piece	245
WBK08L-01	M8 × 1.0	17	14	6.5	13	4	M3, with brass made set piece	490
WBK10L-01	M10 × 1.0	20	17	8	16	5	M4, with brass made set piece	930
WBK12L-01	M12 × 1.0	22	19	8	17	5	M4, with brass made set piece	1350
WBK15L-01	M15 × 1.0	25	22	10	21	6	M4, with brass made set piece	2350
WBK20L-01	M20 × 1.0	35	30	13	26	8	M4, with brass made set piece	4700
WBK25L-01	M25 × 1.0	42	36	16	34	10	M6, with brass made set piece	8400

Remarks: Insert a set piece (brass pad) and tighten the securing set screw.





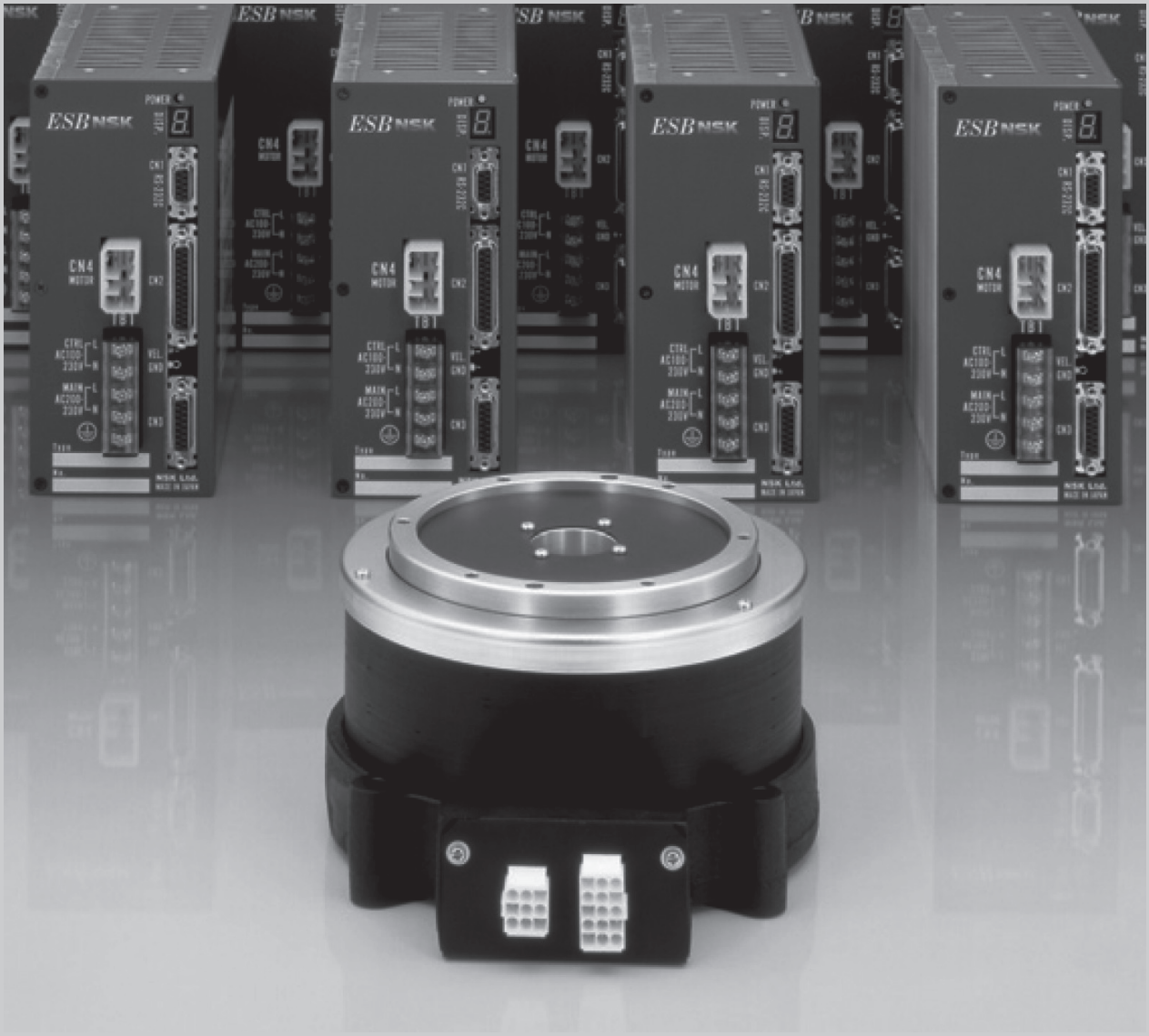
S Type Shapes and dimensions

S Type lock nuts

Unit: mm

Lock nut reference number	*G*	$D_{-0.1}^{0}$	*B*	d_1	d_2	d_3	d_4	d_5	B_1	*S*	Tightening torque N•m (for reference)
WBK17L-31	M17 × 1.0	37	18	30	18	27	4.3	4	10	M6	5400
WBK20L-31	M20 × 1.0	40	18	30	21	30	4.3	4	10	M6	7350
WBK25L-31	M25 × 1.5	45	20	40	26	35	4.3	4	11	M6	13200
WBK30L-31	M30 × 1.5	50	20	40	31	40	4.3	5	11	M6	19600
WBK35L-31	M35 × 1.5	55	22	50	36	45	4.3	5	12	M6	29400
WBK40L-31	M40 × 1.5	60	22	50	41	50	4.3	5	12	M6	39200

Megatorque Motors YSB Series



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Features of YSB Series Megatorque Motors

Point 1: Direct Drive
The Megatorque Motor is capable to drive the load directly without using a mechanical speed reducer, and accordingly, it realizes highly accurate positioning without backlash and lost motion. A Megatorque Motor is a servomotor that equips a position detector to form full closed loop control.

