

Introduction of Crossed Roller Slide Rail Set

Roller Type

- GOORV / GOORD / GOORV-S / GOORD-S / GOORVP / GOORDP are composed of precise crossed rollers with hardened steel formed precisely to be V-grooves rail guides to create linear motion element in high accuracy.
- Limited stroke linear motion system with high rigidity, mid-hard load and spray moment.

GOORV (GRV-S)



GOORD (GRD-S)



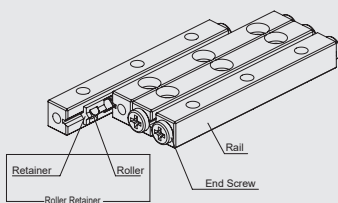
GOORVP



GOORDP

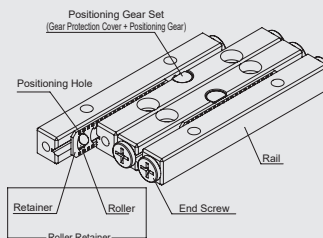


GOORV (GRV-S / GRVP)



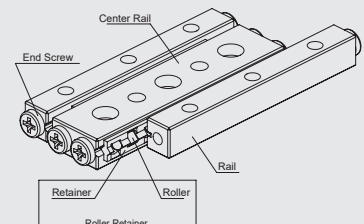
1 set =
4 rails + 2 roller retainers
+ 8 end screws

GOORVG (GRVG-S)



1 set =
4 rails + 2 roller retainers
+ 8 end screws

GOORD (GRD-S / GRDP)



1 set =
1 center rail + 2 rails + 2 roller retainers
+ 8 end screws

Introduction of Crossed Roller Slide Rail Set

Ball Type

- GOOBV&GOOBD are composed of ball retainer combined with precise ball arranged in smaller clearance, with the exclusive rails been heat treatment and cryogenic finish, then, forming precisely grinding V-grooves.
- Limited stroke linear motion system with low friction, light load and high accuracy.

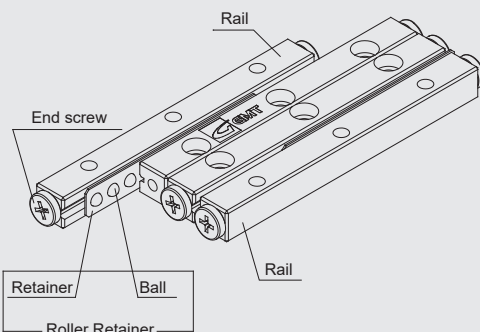
GOOBV



GOOBD

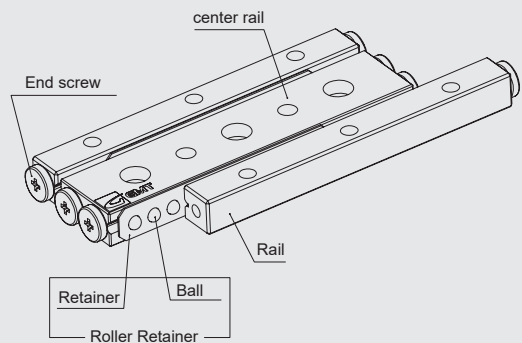


GOOBV



1 set =
4 rails + 2 ball retainers + 8 end screws

GOOBD

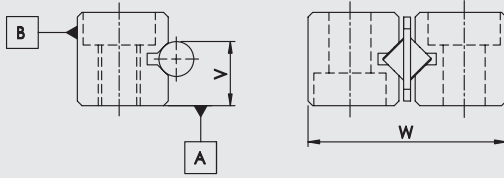


1 set =
1 center rail + 2 rails + 2 ball retainers + 8 end screws

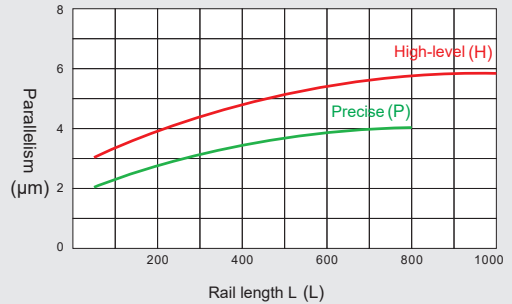
Character & Accuracy

Accuracy Specification

Measure way



Rail Length and Parallelism of Rolling Plane



Accuracy Level

Item	Highlevel	Precise Level
	H	P
Parallelism of rolling plane to A&B	As shown drawing	
Allowable dimension tolerance to Height V	±0.02	±0.01
Paired mutual tolerance to Height V	0.01	0.005
Allowable tolerance to Width W dimension	0 -0.20	0 -0.10

