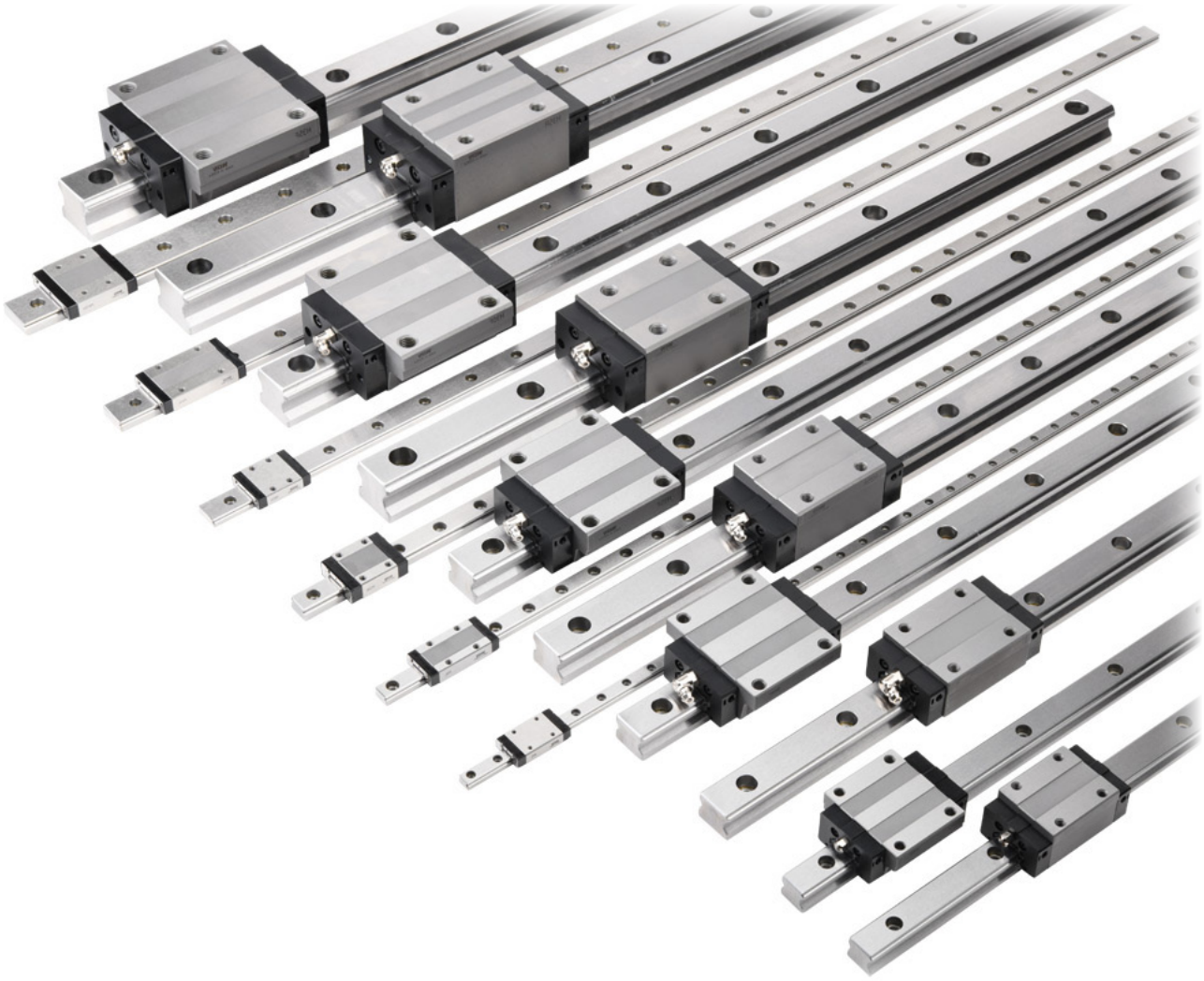
WON Linear Bearing User Manual



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Characteristics

WON Linear Bearings and Rails are precision machined linear motion components used to support a work load. The Bearing's internal recirculating ball bearings provide continuous support of the work load during travel along the rail. Resistance Friction of the Linear Bearing is a function of temperature due to the viscosity of the grease. Expect higher friction in low temperatures and lower friction in high temperatures.

