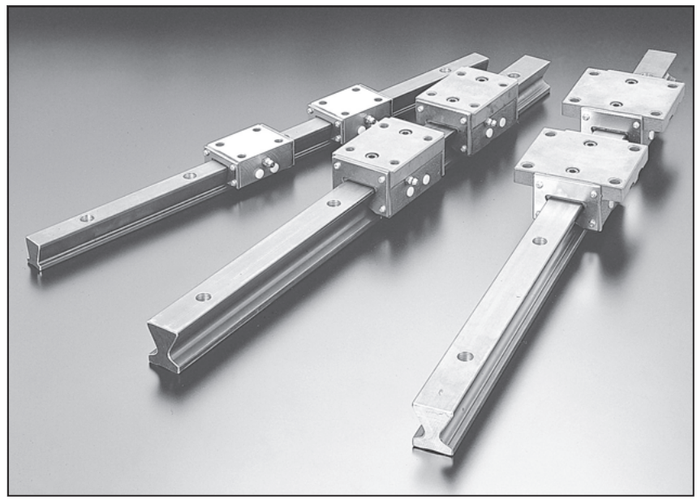
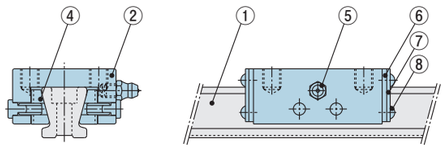
Oiles Slide Shifter SE Type STE/STFE GRE



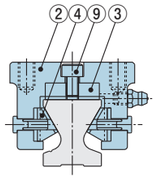
RoHS2 ELV

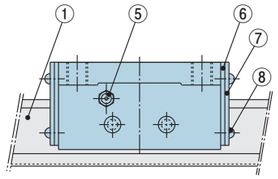
Component Parts・Accuracy

■ STE20 Compact type

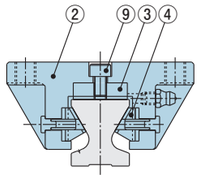


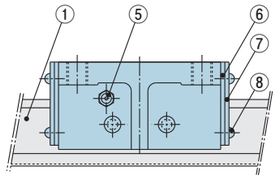
■ STE28 Compact type





■ STFE28 Flange type





Component Parts

No.	Name	Material
①	Guide rail	S45C (Oxide coating)
②	Shift table	FCD450
③	Liner (Sliding material)	Oiles metal
④	Gib (Sliding material)	Oiles metal
⑤	Grease nipple	A-M6F (Screw mounting hole size M6×P0.75)
⑥	Dust seal	Urethane rubber
⑦	Seal fixing screws	SPCC + rust proof
⑧	Fixing screws	——
⑨	Liner fixing bolts	——

※About the shift table
- STE20 has Oiles metal joined to FCD450.
- STE28 and STFE28 have been treated with a zinc phosphate coating for rustproofing (dyed black).

Service Range

Allowable Load

- Static allowable load: Allowable load when a load is applied at a stationary condition or at quite low speed near stopping (not more than 0.0017 m/s [0.1 m/min.])
- Dynamic allowable load: Allowable load in the condition with sliding speed of 1.0 m/s {60 m/min} or less.
- Do not use STC20 in lateral or hanging condition.

Part No.	Allowable load N {kgf}	
	Type	Table position
		Upright
STE20	Static	7,540 { 769}
	Dynamic	2,400 { 245}
STE28	Static	12,350 {1,260}
	Dynamic	4,110 { 419}
STFE28	Static	12,350 {1,260}
	Dynamic	4,110 { 419}

Allowable Velocity

Lubrication conditions	Allowable max velocity	Remarks
Dry	0.5m/s {30m/min}	——
Periodical lubrication	1.0m/s {60m/min}	Apply lubrication every 10 km of sliding

※Greasing is needed if the stroke is 1 meter or more or the allowable wear amount is small.

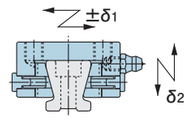
Operating resistance

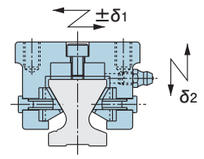
Part No.	STE20	STE28	STFE28
Fs	49.8N {5.0kgf}	62N {6.3kgf}	62N {6.3kgf}

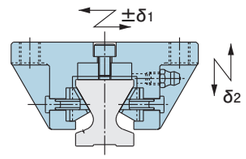
※Please refer to page 337 for setting the driving force.

Design Notes for SE type

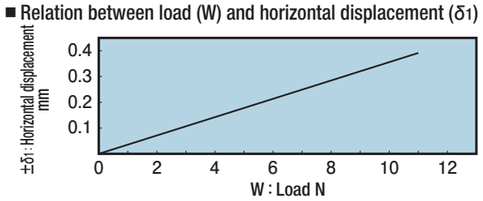
- Do not use in a place where a lateral or hanging load is applied.
- The table may possibly be displaced if a side load is applied to it in the stationary or almost stationary condition. Check the following drawings and check the displacement positions.