Advantages

Suited To Micro-Movement

Due to tiny friction resistance, and almost no difference between starting friction resistance and dynamic friction resistance. In case of tiny movement could also maintain correct trace perform high precision on the linear motion mechanism.

Stability in Low Speed

Even in case of light loading, its variation of friction resistance is also tiny, so stability from low to high speed could be kept.

High Rigidity, High Loading Capacity

Comparison of roller and ball, larger contact area, less elasticity deformation, and non-circulation, great number of units rotating effectively, so high rigidity and large load capacity.

Low Noise

GOOYII Crossed Roller Slide Rail Set has no circulated rotating, no noise occurred. Using roller slide way with roller retainer makes no noise caused by contact friction in between each rolling unit moves alternately, to ensure a quiet movement motion.

Straightness

High-level(H)			Precise level(P)		
Length(mm)		Straightness (µm)	Length(mm)		Straightness (µm)
Above	Below		Above	Below	
—	50	2.0	—	50	1.0
50	100	2.0	50	100	1.0
100	160	3.0	100	160	2.0
160	310	3.0	160	310	2.0
310	510	4.0	310	510	3.0
510	600	4.0	510	600	3.0

(Ra 0.2 µm)

(Ra 0.1 µm)

Calculation of Stroke & Load & Roller Quantity

In selecting slide rail set, stroke length and roller quantity shall be taken into account besides accuracy, load capacity and rated capacity.

Maximum Stroke Length Calculation and Selection

(EX) In case of using cross roller side by side, which specification should be chosen?

Specification... GOORV04

Loading.....P=4000N

Stroke length.....SW=120mm

SOL: Expected stroke length lower than 80% of rail stroke length, required stroke length could be calculated by formula as below.

$$SW \leq 0.8 S \quad S : \text{Stroke length, mm}$$

$$SW : \text{Stroke length in use, mm}$$

If SW=120mm $S \geq (1 / 0.8) \times 120 = 150$

As Rail shown in GOOYII catalog the maximum stroke would be 154mm, product model no. is GOORV04-200.

Allowable Load Calculation

$$F = 2 (Z / 2) FU \quad Z : \text{roller quantity}$$

$$Z / 2 : \text{integer, no remainder}$$

$$FU : \text{Load capacity (N) for each roller (as catalog statistic)}$$

SOL: Searched from catalog : Z=18 , FU = 390 , F = 2 (18 / 2) x 390 =7020 N

So allowed load F is bigger than loading P=4000 N

Load ratio =4000/7020*100=56.98%

It's mid-load to product spec, model no.GOORV04-200.

Calculation of Retainer Length and Roller Quantity

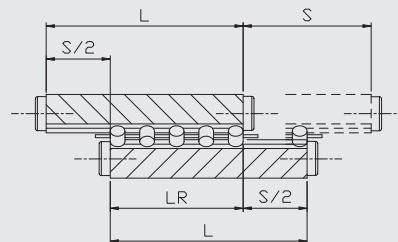
Guide length is decided by stroke length and max. slide length, and calculation depends on end screws and stopper specification. Distance between two end rollers in the retainer is to have stroke length deduct half of max. stroke length.

$$L_R = L - \frac{S}{2}$$

L_R : rated distance between two rollers in ends of retainer mm

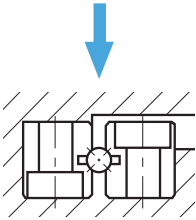
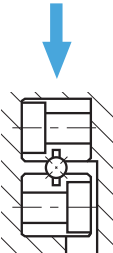
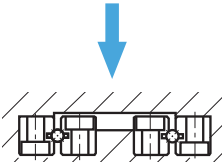
L : rail length mm

