# Locking of fasteners

When bolted joints are put under dynamic stress, they may become loose unless they are properly secured. A distinction is made between two types of fastener locking.

**a) Securing against loss of clamping load (setting)**
With axially stressed, preloaded screws, setting occurs (i.e. smoothing (= local plastic deformation) of the surfaces in the parting planes, compensation of excessive surface pressure) and leads to a loss of clamping load. A drop in preload increases the dynamic portion of the load in the screw and can cause fatigue failure.

**b) Securing against rotation (unscrewing/loosening)**
If a relative movement between the tightened parts is able to occur as a result of high lateral force (or insufficient preload due to loss of clamping load, faulty assembly, or incorrect dimensioning), it releases the self-locking in the thread and the friction in the head or nut section and the fastener will loosen by itself. This can, in fact, result in a total loosening (falling apart) of the bolted joint.

| **Precaution against loss of clamping load** | **Effects** |
|---|---|
| Setting partially compensated by tightening | Setting partially compensated during tightening |
| Increase clamping/diameter ratio, length = 4 x diameter | Greater elasticity, more space for compensation of setting |
| Reduce surface roughness, clean separating seams, minimize the number of parting planes | Less possibilities for loss through setting (embedding) |
| Use flange products | Larger bearing surface prevents exceeding the max - imum permissible surface pressure |
| Use spring elements with sufficient rigidity | Compensation of setting (too soft spring elements have no effect, rather they merely increase the number of separating seams and setting possibilities!) |
| Re-tighten after initial operating time | Compensates setting |

| **Precaution against unscrewing** | **Effects** |
|---|---|
| Tighten properly, increase preload, use larger dimensions, higher property class | Increased axial forces prevent lateral movements |
| Increase clamping/diameter ratio (length = 4 x diameter) | Easier bending of the shank. Prevention of relative movement below head or nut |
| Use shoulder bolts, pin parts together | Prevention of lateral movement (slip) between parts |
| Increase grip on head and nut surface | Helps prevent relative movement under head or nut |
| Increase friction in thread | Unscrewing torque increased |

| Precaution against loosening / (falling apart) | **Effects** |
|---|---|
| Secure against loss of clamping load and unscrewing | No basis for loosening |
| Increase friction in thread | Even when clamping force is fully lost, a minimum torque still exists and prevents a complete unscrewing |
| Limit further rotation through shape locking | Nut cannot be turned beyond the stop. |