



LINEAR MOTION GUIDE



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Linear Motion Guide - H series



Spacer Chain Guide - H...S series



Wide Linear Motion Guide - HB series







Slim Linear Motion Guide - S series



Slim Spacer Chain Guide - S...S series



Slim Linear Motion Guide - HS series



Slim Spacer Chain Guide - HS...S series



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Miniature Linear Motion Guide - M series



Miniature Wide Linear Motion Guide - MB series



Roller Linear Motion Roller Guide - R series



Slim Roller Linear Motion Roller Guide - RS series







Crossed Roller Bearing









Compact Ball Spline













Linear Ball Spline





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Super Ball Bushing - Asia series











Super Ball Bushing - Europe series













Super Ball Bushing - Inch series



Linear Ball Bushing - Asia series





Linear Ball Bushing - Europe series





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Track Roller Guide - outside type





Track Roller Guide - inside type





1 WON Linear Motion Guide

1. Features

WONLinear Motion Guide is a linear motion bearing with the structure in which rolling elements such as balls or rollers softly circulate the inner part of a block that can make an infinite linear motion along the raceway surface of a rail.

The device is able to do rolling motion ideally, bearing high load and 4-direction equal load with high rigidity. With its auto-adjusting ability, the linear motion guide is excellent at error-absorbing and improves its precision after assembly. Since it has low frictional force and less abrasion, it is possible to maintain precision long and to drive silently at high-speed running.

2. Strengths

1) Able to make precise positioning

Since there is less difference between static friction and kinetic friction as well as in speed-induced friction fluctuation, it excellently responds even to micro-migration, allowing precise positioning and high-speed running.

2) Able to maintain stable precision for a long time

Less friction coefficient and wear due to ideal rolling motion makes it possible to maintain stable precision for a long time.

3) Able to eliminate clearance or increase rigidity by preloading

It is possible to eliminate clearance by using rolling elements such as a ball or a roller, or to increase rigidity of Linear Motion Guide by preloading.

4) Simple lubrication

Lubrication is simple, and it is convenient to maintain the device with grease or oil.

5) Able to make compact equipment and save the cost for operating electricity

The device is able to bear high load with high rigidity and has low friction. Therefore, it is possible to design compact and miniaturized equipment and to save manufacturing costs and energy.



3

3. Types

WON ST offers various types of linear motion guide from miniature types to general ball linear motion guide to low-noise linear motion guide to ultra-high rigid roller linear motion guide. Since each one supports different shapes and sizes according to service conditions, you can select the optimal linear motion guide suitable for each usage.

Linear Motion Guide	- A	 World standard ball linear motion guide 4-direction equal load type with 45° contact angle Great error-absorbing ability with D/F combination Linear motion with high rigidity and high precision through ideal rolling motion
Wide Linear Motion Guide		 4-direction equal load type with 45°con- tact angle; a low-centered structure with a wide and short rail; the moment working at a narrow space; usable as an one-axis type where high rigidity is required; a de vice with linear motion
Spacer Chain Linear Motion Guide	C. C	 World standard ball linear motion guide 4-direction equal load type with 45°contact angle Great error-absorbing ability with D/F com bination A spacer ball chain based retainer type; a linear motion device generating low noise and low dust
Miniature Linear Motion Guide		 Miniature high-rigidity Various shapes and sizes A compact linear motion device with high durability and reliability
Roller Linear Motion Guide		 Roller-enabled ultra-rigid linear motion guide 4-direction equal load type with 45°contact angle Able to run reliably for a long time through rolling motion having the wide contact surface A linear motion device with high rigidity and high precision, and bearing high load



2 Selection of Linear Motion Guide

1. Overview

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To select a linear motion guide, it is necessary to identify the details of requirements, prioritize them, and then choose the one that meets the service conditions.

2. Procedure



NA

3 Life Calculation

1. Load rating and life

1) Life

If external load is applied to linear motion guide in driving, fatigue fracture occurs due to the stress made as load is repeatedly applied to the raceway surface and rolling elements, and peeling off scale-like flakes (flaking) arises. Life of a linear motion guide refers to a total driving distance until the point that flaking arises due to initial fatigue fracture.

- A linear motion guide can have defects earlier than the time of normal flaking caused by its wear or fatigue in the following cases:
 - a. Excess load by the imprecise assembly following a difference in temperature or tolerance
 - b. If a linear motion guide is contaminated with foreign substances
 - c. Driving with insufficient lubrication
 - d. Reciprocating motion in a very short distance in the form of vibration or wave during halting or driving
 - e. Excessive load imposed on a linear motion guide
 - f. Deformation of plastic end-plate

2) Rating fatigue life L

Generally linear motion guide does not always have an equal life span even though its products are manufactured in the same way, because of the difference in scattering of original fatigue of rawmaterial. For this reason, the reference value of life of a linear motion guide is defined as the rating fatigue life which is a total driving distance that 90% of linear motion guides in one group with the same specifications can reach without flaking at the time when all in the group run under the same conditions.



3) Basic dynamic load rating C

Basic dynamic load rating is a ability of linear motion guide to bear load, which represents an appli cable constant load in direction and magnitude when the rated fatigue life is 50Km. The reference value of basic of WON linear motion guide dynamic load rating is 50Km (ball type) and 100Km (roller type), respectively. It is used for calculating of life a linear motion guide while driving under constant load in magnitude from the center of a block to bottom. Each value of basic dynamic load rating (C) is described in the catalogue

4) Basic static load rating Co

If a linear motion guide is applied by excessive load or instantly by big impact load, partially perma nent deformation occurs between a rolling element and the raceway surface. If deformation reaches to a certain extent, it hinders smooth driving.

Basic static load rating is defined as the constant static load in direction and magnitude when the total permanent deformation of the raceway surface of block and rail and of a rolling element like a ball or a roller is 0.0001 times bigger than the diameter of the rolling element. In a linear motion guide, it refers to the load applied from top to bottom based on the center of a block.

Each value of basic static load rating (Co) is described in the specification table.

5) Static allowable moment Mo

Moment load can be imposed on a linear motion guide. At this time, a ball or a roller both at the ends is most stressed due to the stress distribution of a ball or a roller as a rolling element in the linear motion guide. Static allowable moment (M0) refers to the constant moment load in direction and magnitude when the total permanent deformation of a ball or roller, a rolling element to which the biggest stress is applied, and of the raceway surface of a block or rail is less than 0.0001 of the diameter of the rolling element. Moment values of three directions (Mp, My, Mr) are described in the catalogue. Static allowable moment (M0) and static moment load rating (Mp) can be reviewed with application of safety factor (fs)

Directions of load and moment

Δ



2. Load calculation

A linear motion guide bears basic dynamic load rating (C) and basic static load rating (Co). Neverthe less, it also needs to bear compression load applied from top to down due to inertia force created by the center of gravity, positioning thrust, acceleration, cutting force, and deceleration as well as various loads including tensile load, horizontal load, and moment load, depending on the service conditions. In this case, load of the linear motion guide changes. To select a linear motion guide, it is required to review these conditions and calculate a proper load.

3. Service condition setting

Service conditions necessary for calculating the load and life of a linear motion guide.

- ① Mass: V(mm/s) m(kg) 6 Velocity diagram Velocity : ② Applicable load direction : Time constant : tn(s) ③ Point of application : l₂, l₃, h₁(mm) Acceleration : $\alpha n(mm/s^2)$ (center of gravity) $N_1(min^{-1})$ ⑦ No. of reciprocating motions per minute : ④ Point of thrust: ⑧ Stroke : ℓ4. h2(mm) Ls(mm) (5) Composition of linear motion guide : l_0 , l_1 (mm) (9) Avg. velocity : Vm(m/s) (No. of blocks & rails) ① Required life : Lh(h)

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4. Load calculation formula

The load applied to a linear motion guide changes depending on external forces such as the center of gravity, position of thrust, acceleration, and cutting resistance. To select a linear motion guide, it is required to calculate the load applied to a block in full consideration of the conditions shown below.

m: Mass(kg) l_n : Mass(mm) F_n : Thrust(N) P_n : Load (vertical, reverse-vertical)(N) P_{nr} : Load (horizontal)(N)	$ \begin{array}{ll} g : \mbox{Acceleration of gravity } (g:9.8m/s^2) & (m/s^2) \\ V : \mbox{Velocity} & (m/s) \\ t_n : \mbox{Time constant} & (s) \\ \alpha_n : \mbox{Velocity} & (m/s^2) \\ \end{array} $
Pnt : Load (horizontal) (N)	



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5. Equivalent load calculation

There are diverse kinds of load imposed on a block in a linear motion guide, such as compression load in vertical direction, tensile load, horizontal load, and moment load. There is also complex load of them. Sometimes the magnitude and direction of load change. Since it is difficult to calculate the variable load when calculating the life of the linear motion guide, it is required to use the equivalent load converted into the compression load or tensile load in vertical direction in order to calculate the life or static safety factor.

6. Equivalent load calculation formula

If a linear motion guide bears vertical compression load or tensile load or horizontal load simul taneously, or if the magnitude or direction of load changes, an equivalent load is calculated in the following formula.

 $P_E(Equivalent load) = P_n + P_{nT}$





7. Static safety factor calculation

Any unexpected big load may be applied to a linear motion guide due to the inertia force caused by vibration impact or quick braking and moment load of mechanical structure. To select a linear motion guide, it is required to take into account static safety factor and prepare for such load. Static safety factor (fs) is the value obtained by dividing basic static load rating by the calculated load. To see the baseline of static safety factor by service condition, please see Table 1–1 and Table 1–2.

Type of rolling element	Service condition	Static safety factor (fs)
	There are no vibration and impacts.	1.0 ~ 1.5
Ball	High driving performance is needed.	1.5 ~ 2.0
	There are moment load, violation, and impacts.	2.5 ~ 7.0
	There are no vibration and impacts.	2.0 ~ 3.0
Roller	High driving performance is needed.	3.0 ~ 5.0
	There are moment load, violation, and impacts.	4.0 ~ 7.0

Table 1-1. Baseline of static safety factor(fs)

Table 1-2.

If compression load is big	$\frac{f_{H} \cdot f_{T} \cdot f_{C} \cdot Co}{Pn} \geq fs$
If tensile load is big	$\frac{f_{H} \cdot f_{T} \cdot f_{C} \cdot C_{OL}}{P_{L}} \geq f_{S}$
If horizontal load is big	$\frac{f_{H} \cdot f_{T} \cdot f_{C} \cdot C_{OT}}{P_{nT}} \geq f_{S}$

- fs : Static safety factor
- Co : Basic static load rating(vertical) (N)
- Col: Basic static load rating (reverse-vertical) (N)
- Cot : Basic static load rating (horizontal) (N)
- Pn : Calculated load (vertical) (N)
- PL : Calculated load (reverse-vertical) (N)
- Pnt : Calculated load (horizontal) (N)
- fн : Hardness factor
- f T : Temperature factor
- fc : Contact factor

8. Mean load calculation

The load applied to a block of a linear motion guide is not constant but differs according to service conditions. Therefore, the load that becomes equal to life under the condition of variable load is used. This is called mean load. If the load applied to the block is changed due to an external condition, it is required to calculate a life with the mean load in consideration of the various conditions shown below. If load applied to block varies in different conditions, it is necessary to a life in consideration of the condition of variable load. Mean load (Pm) refers to constant load that becomes equal to the life under the conditions of variable load when the load applied to a block changes in various conditions while the device is driving.

$$\mathsf{P}_{\mathsf{m}} = \sqrt{\frac{1}{\mathsf{L}} \cdot \sum_{\mathsf{n}=1}^{\mathsf{n}} (\mathsf{P}_{\mathsf{n}}^{i} \cdot \mathsf{L}_{\mathsf{n}})}$$

Pm	: Mean load	(N)
Pn	: Variable load	(N)
L	: Total travel distance	(mm)
Ln	: Travel distance by loading Pn	(mm)
i	: Ball - 3. Roller - 10/3	

Note) the formula above or formula (1) below is applied to a ball type only.

1) Change in phase $P_{m} = \sqrt[3]{\frac{1}{L}(P_{1}^{2} \cdot L_{1} + P_{2}^{2} \cdot L_{2} + P_{n}^{2} \cdot L_{n}) \dots \dots} (1)$ $P_{m} : Magn load (N)$



Total travel distance L

2) Change monotonously $P_m = \frac{1}{3} (P_{min} + 2 \cdot P_{max}) \cdots (2)$ Pmin : Minimum load (N) Pmax : Maximum load (N)



d peo



9. Rating life calculation

Δ

A rating life needs to be calculated because life of a linear motion guide differs even under the same driving conditions. Rating life of a linear motion guide is a total travel distance that a linear motion guide system composed of a certain number of units can drive without flaking in 90% of the race way surface or rolling element after being run under the same working conditions. If a ball or a roller is used as a rolling element, it is possible to calculate a rating life in the following formula.

The formula to calculate the rating life of a ball-enabled linear motion guide

$$L = \left(\frac{f_{H} \cdot f_{T} \cdot f_{C}}{f_{W}} \cdot \frac{C}{P_{c}}\right)^{3} \times 50$$

L	: Rating life	(km)
С	: Basic dynamic load rat	ing (N)
Pc	: Calculated load	(N)
fн	: Hardness factor	See Figure 3
f⊤	: Temperature factor	See Figure 4
fc	: Contact factor	See Table 2
~	1. 1. 6	6 T 0

fw : Load factor See Table 3

The formula to calculate the rating life of a roller-enabled linear motion guide

$$L = \left(\frac{f_{H} \cdot f_{T} \cdot f_{C}}{f_{w}} \cdot \frac{C}{P_{c}} \right)^{\frac{10}{3}} X \ 100$$

L : Rating life	(km)
C : Basic dynamic load ra	ating (N)
Pc: Calculated load	(N)
fн : Hardness factor	See Figure 3
f T : Temperature factor	See Figure 4
fc : Contact factor	See Table 2
fw : Load factor	See Table 3

▶ If the length of stroke and the number of reciprocating motions are constant, it is possible to calculate a life time with the use of the rating life (L) in the following formula:

$$L_{h} = \frac{L \times 10^{6}}{2 \times \ell_{s} \times n_{1} \times 60}$$

Lh	: Life	tim	ie		(N)
•			-	,	

- l_{s} : Length of stroke (mm)
- n1 : No. of reciprocating motions (min⁻¹)

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1) Hardness factor (fH)

To implement the best performance of a lin ear motion guide, it is necessary to maintain appropriately the hardness and depth of the raceway surface of the block and rail that contact a rolling element (ball or roller).

WON linear motion guide has HRC58-64 surface hardness. There is no need to consid er hardness factor. If the hardness is lowered than a baseline, load capacity of a linear moti on guide decreases. In this case, it is necessar y to apply hardness factor to life calculation.

2) Temperature factor (f⊤)

If high temperature over 100°C is applied to a linear motion guide, it is necessary to take into account temperature factor (f_{T}) at the time when a liner motion guide is selected. Please make sure to use WON linear motion guide at below 80°C. At over 80°C, please use a high-temp linear motion guide.

> to use the materials of seal, end plate, and support plate that have specifications for high temperature.

3) Contact factor (fc)

If over two blocks are closely assembled and mounted, uniform load may not be applied to the blocks due to difference among mounting surfaces. Therefore, it is required to multiply basic static load rating (C) and basic dynamic load rating (Co) by the contact factor shown in Table 2.

Table 2 .

No. of blocks in close contact	Contact factor (fc)
2	0.81
3	0.72
4	0.66
5	0.61
Over 6	0.6
Common use	1.0




4) Load factor (fw)

Generally the static load applied to the block of a linear motion guide can be calculated in formula. However, while a machine is running, the load applied to the block tends to come from vibration or impacts. Therefore, as for the vibration or impact load at high-speed running, it is necessary to consider the load factor (fw) shown in Table 3. Divide the basic dynamic load rating of a linear motion guide by a load factor (fw).

Table 3

Δ

External condition	Service Conditions	Load factor
Low	Smooth running at mild speed; no external vibration or impacts	1.0 ~ 1.3
Moderate	Low speed; moderate external vibration or impacts	1.2 ~ 1.5
High	High speed; strong vibration or impacts	1.5 ~ 2.0
Very high	Very high speed; strong vibration and impacts at running	2.0 ~ 4.0

4 Rigidity and Preload

1. Preload

A linear motion guide is preloaded in a way that it improves mechanical precision by eliminating clearance using the rolling element (ball or roller) inserted into the space between a rail and a block or in a way that it applies load to the rolling element in advance by inserting the rolling element larger than the clearance of the raceway between a rail and a block. This process will enhance the rigidity of the linear motion guide and will lessen the displacement level caused by external load.



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2. Radial clearance

Radial clearance refers to a total travel distance in a radial direction from the center of a block of a linear motion guide when mild load is applied to the block up and down from the center part of the rail length after the block is assembled in the rail which is then fixed to base. Radial clearance is usually classified into common clearance (no symbol), G1 clearance (light preload), G2 clearance (heavy load), and Gs clearance (special preload), which is selectable depending on usage. The values are standardized by form.



		Туре	Preload symbol	preload
		Moderate	No symbol	0 ~ 0.03 x C
	Н	Light	G1	0.04 ~ 0.08 x C
S		Heavy	G2	0.09 ~ 0.13 x C
		Moderate	No symbol	0 ~ 0.03 x C
	S	Light	G1	0.03 ~ 0.05 x C
		Heavy	G2	0.06 ~ 0.08 x C
	Light	G1	Equivalent to 0.03C	
	Heavy	G2	Equivalent to 0.08C	
	Special	G3	Equivalent to 0.13C	

 Table 4. Service conditions for radial clearance (preload)

Туре	Preload status	Symbol	Service conditions	Use
1. Moderate	Plus-minus clearance	No symbol (1)	 Load is applied in uniform direction and smooth running is needed There is almost no vibration or im pact and precise running is required. 	Welding machine, textile machinery, packaging machinery, various convey ors, medical equipment, woodworking machine, glass cutting machine, take- out robots, ATC, winding machine
2. Light	A small amount of minus clearance	G1 (2)	 There is a little vibration or impact, and moment load Light load is applied, yet high preci sion is required 	Various industrial robots, measuring equipment, inspection equipment, 3D processor, laser processor, PCB drilling machine, various assembling machines, electric spark machine, punching press
3. Heavy	A large amount of minus clearance	G2 (3)	 There are mild impact load, over- hang load and moment load. Rigid ity and high precision are required. 	CNC lathe, machining center, milling machine, grinding machine, tapping center, drilling machine, hobbing ma chine, a variety of special equipment
4. Special	A small or large amount of minus clearance	Gs (4)	Smaller clearance than that of G1 preload; light and precise operation is required. Larger preload than that of G2; impact load and complex load; high strength and high rigidity are needed.	No preload, ultra-light preload, larg er-than-moderate preload, special preload customized to user condi tions, special processing machine for heavy-duty cutting

Note (1) No clearance or very small clearance.

- (2) Very small minus clearance
- (3) Quiet large minus clearance to enhance rigidity
- (4) Preload below G1 or over G2 to meet service conditions

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Table 5. Radial clearance of H, S & HS Series

Model No.			Symbol				
			Moderate	Light preload	Heavy preload		
			No symbol				
H15	S15	-	-4 ~+2	-12 ~ -4	-		
H20	S20	-	-5 ~ +2	-14 ~ -5	-23 ~ -14		
H25	S25	HS25	-6 ~ +3	-16 ~ -6	-26 ~ -16		
H30	-	HS30	-7 ~ +4	-19 ~ -7	-31 ~ -19		
H35	-	HS35	-8 ~+4	-22 ~ -8	-35 ~ -22		
H45	-	-	-10 ~ +5	-25 ~ -10	-40 ~ -25		
H55	-	-	-12 ~ +5	-29 ~ -12	-46 ~ -29		

Table 6. Radial clearance of HW Series

	Symbol				
Model No.	Moderate	Light preload	Heavy preload		
	No symbol				
HB17	-3 ~ 0	-7 ~ -3	-		
HB21	-4 ~+2	-8 ~ -4	-		
HB27	-5 ~ +2	-11 ~ -5	-		
HB35	-8 ~ +4	-18 ~ -8	-28 ~ -18		

Table 7. Radial clearance of M & MB Series

Model No.		Symbol			
		Moderate	Light preload		
		No symbol			
M5	MB5	0 ~ +1.5	-1 ~ 0		
M7	MB7	-2 ~ +2	-3 ~ 0		
M9	MB9	-2 ~ +2	-4 ~ 0		
M12	MB12	-3 ~ +3	-6 ~ 0		
M15	MBT13,MB15	-5 ~ +5	-10 ~ 0		
M20	-	-7 ~ +7	-14 ~ 0		

Table 8. Radial clearance of R Series

	Symbol				Symbol		
Model No.	Light preload		Special preload	Model No.			Special preload
			G3				
R25	-2 ~ -1	-3 ~ -2	-4 ~ -3	R45	-2 ~ -1	-3 ~ -2	-5 ~ -3
R30	-2 ~ -1	-3 ~ -2	-4 ~ -3	R55	-2 ~ -1	-4 ~ -2	-6 ~ -4
R35	-2 ~ -1	-3 ~ -2	-5 ~ -3	R65	-3 ~ -1	-5 ~ -3	-8 ~ -5

Unit : µm

Unit : µm

Unit : um

Unit : µm

WON

5 Friction

1. Friction

Friction of a linear motion guide resistance is about 1/20-1/40 of an existing sliding guide be cause a rolling element (ball or roller) is assembled in between a rail and a block which is the raceway surface. In addition, the device has low starting torque because the difference between static friction and kinetic friction is very small. low power loss and temperature rise in the part of linear motion are of advantage to speedy operation. high conformability and response make it possible to do high-precise positioning.

2. Friction coefficient

Friction of a linear motion guide resistance relies on the load applied to the linear motion guide, speed, lubrication or form. In the case of light load or speedy motion, lubricant or seal is the main cause of friction resistance. In the case of heavy load or slow motion, the magnitude of load affects friction resistance.



Common friction coefficients of various operating systems are shown below in the table, and are applied if there are appropriate lubricant or assembly and normal load.

Type of operating system	Major model number	Friction factor μ
Lippor Motion Cuido	H, HS, HB, S, SS, HS, HSS, M, MB	0.002 ~ 0.003
	R, RS	0.001 ~ 0.002
Ball Spline	WLS, WSP	0.002 ~ 0.003
Super Ball Bushing / Linear Ball Bushing	SB, SBE, LM, LME	0.001 ~ 0.003
Cross Roller Guideway	WRG	0.001 ~ 0.0025

6 Precision

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1. Precision specification

How to measure degree of a linear motion guide of travel is as follows (See Figure 6).

- a. Tighten the rail to the mounting surface of the bed with a bolt at the defined torque.
- b. Draw a measuring jig right up against the datum plane of the block as shown in the figure.
- c. Make a measurement by making the block and measuring jig travelled in the entire section from the starting point to the end point of the rail.
- d. The value measured in the above way is an error of parallelism of motion that the block has on the basis of the rail.



The degree of parallelization between the datum plane of the block and that of rail



Difference between the blocks installed in the plane

2. Precision design

Table 9. Dimensional tolerance and parallelism of motion

Dimension	Description
Dimensional tolerance of height H	Distance from the base side of rail A to the top side of block C
Difference in height H	Difference in the height of blocks combined from each rail on the same plane
Dimensional tolerance of width W ₂	Distance between the datum plane of rail B and the reference side of block D
Difference in width W2	Difference between the reference side of rail B of the block combined to the rail, and the reference side of block D
Parallelism of motion of C against A	Change in the top side of block C based on the base side of rail A during the motion of the block combined to the rail
Parallelism of motion of D against B	Change in the reference side of block D based on the reference side of rail B during the motion of block combined to the rail

3. Dimension tolerance and difference

Table 10. Precision specification of linear motion guide (H, H...S, HW, S, S...S, HS, HS...S series)

	Moderate	High	Precision	Super precision	Ultra precision
Dimension	N I a su una la sel	Н		SP	UP
	NO SYIIDOI	P6	P5	P4	P3
Dimensional tolerance of height H	±0.080	±0.042	±0.020	±0.010	±0.008
Difference in height H	0.025	0.015	0.007	0.005	0.003
Dimensional tolerance of width W ₂	±0.100	±0.050	±0.025	±0.015	±0.010
Difference in width W ₂	0.030	0.020	0.010	0.007	0.003
Parallelism of motion of C against A			See Table 11.		
Parallelism of motion of D against B			See Table 11.		





Length of rail Below P5 1.5 1.5 1.5 3.5 1.5 2.5 1.5 4.5 1.5 3.5 1.5 4.5 2.5 1.5 8.5 3.5 6.5 2.5 7.5 4.5 8.5 5.5 4.5 9.5 6.5 5.5 7.5

Table 11. Length of rail and parallelism of motion of linear motion guide (H, H...S, HB, S, S...S, HS, HS...S Series) $_{
m Unit\,:\, \mu m}$

Table 12. Precision specification of miniature linear motion guide (M, MB Series)

Unit : mm

Model	Precision spec	Moderate	High	Precision		
No.	Dimension	No symbol	P6	P5		
	Dimensional tolerance of height H	±0.030	-	±0.015		
	Difference in height H	0.015	-	0.005		
F	Dimensional tolerance of width W2	±0.030	-	±0.015		
C	Difference in width W2	0.015	-	0.005		
	Parallelism of motion of C against A	See Table 13.				
	Parallelism of motion of D against B	elism of motion of D against B See Table 13.				
7	Dimensional tolerance of height H	±0.040	± 0.020	±0.010		
9	Difference in height H	0.030	0.015	0.007		
12	Dimensional tolerance of width W2	±0.040	± 0.025	±0.015		
13	Difference in width W2	0.030	0.020	0.010		
15	Parallelism of motion of C against A	See Table 13.				
20	Parallelism of motion of D against B	B See Table 13.				

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Table 13. Length of rail and parallelism of motion of miniature linear motion guide (M, MB series) $Unit: \mu m$

Length	n of rail	Parall	arallelism of motion		Length of rail		Parallelism of motion		
		Moderate	High	Precision			Moderate	High	Precisior
Above	Below	No	Н	Р	Above	Below	No	Н	
		symbol	P6	P5			symbol	P6	P5
-	40	8	4	1	820	850	24	14	5
40	70	10	4	1	850	880	24	14	5
70	100	11	4	2	880	910	24	14	5
100	130	12	5	2	910	940	24	14	5
130	160	13	6	2	940	970	24	14	5
160	190	14	7	2	970	1000	25	14	5
190	220	15	7	3	1000	1030	25	16	5
220	250	16	8	3	1030	1060	25	16	5
250	280	17	8	3	1060	1090	25	16	6
280	310	17	9	3	1090	1120	25	16	6
310	340	18	9	3	1120	1150	25	16	6
340	370	18	10	3	1150	1180	25	17	6
370	400	19	10	3	1180	1210	26	17	6
400	430	20	11	4	1210	1240	26	17	6
430	460	20	12	4	1240	1270	26	17	6
460	490	21	12	4	1270	1300	26	17	6
490	520	21	12	4	1300	1330	26	17	6
520	550	22	12	4	1330	1360	27	17	6
550	580	22	13	4	1360	1390	27	18	6
580	610	22	13	4	1390	1420	27	18	6
610	640	22	13	4	1420	1450	27	18	7
640	670	23	13	4	1450	1480	27	18	7
670	700	23	13	5	1480	1510	27	18	7
700	730	23	14	5	1510	1540	28	19	7
730	760	23	14	5	1540	1570	28	19	7
760	790	23	14	5	1570	1800	28	19	7
790	820	23	14	5					



Super precision Dimensional tolerance of height H ±0.042 ±0.010 ±0.008 ±0.020 Difference in height H 0.015 0.007 0.005 0.003 Dimensional tolerance of width W2 ±0.050 ±0.025 ±0.015 ±0.010 Difference in width W2 0.020 0.010 0.007 0.003 Parallelism of motion of C against A See Table 15. Parallelism of motion of D against B See Table 15.

Table 14. Specifications for precision of linear motion guide (R series)

Table 15. Length of rail and parallelism of motion of linear motion guide (R series)

Unit : µm

Length	n of rail	Parallelism of motion					
About	Deleur	High	Precision	Super precision	Ultra precision		
ADOVE	Below	P6	P5	P4	P3		
-	50	3	2	1 <u>.</u> 5	1		
50	80	3	2	1 <u>.</u> 5	1		
80	125	3	2	1 <u>.</u> 5	1		
125	200	3 <u>.</u> 5	2	1 <u>.</u> 5	1		
200	250	4	2 <u>.</u> 5	1 <u>.</u> 5	1		
250	315	4 <u>.</u> 5	3	1 <u>.</u> 5	1		
315	400	5	3 <u>.</u> 5	2	1 <u>.</u> 5		
400	500	6	4 <u>.</u> 5	2 <u>.</u> 5	1.5		
500	630	7	5	3	2		
630	800	8 <u>.</u> 5	6	3 <u>.</u> 5	2		
800	1000	9	6 <u>.</u> 5	4	2 <u>.</u> 5		
1000	1250	11	7 <u>.</u> 5	4 <u>.</u> 5	3		
1250	1600	12	8	5	4		
1600	2000	13	8 <u>.</u> 5	5 <u>.</u> 5	4 <u>.</u> 5		
2000	2500	14	9.5	6	5		
2500	3150	16	11	6.5	5 <u>.</u> 5		
3150	4000	17	12	7.5	6		

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4. Selection of precision class

Table 16. For the selection of precision class of linear motion guide by unit, please refer to the table shown below.

Ľ		Precision class					Preload		
icatio	Unit	Preload type	High	Precision	Super precision	Ultra precision	Preload type	Light preload	Heavy preload
Appli		No	H	P	SP	UP	No	G1	G2
	CNC Lathe	Jynnoor	•	FJ ●	F4	гэ	Symbol		•
	Machining center		•	•	•				•
	NC milling machine		•	•	•				•
	CNC tapping machine		•	•	•				•
e Too	NC boring machine		•	•	•				•
	NC drilling machine		•	•	•				•
Mac	3D engraving machine		•	•	•				•
	lig boring machine		•	•					•
	EDM electric spark machine		•	•	•	•		•	•
	Grinding machine			•	•	•			•
	Prober equipment			-		•		•	•
	Wire bonder					•		•	•
nent	Slicing machine								
quipr	Dicing machine				•	•		•	
tor e	IC test handler			•	•	-			
onpr	PCB laser via-hole driller			-	•			•	
nicor	PCB inspection equipment			•	•				
	Laser marker			•					
	Chip mounter			•	•			•	
	Mac/Mic inspection equipment			-					
	Phantom inspection equipment								
	Fxposure				•	•			
	Laser repair				•				
	Lighting inspection equipment		•	•	•	•			
	Coater machine		•						
	Chin bonding machine		•		•				
	Dispenser machine		•						
	Dispenser machine		•	•				•	

WON ST CO., LTD.



Ц			Pr	ecision cla	ass			Preload	
icatio	Unit	Preload type	High	Precision	Super precision	Ultra precision	Preload type	Light preload	Heavy preload
Appl		No sym-	H	P	SP	UP	No	G1	G2
	Scriber	DOI	P6	P5	P4	P3	Symbol	•	
	Glass edge grinding machine		•	•				•	
	FPD measuring test equipment			•	•			•	
с Ц	Laminating equipment		•	•				•	
	Indentation test equipment								
	Prober equipment								
	Punching press		•					•	
	Tire molder	•						•	
hine	Tire vulcanizer	•						•	
mac	Auto-shearing machine	•						•	
strial	Auto-welding machine	•					•	•	
Indu	Conveyor	•					•		
	Textile machine	•					•		
	Injection molding machine	•					•	•	
	Cartesian coordinated robot	•	٠	•				•	
	Gantry robot		•					•	
bot	LTR robot		•	•				•	
al rol	Take-out robot							•	
lustri	Cylindrical coordinated robot		•					•	
pul	Vacuum robot		•	•				•	
	Robot carriage								
	Linear actuator		•		•		•	•	
	Office machine						•		
	FA transport equipment						•		
	Medical equipment	•					•	•	
lers	Welding machine	•					•		
Oth	Painting machine	•					•		
	Precision XY table		•	•	•			•	
	UVW stage		٠	•				•	
	3D measuring machine			•	•	•			

7 Lubrication

1. Purpose

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The purpose of lubricating a linear motion guide is to create an oil surface between the raceway surface of rail and block and a rolling element so as to avoid the direct contact of metals, and thereby to reduce friction, wear and heat, preventing the raceway surface and the rolling element from being overheated and melted to be adhered to each other. Moreover, the oil surface created between the raceway surface and a ball decreases load-induced contact stress, so that it can improve the rolling contact fatigue life and prevent rust. A linear motion guide is equipped with a seal. Nevertheless, grease inside the block oozes while the device is in operation. For this reason, it is required to supply a lubricant at a time and interval appropriate to each service condition.

2. Selection of lubricant

To achieve the best performance of a linear motion guide, it is necessary to select the lubricant suitable for service conditions. Lubricants used for a linear motion guide include grease and oil. It is possible to select an appropriate lubricant and lubrication method depending on service conditions, load, operating speed, assembly type, etc.

3. Grease lubrication

Grease is a semisolid lubricant that consists base oil, thickener, and additives.

Generally, when a linear motion guide is lubricated with grease, lithium soap grease is used. In the con dition of high load or the condition of use, the grease mixed with extreme-pressure additive is used. To apply a linear motion guide to a high-vacuum environment or a cleanroom, it of desirable to select a type of grease excellent at low evaporation and low dust generation.

1) Grease refilling

For grease refilling in a linear motion guide, it is necessary to supply a sufficient amount of grease with the use of a grease nipple until remaining grease is discharged. It is appropriate to fill up 50% or so volume block with grease. After refilling, rolling resistance can be increased. In order to reduce the rolling resistance, it is better to take a test run about 20 times prior to the operation.

2) Refill interval

If a travel of linear motion guide exceeds a certain time, its lubricating performance declines. So it is re quired to supply an appropriate amount of grease at a proper time depending on service conditions and environment. Usually, it is necessary to supply grease when travel of the device distance reaches 100km.

$$T = \frac{100 \times 6000}{Ve \times 60}$$
 hr

T : Oil refilling cycle (time) Ve : Velocity (m/min)



4. Oil lubrication

When a linear motion guide is lubricated with oil, it is recommended to use an oil lubricant with high viscosity (68mm² /sec) under the condition of high load, and an oil lubricant with low-viscosity (13mm² /sec) under the condition of high velocity. As for oil lubrication, the recommended oil supply amount per block is 0.3cm³ per hour.

Туре	Checkpoints	Inspection cycle	Refilling time	
Grease	 Check if there is any cutting chip, dust, foreign substance Check if there is any contamination by other substances 	3-6 months	 Generally, supply grease 1-2 times every year. Usually, supply grease more than once every year if travel exceeds 100km/year. Refill depending on a situation after checking the status of grease. 	
Cil	Check a lubricant quantity, contamination, and foreign substance	3-6 months	 Refill depending on the results of inspection, and determine an optimal amount depending on volume of the oil tank 	
OII	Check an oil level (Supply oil mist)	Before every operation	 Refill appropriately after checking how much oil is consumed. Define an optimal amount after how much oil is consumed 	

% Please DO NOT use any oil that affects synthetic resin, a material of linear motion guide parts.

Table 18. Lubricants used for linear motion guide

Application	Main use	Product name	Manufacturer	Manufacturer	Base oil	Type of thickener
Common use (extreme-pressure additive incl.)	Industrial machine, machine tool	BW EP NO.2	BWC	-20 ~+105	Mineral oil	Lithium
Common use	Machine tool, electric spark machine, industrial robot, etc.	GADUS S2 V220 00	SHELL	-30 ~+110	Mineral oil	Lithium
Clean & low dust generation	Semiconductor, FPD equipment	SNG 5050 DEMNUM	NTG DAIKIN	-40 ~+1200 -50 ~+300	Synthetic oil	Urea
Eco-friendly	Semiconductor AMOLED process equipment, driving gear in vacuum chamber	FOMBLIN Krytox High vacuum grease	AUSIMONT DuPont Dow Corning	-20 ~+250	Synthetic oil	Re-fluoride Ethylene fluorinated
Machine tool	Excellent dust prevention and strong oil film strength Hardly emulsified to clearance, so suitable for machine tools	VACTRA NO.2 SLC DTE Oil	ExxonMobil	-20 ~+100	Oil	Way oil Turbine oil
Special use	Corrosion proofing	6459 Grease	SHELL	-20 ~+100	Mineral oil	Polyurethane

8 Surface Treatment

1. Surface treatment

WON ST uses the following methods for the optimal surface treatment of a linear motion guide in order to prevent rust and improve the quality of its appearance.

2. Types of surface treatment

1) Electrolytic rust-preventive black coating (black Cr plating)

This is an industrial black chrome coating type that is used to improve the corrosion proof at low cost. It can achieve better corrosion proof than martensite stainless steel and be used to enhance appearance and prevent the reflection of light.

2) Industrial hard chrome plating

A hardness of surface is over 850HV, so that its wear proof is excellent and its corrosion proof is comparable with that of martensite stainless steel. WON ST offers such surface treatment types such as alkakine col oring and color alumite treatment at a customer request. To use a linear motion guide after its sur face treatment, it is necessary to set a high safety factor.

3) Fluoride low-temperature Cr plating

It is also called "Raydent." This is a combined surface treatment type of black Cr coating with special fluoride resin coating that is used in the places requiring high corrosion proof, or in cleanroom that needs to generate low dust.

9 Dust Proof

1. Dust proof

To make use of the characteristics and performance that a linear motion guide has, it is important to protect the device against external foreign substances which are causes of abnormal wear and its shortened life span. If any dust or foreign substance is expected to be mixed in, it is required to use an effective sealing or dust-proofing system.

2. Types of dust proof

WON Linear Motion Guide has basically a seal assembled. If necessary, it I possible to mount a metal scraper on the device before shipment.

1) Exclusive seal

In order to protect the inside of a bearing against foreign substances, an end seal and a side seal are installed on the both ends and bottom of a block, and an inner seal is mounted on the inside of the block.

2) Metal scraper

A metal scraper is installed outside an end seal, so that it is effective at protecting a device against foreign substances, such as hot spatter or slag generated in a welding process.



10 Measures for Use in Special Environments

WON Linear Motion Guide is useful in various special applications if being used appropriately in accord ance with such service conditions as material, surface treatment, dust proof, and grease.

Table 19.

Application	Conditions of use		Measures
Clean	If used in a clean environment,	Lubricant	For a clean environmentUse the grease that generates low dust
(Clean room) -Semiconductor, FPD, medical equipment-	It is required to minimize dust or particles generated in a linear motion guide, as most as possible.	Rust prevention	 Black Cr coating Fluoride low-temperature colorimet ric Cr plating (Raydent treatment) Use high-corrosion resistant stainless steel as a material
Vacuum	If used in a vacuum environment that needs to maintain vacuum status, it is required to	Lubricant	Use the grease for a vacuum en vironment.
-Semiconductor, FPD deposition equipment -	 control the out gas discharged by a linear motion guide as most as possible. Excellent rust prevention is required, since rust-prone parts cannot be used in this environment. 	Rust prevention (Out Gas)	 Use high-corrosion resistant stainless steel as a material Use a self-oiling agent with special coatings like fluoroplastic coatin Use ceramic as a material
	 If used in a higher temperature environment than general one, 	Lubricant	 Use the grease for high- temperature.
High-temperature environment	where heat proof of a ma terial is important, it is re quired to use metals for plastic synthetic resin parts	Material	 Use an end seal, side seal+ double seal. Use a double seal. Use a special seal for high temperature
	 If used in an environment where there are a lot of cutting 	Seal	 Use a plastic synthetic resin cap Use a metal cap Use a metal scraper
Dust	chips, wood dust, and dust, it is required to take dust proof measures to protect the block	Сар	 Use a plastic synthetic resin cap. Use a metal cap Use a seal plate
	against foreign substances.	Holding door	 Use an exclusive holding door Use an sealing and all-in-one holding door
	 If exposed to a spot welding or 	Spatter	Fluoride black Cr coating
Spatter	arc welding environment, it is required to take measures to	Seal	Use a metal scraper
Spatter	prevent hot spatters from being fixed onto a rail	Dust resistance	Use a metal capUse a seal plate

11 Placement and Installation

1. Placement and structure

To mount a linear motion guide on equipment, it is required to understand the overall structure of the equipment first, and then check the sizes of the base and a transfer table. To determine the optimal in stallation of a linear motion guide, it is necessary to take into account mounting directions such as placing vertically, in slope, or in the back, load, and the life span required.

Installation layout of linear motion guide (examples)



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2. Mounting and fixation

In the structure affected by both vibration and impact, in the place that has complex load or moment load, it is required to fix a linear motion guide in a different way from a general one.



Figure 8. Pushing a pressure plate from the flank

You must be required to use miniature bolts due to the spatial constraint when a rail is pushed by a bolt. It is favorable to use as many bolts for pushing as possible.



Figure 10. Pushing a bolt from the flank

This is a way of fastening a tapered fixture with a bolt. Even slightly bolting up generates big force in a horizontal direction. If it is bolted up too much, deformation may occur in rail, for instance, which needs to be taken a caution.



Figure 9. Pushing a tapered plate

This is a way of pushing a needle roller with the head of a countersunk screw. It is careful to push it to fit the screw.



3. Design of the mounting surface for installation

Design and management of the mounting surface

The precision of mounting surface of a linear motion guide and an error in installation cause unexpected load and stress to the device, negatively influencing the travel and life of the device. So, it is required to take caution to prevent the harmful effects.

Management of the vertical angle of the datum plane for installation

If the vertical angle of the installation surface of a rail or block and of its datum plane is inaccurate, it might not be assembled precisely. So, it is required to review an error of vertical angel in design.





Management of the datum plane for assembly

In designing a linear motion guide, it is important to manage the height and thickness of its assembly datum plane. If the height is too high or low, a rail or a block may fail to be assembled precisely due to its surface attachment; the application of eccentric load, horizontal load and moment load may loosen the strength of joint and cause poor assembly. In this case, precision fails to meet the requirements in de sign. So, attention must be paid.

Management of the shape of contact corner

If the right-angled corner of a rail or block installed to the mounting surface of a linear motion guide is processed in R-shape and R value is bigger than the dimension of the surface of the rail or block, it is possible to cause a failure of precise assembly to the datum plane. So, attention must be paid.





Figure 14. Vertical angle of contact datum plane

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Management of the dimensional tolerance between datum plane and bolt in design

If the dimensional tolerance between the contact datum plane of a rail or block of a linear motion guide and a mounting hole is too big, precise assembly fails. So, attention must be paid. Generally the dimensional tolerance is ±0.1mm as a reference value. If the distance tolerance between the assembly datum plane of rail or block and the assembly bolt hole is too wide or narrow, precise assembly may fail. So, it is required to set the tolerance to W3±0.1mm in design.







- Make a datum plane that can contact the flank in order to secure the assembly convenience or precise position and the assembly surface of a rail or block in the installation process of a linear motion guide.
- The height of the raised spot of contact datum plane or the radius of corner depend on the specifications of a linear motion guide. So please see the table shown below.
- To prevent the raised spot from being deformed by the pressing force from above or pushing force from side, secure sufficient thickness in design.

	, , , . ,				Unit : mm
Model No.	Radius of corner of the installation to rail r1(max.)	Radius of corner of the installation to block r2(max.)	Height of raised spot of the installation to rail H1	Height of raised spot of the installation to block H ₂	H₃
15	0.5	0.5	3	4	4.7
20	0.5	0.5	3.5	5	6
25	1	1	5	5	7
30	1	1	5	5	7.5
35	1	1	6	6	9
45	1	1	8	8	10
55	1.5	1.5	10	10	13

H, H...S, HB, S, S...S, HS, HS...S Series

HB Series

A

Unit : mm

Model No.	Radius of corner of the installation to rail r1(max.)	Radius of corner of the installation to block r2(max.)	Height of raised spot of the installation to rail H1	Height of raised spot of the installation to block H ₂	H₃
17	0.4	0.4	2	4	2.5
21	0.4	0.4	2.5	5	3.3
27	0.4	0.4	2.5	5	3.5
35	0.8	0.8	3.5	5	4

S, S...S Series

Unit : mm

Model No.	Radius of corner of the installation to rail r1(max.)	Radius of corner of the installation to block r2(max.)	Height of raised spot of the installation to rail H1	Height of raised spot of the installation to block H ₂	H3
15	0.5	0.1	2.5	4	4.5
20	0.5	1	4	5	6
25	1	1	5	5	7

M. MB Series

M, MB Se	ries				Unit : mm
Model No.	Radius of corner of the installation to rail r1(max.)	Radius of corner of the installation to block r2(max.)	Height of raised spot of the installation to rail H1	Height of raised spot of the installation to block H ₂	H₃
5	0.2	0.2	0.8	2	1
7	0.2	0.2	1.2	2.5	1.5
9	0.2	0.2	1.5	3	2
12	0.2	0.2	2.5	4	3
13	0.2	0.2		4.5	4
15	0.2	0.2	3	4.5	4
20	0.2	0.2	4	5	5

R Series

Unit : mm

Model No.	Radius of corner of the installation to rail r1(max.)	Radius of corner of the installation to block r2(max.)	Height of raised spot of the installation to rail H1	Height of raised spot of the installation to block H ₂	H₃
25	1	1	4	5	6.5
30	1	1	4.5	5	7
35	1	1	5	6	7
45	1.5	1.5	6	8	9.5
55	1.5	1.5	8	10	10
65	1.5	2	9	10	13



4. Error tolerance of the mounting surface for installation

1) Auto-adjusting and error-absorbing abilities

A linear motion guide has an excellent auto-adjusting ability. Therefore, even though the structure with rail assembly is slightly deformed processing error may occur a little, the straightness or parallelism of a table after assembly is better than the precision in processing before assembly, and quite linear running is available.

2) Error tolerance of the degree of parallelization when using 2-axis assembly (P1)

The error tolerance of the degree of parallelization when a 2-axis assembly is used is shown below



H, H...S, HS, HS...S Series

H, HS, F	HS, HSS Series		Unit : µm
Model No.	Common clearance	G1 clearance	G2 clearance
15	25	18	-
20	25	20	18
25	30	22	20
30	40	30	27
35	50	35	30
45	60	40	35
55	70	50	45

HB Series

A

Model No.	Common clearance	G1 clearance	G2 clearance
17	20	15	-
21	25	18	-
27	25	20	-
35	30	22	20

S, S...S Series

S, SS Se	eries		Unit : µm
Model No.	Common clearance	G1 clearance	G2 clearance
15	25	18	-
20	25	20	18
25	30	22	20

M, MB Series

M, MB Se	ries	Unit : µm
Model No.	Common clearance	G1 clearance
5	2	-
7	3	-
9	4	3
12	9	5
13	10	6
15	10	6
20	13	8

R Series

Unit : µm



Unit : um

3) Error tolerance of height in 2-axis assembly (P₂)

If an error of height in installation is too big, block distortion occurs and its rigidity may be weakened due to block distortion and changes in the raceway groove of the block and rail block and in the contact angle of a ball or roller as a rolling element.

The error tolerance of height level (x) when a 2-axis linear motion guide is used is as follows.



H, H...S, S, S...S, HS, HS...S Series

Model No.	Common clearance	G1 clearance	G ₂ clearance
15	0.26L	0.17L	-
20	0.26L	0.17L	0.10L
25	0.26L	0.17L	0.14L
30	0.34L	0.22L	0.18L
35	0.42L	0.30L	0.24L
45	0.50L	0.34L	0.28L
55	0.60L	0.42L	0.34L

HB Series	5		Unit : µm
Model No.	Common clearance	G1 clearance	G2 clearance
17	0.13L	0.04L	-
21	0.26L	0.17L	-
27	0.26L	0.17L	-
35	0.26L	0.17L	0.14L

M, MB Series

Model No.	Common clearance	G1 clearance
5	0.04L	-
7	0.05L	-
9	0.07L	0.01L
12	0.10L	0.02L
13	0.12L	0.04L
15	0.12L	0.04L
20	0.14L	0.06L

R Series		Unit : µm
Model No.	G2 clearance	G ₃ clearance
25, 30, 35, 45, 55, 65	0.17L	0.12L

5. Description of the datum plane for installation

The datum plane of WON ST Linear Motion Guide is the ground surface on the opposite side of WON mark shown in the block.



Unit : µm



6. Rail connection

If it is necessary to use a longer rail than the one supplied, it is possible to connect rails for the purpose of use. The mark on the rail indicates the point where rails should be linked. If a block passes through the connecting points simultaneously, that may affect travel of the unit or cause a delicate hitch. To solve this problem, it is recommended to make the connecting points intercrossed.



7. Installation

Δ

1) Installation of linear motion guide in the equipment exposed to vibration and impacts



1 Install a rail



Prior to installation, remove burr, dust, and dust prevention oil completely.



Check the status of bolts and fasten every bolt temporarily.





Gently place a linear motion guide on the bed, and push it in the opposite direction of datum plan of the bed.



Fix push bolts to make sure that the rail is in parallel with the datum plane of the bed.

- Step 5: Fasten all bolts with a torque wrench.
 Fasten all bolts at the recommended torque. Fasten the bolt in the center first and then continue fastening each bolt toward both ends in order to maintain preci sion of the rail in the assembly process.
- Step 6: Assemble an auxiliary axis.

Repeat the above procedure for the instal lation of an auxiliary axis.





② Install a block



• Step 1: Assembly bolts temporarily Place a table on the block and fasten all bolts temporarily.

• Step 2: Fasten bolts tightly

Fix the main rail block to the opposite side of datum plane of the table with the use of a push bolt, and adjust position of the table.

• Step 3: Fix and fasten assembly bolts Completely fasten all bolts on the datum plane and subsidiary side in the order of ① to ④.

2) Installation of linear motion guide without a push bolt



1 Install a master rail



Fasten bolts temporarily and push a master rail toward the datum plane using a C-vise. Fasten the bolts sequentially at the pre scribed torque. Install an auxiliary rail



Place a straight edge in between two rails, and make it in parallel with the master rail fixed temporarily. Check the degree of par allelism with a dial gauge, and adjust the rail if needed. And then, fasten bolts in order Δ



Assembly using a table

- 1. Fix two blocks on the datum plane and one block on the auxiliary axis to a table.
- 2. Fix another auxiliary block and rail to the ta ble and bed temporarily.
- 3. Place a dial gauge on the table and make sure that a prober of the gauge contacts the auxiliary axis of the block.
- 4. Separate the table from the end of the rail, and check parallelization between the block and the auxiliary rail.
- 5. Fasten bolts in order.
- Assembly using a rail on the reference axis
- 1. Fix two blocks on the datum plane and one block on the auxiliary axis to a table.
- 2. Fix another auxiliary block and rail to the ta ble and bed temporarily.
- 3. Separate the table from one rail and make adjustment in the way of parallelization with the auxiliary rail in consideration of rolling resistance in movement.
- 4. Fasten bolts in order.





Move the postiion of a block sequentially at the end of the master rail every bolt pitch, and adjust parallelization between the datum plane of the master rail and the master plane of the auxiliary rail with the use of a special jig. Fasten bolts in order.



Completion of the installation











Fix two blocks together onto the meas uring plate and install a temporary datum plane near the rail mounting on the bed. Check the degree of parallelism of the rail, and fasten bolts in order.



Fix a rail to the bed temporarily. Adjust it to be in straight life with the use of a dial gauge. Fasten bolts in order.

② Apply the same method when installing an auxiliary block and rail.

4) Measure precision after installation

It is possible to check the precision of travel by fixing two blocks onto the measuring plate. To meas ure precision, either use a straight edge and check a measurement with a dial gauge, or use a laser interferometer.





8. Torque used for fastening bolts in assembly

1) Select the optimal torque for bolts

To assemble a rail of a linear motion guide, it is required to apply bolt torque appropriately in consider ation of the material of the mounting surface or bolts. Inaccurate bolt torque may affect the mounting precision of the rail. So please use a torque wrench.

2) Recommended torqu	ie by the material of the	mounting base	Unit : N · m
Dolt constitution		Torque value (Unit : N·m)	
DOIL SPECIFICATION	Steel	Casting	Aluminum
M3	2	1.3	1
M4	4	2.7	2
M5	8.8	5.9	4.4
M6	13.7	9.2	6.8
M8	30	20	15
M10	68	45	33
M12	120	78	58
M14	157	105	78
M16	196	131	98
M20	382	255	191



9. Bolt fastening direction by linear motion guide type

	H-FN, H-FL, HB-F, H-FNS, H-FLS
	Since the flange of a block is tap-processed and the counter bore is processed in the bottom, it is possible to tighten bolts in the up and down direction as indicated by the arrows. But, to fasten bolts from bottom to top, it is recommended to use one size smaller.
	H-RN, H-RL, HB-R, H-RNS, H-RLS
3	Since the square body of the block is tap-processed, it is used at the time when bolts need to be fastened from top to bottom as indicated by the arrow
	S-RC, S-RN, S-RCS, S-RNS
	Since the square body of the block is tap-processed, it is used at the time when bolts need to be fastened from top to bottom as indicated by the arrow
	S-FC, S-FN, S-FCS, S-FNS
	S-FC, S-FN, S-FCS, S-FNS Since the flange of a block is tap-processed and the counter bore is processed in the bottom, it is possible to tighten bolts in the up and down direction as indicated by the arrows. But, to fasten bolts from bottom to top, it is recommended to use one size smaller.
	S-FC, S-FN, S-FCS, S-FNS Since the flange of a block is tap-processed and the counter bore is processed in the bottom, it is possible to tighten bolts in the up and down direction as indicated by the arrows. But, to fasten bolts from bottom to top, it is recommended to use one size smaller. R-FN, R-FL
	S-FC, S-FN, S-FCS, S-FNS Since the flange of a block is tap-processed and the counter bore is processed in the bottom, it is possible to tighten bolts in the up and down direction as indicated by the arrows. But, to fasten bolts from bottom to top, it is recommended to use one size smaller. <u>R-FN, R-FL</u> Since the flange of a block is tap-processed and the counter bore is processed in the bottom, it is possible to tighten bolts in the up and down direction as indicated by the arrows. But, to fasten bolts from bottom to top, it is recommended to use one size smaller.
	S-FC, S-FN, S-FCS, S-FNS Since the flange of a block is tap-processed and the counter bore is processed in the bottom, it is possible to tighten bolts in the up and down direction as indicated by the arrows. But, to fasten bolts from bottom to top, it is recommended to use one size smaller. R-FN, R-FL Since the flange of a block is tap-processed and the counter bore is processed in the bottom, it is possible to tighten bolts in the up and down direction as indicated by the arrows. But, to fasten bolts from bottom to top, it is recommended to use one size smaller. R-RN, R-RL, RS-RN, RS-RL

12 Types of Linear Motion Guide

1. Linear Motion Guide H Series

1) Structure of H Series

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WON Linear Motion Guide H Series has a four-row circular arc-groove structure in the raceway groove of a rail or block. In addition, it has a 4-direction equal load type in which it can bear equal load rating for vertical compression load, tensile load, and horizontal load as its ball as a rolling element is combined at 45 degree. Therefore, the model reduces friction resistance and ensures smooth motion and long life. By imposing preload on the balls, it is possible to enhance the rigidity of a linear motion guide and to minimize its deformation for external load.

2) Features of H Series

- a. High quality, high precision, and elimination of labor.
- b. High rigidity and high precision for implementing stable travel precision for a long time.
- c. Excellent wear resistance and friction resistance that ensure a long life.
- d. The face-to-face duplex structure just like the D/F combination of ball bearing, excellent at auto-adjusting and error-absorbing.
- e. Various specifications for easy design.
- f. Easy to use due to high compatibility of rail and block.

2. Spacer Chain Linear Motion Guide H...SSeries

1) Structure of H...S Series

Like H Series, Linear Motion Guide H...S Series has the 4-direction equal load type and auto-adjusting face-to-face D/F structure. It uses a ball as a rolling element and has a spacer between balls to prevent them from colliding each other in rolling motion. Since it makes less noise and more stable circulating motion than a full-ball type, it is possible to implement quiet running at high speed. In addition, the spacer can serve as a pocket of a lubricant.

2) Features of H...S Series

- a. As a spacer-incorporated type that improves frictional properties and prevents the collision of balls, the model not only allows stable circulating motion and smooth running but also reduces noise. By attach ing a special lubricating seal for a longer life span, it is possible to be free of maintenance.
- b. Since a resin spacer is applied to the model, it is possible to prevent the collision of balls and the loss of oil film, and to generate less particles and dust.
- c. High quality, high precision, and elimination of labor.
- d. High rigidity and high precision for implementing stable travel precision for a long time.
- e. Excellent wear resistance and friction resistance that ensure a long life.
- f. The face-to-face duplex structure just like the D/F combination of ball bearing, excellent at auto-adjusting and error-absorbing.
- g. Various specifications for easy design.
- h. Easy to use due to high compatibility of rail and block.

Linear Motion Guide

Linear Motion Guide H Series, H...S Series

45°

45°



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H...S Series (Spacer Chain Type)

Мр Mr Moment Rigidity

Cross Section



Types and Features

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Category	Туре					
Flange type	H-F H-FS		 A general type with the tap-ma chined flange of a block, support ing installation from bottom to top and from top to bottom 4-direction equal load type with high rigidity and high load S Series are types with a spacer retain er helping to reduce ball-to-ball friction and generate less noise and dust 	Machine tool X, Y, & Z axes, CNC machining center, CNC lathe, CNC tapping		
	H-FL H-FLS		 The same cross section as in H-F Series; increased load rating by en larging the entire length (L1) of a block 4-direction equal load type with high rigidity and high load S Series are types with a spacer retain er helping to reduce ball-to-ball friction and generate less noise and dust 	center, Electric injection machine, 3D engraving machine, Laser processer, Milling machine, Welder for exclusive use,		
Compact type	H-R H-RS		 A compact type with the tap-ma chined top of a block, minimizing the width (W) of a block 4-direction equal load type with high rigidity and high load S Series are types with a spacer retain er helping to reduce ball-to-ball friction and generate less noise and dust 	Spark machine, Automation device, Multi-transport system, FPD inspection equipment, Industrial robot, Precision X-Y		
	H-RL H-RLS		 The same cross section as in H-R Series; increased load rating by enlarging the entire length (L1) of a block 4-direction equal load type with high rigidity and high load S Series are types with a spacer retain er helping to reduce ball-to-ball friction and generate less noise and dust 	Various industrial machines		

WON ST CO., LTD.

