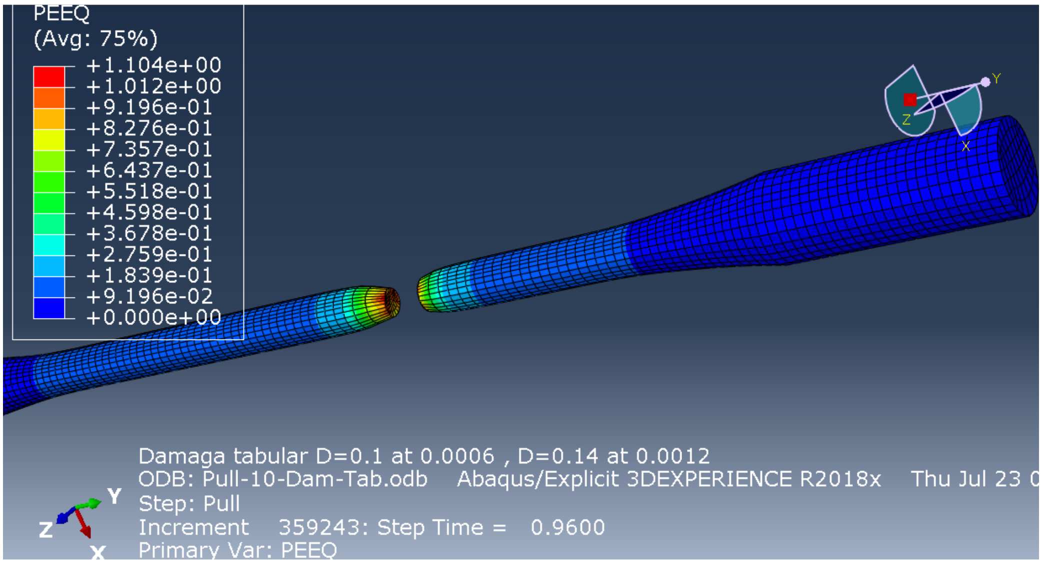
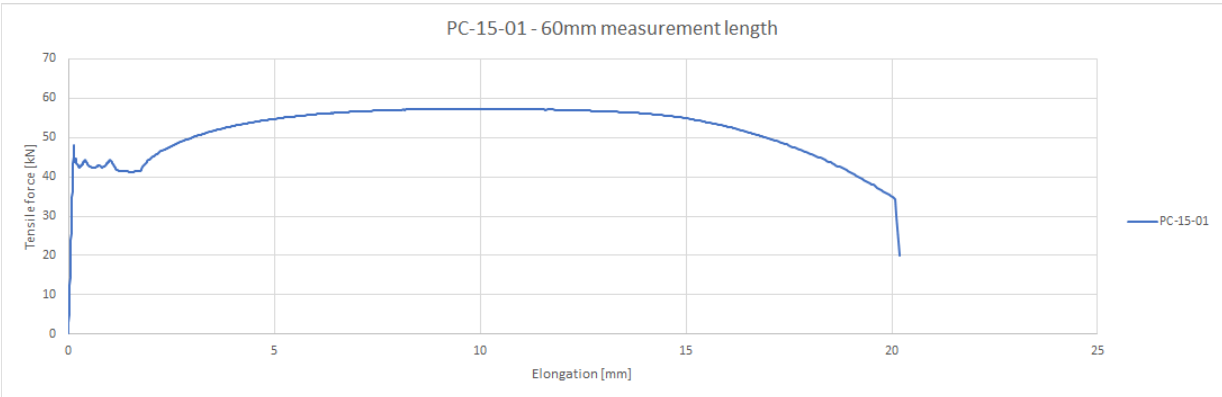
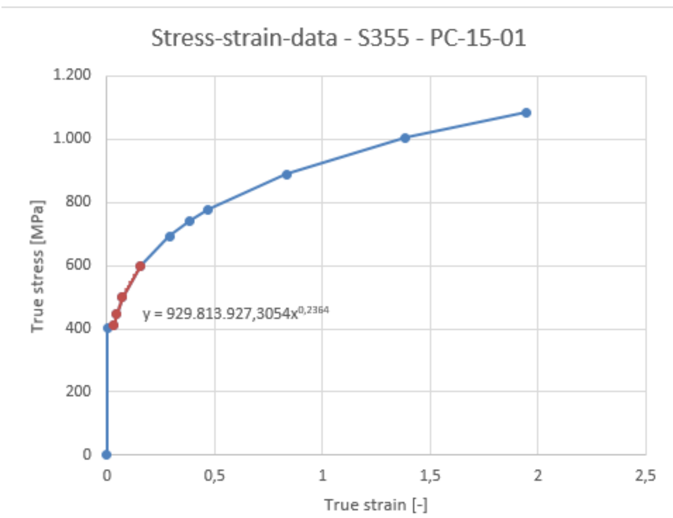
Tensile tie rod - mesh size ~2mm with linear 3D reduced integration elements