Preload

Preload refers to a way of eliminating clearance in the assembly of the Bearing Block and Rail using the size of the Ball Bearing. There are typically 3 levels of Preload (Moderate, Light, and Heavy) that are achieved by assembling the Bearing Block with precisely sized ball bearings. WON pre-assembles the Bearing Block to achieve one of these 3 levels of Preloading. The products in this offering are Moderate Preload.

Moderate Preload is best for service conditions with:

- Load applied in uniform direction
- Smooth, precise running
- Minimal induced vibration or impact loads.

Radial Clearance

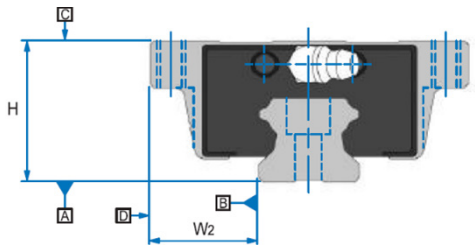
Radial Clearance refers to the total travel distance in a radial direction from the center of the Linear Bearing when a mild load is applied. It's value is determined from a fully secured/mounted rail and linear bearing assembly. Radial clearance is typically classified into 3 categories; Common Clearance, Light Preload (G1), and Heavy Preload (G2). The products in this offering are Common Clearance

SERIES	RADIAL CLEARANCE (µM)
H15	-4 ~ +2
H20	-5 ~ +2
H25	-6 ~ +3
H30	-7 ~ +4
H35	-8 ~ +4
M & MB 7	-2 ~ +2
M & MB 9	-2 ~ +2
M & MB 12	-3 ~ +3

Precision

Precision refers to the difference between the maximum and minimum values of multiple blocks on a rail, as measured by the Figure below. Precision is typically classified into 5 categories: Moderate, High (P6), Precision (P5), Super Precision (P4), Ultra Precision (P3). The products in this offering are Moderate.

DIMENSION	H-SERIES	M & MB SERIES
H tolerance (±mm)	0.080	0.040
H difference (mm)	0.025	0.030
W2 tolerance (±mm)	0.100	0.040
W2 difference (mm)	0.030	0.030



Parallelism of Motion

Defined as the Change in H and/or the Change in W2 as the Bearing Block is moved along the length of the rail. This value is a function of the total rail length. For Moderate Preload classification, see Parrallelism of Motion tables below.

PARALLELISM OF MOTION, H-SERIES	
Length of Rail (mm)	(µm)
0 to 199	5
200 to 249	6
250 to 314	7
315 to 399	8
400 to 499	9
500 to 629	11
630 to 799	12
800 to 999	13
1000 to 1249	15

PARALLELISM OF MOTION, M, MB-SERIES	
Length of Rail (mm)	(µm)
0 to 39	8
40 to 69	10
70 to 99	11
100 to 129	12
130 to 159	13
160 to 189	14
190 to 219	15
220 to 249	16
250 to 309	17
310 to 369	18
370 to 399	19
400 to 459	20
460 to 519	21
520 to 639	22
640 to 819	23
820 to 969	24
970 to 1179	25

Instructions for Handling

Handling

1. The WON Linear Motion bearings and rails are sealed in damp-proof packaging, so please open it just before use.
2. The bearing is fitted with a plastic support rail. Please take caution when assembling it with the rail. The plastic support rail prevents the bearing balls from falling out of the bearing during installation.
3. If you remove a Bearing from a Rail, insert the plastic support rail back into the bearing. This prevents the ball bearings from coming out and prevents foreign debris from intruding into the bearing raceway.
4. The Bearing end plate may be damaged if impact is applied since it is made of plastic material. Please be careful.
5. Dust, debri, metal chips and other small material will damage the Bearing's internal ball bearings as well as scratch the Rail surface. During handling and assembly ensure the work surfaces are clean and free of all debris. Wearing plastic/cloth gloves is recommended.
6. Do Not Drop the Bearing nor Rail. Impact loads can dislodge the ball bearings from the Bearing when it is NOT on the Rail. The Rail surface is hardened and therefore brittle. Impact loads can chip or scratch the precision surface. Should a Bearing be dropped onto the floor, please consider it unfit for use in service. Scrap and replace.

