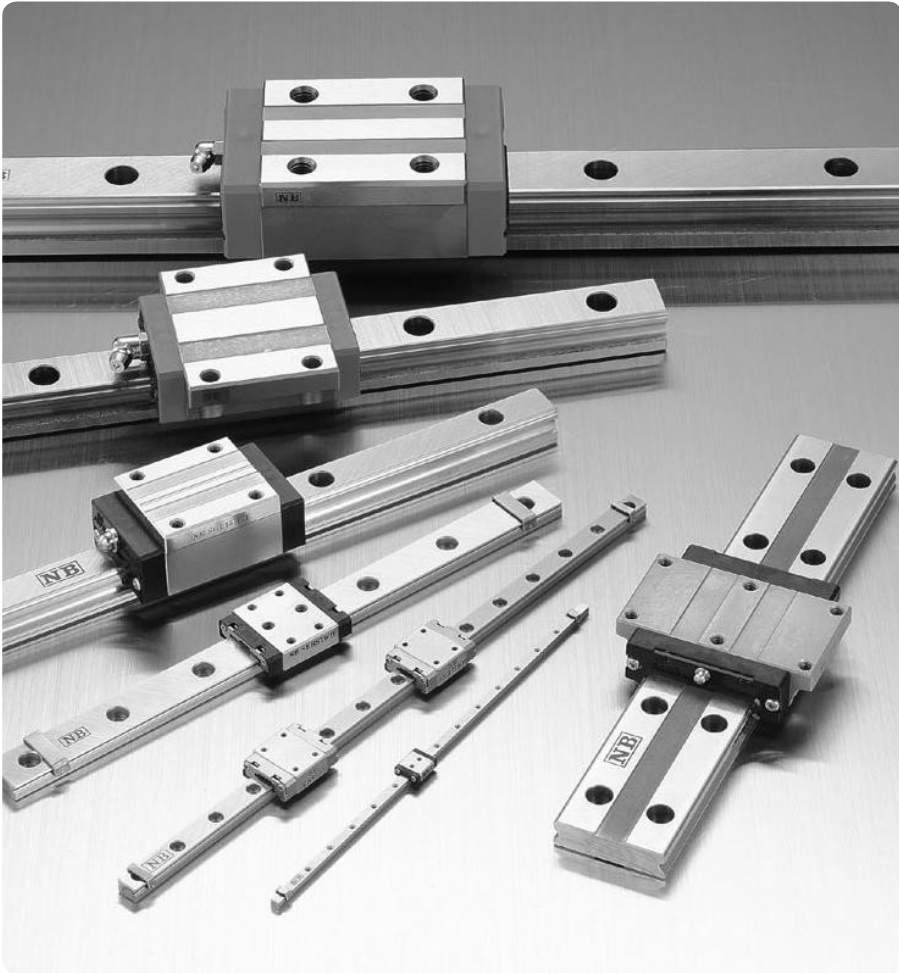


# SLIDE GUIDE

NB slide guides are high-precision and high-rigidity linear bearings designed to utilize the motion of rolling elements. They have numerous advantageous characteristics including low friction, no stick-slip, and smooth linear motion even under high load conditions. Since they can maintain their high-efficiency and high-functionality characteristics for an extended period of time, they meet a wide range of needs, from general industrial to precision machinery.



## TYPES

Table A-1 Types

	rolling element	cross section and contact structure	advantages	page
miniature type	ball	retained ball, 2-row, 4-point contact (SEBS-B type) 	<ul style="list-style-type: none"> <li>● retained ball type</li> <li>● available with all stainless steel components</li> <li>● 2-row, compact</li> <li>● small, light, cost effective</li> </ul>	P.A-22
		2-row, 4-point contact (SEB-A type) 	<ul style="list-style-type: none"> <li>● 2-row, compact</li> <li>● small, light, cost effective</li> <li>● available in various types</li> <li>● available in stainless steel</li> </ul>	P.A-22
	roller	cross roller (SER type) 	<ul style="list-style-type: none"> <li>● miniature roller guide</li> <li>● cross roller, high precision</li> <li>● available with all stainless steel components</li> </ul>	P.A-44
high-rigidity type	ball	4-row, 2-point contact (SGL type) 	<ul style="list-style-type: none"> <li>● high self-centering characteristics</li> <li>● high load capacity due to relatively large ball elements</li> <li>● high dust preventive control with side-seals and under-seals</li> <li>● available in stainless steel</li> </ul>	P.A-52
		4-row, 2-point contact (SGW type) 	<ul style="list-style-type: none"> <li>● high-moment resistant</li> <li>● low-height design</li> <li>● smooth motion due to large number of effective balls</li> <li>● high dust preventive control with side-seals and under-seals</li> </ul>	P.A-74

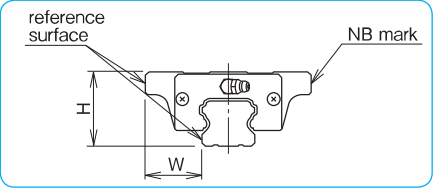
# ACCURACY MEASUREMENT METHOD

The accuracy of slide guides is measured by fixing the rail to the reference base. The accuracy is expressed in terms of the average value at the center portion.

## Dimensional Tolerance and Paired Difference

The accuracy of the slide guide is obtained by measuring the height  $H$ , and width  $W$ , as shown in Figure A-1. The dimensional tolerance is measured for each of the blocks attached to the rail and is expressed in terms of the deviation from the basic dimension. The paired difference is obtained by measuring the blocks attached to the rail and is expressed in terms of the difference between the maximum and minimum values.