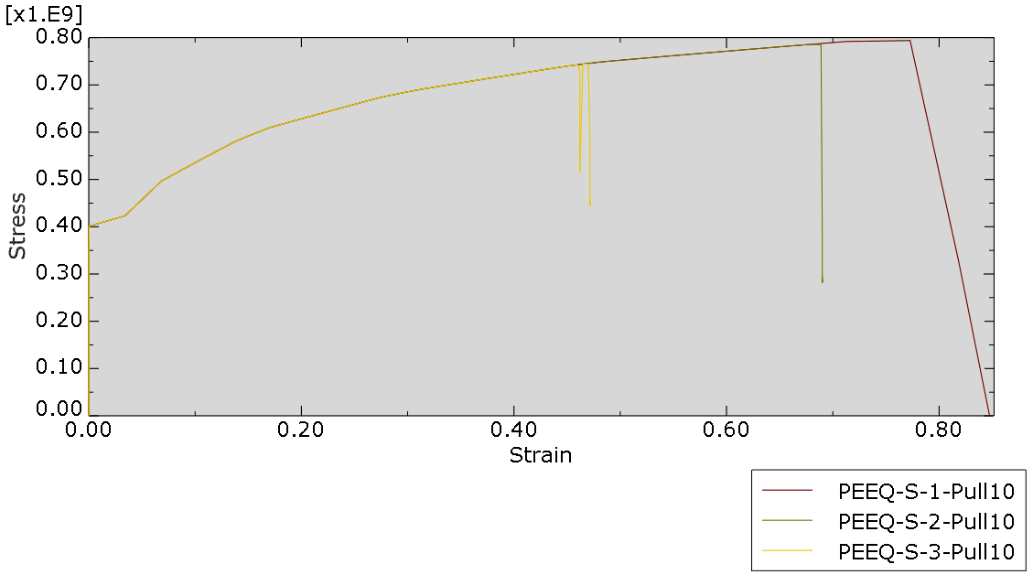
Resulting force-displacement graph from test (60mm measurement length around the necking area on the 6mm diameter S355 steel specimen)



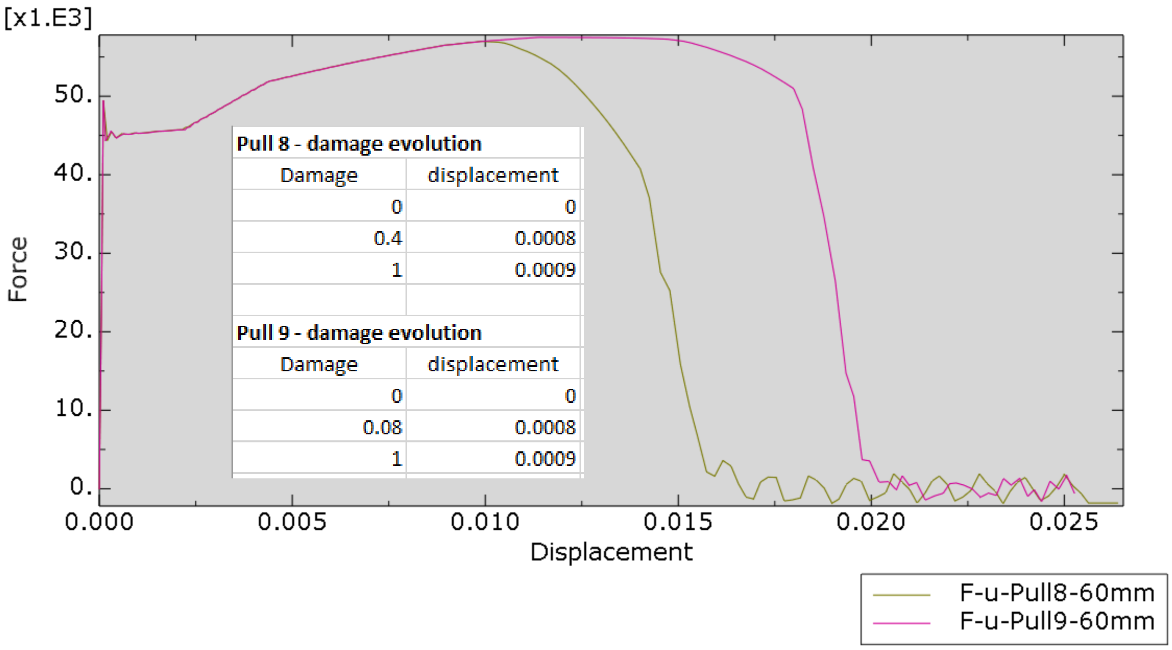
Material data



Von-Mises-Stress / PEEQ-strain plot of three elements close to the failure zone
The elements follow the same stress-strain path and seem to have the same degradation, but the final failure / sudden increase of degradation and element deletion occurs at completely different strain / elongation levels...



Simulation result of two different failure parameter definitions (only damage level changed at displacement of 0.0008 m). The displacement is measured on a 60mm long section including the necking area.
--> failure of the rod shifted to a much earlier and quicker failure. And reaction force at the onset of failure due to change of slope in the damage definition is lower (as expected).



