SPIETH
Adjustable Guide Bushings
Series FDK – FDL and FSK – FSL

Round guiding elements with adjustable play

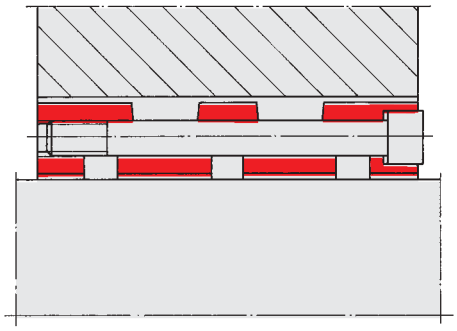
Works standard SN 02.00

SPIETH Adjustable Guide Bushings Series FDK – FDL und FSK – FSL

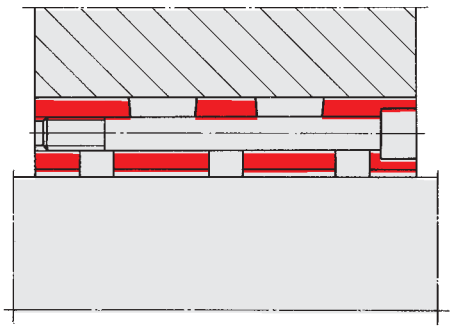
- Low-cost, ready-to-mount guide bushing.
- Existing assembling play ensures simple mounting even with large dimensions.
- Sliding friction in combination with minimum guide play possible.
- Optimum guide play adjustment possible during the assembly process.
- Simply produced connecting elements.
- Precise guidance through guide play adjustment.
- Provides the typical high damping performance characteristic for slideways.
- Fast dismantling capability addresses demands for convenient machine servicing and recycling.

Functional principle:

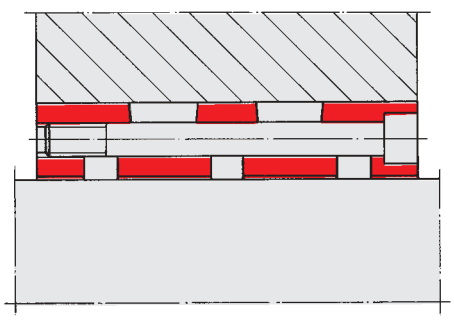
Illustrated here using a series FSL guide bushing. The principle applies to all the listed series.



Connection with assembling play between the housing, guide bushing and centre sleeve.



First phase of axial pre-stress: Assembling play between housing and guide bushing eliminated, firm fit realized.



After further axial pre-stressing, the guide play between the guide bushing and sleeve is optimum adjusted.

The principle is shown in a simplified diagram with enlarged play.

SPIETH guide bushing
Series FDK

SPIETH guide bushing
Series FDL

SPIETH guide bushing
Series FSK

SPIETH guide bushing
Series FSL

Fields of application:

SPIETH-designed guide bushings are round linear guiding elements for all fields of precise mechanical engineering.

These guide bushings are ideal for applications making use of the benefits of the slideway, such as damping properties, but requiring minimal guide play. For those advantages these guide bushings are successfully applied in guide frames, cylindrical carriage guides, on tailstock sleeves, press rams etc.

In addition to their linear movement, simultaneous rotary movements are possible. For reasons of lubrication technology, however, pure rotation as for sliding bearings is not allowed. High acceleration values are possible, as long as an adequate supply of lubrication is ensured.

Benefits:

The simply to produce surrounding components can be done with common ISO tolerance levels. The existing assembling play always permits easy mounting even for large dimensions. The required narrow guidance play can be optimum adjusted during the mounting process, whereby minor geometrical errors in the surrounding components as well as operational influences such as increasing temperature, can be taken into account.
If any wear is occurring, readjusting the play can compensate it.

For the FDK - FDL series the guide play is set by the configuration of the design. Some illustrations are shown in the assembly examples.

For the FSK - FSL series, the guide play is simply set using the integrated clamping screws.

As a result, application of the FDK - FDL series needs more work for the surrounding components. However, this is offset by the benefit of trouble-free guide play reproduction after removal and remounting. In this case, a reproducible peripheral position of the guide bushing must be ensured by integrating the provided fixing pin.