Figure A-1 Accuracy Measurement

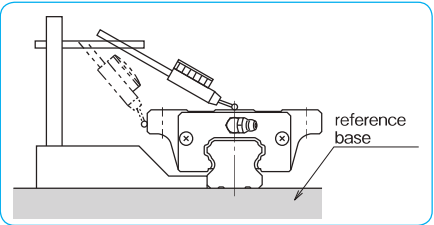


## Motion Accuracy

The rail is first fixed to the reference base. The motion accuracy is obtained by measuring the difference in the indicator readings when the block is moved along the entire span of the rail.

Note: Gauge head is placed on the center of the block reference surface.

Figure A-2 Measurement Method for Motion Accuracy



## Notation for Number of Axes and Paired Difference

When more than one rail is used in parallel, the dimensional difference must be measured on more than one block on more than one rail. For measuring the paired difference for height  $H$ , please specify the number of axes (W2, W3) as the part number example shows. For measuring the paired difference for width  $W$ , please contact NB.

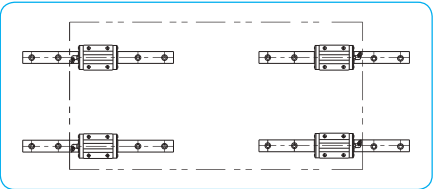
Note : When four rails are used as illustrated in Figure A-3, W4 should be specified in the part number. Please indicate the number of axes when ordering.

part number example

**SGL25TF2-350/W2**

symbol for number of axes  
W2: 2 parallel axes  
W3: 3 parallel axes

Figure A-3 4 Parallel Axes



# RIGIDITY AND PRELOAD

The rolling elements of the slide guide deform elastically due to the applied load. The amount of deformation depends on the type of rolling element. It is proportional to the 2/3 power for ball elements. For rollers, it is proportional to the 9/10 power. In either case, the rate of deformation decreases as the applied load increases. Greater rigidity is achieved by applying a preload.

A preload causes internal stress within the slide guide block, resulting in some reduction in lifetime. However, when the guide is used under shock or vibration loading conditions, a preload will absorb the load and will actually help lengthen the life time. Because the preload causes elastic deformation of the rolling elements, it becomes less tolerable to the installation dimensional errors. Extreme care should be exercised in machining the installation surface.

Four levels of preload are available: clearance, standard, light, and medium. This allows the user to select the appropriate level for the application.

Figure A-4 Elastic Deformation of Rolling Elements

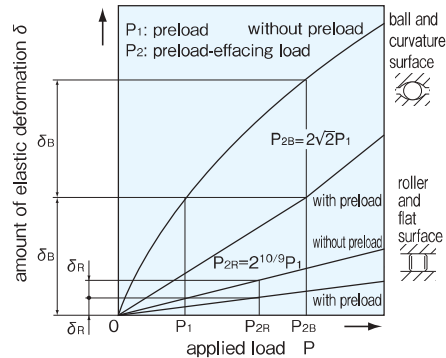


Table A-2 Level of Preload

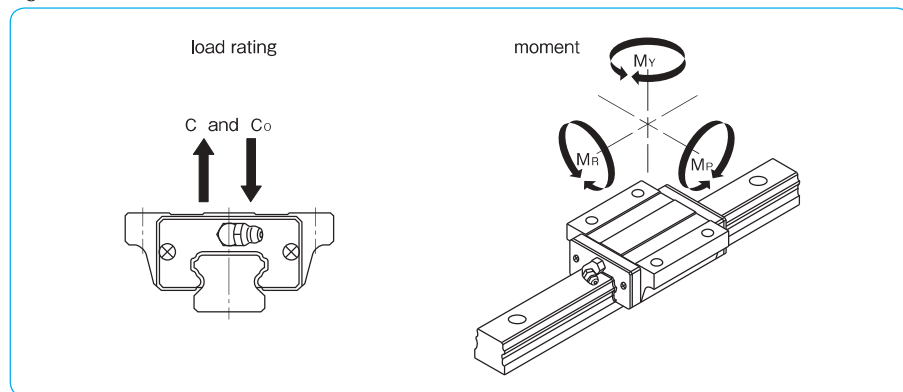
preload	symbol	effect of preload					operating conditions	applicable part number
		vibration absorption ability	self-aligning ability	lifetime	rigidity	frictional resistance		
clearance	T0	increases	reduces	reduces	increases	increases	light motion is required. installation errors to be absorbed.	SEB
standard	blank	increases	reduces	reduces	increases	increases	minute vibration is applied. accurate motion is required. moment is applied in a given direction.	SEB, SGL SGW
light	T1	increases	reduces	reduces	increases	increases	light vibration is applied. light torsional load is applied. moment is applied.	SEB, SGL SGW
medium	T2	increases	reduces	reduces	increases	increases	shock and vibration are applied. over-hang load is applied. torsional load is applied.	SGL, SGW

## LOAD RATING AND RATED LIFE

## Loading Direction and Load Rating

A slide guide experiences load and moment, as shown in Figure A-5. For each load and moment, the basic load ratings and allowable static moments are defined.

Figure A-5 Direction of Load



## Rated Life Calculation

Two types of rolling elements are used in NB slide guides: ball and roller elements. There is a different equation for calculating the rated life of each type.

