Ball joints and homokinetic joints

- Blocking of rotation of longitudinal axis possible with homokinetic version or with anti-twist device
- Strong forces can be transferred
- Compact design
- Suitable for applications with high-frequency pulsations

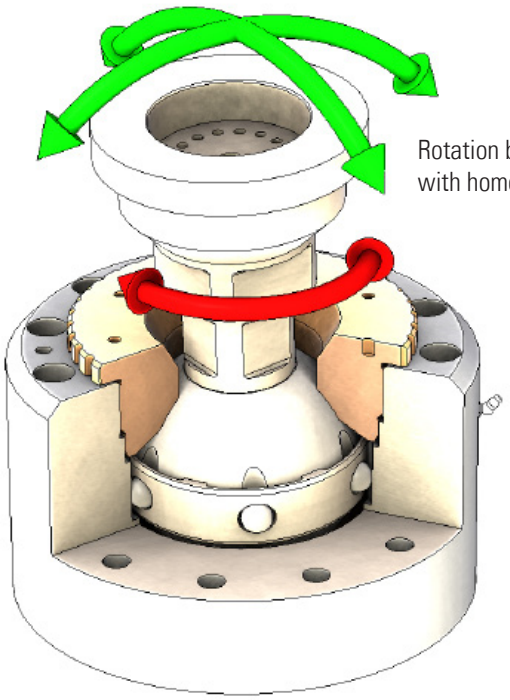
HAGENBUCH
Hydraulic Systems

Description

The Hagenbuch ball joints were originally developed for Hexamove applications. However, they can be used in all applications that require a flexible connection. Ball joints offer the advantage of being able to transfer strong forces despite their relatively small dimensions (compact design). They are also suitable for applications with high-frequency pulsations.
The wear couple consists of a hardened steel ball and special bronze bearing shells; the static friction coefficient of this pairing is approx. 0.25 (the static friction coefficient can be reduced to 0.05 through special treatment of the surfaces). The bearing play is easy to adjust and can be set all the way to a bearing clearance of 0. This is possible because the bearing shells are paired with the ball for a perfect fit. In case of wear out, the bearing play can be readjusted at any time.

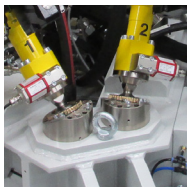
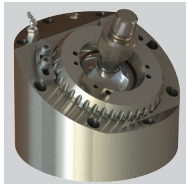
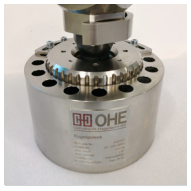
Hagenbuch ball joints come in three different types:

Basic version	The standard version allows movement in three degrees of freedom: pivoting on two sides and rotation around the longitudinal axis.
With anti-twist device	The ball joints have a simple internal anti-twist device. As a result, the joint no longer rotates around the central axis. Only pivoting movements are possible. This version can be used, e.g. to prevent rotation of a cylinder, but it is not suitable for transmission of high torques.
Homokinetic joint	High-end ball joint with integrated anti-twist device. As a result, the joint no longer rotates around the central axis. Only pivoting movements are possible. This version is suitable for transmission of relatively high torques.

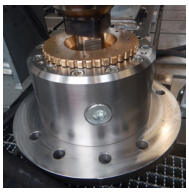


Rotation blocked
with homokinetic joints

Product overview

Technical specifications / Ball joints	Ball diameter	Max. dynamic forces	Max. angle	Alignment of consol	Mass	Anti-twist device
BJB-3-60-20-35 	60 mm	20 kN	+/- 35°	30° or straight	4.8 kg	none
BJB-3-80-120-35 	80 mm	120 kN	+/- 35°	straight	8.5 kg	none
BJB-2V-80-20-23 	80 mm	20 kN	+/- 23°	27°	12 kg	yes
BJB-3-100-280-2 	100 mm	280 kN	+/- 2°	38°	26 kg	none
BJB-2V-120-160-6 	120 mm	160 kN	+/- 6°	straight	48 kg	yes
BJB-3-120-200-30 	120 mm	200 kN	+/- 30°	46°	39 kg	none

Product overview

Technical specifications / Ball joints	Ball diameter	Max. dynamic forces	Max. angle	Alignment of consol	Mass	Anti-twist device
BJB-2V-150-250-6 	150 mm	250 kN	+/- 6°	straight	95 kg	yes
BJB-2H-150-250-10 	150 mm	250 kN	+/- 10°	straight	88 kg	homokinetic

Installation position: as desired
Ambient temperature: between -20°C and +60°C
Static friction coefficient: approx. 0.25

Other ball joint types are possible upon request.

Model code

BJB - 3 - 60 - 20 - 20

3 = three degrees of freedom, rotation around all axes

2V = two degrees of freedom, rotation around longitudinal axis blocked by anti-twist device (for low torques)

