

Compact unit for cost-effective punch velocity control

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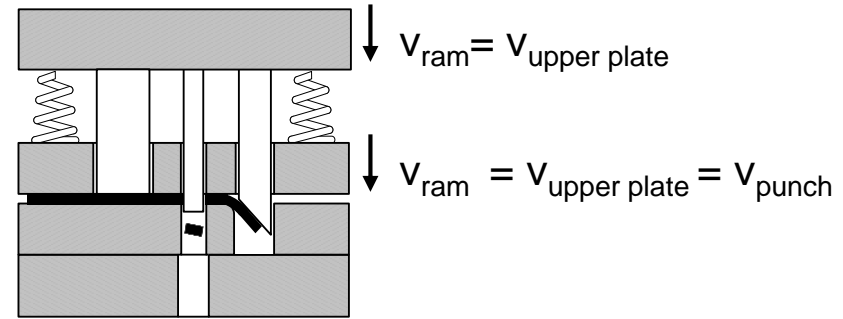
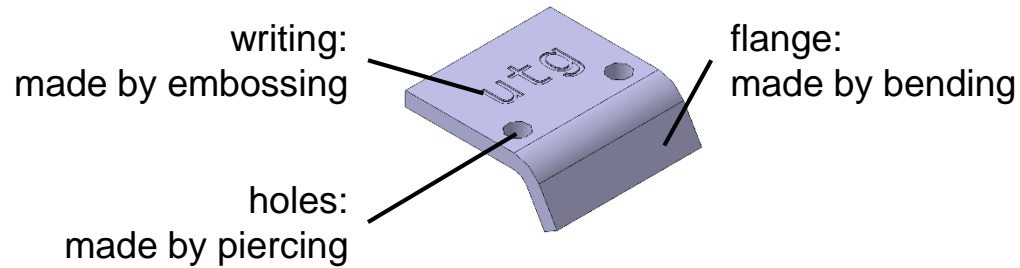
Motivation

Current approaches

Solution

Motivation

Upper plate of a stage tool mechanically couples the active elements



All active elements have the same velocity

"Slowest" manufacturing operation limits the tool's output

No possibility to adjust forming velocity to the manufacturing operation

Final tool velocity is always a compromise, leading to

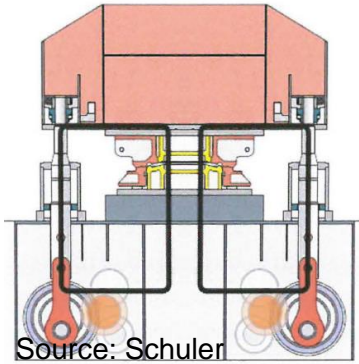
- Reduction of output
- Reduction of part quality
- Increased tool load

