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Concept of the hybrid machining: the laser machining and milling

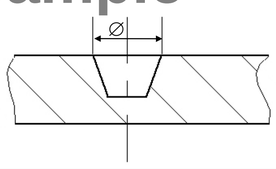
Résumé [1]

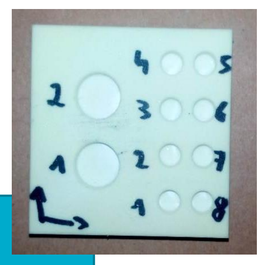
La micro-fabrication connait de plus en plus de succès dans la miniaturisation permettant de développer des outils de diagnostics, la micro- mécanique, les micro-fluidiques et l'électronique. Les composants céramiques sont plus intéressants dans certaines applications, en raison de leur résistance à la corrosion, mais également de l'isolation thermique et du point de fusion élevé.

La mise en forme de la céramique n'est pas aisée. L'usinage d'une céramique peut se faire dans différents états lors de sa production.

Le but est de développer une machine-outil hybride en couplant les avantages de deux technologies: le laser et le fraisage.

Sample

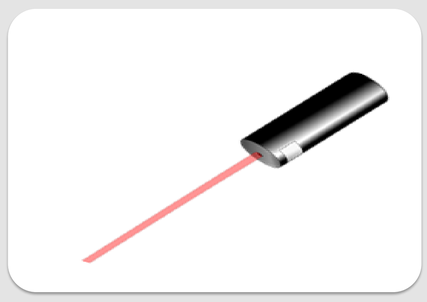




Conical holes:
- 2: ∅10
- 8: ∅5

Taper angle of 10°
Depth of 3 mm

Hybrid concept [2-3]



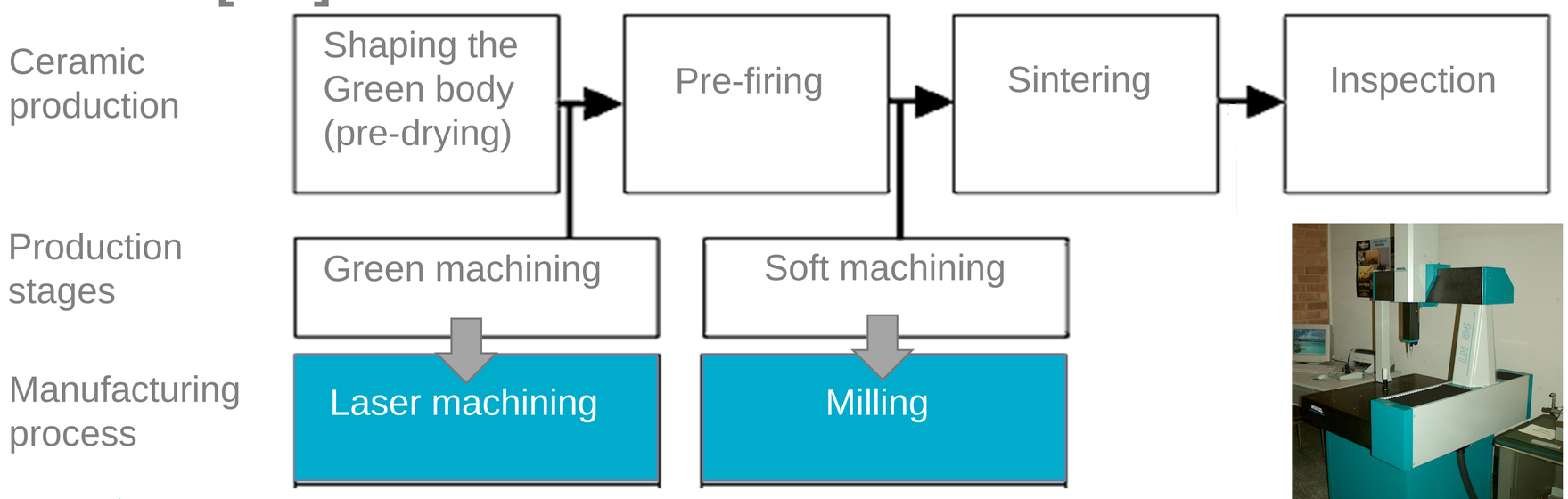
Milling
- Limited miniaturisation
- Tool contact
- Vibration