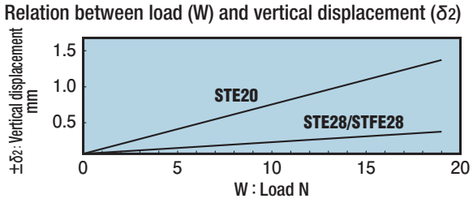




■ Relation between load (W) and horizontal displacement (δ1)



■ Relation between load (W) and vertical displacement (δ2)

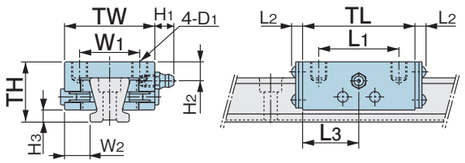


STE/STFE GRE Oiles Slide Shifter SE Type

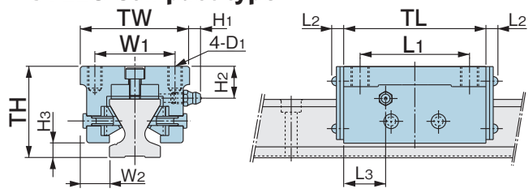
RoHS2 ELV

Shift Tables

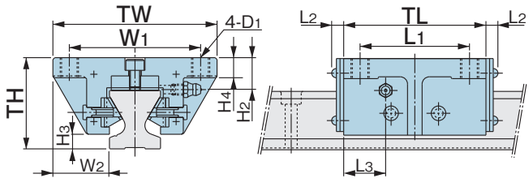
■ STE20 Compact type



■ STE28 Compact type



■ STFE28 Flange type



● Product Identification

Flange type

Specify by **STE** ☐ **Part No.**　　Specify by **STFE28** **Part No.**

(e.g.) When the compact type guide rail width is 19.5mm. ▶ **STE20**

Part No.	TH	TW	TL	W1	W2	L1	L2	L3	D1	H1	H2	H3	H4	Weight kg
STE20	30	45	56	30	12.75	40	5.5	28	M8	8.5	9.5	6	—	0.32
STE28	50	60	78	44	16	50	6.0	23	M8	5	17.5	8	—	0.90
STFE28	50	90	78	72	31	60	6.0	23	M10	—	17.5	8	11	0.94

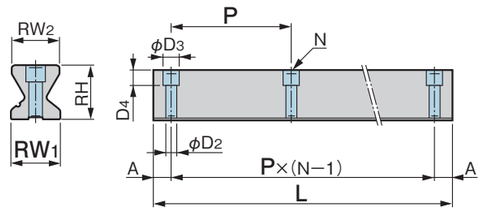
※H1 value is a reference value.

Guide Rails

● Product Identification

Specify by **GRE** **Width** - **Length** **Part No.**

(e.g.) When the width is 20mm and the tength is 1000mm. ▶ **GRE28-1000**



※Use hex socket head cap bolts for installation.
※The maximum length of a single rail is 2000 mm. Connect rails if a 2000 mm or longer rail is needed.
※Bolt hole cap (plastic) is available. Refer to page 295 for the detail.
※There is no bolt hole to fixing Bellows, please refer to page 296 for detail. It is only optionally available.

Part No.	RW1	RW2	RH	L	A	No. of holes N	P	φD2	φD3	D4	Attach bolts	Weight kg
GRE20-300	19.5	19.5	22	300	50	3	100	6.6	11	7	M6×30	0.8
GRE20-500	19.5	19.5	22	500	50	5	100	6.6	11	7	M6×30	1.4
GRE20-1000	19.5	19.5	22	1000	50	10	100	6.6	11	7	M6×30	2.8
GRE20-1500	19.5	19.5	22	1500	50	15	100	6.6	11	7	M6×30	4.2
GRE20-2000	19.5	19.5	22	2000	50	20	100	6.6	11	7	M6×30	5.6
GRE28-300	28	28	32	300	70	2	160	6.6	11	7	M6×40	1.5
GRE28-400	28	28	32	400	40	3	160	6.6	11	7	M6×40	2.0
GRE28-600	28	28	32	600	60	4	160	6.6	11	7	M6×40	3.0
GRE28-1000	28	28	32	1000	20	7	160	6.6	11	7	M6×40	5.0
GRE28-1500	28	28	32	1500	30	10	160	6.6	11	7	M6×40	7.5
GRE28-2000	28	28	32	2000	40	13	160	6.6	11	7	M6×40	10.0

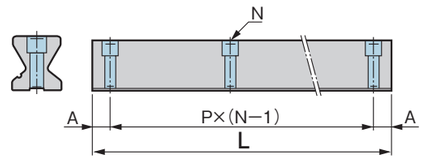
Custom-made Guide Rails

● Product Identification

Specify by **GRE** **Width** - **Length** **Part No.**

(e.g.) When the width is 20mm and the length is 450mm.

GRE20-450



- Select the proper mounting pitch P shown in the right table according to the series.
- The end dimension A is the same at both ends.
- The end dimension A should be 10 mm or more.
- Select the proper number of mounting holes appropriate to the design guide rail length in the right table.
- Select the number of mounting holes of the longer rail if the required length is shorter than the listed L.

