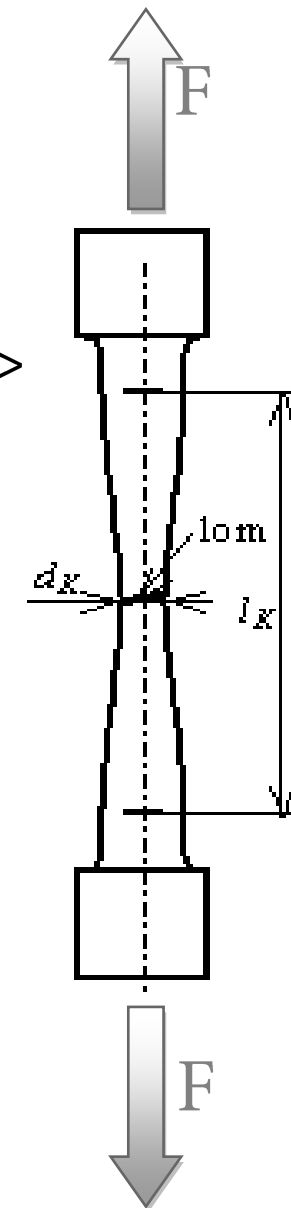
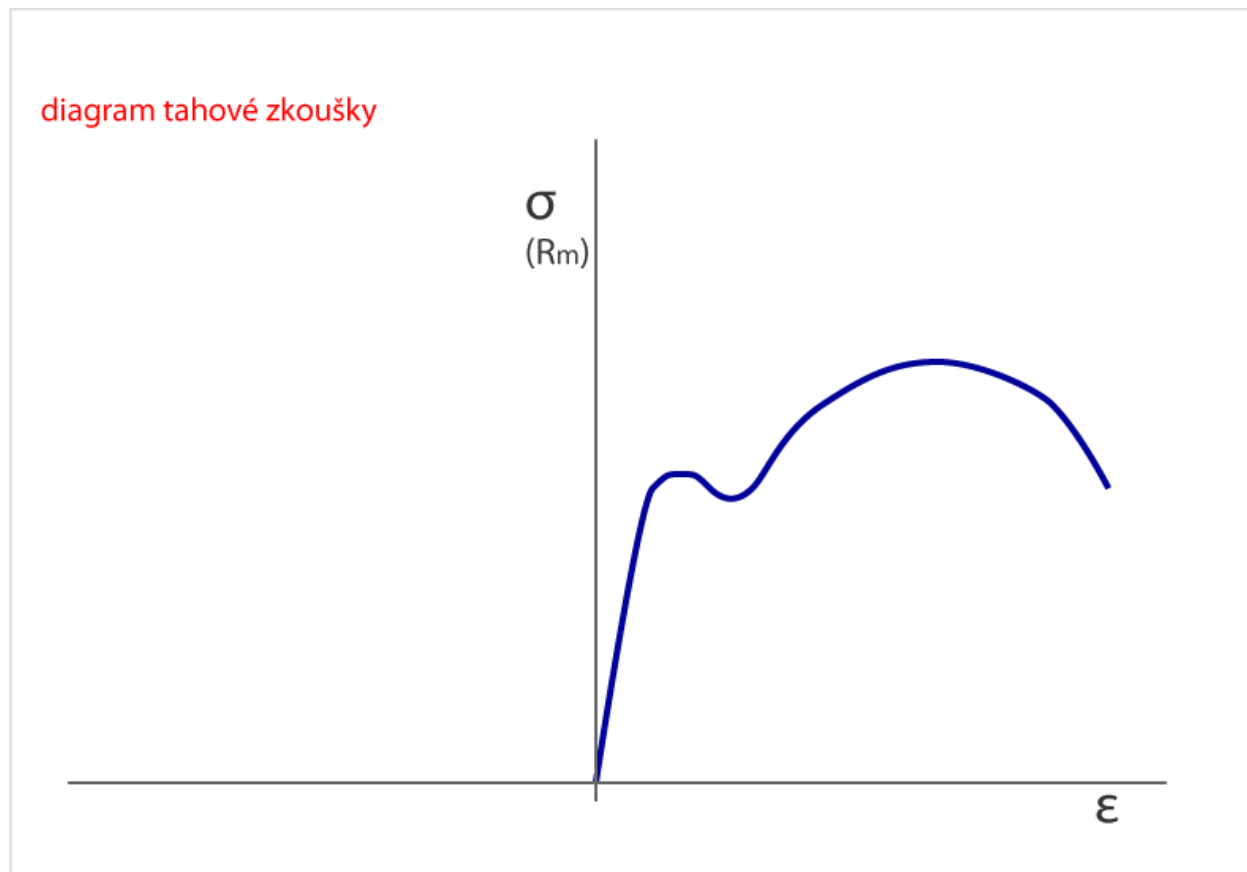