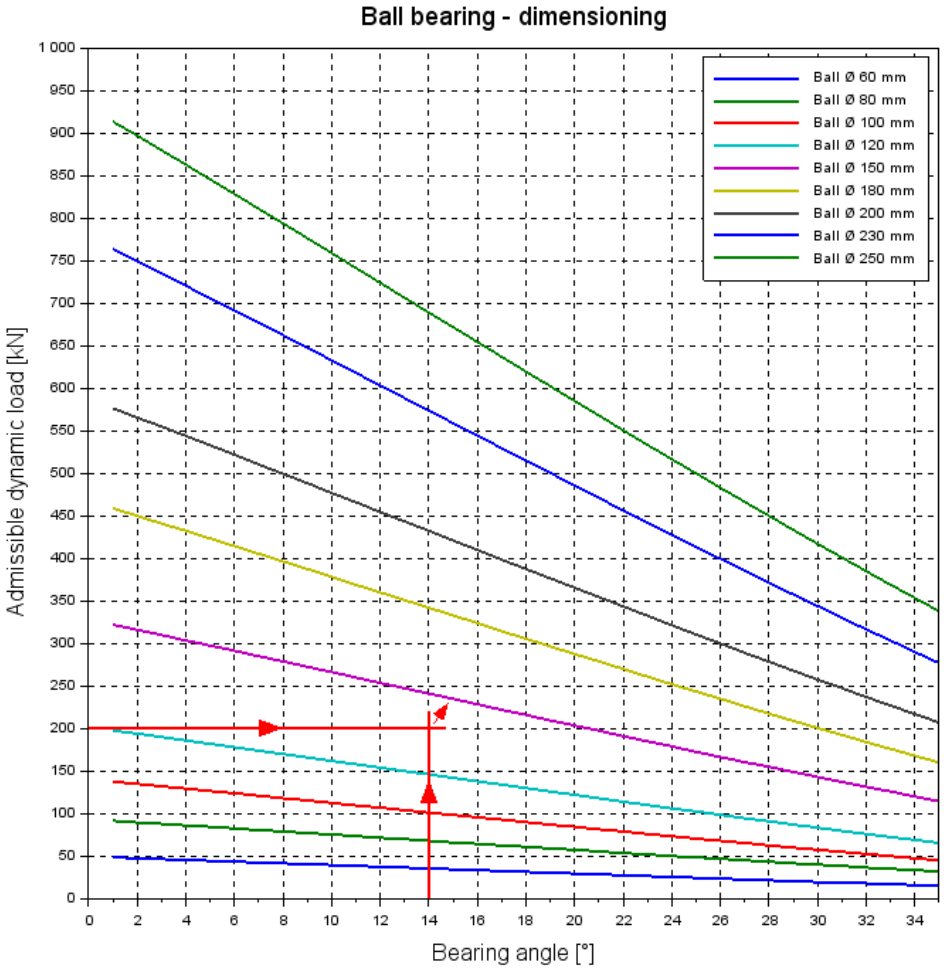
2H = two degrees of freedom, homokinetic version, for high torques around longitudinal axis

Ball diameter in mm
Typical values:
60 mm
80 mm
100 mm
120 mm
150 mm

Load capacity in kN

Pivoting angle in degrees

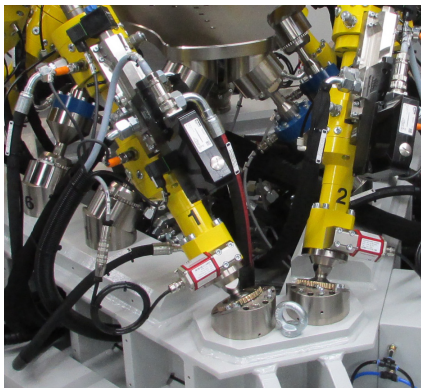
Ball bearing dimensioning



The graphic above shows the possibility of Hagenbuch ball joints. It shows the relationship between the maximum possible bearing angle, the maximum admissible force and the required ball diameter. All possible combinations of force and angle are possible with the standard Hagenbuch construction. Special ball joints can also be developed on request, for example for tight spaces or if the needed tensile and compressive forces are different.

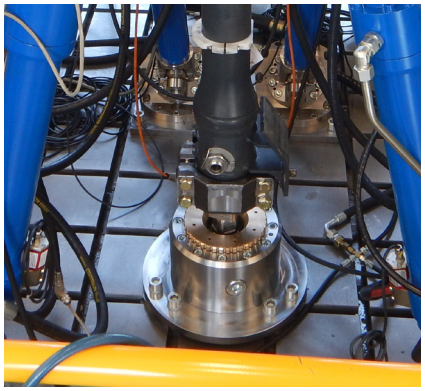
For most applications, the required force and the required bearing angle are known. In this case, the necessary ball diameter can be determined using this graph. The example shows a necessary force of 200 kN and a needed bearing angle of +/- 14°. The ball diameter suitable for this is now the next line above, in this case this would be a ball diameter of 150 mm. This diagram is valid for joints without anti-twist device and also with anti-twist device, but not for homokinetic joints.

Application examples



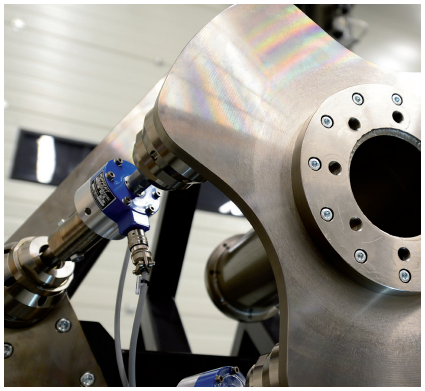
Ball joints in test benches

As an example representing all of the test benches, the use of the ball joints in a Hexapod is described here. The advantages are that they are very compact and have a much longer lifetime compared to joints with rolling elements. The bearing play can be set to 0 to ensure a smooth load change and to extend the lifetime. This property is very important in applications in which forces or accelerations must be precisely measured.



Benefits of the anti-twist device

In this application, forces and torques are introduced into a component. According to the requirement for mounting the component, it needed to be pivoting-mounted but without being able to rotate around the longitudinal axis. This type of mounting was implemented using a homokinetic joint due to the high torques around the vertical axis.



6-DOF force and torque measurement

Six rigid axis with built-in force sensors in a Hexapod design form a force and torque measuring system. The axis are connected to the platforms using ball joints. The joints ensure that no shear forces are introduced into the axis which would corrupt the measurements. In this application, the movement angle of the joints is very small; the focus is on the frictional resistance of the joints. Through special treatment of the contact surfaces, a static friction coefficient of 0.05 can be achieved.

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