Expression of calculating the end dimension A

$$A=\frac{L-\{P\times(N-1)\}}{2}$$

Calculation expression if A found with the above expression is less than 10 mm

$$A=\frac{L-\{P\times(N-2)\}}{2}$$

Calculation example (GRE20-1090)
Select the special-dimension guide rail 1100 mm (P = 100, N = 11) in the right table if the necessary guide rail dimension is 1090 mm.

End dimension $A=\frac{1090-\{100\times(11-1)\}}{2}=45$

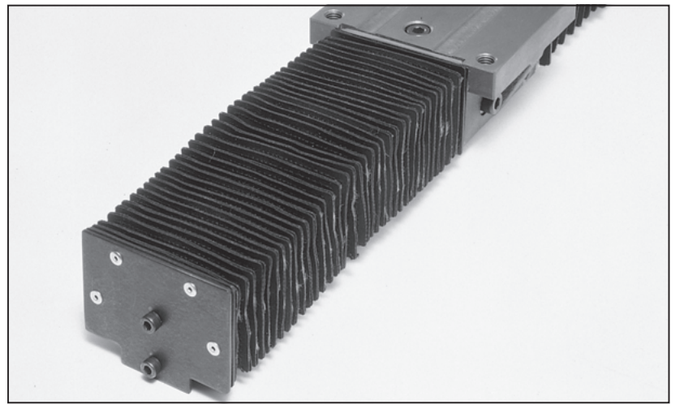
The end dimension = 45 mm and the number of mounting holes = 11 are found.

(Unit: mm)

L	GRE20 A	GRE20 P=100 N	GRE28 A	GRE28 P=160 N
150	25	2	—	—
200	50	2	20	2
250	25	3	45	2
300	50	3	70	2
350	25	4	15	3
400	50	4	40	3
450	25	5	65	3
500	50	5	10	4
550	25	6	35	4
600	50	6	60	4
650	25	7	85	4
700	50	7	30	5
750	25	8	55	5
800	50	8	80	5
850	25	9	25	6
900	50	9	50	6
950	25	10	75	6
1000	50	10	20	7
1050	25	11	45	7
1100	50	11	70	7
1150	25	12	15	8
1200	50	12	40	8
1250	25	13	65	8
1300	50	13	10	9
1350	25	14	35	9
1400	50	14	60	9
1450	25	15	85	9
1500	50	15	30	10
1550	25	16	55	10
1600	50	16	80	10
1650	25	17	25	11
1700	50	17	50	11
1750	25	18	75	11
1800	50	18	20	12
1850	25	19	45	12
1900	50	19	70	12
1950	25	20	15	13
2000	50	20	40	13

※There is no screw hole for mounting the bellows, please refer to page 296.

Optional Parts Applicable to S and SE Types



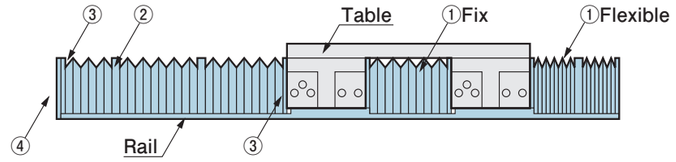
Bellows exclusive for slide shifters

The S and SE types incorporate Oiles bearings on the sliding surfaces and have superior foreign matter resistance. It is recommended to use the exclusive bellows if higher resistance is required. A heat-resistant bellows is also available.

Caps for covering up bolt holes on guide rails

Exclusive caps for preventing dust, etc. from entering the bolt holes for mounting the guide rail are available.

Component Parts for Bellows Exclusive for Slide Shifters

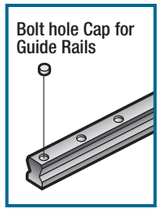


No.	Name	Material
①	Flexible bellows	Neoprene rubber + nylon cloth
	Fix bellows	
	Heat-resistant flexible bellows	GENTEX® + PTFE
	Heat-resistant fix bellows	
②	Slide Plate	PVC
③	Clamp Plate	SPCC
④	End Plate	SPCC

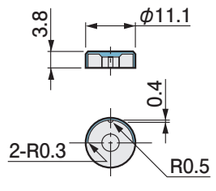
※Determine the positions of the bolts for fixing the rail at both ends when using the 38J or 48J as shown below.

Bolt hole Cap for Guide Rails

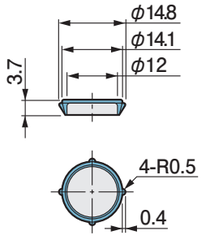
Exclusive bolt hole cap (plastic) is available to keep out the dust from bolt holes.



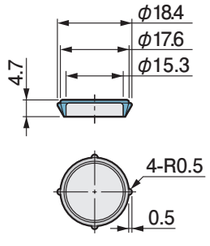
■ **CP-6** (for M6)



■ **CP-8** (for M8)



■ **CP-10** (for M10)



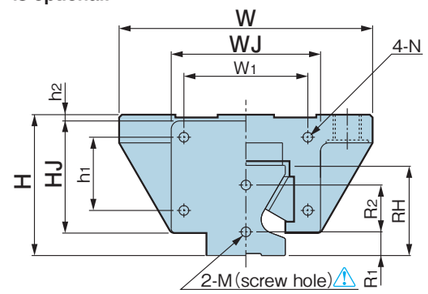
Part No.	Bolt Size	Rails
CP-6	M6	GR20、28、GRE20、28
CP-8	M8	GR38
CP-10	M10	GR48

※Press fit the cap with a plastic hammer.
※Fit CP-6 in the clearance between the rail and the bolt, and twist it to tie up.

