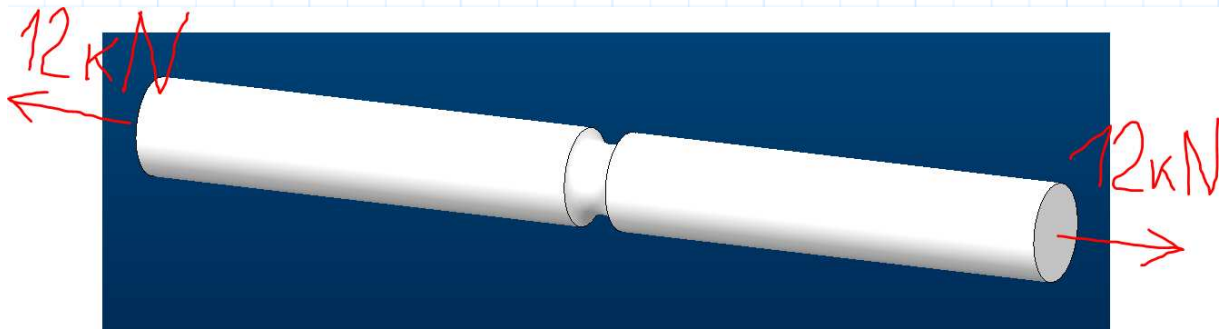


Plasticity Corrections for Elastic Analysis Results: Neuber Method

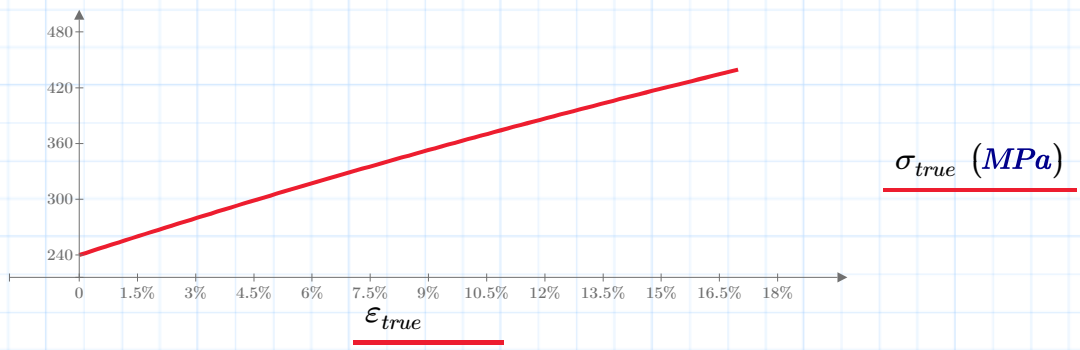
1. Load 12 kN



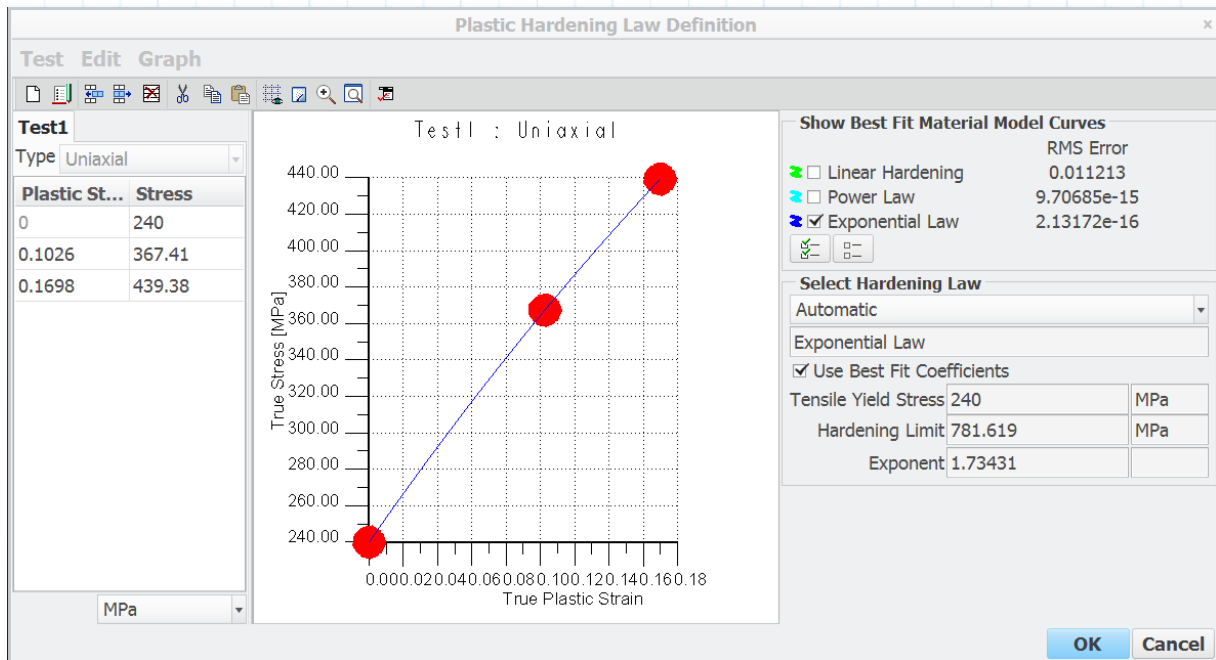
2. Material S235

```
f := READEXCEL (“..\..\0_FEM\neuber\mat_curve.xlsx”, “Tabelle1!A1:B101”)
```

