OILES Sliding Linear Guides
Slide Shifter S Type
Dimensional Compatibility Specifications

New!
Dimensionally compatible with ball types

CAD data
They can be downloaded free of charge from PARTcommunity (managed by CADENAS WEBCAD Inc).
The “Bearings” section on our website (www.OILES.co.jp/en/bearing) also provides the link.

Technical support tool
A technical support tool that can perform automatic calculation of load and moment for linear guide, driving force, and service life is available on our website (www.OILES.co.jp/en/bearing/slide_shifter/simulation).

http://www.oiles.co.jp/en/

The content of this catalog is current as of January 2019. Specifications are subject to change without prior notice for product improvement. JC-250.18SH (1)
OILES Sliding Linear Guides (Slide Shifter S Type Dimensional Compatibility Specifications)

Component Parts / Accuracy

C-STC20/C-STC25: Compact type

C-STC30: Compact type/R-STC30: Standard type

R-STF30: Standard flange type

Service Range

Allowable Load

- Static allowable load: Allowable load when it is born in the stationary condition or at quite low speed near stopping (not more than 0.1 m/min.)
- Dynamic allowable load: Allowable load in the condition with sliding speed of not more than 1.0 m/s (60 m/min.)

Allowable Velocity

Lubrication conditions: Allowable velocity

Remarks

- Maximum speed (60m/min)
- Apply lubrication every 16 km of sliding

Allowable Moment

4 tables on 2 rails

Dimension Table: Shift Table

Order method

- Pay attention to the combination of shift tables and guide rails.

Part No.

Assembled state

Shift table

Nipple

Full bolt

Push bolt

Applicable rail

Order examples

In the case of 4 tables on 2 rails with C-STC20 for tables and a rail length of 520 mm

Order 4 units of C-STC20 and 2 units of C-GR20-520.

Dimension Table: Rail

Standard length

Below 1,000 mm. Use hex socket head bolts to fix.

1,000 mm or longer

Order method

- 'a' portion in the dimension table may be changed.

For customized length, please contact the nearest sales office.

Dimension compatibility with ball type linear guides

- This product is designed to be dimensionally compatible with the major portions of ball-type linear guides.
  
  a) Height in the assembled state (TH), width of shift tables (TW), mounting hole pitch of shift tables, mounting hole pitch of rails
  
  However, please be aware that due to standardization with existing products and design limitation associated with the sliding type, some dimensions differ.
  
  a) Width of rail mounting surface (RW1) — It is "19.5" for C-GP25, while "20" for the ball-type linear guide.
Installation and Adjusting Methods

The clearance between the shift table and guide rail needs to be adjusted.

### Installation Datum Surface

**Stage machining of installation datum and corner dimensions**

![Diagram of installation datum surface](image)

The guide rail and shift table have their own datum surface for correct installation. The datum surface of the guide rail is on the datum mark side (groove). That of the shift table is on the opposite side of the mark.

### 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. When it is installed on a base, the bend is corrected to below 0.03 mm/m. After correction, adjust the bend by means of a clearance adjustment of the shift table.

### Guide Rail Installation Adjustment Example

1. Make 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.
2. Alternative 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.)
   - Install a rigid plate on a planar plate, and install the rail to fit this plate. (See Fig. 2.)
   - Make stages on the mating base with a planar or milling machine, press the datum surface against the machined surface with a vise or bolts and auxiliary plate, and fix the rail. (See Figs. 3, 4 and 5.)

### 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 has no bad influences.

### Clearance Adjusting Method (S Type)

1. Loosen the pull bolts on the side with a mark on the grease nipple side sufficiently. (See Fig. 6.)
2. Tighten the push bolts lightly, check the clearance zero condition, press reversely by approximately 20˚ to 30˚, and return the bolts (See Fig. 7).
3. For fine adjustment, retry adjustment in the order of Fig. 7 and Fig. 8. Clearance is increased or decreased by adjusting the looseness of the bolts shown in Fig. 7.

### Cautions

- Tighten the bolts of the rail from one side or from the center to the right and left in sequence.
- Do not tighten them further.

