BEUTH HOCHSCHULE FÜR TECHNIK BERLIN
University of Applied Sciences

Explizite Finite Elemente Methode

LV10: Masterkurs für MK-M, ME-M und PE-M

Materialverhalten nichtlinear mit großen Verzerrungen

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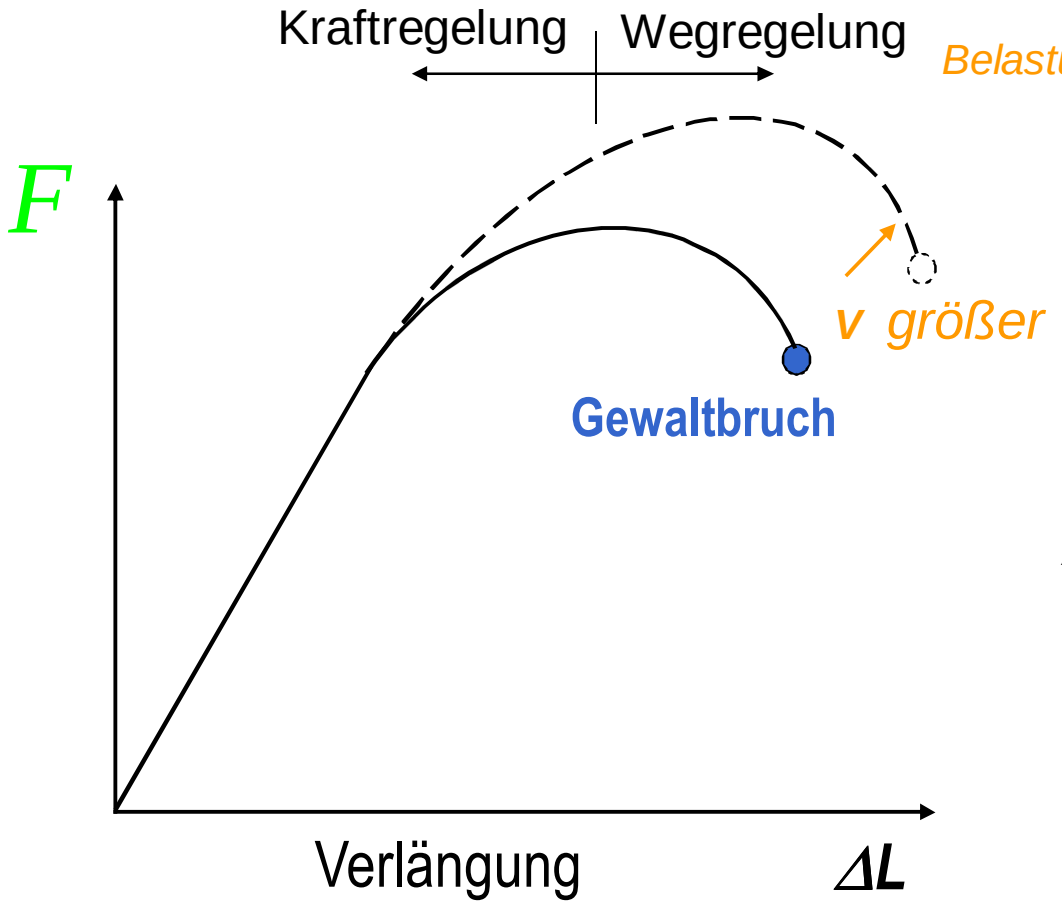
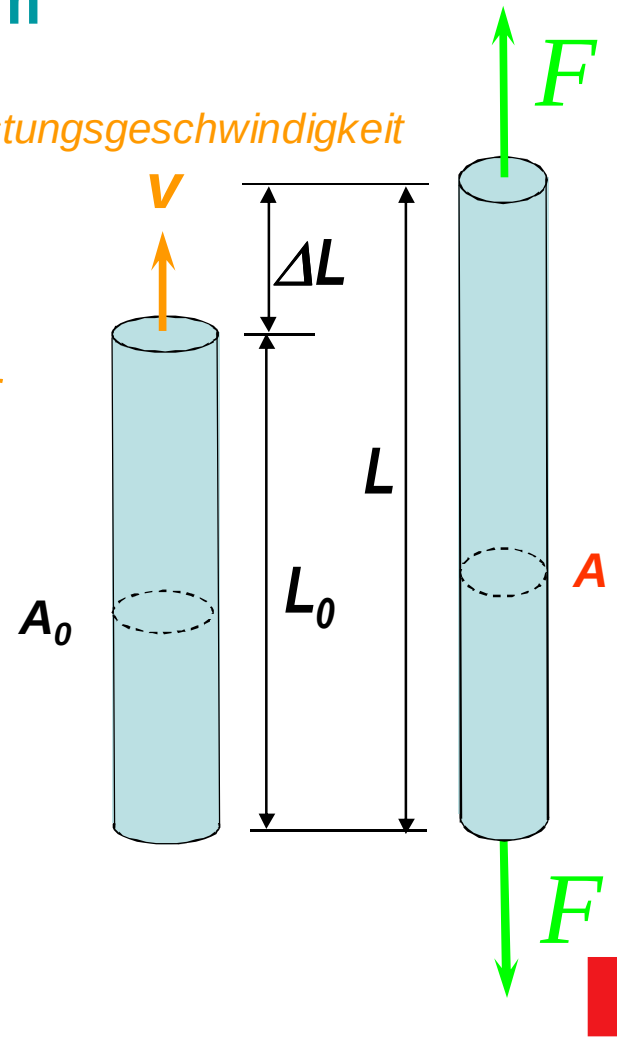
FB VIII: Maschinenbau, Veranstaltungstechnik, Verfahrenstechnik

