



## **Title: CAD-CAE-CAM technology in the manufacture of a prototype of a 3-jaw chuck with independent jaws in acrylic**

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**Editorial label ECORFAN: 607-8695**

**BCIERMMI Control Number: 2022-01**

**BCIERMMI Classification (2022): 261022-0001**

**Pages: 15**

**RNA: 03-2010-032610115700-14**

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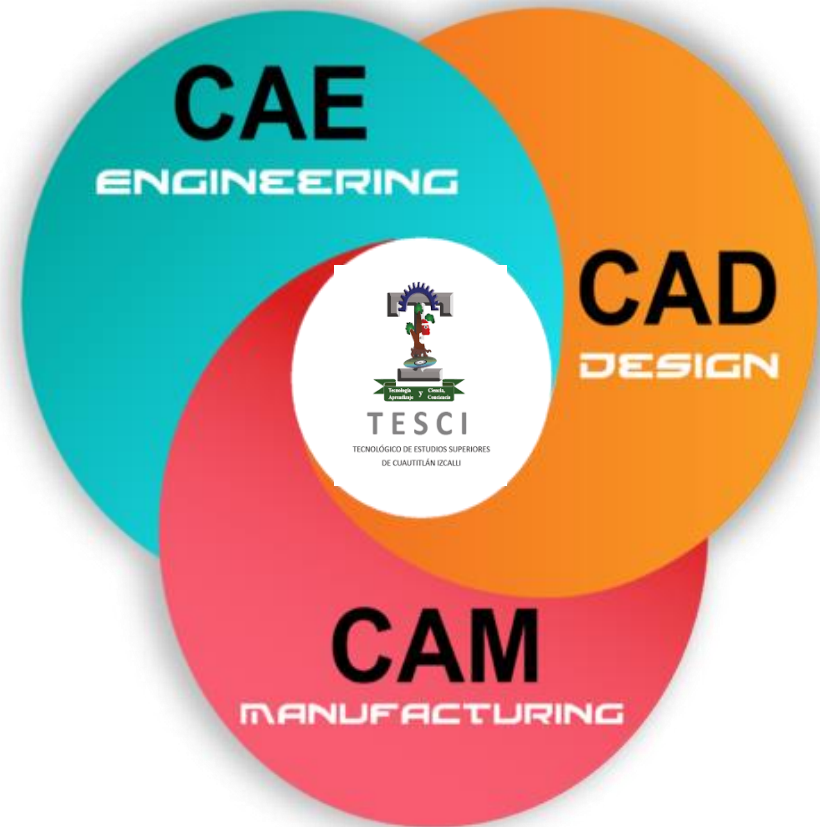
Mexico	Colombia	Guatemala
Bolivia	Cameroon	Democratic
Spain	El Salvador	Republic
Ecuador	Taiwan	of Congo
Peru	Paraguay	Nicaragua

# Introduction

- Application of CAD, CAM, CAE technologies.

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- Set of tools that allow a prototype to be made, from design to manufacturing, with significant savings in time and money. Improve the quality of your products, optimizing design, materials, and manufacturing process



# Introduction

2021 a 23% increase in the consumption of machine tools was projected .

(<https://www.mms-mexico.com/columnas/crece-la-demanda-de-tecnologia-para-la-manufactura-en-2021-a-escala-mundial>).



*Personnel employed in manufacturing*  
(fuente ,([Industria manufacturera \(inegi.org.mx\)](http://inegi.org.mx))

# Introduction

Chucks on the market, 3-jaw spiral chuck and 4-jaw independent chuck.



3-jaw chucks [mandril de 3 mordazas - Bing images](#)

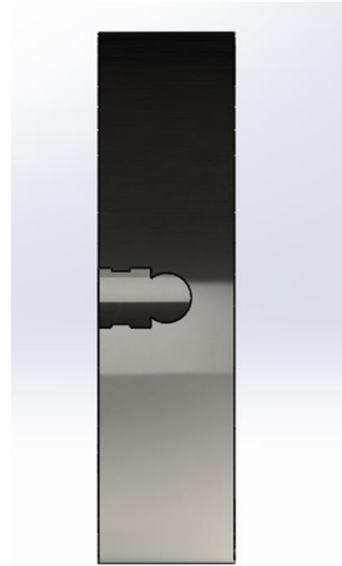


chuck 4  
jaws  
[mandril de 4 mordazas - Bing images](#)