Necessary material characteristic for simple simulation for Linear strength analysis

Uniaxial **stress** / **strain** characteristic of material.

Stress, σ : uniaxial tension / **Strain ϵ** : proportional deformation

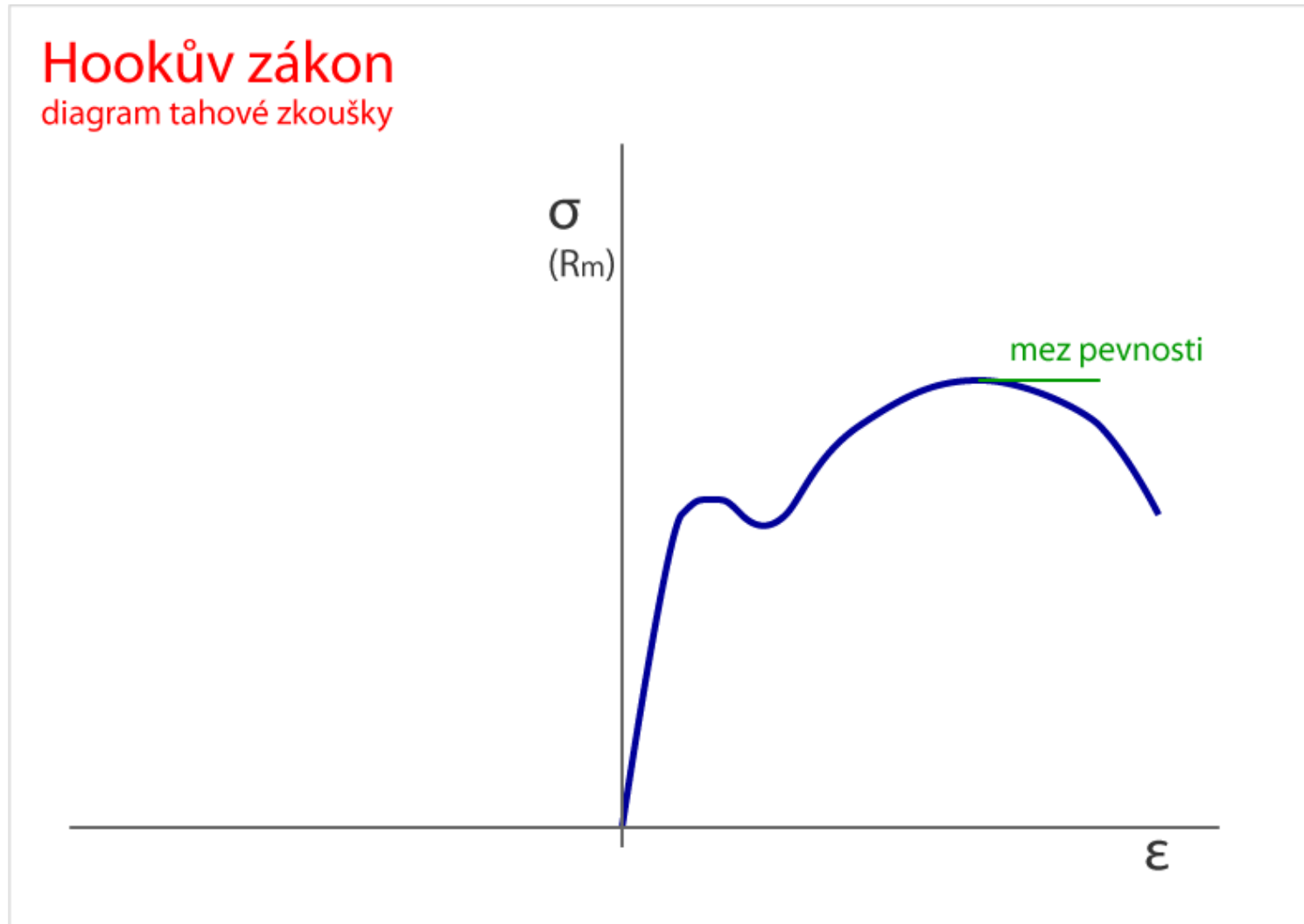
Steel beam specimen, uniaxial increasing loading >>



Strength limit

Uniaxial **stress** / **strain** characteristic of material.