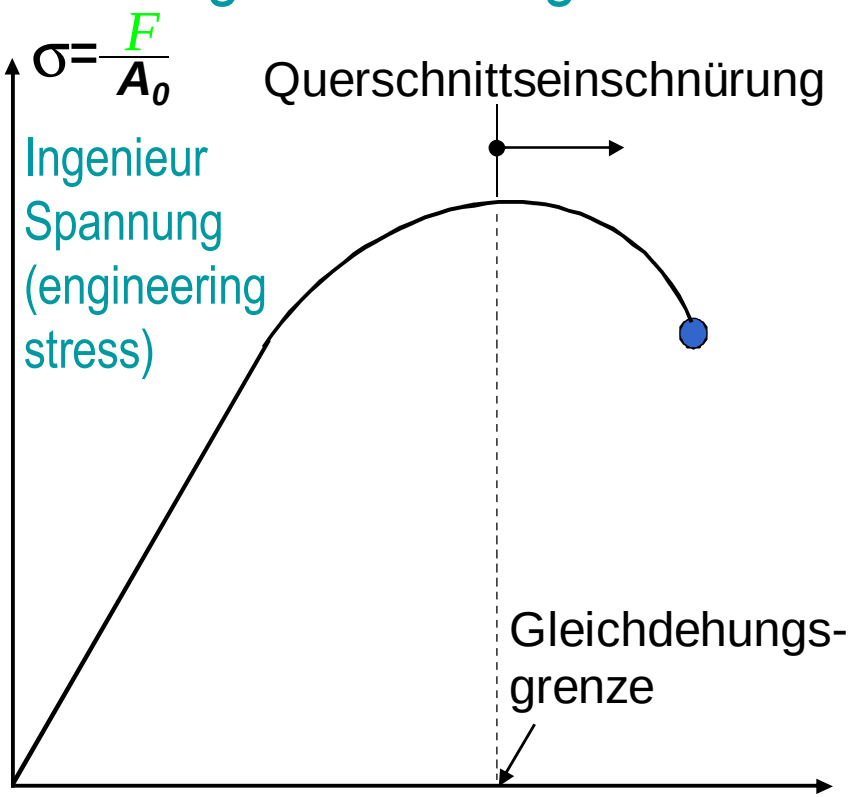
Zugversuch -> Kraft-Weg-Diagramm

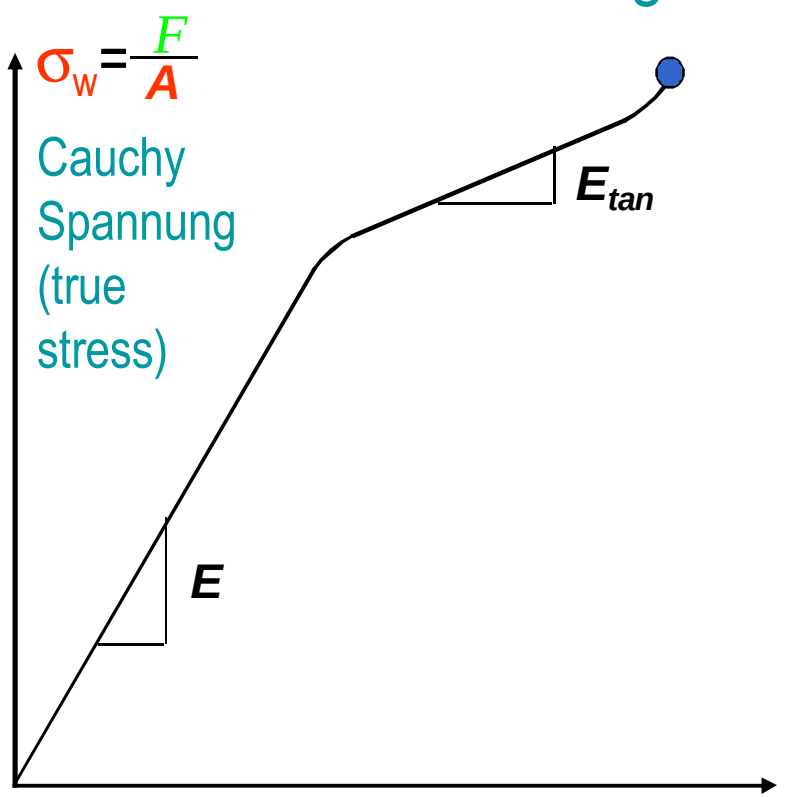




Spannungs-Dehnungs-Diagramme

ingenieurmäßige versus wahre Beschreibung



