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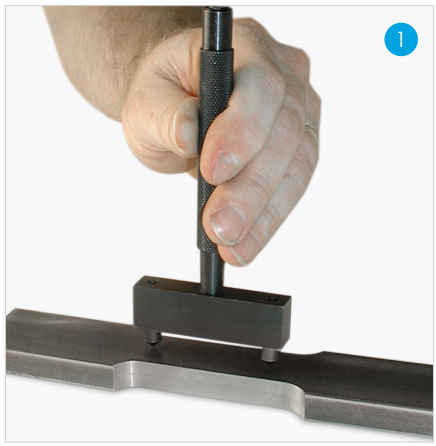
AutoX750 | Should the AutoX Remain on the Specimen Through Failure?

Metals Tensile Applications

For metals tensile applications, it is common to report the percentage total extension at fracture (At) or percentage elongation after fracture (A). Traditionally, elongation after fracture is calculated using manual specimen marking where the markings are set to a defined gauge length (G.L.) before the test starts (Fig. 1), for example 50 mm, and then measured again after the test, for example 56.25 mm. This would give a percentage elongation after fracture of 12.5%. If using a strain measuring instrument that can remain on through failure, ISO 6892-1:2009 allows the total strain measured by the extensometer to determine extension/elongation strain at and after fracture. However, to determine elongation after fracture from the extensometer, the elastic elongation needs to be deducted from the total elongation at fracture to produce a similar result to the manual method. The remaining elongation is called the Non-Proportional Elongation (NPE) and represents the elongation after fracture (A). NPE (Fig. 2) is determined by defining the modulus and creating a line parallel with the modulus. Where this line intersects with the 'break point' defines the NPE.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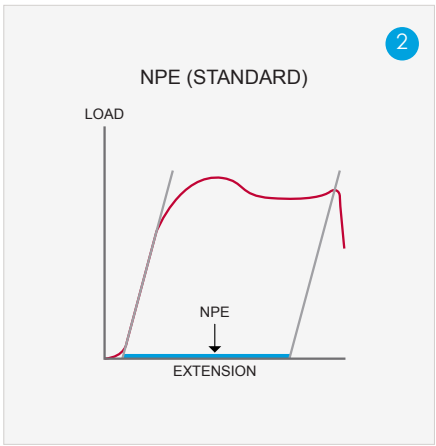
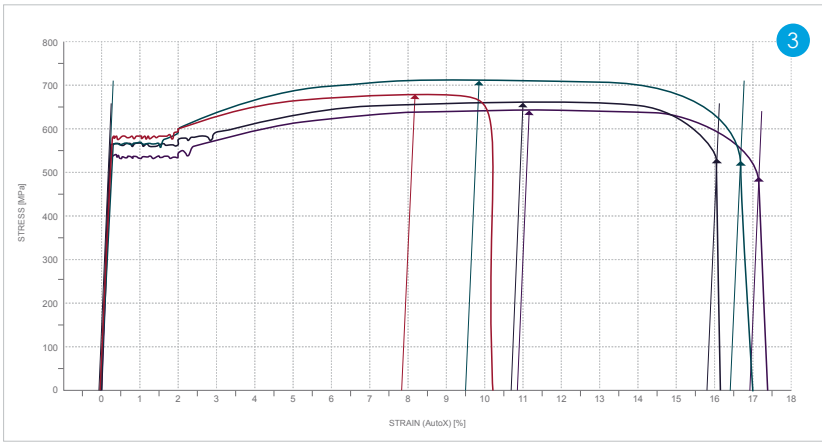


"*The result of this determination is valid only if fracture and localized extension (necking) occurs within the extensometer gauge length*".[1] If localized extension (or the break location) is outside of or on the extensometer knife edge, the result is invalid because the extension outside of the gauge length is not measured by the instrument. This means that the strain at break would be lower than expected. Figure 3 shows the result when one specimen fails outside of the gauge length of the extensometer or the knife edge was in the necking region. To avoid these instances of invalid tests, ISO 6892-1:2009 states: "*If the extensometer is removed or if the extension measurement is interrupted before fracture, but after maximum force (Fm), then it is permitted to use the crosshead displacement to determine additional elongation between removal of the extensometer and fracture.*"

Once maximum force has been achieved on the specimen, total system compliance will now be deflecting back towards the specimen, meaning the extension/elongation/strain at and after fracture would be conservative, but more repeatable between tests. Using a clip-on extensometer can be difficult and unsafe to remove after maximum force. It is safer and more reliable to use an automatic extensometer that remains on the specimen through fracture or removed after ultimate tensile strength.



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