Point 2: High Accuracy
The YSB Series Megatorque Motor incorporates a high-resolution position detector (resolver) that features 819 200 pulses/revolution. This contributes to an exceptionally precise repeatability of ±1.6 arc seconds.

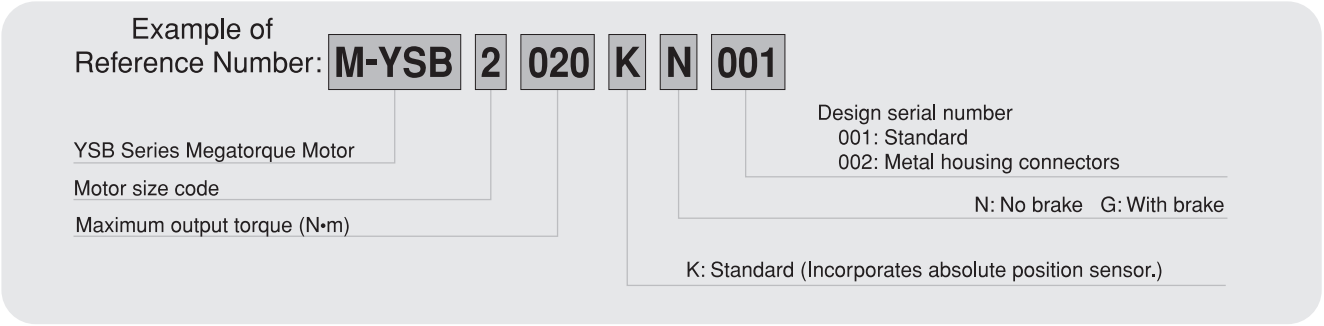
Point 3: High Reliability
The Megatorque Motor is a brushless motor and does not use permanent magnets in its simple construction. It is equipped with a highly rigid and accurate roller bearing (crossed roller bearing), which is packed with lubrication grease, thus offering highly reliable and long-term maintenance-free operation.

Point 4: Highly Functional Driver Unit
The YSB Series Megatorque Motor constitutes a system in combination with an ESB Driver Unit for a digital servo control incorporating a 32-bit microprocessor.
The ESB Driver Unit has a number of command inputs necessary for motion control, thus permitting its connection with sequencers, a variety of positioning controllers and personal computers, etc. In addition, acceleration profiling and networking functions through various field buses are available.

Point 5: Include Absolute Position Detector as Standard Equipment
The YSB Series Megatorque Motor has an absolute position detector as standard equipment. This contributes to eliminate the troublesome Homing and thus improves productivity. Additionally, the motors and the driver units can be randomly matched as a pair. Cable can be freely selected up to lengths of 30m.