Product Identification for Exclusive Bellows for Slide Shifters

⚠CAUTION

■ Mounting screw hole on the guide rail for bellows is optional.



● End plate of 20J sticks out 8mm from the table surface.

■ Flexible Bellows

28J - A - 100 - T
Part No.
- Put T for heat-resistant bellows
- Shortened length of bellows (Lmin)
- Bellows expansion ratio A or B

■ Fix Bellows

28JK - 140 - T
Part No.
- Put T for heat-resistant bellows
- Length of fixed bellows

Part No.	W×H	Bellows size WJ×HJ	Expansion ratio A	Stroke	Expansion ratio B	Stroke	h1	h2	W1	RH	R1	R2	N	M	Applicable tables
20J	45×30	52×32	5	under 1100	3.5	1100 or more	14	凸8	37	22	6	10	M3×10	M4×8	STC20 STE20
28J	90×50	60×40	5	under 1100	3.5	1100 or more	26	凹1	44	32	8	18	M3×10	M4×8	STC28 STF28 STE28 STFE28
38J	110×65	80×52	7	under 1300	5.5	1300 or more	36	凹1	58	42	10	24	M4×12	M5×10	STF38
48J	140×82	101×67	10	under 1300	7.5	1300 or more	50	凹3	74	52	12	30	M6×12	M6×10	STF48

Calculating formula

■ Length of Bellows
(L min=Shortened length, L max=Expanded length)

In case of expansion ratio A

$$L\,min=\frac{S}{A-1},\ L\,max=L\,min\times A$$

In case of expansion ratio B

$$L\,min=\frac{S}{B-1},\ L\,max=L\,min\times B$$

■ Total length of guide rail when using bellows

Using bellows at both ends

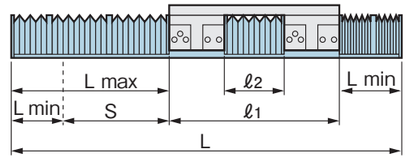
$$L=(L\,min\times 2)+S+\ell_1$$

Using bellows at one end

$$L=L\,min+S+\ell_1$$

In case of standard guid rails, L min dimension needs to be adjusted.

$$L\,min=\frac{L-S-\ell_1}{2}$$



S: Stroke
A, B: Expansion ratio of bellows
L max: Expanded length of bellows
L min: Shortened length of bellows
ℓ_1: Table length
ℓ_2: Fix bellows length
L: Rail length

Calculation example

Expression of calculating the bellows length is $L\,min=\frac{S}{A-1}$

$$L\,min=\frac{400}{5-1}=100mm$$

Required rail length $L_1=(L\,min\times 2)+S+\ell_1$

$$L_1=(100\times 2)+400+300=900mm$$

Bellows length L min when using standard rail length L2 (1000mm)

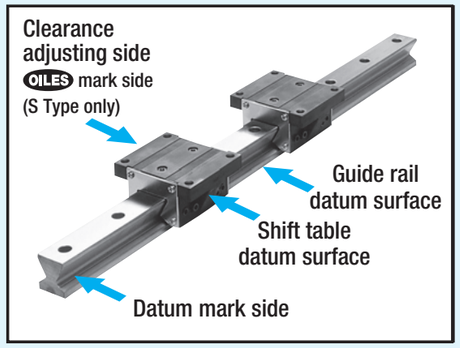
$$L\,min=(1000-400-300)/2=150mm$$

STF28
Stroke: S=400mm
Expansion ratio: A=5
Table length: ℓ_1=300mm
Fix bellows length: ℓ_2=140mm
Required rail length: L_1
Standard rail length: L_2=1000mm

Installation and Adjusting Methods of S and SE Types

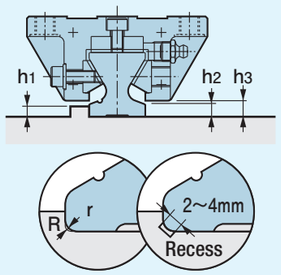
- The clearance between the shift table and guide rail of the S type need be adjusted.
- The shift table of the SE type has an automatic clearance adjustment function.

■ Installation Datum Surface



The guide rail and shift table have their own datum surface for correct installation.
The datum surface of the guide rail is the datum mark side (side B). That of the shift table is the opposite side (side D) to the OILES mark.
※Side B and D refer to the datum mark on page 287.