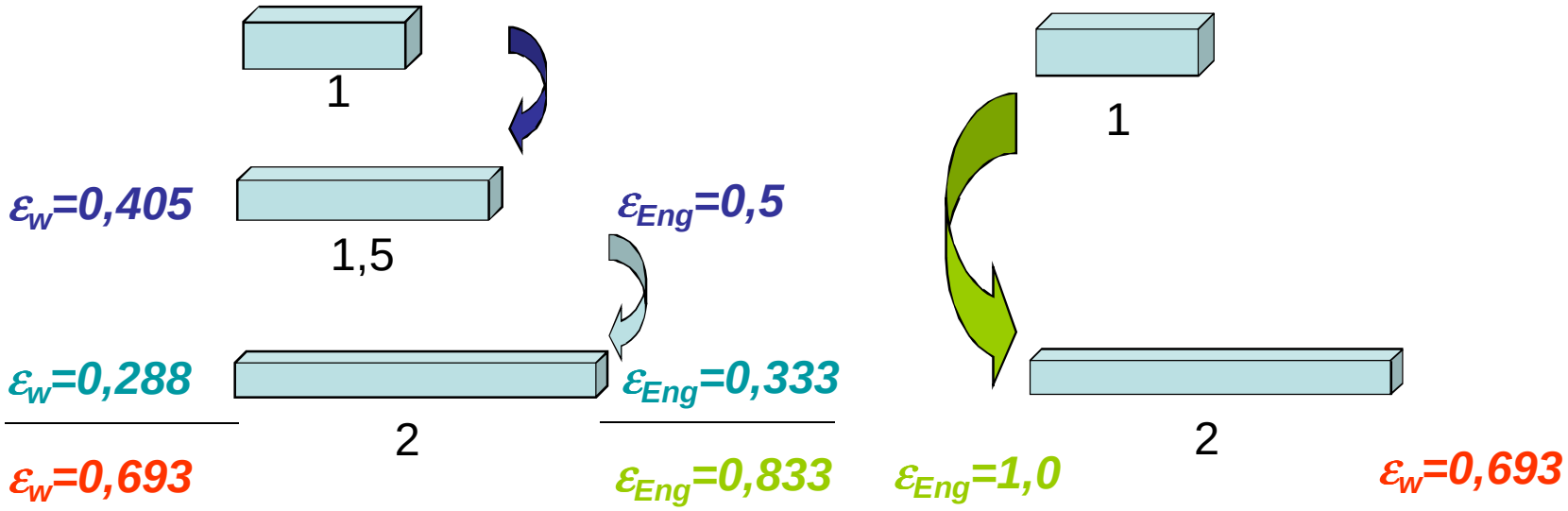


ingenieurmäßige Dehnung $\varepsilon = \frac{\Delta L}{L_0}$
(engineering strain ε_{Eng})

wahre Dehnung $\varepsilon_w = ln(\frac{L}{L_0})$
(true strain, logarithm.
o. Hencky strain ε_H)