- become material crash



Yield strength

Uniaxial **stress** / **strain** characteristic of material.

- become material yield (slip)



Elasticity limit

Uniaxial **stress** / **strain** characteristic of material.

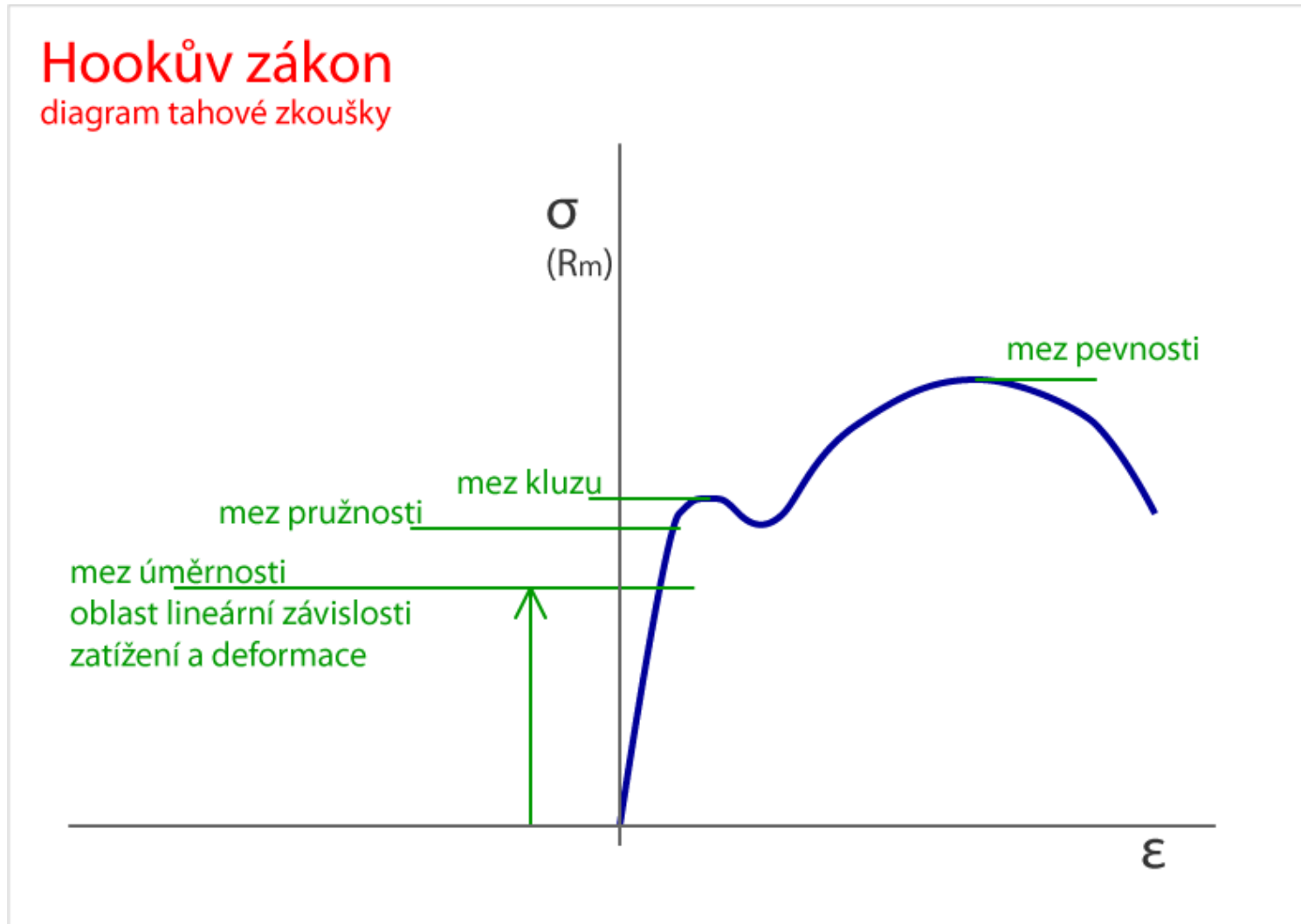
- limit of elasticity deformation, without permanent deformation - **hysteresis**