Point 6: Conformity to the International Safety Regulations
The Megatorque Motor systems conform to the EC Directives (CE Marking) and Underwriters' Laboratory (UL) regulations.

Coding of Motor Reference Number



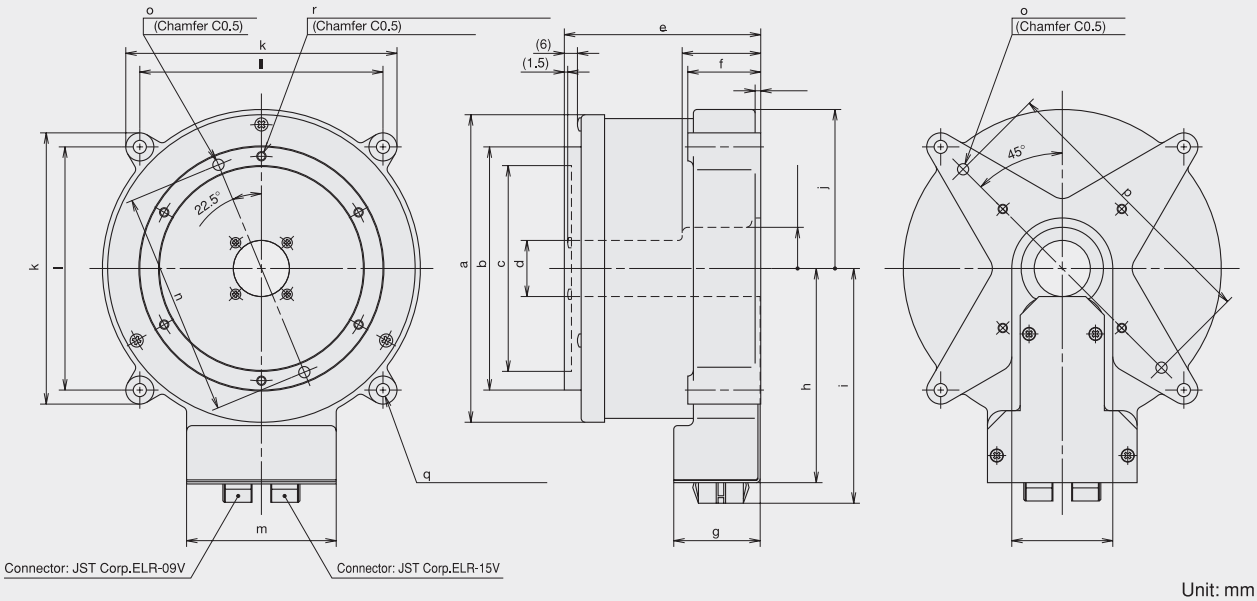
Motor Specifications

Functional Item (Unit) \ Motor Reference Number		M-YSB2020KN001	M-YSB3040KN001	M-YSB4080KN001	M-YSB5120KN001
Maximum output torque	(N•m)	20	40	80	120
Maximum current	(A)	6			
Maximum rotational speed(1)	(s^{-1})	3			
Resolution of position sensor	(pulse/r)	819200			
Absolute positioning accuracy	(sec)	±75			
Repeatability	(sec)	±1.6			
Allowable axial load	(N)	3700	4500	9500	19600
Allowable moment load	(N•m)	60	80	160	400
Mass	(kg)	10	18	32	58
Environmental conditions		Ambient temperature 0-40°C; Humidity: 20-80%; Use indoors, free from dust, condensation and corrosive gas. IP30 equivalent.(2)			

Notes:
(1) Consult with NSK if the motor rotates in one direction continuously at a high speed exceeding 2 (s^{-1}), or oscillates in a very minute angle. Maintain the flatness of motor mounting surface 0.02 mm or less, and mount the jigs so that its center alignment is not off the rotational axis of the motor. Otherwise it will adversely affect the life of the motor.
(2) IP30 is defined as below in a regulation of IEC 529 (International Electronics Commission).
First digit following IP indicates the protection grade against solids. The number 3 indicates protection against penetration of a solid of 2.5 mm or larger into an enclosure. The second digit indicates the protection grade. The number 0 means there is no protection against water.