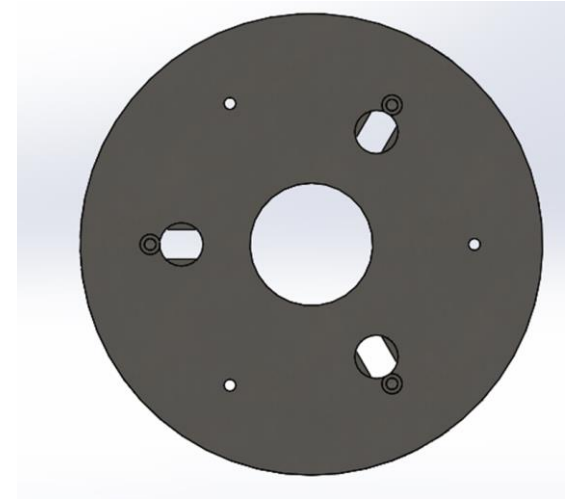
# Methodology

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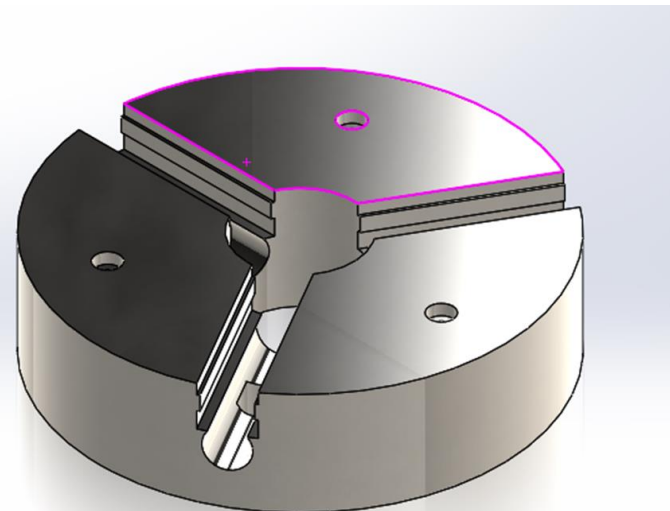
Prototype design in CAD, we start with the design of the housing with a diameter of 203.2 mm (8 inches) in diameter by 50.8 mm (2 inches) high, with 3 cavities for the jaws. acrylic material



Chuck casing, side view, own source



Chuck shell, rear view, own source



Chuck casing, own source

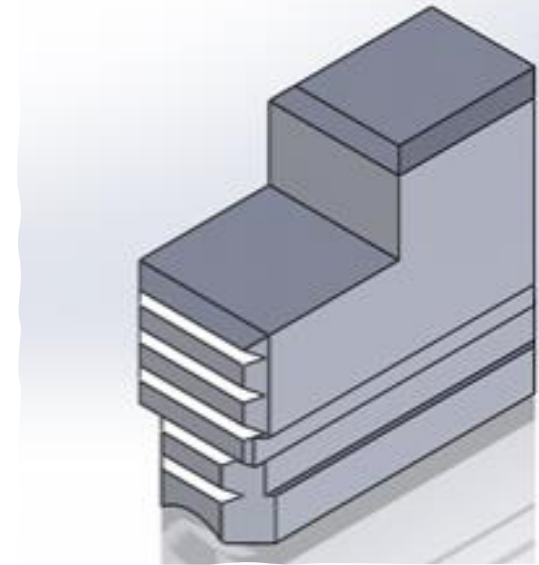
# Methodology

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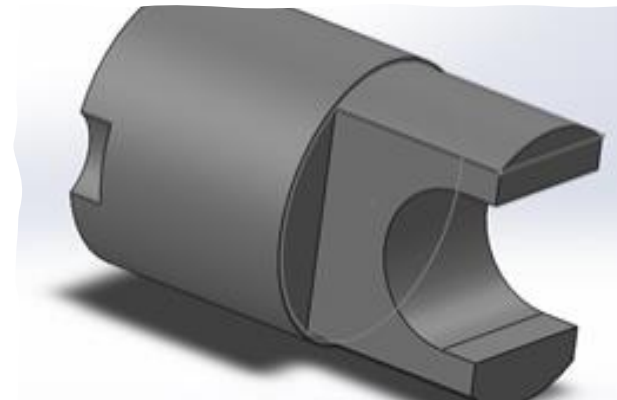
- CAD design of jaws, auger and fork assembly, 1060 aluminum material allocation



