Definition - servo couplings:

Servo couplings are compensating couplings with a backlash free and conformal torque transfer providing high torsional stiffness and a low moment of inertia.
According to these requirements, JAKOB metal bellow couplings can be regarded as the ideal solution. For more than 25 years, they have proven themselves in thousands of servo drives as being excellent. Elastomer couplings with a flexible polyurethan-spider can also represent a perfect alternative for different applications because of their product-specific advantages. All JAKOB servo couplings have one thing in common, they are all backlash free (also shaft-hub-connection) and flexible to allow the compensation of shaft misalignments. Because of the unique characteristics of the different series, the designer will (almost) always find the best solution within the large-scale JAKOB coupling program. The area of application ranges from highly dynamic feed drives of the axis in machine tools to high performance drives in the general machine tool design.

Characteristics - JAKOB servo couplings:

- absolutely backlash free, exact torque transfer
- low moment of inertia
- high balancing quality
- excellent operational characteristics
- high speed
- compensation of shaft misalignments
- low restoring forces
- frictional, easy to fit shaft-hub-connection
- metal bellow: max. torsional rigidity, wear free, up to 350°C
- elastomer spider: plug-in, oscillation dampening, up to 120°C
- compact dimensions, flexible areas of applications
- large number of types and sizes available (modular system)
- precise production
- best quality
- long life

The JAKOB modular system:

As flexible compensating parts, stainless steel bellows are used in different forms as well as polyurethane spiders with different shore hardnesses, oldham- type spacer as polyacetal and stainless steel membrane hubs. Another important aspect is the kind of connection between the driven shafts resp. primary shafts and the coupling hubs. Several versions of backlash free frictional clamping hubs or conical hubs are available.

In the following, the most important and widely used series of compensating elements and kinds of hubs, derived from the numerous possibilities of combinations, are described in this catalogue. A well-contrived modular system, which provides multiple use of many parts, enables production in cost-effective batch sizes and very short delivery period.

The JAKOB coupling program is devided into the following four main groups:

- Metal bellows couplings
- Elastomer couplings
- Miniature couplings
- Distance couplings

For decades, the centre of the JAKOB coupling programhas been a large variety of different metal bellow couplings.

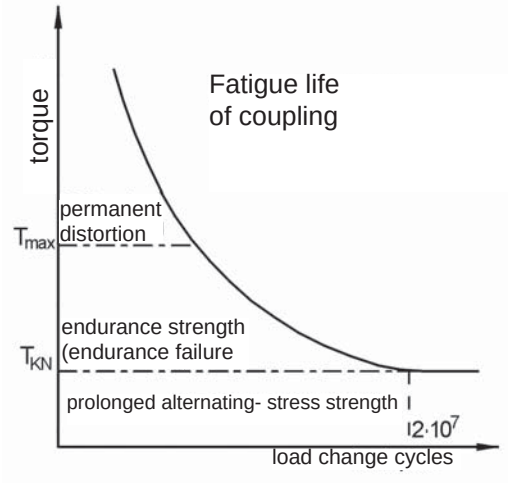
c) according to the shaft diameter:

After selecting the coupling type, it must be checked whether the requested shaft diameter corresponds with the allowed diameter (Dmin / Dmax) of the hub bores. Another coupling type or size must be chosen, if the shaft diameter is overdimensioned in relation to the torque, which means it is larger than Dmax of the hub.

Note: Hub bores which are smaller than "Dmin". are possible; but an optimal transfer of the nominal torque can not be guaranteed in this case, so a reduction of drive torque is necessary.

d) Useful life of the coupling - durability:

The durability of JAKOB compensating couplings is basically determined by the peak torque and the existing shaft displacement or misalignment. If the admissible maximum values for the axial, lateral and angular displacement are not exceeded, and if the operating torque at the same time is below the coupling nominal torque T_{KN}, then the coupling is within the range of prolonged alternating-stress strength limit. An infinite number of start - stop - cycles or acceleration and deceleration can be carried out without having to expect a break - down of the coupling during operation.

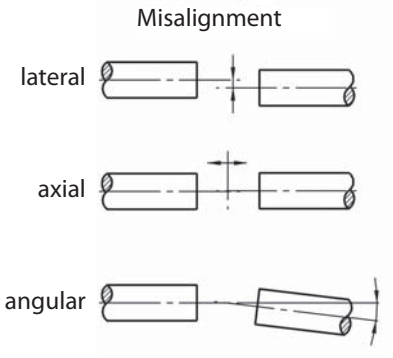


e) Max. load:

In special cases, the couplings (metal bellow, membrane, elastomer spider) can be overloaded for a short time with twice the nominal torque ($2 \times T_{KN}$). The hub-bore-connection, however, must be calculated seperately then.

f) Bearing loads:

Due to the flexibility of the compensating couplings in all directions, considerable bearing loads are prevented, in spite of possible axial, lateral or angular displacement from the drive shaft to the output shaft. Therefore, an early breakdown or higher wear of the rolling bearing can be prevented. This means less difficult and expensive repairing.



g) Operating temperatures:

Metal bellow and membrane couplings are, as whole metal couplings, extremely insensitive to temperature and can be used at temperatures up to 300° C without limitation. The temperature limit of the elastomer spider is at 90° C (98 Sh-A) resp. 120° C (72 Sh-D). At high operating temperatures, an appropriate correction factor needs to be applied.

h) Speeds:

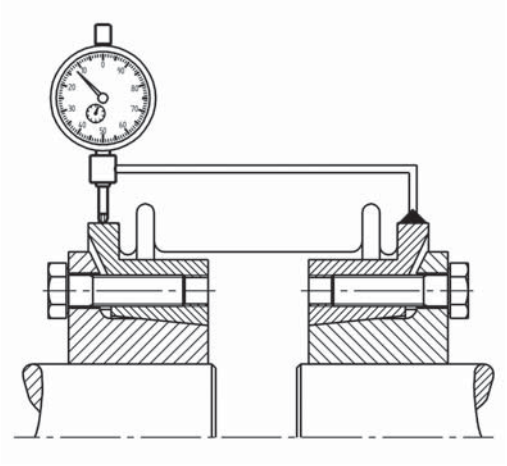
Due to precision machining and the rotation symmetrical design resp. the additional balance pin, the compensating couplings are generally suitable for high speeds up to 20,000 min^{-1} even without additional balancing. The standard balancing quality are approx. Q 6.3 to Q 16. Couplings with conical hubs or hubs with tapered ring can be operated with speeds over 25,000 min^{-1} (please contact us for further consultation). The low moment of inertia also has a positive effect.

i) Maintenance and wear:

Compensation couplings are maintenance and wear free under normal conditions. The polyurethan spiders of the elastomer couplings should be changed in suitable periods, if critical operation parameters are given.

Alignment of shafts:

Axial and angle displacement are usually without problems and also simple to measure. To obtain the lateral displacement it is recommended to proceed as follows:
Fit a dial gauge with an appropriate holding device on one shaft end or on one hub of the coupling and bring it with the stylus onto the second shaft end or onto the second coupling half (sketch). Now the shafts are turned with the dial gauge and the deflection is read. One half of the total deflection is the lateral misalignment. The admissible value for the shaft displacements must be taken from the technical data sheets of the appropriate series.



Shaft - hub connection

The couplings are supplied with finished bores as a rule, in exceptional cases they are also supplied prebored.
The seat shaft / hub is to be selected as a transitional seat (example: hub bore diameter 28 G6 - shaft diameter 28 k6).
Prior to mounting the finished bore shaft end conical sleeve should be lightly oiled to prevent fretting corrosion.
The coupling is then ready for assembly between the two shafts. An existing keyway in the shaft will not affect the frictional connection.

a) Radial clamping hub

Admissible seat clearance shaft hub: min. 0,01mm/max. 0,04mm. Very simple fitting by tightening only one radially arranged clamping screw (DIN 912). The value for the relevant tightening torques can be found in the data sheets. One hole in the housing is sufficient, as a rule, to tightening the clamping screw. (see EASY-clamp-sytem)

b) Conical hub / conical ring hub

Admissible seat clearance shaft - hub: max. 0,02mm Assembly of the conical bush or of the conical clamping ring with several, concentrically arranged mounting screws (as a rule 6x DIN 933). One side of the coupling is fitted onto the shaft end by evenly tightening the screws, crosswise (to prevent uneven draw-on). The drive or output is now turned by a few revolutions, so that the shaft pinion turns in the second hub and the hub can move on the shaft for axial release. Now the 6 screws of the second hub are also evenly tightened.

c) Splited hub

Admissible seat clearance shaft - hub: min. 0,01mm / max. 0,04mm. Two radial clamping screws (DIN 912) are arranged mirrored. The hubs or couplings are split and consist of two loose halves. One of the splitting hubs can be put onto the aligned shaft. Tighten clamping screws evenly, alternating between both sides (note specified tightening torques). A larger opening must be provided in the housing for easy installations.

d) Disassembly

After releasing the 6 retaining screws, the hubs are released with 3 push-off threads each.With axially tight space conditions, it is advisable to screw in and secure the push-off-screws before fitting. For disassembly an opening in the housing should be provided. Disassembly of radial clamping hub see EASY- clamp system page 9!

e) Special notes

- As the metal bellows consist of thin stainless steel sheeting, special care during fitting and disassembly is neccesarry. Damages to the bellows can render the coupling useless.
- Hub bores which are smaller than "Dmin". are possible; but an optimal transfer of the nominal torque can not be guaranteed in this case.
- at smaller shaft diameters the conical hub (larger section thickness) are additional dagged.
- You will find further type specific technical details and characteristics in the data sheets.