Technical details for the calculation of linear tables

Company:

Application:

Telephone:
Telephone:

Telefax:
Telefax:

E-mail:
E-mail:

Branch:
Branch:

Department:
Department:

Name:
Name:

Date:
Date:

Order number:
Order number:

Technical data
Technical data

Axes: [Number]
Positioning accuracy: [mm]
Repetitive accuracy: [mm]
Speed max: [m/min.]
Life (desired): L [km]

With multi-axis-units we need your loads data for each table.

Sketch:

Environment:
(Dirt, humidity ...)

Loads:

<table>
<thead>
<tr>
<th>Forces</th>
<th>Lever arms</th>
</tr>
</thead>
<tbody>
<tr>
<td>F_X =</td>
<td>N</td>
</tr>
<tr>
<td>Y =</td>
<td>mm</td>
</tr>
<tr>
<td>Z =</td>
<td>mm</td>
</tr>
<tr>
<td>F_Y =</td>
<td>N</td>
</tr>
<tr>
<td>X =</td>
<td>mm</td>
</tr>
<tr>
<td>Z =</td>
<td>mm</td>
</tr>
<tr>
<td>F_Z =</td>
<td>N</td>
</tr>
<tr>
<td>X =</td>
<td>mm</td>
</tr>
<tr>
<td>Y =</td>
<td>mm</td>
</tr>
</tbody>
</table>

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Technical information

Linear tables, rotary tables, goniometers

References switches, measuring system: The standard version of our linear tables is equipped with inductive limit and reference switches PNP-nc 10-30 VDC. Optionally PNP-no NPN-no and NPN-nc - switches are available.

The attachment / integration of a length-measuring system with sinusoidal or rectangular signals is possible on request. Encoders can be mounted on the motor. We will be glad to consult you in finding the system appropriate for your application.

Multi-axis units: Franki-linear and rotary tables can easily be combined to multi-axis units. The angles and adapterplates which are necessary for the mounting of the units will be constructed according to your requirements. We deliver completely mounted units cabled and adjusted, on request with further accessories.

Motors: many types of stepping and servomotors can be connected with our linear and rotary tables. Flanges and clutches are to be modified respectively. The customer can contribute own motors as well.

Motor reversal, gear: In our standard version the motor is mounted in extension of the stroke axis. Motor reversal via toothed belt or reversal gear can be supplied for special applications e.g. with limited mounting space.

Maintenance, lubrication: It is indispensable to supervise the bearings in the linear and rotary tables for lubrication. Relubrication periods depend on the environmental conditions and are mainly influenced by the ageing properties of the lubricant. For longtime lubrication completely synthetic lubricants are to be preferred. In our works we use the completely synthetic special grease ISO FLEX TOPAS NCA 52 (make KLÜBER) As alternative we recommend high-grade greases of lithium soap based on of mineral oil.

Where lubricants are to be mixed up the consistency regarding kind of basic oil, thickener, basic oil viscosity and NLGI class has to be ensured. With extreme operating conditions (vacuum, radiation, high temperatures) we recommend you to consult us or a lubricant producer.

Franki linear tables: Franki linear tables are almost maintenance-free. Except for the ball screw our linear tables get a lifetime lubrication in our works. Under normal operating conditions the ageing resistance of the lubricant exceeds the lifetime of the table. Ex works the ball screw is provided with a grease filling which is not a lifetime lubrication. It is a fact that some grease will leak by the ball screw shaft, therefore relubrication is necessary depending on the application. We recommend you to relubricate with about 1-2g grease after about 700 operating hours. In context with the relubrication we recommend you to check the inner space of the table and the guide paths for contamination and to clean them if possible. With this we recommend you to apply some grease to the guide paths.

Franki rotary tables and goniometers: Generally all standard rotary tables are provided with long time lubrication ex works. Depending on the application we recommend relubrication every 6-12 months. The quantity for relubrication should be as follows (approximate values in g per lubricating point):

<table>
<thead>
<tr>
<th>Lubrication</th>
<th>Left</th>
<th>Right</th>
<th>Top</th>
<th>Bottom</th>
<th>Sidewise</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSD175S</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>TSD265S</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>TSD406S</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>TSD125M</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>TSD175M</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>TSD400M</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>TSD300M</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>TSW</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

1. Accuracies

Running accuracy: The running accuracy is defined by the highest possible deviation of an optional point on the moved table surface from the ideal straight line when traversing the total stroke distance (responding to the accuracy of the substructure). Positioning accuracy: The positioning accuracy is defined by the deviation from a pre-selected point which is approached by a previously defined reference (zero) point. Repetitive accuracy: The repetitive accuracy is defined by multiple exact approaches at a preselected point which has to be reached. For the exact repetitive approach at programmed coordinates a reliable measuring system with direct measurements is of importance. Resolution: The resolution is defined by the smallest possible traverse distance of a positioning unit. It is determined e.g. by the spindle pitch, transmission, stepping angle, division of the measuring system. By means of the resolution deviations in the positioning and repetitive accuracy can be neutralized. Therefore the resolution should always be higher than the deviation from the permissible positioning accuracy.

2. Linear tables

2.1 Design

Franki linear tables are designed for the application in automation for the measuring and testing sector as well as for rationalization in handling and mounting. The selection range includes strokes from 40 mm up to 1200 mm, the movement is effected by means of a spindle. The ribbed aluminium structure in combination with the Franki guide system allows high load rating and moment loads whereas the weight is extremely low.