WON

Unit : mm

Standard and maximum lengths of a rail



Model No.	H15	H20	H25	H30	H35	H45	H55
	160	160	220	280	440	570	780
	220	220	280	360	520	675	900
	280	280	340	440	600	780	100
	:	340	400	520	680	885	:
Standard	1360	:	460	600	760	:	2820
length	1480	1960	:	:	:	2880	2940
	1600	2080	2200	2520	2680	2985	3060
		2200	2320	2680	2840	3090	
			2440	2840	3000		
				3000			
Standard pitch P	60	60	60	80	80	105	120
G	20	20	20	20	20	22.5	30
Max. length				4000			

Standard tap hole type of a rail



Model No.		h(mm)
H15	M5	8
H20	M6	10
H25	M6	12
H30	M8	15
H35	M8	17
H45	M12	24
H55	M14	24

H-FN Series, H-FL Series





Model No.	External dimensions			Dimensions of block													
	Height H	Width W	Length L		С	М	Lı			T1					D	Grease nipple	Нз
H 15FN	24	47	56.5	38	30	M5	40.8	-	7	11	6	4.7	3.7	3.25	3.3	A-M5	4.5
H 15FL	24	47	64.8	38	30	M5	49.1	-	7	11	6	4.7	3.7	3.25	3.3	A-M5	4.5
H 20FN	30	63	73.2	53	40	M6	53.1	-	9.2	10	7.5	10.7	6.7	4.25	3.3	B-M6F	6.0
H 20FL	30	63	89.1	53	40	M6	69	-	9.2	10	7.5	10.7	6.7	4.25	3.3	B-M6F	6.0
H 25FN	36	70	83.2	57	45	M8	58.3	-	11.5	16	9	10.2	8	5	3.3	B-M6F	7.0
H 25FL	36	70	103.1	57	45	M8	78.2	-	11.5	16	9	10.2	8	5	3.3	B-M6F	7.0
H 30FN	42	90	99.3	72	52	M10	70.8	-	9.5	18	7.3	9.8	5	5.8	5.2	B-M6F	7.5
H 30FL	42	90	121.5	72	52	M10	93	-	9.5	18	7.3	9.8	5	5.8	5.2	B-M6F	7.5
H 35FN	48	100	111.8	82	62	M10	80.8	-	12.5	21	8	9.7	6.5	6.5	5.2	B-M6F	9.0
H 35FL	48	100	137.2	82	62	M10	106.2	-	12.5	21	8	9.7	6.5	6.5	5.2	B-M6F	9.0
H 45FN	60	120	139.0	100	80	M12	101.9	25	13	15	10	16	8	8	3.3	B-PT1/8	10.0
H 45FL	60	120	170.8	100	80	M12	133.7	25	13	15	10	16	8	8	3.3	B-PT1/8	10.0
H 55FN	70	140	163.0	116	95	M14	117.5	29	19	17	11	16	8	9	3.3	B-PT1/8	13.0
H 55FL	70	140	201.1	116	95	M14	155.6	29	19	17	11	16	8	9	3.3	B-PT1/8	13.0

Composition of Model Name & Number



- Model No. of Linear Motion Guide
- Material of block : No symbol-Standard material / M-Stainless
- Type of block : RN-Rectangular standard type / RL-Rectangular long type/ FN-Flange standard type / FL-Flange long type
 No symbol-Standard block / E-Special block specification
- Type of seal : No symbol-No seal / UU-End seal / SS-End seal+Side seal+Inner seal / DD-Double seal+Side seal+Inner seal / ZZ-End seal+Side seal+Inner seal+Metal scraper / UULF-End seal+LF seal / SSLF-End seal+Side seal+Inner seal+LF seal / SSLF-End seal+LF seal / SSLF-End seal+LF seal / SSLF-End seal+LF seal / ZZLF-End seal+LF seal / SSLF-End seal+Inner seal+Metal scraper+LF seal / DDLF-Double seal+Side seal+Inner seal+LF seal / ZZLF-End seal+Side seal+Inner seal+Metal scraper+LF seal / XLF-End seal+Side seal+Inner seal+Metal scraper+LF seal / Number of blocks assembled in one shaft
- Symbol of clearance : No symbol-Normal preload / G1-Light preload / G2-Heavy preload / GS-Special preload (*2)
- Material of end plate : No symbol Standard material / I Stainless / N Aluminum
- Length of rail
- Material of rail : No symbol-Standard material / M-Stainless
- Size of G value: standard G value has no symbol
- No symbol-Rail counterbore type (top assembly) / A-Rail tap hole type (bottom assembly) (*3)
- Symbol of precision : No symbol-Moderate / H-High / P-Precision / SP-Super precision / UP-Ultra precision (*4)
 No symbol-Standard rail / E-special rail specification (#1)
- Number of axes used in the same plane
- (*1) See Symbol List of Optional Parts at page 101.
 (*2) See Radial Clearance at page 18.
 (*3) See Standard Tap Hole Type of Rail at page 49.
 (*4) See Selection of Precision Class at page 20.





Dimensions of rail						Basic load rating		Stat	ic allowa	ance mo	ment kN	l∙m	Mass	
Width W1	W2	Height H1	ht G Pitch $d_1 x d_2 x h$		d1 X d2 X h	C kN	Co kN	M	lp Double	N	ly Double	Mr 1	Block kg	Rail kg/m
±0.05								block	blocks	block	blocks	block	8	
15	16	13	20	60	4.5x7.5x5.3	12.6	16.2	0.115	0.552	0.115	0.552	0.129	0.19	1.3
15	16	13	20	60	4.5x7.5x5.3	14.3	19.3	0.165	0.769	0.165	0.769	0.154	0.24	1.3
20	21.5	16.5	20	60	6x9.5x8.5	18.3	23.9	0.221	1.049	0.221	1.049	0.251	0.41	2.2
20	21.5	16.5	20	60	6x9.5x8.5	21.8	30.7	0.370	1.692	0.370	1.692	0.322	0.54	2.2
23	23.5	20	20	60	7x11x9	27.0	33.1	0.337	1.636	0.337	1.636	0.398	0.61	3.0
23	23.5	20	20	60	7x11x9	32.8	43.6	0.596	2.760	0.596	2.760	0.525	0.82	3.0
28	31	26	20	80	9x14x12	50.4	57.1	0.711	3.384	0.711	3.384	0.828	1.1	4.85
28	31	26	20	80	9x14x12	60.3	73.6	1.203	5.506	1.203	5.506	1.067	1.3	4.85
34	33	29	20	80	9x14x12	67.0	74.6	1.062	5.012	1.062	5.012	1.298	1.6	6.58
34	33	29	20	80	9x14x12	80.2	96.2	1.797	8.172	1.797	8.172	1.674	2.01	6.58
45	37.5	38	22.5	105	14x20x17	108.5	116.4	2.860	9.912	2.860	9.912	2.275	2.83	11.03
45	37.5	38	22.5	105	14x20x17	129.7	150.1	4.533	16.161	4.533	16.161	2.935	3.70	11.03
53	43.5	44	30	120	16x23x20	155.9	161.5	4.654	16.016	4.654	16.016	3.779	4.36	15.26
53	43.5	44	30	120	16x23x20	187.5	210.1	7.468	26.493	7.468	26.493	4.916	5.76	15.26

1N≒0.102kgf


H-RN Series, H-RL Series





Model	Exter	rnal dii sions	men-				I	Dimens	sions of	fblock					
No.	Height H	Width W	Length L		С	M×l	Lı						D	Grease nipple	Нз
H15RN	28	34	56.5	26	26	M4 x 5	40.8	6	10	4.7	7.7	3.25	3.3	A-M5	4.5
H15RL	28	34	64.8	26	26	M4 x 5	49.1	6	10	4.7	7.7	3.25	3.3	A-M5	4.5
H20RN	30	44	73.2	32	36	M5 x 6	53.1	8	7.5	10.7	6.7	4.25	3.3	B-M6F	6.0
H20RL	30	44	89.1	32	50	M5 x 6	69	8	7.5	10.7	6.7	4.25	3.3	B-M6F	6.0
H25RN	40	48	83.2	35	35	M6 x 8	58.3	8	13	10.2	12	5	3.3	B-M6F	7.0
H25RL	40	48	103.1	35	50	M6 x 8	78.2	8	13	10.2	12	5	3.3	B-M6F	7.0
H30RN	45	60	99.3	40	40	M8 x 10	70.8	8	10.3	9.8	8	5.8	5.2	B-M6F	7.5
H30RL	45	60	121.5	40	60	M8 x 10	93	8	10.3	9.8	8	5.8	5.2	B-M6F	7.5
H35RN	55	70	111.8	50	50	M8 x 12	80.8	10	15	9.7	13.5	6.5	5.2	B-M6F	9.0
H35RL	55	70	137.2	50	72	M8 x 12	106.2	10	15	9.7	13.5	6.5	5.2	B-M6F	9.0
H45RN	70	86	139.0	60	60	M10 x 17	101.9	15	20	16	18	8	3.3	B-PT1/8	10.0
H45RL	70	86	170.8	60	80	M10 x 17	133.7	15	20	16	18	8	3.3	B-PT1/8	10.0
H55RN	80	100	163.0	75	75	M12 x 18	117.5	18	21	16	18	9	3.3	B-PT1/8	13.0
H55RL	80	100	201.1	75	95	M12 x 18	155.6	18	21	16	18	9	3.3	B-PT1/8	13.0

Composition of Model Name & Number



- 1 Model No. of Linear Motion Guide
- Material of block : No symbol-Standard material / M-Stainless
- Type of block : RN-Rectangular standard type / RL-Rectangular long type/ FN-Flange standard type / FL-Flange long type
 No symbol-Standard block / E-Special block specification
- Type of seal : No symbol-No seal / UU-End seal / SS-End seal+Side seal+Inner seal / DD-Double seal+Side seal+Inner seal / ZZ-End seal+Side seal+Inner seal+Metal scraper / KK-Double seal+Side seal+Inner seal+Metal scraper / UULF-End seal+LF seal / SSLF-End seal+Side seal+Inner seal+LF seal / SSLF-End seal+Side seal+Inner seal+LF seal / ZZLF-End seal+LF seal / ZZLF-End seal+Side seal+Inner seal+Metal scraper+LF seal / ZZLF-End seal+Side se
- Number of blocks assembled in one shaft
- Symbol of clearance : No symbol-Normal preload / G1-Light preload / G2-Heavy preload / GS-Special preload (*2)
- B Material of end plate : No symbol Standard material / I Stainless / N Aluminum
- Length of rail
- Material of rail : No symbol-Standard material / M-Stainless
- Size of G value: standard G value has no symbol
- 2 No symbol-Rail counterbore type (top assembly) / A-Rail tap hole type (bottom assembly) (*3)
- Symbol of precision : No symbol-Moderate / H-High / P-Precision / SP-Super precision / UP-Ultra precision (*4)
 No symbol-Standard rail / E-special rail specification
- No symbol-standard rail / E-special rail speci
 Number of axes used in the same plane
- (*1) See Symbol List of Optional Parts at page 101.
 (*2) See Radial Clearance at page 18.
 (*3) See Standard Tap Hole Type of Rail at page 49.
 (*4) See Selection of Precision Class at page 20.





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		Dime	nsion	s of rai		Basic rat	: load ing	Stat	ic allow	ance mo	oment kN		Ма	ass
Width		Height		Pitch		С	Co	M	lp	Ν	ly	Mr	Block	Rail
W1 ±0.05	W2	H1	G		d1 x d2 x h	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
15	9.5	13	20	60	4.5x7.5x5.3	12.6	16.2	0.115	0.552	0.115	0.552	0.129	0.18	1.3
15	9.5	13	20	60	4.5xx7.5x5.3	14.3	19.3	0.165	0.769	0.165	0.769	0.154	0.23	1.3
20	12	16.5	20	60	6x9.5x8.5	18.3	23.9	0.221	1.049	0.221	1.049	0.251	0.31	2.2
20	12	16.5	20	60	6x9.5x8.5	21.8	30.7	0.370	1.692	0.370	1.692	0.322	0.41	2.2
23	12.5	20	20	60	7x11x9	27.0	33.1	0.337	1.636	0.337	1.636	0.398	0.53	3.0
23	12.5	20	20	60	7x11x9	32.8	43.6	0.596	2.760	0.596	2.760	0.525	0.71	3.0
28	16	26	20	80	9x14x12	50.4	57.1	0.711	3.384	0.711	3.384	0.828	0.9	4.85
28	16	26	20	80	9x14x12	60.3	73.6	1.203	5.506	1.203	5.506	1.067	1.1	4.85
34	18	29	20	80	9x14x12	67.0	74.6	1.062	5.012	1.062	5.012	1.298	1.5	6.58
34	18	29	20	80	9x14x12	80.2	96.2	1.797	8.172	1.797	8.172	1.674	2.01	6.58
45	20.5	38	22.5	105	14x20x17	108.5	116.4	2.860	9.912	2.860	9.912	2.275	2.89	11.03
45	20.5	38	22.5	105	14x20x17	129.7	150.1	4.533	16.161	4.533	16.161	2.935	3.74	11.03
53	23.5	44	30	120	16x23x20	155.9	161.5	4.654	16.016	4.654	16.016	3.779	4.28	15.26
53	23.5	44	30	120	16x23x20	187.5	210.1	7.468	26.493	7.468	26.493	4.916	5.59	15.26



H-FN...S Series, H-FL...S Series





	Extern	al dime	nsions					Dim	nensi	ons of	block	•				
Model No.	Height H	Width W	Length L		С	М	Lı		T1					D	Grease nipple	Ηз
H15FNS	24	47	56.5	38	30	M5	40.7	7	11	6.0	4.7	3.7	3.25	3.3	A-M5	4.5
H15FLS	24	47	64.8	38	30	M5	49.1	7	11	6.0	4.7	3.7	3.25	3.3	A-M5	4.5
H20FNS	30	63	73.2	53	40	M6	53.1	9.2	10	7.5	10.7	6.7	4.25	3.3	B-M6F	6.0
H20FLS	30	63	89.1	53	40	M6	69.0	9.2	10	7.5	10.7	6.7	4.25	3.3	B-M6F	6.0
H25FNS	36	70	83.2	57	45	M8	58.3	11.5	16	9.0	10.2	8	5	3.3	B-M6F	7.0
H25FLS	36	70	103.1	57	45	M8	78.2	11.5	16	9.0	10.2	8	5	3.3	B-M6F	7.0
H30FNS	42	90	99.3	72	52	M10	70.8	9.5	18	7.3	9.8	5	5.8	5.2	B-M6F	7.5
H30FLS	42	90	121.5	72	52	M10	93.0	9.5	18	7.3	9.8	5	5.8	5.2	B-M6F	7.5
H35FNS	48	100	111.8	82	62	M10	80.8	12.5	21	8.0	9.7	6.5	6.5	5.2	B-M6F	9.0
H35FLS	48	100	137.2	82	62	M10	106.2	12.5	21	8.0	9.7	6.5	6.5	5.2	B-M6F	9.0

Composition of Model Name & Number



- 1 Model No.
- Aterial of block : No symbol-Standard material / M-Stainless
- 3 Type of block : RN-Rectangular standard type / RL-Rectangular long type / FN-Flange standard type / FL-Flange long type
- 4 No symbol-Standard block / E-Special block specification
- Type of seal : No symbol-No seal / UU-End seal / SS-End seal+Side seal+Inner seal / DD-Double seal+Side seal+Inner seal / ZZ-End seal+Side seal+Inner seal+Metal scraper / KK-Double seal+Side seal+Inner seal+Metal scraper / UULF-End seal+LF seal / SSLF-End seal+Side seal+Inner seal+LF seal / SSLF-End seal+Side seal+Inner seal+LF seal / DDLF-Double seal+Side seal+Inner seal+LF seal / ZZLF-End seal+Side seal+Inner seal+Metal scraper+LF seal / KKLF-Double seal+Side seal+Inner seal+Metal scraper+LF seal (*1)
- **6** Number of blocks assembled in one shaft
- S-Spacer chain type
- 3 Symbol of clearance : No symbol-Normal preload / G1-Light preload / G2-Heavy preload / G5-Special preload (*2)
- Material of end plate : No symbol Standard material / I Stainless / N Aluminum
- Length of rail
- Material of rail : No symbol-Standard material / M-Stainless
- 2 Size of G value: standard G value has no symbol
- 13 No symbol-Rail counterbore type (top assembly) / A-Rail tap hole type (bottom assembly) (*3)
- Symbol of precision : No symbol-Moderate / H-High / P-Precision / SP-Super precision / UP-Ultra precision (*4)
- location No symbol-Standard rail / E-special rail specification
- 16 Number of axes used in the same plane

(*1) See Symbol List of Optional Parts at page 101.
 (*2) See Radial Clearance at page 18.
 (*3) See Standard Tap Hole Type of Rail at page 49.
 (*4) See Selection of Precision Class at page 20.





Linear Motion Guide

		Dime	nsion	s of rai	l	Basic loa	ad rating	Stat	ic allowa	ance mo	ment kN	l∙m	Ма	ISS
Width		Height		Pitch		С	Co	Ν	lp	Ν	ly	Mr	Block	Rail
W1 ±0.05	W2	H1	G		d1xd2xh	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
15	16	13	20	60	4.5×7.5×5.3	12.1	16.2	0.115	0.552	0.115	0.552	0.129	0.19	1.3
15	16	13	20	60	4.5×7.5×5.3	13.7	19.3	0.165	0.769	0.165	0.769	0.154	0.24	1.3
20	21.5	16.5	20	60	6x9.5x8.5	17.6	23.9	0.221	1.049	0.221	1.049	0.251	0.41	2.2
20	21.5	16.5	20	60	6x9.5x8.5	21.1	30.7	0.370	1.692	0.370	1.692	0.322	0.54	2.2
23	23.5	20	20	60	7x11x9	25.8	33.1	0.337	1.636	0.337	1.636	0.398	0.61	3.0
23	23.5	20	20	60	7x11x9	31.7	43.6	0.596	2.760	0.596	2.760	0.525	0.82	3.0
28	31	26	20	80	9x14x12	48	57.1	0.711	3.384	0.711	3.384	0.828	1.1	4.85
28	31	26	20	80	9x14x12	58	73.6	1.203	5.506	1.203	5.506	1.067	1.3	4.85
34	33	29	20	80	9x14x12	63.7	74.6	1.062	5.012	1.062	5.012	1.298	1.6	6.58
34	33	29	20	80	9x14x12	77.1	96.2	1.797	8.172	1.797	8.172	1.674	2.01	6.58



H-RN...S Series, H-RL...S Series





	Externa	al dime	ensions				Γ	Dimer	nsions	of bloc					
Model No.	Height H	Width W	Length L		С	M×l	Lı						D	Grease nipple	Нз
H 15RNS	28	34	56.5	26	26	M4 x 5	40.7	6	10	4.7	7.7	3.25	3.3	A-M5	4.5
H 15RLS	28	34	64.8	26	26	M4 × 5	49.1	6	10	4.7	7.7	3.25	3.3	A-M5	4.5
H 20RNS	30	44	73.2	32	36	M5 × 6	53.1	8	7.5	10.7	6.7	4.25	3.3	B-M6F	6.0
H 20RLS	30	44	89.1	32	50	M5 × 6	69	8	7.5	10.7	6.7	4.25	3.3	B-M6F	6.0
H 25RNS	40	48	83.2	35	35	M6 × 8	58.3	8	13	10.2	12	5	3.3	B-M6F	7.0
H 25RLS	40	48	103.1	35	50	M6 × 8	78.2	8	13	10.2	12	5	3.3	B-M6F	7.0
H 30RNS	45	60	99.3	40	40	M8 × 10	70.8	8	10.3	9.8	8	5.8	5.2	B-M6F	7.5
H 30RLS	45	60	121.5	40	60	M8 × 10	93	8	10.3	9.8	8	5.8	5.2	B-M6F	7.5
H 35RNS	55	70	111.8	50	50	M8 x 12	80.8	10	15	9.7	13.5	6.5	5.2	B-M6F	9.0
H 35RLS	55	70	137.2	50	72	M8 × 12	106.2	10	15	9.7	13.5	6.5	5.2	B-M6F	9.0

Composition of Model Name & Number



- 1 Model No.
- 2 Material of block : No symbol-Standard material / M-Stainless

Type of block : RN-Rectangular standard type / RL-Rectangular long type/ FN-Flange standard type / FL-Flange long type
 No symbol-Standard block / E-Special block specification

- Type of seal : No symbol-No seal / UU-End seal / SS-End seal+Side seal+Inner seal / DD-Double seal+Side seal+Inner seal / ZZ-End seal+Side seal+Inner seal+Metal scraper / KK-Double seal+Side seal+Inner seal+Metal scraper / UULF-End seal+LF seal / SSLF-End seal+Side seal+Inner seal+LF seal / DDLF-Double seal+Side seal+Inner seal+LF seal / ZZLF-End seal+Side seal+Side seal+Inner seal+LF seal / ZZLF-End seal+Side seal+Side seal+Side seal+Inner seal+LF seal / ZZLF-End seal+Side seal+Side
- Number of blocks assembled in one shaft
- S-Spacer chain type
- B Symbol of clearance : No symbol-Normal preload / G1-Light preload / G2-Heavy preload / GS-Special preload (*2)
- Material of end plate : No symbol Standard material / I Stainless / N Aluminum
- Length of rail
- Material of rail : No symbol-Standard material / M-Stainless
- 22 Size of G value: standard G value has no symbol
- 10 No symbol-Rail counterbore type (top assembly) / A-Rail tap hole type (bottom assembly) (*3)
- Symbol of precision : No symbol-Moderate / H-High / P-Precision / SP-Super precision / UP-Ultra precision (*4)
- No symbol-Standard rail / E-special rail specification
 Number of axes used in the same plane
 - (*1) See Symbol List of Optional Parts at page 101.
 (*2) See Radial Clearance at page 18.
 (*3) See Standard Tap Hole Type of Rail at page 49.
 (*4) See Selection of Precision Class at page 20.

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		Dime	nsion	s of rail		Basic loa	ad rating	5	Static allow	ance mo	ment kN∙n		Ма	iss
Width	W ₂	Height		Pitch	davdavb	с	Co		Мр	l	My	Mr	Block	Rail
νν1 ±0.05	VV2	Hı	G		uixuzxii	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
15	9.5	13	20	60	4.5×7.5×5.3	12.1	16.2	0.115	0.552	0.115	0.552	0.129	0.18	1.3
15	9.5	13	20	60	4.5×7.5×5.3	13.7	19.3	0.165	0.769	0.165	0.769	0.154	0.23	1.3
20	12	16.5	20	60	6×9.5×8.5	17.6	23.9	0.221	1.049	0.221	1.049	0.251	0.31	2.2
20	12	16.5	20	60	6x9.5x8.5	21.1	30.7	0.370	1.692	0.370	1.692	0.322	0.41	2.2
23	12.5	20	20	60	7x11x9	25.8	33.1	0.337	1.636	0.337	1.636	0.398	0.53	3.0
23	12.5	20	20	60	7x11x9	31.7	43.6	0.596	2.760	0.596	2.760	0.525	0.71	3.0
28	16	26	20	80	9x14x12	48	57.1	0.711	3.384	0.711	3.384	0.828	0.9	4.85
28	16	26	20	80	9x14x12	58	73.6	1.203	5.506	1.203	5.506	1.067	1.1	4.85
34	18	29	20	80	9x14x12	63.7	74.6	1.062	5.012	1.062	5.012	1.298	1.5	6.58
34	18	29	20	80	9x14x12	77.1	96.2	1.797	8.172	1.797	8.172	1.674	2.01	6.58



3. Wide Linear Motion Guide HB Series

1) Structure of HB Series

Δ

WON Wide Linear Motion Guide HB Series has a four-row circular arc-groove structure in the raceway groove of a rail or block. In addition, it has a 4-direction equal load type in which it can bear equal load rating for vertical compression load, tensile load, and horizontal load as its ball as a rolling element is combined at 45 degree. Therefore, the model reduces friction resistance and ensures smooth motion and long life. Since the model has a wide and short rail, moment works only with one shaft in a narrow space. It is applicable to place that requires high rigidity.

2) Features of HB Series

- a. High quality, high precision, and elimination of labor.
- b. High rigidity and high precision for implementing stable travel precision for a long time.
- c. Excellent wear resistance and friction resistance that ensure a long life.
- d. The face-to-face duplex structure just like the D/F combination of ball bearing, excellent at autoadjusting and error-absorbing.
- e. A higher quantity of balls than that of H Series; higher rigidity and wider rail; sufficient moment working only with one shaft





Types and Features

Category	Туре		Shape & Feature	
Flange type	HB-F		 A general type with the tap-proce ssed flange of a block, supporting installation from bottom to top and from top to bottom 4-direction equal load type with high rigidity and high load 	Electric spark machine Loader CNC lathe Industrial robot Semiconductor display manufacturing
Compact type	HB-R		 A compact type with the tap-proc essed top of a block and without flange 4-direction equal load type with high rigidity and high load 	equipment Measuring equipmentWafer transfer equipment Construction equipment Railway vehicle
		Standard an	d maximum lengths of rail	
	G			G

Unit : mm

Madal Na	ד1	ורסון	דרמון	LIDOE
MOUEI NO.	пы/	поді	HD27	СССОП
	110	130	160	280
	230	230	280	440
	350	380	400	680
	470	480	640	840
Standard length	550	530	880	1000
	÷	÷	:	÷
	1990	1930	3820	3800
		1980	3880	3960
			3940	
Standard pitch P	40	50	60	80
G	15	15	20	20
Max. length	20	00	40	00

HB-F Series

Δ





	Exter	nal dimen	sions				Dimens	ions of	block			
Model No.	Height H	Width W	Length L	В	С	М	Lı	т	N	E	Grease nipple	H₃
HB17F	17	60	51	53	26	M4	37.4	6	4	3.5	A-Ø3	2.5
HB21F	21	68	59	60	29	M5	45.4	8	5	3.5	A-Ø3	3.3
HB27F	27	80	72.5	70	40	M6	54.7	10	6	10.3	B-M6F	3.5
HB35F	35	120	105.3	107	60	M8	82.1	14	7.6	10.3	B-M6F	4

Composition of Model Name & Number



- 1 Model No.
- 2 Type of block : F-Flange standard type / R-Rectangular standard type
- **3** No symbol-Standard block / E-Special block specification
- Z Type of seal : No symbol-No seal / UU-End seal / SS-End seal+ Inside seal / ZZ-End seal+ Inside seal+ Metal scraper/ UULF -End seal+ LF seal / SSLF-End seal+ Inside seal+ LF seal / ZZLF-End seal+ Inside seal+ Metal scraper + LF seal (*1) **5** Number of blocks assembled in one shaft
- 6 No symbol-Full ball type
- Symbol of clearance : No symbol-Normal preload / G1-Light preload / G2-Heavy preload / G5-Special preload (*2)
- 8 Length of rail
- **9** Size of G value: standard G value has no symbol
- **10** No symbol-Rail counterbore type (top assembly)
- Symbol of precision : No symbol-Moderate / H-High / P-Precision / SP-Super precision / UP-Ultra precision (*3)
- 2 No symbol-Standard rail / E-special rail specification
- 13 Number of axes used in the same plane

(*1) See Symbol List of Optional Parts at page 101. (*2) See Radial Clearance at page 18. (*3) See Selection of Precision Class at page 20.







		Dim	iensio	ns of	rail		Basic rat	load ing	Sta	tic allow	ance m	ioment kl	N∙m	Ма	ass
Width			Height		Pitch		c	60	I	Ир		My	Mr	Block	Rail
VV1 0 -0.05	W2	Wз	H1	G	P	d1xd2xh	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
33	13.5	18	8.6	15	40	4.5x7.5x5.3	7.3	12.2	0.081	0.381	0.081	0.381	0.205	0.15	1.9
37	15.5	22	11	15	50	4.5x7.5x5.3	8.4	14.8	0.119	0.547	0.119	0.547	0.278	0.24	2.9
42	19	24	15	20	60	4.5x7.5x5.3	15.3	24.8	0.239	1.114	0.239	1.114	0.527	0.47	4.5
69	25.5	40	19	20	80	7x11x9	33.9	53.2	0.773	3.528	0.773	3.528	1.851	1.40	9.6







	Exterr	nal dimer	nsions			Di	mensior	ns of blo	ock			
Model No.	Height H	Width W	Length L	В	С	МХł	Lı	т	N	E	Grease nipple	Hз
HB17R	17	50	51	29	15	M4 X 5	37.4	5.2	4	3.5	A-Ø3	2.5
HB21R	21	54	59	31	19	M5 X 6	45.4	8	5	3.5	A-Ø3	3.3
HB27R	27	62	72.5	46	32	M6 X 6	54.7	10	6	10.3	B-M6F	3.5
HB35R	35	100	105.3	76	50	M8 X 8	82.1	14	7.6	10.3	B-M6F	4

Composition of Model Name & Number



- 1 Model No.
- Z Type of block : F-Flange standard type / R-Rectangular standard type
- **3** No symbol-Standard block / E-Special block specification
- Type of seal : No symbol-No seal / UU-End seal / SS-End seal+ Inside seal / ZZ-End seal+ Inside seal+ Metal scraper / UULF -End seal+ LF seal / SSLF-End seal+ Inside seal+ LF seal / ZZLF-End seal+ Inside seal+ Metal scraper+ LF seal (*1)
 Number of blocks assembled in one shaft
- 6 No symbol-Full ball type
- Symbol of clearance : No symbol-Normal preload / Gi-Light preload / G2-Heavy preload / GS-Special preload (*2)
- 8 Length of rail
- Size of G value: standard G value has no symbol
- 10 No symbol-Rail counterbore type (top assembly)
- Symbol of precision : No symbol-Moderate / H-High / P-Precision / SP-Super precision / UP-Ultra precision (*3)
- No symbol-Standard rail / E-special rail specification
- Number of axes used in the same plane

(*1) See Symbol List of Optional Parts at page 101.
 (*2) See Radial Clearance at page 18.
 (*3) See Selection of Precision Class at page 20.





		Dim	ensior	ns of	rail		Basic rat	load ing	Sta	tic allow	ance m	oment kN	l∙m	Ма	ISS
Width			Height		Pitch		C	Co		Мр		My	Mr	Block	Rail
VV1 0 -0.05	W2	W3	Hı	G	Р	d1xd2xh	kŇ	kŇ	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
33	8.5	18	8.6	15	40	4.5x7.5x5.3	7.3	12.2	0.081	0.381	0.081	0.381	0.205	0.13	1.9
37	8.5	22	11	15	50	4.5x7.5x5.3	8.4	14.8	0.119	0.547	0.119	0.547	0.278	0.19	2.9
42	10	24	15	20	60	4.5x7.5x5.3	15.3	24.8	0.239	1.114	0.239	1.114	0.527	0.36	4.5
69	15.5	40	19	20	80	7x11x9	33.9	53.2	0.773	3.528	0.773	3.528	1.851	1.20	9.6



4. Slim Linear Motion Guide S Series

1) Structure of S Series

Δ

Linear Motion Guide S Series has a four-row circular arc-groove structure and a 4-direction equal load type. It also has an auto-adjusting face-to-face D/F structure. Using a ball as a rolling element, the model is a slim-type guide with a low sectional height, high rigidity and less noise.

2) Features of S Series

- a. High quality, high precision, and elimination of labor.
- b. High rigidity and high precision for implementing stable travel precision for a long time.
- c. Excellent wear resistance and friction resistance that ensure a long life.
- d. The face-to-face duplex structure just like the D/F combination of ball bearing, excellent at auto-ad justing and error-absorbing.
- e. Various specifications for easy design.
- f. Easy to use due to high compatibility of rail and block.
- g. 4-direction equal load and high-rigidity structure.
- h. A slim shape suitable for horizontal motion, ensuring stable running.

5. Slim Spacer Chain Linear Motion Guide S...S Series

1) Structure of S...S Series

Like S Series, Linear Motion Guide S...S Series has the 4-direction equal load type and auto-adjusting faceto-face D/F structure. It uses a ball as a rolling element and has a spacer between balls to prevent them from colliding each other in rolling motion. Since it makes less noise and more stable circulating motion than a fullball type, it is possible to implement quiet running at high speed. In addition, the spacer can serve as a pocket of a lubricant.

2) Features of S...S Series

- a. As a spacer-incorporated type that improves frictional properties and prevents the collision of balls, the model not only allows stable circulating motion and smooth running but also reduces noise.
- b. Since a resin spacer is applied to the model, it is possible to prevent the collision of balls and the loss of oil film, and to generate less particles and dust.
- c. High quality, high precision, and elimination of labor.
- d. High rigidity and high precision for implementing stable travel precision for a long time.
- e. Excellent wear resistance and friction resistance that ensure a long life.
- f. The face-to-face duplex structure just like the D/F combination of ball bearing, excellent at auto-ad justing and error-absorbing.
- g. Various specifications for easy design.
- h. Easy to use due to high compatibility of rail and block.

Linear Motion Guide

Slim Linear Motion Guide S, S...S Series

S Series (Full-ball Type) S...S Series (Spacer Chain Type) Spacer Ball Chain 45° 45° Cross Section Details of spacer of S...S Series Мр Pnr Mr Pnı Рnт M٧ Moment Rigidity Radial Rigidity



Types and Features

A

Category	Type	Shape & Feature	
Compact	S-RC S-RCS	 A slim type with the tap-pro cessed top of a block, minimizing the width(W) and height(H) of a block 4-row circular structure and 4-di rection equal load type with 45° contact angle S Series are types with a spacer retain er helping to reduce ball-to-ball friction and generate less noise and dust 	Cartesian coordi- nated robot Linear actuator
type	S-RN S-RNS	 The same cross section as in S-RC Series; a slim type with the in creased load rating by enlarging the entire length (L1) of a block 4-row circular structure and 4-di rection equal load type with 45° contact angle S Series are types with a spacer retain er helping to reduce ball-to-ball friction and generate less noise and dust 	Automation system Semiconductor & display manufacturing system LED inspection equipment Dispenser equipment
Flange	S-FC S-FCS	 A slim type with the tap-pro cessed top of a block, minimizing the width(W) and height(H) of a block 4-row circular structure and 4-di rection equal load type with 45° contact angle S Series are types with a spacer retain er helping to reduce ball-to-ball friction and generate less noise and dust 	Medical Equipment High-speed transport system Woodworking machine Take-out robot Small machine tool
type	S-FN S-FNS	 The same cross section as in S-RC Series; a slim type with the in creased load rating by enlarging the entire length (L1) of a block 4-row circular structure and 4-di rection equal load type with 45° contact angle S Series are types with a spacer retain er helping to reduce ball-to-ball friction and generate less noise and dust 	Precision measurement equipment



WON



Unit : mm

Model No.	S15	S20	S25				
	160	160	220				
	220	220	280				
	280	280	340				
	:	340	400				
Standard length	1360	:	460				
	1480	1960	:				
	1600	2080	2200				
		2200	2320				
			2440				
Standard pitch P	60	60	60				
G	20	20	20				
Max. length	4000						

Standard tap hole type of rail



Model No.		h(mm)
S15	M5	8
S20	M6	10
S25	M6	12

S-RC Series, S-RN Series





	Extern	al dime	nsions				I	Dime	nsio	ns o	fblock	(
Model No.	Height H	Width W	Length L	В	С	M×ℓ	Lı	т	N	E	f		D	Grease nipple	Н₃
S15RC	24	24	39.8	20	-	MARC	24.0	C	C	47	27	2.25	2.2		4.5
S15RN	24	34	56.5	26	26	M4x6	40.7	6	б	4.7	3.7	3.25	3.3	A-IVI5	4.5
S20RC	ാറ	42	47.8	22	-	M5v7	27.6	75		10.7	47	4 25	2.2		c
S20RN	28	42	66.8	32 32	IVI5X7	46.7	7.5	5.5	10.7	4.7	4.25	3.3	B-INIQL	б	
S25RC	33	22 40	59.4	25	-		34.4		C	10.2	F	F	2.2		7
S25RN		48	83.2	- 35	35	8X0IVI	58.2	Ő	Ø	10.2	С	Э	5.5	D-IVIOF	/

Composition of Model Name & Number



- 1 Model No.
- Material of block : No symbol-Standard material / M-Stainless
- S Type of block : RC-Rectangular short type / RN-Rectangular standard type / FC-Flange short type/ FN-Flange standard type
- No symbol-Standard block / E-Special block specification
- Type of seal : No symbol-No seal / UU-End seal / SS-End seal+Side seal+Inner seal / DD-Double seal+Side seal+Inner seal / ZZ -End seal+Side seal+Inner seal+Metal scraper / KK-Double seal+Side seal+Inner seal+Metal scraper / UULF-End seal+LF seal / SSLF-End seal+Side seal+Inner seal+LF seal / DDLF-Double seal+Side seal+Inner seal+LF seal / ZZLF-End seal+Side seal+Inner seal+Metal scraper+LF seal / KKLF-Double seal+Side seal+Inner seal+Metal scraper+LF seal (*1)
- 6 Number of blocks assembled in one shaft
- Symbol of clearance : No symbol-Normal preload / G1-Light preload / G2-Heavy preload / G5-Special preload (*2)
- 8 Material of end plate : No symbol Standard material / I Stainless / N Aluminum
- 9 Length of rail
- Material of rail : No symbol-Standard material / M-Stainless
- Size of G value: standard G value has no symbol
- 2 No symbol-Rail counterbore type (top assembly) / A-Rail tap hole type (bottom assembly) (*3)
- 3 Symbol of precision : No symbol-Moderate / H-High / P-Precision / SP-Super precision / UP-Ultra precision (*4)
- No symbol-Standard rail / E-special rail specification
 Number of axes used in the same plane
- (*1) See Symbol List of Optional Parts at page 101.
 (*2) See Radial Clearance at page 18.
 (*3) See Standard Tap Hole Type of Rail at page 67.
 (*4) See Selection of Precision Class at page 20.





	Dimensions of rail					Basic rat	load ing	Sta	atic allowa	m	Mass			
Width	Wa	Height	G	Pitch	dıxdəxh	C	Со		Мр	l	Му	Mr	Block	Rail
±0.05		H1		Р	01/02/11	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kġ	kg/m
15	0.5	12	20	60		9.0	10	0.042	0.224	0.042	0.224	0.079	0.096	1 2
CI	9.5	CI	20	60	4.5x7.5x5.3	12.6	16.2	0.115	0.552	0.115	0.552	0.129	0.156	1.5
20	11	16 F	20	60		12.0	13.1	0.063	0.342	0.063	0.342	0.137	0.153	2.2
20	11	C.01	20	60	0×9,5×6,5	16.8	21.2	0.173	0.838	0.173	0.838	0.223	0.246	Z.Z
22	12 5	20	20	60	7x11x9	19.2	20.4	0.123	0.670	0.123	0.670	0.246	0.254	2.0
23	12,5	20	20	60		27.0	33.1	0.337	1.636	0.337	1.636	0.398	0.413	5.0



S-FC Series, S-FN Series





	Extern	aldime	ensions	Dimensions of block													
Model No.	Height H	Width W	Length L	В	с	М	Lı	т	Tı	N	E	f		D	Grease nipple	Hз	
S15FC	24	52	39.8	41	-	МГ	24.0	C	7	C	47	27	2.25	2.2		4 5	
S15FN	24	52	56.5	41	26	IVI5	40.7	б	/	6	4.7	3.7	3.25	3.3	A-IVI5	4.5	
S20FC	20	го	47.8	40	-	MC	27.6		0		10.7	47	4.25	2.2		C	
S20FN	28	59	66.8	49	32	IVID	46.7	ð	9	5.5	10.7	4.7	4.25	3.3	B-INIOF	б	
S25FC	22	33 73	59.4	<u> </u>	-	M8	34.4	0	10	C	10.2	F	F	2.2		7	
S25FN	33	73	83.2	60	35		58.2	9	10	0	10.2	Э	С	3.3		/	

Composition of Model Name & Number



- 1 Model No.
- Material of block : No symbol-Standard material / M-Stainless
- S Type of block : RC-Rectangular short type / RN-Rectangular standard type / FC-Flange short type / FN-Flange standard type
- No symbol-Standard block / E-Special block specification
- Type of seal : No symbol-No seal / UU-End seal / SS-End seal+Side seal+Inner seal / DD-Double seal+Side seal+Inner seal / ZZ -End seal+Side seal+Inner seal+Metal scraper / KK-Double seal+Side seal+Inner seal+Metal scraper / UULF-End seal+LF seal / SSLF-End seal+Side seal+Inner seal+LF seal / DDLF-Double seal+Side seal+Inner seal+LF seal / ZZLF-End seal+Side seal+Inner seal+Metal scraper+LF seal / KKLF-Double seal+Side seal+Inner seal+Metal scraper+LF seal (*1)
- 6 Number of blocks assembled in one shaft
- Symbol of clearance : No symbol-Normal preload / G1-Light preload / G2-Heavy preload / G5-Special preload (*2)
- 8 Material of end plate : No symbol Standard material / I Stainless / N Aluminum
- 9 Length of rail
- Material of rail : No symbol-Standard material / M-Stainless
- Size of G value: standard G value has no symbol
- 2 No symbol-Rail counterbore type (top assembly) / A-Rail tap hole type (bottom assembly) (*3)
- 3 Symbol of precision : No symbol-Moderate / H-High / P-Precision / SP-Super precision / UP-Ultra precision (*4)
- No symbol-Standard rail / E-special rail specification
 Number of axes used in the same plane
- (*1) See Symbol List of Optional Parts at page 101.
 (*2) See Radial Clearance at page 18.
 (*3) See Standard Tap Hole Type of Rail at page 67.
 (*4) See Selection of Precision Class at page 20.





	Dimensions of rail					Basic rat	load ing	Sta	atic allowa	m	Mass					
Width	W/ 2	Height	G	Pitch	dıxdavh	С	Co		Мр	I	Му	Mr	Block	Rail		
VV1 ±0.05	VV2	Hı	U	Р	UIAUZAII	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m		
15	10 E	12	20	60		9.0	10	0.042	0.224	0.042	0.224	0.079	0.125	12		
CI	10.J	L)	20	60	4.5×7.5×5.3	12.6	16.2	0.115	0.552	0.115	0.552	0.129	0.203	1.5		
20	10 E	16 F	20	60		12.0	13.1	0.063	0.342	0.063	0.342	0.137	0.187	2.2		
20	19.5	C.01	20	60	6x9.5x8.5	16.8	21.2	0.173	0.838	0.173	0.838	0.223	0.301	Z.Z		
12	25.0	20	20	60	7x11x9	19.2	20.4	0.123	0.670	0.123	0.670	0.246	0.320	2.0		
25	25.0	20	20	60		7x11x9	7x11x9	7x11x9	27.0	33.1	0.337	1.636	0.337	0.163	0.398	0.527



S-RC...S Series, S-RN...S Series





	Extern	al dime	nsions					Dime	NSION	s of blo	СК						
Model No.	Height H	Width W	Length L	В	С	M×ℓ	Lı	т	N	E	f		D	Grease nipple	Hз		
S15RCS	24	24	39.8	26	-	MAVE	24.0	G	c	47	27	2.25	2.2		4 5		
S15RNS	24	34	56.5	20	26	IVI4X6	40.7	D	0	4.7	5.7	5.25	5.5	CIVI-A	4.5		
S20RCS	28	42	47.8	22	-	MEV7	27.6	75	FF	10.7	47	1 25	2.2		c		
S20RNS		28	28	28	42	66.8	52	32	IVIDX7	46.7	7.5	5.5	10.7	4.7	4.25	5.5	
S25RCS	33	22 40	59.4	25	-	-	34.4	0	C	10.2	F	r.	2.2		7		
S25RNS		48	83.2	35 35	INIOXA	58.2	ð	6	10.2	5	Э	3.3	B-INPL	/			

Composition of Model Name & Number



Model No.

- Material of block : No symbol-Standard material / M-Stainless
- S Type of block : RC-Rectangular short type / RN-Rectangular standard type / FC-Flange short type/ FN-Flange standard type
- A No symbol-Standard block / E-Special block specification

Type of seal : No symbol-No seal / UU-End seal / SS-End seal+Side seal+Inner seal / DD-Double seal+Side seal+Inner seal / ZZ -End seal+Side seal+Inner seal+Metal scraper / KK-Double seal+Side seal+Inner seal+Metal scraper / UULF-End seal+LF seal / SSLF-End seal+Side seal+Inner seal+LF seal / DDLF-Double seal+Side seal+Inner seal+LF seal / ZZLF-End seal+Side seal+Inner seal+Metal scraper+LF seal / KKLF-Double seal+Side seal+Inner seal+Metal scraper+LF seal (*1)

- 6 Number of blocks assembled in one shaft
- S-Spacer chain type
- Symbol of clearance : No symbol-Normal preload / G1-Light preload / G2-Heavy preload / GS-Special preload (*2)
- Material of end plate : No symbol Standard material / I Stainless / N Aluminum
- 10 Length of rail
- Material of rail : No symbol-Standard material / M-Stainless
- 2 Size of G value: standard G value has no symbol
- 13 No symbol-Rail counterbore type (top assembly) / A-Rail tap hole type (bottom assembly) (*3)
- 2 Symbol of precision : No symbol-Moderate / H-High / P-Precision / SP-Super precision / UP-Ultra precision (*4)
- No symbol-Standard rail / E-special rail specification
- 16 Number of axes used in the same plane
- (*1) See Symbol List of Optional Parts at page 101.
 (*2) See Radial Clearance at page 18.
 (*3) See Standard Tap Hole Type of Rail at page 67.
 (*4) See Selection of Precision Class at page 20.





	Dimensions of rail					Basic rat	load ing	Sta	atic allowa	m	Mass			
WIDTH	Ma	Height	c	Pitch	divdavb	С	Co		Мр		Му	Mr	Block	Rail
±0.05	VVZ	Hı	U	Р	UIAU2AII	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
15	0.5	12	20	60		8.3	10	0.042	0.224	0.042	0.224	0.079	0.096	10
15	9.5	13	20	60	4.5x7.5x5.3	12.1	16.2	0.115	0.552	0.115	0.552	0.129	0.156	1.5
20	11	10.5	20	<u> </u>		11.1	13.1	0.063	0.342	0.063	0.342	0.137	0.153	22
20	11	0.5	20	60	6x9.5x8.5	16.1	21.2	0.173	0.838	0.173	0.838	0.223	0.246	2.2
22	12 5	20	20	<u> </u>	7 11 0	17.9	20.4	0.123	0.670	0.123	0.670	0.246	0.254	2.0
23	12.5	20	20	60	7×11×9	25.8	33.1	0.337	1.636	0.337	1.636	0.398	0.413	3.0



S-FC...SSeries, S-FN...SSeries





	Extern	aldim	ensions	Dimensions of block												
Model No.	Неіднт Н	Width W	Length L	В	С	М	Lı	т	Tı	N	E	f		D	Grease nipple	H₃
S15FCS	24	52	39.8	41	-	ME	24.0	c	7	c	47	27	2.25	2.2		4 5
S15FNS	24	52	56.5	41	26	IVI5	40.7	0	1	0	4.7	5.7	5.25	5.5	CIVI-A	4.5
S20FCS	20	FO	47.8	40	-	MG	27.6	0	0	FF	10.7	47	4 DE	2.2		c
S20FNS	28 59	29	66.8	49	32	M6	46.7	0	9	5.5	10.7	4.7	4.25	5.5		0
S25FCS	22	3 73 59 83	59.4	60	-		34.4		10	c	10.2	F	F	2.2		7
S25FNS	33		83.2	60 <u>35</u>	IVIð	58.2	9	10	6	10.2	5	5	3.3	B-INIPL	/	

Composition of Model Name & Number



1 Model No.

Material of block : No symbol-Standard material / M-Stainless

S Type of block : RC-Rectangular short type / RN-Rectangular standard type / FC-Flange short type/ FN-Flange standard type

A No symbol-Standard block / E-Special block specification

Type of seal : No symbol-No seal / UU-End seal / SS-End seal+Side seal+Inner seal / DD-Double seal+Side seal+Inner seal / ZZ-End seal+Side seal+Inner seal+Metal scraper / KK-Double seal+Side seal+Inner seal+Metal scraper / UULF-End seal+LF seal / SSLF-End seal+Side seal+Inner seal+LF seal / DDLF-Double seal+Side seal+Inner seal+LF seal / ZZLF-End seal+Side seal+Inner seal+Metal scraper+LF seal / KKLF-Double seal+Side seal+Inner seal+Metal scraper+LF seal / KKLF-Double seal+Side seal+Inner seal+Metal scraper+LF seal / XZLF-End seal+Side seal+Inner seal+Metal scraper+LF seal / XZLF-End seal+Side seal+Inner seal+Metal scraper+LF seal / XLF-End seal+Side seal+Inner seal+Metal scraper seal+LF seal / XLF-End seal+Side seal+Inner seal+Metal scraper seal+Side seal+Inner seal+Metal scraper seal+Side seal+Side seal+Side seal+Side seal+Side seal+Side seal+Side se

- 6 Number of blocks assembled in one shaftled in one shaft
- S-Spacer chain type
- Symbol of clearance : No symbol-Normal preload / G1-Light preload / G2-Heavy preload / GS-Special preload (*2)
- Material of end plate : No symbol Standard material / I Stainless / N Aluminum
- 10 Length of rail
- Material of rail : No symbol-Standard material / M-Stainless
- 2 Size of G value: standard G value has no symbol
- 13 No symbol-Rail counterbore type (top assembly) / A-Rail tap hole type (bottom assembly) (*3)
- Symbol of precision : No symbol-Moderate / H-High / P-Precision / SP-Super precision / UP-Ultra precision (*4)
- No symbol-Standard rail / E-special rail specification
- Number of axes used in the same plane

(*1) See Symbol List of Optional Parts at page 101. (*2) See Radial Clearance at page 18.
(*3) See Standard Tap Hole Type of Rail at page 67. (*4) See Selection of Precision Class at page 20.





	Dimensions of rail					Basic rat	load ing	Sta	atic allowa	m	Mass					
WIDTH	Ma	Height	c	Pitch	divdavb	С	Co		Мр		Му	Mr	Block	Rail		
VV 1 ±0.05	VV2	Hī	G	Р	UIXUZXII	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m		
15	10 E	10	20	60		8.3	10	0.042	0.224	0.042	0.224	0.079	0.125	10		
CI	10.J	15	20	60	4.5x7.5x5.3	12.1	16.2	0.115	0.552	0.115	0.552	0.129	0.203	1.5		
20	10 E	16 F	20	60		11.1	13.1	0.063	0.342	0.063	0.342	0.137	0.187	2.2		
20	19.5	C.01	20	60	6x9.5x8.5	16.1	21.2	0.173	0.838	0.173	0.838	0.223	0.301	Z.Z		
12	25.0	20	20	60	7x11x9	17.9	20.4	0.123	0.670	0.123	0.670	0.246	0.320	20		
23	25.0	20	20	00		7x11x9	7x11x9	7x11x9	25.8	33.1	0.337	1.636	0.337	1.636	0.398	0.527



A

6. Slim Linear Motion Guide HS, HS...S Series









Model No.	HS25	HS30	HS35	HS45	HS55						
	220	280	440	570	780						
	340	360	520	675	900						
	400	440	600	780	1020						
	÷	520	760	885	:						
Standard length	2200	÷	840	÷	2820						
	2320	2520	:	2880	2940						
	2440	2680	2840	2985	3060						
		2840	2920	3090							
			3000								
Standard pitch P G	60	80	80	10.5	120						
	20	20	20	22.5	30						
Max. length	4000										

Standard tap hole type of rail



Model No.	S	h(mm)
HS25	M6	12
HS30	M8	15
HS35	M8	17
HS45	M12	24
HS55	M14	24

HS-RN Series, **HS-RL Series**





Model No.	Extern	al dime	nsions	Dimensions of block											
	Height H	Width W	Length L	В	С	M×l	Lı	т	N	E	f		D	Grease nipple	H₃
HS25RN	20	40	83.2	25	35		58.3	0	0	10.2	0	F	2.2		7
HS25RL	30	48	103.1	35	50	IVIDXD.5	78.2	0	9	10.2	ð	5	3.3	D-IVIOF	
HS30RN	42	60	99.3	40	40	M8×8	70.8	8	0.2	0.0	ГO	го	гa		7
HS30RL	42	60	121.5	40	40 60		93		8.2	9.8	5.9	5.8	5.2	B-INPL	/
HS35RN	48	48 70	111.8	50	50	M010	80.8	1	10	0.7	0 5	сг	гa		7 5
HS35RL			137.2	50	72	WðXIU	106.2	15	10	9.7	8.5	6.5	5.2	B-M6F	7.5

Composition of Model Name & Number



- 1 Model No.
- Type of block : RC-Rectangular short type / RN-Rectangular standard type / FC-Flange short type/ FN-Flange standard type
- S No symbol-Standard block / E-Special block specification
- Type of seal : No symbol-No seal / UU-End seal / SS-End seal+Side seal+Inner seal / DD-Double seal+Side seal+Inner seal / ZZ-End seal+Side seal+Inner seal+Metal scraper / UULF-End seal+LF seal / SSLF-End seal+Side seal+Inner seal+LF seal / DDLF-Double seal+Side seal+Inner seal+LF seal / ZZLF-End seal+Side seal+Inner seal+LF seal / DDLF-Double seal+Side seal+Inner seal+LF seal / ZZLF-End seal+Side seal+Inner seal+Metal scraper+LF seal / ZZLF-End seal+Side seal+Side seal+Side seal+Inner seal+Metal scraper+LF seal / ZZLF-End seal+Side seal+Side seal+Inner seal+Metal scraper+LF seal / ZZLF-End seal+Side seal+Side seal+Side seal+Inner seal+Metal scraper+LF seal / ZZLF-End seal+Side seal
- 6 Number of blocks assembled in one shaft
- Symbol of clearance : No symbol-Normal preload / G1-Light preload / G2-Heavy preload / G5-Special preload (*2)
- 8 Material of end plate : No symbol Standard material / I Stainless / N Aluminum
- 9 Length of rail
- 10 Material of rail : No symbol-Standard material / M-Stainless
- Size of G value: standard G value has no symbol
- 2 No symbol-Rail counterbore type (top assembly) / A-Rail tap hole type (bottom assembly) (*3)
- Symbol of precision : No symbol-Moderate / H-High / P-Precision / SP-Super precision / UP-Ultra precision (*4)
- No symbol-Standard rail / E-special rail specification Number of axes used in the same plane
- (*1) See Symbol List of Optional Parts at page 101.
 (*2) See Radial Clearance at page 18.
 (*3) See Standard Tap Hole Type of Rail at page 77.
 (*4) See Selection of Precision Class at page 20.







Dimensions of rail					Basic load rating		Static allowance moment kN · m						Mass											
Width	Ma	Height	c	Pitch	divdavb	с	C Co		Мр		Му	Mr	Block	Rail										
VV1 ±0.05	VV2	Hı	G	Р	UIXUZXII	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m										
22	10 E	20	20	60	7,11,0	27.0	33.1	0.337	1.636	0.337	1.636	0.398	0.53	2.0										
25	12,5	20	20	60	7×11×9	32.8	43.6	0.596	2.760	0.596	2.760	0.525	0.71	5.0										
20	16	2E 1	20	00	0.14.14.1	50.4	57.1	0.711	3.384	0.711	3.384	0.828	0.9	1 OF										
28	10	25.1	20	80	9x14x14.1	60.3	73.6	1.203	5.506	1.203	5.506	1.067	1.1	4.85										
24	34 18 27 20	10	27	20	20	20	20	20	20	20	20	20	20	00	0,14,12	67.0	74.6	1.062	5.012	1.062	5.012	1.298	1.5	6 5 9
34 18 27		21	20	80	9X14X13	80.2	96.2	1.797	8.172	1.797	8.172	1.674	2.01	86.0										



HS-RN...S Series, HS-RL...S Series





	Extern	External dimensions				Dimensions of block										
Model No.	Height H	Width W	Length L	В	с	M×ℓ	Lı	т	N	E	f		D	Grease nipple	H₃	
HS25RNS	20 40		83.2	25	35		58.3	0	0	10.2	0	-	2.2		7	
HS25RLS	30	48	103.1	35	50	0.0×01	78.2	0	9	10.2	ð	5	3.3	D-IVIOF	/	
HS30RNS	42	<u> </u>	99.3	40	40		70.8	0	0.7	0.0	ГO	гo	ГЭ		7	
HS30RLS	42 60		121.5	40	60	60 M8x8		8	8.2	9.8	5.9	5.8	5.2	B-M6F	/	
HS35RNS	40	70	111.8	50	50 50		80.8	15	10	10 07	0.5	сг	ГЭ		75	
HS35RLS	48	70	137.2	50	72	WI8X10	106.2	15	10	9.7	8.5	0.5	5.2	B-INPL	7.5	

Composition of Model Name & Number



- 1 Model No.
- 2 Type of block : RC-Rectangular short type / RN-Rectangular standard type / FC-Flange short type/ FN-Flange standard type
- 3 No symbol-Standard block / E-Special block specification
- Type of seal : No symbol-No seal / UU-End seal / SS-End seal+Side seal+Inner seal / DD-Double seal+Side seal+Inner seal / ZZ -End seal+Side seal+Inner seal+Metal scraper / KK-Double seal+Side seal+Inner seal+Metal scraper / UULF-End seal+LF seal / SSLF-End seal+Side seal+Inner seal+LF seal / DDLF-Double seal+Side seal+Inner seal+LF seal / ZZLF-End seal+Side seal+Inner seal+Metal scraper+LF seal / KKLF-Double seal+Side seal+Inner seal+Metal scraper+LF seal (*1)

S Number of blocks assembled in one shaft

- **6** No symbol-Full ball type / S-Spacer chain type
- Symbol of clearance : No symbol-Normal preload / G1-Light preload / G2-Heavy preload / GS-Special preload (*2)
- 8 Material of end plate : No symbol Standard material / I Stainless / N Aluminum
- Length of rail
- Material of rail : No symbol-Standard material / M-Stainless
- Size of G value: standard G value has no symbol
- 2 No symbol-Rail counterbore type (top assembly) / A-Rail tap hole type (bottom assembly) (*3)
- Symbol of precision : No symbol-Moderate / H-High / P-Precision / SP-Super precision / UP-Ultra precision (*4)
- No symbol-Standard rail / E-special rail specification Number of axes used in the same plane
- (*1) See Symbol List of Optional Parts at page 101.
 (*2) See Radial Clearance at page 18.
 (*3) See Standard Tap Hole Type of Rail at page 77.
 (*4) See Selection of Precision Class at page 20.