Dimensions of Standard Motor

YSB2020 equipped with absolute position sensor



Unit: mm

This drawing is for information only. Please request a design drawing.

Dimensions

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
M-YSB2020KN001	Ø 165.5	Ø 130h8	Ø 110	Ø 30	105	39	46.5	115	126
M-YSB3040KN001	Ø 206.5	Ø 155h8	Ø 135	Ø 44	125	44	46.5	135	145
M-YSB4080KN001	Ø 270.4	Ø 205h8	Ø 175	Ø 50	125	43	53	170	181
M-YSB5120KN001	Ø 360	Ø 280h8	Ø 240	Ø 85	130	48	53	215	226

	j	*k*	*l*	*m*	*n*	*o*	*p*	*q*
M-YSB2020KN001	R85	145	130	80	120	Ø6H7x7	150	Ø7
M-YSB3040KN001	R105	180	160	80	145	Ø6H7x8	190	Ø10
M-YSB4080KN001	R140	235	210	80	190	Ø8H7x8	250	Ø12
M-YSB5120KN001	R185	310	280	80	260	Ø10H7x10	340	Ø14

Coding of Driver Unit Reference Number

Example of Reference Number: **M-ESB - YSB2020 A B 3 02**

- ESB type Driver Unit
- Motor size code
- Main power voltage
  - A: 200–230V AC (single-phase)
  - C: 100–110V AC (single-phase)
- Specification of position sensor
  - B: Incorporates incremental position sensor
- Function
  - 3: Standard (Max. 16 channels)
  - 5: Extended program capacity (64 channels) Analog velocity command available
  - A: Device Net
  - B: PROFIBUS
  - C: CC-Link
- Design serial number
  - 02: With thermal sensor terminal block (Photo coupler)

Driver Unit Specifications

Standard Model (ESBB3)

Position command		Internal Program, Pulse Train Input, RS-232C Communication	
Input signal	Pulse train input	Maximum frequency: 819.2 Kpps	
	Control input	Input pulse format: CW/CCW, Pulse and direction, or Quadrature ϕA/ϕB	
Output signal	Position feedback signal(1)	Output format: Line driver (Only ϕZ can be switched to open collector)	
	Control output	Driver Unit ready, In position, Brake control, Velocity threshold, Target proximity/In target area	
Alarms		Excess position error, Software thermal, CPU error, Position sensor error, Over current, Over heat, Main AC line trouble, Control AC line under voltage	
Monitoring function		Analog velocity monitor, Alarm status, RS-232C communication monitor (Parameters, program contents, position data, and alarm status)	
Communication		RS-232C serial communication, Baud rate: 9600 bps.	
Others		Automatic gain adjustment by RS-232C communication command (Automatic tuning) Programmed acceleration profiling(2) (Modified sine, modified trapezoid, cycloid and arc patterns)	
Main power voltage		200–230V AC, ±10%, Single-phase 50/60 Hz	100–120V AC, ±10%, Single-phase 50/60 Hz
Main power capacity		YSB2020: 1.0KVA	YSB2020: 0.7KVA
		YSB3040: 1.2KVA	YSB3040: 0.9KVA
		YSB4080: 1.4KVA	YSB4080: 1.0KVA
		YSB5120: 1.5KVA	YSB5120: 1.0KVA
Environmental condition		Operating temperature: 0–50°C; Humidity: 20–90%; Use indoors. Free from dust, condensation, and corrosive gas.	

Optional Functions

Option

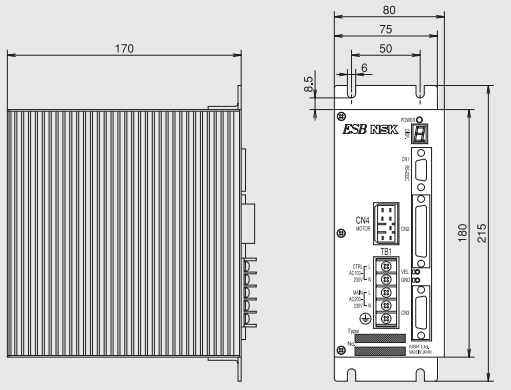
Extended program capacity	Internal program 64 channels
Analog velocity command (Analog torque command)	±10V analog command
Compatible to field bus(3)	CC-Link(4), PROFIBUS, DeviceNet(5)

Notes:
(1) Resolution of the position feedback signal is 51 200 (pulse/r).
(2) Function of acceleration profiling is not available for the field bus specifications.
(3) Detailed consultation with NSK is required for the field bus specifications.
(4) CC-Link is the registered trademark of CC-Link Association.
(5) DeviceNet is the registered trademark of Open DeviceNet Vendor Association Incorporated.

