Proportional Limit

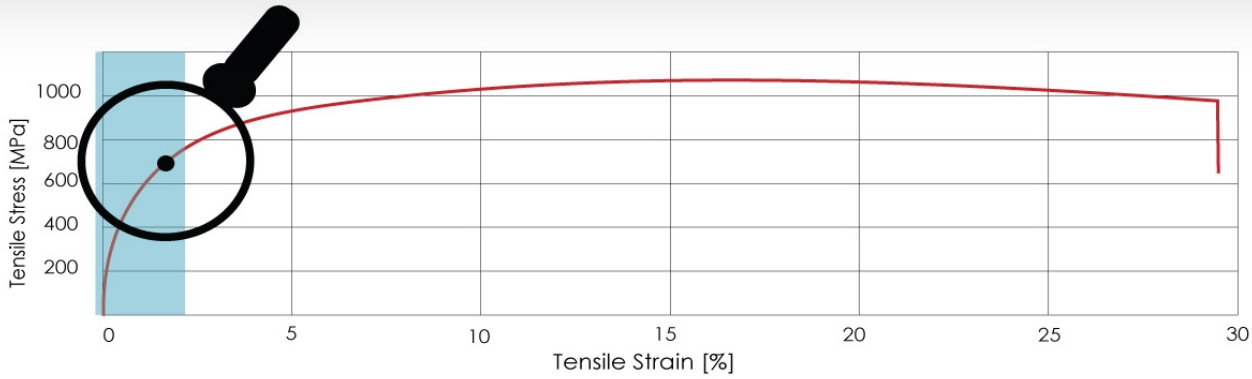
The proportional limit is the point on a stress-strain curve where the linear, elastic deformation region transitions into a non-linear, plastic deformation region. In other words, the proportional limit determines the greatest stress that is directly proportional to strain. The transition point can be calculated by a specified percent change in slope. Because the proportional limit is not required by many test standards, it is often used for educational purposes rather than in practice by the materials testing industry.

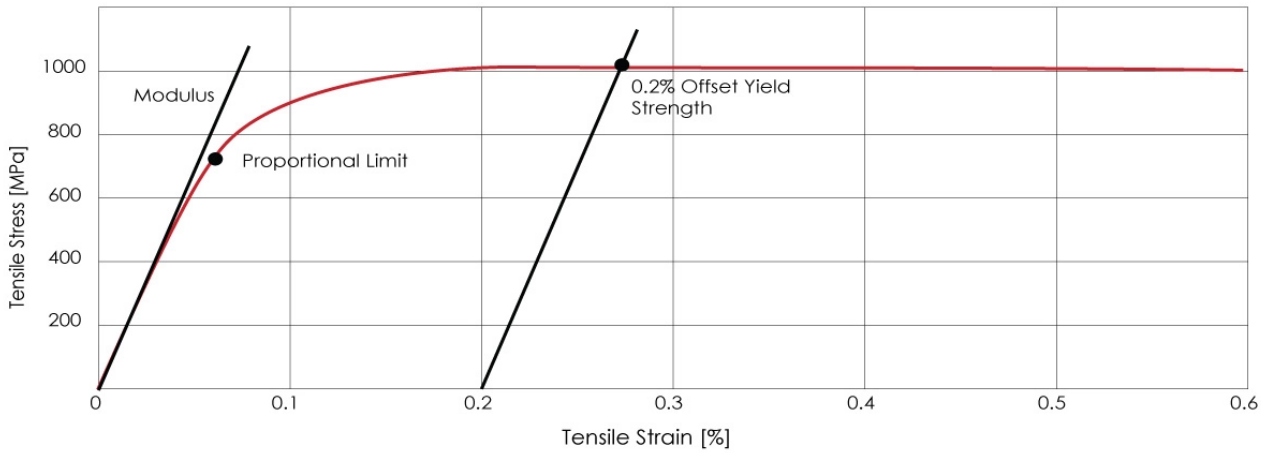
HOW IS PROPORTIONAL LIMIT DIFFERENT FROM ELASTIC LIMIT?

The elastic limit is the greatest stress that can be applied to a material without causing plastic (permanent) deformation. For many materials the elastic limit is equivalent or nearly equivalent to the proportional limit. For other materials, such as elastomers, the stress-strain relationship is non-linear and the material will still be within its elastic region long after it has passed through its proportional limit. The elastic limit is essentially a theoretical value that is difficult to determine using a universal testing machine, and for this reason is used mainly for educational purposes rather than in practice by the materials testing industry.

HOW IS PROPORTIONAL LIMIT DIFFERENT FROM YIELD STRENGTH?

Similar to the elastic limit, the yield strength of a material can also occur beyond the material's proportional limit. Unlike the elastic limit, the yield strength on a stress-strain curve has been defined by ASTM and ISO test standards. Depending on the material's stress-strain behavior at yield, a preferred yield calculation is specified by the chosen standard. For instance, metals test standards (ASTM E8 or





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