Linearity limit - Hook's law

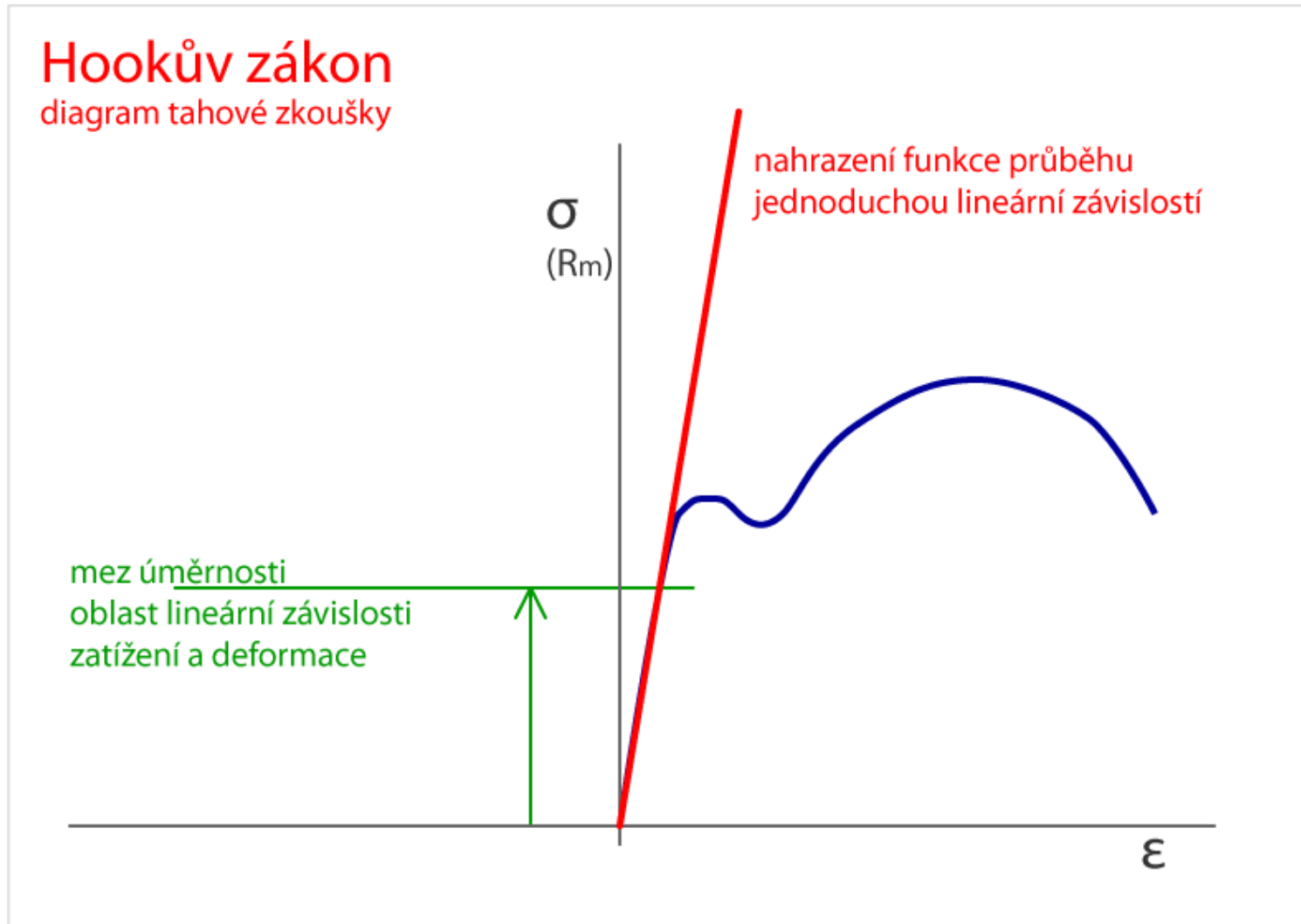
Uniaxial **stress** / **strain** characteristic of material.

