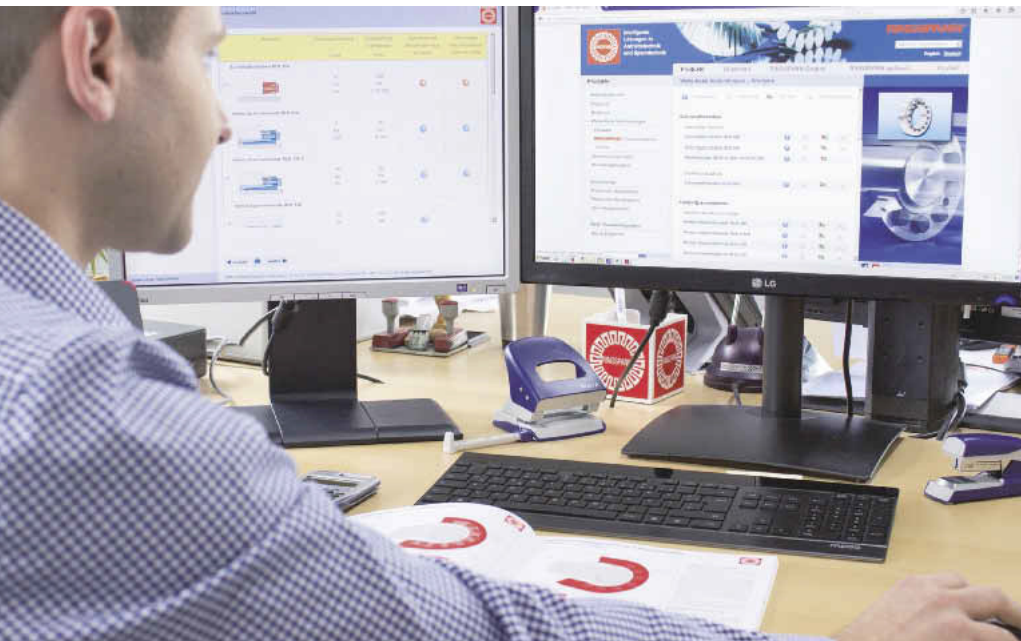


Online Calculation Tool for Shaft-Hub-Connections

Exact Hub Construction

For some time now RINGSPANN, who offer a wide range of elements for Shaft-Hub-Connections, have made their CAD data available to the user online. To enhance the online experience, RINGSPANN has now made it possible to carry out design calculations for these elements on your own using a Calculation Tool.



User using the
RINGSPANN
Calculation Tool

RINGSPANN offers a wide range of Shaft-Hub-Connections. In addition to a variety of Shrink Discs, many different types of Cone Clamping Elements are on offer. Shrink Discs are divided fundamentally into two and three-part Shrink Discs. Both two-part product series RLK 608 und RLK 606 can be path-controlled without a torque wrench. The closed construction form of the two-part Shrink Discs makes this type of Shrink Disc impervious to impurities. The classic three-part Shrink Disc RLK 603 is mounted using a torque wrench and a specified tightening torque.

Cone Clamping Elements for every application

At first glance it is surprising that the many different types of Cone Clamping Elements are needed in practice. If you look at the clamping sets in detail it is possible to identify various distinguishing criteria. For example, the elements differ in construction height and construction width. A fitting element can be selected according to the given clearance. A further important criterion for the selection of an element is for example whether an axial displacement

of the hub to the shaft is permissible during the clamping procedure. At the end you will find a rich selection of models available for any of the various applications in which Shaft-Hub-Connections are employed. Each of these different versions has their merit.

3D CAD data and Calculation Tool available on the Internet

The 3D CAD data has long been available in various formats for the RINGSPANN Shaft-Hub-Connection elements shown in the catalogue. The design engineer is thus offered support during the design process.

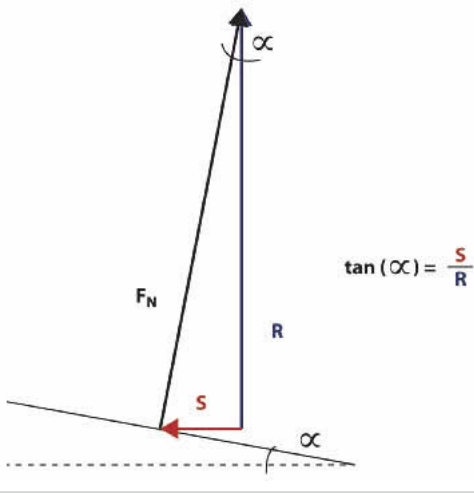
Recently, RINGSPANN has gone one step further. The design know-how of previous decades has now been made available to the user in the form of an online Calculation Tool. It has hereby become possible to move away from rigid

catalogue data and towards element dimensioning for specific applications.

