Locking of screwed fastenings

Form-fitting locking devices against unscrewing

Form-fitting is achieved by using locking serrations or ribs on the supporting surfaces of the screw head or nut. The use of washers with locking serrations or ribs is also possible. Of particular importance here is that the surface hardness of the locking serrations/ribs be considerably stronger than the building components to be connected so that they can dig themselves into the surface. Fundamentally, during assembly it needs to be made sure that locking occurs both under the screw head and under the nut as one of the two parts (screw or nut) may otherwise loosen from the building components to be connected.

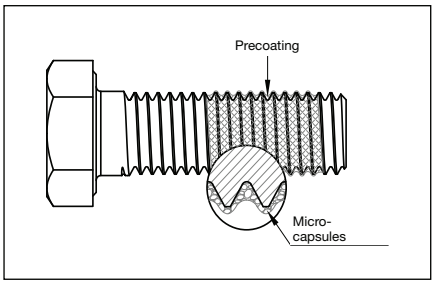
A product overview of form-fitting locking devices against unscrewing can be found in Table 3.

Furthermore, it should be noted that the friction coefficients are strongly affected by the locking serrations/ribs. As such, much higher friction coefficients (0.2 - 0.3) need to be reckoned with, when dealing with soft contact materials (aluminium alloys, construction steel), into which the serration dig. The tightening torques need to be determined accordingly. Ultimately, the optimum tightening torques are to be determined by testing in environments which reflect the actual conditions.

Typical values for tightening torques for form-fitting locking devices against unscrewing can be found in "Technical Information - Assembly TI-179".

Adhesive locking devices against unscrewing

A material bond can be created using an adhesive which is applied to the thread. Locking using an **encapsulated adhesive** is described in DIN 267-27.



The micro-capsules which are applied to the carrier material on the thread contain the adhesive and a hardening agent. The capsules break open during screwing and the adhesive begins to harden. The hardening process usually takes 24 hours to complete. A screwed fastening results which is lock against vibrations and loss of preload and which simultaneously acts as sealant.

Since the micro-capsules are applied to the thread in a special coating process, it is recommended that this be used especially with bulk amounts (➜ Table 1).

When applying micro-capsule adhesives to zinc flake coatings, seals on thick layer passivations and coatings with lubricant additives, a reduction in the breakaway torques vis-à-vis DIN 267-27 may come about. In this case, the application should be safeguarded by carrying out initial sample inspections and by testing in application conditions before using in bulk. **Anaerobic hardening liquid adhesives** which are applied to the thread when assembling the screwed fastening are suitable for universal use. These harden when atmospheric oxygen and metal (iron and copper ions) come into contact with each other. Table 4 provides an overview of which adhesives are suitable for which surface coating. Thread friction coefficients which are set by the corresponding surface coating remain fundamentally unchanged.

Table 1: Product overview of adhesive and locking coatings

Selection of product and brand names for locking coatings		Selection of product and brand names for adhesive coatings	
TUFLOC	Klemm-Tight	LOCTITE	METAFLUX
ES-LOC	Thermo-Tight	INBUS-Plus	OKS
POLYLOC	Heat-Tight	DELO	OMNICOTE
Clemm-Loc	Long-Loc	OMNIFIT	SCOTCH GRIP
Spot-Tight	Hot-Loc	POLYLOC	SPOT-Tight
		WEICON LOCK	STICK-Tight
		PRECOTE	

Table 2: Help for selecting the correct locking device

Design objectives	Locking variations
Reusability	• Form-fitting locking elements
Defined/Constant friction co-efficients	• Nord-Lock washers, adhesive locking devices
Low assembly costs	• Flange screws and nuts with locking serrations/ ribs • Adhesive locking device
Readjustability of the fastenings	• Form-fitting locking elements
Assembly conditions	• Makes it inevitable that the threads to be coupled are free from oil and grease, as such, adhesive locking devices are ineffective
Temperatures	• Adhesive and locking coatings are subject to restricted temperature ranges