

Great Designs in

# STEEL



## Progressive Laser Cutting

**Brandon Reinhold**

**Comau LLC**

1. Comau Introduction
  - History
  - Facts and Figures
2. Comau Laser Solutions
  - Laser Experience & Capabilities
  - Solutions Provided Since 1985
  - Metallurgy Lab Capabilities
3. Progressive Laser Cutting
  - Objective / Test Equipment
  - Test Outline
  - Test Summary
4. Conclusions

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# History

**1973**

Several companies in the Turin area create **CO**nsorzio **MA**chine **U**tensili

**1977**

Establishment of **Comau Industriale** with powertrain and body (welding, assembly and handling) divisions

**1978**

**Comau S.p.A.** is established incorporating Comau Industriale activities

**1995 - 97**

Comau opens plants and offices in **Germany, Brazil, Argentina, France** and **India**

**1998**

Establishment of **Comau Service**

**Comau Poland** is established

**1999**

Comau acquires Renault Automation in France and **Pico** in **USA, Mexico, Germany** and **UK**

**2000 - 03**

Comau **China, Romania** and **Russia** are established

**2009**

Establishment of **Comau Aerospace**

**2010**

Establishment of **Comau Adaptive Solutions** and **eComau**

**2013**

**Comau China** in **expansion:** 3 new sites **Kunshan, Shanghai, Dalian**

**2014**

**Comau Czech** and **Turkey** are established

Comau opens office in **Munich (DE)**

**Comau Mexico** expansion

**2015**

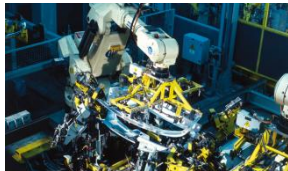
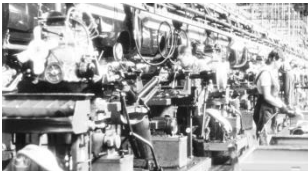
**Comau Thailand** is established

**Comau São Paulo (BR)** is established

**2016**

The **Humanufacturing Innovation Centre** in Pisa is opened

Comau opens an office in **Palo Alto, California**



# A History Rooted in Excellence a Future Driven by Innovation

Comau specializes in producing advanced industrial automation solutions that integrate products, technologies and services to help companies of all sizes increase plant efficiency while lowering operating costs and optimizing returns.

Comau's competency stems from over 40 years of field-proven experience and a strong presence within every major industrial country.



# Comau in the World



# Our Competencies

- Spot, Laser & Arc-welding
- Sealing, Drilling & Riveting
- Machining, Assembly & Test
- Monitoring & Control
- Handling & Logistics

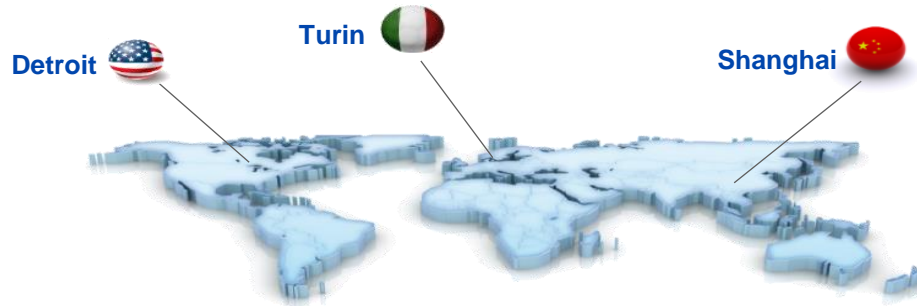
- Maintenance Services
- Consultancy in Manufacturing Process
- Project Management
- Training & Education



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# Comau Laser Experience & Capabilities

- Comau has been involved in laser applications since 1985
- Currently there are hundreds of Comau laser installations in production
- One global team with experienced senior engineers in USA, Europe, Argentina, and China
- Three fully functional laser laboratories in USA, Italy and China for testing and prototyping



# Comau Laser Experience & Capabilities

Customers

Applications

Partners



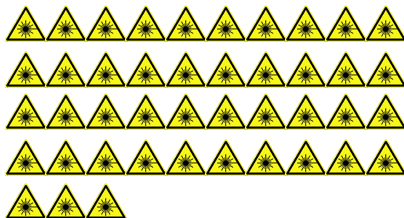
- ✓ Remote Laser Welding
- ✓ Roof Laser Brazing
- ✓ Liftgate Laser Brazing
- ✓ Roof Laser Welding
- ✓ Underbody Laser Welding
- ✓ Laser Cutting



