Relation of friction coefficient classes to guideline values for various materials / surfaces and types of lubrication, for screw connections

according to VDI 2230, edition 2015

The friction coefficients μ_G, μ_K display variations since they are dependent on several factors, e.g. the material combinations, the quality of the surface finish (depth of roughness), the surface treatment (plain, blackened, galvanically zinc coated, zinc flake coatings, etc.) and the method of lubrication (with / without oil, molybdenum disulfide, molycoat paste, anti-friction coating etc)! The following tables give friction coefficients for threads and for bearing surfaces.

The data in the table is valid at room temperature.

Friction coeff. class	Range for μ_G and μ_K	Typical examples for: Material / surfaces	Lubrication
A	0,04 – 0,10	metallic, bright-polished black tempered phosphated galvanized coatings such as Zn, Zn/Fe, Zn/Ni zinc laminated coatings	solid lubricants such as MoS2, graphite, PTFE, PA, PE, PI in lubricating lacquers, or in pastes wax glazes, wax dispersions
B	0,08 – 0,16	metallic, bright-polished black tempered phosphated galvanized coatings such as Zn, Zn/Fe, Zn/Ni zinc laminated coatings Al and Mg alloys	solid lubricants such as MoS_2, graphite, PTFE, PA, PE, PI in lubricating lacquers, or in pastes, wax glazes, wax dispersions, greases, oils, as-delivered condition
		hot-dip galvanized	MoS_2, graphite, wax dispersions
		organic coatings	with integrated solid lubrication or wax dispersion
		austenitic steel	solid lubricants or waxes;
C	0,14 – 0,24	austenitic steel	wax dispersions, pastes
		metallic, bright-polished phosphated	as delivered state (lightly oiled)
		galvanic coatings such as Zn, Zn/Fe, Zn/Ni non electrolytically applied zinc adhesive	none
D	0,20 – 0,35	austenitic steel	oil
		galvanic coatings such as Zn, Zn/Fe hot-dip galvanized	none
E	≥ 0,30	galvanised coatings such as Zn/Fe, Zn/Ni austenitic steel Al and Mg alloys	none

The aim is **to achieve** coefficients of friction which fit into the **friction coefficient class B** in order to apply as high a preload as possible with low scatter. This does not automatically mean using the smallest values and that the friction coefficient scatter present corresponds to the class spread.

For a safe and secure mounting it is important to define the conditions for friction very precisely and to restrict their variations as much as possible. If there is a large variation the desired preload force can vary considerably. In contrast to this the normal range of tolerance for the tightening torque has only a limited effect.

μ_G = coefficient of friction in the thread
μ_K = coefficient of friction in the head bearing area
μ_T = coefficient of friction at the interface