For ball elements (SEB, SGL, and SGW types), the equation is

$$L = \left( \frac{f_c \cdot f_t}{f_w} \cdot \frac{C}{P} \right)^3 \cdot 50$$

For roller elements (SER type), the equation is

$$L = \left( \frac{f_c \cdot f_t}{f_w} \cdot \frac{C}{P} \right)^{10/3} \cdot 50$$

L: rated life (km)  $f_c$ : contact coefficient  
 $f_t$ : temperature coefficient  $f_w$ : applied load coefficient  
 C: basic dynamic load rating (N) P: applied load (N)  
 ※ Refer to page Eng-5 for the coefficients.  
 ※ The contact coefficient is applied when two or more blocks are used in close contact.

If the stroke length and cycles are constant, life can be expressed in terms of time, the equation is

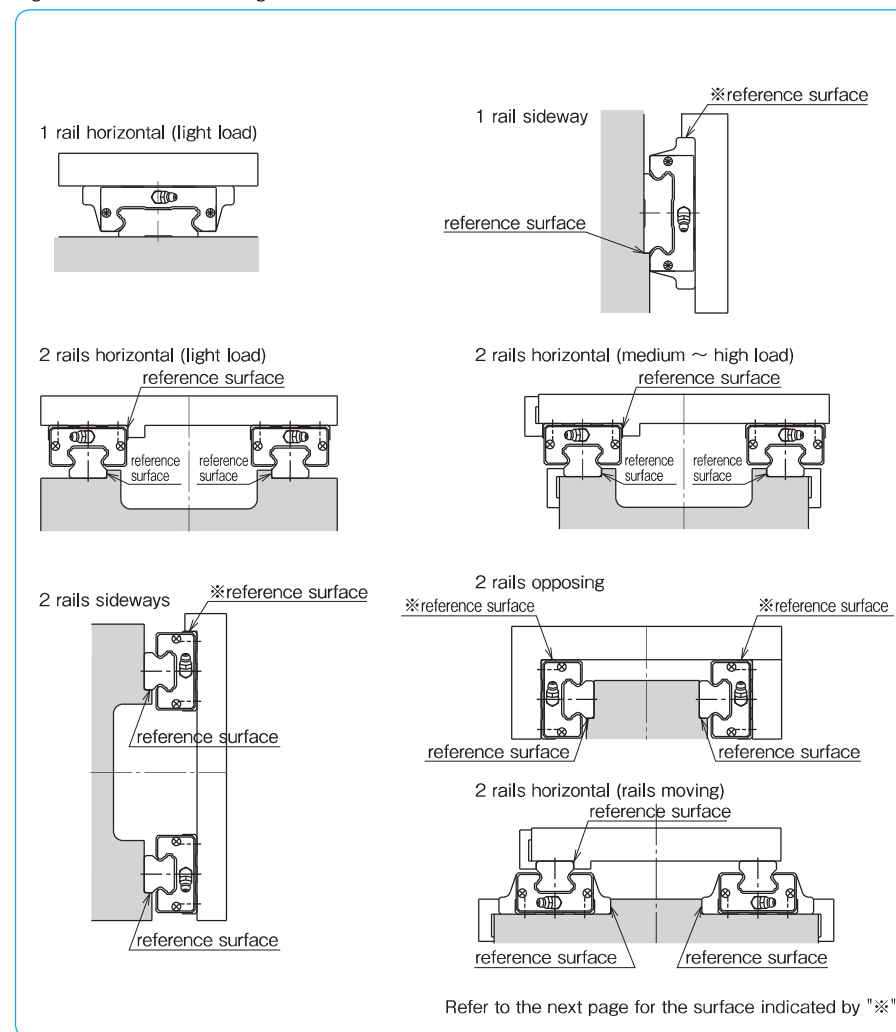
$$L_h = \frac{L \cdot 10^3}{2 \cdot \ell \cdot n \cdot 60}$$

$L_h$ : life time (hr)  $\ell$ : stroke length (m)  
 L: rated life (km)  $n$ : number of cycles per minute (cpm)

## MOUNTING

Slide guides have high load ratings in spite of their compact size. They can be used in various types of machinery and other equipment in various configurations. Figure A-6 shows some typical slide guide arrangements.

Figure A-6 Slide Guide Arrangements



### Mounting Surface and Accuracy

NB slide guides are designed and fabricated to achieve high accuracy after mounting them to a machined mounting base. One typical way is to provide a shoulder on the mounting surface and align the reference surface of the rail or block against the shoulder (Figure A-7). To avoid corner interference, an undercut should be provided at the shoulder corner. Alternatively, the radius of the shoulder corner should be smaller than the radius of the slide guide block/rail corner.

The accuracy of the rail mounting surface affects the accuracy of the machinery or equipment along with the slide guide motion accuracy.

The accuracy of the mounting surface should be equivalent to that of the slide guide motion accuracy. The specified preload may not be achieved due to deformation of the block, for example, the mounted block surface is not flat (Figure A-8). Careful attention should therefore be given to achieve the specified flatness.

Note: Please contact NB for the rail straightness in case the mounting shoulder cannot be provided or the rigidity of the mounting surface is not enough.

### Reference Surface Indication

Reference surfaces are provided to enable accurate and simplified mounting. They are located on the same side, as shown in Figure A-9, opposite to the NB mark.