- Stage machining of installation datum part and corner dimensions



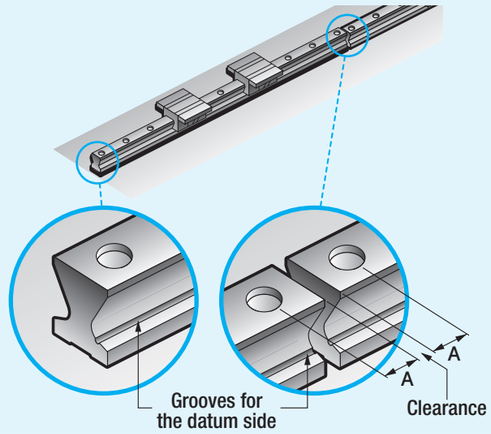
(Unit: mm)

Part No.	h1	h2	h3	r	R mating corner
GR20·GRE20	3~4	4	6	R1	R0.5 or less or recess
GR28·GRE28	4~6	6	8	R1.5	R1 or less or recess
GR38	5~8	8	10	R1.5	Ditto
GR48	5~8	10	11	R2	R1.5 or less or recess

■ Connecting Guide Rails

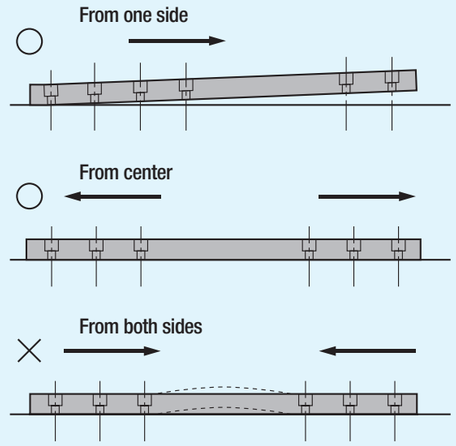
- Joining guide rails

Fix the guide rails with the grooves with the datum marks on the same side.
The distance A between the mounting hole and end face is machined with a minus tolerance and accordingly the joint has a clearance. However, the clearance causes no bad influences.



■ Cautions

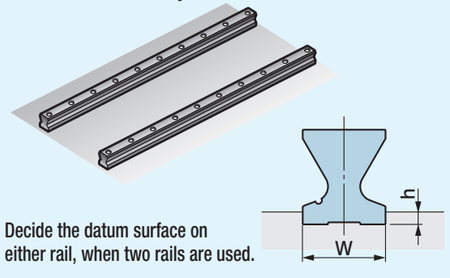
Tighten the bolts of the rail from one side or from the center to the right and left in sequence.



○: Correct ×: Wrong

■ Installation of Guide Rails

It is recommended that the guide rail be corrected before installation. The product alone has a bend of not more than 0.2 mm/m, which also applies to both the S and SE types. When it is installed on a base, the bend is corrected below 0.03 mm/m. After correction, adjust bend of the S type rail by means of clearance adjustment of the shift table. The SE type has an automatic clearance adjustment function and adjusts clearance automatically.

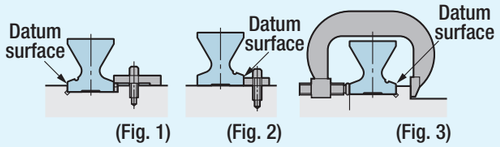


Decide the datum surface on either rail, when two rails are used.

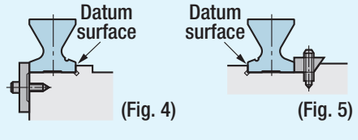
Part No.	W	h
GR20 · GRE20	19.5 +0.08 +0.05	2~3
GR28 · GRE28	28 +0.08 +0.05	3~4
GR38	38 +0.08 +0.05	4~5
GR48	48 +0.08 +0.05	4~5

■ Guide Rail Installation Adjustment Example

①Make a groove along the guide rail axis. Press the rail against the datum surface strongly to correct it. When two rails are used, parallelism is secured easily if grooves are made simultaneously.
②Alternative procedures are as shown below: Make the widths of the installation grooves roughly, insert drill rods and rails into the grooves, and fix the rails while pressing the drill rods. (See Fig. 1.)
③Other procedures as shown below: Install a rigid plate on a planar base, and install the rail to fit this plate. (See Fig. 2.)
④Make stages on the mating base with a planer or milling machine, press the datum surface of the rail against the machined surface with a vice or bolts and auxiliary plate, and fix the rail. (See Figs. 3, 4 and 5.)

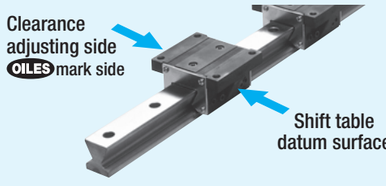


(Fig. 1) (Fig. 2) (Fig. 3)



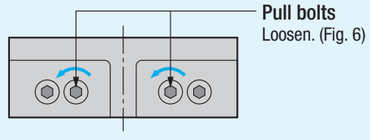
(Fig. 4) (Fig. 5)

■ Clearance Adjusting Method (S Type)

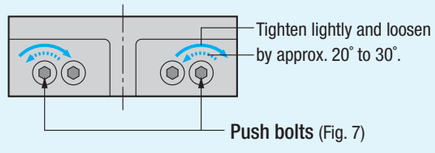


Recommended tightening torque	
STC20	1.47N · m {15kgf · cm}
STC28 · STF28	1.96N · m {20kgf · cm}
STF38	2.45N · m {25kgf · cm}
STF48	2.94N · m {30kgf · cm}

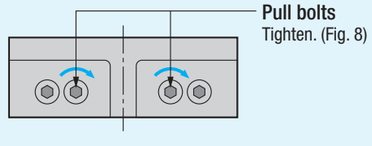
①Loosen the pull bolts on the side with OILES mark (on the grease nipple side) sufficiently. (See Fig. 6.)