Dimensions of rail					Basic load rating		Static allowance moment kN·m						Mass		
Width	W/a	We Height C Pitch dayday		duxdayh C Co Mp My		C Co	My	Mr	Block	Rail					
±0.05	VV2	Hı	0	Р	U1/U2/11	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg kg	kg/m	
22	10 E	20	20	60	7,11,0	25.8	33.1	0.337	1.636	0.337	1.636	0.398	0.53	2.0	
25	3 12.5 20 20	60	781189	31.7	43.6	0.596	2.760	0.596	2.760	0.525	0.71	5.0			
20	16	DE 1	20	00	0.14.14.1	48.0	57.1	0.711	3.384	0.711	3.384	0.828	0.9	1 OF	
28	10	25.1	20	80	9×14×14.1	58.0	73.6	1.203	5.506	1.203	5.506	1.067	1.1	4.85	
24	24 10 27 20 0	00	0 14 12	63.7	74.6	1.062	5.012	1.062	5.012	1.298	1.5	C E O			
34 18 .	27	20	80	9X14X13	77.1	96.2	1.797	8.172	1.797	8.172	1.674	2.01	86.0		



7. Miniature Linear Motion Guide M Series

1) Structure of M Series

Δ

WON Miniature Linear Motion Guide M Series has a shape of a gothic-arch groove in the raceway of a rail and a block and a 4-direction equal type structure with 2-row 4-point contact balls at 45 degree. This model, though small-sized, supports stable travel and high rigidity for variable load or complex load under which a direction or size changes.

2) Features of M Series

- a. A compact and highly-rigid 4-direction equal load type.
- b. A variety of specifications in consideration of space and load rating in order for easy design.
- c. It is convenient to maintain balls at the time of block-rail assembly, for a block has the wire to prevent ball separation built in.
- d. This model made of stainless steel is resistant for rust. Therefore, it is suitable in a rust-resistive envi ronment or the cleanroom that inhibits generation of particles.

8. Wide Miniature Linear Motion Guide MB Series

1) Structure of MB Series

Like M Series, WON Miniature Linear Motion Guide MB Series has the 4-direction equal load type. As its rail and block get widened, the model improves basic load rating and moment load compared to M Series.

2) Features of MB Series

- a. Wide block and rail, an increased number of effective balls, and improved load rating and moment load.
- b. Wider than a general type of miniature linear motion guide, increased rigidity, and very favorable in the use of one axis.
- c. A compact and highly-rigid 4-direction equal load type.
- d. A variety of specifications in consideration of space and load rating in order for easy design.
- e. It is convenient to maintain balls during block-rail assembly, for a block has the wire to prevent ball separation.
- f. This model made of stainless steel is resistant for rust. Therefore, it is suitable in a rust-resistive envi ronment or the cleanroom that inhibits generation of particles. (The bearing steel materials for MB 12 and MB 15 are reserved.)











Types and Features

A

Category	Туре		Shape & Feature	
	M-C	and the second		
Compact type	M-N	and the second	Standard Type of Miniature Linear Motion Guide The bearing steel materials for M12 and M15 (MT12, MT15) are available	Semiconductor inspection equipment Semiconductor assembly
	M-L			equipment Display inspection Head-axis LED inspection equipment Pneumatic
	MB-C MBT-C	C. M.	Wider block (W) and longer total	machinery Table cylinder Automation machinery Medical equipment Smart actuator
Flange type	MB-N MBT-N	a contra	length (L1) than M Series; highly-rig id and wide type with improved load rating and allowance moment The bearing steel materials for MB12 and MB15 (MBT12, MBT15) are ava	Cartesian coordinated robot UVW stage
	MB-L MBT-L		IIADIE	



WON







	Exterr	nal dime	nsions			Dimens	ions of bl	ock												
Model No.	Height H	Width W	Length L	В	С	M×l	Lı	Ν	E	Grease nipple	H₃									
M 5C			17	8	_	$M2 \times 15$	9 <u>.</u> 4													
M 5N	6	12	20	0			12.4	1 <u>.</u> 2	—	—	1									
M 5NA			20	-	7	M2.6 × 1.5	12.4													
M 7C			19 <u>.</u> 8		_		9 <u>.</u> 6													
M 7N	8	17	24.3	12	8	M2 x 25	14 <u>.</u> 1	15	_	_	15									
M7L	0	17	31.8	12	13	NIE X LO	21 <u>.</u> 6													
M7LA			31.0		12		20 <u>.</u> 8													
M 9C			22.4		-	M3 x 3	11 <u>.</u> 8													
M 9N	10	20	31.3	15	10		20.7	22	_	_	2									
M 9L	10		20					20				20	41 <u>.</u> 4	10	16		30.8			
M9LA			71.7		15		30.0													
M 12C			26.4		—		12 <u>.</u> 8													
M 12N	13	27	34.9	20	15	M3 x 3.5	21 <u>.</u> 3	2 <u>.</u> 7	—	—	3									
M 12L			45 <u>.</u> 4		20		31 <u>.</u> 8													
M 15C			34.4		_		17 <u>.</u> 7													
M 15N	16	32	44 <u>.</u> 4	25	20	M3 x 4	27 <u>.</u> 7	3.1	3.3	A - M3	4									
M 15 L			59.4		25		42.7													
M 20 C			39 <u>.</u> 8		_		22.2													
M 20 N	20	40	51.8	30	25	M4 x 6	34.2	4 <u>.</u> 2	3.3	A-M3	5									
M 20 L			69.8		30		52.2													

% The carbon steel materials based rails for M12 and M15 (MT12, MT15) are reserved.





- No symbol–Standard rail /E–Special rail specification
- Number of axes used in the same plane

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	I	Dimen	sions	of rail		Basic loa	ad rating	Sta	tic allow	ance m	oment N	l∙m	Mass	
Width		Height		Pitch		С	Co	Μ	lp	Ν	ly	Mr	Block	Rail
W1 ±0.05	W2	Hī	G	Р	d1xd2xh	Ň	Ň	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
0						516	757	1.3	7.1	1.3	7.1	2.01	3.1	
⁵ -0.02	3.5	3.7	5	15	24x36x08	631	1,009	2.2	11.6	2.2	11.6	2.67	4.0	139
						901	1,136	1.9	11.8	1.9	11.8	4.14	6.4	
_ 0	_	_	_	15	0.4	1,197	1,703	4.2	23.1	4.2	23,1	6.22	9.0	253
′ -0.02	5	Э	5	15	24X42X23	1,631	2,650	10.1	50.0	10.1	50.0	0.67	12.6	200
						1,549	2,460	10.1	50.0	10.1	50.0	9.07	12.0	
				20	3.5×6×3.5	1,180	1,485	3.1	17.9	3.1	17.9	6.90	9.9	
0	55	6	75			1,721	2,545	9.3	46.6	9.3	46.6	11.84	17.1	201
9 -0.02	0.0	0	1.0			2,375	4,030	21.9	102.8	21.9	102.8	18.74	25.2	001
0						2,175	2,385	5.4	32,9	5.4	32.9	14.79	19.8	
12_0.025	7 <u>.</u> 5	8	10	25	35x65x45	3,023	3,816	14.4	75.8	14.4	75.8	23.66	31.5	679
0.025						4,246	6,200	34.8	169.1	34.8	169.1	38.44	45.9	
0						3,418	3,895	12.2	71.6	12,2	71.6	29.99	37.8	
15_0.025	8 <u>.</u> 5	10	15	40	35x65x45	4,540	5,842	28.6	148.7	28.6	148.7	44.99	57.6	1071
-0.025						6,492	9,737	73.5	351.2	73.5	351.2	74.98	85.5	
20 _{-0.03} 10						4,512	5,299	20.7	115.9	20.7	115.9	54.05	80.1	
	10	11	1 20	20 60) 6x95x55	6,191	8,328	50.2	252.7	50.2	252.7	84.94	119.7	1572
				20			8,396	12,870	118.6	554.4	118.6	554.4	131.27	176.4

1N=0.102kgf






	External dimensions Dimensions of block										
Model No.	Height H	Width W	Length L	В	С	M×l	Lı	N	E	Grease nipple	H₃
MB 5C	65	17	21	10	-		13 <u>.</u> 4	1.4	_	_	10
MB 5N	0.0	17	25	15	-		17 <u>.</u> 4	1.4			1.0
MB 7C			24		-	- 10					
MB 7N	9	25	33	19	10 M3 x 3		21 <u>.</u> 6	1 <u>.</u> 7	-	-	2
MB 7L			43 <u>.</u> 5		19		32 <u>.</u> 1				
MB 9C			28 <u>.</u> 1	01	-		16 <u>.</u> 5				
MB 9N	12	30	40.2	21 12 M3 x 3		28.6	3 <u>.</u> 2	-	-	3	
MB 9L			52	23	24		40.4				
MB 12C			31.1		-		17 <u>.</u> 5				
MB 12N	14	40	44.5	28	15	M3 x 3.5	30.9	3	-	_	4
MB 12L			59.7		28		46 <u>.</u> 1				
MBT 13C			35.3		-		18.7				
MBT 13N	15	50	49.2	35	18	M4 x 4.5	32.6	3.1	3.3	A-M3	3
MBT 13L			68.6		35		52				
MB 15C			42 <u>.</u> 8		-		25 <u>.</u> 2				
MB 15N	16	60	56.6	45	20	M4 x 4 <u>.</u> 5	39	3.5	3.3	A-M3	4
MB 15L			75 <u>.</u> 8		35	35 M4 x 4 <u>.</u> 5	58.2		5 3.3 A-		

**The carbon steel materials based rails for M12 and M15 (MT12, MT15) are reserved. **As for MBT13, only carbon steel is prepared.

Composition of Model Name & Number



Number of axes used in the same plane

Δ

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Unit : mm

WON

	Dimensions of rail						Basic lo	ad rating	Stat	ic allow	ance mo	oment k	N∙m	Mass		
Width				Height		Pitch		С	Со	N	lp	Ν	ly	Mr	Block	Rail
W1 ±0.05	W2	VV3	VV4	Hī	G		d1Xd2Xh	kŇ	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
10 0	35	_	_	Λ	Б	20	201/18116	668	1,094	2.6	13.3	2.6	13,3	5,63	5.3	200
-0.025	<u>.</u>			4	5	20	23740710	806	1,430	4.4	21.4	4.4	21.4	7.36	6.8	233
0								1,102	1,514	3.4	19.5	3.4	19.5	10.83	11.7	
14_0.05	5 <u>.</u> 5	-	-	5 <u>.</u> 5	10	30	35x6x32	1,631	2,650	10.1	51.1	10.1	51.1	18.95	18.9	560
-0.05								2,166	3,975	22.5	106.1	22.5	106.1	28.42	27.9	
0								1,515	2,121	6.2	33.4	6.2	33.4	19.41	23.4	
18_0.05	6	-	-	7	10	30	35x6x45	2,197	3,606	18.2	87.6	18.2	87.6	33.00	39.6	912
0.00								2,878	5,303	37.8	172.9	37.8	172.9	48.52	54.9	
0								2,753	3,339	10.3	57.3	10.3	57.3	40.73	40.5	
24_0.05	8	-	-	8 <u>.</u> 5	15	40	45x8x45	4,015	5,723	31.2	152,2	31,2	152.2	69.83	68.4	1369
-0.05								5,539	9,062	73.8	338.7	73.8	338.7	110.56	99.9	1
								3,694	4,351	14.3	82,8	14.3	82.8	66.1	60.0	
30 _{-0.05}	10	-	-	9	15	40	45x8x45	5,457	7,599	43.7	219.3	43.7	219.3	115.5	103.8	2086
								7,576	12,142	111.5	517.4	111.5	517.4	184.6	165.5	
0								4,954	6,056	26.9	145.3	26.9	145.3	128.40	85.5	
42 005	9	23	9.5	9.5	15	40	4.5x8x4.5	6,579	9,085	62.5	306.5	62.5	306.5	192.60	126.0	2886
-0,05								9,076	14,384	147.8	680.6	147.8	680,6	304.94	183.6	

1N≒0<u>.</u>102kgf



9. Roller Linear Motion Guide R Series

1) Structure of R Series

Δ

WON Linear Motion Guide R Series uses the roller in the raceway surface of a rail and a block as a rolling element, and its four-row cylindrical roller has the contact angle of 45° which makes it possible to bears vertical tensile compression load and horizontal load equally. In the model, a roller, a rolling element, has less elastic displacement than a ball so that its displacement by external load is low. Due to the wide area of contact between the raceway surface and a roller, it can bear high load with high rigidity. Therefore, the model has a long life span, and excellent impact resistance and wear resistance. In addition, since it has less friction resistance, it supports smooth motion and quiet running. By imposing appropriate preload on a roller according to use conditions, it is possible to enhance more rigidity of a linear motion guide.

2) Features of R Series

- a. High quality, high precision, and elimination of labor
- b. High rigidity and high precision for implementing stable travel precision for a long time
- c. Excellent wear resistance and friction resistance that ensure a long life
- d. High rigidity and high load capacity, compared to ball type devices with the same model number
- e. Low displacement for impact load or variable load, compared to ball type linear motion guides; excellent vibration resistance with a short vibration decay time for natural frequency
- f. High basic load rating, compared to ball type linear motion guides with the same specification, makes it possible to support a compact design through the use of a smaller model number than that of a ball type device. In case of the same model number, it is possible to have a longer life span due to high load rating.
- g. A variety of specifications for easy design













Types and Features

A

Category	Туре	Shape & Feature	
Flange	R-FN	 A roller type with the tap-pro cessed flange of a block, support ing installation from bottom to top and from top to bottom 4-direction equal load type with high rigidity and high load 	
type	R-FN	 The same cross section as in R-F Series; a roller type with increased load rating by enlarging the entire length (L1) of a block 4-direction equal load type with high rigidity and high load 	Machine tool CNC machining center CNC tapping center NC milling machine Boring machine Multiple machining center
Compact	R-RN	 A compact type with the tap-pro cessed top of a block, minimizing the width (W) of a block 4-direction equal load type with high rigidity and high load 	Planner miller Large injection machine Heavy-duty cutting machine Wire-cut pentahedral processing center Display test equipment
type	R-RL	 The same cross section as in R-R Series; a roller type with increased load rating by enlarging the entire length (L1) of a block 4-direction equal load type with high rigidity and high load 	

WON ST CO., LTD.

WON



						Unit - Hill
Model No.	R25	R30	R35	R45	R55	R65
	220	280	280	570	780	1270
	280	360	360	675	900	1570
	340	440	440	780	1020	1870
	400	520	520	885	1140	2170
Ctandard type	460	600	600	990	1260	2470
Stanuaru type	:	:	:	:	:	2770
	3820	3760	3760	3615	3600	3070
	3880	3840	3840	3720	3720	3670
	3940	3920	3920	3825	3840	3970
	4000	4000	4000	3930	3960	
Standard pitch P	30	40	40	52.5	60	75
G	20	20	20	22.5	30	35
Max. length	4000	4000	4000	3930	3960	3970

Standard tap hole type of rail



Model No.	S	h(mm)
R25	M6	12
R30	M8	15
R35	M8	17
R45	M12	24
R55	M14	24
R65	M16	25

R-FN Series, **R-FL Series**

Α





	Exterr	nal dim	ensions						Din	nensi	ons of	fbloc	k					
Model No.	Неіднт Н	Width W	Length L	В	с	C2	М	Lı	т	Tı	T2	N	E	θ 1	Nı	heta 2	Grease nipple	H₃
R 25FN	26	70	92.2	57	15	40	MO	63.3	75	0	67		12	G		15.2		C E
R 25FL	50	70	110.2	57	45	40	IVIO	81.3	7.5	9	0.7	5,5	12	0	5,5	24.2	D-IVIOF	0,5
R 30FN	12	00	103.8	72	52	11	M10	71	0	11	0	6 E	12	c	c	16		7
R 30FL	42	90	126.6	12	52	44	WIU	93.8	0	11	0	0,5	12	0	0	27.4	D-IVIOF	/
R 35FN	10	100	118.3	റ	62	52	M10	79.5	0	10 E	10 E	76	12	12	76	16		7
R 35FL	40	100	142.3	02	02	52	WIU	103.5	0	12.5	10.5	7.0	12	12	7.0	28	D-IVIOF	/
R 45FN	60	120	146.3	100	00	60	M12	101.7	10	15	12 E	0	16	12	0	17.9	0, דדח ס	0 5
R 45FL	60	120	178.8	100	00	60	IVIIZ	134.2	10	IJ	15.5	0	10	12	0	34.1	D-P11/0	9.5
R 55FN	70	140	168.6	116	OF	70	N / 1 /	121.6	12	10	12 /	0	16	12 E	0	21.3	D DT1/0	10
R 55FL	70	140	207.7	110	95	70	1114	160.7	ΙZ	10	15.4	9	10	15,5	9	40.9	D-P11/0	10
R 65FN	00	170	207.2	142	110	01	MIC	146.2	15	25	24	12.0	16	10 E	12.0	29.1	0 חדו ס	12
R 65FL	90	170	207.2 255.2	142	110	02	10110	194.2	15	25	24	13,0	10	10.5	13,0	53.1	D-F11/0	15

Composition of Model Name & Number



1 Model No.

- Type of block : RN-Rectangular standard type / RL-Rectangular long type / FN-Flange standard type / FL-Flange long type
 No symbol-Standard block / E-Special block specification
- No symbol-standard block / E-Special block specification
- Type of seal : SS-End seal+ Inside seal / ZZ-End seal+ Inside seal+ Metal scraper (*1)
- S Number of blocks assembled in one shaft
- Symbol of clearance : No symbol-Normal preload / G1-Light preload / G2-Heavy preload / GS-Special preload (*2)
- Z Length of rail
- 8 Size of G value: standard G value has no symbol
- O symbol-Rail counterbore type (top assembly) / A- Rail tap hole type (bottom assembly) (*3)
- Symbol of precision : No symbol-Moderate / H-High / P-Precision / SP-Super precision / UP-Ultra precision (*4)
- 11 No symbol-Standard rail / E-special rail specification
- 2 Number of axes used in the same plane
- (*1) See Symbol List of Optional Parts at page 101. (*2) See Radial Clearance at page 18.
- (*3)) See Standard Tap Hole Type of Rail at page 93. (*4) See Selection of Precision Class at page 23.

WON ST CO., LTD.



Linear Motion Guide



Unit : mm

	Dimensions of rail					Basic rat	load ing	Static allowance moment kN · m						Mass				
Width		Height		Pitch		С	Со		Mp		Мy	Mr	Block	Rail				
W1 ±0.05	VV2	Hi	G	Р	G 1X G 2X N	kN	kŇ	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m				
22	22 E	24	20	20	7,11,07	29.1	56.2	0.570	3.090	0.570	3.090	0.820	0.8	2.1				
25	25.5	24	20	50	/X11X9./	35.6	73.1	0.925	4.949	0.925	4.949	1.065	1.1	5.1				
າດ	21	20	20	40	0v14v10	44.4	87.3	0.985	5.395	0.985	5.395	1.470	1.4	1 1				
20	51	20	20	40	9814812	55.0	114.8	1.640	8.946	1.640	8.946	1.935	1.9	4.4				
24	22	21	20	40	0v14v10	61.0	114.0	1.460	7.972	1.460	7.972	2.345	2.1	6.2				
54	22	21	20	40	9814812	75.6	150.0	2.450	13.036	2.450	13.036	3.090	2.8	0.2				
45	27 5	20	<u>ວວ</u> ເ	гэг	14,20,17	103.8	202.0	3.265	17.712	3.265	17.712	5.430	4.0	10.1				
45	37.5	38	22.5	52,5	14×20×17	132.3	276.2	5.840	30.565	5.840	30.565	7.440	5.3	10.1				
ГЭ	12 5	125	20	60	16,00,00	146.9	278.0	5.390	28.523	5.390	28.523	8.880	6.8	12.4				
55	43.5	43.3	30	60	10×23×20	181.9	380.3	8.960	49.534	8.960	49.534	11.690	8.9	15.4				
62	E2 E	66	2E	75	19,76,77	10, 20, 22	10,000,000	10,000,000	10,00,000	231.0	450.6	10.600	56.301	10.600	56.301	17.140	13.0	20.1
03	53,5	55	22	75	10%20%22	303.0	576.0	18.160	91.519	18.160	91.519	21.910	17.2	20,1				

1N≒0.102kgf



R-RN Series, **R-RL Series**

Δ





	Extern	al dime	nsions				Di	mens	ions c	of bloo	ck					
Model No.	Height H	Width W	Length L	В	с	С МХЯ		Т	N	E	θ_{1}	Nı	heta 2	Grease nipple	Hз	
R 25RN	40	10	92.2	25	35 M6 × 9		63.3	0	0.5	12	G	0.5	20.2		6 E	
R 25RL	40	40	110.2	22			81.3	9	9.5	IZ	0	9.5	21.7	D-IVIOF	0.5	
R 30RN	45	60	103.8	10	40	M0 v 11	71	0	0.5	12	G	0	22		7	
R 30RL	45	60	126.6	40	60) 100 × 11	93.8	}	9.5	12	0	9	23.4	D-IVIOL	/	
R 35RN		70	118.3	го	50	MO v 12	79.5	12	14.0	12	12	14.0	22		7	
R 35RL	55	70	142.3	50	72	IVI8 X 13	103.5	IZ	14.0	IZ	IZ	14.0	23	B-INIOL	/	
R 45RN	70	00	146.3	60	60	M10 y 20	101.7	20	10	10	12	10	27.9	D DT1/0	ОГ	
R 45RL	70 86 178.8 60 80 M10 × 20	134.2	20	10	10	12	10	34.1	D-P11/0	9.5						
R 55RN	80	00	100	168.6	75	75	M12 v 10	121.6	20	10	10	12 г	10	31.3	D DT1/0	10
R 55RL	00	100	207.7	75	95	WIZ X 19	160.7	20	19	10	13.5	19	40.9	D-P11/8	10	

Composition of Model Name & Number



2 Number of axes used in the same plane

(*1) See Symbol List of Optional Parts at page 101.
 (*2) See Radial Clearance at page 18.
 (*3)) See Standard Tap Hole Type of Rail at page 93.
 (*4) See Selection of Precision Class at page 23.

WON ST CO., LTD.



Unit : mm

WON

	DIMENSIONS OF RAIL					BASIC LOA	AD RATING	(STATIC ALLOW	ANCE MO	MENT k N · m	۱	Mass	
Width		Height		Pitch		C	Co		Мр		Мy	Mr	Block	Rail
W1 ±0.05	W2	Hı	G	P	d1xd2xh	kŇ	kŇ	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
22	125	24	20	20	7,11,07	29.1	56.2	0.570	3.090	0.570	3.090	0.820	0.7	21
25	12.5	24	20	50	/ / / / / 9./	35.6	73.1	0.925	4.949	0.925	4.949	1.065	0.9	5.1
าด	10	າດ	20	40	0.14.10	44.4	87.3	0.985	5.395	0.985	5.395	1.470	1.2	4.4
28	01	28	20	40	9x14x12	55.0	114.8	1.640	8.946	1.640	8.946	1.935	1.5	4.4
24	10	21	20	40	0v14v10	61.0	114.0	1.460	7.972	1.460	7.972	2.345	2.0	6.2
54	10	51	20	40	9814812	75.6	150.0	2.450	13.036	2.450	13.036	3.090	2.5	0.2
15	20 5	20	22 E	525	14,20,17	103.8	202.0	3.265	17.712	3.265	17.712	5.430	3.9	10.1
45	20.5	20	22.5	52,5	14XZUX17	132.3	276.2	5.840	30.565	5.840	30.565	7.440	5.0	10.1
E2	22 E	12 E	20	60	16,22,20	146.9	278.0	5.390	28.523	5.390	28.523	8.880	6.2	12 /
22	25.5	45.5	50	60	10%25%20	181.9	380.3	8.960	49.534	8.960	49.534	11.690	8.1	15.4

1N≒0.102kgf



Δ

RS-RN Series, **RS-RL Series**





	Exterr	nal dime	nsions				Di	mens	ions c	of blo	ck				
Model No.	Height H	Width W	Length L	В	с	МХł	Lı	т	N	E	θ_{1}	Nı	$ heta_2$	Grease nipple	H₃
RS 25RN	26	10	92.2	25	35	Mexo	63.3	0		12	G		20.2		6 E
RS 25RL	20	40	110.2	55	35 50 Mi6 × 9		81.3	9	5.5	IZ	0	5.5	21.7	D-IVIOF	0,5
RS 35RN	10	70	118.3	EO	50	M0 v 10	79.5	12	76	12	12	76	22		7
RS 35RL	40	70	142.3	50	72	IVIO X IZ	103.5	12	7.0	IZ	12	7.0	23	D-IVIOF	/
RS 45RN	60	06	146.3	60	60	M10 v 10	101.7	20	0	16	12	0	27.9	D DT1/0	0.5
RS 45RL	00	00	178.8	00	80	IVITU X TO	134.2	20	0	10	12	0	34.1	D-F11/0	9.5
RS 55RN	70	100	168.6	75	75	M12 v 10	121.6	20	0	16	12 E	0	31.3	D DT1/0	10
RS 55RL	70	100	207.7	/5	95	WIZ X 19	160.7	20	9	10	13.5	9	40.9	B-PTI/8	10
RS 65RN	00	126	207.2	76	70	M16 v 21	146.2	20	12.0	16	10 E	12.0	49.1	D DT1/0	12
RS 65RL	90	126	255.2	70	120	IVI IO X Z I	194.2	20	15.0	10	10.5	15.0	48.1	D-PII/O	15

Composition of Model Name & Number



(*3)) See Standard Tap Hole Type of Rail at page 93. (*4) See Selection of Precision Class at page 23.

WON ST CO., LTD.



Unit : mm

WON

	Dimensions of rail					Basic load rating			ı	Mass				
Width		Height		Pitch		c	Co		Мр		Мy	Mr	Block	Rail
W1 ±0.05	W2	Hı	G	P	d1xd2xh	kŇ	kŇ	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
าว	12 5	24	20	20	7,11,07	29.1	56.2	0.570	3.090	0.570	3.090	0.820	0.6	2.1
25	12,5	24	20	50	781189.7	35.6	73.1	0.925	4.949	0.925	4.949	1.065	0.8	5.1
24	10	21	20	40	0.14.12	61.0	114.0	1.460	7.972	1.460	7.972	2.345	1.7	6.2
54	10	51	20	40	9814812	75.6	150.0	2.450	13.036	2.450	13.036	3.090	2.1	0.2
15	20 5	20	22 E	EDE	14,20,17	103.8	202.0	3.265	17.712	3.265	17.712	5.430	3.2	10.1
45	20.5	20	22.5	52,5	14X2UX17	132.3	276.2	5.840	30.565	5.840	30.565	7.440	4.2	10.1
E.2	22 E	12 E	20	60	16,22,20	146.9	278.0	5.390	28.523	5.390	28.523	8.880	5.3	12 /
22	25.5	45.5	50	60	16x23x20	181.9	380.3	8.960	49.534	8.960	49.534	11.690	6.8	15.4
(2)			10,00,000	231.0	450.6	5.390	34.735	5.390	34.735	8.880	30.4	20.1		
03	51.5	55	35 75	75	10%20%22	303.0	576.0	8.960	60.425	8.960	60.425	11.690	33.6	20.1

1N≒0.102kgf



13 Options

A

1. Seal and rail cap

ltem	Seal attachment position	Applied environments
End seal	End seal	• Where there is a lot of dust or particles
Side seal	Side seal	 Where foreign substance can easily flow in from the flank or bottom Where the assembled linear motion guide moves in a vertical, horizontal, or reverse direction
Inner seal	Inner seal	 Where there are a lot of cutting chips or for- eign substance Where cutting chips or foreign substances are highly likely to flow into a block
LF seal	End seal LF seal LF seal cover	 Where a long interval of refilling is needed due to a narrow space An environment at 40°C or so Where there needs to avoid any contact with organic solvents, such as thinner or milky white oil
Double seal	End seal End seal Spacer	• Where strong sealing is needed due to a lot of dust or cutting chips
Metal scarper	Metal scraper	 Where spatters, such as slag or metal powder, arise in welding

WON

Symbol List of Optional Parts



Symbol	Optional parts
UU	End seal
SS	Side seal+ Inner seal + End seal
DD	Side seal+ Inner seal + End seal+ Spacer+ End seal
ZZ	Side seal+ Inner seal + End seal+ Metal scraper
KK	Side seal+ Inner seal + End seal+ Spacer+ End seal+ Metal scraper
UUUF	LF Unit+ End seal
SSLF	Side seal+ Inner seal + LF Unit+ End seal
DDLF	Side seal+ Inner seal + LF Unit+ End seal+ Spacer+ End seal
ZZLF	Side seal+ Inner seal + LF Unit+ End seal+ Metal scraper
KKLF	Side seal+ Inner seal + LF Unit+ End seal+ Spacer+ End seal+ Metal scraper

A

Optional-parts mapping table by model number

					Full ba	ll type					Spacer	ball chai	n type		Full roller type
Model N							łS		MB						
End seal	UU	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Side seal	-	0	O *1)	-	0	0	O *1)	-	-	0	O *1)	0	O *1)	0	-
Inner seal	-	0	0	-	0	0	0	-	-	0	0	0	0	0	-
Side seal +Inner seal +End seal	SS	0	0	O *2)	0	0	0	-	-	0	0	0	0	0	O *2)
Side seal +Inner seal +End seal +Metal scraper	ZZ	0	0	0	0	0	0	-	-	0	0	0	0	0	○ *3)
Side seal +Inner seal +Double seal	DD	0	0	0	0	0	0	-	-	0	0	0	0	0	O *3)
Side seal +Inner seal +End seal +Metal scraper	KK	0	0	0	0	0	0	-	-	0	0	0	0	0	O *3)
LF seal +End seal	UULF	0	0	0	0	0	0	0	0	0	0	0	0	0	○ *3)
LF seal +Side seal +Inner seal +End seal	SSLF	0	0	0	0	0	0	-	-	0	0	0	0	0	○ *3)
LF seal +Side seal +Inner seal +Double seal	DDLF	0	0	0	0	0	0	-	-	0	0	0	0	0	○ *3)
LF seal +Side seal +Inner seal +End seal +Metal scraper	ZZLF	0	0	0	0	0	0	-	-	0	0	0	0	0	○ *3)
LF seal +Side seal +Inner seal +Double seal +Metal scraper	KKLF	0	0	-	0	0	0	-	-	0	0	0	0	0	○ *3)

*1) In H,HS, H...S, and HS...S Series, the basic optional part of model no. 30 and no. 35 is Inner Seal.

*2) In H Series (model no. 45 and no. 55) and HB Series and R Series, Side Seal and Inner Seal is an integral type.

*3) In R Series, if it is necessary to apply LF seal and metal scrapper, please contact us.

WON

Dimension Table of the Installation of Optional Parts



Unit:mm

Linear Motion Guide

	Model No.	UU	SS	ZZ	DD	KK	UULF	SSLF	DDLF	ZZLF	KKLF
	15 FN/RN/FNS/RNS	56.5	56.5	60.7	61.5	65.7	70.5	70.5	75.5	74.7	79.7
	15 FL/RL/FLS/RLS	64.8	64.8	69	69.8	74	78.8	78.8	83.8	83	88
	20 FN/RN/FNS/RNS	73.2	73.2	78.2	79.4	84.4	87.2	87.2	93.4	92.2	98.4
	20 FL/RL/FLS/RLS	89.1	89.1	94.1	95.3	100.3	103.1	103.1	109.3	108.1	114.3
	25 FN/RN/FNS/RNS	83.2	93.2	89.2	90.4	96.4	97.2	97.2	104.4	103.2	110.4
	25 FL/RL/FLS/RLS	103.1	103.1	109.1	110.3	116.3	117.1	117.1	124.3	123.1	130.3
u	30 FN/RN/FNS/RNS	99.3	99.3	105.3	106.5	112.5	113.3	113.3	120.5	119.3	126.5
п	30 FL/RL/FLS/RLS	121.5	121.5	127.5	128.7	134.7	135.5	135.5	142.7	141.5	148.7
	35 FN/RN/FNS/RNS	111.8	111.8	117.8	119	125	125.8	125.8	133	131.8	139
	35 FL/RL/FLS/RLS	137.2	137.2	143.2	144.4	150.4	151.2	151.2	158.4	157.2	164.4
	45 FN/RN/FNS/RNS	139	139	148.9	-	-	154	154	-	163.9	-
	45 FL/RL/FLS/RLS	170.8	170.8	180.7	-	-	185.8	185.8	-	195.7	-
	55 FN/RN/FNS/RNS	163	163	172.9	-	-	179	179	-	188.9	-
	55 FL/RL/FLS/RLS	201.1	201.1	211	-	-	217.1	217.1	-	227	-
	17 F/R	51	51	54.6	-	-	61.2	61.2	-	64.8	-
LID	21 F/R	59	59	63.4	-	-	69.2	69.2	-	73.6	-
пр	27 F/R	72.5	72.5	76.9	-	-	85.1	85.1	-	89.5	-
	35 F/R	105.3	105.3	110.9	-	-	120.3	120.3	-	125.9	-
	15 FC/RC/FCS/RCS	39.8	39.8	44	44.8	49	53.8	53.8	58.8	58	63
	15 FN/RN/FNS/RNS	56.5	56.5	60.7	61.5	65.7	70.5	70.5	75.5	74.7	79.7
с	20 FC/RC/FCS/RCS	47.8	47.8	52.8	54	59	61.8	61.8	68	66.8	73
5	20 FN/RN/FNS/RNS	66.8	66.8	71.8	73	78	80.8	80.8	87	85.8	82
	25 FC/RC/FCS/RCS	59.4	59.4	65.4	66.6	72.6	73.4	73.4	80.6	79.4	86.6
	25 FN/RN/FNS/RNS	83.2	83.2	89.2	90.4	96.4	97.2	97.2	104.4	103.2	110.4
	25 RN/RNS	83.2	83.2	89.2	90.4	96.4	97.2	97.2	104.4	103.2	110.4
	25 RL/RLS	103.1	103.1	109.1	110.3	116.3	117.1	117.1	124.3	123.1	130.3
ЦС	30 RN/RNS	99.3	99.3	105.3	106.5	112.5	113.3	113.3	120.5	119.3	126.5
115	30 RL/RLS	121.5	121.5	127.5	128.7	134.7	135.5	135.5	142.7	141.5	148.7
	35 RN/RNS	111.8	111.8	117.8	119	125	125.8	125.8	133	131.8	139
	35 RL/RLS	137.2	137.2	143.2	144.4	150.4	151.2	151.2	158.4	157.2	164.4

			••••••
	- del Me		
M	dael No.	UU	UULF
	5 C	17	21,4
	5 N/NA	20	24.4
	70	19.8	24.8
	7 N	24.3	29.3
	7 L/LA	31.8	36.8
	9 C	22.4	27.4
	9 N	31.3	36.3
	9 L/LA	41.4	46.4
M	12 C	26.4	32.4
	12 N	34.9	40.9
	12 L	45.4	51,4
	15 C	34.4	41.4
	15 N	44.4	51,4
	15 L	59.4	66.4
	20 C	39.8	46.8
	20 N	51.8	58.8
	20 L	69.8	76.8

Unit:mm

Unit:mm

Mod	al No.	l	
MOOR	et no.	UU	UULF
	5C	21	25.4
	5N	25	29.4
	7C	24	29
	7N	33	38
	7L	43.5	48.5
	9C	28.1	33.1
	9N	40.2	45.2
	9L	52	57
MB	12C	31.1	37.1
	12N	44.5	50,5
	12L	59.7	65.7
	13C	35.3	42.3
	13N	49.2	56.2
	13L	68.6	75.6
	15C	42.8	49.8
	15N	56.6	63.6
	161	75.0	010

2. Oil inlet

A

In R Series, it is possible to refill on the side and top. The standard specification of an oil inlet is 'not run through', in order to prevent foreign substances from flowing in a block. For use, please contact WON ST



Unit	;	m	٦r	r	1
------	---	---	----	---	---

Model No.		Hole	for a side ni	pple	Top oil inlet				
MODE	et NO.		Nı	D1	D2	(O-ring)		θ₂	
	25F(L)	6	5.5	3.3	10.2	P7	0.4	6	
	30F(L)	6	6	5.1	10.2	P7	0.4	6.5	
	35F(L)	12	7.6	5.1	10.2	P7	0.4	7.25	
	45F(L)	12	8	5.1	10.2	P7	0.4	7	
	55F(L)	13.5	9	5.1	10.2	P7	0.4	8	
R	65F(L)	18.5	13.75	5.4	10.2	P7	0.4	11	
	25R(L)	6	9.5	3.3	10.2	P7	4.4	6	
	30R(L)	6	9	5.1	10.2	P7	3.4	6.5	
	35R(L)	12	14.6	5.1	10.2	P7	7.4	7.25	
	45R(L)	12	18	5.1	10.2	P7	10.4	7	
	55R(L)	13.5	19	5.1	10.2	P7	10.4	8	
	25R(L)	6	5.5	3.3	10.2	P7	0.4	6	
	35R(L)	12	7.6	5.1	10.2	P7	0.4	7.25	
RS	45R(L)	12	8	5.1	10.2	P7	0.4	7	
	55R(L)	13.5	9	5.1	10.2	P7	0.4	8	
	65R(L)	18.5	13.75	5.4	10.2	P7	0.4	11	



WON ST provides various types of grease nipples necessary for lubricating a linear motion system.



	Nipple	Thread (L) length									
Applied model no.	nodel no.	UU	SS	DD	ZZ	KK	UULF	SSLF	DDLF	ZZLF	KKLF
HB17, HB21	A-Ø3	4	4	-	6.5	-	9	9	-	11	-
M15, M20,MB13,MB15	A-M3	4.2	4.2	-	-	-	7.7	7.7	-	-	-
S-H15	A-M5	5	5	7.5	7.5	10	12	12	14.5	14.5	17
S-H20		7	7	10	10	12	14.5	14.5	17	17	19
S-H25		7	7	10	10	14.5	14.5	14.5	17	17	22
H30		7	7	12	12	14.5	14.5	14.5	19	19	22
H35	D-IVIOF	10	10	14.5	14.5	17	17	17	19	19	22
HB27		5	5	-	7	-	12	12	-	14.5	-
HB35		5	5	-	10	-	12	12	-	17	-
H45, H55	B-PT 1/8	8	8	-	11	-	15.5	15.5	-	18	-

4. Connection of oil pipes

WOL Type

A



WOL-E

WOS Type



WOS-A

WOS-B

WOS-C

WOS-D

Applied model	Nipple	Thread (L) length									
no.	model no.	UU	SS	DD	ZZ	KK	UULF	SSLF	DDLF	ZZLF	KKLF
S-H15	WOL-E	5	5	7.5	7.5	10	12	12	14.5	14.5	17
S-H20	WOS-B	7	7	10	10	12	14.5	14.5	17	17	19
S-H25		7	7	10	10	14.5	14.5	14.5	17	17	22
H30		7	7	12	12	14.5	14.5	14.5	19	19	22
H35	WOL-A, WOL-B	10	10	14.5	14.5	17	17	17	19	19	22
HB27	WOS-A, WOS-B	5	5	-	7	-	12	12	-	14.5	-
HB35		5	5	-	10	-	12	12	-	17	-
H45, H55	WOL-C, WOL-D WOS-C, WOS-D	8	8	-	11	-	15.5	15.5	-	18	-



5. How to install with the use of a support rail

To get a block of a linear motion guide in or out of a rail, it is required to use a support rail for safety. If a rail is mounted on a rail without any support rail, a rolling element can be separated from the block. Moreover, internal parts can be damaged or destroyed by foreign substances.

Installing a block without a rolling element may sharply shorten life of the block, reduce load, and cause early destruction.

If you use a support rail, do not lean it. Adhere it to the end of a rail first and then push it in the rail direction by apply force gradually. If a block has a rolling element separated and gets contaminated by dust, please do not use the product but contact WON ST.



14 Precautions for Handling Linear Motion Guide

1. Handling

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- 1) WON Linear Motion Guide is damp-proof packaged after grease removal and cleaning. So, please open it right before use.
- 2) As for the compatible product of rail and block, a plastic support rail is combined with the block. Please assemble it with the rail carefully.
- 3) If you reassemble a block-rail set product or a single block product after dismantling it into pieces, foreign substance may intrude into the block or cause performance degradation that leads to unsmooth rolling motion or damage. So please do not disassemble it at your discretion.
- 4) If either a rail or a block leans to one side, the block or rail may fall to be damaged. Please be careful not to get a block or rail separated.
- 5) A block' end plate is made of plastic. Imposing an impact on it may cause its damage. Please be careful

2. Lubrication

- 1) If the product supplied is coated with rust preventive oil, clean it off thoroughly first and then fill with a lubricant before use.
- 2) DO NOT mix with other lubricants with a different thickener or additive. If so, it may destroy the structure of grease or cause a harmful effect.
- 3) Viscosity of grease depends on temperature. It increases in winter due to low temperature, and friction of a linear motion guide resistance may increase.
- 4) If you need to use a special lubricant, please contact WON ST before use.
- 5) When you use oil as a lubricant, oil may fail to reach the raceway groove depending on the assembly status or direction of a block or rail. In this case, there is no lubrication effect. WON ST offers different lubrication methods suitable for assembly environments. So please contact us.

3. Caution for use

- 1) After opening the product, please put a damp-proof agent in a dry container for storage.
- 2) Please handle the product after wearing plastic gloves in a clean place.
- 3) Please be careful to prevent foreign substances that may impede rolling motion or cause functional damage.
- 4) Please use a holding door or cover to prevent a linear motion guide from being exposed directly to poor environments that may cause corrosion or damage.
- 5) As for the linear motion guide based on standard plastic end plate, use it at 80°C or below. If you need to use it at 80°C or above, please order a special metal end plate.
- 6) If rail of a linear motion guide is fixed at ceiling or in a high place and its block bears load downwards, it is possible for the block to be separated from the rail and for the block and its attached parts to fall as the end plate is damaged or a ball falls off. So, it is required to take safety measures, such as the installation of a safety device.

4. Storage

A rail may warp depending on a storage condition. For storage, place a linear motion guide horizontally in the package box offered by WON ST or its equivalent box with the flat bottom. Avoid a place with high or low temperature and high humidity.

Troubles and Troubleshooting of Linear Motion Guide

Туре	Trouble	Cause	Action
		Damage by life	Replace the linear motion guide.
Fatigue failure	• Flacking - Caused by rolling fatigue of the rolling surface	Overload	Review the model no. selected; Use a higher model no; Lower a level of load; Reinforce assembly precision for installation; Enhance the rigidity of base and table
rolling surface	 Maximum shear stress-induced internal cracks are expressed on the surface. 	Poor lubrication	Refill a lubricant; Shorten a refilling cycle of lubricant; Review the lubricant in use; Improve the lubricant passage.
		Intrusion of foreign substances	Improve seal performance; Add a seal; Take additio nal measures for dust prevention.
Indentation of the rolling	Indentation Caused by plastic deformation of the rolling	Impact load or exces- sive external load	Review the model no. selected; Make service conditions less strict; Lower a level of load; Reinforce assembly precision for installation; Use a higher model no.
surface	surface due to excessive external load	Careless handling	Improve the methods and conditions of handling to prevent impact and fall.
Calinian	 Burning Rough surface of the rolling surface due to slight burning by friction between a rolling el- 	Poor lubrication	Refill a lubricant; Use an appropriate lubricant; Improve lubrication
Seizing	ement and the rolling surface - Cause for the discoloration of the rolling sur- face, weakened hardness, and flaking	Overload	Review service conditions; Lower a level of load; Use a higher model no.; Enhance assembly preci- sion for installation.
	Cracking Partial broaking into piaces of a rolling element	mpact load or exces- sive external load	Review the model no. selected; Use a higher model no.; Lower a level of load; Reinforce assembly precision for installation
Cracking	or rolling surface due to excessive external load	Poor raceway circulation of a rolling element	Prevent foreign substances; Improve measures for dust prevention; Refill a lubricant; Shorten a refilling cycle of lubricant; Improve lubrication
	• Abnormal wear - Caused by the sliding of a rolling element and	Impact load or excessive external load	Review the model no. selected; Use a higher model no.; Lower a level of load; Reinforce assembly precision for installation.
Abnormal wear	the rolling surface; the more sliding, the rap- idly more wear	Intrusion of foreign substances	Reinforce seal performance; Improve measures for dust prevention
	 Accompany oxidation wear causing poor pre- cision and preload failure 	Poor lubrication	Refill a lubricant; Use an appropriate lubricant; Improve lubrication; Improve the lubrication passage.
	Vibration This problem prices when running at vibrant	Load	Review service conditions; Use a higher model no.; Reinforce assembly precision for installation.
Flatting corrosion	stroke causes the loss of oil film, and the ox- idation of the fine dust caused by the sliding	Vibration	Improve transfer conditions; Replace a lubricant; Improve lubrication; Shorten a refilling cycle of lubricant.
	facilitates wear.	Intrusion of foreign substances	Improve a seal; Establish measures for dust prevention.
Rust	Rust Caused by the loss of oil film or the contact of an exposed part with water acid and alkali	Intrusion of cooling water	Apply surface treatment for rust prevention; Improve seal performance; Replace a lubricant; replace a coolant; Refill a lubricant; Shorten a refilling cycle of lubricant.
generation	In particular, when cooling water flows in a block, it degrades lubrication and causes ruct	High humidity	Apply surface treatment for rust prevention; Improve environments.
	Early flaking arises due to concentrated stress.	Poor handling	Improve a storage place; Reinforce sealing treatment; Apply a sufficient amount of rust preventive oil.

<Table of comparison with the full ball type products made by different manufacturers>

1. H Series (Standard Type)

A

WON	ТНК	NSK	PMI	HIWIN
H 15FN H 15FL	HSR 15A, B, C HSR 15LC	LH 15EL, EM LH 15GL, GM	MSA 15A	HGW 15CA
H 20FN	HSR 20A, B, C	LH 20EL, EM	MSA 20A	HGW 20CA
H 20FL	HSR 20LA, LB, LC	LH 20GL, GM	MSA 20LA	HGW 20HA
H 25FN	HSR 25A, B, C	LH 25EL, EM	MSA 25A	HGW 25CA
H 25FL	HSR 25LA, LB, LC	LH 25GL, GM	MSA 25LA	HGW 25HA
H 30FN	HSR 30A, B, C	LH 30EL, EM	MSA 30A	HGW 30CA
H 30FL	HSR 30LA, LB, LC	LH 30GL, GM	MSA 30LA	HGW 30HA
H 35FN	HSR 35A, B, C	LH 35EL, EM	MSA 35A	HGW 35CA
H 35FL	HSR 35LA, LB, LC	LH 35GL, GM	MSA 35LA	HGW 35HA
H 45FN	HSR 45A, B, C	LH 45EL, EM	MSA 45A	HGW 45CA
H 45FL	HSR 45LA, LB, LC	LH 45GL, GM	MSA 45LA	HGW 45HA
H 55FN	HSR 55A, B, C	LH 55EL, EM	MSA 55A	HGW 55CA
H 55FL	HSR 55LA, LB, LC	LH 55GL, GM	MSA 55LA	HGW 55HA
H 15RN H 15RL	HSR 15R HSR 15LR	lh 15an, al lh 15bl, bl	MSA 15S	HGH 15CA
H 20RN	HSR 20R	LH 20AN, AL	MSA 20S	HGH 20CA
H 20RL	HSR 20LR	LH 20BN, BL	MSA 20LS	HGH 20HA
H 25RN	HSR 25R	lh 25an, al	MSA 25S	HGH 25CA
H 25RL	HSR 25LR	lh 25bn, bl	MSA 25LS	HGH 25HA
H 30RN	HSR 30R	LH 30AN, AL	MSA 30S	HGH 30CA
H 30RL	HSR 30LR	LH 30BN, BL	MSA 30LS	HGH 30HA
H 35RN	HSR 35R	lh 35AN, Al	MSA 35S	HGH 35CA
H 35RL	HSR 35LR	lh 35BN, Bl	MSA 35LS	HGH 35HA
H 45RN	HSR 45R	lh 45an, al	MSA 45S	HGH 45CA
H 45RL	HSR 45LR	lh 45bn, bl	MSA 45LS	HGH 45HA
H 55RN	HSR 55R	LH 55AN, AL	MSA 55S	HGH 55CA
H 55RL	HSR 55LR	LH 55BN, BL	MSA 55LS	HGH 55HA



WEH 35CA

e Type)				
ТНК	NSK	PMI	HIWIN	IKO
HRW 17CA	LW 17EL	-	WEW 17CC	LWFF 33
HRW 21CA	LW 21EL	MSG 21E	WEW 21CC	LWFF 37
HRW 27CA	LW 27EL	MSG 27E	WEW 27CC	LWFF 42
HRW 35CA	LW 35EL	MSG 35E	WEW 35CC	LWFF 69
HRW 17CR	-	-	WEH 17CA	LWFS 33
HRW 21CR	-	MSG 21S	WEH 21CA	LWFS 37
HRW 27CR	-	MSG 27S	WEH 27CA	LWFS 42

MSG 35S

2. HW Series (Wide Type)

HB 17F

HB 21F

HB 27F

HB 35F

HB 17R HB 21R

HB 27R

HB 35R

HRW 35CR

S Series (Slim Type)

WON	ТНК	NSK	PMI	HIWIN
S 15RC	SR 15V	ls 15CL	MSB 15TS	EGH 15SA
S 15RN	SR 15W	Ls 15AL	MSB 15S	EGH 15CA
S 20RC	SR 20V	LS 20CL	MSB 20TS	EGH 20SA
S 20RN	SR 20W	LS 20AL	MSB 20S	EGH 20CA
S 20RC	SR 25V	LS 25CL	MSB 25TS	EGH 25SA
S 20RN	SR 25W	LS 25AL	MSB 25S	EGH 25CA
S 15FC	SR 15SB	LS 15EM	MSB 15TE	EGW 15CA
S 15FN	SR 15TB	LS 15JM	MSB 15E	EGW 15CB
S 20FC	SR 20SB	LS 20EM	MSB 20TE	EGW 20CA
S 20FN	SR 20TB	LS 20JM	MSB 20E	EGW 20CB
S 20FC	SR 25SB	LS 25EM	MSB 25TE	EGW 25CA
S 20FN	SR 25TB	LS 25JM	MSB 25E	EGW 25CB

A

4. M Series (Miniature Standard Type)

WON	ТНК	NSK	PMI	HIWIN	IKO
M 5C	SRS 5GM	-	-	MGN 5C	LWLC 5
M 5N	SRS 5GN	LU 05TL		-	LWL 5
M 7C	SRS 7GS	-	-	-	LWLC 7
M 7N	SRS 7GM	LU 07AL	MSC 7M	MGN 7C	LWL 7
M 7L	SRS 7GN	-	MSC 7LM	MGN 7H	-
M 7LA	-	-	-	-	LWLG 7
M 9C	SRS 9GS	-	-	-	LWLC 9
M 9N	SRS 9GM	LU 09TL	MSC 9M	MGN 9C	LWL 9
M 9L	SRS 9GN	LU 09UL	MSC 9LM	MGN 9H	-
M 9LA	-	-	-	-	LWLG 9
M 12C	SRS 12GS	-	-	-	LWLC 12
M 12N	SRS 12GM	LU 12TL	MSC 12M	MGN 12C	LWL 12
M 12L	SRS 12GN	LU 12UL	MSC 12LM	MGN 12H	LWLG 12
M 15C	SRS 15GS	-	-	-	LWLC 15
M 15N	SRS 15GM	LU 15AL	MSC 15M	MGN 15C	LWL 15
M 15L	SRS 15GN	LU 15BL	MSC 15LM	MGN 15H	LWLG 15
M 20C M 20N M 20L	- SRS 20GM -				LWLC 20 LWL 20 LWLG 20

MB Series (Miniature Wide Type)

WON	ТНК	NSK	PMI	HIWIN	IKO
MB 5C MB 5N	SRS 5WGM SRS 5WGN	- LE 05AL	-	-	LWLFC 10 LWLF 10
MB 7C	SRS 7WGS	-	-	-	LWLFC 14
MB 7N	SRS 7WGM	LU 07TL	MSD 7M	MGW 7C	LWLF 14
MB 7L	SRS 7WGN	-	MSD 7LM	MGW 7H	LWLFG 14
MB 9C	SRS 9WGS	-	-	-	LWLFC 18
MB 9N	SRS 9WGM	LE 09TL, TR	MSD 9M	MGW 9C	LWLF 18
MB 9L	SRS 9WGN	-	MSD 9LM	MGW 9H	LWLFG 18
MB 12C	SRS 12WGS	-	-	-	LWLFC 24
MB 12N	SRS 12WGM	LE 12AL, AR	MSD 12M	MGW 12C	LWLF 24
MB 12L	SRS 12WGN	-	MSD 12LM	MGW 12H	LWLFG 24
MB 15C	SRS 15WGS	-	-	-	LWLFC 42
MB 15N	SRS 15WGM	LE 15AL, AR	MSD 15M	MGW 15C	LWLF 42
MB 15L	SRS 15WGN	-	MSD 15LM	MGW 15H	LWLFG 42





<Table of model number comparison with spacer chain type of a different company>

WON	ТНК	NSK	PMI	HIWIN
H 15FNS	SHS 15C	SH 15FL	SME 15EA	QHW 15CA
H 15FLS	SHS 15LC	SH 15HL	SME 15LEA	-
H 20FNS	SHS 20C	SH 20FL	SME 20EA	QHW 20CA
H 20FLS	SHS 20LC	SH 20HL	SME 20LEA	QHW 20HA
H 25FNS	SHS 25C	SH 25FL	SME 25EA	QHW 25CA
H 25FLS	SHS 25LC	SH 25HL	SME 25LEA	QHW 25HA
H 30FNS	SHS 30C	SH 30FL	SME 30EA	QHW 30CA
H 30FLS	SHS 30LC	SH 30HL	SME 30LEA	QHW 30HA
H 35FNS	SHS 35C	SH 35FL	SME 35EA	QHW 35CA
H 35FLS	SHS 35LC	SH 35HL	SME 35LEA	QHW 35HA
H 45FNS	SHS 45C	SH 45FL	SME 45EA	QHW 45CA
H 45FLS	SHS 45LC	SH 45HL	SME 45LEA	QHW 45HA
H 55FNS H 55FLS	SHS 55C SHS 55LC	SH 55FL SH 55HL	-	-
H 15RNS	SHS 15R	SH 15AN	SME 15SA	QHH 15CA
H 15RLS	-	SH 15BN	SME 15LSA	-
H 20RNS	SHS 20V	SH 20AN	SME 20SA	QHH 20CA
H 20RLS	SHS 20LV	SH 20BN	SME 20LSA	QHH 20HA
H 25RNS	SHS 25R	SH 25AN	SME 25SA	QHH 25CA
H 25RLS	SHS 25LR	SH 25BN	SME 25LSA	QHH 25HA
H 30RNS	SHS 30R	SH 30AN	SME 30SA	QHH 30CA
H 30RLS	SHS 30LR	SH 30BN	SME 30LSA	QHH 30HA
H 35RNS	SHS 35R	SH 35AN	SME 35SA	QHH 35CA
H 35RLS	SHS 35LR	SH 35BN	SME 35LSA	QHH 35HA

1.H...S Series(Standard Type)

2. S...S Series(Slim Type)

A

WON	ТНК	NSK	PMI	HIWIN
S 15RCS	SSR 15XV	SS 15CL	SME 15EB	QEH 15SA
S 15RNS	SSR 15XW	SS 15AL	SME 15LEB	QEH 15CA
S 20RCS	SSR 20XV	SS 20CL	SME 20EB	QEH 20SA
S 20RNS	SSR 20XW	SS 20AL	SME 20LEB	QEH 20CA
S 25RCS	SSR 25XV	SS 25CL	SME 25EB	QEH 25SA
S 25RNS	SSR 25XW	SS 25AL	SME 25LEB	QEH 25CA
S 15FCS	-	SS 15JM	SME 15SB	QEW 15SA
S 15FNS	SSR 15XTB	SS 15EM	SME 15LSB	QEW 15CA
S 20FCS	-	SS 20JM	SME 20SB	QEW 20SA
S 20FNS	SSR 20XTB	SS 20EM	SME 20LSB	QEW 20CA
S 25FCS	-	SS 25JM	SME 25SB	QEW 25SA
S 25FNS	SSR 25XTB	SS 25EM	SME 25LSB	QEW 25CA

3. HS...S Series(Slim Type)

WON	ТНК
HS 25RNS	SHS 25V
HS 25RLS	SHS 25LV
HS 30RNS	SHS 30V
HS 30RLS	SHS 30LV
HS 35RNS	SHS 35V
HS 35RLS	SHS 35LV



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1 Structure and Features of WON Crossed Roller Bearing

1. Structure

R

WON Crossed Roller Bearing has the structure in which a roller as a rolling element is crossed at right angles with the rolling surface with the V-grooved inner ring and outer ring. A spacer-type retainer assembled between rollers prevents the collision and friction of rollers, and the increase in rotational torque. The device has an easy-to-use compact structure.