- limit of linear characteristic



Simplification of simulation, use material linearity

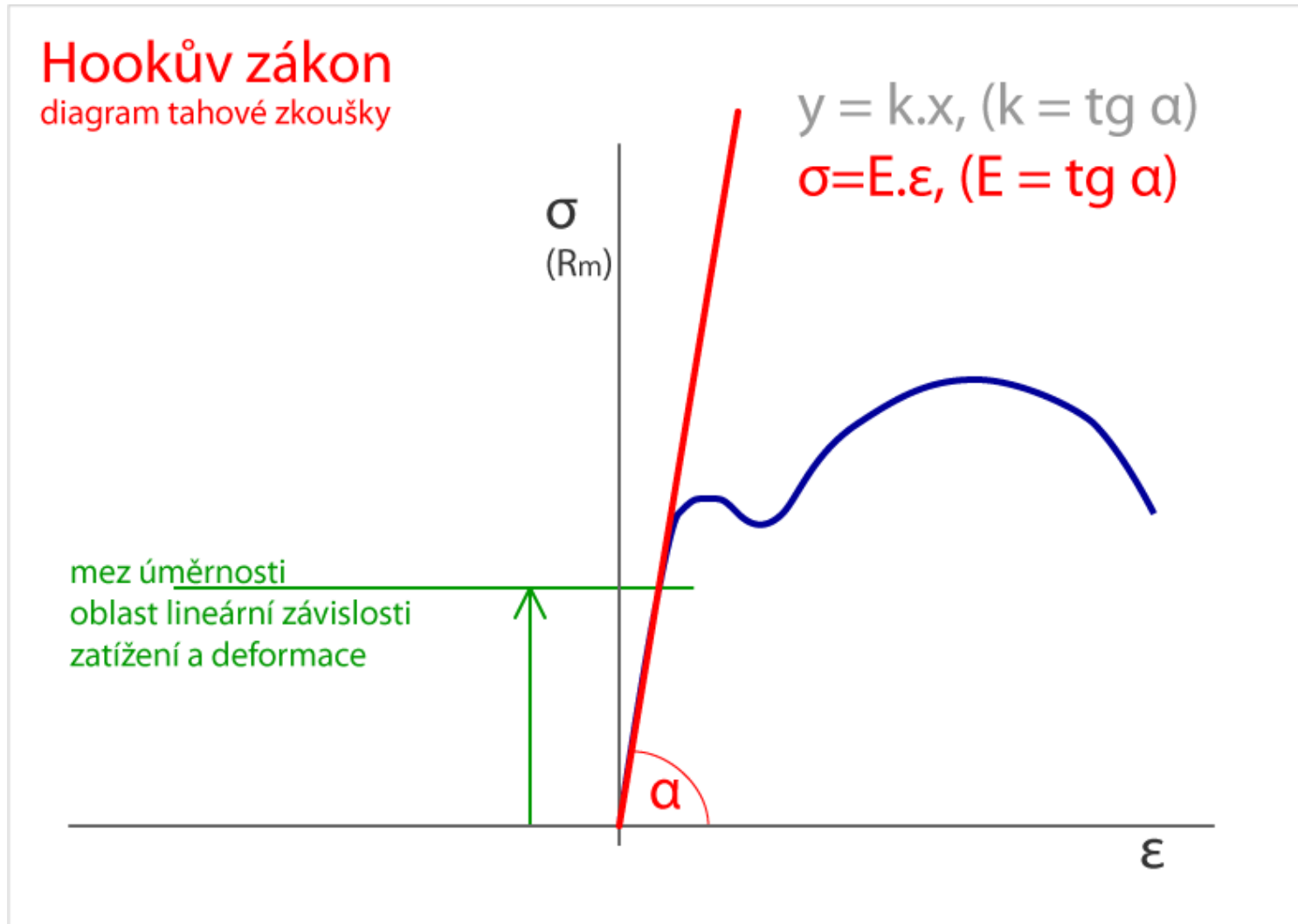
Replacing real characteristic with linear characteristic.



Simplification of simulation, use material linearity

Replacing real characteristic with linear characteristic.