### Clearance adjusting side

![Diagram of clearance adjusting side](image)

**Part No.**

<table>
<thead>
<tr>
<th>C-GR20</th>
<th>H1</th>
<th>H2</th>
<th>H3</th>
<th>R1</th>
<th>R mating corner</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-GR20</td>
<td>3-4</td>
<td>4</td>
<td>6</td>
<td>R1</td>
<td>0.5 or less or recess</td>
</tr>
<tr>
<td>C-GR30</td>
<td>4-6</td>
<td>6</td>
<td>9.5</td>
<td>R1.5</td>
<td>R1 or less or recess</td>
</tr>
</tbody>
</table>

**Part No.**

<table>
<thead>
<tr>
<th>C-STC20/C-STC25</th>
<th>1.47 N·m (15 kgf·cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-STC30/R-STC30/R-STF30</td>
<td>1.96 N·m (20 kgf·cm)</td>
</tr>
</tbody>
</table>

* The product image is not that of this series.
* The product image is not that of this series.

### Recommended tightening torque

- Pull bolts Loosen. (Fig. 6)
- Push bolt (Fig. 7)
- Pull bolts Tighten. (Fig. 8)

**NOTE:** Tighten the pull bolts until the spring washers collapse. Do not tighten them further.
**Installation and Adjusting Methods**

### Installation of Shift Tables
The shift table fixing bolts may be used in the two ways shown below. The recommended bolt diameters and lengths are as shown below.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-STC20</td>
<td>–</td>
<td>M5 × (T + 5)</td>
</tr>
<tr>
<td>C-STC25</td>
<td>–</td>
<td>M5 × (T + 5)</td>
</tr>
<tr>
<td>C-STC30</td>
<td>–</td>
<td>M8 × (T + 8)</td>
</tr>
<tr>
<td>R-STC30</td>
<td>–</td>
<td>M8 × (T + 8)</td>
</tr>
<tr>
<td>R-STF30</td>
<td>M8 × 20</td>
<td>M10 × (T + 8)</td>
</tr>
</tbody>
</table>

### Installing Several Shift Tables on a Single-axis Rail
1. Insert the shift tables in the guide rail and adjust the clearance to zero once.
2. Zero 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.
3. Adjust the clearance on the Datum-side shift tables.

### Installing Several Shift Tables on a Dual-axis Rail
1. Make sure that two rails are in parallel (0.2 mm or less).
2. Insert the shift tables with adjusted clearance into the guide rails.
3. Fix the mating plate to the shift tables temporarily, make sure that the tables move smoothly, and fix the mating plate.
4. Recheck parallelism and clearance of the rails if movement is not smooth. If large moment loads are applied, the resistance increases.

### Other Instructions
1. Use 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.
2. It is recommended that a mating plate with high parallelism 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.
3. Fix the mating plate to the shift tables temporarily, make sure that the tables move smoothly, and fix the mating plate.
4. Recheck parallelism and clearance of the rails if movement is not smooth. If large moment loads are applied, the resistance increases.

### 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 \( t_2 \), \( t_2/t_1 \) exceeds 1.67 when the coefficient of friction \( \mu \) is 0.3, resulting in malfunctioning. Take the allowable moment load into consideration and reduce \( t_2/t_1 \) below 1.5.

#### If the shift table installation position is apart or the point of the drive source is apart
If the \( t_2/t_1 \) 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 \( t_2/t_1 \) below 3. As the point of the drive source becomes apart from the center, the condition worsens. Synchronize the drive source with \( P_1 \) and \( P_2 \) if \( t_2/t_1 \) is inevitably larger than 3 for structure reasons.
Setting Driving Force

The driving forces differ with the shift table installation conditions. The typical load conditions and examples of calculating the driving forces are shown below. Take note of them. When setting the driving force, find the load applied to each table first using the formula shown below, and select a proper table in the allowable load table of each series. Then, calculate the driving force from the found load using the formula shown below.

Formula for calculating loads and driving forces

- **Driving force**
  
  \[ F = (\mu_1 A + \mu_2 B + \mu_3 C + \mu_4 D + \mu_5 E + \mu_6 F) \times S \]

  - \( F \): Driving force
  - \( S \): Safety factor (2 in this example)
  - \( \mu_1, \mu_2, \mu_3, \mu_4, \mu_5, \mu_6 \): Coefficient of friction of each table

- **Load calculation**
  
  \[ A = W/4 - W/2 \times L/L_0 \]
  \[ B = W/4 - W/2 \times L/L_0 \]
  \[ C = W/4 + W/2 \times L/L_0 \]
  \[ D = W/4 + W/2 \times L/L_0 \]

The obtained value is the practical driving force. ±W (weight) is added to the value of the lengthwise vertical tables.