ESBB3 Driver Unit

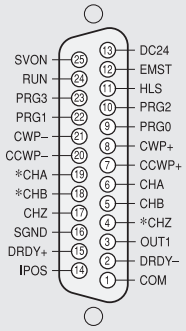
Dimensions of Driver Unit

Standard ESBB3 (16 channels)



CN2

CN2 Pin out



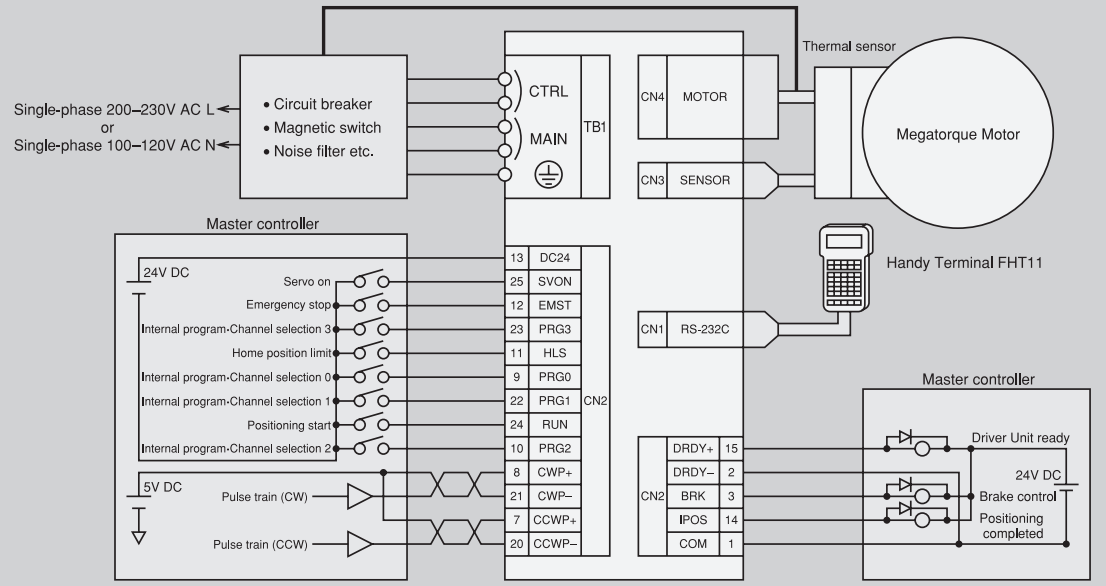
Input/Output Signal Specifications of CN2 Connector

Input/Output	Signal Code	Pin No.	Signal Name	Function
Input signal	CWP+	8	CW pulse train (+)	The motor rotates clockwise by the pulse train input.(1) (This part can be a direction or a ∅B signal.)
	CWP–	21	CW pulse train (–)	
	CCWP+	7	CCW pulse train (+)	The motor rotates counterclockwise by the pulse train input.(1) (This part can be a pulse train or a ∅A signal.)
	CCWP–	20	CCW pulse train (–)	
	EMST	12	Emergency stop	Stops the motor and locks the servo.
	SVON	25	Servo on	This signal sets the motor servo on state.
	PRG0	9	Internal program • channel selection 0(2)	A combination of ON and OFF of these 0–3 signals selects a channel (0–15) to execute its internal program.
	PRG1	22	Internal program • channel selection 1(2)	
	PRG2	10	Internal program • channel selection 2	
	PRG3	23	Internal program • channel selection 3	
	HLS	11	Home position limit switch	After a start of Homing, an activation of this signal completes the Homing.
	RUN	24	Positioning start	Starts the internal program of selected channel
	DC24	13	External power supply	External power supply for the input signals (24V DC, 0.2A or over)
Output signal	CHA	6	Position feedback signal ∅A	Pulse signals indicate a rotational speed of the motor Output format is line driver. (A jumper can switch ∅Z signal only to the open collector format.)
	CHB	5	Position feedback signal ∅B	
	CHZ	17	∅Z/Digital position signal MSB	
	✻CHA	19	Position feedback signal ✻∅A	Reversed output of position feedback signal
	✻CHB	18	Position feedback signal ✻∅B	
	✻CHZ	4	✻∅Z/Digital position signal MSB	
	SGND	16	Signal ground	Ground connection for position feedback signal
	DRDY+	15	Driver Unit ready (+)	This signal notifies that the Driver Unit is ready for operation. (This signal opens when the Driver Unit is not ready or an alarm is given.)
	DRDY–	2	Driver Unit ready (–)	
	IPOS	14	Positioning completed	This signal notifies a completion of positioning.
	OUT1	3	Brake/Velocity threshold/ Target area proximity/Warning	Output signal of brake control (Normally closed)(3)
	COM	1	Output signal, common	Common for position complete and brake control signals