②Tighten the push bolts lightly, check the clearance zero condition, press reversely by approximately 20 to 30°, and return the bolts. (See Fig. 7.)
For fine adjustment, retry adjustment in the order of Fig. 7 and Fig. 8. Clearance is increased or decreased by adjusting the degree of loosing the bolts shown in Fig. 7.



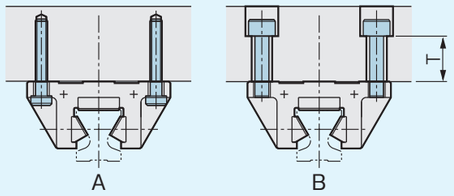
③Tighten the pull bolts. Clearance becomes 0.03 to 0.05 mm. (Fig. 8.)
NOTE: Tighten the pull bolts until the spring washers collapse. However, do not tighten them more strongly.



Installation and Adjusting Methods of S and SE Types

■ Installation of Shift Tables

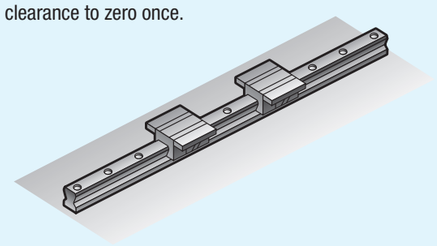
The shift table fixing bolts may be used in two ways as shown below. The recommended bolt diameters and lengths are as shown below.



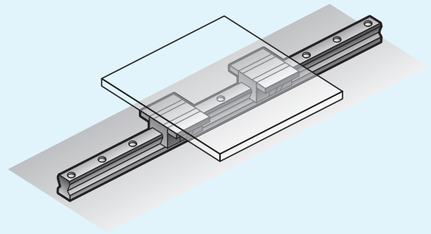
Part No.	A	B
STE20 · STC20	——	M8× (T+ 5)
STE28 · STC28	——	M8× (T+ 8)
STFE28 · STF28	M8×20	M10× (T+ 8)
STF38	M8×25	M10× (T+12)
STF48	M10×30	M12× (T+16)

■ Installing Several Shift Tables on a Single-axis Rail (S Type)

①Insert the shift tables in the guide rail and adjust the clearance to zero once.

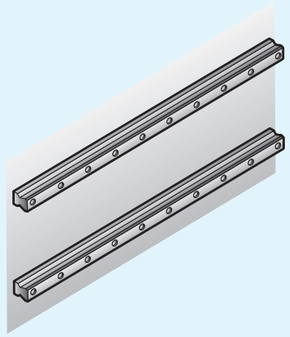


②Fasten the mating plate to the shift tables finally, adjust the linear accuracy, and adjust the clearance.

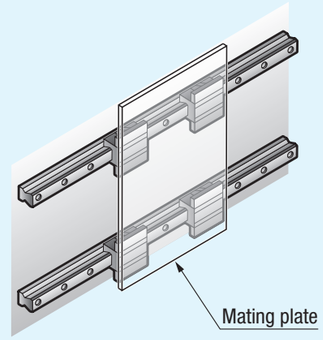


■ Installing Several Shift Tables on Dual-axis Rails Topsy-turvy, Laterally, or Vertically (S Type)

①Make sure that two rails are in parallel. (0.2 mm or less)



②Insert the shift tables with adjusted clearance into the guide rails.

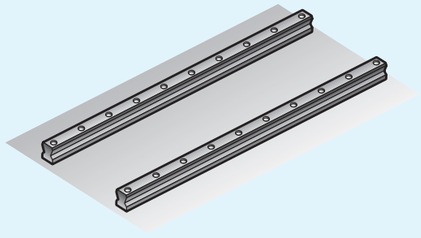


③Fix the mating plate to the shift tables temporarily, make sure that the tables move smoothly, and fix the mating plate finally.

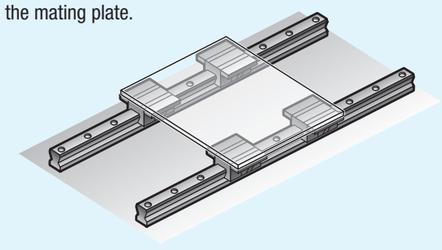
④Recheck parallelism and clearance of the rails if movement is not smooth.
If large moment loads are applied, the resistance increases.

