

## MARYLAND METRICS

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TECHNICAL INFORMATION and DATA

## Calculation of screw dimensions

For the calculation of screw dimensions, yield stress is the most important factor, assuming sufficient nut strength or thread engagement is provided. It is the basis for calculating the highest load not causing plastic deformation of the fastener. When yield stress is exceeded, the fastener will extend more and more and finally break under the increasing load. The highest operating force must neither equal nor surpass the relevant yield load (load at yield stress and at Rp 0.2 respectively: see page T9), but must remain within an adequate safety limit below this factor. For simple static joints, operating force is permitted to reach approx. 90% of the yield load. When safety issues arise, or the load becomes dynamic, operating force must be a smaller portion of the yield load.

The selection of the most suitable property class for bolted joints depends on the force to be transferred and on the designed dimensions. As a rule of thumb, property class 8.8 is to be selected unless special requirements need to be met. Property class 8.8 is not subject to any limiting conditions as a result of electrolytic plating.

Note the following with regard to relevant fields of application:

- For lightweight construction, small given joint sizes are to be used to avoid extra weight, so the highest possible property classes with high mechanical properties should be selected.
- The higher the selected property class, the higher the pressure on the bearing surface under screw head and nut. Check material specifications for maximum bearing stresses.
- The possibility of brittle fracture, especially in case of unforeseen overstressing - or in case of a catastrophe - grows with increasing mechanical properties. This may be compensated to a certain extent by specific designing of the structural parts and by favorable fastening conditions - i.e. longer clamping length or reduced shank diameters.
- With increasing mechanical properties, consider using a plating or coating without embrittling effect.
- Different conditions, such as low-temperature ductility, heat resistance or corrosion resistance have special requirements. Fasteners made of steel according to standardized property classes should only be used within the temperature range of  $-50^{\circ}$  to  $+300^{\circ}\text{C}$ .
- Regulations from official authorities defining material and mechanical properties of fasteners, such as pressure vessel codes, structural bolting and apparatus engineering, are to be duly complied with.
- Production cost of the fully assembled joint should be the guideline for choosing a suitable combination of property class and fastener dimension, and not the price of the fasteners alone. Choosing less expensive screws will often cost more in the end than smaller, high-tensile fasteners, which may be more expensive, but allow smaller joints. Storage and assembly costs need also be considered.
- High-tensile bolted joints are to be used as high-capacity components. Therefore, they require more precise calculations, more careful manufacturing, and quality assurance guarantees which only brand name companies can provide. They further require adequate storage (maintaining finish and tightening friction) and more careful assembly by means of proper tightening methods.