Lubrication

Purpose

The purpose of lubricating the Linear bearing and rail is to reduce friction and wear, and to allow for smoother movement and longer life of the bearing. Proper lubrication also helps to prevent rust. The bearing is equipped with a seal to keep out debris and extend the life of each application of lubricant. However, lubricant must be reapplied at a time and interval appropriate to the application and working environment. The Linear Bearings are preloaded with lubricant Shell GADUS-S2-V200-00. For maintenance and refilling only use the lubricants listed in the table on page page 5.

Refilling of Lubricant

To refill the bearing, supply a sufficient amount of grease through the grease nipple until remaining grease is discharged. It is appropriate to fill grease up to 50% of the volume of the Bearing. To reduce rolling resistance which may increase after grease is filled, it is better to take a test run about 20 times prior to the operation.

Refill interval

If Linear Motion bearing's travel exceeds a certain time, its lubricating performance declines. So it is required to refill an appropriate amount of grease at a proper time depending on service conditions and environment. Usually grease is to be filled when the travel distance reaches 100KM.

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

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

INSPECTION AND REFILLING TIME OF LUBRICANT		
Type	**Inspection Period**	**Refilling Time**
Grease	3~6 months	• Generally 1-2 times per year • Usually more than once per year if travel exceeds 100km/year • Refill depending on the situation after checking the status of grease
Oil	3~6 months	Refill depending on the results of inspection, and determine the optimal amount to refill depending on the capacity of oil tank
	Before every operation	• Refill an appropriate amount after identifying the consumption • Standardize the optimal amount after identifying the consumption
Recommended		

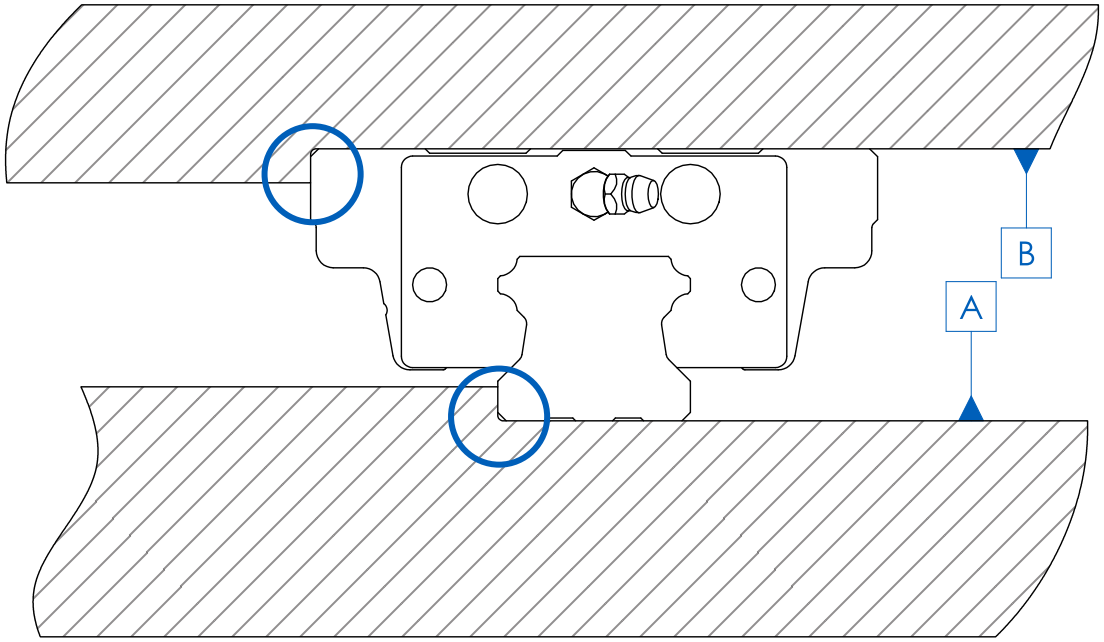
LUBRICANTS USED FOR LINEAR BEARING						
Application	**Main Use**	**Product Name**	**Manufacturer**	**Temp. in Use (°C)**	**Base Oil**	**Type of Thickener**
Common Use	Machine tool, electric spark machine, industrial robots, etc	GADUS S2 V220 00	SHELL	-30 ~ +110	Mineral oil	Lithium
Common Use (Extreme Pressure Additive Included)	Industrial machine, machine tool	BW EP NO.2	BWC	-20 ~ +105	Mineral oil	Lithium
Clean and Low dust raise	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	Ethylene fluorinated
Machine Tool	Excellent in preventing rust and oil film strength Suitable for machine tools because it is hardly emulsified to clearance	VACTRA No.2 SLC DTE Oil	Exxon Mobil	-20 ~ +100	Oil	Way oil, Turbine oil
Special Use	Corrosion proofing	6459 Grease	SHELL	-20 ~ +100	Mineral oil	Polyurethane
Use of any other Grease, not listed in this table, could degrade internal seals, or create internal fowling that will reduce the performance and life of the Bearing and Rail						

