# Basics-Calculation

The calculation of the values, given in the catalogue, are based on the following assumptions and simplifications:

### Transmissible torque

A shrink connection is capable of transmitting torque, bending moment and axial force. Substituted, the transmissible torque $M_{max}$ is specified in the product data. If such loads occur simultaneously then they must be added vectorially to the resultant moment $M_{res}$. The formula below applies to the resulting moment:

$$M_{res} \leq M_{max}$$

*At different load cases, they must be individually checked against $M_{max}$!*

$M_{res}$ is determined for combined loads as follows:

$$M_{res} = \sqrt{M_T^2 + M_B^2 + (F_{AX} \frac{dw}{2})^2}$$

with $M_B \leq 0{,}4\, M_T$ as the limit* for the static bending moment

*In several, the maximum bending moment corresponds to the maximum transmittable torque. The limitation to 0,4 $M_T$ is due to the change of the surface pressure at the edges of the connection. (This information applies to the shrink connection of the coupling only!)

### This results in the following relationships:

Torque only:
The maximum torque is equivalent to $M_{max}$ .

Bending moment only:
The maximum static bending moment corresponds to 0,4 $M_T$ .

Axial force only:
The maximum axial force is $M_{max} \frac{2}{d_W}$ .

### Static and dynamic load

For some applications, a static review of the coupling is sufficient. The clamping forces of the shrink connection are static. Also steady torques and/or axial forces can be considered as static loads. Rotating bending, has to be considered as dynamic load and the coupling must be examined for that. Therefore, it is also essential to specify the occurring load cases.

### Shaft calculation

The sleeve will be deformed due to the applied clamping force. In addition to the clearance between shaft and sleeve, shaft stiffness and surface finish should be concidered. For solid shafts the stiffness can be ignored, but with hollow shafts (see „Bore in the shaft (hollow shaft)“) there is higher deformation and thus higher stresses in the components. This must be considered in addition to other loads.

### Notch effect

Generally there is a notch effect on the components, caused by the radial pressure of the pressure ring. This depends mainly on the applied pressure. The notch effect is generally higher on the sleeve than on the shaft, because the pressure ring is directly pressed onto the sleeve, while the stresses are distributed through the sleeve before reaching the shaft. The notch factors range from 2,5 to 3,5 for the sleeve and between 1,5 and 2 for the shaft. This can be mitigated bysuitable design features, such as relief notches.

### Bore in the shaft (hollow shaft)

A large bore dB in the shaft or the use of a hollow shaft, reduces the stiffness of this component against radial pressure. This leads to a decrease in pressure $p_W$ , a reduced transmissible torque M, a contraction ΔdB within the shaft and an increase of stresses in these components. Basically, a bore should not be greater than 0,3 $d_W$.