# Laser End Effectors Installed Since 2012



## Laser Welding



## Laser Brazing



## Laser Cutting

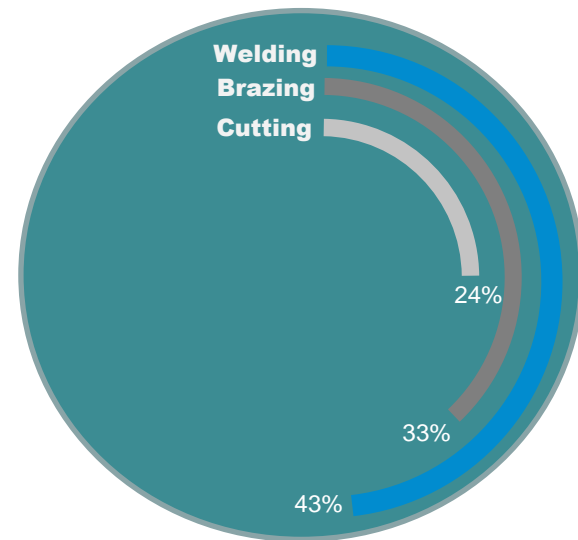


**PRECITEC**

**II-VI HIGHYAG**

**scansonic**

 = 1 End Effector



# Comau Laser Experience

## Global Program

Laser Cutting



Remote Laser Welding



Laser Brazing



## Application

- Front & Rear Doors Remote Laser Welding
- Tailgate Laser Brazing
- Front-end Laser Cutting

Plant	CT
Melfi, Italy	54 s
Pernambuco, Brazil	68 s
Quanzhou, China	68 s

# Comau Metallurgy Lab Capabilities

## Metallurgy Laboratory

- Sectioning
- Mounting
- Grinding/Polishing
- Material Etching
- Microscope Image Analysis
- Hardness Testing
- Tensile/Fatigue/Strength Testing
- 3D Scanning
- XRF Spectrometry

## Offerings

- Training
- Welding Inspection (AWS/CWI Personnel)
- Image Analysis and Measurement
- Material Analysis and Identification



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# Progressive Laser Hole Cutting

## Test Objective

Develop a laser cutting process that can cut holes and shapes without creating a slug.

## Equipment

Robot	Fanuc M20iB 25
Laser	YLS-6000-S2
Fiber	300 micron
Cutting Head	LaserMech FiberCut
Focus	125
Collimation	100
Process Gas	Shop Air 200 psi
Stand Off	.75mm

## Test Location

IPG Photonics Midwest Operations  
46695 Magellan Dr., Novi, MI 48377

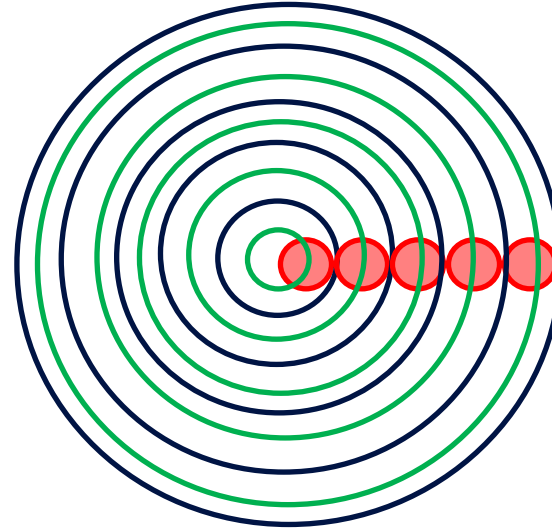


# Progressive Laser Hole Cutting

## Test Objective

Develop a laser cutting process that can cut holes and shapes without creating a slug.

