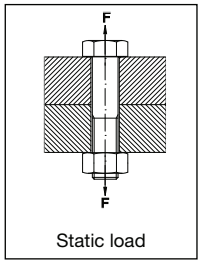
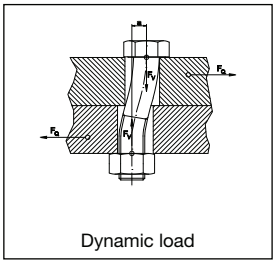
Locking of screwed fastenings

A screwed fastenings should be designed in such a way that the preload applied under working stress remains as intact as possible. While in some cases a clear drop in preload can indeed be tolerated, the screwed fastenings coming undone completely must be prevented. If and how a screwed fastenings can come loose depends mainly on the stress.



Static load



Dynamic load

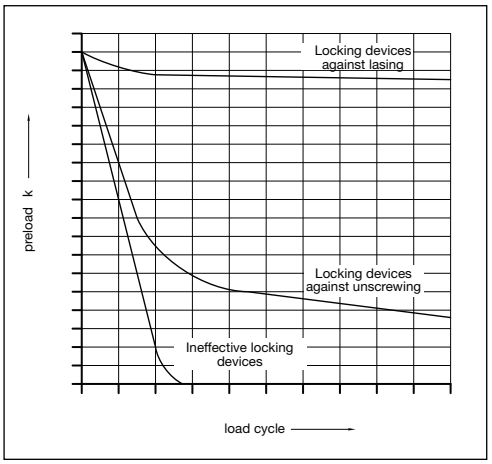
With **static loads** in axial direction, settling, which is dependent on the number and shape of the separation joints between the tensile building components, can lead to a complete loss of preload. With this kind of load, loss of preload may be counteracted with certain constructive measures or by using screw-settling locks.
With **dynamic loads** which run laterally to the centre of the screw and are large enough to shift the stressed building components against each other, a loosening torque is generated which can overcome the self-retention of the joint. If this is the case, the joints will systematically loosen until they come apart or break the joint. These loads become especially critical when they occur a lot. Fastener and unscrew locking devices may provide assistance here.

Measures against losing preload with static loads
To keep settling losses in a screwed fastening as low as possible, the number of separation joints between the building components are to be kept to a minimum. Every unnecessary washer is an additional separation joint. Even the insertion of "soft" washers (e.g. DIN 125 with 140 HV) in a high-strength screwed fastening (≥ property class 8.8) is to be avoided. By selecting a longer screw grip length, e.g. by using extension sleeves, preload losses can be absorbed by greater elastic elongation. The same effects are achieved by using shank expansion screws or screws with full thread or by using higher preloads from higher-strength materials.
If these measures cannot be used, a curved washer can be used in accordance with DIN 6796 to partially balance out intrusions of parts into materials. Here, it should be made sure that the building component onto which the curved washer is placed is strong enough to not move under the strain and that the curved washer does not dig into the building component.

In contrast, DIN 127 and DIN 128 spring lock washers and DIN 137 spring washers are **ineffective**. Normally they are pressed flat, even at property class 5.6 and lower, as determined in the area of use of the product standards, and are not able to balance out any intrusions of parts into materials. For this reason, engineering standards organisations have made allowances for the latest technology and withdrawn these standards.

Additional invalid locking elements are
- DIN 6798 serrated lock washers,
- DIN 6797 toothed lock washers,
- DIN 93, DIN 432 and DIN 463 locking plates,
- DIN 526 safety cups,
- DIN 7967 self locking counter nuts.

In the past the products were assigned according to these standards to the category "Locking against unwinding under dynamic lateral load". However, they do not comply with the requirements. For this reason, the standards mentioned have also been withdrawn. Additionally, sufficient electrical contact, as described in the area of use of these standards, cannot be guaranteed for the serrated lock washers or toothed lock washers, which is why DIN 6797 and DIN 6798 have also been withdrawn.



Measures against losing preload with dynamic lateral loads

Locking devices against losing
While locking devices against losing do not prevent significant loss of preload, they do prevent the joint from coming apart completely. Usually, around 20% of the preload remains. The working principle is based on the gripping action in the thread.

Products included in this category are:
- Prevailing torque type nuts
- Screws with locking element/coating
- Screws with adhesive coating
- Thread rolling screws

Locking coatings are described in DIN 267-28 and serve as locking devices against losing for locking screwed fastenings by generating frictional contact. They come in the form of plastic all-over coating, strip coating or spot coating, which have a locking effect when being screwed in (➜ TI-187, Table 1).

Locking devices against unscrewing
Unscrew locking devices describe elements and methods which are made fundamentally for maintaining the preload in the screwed fastening despite strong dynamic loads. Normally, this prevents the preload from dropping below 80% of the assembly preload. There are two basic locking methods possible (form-fitting and adhering).

Installation example of washers with locking serrations