Due to their individually acting clamping screws, FSK - FSL series guide bushings permit individual sectoral guide play adjustment. This permits, for example, a limited degree of compensation for out-of-round housing boreholes. After removal and remounting, however, the optimum degree of guide play has to be adjusted again.

Execution:

The guide bushings are made of high-grade bearing bronze. The guide borehole is precision turned to ISO tolerance H6, the outside diameter to ISO tolerance h5. As the guide borehole is machined while the guide bushing is in a prestressed condition, control measurement of the guide bushing is not possible in its delivered, non-stressed state.

The clamping screws integrated in the FSK - FSL series bushings are cheese head screws to ISO 4762, which are actuated using an ISO 2936 screwdriver. The radial borehole for mounting the orientating pin is done to ISO tolerance H7.

The transport of lubricant to the various chambers is permitted in the FDK- FDL series by an additional borehole. In the FSK - FSL series, the space between the clamping screws and the through holes is used for this purpose. The lubricant used is predominantly mineral oil, whose viscosity is adjusted to the respective operating conditions.

Connecting components:

The housing borehole must be configured so that the entire outside surface of the guide bushing is covered. The sleeve must also cover the borehole of the guide bushing completely in its most extreme axial position.

Production tolerance of the housing borehole: H6, surface roughness R_Z = 6.3 µm. A cylindricity and concentricity tolerance level of IT 3 (ISO) must be observed.

Production tolerance of the sleeve: g5, surface roughness R_Z = 1 µm. The quality of the round guide depends to a large degree on the cylindricity and the concentricity of the sleeve. Therefore, minimum geometrical error must be aimed for. We recommend observing to tolerance level IT 2 (ISO).

When using series FDK - FDL guide bushings, precise adjustment depends largely on ensuring precise rectangularity of the end face relative to the axis (Fig.1).

For orientation the guide bushing is equipped with a hole for a fixing pin (d_3). The supply of lubrication needs another borehole in the housing (d_4). Be aware of these facts while designung.

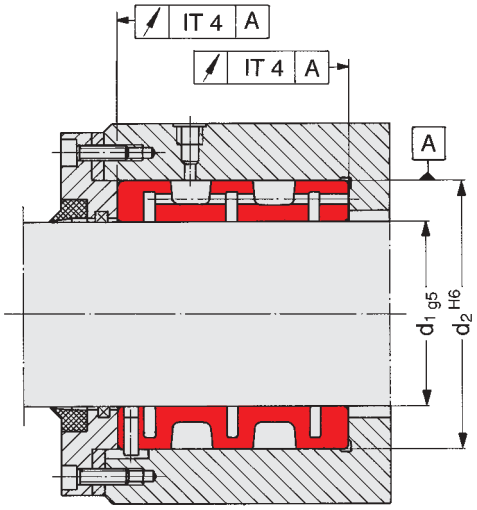


Fig. 1:
Configuration of connecting components when using a series FDK or FDL guide bushing.

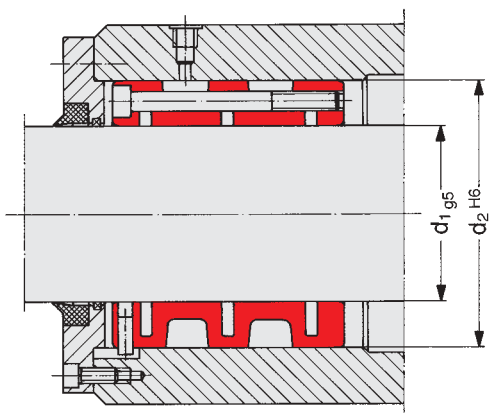
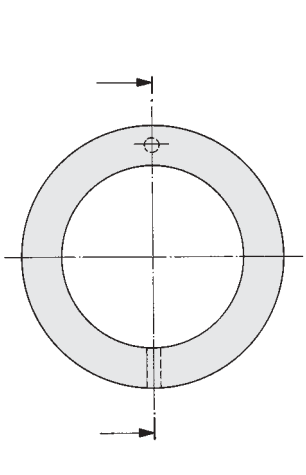
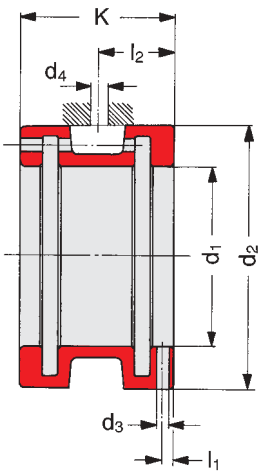
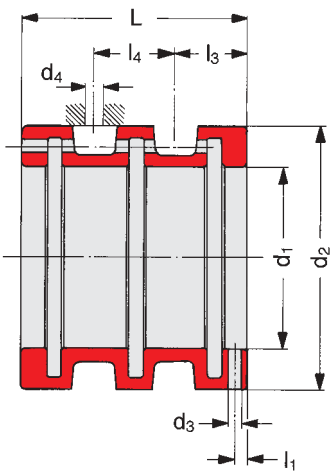