Current approaches to control the velocity of active elements

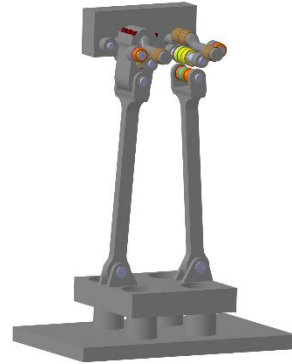
Approaches in press design



Hydraulic drive

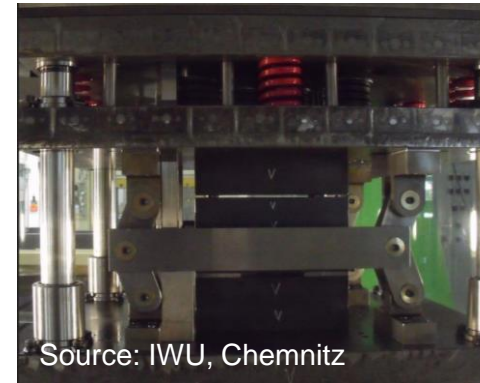


Servo drive

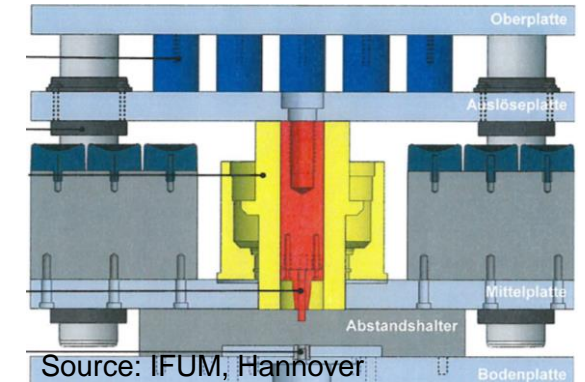


Complex gears
within press drive

Approaches in tool design Transmission to higher velocities only



Toggle lever

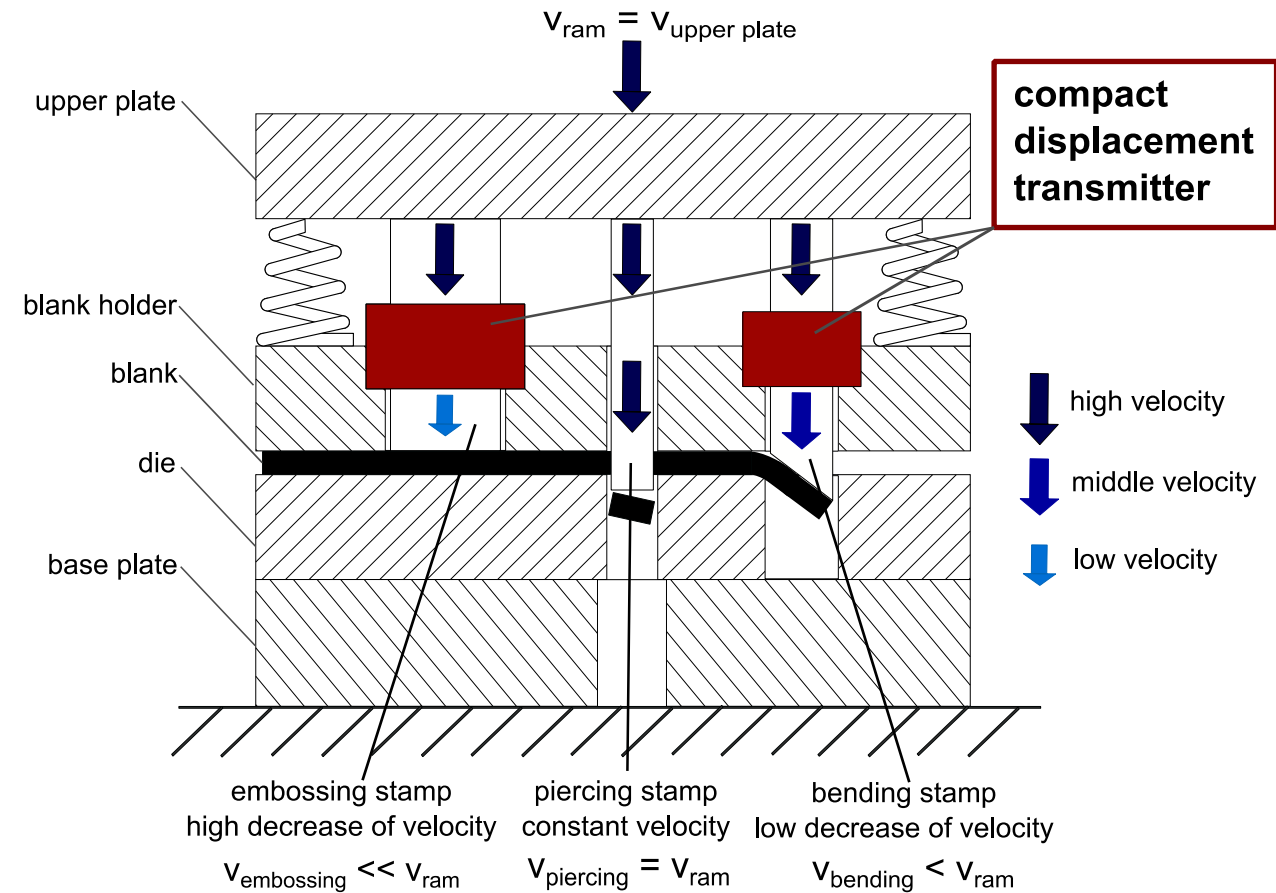


Unlock cylinder

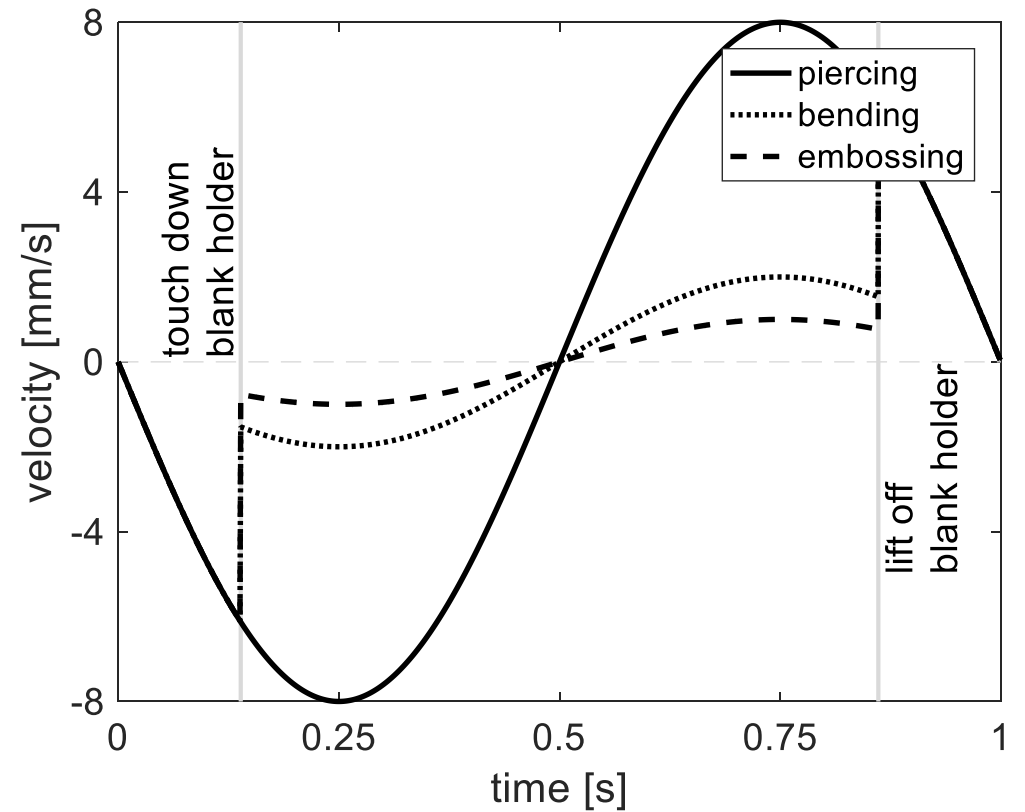
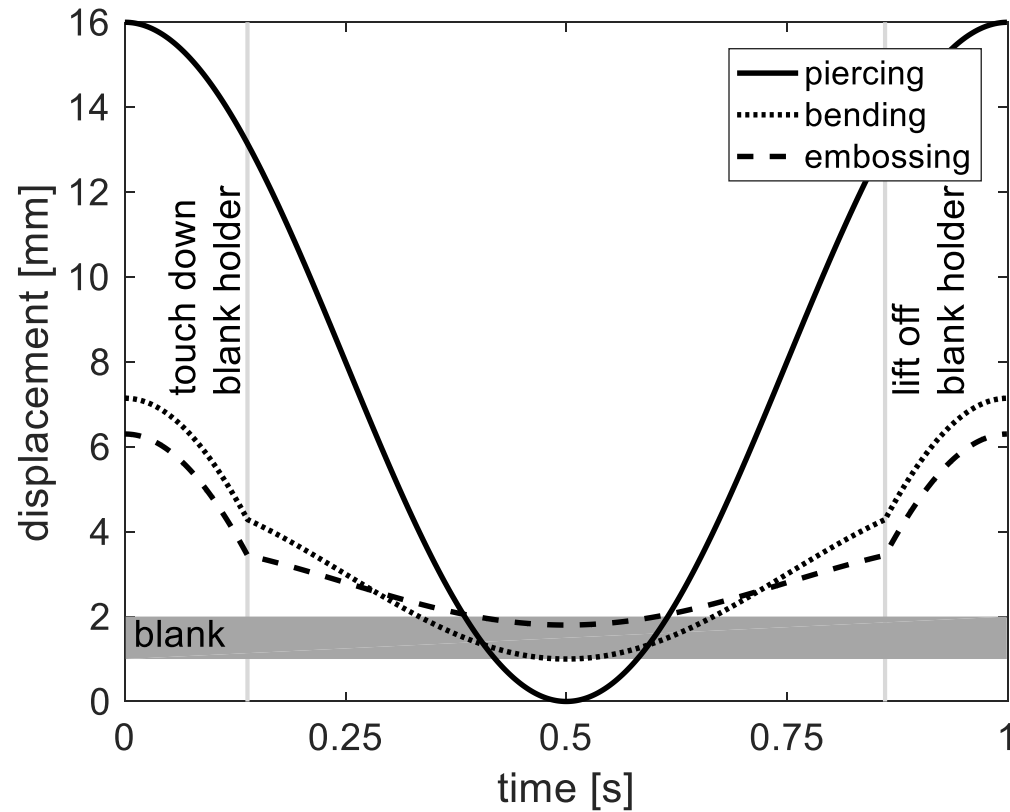
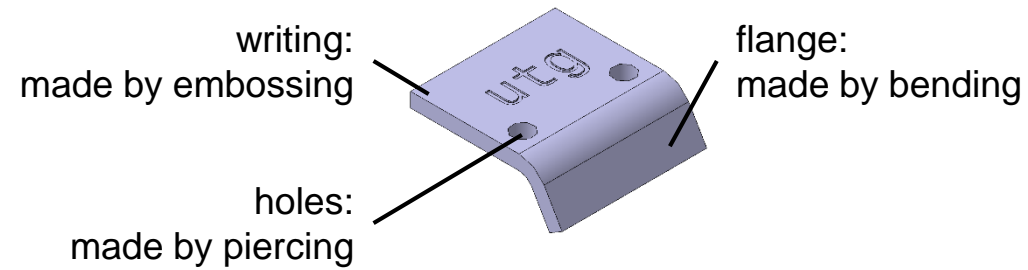
- No decoupling of the single manufacturing operations
- Approaches in tool design do not allow to reduce velocity
- Approaches have limited suitability for high stroke frequencies

Solution - Compact displacement transmitter

- Based on hydraulic displacement transmission
- Adjustable transmission ratio through mechanically adjusting the diameter of large and small punch
- Standardization possible
- Easy integration into new and existing tools
- Velocity increase and decrease possible
- Small component that fits nearly everywhere
- No change of position of bottom dead center with increased production rate



Stroke graphs of punches in tools with displacement transmitter



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