Hybrid
- High MRR
- Roughness control

Machining
- Excellent miniaturisation
- Tool non-contact
- Texturing

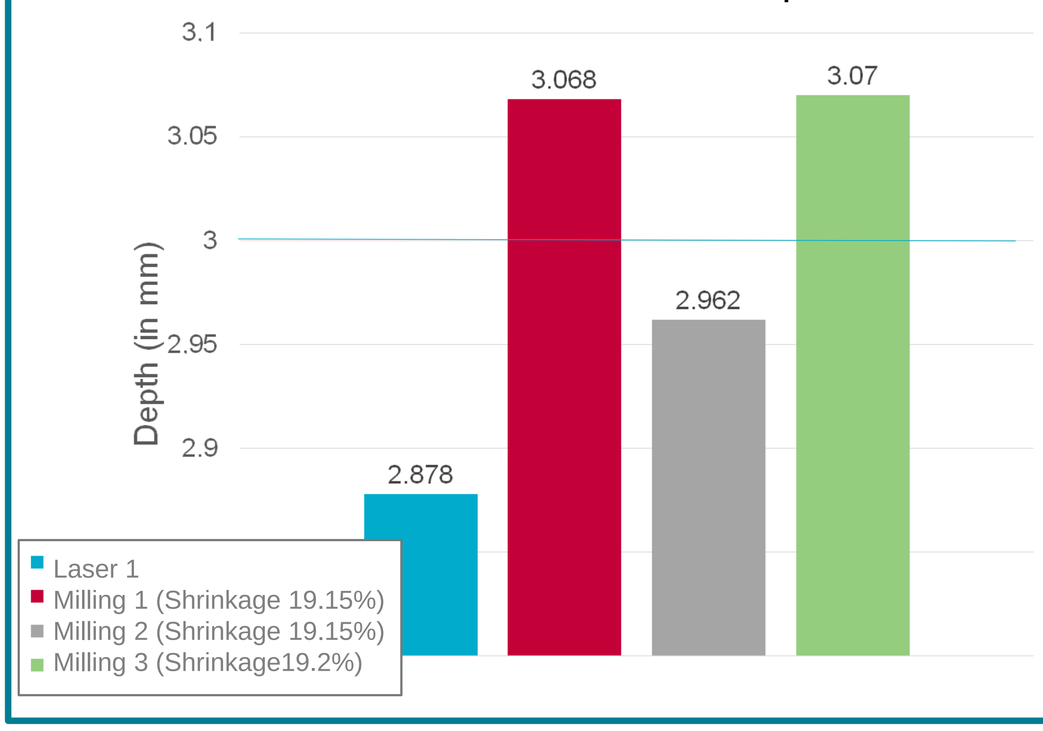
Laser Machining
- Low MRR
- Roughness control
- Taper angle

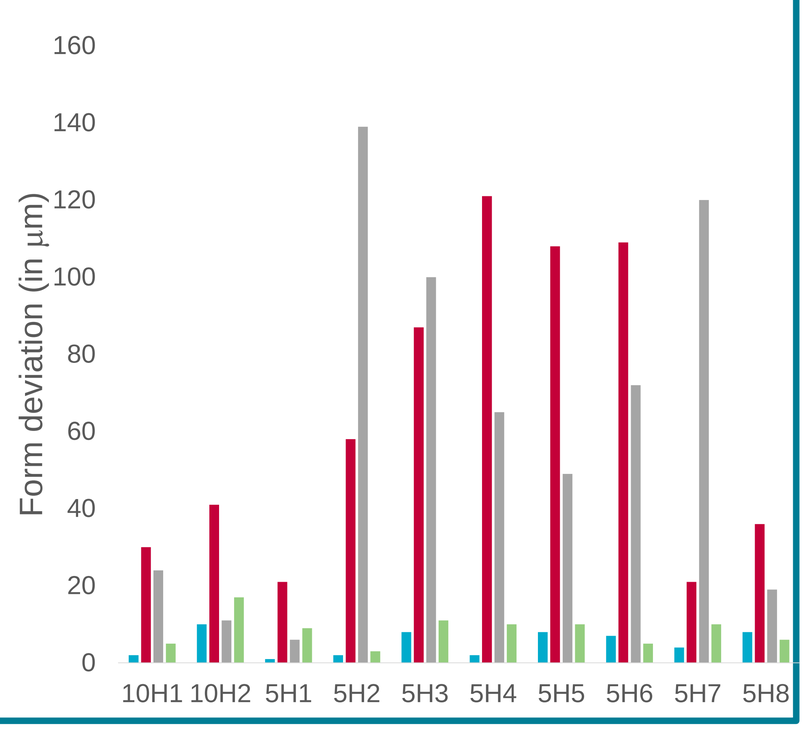
Method [4-5]



Coordinate measuring machine is used to compare each process

Results





Conclusion

- Control to removal material
  - ✚ Milling
  - ▬ Laser machining
- Tool-material contact
  - ✚ Laser machining
  - ▬ Milling

Perspectives

Development of the hybrid machining:
- Control of the tool position
- Optimizing sequential combination 2D/3D

Acknowledgment

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