Notes:
(1) When looking at the motor from the rotor side.
(2) These 2 signals can be switched to the following signals by the setting of a parameter.
(3) These signals can be switched to the signals outlined below by the setting of parameters.
SPD: Velocity output, NEAR: Target proximity/In target area,
OVER: Warning.

Wiring Example

ESBB3 Driver Unit



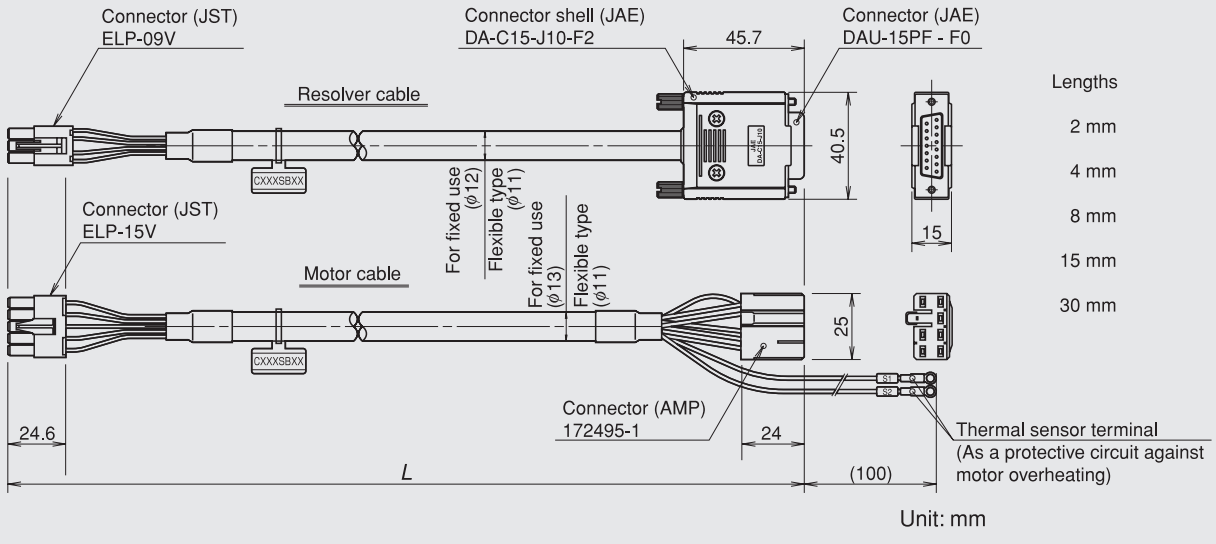
Coding of Reference Number

Example of reference number: **M-C** **004** **SB** **13**

- **M-C**: Cable set
- **004**: Cable length (m)
- **SB**: Metal connector SB: ESB Driver Unit
- **13**: Design serial number
  13: Absolute positioning sensor (Flexible type)
  23: Dust-proof (Flexible type)

Dimensions of Standard Cable Set

For motor with absolute position sensor with standard connector (M-C...SB13), with metal connector (M-C...SB23)



Handy Terminal

Handy Terminal FHT21 is an easy-to-handle RS-232C communication terminal for inputting parameters and programs to the ESB driver unit. You need just connect it to the CN1 connector of the driver unit.