In order to be able to use the RINGSPANN Calculation Tool you are required to log in, free of charge. After a short registration process the program is available to you for use. The program calculates the transmissible torque and axial forces for a specific shaft diameter taking into consideration the tightening torques, the number of clamping screws, yield strength, materials and tolerances. If the torque and axial force are to be transmitted at the same time, the values given in the catalogue for torque and axial forces are reduced. The calculation of the reduced values is also possible with the Calculation Tool.

The transmitted torques can be calculated for Shrink Disc shaft diameters that are not provided in the catalogue. Moreover, the transmissible torques and forces can be determined for available construction components that have a fit length that deviates from the catalogue specification. The DIN fit lengths can be selected in a selection menu. It is possible to calculate the then transmissible torques and pressures for various tightening torques of the clamping screws for all torque-controlled elements.

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Triangle of forces without friction at the cone of the clamping element

Bases for calculation

The relatively simple bases for calculations can be explained quickly. The function of all cone elements is based on the often so-called wedge effect. A force is hereby mechanically strengthened via a wedge as illustrated in the figure. An axial actuating force S is reinforced by a large radial clamping force R. It is clear that this effect is fundamentally influenced by the cone angle Alpha. This simple triangle of forces is however only applicable in such a manner without friction. The occurring friction coefficients must be taken into account for the real elements. This leads to more complex relationships irrespective of the element construction.

After determining clamping force R the transmissible torque can be determined using the following formula:

$$M_t = R \mu d/2$$

μ is where the coefficient of friction between the element and the shaft with diameter d. The pressure loss in the hollow shaft must be taken into account in the calculations for Shrink Discs. Equally, the pressures on the shaft and hub can be calculated with the help of clamping force R. For these calculations it is of great importance how the friction coefficients are hypothesised / factored in. The transmissible torques can be reliably determined using the RINGSPANN calculation method. The approaches used are described in detail in the catalogue for the Shaft-Hub-Connections.

Shaft-Hub-Connections

RINGSPANN
Power Transmission



Two-part Shrink Discs
External clamping connection for simple and secure mounting without torque wrench.



Three-part Shrink Discs
External clamping connection for the fastening of hollow shafts on solid shafts.



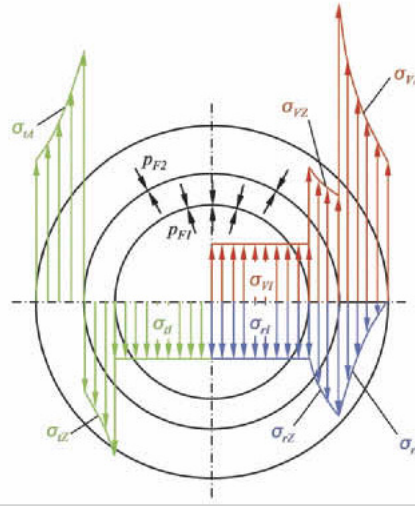
Cone Clamping Elements
Internal clamping connection in small dimensions for high torques.



Star and Clamping Discs
Shaft-Hub-Connection for frequent clamping and release.



Star Spring Washers
Axial spring element for pre-loading of ball bearings.



Clamping distribution in the construction components of a Shrink Disc

Source: Final report FVA-Vorhaben No. 566

Scientifically based hub calculation

The minimal hub outer diameter and the minimal hub width are determined for the Cone Clamping Elements. Other manufacturer's catalogues only use estimation factors for the hub calculation. The RINGSPANN Calculation Tool carries out the hub calculation using formulas derived from the theory of the thick-walled pipe under internal pressure for clamping calculation. This hereby results in a precise calculation for the hub dimensioning. Multiple construction components are involved in a Shaft-Hub-Connection. The stresses in the individual construction components are clearly illustrated in the Shrink Disc connection figure. The relationships are clearly not trivial anymore. Extensive scientific studies are available to RINGSPANN, in particular regarding the eventuality of construction component semi plastic stress.

Applicable only for RINGSPANN elements

Naturally, the calculation results only apply for RINGSPANN elements. Unfortunately it is necessary that this be stated clearly, as time and time again supposedly equivalent Shaft-Hub-Connection elements are offered on the market from various cheap sources. Of course, first and foremost, the detailed designs of the elements differ from manufacturer to manufacturer. In addition, it has been shown that in many cases cheap elements do not comply with the necessary level of quality for a reliable connection.

Type
RLK 608
RLK 606
RLK 603
RLK 110
RLK 130
RLK 131
RLK 132
RLK 133

Wide range of RINGSPANN products

Info & Contact

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Directly to Calculation Tool

RINGSPANN products in the segment Shaft-Hub-Connections