| | | | |
|--------------------------------|--|--|---|
| $\epsilon_{true} := f^{(0)} =$ | $\begin{bmatrix} 0 \\ 0.17\% \\ 0.34\% \\ 0.509\% \\ 0.679\% \\ 0.849\% \\ 1.019\% \\ 1.189\% \\ 1.358\% \\ 1.528\% \\ 1.698\% \\ 1.868\% \\ \vdots \end{bmatrix}$ | $\sigma_{true} := f^{(1)} \cdot MPa =$ | $\begin{bmatrix} 240 \\ 242.298 \\ 244.59 \\ 246.875 \\ 249.153 \\ 251.424 \\ 253.689 \\ 255.947 \\ 258.199 \\ 260.444 \\ 262.682 \\ 264.914 \\ \vdots \end{bmatrix} MPa$ |
|--------------------------------|--|--|---|



3. Creo Simulate non-linear



Static Analysis Definition

Name: test_a

Description:

Nonlinear / Use Load Histories Inertia Relief

Nonlinear Options

- Calculate Large Deformations
- Contacts
- Hyperelasticity
- Plasticity
- Nonlinear Springs

Constraints

| Constraint Set / Component | Time Dependence |
|---|-----------------|
| <input checked="" type="checkbox"/> ConstraintSet1 / FE_EXAMP | f(*) ramp |

Loads

| Load Set / Component | Time Dependence |
|---|-----------------|
| <input checked="" type="checkbox"/> LoadSet1 / FE_EXAMP | f(*) ramp |