- LCD screen: 20 letters × 4 lines
- EEPROM to store parameters and programs.
- Cable length: 3m

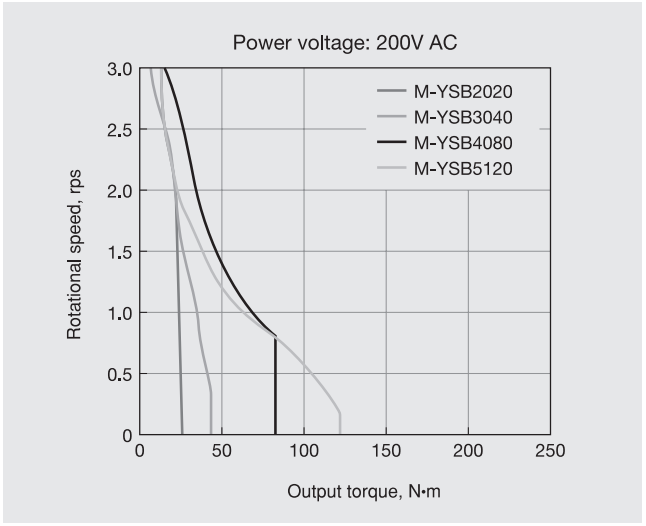
Coding of Reference Number

Example of reference number: **M-FHT** **21**

M-FHT: Handy Terminal

21: Serial number

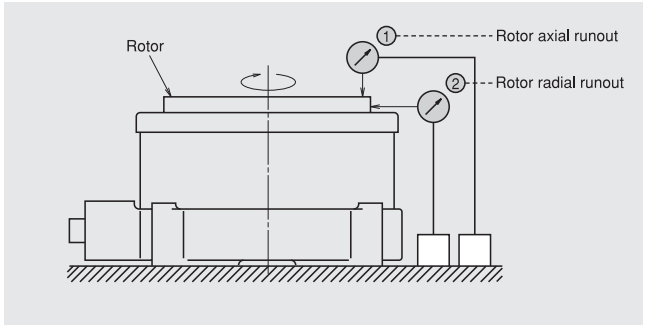
Speed/Output Torque



Runout

(Unit: mm)

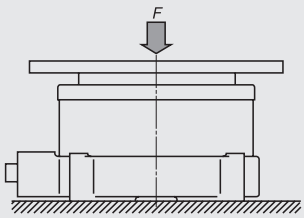
Item	Specification
(1) Rotor axial runout	0.050 or less
(2) Rotor radial runout	0.050 or less



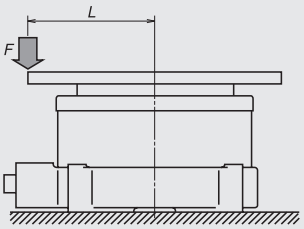
Selection

It is essential to study the allowable load and output torque that requires positioning the motor at a desired time. Refer to the motor specifications for the allowable axial and moment loads. Use the following formulas to obtain an actual load to the motor.

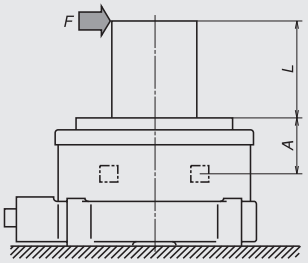
Estimation of Actual Load



(1) **When *F* is an external force:**
- Axial load: $F_a = F$ + total weight of jigs/works
- Moment load: M = 0



(2) **When *F* is an external force:**
- Axial load: $F_a = F$ + total weight of jigs/works
- Moment load: $M = F \times L$



(3) **When *F* is an external force:**
- Axial load: F_a = total weight of jigs/works
- Moment Load: $M = F \times (L+A)$

Motor Reference Number	M-YSB 2020	M-YSB 3040	M-YSB 4080	M-YSB 5120
A dimension (mm)	61.5	72.5	79.0	83.5

How to Use Charts for Minimum Positioning Time

Following the check of allowable loads, study the minimum time required to position the motor.
The charts provided below are for checking the minimum positioning time of the YSB Megatorque Motors. Refer to the charts in the following cases.