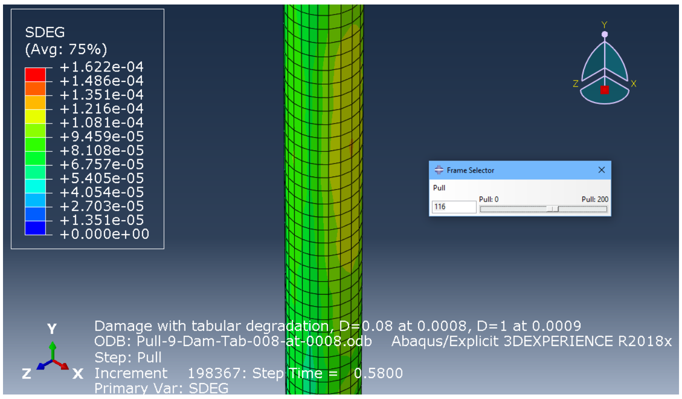
Pull 8 - damage evolution

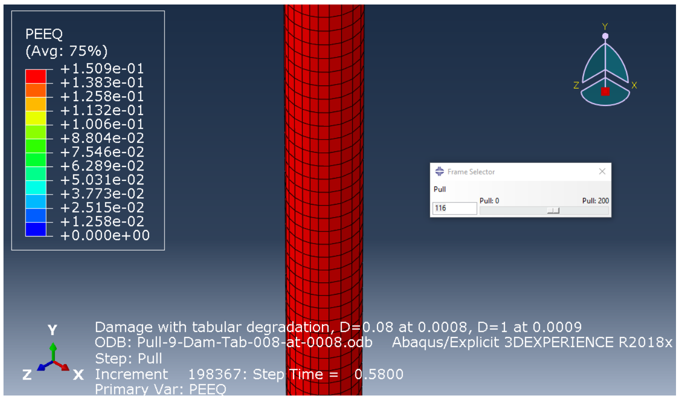
Damage	displacement
0	0
0.4	0.0008
1	0.0009

Pull 9 - damage evolution

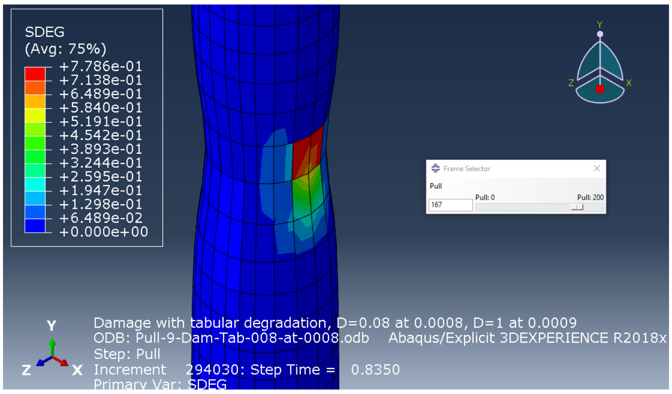
Damage	displacement
0	0
0.08	0.0008
1	0.0009

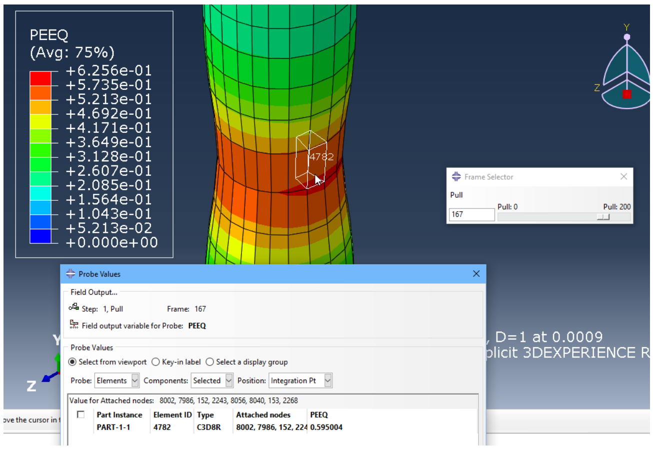
Strain at onset of degradation in simulation Pull 9: 0,15 - as defined in material data
(I know these are averaged node values, but the integration point values are similar!)





And now thre strange part - e.g. in model Pull 9:
Strain at the onset of failure - change of damage-slope at D=0,08: 0,59 !!
According to the material definition with u_f^pl=0,0008, I understood that the true (logarithmic) plastic strain at this point should be u_f^pl / L ~ 0,0008 / 3,5 mm = 0,228. And in addition, all the elements have this point at different strain values... ???





Apart from the above information, a logarithmic strain of 0,6 means an elongation of the element of (EXP(0,6)-1)*L=0,8*L = 0,8*2mm = 1,6mm. This is a elongation twice as big as the defined limit for the plastic displacement at failure of u_f^pl=0,0008 (=0,8mm) as defined for ductile failure model...
Where is my mistake???