Endless screw, own source



Gag isometric view, own source



Own source fork

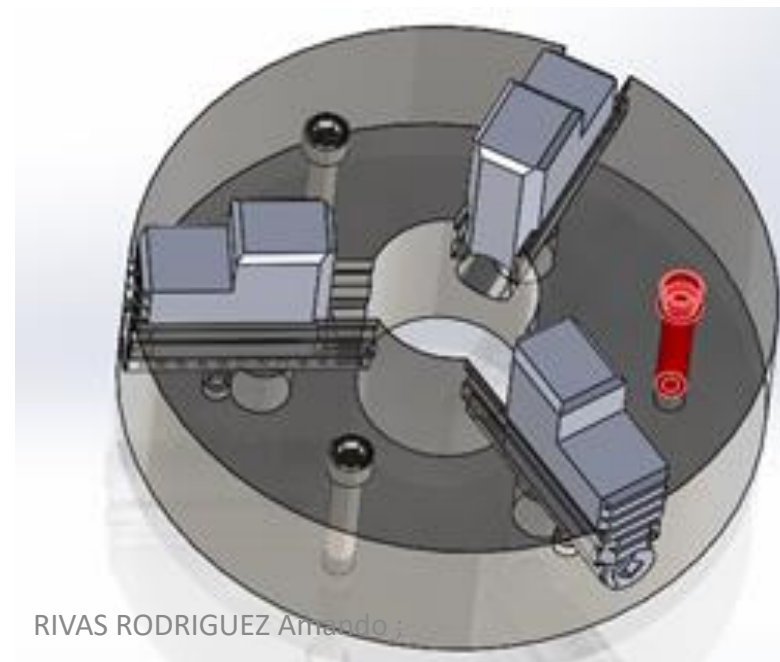
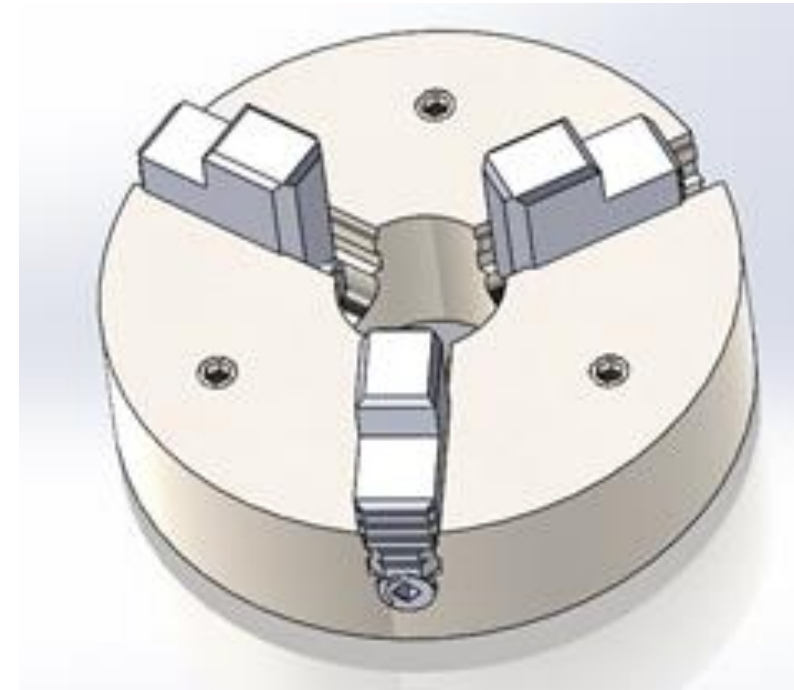
# Methodology

Independent 3-Jaw Chuck  
Assembly, Proprietary Source

- Assembly simulation of a set of parts, jaw, worm, fork and casing.