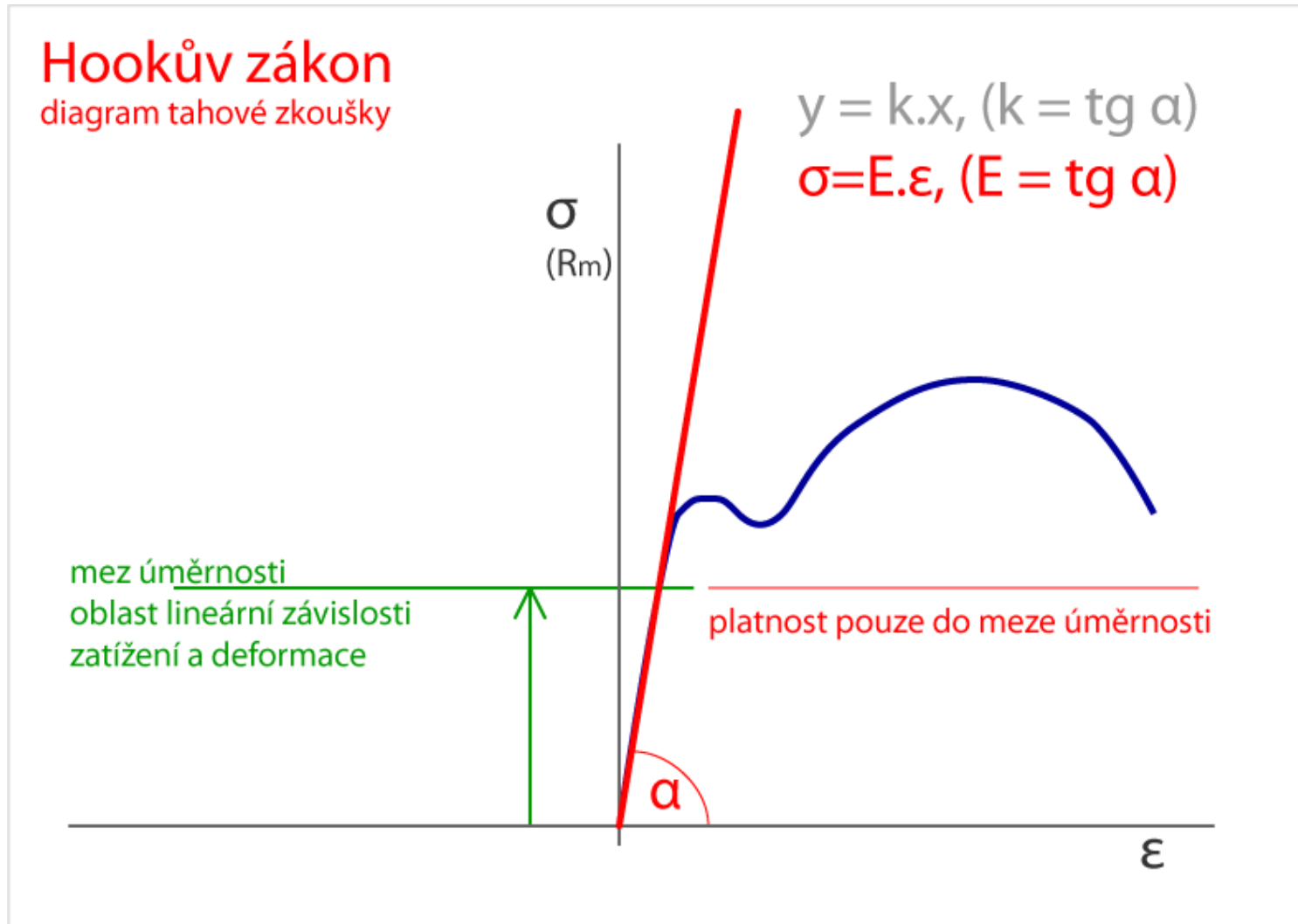
Simpler task. Don't need all complicated characteristic, but only one value **E**.