Ingenieurdehung versus wahrer Dehnung

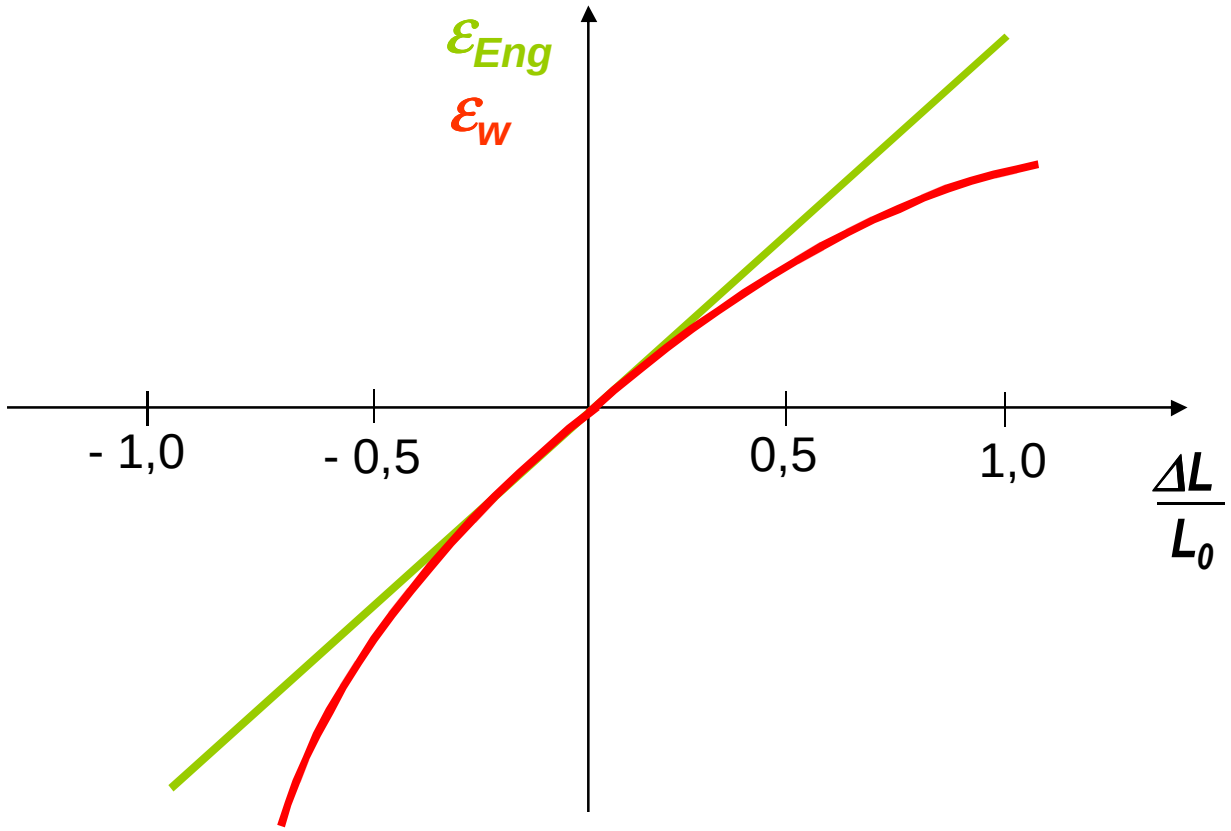
Verdopplung der Länge infolge Spannungen:



Bei Dehnungen > 0,04 sollte mit der wahren Dehnungen gerechnet werden.