- 3-Jaw Chuck Model,

- Assembly Interference Analysis



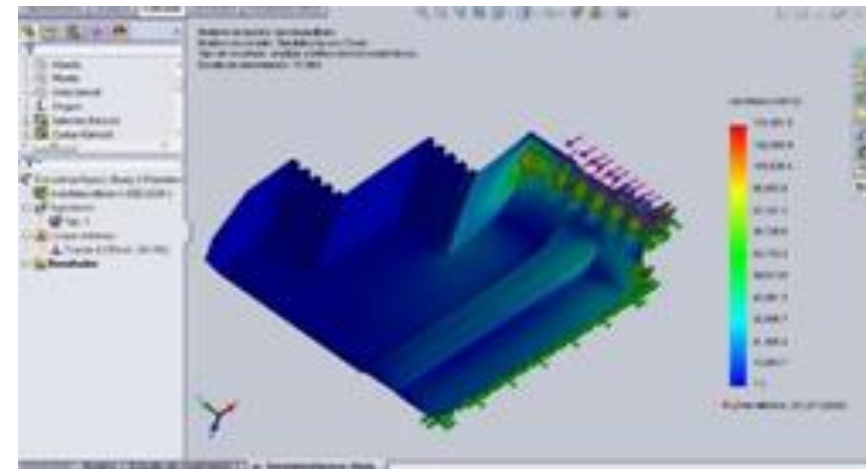
Interference analysis, own source

# Methodology

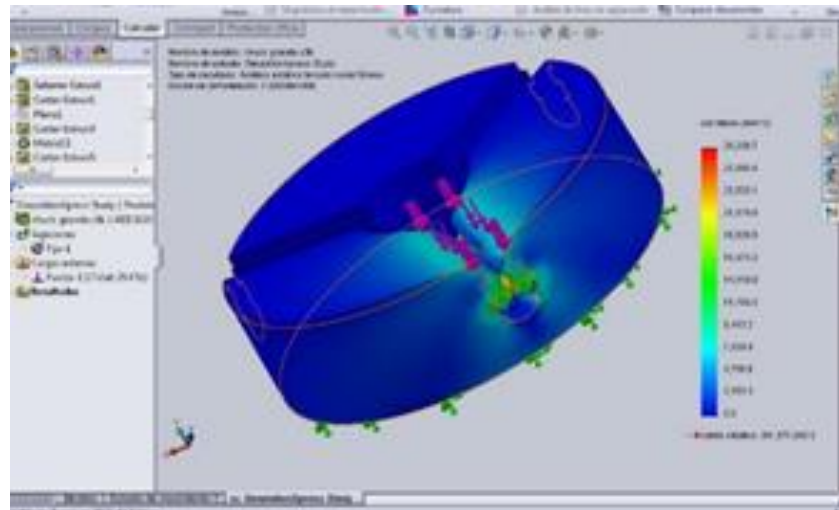
Analysis, CAE computer-aided engineering.

Assignment of material to the designed part and the clamp

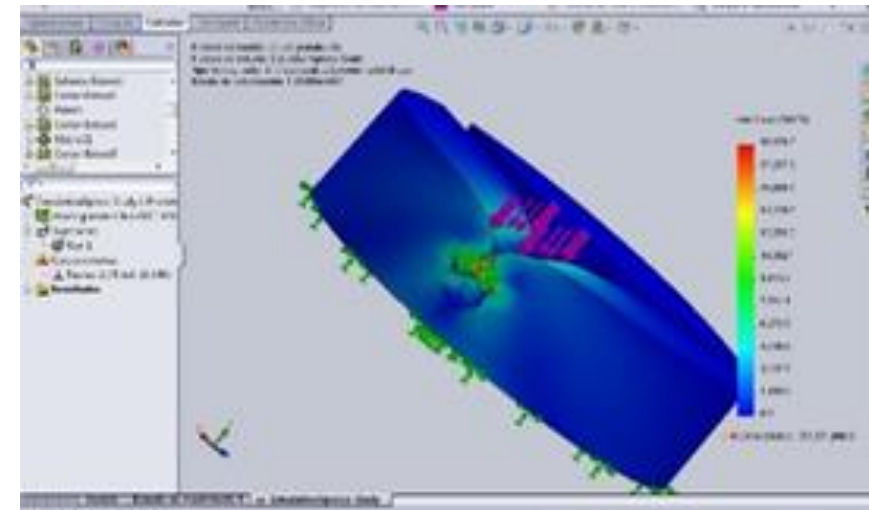
Definition and simulation of compression and shear force



