

# Pressing is the key

**CLAMPING ELEMENTS – Clamping Systems for torque motors present frictional locking between shaft and hub, which even work reliably in dynamic applications.**

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**M**odern power transmission benefits to a great extent from the possibilities offered by power electronics for the control and regulation of electric drives. The associated advantages for users, such as the use of highly dynamic direct drives, create new demands for Shaft-Hub-Connections as well. This means that, in addition to the torque transmission being safe, reliable and backlash-free, it is just as important for the component stress of the motor parts and of the machine shaft to be taken into consideration.

The use of direct power transmission with torque motors is particularly beneficial in applications where high stiffness, low circumferential backlash, few mechanical components and a short and compact design are important. The advantages offered by such solutions are the simple integration

of the drive into the machine, a sound overall efficiency, a very good controllability, high dynamics and last but not least, a low noise emission.

## Frictional connections

In order to utilise these benefits can also be taken advantage of in practice, a frictional connection is recommended for connecting the torque motor with the machine shaft. Standardised machine elements are available for frictional Shaft-Hub-Connections.

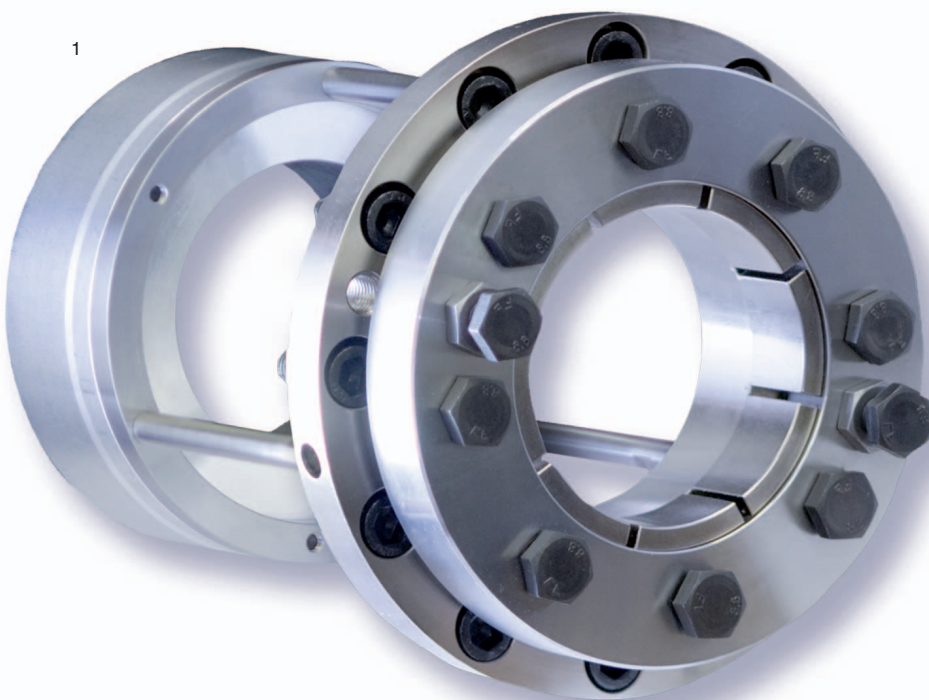
**That means compact and backlash-free solutions with few components.**

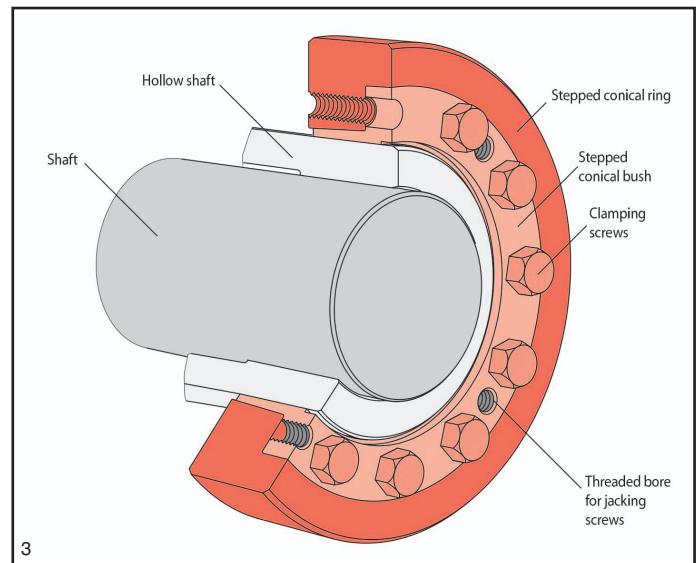
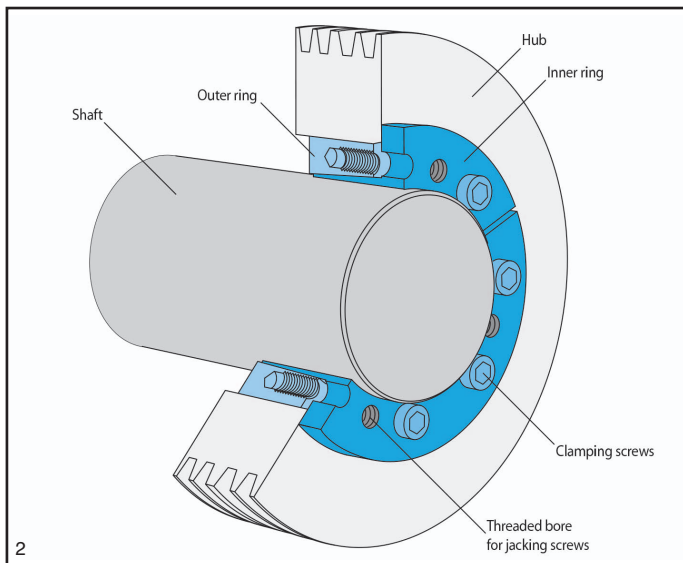
The connections executed with such elements can transmit torques, axial forces, transverse forces and bending moments. The zero backlash required in dynamic applications is ensured by such connections. These connections are optimally suited for cyclic reversing operation. The simultaneous transmission of torque and axial force is ensured as well as the simple alignment of the hub to the shaft. This often results in compact solutions with a high power density. Economical solutions are therefore also created since the shaft and hub geometry can be executed very simply. Generally speaking, frictional connections can still be easily detached even following long periods of operation.