S : stroke length mm



Load Capacity

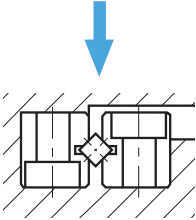

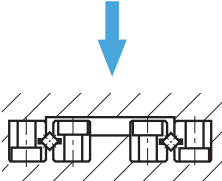
Load Capacity of Ball Bearing

Condition	Single-Axis Use	Single-Axis Vertical Use	Dual-Axes Abreast Use
Loading direction			
Basic dynamic load rating ΣC	$B^{3/4} * \cos \frac{\pi}{4} * C$	$B^{3/4} * 2^{7/9} * \cos \frac{\pi}{4} * C$	
Basic static load rating ΣCo	$B * \cos \frac{\pi}{4} * Co$	$B * 2^{7/9} * Co$	

C : basic dynamic load rating (N) Co : basic static load rating(N)

B : ball quantity in single row

Load Capacity of Roller

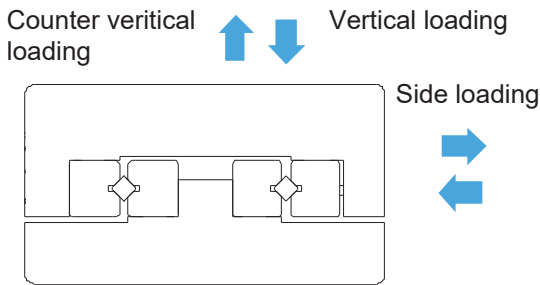
Condition	Single-Axis Use	Single-Axis Vertical Use	Dual-Axes Abreast Use
Loading direction			
Basic dynamic load rating ΣC	$C = \left(\frac{R}{2}\right)^{3/4} * C$	$C = \left(\frac{R}{2}\right)^{3/4} * C * 2^{7/9}$	
Basic static load rating ΣCo	$Co = \frac{R}{2} * Co$	$Co = R * Co$	

C : Basic dynamic load rating (N) Co : Basic static load rating(N)

R : Roller quantity in single row R/2 : Integer, no remainder

Safety Element

Safety Factory Fd in Different Loading Direction



Classification	Loading Direction	Fd
Basic Dynamic Loading	Vertical	1.0
	Side	0.9
	Counter vertical	0.8
Basic Static Loading	Vertical	1.0
	Side	0.9
	Counter vertical	0.8

Safety Factor Fv in Variable Loading

Running Condition	Fv
Normal Running	1~0.5
Smooth Motion Required	0.5~0.25
Vibration, Shock	0.3~0.2

Common contact factor Fc in single rail

Quantity of Linear System Assembled in Single Shaft	Contact Factor Fc
1	1.00
2	0.81
3	0.72
4	0.66
5	0.61

Life Calculation

Ball

$$L = (F_d * F_v * \frac{\sum C}{P})^{10/3} * 50$$

Roller

$$L = (F_d * F_v * \frac{\sum C}{P})^3 * 50$$

L : Usage life (km) Fd : Safety factor in loading direction P : Loading
 Fv : Safety factor in variable direction

Rail Stroke (S), Stroke in Use (Sw)

Stroke in use is less or equal to 80% of rail stroke $Sw \leq 0.8S$

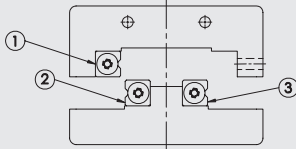
Rail Length (L)

Rail length shall be higher than 1.5 times to stroke length in use, or 1.2 times to rail stroke length.

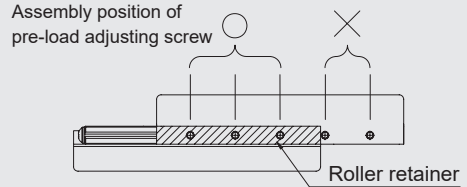
$$L \geq 1.5Sw \quad \text{or} \quad L \geq 1.2S$$

Assembly Way

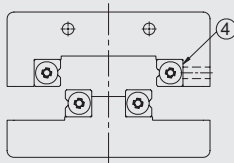
- 1** Lay oil in low viscosity on contact planes, fix rail (code ①~③) with regular torque.