CAE gag analysis, own source



CAE analysis of carcass, own source



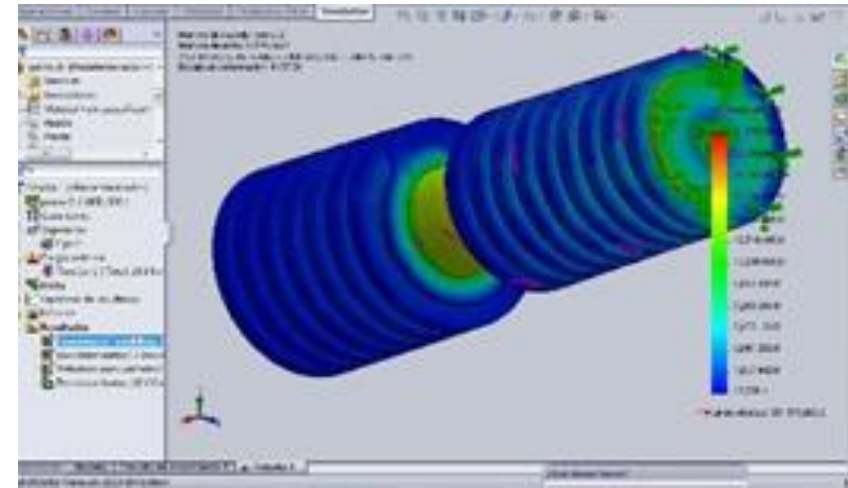
CAE analysis of carcass, own source



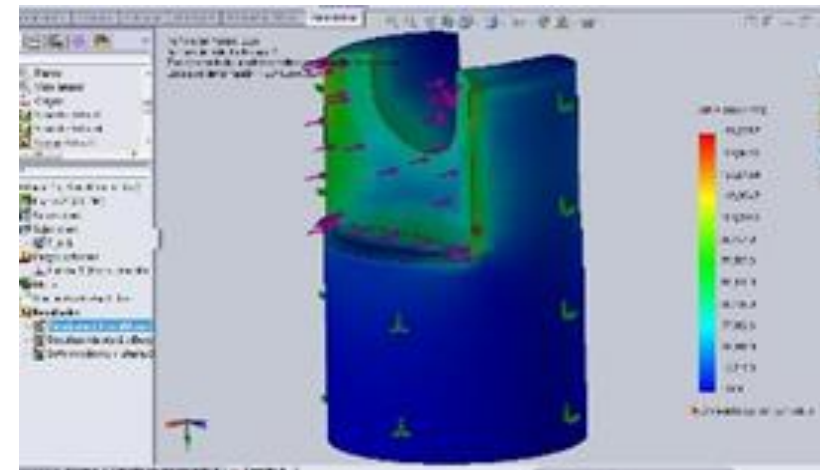
# Introduction

# Methodology

- Analysis, CAE Computer Aided Engineering, Auger and yoke subjected to torsional and shear forces



