5. Computation of the Rotary Stroke Bearing

5.2 Loading capacity with radial load

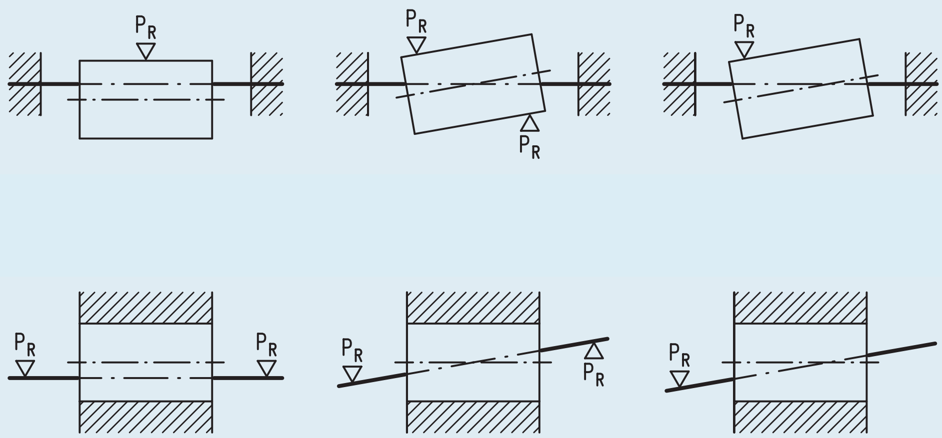
The radial load of a rotary stroke bearing is determined by the position of the point of application of the radial force P_R in relation to the center of the contact length e.

The radial force P_R can also be the resultant of several forces. The forms of radial load illustrated below depend on the position of the point of application of the force.

The illustrations shown below take into account the deflection of the rotary stroke bearing under load which results from the elastic deformation of the balls and rolling faces of the guide bush and shaft. The axes of the guide bush and shaft are assumed to be rigid. The deflection of the shaft must therefore be incorporated into the calculation if necessary.

Load of the rotary stroke bearing by

	Centrally acting radial force P_R (see 5.2.1)	Pure moment M (see 5.2.2)	Combination of radial force P_R and moment M (see 5.2.3)
Guide shaft fixed, guide bush moving			
Guide bush fixed, guide shaft moving			



Load of ball zones	Equal load on all zones of the ball cage	The two end zones of the contact length carry the heaviest load	One end zone of the contact length carries the heaviest load

Fig. 22

The static radial load can take different forms:

1. The radial load is constant and evenly distributed and corresponds to a centrally acting radial force P_R.
2. The radial load is distributed unevenly over the length. In certain special cases, it comprises a pure moment M.

The various forms of radial load lead to different stresses on the individual ball zones. Computation of the loading capacity is based on the determination of the highest portion of radial force P_{10} of a ball zone 10 mm long. The relationships between the external load P_R or M and this specific radial force P_{10} are given below for various forms of static radial load.

The elastic deformation of the ball zones results in a deformation of the rotary stroke bearing axis. The elastic deformation of the individual ball zones varies depending on the load. With a specific radial force P_{10}, the radial deflection of the axis of the 10 mm ball zone which is under maximum load is defined as the specific deflection A_{10}. This value can be used to calculate the shaft deflection which can be expected at the force application point A.

5.2.1 Uniform constant radial load

The radial force portion of every 10 mm ball zone is: $\mathbf{P_{10}} = \frac{\mathbf{P_R}}{\mathbf{e}} \cdot \mathbf{10}$ [N] — P_R in N, contact length e in mm

The expected parallel displacement of the axis is: $\mathbf{A_{10}} = \mathbf{P_{10}} \cdot \mathbf{R_{10}}$ [µm] — P_{10} in N, R_{10} in µm/N from table (Fig. 27 or 28).