2. Features

In the rolling surface of the inner and outer rings of a crossed roller bearing, rollers are assembled. Therefore, the device reduces the elastic displacement by external load, and bears all complex loads, such as radial load, axial load, and moment load, at the same time. Since it adopts a spacer retainer, it avoids inclined surface of a roller, uneven wear caused by uneven contact, or hitching. Therefore, the product with high precision and high rigidity implements smooth rotary motion, and support preload adjustment differently depending on service conditions.

3. Use

This product is mainly usable in an environment that needs complex loads, high rigidity and rotational precision. It is applied to various types of equipment, such as industrial robot, machine tool index table, ATC, medical equipment, precise alignment stage, semiconductor manufacture equipment, and DD motor.



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WN

2 Types of Crossed Roller Bearing

1. CB Series for Revolving Inner Ring

- 1) The inner ring of a crossed roller bearing has an integral type, and its outer ring is separable into upper and lower parts that are bolted for easy handling.
- 2) This model is mainly applied to the parts that needs the rotational precision of its inner ring, such as the index table of machine tool, or the joint or turning part of industrial robot.



2. CH Series with High Stiffness

- 1) The inner and outer rings of a crossed roller bearing have an integral type, so that the device has a small installation error. In addition, this model with high precision and high rigidity secures stablerotational precsion.
- This model is used in an environment where its inner and outer rings need to be rotated simultaneously or individually



B

3. CA Series for Slim Revolving Inner Ring

- 1) As a slim compact type, this model has minimum thickness of its inner and outer rings. Its inner ring has an integral type, and its outer ring is separable into upper and lower parts that are bolted for easy handling.
- 2) This model is mainly applied to the parts that needs the rotational precision of its inner ring and need to become light weight and small, such as the joint or turning part of industrial robot.



4. Customized Special Type CS Series

1) This is a customized model. If you need a special type in terms of the shape, size, material, and specification of the inner and outer rings, please contact WON ST.





3 Selection of Crossed Roller Bearing

1. Overview

To select a crossed roller bearing, it is necessary to identify the details of requirements, prioritize them, and then choose the one that meets the service conditions.

2. Procedure

2

3

Determine service conditions

The equipment to be used, requirements, service environments, precision, rigidity, life, and others

Integral type, Inner ring separation type, Outer ring separation type, General type, High rigidity type

Calculate radial load, axial load, moment load, and dynamic equivalent load

4 Calculate rated service life

Calculate load

5 Calculate static safety factor

6 Determine rigidity and preload

7 Determine precision level

8 Determine lubrication

9

Calculate a rated service life

Calculate a static safety factor in consideration of the characteristics of equipment, external load, etc.

Determine clearance and preload values in consideration of motion conditions, rotational precision, etc.

Determine a level of precision in consideration of rotational precision and assembly precision.

Determine oil, grease, or a special lubricant.

Complete selection

4 Life Calculation

1. Rated service life (L)

B

It is possible to calculate the basic rated life of cross roller bearing in the following formula.



Service life time





 $\label{eq:linear} \begin{array}{l} L : Rated service life \\ C : Basic dynamic load rating(N) \\ Pc : Dynamic equivalent radial load(N) \\ f_{T} : Temperature factor \\ f_{W} : Load factor \\ L_{h} : Service life time(h) \\ N : RPM(rpm) \end{array}$

% Note: Usually, workable temperature is 80°C or below. If above, please contact WON ST.

WON

2. Life calculation under heaving operation condition

Service life of a bearing under heaving operation condition is calculated as follows.

$$L_{0c} = \frac{90}{\theta} \left(\frac{C}{P_c}\right)^{P}$$

- Loc : rated service life 10⁶ cycle indicated in heaving frequency of the bearing under heaving operation
- θ : heaving angle (See Fig.3.)
- $\mathsf{P}_c\ \colon\ \mathsf{dynamic}\ \mathsf{equivalent}\ \mathsf{radial}\ \mathsf{load}$

% If \emptyset is small, it is hard to generate an oil film on the contact surface between the raceway surface and a rotating body. In addition, it may cause corrosion.

In case of heaving operation

Service life
timeLh = $360 \times L$ Lh = $2 \times \theta \times n_0 \times 60$ Lh : Service life time(h) θ : Heaving angle(deg)(\times See the figure on the right.)No : Number of reciprocating motions (min-1)Figure 3.

3. Static safety factor (fs)

Static safety factor (fs) of a crossed roller bearing is calculated as follows. For the general static safety factor, see Table 1.

$$f_s = \frac{C_0}{P_0}$$

fs : static safety factor Co : basic static load rating (N) Po : static equivalent radial load (maximum load) (N)

Table 1. Static safety factor (fs)

Working condition	Lower limit of fs
High rotational precision is required.	≥3
Under normal operation condition	≥2
Almost no rotation and no significance of smooth operation under normal operation condition	≥1

4. Static equivalent radial load (Po)

Static equivalent radial load of a crossed roller bearing is calculated in the following formula.

$$P_0 = F_r + \frac{2M}{D_{PW}} + 0.44 F_a$$

- Po: Static equivalent radial load (N)
- Fr: Radial load N)

B

- Fa: Axial load(N)
- M:Moment(N mm)

DPw: Roller set pitch diameter (DPw $\doteq \frac{d+D}{2}$)



5. Dynamic equivalent radial load (Pc)

Dynamic equivalent radial load of a crossed roller bearing is calculated in the following formula.

$$P_{c} = X \left(F_{r} + \frac{2M}{D_{PW}}\right) + Y F_{a}$$

- Pc: Dynamic equivalent radial load(N)
- F_r : Radial load (N)
- Fa: Axial load(N)
- $M:Moment(N \cdot mm)$
- X : Radial load factor (See Table 2.)
- Y : Axial load factor (See Table 2.)

DPw: Roller set pitch diameter (DPw $\doteq \frac{d+D}{2}$)

Table 2. Radial load factor and axial load factor

Classification		
$\frac{F_a}{F_r + 2M/D_{PW}} \leq 1.5$	1	0.45
Fa > 1.5	0.67	0.67





6. Load factor (fw)

When a crossed roller bearing is used, the load imposed on the bearing by vibration and impacts in operation is often greater than the calculated load. To select a crossed roller bearing, it is required to take into account the load factor values in the table shown below.

Table 3. Load factor (fw)

Load condition	fw
Smooth operation condition without impacts	1 ~ 1.2
Normal operation condition	1.2 ~ 1.5
The operation condition with both vibration load and impact load	1.5 ~ 3

7. Temperature factor (fr)

Temperature factor is presented in the following graph.



※ Note: Usually, workable temperature is 80℃ or below. If above, please contact WON ST

5 Load rating

1. Basic dynamic load rating (C)

It refers to the radial load with a constant size and direction, which makes it possible to meet the condition where over 90% in the group of multiple crossed roller bearings with the same model have no flaking and can rotate a million times.

2. Basic static load rating (Co)

It refers to the static radial load that imposes a certain level of contact stress on the raceway surface with the maximum load and on the center of the contact part of a rotating body in a crossed roller bearing.
6 Permissible RPM

R

For the permissible RPM of a crossed roller bearing, see the table below. A permissible RPM depends on assembly or service conditions.

Table 4. Permissible RPM of crossed roller bearing (dm • n)

Bearing Type	Seal	Grease lubrication	Oil lubrication
Bearing	No seal	75,000	150,000
Spacer retainer	Seals on the both sides	60,000	-

% dm • n = dm X n
dm : The mean value of inside and outside dimeters (mm)

n: Revolution count (rpm)

7 Lubrication

A crossed roller bearing is commonly lubricated with grease. An oil inlet of the inner ring and outer ring is used for grease supply. A crossed roller bearing with double-sided seal mounting type is filled with Albania EP2 grease.

If a bearing is not filled with a lubricant, please fill it with the grease or oil suitable for service conditions before use. Without lubrication, it is possible to make the rolling surface worn out more and shorten of a bearing life.

8 Cautions in Designing Compression Plate and Housing

A crossed roller bearing is compact and slim. It is required to evaluate the rigidity of a pressure plate or housing plate and the torque of bolts in the process of designing an installation part.

In the case of poor rigidity, it is impossible to assemble the inner and outer rings of a bearing evenly and tightly, and the bearing can be deformed in moment load. In such deformation, a roller fails to make contact uniform and thus performance of the bearing is degraded significantly.

1. Housing design for installation

Housing thickness should be at least 60% of cross-section height of a bearing.

T =
$$\frac{D-d}{2}$$
 X 0.6 or more

- T : Housing thickness
- D : The outside diameter of the outer ring
- d : The outside diameter of the inner ring

2. Tap for separation

If a separation tap is applied to a design, it is easy to separate the inner and outer rings without any damage to a bearing.







Crossed Roller Bearing

3. Installation and assembly

For installation and assembly, see the following figure.



4. Selection of compression flange and bolt

The more numbers of the fastening bolts for compression, the more stable. Bolts are arranged in the equimultiples as shown in Table 5. For the thickness (F) and gap (S) of the flange for compression, see the following table of dimensions

$$H = B_{-0.1}^{0}$$

S = 0.5mm

M6

To prevent a flange for compression from being loosened, it is required to make firm connection in an appropriate torque level. If a shaft or housing is made of a light alloy material, use steel. For general heavy or light steel, see the following table.

external diameter of outer ring			of bolts		Bolt size
Above	Below				
-	100	8	or more		M3 ~ M5
100	200	12	or more		M4 ~ M8
200	300	16	or more		M5 ~ M12
Table 6. Maxir	num clampin	g to	rque of bo	olts	Unit:N•m
Bolt No.	Clamping tor	Clamping torque Bolt			Clamping torque
M3	2		M8		30
M4	4		M10		70
M5	9	M12			120

14



Table 5. Number of compression bolts and bolt size Unit:mm

* Assembly procedure for installation

The assembly procedure of a crossed roller bearing is as follows.

1. Preliminary check before mounting

Wash a housing or other assembly parts clearly and check if they have any scratch or sharp edge.

2. Axis or housing assembly

B

Since a bearing is slim, it can be easily inclined in the process of assembly. Make it balanced horizontally with the use of a plastic hammer, and then hammer the cylinder of the outer ring gradually and insert it. Carefully hammer it until the part is set in the contact surface completely.

- 3. Compression-flange mounting
- 1) Mount a flange for compression. Check a position for bolt fastening by shaking the flange before assembly.
- 2) Check that a bolt is positioned well in a hole before fastening the bolt.
- 3) The bolt fastening process is comprised of 2 to 5 steps from temporary fastening to complete fastening. If the inner ring and outer ring are separated from each other, rotate the integral axis gently and slowly in order to secure an assembly position, and then fasten a bolt in 2 to 5 steps.



9 Fitting

For fitting, see the following table

Table 7. Recommended fitting in normal load

	Tolerance range class						
Radial internal clearance	Load f	fixed to inner ring	Load f	ixed to outer ring			
	Shaft	Housing bore	Shaft	Housing bore			
G2 clearance	h5	H7	g5	J7 ⁽¹⁾			
G1 clearance	j5	H7	g5	J7 ⁽¹⁾			

Note⁽¹⁾ It is recommended to fit to a small edge according to measured value of a bearing.

Table8. Recommended fitting for the normal clearance of a slim type

	L	oad fixed t	o inner rir	ng		Load fixed to outer ring			
Inside diameter of bearing (d)	Sh	aft	Housir	ng bore	Sh	aft	Housing bore		
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
50	+15	0	+13	0	-15	-30	-13	-25	
60	+15	0	+13	0	-15	-30	-13	-25	
70	+15	0	+15	0	-15	-30	-15	-30	
80	+20	0	+15	0	-20	-40	-15	-30	
90	+20	0	+15	0	-20	-40	-15	-30	
100	+20	0	+15	0	-20	-40	-15	-30	
110	+20	0	+20	0	-20	-40	-20	-40	
120	+25	0	+20	0	-25	-50	-20	-40	
130	+25	0	+25	0	-25	-50	-25	-50	
140	+25	0	+25	0	-25	-50	-25	-50	
150	+25	0	+25	0	-25	-50	-25	-50	
160	+25	0	+25	0	-25	-50	-25	-50	
170	+25	0	+30	0	-25	-50	-30	-60	
180	+30	0	+30	0	-30	-60	-30	-60	
190	+30	0	+30	0	-30	-60	-30	-60	
200	+30	0	+30	0	-30	-60	-30	-60	

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10 Precision Specification of Crossed Roller Bearing

Precision of a crossed roller bearing and dimensional tolerance are calculated with the dimensions described in Table 9 to Table 18.

	Inner rir	ng radial runout to	olerance	Inner ring axis runout tolerance			
Model No.	Precision	Super precision	Ultra precision	Precision	Super precision	Ultra precision	
	P5	P4	P2	P5	P4	P2	
CH42	4	3	2.5	4	3	2.5	
CH66	5	4	2.5	5	4	2.5	
CH85	5	4	2.5	5	4	2.5	
CH124	5	4	2.5	5	4	2.5	
CH148	6	5	2.5	6	5	2.5	
CH178	6	5	2.5	6	5	2.5	
CH228	8	6	5	8	6	5	
CH297	10	8	5	10	8	5	
CH445	15	12	7	15	12	7	

Table 9. Rotational precision of the inner ring of CH Series

Note⁽¹⁾: Standard rotational precision of CH series is P5.

Table 10. Rotational precision of the outer ring of CH Series

CH42 CH66 CH85 CH124 CH148 CH178 CH228 CH297 CH445

Note⁽¹⁾: Standard rotational precision of CH series is P5.

Unit∶µm

Unit:µm

B

Table 11. Rotational precision of the inner ring of CB Series U										Unit∶µm	
Nominal of	dimension	Ir	Inner ring radial runout tolerance					Inner ring axis runout tolerance			
(mm) of diameter (o	the inside 1) of bearing	0	PE6	PE5	PE4	PE2	0	PE6	PE5	PE4	PE2
Above	Below		P6	P5	P4	P2	U	P6	P5	P4	P2
18	30	13	8	4	3	2.5	13	8	4	3	2.5
30	50	15	10	5	4	2.5	15	10	5	4	2.5
50	80	20	10	5	4	2.5	20	10	5	4	2.5
80	120	25	13	6	5	2.5	25	13	6	5	2.5
120	150	30	18	8	6	2.5	30	18	8	6	2.5
150	180	30	18	8	6	5	30	18	8	6	5
180	250	40	20	10	8	5	40	20	10	8	5
250	315	50	25	13	10	(6)	50	25	13	10	(6)
315	400	60	30	15	12	(7)	60	30	15	12	(7)
400	500	65	35	18	14	(9)	65	35	18	14	(9)
500	630	70	40	20	16	(10)	70	40	20	16	(10)
630	800	80	(45)	(23)	(18)	(11)	80	(45)	(23)	(18)	(11)
800	1000	90	(50)	(25)	(20)	(12)	90	(50)	(25)	(20)	(12)

Table 11. Rotational precision of the inner ring of CB Series

Table 12. Rotational precision of the inner ring of CA Series

Nominal dimension (mm) of th	Radial run-out	
Above	Below	Allowable value of axial run-out
40	65	13
65	80	15
80	100	15
100	120	20
120	140	25
140	180	25
180	200	30

Unit∶*µ*m

		ب س										
Nominal dim	ension (mm) diameter (d)		Tolerance of dm Note (2)									
of the maide	aring	0,P6,P5,P	4,P2,WUP	PE6		PE5		PE4, PE2				
Above	Below	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.			
18	30	0	-10	0	-8	0	-6	0	-5			
30	50	0	-12	0	-10	0	-8	0	-6			
50	80	0	-15	0	-12	0	-9	0	-7			
80	120	0	-20	0	-15	0	-10	0	-8			
120	150	0	-25	0	-18	0	-13	0	-10			
150	180	0	-25	0	-18	0	-13	0	-10			
180	250	0	-30	0	-22	0	-15	0	-12			
250	315	0	-35	0	-25	0	-18	-	-			
315	400	0	-40	0	-30	0	-23	-	-			
400	500	0	-45	0	-35	-	-	-	-			
500	630	0	-50	0	-40	-	-	-	-			
630	800	0	-75	0	-	-	-	-	-			
800	1000	0	-100	-	-	-	-	-	-			

Table 13. Dimensional tolerance of the inside diameter of bearing

Unit:*u*m

Unit: um

Note⁽¹⁾: Standard precision of the inside diameter of CH series is class 0. For higher precision, please contact WON ST.

Note⁽²⁾: dm is the mean value between the max diameter and min diameter of the 2-point measurement values of bearing inside diameter.

Note⁽³⁾: In case of no indication of precision class, the highest of the low precision classes is applied.

Table 14. Dimensional tolerance of the outside diameter of bearing

30 50 0 -11 0 -9 0 -7 0 -6 50 80 -13 0 -11 -9 -7 80 120 0 -15 0 -13 -10 0 -8 120 150 -18 0 -15 0 -11 -9 150 -25 180 0 -18 -13 0 -10 -30 0 0 180 250 -20 -15 -11 250 0 -35 0 -25 0 -18 0 -13 315 315 400 -40 0 -28 0 -20 -15 400 500 0 -45 0 -33 -23 _ _ -50 -28 500 630 0 -38 630 800 0 -75 0 -45 0 -35 _ _ 800 1000 -100 _ _ _

Note(1): Standard precision of the inside diameter of CH series is class 0. For higher precision, please contact WON ST.

Note⁽²⁾: dm is the mean value between the max diameter and min diameter of the 2-point measurement values of bearing outside diameter

Note⁽³⁾: In case of no indication of precision class, the highest of the low precision classes is applied.



Unit:µm

Madal Na	Toleran	Tolerance of B1				
Model No.	Max.	Min.	Cro			
CH42	0	-75	sse			
CH66	0	-75	d Ro			
CH85	0	-75	olle			
CH124	0	-75	r Be			
CH148	0	-75	ari			
CH178	0	-100	5			
CH228	0	-100				
CH297	0	-100				
CH445	0	-150				

Table 15. Tolerance of the inner & outer ring width of CB Series

Table 15. Tolerance of the inner & outer ring width of CB Series

Unit∶µm

Nominal dimension (mm) of the inside		Toleran	ce of B1	Tolerance of B1		
diameter (d) of bearing		Applied to the i	nner ring of CB	Applied to the outer ring of CB		
Above	Below	Max.	Min.	Max.	Min.	
18	30	0	-75	0	-100	
30	50	0	-75	0	-100	
50	80	0	-75	0	-100	
80	120	0	-75	0	-100	
120	150	0	-100	0	-120	
150	180	0	-100	0	-120	
180	250	0	-100	0	-120	
250	315	0	-120	0	-150	
315	400	0	-150	0	-200	
400	500	0	-150	0	-200	
500	630	0	-150	0	-200	
630	800	0	-150	0	-200	
800	1000	0	-300	0	-400	

11 Precision Specification of WUP-class Series

1. Rotational precision of WUP-class series (example)

WUP-class Series has higher rotational precision than those of ISO Class2, KS 2, DIN P2, AFBMA ABCE9, and JIS2.

2. Precision specification

B

The runout precision of CH, CB and WUP-class crossed roller bearing series is based on the Table 17 and Table 18.

MadalNa	Runout preci inner ring c	cision of the of CH series	Runout precision of the outer ring of CH series						
would no.	Radial runout tolerance	Axis runout tolerance	Radial runout tolerance	Axis runout tolerance					
CH42	2	2	3	3					
CH66	2	2	3	3					
CH85	2	2	3	3					
CH124	2	2	3	3					
CH148	2	2	4	4					
CH178	2	2	4	4					
CH228	2.5	2.5	4	4					
CH297	3	3	5	5					
CH445	4	4	7	7					

Table 17. Runout precision of CH and WUP-class series Unit : µm

Nominal dimens inner diameter diame	ions (mm) of the (d) and outside ter (D)	Runout precision of the inner ring of CB series					
Above	Below	Radial runout tolerance	Axis runout tolerance				
80	180	2.5	2.5				
180	250	3	3				
250	315	4	4				
315	400	4	4				
400	500	5	5				
500	630	6	6				
630	800	-	-				

Table 18. Runout precision of CB and WUP-class series Unit : um

12 Radial Clearance

The radial clearance of CH, CB, and CA series is shown in the following tables

Unit:um

Table 19. Radial clearance of CH series

				p			
	G		G2				
Model No.	Starting (N•	j torque m)	Radial clearance (µm)				
	Min.	Max.	Min.	Max.			
CH42	0.1	0.5	0	25			
CH66	0.3	2.2	0	30			
CH85	0.4	3	0	40			
CH124	1	6	0	40			
CH148	1	10	0	40			
CH178	3	15	0	50			
CH228	5	20	0	60			
CH297	10	35	0	70			
CH445	20	55	0	100			

Note: G3 clearance of CH series is controlled by starting torque, and the starting torque of G3 clearance has no seal resistance.

Table 20. Radial clearance of CB and WUP-class series Unit : "m

Pitch diamete (dp)	circle r of roller (mm)		〕 3	G2			
Above	Below	Min.	Max.	Min.	Max.		
120	160	-10	0	0	40		
160	200	-10	0	0	50		
200	250	-10	0	0	60		
250	280	-15	0	0	80		
280	315	-15	0	0	100		
315	355	-15	0	0	110		
355	400	-15	0	0	120		
400	500	-20	0	0	130		
500	560	-20	0	0	150		
560	630	-20	0	0	170		
630	710	-20	0	0	190		



Unit:µm

WON

٨	1	\cap	NL	C	г.	C	\cap		17	ē.	n	
V١	V	U	I N	5		C	U	• ?			ν	

Table 21. Radial clearance of CB series

Unit	:	μm

Pitch diamete (dp)	circle r of roller (mm)			C	G2	Ċ	〕 1
Above	Below	Min.	Max.	Min.	Max.	Min.	Max.
18	30	-8	0	0	15	15	35
30	50	-8	0	0	25	25	50
50	80	-10	0	0	30	30	60
80	120	-10	0	0	40	40	70
120	140	-10	0	0	40	40	80
140	160	-10	0	0	40	40	90
160	180	-10	0	0	50	50	100
180	200	-10	0	0	50	50	110
200	225	-10	0	0	60	60	120
225	250	-10	0	0	60	60	130
250	280	-15	0	0	80	80	150
280	315	-15	0	30	100	100	170
315	355	-15	0	30	110	110	190

Unit:µm										
Pitch circle diameter of roller (dp) (mm)		G3		Ċ	52	G1				
Above	Below	Min.	Max.	Min.	Max.	Min.	Max.			
355	400	-15	0	30	120	120	210			
400	450	-20	0	30	130	130	230			
450	500	-20	0	30	130	130	250			
500	560	-20	0	30	150	150	280			
560	630	-20	0	40	170	170	310			
630	710	-20	0	40	190	190	350			
710	800	-30	0	40	210	210	390			
800	900	-30	0	40	230	230	430			
900	1000	-30	0	50	260	260	480			
1000	1120	-30	0	60	290	290	530			
1120	1250	-30	0	60	320	320	580			
1250	1400	-30	0	70	350	350	630			

Table 22. Radial clearance of CA series

Pitch circle diameter of roller (dp) (mm)		C	3 3	G2			
Above	Below	Min.	Max.	Min.	Max.		
50	80	-8	0	0	15		
80	120	-8	0	0	15		
120	140	-8	0	0	15		
140	160	-8	0	0	15		
160	180	-10	0	0	20		
180	200	-10	0	0	20		
200	225	-10	0	0	20		

13 Dimensions of Crossed Roller Bearing

1. CB Series

B

Composition of Model Name & Number



- 1 Model No.
- 2 No symbol- No seal / UU- Two-side seal / U- One-side seal
- Symbol of clearance: G1-Normal preload / G2-Light preload / G2-Light preload / G3-Heavy preload / GS-Special preload
- Symbol of precision: No symbol-Moderate / H6-High / P4-Super Precision / P2-Ultra Precision
- 5 No symbol-Standard product /E-special specification

- Standard type, The structure inner ring rotation and outer ring separation



Unit : mm

			Major dimensions							mbly	Basic load		Macc
	Model No			Pitch circle	\\/id+b	Oil i	nlet		dimer	nsions	rating	(radial)	IVIdSS
diameter				diameter of roller dp	B B1		b	min	ds max	Dh min	C kN	Co kN	kg
20	CB 2008	20	36	27	8	2	0.8	0.5	23.5	30.5	3.23	3.1	0.04
25	CB 2508	25	41	32	8	2	0.8	0.5	28.5	35.5	3.63	3.83	0.05
30	CB 3010	30	55	41.5	10	2.5	1	0.6	37	47	7.35	8.36	0.12
35	CB 3510	35	60	46.5	10	2.5	1	0.6	41	51.5	7.64	9.12	0.13
40	CB 4010	40	65	51.5	10	2.5	1	0.6	47.5	57.5	8.33	10.6	0.16
45	CB 4510	45	70	56.5	10	2.5	1	0.6	51	61.5	8.62	11.3	0.17
50	CB 5013	50	80	64	13	2.5	1.6	0.6	57.4	72	16.7	20.9	0.27
60	CB 6013	60	90	74	13	2.5	1.6	0.6	68	82	18	24.3	0.3
70	CB 7013	70	100	84	13	2.5	1.6	0.6	78	92	19.4	27.7	0.35
80	CB 8016	80	120	98	16	3	1.6	0.6	91	111	30.1	42.1	0.7
90	CB 9016	90	130	108	16	3	1.6	1	98	118	31.4	45.3	0.75
100	CB 10016	100	140	119.3	16	3.5	1.6	1	109	129	31.7	48.6	0.83
100	CB 10020	100	150	123	20	3.5	1.6	1	113	133	33.1	50.9	1.45
	CB11012		135	121.8	12	2.5	1	0.6	117	127	12.5	24.1	0.4
110	CB 11015	110	145	126.5	15	3.5	1.6	0.6	122	136	23.7	41.5	0.75
	CB 11020		160	133	20	3.5	1.6	1	120	143	34	54	1.56



Unit : mm

				Major di	mensio				Asse	mbly	Basic load		Mass
Shaft	Model No			Pitch circle	VA (* 101	Oili	nlet		dimer	nsions	rating	(radial)	IVIdSS
diameter	woder No.	diam- eter d	diam- eter D	diameter of roller dp	Width BB1	а	b	r min	ds max	Dh min	C kN	Co kN	kg
120	CB 12016	120	150	134.2	16	3.5	1.6	0.6	127	141	24.2	43.2	0.72
120	CB 12025	120	180	148.7	25	3.5	2	1.5	133	164	66.9	100	2.62
130	CB 13015	130	160	144.5	15	3.5	1.6	0.6	137	152	25	46.7	0.72
150	CB 13025	150	190	158	25	3.5	2	1.5	143	174	69.5	107	2.82
1/0	CB 14016	1/10	175	154.8	16	2.5	1.6	1	147	162	25.9	50.1	1
1-10	CB 14025	1-0	200	168	25	3.5	2	1.5	154	185	74.8	121	2.96
	CB 15013		180	164	13	2.5	1.6	0.6	157	172	27	53.5	0.68
150	CB 15025	150	210	178	25	3.5	2	1.5	164	194	76.8	128	3.16
	CB 15030		230	188	30	4.5	3	1.5	173	211	100	156	5.3
160	CB 16025	160	220	188.6	25	3.5	2	1.5	173	204	81.7	135	3.14
170	CB 17020	170	220	191	20	3.5	1.6	1.5	184	198	29	62.1	2.21
180	CB 18025	180	240	210	25	3.5	2	1.5	195	225	84	143	3.44
190	CB 19025	190	240	211.9	25	3.5	1.6	1	202	222	41.7	82.9	2.99
	CB 20025		260	230	25	3.5	2	2	215	245	84.2	157	4
200	CB 20030	200	280	240	30	4.5	3	2	221	258	114	200	6.7
	CB 20035		295	247.7	35	5	3	2	225	270	151	252	9.6
220	CB 22025	220	280	250.1	25	3.5	2	2	235	265	92.3	171	4.1
240	CB 24025	240	300	269	25	3.5	2	2.5	256	281	68.3	145	4.5
	CB 25025		310	277.5	25	3.5	2	2.5	265	290	69.3	150	5
250	CB 25030	250	330	287.5	30	4.5	3	2.5	269	306	126	244	8.1
	CB 25040		355	300.7	40	6	3.5	2.5	275	326	195	348	14.8
	CB 30025		360	328	25	3.5	2	2.5	315	340	76.3	178	5.9
300	CB 30035	300	395	345	35	5	3	2.5	322	368	183	367	13.4
	CB 30040		405	351.6	40	6	3.5	2.5	326	377	212	409	17.2
350	CB 35020	350	400	373.4	20	3.5	1.6	2.5	363	383	54.1	143	3.9
400	CB 40035	100	480	440.3	35	5	3	2.5	422	459	156	370	14.5
400	CB 40040	400	510	453.4	40	6	3.5	2.5	428	479	241	531	23.5
450	CB 45025	450	500	474	25	3.5	1.6	1	464	484	61.7	182	6.6
	CB 50025		550	524.2	25	3.5	1.6	1	514	534	65.5	201	7.3
500	CB 50040	500	600	548.8	40	6	3	2.5	526	572	239	607	26
	CB 50050		625	561.6	50	6	3.5	2.5	536	587	267	653	41.7
600	CB 60040	600	700	650	40	6	3	3	627	673	264	721	29
700	CB 70045	700	815	753.5	45	6	3	3	731	777	281	836	46
800	CB 80070	800	950	868.1	70	6	4	4	836	900	468	1330	105
900	CB 90070	900	1050	969	70	6	4	4	937	1001	494	1490	120

2. CH Series Composition of Model Name & Number



1 Model No.

B

- Shape: No symbol-The same direction of counterbore / G-Opposite direction of counterbore/ X-inner ring tap hole
- S No symbol- No seal / UU- Two-side seal / U- One-side seal (one-side seal of the counterbore of outer ring)/UT-One-side seal (the opposite of the counterbore of outer ring)
- Symbol of clearance: G1-Normal preload / G2-Light preload / G2-Heavy preload / GS-Special preload
- Symbol of precision: No symbol-Moderate / H6-High / P4-Super Precision / P2-Ultra Precision
- **6** No symbol–Standard product /E-special specification

- High-rigidity type, Integral structure of the inner and outer rings



U	Init	:	mm

				Majo	or dimen	sions		Asse	mbly	Basic loa	ad rating	Maga
Shaft	Model No		Outside	Pitch circle	Width	Oil inlet		dimer	nsions			IVIdSS
diameter				diameter of roller dp	B	dı	min	ds max	Dh min	C kN	Co kN	kg
20	CH 42	20	70	41.5	12	3.1	0.6	37	47	7.35	8.35	0.29
35	CH 66	35	95	66	15	3.1	0.6	59	74	17.5	22.3	0.62
55	CH 85	55	120	85	15	3.1	0.6	79	93	20.3	29.5	1
00	CH 124(G)	00	165	124	าา	2.1	1	11/	12/	22 I	EOO	26
00	CH 124X	00	105	124	ZZ	J. I	I	114	134	JJ. I	50.9	2.0
00	CH 148(G)	00	210	1 / 7 E	2E	2.1	1 5	100	162	10.1	76.0	10
90	CH 148X	90	210	147.5	25	5.1	1.5	100	TOZ	49.1	/0.0	4.9
115	CH 178(G)	115	240	170	20	21	15	161	105	00.2	125	60
115	CH 178X	IIJ	240	170	20	J. I	1.5	101	195	00.5	155	0.0
160	CH 228(G)	160	205	227 5	25	6	2	200	246	104	172	11 /
100	CH 228X	100	295	227.5	55	0	Z	200	240	104	175	11.4
210	CH 297(G)	210	200	207.2	40	6	25	272	220	156	201	21.2
210	CH 297X	210	200	297.3	40	0	2.5	212	320	100	201	21.5
250	CH 445(G)	250	540	115 1	15	6	25	/17	172	222	172	25 /
550	CH 445X	550	540	440.4	40	0	2.5	41/	4/3	LLL	4/3	55.4







Unit : mm

		Inner ring			Outer ring		
Shaft diameter	Model No.	PCD 1	Mounting hole	PCD 2	Mounting hole		
20	CH 42	28	6-M3 penetrated	57	$6\mathchar`-$ ø 3.4 penetrated, ø 6.5 counterbore depth 3.3		
35	CH 66	45	8-M4 penetrated	83	8-ø4.5 penetrated, ø8 counterbore depth 4.4		
55	CH 85	65	8-M5 penetrated	105	8-ø5.5 penetrated, ø9.5 counterbore depth 5.4		
80	CH 124(G)	97	10-ø5.5 penetrated, ø9.5 counterbore depth 5.4	148	10-ø5.5 penetrated, ø9.5 counterbore depth 5.4		
	CH 124X		10-M5 penetrated				
00	CH 148(G)	112	12-ø9 penetrated, ø14 counterbore depth 8.6	197	12-ø9 penetrated, ø14 counterbore depth 8.6		
90	CH 148X		12-M8 penetrated	107			
115	CH 178(G)	139	12-ø9 penetrated, ø14 counterbore depth 8.6	217	12-ø9 penetrated, ø14 counterbore depth 8.6		
115	CH 178X		12-M8 penetrated	217			
160	CH 228(G)	10/	12-ø11 penetrated, ø17.5 counterbore depth 10.8	270	12- «11 popotrated «17.5 counterborn donth 10.8		
100	CH 228X	104	12-M10 penetrated	270	12 ⁻ Ø 11 penetrateu, Ø 17.5 counterbore depth 10.8		
210	CH 297(G)	16-ø14 penetrated, ø20 counterbore depth 13	250				
210	CH 297X	240	16-M12 penetrated	300	10-Ø14 penetrated, Ø20 counterbore deptn 13		
250	CH 445(G)	205	24-ø14 penetrated, ø20 counterbore depth 13	505	24- a 14 popotrated a 20 counterbora donth 12		
300	CH 445X	305	24-M12 penetrated	505	24 p 14 perieu aleu, p 20 counterbore deptri 13		

3. CA Series

B

Composition of Model Name & Number



- 1 Model No.
- 2 No symbol- No seal / UU- Two-side seal / U- One-side seal
- Symbol of clearance: G1-Normal preload / G2-Light preload / G3-Heavy preload / GS-Special preload
- Symbol of precision: No symbol-Moderate / H6-High / P4-Super Precision / P2-Ultra Precision
- **5** No symbol–Standard product /E-special specification

- Slim type, The structure inner ring rotation and outer ring separation



Unit : mm

				Мајс	or dimen	isions			Assembly		Basic load rating		Macc
	Model No		Outside	Pitch circle	Width	Oil inlet			dimensions		(radial)		IVIOSS
diameter				diameter of roller dp	B B1		b		ds (max)	Dh (min)	C kN	Co kN	kg
50	CA 5008	50	66	57	8	2	0.8	0.5	53.5	60.5	5.1	7.19	0.08
60	CA 6008	60	76	67	8	2	0.8	0.5	63.5	700.5	5.68	8.68	0.09
70	CA 7008	70	86	77	8	2	0.8	0.5	73.5	80.5	5.98	9.8	0.1
80	CA 8008	80	96	87	8	2	0.8	0.5	83.5	90.5	6.37	11.3	0.11
90	CA 9008	90	106	97	8	2	0.8	0.5	93.5	100.5	6.76	12.4	0.12
100	CA 10008	100	116	107	8	2	0.8	0.5	103.5	110.5	7.15	13.9	0.14
110	CA 11008	110	126	117	8	2	0.8	0.5	113.5	120.5	7.45	15	0.15
120	CA 12008	120	136	127	8	2	0.8	0.5	123.5	130.5	7.84	16.5	0.17
130	CA 13008	130	146	137	8	2	0.8	0.5	133.5	140.5	7.94	17.6	0.18
140	CA 14008	140	156	147	8	2	0.8	0.5	143.5	150.5	8.33	19.1	0.19
150	CA 15008	150	166	157	8	2	0.8	0.5	153.5	160.5	8.82	20.6	0.2
160	CA 16013	160	186	172	13	2.5	1.6	0.8	165	179	23.3	44.9	0.59
170	CA 17013	170	196	182	13	2.5	1.6	0.8	175	189	23.5	46.5	0.64
180	CA 18013	180	206	192	13	2.5	1.6	0.8	185	199	24.5	49.8	0.68
190	CA 19013	190	216	202	13	2.5	1.6	0.8	195	209	24.9	51.5	0.69
200	CA 20013	200	226	212	13	2.5	1.6	0.8	205	219	25.8	54.7	0.71



14 Precautions for Handling Crossed Roller Bearing

- 1. If the assembly part for installation fails to have sufficient rigidity, the contact part of the rollers has intensive stress that severely degrades the performance of a bearing. In an environment with large moment, it is required to evaluate the rigidity of housing and bolts in the process of design.
- 2. Some parts of a crossed roller bearing are made of special synthetic rubber and synthetic resin. For the use at above 80°C, please contact WONST.
- 3. It is required to manage dimensional tolerance of assembly parts according to standards in order to make the inner and outer rings in tight contact with the sides.
- 4. A crossed roller bearing may be damaged by its fall or hit. Any impact to the bearing may cause functional loss even if there is no damage to its appearance. Be careful to handle the product.
- 5. If foreign substances flow in a crossed roller bearing, they may cause its functional loss. It is required to take measures to prevent cutting chips or dust from intruding in the device.
- 6. A crossed roller bearing is already filled with lithium soap grease at the time of shipment. So, it can be used without refilling at the time of assembly. It is necessary to connect a lubrication hole with the oil inlet of the inner or outer ring. Regardless of rotation frequency, it is required to refill enough not for a lubricant to ooze out in the cycle of six months to one year.
- 7. Avoid lubricants with different thickeners or additives, if possible.
- 8. If you need to use the product in a place with impact or vibration load, in cleanroom, or in a special environment with vacuum, low temperature, or high temperature. please contact WON ST.





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1 WON Ball Spline

1. Structure and Features

WON Ball Spline consists of a nut and a shaft. The ball of the nut has a rolling linear motion along the groove of the precisely-ground spline shaft. The spline has the linear motion to deliver torque in the circu mferential direction of the shaft. Based on one nut, the device exerts high performance in the radial direction, in an environment with vibration and impact load, in an environment that requires high positioning precision, or in an environment that needs high-speed motion.

2. Transmission of high torque

A spline groove is precisely ground in the shape close to a ball diameter. For this reason, if torque load is imposed on a shaft or nut, it is evenly applied to two rows of the ball in the torque load direction in the transmission of rotatory force.

3. High load capacity and long life

WON Ball Spline can be designed to be compact. It ensures high stability and long life in an environment with high load or torsional load.

4. Zero gap

Since a ball spline minimizes the gap of the rotational direction, and, if necessary, imposes preload on one spline nut to make clearance zero, it can have a small displacement value and obtain high rigidity and high positioning precision.



WON

2 Selection of Ball Spline

1. Overview

To select a ball spline, it is necessary to identify the details of requirements, prioritize them, and then choose the one that meets the service conditions.

2. Procedure

- Determine service conditions
 Select a type
 Select a model
- 3 Select a model number
- ⁴ Calculate load
- 5 Calculate equivalent load
- 6 Calculate mean load
- 7 Calculate static safety factor
- 8 Calculate life
- 9 Review preload and clearance
- 10 Determine a class of precision
- 11 Lubrication, dust proof, and surface treatment
- 12 Complete selection

- The equipment to be used, maintenance structure, installation space, assembly state, functional requirements, service environments
 Determine an appropriate type in consideration of motion conditions, load magnitude, rigidity, friction, and assembly.
 Determine an appropriate model number and a quantity of nuts in consideration of the assembled space, load, etc.
- Calculate the vertical, horizontal, and moment load imposed on nut and shaft, a critical speed of shaft, an operating speed of shaft, etc.
- Convert each load imposed on nut and shaft into equivalent load.
- Convert each load imposed on nut and shaft and the variable load
 at deceleration & acceleration into mean load.
 - Calculate the static safety factor with basic load rating and maximum equivalent load, and check if the calculated value meets a service condition.
 - Calculate load rating and life, and check if the calculated values meet service conditions.
 - Determine the preload and clearance that meet service conditions.
 - Determine a class of precision for the travel or rotation that a ball spline needs.
- ••••
 - Determine a grease lubricant, oil lubricant, or a special lubricant suitable for an environment. Select a dust-proof seal/ Determine the surface treatment for dust proof and low dust generation.
 - Determine the final specifications of a ball spline.

3 Life Calculation

1. Life

When a ball spline runs in the course of bearing external load, the stress, which arises when the raceway surface of nut and axis and a rolling element bear continuously repeated load, causes fatigue failure and leads to flaking. Life of a ball spline refers to a total travel distance until the point that flaking arises due to initial fatigue failure.

- A ball spline can have defects earlier than the time of normal flaking caused by its wear or fatigue in the following cases
 - a. Excess load by the imprecise assembly following a difference in temperature or tolerance
 - b. If a ball spline is contaminated with foreign substances
 - c. Driving with insufficient lubrication
 - d. Reciprocating motion in a very short distance in the form of vibration or wave during halting or driving
 - e. Excessive load or rotational torque imposed on a ball spline
 - f. Deformation of plastic end-plate

2. Rating fatigue life L

Generally Ball Spline does not always have an equal life span even though its products are manufactured in the same way, because of the difference in scattering of original fatigue of raw material. For this reason, the reference value of life of a ball spline is defined as the rating fatigue life which is a total driving distance that 90% of ball splines in one group with the same specifications can reach without flaking at the time when all in the group run under the same conditions.

Radial load

$$L = \left(\frac{f_{H} \cdot f_{T} \cdot f_{C}}{f_{w}} \cdot \frac{C}{P_{c}} \right)^{3} X 50 \text{ km}$$
Torque load

$$L = \left(\frac{f_{H} \cdot f_{T} \cdot f_{C}}{f_{w}} \cdot \frac{T}{P_{T}} \right)^{3} X 50 \text{ km}$$

$$L_{h} = \frac{10^{3} \cdot L}{2 \times \ell_{s} \times n_{t} \times 60}$$

L	:Rated life	(km)
С	: Basic dynamic rated load	(N)
Т	: Basic dynamic rated torque	(N · m)
Рс	: Calculated load	(N)
Ρт	: Calculated torque	$(N \cdot m)$
fн	: Hardness factor (See Figure 2.)	
f⊤	: Temperature factor (See Figure 3.)	

- fc : Contact factor (See Table 2.)
- fw : Load factor (See Table 3.)
- Lh : Life time (h)
- ls Stroke length (m)
- n_1 : No. of reciprocating motions per minute (min⁻¹)

• Hardness factor (fH)

To implement the best performance of a ball spline, it is necessary to maintain appropriately the hardness and depth of the raceway surface of the nut and shaft that contact a ball as a rolling element.

WON Ball Spline has HRC58–64 surface hardness. There is no need to consider hardness factor. If the hardness is lowered than a baseline, load

capacity of a ball spline decreases. In this case, it is necessary to apply hardness factor to life calculation

• Temperature factor (fT)

If high temperature over 100°C is applied to a ball spline, it is necessary to take into account the temperature factor (f_T) shown in the figure at the time when a ball spline is selected. For use at over 80°C, please contact WON ST.

• Contact factor (fc)

If over two blocks of a ball splines are closely assembled and mounted, uniform load may not be applied to them due to difference among mounting surfaces. Therefore, it is required to multiply basic static load rating (C) and basic dynamic load rating (Co) by the contact factor shown in Table 1.

the one which meets the specifications for high temperature.

150

200

Temperature factor (℃)

Figure 3. Temperature factor(fr) Note) If ambient temperature is over 80°C, it is necessary to change the material of seal, end plate, and support plate to

250

Table 2. Contact factor (fc)

1.0

0,9

0.8

0,7

0.6

0,5

100

Temperature factor (f⊤)

No. of nuts in close contact	Contact factor fc
2	0.81
3	0.72
4	0.66
5	0.61
Over 6	0.6
Common use	1.0





• Load factor (fw)

Generally the static load applied to the nut of a linear motion guide can be calculated in formula. However, while a machine is running, the load imposed on the nut tends to come from vibration or impacts. Therefore, as for the vibration or impact load at high–speed running, it is necessary to divide the basic dynamic load rating of a ball spline by the load factor (fw) shown in Table 3.

Table 3.	Load facto	(fw)
----------	------------	------

External condition	Service conditions	Load factor(fw)
Low	Smooth running at mild speed; no external vibration or impacts	1.0 ~ 1.3
Moderate	Moderate - Low speed; moderate external vibration or impacts	1.2 ~ 1.5
High	High - High speed; strong vibration or impacts	1.5 ~ 2.0
Very high	Very high - Very high speed: strong vibration and impacts at running	2.0 ~ 4.0

Static Safety Factor fs

If heavy load or big impact is imposed on a ball spline, its rolling element and raceway surface have local and permanent deformation that leads to lowering its running performance. Limit of a ball spline depends on its service conditions and requirements.

In this case, the static safety factor fs is calculated in the following formula, and its general values are presented in Table 4.

Table /	Static safety factor	(f_c)
Table 4.	Static Salety lactor	(15)

Service condition	safety factor (fs)
Vibration and impacts	3~5
High running	2~4
Normal operation	1~3

- fs : Static safety factor
- Co : Basic static rated load (N)
- To : Basic static rated torque (N \cdot m)
- Pro : Calculated load (N)
- Pto : Calculated torque $(N \cdot m)$

4. Basic Dynamic Load Rating (C)

Basic dynamic load rating is ability of a ball spline to bear load, which represents an applicable constant load in direction and magnitude when the rated fatigue life is 50km. The reference value of basic dynamic load rating of WON Ball Spline is 50km (ball type). It is used for calculating life of a ball spline while driving under constant load in magnitude from the center of a nut to bottom. Each value of basic dynamic load rating (C) is described in the catalogue.



5. Basic static load rating Co

If a ball spline is applied by excessive load or instantly by big impact load, partially permanent deformation occurs between a rolling element and the raceway surface. If deformation reaches to a certain extent, it hinders smooth driving.

Basic static load rating is defined as the constant static load in direction and magnitude when the total permanent deformation of the raceway surface of nut and shaft and a ball as a rolling element is 0.0001 times bigger than the diameter of the rolling element.

In a ball spline, it refers to the load in radial direction on the center of the contact of nut and ball. Each value of basic static load rating (C_0) is described in the specification table.

6. Basic Dynamic Rated Torque T

Load rated torque refers to the constant torque in direction and size in the condition where 90% in one group of ball splines with the same specification travel 50km without material damage (flaking). See Figure 5.

7. Basic Static Rated Torque To · Basic Static Rated Moment TM

Basic static torque and basic static moment refer to the static torque and moment that can face a certain amount of contact stress at the center of the contact of the rolling element with the maximum load and the raceway surface, when torque or moment load is imposed on. The TM described in the table of dimensions is the basic static rated moment of one sleeve and of two sleeves in close contact.



A compact-type ball spline is used after load rating is corrected in the direction of load. The basic dynamic load rating and basic static load rating shown in the table of dimensions are corrected according to the following table.

(Basic dynamic rated torque, basic static rated torque and basic rated moment are also corrected in the same multiple.)

Sizo	Basic	dynamic load	rating	Basic static load rating				
SIZE	Pressure load	Tension load	Transverse load	Pressure load	Tension load	Transverse load		
4~12	С	С	1.73Co	Co	Co	1.73Co		
15~40	С	С	1.19Co	Co	Co	1.19Co		

WN

4 Preload of Ball Spine

Preload

A ball spline can be preloaded differently depending on service conditions. In order to increase rigidity of a ball spline and lessen the displacement for external load, it is possible to preload the device in the way of removing a gap with the use of the ball (as a rolling element) inserted in between a shaft and a nut, or inserting a ball larger than the gap between the shaft and nut. If vibration or variable load is imposed on and high rigidity are needed, it is necessary to determine the preload suitable for service conditions in consideration of life of a ball spline.

Table 5. Preload

External condition	Symbol	Preload (N)	Applied equipment
Zero preload	CL	$0^{(1)} \sim +$	Mechanical equipment requiring light running with small torque
Standard	СМ	0 ⁽²⁾ ~ -	General mechanical equipment Mechanical equipment requiring small motion resistance
Light preload	СТ	0.02Co	 Mechanical equipment requiring rigidity Mechanical equipment to which large vibration or impact load is applied Mechanical equipment to which big moment load or variable load is applied

Note. (1) Zero preload

(2) Zero or a little of preload

Remark: Light preload is not applied to WSP (F) (K) 4.



WON

5 Precision

Precision of a ball spline is related to its outside diameter of nut runout on the basis of shaft. WON Ball Spline has the precision of KS B 1422(JIS B 1193).

The precision of ball spline is categorized into three classes: normal (no symbol), high (H), and precision (P).

A class of precision is described according to the arrangement of a model number.

The values in the tables include the precision in the case where the shaft ends are processed.

For the precision class of ball spline, see tables 6, 7, and 8.

WON ST also manufactures a product that has higher precision than in the tables, or a product with a special shape at request of a customer. If necessary, please contact us.





Table 6. Torsion of ball spline

С

Table 7. Precision of each part of ball spline

Unit∶µm

Mode	el no.	WSP4	WSP 5 -	WSP6	WSP8 WLS8	WSP10 WLS10	WSP 12 -	– WLS 13	WSP15 WLS16	WSP 20 WLS 20	WSP 25 WLS 25	WSP 30 WLS 30	WSP40 WLS40
	Normal (No symbol)		3	3		4	1	46			53		62
	High (H) 14				1	7		19		2	22		
	Precision (P)		8			1	0	12			13		15
©Vertical angle	Normal (No symbol)			2	2			27			3	39	
of the cross secti	High (H)			()		6				1	16	
	Precision (P)		6						8		<u>(</u>)	11
③ Vertical angle of th	Normal (No symbol)		2	7			33				3	9	46
	High (H)		1	1		13					1	6	19
	Precision (P)		{	3		9					1	1	13





Unit:um

Table 8. Radial direction runout of the central line of ball spline shaft

6 Lubrication and Dust Resistance

A ball spline has the treatment with anti-rust additives that has affinity with all mineral oils. It can be lubricated with oil or grease. Grease lubrication generates an additional sealing effect, and sticks well in a ball spline. Therefore, it is recommended to use grease.

In case of grease refilling, it is necessary to use a ball spline whose nut has an oil hole. WON Ball Spline is dust resistant through its special rubber seal. Nevertheless, if a lot of foreign substances or dust float, it is recommended to attach an anti-dust device to protect a spline shaft against relatively large impurities like cutting chips or sand.





7 Assembly

Nut fitting

As for nut and housing fitting, WON Ball Spline has a transition fit (J7).

If precision and rigidity are not needed much, it is possible to apply a clearance fit (H7).

Insertion of spline nut

Inserting a spline nut into a housing may affect the operation of a device. In order to prevent any impact from being imposed on a retainer, use a jig for installation as shown in the following figure when inserting the nut.

Insertion of spline shaft

When a spline shaft is inserted into a spline nut, a ball may come out. Therefore, set raceway groove of the shaft, ball row of the spline nut, and position of a seal rightly before insertion.

8 Caution for Use

- The working temperature of WON Ball Spline is max. 120℃ in case of discontinuous use, and max. 80℃ for continuous use. If above 80℃, please contact WON ST.
- (2) WON Ball Spline is set to optimal precision in the condition where its spline shaft and nut mark are in the same direction and position (See Figure 10). To attach it to a machine, it is careful not to change steering of a spline shaft, arrangement of a nut, and a steering direction.
- ③ If more than two keys are used to fix the rotation direction of an outer sleeve on the basis of one shaft and over two nuts, it is required to make the position of each key groove of nut in parallel. For this case, please contact WON ST.







9 Compact Ball Spline

1. Structure and Features

WON Ball Spline is composed of a nut and a shaft. The nut has a ball as a rolling element installed in. The rolling surface of the shaft has a Gothic arch shaped groove processed. The ball of the nut rolls in a linear line along the precisely polished groove of the rolling surface. With one nut, the device can bear radial load and moment load and can transmit rotational torque in the circumferential direction of the shaft. With the use of the ball in between the raceways of nut and shaft, it is possible to apply preload. For this reason, the ball spline is strongly resistant for vibration or impact load. The linear motion system is applicable to an environment that needs high positioning precision, high-speed motion, and a long life span.

2. Transmission of high torque

A ball spline have Gothic arch shaped grooves in two rows on the rolling surface of nut and the rolling surface of shaft, which are precisely polished. Therefore, a ball can contact four points. Thanks to such a structure, it is possible to let the two rows evenly bear the rotational torque of nut and transmit rotational force.

3. High load capacity and long life

A ball spline has a linear type and has the structure of contact between the rolling surface of nut and shaft, and a ball as a rolling element. In the condition diameter of a shaft is equal, the device is capable of bearing rated load about ten times more than a ball bushing, ensuring a long life span. Therefore, it supports a compact design of equipment and bears moment load and overhang load as well as radial load.







Classification	Туре	Shape	and Features	
Cylinder	WSP WSPL	2	It has a general spline nut that has a key groove helping to fix the position of a rotational direction accurately.	Ba
Type WSPT WSPTO	2	Since a retainer is placed inside, this ball spline has good appearance and rigidity.	all Spline	
Flange Type	WSPF WSPFL	3.7	As a round flange type, it can be installed easily.	
	WSPK WSPKL	3.7	As a square flange type, it can be installed easily.	
	WSPTF WSPTFO	3.)	As a round flange type, it can be installed easily.	

WSP Series

An example of the Composition of Model Name & Number



- 1 Number of nuts assembled in one shaft
- 2 Model No.
- 3 Material of nut: No symbol-Standard material/M-Stainless
- A No symbol-Standard nut / E-Special nut specification
- Type of shaft: S-Solid / H-Hollow
- 6 Length of shaft
- Symbol of clearance : CL-No preload / CM-Standard / CT-Light preload
- Symbol of precision : No symbol-Normal / H-Precision / P-Super
- S Material of shaft : No symbol-Standard material / M-Stainless
- No symbol-Standard shaft / E-Special shaft specification

		Major dimensions										
Model No.	Outside diameter				Dir	Dimension of key groove				Main	Length	Max.
	D	Tolerance				Tolerance			d	Tolerance		length
WSP 4 ⁽²⁾	8	0	12	7.9	-		1	-	4		100 150	200
WSP 5	10	-0.009	17.5	7.5 8.9 2	2		1.2	6	5	0 -0.012	100 150	200
WSP 6	12	0	20.6	12	2	+0.014	1.2	8	6	0.012	150 200	300
WSP 8	15	-0.011	24.4	14	2.5	0	1.5	8.5	8	0	150 200 250	500
WSP10	19	_	29.6	17.8	3		1.8	11	10	-0.015	200 300	600
WSP12	21	0 -0.013	34.7	22.7	3		1.8	15	12	0	200 300 400	800
WSP15	23	0.010	40	27	3.5		2	20	13.6	-0.018	200 300 400	1000
WSP 20	30		50	33	4	+0.018	2.5	26	18.2		300 400 500 600	1000
WSP 25	37	0 -0.016	60	39.2	5	0	3	29	22.6	0 -0.021	300 400 500 600 800	
WSP 30	45		70	43	43 7	10.022	4	35	27.2		400 500 600	1200
WSP 40	60	0 -0.019	100	70.8	10	+0.022 0	4.5	55	37.2	0 -0.025	400 500 600 700 1100	

Τм

Note (1) The top value of the static rated moment TM means the value of one nut, and the bottom value represents the value of two nuts in contact.

(2) WSP4 has no seal.





Unit : mm

Ball Spline

Basic dynamic load rating	Basic static load rating	Basic dynamic rated torque	Basic static rated torque	Basic static rated moment ⁽¹⁾	Splin	e nut	Model
C N	Co N	T N∙m	To N∙m	Tм N∙m	Spline nut g	Spline shaft g/100mm	No.
304	382	0.686	0.882	0.49 2.94	2.5	9.6	WSP4
588	637	1.764	1.96	1.078 7.84	4.8	14.9	WSP 5
715	853	2.45	3.038	<u> </u>	8.9	19	WSP 6
1176	1372	5.488	6.174	3.234 21.56	15.9	39	WSP 8
1862	2156	10.78	12.74	6.958 41.16	31.5	60.5	WSP 10
2156	2646	14.7	18.62	10.78 58.80	44	87.5	WSP 12
4241	6076	31.36	45.08	27.44 151.90	59.5	111	WSP 15
6566	9016	65.66	90.6	49.00 287.14	130	202	WSP 20
11196	14294	138.94	177.93	92.76 550.78	220	310	WSP 25
15394	19392	230.91	291.88	146.94 873.65	430	450	WSP 30
21291	31587	425.83	631.75	363.85 1939.22	760	808	WSP 40

1N≒0.102kgf

WSPL Series

An example of the Composition of Model Name & Number



- 2 Model No.
- 3 Material of nut: No symbol-Standard material/M-Stainless
- A No symbol-Standard nut / E-Special nut specification
- **5** Type of shaft: S-Solid / H-Hollow
- 6 Length of shaft
- Symbol of clearance : CL-No preload / CM-Standard / CT-Light preload
- Symbol of precision : No symbol-Normal / H-Precision / P-Super
- S Material of shaft : No symbol-Standard material / M-Stainless
- No symbol-Standard shaft / E-Special shaft specification

		Major dimensions										
Model No.	Outside diameter				Dir	Dimension of key groove				Main	Length	Max.
	D	Tolerance				Tolerance			d	Tolerance		length
WSPL 5	10	0 -0.009	26	26 17.4 2 1.2 6 5	2	0	100 150	200				
WSPL 6	12	0	29.8	21.2	2	+0.014	1.2	8	6	-0.012	150 200	300
WSPL 8	15	-0.011	36.7	26.3	2.5	0	1.5	8.5	8		150 200 250	500
WSPL 10	19		47	34.9	3		1.8	11	10	0 -0.015	200 300	600
WSPL12	21	0 -0.013	53.1	41.1	3		1.8	15	12		200 300 400	800
WSPL15	23	0.010	65	52	3.5		2	20	13.6		200 300 400	1000
WSPL 20	30		71	54	4	+0.018	2.5	26	18.2	-0.018	300 400 500 600	1000
WSPL 25	37	0 -0.016	84	63.2	5	Ŭ	3	29	22.6	0	300 400 500 600 800	1200
WSPL 30	45		98	71	7	+0.022 0	4	35	27.2	-0.021	400 500 600 700 1100	1200

Τм

Note (1) The top value of the static rated moment TM means the value of one nut, and the bottom value represents the value of two nuts in contact.