Shrink Discs and Cone Clamping Elements assume an important role among the frictional Shaft-Hub-Connections. The conical surfaces of these elements, which are pulled onto one another by means of clamping screws, produce radial forces; these ensure the necessary friction-locking between the parts involved in the transmission of torques or forces. Shrink Discs and Cone Clamping Elements can transmit substantially higher torques than positive-locking connections such as those with a feather key.

Two-part Shrink Discs consist of an outer part, the stepped conical ring, and an inner part, the stepped conical bushing, as well as several clamping screws. Through tightening the clamping screws, the stepped conical ring is pulled onto the stepped conical bushing.

A radial clamping force is created here through the conical surfaces. The radial clamping force presses the hollow shaft onto the shaft and causes a friction-locking within the contact area between the shaft and hollow shaft. Hereby torques and/or axial forces can be transmitted between the shaft and hollow shaft through. During the clamping process, the position of the stepped conical bushing relative to the hollow shaft remains unchanged.





**1** RINGSPANN offers its customers high-performance Clamping Elements, for example for frictional locking Shaft-Hub-Connections for torque motors. **2** With the conical surfaces of RINGSPANN Cone Clamping Elements radial forces are created that ensure friction locking. **3** Through tightening the clamping screws, the stepped conical ring is pulled onto the stepped conical bushing. A radial clamping force is created here through the conical surfaces.

Cone Clamping Elements consist for example of an external ring with an internal cone and an internal ring with an external cone, as well as several clamping screws. Through tightening the clamping screws, the external ring is pulled onto the internal ring. This equally causes radial clamping forces due to the conical surfaces and in turn, friction-locking.

### Clamping systems for torque motors

We at RINGSPANN use our know-how regarding frictional Shaft-Hub-Connections in the right places so as to make connecting torque motors to hollow shafts possible. Torque motors are available as built-in or complete motors. Both variants can be friction-connected with machine shafts using the clamping systems of RINGSPANN. In addition to the safe, reliable and backlash-free transmission of torque, the necessary centring of the motor on the machine shaft is also ensured.

A possible execution is the clamping system RTM 607. This consists of a clamping element and a centring bushing. The clamping element ensures the transmission of the motor torque onto the machine shaft and centres the torque motor at the driving end. The centring bushing made of aluminium, as a second centring unit, ensures an altogether sound alignment of the torque motor to the machine shaft. The centring bushing is secured in its axial position

using rods and a holding ring. On the whole, such a clamping system creates the mechanical connection, support and centring between rotor and machine shaft. The backlash-free connection makes it possible to use the highly dynamic characteristics of the torque motor in the application. A high truth of running is ensured at the same time.

When clamping hollow shafts, the tension arising in the hollow shaft must definitely be taken into account. In the case of thin-walled shafts, the yielding point of the material can be exceeded very quickly. Thanks to the optimal design of the contact

pressure of RINGSPANN clamping systems for torque motors, it can be ensured that no inadmissible yielding occurs in the material of the machine's hollow shaft or motor hollow shaft. At the same time, the clamping system can be easily detached again for servicing, even after long periods of operation. There are different designs of clamping system available for different applications. Individual consultation for the specific case of use is recommended in order to discuss practical application and take all influencing factors into consideration.

### Summary

Modern torque motors offer design engineers and developers the possibility of implementing dynamic applications in a simple manner. Doing without gearboxes means compact and backlash-free solutions with few components. At the same time, new challenges for connecting the drive to the machine shaft arise. The targeted use of frictional clamping systems is a good way of solving these problems. Especially when connecting to hollow shafts, it is to be made sure that the complex technical relationships are given the right consideration. RINGSPANN offers different designs of clamping system for the various applications. Users can take advantage of our experience and have us advise them when choosing the right system for them.

### AT A GLANCE

#### RINGSPANN-Group

- Specialist in power transmission components and precision clamping fixtures.
- Headquarter: Bad Homburg, Germany.
- Founded in 1944.
- Subsidiaries in Germany, France, Great Britain, Netherlands, Switzerland, Spain, USA, China, India.
- Agencies in Europe, Asia and Africa.
- No. of employees: HQ Bad Homburg: 265, Group: 400.
- Group turnover: 65 Mill. EUR consolidated.
- Active co-operation in the VDMA and the Power Transmission Research Association FVA
- Certification: ISO 9001: 2008 and ISO 14001: 2004

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