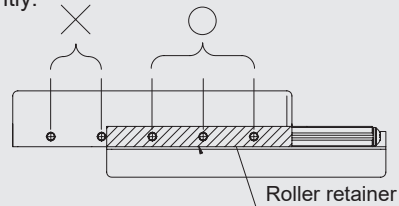
- 5** Move table to end of one side, and lock pre-load adjusting screw slightly.



- 2** Temporarily lock rail in adjusted side (code ④)

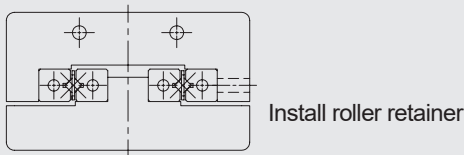


- 6** Move table to the end of another side, as above description, and lock pre-load adjusting screw slightly.

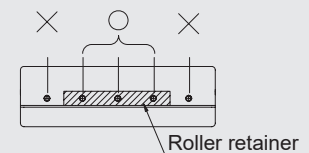


- 3** Disassemble end screw from end of one side, and carefully insert roller retainer to nearby center of the rail.

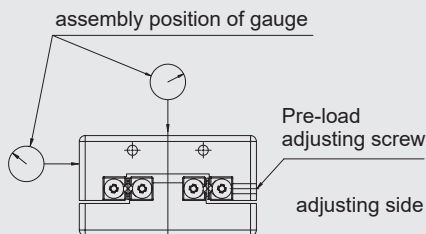
- (3-1) Lock the end screw again.
(3-2) Slowly move table back and forth to the rail end, and adjust roller retainer position to rail center.



- 7** Return table back to center and lock pre-loads adjusting screw slightly. Adjust clearance of table to zero. In case of clearance free, move table back and forth, and index change performance on the fixed gauge would be smallest. Notice that, last adjustment of preloading is to set correct torque value with torque wrench and prepare to lock rail fix screw.



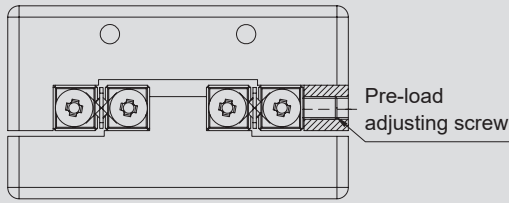
- 4** Fix gauges both in center and side of the table (level plane)



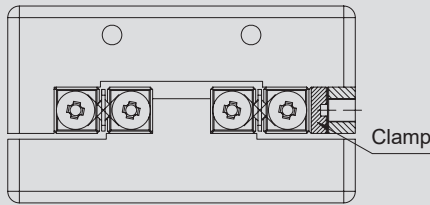
- 8** Finally surely lock the rail (code ④). As steps of screw adjustment, move table back and forth, then have the table over roller retainer, and lock screws in order.

O : Loading on to pre-load adjusting screw.
x : Loading off to pre-load adjusting screw.

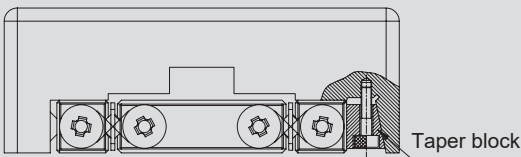
Installation Precaution & Application Examples



In regular situation, use pre-load adjusting screw to adjust pre-load.



Use clamp to meet require of accuracy and rigidity.

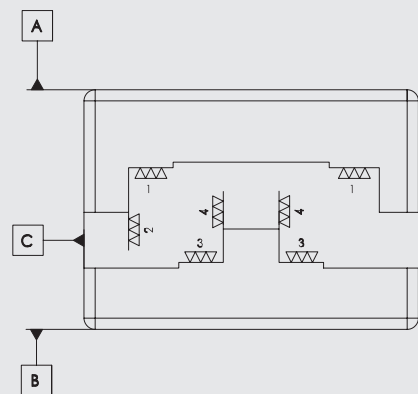


Use taper block to meet special requirement of high rigidity and high accuracy.

Installation Precaution

- In order to let GOOYII Crossed Roller Slide Rail Set perform its excellent product function, it's recommended to install assembly planes with accuracy same as parallelism precisely processed in Crossed Roller Slide Rail Set.
- All burrs, dent, dust, miscellaneous objects on the rail of table and base need to be cleaned spotlessly and keep eyes on assembly operation application.
- Preload adjustment, too much preload would cause press damage to reduce life; it's normally recommended to use zero or tiny preload.