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Ball Spline

Ball Spline



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Basic dynamic load rating	Basic static load rating	Basic dynamic rated torque	Basic static rated torque	Basic static rated moment ⁽¹⁾	Splin	e nut		
C N	Co N	⊤ N∙m	To N∙m	Tм N∙m	Spline nut g	Spline shaft g/100mm	WODELINO.	
882	1176	2.646	3.528	3.136 19.60	7.9	14.9	WSPL 5	
1078	1470	3.626	5.194	4.998 27.44	14.5	19	WSPL 6	
1764	2450	8.33	11.76	9.80 56.84	26.5	39	WSPL 8	
2842	4018	16.66	23.52	22.54 115.64	56.5	60.5	WSPL 10	
3234	4802	21.56	33.32	32.34 156.80	76.8	87.5	WSPL 12	
6370	11564	48.02	86.24	94.08 447.86	110	111	WSPL 15	
9310	15092	93.10	150.92	127.40 619.36	198	202	WSPL 20	
15394	23191	192.92	289.88	228.91 1189.52	336	310	WSPL 25	
21291	31587	319.87	473.81	363.85 1899.24	634	450	WSPL 30	


WSPT Series

An example of the Composition of Model Name & Number



- 1 Number of nuts assembled in one shaft
- **2** Model No.
- 3 Material of nut: No symbol-Standard material/M-Stainless
- A No symbol-Standard nut / E-Special nut specification
- 5 Type of shaft: S-Solid / H-Hollow
- 6 Length of shaft
- Symbol of clearance : CL-No preload / CM-Standard / CT-Light preload
- Symbol of precision : No symbol-Normal / H-Precision / P-Super
- S Material of shaft : No symbol-Standard material / M-Stainless
- No symbol-Standard shaft / E-Special shaft specification

				Major dimensions										
Model No.	Outsid	e diameter		D	imension of	key groo		Main		Length	Max.			
	D	Tolerance			Tolerance			d	Tolerance		length			
WSPT 4	10	0 -0.009	16	2		1.2	6	4	0	100 150	200			
WSPT 5	12		20	2.5		1.2	8	5	-0.012	100 1 50	200			
WSPT 6	14	0	25	2.5	+0.014	1.2	10.5	6		150 200	300			
WSPT 8	16	0.011	25	2.5	0	1.2	10.5	8	0	150 200 250	500			
WSPT 10	21		33	3		1.5	13	10	-0.015	200 300	600			
WSPT 12	24	0 -0.013	36	3		1.5	15	12	0	200 300 400	800			
WSPT 15	31	0.015	50	3.5	10.010	2	17.5	13.6	-0.018	200 300 400	1000			
WSPT 20	35	0 -0.016	63	4	+0.018 0	2.5	29	18.2	0 -0.021	300 400 500 600	1000			

Τм

Note (1) The top value of the static rated moment TM means the value of one nut, and the bottom value represents the value of two nuts in contact.





Unit : mm

Ball Spline

Basic dynamic load rating	Basic static load rating	Basic dynamic rated torque	Basic static rated torque	Basic static rated moment ⁽¹⁾	Splin	e nut	
	Co N	⊤ N∙m	To N∙m	Tм N∙m	Spline nut g	Spline shaft g/100mm	Model No.
441	637	0.588	0.784	0.882 6.272	2.5	9.6	WSPT 4 ⁽²⁾
686	882	0.882	1.372	1.47 11.368	4.8	14.9	WSPT 5
1176	2156	0.98	1.96	4.9 35.57	8.9	19	WSPT 6
1470	2548	1.96	2.94	5.88 43.12	15.9	39	WSPT 8
2842	4900	3.92	7.84	15.68 96.04	31.5	60.5	WSPT 10
3528	5782	5.88	10.78	19.20 135.24	44	87.5	WSPT 12
7056	12642	31.36	34.30	66.84 385.14	59.5	111	WSPT 30
10192	17836	56.84	55.86	115.64 686.0	130	202	WSPT 40

WSPTF Series

An example of the Composition of Model Name & Number



- 1 Number of nuts assembled in one shaft
- **2** Model No.
- 3 Material of nut: No symbol-Standard material/M-Stainless
- A No symbol-Standard nut / E-Special nut specification
- 5 Type of shaft: S-Solid / H-Hollow
- 6 Length of shaft
- Symbol of clearance : CL-No preload / CM-Standard / CT-Light preload
- Symbol of precision : No symbol-Normal / H-Precision / P-Super
- S Material of shaft : No symbol-Standard material / M-Stainless
- 10 No symbol-Standard shaft / E-Special shaft specification





		Major dimensions									
Model No.	Outside			D.			V			Length	Max.
	D	Tolerance		DI		pcu	AXTXZ	d	Tolerance		length
WSPTF 6	14	0 -0.011	25	30	5	22	3.4×6.5×3.3	6		150 200	300
WSPTF 8	16	0	25	32	5	24	3.4×6.5×3.3	8	0 -0.012	150 200 250	500
WSPTF 10	21	-0.013	33	42	6	32	4.5×8×4.4	10		200 300	600
WSPTF 12	24		36	44	7	33	4.5×8×4.4	12	0	200 300 400	800
WSPTF 15	31	0 -0.016	50	51	7	40	4.5×8×4.4	13.6	-0.015	200 300 400	1000
WSPTF 20	35		63	58	9	45	5.5 x 9.5 x 5.4	18.2	0 -0.018	300 400 500 600	1000

Note (1) The top value of the static rated moment TM means the value of one nut, and the bottom value represents the value of two nuts in contact.







Unit : mm

Basic dynamic load rating	Basic static load rating	Basic dynamic rated torque	Basic static rated torque	Basic static rated moment ⁽¹⁾	Spline nut		Model No
C N	Co N	T N∙m	To N∙m	Tм N∙m	Spline nut g	Spline shaft g/100mm	Model No.
1176	2156	0.98	1.96	4.9 35.57	37.2	19	WSPTF 6
1470	2548	1.96	2.94	5.88 43.12	39.5	39	WSPTF 8
2842	4900	3.92	7.84	15.68 96.04	64.2	60.5	WSPTF 10
3528	5782	5.88	10.78	19.20 135.24	124.7	87.5	WSPTF 12
7056	12642	31.36	34.30	66.64 385.14	265.7	111	WSPTF 15
10192	17836	56.84	55.86	115.64 686	392.5	202	WSPTF 20

WSPF Series

An example of the Composition of Model Name & Number



- 1 Number of nuts assembled in one shaft
- **2** Model No.
- S Material of nut: No symbol-Standard material/M-Stainless
- A No symbol-Standard nut / E-Special nut specification
- **5** Type of shaft: S-Solid / H-Hollow
- 6 Length of shaft
- Symbol of clearance : CL-No preload / CM-Standard / CT-Light preload
- Symbol of precision : No symbol-Normal / H-Precision / P-Super
- S Material of shaft : No symbol-Standard material / M-Stainless
- No symbol-Standard shaft / E-Special shaft specification

							Major	dimensi	ons				
Model No.	Outside	diameter	L1	L2	D1	Е		pcd	dı		ameter	Length	Max.
	D	Tolerance								d	lolerance	L	length
WSPF 5	10	0 -0.009	17.5	8.9	23	7	2.7	17	3.4	5	0	100 150	200
WSPF 6	12	0	20.6	12	25	7	2.7	19	3.4	6	-0.012	150 200	300
WSPF 8	15	-0.011	24.4	14	28	9	3.8	22	3.4	8	0	150 200 250	500
WSPF 10	19		29.6	17.8	36	10	4.1	28	4.5	10	-0.015	200 300	600
WSPF 12	21	0 -0.013	34.7	22.7	38	10	4	30	4.5	12	0	200 300 400	800
WSPF 15	23		40	27	40	11	4.5	32	4.5	13.6	-0.018	200 300 400	1000
WSPF 20	30		50	33	46	14	5.5	38	4.5	18.2		300 400 500 600	1000
WSPF 25	37	0 -0.016	60	39.2	57	17	6.6	47	5.5	22.6	0 -0.021	300 400 500 600 800	
WSPF 30	45		70	43	65	21	7.5	54	6.6	27.2		400 500 600	1200
WSPF 40	60	0 -0.019	100	70.8	93	26.6	12	73	9	37.2	0 -0.025	700 1100	

Note (1) The top value of the static rated moment TM means the value of one nut, and the bottom value represents the value of two nuts in contact.



Τм







Unit : mm

Ball Spline

Basic dynamic load rating	Basic static load rating	Basic dynamic rated torque	Basic static rated torque	Basic static rated moment ⁽¹⁾	d Splinenut		Model No.	
C N	Co N	T N∙m	To N∙m	Tм N∙m	Spline nut g	Spline shaft g/100mm	Moder No.	
588	637	1.764	1.96	1.078 7.84	8.9	14.9	WSPF 5	
715.4	853	2.45	3.038	1.764 11.76	13.9	19	WSPF 6	
1176	1372	5.488	6.174	3.234 21.56	23.5	39	WSPF 8	
1862	2156	10.78	12.74	6.958 41.16	45	60.5	WSPF 10	
2156	2646	14.70	18.62	10.78 58.80	59	87.5	WSPF 12	
4214	6076	31.36	45.08	27.44 151.90	77	111	WSPF 15	
6566	9016	65.66	90.16	49.00 287.14	150	202	WSPF 20	
11196	14294	138.94	177.93	92.76 550.78	255	310	WSPF 25	
15349	19392	230.91	291.88	146.94 873.65	476	450	WSPF 30	
21291	31587	425.83	631.75	363.85 1939.22	962	808	WSPF 40	

WSPFL Series

An example of the Composition of Model Name & Number



1 Number of nuts assembled in one shaft

- 2 Model No.
- 3 Material of nut: No symbol-Standard material/M-Stainless
- A No symbol-Standard nut / E-Special nut specification
- **5** Type of shaft: S-Solid / H-Hollow
- 6 Length of shaft
- Symbol of clearance : CL-No preload / CM-Standard / CT-Light preload
- 8 Symbol of precision : No symbol-Normal / H-Precision / P-Super
- Material of shaft : No symbol-Standard material / M-Stainless
- 10 No symbol-Standard shaft / E-Special shaft specification





	Major dimensions												
Model No.	Outside	diameter						ncd	d			Length	Max.
	D	Tolerance			וט			μcu	u	d	Tolerance		length
WSPFL 5	10	0 -0.009	26	17.4	23	7	2.7	17	3.4	5	0	100 150	200
WSPFL 6	12	0	29.8	21.2	25	7	2.7	19	3.4	6	-0.012	150 200	300
WSPFL 8	15	-0.011	36.7	26.3	28	9	3.8	22	3.4	8	0	150 200 250	500
WSPFL 10	19		47	34.9	36	10	4.1	28	4.5	10	-0.015	150 200 250	600
WSPFL 12	21	0 -0.013	53.1	41.1	38	10	4	30	4.5	12	0	200 300	800
WSPFL 15	23		65	52	40	11	4.5	32	4.5	13.6	-0.018	200 300 400	1000
WSPFL 20	30		71	54	46	14	5.5	38	4.5	18.2		300 400 500 600	1000
WSPFL 25	37	0 -0.016	84	63.2	57	17	6.5	47	5.5	22.6	0 -0.021	300 400 500 600 800	1200
WSPFL 30	45		98	71	65	21	7.5	54	6.5	27.2		400 500 600 700 1100	1200

Note (1) The top value of the static rated moment TM means the value of one nut, and the bottom value represents the value of two nuts in contact.



WON







Basic dynamic load rating	Basic static load rating	Basic dynamic rated torque	Basic static rated torque	Basic static rated moment ⁽¹⁾	^{ed} Spline nut		Model No.	
C N	Co N	T N∙m	To N∙m	Tм N∙m	Spline nut g	Spline shaft g/100mm	MODELINO.	
882	1176	2.646	3.528	3.136 19.60	12	14.9	WSPFL 5	
1078	1470	3.626	5.194	4.998 27.44	19.5	19	WSPFL 6	
1764	2450	8.33	11.76	9.80 56.84	34.1	39	WSPFL 8	
2842	4018	16.66	23.52	22.54 115.64	70	60.5	WSPFL 10	
3234	4802	21.56	33.32	32.34 156.80	91.8	87.5	WSPFL 12	
6370	11564	48.02	86.24	94.08 447.86	127.5	111	WSPFL 15	
9310	15092	93.10	150.92	127.40 619.36	218	202	WSPFL 20	
15394	23191	192.92	289.88	228.91 1189.52	371	310	WSPFL 25	
21291	31587	319.84	473.81	363.85 1899.24	680	450	WSPFL 30	

WSPK Series

An example of the Composition of Model Name & Number



- 1 Number of nuts assembled in one shaft
- **2** Model No.
- 3 Material of nut: No symbol-Standard material/M-Stainless
- A No symbol-Standard nut / E-Special nut specification
- S Type of shaft: S-Solid / H-Hollow
- 6 Length of shaft
- Symbol of clearance : CL-No preload / CM-Standard / CT-Light preload
- **8** Symbol of precision : No symbol-Normal / H-Precision / P-Super
- S Material of shaft : No symbol-Standard material / M-Stainless
- 10 No symbol-Standard shaft / E-Special shaft specification

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	Major dimensions													
Model No.	Outside	diameter			Dı				ncd				Length	Max.
	D	Tolerance				D			pcu	u	d	Tolerance		length
WSPK 4 (2)	8	0	12	7.9	21	10	4.6	2.5	15	3.4	4		100 150	200
WSPK 5	10	-0.009	17.5	8.9	23	18	7	2.7	17	3.4	5	0 -0.012	100 150	200
WSPK 6	12	0	20.6	12	25	20	7	2.7	19	3.4	6		150 200	300
WSPK 8	15	-0.011	24.4	14	28	22	9	3.8	22	3.4	8	0	150 200 250	500
WSPK 10	19		29.6	17.8	36	28	10	4.1	28	4.5	10	-0.015	200 300	600
WSPK 12	21	0 -0.013	34.7	22.7	38	30	10	4	30	4.5	12	0	200 300 400	800
WSPK 15	23		40	27	40	31	11	4.5	32	4.5	13.6	-0.018	200 300 400	1000
WSPK 20	30		50	33	46	35	14	5.5	38	4.5	18.2		300 400 500 600	1000
WSPK 25	37	0 -0.016	60	39.2	57	43	17	6.6	47	5.5	22.6	0 -0.021	300 400 500 600 800	
WSPK 30	45		70	43	65	50	21	7.5	54	6.6	27.2		400 500 600	1200
WSPK 40	60	0 -0.019	100	70.8	93	73	26.6	12	73	9	37.2	0 -0.025	700 1100	

Note (1) The top value of the static rated moment TM means the value of one nut, and the bottom value represents the value of two nuts in contact.

(2) WSPK4 has no seal.





Unit : mm

Ball Spline

WON

Basic dynamic load rating	Basic static load rating	Basic dynamic rated torque	Basic static rated torque	Basic static rated moment ⁽¹⁾	ed Spline nut		Model No
C N	Co N	T N∙m	To N∙m	Tм N∙m	Spline nut g	Spline shaft g/100mm	MODELINO.
303	382	0.686	0.882	0.49 2.94	5.1	9.6	WSPK 4 (2)
588	637	1.764	1.96	1.078 7.84	8.9	14.9	WSPK 5
715.4	852.6	2.45	3.038	1.764 11.76	13.9	19	WSPK 6
1176	1372	5.488	6.174	3.234 21.56	23.5	39	WSPK 8
1862	2156	10.78	12.74	6.958 41.16	45	60.5	WSPK 10
2156	2646	14.70	18.62	10.78 58.80	59	87.5	WSPK 12
4214	6076	31.36	45.08	27.44 151.90	77	111	WSPK 15
6566	9016	65.66	90.16	49.00 287.14	150	202	WSPK 20
11196	14294	138.94	177.93	92.76 550.78	255	310	WSPK 25
15394	19392	230.91	291.88	146.94 873.65	476	450	WSPK 30
21291	31587	425.83	631.75	363.85 1939.22	962	808	WSPK 40

WSPKL Series

An example of the Composition of Model Name & Number



- 1 Number of nuts assembled in one shaft
- 2 Model No.
- 3 Material of nut: No symbol-Standard material/M-Stainless
- A No symbol-Standard nut / E-Special nut specification
- **5** Type of shaft: S-Solid / H-Hollow
- 6 Length of shaft
- Symbol of clearance : CL-No preload / CM-Standard / CT-Light preload
- Symbol of precision : No symbol-Normal / H-Precision / P-Super
- Material of shaft : No symbol-Standard material / M-Stainless
- 10 No symbol-Standard shaft / E-Special shaft specification

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							M	ajor dir	mensio					
Model No.	Outside	diameter			D,								Length	Max.
	D	Tolerance					D		μcu	u	d	Tolerance		length
WSPKL 5	10	0 -0.009	26	17.4	23	7	18	2.7	17	3.4	5	0	100 150	200
WSPKL 6	12	0	29.8	21.2	25	7	20	2.7	19	3.4	6	-0.012	150 200	300
WSPKL 8	15	-0.011	36.7	26.3	28	9	22	3.8	22	3.4	8	0	150 200 250	500
WSPKL 10	19		47	34.9	36	10	28	4.1	28	4.5	10	-0.015	200 300	600
WSPKL 12	21	0 -0.013	53.1	41.1	38	10	30	4	30	4.5	12	0	200 300 400	800
WSPKL 15	23		65	52	40	11	31	4.5	32	4.5	13.6	-0.018	200 300 400	1000
WSPKL 20	30		71	54	46	14	35	5.5	38	4.5	18.2		300 400 500 600	1000
WSPKL 25	37	0 -0.016	84	63.2	57	17	43	6.6	47	5.5	22.6	0 -0.021	300 400 500 600 800	1200
WSPKL 30	45		98		65	21	50	7.5	54	6.6	27.2		400 500 600 700 1100	1200

Note (1) The top value of the static rated moment TM means the value of one nut, and the bottom value represents the value of two nuts in contact.









Unit : mm

Basic dynamic load rating	Basic static load rating	Basic dynamic rated torque	Basic static rated torque	Basic static rated moment ⁽¹⁾	d Spline nut		Model No	
C N	Co N	T N∙m	To N∙m	Tм N∙m	Spline nut g	Spline shaft g/100mm	MODELINO.	
882	1176	2.646	3.528	3.136 19.60	12	14.9	WSPKL 5	
1078	1470	3.626	5.194	4.998 27.44	19.5	19	WSPKL 6	
1764	2450	8.33	11.76	9.80 56.84	34.1	39	WSPKL 8	
2842	4010	16.66	23.52	22.54 115.64	70	60.5	WSPKL 10	
3234	4802	21.56	33.32	32.34 156.80	91.8	87.5	WSPKL 12	
6370	11564	48.02	86.24	94.08 447.86	127.5	111	WSPKL 15	
9310	15092	93.10	150.92	127.40 619.36	218	202	WSPKL 20	
15394	23191	192.92	289.88	228.91 1189.52	371	310	WSPKL 25	
21291	31587	319.87	473.81	363.85 1899.24	680	450	WSPKL 30	

WSPTO Series



단위 : mm

		Major dimensions												
Model No.	Outside diameter			Din	nension o	f key groo	ove	Axial di	ameter	Length	Max.			
	D	Tolerance			Tolerance			d	Tolerance		length			
WSPTO 16	31	0 -0.013	50	3.5	+0.018	2	17.5	16	0 -0.017	200 300 400	1000			
WSPTO 20	35	0 -0.016	63	4	0	2.5	29	20	0 -0.020	300 400 500 600	1000			

Model No.	Basic dynamic Basic static load load rating rating		Basic dynamic rated torque	Basic static rated torque	Basic static rated moment ⁽¹⁾	Splin	Spline nut	
		Co N		To N∙m	Tм N∙m	Spline nut g	Spline shaft g/100mm	
WSPTO 16	7060	12600	31.4	34.3	67.6 393	165	160	
WSPTO 20	10200	17800	56.9	55.9	118 700	225	250	

1N≒0.102kgf

Note (1) The top value of the static rated moment TM means the value of one nut, and the bottom value represents the value of two nuts in contact.





Ball Spline









1 Number of nuts assembled in one shaft

2 Model No.

3 Material of nut: No symbol-Standard material/M-Stainless

- No symbol-Standard nut / E-Special nut specification
- 5 Type of shaft: S-Solid / H-Hollow
- 6 Length of shaft
- Symbol of clearance : CL-No preload / CM-Standard / CT-Light preload
- 8 Symbol of precision : No symbol-Normal / H-Precision / P-Super
- S Material of shaft : No symbol-Standard material / M-Stainless
- 10 No symbol-Standard shaft / E-Special shaft specification





Unit : mm

		Major dimensions													
Model No.	Outside diameter							Axial diameter		Length	Max.				
	D	Tolerance	L1	01		ρεα	XXXXZ	d	Tolerance	e L	length				
WSPTFO 16	31	0 -0.013	50	51	7	40	4.5x8x4.4	16	0 -0.017	200 300 400	1000				
WSPTFO 20	35	0 -0.016	63	58	9	45	5.5x9.5x5.4	20	0 -0.020	300 400 500 600	1000				

Model No.	Basic dynamic Basic static load load rating rating		Basic dynamic rated torque	Basic static rated torque	Basic static rated moment ⁽¹⁾	Spline nut		
		Co N		To N∙m	Тм N • m	Spline nut g	Spline shaft g/100mm	
WSPTFO 16	7060	12600	31.4	34.3	67.6 393	165	160	
WSPTFO 20	10200	17800	56.9	55.9	118 700	225	250	

1N≒0.102kgf

Note (1) The top value of the static rated moment TM means the value of one nut, and the bottom value represents the value of two nuts in contact.

10 Linear Ball Spline

1. Structure and Features

WON Linear Ball Spline is composed of a spline shaft with a groove and a nut. The spline nut has a retainer, a seal, and a ball installed in. It supports smooth motion.

2. High load capacity and long life

The raceway surface an R-shape similar to diameter of a ball. Since it is precisely polished, it has a wide area of contact with a ball. Therefore, the device a high load capacity and a long life span.

3. Torque transmission with high precision

The groove of shaft and cylinder adjusts a ball at an appropriate contact angle. Therefore, with one shaft, it is possible to transmit torque.

In addition, by setting the gap of the rotation direction for preload to zero, it is possible to increase rigidity and determine an accurate position of rotation.

4. High speed movement and high speed rotation

The cylinder of a linear ball spline is compact and is balanced well. Therefore, it has good performance in high-speed motion or high-speed rotation.

5. Product components

WON Linear Ball Spline has eight different types (8 to 40) of sizes, and has two different types of nut shapes (cylinder type: WLS, flange type: WLSF).

% If you need a linear ball spline with a different material, please contact us.

6. Easy further processing

WON Linear Ball Spline has a groove installed in its round shaft. Therefore, the device supports multiple types of processing easily and is applicable in wide areas.







Classification	Туре	Shape	and Features
Cylinder Type	WLS	31	It has a general spline nut that has a key groove helping to fix the position of a rotational direction accurately.
Flange Type	WLSF	5	Flange Type – As a round flange type, it can be installed easily.

% It is possible to select a different type of WON Linear Ball Spline depending on a use. A seal is basically installed in any type of nut.

WLS Series

An example of the Composition of Model Name & Number



- 1 Number of nuts assembled in one shaft
- 2 Model No.
- 3 Material of nut: No symbol-Standard material/M-Stainless
- A No symbol-Standard nut / E-Special nut specification
- 5 Type of shaft: S-Solid / H-Hollow
- 6 Length of shaft
- Symbol of clearance : CL-No preload / CM-Standard / CT-Light preload
- 8 Symbol of precision : No symbol-Normal / H-Precision / P-Super
- Material of shaft : No symbol-Standard material / M-Stainless
- 10 No symbol-Standard shaft / E-Special shaft specification

		Major dimensions											
Model No.	Outside	diameter	Ler	Length		mension o	of key groc		0	Axial d	iameter		
	D	Tolerance		Tolerance		Tolerance				d	Tolerance		
WLS 8	16	0 -0.011	25		2.5		1.2	10.5	1.5	8	0		
WLS 10	21	0	33	0 -0.011	3	+0.014 0	1.5	13	1.5	10	-0.015		
WLS 13	24	-0.013	36		3		1.5	15	1.5	13	0		
WLS 16	31		50		3.5		2	17.5	2	16	-0.018		
WLS 20	35	0	63		4		2.5	29	2	20			
WLS 25	42	-0.016	71		4	+0.018 0	2.5	36	3	25	0 -0.021		
WLS 30	47		80	0 -0.019	4		2.5	42	3	30			
WLS 40	64	0 -0.019	100	0.015	6		3.5	52	4	40	0		









WLS 16~40





	Init		m	m	
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Basic dynamic load rating	Basic static load rating	Basic dynamic rated torque	Basic static rated torque	Basic static rated torque	Spline nut		Model No.	
	Co N	T N∙m	To N∙m	Tм N∙m	Spline nut g	Spline shaft g/100mm	Model No.	
1,450	2,870	2.1	3.7	7.4	23	38	WLS 8	
2,730	5,070	4.4	8.2	18.0	54	60	WLS 10	
2,670	4,890	21	39.2	13.7	70	100	WLS 13	
6,120	11,200	60	110	46	150	150	WLS 16	
8,900	16,300	105	194	110	220	240	WLS 20	
12,800	23,400	189	346	171	330	370	WLS 25	
18,600	23,200	307	439	181	360	540	WLS 30	
30,800	37,500	647	934	358	950	960	WLS 40	

WLSF Series

An example of the Composition of Model Name & Number



- 1 Number of nuts assembled in one shaft
- 2 Model No.
- 3 Material of nut: No symbol-Standard material/M-Stainless
- A No symbol-Standard nut / E-Special nut specification
- 5 Type of shaft: S-Solid / H-Hollow
- 6 Length of shaft
- Symbol of clearance : CL-No preload / CM-Standard / CT-Light preload
- Symbol of precision : No symbol-Normal / H-Precision / P-Super
- S Material of shaft : No symbol-Standard material / M-Stainless
- 10 No symbol-Standard shaft / E-Special shaft specification



	Major dimensions												
Model No.	Outside	diameter	Ler	ngth				V v V v 7			Axial di	ameter	
	D	Tolerance		Tolerance	DI		FCD	~~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~		0	d	Tolerance	
WLSF8	16	0 -0.011	25		32	5	24	3.4x6.5x3.3	7.5	1.5	8	0	
WLSF 10	21	0	33		42	6	32	4.5x8x4.4	10.5	1.5	10	-0.015 0 -0.018	
WLSF13	24	-0.013	36	0 -0.2 0 -0.3	44	7	33	4.5x8x4.4	11	1.5	13		
WLSF 16	31		50		50	7	40	4.5x8x4.4	18	2	16		
WLSF 20	35	0	63		58	9	45	5.5x9.5x5.4	22.5	2	20		
WLSF 25	42	-0.016	71		65	9	52	5.5x9.5x5.4	26.5	3	25	0 -0.021	
WLSF 30	47		80		75	10	60	6.6x11x6.5	30	3	30		
WLSF 40	64	0 -0.019	100		100	14	82	9x14x8.6	36	4	40	0 -0.025	





Basic dynamic load rating	Basic static load rating	Basic dynamic rated torque	Basic static rated torque	Basic static rated torque	Spline nut		MadalNa
C N	Co N		To N∙m	Тм N • m	Spline nut g	Spline shaft g/100mm	would no.
1,450	2,870	2.1	3.7	7.4	42	38	WLSF 8
2,730	5,070	4.4	8.2	18.0	94	60	WLSF 10
2,670	4,890	21	39.2	13.7	100	100	WLSF 13
6,120	11,200	60	110	46	200	150	WLSF 16
8,900	16,300	105	194	110	330	240	WLSF 20
12,800	23,400	189	346	171	450	370	WLSF 25
18,600	23,200	307	439	181	550	540	WLSF 30
30,800	37,500	647	934	358	1,410	960	WLSF 40

1N≒0.102kgf

Unit : mm





Cross Roller Guide Way Contents



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1 Structure and Features of Cross Roller Guide Way

WON Cross Roller Guide Way is composed of the race rail and roller cage precisely polished. For use, the roller cages assembled in the reverse direction of precise roller are put together with the 90 ° V grooved raceway surface of a race rail. The device has the non-circular and highly-precise linear motion system with low frictional resistance. It is mainly applied to electric discharge machine, optical equipment, measuring equipment, and electronic parts assembly & inspection equipment.

1. Precise and fine linear motion

A cross roller guide way has very low frictional resistance and almost no static and dynamic frictional resistance. Therefore, it supports precise and fine linear motion, obtaining stable linear motion in the conditions of light load and low speed.

2. Low noise

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WON Cross Roller Guide Way has a non-circular linear motion system. Therefore, it has no noise of circulation part. Since its roller cage supports a roller at a certain interval, the device runs smoothly without any noise of contact between rollers.

3. High load capacity

Since a cross roller guide way uses a precise roller as a rolling element, it has high rigidity and a high load capacity.



2 WON Anti-Creep Structures and Features of Anti-Creep Cross Roller Guide Way

WON Anti-Creep Cross Roller Guide Way is the product with the rack and pinion gear built in a conventional cross roller guide way. Therefore, it has very high precision and the anti-creep protection.



Structure of WON Anti-Creep cross roller guide way





1. Responses to multiple types of operation

The anti-creep function makes it possible to respond to very high deceleration and acceleration. Unlike a conventional cross roller guide way, this device is safely applicable in difficult service conditions like vertical axis.

2. Low noise and smooth motion

This product adopts a resin cage, rather than a steel cage applied to our other products, in order to minimize the noise of friction between a case and a roller and to implement quit and smooth running.

3. High load capacity based on complete compatibility of installation dimensions

This product has a unique structure in which a pinion gear wraps of roller a cage. It has the same quantity of rollers and the same load rating and stroke assembly dimension as a general cross roller guide way, so that it has good compatibility for convenient replacement.¹⁾



Note¹⁾ The model numbers 1 & 2 have a different quantity of rollers.

D

3 Types and Features

Classification	Туре	Shape and Feature						
	Roller Cage	AULSUCH .	In WRG type, the roller cage with the precision rollers crossed at a right angle is put together with the					
Guide	WRG WRGO WRG-AC	the state of the second	sive rail. By mounting two-roll roller guides in parallel, it is possible to bear any load in all directions, which is imposed on the shaft at a right angle. In addition, since preload can be applied simply, the cross roller					
	WRGW		guide way can become a light slidin device with no clearance and high rig dity.					
Table	WRGT	1.2	A cross roller table is the compact, highly precise and highly rigid unit					
Table	WRGU WRGU-AC		guiding a finite linear line. A cross rolle r guide way is put in between a highly precise table and the base.					



Precision 4

Precision of WON Cross Roller Guide Way is classified into normal, precision, and super precision types.



Table 1. Precision of each part of the race rail

Unit : mm

Class of precision	Normal	Precision	Super Precision	
Symbol Item	No symbol	Н	Ρ	
Parallelism of the race rail for @&b sides	See Table 2.			
Dimensional tolerance of the height E	±C	±0.01		
Difference of the height E	0.02	0.01	0.005	
Tolerance of M) —(0 -0.1		

Note) The difference of the height E is applied to four race rails used on the same plane.

Table 2. Parallelism of the race rail for @&b sides

Unit:mm

Cross Roller Guide Way

Class of precision race rail	Normal (No symbol)	Precision (H)	Super Precision (P)
Length > 200	8	4	2
$200 \leq \text{length} > 400$	10	5	3
400 \leq length > 600	14	7	4
$600 \leq \text{length} > 800$	15	9	5
$800 \leq \text{length}$	20	10	5

D)

5 Load rating and life

As for the basic load rating C and Co, the basic load rating of the running-roller count (Z) actually applied is calculated with the basic load rating Cz and Coz equivalent to one running roller.

> Basic dynamic load rating $C = \left(\frac{Z}{2}\right)^{\frac{3}{4}} \cdot Cz$

Basic static load rating

 $Co = \left(\frac{Z}{2}\right) \cdot Coz$ $* \left(\frac{Z}{2}\right) = \frac{Removal of}{decimals}$

Rating life refers to a total travel distance that 90% in one group of linear motion systems, each of which runs under the same condition, can reach without flaking. After the basic dynamic load rating is calculated in the above formula, it is possible to calculate the life of a cross roller guide way in the following formula.

$$L = \left[\left(\frac{f_{H} \cdot f_{T}}{f_{W}} \right) \cdot \left(\frac{C}{P_{C}} \right) \right]^{\frac{10}{3}} \cdot 100$$

Where	L	: basic load rating	(km)
	С	: basic dynamic load rating	(kN)
	Pc	: Calculated load	(kN)
	fн	: Hardness factor	
	c	-	

ft : Temperature factor

fw : Load factor

If stroke length and the number of strokes per minute are given, it is possible to calculate a service life in the following formula.

$$L_{h} = \frac{L \times 10^{3}}{2 \times l_{s} \times n_{1} \times 60}$$

Where Lh : Rating life *ls* : Stroke length

(hr) (m) n₁ : Number of strokes per minute (o.p.m.)





Table 3. Hardness factor

A type of race rail	fн
Carbon steel race rail	1
Stainless steel race rail	0.8

Table 4. Temperature factor

Temperature of linear motion system (°C)	fr
100	1.00
120	0.97
140	0.93
160	0.88
180	0.82

Table 5. Load factor

Impacts & vibration	Velocity (V)	Measured value of vibration (G)	fw
No external impacts and vibration	Low speed V≦ 15m/mim	G≦ 0.5	1.0 ~ 1.5
Very weak impacts and vibration	Middle speed 15< V≦ 60m/mim	0.5≦ G≦ 1.0	1.5 ~ 2.0
External impacts and vibration	High speed V > 60m/mim	1.0≦ G≦ 2.0	2.0 ~ 3.5



6 Preload

If a cross roller guide way has no appropriate level of preload, it is impossible to obtain the precision needed, or it is possible to cause scratches or shorten its service life. Therefore, fasten an adjustment bolt by checking an allowable preload level.

(* Adjust an adjustment bolt in the same line with a roller.)

Table 6. Allowable preload level of roller cage in the row 1 Unit : µ							
Model No. R1 R2 R3 R4 R5 R							
Allowable preload	-2	-3	-4	-5	-7	-10	





7 Precision of mounting surface

To obtain a certain level of travel precision, it is required for the mounting face of a race rail to secure more than a level of precision described in Table 1. Generally, polishing process is applied.

8 How to install



- 1) Place the mounting surfaces of the race rails ①, ②, and ③ closely and accurately on the bed and table and connect them completely.
- 2) Connect the race rail ④ temporarily with the table and secure a gap enough to push a roller cage into the side.
- 3) Set a dial gauge as shown in Figure 4. Lightly fasten an adjustment bolt until the table has no runout in order to obtain a certain amount of stroke. Set the dial gauge to zero.
- 4) Place the roller cage at the center as shown in Figure 5. Fasten the adjustment bolt with a torque wrench until the dial gauge shows a certain amount of displacement that represents an allowable preload level. Fasten the mounting bolt of the race rail ④ completely.
- 5) Slide the table left and right and fasten another adjustment bolt and mounting bolt (a,e) in the same way as above. Now the installation is complete.

Cross Roller Guide Way

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Generally, push the rail with the adjustment bolt.



If precision and rigidity are needed, use a holding bar.



In particular, if high precision and high rigidity are needed, use tapered gibs 1 and 2.

Figure 6. An example of clearance adjustment

WON

9 Lubrication and Dust Proof

WON Cross Roller Guide Way (WRGT, WRGU) is already filled with lithium grease. If you need to refill, it is recommended to use the same type of grease.

If a large amount of foreign substances or dust float, or if a cross roller guide way is exposed to relatively big foreign substances like cutting tips or sand, it is recommended to attach a cover to protect the device.



10 Caution for Use

1. Installation

D)

If the mounting surface is polished with lower than a required level of precision, or an inappropriate preload level is applied, a race rail can face torsion. In this case, asymmetric load, race rail wear, and a shortened service life occur. Therefore, it is recommended to meet the required precision of the polished surface and level of preload.

2. Stopper

Stoppers are installed on both ends of a race rail only for the purpose of preventing the separation of a roller cage. Therefore, it is required to install a table stopper separately.

3. Use of an equal set

As for WON Cross Roller Guide Way, WRG type has one set of four race rails, and WRGW type one set of three race rails.

The V-groove difference of each type is adjusted in the set. Therefore, a combination of different sets can cause an error that degrades precision and shortens a service life. Be careful.



Roller Cage

An example of the composition of model name & number









Model No.	D		W	Р		Cz(kN)	Coz(kN)
R1	1.5	0.2	3.8	2.5	2	0.152	0.153
R2	2	0.25	5	4	2.5	0.276	0.271
R3	3	0.3	7	5	3	0.639	0.611
R4	4	0.3	10.5	7	4.5	1.38	1.35
R6	6	0.6	13.5	10	6	3.78	3.78
R9	9	1.0	19	14	7.5	9.53	9.48

 $1N \approx 0.102 \text{kgf}$

WRG Type

An example of the composition of model name & number



1 Model No.

2 Length of race rail

S No symbol – Standard race rail / E-Special specification of race rail

Symbol of precision: No symbol – Normal / H-Precision / P-Super precision

5 Number of rollers



			No of	Main dimensions					
Model No.	Max. stroke	D	rollers Z		А	В	С	M x P	Ν
WRG 1020 WRG 1030 WRG 1040 WRG 1050 WRG 1060 WRG 1070 WRG 1080	12 22 27 32 37 42 52	1.5	5 7 10 13 16 19 21	20 30 40 50 60 70 80	8.5	4	3.8	1 X 10 2 X 10 3 X 10 4 X 10 5 X 10 6 X 10 7 X 10	5
WRG 2030 WRG 2045 WRG 2060 WRG 2075 WRG 2090 WRG 2105 WRG 2120 WRG 2135 WRG 2135 WRG 2150 WRG 2165	18 24 30 44 50 64 70 84 90 96 102	2	5 8 11 13 16 18 21 23 26 29 32	30 45 60 75 90 105 120 135 150 165 180	12	6	5.5	1 X 15 2 X 15 3 X 15 4 X 15 5 X 15 6 X 15 7 X 15 8 X 15 9 X 15 9 X 15 10 X 15 11 X 15	7.5
WRG 3050 WRG 3075 WRG 3100 WRG 3125 WRG 3150 WRG 3175 WRG 3200 WRG 3225 WRG 3250 WRG 3275 WRG 3250 WRG 3250 WRG 3325 WRG 3350	28 48 58 78 88 108 118 138 148 168 168 178 198 208	3	7 10 14 17 21 28 31 35 38 42 45 49	50 75 100 125 150 175 200 225 250 275 300 325 350	18	8	8.3	1 X 25 2 X 25 3 X 25 4 X 25 5 X 25 6 X 25 7 X 25 8 X 25 9 X 25 10 X 25 11 X 25 12 X 25 13 X 25	12.5

Note (1) 1 SET (Race rail: 4EA, Roller cage: 2EA, Stopper: 8EA)

(2) Basic load rating is based on 1 set.







Unit : mm

Cross Roller Guide Way

Dimensions						Basic load rating		Mass	
E		d	G	н		Dynamic C (kN)	Static Co (kN)	(1SET) g	Model No.
1.8	M2	1.65	3	1.4	1.5	0.46 0.63 0.95 1.09 1.37 1.50 1.63	0.61 0.92 1.53 1.84 2.45 2.75 3.06	9 13 18 22 26 30 35	WRG 1020 WRG 1030 WRG 1040 WRG 1050 WRG 1060 WRG 1070 WRG 1080
2.5	M3	2.55	4.4	2	2	0.84 1.46 1.74 2.01 2.52 2.76 3.00 3.23 3.68 3.90 4.32	1.08 2.17 2.71 3.25 4.34 4.88 5.42 5.96 7.05 7.05 7.59 8.67	28 43 57 71 85 98 112 126 140 153 166	WRG 2030 WRG 2045 WRG 2060 WRG 2075 WRG 2090 WRG 2105 WRG 2120 WRG 2135 WRG 2150 WRG 2165 WRG 2180
3.5	M4	3.30	6	3.1	2.5	2.71 4.06 5.28 5.86 6.98 8.05 9.08 9.58 10.56 11.52 12.45 12.91 13.82	3.67 6.11 8.55 9.78 12.2 14.7 17.1 18.33 20.8 23.2 25.7 26.9 29.3	98 148 195 242 289 336 384 431 478 525 572 619 647	WRG 3050 WRG 3075 WRG 3100 WRG 3125 WRG 3125 WRG 3175 WRG 3200 WRG 3225 WRG 3250 WRG 3275 WRG 3300 WRG 3325 WRG 3350
WRG Type

D

An example of the composition of model name & number



1 Model No.

2 Length of race rail

S No symbol – Standard race rail / E-Special specification of race rail

Symbol of precision: No symbol – Normal / H-Precision / P-Super precision

5 Number of rollers



			No of			Main din	nensions		
Model No.	Max. stroke	D	rollers Z		A	В	С	M x P	N
WRG 4080 WRG 4120 WRG 4160 WRG 4200 WRG 4240 WRG 4240 WRG 4280 WRG 4320 WRG 4360 WRG 4400 WRG 4440 WRG 4440	58 82 106 130 154 178 202 226 250 274 298	4	7 11 15 19 23 27 31 35 39 43 43	80 120 200 240 280 320 360 400 440 480	22	11	10.2	1 X40 2 X40 3 X40 4 X40 5 X40 6 X40 7 X40 8 X40 9 X40 10 X40 11 X40	20
WRG 6100 WRG 6150 WRG 6200 WRG 6250 WRG 6300 WRG 6350 WRG 6450 WRG 6450 WRG 6550 WRG 6550 WRG 6600	56 96 136 196 216 256 276 316 336 336 376	6	7 10 13 17 20 24 27 31 34 38 41	100 150 200 250 300 350 400 450 500 550 600	31	15	14.2	1 X 50 2 X 50 3 X 50 4 X 50 5 X 50 6 X 50 7 X 50 8 X 50 9 X 50 10 X 50 11 X 50	25
WRG 9200 WRG 9300 WRG 9400 WRG 9500 WRG 9600 WRG 9700 WRG 9800 WRG 9900 WRG 91000	118 178 238 298 358 418 478 538 598	9	10 15 20 25 30 35 40 45 50	200 300 400 500 600 700 800 900 1000	44	22	20.2	1 X 100 2 X 100 3 X 100 4 X 100 5 X 100 6 X 100 7 X 100 8 X 100 9 X 100	50

Note (1) 1 SET (Race rail: 4EA, Roller cage: 2EA, Stopper: 8EA)

(2) Basic load rating is based on 1 set.









Dimensions						Basic loa	d rating	Mass	
E		d	G	Н		Dynamic C (kN)	Static Co (kN)	(1SET) g	Model No.
4.5	M5	4.3	8	4.2	2.5	5.92 8.85 11.5 14.0 16.4 18.7 20.88 23.0 25.1 27.1 29.1	8.10 13.5 18.9 24.3 29.7 35.1 40.5 45.9 51.3 56.7 62.1	260 400 530 660 790 920 1050 1180 1300 1430 1530	WRG 4080 WRG 4120 WRG 4160 WRG 4200 WRG 4240 WRG 4280 WRG 4280 WRG 4320 WRG 4360 WRG 4440 WRG 4440 WRG 4480
6	M6	5.2	9.5	5.2	3	16.4 24.5 28.2 35.4 42.1 48.5 51.7 57.8 63.7 69.5 72.3	22.7 37.8 45.4 60.5 75.6 90.7 98.3 113 128 143 151	630 950 1260 1570 1800 2190 2490 2810 3110 3420 3730	WRG 6100 WRG 6150 WRG 6200 WRG 6250 WRG 6350 WRG 6350 WRG 6400 WRG 6450 WRG 6500 WRG 6500 WRG 6500 WRG 6500
9	M8	6.8	10.5	6.2	4	62.3 81.1 107 123 147 162 184 198 219	94.8 133 190 228 284 322 379 417 474	2710 4050 5350 6680 8010 9330 10650 11970 13300	WRG 9200 WRG 9300 WRG 9400 WRG 9500 WRG 9600 WRG 9700 WRG 9800 WRG 9900 WRG 91000

WRGO Type

D

An example of the composition of model name & number



1 Model No.

- 2 Length of race rail
- S No symbol Standard race rail / E-Special specification of race rail
- Symbol of precision: No symbol Normal / H-Precision / P-Super precision

5 Number of rollers



Model No			No of			Main din	nensions		
Model No.	Max. stroke	D	rollers Z		А	В	С	M x P	N
WRGO 6100	56		7	100				1 X 50	
WRGO 6150	96		10	150				2X50	
WRGO 6200	136		13	200				3X50	
WRGO 6250	156		17	250				4X50	
WRGO 6300	196		20	300				5X50	
WRGO 6350	216	6	24	350	30	15	14.4	6X50	25
WRGO 6400	256		27	400				7X50	
WRGO 6450	276		31	450				8X50	
WRGO 6500	316		34	500				9X50	
WRGO 6550	336		38	550				10X50	
WRGO 6600	376		41	600				11 X 50	
WRGO 9200	118		10	200				1 X 100	
WRGO 9300	178		15	300				2X100	
WRGO 9400	238		20	400				3X100	
WRGO 9500	298		25	500				4X100	
WRGO 9600	359		30	600				5X100	
WRGO 9700	418	9	35	700	40	20	19.2	6X100	50
WRGO 9800	478		40	800				7X100	
WRGO 9900	538		45	900				8X100	
WRGO 91000	598		50	1000				9X100	
WRGO 91100	658		55	1100				10X 100	
WRGO 91200	718		60	1200				11 X 100	

Note (1) 1 SET (Race rail: 4EA, Roller cage: 2EA, Stopper: 8EA)

(2) Basic load rating is based on 1 set.







Unit∶mm

Cross Roller Guide Way

Dimensions					Basic loa	id rating	Mass		
E		d	G	Н		Dynamic C (kN)	Static Co (kN)	(1SET) g	Model No.
						16.4	22.7	640	WRGO 6100
						24.5	37.8	940	WRGO 6150
						28.2	45.4	1250	Mass (1SET) Model No. g WRG0 6100 940 WRG0 6150 1250 WRG0 6200 1560 WRG0 6200 1560 WRG0 6300 2170 WRG0 6300 2170 WRG0 6400 2780 WRG0 6400 3390 WRG0 6500 3700 WRG0 6500 3400 WRG0 9200 3400 WRG0 9300 4510 WRG0 9400 5620 WRG0 9500 6740 WRG0 9500 7850 WRG0 9800 10070 WRG0 9100 1190 WRG0 9100 12300 WRG0 91100
						35.4	60.5	Pating Mass (1SET) Model No. Static Co (kN) g Model No. 22.7 640 WRG0 6100 37.8 940 WRG0 6150 45.4 1250 WRG0 6200 60.5 1560 WRG0 6300 90.7 2170 WRG0 6300 90.7 2170 WRG0 6400 113 2780 WRG0 6400 113 2780 WRG0 6500 143 3390 WRG0 6500 151 3700 WRG0 9200 133 3400 WRG0 9300 190 4510 WRG0 9400 228 5620 WRG0 9500 284 6740 WRG0 9500 379 8960 WRG0 9800 417 10070 WRG0 9900 417 11190 WRG0 91100 569 13410 WRG0 91200	
						42.1	75.6		
6	M6	5.2	9.5	5.2	3	48.5	90.7		
					51.7 98.3 2490 57.8 113 2780 63.7 128 3090	WRGO 6400			
						57.8	2 45.4 1250 WRGO 6200 4 60.5 1560 WRGO 6250 .1 75.6 1860 WRGO 6300 .5 90.7 2170 WRGO 6400 .8 113 2780 WRGO 6450 .7 128 3090 WRGO 6500 .5 143 3390 WRGO 6500 .5 143 3390 WRGO 6600 .3 94.8 2280 WRGO 9200 .1 133 3400 WRGO 9300 .7 190 4510 WRGO 9400		
					57.8 113 2780 WRG0 63.7 128 3090 WRG0 69.5 143 3390 WRG0 72.2 151 2700 WRG0	WRGO 6500			
						69.5	143	3390	WRGO 6550
						72.3	151	3700	WRGO 6600
						62.3	94.8	2280	WRGO 9200
						81.1	133	3400	WRGO 9300
						107	190	4510	WRGO 9400
						123	228	(13E1) Widdel NO. g 640 WRG0 6100 940 WRG0 6150 1250 WRG0 6200 1560 WRG0 6200 1560 WRG0 6300 2170 WRG0 6300 2170 WRG0 6400 2780 WRG0 6400 2780 WRG0 6500 3090 WRG0 6500 3390 WRG0 6500 3700 WRG0 9200 3400 WRG0 9200 3400 WRG0 9300 4510 WRG0 9400 5620 WRG0 9500 6740 WRG0 9600 7850 WRG0 9900 10070 WRG0 9900 11190 WRG0 91000 12300 WRG0 91100	WRGO 9500
						147	284	6740	WRGO 9600
8	M8	6.8	10.5	6.2	4	162	322	7850	WRGO 9700
						184	379	8960	WRGO 9800
						198	417	10070	WRGO 9900
						219	474	11190	WRGO 91000
						232	512	12300	WRGO 91100
						252	569	13410	WRGO 91200

WRG-AC Type

An example of the composition of model name & number



1 Model No.

D

- 2 Length of race rail
- AC-Cage Anti-creep type
- No symbol Standard race rail / E-Special specification of race rail
- Symbol of precision: No symbol –Normal / H-Precision / P-Super precision

6 Number of rollers



			No. of			Main din	nensions		
Model No.	Max. stroke	D	rollers Z		A	В	С	M x P	N
WRG 2030 AC WRG 2045 AC WRG 2050 AC WRG 2075 AC WRG 2105 AC WRG 2120 AC WRG 2135 AC WRG 2135 AC WRG 2150 AC WRG 2165 AC WRG 2180 AC	18 24 30 44 50 64 70 84 90 96 102	2	4 7 10 12 15 17 20 22 25 28 31	30 45 60 75 90 105 135 150 165 180	12	6	5.4	1 X 15 2 X 15 3 X 15 4 X 15 5 X 15 6 X 15 7 X 15 8 X 15 9 X 15 10 X 15 11 X 15	7.5
WRG3050AC2 WRG3075AC2 WRG3100AC2 WRG3125AC2 WRG3125AC2 WRG3175AC2 WRG3175AC2 WRG3200AC2 WRG3225AC2	24 54 66 78 90 100 112 144	4	6 8 12 16 20 24 28 30	50 75 100 125 150 175 200 225	18	8	8.6	1x25 2x25 3x25 4x25 5x25 6x25 7x25 8x25	12.5
WRG 4080 AC WRG 4120 AC WRG 4160 AC WRG 4200 AC WRG 4240 AC WRG 4280 AC WRG 4320 AC WRG 4360 AC WRG 4400 AC WRG 4440 AC WRG 4480 AC	58 82 106 130 154 178 202 226 250 274 298	4	7 11 15 19 23 27 31 35 39 43 43	80 120 200 240 280 320 360 400 440 480	22	11	10.2	1 X 40 2 X 40 3 X 40 4 X 40 5 X 40 6 X 40 7 X 40 8 X 40 9 X 40 10 X 40 11 X 40	20

Note (1) 1 SET (Race rail: 4EA, Roller cage: 2EA, Stopper: 8EA)

(2) Basic load rating is based on 1 set.

(3) If a stopper is needed, please make separate description.

 $\ensuremath{\left(4\right)}$ For the vertical use of the device, please contact us.







Unit : mm

Cross Roller Guide Way

	l I	Dimensions				nd rating	Mass	
E		d	G	Н	Dynamic C (kN)	Static Co (kN)	(1SET) g	Model No.
2.5	МЗ	2.55	4.4	2	0.62 0.86 1.28 1.48 1.67 1.85 2.2 2.37 2.54 2.86 3.02	0.73 1.10 1.83 2.20 2.56 2.93 3.66 4.03 4.39 5.13 5.49	28 43 57 71 85 98 112 126 140 153 166	WRG 2030 AC WRG 2045 AC WRG 2060 AC WRG 2075 AC WRG 2105 AC WRG 2105 AC WRG 2120 AC WRG 2135 AC WRG 2150 AC WRG 2150 AC WRG 2180 AC
3.5	M4	3.30	6	3.1	6.53 8.20 11.27 14.12 16.81 19.38 21.86 23.06	9.37 12.50 18.75 25.00 31.25 37.50 43.75 46.88	99 144 190 236 281 327 373 418	WRG3050AC2 WRG3075AC2 WRG3100AC2 WRG3155AC2 WRG3150AC2 WRG3175AC2 WRG3200AC2 WRG3225AC2
4.5	M5	4.3	8	4.2	5.92 8.85 11.5 14.0 16.4 18.7 20.88 23.0 25.1 27.1 29.1	8.10 13.5 18.9 24.3 29.7 35.1 40.5 45.9 51.3 56.7 62.1	260 400 530 790 920 1050 1180 1300 1430 1530	WRG 4080 AC WRG 4120 AC WRG 4120 AC WRG 4200 AC WRG 4240 AC WRG 4280 AC WRG 4320 AC WRG 4360 AC WRG 4400 AC WRG 4440 AC WRG 4480 AC

WRGW Type

An example of the composition of model name & number



1 Model No.

2 Length of race rail

S No symbol – Standard race rail / E-Special specification of race rail

Symbol of precision: No symbol –Normal / H-Precision / P-Super precision

5 Number of rollers



			No of	No. of		Main dimensions					
Model No.	Max. stroke	D	rollers Z		A		Bı	B2	С	P1	
WRGW 1020 WRGW 1030 WRGW 1040 WRGW 1050 WRGW 1060 WRGW 1070 WRGW 1080	12 22 27 32 37 42 52	1.5	5 7 10 13 16 19 21	20 30 40 50 60 70 80	4.5	0.5	17	7.6	3.8	13.4	
WRGW 2030 WRGW 2045 WRGW 2060 WRGW 2075 WRGW 2090 WRGW 2105 WRGW 2120	18 24 30 44 50 64 70	2	5 8 11 13 16 18 21	30 45 60 75 90 105 120	6.5	0.5	24	11	5.5	19	
WRGW 3050 WRGW 3075 WRGW 3100 WRGW 3125 WRGW 3150 WRGW 3175 WRGW 3200	28 48 58 78 88 108 118	3	7 10 14 17 21 24 28	50 75 100 125 150 175 200	8.5	0.5	36	16.6	8.3	29	
WRGW 4080 WRGW 4120 WRGW 4160 WRGW 4200 WRGW 4240 WRGW 4280	58 82 106 130 154 178	4	7 11 15 19 23 27	80 120 160 200 240 280	11.5	0.5	44	20.4	10.2	35	

Note (1) 1 SET (Race rail: 4EA, Roller cage: 2EA, Stopper: 8EA)

(2) Basic load rating is based on 1 set.





Unit∶mm

5

B2

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WON

Dimensions										Basic loa	ad rating	Mass	
M1 X P2	N1	M2 X P3	N2		dı	G	Н		d2		Static Co (kN)	(1SET) g	Model No.
1 X 10 2 X 10 3 X 10 4 X 10 5 X 10 6 X 10 7 X 10	5	- 1 X 10 2 X 10 3 X 10 4 X 10 5 X 10 6 X 10	10	M2	1.65	3	1.4	1.5	2	0.46 0.63 0.95 1.09 1.37 1.50 1.63	0.61 0.92 1.53 1.84 2.45 2.75 3.06	9 14 18 22 26 31 35	WRGW 1020 WRGW 1030 WRGW 1040 WRGW 1050 WRGW 1060 WRGW 1070 WRGW 1080
1 X 15 2 X 15 3 X 15 4 X 15 5 X 15 6 X 15 7 X 15	7.5	- 1 X 15 2 X 15 3 X 15 4 X 15 5 X 15 6 X 15	15	M3	2.55	4.4	2	2	3	0.84 1.46 1.74 2.01 2.52 2.76 3.00	1.08 2.17 2.71 3.25 4.34 4.38 5.42	29 43 58 72 83 99 113	WRGW 2030 WRGW 2045 WRGW 2060 WRGW 2075 WRGW 2090 WRGW 2105 WRGW 2120
1 X 25 2 X 25 3 X 25 4 X 25 5 X 25 6 X 25 7 X 25	12.5	- 1 X 25 2 X 25 3 X 25 4 X 25 5 X 25 6 X 25	25	M4	3.3	6	3.1	2.5	4	2.71 4.06 5.28 5.86 6.98 8.06 9.08	3.67 6.11 8.55 9.78 12.2 14.7 17.1	101 142 197 240 292 339 387	WRGW 3050 WRGW 3075 WRGW 3100 WRGW 3125 WRGW 3150 WRGW 3175 WRGW 3200
1 X 40 2 X 40 3 X 40 4 X 40 5 X 40 6 X 40	20	- 1 X 40 2 X 40 3 X 40 4 X 40 5 X 40	40	M5	4.3	8	4.2	2.5	5	5.92 8.85 11.5 14.0 16.4 18.7	8.10 13.5 18.9 24.3 29.7 35.1	263 401 530 660 787 920	WRGW 4080 WRGW 4120 WRGW 4160 WRGW 4200 WRGW 4240 WRGW 4280

WRGT Series

D

An example of the composition of model nubmer



- 1 Model No.
- 2 Length of table
- **3** No symbol Base tap type
- **4** No symbol- Standard specification / E-Special processing specification
- % For other sizes and specifications than those in the table of dimensions, please contact us.