- **The user wishes to know which motor size should be selected for positioning within a required time, when the indexing angle and the load inertia are predetermined.**
- **The user wishes to know the required time for positioning, when an indexing angle, the load inertia and the motor size are predetermined.**

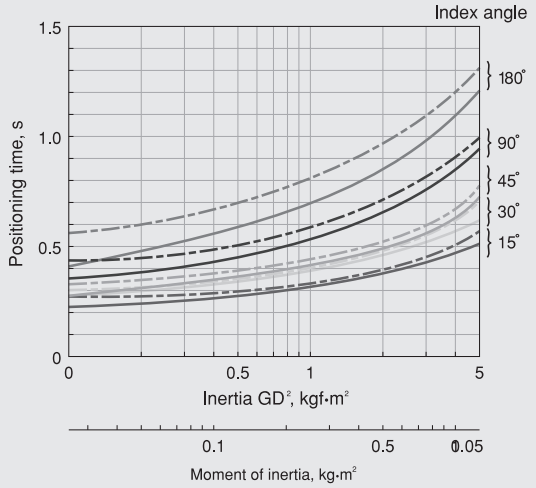
These charts can be used only when the following conditions are satisfied;
1) The load is directly coupled to the rotor, neither using a mechanical speed reducer such as a belt or gears nor coupling, and is sufficiently rigid (natural frequency is 50 Hz or over).
2) No load torque is applied on a motor.

In addition, further examination is recommended when a motor is to be used in any of the following conditions.
a. Load inertia exceeds the allowable value so that it may not appear on the charts: Even in this case, driving a motor is not always impossible, but may take a longer time than the theoretical value because considerable limitations will be placed on the acceleration and the rotational speed.
b. When there is no chart applicable to the indexing angle: Separate calculation shall be made. However, the minimum time for positioning cannot be obtained when the indexing angle is too small.
c. The settling time of 0.2 seconds is added initially. You may change the settling time to be shorter if you can relax the repeatability.

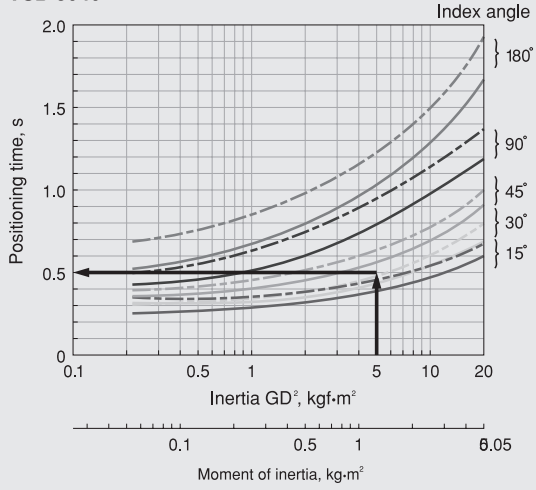
Example: Motor: M-YSB 3040 (100V AC) Moment of inertia: 1.25 kg•m² (GD²: 5 kgf•m²) Index angle: 30°
Following the arrows on the chart below right, the minimum positioning time is 0.5 seconds.

— – — (Power voltage: 200V AC ———)

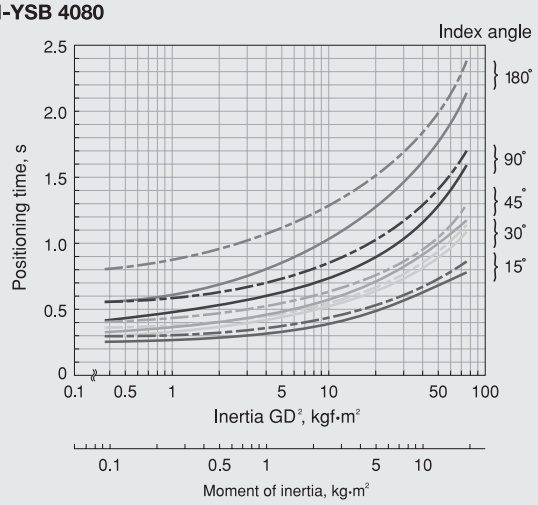
M-YSB 2020



M-YSB 3040



M-YSB 4080



M-YSB 5120