Depending on the mounting arrangement, the standard reference surface may not ensure mounting accuracy (for example, 1 rail sideways or 2 rails opposing, Figure A-6, page A-7). In such cases, NB can provide a reference surface on the opposite side. Please specify the side when ordering.

Figure A-7 Profile of Mounting Reference Surface

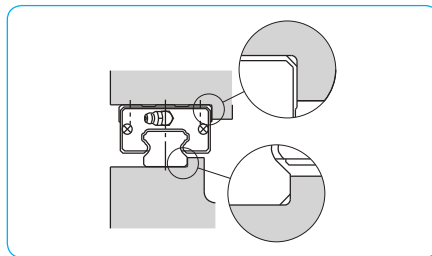


Figure A-8 Effect of Flatness

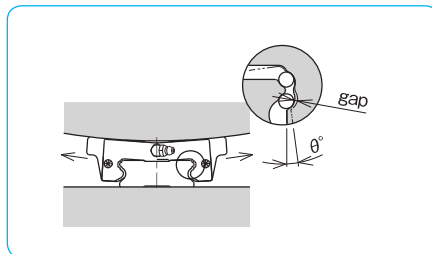
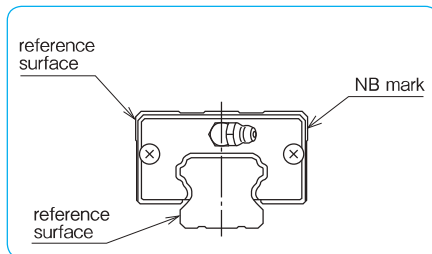


Figure A-9 Reference Surface



### Mounting

In general, slide guides are used with 2 rails in parallel. In that case, one rail is on the so-called reference side and the other is on the so-called adjustable side.

- Applications where shock/vibration and high load are involved/high accuracy is required. The effect of shock and vibration on accuracy is eliminated by using side pieces such as side plates (Figure A-10), tightening set screws (Figure A-11), or tapered gibs (Figure A-12).

Figure A-11 Using Tightening Set Screw

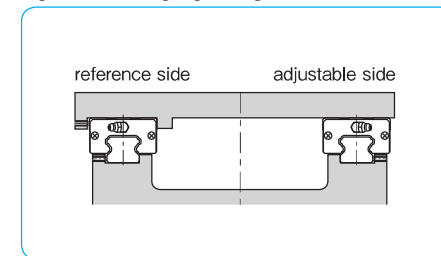


Figure A-10 Using Side Plate

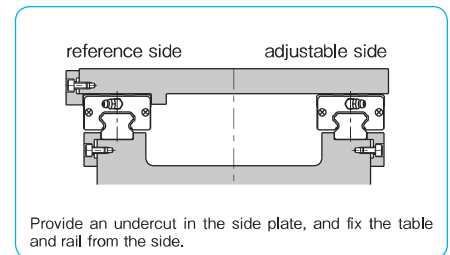
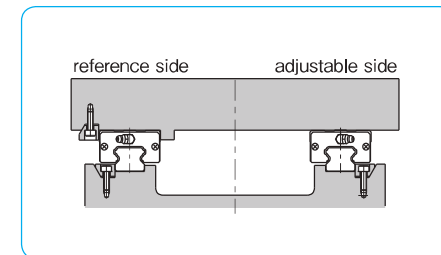


Figure A-12 Using Tapered Gib



- Applications where light load and low speed are involved.

Figures A-13~15 show the mounting methods when high accuracy is not required or the load capacity of the slide guide is sufficient due to a light load or low speed. In these cases, side pieces or reference surface may not be required.

Figure A-14 No Reference Surface on Adjustable Side

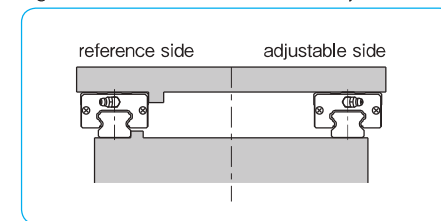


Figure A-13 Without Side Piece

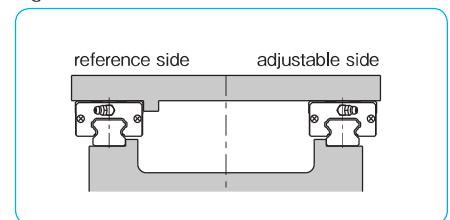
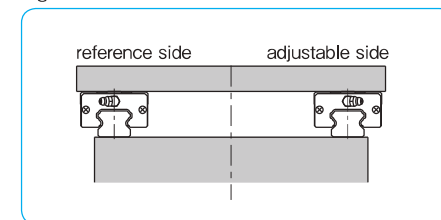


Figure A-15 Without Reference Surface



## Mounting Procedure

When reference surfaces are provided for both the table and the base, please follow the following procedure to mount the slide guide.