	N	Main din	nension	S	Dimensions of the table surface									
Model No	Max	Width	Height	Length	Posit	tion of	table atta	achme	nt tap					
moderno.	stroke	W ±0.1	M ± 0.1	L	В	F	n X F	G	S	F1	n1XF1	D1	Bı	G1
WRGT 1025 WRGT 1035 WRGT 1045 WRGT 1055 WRGT 1065 WRGT 1075 WRGT 1085	12 18 25 32 40 45 50	20	8	25 35 45 55 65 75 85	14	18 28 20 30 20 30 30	1 X 18 1 X 28 1 X 20 1 X 30 2 X 20 1 X 30 2 X 30	3.5 3.5 12.5 12.5 12.5 22.5 12.5	M2.6	10	1 X 10 2 X 10 3 X 10 4 X 10 5 X 10 6 X 10 7 X 10	4.1	12.4	7.5
WRGT 2035 WRGT 2050 WRGT 2065 WRGT 2080 WRGT 2095 WRGT 2110 WRGT 2125	18 30 40 50 60 70 80	30	12	35 50 65 80 95 110 125	22	28 43 30 45 30 45 45	1 X 28 1 X 43 1 X 30 1 X 45 2 X 30 1 X 45 2 X 45	3.5 3.5 17.5 17.5 17.5 32.5 17.5	M3	15	1 X 15 2 X 15 3 X 15 4 X 15 5 X 15 6 X 15 7 X 15	6	20	10
WRGT 3055 WRGT 3080 WRGT 3105 WRGT 3130 WRGT 3155 WRGT 3180 WRGT 3205	30 45 60 75 90 105 130	40	16	55 80 105 130 155 180 205	30	40 65 50 75 50 75 75	1X40 1X65 1X50 1X75 2X50 1X75 2X75	7.5 7.5 27.5 27.5 27.5 52.5 27.5	M4	25	1X25 2X25 3X25 4X25 5X25 6X25 7X25	7.5	28.4	15

WON











Unit∶µm

Cross Roller Guide Way

Dim	ensions	s of the	side	p	mensions osition of	of the base sil attachment ho	de ble	Basic loa	d rating	Precis	ion µm	
т	Н	W1		S1		n2Xf1	g	Dynamic C (kN)	Static Co (kN)	⊿с	⊿d	Model No.
7.5	4	6.6	M2	M2.6	7.5 10.0 10.0 10.0 10.0 10.0	2X7.5 2X10 3X10 4X10 5X10 6X10	5 7.5 7.5 7.5 7.5 7.5 7.5	0.46 0.63 0.95 1.09 1.23 1.50	0.61 0.92 1.53 1.84 2.14 2.75	2 2 2 2 2 2 2 2	4 4 5 5 5 5 5	WRGT 1025 WRGT 1035 WRGT 1045 WRGT 1055 WRGT 1065 WRGT 1075
					10.0	7X10	7.5	1.63	3.06	2	5	WRGT 1085
11.5	6	12.0	M2	M3	20.0 15.0 15.0 15.0 15.0 15.0 15.0	1 X 20 2 X 15 3 X 15 4 X 15 5 X 15 6 X 15 7 X 15	7.5 10 10 10 10 10 10	0.84 1.17 1.46 2.01 2.27 2.52 2.76	1.08 1.63 2.17 3.25 3.79 4.34 4.88	2 2 2 2 2 2 2 2 2	4 5 5 5 5 5 5	WRGT 2035 WRGT 2050 WRGT 2065 WRGT 2080 WRGT 2095 WRGT 2110 WRGT 2125
15.5	8	16.0	M2	M4	35.0 25.0 25.0 25.0 25.0 25.0 25.0	1 X 35 2 X 25 3 X 25 4 X 25 5 X 25 6 X 25 7 X 25	10 15 15 15 15 15 15	2.71 4.06 4.68 5.86 6.98 8.05 8.57	3.67 6.11 7.33 9.78 12.2 14.7 15.9	2 2 3 3 3 3 3 3 3	5 6 6 6 6	WRGT 3055 WRGT 3080 WRGT 3105 WRGT 3130 WRGT 3155 WRGT 3180 WRGT 3205

WRGT-B Series

An example of the composition of model nubmer



1 Model No.

D

- 2 Length of table
- B-Base hole type
- **4** No symbol-Standard specification / E-Special processing specification
- % For other sizes and specifications than those in the table of dimensions, please contact us.



		Main dii	mensior	าร	Dimensions of the table surface									
Model No	Max	Width	Height	Length	Posit	ion of t	table atta	achmer	nt tap					
moder no.	stroke	W ±0.1	M ±0.1	L	В	F	n X F	G	S	F1	n1XF1	Dı	Bı	Gı
WRGT 1025B WRGT 1035B WRGT 1045B WRGT 1055B WRGT 1065B WRGT 1075B WRGT 1085B	12 18 25 32 40 45 50	20	8	25 35 45 55 65 75 85	14	18 28 20 30 20 30 30	1 X 18 1 X 28 1 X 20 1 X 30 2 X 20 1 X 30 2 X 30	3.5 3.5 12.5 12.5 12.5 22.5 12.5	M2.6	10	1 X 10 2X 10 3X 10 4X 10 5X 10 6X 10 7X 10	4.1	12.4	7.5
WRGT 2035B WRGT 2050B WRGT 2065B WRGT 2080B WRGT 2095B WRGT 2110B WRGT 2125B	18 30 40 50 60 70 80	30	12	35 50 65 80 95 110 125	22	28 43 30 45 30 45 45	1 X 28 1 X 43 1 X 30 1 X 45 2 X 30 1 X 45 2 X 45	3.5 3.5 17.5 17.5 17.5 32.5 17.5	M3	15	1 X 15 2 X 15 3 X 15 4 X 15 5 X 15 6 X 15 7 X 15	6	20	10
WRGT 3055B WRGT 3080B WRGT 3105B WRGT 3130B WRGT 3155B WRGT 3180B WRGT 3205B	30 45 60 75 90 105 130	40	16	55 80 105 130 155 180 205	30	40 65 50 75 50 75 75	1X40 1X65 1X50 1X75 2X50 1X75 2X75	7.5 7.5 27.5 27.5 27.5 52.5 27.5	M4	25	1X25 2X25 3X25 4X25 5X25 6X25 7X25	7.5	28.4	15













Unit∶*µ*m

WON

Dime	ension	s of the	side	position of	attachme	ent hole		Basic loa	id rating	Precis	tion µm	
Т	Н	W1		dXDXh	Q 1	Q 2	g	Dynamic C (kN)	Static Co (kN)	⊿c	⊿D	Model No.
					18	-	3.5	0.46	0.61	2	4	WRGT 1025B
					25	-	5.0	0.63	0.92	2	4	WRGT 1035B
					38	25	3.5	0.95	1.53	2	5	WRGT 1045B
7.5	4	6.6	M2	2.5X4.1X2.2	48	29	3.5	1.09	1.84	2	5	WRGT 1055B
					55	31	5.0	1.23	2.14	2	5	WRGT 1065B
					65	35	5.0	1.50	2.75	2	5	WRGT 1075B
					75	40	5.0	1.63	3.06	2	5	WRGT 1085B
					25	-	5.0	0.84	1.08	2	4	WRGT 2035B
					35	-	7.5	1.17	1.63	2	4	WRGT 2050B
					55	33	5.0	1.46	2.17	2	5	WRGT 2065B
11.5	6	12.0	M2	3.5X6X3.2	70	40	5.0	2.01	3.25	2	5	WRGT 2080B
					85	45	5.0	2.27	3.79	2	5	WRGT 2095B
					95	50	7.5	2.52	4.34	2	5	WRGT 2110B
					110	55	7.5	2.76	4.88	2	5	WRGT 2125B
					40	-	7.5	2.71	3.67	2	5	WRGT 3055B
					68	43	6.0	4.06	6.11	2	5	WRGT 3080B
					90	55	7.5	4.68	7.33	3	6	WRGT 3105B
15.5	8	16.0	M2	4.5X7.5X4.2	115	65	7.5	5.86	9.78	3	6	WRGT 3130B
					140	95	7.5	6.98	12.2	3	6	WRGT 3155B
					165	85	7.5	8.05	14.7	3	6	WRGT 3180B
					190	90	7.5	8.57	15.9	3	6	WRGT 3205B

WRGU Series

D

An example of the composition of model name & number



1 Model No.

- 2 Length of table
- **3** No symbol Standard specificatoin /E-Special processing specification
- % For other sizes and specifications than those in the table of dimensions, please contact us.



		Ма	in dim	ensior	าร		테이블면치수											
Model No.	Max	Width	Width	Height	Longth	Macc		부븱애	백태위	م			츽	견부츠	태위	치		
	stroke	W	toler- ance	M ±0.1	L	(kg)	В	nXF	G	S	Bı	n1XF1	G1	G2	K	bı	t1	S₁Xℓ
WRGU 1025 WRGU 1035 WRGU 1045 WRGU 1055 WRGU 1065 WRGU 1075 WRGU 1085	12 18 25 32 40 45 50	30	-0.2 -0.4	17	25 35 45 55 65 75 85	0.08 0.11 0.15 0.18 0.21 0.24 0.27	18.4	- 1X10 2X10 3X10 4X10 5X10 6X10	12.5	M2	10	1 X 10 2 X 10 3 X 10 4 X 10 5 X 10 6 X 10 7 X 10	7.5	2.5 4.5 6 7.5 8.5 11 13.5	6.5	12	2.5	M2X4
WRGU 2035 WRGU 2050 WRGU 2065 WRGU 2080 WRGU 2095 WRGU 2110 WRGU 2125	18 30 40 50 60 70 80	40	-0.2 -0.4	21	35 50 65 80 95 110 125	0.2 0.26 0.34 0.42 0.5 0.58 0.66	25	- 1X15 2X15 3X15 4X15 5X15 6X15	17.5	M3	15	1X15 2X15 3X15 4X15 5X15 6X15 7X15	10	3 4.5 7 9.5 12 14.5 17	7.5	16	3.4	M2X4
WRGU 3055 WRGU 3080 WRGU 3105 WRGU 3130 WRGU 3155 WRGU 3180 WRGU 3205	30 45 60 75 90 105 130	60	±0.1	28	55 80 105 130 155 180 205	0.57 0.8 1.03 1.26 1.49 1.72 1.95	39	- 1X25 2X25 3X25 4X25 5X25 6X25	27.5	M4	25	1X25 2X25 3X25 4X25 5X25 6X25 7X25	15	5.5 10.5 15.5 20.5 25.5 30.5 30.5	10	40	5.5	M3X6

Max. stroke





A h

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Unit∶mm

WON

	Dimensions of the side				position of attachment hole				Basic loa	id rating	Precisi	onmm			
	Н	dXDXh	Dı	A		B2		f2	fз	g	Dynamic C (kN)	Static Co (kN)	⊿c	⊿d	Model No.
11	5.5	2.55X4.1X2.5	4.1	9	M2	22	18 28 38 48 58 68	- - 28 38 48		3.5	0.46 0.63 0.95 1.09 1.23 1.50	0.61 0.92 1.53 1.84 2.14 2.75	2 2 2 2 2 2 2	4 4 5 5 5	WRGU 1025 WRGU 1035 WRGU 1045 WRGU 1055 WRGU 1065 WRGU 1075
							78	58	-		1.63	3.06	2	5	WRGU 1085
14	6.5	3.5X6X3.5	6.0	11	M3	30	25 40 55 70 85 100 115	- - 40 55 70 85		5	0.84 1.17 1.46 2.01 2.27 2.52 2.76	1.08 1.63 2.17 3.25 3.79 4.34 4.88	2 2 2 2 2 3 4	4 5 5 6 6	WRGU 2035 WRGU 2050 WRGU 2065 WRGU 2080 WRGU 2095 WRGU 2110 WRGU 2125
18.5	9	4.5X7.5X5	7.5	14.5	M4	40	35 60 85 110 135 160 185	- - - - 85	- - 85 110 135	10	2.71 4.06 4.68 5.86 6.98 8.05 8.57	3.67 6.11 7.33 9.78 12.2 14.7 15.9	2 2 3 3 3 3 3 3 3	5 5 6 6 7 7	WRGU 3055 WRGU 3080 WRGU 3105 WRGU 3130 WRGU 3155 WRGU 3180 WRGU 3205

 $1N \approx 0.102 \text{kgf}$

WRGU Series

D

An example of the composition of model name & number



- 1 Model No.
- 2 Length of table
- 3 No symbol Standard specification /E-Special processing specification
- % For other sizes and specifications than those in the table of dimensions, please contact us.



	Main dimensions					Dimensions of the table surface												
Model No.	May	Width	Height	Length	Mace	Position of table attachment tap				Side attachment tap position								
	stroke	W	M ±0.1	L	(kg)	В	nXF	G	S	Bı	n1XF1	Gı	G2	bı	b2	t۱	t2	S1X ℓ
WRGU 4085 WRGU 4125 WRGU 4165 WRGU 4205 WRGU 4245 WRGU 4285	50 75 105 135 155 185	80	35	85 125 165 205 245 285	1.5 2.3 3.1 3.8 4.6 5.3	53	- 1X40 2X40 3X40 4X40 5X40	42.5	M5	40	1X40 2X40 3X40 4X40 5X40 6X40	22.5	10.5 18.0 23.0 30.5 38 43.0	55	-	6.5	-	M3X6
WRGU 6110 WRGU 6160 WRGU 6210 WRGU 6260 WRGU 6310 WRGU 6360 WRGU 6410	60 95 130 165 200 235 265	100	45	110 160 210 260 310 360 410	3.2 4.6 6.0 7.4 8.7 10.1 11.5	63	- 1X50 2X50 3X50 4X50 5X50 6X50	55	M6	50	1X50 2X50 3X50 4X50 5X50 6X50 7X50	30.0	16.0 23.5 31.0 38.5 46.0 53.5 63.5	60	92	8	15	M4X8
WRGU 9210 WRGU 9310 WRGU 9410 WRGU 9510 WRGU 9610 WRGU 9710 WRGU 9810 WRGU 9910	130 180 350 550 650 750 850 950	145	60	210 310 410 510 610 710 810 910 1010	12.0 17.6 23.2 28.8 34.4 40.0 45.6 51.2 56.8	96	- 1X100 2X100 3X100 4X100 5X100 6X100 7X100 8X100	105	M8	85	1X100 2X100 3X100 4X100 5X100 6X1007X 100 8X100 9X100	55.0	27.0 52.0 17.0 17.0 17.0 17.0 17.0 17.0	90	135	11	20	M4X8



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Unit∶mm

Cross Roller Guide Way

	D	imensions of	the si	de _		attachment hole					Basic load rating		Precision mm			
Т	Н	dXDXh	D1		m2	B2		f2	fз	f4	g	Dynamic C (kN)	Static Co (kN)	⊿c	⊿d	Model No.
							65	-	-	-	10	5.92	8.10	2	5	WRGU 4085
							80	-	-	-	22.5	8.85	13.5	2	6	WRGU 4125
24	10.5	E E VO E V 6	0.5	N//	N/4	60	120	-	-	-	22.5	11.5	18.9	2	7	WRGU 4165
24	10.5	3.389.380	9.5	11/14	IVI4	00	160	80	-	-	22.5	14.0	24.3	2	7	WRGU 4205
							200	120	-	-	22.5	16.4	29.7	2	7	WRGU 4245
							240	160	-	-	22.5	18.7	35.1	2	7	WRGU 4285
							90	-	-	-	10	16.4	22.7	2	6	WRGU 6110
							140	-	-	-	10	20.5	30.2	2	6	WRGU 6160
							190	-	90	-	10	28.2	45.4	2	7	WRGU 6210
31	13	7X11X7	11	M5	M5	60	240	-	140	-	10	35.4	60.5	2	7	WRGU 6260
							290	-	190	-	10	38.8	68.0	2	8	WRGU 6310
							340	140	240	-	10	45.4	83.2	3	8	WRGU 6360
							390	190	290	-	10	51.7	98.3	4	8	WRGU 6410
							100	-	-	-	55	52.3	75.8	3	7	WRGU 9210
							200	-	-	-	55	81.1	133	3	7	WRGU 9310
							300	-	100	-	55	81.1	133	4	8	WRGU 9410
							400	-	200	-	55	98.7	171	4	8	WRGU 9510
43	16	9X14X9	14	M8	M6	90	500	100	300	-	55	115	209	4	9	WRGU 9610
							600	200	400	-	55	131	246	4	9	WRGU 9710
							700	300	500	100	55	139	265	5	10	WRGU 9810
							800	400	600	200	55	155	303	5	10	WRGU 9910
							900	500	700	300	55	169	341	5	10	WRGU 91010

 $1N \approx 0.102 \text{kgf}$

WRGU-AC Series

An example of the composition of model name & number



1 Model No

D

- 2 Length of table
- AC-Cage anti-creep type
- **4** No symbol-Standard specification /E-Special processing specification
- % For other sizes and specifications than those in the table of dimensions, please contact us.



		Main	dimer	nsions		Dimensions of the table surface										
Model No.	Max	Width	Height	Longth	Mass	Positio	n of table a	attachm	ent tap		Sidea	attacl	nment	tap p	ositio	n
	stroke	W ±0.1	M ±0.1	Length	(kg)	В	n X F	G	S	Bı	n1XF1	Gı	G2	bı	t۱	S1X ₽
WRGU 2035 AC WRGU 2050 AC WRGU 2065 AC WRGU 2080 AC WRGU 2095 AC WRGU 2110 AC WRGU 2125 AC	18 30 40 50 60 70 80	40	21	35 50 65 80 95 110 125	0.2 0.26 0.34 0.42 0.5 0.58 0.66	25	- 1X15 2X15 3X15 4X15 5X15 6X15	17.5	M3	15	1X15 2X15 3X15 4X15 5X15 6X15 7X15	10	3 4.5 7 9.5 12 14.5 17	16	3.4	M2X4
WRGU 3055 AC WRGU 3080 AC WRGU 3105 AC WRGU 3130 AC WRGU 3155 AC WRGU 3180 AC WRGU 3205 AC	30 45 60 75 90 105 130	60	28	55 80 105 130 155 180 205	0.57 0.8 1.03 1.26 1.49 1.72 1.95	39	- 1X25 2X25 3X25 4X25 5X25 6X25	27.5	M4	25	1X25 2X25 3X25 4X25 5X25 6X25 7X25	15	5.5 10.5 15.5 20.5 25.5 30.5 30.5	40	5.5	M3X6
WRGU 4085 AC WRGU 4125 AC WRGU 4165 AC WRGU 4205 AC WRGU 4245 AC WRGU 4285 AC	50 75 105 130 155 185	80	35	85 125 165 205 245 285	1.5 2.3 3.1 3.8 4.6 5.3	53	- 1X40 2X40 3X40 4X40 5X40	42.5	M5	40	1X40 2X40 3X40 4X40 5X40 6X40	22.5	10.5 18.0 23.0 30.5 38.5 43.0	55	6.5	M3X6

WON





Gı

Ω

n1 x F1

Gı

 $1N \approx 0.102 \text{kgf}$







Curved Cross Roller Guide Way Contents



1	Structure and Features of Curved Cross-Roller Guideway
2	Precision 217
3	Life Calculation
4	Installation
5	Precautions for Use 220

1 1. Structure and Features of Curved Cross-Roller Guideway

The curved cross-roller guideway of WON is a non-cyclic, curved motion bearing with low friction. Use high-precision optical measuring equipment to change the slope without chang-ing the center of rotation or when an accurate slope is required.

The WON Curved Cross–Roller Guideway CRG type consists of a curved track bed with a V–groove of precisely grinding curves and a curved roller cage. The WON Curved Cross–Roller Guide CRGF type is a precisely ground V groove with a curved surface, flat installation surface, and a curved roller cage. Since the motor does not circulate, there is almost no change in the friction resistance, and very low friction resistance allows for a curved motion.

1) Low friction resistance and fine motion

V grooves are precisely ground and the friction resistance is very low, using a precision roller. There is only slight variation in static and dynamic friction resistance, enabling fine and accurate curved motion.

2) Low noise

There is no noise as the rolling element does not circulate. In addition, the curved roller cage supports the rollers at regular intervals, providing smooth driving without any sound of contact between the rollers

3) High load capacity

Precision rollers are used as a rolling element, which is more rigid and has a considerable load capacity than the ball.

4) Convenient installation

The CRGF-type installation surface is flat, so there is no need for complicated machining of the table and base during installation. As a result, processing costs can be significantly reduced.

5) Equal center of rotation

The V groove is precisely ground and has an accurate center of rotation.







2 Precision

1) Precision of CRG type

Table 1. Precision	Unit: mm	B- ∢ ▼D
Model Number	Precision	
CRG2050-61		
CRG2050- 78		
CRG2050-96		
CRG2050- 50		
CRG2050- 68		
CRG2060- 60		
CRG3070- 70	10	G × − × E
CRG3070- 87	10	
CRG3070- 90		Figure 3. CRG-Type Precision
CRG3070-96		
CRG3070-110		
CRG3070-122		
CRG3070-136		$[\psi] \psi] \psi] \psi] \psi]$
CRG3100-160		لهالها لهالها
2) Precision of CRGF ty	ре	
Table 2. Precision	Unit: mm	
Differ Model Number Differ	ence betweenDifference between A and B E and F ence betweenDifference between C and D H and I	

3 Life Calculation

10

CRGF2050-87

CRGF3070-110

You can obtain the rated operating life of the curved cross roller guideway using the following equation.

10

$$L = \frac{90}{\theta} \times \left(\frac{f_{T}}{f_{w}} \times \frac{C}{P}\right)^{\frac{10}{3}} \times 10^{6}$$

Operating lifetime

$$L_{h} = \frac{L \times 10^{6}}{60 \times n}$$

L: Rated operating life

$$\theta$$
: Rotating angle (°)
C: Basic dynamic rating load (N)
P: Applied load (N)
fr: Temperature coefficient
fw: Load coefficient
Lh: Operating life time (h)
n: Number of revolutions per minute

Figure 4. CRGF-Type Precision

4 Installation

1) Precision of mounting surface

The precision of mounting surfaces 1, 2, 3, and 4 directly affects the precision of curved motion (Figure 5). To optimize the performance of the WON curved cross roller guideway, the installation surface must be machined precisely.



2) Installation method

1) Remove debris from the mounting surface of the table and bed.

- Apply low viscosity oil to the V groove.
 Tighten the bolts with regulated torque by keeping track 1, 2 and 3 of Figure 6a in close contact with the mounting surface. (Table 3)
- 3) Secure the gap to push the roller cage into the side by temporarily fastening track 4 in Figure 6a.
- Remove the stopper on one side of the rail and in sert the roller cage as shown in Figure 6c.
- 5) Reseat the stopper.
- Center the roller cage by moving the table left and right (in the direction of the stroke).
- 7) Install the dial gauge on the side of the table in the reference plane. (Figure 6d)
- 8) Move the table to one end of the stroke and tighten the adjustment bolt slightly. (Figure 6e) Adjustment bolts outside the roller cage should not be tightened in this case.
- 9) Move the table to the opposite end of the stroke and tighten the adjustment bolt slightly. (Figure 6f) Adjustment bolts outside the roller cage should not be tightened in this case.



WON

- 10) Move the table to the center and tighten the ad justment bolt slightly. (Figure 6g)
- 11) Repeat steps 8) through 10) until there is no space between the table and the roller cage. Be careful not to apply excessive pre-load
- 12) Tighten the adjustment bolts evenly with a torque wrench.
- Fastening bolts on track 4 in the same way as 8) through 10) Adjustment bolt tightening while mov ing the table.

Figure	5 Accura	cv of I	Mounting	Surface	Unit : I	٧٠m
i igui c	J. Accura	Cy Oi i	mounting	Junace	Unit - I	

Size	
M2.5	0.5
M3	1.1



Figure 6. Installation Method

3) Design of Installation Surface

The curved cross-roller guideway is fitted with the reference plane of the track band in contact with the corner of the mounting surface. The corners shall be relaxed as shown in Figure 7 to avoid interfering with the reference corners of the track. Alternatively, the corners shall be rounded as shown in Figure 8 and within the prescribed radial dimensions of Table 4.



Tal	ble	4.	Edge	Radius	Maxi	mum
-----	-----	----	------	--------	------	-----

Unit:	mm
-------	----

Size	
CRG2 CRGF2	0.05
CRG3 CRGF3	0.1

5 Precautions for use

1) Lubrication

V grooves are precisely ground and the friction resistance is very low, using a precision roller. There is only slight variation in static and dynamic friction resistance, enabling fine and accurate curved motion.

2) Dust protection

If foreign substances enter the WON curved cross roller guideway, they may affect precision and life expectancy and should be protected by a cover in poor conditions

3) Driving Environment

The recommended operating temperature of the WON curved cross roller guideway is −20°C to 80°C.

4) Mediation

Improper installation surfaces or poor pre-load adjustment can result in reduced precision and reduced lifespan.

5) Roller Cage Slip

For WON curved cross roller guides, roller cages may slip under high speed motion, vertical use, load imbalance, and vibration conditions. It is recommended that you set the rotation range with sufficient margin and avoid excessive pre-load. It is also recommended that the roller cage returns to the center by moving the table several times to the maximum stroke at regular intervals

6) Stopper

Stoppers are installed at both ends of the track, but only for preventing separation of the roller cage and the stopper of the table must be installed separately outside.

7) Handle with care

Dropping the WON curve cross roller guideway may damage the V groove orbital surface of the rolling element. This can lead to poor precision as smooth exercise is not possible. Please handle the product carefully.

Use the same set

Since the four tracks are precisely combined in one set, combining them with other sets of track can result in reduced precision

9) Allowable Load

If smooth and high precision is required, be sure to use it within the allowable load.





CRG Type

D

An example of the composition of model name & number



- 4 Number of rollers



		roller diameter	number of rollers					
Model No.	rotaion range	D	Z	L	R	R1	R2	А
		mm		mm	mm	mm	mm	mm
CRG2050- 61	±3°		12	50	61	64	58	12
CRG2050-78	±5°		10	50	78	81	75	12
CRG2050-96	±4°	2	10	50	96	99	93	12
CRG2050-50	±15°	2	9	50	50	53	47	15
CRG2050-68	±11°		9	50	68	71	65	15
CRG2060-60	±10°		12	60	60	63	57	15
CRG3070-70	±7°		12	70	70	74	66	18
CRG3070-87	±7°		12	70	87	91	83	18
CRG3070-90	±7°		11	70	90	94	86	18
CRG3070-96	±4°	2	12	70	96	100	92	18
CRG3070-110	±10°	5	10	70	110	114	106	18
CRG3070-122	±5°		11	70	122	126	118	18
CRG3070-136	±4°		9	70	136	140	132	18
CRG3100-160	±10°		14	100	160	164	156	18





-

В	C	MxP	Ν	E	S1	Т		Model No.
mm	mm	mm	mm	mm		mm		
6	5.5	3 x 10	10	3	M2.5	1.5	48.3°	CRG2050- 61
6	5.5	3 x 10	10	3	M2.5	1.5	37.3°	CRG2050-78
6	5.5	3 x 10	10	3	M2.5	1.5	30.1°	CRG2050-96
6	7.25	3 x 12.5	6.25	2.5	M3	1.5	58.6°	CRG2050- 50
6	7.25	3 x 12.5	6.25	2.5	M3	1.5	42.2°	CRG2050- 68
6	7.25	3 x 12.5	11.25	2.5	M3	1.5	60°	CRG2060-60
8	8.5	3 x 15	12.5	3	M3	1.8	59°	CRG3070-70
8	8.5	3 x 15	12.5	3	M3	1.8	46.7°	CRG3070- 87
8	8.5	3 x 15	12.5	3	M3	1.8	45°	CRG3070-90
8	8.5	3 x 15	12.5	3	M3	1.8	42.1°	CRG3070-96
8	8.5	3 x 15	12.5	3	M3	1.8	36.5°	CRG3070-110
8	8.5	3 x 15	12.5	3	M3	1.8	32.8°	CRG3070-122
8	8.5	3 x 15	12.5	3	M3	1.8	29.3°	CRG3070-136
8	8.5	5 x 15	12.5	3	M3	1.8	36.4°	CRG3100-160

CRGF Type

D

An example of the composition of model name & num





	rotaion	roller diameter	number of		major dimensions							
Model No.	range		rollers	L	R	R1	R2	Hı	H2	h1	h2	
		mm		mm	mm	mm	mm	mm	mm	mm	mm	
CRGF2050- 87	±8°	2	10	50	87	84	89.5	89.5	81.5	7.5	7.5	
CRGF3070-110	±10°	3	10	70	70	106	114	114.5	100.5	12.8	12.5	











major dimensions										
А	В	MxP	Ν	E	S1		G	Т		Model No.
mm	mm		mm	mm	mm	mm	mm	mm		
15	7.25	3 x 12.5	6.25	2.5	M2.5	4	3	2	33.3°	CRGF2050- 87
10	0.5	215	10 5	2	140	7	2 5	17	27.1°	CDCF2070 110





Super Ball Bushing Contents



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F

1 Features of Super Ball Bushing

WON ST localized super ball bushing for the first time in Korea. WON Super Ball Bushing with heavy load & self-aligning type has significant features as follows.

1. 27 times longer service life (3 times more load capacity)

WON Super Ball Bushing has about 3 times more dynamic load rating capacity than a general ball bushing with the same specifications. Therefore, its travel life is 27 times longer.

- The plate of a super ball bushing is made of the special steel with heat treatment. The precisely polished raceway of a ball is designed to be a fewer larger than diameter of the ball in order to be suitable for rolling motion of the ball and high load.
- The 0.5° self-aligning function helps to make even distribution of ball load and to prevent partial intensive pressure that causes a shortened service life.

2. 0.5°Self-aligning

The outer side of the plate of WON Super Ball Bushing is curved so as to have 0.5° self-aligning function in the direction of shaft length. This function helps to absorb the increased pressure between the corner of a ball bushing and a shaft, which is caused by inconsistence between the center lines of the ball bushing and the shaft, and thereby to distribute evenly load on each ball. In addition, it helps to make a ball easily come in and out of the load-carrying area and thus supports smooth running.

(It is recommended to design a system composed of two shafts, each of which has two ball bushings.)

3. Compatibility

WON Super Ball Bushing is classified into Asia Series (SB) and Europe Series (SBE). SB Series has compatibility, since its installation dimensions are equal to those of general ball bushing products used domestically.

4. Fast speed and acceleration

A super ball bushing supports 3m/sec of velocity and 150m/ sec² of acceleration without shortening its service life.







5. Easy adjustment of gap

When the bearing plate in the radial direction is installed in the housing making it possible to adjust clearance, it is easy to adjust a gap in the radial direction in order for precise travel without runout.

- Zero gap adjustment

After WON Super Ball Bushing is installed in the housing supporting clearance adjustment, insert a shaft. Adjust the gap with an adjustment screw until you feel a tiny resistance at the time of turning the shaft.

- Preload

To apply preload, set a shaft, which is smaller as many as a preload level (μ) than the shaft (diameter: d) to be used, to zero gap.

6. Reduction in installation cost

The self-aligning function of a super ball bushing helps to absorb inaccurate processing or inaccuracy of installation and thus to drive smoothly. Therefore, it saves installation time and cost.

7. Smooth driving

The self-aligning function makes it easy for a ball to enter in the load-carrying area. Since the outer sleeve and retainer are made of light and anti-wear polyamide, it supports smooth driving with low inertial force and noise. In the condition of oil lubrication without any seal, the maximum coefficient of friction is 0.001.

8. Available temperature

If a super ball bushing is used at above 100°C, it shortens its service life. (Figure 6. See the temperature factor in the calculation of life.)







2 Types of Super Ball Bushing

1. Asia Series

Е





WON

2. Europe Series



3. Inch Series


3 Life of Super Ball Bushing

A linear motion system has rolling linear motion by bearing load. For this reason, the raceway surface and a rolling element of the system have repetitive stress all the times. Accordingly, if the system reaches a certain travel distance, its raceway or rolling element surface faces a fatigue crack and a scale-like shape appears on part of the surface. Such a phenomenon is called flaking.

Life of a linear motion system refers to a total travel distance until the initial flaking arises on the raceway surface or a rolling element.

1. Basic dynamic load rating (C)

Basic dynamic load rating refers to the load with a constant direction and size, which makes it possible for 90% in one group of linear motion systems to run 50km without any material damage caused by fatigue when each one of the systems runs under the same condition. A value of basic dynamic load rating is described in the table of dimensions.

(km)

(N)

2. Hardness factor (fH)

If a ball bushing has a low hardness factor of shaft, its life is shortened.

$$L = \left(\frac{C}{P} \cdot f_{H} \cdot f_{T} \cdot f_{D}\right)^{3} \cdot 50(km)$$

- : Running distance life L
- C : Basic dynamic load rating (N)
- T : Basic dynamic rated torque $(N \cdot m)$
- P : Applied load
- fH : Hardness factor (See Figure 5.)
- (See Figure 6.) fr : Temperature facto
- fb : Load direction factor (See Figure 8.)



Lh	: Rating life	(hr)
L	: Running distance life	(km)
ls	: Stroke length	(m)
nı	: Number of strokes per minute	(o.p.m)





Figure 6. Temperature factor





3. Temperature factor (fT)

If a super ball bushing is used at above 100 $^\circ\text{C},$ it shortens its service life. (Figure 6.)

4. Load direction factor (fD)

The values of the basic load rating C and Co, shown in the table of dimensions, mean the values when the load direction is the 'min' position (Figure 7). The values of C and Co are changed differently depending on a load direction, as shown in Figure 8.





5. Basic static load rating (Co)

Basic static load rating refers to the load with a constant direction and size in the condition where the total permanent deformation of the rolling element and raceway surface is 0.0001 times more than diameter of a ball as elasticity of the contact part with maximum stress is out of its limit. If inertial force exceeds basic static load rating in the condition of vibration, impacts, or fast velocity, a super ball bushing fails to have smooth linear motion and shortens its service life greatly. Be careful.

6. Housing and shaft tolerance

To use WON Super Ball Bushing, it is necessary to prepare a housing. The tolerance of inside dimeter of the housing affects precision and life of the device. For the housing and shaft tolerance of WON Super Ball Bushing, see Tables 2 to 7.

- Housing tolerance

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Table 2. Asia Series					Unit : mm
Model No.	SB 16	SB 20	SB 25	SB 30	SB 40
Inside diameter (D)	28	32	40	45	60
Tolerance(H7)	+0.021 0		+0.025 0		+0.030 0

Table 3. Europe Series

Model No.	SBE 16	SBE 20	SBE 25	SBE 30	SBE 40	SBE 50
Inside diameter (D)	26	32	40	47	62	75
Tolerance(H7)	+0.021 0		+0.025 0		+0.	030

Unit:mm

Unit:inch

Table 4. Inch Series

Model No.	SBA 4	SBA 6	SBA 8	SBA 10	SBA 12	SBA 16	SBA 20	SBA24
Inside diameter (D)	0.5	0.625	0.875	1.125	1.25	1.5625	2	2.375
Tolerance(H7)	+0.0)007)	+0.(8000 0	+0.0)010)	+0.0)012)

- Shaft Tolerance

Table 5. Asia Series					Unit : mm
Model No.	SB 16	SB 20	SB 25	SB 30	SB 40
Axial diameter	16	20	25	30	40
Tolerance(h6)	0 -0.011		0 -0.013		0 -0.016

Table 6. Europe Series Unit:mm SBE 25 SBE 20 25 Axial diameter 16 20 30 40 50 0 0 0 Tolerance(h6) -0.011 -0.013 -0.016

Table 7. Inch Series								Unit : inch
Model No.	SBA 4	SBA 6	SBA 8	SBA 10	SBA 12	SBA 16	SBA 20	SBA24
Axial diameter	0.25	0.375	0.5	0.625	0.75	1	1.25	1.5
Tolerance(h6)	-0.0 -0.0)002)006	-0.0 -0.0)002)007	-0.0 -0.0)003)008	-0.0 -0.0)004)010



4 Assembly

As for WON Super Ball Bushing, good to use a jig in order for housing fitting. In this case, be careful not to impose any pressure on a retainer or seal. For shaft fitting, required to get corner of a shaft chamfered, and careful not to make Won Super Ball Bushing tilted in assembly.

Life shortening in a short distance

In a short stroke distance, life of a shaft is shorter than that of a ball bushing. Possible to shorten a service life up to about 70% depending on a stroke distance.





Ε

Asia Series Super Ball Bushing



Closed type



Unit : mm

	Model No.			Mair	n dimens	ions		Diameter	No. of	Basic loa	ad rating	
No seal	Seal on one side	Seals on both sides	D	D D1		Bı	B2	of shaft d	ball rows	Dynamic C (N)	Static Co (N)	(g)
SB 16	SB 16U	SB 16UU	28	27	37	26.5	1.6	16	5	1240	800	34
SB 20	SB 20U	SB 20UU	32	30.5	42	30.5	1.6	20	6	2280	1400	58
SB 25	SB 25U	SB 25UU	40	38.5	59	44	1.9	25	6	3980	2465	120
SB 30	SB 30U	SB 30UU	45	43	64	48	1.7	30	6	4420	2800	148
SB 40	SB 40U	SB 40UU	60	58	80	60.9	2.05	40	6	8980	5460	314

1N = 0.102kgf





SBO Series

Asia Series Super Ball Bushing



Open Type



	Model No.			M	ain din	nensior	าร			Diameter	No.	Basic loa	d rating	
No seal	Seal on one side	Seals on both sides	D	Dı	В	Bı	B2	E	Angle θ	of shaft d	of ball rows	Dynamic C (N)	Static Co (N)	Weigh (g)
SBO 16	SBO 16U	SBO 16UU	28	27	37	26.5	1.6	11	60°	16	4	1410	960	26
SBO 20	SBO 20U	SBO 20UU	32	30.5	42	30.5	1.6	11	60°	20	5	2300	1430	48
SBO 25	SBO 25U	SBO 25UU	40	38.5	59	44	1.9	12.5	60°	25	5	4030	2540	100
SBO 30	SBO 30U	SBO 30UU	45	43	64	48	1.7	15	60°	30	5	4475	2890	122
SBO 40	SBO 40U	SBO 40UU	60	58	80	60.9	2.05	20	60°	40	5	9100	5625	262

1N ≒ 0.102kgf

Unit : mm



SH Series

Asia Series Super Ball Bushing Block



Closed Type (Ball Bushing: 1 pc of SB series)





Unit : mm

			Ма	in din	nensi	ons				Moun	ting	dimen	isions		Diamotor	Basic loa	d rating	
Model No.	D			W					В	с	К	Sı	S2		of shaft d	Dynamic C (N)	Static Co (N)	Weight (g)
SH 16UU	28	19	25	50	44	38.5	32,5	9	36	34	7	M5	4.3	12	16	1240	800	148
SH 20UU	32	21	27	54	50	41	35	11	40	40	7	M6	5.2	12	20	2280	1400	198
SH 25UU	40	26	38	76	67	51.5	42	12	54	50	11	М8	7	18	25	3980	2465	472
SH 30UU	45	30	39	78	72	59.5	49	15	58	58	10	М8	7	18	30	4420	2800	589
SH 40UU	60	40	51	102	90	78	62	20	80	60	11	M10	8.7	25	40	8980	5460	1225
SH 50UU	75	52	61	122	110	102	80	25	100	80	11	M10	8.7	25	50	12965	7940	2420

1N = 0.102 kgf





SHW Series

Asia Series Super Ball Bushing Block



Double Closed Type (Ball Bushing: 2pcs of SB Series)





			Ма	in din	nensio	ons				Mour	nting	dimen	sions			Basic loa	d rating	
Model No.	D			w					В	с	K	S1			Diameter of shaft d	Dynamic C (N)	Static Co (N)	Weight (g)
SHW 16UU	28	19	25	50	85	38.5	32.5	9	36	60	7	M5	4.3	12	16	1965	1600	308
SHW 20UU	32	21	27	54	96	41	35	11	40	70	7	M6	5.2	12	20	3615	2800	422
SHW 25UU	40	26	38	76	130	51.5	42	12	54	100	11	M8	7	18	25	6315	4930	972
SHW 30UU	45	30	39	78	140	59.5	49	15	58	110	10	M8	7	18	30	7015	5600	1180
SHW 40UU	60	40	51	102	175	78	62	20	80	140	11	M10	8.7	25	40	14255	10920	2461

1N ≒ 0.102kgf

Unit : mm



F

Asia Series Super Ball Bushing Block



Closed and Clearance Adjustment Type (Ball Bushing: 1 pc of SB Series)





Unit : mm

			Ма	in din	nensi	ons				Moun	iting	dimen	isions		Diamotor	Basic loa	d rating	
Model No.	D			w	L				В	с	К	S1			ofshaft d	Dynamic C (N)	Static Co (N)	Weight (g)
SH 16AUU	28	19	25	50	44	38.5	32 <u>.</u> 5	9	36	34	7	M5	4.3	12	16	1240	800	160
SH 20AUU	32	21	27	54	50	41	35	11	40	40	7	M6	5.2	12	20	2280	1400	218
SH 25AUU	40	26	38	76	67	51.5	42	12	54	50	11	М8	7	18	25	3980	2465	490
SH 30AUU	45	30	39	78	72	59.5	49	15	58	58	10	М8	7	18	30	4420	2800	610
SH 40AUU	60	40	51	102	90	78	62	20	80	60	11	M10	8.7	25	40	8980	5460	1200
SH 50AUU	75	52	61	122	110	102	80	25	100	80	11	M10	8.7	25	50	12965	7940	2400

1N ≒ 0.102kgf





SHO Series

Asia Series Super Ball Bushing Block



Open Type (Ball Bushing: 1 pc of SBO Series)





Unit : mm

Super Ball Bushing

			Ма	in din	nensic	ons				Moun	ting c	limen	sions			Basic loa	ad rating	
Model No.	D			W	L				В	с	K	S1			Diameter of shaft d	Dynamic C (N)	Static Co (N)	Weight (g)
SHO 16UU	28	20	22.5	45	45	33	9	11	60°	32	30	6.5	M5	12	16	1410	960	124
SHO 20UU	32	23	24	48	50	39	11	11	60°	35	35	6.5	M6	12	20	2300	1430	178
SHO 25UU	40	27	30	60	65	47	14	12.5	60°	40	40	10	М6	12	25	4030	2540	352
SHO 30UU	45	33	35	70	70	56	15	15	60°	50	50	10	M8	18	30	4475	2890	507
SHO 40UU	60	42	45	90	90	72	20	20	60°	65	65	12.5	M10	20	40	9100	5625	1055

1N ≒ 0.102kgf



Ε

SBE Series

Europe Series Super Ball Bushing



Closed Type



Unit : mm

	Model No.			Maii	n dimens	ions			No. of	Basic loa	d rating	
No seal	Seal on one side	Seals on both sides	D	D1	В	B1	B2	Diameter of shaft d	ball rows	Dynamic C (N)	Static Co (N)	Weight (g)
SBE 16	SBE 16U	SBE 16UU	26	24.5	36	25	1.4	16	5	1140	710	26
SBE 20	SBE 20U	SBE 20UU	32	30.5	45	31.5	1.65	20	6	2280	1400	60
SBE 25	SBE 25U	SBE 25UU	40	38.5	58	44	2	25	6	4280	2740	120
SBE 30	SBE 30U	SBE 30UU	47	46.4	68	52	1.6	30	6	5020	3365	184
SBE 40	SBE 40U	SBE 40UU	62	58	80	60.5	2.15	40	6	8980	5460	342
SBE 50	SBE 50U	SBE 50UU	75	71	100	77.5	3.65	50	6	12965	7940	586

1N ≒ 0,102kgf





Super Ball Bushing

SBEO Series

Europe Series Super Ball Bushing



Open Type





	Model No.			М	ain din	nensio	ns				No.	Basic loa	ad rating	
No seal	Seal on one side	Seals on both sides	D	Dı	В	Bı	B2	E	Angle θ	Diameter of shaft d	of ball rows	Dynamic C (N)	Static Co (N)	Weight (g)
SBEO 16	SBEO 16U	SBEO 16UU	26	24.5	36	25	1.4	9	68°	16	4	1330	910	20
SBEO 20	SBEO 20U	SBEO 20UU	32	30.5	45	31.5	1.65	9	55°	20	5	2310	1445	50
SBEO 25	SBEO 25U	SBEO 25UU	40	38.5	58	44	2	11.5	57°	25	5	4330	2820	100
SBEO 30	SBEO 30U	SBEO 30UU	47	46.4	68	52	1.6	14	57°	30	5	5080	3460	154
SBEO 40	SBEO 40U	SBEO 40UU	62	58	80	60.5	2.15	19.5	56°	40	5	9095	5625	286
SBEO 50	SBEO 50U	SBEO 50UU	75	71	100	77.5	3.65	22.5	54°	50	5	13130	8175	486

1N = 0.102kgf

Unit : mm



Ε

Europe Series Super Ball Bushing



Closed Type (Ball Bushing: 1 pc of SBE Series)







ВТуре

Unit : mm

			Mai	n din	nensi	ons				Moun	nting c	limer	isions				Basic lo	ad rating	
Model No.	D			w	L				В	С	К	b	S1		Diameter of shaft d	No. of ball rows	Dynamic C (N)	Static Co (N)	Weight (g)
CS 16UU	26	22	26 5	52	12	10	20	10	40	26	65	10	MG	-	16	5	1140	710	204
CS 16UU-B	20	22	20,5	00	43	42	29	10	40	20	0,5	13	IVI O	М5	10	5	1140	710	204
CS 20UU	30	25	30	60	51	50	31	12	15	30	75	18	мя	-	20	6	2280	1400	340
CS 20UU-B	52	20	50	00	54	50	54	12	45	52	7.5	10	IVIO	M6	20	0	2200	1400	340
CS 25UU	10	30	30	78	67	60	10	15	60	40	a	22	M10	-	25	6	1280	2740	636
CS 25UU-B	40	30	33	10	07	00	40	10	00	40	3	22	WITO	M8	20	0	4200	2740	030
CS 30UU	47	25	125	07	70	70	10	17	60	45	0.5	22	M10	-	20	6	5020	2265	070
CS 30UU-B	47	30	43,0	07	19	70	40	17	00	40	9.0	22	IVI I U	M8	30	0	3020	3305	970
CS 40UU	60	45	51	109	01	00	62	22	98	58	11	26	M12	-	40	6	8080	5460	17/10
CS 40UU-B	02	45	54	100	91	90	02	22	00	00		20	IVI I Z	M10	40	0	0900	5400	1740
CS 50UU	75	50	66	122	112	105	69	25	109	50	12	24	M16	-	50	6	12065	79/0	2022
CS 50UU-B	75	50	00	132	113	105	00	20	100	50	12	54	WITO	M12	50	0	12303	7340	2922

1N ≒ 0.102kgf





Super Ball Bushing

CS-A Series

Europe Series Super Ball Bushing



Double Closed Type (Ball Bushing: 2pcs of SBE Series)



ВТуре

			Mai	n din	nensi	ons				Moun	ting c	limer	sions	;			Basic loa	nd rating	
Model No.	D			w	L				В	С	К		S 1		Diameter of shaft d	No. of ball rows	Dynamic C (N)	Static Co (N)	Weight (g)
CS 16AUU	20	22	265	E 2	10	10	20	10	40	26	e e	10	MG	-	16	E	11.40	710	100
CS 16AUU-B	20	22	20,0	53	43	42	29	10	40	20	0,0	13	IVIO	M5	10	5	1140	/10	192
CS 20AUU	20	25	20	60	51	50	24	10	45	22	7 5	10	MO	-	20	6	2200	1400	200
CS 20AUU-B	32	20	30	00	54	50	34	12	40	32	7.5	10	IVIO	M6	20	0	2280	1400	322
CS 25AUU	10	20	20	70	67	60	10	15	60	40	0	22	M10	-	25	6	1200	2740	632
CS 25AUU-B	40	30	39	10	07	00	40	10	00	40	9	22	WITU	M8	20	0	4200	2740	0.52
CS 30AUU	47	25	125	07	70	70	10	17	60	15	0 5	22	M10	-	20	6	5020	2265	065
CS 30AUU-B	47	30	43.0	07	19	70	40	17	00	40	9.0	22	WITU	M8	30	0	5020	3305	303
CS 40AUU	00	45	ΕA	100	01	00	60	22	06	FO	44	26	1410	-	40	6	0000	5460	1736
CS 40AUU-B	02	40	54	100	91	90	02	22	00	00		20	IVI I Z	M10	40	0	0900	5400	1750
CS 50AUU	75	50	66	100	110	105	60	25	100	50	10	24	MIG	-	50	6	12065	70/0	2010
CS 50AUU-B	15	50	00	132	113	105	00	20	100	50	12	34	IVI I O	M12	30	0	12303	7340	2010

1N = 0.102kgf

Unit : mm



Ε

Europe Series Super Ball Bushing



Double Closed Type (Ball Bushing: 2pcs of SBE Series)







ВТуре

Unit : mm

			Mai	n din	nensi	ons				Mour	iting c	limer	isions				Basic loa	d rating	
Model No.	D			W					В	С	K		S1	S2	Diameter of shaft d	No. of ball rows	Dynamic C (N)	Static Co (N)	Weight (g)
CSW 16 UU	26	22	26.5	53	84	12	20	10	40	64	65	13	М6	-	16	5	1910	1/20	380
CSW 16 UU-B	20	22	20,5	55	04	42	29	10	40	04	0.5	15	IVIO	М5	10	5	1010	1420	300
CSW 20 UU	22	25	20	60	10.4	50	24	10	45	76	75	10	MO	-	20	6	2615	2000	640
CSW 20 UU-B	32	20	30	00	104	50	34	12	40	70	7.5	10	IVIO	M6	20	0	3015	2000	040
CSW 25 UU	10	30	30	78	130	60	10	15	60	QЛ	۵	22	M10	-	25	6	6700	5/80	1248
CSW 25 UU-B	40	30	29	10	130	00	40	15	00	94	9	22	WITO	M8	23	0	0790	5400	1240
CSW 30 UU	47	25	125	07	150	70	10	17	60	106	0.5	22	M10	-	20	6	7065	6720	1800
CSW 30 UU-B	47	30	43.0	01	192	70	40	17	00	100	9.0	22	WITO	M8	30	0	7905	0730	1030
CSW 40 UU	60	45	51	100	176	00	ດວ	$\gamma\gamma$	90	104	11	26	M12	-	10	6	1/255	10020	3404
CSW 40 UU-B	02	45	54	100	170	90	02	22	00	124		20	IVI I Z	M10	40	0	14200	10920	5404
CSW 50 UU	75	50	66	122	224	105	69	25	100	160	10	34	MIG	-	50	6	20580	15880	5856
CSW 50 UU-B	75	50	00	132	224	105	00	20	100	100	12	54	IVI I O	M12	30	0	20000	10000	5050

1N ≒ 0.102kgf





CSW-A Series

Europe Series Super Ball Bushing



Closed and Clearance Adjustment Type (Ball Bushing: 2pcs of SBE Series)







Super Ball Bushing

ВТуре

			Mair	n din	nens	ions				Mou	ntingo	limens	sions				Basic loa	ad rating	
Model No.	D			w	L				В	С	K	b	S1		Diameter of shaft d	No. of ball rows	Dynamic C (N)	Static Co (N)	Weight (g)
CSW 16AUU	26	22	26.5	52	01	12	20	10	40	64	65	10	Ме	-	16	5	1010	1400	264
CSW 16AUU-B	20	22	20,0	00	04	42	29	10	40	04	0.5	13	WIO	M5	10	5	1810	1420	304
CSW 20AUU	22	25	20	60	10.4	50	24	10	45	76	75	10	110	-	20	6	2615	2000	614
CSW 20AUU-B	32	20	30	00	104	50	34	12	40	70	7.5	10	IVIO	M6	20	0	3010	2800	014
CSW 25AUU	10	30	30	78	130	60	10	15	60	04	Q	22	M10	-	25	6	6700	E100	1212
CSW 25AUU-B	40	30	39	10	130	00	40	10	00	94	9	22	WITU	M8	20	0	6790	5460	1212
CSW 30AUU	17	25	125	07	150	70	10	17	60	106	0.5	22	M10	-	20	6	7065	6720	1252
CSW 30AUU-B	47	35	43.0	07	IJΖ	70	40	17	00	100	9.5	22	WITU	M8	30	0	7905	0730	1202
CSW 40AUU	ດວ	45	54	100	176	00	ດວ	າງ	96	124	11	26	M12	-	40	6	1/255	10020	3310
CSW 40AUU-B	02	45	54	100	170	90	02	22	00	124	11	20	IVITZ	M10	40	0	14200	10920	3310
CSW 50AUU	75	50	66	122	<u></u>	105	60	25	100	160	10	24	MIG	-	50	6	20500	15000	5856
CSW 50AUU-B	75	30	00	132	224	105	00	20	100	100	12	54	WITO	M12	50	0	20300	13880	0000

Unit : mm

 $1N \approx 0.102 \text{kgf}$



Ε

Europe Series Super Ball Bushing



Open Type (Ball Bushing: 1pc of SBEO Series)





Unit : mm

			Μ	lain d	lime	nsior	۱S			М	ount	ingo	lime	nsio	ns			Basic loa	ad rating	
Model No.	D			w				h1		В	с	к		S1		Diameter ofshaft d	No. of ball rows	Dynamic C (N)	Static Co (N)	Weight (g)
CSO 16UU	26	22	265	53	13	35	8	a	68°	10	26	65	13	ме	-	16	Л	1220	010	160
CSO 16UU-B	20	22	20,0	55	40	55	0	3	00	40	20	0.0	10	WIO	М5	10	4	1000	310	100
CSO 20UU	32	25	30	60	54	12	10	a	55°	15	32	75	18	мя	-	20	5	2310	1//5	280
CSO 20UU-B	52	20	30	00	54	42	10	3	55	40	52	7.5	10	WIO	М6	20	9	2010	1440	200
CSO 25UU	10	30	30	78	67	51	13	11 5	57°	60	10	a	22	M10	-	25	5	1330	2820	552
CSO 25UU-B	40	50	00	10	07	51	10	11,0	57	00	40	3	~~	WIIO	М8	20	9	4000	2020	002
CSO 30UU	17	35	135	87	70	60	15	1/	57°	68	15	0.5	22	M10	-	30	5	5080	3460	846
CSO 30UU-B	47	00	40,0	07	13	00	10	14	57	00	40	9.5	22	WIIO	М8	50	5	5000	0400	040
CSO 40UU	62	15	54	100	01	77	20	10.5	56°	96	59	11	26	N112	-	10	Б	9095	5625	1516
CSO 40UU-B	02	40	54	100	91	11	20	19.0	50	00	50		20	IVITZ	M10	40	5	3035	5025	1310
CSO 50UU	75	50	88	122	112	00	25	02 5	БЛ°	100	50	12	24	M16	-	50	Б	13130	8175	25/16
CSO 50UU-B	75	30	00	132	113	00	20	22,0	54	100	50	12	54	WIO	M12	50	5	10100	0175	2040

 $1N \approx 0.102 \text{kgf}$





CSO-A Series

Europe Series Super Ball Bushing



Open Type (Ball Bushing: 1pc of SBEO Series)



DT	Γ,	00
D	١y	pe

Unit : mm

			Ν	lain d	dime	nsion	IS			М	ount	ting c	dime	nsio	ns			Basic lo	ad rating	
Model No.	D			w	L			h1		В	с	к		S 1		Diameter ofshaft d	No. of ball rows	Dynamic C (N)	Static Co (N)	Weight (g)
CSO 16AUU	26	22	265	53	13	35	Q	a	68°	10	26	65	12	Ме	-	16	4	1000	010	159
CSO 16AUU-B	20	22	20,0	00	43	30	0	9	00	40	20	0,5	13	IVIO	М5	10	4	1330	910	100
CSO 20AUU	22	25	30	60	54	12	10	Q	55°	45	30	75	18	MR	-	20	5	2210	1445	277
CSO 20AUU-B	52	20	30	00	54	42	10	9	55	45	52	7.5	10	IVIO	М6	20	5	2310	1440	211
CSO 25AUU	10	30	30	79	67	51	12	11 5	57°	60	10	a	22	M10	-	25	5	1220	2020	5/8
CSO 25AUU-B	40	30	39	10	07	51	10	11,5	57	00	40	9	22	WIIO	М8	20	5	4330	2020	540
CSO 30AUU	17	25	125	97	70	60	15	1/	57°	69	45	0.5	22	M10	-	20	5	5090	3460	840
CSO 30AUU-B	47	35	43,5	07	19	00	15	14	57	00	43	9.5	22	WIIO	М8	30	5	3080	3400	040
CSO 40AUU	62	45	51	109	01	77	20	10.5	56°	99	59	11	26	M12	-	10	5	0005	5625	1510
CSO 40AUU-B	02	45	54	100	91	11	20	19,0	50	00	50		20	IVITZ	M10	40	5	9095	5025	1310
CSO 50AUU	75	50	66	122	112	00	25	22 F	۶1°	109	50	10	24	MIG	-	50	Б	12120	Q175	2535
CSO 50AUU-B	75	50	00	132	113	00	20	22,3	54	100	50	12	54	NI IO	M12	30	5	13130	0175	2000

Super Ball Bushing

1N ≒ 0.102kgf

CSOW Series

Ε

Europe Series Super Ball Bushing



Double Open Type (Ball Bushing: 2pcs of SBEO Series)



Βī	Гy	ре
	_	

Unit : mm

			Μ	lain c	dime	nsior	าร			М	ount	ingo	dime	nsio	ns			Basic loa	ad rating	
Model No.	D			w				h1		в	с	K		S 1		Diameter of shaft d	No. of ball rows	Dynamic C (N)	Static Co (N)	Weight (g)
CSOW 16UU	26	22	26.5	53	84	35	8	q	68°	40	64	65	13	мө	-	16	Л	2110	1820	338
CSOW 16UU-B	20	~~	20,0	00	04	00	0	9	00	40	04	0.0	10	NIO	М5	10	4	2110	1020	000
CSOW 20UU	32	25	30	60	104	12	10	a	55°	15	76	75	18	MR	-	20	5	5745	5600	552
CSOW 20UU-B	52	20	30	00	104	42	10	3	55	43	10	7.5	10	IVIO	Μ6	20	5	5745	5000	002
CSOW 25UU	10	30	30	78	130	51	13	11 5	57°	60	QЛ	a	22	M10	-	25	5	10795	10060	1092
CSOW 25UU-B	40	30	00	10	150	51	10	11,5	57	00	34	3	22	WHO	М8	20	5	10765	10900	1002
CSOW 30UU	17	25	125	07	150	60	15	11	67°	69	106	0.5	22	M10	-	20	Б	12650	12/60	1656
CSOW 30UU-B	41	35	40,0	07	152	00	10	14	57	00	100	9.5	22	IVITO	М8	30	5	12000	13400	1050
CSOW 40UU	62	15	51	100	176	77	20	10 5	E G°	90	101	11	26	M10	-	10	5	22625	21040	3062
CSOW 40UU-B	02	45	54	100	170	11	20	19.0	50	00	124		20	IVITZ	M10	40	5	22025	21040	5002
CSOW 50UU	75	50	88	122	224	00	25	22.5	51°	109	160	12	25	M16	-	50	Б	32670	31760	50/2
CSOW 50UU-B	15	50	00	132	224	00	20	22,0	54	100	100	12	35	WID	M12	30	5	02010	51700	0042

¹N = 0.102kgf





CSOW-A Series

Europe Series Super Ball Bushing



Double Open and Clearance Adjustment Type (Ball Bushing: 2pcs of SBEO Series)





Unit : mm

			М	ain c	dime	nsior	15			М	ount	ing c	dime	nsior	าร			Basic loa	ad rating	
Model No.	D			W	L			h1		В	с	к		S1		Diameter of shaft d	No. of ball rows	Dynamic C (N)	Static Co (N)	Weight (g)
CSOW 16AUU	26	22	265	53	81	35	8	a	68°	40	64	65	13	Ме	-	16	Λ	2110	1000	220
CSOW 16AUU-B	20	22	20,0	55	04	00	0	3	00	40	04	0.0	10	NIO	Μ5	10	4	2110	1020	330
CSOW 20AUU	30	25	20	60	104	12	10	Q	55°	15	76	75	10	MQ	-	20	Б	5745	5600	540
CSOW 20AUU-B	52	20	30	00	104	42	10	9	55	45	70	7.5	10	IVIO	M6	20	5	5745	5000	540
CSOW 25AUU	10	30	30	79	120	51	13	11 5	Б7°	60	0.1	٥	22	M10	-	25	5	10795	10060	1080
CSOW 25AUU-B	40	30	39	10	130	51	10	11,5	57	00	94	9	22	WITO	M8	20	5	10705	10800	1000
CSOW 30AUU	17	35	135	97	152	60	15	1/	57°	68	106	0.5	22	M10	-	30	5	12650	12/60	16/5
CSOW 30AUU-B	41	35	43,5	07	192	00	10	14	57	00	100	9.5	22	WITO	M8	30	5	12030	13400	1045
CSOW 40AUU	ຄວ	45	51	100	176	77	20	10.5	56°	96	101	11	26	M12	-	40	Б	22625	219/0	2045
CSOW 40AUU-B	02	40	54	100	170	11	20	19,0	50	00	124		20	IVI I Z	M10	40	5	22025	21040	3043
CSOW 50AUU	75	50	66	122	224	00	25	22 F	۶1°	100	160	12	25	M16	-	50	Б	32670	31760	5020
CSOW 50AUU-B	75	50	00	132	224	00	20	22,0	54	100	100	12	55	WITO	M12	30	5	02070	51700	5030

1N = 0.102 kgf

SBA Series Inch Series Ball Bushing

Ε



SBAO Series Inch Series Ball Bushing



Unit∶inch

			Ma	ain dimensions Diameter of shaft					ft Basic load ra				
Model No.	D		Tolerance		Tolerance	B2	Dı		Tolerance	No. of ball rows	Dynamic C (N)	Static Co (N)	Weight (N)
SBA4	0.5	0.75	0 -0.015	0.515	0 -0.015	0.039	0.4687	0.25	0 -0.0005	4	265	355	0.04
SBA6	0.625	0.875	0 -0.015	0.703	0 -0.015	0.039	0.588	0.375	0 -0.0005	4	420	530	0.06
SBA8	0.875	1.25	0 -0.02	1.032	0 -0.02	0.0459	0.8209	0.5	0 -0.0005	4	1020	1290	0.19
SBA10	1.125	1.5	0 -0.02	1.112	0 -0.02	0.0559	1.059	0.675	0 -0.0005	5	1780	2220	0.46
SBA12	1.25	1.625	0 -0.02	1.272	0 -0.02	0.0559	1.176	0.75	0 -0.0005	6	2090	2620	0.55
SBA16	1.5625	2.25	0 -0.02	1.886	0 -0.02	0.0679	1.4687	1	0 -0.0005	6	3780	4710	1.18
SBA20	2	2.625	0 -0.025	2.011	0 -0.025	0.0679	1.8859	1.25	0 -0.0006	6	5470	6800	2.16
SBA24	2.375	3	0 -0.03	2.422	0 -0.03	0.0859	2.2389	1.5	0 -0.0006	6	6580	8220	3.34

% 1 inch=25.4mm 1N ≒ 0.102kgf







Unit : inch

				/ain d	imensior				Diame	ter of shaft	Fixt	ure pinh	ole		Basic load rating			
Model No.	D						D1			Tolerance				No. of ball rows	Dynamic C (N)	Static Co (N)	Weight (N)	
SBAO8	0.875	1.25	0 -0.02	1.032	0 -0.02	0.0459	0.8209	0.313	0.5	0 -0.0005	0.136	0.625	Penetrated	3	1020	1290	0.15	
SBAO10	1.125	1.5	0 -0.02	1.112	0 -0.02	0.0559	1.059	0.375	0.675	0 -0.0005	0.105	0.125	0.039	4	1780	2220	0.37	
SBAO12	1.25	1.625	0 -0.02	1.272	0 -0.02	0.0559	1.176	0.438	0.75	0 -0.0005	0.136	0.125	0.059	5	2090	2620	0.45	
SBAO16	1.5625	2.25	0 -0.02	1.886	0 -0.02	0.0679	1.4687	0.563	1	0 -0.0005	0.136	0.125	0.047	5	3780	4710	0.98	
SBAO20	2	2.625	0 -0.025	2.011	0 -0.025	0.0679	1.8859	0.625	1.25	0 -0.0006	0.201	0.1875	0.09	5	5470	6800	1.86	
SBAO24	2.375	3	0 -0.03	2.422	0 -0.03	0.0859	2.2389	0.75	1.5	0 -0.0006	0.201	0.1875	0.09	5	6580	8220	2.84	

* 1 inch=25.4mm 1N = 0.102kgf





Linear Ball Bushing Contents



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WON

1 Linear Ball Bushing

WON Linear Ball Bushing Linear Motion Series has the infinite linear motion system in combination with a cylindrical linear motion shaft. Since a load ball and a linear motion shaft have a contact point, the device has low allowable load, but has a rolling motion with minimum frictional resistance and a highly precise and light motion.