Installation

Design of mounting surface

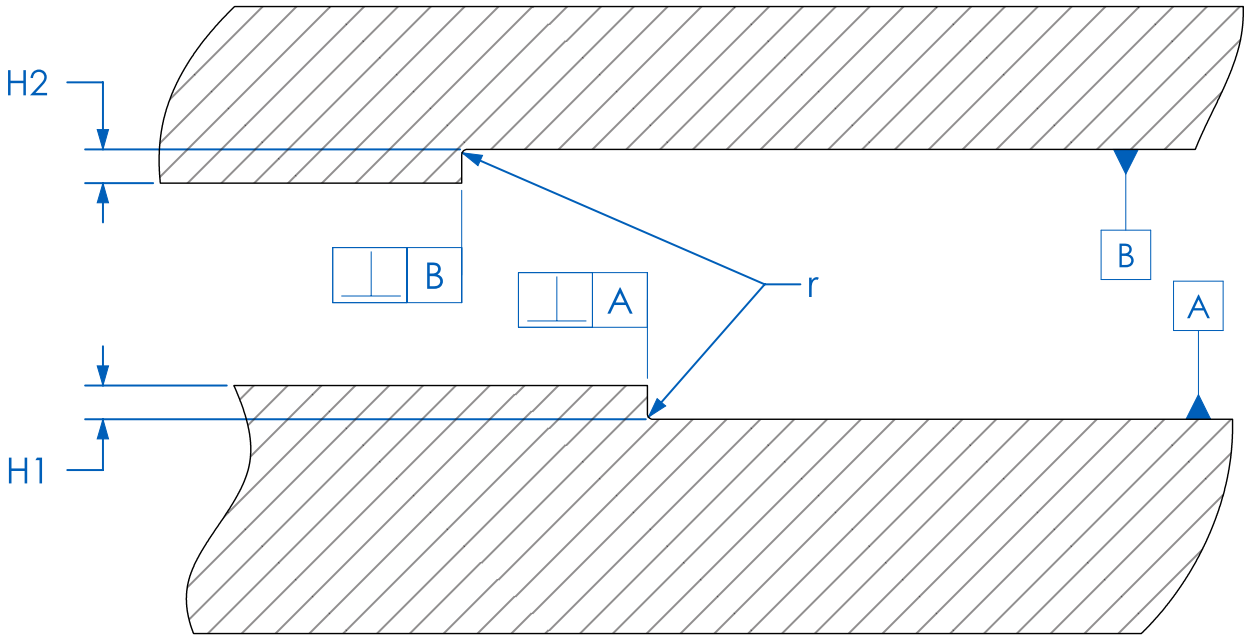
The Bed should be designed as precise as practical for the application's needs. Depending on the application, extra support and stability can be given to the rail if a 'step feature' is included in the bed. (highlighted by blue circles). Datum Planes (A and B below) are reference planes for the Bed and Table respectively.