1. Remove burrs, scratches, dust, etc. from the base and table. Apply a low viscosity oil to the base and the table. Place the slide guide on the base carefully. Temporarily fix the rail mounting screws. (Figure A-16a)

2. Tighten the screw for the side piece so that the installation reference surface and the rail reference surface are in close contact. (Figure A-16b) If a side piece is not provided, use a C clamp to position the mounting reference surface and the rail reference surface so that they contact each other. (Figure A-16c)

3. Tighten the mounting screws to the specified torque, and complete the mounting of the rail. The rail is designed so that its accuracy is optimum when the screws are tightened to the specified value. Please refer to the recommended torque table for each product type. (Figure A-16d)

4. Repeat steps 2 and 3 for the rail on the adjustable side.

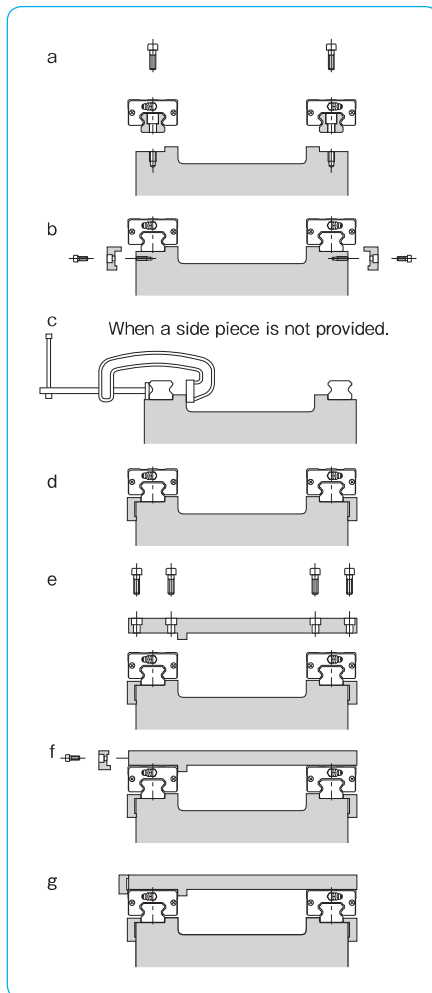
5. Move the blocks at the mounting location of the table, and place the table gently. Then slightly tighten the screws. (Figure A-16e)

6. Fix the reference surface of the block against the table by the side piece. Tighten the mounting screws in a diagonal sequence. (Figure A-16f)

7. In the same manner, tighten the mounting screws for the blocks on the adjustable side. (Figure A-16g)

8. Finally, move the table through the stroke length to check if thrust is even. Please repeat 5 and 6 ( 2 to 6 when necessary) if thrust is not even. If thrust is even, please do a final tightening of the screws.

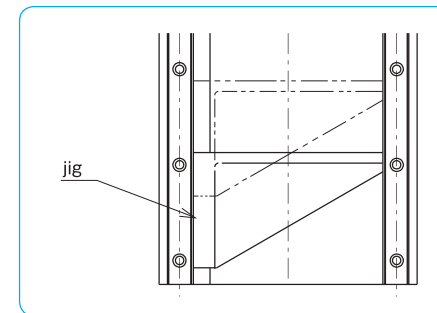
Figure A-16 Mounting Method



## When the Reference Surface is Not Provided on the Adjustable Side

When a reference surface is not provided on the adjustable side, mount the 2 rails in parallel by using a jig, as mounted in Figure A-17. After mounting the reference-side guide, install the adjustable-side guide by moving the table to achieve parallelism.

Figure A-17 Using a Jig



## When the Reference Surface is Not Provided on the Reference Side

When a reference surface is not provided on the reference side, mount the 2 rails by using a reference surface close to the slide guide.

Temporarily fix the slide guide to the base, and mount an indicator on a measurement plate. Please fix the measurement plate on two or more blocks. (Figure A-18)

Place the indicator against the reference surface of the base. Tighten the screws from one end of the rail to ensure straightness.

If there is no reference surface close-by, use a straight edge to achieve straightness. (Figure A-19)

Figure A-18 Using Base Reference Surface

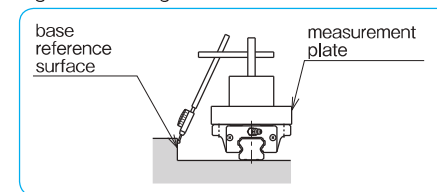
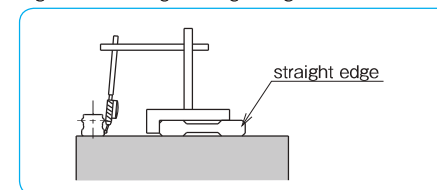


Figure A-19 Using a Straight Edge

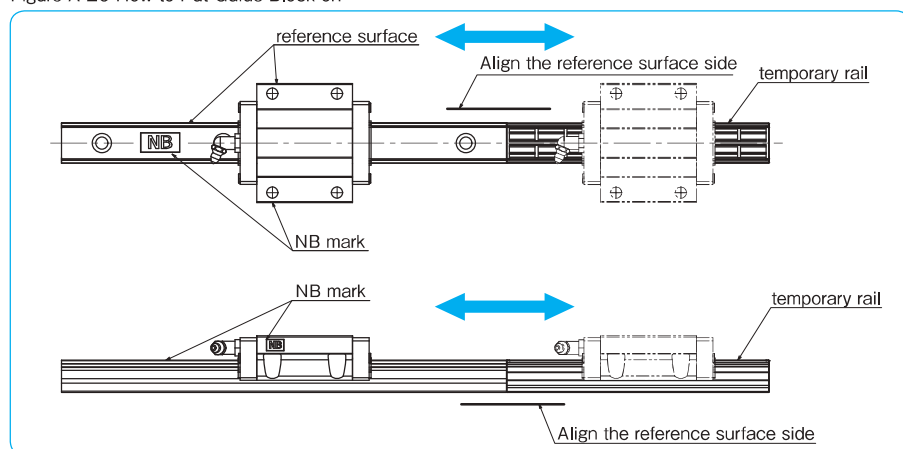


## USE AND HANDLING PRECAUTIONS

NB Slide Guides are accurately tuned precision components. Please pay special attention to the following notes.