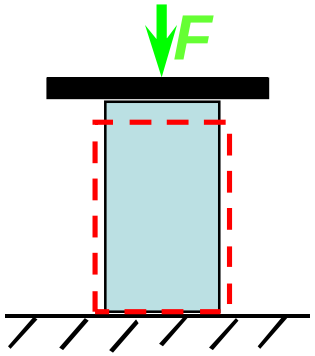
Ingenieurdehung versus wahrer Dehnung

$$\varepsilon_w = \int_{L_0}^{L} \frac{dL}{L} = \ln\left(\frac{L}{L_0}\right) = \ln\left(\frac{L_0 + \Delta L}{L_0}\right) = \ln(1 + \varepsilon_{Eng}) \approx \varepsilon_{Eng} - \frac{1}{2}\varepsilon_{Eng}^2$$

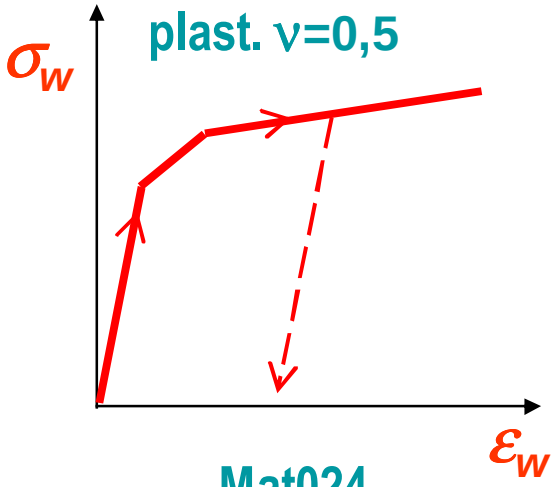


Nichtlineares verhalten von Werkstoffen

Metalle mit Fließeigenschaften

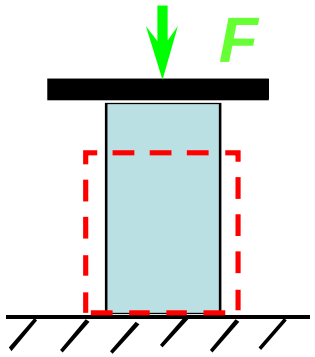


elast. ν=0,3
plast. ν=0,5

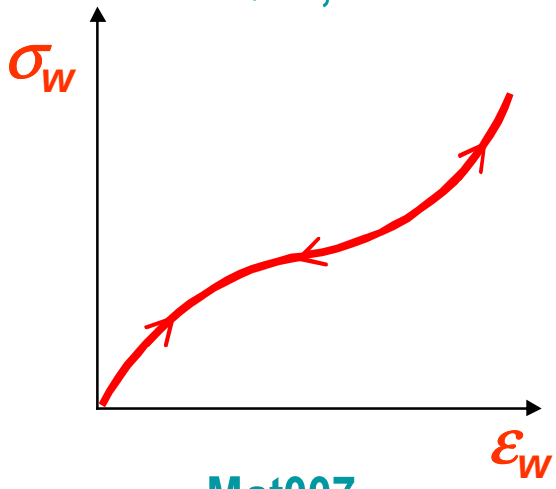


Mat024
piecewise

Gummi

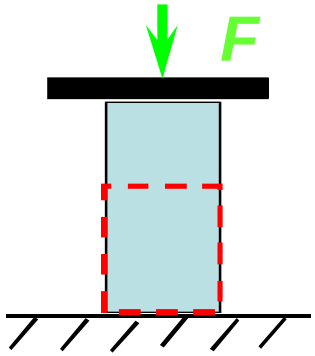


ν=0,5

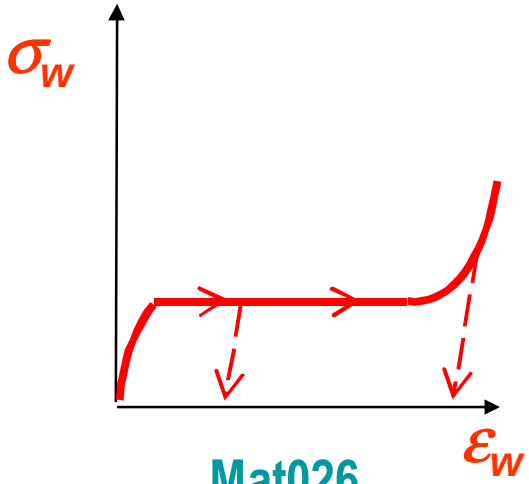


Mat007
Batz Ko Rubber

Schaumstoffe



ν=0



Mat026
Honeycomb