Examples of Load Calculation and Driving Force Calculation

[Use conditions] Four erecting dual-axis tables, \( W = 100 \text{ kgf} \), \( L_0 = L_1 = L_2 = L_3 = 200 \text{ mm} \)

1. **Calculating loads applied to tables**

   \[ A = W/4 + W/2 \times L/L_1 \]
   \[ B = W/4 - W/2 \times L/L_1 \]
   \[ C = W/4 - W/2 \times L/L_1 \]
   \[ D = W/4 + W/2 \times L/L_1 \]

   Use the load calculating formula shown above and find the load to be applied to each table from the use conditions.

   \[ W = \text{load} = 100 \text{ kgf} \]
   \( L_0, L_1, L_2, L_3 = \text{distance between load application point and each table} \)

   Find A, B, C and D (load to be applied to each table) from \( L_0 = L_1 = L_2 = L_3 = 200 \text{ mm} \).

   \[ A = 100/4 + 100/2 \times 200/200 = 25 \]
   \[ B = 100/4 - 100/2 \times 200/200 = -75 \]
   \[ C = 100/4 - 100/2 \times 200/200 = 75 \]
   \[ D = 100/4 + 100/2 \times 200/200 = 125 \]

   Select the proper shift tables so that the values of A, B, C and D are within the ranges of values in the allowable load table shown in the description. (See p.2.)

   A = 25 kgf (erecting)
   B = -75 kgf (hanging) * See the hanging values for negative values.
   C = 25 kgf (erecting)
   D = 125 kgf (erecting)

2. **Calculating driving force**

   \[ F = (0.15 \times 25 + 0.17 \times (-75) + 0.15 \times 25 + 0.15 \times 125) \times 2 \]

   Calculation result: 97.5 kgf

- **Type of installation**
  - Erecting
  - Lateral
  - Hanging

- **Coefficient of friction \( \mu \)**
  - Erecting: 0.15
  - Lateral: 0.17
  - Hanging: 0.30

<table>
<thead>
<tr>
<th>Type</th>
<th>S type</th>
<th>Coefficient of friction ( \mu )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation condition</td>
<td>Erecting</td>
<td>Lateral</td>
</tr>
<tr>
<td>Coefficient of friction ( \mu )</td>
<td>0.15</td>
<td>0.17</td>
</tr>
</tbody>
</table>

- Do not use C-STC20 and C-STC25 in lateral or hanging position.
Calculating Service Life

OILES slide shifters employ OILES bearings and work without the need for lubrication, in principle. If they are lubricated, foreign matter may be removed and the durability is further improved.

The service life of the OILES slide shifters depends on the speed, environmental conditions, etc. Take the condition shown below into consideration and find the service life using the service life calculation formula. It will be the basis of design.

<table>
<thead>
<tr>
<th>Service life calculation formula</th>
<th>[ N = a \times K \times \frac{1}{2S} \times \frac{Wa}{W_i/n} \times \frac{fc}{fw \times fv \times fe \times f_{\ell}} ]</th>
</tr>
</thead>
</table>

- **a** = allowable wear amount [mm]
- **K** = coefficient of friction
  The slide shifters use various types of OILES bearings. The coefficient of friction is set according to their performances and use conditions.
- **S** = stroke [m]
- **Wa** = allowable load [N (kgf)]
  See the Parts List.
- **Wi** = applied load [N (kgf)]
  Select the severest one (i.e., value nearest the allowable load) at the load applied to each table calculated with the load calculating formula.
- **n** = number of tables
  Use the table with the severest condition when several shifters are used. In such a case, \( n = 1 \).
- **fc** = contact factor
  When several shift tables are used, it is difficult to obtain uniform load distribution due to influences of the installation surface accuracy. This factor is determined by taking the contact conditions of the shift tables into consideration.