2.2 Limit switch/reference points

Franki linear tables of series TSL06U-16M are equipped with a cam strip and continuous control cams on the outer side of the slider part. Setting of the cams according to the required reference points and changing of these points is possible without dismantling the table. The limit switches of the tables TLA and TLL are in a fixed position which is adjusted for full stroke length. Linear tables series TSL06L are equipped with movable control cams which are placed at the right slider part underneath the side cover. To adjust the cams the side cover has to be dismounted. After adjusting the cams the fixing of the side cover fastener the cams.

3. Rotary Tables

Franki rotary tables are compact and have high load capacity. They are particularly used for mounting, measuring, and testing operations. The high-grade wormgear guarantees high precision in permanent operation. All rotary tables are equipped with aluminium housings, the integrated Franki guide system makes them extremely resistant to tilt while their own weight is very low. Please make use of our mounting and maintenance instructions which come with every consignment.
Necessary torque

The size of the linear drive and the necessary torque can be determined by using the known mass, the mounting position and the desired acceleration according to the following diagrams. The mass on which the diagrams are based is composed of the external mass and the movable mass of the linear drive.

Please notice:
Where an additional guide is used the mass of the slider has to be taken into account.

Central supports
(Explanations see page 79)

From certain stroke lengths central supports are necessary to avoid deflexion and vibrations caused by the drive. The diagrams show the max. support width responding to the load. We have to make a difference between load example 1 and load example 2. Deflexion of max. 0.5mm between the supports is not permissible.

Please observe the separate mounting and maintenance instructions which are enclosed to every consignment.

Load example 1

Load example 2

Maximum support distance
Technical information

Sliding tables

1. General hints

The design of our sliding tables enables them to be used as well for the automation in measuring and test procedures as for the rationalisation in handling and mounting.

Franke sliding tables are based on an aluminium structure and are equipped with the well-tried Franke guiding system. This combination guarantees the user high load capacities and high moment load at a low tare weight. Sliding tables with ball guides are especially suitable for rapid stroke movements. Their load capacity and precision has proved more than sufficient in most cases. Furthermore sliding tables with roller guides present not only a high load capacity with the same number of rolling elements, they also come with higher precision. However they should only be used with relatively low stroke speeds.

2. Design

Franke sliding tables are movement units are ready for installation. They are available in an open or closed version. The scope of sliding tables includes many different versions from the corrosion resistant type to tables with spindle control and locking device.

Four version are available:

<table>
<thead>
<tr>
<th>Series</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TFR...A</td>
<td>open version</td>
</tr>
<tr>
<td>TFR...G</td>
<td>closed version with protected guide tracks</td>
</tr>
<tr>
<td>TFR...S</td>
<td>for manual precise displacement</td>
</tr>
<tr>
<td>TFR...K</td>
<td>for movements along two axes</td>
</tr>
</tbody>
</table>

3. Running accuracy

The running accuracy is defined by the highest possible deviation of an optional point on the moved table surface from the ideal straight line when traversing the total stroke distance (responding to the accuracy of the substructure).

4. Fastening / mounting

The guide part is to be screwed onto the basis (screw quality: 8.8). Inside the slider plate there are auxiliary bores for the insertion of the fastening screws. Therefore it is not necessary to dismantle the sliding table.

5. Combinations

Franke sliding tables can be combined to diverse, multi-axis systems. Angles and adapter plates will be machined according to your instructions. We supply completely mounted and adjusted units for complex motion processes.

Please make use of our mounting and maintenance instructions which come with every consignment.
Carriage slides

1. Carriage slide selection

Franke carriage slides are mainly used for the displacement of welding cylinders and tongs and are adjusted with preload in our works. All parts are coated with wash primer.

Series TFS...B basic version

Series TFS...F is recommended for dirty environments. The set-up plate of the slider is equipped with felt seals to prevent the guiding system from dirt. It also allows easy mounting of the carriage slide to the substructure. The mounting position is optional where the full stroke is used.

Series TFS...P is equipped with integrated thrustors for pneumatically controlled strokes. Shock absorbers to absorb the impact in the stroke end position installed on request. As long as the full stroke length is used, the mounting position is optional.

2. Size of the carriage slide

For the selection of the carriage size we recommend you to calculate the carrying capacity. We should be glad to make this calculation for you (see page 56).

3. Seal

Carriage slides Series TFS...F are protected against dirty environment by a slider set-up plate with felt seals. Seals for other series on request.

4. Running accuracy

The running accuracy achieved with carriage slides is about 0.1 mm measured from an optional point on the slider plate to the ideal straight line of stroke.

5. Design / Mounting hints

5.1 General notes

Each carriage slide has a stop screw for the stroke limitation within a range of 10-20 mm in its front plates. To ensure long service life the residual energy should be quite low when the slider runs against the stop screws.

Please observe our mounting and maintenance instructions which come with every consignment.

5.2 Guide part and substructure

The guide part is screwed to the base and dowelled. The bores for dowelling are already pre-bored in the guide part. Auxiliary drill holes are found in the slider plate which enable the fastening screws to be inserted into the guide part. When boring the dowel holes we recommend you to use the protective sleeves. After cleaning of the carriage slide these sleeves should again be put into the counterbores in order to fix the guide part. Before initial operation all auxiliary bores should be covered to prevent the penetration of dirt. Due to the enlarged basic plate it is easier to fasten the sealed version series TSF...F.

5.3 Sliderplate and superstructure

Where superstructures are built on top of the slider plate we recommend to use an intermediate plate. One of the screws of the slider which are arranged in pairs, can be used for fastening.