Temperature Distribution **Convergence** Output Excluded Elements

Method

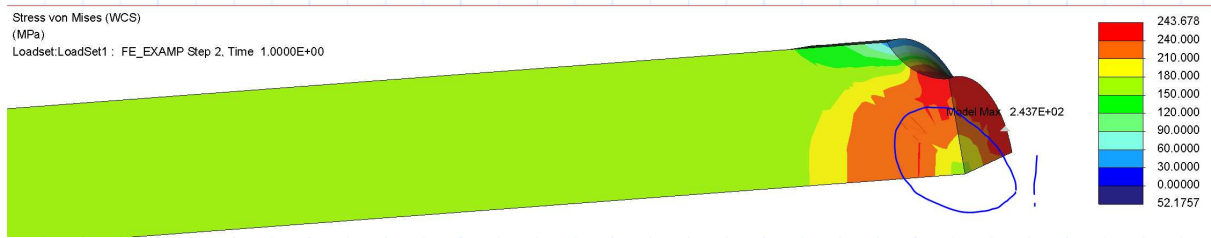
Single-Pass Adaptive

Include Snap-through

Localized Mesh Refinement Check Contact Force

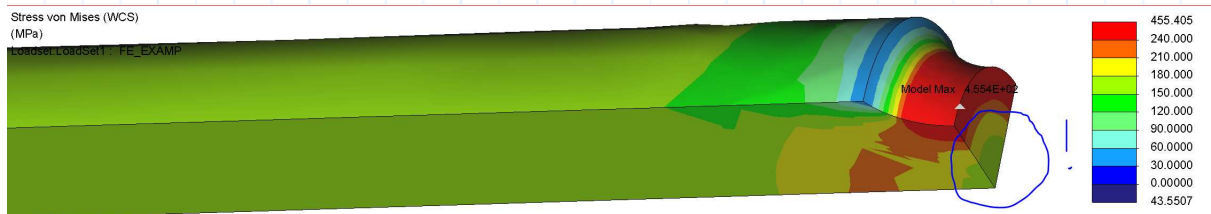
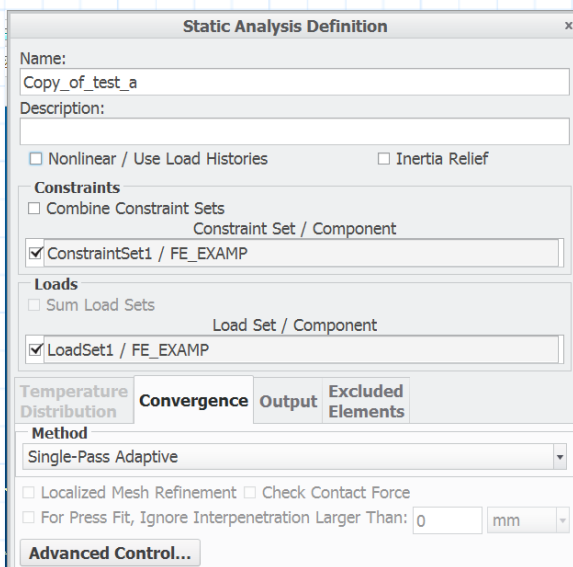
For Press Fit, Ignore Interpenetration Larger Than: 0 mm

Advanced Control...



$$\sigma_{vm_true} := 244 \text{ MPa}$$

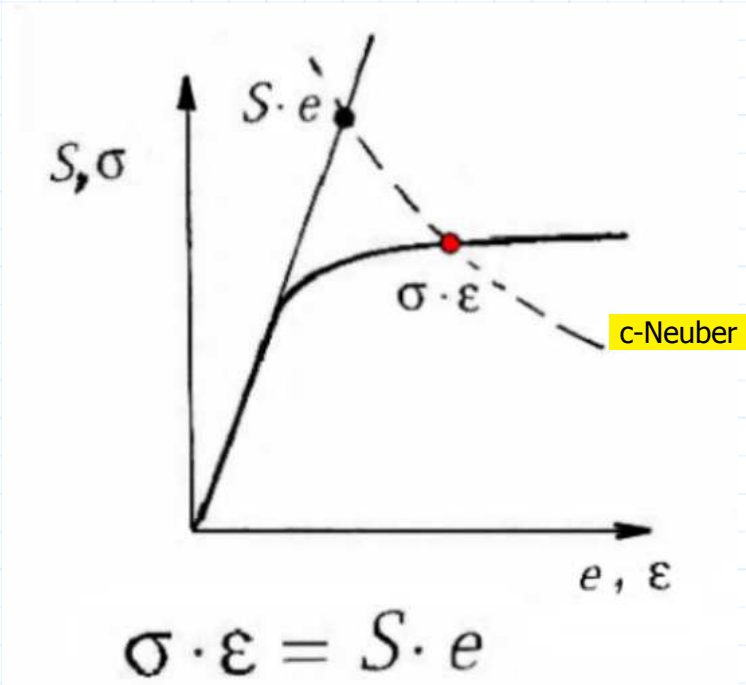
4. Creo Simulate linear



$$\sigma_{vm_max} := 455 \text{ MPa}$$

$$E := 210000 \text{ MPa}$$

5. Neuber Method



$$\sigma_{vm_max} = 455 \text{ MPa}$$

$$c := \frac{\sigma_{vm_max}^2}{E} = 0.986 \text{ MPa}$$

$$c_1 := \sigma_{true}^{\widehat{1}} \cdot \varepsilon_{true}^{\widehat{1}} = 0.411 \text{ MPa}$$

$$\sigma_{true}^{\widehat{1}} = [242.298] \text{ MPa}$$

$$c_2 := \sigma_{true}^{\widehat{2}} \cdot \varepsilon_{true}^{\widehat{2}} = 0.831 \text{ MPa}$$

$$\sigma_{true}^{\widehat{2}} = [244.59] \text{ MPa}$$

$$c = 0.986 \text{ MPa}$$

$$\sigma_{vm_neuber} = (244 - 246) \text{ MPa}$$

$$c_3 := \sigma_{true}^{\widehat{3}} \cdot \varepsilon_{true}^{\widehat{3}} = 1.258 \text{ MPa}$$

$$\sigma_{true}^{\widehat{3}} = [246.875] \text{ MPa}$$

$$\sigma_{vm_true} = 244 \text{ MPa}$$