The Table should also be designed as precise as practical for application's needs. And like-wise a 'step feature' will provide extra support and stability.



Should the step feature be desired, use the following parameters to assist in the design detailing

Step Feature Constraints



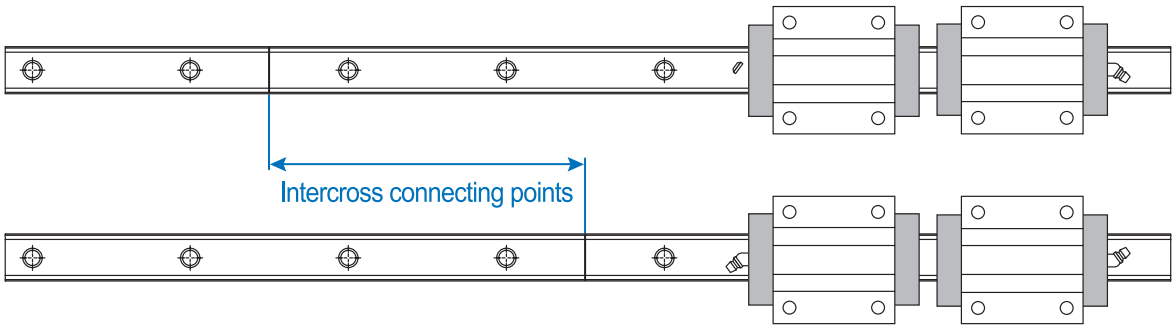
- **Perpendicularity**: The step should be perpendicular to the respective datums.
- **Step Height**: The height should not exceed the values shown in the table below. This will prevent proper installation as the Bearing Bearing would not have enough clearance to move along the rail

- **Internal Radius**: The corners of the bearings and rails are chamfered. The internal radius, r must not exceed the values listed in the table below

DESIGN PARAMETERS (mm)			
Series	**Max Internal Radius, r**	**Max Step Height, H1**	**Max Step Height, H2**
H15	0.5	3	4
H20		3.5	5
H25	1	5	
H30			
H35		6	6
H45		8	8
H55	1.5	10	10
M7/MB7	0.2	1.2	2.5
M9/MB9		1.5	3
M12/MB12		2.5	4

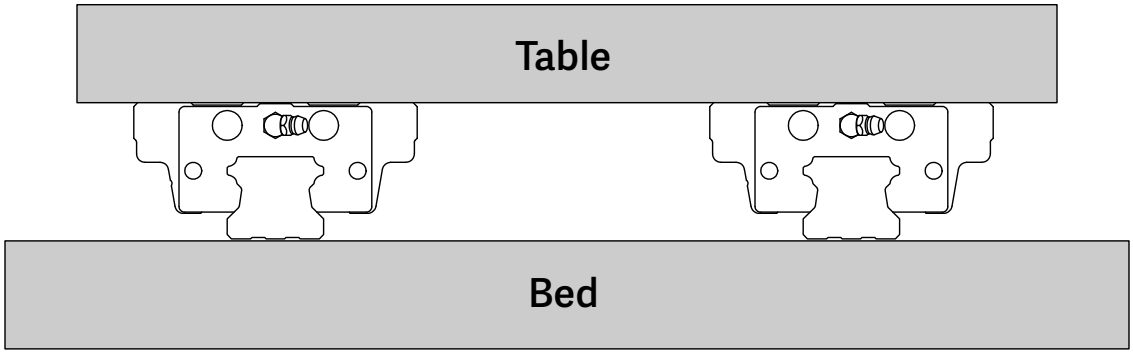
Connection of rails

If you need a longer rail than the one supplied, you can Align mount rails end to end to the desired length. When using a master and auxilliary rail together, it is recomended to intercross the Align joint as shown below. This prevents bearings simultaneously traversing a seam as the bearing passes through the connecting points simultaneously.