Hook's law, E: Young's modulus of elasticity

E: defines the slope of linear characteristic – angle: by tangent the angle α

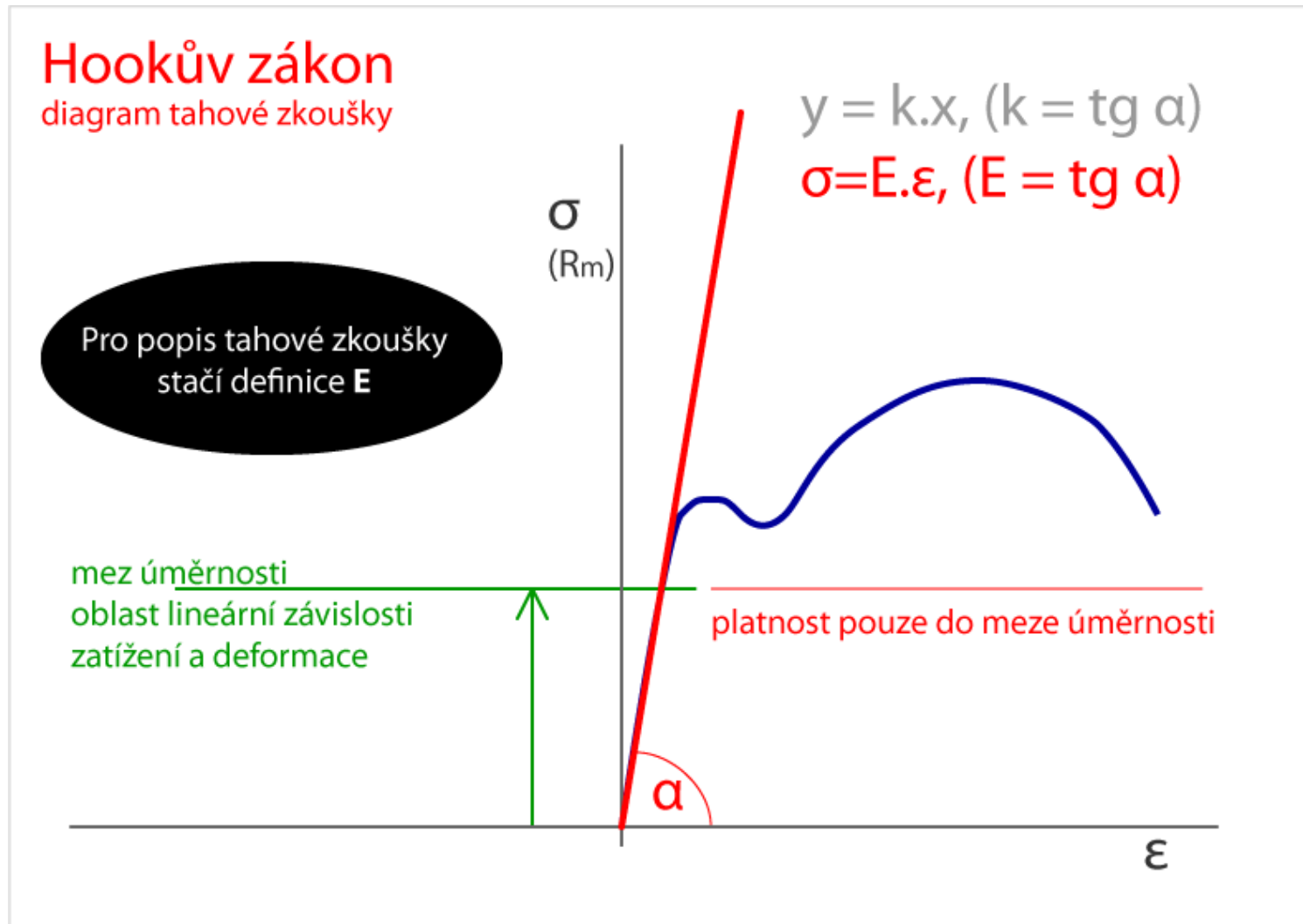
Unit: **Pa** (MPa, GPa), Value E for steel: approx **210 GPa**, $2,1 \cdot 10^5$ MPa



LINEAR MATERIAL or MATERIAL LINEARITY is SIMPLIFICATION

Real characteristic is replaced with linear characteristic by one value parameter E .

!!!!Attention!!!!: relevant results under linearity limit only





Hook's law

During the first phase increasing loading is the material characteristic stress/strain linear.

This is valid under the linear limit of material only.

Each material has a different the linear limit.

E Young's modulus of elasticity

Parameter defining the elasticity of the material during the first phase of loading.

E is determined by uniaxial tensile test.

E is angle of linear part of characteristic stress/strain.

More elastic material: Big or Low value of E?

More rigid material: Big or Low value of E?