1. Structure and Features

In the linear ball bushing linear motion series, the ball rolling surface of the linear motion shaft and outer sleeve has a cylindrical shape, and the load balls are aligned in the linear motion shaft direction by a retainer, as shown in Figure 1.

The outer sleeve is made of high carbon chromium bearing steel. The inside diameter and outside diameter are polished after heat treatment.

2. Compatibility

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This product has compatibility because the dimensional tolerance of each part of a linear ball bushing is standardized. A linear motion shaft is easily cylindrical-polished. So, it is possible to obtain fitting clearance with high precision.

3. Outer sleeve with rigidity

Since the outer sleeve is made of strong bearing steel, it is possible to put a needle bearing in the outside diameter.

4. Retainer with high precision

A retainer guiding 4 to 6 ball rows has an integral structure. So, it guides the ball direction accurately and helps to secure stable running precision.

5. Use

A linear ball bushing is widely applied to various kinds of equipment, such as computer and pe ripheral equipment, measuring equipment, auto recording equipment, 3D measuring equipment, multi-axis drilling machine, punching press, tool grinder, automatic gas cutting machine, printing machine, food packing machine, linear motion guides, athletic equipment, and wood equipment.





2 Types and Features

Classification	Туре	Shape and	Feature
	Standard Type LM LME		Cylindrical shape with high precision
Linear Ball Bushing	Open Type LM⊟OP LME⊟OP	Contraction of the second seco	Cutting the one ball row of the outer sleeve and using it in the place where a shaft support is used
	Adjustable Clearance Type LM⊡AJ LME⊡AJ		Cutting in the length direction of the outer sleeve and easily adjusting a shaft and a gap
	Long Type LM□L LME□L		Two retainers connected to the outer sleeve: optimal to the place to which moment is applied

F

Classification	Туре	Shape and Feature				
	Round Type LMF		An integral structure: easy-to-install			
Flange Type	Square Type LMK	a ca	Lower height of the center than that of round-type flange; supporting compact design			
Linear Ball Bushing	Oval Type LMH		Lower height of the center than that of round-type flange; supporting compact design			
	Long type LMF=L LMK=L		Two retainers connected to the out- er sleeve; optimal to the place to which moment is applied			



3 Model number composition of linear ball bushing



1. Precision specification

The precision values of the inside diameter, outside diameter, width, etc. of a linear ball bushing are described in the table of dimensions. The precision values of the inside diameter and outside diameter of the adjustable clearance type (...AJ) and open type (...OP) mean the values before opening.

2. Load rating and life

The load rating of a linear ball bushing depends on position of a ball for a load direction. The value of the basic load rating presented in the table of dimensions means the value at the time when a load ball in the row 1 is right under load. If the ball installed has symmetric load for a load direction, load rating increases as shown in Figure 2, and thus life performance of the device can be improved. Life of a linear ball bushing is calculated in the following formula:

$$L = \left(\frac{f_{H} \cdot f_{C} \cdot f_{T}}{f_{W}} \times \frac{C}{P}\right)^{3} \times 50$$

$$L_{100} = \left(\frac{f_{H} \cdot f_{C} \cdot f_{T}}{f_{W}} \times \frac{C_{100}}{P}\right)^{3} \times 100$$

L L100 C	: Rating life : Rating life : Basic load rating	(km) (km) (N) (N)
C100	: Basic load rating (C/1.26)	(N)
Ρ	: Load	
fH	: Hardness factor	
fw	: Load factor	
fC	: Contact factor	
fT	: Temperature factor	

: Temperature factor

No.of	o, of Ball position		No. of	Ballpo	osition	No.of	Ball position		
ball rows	Max. load	Min. load	ballrows	Max. load	Min. load	ballrows	Max. load	Min. load	
4		₽ ₽	5	F 1 40 HC	F O	6		F O	
	F=1.41×C	⊢=C		F=1.46×C	⊢=C		F=1.26×C	F=C	

Figure 2. Load rating according to ball-row arrangement

C: See the table of dimensions

• If one outer sleeve or two in contact is used and moment is applied, it is required to calculate the equivalent radial load at the time when moment is applied.

$$P_{U} \doteq K \cdot M$$

- Pu: Equivalent radial load (N) (when moment is applied)
- K : Equivalent factor (See Tables 1 to 3.)
- $\mathsf{M} : \mathsf{Load} \mathsf{moment} \qquad (\mathsf{N} \cdot \mathsf{mm})$

In this case, P_{U} should be within basic static load rating (Co).

• If both moment and radial load are applied at the same time, it is necessary to calculate a life in the way of adding up the radial load and equivalent radial load. After the value (L) is obtained in the above formula, it is possible to calculate life hours in the following formula in the condition where the length of stroke and the number of strokes are constant.

$$L_{h} = \frac{L \times 10^{3}}{2 \times l_{s} \times n_{1} \times 60}$$

$$L_{h} : Life hours \qquad (hr)$$

$$l_{s} : Stroke length \qquad (m)$$

$$n_{1} : Number of strokes per minute \qquad (o.p.m)$$

• In the case of short stroke, it is possible to calculate life hours in the way of multiplying basic static load rating by length factor (Kc).

3. An example of calculation

The main influential factors on the determination of an optimal linear bushing model number are maximum load and life. How to calculate an expected life and to determine an appropriate linear ball bushing model number is presented in the following example.

-Service conditions-

 $V = 2 \times l_{0.5} \times n_{1}$ = 2 \times 0.250 \times 60 = 30 m/min (fw = 1.6) Applied load : 250 N (P) Stroke :0.0250 m (ls) Number of strokes per minute : 60 (n_1) Hardness of linear motion shaft : HRC 60 (fH=1.0)



4. Calculation of expected life

In the conditions where basic dynamic load rating based on 50km travel and the values of other factors are 1.0, it is necessary to determine an appropriate model number that is used to expect life hours. In the above conditions, let's try the model number LM40UU.

$$L = \left(\frac{1.0 \times 1.0 \times 1.0}{1.6} \times \frac{2,150}{250}\right)^{3} \times 50 \qquad L_{h} = \frac{7,764 \times 10^{3}}{2 \times 0.250 \times 60 \times 60}$$

= 7,764 km = 4,313 hours

In the assumption that life of a linear ball bushing hours are 15,000, L = $15,000 \times 2 \times 0.250 \times 10^{-3} \times 60 \times 60 = 27,000$ km

$$C = \frac{250 \times 1.6}{1.0 \times 1.0 \times 1.0} \times \sqrt[3]{\frac{27,000}{50}} \\ \approx 3,257 \text{ N}$$

Accordingly, the linear ball bushing model number that meets the above conditions is determined to be LM50UU, whose basic dynamic load rating is 3,822N

4 Equivalent factor

Table 1. Equivalent factor of LM Series

Madal Na	Equivalent factor : K						
MOUELNO.	1 ball bushing	2 ball bushings in contact					
LM 5	1.253	0.178					
LM 6	0.553	0.162					
LM 8S	0.708	0.166					
LM 8	0.442	0.128					
LM 10	0.389	0.101					
LM 12	0.389	0.097					
LM 13	0.343	0.093					
LM 16	0.279	0.084					
LM 20	0.257	0.071					
LM 25	0.163	0.054					
LM 30	0.153	0.049					
LM 35	0.143	0.045					
LM 40	0.117	0.040					
LM 50	0.096	0.032					
LM 60	0.093	0.028					

Note: The equivalent factor of LMF/K/H and SH Series is equal to that of LM Series.

es

Model No	Equivalent factor : K	
MOUELNO.	1 ball bushing	
LM 5L	0.223	
LM 6L	0.201	
LM 8L	0.151	
LM 10L	0.118	
LM 12L	0.113	
LM 13L	0.107	
LM 16L	0.096	
LM 20L	0.082	
LM 25L	0.060	
LM 30L	0.053	
LM 35L	0.050	
LM 40L	0.043	
LM 50L	0.034	
LM 60L	0.031	

Note: The equivalent factor of LMF/K/H–L Series is equal to that of LM–L Series

Table 3. Equivalent factor of LME Series

Model No	Equivalent factor : K			
model no.	1 ball bushing	2 ball bushings in contact		
LME 5	0.669	0.123		
LME 8	0.514	0.116		
LME 12	0.389	0.090		
LME 16	0.343	0.081		
LME 20	0.291	0.063		
LME 25	0.209	0.052		
LME 30	0.167	0.045		
LME 40	0.127	0.039		
LME 50	0.105	0.031		
LME 60	0.093	0.024		

Note: The equivalent factor of LMF/K/H and SH Series is equal to that of LM Series.

Application of short stroke

If short stroke is applied, life of a linear ball bushing is shorter than that of a shaft. If short stroke is applied, the basic dynamic load rating required is in proportion to the length factor (Kc), as shown in Figure 3.





5 Lubrication and Friction

A linear ball bushing is sometimes used in the no-lubrication state. Generally, grease or oil lubric ation is applied.

1. Grease lubrication

A linear ball bushing is coated with rust-prevention oil at the time of initial shipment. Therefore, after the device needs to be washed with clean white oil or an organic solvent, it is required to coat it with grease.

In the case of "..UU" type (seals on the both ends), it is required to coat ball rows of a linear ball bushing with grease before use. In the case of no seal, either apply

the above process, or coat a linear shaft with grease. It is recommended to use lithium grease (JIS2) with good quality.

2. Use of lubricant

If a lubricant is used for lubrication, there is no need of removal the anti-rust oil applied already. It is recommended to use a lubricant whose ISO viscosity is in the range of VG15-100.

Available temperature range	Viscosity
-30℃~50℃	VG 15~46
50℃~80℃	VG46~100

General lubricants are turbine oil, machine oil, and spline oil. Drop a lubricant on a linear motion shaft, or inject a lubricant in the oil inlet after processing a housing, as shown in Figure 4. Our company also manufactures a product that has an oil inlet on the outside diameter of a linear ball bushing as customer request. For more information, please contact WON ST.



In the case of a seal type, a seal removes a lubricant. Except for a type of the seal on one side, no oil dropping is applied.

3. Coefficient of friction

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A linear ball bushing makes a rolling motion with the use of balls as a rolling element in the rolling surface, so that it has low frictional resistance. In particular, there is greatly less static friction, and almost no dynamic friction. Therefore, the device does not generate any stick sleep, and supports transfer highly precisely.

Generally, a coefficient of friction is shown in Figure 5.

Frictional resistance force can be calculated in the following formula:

 $F = \mu \cdot P + fs$

- F : Frictional force (N)
- fs : Seal resistance (1.3 ~ 204 N)
- P : Externally applied load (vertical load to the central line of shaft)) (N)
- μ : Coefficient of friction (dynamic or static)





6 Assembly

1. Inside diameter of housing

Table 4 presents the recommended tolerance of the inside diameter of the housing in a linear ball bushing. Commonly, a housing fit is a clearance fit. To remove clearance, it is necessary to apply a transition fit.

Table 4. Inside diameter tolerance of housing

Туре		Housing	
Model No.	Precision	Clearance fit	Transition fit
LM	High (H)	H7	J7
LME	_	H7	K6, J6
LMF			
LMK			
LMH			
LM-L	-	H7	J7
LMF-L			
LMK-L			
LMH-L			

2. Clearance of outer sleeve and linear motion shaft

If you need to combine a linear ball bushing with a linear motion shaft, it is necessary to apply a running fit generally. To remove clearance, apply precise clearance.

Table 5. Outside diameter tolerance of shaft

Туре		LMshaft	
Model No.	Precision	Normal clearance	Precision clearance
LM	High (H)	f6, g6	h6
LME	-	h7	k6
LMF			
LMK			
LMH			
LM-L	-	f6, g6	h6
LMF-L			
LMK-L			
LMH-L			

Note 1. If you need to set clearance to a minus value after mounting, the value should not exceed the tolerance of radial clearance shown in the table of dimensions.

Note 2. In Case Unit SH, SHW, and SHO Series, the tolerance of a shaft should be equivalent to a high level.

3. Mounting of outer sleeve

F

Mounting the outer sleeve of a linear ball bushing does not require the direction of a linear motion shaft and high precision. Nevertheless, it is required to avoid hammering for fixture. For the tolerance of inside diameter of a housing, see Table 4.

4. Standard mounting

An example of the mounting of standard-type linear ball bushing is illustrated in Figures 6 and 7. Fix the device with the use of a snap ring, a fixing plate, and so on.





5. Retaining ring for mounting (for reference)

For the retaining ring for fixture in Linear Ball Bushing LM Series, see the following table.

	Retaining ring			
Model No	For outside diameter (for shaft)		For inside diameter (for bore)	
	C-Type Concentric	Ć-Type Concentric	C-Type Concentric	Ċ-Type Concentric
LM 5	10	10	10	10
LM 6	12	12	12	12
LM 8	-	15	15	15
LM 8S	-	15	15	15
LM 10	19	19	19	19
LM 12	21	21	21	21
LM 13	23	22	23	-
LM 16	28	-	28	28
LM 20	32	-	32	32
LM 25	40	40	40	40
LM 30	45	45	45	45
LM 35	52	52	52	52
LM 40	-	60	60	60
LM 50	-	80	80	80
LM 60	-	90	90	90

Note: The table is commonly applied to LM and LM-L.

6. Setscrew mounting prohibited

Avoid fixing the outside diameter of the outer sleeve with the use of one setscrew, which causes deformation of the outer sleeve.





7. Flange-type mounting

LMF, LMK, and LMH (including long-type) Series have the integral structure of flange and outer sleeve. Therefore, it is possible to fix only with the flange.

Note: In the case of the mounting based on outer sleeve, pay attention to the shape tolerance in the table of dimensions.



8. Adjustable-type mounting

As for the clearance adjustment of the adjustable type (..AJ), it is possible to adjust the clearance of a linear ball bushing and a linear motion shaft easily by using an adjustable housing. At this time, the cutting part of the linear ball bushing is positioned at 90° of the cutting part of the housing, and thus it is possible to apply an even change in the circumferential direction. (See Figure 10.)

9. Open-type mounting

For the open type (..OP), it is also possible to use a clearance adjustable housing. Commonly, light preload is applied. Please be careful not to apply excessive preload.


10. Shaft support mounting

F

In Shaft Support WK Series, it is possible to fix a device to a table easily with a mounting bolt. With a jointing bolt, it is possible to install a linear motion shaft firmly.



7 Caution for Use

1. Assembly of outer sleeve

To combine a standard-type linear ball bushing to a housing, use either a jig for even hitting and insertion in order to prevent a side plate or seal from being hit directly, or a bed plate for light indentation. (See Figure 14.)

2. Insertion of linear motion shaft

In case of the insertion of a linear motion shaft, if the linear motion shaft tilts, a ball can fall, or a retainer has deformation. Therefore, slowly assemble after setting the center rightly. (See Figure 15.)





3. When moment load applied

As for a linear ball bushing, it is required to apply even load to the entire length of rolling surface of a ball.

In particular, if moment is applied, it is required to use more than two linear ball bushings for one linear motion shaft, and to set the mounting distance between linear ball bushings as long as possible.

If moment load works, it is required to calculate equivalent radial load and check a model number.

(See Tables 1, 2, and 3).

4. Avoid rotation motion

A linear ball bushing is not suitable for rotary motion in terms of its structure. (See Figure 16.) If it rotates by force, ball creeping can cause wear and retainer damage. Be careful.

5. Caution for mounting open-type linear ball bushing with three ball rows

To install an open-type three-ball-row linear ball bushing, it is required to consider load distribution. It is recommended to install the device as shown in Figure 17.





LM Series

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Unit :	: mm
--------	------

		LM Se		Basic loa	ad rating	Incida diamator			
Cylindrica	Птуре	Open type	(OP)	Adjustable ty	vpe(AJ)			Insided	larneter
Model No.	No. of ball rows	Model No.	No. of ball rows	No. of ball rows		Dynamic C(N)	Static Co(N)	dr (mm)	Toler- ance (µm)
LM4UU	4	-	-	-	-	88	127	4	0 -8
LM5UU	4	-	-	-	-	167	206	5	-8
LM6UU	4	-	-	LM 6UUAJ	4	206	265	6	
LM8SUU	4	-	-	LM8SUUAJ	4	176	216	8	
LM8UU	4	-	-	LM 8UUAJ	4	274	392	8	
LM10UU	4	-	-	LM10UUAJ	4	372	549	10	0 -9
LM12UU	4	LM12UUOP	3	LM12UUAJ	4	510	784	12	Ĵ
LM13UU	4	LM13UUOP	3	LM13UUAJ	4	510	784	13	
LM16UU	5	LM16UUOP	4	LM16UUAJ	5	774	1180	16	
LM20UU	5	LM20UUOP	4	LM20UUAJ	5	882	1370	20	
LM25UU	6	LM25UUOP	5	LM25UUAJ	6	980	1570	25	0 -10
LM30UU	6	LM30UUOP	5	LM30UUAJ	6	1570	2740	30	
LM35UU	6	LM35UUOP	5	LM35UUAJ	6	2160	3140	35	
LM40UU	6	LV40UUOP	5	LM40UUAJ	6	3820	4020	40	0 -12
LM50UU	6	LM50UUOP	5	LM50UUAJ	6	3820	7940	50	
LM60UU	6	LM60UUOP	5	LM60UUAJ	6	4700	10000	60	0 -15

Note: As for surface treatment, plating or Raydent treatment is applicable.

1N ≒ 0.102kgf





LM





LM□AJ

Unit : mm

Linear Ball Bushing

WON

						Tolerance																	
[3						Wqt*	of radial	MadalNa										
(mm)	Toler- ance (µm)		Toler- ance (µm)		Toler- ance (µm)		D1				(ğf)	clearance (µm)	woden no.										
8	0	12	0	-	-	-	-	-	-	-	2		LM4UU										
10	-9	15	-0.12	10.2		1.1	9.6	-	-	-	4		LM5UU										
12		19		13.5		1.1	11.5	1	-	-	8.5	-3	LM6UU										
15	0 -11	17		11.5		1.1	14.3	1	-	-	11		LM8SUU										
15		24		17.5	7.5 22 0 0.2	1.1	14.3	1	-	-	17	1	LM8UU										
19		29	0	22 0 23 -0.2 23 -0.2 23 -0.2		1.3	18	1	6.8	80°	36		LM10UU										
21	0	30	-0.2		1.3	20	1.5	8	80°	42	-4	LM12UU											
23	-13	32			1.3	22	1.5	9	80°	49		LM13UU											
28		37				1.6	27	1.5	11	80°	76		LM16UU										
32		42		30.5		1.6	30.5	1.5	11	60°	100	-6	LM20UU										
40	0 -16	59		41		1.85	38	2	12	50°	240		LM25UU										
45		64												44.5		1.85	43	2.5	15	50°	270	0	LM30UU
52		70	0	49.5	0	2.1	49	2.5	17	50°	425	-8	LM35UU										
60	0 -19	80	-0.3	60.5	-0.4	2.1	57	3	20	50°	654	-10	LM40UU										
80		100		74		2.6	76.5	3	25	50°	1700		LM50UU										
90	-22	110		85		3.15	86.5	3	30	50°	2000	-13	LM60UU										

% Based on cylindrical type

1N ≒ 0.102kgf

LME5UU

LME8UU

LME12UU

LME16UU

I ME20UU

LME25UU

LME30UU

LME40UU

LME50UU

LME60UU

5

6

6

6

6

6

LME Series

F

9)	T





+8

Õ

+9 -1

+11 -1

+13

-2

		LME Sei		Basic load rating				
cal	Туре	Open type ((OP)	Adjustable clea type(AJ)	irance	Dvn	Stat.	
	No. of ball rows	Model No.	No. of ball rows	Model No.	No. of ball rows	2 (N)	(S)	
	4	-	-	LME5UUAJ	4	206	265	
	4	-	-	LME8UUAJ	4	265	402	
	4	LME12UUOP	3	LME12UUAJ	4	510	784	
	5	LME16UUOP	4	LME16UUAJ	5	578	892	

LME20UUAJ

LME25UUAJ

LME30UUAJ

LME40UUAJ

LME50UUAJ

LME60UUAJ

5

6

6

6

6

6

862

980

1570

2160

3820

4700

Note: As for surface treatment, plating or Raydent treatment is applicable.

Reference to basic dynamic load rating
 Basic dynamic load rating is based on the 50km stroke.
 In the case of 100km as a base, it is necessary to divide the C value in the table by 1.26.

LME20UUOP

LME25UUOP

LME30UUOP

LME40UUOP

LME50UUOP

LME60UUOP

4

5

5

5

5

5

E.g. LME 20 C : 860 N C 100 : 682 N
L =
$$(\frac{C}{P})^3 \times 50$$
 km, L = $(\frac{C 100}{P})^3 \times 100$ km,





5

8

12

16

20

25

30

40

50

1370

1570

2740

4020

7940



WON ST CO., LTD.





LME





LME□AJ

Unit : mm

						Tolerance								
C				В							Wgt*	otradial direction	Part.No.	
(mm)	Tol. (µm)	(mm)	Tol. (mm)	(mm)	Tol. (mm)		D1		h1	θ(°)	(g)	dearance (µm)		
12	0	22		14.5		1.1	11.5	1	-	-	11	2	LME5UU	
16	-8	25		16.5 22.9 24.9	16.5	1.1	15.2	1	-	-	22	-5	LME8UU	
22	0	32	0 -0.2		22.9 0 -0.3 24.9 31.5	1.3	21	1.5	7.5	78°	45	4	LME12UU	
26	-9	36	0.12			1.3	24.9	1.5	10	78°	60	-4	LME16UU	
32		45		31.5		1.6	30.3	2	10	60°	102	C	LME20UU	
40	0 -11	58		44.1		1.85	37.5	2	12.5	60°	235	-0	LME25UU	
47		68	0	52.1		1.85	44.5	2	12.5	50°	360	0	LME30UU	
62	0	80	-0.3	60.6	0	2.15	59	3	16.8	50°	770	-0	LME40UU	
75	-13	100		77.6	-0.4	2.65	72	3	21	50°	1250		LME50UU	
90	0 -15	125	0 -0.4	101.7		3.15	86.5	3	27.2	54°	2220	-13	LME60UU	

% based on cylindrical flange type

Note: As for surface treatment, plating or Raydent treatment is applicable. % Based on cylindrical flange type

Linear Ball Bushing 273

1N ≒ 0.102kgf

F



Unit	:	mm

	Model No.				Tolerance	Basic loa	ad rating	Inside diameter		
Round type	Square type	Ovaltype	No. of ball rows	Weight* (g)	of radial direction clearance (µm)	Dynamic C(N)	Static Co (N)	dr (mm)	Toler- ance (µm)	
LMF6UU	LMK6UU	-	4	24	_2	206	265	6		
LMF8UU	LMK8UU	-	4	37	-5	274	392	8		
LMF10UU	LMK10UU	LMH10UU	4	72		372	549	10	0	
LMF12UU	LMK12UU	LMH12UU	4	76	-4	510	784	12	-9	
LMF13UU	LMK13UU	LMH13UU	4	88		510	784	13		
LMF16UU	LMK16UU	LMH16UU	5	120		774	1180	16		
LMF20UU	LMK20UU	LMH20UU	5	180	-6	882	1370	20		
LMF25UU	LMK25UU	LMH25UU	6	340		980	1570	25	0 -10	
LMF30UU	LMK30UU	LMH30UU	6	470	0	1570	2740	30		
LMF35UU	LMK35UU	-	6	650	-0	1670	3140	35		
LMF40UU	LMK40UU	-	6	1060	-10	2160	4020	40	0 -12	
LMF50UU	LMK50UU	-	6	2200		3820	7940	50		
LMF60UU	LMK60UU	-	6	3000	-13	4700	10000	60	0 -15	

Note: As for surface treatment, plating or Raydent treatment is applicable.

% Based on cylindrical flange type

1N ≒ 0.102kgf









LMH

Main dimensions (mm)													
Out: diame	side ter(D)	Leng	th(L)	D1	Ц							divdavb	Model No.
(mm)	Tol. (µm)	(mm)	Tol. (mm)	(mm)		PCD					(µm)	urxuzxn	
12	0	19		28	5	20	22	18	20	-	12	25,6,21	LMF/K/H6UU
15	-11	24		32	5	24	25	21	24	-	12	2.2X0X2.1	LMF/K/H8UU
19		29		40	6	29	30	25	29	-	12		LMF/K/H10UU
21	0	30	-0.2	42	6	32	32	27	32	-	12	15×75×11	LMF/K/H12UU
23	-13	32		43	6	33	34	29	33	-	12	4.3X7.3X4.1	LMF/K/H13UU
28		37		48	6	38	37	34	31	22	12		LMF/K/H16UU
32		42		54	8	43	42	38	36	24	15		LMF/K/H20UU
40	0 -16	59		62	8	51	50	46	40	32	15	2.2X9X2.1	LMF/K/H25UU
45		64		74	10	60	58	51	49	35	15	66411461	LMF/K/H30UU
52		70		82	10	67	64	-	-	-	20	0.0 X 1 1 X 0. 1	LMF/K/H35UU
60	0 -19	80	-0.3	96	13	78	75	-	-	-	20	0 14 01	LMF/K/H40UU
80	15	100		116	13	98	92	-	-	-	20	9x 14x8.1	LMF/K/H50UU
90	0 -22	110		134	18	112	106	-	-	-	25	11x17x11.1	LMF/K/H60UU

Unit : mm

 \triangleleft

 $1N \doteq 0.102 kgf$



F



Unit : mm

Mode	el No.			Tolerance	Basic loa	d rating	Inside d	iameter	
Round type	Square type	No. of ball rows	Weight* (g)	Weight [*] direction (g) dearance (µm)		Staticload rating Co (N)	dr (mm)	Tolerance (µm)	
LMF6LUU	LMK6LUU	4	31	_2	323	529	6		
LMF8LUU	LMK8LUU	4	51	-5	431	784	8		
LMF10LUU	LMK10LUU	4	98		588	1100	10	0	
LMF12LUU	LMK12LUU	4	110	-4	813	1570	12	-10	
LMF13LUU	LMK13LUU	4	130		813	1570	13		
LMF16LUU	LMK16LUU	5	190		1230	2350	16		
LMF20LUU	LMK20LUU	5	260	-6	1400	2740	20		
LMF25LUU	LMK25LUU	6	540		1560	3140	25	0 -12	
LMF30LUU	LMK30LUU	6	680	_0	2490	5490	30		
LMF35LUU	LMK35LUU	6	1020	-0	2650	6270	35		
LMF40LUU	LMK40LUU	6	1570	-10	3430	8040	40	0 -15	
LMF50LUU	LMK50LUU	6	3600		6080	15900	50		
LMF60LUU	LMK60LUU	6	4500	-13	7550	20000	60	0 -20	

 $1N \approx 0.102 \text{kgf}$

Note: As for surface treatment, plating or Raydent treatment is applicable. % Based on cylindrical flange type







Unit : mm

Linear Ball Bushing

LMK□L

	Main dimensions (mm)											
Out diame	side ter(D)	Leng	gth(L)	D1	н			Square- ness	divdavh	Model No.		
(mm)	Tol. (µm)	(mm)	Tol. (mm)	(mm)		TCD			ur xuz xm			
12	0	35		28	5	20	22	15	25,6,21	LMF/K6LUU		
15	-13	45		32	5	24	25	15	3.3X0X3.1	LMF/K8LUU		
19		55		40	6	29	30	15		LMF/K10LUU		
21	0	57	0 -0.3	42	6	32	32	15	15,75,11	LMF/K12LUU		
23	-16	61		43	6	33	34	15	4.3X7.3X4.1	LMF/K13LUU		
28		70		48	6	38	37	15		LMF/K16LUU		
32		80		54	8	43	42	20		LMF/K20LUU		
40	0 -16	112		62	8	51	50	20	2.2X9X2.1	LMF/K25LUU		
45		123		74	10	60	58	20	66411461	LMF/K30LUU		
52		135	0	82	10	67	64	25	0.0X X0.	LMF/K35LUU		
60	0 -19	154	-0.4	96	13	78	75	25	01401	LMF/K40LUU		
80		192		116	13	98	92	25	9X14X8.1	LMF/K50LUU		
90	0 -22	211		134	18	112	106	25	11x17x11.1	LMF/K60LUU		

1N ≒ 0.102kgf

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Unit : mm

LM□L Se	ries	Incido d	iamotor			Main	dimens	sions (m	nm)				Basic loa	ad rating
ModelNo	No. of	II ISIUE U							3		Dı	Wgt* (q)	Dynamic	Static
MOUELINU.	rows	dr (mm)	lol. (µm)	(mm)	lol. (<i>u</i> m)	(mm)	lol. (mm)	(mm)	lol. (mm)				C(N)	Co(N)
LM6LUU	4	6		12	0	35		27		1.1	11.5	16	323	530
LM8LUU	4	8		15	-13	45		35		1.1	14.3	31	431	784
LM10LUU	4	10	0	19		55	0	44	0	1.3	18	62	588	1100
LM12LUU	4	12	-10	21	0	57	-0.3	46	-0.4	1.3	20	80	813	1570
LM13LUU	4	13		23	-16	61		46		1.3	22	90	813	1570
LM16LUU	5	16		28		70		53		1.6	27	145	1230	2350
LM20LUU	5	20	0	32		80		61		1.6	30.5	180	1400	2740
LM25LUU	6	25	-12	40	-19	112		82		1.85	38	440	1560	3140
LM30LUU	6	30		45		123		89		1.85	43	480	2490	5490
LM35LUU	6	35	0	52		135	0	99	0	2.1	49	795	2650	6270
LM40LUU	6	40	-15	60	-22	151	-0.4	121	-0.5	2.1	57	1170	3430	8040
LM50LUU	6	50	10	80		192		148		2.6	76.5	3100	6080	15900
LM60LUU	6	60	0 -20	90	0 -25	209		170		3.15	86.5	3500	7550	20000
LME_L Serie	s													
LME8LUU	4	8	+9	16	0/-9	46		33		1.1	15.2	40	421	804
LME12LUU	4	12	-1	22	0	61	0	45.8	0	1.3	21	80	813	1570
LME16LUU	5	16	+11	26	-11	68	-0.3	49.8	-0.4	1.3	24.9	115	921	1780
LME20LUU	5	20	-1	32		80		61		1.6	30.5	180	1370	2740
LME25LUU	6	25	+13	40	-13	112		82		1.85	38	430	1570	3140
LME30LUU	6	30	-2	47	.0	123	0	104.2	0	1.85	44.5	615	2500	5490
LME40LUU	6	40	.10	62	0	151	-0.4	121.2	-0.5	2.15	59	1400	3430	8040
LME50LUU	6	50	+16 -4	75	-15	192	5.1	155.2	5.5	2.65	72	2320	6080	15900
LME60LUU	6	60		90	0/-20	209		170		3.15	86.5	3900	7550	20000

Note: As for surface treatment, plating or Raydent treatment is applicable.

1N ≒ 0.102kgf



SC Series



Unit : mm

Linear Ball Bushing

				Main	dimer	isions			N	1ounti	ng dim	ensior		Di-		Basic loa	ad rating
Model No.	Weight (g)								В					ame- ter of shaft d	No. of ball rows	Dy- namic C (N)	Static Co (N)
SC 8UU	52	11	17	34	30	22	18	6	24	18	5	8	3.4	8	4	260	400
SC 10UU	92	13	20	40	35	26	22	8	28	21	6	12	4.3	10	4	370	540
SC 12UU	102	15	21	42	36	29	25	8	30.5	26	5.75	12	4.3	12	4	410	490
SC 13UU	123	15	22	44	39	30	26	8	33	26	5.5	12	4.3	13	4	500	770
SC 16UU	189	19	25	50	44	38.5	35	9	36	34	7	12	4.3	16	5	770	1170
SC 20UU	237	21	27	54	50	41	36	11	40	40	7	12	5.2	20	5	860	1370
SC 25UU	555	26	38	76	67	51.5	41	12	54	50	11	18	7	25	6	980	1560
SC 30UU	685	30	39	78	72	59.5	49	15	58	58	10	18	7	30	6	1560	2740
SC 35UU	1100	34	45	90	80	68	54	18	70	60	10	18	7	35	6	1660	3130
SC 40UU	1600	40	51	102	90	78	62	20	80	60	11	25	8.7	40	6	2150	4010
SC 50UU	3350	52	61	122	110	102	80	24	100	80	11	25	8.7	50	6	3820	7930

Note: 1) LM __UU jointed. 2) SH__UU marked in the side of the product.

1N ≒0.102kgf

SCWN Series

F



Unit : mm

	Main dimensions						Mounting dimensions					Di-		Basic loa	adrating	
Model No.								В					ame- ter of shaft d	No. of ball rows	Dy- namic C (N)	Static C0 (N)
SCWN 10UU	13	20	40	68	26	22	8	28	46	6	12	4.3	10	4	588	1100
SCWN 12UU	15	21	42	70	29	25	8	30.5	50	5.75	12	4.3	12	4	813	1570
SCWN 13UU	15	22	44	75	30	26	8	33	50	5.5	12	4.3	13	4	813	1570
SCWN 16UU	19	25	50	85	38.5	35	9	36	60	7	12	4.3	16	5	1230	2350
SCWN 20UU	21	27	54	96	41	36	11	40	70	7	12	5.2	20	5	1400	2740
SCWN 25UU	26	38	76	130	51.5	41	12	54	100	11	18	7	25	6	1560	3140
SCWN 30UU	30	39	78	140	59.5	49	15	58	110	10	18	7	30	6	2490	5490
SCWN 35UU	34	45	90	155	68	54	18	70	120	10	18	7	35	6	2650	6270
SCWN 40UU	40	51	102	175	78	62	20	80	140	11	25	8.7	40	6	3430	8040
SCWN 50UU	50	61	122	215	102	80	24	100	160	11	25	8.7	50	6	6080	15900

Note: 1) LM __UU 2EA jointed 2) SHW__UU marked in the side of the product

1N ≒0.102kgf

WON ST CO., LTD.



LM Shaft Contents



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1 Linear Motion Shaft

1. Types

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WON Linear Motion Shaft for Ball Bushing guides a ball bushing in order to obtain the linear motion with high precision.

A linear motion shaft is used in combination with a ball bushing that has a linear motion. Therefore, the shaft not only guides the ball bushing, but serves as the inner ring of a bearing. The quality of a shaft greatly affects the function of linear motion system as well as a ball bushing.

WON ST selects materials and applies heat treatment, polishing, and mechanical processing in consideration of such a fact, and guarantees the function of WON Linear Motion Shaft through its long-accumulated technologies

2. Materials

- High carbon steel for linear motion shaft (WON ST standard material)
- High carbon chrome bearing steel (KS: STB-2, JIS: SUJ-2)
- Martensitic stainless steel (SUS440C) Generally, High carbon chrome bearing steel (STB-2) is used. If corrosive resistance or no lubrication (e.g., chemical & food product machine, medical equipment, semiconductor equipment) is needed, SUS440C is mostly applied.
- Other materials (not for ball bushing)
 -S45C -SUS 303 -SUS 304 -SUS 316

2 Heat Treatment

The linear motion shaft heat treatment equipment of WON ST is capable of performing heat treatment with accurate and stable high frequency. Based on the material screened without decarbonized layer, scratches, and cracks, high-frequency heat treatment is applied appropriately depending on a size of a shaft. Tempering is applied to make hardness and the depth of hardened layer uniform according to the length direction and circumferential direction of a shaft.



3 Precision

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Tolerance of outside diameter	Surface roughness	Straightness
g6, h6, and h5 shafts are mainly manufactured.	1.5 µm Rmax or less	20µm / 300mm or less

4 Calculation of the bending angle of shaft

Support method	Service conditions	Formula to calculate a bending angle	Formula to calculate a bending angle
Fixture of both ends	X L/2 P	$\delta \max = \frac{P\ell^3}{192EI} = \frac{1}{4} \times P\ell^3 C$	$i_1 = 0$ $i_2 = 0$
Fixture of both ends		$\delta_1 = \frac{Pa^3}{6EI} \left(2 - \frac{3a}{\ell}\right) = 8Pa^3 \left(2\frac{3a}{\ell}\right) C$ $\delta max = \frac{Pa^3}{24EI} \left(2 + \frac{3b}{a}\right) = 2Pa^3 \left(2 + \frac{3b}{a}\right) C$	$i_{1} = \frac{Pa^{2}b}{2EI \cdot l} = \frac{24Pa^{2}bc}{l}$ $i_{2} = 0$
Fixture of one end	P ©	δmax = <u>Pℓ³</u> 3EI = 16Pℓ³C	$i_{1} = \frac{P\ell^{2}}{2EI} = 24P\ell^{2}c$ $i_{2} = 0$

- δ_1 : A bending angle at load point (mm)
 - t point E · Ma
- i 2 : A load angle at support point
 I : 2nd moment of cross section (mm⁴)
- a, b : Distance between load points
 - P : Intensive load (N)

- $\delta \max$: Max. bending angle (mm)
 - E : Modulus of elasticity 2.06⁵X10N/mm²
 - i. : A bending angle at load point
 - ℓ : Length (mm)
 - C : 1/48EI(1/kgf · mm)2



1. Solid shaft

2nd moment of cross section (|) = $\frac{\pi D^4}{64}$ (mm⁴) D = Outside diameter (mm)

The 2^{nd} moment of the cross section of a shaft and the value of C (=1/48EI) are presented below.

Outside diameter	2 nd moment of cross section I (mm ⁴)	$C=1/48EI(1/N \cdot mm^2)$
3	3 <u>.</u> 98	2.49 × 10 ⁻⁸
4	1 <u>.</u> 26 x 10	7 <u>.</u> 87 x 10 ⁻⁹
5	3.07 x 10	3.23 x 10 ⁻⁹
6	6.36 x 10	1.56 × 10 ⁻⁹
8	2.01 x 10 ²	4.94 × 10 ⁻¹⁰
10	4.91 × 10 ²	2.02 × 10 ⁻¹⁰
12	1.02×10^3	9.73 x 10 ⁻¹¹
13	1.40 x 10 ³	7.09 × 10 ⁻¹¹
15	2.49 x 10 ³	3.98 x 10 ⁻¹¹
16	3.22×10^3	3.08 × 10 ⁻¹¹
20	7.85 x 10 ³	1.26 × 10 ⁻¹¹
25	1.92 × 104	5.17 x 10 ⁻¹²
30	3.98 x 104	2.49 x 10 ⁻¹³
35	7 <u>.</u> 37 × 10 ⁴	1.35 x 10 ⁻¹³
40	1.26 × 10 ⁵	7.87 x 10 ⁻¹³
50	3 <u>.</u> 07 × 10 ⁵	3.23 x 10 ⁻¹³
60	6.36 x 10 ⁵	1.56 x 10 ⁻¹³
80	2.01 × 10 ⁶	4.94 × 10 ⁻¹⁴
100	4.91 × 10 ⁶	2.02×10^{-14}
120	1.02 × 107	9.73 x 10 ⁻¹⁵
150	2.49 x 10 ⁷	3.98 x 10 ⁻¹⁵

• An example of calculation

-In the conditions where the outside diameter is 2.5mm, the length of a shaft is 430mm, and the intensive load on the center of the shaft is 784N, the maximum bending value is calculated as follows: (In this case, ignore empty weight of a shaft.)

- if) If both ends are fixed, substitute P=784 (N), ℓ=430 (mm), and
 - C=5.17 x 10 (1/kgf \cdot mm²) (the value of the outside diameter 25mm in the above table) in the formula of bending.

$$\delta \max = \frac{1}{4} \operatorname{Pl}^{3} \mathrm{C} = 0.08 \, (\mathrm{mm})$$

2. Hollow shaft

2nd moment of cross section (1) = $\frac{\pi}{64} \times (d2^4 - d1^4) (mm^4)$

 $d_2 = Outside diameter(mm), d_1 = Inside diameter(mm)$

Outside diameter d2(mm)	Inside diameter d1(mm)	2 nd moment of cross section I (mm ⁴)	C=1 / 48EI (1/N · mm⁴)
10	4	4.78×10^{2}	2.08×10^{-10}
13	6	1.34×10^{3}	7.40×10^{-11}
16	8	3.01 x 10 ³	3.30×10^{-11}
20	14	5.97 x 10 ³	1.66×10^{-11}
25	16	1.60×10^4	6.20×10^{-12}
30	17	3.57×10^4	2.78×10^{-12}
35	19	6.73×10^4	1.47×10^{-12}
40	20	1.18 x 10 ⁵	8.41 x 10^{-13}
50	25	2.88×10^{5}	3.44×10^{-13}
60	30	5.96 x 10 ⁵	1.66×10^{-13}
80	40	1.88 x 10 ⁶	5.28×10^{-14}
100	50	4.60 x 10 ⁶	2.16×10^{-14}

• An example of calculation

-In the conditions where the outside diameter is 50mm, the inside diameter is 25mm, the length of a hollow shaft is 1800mm, and the intensive load on the center of the shaft is 784N, the maximum bending value based on an empty weight is calculated as follows: (See the next page.)

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if) If both ends are fixed, substitute P=100, ℓ=1800 (mm), and C = 3.44 x 10⁻¹³ (1/N . mm²) (in the table) in the formula of bending.

$$\delta \max = \frac{1}{4} P\ell^3 C = 0.05 \text{ (mm)}$$

5 Composition of model name & number

1. Model number format I (solid shaft)



① Symbol of shaft model number

	WS	This model is the ball bushing shaft most used. • Material: high carbon steel for linear motion shaft (S55C), STB-2(SUJ-2)
Solid shaft	WAS	This model as a shaft for ball bushing is excellent at corrosive resistance, and is suitable for an environment with easy corrosion, an oxidative environment with no use of lubricants, and cleanroom. • Material: SUS440C
	WCS	The surface of this model is treated with hard chrome plating. It is suitable and eco- nomic for an easy-to-rust environment or poor environment. • Material: high carbon steel for linear motion shaft (S55C), STB-2(SUJ-2)

② Symbol of mechanical processing (No description means a standard product or a simple cut product.)

D Processed in reference to a drawing



Outside diameter	Allowable tolerance of outside diameter (ʉฑ)				Standard length in stock L (mm)								
(mm)	g6	h5	h6	300	500	1000	1200	1500	2000	3000			
3	$-2 \sim -8$	$0 \sim -4$	$0 \sim -6$										
4													
5	$-4 \sim -12$	$0 \sim -5$	$0 \sim -8$										
6													
8	5 or 14		0.01										
10	-5/0-14	$0 \sim -6$	0.0-9										
12													
13	$-6 \sim -17$	$0 \sim -8$	3 0∼−11										
16													
20													
25	− 7 ~ − 20	$0 \sim -9$	0∼ − 13										
30													
35													
40	$-9 \sim -25$	$0 \sim -11$	0~-16										
50													
60	-10 20	0.0/-12	0.00-10										
80	-10.9-29	0.2-13	0 19										

(3) Outside diameter (mm), (4) Allowable tolerance of outside diameter (μ m), (5) Length (mm)

Note 1. For any question about the maximum length, please contact us.

2. The available maximum dimension of outside diameter is ø300.

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2. Model number format II (Hollow shaft)



① Symbol of shaft model number

	WTS	This model helps to make equipment and machine lightweight, and to lessen greatly inertial force if a shaft has a linear motion. In addition, an internal bore can be used for wiring or piping. • Material: high carbon steel for linear motion shaft (S55C), STB-2(SUJ-2)
hollow shaft	WTCS	This model is the ball bushing shaft plated with hard chrome in order to prevent corrosion in the outside diameter. • Material: high carbon steel for linear motion shaft (S55C), STB-2(SUJ-2)
	WTAS	This model is the stainless shaft with a bore. It has the advantages of both WAS and WTS. • Material: SUS440C

② Symbol of mechanical processing (No description means a standard product or a simple cut product.)

D	Processed in reference to a drawing
---	-------------------------------------

(3) Outside diameter (mm), (4) Allowable tolerance of outside diameter (µm), (5) Inside diameter (mm), (6) Length (mm)

Outside	Inside	Allowable tole	ance of outside diameter (µm)		Standard longth in stack 1 (mm)
(mm)	(mm)	g6	h5	h6	Standard tength in stock L (mm)
10	4	-5~-14	0~-6	0~-9	
12	6	-6~-17	0~0	0~=11	
16	8	-0/0-17	0~0	0/*-11	
20	14				
25	16	-7~-20	0~-9	0~-13	1000, 1200, 1500, 2000, 3000
30	17				
35	19				
40	20	-9~-25	0~-11	0~-16	
50	25				

Note : Hollow shafts with different specifications can be manufactured.



3. Model number format III (Tapped shaft)





① Symbol of shaft model number

Line tapped shaft	WBS	General line tapped shaft • Material : high carbon steel for linear motion shaft (S55C), STB-2(SUJ-2)	This device is used together with
	WBAS	Stainless line tapped shaft with corrosive resistance · Material : SUS440C	a shaft line support. It is mostly applied to an environment where shaft bending or vibration occurs
	WBCS	Anti-corrosive line tapped shaft plated with hard Cr • Material : high carbon steel for linear motion shaft (S55C), STB-2(SUJ-2)	

② Outside diameter (mm), ③ Allowable tolerance of outside diameter (µm), ④ Length (mm), ⑤ Tap size (mm), ⑥ Tap distance (mm), ⑦ Distance between both ends (mm) / Standard length in stock

Outside diameter	Allowable tolerance of outside diameter (μm)			Stan	dard len	gth in st	Tap size	Tap distance	Distance between		
D(mm)	g6	h5	h6	1000	1200	1500	2000	3000		(mm)	(mm)
10	-5~-14	$0 \sim -6$	$0\!\sim\!-9$						M4 x 0.7 x 6	100	50
12	-6~-17	0~-8	0~-11						M4 x 0.7 x 6	100	50
13	0 - 17	0 - 0	012 11						M4 x 0.7 x 6	100	50

G

Outside diameter	Allowable tolerance of outside diameter (μm)			Stan	idard len	gth in st	ock L (m	Tap size	Tap distance	Distance between	
D(mm)	g6	h5	h6	1000	1200	1500	2000	3000		(mm)	(mm)
16									M5×0.8×9	150	75
20	70/ 20	0.0	0.0, 12						M6×1×10	150	75
25	-7/0-20	0, -9	0.0-13						M6x1x12	200	100
30									M8x1 <u>.</u> 25x15	200	100
35									M8x1.25x15	200	100
40	-9~-25	0~-11	1 0~-16						M8x1 <u>.</u> 25x18	300	150
50									M10x1.5x22	300	150

Note : For any question about the maximum length, please contact us.

6 Shaft Supports

1. Shaft end support

It helps to support the both ends of a linear motion shaft for ball bushing without any special processing. There is a model for a plane.



2. Shaft line support

It helps to support a line tapped shaft in an environment where there is any concern about ball shaft bending or vibration. Together with an open-type ball bushing, it is used to make a slide rail unit.



STU Series Shaft Line Support II



WK Type

Shaft end support for a plane



Unit : mm

Linear Motion Shaft

WON

Model No.	Diameter of			M	Mounting	Fastening					
Model No.	shaft d	Н	Е	W		F		Ρ	В	bolt spec S1	bolt spec S2
WK 10	Ø10	20	21	42	14	32.8	6	18	32	M5	M4
WK 12	Ø12	23	21	42	14	38	6	20	32	M5	M4
WK 13	Ø13	23	21	42	14	38	6	20	32	M5	M4
WK 16	Ø16	27	24	48	16	44	8	25	38	M5	M4
WK 20	Ø20	31	30	60	20	51	10	30	45	M6	M5
WK 25	Ø25	35	35	70	24	60	12	38	56	M6	M6
WK 30	Ø30	42	42	84	28	70	12	44	64	M8	M6
WK 35	Ø35	50	49	98	32	82	15	50	74	M10	M8
WK 40	Ø40	60	57	114	36	96	15	60	90	M10	M8

• Material : Aluminum AL6061



G

Applied ball bushing block SHO





Unit : mm

Model No	Diameter of		Mair	n dimens	ions	Mounting dimensions				
Model No.	d	Н	Е	W			В	Ν	S1	S2
S-ST16×50	Ø16	25	20	40	50	5	30	25	M5	M5
S-ST20×50	Ø20	27	22.5	45	50	5	30	25	M5	M6
S-ST25×50	Ø25	33	27.5	55	50	6	35	25	M6	M6
S-ST30×60	Ø30	37	30	60	60	7	40	30	M6	M8
S-ST40×70	Ø40	48	37.5	75	70	9	55	35	M8	M8

Ν





ST Type Shaft line support I



Unit : mm

Model No.	Diameter of shaft	Main dimensions					Mounting dimensions				
model no.	d	Н	Е	W			В	P*	S1	S2	
ST 16	Ø16	25	20	40	Max.	5	30	150	M5	M5	
ST 20	Ø20	27	22.5	45	3m	5	30	150	M5	M6	
ST 25	Ø25	33	27.5	55	Linking	6	35	200	M6	M6	
ST 30	Ø30	37	30	60	supports	7	40	200	M6	M8	
ST 40	Ø40	48	37.5	75	available	9	55	300	M8	M8	

Note: P* dimensions can be changed at a customer request.

S-STU Type

Shaft line support II

Applied ball bushing block SHO , CSO





Unit : mm

Model No	Diameter of		Mair	n dimens	ions	Mounting dimensions				
Model No.	d	Н	Е	W			В	Ν	S1	S2
S-STU16x50	Ø16	27	21	42	50	6	31	25	M5	M5
S-STU20x50	ø20	31	25	50	50	6	36	25	M6	M6
S-STU25x50	ø25	36	26.5	53	50	7	39	25	M6	M6
S-STU30x50	ø 30	43	33.5	67	60	8	49	30	M8	M8
S-STU40x50	ø40	55	37	74	70	11	56	35	M8	M8

Ν





STU Type Shaft line support II



Unit : mm

Model No.	Diameter of			Main dir	nensions	Mounting dimensions				
model no.	d	Н	Е	W			В	Ρ*	S1	S2
STU16	Ø16	27	21	42	Max.	6	31	150	M5	M5
STU20	Ø20	31	25	50	3m	6	36	150	M6	M6
STU25	Ø25	36	26.5	53	Linking	7	39	200	M6	M6
STU30	Ø30	43	33.5	67	supports	8	49	200	M8	M8
STU40	Ø40	55	37	74	available	11	56	300	M8	M8

Note: P* dimensions can be changed at a customer request.

