

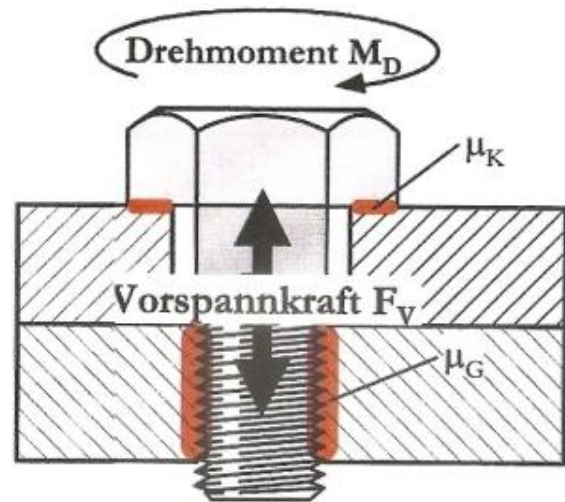
Lubrication of bolts

Basics

Friction is located between the tightening torque (M_D) and the resulting bolt load (F_V). It occurs in every bolted connection at the thread and under the nut head.

The tightening torque is calculated from the yield strength of the bolt material, the bolt size and the friction coefficients for thread (μ_G) and bolt head contact (μ_K).

A torque specification for a bolt of a certain size and a certain material without the specification of the underlying friction coefficients is technically nonsense!



Lubrication yes or no?

Basically, a bolt can be tightened with the torque calculated taking into account all boundary conditions (size, yield point, coefficient of friction).

Exemplary calculation: bolt M16, bolt material 25CrMo4 (440 MPa yield strength), μ_G 0.13, μ_K 0.13, yield strength utilization 70% results in a tightening torque of 119 Nm according to VDI guideline 2230. If the coefficients of friction are changed, e.g. μ_G 0.24 and μ_K 0.2, this results in a tightening torque of 162 Nm.

By lubricating the screws with a suitable paste (e.g. OKS 250), lower coefficients of friction are achieved than is possible with non-lubricated bolts (oils and greases should not be used on bolts). The biggest advantage of bolt lubrication, however, is the much smaller scatter range of friction. With correct lubrication, the coefficients of friction are usually in the range of approx. 0.11 - 0.15. Without lubrication, on the other hand, experience shows that coefficients of friction can vary between approx. 0.2 and 0.5.



What else is to be considered?

In order to "master" the friction coefficients, it is recommended to use hardened washers (e.g. DIN ISO 7089 200HV or 300HV) as specified in the VCI guidelines for flange mounting.

Likewise, nuts should always be mounted with the marking on the head support surface visible to the outside, so that any burr does not adversely affect friction.



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Myth: Lubrication leads to loose bolts:

The best way to secure bolts against loosening, e.g. due to vibrations, is to apply the highest possible bolt pre-tensioning force. The presence of a suitable screw lubrication does not have a negative effect on the "bolt locking".

The use of e.g. serrated lock washers for bolt locking is usually a disadvantage, as the friction coefficients of the nut head are massively increased and the increase of the tightening torque necessary in this case is not applied.

Application engineering questions?

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