Installation of Linear Motion Bearing & Rail

The in-use performance of the WON Linear Bearings and Rails are dependent upon the installation process following the specifications of the overall system's design intent. Use of precision measurement tools is recommended to accurately measure and align during and after installation. As guidance the following principles should be followed.



Single Rail Installation Principles

1. The Rail should be securely mounted to the Bed, at each bolt hole.
2. The Rail should form a straight line.
3. The Rail's Top 'plane' should be parallel to the Bed surface.

2 Parallel Rail Installation Principles

1. Install 1 Rail first. Use this rail as the Datum for the 2nd 'Auxiliary' Rail.
2. Install 2nd Auxiliary Rail
3. The Auxiliary Rail should be securely mounted to the Bed, at each bolt hole.
4. The Auxiliary Rail should be parallel, the entire length, to the Datum Rail.
5. The Auxiliary Rail's Top plane should be co-planar to the Datum Rail's Top plane.

Single Bearing on 1 Rail Installation.

1. Align plastic support rail, with Bearing, against the end of the Rail.
2. Slide the Bearing onto the Rail.
3. Stroke the Bearing back and forth, along the entire length of the Rail, several times. This will distribute the lubricant along the Rail and internally in the Bearing. The stroking resistance should decrease as the lubricant distributes.
4. Loosely attach the table piece to the Bearing top with 4 screws.
5. Stroke the Bearing assembly back and forth along the Rail.
6. Tighten each screw in a criss-cross sequence between strokes
7. Torque each screw, in a criss-cross sequence.
8. Stroke the Bearing assembly a final time to ensure consistent resistance the entire length of the Rail.

Dual Bearings on 1 Rail Installation.

1. Align plastic support rail, with Bearing, against the end of the Rail.
2. Slide the Bearing onto the Rail.
3. Repeat step 2 for 2nd Bearing.
4. Stroke the Bearings back and forth, along the entire length of the Rail, several times. This will distribute the lubricant along the Rail and internally in the Bearing. The stroking resistance should decrease as the lubricant distributes.
5. Loosely attach the table piece to the Bearing tops with 8 screws.
6. Stroke the Bearing assembly back and forth along the Rail.
7. Tighten each screw in a criss-cross sequence, spanning the Bearings, between strokes
8. Torque each screw, in a criss-cross sequence, spanning the Bearings.
9. Stroke the Bearing assembly a final time to ensure consistent resistance the entire length of the Rail.

Four Bearings on Dual Rails Installation.

1. Align plastic support rail, with Bearing, against the end of the Rail.
2. Slide the Bearing onto the Rail.
3. Repeat steps 1 & 2 for remaining Bearings.
4. Stroke the Bearings back and forth, along the entire length of the Rail, several times. This will distribute the lubricant along the Rail and internally in the Bearing. The stroking resistance should decrease as the lubricant distributes.
5. Loosely attach the table piece to the Bearing tops with 16 screws.
6. Stroke the Bearing assembly back and forth along the Rail.
7. Tighten each screw in a criss-cross sequence, spanning the 4 Bearings, between strokes
8. Torque each screw, in a criss-cross sequence, spanning the 4 Bearings.
9. Stroke the Bearing assembly a final time to ensure consistent resistance the entire length of the Rail.

Recommended torques by the material of mounting base

Bolt Size	Torque value (N·m)		
	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	256	191

For additional installation bearinglines and calculations visit WON ST at this link: http://www.wonshaft.com/english/assets/file/wonst_catalog.pdf