AD FALCON API Manual

Nonlinear Elasticity

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1 Nonlinear Elasticity

1.1 Syntax

This model is configured in `% Materials` as a user-defined mechanical material. Use `@UMAT:` with category `Mechanical` and pass the parameters as `name=value` pairs.

Example:

```
@UMAT: path/to/nonlinear_elastic.cpp path/to/nonlinear_elastic.hpp
Mechanical K0=400 G0=200 PATM=101325 P_min=1.0
```

The model employs two hypoelastic laws to describe the elastic behavior through bulk and shear moduli, characterized by K_0 and G_0 as the primary elasticity parameters.

1.1.1 Bulk Modulus

$$K = K_0 p_{atm} \frac{(1+e)}{e} \left(\frac{p'}{p_{atm}} \right)^{\frac{2}{3}} \tag{1}$$

1.1.2 Shear Modulus

$$G = G_0 p_{atm} \frac{(2.97-e)^2}{1+e} \left(\frac{p'}{p_{atm}} \right)^{\frac{1}{2}} \tag{2}$$