■ Installing Several Shift Tables on Dual-axis Rails (S Type)

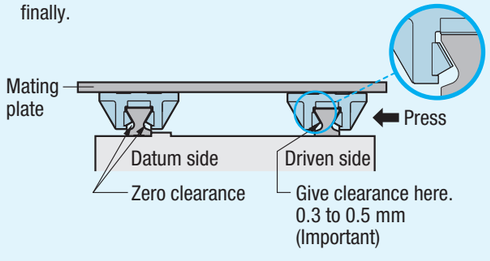
①Make sure that two rails are in parallel. (0.2 mm or less)



②Insert the shift tables into the guide rails with the clearance adjusting sides (OILES marks) outward. Put the mating plate.

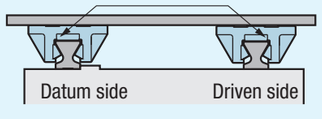


③Zero the clearance of the datum-side shift tables. Set the clearance of the driven shift tables to 0.3 to 0.5 mm, press the shift tables against the rails in the direction of the arrow, and fix the shift tables to the mating plate finally.



④Adjust the clearance on the datum-side shift tables.

Both outer clearances are the same as the amount of clearance adjustment, which depends on the parallelism of the guide rails.



■ Other Instructions

①Use knock pins for both the guide rails and shift tables if vibrations or large impact loads are applied to them. The fixing holes of the guide rails may be used at intervals of several holes for the knock pins.

②It is recommended that a mating plate with high parallelism should be used. If sufficient parallelism cannot be secured for reasons of machining, carry out adjustment with shims so that the guide rails and shift table are in good contact.

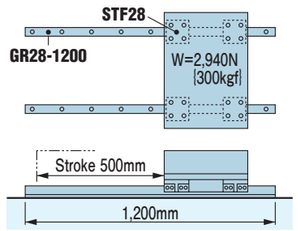
Durability Test Data / To Prevent Malfunctioning

Durability Test Data

S Type

<Testing conditions>
Type: STF28 four shift tables
GR28-1200 dual-axis
Load: 2,940N {300kgf}
Velocity: 0.33m/s {20m/min}
Stroke: 500mm
Sliding distance: 1,000km

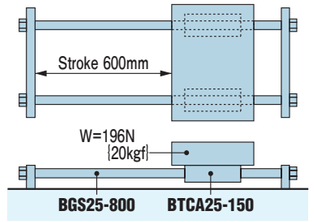
<Result>
Wear amount on liner: 0.025mm
on rail: 0.005mm
Coefficient of friction: 0.08～0.14
Temperature of friction: 32～42℃



BA Type

<Testing conditions>
Type: BTCA25-150 one shift table
BGS25-800 dual-axis
Load: 196N {20kgf}
Velocity: 0.50m/s {30m/min}
Stroke: 600mm
Sliding distance: 1,000km

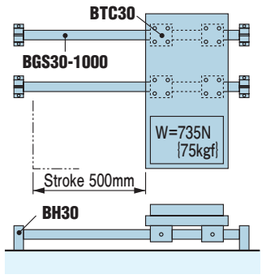
<Result>
Wear amount on bushing: 0.055mm
on shaft: 0.008mm
Coefficient of friction: 0.20～0.28



BC Type

<Testing conditions>
Type: BTC30 four shift tables
BGS30-1000 dual-axis
Load: 735N {75kgf}
Moment: 323N·m {33kgf·m}
Velocity: 0.25m/s {15m/min}
Stroke: 500mm
Sliding distance: 300km (300000 cycles)

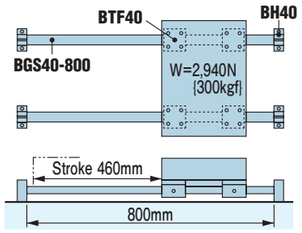
<Result>
Wear amount on bushing: 0.032mm
on shaft: 0.006mm
Coefficient of friction: 0.12～0.30



BF Type

<Testing conditions>
Type: BTF40 four shift tables
BGS40-800 dual-axis
Load: 2,940N {300kgf}
Velocity: 0.42m/s {25m/min}
Stroke: 460mm
Sliding distance: 1,000km

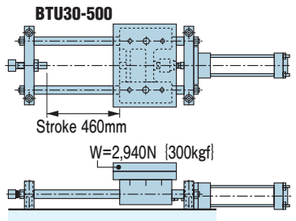
<Result>
Wear amount on bushing: 0.035mm
on shaft: 0.008mm
Coefficient of friction: 0.10～0.25
Temperature of friction: 42～85℃