- Please install the Slide Guide as a set. It is not recommended to remove the block for installation.
- When block removal is necessary, please use a temporary (plastic dummy) rail to prevent balls from dropping out.
- To put a guide block on the rail, as the pictures below show, align the reference surface and the height between the rail and a temporary rail. It is very important to maintain the original combination of block(s) and rail.

Figure A-20 How to Put Guide Block on



- Please do not turn around a block on the rail to change the grease-fitting orientation. Relocate fitting to the opposite end by removing red plug, and re-insert red plug to where fitting was originally.
- Never try to disassemble the block. This will most assuredly void warranty of the product.
- Please remove burrs, dust, or any other debris from the base and table before installation.
- Slide Guides are pre-lubricated for immediate use. Please relubricate with a similar type of grease regularly. Special lubricants must be matched with the same type of grease to prevent contamination.
- The SEB(S) and SER(S) Slide Guides have metal clip stoppers (picture below) to avoid a block fall-out during shipment and assembly. Please remove the stoppers only after installation is finished with a screwdriver as these clips should not be used as 'mechanical' stoppers.

## JOINT RAILS

Rails can be joined together to obtain a length which exceeds the maximum length. There are two ways to do this.

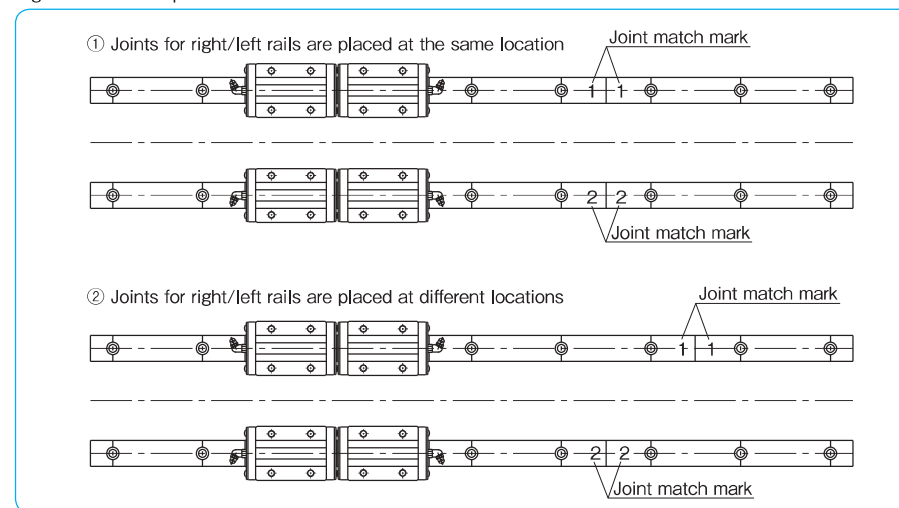
- Place the joints at the same location for the right and left rails so as to make the design and maintenance simple (Figure A-21 ①).
- Place the joints for the right and left rails at different locations so that the block does not move over the two joints at the same time so as to minimize the effect of the joint on accuracy (Figure A-21 ②).

Please keep the following points in mind when using joint rails.

- To avoid dislocation at joints due to shock loading, provide a shoulder at the joint on the installation side.
- If a shoulder cannot be provided, make sure that any excess load does not change the rail position.
- Use the joint marks provided for installation.
- Tightly butt the rails to be joined so that there is no gap between them.
- Make sure the reference surface side of the joint rails to be aligned.

Note: Joined rails are available for SGL and SGW series with standard grade, high grade, and with standard preload. For joined rails on SEB series, please contact NB. Joined rails are not available for SER series.

Figure A-21 Examples of Joined Guide Rails





SLIDE GUIDE SGL TYPE

The NB slide guide SGL type is a linear motion bearing utilizing the rolling motion of ball elements along four rows of raceway grooves. It can be used in various applications due to its compactness and high load capacity.

STRUCTURE AND ADVANTAGES

The NB slide guide SGL type consists of a rail with 4 rows of precisely machined raceway grooves and a block assembly. The block assembly consists of the main body, ball elements, retainers, and return caps.

High Load Capacity and Long Life

The use of relatively large ball elements and raceway grooves machined to a radius close to that of the ball elements increases the contact area resulting in a high load capacity and a long travel life.

Low Friction

Because a 4-row/2-point contact design is used, low friction and stable motion characteristics are achieved even under a preloaded conditions.

Omni-Directional Load Capacity

The ball elements are positioned at 45° contact angle so that the load capacity is equal in four directions (above, below, right and left).

Absorption of Mounting Dimensional Error

Because the ball elements are positioned to increase their self-aligning characteristics, the dimensional error caused during installation is absorbed.

Anti-corrosion Specification

The rail and block assembly can be treated with low temperature black chrome treatment to increase the

corrosion resistance. This treatment is standardized with the symbol "LB". Stainless steel SGLS type is suitable for use in clean room application.

Dust Prevention

Side-seals are provided as a standard. To improve the dust prevention characteristics, under-seals, double-seals, scrapers, bellows and special rail mounting caps are also available.