CAE analysis of endless screw, own source



Fork CAE analysis, own source

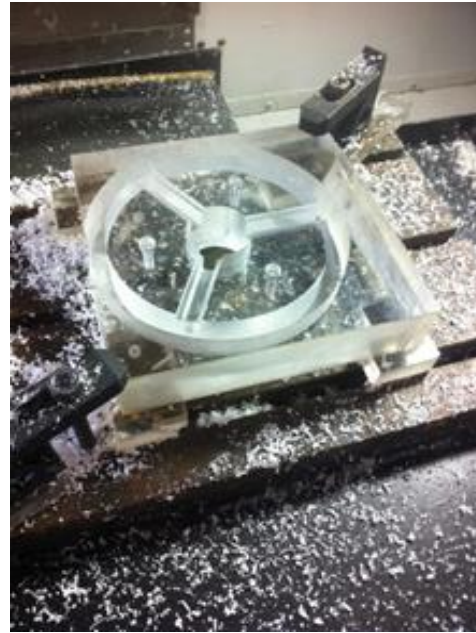


# Introduction

# Methodology

CNC machining

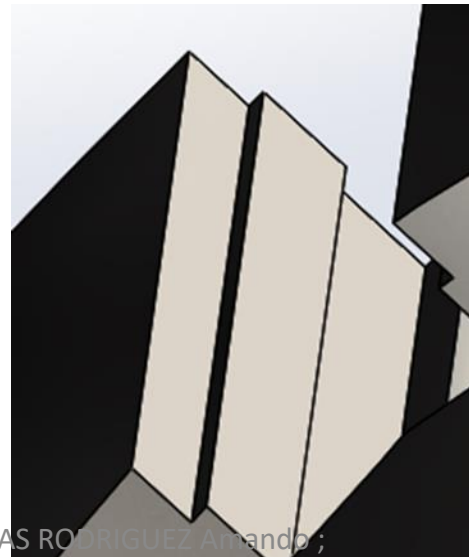
- Shape of circular contour in machining center
- Slots at 120 degrees 4th axis



CNC machined, own source



CNC machined, own source



Housing slot detail view,  
own source

# Methodology

- CNC machining, with 4th axis support.
- 120 degree drilling, worm drive



CNC machined, own source



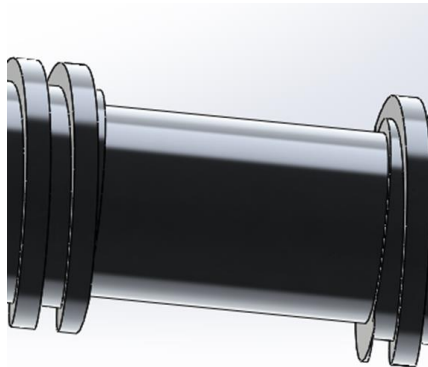
Endless cavity detail, own source



Mounting 4th axis in CNC, own source

# Methodology

Machining around:  
endless screw  
and fork



Octubre - 2022

*Detalle tornillo sinfin, fuente propia*



Fork, own source



Gag, own source



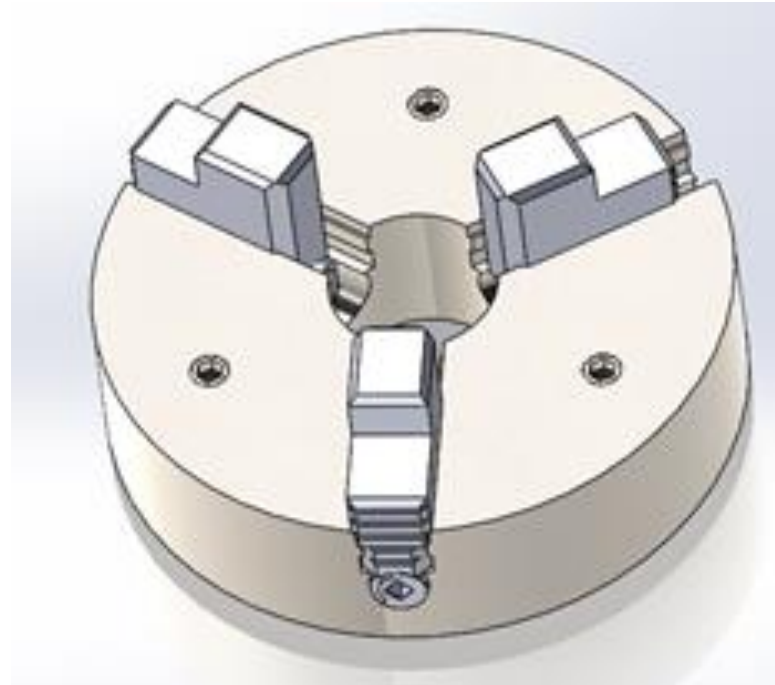
Endless screw, own source

# Results

Parts designed and  
manufactured with CAD, CAM  
CAE:

Body or casing Worm screw  
Fork Jaws

Prototype chuck in acrylic and  
aluminum 1060



Independent 3-Jaw Chuck  
Assembly, Proprietary Source



Acrylic mandrel prototype, own  
source

# Conclusions

The use and application of CAD-CAE-CAM technologies facilitated the realization of the prototype.

The feasibility of manufacturing independent 3-jaw chucks with the available resources was demonstrated.

Minimum errors and time savings with the use and application of CAD-CAE-CAM

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