Pass #	Hole Diameter
1	1.750 mm
2	3.125 mm
3	4.500 mm
4	5.875 mm
5	7.300 mm



Actual Hole
Robot Path
Laser Kerf

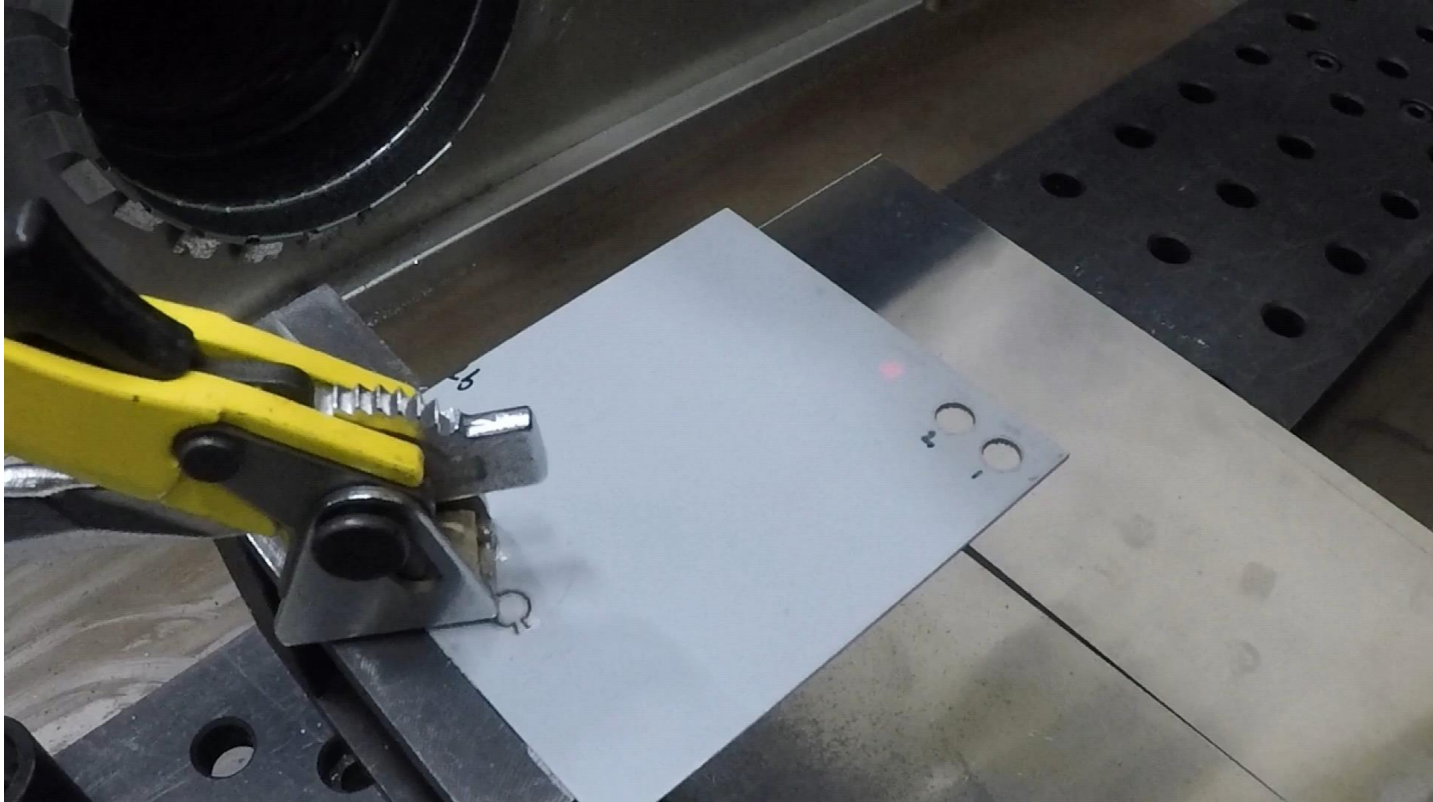
## Robot Path Target

Target	Kerf	Robot Path
7.675 mm	0.375 mm	7.30 mm

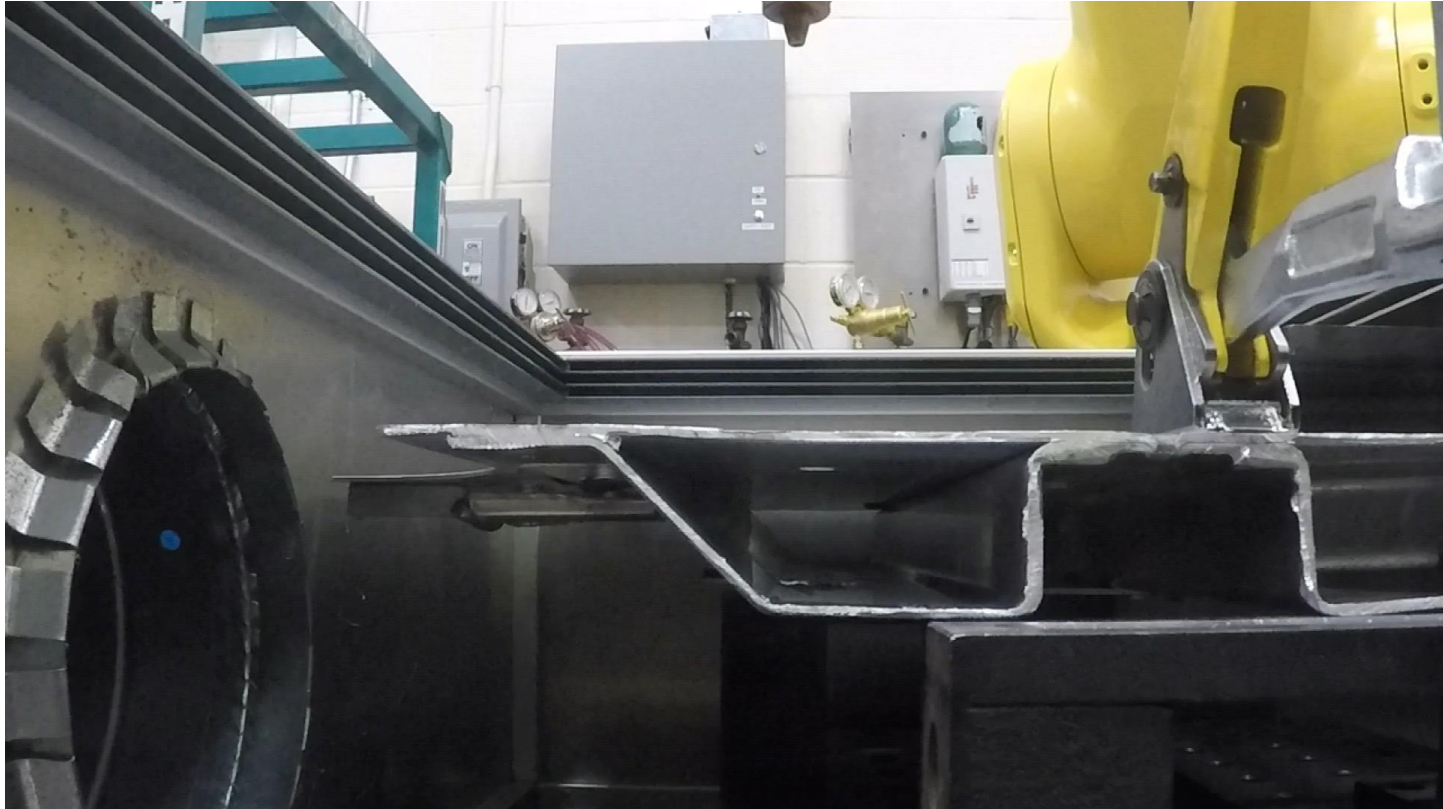
## Target Hole Size

Min	Max	Target
7.60 mm	7.75 mm	7.675 mm

# Progressive Laser Hole Cutting



# Progressive Laser Hole Cutting

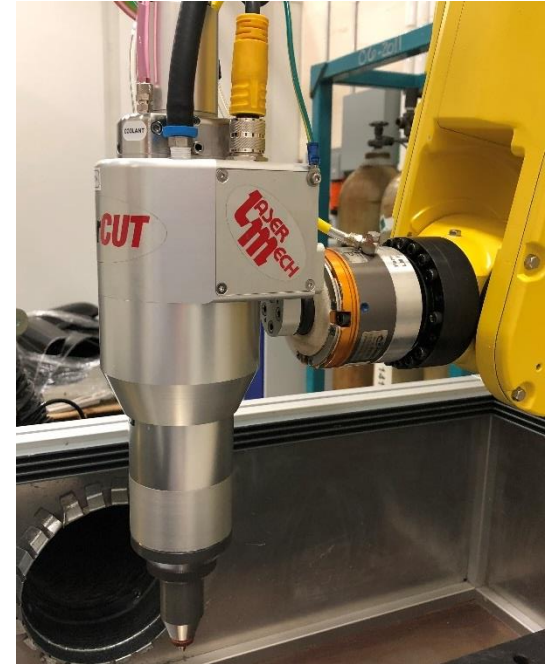


# Progressive Laser Hole Cutting

## Test Summary

The trial achieved good results with an acceptable cleanliness of the parts after cutting (expelled material left from the cutting process), while also meeting the customer's cycle time requirements.

The actual cut time was roughly 5.0 seconds for all 5 cuts, however we need to add in head time and robot move time. The suggested budgeted process cycle time for this process is 6.0 seconds for a 7.675mm hole and 8.25 seconds for a 10.0mm hole in aluminum material.



# Thank you!