BTU Type

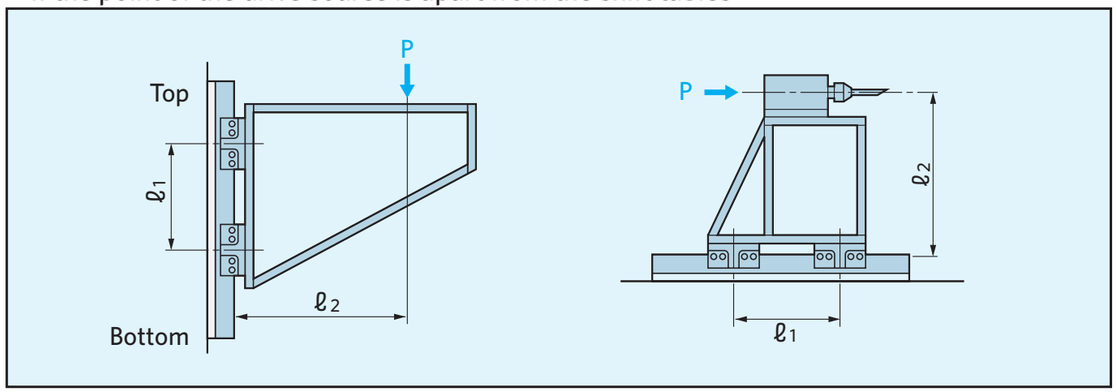
<Testing conditions>
Type: BTU30-500
Load: 2,940N {300kgf}
Velocity: 0.42m/s {25m/min}
Stroke: 460mm
Sliding distance: 730 (800000 cycles)

<Result>
Wear amount on bushing: 0.023mm
on shaft: 0.012mm
Coefficient of friction: 0.16～0.20



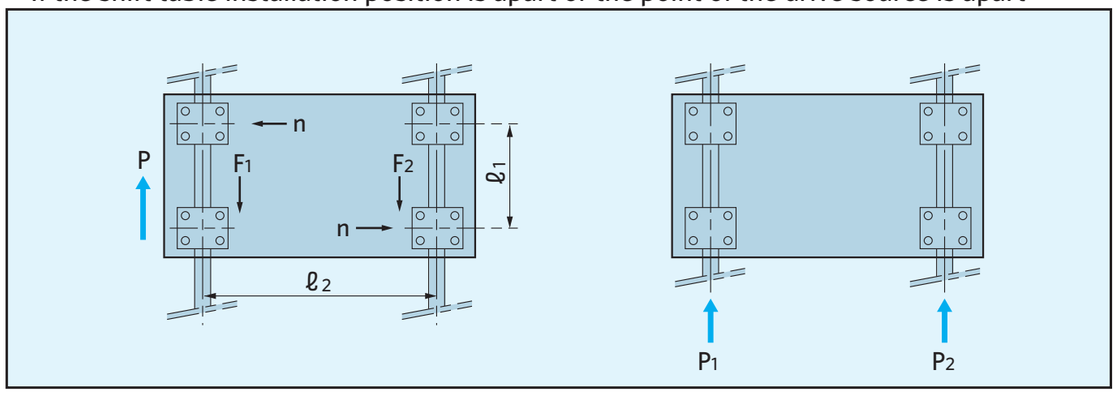
To Prevent Malfunctioning

■ If the point of the drive source is apart from the shift tables



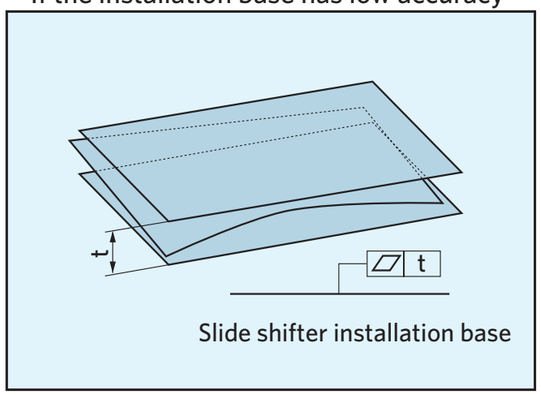
If the position of drive source P is apart from the rail surface by ℓ_2, of ℓ_2/ℓ_1 exceeds 1.67 when the coefficient of friction μ is 0.3, resulting in malfunctioning. Take the allowable moment load into consideration and reduce ℓ_2/ℓ_1 below 1.5.

■ If the shift table installation position is apart or the point of the drive source is apart

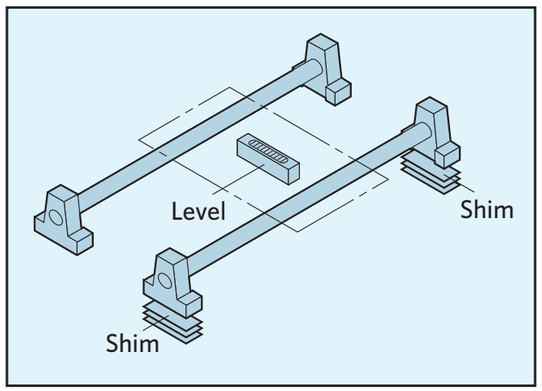


If the ℓ_2/ℓ_1 ratio of dual-axis parallel rails is large, the couple of the drive source P and resistance F_1 and F_2 becomes large and the slide shifter works improperly. Reduce ℓ_2/ℓ_1 below 3. As the point of the drive source becomes apart from the center, the condition becomes worse. Synchronize the drive source with P_1 and P_2 if ℓ_2/ℓ_1 is inevitably larger than 3 for reasons of the structure.

■ If the installation base has low accuracy



Do not select the S type if the parallelism t exceeds 0.3.



Select the B type if the parallelism t exceeds 0.3. Insert shims under the shaft holders to adjust them.
After adjustment, check the parallelism with a level, straight edge, clearance gauge, etc.