Accuracy of intallation assembly plane.



Recommendation

Pre-Load Adjusting Screw Lock Torque (Unit/n·m)

Specification	Screw Size	Lock Torque
GOORV1	M2	0.008
GOORV2	M3	0.012
GOORV3	M4	0.05
GOORV4	M4	0.08
GOORV6	M5	0.2
GOORV9	M6	0.4

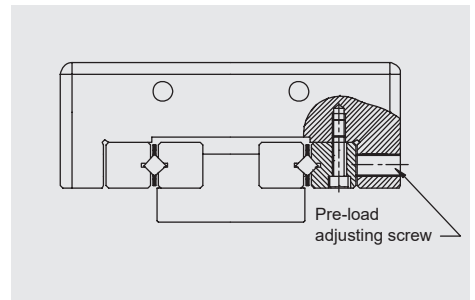
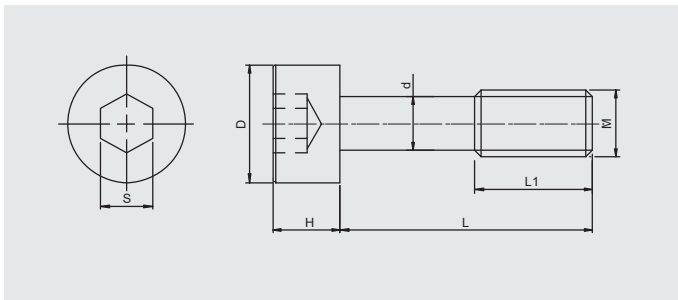
Fix Screw Lock Torque (Unit/n·m)

Specification	Lock Torque
M2	0.28
M3	1.02
M4	2.37
M5	4.77
M6	8.14
M8	19.69

(Use steel alloy screw)

Reserved Lock Screw

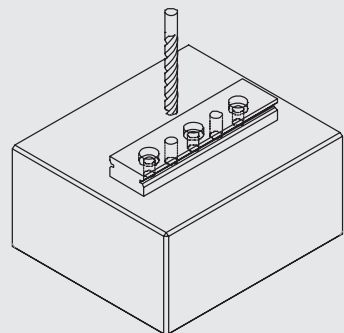
GOOYII Crossed Roller SlideRail Set, used in socket-head screw hole assembly, it's recommended to use reserved lock screw.



M (mm)	d (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	S (mm)	Slide way
M3	2.3	5	3	12	5	2.5	GOORV3
M4	3.1	5.8	4	15	7	3	GOORV4
M5	3.9	8	5	20	8	4	GOORV6
M6	4.6	8.5	6	30	12	5	GOORV9
M8	6.25	11.3	8	40	17	6	GOORV12

Operation Precaution

Adjustment	Operating under situations of improper accuracy of assembly plane & preloadadjustment, would cause running in low accuracy and slip-out to affect usage life. Notice more in adjustment.
Retainer Deviation	GOOYII Crossed Roller Slide Rail Set, in high speed or off-center load, vibration load, might cause retainer deviation. Please keep enough space for stroke design, and not to have over pre-load set.
End Screw	Ends of Crossed Roller Slide Rail Set are located with end screws, but this funtion is to prevent retainer falling off, instead of stopping mechanism. If requirement of stopping function, it's recommended to design reserved block mechanism.
Careful Operation	Any carelessness of falling off Crossed Roller Slide Rail Set or unusual collision and extruding, would appear identation made by contact of V-groove and rollers (ball), to cause non-smooth motion, affected accuracy. Please be more careful in operation.
Whole Set Match Principle	Crossed Roller Slide Rail Set accuracy is made by whole set as unit to precisely control it's error range. Different sets of slide rail set mixed in use may result in accuracy variation. Please notice more in assembling.
Locating Pin Hole	<p>GOOYII Crossed Roller Slide Rail Set, application series - GOORD&-GOOBD series, locating pin hole processing needs to fix center rail on the plane, and drilling process.</p> <p>Be sure to clean all cutting bits out, and washing if necessary after pin hole process.</p>



Locating pin hole processing