Fig. 2:
Configuration of connecting components when using a series FSK or FSL guide bushing.





Series FDK



Series FDL

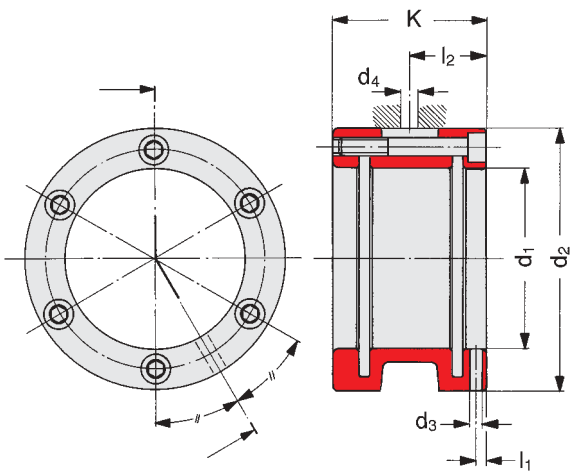
SPIETH Guide bushings Series FDK/FDL

Designation of a guide bushing with d_1 = 40 mm and d_2 = 62 mm and K = 42 mm:
Guide bushing FDK 40.62

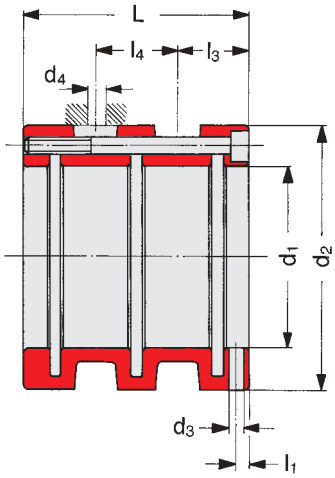
Subject to changes.
Special versions:
On request, by sending of an explanatory sketch.

Code	Dimensions in mm										Adm. radial stress (guideline values)	
FDK FDL	d_1	d_2	K	L	d_3	l_1	l_2	l_3	l_4	d_4	FDK	FDL
	H6 [1]	h5			H7					max.	N	
20 · 37	20	37	30	46	3	2.5	15	15	16	6	1800	3600
25 · 42	25	42	30	46	3	2.5	15	15	16	6	2260	4500
30 · 47	30	47	30	46	3	2.5	15	15	16	6	2810	5720
35 · 55	35	55	42	62	4	3.5	21	20	22	10	5290	9070
40 · 62	40	62	42	62	4	3.5	21	20	22	10	6050	10370
45 · 68	45	68	42	62	4	3.5	21	20	22	10	6800	11660
50 · 72	50	72	42	62	4	3.5	21	20	22	10	7560	12960
55 · 80	55	80	42	68	4	3.5	21	21.5	25	12	8320	16630
60 · 85	60	85	42	68	4	3.5	21	21.5	25	12	9070	18140
65 · 90	65	90	42	68	4	3.5	21	21.5	25	12	9830	19660
70 · 100	70	100	48	78	4	3.5	24	24	30	14	12100	25200
75 · 105	75	105	48	78	4	3.5	24	24	30	14	12960	27000
80 · 110	80	110	48	78	4	3.5	24	24	30	14	13820	28800
85 · 120	85	120	60	92	5	4.5	30	28.5	35	16	20810	36110
90 · 125	90	125	60	92	5	4.5	30	28.5	35	16	22030	38230
95 · 130	95	130	60	92	5	4.5	30	28.5	35	16	23260	40360
100 · 140	100	140	66	102	5	5.5	33	31.5	39	16	25920	47520
110 · 150	110	150	66	102	5	5.5	33	31.5	39	16	28510	52270
120 · 165	120	165	72	114	6	6	36	36	42	16	34560	58750
130 · 180	130	180	78	124	6	6	39	39	46	16	41180	71140
140 · 190	140	190	78	124	6	6	39	39	46	16	44350	80640
150 · 200	150	200	78	124	6	6	39	39	46	16	47520	86400

1) As the guide borehole is machined while the guide bushing is in a prestressed condition, control measurement of the guide bushing is not possible in its delivered, non-stressed state.