Slide Rail Unit

G

A slide rail unit is composed of an open-type block, a line tapped shaft, and a shaft line support.





Assembly height A

Diameter of shaft	Shaft line support Open-type block	S-ST ST	S-STU STU
16	SHO 16 UU	45	47
10	CSO 16 UU		49
20	SHO 20 UU	50	54
20	CSO 20 UU		56
25	SHO 25 UU	60	63
20	CSO 25 UU		66
20	SHO 30 UU	70	76
30	CSO 30 UU		78
40	SHO 40 UU	90	97
40	CSO 40 UU		100



T.R Guide Contents





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4 Assembly and Adjustment

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1 Track Roller Guide

1. Structure and Features







WON Track Roller Guide was developed with the experiences and knowledge that WON ST research ers have accumulated for several years. It consists of the guide rail in which a precisely polished shaft with heat treatment (HRC 62) is inserted, and a roller unit. The device supports high-speed transfer and high precision. It has a simple structure for easy installation and maintenance and a very economic linear motion system.

2. Speed and noise

In a conventional linear guide, a ball as a rolling element has the structure of circulation that causes a noise and restricts a speed of motion. In the case of a track roller guide, its circulation part has no noise, and the device can run up to the maximum rotary speed of a ball.

- Max. velocity V max = 10 m/s

- Max. acceleration A max = 50 m/s²

3. Clearance

If preload or zero clearance is needed in between a guide rail and a track roller, it is possible to adjust clearance easily with the use of eccentric axis of a roller.

4. Load capacity in each direction

A track roller is based on multi-row angular contact ball bearing capable of withstanding load in each direction.

5. Perfect sealing and lubrication

A cap seal prevents any intrusion of foreign substances in between a track roller and a guide rail, and an oil storage seal supports lubrication.

6. Available temperature

-20℃~80℃

7. Simple installation

Thanks to its light weight and simple structure, it is easy to install and handle the product.



.R Guide

2 Types of Guide Rail

1. Outside Type

Н



Standard and maximum lengths of guide rail

The standard length and maximum length of WON Guide Rail are presented below. In case of over maximum length, it is possible to link multiple guide rails. For other specifications, please contact us.

500							
	G	. Р.					G
				1	0		

| Init[.]mm

						011011111
Model No.	20	25	32	42	52	TW52
	300	300	550	675	800	675
	550	550	800	925	1050	925
Standard length of guide rail (Lo)	800	800	1050	1175	1300	1175
	1050	1050	1300	1425	1550	1425
	1300	1300	1550	1675	1800	1675
	1550	1550	1800	1925	2050	1925
	1800	1800	2050	2175	2300	2175
	2300	2300	2300	2425	2550	2425
	2800	2800	2550	2675	2800	2675
			2800	2925		2925
Р	62.5	62.5	125	125	250	250
G	25	25	25	25	25	25
Lmax	6000	6000	6000	6000	6000	6000





2. Inside Type



Standard and maximum lengths of guide rail

The standard length and maximum length of WON Guide Rail are presented below. In case of over maximum length, it is possible to link multiple guide rails. For other specifications, please contact us.

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	<u>.</u>	

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G P				G
	-	Lo		

							ornernin
Model No.	15	20	25	30	35	45	55
	170	230	230	310	310	625	820
	410	410	410	550	550	1045	1060
	710	710	710	630	630	1255	1540
	1010	1010	1010	1030	1030	1570	2020
	1310	1310	1310	1430	1430	2095	2500
Standard	1610	1610	1610	1510	1510	2515	2740
length of	1910	1910	1910	1830	1830	3040	3100
guide rail	2210	2210	2210	2070	2070	3355	3340
(Lo)	2510	2510	2510	2230	2230	3565	3580
	2810	2810	2810	2550	2550	4090	3940
	3110	3110	3110	2630	2630	4510	4060
	3410	3410	3410	3030	3030		4540
	3710	3710	3710	3430	3430		
	4010	4010	4010	3830	3830		
	4310	4310	4310	4630	4630		
Р	60	60	60	80	80	105	120
G	25	25	25	35	35	50	50
Lmax	6000	6000	6000	6000	6000	6000	6000

Linit:mm

3 Types of Block

1. Outside Type

The block for WON Tracker Roller Guide is classified into Fixture Block and Clearance Adjustable Block.

- Fixture block

A fixture block is put together with a precise guide rail well. The gap between the rail and the block is 20μ m or so. Economically, the block needs no eccentric bolt for clearance adjustment.

- Clearance Adjustable Block

A clearance adjustable block is used to apply zero gap or preload.



0





- Maximum allowable load



Fy



Fz





My



Model No.	Fymax (N)	Foymax (N)	Fzmax (N)	Fozmax (N)	Mxmax (N∙m)	Moxmax (N∙m)	Mymax (N∙m)	Moymax (N∙m)	Mzmax (N∙m)	Mozmax (N∙m)
20	406	400	238	200	1.9	1.6	5.9	5.0	10.2	10.0
25	1495	1140	713	560	6.8	5.3	19.6	15.4	41.1	31.4
32	1495	1140	713	560	9.3	7.3	23.2	18,2	48.6	37.1
42	3574	2600	1663	1240	26.6	19.8	58.2	43.4	125,1	91.0
52	3574	2600	1663	1240	34.9	26.0	74.8	55.8	160.8	117.0

Мx

% The load in use should not exceed the maximum allowable load shown in the table.

1N≒0.102kgf 1N⋅m ≒0.102kgf・m



2. Inside Type

The block for WON Tracker Roller Inside Type (TRI) is classified into Fixture Block and Clearance Ad justable Block.

- Fixture block

A fixture block is put together with a precise guide rail well. The gap between the rail and the block is 20μ m or so. Economically, the block needs no eccentric bolt for clearance adjustment.

- Clearance adjustable block

A clearance adjustable block is used to apply zero gap or preload.



- Maximum allowable load







	гу		FZ	IVIX		iviy		IVIZ		
Model No.	Fy _{max} (N)	Foymax (N)	Fz _{max} (N)	Fozmax (N)	Mx _{max} (N⋅m)	Mox _{max} (N⋅m)	Mymax (N∙m)	Moymax (N⋅m)	Mz _{max} (N⋅m)	Mozmax (N∙m)
TRI 15	406	400	194	150	1.8	1.4	3.3	2.6	6.9	6.8
TRI 15L	406	400	238	200	2.3	1.9	6.3	5.3	10.8	10.7
TRI 20	406	400	194	150	2.3	1.8	3.5	2.7	7.3	7.2
TRI 20L	406	400	238	200	2.9	2.4	7.8	6.6	13.4	13.2
TRI 25	1495	1140	583	420	9.0	6.5	14.6	10.5	37.4	28.5
TRI 25L	1495	1140	713	560	11.0	8.7	26.7	21.0	56.0	42.8
TRI 30	1495	1140	583	420	10.5	7.6	15.7	11.3	40.4	30.8
TRI 30L	1495	1140	713	560	12.8	10.1	31.0	24.4	65.0	49.6
TRI 35	3574	2600	1359	930	30.6	20.9	48.9	33.5	128.7	93.6
TRI 35L	3574	2600	1663	1240	37.4	27.9	89.8	67.0	193.0	140.4
TRI 45	3574	2600	1359	930	34.0	23.3	50.3	34.4	132.2	96.2
TRI 45L	3574	2600	1663	1240	41.6	31.0	99.8	74.4	214.4	156.0
TRI 55	3574	2600	1359	930	40.8	27.9	61.2	41.9	160.8	117.0
TRI 55L	3574	2600	1663	1240	49.9	37.2	122.2	91.1	262.7	191.1

% The load in use should not exceed the maximum allowable load shown in the table.

1N≒0.102kgf 1N⋅m ≒0.102kgf・m
4 Assembly and Adjustment

1. Outside Type

The clearance adjustable block for WON Track Roller Guide makes it possible to run precisely through clearance adjustment.

While the block is running smoothly, all bearings rotate and accurate adjustment is made. If a bearing is adjusted with too much force, it is possible to shorten service life of a system.

- 1) By connecting fully the bearing in the concentric axis (which is the basis) and temporarily the bearing in the eccentric axis, it is possible to secure a sufficient gap between a rail and a clearance adjustable block.
- 2) After the block is put together with a rail, slowly turn an adjustment wrench until the bearing in the eccentric axis contacts rightly the rail.
- 3) If the bearing in the eccentric axis is adjusted accurately, fasten a fixture nut fully according to the roller assembly torque shown below.



- Roller Assembly Torque (A)

Model No.	20	25	32	42	52
Max (N·m)	2.0	8.0	8.0	46	46

- Rail Assembly Torque(B)

Model No.	M5	M6	M8	M10	M12
Max (N·m)	5 <u>.</u> 8	9.9	24	48	80

1N≒0.102kgf 1N⋅m ≒0.102kgf・m



2. Inside Type

The clearance adjustable block for WON Track Roller Guide Inside Type (TRI) makes it possible to run precisely through clearance adjustment.

- 1) By connecting fully a fixture bearing (which is the basis) and temporarily an adjustable bearing, it is possible to secure a sufficient gap between a rail and a clearance adjustable block.
- 2) After the block is put together with a guide rail, slowly turn the adjustment bolt on the side of the block until a roller contacts the rail.
 - While the block runs smoothly, it is required to rotate all bearings for adjustment.
 - If a bearing is adjusted with too much force, it is possible to shorten service life of a system.
- 3) If the adjustable bearing is adjusted accurately, fasten a nut and bolt fully according to the roller assembly torque shown below.
- 4) Fasten the loose-proof bolt on the top of the nut.







- Roller Assembly Torque

Model No.	15	20	25	30	35	45	55
Max (N·m)	2.0	2.0	8.0	8.0	46	46	46

- Rail Assembly Torque

Model No.	15(M4)	20(M5)	25(M6)	30(M6)	35(M8)	45(M10)	55(M12)
Max (N·m)	2.5	5.8	9.9	9.9	24	48	80

1N≒0.102kgf 1N⋅m ≒0.102kgf・m

5 Track Roller

A track roller based on multi-row angular contact ball bearing is composed of an eccentric axis roller and a concentric axis roller.



- Concentric Axis Roller

This roller is used in the case where there is an instal lation in the fixture axis, the opposite of eccentric axis, or where there is no need of clearance adjustment.



- Eccentric Axis Roller

This roller is used to apply zero clearance between a guide rail and a roller or preload.



6 End Seal (T Type)

This seal is installed before and after a block in order to prevent foreign substances from intruding in a roller. It helps to extend a life and improve running stability.



7 Cap Seal

- This seal wraps a roller in order to prevent foreign substances from intruding in the raceway surface.
- A seal storing a lubricant supplies the lubricant to the contact surface.
- It is designed to refill the contact surface.
- It helps to extend a life and improve running sta bility.



8 Assembly and adjustment of cap seal

It is recommended to mount a cap seal after a roller is adjusted completely.

To mount a cap seal on a block, do the following: 1. Separate the block from a guide rail. 2. Temporarily connect the cap seal with the block in order to secure a sufficient gap of the cap seal. 3. Put the cap seal to gether with the guide rail again. 4. Adjust clearance by making the cap seal in contact with the shaft surface. ※ The more contact with the shaft, the better sealing effect. In this case, be careful of friction increase.





WON ST CO., LTD.

9 Precision

For the precision of WON Track Roller Guide, inspect its precision after installing a rail in the datum plane of floor.





10 Rating life

Rating life refers to a total travel distance that 90% in one group of bearings run without any material damage.

1. Basic dynamic load rating C (basic dynamic moment M)

Basic dynamic load rating (basic dynamic rated moment) refers to the load (moment) with which 90% in one group of bearings can run 100km without any material damage.

2. Basic static load rating Co (basic static moment Mo)

Basic static load rating (basic static rated moment) refers to the load and (moment) that can cause the race way surface of a bearing and the rolling element to be deformed permanently as many as 0.0001 of diameter of the rolling element.

3. Maximum allowable load (maximum allowable moment)

Maximum allowable load (maximum allowable moment) refers to the maximum load (maximum moment) that allows smooth linear motion in consideration of load transmission capacity of a track roller, and the inten sity of rail, block, and jointing bolt.

4. Rating life for the load in each direction

$$L = \left(\frac{C_{yz}}{P}\right)^{3} \cdot 10^{5}$$
$$L_{h} = \frac{L}{2 \cdot l_{s} \cdot n_{1} \cdot 60}$$

- : Rating life (m) L (h)
- : Rating life Lh
- Cyz : Basic dynamic load rating in each direction (N)
- Ρ : Operating load in each direction (N)
- : Stroke length (m) 0s
- : No. of strokes (o.p.m.) n1
- % If operating load is less than the maximum allowable load Cyz, it is required to calculated rating life in the above formula.

5. Rating life for the moment in each direction

$$L = \left(\frac{M_{xyz}}{M}\right)^{3} \cdot 10^{5}$$
$$L_{h} = \frac{L}{2 \cdot \ell_{s} \cdot n_{1} \cdot 60}$$

L	: Rating life	(m)
Lh	: Rating life	(h)
Mxyz	: Basic dynamic rated moment in each direction	(N • m)
Μ	: Operating moment in each direction	(N • m)
ls	: Stroke length	(m)
n1	: No. of strokes	(o.p.m.)
× If o	porating moment is loss than the maximu	m

If operating moment is less than the maximum. allowable moment Mxyz, it is required to calculated rating life in the above formula.



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An example of the composition of model name & number









Unit:mm

	Main dir	mensions			D	imensior	ns of rail		
Model No.	W	L (max.)	С	ds	h	h۱	d×D×p	G	Ρ
STF 32	26	6000	10	6	10	5	6.5×12×6.5	25	125
STF 52	42	6000	16	10	18	9	11×19×13	25	250

* For other specifications, please contact us

% For vertical use, please contact us.

TS Series

An example of the composition of model name & number



5 Length of rail



Basic load rating and moment



		Basic lo	bad rating		Allowable static moment								
Model No.	Cy (N)	Coy (N)	Cz (N)	Coz (N)	Mx (N⋅m)	Mox (N∙m)	My (N∙m)	Moy (N∙m)	Mz (N∙m)	Moz (N∙m)			
TS 20	1860	1600	870	760	7.0	6.1	21.8	19.0	46.7	40.0			
TS 25	5960	4560	2850	2200	27 <u>.</u> 1	20.9	78.4	60.5	164.0	125.4			
TS 32H	5960	4560	2850	2200	37.1	28.6	92.6	71.5	193.8	148.2			
TS 42H	13930	10200	6620	4920	106.0	78.7	231	172	487	357			
TS 52H	13930	10200	6620	4920	139.0	103	298	221	627	459			

% For other specifications, please contact us.

- % The rail of TS 32H or more has a hollow type.
- % The values of load rating and moment are needed for life calculation. For the value of maximum allowable load, see the information at page 292.
- % For vertical use, please contact us.











Unit:mm

		Mair	n dimer	nsions		Di	mens	ions o	of bloc	ck	Dimensions of rail						
Model No.	W	W1		Lı	н	Hı	H2	S	T1	T2		ds	h	hı	d×D×p	G	Ρ
TS 20	60	20	6000	110	25,5	16.5	12.5	M 5	25	50	17	4	12.2	9	4.5×8×4.6	25	62.5
TS 25	85	25	6000	125	34.1	23,5	17	M 6	35	55	21	6	15	10.6	5.5×10×6.5	25	62.5
TS 32H	90	32	6000	145	38.5	23.5	17	M 6	37.5	65	24	6	20	15	6.5×12×7.5	25	125
TS 42H	120	42	6000	170	47.5	34.9	25,2	M 8	50	75	28	10	20	12,6	9×15×8.5	25	125
TS 52H	130	52	6000	205	60	34.9	25,2	M10	52.5	90	40	10	34	25.1	11×19×13	25	250

1N ≒ 0.102kgf 1N•m ≒ 0.102kgf•m





TC Series

Н

An example of the composition of model name & number





Basic load rating and moment



		Basic lo	bad rating			Allo	owable sta	itic mome	nt	
Model No.	Су	Соу	Cz	Coz	Мх	Мох	Му	Моу	Mz	Moz
	(N)	(N)	(N)	(N)	(N∙m)	(N∙m)	(N∙m)	(N∙m)	(N∙m)	(N∙m)
TC 20	1860	1600	870	760	7.0	6,1	21.8	19.0	46.7	40.0
TC 25	5960	4560	2850	2200	27.1	20.9	78.4	60.5	164	125
TC 52	13930	10200	6620	4920	139	103	298	221	627	459

% For other specifications, please contact us.

% The values of load rating and moment are needed for life calculation. For the value of maximum allowable load, see the information at page 292.

% For vertical use, please contact us.









		Maii	n dimer	nsion		Dimensions of block				Dimensions of rail										
Model No.	W	W1	L (max.)	Lı	Н	Ηı	H2	S	T1	T2				аз	ds	h	hı	h2	hз	h₄
TC 20	60	20	6000	110	57	16.5	12.5	Μ5	25	50	56	5.3	8.3	30	4	43.7	40.5	22	-	31.5
TC 25	85	25	6000	125	81.1	23.5	17	Μ6	35	55	75	8.3	14	43	6	62	57.6	25	-	47
TC 52	130	52	3000	205	113,5	34.9	25.2	M10	52,5	90	112	8.3	14	80	10	86	78,6	25	50	66

% For the specifications of bracket, see the information at page 318.

1N = 0.102 kgf $1\text{N·m} = 0.102 \text{kgf} \cdot \text{m}$





TF Series

An example of the composition of model name & number





Basic load rating and moment



		Basic lo	bad rating			Allo	owable sta	itic momei	nt	
Model No.	Су	Соу	Cz	Coz	Мх	Мох	My	Моу	Mz	Moz
	(N)	(N)	(N)	(N)	(N∙m)	(N∙m)	(N∙m)	(N∙m)	(N·m)	(N∙m)
TF 32	5960	4560	2850	2200	37.1	28.6	92.6	71,5	193	148
TF 42	13930	10200	6620	4920	106	78.7	231	172	487	357
TF 52	13930	10200	6620	4920	139	103	298	221	627	459

% For other specifications, please contact us.

% The values of load rating and moment are needed for life calculation. For the value of maximum allowable load, see the information at page 292.

 $\ensuremath{\overset{\scriptstyle <}{_{\scriptstyle \sim}}}$ For vertical use, please contact us.





WON ST CO., LTD.









Unit:mm

		Main	dimens	ions		Di	mens	sions	of blo	ck	Dimensions of rail					
Model No.	W	W1	L (max.)	Lı	Н	Ηı	H2	S	T1	T2	ds	h	hı	d×D×p	G	Ρ
TF 32	90	32	6000	145	33	23.5	17	Μ6	37.5	65	6	10	5	6.5×12×6.5	25	125
TF 42	120	42	6000	170	47.2	34.9	25.2	M 8	50	75	10	15	7.5	9×15×7	25	125
TF 52	130	52	6000	205	47.2	34.9	25.2	M10	52,5	90	10	18	9	11×19×10	25	250

1N ≒ 0.102kgf 1N•m ≒ 0.102kgf • m





TW Series

Н

An example of the composition of model name & number





Basic load rating and moment



		Basic lo	oad rating			Allo	wable sta	itic mome	nt	
Model No.	Су	Соу	Cz	Coz	Мх	Мох	Му	Моу	Mz	Moz
moderno.	(N)	(N)	(N)	(N)	(N·m)	(N∙m)	(N∙m)	(N∙m)	(N∙m)	(N∙m)
TW 52	13938	10200	6620	4920	364.3	270.6	298.1	221.4	627.2	459.0

% For other specifications, please contact us.

※ The values of load rating and moment are needed for life calculation. For the value of maximum allowable load, see the information at page 292.

X For vertical use, please contact us.









Unit:mm

		Main dimensions					mens	sions	of blc	ock			Di	mens	sions of rail		
Model No.	W	W1	L (max.)	Ы	Н	Hı	H2	S	T1	T2		ds	h	hı	d×D×P	G	Ρ
TW 52	200	120	6000	205	51	34.9	25.2	M10	87.5	90	100	10	25	16 <u>.</u> 1	11×19×13	25	250

а

$1N \ \doteq \ 0.102 \text{kgf}$ $1N \cdot \text{m} \ \doteq \ 0.102 \text{kgf} \cdot \text{m}$



TRI Series - Standard Type

An example of the composition of model name & number





Basic load rating and moment



		Basic lo	oad rating			Allo	owable sta	itic mome	nt	
Model No.	Cy (N)	Coy (N)	Cz (N)	Coz (N)	Mx (N∙m)	Mox (N∙m)	My (N₊m)	Moy (N∙m)	Mz (N∙m)	Moz (N∙m)
TRI 15	1860	1600	710	570	8.3	5.4	12 <u>.</u> 1	9.7	31.8	27 <u>.</u> 2
TRI 20	1860	1600	710	570	8.5	6.8	12.8	10.3	33.6	28.8
TRI 25	5960	4560	2330	1650	36.1	25.6	58.3	41.3	149	114
TRI 30	5960	4560	2330	1650	41.9	29.7	62.9	44.6	161	123
TRI 35	13900	10200	5410	3690	121	83.0	195	132	501	367
TRI 45	13900	10200	5410	3690	135	92.3	200	136	515	377
TRI 55	13900	10200	5410	3690	162	110	243	166	627	459

% For other specifications, please contact us.

% The values of load rating and moment are needed for life calculation. For the value of maximum allowable load, see the information at page 292.

% For vertical use, please contact us.











Unit:mm

	Ma	ain di	mensi	ons	D	vimen	sions	of blo	ck			D	imen	sions	of rail		
Model No.	W	Н		Lmax	Lı	H2	S	T1	T2	ds	h	h۱		С	d×D×p	G	Ρ
TRI 15	34	24	57	6000	54.2	10.3	M4	26	26	4	14 <u>.</u> 7	4	24	3.3	4.5×8×4.5	25	60
TRI 20	42	28	66.2	6000	63.4	11.3	M5	32	32	4	17.7	5	30	3.3	5.5×9.4×5.5	25	60
TRI 25	48	33	83	6000	80,2	12	M6	35	35	6	22	6	34	4 <u>.</u> 2	6.5×11×6.5	25	60
TRI 30	60	42	96.8	6000	94	17.5	M8	40	40	6	26	7	44	5	6.5×11×6.5	35	80
TRI 35	70	48	117	6000	114.2	18 <u>.</u> 5	M8	50	50	10	31.5	8	50	6.8	9×14×9	35	80
TRI 45	86	60	126	6000	123 <u>.</u> 2	23	M10	60	60	10	39.5	12	60	6.8	11×17,5×11	50	105
TRI 55	100	68	156	6000	153,2	28	M12	75	75	12	43.5	12	70	8 <u>.</u> 5	13×20×13	50	120

 $1N \ \doteq \ 0.102 kgf \\ 1N \cdot m \ = \ 0.102 kgf \ m$





TRI Series – Long Type

An example of the composition of model name & number





Basic load rating and moment



		Basic lo	bad rating			Allo	wable sta	tic momer	nt	
Model No.	Cy (N)	Coy (N)	Cz (N)	Coz (N)	Mx (N₊m)	Mox (N∙m)	My (N₊m)	Moy (N∙m)	Mz (N∙m)	Moz (N∙m)
TRI 15L	1860	1600	870	760	8.3	7.2	23.2	20.3	49.9	42.7
TRI 20L	1860	1600	870	760	10.5	9.1	28.7	25.1	61.6	52.8
TRI 25L	5960	4560	2850	2200	44.2	34.1	106	82.5	223	171
TRI 30L	5960	4560	2850	2200	51.3	39.6	124	95.7	259	198
TRI 35L	13900	10200	6620	4920	149	110	357	265	752	550
TRI 45L	13900	10200	6620	4920	165	123	397	295	836	612
TRI 55L	13900	10200	6620	4920	198	147	486	361	1024	749

% For other specifications, please contact us.

 The values of load rating and moment are needed for life calculation. For the value of maximum allowable load, see the information at page 292.
For vertical use, please contact us.











Unit:mm

	Ma	ain di	mensi	ons	D	imens	sions	of blo	ck				imen	isions	of rail		
Model No.	W	Η		Lmax	Lı	H2	S	T1	T2	ds	h	hı		С	d×D×p	G	Ρ
TRI 15L	34	24	79.4	6000	76.6	10.3	M4	26	34	4	14 <u>.</u> 7	4	24	3.3	4.5×8×4.5	25	60
TRI 20L	42	28	98	6000	95 <u>.</u> 2	11 <u>.</u> 3	M5	32	50	4	17 <u>.</u> 7	5	30	3.3	5.5×9.4×5.5	25	60
TRI 25L	48	33	109	6000	106.2	12	M6	35	50	6	22	6	34	4.2	6.5×11×6.5	25	60
TRI 30L	60	42	131	6000	128.2	17.5	M8	40	60	6	26	7	44	5	6.5×11×6.5	35	80
TRI 35L	70	48	152	6000	149.2	18.5	M8	50	72	10	31.5	8	50	6.8	9×14×9	35	80
TRI 45L	86	60	174	6000	171 <u>.</u> 2	23	M10	60	80	10	39.5	12	60	6.8	11×17,5×11	50	105
TRI 55L	100	68	213	6000	210.2	28	M12	75	95	12	43.5	12	70	8.5	13×20×13	50	120







RF Series/RA Series

Track Roller (Outside Type)

An example of the composition of model name & number



Н

Model type: RF-Concentric Roller, RA-Eccentric Roller
Model No.



Load of applied roller







Model No.	Cy (N)	Coy (N)	Cz (N)	Coz (N)	Fymax. (N)	Fzmax. (N)
RF 04/RA 04	1150	800	330	190	250	100
RF 06/RA 06	3670	2280	1080	550	920	270
RF 10/RA 10	8580	5100	2510	1230	2200	630
RF 12	8580	5100	2510	1230	2200	630











													Unit:mm
Model No.	ds	d	D	Do	Н	h	E	М	N	L		K	Applied rail
RF 04	4	А	10	00	7		-	1 F	0.5	10 F	0.5	0.4	00
RA 04	4	4	01	22	1	Э	0.5	1.5	0.5	18.5	0.5	2.4	20
RF 06	6	e	04	24	4.4	e e	_	4	4	07	1.0	F	05 00
RA 06	0	Ö	24	34	11	0.0	1	1		21	1.0	Э	20, 32
RF 10	10	10	05	E1 0	15.0	0.05	-	4	4 7	10 F	0	0	40 50
RA 10	10	10	35	51.3	15.9	0.95	1		г./	40.5	2	Ó	42, 52
RF 12	12	10	42	60.93	19	9.5	_	_	3	43.2	1	12.5	55

1N ≒ 0.102kgf

1N•m ≒ 0.102kgf•m

Н

RFI Series Track Roller (Inside Type)

An example of the composition of model name & number



2 Model No.



Load and moment of applied roller







Model No.	Cy (N)	Coy (N)	Cz (N)	Coz (N)	Fymax. (N)	Fzmax. (N)
RFI 04	1150	800	330	190	250	100
RFI 06	3670	2280	1080	550	920	270
RFI 10	8580	5100	2510	1230	2200	630
RFI 12	8580	5100	2510	1230	2200	630











Model No.	ds	d	D	Do	Н	h	d1	М	Ν			K	Applied rail
RFI 04	4	Λ	10	22	7	F	10	1 5	0 E	17	0.5	E E	TRI 15
RFI 04-1	4	4	10	22	1	Э	10	1.5	0.5	18	0.5	5.5	TRI 20
RFI 06	G	e	04	24	44	e e	14	4	4	21.5	0 5	6	TRI 25
RFI 06-1	0	0	24	34	11	0.0	14	I		25.9	0.5	0	TRI 30
RFI 10	10	10	25	E1 0	15.0	0.05	22	4	1 75	33.35	4	0	TRI 35
RFI 10-1	10	10	30	51.5	15.9	0.90	22	I	1.75	37.35	I	9	TRI 45
RFI 12	12	12	42	60.93	19	9.5	22	-	3	43.2	1	12.5	TRI 55

1N ≒ 0.102kgf

Unit:mm

1N•m ≒ 0.102kgf•m



An example of the composition of model name & number



Η









Unit:mm

Model No.	А	A1	В	Н	Hı	С	S	Applied roller
S 04	38	30	12	20	8	10		RF, RA 04
S 06	45	36	16	28	12	14	3.2×6×3.5	RF, RA 06
S 10	60	50	22	39	17 <u>.</u> 5	19.5		RF, RA 10



T Series End Seal

An example of the composition of model name & number









Model No.	L	Н	t	С	h	D	d
T 15	30	15.5	3	20	3	5.5	3.5
T 20	38	16.5	3	22	4	5.5	3.5
T 25	44	20	3	25	4	6	3.5
T 30	56	24.4	3	36	6	8	4.5
T 35	65	31.9	3	40	7	8	4.5
T 45	80	35.4	3	46	9	8	4.5
T 55	94	40.7	3	66	9.5	8	4.5



Н

An example of the composition of model name & number











Unit:mm

Model No.	А	В	Н		d × D	h	Е	F×n	G
B 20-1	20	7	00 F	40	C C VII	17	7 5	25 ×1	7 6
B 20-2	20	1	23.0	65	0,0×11	17	7.0	25 ×2	7.5
B 25-1	20	10	27	47 <u>.</u> 5	0.01/11	20 E	0	32 <u>.</u> 5×1	7 6
B 25-2	20	10		80	0.0×11	20.5	9	32.5×2	7.5
B 52-1	20	11 5	07	70	0 ×14	10 E	0.5	55 ×1	7.5
B 52-2	30	п.э	21	125	9 × 14	10.0	9.0	55 ×2	

Bracket Assembly Torque

Model No.	M5	M6	M8
Max(N·m)	5.8	9.9	24



Appendix Contents

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1. Conversion Table from International System of Units (SI)

A table of comparison between SI, CGS system, and engineering

Amount Unit system	Length	Mass	Time	Temp.	Acceleration	Force	Stress	Pressure	Energy	Power
SI	m	kg	S	K, ℃		Ν	Pa	Pa	J	W
CGS System	cm	g	S	°C	Gal	dyn	dyn/cm ²	dyn/cm ²	erg	erg/s
Engineering Unit System		kgf ∙S²/m		°C	m/s ²	kgf	kgf/m ²	kgf/m ²	kgf∙m	kgf · m/s

Conversion Factor in SI Units

L ese este	SI Units		Other units than SI		Conversion factoria SL units	
Length	Name of unit	Symbol	Name of unit	Symbol	Conversion factor in SI units	
Angle	Radian	rad	Degree Minute Second	° , "	180/π 10 180/π 648 000/π	
Length	Meter	m	Micron Angstrom	μ Å	10 ⁶ 10 ¹⁰	
Area	Square meter	m²	Are Hectare	a ha	10 ⁻² 10 ⁻⁴	
Volume	Cubic meter	m ³	Liter Deciliter	l' L dl' dL	10 ³ 10 ⁴	
Time	Second	S	Minute Hour Day	min h d	1/60 1/3 600 1/86 400	
Vibration, Frequency	Hertz	Hz	Cycle	S ⁻¹	1	
Revolutions	Revolutions/second	S ²	Revolutions/minute	rpm	60	
Speed	Meter/second	m/s	Kilometer/hour Knot	km/h kn	3 600/1000 3 600/1852	
Acceleration	Meter/second	m/s	Gal G	Gal G	10 ² 1/9.806 65	
Mass	Kilogram	kg	Ton	Т	10 ⁻³	
Force	Newton	N	Kilogram weight Ton weight Dyne	kgf tf dyn	1/9.806 65 1/(9.806 65 X 10 ³) 10 ²	
Torque and force moment	Newton meter	N∙m	Kilogram weight	kgf∙m	1/9.806 65	
Stress	Pascal (Newton/square meter)	Pa (N/m)	Kilogram weight/square centimeter Kilogram weight/Millimeter	kgf/cm² kgf/mm²	1/(9.806 65 X 10 ⁴) 1/(9.806 65 X 10 ⁶)	



Factor by which the unit is multiplied	Name and syr	mbol of prefix	Factor by which the unit is multiplied	Name and sys	mbol of prefi
10 ¹⁸ 10 ¹⁵ 10 ¹²	Exa Peta Tera	E P T	10 ⁻¹ 10 ⁻² 10 ⁻³	Deci Centi Milli	d c m
10 ⁹ 10 ⁶ 10 ³	Giga Mega Kilo	G M k	10 ⁻⁶ 10 ⁻⁹ 10 ⁻¹²	Micro Nano Pico	μ n p
10 ² 10 ¹	Hecto Deca	h da	10 ⁻¹⁵ 10 ⁻¹⁸	Femto Ato	f a

Conversion Factor in SI Units (cont'd)

A management	SI unit	S	Other units	SI	Conversion factor in Slupita	
Amount	Name of unit	Symbol	Name of unit	Symbol	Conversion lactor in Si units	
Pressure	Pascal (Newton/square meter)	Pa (N/m²)	Kilogramweight /squaremeter Aqua meter Mercury millimeter Torr Bar Atmosphere	kgf/m ² mH ₂ O mmHg Torr bar atm	1/9.806.65 1/(9.806.65X10 ³) 760/(1.013.25X10 ⁵) 760/(1.013.25X10 ⁵) 10 ⁻⁵ 1/(1.013.25X10 ⁵)	
Energy	Joule (Newton meter)	J (N·m)	Erg Calorie (international) Kilogram meter weight Kilowatt-hour Metric horsepower-hour	erg calrr kgf∙m kM∙h PS∙h	10 ⁷ 1/4.1868 1/9.80665 1/(3.6 X 10 ⁶) ≈3.77672 X 10 ⁻⁷	
Power	Power Watt W (Newton meter) (J/S)		Kilogram weight/second Kilogram/hour Metric horsepower	kgf∙m/s kcal/h PS	1/9.806 1/1.163 ≈1/735.4988	
Viscosity, Viscosity Index	Pascal	Pa∙s	Poise	Р	10	
Kinetic viscosity, Kinetic viscosity index	Square meter/second	m²/s	Stokes Centistokes	St cSt	10 ⁴ 10 ⁶	
Temperature, Temperature difference	Kelvin, Celsius	K, °C	Degree	°C	[See Note (1).]	
Current, Magnetomotive force	Ampere	А	Ampere	°C	1	
Current, electromotive force	Volt	V	(Watt/Ampere)	(W/A)	1	
Magnetic intensity	Ampere/meter	A/m	Oersted	Oe	4π/10 ³	
Magnetic flux density	flux density Tesla T Gausas gamma		Gs γ	10 ⁴ 10 ⁹		
Electric resistance	Ohm	Ω	Ampere/volt	(V/A)	1	

Note (1) Remark

In TK, the temperature conversion to θ° C is θ =T-273.15. In temperature difference, Δ T= $\Delta\theta$. ΔT and $\Delta \theta$ represent the temperature difference measured in Kelvin and Celsius scales, respectively. The name or symbol of a unit in parenthesis is the definition of the unit described above or in the left. An example of conversion 1N=1/9.809 65kgf

2. N-kgf Conversion Table

[How to read] For example, if you convert 10N, find '10' in the middle column of the 1st block and read the value on its right side in the column kgf. It is found that 10N is converted into 1.0197kgf. If you convert 10kgf, find '10' in the middle column of the same block and read the value on its left side in the column N, which is 98.066N.

1N=0.1019716kgf 1kgf=9.80665 N

N		kgf	N		kgf	N		kgf
9.8066	1	0.1020	333.43	34	3.4670	657.05	67	6.8321
19.613	2	0.2039	343.23	35	3.5690	666.85	68	6.9341
29.420	3	0.3059	353.04	36	3.6710	676.66	69	7.0360
39.227	4	0.4079	362.85	37	3.7729	686.47	70	7.1380
49.033	5	0.5099	372.65	38	3.8749	696.27	71	7.2400
58.840	6	0.6118	382.46	39	3.9769	706.08	72	7.3420
68.647	7	0.7138	392.27	40	4.0789	715.89	73	7.4439
78.453	8	0.8158	402.07	41	4.1808	725.69	74	7.5459
88.260	9	0.9177	411.88	42	4.2828	735.50	75	7.6479
98.066	10	1.0197	421.69	43	4.3848	745.31	76	7.7498
107.87	11	1.1217	431.49	44	4.4868	755.11	77	7.8518
117.68	12	1.2237	441.30	45	4.5887	764.92	78	7.9538
127.49	13	1.3256	451.11	46	4.6907	774.73	79	8.0558
137.29	14	1.4279	460.91	47	4.7927	784.53	80	8.1577
147.10	15	1.5296	470.72	48	4.8946	794.34	81	8.2597
156.91	16	1.6315	480.53	49	4.9966	804.15	82	8.3617
166.71	17	1.7335	490.33	50	5.0986	813.95	83	8.4636
176.52	18	1.8355	500.14	51	5.2006	823.76	84	8.5656
186.33	19	1.9375	509.95	52	5.3025	833.57	85	8.6676
196.13	20	2.0394	519.75	53	5.4045	843.37	86	8.7696
205.94	21	2.1414	529.56	54	5.5065	853.18	87	8.8715
215.75	22	2.2434	539.37	55	5.6084	862.99	88	8.9735
225.55	23	2.3453	549.17	56	5.7104	872.79	89	9.0755
235.36	24	2.4473	558.98	57	5.8124	882.60	90	9.1774
245.17	25	2.5493	568.79	58	5.9144	892.41	91	9.2794
254.97	26	2.6513	578.59	59	6.0163	902.21	92	9.3814
264.78	27	2.7532	588.40	60	6.1183	912.02	93	9.4834
274.59	28	2.8552	598.21	61	6.2203	921.83	94	9.5853
284.39	29	2.9572	608.01	62	6.3222	931.63	95	9.6873
294.20	30	3.0591	617.82	63	6.4242	941.44	96	9.7893
304.01	31	3.1611	627.63	64	6.5262	951.25	97	9.8912
313.81	32	3.2631	637.43	65	6.6282	961.05	98	9.9932
323.62	33	3.3651	647.24	66	6.7301	970.86	99	10.095



3. kg-lb Conversion Table

[How to read]

For example, if you convert 10kg, find '10' in the middle column of the 1st block and read the value on its right side in the column lb. It is found that 10kg is converted into 22.046lb. If you convert 10lb, find '10' in the middle column of the same block and read the value on its left side in the column kg, which is 4.536kg.

1kg=2.2046226lb 1lb=0.45359237kg

		lla -	l.e.		11-	les -					
кg		dl	кд		dl	кд		dl			
0.454	1	2.205	15.422	34	74.957	30.391	67	147.71			
0.907	2	4.409	15.876	35	77.162	30.844	68	149.91			
1.361	3	6.614	16.329	36	79.366	31.298	69	152.12			
1.814	4	8.818	16.783	37	81.571	31.751	70	154.32			
2.268	5	11.023	17.237	38	83.776	32.205	71	156.53			
2.722	6	13,228	17.690	39	85.980	32,659	72	158.73			
3.175	7	15,432	18.144	40	88.185	33,112	73	160.94			
3.629	8	17,637	18.597	41	90.390	33,566	74	163.14			
4.082	9	19,842	19.051	42	92.594	34,019	75	165.35			
4.536	10	22,046	19.504	43	94.799	34,473	76	167.55			
4.990	11	24.251	19.958	44	97.003	34.927	77	169.76			
5.443	12	26.455	20.412	45	99.208	35.380	78	171.96			
5.897	13	28.660	20.865	46	101.41	35.834	79	174.17			
6.350	14	30.865	21.319	47	103.62	36.287	80	176.37			
6.804	15	33.069	21.772	48	105.82	36.741	81	178.57			
7.257	16	35.274	22.226	49	108.03	37.195	82	180.78			
7.711	17	37.479	22.680	50	110.23	37.648	83	182.98			
8.165	18	39.683	23.133	51	112.44	38.102	84	185.19			
8.618	19	41.888	23.587	52	114.64	38.555	85	187.39			
9.072	20	44.092	24.040	53	116.84	39.009	86	189.60			
9.525	21	46.297	24.494	54	119.05	39.463	87	191.80			
9.979	22	48.502	24.948	55	121.25	39.916	88	194.01			
10.433	23	50.706	25.401	56	123.46	40.370	89	196.21			
10.886	24	52.911	25.855	57	125.66	40.823	90	198.42			
11.340	25	55.116	26.308	58	127.87	41.277	91	200.62			
11.793	26	57.320	26.762	59	130.07	41.730	92	202.83			
12.247	27	59.525	27.216	60	132.28	42.184	93	205.03			
12.701	28	61.729	27.669	61	134.48	42.638	94	207.23			
13.154	29	63.934	28.123	62	136.69	43.091	95	209.44			
13.608	30	66.139	28.576	63	138.89	43.545	96	211.64			
14.061	31	68.343	29.030	64	141.10	43.998	97	213.85			
14.515	32	70.548	29.484	65	143.30	44.452	98	216.05			
14.969	33	72.753	29.937	66	145.51	44.906	99	218.26			

Appendix

4. Hardness Conversion Table

		Brinell H	ardness	Rockwell	Hardness	
Rockwell C Scale Hardness (1 471N)	Vickers Hardness	Standard Ball	Tungsten Carbide Ball	A Scale Load 588.4N(69kgf) Brale Indenter	B Scale Load 980.7N (100kgf) Diameter 1.588mm (1/16in)	Shore Hardness
68 67 66 65 64	940 900 865 832 800	- - - - -	- - 739 722	85.6 85.0 84.5 83.9 83.4	- - - - -	97 95 92 91 88
63	772	-	705	82.8	-	87
62	746	-	688	82.3	-	85
61	720	-	670	81.8	-	83
60	697	-	654	81.2	-	81
59	674	-	634	80.7	-	80
58	653	-	615	80.1	-	78
57	633	-	595	79.6	-	76
56	613	-	577	79.0	-	75
55	595	-	560	78.5	-	74
54	577	-	543	78.0	-	72
53	560	_	525	77.4	-	71
52	544	500	512	76.8	-	69
51	528	487	496	76.3	-	68
50	513	475	481	75.9	-	67
49	498	464	469	75.2	-	66
48	484	451	455	74.7	-	64
47	471	442	443	74.1	-	63
46	458	432	432	73.6	-	62
45	446	421	421	73.1	-	60
44	434	409	409	72.5	-	58
43 42 41 40 39	423 412 402 392 382	400 390 381 371 362	400 390 381 371 362	72.0 71.5 70.9 70.4 69.9	- - - -	57 56 55 54 52





		Brinell H	ardness	Rockwell	Hardness	
Rockwell C Scale Hardness (1 471N)	Vickers Hardness	Standard Ball	Tungsten Carbide Ball	A Scale Load 588.4N(69kgf) Brale Indenter	B Scale Load 980.7N (100kgf) Diameter 1.588mm (1/16in)	Shore Hardness
38 37 36 35 34	372 363 354 345 336	353 344 336 327 319	353 344 336 327 319	69.4 68.9 68.4 67.9 67.4	(109.0) (108.5) (108.0)	51 50 49 48 47
33 32 31 30 29	327 318 310 302 294	311 301 294 286 279	311 301 294 286 279	66.8 66.3 65.8 65.3 64.7	(107.5) (107.0) (106.0) (105.5) (104.5)	46 44 43 42 41
28 27 26 25 24	286 279 272 266 260	271 264 258 253 247	271 264 258 253 247	64.3 63.8 63.3 62.8 62.4	(104.0) (103.0) (102.5) (101.5) (101.0)	41 40 38 38 38 37
23 22 21 20	254 248 243 238	243 237 231 226	243 237 231 226	62.0 61.5 61.0 60.5	100.0 99.0 98.5 97.8	36 35 35 34
(18) (16) (14) (12)	230 222 213 204	219 212 203 194	219 212 203 194	- - - -	96.7 95.5 93.9 92.3	33 32 31 29
(10) (8) (6) (4) (2) (0)	196 188 180 173 166 160	187 179 171 165 158 152	187 179 171 165 158 152	- - - - -	90.7 89.5 87.1 85.5 83.5 81.7	28 27 26 25 24 24

1

5. Dimensional Tolerance of Shaft

Diamet	er (mm)						ь. г	L O		F 0	L O	610		
Above	Below	۵b	еб	ΪĎ	go	go	no	пъ	n <i>r</i>	nø	ny	niu	JSD	JSD
3	6	-30 -38	-20 -28	-10 -18	-4 -9	-4 -12	0 - 5	0 8	0 12	0 —18	0 -30	0 48	±2 <u>.</u> 5	±4
6	10	-40 -49	-25 -34	-13 -22	5 11	5 14	0 6	0 —9	0 —15	0 22	0 36	0 58	±3	±4 <u>.</u> 5
10	18	-50 -61	-32 -43	16 27	6 14	6 17	0 8	0 —11	0 —18	0 27	0 43	0 70	±4	±5 <u>.</u> 5
18	30	-65 -78	-40 -53	-20 -33	-7 -16	-7 -20	0 9	0 —13	0 21	0 33	0 - 52	0 - 84	±4 <u>.</u> 5	±6 <u>.</u> 5
30	50	80 96	-50 -66	-25 -41	9 20	9 25	0 —11	0 16	0 - 25	0 39	0 62	0 100	±5 <u>.</u> 5	±8
50	80	100 119	-60 -79	-30 -49	10 23	-10 -29	0 13	0 —19	0 30	0 - 46	0 - 74	0 120	±6 <u>.</u> 5	±9 <u>.</u> 5
80	120	-120 -142	-72 -94	-36 -58	-12 -27	-12 -34	0 15	0 22	0 35	0 54	0 87	0 —140	±7 <u>.</u> 5	±11
120	180	-145 -170	85 110	-43 -68	14 32	-14 -39	0 18	0 25	0 40	0 63	0 100	0 —160	±9	±12 <u>.</u> 5
180	250	170 199	-100 -129	-50 -79	15 35	15 44	0 20	0 29	0 46	0 72	0 —115	0 —185	±10	±14 <u>.</u> 5
250	315	190 222	-110 -142	-56 -88	-17 -40	-17 -49	0 23	0 -32	0 52	0 81	0 —130	0 210	±11 <u>.</u> 5	±16
315	400	-210 -246	-125 -161	-62 -98	18 43	- 18 -54	0 25	0 36	0 57	0 89	0 —140	0 230	±12 <u>.</u> 5	±18
400	500	-230 -270	-135 -175	68 108	-20 -47	- 20 -60	0 27	0 40	0 63	0 97	0 155	0 250	±13 <u>.</u> 5	±20
500	630	-260 -304	-145 -189	76 120	-	- 22 -66	_	0 44	0 70	0 —110	0 —175	0 280	-	±22
630	800	-290 -340	160 210	80 130	-	- 24 -74	_	0 50	0 80	0 125	0 200	0 320	-	±25
800	1000	-320 -376	170 226	-86 -142	-	-26 -82	_	0 56	0 90	0 —140	0 230	0 360	-	±28
1000	1250	-350 -416	195 261	-98 -164	_	28 94	_	0 - 66	0 105	0 165	0 260	0 420	-	±33
1250	1600	-390 -468	-220 -298	-110 -188	_	-30 -108	_	0 - 78	0 125	0 —195	0 310	0 500	-	±39
1600	2000	-430 -522	-240 -332	-120 -212	-	-32 -124	_	0 92	0 —150	0 230	0 370	0 600	-	±46



i5	i6	i7	k5	k6	k7	m5 m6 n6 n6		r6	r7	Diameter (mm)							
10		J.							P •			Above	Below				
+3 -2	+6 -2	+8 -4	+6 +1	+9 +1	+13 +1	+9 +4	+12 +4	+16 +8	+20 +12	+23 +15	+27 +15	3	6				
+4 -2	+7 -2	+10	+7 +1	+10 +1	+16 +1	+12 +6	+15 +6	+19 +10	+24 +15	+28 +19	+34 +19	6	10				
+5 	+8 -3	+12 -6	+9 +1	+12 +1	+19 +1	+15 +7	+18 +7	+23 +12	+29 +18	+34 +23	+41 +23	10	18				
+5 -4	+9 -4	+13 -8	+11 +2	+15 +2	+23 +2	+17 +8	+21 +8	+28 +15	+35 +22	+41 +28	+49 +28	18	30				
+6 -5	+11 -5	+15 -10	+13 +2	+18 +2	+27 +2	+20 +9	+25 +9	+33 +17	+42 +26	+50 +34	+59 +34	30	50				
+6	+12	+18	+15	+21	+32	+24	+30	+39	+51	+60 +41	+71 +41	50	65				
-7	-7	-12	+ 2	+ 2	+ 2	+ 11	+ 11	+20	+32	+62 +43	+73 +43	65	80				
+6	+13	+20	+18	+25	+38	+28	+35	+45	+59	+73 +51	+86 +51	80	100				
-9	-9	-15	+3	+ 3	+ 3	+13	+13	+23	+37	+76 +54	+89 +54	100	120				
. 7		. 00	. 01		+43 + 3		+40 +15	. 50		+88 +63	+103 +63	120	140				
+7 _11	+14 11	+22	+21 +3	+28 + 3		+33 +15		+52 +27	+68 +43	+90 +65	+105 +65	140	160				
		10	.0	. 0		110		121		+93 +68	+108 +68	160	180				
+7 +16 -13 -13				+33 + 4	+50 + 4	+37 +17	+46 + 17	+60 +31	+79 +50	+106 +77	+123 +77	180	200				
	+16 -13	+25 -21	+24 + 4							+109 +80	+126 +80	200	225				
	10									+113 +84	+130 +84	225	250				
+7 -16	10	±26	+27	+36	+56	+43	+52	+66	+88	+126 +94	+146 +94	250	280				
	±10		+ 4	+ 4	+ 4	+20	+20	+34	+56	+130 +98	+150 +98	280	315				
+7	±10	+29	+29	+40	+61	+46	+57	+73	+98	+144 +108	+165 +108	315	355				
-18	±18	-28	+ 4	+ 4	+ 4	+21	+21	+37	+62	+150 +114	+171 +114	355	400				
+7 -20 ±20	+20	+31 -32	+32	+45	+68	+50	+63	+80	+108	+166 +126	+189 +126	400	450				
	±20		+ 5	+ 5	+ 5	+23	+23	+40	+68	+172 +132	+195 +132	450	500				
				+44	+70		+70	+88	+122	+194 +150	+220 +150	500	560				
-	-	-	_	0	0	_	+26	+44	+78	+199 +155	+225 +155	560	630				
							+50	+80		+80	+100	+138	+225 +175	+255 +175	630	710	
			_	0	0	-	+30	+ 50	+88	+235 +185	+265 +185	710	800				
		-		+56	+90 0		+90	+112	+156	+266 +210	+300 +210	800	900				
-	-		—	0		-	+34	+56	+100	+276 +220	+310 +220	900	1000				
	-	-		+66	+105		+106	+132	+186	+316 +250	+355 +250	1000	1120				
-			_	-	_	_	0	0	-	+ 40	+66	+120	+326 +260	+365 +260	1120	1250	
	_			+78	+125		+126	+156	+218	+378 +300	+425 +300	1250	1400				
_		_	_	-	_	_	_	0	0	_	+ 48	+78	+140	+408 +330	+455 +330	1400	1600
				+92	+150		+150	+184	+262	+462 +370	+520 +370	1600	1800				
	_	-	_	_	_	_	-	0	0	-	+ 58	+92	+170	+492 +400	+550 +400	1800	2000

6. Dimensional Tolerance of Housing Hole

Diameter (mm)		56	Ee	E7	C.6	67	ЦС	Ц 7	ЦО	16	17	196	197
Above	Below	LU	10		uu	ur	110	117	110	00		000	007
10	18	+43 +32	+27 +16	+34 +16	+17 + 6	+24 + 6	+11 0	+18 0	+27 0	+6 -5	+10 8	±5 <u>.</u> 5	±9
18	30	+53 +40	+33 +20	+41 +20	+20 + 7	+28 + 7	+13 0	+21 0	+33 0	+8 -5	+12 -9	±6 <u>.</u> 5	±10 <u>.</u> 5
30	50	+66 +50	+41 +25	+50 +25	+25 + 9	+34 + 9	+16 0	+25 0	+39 0	+10 - 6	+14 11	±8	±12 <u>.</u> 5
50	80	+79 +60	+49 +30	+60 +30	+29 +10	+40 +10	+19 0	+30 0	+46 0	+13 - 6	+18 -12	±9 <u>.</u> 5	±15
80	120	+94 +72	+58 +36	+71 +36	+34 +12	+47 +12	+22 0	+35 0	+54 0	+16 - 6	+22 -13	±11	±17.5
120	180	+110 +85	+68 +43	+83 +43	+39 +14	+54 +14	+25 0	+40 0	+63 0	+18 -7	+26 -14	±12 <u>.</u> 5	±20
180	250	+129 +100	+79 +50	+96 +50	+44 +15	+61 +15	+29 0	+46 0	+72 0	+22 - 7	+30 -16	±14 <u>.</u> 5	±23
250	315	+142 +110	+88 +56	+108 + 56	+49 +17	+69 +17	+32 0	+52 0	+81 0	+25 - 7	+36 -16	±16	±26
315	400	+161 +125	+98 +62	+119 +62	+54 +18	+75 +18	+36 0	+57 0	+89 0	+29 - 7	+39 18	±18	±28 <u>.</u> 5
400	500	+175 +135	+108 +68	+131 +68	+60 +20	+83 +20	+40 0	+63 0	+97 0	+33 - 7	+43 - 20	±20	±31.5
500	630	+189 +145	+120 +76	+146 +76	+66 +22	+92 +22	+44 0	+70 0	+110 0	-	-	±22	±35
630	800	+210 +160	+130 +80	+160 +80	+74 +24	+104 + 24	+50 0	+80 0	+125 0	-	-	±25	±40
800	1000	+226 +170	+142 +86	+176 +86	+82 +26	+116 +26	+56 0	+90 0	+140 0	-	-	±28	±45
1000	1250	+261 +195	+164 +98	+203 + 98	+94 +28	+133 + 28	+66 0	+105 0	+165 0	-	-	±33	±52.5
1250	1600	+298 +220	+188 +110	+235 +110	+108 +30	+155 + 30	+78 0	+125 0	+195 0	_	-	±39	±62.5
1600	2000	+332 +240	+212 +120	+270 +120	+124 +32	+182 + 32	+92 0	+150 0	+230 0	-	-	±46	±75
2000	2500	+370 +260	+240 +130	+305 +130	+144 +34	+209 + 34	+110 0	+175 0	+280 0	-	-	±55	±87 <u>.</u> 5



K5	K6	К7	М5	Мб	M7	N5	N6	N7	P6	P6 P7	Diameter (mm)	
			WIO	NIC					10		Above	Below
+2 - 6	+2 -9	+6 - 12	-4 -12	-4 -15	0 18	-9 -17	- 9 -20	- 5 -23	15 26	11 29	10	18
+1 8	+2 11	+6 - 15	5 14	-4 -17	0 21	-12 -21	- 11 -24	- 7 -28	-18 -31	-14 -35	18	30
+2 -9	+3 - 13	+7 18	5 16	-4 -20	0 - 25	-13 -24	-12 -28	- 8 -33	-21 -37	-17 -42	30	50
+3 -10	+4 - 15	+9 -21	6 19	5 24	0 30	15 28	-14 -33	- 9 -39	-26 -45	-21 -51	50	80
+2 -13	+4 —18	+10 - 25	8 23	6 28	0 35	-18 -33	16 38	-10 -45	-30 -52	-24 -59	80	120
+3 - 15	+4 - 21	+12 -28	9 27	8 33	0 40	-21 -39	-20 -45	-12 -52	-36 -61	-28 -68	120	180
+2 - 18	+5 - 24	+13 - 33	11 31	8 37	0 46	-25 -45	-22 -51	-14 -60	-41 -70	-33 -79	180	250
+ 3 - 20	+5 - 27	+16 - 36	-13 -36	-9 -41	0 - 52	-27 -50	-25 -57	-14 -66	-47 -79	-36 -88	250	315
+ 3 - 22	+7 29	+17 40	-14 -39	-10 -46	0 57	-30 -55	-26 -62	16 73	51 87	-41 -98	315	400
+ 2 - 25	+8 -32	+18 - 45	16 43	-10 -50	0 63	-33 -60	-27 -67	- 17 80	55 95	-45 -108	400	500
	0 44	0 70	-	-26 -70	-26 -96	_	-44 -88	-44 -114	78 122	78 148	500	630
_	0 50	0 80	-	-30 -80	- 30 -110	_	- 50 -100	- 50 -130	88 138	88 168	630	800
_	0 - 56	0 90	-	-34 -90	- 34 -124	_	- 56 112	- 56 -146	-100 -156	-100 -190	800	1000
_	0 66	0 105	-	- 40 -106	- 40 -145	_	- 66 -132	-66 -171	-120 -186	-120 -225	1000	1250
_	0 78	0 125	-	- 48 126	- 48 -173	-	- 78 -156	- 78 -203	140 218	-140 -265	1250	1600
_	0 92	0 150	-	- 58 -150	- 58 -208	-	- 92 -184	- 92 -242	-170 -262	-170 -320	1600	2000
_	0 110	0 175	-	-68 -178	- 68 -243	_	110 220	-110 -285	-195 -305	-195 -370	2000	2500
7. Usage Example of Linear Motion Guide

























Appendix 343













Appendix













8. Usage Example of Crossed Roller Bearing







WON ST CO., LTD.



















MEMO

MEMO



LINEAR MOTION SYSTEM

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