### Calculation Examples of Service Life

#### Use conditions and required service life

<table>
<thead>
<tr>
<th>N = a x K x (1/2S) x (Wa/Wi) x fc/(fw x fv x fe x f_{\ell})</th>
</tr>
</thead>
<tbody>
<tr>
<td>( fc = 0.75 ) 2 tables on 1 rail</td>
</tr>
<tr>
<td>( fw = 1.0 ) No impact load</td>
</tr>
<tr>
<td>( fv = 1.0 ) 0.05 m/s</td>
</tr>
<tr>
<td>( f_{v} = 1.0 ) 60°C or less, no foreign matter</td>
</tr>
<tr>
<td>( fe = 1.0 ) No lubrication</td>
</tr>
</tbody>
</table>

Find the service life from the use conditions using the above formula.

\[ N = \text{service life} = \text{required service life (1 million cycles)} \]

- \( a = 0.1 \text{ mm} \)
- \( K = 5 \times 10^6 \)
- \( S = 0.25 \text{ m} \)
- \( W = 100 \text{ kgf} \)
- \( Wa = \text{allowable load} = 130 \text{ kgf (trial calculation for a hanging R-STF30)} \)
- \( W_i = \text{applied load} = 75 \text{ kgf} \)
- \( fc = \text{contact factor} = 0.75 \) (Two single-axis units)
- \( fw = \text{load factor} = 1.0 \) (No impact load)
- \( fv = \text{velocity factor} = 1.0 \) (0.05 m/s)
- \( fe = \text{environmental factor} = 1.0 \) (60°C or less, no foreign matter)
- \( f_{\ell} = \text{lubrication factor} = 1.0 \) (No lubrication)

The value of \( N \) is found as shown below:

\[ N = 0.1 \times 5 \times 10^6 \times \frac{1}{2 \times 0.25} \times \frac{130}{75} \times 0.75/ (1.0 \times 1.0 \times 1.0 \times 1.0) = 1,300,000 \]

The required service life of 1 million cycles is satisfied.

#### Impact fluctuating loads

<table>
<thead>
<tr>
<th>Load factor ( fw )</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
<tr>
<td>1.0</td>
</tr>
</tbody>
</table>

#### Contact factor \( fc \)

This factor is used for compensation of the load conditions, since it is difficult to grasp the actual vibrations, impacts, etc. produced in machines.

#### Velocity factor \( fv \)

This factor is used for compensation of the velocity conditions.

<table>
<thead>
<tr>
<th>Velocity condition</th>
<th>0.0017 or less</th>
<th>0.0017-0.05</th>
<th>0.05-0.5</th>
<th>0.5-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Velocity factor ( fv )</td>
<td>0.25-0.3</td>
<td>0.3-1.0</td>
<td>1.0-2.0</td>
<td>2.0-4.0</td>
</tr>
</tbody>
</table>

#### Environmental factor \( fe \)

This factor is used for compensation of the ambient temperature and influences of foreign matter.

<table>
<thead>
<tr>
<th>Ambient temperature</th>
<th>60°C or less</th>
<th>60-100°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign matter</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Environmental factor ( fe )</td>
<td>1.0-2.0</td>
<td>3.0-6.0</td>
</tr>
</tbody>
</table>

- \( * \) Lubrication is needed if the temperature is 100°C or more.

#### Lubrication factor \( f_{\ell} \)

Lubrication enhances the effect in high-speed operation or foreign matter removal.

#### Number of tables per axis

<table>
<thead>
<tr>
<th>Number of tables per axis</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
<th>Four</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact factor ( fc )</td>
<td>1.0</td>
<td>0.75-0.85</td>
<td>0.65-0.75</td>
<td>0.6-0.65</td>
</tr>
</tbody>
</table>

#### Running distance and lubrication

<table>
<thead>
<tr>
<th>Running distance and lubrication</th>
<th>No lubrication</th>
<th>Lubrication every 10km</th>
<th>Lubrication every 1km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lubrication factor ( f_{\ell} )</td>
<td>1.0-1.5</td>
<td>0.3-0.5</td>
<td>0.2-0.3</td>
</tr>
</tbody>
</table>

The use conditions are the same as those for load calculation examples in page 9.

Therefore, the results of page 9 are used for the values of allowable load \( Wa \) and applied load \( Wi \).