Series FSK



Series FSL

SPIETH Guide bushings Series FSK/FSL

Designation of a guide bushing with d_1 = 60 mm and d_2 = 85 mm and K = 42 mm:
Guide bushing FSK 60.85

Subject to changes.
Special versions:
On request, by sending of an explanatory sketch.

Code	Dimensions in mm										Clamping screws		Adm. radial stress (guideline values)	
FSK FSL	d_1	d_2	K	L	d_3	l_1	l_2	l_3	l_4	d_4	ISO 4762	Number	FSK	FSL
	H6 [1]	h5			H7					max.			N	
20 · 37	20	37	30	46	3	2.5	15	15	16	6	M4	4	1800	3600
25 · 42	25	42	30	46	3	2.5	15	15	16	6	M4	4	2260	4500
30 · 47	30	47	30	46	3	2.5	15	15	16	6	M4	6	2810	5720
35 · 55	35	55	42	62	4	3.5	21	20	22	10	M4	6	5290	9070
40 · 62	40	62	42	62	4	3.5	21	20	22	10	M4	6	6050	10370
45 · 68	45	68	42	62	4	3.5	21	20	22	10	M5	6	6800	11660
50 · 72	50	72	42	62	4	3.5	21	20	22	10	M5	6	7560	12960
55 · 80	55	80	42	68	4	3.5	21	21.5	25	12	M5	6	8320	16630
60 · 85	60	85	42	68	4	3.5	21	21.5	25	12	M5	6	9070	18140
65 · 90	65	90	42	68	4	3.5	21	21.5	25	12	M5	6	9830	19660
70 · 100	70	100	48	78	4	3.5	24	24	30	14	M5	6	12100	25200
75 · 105	75	105	48	78	4	3.5	24	24	30	14	M5	6	12960	27000
80 · 110	80	110	48	78	4	3.5	24	24	30	14	M5	6	13820	28800
85 · 120	85	120	60	92	5	4.5	30	28.5	35	16	M6	6	20810	36110
90 · 125	90	125	60	92	5	4.5	30	28.5	35	16	M6	6	22030	38230
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100 · 140	100	140	66	102	5	5.5	33	31.5	39	16	M6	6	25920	47520
110 · 150	110	150	66	102	5	5.5	33	31.5	39	16	M6	6	28510	52270
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130 · 180	130	180	78	124	6	6	39	39	46	16	M6	8	41180	71140
140 · 190	140	190	78	124	6	6	39	39	46	16	M8	8	44350	80640
150 · 200	150	200	78	124	6	6	39	39	46	16	M8	8	47520	86400

1) As the guide borehole is machined while the guide bushing is in a prestressed condition, control measurement of the guide bushing is not possible in its delivered, non-stressed state.

Application:

Before mounting, all parts belonging to the round guide must be carefully cleaned and wet slightly using low viscosity machine oil.

Assembly of series FDK - FDL:

1. Insert the guide bushing in the housing borehole. If there is an orientation pin mounted, this must not come to rest axially against the groove in the housing.

2. Mount the flange cover loosely without the shim ring.

3. Insert the centre sleeve.

4. Tighten the clamping screws in the flange cover evenly crosswise until loss of play in the centre sleeve is indicated by stiffer sliding action. Check the parallelism of the mounting gap for the shim ring and correct if necessary.

5. Gauge the mounting gap for the shim ring, remove the flange cover.

6. Adjust the high of the shim ring. Recommendation: Measured mounting gap + approx. 0.02 mm for contact surface compression.

7. Mount the flange cover and the underneath shim ring, tighten the screws crosswise.

8. Check the guide play. If necessary, correct by reworking the shim ring (reducing guide play) or the flange cover (increasing guide play). Guideline value: 0.1 mm alteration of the height corresponds to ~0.01 mm alteration in diameter.