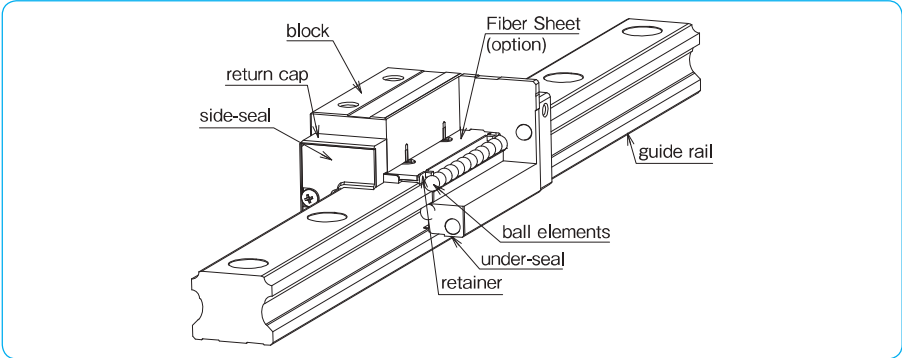
Fiber Sheet Extends Lubricant Replenishment Intervals

A lubricant-containing Fiber Sheet incorporated in the block supplies appropriate amount of lubricant to the raceway grooves at appropriate intervals, which can significantly extend the lubricant replenishment interval. (refer to page A-18)

REVERSE-SEAL

NB Reverse-seal realizes maintenance free by reducing grease leakage and loss. (refer to page A-19)

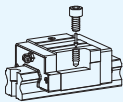
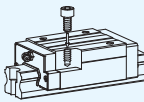
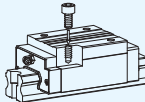
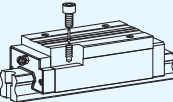
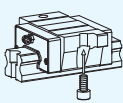
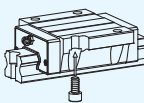
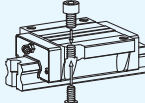
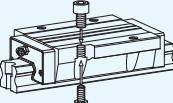
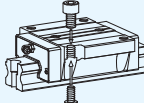
Figure A-55 Structure of SGL type Slide Guide



A-52

BLOCK TYPES

Eleven SGL block types are available depending on the material and mounting method.

SGL-F type P.A-56 SGLS-F type P.A-56	SGL-TF type P.A-58 SGLS-TF type P.A-58	SGL-HTF type P.A-60	SGL-HYF type P.A-62	
				
high-rigidity short type	high-rigidity	high-rigidity	high-rigidity long type	
SGL-E type P.A-64	SGL-TE type P.A-66	SGL-HTE type P.A-68	SGL-HYE type P.A-70	SGL-HTEX type P.A-72
				
high-rigidity short flange type	high-rigidity flange type	high-rigidity flange type	high-rigidity long flange type	high-rigidity six holes flange type

ACCURACY

Three accuracy grades are available: standard grade (blank), high grade (H), and precision grade (P).

Table A-25 Accuracy unit : mm

part number	SGL15,20			SGL25,30,35			SGL45		
accuracy grade	standard	high	precision	standard	high	precision	standard	high	precision
accuracy symbol	blank	H	P	blank	H	P	blank	H	P
allowable dimensional tolerance for height H	±0.1	±0.03	-0.03~0	±0.1	±0.04	-0.04~0	±0.1	±0.05	-0.05~0
paired difference for height H	0.02	0.01	0.006	0.02	0.015	0.007	0.03	0.015	0.007
allowable dimensional tolerance for width W	±0.1	±0.03	-0.03~0	±0.1	±0.04	-0.04~0	±0.1	±0.05	-0.05~0
paired difference for width W	0.02	0.01	0.006	0.03	0.015	0.007	0.03	0.02	0.01

Running parallelism of surface C to surface A  
Running parallelism of surface D to surface B

refer to Figure A-56, 57

Figure A-56 Motion Accuracy

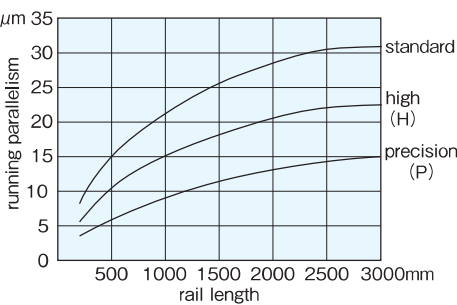
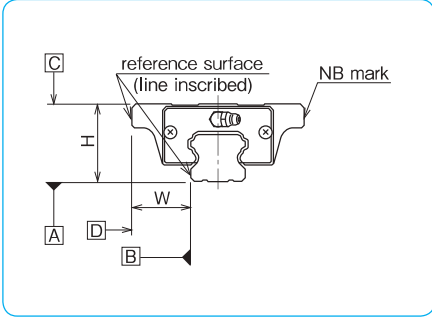


Figure A-57 Accuracy



A-53

## PRELOAD

SGL type slide guides are available with a standard preload (blank), light preload (T1), and medium preload (T2).