Assembly of series FSK - FSL:

1. Insert the guide bushing in the housing borehole. If there is a orientation pin mounted, this must not come to rest axially against the groove in the housing.

2. Tighten the clamping screws in the flange cover evenly crosswise until the guide bushing is seated firmly in the housing. Even actuation of the clamping screws can be achieved by tightening in each case by a certain angular amount (e.g. 30°). Specifying a certain degree of torque for the clamping screws is a less suitable method of ensuring even guide play adjustment.

3. Insert the sleeve and continue tightening the clamping screws as described above, until loss of play is indicated by stiffer sliding action of the sleeve.

4. Remove the sleeve, apply a thin coating of inking paste and re-insert in the guide bushing to check the contact pattern.

5. Move the sleeve backwards and forwards with an oscillating motion, remove and assess the ink impression left on the guide bushing.

6. Should the surface impression be incomplete, insert the sleeve again and tighten the screws in the sector, which is not making correct contact. Stop tightening when you notice the sleeve running more stiffly in the bushing.

7. After optimising the contact pattern, clean the sleeve and guide bushing borehole, oil and re-insert the sleeve.

Assembly examples

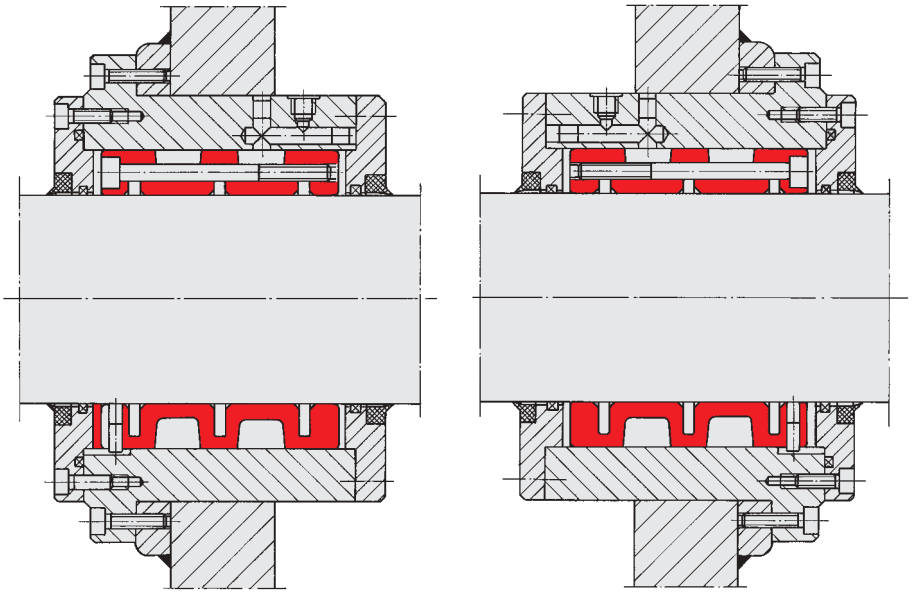

Fig. 3:
Round guide on a welded machine column. Due to the long guidance basis of the guide bushings, particular attention must be paid here to ensuring a precisely flush housing borehole.

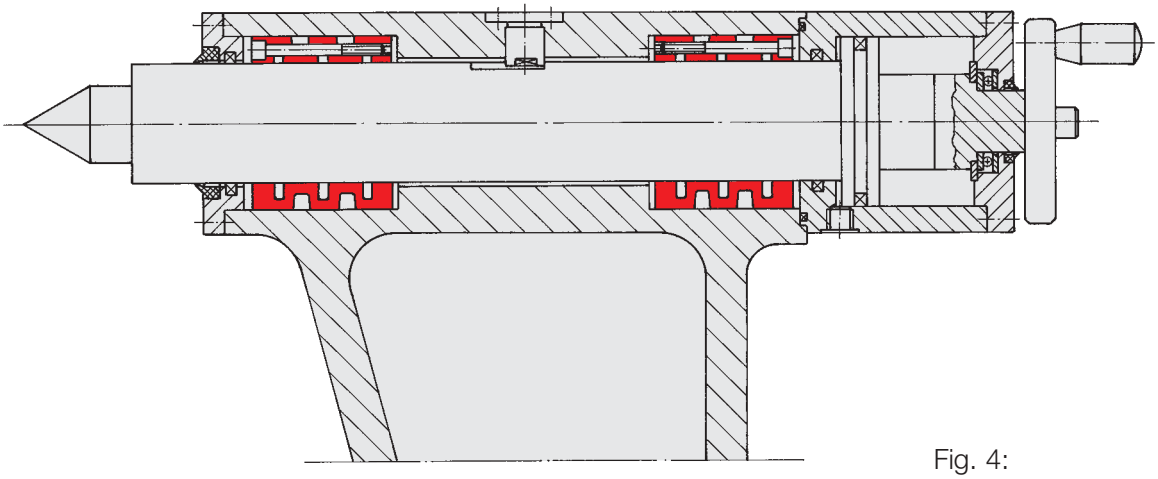

Fig. 4:
Sleeve guide in a tailstock. Minimal guide play can be achieved here during the assembly process. Guide play readjustment is possible at any time. Grease lubrication with facility for occasional re-lubrication is sufficient here.

Assembly examples

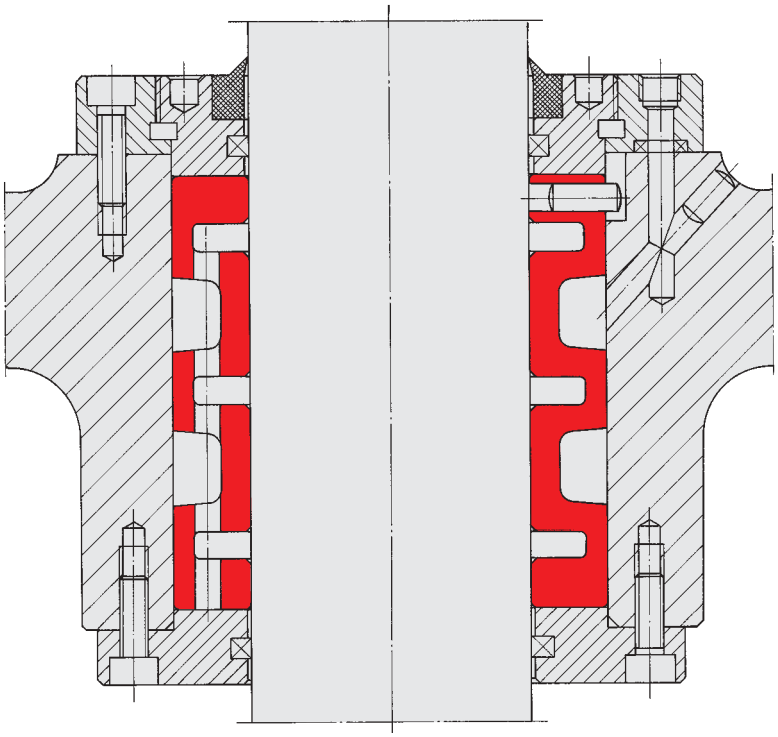

Fig. 5:
Column guide:
Guide play adjustment using threaded ring.
A locating fit at the threaded ring ensures the necessary rectangularity of face contact at the guide bushing. The required feed path can be prescribed when the flange cover has not yet been tightened by turning the threaded ring. The guide bushing is then pre-stressed by tightening the screws at the flange cover.

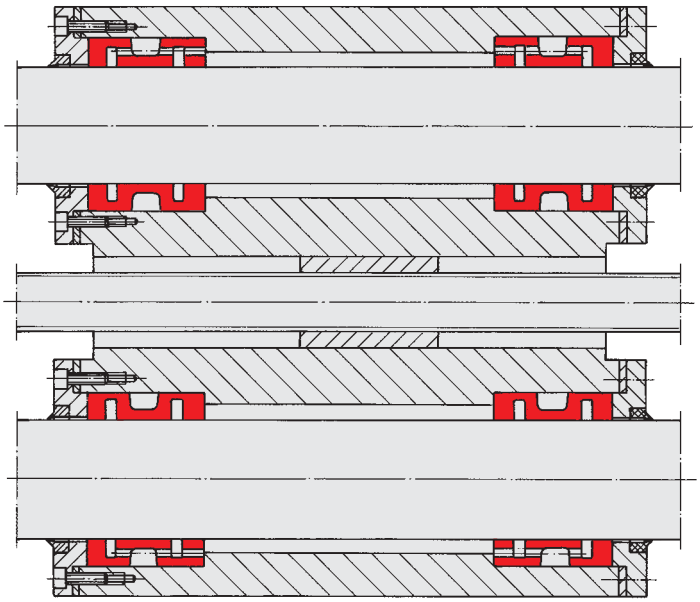

Fig. 6:
Working slide with circular guidance.
The required degree of guide play is set here by changing the height of the shim ring (see page 8, Assembly series FDK - FDL).
Due to existing overdefinition, the actual position for the guide bars cannot be finally determined until guide play adjustment is complete.