Table A-26 Preload Symbol and Radial Clearance unit:  $\mu\text{m}$ 

preload	standard	light	medium*
preload symbol	blank	T1	T2
SGL15	- 4~+2	-12~- 4	-
SGL20	- 5~+2	-14~- 5	-23~-14
SGL25	- 6~+3	-16~- 6	-26~-16
SGL30	- 7~+4	-19~- 7	-31~-19
SGL35	- 8~+4	-22~- 8	-35~-22
SGL45	-10~+5	-25~-10	-40~-25

Table A-27 Operating Conditions and Preload

preload	symbol	operating conditions
standard	blank	minute vibration is applied. accurate motion is required. moment is applied in a given direction.
light	T1	light vibration is applied. light torsional load is applied. moment is applied.
medium*	T2	shock and vibration are applied. over-hang load is applied. torsional load is applied.

\* Frictional resistance may be affected by preload.

## RAIL LENGTH

Slide guides with most commonly used lengths are available as standard. For slide guides with a non-standard length, unless otherwise specified, the distance from one end of the rail to the first hole center (N) will be within the range listed in Table A-28, satisfying the following equation.

$$L = M \cdot P + 2N$$

L: length (mm) M: number of pitches P: hole pitch (mm)  
N: distance from the end of the rail to the first hole center (mm)

Figure A-58 Rail

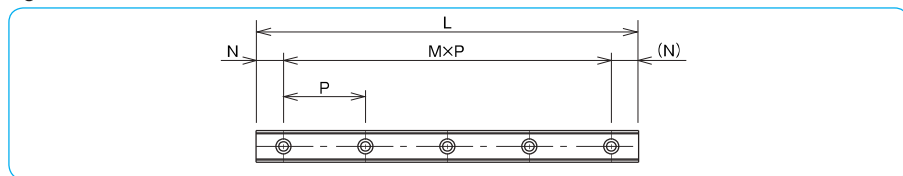


Table A-28 N Dimension unit: mm

part number	N	
	and over	less than
SGL15	6	36
SGL20	10	40
SGL25	11	41
SGL30	12	52
SGL35	16	56
SGL45	20	72.5

## MOUNTING

Slide guides are generally mounted by pushing the reference surface of the rail and block against the shoulder of the mounting surface. An undercut should be provided at the corner of the shoulder in order to avoid interference with the corner of the rail or block. The recommended shoulder height values are shown in Table A-30.

The screws to fasten the rail should be tightened equally using a torque wrench in order to secure the motion accuracy. The recommended torque values are listed in Table A-29. Please adjust the torque depending on the operating conditions.

Figure A-59 Mounting Reference Surface Profile

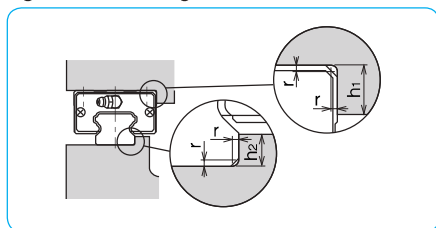


Table A-29 Recommended Torque unit: N·m

size	M3	M4	M5	M6	M8	M12
recommended torque	1.4	3.2	6.6	11.2	27.6	96.4

(for steel alloy screws)

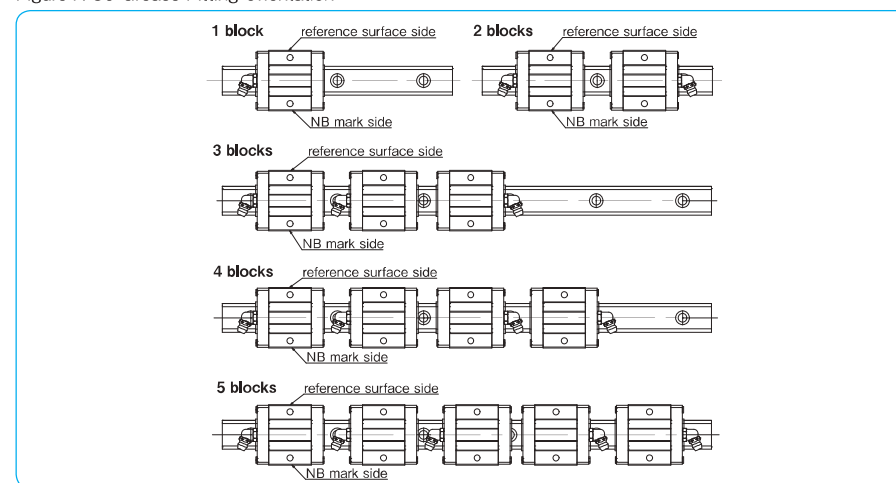
Table A-30 Shoulder Height Dimensions unit: mm

part number	h <sub>1</sub>	h <sub>2</sub>	r <sub>max.</sub>
SGL15	4	3.5	0.5
SGL20	5	5	0.5
SGL25	5	5.5	1
SGL30	6	7.5	1
SGL35	6	8	1
SGL45	8	8	1

## GREASE FITTING

A grease fitting is attached to the return cap of SGL type guide blocks for lubrication purposes. Unless otherwise specified, the orientation of the grease fitting is as shown in Figure A-59. When more than 6 blocks are used on one rail, the orientation of the grease fitting is same as the orientation of 3 to 5 block used on one rail.

Figure A-59 Grease Fitting Orientation



## LUBRICATION

A high grade lithium soap based grease is applied to the NB slide guides prior to shipment for immediate use. Please relubricate with a similar type of grease periodically depending on the operating conditions. For use in clean rooms or vacuum environments, NB slide guides without grease are available upon request. Please contact NB for customer specified grease types.

Please refer to page Eng-41 for details on the low dust generation grease.

A Grease Gun Set is available as a maintenance kit (refer to page Eng-44).