Assembly examples

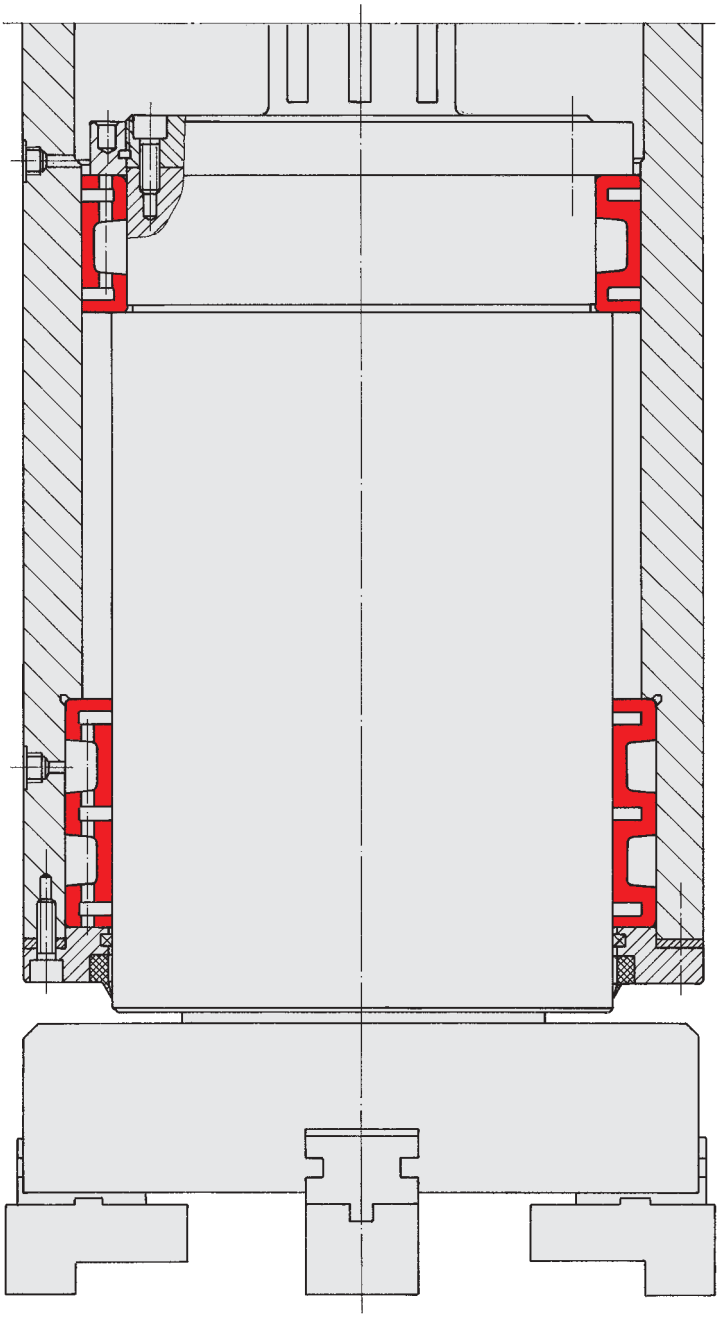

Fig. 7:
Particularly in large-scale machines with their high operating loads, it is advantageous if the design can be configured to ensure an optimum guidance basis at every position of the sleeve.

This is achieved using the arrangement illustrated here. The external guide bushing shown at the top of the illustration can be offered on request as a special version.

The two most frequently applied methods of adjusting the guide play are illustrated here. The upper one is with a thread ring and the lower one with a shim ring. For a more detailed description, see Figs. 5 and 6.

All variants of these guide bushings can be supplied in a special version up to a maximum diameter of 430 mm.

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